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Rev. A

T-BERD 310 Communications Analyzer Reference Manual for the 310-S Option

SEPTEMBER 1995

This manual addresses the T-BERD 310-S Option for use with the T-BERD 310 Revision G or greater software.

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1.1 INTRODUCTION

This section provides an overview of the Telecommunications Techniques Corporation (TTC) T-BERD 310 Communications Analyzer with the 310-S Option installed, as well as information on available TTC options, accessories and cables, instrument setup and checkout procedures, and maintenance and service information. Refer to Section 2 for more information on the front- and side-panel controls, indicators, and connections.

Refer to the *T-BERD 310 User's Guide* for information on setting up and operating the T-BERD 310 in various in-service and out-of-service applications.

1.2 INSTRUMENT OVERVIEW

The T-BERD 310 is a portable test instrument that can test and analyze SONET, DS3, and DS1 transmission systems from SONET, DS3, and DS1 access points during circuit installation, acceptance testing, and fault isolation. The T-BERD 310 can generate and receive test patterns for out-of-service testing, or monitor SONET, DS3, and DS1 circuits without service interruption. Options can be added which enable the T-BERD 310 to perform DS1 testing, drop and insert a DS1 channel on a live DS3 line, drop E1 channels, and drop and insert OC-3, OC-3c, DS3 and DS1 payloads on SONET signals.

The following information describes the standard and optional features for the T-BERD 310.

1.2.1 Standard Features

The T-BERD 310 offers the following standard features:

Enhanced user interface allows DS3 circuit testing using unframed, M13 framed, C-bit parity framed, multiplexed (channelized) M13 framed, multiplexed C-bit parity framed, and THRU mode formatting. Re-engineered test setup switches and status and alarm LEDs for DS3, SONET and ATM make test setup configuration easy.

Multiplexed C-Bit parity and M13 framed operating modes enable the T-BERD 310 to insert DS1 D4 or ESF formatted test patterns or loop codes into the DS3 signal.

Automatic configuration mode allows the T-BERD 310 to configure itself automatically to the received DS3 signal framing and pattern.

Standard and programmable DS3 test patterns are selectable from a front-panel switch.

Five side-panel DS3 outputs provide the same signal as the front-panel output jack.

Simultaneous test result accumulation minimizes the time needed to test for logic errors, BPVs, M13, C-bit parity and frame errors, performance analysis (errored and error free seconds), and signal measurements (frequency, signal loss time, power, and pulse shape).

A SUMMARY test results category displays key non-zero and "out-of-spec" test results, eliminating the need to search through long lists of test results.

Pulse shape analysis measures the height, width, rise time, and fall time of the DS3 pulse. The pulse shape can be compared to pulse shape specifications outlined in the proposed CCITT G.703, ANSI T1.102-1991, ANSI T1.102-1993, and ANSI T1.404-1993 specifications. A pulse shape graph showing the pulse shape and pulse shape mask can also be printed on a graphics compatible printer (e.g., the TTC PR-40A Thermal Printer).

Pattern slips can be counted between the transmitted and received signal by testing the circuit with pseudorandom test patterns.

Logic error, BPV, and frame error insertion capabilities enable the T-BERD 310 to simulate errors as they occur. Errors can be inserted singly, in bursts at preselected durations and error rates, or continuously at preselected error rates.

Connecting a printer to the T-BERD 310 allows generation of test results, signal status and alarm messages, front-panel switch configurations, and pulse shape graphs. The T-BERD 310 comes equipped with an RS-232-C serial interface or optional IEEE-488 interface (IEEE-488 Option).

An internal 20-kbyte print buffer allows printouts to be stored until a printer is connected to the T-BERD 310. The print buffer is battery-backed which allows power to be turned off without losing the printout information.

Customized test result printouts can be created for specific tests.

Remote control operation enables the T-BERD 310 to be installed at a remote location or in a manufacturing test facility. An RS-232-C serial interface or optional IEEE-488 interface (IEEE-488 Option) is available for remote control operation.

Multiple displays enable the operating mode, test pattern, and two test results to be displayed on the front panel at the same time.

Audible alarms can be used to indicate pattern synchronization, threshold errored seconds, and any other error event.

DS1 channels can be dropped from a DS3 signal to the DS1/DS0 Analyzer Option or an external DS1 test set.

DS2 frame synchronization and loss detection LEDs provide status and alarm indications on the front panel.

Far-End Alarm and Control (FEAC) messages can be monitored and displayed on the front panel and reported in a printout. FEAC messages can also be selected and transmitted from the T-BERD 310.

1.2.2 Optional Features

The following optional features are available for the T-BERD 310. Unless otherwise indicated, the T-BERD 310 can be upgraded in the field with one or more of the options. Contact TTC at (800) 638-2049 for additional information on upgrading the T-BERD 310 .

310-1 DS1/DS0 Analyzer Option

The user-installed DS1/DS0 Analyzer Option allows the T-BERD 310 to test and analyze DS1 and DS0 channels from either a SONET, DS3 or DS1 access point. All 28 DS1s can be scanned from either a SONET or DS3 signal for frame synchronization, frame loss, frame errors, CRC errors, timing slips, and alarms. A user interface is housed in the T-BERD 310 front cover allowing easy access and control over the DS1/DS0 analyzer. This option provides DS1 (input and output), datalink (ESF and SLC), DS0, and VF signal access through the T-BERD 310 side panel. Refer to Section 2.8 for additional information on the DS1/DS0 Analyzer Option.

310-2 E1 Drop Option

The user-installed E1 Drop Option enables the T-BERD 310 to drop both DS1 and E1 channels from the DS3 signal. This option adds a 3-pin banana jack to the side panel. The DS1 channels can be analyzed with the DS1/DS0 Analyzer Option or an external DS1 test set, such as the TTC T-BERD 211. The E1 channels can be analyzed by an external E1 test set, such as the TTC INTERCEPTOR 1402 Communications Analyzer. Refer to Section 2.15 for additional information on the E1 Drop Option.

310-3 DS1 Insert Option

The user-installed DS1 Insert Option enables the T-BERD 310 to insert a DS1 channel into a live DS3 signal without affecting the DS3 signal or the other 27 DS1 channels. This option provides a secondary DS3 receiver and a DS1 input. The secondary DS3 receiver allows the DS3 signal to pass through the T-BERD 310 and accommodate the insertion of the DS1 channel. The secondary DS3 signal can be monitored from the front panel and tested for in-service BPV, frame, M13 parity, C-bit parity, FEBE errors, and the received frequency.

The secondary DS3 receiver also enables the T-BERD 310 to perform full-duplex (bi-directional) in-service monitoring of a DS3 line. The DS1 input allows a DS1 channel to be inserted from an external DS1 source. A DS1 channel can also be inserted from the DS1/DS0 Analyzer Option. Refer to Section 2.20 for additional information on the DS1 Insert Option.

310-5 DS3 Jitter Option

The user-installed DS3 Jitter Option enables the T-BERD 310 to measure the DS3 signal for wideband and highband jitter. The option provides test results that measure the current wideband and highband peak-to-peak jitter and the maximum wideband and highband peak-to-peak jitter since the start of the test. The results are presented in Unit Intervals (UIs). The option also provides an output that can drive an external spectrum analyzer to determine the amplitude and frequency components of the jitter. Refer to Section 2.31 for additional information on the DS3 Jitter Option.

310-6 IEEE-488 Option

The user-installed IEEE-488 Option enables the T-BERD 310 to communicate with IEEE-488 compatible devices. This option adds an IEEE-488 interface which complies with the IEEE Standard Interface for Programmable Instrumentation (STD 488-1978) standard. This interface offers both addressable and talk-only operating modes for remote control and printer operation. Refer to Section 3 or 4 for additional information on the IEEE-488 Option.

310-7 220 V Option

The factory-installed 220 V Option configures the T-BERD 310 with a 220 VAC power supply. Newer units are equipped with auto-ranging power supplies.

310-8 358 Connector Option

The factory-installed 358 Connector Option configures the T-BERD 310 with WECO 358 jacks; replacing the WECO 560A jacks.

310-9A Enhanced ESF/DS1 Timing Slips Option

The user-installed 310-9A Enhanced ESF/DS1 Timing Option adds the following functions to the DS1/DS0 Analyzer Option.

- Test and analyze the ESF and ZBTSI datalink ANSI T1.403 Performance Report Messages (PRM).
- Generate PRMs on the transmitted signal which are based on the received DS1 signal.
- Generate ESF and ESFz out-of-band loop codes.
- Adds the ESFz operating mode which enables the DS1/DS0 Analyzer Option to test and analyze ZBTSI-encoded (Zero Byte Time Slot Interchange) ESF circuits.
- Adds the DS1 timing slip test result which enables the DS1/DS0 Analyzer Option to measure bit and frame slips between two DS1 signals.

Refer to Section 2.8 for additional information on the DS1/DS0 Analyzer Option.

310-9B Enhanced DS1 Testing Option

The user-installed Enhanced DS1 Testing Option adds the following test capabilities to the DS1/DS0 Analyzer Option. This option obsoletes the 310-9A option.

- Tests and analyzes the ESF datalink ANSI T1.403 Performance Report Messages (PRM).
- Generates PRMs on the transmitted signal which are based on the received DS1 signal.
- Generates ESF out-of-band loop codes.
- Adds the DS1 timing slip test result which enables the DS1/DS0 Analyzer Option to measure bit and frame slips between two DS1 signals.
- Adds Fractional-T1 testing.
- Adds long user patterns (LUP).
- Adds an ESF datalink timing synchronization message test result.

Refer to Section 2.8 for additional information on the DS1/DS0 Analyzer Option.

310-10 G.821 Results Option

The user-installed G.821 Results Option adds the CCITT Recommendation G.821 performance analysis test results to the T-BERD 310 and DS1/DS0 Analyzer Option. The G.821 results include available seconds, % available seconds, severely errored seconds (except the 310-1), % severely errored seconds, consecutive severely errored seconds (except the 310-1), degraded minutes, % degraded minutes, and unavailable seconds. Refer to Section 2.74 or 2.83 for additional information on the G.821 Results Option.

310-11 Three Slot Expansion Option

This T-BERD 310 chassis provides three additional PC board slots for a fully optioned T-BERD 310. Without this option, up to three of the following options can be installed: 310-1, 310-3, 310-5, 310-12 or 310-16.

310-12 SONET OC-12 Transmit/Receive Option

The user-installed SONET OC-12 Transmit/Receive Option provides both SONET transmit and receive signals, OC-3c, DS3, and DS1 payload drop and insert, and through mode capabilities at the OC-12 rate. The 310-14R and 310-14T pair (310-14R/T pair) option is required to support this option. Refer to Section 2.26 for additional information on the SONET OC-12 Transmit/Receive Option.

310-12-DUAL SONET Dual-Wavelength OC-12 Transmit Option

The SONET Dual-Wavelength Transmitter Option is a factory upgrade that allows the transmission of either 1310 nm or 1550 nm wavelengths from a SONET OC-12 transmitter.

310-13R SONET STS-1 Receive Option

The user-installed SONET STS-1 Receive Option provides SONET receive signal input and DS3 or DS1 payload drop capabilities at the STS-1 rate. SONET DCC drop and insert (310-13T required) capabilities are also provided. Refer to Section 2.26 for additional information on the SONET STS-1 Receive Option.

310-13T SONET STS-1 Transmit Option

The user-installed SONET STS-1 Transmit Option provides SONET transmit signal output and DS3 or DS1 payload insert capabilities at the STS-1 rate. SONET orderwire drop (310-13R required) and insert capabilities and a DS1 BITS clock input are also provided. Refer to Section 2.26 for additional information on the SONET STS-1 Transmit Option.

310-14R SONET STS-1, OC-1, OC-3 Receive Option

The user-installed SONET STS-1, OC-1, OC-3 Receive Option provides SONET receive signal inputs and OC-3c (OC-3 only), DS3, or DS1 payload drop capabilities at the STS-1, OC-1, and OC-3 rates. SONET DCC drop and insert (310-14T required) capabilities are also provided. Refer to Section 2.26 for additional information on the SONET STS-1, OC-1, OC-3 Receive Option.

310-14T SONET STS-1, OC-1, OC-3 Transmit Option

The user-installed SONET STS-1, OC-1, OC-3 Transmit Option provides SONET transmit signal outputs and OC-3c (OC-3 only), DS3, or DS1 payload insert capabilities at the STS-1, OC-1, and OC-3 rates. SONET orderwire drop (310-14R required) and insert capabilities and a DS1 BITS clock input are also provided. Refer to Section 2.26 for additional information on the SONET STS-1, OC-1, OC-3 Transmit Option.

310-14T-DUAL SONET Dual-Wavelength OC-1, OC-3 Transmit Option

The SONET Dual-Wavelength Transmitter Option is a factory upgrade that allows the transmission of either 1310 nm or 1550 nm wavelengths from a SONET OC-1/3 transmitter.

310-15 OC-3c ATM Option

The user-installed OC-3c ATM Option provides the T-BERD 310 with asynchronous transfer mode (ATM) test functionality at the OC-3c rate for the SONET options: 310-14R/T. Refer to Section 2.36 for additional information on the OC-3c ATM Option.

310-16 Optical Media Test Option

The Optical Media Test Option is a user-installed card that enables the T-BERD 310 to measure optical power and return loss on a fiber optic cable. The card also provides a stable laser source to perform end-to-end insertion loss measurements. Refer to Section 2.41 for additional information on the Optical Media Test Option.

1.3 ACCESSORIES AND CABLES

Table 1-1 lists accessories and cables for the T-BERD 310. Contact TTC for additional information on accessories and cables at (800) 638-2049.

Table 1-1
T-BERD 310 Accessories and Cables

Model	Description
10966	Thermal printer paper (10 rolls)
11255	RJ-11 orderwire handset
12189	Software upgrade to the T-BERD 310 Communications Analyzer
12539	T-BERD 310 calibration kit
41306-02	Soft carrying case
41306-03	Expanded soft carrying case for the 310-11
41846-01	19" rack mount for the T-BERD 310
41846-02	23" adaptor kit for the T-BERD 310
42138-01	19" Rack mount for the 310-1
42138-02	23" adaptor kit for the 310-1
DTM	TTC Distributed Test Manager software package
ML11826	Replacement T-BERD 310 Communications Analyzer operating manual set
PR-35	Rack mount printer
PR-40A	Thermal printer
2002	FC(PC) singlemode fiber optic (3 m) cable
2150	FC(PC) to biconic hybrid fiber optic (singlemode, 3 m) cable
2152	FC(PC) to D4(PC) singlemode fiber optic (3 m) cable
2541	FC(PC) to biconic singlemode fiber optic connector converter sleeve
2542	FC(PC) to D4(PC) singlemode fiber optic connector converter sleeve
2543	FC(PC) to ST(PC) singlemode fiber optic connector converter sleeve
2803	FC singlemode fiber optic barrel connector
2804	D4 singlemode fiber optic barrel connector
2805	Biconic singlemode fiber optic barrel connector
10420	WECO 310 to WECO 310 (10') cable
10558	WECO 310 plug to alligator clips (10') cable
10559	WECO 310 plug to bantam plug (10') cable
10598	WECO 310 to WECO 310 (4') cable
10599	WECO 310 plug to bantam plug (4') cable

Model	Description
10830	440A to BNC adaptor cable
10831	358 to BNC adaptor cable
30598-02	440A to 440A adaptor (1') cable
30598	440A to 440A adaptor (10') cable
30599	440A to 358 adaptor (10') cable
30662	BNC to BNC (6') cable
30667-01	358 to 358 (1') cable
30667-02	358 to 358 (1') cable
30667	358 to 358 (10') cable
30687	3-pin banana to 3-pin banana (10') cable
30697	WECO 310 plug to mini-test clips (6') cable
30767	BNC to push-on jack adaptor(10') cable
30914	WECO 310 plug to 3-pin banana (6') cable
31174	9-pin D to 25-pin D, DS0 Drop (6') cable
31211	440 male to 358 female adaptor (8") cable
42414	Split dual WECO 310 to male 15-pin D (10') cable
42836	15-pin to 37-pin adaptor cable

1.4 UNPACKING AND INITIAL INSPECTION

The T-BERD 310 shipping container should be inspected for the equipment included with the shipment (see Section 1.5) and for any signs of damage. If the shipping container or shipping material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument is checked mechanically and electrically. The electrical performance of the instrument can be checked by performing the instrument checkout procedure in Section 1.9. If the contents of the shipment are incomplete or if the T-BERD 310 does not pass the checkout procedure, notify TTC Customer Service at (800) 638-2049. If the shipping container is damaged, notify the carrier and TTC. Keep the shipping container and materials for the carrier's inspection.

1.5 EQUIPMENT INCLUDED

The following items should be present when the T-BERD 310 is received and unpacked.

- T-BERD 310 Communications Analyzer with front-panel cover
- 3-prong AC line cord
- T-BERD 310 Reference Manual
- T-BERD 310 User's Guide
- 1-foot loopback cable
- Snap-on pouch

Check the purchase order against the rear-panel option stickers to verify that the ordered options are installed.

1.6 WARNINGS

The following warnings must be observed before and during all phases of instrument operation. Failure to comply with these and other specific warnings contained elsewhere in this manual may cause physical harm to the operator and/or damage to the instrument. TTC assumes no liability due to the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an approved 3-contact electrical outlet or used with a 3-contact to 2-contact adaptor with the grounding wire firmly connected to an electrical ground at the power outlet.

KEEP AWAY FROM LIVE VOLTAGES

Do not remove the instrument's top cover or insert fingers or other objects through the side panel holes while power is applied.

DO NOT OPERATE IN AN AMBIENT TEMPERATURE ABOVE 122°F (50°C)

Do not operate the instrument in ambient temperatures that exceed 45°C. Operating this unit in temperatures above 45°C can cause damage to the instrument.

REPLACE BLOWN AC FUSE WITH A PROPERLY RATED FUSE

Do not operate the instrument with an improperly rated AC fuse. An improperly rated fuse can cause damage to the instrument.

1.7 POWER REQUIREMENTS

Older T-BERD 310 units are configured with either a single phase, 115 VAC, 50/60 Hz power supply or a factory-installed 220 VAC, 50/60 Hz power supply. Newer units are configured with a single phase, 115/220 VAC, 50/60 Hz power supply. The power supply automatically accepts either a 115 or 220 voltage source. Refer to Section 1.10.2 for more information on fuse requirements and replacement.

1.8 SETTING UP THE T-BERD 310

The following procedure describes how to setup the T-BERD 310.

1.8.1 Opening the T-BERD 310

Perform the following procedure to open and apply power to the T-BERD 310.

1. **Set the instrument on a flat surface**

2. **Raise the front of the instrument (see Figure 1-1)**
   Extend the two bottom front feet to raise the front panel up for better viewing and allow the front cover to be opened.

3. **Press down on the two front-cover buttons and open the cover**
   The cover is designed to lay flat on the table while still attached to the instrument. If the DS1/DS0 Analyzer Option is installed in the cover, the cover should remain attached to the instrument.

4. **Connect the AC power cord on the side panel**
   Verify that the **AC Power** switch is set to OFF (the "0" side is down) before connecting the power cord to an AC outlet.

5. **Press the AC Power switch (the "1" side is down) to turn the power ON**
   During an initial power-up sequence, the instrument performs a diagnostic self-test that is described in Section 1.8.2.

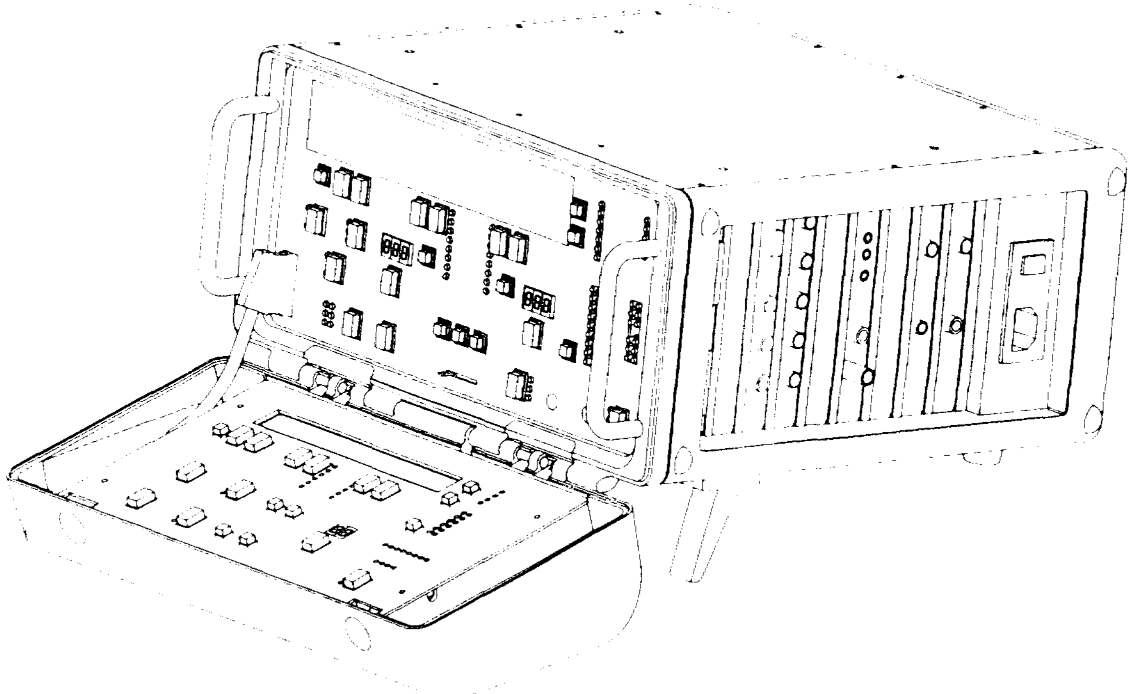

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Figure 1-1
Opening the T-BERD 310

1.8.2 Power-Up Self-Test

The instrument performs the following diagnostic self-test upon power-up:

- The mainframe software version appears in the display and all of the front-panel LEDs momentarily illuminate. This provides a visual inspection of the LEDs. If an LED is burned out, make note of it. A burned-out LED does not affect normal operation, but should be repaired to avoid confusion and inconvenience.

- All front-panel switches are checked. If a switch is found to be stuck in an active position, a message is displayed (see Appendix B) indicating a switch is stuck. A switch identified as stuck becomes inoperative. A stuck switch does not affect normal operation, but should be repaired to avoid confusion and inconvenience.

- The instrument configuration stored in the NOVRAM data is checked. If the data has not changed since the last power down, the instrument is configured accordingly. If options are installed, removed, or software is changed, NOVRAM is automatically reloaded; this normal and is not a cause for concern. If errors are found in the NOVRAM data, the message *RELOADING NOVRAM* is displayed, the factory default settings are reloaded, and the front panel is configured accordingly. The T-BERD 310 remains fully functional even though the instrument configuration may not have been saved during the power cycle. While the instrument may be used, TTC should be called for service at (800) 638-2049.

- The internal components are checked. If faults are found in the internal components, specific messages are displayed. In the event that a self-test error message is displayed, record the message and call TTC for assistance. There are no user-serviceable parts in the T-BERD 310, except the fuse located on the side panel.

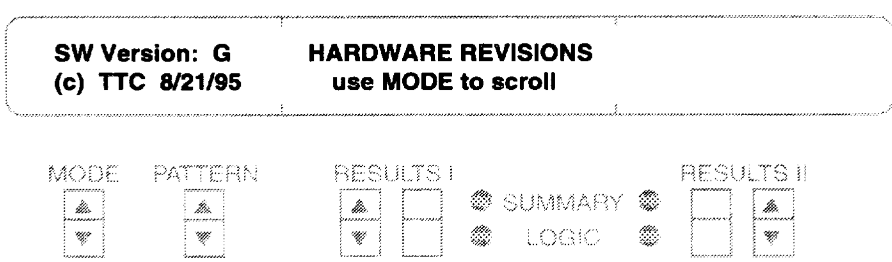
- The pulse shape measurement capability is calibrated.

During power up two functions can be performed, reloading NOVRAM with the factory default settings, and checking the current software and hardware versions installed in the test set.

To reload the factory default settings, press and hold the **RESTART** switch while turning the power on (press the **AC Power** switch). Release the **RESTART** switch when the message *RELOADING NOVRAM* appears (less than 1 second) to allow the power-up sequence to continue. If the **RESTART** switch is pressed too long the message *STUCK KEYS DETECTED* appears. Release the switch and the power-up sequence continues. When the power-up self-test is completed, the front panel should look like Figure 1-2. Refer to Appendix A for a list of the factory default settings.

To display the current software and hardware versions press the **MODE** switch during power up as illustrated in the following steps. The displayed information may appear differently depending the T-BERD 310's configuration.

1. **Press and hold MODE switch down arrow for 5 seconds while turning power on**
   The following information appears.



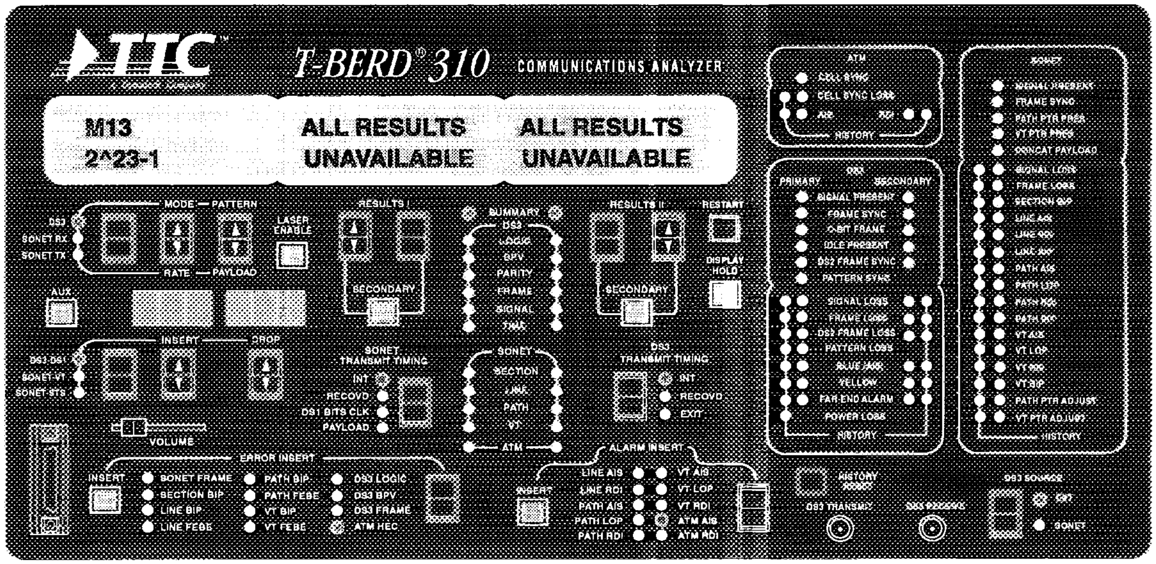


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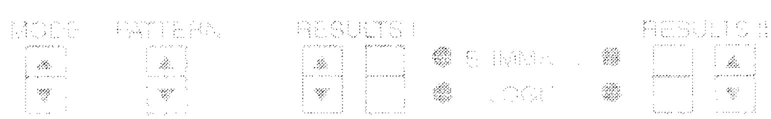
Figure 1-2
Front Panel After Power-Up

2. **Release the MODE switch**
   Release the switch and the first hardware revision appears.

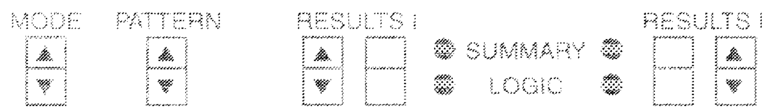
SW Version: G	**IEEE-488 OPTION**
(c) TTC 8/21/95	**not installed**



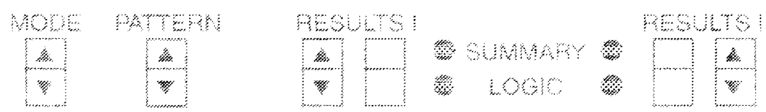
3. Press the MODE switch down arrow

Press successive times to scroll through the list of installed boards and options.

SW Version: G TRANSMITTER BOARD
(c) TTC 8/21/95 Module code = 00



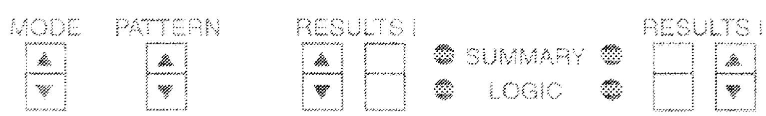
SW Version: G G.821 RESULTS OPTION
(c) TTC 8/21/95 not installed



4. Press the MODE switch down arrow

After the last hardware revision is scrolled by, the power-up sequence continues with the software version displayed and the front-panel LEDs illuminating.

SW Version: G
(c) TTC 8/21/95



1 T-BERD 310-S

It is recommended that all switches be left in the positions they were in when the problem occurred. This is requested so that the TTC Instrument Service Center can analyze the switch positions along with a detailed description of the problem or of the service requested.

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC-issued RA number on the outside of the package and ship it prepaid and insured to TTC.

INSTRUMENT DESCRIPTION

INSTRUMENT DESCRIPTION

2.1 INTRODUCTION

This section describes the controls, indicators, connections, and test results used to set up and operate the T-BERD 310 mainframe (see Figure 2-1) and the available options.

The T-BERD 310 mainframe is described first, and then the major options are described afterwards in separate sections as follows:

- DS3 Testing
- 310-1 DS1/DS0 Analyzer Option
  - 310-9A Enhanced ESF/DS1 Timing Slips Option
  - 310-9B Enhanced DS1 Testing Option
- 310-2 E1 Drop Option
- 310-3 DS1 Insert Option
- SONET Options
  - 310-12 SONET OC-12 Transmit/Receive Option
  - 310-13R SONET STS-1 Receive Option
  - 310-13T SONET STS-1 Transmit Option
  - 310-14R SONET STS-1, OC-1, OC-3 Receive Option
  - 310-14T SONET STS-1, OC-1, OC-3 Transmit Option
- 310-5 DS3 Jitter Option
- 310-15 OC-3c ATM Option
- 310-16 Optical Media Test Option
- Auxiliary Functions
- Test Results
  - 310-10 G.821 Test Results Option

After the options are described, complete descriptions of the auxiliary functions and test results are also separated into subsections.

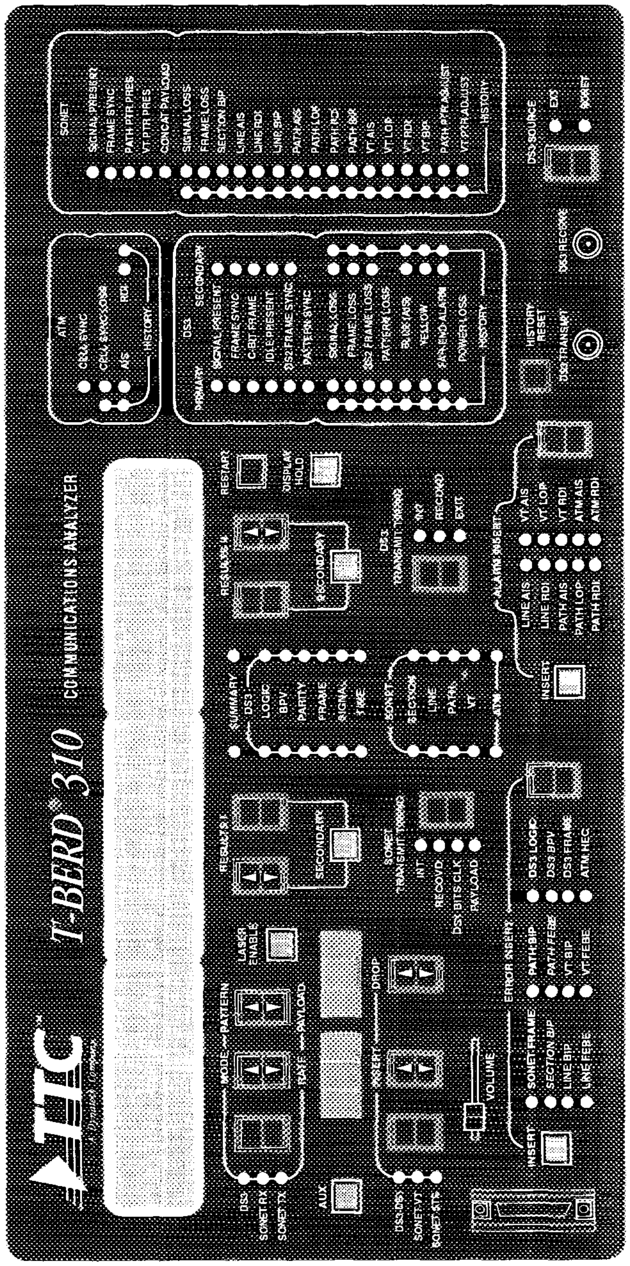


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Figure 2-1
T-BERD 310 Front Panel

DS3

DS3 TESTING

2.2 INITIAL TEST SETUP

The following controls and indicators (see Figure 2-2) are used to initially configure the T-BERD 310 to test a circuit from a DS3 access point. The controls and indicators are described in the order that you would normally use them.

2.2.1 DS3 SOURCE Switch (1)

The **DS3 SOURCE** switch is used to select the DS3 signal from either a side-panel SONET input signal or front-panel DS3 input signal. The switch is functional only when a SONET receive option is installed. The switch selections include:

EXT — Selects the DS3 RECEIVE jack as the DS3 input source.

SONET — Selects the internal DS3 signal dropped from one of the side-panel SONET input connections as the DS3 source.

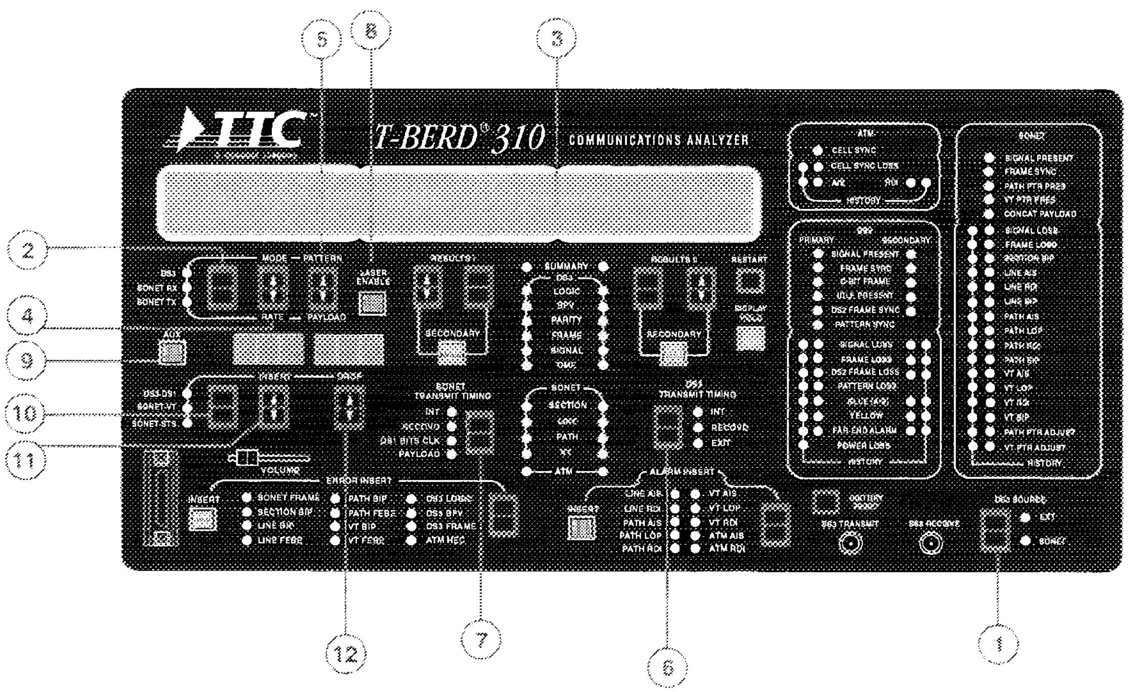

Figure 2-2
Test Setup Controls and Indicators

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2.2.2 SETUP Switch 2

The **SETUP** switch is used to select the way mode and test pattern information is changed and displayed on the left window of the display. This switch is functional only when the appropriate SONET options are installed. The switch selections include:

DS3 — Uses the **MODE/RATE** and **PATTERN/PAYLOAD** switches to effect changes to the DS3 transmit and receive signals.

SONET RX — Available only with a SONET receiver installed. Refer to Section 2.25 for information on the SONET options.

SONET TX — Available only with a SONET transmitter installed. Refer to Section 2.25 for information on the SONET options.

2.2.3 Front-Panel Display 3

Operating modes, test patterns, results, and auxiliary functions are viewed in the display shown in Figure 2-2. The display is divided into three 2-line windows. The left window indicates the current operating mode and test pattern. The operating mode and test pattern are selected by pressing the **MODE** and **PATTERN** switches. The other two windows, identified as RESULTS I and RESULTS II, display the results and instrument status messages. The RESULTS windows are controlled by the **RESULTS** switches.

All three windows of the front-panel display are used to configure auxiliary functions (**AUX** switch is illuminated). The selected auxiliary group and function name are indicated in the left MODE/PATTERN window. The other two windows indicate the available selections for the auxiliary function.

2.2.4 MODE/RATE Switch 4

NOTE: This section describes using the **MODE/RATE** switch for DS3 testing. Refer to Section 2.25 for information on using this switch with a SONET option.

The operation of the **MODE/RATE** switch depends on the setting of the **SETUP** switch.

- When DS3 is selected, the **MODE/RATE** switch is used to select the DS3 transmit and receive framing mode for the T-BERD 310.
- When SONET RX is selected, the **MODE/RATE** switch can be used to select the receive SONET rate.
- When SONET TX is selected, the **MODE/RATE** switch can be used to select the output transmit rate.

When DS3 is selected, and the **AUX** switch is not activated, the **MODE** switch selects the DS3 transmit and receive framing for the T-BERD 310. This should match the circuit being tested. If the framing format is unknown, select the AUTO mode to allow the T-BERD 310 to automatically analyze the received signal and configures itself accordingly.

Press the **MODE** switch to scroll through the available operating modes in the MODE window. Allowing the selected mode to be displayed for more than one second configures the T-BERD 310 for that mode and restarts the test. Press the **MODE** switch to select one of the following modes:

M13 — Configures the T-BERD 310 to test non-channelized DS3 M13 formatted signals.

C-BIT — Configures the T-BERD 310 to test non-channelized DS3 C-bit parity formatted signals.

MUXED M13 — Configures the T-BERD 310 to generate a multiplexed (channelized) DS3 M13 signal. The multiplexed DS3 signal contains embedded DS2 and DS1 framing. DS1 level test patterns are selectable with the **PATTERN** switch. The test pattern is inserted into the desired DS1 channels using the **DS3-DS1 CHANNEL INSERT** switch.

MUXED C-BIT — Configures the T-BERD 310 to generate a multiplexed (channelized) DS3 C-bit parity signal. The multiplexed DS3 signal contains embedded DS2 and DS1 framing. DS1 level test patterns are selectable with the **PATTERN** switch. The test pattern is inserted into the desired DS1 channels using the **DS3-DS1 CHANNEL INSERT** switch.

DS1 INSERT — Appears when the DS1 Insert Option is installed.

THRU — Configures the receiver to scan and synchronize to the DS3 input signal framing and pattern information. The transmitter retransmits the received framing and pattern as it is received, including any errors (not BPVs). In THRU mode, the **DS3 TRANSMIT TIMING** switch defaults to RECOVD timing.

If the received signal is recognized as a test pattern:

- The test pattern name appears in lowercase characters in the PATTERN window.
- The transmitter retransmits the received signal, including errors (not BPVs).
- Logic errors and BPVs can be inserted with the **ERROR INSERT** switches.
- Full logic, BPV, parity, frame, and signal error analysis is performed on the received signal.
- The appropriate DS3 Status LEDs illuminate.

If the received signal is *not* recognized as a test pattern, but live data:

- The word *live* appears in the PATTERN window.

- The transmitter retransmits the received signal, including errors (not BPVs).
- Logic errors and BPVs can be inserted with the **ERROR INSERT** switches.
- Full BPV, parity, frame, and signal error analysis is performed on the received signal. The LOGIC category is not applicable during live data analysis.
- The appropriate DS3 Status LEDs illuminate.

AUTO — Configures the receiver to scan and synchronize to the DS3 input signal framing and pattern information. After achieving synchronization, the transmitter regenerates the framing and test pattern without errors. If *live* data is declared, the **DS3 TRANSMIT TIMING** switch defaults to RECOVD. If signal loss occurs and then returns, press the **RESTART** switch to restart AUTO mode.

If the received signal is recognized as a test pattern:

- The test pattern name appears in lowercase characters in the PATTERN window.
- The transmitter is configured to generate the recognized framing format and test pattern.
- Logic errors, frame errors (with framed signal only), and BPVs can be inserted with the **ERROR INSERT** switches.
- Full logic, BPV, parity, frame, and signal error analysis is performed on the received signal.
- The appropriate DS3 Status LEDs illuminate.

If the received signal is *not* recognized as a test pattern, but live data:

- The word *live* appears in the PATTERN window.
- The transmitter retransmits the received signal, including errors (not BPVs).
- Logic errors and BPVs can be inserted with the **ERROR INSERT** switches.
- Full BPV, parity, frame, and signal error analysis is performed on the received signal. The LOGIC category is not applicable during live data analysis.
- The appropriate DS3 Status LEDs illuminate.

UNFRAMED — Configures the T-BERD 310 to test unframed DS3 circuits.

2.2.5 PATTERN/PAYLOAD Switch (5)

NOTE: This section describes DS3 testing using the **PATTERN** switch. Refer to Section 2.25 for information on using the **PAYLOAD** switch with a SONET option.

The operation of the **PATTERN/PAYLOAD** switch depends on the setting of the **SETUP** switch as follows:

- When DS3 is selected, the **PATTERN/PAYLOAD** switch is used to select the DS3 transmit and receive framing mode for the T-BERD 310.

- When SONET RX is selected, the **PATTERN/PAYLOAD** switch can be used to select the SONET receive rate.

- When SONET TX is selected, the **PATTERN/PAYLOAD** switch can be used to select the SONET transmit rate.

When the **AUX** switch is not activated, the **PATTERN** switch selects the mode-specific test pattern transmitted by the T-BERD 310. The selected test pattern is also used to obtain pattern synchronization on the receiver. Press the **PATTERN** switch to scroll through the available test patterns in the PATTERN window. Table 2-1 lists the test patterns and their associated mode. Allowing the selected test pattern to be displayed for more than a half second configures the T-BERD 310 for that test pattern and restarts the test.

Table 2-1
Mode Specific Test Patterns

Operating Modes	Patterns
AUTO, UNFRAMED, M13, and C-BIT	2^23-1, 2^20-1, 2^15-1, 1111, 1100 (IDLE)[1], 1010 (BLUE)[1], and USER1
MUXED M13 and MUXED C-BIT	T1D4 QRSS, T1D4 3/24, T1D4 1:7, T1D4 1004Hz, T1D4 LPUP, T1D4 LPDN, T1ESF QRSS, T1ESF 3/24, T1ESF 1:7, T1ESF 1004Hz, T1ESF LPUP, T1ESF LPDN
DS1 INSERT[2]	EXTERNAL DS1 and INTERNAL DS1[3]

[1] IDLE and BLUE appear only for framed signals.
[2] Requires the DS1 Insert Option.
[3] Requires the DS1/DS0 Analyzer Option.

When the operating mode is changed, the displayed test pattern may not be valid for the new mode. In this case, the last valid test pattern for the selected mode is displayed. The mode-specific test patterns are divided into three groups: non-channelized, channelized, and DS1 Insert. The test patterns are described as follows:

Non-channelized test patterns — These patterns are non-channelized, i.e., they do not contain DS2 or DS1 framing. Unless otherwise indicated, the following DS3 test patterns can be transmitted in the M13, C-BIT, UNFRAMED, and AUTO modes.

2^23-1 — An 8,388,607-bit pseudorandom pattern which generates a maximum of 22 sequential zeros and 23 sequential ones. This pattern conforms to CCITT Recommendation O.151.

2^20-1 — A 1,048,575-bit pseudorandom pattern which generates a maximum of 19 sequential zeros and 20 sequential ones. This pattern conforms with Bell Compatibility Bulletin No. 114.

2^15-1 — A 32,767-bit pseudorandom pattern which generates a maximum of 14 sequential zeros and 15 sequential ones. This pattern conforms to CCITT Recommendation O.151.

1111 — An all marks (1) pattern and is available in all modes except MUXED M13 and MUXED C-BIT.

1100 (IDLE) — A repeating two marks (1) and two spaces (0) pattern which equates to sending the DS3 Idle Signal. It is only available in the M13 and C-BIT modes.

1100 — An unframed repeating two marks (1) and two spaces (0) pattern which is only available in the UNFRAMED mode.

1010 (BLUE) — An alternating marks (1) and spaces (0) pattern which equates to sending the DS3 Blue Signal. It is only available in the M13 and C-BIT modes.

1010 — An unframed alternating marks (1) and spaces (0) pattern which is only available in the UNFRAMED mode.

USER1 — A 3- to 24-bit user-programmable test pattern. This allows the T-BERD 310 to transmit specific patterns to test circuit sensitivity. The pattern is entered in binary form through the MISC-USER1 auxiliary function.

Channelized test patterns — These patterns are channelized; i.e., they contain embedded DS2 and DS1 framing. The following DS1 test patterns are available when either the MUXED M13 or MUXED C-BIT mode is selected. The test patterns are formatted with either D4 or ESF framing.

NOTE: These DS1 patterns are generated on the mainframe. Errors inserted from the DS1/DS0 Analyzer Option are not inserted on these DS1 patterns.

T1D4 QRSS — A modified 2^{20}-1 pseudorandom pattern which allows a maximum of 14 sequential zeros and 20 sequential ones. The T1D4 QRSS pattern simulates live data for T1 applications.

T1D4 3/24 — A fixed test pattern of F0100 0100 0000 0000 0000 0100.... The pattern is aligned with the D4 F-bits as indicated.

T1D4 1:7 — A fixed test pattern of F01000000.... The pattern is aligned with the D4 F-bits as indicated, to prevent false Yellow Alarms.

T1D4 1004Hz — A 1004 Hz tone which is transmitted over the selected DS1 channel. The tone is phase shifted between adjacent DS0 channels to prevent Yellow Alarms.

T1D4 LPUP — A loop-up code selected with the MUXED TX-DS1 LP CODE auxiliary function.

T1D4 LPDN — A loop-down code selected with the MUXED TX-DS1 LP CODE auxiliary function.

T1ESF QRSS — A modified 2^{20}-1 pseudorandom pattern which allows a maximum of 14 sequential zeros and 20 sequential ones. The T1ESF QRSS pattern simulates live data for T1 applications.

T1ESF 3/24 — A fixed test pattern of F0100 0100 0000 0000 0000 0100.... The pattern is aligned with the ESF F-bits as indicated.

T1ESF 1:7 — A fixed test pattern of F01000000....

T1ESF 1004Hz — A 1004 Hz tone which is transmitted over the selected DS1 channel.

T1ESF LPUP — A loop-up code selected with the MUXED TX-DS1 LP CODE auxiliary function.

T1ESF LPDN — A loop-down code selected with the MUXED TX-DS1 LP CODE auxiliary function.

DS1 INSERT mode — This mode is only available when the DS1 Insert Option is installed.

EXTERNAL DS1 — Selects the DS1 signal input from the side-panel DS1 INSERT INPUT jack.

INTERNAL DS1 — Selects the DS1 signal generated by the DS1/DS0 Analyzer Option.

2.2.6 DS3 TRANSMIT TIMING Switch 6

The **DS3 TRANSMIT TIMING** switch selects the DS3 transmit clocking source for the T-BERD 310. The switch LEDs flash if the appropriate timing signal is not present. Press the **DS3 TRANSMIT TIMING** switch to select one of the following:

INT — The transmit timing source is generated by the internal crystal-controlled oscillator.

RECOVD — The transmit timing source is taken from the clock signal recovered from the received data. In the THRU and DS1 INSERT modes, the **DS3 TRANSMIT TIMING** switch automatically defaults to RECOVD regardless of the current setting. Recovered timing is used when the T-BERD 310 is monitoring a received signal.

EXT — The transmit timing source is taken from an external clock source received through the side-panel EXT CLOCK connector.

2.2.7 SONET TRANSMIT TIMING Switch 7

A SONET transmit option must be installed for this switch to be operational. It allows the user to select a variety of timing sources for SONET testing. Refer to Section 2.25 for more information about this switch.

2.2.8 LASER ENABLE Switch 8

When either the 310-14T or 310-12 SONET option is installed, the T-BERD 310 can perform optical data transmission testing from the side-panel optical connections. When the laser transmitter is enabled the **LASER ENABLE** switch illuminates. The **LASER ENABLE** switch is inoperative if no SONET transmit options are installed, if the unit is configured for STS-1 testing, or if the 310-13T is installed. Note that in any case laser sources are disabled at power-up to prevent accidental exposure to the laser. Refer to Section 2.25 for more information about this switch.

2.2.9 AUX Switch 9

The **AUX** switch illuminates when the auxiliary functions are displayed. When the **AUX** switch is *not* illuminated, the mode, test pattern, and results are displayed. Auxiliary functions allow access to parameters that are not frequently used and do not have dedicated switches. The auxiliary functions are divided into auxiliary groups as listed in Table 2-2. Refer to *Mainframe Auxiliary Functions* for detailed information on the auxiliary functions.

Table 2-2
T-BERD 310 Auxiliary Functions

Group (MODE Switch)	Function (PATTERN Switch)	Description
ERR INSERT		DS3 Error Insertion Group
	LOG/BPV RT	Logic and BPV Error Insertion Rate
	FRAME ERROR	M-Frame Error Insertion Rate
	LOG/BPV BUR	Logic and BPV Error Insertion Burst Duration
ERR RECEIVE		DS3 Received Signal Error Group
	PAR ERR RT	Parity Category Error Rate Calculation
	FRM LOSS THR	Frame Synchronization Loss Threshold
	ERROR THR	Logic, BPV, and Frame Errored Second Rate Threshold
	PAT LOSS THR	Pattern Loss Threshold
MUXED TX		Multiplexed Loop Code Group
	DS1 LP CODE	DS1 Loop Code Select
	PGM LPUP	Programmable Loop-Up Code
	PGM LPDN	Programmable Loop-Down Code
TIME		Time and Date Group
	SET TIME	Set Time
	SET DATE	Set Date
	TEST LENGTH	Set Test Length
	TEST	Set Test Duration Type
PRINT		Printer/Remote Control Interface Group
	INTERVAL	Timed Printout Interval
	MODE	Printout Mode
	FORMAT	Printout Format
	CUSTOM	Customized Printout Contents
	GRAPH	Print Pulse Shape Graph
	BAUD RATE	RS-232 Interface Baud Rate
	PARITY	RS-232 Interface Parity
	TERMINATOR	Printout Line Terminator
	WIDTH	Printout Line Width
	PORT	Printer/Remote Control Interface Port Selection (310-6 option)
	PRINT EVENT	Set Printout Event
	PRINT TYPE	Set Printout Type

Group Function (MODE Switch)	(PATTERN Switch)	Description
MISC		Miscellaneous Group
	USER1	User-Programmable Test Pattern
	TX X-BIT	X-Bi Transmission
	BLU SIG CRI	Blue Signal Detection Criteria
	DS1 LINECODE	DS1 Drop Output Line Coding
	BEEP CRI	Beep Criteria
	PULSE MASK	Pulse Shape Mask
	FEAC ALARMS	DS3 FEAC Alarm Control
	FEAC LOOP	DS3 FEAC Message Loopback Control
	LCD CONTRAST	Display Contrast Control (some 310-1 options)
	DS1 SIG BITS	DS1 Signaling Transfer Mode (310-13R/T pair or 310-14R/T pair option)
	DS1 BITS CLK	DS1 Building Integrated Timing Source (BITS) Clock Termination (310-13T or 310-14T option)
	DS1/VT MAP	DS1/VT Mapping Select
	DS3 LEVEL	Set DS3 Transmit and Receive Levels
SONET RX		SONET RX Group (310-13R or 310-14R Option)
	DS1 DROP OUT	DS1 Drop Output Source
	STS RX LEVEL	STS Receive Level
	SONET DCC	SONET Data Communication Channel Drop and Insert Control
SONET TX		SONET TX Group(310 13T or 310-14T Option)
	STS TX LEVEL	STS Transmit Level
	SONET ERR RT	SONET Error Rate Select
	SPE POINTER	Synchronous Payload Envelope Pointer Control
	PATH TRACE	Path Trace Message Insertion Control
	ORDERWIRE	Orderwire Channel Control
	TX WAVELEN	Dual Wavelength Transmitter Control (310-12 DUAL or 310-14T DUAL option)
JITTER		DS3 Jitter Group (310-5 Option)
	JIT FILTER	Jitter Bandpass Filter Select
	JIT SCALE	Jitter Amplitude Scale Select
	JIT THRESH	DS3 Jitter Threshold Select
ATM RX		ATM RX Group (310-15 Option)
	PREVIEW	Received ATM Cell Test Profile Preview Select
	NETWORK I/F	Received ATM Network Interface Select
	TEST MASK	Received ATM Cell Test Mask Control
	PROFILE Pn	Received ATM Cell Test Profile Control (n = 1 to 4)
	BW PERIOD	Received ATM Cell Test Profile Bandwidth Select

Group Function (MODE Switch)	(PATTERN Switch)	Description
ATM TX		ATM TX Group (310-15 Option)
	NETWORK I/F	Transmitted ATM Network Interface Select
	PROFILE Pn	Transmitted ATM Cell Test Profile Control (n = 1 to 4)
	TEST PROFILE	Transmitted ATM Cell Test Profile Select
	CELL BANDWDTH	Transmitted ATM Cell Test Profile Bandwidth Select
	PEAK BANDWDTH	Transmitted ATM Cell Test Profile Peak Bandwidth Select
	PEAK DURATION	Transmitted ATM Cell Test Profile Peak Duration Select
	HEC ERR RATE	Transmitted ATM Header Error Control Error Rate
	HEC ERR INS	Transmitted ATM Header Error Control Error Insert Control
	OAM INSERT	Transmitted ATM OAM Insert Control
	OAM FLOW	Transmitted ATM OAM Flow Control (Continued)
	CORRELATION	Transmitted ATM Correlation Tag Control
OPTICAL TEST		Optical Test Group (310-16 Option)
	STABLE SOURCE	Optical Stable Source Select
	RETURN LOSS	Return Loss Measurement Type
	OPTICAL PWR	Optical Power Measurement Control

2.2.10 CHANNEL CONTROL Switch 10

The **CHANNEL CONTROL** Switch is used to specify the use of the **CHANNEL INSERT** and **CHANNEL DROP** switches. Note that the switch is locked into the DS3-DS1 position when the SONET transmit and receive options are not installed.

DS3-DS1 — Uses the **INSERT** and **DROP** switches to select the DS1 to be dropped and inserted into the primary DS3 signal.

SONET-VT — Uses the **INSERT** and **DROP** switches to select the VT to be dropped and inserted into the SONET signal. The SONET transmit option must be installed for this choice to be available. Refer to Section 2.25 for more information about the switch.

SONET-STS — Uses the **INSERT** and **DROP** switches to select the STS-1 to be dropped and inserted into the SONET signal. The SONET receive option must be installed for this choice to be available. Refer to Section 2.25 for more information about the switch.

2.2.11 CHANNEL INSERT Switch 11

This section discusses the use of the **CHANNEL INSERT** switch when the **CHANNEL CONTROL** switch is set to DS3-DS1. For more information on the **CHANNEL INSERT** switch and the SONET-VT or SONET-STS selections, refer to Section 2.25.

The **CHANNEL INSERT** switch is controlled by the **CHANNEL CONTROL** switch as follows.

DS3-DS1 — Uses the **INSERT** switch to select the DS1 to be inserted into the primary DS3 signal.

SONET-VT — Uses the **INSERT** switch to select the VT to be inserted into the SONET signal. The SONET transmit option must be installed for this choice to be available.

SONET-STS — Uses the **INSERT** switch to select the STS-1 to be inserted into the SONET signal. The SONET transmit option must be installed for this choice to be available.

When the **CHANNEL CONTROL** switch is set to DS3-DS1, the **INSERT** switch selects the DS1 channel to be inserted into a DS3 signal. This switch is available in either MUXED M13, MUXED C-BIT, or DS1 INSERT modes. Either a D4 or ESF framed test pattern, 1004 Hz tone, or DS1 loop codes can be inserted into the selected channel. When the **CHANNEL INSERT** switch is pressed, the channel number flashes for three seconds before the new selection is affected. This allows time to change the selection without affecting a DS1 channel unintentionally. The **CHANNEL INSERT** switch selections include:

1 to 28 — Inserts the test pattern on the selected DS1 channel. A framed All Ones pattern is inserted on the other 27 DS1 channels.

ALL — Inserts the selected test pattern on all 28 DS1 channels.

— — — (none) — Inserts a framed All Ones pattern on all 28 DS1 channels.

When the DS1 INSERT mode is selected, the **DS3-DS1 CHANNEL INSERT** switch functions differently. In some instances the **DS3-DS1 CHANNEL INSERT** switch window can appear blank or display three bars (— — —) depending on the selected mode, in which case the **DS3-DS1 CHANNEL DROP** switch can select a channel being inserted.

NOTE: In MUXED M13 or MUXED C-BIT mode the DS1 pattern is generated by the mainframe, not the DS1/DS0 Analyzer Option. Errors inserted from the option are not inserted in the DS3 signal.

2.2.12 CHANNEL DROP Switch 12

This section discusses the use of the **CHANNEL DROP** switch when the **CHANNEL CONTROL** switch is set to DS3-DS1. For more information on the **CHANNEL DROP** switch and the SONET-VT or SONET-STS selections, refer to Section 2.25.

The **CHANNEL DROP** switch is controlled by the **CHANNEL CONTROL** switch as follows.

DS3-DS1 — Uses the **DROP** switch to select the DS1 to be dropped from the primary DS3 signal.

SONET-VT — Uses the **DROP** switch to select the VT to be dropped from the SONET signal. The SONET receive option must be installed for this choice to be available.

SONET-STS — Uses the **DROP** switch to select the STS-1 to be dropped from the SONET signal. The SONET receive option must be installed for this choice to be available.

When the **CHANNEL CONTROL** switch is set to DS3-DS1, the **CHANNEL DROP** switch selects the DS1 channel to be dropped from a DS3 signal. The selected DS1 channel number (1 to 28) appears in the channel drop window above the switch.

When the AIS indication is detected on the dropped DS1 channel, three decimal points appear in the **CHANNEL DROP** switch display.

The DS1 channel (1 to 28) can be dropped to the DS1/DS0 Analyzer Option. If a SONET option is installed, a DS1 channel can be dropped from a SONET DS3 or DS1 payload. If the E1 Drop Option is installed, E1 channels (E1 to E21) can be dropped to the E1 DROP jack.

The DS1 channel can also be dropped from the DS3 RECEIVE jack to the side-panel DS1 DROP jack. The DS1 DROP jack allows an external DS1 test set to be connected to the T-BERD 310.

2.3 TEST CONNECTIONS

The T-BERD 310 provides a number of connections and switches used to access the circuit being tested. The primary DS3 signal connections are provided on the front panel as shown in Figure 2-3. The side panel contains standard and optional connections. The standard side-panel connections are described in this section; the optional connections are described in the individual option sections.

The DS3 WECO 560A jacks can be replaced with WECO 358 jacks when the factory-installed 310-8 358 Connector Option is ordered.

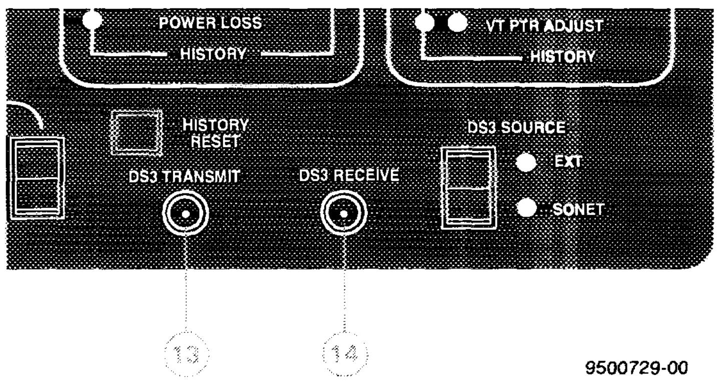

Figure 2-3
Front-Panel Connections

2.3.1 Front-Panel Connections

The following front-panel connections and switches are used to receive and source a DS3 signal.

DS3 RECEIVE jack 14 —This WECO 560A jack is used to receive the DS3 signal from the circuit under test. The input signal equalization is controlled by the MISC-DS3 LEVEL auxiliary function.

DS3 TRANSMIT jack 13 —This WECO 560A jack is used to transmit a DS3 signal from the T-BERD 310 to the circuit under test. The output level is controlled by the MISC-DS3 LEVEL auxiliary function.

2.3.2 Side-Panel Connections

Depending on the configuration of the T-BERD 310, the side panel provides a number of standard and optional connections. The standard side-panel connections (see Figure 2-4) include the following:

RS-232 interface connector — This RS-232-C, 25-pin D connector is configured as DCE. It is used to connect the T-BERD 310 to a serial printer, dumb terminal, computer, or other asynchronous communications device. The PRINT auxiliary group controls the baud rate, parity, and line terminator of the connector. The connector pin assignments are described in Section 5.

MULTIPLE DS3 OUTPUT jacks — These WECO 560A jacks provide five additional DS3 signal outputs and are identical to the DS3 TRANSMIT jack signal.

DS1 DROP jack — This Bantam (new units) or WECO 310 (old units) jack enables the selected DS1 channel (**DS3-DS1 CHANNEL DROP** switch) to be dropped to an external DS1 test set. The MISC-DS1 LINECODE auxiliary function controls the output signal coding (AMI or B8ZS). If a SONET option is installed, the SONET RX-DS1 DROP OUT auxiliary function controls this output. Refer to Section 2.25 for more details.

EXT CLOCK connector — This BNC connector enables an external DS3 clock source to be input to the T-BERD 310 as the DS3 transmit clock. The clock source is selected when the **DS3 TRANSMIT TIMING** switch is set to EXT.

The optional connections are described in the appropriate sections.

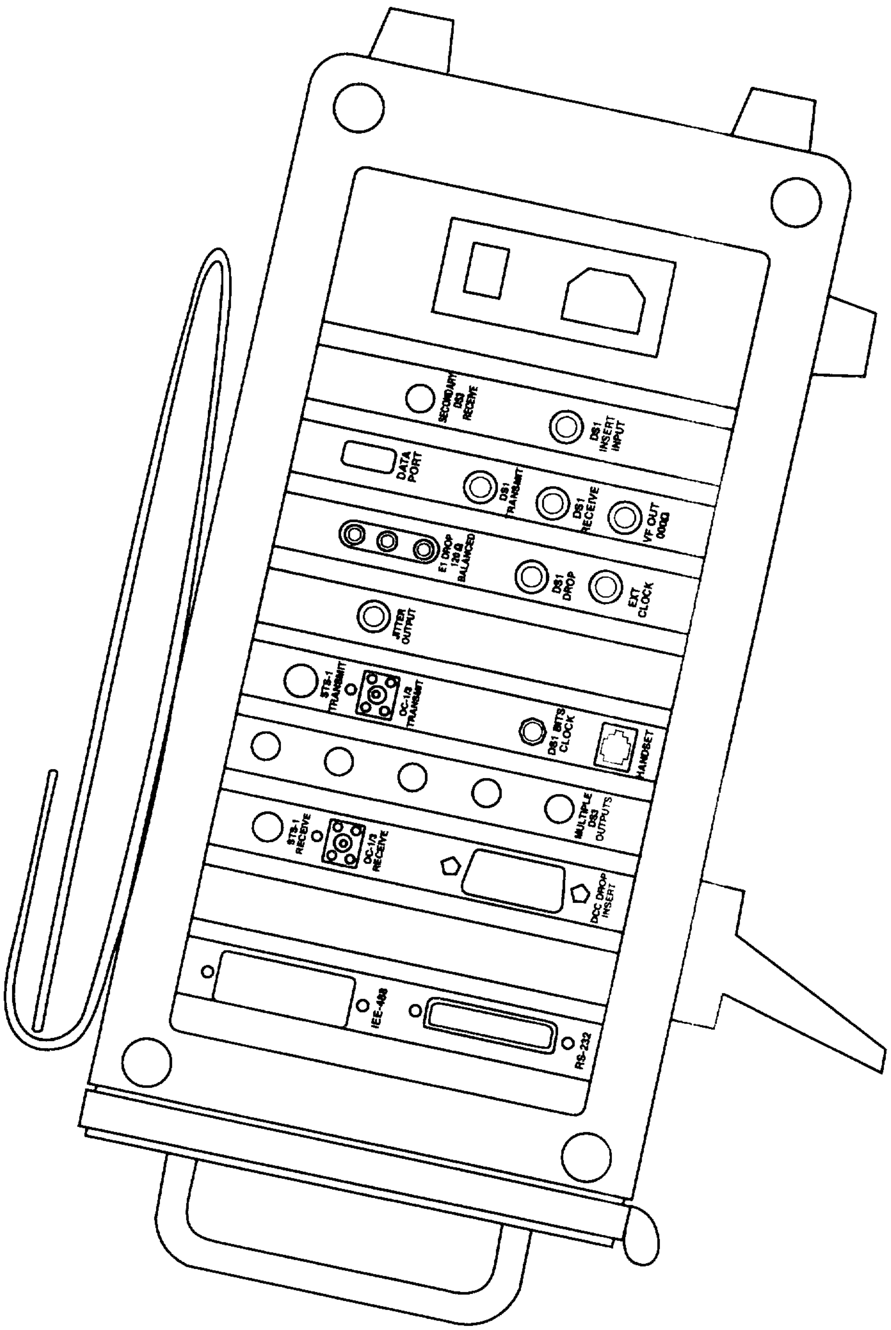

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Figure 2-4
T-BERD 310 Side-Panel

2.4 SIGNAL VERIFICATION

The following indicators and results are used to verify that the T-BERD 310 has properly acquired the received DS3 signal (see Figure 2-5).

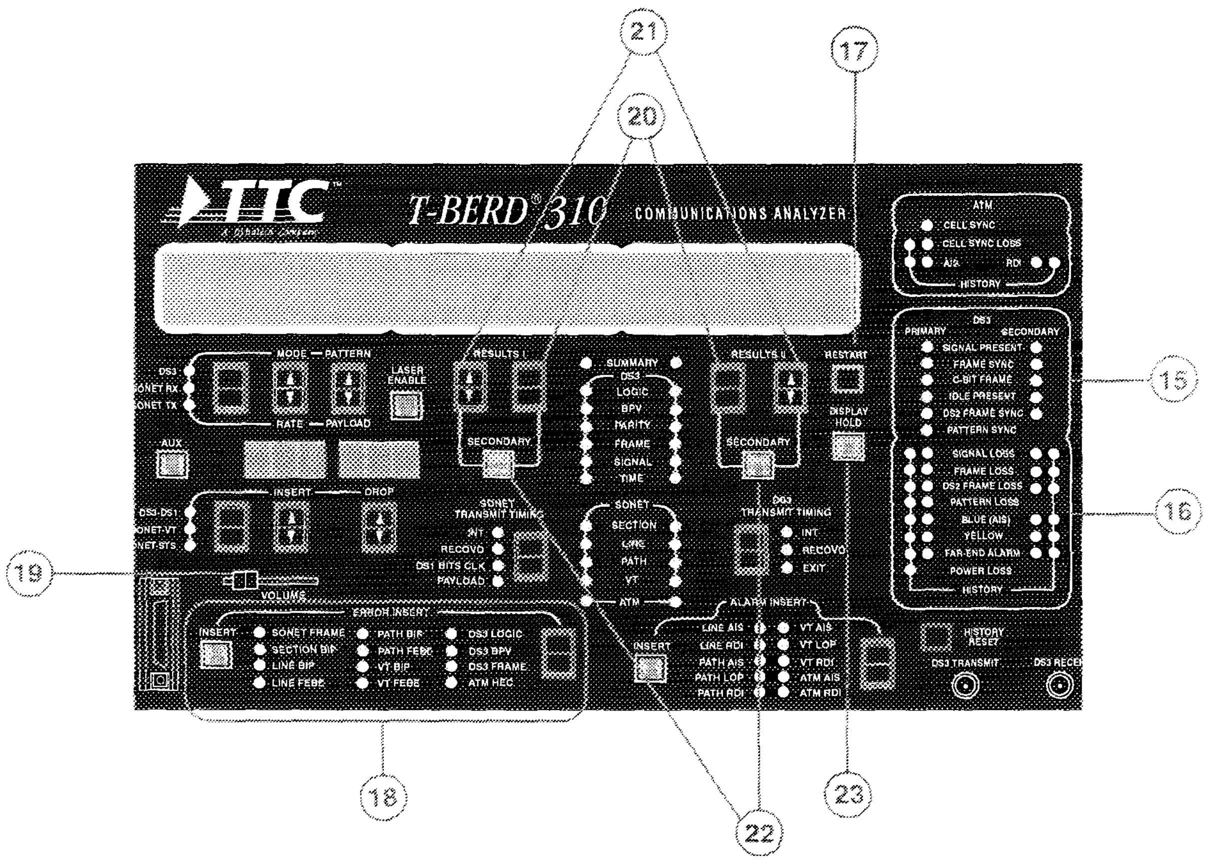

Figure 2-5
Controls and Indicators for Testing

2.4.1 DS3 Status LEDs 15

NOTE: This section describes the DS3 Status LEDs only. For descriptions of SONET and ATM LEDs, refer to Section 2.25 and Section 2.36 respectively.

For DS3 signal testing, the green Status LEDs provide information about the current condition of the received primary and secondary (optional) DS3 signals. The DS3 Status LEDs are divided into two groups, PRIMARY and SECONDARY. The Primary Status LEDs refer to the signal received through the DS3 RECEIVE jack. The Primary Status LEDs also indicate the condition of the DS3 signal dropped from a SONET DS3 payload. The Secondary Status LEDs refer to the DS3 signal received through the SECONDARY DS3 RECEIVE jack when the DS1 Insert Option is installed. The DS3 Status LEDs are described as follows:

Signal Present — Illuminates when the T-BERD 310 detects multiple DS3 pulses. If the received signal is lost, the LED goes out and the Signal Loss LED illuminates.

Frame Sync — Illuminates when the T-BERD 310 acquires M13 or C-bit frame synchronization. If the received framing format is lost, the LED goes out and the Frame Loss LED illuminates.

C-Bit Frame — Illuminates when the T-BERD 310 acquires C-bit frame synchronization.

Idle Present — Illuminates when the T-BERD 310 detects a DS3 Idle Signal.

DS2 Frame Sync — Illuminates when the T-BERD 310 synchronizes to the DS2 framing format corresponding to the dropped DS1 channel. The T-BERD 310 must be synchronized with the DS2 framing format before a DS1 signal can be inserted. If the received DS2 framing format is lost, the LED goes out and the DS2 Frame Loss LED illuminates.

Pattern Sync — Illuminates when the T-BERD 310 synchronizes to the test pattern displayed in the PATTERN window. If pattern synchronization is lost, the LED goes out and the Pattern Loss LED illuminates.

2.4.2 DS3 Alarm LEDs 16

NOTE: This section describes the DS3 Alarm LEDs only. For descriptions of SONET and ATM LEDs, refer to Section 2.25 and Section 2.36 respectively.

For DS3 signal testing, the red Alarm LEDs provide information about the current and historical alarm conditions related to the received primary and secondary (optional) DS3 signals. The DS3 Alarm LEDs are divided into two groups, PRIMARY and SECONDARY with two columns for current and history conditions (see Figure 2-5).

The Primary Alarm LEDs refer to the signal received through the DS3 RECEIVE jack. The Primary Alarm LEDs also indicate the condition of the DS3 signal dropped from a SONET DS3 payload. The Secondary Alarm LEDs refer to the signal received through the SECONDARY DS3 RECEIVE jack when the DS1 Insert Option is installed.

The Alarm LEDs (inside columns) illuminate when an alarm condition occurs and remain illuminated as long as the alarm exists. When the alarm condition is cleared, the Alarm LED goes out and the associated History LED (outside columns) illuminates. The History LEDs indicate past occurrences of the alarm and remain illuminated until either the **HISTORY RESET** switch is pressed or a test restart is initiated. The Primary Alarm LEDs are described as follows:

Signal Loss — Illuminates when DS3 pulses are no longer detected after initial signal detection. When the DS3 pulses are detected again, the LED goes out, and the associated History LED and the Signal Present LED illuminate.

Frame Loss — Illuminates when the T-BERD 310 loses DS3 frame synchronization. When DS3 framing is detected again, the LED goes out, and the associated History LED and the Frame Sync LED illuminate. The ERR RECEIVE-FRM LOSS THR auxiliary function sets the frame loss criteria.

DS2 Frame Loss — Illuminates when the T-BERD 310 loses frame synchronization to the DS2 signal for the corresponding dropped DS1 channel. When DS2 framing is detected again, the LED goes out, and the associated History LED and the DS2 Frame Sync LED illuminate.

Pattern Loss — Illuminates when the T-BERD 310 loses DS3 pattern synchronization. When the pattern is resynchronized again, the LED goes out, and the associated History LED and the Pattern Sync LED illuminate. The ERR RECEIVE-PAT LOSS THR auxiliary function sets the pattern loss criteria.

Blue (AIS) — Illuminates when the T-BERD 310 detects the Blue Signal (Alarm Indication Signal). When the Blue Signal is no longer detected, the LED goes out and the associated History LED illuminates. The MISC-BLU SIG CRI auxiliary function sets Blue Signal detection criteria.

Yellow — Illuminates when the T-BERD 310 detects the Yellow Alarm or Far-End Out-of-Frame (FEOOF) signal (X-bits set to zero). When the Yellow Alarm is no longer detected, the LED goes out and the associated History LED illuminates.

Far-End Alarm — Illuminates when the T-BERD 310 detects Far-End Alarm and Control (FEAC) messages in the C-bit parity framing format (third C-bit in the M1 subframe). When the far-end alarm is no longer detected, the LED goes out and the associated History LED illuminates. The alarm messages are reported in the SUMMARY category. Refer to Section 2.73.2 for a list of far-end alarm messages.

Power Loss — Illuminates when the T-BERD 310 regains power after power was lost.

HISTORY RESET switch — This switch clears all History LEDs on the T-BERD 310. This switch does not restart a test, nor does it affect any of the Alarm LEDs or accumulated results. It is not operable when the **DISPLAY HOLD** switch is activated. The **RESTART** switch also clears the History LEDs.

2.4.3 SUMMARY Category Messages

The SUMMARY category provides a convenient way to monitor specific results and measurements without having to search through the other categories. The SUMMARY category also provides a number of messages indicating whether the results are in or out of specification. The SUMMARY category is selected by pressing either the **RESULTS I Category** switch or the **RESULTS II Category** switch. When the category is selected, the appropriate yellow LED illuminates.

During initial acquisition of the received signal, the SUMMARY category should be displayed. The following messages can appear during signal acquisition:

> ***ALL RESULTS UNAVAILABLE*** — This indicates that the T-BERD 310 has not detected the received signal.
>
> ***ALL RESULTS OK*** — This indicates that the T-BERD 310 has detected and synchronized to the received signal and that no key results are non-zero or out-of-specification.

When an error is detected, the appropriate test result appears in the SUMMARY category window. Refer to Section 2.72 for more information on the results that appear in the SUMMARY category.

2.5 STARTING AND RUNNING THE TEST

The following controls, indicators, and results are used to start and perform a test (see Figure 2-5).

2.5.1 RESTART Switch 17

Pressing the **RESTART** switch halts the current test, clears all results, clears the Status and Alarm LEDs, resynchronizes the receiver to the received signal, and restarts the test.

NOTE: Pressing one of the following switches also causes a test restart of the T-BERD 310: **MODE, PATTERN, DS3 RECEIVE,** and **Power**. Modifying one of the following auxiliary functions causes a test restart: ERR RECEIVE-PAR ERR RT, ERR RECEIVE-FRM LOSS THR, ERR RECEIVE-ERROR THR, ERR RECEIVE-PAT LOS THR, TIME-TEST LENGTH, MISC-USER1, and MISC-PULSE MASK.

2.5.2 ERROR INSERTION (DS3 LOGIC, DS3 BPV, DS3 FRAME) 18

After the T-BERD 310 has synchronized to the received signal, in-service monitoring and analysis can be performed without additional setup requirements. However, if the circuit being tested is configured for an out-of-service loopback or end-to-end test, you may need to verify that the transmitted signal is being received. One way to verify this is to insert an error into the transmitted signal and verify that the error is received. DS3 errors are inserted into the data stream one type at a time. Error insertion affects the transmitted signal at the DS3 TRANSMIT and MULTIPLE DS3 OUTPUT jacks.

To insert errors, press the **ERROR INSERT** switch (see Figure 2-5) to select the desired error type; the LED illuminates, then perform the appropriate actions as described below:

Inserting DS3 Logic Errors

Select DS3 LOGIC to insert single, burst, or continuous logic errors into the transmitted DS3 data and overhead bits. When DS3 LOGIC is selected and the **INSERT** switch is pressed the associated LED illuminates, indicating errors are being inserted. Duration is affected by the way the **INSERT** switch is pressed as described below, and by setting appropriate auxiliary functions as follows. Upon error insertion, the DS3 LOGIC LED illuminates either for 1 second (single error) or for the duration of the insertion, whichever is greater. The error insertion duration and rate are controlled as follows:

Single and Burst Errors — Set the ERR INSERT-LOG/BPV BUR auxiliary function to insert a single error, or to set a burst duration of from 25 ms to 5 seconds. Press the **INSERT** switch for less than 1 second to insert a single error or a burst of errors.

Continuous Errors — Set the ERR INSERT-LOG/BPV RT auxiliary function for a continuous error rate from 1E-2 to 1E-9. Press the **INSERT** switch for more than 1 second to insert continuous errors.

To stop error insertion, press the **INSERT** switch again. (Scrolling the **ERROR INSERT** switch to another selection also halts error insertion.)

When the T-BERD 310 is in MUXED M13 or MUXED C-BIT mode, the **INSERT** switch inserts single logic errors into the selected DS1 channel. If the **DS3-DS1 CHANNEL INSERT** switch is set to "— — —" (none), no error is inserted when the **INSERT** switch is used. If the **DS3-DS1 CHANNEL INSERT** switch is set to ALL, a single logic error is inserted into all 28 channels simultaneously. Single DS3 errors are no longer present in the DS3 signal since the DS1 error occurs before multiplexing to the higher rate. The rate and burst features of the **INSERT** switch continue to simulate random signal degradation across the entire DS3 signal.

Inserting DS3 BPVs

Select DS3 BPV to insert single, burst, or continuous BPVs into the transmitted DS3 signal. When the DS3 BPV is selected and the **INSERT** switch is pressed the associated LED illuminates, indicating violations are being inserted. Duration is affected by the way the **INSERT** switch is pressed as described in step 2 below, and by setting appropriate auxiliary functions as follows. The DS3 BPV LED illuminates either for 1 second (single error) or for the duration of the insertion, whichever is greater. The error insertion duration and rate are controlled as follows:

> **Single and Burst Errors** — Set the ERR INSERT-LOG/BPV BUR auxiliary function to insert a single error, or to set a burst duration of from 25 ms to 5 seconds. Press the **INSERT** switch for less than 1 second to insert a single error or a burst of errors.
>
> **Continuous Errors** — Set the ERR INSERT-LOG/BPV RT auxiliary function for a continuous error rate from 1E-2 to 1E-9. Press the **INSERT** switch for more than 1 second to insert continuous errors.

To stop error insertion, press the **INSERT** switch again. (Scrolling the **ERROR INSERT** switch to another selection also halts error insertion.)

Inserting DS3 Frame Errors

Select DS3 FRAME to insert single, multiple, or continuous consecutive M-frame errors into the transmitted DS3 framing bits. The DS3 FRAME is disabled in the UNFRAMED, THRU, AUTO (with *live* pattern displayed), and DS1 INSERT (DS1 Insert Option installed) modes. When DS3 FRAME is used the associated LED illuminates, indicating errors are being inserted. Duration is affected by the way the **INSERT** switch is pressed as described below, and by setting the ERR INSERT-FRAME ERROR auxiliary function as follows:

> **Single Frame Error** — Set the auxiliary function to 1/M-FRAME (one frame error per M-frame). Press the **INSERT** switch for less than 1 second to inject a single frame error.
>
> **Multiple Frame Errors** — Set the auxiliary function to 2/M-FRAME (two consecutive frame errors per M-frame). Press the **INSERT** switch for less than 1 second to inject two consecutive frame errors.
>
> **Continuous Consecutive Frame Errors** — Set the auxiliary function to either 1/M-FRAME or 2/M-FRAME. Press the **INSERT** switch for more than 1 second to inject continuous frame errors.

In DS3 THRU MODE only DS3 LOGIC and DS3 BPV errors can be inserted. The DS3 Frame error selection can be scrolled to, but the **INSERT** switch is not functional.

Inserting SONET Errors

The SONET transmit option must be installed for the SONET LEDs to function. For a description of SONET error insertion, refer to Section 2.25.

Inserting ATM HEC Errors

The ATM HEC error insert is set up in the HEC ERR RATE and HEC ERR INS auxiliary functions. For a description of ATM HEC error insert, refer to the *OC-3C ATM Option* section.

2.5.3 VOLUME Switch (19)

The **VOLUME** control switch (see Figure 2-5) controls the output of the built-in speaker. The T-BERD 310 beeps whenever conditions set by the MISC-BEEP CRI auxiliary function are met. If the DS1/DS0 Analyzer Option is installed, the **VOLUME** switch also controls the DS0 channel volume of the speaker.

2.6 COLLECTING TEST RESULTS

This section describes the available test result categories and controls used to collect the test results.

2.6.1 Categorized Test Results

During a test, the available results and signal measurements are continuously updated. The results are divided into six DS3 categories, four SONET categories, and one ATM category. The first and most commonly used category is the SUMMARY category. During the initial test setup procedure, the SUMMARY category displays key non-zero or out-of-specification results. Refer to Section 2.72 for more information on the test results. The available categories include:

SUMMARY category — Lists key results that are non-zero or out-of-specification.
DS3 LOGIC category — Lists DS3 pattern bit error related results.
DS3 BPV category — Lists DS3 bipolar violation related results.
DS3 PARITY category — Lists DS3 P-bit, C-bit, FEBE, and parity error related results.
DS3 FRAME category — Lists DS3 and DS2 frame error related results.
DS3 SIGNAL category — Lists DS3 signal (frequency, level, and pulse shape) related results.
DS3 TIME category — Lists time-related results.
SONET SECTION category — Lists SONET Section overhead test results.
SONET LINE category — Lists SONET Line overhead test results.
SONET PATH category — Lists SONET Path overhead test results.
SONET VT category — Lists SONET virtual tributary overhead test results.
ATM category —Lists ATM test results (Requires 310-15 option).

2.6.2 RESULTS Switches and Windows

When the mode and pattern are displayed, two results are displayed simultaneously in the RESULTS I and RESULTS II windows. The available categories and results are selected with the following switches:

RESULTS I Category switch or RESULTS II Category switch — Selects the category from the list of categories next to the switch. The labeled LEDs illuminate as the category is selected. Categories are skipped when they do not apply to a particular operating mode.

RESULTS I Results switch or RESULTS II Results switch — Selects the individual results from the indicated category.

RESULTS I SECONDARY switch or RESULTS II SECONDARY switch — Selects the results from the secondary DS3 signal when the DS1 Insert Option is installed. The SUMMARY, BPV, PARITY, FRAME, and SIGNAL categories are the only categories available when the **SECONDARY** switch is pressed. The associated LED illuminates when the secondary DS3 results are displayed. Use the **RESULTS** switches to select the secondary DS3 results.

