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Rev. P

T-BERD 209A/211
T-CARRIER ANALYZER

REFERENCE MANU AL

JUNE 1994

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GENERAL INFORMATION

1.1 INTRODUCTION

The purpose of this reference manual is to provide information about the physical features, functional operation, and specifications of the Telecommunications Techniques Corporation (TTC) T-BERD 209A and T-BERD 211 T-Carrier Analyzers.

This manual provides information on the following options that are available for the T-BERD 209A and T-BERD 211.

- G.821 Performance Analysis Option (209A/211-1)
- Jitter Spectral Analysis Option (211-2)
- Rechargeable Lead-Acid Battery Option (209A-2)
- Advanced BERT Option (209A/211-3)
- Enhanced ESF Option (209A/211-4)
- Time Domain Reflectometer Option (209A/211-5)
- Fractional T1 Option (209A/211-6)
- T-BERD DLC Analyzer Option (209A/211-96)
- T-BERD T1 Channel Monitor Option (Model 40849)
- T-BERD Repeater Power Supply Option (Model 41084)

In addition to this manual, a *T-BERD 209A/211 User's Guide* provides information on setting up and operating the T-BERD 209A and T-BERD 211 in a number of in-service and out-of-service applications.

1.2 INSTRUMENT OVERVIEW

The T-BERD 209A/211 is a portable and comprehensive test instrument for the installation and maintenance of T1 and T1C transmission systems. Designed primarily for central office testing, the T-BERD 209A/211 can be used during circuit installation, acceptance testing and troubleshooting. The T-BERD 209A/211 can receive and generate test patterns during out-of-service circuit tests or can monitor T1 and T1C circuits without service interruption. The T-BERD 209A/211 can emulate network devices, such as Network Interface Units (NIUs) or Channel Service Units (CSUs). In addition, it can detect and isolate circuit problems in customer premises and network equipment.

1.3 STANDARD FEATURES

D4, ESF, and SLC™-96 framing patterns offer compatibility with a variety of framing formats. An unframed mode is also available for applications where framing is not required.

Summary test results category displays key non-zero and out-of-specification results, eliminating the need to search through long lists of test results.

Automatic configure mode lets the T-BERD 209A/211 configure itself to the proper line rate (T1 or T1C), framing, coding, and pattern. No set up is required when monitoring live circuits.

Simultaneous logic error, bipolar violation, and frame error analysis is performed along with associated error rate, errored second, and percent error-free second calculations.

Automated BRIDGTAP™ test allows the T-BERD 209A/211 to evaluate a T1 span for bridge taps. The test automatically generates 21 test patterns which are monitored for errors.

Automated MULTIPAT™ test generates five standard T1 test patterns with variable duration that eliminates the need to perform individual tests with each pattern.

Signal analysis with simplex current, signal level, timing slip, and recovered clock frequency measurements.

Slips and wander measurements identify wander impairments or the potential for frame slips.

Pulse shape analysis allows you to measure the height, width, rise time, fall time, overshoot and undershoot of a T1 pulse. Pulse shapes can also be measured for conformance to AT&T Compatibility Bulletin 119 or ANSI T1.403 Network Interface specifications.

Wideband and highband jitter (T-BERD 211only) is measured for 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).

Logic, BPV, and frame error insertion enables the T-BERD 209A/211 to simulate errors as they occur. Errors may be inserted singly, in a burst, or at variable rates.

RS-232 printer/remote control interface allows you to print graphic displays (e.g., pulse shapes) and error analysis results, and to remotely control the T-BERD 209A/211.

Results history buffer stores up to six sets of your most recent test results that can be viewed from the front panel.

1.4 OPTIONS

T-BERD 209A/211 mainframe options are discussed in detail in Section 3. T-BERD 209A/211 lid options are discussed in detail in Section 4.

G.821 Performance Analysis Option — Option 209A/211-1

CCITT Recommendation G.821 performance analysis evaluates the long-term performance of your system.

Adds unavailable second, percent availability, degraded minute, percent degraded minute, and severely errored second results to the LOGIC category.

Jitter Spectral Analysis Option — Option 211-2 (T-BERD 211 Only)

Analyzes timing jitter present on T1 networks.

Measures Jitter against five industry standards for jitter impairments or in UI.

Displays the relative amount of jitter as a percentage against a specification mask.

Rechargeable Lead-Acid Battery Option — Option 209A-2 (T-BERD 209A Only)

Provides battery backup when AC power is lost.

Provides continuous battery operation when AC power is not available.

Operates up to five hours on a single charge.

Continuously charges when AC power is applied.

Turns off the display to conserve power when no switches are pressed for five minutes.

Advanced BERT Option — Option 209A/211-3

Adds a user programmable 1- to 2000-character hexadecimal test pattern that determines the circuit sensitivity to the pattern when transmitted.

Adds a minimum/maximum density stress pattern that can be used for framed or unframed signal testing.

Adds test patterns that can stress test timing recovery circuits and span-line repeater ALBO circuitry.

Provides intelligent repeater loop codes that enable the T-BERD 209A/211 to control Teltrend, Wescom, Westell, XEL, or equivalent intelligent span equipment.

Provides command codes that enable the T-BERD 209A/211 to control Teltrend and Westell T1 maintenance switches.

Enhanced ESF Option — Option 209A/211-4

Monitors and reports on the received ESF datalink ANSI T1.403 Performance Report Message (PRM).

Analyzes and generates the PRM for the received T1 signal.

Adds a SMARTNIU mode that enables the T-BERD 209A/211 to query, retrieve, store, and clear T1 circuit statistics obtained by a Westell NIU/Performance Monitor.

Time Domain Reflectometer Option — Option 209A/211-5

Uses TDR signal analysis to locate line impairments such as shorts, opens, splices, coils, and bridge taps on copper wire pairs.

Displays faults and distances in plain English for shorts, opens, and bridge taps on the front panel.

Provides printouts of test results, setup, and fault location trace using the TTC PR-40A Thermal Printer.

Enables fault identification and location on cable pairs of varying lengths (100 to 6500 feet).

Provides a TDR fault trace and distance graph that indicates all line impairments detected on the cable pair in a normal or a magnified mode.

Enables printout or dual traces that compare the current trace to a reference trace.

Fractional T1 Option — Option 209A/211-6

Fractional T1 (FT1) modes provide contiguous and noncontiguous, 56xN and 64xN, fractional T1 testing capabilities in D4, ESF, and ESFz framing formats.

Provides FT1 stress patterns that enable the T-BERD 209A/211 to test DDS and fractional T1 circuits.

T-BERD DLC Analyzer Option — Option 209A/211-96 (Model 42170)

Provides drop and insert capability for DLC datalink and T1 channel information.

Displays DLC datalink alarm status on the front panel.

Generates DLC datalink alarms to test terminal alarm circuits.

Initiates and monitors automated maintenance test procedures.

Establishes far-end loopbacks over a given shelf or protection line. The selected shelf is automatically switched to the protection line when placed in loopback.

Initiates a switch to protection line for a given shelf.

Generates on-hook, off-hook, and ringing conditions using dedicated front-panel switches.

Monitors A, B, C, and D channel signaling bits on all channels or timeslots simultaneously.

Monitors SLC-96 Mode 2 timeslot channel assignments from the front panel.

Provides VF outputs that enable DS0 channels or timeslots to be analyzed by an external TIMS test set or listened to over the built-in speaker.

Measures VF signal level and frequency for an individual DS0 channel or timeslot.

Inserts tones (404 Hz, 1004 Hz, and 2804 Hz) into an individual DS0 channel or timeslot.

Decodes DTMF dialing sequences and the dialed number of the received signal is displayed.

Provides 2-wire VF input/output that enables two-way testing over a selected DS0 channel or timeslot.

T-BERD T1 Channel Monitor Option — Model 40849

Simultaneously displays all 24 signaling bits, which allows a quick look at the hook switch and ringing status of a T1 channel or a view of the ongoing signaling of a T1 trunk.

Provides an LED bar graph display of the VF signal level from -54 dBm to +3 dBm in 3 dBm steps.

Drops and inserts the ESF or SLC-96 datalink for monitoring or testing with an external test set.

Supplies a selected VF channel to an external VF test set via the VF OUT 600 OHMS jack.

Establishes ISDN compatibility by dropping one of the 24 channels (64 kb/s).

T-BERD Repeater Power Supply Option — Model 41084

Provides power and a T1 signal interface, which enable testing and verification of newly installed T-Carrier circuits before span power is applied at the central office.

Measures the voltage across the circuit to determine whether the applied voltage correlates with the expected voltage dictated by the circuit design.

Measures span current to verify proper powering of span repeaters.

Uses a Loopback Connector to provide a hard loop at the central office, which allows a single technician to sectionalize and isolate T1 span line faults.

Complies with IEEE STD-743 and UL1459, Telephone Equipment, 1st and 2nd Editions, as tested and listed by a National Recognized Testing Laboratory (NRTL).

1.5 ACCESSORIES

The following accessories aid in the installation, transport, and operation of the T-BERD 209A/211.

Part No.	Description
10949	DC-to-AC inverter.
10958-01	19” rack mount with a 7” vertical space requirement.
10958-02	19” rack mount with a 9” vertical space requirement.
10959-01	23” rack mount with a 7” vertical space requirement.
10959-02	23” rack mount with a 9” vertical space requirement.
10966	Thermal printer paper (10 rolls).
40644-02	Soft carrying case.
41157	Repeater Extender.
PR-40A	Thermal 40-column graphic printer with cable and carrying case (AC or DC operation).

1.6 CABLES

The following cables provide an interconnection between the T-BERD 209A/211, other test sets, and the network.

Part No.	Description
10199	15-pin D to 15-pin D (10’).
10420	310 plug to 310 plug (10’).
10558	310 plug to alligator clips (10’).
10559	310 plug to bantam plug (10’).
10598	WECO 310 plug to WECO 310 plug (4’).
10599	WECO 310 plug to bantam plug (4’).
10615	Bantam plug to bantam plug (10’).
10648	Bantam plug to alligator clips (10’).
10686	15-pin D to RJ45 (10’).
30697	WECO 310 plug to mini-test clips (6’).

1.7 ORDERING INFORMATION

Contact TTC Customer Service at (800) 638-2049 for information on ordering options or accessories.

INSTRUMENT CHECKOUT AND SERVICE

2.1 UNPACKING AND INITIAL INSPECTION

The T-BERD 209A/211 shipping container should be inspected for damage when it is received. If the shipping container or shipping material is damaged, it should be kept until the contents of the shipment have been checked. If the contents are incomplete, notify TTC at (800) 638-2049. If the shipping container is damaged, notify the carrier as well as TTC, and keep the shipping container and materials for the carrier's inspection.

2.2 EQUIPMENT INCLUDED

- T-BERD 209A/211 T-Carrier Analyzer
- Power cord
- Reference Manual and User's Guide
- Front cover or lid option

2.3 WARNINGS AND CAUTIONS

The following warnings list precautions that 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 three-contact electrical outlet or used with a three-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 from the chassis while the power is applied to the unit.

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

Operating this unit in temperatures above 122° F (50° C) can cause damage to the unit.

2.4 POWER REQUIREMENTS

The T-BERD 209A/211 is configured with a 90 to 135 VAC single-phase 48 to 60 Hz power supply. The **AC Power** switch, AC line fuse, and connector are located on the side of the T-BERD 209A/211.

AC Power Connector — The AC power cord plugs into this three-prong receptacle to provide line voltage to the instrument. The safety ground connection is wired directly to the chassis.

AC Power Cord — This instrument is equipped with a three-conductor AC power cable. The power cord must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adaptor with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

AC Line Fuse — The AC line fuse compartment is located between the AC power connector and the **AC Power** switch. A 1A 250V Slo-Blo fuse (Littlefuse #218001 or equivalent) provides overload protection for the T-BERD 209A/211 (in black holder). A spare fuse is also located in the compartment (in white holder). *Always use the correctly rated fuse.* Refer to Section 2.7 for instructions to replace a blown fuse.

AC Power Switch — The switch controls the AC power to the instrument. The switch is labeled with a “1” for the ON position and a “0” for the OFF position. Always place the switch in the OFF position before connecting power. When power is removed, the front-panel configuration is retained in memory. Pressing the **MODE** switch when power is applied displays the software and hardware revision levels. Pressing the **RESTART** switch when power is applied defaults the instrument configuration to the factory defaults.

Low Battery LED (T-BERD 209A only) — When the optional lead-acid battery is installed, the LED illuminates approximately 15 minutes before the battery is completely drained of power. The history LED illuminates when the current LED is illuminated and AC power is applied to the instrument.

Power Loss LED — Located on the front panel, the LED illuminates when the T-BERD 209A/211 regains power after a power loss. If a test is in progress at the time of a power loss, the T-BERD 209A/211 is automatically restarted when power is regained. The LED remains illuminated until either the **HISTORY RESET** switch is pressed or a major switch change (e.g., **MODE, PATTERN,** etc.) has occurred. If a printer is connected, a results printout is generated when power is restored.

2.5 INSTRUMENT SELF-TEST/CHECKOUT

1. **Remove the front cover or lid option**
   Unsnap the metal latches on each side of the instrument. For the standard cover, turn the cover upside down and pull the compartment panel out to access the AC line cord.

   NOTE: Power on the T-BERD 209A/211 before connecting any of the lid options.

2. **AC power cord**
   Insert the AC line cord into the AC receptacle on the T-BERD 209A/211 side panel and plug the other end of the cord into a 115 VAC power source.

   WARNING: **Ground the instrument.** To minimize shock hazard, the instrument chassis must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact-to-two-contact adaptor with grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

   CAUTION: The T-BERD 209A/211 should be operated with a 1A, 250V, Slo-Blo fuse (Littlefuse #218001 or equivalent.) *Always use correct fuse size.*

3. AC Power switch

Press this switch to apply power to the T-BERD 209A/211. When the instrument is powered up, an automatic self-test is initiated that:

- Momentarily illuminates all front-panel and switch LEDs.
- Checks the position of all switches. If a switch is stuck in an active position, the switch is noted in the display.
- Checks the nonvolatile RAM (NOVRAM) and restores the front-panel switches to the previous settings before the last power-down. If any changes are found, the factory default settings are reloaded and the message *RELOAD NOVRAM* is displayed.
- Checks the instrument RAM, EPROM, and microprocessor. If any error is found, the messages *BAD RAM, BAD ROM*, or *BAD PROCESSOR* appears. If one of these messages is displayed, contact the TTC Customer Service at (800) 638-2049.

4. Press the MODE switch to select the AUX mode

5. Press the PATTERN switch to select AUX HALT/CONT

Set AUX HALT/CONT to HALT. Press the **PATTERN** switch to scroll through the following auxiliary functions and set them as indicated:

- AUX PLS MASK — set to DSX (CB119)
- AUX ERR SEL — set to SINGLE ERROR
- AUX FRM ERROR — set to SINGLE ERROR
- AUX ER RATE — set to 1.0 E-6

6. MODE switch

Press this switch until the SELF TST operating mode appears in the MODE window.

7. Configure the T-BERD 209A/211 switches:

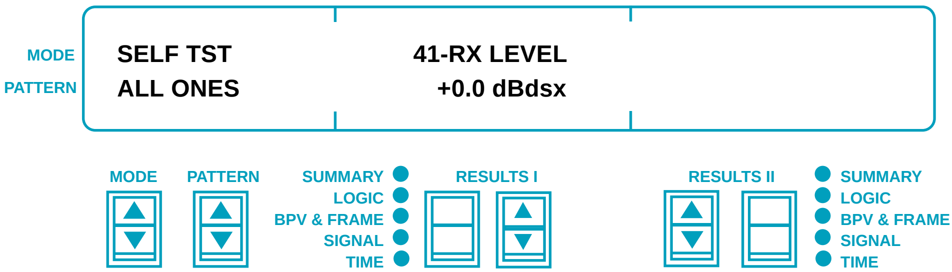
PATTERN	ALL ONES.
RECEIVE INPUT	TERM.
TRANSMIT OUTPUT	0 dB(DSX).

8. Status and Alarm LEDs

These LEDs should illuminate: T1 Pulses, Pattern Sync, Frame Sync, and All Ones.

9. RESULTS I switches

Press the **RESULTS I Category** switch to select the SIGNAL category. Press the **RESULTS I Results** switch to scroll through the results until the 41-RX LEVEL test result appears. The value should be 0 dBdsx ±0.5 dB.



10. Press the TRANSMIT OUTPUT switch to select -7.5 dB

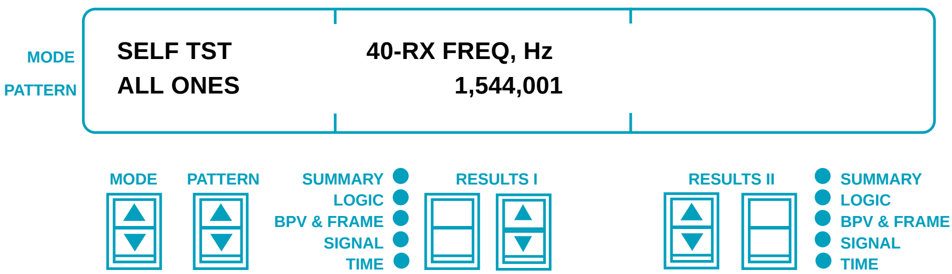
Verify the 41-RX LEVEL result changes to -7.5 dBdsx ±1.5 dB.

11. Press the TRANSMIT OUTPUT switch to select -15 dB

Confirm that the 41-RX LEVEL result changes to -15 dBdsx ±2.0 dB.

12. Press the RESULTS I Results switch to select 40-RX FREQ

Verify the value for this result is 1,544,000 Hz ±1 Hz.



13. Press the RESTART switch

14. Press the RESULTS I Category switch to select the SUMMARY category

The message *ALL RESULTS OK* should appear in the RESULTS I window.

15. Press and release the FRAME ERROR INSERT switch several times

Verify the 30-FRM ERRORS test result appears in the display and increments by one each time the switch is pressed.

16. Press and release the BPV ERROR INSERT switch several times

Verify the 25-VIOLATIONS test result appears in the display and increments by one each time the switch is pressed.

17. Connect a cable between the TRANSMIT and RECEIVE jacks

Plug a bantam or WECO 310 patch cord into these connectors to loop the TRANSMIT output to the RECEIVE input.

18. Configure the T-BERD 209A/211 switches:

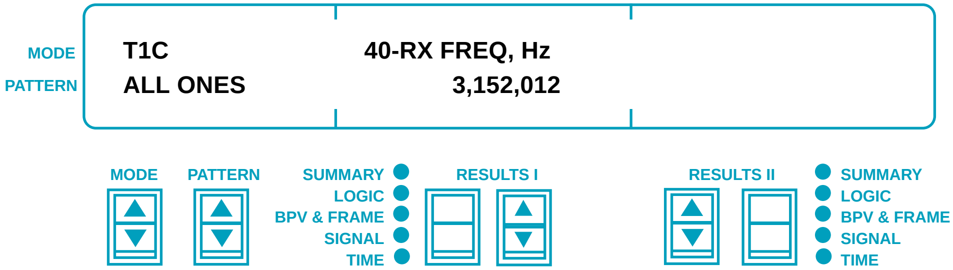
MODE	TIC.
TIMING	Select INT (internal timing).

19. Press and release the LOGIC ERROR INSERT switch several times

Verify the 00-BIT ERRORS test result appears in the display and increments by one each time the switch is pressed.

20. Press the RESULTS I Category switch to select the SIGNAL category

Press the **RESULTS I Results** switch to scroll to the 40-RX FREQ test result. Confirm that the received frequency is 3,152,000 Hz ±32 Hz.



21. Press the RESTART switch

22. Press and hold the LOGIC ERROR INSERT switch

Press and hold this switch until the switch LED illuminates continuously.

23. Press and hold the BPV ERROR INSERT switch

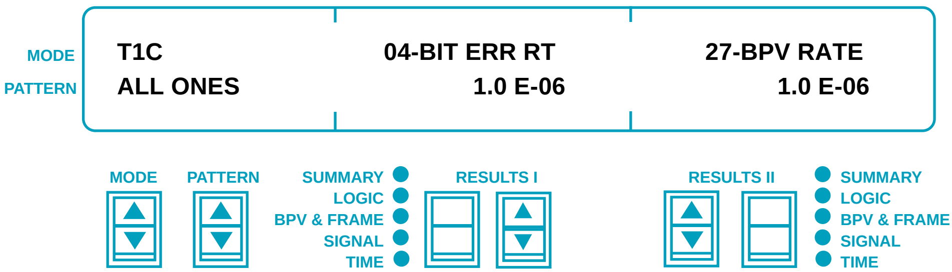
Press and hold this switch until the switch LED illuminates continuously.

24. Display the 04-BIT ERR RT and 27-BPV RATE test results

Press the **RESULTS I Category** switch to select the LOGIC category. Press the **RESULTS I Results** switch to scroll through the results until the 04-BIT ERR RT test result appears.

Press the **RESULTS II Category** switch to select the BPV & FRAME category. Press the **RESULTS II Results** switch to scroll through the results until the 27-BPV RATE test result appears.

After 10 seconds, both of the displays should show values within the range 9.0 E-07 to 1.1 E-06.



2.6 IN CASE OF DIFFICULTY

If the T-BERD 209A/211 fails to operate and no front-panel indicators are illuminated:

- Check the AC power cord to ensure that it is securely connected to the T-BERD 209A/211.
- Make sure that the power supply is uninterrupted by plugging another electrical device into the electrical outlet used by the T-BERD 209A/211.
- Verify that a proper, working AC line fuse is installed.
- Verify that the T-BERD 209A/211 was powered on before the lid option was connected.

If the T-BERD 209A/211 still fails to operate, contact TTC Customer Service at (800) 638-2049.

In addition, contact TTC Customer Service if:

- The *RELOAD NOVRAM* message is displayed at each startup.
- The front-panel indicators illuminate, but the instrument does not operate properly. Prior to calling, perform the Instrument Self-Test/Checkout procedure to localize the problem.

To restore all switch settings to the factory defaults:

1. **Power and RESTART switches**
   With the power off, press and hold the **RESTART** switch, then turn the power on.

2. **RESTART switch**
   When the message *CALIBRATING* appears, release the **RESTART** switch. The display and all the LEDs should illuminate, and the message *RELOAD NOVRAM* should appear.

3. **RESTART switch**
   Press the **RESTART** switch to take the T-BERD 209A/211 out of Self-Test mode.

2.7 AC LINE FUSE REPLACEMENT

The T-BERD 209A/211 AC line fuse is stored in the AC fuse receptacle located just underneath the **AC Power** switch. If the fuse is open, it should be replaced with a 1A 250V, Slo-Blo fuse (Littlefuse #218001 or equivalent). *Always use the correctly rated fuse.*

To replace the AC line fuse, perform the following:

1. **AC Power switch receptacle**
   Locate the small tab to the plastic fuse cover just above the switch.

2. **Open fuse cover**
   Using a small screwdriver or similar instrument, *gently* pry the fuse cover open. The cover is hinged at the bottom.

3. **Replace the fuse**
   Remove the opened fuse in the black holder and install a new fuse of the correct size. There is a spare fuse in the white holder. When returning the fuse holder to the fuse compartment, align the fuse holder arrow with the arrow on the inside of the compartment cover.

4. **Close fuse cover**
   Press down on the cover until it snaps shut. Watch that the cover opening does not catch on the **AC Power** switch.

2.8 BATTERY CARE (T-BERD 209A ONLY)

When the lead-acid battery option is installed and the Low Battery LED illuminates, the battery can continue to power the T-BERD 209A for another 15 minutes. The T-BERD 209A can operate for approximately five hours on a fully charged battery. To fully recharge the battery, connect the AC power to the T-BERD 209A for at least eight hours without turning the instrument on. Whether the T-BERD 209A is on or not, the battery is always being charged.

The AUX PWR SAVE function can be used to prolong the battery charge by turning the front-panel display off when the switches are not being used.

2.9 AUTO-CALIBRATION PROCEDURE

The T-BERD 209A/211 features an auto-calibration function that allows you to automatically adjust receive level measurement, recovered clock extraction, T1/T1C detectors, and simplex current measurements. Auto-calibration should be performed once a year to compensate for the normal aging of components.

You can perform auto-calibration by pressing the **DISPLAY HOLD** switch while turning on the T-BERD 209A/211. Keep the **DISPLAY HOLD** switch pressed until the message *CALIBRATING* appears in the display.

NOTE: Allow the unit to warm up at normal room temperature for approximately 30 minutes before performing auto-calibration.

If an error occurs during auto-calibration, an error message appears in the display; contact TTC Customer Service for assistance at (800) 638-2049.

2.10 WARRANTY

2.10.1 Warranty Policy

All equipment manufactured by TTC is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC. No other warranty is expressed or implied. TTC is not liable for consequential damages.

Liability under this warranty extends only to the replacement value of the equipment. The warranty is void under the following conditions:

- Equipment has been altered or repaired without specific authorization from TTC.
- Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

2.10.2 In-Warranty Service

Equipment that requires in-warranty service must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in Section 2.11. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Repair Department at (800) 638-2049. The RA number should then appear on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

2.10.3 Out-of-Warranty Service

The procedure for returning and repairing out-of-warranty equipment is the same as for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department at (800) 638-2049 for specific information on the minimum out-of-warranty repair charge.

The customer will be billed for parts plus standard labor rates in effect at the time of the repair. The customer will also be required to furnish a purchase order number before repair work can be started, and a hard copy of the purchase order must be received by TTC before the repaired equipment is shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

2.11 EQUIPMENT RETURN INSTRUCTIONS

To all equipment returned for repair, attach a tag that includes the following information:

- Owner’s name and address.
- A list of the equipment being returned and the applicable serial number(s).
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.
- The Return Authorization (RA) number.

NOTE: Leave all switches in the positions they were in when the problem occurred.

If possible, 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; when needed, appropriate packing materials can be obtained by contacting the TTC Repair Department. 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

3.1 INTRODUCTION

This section can be used as a reference during testing and as a guide to understanding the functions of the T-BERD 209A (see Figure 3-1) and T-BERD 211 (see Figure 3-2).