2.6.3 DISPLAY HOLD Switch 23

While the **DISPLAY HOLD** switch is illuminated the results and Status and Alarm LEDs are frozen in their current state (see Figure 2-5). During the display hold, all results can be examined by using the **RESULTS** switches. The results continue to accumulate in the background, and when the switch is released the results and LED states are updated.

DS1DS0

DS1/DS0 ANALYZER OPTION

2.7 INTRODUCTION

The 310-1 DS1/DS0 Analyzer Option attaches to the T-BERD 310 Communications Analyzer to provide DS1 and DS0 test and analysis capabilities from DS3, DS1, and SONET access points.

The DS1/DS0 Analyzer Option replaces the standard T-BERD 310 cover. An extension cable connects the DS1/DS0 Analyzer Option to the T-BERD 310 for power and communications. This connection is made through the DS1/DS0 Analyzer Option port. DS1, ESF and SLC datalink, DS0, and VF signal connections for the DS1/DS0 Analyzer Option are provided through the T-BERD 310 side panel.

Appendix C shows the functional block diagram of the T-BERD 310 mainframe and the DS1/DS0 Analyzer Option.

2.7.1 Features and Capabilities

The DS1/DS0 Analyzer Option is designed to test and analyze T-Carrier transmission systems at the DS1 and DS0 levels from DS3 or DS1 access points. The DS1/DS0 Analyzer Option provides the following features and capabilities:

Analyzes a DS1 channel dropped from a DS3, DS1, or SONET access point for out-of-service testing and in-service monitoring.

Generates DS1 test patterns (QRSS, 3 IN 24, 1:1, 1:7, ALL ONES, 2^{23}-1, 2^{20}-1, 2^{15}-1, and programmable) with the appropriate DS1 framing requirements.

Operates in T1 unframed and framed modes which includes: T1 D4, T1 ESF, and SLC-96.

Auto configure mode enables the DS1/DS0 Analyzer Option to scan the received signal and configure itself to the signal framing and pattern.

Displayed results provide simultaneously accumulated logic, BPV, CRC, and frame error counts; error rates, errored seconds, and percent of error-free seconds results; pattern slips, received frequency measurement, and D4, ESF, optional ESFz, and SLC signaling status.

Monitors for T1 pulses, pattern and frame synchronization, and reports them as successful events on the front panel.

Monitors for signal, pattern, and frame losses and reports them as current and historical alarm events on the front panel.

Scans all DS1 channels within a DS3 or SONET signal for framing errors, CRC errors, timing slips, and alarms. DS1 scanning can be performed in a continuous or triggered mode.

Monitors for Excess Zeros, Yellow Alarms, and All Ones conditions and reports them on the front panel.

Logic error and BPV insertion can be done as a single error or continuously at a rate of 10^{-3} to stress circuits or verify signal continuity between the transmitted and received signals.

Transmit timing control is provided through a front-panel switch for internal or recovered clock source.

T1 DSX-level output allows the DS1/DS0 Analyzer Option to be connected to a DS1 access point and transmit DS1 formatted test patterns.

T1 input accepts the DS1 signal from DS1 DSX access points.

Selects individual DS0 channels allowing data bits and D4, ESF, optional ESFz, and SLC signaling bits (A, B, C, and D) to be monitored.

A speaker and VF output jack (with fixed output) provide audible VF outputs for the selected DS0 channel.

Fixed and programmable loop codes provide remote loopback capabilities from a single site.

A dataport interface provides access to DS0 channels and the ESF, optional ESFz, and SLC datalinks.

Operates with AMI and B8ZS encoded data.

2.7.2 Options and Accessories

The following options and accessories are available for the DS1/DS0 Analyzer Option.

- 310-9A Enhanced ESF/DS1 Timing Slips Option adds ESF out-of-band loop codes, ESF PRM transmit and receive functions, and the optional ESFz (ZBTSI encoding) operating mode. It also adds the DS1 Timing Slips test result to the SIGNAL category.

- 310-9B Enhanced DS1 Testing Option includes the ESF out-of-band loop codes, ESF PRM transmit and receive functions, and DS1 timing slips measurement of the 310-9A option. It also adds long user pattern (LUP) test patterns, Fractional-T1 (FT1) testing, and ESF synchronization message test result to the SIGNAL category. This option replaces the 310-9A option.

- 310-10 G.821 Results Option adds the CCITT G.821 performance analysis results to the T-BERD 310 and DS1/DS0 Analyzer Option LOGIC categories. The G.821 results include available seconds, % available seconds, % severely errored seconds, degraded minutes, % degraded minutes, and unavailable seconds.

- 19" Rack Mount, 41855-01.
- 23" Rack Mount, 41855-02.

2.8 INITIAL TEST SETUP

The following controls and indicators (see Figure 2-6) are used to initially configure the T-BERD 310/310-1 to test a circuit from a DS1 access point. The controls and indicators are described in the order that you would normally use them.

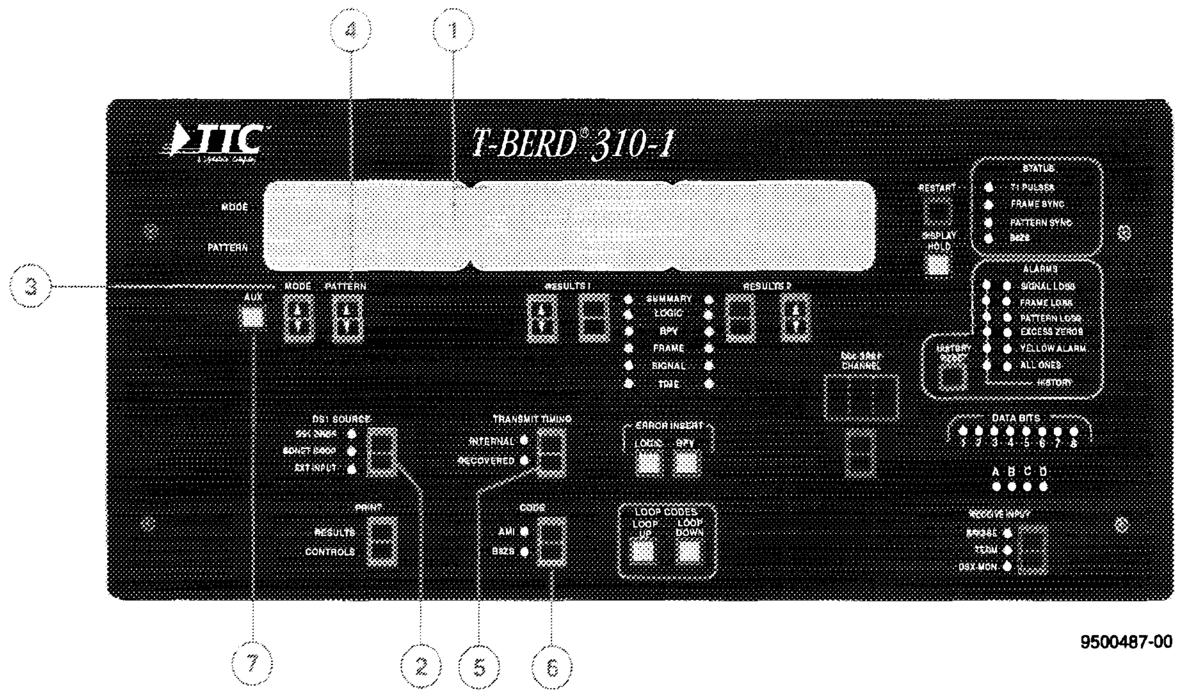

Figure 2-6
DS1/DS0 Analyzer Option Front Panel

2.8.1 Power

Power is supplied through the DS1/DS0 Analyzer Option port connector and the T-BERD 310 AC power connection. During power-up, the DS1/DS0 Analyzer Option performs a self-test on itself and the interface with the T-BERD 310.

2.8.2 Front-Panel Display 1

The display is divided into three windows: MODE/PATTERN, RESULTS I, and RESULTS II. The MODE/PATTERN window indicates the operating mode and test pattern of the DS1/DS0 Analyzer Option. The RESULTS I and RESULTS II windows indicate the results of the DS1/DS0 Analyzer Option. Adjust the DS1/DS0 Analyzer Option LCD viewing angle through the T-BERD 310 MISC-LCD CONTRAST auxiliary function.

2.8.3 DS1 SOURCE Switch 2

The **DS1 SOURCE** switch selects the DS1 input source for the DS1/DS0 Analyzer Option. Press the **DS1 SOURCE** switch to select one of the following:

DS3 DROP — The DS1 signal is provided internally from the T-BERD 310 and selected with the **CHANNEL DROP** switch with DS3-DS1 selected. Verify that the mainframe indicates DS2 Frame Sync before attempting to analyze the DS1 payload.

SONET DROP — With SONET-VT selected. the **CHANNEL DROP** switch can be used to select the DS1 dropped from SONET. Verify that the PATTERN window auto's to a DS1 payload when the **SETUP** switch is set to SONET RX before attempting to analyze a DS1 payload.

EXT. INPUT — The DS1 signal is provided directly from the side-panel DS1 RECEIVE jack.

2.8.4 MODE Switch 3

The **MODE** switch selects the transmit and receive framing format configuration for the DS1/DS0 Analyzer Option. Press the **MODE** switch to select one of the following modes:

T1 — Configures the DS1/DS0 Analyzer Option to transmit and receive unframed T1 signals.

T1 D4 — Configures the DS1/DS0 Analyzer Option to transmit and receive D4 framed T1 signals.

T1 ESF — Configures the DS1/DS0 Analyzer Option to transmit and receive extended superframe (ESF) T1 signals. With the 310-9A/B option installed, the ESF out-of-band loop codes are available, and the ESF PRM can be transmitted and received.

T1 SLC — Configures the DS1/DS0 Analyzer Option to transmit and receive Subscriber Loop Carrier (SLC) framed T1 signals.

AUTO — Configures the receiver to automatically scan and synchronize to the input signal framing and pattern information. After achieving synchronization, the transmitter regenerates the framing and test pattern without errors. When the framing format is recognized, the framing format name appears in lowercase characters in the MODE/PATTERN window. If *live* data is declared, the DS1 **TRANSMIT TIMING** switch defaults to RECOVD.

If the received signal is recognized as a test pattern:

- The test pattern name appears in lowercase characters in the PATTERN window.
- The transmitter is configured to generate the recognized framing format and test pattern.
- Logic and BPV errors can be inserted with the **ERROR INSERT** switches.
- Full DS1 logic, BPV, parity, frame, and signal error analysis is performed on the received signal.
- The appropriate LEDs illuminate.

If the received signal is *not* recognized as a test pattern, but live data:

- The word *live* appears in the PATTERN window.
- The transmitter retransmits the received signal, including errors.
- Logic errors and BPVs can be inserted with the **ERROR INSERT** switches.
- Full DS1 BPV, CRC, frame, and signal error analysis is performed on the received signal. The LOGIC category is not applicable during live data analysis.
- The appropriate LEDs illuminate.

SCAN — Automatically scans and analyzes all DS1 channels available within the signal indicated by the **DS1 SOURCE** switch. The SCAN mode can be configured as either CONTINUE or TRIGGER with the **PATTERN** switch.

SCAN CONTINUE — The DS1/DS0 Analyzer Option continually cycles through the available DS1 channels, records the status of the channels, and presents the information in real time. In continuous DS1 scan mode, the 310-1:

- Cycles through all 28 DS1 channels from the source indicated by the **DS1 SOURCE** switch.

- Previews each channel in cycle 0 to determine the framing format before checking for the other conditions.
- Repeatedly monitors each channel for the established conditions for 15 seconds in the succeeding cycles.
- Displays scan cycle counts and the channel number in the RESULTS I window.
- Automatically sets the RESULTS II window to the SUMMARY category and displays any alarms or errors found.

SCAN TRIGGER — Each channel is scanned for events which are selected in the AUX-SCAN TRIG auxiliary function. In the triggered DS1 scan mode, the 310-1:

- Cycles through all 28 DS1 channels from the source indicated by the **DS1 SOURCE** switch.
- Previews each channel in cycle 0 to determine the framing format before checking for the other conditions.
- Repeatedly monitors each channel for the events selected in the AUX-SCAN TRIG auxiliary function for 15 seconds in the succeeding scan cycles.
- Displays the scan cycle counts and channel number in the RESULTS I window.
- Identifies the scan progress in the RESULTS II window.

When a selected event is identified, the 310-1:

- Stops scanning the dropped signal and automatically configures to the current channel. A leading asterisk (*), framing format, and pattern appear in the MODE/PATTERN window.
- Performs full DS1 logic, BPV, CRC, frame, and signal error analysis on the received signal. The LOGIC category is not applicable during live data analysis.
- Displays BER analysis in the RESULTS I and II windows.
- Pressing the **RESTART** switch in this state resumes scanning on the next DS1 channel.

2.8.5 PATTERN Switch 4

The **PATTERN** switch selects the DS1 test pattern transmitted from the side-panel DS1 TRANSMIT jack. The selected test pattern is also used to obtain pattern synchronization on the receiver. Press the **PATTERN** switch to select one of the following test patterns:

QRSS — A modified 2^{20}-1 pseudorandom pattern which allows a maximum of 14 sequential zeros and 20 sequential ones. The QRSS pattern simulates live data for T1 applications.

2^23-1 — An 8,388,607-bit pseudorandom pattern which generates a maximum of 22 sequential zeros and 23 sequential ones. This pattern conforms to CCITT Recommendation O.151. The pattern exceeds excess zeros and does not meet the minimum ones density requirements for T1 applications.

2^20-1 — A 1,048,575-bit pseudorandom pattern which generates a maximum of 19 sequential zeros and 20 sequential ones. This pattern conforms with Bell Compatibility Bulletin No. 114. The pattern exceeds excess zeros and does not meet the minimum ones density requirements for T1 applications.

2^15-1 — A 32,767-bit pseudorandom pattern which generates a maximum of 14 sequential zeros and 15 sequential ones. This pattern conforms to CCITT Recommendation O.151. The pattern provides a maximum number of zeros allowed for framed, non-B8ZS testing. The pattern does not meet the minimum ones density requirement.

USER1 — A 3- to 24-bit user-programmable test pattern. This allows the DS1/DS0 Analyzer Option to transmit specific bit patterns to test circuit sensitivity to a particular pattern. The pattern is entered in binary form through the AUX-USER1 auxiliary function.

ALL ONES — A fixed test pattern of only pulses (mark). This pattern is generally used to stress span repeater current regulator circuits. It can be used as an Alarm Indication Signal (AIS) in unframed circuits, or a keep alive signal, idle code, or red alarm in other circuits. The pattern is required to measure the signal power level in dBm (see SIGNAL category).

1:1 — A fixed test pattern of alternating marks (1) and spaces (0). 1:1 is generally used to perform a minimum level stress test on clock recovery circuits.

1:7 — A fixed test pattern of F01000000.... The pattern is aligned with the F-bits as indicated to prevent false Yellow Alarms. 1:7 is generally used to stress the 12.5% ones density requirement for T1 circuits.

3 IN 24 — A fixed test pattern of F0100 0100 0000 0000 0000 0100.... The pattern is aligned with the F-bits as indicated. 3 IN 24 provides the minimum ones density (12.5%) and the maximum excess zeros (15) requirements to stress T1 circuits. When the pattern is framed, it violates the minimum ones density requirements.

ALL ZEROS — A fixed all zeros (0) pattern. Used to stress circuits for B8ZS coding errors.

CONTINUE — Continuous DS1 scan mode, refer to Section 2.9.4 for a description of the SCAN mode.

TRIGGER — Triggered DS1 scan mode, refer to Section 2.9.4 for a description of the SCAN mode.

The following long user patterns only appear when the Enhanced DS1 Testing Option is installed.

MIN/MAX — A fixed 72-octet minimum/maximum density pattern that can be used to stress test repeater pre-amplification, equalization, and ALBO circuitry. The pattern generates rapid transitions from low ones density octets to high ones density octets. When the pattern is frame aligned, it meets the maximum zeros and ones density criteria.

T1-DALY — A fixed framed or unframed 55-octet pattern (except the seventh octet is 80H instead of 00H) that meets the ones density and excess zeros criteria to test timing recovery circuits.

T1-2 — A fixed framed or unframed 96-octet pattern used to stress M12 circuits in DS3 equipment. The pattern consists of a long series of high ones density octets followed by quick changes from average ones density to low ones density octets. When the pattern is frame aligned, it provides a maximum of 15 zeros and meets the ones density criteria. This pattern causes false frame synchronization on SLC-96-type framed circuits.

T1-3 — A fixed 54-octet pattern used to stress T1 circuits and equipment. This pattern can be used to stress test repeater pre-amplification, equalization, and automatic line build-out (ALBO) circuitry. The pattern consists of rapid transitions from low ones density octets to high ones density octets. When the pattern is frame aligned, it exceeds the maximum zeros criteria and ones density criteria. The pattern should only be transmitted over the repeatered span and not the network.

T1-4 — A fixed 120-octet pattern used to stress T1 circuits and equipment. This pattern can be used to stress test equalization circuits between T1 multiplexers. The pattern is similar to the T1-2 pattern and consists of rapid changes from high ones density to minimum ones density octets. When the pattern is frame aligned, it contains a maximum of eight zeros and meets the ones density criteria.

T1-5 — A fixed 53-octet pattern used to stress T1 circuits and equipment. This pattern can be used to stress test repeater equalization and ALBO circuitry. The pattern consists of rapid transitions from high ones density octets to low ones density octets. When the pattern is frame aligned, it does not exceed the maximum zeros criteria, but it does exceed the 8(n+1) ones density criteria. The pattern should only be transmitted over the repeatered span and not the network.

55 OCTET — A fixed unframed 55-octet pattern and a variant of the MIN/MAX repeater stress pattern. This pattern can be used to stress test repeater timing recovery and ALBO circuitry. The pattern consists of rapid transitions from high ones density octets to low ones density octets. When the pattern is frame aligned, it violates the maximum zeros and ones density criteria. The pattern should only be transmitted over the repeatered span and not the network.

2.8.6 DS1 TRANSMIT TIMING Switch 5

The DS1 **TRANSMIT TIMING** switch selects the DS1 transmit clocking source for the transmitted DS1 signal. Changing this switch causes a DS1/DS0 Analyzer Option test restart. Press the DS1 **TRANSMIT TIMING** switch to select one of the following:

INTERNAL — The transmit timing is generated by the internal crystal-controlled oscillator.

RECOVERED — The transmit timing source is taken from the clock signal recovered from the received data. The LED flashes when no signal is present at the DS1 RECEIVE jack.

2.8.7 CODE Switch 6

The **CODE** switch selects the transmitted DS1 signal coding. The **CODE** switch only affects the transmitted output at the side-panel DS1 TRANSMIT jack. B8ZS decoding is performed automatically on the received input and is independent of the switch position. When B8ZS coding is detected , the B8ZS LED illuminates. When AMI coding is selected and B8ZS coding is detected at any point during a test, the message *B8ZS DETECTED* appears in the SUMMARY category and the B8ZS LED illuminates. When the optional T1 ESFz mode is selected, the **CODE** switch is disabled. Press the **CODE** switch to select:

AMI — Alternate Mark Inversion line coding.
B8ZS — Bipolar with 8-Zero Substitution encoding.

2.8.8 AUX Switch 7

The **AUX** switch provides access to a number of auxiliary functions which have limited use during normal testing. Pressing the **AUX** switch illuminates an LED which indicates the auxiliary functions are displayed and available for verification or modification. Pressing the **PATTERN** switch scrolls the auxiliary functions in the display. The auxiliary function name appears in the MODE/PATTERN window. The auxiliary function parameters appear in the RESULTS I and RESULTS II windows. The **RESULTS I** and **RESULTS II** switches are used in combination to change or enter information into the selected auxiliary function. The following auxiliary functions control the 310-1 DS1/DS0 Analyzer. Refer to *DS1/DS0 Analyzer Option Auxiliary Functions* for more detailed information on the auxiliary functions.

AUX-USER1 — User-Programmable Test Pattern
Forward/Reverse - Cursor control.

Toggle/End - Change bit or save entry.

AUX-PGM LPUP — Programmable Loop-Up Code
Forward/Reverse - Cursor control.

Toggle/End - Change bit or save entry.

AUX-PGM LPDN — Programmable Loop-Down Code
Forward/Reverse - Cursor control.

Toggle/End - Change bit or save entry.

AUX-LP CODE — Loop Code Select
Select - CSU, Programmable, Facility 1, or Facility 2.

Out-of-Band - Line, Payload, or Network (310-9A/B).

AUX-ESF LOOP — ESF Loop Code Select (310-9A/B)

Select - In-band or Out-of-band.

AUX-PRM — ESF Datalink Performance Report Message Control (310-9A/B)

PRM Transmit - Off, Emulate Customer, or Emulate Carrier.

PRM Receive - On or Off.

AUX-DATAPORT — DATAPORT Connector Output

Select - DS0 or Datalink.

AUX-CUSTOM — Customized Printout Format

Select - Test results and LEDs.

On/Off - On or Off.

AUX-SLIP REF — DS1 Timing Slip Reference Source (310-9A/B)

Select - Pri DS3 Drop, Sec DS3 Drop, SONET Drop, DS1 Receive, DS1 Insert, or DS1 BITS Clock.

AUX-SCAN TRIG — Triggered DS1 Scan Mode Event Criteria

Select - Frame Errors, CRC Errors, All Ones, Yellow Alarm, Timing Slips, Frame Sync, or Frame Loss.

On/Off - On or Off.

AUX-CHAN FMT — FT1 Channel Format Select (310-9B)

Select - Full T1 or 64xN.

64xN Select - Contiguous or Non-contiguous.

AUX-CONTIG — FT1 Contiguous Channel Format Select (310-9B)

Start Channel - 1 to 24.

Length - 24 to 1.

AUX-N-CONTIG — FT1 Non-Contiguous Channel Format Select (310-9B)

Forward/Reverse - Cursor control.

Toggle/End - Select channel or save entry.

2.9 TEST CONNECTIONS

The DS1/DS0 Analyzer Option can receive and analyze a DS1 signal from DS1, DS3, and SONET DS1 signal sources. The DS1/DS0 Analyzer Option also provides connections to drop DS0, VF, and datalink (ESF, optional ESFz, and SLC-96) signals. Figure 2-7 shows the location of the DS1/DS0 Analyzer Option connections on the T-BERD 310 side panel.

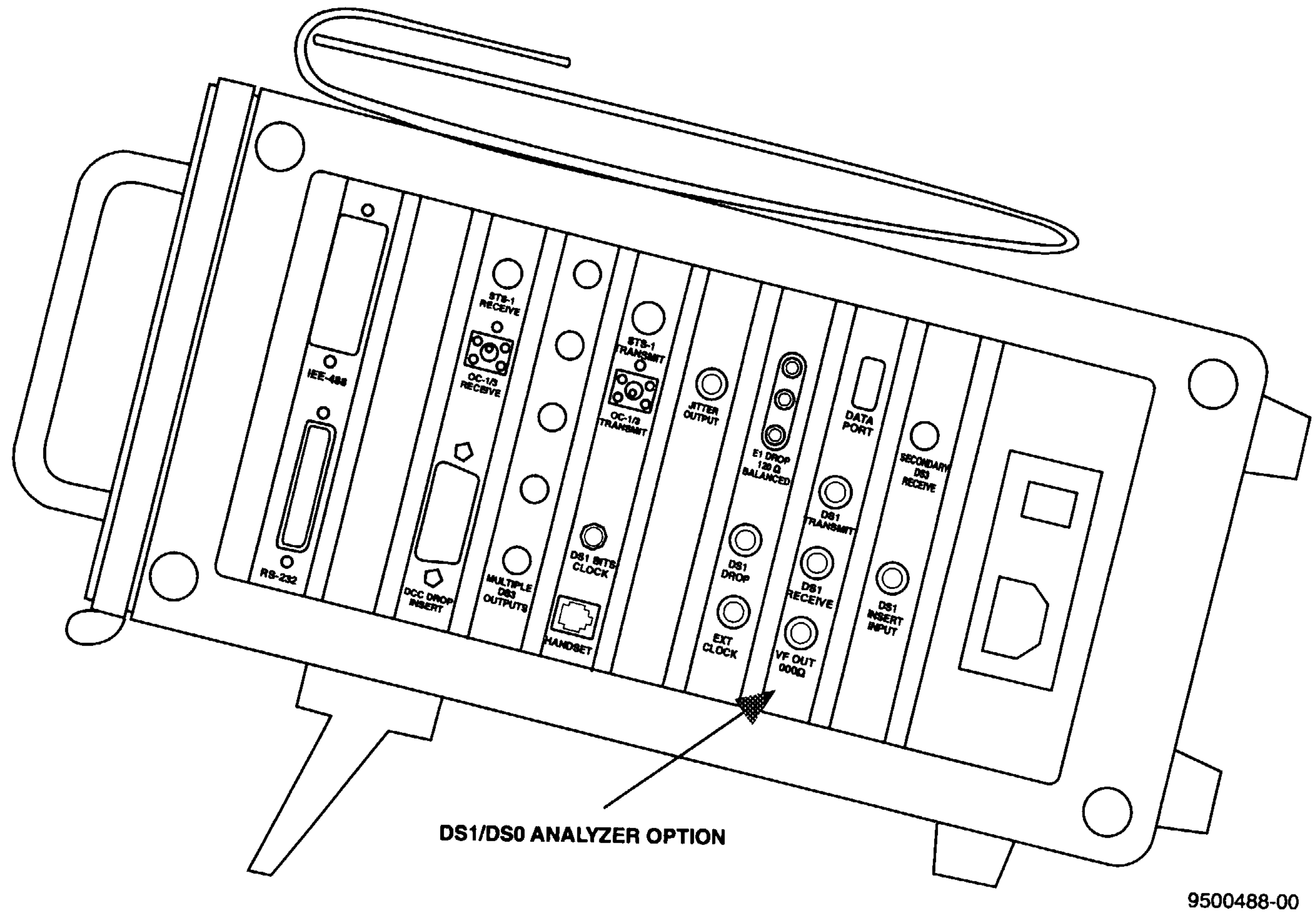

Figure 2-7
DS1/DS0 Analyzer Option Connections

2.9.1 Input Signal Connections

The following input signal connections are used to receive a DS1 signal from a DS1, DS3, or SONET source.

DS1 RECEIVE jack — The side-panel Bantam (new units) or WECO 310 (old units) jack accepts DS1 level signals. The **DS1 SOURCE** switch must be set to EXT. INPUT to select the DS1 RECEIVE jack. The receive input level is controlled by the **RECEIVE INPUT** switch.

RECEIVE INPUT switch *8* (see Figure 2-6) — This switch selects the input level for the DS1 RECEIVE jack. Changing the switch position causes a test restart of the 310-1. The **RECEIVE INPUT** switch selections include:

BRIDGE — Provides an input impedance greater than 1000 ohms for bridging lines that are already terminated. The BRIDGE setting provides Automatic Line Build-out (ALBO) compensation for cable losses of up to 35 dB. This is useful for bridging directly across copper cable pairs.

TERM — Provides an input impedance of 100 ohms. The TERM setting provides ALBO compensation for cable losses of up to 35 dB. This is useful for terminating a circuit with the DS1/DS0 Analyzer Option.

DSX-MON — Provides both 100 ohms of input impedance and compensation for resistive loss. DSX-MON is useful for monitoring T1 lines at DSX-monitor points which are resistor-isolated. When cable compensation is not desired, the line can be terminated with this selection.

DS3 RECEIVE jack (see Figure 2-1) — The DS1 channel can be dropped from the DS3 RECEIVE jack. To drop the DS1 signal from the DS3 RECEIVE jack, set the following switches:

DS3 SOURCE switch (310) — Set to EXT.

DS1 SOURCE switch (310-1) — Set to DS3 DROP.

CHANNEL CONTROL Switch (310) — Set to DS3-DS1.

CHANNEL DROP switch: DS3-DS1 (310) — Select the desired DS1 channel from the DS3 signal.

STS-1 RECEIVE jack or OC-1/3/12 RECEIVE connector — A DS1 channel can be dropped directly from a SONET signal containing VT1.5 payloads received at the STS-1, OC-1, OC-3, or OC-12 RECEIVE connector. To drop the DS1 channel from a VT1.5 mapped signal, set the following switches:

DS1 SOURCE switch (310-1) — Set to SONET DROP.

CHANNEL CONTROL switch (310) — Set to SONET-STS to select the correct SONET STS-1.
Set to SONET-VT to select the correct DS1 (VT1.5).

The DS1 channel can also be dropped from a DS3 payload within a SONET signal received through the side-panel STS-1, OC-1, OC-3, or OC-12 RECEIVE connector. To drop a DS1 channel from a DS3 payload within a SONET signal, set the following switches:

DS3 SOURCE switch (310) — Set to SONET.

DS1 SOURCE switch (310-1) — Set to DS3 DROP.

CHANNEL CONTROL switch (310) — Set to SONET-STS to select the correct STS identifier.

CHANNEL DROP switch: DS3-DS1 (310) — Select the desired DS1 channel from the SONET DS3 payload.

NOTE: The SONET AUTO mode can be used to easily identify a DS1 payload from a DS3 payload. Configure the **Setup** switch for SONET RX, and select AUTO with the **PATTERN** switch.

2.9.2 Output Signal Connections

The DS1/DS0 Analyzer Option provides connections that transmit framed and unframed T1 signals. DS0 channels or ESF, optional ESFz, and SLC-96 datalink signals can be dropped to external test sets. These connections are found on the T-BERD 310 side-panel and are described as follows:

DS1 TRANSMIT jack — This Bantam (new units) or WECO 310 (old units) jack transmits DS1 signals with either AMI or B8ZS coding. The output signal format is controlled through the **MODE** switch.

DATAPORT connector — This 9-pin, female D connector provides access to the ESF, SLC-96, or ZBTSI datalinks and 64 or 56 kb/s DS0 channels. The DATAPORT is active only when frame synchronization is achieved. The AUX-DATAPORT auxiliary function controls the signal sent to the DATAPORT connector. Use the **MODE** switch to select the T1 ESF, optional T1 ESFz, or T1 SLC datalink. Use the **DS0 DROP CHANNEL** switch to select the DS0 channel. Refer to Section 5 for the DATAPORT connector pin assignments. A DATAPORT adaptor cable is available from TTC.

VF OUT 600-OHM jack — The Bantam (new units) or WECO 310 (old units) jack provides a calibrated 0 dBm VF output across a 600-ohm termination. The output can also be heard from the speaker. The T-BERD 310 **VOLUME** switch only controls the speaker output. When frame synchronization is lost, the jack and speaker outputs are squelched.

2.10 SIGNAL VERIFICATION

The following indicators and results are used to verify that the DS1/DS0 Analyzer Option has properly acquired the received DS1 signal (see Figure 2-8).

2.10.1 DS1 Status LEDs 8

The following green Status LEDs provide information about the condition of the received DS1 signal.

T1 Pulses — Illuminates when the DS1/DS0 Analyzer Option detects multiple T1 pulses from one of three DS1 sources: the side-panel DS1 RECEIVE jack, channelized DS3, or SONET DS1 payload. If the received signal is lost, the LED goes out and the DS3 Signal Loss LED illuminates.

Frame Sync — Illuminates when the DS1/DS0 Analyzer Option acquires frame synchronization. If the received framing format is lost, the LED goes out and the Frame Loss LED illuminates.

Pattern Sync — Illuminates when the DS1/DS0 Analyzer Option synchronizes to the test pattern displayed in the PATTERN window. If pattern synchronization is lost, the LED goes out and the DS3 Pattern Loss LED illuminates.

B8ZS — Illuminates when B8ZS clear channel coding is detected in the received DS1 signal. If B8ZS encoding is detected during any part of the test and the **CODE** switch is set to AMI, the message *B8ZS DETECTED* is displayed in the SUMMARY category. The LED is only active when the **DS1 SOURCE** switch is set to EXT. INPUT (side-panel DS1 RECEIVE jack).

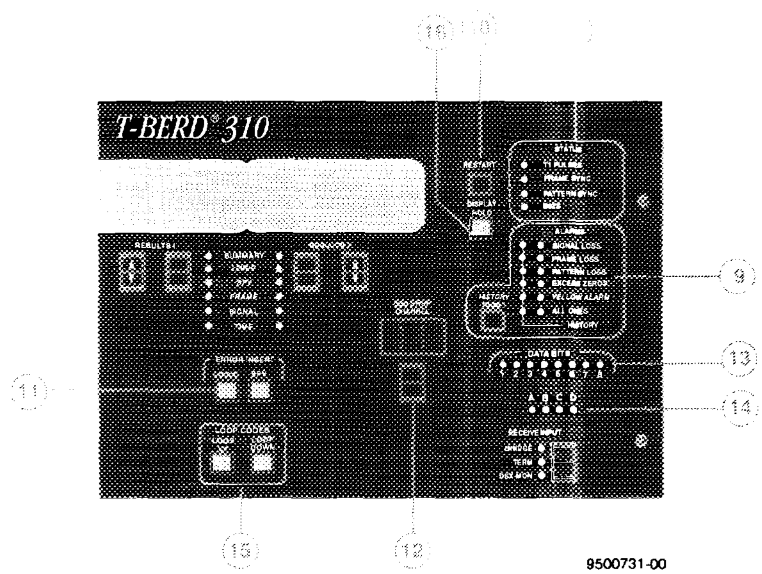

Figure 2-8
Controls and Indicators to Verify the Received Signal

2.10.2 DS1 Alarm LEDs 9

The red Alarm LEDs provide information about the current and historical alarm conditions related to the received signal. These LEDs are divided into two columns (current and history) as shown in Figure 2-8. The right column illuminates when an alarm condition occurs and remains illuminated as long as the alarm exists. When the current alarm condition is cleared (e.g., pattern sync reestablished), the associated History LED illuminates. The History LEDs indicate past occurrences of the alarm and remain illuminated until either the **HISTORY RESET** switch is pressed or a DS1/DS0 Analyzer Option test restart occurs. The Alarm LEDs are described as follows:

Signal Loss — Illuminates when no pulses are detected. When T1 pulses are detected again, the Alarm LED goes out, and the associated History LED and the T1 Pulses LED illuminate.

Frame Loss — Illuminates when frame synchronization is lost. When DS1 framing is detected again, the Alarm LED goes out, and the associated History LED and Frame Sync LED illuminate.

Pattern Loss — Illuminates when pattern synchronization is lost. When the pattern is resynchronized, the Alarm LED goes out, and the associated History LED and Pattern Sync LED illuminate.

Excess Zeros — Illuminates when excess zeros are detected in AMI or B8ZS coding. When excess zeros are no longer detected, the LED goes out and the associated History LED illuminates. The LED is only active when the **DS1 SOURCE** switch is set to EXT. INPUT.

Yellow Alarm — Illuminates when a Yellow Alarm is detected. When the Yellow Alarm is no longer detected, the LED goes out and the associated History LED illuminates.

All Ones — Illuminates when all ones are detected in an unframed DS1 signal. When All Ones are no longer detected, the LED goes out and the associated History LED illuminates.

HISTORY RESET switch — This switch clears all History LEDs on the 310-1. This switch does not restart a test, nor does it affect any of the Alarm LEDs or accumulated results. The switch is not operable when the **DISPLAY HOLD** switch is activated. **The RESTART** switch also clears the History LEDs.

2.10.3 SUMMARY Category Messages

The SUMMARY category provides a convenient way to monitor specific results and measurements without having to search through the other categories. The SUMMARY category also provides a number of messages indicating whether the results are in or out of specification. The SUMMARY category is selected by pressing either the **RESULTS I Category** or the **RESULTS II Category** switch. When the category is selected, the appropriate yellow LED illuminates.

NOTE: If B8ZS encoding is detected during any part of the test and the **CODE** switch is set to AMI, the message *B8ZS DETECTED* is displayed in the SUMMARY category. The LED is only active when the **DS1 SOURCE** switch is set to EXT. INPUT (side-panel DS1 RECEIVE jack).

During initial acquisition of the received signal, the SUMMARY category should be displayed. The following messages can appear during signal acquisition:

ALL RESULTS UNAVAILABLE — This indicates that the DS1/DS0 Analyzer Option has not detected the received signal.

ALL RESULTS OK — This indicates that the DS1/DS0 Analyzer Option has detected and synchronized to the received signal and that no key results are non-zero or out-of-specification.

When an error is detected, the appropriate result appears in the SUMMARY category window. Refer to *DS1/DS0 Analyzer Option Test Results* for more information on the test results that appear in the SUMMARY category.

2.11 STARTING AND RUNNING THE TEST

This section explains the controls, indicators, and results used to run a test. The following front-panel controls and indicators are described in this section (see Figure 2-8):

2.11.1 RESTART Switch 10

Pressing the **RESTART** switch halts the current test, clears all results, clears the Status and Alarm LEDs, resynchronizes the receiver to the received signal, and restarts the test.

NOTE: Pressing one of the following switches also causes a test restart of the 310-1: **MODE, PATTERN,** and **RECEIVE INPUT**. Changing the AUX-USER1 auxiliary function when the USER1 test pattern is being transmitted also causes a test restart of the 310-1.

2.11.2 ERROR INSERT Switches 11

The two **ERROR INSERT** switches, **LOGIC** and **BPV**, insert logic errors and BPVs into the data stream individually or simultaneously. The **ERROR INSERT** switches perform the following functions:

LOGIC ERROR INSERT switch — Press the **LOGIC ERROR INSERT** switch to insert single or continuous logic errors into the transmitted DS1 data and overhead bits. A single logic error is inserted when the **LOGIC** switch is pressed for less than one second. The switch LED flashes once indicating a single logic error is inserted. Continuous logic errors are inserted at a 10^{-3} error rate when the **LOGIC** switch is pressed for more than one second. The switch LED flashes once and then illuminates continuously. Pressing the illuminated switch again turns the error insertion off and extinguishes the LED. Logic error insertion affects the signal transmitted from the side-panel DS1 TRANSMIT jack. It also affects the inserted DS1 signal when the DS1 INSERT mode is selected.

BPV ERROR INSERT switch — Press the **BPV ERROR INSERT** switch to insert single or continuous BPVs into the transmitted DS1 signal. A single BPV is inserted when the **BPV** switch is pressed for less than one second. The switch LED flashes once indicating a single BPV is inserted. Continuous BPVs are inserted at a 10^{-3} error rate when the **BPV** switch is pressed for more than one second. The switch LED flashes once and then illuminates continuously. Pressing the illuminated switch again turns the error insertion off and extinguishes the LED. BPV insertion only affects the signal transmitted from the side-panel DS1 TRANSMIT jack.

2.11.3 DS0 DROP CHANNEL Switch and Window 12

This switch selects the DS0 channel dropped from the DS1 signal. The selected DS0 signal appears at the Data Bit LEDs, Channel Signaling Status LEDs, T-BERD 310 speaker, side-panel VF OUT jack, and DATAPORT connector. The selected DS0 channel number (1 to 24) is visible in the channel window above the switch.

2.11.4 Data Bit LEDs 13

The eight yellow LEDs indicate the contents of the selected DS0 channel. The Data Bit LEDs are not illuminated when frame synchronization is lost.

2.11.5 Channel Signaling Status LEDs 14

The four LEDs, labeled A, B, C, and D, indicate the T1 ESF and optional T1 ESFz (ZBTSI) channel signaling status of the selected DS0 channel. LEDs A and B also indicate the T1 D4 and T1 SLC channel signaling status of the selected DS0 channel. The channel signaling status LEDs only respond to signaling after frame synchronization is established. All 24 DS0 channel signaling bits are displayed in the SIGNAL category "abcd" result.

2.11.6 LOOP CODES Switches 15

The **LOOP UP** and **LOOP DOWN** switches are used to generate loop codes to place CSUs or other facilities into loopback or release them from a loopback. When either switch is pressed, test restart occurs, the loop code is transmitted, and a loop code message appears in place of the displayed test pattern (in the PATTERN window). When the loop code transmission is completed, the DS1/DS0 Analyzer Option returns to transmitting the selected test pattern (the pattern reappears in the window). The AUX-LP CODE auxiliary function selects the loop code type being transmitted. Four different loop codes can be selected (FACILITY 1, FACILITY 2, CSU, and PROGRAMMABLE).

LOOP UP switch — This switch controls the transmission of the loop-up code selected through the AUX-LP CODE auxiliary function. When the **LOOP UP** switch is pressed, the LED inside the switch illuminates and the loop-up code is transmitted. The loop code is transmitted continuously until (1) the loop-up code is detected by the DS1/DS0 Analyzer Option receiver for 250 ms, (2) the **LOOP UP** switch is pressed again, (3) the **LOOP DOWN** switch is pressed, or (4) a test restart of the DS1/DS0 Analyzer Option occurs. One of the following loop-up messages appear in the PATTERN window when a loop-up code is transmitted:

CSU LPUP	The CSU loop-up code is being transmitted
FAC1 LPUP	The facility 1 loop-up code is being transmitted
FAC2 LPUP	The facility 2 loop-up code is being transmitted
PGM LPUP	The programmable loop-up code is being transmitted

LOOP DOWN switch — This switch controls the transmission of the loop-down code selected through the AUX-LP CODE auxiliary function. When the **LOOP DOWN** switch is pressed, the LED inside the switch illuminates and the loop-down code is transmitted. The loop code is transmitted continuously until either (1) the loop-down code is no longer detected by the DS1/DS0 Analyzer Option receiver, (2) the **LOOP DOWN** switch is pressed again, (3) the **LOOP UP** switch is pressed, or (4) a test restart of the DS1/DS0 Analyzer Option occurs. One of the following loop-down messages appear in the PATTERN window when a loop-down code is transmitted:

CSU LPDN	The CSU loop-down code is being transmitted
FAC1 LPDN	The facility 1 loop-down code is being transmitted
FAC2 LPDN	The facility 2 loop-down code is being transmitted
PGM LPDN	The programmable loop-down code is being transmitted

2.12 COLLECTING TEST RESULTS

This section describes the available test result categories and the following controls to collect the test results.

2.12.1 Categorized Test Results

The results are divided into six categories. The first and most commonly used category is the SUMMARY category. During the initial test setup procedure, the SUMMARY category displays key non-zero or out-of-specification results. Refer to *DS1/DS0 Analyzer Option Test Results* for more information on test results. The available categories include:

SUMMARY Category — Lists key results that are non-zero or out-of-specification.
LOGIC Category — Lists pattern bit error related results.

BPV Category — Lists bipolar violation related results.
FRAME Category — List DS1 frame and CRC error related results.
SIGNAL Category — List signal (frequency, level, and loss seconds) related results.
Time Category — Lists time related results.

2.12.2 RESULTS Switches and Windows

When the mode and pattern are displayed, two results are displayed simultaneously in the RESULTS I and RESULTS II window. The available categories and results are selected with the following switches.

RESULTS I and RESULTS II Category switches — Selects the category from the list of categories next to the switch. The labeled LEDs illuminate as the category is selected.

RESULTS I and RESULTS II Category switches — Selects the individual results from the indicated category.

2.12.3 DISPLAY HOLD Switch 16

Pressing the **DISPLAY HOLD** switch temporarily freezes the results and Status and Alarm LEDs for the DS1/DS0 Analyzer Option only (see Figure 2-8). The LED illuminates to indicate that the results and LEDs are frozen. During the display hold, all results can be examined using the **RESULTS** switches. The results continue to accumulate in the background. When the **DISPLAY HOLD** switch is released, the results and LEDs are updated.

2.13 PRINTING THE TEST SETUP AND RESULTS

The DS1/DS0 Analyzer Option provides manual test result and front-panel control printouts through the **PRINT** switch. The T-BERD 310 **PRINT EVENT** switch and PRINT auxiliary group determine the DS1/DS0 Analyzer Option printout format and interval. Refer to Section 3 for additional information.

E1 DROP

E1 DROP OPTION

2.14 INTRODUCTION

The 310-2 E1 Drop Option enables the T-BERD 310 to drop an E1 channel from a DS3 signal to an external test set such as the TTC INTERCEPTOR 1402 Communications Analyzer. The E1 Drop Option adds an E1 drop output connection on the T-BERD 310 side panel. Unless otherwise indicated in this section, the T-BERD 310 functions as previously described.

2.15 INITIAL TEST SETUP

The following controls and indicators (see Figure 2-9) are used to initially configure the T-BERD 310 to test DS3 signals and drop out an E1 channel with the E1 Drop Option.

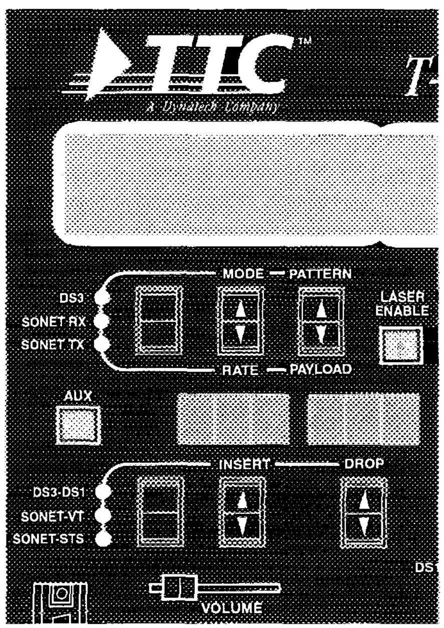

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Figure 2-9
Test Set-Up Controls and Indicators

2.15.1 SETUP Switch

Set the **SETUP** switch to DS3 for E1 drop testing.

2.15.2 MODE Switch

Select either the M13, C-BIT, AUTO, or THRU mode to drop an E1 signal. The received DS3 signal must have the proper DS2 Frame Alignment Sequence (DS2 FAS) to drop the E1 channel. The T-BERD 310 automatically senses the DS2 FAS.

2.15.3 DS3-DS1 CHANNEL DROP Switch

When a DS3 signal is received, the **DS3-DS1 CHANNEL DROP** switch can select either a DS1 or an E1 channel. The selected DS1 channel is dropped to the side-panel DS1 DROP jack and the selected E1 channel is dropped to the side-panel E1 DROP jack. The E1 channel number (E1 to E21) is displayed in the DS3-DS1 CHANNEL DROP window.

Table 2-3 shows how the DS1 and E1 channels are grouped by DS2 M-frames. As the DS1/E1 channel is selected from one DS2 M-frame to another, the T-BERD 310 automatically synchronizes to the appropriate DS2 framing pattern. The message *DS2 TEST RESTART* also appears in the MODE/PATTERN window when changing from one DS2 M-frame to another.

If the DS3 signal contains both DS1 and E1 channels, the DS1 channels are displayed as "1" through "28" and the E1 channels are displayed as "E1" to "E21". When changing from one DS2 M-frame to another with alternating DS1 and E1 channels (by M-frame), the T-BERD 310 automatically senses the appropriate DS2 framing format and changes the channel number accordingly. For example, if the first DS2 M-frame has DS1 channels (1 to 4) and the second DS2 M-frame has E1 channels (E4 to E6), changing from DS1 channel 4 to 5 (see Table 2-3), would actually change the displayed channel from DS1 channel 4 to E1 channel E4.

Table 2-3
DS1 and E1 Channel Numbers

DS2 M-frames	DS1 Channel	E1 Channel
1	1	E1
	2	E2
	3	E3
	4	
2	5	E4
	6	E5
	7	E6
	8	
3	9	E7
	10	E8
	11	E9
	12	
4	13	E10
	14	E11
	15	E12
	16	
5	17	E13
	18	E14
	19	E15
	20	
6	21	E16
	22	E17
	23	E18
	24	
7	25	E19
	26	E20
	27	E21
	28	

2.16 TEST CONNECTIONS

The E1 Drop Option adds the E1 DROP 3-pin banana jack to the side-panel DS1 DROP/EXT CLOCK slot (see Figure 2-10). The front-panel DS3 input provides the connection to receive the DS3 signal with the E1 channels.

2.16.1 Input Signal Connections

The DS3 RECEIVE jack provides the only input signal to drop an E1 signal. If a SONET option is installed, an E1 channel can be dropped from a SONET DS3 payload.

2.16.2 Output Signal Connections

The E1 DROP jack is the only output for E1 signals. This allows an external test set, such as the TTC INTERCEPTOR 1402 Communications Analyzer, to be connected to the T-BERD 310 to analyze the selected E1 channel dropped from the DS3 signal.

2.17 SIGNAL VERIFICATION

The following indicators and results are used to verify that the T-BERD 310 has properly acquired the received DS3 signal (see Figure 2-11) and dropped the E1 channel.

2.17.1 DS3 Primary Status LEDs

The DS3 Primary Status LEDs perform the same functions as previously described in this section with the exception of the DS2 Frame Sync LED. The DS2 Frame Sync LED also illuminates when a valid DS2 FAS is detected.

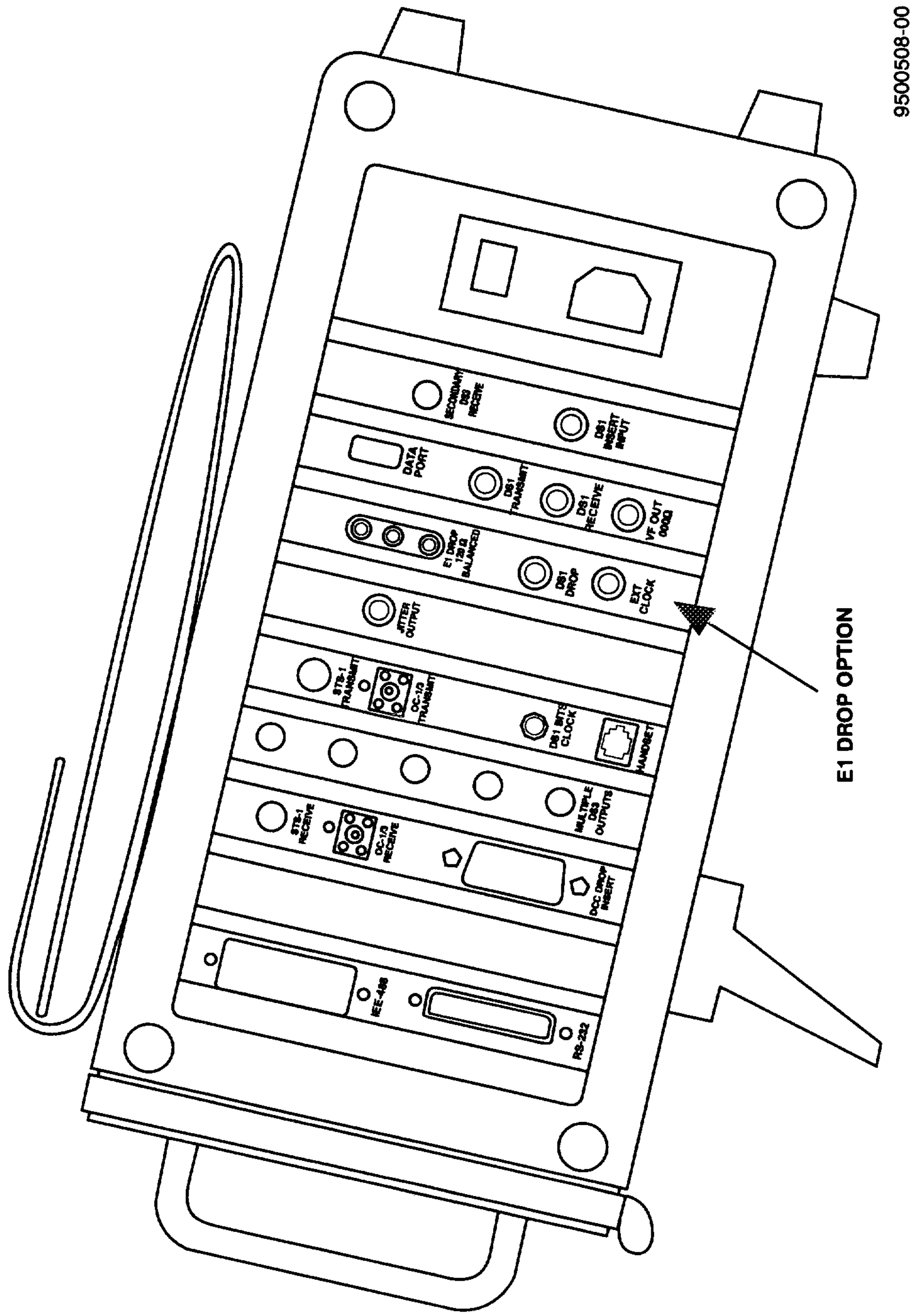

Figure 2-10
E1 Drop Option Connection

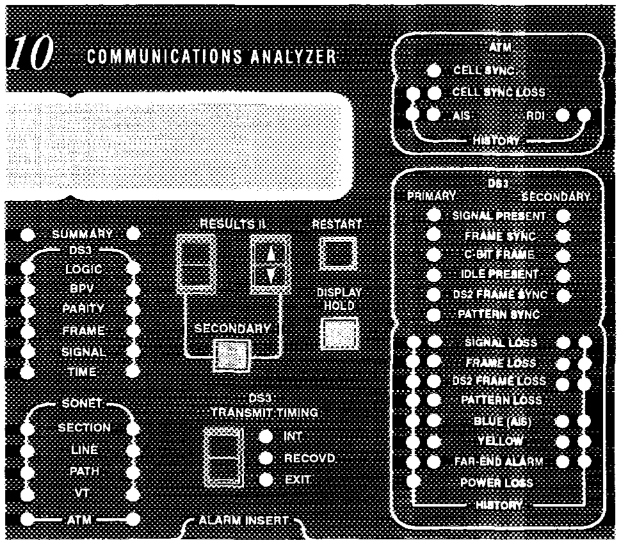

Figure 2-11
DS3 Signal Verification

2.17.2 DS3 Primary Alarm LEDs

The DS3 Primary Alarm LEDs perform the same functions as previously described in this section with the exception of the DS2 Frame Loss LED. The DS2 Frame Loss LED illuminates when the DS2 FAS is lost. When DS2 framing is detected again, the LED goes out, and the associated DS3 History LED and the DS2 Frame Sync LED illuminate.

2.17.3 SUMMARY Category Test Results and Messages

The SUMMARY category performs the same functions as previously described in this section for the DS3 signal analysis. During the initial acquisition of the received signal, the SUMMARY category should be displayed. This provides you with key results on the received DS3 signal when an error does occur.

2.17.4 DS3-DS1 CHANNEL DROP Window

When the T-BERD 310 is synchronized to the DS2 FAS (DS3/DS2 Frame Sync LED illuminated), an "E" appears in front of the E1 channel number (E1 to E21). When the T-BERD 310 is synchronized to the DS2 framing (DS3 DS2 Frame Sync LED illuminated), the DS1 channel number appears (1 to 28).

2.18 COLLECTING TEST RESULTS

The E1 signal test results and measurements must be made through an external test set, such as the TTC INTERCEPTOR 1402 Communications Analyzer. The DS3 signal test results should be checked to verify that the DS3 signal is functioning properly. When a DS3 signal is received with embedded E1 channels, the DS2 FRM ERR, DS2 FRM ERT, and DS2 AV F ERT results indicate DS2 FAS errors, not DS2 frame errors.

DS1 INSERT

DS1 INSERT OPTION

2.19 INTRODUCTION

This section describes the 310-3 DS1 Insert Option which allows the T-BERD 310 to insert a DS1 channel into a multiplexed DS3 signal. The option equips the T-BERD 310 with a secondary DS3 receiver and a DS1 receiver.

Figure 2-12 illustrates the signal flow when performing DS1 drop and insert testing. A DS1 signal is inserted into a selected channel of the secondary DS3 receive input. The DS1 signal can be sourced internally from the DS1/DS0 Analyzer Option, or externally from the DS1 insert input. Once the DS1 channel is inserted into the DS3 signal, the full DS3 is transmitted into the network. The DS1 channel can then be looped back into the returning DS3 signal. This DS3 signal is then accepted by the DS3 receive jack. The DS1 channel can then be dropped and analyzed by either the DS1/DS0 Analyzer Option or by an external DS1 test set.

Additionally, the T-BERD 310 can perform dual DS3 signal monitoring by using the secondary DS3 receiver with the primary DS3 receiver. DS3 signal analysis can be performed simultaneously on both the primary and secondary DS3 input signals.

Appendix C shows the functional block diagram of the T-BERD 310 mainframe and the 310-3 DS1 Insert Option.

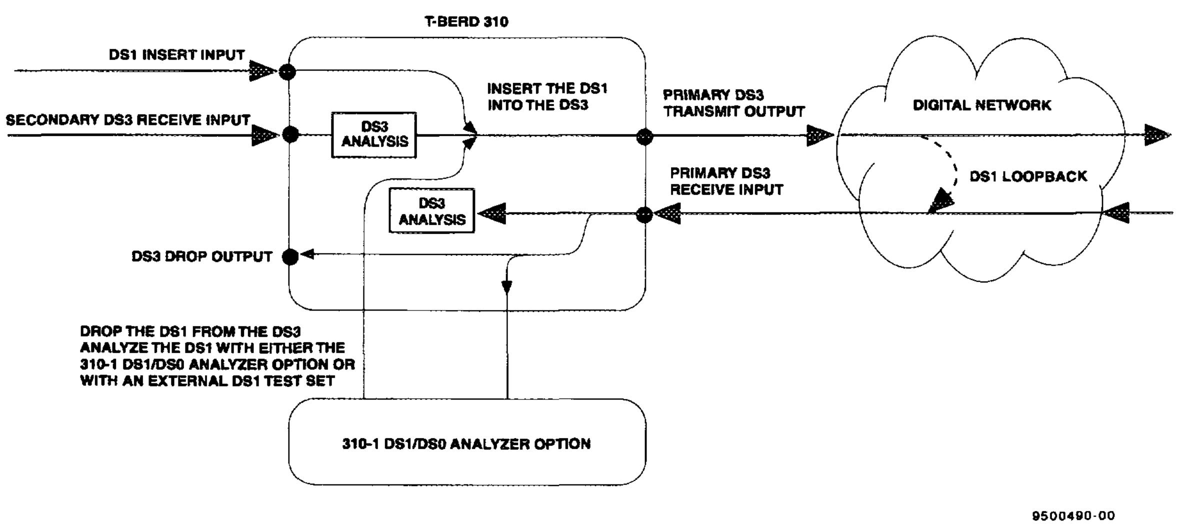

Figure 2-12
DS1 Insert Option Signal Flow

2.20 INITIAL TEST SETUP

This section describes the controls and indicators (see Figure 2-13) used to initially configure the T-BERD 310 to drop and insert a DS1 channel from a DS3 signal.

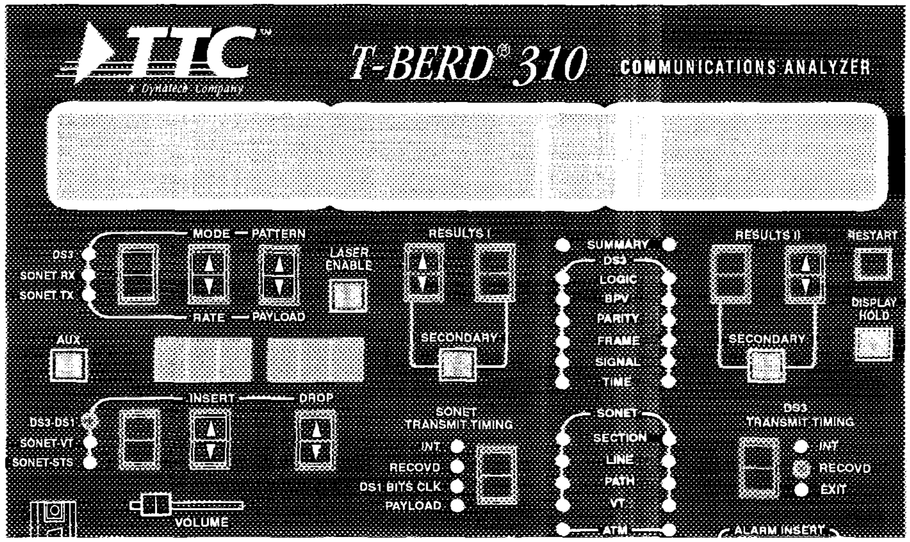

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Figure 2-13
Test Setup Controls and Indicators

2.20.1 MODE Switch

Press the **MODE** switch to select the DS1 INSERT mode. The DS1 INSERT mode configures the T-BERD 310 to insert a DS1 channel into a secondary DS3 signal. Use the **PATTERN** switch to select the DS1 input source. The T-BERD 310 automatically configures itself to the received secondary DS3 framing.

2.20.2 PATTERN Switch

Press the **PATTERN** switch to select the DS1 input source when the DS1 INSERT mode is selected. Select the DS1 input source from one of the following:

EXTERNAL DS1 — Selects the side-panel DS1 INSERT INPUT jack as the source of the DS1 channel to be inserted into the DS3 signal from the SECONDARY DS3 RECEIVE jack.

INTERNAL DS1 — Selects the DS1 signal generated by the DS1/DS0 Analyzer Option as the source of the DS1 channel to be inserted into the DS3 signal from the SECONDARY DS3 RECEIVE jack. This selection is only available when the DS1/DS0 Analyzer Option is installed.

2.20.3 DS3 TRANSMIT TIMING Switch

When the DS1 INSERT mode is selected, this switch defaults to RECOVD timing. The T-BERD 310 uses the secondary DS3 input signal as the recovered timing source.

2.20.4 DS3-DS1 CHANNEL INSERT Switch

When in the DS1 INSERT mode, this switch selects the DS1 channel to be inserted into the secondary DS3 signal. Each time the **DS3-DS1 CHANNEL INSERT** switch is pressed, the channel number flashes for three seconds before the new selection takes affect. This allows the selection to be changed without affecting the test. The **DS3-DS1 CHANNEL INSERT** switch selections include:

1 to 28 — Select the inserted DS1 channel. The remaining 27 DS1 channels are not affected.

— — — (triple dashes) — Select to pass the full secondary DS3 signal. No DS1 channels are inserted.

2.21 TEST CONNECTIONS

The DS1 Insert Option adds two connections to the T-BERD 310: SECONDARY DS3 RECEIVE and DS1 INSERT INPUT jacks (see Figure 2-14). The front-panel DS3 connections provide access to the primary DS3 signal. The side-panel DS1 DROP jack provides access to the dropped DS1 signal.

2.21.1 Input Signal Connections

The following input signal connections are used to receive the primary and secondary DS3 signals and the DS1 channel.

SECONDARY DS3 RECEIVE jack — This jack is located on the side panel. It allows a secondary DS3 signal to be analyzed and retransmitted from the DS3 TRANSMIT jack. In the DS1 INSERT mode, connect the secondary DS3 signal to the T-BERD 310 first. This allows the T-BERD 310 to synchronize to the secondary DS3 signal before connecting the T-BERD 310 output and interrupting the circuit under test. The jack can accept a DSX-3 or HIGH input level.

DS1 INSERT INPUT jack — This Bantam (new units) or WECO 310 (old units) jack accepts a DS1 channel to be inserted into the DS3 signal from the SECONDARY DS3 RECEIVE jack. The jack can accept a DSX-1 input level.

2.21.2 Output Signal Connection

The DS3 TRANSMIT jack retransmits the secondary DS3 signal containing the inserted DS1 channel.

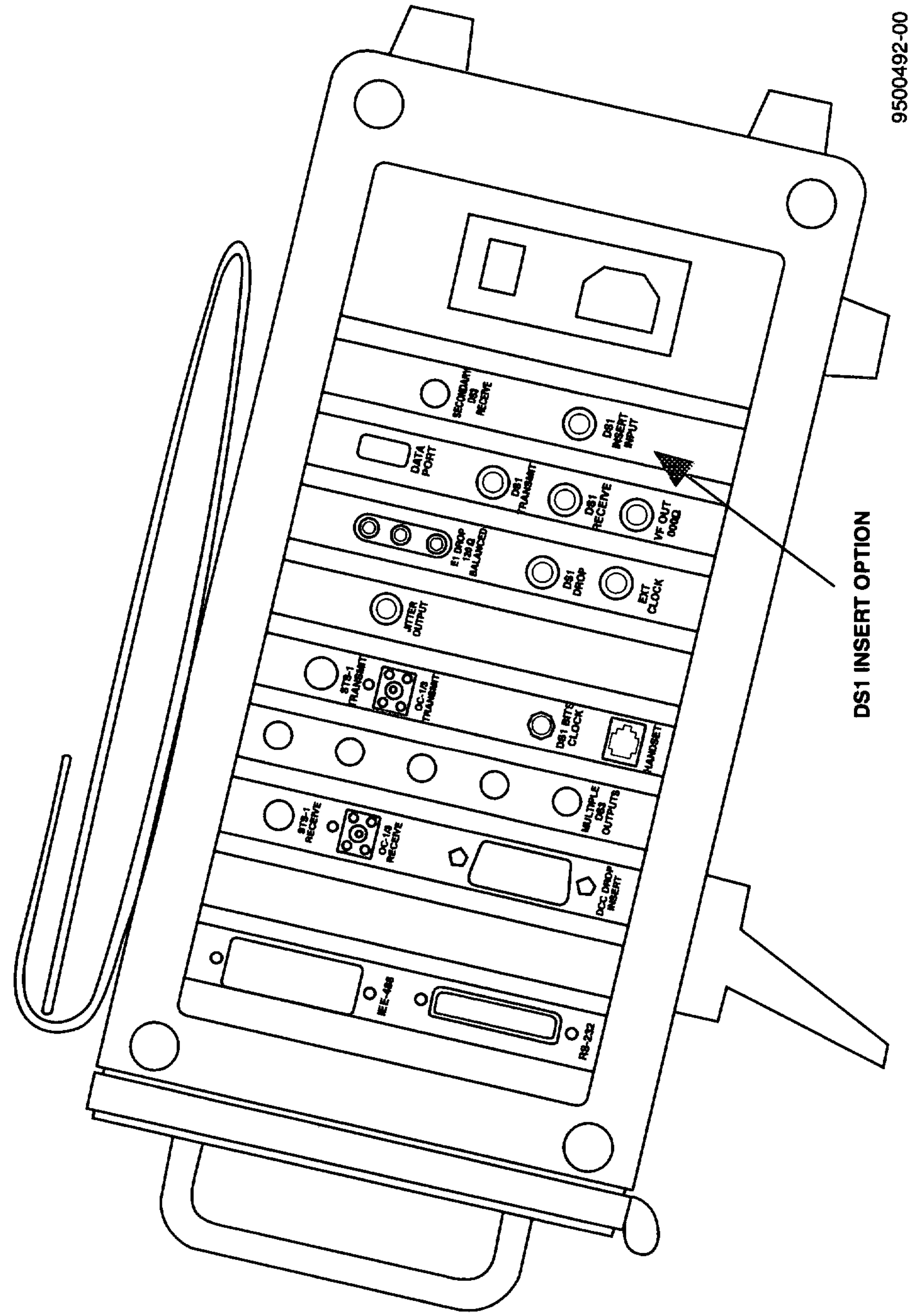

Figure 2-14
DS1 Insert Option Connections

2.22 SIGNAL VERIFICATION

This section describes the following controls, indicators, and results used to verify that the T-BERD 310 has properly acquired the received secondary DS3 signal (see Figure 2-15).

2.22.1 DS3 Secondary Status LEDs

The green DS3 Secondary Status LEDs provide information about the current condition of the received secondary DS3 signal. The DS3 Secondary Status LEDs perform the same functions as described in Section 2.4.1 with the exception of the DS2 Frame Sync LED. The DS2 Frame Sync LED illuminates when the T-BERD 310 synchronizes to the DS2 framing format which corresponds to the inserted DS1 channel. The T-BERD 310 must be synchronized with the DS2 framing format before a DS1 signal can be inserted. If the received DS2 framing format is lost, the LED goes out, the DS2 Frame Loss LED illuminates, and the DS1 insertion is discontinued.

2.22.2 DS3 Secondary Alarm LEDs

The red DS3 Secondary Alarm LEDs provide information about the current and historical alarm conditions related to the received secondary DS3 signal. The DS3 Secondary Alarm LEDs perform the same functions as described in Section 2.4.2 with the exception of the DS2 Frame Loss LED. The DS2 Frame Loss LED illuminates when the T-BERD 310 loses DS2 frame synchronization which corresponds to the inserted DS1 channel. When the DS2 framing is detected again, the LED goes out and the associated DS3 History LED and DS2 Frame Sync LED illuminate.

2.22.3 RESULTS I and RESULTS II SECONDARY Switches

Press either switch to select the Secondary DS3 results. The internal **SECONDARY** switch LED illuminates when the Secondary DS3 results are displayed. The SUMMARY, BPV, PARITY, FRAME, and SIGNAL categories are available when the **SECONDARY** switch is pressed. The Secondary SUMMARY category performs the same function as described in Section 2.4.3 except for the Secondary DS3 signal.

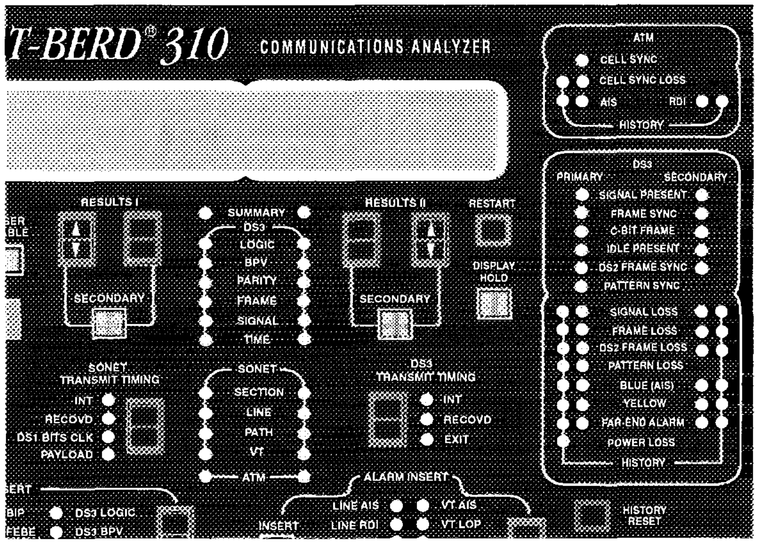

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Figure 2-15
Secondary DS3 Signal Verification

2.23 COLLECTING TEST RESULTS

The Secondary DS3 category results are divided into five categories. They are only available when the **RESULTS I** or **RESULTS II SECONDARY** switch is illuminated. During the initial test set-up procedure, the SUMMARY category displays key results that are non-zero or out-of-specification. Refer to *Mainframe Test Results* for additional information on selecting and collecting the test results. When the Secondary DS3 signal is analyzed, the primary DS3 category results are also available. The available Secondary DS3 category results include:

SUMMARY Category

VIOLATIONS (BPV Category)
FRM ERRORS (FRAME Category)
PAR ERRORS (PARITY Category)
C-BIT ERRORS (PARITY Category)
FEBE (PARITY Category)
RX FREQ Hz (SIGNAL Category)
FEAC Messages

BPV Category

VIOLATIONS — Bipolar Violations
BPV ERR RT — BPV Error Rate
AV BPV ERT — Average BPV Error Rate
BPV ERR SEC — BPV Errored Seconds
BPV %EFS — BPV, Percentage of Error-Free Seconds

PARITY Category

PAR ERRORS — Parity (P-bit) Errors
PAR ERR RT — Parity (P-bit) Error Rate
AV PAR ERT — Average Parity (P-bit) Error Rate
PAR ERR SEC — Parity (P-bit) Errored Seconds
PAR %EFS — Parity (P-bit), Percentage of Error-Free Seconds
C-BIT ERRORS — C-bit Parity Errors
C-BIT ERR RT — C-bit Parity Error Rate
AV C-BIT ERT — Average C-bit Parity Error Rate
C-BIT TYPE A — C-bit Parity Errored Seconds, Type A
C-BIT TYPE B — C-bit Parity Errored Seconds, Type B
C-BIT TYPE C — C-bit Parity Errored Seconds, Type C
C-BIT %EFS — C-bit Parity, Percentage of Error-Free Seconds
FEBE — Far-End Block Errors
FEBE RT — Far-End Block Error Rate
AV FEBE RT — Average Far-End Block Error Rate
FEBE TYPE A — Far-End Block Errored Seconds, Type A
FEBE TYPE B — Far-End Block Errored Seconds, Type B
FEBE TYPE C — Far-End Block Errored Seconds, Type C
FEBE %EFS — Far-End Block Error, Percentage of Error-Free Seconds

FRAME Category

FRM ERRORS — Frame Errors
FRM ERR RT — Frame Error Rate
AV FRM ERT — Average Frame Error Rate
FRM ERR SEC — Frame Errored Seconds
FRM %EFS — Frame, Percentage of Error-Free Seconds

SIGNAL Category

RX FREQ — Received Frequency in Hertz

2.24 PRINTING TEST RESULTS AND CONFIGURATIONS

Secondary DS3 results are printed with the primary DS3 results. The secondary DS3 results can be customized through the PRINT-CUSTOM auxiliary function. Press the **RESULTS I/II SECONDARY** switch to select the desired secondary DS3 results for the customized test results printout. Refer to Section 3 for more information on printing the results. Refer to Appendix B for a list of alarm, status, and note messages that apply to the primary and secondary input signal analysis.

SONET

SONET OPTIONS

2.25 INTRODUCTION

This section describes the option configurations, instrument setup, auxiliary functions, and test results for the following T-BERD 310 Synchronous Optical Network (SONET) options.

310-12 SONET OC-12 Transmit/Receive Option — Provides both SONET transmit and receive signals, OC-3c, DS3, and DS1 payload drop and insert, and through mode capabilities at the OC-12 rate. Either the 310-13R and 310-13T pair (310-13R/T pair) or 310-14R and 310-14T pair (310-14R/T pair) option is required to support this option.

310-13R SONET STS-1 Receive Option — Provides receive signal and payload drop capabilities at the STS-1 rate. SONET DCC drop and insert (310-13T required) capabilities are also provided.

310-13T SONET STS-1 Transmit Option — Provides transmit signal and payload insert capabilities at the STS-1 rate. SONET orderwire drop (310-13R required) and insert capabilities and a DS1 BITS clock input are also provided.

310-14R SONET STS-1, OC-1, OC-3 Receive Option — Provides receive signal and OC-3c (OC-3 only), DS3, and DS1 payload drop capabilities at the STS-1, OC-1, and OC-3 rates. SONET DCC drop and insert (310-14T required) capabilities are also provided.

310-14T SONET STS-1, OC-1, OC-3 Transmit Option — Provides transmitted signal and OC-3c (OC-3 only), DS3, and DS1 payload insert capabilities at the STS-1, OC-1, and OC-3 rates. SONET orderwire drop and insert (310-14R required) capabilities and a DS1 BITS clock input are also provided.

310-15 OC-3c ATM Option — Provides asynchronous transfer mode (ATM) signal generation and analysis capabilities at the OC-3c rate. Refer to *OC-3c ATM Option* (Section 2.36) for more information on the OC-3c ATM Option.

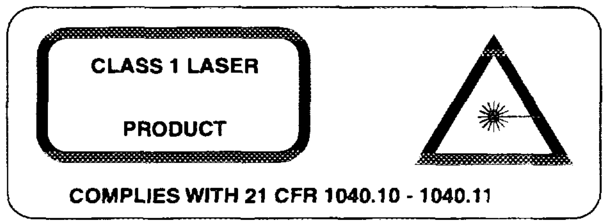
The SONET options enable the T-BERD 310 to transmit and receive SONET signals from a Synchronous Transport Signal - level 1 (STS-1), Optical Carrier - level 1 (OC-1), Optical Carrier - level 3 (OC-3), or Optical Carrier - level 12 (OC-12), signal.

The T-BERD 310 can analyze the SONET STS-1, OC-1, OC-3, OC-3c, OC-3c ATM, or OC-12 signal overhead, and drop or insert DS3 and DS1 payloads. The DS1 payload can be dropped to either the DS1/DS0 Analyzer Option or an external DS1 test set. Floating asynchronous and floating bit-synchronous DS1 mapping formats are supported in all options. Floating byte-synchronous DS1 mapping is supported only by the 310-13R/T pair and 310-14R/T pair options.

Appendix C shows the functional block diagram of the T-BERD 310 mainframe and the SONET options.

2.25.1 Cautions for Optical Connections

The following cautions must be observed before and during all phases of instrument operation.



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Use of controls, adjustments or procedures other than those specified herein may result in hazardous laser light exposure.

WARNING: DO NOT LOOK DIRECTLY INTO THE T-BERD 310 OPTICAL OUTPUT

The T-BERD 310 optical source is designed for safe Class I operation. However, it is recommended that you not look directly into the optical output of the instrument or at the output of any optical cable being connected to the instrument. If a fiber optic connection is removed from a transmitting connector, screw the safety cap onto the connector to prevent inadvertent exposure to the laser output.

ALWAYS USE COMPATIBLE CONNECTORS

When making optical connections, use compatible connector types. DO NOT ATTEMPT TO MATE INCOMPATIBLE CONNECTORS. Connector ends are fragile and become unusable when damaged.

CLEAN FIBER OPTIC CONNECTORS BEFORE USE

Keep fiber optic connectors free of dust and debris by cleaning them before each use. Fiber optic connectors are delicate and can be damaged easily by small bits of dirt or debris on the end of the connector. Once a fiber optic connector on the T-BERD 310 is damaged, it must be replaced at the factory.

KEEP SAFETY CAP ON THE CONNECTOR WHEN NOT IN USE

When the T-BERD 310 is not being used, screw the safety cap on the connector(s) to keep the optical connection clean and to minimize damage to the fiber.

2.25.2 Cleaning Optical Connectors

A clean fiber optic surface is essential for accurate test results and to protect fiber optic surfaces from abrasive dirt particles.

CAUTION: Fiber optic connectors are delicate and can be damaged easily. Once damaged, the T-BERD 310 connector must be replaced at the factory. Therefore, clean the T-BERD 310 connector and the mating connectors often.

When the T-BERD 310 is used in a low-dust environment, minimal amounts of dirt and debris are expected on the connectors. Therefore, the following cleaning procedure is sufficient to maintain the connectors contamination free and protect the fiber from damage.

1. **TRANSMIT or RECEIVE OC-1, OC-3, or OC-12 optical connections**
   Remove the safety cap from the fiber optic connector.

2. **Clean fiber optic surfaces**
   Carefully clean the fiber optic connector and cable ends with a cotton swab dipped in alcohol or an alcohol wipe.

3. **Dry fiber optic surfaces**
   Wipe the fiber optic connector and cable ends with a clean, dry swab.

4. **Repeat as necessary**
   Repeat approximately every tenth usage or more if the T-BERD 310 is operated in a dusty environment. Replace safety cap after each test.

2.26 INITIAL TEST SETUP

The following controls and indicators (see Figure 2-16) are used to initially configure the T-BERD 310 to test SONET signals.

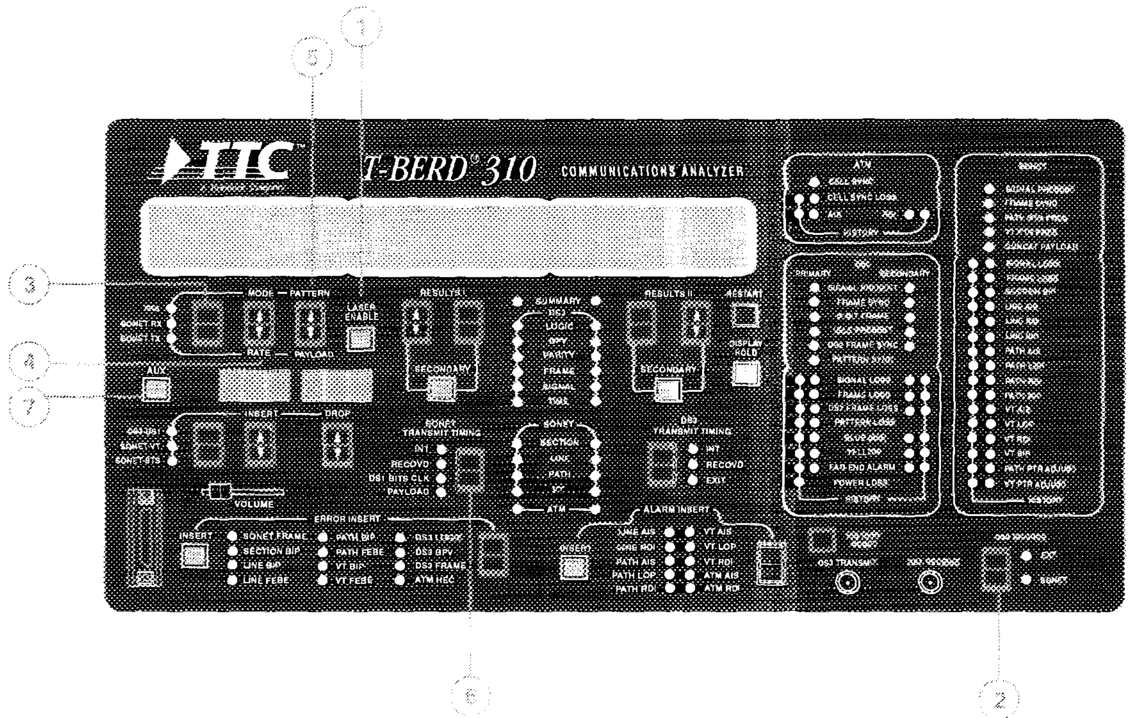

Figure 2-16
Test Setup Controls and Indicators

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2.26.1 LASER ENABLE Button 1

When either the 310-14T or 310-12 SONET option is installed, the T-BERD 310 can perform optical data transmission via laser from the side-panel SONET connections.

When the transmit laser is enabled the **LASER ENABLE** switch illuminates.

The T-BERD 310 disables SONET laser sources at power-up to prevent accidental exposure to the laser. The **LASER ENABLE** switch is typically used to re-enable the laser after the test set is powered on with an optical output signal configured.

Note that whenever the T-BERD 310 is on and a new optical output is selected (i.e., OC-1, OC-3, and OC-12 sources are selected with the **RATE** switch) the transmit laser is enabled and the **LASER ENABLE** switch illuminates.

To disable the laser sources during normal operation, press the illuminated **LASER ENABLE** switch.

The **LASER ENABLE** switch is inoperative if no SONET transmit options are installed, if the unit is set up for STS-1 testing, or if the 310-13T is installed.

2.26.2 DS3 SOURCE Switch 2

Press this switch to test a DS3 signal from either a side-panel SONET input connection or the front-panel DS3 RECEIVE jack. The DS3 Primary Status LEDs, DS3 Alarm LEDs and test results apply to the selected DS3 signal. The switch selections include:

EXT — Selects the DS3 RECEIVE jack.

SONET — Selects the side-panel SONET connections which are selected with the **SETUP** switch.

2.26.3 SETUP Switch 3

The **SETUP** 10 times is used to select the way mode and test pattern or rate and payload information is changed and displayed on the left-most third of the Front Panel Display. (The **Rate** and **Payload** switches to effect changes to the SONET transmit and receive signals: see the Rate and Payload sections below).

The **SETUP** switch selections include DS3, SONET RX and SONET TX settings, as listed below.

DS3 selection — See the DS3 Testing section for information on the DS3 setting.

SONET RX selection — The SONET RX selection can only be selected when the 310-12, 310-13R, or 310-14R option is installed. When SONET RX is selected, the **RATE** switch is used to select the receive SONET rate, and the **PAYLOAD** switch is used to select the inserted payload type.

SONET TX selection — The SONET TX selection can only be selected when the 310-13T or 310-14T option is installed. Choosing SONET TX allows selection of the SONET output transmit rate, connection, and STS on which to perform payload insertion. When SONET TX is selected, the **RATE** switch is used to select the transmit SONET rate, and the **PAYLOAD** switch is used to select the inserted payload type.

2.26.4 RATE/MODE Switch 4

SONET RX Selection

When SONET RX is selected, the **RATE** switch is used to select the receive SONET rate.

NOTE: To analyze an OC-3c tributary, select either OC-3 or OC-12 to select the appropriate OC-3 or OC-12 RECEIVE connection. If you select an STS ID that is part of an OC-3c tributary, the entire OC-3c signal is analyzed.

Select from the following SONET receive rates:

STS-1 — Selects the side-panel STS-1 RECEIVE jack to analyze an STS-1 signal. Set the receive level with the SONET RX-STS RX LEVEL auxiliary function.

OC-1 — Selects the side-panel OC-1/OC-3 RECEIVE connector to analyze an OC-1 signal.

OC-3 — Selects the side-panel OC-1/OC-3 RECEIVE connector to analyze an OC-3 signal. Press the **RESULTS II Results** switch to select the STS ID number (1, 2, or 3) in the RESULTS II window.

OC-12 — Selects the side-panel OC-12 RECEIVE connector on the installed 310-12 option to analyze an OC-12 signal. Press the **RESULTS II Results** switch to select the STS ID number (1 to 12) in the RESULTS II window.

SONET TX Selection

When SONET TX is selected the **RATE** switch is used to select the output transmit rate, connection, and STS on which to perform payload insertion. This auxiliary function is only available when the 310-13T or 310-14T option is installed.

To transmit an OC-3c tributary, select either **OC-3** or **OC-12** to select the appropriate OC-3 or OC-12 TRANSMIT connection. Then, set the front panel **CHANNEL CONTROL** switch to SONET-VT. When inserting (or generating) an OC-3c tributary signal, the STS ID is not selectable (**ALL** appears). The same OC-3c signal is generated for the OC-3 payload and for all four OC-12 payload slots.

Select from one of the following SONET outputs.

STS-1 — Selects the side-panel STS-1 TRANSMIT jack to transmit an STS signal. Set the output level with the SONET TX-STS TX LEVEL auxiliary function.

OC-1 — Selects the side-panel OC-1/OC-3 TRANSMIT connector to transmit an OC-1 signal.

OC-3 — Selects the side-panel OC-1/OC-3 TRANSMIT connector to transmit an OC-3 signal. Press the RESULTS II Results switch to select the STS ID number (1, 2, or 3) or ALL in the RESULTS II window. Select an STS ID number to insert a test signal into the STS signal. Select ALL to insert a test signal into all STSs.

OC-12 — Selects the side-panel OC-12 TRANSMIT connector on the installed 310-12 option to transmit an OC-12 signal. Press the RESULTS II Results switch to select the STS ID number (1 to 12) or ALL in the RESULTS II window. Select an STS ID number to insert a test signal into the STS signal. Select ALL to insert a test signal into all STSs.

THRU (SONET THRU Mode) — Connects a SONET receiver input with the appropriate SONET transmitter output, i.e., STS-1 in to STS-1 out, OC-1 in to OC-1 out, OC-3 in to OC-3 out, and OC-12 in to OC-12 out. Select the rate and connections by setting the front panel **SETUP** switch to SONET RX. Payloads can be dropped from the received SONET signal. Frame word errors, Section BIP errors, Line BIP errors can be inserted. Alarms, payloads, DCC, and orderwire channels cannot be inserted into the transmitted signal. If the received signal is not present at the appropriate input connection, Line AIS is transmitted. The insert functions of the T-BERD 310 can be configured, but they do not have any effect on the transmitted SONET signal. Transmit timing defaults to recovered. This function only appears with the installed 310-13R/T pair or 310-14R/T pair option.

2.26.5 PAYLOAD/PATTERN Switch (5)

SONET RX Selection

When SONET RX is selected the **PAYLOAD** switch is used to select the dropped payload signal type and DS1 channel for VT1.5 signal analysis, if applicable. This function is only available when the 310-12, 310-13R, or 310-14R option is installed.

Select from the following payload formats.

AUTO — The T-BERD 310 automatically determines the payload type from the payload information itself. When the T-BERD 310 determines the payload format, the payload name appears in lowercase characters replacing AUTO as follows:

ds3 asyn — Appears when a DS3 asynchronous payload is detected in the selected STS ID.

ds1 asyn — Appears when a DS1 asynchronous payload is detected in the selected STS ID and DS1 channel.

ds1 byte — Appears when a DS1 byte-synchronous payload is detected in the selected STS ID and DS1 channel.

concat (3c) — Appears when an OC-3c tributary is detected in the selected STS ID grouping. It also appears for an OC-3c ATM tributary if the OC-3c ATM Option is not installed or ATM cells are not recognized.

atm (3c) — Appears when an OC-3c ATM tributary is detected in the selected STS ID grouping.

unknown — Appears when a one of the previous payloads cannot be detected in the selected STS ID. AIS is dropped in place of the DS3 and DS1 payloads.

AUTO appears until one of the previous payload types is detected. If the last payload is lost, or a test restart occurs, AUTO continues to scan for it. Note that AUTO mode cannot declare bit synchronization on a DS1 bit-synchronous payload; it is an undetectable format of a DS1 asynchronous payload.

Scanning can also be manually controlled by selecting one of the following payload types:

DS3 ASYN — Analyzes a DS3 asynchronous payload from the selected STS ID.

DS1 ASYN — Analyzes a DS1 asynchronous payload from the selected STS ID and DS1 channel.

DS1 BIT — Analyzes a DS1 bit-synchronous payload from the selected STS ID and DS1 channel.

DS1 BYTE — Analyzes a DS1 byte-synchronous payload from the selected STS ID and DS1 channel.

NOTE: The CONCAT (3c) and ATM (3c) payload types below can only be selected when OC-3 or OC-12 is selected.

CONCAT (3c) — Analyzes an OC-3c tributary from the selected STS ID group of either an OC-3 or OC-12 signal.

ATM (3c) — Analyzes an OC-3c ATM tributary from the selected STS ID group of either an OC-3 or OC-12 signal. Requires the OC-3c ATM Option. Refer to Section 2.36 for additional information.

SONET VT1.5s may be mapped by transmission equipment either sequentially or VT Group/VT. The MISC-DS1/VT MAP auxiliary function can be used to select each mapping type (e.g., when having difficulty locating a particular VT1.5).

SONET TX Selection

When the SONET TX selected the **PAYLOAD** switch is used to select the inserted payload type. Select from the following payload formats and sources.

DS3 ASYN INT — Inserts a T-BERD 310 internally generated DS3 asynchronous signal into the selected STS ID.

DS3 ASYN EXT — Inserts an externally generated DS3 asynchronous signal from the DS3 RECEIVE jack into the selected STS ID. If the DS3 signal is lost, Path AIS is transmitted on the selected STS ID.

DS1 ASYN INT — Inserts a DS1/DS0 Analyzer Option internally generated DS1 asynchronous signal into the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

DS1 ASYN EXT — Inserts an externally generated DS1 asynchronous signal from the DS1/DS0 Analyzer Option DS1 RECEIVE jack into the selected STS ID. If the DS1 signal is lost, VT AIS is transmitted on the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

DS1 BIT INT — Inserts a DS1/DS0 Analyzer Option internally generated DS1 bit-synchronous signal into the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

DS1 BIT EXT — Inserts an externally generated DS1 bit-synchronous signal from the DS1/DS0 Analyzer Option DS1 RECEIVE jack into the selected STS ID. If the DS1 signal is lost, VT AIS is transmitted on the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

DS1 BYTE INT — Inserts a DS1/DS0 Analyzer Option internally generated DS1 byte-synchronous signal into the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

DS1 BYTE EXT — Inserts an externally generated DS1 byte-synchronous signal from the DS1/DS0 Analyzer Option DS1 RECEIVE jack into the selected STS ID. This is not available in older units. If the DS1 signal is lost or DS1 frame synchronization is not present or lost, VT AIS is transmitted on the selected STS ID. The DS1 channel or group and VT number appears in the RESULTS II window.

NOTE: The previous DS1 selections only appear when the DS1/DS0 Analyzer Option is installed.

CONCAT (3c) — Generates an OC-3c tributary signal. **CONCAT (3c)** only appears when **OC-3** or **OC-12** is selected with the SETUP switch set to SONET TX.

ATM (3c) — Generates an ATM signal. **ATM (3c)** only appears when **OC-3** or **OC-12** is selected with the SETUP switch set to SONET TX.. Requires the OC-3c ATM Option.

PATH UNEQ — Inserts a Path unequipped signal and the selected STS ID payload is marked unequipped.

VT1.5 UNEQ — Inserts a VT1.5 unequipped signal and each VT1.5 payload is marked unequipped.

(thru mode) — Appears when the SONET THRU mode is selected with the SETUP switch set to SONET TX.

SONET VT1.5s may be mapped by transmission equipment either sequentially or VT Group/VT. The MISC-DS1/VT MAP auxiliary function can be used to select each mapping type (e.g., when having difficulty locating a particular VT1.5).

2.26.6 SONET TRANSMIT TIMING Switch 6

When the SONET transmit option is installed this switch determines the SONET Transmit Timing Source. Of the four available selections, three are user-selectable, and one (PAYLOAD) is "forced".

INT — Selects an internal clock to transmit the SONET signal

RECOVD — Selects the clock generated from the received SONET signal which is selected by setting the front panel **SETUP** switch to SONET RX. This is the default timing source when the T-BERD 310 is operating in SONET THRU mode. It is only available with the installed 310-13R or 310-14R option. This LED flashes if the SONET receive frequency is out of tolerance or is missing. When the RECOVD LED is flashing the T-BERD 310 transmits the SONET signal using internal timing.

DS1 BITS CLK — Selects the timing source connected to the side-panel DS1 BITS CLOCK connector. This LED flashes if the BITS clock input frequency is out of tolerance or is missing. When the DS1 BITS CLK LED is flashing the T-BERD 310 transmits the SONET signal using internal timing.

PAYLOAD — The PAYLOAD setting is not user-selectable, but is forced whenever a DS1 bit-synchronous or DS1 byte-synchronous payload is inserted into the SONET signal. The original user setting will be restored whenever payload timing is no longer forced.

2.26.7 AUX Switch 7

Depending on the installed SONET options, the following SONET RX and/or SONET TX auxiliary groups are added to the T-BERD 310. Refer to Sections 2.52 and 2.53 for more information on the SONET option auxiliary functions.

SONET RX Auxiliary Group - 310-13R and 310-14R Options

SONET RX-DS1 DROP OUT — DS1 Drop Output Source
Select - DS3 or SONET.

SONET RX-STS RX LEVEL — STS Receive Level
Select - DSX or HIGH.

SONET RX-SONET DCC — SONET Data Communication Channel Drop and Insert Control
Select - Line, Section, or None.

SONET TX Auxiliary Group - 310-13T and 310-14T Options

SONET TX-STS TX LEVEL — STS Transmit Level
Select - DSX or High.

SONET TX-SONET ERR RT — SONET Error Rate Select
Select - 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, and 1E-9.

Frame Error - 1 to 5.

SONET TX-SPE POINTER — Synchronous Payload Envelope Pointer Control
Increment/Decrement - 0 to 782.

+2 NDF -2 - ±2 byte.

SONET TX-PATH TRACE — Path Trace Message Insertion Control
Select - USER1, USER2, or USER3.

Message - User message displayed.

SONET TX-ORDERWIRE — Orderwire Channel Control
Select - Line, Section, or None.

SONET TX-TX WAVELEN — Dual Wavelength Transmit
Select - OC 1/3 or OC 12, 1310 nm or 1550 nm.

MISC Auxiliary Group - 310-13R, 310-13T, 310-14R, or 310-14T Options

MISC-DS1 SIG BITS — DS1 Signaling Transfer Mode
Select - Pass Thru or Out of Slot.

MISC-DS1 BITS CLK — DS1 BITS Clock Termination
Select - Terminated or Bridged.

MISC-DS1/VT MAP — DS1/VT Mapping Select
Select - M13, TR-253, or Sequential.

2.27 TEST CONNECTIONS

The SONET options add connections for electrical and optical SONET signals operating at STS-1, OC-1, OC-3, and OC-12 (see Figure 2-17); access to the Line and Section orderwire and DCC channels; and an input for a DS1 BITS clock. The available connections are described by option. In addition to these connections, the T-BERD 310 and DS1/DS0 Analyzer Option connections are also described that allow DS3 and DS1 payloads to be dropped and inserted into and out of a SONET signal.

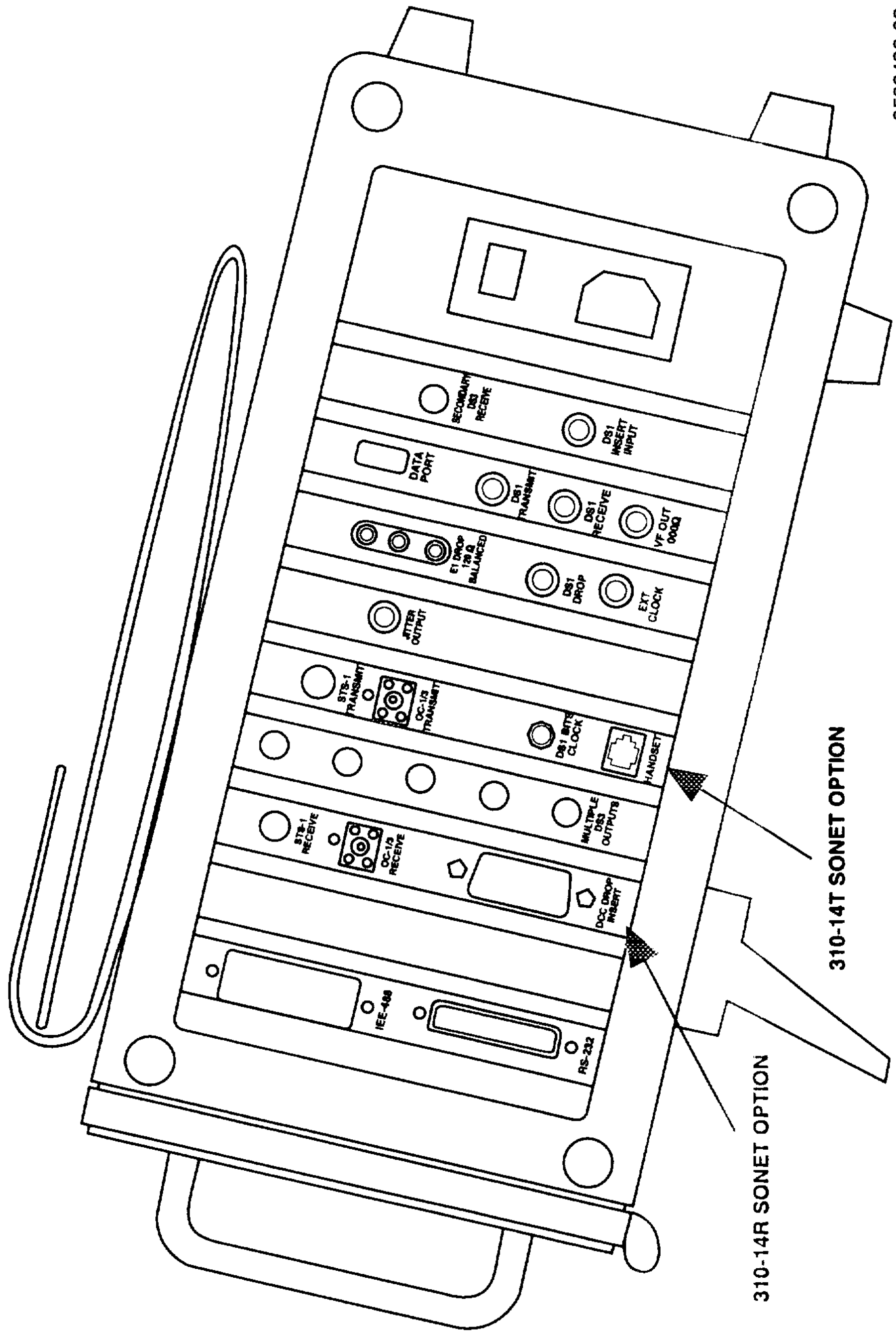
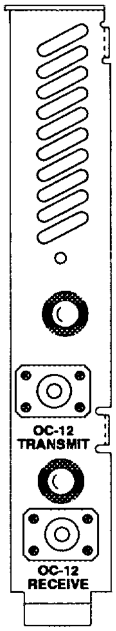


Figure 2-17
SONET Option Connections

2.27.1 310-12 SONET OC-12 Transmit/Receive Option



310-12

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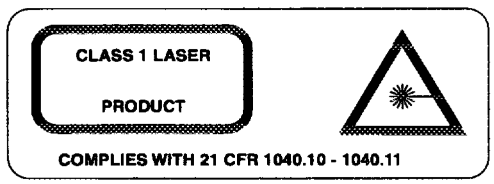
OC-12 TRANSMIT connector — This is a standard FC(PC) optical connector (ST® and SC optical connectors optional) which allows an OC-12 signal to be transmitted from the T-BERD 310. An LED above the connector illuminates when an optical signal is being transmitted. Select this connection with the **PATTERN** switch while the **SETUP** switch is set to SONET TX.

NOTE: If the 310-12 DUAL SONET OC-12 Dual Wavelength Transmitter Option is installed, use the SONET TX-TX WAVELEN auxiliary function to select the desired transmit wavelength (1310 nm or 1550 nm).

OC-12 RECEIVE connector — This is a standard FC(PC) optical connector (ST® and SC optical connectors are optional) which allows an OC-12 signal to be connected to the T-BERD 310. An LED above the connector illuminates when an optical signal is received. Select this connection with the **PATTERN** switch while the **SETUP** front panel switch is set to SONET RX.



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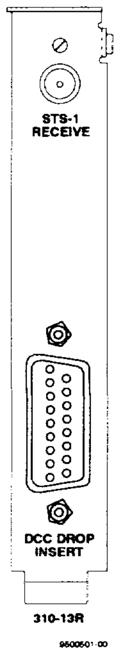
Use of controls, adjustments or procedures other than those specified may result in hazardous laser light exposure.

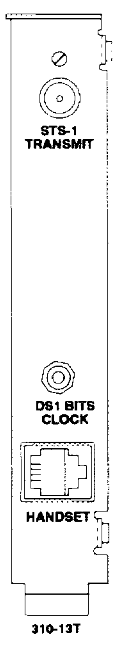
2.27.2 310-13R SONET STS-1 Receive Option



STS-1 RECEIVE jack — This is a standard WECO 560A jack (WECO 358 optional) which allows an STS-1 signal to be connected to the T-BERD 310. Set the input level with the SONET RX-STS RX LEVEL auxiliary function.

DCC DROP INSERT connector — This is a 15-pin, D-type female connector which allows the SONET DCC to be dropped and inserted (310-13T required) through the T-BERD 310. Select the either Line or Section DCC access with the SONET RX-SONET DCC auxiliary function. A 15-pin to 37-pin adaptor cable is supplied with the option to provide RS-449 compatible signals.

2.27.3 310-13T SONET STS-1 Transmit Option

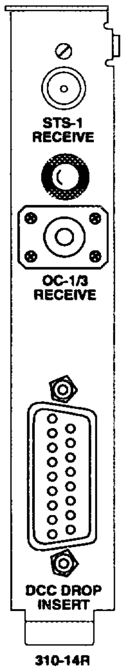


STS-1 TRANSMIT jack — This is a standard WECO 560A jack (WECO 358 optional) which allows an STS-1 signal to be transmitted from the T-BERD 310. Set the output level with the SONET TX-STS TX LEVEL auxiliary function.

DS1 BITS CLOCK jack — This is a bantam jack which allows a DS1 BITS clock to be used as an external SONET transmit timing source, or for DS1 timing slip testing. Set the input termination with the MISC-DS1 BITS CLK auxiliary function. Select the connection using the **SONET TRANSMIT TIMING** front panel switch when used as an external SONET transmit timing source. Select the connection through the AUX-SLIP REF auxiliary function for DS1 timing slip testing.

HANDSET jack — This is an RJ-11 jack which allows access to the SONET orderwire channel. Select either the Line or Section orderwire channel with the SONET TX-ORDERWIRE auxiliary function. A handset (Model 11255) is supplied with the option.

2.27.4 310-14R SONET STS-1, OC-1, OC-3 Receive Option

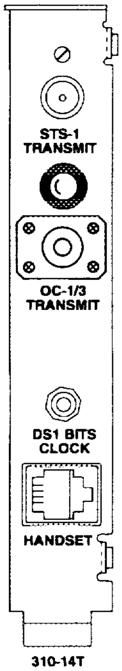


STS-1 RECEIVE jack — This is a standard WECO 560A jack (WECO 358 optional) which allows an STS-1 signal to be connected to the T-BERD 310. Set the input level with the SONET RX-STS RX LEVEL auxiliary function.

OC-1/OC-3 RECEIVE connector — This is a standard FC(PC) optical connector (ST® and SC are optional) which allows either an OC-1 or OC-3 signal to be connected to the T-BERD 310. An LED above the connector illuminates when an optical signal is received. Select this connection by setting the front panel **SETUP** switch to SONET RX.

DCC DROP INSERT connector — This is a 15-pin, D-type female connector which allows the SONET DCC to be dropped and inserted (310-13T required) through the T-BERD 310. Select either the Line or Section DCC access with the SONET RX-SONET DCC auxiliary function. A 15-pin to 37-pin adaptor cable is supplied with the option.

2.27.5 310-14T SONET STS-1, OC-1, OC-3 Transmit Option



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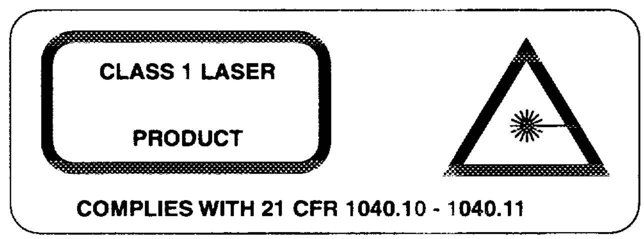
STS-1 TRANSMIT jack—This is a standard WECO 560A jack (WECO 358 optional) which allows an STS-1 signal to be transmitted from the T-BERD 310. Set the output level with the SONET TX-STS TX LEVEL auxiliary function.

OC-1/OC-3 TRANSMIT connector—This is a standard FC(PC) optical connector (ST® and SC optical connectors optional) which allows either an OC-1 or OC-3 signal to be transmitted from the T-BERD 310. An LED above the connector illuminates when an optical signal is being transmitted. Select this connection and activate the laser with the **LASER ENABLE** switch.

NOTE: If the 310-14T DUAL SONET STS-1, OC-1, OC-3 Dual Wavelength Transmitter Option is installed, use the SONET TX-TX WAVELEN auxiliary function to select the desired transmit wavelength (1310 nm or 1550 nm).



9500512-00

Use of controls, adjustments or procedures other than those specified may result in hazardous laser light exposure.

DS1 BITS CLOCK jack—This is a bantam jack which allows a DS1 BITS clock to be used as an external SONET transmit timing source, or for DS1 timing slip testing. Set the input termination with the MISC-DS1 BITS CLK auxiliary function. Select the DS1 BITS CLK connection through the **SONET TRANSMIT TIMING** switch when used as an external SONET transmit timing source. Select the connection through the AUX-SLIP REF auxiliary function for DS1 timing slip testing.

HANDSET jack — This is an RJ-11 jack which allows access to the SONET orderwire channel. Select either the Line or Section orderwire channel with the SONET TX-ORDERWIRE auxiliary function. A handset (Model 11255) is supplied with the option.

2.27.6 T-BERD 310 Mainframe

DS3 TRANSMIT jack — This jack retransmits the SONET DS3 payload when the **DS3 SOURCE** switch is set to SONET, and the T-BERD 310 is set for DS3 THRU mode (set with **MODE** switch).

DS1 DROP jack — This jack drops the SONET DS1 payload when the SONET RX-DS1 DROP OUT auxiliary function is set to SONET.

DS3 RECEIVE jack — This jack inserts the DS3 signal into the selected STS ID when front panel **CHANNEL CONTROL** switch is set to SONET<—>VT and DS3 ASYN EXT is selected.

2.27.7 DS1/DS0 Analyzer Option

DS1 TRANSMIT jack — This jack retransmits the SONET DS1 payload when the **DS1 SOURCE** switch is set to SONET DROP, and the DS1/DS0 Analyzer Option is set for AUTO mode (set with **MODE** switch) with live data being received.

DS1 RECEIVE jack — This jack inserts the DS1 signal into the SONET signal when the front panel **CHANNEL CONTROL** switch is set to SONET-VT and DS1 ASYN EXT, DS1 BIT EXT, or DS1 BYTE EXT is selected. (Not available in some older 310-1 options.)

2.28 SIGNAL VERIFICATION

The following indicators and results verify that the T-BERD 310 has properly acquired the received SONET signal (see Figure 2-18).

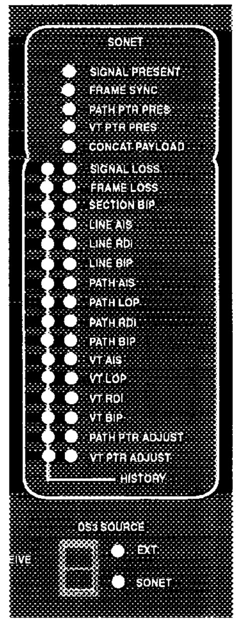


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Figure 2-18
SONET Signal Verification

2.28.1 SONET Status LEDs

The green SONET status LEDs provide information on the condition of the SONET signal. Lighted status LEDs indicate the following conditions.

SIGNAL PRESENT — SONET signal detected from the selected side-panel SONET receive jack. Subsequent loss of signal causes the Signal Present LED to go out and the Signal Loss alarm LED to illuminate.

FRAME SYNC — Frame synchronization is acquired. Subsequent loss of frame synchronization would cause the Frame Sync LED to go out and the Frame Loss alarm LED to illuminate.

PATH PTR PRES — STS Path pointer is present.

VT PTR PRES—Virtual tributary pointer is present; indicates DS1s are embedded in the received SONET signal.

CONCAT PAYLOAD — Concatenated pointer value is detected in the current receive STS.

2.28.2 SONET Alarm LEDs

The red SONET LEDs provide information about specific alarm conditions related to losing the SONET signal. The Signal Loss and Frame Loss LEDs illuminate when the SONET signal is no longer detected after its initial detection. When the SONET signal is detected again after a loss, the Signal Loss and Frame Loss LEDs go out and the associated History LEDs illuminate.

Illuminated SONET Alarm LEDs indicate the following conditions.

SIGNAL LOSS—Indicates no SONET pulse signals present. When the signal is acquired again, the LED goes out, and the associated History and Signal Present LEDs illuminate.

FRAME LOSS — Indicates loss of frame synchronization. When synchronization is acquired again, the LED goes out, and the associated History and Frame Sync LEDs illuminate.

SECTION BIP — Flashes on for 100 milliseconds whenever a section Bit Interleaved Parity (BIP) error occurs. When the Section BIP LED goes out, the associated History LED illuminates and until a restart or history reset is initiated.

LINE AIS—Line alarm indication signal (AIS) alarm is declared after detecting a 111 pattern in the Line overhead APS byte (K2), Bits 6 to 8, for five consecutive frames. Line AIS is removed after detecting a pattern other than 111 in Bits 6-8 of byte K2 for five consecutive frames. Line AIS indicates to downstream equipment that an upstream section terminating equipment (STE) has detected loss of signal or loss of framing.

LINE RDI — Line remote defect indication (RDI) alarm (also known as far-end receive fail (FERF) alarm) is declared after detecting a 110 pattern in the Line overhead APS byte (K2), Bits 6 to 8, for five consecutive frames. Line RDI is removed after detecting a pattern other than 110 in Bits 6-8 of byte K2 for five consecutive frames. Line RDI alerts an upstream device of a downstream failure, such as loss of signal, loss of frame, or Line AIS.

LINE BIP— Flashes on for 100 milliseconds whenever a line Bit Interleaved Parity (BIP) error occurs. When the Line BIP LED goes out, the associated History LED will light and stay lit until a Restart or History Reset is initiated.

PATH AIS— Path AIS alarm is declared after detecting an all ones pattern in the Line overhead pointer bytes (H1 and H2) for three consecutive frames. Path AIS is removed when a valid set of pointer bytes and active new data flags (NDFs) are received, or when a valid pointer value is observed in three consecutive frames. Path AIS alerts the downstream path terminating equipment (PTE) that an upstream failure has occurred.

PATH LOP — Path loss of pointer (LOP) alarm is declared when a valid pointer value cannot be determined from the Line overhead pointer bytes (H1 and H2). Specifically, Path LOP is declared if a valid pointer is not found in eight consecutive frames, if eight consecutive active NDFs are received without the corresponding concatenation indication. The Path LOP alarm is removed when a consistent pointer value or concatenation indication is received for three consecutive frames.

PATH RDI — Path RDI alarm (also known as RAI or Yellow Alarm) is declared after detecting a one in Bit 5 of the Path status byte (G1) for five consecutive frames. STS Path RDI is removed after Bit 5 of byte G1 contains a zero for five consecutive frames. Path RDI indicates to the upstream PTE that a downstream failure has been detected.

PATH BIP — Flashes on for 100 milliseconds whenever a path Bit Interleaved Parity (BIP) error occurs. When the Path BIP LED goes out, the associated History LED will light and stay lit until a Restart or History Reset is initiated.

VT AIS — VT AIS alarm is declared after detecting an all ones pattern in the VT pointer bytes (V1 and V2) for three consecutive VT superframes. VT Path AIS is removed under two conditions: when a valid VT pointer, valid VT size, and the NDF 1001 flag are detected, or three consecutive VT superframes containing a valid VT pointer, valid VT size, and a normal NDF are detected. VT AIS alerts the downstream VT PTE of an upstream failure.

VT LOP — VT LOP alarm is declared when a valid pointer value cannot be determined from the VT Path overhead bytes (V1 and V2). Specifically, VT Path LOP is declared if a valid pointer is not found in eight consecutive frames, if eight consecutive active NDFs are received without the corresponding concatenation indication. The VT Path LOP alarm is removed when a consistent pointer value or concatenation indication is received for three consecutive frames.

VT RDI — VT RDI alarm (also known as RAI or Yellow Alarm) is declared after detecting a one in Bit 8 of the VT Path overhead byte (V5) for five consecutive VT superframes. The VT Path RDI alarm is removed when a zero is detected in Bit 8 of byte V5 for five consecutive frames. VT RDI indicates to the upstream VT PTE that a downstream failure has been detected.

VT BIP — Flashes on for 100 milliseconds whenever a virtual tributary Bit Interleaved Parity (VT BIP) error occurs. When the Line BIP LED goes out, the associated History LED will light and stay lit until a Restart or History Reset is initiated.

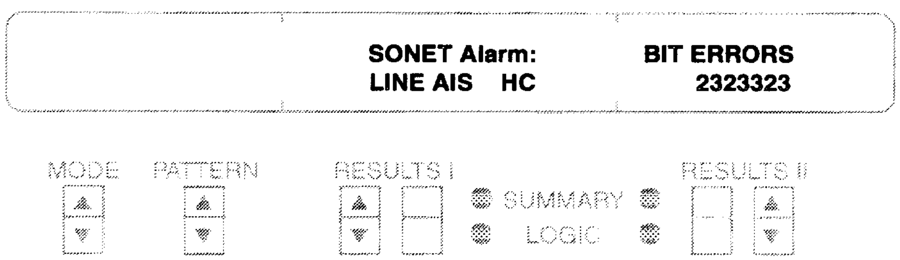
PATH PTR ADJUST — Flashes on for 100 milliseconds whenever a change in the STS path pointer value occurs. When this goes out, the associated History LED will light and stay lit until a Restart or History Reset is initiated.

VT PTR ADJUST — Flashes on for 100 milliseconds whenever a change in the virtual tributary (VT) path pointer value occurs. When this goes out, the associated History LED will light and stay lit until a Restart or History Reset is initiated.

2.28.3 SUMMARY Category Messages

During initial acquisition of the received SONET signal, the SUMMARY category should be displayed. This provides key section, line, and path results on the received SONET signal. When an error is detected, the appropriate result appears in the displayed SUMMARY category.

Additional SONET alarms also appear as messages in the SUMMARY category. To provide both current and history indications, an "H" and/or "C" appears at the right side of the window. The alarms apply to the selected SONET signal being received. The VT-related alarms apply to the selected DS1 channel. The SONET alarms appear as follows in the SONET Alarm result. The following example indicates current *and* past Line AIS conditions, as well as DS3 Bit Errors.



SEF — Severely Errored Frame alarm is declared when four consecutive STS-N frames are received with frame word errors.

LOS — Loss of Signal is declared when either the STS-1 or OC-n signal is lost.

LOF — Loss of Frame alarm is declared when an SEF condition exists for 3 ms or a random unframed signal is detected for 625 µs. Loss of frame is removed when two consecutive error-free frames are detected.

LINE AIS — Line alarm indication signal (AIS) alarm is declared after detecting a 111 pattern in the Line overhead APS byte (K2), Bits 6 to 8, for five consecutive frames. Line AIS is removed after detecting a pattern other than 111 in Bits 6-8 of byte K2 for five consecutive frames. Line AIS indicates to downstream equipment that an upstream section terminating equipment (STE) has detected loss of signal or loss of framing.

LINE RDI — Line remote defect indication (RDI) alarm (also known as far-end receive fail (FERF) alarm) is declared after detecting a 110 pattern in the Line overhead APS byte (K2), Bits 6 to 8, for five consecutive frames. Line RDI is removed after detecting a pattern other than 110 in Bits 6-8 of byte K2 for five consecutive frames. Line RDI alerts an upstream device of a downstream failure, such as loss of signal, loss of frame, or Line AIS.

PATH AIS — Path AIS alarm is declared after detecting an all ones pattern in the Line overhead pointer bytes (H1 and H2) for three consecutive frames. Path AIS is removed when a valid set of pointer bytes and active new data flags (NDFs) are received, or when a valid pointer value is observed in three consecutive frames. Path AIS alerts the downstream path terminating equipment (PTE) that an upstream failure has occurred.

PATH RDI — Path RDI alarm (also known as RAI or Yellow Alarm) is declared after detecting a one in Bit 5 of the Path status byte (G1) for five consecutive frames. STS Path RDI is removed after Bit 5 of byte G1 contains a zero for five consecutive frames. Path RDI indicates to the upstream PTE that a downstream failure has been detected.

PATH LOP — Path loss of pointer (LOP) alarm is declared when a valid pointer value cannot be determined from the Line overhead pointer bytes (H1 and H2). Specifically, Path LOP is declared if a valid pointer is not found in eight consecutive frames, if eight consecutive active NDFs are received without the corresponding concatenation indication. The Path LOP alarm is removed when a consistent pointer value or concatenation indication is received for three consecutive frames.

VT AIS — VT AIS alarm is declared after detecting an all ones pattern in the VT pointer bytes (V1 and V2) for three consecutive VT superframes. VT Path AIS is removed under two conditions: when a valid VT pointer, valid VT size, and the NDF 1001 flag are detected, or three consecutive VT superframes containing a valid VT pointer, valid VT size, and a normal NDF are detected. VT AIS alerts the downstream VT PTE of an upstream failure.

VT RDI — VT RDI alarm (also known as RAI or Yellow Alarm) is declared after detecting a one in Bit 8 of the VT Path overhead byte (V5) for five consecutive VT superframes. The VT Path RDI alarm is removed when a zero is detected in Bit 8 of byte V5 for five consecutive frames. VT RDI indicates to the upstream VT PTE that a downstream failure has been detected.

VT LOP — VT LOP alarm is declared when a valid pointer value cannot be determined from the VT Path overhead bytes (V1 and V2). Specifically, VT Path LOP is declared if a valid pointer is not found in eight consecutive frames, if eight consecutive active NDFs are received without the corresponding concatenation indication. The VT Path LOP alarm is removed when a consistent pointer value or concatenation indication is received for three consecutive frames.

2.29 STARTING AND RUNNING THE TEST

2.29.1 Inserting SONET Errors

The SONET transmitter option must be installed in order to perform SONET error insertion. Otherwise, none of the error types can be selected. Errors may be inserted one type at a time through **ERROR INSERT** switch and **INSERT** button.

ERROR INSERT Switch

The **ERROR INSERT** switch is used to select an error type. The selected error type is indicated by an illuminated yellow LED.

INSERT Switch

Pressing and releasing the **INSERT** switch one time inserts a single error of the selected type, and the switch flashes briefly.

NOTE: For SONET FRAME error insertion the switch flashes once for each frame inserted, as specified in the SONET ERR RT auxiliary function.

Pressing the **INSERT** switch for more than 1 second inserts errors at the rate specified in the SONET ERR RT auxiliary function. The switch remains illuminated and the error insertion continues until the switch is pressed again.

NOTE: For SONET FRAME errors continuous frame errors will be inserted until the button is pressed again.

Inserting Errors

The **ERROR INSERT** switch can select from the following error types.

SONET FRAME — Selects frame word for error insertion.

SECTION BIP — Selects section BIP error type for insertion.

NOTE: Line error insert is inactive if a Line AIS is being transmitted. If the test is set is in THRU mode, only Line BIP error insert is active.

LINE BIP — Selects line BIP error type for insertion.

LINE FEBE — Selects line FEBE error type for insertion.

NOTE: Path error insert is inactive if a Path AIS or Line AIS is being transmitted, or the test is set is in THRU mode.

PATH BIP — Selects path BIP error type for insertion in the selected STS ID.

PATH FEBE — Selects path FEBE error type for insertion in the selected STS ID.

NOTE: VT error insert is inactive if an AIS condition is being transmitted, or the test set is in THRU mode

VT BIP — Selects VT BIP error type for insertion in the selected STS ID and DS1 channel.

VT FEBE — Selects VT FEBE for insertion in the selected STS ID and DS1 channel.

2.29.2 ALARM INSERT Switches

SONET alarms cannot be transmitted in the SONET THRU mode.

SONET alarms may be selected and generated one type at a time through the **ALARM INSERT** switch and **INSERT** button.

The **ALARM INSERT** switch is used to select error types one at a time. The selected error type is indicated by an illuminated yellow LED.

NOTE: If the **ALARM INSERT** switch is used to scroll through Alarm LEDs while an alarm is being transmitted, alarm generation ceases and the **INSERT** switch goes out.

Pressing and releasing the **INSERT** switch inserts an alarm of the selected type; the switch remains illuminated until pressed again.

Forced Alarm Conditions

When present, "forced alarm" conditions must be cleared before new alarms can be selected and inserted. When these "forced" alarms are present the LED for the alarm illuminates, and the **INSERT** switch also illuminates. However, both the rocker switch and the **INSERT** button are disabled until the existing alarm is cleared. The forced alarm conditions are described as follows:

LINE AIS in SONET THRU mode— This alarm is "forced" in SONET THRU MODE when the receiver loses SONET FRAME SYNC.

PATH AIS in DS3 ASYNC EXT mode— This alarm is "forced" when the SONET INSERT selection is set to DS3 ASYNC EXT and the external DS3 signal is not present.

VT AIS in DS1 ASYNC EXT, DS1 BIT EXT, or DS1 BYTE EXT modes— This alarm is "forced" when the SONET INSERT selection is set to either DS1 ASYNC EXT, DS1 BIT EXT, or DS1 BYTE EXT, and the external DS1 signal is not present.

VT AIS in DS1 BYTE EXT DS1 BYTE INT modes— This alarm is "forced" if frame synchronization does not exist on the DS1 signal.

Alarm Types

Use the **ALARM INSERT** switch to select the following alarm types.

LINE AIS — Inserts a Line AIS alarm. The Line AIS indicates to downstream equipment that upstream STE has detected a loss of signal or loss of framing. This alarm is transmitted in the transport overhead.

LINE RDI — Inserts a Line RDI alarm. The Line RDI (also known as far-end receive fail (FERF) alarm) is asserted by line terminating equipment (LTE) when loss of signal, loss of frame, or line AIS is detected on the incoming signal. This alarm is transmitted in the transport overhead.

PATH AIS — Inserts a Path AIS alarm. The Path AIS alerts the downstream STS PTE that an upstream failure has occurred. This alarm is transmitted in the selected STS.

PATH LOP — Inserts a Path LOP alarm. The STS Path LOP is declared when a valid STS pointer value cannot be obtained. In order to generate a Path LOP in the SONET transmission equipment, the T-BERD 310 invalidates the STS pointer bytes (H1, H2). This alarm is transmitted in the transport overhead of the selected STS.

PATH RDI — Inserts a Path RDI alarm (also known as RAI or Yellow Alarm). The Path RDI indicates to the upstream PTE that a downstream failure has been declared. This alarm is transmitted in the selected STS.

VT AIS — Inserts a VT AIS alarm. The VT AIS alerts the downstream VT PTE of an upstream failure. It is defined as an all ones pattern in the entire VT. The T-BERD 310 generates this alarm on the selected DS1 channel. This alarm is transmitted in the selected STS.

VT LOP — Inserts a VT LOP alarm. The VT LOP is declared when a valid VT pointer value cannot be obtained. In order to generate a VT LOP in the SONET transmission equipment, the T-BERD 310 invalidates the VT pointer bytes (V1, V2) on the selected DS1 channel. This alarm is transmitted in the selected STS.

VT RDI — Inserts a VT RDI alarm (also known as RAI or Yellow Alarm). The VT RDI indicates to the upstream VT PTE that a downstream failure has been declared. The T-BERD 310 generates this alarm on the selected DS1 channel. This alarm is transmitted in the selected STS.

ATM AIS — Reference the *OC-3c ATM Option* section for information on this alarm.

ATM RDI — Reference the *OC-3c ATM Option* section for information on this alarm.

2.30 COLLECTING TEST RESULTS

The SONET results are found in the SECTION, LINE, PATH, or VT categories. The SUMMARY category displays key results that are non-zero or out-of-specification. When a SONET DS3 payload is dropped for analysis, the primary DS3 category results are also available. When a SONET DS1 payload is dropped for analysis, the DS1 signal can be analyzed from either the DS1/DS0 Analyzer Option or an external DS1 test set connected to the side-panel DS1 DROP jack.

DS3 JITTER

DS3 JITTER OPTION

2.31 INTRODUCTION

This section describes the 310-5 DS3 Jitter Option which allows the T-BERD 310 to measure wideband and highband jitter in the received DS3 signal. The option provides test results that measure the amplitude of the wideband and highband jitter in Unit Intervals (UIs). One UI equals (22.35 ns) the period of a DS3 44.736 MHz master clock. The option also provides a demodulated output that can drive a spectrum analyzer to determine the component amplitudes and frequencies of the jitter.

Appendix C shows the functional block diagram of the T-BERD 310 mainframe and the DS3 Jitter Option.

2.32 INITIAL TEST SETUP

DS3 jitter can be measured from the DS3 signal received through the DS3 RECEIVE jack. To obtain the most accurate jitter measurements, allow the T-BERD 310 to warm up for at least 3 minutes.

During the initial configuration of the T-BERD 310, the JITTER auxiliary group should be checked and modified if required to measure the primary DS3 input signal for jitter. Press the **AUX** switch to select the auxiliary functions, and press the **MODE** switch to select the JITTER auxiliary group. Press the **PATTERN** switch to select the following jitter auxiliary functions:

JITTER-JIT FILTER — Jitter Bandpass Filter Select
Select - Auto, Wideband, or Highband.

JITTER-JIT SCALE — Jitter Amplitude Scale Select
Select - 2, 5, or 20 UI peak-to-peak scale or Auto.

JITTER-JIT THRESH — DS3 Jitter Threshold Select
Select - 0.2 to 20.0 UI.

2.33 TEST CONNECTIONS

The signal into the DS3 RECEIVE jack is the only DS3 input signal that can be tested for jitter.

The side-panel JITTER OUTPUT BNC connector provides a demodulated 1 Vp-p signal across a 50 ohm termination. The JITTER-JIT FILTER auxiliary function controls the bandwidth of the JITTER OUTPUT signal. When either the JITTER-JIT FILTER or JITTER-JIT SCALE auxiliary function is set to AUTO, the JITTER OUTPUT signal is disabled.

2.34 SIGNAL VERIFICATION

The DS3 jitter measurements can only be obtained when a valid DS3 signal is received. The DS3 Primary Signal Present LED should be illuminated to verify that a valid DS3 signal is received. When the DS3 Primary Signal Loss LED is illuminated, the WB JITTER and HB JITTER results are not available. The MAX WB JIT and MAX HB JIT results are frozen by signal loss.

2.35 COLLECTING TEST RESULTS

The jitter amplitude test results are found in the SIGNAL category and are dependent on the JITTER auxiliary group settings. The SIGNAL category includes the following jitter test results:

WB JITTER — Wideband Jitter
MAX WB JIT — Maximum Wideband Jitter
HB JITTER — Highband Jitter
MAX HB JIT — Maximum Highband Jitter

The message *UNAVAILABLE* appears in the result when the jitter option is initializing; after test restart; and in the AUTO mode when the T-BERD 310 is searching for the proper scale. When the combined frequency and amplitude exceed the selected hardware filter and scale, the message *OUT OF RANGE* appears in the result. The JITTER-JIT THRESH auxiliary function can be used to set the jitter threshold to display the MAX WB JIT and MAX HB JIT test results in the SUMMARY category when the threshold is exceeded.

OC-3C ATM OPTION

2.36 INTRODUCTION

The 310-15 OC-3c ATM Option provides the following OC-3c ATM features for the SONET 310-14R/T Option.

- Supports network node interface (NNI), network-to-network interface (NNI), and user network interface (UNI) cell formats.
- Stores four user-programmable ATM cells which enable any value to be entered into the generic flow control (GFC), virtual path identifier (VPI), virtual channel identifier (VCI), payload type identifier (PTI), and cell loss priority (CLP) fields in the ATM headers.
- Generates ATM compliant idle cells.
- Generates operations, administration, and maintenance (OAM) cells to control ATM-AIS and ATM-RDI alarms, and loopback cells for path integrity verification. The OAM cells can be configured for virtual path connection (VPC) and virtual channel connection (VCC) formats and defined for segment and end-to-end functions.
- Inserts correctable or non-correctable header error control (HEC) errors in all cells continuously, on individual cells, or at specific error rates.
- Delineates received ATM cells mapped into the OC-3c payload.
- Descrambles/scrambles the received/transmitted 48-byte ATM cell payload.
- Detects ATM cells by VPI/VCI address or functional bit mask of the ATM cell header.
- Analyzes overall ATM measurements which include HEC errors, idle bandwidth, bandwidth utilization, out of delineation seconds, and loss of delineation seconds.
- Analyzes individual detailed measurements which include HEC errors, dropped cells, out of sequence cells, mis-inserted cells, bandwidth utilization, PTI, and CLP values, percentage of cells with CLP = 1, and detection of AIS, FERF/RDI, and loopback cells.
- Generates one primary ATM test cell channel and three ATM background channels within the OC-3c payload envelope.

2.37 INITIAL TEST SETUP

The following information is used to configure the T-BERD 310 to transmit and analyze ATM cells through OC-3c payloads. Refer to Section 2.25 to configure the T-BERD 310 to transmit and receive an ATM payload from an OC-3 or OC-12 signal.

2.37.1 SETUP Switch

The **SETUP** switch is used to select the way mode and test pattern information is changed and displayed on the left-hand display. The switch selections include:

DS3 Selection — See the DS3 Testing section for information on the DS3 setting.

SONET RX Selection —The T-BERD 310 can analyze an OC-3c ATM payload dropped from either an OC-3 or OC-12 source. Set the **SETUP** switch to SONET RX and select either **OC-3** (OC-1/OC-3 RECEIVE connector) or **OC-12** (OC-12 RECEIVE connector) for the appropriate input connection and STS ID. To drop an ATM payload, select SONET RX from the **SETUP** switch, then use the **RATE** and **PAYLOAD** switches to select the either **ATM(3c)** or **AUTO** to configure the T-BERD 310 to accept the ATM payload. The ATM payload is analyzed with the following ATM RX group auxiliary functions.

SONET TX Selection —The T-BERD 310 can generate an OC-3c ATM payload and insert it into either an OC-3 or OC-12 signal. Select SONET TX using the **SETUP** switch, then use the **RATE** switch to select either OC-3 (OC-1/OC-3 TRANSMIT connector) or OC-12 (OC-12 TRANSMIT connector). To insert an ATM payload, select SONET TX using the **SETUP** switch, then use the **RATE** and **PAYLOAD** switches to select **ATM(3c)**. The ATM payload is configured with the following ATM TX group auxiliary functions.

2.37.2 AUX Switch

To test ATM circuits, the T-BERD 310 is configured through the following auxiliary groups. Press the **AUX** switch to display the auxiliary functions and press the **MODE** switch to select the auxiliary groups. Press the **PATTERN** switch to display the specified auxiliary functions.

ATM RX Auxiliary Group

The following ATM RX group auxiliary functions configure the T-BERD 310 to accept and analyze the ATM network interface, test mask, cell profile, primary test cell, cell bandwidth, cell preview, and cell peak bandwidth and duration. Refer to *Mainframe Auxiliary Functions* for additional information on the auxiliary functions.

ATM RX-NETWORK I/F — Received ATM Network Interface Select

Interface - UNI or NNI.

Scramble - Off or On.

ATM RX-TEST MASK — Received ATM Cell Test Mask Control

Masks - TX TEST, RX PROFILE n, SRCH MASK, AIS SEARCH, RDI SEARCH, TTC SEARCH, PREVIEW.

VPI/VCI - channel numbers.

Results - NORMAL or DLAY VAR

ATM RX-PROFILE Pn — Received ATM Cell Test Profile Control (n = 1 to 4)

Pn - 1 to 4, or SRCH MASK.

Control Bytes - GFC, VPI, VCI, PTI, and CLP.

ATM RX-BW PERIOD — Received ATM Cell Test Profile Bandwidth Select

Period - 0.1 to 9.9 sec in 0.1 sec steps.

ATM RX-PREVIEW — Received ATM Cell Test Profile Preview Select

VPI/VCI - channel numbers.

ATM TX Auxiliary Group

The following ATM TX group auxiliary functions select the ATM network interface, cell profile, primary test cell, cell bandwidth, cell peak bandwidth and duration. Refer to *Mainframe Auxiliary Functions* for additional information on the auxiliary functions.

ATM TX-NETWORK I/F — Transmitted ATM Network Interface Select

Interface - UNI or NNI.

Scramble - Off or On.

ATM TX-PROFILE Pn — Transmitted ATM Cell Test Profile Control (n = 1 to 4)

Pn - 1 to 4.

Bytes - GFC, VPI, VCI, PTI, and CLP.

ATM TX-TEST PROFILE — Transmitted ATM Cell Test Profile Select

Select - P1 to P4.

ATM TX-CELL BANDWDTH — Transmitted ATM Cell Test Profile Bandwidth Select

Test - 0% to 99% in 1% steps.

Background - 99% to 0% in 1% steps.

ATM TX-PEAK BANDWDTH — Transmitted ATM Cell Test Profile Peak Bandwidth Select

Select - 0% to 99% in 1% steps.

ATM TX-PEAK DURATION — Transmitted ATM Cell Test Profile Peak Duration Select

Duration - 0.1 to 9.9 sec in 0.1 sec steps.

Stop/Send - Sending or Not Sending.

ATM TX-HEC ERR RATE — Transmitted ATM Header Error Control Error Rate

Rate - 1E-2 to 1E-9 or Continuous.

Cell Burst - 1 to 10.

ATM TX-HEC ERR INS — Transmitted ATM Header Error Control Error Insert Control

Type - Correctable or Non-correctable.

Rate - Burst, Rate, or Off.

ATM TX-OAM INSERT — Transmitted ATM OAM Insert Control

Message - AIS, RDI or Loopback.

Stop/Send - Sending or Not Sending.

ATM TX-OAM FLOW — Transmitted ATM OAM Flow Control

Format - VP(F4) or VC(F5).

Function - Segment or End to End.

ATM TX-CORRELATION — Transmitted ATM Correlation Tag Control

Value - 0000 to FFFF.

2.38 TEST CONNECTIONS

ATM testing is performed through the optical connections provided on the SONET option cards; OC-1/OC-3 and OC-12.

2.39 SIGNAL VERIFICATION

This section describes the ATM status and alarm LEDs only. For descriptions of SONET and DS3 alarms, refer to the Section 2.25, SONET Options, and Section 2.2, DS3 Testing.

The initial ATM signal detection and synchronization is accomplished after the T-BERD 310 has synchronized with the received SONET signal. The ATM Alarm test result appears in the SUMMARY category and the ATM Status test result appears in the ATM category. Status and alarms are indicated by green and red LEDs, respectively.

2.39.1 ATM Status LEDs

ATM CELL SYNC — (Cell delineation/CD) This LED lights whenever 6 consecutive unerrored HEC frames have been received. IF cell synchronization loss occurs this LED will go out and the CELL SYNC LOSS LED will light.

2.39.2 ATM Alarm LEDs

The ATM Alarm test result displays current (C) and historical (H) signal status for the following conditions (nn = C, H, or HC).

NOTE: ATM alarms are cleared any time the ATM RX profile selection changes or a test restart occurs.

CELL SYNC LOSS — Loss of Synchronization alarm indicates continued loss of synchronization 4 ms after out of synchronization occurred after 7 consecutive errored HEC frames are received. Equivalent to loss of cell delineation (LCD).

NOTE: The ATM AIS and RDI alarms (below), and their associated History LEDs, are cell address-specific and only occur in relation to a specific profile or address. Therefore, upon changing the receive profile or cell address these alarms and their associated History LEDs will be reset.

ATM AIS — The ATM Alarm Indication Signal (AIS) alarm appears from the time an AIS OAM cell is received until an AIS OAM cell is not received for the reported address for 3 seconds or until a good cell is received for that address. For a profile that spans multiple addresses (using don't care values), the LED will be lit from the time an AIS OAM cell is received until no AIS OAM cells are received for any address for 3 seconds.

ATM RDI — ATM Remote Defect Indication (RDI) alarm appears from the time an RDI OAM cell is received until an RDI OAM cell is not received for the reported address for 3 seconds or until a good cell is received for that address. For a profile that spans multiple addresses (using don't care values), the result appears from the time an RDI OAM cell is received until no RDI OAM cells have been received for any address for 3 seconds.

OUT OF SYNC nn — Out of Synchronization alarm indicates the reception of at least seven consecutive errored HECs after cell synchronization. Equivalent to out of cell delineation (OCD).

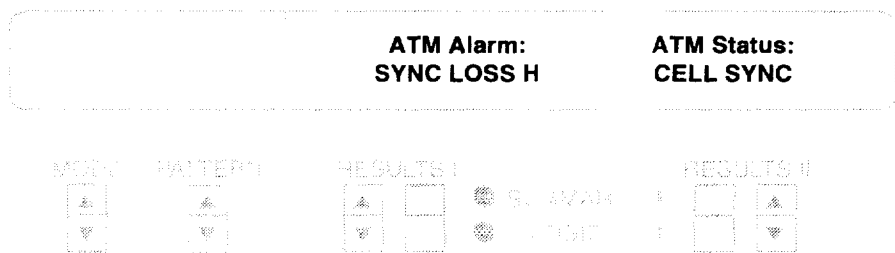
SYNC LOSS nn — Loss of Synchronization alarm indicates continued loss of cell synchronization 4 ms after out of synchronization occurred. Equivalent to loss of cell delineation (LCD).

SYNC FAIL nn — Synchronization Failure alarm indicates synchronization loss is present for 2.5 seconds. Cleared when cell synchronization is regained and loss of synchronization has not occurred in 10.0 seconds. Equivalent to loss of cell delineation failure (LCD FAILURE).

NOTE: The ATM alarms are cleared any time the ATM RX profile selection changes or a test restart occurs.

The ATM Status test result displays current signal status for the following conditions as they occur:

CELL SYNC — Cell Synchronization
OUT OF SYNC — Out of Synchronization
SYNC LOSS — Loss of Synchronization
SYNC FAIL — Synchronization Failure



2.40 COLLECTING TEST RESULTS

The following ATM test results are found in the ATM category and include in-use and idle cell utilization, cell congestion, mis-inserted cells, out of sequence cells, dropped cells, HEC errors, and OAM alarmed seconds. Refer to Section 2.80 for definitions of the ATM test results.

% CLP=1	Percent of Cells with CLP Equals One
% DROP'D	Percent of Dropped Received Mask Cells (TTC)
% OUT OF SEQ	Percent of Out of Sequence Cells (TTC)
%MISINSERTED	Percent of Mis-inserted Cells (TTC)
AIS SECONDS	AIS Alarm Seconds
ATM Alarm	ATM Alarm Status Results, Summary Category

ATM STATUS	ATM Status Results, Summary Category
AVG DLAY VAR	Average estimated cell delay variation
BKGRD BW	Background Bandwidth
BKGRD RT	Background Rate
BURST BW	Burst Bandwidth
BURST RT	Burst Rate
CLP=1	Cells with CLP Equals One
CORR TAG	Correlation Tag (TTC)
CORRECT ERRS	Correctable HEC Errors
CORRECT RATE	Correctable HEC Error Rate
CSF SECONDS	Count of SYNC FAILURE cell seconds
DROP'D CELLS	Dropped Received Mask Cells (TTC)
HEC ERR RATE	Header Error Control Error Rate
HEC ERRORS	Header Error Control Errors
IDLE BW	Idle Bandwidth
IDLE RT	Idle Cell Rate
IN-USE BW	In-Use Bandwidth
IN-USE RT	In-Use Rate
LOOP END-END	OAM End-to-End loopback cell count
LOOP SEGMENT	OAM segment loopback cell count
MASK CELL BW	Mask Cell Bandwidth
MASK CELL RT	Mask Cell Rate
MASK CELLS	Mask Cells
MASK CONGEST	Received Mask Cells Marked Congested
MIN DLAY VAR	Minimum cell delay variation (maximum negative variation)
MAX DLAY VAR	Maximum positive cell delay variation
MIN/MAX BW	Minimum/Maximum bandwidth
MIN/MAX RT	Minimum/Maximum Rate
MISINSERTED	Mis-inserted Cells (TTC)
NON-COR ERRS	Non-Correctable HEC Errors
NON-COR RATE	Non-Correctable HEC Error Rate
OUT OF SEQ	Out of Sequence Cells (TTC)
RDI SECONDS	RDI Alarm Seconds
TOTL CONGEST	Total Received ATM Cells Marked Congested

Table 2-4 associates the applicability of TEST MASK, SEARCH/PREVIEW, DLAY VAR and NORMAL mask fields with the ATM testing mode. Note that PTI and CLP fields are not used for applicability determination.

Instrument Description

Table 2-4
ATM Results Applicability

RESULT [1]	TEST MASK [2]	SEARCH/ PREVIEW [3]	DLAY VAR [4]	NORMAL [5]
MASk CELls ?		n/a		
MASk CELl BW ?		n/a		
MASk CELl RT?		n/a		
IDLe BW ?	Not affected	n/a		
IDLe RT ?	Not affected	n/a		
IN-Use BW ?	Not affected	n/a		
IN-Use RT ?	Not affected	n/a		
BKGrd BW ?		n/a		
BKGrd RT ?		n/a		
MIN BW ?		n/a		
MIN RATe ?		n/a		
MAX BW ?		n/a		
MAX RATe ?		n/a		
BURst BW ?		n/a		
BURst RATe ?		n/a		
MIN DLAy VAR ?		n/a		n/a
MAX DLAy VAR ?		n/a		n/a
AVG DLAy VAR ?		n/a		n/a
TOTl CONgest ?	Not affected	n/a		
MASk CONgest ?		n/a		
CLP=1 ?		n/a		
% CLP=1 ?		n/a		
MISinserted ?		n/a	n/a	*
% MISinserted ?		n/a	n/a	*
OUT OF SEQ ?		n/a	n/a	*
% OUT OF SEQ ?		n/a	n/a	*
DROp'd CELls ?		n/a	n/a	*
% DROp'd ?		n/a	n/a	*
HEC ERRors ?	Not affected			
HEC ERR RATe ?	Not affected			
CORrect ERRs ?	Not affected			
CORrect RATe ?	Not affected			
NON-cor ERRs ?	Not affected			
NON-cor RATe ?	Not affected			
CORr TAG ?		n/a	n/a	*
ATM STAtus ?	Not affected			
CSF SEConds ?	Not affected			
AIS SEConds ?		n/a		
RDI SEConds ?		n/a		
LOOp SEGment ?		n/a	n/a	
LOOp END-end ?		n/a	n/a	

[1] Results are affected unless otherwise stated.
[2] Results in this column are dependent on the value selected in the ATM Receive Profile.
[3] Results marked "n/a" in this column are not accumulated during cell Search or Preview operation.
[4] Results marked "n/a" in this column are not applicable while cell delay variation is being calculated.
[5] Results marked "n/a" in this column are not applicable while normal results are being accumulated.

OPTICAL MEDIA

OPTICAL MEDIA TEST OPTION

2.41 INTRODUCTION

The 310-16 Optical Media Test Option provides optical physical layer testing by measuring optical power and return loss independent of the data rate. The card can be field installed and provides independent optical power meter and optical return loss/stable source side panel connections for the T-BERD 310. The option also provides dual wavelength (1310 and 1550 nm) measurements. Optional FC-, ST-, or SC-type fiber optic connectors can be ordered for the side panel connections.

The optical power meter test result appears as OPTICAL PWR and return loss measurement test result appears as RETURN LOSS in the SIGNAL category test results.

2.42 INITIAL TEST SETUP

Use the following information to configure the Optical Media Test Option to measure optical power from an optical source, measure optical return loss, or generate an optical source.

2.42.1 AUX Switch

The Optical Media Test Card is configured through the following auxiliary functions in the OPTICAL TEST auxiliary group. Press the **AUX** switch to display the auxiliary functions and press the **MODE** switch to select the auxiliary groups. Press the **PATTERN** switch to display the specified auxiliary functions. The auxiliary functions are described in Section 2.57.

OPTICAL TEST-STABLE SOURCE — Optical Stable Source Select
Select - 1310 or 1550.

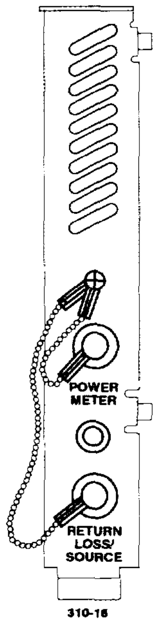
OPTICAL TEST-RETURN LOSS — Return Loss Measurement Type
Select - Absolute or Referenced.

Store Reference - Not Stored or Stored.

OPTICAL TEST-OPTICAL PWR — Optical Power Measurement Control
Select - 1310 or 1550.

2.43 TEST CONNECTIONS

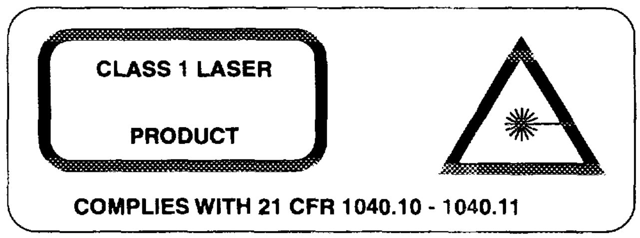
The Optical Media Test Option provides the following connections to measure optical power and return loss on fiber optic cable.



95005 10-00

POWER METER connector — This is a standard FC(PC) optical connector which allows an optical source to be connected to the T-BERD 310 to measure optical power. Set the input wavelength with the OPTICAL TEST-OPTICAL PWR auxiliary function.

RETURN LOSS/SOURCE connector — This is a standard FC (UPC) optical connector which allows return loss measurements to be performed while generating a stable continuous wave (CW) output source. A side-panel LED illuminates when the laser is transmitting. Select the wavelength with the OPTICAL TEST-STABLE SOURCE auxiliary function. Set the return loss measurement type with the OPTICAL TEST-RETURN LOSS auxiliary function.



9500523-00

2.44 SIGNAL VERIFICATION

When measuring the optical power, display the OPTICAL PWR test result in the DS3 SIGNAL category. When measuring the optical return loss on a fiber optic cable, display the RETURN LOSS test result in the DS3 SIGNAL category.

MAINFRAME AUXILIARY FUNCTIONS

2.45 INTRODUCTION

Auxiliary functions allow access to parameters that are not frequently used and do not have dedicated switches. Press the **AUX** switch to access the auxiliary functions. The auxiliary functions appear in all three display windows. The **MODE, PATTERN, RESULTS I,** and **RESULTS II** switches are used to manipulate the displayed auxiliary function as follows:

MODE switch — Press this switch to scroll through the auxiliary groups that appear in the MODE window.

PATTERN switch — Press this switch to scroll through the auxiliary functions of the selected auxiliary group. The auxiliary function name appears in the PATTERN window.

RESULTS I and RESULTS II switches — These switches are used in combination to change or enter information into the selected auxiliary function.

The T-BERD 310 mainframe auxiliary functions are divided into the following auxiliary groups:

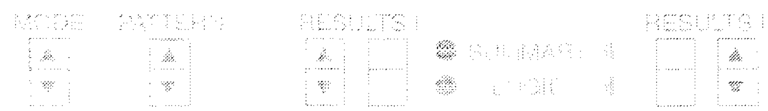
ERR INSERT	DS3 Error Insertion Auxiliary Group
ERR RECEIVE	DS3 Received Signal Error Auxiliary Group
MUXED TX	Multiplexed Loop Code Auxiliary Group
TIME	Time and Date Auxiliary Group
PRINT	Printer/Remote Control Interface Auxiliary Group
MISC	Miscellaneous Auxiliary Group
SONET RX	SONET Receive Auxiliary Group (requires SONET options)
SONET TX	SONET Transmit Auxiliary Group (requires SONET options)
JITTER	DS3 Jitter Auxiliary Group (requires DS3 Jitter Option)
ATM RX	ATM Receive Auxiliary Group (requires 310-15 Option)
ATM TX	ATM Transmit Auxiliary Group (requires 310-15 Option)
OPTICAL TEST	Optical Test Auxiliary Group (requires 310-16 Option)

2.46 ERR INSERT — DS3 ERROR INSERTION AUXILIARY GROUP

The ERR INSERT auxiliary group controls the DS3 logic, BPV, and frame error insertion capabilities of the **ERROR INSERT** switches. The following describes the ERR INSERT auxiliary group.

2.46.1 LOG/BPV RT — Logic and BPV Error Insertion Rate

```
ERR INSERT          ↑ select ↓
LOG/BPV RT            1E-2
```



The ERR INSERT-LOG/BPV RT auxiliary function sets the logic error and BPV insertion rate when a burst of errors (see the ERR INSERT-LOG/BPV BUR auxiliary function) or continuous errors are inserted into the transmitted bit stream. Errors and violations are inserted with the **LOGIC** and **BPV ERROR INSERT** switches. Press the **RESULTS I Results** switch to select the error rate from 1E-2 to 1E-9.

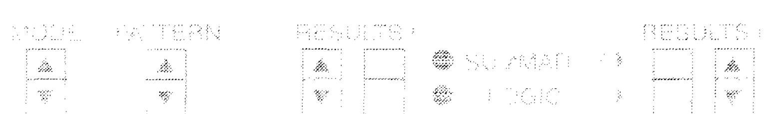
2.46.2 FRAME ERROR — M-Frame Error Insertion Rate

```
ERR INSERT          ↑ select ↓
FRAME ERROR         1/M-FRAME
```

The ERR INSERT-FRAME ERROR auxiliary function selects the number of consecutive frame errors (per M-frame) that are inserted into the transmitted framing pattern. The frame errors are inserted with the **FRAME ERROR INSERT** switch. Press the **RESULTS I Results** switch to select one or two frame errors per M-frame.

2.46.3 LOG/BPV BUR — Logic and BPV Error Insertion Burst Duration

```
ERR INSERT          ↑ select ↓
LOG/BPV BUR           SINGLE
```



The ERR INSERT-LOG/BPV BUR auxiliary function sets the duration for logic error or BPV bursts when the **LOGIC** or **BPV ERROR INSERT** switch is pressed for less than one second. The ERR INSERT-LOG/BPV RT auxiliary function sets the error rate for the burst. Press the **RESULTS I Results** switch to select one of the following burst durations:

SINGLE — Inserts either a single logic error or BPV when the appropriate switch is pressed for less than one second.

25 ms to 1.0 second burst (in 25 ms steps) — Inserts a logic error or BPV burst from 25 ms to one second when the appropriate switch is pressed for less than one second.

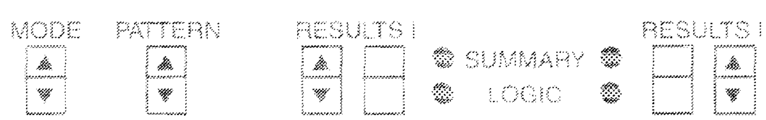
1.0 to 5.0 seconds burst (in 100 ms steps) — Inserts a logic error or BPV burst from one to five seconds when the appropriate switch is pressed for less than one second.

2.47 ERR RECEIVE — DS3 RECEIVED SIGNAL ERROR AUXILIARY GROUP

The ERR RECEIVE auxiliary group controls the parity error rate calculation method, logic, BPV, and frame error rate threshold for the appropriate categories, and frame synchronization loss threshold. The ERR RECEIVE auxiliary group is described as follows:

2.47.1 PAR ERR RT — Parity Category Error Rate Calculation

ERR RECEIVE	**↑ select ↓**
PAR ERR RT	**BIT ERROR**



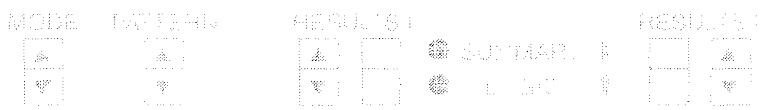
The ERR RECEIVE-PAR ERR RT auxiliary function selects the parity error rate calculation method. Changing the selection causes a test restart. Press the **RESULTS I Results** switch to select the desired calculation method:

BLOCK ERROR — The block error method is calculated as the ratio of the total number of parity errors to the total number of M-frames received.

BIT ERROR — The bit parity error rate is calculated as the ratio of the total number of parity errors to the total number of bits over which the parity was calculated (number of received M-frames multiplied by 4704). The bit parity error rate gives the best indication of the actual bit error rate.

2.47.2 FRM LOSS THR — Frame Synchronization Loss Threshold

ERR RECEIVE	**↑ select ↓**
FRM LOSS THR	**3 OUT OF 15**



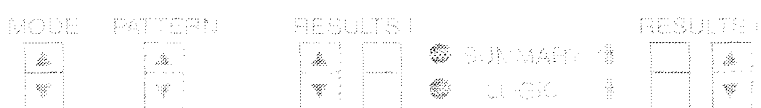
The ERR RECEIVE-FRM LOSS THR auxiliary function determines when the T-BERD 310 loses frame synchronization. Changing the selection causes a test restart. Press the **RESULTS I Results** switch to select the desired threshold:

3 OUT OF 15 — Frame synchronization is lost when three frame errors are counted in 15 received frame bits.

6 OUT OF 15 — Frame synchronization is lost when six frame errors are counted in 15 received frame bits.

2.47.3 ERROR THR — Logic, BPV, and Frame Errored Second Threshold

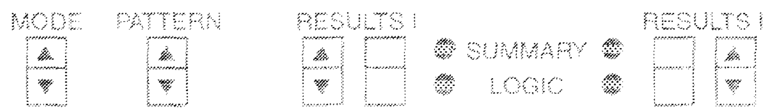
ERR RECEIVE	**↑ select ↓**
ERROR THR	**1E-2**



The ERR RECEIVE-ERROR THR auxiliary function selects the errored second thresholds for the BIT THR ES, FRM THR ES, and BPV THR ES results. Changing the selection causes a test restart. Press the **RESULTS I Results** switch to select the desired error rate threshold from 1E-2 to 1E-7.

2.47.4 PAT LOSS THR — Pattern Loss Threshold

```
ERR RECEIVE        ↑ select ↓
PAT LOSS THR         FAST
```



The ERR RECEIVE-PAT LOSS THR auxiliary function selects the criteria that determines when the T-BERD 310 loses pattern synchronization. Changing the selection causes a test restart. Press the **RESULTS I Results** switch to select the desired threshold criteria:

FAST — Pattern synchronization is lost when 1024 or more bit errors are counted in 32,767 bits received.

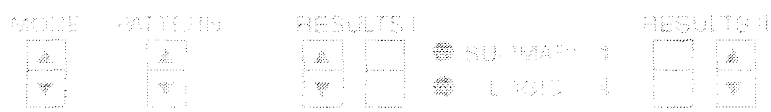
SLOW — Pattern synchronization is lost when 250,000 or more bit errors are counted in 1,000,000 bits received.

2.48 MUXED TX — MULTIPLEXED LOOP CODE AUXILIARY GROUP

The MUXED TX auxiliary group controls the multiplexed DS3 output DS1 loop codes. The MUXED TX auxiliary group is described as follows:

2.48.1 DS1 LP CODE — DS1 Loop Code Select

MUXED TX	**↑ select ↓**
DS1 LP CODE	**CSU**



The MUXED TX-DS1 LP CODE auxiliary function selects the DS1 loop code for the MUXED M13 and MUXED C-BIT operating modes. The appropriate loop code is transmitted when the T1D4 LPDN, T1D4 LPUP, T1ESF LPDN, or T1ESF LPUP pattern is selected. The loop code is inserted with the **DS3-DS1 CHANNEL INSERT** switch. Press the **RESULTS I Results** switch to select the desired loop code from the following:

CSU — The Customer Service Unit loop codes allow the T-BERD 310 to establish a DS1 loopback with a compatible CSU. The transmitted loop-up code is 10000 and the loop-down code is 100.

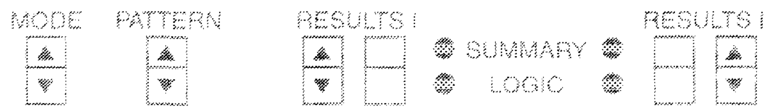
FACILITY 1 — The 4-bit facility or network (or smart jack) loop codes allow the T-BERD 310 to establish a loopback with a compatible facility interface. The transmitted loop-up code is 1100 and the loop-down code is 1110.

FACILITY 2 — The 5-bit facility or network (or smart jack) loop codes allow the T-BERD 310 to establish a loopback with a compatible facility interface. The transmitted loop-up code is 11000 and the loop-down code is 11100.

PROGRAMMABLE — The 3- to 8-bit programmable loop codes allow the T-BERD 310 to establish a loopback with any nonstandard device. The loop codes are programmed through the MUXED TX-PGM LPUP and MUXED TX-PGM LPDN auxiliary functions.

2.48.2 PGM LPUP — Programmable Loop-Up Code

MUXED TX	**↑ forward rev ↓**	**↑ toggle end ↓**
PGM LPUP	**10000**	



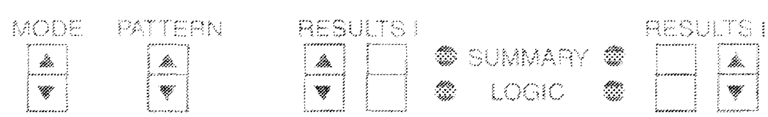
The MUXED TX-PGM LPUP auxiliary function programs a 3- to 8-bit user-defined loop-up code. This allows the T-BERD 310 to transmit nonstandard loop codes. The programmed loop-up code is transmitted when the MUXED M13 or MUXED C-BIT mode and the T1D4 LPUP or T1ESF LPUP pattern are selected. The MUXED TX-DS1 LP CODE auxiliary function must be set to PROGRAMMABLE. The loop code is transmitted in left-to-right order. The MUXED TX-PGM LPUP auxiliary function is controlled by the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to eight bits. Press the down arrow to move the cursor in reverse from right to left.

RESULTS II Results switch — Press the up arrow to toggle the highlighted bit from 0 to 1. Press the down arrow to save and end the displayed bit pattern up to the position of the cursor. Any bits to the right of the cursor are deleted and the cursor returns to the left most bit position. The loop code is only saved when *end* is selected.

2.48.3 PGM LPDN — Programmable Loop-Down Code

MUXED TX	**↑ forward rev ↓**	**↑ toggle end ↓**
PGM LPDN	**100**	



The MUXED TX-PGM LPDN auxiliary function programs a 3- to 8-bit user-defined loop-down code. This allows the T-BERD 310 to transmit nonstandard loop codes. The programmed loop-down code is transmitted when the MUXED M13 or MUXED C-BIT mode and the T1D4 LPDN or T1ESF LPDN pattern are selected.

The MUXED TX-DS1 LP CODE auxiliary function must be set to PROGRAMMABLE. The loop code is transmitted in left-to-right order. The MUXED TX-PGM LPDN auxiliary function is controlled by the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to eight bits. Press the down arrow to move the cursor in reverse from right to left.

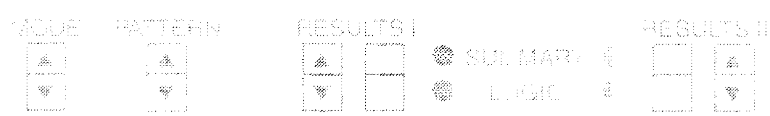
RESULTS II Results switch — Press the up arrow to toggle the highlighted bit from 0 to 1. Press the down arrow to save and end the displayed bit pattern up to the position of the cursor. Any bits to the right of the cursor are deleted and the cursor returns to the left most bit position. The loop code is only saved when *end* is selected.

2.49 TIME — TIME AND DATE AUXILIARY GROUP

The TIME auxiliary group controls the date and time for the battery-backed clock, and the test length for timed tests. The TIME auxiliary group is described as follows:

2.49.1 SET TIME — Set Time

TIME	**↑ hour ↓**	**↑ minute ↓**
SET TIME	**12**	**25**



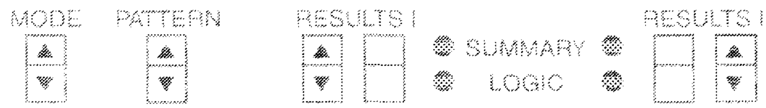
The TIME-SET TIME auxiliary function sets the time for the battery-backed clock. The current time of day is displayed in the ATM category and printed on all printouts. Press the **RESULTS** switches to select the desired time:

RESULTS I Results switch — Press this switch to set the hour in a 24-hour clock format.

RESULTS II Results switch — Press this switch to set the minutes from 00 to 59 minutes.

2.49.2 SET DATE — Set Date

TIME	**↑ month ↓**	**↑ day ↓**
SET DATE	**JAN**	**1**



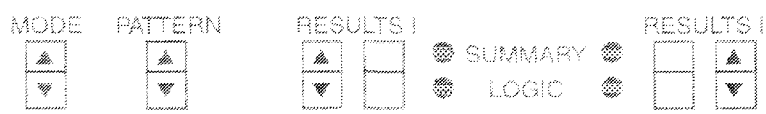
The TIME-SET DATE auxiliary function sets the month and the day. The current month and day are displayed in the ATM category and printed on all printouts. Press the **RESULTS** switches to select the desired date:

RESULTS I Results switch — Press this switch to set the month from JAN to DEC.

RESULTS II Results switch — Press this switch to set the day from 1 to 31.

2.49.3 TEST LENGTH — Set Test Length

TIME	**↑ hour ↓**	**↑ minute ↓**
TEST LENGTH	**12**	**25**



The TIME-TEST LENGTH auxiliary function sets the timed test length when the TIME-TEST auxiliary function is set to TIMED. If the test length is changed, a test restart occurs when the auxiliary function is exited. The timed test range is from 00:01 to 999:59. Press the **RESULTS** switches to select the desired test length:

RESULTS I Results switch — Press this switch to set the hour from 0 to 999 hours.

RESULTS II Results switch — Press this switch to set the minutes from 00 to 59 minutes.

2.49.4 TEST— Set Test Duration Type

The TIME-TEST auxiliary function sets the duration of the test being performed. Changing from TIMED to CONTINUOUS does not cause a test restart, but changing from CONTINUOUS to TIMED does.

CONTINUOUS — This allows continuous testing. The TIME category ELAPSED TIME result indicates the elapsed time from the test restart. The test results indicate accumulative counts since the test restart.

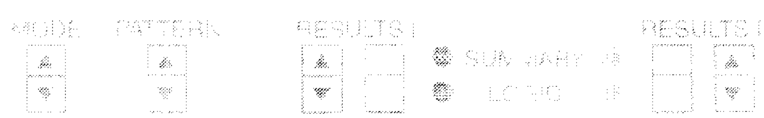
TIMED — This allows timed testing. The timed test length is set through the TIME-TEST LENGTH auxiliary function. At the end of a timed test, the results and the state of the Status and Alarm LEDs are frozen. A test results printout is generated at the end of the timed test when the PRINT-PRINT EVENT auxiliary function is set to any position, except OFF.

2.50 PRINT — PRINTER/REMOTE CONTROL INTERFACE AUXILIARY GROUP

The PRINT auxiliary group configures the RS-232-C and IEEE-488 (optional) interface operation, and the printout generation. The 310-6 IEEE-488 Option provides an IEEE-488 interface. Refer to Section 3 when the selected interface drives a printer. Refer to Section 4 when the selected interface is connected to a computer or terminal for remote operation. The PRINT auxiliary group is described as follows:

2.50.1 INTERVAL — Timed Printout Interval

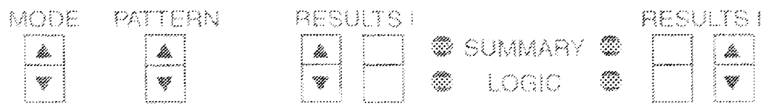
PRINT	**↑ hour ↓**	**↑ minute ↓**
INTERVAL	**6**	**00**



The PRINT-INTERVAL auxiliary function allows you to select the amount of time between printouts when the PRINT-PRINT EVENT auxiliary function is set to TIMED. The maximum time that can be entered is 24 hours 59 minutes. The minimum time that can be entered is 00 hours 01 minute. Press the **RESULTS I Results** switch to set the hours from 0 to 24 hours. Press the **RESULTS II Results** switch to set the minutes from 00 to 59 minutes. The printout format is determined by the PRINT-FORMAT and PRINT-MODE auxiliary functions.

2.50.2 MODE — Printout Mode

PRINT **↑ select ↓**
MODE **CONTINUOUS**



The PRINT-MODE auxiliary function selects how the results are accumulated for all PRINT-PRINT EVENT auxiliary function positions. Press the **RESULTS I Results** switch to select one of the following:

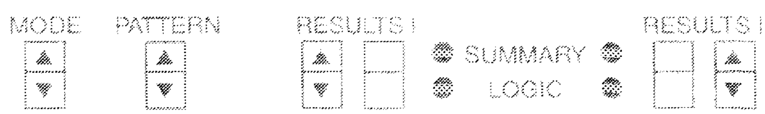
CONTINUOUS — Results are continuously accumulated for the duration of the test.

DELTA — Results are accumulated from a test restart or the previous delta printout. As the printout is sent to the print buffer, the test result counters are reset to zero.

NOTE: The DELTA mode selection does not affect front-panel results, power-down test results printouts, squelch-off test results printouts, and manual test results printouts.

2.50.3 FORMAT — Printout Format

PRINT **↑ select ↓**
FORMAT **NORMAL**



The PRINT-FORMAT auxiliary function selects the format for the test results printouts. Press the **RESULTS I Results** switch to select one of three formats:

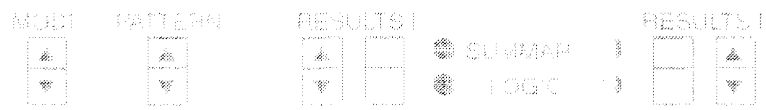
NORMAL — The NORMAL RESULTS PRINT lists the Primary (and Secondary) Status and Alarm LEDs and all results by category for the current T-BERD 310 configuration.

SUMMARY — The SUMMARY RESULTS PRINT lists the Primary (and Secondary) Status and Alarm LEDs and current SUMMARY category results.

CUSTOM — The CUSTOM RESULTS PRINT lists the Primary (and Secondary) Status and Alarm LEDs, FEAC codes, and test results selected through the PRINT-CUSTOM auxiliary function.

2.50.4 CUSTOM — Customized Printout Contents

PRINT	**↑ select ↓**	**↑ on off ↓**
CUSTOM	**SIGNAL PRES**	**OFF**



The PRINT-CUSTOM auxiliary function selects specific test results, FEAC codes, and Status and Alarm LED conditions to be included in a custom test results printout. Press the **RESULTS** switches to select the desired printout line items:

RESULTS I Category switch — Press this switch to select the desired category. The Status and Alarm LEDs and FEAC codes are selected from the SUMMARY category. Select the test results from the other categories.

RESULTS I Results switch — Press this switch to select the results and LEDs.