NOTE: Unless indicated, the capabilities of the mainframe T-BERD 209A/211 are applicable to the options.

The switches, indicators, and connectors are presented in the following functional areas:

- Test Setup
- Circuit Connections
- Signal Verification
- Starting Test/Collecting Results
- Troubleshooting Controls
- Printer Controls

NOTE: Throughout this section, a circled number appears after each control name. These numbers match the callouts in the figures. Use these numbers to locate switches, indicators, and connectors on the front panel.

3.2 MAINFRAME — TEST SETUP

The following controls and indicators (see Figure 3-3) are described in the order that you would normally use them to set up the T-BERD209A/211 to test a circuit from a DS1 access point.

Help Card

The pull-out help card furnishes a quick reference to the following information:

- Available mode and pattern selections
- Auxiliary functions
- Available results, grouped by category and sorted by result number
- TDR Option setup parameters

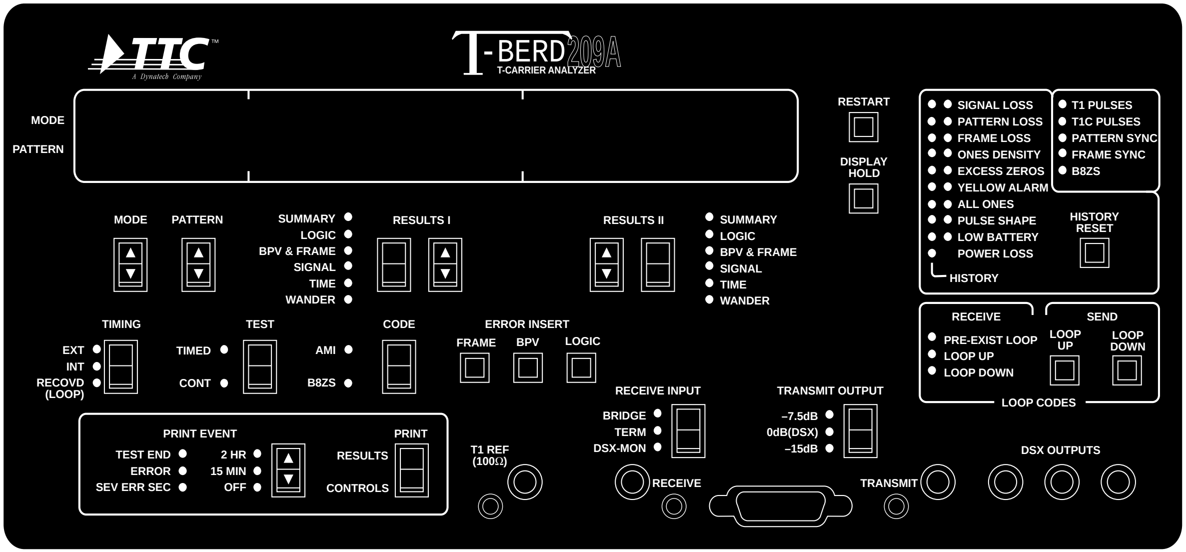


Figure 3-1
T-BERD 209A Front Panel

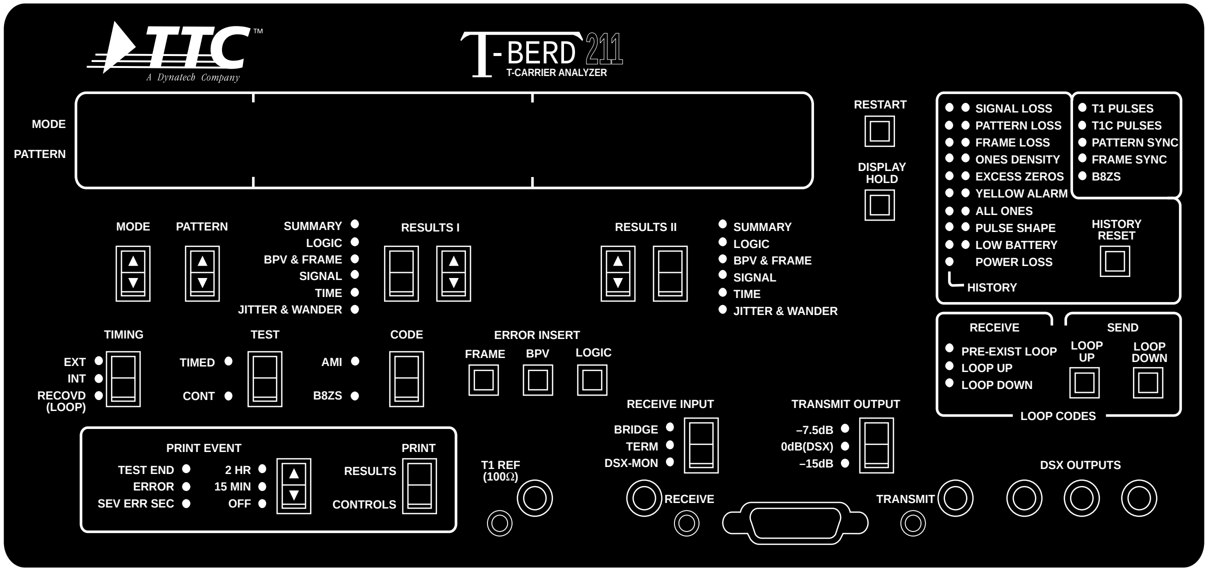


Figure 3-2
T-BERD 211 Front Panel

The help card is stored below the front panel. To pull out the card, locate the small tab along the bottom edge of the front panel and slide the card straight out. The card remains attached to the instrument but is hinged so that it folds down for better viewing.

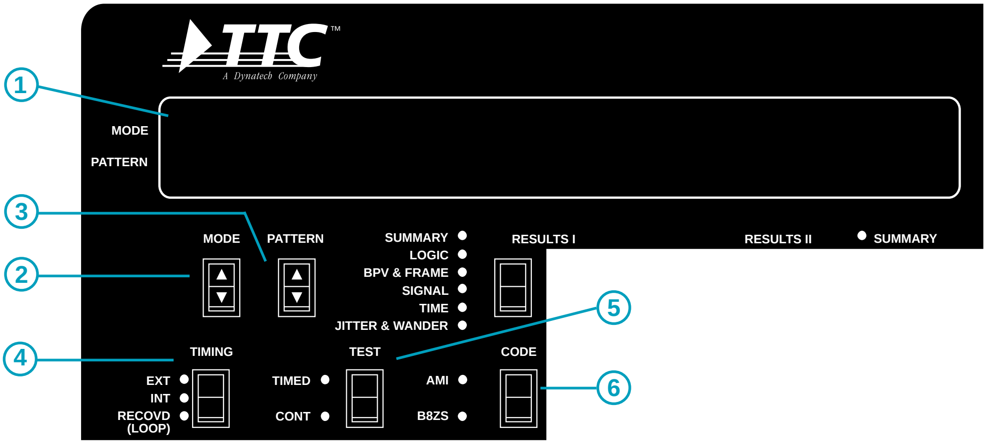


Figure 3-3
Test Setup Controls and Indicators

Front-Panel Display 1

Operating modes, test results, test patterns, and auxiliary functions appear in the three window, two-line, green fluorescent display.

The first section (left side) indicates the current operating mode (MODE window) and test pattern (PATTERN window) of the instrument. Pressing the **MODE** and **PATTERN** switches selects the displayed information.

The other two sections display the test results, auxiliary functions, and signal detection and operating mode status messages. The middle section is identified as the RESULTS I window, and the right section is identified as the RESULTS II window. The RESULTS I window is controlled by the two **RESULTS I** switches just below the window. The RESULTS II window is controlled by the two **RESULTS II** switches just below the window.

When the auxiliary functions appear, the two windows identify the function of the **RESULTS** switches.

MODE Switch (2)

This switch performs the following functions:

- Selects the framing format (i.e., D4, ESF, SLC, or unframed) and data rate (i.e., T1 or T1C) of the transmitted data and informs the receiver what to expect.
- Configures the T-BERD 209A/211 for Test and Line Loopback modes for CSU or repeater loopback emulation.
- Sets the instrument in a self-test mode to verify instrument operation.
- Selects an auto-configure mode which allows the instrument to automatically configure itself to the received data rate and framing format.
- Provides access to a number of auxiliary functions.

The selected operating mode appears in the MODE window and the instrument configures itself to the selected mode. The current operating mode remains in effect until another operating mode is selected. Pressing the **MODE** switch once steps the display between the current operating mode and the AUX mode, and vice versa. When the AUX mode is displayed, the auxiliary functions are accessible, and the previously selected operating mode remains in effect.

Pressing the **MODE** switch quickly two or more times skips the AUX mode and allows another operating mode to be selected. Continuously pressing the **MODE** switch scrolls the operating and AUX modes in the display. Releasing the **MODE** switch on a displayed mode or AUX selects that mode.

NOTE: With the exception of AUX mode, changing modes causes a test restart after the **MODE** switch is released.

With the exception of the AUX mode, the following operating modes are listed in factory default order.

SELF TST — Configures the T-BERD 209A/211 in a self-test loopback mode that loops the transmit output to the receive input. The data is transmitted at the T1 rate with ESF framing. The **TIMING** switch is automatically set for INTernal timing in the SELF TST mode. When leaving SELF TST mode, the **TIMING** switch reverts to its previous position. Any test pattern can be selected but ALL ONES is recommended.

AUTO — Enables the T-BERD 209A/211 to automatically configure itself to the received line rate and framing format. When auto-configuration is successful, both the received framing mode and pattern (only if the signal is recognized as a pattern) appear in lower-case characters in the MODE and PATTERN windows. When the received signal is not recognized as a pattern, the word *live* appears in the PATTERN window.

T1 — T1 Unframed mode configures the T-BERD 209A/211 to transmit and receive unframed T1 data to test T1 unframed circuits. The **FRAME ERROR INSERT** switch is disabled in this mode.

T1 D4 — T1 D4 Superframe mode configures the T-BERD 209A/211 to transmit and receive D4 framed T1 data to test D4 framed circuits. This mode can also be used to test D1D, D2, and D3 framed circuits.

T1 ESF — T1 Extended Superframe mode configures the T-BERD 209A/211 to transmit and receive ESF framed T1 data to test ESF framed circuits. For loopback testing, the AUX LP CODE function provides in-band and ESF out-of-band loop code transmission capabilities in this mode.

T1 SLC — T1 Subscriber Loop Carrier mode configures the T-BERD 209A/211 to transmit and receive SLC framed T1 data to test SLC-96 framed circuits. The instrument ignores the SLC datalink (F_S) bits in the received signal. The SLC datalink bits are set to all zeros in the transmitted test pattern.

T1 TLB — Configures the T-BERD 209A/211 into a T1 Test Loopback (TLB) mode in which all received data and framing are echoed by the transmitter. This mode emulates a CSU in loopback.

BPVs are *removed* from the received signal, but BPVs, logic errors, frame errors, and B8ZS encoding *can* be inserted into the retransmitted data stream using the **ERROR INSERT** and **CODE** switches, respectively. If the received data pattern matches the selected test pattern (e.g., QRSS), pattern synchronization is declared (Pattern Sync LED illuminates) and logic error test results are available.

The **LOOP CODE** and **FRAME ERROR INSERT** switches are disabled. The RE-CEIVE LOOP CODE status LEDs indicate a received loop code (when AUX LP CODE function matches the received loop code), but the T-BERD 209A/211 does not respond to the loop codes. The **TIMING** switch automatically defaults to RECOVD (LOOP) timing.

T1 LLB — Configures the T-BERD 209A/211 into a T1 Line Loopback (LLB) mode in which all received data and framing are echoed by the transmitter. This mode emulates a repeater.

BPVs *are not removed* from the received signal. If the received data pattern matches the selected test pattern (e.g., QRSS), pattern synchronization is declared (Pattern Sync LED illuminates) and logic error test results are available.

The **LOOP CODE**, **ERROR INSERT**, and **CODE** switches are disabled. However, the RECEIVE LOOP CODE status LEDs indicate a received loop code (when AUX LP CODE function matches the received loop code), but the T-BERD 209A/211 does not respond to the loop codes. The **TIMING** switch automatically defaults to RECOVD (LOOP) timing.

T1C — T1C Unframed mode configures the T-BERD 209A/211 to transmit and receive unframed T1C data to test T1C circuits. When the T1C mode is selected, the **FRAME ERROR INSERT** switch is disabled. When T1C data is received, the T1C Pulses LED illuminates.

T1C TLB — Configures the T-BERD 209A/211 into a T1C Test Loopback (TLB) mode in which all received data and framing are echoed by the transmitter. This mode emulates a CSU in loopback. The receiver only accepts unframed T1C data in this mode.

BPVs *are removed* from the received signal. However, BPVs, logic errors, frame errors, and B8ZS encoding *can be* inserted into the retransmitted data stream using the **ERROR INSERT** and **CODE** switches, respectively. If the received data pattern matches the selected test pattern (e.g., QRSS), pattern synchronization is declared (Pattern Sync LED illuminates) and logic error test results are available.

The **LOOP CODE** and **FRAME ERROR INSERT** switches are disabled. The RECEIVE LOOP CODE status LEDs indicate a received loop code (when AUX LP CODE function matches the received loop code), but the T-BERD 209A/211 does not respond to the loop codes. The **TIMING** switch automatically defaults to RECOVD (LOOP) timing.

Auxiliary Functions

Auxiliary functions allow access to selectable functions and parameters that are less frequently used and do not have dedicated switches. When the AUX mode is selected, the selected auxiliary function is identified in the PATTERN window. The displayed test results in the RESULTS I and RESULTS II windows are also replaced by the auxiliary function parameters. Pressing the **PATTERN** switch scrolls the available auxiliary functions in the display (see Table 3-1). The auxiliary functions are described in detail in Section 5.

Table 3-1
Auxiliary Functions

Auxiliary Function	Description
Mainframe	
AUX USER1	User 1 Programmable Test Pattern
AUX USER2	User 2 Programmable Test Pattern
AUX RESPONSE	Loop Code Response Function
AUX PGM LPUP	Programmable Loop-up Code
AUX PGM LPDN	Programmable Loop-down Code
AUX BAUD	RS-232 Printer/Remote Control Baud Rate Select
AUX PARITY	RS-232 Printer/Remote Control Parity Select
AUX HLT/CONT	Action on Pattern Synchronization Loss
AUX PRNT FMT	Results Printout Format
AUX TERM	RS-232 Printer/Remote Control Line Terminator
AUX PLS MASK	Pulse Shape Measurement Mask Select
AUX RES HIST	Results History Buffer
AUX HIST CLR	Clear History and Printer Buffers
AUX ERR SEL	BPV and Logic Error Burst Duration Select
AUX FRM ERR	Frame Error Insertion Select
AUX ER RATE	BPV and Logic Error Insertion Rate
AUX CLOCK	Set Clock Time
AUX DATE	Set Date
AUX TEST LEN	Set Timed Test Length Duration
AUX GRAPH	Print Graph Function
AUX LP CODE	Loop Code Select
AUX ESF LOOP	ESF Loop Code Select
AUX MULTIPAT	MULTIPAT Pattern Selection and Duration
Battery Option (T-BERD 209A Only)	
AUX PWR SAVE	Battery Power Save Control
Jitter Spectral Analysis Option (T-BERD 211 Only)	
AUX JIT S/A	Jitter Spectral Analysis Control
AUX JIT MASK	Spectral Analysis Jitter Mask Select
AUX JIT TRIG	Spectral Analysis Jitter Trigger Select

Table 3-1
Auxiliary Functions (Continued)

Auxiliary Function	Description
	Advanced BERT Option
AUX LUP	Programmable Long User Pattern
	Fractional T1 Option
AUX FT1 CHAN AUX FT1 SETUP	Fractional T1 Channel Bandwidth FT1 Idle Code and Channel Rate
	Enhanced ESF Option
AUX PRM	Performance Report Message Control

PATTERN Switch 3

This switch selects the data pattern to be transmitted and informs the receiver which data pattern to expect. Press the **PATTERN** switch to scroll through the available data patterns; the test pattern names appear in the PATTERN window. Select a test pattern by releasing the switch when the desired pattern appears in the display. Changing the test patterns always restarts the test.

All patterns can be used in any framed or unframed operating mode. The patterns are not transmitted in the T1 TLB, T1 LLB, or T1C TLB modes, but the displayed pattern must match the received test pattern to obtain logic results.

The following test patterns are listed in factory default order.

ALL ONES — All ones pattern is a fixed test pattern of AMI pulses (Mark). ALL ONES is generally used to stress span repeater current regulator circuits. It can be used as an Alarm Indication Signal (AIS) in unframed circuits, a keep alive signal, idle code, or Red alarm in other circuits. The pattern is required to measure the signal power level in dBm.

1:1 — Alternating ones and zeros pattern is a fixed test pattern of alternating AMI ones (Mark) and zeros (Space) pulses. 1:1 is generally used to perform a minimum level stress test on clock recovery circuits.

1:7 — One and seven zeros pattern is a fixed test pattern of F01000000... The pattern is aligned with the framing (F) bits as indicated. 1:7 is generally used to stress the ones density requirement for T1 circuits.

2 IN 8 – Two ones in eight-bits pattern is a fixed test pattern of F0100 0010... The pattern is aligned with the framing (F) bits as indicated. 2 IN 8 is generally used to test mis-optioned equipment for B8ZS encoding.

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

T1-QRSS — T1 Quasi-Random Signal Source pattern simulates live data for T1 applications. This pattern is a modified 2^{20}-1 pseudorandom pattern that allows a maximum of 14 sequential zeros and 20 sequential ones.

T1C-QRSS — T1C Quasi-Random Signal Source pattern simulates live data for T1C applications. This pattern is a 2^{20}-1 pseudorandom pattern that allows a maximum of 19 sequential zeros and 20 sequential ones; there is no zero suppression.

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

2^20-1 — 1,048,575-bit pseudorandom pattern generates a maximum of 19 sequential zeros and 20 sequential ones. The pattern exceeds excess zeros and does not meet the minimum ones density requirements for T1 applications.

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

BRIDGTAP — Bridge tap detection test pattern determines if bridge taps are connected to a T1 span by sequentially testing the span with 21 test patterns that have a variety of ones and zeros densities. The 21 test patterns are transmitted continuously in the order shown in Table 3-2.

The test patterns are identified in the PATTERN window in lower-case characters (e.g., ALL ONES = all ones). As the patterns are transmitted, the word BRIDGTAP alternates with the name of the test pattern being transmitted. One complete BRIDGTAP test pattern sequence takes approximately 10 minutes and 30 seconds to transmit.

The BRIDGTAP pattern is designed to operate with AMI coding to test a span for bridge taps. Using B8ZS encoding redistributes the test pattern energy making it less effective in detecting bridge taps.

Refer to Section 7 for information on the BRIDGTAP results printout.

Table 3-2
BRIDGTAP Patterns

Pattern Name	Bit Pattern
ALL ONES	F 1111
1:1	F 1010
1:3	F 0100
1:5	F 0100 00
1:6	F 0100 000
1:7	F 0100 0000
2:8	F 1100 0000 00
2:9	F 1100 0000 000
2:10	F 1100 0000 0000
2:11	F 1100 0000 0000 0
2:12	F 1100 0000 0000 00
2:13	F 1100 0000 0000 000
2:14	F 1100 0000 0000 0000
3 IN 18	F 1101 0000 0000 0000 00
3 IN 19	F 1100 1000 0000 0000 000
3 IN 20	F 1100 0100 0000 0000 0000
3 IN 21	F 0100 0100 0000 0000 0000 1
3 IN 22	F 0100 0100 0000 0000 0000 10
3 IN 23	F 0100 0100 0000 0000 0000 100
3 IN 24	F 0100 0100 0000 0000 0000 0100
T1-QRSS	2^{20}-1 pseudorandom pattern with 14-zero suppression

F = Framing bit, which is shown in its relative position to the test pattern.

MULTIPAT — Automated multipattern test generates five commonly used test patterns that allow the T-BERD 209A/211 to test a T1 span without having to select each test pattern individually. The T-BERD 209A/211 monitors the received test patterns for bit errors, BPVs, and frame errors.

The five test patterns are transmitted continuously in the order shown in Table 3-3. As the patterns are transmitted, the word MULTIPAT alternates with the name of the test pattern being transmitted. The test patterns are identified in the PATTERN window in lowercase characters (e.g., ALL ONES = all ones). The AUX MULTIPAT function controls the duration of each selected MULTIPAT test pattern from 0 to 15 minutes.

Refer to Section 7 for information on the MULTIPAT results printout.

Table 3-3
MULTIPAT Patterns

Pattern Name	Bit Pattern
ALL ONES	F 1111
1:7	F 0100 0000
2 IN 8	F 0100 0010
3 IN 24	F 0100 0100 0000 0000 0000 0100
T1-QRSS	2^{20}-1 pseudorandom pattern with 14-zero suppression

F = Framing bit, which is shown in its relative position to the test pattern.

USER1 and USER2 — User 1 and User 2 programmable bit pattern provides the ability to transmit a 3- to 24-bit user programmable test pattern. This allows the T-BERD 209A/211 to transmit specific bit patterns to test circuit sensitivity to a particular pattern. The pattern is entered in binary form through the AUX USER1 and AUX USER2 functions (see Section 5). The pattern is transmitted starting from left to right in the AUX USER function display.

ALL ZERO — All zeros pattern allows the T-BERD 209A/211 to test T1 circuits for B8ZS clear channel capability (CCC). The pattern can be transmitted framed or unframed, and should always be transmitted with B8ZS encoding selected.

When using the ALL ZERO pattern and B8ZS encoding, the T-BERD 209A/211 can test a circuit for spans that are not configured for or are incompatible with B8ZS encoded data by monitoring the received signal for the normal B8ZS sequence, 000V 10V1 (where V is a bipolar violation). However, if the T-BERD 209A/211 receives the B8ZS sequence in an alternate mark inversion (AMI) format (0001 1011), instead of all zeros (0000 0000) after decoding, the T-BERD 209A/211 reports the sequence as an error. The message *NOT*

B8ZS COMPATIBLE also appears in the SUMMARY category. The failure of the network to maintain the B8ZS sequence in the received ALL ZERO pattern can occur at a multiplexer or DSX with an improperly set coding option; the coding option would be set for AMI instead of B8ZS.

When the T-BERD 209A/211 is set for B8ZS encoding and testing B8ZS compatible circuits, the Excess Zeros LEDs (current and history) illuminate when the T-BERD 209A/211 detects eight or more consecutive zeros in any operating mode and pattern. The Excess Zeros LEDs operate normally when testing AMI encoded T1 circuits.

TIMING Switch 4

This three-position switch selects the transmit timing source. The labeled LEDs, EXT, INT, and RECOVD (LOOP), illuminate showing the current position of this switch. In Self-Test mode, timing is automatically set to INT regardless of the current setting. In T1 TLB, T1 LLB, AUTO LLB, and T1C TLB modes, timing is automatically set to RECOVD regardless of the current setting of the **TIMING** switch.

EXT — External transmit timing is taken from either the external clock source attached to the EXT CLK IN BNC connector on the right side or from the T1 REF input on the front panel as follows:

- When the EXT CLK IN timing is present and the T1 REF (TDR) timing is not present, the external clock source is taken from the EXT CLK IN timing source.
- When the EXT CLK IN timing is not present and the T1 REF (TDR) timing is present, the external clock source is taken from the T1 REF (TDR) timing source.
- When the EXT CLK IN timing and the T1 REF (TDR) timing are present, the external clock source is taken from the EXT CLK IN timing source.
- When the EXT CLK IN timing and the T1 REF (TDR) timing are not present, the EXT LED flashes.

INT — Internal crystal-controlled oscillator generates the timing source for the transmitted data at either the T1 or T1C rate (selected by the **MODE** switch).

RECOVD (LOOP) — Recovered transmit timing source is taken from the clock signal recovered from the received data. When choosing recovered timing in any T1 mode (except for T1 TLB or T1 LLB), jitter is removed from the clock signal before it is used as the transmit clock source.

TEST Switch 5

This two-position switch controls the test duration. The CONTinuous position enables unlimited test duration. The TIMED position allows a timed test of up to 200 hours and 59 minutes to be conducted. Changing from CONTinuous to TIMED causes a test restart; however, changing from TIMED to CONTinuous allows the test to continue (i.e., test results continue to accumulate). Refer to the AUX TEST LEN function to set the timed test duration (see Section 5).

CODE Switch 6

This two-position switch determines whether the T-BERD 209A/211 transmits AMI-encoded data or B8ZS clear-channel encoded data. The LEDs adjacent to this switch illuminate indicating the current selection. The **CODE** switch only affects the transmitter; B8ZS decoding is performed automatically on the receiver. The B8ZS LED illuminates when zero substitution codes are detected. When B8ZS encoding is detected in instances where the **CODE** switch is set to the AMI position, the message *B8ZS DETECTED* appears in the SUMMARY category.

3.3 MAINFRAME — CIRCUIT CONNECTIONS

The following connections and switches are used to connect the T-BERD 209A/211 to the circuit being tested. The DS1 signal connections are provided on the front panel as shown in Figure 3-4.

WARNING: If a T-BERD 209A/211 receive or output jack is connected to a simplex-powered span line, the line voltage is also present at the other circuit connection jacks. Therefore, do not use the other connections.

RECEIVE Jacks 7

Three receive input connectors allow either a WECO 310 jack, a bantam jack, or a 15-pin D connector to receive the input signal. Use the **RECEIVE INPUT** switch to set the line termination for the connection. These connectors also provide the simplex current path to the TRANSMIT jacks.

NOTE: Only use one RECEIVE jact at any given time.