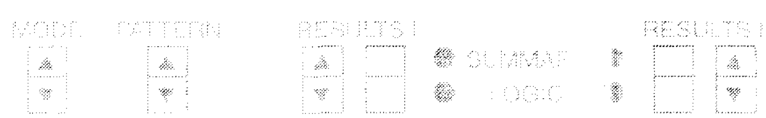
RESULTS II Results switch — Press the up arrow to toggle ON or the down arrow to toggle OFF the status condition.

NOTE: To generate a custom test results printout, set the PRINT-FORMAT auxiliary function to CUSTOM.

Refer to *Mainframe Test Results* for the list of categories and results. If the DS1 Insert Option is installed, the **RESULTS I SECONDARY** switch can be pressed to select the desired secondary DS3 results for the customized test results printout.

2.50.5 GRAPH — Print Pulse Shape Graph

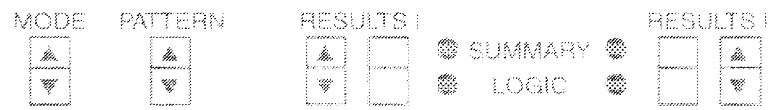
PRINT	**↑ print ↓**
GRAPH	**PULSE**



The PRINT-GRAPH auxiliary function generates the pulse shape graph printout. Press the **RESULTS I Results** switch to print the pulse shape graph. Select the pulse shape mask with the MISC-PULSE MASK auxiliary function. Set the PRINT-PARITY auxiliary function to NONE (character length to 8 bits) to properly print a graph.

2.50.6 BAUD RATE — RS-232 Interface Baud Rate

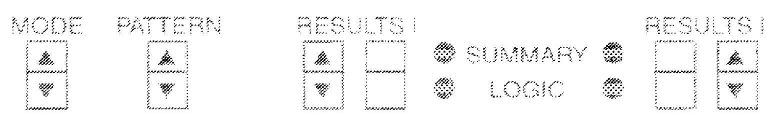
PRINT	**↑ select ↓**
BAUD RATE	**2400**



The PRINT-BAUD RATE auxiliary function selects the RS-232 interface baud rate. Press the **RESULTS I Results** switch to select one of the following: 110, 300, 600, 1200, 2400, 4800, or 9600.

2.50.7 PARITY — RS-232 Interface Parity

PRINT	**↑ select ↓**
PARITY	**NONE**



The PRINT-PARITY auxiliary function selects the RS-232 interface parity. Press the **RESULTS I Results** switch to select one of the following:

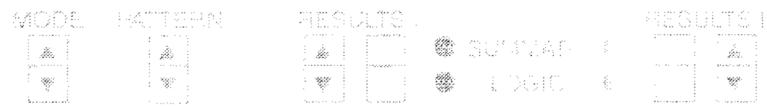
NONE — Parity is disabled and the data output is configured for an 8-bit character length. Parity must be set to NONE to print the pulse shape graph.

EVEN — Even parity is enabled with the data output configured for a 7-bit character length.

ODD — Odd parity is enabled with the data output configured for a 7-bit character length.

2.50.8 TERMINATOR — Printout Line Terminator

```
PRINT                  ↑ select ↓
TERMINATOR               CRLF
```

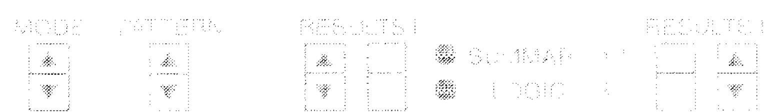


The PRINT-TERMINATOR auxiliary function selects the end-of-line terminator characters for both printouts and remote control devices. Press the **RESULTS I Results** switch to select one of the following line terminator characters:

CRLF — Carriage Return and Linefeed
CR — Carriage Return
LF — Linefeed

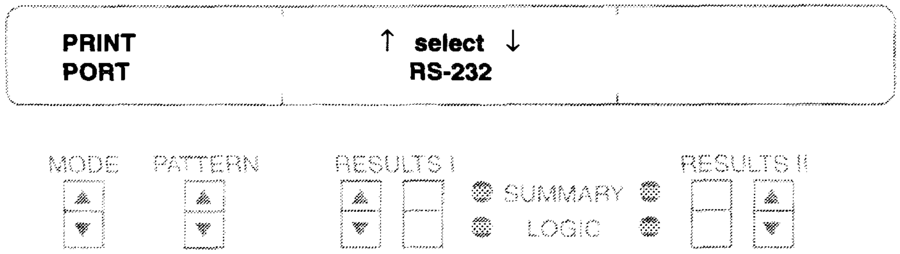
2.50.9 WIDTH — Printout Line Width

```
PRINT                  ↑ select ↓
WIDTH                     40
```



The PRINT-WIDTH auxiliary function selects the character line width for printouts and terminal displays. Press the **RESULTS I Results** switch to select either a 40- or 80-column width.

2.50.10 PORT — Printer/Remote Control Interface Port Selection



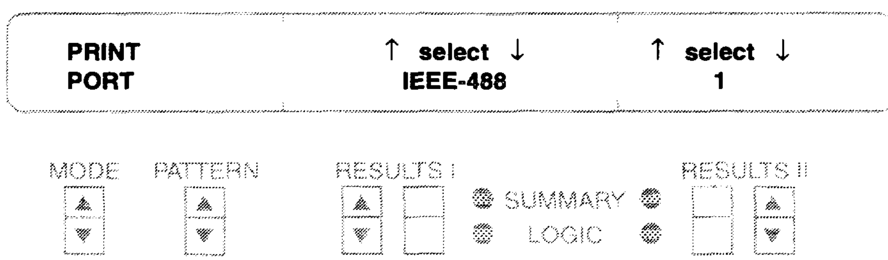
The PRINT-PORT auxiliary function selects between the RS-232 or 310-6 IEEE-488 Option interface for printer or remote control operation.

NOTE: This auxiliary function only appears when the 310-6 IEEE-488 Option is installed.

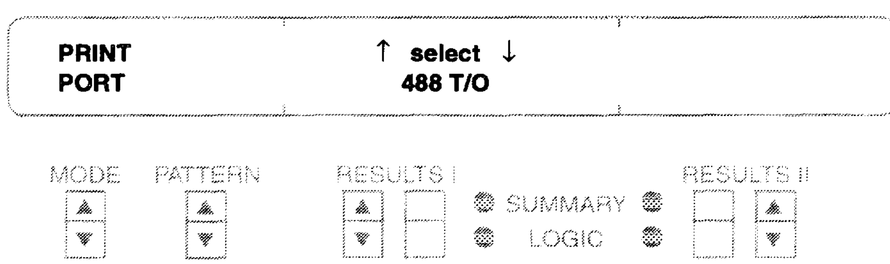
Press the **RESULTS I Results** switch to select between the RS-232 and IEEE-488 interfaces. The IEEE-488 interface has two selections:

RS-232 — This selects the side-panel RS-232 interface for printer or remote control operation.

Addressable IEEE-488 — This selects the side-panel IEEE-488 interface for remote control operation from a compatible IEEE-488 controller. Press the **RESULTS II Results** switch to select the bus address from 0 to 30 for the T-BERD 310.



488 T/O — The IEEE-488 talk-only mode enables the T-BERD 310 to drive a compatible IEEE-488 listen-only printer from the side-panel IEEE-488 interface.



2.50.11 PRINT EVENT — Set Printout Event Criteria

The PRINT-PRINT EVENT auxiliary function selects the event that automatically initiates a test results printout. When a print event is selected (other than OFF), the following conditions can occur:

- A test results printout is generated at the indicated time or event.
- Status or alarm messages are automatically generated as appropriate.
- At power-up, the power-down test results printout is generated.
- The printer squelch function is enabled.
- A test end test results printout occurs if a timed test is completed.

Sub-function descriptions are as follows.

OFF — The print event functions are disabled, the print buffer is cleared, and status or alarm messages are not printed.

15 MIN — A test results printout is generated every 15 minutes after test restart.

30 MIN — A test results printout is generated every 30 minutes after test restart.

TEST END — A test results printout is generated when the timed test has expired. The timed test is selected when the **TEST** switch is set to TIMED. The TIME-TEST LENGTH auxiliary function controls the test interval. This selection only allows the test end test results printout to be generated

ERR SEC — A test results printout occurs for every occurrence of an errored second after test restart.

TIMED — A test results printout is generated at a user-specified interval. The print interval is set using the PRINT-INTERVAL auxiliary function. The PRINT-MODE auxiliary function sets the print mode: continuous and delta.

NOTE: If any of the print events (except OFF) are selected and the **TEST** auxiliary function is set to TIMED, the selected print event (e.g., 30 MIN) and the test end test results printouts are generated at the appropriate time.

2.50.12 PRINT TYPE — Set Printout Type

The PRINT-PRINT TYPE auxiliary function initiates either a test results or controls printout. The switch positions perform the following functions:

RESULTS — This generates a date- and time-stamped printout of the current test results. Test results become available only after the T-BERD 310 has received a valid signal. The test results can be customized through the PRINT-FORMAT and PRINT-CUSTOM auxiliary functions.

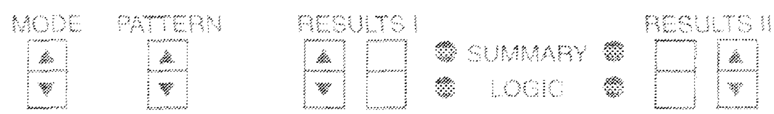
CONTROLS — This generates a date- and time-stamped printout of the current front-panel and auxiliary function configurations. This printout records how the T-BERD 310 is configured for a test.

2.51 MISC — MISCELLANEOUS AUXILIARY GROUP

The MISC auxiliary group controls the user-programmable test pattern, X-bit transmission, Blue Signal detection criteria, DS1 line coding, beep criteria, and the pulse shape mask. The MISC auxiliary group is described as follows:

2.51.1 USER1 — User 1 Programmable Test Pattern

MISC	**↑forward rev↓**	**↑toggle end↓**
USER1	**100**	



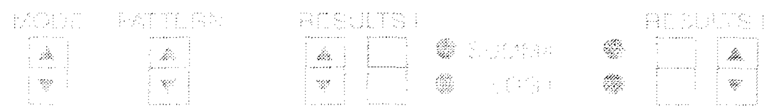
The MISC-USER1 auxiliary function programs a 3- to 24-bit user-programmable test pattern. This allows the T-BERD 310 to transmit specific patterns to test circuit sensitivity. The pattern is transmitted when the USER1 pattern is selected with the **PATTERN** switch. The pattern is transmitted in left-to-right order. A test restart of the T-BERD 310 occurs when the pattern is saved while the USER1 pattern is transmitted. The test pattern is programmed with the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to 24 bits. Press the down arrow to move the cursor in reverse from right to left.

RESULTS II Results switch — Press the up arrow to toggle the highlighted bit between "1" and "0". Press the down arrow to end or save the bit pattern from the position of the cursor to the first bit on the left. Any bits to the right of the cursor are deleted when the down arrow is pressed. The pattern is saved when *end* is selected.

2.51.2 TX X-BIT — X-Bit Transmission

MISC ↑ **select** ↓
TX X-BIT **11**

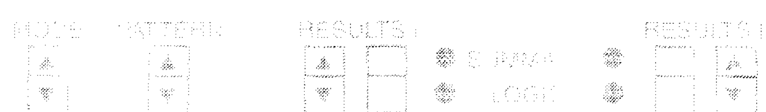


The MISC-TX X-BIT auxiliary function determines how the T-BERD 310 transmits the X-bits in all modes except THRU and UNFRAMED. Press the **RESULTS I Results** switch to select the required bit pattern: 11, 00, or EMULATE. EMULATE causes the T-BERD 310 to automatically transmit the X-bits according to the received signal frame status. If the received framing is lost, 00 (Yellow Alarm) is transmitted. If the receive framing is valid, 11 (no Yellow Alarm) is transmitted.

NOTE: If either pattern, IDLE (1100) or BLUE (1010), is transmitted, the T-BERD 310 overrides the 00 bit pattern and transmits 11.

2.51.3 BLU SIG CRI — Blue Signal Detection Criteria

MISC ↑ **select** ↓
BLU SIG CRI **STUCK C-BIT**



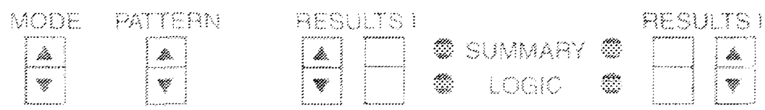
The MISC-BLU SIG CRI auxiliary function selects the Blue Signal detection criteria. Changing the auxiliary function causes a test restart. Press the **RESULTS I Results** switch to select one of the following detection criteria:

STUCK C-BIT — The T-BERD 310 declares a Blue Signal based primarily on receiving a signal with the C-bits set to zero.

1010 — The T-BERD 310 declares a Blue Signal if the received signal contains a 1010 pattern.

2.51.4 DS1 LINECODE — DS1 Drop Output Line Coding

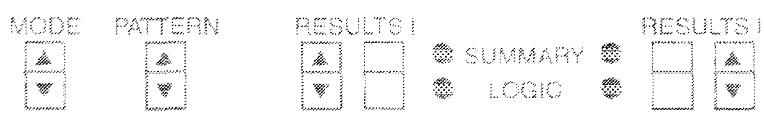
MISC	**↑ select ↓**	
DS1 LINECODE	**AMI**	



The MISC-DS1 LINECODE auxiliary function selects the DS1 line code, for the side-panel DS1 DROP output jack. Press the **RESULTS I Results** switch to select either AMI or B8ZS DS1 line coding.

2.51.5 BEEP CRI — Beep Criteria

MISC	**↑ select ↓**	**↑ on off ↓**
BEEP CRI	**PATT SYNC**	**OFF**



The MISC-BEEP CRI auxiliary function selects the criteria for the T-BERD 310 to generate an audible warning. Press the **RESULTS I Results** switch to select the criteria. Press the **RESULTS II Results** switch to toggle the criteria ON or OFF.

PATT SYNC — The T-BERD 310 beeps when pattern synchronization occurs (DS3 Pattern Sync LED illuminated).

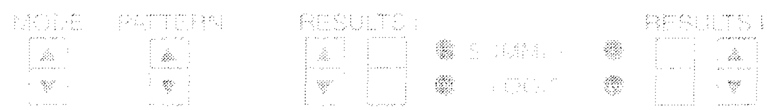
THR ERR SEC — The T-BERD 310 beeps once a second when the errored second threshold (ERR RECEIVE-ERROR THR auxiliary function) is exceeded.

ERROR EVENT — The T-BERD 310 beeps once a second when a non-zero test result appears in the SUMMARY category. This includes primary and secondary DS3 signal results and SONET overhead results.

DS1 SCANTRIG — The T-BERD 310 beeps when an event occurs during a DS1/DS0 Analyzer Option triggered DS1 scan mode test. Select the trigger event with the AUX-SCAN TRIG function. This selection is only available with the installed DS1/DS0 Analyzer Option.

2.51.6 PULSE MASK — Pulse Shape Mask

MISC	**↑ select ↓**	
PULSE MASK	**93 ANSI**	



The MISC-PULSE MASK auxiliary function selects the pulse mask used to evaluate the received signal pulse shape. The selected pulse mask appears on the pulse shape graph printout (PRINT-GRAPH auxiliary function). Changing the PULSE MASK causes a test restart. Press the **RESULTS I Results** switch to select one of the following pulse masks:

NONE — The pulse shape is not evaluated against a pulse mask specification. However, the pulse shape measurements are still made. When selected, the PULSE SHAPE result indicates N/A.

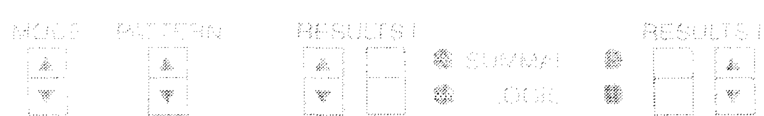
ANSI — The pulse shape is evaluated against the ANSI T1.102-1991 Network Interface pulse mask specification.

93 ANSI — The pulse shape is evaluated against the ANSI T1.102-1993 and ANSI T1.404-1993 Network Interface pulse mask specification.

CCITT — The pulse shape is evaluated against the proposed CCITT G.703 network interface pulse mask recommendation.

2.51.7 FEAC ALARMS — FEAC Message Alarm Control

MISC	**↑ DS1 EQUIP**	**↑send stop↓**
FEAC ALARMS	**↓ FAIL (SA)**	**NOT SENDING**



The MISC-FEAC ALARMS auxiliary function is used to transmit Far-End Alarm and Control (FEAC) alarm messages. Press the **RESULTS I Results** switch to scroll through the following messages.

DS3 EQUIP FAIL (NSA) — DS3 Equipment Failure, Non-Service Affecting (Type 2 equipment failure)

DS3 EQUIP FAIL (SA) — DS3 Equipment Failure, Service Affecting (Type 1 equipment failure)

DS3 LOS/HBER — DS3 Loss-of-Signal/High Bit Error Ratio

DS3 OUT OF FRAME — DS3 Out-of-Frame, Loss of DS3 Frame Synchronization

DS3 AIS RECEIVED — DS3 Alarm Indication Signal Received

DS3 IDLE RECEIVED — DS3 Idle Signal Received

COMM EQUIP FAIL (NSA) — Common Equipment Failure, Non-Service Affecting (Type 2 equipment failure)

DS1 EQUIP FAIL (NSA) — DS1 Equipment Failure, Non-Service Affecting (Type 2 equipment failure)

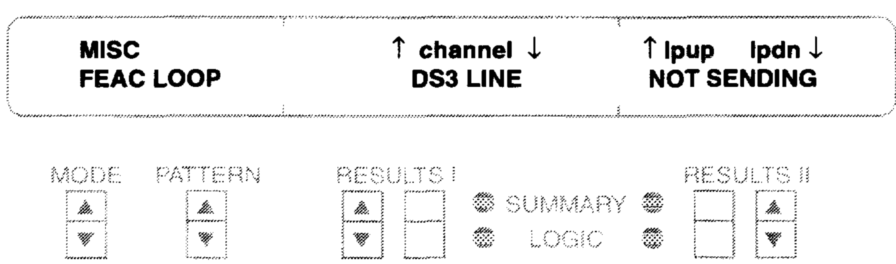
DS1 EQUIP FAIL (SA) — DS1 Equipment Failure, Service Affecting (Type 1 equipment failure)

SINGLE DS1 LOS/HBER — Single DS1 Loss-of-Signal/High Bit Error Ratio

MULT DS1 LOS/HBER — Multiple DS1 Loss-of-Signal/High Bit Error Ratio

Press the **RESULTS II Results** switch up arrow to *send* (*SENDING* appears) the alarm message and the down arrow to *stop* (*NOT SENDING* appears) the message. Only one alarm message is transmitted at one time for one second. The FEAC alarms can only be transmitted in the C-BIT and MUXED C-BIT modes. *N/A* appears in the RESULTS II window when the FEAC alarm messages do not apply to the selected operating mode.

2.51.8 FEAC LOOP — FEAC Message Loopback Control



The MISC-FEAC LOOP auxiliary function is used to transmit FEAC loop-code messages. The loop-code messages can loop up or loop down the DS3 line, a DS1 channel, or all DS1 channels. The FEAC alarms can only be transmitted in the C-BIT and MUXED C-BIT modes. *N/A* appears in the RESULTS II window when the FEAC loop-code messages do not apply to the selected operating mode. Press the **RESULTS I Results** switch to scroll through the following loop-code messages.

DS3 LINE — Loopback the DS3 line at the DS3 multiplexer.

DS3 NIU — Loopback the DS3 network interface unit.

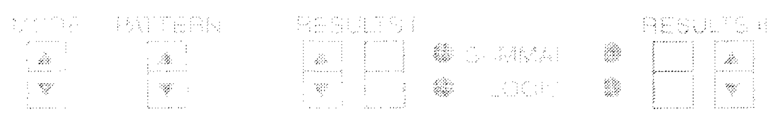
ALL DS1s — Loopback all the low-speed DS1 channels at the DS3 multiplexer.

DS1 #1 - 28 — Loopback the selected low-speed DS1 channel at the DS3 multiplexer.

Press the **RESULTS II Results** switch up arrow to *send* the loop-up code and the down arrow to *send* the loop-down code. When the loop-up code is transmitted, *LOOPING UP* appears in the RESULTS II window until the loopback is established or when one second is exceeded. When the loop-down code is transmitted, *LOOPING DOWN* appears in the RESULTS II window until the loopback is released or when one second is exceeded. NOT *SENDING* appears when the loop code is not being transmitted. Only one loop code can be transmitted at a time.

2.51.9 LCD CONTRAST — DS1/DS0 Analyzer Option Display Contrast Control

MISC	**↑ select ↓**
LCD CONTRAST	**5**

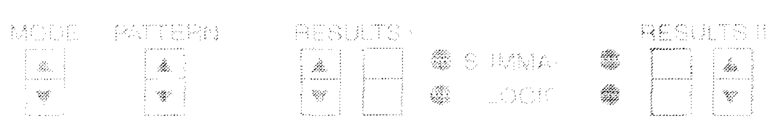


The MISC-LCD CONTRAST auxiliary function adjusts the DS1/DS0 Analyzer Option display contrast. Press the **RESULTS I Results** switch to adjust the contrast ten different contrast levels. Adjust the contrast for the best viewing angle.

NOTE: This function is unavailable with some T-BERD 310 options.

2.51.10 DS1 SIG BITS — DS1 Signaling Transfer Mode

MISC	**↑ select ↓**
DS1 SIG BITS	**PASS-THRU**



The MISC-DS1 SIG BITS auxiliary function controls the DS1 signaling transfer mode for DS1 signals carried in the VT1.5 byte-synchronous channel. The selected function affects both drop and insert signals. This auxiliary function appears with either the installed 310-13R, 310-13T, 310-14R, or 310-14T option.

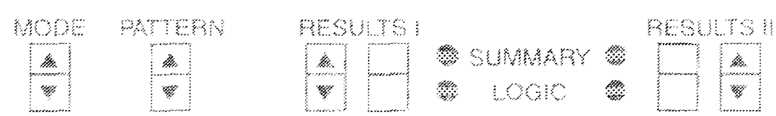
Select — Press the **RESULTS I Results** switch to select one of the following transfer modes:

PASS-THRU — Allows the embedded DS1 signaling bits (if any) to pass through with the DS1 signal.

OUT-SLOT — On the inserted DS1 signal, this mode copies the DS1 signaling bits into the VT overhead. In addition, if the DS1 signal is a superframe format, the signaling bits are set to one. On the dropped DS1 signal, replaces the signaling bits from the VT overhead to the DS1 robbed bit frames. When applied to a dropped ESF payload, the CRC is recalculated for each DS1 superframe. The DS1 ESF datalink is not manipulated when recalculating CRCs.

2.51.11 DS1 BITS CLK — DS1 BITS Clock Termination

MISC	**↑ select ↓**
DS1 BITS CLK	**TERM**



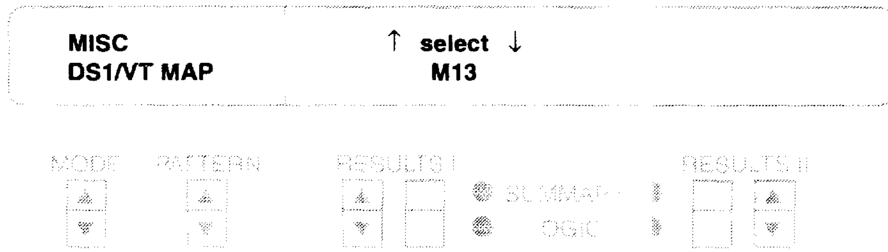
DS1 BITS CLOCK Jack: The MISC-DS1 BITS CLK auxiliary function controls the DS1 BITS CLOCK jack input termination. This auxiliary function appears only with the 310-13T, 310-14T, or 310-14T-DUAL option installed.

Select — Press the **RESULTS I Results** switch to select one of the following input terminations:

TERM — Terminates an unterminated input signal across 100 ohms.

BRIDGE — Terminates the input signal across 1000 ohms to bridge terminated lines.

2.51.12 DS1/VT MAP — DS1/VT Mapping Select



The MISC-DS1/VT MAP auxiliary function selects the DS1 channel format.

Select — Press the **RESULTS I Results** switch to select one of the following DS1 channel formats (see Table 2-5):

M13 — Enables the DS1 signals to be selected sequentially through the seven VT1.5 groups with the first four channels in the first group, the second four channels in the second group, and so forth. The groups are numbered from 1 to 7 and the VT channels are numbered from 1 to 4.

TR-253 — Enables the DS1 signals to be selected sequentially through the seven VT1.5 groups with the first channel in each first group numbered first, the second four channels in the second group, and so forth. The groups are numbered from 1 to 7 and the VT channels are numbered from 1 to 4. This format conforms to the ANSI TR-253 and Bellcore specifications for identifying VT1.5 channels.

SEQUENTIAL — Enables the DS1 signals to be selected sequentially using DS1 channel numbers from 1 to 28.

Table 2-5
SONET DS1 Signal Numbering

Sequential DS1 DS1 chan	M13 Order gp,vt	TR-253 Order gp,vt
1	1,1	1,1
2	1,2	2,1
3	1,3	3,1
4	1,4	4,1
5	2,1	5,1
6	2,2	6,1
7	2,3	7,1
8	2,4	1,2
9	3,1	2,2
10	3,2	3,2
11	3,3	4,2
12	3,4	5,2
13	4,1	6,2
14	4,2	7,2
15	4,3	1,3
16	4,4	2,3
17	5,1	3,3
18	5,2	4,3
19	5,3	5,3
20	5,4	6,3
21	6,1	7,3
22	6,2	1,4
23	6,3	2,4
24	6,4	3,4
25	7,1	4,4
26	7,2	5,4
27	7,3	6,4
28	7,4	7,4
ALL	ALL	ALL

2.51.13 DS3 LEVEL — Set DS3 Transmit and Receive Levels

DS3 RECEIVE — Input signal equalization for DS3 receive signals from the circuit under test are controlled by this auxiliary function. This function sets the DS3 RECEIVE jack receiver for the desired DS3 signal level as follows:

HIGH — The receiver accepts a nominal signal level of 0.9 Vp (0 feet of cable attenuation from a HIGH source). When presented with cable attenuation, the input signal level may range from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal input level (0.9 Vp). When presented with resistive attenuation, the signal level may range from +6 dB of gain to -26 dB of loss from the nominal input level (0.9 Vp).

DSX — The receiver accepts a nominal signal level of 0.5 Vp (450 feet of cable attenuation form a HIGH source). When presented with cable attenuation, the input signal level may range from + 6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal level (0.5 Vp). When presented with resistive attenuation, the input signal level may range from +6 dB of gain to -26 dB of loss from the nominal level (0.5 Vp).

LOW — The receiver accepts a nominal signal level of 0.2 Vp (900 feet of cable attenuation from a HIGH source). When presented with cable attenuation, the input signal level may range from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal level (0.2 Vp). When presented with resistive attenuation, the input signal level may range from +6 dB of gain to -20 dB of loss from the nominal level (0.2 Vp).

DS3 TRANSMIT — Output levels for transmitted DS3 signals from the T-BERD 310 to the circuit under test are controlled by this auxiliary function. This function sets output transmit levels as follows:

HIGH — Sets the transmit output signal level to 0.91 Vp. Use this setting to send the DS3 signal from the DS3 terminal location towards the DSX-3 patch panel.

DSX — Sets the transmit output signal level to 0.6 Vp. Use this setting to send the DS3 signal from the DSX-3 patch panel IN jack. The signal level is equal to a HIGH signal sent through 450 feet of coaxial cable.

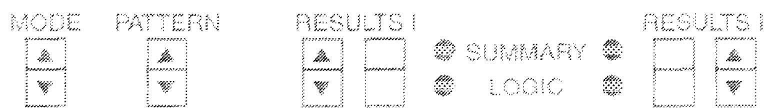
LOW — Sets the transmit output signal level to 0.3 Vp. Use this setting to stress-test the DS3 input to a multiplexer. The signal level is equal to a HIGH signal sent through 900 feet of coaxial cable.

2.52 SONET RX — SONET RECEIVE AUXILIARY GROUP

The following auxiliary functions select the DS1 channel and output, STS receive level, and DCC access. They only appear when a SONET option is installed.

2.52.1 DS1 DROP OUT — DS1 Drop Output Source

```
SONET RX          ↑ select ↓
DS1 DROP OUT        SONET
```



The SONET RX-DS1 DROP OUT auxiliary function selects the DS1 source for the side-panel DS1 DROP jack.

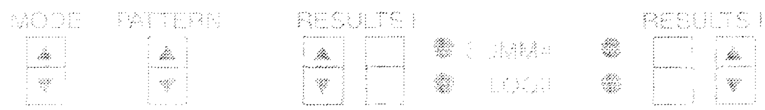
Select — Press the **RESULTS I Results** switch to select one of the following sources:

DS3 — Drops the DS1 signal from the specified DS3 source. When the **DS3 SOURCE** switch is set to EXTERNAL, the DS1 channel is dropped from the DS3 signal received through the DS3 RECEIVE jack. When the **DS3 SOURCE** switch is set to SONET, the DS1 channel is dropped from the SONET DS3 payload received through a SONET input connection.

SONET — Selects the SONET input as the DS1 source. This allows a DS1 channel to be dropped from the SONET DS1 payload received through a SONET input connection. With the installed 310-4 or 310-4A option, select the DS1 channel (1 to 28) to be dropped with the SONET RX-SONET DS1 CH auxiliary function. With the installed 310-13R or 310-14R option, select the dropped DS1 channel with the front panel **CHANNEL CONTROL** switch set to DS3-DS1.

2.52.2 SONET DS1 CH — SONET DS1 Channel Select

SONET RX **↑ select ↓**
SONET DS1 CH **1**



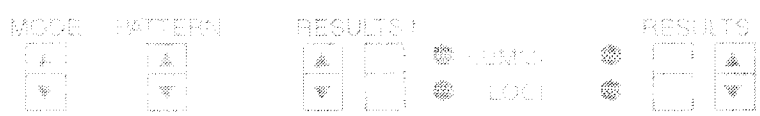
The SONET RX-SONET DS1 CH auxiliary function selects the DS1 channel (1 to 28) to be dropped from the SONET DS1 payload. This auxiliary function only appears with the installed 310-4 or 310-4A option. The DS1 channel can be dropped to either the DS1/DS0 Analyzer Option (**DS1 SOURCE** switch set to SONET DROP) or the DS1 DROP jack (SONET RX-DS1 DROP OUT auxiliary function set to SONET).

Select — Press the **RESULTS I Results** switch to select the DS1 channel from 1 to 28.

NOTE: The DS1 channel dropped from the SONET DS1 payload is selected with the SONET RX-SONET DS1 CH auxiliary function, *not* the **DS3-DS1 CHANNEL DROP** switch.

2.52.3 STS RX LEVEL — STS Receive Level

SONET RX **↑ select ↓**
STS RX LEVEL **DSX**



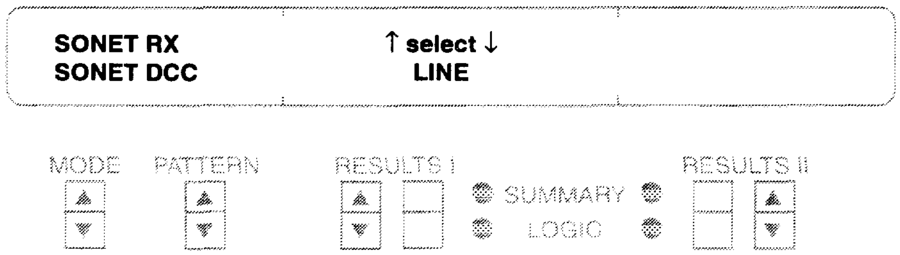
The SONET RX-STS RX LEVEL auxiliary function selects the STS input signal level range for the side-panel STS-1 RECEIVE jack.

Select — Press the **RESULTS I Results** switch to select one of the following levels:

DSX — Select for signal levels received at a DSX level.

HIGH — Select for signal levels received at a high level.

2.52.4 SONET DCC — SONET Data Communication Channel Drop and Insert Control



The SONET RX-SONET DCC auxiliary function controls the drop and insert capabilities for the DCC. The DCC is accessed through the DCC DROP/INSERT connector on the 310-13R or 310-14R option. The auxiliary function only appears with the installed 310-13R or 310-14R option. The 310-13R/T pair or 310-14R/T pair allows for full DCC drop and insert capabilities.

Select — Press the **RESULTS I Results** switch to select either the Line or Section DCC to drop and insert the DCC through the DCC DROP/INSERT connector. Section and Line DCC are only valid in the STS ID 1 of an STS-N signal.

LINE — Selects the Line DCC. The Line DCC is contained in bytes D4 through D12. An all-zeros pattern is transmitted on the Section DCC.

SECTION — Selects the Section DCC. The Section DCC is contained in bytes D1, D2, and D3. An all-zeros pattern is transmitted on the Line DCC.

NONE — The DCC drop and insert function is disabled. An all-zeros pattern is transmitted over both channels.

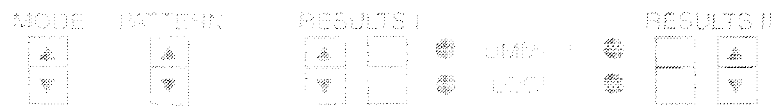
2.53 SONET TX — SONET TRANSMIT AUXILIARY GROUP

The following auxiliary functions select the SONET output signal, the inserted payload format, transmit timing source, STS transmit level, error insertion, alarm generation, SPE pointer manipulation, orderwire drop and insert, and path trace message insertion.

Instrument Description

2.53.1 STS TX LEVEL — STS Transmit Level

SONET TX	**↑ select ↓**
STS TX LEVEL	**DSX**



The SONET TX-STS TX LEVEL auxiliary function selects the output signal level for the side-panel STS-1 TRANSMIT jack. This auxiliary function only appears with the installed 310-13T or 310-14T option.

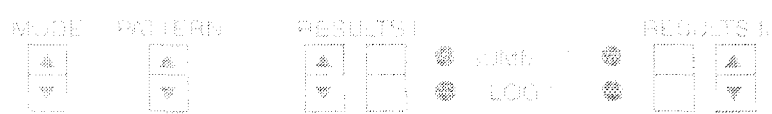
Select — Press the **RESULTS I Results** switch to select one of the following levels:

DSX — Select to transmit the STS signal at a DSX level.

HIGH — Select to transmit the STS signal at a high level.

2.53.2 SONET ERR RT — SONET Error Rate Select

SONET TX	**↑ select ↓**	**↑ frame err ↓**
SONET ERR RT	**1E-4**	**1**

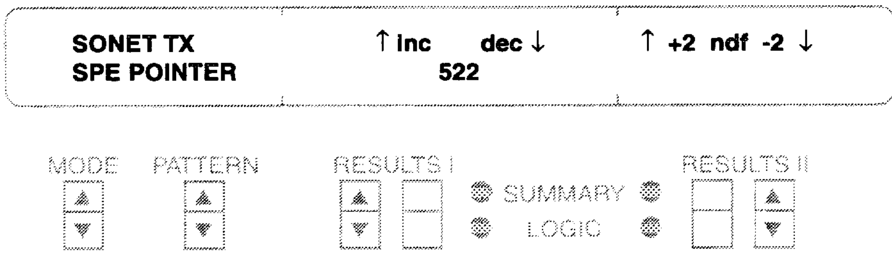


The SONET TX-SONET ERR RT auxiliary function selects the bit error rate for inserting bit interleaved parity (BIP) errors and far-end block errors (FEBE) in the transmitted SONET signal. It also selects the number of consecutive frame errors for inserting frame word errors. This auxiliary function only appears with the installed 310-13T or 310-14T option.

Select — Press the **RESULTS I Results** switch to select one of the following error rates: 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, and 1E-9. (This error rate is applied via the BIP and FEBE selections of the front panel error **INSERT** switch.)

Frame err — Press the **RESULTS II Results** switch to select one of the following number of consecutive frame errors: 1 to 5. (The number of errors is applied with the SONET FRAME selection of the front panel error **INSERT** switch.)

2.53.3 SPE POINTER — Synchronous Payload Envelope Pointer Control



The SONET TX-SPE POINTER auxiliary function manipulates the synchronous payload envelope (SPE) payload pointer. This auxiliary function only appears with the installed 310-13T or 310-14T option. The STS payload pointer cannot be manipulated in SONET THRU mode.

Inc/dec — Press the **RESULTS I Results** switch to increment or decrement the payload pointer value from 0 to 782. The value is reset to 522 when changing SONET payload related configurations. The displayed value is not saved in NOVRAM. The pointer value cannot be incremented/decremented from 0 to 782 or from 782 to 0.

If the following messages appear, the payload pointer cannot be manipulated.

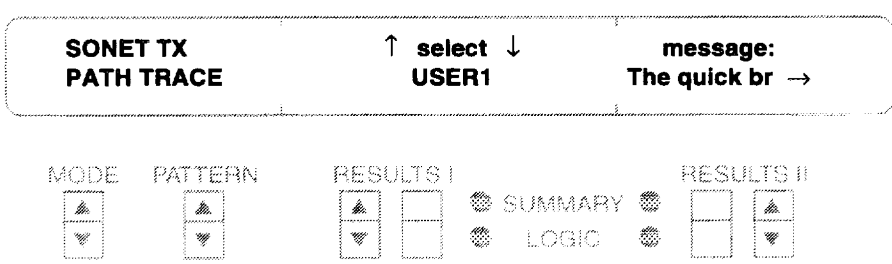
(thru mode) — The T-BERD 310 is in SONET THRU mode.

(ais) — The T-BERD 310 is inserting a Line AIS or Path AIS alarm.

(lop) — The T-BERD 310 is inserting a Path LOP alarm.

+2 ndf -2 — Press the **RESULTS II Results** switch to cause the NDF to increment or decrement the payload pointer by ±2 bytes. Changing the NDF changes the payload pointer value in the RESULTS I window. It also disrupts the inserted payload data by either inserting extra zero bytes or by removing data bytes.

2.53.4 PATH TRACE — Path Trace Message Insertion Control



The SONET TX-PATH TRACE auxiliary function enables one of three default or user-defined messages to be transmitted over the path trace byte (J1) of the inserted STS-1 signal. The path trace message is a 64-byte ASCII message which includes spaces, null characters, and CR/LF line terminating characters. The default message strings are 64-bytes long. This auxiliary function is valid to insert the message with the installed 310-13T or 310-14T option. The 310-13R/T pair or 310-14R/T pair option allows for full drop and insert path trace capabilities.

Select — Press the **RESULTS I Results** switch to select one of the following default messages to transmit:

> **USER1** — The quick brown fox jumps over the lazy dog 1234567890 !@#$%&*
>
> **USER2** — Telecommunications Techniques Corporation... Expect Excellence
>
> **USER3** — T-BERD 310: Communications Analyzer for SONET, DS3, DS1, & DS0

The messages can be changed through the T-BERD 310 remote control function.

Message — The display acts as a window over the full message. If the message is longer than 12 characters, the first 11 characters and a right arrow (→) appear in the window. The right arrow indicates additional characters exist to the right of the window. Press the **RESULTS II Results** switch down arrow to move the window to the right; the message moves to the left. When the message moves to the left, a left arrow (←) also appears indicating additional characters exist to the left of the window. Press the **RESULTS II Results** switch up arrow to move the window to the left; the message moves to the right. When the window reaches the end of the message, the last 11 characters and a left arrow (←) appear in the window.

2.53.5 ORDERWIRE — Orderwire Channel Control

SONET TX	**↑ select ↓**
ORDERWIRE	**LINE**

The SONET TX-ORDERWIRE auxiliary function controls the drop and insert capabilities for the orderwire channel. The orderwire channel is accessed through the HANDSET connector on the 310-13T or 310-14T option. This auxiliary function only appears with the installed 310-13T or 310-14T option. The 310-13R/T pair or 310-14R/T pair option allows for full orderwire drop and insert capabilities.

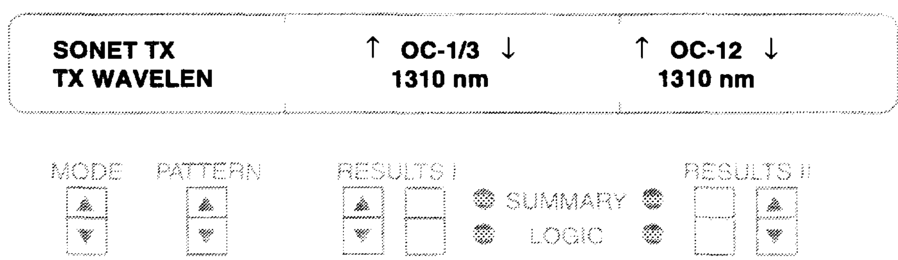
Select — Press the **RESULTS I Results** switch to select either the Line or Section orderwire channel to drop and insert the orderwire channel through the HANDSET connector.

LINE — Selects the Line orderwire channel. A quiet tone is transmitted on the Section orderwire channel.

SECTION — Selects the Section orderwire channel. A quiet tone is transmitted on the Line orderwire channel.

NONE — The orderwire drop and insert function is disabled. A quiet tone is transmitted over both channels.

2.53.6 TX WAVELEN — Dual Wavelength Transmitter Control



The SONET TX-TX WAVELEN auxiliary function selects the wavelength for the selected data rate for the 310-12 DUAL or 310-14T DUAL option.

OC-1/3 — Press the **RESULTS I Results** switch to select the wavelength (1310 or 1550 nm) for the 310-14T DUAL option.

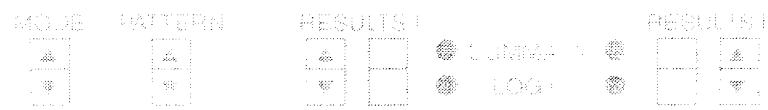
OC-12 — Press the **RESULTS II Results** switch to select the wavelength (1310 or 1550 nm) for the 310-12 DUAL option.

2.54 JITTER — DS3 JITTER AUXILIARY GROUP

The following 310-10 DS3 Jitter Option auxiliary functions only appear when the option is installed. The auxiliary functions establish jitter filter bandpass, jitter scale, and jitter threshold conditions to measure jitter.

2.54.1 JIT FILTER — Jitter Bandpass Filter Select

JITTER	**↑ select ↓**
JIT FILTER	**AUTO**



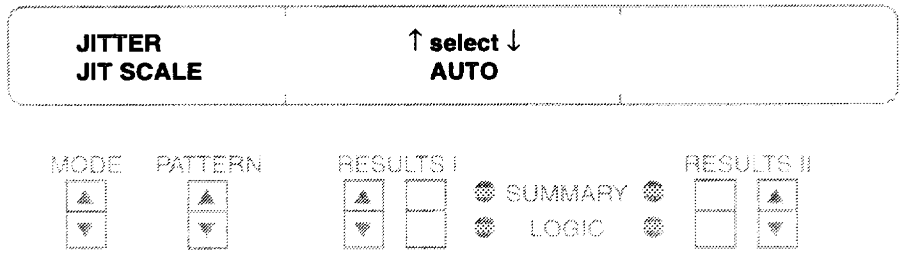
The JITTER-JIT FILTER auxiliary function selects one of three jitter bandpass filter configurations to measure the jitter frequency. Press the **RESULTS I Results** switch to select one of the following filters:

WIDEBAND — Selects a wideband filter (10 Hz to 400 kHz). The HB JITTER and MAX HB JIT results are not available with this selection.

HIGHBAND — Selects a highband filter (30 kHz to 400 kHz). The WB JITTER and MAX WB JIT results are not available with this selection.

AUTO — Automatically sequences between the wideband and highband filters when measuring jitter. The JITTER OUTPUT jack is disabled with this selection.

2.54.2 JIT SCALE — Jitter Amplitude Scale Select



The JITTER-JIT SCALE auxiliary function selects one of four jitter amplitude scales to measure the jitter amplitude. Press the **RESULTS I Results** switch to select one of the following scales:

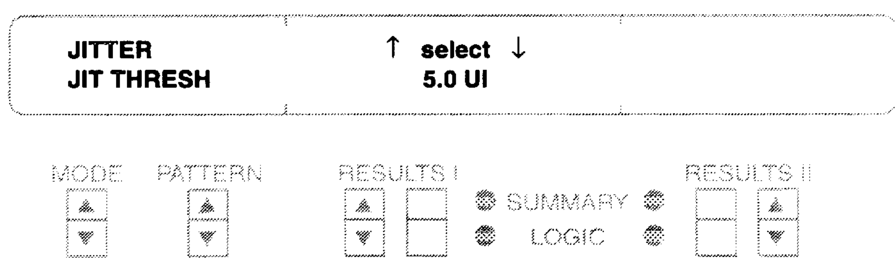
2 UI P-P — Selects the scale from 0 to 2.000 UI peak-to-peak.

5 UI P-P — Selects the scale from 0 to 5.00 UI peak-to-peak.

20 UI P-P — Selects the scale from 0 to 20.00 UI peak-to-peak.

AUTO — Automatically sets the scale to the measured amplitude. The JITTER OUTPUT jack is disabled with this selection.

2.54.3 JIT THRESH — DS3 Jitter Threshold Select



The JITTER-JIT THRESH auxiliary function sets the jitter threshold for the HB JIT or WB JIT test results. When the threshold is exceeded, the test result appears in the SUMMARY category.

Select — Press the **RESULTS I Results** switch to select the desired jitter threshold as follows:

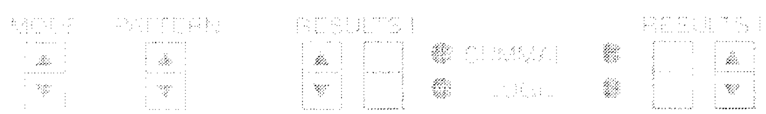
0.2 to 1.0 UI in 0.2 UI steps.
1.0 to 5.0 UI in 1.0 UI steps.
5.0 to 20.0 UI in 5.0 UI steps.

2.55 ATM RX — ATM RECEIVE AUXILIARY GROUP

The following auxiliary functions configure the T-BERD 310 to accept and analyze the ATM network interface, cell profile, primary test cell, cell bandwidth, and cell peak bandwidth and duration. The ATM RX group only appears when the OC-3c ATM Option is installed.

2.55.1 NETWORK I/F — Received ATM Network Interface Select

ATM RX	**↑ select ↓**	**↑ scramble ↓**
NETWORK I/F	**NNI**	**ON**



The ATM RX-NETWORK I/F auxiliary function selects the ATM network interface to be received and analyzed. It also controls the 43-bit cell descrambler.

Select — Press the **RESULTS I Results** switch to select one of the following ATM network interfaces:

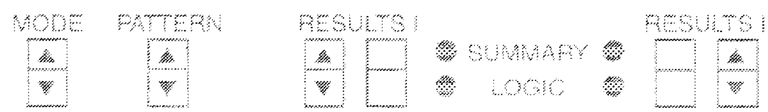
> **UNI** — Configures the ATM receiver to detect the user network interface (UNI) cell format.
>
> **NNI** — Configures the ATM receiver to detect the network node interface or network-to-network interface cell format.

Scramble — Press the **RESULTS II Results** switch to control the 43-bit cell payload descrambler:

> **ON** — Enables the 43-bit cell payload descrambler.
>
> **OFF** — Disables the 43-bit cell payload descrambler.

2.55.2 TEST MASK — Received ATM Cell Test Mask Control

ATM RX	**↑ select ↓**	**↑ results ↓**
TEST MASK	**TX TEST**	**NORMAL**



The ATM RX-TEST MASK auxiliary function selects the cell format to look for in the received signal.

Select — Press the **RESULTS I Results** switch to select one of the following ATM test masks:

TX TEST — Configure the receiver to look for the VPI/VCI of the transmitted test cell. Select NORMAL results accumulation to monitor normal ATM results. Select DLAY VAR to calculate an estimated cell delay variation.

RX PROFILE n — Configure the receiver to look for the received ATM cells that match a stored header profile.

SRCH MASK — Configure the receiver to perform results accumulation on an address saved during Search or Preview mode.

NOTE: When an active address is found, the address is displayed in the Results II window. If an address matching the AIS, RDI or TTC Search criteria is found, or the next address is found in Preview, the address is displayed in the Results II window. If the **Results II** switch is pressed UP, the next active address is located. If the **Results II** switch is pressed DOWN, the address is saved in the SRCH MASK profile. The SRCH MASK can then be used to perform full results analysis.

AIS SEARCH — Configure the receiver to look for OAM AIS cells.

RDI SEARCH — Configure the receiver to look for OAM RDI cells. The displayed address indicates the first found VPI/VCI address.

TTC SEARCH — Configure the receiver to look for OAM TTC cells.

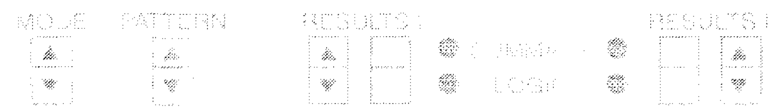
PREVIEW — Configure the receiver to preview the entire OC-3C signal. (View the incoming addresses in the Preview auxiliary function.)

NOTE: During Search or Preview modes, full results analysis is not supported.

VPI/VCI — Press the **RESULTS II Results** switch to change the VPI/VCI address to manually search for the next selected cell format. This selection appears when the AIS, RDI, or TTC search mode is selected.

2.55.3 PROFILE Pn — Received ATM Cell Test Profile Control

ATM RX	**↔GFC**	**VPI**	**VCI**	**PT**	**CL**	**↑↓**
PROFILE P1	**1**	**05**	**0F3A**	**3**	**1**	



The ATM RX-PROFILE Pn auxiliary function configures the ATM receiver to accept up to four specific test cell profiles (n = 1 to 4). This enables the ATM cell header fields — GFC, VPI, VCI, PTI, and CLP — to be preprogrammed four different ways with any value. Press the **PATTERN** switch to select each test profile, P1 to P4.

↔ — Press the **RESULTS I Results** switch to move the cursor from left to right across the digits of each field. Press the up arrow to move the cursor to the right. Conversely, press the down arrow to move left.

↑↓ — Press the **RESULTS II Results** switch to change the value of the digit at the cursor. The ATM cell header fields can be set to the following values:

GFC — Set the hexadecimal value for the GFC field. For the UNI cell format, the range is 0 to F or X. For the NNI cell format, the value is appended to the VPI field and a dash (-) appears. Select X when you do not care what the value is.

NOTE: Delay variation measurements can not be performed if any part of the GFC address is "X" (*don't care*).

VPI — Set the hexadecimal value for the VPI field. For the UNI cell format the range is 00 to FF or XX (256 virtual paths). For the NNI cell format, the value is appended with the GFC field and the range is 000 to FFF or XXX (4096 virtual paths). Select X when you do not care what the value is.

NOTE: Delay variation measurements can not be performed if any part of the VPI address is "X" (don't care).

VCI — Set the hexadecimal value for the VCI field. The range is 0000 to FFFF or XXXX (65,536 virtual channels for each VPI). Select X when you do not care what the value is.

NOTE: Delay variation measurements can not be performed if any part of the VCI address is "X" (don't care).

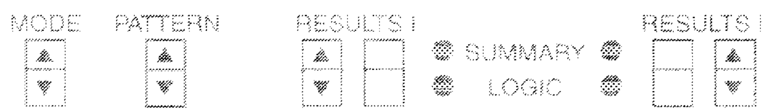
PT — Set the PTI value. The range is 0 to 7. The PTI value is defined as follows:

0	User Data Cell, congestion not experienced, SDU-type.
1	User Data Cell, congestion not experienced, SDU-type.
2	User Data Cell, congestion experienced, SDU-type.
3	User Data Cell, congestion experienced, SDU-type.
4	Segment OAM F5 flow cell (for VC loopbacks and alarms).
5	End-to-end OAM F5 flow cell (for VC loopbacks and alarms).
6	Reserved for future traffic control and remote monitoring functions.
7	Reserved for future functions.
X	Don't care what the value is.

CL — Set the CLP value. The range is 0, 1, or X. 1 allows the cell to be dropped. 0 prevents the cell from being dropped. Select X when you do not care what the value is. ATM switches can change the CLP value when congested, or if customer traffic exceeds contracted rates.

2.55.4 PREVIEW — Received ATM Cell Test Profile Preview Select

ATM RX	↑↓	**VPI**	**VCI ↔**	**%BW**	**TYPE**
PREVIEW		**00**	**0000**	**00**	**ais**



The ATM RX-PREVIEW auxiliary function enables the test instrument to detect in-use VPI/VCI addresses and display approximate bandwidth usage, and indicate traffic types used by the address being analyzed.

↔ — Press the **RESULTS I Results** switch up arrow to locate the next active cell in the next numerically greater VP address. Press the down arrow to locate the next numerically lower VP active cell. Conversely, press the down arrow to move left.

↑↓ — Press the **RESULTS II Results** switch up to locate the next numerically greater VC if it exists in the same VC. Press the switch down to locate the next numerically lower VC if it exists in the same VC.

The following test results indicate the initial status of the VPI/VCI address being previewed:

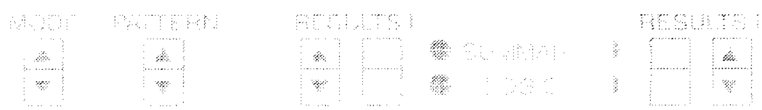
NOTE: Unless the TEST MASK function is set to PREVIEW, the PREVIEW auxiliary function will display N/A (not applicable).

BW — Measures the bandwidth of the selected profile. The range is 0.0% to 100.0%. BW results are restarted when the cell is located.

TYPE — Indicates the traffic type of the selected profile. Traffic indicators use ais, rdi, live or test to indicate that the incoming cells are alarms (ais, rdi), test traffic (ttc), or user traffic (live).

2.55.5 BW PERIOD — Received ATM Cell Test Profile Bandwidth Select

ATM RX	**↑ select ↓**
BW PERIOD	**0.1 sec**



The ATM RX-BW PERIOD auxiliary function selects the period for burst bandwidth measurements being taken.

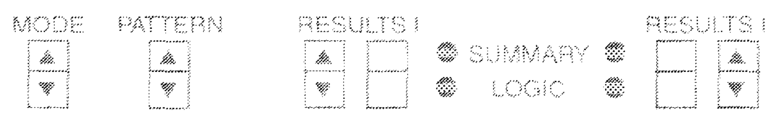
Select — Press the **RESULTS I Results** switch to select period to measure the bandwidth from 0.1 seconds to 9.9 seconds in 0.1 second steps.

2.56 ATM TX — ATM TRANSMIT AUXILIARY GROUP

These auxiliary functions select the ATM network interface, cell profile, primary test cell, cell bandwidth, cell peak bandwidth and duration. The ATM TX group only appears when the OC-3c ATM Option is installed.

2.56.1 NETWORK I/F — Transmitted ATM Network Interface Select

ATM TX	**↑ select ↓**	**↑ scramble ↓**
NETWORK I/F	**NNI**	**ON**



The ATM TX-NETWORK I/F auxiliary function selects the ATM network interface to be tested. It also controls the 43-bit cell scrambler.

Select — Press the **RESULTS I Results** switch to select one of the following ATM network interfaces:

UNI — Configures the ATM transmitter to send the user network interface (UNI) cell format.

NNI — Configures the ATM transmitter to send the network node interface or network-to-network interface cell format.

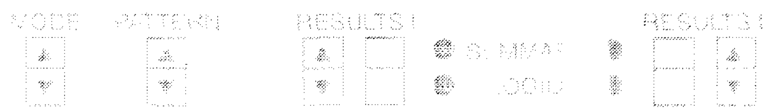
Scramble — Press the **RESULTS II Results** switch to control the 43-bit cell payload scrambler:

ON — Enables the 43-bit cell payload scrambler.

OFF — Disables the 43-bit cell payload scrambler.

2.56.2 PROFILE Pn — Transmitted ATM Cell Test Profile Control

```
ATM TX          ↔ GFC  VPI  VCI  PT  CL ↑↓
PROFILE P1        1    05   1015  3   1
```



The ATM TX-PROFILE Pn auxiliary function configures the ATM transmitter to transmit up to four specific test cell profiles (n = 1 to 4). This enables the ATM cell header fields — GFC, VPI, VCI, PTI, and CLP — to be preprogrammed four different ways with any value. The test profiles are selected and transmitted with the ATM TX-TEST PROFILE auxiliary function. Press the **PATTERN** switch to select each test profile, P1 to P4.

↔ — Press the **RESULTS I Results** switch to move the cursor from left to right across the digits of each field. Press the up arrow to move the cursor to the right. Conversely, press the down arrow to move left.

↑↓ — Press the **RESULTS II Results** switch to change the value of the digit at the cursor. The ATM cell header fields can be set to the following values:

GFC — Set the hexadecimal value for the GFC field. For the UNI cell format, the range is 0 to F. For the NNI cell format, the value is appended to the VPI field and a dash (-) appears.

VPI — Set the hexadecimal value for the VPI field. For the UNI cell format the range is 00 to FF (256 virtual paths). For the NNI cell format, the value is appended with the GFC field and the range is 000 to FFF (4096 virtual paths).

VCI — Set the hexadecimal value for the VCI field. The range is 0000 to FFFF (65,536 virtual channels for each VPI).

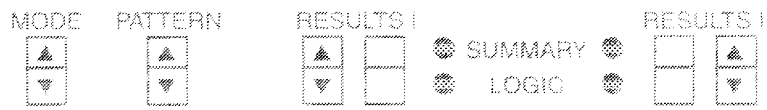
PT — Set the PTI value. The range is 0 to 7. The PTI value is defined as follows:

0	User Data Cell, congestion not experienced, SDU-type.
1	User Data Cell, congestion not experienced, SDU-type.
2	User Data Cell, congestion experienced, SDU-type.
3	User Data Cell, congestion experienced, SDU-type.
4	Segment OAM F5 flow cell (for VC loopbacks and alarms).
5	End-to-end OAM F5 flow cell (for VC loopbacks and alarms).
6	Reserved for future traffic control and remote monitoring functions.
7	Reserved for future functions.

CL — Set the CLP value. The range is 0 or 1. 1 allows the cell to be dropped. 0 prevents the cell from being dropped. ATM switches can change the CLP value when it detects congestion.

2.56.3 TEST PROFILE — Transmitted ATM Cell Test Profile Select

ATM TX	**↑ select ↓**	**backgrnd**
TEST PROFILE	**P1**	**(P2 P3 P4)**



The ATM TX-TEST PROFILE auxiliary function selects the test profile to be transmitted as the primary test channel. The test profiles are created with the ATM TX-PROFILE Pn auxiliary function.

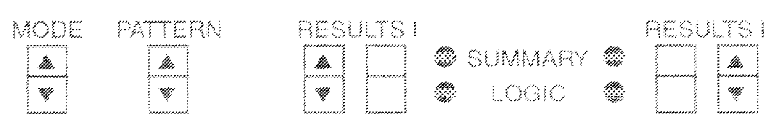
Select — Press the **RESULTS I Results** switch to select one of the following test profiles as the primary test channel:

P1 — Transmit test cell profile 1.
P2 — Transmit test cell profile 2.
P3 — Transmit test cell profile 3.
P4 — Transmit test cell profile 4.

Backgrnd — Indicates which test profiles are used as background traffic. In the previous example, P2, P3, and P4 are the background profiles and P1 is the primary test profile. The three test profiles not selected are used as the background channels. If a profile has not been defined, the default header is an idle cell.

2.56.4 CELL BANDWDTH — Transmitted ATM Cell Test Profile Bandwidth Select

ATM TX	**↑ test ↓**	**↑ backgrnd ↓**
CELL BANDWDTH	**2%**	**98%**



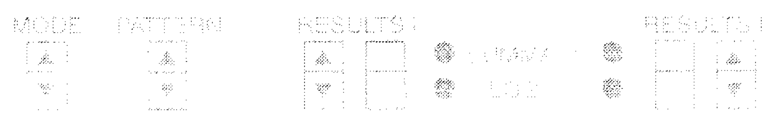
The ATM TX-CELL BANDWDTH auxiliary function sets the primary and background test profile and idle code bandwidth. The sum of the test, background, and idle cells equals the total bandwidth. For example, if the primary profile is set to 50% and the background profile is set to 30%, then the idle signal bandwidth automatically sets to 20%. The minimum idle bandwidth is 1%.

Test — Press the **RESULTS I Results** switch to select the primary test profile bandwidth from 0% to 99% in 1.0% steps.

Backgrnd — Press the **RESULTS II Results** switch to select the background test profile bandwidth from 0% to 99% in 1% steps.

2.56.5 PEAK BANDWDTH — Transmitted ATM Cell Test Profile Peak Bandwidth Select

ATM TX	**↑ select ↓**
PEAK BANDWDTH	**28%**

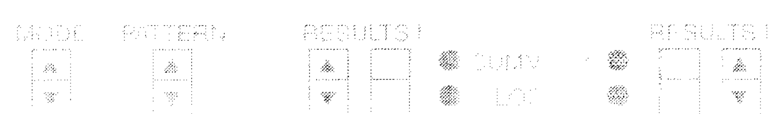


The ATM TX-PEAK BANDWDTH auxiliary function sets the percentage of burstiness for the primary test profile peak bandwidth. The burst bandwidth is taken from the available idle signal bandwidth first then the background cell bandwidth.

Select — Press the **RESULTS I Results** switch to select the burstiness from 0% to 99% in 1% steps.

2.56.6 PEAK DURATION — Transmitted ATM Cell Test Profile Peak Duration Select

ATM TX	**↑ select ↓**	**↑ send stop ↓**
PEAK DURATON	**0.1 sec**	**NOT SENDING**



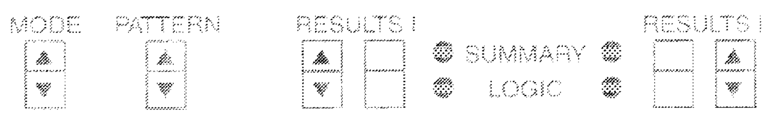
The ATM TX-PEAK DURATION auxiliary function selects the peak pulse duration for the peak bandwidth and transmit the burst.

Select — Press the **RESULTS I Results** switch to select duration of the burst from 0.1 to 9.9 seconds in 0.1 second steps.

Send/Stop — Press the **RESULTS II Results** switch to send (up arrow) or stop (down arrow) the burst. *NOT SENDING* appears when the burst is not being transmitted. *SENDING* appears when the burst is being transmitted.

2.56.7 HEC ERR RATE — Transmitted ATM Header Error Control Error Rate

ATM TX	**↑ select ↓**	**↑ burst ↓**
HEC ERR RATE	**1E-2**	**6 CELLS**



The ATM TX-HEC ERR RATE auxiliary function selects the error rate and the number of consecutive cells affected by the inserted errors. Refer to the ATM TX-HEC ERR INS auxiliary function to set the error type and control the transmitted errors.

Select — Press the **RESULTS I Results** switch to select the HEC error rate as follows:

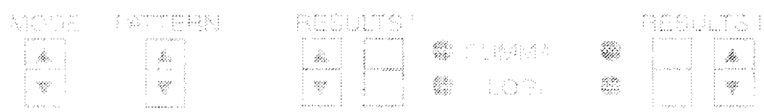
1E-2, 1E-3 ... 1E-8, 1E-9 — Inserts the selected error rate.

CONTINUOUS — Inserts HEC errors on all cells.

Burst — Press the **RESULTS II Results** switch to select the number of consecutive cells to be errored from 1 CELL to 10 CELLS.

2.56.8 HEC ERR INS — Transmitted ATM Header Error Control Error Insert Control

ATM TX	**↑ select ↓**	**↑ burst rate ↓**
HEC ERR INS	**CORRECTABLE**	**OFF**



The ATM TX-HEC ERR INS auxiliary function selects the type of error inserted and controls the transmission of the errors. Refer to the ATM TX-HEC ERR RATE auxiliary function to set the error rate and the number of cells to be affected.

Select — Press the **RESULTS I Results** switch to select the type of error transmitted as follows:

CORRECTABLE — Transmits a correctable HEC error which consists of a single error in the header.

NON-CORRECTABLE — Transmits a non-correctable HEC error which consists of two bit errors in the header.

Burst Rate/Stop — Press the **RESULTS II Results** switch to select the error rate to be transmitted as follows:

OFF — Disables the HEC error insertion.

BURST x — Inserts errors in the indicated number of cells (x = 1 to 10). CONTINUOUS replaces BURST x when selected from the ATM TX-HEC ERR RATE auxiliary function.

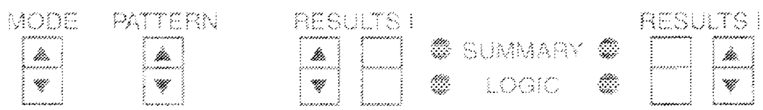
RATE 1E-x — Inserts the indicated error rate (x = 2 to 9) selected from the ATM TX-HEC ERR RATE auxiliary function. If a continuous rate is selected, RATE CONTIN appears.

(n/a) — HEC errors are not applicable in the current test instrument configuration.

When the errors are being inserted, the RESULTS II window changes from *burst rate* to *stop*. Pressing the **RESULTS II Results** switch with *stop* displayed disables the error insertion function.

2.56.9 OAM INSERT — Transmitted ATM OAM Insert Control

ATM TX	**↑ select ↓**	**↑ send stop ↓**
OAM INSERT	**AIS**	**NOT SENDING**



The ATM TX-OAM INSERT auxiliary function selects and inserts operation, administration and maintenance (OAM) fault management signals. Refer to the ATM TX-OAM FLOW auxiliary function to set the cell format and function.

Select — Press the **RESULTS I Results** switch to select one of the following signals:

AIS — Inserts the ATM alarm indication signal alarm cell for the primary transmit address.

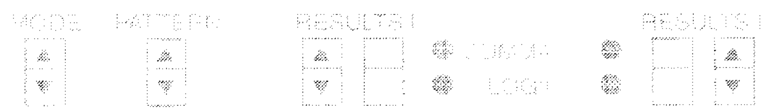
RDI — Inserts the ATM remote defect indication alarm cell for the primary transmit address.

LOOPBACK — Inserts ATM loopback cells into the primary transmit channel. ATM loopback cells are not loop codes that affect the physical network connectivity. They are routed by the proper ATM switch to be transmitted back to the transmit location; without affecting the other ATM traffic.

Send/Stop — Press the **RESULTS II Results** switch to send or stop the selected alarm or loopback cell. *NOT SENDING* appears when the alarm or loopback is not being transmitted. *SENDING* appears when the alarm or loopback is being transmitted. When the AIS and RDI cells are being transmitted, the T-BERD 310 automatically stops transmitting all other test cells on the primary channel. This is required to fully emulate the AIS and RDI operation. When the AIS and RDI cell transmission is stopped, the test cells are once again transmitted at the proper rates.

2.56.10 OAM FLOW — Transmitted ATM OAM Flow Control

ATM TX	**↑ select ↓**	**↑ CONNECT ↓**
OAM FLOW	**VP(F4)**	**SEGMENT**



The ATM TX-OAM FLOW auxiliary function selects OAM format and signal function for the alarm or loopback selected from the ATM TX-OAM INSERT auxiliary function.

Select — Press the **RESULTS I Results** switch to select one of the following OAM signal formats:

VP(F4) — Formats the OAM signal for a virtual path connection (VPC).

VC(F5) — Formats the OAM signal for a virtual channel connection (VCC).

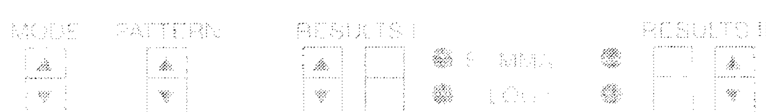
Connect — Press the **RESULTS II Results** switch to select one of the following OAM signal functions:

SEGMENT — Establishes a link with the next network element in the path.

END TO END — Establishes a link with the last network element in the path.

2.56.11 CORRELATION — Transmitted ATM Correlation Tag Control

ATM TX	**↔ left - right**	**up - down ↑↓**
CORRELATION	**0000**	



The ATM TX-CORRELATION auxiliary function configures the transmitted correlation tag in the test cell. This allows cells from multiple T-BERD 310 units to be differentiated from one another. The correlation tag is two bytes long. The entered value is transmitted from left to right.

↔ — Press the **RESULTS I Results** switch to move the cursor from left to right across the digits of the field. Press the up arrow to move the cursor to the right. Conversely, press the down arrow to move left.

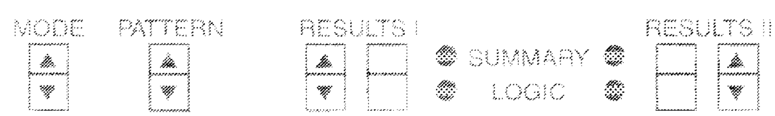
↑↓ — Press the **RESULTS II Results** switch to change the value of the digit at the cursor. The range is 0 to F for each digit; each digit represents four bits within the 2 byte tag.

2.57 OPTICAL TEST — OPTICAL TEST AUXILIARY GROUP

The following 310-16 Optical Media Test Option auxiliary functions only appear when the option is installed. The auxiliary functions configure the stable source for return loss measurements, setting the return loss measurement type, and power meter wavelength.

2.57.1 STABLE SOURCE — Optical Stable Source Select

OPTICAL TEST	**↑ select ↓**
STABLE SOURCE	**OFF**



The OPTICAL TEST-STABLE SOURCE auxiliary function controls the wavelength of the RETURN LOSS/SOURCE connector on the Optical Media Test Option.

Select — Press the **RESULTS I Results** switch to select one of the following uses for the RETURN LOSS/SOURCE connector:

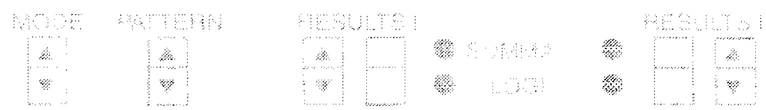
OFF — Disables the RETURN LOSS/SOURCE connector.

1310 nm — Sets the laser source wavelength for 1310 nm.

1550 nm — Sets the laser source wavelength for 1550 nm.

2.57.2 RETURN LOSS — Return Loss Measurement Type

OPTICAL TEST	**↑ select ↓**
RETURN LOSS	**ABSOLUTE**



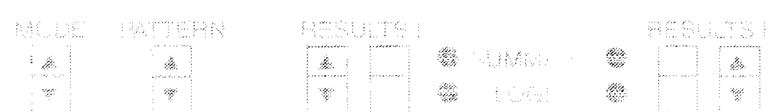
The OPTICAL TEST-RETURN LOSS auxiliary function sets the type of return loss measurement being performed when the OPTICAL TEST-STABLE SOURCE auxiliary function is enabled.

Select — Press the **RESULTS I Results** switch to select one of the following return loss types:

ABSOLUTE — Configures the return loss measurement to measure all return loss starting with the RETURN LOSS/SOURCE connector.

REFERENCED — Configures the return loss measurement to measure all return loss except from the RETURN LOSS/SOURCE connector. Selecting REFERENCED displays the **sto/clr** window.

OPTICAL TEST	**↑ select ↓**	**↑ sto clr ↓**
RETURN LOSS	**REFERENCED**	**NO REFERENCE**



Sto/clr — Press the **RESULTS II Results** switch up arrow to display one of the following conditions:

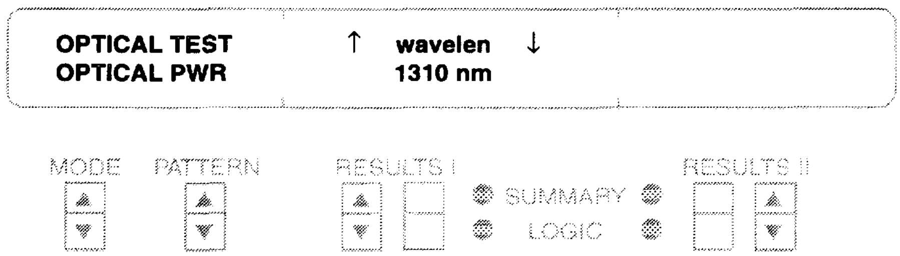
NO REFERENCE — No reference is stored. The RETURN LOSS/SOURCE connector return loss has not been measured. When displayed, press the **RESULTS II Results** switch up arrow to store the reference.

REF STORED — A reference is stored. The RETURN LOSS/SOURCE connector return loss has been measured. Before pressing the **RESULTS II Results** switch up arrow, wrap the fiber cable in a tight loop around a pencil 5 to 10 times to create a mandrel wrap. The mandrel wrap cancels out the fiber and allows the T-BERD 310 to measure the return loss of the RETURN LOSS/SOURCE connector. Unwrap the fiber to measure the return loss of the cable. The stored value is canceled out of the return loss measurement. This procedure allows a more accurate measurement to be made by eliminating the dominant reflection from the connector.

(source off) — Indicates the stable source is off. Enable the stable source with the OPTICAL TEST-STABLE SOURCE auxiliary function.

Press the **RESULTS II Results** switch down arrow to clear the stored reference. The RETURN LOSS test result appears in the SIGNAL category.

2.57.3 OPTICAL PWR — Optical Power Measurement Control



The OPTICAL TEST-OPTICAL PWR auxiliary function controls the wavelength for the POWER METER connector. The optical power measurement result appears in the SIGNAL category.

Wavelen — Press the **RESULTS I Results** switch to select one of the following wavelengths:

1310 nm — Enables the optical power detector and optical power measurement test result for 1310 nm.

1550 nm — Enables the optical power detector and optical power measurement test result for 1550 nm.

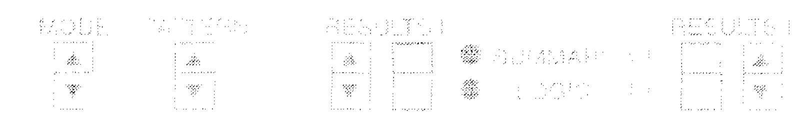
DS1/DS0 ANALYZER OPTION AUXILIARY FUNCTIONS

2.58 INTRODUCTION

The following auxiliary functions configure the 310-1 DS1/DS0 Analyzer Option to transmit a user-programmable test pattern, transmit standard and programmable loop codes, transmit and report on ESF PRMs, control the DATAPORT connector signal, customize test result printouts, measure DS1 timing slips, scan and report on specified events, and test FT1 channels.

2.59 USER1 — USER-PROGRAMMABLE TEST PATTERN

AUX	**↑ forward rev ↓**	**↑ toggle end ↓**
USER1	**10000**	



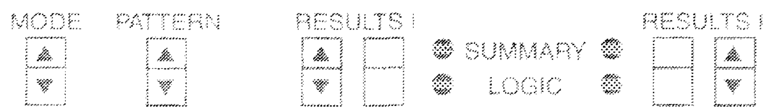
The AUX-USER1 auxiliary function programs a 3- to 24-bit user-programmable test pattern. This allows the DS1/DS0 Analyzer Option to transmit specific patterns to test circuit sensitivity. The pattern is transmitted when the USER1 pattern is selected with the **PATTERN** switch. The pattern is transmitted in left-to-right order. A test restart of the DS1/DS0 Analyzer Option occurs when the pattern is saved while the USER1 pattern is transmitted. The test pattern is programmed with the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to 24 bits. Press the down arrow to move the cursor in reverse from right to left.

RESULTS II Results switch — Press the up arrow to toggle the highlighted bit between "1" and "0". Press the down arrow to end or save the bit pattern from the position of the cursor to the first bit on the left. Any bits to the right of the cursor are deleted when the down arrow is pressed. The pattern is saved when *end* is selected.

2.60 PGM LPUP — PROGRAMMABLE LOOP-UP CODE

AUX **↑ forward rev ↓** **↑ toggle end ↓**
PGM LPUP **10000**



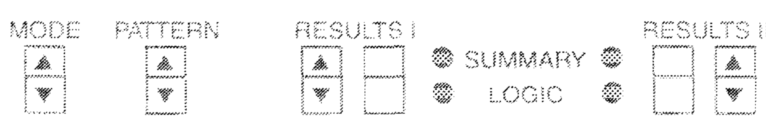
The AUX-PGM LPUP auxiliary function programs a 3- to 8-bit user-defined loop-up code. This allows the DS1/DS0 Analyzer Option to transmit nonstandard loop codes. The programmed loop-up code is transmitted when the **LOOP UP** switch is pressed and the AUX-LP CODE auxiliary function is set to PROGRAMMABLE. The loop code is transmitted in left-to-right order. The loop-up code is programmed with the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to eight bits. Press the down arrow to move the cursor in reverse from right to left.

RESULTS II Results switch — Press the up arrow to toggle the highlighted bit from 0 to 1. Press the down arrow to save and end the displayed bit pattern up to the position of the cursor. Any bits to the right of the cursor are deleted and the cursor returns to the left most bit position. The loop code is only saved when *end* is selected.

2.61 PGM LPDN — PROGRAMMABLE LOOP-DOWN CODE

AUX **↑ forward rev ↓** **↑ toggle end ↓**
PGM LPDN **100**



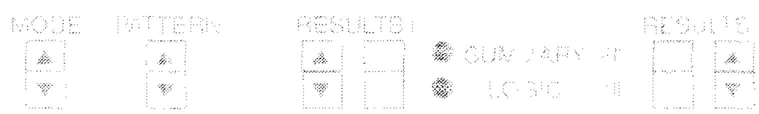
The AUX-PGM LPDN auxiliary function programs a 3- to 8-bit user-defined loop-down code. This allows the DS1/DS0 Analyzer Option to transmit nonstandard loop codes. The programmed loop-down code is transmitted when the **LOOP DOWN** switch is pressed and AUX-LP CODE auxiliary function must be set to PROGRAMMABLE. The loop code is transmitted in left-to-right order. The loop-down code is programmed with the following switches:

RESULTS I Results switch — Press the up arrow to move the cursor forward from left to right. Moving the cursor forward past the last displayed bit automatically inserts a "0" in each new position up to eight bits. Press the down arrow to move the cursor in reverse from right to left.

RESULTS II Results switch — Press the up arrow to toggle the highlighted bit from 0 to 1. Press the down arrow to save and end the displayed bit pattern up to the position of the cursor. Any bits to the right of the cursor are deleted and the cursor returns to the left most bit position. The loop code is only saved when *end* is selected.

2.62 LP CODE — LOOP CODE SELECT

AUX	**↑ select ↓**
LP CODE	**CSU**



The AUX-LP CODE auxiliary function selects the in-band (in-band or ESF out-of-band) T1 loop code transmitted when the **LOOP CODE** switches are pressed. Transmitting a loop code restarts the test. The loop code bit patterns in the following descriptions are transmitted in left-to-right order. Press the **RESULTS I Results** switch to select one of the following in-band loop codes:

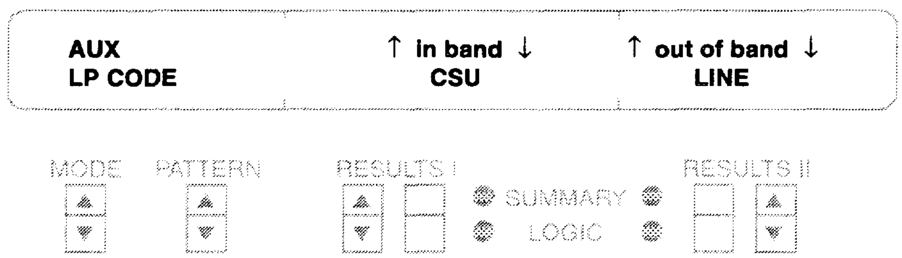
CSU — The Customer Service Unit loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible CSU. The transmitted loop-up code is 10000 and the loop-down code is 100.

PROGRAMMABLE — The 3- to 8-bit programmable loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with any nonstandard device. The loop codes are programmed through the AUX-PGM LPUP and AUX-PGM LPDN auxiliary functions.

FACILITY 2 — The 5-bit facility or network (smart jack) loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible facility interface. The transmitted loop-up code is 11000 and the loop-down code is 11100.

FACILITY 1 — The 4-bit facility or network (smart jack) loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible facility interface. The transmitted loop-up code is 1100 and the loop-down code is 1110.

When the 310-9A/B option is installed, the ESF out-of-band loop code selection appears in the RESULTS II window.



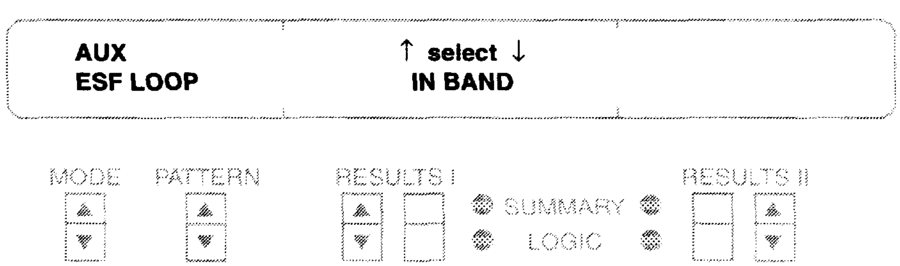
When the T1 ESF or optional T1 ESFz mode is selected, the ESF loop code type (in-band or out-of-band) is selected from the AUX-ESF LOOP auxiliary function. Press the **RESULTS I Results** switch to select one of the in-band loop codes. Press the **RESULTS II Results** switch to select one of the following ESF out-of-band loop codes:

LINE — The line loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible terminal. The transmitted loop-up code is 1111 1111 0111 0000 and the loop-down code is 1111 1111 0001 1100.

PAYLOAD — The payload loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible terminal. The transmitted loop-up code is 1111 1111 0010 1000 and the loop-down code is 1111 1111 0100 1100.

NETWORK — The network loop codes allow the DS1/DS0 Analyzer Option to establish a loopback with a compatible terminal. The transmitted loop-up code is 1111 1111 0100 1000 and the loop-down code is 1111 1111 0010 0100.

2.63 ESF LOOP — ESF LOOP CODE SELECT

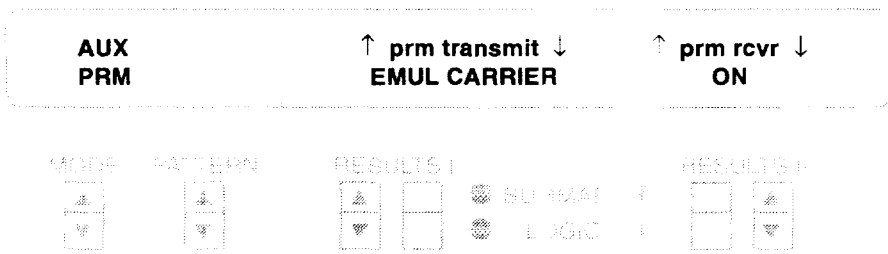


The AUX-ESF LOOP auxiliary function selects the loop code type that is transmitted through an ESF circuit when the **LOOP CODE** switches are pressed. The specific loop code is selected through the AUX-LP CODE auxiliary function. This auxiliary function only appears when the 310-9A/B option is installed. Press the **RESULTS I Results** switch to select the method of transmitting the loop code:

IN BAND — The in-band loop codes (CSU, PGM, FAC1, and FAC2) are transmitted in place of the data or test pattern.

OUT OF BAND — The out-of-band loop codes (LINE, PAYLOAD, and NETWORK) are transmitted over the ESF datalink.

2.64 PRM — ESF DATALINK PERFORMANCE REPORT MESSAGE CONTROL



The AUX-PRM auxiliary function determines how the PRM is transmitted and whether the PRM results are accumulated. The auxiliary function is only active in the ESF and optional ESFz operating modes when the 310-9A/B option is installed. Press the **RESULTS I Results** switch to select how the PRM is transmitted from the DS1/DS0 Analyzer Option.

OFF — The PRM transmit function is disabled.

EMUL CUSTOMER — Emulates the customer PRM. Selecting EMUL CUSTOMER sets the PRM C/R bit to 0.

EMUL CARRIER — Emulates the carrier PRM. Selecting EMUL CARRIER sets the PRM C/R bit to 1.

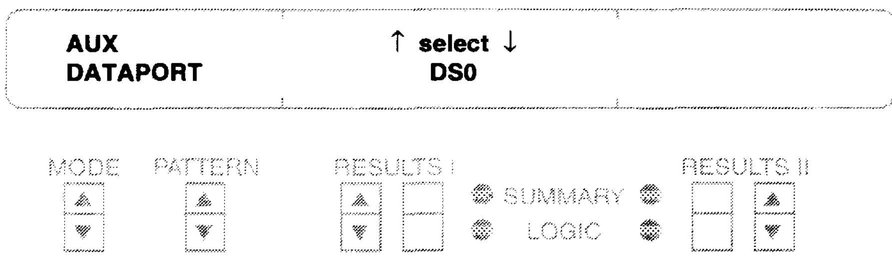
When transmitting the PRM, the SE bit is set to 1 when the DS1/DS0 Analyzer Option detects a frame loss in the received signal; SL bit is always set to 0; and the LB bit is always set to 0.

Press the **RESULTS II Results** switch to control the PRM receiver as follows:

OFF — The PRM receiver is disabled and the DS1/DS0 Analyzer Option does not report on the PRM status.

ON — The PRM receiver is enabled and the DS1/DS0 Analyzer Option reports on the PRM status in the BPV, FRAME, and TIME categories.

2.65 DATAPORT — DATAPORT CONNECTOR OUTPUT

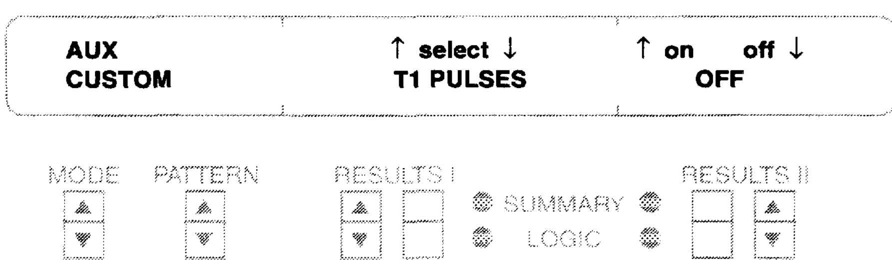


The AUX-DATAPORT auxiliary function selects the drop output (DS0 or datalink) for the side-panel DATAPORT connector. The DATAPORT is active only when frame synchronization is achieved. Press the **RESULTS I Results** switch to select one of the following outputs:

DS0 — Provides access to the 56 or 64 kb/s DS0 channel selected with the **DS0 DROP CHANNEL** switch. The DS0 data bits can be monitored through the Data Bit LEDs or analyzed with an external test set.

DATALINK — Provides access to the ESF, optional ESFz, or SLC-96 formatted datalink output when the respective operating mode is selected. External decoding is required to separate the datalink bits from the Fs bits.

2.66 CUSTOM — CUSTOMIZED PRINTOUT CONTENTS



The AUX-CUSTOM auxiliary function selects specific DS1 results and Status and Alarm LED conditions to be included in a test results printout. Select the custom test results printout from the T-BERD 310 PRINT-FORMAT auxiliary function. Press the **RESULTS** switches to select the desired printout line items:

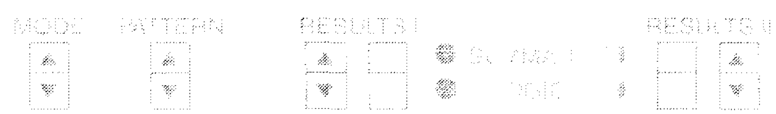
RESULTS I Category switch — Press this switch to select the desired category. The Status and Alarm LEDs and FEAC codes are selected from the SUMMARY category.

RESULTS I Results switch — Press this switch to select the results and LEDs. Refer to *DS1/DS0 Analyzer Option Test Results* for the available test results.

RESULTS II Results switch — Press the up arrow to toggle ON or the down arrow to toggle OFF the status condition.

2.67 SLIP REF — DS1 TIMING SLIP REFERENCE SOURCE

AUX	**↑ select ↓**
SLIP REF	**PRI DS3 DROP**



The AUX-SLIP REF auxiliary function selects the TIMING SLIPS result reference signal source. This auxiliary function only appears with the installed 310-9A/B option. Press the **RESULTS I Results** switch to select one of the following reference signal sources:

PRI DS3 DROP — Selects the DS1 channel that is internally dropped from the DS3 RECEIVE jack. Select the DS1 channel with the **DS3-DS1 CHANNEL DROP** switch.

SEC DS3 DROP — Selects the DS1 channel that is internally dropped from the SECONDARY DS3 RECEIVE jack on the DS1 Insert Option. Select the DS1 channel with the **DS3-DS1 CHANNEL INSERT** switch. If the **DS3-DS1 CHANNEL INSERT** switch is blank or displays three bars (— — —) depending on the selected mode, the **DS3-DS1 CHANNEL DROP** switch can select a channel for the reference signal source.

SONET DROP — Selects the DS1 channel that is dropped from the STS-1, OC-1, OC-3, or OC-12 RECEIVE connector on a SONET option. Select the SONET DS1 channel to drop by setting the front panel **CHANNEL CONTROL** switch to SONET<—> VT (for the 310-13R or 310-14R option). Do not use the **DS3-DS1 CHANNEL DROP** switch to select the DS1 channel.

DS1 RECEIVE — Selects the DS1 signal from the DS1 RECEIVE jack on the DS1/DS0 Analyzer Option.

DS1 INSERT — Selects the DS1 signal from DS1 INSERT INPUT jack on the DS1 Insert Option.

DS1 BITS CLOCK — Selects the DS1 signal from DS1 BITS CLOCK jack on the 310-13T or 310-14T option.

Select the DS1 test signal source with the **DS1 SOURCE** switch. Table 2-6 indicates the relationship between the test signal source and the reference signal source. Refer to the *T-BERD 310 User's Guide* for additional information on how to setup for a DS1 timing slip test.

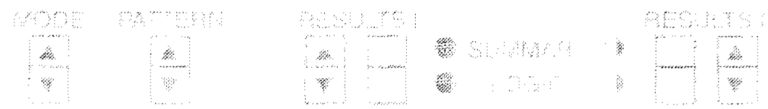
Table 2-6
DS1 Timing Slip Test and Reference Signals

		Test Signal Source DS1 SOURCE Switch		
Selection	**Reference Signal Source Connections**	**DS3 DROP**	**SONET DROP**	**EXT. INPUT**
PRI DS3 DROP	PRIMARY DS3 RECEIVE INPUT	—	X	X
SEC DS3 DROP	SECONDARY DS3 RECEIVE	X	X	X
SONET DROP	STS-1 RECEIVE	X	—	X
	OC-1/OC-3 RECEIVE	X	—	X
	OC-12 RECEIVE	X	—	X
DS1 RECEIVE	DS1 RECEIVE	X	X	—
DS1 INSERT	DS1 INSERT INPUT	X	X	X
DS1 BITS CLOCK	DS1 BITS CLOCK	X	X	X

X Valid selection.
— Same connection. The TIMING SLIP result indicates SAME REF.

2.68 SCAN TRIG — TRIGGERED DS1 SCAN MODE EVENT CRITERIA

AUX	**↑ select ↓**	**↑ on off ↓**
SCAN TRIG	**FRM ERRORS**	**OFF**



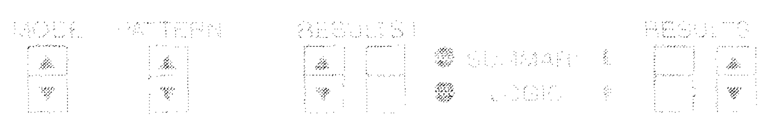
The AUX-SCAN TRIG auxiliary function selects the criterion to be scanned on the DS1 channels during a triggered DS1 scan test. When the scan mode detects a selected event, the DS1/DS0 Analyzer Option stops scanning, auto configures to the dropped signal, and performs full BER analysis. Press the **RESULTS I Results** switch to select one of the following events:

FRM ERRORS — Frame Errors
CRC ERRORS — Cyclic Redundancy Check Errors
ALL ONES — All Ones pattern
YELLOW ALARM — Yellow Alarm
TM SLIPS — Timing Slips (requires the 310-9A/B option and a reference signal source)
FRM SYNC — Frame Synchronization
FRM LOSS — Frame Loss

Press the **RESULTS II Results** switch to enable or disable the selected trigger event. If all of the events are disabled, the message *NO TRIGGER EVENTS SET* appears when SCAN TRIGGER is selected. At least one trigger event must be enabled to use the triggered DS1 scan test.

2.69 CHAN FMT — CHANNEL FORMAT SELECT

AUX	**↑ select ↓**
CHAN FMT	**FULL T1**



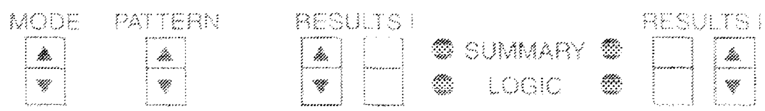
The CHAN FMT auxiliary function configures the test instrument for Fractional-T1 (FT1) testing. This auxiliary function only appears with the installed 310-9B option.

Select — Press the **RESULTS I Results** switch to select one of the following FT1 formats:

FULL T1 — Sets the test instrument to test full T1 bandwidths. All of the other operating modes can be selected.

64xN — Sets the test instrument to test contiguous or non-contiguous FT1 channels. When 64xN is selected, the RESULTS II windows displays the following selections:

AUX	**↑ select ↓**	**↑ select ↓**
CHAN FMT	**64xN**	**CONTIG**

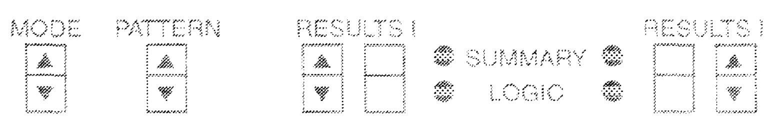


CONTIG — Sets the test instrument to test contiguous FT1 channels. When CONTIG is selected, the CONTIG auxiliary function can be selected to set the base channel and bandwidth of the FT1 channel.

N-CONTIG — Sets the test instrument to test non-contiguous FT1 channels. When N-CONTIG is selected, the N-CONTIG auxiliary function can be selected to set the non-contiguous FT1 channels.

2.70 CONTIG — FT1 CONTIGUOUS CHANNEL SELECT

AUX	**↑ start chan ↓**	**↑ length ↓**
CONTIG	**1**	**24**



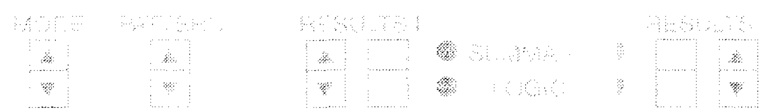
The CONTIG auxiliary function configures the test instrument for contiguous Fractional-T1 (FT1) testing. As the base channel is increased from 1 to 24, the FT1 channel bandwidth decreases from 24 to 1. This auxiliary function only appears with the installed 310-9B option.

Start chan — Press the **RESULTS I Results** switch to select the base channel, 1 to 24.

Length — Press the **RESULTS II Results** switch to select the FT1 channel bandwidth, 24 to 1.

2.71 N-CONTIG — FT1 NON-CONTIGUOUS CHANNEL SELECT

```
AUX              ↑ forward  rev ↓    ↑ toggle   end ↓
N-CONTIG 111111  111111  111111  111111
```



The N-CONTIG auxiliary function configures the test instrument for non-contiguous Fractional-T1 (FT1) testing. This auxiliary function only appears with the installed 310-9B option.

Forward/Rev — Press the **RESULTS I Results** switch up arrow to move the cursor from left to right. Press the **RESULTS I Results** switch down arrow to move the cursor from right to left.

Toggle/End — Press the **RESULTS II Results** switch up arrow to toggle the 1 to a 0 or a 0 to a 1 at the cursor location. A 1 indicates the channel is activated, and a 0 indicates the channel is disabled. Number the positions from left to right, 1 to 24. Press the **RESULTS II Results** switch down arrow to end the session and save the selected non-contiguous bandwidth.

TEST RESULTS

MAINFRAME TEST RESULTS

2.72 INTRODUCTION

The primary DS3 receiver has full Bit Error Rate Test (BERT) capabilities and supports all the DS3 results defined in the following sections. Two results can be displayed at one time in the RESULTS I and RESULTS II windows. The **RESULTS I** and **RESULTS II** switches enable the categorized results to be displayed. The **RESULTS I** and **RESULTS II SECONDARY** switches are only functional when the DS1 Insert Option is installed.

The available results depend on framing type, pattern synchronization, installed options, etc. Results that are *not available* display the message *UNAVAILABLE* in place of the result count. The results that are *not applicable* to the current mode display *N/A* in place of the result count. When the displayed count exceeds 99,999,999, a ">" (greater than sign) appears in the window. When the number rolls over, the count continues.

2.73 SUMMARY CATEGORY

The SUMMARY category automatically displays key results that are non-zero or out-of-specification. This allows quick access to the results without having to search through the other categories.

2.73.1 DS3 Summary Test Results

The following DS3 test results appear in the SUMMARY category when they begin to detect error conditions.

- BIT ERRORS (LOGIC category)
- SLIPS (LOGIC category)
- VIOLATIONS (BPV category)
- PAR ERRORS (PARITY category)
- C-BIT ERRORS (PARITY category)
- FEBE (PARITY category)
- FRM ERRORS (FRAME category)
- DS2 FRM ERR (FRAME category)
- RX FREQ (SIGNAL category)
- FEAC Messages

When all SUMMARY results are error-free, the message *ALL RESULTS OK* is displayed. When an error is detected, the appropriate test result appears in the SUMMARY category window. When more than one error is detected, press either the **RESULTS I Results** switch or **RESULTS II Results** switch to scroll through the results.

2.73.2 FEAC Message and Loop Code Summary Test Results

The Far-End Alarm and Control (FEAC) messages (Table 2-7) and loop codes (Table 2-8) appear in the SUMMARY category under the FEAC Code result. The FEAC messages are accumulated as they are detected. Only the last FEAC loop code is stored in the FEAC Code result. The results remain in the SUMMARY category until a test restart is initiated. The messages comply with the ANSI T1.107a-1990 standard and can be transmitted using the MISC-FEAC ALARMS and MISC-FEAC LOOP auxiliary functions. They are also printed as status (loop code messages) and alarm messages.

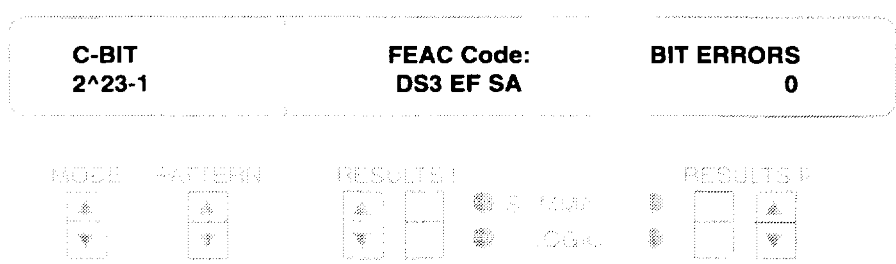


Table 2-7
Far-End Alarm and Control Messages

Message	Description
DS3 EF SA	DS3 Equipment Failure, Service Affecting (Type 1 equipment failure)
DS3 L/H	DS3 Loss-of-Signal/High Bit Error Ratio
DS3 OOF	DS3 Out-of-Frame, Loss of DS3 Frame Synchronization
DS3 AIS RX	DS3 Alarm Indication Signal Received
DS3 IDLE RX	DS3 Idle Signal Received
DS3 EF NSA	DS3 Equipment Failure, Non-Service Affecting (Type 2 equipment failure)
COMM EF NSA	Common Equipment Failure, Non-Service Affecting (Type 2 equipment failure)
MULT DS1 L/H	Multiple DS1 Loss-of-Signal/High Bit Error Ratio
DS1 EF SA	DS1 Equipment Failure, Service Affecting (Type 1 equipment failure)
SING DS1 L/H	Single DS1 Loss-of-Signal/High Bit Error Ratio
DS1 EF NSA	DS1 Equipment Failure, Non-Service Affecting (Type 2 equipment failure)

Table 2-8
FEAC Far-End Loop Code Messages

Message	Description
ALL DS1 LPDN	All DS1 Lines loop-down code
ALL DS1 LPUP	All DS1 Lines loop-up code
DS1 xx LPDN	DS1 Line No. xx loop-down code (xx = 1 to 28)
DS1 xx LPUP	DS1 Line No. xx loop-up code (xx = 1 to 28)
DS3 LN LPDN	DS3 Line loop-down code
DS3 LN LPUP	DS3 Line loop-up code

2.73.3 SONET Option Summary Test Results

The following SONET test results appear in the SUMMARY category when the T-BERD 310 has properly recognized and synchronized to a SONET signal:

- APS MSG CNT — Automatic Protection Switching Message Count
- FRM WORD ERR — Frame Word Errors
- LINE BIP ERR — Line BIP Errors
- LINE FEBE — Line Far-End Block Errors
- LINE UAS — Line Unavailable Seconds
- PATH BIP ERR — Path BIP Errors
- PATH FEBE — Path FEBE
- PATH UAS — Path Unavailable Seconds
- POINTER SIZE — SPE Pointer Size
- SECT BIP ERR — Section Bit Interleaved Parity Errors
- SON RX FREQ — SONET Receive Frequency
- VT BIP ERR — VT BIP Errors
- VT FEBE — VT FEBE
- VT UAS — VT Unavailable Seconds

2.73.4 OC-3c ATM Option Summary Test Results

When the OC-3c ATM Option is installed, the SUMMARY category automatically displays the ATM alarms when they exceed predefined conditions. The ATM Alarm test result displays current (C) and historical (H) signal status for the following conditions (nn = C, H, or HC):

- ATM AIS nn — ATM Alarm Indication Signal
- ATM RDI nn — ATM Remote Defect Indication
- OUT OF SYNC nn — Out of Synchronization
- SYNC LOSS nn — Loss of Synchronization
- SYNC FAIL nn — Synchronization Failure

2.73.5 DS3 Jitter Option Summary Test Results

When the DS3 Jitter Option is installed and the JITTER-JIT THRESH auxiliary function threshold is set, the SUMMARY category automatically displays the MAX WB JIT and MAX HB JIT test results when the threshold is exceeded.

2.74 LOGIC CATEGORY

Logic errors are based on discrepancies between the transmitted and received bit stream. The accumulation of logic errors is dependent on frame synchronization (if in a framed mode) and pattern synchronization. Logic errors are not available until initial pattern synchronization is obtained. The results are also not available when transmitting a channelized test pattern (i.e., the operating mode is set for MUXED M13 or MUXED C-BIT). During loss of frame or pattern synchronization, the accumulation of errors is halted.

2.74.1 DS3 Test Results

The DS3 LOGIC category test results are defined as follows:

BIT ERRORS
Bit Errors — The number of received pattern bits which have a value opposite that of the corresponding transmitted bit pattern since initial DS3 pattern synchronization.

BIT ERR RT
Bit Error Rate — The ratio of pattern bit errors to received pattern bits over the previous block of 10^8 bits.

AV BIT ERT
Average Bit Error Rate — The ratio of pattern bit errors to the total number of received pattern bits while DS3 pattern synchronization is present.

BIT ERR SEC
Bit Errored Seconds — The number of seconds during which one or more pattern bit errors occurred since initial DS3 pattern synchronization.

BIT %EFS
Bit, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no pattern bit errors were detected, to the total number of seconds while DS3 pattern synchronization is present.

BIT THR ES
Bit, Threshold Errored Seconds — The number of seconds during which the pattern bit error rate exceeded or equaled the user-defined threshold. The threshold is set through the ERR RECEIVE-ERROR THR auxiliary function.

SYNC ES
Synchronous Errored Seconds — The number of seconds during which at least one pattern bit error has occurred. Each second is initiated by, and synchronized to, a pattern bit error.

SYNC L SEC

Synchronization Loss Seconds — The number of seconds during which the receiver has lost pattern synchronization, even momentarily, since initial DS3 pattern synchronization.

SLIPS

Slips — The number of times the received pattern becomes skewed relative to the expected (i.e., internally generated) test pattern. When a slip is detected, the T-BERD 310 automatically resynchronizes to the received pattern. However, pattern bit errors are not suppressed during this process. Pattern slips are available only when using pseudorandom patterns.

2.74.2 G.821 Results Option Test Results

The G.821 Results Option enables the T-BERD 310 to evaluate the long-term performance of your system. The option adds eight performance analysis results to the LOGIC category. The G.821 performance results are defined as follows:

AVAIL SEC

Available Seconds — A count of elapsed seconds since pattern synchronization in which the bit error rate is less than 10^{-3}.

%AVAIL SEC

% Available Seconds — The ratio, expressed as a percentage, of available seconds to the total elapsed seconds since pattern synchronization.

SEV ERR SEC

Severely Errored Seconds — A count of seconds during which the bit error rate is worse than 10^{-3} within the available time.

%SEVERR SEC

% Severely Errored Seconds — The ratio, expressed as a percentage, of severely errored seconds to the number of available seconds.

CSES

Consecutive Severely Errored Seconds — A count of three or more contiguous severely errored seconds in which a bit error rate worse than 10^{-3} in each second.

DEG MIN

Degraded Minutes — A count of minutes during which the bit error ratio is worse than 10^{-6} and less than 10^{-3}.

%DEG MIN

% Degraded Minutes — The ratio, expressed as a percentage, of degraded minutes to the number of available non-severely errored minutes.

UNAVAIL SEC

Unavailable Seconds — A count of elapsed seconds since pattern synchronization in which the bit error rate is greater than or equal to 10^{-3}.

The G.821 results are only available after gaining initial pattern synchronization in any DS3 framing mode except MUXED M13, MUXED C-BIT, and AUTO when live data is transmitted. After gaining initial pattern synchronization from the DS3 RECEIVE jack, the G.821 results, except for the degraded minute results, are directly affected by signal, frame, and pattern loss. When DS3 pattern synchronization is achieved from a SONET source, the G.821 results, except for the degraded minute results, are directly affected by the SONET signal and frame loss.

CCITT Recommendation G.821 defines available and unavailable time as follows:

> *A period of unavailable time begins when the bit error rate in each second is worse than 10^{-3} for 10 consecutive seconds. These 10 seconds are considered to be unavailable time. The period of unavailable time terminates when the bit error rate in each second is better than 10^{-3} for 10 consecutive seconds. These 10 seconds are considered to be available time.*

Available and unavailable times are measured in seconds — available seconds (AVAIL SEC) and unavailable seconds (UNAVAIL SEC), respectively. All test seconds must fall into one of the two categories (total available seconds + total unavailable seconds = total test seconds).

At the beginning of a test, test seconds are considered to be available time; the available seconds begin counting. These seconds continue to be counted until 10 consecutive seconds occur each with a bit error rate worse than 10^{-3}. A sliding window, 10 seconds in length, is used to detect this transition from available to unavailable time and vice versa.

Degraded minutes (DEG MIN) is an error analysis result that is affected by available and unavailable time. DEG MIN is a count of the number of minutes during which an average bit error rate worse than 10^{-6}, but better than 10^{-3}, occurs. The 1-minute intervals are derived by removing unavailable seconds and severely error seconds from the total test time and then consecutively grouping the remaining seconds into blocks of 60. The average bit error rate is calculated for the block of 60 seconds and, if it is worse than 10^{-6}, the block is counted as a degraded minute.

In the transition from available time to unavailable time, the DEG MIN result is unaffected. This is because a switch to unavailable time requires 10 consecutive seconds each with a bit error rate worse than 10^{-3}. Any second in available time with a bit error rate worse than 10^{-3} is considered to be a severely errored second and, therefore, is not included in the accumulation of seconds used to calculate degraded minutes.

Moving from unavailable time to available time may affect the DEG MIN count. While in unavailable time, 10 consecutive seconds each with a bit error rate better than 10^{-3} are required for the transition to available time. When this happens, those 10 seconds are subtracted from the UNAVAIL SEC count and are added to the available seconds count. Since these seconds are now considered to be a part of available time and they are not severely errored seconds, they are included in the calculation of degraded minutes.

2.75 BPV CATEGORY

Bipolar violations are caused by successive DS3 pulses with the same polarity being detected (except those pulses that are part of the B3ZS encoding). Bipolar violation results are only accumulated when the signal is present. The BPV category results are defined as follows:

VIOLATIONS

Bipolar Violations — The number of bipolar violations (BPVs) detected since detecting the signal. Intentional B3ZS code violations are excluded from the count.

BPV ERR RT

BPV Error Rate — The ratio of BPVs to received bits over the previous block of 10^8 bits.

AV BPV ERT

Average BPV Error Rate — The ratio of BPVs to the total number of received bits since detecting the signal.

BPV ERR SEC

BPV Errored Seconds — The number of seconds during which one or more BPVs occurred since detecting the signal.

BPV %EFS

BPV, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no BPVs were detected, to the total number of seconds since detecting the signal.

BPV THR ES

BPV Threshold Errored Seconds — The number of seconds during which the BPV rate exceeded or equaled the user-defined threshold. The threshold is set through the ERR RECEIVE-ERROR THR auxiliary function.

2.76 PARITY CATEGORY

The PARITY category results depend on the current framing mode and the received framing signal. The PARITY category results are defined as follows:

PAR ERRORS

Parity (P-bit) Errors — The number of parity errors detected since initial DS3 frame synchronization.

PAR ERR RT

Parity (P-bit) Error Rate — The ratio of parity errors to (1) the number of bits over which parity was calculated (Bit mode), or (2) the number of DS3 M-frames received (Block mode). The error rate is computed over the previous block of 10^8 bits. The result is derived as a bit or block error rate based on the setting of ERR RECEIVE-PAR ERR RT auxiliary function.

AV PAR ERT

Average Parity (P-bit) Error Rate — The ratio of parity errors to (1) the number of bits over which parity was calculated (Bit mode), or (2) the number of DS3 M-frames received (Block mode). The error rate is computed while DS3 frame synchronization is present. The result is derived as a bit or block error rate based on the setting of the ERR RECEIVE-PAR ERR RT auxiliary function.

PAR ERR SEC

Parity (P-bit) Errored Seconds — The number of seconds during which one or more parity errors occurred since initial DS3 frame synchronization.

PAR %EFS

Parity (P-bit), Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no parity errors were detected, to the total number of seconds while DS3 frame synchronization is present.

C-BIT ERRORS

C-bit Parity Errors — The number of parity errors detected since initial DS3 C-bit frame synchronization.

C-BIT ERR RT

C-bit Parity Error Rate — The ratio of C-bit parity errors to (1) the number of bits over which C-bit parity was calculated (Bit mode), or (2) the number of DS3 C-bit M-frames received (Block mode). The error rate is computed over the previous block of 10^8 bits. The result is derived as a bit or block error rate based on the setting of the ERR RECEIVE-PAR ERR RT auxiliary function.

AV C-BIT ERT

Average C-bit Parity Error Rate — The ratio of C-bit parity errors to (1) the number of bits over which C-bit parity was calculated (Bit mode), or (2) the number of DS3 C-bit M-frames received (Block mode). The error rate is computed while DS3 C-bit frame synchronization is present. The result is derived as a bit or block error rate based on the setting of the ERR RECEIVE-PAR ERR RT auxiliary function.

C-BIT TYPE A

C-bit Parity Errored Seconds, Type A — The number of seconds during which one and only one C-bit parity error occurred since initial DS3 C-bit frame synchronization.

C-BIT TYPE B

C-bit Parity Errored Seconds, Type B — The number of seconds during which 2 to 44 C-bit parity errors occurred since initial DS3 C-bit frame synchronization.

C-BIT TYPE C

C-bit Parity Errored Seconds, Type C — The number of seconds during which more than 44 C-bit parity errors occurred since initial DS3 C-bit frame synchronization.

C-BIT %EFS

C-bit Parity, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no C-bit parity errors were detected, to the total number of seconds while DS3 C-bit frame synchronization is present.

FEBE

Far-End Block Errors — The number of far-end block errors (FEBEs) detected since initial DS3 C-bit frame synchronization.

FEBE RT

Far-End Block Error Rate — The ratio of FEBEs to (1) the number of bits over which C-bit parity was calculated (Bit mode), or (2) the number of DS3 C-bit M-frames received (Block mode). The error rate is computed over the previous block of 10^8 bits. The result is derived as a bit or block error rate based on the setting of the ERR RECEIVE-PAR ERR RT auxiliary function.

AV FEBE RT

Average Far-End Block Error Rate — The ratio of FEBEs to (1) the number of bits over which C-bit parity was calculated (Bit mode), or (2) the number of DS3 C-bit M-frames received (Block mode). The error rate is computed while DS3 C-bit frame synchronization is present. The result is derived as a bit or block error rate based on the setting of the ERR RECEIVE-PAR ERR RT auxiliary function.

FEBE TYPE A

Far-End Block Errored Seconds, Type A — The number of seconds during which one and only one FEBE occurred since initial DS3 C-bit frame synchronization.

FEBE TYPE B

Far-End Block Errored Seconds, Type B — The number of seconds during which 2 to 44 FEBEs occurred since initial DS3 C-bit frame synchronization.

FEBE TYPE C

Far-End Errored Seconds, Type C — The number of seconds during which more than 44 FEBEs occurred since initial DS3 C-bit frame synchronization.

FEBE %EFS

Far-End Block Error, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no FEBEs were detected, to the total number of seconds while DS3 C-bit frame synchronization is present.

2.77 FRAME CATEGORY

Frame errors are based on counting framing bits and identifying frame errors in the incoming DS3 signal after initial frame synchronization. The results are available whenever the receiver detects a valid M13 or C-bit parity framed signal, regardless of the transmitter framing mode. The FRAME category results are defined as follows:

FRM ERRORS
Frame Errors — The number of frame errors detected since initial DS3 frame synchronization.

FRM ERR RT
Frame Error Rate — The ratio of frame errors to received framing bits over the previous block of 10^8 bits.

AV FRM ERT
Average Frame Error Rate — The ratio of frame errors to the total number of received framing bits while DS3 frame synchronization is present.

FRM ERR SEC
Frame Errored Seconds — The number of seconds during which one or more frame errors occurred since initial DS3 frame synchronization.

FRM %EFS
Frame, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no frame errors were detected, to the total number of seconds while DS3 frame synchronization is present.

FRM THR ES
Frame Threshold Errored Seconds — The number of seconds during which the frame error rate exceeded or equaled the user-defined threshold. The threshold is set through the ERR RECEIVE-ERROR THR auxiliary function.

FEOOF SEC
Far-End Out-of-Frame Seconds — The number of seconds during which the received X-bits are zero within the one second interval.

NEOOF SEC
Near-End Out-of-Frame Seconds — The number of seconds during which an out-of-frame condition or an AIS is detected.

DS2 FRM ERR
DS2 Frame Errors — The number of DS2 frame errors detected since initial DS2 frame synchronization. The result applies only to the DS2 signal that contains the DS1 channel being dropped. The count is reset when the selected dropped channel is changed such that the new channel being dropped corresponds to a different DS2 signal. Table 2-9 identifies the DS2 channels and the corresponding DS1 channels.

Table 2-9
DS2 Channels vs. the Dropped DS1 Channels

Signal	Channels						
DS2	1	2	3	4	5	6	7
DS1	1-4	5-8	9-12	13-16	17-20	21-24	25-28

DS2 FRM ERT

DS2 Frame Error Rate — The ratio of detected DS2 frame errors to the total DS2 framing bits received. The result applies only to the DS2 signal that contains the DS1 channel being dropped. The count is reset when the selected dropped DS1 channel is changed such that the new channel being dropped corresponds to a different DS2 signal. Table 2-9 identifies the DS2 channels and the corresponding DS1 channels.

DS2 AV F ERT

DS2 Average Frame Error Rate — The ratio of DS2 frame errors to the total number of received framing bits while DS2 frame synchronization is present.

TX X-BIT

Transmitted X-bit — The current setting of the transmitted X-bits when in a framed mode. The transmitted X-bits are set through the MISC-TX X-BIT auxiliary function.

RX X-BIT

Received X-bit — The current status of the received X-bits when in a framed mode. The result is available after receiving DS3 frame synchronization.

FRM LOSS CNT

DS3 Frame Loss Count — The number of DS3 frame losses occurring after initial frame synchronization.

2.78 SIGNAL CATEGORY

The SIGNAL category results include signal loss seconds, frequency, power, level, and pulse shape measurements. If the DS3 Jitter Option is installed, jitter amplitude results are also included in the SIGNAL category. The results are accumulated after initial signal detection.

2.78.1 DS3 Test Results

The DS3 SIGNAL category test results are defined as follows:

SIG L SEC
Signal Loss Seconds — The number of seconds during which the received DS3 signal was lost for all or part of a second since initial signal detection.

TX FREQ
Transmit Frequency — The frequency of the transmit clock measured in Hz.

RX FREQ
Receive Frequency — The frequency of the clock recovered from the received data measured in Hz.

POWER
Receive Signal Power — The power level of the received DS3 signal measured in dBm.

LEVEL
Receive Signal Level — The level of the received DS3 signal in volts peak.

PULSE SHAPE
Pulse Shape — A PASS/FAIL result which shows whether the DS3 pulse shape is within the specified pulse mask boundary. The pulse shape mask is set through the MISC-PULSE MASK auxiliary function. *UNAVAILABLE* appears if the T-BERD 310 has not received enough isolated pulses to measure the pulse shape (*DENSITY ERR* appears in the other pulse shape results). *N/A* appears when the pulse shape mask is not selected.

PULSE WIDTH
Pulse Width — The pulse width of the DS3 pulse measured in nanoseconds.

RISE TIME
Pulse Rise Time — The time interval between the 10% and 90% points of the rising edge of the DS3 pulse measured in nanoseconds.

FALL TIME
Pulse Fall Time — The time interval between the 10% and 90% points of the falling edge of the DS3 pulse measured in nanoseconds.

NOTE: The pulse shape test results (PULSE WIDTH, RISE TIME, and FALL TIME) require isolated pulses to properly measure the pulse shape against a pulse shape mask. If these results display *DENSITY ERR*, the received signal does not contain enough isolated pulses to measure the pulse shape.

2.78.2 DS3 Jitter Option Test Results

The following DS3 Jitter Option test results enable the T-BERD 310 to measure wideband and highband jitter as well as maximum wideband and highband jitter.

WB JITTER

Wideband Jitter — The current wideband (10 Hz to 400 kHz) jitter amplitude, expressed in peak-to-peak UIs. This result is only available in the jitter AUTO and WIDEBAND filter modes.

MAX WB JIT

Maximum Wideband Jitter — The maximum peak-to-peak wideband jitter amplitude, expressed in peak-to-peak UIs, since initial signal presence or test restart. This result is only available in the jitter AUTO and WIDEBAND filter modes. This result is unavailable if the WB JITTER result has been out of range since test restart. If the WB JITTER result is available and then goes *OUT OF RANGE*, this result also goes *OUT OF RANGE* indicating the peak jitter reading is outside the current range.

HB JITTER

Highband Jitter — The current highband (30 kHz to 400 kHz) jitter amplitude, expressed in peak-to-peak UIs. This result is only available in the jitter AUTO and HIGHBAND filter modes.

MAX HB JIT

Maximum Highband Jitter — The maximum peak-to-peak highband jitter amplitude, expressed in peak-to-peak UIs, since initial signal presence or test restart. This result is only available in the jitter AUTO and HIGHBAND filter modes. This result is unavailable if the HB JITTER result has been out of range since test restart. If the HB JITTER result is available and then goes *OUT OF RANGE*, this result also goes *OUT OF RANGE* indicating the peak jitter reading is outside the current range.

2.78.3 Optical Media Test Option Test Results

The following Optical Media Test Option test results enable the T-BERD 310 to measure optical power and return loss from a fiber optic cable.

OPTICAL PWR

Optical Power — Measures optical power at the POWER METER connector. Set the wavelength with the OPTICAL TEST-OPTICAL PWR auxiliary function.

RETURN LOSS

Optical Return Loss — Measures optical return loss at the RETURN LOSS/SOURCE connector. Set the type of measurement performed with the OPTICAL TEST-RETURN LOSS auxiliary function. Select the return loss function and wavelength with the OPTICAL TEST-STABLE SOURCE auxiliary function.

2.79 TIME CATEGORY

The TIME category test results are defined as follows:

TIME

Current Time of Day — The current time of day in hours, minutes, and seconds. The time is set through the TIME-SET TIME auxiliary function.

DATE

Current Date — The current day and month. The date is set through the TIME-SET DATE auxiliary function.

ELAPSED TIME

Elapsed Time — The elapsed time in hours, minutes, and seconds since the last test restart. If no DS3 signal is present after test restart, the test will not begin.

TEST LENGTH

Timed Test Length — The currently set test length for a timed test in hours and minutes. The test length is set through the TIME-TEST LENGTH auxiliary function. This result is N/A unless the **TEST** switch is set to TIMED.

TIME LEFT

Timed Test Time Left — The time remaining for a timed test in hours, minutes, and seconds. This result is N/A unless the **TEST** switch is set to TIMED.

2.80 SONET SECTION CATEGORY

The following test results enable the T-BERD 310 to analyze the SONET Section overhead of a signal. The results are only available when a SONET RX option is installed.

FRM WORD ERR

Frame Word Errors — Counts the number of errored frame alignment signal (FAS) subsets (subset of bytes A1 and A2) received since gaining initial frame synchronization.

SON SEF SEC

SONET Severely Errored Frame Seconds — Counts the number of seconds in which one or more loss of frame (LOF) alarms have occurred since gaining initial frame synchronization. A severely errored frame (SEF) is defined as four consecutive STS-N frames received with errored frame words. An LOF is defined as SEFs persisting for 3 ms or a random unframed signal for 625 microseconds.

SON LOS SEC

SONET Loss of Signal Seconds — Counts the number of seconds in which one or more SONET loss of signal (LOS) events occur. An LOS is defined as an all zeros pattern which lasts for least 100 microseconds. An LOS is removed after two consecutive valid frame alignment signals are detected without an intervening loss of signal.

SON RX FREQ

SONET Receive Frequency — Displays the recovered clock frequency of the received SONET signal in hertz.

SON TX FREQ

SONET Transmit Frequency — Displays the frequency of the transmitted SONET signal in hertz.

SECT BIP ERR

Section BIP Errors — Counts the number of times the Section BIP byte (B1) indicates an error in the previous frame since test restart. Up to eight section BIP errors can be counted in a single frame.

SECT EQU BER

Section Equivalent Bit Error Rate — Presents an equivalent Section bit error rate (BER) which is derived from the received section BIP error count since initial SONET frame synchronization.

SECT BIP ES

Section BIP Errored Seconds — Counts the number of seconds in which one or more Section BIP errors occurred since test restart. The errored second interval is not synchronous to the occurrence of the BIP error.

SECT BIP ESA

Section BIP Errored Seconds, Type A — Counts the number of seconds in which exactly one Section BIP error occurred, and no LOF or LOS alarms occurred.

SECT BIP ESB

Section BIP Errored Seconds, Type B — Counts the number of seconds in which more than one but less than 2500 Section BIP errors occurred for an STS-1, OC-1, or OC-3 signal; or less than 8800 occurred for an OC-12 signal.

SECT BIP SES

Section BIP Severely Errored Seconds — Counts the number of seconds in which more than 2500 Section BIP errors occurred for an STS-1, OC-1, or OC-3 signal; or more than 8800 occurred for an OC-12 signal.

2.81 SONET LINE CATEGORY

The following test results enable the T-BERD 310 to analyze the SONET Line overhead of a signal. The results are only available when a SONET receive option is installed.

APS CONFIG

APS Configuration — Presents the current APS configuration: 1:n verses 1+1, and bi-directional verses unidirectional. This information is obtained from the APS line overhead byte (K2). Table 2-10 lists the possible APS configuration messages. The Mode appears on the left half of the result window, and Switching appears on the right half.

Table 2-10
SONET APS Configuration Result Message

Message	Switch Request
	Mode
1:n	Provisioned for 1:n mode
1+1	Provisioned for 1+1 mode
	Switching
BIDIR	Provisioned for Bi-directional Switching
UNIDIR	Provisioned for Unidirectional Switching
AIS	Line AIS
RDI	Line RDI

APS INFO

APS Information — Presents the current protection switch request message and channel as indicated by the line overhead byte (K1). The displayed messages are listed in Table 2-11. ## is the channel number from 0 to 15. Since the APS data bytes (K1 and K2) may change rapidly during a protection switch operation, the display may not indicate every transition.

Table 2-11
SONET APS Information Result Messages

Message	Switch Request
## LOCKOUT	Lockout of Protection
## FORCE SW	Forced Switch
## SIG FAILH	Signal Fail High-priority
## SIG FAILL	Signal Fail Low-priority
## SIG DEGRH	Signal Degrade High-priority
## SIG DEGRL	Signal Degrade Low-priority
## MANUAL SW	Manual Switch
## WTR	Wait to Restore
## EXERCISE	Exerciser
## REVERSE	Reverse Request
## NO REVERT	Do Not Revert
## NO REQ	No Request

APS MSG CNT

APS Message Count — Counts the number of transitions occurring in the switch priority field of the line overhead byte (K1), Bits 1 to 4. This is an indication of protection switch activity; it is not a direct count of protection switches.

LINE BIP ERR

Line BIP Errors — Counts the number of times in which the Line BIP byte (B2) indicates an error in the previous frame since initial SONET frame synchronization. Up to eight Line BIP errors can be counted in a single frame.

LINE EQU BER

Line Equivalent Bit Error Rate — Presents an equivalent Line BER which is derived from the received Line BIP error count since initial SONET frame synchronization.

LINE BIP ES

Line BIP Errored Seconds — Counts the number of seconds in which one or more Line BIP errors occurred since initial SONET frame synchronization. The errored second interval is not synchronous to the occurrence of the BIP error.

LINE BIP ESA

Line BIP Errored Seconds, Type A — Counts the number of seconds in which exactly one Line BIP error occurred, and no LOF or LOS alarms occurred.

LINE BIP ESB

Line BIP Errored Seconds, Type B — Counts the number of seconds in which more than one but less than 2500 Line BIP errors occurred for an STS-1, OC-1, or OC-3 signal; or less than 10,000 errors occurred for an OC-12 signal.

LINE BIP SES

Line BIP Severely Errored Seconds — Counts the number of seconds in which more than 2500 Line BIP errors occurred in 1 second for an STS-1, OC-1, or OC-3 signal; or more than 10,000 errors occurred for an OC-12 signal.

LINE UAS

Line Unavailable Seconds — Counts the number of seconds in which the line is not available based on counts of consecutive line severely errored seconds, or the presence of an AIS alarm.

LINE AIS SEC

Line AIS Seconds — Counts the number of seconds in which one or more line AIS alarms occurred.

LINE FEBE

Line FEBE — Counts the line FEBEs detected. Line far-end block errors are defined in the Z2 byte for the STS-1, OC-3, and an OC-12 signal.

LINE FEBE RT

Line FEBE Rate — Presents an equivalent BER based on received line FEBE counts.

POINTER JUST

Pointer Justifications — Counts the number of times the synchronous payload envelope (SPE) pointer changed since initial SONET frame synchronization.

POINTER INC

Pointer Increments — Counts the number of times the pointer bytes (H1 and H2) indicated an increment to the path payload pointer since initial SONET frame synchronization.

POINTER DEC

Pointer Decrements — Counts the number of times the pointer bytes (H1 and H2) indicated a decrement to the path payload pointer since initial SONET frame synchronization.

POINTER NDF

Pointer New Data Flags — Counts the number of times the pointer bytes (H1 and H2) indicated an active new data flag (arbitrary change in pointer) since initial SONET frame synchronization. An active NDF occurs during a change in payload content, or after an AIS or some other failure condition. If a change in the pointer is detected for three consecutive frames, the change is counted as an NDF, even if the pointer never has an active NDF.

POINTER DATA

Pointer Data — Presents the current STS path pointer value from 0 to 782. *UNAVAILABLE* appears under a number of error conditions, such as line AIS, etc. *OUT OF RANGE* appears if the pointer value is outside 0 to 782.

POINTER SIZE

Pointer Size Bits — Indicates the binary setting of the size bits in the SONET H1 byte. The normal setting for the pointer size bits is 00 to indicate a SONET payload. If the received bits are other than 00, the result appears in the SUMMARY category.

SYNC MSG

Z1 Byte Synchronization Message — Displays the Z1 byte message after SONET frame synchronization and signal presence are detected. The test result displays the following Z1 byte messages:

20 PPM CLK — A 20 parts per million based clock is being used.
RESERVED — The received Z1 byte is reserved for other purposes.
STRATUM 1 — A Stratum 1 based clock is being used.
STRATUM 2 — A Stratum 2 based clock is being used.
STRATUM 3 — A Stratum 3 based clock is being used.
TRACE UNKN — Traceability is unknown.
UNKNOWN — Any byte other than the above.
DO NOT USE — The timing source should not be used for synchronization, as it would cause a timing loop.

2.82 SONET PATH CATEGORY

The following test results enable the T-BERD 310 to analyze the SONET Path overhead of a signal. The results are only available if a SONET receive option is installed.

PATH BIP ERR

Path BIP Errors — Counts the number of times in which the Path BIP byte (B3) indicates an error in the previous frame since initial SONET frame synchronization. Up to eight Path BIP errors can be counted in a single frame.

PATH EQU BER

Path Equivalent Bit Error Rate — Presents an equivalent Path BER which is derived from the received Path BIP error count since initial SONET frame synchronization.

PATH BIP ES

Path BIP Errored Seconds — Counts the number of seconds in which one or more Path BIP errors occurred since initial SONET frame synchronization. The errored second interval is not synchronous to the occurrence of the BIP error.

PATH BIP ESA

Path BIP Errored Seconds, Type A — Counts the number of seconds in which exactly one Path BIP error occurred, and no LOF or LOS alarms occurred.

PATH BIP ESB

Path BIP Errored Seconds, Type B — Counts the number of seconds in which more than one but less than 2400 Path BIP errors occurred.

PATH BIP SES

Path BIP Severely Errored Seconds — Counts the number of seconds in which 2400 or more Path BIP errors occurred since initial SONET frame synchronization.

PATH UAS

Path Unavailable Seconds — Counts the number of seconds in which the line is unavailable. The path is unavailable when 10 consecutive frame word errors are received, or when a condition leading to a failure (i.e., loss of signal) occurs. If the failure was preceded by one or more consecutive frame word errors, then path unavailability starts with the frame word errors. The path becomes available again after a minimum of 10 consecutive seconds without any frame word errors, or when the failure is removed, whichever is greater. All path related results count when the path is available. When the path is unavailable, only this result counts.

PATH AIS SEC

Path AIS/LOP Seconds — Counts the number of seconds in which one or more Path AIS or LOP occurs.

PATH FEBE

Path FEBE — Counts the number of Path BIP errors detected by the downstream PTE.

PATH FEBE RT

Path FEBE Rate — Presents an equivalent BER based on received Path FEBE counts.

PATH TRACE

Path Trace Message — Displays the 64-byte path trace ASCII message which is carried in the path overhead byte (J1). The message scrolls across the results window in a ticker tape fashion, 12 characters at a time.

SIGNAL LABEL

Signal Label — Presents the payload type being carried in the current position of the current STS. The information is derived from the Path signal label (C2) and VT overhead (V5) bytes. Any C2/V5 combinations which cannot be decoded appear as *UNRECOGNIZED*. Table 2-12 lists the signal label messages. The V5 byte for VT1.5 payloads is fully decoded. For other virtual tributary sizes (VT2, VT3, and VT6), only the floating/locked indication and size are shown.

Table 2-12
SONET Signal Label Result Messages

Displayed Name	Description
DS4NA	DS4 North American (139.264 Mb/s)
ATM	Asynchronous Transfer Mode
DQDB	Distributed Queue Dual Bus (MAN)
DS1 ASYN	DS1 Asynchronous
DS1 ASYN L	DS1 Asynchronous, Locked Mode
DS1 BIT	DS1 Bit Synchronous
DS1 BIT L	DS1 Bit Synchronous, Locked Mode
DS1 BYTE	DS1 Byte Synchronous
DS1 BYTE L	DS1 Byte Synchronous, Locked Mode
DS3 ASYN	Asynchronous DS3
FDDI	Fiber Distributed Data Interface
PATH EQNS	Path Equipped Nonspecific
PATH UNEQ	Path Unequipped
SYNTRAN	Byte Observable SYNTRAN
UNKNOWN_xxx	Undecodable. xxx is the numeric value of the C2 byte.
VT1.5 EQNS L	VT1.5 Equipped Nonspecific, Locked Mode
VT1.5 EQNS	VT1.5 Equipped Nonspecific
VT1.5 UNAS L	VT1.5 Unassigned, Locked Mode
VT1.5 UNAS	VT1.5 Unassigned
VT1.5 UNEQ L	VT1.5 Unequipped, Locked Mode
VT1.5 UNEQ	VT1.5 Unequipped
VT2 L	VT2, Locked Mode
VT2	VT2
VT3 L	VT3, Locked Mode
VT3	VT3
VT6 L	VT6, Locked Mode
VT6	VT6

2.83 SONET VIRTUAL TRIBUTARY (VT) CATEGORY

The following test results enable the T-BERD 310 to analyze the SONET Virtual Tributary overhead of a signal. The results are only available if a SONET receive option is installed.

VT BIP ERR

VT BIP Errors — Counts the number of times in which the VT BIP byte (V5, Bits 1 and 2) indicates an error in the received signal. A maximum of two VT BIP errors can be counted in each SONET frame.

VT EQU BER

VT Equivalent Bit Error Rate — Presents an equivalent VT BER which is derived from the received VT BIP error count since initial SONET frame synchronization.

VT BIP ES

VT BIP Errored Seconds — Counts the number of seconds in which one or more VT BIP errors, an AIS, or VT LOP occurred.

VT BIP ESA

VT BIP Errored Seconds, Type A — Counts the number of seconds in which exactly one VT BIP error occurred.

VT BIP ESB

VT BIP Errored Seconds, Type B — Counts the number of seconds in which more than one but less than 600 VT BIP errors occurred.

VT BIP SES

VT BIP Severely Errored Seconds — Counts the number of seconds in which 600 or more VT BIP errors occurred during a single second.

VT UAS

VT Unavailable Seconds — Counts the number of seconds in which the VT path is unavailable. The path is unavailable when 10 consecutive severely errored seconds are received, or when a condition leading to a failure (i.e., loss of signal) occurs. If the failure was preceded by one or more consecutive severely errored seconds, then VT path unavailability starts with the severely errored seconds. The VT path becomes available again after a minimum of 10 consecutive seconds without any severely errored seconds, or when the failure is removed, whichever is greater. All VT path related results count when the VT path is available. When the VT path is unavailable, only this result counts.

VT AIS SEC

VT AIS/LOP Seconds — Counts the number of seconds in which one or more VT AIS or LOP occurs.

VT FEBE

VT FEBE — Counts the number of VT BIP errors detected by the downstream PTE. It is calculated by summing the FEBE counter of the path status byte (V5, Bit 3) from each received VT superframe.

VT PTR JUST

VT Pointer Justifications — Counts the number of times the VT path pointer byte (V1 and V2) changed since initial SONET frame synchronization.

VT PTR INC

VT Pointer Increments — Counts the number of times the VT pointer bytes (V1 and V2) indicated an increment to the VT payload pointer since initial SONET frame synchronization.

VT PTR DEC

VT Pointer Decrements — Counts the number of times the VT pointer bytes (V1 and V2) indicated a decrement to the VT payload pointer since initial SONET frame synchronization.

VT PTR NDF

VT Pointer New Data Flags — Counts the number of times the VT pointer bytes (V1 and V2) indicated an active new data flag (arbitrary change in pointer) since initial SONET frame synchronization. An active NDF occurs during a change in payload content, or after an AIS or some other failure condition.

VT PTR DATA

VT Pointer Data — Presents the current VT pointer value from 0 to 103. *UNAVAILABLE* appears under a number of error conditions, such as line AIS, etc. *OUT OF RANGE* appears if the pointer value is outside 0 to 103.

2.84 ATM CATEGORY

When the OC-3c ATM Option is installed, the ATM test results enable the T-BERD 310 to analyze the ATM cell overhead and payload usage.

MASK CELLS

Mask Cells — Counts all cells received that match specified test mask receive addresses selected in the ATM RX auxiliary functions.

MASK CELL BW

Mask Cell Bandwidth — Measures bandwidth of the selected received profile. Select the received profile using the ATM RX-PROFILE auxiliary function.

IDLE BW

Idle Bandwidth — Measures bandwidth of all inactive cells as a percentage of the received signal.

IN-USE BW

In-Use Bandwidth — Measures the active cell bandwidth as a percentage of the received signal.

BKGRD BW

Background Bandwidth — Measures the active cell traffic that does not match the selected test mask. The value is measured as a percentage of the received signal, and does not include idle cells. The test cell can be selected with the ATM RX-TEST MASK auxiliary function.

MIN/MAX BW

Minimum/Maximum Bandwidth — Measures highest and lowest values for the bandwidth using the selected received bandwidth period. The bandwidth period is selected through the ATM RX-BW PERIOD auxiliary function.

BURST BW

Burst Bandwidth — Measures the current bandwidth using the selected received bandwidth period. The bandwidth period is selected through the ATM RX-BW PERIOD auxiliary function.

MASK CELL RT

Mask Cell Rate — Measures the cell rate of the selected received profile in cells per second (C/s).

IDLE RT

Idle Cell Rate — Measures idle cells in cells per second (C/s).

IN-USE RT

In-Use Rate — Measures the active cells in cells per second (C/s).

BKGRD RT

Background Rate — Measures the active cell traffic that does not match the selected test mask. This value is measured in cells per second (C/s) and does not include idle cells. Select the test mask through the ATM RX-TEST MASK auxiliary function.

MIN/MAX RT

Minimum/Maximum Rate — Records the highest and lowest in-use rates during the programmed bandwidth period. Select the programmed bandwidth period through the ATM RX-BW PERIOD auxiliary function.

BURST RT

Burst Rate — Measures the current mask cell burst (in C/s) rate using the selected received bandwidth period.

MIN DLAY VAR

Minimum Cell Delay Variation — Measures the minimum (maximum negative) cell delay variation on the transmitted cell profile. This result is only available when Delay Variation Results are enabled (selected) in the ATM RX Test Mask auxiliary function.

MAX DLAY VAR

Maximum Cell Delay Variation — Measures maximum positive cell delay variation on the transmitted cell profile. This result is only available when Delay Variation Results are enabled (selected) in the ATM RX Test Mask auxiliary function.

AVG DLAY VAR

Average Cell Delay Variation — Measures average cell delay variation on the transmitted cell profile. This result is only available when Delay Variation Results are enabled (selected) in the ATM RX Test Mask auxiliary function.

TOTL CONGEST

Total Marked Congestion — Measures bandwidth of all cells marked congested as a percentage of total active cells, not including idle cells, since initial cell synchronization.

MASK CONGEST

Received Mask Cells Marked Congested — Measures bandwidth of the cells matching the receive mask which are marked congested, as a percentage of total active cells, not including idle cells, since initial cell synchronization.

% CLP=1

Percent of Cells with CLP Equals One — Measures percentage of all cells that match the selected RX mask with CLP equal to 1.

CLP=1

Cells with CLP Equals One — Counts all cells that match the selected RX mask with CLP equal to 1.

MIS-INSERTED

Mis-inserted Cells (TTC) — Counts cells that do not have the TTC payload. The result is only available when a TTC profile is received.

%MISINSERTED

Percent of Mis-inserted Cells (TTC) — Measures percentage of cells that do not have the TTC payload. The result is only available when a TTC profile is received.

OUT OF SEQ

Out Of Sequence TTC Sequence Number (TTC) — Counts cells that have an out of sequence TTC sequence number in the payload of the cell. The result is only available when TTC test cells are received.

% OUT OF SEQ

Percent of Out Of Sequence TTC Sequence Number (TTC) — Measures percentage of cells that have an out of sequence TTC sequence number in the payload of the cell. The result is only available when TTC test cells are received.

DROP'D CELLS

Dropped Received Mask Cells (TTC) — Counts the dropped RX Mask Cells. The result is only available when TTC test cells are received.

% DROP'D

Percent of Dropped Received Mask Cells (TTC) — Measures percentage of dropped RX Mask Cells. The result is only available when TTC test cells are received.

HEC ERRORS

Header Error Control Errors — Counts all cells with at least one HEC error.

HEC ERR RATE

Header Error Control Error Rate — Counts the ratio of HEC errors over the total number of received cells.

CORRECT ERRS

Correctable HEC Errors — Counts the cells with only one HEC error. If a cell with a single HEC error is followed by consecutive cells that have one or more HEC errors, then only the first HEC errored cell is counted as correctable.

CORRECT RATE

Correctable HEC Error Rate — Counts the ratio of correctable errors over the total number of received cells.

NON-COR ERRS

Non-Correctable HEC Errors — Counts cells with more than one HEC error. Also the count of consecutive cells that have HEC errors excluding the first cell, if and only if, it has a single HEC error.

NON-COR RATE

Non-Correctable HEC Error Rate — Counts the ratio of non-correctable errors over the total number of received cells.

CORR TAG

Correlation Tag (TTC) — Indicates the current received TTC cell correlation tag number. The result is only available when a TTC profile is received.

AIS SECONDS

AIS Alarm Seconds — Counts the seconds an ATM AIS alarm is detected since the last test restart or history reset.

RDI SECONDS

RDI Alarm Seconds — Counts the seconds an ATM RDI alarm is detected since the last test restart or history reset.

LOOP END-END

Loopback End-to-End — Counts the number of ATM end-to-end loopback cells received since the last test restart.

LOOP SEGMENT

Loopback Segment — Counts the number of ATM segment loopback cells received since the last test restart.

CSF SECONDS

Cell Synchronization Failure Seconds — Counts number of cell synchronization failure seconds detected.

ATM STATUS

ATM Status Results, Summary Category — Displays the following ATM signal status conditions as they occur:

CELL SYNC — Cell Synchronization indicates the reception of six consecutive unerrored HECs. This is equivalent to a cell delineation (CD) indication.

OUT OF SYNC — Out of Synchronization — Indicates the reception of at least seven consecutive errored HECs after cell synchronization. This is equivalent to an out of cell delineation (OCD).

SYNC LOSS — Loss of Synchronization — Indicates continued loss of cell synchronization 4 ms after out of synchronization occurred. This is equivalent to a loss of cell delineation (LCD) indication.

SYNC FAILURE — Synchronization Failure — Indicates synchronization loss is present for 2.5 seconds. Cleared when cell synchronization is regained and loss of synchronization has not occurred in 10 seconds. This is equivalent to a loss of cell delineation failure (LCD FAILURE) indication.

DS1/DS0 ANALYZER OPTION TEST RESULTS

2.85 INTRODUCTION

The DS1/DS0 Analyzer Option has full Bit Error Rate Test (BERT) capabilities and supports all the DS1 results defined in the following sections. Two results can be displayed at one time in the RESULTS I and RESULTS II windows. The **RESULTS I** and **RESULTS II** switches enable the categorized results to be displayed.

The available results depend on framing type, pattern synchronization, installed options, etc. Results that are *not available* display the message *UNAVAILABLE* in place of the result count. The results that are *not applicable* to the current mode display *N/A* in place of the result count. When the displayed count exceeds 99,999,999, a ">" (greater than sign) appears in the window. When the number rolls over, the count continues.

2.86 SUMMARY CATEGORY

The SUMMARY category automatically displays key results that are non-zero or out-of-specification. This allows quick access to the results without having to search through the other categories. The results that appear in the SUMMARY category include:

- BIT ERRORS (LOGIC category)
- SLIPS (LOGIC category)
- VIOLATIONS (BPV category)
- FRM ERRORS (FRAME category)
- CRC ERRORS (FRAME category)
- RX FREQ (SIGNAL category)

When all SUMMARY results are error-free, the message *ALL RESULTS OK* is displayed. When an error is detected, the appropriate test result appears in the SUMMARY category window. When more than one error is detected, press either the **RESULTS I Results** switch or **RESULTS II Results** switch to scroll through the results.

2.86.1 310-9A/B Option PRM Test Results

When the 310-9A/B option is installed and the PRM results are enabled, the following results can appear in the SUMMARY category. It should be noted that these results apply to the far-end received signal.

- FAR BPV SEC (BPV category)
- FAR FRM ES (FRAME category)
- FAR FRM SES (FRAME category)
- FAR SLIP SEC (FRAME category)
- FAR CRC ERR (FRAME category)

The optional ESF datalink far-end Performance Report Message (PRM) results enable the DS1/DS0 Analyzer Option to monitor and report on the status of the ESF PRM as described in the ANSI T1.403-1989 standard. The far-end PRM results are available when the ESF or optional ESFz operating mode is selected and the AUX-PRM receiver auxiliary function is enabled. The AUX-PRM auxiliary function determines whether the following PRM results are reported.

BPV Category
- FAR BPV SEC — Far-End BPV Seconds

FRAME Category
- FAR FRM ES — Far-End Frame Error Seconds
- FAR FRM SES — Far-End Severely Errored Framing Seconds
- FAR SLIP SEC — Far-End Controlled Slip Seconds
- PAYLOAD SOURCE — Far-End Payload Source/Loopback
- FAR CRC ERR — Far-End CRC Error Events
- FCRC 1 — Far-End CRC 1 Bin
- FCRC 2-5 — Far-End CRC 2 to 5 Bin
- FCRC 6-10 — Far-End CRC 6 to 10 Bin
- FCRC 11-100 — Far-End CRC 11 to 100 Bin
- FCRC 101-319 — Far-End CRC 101 to 319 Bin
- FCRC >319 — Far-End CRC 320 to 333 Bin

TIME Category
- FAR PRM SEC — Far-End Performance Report Seconds

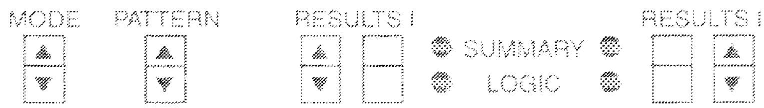
When a far-end PRM result count is an approximation because of a lost PRM, a "~" (tilde) precedes the result. The results are halted when the frame synchronization or the signal is lost during testing. When the FAR CRC ERR result is displayed and the indicated count is an approximation of the actual CRC error count, a ">" (greater than) sign precedes the count.

2.86.2 310-9A/B Option SCAN Mode Test Results

When the DS1/DS0 Analyzer Option is configured in SCAN mode, the results appear according to the selected SCAN mode: CONTINUE or TRIGGER.

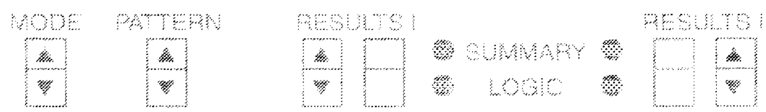
SCAN CONTINUE — In the continuous DS1 scan mode, the RESULTS I window displays the CYCLE and CHANNEL results. The CYCLE result indicates the number of times the scan has cycled completely through all the DS1 channels. The CHANNEL number result indicates the channel which is currently being scanned. The RESULTS II window displays the status messages, alarms, or errors. If the dropped DS1 channels are error free, the message *ALL CHANNELS OK* appears.

SCAN	**CYCLES: 78**	**ALL CHANNELS**
CONTINUE	**CHANNEL: 10**	**OK**



When an error or alarm is detected, the channel number and error appear in the RESULTS II window.

SCAN	**CYCLES: 78**	**CHANNEL 2**
CONTINUE	**CHANNEL: 10**	**FRM ERR HC**

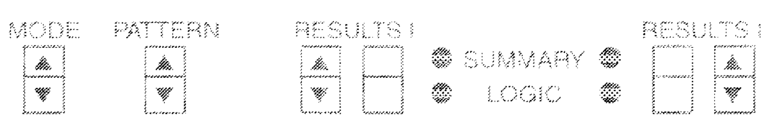


An **H** or **C** appears next the to test result indicating the error status as *History* or *Current*. The following errors or alarms are detectable:

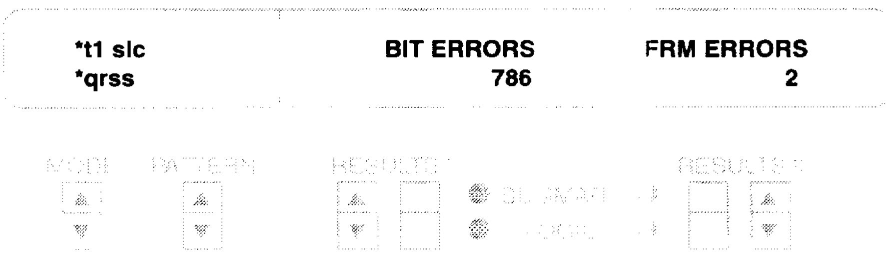
CRC ERRORS — Cyclic Redundancy Check Errors
FRM ERRORS — Frame Errors
SLIPS — Timing Slips (requires the 310-9A/B option and a reference signal source)
ALL ONES — All Ones Pattern
YELLOW — Yellow Alarm
FRM LOSS— Frame Synchronization Loss

SCAN TRIGGER — In SCAN TRIGGER mode the RESULTS I window displays the CYCLE and CHANNEL results. The CYCLE result indicates the number of times the scan has cycled completely through all the DS1 channels. The CHANNEL number result indicates the channel which is currently being scanned. The RESULTS II window displays test status messages.

SCAN	**CYCLES: 78**	**SEARCHING FOR**
TRIGGER	**CHANNEL: 10**	**TRIGGER EVENT**



If the scan detects a selected event from the AUX-SCAN TRIG auxiliary function, the DS1/DS0 Analyzer Option stops scanning and automatically configures to the dropped channel. A leading asterisk (*), framing format, and pattern appear in lowercase characters in the MODE/PATTERN window. When an event is detected, scanning stops and full DS1 logic, BPV, CRC, frame, and signal error analysis is performed. The LOGIC category is not applicable during live data analysis. The RESULTS I and II windows provide BERT analysis results.



2.87 LOGIC CATEGORY

Logic errors are based on discrepancies between the transmitted and received bit stream. The accumulation of logic errors is dependent on frame synchronization (if in a framed mode) and pattern synchronization. Logic errors are not available until initial pattern synchronization is obtained. The results are also not available when sending loop codes. During loss of frame or pattern synchronization, the accumulation of errors is halted.

2.87.1 DS1 Test Results

The DS1 LOGIC category test results are defined as follows:

BIT ERRORS

Bit Errors — The number of received pattern bits which have a value opposite that of the corresponding transmitted bit pattern since initial DS1 pattern synchronization.

BIT ERR RT

Bit Error Rate — The ratio of pattern bit errors to received pattern bits since initially acquiring pattern synchronization.

ASYNC ERR SEC

Asynchronous Errored Seconds — The number of seconds during which one or more pattern bit errors occurred since initial DS1 pattern synchronization.

SYNC ERR SEC

Synchronous Errored Seconds — The number of seconds during which at least one pattern bit error has occurred. Each second is initiated by, and synchronized to, a pattern bit error.

%EFS

Bit, Percentage of Error-Free Seconds — The ratio, expressed as a percentage, of seconds during which no pattern bit errors were detected, to the total number of seconds while DS1 pattern synchronization is present.

SYNC L SEC

Out-of-Synchronization Seconds — The number of seconds during which the receiver has lost pattern synchronization, even momentarily, since initial DS1 pattern synchronization.

SEV ERR SEC

Severely Errored Seconds — The number of seconds during which the pattern bit error rate exceeded or equaled 10^{-3} b/s.

CSES

Consecutive Severely Errored Seconds — The number of groups of three or more severely errored seconds.

SLIPS

Slips — The number of times the received pattern becomes skewed relative to the expected (i.e., internally generated) test pattern. When a slip is detected, the DS1/DS0 Analyzer Option automatically resynchronizes to the received pattern. However, pattern bit errors are not suppressed during this process. Pattern slips are available only when using pseudorandom patterns. (Timing slips are measured from the SIGNAL category.)

2.87.2 G.821 Results Option Test Results

The G.821 Results Option enables the DS1/DS0 Analyzer Option to evaluate the long-term performance of your system. The option adds eight performance analysis results to the LOGIC category. The G.821 performance results are defined as follows:

AVAIL SEC

Available Seconds — A count of elapsed seconds since pattern synchronization in which the bit error rate is less than 10^{-3}.

%AVAIL SEC

% Available Seconds — The ratio, expressed as a percentage, of available seconds to the total elapsed seconds since pattern synchronization.

%SEV ER SEC

% Severely Errored Seconds — The ratio, expressed as a percentage, of severely errored seconds to the number of available seconds.

DEG MIN

Degraded Minutes — A count of minutes during which the bit error ratio is worse than 10^{-6} and less than 10^{-3}.

%DEG MIN

% Degraded Minutes — The ratio, expressed as a percentage, of degraded minutes to the number of available minutes.

UNAVAIL SEC

Unavailable Seconds — A count of elapsed seconds since pattern synchronization in which the bit error rate is greater than or equal to 10^{-3}.

2.88 BPV CATEGORY

Bipolar violations are caused by successive DS1 pulses with the same polarity being detected (except those pulses that are part of the B8ZS encoding). Bipolar violation results are only accumulated when the signal is present. The BPV category results are defined as follows:

VIOLATIONS

Bipolar Violations — The number of bipolar violations (BPVs) detected since the beginning of the test. Intentional B8ZS code violations are excluded from the count.

BPV ERR RT

BPV Error Rate — The ratio of BPVs to received bits since initially acquiring signal presence.

BPV ERR SEC

BPV Errored Seconds — The number of seconds during which one or more BPVs occurred since the beginning of the test.

FAR BPV SEC

Far-End BPV Seconds — The number of seconds during which one or more BPVs occurred in the far-end received signal. This result reports on the PRM Line-Code Violation Event Bit (LV = 1) status. Requires the 310-9A/B option.

2.89 FRAME CATEGORY

Frame errors begin accumulating after initial frame synchronization on the incoming DS1 signal. For T1 circuits with ESF or optional ESFz framing, the DS1/DS0 Analyzer Option detects and accumulates CRC-6 errors which are used to calculate the CRC error rate and CRC errored seconds. The DS1/DS0 Analyzer Option only compiles the results that apply to the selected framing format.

2.89.1 DS1 Frame Test Results

The DS1 FRAME category test results are defined as follows:

FRM ERRORS
Frame Errors — The number of frame errors detected since initial DS1 frame synchronization.

FRM ERR RT
Frame Error Rate — The ratio of frame errors to received framing bits since initially acquiring frame synchronization.

FRM ERR SEC
Frame Errored Seconds — The number of seconds during which one or more frame errors occurred since initial DS1 frame synchronization.

FRM SES
Frame Severely Errored Seconds — The number of seconds during which the total number of frame errors equals 12 or more (D4 framing only).

FRM L SEC
Frame Loss Seconds — The number of seconds during which one or more frame synchronization losses occurred or during which frame synchronization could not be achieved, since initial DS1 frame synchronization.

CRC ERRORS
Cyclic Redundancy Check Errors — The number of CRC errors detected since initial DS1 frame synchronization. CRC errors are counted only when ESF or optional ESFz framing is present in the received T1 data.

CRC ERR SEC
Cyclic Redundancy Check Errored Seconds — The number of seconds during which one or more CRC errors occurred.

CRC ERR RT
Cyclic Redundancy Check Error Rate — The ratio of CRC errors to the number of superframes received.

CRC SES

2
T-BERD 310-S

- OC-1/3 RECEIVE connector (SONET option)
- SECONDARY DS3 RECEIVE jack (DS1 Insert Option)
- OC-12 RECEIVE connector (310-12 SONET option)
- DS1 INSERT INPUT jack (DS1 Insert Option)

When the same signal source is used, the TIMING SLIPS result indicates SAME REF (same reference). If either signal is lost after both signals are present simultaneously, the bit slip result resets to zero and the frame slip result is frozen. As long as either signal is missing, UNAVAILABLE remains in the result. If the DS1 reference signal is lost, REF LOSS appears, the bit slip result resets to zero, and the frame slip result is frozen. If the DS1 test signal is lost, CLK LOSS appears, the bit slip result resets to zero, and the frame slip result is frozen. If the DS1 reference signal and DS1 test signal are lost, only CLK LOSS appears.

2.91 TIME CATEGORY

The TIME category lists current date, time, and timed results. The TIME category results are defined as follows:

TIME

Current Time of Day — The current time of day in hours, minutes, and seconds. The time is set through the TIME-SET TIME auxiliary function.

DATE

Current Date — The current day and month. The date is set through the TIME-SET DATE auxiliary function.

ELAPSED TIME

Elapsed Time — The elapsed time in hours, minutes, and seconds since the last DS1/DS0 Analyzer Option test restart.

TEST LENGTH

Timed Test Length — The currently set test length for a timed test in hours and minutes on the DS1/DS0 Analyzer Option. The test length is set through the TIME-TEST LENGTH auxiliary function.

TIME LEFT

Timed Test Time Left — The time remaining for a timed test in hours, minutes, and seconds on the DS1/DS0 Analyzer Option.

FAR PRM SEC

Far-End Performance Report Seconds — The number of total seconds, since test restart, during which a valid PRM was received. Requires the 310-9A/B option.

PRINTER OPERATION

3.1 INTRODUCTION

The T-BERD 310 can generate four types of printouts: test results, controls, pulse shape, and messages. This section describes each of the printouts and how to generate them using either the RS-232-C or IEEE-488 interface (310-6 IEEE-488 Option required).

3.2 T-BERD 310 PRINTER SETUP

The following connections, controls, indicators, and auxiliary functions are used to set up the printer and T-BERD 310.

3.2.1 Printer Connections

The RS-232 interface is located on the side panel. The connector is configured as a Data Communications Equipment (DCE) connection, which allows you to connect the T-BERD 310 to Data Terminal Equipment (DTE). Connecting to another DCE, such as a modem, is possible using a DCE/DCE adaptor (crossover) cable. Refer to Section 5 for the RS-232 pin assignments.

3.2.2 PRINT Auxiliary Group

The PRINT auxiliary group controls the operation and printout generation when using either the RS-232-C or the IEEE-488 (IEEE-488 Option required) interface.

Table 3-1 shows the auxiliary functions used to configure the interface parameters. The default RS-232 interface settings match the TTC PR-40A printer default parameters. Refer to Section 2 for additional information on the PRINT auxiliary group.

Table 3-1
Printer Control Auxiliary Functions

Auxiliary Function	Definition	Selections
INTERVAL	Timed Printout Interval	0 to 24 Hours/00 to 59 minutes.
MODE	Print Mode	CONTINUOUS or DELTA.
FORMAT	Printout Format	NORMAL, CUSTOM, or SUMMARY.
CUSTOM	Customized Printout Contents	Category, Test Result, or LED/ON or OFF.
GRAPH	Print Pulse Shape Graph	Print PULSE.
BAUD RATE	RS-232 Interface Baud Rate	110, 300, 600, 1200, 2400, 4800, or 9600.
PARITY[1]	RS-232 Interface Parity	EVEN, ODD, or NONE.
TERMINATOR	Line Terminator	CR, LF, or CRLF.
WIDTH	Printout Line Width	40 or 80.
PORT (optional)	Printer/Remote Control Interface Selection	RS-232, IEEE-488/bus 0 to 30, or 488 T/O.
PRINT TYPE	Set Printout Type	RESULTS or CONTROLS.
PRINT EVENT	Set Printout Event	OFF, 15 MIN, 30 MIN, TEST END, ERR SEC, or TIMED.

[1] Word length is controlled by the parity selection, seven bits for odd or even parity and eight bits for no parity.

3.3 DS1/DS0 ANALYZER OPTION PRINTER SETUP

The following connections, controls, indicators, and auxiliary functions are used to set up the printer and DS1/DS0 Analyzer Option.

3.3.1 Printer Connections

Printouts from the DS1/DS0 Analyzer Option are generated through the T-BERD 310 RS-232 interface located on the side panel. The DS1/DS0 Analyzer Option must be connected to the T-BERD 310 through the DS1/DS0 Analyzer Option port connector to generate printouts. Refer to the previous section for additional information on the RS-232 interface.

3.3.2 Printer Controls

The DS1/DS0 Analyzer Option printout generation is controlled through the DS1/DS0 Analyzer Option **PRINT** switch and the T-BERD 310 **PRINT-PRINT EVENT** auxiliary function.

DS1/DS0 Analyzer Option PRINT Switch

The **PRINT** switch generates either a test results or a controls printout. The switch performs the following functions:

RESULTS — This position generates a date- and time-stamped printout of the current DS1/DS0 Analyzer Option test results. Test results become available only after the DS1/DS0 Analyzer Option has received a valid signal. The test results can be customized through the AUX-CUSTOM auxiliary function.

CONTROLS — This position generates a date- and time-stamped printout of the current DS1/DS0 Analyzer Option front-panel and auxiliary function configuration. This printout records how the DS1/DS0 Analyzer Option is configured for testing.

T-BERD 310 PRINT-PRINT EVENT Auxiliary Function

The T-BERD 310 auxiliary function selects the event that automatically initiates a test results printout. Setting it to any print event selection generates both T-BERD 310 and DS1/DS0 Analyzer Option test results. However, the printouts from each unit are generated independently from each other. Refer to the previous section for more information.

3.3.3 Auxiliary Functions

The AUX-CUSTOM auxiliary function determines which DS1 test results and Status and Alarm LED conditions are printed in a customized test results printout. The custom test results printout is selected through the T-BERD 310 PRINT-FORMAT auxiliary function.

The T-BERD 310 PRINT auxiliary group controls the operation and printout generation of the DS1/DS0 Analyzer Option. The following auxiliary functions control the DS1/DS0 Analyzer Option test results printouts in addition to the T-BERD 310 printer configuration.

INTERVAL	Timed Test Length Interval
MODE	Printout Mode
FORMAT	Printout Format
TERMINATOR	Printout Line Terminator
WIDTH	Printout Line Width

Refer to the previous section for additional information on the T-BERD 310 auxiliary functions.

3.4 PRINTOUTS

The T-BERD 310 generates four types of printouts: controls, test results, status messages, and pulse shape. If a printer is not connected to the instrument, the printouts can be generated and stored in a 20-kbyte print buffer.

Depending on the type of printout generated, up to approximately 20 test results printouts, 80 controls printouts, 400 status and alarm messages, or 9 pulse shapes can be stored in the print buffer. If the print buffer is full and a printer is not connected or is off line, the first and the most recent printouts are retained while any newly generated printouts overwrite ones stored in the middle of the print buffer queue. The print buffer can be purged by clearing the PRINT EVENT auxiliary function.

In the event of a power loss, a power-down test results printout is also stored. When power is restored, the printout is generated along with any other stored printouts.

Unless otherwise indicated, the following information also applies to printouts generated by the DS1/DS0 Analyzer Option.

3.4.1 Test Results Printouts

A test results printout is a hard-copy list of the test results accumulated during a test. Figure 3-1 illustrates a sample test results printout. The following information describes the test results printout in Figure 3-1.

```
             NORMAL RESULTS PRINT
-------------------------------------------
Manual Printout                       JUN 5
Continuous Count                   17:57:44
-------------------------------------------
          MAINFRAME TEST RESULTS
-------------------------------------------


  PRIMARY DS3 STATUS
-------------------------------------------
    Signal Present:             ON
    Frame Sync:                 ON
    C-Bit Frame:                ON
    Idle Present:               OFF
    DS2 Frame Sync:             ON
    Pattern Sync:               OFF

  SONET STATUS
-------------------------------------------
    Signal Present:             OFF
                  •
                  •
                  •
    VT Ptr Data:          UNAVAILABLE

  TIME
-------------------------------------------
    Time:                    17:57:44
    Date:                       JUN 5
    Elapsed Time:            00:19:06
    Test Length:                  N/A
    Time Left:                    N/A


               END OF PRINTOUT
```

Figure 3-1
NORMAL RESULTS PRINT Printout

Printout Formats

The format is identified across the top of the test results printout. The format is selected through the PRINT-FORMAT auxiliary function. Depending on the configuration of the T-BERD 310, additional information, Status and Alarm LEDs, and test results may be reported.

NORMAL RESULTS PRINT — Lists all Status and Alarm (current and history) LEDs and test results for primary and secondary inputs.

CUSTOM RESULTS PRINT — Lists the user-selected Status and Alarm LEDs, FEAC codes, and test results for primary and secondary inputs. The individual test results and LEDs are selected through the T-BERD 310 PRINT-CUSTOM auxiliary function and the DS1/DS0 Analyzer Option AUX-CUSTOM auxiliary function.

SUMMARY RESULTS PRINT — Lists the Status and Alarm LEDs, the SUMMARY category test results or messages, and the DS3 far-end alarm (FEAC) messages for primary and secondary inputs.

Print Type

The print type identifies how the printout was generated. The print types include:

15-Minute Timed Results — Indicates the PRINT EVENT auxiliary function set to 15 MIN.

30-Minute Timed Results — Indicates the PRINT EVENT auxiliary function was set to 30 MIN.

Errored Second Results — Indicates the PRINT EVENT auxiliary function was set to ERR SEC.

Manual — Indicates the PRINT auxiliary function was executed to initiate the test results printout.

Power Down — Initiated by a power loss. The printout is generated immediately after power up.

Squelch Off — Indicates the printout was generated after the printer squelch feature has been turned on and then turned off.

Test End — Indicates the PRINT EVENT auxiliary function was set to TEST END and the printout was initiated at the end of a timed test.

Timed Results — Indicates the PRINT EVENT auxiliary function was set to TIMED and the printout was generated at a specified interval. The test interval is set in the PRINT-INTERVAL auxiliary function.

Print Mode

The third line of the test results printout identifies the print mode (Continuous or Delta) that was used to accumulate the test results during the test. The print mode is selected with the PRINT-MODE auxiliary function. When the continuous print mode is used, the printed test results are continuously accumulated from test restart. When the delta print mode is used, the printed test results are accumulated from a test restart or the previous delta printout. Each time a printout is generated, the test results stored in the print buffer are reset to zero. Manual and power-down printouts are always printed in continuous mode regardless of the PRINT-MODE auxiliary function setting. The print mode only affects the printed test results, not the displayed test results.

Date and Time

The date and time on the printout indicate when the printout was requested; not when it was printed. The printouts are printed in sequential order by date and time. The date and time are set through the TIME-SET DATE and TIME-SET TIME auxiliary functions.

Status and Alarm LEDs

The printout shows which DS3 (Primary and Secondary) and DS1 Status and Alarm LEDs are ON or OFF at the time the printout was generated.

Printed Test Result

The test results are listed by category. The available test results depend on the configuration of the T-BERD 310 (and DS1/DS0 Analyzer Option). Test results that are *not available* display the message *UNAVAILABLE* in place of the result count. The test results that are *not applicable* to the current mode display *N/A* in place of the result count. When the count exceeds 99,999,999, a ">" (greater than sign) precedes the result, the number rolls over, and the count continues.

End of Printout

A normal test results printout ends with the message *END OF PRINTOUT.* However, if the printout is terminated before it is finished, the message *PRINTOUT TERMINATED BY USER* is issued.

3.4.2 Controls Printout

The controls printout lists the current setting of the T-BERD 310 (and DS1/DS0 Analyzer Option) front-panel switches and the auxiliary functions. The MAINFRAME CONTROLS PRINT is initiated by setting the PRINT-PRINT TYPE auxiliary function to CONTROLS. Figure 3-2 is an example of a MAINFRAME CONTROLS PRINT printout.

```
        MAINFRAME CONTROLS PRINT
----------------------------------------
JUN 5                           18:01:58
----------------------------------------

  DS3 PANEL SETTINGS
----------------------------------------
    Mode:                   MUXED C-BIT
    Pattern:                   T1D4 QRSS
    DS3 Source:                 EXTERNAL
    Test Type:                CONTINUOUS
    TX Timing:                  INTERNAL
    DS1 Insert Channel:             NONE
    DS1 Drop Channel:                  9
                  •
                  •
                  •
      User3:    T-Berd 310: Communi...
    Orderwire:                      NONE

           END OF PRINTOUT
```

Figure 3-2
MAINFRAME CONTROLS PRINT Printout

3.4.3 Printed Messages

Status, alarm, and note messages are initiated automatically when an important development or condition occurs. The 2-line message format includes the type of message (status, alarm, or note), the message identifying the reported condition, time, date, and the number of times the condition has occurred. Figure 3-3 illustrates a typical sequence of status messages at a test restart. The messages are described in Appendix B.

```
*** NOTE:                  DS3 Test Restart
    MAR 05 10:12:25                     001
*** NOTE:             DS3 New Configuration
    MAR 05 10:12:26                     001
*** STATUS:    DS3 Primary Signal Present
    MAR 05 10:12:27                     001
*** STATUS: DS3 Primary C-Bit Frame Sync
    MAR 05 10:12:28                     001
*** STATUS:      DS3 Primary Pattern Sync
    MAR 05 10:12:29                     001
*** NOTE:                 DS3 Test Complete
    MAR 05 12:12:30                     001
```

Figure 3-3
Reporting Status Messages

Status Messages

Status messages indicate positive conditions in the received signal and relate to the state of the Status LEDs. Status messages start with the header "*** STATUS:".