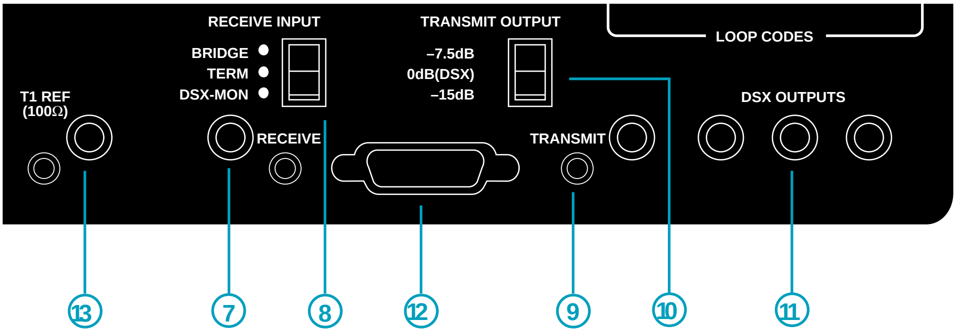


Figure 3-4
Front-Panel Connections

RECEIVE INPUT Switch 8

This three-position switch selects the input impedance and signal conditioning for the RECEIVE jacks. Changing the **RECEIVE INPUT** switch position causes a test restart.

BRIDGE — Provides an input impedance greater than 1000 ohms for bridging lines that are already terminated. This setting provides Automatic Line Build-Out (ALBO) compensation for cable losses of up to 35 dB for T1 and 6 dB for T1C lines. This is useful for bridging directly across copper cable pairs.

TERM — Provides an input impedance of 100 ohms for terminating a circuit. This setting provides ALBO compensation for cable losses of up to 35 dB for T1 and 6 dB for T1C lines.

DSX-MON — Provides both 100 ohms of input impedance and compensation for resistive loss. This setting is useful for monitoring T1/T1C lines at DSX monitor points which are resistor-isolated. When ALBO is not desired, the line can be terminated with this selection.

TRANSMIT Jacks 9

Three primary transmit output connectors allow either a WECO 310 jack, a bantam jack, or a 15-pin D connector to transmit an output signal to the circuit being tested. Use the **TRANSMIT OUTPUT** switch to set the output level. These connectors also provide the simplex current path to the RECEIVE jacks.

NOTE: Only use one TRANSMIT jack at any given time.

TRANSMIT OUTPUT Switch 10

This three-position switch allows emulation of three different LBOs for T1 rates:-7.5dB, 0dB (DSX), and-15dB. The LBO circuit (T1 only) inserts artificial line sections with either 7.5 or 15 dB of loss at 772 kHz or bypasses the artificial lines, presenting a DSX-level output. The selected cable loss affects the transmit signal only at the 15-pin D connector, and the TRANSMIT bantam and 310 jacks; the DSX OUTPUTS are unaffected. When the **MODE** switch is set to T1C, the 0dB (DSX) position is automatically selected.

DSX OUTPUTS Jacks 11

Three WECO 310 jacks provide additional DSX-level transmit outputs. Each output provides a 3-volt base-to-peak output into a 100-ohm load. All three outputs can be used simultaneously; however, a TRANSMIT jack should always be used first.

Network Interface Connector 12

This female, 15-pin D connector allows connection to the CSU or local loop. A 15-pin male-to-male cable is used to connect to the customer side of the CSU or to the local loop network interface connector. The connector is used in lieu of the TRANSMIT and RECEIVE jacks. Refer to Section 9 for the connector pin assignments. This connection is also used by the Lid Options (see Section 4).

T1 REF (TDR) Jacks 13

T1 REF (TDR) provides WECO 310 and bantam jacks for two functions: T-Carrier reference clock input and TDR connection. The jacks provide a 167-ohm termination.

T1 Reference Clock Input — Provides a T-Carrier reference clock input to measure timing slips and wander. The input accepts resistively attenuated signals from +6 to -24 dBdsx (DSX MON jack or T-BERD 209A/211 DSX OUTPUT jack). It can also be used as an external timing source input when the **TIMING** switch is set to EXT.

TDR— Provides a connection for the time domain reflectometer (TDR) to test a cable pair for shorts, opens, bridge taps, etc. The TDR Option must be installed and the TDR mode selected to test for faults. Refer to Section 3.27 for additional information on setting up and operating in the TDR mode.

EXT CLK IN Connector

This BNC connector is used to input an external clock source. This clock source can be selected and used to generate data when the **TIMING** switch is set to EXT. A reference clock for timing slips can also be input on this connector. This input is AC coupled and has a 50-ohm input impedance.

3.4 MAINFRAME — SIGNAL VERIFICATION

The following controls, indicators, and results are used to verify that the T-BERD 209A/211 has properly acquired the received DS1 signal (see Figure 3-5).

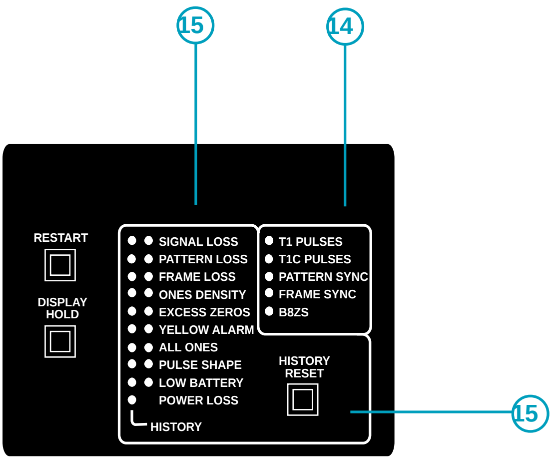


Figure 3-5
Signal Verification Indicators

Signal Status LEDs 14

The green LEDs illuminate for at least 100 ms providing the status and type of signal being received. The LEDs are:

T1 Pulses — Illuminates when a valid T1 signal is detected at the RECEIVE input connector. If the received signal is lost, the LED goes out and the Signal Loss LED illuminates.

T1C Pulses — Illuminates when a valid T1C signal is detected at the RECEIVE input connector. If the received signal is lost, the LED goes out and the Signal Loss LED illuminates.

Pattern Sync — Illuminates when pattern synchronization is achieved. If pattern synchronization is lost, the LED goes out and the Pattern Loss LED illuminates.

Frame Sync — Illuminates when the T-BERD 209A/211 achieves synchronization to the selected framing format within the T1 data stream. In T1 TLB and T1 LLB modes, the T-BERD 209A/211 automatically determines the framing type and configures itself to accept either unframed data, D4-framed data, ESF-framed data, or SLC-framed data. If frame synchronization is lost, the LED goes out and the Frame Loss LED illuminates.

B8ZS — Illuminates when B8ZS clear channel encoding is detected in the received T1 or T1C signal. When B8ZS encoding is detected with the **CODE** switch set to AMI, the message *B8ZS DETECTED* appears in the SUMMARY category.

Signal Alarm LEDs 15

The two columns of red LEDs illuminate on the occurrence of specific alarm conditions. When an alarm condition first occurs, the current alarm LEDs illuminate for at least 100 ms. After the current alarm condition is cleared (e.g., pattern synchronization reestablished), the history alarm LEDs illuminate indicating the alarm condition occurred sometime during the test. The alarm LEDs are described as follows:

Signal Loss — Illuminates when no pulses are detected for 150 ms. When the DS1 pulses are detected again, the LED goes out, and the associated History LED and the T1 Pulses (or T1C Pulses) LED illuminates.

Pattern Loss — Illuminates whenever 250 bit errors are counted in 1000 or less data bits, thereby signaling a loss of pattern synchronization. When pattern synchronization is reacquired, the LED goes out, and the associated History LED and the Pattern Sync LED illuminates.

Frame Loss — Illuminates when 2 out of 5 F_t bits are detected in error for D4 or SLC-96 framing, or when 2 out of 5 framing bits are detected in error for ESF framing. When frame synchronization is reacquired, the LED goes out, and the associated History LED and the Frame Sync LED illuminates.

Ones Density — Illuminates when the received data contains less than n ones in 8(n+1) bits, where n = 1 to 23. This conforms with the pulse density criteria specified in AT&T Technical Reference PUB62411 and ANSI T1.403 Network Interface specifications. The 2^15-1, 2^20-1, 2^23-1, and framed 3 IN 24 test patterns all cause this LED to illuminate.

Excess Zeros — Illuminates when 16 or more consecutive zeros are detected in T1 modes with AMI coding selected, or when 34 or more consecutive zeros are detected in T1C modes. When using B8ZS encoding, the LED illuminates when eight or more zeros are detected.

Yellow Alarm — Illuminates when bit 2 of each DS0 channel has been forced to a zero for D4 or SLC-96 framing, or when the yellow alarm pattern (0000 0000 1111 1111 ...) is detected in the ESF datalink. This alarm condition only applies to framed T1 signals.

All Ones — Illuminates when 2048 consecutive ones are detected for T1C or unframed T1 signals, or when 256 consecutive DS0 channels contain all ones for T1 framed modes.

Pulse Shape — Illuminates when the pulse shape does not fit within the selected mask (see AUX PLS MASK function, Section 5). Pulse shape measurements are available only when the signal level is 0 dBdsx ±4 dB for BRIDGE and TERM connections, or when the signal level is -20 dBdsx ±4 dB for DSX-MON connections. The LED does not illuminate when the signal level is out of range.

Jitter (T-BERD 211 only) — Illuminates when the wideband jitter exceeds 5 UI or the highband jitter exceeds 0.1 UI. Refer to Section 3.16 for additional information.

Low Battery LED (T-BERD 209A only) — When the optional lead-acid battery is installed, the LED illuminates approximately 15 minutes before the battery is completely drained of power. The history LED illuminates when the current LED is illuminated and AC power is applied to the instrument. Refer to Section 2 for additional information.

Power Loss — Illuminates when the T-BERD 209A/211 regains power after a power loss. If a test is in progress at the time of a power loss, the T-BERD 209A/211 is automatically restarted when power is regained. If a printer is connected, a results printout is generated when power is restored.

HISTORY RESET Switch 16

This pushbutton switch clears the history alarm LEDs. However, it does not restart a test nor affect any of the current LEDs or accumulated test results. This switch is disabled when the **DISPLAY HOLD** switch is activated. The **RESTART** switch also clears the illuminated history alarm LEDs.

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 OK —*** Message appears when all summary results are error-free or meet specification boundaries (e.g., RX FREQ Hz and PULSE SHAPE).
>
> ***ALL RESULTS UNAVAILABLE —*** Message appears at a test restart when the instrument has not synchronized with the received signal.

When an error is detected, the appropriate test result appears in the SUMMARY category window. Refer to Section 6 for more information on the results that appear in the SUMMARY category.

3.5 MAINFRAME — STARTING TEST/COLLECTING RESULTS

Once the T-BERD 209A/211 is configured and connected to the circuit, use the following switches and indicators to initiate the test and collect the test results (see Figure 3-6).

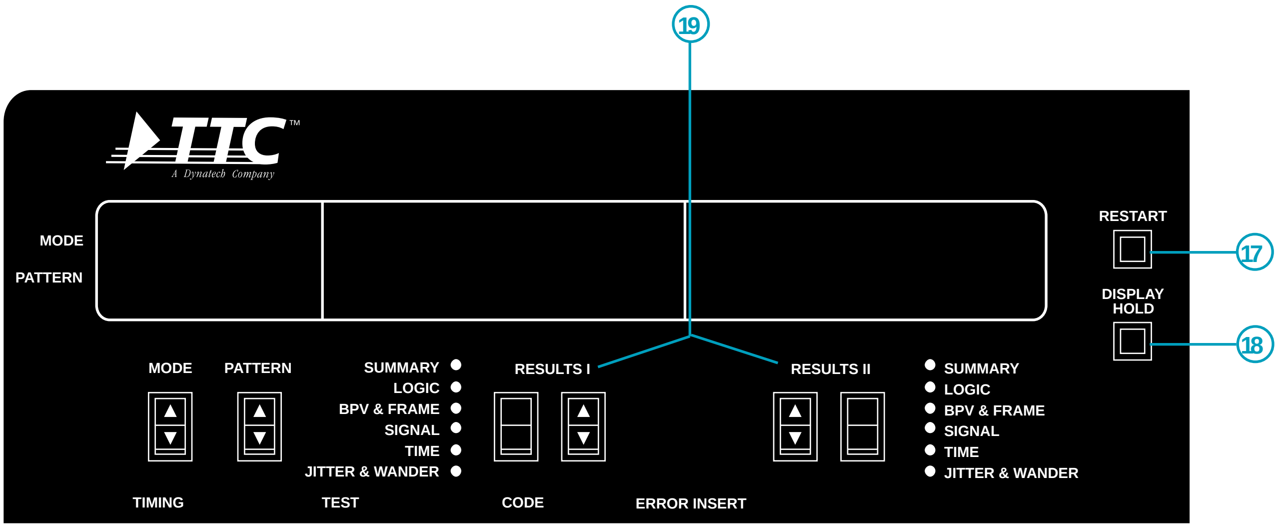


Figure 3-6
Starting Tests and Collecting Results

RESTART Switch 17

This pushbutton switch restarts any test in progress. When pressed, all test results and history LEDs are cleared. The **RESTART** switch can also be used to exit the AUX mode and reenter the previous mode selection; a restart also occurs.

DISPLAY HOLD Switch 18

This pushbutton switch freezes the displayed results and alarm and status LEDs at the moment the switch is pressed. When active, the switch LED illuminates indicating that the displayed results are not current. If this switch is pressed again while the LED is illuminated, the test results and LEDs are immediately updated.

RESULTS Switches 19

When the mode and pattern appear in the MODE/PATTERN window, two results also appear simultaneously in the RESULTS I and RESULTS II windows. The available categories and results are selected with the **RESULTS** switches below the windows.

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.

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

Collecting Test Results

During a test, the available results and signal measurements are continuously updated. The results are divided into six categories (refer to Section 6). The six categories and the available results are listed as follows.

SUMMARY Category

Mainframe	Enhanced ESF Option
00-BIT ERRORS	17-FAR FRM ES
09-SLIPS	18-FAR FRM SES
25-VIOLATIONS	19-FAR BPV SEC
30-FRM ERRORS	20-FAR SLP SEC
32-CRC ERRORS	22-FAR CRC ERR
34-FRM LOS CNT	
40-RX FREQ, Hz	
44-PULSE SHAPE	
51-TIMING SLIP	

LOGIC Category

Mainframe	G.821 Performance Analysis Option
00-BIT ERRORS	10-SEV ERR SEC
01-ASYN ER SEC	11-%SEV ER SEC
04-BIT ERR RT	12-DEGR MIN
05-ER FREE SEC	13-%DEGR MIN
06-%EFS	14-UNAVL SEC
07-SYN ERR SEC	15-%AVLBILITY
08-OUT SYN SEC	16-CSES
09-SLIPS	

BPV & FRAME Category

Mainframe	Enhanced ESF Option
25-VIOLATIONS	17-FAR FRM ES
26-BPV SECONDS	18-FAR FRM SES
27-BPV RATE	19-FAR BPV SEC
28-FRM ERR SEC	20-FAR SLP SEC
29-FRM SES	21-FAR PRM SEC
30-FRM ERRORS	22-FAR CRC ERR
31-FRM ER RATE	22-FCRC 1
32-CRC ERRORS	22-FCRC 2-5
33-CRC ERR SEC	22-FCRC 6-10
34-FRM LOS CNT	22-FCRC11-100
35-FRM LOS SEC	22-FCRC101-319
36-CRC SES	22-FCRC>319
37-CRC ERR RT	23-PAY SRC

SIGNAL Category

Mainframe

40-RX FREQ, Hz	47-FALL TIME
41-RX LEVEL (dBdsx)	48-UNDERSHOOT
42-RX LEVEL (dBm)	49-OVERSHOOT
43-RX LEVEL (Vp-p)	50-SPX CURRENT
44-PULSE SHAPE	51-TIMING SLIP
45-PULSE WIDTH	53-SLP ANA SEC
46-RISE TIME	

TIME Category

Mainframe

60-SIG LOS SEC	64-TEST END IN
61-ALARMED SEC	65-CLOCK TIME
62-TEST LENGTH	66-DATE
63-ELAPSE TIME	

WANDER Category (T-BERD 209A Only)

Mainframe

70-WANDER +PK
71-WANDER -PK
72-P-P WANDER
73-15m WANDER
74-24h WANDER
75-TIE WANDER

JITTER & WANDER Category (T-BERD 211 Only)

Mainframe

70-WANDER +PK	80-WB/HB JIT
71-WANDER -PK	81-WB JITTER
72-P-P WANDER	82-HB JITTER
73-15m WANDER	84-MAX WB JIT
74-24h WANDER	85-MAX HB JIT
75-TIE WANDER	

Jitter Spectral Analysis Option
88-SA P/F
89-SA FREQ (auto scan)
90-SA FREQ (man. scan)

3.6 MAINFRAME — TROUBLESHOOTING CONTROLS

During T1 circuit testing, it is often necessary to determine the location of problems identified through testing. Use the following troubleshooting controls to help sectionalize the span (see Figure 3-7).

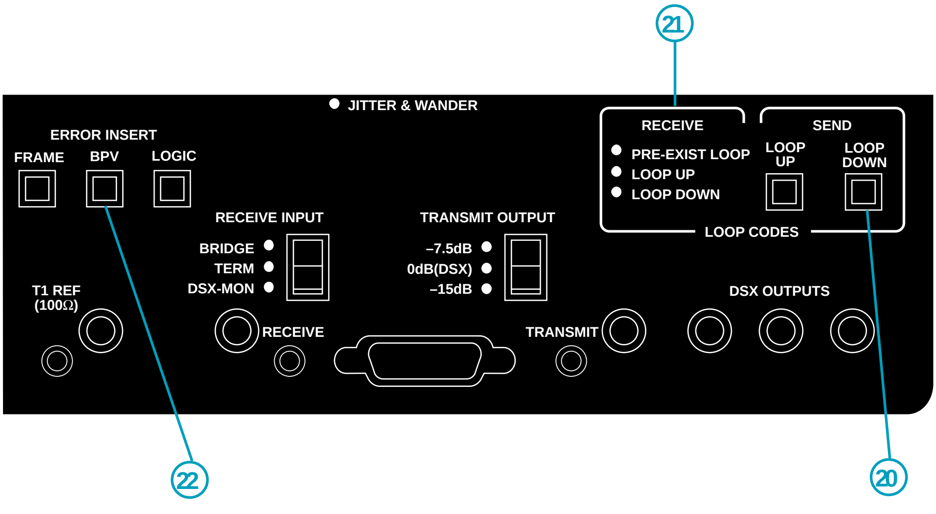


Figure 3-7
Troubleshooting Controls

LOOP CODE Switches 20

The LOOP CODE control transmits loop-up and loop-down codes (**LOOP UP** and **LOOP DOWN** switches) from the T-BERD 209A/211 to devices that can respond to in-band and out-of-band (ESF datalink) loop codes. This enables the T-BERD 209A/211 to establish an out-of-service loopback anywhere along the span.

The loop code transmitted and responded to by the T-BERD 209A/211 is selected through the following auxiliary functions (see Section 5):

AUX RESPONSE — Determines if the T-BERD 209A/211 responds to the selected loop code and establishes a loopback.

AUX LP CODE — Selects the loop code that is transmitted or responded to by the T-BERD 209A/211.

AUX ESF LOOP — Determines how loop codes are transmitted or responded to when using the ESF operating mode.

AUX PGM LPUP — Programs the programmable loop-up code.

AUX PGM LPDN — Programs the programmable loop-down code.

The **LOOP CODE** switches and LEDs perform the following functions:

LOOP UP Switch — This pushbutton switch controls the transmission of the loop-up code. The switch LED illuminates for the duration of loop-code transmission. This switch is disabled in T1 TLB, T1 LLB, and T1C TLB modes. When the **LOOP UP** switch is pressed, the loop-up code is continuously transmitted until one of the following conditions occur:

- The loop-up code is detected at the receiver.
- The **LOOP UP** switch is pressed again.
- The **MODE, PATTERN, RESTART, RECEIVE INPUT,** or **TIMING** switch is pressed.

When the **LOOP UP** switch is pressed, the selected loop-up code name appears in the PATTERN window and is transmitted. When the loop code transmission is terminated, the test pattern reappears in the window. If an in-band loop-up code is selected, the transmitted loop code overrides the selected data pattern until one of the previous conditions occur. If the ESF out-of-band loop code is selected, the loop code is transmitted in the datalink channel and does not overwrite the test pattern.

LOOP DOWN Switch — This pushbutton switch controls the transmission of the loop-down code. The switch LED illuminates for the duration of loop-code transmission. This switch is disabled in T1 TLB, T1 LLB, and T1C TLB modes. When the **LOOP DOWN** switch is pressed, the loop-down code is continuously transmitted until one of the following conditions occur:

- The loop-down code is no longer detected at the receiver.
- The **LOOP DOWN** switch is pressed again.
- The **MODE, PATTERN, RESTART, RECEIVE INPUT,** or **TIMING** switch is pressed.

When the **LOOP DOWN** switch is pressed, the selected loop-down code name appears in the PATTERN window and is transmitted. When the loop code transmission is terminated, the test pattern reappears in the window. If an in-band loop-down code is selected, the transmitted loop code overrides the selected data pattern until one of the previous conditions occur. If the ESF out-of-band loop code is selected, the loop code is transmitted in the datalink channel and does not overwrite the test pattern.

RECEIVE LOOP CODE Status LEDs 21

These LEDs provide information about loop codes being received by the T-BERD 209A/211. The loop-code LEDs are:

Pre-Exist Loop — Illuminates when an in-band loop-up code is detected within 1.5 seconds from the start of loop-up code transmission. This LED remains illuminated for 5 seconds. When a pre-existing loop is detected, the transmission of the in-band loop-up code is immediately halted. The LED is disabled when the ESF out-of-band (datalink) loop code is selected.

Loop Up — Illuminates when an in-band or ESF out-of-band loop-up code is received by the T-BERD 209A/211. The presence of a loop-up code can be detected when the error rate is 10^{-3} or less. It can also be detected with or without the presence of T1 framing.

Loop Down — Illuminates whenever an in-band or ESF out-of-band loop-down code is received by the T-BERD 209A/211. Like the loop-up code, the presence of a loop-down code can be detected when the error rate is 10^{-3} or less. It can also be detected with or without the presence of T1 framing.

ERROR INSERT Switches (22)

The three **ERROR INSERT** switches, **FRAME**, **BPV**, and **LOGIC**, insert frame errors, BPVs, and logic errors into the data stream individually or simultaneously.

FRAME Switch — Inserts logic errors on the transmitted synchronization bits, i.e., F_t bits in D4 and SLC framing, and Frame Pattern Sequence (FPS) bits in ESF framing.

BPV Switch — Inserts bipolar violations (coding) on any of the transmitted bits, except when the T1 LLB mode is selected. BPVs are inserted without regard to B8ZS encoding. This may cause the same error multiplication (one inserted error causing multiple errors) that occurs on a repeatered span.

LOGIC Switch — Inserts logic errors on any of the transmitted bits, except when the T1 LLB mode is selected. The logic errors are inserted without regard to B8ZS sequences. This may cause the same error multiplication (one inserted error causing multiple errors) that occurs on a repeatered span.

The error insertion duration and rate are selected through the following auxiliary functions (see Section 5):

AUX ERR SEL — Controls logic and BPV error burst duration (single and bursts from 25 ms to 5 sec).

AUX FRM ERR — Controls consecutive frame error insertion (single and 2 to 6 consecutive frame errors).

AUX ER RATE — Controls BPV and logic continuous or burst error rate (from 1.0 E-2 to 9.9 E-9).

The auxiliary functions allow frame errors, BPVs, and logic errors to be inserted in three ways: single error, burst of errors, and continuously. When the **ERROR INSERT** switches are pressed, an internal LED illuminates indicating the error insertion duration selected as follows:

Single Error — Inserted by having the AUX ERR SEL or AUX FRM ERR function set to SINGLE ERROR and pressing the **ERROR INSERT** switch once. The switch LED flashes once indicating a single error is inserted.

Burst of Logic or BPV Errors — Inserted by setting the AUX ERR SEL function to a specified duration, setting the AUX ER RATE function to a specified error rate, and pressing the **LOGIC** or **BPV ERROR INSERT** switch once. The **LOGIC** or **BPV** switch LED flashes twice indicating a burst of logic errors or BPVs is inserted at the specified duration and rate.

Consecutive Frame Errors — Inserted by setting the AUX FRM ERR function to a specified number of consecutive frame errors and pressing the **FRAME ERROR INSERT** switch once. The **FRAME** switch LED flashes twice indicating consecutive frame errors are inserted.

Continuous Errors — Inserted by pressing the **ERROR INSERT** switches for more than two seconds. The switch LED flashes, then it illuminates continuously until the switch is pressed again. The continuous error rate is controlled by the AUX ER RATE function for BPVs and logic errors and the AUX FRM ERR function for frame errors. Pressing the illuminated **ERROR INSERT** switch again turns off the error insertion.

3.7 MAINFRAME — PRINTER CONTROL

The T-BERD 209A/211 can generate a printout manually or automatically. The printouts provide a hard copy of the test results and the instrument configuration. The following switches and connector are used to generate the printouts (see Figure 3-8).

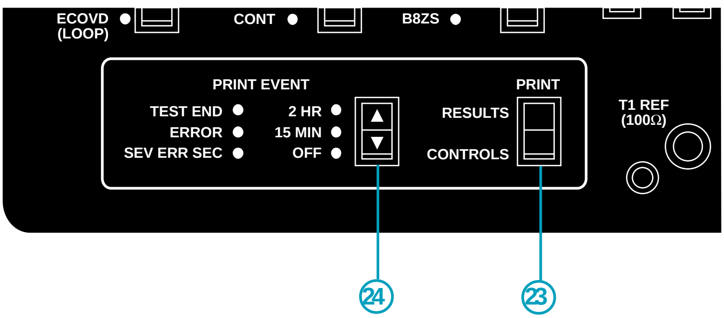


Figure 3-8
Printer Controls

When a results printout is initiated either manually or automatically, the test results are stored in the results history buffer and printer buffer. This allows the results to be reviewed from the AUX RES HIST function and stored in memory when a printer is not connected to the T-BERD 209A/211.

PRINT Switch 23

This two-position switch initiates a test results and front-panel controls printout whenever the appropriate position is pressed.

RESULTS — Initiates a printout of the current test results.

CONTROLS — Initiates a printout of the current T-BERD 209A/211 front-panel switch and auxiliary function settings.

PRINT EVENT Switch 24

This six-position switch determines the events that automatically initiate a results printout.

OFF — No status or alarm messages are printed. Only manual prints can be initiated using the **PRINT** switch. When the **PRINT EVENT** switch is changed from one setting to OFF, all printer buffers are cleared; any previously stored test results or messages are not printed.

TEST END — If a timed test is in progress (see **TEST** switch), the results are printed when the test interval has expired. The test interval is controlled through the AUX TEST LEN function.

ERROR — Results are printed when logic errors, CRC errors, frame errors, BPVs, or changes in alarm conditions occur.

SEV ERR SEC — Results are printed when the bit error rate exceeds 10^{-3}. This selection is only available when the G.821 Performance Analysis Option is installed.

2 HR — Results are printed every 2 hours.

15 MIN — Results are printed every 15 minutes.

The AUX PRNT FMT function determines how the results printouts are formatted (NORMAL, SUMMARY, and SHORT). Refer to Section 5 for additional information.

RS-232 Connector

The female 25-pin D connector serves as the RS-232 printer or remote control interface connector. It is configured with DCE pin-outs to connect the T-BERD 209A/211 to a printer. The connector interface is configured with the following auxiliary functions (see Section 5):

AUX BAUD — Sets the interface baud rate (300 bps, 1200 bps, 2400 bps, and 4800 bps).

AUX PARITY — Sets the interface parity (ODD, EVEN, or NONE).

AUX TERM — Sets the interface line terminator characters (CR or CRLF).

3.8 G.821 OPTION — INTRODUCTION

The G.821 Performance Analysis Option (209A/211-1) enables the T-BERD 209A/211 to evaluate the long-term performance of your system. The option adds seven performance analysis results to the LOGIC category that are defined in the CCITT Recommendation G.821. The option also enables the **PRINT EVENT** switch SEV ERR SEC print event.

3.9 G.821 OPTION — TEST SETUP

Auxiliary Functions

In addition to the standard mainframe auxiliary functions, the following auxiliary functions are affected by or have an effect on the G.821 Option functions (see Section 5).

AUX HALT/CONT — When pattern synchronization is lost, the bit error count continues or halts based on the AUX HALT/CONT function setting.

AUX JIT TRIG (T-BERD 211 only) — If the Jitter Spectral Analysis Option is installed, this auxiliary function can select the occurrence of a severely errored second to trigger a jitter snapshot.

3.10 G.821 OPTION — STARTING TEST/COLLECTING RESULTS

Collecting Test Results

In addition to the standard mainframe LOGIC category results, the following G.821 test results are added to the LOGIC category (see Section 6).

10 - SEV ERR SEC	Severely Errored Seconds
11 - %SEV ER SEC	% Severely Errored Seconds
12 - DEGR MIN	Degraded Minutes
13 - %DEGR MIN	% Degraded Minutes
14 - UNAVL SEC	Unavailable Seconds
15 - %AVLBILITY	% Availability
16 - CSES	Consecutive Severely Errored Seconds

3.11 G.821 OPTION — PRINTER CONTROL

PRINT EVENT Switch

The **PRINT EVENT** switch SEV ERR SEC function is activated when this option is installed. This enables a results printout to be generated when the bit error rate exceeds 10^{-3}.

3.12 JITTER SPECTRAL ANALYSIS OPTION — INTRODUCTION

The Jitter Spectral Analysis Option (211-2) enables the T-BERD 211 to perform a spectral analysis of the timing jitter present on T1 networks. The option provides jitter versus jitter mask results over 40 frequency bands that can be displayed in UIs or as a percentage between the spectral jitter response and five industry standards for jitter impairments. Appendix D shows a graph of the jitter mask specifications.

3.13 JITTER SPECTRAL ANALYSIS OPTION — TEST SETUP

Auxiliary Functions

In addition to the standard mainframe auxiliary functions, the following auxiliary functions control the setup and operation of the Jitter Spectral Analysis Option (see Section 5):

AUX JIT S/A — The Jitter Spectral Analysis Control auxiliary function controls the Jitter Spectral Analysis Option.

AUX JIT MASK — The Jitter Mask Select auxiliary function selects the jitter mask when the Jitter Spectral Analysis Option is enabled. The jitter masks are shown in Appendix D.

AUX JIT TRIG — The Jitter Trigger Select auxiliary function controls the selection of the jitter trigger when the Jitter Spectral Analysis Option is enabled. Jitter spectral measurements can be made continuously, or can be triggered by a specific event.

AUX GRAPH — The Print Graph Function auxiliary function is used to generate a jitter vs frequency graph when the AUX JIT S/A function is set to ON.

3.14 JITTER SPECTRAL ANALYSIS OPTION — CIRCUIT CONNECTIONS

RECEIVE INPUT Switch

The T-BERD 211 automatically measures peak-to-peak highband and wideband jitter whenever the appropriate T1 input signal level requirements are met. The input signal level requirements are:

- BRIDGE and TERM +4 to -4 dBdsx.
- DSX MON -16 to -24 dBdsx.

3.15 JITTER SPECTRAL ANALYSIS OPTION — SIGNAL VERIFICATION

Signal Alarm LEDs

Jitter LED — With the Jitter Spectral Analysis Option enabled, this LED illuminates when the jitter exceeds the selected mask. When the Jitter Spectral Analysis Option is enabled and no jitter mask is selected, this LED is disabled. When the Jitter Spectral Analysis Option is disabled, this LED illuminates when the wideband jitter measurement exceeds 5 UI or the highband jitter measurement exceeds 0.1 UI.

3.16 JITTER SPECTRAL ANALYSIS OPTION — STARTING TEST/COLLECTING RESULTS

Collecting Test Results

The following jitter spectral analysis test results are added to the JITTER & WANDER category to measure the jitter versus frequency across the full spectrum (see Section 6).

88 - SA P/F	Spectral Analysis Content (pass/fail)
89 - SA FREQ (auto scan)	Relative Jitter in All 40 Frequency Bands
90 - SA FREQ (man. scan)	Relative Jitter in Each Frequency Band

3.17 JITTER SPECTRAL ANALYSIS OPTION — PRINTER CONTROL

With a graphics compatible printer connected to the T-BERD 211, a jitter versus frequency spectrum analysis graph can be printed. The graph printout is controlled through the AUX GRAPH function. Figure 3-9 shows a sample of the jitter graph.

NOTE: To properly generate a graphic printout, the AUX PARITY function must be set to NONE and the AUX TERM function must be set to CR (see Section 5).

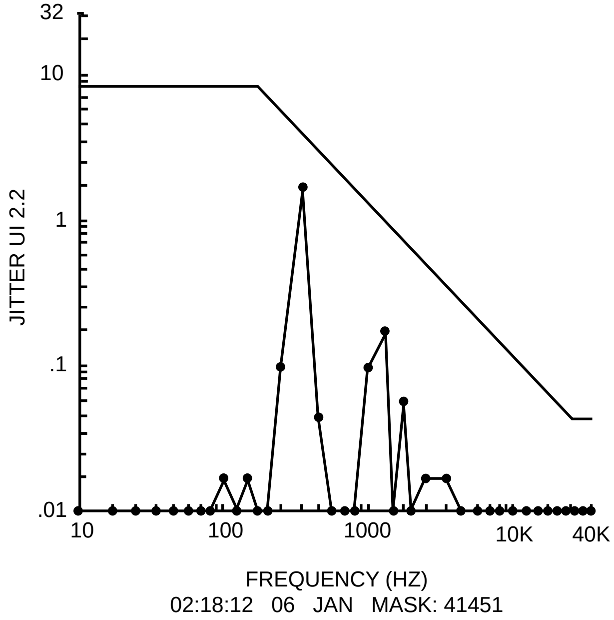


Figure 3-9
Sample Jitter vs Frequency Graph

3.18 ADVANCED BERT OPTION — INTRODUCTION

The Advanced Bit Error Rate Test (BERT) Option (209A/211-3) adds seven T1 stress patterns, intelligent span equipment loop codes, and a programmable long user pattern to the T-BERD 209A/211. The seven minimum/maximum density stress patterns are designed to stress test timing recovery circuits and span-line repeater ALBO circuitry. The intelligent span equipment loop codes are used to loop up and loop down individual addressable office repeaters and line repeaters or to transmit maintenance switch commands. The programmable long user pattern (LUP) enables patterns of up to 2000 hexadecimal bytes to be programmed into memory.

The following addressable T1 office repeaters, and line repeaters, or equivalent, can be armed, disarmed, queried, and looped back when the Advanced BERT Option is installed.

- Teltrend Model IOR7231/ILR7239 Intelligent Repeaters
- Teltrend Model IOR7231E/ILR7239 Intelligent Repeaters
- Teltrend Model IOR7231LC/ILR7239LC Intelligent Repeaters
- Teltrend Model IOR7231LD/ILR7239LD Intelligent Repeaters
- Teltrend Model IOR7231LP/ILR7239LP Intelligent Repeaters
- Teltrend Model IOR7231LS/ILR7239LS Intelligent Repeaters
- Teltrend Model IOR7231LW/ILR7239LW Intelligent Repeaters
- Teltrend T1 Maintenance Switch System
- Westell 3150-56 T1 Line Repeater with Addressable Loopback Plus
- Westell 3130-56 T1 Office Repeater with Addressable Loopback Plus
- Westell 3171 T1 Network Interface and Maintenance System-20 (NIMS - 12 bit)
- Westell 3171 T1 Network Interface and Maintenance System-60 (NIMS - 16 bit)
- Wescom Smart Span T1 Span Line System with Addressable Bi-Directional Loop-back
- XEL 7853-000 Mini T1 Line Repeater

3.19 ADVANCED BERT OPTION — TEST SETUP

Auxiliary Functions

In addition to the standard mainframe auxiliary functions, the following auxiliary functions are added or affected by the Advanced BERT Option (see Section 5):

AUX LUP — Long User Pattern auxiliary function is used to program LUP into the T-BERD 209A/211 in a hexadecimal format.

AUX LP CODE — Loop Code auxiliary function is used to select intelligent T1 office and line repeater loop codes that can arm, disarm, query, and loop back individual repeaters. It is also used to transmit maintenance switch commands.

PATTERN Switch

In addition to the standard mainframe test patterns, the Advanced BERT Option adds the following test patterns. Unless otherwise indicated, these patterns can be transmitted framed or unframed. Refer to Appendix C for the bit and hexadecimal patterns.

T1 DALY — This pattern is identical to the 55 OCTET pattern, except that the seventh octet is 80H instead of 00H. This change enables the pattern to meet ones density and excess zeros criteria.

T1-2/96 — This is a 96-octet pattern that can be used to detect faulty M12 cards 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.

T1-3/54 — This is a 54-octet pattern that 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.

T1-4/120 — This is a 120-octet pattern that can be used to stress test equalization circuits between T1 multiplexers. The pattern is similar to the T1-2/96 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.

T1-5/53 — This is a 53-octet pattern that 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 — This is a 55-octet pattern that 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.

MIN/MAX — This is a 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.

LUP — Long User Pattern provides the ability to transmit a 1- to 2000-hexadecimal user programmable test pattern. This allows the T-BERD 209A/211 to transmit specific character patterns to test circuit sensitivity to a particular pattern. The pattern is entered in hexadecimal form through the AUX LUP function. The pattern is transmitted starting from the LSB to the MSB of each hexadecimal character.

Example: 74H = (MSB) 0111 0100 (LSB); transmitted in the following order: (LSB) 0010 1110 (MSB). The LUP pattern is frame aligned when transmitted in the framed T1 modes.

3.20 ENHANCED ESF OPTION — INTRODUCTION

The Enhanced ESF Option (209A/211-4) provides the comprehensive and advanced test capabilities required for installing and maintaining ANSI T1.403 ESF circuits. This option provides monitor and emulation capabilities of the one-second broadcast or Performance Report Message (PRM), per the ANSI T1.403 specification.

The Enhanced ESF Option also adds the SMARTNIU operating mode, which provides access to the T1 span performance statistics recorded by the Westell NIU/Performance Monitor. This operating mode also supports the Clear Memory and Set Clock features of the NIU/Performance Monitor.

3.21 ENHANCED ESF OPTION — TEST SETUP

MODE Switch

In addition to the standard mainframe operating modes, the following modes are added to the switch selections:

SMARTNIU — Smart NIU/Performance Monitor mode configures the T-BERD 209A/211 to query the Performance Monitor portion of combined NIU/Performance Monitor equipment for the recorded T1 span statistics. The SMARTNIU mode enables three functions; Query, Clear Memory, and Set Clock.

PATTERN Switch

When the SMARTNIU mode is enabled, the following switch selections are available:

RESULTS — The RESULTS position activates the Query function of the SMARTNIU mode, which queries, retrieves, and stores the performance monitor statistics.

SETUP — The SETUP position allows the T-BERD 209A/211 to either clear the recorded statistics from the NIU/Performance Monitor after the results are retrieved (Clear Memory function) or set the NIU/Performance Monitor time and date to match the T-BERD 209A/211 time and date (Set Clock function).

Auxiliary Functions

The following auxiliary functions control the setup and operation of the Enhanced ESF Option (see Section 5).

AUX PRM — The Performance Report Message Control auxiliary function determines how the PRM is transmitted and whether the PRM results are accumulated. The auxiliary function is only active in the ESF or FT1 ESF operating mode.

3.22 ENHANCED ESF OPTION — STARTING TEST/COLLECTING RESULTS

RESTART Switch

When the T-BERD 209A/211 is in the SMARTNIU mode, pressing the **RESTART** switch forces the T-BERD 209A/211 to the RESULTS position and activates the Query function, which retrieves the T1 span performance statistics from the NIU/Performance Monitor.

RESULTS Switches

The **RESULTS** switches perform the following functions in the SMARTNIU mode with the SETUP menu displayed:

RESULTS I Results Switch — Pressing the **RESULTS I Results** switch activates the SET CLOCK function.

RESULTS II Results Switch — Pressing the **RESULTS II Results** switch activates the CLEAR NIU (Memory) function.

Collecting Test Results

The ESF datalink far-end PRM results enable the T-BERD 209A/211 to monitor and report on the status of the ESF datalink PRM as described in the ANSI T1.403-1989 standard. The far-end PRM results appear in the BPV & FRAME and SUMMARY categories and include (see Section 6):

17-FAR FRM ES	Far-End Frame Error Seconds
18-FAR FRM SES	Far-End Severely Errored Framing Seconds
19-FAR BPV SEC	Far-End BPV Seconds
20-FAR SLP SEC	Far-End Controlled Slip Seconds
21-FAR PRM SEC	Far-End Performance Report Seconds
22-FAR CRC ERR	Far-End CRC Error Events
22-FCRC 1	Far-End CRC 1 Bin
22-FCRC 2-5	Far-End CRC 2 to 5 Bin
22-FCRC 6-10	Far-End CRC 6 to 10 Bin
22-FCRC11-100	Far-End CRC 11 to 100 Bin
22-FCRC101-319	Far-End CRC 101 to 319 Bin
22-FCRC>319	Far-End CRC 320 to 333 Bin
23-PAY SRC	Far-End Payload Source/Loopback

The far-end PRM results are available when either the ESF or FT1 ESF operating mode is selected and the AUX PRM function is enabled. The far-end PRM results are also available in the AUTO LLB, T1 LLB, and T1 TLB modes.

In the SMARTNIU mode with the RESULTS position selected, pressing the **RESTART** switch activates the Query function. The T-BERD 209A/211 displays the following message:

> ### OF nnn RECEIVED — indicates the Query function is continuing and has retrieved a portion of the total messages stored in the NIU/Performance Monitor, where ### is the number of messages retrieved and *nnn* is the number of total messages stored in the NIU/Performance Monitor.

In addition, the T-BERD 209A/211 simultaneously displays the Performance Indication Ratio (PIR) in the RESULTS I window (if available). The PIR, expressed as a percentage, is intended to give you a quick glance indication of the span's performance. The closer the number is to 100, the better the performance.

When the Query function stops, the T-BERD 209A/211 displays one of the following messages to indicate the results:

QUERY COMPLETE/ALL DATA OK — indicates Query function is complete with no errors reported.

QUERY COMPLETE/ERRORS DETECTED — indicates Query function is complete with one or more errors reported.

QUERY FAILURE/NO DATA AVAILABLE — indicates the Query function failed with no data retrieved. Query failure was caused by loss of signal, loss of frame, excessive re-transmission of a message, timeout of a response to a query message, or loss of power.

QUERY FAILURE/PARTIAL DATA OK — indicates the Query function failed with some messages retrieved. The retrieved data reported no errors. Query failure was caused by loss of signal, loss of frame, excessive re-transmission of a message, timeout of a response to a query message, or loss of power.

QUERY FAILURE/ERRORS DETECTED — indicates the Query function failed with some messages retrieved. The retrieved data included error messages. Query failure was caused by loss of signal, loss of frame, excessive re-transmission of a message, timeout of a response to a query message, or loss of power.

In the SMARTNIU mode with the SETUP position selected, pressing the **RESULTS I Results** switch activates the Set Clock function. The T-BERD 209A/211 displays the following message for approximately ten seconds.

SET CLOCK IN PROGRESS **—** Indicates the Set Clock function is activated.

When the Set Clock function stops, the T-BERD 209A/211 displays one of the following messages to indicate the results:

SET CLOCK FAILED — Indicates the Set Clock function failed to set the time and date to match the T-BERD 209A/211's time and date. This could be the result of poor connections or span impairment with bit errors. Check the T1 circuit connections and try again. If it fails again, check the bit error rate in the LOGIC category.

CLOCK SET — Indicates the Set Clock function has set the NIU/Performance Monitor time and date to match the T-BERD 209A/211's time and date.

In the SMARTNIU mode with the SETUP position selected, pressing the **RESULTS II Results** switch activates the Clear Results function. The T-BERD 209A/211 displays the following message for approximately ten seconds.

CLEAR NIU IN PROGRESS — Indicates the Clear function is activated.

When the Clear Memory function stops, the T-BERD 209A/211 displays one of the following messages to indicate the results:

CLEAR NIU FAILED — Indicates the Clear function failed to clear the NIU/ Performance Monitor of all messages. This could be the result of poor connections or span impairment with bit errors. Check the T1 circuit connections and try again. If it fails again, check the bit error rate in the LOGIC category.

NIU CLEARED — Indicates all results are cleared from the NIU/Performance Monitor.

3.23 ENHANCED ESF OPTION — PRINTER CONTROL

PRINT Switch

When in SMARTNIU mode, press the **PRINT** switch RESULTS position to generate a SMARTNIU results printout. The printout lists the statistics retrieved from the NIU/Performance Monitor at the end of a standard results printout. A complete SMARTNIU results printout will list recorded results for the current hour (CURRENT HOUR), each of the previous 23 hours (HISTORY HOUR 01 through HISTORY HOUR 23), the current day (CURRENT DAY), and the previous week (HISTORY DAY 01 through HISTORY DAY 07) in the following format:

```
SMART NIU RESULTS      DATA COLLECTED AT:
  13:14  08-27-93

Key for STAT res.
- - - - - - - - - -
1 = Looped Back
2 = Data Incomplete
3 = Loss of Signal
4 = Unused
5 = Power Loss
6 = AIS
7 = Yellow Alarm
8 = Out of Frame

AZ-PIR EFS:         100%       AZ-PIR STAT:    <=91%
ZA-PIR EFS:         100%       ZA-PIR STAT:    <=91%

CURRENT HOUR                   13:00        08-27-93
AZ-CVL :         1372261       AZ-ESL :           14
AZ-SESL:               0       AZ-UASL:            0
AZ-CVP :         1372261       AZ-ESP :           14
AZ-SESP:               0       AZ-UASP:            0
AZ-PDVS:               0       AZ-B8ZS:            0
AZ-MSEC:               0       AZ-STAT:           21

ZA-CVL :          358367       ZA-ESL :         3518
•
•
•

HISTORY HOUR 01                12:00        08-27-93
AZ-CVL :               0       AZ-ESL :           08
•
•
•
```

In the SMARTNIU mode, the NIU/Performance Monitor stored statistics are a historical record of the T1 circuit's performance. The T1 circuit is monitored in both directions, and the results are stored as either AZ (CO to NIU) or ZA (Customer Premise to NIU). The statistics abbreviations are identified as follows:

CVL — Line Coding Violations is a count of bipolar violations that are not part of a B8ZS sequence.

ESL — Line Errored Seconds is a count of seconds in which at least one CVL has occurred.

SESL — Line Severely Errored Seconds is a count of seconds in which 1544 or more CVLs have occurred (corresponds to a bit error rate of 10E-3).

UASL — Line Unavailable Seconds is a count of seconds that a line was unavailable. A line is unavailable when ten or more consecutive SESLs occur.

CVP — Path Coding Violation is a count of CRC-6 errors (ESF framing) or frame errors (D4 framing).

ESP — Path Errored Seconds is a count of seconds in which at least one CVP has occurred.

SESP — Path Severely Errored Seconds is a count of seconds in which 330 or more CRC-6 errors (ESF framing) or 8 or more frame errors (D4 framing) have occurred.

UASP — Path Unavailable Seconds is a count of seconds that a line was unavailable. A line is unavailable when ten or more consecutive SESPs occur.

PDVS — Pulse Density Violation Seconds is a count of seconds in which 16 consecutive zeros have occurred (8 consecutive zeros for B8ZS encoding).

B8ZS — B8ZS Violation Seconds is a count of seconds in which a B8ZS code is detected on a non-B8ZS circuit. This parameter is not valid on B8ZS circuits.

MSEC — Monitored Seconds is a count of seconds in which valid performance information is recorded.

STAT — Status Register is an eight-bit register with the following bits: Bit 1 - Loopback Request, Bit 2 - Data Incomplete Indicator, Bit 3 - Loss of Signal Indicator, Bit 5 - Loss of Power, Bit 6 - Alarm Indication Signal (AIS), Bit 7 - Yellow Alarm, and Bit 8 - Out-of-Frame.

PIR — Performance Indication Ratio is a percentage providing a "quick glance" indication of the performance of the span. The closer the number is to one-hundred, the better the performance.

3.24 TDR OPTION — INTRODUCTION

The TDR Option (209A/211-5) configures the T-BERD 209A/211 to operate as a Time Domain Reflectometer. The TDR locates line impairments such as shorts, opens, splices, coils, and bridge taps on twisted-pair copper wire with minimal setup. Faults and distances appear in plain English on the front panel. Test results, TDR setup, and fault location trace can be printed in graphic form using a graphics printer (e.g., the TTC PR-40A Thermal Printer).

3.25 TDR OPTION — TEST SETUP

Front-Panel Display

The display is the only indicator used in the TDR mode; all others are disabled. There are three basic displays that appear in the TDR mode: setup, results, and testing.

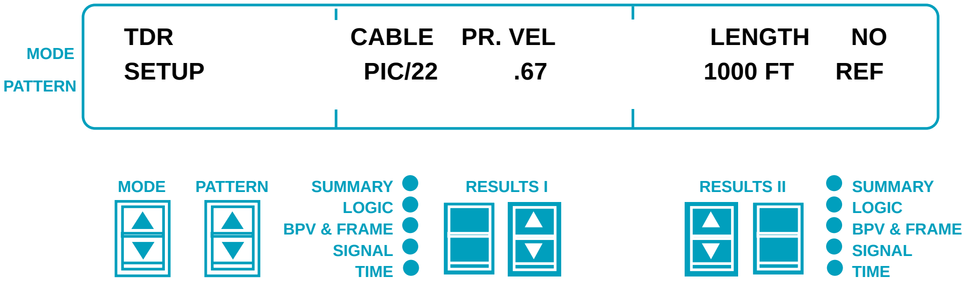
MODE Switch

Pressing the **MODE** switch until TDR appears in the MODE window selects the TDR mode. When TDR is selected, either the SETUP menu or the previous test results appear in the display. However, at power-up the TDR SETUP menu is the default display. The T-Carrier modes are disabled when TDR is selected. However, the last T-Carrier mode selected and configured remains in memory.

PATTERN Switch

Pressing the **PATTERN** switch selects either the TDR SETUP menu or the TDR RESULTS display. The TDR SETUP menu is used to select the cable type, propagation velocity (PR. VEL), and cable length. It can also be used to store the current trace as a reference trace for a printout. The TDR RESULTS display indicates up to four faults and their distances from the T-BERD 209A/211.

When the TDR mode SETUP menu is selected, the following display appears:



RESULTS Switches

The **RESULTS** switches perform the following functions in the TDR SETUP menu:

RESULTS I Category Switch — Press this switch to select the desired CABLE type, associated wire gauge, and PR. VEL displayed in the RESULTS I window. Table 3-4 lists three commonly used cable types and three copper wire gauges that are available with each type.

The **RESULTS I Category** switch is disabled during testing and after the TDR RESULTS appear.

It is very important to match the TDR CABLE type setting with the type of cable being tested. If the TDR CABLE type selection and cable being tested are not matched, inaccurate distances can occur and faults can be misinterpreted. The USER selection allows the wire gauge and PR. VEL of an unlisted cable type to be selected (see **RESULTS I Results** switch).

Table 3-4
Selectable Cable Types

CABLE	PROP VEL	Description
PIC/22 PIC/24 PIC/26	.67 .66 .65	22 to 26 gauge PIC (polyethylene insulated cable) wire.
JELL/22 JELL/24 JELL/26	.62 .61 .60	22 to 26 gauge jelly-filled insulated wire.
PULP/22 PULP/24 PULP/26	.71 .70 .68	22 to 26 gauge paper-pulp insulated wire.
USER/22 USER/24 USER/26	.40 - .99	When the wire gauge and PR. VEL are known for a cable not listed, select the wire gauge with the **RESULTS I Category** switch and PR. VEL with the **RESULTS I Results** *switch in 0.01 steps.*
DEFAULT	*.66*	*If the PR. VEL and CABLE type are unknown, select DEFAULT to set the PR. VEL at 0.66.*

RESULTS I Results Switch — When USER/22, USER/24, or USER/26 appears under CABLE (selected with the **RESULTS I Category** switch), press this switch to select the desired PR. VEL from 0.40 to 0.99 in 0.01 steps. This is helpful when the cable type is not listed under CABLE. This switch is disabled when the other CABLE selections are displayed.