Alarm Messages

Alarm messages indicate negative conditions in the received signal and relate to the state of the Alarm LEDs. Alarm messages start with the header "*** ALARM:".

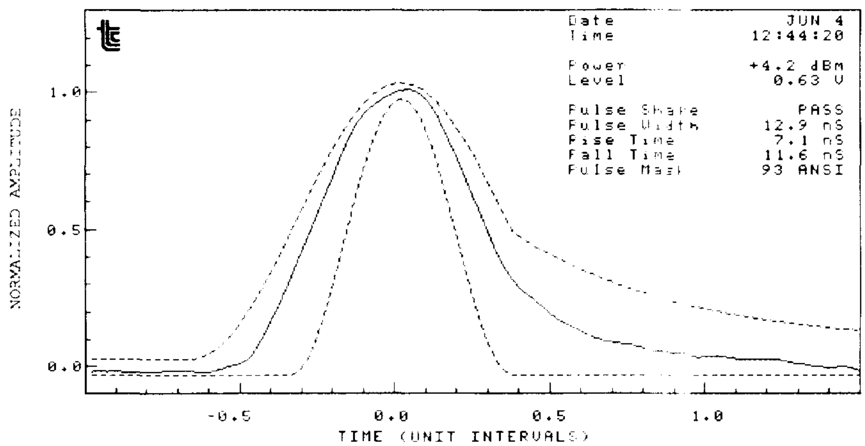
Note Messages

Note messages indicate conditions affecting the operation of the T-BERD 310. Note messages start with the header "*** NOTE:".

3.4.4 Pulse Shape Graph

The T-BERD 310 pulse shape graph provides a graphic printout of the normalized DS3 pulse shape. The pulse shape graph includes the pulse shape, date, time, power in dBm, level in volts, pulse shape pass/fail indication, pulse width, rise time, fall time, and the selected pulse mask. Figure 3-4 illustrates a typical pulse shape graph.

A graphics compatible printer with parity set to none, e.g., the TTC PR-40A Thermal Printer, and connected to the RS-232 interface is required to print the pulse shape printout. The pulse mask is selected through the MISC-PULSE MASK auxiliary function. The pulse shape graph is generated through the PRINT-GRAPH auxiliary function. If the received signal is not present and the PRINT-GRAPH auxiliary function is executed, the message *Pulse Shape Unavailable* is printed in place of the graph.



9500518-00

Figure 3-4
DS3 Pulse Shape Graph

3.4.5 Printer Squelch Feature

The automatic printer squelch feature prevents 20 or more errored second test results printouts or status and alarm messages from being generated in a 60-second period. After the 20th printout, the following message is printed indicating that the squelch is on.

```
*** NOTE:                     Squelch On
    MAR 05  12:12:30                 001
```

While the squelch feature is on, the T-BERD 310 continues to monitor for errored events, but no automatic errored second test results printouts or status and alarm messages are generated or stored. The timed and manual printouts are not affected by the squelch feature.

The squelch is turned off when five or less errored second test results printouts or status and alarm messages occur in a 60-second period. When this condition is met, the following message is printed indicating that the squelch is off.

```
*** NOTE:                    Squelch Off
    MAR 05  12:12:30                 001
```

A SQUELCH OFF test results printout immediately follows the *Squelch Off* message. Both printouts occur only when the squelch is turned off automatically. A status and alarm message count is also printed. The test results and message counts continue to accumulate when the squelch feature is on.

NOTE: The squelch feature is reset by pressing the **RESTART** switch, changing the PRINT-PRINT EVENT auxiliary function to OFF, changing the test length, or completing a timed test.

3.4.6 DS1 SCAN Test Results Printout

The DS1/DS0 Analyzer Option DS1 SCAN test results printout (see Figure 3-5) presents the accumulated test results during a continuous DS1 scan mode test. The DS1 SCAN test results printout is only available when SCAN mode is set to CONTINUE.

NOTE: When SCAN mode is set to TRIGGER a test results printout is not available. Once the selected trigger criteria is met, the message **** NOTE: 08:34:35 Trigger Event Found* is generated. This signifies that a standard test results printout (not a scan printout) can be generated.

SCAN RESULTS PRINT

Manual Printout JUN 5
17:47:25

DS1 SCAN RESULTS

Cycles: 2
Channel: 7

CHANNEL	FRAMING	FRM LOSS	FRM ERR	CRC ERR	ALL ONES	YELLOW	TM SLIPS	SRC LOSS
1	D4							
2	D4							
3	D4							
4	D4	H	H					
5	D4							
•								
•								
•								
23	D4							
24	D4	H	HC		H			H
25	D4							
26	D4							
27	D4							
28	D4							

END OF PRINTOUT

Figure 3-5
DS1 SCAN RESULTS Printout

Initiate the DS1 SCAN test results printout manually by pressing the DS1/DS0 Analyzer Option **PRINT RESULTS** switch or automatically by setting the PRINT-PRINT EVENT auxiliary function to 30 MIN or 15 MIN. If the auxiliary function is set to TEST END or ERR SEC, a DS1 SCAN test results printout is generated when the channel state changes. In order for a channel state change to be detected, two previous scan cycles must occur. The DS1 SCAN RESULTS printout presents the following information:

Cycles — Indicates the number of completed scan cycles.

Channels — Indicates the current channel being scanned at the time of the printout.

FRAMING — Indicates the framing format of the indicated channel which include: SLC, UNF (unframed), ESF, D4, and E1. A question mark (?) indicates an unknown problem with the dropped channel. A dash (-) indicates a gap channel in an E1 filled DS2 group.

FRM LOSS — Indicates a frame loss occurred.

FRM ERR — Indicates a frame error occurred.

CRC ERR — Indicates a CRC error occurred.

ALL ONES — Indicates an All Ones signal occurred.

YELLOW — Indicates a Yellow Alarm occurred.

SLIPS — Indicates a timing slip occurred (requires the 310-9A/B option and test reference source). An "**R**" appears on the indicated channel when the test reference source is not available.

SRC LOSS — Indicates the status of the signal source from which the DS1 channels are being dropped.

The error and alarm condition are indicated as follows:

C — The error or alarm is occurring at the moment of the printout.

H — The error or alarm occurred at some point in the past of the printout.

Blank — The condition has not occurred since the last test restart or initial signal presence.

3.5 COMPATIBLE PRINTERS

The T-BERD 310 generates printouts to either an RS-232-compatible serial or an IEEE-488-compatible listen-only, graphics dot-matrix printer. A graphics printer (TTC PR-40A or equivalent) is required to print the pulse shape printout. Table 3-2 lists the printer configurations available with the T-BERD 310.

Table 3-2
T-BERD 310 Printer Capabilities

Function	Selections
Printer Interfaces	RS-232-C — female 25-pin D connector. IEEE-488 — parallel connector.
Data Rates	RS-232-C — 110, 300, 600, 1200, 2400, 4800, or 9600 b/s. IEEE-488 — 300 words per second.
Character Length	RS-232-C — 7 bits with parity or 8 bits without parity. IEEE-488 — 8 bits.
Line Terminator	RS-232-C — CR, LF, or CRLF. IEEE-488 — CR, LF, or CRLF with EOI.
Flow Control	RS-232-C — DTR/CTS and in-band XON/XOFF supported.
Parity	RS-232-C — odd, even, or none.
Interface Configuration	RS-232-C — DCE. IEEE-488 — talk only or addressable.
Start Bits	RS-232-C — 1 bit.
Stop Bits	RS-232-C — 2 bits on transmit, 1 or more on receive.
Column Width	40 or 80.
Timing	RS-232-C — Asynchronous.
Character Format	ASCII.

3.6 PRINTING WITH THE TTC PR-40A THERMAL PRINTER

Use the following information to configure the T-BERD 310 to print with the TTC PR-40A Thermal Printer. The RS-232 interface default settings match the TTC PR-40A printer default parameters. The easiest way to configure the T-BERD 310 for the PR-40A printer is to press the **RESTART** switch during power-up. This reconfigures the T-BERD 310 with the factory defaults. The PR-40A factory defaults are listed in Table 3-3. The factory defaults for the PRINT auxiliary group are listed in Table 3-4.

NOTE: Pressing the **RESTART** switch during power-up clears ALL previous T-BERD 310 configurations and reconfigures the T-BERD 310 with the factory defaults.

Table 3-3
PR-40A Printer Default Settings

Switch	Position	Function	Parameter
		Printer Control DIP Switches	
SW1	OFF	Data Input	Serial
SW2	ON	Auto Line Feed	Enable
SW3	ON	Columns Per Line	40
SW4	OFF	Character Selection	Special
SW5	OFF	Zero Format	Ø
SW6	OFF	International Characters	USA
SW7	ON	International Characters	USA
SW8	ON	International Characters	USA
		RS-232 DIP Switches	
SW1	ON	Data Bits	8 (GRAPHICS)
SW2	ON	Parity	DISABLED
SW3	OFF	Parity Selection	EVEN
SW4	OFF	Baud Rate	2400
SW5	ON	Baud Rate	2400
SW6	OFF	Baud Rate	2400

Table 3-4
T-BERD 310 PRINT Auxiliary Group

Auxiliary Function	Factory Default	Description
Printer Control		
INTERVAL	06:00	Timed Test Length Interval
MODE	Continuous	Printout Mode
FORMAT	Normal	Printout Format
CUSTOM	All Off	Customized Printout Contents
GRAPH	N/A	Print Pulse Shape Graph
WIDTH	40	Printout Line Width
RS-232 Interface Control		
BAUD RATE	2400	RS-232 Interface Baud Rate
PARITY	None	RS-232 Interface Parity
TERMINATOR	CR	Printout Line Terminator
PORT[1]	RS-232	Printer/Remote Control Interface Selection

[1] Only appears when the IEEE-488 Option is installed.

3.7 PRINTING WITH AN IEEE-488 COMPATIBLE PRINTER

Use Table 3-5 to configure the T-BERD 310 to generate test results and controls printouts with an IEEE-488 compatible printer. The PRINT-TERMINATOR auxiliary function must be set for the proper line terminator. The PRINT-PORT auxiliary function must be set to 488 T/O to select the IEEE-488 interface in talk-only mode.

Table 3-5
IEEE-488 Printer Requirements

Function	Parameter
Printer Interface	Parallel connector.
Data Rate	300 words per second.
Character Length	8 bits.
Line Terminator	CR, LF, or CRLF with EOI.
Interface Configuration	Talk only or addressable.

REMOTE CONTROL OPERATION

REMOTE CONTROL OPERATION

4.1 INTRODUCTION

During normal operation, the T-BERD 310 can be setup and controlled through either an RS-232-compatible or an IEEE-488-compatible remote control device. The following information describes the remote control capabilities and setup procedures to configure the T-BERD 310 for remote control operation. Table 4-1 lists the interface capabilities available from the T-BERD 310.

Table 4-2 lists the PRINT auxiliary group used to configure the RS-232-C and IEEE-488 interfaces for remote control operation. The presentation of the T-BERD 310 test result, front panel controls, and alarm and status message printouts sent to the remote control device are described in Sections 2 and 3.

Table 4-1
T-BERD 310 Remote Control Capabilities

Function	Capabilities
Remote Interfaces	RS-232-C — female 25-pin D connector. IEEE-488 — parallel connector
Data Rate	RS-232-C — 110, 300, 600, 1200, 2400, 4800, or 9600 b/s. IEEE-488 — 300 words per second.
Character Length	RS-232-C — 7 bits with parity or 8 bits without parity. IEEE-488 — 8 bits.
Line Terminator	RS-232-C — CR, LF, or CRLF. IEEE-488 — CR, LF, or CRLF with EOI.
Flow Control	RS-232-C — DTR/CTS or in-band XON/XOFF supported.
Parity	RS-232-C — odd, even, or none.
Interface Configuration	RS-232-C — DCE. IEEE-488 — addressable.
Start Bits	RS-232-C — 1 bit.
Stop Bits	RS-232-C — 1 bit on transmit, 1 or more on receive.
Column Width	40 or 80.
Timing	RS-232-C — Asynchronous.
Character Format	ASCII character set.

Table 4-2
PRINT Auxiliary Group Parameters

Auxiliary Function	Definition	Selections
BAUD RATE	RS-232 Interface Baud Rate	110, 300, 600, 1200, 2400, 4800, or 9600.
PARITY[1]	RS-232 Interface Parity	EVEN, ODD, or NONE.
TERMINATOR[2]	Printout Line Terminator	CR, LF, or CRLF.
WIDTH	Printout Line Width	40 or 80.
PORT	Printer/Remote Control Interface Port Selection	RS-232, IEEE-488/bus 0 to 30, or 488 T/O.

[1] Word length is controlled by the parity selection, 7 bits for odd or even parity and 8 bits for no parity.
[2] When entering remote control operation, the line terminator defaults to CRLF.

4.2 RS-232 REMOTE CONTROL OPERATION

The RS-232-C interface enables the user to remotely control the T-BERD 310 from either a dumb terminal or a computer. The RS-232 interface is a 25-pin female D connector located on the side panel. It is configured to function as data communication equipment (DCE) and it can be connected directly to data terminal equipment (DTE). Connecting to another DCE is possible with the use of an adaptor cable. Auxiliary functions select the baud rate, parity error detection format, and line terminator. Refer to Section 5 for a description of the RS-232 connector pin assignments.

4.2.1 Setup for Remote Control Operation

Before entering remote control through the RS-232 interface, the baud rate, line termination character, and parity must be set to ensure the T-BERD 310 is properly configured to communicate with the remote control device. The baud rate and parity can only be configured manually from auxiliary functions or the autobaud function. The following information describes how to setup the T-BERD 310 for manual or autobaud operation.

Manual Setup for Remote Control Operation

Use the following procedure to manually set the baud rate and parity from the front panel to match the settings of the intended remote control device.

1. **Press the AUX switch**
   Select the auxiliary functions.

2. **Press the MODE switch**
   Select the PRINT auxiliary group.

3. **Press the PATTERN switch to select the PRINT-BAUD RATE auxiliary function**
   Press the **RESULTS I Results** switch to select one of the following baud rates: 110, 300, 600, 1200, 2400 (default), 4800, or 9600.

4. **Press the PATTERN switch to select the PRINT-PARITY auxiliary function**
   Press the **RESULTS I Results** switch to select one of the following parity types: ODD, EVEN, or NONE. When setting PARITY to ODD or EVEN, the number of data bits equals seven; when PARITY is set to NONE, the number of data bits equals eight.

5. **Press the PATTERN switch to select the PRINT-TERMINATOR auxiliary function**
   Press the **RESULTS I Results** switch to select one of the following line termination characters: CR, LF, or CRLF.

6. **Press the AUX switch**
   Leave the auxiliary functions.

7. **Terminal or remote operation**
   For terminal mode operation, at the remote device, press the < . > (period) key and <RETURN>, or enter the **TERminal** command and <RETURN>. The following messages appear when the T-BERD 310 and remote control device enter terminal mode. The prompt (>) indicates the T-BERD 310 is ready to receive commands.

```
Terminal mode activated.
Enter "HELP" or "?" followed by <RETURN> for help.
>
```

   For remote mode operation, at the remote device, press the < , > (comma) key and <RETURN>, or enter the **REMote** command and <RETURN>. The following message appears when the T-BERD 310 and remote control device enter the remote mode. Commands are entered in the dark; character echo is disabled.

```
Remote control activated, now in control.
```

Autobaud Setup for Terminal or Remote Control Operation

The autobaud function allows baud rate, number of data bits, and parity values to be automatically configured. The autobaud function offers possible baud rates of 300, 600, 1200, 2400, 4800, and 9600 and possible parity settings of even, odd, or none. The number of data bits is determined by the parity setting. To establish communication between the remote control unit and the T-BERD 310 through the autobaud function, perform the following procedure from the remote device.

CAUTION: The remote device must be capable of sending a BREAK signal to the T-BERD 310 to use the autobaud feature.

NOTE: The autobaud function must be completed within 30 seconds. If autobaud is not acquired within the 30-second period, the autobaud function is aborted and the message *Autobaud aborted.* is printed to the remote device using the current the communication settings.

1. **Press the <BREAK> key once**
   The following message should appear.

```
Autobaud sequence initiated...
Press <BREAK> again, then hold down the <SPACEBAR> to enter autobaud
mode; or press <SPACEBAR> to abort.
```

2. **Press the <BREAK> key again, then press the <SPACEBAR> once a second until the following message appears**

```
Autobaud achieved.  Press <ESCAPE> to continue.
```

3. **Press the <ESCAPE> key once**
   The following messages appear when the T-BERD 310 and remote control device are ready to enter remote or terminal mode.

```
Character format determined.
New baud rate now in effect.
```

4. **Terminal or remote operation**
   For terminal mode operation, at the remote device, press the < . > (period) key or enter the **TERminal** command and <RETURN>. The following messages appear when the T-BERD 310 and remote control device enter terminal mode. The prompt (>) indicates the T-BERD 310 is ready to receive commands.

```
Terminal mode activated.
Enter "HELP" or "?" followed by <RETURN> for help.
>
```

For remote mode, at the remote device, press the < , > (comma) key or enter the REMote command and <RETURN>. The following message appears when the T-BERD 310 and remote control device enter remote mode. Commands are entered in the dark; character echo is disabled.

```
Remote control activated, now in control.
```

4.2.2 Remote Control Modes

When operating in remote control through the RS-232 interface, the T-BERD 310 functions in either an interactive terminal mode or non-interactive remote mode.

The interactive terminal mode is used with either a dumb terminal or an interactive communications package on a personal computer emulating a dumb terminal that is connected directly to the T-BERD 310. The terminal mode (1) provides a prompt string whenever the T-BERD 310 is ready to receive a command, (2) echoes all characters back to the remote device as they are keyed in, and (3) enables access to the test results from the front panel. After entering the terminal mode, the **LOCal** command returns control of the T-BERD 310 to the front panel. The message *232 REMOTE CONTROL* flashes in the MODE/PATTERN window while the T-BERD 310 is in terminal mode.

The non-interactive remote mode allows direct interaction between the remote computer and the T-BERD 310 without interruption from the T-BERD 310. The remote mode does *not* (1) provide a prompt character, (2) echo characters back, and (3) provide front panel access. Commands are entered in the dark and automatic printouts and error messages are sent to the remote computer only upon request. The message *232 REMOTE CONTROL* flashes in the MODE/PATTERN window while the T-BERD 310 is in remote mode. After entering the remote mode, the **LOCal** command returns control of the T-BERD 310 to the front panel.

4.2.3 Prompts in Terminal Mode

Three possible prompts can be generated by the T-BERD 310 in the terminal mode: default greater than sign (>), user-defined, and printer-hold plus sign (+) prompts. The default ">" prompt appears when the T-BERD 310 is first placed in terminal mode. A user-defined prompt (up to 32 characters) can be created to replace the default prompt. The user-defined prompt is created by sending the **PROmpt STRing <prompt string>** command (where **<prompt string>** are ASCII characters). This can also be used to create a prompt that identifies the T-BERD 310 attached to the terminal. A user-defined prompt is saved when the T-BERD 310 power is turned OFF. The printer-hold "+" prompt replaces the previous prompt in response to the **HOLd** command. The "+" prompt indicates that the print buffer is not sending printouts to the terminal. Sending the **RELease** command releases the printer hold, which allows printouts to be generated again and returns the prompt to its pre-hold state.

4.2.4 Terminating Terminal or Remote Control Operation

To end any remote operation and return the T-BERD 310 to local control, send either **LOCal** or "**/**" followed by a <RETURN>. The T-BERD 310 front panel controls are returned to local control and the *232 REMOTE CONTROL* message is no longer displayed.

NOTE: Turning the power OFF also aborts a remote operating mode.

4.3 IEEE-488 REMOTE CONTROL OPERATION

The 310-6 IEEE-488 Option interface allows the T-BERD 310 to be connected to an IEEE-488 bus. The IEEE-488 interface and operating mode (addressable or talk-only) is selected through the PRINT-PORT auxiliary function.

In the addressable mode, the T-BERD 310 IEEE-488 bus address (a value between 0 and 30) must be set in the PRINT-PORT auxiliary function. The T-BERD 310 address allows the controller to designate the T-BERD 310 as a "listen" (receive remote commands) or "talk" (send data) device. The IEEE-488 interface connection is located on the T-BERD 310 side panel above the RS-232-C interface connector. Refer to Section 5 for information on the IEEE-488 connector pin assignments.

4.3.1 IEEE-488 Interface Remote Control Setup Procedure

The following setup procedure applies to configuring the IEEE-488 interface for remote control operation.

1. **Press the AUX switch**
   Select the auxiliary functions.

2. **Press the MODE switch**
   Select the PRINT auxiliary group.

3. **Press the PATTERN switch**
   Select the PRINT-PORT auxiliary function.

4. **Press the RESULTS I Results switch**
   Select one of the following port configurations:

   488 T/O — Refer to Section 3 for the IEEE-488 talk-only printer operation.
   IEEE-488 — Continue with the IEEE-488 addressable setup procedure.

5. Press the RESULTS II Results switch
Select the bus address from 0 to 30. The address should be unique to this instrument.

6. Press the PATTERN switch to select the PRINT-TERMINATOR auxiliary function
Select one of the following line termination characters: CR, LF, or CRLF.

7. Press the AUX switch
Leave the auxiliary functions.

4.3.2 Remote Control Mode

Prior knowledge of IEEE-488 controller programming and operation is recommended before attempting to operate the T-BERD 310 through the IEEE-488 connector. The following sections describe how to set up and operate the T-BERD 310 from an IEEE-488 controller.

In the IEEE-488 addressable remote control mode, the T-BERD 310 bus address must be set to a value between 0 and 30. This address is used by the controller to determine which device is being addressed.

Unlike an RS-232 connection, the IEEE-488 bus requires that one device on the bus act as a controller. All other devices connected to the bus must act as slaves to that controller. The T-BERD 310 can only act as a slave; another intelligent device must act as the bus controller.

The following steps are typically performed during a remote control input sequence.

1. The controller device addresses the T-BERD 310.
2. The controller sends a valid remote control command.
3. The controller sends a valid remote control line terminator.
4. When the line terminator is received, the T-BERD 310 analyzes the remote command and performs the appropriate action.

When the characters are received, the ASCII null characters are discarded and the remaining characters are saved until the line terminator is received. Upon receipt of the line terminator, the received command is analyzed. If no error is detected, the T-BERD 310 performs the appropriate action and then prepares to receive another command. However, if an error is detected in the command string, an SRQ is asserted and the Least Significant Bit (LSB) of the serial poll register is set. If a response is appropriate, the Most Significant Bit (MSB) is set and an SRQ is asserted.

The line terminator transmitted from the T-BERD 310 can be set to carriage return (CR), linefeed (LF), or both (CRLF). Regardless of the mode or line terminator selection, the EOI signal is asserted with the final character of an entire output.

4.3.3 IEEE-488 Programming Hints

Before attempting to read data from a device, it is necessary to know if the device has data to send. The controller has two ways of determining that the T-BERD 310 has data: (1) Bit 7 of the serial poll register (DAV) is set whenever a line of data is available and (2) the T-BERD 310 sends an SRQ to the IEEE-488 controller whenever it has data available. An SRQ can also occur when any remote control error is detected.

The statement used to read data from the T-BERD 310 must be able to terminate the read operation when it encounters the last character of the line. The most foolproof way to detect the last character is by sensing the EOI signal.

4.3.4 Remote Control Commands

The following remote control commands *cannot* be used when controlling the T-BERD 310 from an IEEE-488 controller. An error message may occur when attempting to use any of these commands.

ECHo	Echo in Terminal Mode
LOCal	Return Control to the Front Panel
PROmpt	Prompts in Terminal Mode

4.4 T-BERD 310 REMOTE CONTROL COMMANDS

This section presents the formats and entry sequence for remote control commands, as well as an alphabetical list of all the remote control commands. The T-BERD 310 remote control commands are described in Appendix E in alphabetical order.

Three primary command types are available with the T-BERD 310 remote control facility:

- Switch commands set the T-BERD 310 front-panel switches.
- Auxiliary commands set the T-BERD 310 auxiliary functions.
- Control commands pertain exclusively to remote control operation.

4.4.1 Command Formats And Entry Sequence

The general format for any remote control command is:

command_name or
command_name [parameter]

The **command_name** entry specifies the name of the executed command. The **command_name** may be abbreviated to the first three characters (e.g., **TERminal**), however some **command_names** require additional characters (e.g., **RESTART**). Multiple word **command_names** require a space between each word.

The **[parameter]** entry specifies any parameter(s) associated with the command. A **[parameter]** must be separated from the **command_name** by at least one space. The **[parameter]** may be abbreviated to the first three characters (e.g., **TRAnsmit TIMing [EXTernal]**), however some **[parameters]** require additional characters (e.g., **DS1 LP CODe [FAC1]** or **PATTern [USER1]**). Multiple word **[parameters]** require a space between each word. The on-line **HELP <command>** page displays the required characters in UPPERCASE and the optional characters in lowercase.

NOTE: The DS1/DS0 Analyzer Option commands require an "@" character to precede each command to distinguish the command from the T-BERD 310 mainframe commands. Refer to Section 4.5 for additional information.

Most remote control commands can be used to select a new command state or to display the status of the command. To select a new command state, enter both the **command_name [parameter]** string on the command line. To display the current state of a command, enter the **command_name** only or follow it with a space and a question mark (**?**). Note, however, that some commands (e.g., **CLS**) are "executable only" and have no current or changeable state. The **command_name [parameter]** string should always be followed by a <RETURN>.

Error messages are generated by improper command and parameter syntax, parameters out-of-range, or improper configurations. Error messages are formatted with the prefix "*****ERROR**" or "*****WARNING**", the message indicating the problem, and in some cases the improperly entered command or parameter. Error messages are available in all modes. The error and warning messages are described in Appendix B.

Remote control commands are divided into three basic groups: switch commands, auxiliary function commands, and remote control-only commands. The command groups are described in the following sections.

4.4.2 Front-Panel Switch Commands

The T-BERD 310 switch commands control the functions normally associated with the front panel switches. Mnemonics represent the first three characters of the switch name or switch position as it appears on the front panel. Table 4-3 lists the switch commands that apply to the mainframe switches. The brackets ([ ]) indicate the availability of associated parameters. The parameters associated with each command are described in Appendix E.

Table 4-3
Front-Panel Switch Commands

Command	Switch Name	Description
ATM HEC ERRor INSert [ ]	ERROR INSERT-ATM HEC	Insert ATM HEC errors
DISplay HOLd [ ]	DISPLAY HOLD	Locks out front panel result or LED updates.
DS1 DROp CHAnnel [ ]	Channel Control DS3-DS1 (Drop)	Select DS1 Channel to be dropped from a DS3 signal.
DS1 INSert CHAnnel [ ]	Channel Control DS3-DS1 (Insert)	Select DS1 Channel to be inserted into a DS3 signal.
DS3 SOUrce [ ]	DS3 SOURCE	Specify EXT or SONET as the source of the DS3 signal to analyze.
ERRor INSert BPV	ERROR INSERT-BPV	Insert DS3 BPV errors.
ERRor INSert FRAme	ERROR INSERT-FRAME	Insert DS3 Frame errors.
ERRor INSert LOGic	ERROR INSERT-LOGIC	Insert DS3 Logic bit errors.
HIStory RESet	HISTORY RESET	Reset History SONET, ATM and DS3 LEDs.
MODe [ ]	Setup - DS3 (Mode)	Specify DS3 Framing Mode.
PATTern [ ]	Setup - DS3 (Pattern)	Specify DS3 Pattern type.
RES1 [ ]	RESULTS I	Set front panel results display to a category.
RES2 [ ]	RESULTS II	Set front panel results display to a category.
RESTART	RESTART	Restart a mainframe test.
RESULTS	PRINT RESULTS	Generate Test Results Printout
SONet ALArm [ ]	ALARM INSERT	Insert a SONET Alarm.
SONet DROp [ ]	Setup - SONET RX (Payload)	Specify a SONET Payload type to receive.
SONet DS1 CHAnnel RX[ ]	Channel Control - STS-VT (Drop)	Specify a VT1.5 channel to analyze in the selected STS-1.
SONet DS1 CHAnnel TX[ ]	Channel Control - STS-VT (Insert)	Specify a VT1.5 channel to insert in the selected STS-1.
SONet ERRor INSert	ERROR INSERT-SONET	Insert a SONET error.
SONet INPut	SETUP - SONET RX (Rate)	Specify a SONET rate to receive.
SONet INSert	SETUP - SONET TX (Payload)	Specify a SONET payload type to transmit.
SONet OUTput	SETUP - SONET TX (Rate)	Specify a SONET rate to transmit.
SONet STS ID RX	Channel Control SONET-STS (Drop)	Specify a SONET STS-1 channel to receive.
SONet STS ID TX	Channel Control SONET-STS (Insert)	Specify a SONET STS-1 channel to insert.
SONet TIMing [ ]	SONET TRANSMIT TIMING	Specify a timing source to transmit a SONET signal.
TRAnsmit TIMing [ ]	DS3 TRANSMIT TIMING	Specify a timing source to transmit a DS3 signal.

4.4.3 Auxiliary Function Commands

The T-BERD 310 auxiliary function commands set the parameters of the auxiliary functions. Table 4-4 lists the auxiliary function commands that apply to the mainframe auxiliary functions. The brackets ([ ]) indicate the availability of associated parameters. The parameters associated with each command are described in Appendix E.

Table 4-4
Auxiliary Function Commands

Command	Auxiliary Function Name	Description
	ERR INSERT Auxiliary Group	
FRAme ERRor [ ]	ERR INSERT-FRAME ERROR	Sets the DS3 Frame Error Insert function to 1/M-Frame or 2/M-Frame.
LOG/bpv BURst [ ]	ERR INSERT-LOG/BPV BUR	Set Logic/BPV Burst Duration.
LOG/bpv RaTe [ ]	ERR INSERT-LOG/BPV RT	Sets the DS3 Logic and BPV Error Insert Rate.
	ERR RECEIVE Auxiliary Group	
ERRor THReshold [ ]	ERR RECEIVE-ERROR THR	Sets the error rate threshold for DS3 Severely Errored Seconds.
FRaMe LOSs THReshold [ ]	ERR RECEIVE-FRM LOSS THR	Sets the DS3 Frame Loss Threshold at 3 of 15 frames or 6 of 15 frames.
PARity ERRor RT [ ]	ERR RECEIVE-PAR ERR RT	Sets DS3 Parity Error Calculation for Bit or Block mode.
PATTern LOSs THReshold [ ]	ERR RECEIVE-PAT LOSS THR	Sets the DS3 Pattern Loss Threshold for Fast or Slow.
	MUXED TX Auxiliary Group	
DS1 LP CODe [ ]	MUXED TX-DS1 LP CODE	Sets the DS1 loopback in Muxed DS3 mode to CSU, FAC1, FAC2 or User.
PGM LPDn [ ]	MUXED TX-PGM LPDN	Programs the User DS1 Loop Down code.
PGM LPUp [ ]	MUXED TX-PGM LPUP	Programs the User DS1 Loop Up code.

Table 4-4
Auxiliary Function Commands (Continued)

TIME Auxiliary Group		
SET DATe [ ]	TIME-SET DATE	Sets the calendar date.
SET TIMe [ ]	TIME-SET TIME	Set the time of day.
TESt [ ]	TEST LENGTH	Configures a test for timed or continuous operation.
TESt LENgth [ ]	TIME-TEST LENGTH	Configures a test length for a timed test.
PRINT Auxiliary Group		
CONtrols [ ]	CONTROLS	Generate a Mainframe Controls printout.
PRInt BAUd RATe	PRINT-BAUD RATE	Print RS-232 interface baud rate.
PRInt CUStom [ ]	PRINT-CUSTOM	Configure a custom Results printout.
PRInt EVEnt [ ]	PRINT-EVENT	Set up a print event operation, including timed, errored second, test end, 15 minute, 30 minute.
PRInt FORmat [ ]	PRINT-FORMAT	Select a Test Results printout format; normal, summary or custom.
PRInt GRAph	PRINT-GRAPH	Print a DS3 Pulse Shape graph
PRInt INTerval [ ]	PRINT-INTERVAL	Set a custom print interval in hours:minutes.
PRInt MODe [ ]	PRINT-MODE	Select a printer results mode; Delta or Continuous.
PRInt PARity	PRINT-PARITY	Print RS-232 interface parity
PRInt TERminator [ ]	PRINT-TERMINATOR	Set line termination character: cr, lf or crlf
PRInt WIDth [ ]	PRINT-WIDTH	Set a printout and display line width of 40 or 80 characters.
RESUlts	RESULTS	Generate a Mainframe Results printout.

Table 4-4
Auxiliary Function Commands (Continued)

MISC Auxiliary Group		
BEEp CRIteria [ ]	MISC-BEEP CRI	Configure the automatic beep on selected events.
BLUe SIGnal CRIteria [ ]	MISC-BLU SIG CRI	Select the blue signal criteria for 1010 or Stuck C-Bit algorithms.
DS1 BITs CLK [ ]	MISC-DS1 BITS CLK	Select an input termination setting for the BITS clock input jack; term or bridge.
DS1 LINecode [ ]	MISC-DS1 LINECODE	Select a DS1 linecoding for AMI or B8ZS from the mainframe.
DS1 SIGnaling BITs [ ]	MISC-DS1 SIG BITS	Configure the SONET receiver for pass through or outslot treatment of signaling bits in byte sync mode.
DS1/VT MAP [ ]	MISC-DS1/VT MAP	Configure the SONET DS1 mappings either sequentially, according to Bellcore, or similar to M13 mux equipment.
FEAc ALArms [ ]	MISC-FEAC ALARMS	Generate Far End Alarms in DS3 C-Bit mode.
FEAc LOOp [ ]	MISC-FEAC LOOP	Generate Far End Loop Codes in DS3 C-Bit mode.
LCD CONtrast	MISC-LCD CONTRAST	Adjust the contrast of the 310-1 Option (not available on older units).
PULse MASk [ ]	MISC-PULSE MASK	Select a specification to evaluate the DS3 Pulse Shape against; 1991 ANSI, 1993 ANSI or CCITT.
RECeive INPut	MISC-D53 LEVEL	Configure the DS3 Receive Input setting for DSX, HIGH or LOW.
TRAnsmit OUTput	MISC-D53 LEVEL	Configure the DS3 Transmit Output setting for DSX, HIGH or LOW.
TX X-Bit [ ]	MISC-TX X-BIT	Configure the transmitted X-Bits as 11, 00 or emulate to automatically send yellow as needed.
USER1 [ ]	MISC-USER1	Program a DS3 user test pattern to transmit.

Table 4-4
Auxiliary Function Commands (Continued)

SONET RX Auxiliary Group		
DS1 DROp OUT [ ]	SONET RX-DS1 DROP OUT	Set up the side panel DS1 DROP OUT connection by using a DS1 from SONET or DS3.
SONet DCC [ ]	SONET RX-SONET DCC	Select the SONET DCC to Drop or Insert from Section or Line to the side panel connector.
SONet DROp [ ]	SONET RX-SONET DROP	SONET Dropped Payload Format
SONet DS1 CHAnnel RX [ ]	SONET RX-SONET DS1 CH	SONET DS1 Channel Select
SONet INPut [ ]	SONET RX-SONET INPUT	SONET Input Signal Source.
STS RX LEVel [ ]	SONET RX-STS RX LEVEL	Select an STS-1 receive level as HIGH or DSX.
SONet STS ID RX [ ]	SONET RX-SONET INPUT, STS ID	SONET Input Signal Source, STS ID
SONET TX Auxiliary Group		
ORDerwire [ ]	SONET TX-ORDERWIRE	Select the SONET Orderwire channel to Drop or Insert from Section or Line to the side panel connector.
PATH TRAce [ ]	SONET TX-PATH TRACE	Select a Path Trace message to transmit in the SONET signal.
SONet ALArm [ ]	SONET TX-SONET ALARM	SONET Alarm Insertion Select.
SONet DS1 CHAnnel TX [ ]	SONET TX-SONET INSERT, DS1 Channel	SONET Insert Signal Source, DS1 Channel
SONet ERRor RATe [ ]	SONET TX-SONET ERR RT	Configure a SONET Error Rate.
SONet FRAme ERRor [ ]	SONET TX-SONET ERR RT, Frame Error	SONET Error Rate Select, Frame Error; select the number of SONET Frame Word errors to insert.
SONet INSert [ ]	SONET TX-SONET INSERT	SONET Insert Signal Source.
SONet OUTput [ ]	SONET TX-SONET OUTPUT	SONET Output Signal Source.
SONet STS ID TX [ ]	SONET TX-SONET OUTPUT, STS ID	SONET Output Signal Source, STS ID
SONet TIMing [ ]	SONET TX-SONET TIMING	SONET Transmit Timing Source.
SONet TRAnsmit WAVelength OC-12	SONET TX - TX WAVELENGTH, OC-12	Select 1310 or 1550 nm wavelength to transmit for SONET at OC-12.
SONet TRAnsmit WAVelength OC-3	SONET TX - TX WAVELENGTH, OC-3	Select 1310 or 1550 nm wavelength to transmit for SONET at OC-1 and OC-3.
SPE POInter [ ]	SONET TX-SPE POINTER	Configure the Path Pointer to increment or decrement.
STS TX LEVel [ ]	SONET TX-STS TX LEVEL	Select a STS-1 Transmit level at HIGH or DSX.

Table 4-4
Auxiliary Function Commands (Continued)

JITTER Auxiliary Group		
JITter FILter [ ]	JITTER-JIT FILTER	Select a filter to analyze DS3 Jitter, Highband, Wideband or automatically cycle between both filters.
JITter SCAle [ ]	JITTER-JIT SCALE	Select a scale to analyze DS3 Jitter; 20, 5, 2 unit intervals, or automatically select the best scale.
JITter THReshold [ ]	JITTER-JIT THRESH	Select a threshold of incoming jitter after which the jitter result appears in the Summary category.
ATM RX Auxiliary Group		
ATM RX BANdwidth PERiod [ ]	ATM RX-BW PERIOD	Select the received ATM cell test profile bandwidth.
ATM RX NETwork INTerface [ ]	ATM RX-NETWORK I/F, Select	Select the received ATM network interface.
ATM RX PREview	ATM RX-PREVIEW	Received ATM cell test profile preview selection.
ATM RX PROfile [ ]	ATM RX-PROFILE P1	Transmitted ATM cell test profile control.
ATM RX SCRamble [ ]	ATM RX-NETWORK I/F, Scramble	Receiver 43-Bit Cell Payload Descrambler Control.
ATM RX TESt MASk [ ]	ATM RX-TEST MASK	Received ATM Cell Test Mask Control.
ATM TX Auxiliary Group		
ATM CELl BANdwidth [ ]	ATM TX-CELL BANDWDTH	Select the transmitted ATM cell test profile bandwidth.
ATM CORrelation [ ]	ATM TX-CORRELATION	Transmitted ATM Correlation Tag control.
ATM HEC ERRor INSert [ ]	ATM TX-HEC ERR INS	Transmitted ATM Header Error Control Error Insert control.
ATM HEC ERRor RATe [ ]	ATM TX-HEC ERR RATE	Transmitted ATM Header Error Control Error Rate.
ATM OAM FLOw [ ]	ATM TX-OAM FLOW	Transmitted ATM OAM Flow control.
ATM OAM INSert [ ]	ATM TX-OAM INSERT	Transmitted ATM OAM Insert control.
ATM PEAk BANdwidth [ ]	ATM TX-PEAK BANDWDTH	Select the transmitted ATM cell test profile peak bandwidth.

Table 4-4
Auxiliary Function Commands (Continued)

ATM TX Auxiliary Group		
ATM PEAk DURation [ ]	ATM TX-PEAK DURATION	Transmitted ATM cell test profile peak duration.
ATM TX NETwork INTerface [ ]	ATM TX-NETWORK I/F, Select	Transmitted ATM network interface selection.
ATM TX PROfile [ ]	ATM TX-PROFILE P1	Transmitted ATM cell test profile control.
ATM TX SCRamble [ ]	ATM TX-NETWORK I/F, Scramble	Transmitter 43-Bit Cell Payload Scrambler control.
ATM TX TESt PROfile [ ]	ATM TX-TEST PROFILE	Transmitted ATM cell test profile selection.
OPTICAL TEST Auxiliary Group		
OPTical POWer WAVelength [ ]	OPTICAL TEST-OPTICAL PWR	Select 1310 or 1550 wavelength to calculate Optical Power.
OPTical RETurn LOSs REFerence [ ]	OPTICAL TEST-RTN LOSS TYPE, Store Reference	Return Loss Measurement Set reference.
OPTical RETurn LOSs TYPe [ ]	OPTICAL TEST-RTN LOSS TYPE, Select	Return Loss Measurement Type selection.
OPTical SOUrce [ ]	OPTICAL TEST-OPTICAL SRC	Select 1310 or 1550 wavelength to transmit as a stable source and to calculate Optical Return Loss.

4.4.4 Remote Control-Only Commands

The T-BERD 310 remote control-only commands have no front panel or auxiliary function equivalent. These commands are used to obtain information from the T-BERD 310 or to modify the remote control/printer protocol. Table 4-5 lists the remote control-only commands. The brackets ([ ]) indicate the availability of associated parameters. The parameters associated with each command are described in Appendix E.

Table 4-5
Remote Control-Only Commands

Command	Description
ALArms [ ]	Select whether or not alarms are automatically generated by remote on the printer.
ATM LEDs	Generates a report of all ATM Status and Alarm LEDs.
CLEar PRInt BUFfer	Clears the print buffer.
CLS	Clears the remote controlled screen.
DISplay [ ]	Set RESULTS Switches control; controls whether or not the local user can scroll results while the unit is under remote control.
ECHo [ ]	Set Terminal Echo Mode.
FIRST POWERUP	Restore T-BERD 310 to factory default settings.
HELLO	Generates a report of all installed options and the hardware and software revision codes.
HELP [ ]	Displays on-line Help for any remote control command.
HOLd	Holds all printouts in the print buffer until Release is entered.
LASt ERRor	Prints the last remote control error message sent to the user.
LEDs	Generates a report of all DS3 Status and Alarm LEDs.
LOCAL (/)	Return control to the front panel; gives the local user control over the test set.
PRInt [ ]	Print selected test result.
PROmpt [ ]	Set Terminal Mode prompt.
RELease	Release all printer output.
REMote (,)	Enter Remote Control Mode.
SONet LEDs	Generates a report of all SONET Status and Alarm LEDs.
TERminal (.)	Enter Terminal Mode.

4.4.5 Input Sequence

A remote command consists of an ASCII character string followed by either a CR, LF, or CRLF. When specifying a remote control command, the following rules apply:

1. Commands can be entered either in uppercase, lowercase, or mixed case characters.

2. Spaces must be inserted between the **command_name(s)** and **[parameter(s)]**.

3. Entering a <CTRL> <C> (Control C) or a <CTRL> <X> (Control X) before issuing a <RETURN> cancels the input line. (<CTRL> <C> also aborts all printing.)

4. Entering a <CTRL> <H> (Control H) or a <BACKSPACE> erases the last character entered. This is available for the RS-232 interface only.

5. Up to 20 previously entered commands can be recalled by using <ESCAPE>. When the number of previously sent commands exceeds 20, the earliest command entries are overwritten. This is available for the RS-232 and IEEE-488 interface.

After receiving a line terminator, the T-BERD 310 analyzes the data in its input buffer. It checks the data for parity, overrun, framing, overflow, and syntax errors as it is received. If any error is detected, the appropriate error message is returned through the interface. If no error is detected, the command is executed and the appropriate response generated.

If the **ECHo** command is enabled, the entered character string is echoed back to the controller. If the **PROmpt** command is enabled, the default prompt (">") or a user-defined prompt is used to indicate that the previous command has been processed and that the T-BERD 310 is ready to accept another command.

NOTE: The **TERminal** command automatically enables **ECHo** and **PROmpt** when entering the terminal mode. With either the **PROmpt** or **ECHo** command enabled, any characters used to cancel a line are echoed to the remote control unit. The prompt and echo features are only applicable for the RS-232 interface.

4.4.6 Output Sequence

The following rules apply for output sequences:

1. All remote control output sequences have a higher priority than the print buffer.

2. The **HOLd** command suspends the printer output until the **RELease** command is sent. When sending the **HOLd** command and the prompt is ON, the prompt character automatically changes to a "+" to indicate that data is waiting to be printed. After sending the **RELease** command and if the prompt is ON, the default prompt (>) or the user-defined prompt is returned. Note that the remote control output is not affected by **HOLd**.

3. <CTRL> <S> suspends all output. Sending a <CTRL> <Q> (Control Q), releases the printer output suspended by the <CTRL> <S>. These control characters only apply for RS-232 controllers.

4. Sending a <CTRL> <C> (Control C) clears the entire print buffer.

4.5 DS1/DS0 ANALYZER OPTION REMOTE CONTROL COMMANDS

This section describes the 310-1 DS1/DS0 Analyzer Option remote control commands used to control the DS1/DS0 Analyzer Option from a remote device.

All DS1/DS0 Analyzer Option commands must be preceded with an "@" character to distinguish them from T-BERD 310 mainframe commands. The DS1/DS0 Analyzer Option commands are divided into three categories: front-panel switch commands, auxiliary function commands, and remote control-only commands. The DS1/DS0 Analyzer Option commands are described in alphabetical order in Appendix E.

When remote control is activated (enter valid command), both the DS1/DS0 Analyzer Option and the T-BERD 310 are placed under remote control. The same applies to exiting remote control. While in remote control, the front-panel switches on both panels are disabled except for the **RESULTS** switches.

4.5.1 Front-Panel Switch Commands

The DS1/DS0 Analyzer Option switch commands control the functions normally associated with the front panel switches. Mnemonics represent the first three characters of the switch name or switch position as it appears on the front panel. The front-panel switch commands are listed alphabetically in Table 4-6.

Table 4-6
Front-Panel Switch Commands

Command	Switch Name	Description
@CODe	CODE	Set DS1 Line Code Type
@CONtrols	PRINT CONTROLS	Generate Controls Printout
@DISplay HOLd [ ]	DISPLAY HOLD	Set Display Hold
@DS0 DROp CHAnnel [ ]	DS0 DROP CHANNEL	Set Dropped DS0 Channel
@DS1 SOUrce [ ]	DS1 SOURCE	Set DS1 Input Source
@ERRor INSert BPV [ ]	BPV ERROR INSERT	Execute BPV Insertion
@ERRor INSert LOGic [ ]	LOGIC ERROR INSERT	Execute Logic Error Insertion
@HIStory RESet	HISTORY RESET	Clear History Alarm LEDs
@LOOp DOWn [ ]	LOOP DOWN	Generate Loop-Down Code
@LOOp UP [ ]	LOOP UP	Generate Loop-Up Code
@MODe [ ]	MODE	Set Transmit and Receive Operating Mode
@PATtern [ ]	PATTERN	Set Data Pattern
@PRInt RESults	PRINT RESULTS	Generate Test Results Printout
@RECeive INPut [ ]	RECEIVE INPUT	Set DS1 Receive Input Level
@RES1 [ ] or @RES2 [ ]	RESULTS I or II	Result Display I/II Control
@RESTART	RESTART	Initiate Test Restart
@RESUlts	PRINT RESULTS	Generate Test Results Printout
@TRAnsmit TIMing [ ]	DS3 TRANSMIT TIMING	Set DS1 Transmit Timing Source

4.5.2 Auxiliary Function Commands

The DS1/DS0 Analyzer Option auxiliary function commands set the parameters of the auxiliary functions. The auxiliary function commands are listed alphabetically in Table 4-7.

Table 4-7
Auxiliary Function Commands

Command	AUX Name	Description
@CHAnnel FMT [2]	AUX-CHAN FMT, Format	Channel Format Select
@CONTiguous [2]	AUX-CONTIG	FT1 Contiguous Channel Select
@DATaport [ ]	AUX-DATAPORT	Set DATAPORT Output
@ESF LOOp [ ] [1]	AUX-ESF LOOP	ESF Loop Code Select
@FRActional-t1 TYPe [2]	AUX-CHAN FMT, 64xN	FT1 Channel Format Select
@LOOp CODe [ ]	AUX-LP CODE	Set DS1 Loop Code Type
@NON CONtiguous [2]	AUX-N-CONTIG	FT1 Non-Contiguous Channel Select
@PGM LPDn [ ]	AUX-PGM LPDN	Set Programmable Loop-Down Code
@PGM LPUp [ ]	AUX-PGM LPUP	Set Programmable Loop-Up Code
@PRInt CUStom [ ]	AUX-CUSTOM	Set Custom Results Printout
@PRM EMUlate [ ] [1]	AUX-PRM	Set PRM Transmission Control
@PRM RECeive [ ] [1]	AUX-PRM	PRM Results Analysis Control
@SCAN TRIgger [ ]	AUX-SCAN TRIG	Set Triggered DS1 Scan Mode Criteria
@SLIp REFerence [ ] [1]	AUX-SLIP REF	DS1 Timing Slip Reference Source
@USER1 [ ]	AUX-USER1	Set User-Programmable Test Pattern

[1] Requires the 310-9A or 310-9B option.
[2] Requires the 310-9B option.

4.5.3 Remote Control-Only Commands

The DS1/DS0 Analyzer Option remote control-only commands have no front panel or auxiliary function equivalent. These commands are used to obtain information from the DS1/DS0 Analyzer Option or to modify the remote control/printer protocol. The remote control-only commands are listed alphabetically in Table 4-8.

Table 4-8
Remote Control-Only Commands

Command	Description
@HELP	Display On-Line Help
@LEDs	Print State of Status and Alarm LEDs
@PRInt [ ]	Print Selected Test Result

4.5.4 Error Messages

A command entered without the "@" character can be interpreted as a T-BERD 310 command or as invalid. If an invalid command is entered, the T-BERD 310/310-1 sends an error message indicating the error. Refer to Appendix B for additional error messages.

SPECIFICATIONS

5.1 INTRODUCTION

This section contains the specifications for the T-BERD 310 Communications Analyzer and its options.

5.2 GENERAL

5.2.1 Physical

Dimensions:	Standard 9-Slot T-BERD 310 with Cover — 6.5"H x 14.0"W x 16.0"D (16.5 cm x 35.6 cm x 40.6 cm).
	Optional 12-Slot T-BERD 310 with Cover (310-11) — 6.5"H x 14.0"W x 18.7"D (16.5 cm x 35.6 cm x 47.5 cm).
Weight:	Standard 9-Slot T-BERD 310 with Cover — 22.6 lbs. (10.2 kg).
	Optional 12-Slot T-BERD 310 with Cover (310-11) — (24.2 lbs. (11 kg).

5.2.2 Environmental

Operating Temperature Range:	32°F to 113°F (0°C to 45°C).
Storage Temperature Range:	-40°F to 158°F (-40°C to 70°C).
Operating Humidity:	90% maximum, noncondensing.
Storage Humidity:	5% to 95% noncondensing.
Shock and Vibration:	Meets IEEE-743.

5.2.3 Power

Power:	Older T-BERD 310 — 115 VAC, 90 to 132 VAC from 47 to 63 Hz. 220 VAC, (factory installed option), 180 to 240 VAC from 47 to 63 Hz. Newer T-BERD 310 — 115/220 VAC (automatic voltage selection), 90 to 264 VAC from 47 to 63 Hz.
Fuse:	5 A, 250 V, Slo-Blo, 5 x 20 mm (Littlefuse #218005 or equivalent).

5.3 INPUT

5.3.1 DS3 Input

Input Level Range:	HIGH — Accepts a nominal signal level of 0.9 Vp (0 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.9 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -26 dB of loss from the nominal signal level (0.9 Vp). DSX — Accepts a nominal signal level of 0.5 Vp (450 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.5 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -26 dB of loss from the nominal signal level (0.5 Vp). LOW — Accepts a nominal signal level of 0.2 Vp (900 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.2 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -20 dB of loss from the nominal signal level (0.2 Vp).
Input Jitter Tolerance:	The instrument meets or exceeds the mask specified in AT&T PUB 43802 and Bellcore TR-TSY-000009. For the 2^15-1 pattern, the mask is defined with a jitter amplitude of 5.0 UIp-p from 10 Hz to 2300 Hz, slope of -24 dB/decade from 2.3 kHz to 60 kHz, and an amplitude of 0.1 UIp-p from 60 kHz to 300 kHz.
Input Impedance:	75 ohms ±5%, unbalanced to ground.
Connector:	WECO 560A jack (WECO 358 optional).
Frequency:	44.736 Mb/s ±1000 Hz.
Line Code:	B8ZS.

5.3.2 External Clock Input

Input Connector:	Non-isolated, AC-coupled, 75-ohm BNC.
Input Frequency Range:	44.736 MHz ±300 ppm.
Input Amplitude:	1 Vp-p to 3 Vp-p.

5.4 OUTPUT

5.4.1 DS3 Output

Output Connector:	Six WECO 560A jacks (one front panel and five side panel). Factory installed 358A jacks are also available.
Output Signal:	Internal Frequency — 44.736 MHz ±5 ppm.
Output Level Range:	HIGH — Nominal 0.91 Vp. Signal meets ANSI T1.102-1989, Table 5, and CCITT Recommendation G.703 when transmitted through 450 feet of coaxial cable (WECO 728A, RG59B/U, or equivalent). DSX — Nominal 0.6 Vp. Signal meets ANSI T1.102-1989, Table 5, and CCITT Recommendation G.703, Section 5. LOW — Nominal 0.3 Vp. Signal is equivalent to a DSX signal transmitted through 450 feet of coaxial cable (WECO 728A, RG59B/U, or equivalent).
Line Code:	B8ZS.
Output Impedance:	75 ohms nominal, unbalanced to ground.

5.4.2 DS1 Drop Output

Output Connector:	Bantam (new units) or WECO 310 (old units) jack, side panel.
Pulse Shape:	With output terminated in 100-ohm resistive load, the T-BERD 310 meets pulse shape specifications given in CCITT Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and PUB62508; and AT&T PUB62411.

Jitter Attenuation:	Meets or exceeds the jitter attenuation characteristics of AT&T PUB43802 and Bellcore TR-TSY-000191.
Line Code:	AMI or B8ZS (selectable).

5.5 INPUT SIGNAL MEASUREMENTS

5.5.1 Power

An unframed All Ones pattern must be used to obtain an accurate power reading. The value is expressed in dBm and referenced across 75 ohms. 0 dBm corresponds to a DS3 signal level of approximately 0.39 Vp.

Power Levels:	10.0 to 13.4 dBm with an accuracy of ±2 dBm. -12.0 to 9.9 dBm with an accuracy of ±1 dBm. -26.0 to -12.1 dBm with an accuracy of ±2 dBm.
Resolution:	0.1 dBm.
Range:	Less than -26.0 to +13.4 dBm.

5.5.2 Frequency

Accuracy:	±2 ppm.
Resolution:	10 Hz.
Range:	44.736 MHz ±1.5 MHz.

5.5.3 Level

The maximum peak voltage of the received signal is measured.

Level Accuracy:	1.2 to 1.8 Vp with an accuracy of ±0.2 V. 0.80 to 1.1 Vp with an accuracy of ±0.1 V. 0.25 to 0.79 Vp with an accuracy of ±0.03 V. 0.00 to 0.24 Vp with an accuracy of ±0.02 V.
Level Resolution:	0.00 to 1.99 Vp with a resolution of 0.01 V.
Range:	0.00 to 1.99 Vp.

5.6 ALARM CRITERIA

Signal Loss:	0.02 ms without valid input pulses.
Frame Loss:	3 OUT OF 15 — 3 out of 15 F-bits in error, or 2 out of 3, 010 M-bit sequences in error. 6 OUT OF 15 — 6 out of 15 F-bits in error.
DS2 Frame Loss:	2 out of 4 DS2 F-bit errors. Occurs when the DS2 corresponding to the selected DS1 drop channel loses frame synchronization.
Pattern Loss:	FAST — 1024 errors per 32,767 data bits. SLOW — 250,000 errors per 1,000,000 bits.
Blue (AIS):	STUCK C-BIT — valid framing, valid parity, all stuffing indicator C-bits equal zero, and the 1010 criteria. 1010 — 30 ms of 1010 pattern with framing.
Yellow:	Both X-bits = 0.
Far-End Alarm:	Receipt of valid far-end alarm message (not loop codes) through the third C-bit in subframe 1 (FEAC-bit).

5.7 PULSE SHAPE CRITERIA

ANSI:	T1.102-1991, Figure 5.
CCITT:	Proposed CCITT G.703, Figure 14/G.703.
93 ANSI:	T1.102-1993 and ANSI T1.404-1993 Network Interface pulse mask.

5.8 PATTERNS

5.8.1 Non-Channelized Test Pattern Definitions

2^23-1:	Pseudorandom pattern with length of 2^{23}-1 bits. This pattern conforms with CCITT Recommendation O.151.
2^20-1:	Pseudorandom pattern with length of 2^{20}-1 bits. This pattern conforms with Bell Compatibility Bulletin No. 114.
2^15-1:	Pseudorandom pattern with length of 2^{15}-1 bits. This pattern conforms with CCITT Recommendation O.151.
1111:	Fixed pattern consisting of marks only.
1100:	Fixed pattern of two marks followed by two spaces. In framed mode, the pattern is synchronized to the framing bits. In addition, C-bits are changed to indicate M13 or C-bit parity Idle Signal as described in the ANSI T1.107-1990 standard.
1010:	Fixed pattern of one mark and one space. In framed mode, the pattern is synchronized to the framing bits. When either M13 or C-bit parity framing is on, this is equivalent to sending a Blue Signal. All C-bits are set to zero to indicate stuck C-bits and the FID-bit is set to zero as described in the ANSI T1.107-1990 standard.
USER1:	3- to 24-bit programmable pattern.

5.8.2 Channelized Test Pattern Definitions

T1D4 1:7:	F01000000.... Pattern is aligned with the T1 D4 framing (F) format as indicated.
T1D4 QRSS:	2^{20}-1 bit pseudorandom pattern with 14-zero suppression and T1 D4 framing.
T1D4 3/24:	F0100 0100 0000 0000 0000 0100.... Pattern is aligned with the T1 D4 framing (F) format as indicated.
T1D4 1004Hz:	1004 Hz tone on all DS0s with T1 D4 framing. The tone is phase shifted between adjacent DS0 channels to prevent Yellow Alarms.

T1ESF 1:7:	F01000000.... Pattern is aligned with the T1 ESF framing (F) format as indicated.
T1ESF QRSS:	2^{20}-1 bit pseudorandom pattern with 14-zero suppression and T1 ESF framing.
T1ESF 3/24:	F0100 0100 0000 0000 0000 0100.... Pattern is aligned with the T1 ESF framing (F) format as indicated.
T1ESF 1004Hz:	1004 Hz tone on all DS0s with T1 ESF framing.

5.8.3 Pattern Synchronization Acquisition Criteria

Pseudorandom Patterns:	60 + n consecutive error-free bits for pattern length 2^n - 1.
Fixed Patterns:	64 consecutive error-free bits.

5.9 FRAME SYNCHRONIZATION DETECTION CRITERIA

Frame Sync:	15 consecutive error-free F-bits and 2 consecutive error-free M_0 M_1 M_0 sequences.

5.10 DS3 M13 FRAMING FORMAT

The DS3 M13 frame consists of seven subframes each with eight overhead bits. There are 84 data bits between each of the overhead bits. The DS3 overhead bits are shown in Table 5-1.

Table 5-1
DS3 M13 Overhead Bits

subframe 1	X	F_1	C_{11}	F_0	C_{12}	F_0	C_{13}	F_1
subframe 2	X	F_1	C_{21}	F_0	C_{22}	F_0	C_{23}	F_1
subframe 3	P	F_1	C_{31}	F_0	C_{32}	F_0	C_{33}	F_1
subframe 4	P	F_1	C_{41}	F_0	C_{42}	F_0	C_{43}	F_1
subframe 5	M_0	F_1	C_{51}	F_0	C_{52}	F_0	C_{53}	F_1
subframe 6	M_1	F_1	C_{61}	F_0	C_{62}	F_0	C_{63}	F_1
subframe 7	M_0	F_1	C_{71}	F_0	C_{72}	F_0	C_{73}	F_1

$F_1\,F_0\,F_0\,F_1$ = 1001: Frame Alignment Bits.

$M_0\,M_1\,M_0$ = 010: Multiframe Alignment Bits.

XX = 00 or 11: User-Defined - X-bits must be the same in a given frame and they should not change more than once a second.

PP = 00 or 11: Parity Bits - Parity is calculated over the preceding frame of 4704 data bits. Parity equals 11 if the number of marks is odd and 00 if the number of marks is even.

$C_{n1}\,C_{n2}\,C_{n3}$ = 000 or 111: Stuff Indicator Bits - The 21 stuff indicator bits are all the same for a given frame and follow an 18-frame pattern: 001 001 001 001 001 011. When transmitting a Blue Signal, the C-bits are all set to zero. Note that if the MUXED M13 or MUXED C-BIT mode is being used, the indicator bits are set to allow proper stuffing rates for the embedded DS1 signals.

5.11 DS3 C-BIT FRAMING FORMAT

C-bit framing is the same as DS3 M13 framing, except all C-bits are redefined and used to do more extensive performance monitoring. No stuff bits are used because the DS3 C-bit framing format is synchronous. The X-bits are also given a more specific definition. The framing, multiframing, and parity bits are the same as the definitions within the DS3 M13 framing format. Table 5-2 describes the C-bit overhead bits.

Table 5-2
DS3 C-Bit Overhead Bits

subframe 1	X	F_1	FID	F_0	N_a	F_0	FEAC	F_1
subframe 2	X	F_1	DL_a	F_0	DL_a	F_0	DL_a	F_1
subframe 3	P	F_1	CP	F_0	CP	F_0	CP	F_1
subframe 4	P	F_1	FEBE	F_0	FEBE	F_0	FEBE	F_1
subframe 5	M_0	F_1	DTL	F_0	DTL	F_0	DTL	F_1
subframe 6	M_1	F_1	DL_a	F_0	DL_a	F_0	DL_a	F_1
subframe 7	M_0	F_1	DL_a	F_0	DL_a	F_0	DL_a	F_1

FID = 1: Format Identification Bit is always one to indicate C-bit parity framing. If more than 4 out of 16 zeros at this bit are detected, regular bit framing is assumed.

XX = 00 or 11: Used to transmit a near-end out-of-frame condition to the far-end. X-bits must be the same in a given frame and should not change more than once a second.

PP = 00 or 11: Parity Bits – Parity is calculated over the preceding frame of 4704 data bits. Parity equals 11 if the number of marks is odd and 00 if the number of marks is even.

N_a: Reserved Network Application Bit.

FEAC: Far-End Alarm and Control Channel.

DL_a: Application Specific Datalink Bits.

DL_T: Terminal-to-Terminal Path Maintenance Datalink Bits - currently not available.

CP = 000 or 111: C-Bit Parity Bits – Same as parity bits (PP), but C-bit parity (CP) allows end-to-end performance monitoring. CP-bits are not recalculated at every facility as parity bits are. Majority voting among the three CP-bits determines parity.

FEBE = 000 or 111: Far-End Block Errors are generated when a C-bit parity or framing error is detected. FEBE = 111 indicates no errors. FEBE = 000 indicates error(s). Majority voting among the three FEBE bits is *not* used to declare a far-end block error.

5.12 RS-232 INTERFACE CONNECTOR

Connector Pin Assignments: See Table 5-3.

Table 5-3
RS-232 Connector Pin Assignments

Pin #	Designation	Direction	Description
1	Prot. Gnd	—	Protective Ground — Connected to chassis ground.
2	TD	IN	Transmitted Data — The T-BERD 310 receives data on this lead.
3	RD	OUT	Received Data — The T-BERD 310 transmits data on this lead.
5	CTS	OUT	Clear to Send — This lead is asserted by the T-BERD 310 when it is ready to receive data. It should be monitored by the DTE to avoid transmitting data too fast to the T-BERD 310.
6	DSR	OUT	Data Set Ready — This lead is always ON when power is applied.
7	Sig. Gnd	—	Signal Ground — Connected to signal ground.
8	+ VDC	—	Test Voltage — This lead provides +12 VDC (RS-232 ON).
9	+ VDC	—	Test Voltage — This lead provides +12 VDC (RS-232 ON).
10	- VDC	—	Test Voltage — This lead provides -12 VDC (RS-232 OFF).
12	SRLSD	OUT	Secondary Received Line Signal Detector — This lead is driven ON by the T-BERD 310 when data is being sent.
20	DTR	IN	Data Terminal Ready — When this lead is asserted by the receiving device (e.g., printer), the T-BERD 310 transmits data.

Character Format: Seven or eight data bits (ASCII coding). Even or odd parity. Two transmitted stop bits. Accepts one or more received stop bits.

Baud Rates: 110, 300, 600, 1200, 2400, 4800, and 9600.

Terminator: CR, LF, and CRLF.

Print Width: 40-column or 80-column.

Connector Configuration: DCE.

Connector: 25-pin female D.

5.13 GROUNDING

Chassis and Signal Grounds: Connected internally.

WECO 560A Jack Sleeves: Connected to chassis ground.

Power Cord: Center ground pin connected to chassis ground.

25-pin D Connector: Pin 1 to chassis ground.
Pin 7 to signal ground.

5.14 310-1 DS1/DS0 ANALYZER OPTION

This section contains the specifications for the 310-1 DS1/DS0 Analyzer Option.

5.14.1 Environmental

Operating Temperature Range: 32°F to 113°F (0°C to 45°C).

Storage Temperature Range: -40°F to 158°F (-40°C to 70°C).

Operating Humidity: 90% maximum, noncondensing.

Storage Humidity: 5% to 95% noncondensing.

5.14.2 T1 Input

Connector:	Bantam (new units) or WECO 310 (old units) jack.
Frequency:	1,544,000 Hz ±5000 Hz.
Impedance:	BRIDGE — 1000 ohms or greater. TERM — 100 ohms ±5%. DSX-MON — 100 ohms ±5%.
Operating Range:	BRIDGE — +6 to -35 dBdsx cable loss. TERM — +6 to -35 dBdsx cable loss. DSX-MON — +6 to -24 dBdsx resistive loss.
Line Code:	AMI or B8ZS. Received B8ZS is automatically decoded.
Jitter Tolerance:	per AT&T PUB62411, 1985.
T1 Framing Formats:	D4 Superframe, ESF, SLC-96, and Unframed.

5.14.3 T1 Output

Connector:	Bantam (new units) or WECO 310 (old units) jack.
Signal Level:	3 V base-to-peak into a 100-ohm load (0 dBdsx).
Pulse Shape:	With the output terminated into a 100-ohm resistive load (DSX-MON), the 310-1 meets pulse shape specifications given in CCITT Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and AT&T PUB62508; and AT&T PUB62411.
Internal Oscillator Accuracy:	±5 ppm.
Line Code:	AMI or B8ZS.
T1 Framing Formats:	D4 Superframe, ESF, SLC-96, and Unframed.

5.14.4 Alarm Criteria

Signal Loss:	150 ms without input pulses after initial signal detected.
Pattern Sync Loss:	QRSS, 2^{15}-1, 2^{20}-1, and 2^{23}-1 — 250 errors in 1000 or fewer bits. 1:1, 1:7, ALL ONES, 3 IN 24, and USER1 — 100 errors in 1000 or fewer bits.
Frame Sync Loss:	D4 — two out of five Ft bits in error. ESF — two out of five frame bits in error. SLC — two out of four Ft bits in error.
Excess Zeros:	16 or more consecutive zeros with AMI line coding. 8 or more consecutive zeros with B8ZS line coding.
Yellow Alarm:	D4 and SLC — Bit 2 is a "0" for 255 consecutive channels. ESF — 256 bits ±16 bits of repetitive 11111111 00000000 pattern received in the datalink.
All Ones:	Unframed — 2048 or more consecutive ones. Framed — 256 consecutive DS0 channels with all ones.

5.14.5 Test Pattern Definitions

1:1:	Alternating ones (mark) and zeros (space) pulses.
1:7:	F01000000.... A single one and seven zeros pattern. When framed, the pattern is aligned with the F-bits as indicated to prevent false Yellow Alarms.
2^15-1:	32,767-bit pseudorandom pattern generates a maximum of 14 sequential zeros and 15 sequential ones.
2^20-1:	1,048,575-bit pseudorandom pattern generates a maximum of 19 sequential zeros and 20 sequential ones.
2^23-1:	8,388,607-bit pseudorandom pattern generates a maximum of 22 sequential zeros and 23 sequential ones.
3 IN 24:	F0100 0100 0000 0000 0000 0100. Pattern synchronized to framing bits to prevent D4 Yellow Alarms or Excess Zeros.

ALL ONES:	All Ones (marks).
ALL ZEROS:	All Zeros (spaces).
QRSS:	Quasi-Random Signal Source. Modified $2^{20}-1$ pseudorandom pattern which generates a maximum of 14 sequential zeros and 20 sequential ones.
USER1:	3- to 24-bit programmable pattern; factory setting is 10000.

5.14.6 Pattern Synchronization Acquisition Criteria

Fixed Patterns:	30 consecutive error-free bits.
Pseudorandom Patterns:	30 + n consecutive error-free bits for a pattern length of 2^n-1 (for QRSS, n = 20).

5.14.7 Loop Code Pattern Definitions

In-band Loop Codes:	CSU — Loop up: 10000. Loop down: 100. FACILITY 1 — Loop up: 1100. Loop down: 1110. FACILITY 2 — Loop up: 11000. Loop down: 11100. PROGRAMMABLE — 3- to 8-bit programmable pattern for both loop codes.
ESF Out-of-Band Loop Codes:	LINE — Loop up: 1111 1111 0111 0000. Loop down: 1111 1111 0001 1100. PAYLOAD — Loop up: 1111 1111 0010 1000. Loop down: 1111 1111 0100 1100. NETWORK — Loop up: 1111 1111 0100 1000. Loop down: 1111 1111 0010 0100.

5.14.8 Loop-Code Detection Criteria

In-band Loop Codes:	Loop Up — Continuously transmitted until the code is received error-free for 250 ms or the switch is pressed a second time. Loop Down — Continuously transmitted until the code is no longer received or the switch is pressed a second time.
ESF Out-of-Band Loop Codes:	Not detectable. However, the loop codes are transmitted for only one second.

5.14.9 DS1 Frequency Measurement

Accuracy:	±5 ppm.
Resolution:	1 Hz.

5.14.10 DS1 Timing Slips Measurement

Range:	0 bit slips to 999 frame slips and 192 bit slips.
Resolution:	1 bit slip.

5.14.11 DS1 Level Measurement

Range:	+6 dBdsx to -40 dBdsx.
Accuracy:	±1.0 dB between +6 dBdsx and -18 dBdsx. ±2.0 dB between -18 dBdsx and -40 dBdsx.
Resolution:	0.1 dBdsx.

5.14.12 VF Level Measurement

Range:	+3 dBm0 to -50 dBm0.
Accuracy:	±0.3 dBm.
Resolution:	0.01 dBm.

Specifications

5.14.13 DATAPORT Interface

Connection: 9-position, 6-pin, female D connector.

Configuration: Synchronous DCE (transmit only).

Pin Assignments: See Table 5-4.

Data Format: DS0 or datalink.

Data Output: DS0 — 56 and 64 kb/s clear channel.
ESF — 4 kb/s datalink.
SLC — 4 kb/s datalink and Fs bits (external decoding required).

Timing: Recovered clock from received data on DS1 RECEIVE jack. Attached test set must synchronize to clock source on Pin 9. Output is squelched until the instrument is synchronized with framing bits.

Control Level: +12 VDC for ON (0) and -12 VDC for OFF (1).

Output Signal Level: +12 VDC for a space (0) and -12 VDC for a mark (1).

Clock Signal Level: ±12 VDC.

Table 5-4
DATAPORT Connector Pin Assignments

Pin #	Designation	Description
1	Signal Ground	Connected to signal ground.
5	Control	This lead is ON when the output signal (pin 6) is available.
6	Output Signal	This lead provides 64 or 56 kb/s DS0 channel, SLC-96 4 kb/s datalink, or ESF 4 kb/s datalink signals. The output is controlled through the AUX-DATAPORT auxiliary function and **MODE** switch.
9	Clock Signal	This lead provides an external clock source for the attached test set.

5.14.14 Voice Frequency Output

Connection:	Bantam (new units) or WECO 310 (old units) jack.
Jack:	Impedance — 600 ohms resistive. Level — calibrated to dBm0 = 0 dBm.

5.15 310-2 E1 DROP OPTION

This section contains the E1 output specifications for the E1 Drop Option.

Connector:	Three-pin banana jack.
Impedance:	120 ohms ±5%, balanced to ground.
Signal Level:	3 V ±0.3 V.
Coding:	HDB3.
Pulse Shape:	Conforms to CCITT Recommendation G.703, Figure 15.

5.16 310-3 DS1 INSERT OPTION

This section contains the specifications for the 310-3 DS1 Insert Option.

5.16.1 DS1 Insert Input Specifications

Connector:	Bantam (new units) or WECO 310 (old units) jack.
Frequency:	1,544,000 Hz ±1000 Hz.
Impedance:	100 ohms ±5%, balanced to ground.
Signal Level Range:	+6 to -6 dBdsx cable loss. +6 to -26 dBdsx resistive loss.
Jitter Tolerance:	per AT&T PUB62411, 1983.

5.16.2 Secondary DS3 Receive Specifications

Connector:	WECO 560A jack.
Frequency:	44.736 Mb/s ±1000 Hz.
Impedance:	75 ohms ±5%, unbalanced to ground.
Line Code:	B3ZS.

5.17 SONET OPTIONS

This section contains the specifications for the SONET options 310-12, 310-13R, 310-14R 310-13T, and 310-14T.

5.17.1 STS-1 Receive Signal (310-13R or 310-14R Option)

Connector:	Standard — WECO 560A jack. Optional — WECO 358 jack.
Frequency:	51.840 Mb/s ±200 ppm.
Impedance:	75 ohms ±5%, unbalanced to ground.
Line Code:	B3ZS.
Signal Level Range:	DSX — Up to 3 dB of cable loss or 20 dB of resistive attenuation from a nominal DSX level. HIGH — Up to 3 dB of cable loss or 20 dB of resistive attenuation from a nominal HIGH level.

5.17.2 STS-1 Transmit Signal (310-13T or 310-14T Option)

Connector:	Standard — WECO 560A jack. Optional — WECO 358 jack.
Frequency:	51.840 Mb/s ±5 ppm (internal timing).
Impedance:	75 ohms ±5%, unbalanced to ground.
Line Code:	B3ZS.
Signal Level Range:	HIGH — Nominal rectangular pulse with an amplitude of 1.03 Vp ±10% and a maximum undershoot and overshoot of less than 10%. Signal meets ANSI specification T1.102 STS-1 Eye Diagram Mask after passing through 450 feet of 728A cable. DSX — Amplitude of 0.516 Vp ±10%. Signal meets ANSI specification T1.102 Eye Diagram Mask for STSX-1 Interconnection.

5.17.3 OC-1 and OC-3 Receive Signal (310-14R Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-1 — 51.840 Mb/s ±200 ppm. OC-3 — 155.520 Mb/s ±200 ppm.
Optical Input:	1310 and 1550 nm, 50/125 multimode pigtail.
Input Power Range:	-35.0 dBm to -7.0 dBm with a 10^{-10} error rate on a 2^{23}-1 pattern, unscrambled.

5.17.4 OC-1 and OC-3 Transmit Signal (310-14T Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-1 — 51.840 Mb/s ±5 ppm (internal timing). OC-3 — 155.520 Mb/s ±5 ppm (internal timing).
Optical Wavelength:	Standard — 1310 nm, intermediate reach. Optional — 1550 nm, intermediate reach.
Output Power Range:	-15.0 dBm to -8.0 dBm.

5.17.5 OC-12 Receive Signal (310-12 Option)

Connector: Standard — FC(PC).

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T-BERD 310-S

5.21.3 Optical Stable Source

Connector:	Standard — FC(UPC). Optional — ST or SC.
Optical Wavelengths:	1310 nm ±30 nm or 1550 nm ±30 nm.
Output Power:	-10 dBm ±0.1 dB.
Power Stability:	0.05 dB after 5 mins @ 25°C.

Specifications

APPENDIXES

FACTORY DEFAULT SETTINGS

This appendix identifies the T-BERD 310 and 310-1 factory default settings for the switch positions and auxiliary functions that are stored in nonvolatile memory. To configure the T-BERD 310 and 310-1 with the factory default settings, press the **RESTART** switch for several seconds while first applying power.

Table A-1
T-BERD 310 Switch Defaults

Front Panel Switch	Default
ALARM INSERT	N/A
AUX	OFF
CHANNEL CONTROL: DS3-DS1	
INSERT	(NONE)
DROP	28
CHANNEL CONTROL: SONET-VT	
INSERT	(NONE)
DROP	7,-4
CHANNEL CONTROL: SONET-STS	
INSERT	(STS-1)
DROP	(STS-1)
DISPLAY HOLD	OFF
DS3 SOURCE	EXT
DS3 TRANSMIT TIMING	INT
ERROR INSERT	DS3 LOGIC
HISTORY RESET	OFF
RESTART	N/A
RESULTS I and II SECONDARY	OFF
RESULTS I and II Category	SUMMARY
SETUP: DS3	
MODE	M13
PATTERN	2^23-1
SETUP: SONET RX	
RATE	STS-1
PAYLOAD	DS3 ASYN INT
SETUP: SONET TX	
RATE	STS-1
PAYLOAD	AUTO
SONET TRANSMIT TIMING	INT
VOLUME	N/A
LASER ENABLE	OFF

Table A-2
T-BERD 310 Auxiliary Function Defaults

Auxiliary Function	Default
ERR INSERT Auxiliary Group	
LOG/BPV RT	1E-2
FRAME ERROR	1/M-FRAME
LOG/BPV BUR	SINGLE
ERR RECEIVE Auxiliary Group	
PAR ERR RT	BIT ERROR
FRM LOSS THR	3 OUT OF 15
ERROR THR	1E-2
PAT LOSS THR	FAST
MUXED TX Auxiliary Group	
DS1 LP CODE	CSU
PGM LPUP	10000
PGM LPDN	100
TIME Auxiliary Group	
SET DATE	Current date
SET TIME	Current time
TEST LENGTH	01:00:00
TEST	CONTINUOUS
PRINT Auxiliary Group	
INTERVAL	06:00
MODE	CONTINUOUS
FORMAT	NORMAL
CUSTOM	All selections OFF
GRAPH	N/A
BAUD RATE	2400
PARITY	NONE
TERMINATOR	CR
WIDTH	40
PORT	RS-232
PRINT EVENT	OFF
PRINT TYPE	N/A

Table A-2
T-BERD 310 Auxiliary Function Defaults (Continued)

Auxiliary Function	Default
MISC Auxiliary Group	
USER1	100
TX X-BIT	11
BLU SIG CRI	STUCK C-BIT
DS1 LINECODE	AMI
BEEP CRI	All OFF
PULSE MASK	93 ANSI
FEAC ALARMS	All OFF
FEAC LOOP	All OFF
LCD CONTRAST	5
DS1 SIG BITS	PASS-THRU
DS1 BITS CLK	TERM
DS1/VT MAP	M13
DS3 LEVEL	TX-DSX / RX-DSX
SONET RX Auxiliary Group	
DS1 DROP OUT	DS3
STS RX LEVEL	DSX
SONET DCC	NONE
SONET TX Auxiliary Group	
STS TX LEVEL	DSX
SONET ERR RT	
BIP/FEBE	1E-4
FRAME ERROR	1
SPE POINTER	522
ORDERWIRE	NONE
PATH TRACE	USER1
TX WAVELENGTH	1330
JITTER Auxiliary Group (310-5)	
JIT SCALE	AUTO
JIT FILTER	AUTO
JIT THRESH	5 UI

Table A-2
T-BERD 310 Auxiliary Function Defaults (Continued)

Auxiliary Function	Default
ATM RX Auxiliary Group (310-15)	
NETWORK I/F	
Interface	UNI
Scramble	ON
TEST MASK	TX TEST
PROFILE Pn	P1, all Xs
BW PERIOD	0.1 seconds
ATM TX Auxiliary Group (310-15)	
NETWORK I/F	
Interface	UNI
Scramble	ON
PROFILE Pn	P1, all 0s
TEST PROFILE	P1
CELL BANDWDTH	
Test	1%
Background	98%
PEAK BANDWDTH	50%
PEAK DURATION	0.1 seconds, not sending
HEC ERR RATE	
Rate	1E-2
Burst	1 cell
HEC ERR INS	
Type	CORRECTABLE
OAM INSERT	LOOPBACK, not sending
OAM FLOW	
Format	VC (F5)
Function	END-TO-END
CORRELATION	0000
OPTICAL TEST Auxiliary Group (310-16)	
STABLE SOURCE	OFF
RETURN LOSS	ABSOLUTE
OPTICAL PWR	1310

Table A-3
310-1 Factory Default Settings

Front Panel Switches	Default
BPV ERROR INSERT	OFF
CODE	AMI
DISPLAY HOLD	OFF
DS0 DROP CHANNEL	24
DS1 SOURCE	DS3 DROP
HISTORY RESET	N/A
LOGIC ERROR INSERT	OFF
LOOP DOWN	OFF
LOOP UP	OFF
MODE	T1
PATTERN	QRSS
RECEIVE INPUT	TERM
RESTART	N/A
RESULTS I/II Category	SUMMARY
DS3 TRANSMIT TIMING	INTERNAL
Auxiliary Functions	**Default**
USER1	100000
PGM LPUP	10000
PGM LPDN	100
LP CODE	CSU/LINE [1]
ESF LOOP [1]	IN BAND
PRM, transmit/receiver [1]	OFF/ON
DATAPORT	DS0
CUSTOM	All OFF
SLIP REF [1]	PRI DS3 DROP
SCAN TRIG	
FRAME ERRORS	ON
CRC ERRORS	ON
ALL ONES	ON
YELLOW ALARM	ON
TM SLIPS [1]	OFF
FRAME SYNC	OFF
FRAME LOSS	OFF
CHAN FMT [2]	FULL T1
CONTIG [2]	
Start Channel	1
Length	24
N-CONTIG [2]	All channels 1

[1] Requires the 310-9A or 310-9B option.
[2] Requires the 310-9B option.

OPERATING MESSAGES

B.1 INTRODUCTION

This appendix lists the printed status, alarm, and note messages; the messages that appear on the front panel; and error and warning messages generated during local and remote control operation. These messages are divided by mainframe and option.

B.2 PRINTED STATUS, ALARM, AND NOTE MESSAGES

These messages are identified as status, alarm, and note messages. They are generated automatically when an important condition occurs. Set the PRINT-PRINT EVENT auxiliary function to a selection other than OFF to generate these messages. The two-line message format includes the message type (status, alarm, or note), time, date, the number of times the condition occurs (i.e., it keeps counting even if not reported) over the course of the test, and the message identifying the reported condition.

B.2.1 Status Messages

The status messages indicate positive conditions in the received signal and relate to the DS3 Status LEDs. The Status messages start with the *** *STATUS:* header.

T-BERD 310 Mainframe

DS3 FEAC Pri LPDN All DS1 — A DS1 FEAC loop-down code for all DS1 channels is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPDN DS1 n — A DS1 FEAC loop-down code for DS1 channel **n** (n = 1 to 28) is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPDN DS3 NIU — A DS3 FEAC loop-down code for an NIU is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPDN DS3 — A DS3 FEAC loop-down code is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPUP All DS1 — A DS1 FEAC loop-up code for all DS1 channels is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPUP DS1 n — A DS1 FEAC loop-up code for DS1 channel **n** (n = 1 to 28) is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPUP DS3 NIU — A DS3 FEAC loop-up code for an NIU is detected in the received Primary DS3 signal.

DS3 FEAC Pri LPUP DS3 — A DS3 FEAC loop-up code is detected in the received Primary DS3 signal.