RESULTS II Results Switch — Press this switch to select one of the following LENGTH selections: 1000, 3000, and 6500 feet or AUTO mode. The LENGTH selections determine how far out the TDR tests the cable pair.

The AUTO mode automatically tests the cable pair out to the first fault. The selected length also affects the distance scale printed on the TDR GRAPH.

Changing the LENGTH when REF STORED is displayed in the TDR SETUP menu erases the reference trace and any results that are in memory. NO REF also replaces REF STORED in the display.

RESULTS II Category Switch — Press this switch to toggle between NO REF and REF STORED which indicates the current status of the reference trace print buffer and how the TDR GRAPH is printed.

NO REF indicates that the buffer is empty. With NO REF displayed, pressing this switch saves the current test result in memory as the reference trace and REF STORED appears.

REF STORED indicates that the buffer has a stored reference trace. With REF STORED displayed, pressing this switch erases the reference trace from memory and NO REF appears. Refer to Section 3.30 to print a TDR graph.

3.26 TDR OPTION — CIRCUIT CONNECTIONS

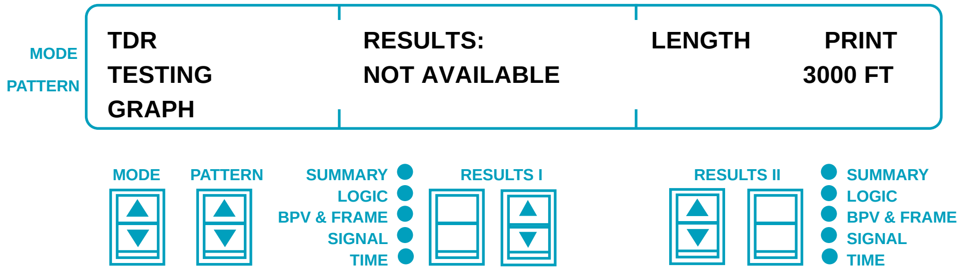
When the TDR mode is selected, the T1 REF (TDR) jacks become the TDR connection (only one jack can be used at one time) for the T-BERD 209A/211. The T1 REF (TDR) jack is terminated so that the TDR can be connected directly to the copper wire. The TDR only tests one cable pair at a time.

NOTE: The T-BERD 209A/211 T1 connections (TRANSMIT and RECEIVE jacks) must be disconnected before testing the line with the TDR to prevent unwanted reflections.

WARNING: To prevent the risk of electrical shock when performing a TDR test on a T1 span, remove simplex current before connecting the T1 REF (TDR) jack to the cable pair.

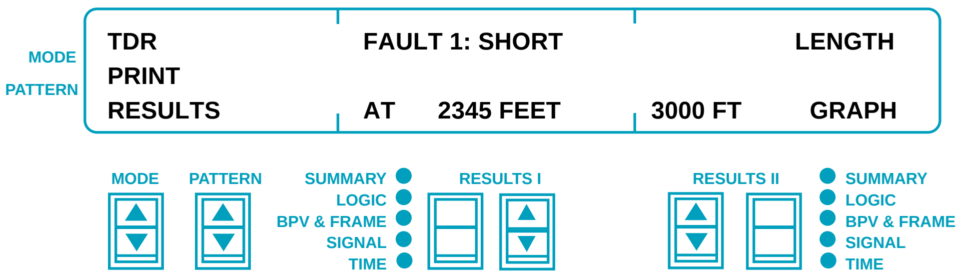
3.27 TDR OPTION — STARTING TEST/COLLECTING RESULTS

Once the TDR SETUP menu is configured, pressing the **RESTART** switch activates the TDR. The testing display flashes the messages *TESTING* in the PATTERN window and *RESULTS: NOT AVAILABLE* in the RESULTS I window. The front-panel switches (except the **MODE** switch) are disabled until the test is complete.



A typical TDR test takes approximately 12 seconds to perform but can range from 5 to 20 seconds depending on the cable length and the number of faults found. Once the test is complete, the TDR RESULTS appear.

Once the TDR test signal has reached the selected test length, the first fault, or the maximum test length in AUTO mode, the TDR RESULTS display appears indicating whether faults were detected.



RESULTS Switches

The **RESULTS** switches perform the following functions in the TDR RESULTS display:

RESULTS I Category Switch — This switch is disabled when the TDR RESULTS appear.

RESULTS I Results Switch — Press this switch repeatedly to scroll through the reported faults that appear in the RESULTS I window. Press the up arrow to scroll the faults from Fault 1 to the last detected fault and press the down arrow to scroll the faults from the last detected fault to Fault 1. Up to four faults can be detected and reported in the display during one test. The following messages and faults can appear in the TDR RESULTS display:

NONE — No faults were detected within the selected cable length, which usually occurs when the selected cable length is less than the actual length of the cable pair being tested. A terminated cable pair with no faults between the termination and the T-BERD 209A/211 is also indicated as NONE.

OPEN at nnnn FT — An open in the cable pair is detected at *nnnn* feet. If the distance to the open is less than the known cable length, the open must be repaired and the cable pair retested. If the distance to the open is equal to the known cable pair length, then the cable pair is good.

SHORT at nnnn FT — A short in the cable pair is detected at *nnnn* feet. If the distance to the short is less than the known length of the cable pair, then the short must be repaired and the cable pair retested. If the end of the cable pair is shorted and the displayed distance is equal to the cable length, then the cable pair is good.

B-TAP at nnnn FT — A bridge tap is detected at *nnnn* feet. The bridge tap should be removed and the pair retested.

UNREC at nnnn FT — An unrecognized fault in the cable pair is detected at *nnnn* feet. Further investigation is required. Printing a TDR GRAPH may provide an indication of the fault.

RESULTS II Results Switch — This switch performs the same function as previously described. The LENGTH can be changed between each test without having to return to the TDR SETUP menu. However, changing the LENGTH when a reference trace is stored in memory erases the trace; the PRINT GRAPH function cannot print a graph with two different lengths.

RESULTS II Category Switch — Press this switch, when labeled PRINT GRAPH, to print a TDR trace and distance graph on a graphics compatible printer.

3.28 TDR OPTION — PRINTER CONTROL

Three possible printouts are generated in the TDR mode: controls printout, results printout, and a graph printout. All printouts are date- and time-stamped.

Printing TDR Setup Controls and Results

Press the **PRINT** switch CONTROLS position to generate a TDR SETUP controls printout. The printout lists the current TDR SETUP menu configuration.

Press the **PRINT** switch RESULTS position to generate a TDR results printout. The printout lists the current faults detected and the distance to the fault as they appear in the TDR RESULTS display.

Printing TDR Graphs

The TDR graph printout is initiated by pressing the **RESULTS II Category** switch when the TDR mode RESULTS and PRINT GRAPH appear. Figure 3-10 shows a sample TDR graph printout. Refer to Section 7 for information on printing single, dual, and magnified TDR graphs.

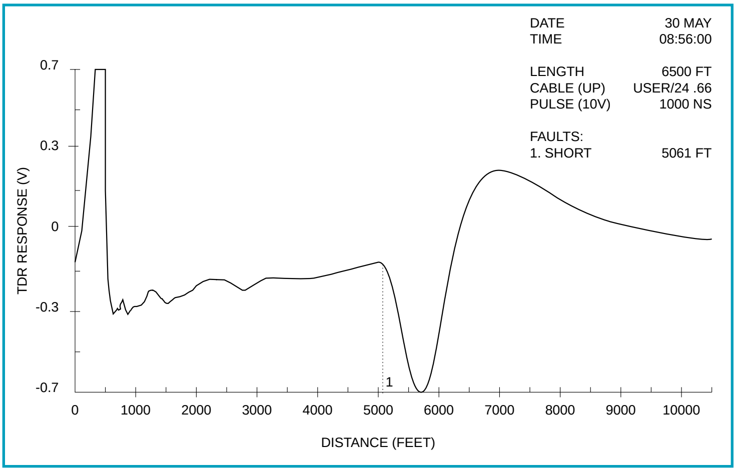


Figure 3-10
TDR Graph Printout

3.29 FT1 OPTION — INTRODUCTION

The Fractional T1 (FT1) Option (209A/211-6) provides fractional T1 modes for contiguous and noncontiguous, 56xN and 64xN, FT1 testing capabilities in D4 and ESF framing formats. It also provides three FT1 stress patterns (63, 511, and 2047) for testing DDS and fractional T1 circuits.

3.30 FT1 OPTION — TEST SETUP

MODE Switch

In addition to the mainframe operating modes, the following FT1 operating modes are also available:

FT1 D4 — D4 Superframe Fractional T1 mode configures the T-BERD 209A/211 to transmit and receive D4 framed FT1 data. The FT1 D4 mode is compatible with D3 and D4 superframe formats.

FT1 ESF — Extended Superframe Fractional T1 mode configures the T-BERD 209A/211 to transmit and receive ESF framed FT1 data.

Auxiliary Functions

In addition to the standard mainframe auxiliary functions, the following auxiliary functions are added to the T-BERD 209A/211 (see Section 5).

AUX FT1 CHAN — The Fractional T1 Channel Bandwidth auxiliary function selects the FT1 channel bandwidth being tested in FT1 circuits.

AUX FT1 SETUP — The Fractional T1 Idle Code and Channel Rate auxiliary function sets the 8-bit FT1 idle code and channel rate (56xN or 64xN).

The following auxiliary functions are affected by or have an affect on the FT1 Option (see Section 5).

AUX RESPONSE — When operating in an FT1 mode with AUTO RESPONSE enabled, the T-BERD 209A/211 does not respond to in-band loop codes. However, the T-BERD 209A/211 does respond to ESF out-of-band loop codes when configured for FT1 ESF operation. The AUTO RESPONSE mode also establishes a full bandwidth loopback and bit error rate test.

AUX ERR SEL — To test Fractional T1 circuits, a single error is only inserted in the selected FT1 bandwidth. However, the burst, consecutive, and continuous error insertion is applied to the entire T1 bandwidth.

AUX ESF LOOP — When the FT1 ESF mode is selected, the in-band and ESF out-of-band loop code types are selected from the AUX ESF LOOP function.

AUX LP CODE — When an FT1 mode is selected, the T-BERD 209A/211 only sends in-band loop codes within the selected FT1 channel bandwidth. However, the T-BERD 209A/211 does not respond to FT1 in-band loop codes.

PATTERN Switch

The BRIDGTAP and MULTIPAT patterns are not available in the FT1 modes. When configured in an FT1 mode, the LUP pattern is not frame aligned within the selected FT1 bandwidth.

When an FT1 mode is enabled, the following stress patterns are available:

63 — A 63-bit (2^6-1) pseudorandom pattern that generates a maximum of five sequential zeros and six sequential ones.

511 — A 511-bit (2^9-1) pseudorandom pattern that generates a maximum of eight sequential zeros and nine sequential ones. This pattern is generally used to test DDS and other circuits operating below 9.6 kb/s.

2047 — A 2047-bit (2^{11}-1) pseudorandom pattern that generates a maximum of ten sequential zeros and eleven sequential ones. This pattern is generally used to test DDS and other circuits operating between 9.6 and 56 kb/s.

3.31 FT1 OPTION — TROUBLESHOOTING CONTROLS

LOOP CODE Switches

When testing FT1 circuits, the T-BERD 209A/211 only sends in-band loop codes within the selected FT1 channel bandwidth or in the ESF datalink. For loopback testing, the AUX ESF LOOP function provides in-band and ESF out-of-band loop code transmission capabilities in the FT1 ESF mode.

ERROR INSERT Switches

To test FT1 circuits, a single error is only inserted in the selected FT1 bandwidth, and CRC errors are not calculated. The burst, consecutive, and continuous error insertion is applied to the entire T1 bandwidth.

T-BERD T1 CHANNEL MONITOR OPTION

4.1 T1 CHANNEL MONITOR — FEATURES

The T-BERD T1 Channel Monitor Option attaches to the T-BERD 209A/211 to provide DS0 channel monitoring from a DS1 access point. The T-BERD T1 Channel Monitor provides the following features and characteristics:

Simultaneously displays all 24 signaling bits which allows a *quick* look at the hook switch and ringing status of a T1 channel or a view of the ongoing signaling of a T1 trunk.

Provides an LED bar graph display of the VF signal level from -54 dBm to +3 dBm in 3 dBm steps.

Drops and inserts the ESF datalink which permits monitoring or testing of the ESF datalink from an external test set.

Drops the SLC-96 datalink, which permits monitoring of the SLC-96 datalink from an external test set.

Supplies the selected VF channel to an external VF test set via the VF OUT 600 OHMS jack.

Establishes ISDN compatibility by dropping one of the 24 channels (64 kb/s).

4.2 T1 CHANNEL MONITOR — CONNECTION TO T-BERD 209A/211

The T-BERD T1 Channel Monitor attaches to the T-BERD 209A/211 by connecting the coiled cable from the T-BERD T1 Channel Monitor to the T-BERD 209A/211 15-pin D connector (see Figure 4-1). The cable provides power and the T1 signal to the T-BERD T1 Channel Monitor.

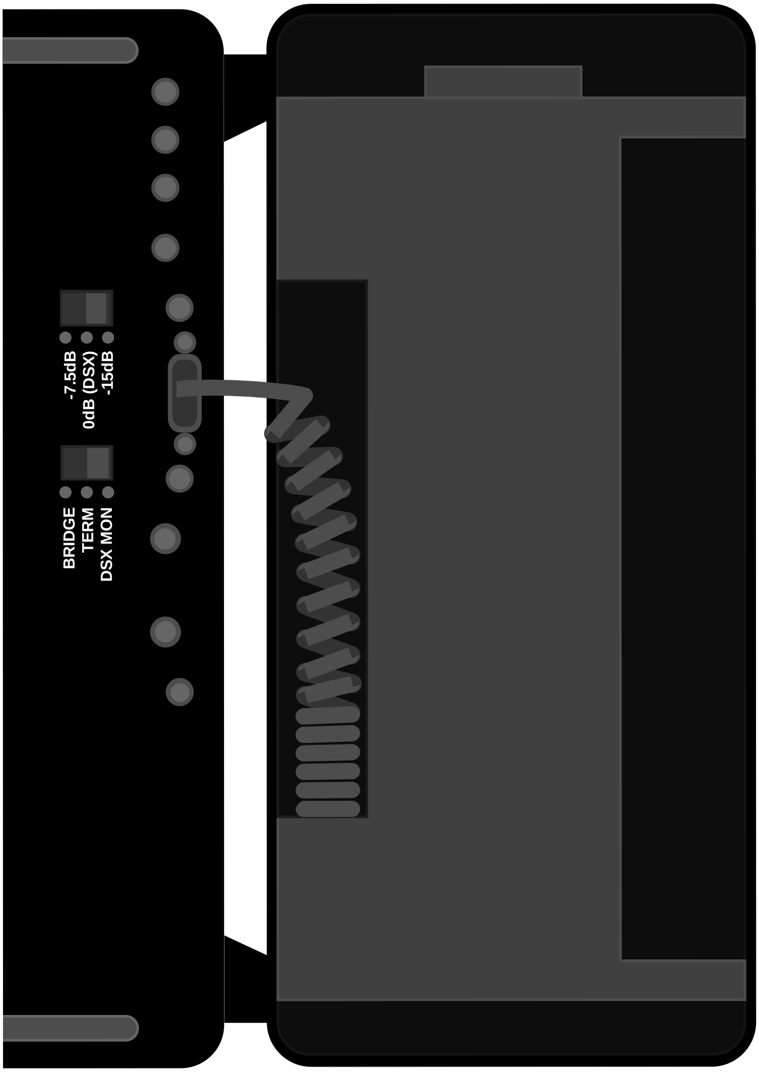


Figure 4-1
Connecting the T-BERD T1 Channel Monitor to the T-BERD 209A/211

4.3 T1 CHANNEL MONITOR — TEST SETUP

The following T-BERD T1 Channel Monitor controls, indicators, and connections (see Figure 4-2) are described in the order that you would normally use them to drop and monitor the channel signaling, VF signal and level, data bits, ESF or SLC datalink, and DS0 channel.

FRAME FORMAT Switch 1

This multiposition switch sets the framing format to match the T1 circuit under test. The five framing formats and associated LEDs are ESF, SLC, D3/D4, D2, and D1D. The framing format must match the format set on the T-BERD 209A/211. D3/D4 framing is the default setting at power-up.

Frame Sync Loss LED

This red LED illuminates when the T-BERD 209A/211 is not synchronized to the received framing format.

CHANNEL SELECT Switch 2

This switch selects the DS0 channel to be monitored on the T1 circuit. The channel number is displayed in a two-digit readout located next to the switch. Channel 24 is the default setting at power-up.

SIGNALING Display 3

This 4 x 24 LED array shows the channel signaling status for each of the 24 channels in the T1 signal. When ESF framing is selected, the entire array (rows A-D) is multiplexed and updated at the ESF signaling rate (333 times per second). In the other framing formats, only rows A and B are updated. Table 4-1 shows the channel timeslot assignments for each of the T1 framing formats.

NOTE: The SIGNALING display is blank during the absence or loss of frame synchronization.

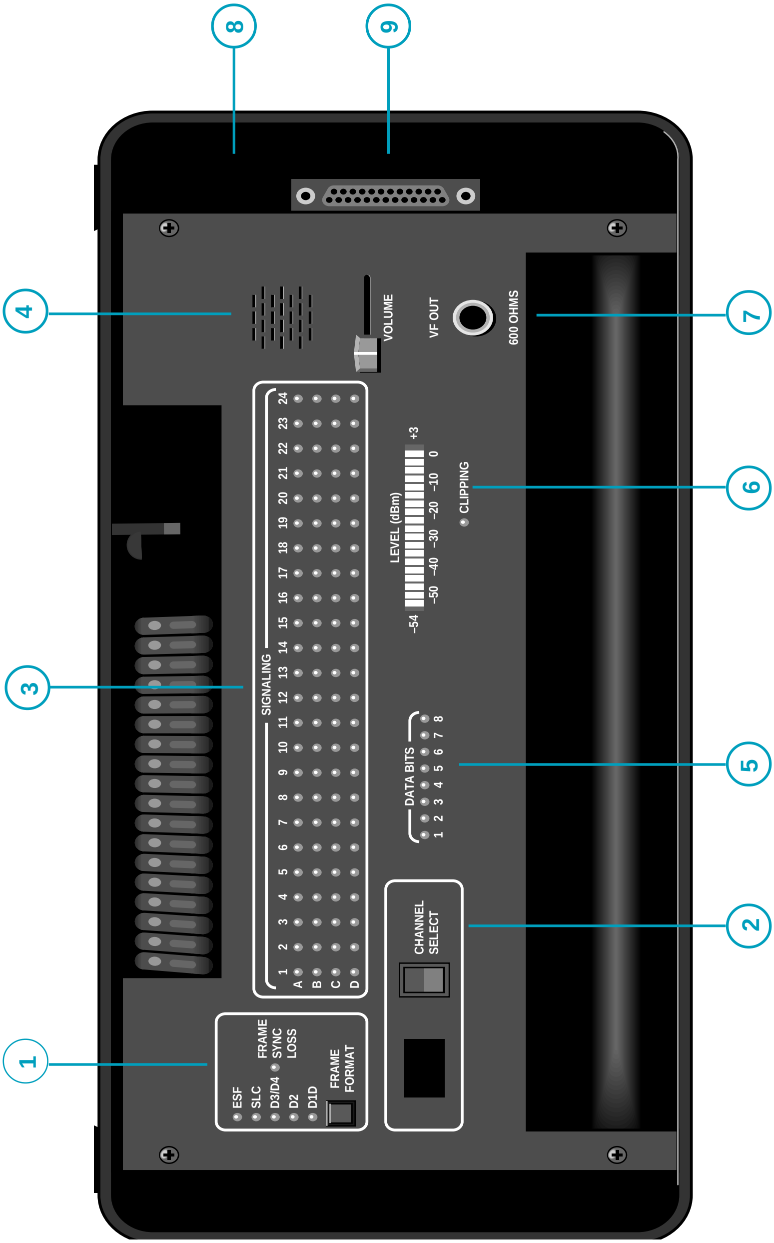


Figure 4-2
T-BERD T1 Channel Monitor Front Panel

Speaker and VOLUME Control 4

The built-in speaker allows you to hear the decoded audio output of the voice frequency signal. The **VOLUME** switch below the speaker controls the volume level.

Data Bit LEDs 5

The eight LEDs indicate the status of the individual data bits for the selected channel.

NOTE: The Data Bit LEDs are blank during the absence or loss of frame synchronization.

Table 4-1
Channel Timeslot Assignments

T1 Timeslot	D1D Channel Number	D2 Channel Number	D3/D4/ESF Channel Number	SLC Channel Number
1	1	12	1	1
2	13	13	2	13
3	2	1	3	2
4	14	17	4	14
5	3	5	5	3
6	15	21	6	15
7	4	9	7	4
8	16	15	8	16
9	5	3	9	5
10	17	19	10	17
11	6	7	11	6
12	18	23	12	18
13	7	11	13	7
14	19	14	14	19
15	8	2	15	8
16	20	18	16	20
17	9	6	17	9
18	21	22	18	21
19	10	10	19	10
20	22	16	20	22
21	11	4	21	11
22	23	20	22	23
23	12	8	23	12
24	24	24	24	24

LEVEL (dBm) Display 6

This 20-segment bar graph displays the average signal level of the currently selected VF channel. Each segment represents 3 dB in amplitude. The more segments that illuminate, the greater the signal level.

Clipping LED

This LED illuminates when either the maximum positive or negative digital VF signal is received (while the +3 dB bar graph segment is illuminated). When the Clipping LED flashes during normal conversation, it signals that the gain at the source may be too high.

VF OUT 600 OHMS Jack 7

This 600-ohm output jack allows the currently selected VF channel to be output to an external VF test set for in-depth analysis.

DATALINK/CHANNEL Switch 8

This switch controls the output of the RS-232 connector. It enables either the 4 kb/s ESF datalink, SLC-96 datalink, or DS0 channel data to be output through the connector as follows:

- To output the SLC-96 datalink, set the **FRAMING** switch to SLC and the **DATALINK/CHANNEL** switch to DATALINK.
- To output the ESF datalink, set the **FRAMING** switch to ESF and the **DATALINK/CHANNEL** switch to DATALINK.
- To output the selected DS0 channel, set the **FRAMING** switch to the desired framing format and the **DATALINK/CHANNEL** switch to CHANNEL.

In ESF framing format, data can be inserted on the datalink no matter what the **DATALINK/CHANNEL** switch is set to, or which channel is selected.

RS-232 Connector 9

The RS-232 connector enables terminal equipment (e.g., protocol analyzer) to be connected to the T-BERD T1 Channel Monitor to provide access to the datalink or a DS0 channel for further analysis.

The RS-232 connector is configured as a DCE and transmits data synchronously. A transmit clock is supplied with the transmit data, and a receive clock synchronizes the received data to be inserted into the datalink. Refer to Section 9 for the RS-232 connector pin assignments.

T-BERD REPEATER POWER SUPPLY OPTION

4.4 REPEATER POWER SUPPLY — FEATURES

The T-BERD Repeater Power Supply Option (see Figure 4-3) attaches to the T-BERD 209A/211 to provide power to a T1 span and access to the T1 circuit for testing. The T-BERD Repeater Power Supply Option offers the following features and capabilities:

Provides power and a T1 signal interface, which enable testing and verification of newly installed T-Carrier circuits before span power is applied at the central office.

Measures the voltage across the circuit to determine whether the applied voltage correlates with the expected voltage dictated by the circuit design.

Measures span current to verify proper powering of span repeaters.

Uses a Loopback Connector to provide a hard loop at the central office, which allows a single technician to sectionalize and isolate T1 span line faults.

Complies with IEEE STD-743 and UL1459, Telephone Equipment, 1st and 2nd Editions, as tested and listed by a National Recognized Testing Laboratory (NRTL).

4.5 REPEATER POWER SUPPLY — WARNINGS AND CAUTIONS

The following safety precautions and features must be observed before and during all phases of T-BERD Repeater Power Supply operation. Failure to comply with these and other specific warnings contained 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.

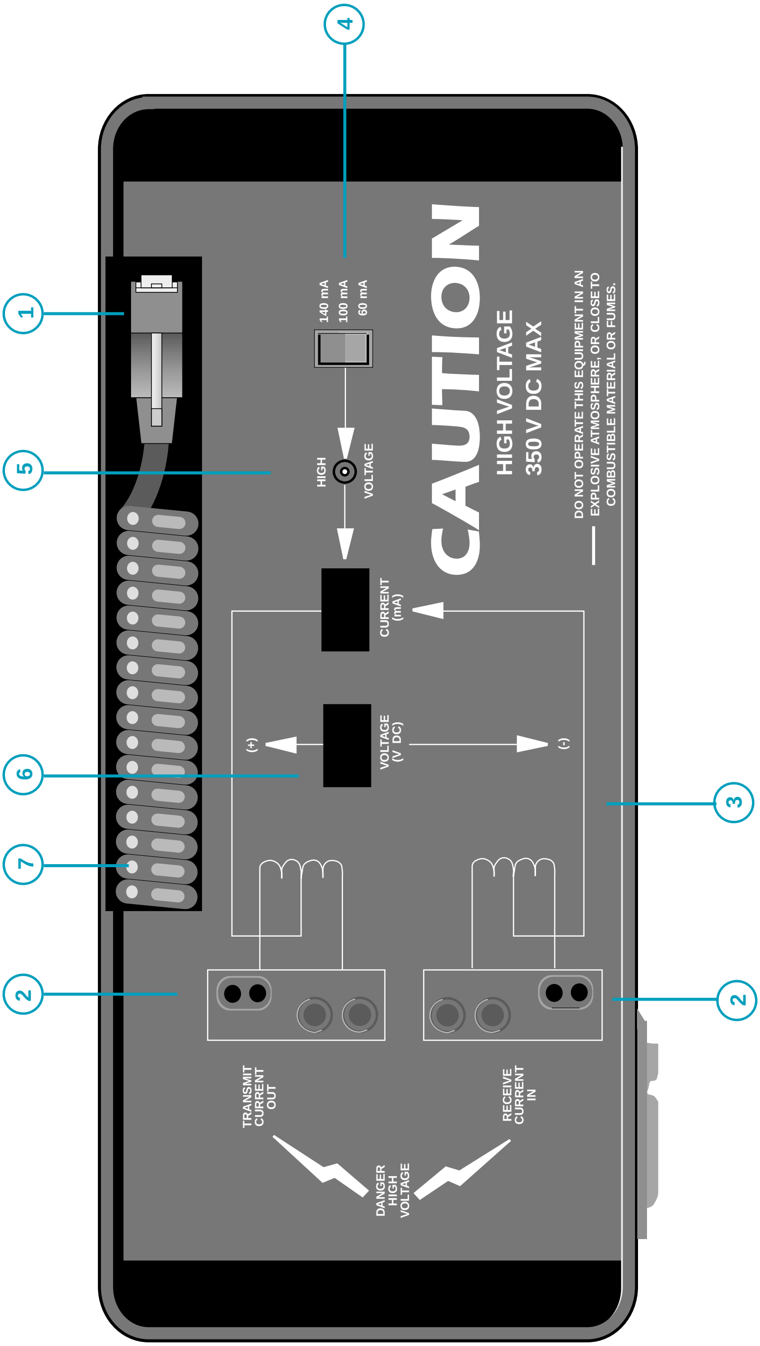


Figure 4-3
T-BERD Repeater Power Supply Front Panel

KEEP AWAY FROM LIVE VOLTAGES

Do not touch the output jacks when the High Voltage LED is illuminated. The output voltage varies up to 260 VDC, depending on the number of repeaters powered, the span length, and the wire gauge. When the circuit is disconnected, the potential across the terminals can be as much as 350 VDC.

ALWAYS USE THE CORRECT AC POWER SUPPLY

To prevent internal damage to the T-BERD Repeater Power Supply, use only 120 VAC.

AVOID OPERATING IF YOU ARE IN A HIGH RISK GROUP

People with cardiac conditions are at an increased risk of fatal injury when operating this instrument. Pregnant women should avoid using it, and it should be kept out of the reach of children.

DO NOT OPERATE IN HIGH HUMIDITY AREAS

Do not use the T-BERD Repeater Power Supply in areas of high moisture or condensation.

BE AWARE OF THE SAFETY FEATURES

You should be aware of the following safety features before beginning operation.

- The T-BERD Repeater Power Supply voltage is not relative to ground and does not seek ground through the technician in case of accidental contact across a pair of leads.
- The voltage output is not sent to the office side of the line, since it is only provided to the tip side of the connections at the distribution frame lightning protection block.
- When the output current is below 40 mA, a low-current sensing circuit pulses the output signal on for 10 ms and off for 800 ms. When the output current goes above 40 mA, the low-current sensing circuit continues to pulse for five seconds and then engages on continuously.

- The red High Voltage LED illuminates when the unit is turned on and voltage is applied to the transmit and receive connectors.
- A bright yellow caution label on the front panel reads:

CAUTION **HIGH VOLTAGE** **350 VDC MAX** **DO NOT OPERATE THIS EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE, OR CLOSE TO COMBUSTIBLE MATERIAL OR FUMES**

- Another bright yellow caution label on the front panel reads:

DANGER **HIGH** **VOLTAGE**

4.6 REPEATER POWER SUPPLY — T-BERD 209A/211 CONNECTION 1

The Mainframe Interconnect Cable (coiled cable with 15-pin D connector) provides the T1 signal interface to the T-BERD 209A/211 via the 15-pin D connector on the T-BERD 209A/211 front panel.

The Mainframe Interconnect Cable can also be used to create a hard loopback of the received T1 test pattern at the T-BERD Repeater Power Supply. This hard loopback is established by attaching the Loopback Connector to the Mainframe Interconnect Cable 15-pin D connector. Establishing the hard loopback at the T-BERD Repeater Power Supply enables a technician to take the T-BERD 209A/211 to mid-span for troubleshooting. The signal level at the distribution frame should be -15 dBdsx or greater to ensure proper operation when using the Loopback Connector.

4.7 REPEATER POWER SUPPLY — T1 SPAN TESTING (2)

Connect the T-BERD Repeater Power Supply to the T1 span at the central office distribution frame with a W4CJ test access cord for 303-type protection blocks, or a W4BR test access cord for 302- and 308-type protection blocks.

There are two sets of TRANSMIT CURRENT OUT and RECEIVE CURRENT IN jacks. One set is compatible with a dual WECO 310 jack, and the other set is compatible with a dual bantam jack. The TIP and RING signals are provided on the tips of the dual connectors, and the shields of the jacks are not connected. These dual jacks are compatible with cables used in the central office to access signals at the distribution frame lightning protectors.

4.8 REPEATER POWER SUPPLY — AC POWER CONNECTION (3)

A power cord is supplied with the T-BERD Repeater Power Supply to connect it to a 120 VAC, 60 Hz power outlet. The AC power receptacle is located on the bottom side of the cover. The **AC Power** switch and fuse compartment are located next to the receptacle.

NOTE: If power is applied to the T-BERD Repeater Power Supply, the High Voltage LED illuminates.

4.9 REPEATER POWER SUPPLY — CURRENT SETTING (4)

Press the **60 mA 100 mA 140 mA** switch to select the desired simplex current for the T1 span. The setting is determined by the user, and is based on the repeater type used in the span.

4.10 REPEATER POWER SUPPLY — APPLYING POWER

Press the **AC Power** switch to apply power to the T-BERD Repeater Power Supply. The following indicators illuminate:

High Voltage LED 5 — This red LED indicates that power is being applied to the unit and that high voltage is present at the transmit and receive pairs. The LED illuminates continuously when the current loop is established. The LED flashes to indicate the current loop is not established and the output current is being pulsed.

CURRENT (mA) Display 6 — This three-digit readout shows the current being drawn by the circuit. It has a range of 0 mA to 399 mA. The readout is only valid when the High Voltage LED is illuminated continuously.

VOLTAGE (VDC) Display 7 — This three-digit readout shows the voltage applied to the circuit. It has a range of 0 VDC to 399 VDC. The readout is only valid when the High Voltage LED is illuminated continuously.

If these indicators do not illuminate, remove power and check the fuse in the AC power receptacle. If the fuse is open, replace it with a 1 A fast-blow fuse (1 A AGC 3). Refer to the *T-BERD Repeater Power Supply Operating Manual* (ML11251) to replace the fuse.

To determine if the measured voltage is correct, calculate the expected span line voltage drop using the formula: Total V_{drop} = (# repeaters X Vrpt) + (V_{cable} X kft of cable). The V_{rpt} and V_{cable} can be found in Tables 4-2 and 4-3, respectively.

- If the transmit and receive connections are reversed, the measured voltage will be much less than the expected voltage. When current is reversed, V_{rpt} is typically between 1 and 2 volts.

- Allow for any extra voltage drop required for office repeaters and NIUs. The typical voltage drop for transmission devices is 8 to 16 volts each.

- Allow for additional CSU voltage drops of 14 to 24 volts.

Table 4-2
Typical Repeater Voltage Drop

	Voltage Drop/Repeater (V_{rpt})		
Repeater Type	**60 mA**	**100 mA**	**140 mA**
238 A/B	7.0	7.1	7.2
239 A/B	7.6	8.2	8.7
239E	8.4	9.6	10.7

Table 4-3
Typical Cable Gauge Voltage Drop

	Voltage Drop/kft (V_{cable})		
Cable Gauge	**60 mA**	**100 mA**	**140 mA**
26	2.7	4.5	6.3
24	1.7	2.8	4.0
22	1.1	1.8	2.6
19	0.5	0.8	1.2

T-BERD DLC ANALYZER OPTION

4.11 DLC ANALYZER OPTION — FEATURES

The T-BERD DLC Analyzer Option (see Figure 4-4) attaches to the T-BERD 209A/211 to provide the ability to test Digital Loop Carrier (DLC) systems during circuit installation, acceptance testing, and troubleshooting applications. The T-BERD DLC Analyzer Option provides the following features and capabilities:

Provides drop and insert capability for DLC datalink and T1 channel information.

Displays DLC datalink alarm status on the front panel.

Generates DLC datalink alarms to test terminal alarm circuits.

Initiates and monitors automated maintenance test procedures.

Establishes far-end loopbacks over a given shelf or protection line. The selected shelf is automatically switched to the protection line when placed in loopback.

Initiates a switch to protection line for a given shelf.

Generates on-hook, off-hook, and ringing conditions using dedicated front-panel switches.

Monitors A, B, C, and D channel signaling bits on all channels or timeslots simultaneously.

Monitors SLC-96 Mode 2 timeslot channel assignments from the front panel.

Provides VF outputs that enable DS0 channels or timeslots to be analyzed by an external TIMS test set or listened to over the built-in speaker.

Measures VF signal level and frequency for an individual DS0 channel or timeslot.

Inserts tones (404 Hz, 1004 Hz, and 2804 Hz) into an individual DS0 channel or timeslot.

Decodes DTMF dialing sequences and the dialed number of the received signal is displayed.

Provides 2-wire VF input/output that enables two-way testing over a selected DS0 channel or timeslot.

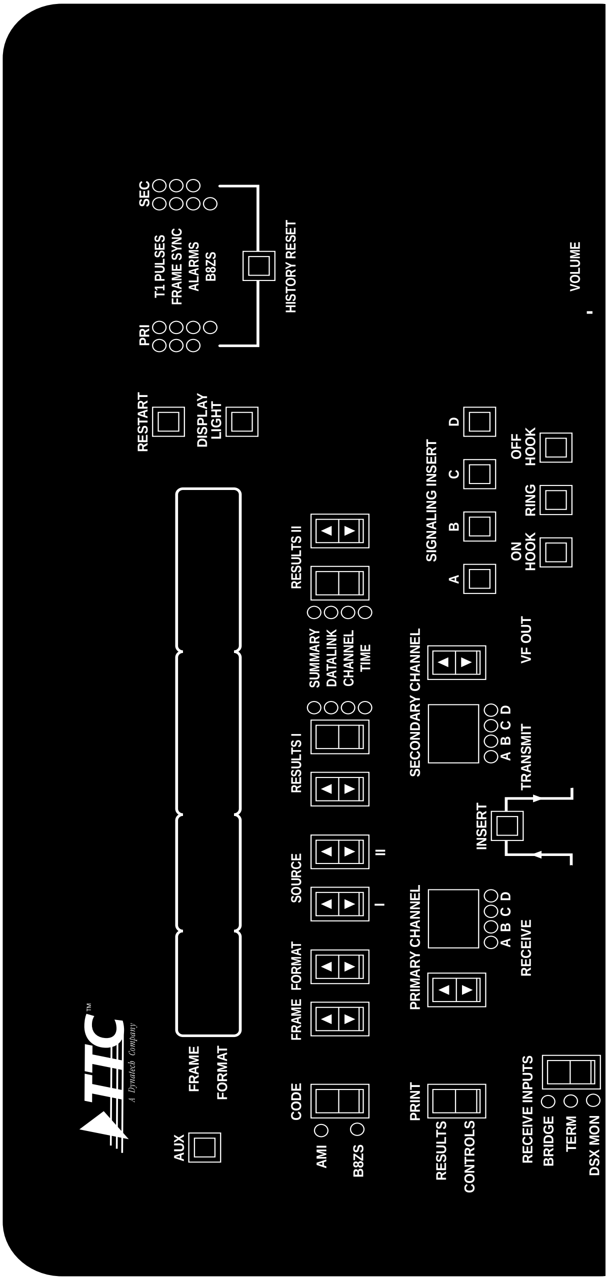


Figure 4-4
T-BERD DLC Analyzer Option Front Panel

4.12 DLC ANALYZER OPTION — CONNECTING TO T-BERD 209A/211

The T-BERD DLC Analyzer Option gets power from the T-BERD 209A/211 via a coiled cable that attaches to the 15-pin D connector or to an external power supply (Model 12445). Connect the coiled cable after the T-BERD 209A/211 is powered up.

4.13 DLC ANALYZER OPTION — TEST SETUP

The following T-BERD DLC Analyzer Option controls and indicators (see Figure 4-5) are described in the order that they are normally used to set up for T1 circuit testing at a DSX-1 patch panel.

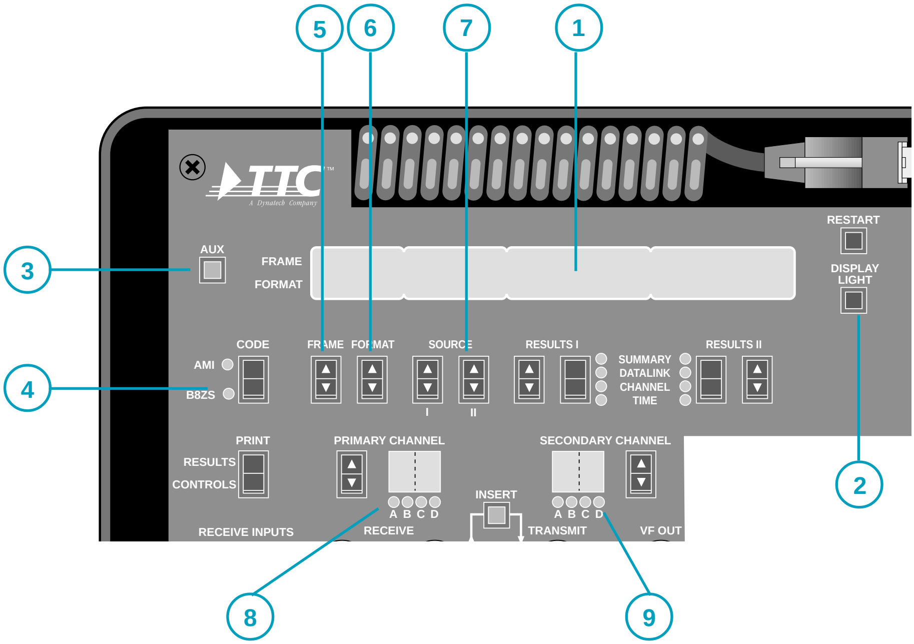


Figure 4-5
Test Setup Controls and Indicators

Front-Panel Display 1

Operating modes, test results, test patterns, and auxiliary functions are displayed in the four window, two-line, liquid crystal display (LCD).

The first window (from left to right) indicates the current framing mode (FRAME window) and format (FORMAT window) of the instrument. The displayed information is selected by pressing the **FRAME** and **FORMAT** switches.

The second window indicates the current source test signal for the selected framing and format modes. The SOURCE I line is controlled with the **SOURCE I** switch, and the SOURCE II line is controlled with the **SOURCE II** switch.

The third window is identified as the RESULTS I window, and the fourth window is identified as the RESULTS II window. The RESULTS I window is controlled by the two **RESULTS I** switches. The RESULTS II window is controlled by the two **RESULTS II** switches. These windows display the test results, auxiliary function selections, and status messages.

DISPLAY LIGHT Switch 2

Press this switch to backlight the display in low light conditions. Press the switch once to backlight the display for 30 seconds. Press the switch again during the 30 seconds and the display remains illuminated. Press the switch a third time to turn the backlighting off.

AUX Switch 3

Press this switch to access the auxiliary functions. The switch LED illuminates when the auxiliary functions appear in the display. Auxiliary functions allow access to parameters that are not frequently used and do not have dedicated front-panel switches. When the **AUX** switch is pressed a second time, the switch LED goes out and the display returns to its normal operating display. Refer to Section 5 for detailed information on the following auxiliary functions.

CHANNEL/VF DROP	T1 Source for Channel VF Drop
CHANNEL/CHANNEL SCROLL	Channel Scroll
CHANNEL/TRUNK TYPE	Channel Trunk Type
TRANSMIT/LBO	T1 Transmitter Line Build-Out
TIME/SET TIME	Set Time of Day
TIME/SET DATE	Set Date

CODE Switch (4)

Press this two-position switch to set the transmitted coding for either AMI-encoded data or B8ZS clear-channel encoded data. The LEDs adjacent to the switch illuminate to indicate the current selection. The **CODE** switch only affects the transmitted output; B8ZS decoding is performed automatically at the receiver.

Switch Configurations

The **FRAME**, **FORMAT**, **SOURCE I**, and **SOURCE II** switches are interrelated. They configure the T-BERD DLC Analyzer Option to the circuit framing mode and select a signal for insertion into either the selected DS0 channel or DLC datalink.

Table 4-4 lists the available switch selections to test a Mode 1 SLC-96 (SLC-M1) circuit from the Shelf A datalink.

Table 4-4
Mode 1 SLC-96 Datalink Source Test Signals

Switch	Configuration			
FRAME	SLC-M1			
FORMAT	DATLINK			
SOURCE I	MAJOR	FE LOOP	SW PROT	MINOR, PWR/MISC, MAINT, and IDLE
SOURCE II	SHELF A SHELF B SHELF C SHELF D NO SHELF	SHELF A SHELF B SHELF C SHELF D PROTECT	SHELF A SHELF B SHELF C SHELF D	

Table 4-5 lists the available switch selections to test a Mode 2 SLC-96 (SLC-M2) circuit from either the Shelf A or C datalink.

Table 4-5
Mode 2 SLC-96 Datalink Test Signals

Switch	Configuration			
FRAME	SLC-M2			
FORMAT	DATLINK			
SOURCE I	MAJOR	FE LOOP	SW PROT	MINOR, PWR/MISC, and IDLE
SOURCE II	SHELF A SHELF B SHELF C SHELF D NO SHELF	SHELF A SHELF C PROTECT	SHELF A SHELF C	

Table 4-6 lists the available tones and levels, as well as a 2-wire interface, that can be used to test a DS0 channel. The switches and selections are described in the following sections.

Table 4-6
DS0 Channel Test Signals

Switch	Configuration			
FRAME	SLC-M1, SLC-M2, T1 D1D, T1 D4, and T1 ESF			
FORMAT	CHANNEL			
SOURCE I	404 Hz	1004 Hz	2804 Hz	VF INTF
SOURCE II	-16 dBm -10 dBm -3 dBm 0 dBm +3 dBm	-16 dBm -10 dBm -3 dBm 0 dBm +3 dBm	-16 dBm -10 dBm -3 dBm 0 dBm +3 dBm	

FRAME Switch 5

Press this switch to select the transmitted framing mode and configure both receivers for the expected framing mode. The framing mode appears in the FRAME window. Holding the switch automatically scrolls the framing modes in the window. Releasing the switch activates the indicated framing mode and initiates a test restart. The framing modes include:

SLC-M1 — Configures the T-BERD DLC Analyzer Option to transmit and receive a SLC96 (Mode 1) signal.

SLC-M2 — Configures the T-BERD DLC Analyzer Option to transmit and receive a SLC96 (Mode 2) signal.

T1 D1D — Configures the T-BERD DLC Analyzer Option to transmit and receive a D1D framed T1 signal.

T1 D4 — Configures the T-BERD DLC Analyzer Option to transmit and receive a D4 framed T1 signal.

T1 ESF — Configures the T-BERD DLC Analyzer Option to transmit and receive a ESF framed T1 signal.

AUTO — Automatically configures the T-BERD DLC Analyzer Option to a received SLC-96 (Mode 1), T1 D1D, or T1 ESF framed signal. When the T-BERD DLC Analyzer Option searches for the framing format, the message scan… appears in the FORMAT window. When the framing is recognized, the framing mode name appears in the FRAME window in lowercase characters.

FORMAT Switch 6

This switch selects the bandwidth that the source test signal (see **SOURCE** switches) is inserted into when the **INSERT** switch is pressed. The source test signal is inserted into one of the following bandwidths:

CHANNEL — Enables access to the DS0 channels or timeslots. An internally generated tone or externally generated signal, along with channel signaling can be inserted into the selected DS0 channel or timeslot. The **SIGNALING INSERT** switches are active only in this format.

DATLINK — Enables access to the SLC-96 Mode 1 (Shelf A) or Mode 2 (Shelf A or C) datalink. This allows alarm, maintenance, far-end loop, switch to protection line, and idle messages to be sent to the RT, digital switch, or COT. DATLINK is only available in the SLC-M1 and SLC-M2 framing modes.

Source Test Signal Switches 7

The **SOURCE I** and **SOURCE II** switches work in conjunction with the **FRAME** and **FORMAT** switches to select source test signals (tones, levels, alarms, or circuit requests) that can be inserted into either a DS0 channel/timeslot or the DLC datalink when the **INSERT** switch is illuminated. The selected source test signal is inserted into the T1 signal that passes through the T-BERD DLC Analyzer Option from the SECONDARY RECEIVE input to the TRANSMIT output. The inserted source test signal overwrites the information in the selected DS0 channel or datalink field.

SOURCE I Switch

Press this switch to scroll through and select the source test signals displayed in the SOURCE I line. The source test signals are dependent on the selected format (CHANNEL or DATLINK) and framing mode.

When the **FORMAT** switch is set to CHANNEL, the T-BERD DLC Analyzer Option can be configured to insert one of three tones or the input from a 2-wire interface into the selected DS0 channel or timeslot along with signaling when the **INSERT** switch LED is illuminated. The DS0 channel or timeslot is selected with the **SECONDARY CHANNEL** switch. The source test signals include:

> **404 Hz, 1004 Hz, or 2804 Hz —** Select one of the internally generated tones to insert on the selected DS0 channel or timeslot. The output level is selected with the SOURCE II switch (-16 dBm, -10 dBm, -3 dBm, 0 dBm, or +3 dBm).
>
> **VF INTF —** Select the external 2-wire interface (two posts next to the RS-232 connector) to insert an externally generated signal (e.g., voice, tones, etc.) in the selected DS0 channel or timeslot.

When the **FORMAT** switch is set to DATLINK, the T-BERD DLC Analyzer Option can be configured to insert alarms, far-end loop, switch to protection line, maintenance test, or idle messages into the DLC datalink when the **INSERT** switch LED is illuminated. When DATLINK is selected, the DS0 channel data and signaling pass through the T-BERD DLC Analyzer Option from the SECONDARY RECEIVE input. To test from the datalink, the T-BERD DLC Analyzer Option must be connected to either Shelf A in a Mode 1 SLC-96 circuit or Shelf A or C in a Mode 2 SLC-96 circuit. If the T-BERD DLC Analyzer Option has frame synchronization but no datalink synchronization, all datalink information is passed through the T-BERD DLC Analyzer Option until datalink synchronization is achieved. The source test signals include:

> **MAJOR —** Sends a major alarm with or without an accompanying shelf alarm. Select Shelf A, B, C, D, or No Shelf with the **SOURCE II** switch.

MINOR — Sends the minor alarm message.

PWR/MISC — Sends the power/miscellaneous alarm message.

FE LOOP — Sends the far-end loop command to loop back the selected shelf. A minor alarm message is also transmitted. Select Shelf A, B, C, D, or Protection Line with the **SOURCE II** switch. The selected shelf is automatically switched to the protection line to prevent customer interruption. If the line does not switch to the protection line, the loopback does not occur.

NOTE: The protection line must be idle (no other shelf on the protection line) to allow you to loop back the selected shelf.

SW PROT — Sends the switch to protection line command to switch the selected shelf to the protection line. Select Shelf A, B, C, or D with the SOURCE II switch. If the switch to the protection line is successful, the message *P/S SHELF x ON PROT* appears in the SUMMARY and DATALINK categories.

If the switch to protect fails, message *SW PROT FAILED* flashes in the SUMMARY category under the following conditions:

- The selected shelf fails to switch to the protection line.
- Another line is already on the protection line when the command is sent. The T-BERD DLC Analyzer Option waits until the protection line is cleared to switch the selected shelf to the protection line.

MAINT — Sends the automated maintenance test sequence to test the RT channel test unit (CTU). This command emulates the CO equipment performing an automated maintenance test. Select the DS0 channel to be tested with the **SECONDARY CHANNEL** switch. When performing the maintenance test, the T-BERD DLC Analyzer Option can only select channels 1 to 24 on Shelf A (i.e., the switch position can be set up to 96, but the channels automatically mask to the corresponding slot on Shelf A).

The T-BERD DLC Analyzer Option displays progress messages in lowercase in the SOURCE II display. These progress messages include, *hook/seize, proceed, succeed*, *test alarm* (means no response from the RT), *failed*, (means test alarm from RT). The *uppercase* messages are the expected responses from the RT that appear in the SUMMARY and DATALINK categories:

- When the *hook/seize* message appears, the T-BERD DLC Analyzer Option is waiting for the RT to respond with the *P hook/seize* message.

- When the *proceed* message appears, the T-BERD DLC Analyzer Option is waiting for the RT to respond with the *P proceed* message.
- When the *succeed* message appears, the maintenance test sequence is successful and the *P HOOK/SEIZE* and *P PROCEED* messages appear.
- If the *abort* message appears and the RT only responds with a *P TEST ALARM* message, the RT may not have been able to seize the bypass pair.
- If the *abort* message appears and the RT responds with either the *P HOOK/SEIZE* or *PROCEED* message, an indeterminate problem occurred.
- If the *test alarm* message appears and the RT does not respond within the required time, either the subscriber channel unit or the CTU may not be responding to the maintenance test sequence.
- If the *test alarm* message appears and the RT only responds with the *P HOOK/SEIZE* message, the CTU may not be responding to the maintenance test sequence.

IDLE — Sends the idle message on the datalink. Alarms are not indicated, shelves are not switched to the protection line, and the maintenance test does not continue. This message also masks any of these functions being performed by the system.

SOURCE II Switch

Press this switch to scroll through and select the source test signals displayed in the SOURCE II line. The source test signals are dependent on the SOURCE I selection. In some cases a SOURCE I selection does not have a SOURCE II selection and the **SOURCE II** switch is disabled.