DS3 Primary C-Bit Frame Sync — The DS3 C-bit parity framing format is detected in the received Primary DS3 signal.

DS3 Primary DS2 Frame Sync — The DS2 framing format is detected in the received Primary DS3 signal.

DS3 Primary Frame Sync — The DS3 framing format is detected in the received Primary DS3 signal.

DS3 Primary Idle Detect — The DS3 Idle Signal is detected in the received Primary DS3 signal.

DS3 Primary Pattern Sync — The DS3 test pattern is recognized in the received Primary DS3 signal.

DS3 Primary Signal Present — DS3 pulses of a valid frequency and level are present in the received Primary DS3 signal.

310-1 DS1/DS0 Analyzer Option

DS1 B8ZS Detect — B8ZS encoding is detected in the received DS1 signal.

DS1 Frame Sync — The DS1 framing format is detected in the received DS1 signal.

DS1 Pattern Sync — The DS1 test pattern is recognized in the received DS1 signal.

T1 Pulses — DS1 pulses of a valid frequency and level are present in the received DS1 signal.

310-3 DS1 Insert Option

DS3 FEAC Sec LPDN All DS1 — A DS1 FEAC loop-down code for all DS1 channels is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPDN DS1 n — A DS1 FEAC loop-down code for DS1 channel **n** (n = 1 to 28) is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPDN DS3 NIU — A DS3 FEAC loop-down code for an NIU is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPDN DS3 — A DS3 FEAC loop-down code is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPUP All DS1 — A DS1 FEAC loop-up code for all DS1 channels is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPUP DS1 n — A DS1 FEAC loop-up code for DS1 channel **n** (n = 1 to 28) is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPUP DS3 NIU — A DS3 FEAC loop-up code for an NIU is detected in the received Secondary DS3 signal.

DS3 FEAC Sec LPUP DS3 — A DS3 FEAC loop-up code is detected in the received Secondary DS3 signal.

DS3 Sec C-Bit Frame Sync — The DS3 C-bit parity framing format is detected in the received Secondary DS3 signal.

DS3 Secondary DS2 Frame Sync — The DS2 framing format is detected in the received Secondary DS3 signal.

DS3 Secondary Frame Sync — The DS3 framing format is detected in the received Secondary DS3 signal.

DS3 Secondary Idle Detect — The DS3 Idle Signal is detected in the received Secondary DS3 signal.

DS3 Secondary Signal Present — DS3 pulses of a valid frequency and level are present in the received Secondary DS3 signal.

310-4 or 310-4A SONET Drop Option (No longer sold.)

SONET Present — A framed SONET signal is detected at the selected SONET input.

310-12, 310-13R/T, or 310-14R/T SONET Option

SONET Frame Sync — SONET frame synchronization is established with the received SONET signal.

SONET Path Pointer Present — A valid SONET path pointer is detected in the received SONET signal.

SONET Signal Present — The SONET signal is detected at the selected SONET input.

SONET VT Pointer Present — A valid SONET VT pointer is detected in the received SONET signal.

B.2.2 Alarm Messages

The alarm messages indicate negative conditions in the received signal and relate to the current Alarm LEDs. The Alarm messages start with the *** *ALARM:* header.

T-BERD 310 Mainframe

DS3 FEAC Pri AIS RX — A DS3 Alarm Indication Signal Received message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 AIS RECEIVED* message.

DS3 FEAC Pri Comm EF NSA — A Common Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Primary DS3 signal. This is the same as the front panel *COMM EQUIP FAIL (NSA)* message.

DS3 FEAC Pri DS1 EF NSA — A DS1 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Primary DS3 signal. This is the same as the front panel *DS1 EQUIP FAIL (NSA)* message.

DS3 FEAC Pri DS1 EF SA — A DS1 Equipment Failure, Service Affecting (Type 1 equipment failure) message is detected in the received Primary DS3 signal. This is the same as the front panel *DS1 EQUIP FAIL (SA)* message.

DS3 FEAC Pri EF NSA — A DS3 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 EQUIP FAIL (NSA)* message.

DS3 FEAC Pri EF SA — A DS3 Equipment Failure, Service Affecting (Type 1 equipment failure) message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 EQUIP FAIL (SA)* message.

DS3 FEAC Pri Idle RX — A DS3 Idle Signal Received message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 IDLE RECEIVED* message.

DS3 FEAC Pri L/H — A DS3 Loss-of-Signal/High Bit Error Ratio message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 LOS/HBER* message.

DS3 FEAC Pri Mult DS1 L/H — A Multiple DS1 Loss-of-Signal/High Bit Error Ratio message is detected in the received Primary DS3 signal. This is the same as the front panel *MULT DS1 LOS/HBER* message.

DS3 FEAC Pri OOF — A DS3 Out-of-Frame, Loss of DS3 Frame Synchronization message is detected in the received Primary DS3 signal. This is the same as the front panel *DS3 OUT OF FRAME* message.

DS3 FEAC Pri Sing DS1 L/H — A Single DS1 Loss-of-Signal/High Bit Error Ratio message is detected in the received Primary DS3 signal. This is the same as the front panel *SINGLE DS1 LOS/HBER* message.

DS3 Primary Blue (AIS) — The DS3 Blue Alarm is detected in the received Primary DS3 signal.

DS3 Primary DS2 Frame Loss — The DS2 framing format is no longer present in the received Primary DS3 signal.

DS3 Primary Far-End Alarm — The T-BERD 310 is receiving a DS3 Far-End Alarm and Control (FEAC) condition in the received Primary DS3 signal.

DS3 Primary Frame Loss — The DS3 framing format is no longer present in the received Primary DS3 signal.

DS3 Primary Pattern Loss — The DS3 test pattern is no longer present in the received Primary DS3 signal.

DS3 Primary Signal Loss — Valid DS3 pulses are no longer present in the received Primary DS3 signal.

DS3 Primary Yellow — The DS3 Yellow Alarm is detected in the received Primary DS3 signal.

310-1 DS1/DS0 Analyzer Option

DS1 All Ones — An All Ones pattern is detected in the received DS1 signal.

DS1 Excess Zeros — Excess zeros are present in the received DS1 signal.

DS1 Frame Loss — The DS1 framing format is no longer present in the received DS1 signal.

DS1 Pattern Loss — The DS1 test pattern is no longer present in the received DS1 signal.

DS1 Signal Loss — Valid DS1 pulses are no longer present in the received DS1 signal.

DS1 Yellow Alarm — The DS1 Yellow Alarm is detected in the received DS1 signal.

310-3 DS1 Insert Option

DS3 FEAC Sec AIS RX — A DS3 Alarm Indication Signal Received message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 AIS RECEIVED* message.

DS3 FEAC Sec Comm EF NSA — A Common Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Secondary DS3 signal. This is the same as the front panel *COMM EQUIP FAIL (NSA)* message.

DS3 FEAC Sec DS1 EF NSA — A DS1 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS1 EQUIP FAIL (NSA)* message.

DS3 FEAC Sec DS1 EF SA — A DS1 Equipment Failure, Service Affecting (Type 1 equipment failure) message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS1 EQUIP FAIL (SA)* message.

DS3 FEAC Sec EF NSA — A DS3 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 EQUIP FAIL (NSA)* message.

DS3 FEAC Sec EF SA — A DS3 Equipment Failure, Service Affecting (Type 1 equipment failure) message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 EQUIP FAIL (SA)* message.

DS3 FEAC Sec Idle RX — A DS3 Idle Signal Received message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 IDLE RECEIVED* message.

DS3 FEAC Sec L/H — A DS3 Loss-of-Signal/High Bit Error Ratio message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 LOS/HBER* message.

DS3 FEAC Sec Mult DS1 L/H — A Multiple DS1 Loss-of-Signal/High Bit Error Ratio message is detected in the received Secondary DS3 signal. This is the same as the front panel *MULT DS1 LOS/HBER* message.

DS3 FEAC Sec OOF — A DS3 Out-of-Frame, Loss of DS3 Frame Synchronization message is detected in the received Secondary DS3 signal. This is the same as the front panel *DS3 OUT OF FRAME* message.

DS3 FEAC Sec Sing DS1 L/H — A Single DS1 Loss-of-Signal/High Bit Error Ratio message is detected in the received Secondary DS3 signal. This is the same as the front panel *SINGLE DS1 LOS/HBER* message.

DS3 Secondary Blue (AIS) — The DS3 Blue Alarm is detected in the received Secondary DS3 signal.

DS3 Secondary DS2 Frame Loss — The DS2 framing format is no longer present in the received Secondary DS3 signal.

DS3 Secondary Far-End Alarm — The T-BERD 310 is receiving a DS3 Far-End Alarm and Control (FEAC) condition in the received Secondary DS3 signal.

DS3 Secondary Frame Loss — The DS3 framing format is no longer present in the received Secondary DS3 signal.

DS3 Secondary Pattern Loss — The DS3 test pattern is no longer present in the received Secondary DS3 signal.

DS3 Secondary Signal Loss — Valid DS3 pulses are no longer present in the received Secondary DS3 signal.

DS3 Secondary Yellow — The DS3 Yellow Alarm is detected in the received Secondary DS3 signal.

310-4 or 310-4A SONET Drop Option (No longer sold.)

SONET Loss — A loss of SONET signal or framing has been detected.

310-12, 310-13R/T, or 310-14R/T SONET Option

SONET Line AIS — A Line AIS is detected in the received SONET signal.

SONET Line RDI — A Line RDI is detected in the received SONET signal.

SONET Loss of Frame — SONET frame synchronization is no longer present between test instrument and the received SONET signal.

SONET Loss of Signal — The SONET signal is no longer detected.

SONET Path AIS — A Path AIS is detected in the received SONET signal.

SONET Path LOP — A Path LOP is detected in the received SONET signal.

SONET Path RDI — A Path RDI is detected in the received SONET signal.

SONET Severely Errored Frame — A severely errored frame is detected in the received SONET signal.

SONET VT AIS — A VT AIS is detected in the received SONET signal.

SONET VT LOP — A VT LOP is detected in the received SONET signal.

SONET VT RDI — A VT RDI is detected in the received SONET signal.

B.2.3 Note Messages

The note messages indicate conditions affecting the T-BERD 310 operation. The Note messages start with the *** *NOTE:* header.

T-BERD 310 Mainframe

DS2 Test Restart — A DS2 test restart occurred on the T-BERD 310 when the DS1 channel and DS2 M-frame changed.

DS3 New Configuration — The configuration of the T-BERD 310 has been modified.

DS3 Test Complete — The end of a timed test has been reached on the T-BERD 310.

DS3 Test Restart — A test restart occurred on the T-BERD 310.

Print Buffer Full — The T-BERD 310 print buffer has overflowed. When the message appears, at least one printout has been lost (discarded). There is no date and time associated with this note message.

Squelch Off — The generation of 5 or less errored second, alarm, note, or status print requests occurred during the previous 60 seconds while the printer squelch was on.

Squelch On — More than 20 errored second, alarm, note, or status printouts have been generated within 60 seconds. The printer squelch is turned on and no more messages or automatic ERR SEC result printouts are printed or stored.

310-1 DS1/DS0 Analyzer Option

DS1 New Configuration — The configuration of the 310-1 has been modified.

DS1 Test Complete — The end of a timed test has been reached on the 310-1.

DS1 Test Restart — A test restart occurred on the 310-1.

310-12, 310-13R/T, or 310-14R/T SONET Option

SONET Test Restart — A test restart occurred on a SONET option.

B.3 FRONT-PANEL MESSAGES

Operating messages provide visual indications of the instrument operation and the received signal. Some messages are displayed once and others flash until the cause of the condition is changed or corrected. The messages are defined in alphabetical order as follows:

T-BERD 310 Mainframe

232 REMOTE CONTROL — This message is flashed when the unit is under remote control. This message alternates with the displayed results and operating status. This message is disabled by exiting the remote control mode and returning to local control.

488 REMOTE CONTROL — This message is flashed when the unit is under remote control. This message alternates with the displayed results and operating status. This message is disabled by exiting the remote control mode and returning to local control. This message only appears when operating from the 310-6 IEEE-488 Option interface.

DS2 TEST RESTART — This message is flashed when the **DS3-DS1 CHANNEL DROP** switch changes the DS1 channel from one DS2 M-frame to another.

OPTION NOT INSTALLED — This message is displayed when an option, which is not currently installed, is required for a switch to operate properly.

SIGNAL LOSS — This message is flashed when the unit loses the DS3 signal.

TIMED TEST COMPLETE — This message is displayed when a timed test is finished. This message is disabled by setting the **TEST** switch to CONT, or by pressing the **RESTART** switch. This message is flashed alternating with the displayed results and operating status.

NO DS3 SIG TRY STS-1 — This message appears when the signal connected to the DS3 RECEIVE jack has a frequency outside the recoverable range of the DS3 receiver. The signal may be confused with an STS-1 SONET signal. Try connecting this signal to the side panel STS-1 RECEIVE connector of the SONET option, if installed.

310-1 DS1/DS0 Analyzer Option

SIGNAL LOSS — This message is flashed when the 310-1 loses the DS1 signal.

TEST COMPLETE — This message is displayed when a timed test is finished. This message is disabled by pressing the **RESTART** switch. This message is flashed alternating with the displayed results and operating status.

310-12, 310-13R/T, or 310-14R/T SONET Option

LASER OVERHEATED — This message appears when the optional lasers have malfunctioned. Contact TTC for assistance.

NO STS SIG TRY DS3 — This message appears when the signal connected to the STS-1 RECEIVE connector on the side panel of the SONET options is outside the recoverable frequency range of the STS-1 receiver. The signal may be a DS3 signal. Try connecting this signal to the DS3 RECEIVE jack.

B.4 REMOTE CONTROL MESSAGES

The following error, warning, and general messages appear when entering commands and/or parameters incorrectly. The error and warning messages are formatted with an ****ERROR* or ****WARNING* header, the problem, and in some cases the improperly entered command or parameter.

B.4.1 Error Messages

Already transmitting FEAC control message. — A FEAC message or loop code is being transmitted. Use the **FEAc ALArms** or **FEAc LOOp** command to halt the transmission of the message or loop code.

Bad command syntax. — The **command_name** was entered improperly. Reenter the first three characters of the **command_name** or as required. See the **HELP !** command for a list of valid **command_names**.

Bad configuration parameter: xxxxx — The indicated **[parameter]** was an invalid parameter for the setup configuration. Reenter the entire command string with the correct **[parameter]**. See the **HELP <command-name>** command for a list of valid **[parameters]**.

Bad parameter: xxxxx — The indicated **[parameter]** was entered improperly. Reenter the entire command string with the correct **[parameter]**. See the **HELP <command-name>** command for a list of valid **[parameters]**.

Command line too long (255 character limit). — The number of characters entered in the command line exceeds the 255 character limit. Reduce the character count and reenter the command.

Framing errors not allowed in DS1 Insert mode. — Attempted to insert framing errors in the DS1 INSERT mode. Either do not insert framing errors in the DS1 INSERT mode or change the operating mode.

Framing errors not allowed in Thru & Auto modes. — Attempted to insert framing errors in either the THRU or AUTO mode. Either do not insert framing errors in the THRU or AUTO mode or change the operating mode.

Framing errors not allowed in Unframed mode. — Attempted to insert framing errors in the UNFRAMED mode. Either do not insert framing errors in the UNFRAMED mode or change the operating mode.

No such command: xxxxx — The indicated **command_name** is not a valid command. See the **HELP !** command for a list of valid **command_names**.

No such help page: xxxxx — The indicated help page is not valid. See the **HELP** command for a list of valid page names and numbers.

Not allowed in IEEE-488 mode. — The **command_name** is not allowed when operating the T-BERD 310 from an IEEE-488 controller, i.e., the **PRInt GRAph** command cannot be executed from an IEEE-488 controller.

Not enough command words specified. — The **command_name** is incomplete. See the **HELP !** command for a list of valid **command_names**.

Not enough letters specified: xxxxx — The **command_name** does not have enough characters entered. See the **HELP <command-name>** command for a list of valid **command_names** or **[parameters]**.

Not enough parameters specified. — The **[parameter]** in the command is incomplete. Use the **HELP <command-name>** command to list the valid **[parameters]** for the command.

Operation not allowed; not originating frame. — The T-BERD 310 is not generating framing, i.e., AUTO or THRU mode, and the entered operation is not allowed, i.e., inserting a pattern, FEAC messages, or frame errors in AUTO mode.

Operation not allowed; not transmitting C-bit. — The T-BERD 310 is not generating C-bit framing and the entered operation is not allowed, i.e., inserting FEAC messages.

Page name too long: xxxxx — The indicated help page name is longer than the longest valid help page name. See the **HELP** or **@HELP** command for a list of valid page names and numbers.

Parameter out of range: xxxxx — The previous **[parameter]** exceeds the command parameter limits. Reenter the entire command string with the correct **[parameter]**. See the **HELP <command>** command for a list of valid **[parameters]**.

Parameter(s) required. — The **command_name** requires a **[parameter]**. See the **HELP <command>** command for a list of valid **[parameters]**.

Pattern not changeable in current mode. — The selected pattern cannot be changed in the current operating mode. Either change the test pattern or operating mode.

Pattern not supported by current mode. — The previous test pattern is not valid for the current operating mode. Change either the test pattern or operating mode.

Remote Control cannot modify this setting. — An attempt was made to modify the **PRInt PARity** or **PRInt BAUd RATe** command.

Required option not installed. — Option-specific text was detected in the command line. The previous command is only valid when the appropriate options are installed, i.e., the **PATTern INTernal DS1** command requires the 310-3 DS1 Insert Option and the 310-1 DS1/DS0 Analyzer Option.

Result not supported by current ROM revision — The current software does not support the selected test result.

That operation is not relevant to the current mode — The previous operation does not apply to the current operating mode. The operation succeeded, but it has no effect on the current mode.

Too many command words specified. — The **command_name** is too long. See the **HELP !** command for a list of valid **command_names**.

Too many parameters specified. — The number of **[parameters]** exceeds the command requirements. Use the **HELP <command-name>** command to list the valid **[parameters]** for the command.

B.4.2 Warning Messages

Current configuration forces Recovered Timing mode — The transmit timing mode was changed to either internal or external and the configuration requires recovered timing. The instrument defaults to recovered timing.

DS1s present in selected DS2; channel may differ. — An E1 channel number was entered with the **DS1 DROp CHAnnel** command and the DS2 frame actually contains DS1 channels.

E1s present in selected DS2; channel may differ. — A DS1 channel number was entered with the **DS1 DROp CHAnnel** command and the DS2 frame actually contains E1 channels.

Prompt string too long, truncated. — The entered **<prompt string>** exceeds the 32 character length limit and was truncated.

Seconds value ignored. — Seconds were entered in the **PRInt INTerval** command and none were required.

T1 linecode forced to AMI when transmitting ZBTSI. — The **@CODe B8Zs** command was entered when the **@MODe T1 ESFZ** command is established. The DS1/DS0 Analyzer Option defaults to AMI coding when the T1 ESFz mode is selected.

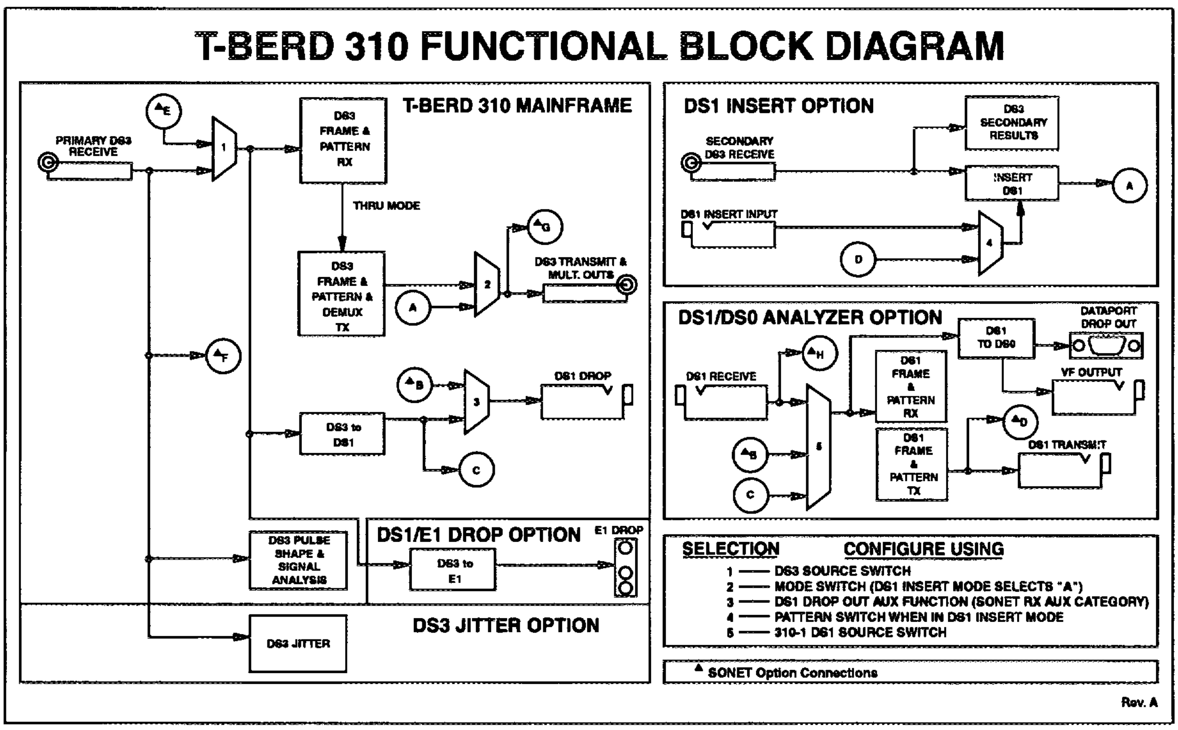
B.4.3 General Messages

Result N/A. — The selected test result does not apply to the current configuration.

Result unavailable. — The selected test result is not available. See the **PRI, RES1,** or **RES2** command.

T-BERD 310 FUNCTIONAL BLOCK DIAGRAM

The T-BERD 310 Functional Block Diagram provides a quick and easy reference for following each SONET, DS3, DS1, and DS0 signal path throughout the T-BERD 310. The diagram shows signal input jacks and the functions that can be performed on each signal. The diagram also indicates the functional locations where lower level channels can be dropped from higher level signals (e.g., dropping a DS1 channel from a DS3 signal). Front-panel switches or auxiliary functions required to make any selections are identified on the diagram.



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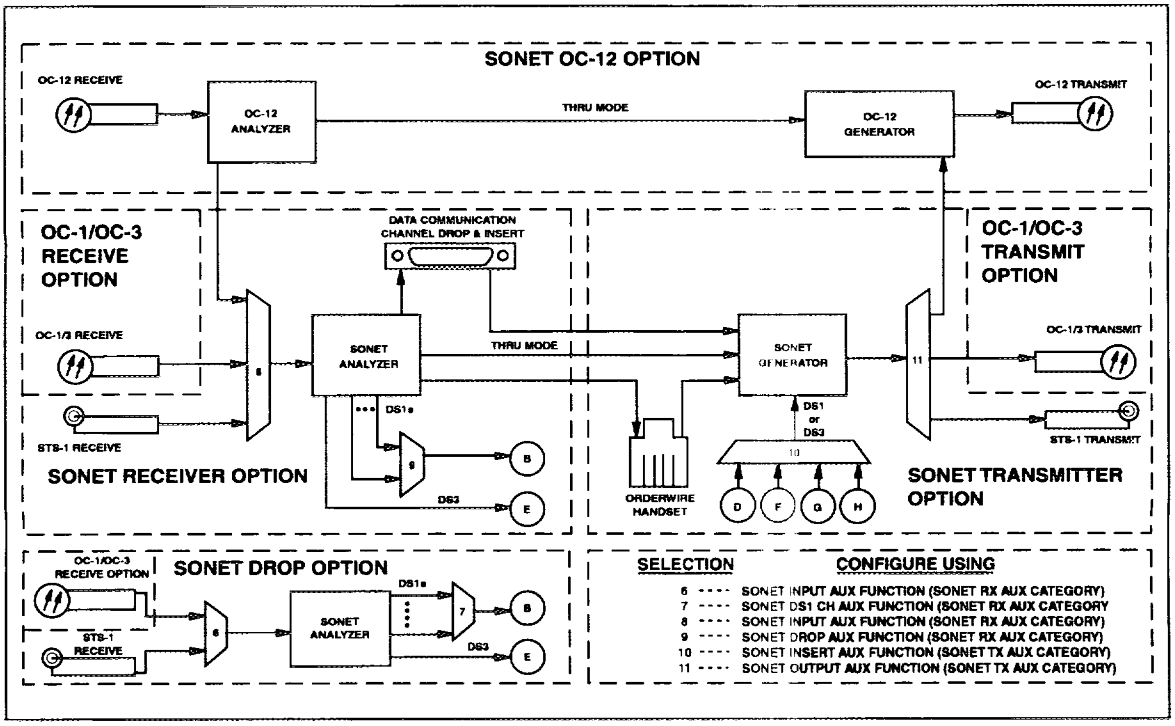
9500521-00



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9500522-00

STRESS PATTERNS

The stress patterns are represented in a right-to-left format. When the pattern is transmitted in binary form the least significant bit is transmitted first. This requires that the binary representation be turned over for transmission. Example: The binary representation of the hexadecimal value 01 would be 0000 0001. The stress patterns are provided with the Enhanced DS1 Testing Option.

Hexadecimal-to-Binary Conversion

H	8421
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111
MSB	LSB

74H = 0111 0100

Min/Max Stress Pattern

01	02	03	04	05	06	07	08	09	10
80H	80H	80H	80H	01H	00H	01H	01H	01H	03H
1000 0000	1000 0000	1000 0000	1000 0000	0000 0001	0000 0000	0000 0001	0000 0001	0000 0001	0000 0011
11	12	13	14	15	16	17	18	19	20
80H	01H	80H	01H	01H	80H	01H	22H	00H	20H
1000 0000	0000 0001	1000 0000	0000 0001	0000 0001	1000 0000	0000 0001	0010 0010	0000 0000	0010 0000
21	22	23	24	25	26	27	28	29	30
22H	00H	20H	AAH	AAH	AAH	AAH	AAH	55H	55H
0010 0010	0000 0000	0010 0000	1010 1010	1010 1010	1010 1010	1010 1010	1010 1010	0101 0101	0101 0101
31	32	33	34	35	36	37	38	39	40
55H	55H	AAH	AAH	AAH	AAH	55H	AAH	AAH	55H
0101 0101	0101 0101	1010 1010	1010 1010	1010 1010	1010 1010	0101 0101	1010 1010	1010 1010	0101 0101
41	42	43	44	45	46	47	48	49	50
55H	55H	80H	80H	FFH	FFH	FFH	FFH	FFH	FFH
0101 0101	0101 0101	1000 0000	1000 0000	1111 1111	1111 1111	1111 1111	1111 1111	1111 1111	1111 1111
51	52	53	54	55	56	57	58	59	60
FFH	FEH	FFH	FFH	24H	49H	92H	88H	88H	88H
1111 1111	1111 1110	1111 1111	1111 1111	0010 0100	0100 1001	1001 0010	1000 1000	1000 1000	1000 1000
61	62	63	64	65	66	67	68	69	70
10H	42H	08H	21H	84H	20H	08H	82H	40H	20H
0001 0000	0100 0010	0000 1000	0010 0001	1000 0100	0010 0000	0000 1000	1000 0010	0100 0000	0010 0000
71	72	73							
10H	80H	- -							
0001 0000	1000 0000								

T1-2 Stress Pattern

01 FFH 1111 1111	02 FFH 1111 1111	03 FFH 1111 1111	04 FFH 1111 1111	05 FFH 1111 1111	06 FFH 1111 1111	07 FFH 1111 1111	08 FFH 1111 1111	09 FFH 1111 1111	10 FFH 1111 1111
11 FFH 1111 1111	12 FFH 1111 1111	13 FFH 1111 1111	14 FFH 1111 1111	15 FFH 1111 1111	16 FFH 1111 1111	17 FFH 1111 1111	18 FFH 1111 1111	19 FFH 1111 1111	20 FFH 1111 1111
21 FFH 1111 1111	22 FFH 1111 1111	23 FFH 1111 1111	24 FFH 1111 1111	25 FFH 1111 1111	26 FFH 1111 1111	27 FFH 1111 1111	28 FFH 1111 1111	29 FFH 1111 1111	30 FFH 1111 1111
31 FFH 1111 1111	32 FFH 1111 1111	33 FFH 1111 1111	34 FFH 1111 1111	35 FFH 1111 1111	36 FFH 1111 1111	37 FFH 1111 1111	38 FFH 1111 1111	39 FFH 1111 1111	40 FFH 1111 1111
41 FFH 1111 1111	42 FFH 1111 1111	43 FFH 1111 1111	44 FFH 1111 1111	45 FFH 1111 1111	46 FFH 1111 1111	47 FFH 1111 1111	48 FFH 1111 1111	49 AAH 1010 1010	50 AAH 1010 1010

T1-2 Stress Pattern (Continued)

51 AAH 1010 1010	52 AAH 1010 1010	53 80H 1000 0000	54 01H 0000 0001	55 80H 1000 0000	56 01H 0000 0001	57 80H 1000 0000	58 01H 0000 0001	59 80H 1000 0000	60 01H 0000 0001
61 80H 1000 0000	62 01H 0000 0001	63 80H 1000 0000	64 01H 0000 0001	65 80H 1000 0000	66 01H 0000 0001	67 80H 1000 0000	68 01H 0000 0001	69 80H 1000 0000	70 01H 0000 0001
71 80H 1000 0000	72 01H 0000 0001	73 AAH 1010 1010	74 AAH 1010 1010	75 AAH 1010 1010	76 AAH 1010 1010	77 80H 1000 0000	78 01H 0000 0001	79 80H 1000 0000	80 01H 0000 0001
81 80H 1000 0000	82 01H 0000 0001	83 80H 1000 0000	84 01H 0000 0001	85 80H 1000 0000	86 01H 0000 0001	87 80H 1000 0000	88 01H 0000 0001	89 80H 1000 0000	90 01H 0000 0001
91 80H 1000 0000	92 01H 0000 0001	93 80H 1000 0000	94 01H 0000 0001	95 80H 1000 0000	96 01H 0000 0001				

T1-3 Stress Pattern

01 01H 0000 0001	02 01H 0000 0001	03 01H 0000 0001	04 01H 0000 0001	05 01H 0000 0001	06 01H 0000 0001	07 00H 0000 0000	08 01H 0000 0001	09 01H 0000 0001	10 01H 0000 0001
11 01H 1000 0000	12 01H 0000 0001	13 01H 0000 0001	14 03H 0000 0011	15 01H 0000 0001	16 01H 0000 0001	17 01H 0000 0001	18 01H 0000 0001	19 07H 0000 0111	20 01H 0000 0001
21 01H 0000 0001	22 01H 0000 0001	23 01H 0000 0001	24 55H 0101 0101	25 55H 0101 0101	26 55H 0101 0101	27 55H 0101 0101	28 AAH 1010 1010	29 AAH 1010 1010	30 AAH 1010 1010
31 AAH 1010 1010	32 01H 0000 0001	33 01H 0000 0001	34 01H 0000 0001	35 01H 0000 0001	36 01H 0000 0001	37 01H 0000 0001	38 FFH 1111 1111	39 FFH 1111 1111	40 FFH 1111 1111
41 FFH 1111 1111	42 FFH 1111 1111	43 FFH 1111 1111	44 80H 1000 0000	45 01H 0000 0001	46 80H 1000 0000	47 01H 0000 0001	48 80H 1000 0000	49 01H 0000 0001	50 80H 1000 0000
51 01H 0000 0001	52 80H 1000 0000	53 01H 0000 0001	54 80H 1000 0000						

T1-4 Stress Pattern

01 FFH 1111 1111	02 FFH 1111 1111	03 FFH 1111 1111	04 FFH 1111 1111	05 FFH 1111 1111	06 FFH 1111 1111	07 FFH 1111 1111	08 FFH 1111 1111	09 FFH 1111 1111	10 FFH 1111 1111
11 FFH 1111 1111	12 FFH 1111 1111	13 FFH 1111 1111	14 FFH 1111 1111	15 FFH 1111 1111	16 FFH 1111 1111	17 FFH 1111 1111	18 FFH 1111 1111	19 FFH 1111 1111	20 FFH 1111 1111
21 FFH 1111 1111	22 FFH 1111 1111	23 FFH 1111 1111	24 FFH 1111 1111	25 FFH 1111 1111	26 FFH 1111 1111	27 FFH 1111 1111	28 FFH 1111 1111	29 FFH 1111 1111	30 FFH 1111 1111
31 FFH 1111 1111	32 FFH 1111 1111	33 FFH 1111 1111	34 FFH 1111 1111	35 FFH 1111 1111	36 FFH 1111 1111	37 FFH 1111 1111	38 FFH 1111 1111	39 FFH 1111 1111	40 FFH 1111 1111
41 FFH 1111 1111	42 FFH 1111 1111	43 FFH 1111 1111	44 FFH 1111 1111	45 FFH 1111 1111	46 FFH 1111 1111	47 FFH 1111 1111	48 FFH 1111 1111	49 FFH 1111 1111	50 FFH 1111 1111
51 FFH 1111 1111	52 FFH 1111 1111	53 FFH 1111 1111	54 FFH 1111 1111	55 FFH 1111 1111	56 FFH 1111 1111	57 FFH 1111 1111	58 FFH 1111 1111	59 FFH 1111 1111	60 FFH 1111 1111

T1-4 Stress Pattern (Continued)

61 FFH 1111 1111	62 FFH 1111 1111	63 FFH 1111 1111	64 FFH 1111 1111	65 FFH 1111 1111	66 FFH 1111 1111	67 FFH 1111 1111	68 FFH 1111 1111	69 FFH 1111 1111	70 FFH 1111 1111
71 FFH 1111 1111	72 FFH 1111 1111	73 AAH 1010 1010	74 AAH 1010 1010	75 AAH 1010 1010	76 AAH 1010 1010	77 10H 0001 0000	78 10H 0001 0000	79 10H 0001 0000	80 10H 0001 0000
81 10H 0001 0000	82 10H 0001 0000	83 10H 0001 0000	84 10H 0001 0000	85 10H 0001 0000	86 10H 0001 0000	87 10H 0001 0000	88 10H 0001 0000	89 10H 0001 0000	90 10H 0001 0000
91 10H 0001 0000	92 10H 0001 0000	93 10H 0001 0000	94 10H 0001 0000	95 10H 0001 0000	96 10H 0001 0000	97 AAH 1010 1010	98 AAH 1010 1010	99 AAH 1010 1010	100 AAH 1010 1010
101 10H 0001 0000	102 10H 0001 0000	103 10H 0001 0000	104 10H 0001 0000	105 10H 0001 0000	106 10H 0001 0000	107 10H 0001 0000	108 10H 0001 0000	109 10H 0001 0000	110 10H 0001 0000
111 10H 0001 0000	112 10H 0001 0000	113 10H 0001 0000	114 10H 0001 0000	115 10H 0001 0000	116 10H 0001 0000	117 10H 0001 0000	118 10H 0001 0000	119 10H 0001 0000	120 10H 0001 0000

T1-5 Stress Pattern

01 80H 1000 0000	02 01H 0000 0001	03 80H 1000 0000	04 01H 0000 0001	05 80H 1000 0000	06 01H 0000 0001	07 80H 1000 0000	08 01H 0000 0001	09 80H 1000 0000	10 01H 0000 0001
11 80H 1000 0000	12 01H 0000 0001	13 80H 1000 0000	14 01H 0000 0001	15 80H 1000 0000	16 01H 0000 0001	17 80H 1000 0000	18 01H 0000 0001	19 80H 1000 0000	20 01H 0000 0001
21 80H 1000 0000	22 01H 0000 0001	23 80H 1000 0000	24 01H 0000 0001	25 80H 1000 0000	26 01H 0000 0001	27 80H 1000 0000	28 01H 0000 0001	29 80H 1000 0000	30 01H 0000 0001
31 01H 0000 0001	32 AFH 1010 1111	33 AAH 1010 1010	34 AFH 1010 1111	35 01H 0000 0001	36 01H 0000 0001	37 01H 0000 0001	38 01H 0000 0001	39 FFH 1111 1111	40 FFH 1111 1111
41 FFH 1111 1111	42 FFH 1111 1111	43 01H 0000 0001	44 01H 0000 0001	45 01H 0000 0001	46 01H 0000 0001	47 FFH 1111 1111	48 FFH 1111 1111	49 FFH 1111 1111	50 FFH 1111 1111
51 FFH 1111 1111	52 FFH 1111 1111	53 CBH 1100 1011							

T1-6 Stress Pattern

01 01H 0000 0001	02 01H 0000 0001	03 01H 0000 0001	04 01H 0000 0001	05 01H 0000 0001	06 01H 0000 0001	07 00H 0000 0000	08 01H 0000 0001	09 01H 0000 0001	10 01H 0000 0001
11 01H 0000 0001	12 01H 0000 0001	13 01H 0000 0001	14 03H 0000 0011	15 01H 0000 0001	16 01H 0000 0001	17 01H 0000 0001	18 01H 0000 0001	19 07H 0000 0111	20 01H 0000 0001
21 01H 0000 0001	22 01H 0000 0001	23 01H 0000 0001	24 55H 0101 0101	25 55H 0101 0101	26 55H 0101 0101	27 55H 0101 0101	28 AAH 1010 1010	29 AAH 1010 1010	30 AAH 1010 1010
31 AAH 1010 1010	32 01H 0000 0001	33 01H 0000 0001	34 01H 0000 0001	35 01H 0000 0001	36 01H 0000 0001	37 01H 0000 0001	38 FFH 1111 1111	39 FFH 1111 1111	40 FFH 1111 1111
41 FFH 1111 1111	42 FFH 1111 1111	43 FFH 1111 1111	44 80H 1000 0000	45 01H 0000 0001	46 80H 1000 0000	47 01H 0000 0001	48 80H 1000 0000	49 01H 0000 0001	50 80H 1000 0000
51 01H 0000 0001	52 80H 1000 0000	53 01H 0000 0001	54 80H 1000 0000	55 01H 0000 0001					

T1-DALY Stress Pattern

01	02	03	04	05	06	07	08	09	10
01H	01H	01H	01H	01H	01H	80H	01H	01H	01H
0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	1000 0000	0000 0001	0000 0001	0000 0001
11	12	13	14	15	16	17	18	19	20
01H	01H	01H	03H	01H	01H	01H	01H	07H	01H
0000 0001	0000 0001	0000 0001	0000 0011	0000 0001	0000 0001	0000 0001	0000 0001	0000 0111	0000 0001
21	22	23	24	25	26	27	28	29	30
01H	01H	01H	55H	55H	55H	55H	AAH	AAH	AAH
0000 0001	0000 0001	0000 0001	0101 0101	0101 0101	0101 0101	0101 0101	1010 1010	1010 1010	1010 1010
31	32	33	34	35	36	37	38	39	40
AAH	01H	01H	01H	01H	01H	01H	FFH	FFH	FFH
1010 1010	0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	1111 1111	1111 1111	1111 1111
41	42	43	44	45	46	47	48	49	50
FFH	FFH	FFH	80H	01H	80H	01H	80H	01H	80H
1111 1111	1111 1111	1111 1111	1000 0000	0000 0001	1000 0000	0000 0001	1000 0000	0000 0001	1000 0000
51	52	53	54	55					
01H	80H	01H	80H	01H					
0000 0001	1000 0000	0000 0001	1000 0000	0000 0001					

REMOTE CONTROL COMMANDS

This appendix describes the T-BERD 310 and DS1/DS0 Analyzer Option remote control commands in alphabetical order. Unless otherwise indicated, the remote control commands apply to the T-BERD 310 mainframe. Remote control commands that require an option to be installed are identified by the option number as follows:

- 310-1 — DS1/DS0 Analyzer Option
- 310-2 — E1 Drop Option
- 310-3 — DS1 Insert Option
- 310-5 — DS3 Jitter Option
- 310-9A — Enhanced ESF/DS1 Timing Slips Option
- 310-9B — Enhanced DS1 Testing Option
- 310-10 — G.821 Test Results Option
- 310-12 — SONET OC-12 Transmit/Receive Option
- 310-12-DUAL — SONET OC-12 Dual Wavelength Option
- 310-13R — SONET STS-1 Receive Option
- 310-13T — SONET STS-1 Transmit Option
- 310-14R — SONET STS-1, OC-1, OC-3 Receive Option
- 310-14T — SONET STS-1, OC-1, OC-3 Transmit Option
- 310-14T-DUAL — SONET OC-1 / OC-3 Dual Wavelength Option
- 310-15 — OC-3c ATM Option
- 310-16 — Optical Media Test Option

REMOTE CONTROL COMMANDS

T-BERD 310 MAINFRAME

ALArms

ALArms

Set Alarm Message Printout Control

This command sets or prints the alarm message printout function. The command controls whether alarm, status, and note messages are printed when a print event is selected with the **PRInt EVEnt** command.

ALA ?
Print the alarm message printout status.

ALA ON
Enable the alarm message printout control. Alarm, status, and note messages are printed when a print event is selected. When the **PRInt EVEnt** command is **OFF**, the **ALArms ON** command is not functional.

ALA OFF
Disable the alarm message printout control. Alarm, status, and note messages are not printed when a print event is selected.

ATM CELl BANdwidth

ATM CELl BANdwidth

Transmitted ATM Primary Cell Profile Bandwidth Select

This command sets or prints the primary test and background profile cell bandwidth. The sum of the primary, background, and idle cells equals the total bandwidth. For example, if the primary profile is set to 50% and the background profile is set to 30%, then the idle signal bandwidth automatically sets to 20% of the total cell bandwidth. The minimum idle bandwidth is 1%. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to **OC-3** or **OC-12**.

ATM CEL BAN ?
Print the current primary profile cell bandwidth: test, background, and idle.

ATM CEL BAN <test,background>
Set the primary test and background profile cell bandwidth. Enter the **<test,xx>** parameter from **00**% to **99**% in 1% steps. Enter the **<xx,background>** parameter from **99**% to **00**% in 1% steps.

See also: **ATM RX BANdwidth PERiod, ATM PEAk BANdwidth, ATM PEAk DURation,** and **SONet INPut**

ATM CORrelation

Transmitted ATM Correlation Tag Control

This command sets or prints the transmitted correlation tag in the test cell. This allows multiple T-BERD 310s to be differentiated from one another. The correlation tag is two bytes long. The entered value is transmitted from left to right. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM COR ?
Print the current correlation tag.

ATM COR xxxx
Set the correlation tag from 0000 to FFFF. **x** equals 0 to F.

See also: **SONet INPut**

ATM HEC ERRor INSert

Transmitted ATM Header Error Control Error Insert Control

This command sets or prints the HEC error rate type and insertion rate. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM HEC ERR INS ?
Print the current HEC error rate.

ATM HEC ERR INS [NON | COR] BUR
Insert a non-correctable or correctable burst of HEC errors. Set the burst duration with the **ATM HEC ERRor RATe BURst** command and the error rate with the **ATM HEC ERRor RATe x** command.

ATM HEC ERR INS [NON | COR] OFF
Disable the inserted non-correctable or correctable HEC errors.

ATM HEC ERR INS [NON | COR] RAT
Insert non-correctable or correctable HEC errors at the specified error rate. Set the error rate with the **ATM HEC ERRor RATe** command.

See also: **ATM HEC ERRor RATe** and **SONet INPut**

ATM HEC ERRor RATe

ATM HEC ERRor RATe

Transmitted ATM Header Error Control Error Rate

This command sets or prints the error rate and the number of consecutive cells affected by the inserted errors. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12. Insert the HEC errors with the **ATM HEC ERRor INSert** command.

ATM HEC ERR RAT ?
Print the current HEC error rate.

ATM HEC ERR RAT <rate,burst>
Set the HEC error rate and burst rate. Enter the **<rate,xx>** parameter from **2** to **9** or **C** (continuous). Entering the **C** inserts a bit error in every transmitted cell. Enter the **<xx,burst>** parameter from **01** to **10**.

See also: **ATM HEC ERRor INSert** and **SONet INPut**

ATM OAM FLOw

ATM OAM FLOw

Transmitted ATM OAM Flow Control

This command sets or prints the OAM format and signal function for the alarm or loopback selected from the **ATM OAM INSert** command (select the signal first). This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM OAM FLO ?
Print the current OAM format and signal function.

ATM OAM FLO [VPC | VCC] END
Send the OAM signal for a virtual path connection (VPC) or a virtual channel connection (VCC) in an end-to-end test.

ATM OAM FLO [VPC | VCC] SEG
Send the OAM signal for a virtual path connection (VPC) or a virtual channel connection (VCC) in a segmented test.

See also: **ATM OAM INSert** and **SONet INPut**

ATM OAM INSert — ATM OAM INSert

Transmitted ATM OAM Insert Control

This command selects and inserts or prints the OAM fault management signals. Refer to the **ATM OAM FLOw** command to set the signal format and function. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM OAM INS ?
Print the current OAM fault management signal.

ATM OAM INS AIS
Send the OAM AIS signal.

ATM OAM INS LOO
Send OAM loopback cells.

ATM OAM INS OFF
Disable the OAM signal.

ATM OAM INS RDI
Send the OAM RDI signal.

See also: **ATM OAM FLOw** and **SONet INPut**

ATM PEAk BANdwidth — ATM PEAk BANdwidth

Transmitted ATM Cell Test Profile Peak Bandwidth Select

This command sets or prints the percentage of burstiness for the primary test profile peak bandwidth. The burst bandwidth is taken from the available idle signal bandwidth first then the background cell bandwidth. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM PEA BAN ?
Print the current percentage of burstiness for the primary test profile peak bandwidth.

ATM PEA BAN xx
Set the percentage of burstiness for the primary test profile peak bandwidth. **xx** equals 0% to 99% in 1% steps.

See also: **ATM CELl BANdwidth, ATM RX BANdwidth PERiod, ATM PEAk DURation,** and **SONet INPut**

ATM PEAk DURation **ATM PEAk DURation**

Transmitted ATM Cell Test Profile Peak Duration Select

This command sets or prints the peak pulse duration for the peak bandwidth. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM PEA DUR ?
Print the current peak pulse duration for the peak bandwidth.

ATM PEA DUR x.x
Set the peak pulse duration for the peak bandwidth. **x.x** equals 0.1 to 9.9 seconds in 0.1 second steps.

ATM PEA DUR STO
Stop the peak pulse duration.

See also: **ATM CELl BANdwidth, ATM RX BANdwidth PERiod, ATM PEAk BANdwidth,** and **SONet INPut**

ATM RX BANdwidth PERiod **ATM RX BANdwidth PERiod**

Received ATM Cell Test Profile Bandwidth Select

This command sets or prints the period for bandwidth measurements being taken. This command requires the 310-15 option. The command is only valid when the **SONet DROp** command is set to OC-3 or OC-12.

ATM RX BAN PER ?
Print the current period for bandwidth measurements being taken.

ATM RX BAN PER x.x
Set period to measure the bandwidth from 0.1 seconds to 9.9 seconds in 0.1 second steps.

See also: **ATM CELl BANdwidth, ATM PEAk BANdwidth, ATM PEAk DURation,** and **SONet DROp**

ATM RX NETwork INTerface **ATM RX NETwork INTerface**

Received ATM Network Interface Select

This command sets or prints the received ATM network interface being tested. This command requires the 310-15 option. The command is only valid when the **SONet DROp** command is set to OC-3 or OC-12.

ATM RX NET INT ?
Print the current ATM network interface selected.

ATM RX NET INT NNI
Configure the ATM receiver to receive the network node interface or network-to-network interface cell format.

ATM RX NET INT UNI
Configure the ATM receiver to receive the user network interface cell format.

See also: **ATM RX SCRamble, ATM TX SCRamble, ATM TX NETwork INTerface,** and **SONet DROp**

ATM RX PREview **ATM RX PREview**

Received ATM Cell Test Profile Preview Select

This command sets or prints the test instrument preview function. An initial indication of the bandwidth usage and cell type can be monitored through the MASK CELL BW, HEC ERRORS, and ATM Status test results. This command requires the 310-15 option. The command is only valid when the **SONet DROp** command is set to OC-3 or OC-12.

ATM RX PRE ?
Print the current preview status.

ATM RX PREview VPI NEXt
Increment the VPI to the next detected higher VPI.

ATM RX PREview VPI PREvious
Decrement the VPI to the next detected lower VPI.

ATM RX PREview VCI NEXt
Increment the VCI to the next detected higher VCI.

ATM RX PREview VCI PREvious
Decrement the VPI/VCI to the next detected lower VCI.

See also: **ATM TX TESt PROfile, ATM TX PROfile, ATM RX PROfile, SONet INSert,** and **SONet DROp**

Received ATM Cell Test Profile Control

This command sets or prints the ATM receiver for up to four specific test cell profiles (n = 1 to 4). This enables the ATM cell header fields — GFC, VPI, VCI, PTI, and CLP — to be preprogrammed four different ways with any value. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM RX PRO Pn ?

Print the current ATM test profile where Pn equals **P1**, **P2**, **P3**, or **P4**.

ATM RX PRO Pn <gfc,vpi,vci,pti,clp>

<gfc> — Set the single digit hexadecimal value for the GFC field. For the UNI cell format, the range is **0** to **F** or **X**. For the NNI cell format, the value is appended to the VPI field.

NOTE: Separate each field with a comma as follows: x,xx,xxxx,x,x. Select **X** when you do not care what the value is.

<vpi> — Set the two or three digit hexadecimal value for the VPI field. For the UNI cell format the range is **00** to **FF** or **XX** (256 virtual paths). For the NNI cell format, the value is appended with the GFC field and the range becomes **000** to **FFF** or **XXX** (4096 virtual paths).

<vci> — Set the four digit hexadecimal value for the VCI field from **0000** to **FFFF** or **XXXX** (65,536 virtual channels for each VPI).

<pti> — Set the single digit PTI value from **0** to **7** or **X**. The PTI value is defined as follows:

0	User Data Cell, congestion not experienced, SDU-type.
1	User Data Cell, congestion not experienced, SDU-type.
2	User Data Cell, congestion experienced, SDU-type.
3	User Data Cell, congestion experienced, SDU-type.
4	Segment OAM F5 flow cell (for VC loopbacks and alarms).
5	End-to-end OAM F5 flow cell (for VC loopbacks and alarms).
6	Reserved for future traffic control and remote monitoring functions.
7	Reserved for future functions.
X	Don't care what the value is.

<clp> — Set the CLP value for **0**, **1**, or **X**. **1** allows the cell to be dropped. **0** prevents the cell from being dropped. ATM switches can change the CLP value when it detects congestion.

See also: **ATM TX TESt PROfile, ATM TX PROfile, ATM RX TESt MASk, SONet INPut,** and **SONet DROp**

ATM RX SCRamble

ATM RX SCRamble

Receiver 43-Bit Cell Payload Descrambler Control

This command sets or prints the configuration of the receiver 43-bit cell descrambler. This command requires the 310-15 option. The command is only valid when the **SONet DROp** command is set to OC-3 or OC-12.

ATM RX SCR ?
Print the current receiver 43-bit cell payload descrambler configuration.

ATM RX SCR OFF
Disable the receiver 43-bit cell payload descrambler.

ATM RX SCR ON
Enable the receiver 43-bit cell payload descrambler.

See also: **ATM RX NETwork INTerface, ATM TX SCRamble, ATM TX NETwork INTerface,** and **SONet DROp**

ATM RX TESt MASk

ATM RX TESt MASk

Received ATM Cell Test Mask Control

This command sets or prints the cell test mask format to look for in the received signal. This command requires the 310-15 option. The command is only valid when the **SONet DROp** command is set to OC-3 or OC-12.

ATM RX TES MAS ?
Print the current cell test mask format.

ATM RX TES MAS AIS SEA
Search for the transmitted OAM AIS test cell.

ATM RX TES MAS SEA
Use the Search Mask to perform Results Analysis.

ATM RX TES MAS Pn
Search for the selected profile test cell. **Pn** equals P1 to P4.

ATM RX TES MAS PRE
Enter Preview Mode.

ATM RX TES MAS RDI SEA
Search for the transmitted OAM RDI test cell.

ATM RX TES MAS TTC SEA
Search for the transmitted OAM TTC test cell.

ATM RX TES MAS TX
Use the Transmit Test Mask to perform Results Analysis.

ATM RX TES MAS AIS NEX
Increment to the next VPI/VCI in the AIS Search Mode.

ATM RX TES MAS RDI NEX
Increment to the next VPI/VCI in the RDI Search Mode.

ATM RX TES MAS TTC NEX
Increment to the next VPI/VCI in the TTC Search Mode.

ATM RX TES MAS AIS USE
Store the current VPI/VCI detected in AIS Search Mode as the Search Profile.

ATM RX TES MAS RDI USE
Store the current VPI/VCI detected in RDI Search Mode as the Search Profile.

ATM RX TES MAS TTC USE
Store the current VPI/VCI detected in TTC Search Mode as the Search Profile.

ATM RX TES MAS RES NOR
Set the receiver to normal results analysis mode.

ATM RX TES MAS RES CDV
Set the receiver to delay variation analysis mode.

See also: **ATM TX TESt PROfile, ATM TX PROfile, ATM RX PROfile, SONet INSert,** and **SONet DROp**

ATM TX NETwork INTerface

ATM TX NETwork INTerface

Transmitted ATM Network Interface Select

This command sets or prints the transmitted ATM network interface to be tested. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM TX NET INT ?
Print the current ATM network interface selected.

ATM TX NET INT NNI
Configure the ATM transmitter to send the network node interface or network-to-network interface cell format.

ATM TX NET INT UNI
Configure the ATM transmitter to send the user network interface cell format.

See also: **ATM RX NETwork INTerface, ATM TX SCRamble, SONet DROp,** and **SONet INPut**

ATM TX PROfile

ATM TX PROfile

Transmitted ATM Cell Test Profile Control

This command sets or prints the four specific test cell profiles ($n = 1$ to 4). This enables the four sets of ATM cell header fields — GFC, VPI, VCI, PTI, and CLP — to be preprogrammed different ways with any value. The test profiles are selected and transmitted with the **ATM TX TESt PROfile** command. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM TX PRO Pn ?
Print the current ATM test profile where **Pn** equals **P1**, **P2**, **P3**, or **P4**.

ATM TX PRO Pn <gfc,vpi,vci,pti,clp>
<gfc> — Set the single digit hexadecimal value for the GFC field. For the UNI cell format, the range is **0** to **F**. For the NNI cell format, the value is appended to the VPI field.

NOTE: Separate each field with a comma as follows: x,xx,xxxx,x,x.

<vpi> — Set the two or three digit hexadecimal value for the VPI field. For the UNI cell format the range is **00** to **FF** (256 virtual paths). For the NNI cell format, the value is appended with the GFC field and the range becomes **000** to **FFF** (4096 virtual paths).

<vci> — Set the four digit hexadecimal value for the VCI field from **0000** to **FFFF** (65,536 virtual channels for each VPI).

<pti> — Set the single digit PTI value from **0** to **7** . The PTI value is defined as follows:

0	User Data Cell, congestion not experienced, SDU-type.
1	User Data Cell, congestion not experienced, SDU-type.
2	User Data Cell, congestion experienced, SDU-type.
3	User Data Cell, congestion experienced, SDU-type.
4	Segment OAM F5 flow cell (for VC loopbacks and alarms).
5	End-to-end OAM F5 flow cell (for VC loopbacks and alarms).
6	Reserved for future traffic control and remote monitoring functions.
7	Reserved for future functions.

<clp> — Set the CLP value for **0** or **1**. The **1** allows the cell to be dropped. The **0** prevents the cell from being dropped. ATM switches can change the CLP value when it detects congestion.

See also: **ATM TX TESt PROfile, ATM RX TESt MASk, ATM RX PROfile, SONet INSert,** and **SONet INPut**

ATM TX SCRamble — ATM TX SCRamble

Transmitter 43-Bit Cell Payload Scrambler Control

This command sets or prints the configuration of the transmitter 43-bit cell payload scrambler. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM TX SCR ?
Print the current transmitter 43-bit cell payload scrambler configuration.

ATM TX SCR OFF
Disable the transmitter 43-bit cell payload scrambler.

ATM TX SCR ON
Enable the transmitter 43-bit cell payload scrambler.

See also: **ATM RX SCRamble, ATM TX NETwork INTerface,** and **SONet INPut**

ATM TX TESt PROfile

Transmitted ATM Cell Test Profile Select

This command selects or prints the primary test profile to be transmitted. The test profiles are created with the **ATM TX PROfile** command. This command requires the 310-15 option. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12.

ATM TX TES PRO ?
Print the current ATM test profiles.

ATM TX TES PRO Pn
Select the test profile to be transmitted. **Pn** equals **P1** to **P4**.

See also: **ATM TX PROfile, ATM RX TESt MASk, ATM RX PROfile, SONet INSert,** and **SONet INPut**

BEEp CRIteria

Set Beep Criteria

This command sets or prints the beep criteria for specific events.

BEE CRI ?
Print the current beep criteria status.

BEE CRI ALL [ON | OFF]
Enable/Disable all of the beep criterion.

BEE CRI ERR EVE [ON | OFF]
Enable/Disable the T-BERD 310 to beep on an error event.

BEE CRI PAT SYN [ON | OFF]
Enable/Disable the T-BERD 310 to beep on pattern synchronization.

BEE CRI THR ERR SEC [ON | OFF]
Enable/Disable the T-BERD 310 to beep on an errored second.

BEE CRI DS1 SCANTRIG [ON | OFF]
Enable/Disable the T-BERD 310 to beep when an event specified in the **@DS1 SCAn TRIgger** command occurs during a triggered DS1 scan mode test. This command requires the 310-1 option.

BLUe SIGnal CRIteria

BLUe SIGnal CRIteria

Set Blue Signal Detection Criteria

This command sets or prints the Blue Signal detection criteria. Changing the command parameter causes a test restart.

BLU SIG CRI ?
Print the Blue Signal detection criteria.

BLU SIG CRI 1010
Set the Blue Signal detection to the 1010 criteria.

BLU SIG CRI STU C
Set the Blue Signal detection to the stuck C-bit criteria.

CLEar PRInt BUFfer

CLEar PRInt BUFfer

Clear Print Buffer

This command clears all printouts from the print buffer.

CLE PRI BUF
This command clears all printouts from the print buffer.

CLS

CLS

Clear Terminal Screen

CLS
This command clears the terminal screen with 30 carriage returns.

Generate Controls Printout

CON

This command generates a controls printout of the T-BERD 310 front panel configuration. The **PRInt CONtrols** command performs the same function.

See also: **PRInt CONtrols**

EXAMPLE:

> CON

```
              DS3 CONTROLS PRINT

  AUG 14                          13:46:09


    DS3 PANEL SETTINGS

      Mode:                    MUXED C-BIT
      Pattern:                   T1D4 3/24
      DS3 Source:                 EXTERNAL
      Test Type:                     TIMED
                     •
                     •
                     •
      Pulse Mask:                     NONE

    AUX - SONET

      SONET Input:                   STS-1
      SONET STS Number:                  1
      DS1 Drop Out:                  SONET
      SONET DS1 Channel:                28
      STS Rx Level:                    DSX

               END OF PRINTOUT
```

>

DISplay HOLd

DISplay HOLd

Set Display Hold

This command sets or prints the display hold.

DIS HOL ?
Print the display hold status.

DIS HOL ON
Activate the display hold function. The results and Status and Alarm LEDs are frozen.

DIS HOL OFF
Disable the display hold function. The results and the Status and Alarm LEDs are released and updated.

NOTE: While the **DISplay HOLd** command is ON, updated results can be checked with the **RES1** or **RES2** command.

See also: **PRInt** and **RESUlts**

DISplay

DISplay

Set **RESULTS** Switches Control

This command sets or prints the **RESULTS** switches control on the T-BERD 310 and 310-1.

DIS ?
Print the **RESULTS** switches control status.

DIS LOC
Set the **RESULTS** switches for local front-panel and remote control operation.

DIS REM
Set the **RESULTS** switches for remote control operation only.

DS1 BITs CLK **DS1 BITs CLK**

DS1 BITS Clock Termination

This command sets or prints the DS1 BITS CLOCK connector input termination. This command requires the 310-13T or 310-14T option.

DS1 BIT CLK ?
Print current DS1 BITS CLOCK connector input termination.

DS1 BIT CLK TER
Select to terminate an unterminated input signal across 100 ohms.

DS1 BIT CLK BRI
Select to terminate input signal across 1000 ohms to bridge terminated lines.

DS1 DROp CHAnnel **DS1 DROp CHAnnel**

Set Dropped DS1/E1 Channel

This command sets or prints the dropped DS1/E1 channel.

NOTE: When the AIS indication is detected on the dropped DS1 channel, three decimal points appear in the **DS3 - DS1 CHANNEL DROP** switch display. This indication is not reported during remote control operation.

DS1 DRO CHA ?
Print the dropped DS1/E1 channel.

DS1 DRO CHA [1 | 2 to 28]
Select the DS1 channel to be dropped. DS1 channels are entered with numbers from 1 to 28.

DS1 DRO CHA [E1 | E2 to E21]
Select the E1 channel to be dropped. E1 channels are entered with numbers from E1 to E21. This command requires the 310-2 option.

DS1 DROp OUT — DS1 DROp OUT

Set Dropped DS1 Channel Source

This command sets or prints the dropped DS1 channel source (DS3 or SONET) for the side-panel DS1 DROP jack. Requires a SONET option.

DS1 DRO OUT ?
Print the current dropped DS1 channel source status.

DS1 DRO OUT DS3
Set the dropped DS1 channel source to the received DS3 signal. The DS1 signal is dropped from the DS3 RECEIVEjack.

DS1 DRO OUT SON
Set the dropped DS1 channel source to the received SONET signal. The DS1 signal is dropped from the side-panel STS-1, OC-1, OC-3, or OC-12 RECEIVE connection depending on the installed SONET option.

DS1 INSert CHAnnel — DS1 INSert CHAnnel

Set DS1 Insert Channel

This command sets or prints the inserted DS1 channel. The command is also used to insert a DS1 channel into the secondary DS3 signal when the DS1 INSERT mode is selected.

DS1 INS CHA ?
Print the inserted DS1 channel selection.

DS1 INS CHA [1 | 2 to 28]
Select the DS1 channel into which the DS1 signal is to be inserted.

DS1 INS CHA ALL
Insert the DS1 signal into all DS1 channels. This command only applies to MUXED M13 and MUXED C-BIT modes.

DS1 INS CHA NON
No DS1 channels are inserted. In the MUXED modes, this command leaves an All Ones pattern in all the DS1 channels. In the DS1 INSERT mode (requires the 310-3 option), the command allows the entire secondary DS3 signal to pass unaffected and prevents the DS1 signal from being inserted.

See also: **MODe**

DS1 LINecode

DS1 LINecode

Set DS1 Transmitted Line Coding

This command sets or prints the DS1 line coding for the side-panel DS1 DROP output jack.

DS1 LIN ?
Print the DS1 line code.

DS1 LIN AMI
Set the DS1 line code to AMI.

DS1 LIN B8Z
Set the DS1 line code to B8ZS.

DS1 LP CODe

DS1 LP CODe

Set DS1 Loop Code Type

This command sets or prints the transmitted DS1 loop code type. The command only applies when operating in the MUXED M13 or MUXED C-BIT mode and the T1D4 or T1ESF LPUP or LPDN pattern is selected.

DS1 LP COD ?
Print the DS1 loop code.

DS1 LP COD CSU
Set the DS1 loop code type to CSU. The loop-up code is 10000 and the loop-down code is 100.

DS1 LP COD FAC1
Set the DS1 loop code type to Facility 1. The loop-up code is 1100 and the loop-down code is 1110.

DS1 LP COD FAC2
Set the DS1 loop code type to Facility 2. The loop-up code is 11000 and the loop-down code is 11100.

DS1 LP COD PGM
Set the loop code type to Programmable. Use the **PGM LPDn** and **PGM LPUp** commands to program the loop codes.

See also: **MODe, PGM LPUp,** and **PGM LPDn**

DS1 SIGnaling BITs

DS1 Signaling Bits Transfer Mode

This command sets or prints the DS1 signaling bits transfer mode for DS1 signals carried in the VT1.5 byte-synchronous channel. The selected function affects both drop and insert signals. The **SONet INSert DS1 BYTe** command must be selected to make this command functional. This command requires the 310-13R, 310-13T, 310-14R, or 310-14T option.

DS1 SIG BIT ?
Print current DS1 signaling bits transfer mode.

DS1 SIG BIT PAS
Select to allow the embedded DS1 signaling bits (if any) to pass through with the DS1 signal. This is appropriate for clear channel DS0s.

DS1 SIG BIT OUT
Select to allow out-of-slot DS1 signaling. On the inserted DS1 signal, the DS1 signaling bits are removed and placed within the VT overhead. On the dropped DS1 signal, the DS1 signaling bits are inserted into the DS1 robbed bit frames.

See also: **SONet INSert**

DS1 VT MAP

DS1/VT Mapping Select

This command sets or prints the DS1 channel format used in the **SONet INSert** and **SONet DROp** commands.

DS1 VT MAP ?
Print the current DS1/VT mapping being used.

DS1 VT MAP M13
Enables the DS1 signals to be selected sequentially through the seven VT1.5 groups with the first four channels in the first group, the second four channels in the second group, and so forth.

DS1 VT MAP TR-253
Enables the DS1 signals to be selected sequentially through the seven VT1.5 groups with the first channel in each first group numbered first, the second four channels in the second group, and so forth.

DS1 VT MAP SEQ
Enables the DS1 signals to be selected sequentially using DS1 channel numbers from 1 to 28.

See also: **SONet INSert** and **SONet DROp**

DS3 SOUrce

DS3 SOUrce

Set DS3 Input Source

This command sets or prints the DS3 input source. Requires a SONET option.

DS3 SOU ?
Print the DS3 input source status.

DS3 SOU EXT
Set the DS3 input source to the DS3 RECEIVE jack.

DS3 SOU SON
Set the DS3 input source to the DS3 signal dropped out of a side-panel STS-1, OC-1, OC-3, or OC-12 RECEIVE connection (depends on the installed SONET option).

ECHo

ECHo

Set Terminal Echo Mode

This command sets or prints the terminal echo mode.

ECH ?
Print the terminal echo mode.

ECH ON
Enable the terminal echo mode. All characters entered from a terminal are echoed back from the T-BERD 310. The command is automatically enabled in terminal mode.

ECH OFF
Disable the terminal echo mode. All characters entered from a terminal are *not* echoed back from the T-BERD 310. The command is automatically disabled in remote mode.

See also: **REMote** and **TERminal**

Execute BPV Insertion

This command sets or prints the BPV insertion setting.

ERR INS BPV ?
Print the BPV insertion setting.

ERR INS BPV OFF
Disable the continuous BPV insertion.

ERR INS BPV BUR
Insert a burst of BPVs. Set the burst length with the **LOG/bpv BURst** command. Set the insertion rate with the **LOG/bpv RT** command.

ERR INS BPV RAT
Insert continuous BPVs. Set the insertion rate with the **LOG/bpv RT** command.

ERR INS BPV SIN
Insert a single BPV.

See also: **LOG/bpv BURst** and **LOG/bpv RT**

EXAMPLE:

> **LOG BUR 0.5** (Set the Logic/BPV burst duration for 0.5 seconds.)
> **LOG RT 1E-3** (Set the Logic/BPV error insertion rate to 1E-3 (10^{-3}).)
> **ERR INS BPV BUR** (Send a burst of BPVs for 0.5 seconds at a rate of 1E-3.)
> **PRI VIOLATIONS** (Print the VIOLATIONS result.)
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>

ERRor INSert FRAme **ERRor INSert FRAme**

Execute Frame Error Insertion

This command sets or prints the frame error insertion setting.

ERR INS FRA ?
Print the frame error insertion setting.

ERR INS FRA OFF
Stop all frame error insertion.

ERR INS FRA MUL
Insert multiple frame errors into one M-frame. Set the number of frame errors with the **FRAme ERRor** command.

ERR INS FRA CON
Insert multiple frame errors continuously. Set the number of frame errors with the **FRAme ERRor** command.

ERR INS FRA SIN
Insert a single frame error.

See also: **FRAme ERRor**

EXAMPLE:

> **FRA ERR 2** (Set the number of M-frame errors to two.)
> **ERR INS FRA CON** (Send two frame errors per M-frame continuously.)
> **ERR INS FRA OFF** (Stop the continuous frame error insertion.)
> **PRI FRM ERRORS** (Print the results of the FRM ERRORS result.)
2345

Remote Control Commands

Execute Logic Error Insertion

This command sets or prints the logic error insertion setting.

ERR INS LOG ?
Print the logic error insertion setting.

ERR INS LOG OFF
Disable the continuous logic error insertion.

ERR INS LOG BUR
Insert a burst of logic errors. Set the burst duration with the **LOG/bpv BURst** command. Set the insertion rate with the **LOG/bpv RT** command.

ERR INS LOG RAT
Insert continuous logic errors. Set the insertion rate with the **LOG/bpv RT** command.

ERR INS LOG SIN
Insert a single logic error.

See also: **LOG/bpv BURst** and **LOG/bpv RT**

EXAMPLE:

> **LOG BUR 0.5** (Set the Logic/BPV burst duration for 0.5 seconds.)
> **LOG RT 1E-6** (Set the Logic/BPV error insertion rate to 1E-6 (10^{-6}).)
> **ERR INS LOG BUR** (Send a burst of logic errors for 0.5 seconds at a rate of 1E-6.)
> **PRI BIT ERRORS** (Print the results of the BIT ERRORS result.)
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ERRor THReshold

ERRor THReshold

Set Errored Second Threshold

This command sets or prints the errored second threshold for the BIT THR ES, FRM THR ES, and BPV THR ES results.

ERR THR ?
Print the current errored second threshold status.

ERR THR [1E-2 | 1E-3 to 1E-7]
Set the errored second threshold from 1E-2 to 1E-7.

FEAc ALArms

FEAc ALArms

FEAC Message Alarm Control

This command sets, sends, halts, or prints the Far-End Alarm and Control (FEAC) alarms. The alarm message is transmitted for one second. Set the **MODe** command to the **C-Bit** to send FEAC alarms.

FEA ALA ?
Print the FEAC alarm status.

FEA ALA STO
Halt the selected FEAC alarm message.

FEA ALA DS3 EQU FAI (SA)
Select and send the DS3 Equipment Failure, Service Affecting (Type 1 equipment failure) alarm message.

FEA ALA DS3 LOS
Select and send the DS3 Loss-of-Signal/High Bit Error Ratio alarm message.

FEA ALA DS3 OUT OF FRA
Select and send the DS3 Out-of-Frame, Loss of DS3 Frame Synchronization alarm message.

FEA ALA DS3 AIS REC
Select and send the DS3 Alarm Indication Signal Received alarm message.

FEA ALA DS3 IDL REC
Select and send the DS3 Idle Signal Received alarm message.

FEA ALA DS3 EQU FAI (NSA)
Select and send the DS3 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) alarm message.

FEA ALA COM EQU FAI (NSA)
Select and send the Common Equipment Failure, Non-Service Affecting (Type 2 equipment failure) alarm message.

FEA ALA MUL DS1 LOS
Select and send the Multiple DS1 Loss-of-Signal/High Bit Error Ratio alarm message.

FEA ALA DS1 EQU FAI (SA)
Select and send the DS1 Equipment Failure, Service Affecting (Type 1 equipment failure) alarm message.

FEA ALA SIN DS1 LOS
Select and send the Single DS1 Loss-of-Signal/High Bit Error Ratio alarm message.

FEA ALA DS1 EQU FAI (NSA)
Select and send the DS1 Equipment Failure, Non-Service Affecting (Type 2 equipment failure) alarm message.

See also: **FEAc LOOp** and **MODe**

FEAc LOOp — FEAc LOOp

FEAC Message Loopback Control

This command sets, loops up, loops down, or prints the FEAC message loop codes. Set the **MODe** command to the **C-Bit** to send FEAC message loop codes.

FEA LOO ?
Print the FEAC message loop code status.

FEA LOO UP DS3 LIN
Select and send the DS3 line loop-up code.

FEA LOO DOW DS3 LIN
Select and send the DS3 line loop-down code.

FEA LOO UP ALL DS1s
Select and send the DS1 line loop-up code to loop up all the low-speed DS1 channels.

FEA LOO DOW ALL DS1s
Select and send the DS1 line loop-down code to loop down all the low-speed DS1 channels.

FEA LOO UP DS1 [1 | 2 to 28]
Select and send the DS1 line loop-up code to loop up the indicated low-speed DS1 channel.

FEA LOO DOW DS1 [1 | 2 to 28]
Select and send the DS1 line loop-down code to loop down the indicated low-speed DS1 channel.

FEA LOO UP DS3 NIU
Select and send the DS3 NIU loop-up code.

FEA LOO DOW DS3 NIU
Select and send the DS3 NIU loop-down code.

See also: **FEAc ALArms** and **MODe**

FIRST POWERUP — FIRST POWERUP

Restore T-BERD 310 to Factory Defaults

FIRST POWERUP
This command reinitializes the T-BERD 310 (and all options) to its factory default settings. It also takes the instrument out of remote control.

FRAme ERRor — FRAme ERRor

Set Number of M-Frame Errors Inserted

This command sets or prints the number of frame errors per M-frame inserted when the **ERRor INSert FRAme** command is used.

FRA ERR ?
Print the current number of frame errors per M-frame to be inserted.

FRA ERR [1 | 2]
Set the number of frame errors per M-frame from 1 to 2.

See also: **ERRor INSert FRAme**

Set Frame Synchronization Loss Threshold

This command sets or prints the frame synchronization loss threshold.

FRM LOS THR ?
Print the frame loss threshold.

FRM LOS THR 3
Set the threshold to 3 frame errors out of 15 framing bits received.

FRM LOS THR 6
Set the threshold to 6 frame errors out of 15 framing bits received.

Display T-BERD 310 Software and Hardware Revision Levels

HELLO

Print the current software revision level and installed options of the T-BERD 310. This information is useful to verify the T-BERD 310 configuration before calling TTC for assistance.

EXAMPLE:

> HELLO

```
Software version E.02 11/05/94

Installed boards/options and module codes:

   PROCESSOR      BOARD: Module code = 01
   IEEE-488      OPTION: Not installed
   TRANSMITTER    BOARD: Module code = 00
   RECEIVER       BOARD: Module code = 00
   FRAMING        BOARD: Module code = 00
   E1 DROP       OPTION: Installed
   DS1 BERTS     OPTION: Module code = 02
   ENHANCED ESF  OPTION: Module code = 02
   DS1 INSERT    OPTION: Not installed
   SONET DROP    OPTION: Not installed
   SONET DROP FPGA     : Not installed
   OPTICAL I/F   OPTION: Not installed
   JITTER        OPTION: Not installed
   DS3 USER I/F   BOARD: Module code = 00
   DS1 USER I/F  OPTION: Module code = 00
   G.821 RESLTS  OPTION: Installed
   SONET RCVR    OPTION: Module code = 00
   SON RCVR OPTIC   OPT: Installed
   SON RCVR FPGA       : Module code = 1E
   SONET XMIT    OPTION: Module code = 00
   SON XMIT OPTIC   OPT: Installed
   SON XMIT FPGA       : Module code = 10
   SONET OC-12   OPTION: Module code = 00
```

\>

Display On-Line Help

This command prints the on-line help pages for the T-BERD 310.

HELP (?)

Use **HELP** or **?** to print the introduction to the T-BERD 310 help pages. The help page identifies the command syntax for entering commands and a list of the available help page commands. The "**?**" can be used in place of **HELP** in the following commands. Use the page number (e.g., **? 4**) or the page name (e.g., **? FRO**) to select the required help page.

HELP !

List all the available T-BERD 310 remote control commands.

HELP [0 | MIS]

List the T-BERD 310 (and 310-1) miscellaneous remote control commands.

HELP [1 | FRO]

List the T-BERD 310 front-panel remote control commands.

HELP [2 | AUX1]

List page 1 of the T-BERD 310 auxiliary function remote control commands.

HELP [3 | AUX2]

List page 2 of the T-BERD 310 auxiliary function remote control commands.

HELP [4 | MAI]

List the remote control commands that affect the operation of the T-BERD 310 (and 310-1).

HELP [5 | 232/488]

List the remote control commands that affect the operation of the RS-232 and IEEE-488 (requires the 310-6 option) interfaces.

HELP <command-name>

Describe the **<command-name>** and any parameters in detail.

See also: **@HELp**

Clear History Alarm LEDs

HIS RES

Clear any illuminated Primary (and Secondary) History Alarm LED.

EXAMPLE:

> **LED** (Print the state of the Status and Alarm LEDs.)

```
 ______________________________________________________________________________
|                - alarms -                    |            - status -         |
|  primary                       secondary     | primary              secondary |
|  ON    ON    signal      loss  OFF   OFF     |  OFF   signal     present  OFF |
|  ON    ON    frame       loss  OFF   OFF     |  OFF   frame      sync     OFF |
|  OFF   ON    ds2 frame   loss  OFF   OFF     |  OFF   c-bit      frame    OFF |
|  OFF   OFF   pattern     loss        |       |  OFF   idle       present  OFF |
|  OFF   OFF   blue        (AIS) OFF   OFF     |  OFF   ds2 frame  sync     OFF |
|  OFF   OFF   yellow            OFF   OFF     |  OFF   pattern    sync         |
|  OFF   OFF   far-end     alarm OFF   OFF     |  OFF   sonet      present      |
|  OFF   OFF   sonet       loss        |       |______________________________|
|  OFF         power       loss        |       |
|   |                                  |       |
|   |_________  history  _____________|       |
|______________________________________________|
```

> **HIS RES** (Reset the History Alarm LEDs.)

> LED (Print the state of the Status and Alarm LEDs.)

```
 __________________________________________________________________________________
|                - alarms -                   |             - status -             |
|   primary                       secondary   | primary                  secondary |
|   OFF  OFF  signal     loss  OFF  OFF       |   ON    signal    present  OFF     |
|   OFF  OFF  frame      loss  OFF  OFF       |   ON    frame     sync     OFF     |
|   OFF  OFF  ds2 frame  loss  OFF  OFF       |   ON    c-bit     frame    OFF     |
|   OFF  OFF  pattern    loss          |      |   OFF   idle      present  OFF     |
|   OFF  OFF  blue       (AIS) OFF  OFF       |   ON    ds2 frame sync     OFF     |
|   OFF  OFF  yellow           OFF  OFF       |   OFF   pattern   sync             |
|   OFF  OFF  far-end    alarm OFF  OFF       |   OFF   sonet     present          |
|   OFF  OFF  sonet      loss          |      |____________________________________|
|   OFF       power      loss          |      |
|    |                                 |      |
|    |________   history   ____________|      |
|_____________________________________________|
```

>

HOLd HOLd

Hold All Printer Output

HOL

This command places a temporary hold on the following print buffer outputs: result prints, controls prints, and alarm, status, and note messages. When the command is executed, the prompt changes from the ">" (greater than) or user-defined prompt to a "+" (plus). The "+" indicates that the print buffer is temporarily on hold.

When the "+" prompt appears, command responses (except for **CONtrols** and **RESUlts**), help pages, and syntax error messages continue to be generated. The results, controls, and message printouts are generated and stored in the print buffer.

Use the **RELease** command to release the print buffer and print all stored printouts. Turning the power off and on performs the same function as the **RELease** command.

See also: **RELease** and **PROmpt**

JITter FILter — JITter FILter

Set Jitter Bandpass Filter

This command sets or prints the jitter bandpass function for the jitter test results. This command requires the 310-5 option.

JIT FIL ?
Print the jitter bandpass function status.

JIT FIL WID
Select the wideband filter (10 Hz to 400 kHz).

JIT FIL HIG
Select the highband filter (30 kHz to 400 kHz).

JIT FIL AUT
Select the automatic bandpass filter function. This selection alternates between both filters to provide continuous measurement for both fequency ranges.

See also: **JITter SCAle** and **JITter THReshold**

JITter SCAle — JITter SCAle

Set Jitter Amplitude Scale

This command sets or prints the jitter amplitude scale for the jitter test results. Enter the scale parameter by the number itself, e.g., **2**, **5**, or **20**, or by the complete parameter, e.g., **2 UI P-P**. This command requires the 310-5 option.

JIT SCA ?
Print the jitter amplitude scale status.

JIT SCA 2
Set the scale to the 2 UIp-p range.

JIT SCA 5
Set the scale to the 5 UIp-p range.

JIT SCA 20
Set the scale to the 20 UIp-p range.

JIT SCA AUT

Set the scale for autoranging. This command selects the appropriate scale for the most accurate measurements.

See also: **JITter FILter** and **JITter THReshold**

JITter THReshold — JITter THReshold

DS3 Jitter Threshold Select

This command sets or prints the jitter threshold for the HB JIT or WB JIT test results. When the threshold is exceeded, the test result appears in the Summary category. This command requires the 310-5 option.

JIT THR ?

Print the current jitter threshold.

JIT THR <threshold>

Set the jitter **<threshold>** as follows:

0.2 to 1.0 UI in 0.2 UI steps.
1.0 to 5.0 UI in 1.0 UI steps.
5.0 to 20.0 UI in 5.0 UI steps.

See also: **JITter FILter** and **JITter SCAle**

LASt ERRor — LASt ERRor

Print Last Error Message

LAS ERR

This command prints and clears the last error message generated by remote control.

EXAMPLE:

> LAS ERR

*** ERROR: Remote Control cannot modify this setting.
> LAS ERR

No Error.

LCD CONtrast **LCD CONtrast**

Set 310-1 LCD Contrast

This command sets or prints the 310-1 LCD display contrast adjustment. This command is only avialable on newer 310-1 options.

LCD CON ?
Print the current contrast setting for the 310-1 display.

LCD CON [1 to 10]
Adjust the 310-1 display viewing between ten different levels of contrast.

LEDs **LEDs**

Print State of Status and Alarm LEDs

LED
This command prints the state of the Status and Alarm LEDs.

EXAMPLE:

> LED

```
 ___________________________________________________   ________________________________
|               - alarms -                          | |           - status -           |
|     primary                       secondary       | | primary                secondary |
|     ON    ON    signal     loss   OFF   OFF       | |   OFF   signal    present   OFF |
|     ON    ON    frame      loss   OFF   OFF       | |   OFF   frame     sync      OFF |
|     OFF   ON    ds2 frame  loss   OFF   OFF       | |   OFF   c-bit     frame     OFF |
|     OFF   OFF   pattern    loss         |         | |   OFF   idle      present   OFF |
|     OFF   OFF   blue       (AIS)  OFF   OFF       | |   OFF   ds2 frame sync      OFF |
|     OFF   OFF   yellow            OFF   OFF       | |   OFF   pattern   sync          |
|     OFF   OFF   far-end    alarm  OFF   OFF       | |   OFF   sonet     present       |
|     OFF   OFF   sonet      loss         |         | |________________________________|
|     OFF         power      loss         |         |
|      |                                  |         |
|      |_________    history  ____________|         |
|___________________________________________________|
```

>

LOCal

LOCal

Return Control to the Front Panel

LOC (/)

This command returns the T-BERD 310 (and 310-1) to local front panel control from terminal or remote mode. The message *232 REMOTE CONTROL* stops flashing in the MODE/PATTERN window. The T-BERD 310 always monitors the remote control interface for commands from the remote control device. When any command is received, the T-BERD 310 goes into remote mode.

See also: **TERminal** and **REMote**

LOG/bpv BURst

LOG/bpv BURst

Set Logic/BPV Burst Duration

This command sets or prints the logic error or BPV insertion burst duration.

LOG BUR ?

Print the current burst duration.

LOG BUR [0.025 | 0.050 to 5.0]

Set the burst duration from 0.025 to 1.0 second in 0.025 second steps and from 1.0 to 5.0 seconds in 0.100 second steps. For whole seconds (1 to 5), drop the zero.

LOG BUR [25 | 50 to 5000]

Set the burst duration from 25 to 1000 ms in 25 ms steps and from 1000 to 5000 ms in 100 ms steps.

LOG BUR SIN

Set the burst duration for a single logic error or BPV.