When the **FORMAT** switch is set to CHANNEL, the **SOURCE II** switch selects the output level for the selected tone shown in the SOURCE I line. The source test signal levels include:

-16 dBm, -10 dBm, -3 dBm, 0 dBm, and +3 dBm — Select the desired output level for the selected tone.

When the FORMAT switch is set to DATLINK, the **SOURCE II** switch selects the shelf or line that an alarm, far-end loop, or switch to protection line message is assigned.

SHELF A, SHELF B, SHELF C, SHELF D, or NO SHELF — When MAJOR alarm is selected with the **SOURCE I** switch, select the desired shelf or no shelf to identify the major alarm.

SHELF A, SHELF B, SHELF C, SHELF D, or PROTECT — When FE LOOP is selected with the **SOURCE I** switch, select the desired shelf or protection line to loopback. When a shelf is looped back, the shelf automatically switches to the protection line. Only SHELF A, SHELF C, and PROTECT are selectable in the SLC-M2 mode.

SHELF A, SHELF B, SHELF C, or SHELF D — When SW PROT is selected with the **SOURCE I** switch, select the shelf that is going to be switched to the protection line. Only SHELF A and SHELF C are selectable in the SLC-M2 mode.

MAINT Messages (Mode 1 only) — During the automated maintenance test, the maintenance test sequence messages appear automatically in lowercase characters in the SOURCE II line. Refer to the SOURCE 1 MAINT command for a description of the displayed messages. The messages are not user selectable.

PRIMARY CHANNEL Switch 8

Press this switch to select the DS0 channel or timeslot to be dropped from the T1 signal received at the PRIMARY RECEIVE jack. This enables the T-BERD DLC Analyzer Option to monitor the selected DS0 channel or timeslot through the internal speaker, measure the VF level and frequency, and monitor the channel data bits and DTMF dialed telephone numbers. Changing the channel number clears the CHANNEL category primary results.

For all of the framing modes, except SLC-M2, the number displayed in the Primary Channel display indicates the selected channel from 1 to 96. In SLC-M2 framing, the Primary Channel display indicates the selected timeslot from 1 to 48. A double dash (— —) indicates that a channel or timeslot is not selected. Table 4-7 identifies the shelves and the associated channel numbers for a typical SLC-96 channel numbering scheme.

Table 4-7
SLC-96 Channel Numbering Scheme

Shelf	Plug-In Circuit Channel Numbers											
D	73|74	75|76	77|78	79|80	81|82	83|84	85|86	87|88	89*|90	91*|92	93*|94	95*|96
C	49|50	51|52	53|54	55|56	57|58	59|60	61|62	63|64	65*|66	67*|68	69*|70	71*|72
B	25|26	27|28	29|30	31|32	33|34	35|36	37|38	39|40	41*|42	43*|44	45*|46	47*|48
A	1|2	3|4	5|6	7|8	9|10	11|12	13|14	15|16	17*|18	19*|20	21*|22	23*|24

* In Mode 2 operation, the asterisk indicates the channels that allow you to use single circuit plug-ins.

The **PRIMARY CHANNEL** switch and **SECONDARY CHANNEL** switch can scroll channels or timeslots separately or simultaneously through the CHANNEL/CHANNEL SCROLL auxiliary function. Set the CHANNEL/VF DROP auxiliary function to either PRIMARY or BOTH to analyze the selected primary T1 signal DS0 channel or timeslot.

Primary Channel ABCD Signaling LEDs

The four LEDs indicate the status of the signaling bits for the selected channel received on the PRIMARY RECEIVE jack.

SECONDARY CHANNEL Switch 9

This switch performs three functions:

- Selects the DS0 channel or timeslot to be dropped from the secondary T1 signal received at the SECONDARY RECEIVE jack. This enables the T-BERD DLC Analyzer Option to monitor the selected DS0 channel or timeslot through the internal speaker, measure the VF level and frequency, and monitor the channel data bits and DTMF dialed telephone numbers. Changing the channel number clears the CHANNEL category secondary results.

- Selects the DS0 channel or timeslot that a source test signal and channel signaling bits can be inserted into when the **INSERT** switch is illuminated and the **FORMAT** switch is set to CHANNEL.

- Selects the Shelf A DS0 channel or timeslot that is placed on the bypass pair when the maintenance test sequence is performed from the T-BERD DLC Analyzer Option when the **INSERT** switch is illuminated and the FORMAT switch is set to DATLINK.

For all of the framing modes, except SLC-M2, the number displayed in the Secondary Channel display indicates the selected channel from 1 to 96. In SLC-M2 framing, the Secondary Channel display indicates the selected timeslot from 1 to 48. A double dash (— —) indicates that a channel or timeslot is not selected. Select the desired channel or timeslot before plugging into a shelf. Table 4-8 identifies the shelves and the associated channel numbers for a typical SLC-96 channel numbering scheme.

The **PRIMARY CHANNEL** switch and **SECONDARY CHANNEL** switch can scroll channels or timeslots separately or simultaneously through the CHANNEL/CHANNEL SCROLL auxiliary function. Set the CHANNEL/VF DROP auxiliary function to either SECONDARY or BOTH to analyze the selected secondary T1 signal DS0 channel or timeslot.

Secondary Channel ABCD Signaling LEDs

The four LEDs indicate the status of the signaling bits for the selected channel received on the SECONDARY CHANNEL jack.

4.14 DLC ANALYZER OPTION — CIRCUIT CONNECTIONS

The front-panel connections (see Figure 4-6) allow the T-BERD DLC Analyzer Option to receive two T1 signals simultaneously and transmit one T1 signal. Additional connections allow for VF inputs and outputs.

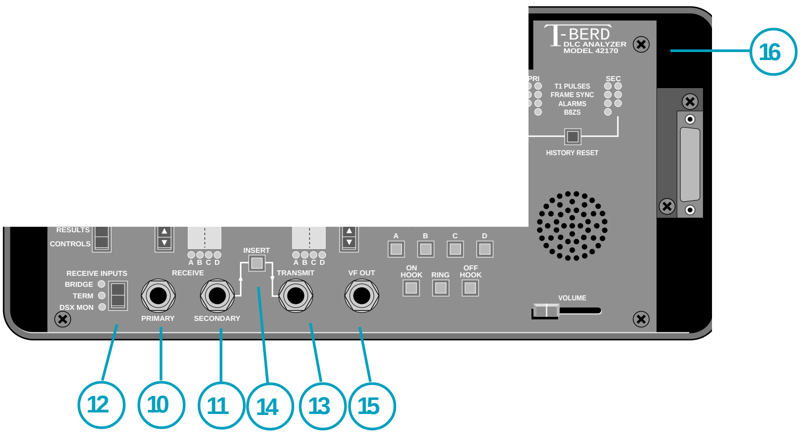


Figure 4-6
T-BERD DLC Analyzer Option Circuit Connections

PRIMARY RECEIVE Jack 10

This WECO 310 jack accepts a T1 signal to be monitored and analyzed by the T-BERD DLC Analyzer Option. The input impedance and signal conditioning are controlled through the **RECEIVE INPUT** switch.

SECONDARY RECEIVE Jack 11

This WECO 310 jack accepts a T1 signal to be monitored and analyzed by the T-BERD DLC Analyzer Option. The received T1 signal is also retransmitted through the TRANSMIT jack, which enables a source test signal to be inserted into one of the DS0 channels, timeslots, or DLC datalink. The received secondary T1 signal provides recovered timing for the transmitted signal. The input impedance and signal conditioning are controlled through the **RECEIVE INPUT** switch.

RECEIVE INPUT Switch 12

This switch sets the input impedance and signal conditioning for the PRIMARY RECEIVE and SECONDARY RECEIVE jacks. The selections include:

BRIDGE — This setting provides an impedance of greater than 1000 ohms to connect across a terminated line.

TERM — This setting provides an impedance of 100 ohms to terminate a connection.

DSX-MON — This setting provides an impedance of 100 ohms and amplification to monitor a T1 signal from a DSX-1 monitor point.

TRANSMIT Jack 13

This WECO 310 jack provides the T1 output from the T-BERD DLC Analyzer Option. Once frame synchronization is achieved on the received signal, the T-BERD DLC Analyzer Option regenerates framing for the output signal. The status of the signal at the SECONDARY RECEIVE jack determines which of the following outputs is transmitted.

An unaffected T1 signal — This output is transmitted when the **INSERT** switch is not illuminated or when the signal is received but frame synchronization is not achieved.

A T1 signal with a test signal inserted into a DS0 channel or timeslot — This output is transmitted when the **INSERT** switch is illuminated, the CHANNEL format is selected, a T1 signal is present at the SECONDARY RECEIVE jack, and frame syychronization is established. Datalink information is unaffected.

A T1 signal with a datalink signal inserted into the DLC datalink — This output is transmitted when the **INSERT** switch is illuminated, the DATLINK format is selected, a T1 signal is present at the SECONDARY RECEIVE jack, and frame synchronization is established. The DS0 channel or timeslot data and signaling are unaffected.

A framed all ones pattern — This output is transmitted if a signal is not present at the SECONDARY RECEIVE jack. The T-BERD DLC Analyzer Option inserts into the signal if the **INSERT** switch is illuminated.

An unframed all ones (AIS) pattern — This output is transmitted if the signal is lost after having it present at the SECONDARY RECEIVE jack. The T-BERD DLC Analyzer Option does not insert into the signal if the **INSERT** switch is illuminated.

The output level is controlled through the TRANSMIT/LBO auxiliary function. The transmitted output timing is taken from the recovered clock of the SECONDARY RECEIVE input, or from an internal clock when the T1 signal is not connected to the SECONDARY RECEIVE input. Before connecting the TRANSMIT output to a shelf, disable the **INSERT** switch (not illuminated) to prevent inadvertent source test signal insertion.

INSERT Switch 14

This switch controls the insertion of the source test signal (channel tones, channel signaling bits, and datalink messages) into the T1 signal transmitted from the TRANSMIT output jack. When the switch LED is illuminated, the source test signal is inserted into the transmitted T1 signal. When the switch LED is not illuminated, the inserted source test signal is suspended and the T1 signal passes through the T-BERD DLC Analyzer Option unaffected. Data is inserted only when the T-BERD DLC Analyzer Option has frame synchronization or we are sourcing (i.e., an input signal was never received).

The following conditions cause the **INSERT** switch to flash for three seconds.

- Pressing the **INSERT** switch when it is not illuminated.
- Changing the **FORMAT** switch or FRAME switch selection.
- Changing either the **SOURCE I** or **SOURCE II** switch when the **FORMAT** switch is set to DATLINK.

- Changing the **SECONDARY CHANNEL** switch when the **FORMAT** switch is set to DATLINK and the maintenance test is being performed.

- Changing the **SECONDARY CHANNEL** switch when the **FORMAT** switch is set to CHANNEL.

During the three seconds, the inserted source test signal is temporarily inhibited, the instrument is reconfigured, and the T1 signal from the SECONDARY RECEIVE input is passed on to the TRANSMIT output unaffected. When the **INSERT** switch LED stops flashing and illuminates, the new source test signal is inserted into the T1 signal.

VF OUT Jack 15

This WECO 310 jack provides a 4-wire, 600 ohm termination, to drop a DS0 channel to an external device such as a TIMS test set. The output source is determined by the CHANNEL/VF DROP auxiliary function and the **SECONDARY CHANNEL** switch.

2-Wire VF Posts 16

This 2-wire interface is located in the right-side inset of the T-BERD DLC Analyzer Option. The two posts allow a butt-set to be connected to the T-BERD DLC Analyzer Option for two-way access to the selected DS0 channel. The posts provide a 600 ohm termination. Select the 2-wire interface by setting the SOURCE I switch to VF INTF. The input and output source is determined by the CHANNEL/VF DROP auxiliary function, the **SECONDARY CHANNEL** switch, and the **INSERT** switch.

4.15 DLC ANALYZER OPTION — SIGNAL VERIFICATION

The following controls, indicators, and results are used to verify that the T-BERD DLC Analyzer Option has properly acquired the received DS1 signal from both receiver inputs (see Figure 4-7).

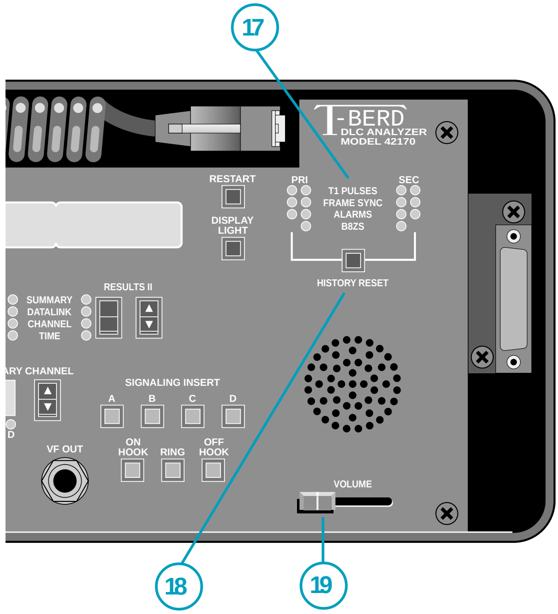


Figure 4-7
Signal Verification Controls and Indicators

Primary and Secondary Status LEDs (17)

Four columns of LEDs, two columns for the PRIMARY RECEIVE input and two columns for the SECONDARY RECEIVE input, indicate the current and history status of the received signal. The two inside columns provide the current status of the incoming T1 signal, and the two outside columns indicate the historical status. The green LEDs indicate a positive condition (e.g., signal present) and the red LEDs indicate historical, alarm, or failure conditions (e.g., frame loss). Using two LEDs for each status condition allows the following conditions to be indicated:

Both LEDs Off — The indicated condition, past or present, has not occurred.

Current LED On, History LED Off — The indicated condition is occurring for the first time.

Current LED OFF, History LED On — The indicated condition has occurred some time in the past.

Both LEDs On — The indicated condition is occurring at the present time and has occurred some time in the past.

The status LEDs are described as follows:

T1 Pulses — The green LED illuminates when valid T1 pulses are detected. The red history LED illuminates when T1 pulses are no longer detected after initial signal detection.

Frame Sync — The green LED illuminates when the T-BERD DLC Analyzer Option has achieved frame synchronization with the selected framing pattern (see **FRAME** switch). The red history LED illuminates when frame synchronization is lost, after achieving initial frame synchronization.

Alarms — The current red LED illuminates when any of the following conditions is detected in the DLC datalink.

- Major alarms
- Minor alarms
- Power/miscellaneous alarms
- Shelf alarms
- Far-end loop event
- Switch to protection line event
- Maintenance test event (suppressed in SLC-M2)

If the current LED is illuminated, check the SUMMARY and DATALINK categories for the current alarms and messages. If the history LED is illuminated, check the DATALINK category for the previously received alarms and messages.

B8ZS — The current green status LED illuminates when B8ZS clear channel encoding is detected in the received signal.

HISTORY RESET Switch 18

This switch clears the history LEDs that are currently illuminated and all non-current alarm messages in the DATALINK category.

VOLUME Control 19

This slide switch controls the output of the internal speaker. The speaker enables the selected DS0 channel to be monitored audibly.

SUMMARY Category Messages

The SUMMARY category provides a convenient way to monitor specific non-zero results, messages, and measurements without having to search through the other categories. 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 signal acquisition, the SUMMARY category should be displayed to watch for the following messages:

> ***ALL RESULTS OK —*** This message appears after initial signal presence is detected on one input and no errors or alarms are detected.
>
> ***ALL RESULTS UNAVAILABLE —*** This message appears at test restart when the instrument has not synchronized with the received signal or no signal is attached.

When an error or alarm is detected, the appropriate result appears in the SUMMARY category window. Each result is preceded with either a “P” (Primary) or “S” (Secondary) to indicate the input source. The SUMMARY category results are divided into four types of results: flashing messages, alarm messages, maintenance test messages, and T1 signal errors. The “x” in some of the results indicates a shelf or line designation, A, B, C, or D.

The flashing messages include:

P/S DATALINK SYNC LOSS
P/S SIGNAL LOSS
SW PROT FAILED
OPTION NOT INSTALLED

The current alarm messages include:

P/S ALARM SHELF x
P/S FE LOOP PROTECT
P/S FE LOOP SHELF x
P/S MAJOR NO SHELF
P/S MAJOR SHELF x
P/S MINOR
P/S PWR/MISC
P/S SHELF x ON PROT

The maintenance test messages include:

P/S MAINT HOOK/SEIZE
P/S MAINT PROCEED
P/S MAINT TEST ALARM

The T1 signal error results include:

P/S CRC ERROR (ESF framing only)
P/S FRM ERROR
P/S VIOLATION

Refer to Section 5 for more information on the results that appear in the T-BERD DLC Analyzer Option SUMMARY category.

4.16 DLC ANALYZER OPTION — STARTING TEST/COLLECTING RESULTS

Once the T-BERD DLC Analyzer Option is configured and connected to the circuit, use the following switches and indicators to initiate the test and collect test results (see Figure 4-8).

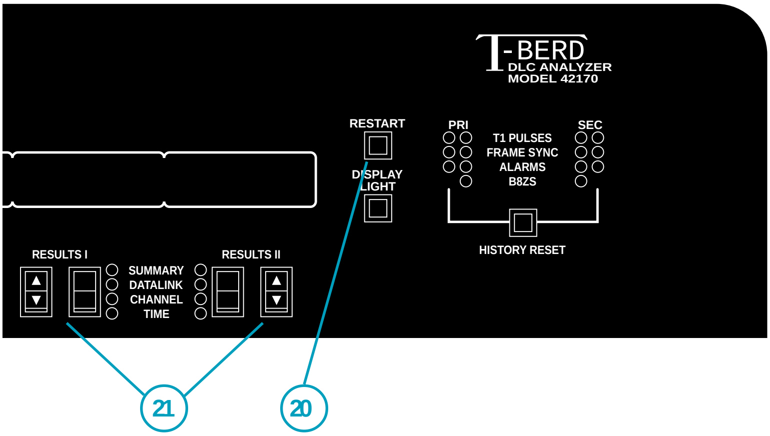


Figure 4-8
Controls to Start Tests and Collect Results

RESTART Switch 20

This switch restarts the test in progress. When it is pressed, all test results and status LEDs are cleared. A test is also restarted when the **FRAME** or **RECEIVE INPUT** switch is pressed.

RESULTS Switches 21

When test results appear in the RESULTS I and RESULTS II windows, the categories and results are selected with the **RESULTS** switches below the windows.

RESULTS I Category Switch or RESULTS II Category Switch — Selects the category of results to be displayed. The labeled LEDs illuminate to indicate the selected category. Holding the switch automatically scrolls the categories.

RESULTS I Results Switch or RESULTS II Results Switch — Selects the individual results from the indicated category. Holding the switch automatically scrolls the results.

Collecting Test Results

During a test, the available results and alarm messages are continuously updated. The results are divided into four categories. During the test, the SUMMARY category displays key non-zero or alarm message results. Refer to Section 5 for more information on the test results. The available categories and results include:

SUMMARY Category — Lists key non-zero error results, flashing messages, or current alarm messages.

Flashing Messages
P/S SIGNAL LOSS
P/S DATALINK SYNC LOSS
P/S PROT FAILED
OPTION NOT INSTALLED

Maintenance Messages
P/S MAINT PROCEED
P/S MAINT HOOK/SEIZE
P/S MAINT TEST ALARM

Alarm Messages
P/S MAJOR SHELF x
P/S MAJOR NO SHELF
P/S ALARM SHELF x
P/S SHELF x ON PROT
P/S FE LOOP PROTECT
P/S FE LOOP SHELF x
P/S MINOR
P/S PWR/MISC

T1 Signal Errors
P/S VIOLATION
P/S FRM ERROR
P/S CRC ERROR (ESF only)

DATALINK Category — Lists DLC datalink related results, current and historical alarms, and maintenance test messages.

Alarm Messages
P/S MAJOR SHELF x
P/S MAJOR NO SHELF
P/S ALARM SHELF x
P/S SHELF x ON PROT
P/S FE LOOP PROTECT
P/S FE LOOP SHELF x
P/S MINOR
P/S PWR/MISC

Maintenance Messages
P/S MAINT PROCEED
P/S MAINT HOOK/SEIZE
P/S MAINT TEST ALARM

Datalink Results
P/S SLC A SEC
P/S DATALINK BITS
P/S ALM FIELD

CHANNEL Category — Lists results for timeslot or channel signaling bits, data bits, channel assignments, and measurements.

Channel Signaling
P/S TRAFFIC CHANNEL AB
P/S TRAFFIC CHANNEL ABCD
P/S TRAFFIC TIMESLOT AB

VF Results
P/S VF LEVEL
P/S VF FREQ
P/S DATA BITS
DTMF SEQ
P/S TS CHAN

TIME Category — Lists results for time of day, date, and signal loss seconds.

TIME
DATE
P/S SIG L SEC

4.17 DLC ANALYZER OPTION — TROUBLESHOOTING CONTROLS

During circuit testing, it is often necessary to control the channel signaling bits of the individual channels (see Figure 4-9).

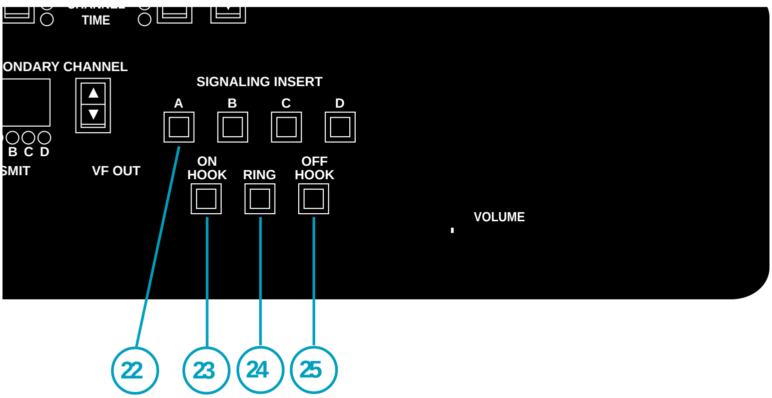


Figure 4-9
Signaling Insert Controls and Indicators

SIGNALING INSERT Switches

Seven switches provide signaling control over the selected channel or timeslot. The selected channel or timeslot appears in the SECONDARY CHANNEL window. When the CHANNEL format is selected and the **INSERT** switch is illuminated, the signaling bits are inserted over the received signaling bits on the selected DS0 channel.

When either the **ON HOOK, RING,** or **OFF HOOK** switch is pressed, the signaling protocol (loop start or ground start) sequence is generated — the switches may flash during the sequence. When the process is completed, the switches are updated to reflect the selected state (on-hook, off-hook, or ringing). The transmitted signaling protocol is set by the TRUNK TYPE auxiliary function and framing format.

Table 4-8 provides the signaling bit patterns that can be used to control D4, D1D, and SLC channel banks. Table 4-9 provides the signaling bit patterns that can be used to control T1 ESF channel banks. When the secondary channel number is changed and the **INSERT** switch is illuminated, the **SIGNALING INSERT** switches are temporarily inhibited until the **INSERT** switch stops flashing.

NOTE: The **ON HOOK, OFF HOOK,** and **RING** switches are not functional in the SLC-M2 mode.

Table 4-8
D4, D1D, and SLC Framed Signaling States

Signaling State	A	B
On-hook	0	0
Off-hook	1	0
Ringing	1	1/0

Table 4-9
T1 ESF Signaling States

Direction	Signaling State	A	B	C	D
Ground Start Signaling					
Transmit	On-hook Ringing Off-hook	0 1 1	0 1 0	0 1 1	0 0 0
Receive	On-hook Off-hook	0 0	0 1	0 0	0 0
Loop Start Signaling					
Transmit	On-hook Off-hook	0 1	0 0	0 1	0 0
Receive	On-hook Ringing Off-hook	1 1 1	1 1 1	1 1 1	1 0 1

NOTE: The T-BERD DLC Analyzer Option generates on-hook and off-hook signaling states that emulate the station end of the circuit and assumes the far end is sending office supervision. The ring signaling state emulates the office signaling.

When the format is toggled between CHANNEL and DATLINK, the **SIGNALING INSERT** switch settings are stored in memory. When the **FORMAT** switch is set to DATLINK, the signaling passes through the T-BERD DLC Analyzer Option unaffected and the **SIGNALING INSERT** switches are disabled. The **AB** switches are functional in all frame modes. The **CD** switches are only functional in the T1 ESF mode.

ABCD Switches (22)

The individual signaling bits can be set using the **ABCD** switches. The signaling bits can be set to a logic 0, 1, or toggled 0/1 in the following manner.

- To insert a logic 1, press the switch for less than one second; the switch LED illuminates and the logic 1 is inserted into the appropriate bit location when the **INSERT** switch is illuminated.

- To insert a logic 0, press the switch for less than one second; the switch LED goes out and the logic 0 is inserted into the appropriate bit location when the **INSERT** switch is illuminated.

- To toggle the bit location between a logic 1 and 0, press the switch for more than one second; the switch LED flashes and the toggled bits are inserted into the appropriate bit location when the **INSERT** switch is illuminated. The toggling state is stopped by pressing the switch again.

If the **ABCD** switches are all illuminated in the T1 ESF mode and another mode is selected, the **CD** switches are turned off. When an on-hook, off-hook, or ring signaling state is set with the **ABCD** switches, the **ON HOOK, OFF HOOK,** or **RING** switch LED illuminates indicating the signaling state. The **ABCD** switch LEDs also illuminate when the **ON HOOK, OFF HOOK,** or **RING** switches are used. Only one of these signaling conditions can be activated at one time with the **ABCD** switches or one of the following switches.

ON HOOK Switch (23)

Press this switch to send an on-hook state. When the **ON HOOK** switch is pressed and the signaling protocol sequence is completed, the **ABCD** switches are updated to reflect the on-hook state.

RING Switch 24

Press this switch to send a ringing state. When the **RING** switch is pressed and the signaling protocol sequence is completed, the **ABCD** switches are updated to reflect the ringing state.

OFF HOOK Switch 25

Press this switch to send an off-hook state. When the **OFF HOOK** switch is pressed and the signaling protocol sequence is completed, the **ABCD** switches are updated to reflect the off-hook state.