See also: **ERRor INSert BPV** and **ERRor INSert LOGic**

EXAMPLE:

\> **LOG BUR 0.5** (Set the Logic/BPV burst duration for 0.5 seconds.)
\> **LOG RT 1E-3** (Set the Logic/BPV error insertion rate to 1E-3 (10^{-3}).)
\> **ERR INS BPV BUR** (Send a burst of BPVs for 0.5 seconds at a rate of 1E-3.)
\> **PRI VIOLATIONS** (Print the results of the VIOLATIONS result.)
4434
\>

LOG/bpv RT

LOG/bpv RT

Set Logic/BPV Error Insertion Rate

This command sets or prints the logic error or BPV insertion rate.

LOG RT ?
Print the insertion rate.

LOG RT [1E-2 I 1E-3 to 1E-9]
Set the insertion rate from 1E-2 to 1E-9.

See also: **ERRor INSert BPV** and **ERRor INSert LOGic**

MODe

MODe

Set Transmit and Receive Operating Mode

This command sets or prints the transmit and receive operating mode.

MOD ?
Print the operating mode.

MOD AUT
Select the automatic configure frame and pattern mode.

MOD C-B
Select the DS3 C-bit parity frame formatted mode.

MOD DS1 INS
Select the DS1 INSERT mode.

MOD M13
Select the DS3 M13 frame formatted mode.

MOD MUX C-Bit
Select the demultiplexable DS3 C-bit frame formatted mode.

MOD MUX M13
Select the demultiplexable DS3 M13 frame formatted mode.

MOD THR
Select the through mode.

MOD UNF
Select the unframed DS3 mode.

See also: **PATTern**

OPTical POWer WAVelength

OPTical POWer WAVelength

Optical Power Measurement Wavelength Select

This command sets or prints the optical power measurement wavelength for the POWER METER connector. This command requires the 310-16 option.

OPT POW WAV ?
Print current optical power measurement wavelength.

OPT POW WAV 1310
Select the 1310 nm wavelength for the optical power detector and optical power measurement test result.

OPT POW WAV 1550
Select the 1550 nm wavelength for the optical power detector and optical power measurement test result.

OPTical RETurn LOSs REFerence

OPTical RETurn LOSs REFerence

Return Loss Measurement Reference Control

This command sets or prints the return loss measurement reference when the **OPTical RETurn LOSs TYPe** command is set to **REFerence**. This command requires the 310-16 option.

OPT RET LOS REF ?
Print current use of the RETURN LOSS/SOURCE connector.

OPT RET LOS REF CLE
Clear the stored return loss offset from the RETURN LOSS/SOURCE connector.

OPT RET LOS REF SET

Measure and store the return loss of the RETURN LOSS/SOURCE connector. Before executing the command, wrap the fiber cable in a tight loop around a pencil 5 to 10 times to create a mandrel wrap. The mandrel wrap cancels out the fiber and allows the T-BERD 310 to measure the return loss of the RETURN LOSS/SOURCE connector. Unwrap the fiber to measure the return loss of the cable.

See also: **OPTical SOUrce** and **OPTical RETurn LOSs TYPe**

OPTical RETurn LOSs TYPe — OPTical RETurn LOSs TYPe

Return Loss Measurement Type Select

This command sets or prints the type of return loss measurement being performed when the **OPTical SOUrce** command is set to **1310** or **1550**. This command requires the 310-16 option.

OPT RET LOS TYP ?

Print current use of the RETURN LOSS/SOURCE connector.

OPT RET LOS TYP ABS

Configure the return loss measurement to measure all return loss starting with the RETURN LOSS/SOURCE connector.

OPT RET LOS TYP REF

Configure the return loss measurement to measure all return loss except from the RETURN LOSS/SOURCE connector. Set the stored reference with the **OPTical RETurn LOSs REFerence** command.

See also: **OPTical SOUrce** and **OPTical RETurn LOSs REFerence**

OPTical SOUrce — OPTical SOUrce

Optical Stable Source Select

This command sets or prints the wavelength of the RETURN LOSS/SOURCE connector. Use the **OPTical RETurn LOSs TYPe** command to set the return loss type. This command requires the 310-16 option.

OPT SOU ?

Print current use of the RETURN LOSS/SOURCE connector.

OPT SOU 1310

Select the 1310 nm wavelength for the RETURN LOSS/SOURCE connector and return loss measurement test result.

OPT SOU 1550

Select the 1550 nm wavelength for the RETURN LOSS/SOURCE connector and return loss measurement test result.

OPT SOU OFF

Disable the RETURN LOSS/SOURCE connector.

See also: **OPTical RETurn LOSs**

ORDerwire ORDerwire

Orderwire Channel Control

This command sets or prints the drop and insert capabilities for the appropriate orderwire channel. The orderwire channel is accessed through the HANDSET connector. This command requires the 310-13T or 310-14T option and is limited to orderwire insert only. The 310-13R/T pair or 310-14R/T pair option is required for full orderwire drop and insert capabilities.

ORD ?

Print the current in-use orderwire channel.

ORD NON

Disable the drop of either orderwire channel. A quiet tone is placed in the transmitted Line and Section orderwire channel.

ORD LIN

Select the Line orderwire channel to be dropped and inserted.

ORD SEC

Select the Section orderwire channel to be dropped and inserted.

PARity ERRor RT

Set Parity Error Rate Calculation Criteria

This command sets or prints the PARITY error rate calculation criteria.

PAR ERR RT ?
Print the error rate calculation criteria.

PAR ERR RT BIT ERR
Set the error rate calculation criteria to BIT error mode.

PAR ERR RT BLO ERR
Set the error rate calculation criteria to BLOCK error mode.

PATH TRAce

Path Trace Message Insertion Control

This command sets or prints one of three default or user-defined messages to be transmitted over the path trace byte (J1) of the currently inserted STS-1 signal. The path trace message is a 64-character ASCII message which includes alphanumeric characters, spaces, null characters, and CR/LF line terminator.

The user-defined messages can be up to 62-characters long. The T-BERD 310 automatically pads the transmitted message with nulls and the CR/LF line terminator to make up the 64-character message. The default message strings are 64-characters long.

This command requires the 310-13T or 310-14T option to insert the message. The 310-13R/T pair or 310-14R/T pair option is required for full drop and insert path trace capabilities.

PATH TRA ?
Print the current path trace message number (USER 1, 2, or 3).

PATH TRA USER1
Send the current USER1 path trace message.

PATH TRA GET USER1 ?
Print the current USER1 path trace messages.

PATH TRA SET USER1 <text>
Enter a user-defined path trace message for USER1.

PATH TRA USER2
Send the current USER2 path trace message.

PATH TRA GET USER2 ?
Print the current USER2 path trace messages.

PATH TRA SET USER2 <text>
Enter a user-defined path trace message for USER2.

PATH TRA USER3
Send the current USER3 path trace message.

PATH TRA GET USER3 ?
Print the current USER3 path trace messages.

PATH TRA SET USER3 <text>
Enter a user-defined path trace message for USER3.

The default messages include the following:

USER1 — The quick brown fox jumps over the lazy dog 1234567890 !@#$%&*

USER2 — Telecommunications Techniques Corporation... Expect Excellence

USER3 — T-Berd 310: Communications Analyzer for SONET, DS3, DS1, & DS0

EXAMPLE:

>PATH TRA ? (Print the current path trace message.)
USER1
>PATH TRA SET USER1 Test 1 (Enter a user-defined path trace message for USER1.)
>PATH TRA GET USER1 ? (Print the current USER1 path trace message.)
Test 1
>

PATTern LOSs THReshold **PATTern LOSs THReshold**

Set Pattern Loss Threshold Criteria

This command sets or prints the pattern loss threshold criteria.

PATT LOS THR ?
Print the pattern loss threshold criteria.

PATT LOS THR FAS
Set the pattern loss threshold to FAST. Pattern loss occurs when 1024 or more bit errors are counted in 32,767 bits received.

PATT LOS THR SLO
Set the pattern loss threshold to SLOW. Pattern loss occurs when 250,000 or more bit errors are counted in 1,000,000 bits received.

PATTern **PATTern**

Set Data Pattern

This command sets or prints the transmitted test pattern. The following patterns are divided into three groups: non-channelized patterns, channelized patterns, and DS1 insert patterns. The test pattern does not need to be set when the AUTO or THRU mode is selected.

PATT ?
Print the current pattern.

PATT <pattern>
Select the appropriate test pattern from the following list.

Non-channelized Test Patterns — The following patterns only apply to the M13, UNFRAMED, and C-BIT modes.

2^15-1 — Select the 32,767-bit pseudorandom pattern.

2^20-1 — Select the 1,048,575-bit pseudorandom pattern.

2^23-1 — Select the 8,388,607-bit pseudorandom pattern.

1010 — Select the fixed framed or unframed alternating marks (1) and spaces (0) pattern.

1100 — Select the fixed framed or unframed repeating two marks (1) and two spaces (0) pattern.

1111 — Select the fixed framed or unframed all marks (1) pattern.

USER1 — Select the fixed 3- to 24-bit user-programmable test pattern. Use the **USER1** command to set the test pattern.

Channelized Test Patterns — The following patterns only apply to the MUXED M13 and MUXED C-BIT modes.

T1D4 1:7 — Select the T1 D4 formatted 1:7 pattern

T1D4 3/24 — Select the T1 D4 formatted 3 IN 24 pattern.

T1D4 1004 — Select the T1 D4 formatted 1004 Hz tone.

T1D4 LPD — Select the T1 D4 formatted loop-down code pattern.

T1D4 LPU — Select the T1 D4 formatted loop-up code pattern.

T1D4 QRS — Select the T1 D4 formatted QRSS pattern.

T1E 1:7 — Select the T1 ESF formatted 1:7 pattern.

T1E 3/24 — Select the T1 ESF formatted 3 IN 24 pattern.

T1E 1004 — Select the T1 ESF formatted 1004 Hz tone.

T1E LPD — Select the T1 ESF formatted loop-down code pattern.

T1E LPU — Select the T1 ESF formatted loop-up code pattern.

T1E QRS — Select the T1 ESF formatted QRSS pattern.

DS1 Insert Source — The following selections only apply to the DS1 INSERT mode. This command requires the 310-3 option.

EXT DS1 — Select the side-panel DS1 RECEIVE jack signal as the DS1 signal source to be inserted into the secondary DS3 signal.

INT DS1 — Select the 310-1 as the DS1 signal source to be inserted into the secondary DS3 signal.

See also: **MODe**

PGM LPDn   PGM LPDn

Set Programmable Loop-Down Code

This command sets or prints the DS1 3- to 8-bit programmable loop-down code. The command only applies when operating in the MUXED M13 or MUXED C-BIT mode and the T1D4 LPDN or T1ESF LPDN pattern is selected. Set the **DS1 LP CODe** command to **PGM** to select the loop code. The pattern is transmitted from left to right.

PGM LPD ?
Print the loop-down code.

PGM LPD [000 | 001 to 11111111]
Set the loop-down code in a binary format from 000 to 11111111.

See also: **DS1 LP CODe** and **PATTern**

PGM LPUp   PGM LPUp

Set Programmable Loop-Up Code

This command sets or prints the DS1 3- to 8-bit programmable loop-up code. The command only applies when operating in the MUXED M13 or MUXED C-BIT mode and the T1D4 LPUP or T1ESF LPUP pattern is selected. Set the **DS1 LP CODe** command to **PGM** to select the loop code. The pattern is transmitted from left to right.

PGM LPU ?
Print the loop-up code.

PGM LPU [000 | 001 to 11111111]
Set the loop-up code in a binary format from 000 to 11111111.

See also: **DS1 LP CODe** and **PATTern**

PRInt BAUd RATe

PRInt BAUd RATe

Print RS-232 Interface Baud Rate

PRI BAU RAT

Prints the RS-232 interface baud rate. The baud rate can only be changed from the front panel (PRINT-BAUD RATE auxiliary function).

PRInt CONtrols

PRInt CONtrols

Generate Controls Printout

PRI CON

This command prints the front-panel controls and auxiliary function configuration for the T-BERD 310. The **CONtrols** command performs the same function.

See also: **CONtrols**

EXAMPLE:

> **PRI CON** (Print the front-panel controls and auxiliary function configuration.)

```
        MAINFRAME CONTROLS PRINT

  JUN 22                        08:18:17


    DS3 PANEL SETTINGS

      Mode:                         M13
      Pattern:                   2^23-1
      DS3 Source:              EXTERNAL
      Test Type:             CONTINUOUS
      TX Timing:               INTERNAL
      DS1 Insert Channel:     NO STATUS
      DS1 Drop Channel:              28
                        •
                        •
                        •
```

>

PRInt CUStom **PRInt CUStom**

Set Custom Results Printout

This command sets or prints the selected test results for a custom results printout. Select the custom results printout with the **PRInt FORmat** command. The custom results printout is generated with the **PRInt RESults** or **RESUlts** command. Refer to the **PRInt** command for a list of **<result names>.**

PRI CUS ?
Print the selected test results for the custom results printout.

PRI CUS <result name> ON
Set the **<result name>** to ON. A **<result name>** that is set to ON is printed in the custom results printout.

PRI CUS <result name> OFF
Set the **<result name>** to OFF. A **<result name>** that is set to OFF is not printed in the custom results printout.

PRI CUS ALL ON
Set ALL the **<result names>** and Status and Alarm LEDs to ON. The custom results printout lists all the test results.

PRI CUS ALL OFF
Set ALL the **<result names>** and Status and Alarm LEDs to OFF. The custom results printout header is generated without the results.

PRI CUS SEC <result name> ON
Set the secondary DS3 **<result name>** to ON. A **<result name>** that is set to ON is printed in the custom results printout.

PRI CUS SEC <result name> OFF
Set the secondary DS3 **<result name>** to OFF. A **<result name>** that is set to OFF is not printed in the custom results printout.

Refer to the following list for Status and Alarm LED, FEAC code, and SONET **<result names>**.

DS3 Status LEDs <result names>

C-BIT FRAME*	C-bit Frame Status LED
DS2 FRM SYNC*	DS2 Frame Sync Status LED
FRAME SYNC*	Frame Sync Status LED
IDLE PRES*	Idle Present Status LED
PATTERN SYNC	Pattern Sync Status LED
SIGNAL PRES*	Signal Present Status LED
SONET PRES	SONET Present Status LED (SONET option required)

DS3 Alarm LEDs <result names>	
BLUE (AIS)*	Blue (AIS) Alarm LED
DS2 FRM LOSS*	DS2 Frame Loss Alarm LED
FAR-END ALRM*	Far-End Alarm LED
FRAME LOSS*	Frame Loss Alarm LED
PATTERN LOSS	Pattern Loss Alarm LED
POWER LOSS	Power Loss Alarm LED
SIGNAL LOSS*	Signal Loss Alarm LED
YELLOW*	Yellow Alarm LED
FEAC Codes <result names>	
FEAC CODES*	FEAC Codes (prints detected codes)
SONET Status <result names> (SONET option required)	
SONET FRAME	SONET Frame Sync
SONET P PTR	SONET Path Pointer
SONET SIGNAL	SONET Signal Present
SONET VT PTR	SONET VT Pointer
SONET Alarms <result names> (SONET option required)	
SONET L AIS	SONET Line Alarm Indication Signal
SONET L RDI	SONET Line Remote Defect Indication
SONET LOF	SONET Loss Of Frame
SONET LOS	SONET Signal Loss
SONET P AIS	SONET Path Alarm Indication Signal
SONET P LOP	SONET Path Loss Of Pointer
SONET P RDI	SONET Path Remote Defect Indication
SONET SEF	SONET Severely Errored Frame
SONET VT AIS	SONET VT Alarm Indication Signal
SONET VT LOP	SONET VT Loss Of Pointer
SONET VT RDI	SONET VT Remote Defect Indication

*Valid DS3 Secondary <result names>.

See also: **PRInt FORmat, PRInt RESults,** and **RESUlts**

PRInt EVEnt — PRInt EVEnt

Set Print Event Function

This command sets or prints the print event setting.

PRI EVE ?
Print the print event setting.

PRI EVE OFF
Set the print event to OFF. Press <CTRL> <C> to clear the print buffer.

PRI EVE 15 MIN
Set the print event for 15 minutes.

PRI EVE 30 MIN
Set the print event for 30 minutes.

PRI EVE ERR SEC
Set the print event for errored seconds.

PRI EVE TES END
Set the print event for test end. The **TESt** command must be set to **TIMed**.

PRI EVE TIM
Set the print event function for timed. Set the **PRInt INTerval** command.

See also: **TESt** and **PRInt INTerval**

PRInt FORmat — PRInt FORmat

Set Test Results Printout Format

This command sets or prints the test results printout format for the T-BERD 310 and 310-1. Generate the selected results printout with the **PRInt RESults** or **RESUlts** command.

PRI FOR ?
Print the test results printout format.

PRI FOR CUS
Set the test results printout format to CUSTOM. Select the custom results with the **PRInt CUStom** command.

PRI FOR NOR

Set the test results printout format to NORMAL. The normal results printout lists the state of all Status and Alarm LEDs and test results.

PRI FOR SUM

Set the test results printout format to SUMMARY. The summary results printout lists the state of all Status and Alarm LEDs and the test results that appear in the SUMMARY category.

See also: **PRInt CUStom, PRInt RESults,** and **RESUlts**

PRInt GRAph — PRInt GRAph

Print Pulse Shape Graph

PRI GRA

This command generates a pulse shape graph. A graphics compatible terminal must be used to generate the pulse shape graph.

See also: **PULse MASk**

PRInt INTerval — PRInt INTerval

Set Timed Print Event Interval

This command sets or prints the amount of time between printouts when the **PRInt EVEnt** command is set to **TIMed**.

PRI INT ?

Print the timed print interval.

PRI INT <hh:mm>

Set the print interval from 00:01 to 24:59.

See also: **PRInt EVEnt**

EXAMPLE:

\> **PRI INT 01:30** (Print a results printout every 1 hour and 30 minutes.)
\> **PRI EVE TIM** (Set the print event for timed.)
\>

```
            NORMAL RESULTS PRINT

  Timed - 01:30:00                JUN 22
  Continuous                     08:46:01

        MAINFRAME TEST RESULTS

    PRIMARY DS3 STATUS

      Signal Present:            ON
      Frame Sync:                ON
      C-bit Frame:               OFF
      Idle Present:              OFF
      DS2 Frame Sync:            OFF
      Pattern Sync:              ON
                         •
                         •
                         •
```

> **PRI EVE OFF** (Set the print event to OFF.)
>

PRInt MODe **PRInt MODe**

Set Printout Mode

This command sets or prints the mode of the results printout. The command selects how the test results are accumulated when the **PRInt EVEnt** command is set to **TIMed, ERRored SECond, 15 MINutes**, or **30 MINutes**.

PRI MOD ?
Print the print mode.

PRI MOD CON
Set the print mode to CONTINUOUS. Test results are accumulated for the duration of the test.

PRI MOD DEL
Set the print mode to DELTA. Test results are accumulated from a test restart or the previous delta printout. As the printout is sent to the print buffer, all test result counters are reset to zero.

See also: **PRInt EVEnt** and **RESUlts**

PRInt PARity

PRInt PARity

Print RS-232 Interface Parity

PRI PAR

Prints the RS-232 interface parity. The parity can only be changed from the front panel (PRINT-PARITY auxiliary function).

PRInt RESults

PRInt RESults

Generate Test Results Printout

PRI RES

This command generates a T-BERD 310 test results printout.

See also: **RESUlts**

PRInt TERminator

PRInt TERminator

Set Line Terminator

This command sets or prints the line terminator.

PRI TER ?

Print the line terminator.

PRI TER CR

Set the line terminator to a carriage return.

PRI TER LF

Set the line terminator to a linefeed.

PRI TER CRL

Set the line terminator to a carriage return and linefeed.

PRInt WIDth PRInt WIDth

Set Printout and Display Line Width

This command sets or prints the line width of printouts. The command does not affect commands that do not generate printouts, e.g., help pages.

PRI WID ?
Print the line width.

PRI WID 40
Set the print line width to 40 characters per line.

PRI WID 80
Set the print line width to 80 characters per line.

PRInt PRInt

Print Selected Test Result

This command prints the selected T-BERD 310 test result value.

PRI <result name>
Print the primary DS3 test result value.

PRI SEC <result name>
Print the secondary DS3 test result value. This command requires the 310-3 option.

NOTE: The **<result name>** must be keyed in as indicated.

PRIMARY DS3 <result names>
LOGIC Category

AV BIT ERT	Average Bit Error Rate
BIT %EFS	Bit, Percentage of Error-Free Seconds
BIT ERR RT	Bit Error Rate
BIT ERR SEC	Bit Errored Seconds
BIT ERRORS	Bit Errors
BIT THR ES	Bit, Threshold Errored Seconds
SLIPS	Pattern Slips
SYNC ES	Synchronous Errored Seconds
SYNC L SEC	Synchronization Loss Seconds

LOGIC Category, 310-10 Option

% AVAIL SEC	% Available Seconds
% DEG MIN	% Degraded Minutes
% SEVERR SEC	% Severely Errored Seconds
AVAIL SEC	Available Seconds
CSES	Consecutive Severely Errored Seconds
DEG MIN	Degraded Minutes
SEV ERR SEC	Severely Errored Seconds
UNAVAIL SEC	Unavailable Seconds

BPV Category

AV BPV ERT	Average BPV Error Rate
BPV %EFS	BPV, Percentage of Error-Free Seconds
BPV ERR RT	BPV Error Rate
BPV ERR SEC	BPV Errored Seconds
BPV THR ES	BPV Threshold Errored Seconds
VIOLATIONS	Bipolar Violations

PARITY Category

AV C-BIT ERT	Average C-Bit Error Rate
AV FEBE RT	Average Far-End Block Error Rate
AV PAR ERT	Average Parity (P-Bit) Error Rate
C-BIT %EFS	C-Bit, Percentage of Error-Free Seconds
C-BIT ERR RT	C-Bit Error Rate
C-BIT ERRORS	C-Bit Errors
C-BIT TYPE A	C-Bit Errored Seconds, Type A
C-BIT TYPE B	C-Bit Errored Seconds, Type B
C-BIT TYPE C	C-Bit Errored Seconds, Type C
FEBE %EFS	Far-End Block Error, Percentage of Error-Free Seconds
FEBE	Far-end Block Errors
FEBE RT	Far-end Block Error Rate
FEBE TYPE A	Far-End Block Error, Errored Seconds, Type A
FEBE TYPE B	Far-End Block Error, Errored Seconds, Type B
FEBE TYPE C	Far-End Block Error, Errored Seconds, Type C
PAR %EFS	Parity (P-Bit), Percentage of Error-Free Seconds
PAR ERR RT	Parity (P-Bit) Error Rate
PAR ERR SEC	Parity (P-Bit) Errored Seconds
PAR ERRORS	Parity (P-Bit) Errors

FRAME Category

AV FRM ERT	Average Frame Error Rate
DS2 AV F ERT	DS2 Average Frame Error Rate
DS2 FRM ERR	DS2 Frame Errors
DS2 FRM ERT	DS2 Frame Error Rate
FEOOF SEC	Far-End Out-of-Frame Seconds
FRM %EFS	Frame, Percentage of Error-Free Seconds
FRM ERR RT	Frame Error Rate
FRM ERR SEC	Frame Errored Seconds

FRM ERRORS	Frame Errors
FRM LOSS CNT	DS3 Frame Loss Count
FRM THR ES	Frame Threshold Errored Seconds
NEOOF SEC	Near-End Out-of-Frame Seconds
RX X-BIT	Received X-Bit
TX X-BIT	Transmitted X-Bit
SIGNAL Category	
FALL TIME	DS3 Pulse Fall Time
LEVEL	Received Signal Level, Vp
POWER	Received Signal Power Measurement
PULSE SHAPE	DS3 Pulse Shape Status
PULSE WIDTH	DS3 Pulse Width
RISE TIME	DS3 Pulse Rise Time
RX FREQ	Received Frequency
SIG L SEC	Signal Loss Seconds
TX FREQ	Transmitted Frequency
SIGNAL Category, 310-5 Option	
HB JITTER	Highband Jitter
MAX HB JIT	Maximum Highband Jitter
MAX WB JIT	Maximum Wideband Jitter
WB JITTER	Wideband Jitter
SIGNAL Category, 310-16 Option	
OPTICAL PWR	Optical Power
RETURN LOSS	Optical Return Loss
TIME Category	
DATE	Current Date
ELAPSED TIME	Elapsed Time
TEST LENGTH	Timed Test Length
TIME	Current Time of Day
TIME LEFT	Timed Test Time Left
SONET Category, 310-12, 310-13R, and 310-14R Options	
APS CONFIG	APS Configuration
APS INFO	APS Information
APS MSG CNT	APS Message Count
FRM WORD ERR	Frame Word Errors
LINE AIS SEC	Line AIS Seconds
LINE BIP ERR	Line BIP Errors
LINE BIP ES	Line BIP Errored Seconds
LINE BIP ESA	Line BIP Errored Seconds, Type A
LINE BIP ESB	Line BIP Errored Seconds, Type B
LINE BIP SES	Line BIP Severely Errored Seconds
LINE EQU BER	Line Equivalent Bit Error Rate
LINE FEBE	Line FEBE
LINE FEBE RT	Line FEBE Rate
LINE UAS	Line Unavailable Seconds

PATH AIS SEC	Path AIS/LOP Seconds
PATH BIP ERR	Path BIP Errors
PATH BIP ES	Path BIP Errored Seconds
PATH BIP ESA	Path BIP Errored Seconds, Type A
PATH BIP ESB	Path BIP Errored Seconds, Type B
PATH BIP SES	Path BIP Severely Errored Seconds
PATH EQU BER	Path Equivalent Bit Error Rate
PATH FEBE	Path FEBE
PATH FEBE RT	Path FEBE Rate
PATH TRACE	Path Trace Message
PATH UAS	Path Unavailable Seconds
POINTER DATA	Pointer Data
POINTER DEC	Pointer Decrements
POINTER INC	Pointer Increments
POINTER JUST	Pointer Justifications
POINTER NDF	Pointer New Data Flags
POINTER SIZE	Pointer Size Bits
SECT BIP ERR	Section BIP Errors
SECT BIP ES	Section BIP Errored Seconds
SECT BIP ESA	Section BIP Errored Seconds, Type A
SECT BIP ESB	Section BIP Errored Seconds, Type B
SECT BIP SES	Section BIP Severely Errored Seconds
SECT EQU BER	Section Equivalent Bit Error Rate
SIGNAL LABEL	Signal Label
SON LOS SEC	SONET Loss of Signal Seconds
SON RX FREQ	SONET Receive Frequency
SON SEF SEC	SONET Severely Errored Frame Seconds
SON TX FREQ	SONET Transmit Frequency
VT AIS SEC	VT AIS/LOP Seconds
VT BIP ERR	VT BIP Errors
VT BIP ES	VT BIP Errored Seconds
VT BIP ESA	VT BIP Errored Seconds, Type A
VT BIP ESB	VT BIP Errored Seconds, Type B
VT BIP SES	VT BIP Severely Errored Seconds
VT EQU BER	VT Equivalent Bit Error Rate
VT FEBE	VT FEBE
VT PTR DATA	VT Pointer Data
VT PTR DEC	VT Pointer Decrements
VT PTR INC	VT Pointer Increments
VT PTR JUST	VT Pointer Justifications
VT PTR NDF	VT Pointer New Data Flags
VT UAS	VT Unavailable Seconds

ATM Category, 310-15 Option

% CLP=1	Percent of Cells with CLP Equals One
% DROP'D	Percent of Dropped Received Mask Cells (TTC)

% OUT OF SEQ	Percent of Out Of Sequence Cells (TTC)
%MISINSERTED	Percent of Misinserted Cells (TTC)
AIS SECONDS	AIS Alarm Seconds
ATM Alarm	ATM Alarm Status Results, Summary Category
ATM STATUS	ATM Status Results, Summary Category
AVG DLAY VAR	Average Cell Delay Variation
BKGRD BW	Background Bandwidth
BKGRD RT	Background Rate
BURST BW	Burst Bandwidth
BURST RT	Burst Rate
CLP=1	Cells with CLP Equals One
CORR TAG	Correlation Tag (TTC)
CORRECT ERRS	Correctable HEC Errors
CORRECT RATE	Correctable HEC Error Rate
DROP'D CELLS	Dropped Received Mask Cells (TTC)
HEC ERR RATE	Header Error Control Error Rate
HEC ERRORS	Header Error Control Errors
IDLE BW	Idle Bandwidth
IDLE RT	Idle Cell Rate
IN-USE BW	In-Use Bandwidth
IN-USE RT	In-Use Rate
MASK CELL BW	Mask Cell Bandwidth
MASK CELL RT	Mask Cell Rate
MASK CELLS	Mask Cells
MASK CONGEST	Received Mask Cells Marked Congested
MAX DLAY VAR	Maximum Cell Delay Variation
MIN DLAY VAR	Minimum Cell Delay Variation
MIN/MAX BW	Minimum/Maximum bandwidth
MIN/MAX RT	Minimum/Maximum Rate
MISINSERTED	Misinserted Cells (TTC)
NON-COR ERRS	Non-Correctable HEC Errors
NON-COR RATE	Non-Correctable HEC Error Rate
OUT OF SEQ	Out Of Sequence Cells (TTC)
RDI SECONDS	RDI Alarm Seconds
TOTL CONGEST	Total received ATM Cells Marked Congested

SECONDARY DS3 <result names> (requires the 310-3 option)

BPV Category

AV BPV ERT	Average BPV Error Rate
BPV %EFS	BPV, Percentage of Error-Free Seconds
BPV ERR RT	BPV Error Rate
BPV ERR SEC	BPV Errored Seconds
VIOLATIONS	Bipolar Violations

PARITY Category	
AV C-BIT ERT	Average C-bit Parity Error Rate
AV FEBE RT	Average Far-End Block Error Rate
AV PAR ERT	Average Parity (P-bit) Error Rate
C-BIT %EFS	C-bit Parity, Percentage of Error-Free Seconds
C-BIT ERR RT	C-bit Parity Error Rate
C-BIT ERRORS	C-bit Parity Errors
C-BIT TYPE A	C-bit Parity Errored Seconds, Type A
C-BIT TYPE B	C-bit Parity Errored Seconds, Type B
C-BIT TYPE C	C-bit Parity Errored Seconds, Type C
FEBE %EFS	Far-End Block Error, Percentage of Error-Free Seconds
FEBE	Far-End Block Errors
FEBE RT	Far-End Block Error Rate
FEBE TYPE A	Far-End Block Errored Seconds, Type A
FEBE TYPE B	Far-End Block Errored Seconds, Type B
FEBE TYPE C	Far-End Errored Seconds, Type C
PAR %EFS	Parity (P-bit), Percentage of Error-Free Seconds
PAR ERR RT	Parity (P-bit) Error Rate
PAR ERR SEC	Parity (P-bit) Errored Seconds
PAR ERRORS	Parity (P-bit) Errors
FRAME Category	
AV FRM ERT	Average Frame Error Rate
FRM %EFS	Frame, Percentage of Error-Free Seconds
FRM ERR RT	Frame Error Rate
FRM ERR SEC	Frame Errored Seconds
FRM ERRORS	Frame Errors
SIGNAL Category	
RX FREQ	Received Frequency in Hertz

PROmpt — PROmpt

Set Terminal Mode Prompt

This command sets or prints the terminal mode prompt. A ">" (greater than sign) indicates the T-BERD 310 is ready to accept a command. The ">" is the prompt default. A "+" (plus sign) indicates when the T-BERD 310 is ready to accept a command and the **HOLd** command has been executed. A user-defined prompt can also be created.

PRO ?
Print the terminal mode prompt.

PRO ON
Turn the prompt ON.

PRO OFF
Turn the prompt OFF.

PRO STR <prompt string>
Create a user-defined prompt. The **<prompt string>** can be 32 characters in length. The **<prompt string>** is stored in NOVRAM. The prompt can be removed by creating a new prompt or executing the **FIRST POWERUP** command.

See also: **HOLd** and **RELease**

EXAMPLE:

> PRO STR T-BERD 310 SITE 5> (Create the prompt "T-BERD 310 SITE 5>".)
T-BERD 310 SITE 5> I (Prompt identifies the T-BERD 310. The "I" is the cursor.)
T-BERD 310 SITE 5> PRO STR > (Create the prompt ">". This removes the old prompt.)
> I (New prompt.)

PULse MASk

Set Pulse Shape Mask Specification

This command sets or prints the selected DS3 pulse shape mask. The selected mask is generated along with the normalized pulse shape in the pulse shape graph printout. The SIGNAL category PULSE SHAPE result is affected by the selected pulse mask.

PUL MAS ?
Print the pulse mask setting.

PUL MAS NON
Set the pulse mask to NONE. The pulse shape continues to be analyzed but is not compared to a pulse mask.

PUL MAS ANS
Set the pulse mask to the ANSI T1.102-1991 pulse mask specification.

PUL MAS 93A
Set the pulse mask to the ANSI T1.102-1993 pulse mask specification.

PUL MAS CCI
Set the pulse mask to the proposed CCITT G.703 pulse mask recommendation.

See also: **PRInt GRAph**

RECeive INPut — RECeive INPut

Set Primary DS3 Receive Input Level

This command sets or prints the DS3 RECEIVE jack receive input level.

REC INP ?
Print the receive input level.

REC INP HIG
Set the receive input to HIGH.

REC INP DSX
Set the receive input to DSX.

REC INP LOW
Set the receive input to LOW.

RELease — RELease

Release All Printer Output

REL
This command disables the **HOLd** command and releases the print buffer output. The prompt changes from + to > when the buffer hold is released. Any printouts generated during the hold are printed.

See also: **HOLd** and **PROmpt**

REMote **REMote**

Enter Remote Control Mode

REM (,)

This command places the T-BERD 310 in the remote control mode from the local or terminal mode. The command disables the following functions: **PROmpt**, **ECHo**, and front-panel switches (except **RESULTS** switches). The message "232 REMOTE CONTROL" flashes in the MODE/PATTERN window. The comma (,) can be used in place of **REMote**.

See also: **LOCal, TERminal, PROmpt,** and **ECHo**

EXAMPLE 1 (local to remote mode):

(The T-BERD 310 (and 310-1) is in local mode. Enter the **REM** command. The command is not echoed from the T-BERD 310.)

```
Remote Control activated, now in control
```

(The T-BERD 310 responds with the above message and is placed in remote control mode. The **PROmpt**, **ECHo**, and front-panel switches (except **RESULTS** switches) are disabled. *232 REMOTE CONTROL* flashes in the MODE/PATTERN window.)

Enter **PRI TIM** (This is not echoed.)
12:34:23 (The T-BERD 310 responds with the current time.)

EXAMPLE 2 (terminal to remote mode):

> rem (The T-BERD 310 (and 310-1) is in local mode. Enter the **REM** command. The command is echoed from the T-BERD 310.)

```
Terminal mode deactivated.
```

(The T-BERD 310 responds with the above message and is in remote control mode. The **PROmpt**, **ECHo**, and front-panel switches (except **RESULTS** switches) are disabled. *232 REMOTE CONTROL* flashes in the MODE/PATTERN window.)

Enter **PRI TIM** (This is not echoed.)
12:34:23 (The T-BERD 310 responds with the current time.)

RES1 or RES2

RES1 or RES2

Test Results Display I/II Control

These commands set or print the test results being displayed in the RESULTS I and RESULTS II windows. Refer to the **PRInt** command for a list of valid **<result names>.**

RES1 or RES2 ?
Print the test result displayed in the RESULTS I or RESULTS II window.

RES1 or RES2 <result name>
Display the primary DS3 **<result name>** in the RESULTS I or RESULTS II window.

RES1 or RES2 SECondary <result name>
Display the secondary DS3 **<result name>** in the RESULTS I or RESULTS II window. This command requires the 310-3 option.

See also: **PRInt**

RESTART

RESTART

Initiate Test Restart

RESTART
This command restarts the T-BERD 310 mainframe test. All SONET and DS3 test results are set to zero. All 310-1 test results continue to accumulate until the **@RESTART** command is executed.

See also: **@RESTART**

RESUlts **RESUlts**

Generate Test Results Printout

RESU

This command generates a T-BERD 310 test results printout.

See also: **PRInt RESUlts** and **PRInt EVEnt**

EXAMPLE:

> **RESU** (Print the test results.)

```
           NORMAL RESULTS PRINT

  Manual                          JUN 22
  Continuous                     08:46:01

       MAINFRAME TEST RESULTS


    PRIMARY DS3 STATUS

      Signal Present:            ON
      Frame Sync:                ON
      C-bit Frame:               OFF
      Idle Present:              OFF
      DS2 Frame Sync:            OFF
      Pattern Sync:              ON
                       •
                       •
                       •
```

>

SET DATe

Set Calendar Date

This command sets or prints the calendar date.

SET DAT ?
Print the calendar date.

SET DAT <mmm dd>
Set the calendar date with the correct month and day. Enter the month (mmm) from JANuary to DECember. Enter the date (dd) from 1 to 31.

SET TIMe

Set Time of Day

This command sets or prints the time of day.

SET TIM ?
Print the time of day.

SET TIM <hh:mm>
Set the time of day in hours and minutes using the 24 hour clock format.

SONet ALArm

SONET Alarm Insertion Select

This command sets or prints the SONET alarms to be transmitted over the SONET signal. This command requires the 310-13T or 310-14T option. Use the **SONet LEDs** command to report on the status of the received alarms.

SON ALA ?
Print current inserted alarm status.

SON ALA LIN AIS
Insert a Line alarm indication signal alarm.

SON ALA LIN RDI
Insert a Line remote defect indication alarm.

SON ALA OFF
Disable the transmitted alarm.

SON ALA PAT AIS
Insert a Path alarm indication signal alarm.

SON ALA PAT LOP
Insert a Path loss of pointer alarm.

SON ALA PAT RDI
Insert a Path remote defect indication alarm.

SON ALA VT AIS
Insert a VT alarm indication signal alarm.

SON ALA VT LOP
Insert a VT loss of pointer alarm.

SON ALA VT RDI
Insert a VT remote defect indication alarm.

See also: **SONet LEDs**

SONet DCC — SONet DCC

SONET Data Communication Channel Drop and Insert Control

This command sets or prints the drop and insert capabilities for the data communication channel (DCC). The DCC is accessed through the DCC DROP/INSERT connector on the 310-13R or 310-14R option. This command requires the 310-13R/T pair or 310-14R/T pair option for full DCC drop and insert capabilities.

SON DCC ?
Print the current DCC function.

SON DCC NON
Disable the insert function of the selected DCC. An all zeros signal is placed in the transmitted Line and Section DCC.

SON DCC LIN
Select the Line DCC to be dropped and inserted.

SON DCC SEC

Select the Section DCC to be dropped and inserted.

SONet DROp SONet DROp

SONET Dropped Payload Format

This command sets or prints the SONET dropped payload signal format. For the DS1 payload formats, use the **SONet DS1 CHAnnel RX** command to select the dropped channel. This command requires the 310-13R or 310-14R option.

SON DRO ?

Print the current SONET dropped payload signal format selection. If lowercase characters appear, the **SONet DROp AUTo** command has been executed.

SON DRO ATM(3C)

Drop an ATM tributary from the selected STS ID of an OC-3c or OC-12 signal. The command is only valid when the **SONet INPut** command is set to OC-3 or OC-12. This command requires the 310-15 option.

SON DRO CON

Drop an OC-3c tributary from an OC-3 or OC-12 signal.

SON DRO AUT

Enable the automatic payload detection function.

SON DRO DS1 ASY

Drop a DS1 asynchronous payload from the selected STS ID.

SON DRO DS1 BIT

Drop a DS1 bit-synchronous payload from the selected STS ID.

SON DRO DS1 BYT

Drop a DS1 byte-synchronous payload from the selected STS ID.

SON DRO DS3 ASYn

Drop a DS3 asynchronous payload from the selected STS ID.

See also: **SONet DS1 CHAnnel RX, SONet INSert, SONet INPut, SONet DS1 CHAnnel TX,** and **DS1 SIGnaling BITs**

SONet DS1 CHAnnel RX

SONet DS1 CHAnnel RX

SONET DS1 Channel Select

This command sets or prints the DS1 channel (1 to 28) from the SONET DS1 signal. For the 310-13R or 310-14R option, select the DS1 payload format with the **SONet DROp** command. Set the channel type with the **DS1 VT MAP** command. This command requires the 310-13R, or 310-14R option.

SON DS1 CHA RX ?
Print the current SONET DS1 channel status.

SON DS1 CHA RX [1 to 28]
Set the SONET DS1 channel from 1 to 28.

SON DS1 CHA RX wx, y
Set the SONET DS1 channel to the selected group and VT where **w** is T (TR253) or M (M13), **x** is the group, and **y** is the virtual tributary.

See also: **SONet DROp** and **DS1 VT MAP**

SONet DS1 CHAnnel TX

SONet DS1 CHAnnel TX

SONET Insert Signal Source, DS1 Channel

This command sets or prints the SONET DS1 payload to be inserted. Use the **SONet INSert** command to select the SONET payload signal format: **DS1 ASYn**, **DS1 BIT**, or **DS1 BYTe**. The **SONet DS1 CHAnnel TX** is not valid when the **SONet INSert** command is set to **DS3 ASYn** or **UNEquipped**. Set the channel type with the **DS1 VT MAP** command. This command requires the 310-13T or 310-14T option.

SON DS1 CHA TX ?
Print current SONET DS1 channel insert signal source.

SON DS1 CHA TX [1 to 28]
Insert the DS1 test signal into the selected VT1.5 channel, 1 to 28.

SON DS1 CHA TX wx, y
Set the SONET DS1 channel to the selected group and VT where **w** is T (TR253) or M (M13), **x** is the group, and **y** is the virtual tributary.

SON DS1 CHA TX ALL
Insert the DS1 test signal into all VT1.5 channels.

See also: **SONet INSert** and **DS1 VT MAP**

SONET Error Insertion Select

This command sets or prints the type of BIP, FEBE, or frame word error being inserted. Only one **<error_type>** can be inserted at a time. Use the **SONet ERRor RATe** command to set the error insertion rate. Use the **SONet FRAme ERRor** command to set the number of consecutive frame word errors to insert. This command requires the 310-13T or 310-14T option.

SON ERR INS ?
Print current SONET error insertion selection.

SON ERR INS OFF
Disable the selected BIP, FEBE, or frame word error insertion selection.

SON ERR INS <error_type> <insertion_type>
Insert the indicated **<error_type>** and **<insertion_type>** from the following selections.

Select an **<error_type>**:

FRA WOR — Insert frame word errors at the indicated insertion rate.
LIN BIP — Insert Line BIP errors at the indicated insertion rate.
LIN FEB — Insert Line FEBEs at the indicated insertion rate.
PAT BIP — Insert Path BIP errors at the indicated insertion rate.
PAT FEB — Insert Path FEBEs at the indicated insertion rate.
SEC BIP — Insert Section BIP errors at the indicated insertion rate.
VT BIP — Insert VT BIP errors at the indicated insertion rate.
VT FEB — Insert VT FEBEs at the indicated insertion rate.

NOTE: VT errors can only be inserted when VT1.5 mapping is selected with the **SONet INSert** command.

Select an **<insertion_type>**:

SIN — Insert a single BIP or FEBE error with the indicated error type.

RAT — Insert continuous BIP or FEBE errors with the indicated error type at the error rate selected with the **SONet ERRor RATe** command.

BUR — Insert a single burst of consecutive frame word errors. Select the number of consecutive frame word errors with the **SONet FRAme ERRor** command.

CON — Insert continuous consecutive frame word errors. Select the number of consecutive frame word errors with the **SONet FRAme ERRor** command.

See also: **SONet ERRor RATe** and **SONet FRAme ERRor**

SONet ERRor RATe — SONet ERRor RATe

SONET Error Insertion Rate Select, BIP and FEBE Errors

This command sets or prints the bit error rate for inserting BIP errors and FEBEs in the transmitted SONET signal. This error rate applies to the **SONet ERRor INSert BIP** and **FEBe** commands. This command requires the 310-13T or 310-14T option.

SON ERR RAT ?
Print current SONET error insertion rate.

SON ERR RAT <insertion_rate>
Select the SONET error insertion rate as follows: 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, and 1E-9.

See also: **SONet ERRor INSert**

SONet FRAme ERRor — SONet FRAme ERRor

SONET Error Insertion Rate Select, Frame Word Errors

This command sets or prints the number of consecutive frame errors for inserting frame word errors. This error rate applies to the **SONet ERRor INSert FRAme WORd** command. This command requires the 310-13T or 310-14T option.

SON FRA ERR ?
Print current number of consecutive frame word errors being inserted.

SON FRA ERR [1 | 2 | 3 | 4 | 5]
Select the number of consecutive frame word errors to be inserted: 1, 2, 3, 4, or 5.

See also: **SONet ERRor INSert**

SONet INPut — SONet INPut

SONET Input Signal Source

This command sets or prints the SONET input receive rate and connection to be analyzed. This command requires the 310-12, 310-13R, or 310-14R option.

SON INP ?

Print current SONET input receive rate and connection.

SON INP STS-1

Select the side-panel STS-1 RECEIVE jack on the 310-13R or 310-14R option to analyze an STS-1 signal. Use the **STS RX LEVel** command to set the receive level.

SON INP OC-1

Select the side-panel OC-1/3 RECEIVE connector on the 310-14R option to analyze an OC-1 signal.

SON INP OC-3

Select the side-panel OC-1/3 RECEIVE connector on the 310-14R option to analyze an OC-3 signal or OC-3c or ATM tributary. Use the **SONet STS ID RX** command to select the STS-1 to be analyzed.

SON INP OC-12

Select the side-panel OC-12 RECEIVE connector to analyze an OC-12 signal or OC-3c or ATM tributary. Use the **SONet STS ID RX** command to select the STS-1 to be analyzed. This command requires the 310-12 option.

See also: **STS RX LEVel, SONet STS ID RX, SONet OUTput,** and **SONet STS ID TX**

SONet INSert — SONet INSert

SONET Insert Signal Source

This command sets or prints the SONET payload signal format and connection to be inserted. Use the **SONet DS1 CHAnnel TX** command to select the VT1.5 channel to insert the DS1 signal. The **SONet INSert** command is not applicable with the **SONet OUTput THRu** command. This command requires the 310-13T or 310-14T option. The DS1 commands require the 310-1 option.

SON INS ?

Print current SONET payload signal format and connection to be inserted.

SON INS <payload>

Select the SONET payload signal format and connection to be inserted from the following list.

ATM(3C) — Insert (or generate) an ATM signal. The command is only valid when **SONet OUTput** command is set to OC-3 or OC-12. This command requires the 310-15 option.

CON — Insert an OC-3c tributary into an OC-3 or OC-12 signal.

DS1 ASY EXT — Insert an externally generated DS1 asynchronous signal from the 310-1 DS1 RECEIVE jack into the selected STS ID.

DS1 ASY INT — Insert a 310-1 internally generated DS1 asynchronous signal into the selected STS ID.

DS1 BIT EXT — Insert an externally generated DS1 bit-synchronous signal from the 310-1 DS1 RECEIVE jack into the selected STS ID.

DS1 BIT INT — Insert a 310-1 internally generated DS1 bit-synchronous signal into the selected STS ID.

DS1 BYT EXT — Insert an externally generated DS1 byte-synchronous signal from the 310-1 DS1 RECEIVE jack into the selected STS ID.

DS1 BYT INT — Insert a 310-1 internally generated DS1 byte-synchronous signal into the selected STS ID.

DS3 ASY EXT — Insert an externally generated DS3 asynchronous signal from the DS3 RECEIVE jack into the selected STS ID.

DS3 ASY INT — Insert a T-BERD 310 internally generated DS3 asynchronous signal into the selected STS ID.

PAT UNE — Insert a Path unequipped signal. The test signal is not inserted and the selected STS ID payload is marked unequipped.

VT1.5 UNE — Insert a VT1.5 unequipped signal. The test signal is not inserted and the each VT1.5 signal is marked unequipped.

See also: **SONet DS1 CHAnnel TX** and **SONet OUTput**

SONet LEDs **SONet LEDs**

Print State of SONET Status and Alarm LEDs

SON LED

This command prints the state of the SONET Status and Alarm LEDs.

See also: **LEDs**

EXAMPLE:

>SON LED (Print the state of the SONET Status and Alarm LEDs.)

```
- SONET alarms - H   C
SEF            OFF OFF
LOF            OFF OFF
LINE AIS       OFF OFF
LINE RDI       OFF OFF
PATH AIS       OFF OFF
PATH RDI       OFF OFF
PATH LOP       OFF OFF
VT AIS         OFF OFF
VT RDI         OFF OFF
VT LOP         OFF OFF

>
```

SONet OUTput

SONet OUTput

SONET Output Signal Source

This command sets or prints the SONET output transmit rate and connection. This command requires the 310-12, 310-13T, or 310-14T option.

NOTE: To disable the OC-1, OC-3, or OC-12 transmitter, select STS-1.

SON OUT ?
Print current SONET output transmit rate and connection used.

SON OUT STS-1
Select the side-panel STS-1 TRANSMIT jack on the 310-13T or 310-14T option to transmit an STS-1 signal. Use the **STS TX LEVel** command to set the transmit level.

SON OUT OC-1
Select the side-panel OC-1/3 TRANSMIT connector on the 310-14T option to transmit an OC-1 signal.

SON OUT OC-3
Select the side-panel OC-1/3 TRANSMIT connector on the 310-14T option to transmit an OC-3 signal. Use the **SONet STS ID TX** command to select the STS-1 being inserted.

SON OUT OC-12
Select the side-panel OC-12 TRANSMIT connector on the installed 310-12 option to transmit an OC-12 signal. Use the **SONet STS ID TX** command to select the STS-1 being inserted.

SON OUT THR

Connect a SONET receiver input with the appropriate SONET transmitter output, i.e., STS-1 in to STS-1 out, OC-1 in to OC-1 out, OC-3 in to OC-3 out, and OC-12 in to OC-12 out. Set the rate and select the connections with the **SONet INPut** command. Select the STS-1 signal to be tested with the **SONet STS ID RX** command. Insert frame word errors, Section BIP errors, or Line BIP errors with the **SONet ERRor INSert** command. This command requires the 310-12, 310-13R/T pair, or 310-14R/T pair option.

See also: **STS TX LEVel, SONet STS ID TX, SONet INPut, SONet STS ID RX,** and **SONet ERRor INSert**

SONet STS ID RX SONet STS ID RX

SONET Input Signal Source, STS ID

This command sets or prints the OC-3 or OC-12 STS ID to be analyzed. Use the **SONet INPut** command to select the input signal. This command requires the 310-12 or 310-14R option.

SON STS ID RX ?

Print current OC-3 or OC-12 STS ID.

SON STS ID RX [1 to 3]

Select the STS ID to be analyzed from an OC-3 signal.

SON STS ID RX [1 to 12]

Select the STS ID to be analyzed from an OC-12 signal. This command requires the 310-12 option.

NOTE: If you select an STS ID that is part of an OC-3c tributary, the entire OC-3c signal is analyzed.

See also: **SONet INPut**

SONet STS ID TX SONet STS ID TX

SONET Output Signal Source, STS ID

This command sets or prints the OC-3 or OC-12 STS ID to be inserted. Use the **SONet OUTput** command to select the output signal. This command requires the 310-12 or 310-14T option.

SON STS ID TX ?

Print current OC-3 or OC-12 STS ID.

SON STS ID TX [1 to 3]
Select the STS ID to be inserted in an OC-3 signal.

SON STS ID TX [1 to 12]
Select the STS ID to be inserted in an OC-12 signal. This command requires the 310-12 option.

NOTE: This command is not applicable when inserting (or generating) an OC-3c tributary. The same OC-3c tributary signal is generated for the OC-3 payload and for all four OC-12 payload slots.

See also: **SONet INPut**

SONet TIMing — SONet TIMing

SONET Transmit Timing Source

This command sets or prints the SONET transmit timing source. This command requires the 310-13T or 310-14T option.

SON TIM ?
Print current SONET transmit timing source. If a DS1 bit-synchronous or DS1 byte-synchronous payload is inserted into the SONET signal, the message "(payload)" appears and the timing cannot be changed.

SON TIM DS1 BIT CLK
Select the timing source connected to the side-panel DS1 BITS CLOCK connector.

SON TIM INT
Select the internal clock to transmit the SONET signal.

SON TIM REC
Select the recovered clock generated from the received SONET signal which is selected through the **SONet INPut** command. This command requires the 310-13R or 310-14R option.

See also: **SONet INPut** and **SONet INSert**

SPE POInter

Synchronous Payload Envelope Pointer Control

This command sets or prints the synchronous payload envelope (SPE) payload pointer. The SPE pointer cannot be manipulated while in SONET THRU mode, or inserting Line or Path AIS or LOP. This command requires the 310-13T or 310-14T option.

SPE POI ?
Print current SPE payload pointer.

SPE POI DEC
Decrement the SPE payload pointer by one from 782 to 0.

SPE POI INC
Increment the SPE payload pointer by one from 0 to 782.

SPE POI NDF [+2 | -2]
Change the NDF to adjust the SPE payload pointer by +2 or -2 bytes.

See also: **SONet INPut** and **SONet INSert**

STS RX LEVel

STS Receive Level

This command sets or prints the STS input signal level range for the side-panel STS-1 RECEIVE jack. This command requires the 310-13R or 310-14R option.

STS RX LEV ?
Print current STS input signal level range.

STS RX LEV DSX
Select for signal levels received at a DSX level.

STS RX LEV HIG
Select for signal levels received at a high level.

STS TX LEVel

STS Transmit Level

This command sets or prints the STS output signal level for the side-panel STS-1 TRANSMIT jack. This command requires the 310-13T or 310-14T option.

STS TX LEV ?
Print current STS output signal level.

STS TX LEV DSX
Select to transmit the STS signal at a DSX level.

STS TX LEV HIG
Select to transmit the STS signal at a high level.

TERminal

Enter Terminal Mode

TER (.)
This command places the T-BERD 310 in the terminal control mode from the local or remote mode. The command enables the **PROmpt** and **ECHo** commands and disables front-panel switches (except **RESULTS** switches). The command also sets the **PRInt TERminator** command to **CRLf** and the **PRInt WIDth** command to **80**. The message *232 REMOTE CONTROL* flashes in the MODE/PATTERN window. A period (.) can be used in place of **TER**.

See also: **PROmpt, ECHo, LOCal,** and **REMote**

EXAMPLE (local to terminal mode):

(Enter **TER** or ". ". The T-BERD 310 (and 310-1) enters local mode. The command is not echoed back from the T-BERD 310.)

```
  Terminal mode activated.
  Enter "HELP" or "?" followed by <RETURN> for help.
>
```

(The T-BERD 310 responds with this message and is in terminal mode. The **PROmpt** and **ECHo** commands are enabled and front-panel switches (except **RESULTS** switches) are disabled. *232 REMOTE CONTROL* flashes in the MODE/PATTERN window.)

TESt LENgth

Set Timed Test Length

This command sets or prints the timed test length. This command is required when the **TESt** command is set to **TIMed**. If the **PRInt EVEnt** command is set to **TESt END**, a timed test result printout is generated at the end of the test.

TES LEN ?
Print the timed test length.

TES LEN <hhh:mm>
Set the test length time in hours and minutes from 00:01 to 999:59.

See also: **TESt** and **PRInt EVEnt**

TESt

Set Test Duration

This command sets or prints the duration of the test being performed.

TES ?
Print the test duration.

TES CON
Set to continuous testing. The test results indicate accumulative counts since test restart.

TES TIM
Set to timed testing. Set the test length with the **TESt LENgth** command. The test results indicate accumulative counts since test restart.

See also: **TESt LENgth** and **PRInt EVEnt**

TRAnsmit OUTput

TRAnsmit OUTput

Set DS3 Transmit Output Level

This command sets or prints the DS3 transmit output level.

TRA OUT ?
Print the transmit output level.

TRA OUT HIG
Set the transmit output level to HIGH.

TRA OUT DSX
Set the transmit output level to DSX.

TRA OUT LOW
Set the transmit output level to LOW.

TRAnsmit TIMing

TRAnsmit TIMing

Set DS3 Transmit Timing Source

This command sets or prints the DS3 transmit timing source. If the DS1 INSERT mode is selected, the DS3 transmit timing source defaults to recovered timing.

TRA TIM ?
Print the DS3 transmit timing source.

TRA TIM INT
Set the DS3 transmit timing source to INTERNAL.

TRA TIM EXT
Set the DS3 transmit timing source to EXTERNAL.

TRA TIM REC
Set the DS3 transmit timing source to RECOVERED.

TX X-Bit

Set Transmitted X-Bit Pattern

This command sets or prints the transmitted X-bit setting.

TX X-B ?
Print the transmitted X-bit setting.

TX X-B [00 | 11]
Set the transmitted X-bits to 00 or 11 (X_0 X_1).

TX X-B EMU
Set the transmitted X-bit setting to EMULATE. EMULATE causes the T-BERD 310 to automatically transmit the X-bits according to the received signal frame status.

USER1

Set User-Programmable Test Pattern

This command sets or prints the user-programmable 3- to 24-bit test pattern. The command only applies when the **USER1** test pattern is selected with the **PATTern** command. The pattern is transmitted from left to right.

USER1 ?
Print the user-programmable test pattern.

USER1 [000 | 001 to 111111111111111111111111]
Set the test pattern in a binary format from 000 to 111111 111111 111111 111111 .

See also: **PATTern**

DS1/DS0 ANALYZER OPTION

REMOTE CONTROL COMMANDS

@CHAnnel FMT　@CHAnnel FMT

Channel Format Select

This command sets or prints the channel format for full T1 or Fractional-T1 (FT1) testing. This command requires the 310-9B option.

@CHA FMT ?
Print the current channel format.

@CHA FMT FUL
Select full T1 channel format. All of the other operating modes can be selected.

@CHA FMT NX64
Select Nx64 FT1 channels. Use the **@FRACtional-t1 TYPe** command to select the contiguous or non-contiguous channel format.

See also: **@MODe** and **@FRACtional-t1 TYPe**

@CODe　@CODe

Set DS1 Line Code Type

This command sets or prints the transmitted DS1 line code type.

@COD ?
Print the DS1 line code status.

@COD AMI
Set the DS1 line code to alternate mark inversion (AMI).

@COD B8Z
Set the DS1 line code to B8ZS encoding.

See also: **@MODe**

@CONTiguous — @CONTiguous

FT1 Contiguous Channel Select

This command sets or prints the contiguous FT1 base channel and bandwidth. Select FT1 testing with the **@CHAnnel FMT** command. Enable contiguous FT1 testing with the **@FRActional-t1 TYPe** command. This command requires the 310-9B option.

@CONT ?
Print the current FT1 contiguous channel format.

@CONT <base_channel,bandwidth>
Select the **<base_channel,xx>** from 1 to 24. Select the **<xx,bandwidth>** from 24 to 1.

See also: **@FRActional-t1 TYPe, @CHAnnel FMT,** and **@NON CONtiguous**

@CONtrols — @CONtrols

Generate Controls Printout

@CON
This command generates a controls printout of the 310-1 front panel configuration. The **@PRInt CONtrols** command performs the same function.

See also: **@PRInt CONtrols**

EXAMPLE:

> @CON (Print the 310-1 front-panel configuration.)

>

```
            DS1 CONTROLS PRINT

 AUG 12                          12:18:12

   DS1 PANEL SETTINGS

     Mode:                            T1
     Pattern:                       QRSS
     DS1 Source:                DS3 DROP
     TX Timing:                 INTERNAL
     Code:                           AMI
     Logic Err Insert:               OFF
     BPV Err Insert:                 OFF
                 •
                 •
                 •

   AUX FUNCTIONS

     User1:                       100000
     Pgm Loop Up:                  10000
     Pgm Loop Down:                  100
     Loop Code:                      CSU
     Data Port:                      DS0


             END OF PRINTOUT

>
```

@DATaport @DATaport

Set DATAPORT Output

This command sets or prints the side-panel DATAPORT output.

@DAT ?
Print the DATAPORT output status.

@DAT DAT
Set the DATAPORT output to access either the ESF, optinal ESFz, or SLC-96 datalink. The **MODe** command must be set to either T1 ESF, optinal T1 ESFz, or T1 SLC-96 respectively.

@DAT DS0

Set the DATAPORT output to access a DS0 channel. The DS0 channel is selected with the **@DS0 DROp CHAnnel** command.

See also: **@DS0 DROp CHAnnel** and **@MODe**

@DISplay HOLd @DISplay HOLd

Set Display Hold

This command sets or prints the display hold.

@DIS HOL ?

Print the display hold status.

@DIS HOL ON

Activate the display hold function. The results and the Status and Alarm LEDs are frozen.

@DIS HOL OFF

Disable the display hold function. The results and the Status and Alarm LEDs are released and updated.

NOTE: While the **@DISplay HOLd** command is ON, updated results can be checked with the **@RES1** or **@RES2** command.

See also: **@PRInt** and **@RESUlts**

@DS0 DROp CHAnnel @DS0 DROp CHAnnel

Set Dropped DS0 Channel

This command sets or prints the dropped DS0 channel.

@DS0 DRO CHA ?

Print the dropped DS0 channel.

@DS0 DRO CHA 1 to 24

Select the DS0 channel to be dropped. DS0 channels are entered with numbers from 1 to 24.

@DS0 DRO CHA NON

Set the DS0 channel to be dropped to none.

@DS1 SOUrce

@DS1 SOUrce

Set DS1 Input Source

This command sets or prints the DS1 input source.

@DS1 SOU ?
Print the DS1 source input status.

@DS1 SOU DS3 DRO
Set the DS1 source input source to the received DS3 signal. The DS1 signal is dropped from the DS3 signal received at the DS3 RECEIVEjack.

@DS1 SOU EXT INP
Set the DS1 source input to the external input. The DS1 signal is received from the side-panel DS1 RECEIVE jack.

@DS1 SOU SON DRO
Set the DS1 input source to the received SONET signal. The DS1 signal is dropped from the side-panel STS-1, OC-1, OC-3, or OC-12 RECEIVE connection. Requires a SONET option.

@ERRor INSert BPV

@ERRor INSert BPV

Execute BPV Insertion

This command sets or prints the BPV insertion setting.

@ERR INS BPV ?
Print the BPV insertion setting.

@ERR INS BPV OFF
Disable the continuous BPV insertion. This command only applies when the **RATe** parameter is used.

@ERR INS BPV RAT
Insert continuous BPVs at a 10^{-3} error rate.

@ERR INS BPV SIN
Insert a single BPV.

See also: **@ERRor INSert LOGic**

@ERRor INSert LOGic

@ERRor INSert LOGic

Execute Logic Error Insertion

This command sets or prints the logic error insertion setting.

@ERR INS LOG ?
Print the logic error insertion setting.

@ERR INS LOG OFF
Disable the continuous logic error insertion. This command only applies when the **RATe** parameter is used.

@ERR INS LOG RAT
Insert continuous logic errors at a 10^{-3} error rate.

@ERR INS LOG SIN
Insert a single logic error.

See also: **@ERRor INSert BPV**

@ESF LOOp

@ESF LOOp

Set ESF Loop Code Type

This command sets or prints the ESF loop code type. This only applies when transmitting loop codes in the T1 ESF mode and the 310-9A/B option is installed.

@ESF LOO ?
Print the ESF loop code type setting.

@ESF LOO IN BAN
Select the ESF in-band loop codes.

@ESF LOO OUT OF BAN
Select the ESF out-of-band loop codes.

See also: **@LOOp CODe** and **@MODe**

EXAMPLE:

> **@ESF LOO ?** (Print the ESF loop code type status.)
In-band loop codes (The ESF loop code type is in-band loop codes.)
> **@ESF LOO OUT OF BAN** (Set the ESF loop code type for out-of-band loop codes.)
> **@LOO COD LINE** (Set the out-of-band loop code to LINE.)
> **@LOO UP ON** (Send the LINE loop-up code.)
>

@FRActional-t1 TYPe — @FRActional-t1 TYPe

FT1 Channel Format Select

This command sets or prints the configuration for Fractional-T1 (FT1) testing. Enable FT1 testing with the **@FT1 CHAnnel FMT NX64** command. This command requires the 310-9B option.

@FRA TYP ?
Print the current FT1 channel format.

@FRA TYP CON
Select Nx64 contiguous FT1 channels. Set the base channel and bandwidth with the **@CONTigous** command.

@FRA TYP N-C
Select Nx64 non-contiguous FT1 channels. Set the timslots with the **@NON CONtigous** command.

See also: **@FT1 CHAnnel, @CONTiguous,** and **@NON CONtiguous**

@HELP — @HELP

Display On-Line Help

This command prints the on-line help pages for the 310-1.

@HELP (?)
Use **@HELP** or **@?** to print the introduction to the 310-1 help pages. The help page identifies the command syntax for entering commands and a list of the available help page commands. The "**@?**" can be used in place of **@HELP** in the following commands. Use the page number (e.g., **? 4**) or the page name (e.g., **? FRO**) to select the required help page.

@HELP !
List all the available 310-1 remote control commands.

@HELP [6 I FRO]
List the 310-1 front-panel remote control commands.

@HELP [7 I AUX]
List the 310-1 auxiliary function remote control commands.

@HELP <command-name>
Describe the **<command-name>** and any parameters in detail. Do not use the **@** sign in the **<command-name>**.

See also: **HELP**

@HIStory RESet — @HIStory RESet

Clear History Alarm LEDs

@HIS RES
Clear any illuminated 310-1 History Alarm LED.

See also: **@LEDs**

@LEDs @LEDs

Print State of Status and Alarm LEDs

@LED
This command prints the state of the Status and Alarm LEDs.

See also: **@HIStory RESet**

EXAMPLE:

> @LED

```
 _______________________________________________________________
|          - alarms -|      - status -          |
|    OFF  OFF  signal  loss    |     ON   T1 pulses      |
|    OFF  OFF  frame   loss    |     ON   frame   sync   |
|    OFF  OFF  pattern loss    |     ON   pattern sync   |
|    ON   OFF  excess zeros    |     ON   b8zs           |
|    OFF  OFF  yellow alarm    |_________________________|
|    OFF  OFF  all ones        |
|     |                        |
|     |_____   history         |
|______________________________|
```

@LOOp CODe @LOOp CODe

Set DS1 Loop Code Type

This command sets or prints the transmitted DS1 in-band (CSU, FAC1, FAC2, and PGM) and ESF out-of-band (**LINe**, **NETwork**, and **PAYload**) loop code. The ESF out-of-band loop codes only apply when transmitting loop codes in the T1 ESF and optional T1 ESFz modes and the 310-9A/B option is installed.

@LOO COD ?
Print the DS1 loop code.

@LOO COD CSU
Set the loop code type to CSU. The loop-up code is 10000 and the loop-down code is 100.

@LOO COD FAC1
Set the loop code type to Facility 1.

@LOO COD FAC2
Set the loop code type to Facility 2.

@LOO COD PGM
Set the loop code type to Programmable. Use the **@PGM LPDn** and **@PGM LPUp** commands to program the loop codes.

@LOO COD LIN
Set the ESF out-of-band loop code type to LINE.

@LOO COD NET
Set the ESF out-of-band loop code type to NETWORK.

@LOO COD PAY
Set the ESF out-of-band loop code type to PAYLOAD.

See also: **@ESF LOOP, @LOOp DOWn, @LOOp UP, @PGM LPDn,** and **@PGM LPUp**

@LOOp DOWn @LOOp DOWn

Generate Loop-Down Code

This command sets or prints the generated loop-down code.

@LOO DOW ?
Print the generated loop-down code status.

@LOO DOW ON
Transmit the loop-down code.

@LOO DOW OFF
Disable the transmitted loop-down code.

See also: **@ESF LOOp, @LOOp CODe,** and **@LOOp UP**

@LOOp UP

@LOOp UP

Generate Loop-Up Code

This command sets or prints the generated loop-up code.

@LOO UP ?
Print the generated loop-up code status.

@LOO UP ON
Transmit the loop-up code.

@LOO UP OFF
Disable the transmitted loop-up code.

See also: **@ESF LOOp, @LOOp CODe,** and **@LOOp DOWn**

@MODe

@MODe

Set Transmit and Receive Operating Mode

This command sets or prints the 310-1 transmit and receive operating mode. Enable full T1 or FT1 testing with the **@CHAnnel FMT** command.

@MOD ?
Print the operating mode.

@MOD AUT
Select the automatic configure frame and pattern mode.

@MOD T1 D4
Select the T1 D4 mode.

@MOD T1 ESF
Select the T1 ESF mode.

@MOD T1 SLC
Select the T1 SLC mode.

@MOD T1
Select the T1 unframed mode.

@MOD SCA
Select the DS1 scan mode.

See also: **@CHAnnel FMT**

@NON CONtiguous

@NON CONtiguous

FT1 Non-Contiguous Channel Select

This command sets or prints the non-contiguous FT1 bandwidth. Select FT1 testing with the **@CHAnnel FMT** command. Enable contiguous FT1 testing with the **@FRActional-t1 TYPe** command. This command requires the 310-9B option.

@NON CON ?
Print the current non-contiguous FT1 channel format.

@NON CON <123456789012345678901234>
Select the non-contiguous FT1 channel by entering 1s for the FT1 channel and 0s for the idle channels. For example, to enter an FT1 channel starting with the base channel 4 and a bandwidth of 5 which includes every third timeslot, enter the command as follows:

```
@NON CON   000100100010001000000000
chan       123456789012345678901234
```

See also: **@FT1 CONtiguous** and **@FT1 CHAnnel FMT**

@PATtern

@PATtern

Set Data Pattern

This command sets or prints the transmitted test pattern.

@PAT ?
Print the pattern.

@PAT <pattern>

Select the test pattern from the following list.

1:1 — Select the 1:1 pattern.

1:7 — Select the 1:7 pattern.

2^15-1 — Select the 32,767-bit pseudorandom pattern.

2^20-1 — Select the 1,048,575-bit pseudorandom pattern.

2^23-1 — Select the 8,388,607-bit pseudorandom pattern.

3/24 — Select the 3 IN 24 pattern.

55OCTET — Select the 55 Octet pattern. This selection requires the 310-9B option.

ALL ONE — Select the All Ones pattern.

ALL ZER — Select the All Zeros pattern.

CON — Select the continuous DS1 scan mode.

MINMAX — Select the Minimum/Maximum pattern. This selection requires the 310-9B option.

QRS — Select the QRSS pattern.

T12 — Select the T1-2 pattern. Do not use pattern in T1 D4 or T1 SLC framing. This selection requires the 310-9B option.

T13 — Select the T1-3 pattern. This selection requires the 310-9B option.

T14 — Select the T1-4 pattern. This selection requires the 310-9B option.

T15 — Select the T1-5 pattern. This selection requires the 310-9B option.

T1DALY — Select the T1-DALY pattern. This selection requires the 310-9B option.

TRI — Select the triggered DS1 scan mode. This selection requires the 310-1 option.

USER1 — Select the fixed 3- to 24-bit user-programmable test pattern. Use the **@USER1** command to set the test pattern.

See also: **@USER1** and **@MODe**

@PGM LPDn @PGM LPDn

Set Programmable Loop-Down Code

This command sets or prints the DS1 3- to 8-bit programmable loop-down code. Set the **@LOOp CODe** command to **PGM** to select the loop code. Set the **@LOOp DOWn** command to **ON** to transmit the loop code. The pattern is transmitted from left to right.

@PGM LPD ?
Print the loop-down code.

@PGM LPD [000 | 001 to 11111111]
Set the loop-down code in a binary format from 000 to 11111111.

See also: **@LOOp CODe** and **@LOOp UP**

@PGM LPUp @PGM LPUp

Set Programmable Loop-Up Code

This command sets or prints the DS1 3- to 8-bit programmable loop-up code. Set the **@LOOp CODe** command to **PGM** to select the loop code. Set the **@LOOp UP** command to **ON** to transmit the loop code. The pattern is transmitted from left to right.

@PGM LPU ?
Print the loop-up code.

@PGM LPU [000 | 001 to 11111111]
Set the loop-up code in a binary format from 000 to 11111111.

See also: **@LOOp CODe** and **@LOOp DOWn**

Generate Controls Printout

@PRI CON

This command generates a controls printout of the 310-1 front panel configuration. The **@CONtrols** command performs the same function.

See also: **@CONtrols**

EXAMPLE:

> **@PRI CON** (Print the 310-1 front-panel configuration.)

```
            DS1 CONTROLS PRINT

  AUG 12                          12:18:12

    DS1 PANEL SETTINGS

      Mode:                         T1
      Pattern:                    QRSS
      DS1 Source:             DS3 DROP
      TX Timing:              INTERNAL
      Code:                        AMI
      Logic Err Insert:            OFF
      BPV Err Insert:              OFF
      Loop Up Code:                OFF
      Loop Down Code:              OFF
      DS0 Drop Channel:             24
      RX Input:                   TERM

    AUX FUNCTIONS

      User1:                    100000
      Pgm Loop Up:               10000
      Pgm Loop Down:               100
      Loop Code:                   CSU
      Data Port:                   DS0
                  •
                  •
                  •

             END OF PRINTOUT
>
```

@PRInt CUStom — @PRInt CUStom

Set Custom Results Printout

This command sets or prints the selected test results for a custom results printout. The custom results printout is selected with the T-BERD 310 **PRInt FORmat** command set to **CUStom.** The custom results printout is generated with the **@PRInt RESults** or **@RESUlts** command. Refer to the **@PRInt** command for a list of **<result names>.**

@PRI CUS ?
Print the selected test results for the custom results printout.

@PRI CUS <result name> ON
Set the **<result name>** to ON. A **<result name>** that is set to ON is printed in the custom results printout.

@PRI CUS <result name> OFF
Set the **<result name>** to OFF. A **<result name>** that is set to OFF is not printed in the custom results printout.

@PRI CUS ALL ON
Set ALL the **<result names>** and Status and Alarm LEDs to ON. The custom results printout lists all the test results.

@PRI CUS ALL OFF
Set ALL the **<result names>** and Status and Alarm LEDs to OFF. The custom results printout header is generated without the results.

See also: **@PRInt RESults** and **@RESUlts**

@PRInt RESults — @PRInt RESults

Generate Test Results Printout

@PRI RES
This command generates a 310-1 test results printout.

See also: **@RESUlts**

EXAMPLE:

> **@PRI RES** (Print the test results.)

```
               NORMAL RESULTS PRINT

  Manual                           AUG 12
  Continuous                     12:23:58

                 DS1 TEST RESULTS

    DS1 STATUS

      T1 Pulses:                 ON
      Frame Sync:                OFF
      Pattern Sync:              ON
      B8ZS:                      OFF

                        •
                        •
                        •
                 END OF PRINTOUT
>
```

@PRInt **@PRInt**

Print Selected Test Result

@PRI <result name>

This command prints the selected 310-1 test result value.

LOGIC Category	
%EFS	Percentage of Error-Free Seconds
ASYNC ERR SEC	Asynchronous Errored Seconds
BIT ERR RT	Bit Error Rate
BIT ERRORS	Bit Errors
CSES	Consecutive Severely Errored Seconds
SEV ERR SEC	Severely Errored Seconds
SLIPS	Pattern Slips
SYNC ERR SEC	Synchronous Errored Seconds
SYNC L SEC	Out-of-Synchronization Seconds
LOGIC Category, G.821 Results Option	
% AVAIL SEC	% Available Seconds
% DEG MIN	% Degraded Minutes
% SEVERR SEC	% Severely Errored Seconds
AVAIL SECOND	Available Seconds
DEG MIN	Degraded Minutes
UNAVAIL SEC	Unavailable Seconds

BPV Category

BPV ERR RT	Bipolar Violation Rate
BPV ERR SEC	Bipolar Violation Seconds
VIOLATIONS	Bipolar Violations
BPV Category, Enhanced DS1 Testing Option	
FAR BPV SEC	Far-End BPV Seconds
FRAME Category	
CRC ERR RT	Cyclic Redundancy Check Error Rate
CRC ERR SEC	Cyclic Redundancy Check Errored Seconds
CRC ERRORS	Cyclic Redundancy Check Errors
CRC SES	Cyclic Redundancy Check Severely Errored Seconds
FRM ERR RT	Frame Error Rate
FRM ERR SEC	Frame Errored Seconds
FRM ERRORS	Frame Errors
FRM L SEC	Frame Loss Seconds
FRM SES	Frame Severely Errored Seconds
FRAME Category, Enhanced DS1 Testing Option	
FAR CRC ERR	Far-End CRC Error Events
FAR FRM ES	Far-End Frame Error Seconds
FAR FRM SES	Far-End Severely Errored Framing Seconds
FAR SLIP SEC	Far-End Controlled Slip Seconds
FCRC 1	Far-End CRC 1 Bin
FCRC 2-5	Far-End CRC 2 to 5 Bin
FCRC 6-10	Far-End CRC 6 to 10 Bin
FCRC 11-100	Far-End CRC 11 to 100 Bin
FCRC 101-319	Far-End CRC 101 to 319 Bin
FCRC >319	Far-End CRC 320 to 333 Bin
PAYLOAD SOURCE	Far-End Payload Source/Loopback
SIGNAL Category	
RX FREQ	Received Frequency in Hertz
RX LVL dBdsx	Received Signal Level in dBdsx
SIG BIT	Channel A/BC/D Signaling Status
SIG L SEC	Signal Loss Seconds
VF LVL dBm	Received Signal Level in dBm
SIGNAL Category, Enhanced DS1 Testing Option	
TIMING SLIPS	DS1 Timing Slips
SYNC MSG	ESF Datalink Synchronization Message
TIME Category	
DATE	Current Date
ELAPSED TIME	Elapsed Time
TEST LENGTH	Timed Test Length
TIME	Current Time of Day
TIME LEFT	Timed Test Time Left
TIME Category, Enhanced DS1 Testing Option	
FAR PRM SEC	Far-End Performance Report Seconds

See also: **@PRInt RESults, @RESUlts,** and **@RES1** or **@RES2**

@PRM EMUlate @PRM EMUlate

Set PRM Transmission Control

This command sets or prints the PRM transmission control function. The command only applies when operating in the T1 ESF and optional T1 ESFz modes and the 310-9A/B option is installed.

@PRM EMU ?
Print the PRM transmission control function.

@PRM EMU CAR
Set the PRM transmission control function to carrier emulation.

@PRM EMU CUS
Set the PRM transmission control function to customer emulation.

@PRM EMU OFF
Turn the PRM transmission control function OFF.

See also: **@PRM RECeive** and **@MODe**

@PRM RECeive @PRM RECeive

PRM Results Analysis Control

This command sets or prints the PRM results analysis control function. The command only applies when operating in the T1 ESF and optional T1 ESFz modes and the 310-9A/B option is installed.

@PRM REC ?
Print the PRM results analysis control function.

@PRM REC ON
Turn the PRM results analysis control function ON.

@PRM REC OFF
Turn the PRM results analysis control function OFF.

See also: **@PRM EMUlate, @PRInt,** and **@MODe**

@RECeive INPut

@RECeive INPut

Set DS1 Receive Input Level

This command sets or prints the DS1 RECEIVE jack receive input level.

@REC INP ?
Print the receive input level.

@REC INP BRI
Set the receive input to BRIDGE.

@REC INP DSX
Set the receive input to DSX-MON.

@REC INP TER
Set the receive input to TERM.

@RES1 or @RES2

@RES1 or @RES2

Test Results Display I/II Control

These commands set or print the test results being displayed in the 310-1 RESULTS I and RESULTS II windows. Refer to the **@PRInt** command for a list of valid **<result names>.**

@RES1 or @RES2 ?
Print the test result displayed in the RESULTS I or RESULTS II windows.

@RES1 or @RES2 <result name>
Display the **<result name>** in the RESULTS I or RESULTS II window.

See also: **@PRInt, @PRInt RESults,** and **@RESUlts**

@RESTART

@RESTART

Initiate Test Restart

@RESTART
This command restarts the 310-1 test.

Generate Test Results Printout

@RESU

This command generates a 310-1 test results printout.

See also: **@PRInt RESults**

EXAMPLE:

> **@RESU** (Print the current test results.)

```
              NORMAL RESULTS PRINT

 Manual                              AUG 12
 Continuous                        12:23:58

                DS1 TEST RESULTS


   DS1 STATUS

     T1 Pulses:                     ON
     Frame Sync:                    OFF
     Pattern Sync:                  ON
     B8ZS:                          OFF

   DS1 ALARMS                 HIST  CURR

     Signal Loss:             OFF   OFF
     Frame Loss:              OFF   OFF
     Pattern Loss:            OFF   OFF
     Excess Zeros:            OFF   OFF
                       •
                       •
                       •
                END OF PRINTOUT
```

>

@SCAn TRIgger

@SCAn TRIgger

Set Triggered DS1 Scan Mode Criteria

This command sets or prints the 310-1 triggered DS1 scan mode test criteria. One or all events can be enabled or disabled.

@SCA TRI ?
Print the current triggered DS1 scan mode test criteria.

@SCA TRI ALL ONE [ON | OFF]
Enable/Disable the 310-1 to trigger on an All Ones signal.

@SCA TRI CRC ERR [ON | OFF]
Enable/Disable the 310-1 to trigger on a CRC error.

@SCA TRI FRA ERR [ON | OFF]
Enable/Disable the 310-1 to trigger on a frame error.

@SCA TRI FRA LOS [ON | OFF]
Enable/Disable the 310-1 to trigger on a frame loss.

@SCA TRI FRA SYN [ON | OFF]
Enable/Disable the 310-1 to trigger on a frame synchronization.

@SCA TRI TM SLI [ON | OFF]
Enable/Disable the 310-1 to trigger on a timing slip.

@SCA TRI YEL ALA [ON | OFF]
Enable/Disable the 310-1 to trigger on a Yellow Alarm.

DS1 Timing Slip Reference Source

This command sets or prints the DS1 timing slip reference source for the TIMING SLIP result. Select the DS1 test signal source with the **@DS1 SOUrce** command. Refer to Table 2-5 for the relationship between the test signal source and the reference signal source. This command requires the 310-9A/B option.

@SLI REF ?
Print the timing slip reference source status.

@SLI REF PRI DS3 DRO
Select the DS1 channel that is internally dropped from the DS3 RECEIVE jack. The DS1 channel is selected with the **DS1 DROp CHAnnel** command.

@SLI REF SEC DS3 DRO
Select the DS1 channel that is internally dropped from the SECONDARY DS3 RECEIVE jack on the 310-3 option. The DS1 channel is selected with the **DS1 INSert CHAnnel** command.

@SLI REF SON DRO
Select the DS1 channel that is internally dropped from the side-panel STS-1, OC-1, OC-3, or OC-12 RECEIVE connection. Select the SONET DS1 payload channel through the **SONet DS1 CHAnnel RX** command. For the 310-13R or 310-14R option, select the DS1 payload format with the **SONet DROp** command. Requires a SONET option.

@SLI REF DS1 REC
Select the DS1 signal from the DS1 RECEIVE jack on the 310-1 option.

@SLI REF DS1 INS
Select the DS1 signal from DS1 INSERT INPUT jack on the 310-3 option.

@SLI REF DS1 BIT CLK
Select the DS1 clock rate signal from the side-panel DS1 BITS CLOCK jack on the 310-13T or 310-14T option.

See also: **DS1 DROp CHAnnel, DS1 INSert CHAnnel, SONet DS1 CHAnnel, @DS1 SOUrce,** and **@PRInt**

@TRAnsmit TIMing @TRAnsmit TIMing

Set DS1 Transmit Timing Source

This command sets or prints the DS1 transmit timing source.

@TRA TIM ?
Print the DS1 transmit timing source.

@TRA TIM INT
Set the DS1 transmit timing to INTERNAL.

@TRA TIM REC
Set the DS1 transmit timing to RECOVERED.

@USER1 @USER1

Set User-Programmable Test Pattern

This command sets or prints the user-programmable 3- to 24-bit test pattern. The command only applies when the **@USER1** test pattern is selected with the **@PATtern** command. The pattern is transmitted from left to right.

@USER1 ?
Print the user-programmable test pattern.

@USER1 [000 | 001 to 111111111111111111111111]
Set the test pattern in a binary format from 000 to 111111 111111 111111 111111.

See also: **@PATtern**

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