4.18 DLC ANALYZER OPTION — PRINTER CONTROL

The **PRINT** switch and the RS-232 interface are for future enhancements. If the **PRINT** switch is pressed, the message *OPTION NOT INSTALLED* flashes in the RESULTS I window.

AUXILIARY FUNCTIONS

5.1 INTRODUCTION

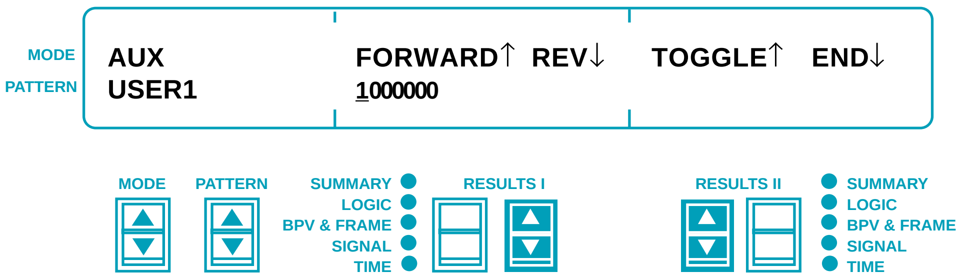
This section describes the auxiliary functions for the T-BERD 209A/211 mainframe and the T-BERD DLC Analyzer Option. Auxiliary functions allow access to selectable functions and parameters that are less frequently used and do not have dedicated switches.

5.2 MAINFRAME — AUXILIARY FUNCTIONS

The mainframe auxiliary functions are selected using the **MODE** switch. Press the **MODE** switch once from an operating mode (e.g., T1 D4), to select the AUX mode. When the AUX mode appears, the auxiliary functions are selected by pressing the **PATTERN** switch.

The auxiliary functions are described in factory-default order.

AUX USER1 — User 1 Programmable Test Pattern



The AUX USER1 function enables you to program a 3- to 24-bit test pattern. This allows the T-BERD 209A/211 to transmit specific bit patterns to test circuit sensitivity to the pattern.

FORWARD— Press the **RESULTS I Results** switch up arrow to move the cursor FORWARD from left to right. Moving the cursor (blinking bit) FORWARD past the last displayed bit automatically inserts a “0” in each new position up to 24 bits.

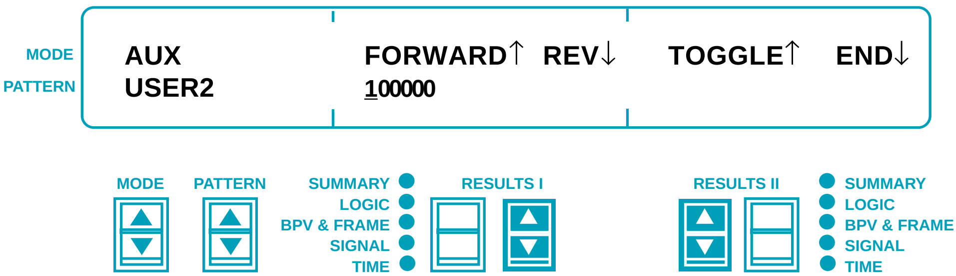
REV— Press the **RESULTS I Results** switch down arrow to move the cursor in REVerse from right to left.

TOGGLE— Press the **RESULTS II Results** switch up arrow to TOGGLE the bit between “1” and “0” at the cursor.

END— Press the **RESULTS II Results** switch 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 this switch is pressed.

The pattern is generated when USER1 is selected with the **PATTERN** switch. The pattern is transmitted from left to right as it is displayed. A test restart occurs when this pattern is saved and being transmitted at the same time.

AUX USER2 — User 2 Programmable Test Pattern



The AUX USER2 function enables you to program a 3- to 24-bit test pattern. This allows the T-BERD 209A/211 to transmit specific bit patterns to test circuit sensitivity to the pattern.

FORWARD— Press the **RESULTS I Results** switch up arrow to move the cursor FORWARD from left to right. Moving the cursor (blinking bit) FORWARD past the last displayed bit automatically inserts a “0” in each new position up to 24 bits.

REV— Press the **RESULTS I Results** switch down arrow to move the cursor in REVerse from right to left.

TOGGLE— Press the **RESULTS II Results** switch up arrow to TOGGLE the bit between "1" and "0" at the cursor.

END— Press the **RESULTS II Results** switch 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 switch is pressed.

The pattern is generated when USER2 is selected with the **PATTERN** switch. The pattern is transmitted from left to right as it is displayed. A test restart occurs when the pattern is saved and being transmitted at the same time.

AUX RESPONSE — Loop Code Response Function

The AUX RESPONSE function determines whether the T-BERD 209A/211 enters automatic line loopback mode (AUTO LLB) in response to received loop codes. For more information on AUTO LLB, refer to Section 3.2.

RESPONSE— Press the **RESULTS I Results** switch to select one of the following:

> **NO RESPONSE—** T-BERD 209A/211 does not respond to received loop codes except to illuminate the Loop Up or Loop Down LED.
>
> **AUTO RESPONSE—** T-BERD 209A/211 automatically responds to received loop codes by enabling or disabling the AUTO LLB mode. The instrument only responds to loop codes matching the loop code selected from the AUX LP CODE and AUX ESF LOOP functions. The T-BERD 209A/211 does not respond to the addressable repeater loop codes described in the AUX LP CODE function or to ESF PAYLOAD loop codes.

In AUTO RESPONSE mode, T-BERD 209A/211 enables AUTO LLB after receiving 5 seconds of in-band loop-up code or after receiving 250 ms of ESF out-of-band loop-up code.

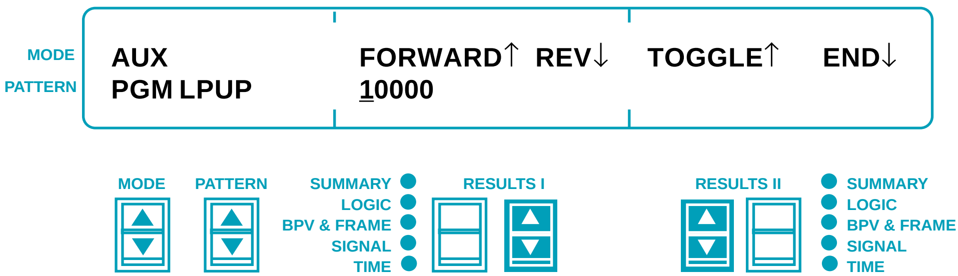
If the T-BERD 209A/211 is set to T1 LLB or T1C TLB mode, the T-BERD 209A/211 does not respond to the received loop codes, except it illuminates the Loop Up or Loop Down LED. AUTO LLB is disabled after receiving the in-band or ESF out-of-band loop-down code. When AUTO LLB is disabled, the instrument returns to the previously selected operating mode.

When operating in the FT1 modes (FT1 D4 or FT1 ESF), the T-BERD 209A/211 still responds to in-band loop codes, but only if they are sent over the entire T1 bandwidth. The T-BERD 209A/211 does respond to ESF out-of-band loop codes when configured for T1 ESF or FT1 ESF operation. AUTO LLB mode establishes a full bandwidth loopback and bit error rate test.

Consider the following functions when changing AUX RESPONSE:

- AUX LP CODE (select loop code type)
- AUX ESF LOOP (select ESF loop code type)
- Loop Code LEDs

AUX PGM LPUP — Programmable Loop-up Code



The AUX PGM LPUP function enables you to program a 3- to 8-bit loop-up code. This allows the T-BERD 209A/211 to transmit and respond to non-standard loop codes.

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

REV— Press the **RESULTS I Results** switch down arrow to move the cursor in REVerse from right to left.

TOGGLE— Press the **RESULTS II Results** switch up arrow to TOGGLE the bit between "1" and "0" at the cursor.

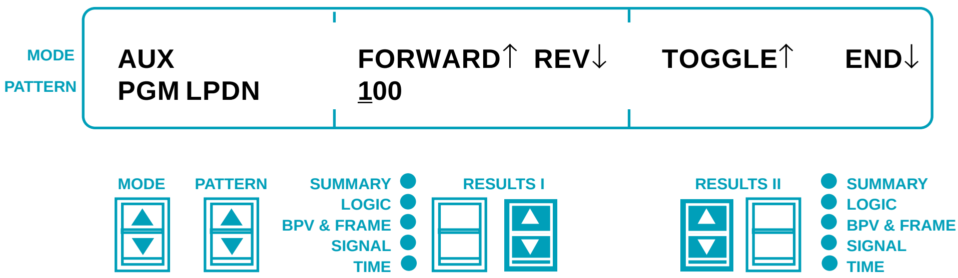
END— Press the **RESULTS II Results** switch down arrow to END or save the bit pattern from the position of the cursor to the first bit on the left. Any bits to the right of the cursor are deleted when this switch is pressed.

A loop-up code is generated when the **LOOP UP** switch is pressed and PGM is selected in the AUX LP CODE function. The loop code is transmitted from left to right as displayed.

Consider the following auxiliary functions when changing AUX PGM LPUP:

- AUX LP CODE
- AUX ESF LOOP
- AUX PGM LPDN
- AUX RESPONSE

AUX PGM LPDN — Programmable Loop-down Code



The AUX PGM LPDN function enables you to program a 3- to 8-bit loop-down code. This allows the T-BERD 209A/211 to transmit and respond to non-standard loop codes.

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

REV— Press the **RESULTS I Results** switch down arrow to move the cursor in REVerse from right to left.

TOGGLE— Press the **RESULTS II Results** switch up arrow to TOGGLE the bit between "1" and "0" at the cursor.

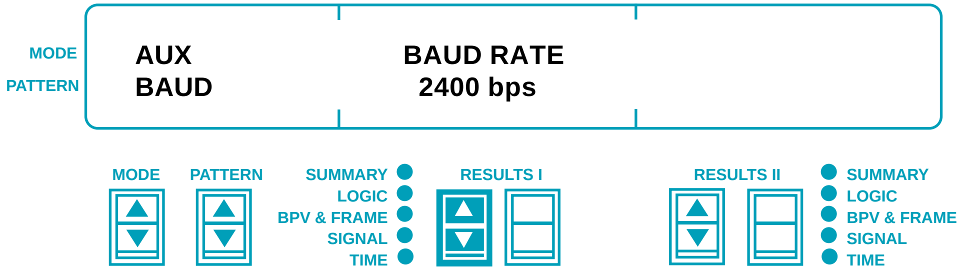
END— Press the **RESULTS II Results** switch down arrow to END or save the bit pattern from the position of the cursor to the first bit on the left. Any bits to the right of the cursor are deleted when this switch is pressed.

A loop-down code is generated when the **LOOP DOWN** switch is pressed and PGM is selected in the AUX LP CODE function. The loop code is transmitted from left to right as displayed.

Consider the following auxiliary functions when changing AUX PGM LPDN:

- AUX LP CODE
- AUX ESF LOOP
- AUX PGM LPUP
- AUX RESPONSE

AUX BAUD — RS-232 Printer/Remote Control Baud Rate Select



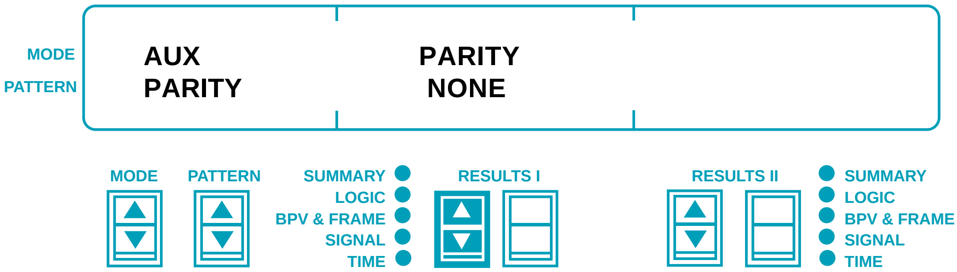
The AUX BAUD function selects the baud rate for the RS-232 Printer/Remote Control interface.

BAUD RATE— Press the **RESULTS I Results** switch to select one of the following baud rates: 300 bps, 1200 bps, 2400 bps, and 4800 bps.

Consider the following functions and modes when changing AUX BAUD:

- AUX PARITY
- AUX TERM
- RS-232-C Printer/Remote Control Interface
- Printer and remote control operation

AUX PARITY — RS-232 Printer/Remote Control Parity Select



The AUX PARITY function selects the parity for the RS-232 Printer/Remote Control interface connector.

PARITY— Press the **RESULTS I Results** switch to select one of the following parity modes:

NONE— Disables parity and configures the data output for eight data bits. Parity must be set to NONE to print the pulse shape graph; graphics printers require eight data bits.

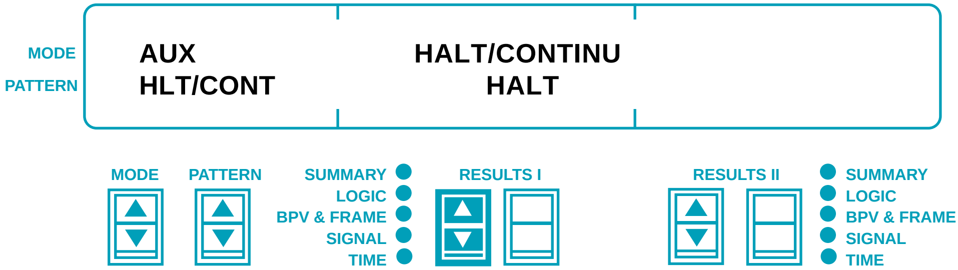
EVEN— Enables EVEN parity and configures the data output for seven data bits.

ODD— Enables ODD parity and configures the data output for seven data bits.

Consider the following functions and modes when changing AUX PARITY:

- AUX TERM
- AUX BAUD
- RS-232-C Printer/Remote Control Interface
- Printer and remote control operation

AUX HLT/CONT — Action on Pattern Synchronization Loss



The AUX HLT/CONT function determines how the LOGIC category results are accumulated during pattern synchronization loss. Changing AUX HLT/CONT during a test, restarts the test.

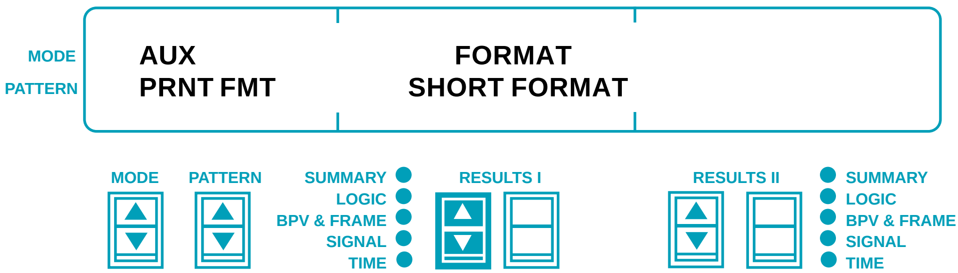
HALT/CONTINU — Press the **RESULTS I Results** switch to select one of the following conditions:

HALT — Freezes all LOGIC category results when pattern synchronization is lost; the results resume counting when synchronization is reacquired.

CONTINUOUS — Error and slip counts continue throughout synchronization loss.

NOTE: When any Advanced BERT Option test pattern is selected, the instrument defaults to the HALT mode.

AUX PRNT FMT — Results Printout Format



The AUX PRNT FMT function selects the results printout format transmitted through the RS-232 Printer/Remote Control interface.

FORMAT— Press the **RESULTS I Results** switch to select one of the following:

SHORT FORMAT— Results printout lists a standard set of results with additional results that are mode specific.

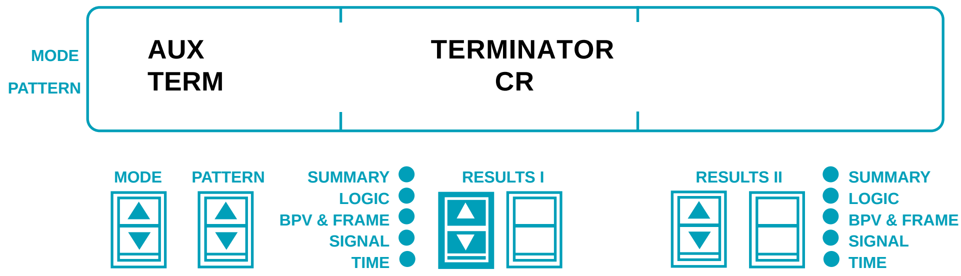
SUMMARY PRINT— Results printout lists SUMMARY category results.

NORMAL FORMAT— Results printout lists all test results.

Consider the following functions and modes when changing AUX PRNT FMT:

- RS-232-C Printer/Remote Control Interface
- Printer and remote control operation

AUX TERM — RS-232 Printer/Remote Control Line Terminator



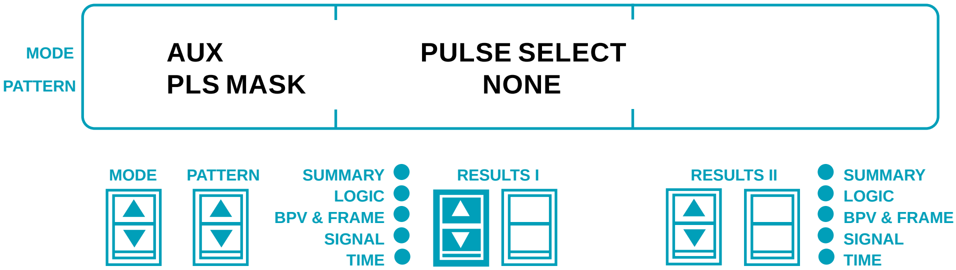
The AUX TERM function selects the line termination character transmitted through the RS-232 Printer/Remote Control interface.

TERMINATOR— Press the **RESULTS I Results** switch to select either CR (carriage return) or CRLF (carriage return/linefeed).

Consider the following functions and modes when changing AUX TERM:

- AUX PARITY
- AUX BAUD
- RS-232-C Printer/Remote Control Interface
- Printer and remote control operation

AUX PLS MASK — Pulse Shape Measurement Mask Select



The AUX PLS MASK function selects the standard pulse shape mask used to evaluate the received pulses.

PULSE SELECT — Press the **RESULTS I Results** switch to select one of the following:

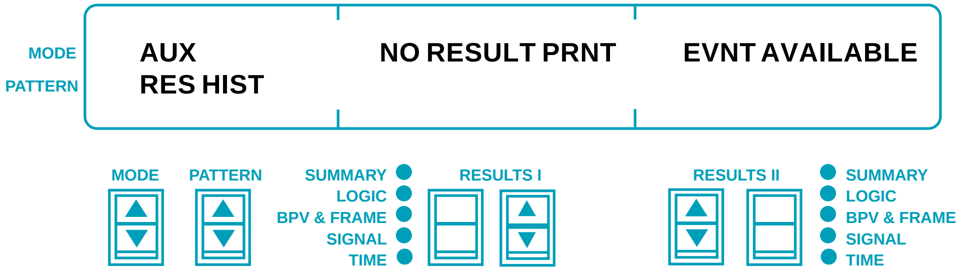
NONE — The pulse shape is not evaluated against pulse mask specifications, however, the pulse shape measurements are still made. When NONE is selected, the Pulse Shape LED is disabled, no mask appears on the pulse shape printout, and the message *NO MASK* appears in the 44-PULSE SHAPE result.

NI (ANSI) — The pulse shape is evaluated against the ANSI T1.403 Network Interface pulse mask specification.

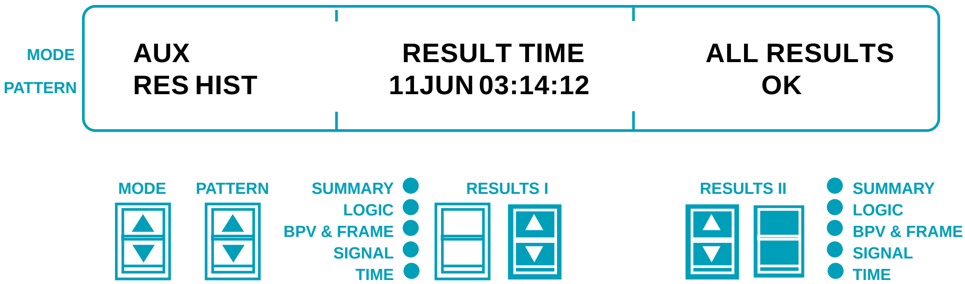
DSX (CB119) — The pulse shape is evaluated against the AT&T Compatibility Bulletin 119 and ANSI T1.102 pulse mask specifications.

When a mask is selected, the Pulse Shape LED illuminates when the pulse shape violates the mask. Changing AUX PLS MASK during a test restarts the test. If a mask is selected, the message *PASS, FAIL, OUT OF RANGE*, or *UNAVAILABLE* can appear in the 44-PULSE SHAPE result.

AUX RES HIST — Results History Buffer



The AUX RES HIST function allows the most recent results generated to be reviewed from the front panel. When the message *NO RESULT PRNT EVNT AVAILABLE* (no result print event available) appears, the **RESULTS** switches are not functional and no results are stored in memory. If the history buffer contains stored results, the following appears:



The AUX RES HIST function provides access to six sets of the most recent test results generated when a print event occurs or the **PRINT RESULTS** switch is pressed. The oldest result is dropped when a new result is stored.

RESULT TIME— Press the **RESULTS I Results** switch to scroll through the time-stamped RESULT TIME list displayed in the RESULTS I window.

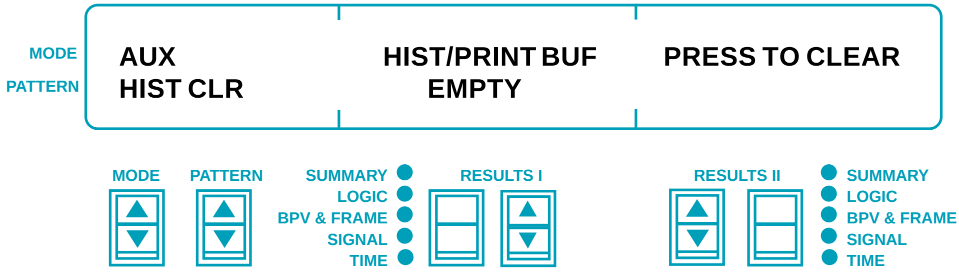
Press the **RESULTS I Results** switch up arrow to scroll to the most recent result. The message *MOST RECENT RESULTS* flashes in the RESULTS I window when the **RESULTS I Results** switch up arrow is pressed to scroll past the most recent result.

Press the **RESULTS I Results** switch down arrow to scroll to the earliest result saved. The message *EARLIEST SAVED RESULTS* flashes in the RESULTS I window when the **RESULTS I Results** switch down arrow is pressed to scroll past the earliest saved result.

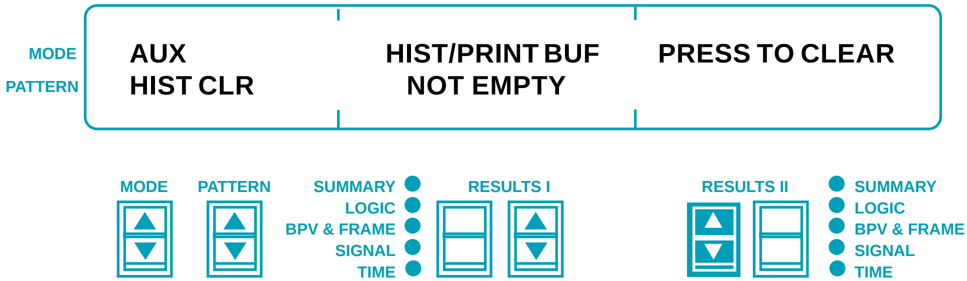
Press the **RESULTS II Category** switch to select the desired category.

Press the **RESULTS II Results** switch to scroll through all results in the selected category.

AUX HIST CLR — Clear History and Printer Buffers

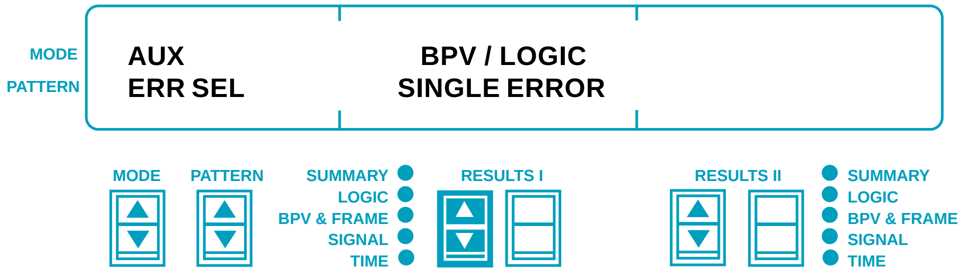


The AUX HIST CLR function clears the History and Print buffers. When the message *HIST/PRINT BUF EMPTY* appears, the **RESULTS** switches are not functional and no results are stored in memory. If results are stored in the results history buffer or the printer buffer, the following appears:



To clear the buffers, press the **RESULTS II Results** switch; the message *HIST/PRINT BUF EMPTY* appears in the RESULTS I window when the buffers are empty.

AUX ERR SEL — BPV and Logic Error Burst Duration Select



The AUX ERR SEL function selects the duration for the BPV and logic error bursts when the **BPV** and **LOGIC ERROR INSERT** switches are pressed once.

BPV/LOGIC— Press the **RESULTS I Results** switch to select one of the following:

SINGLE ERROR— Inserts a single BPV or LOGIC error when the appropriate switch is pressed once.

5.0 sec Burst to 1.5 sec Burst (in 0.5 sec Steps)— Inserts a BPV or logic error burst from 1.5 seconds to 5.0 seconds when the appropriate switch is pressed once.

1.5 sec Burst to 0.5 sec Burst (in 0.1 sec Steps)— Inserts a BPV or logic error burst from 0.5 seconds to 1.5 seconds when the appropriate switch is pressed once.

500 ms Burst to 200 ms Burst (in 50 ms Steps)— Inserts a BPV or logic error burst from 200 milliseconds to 500 milliseconds when the appropriate switch is pressed once.

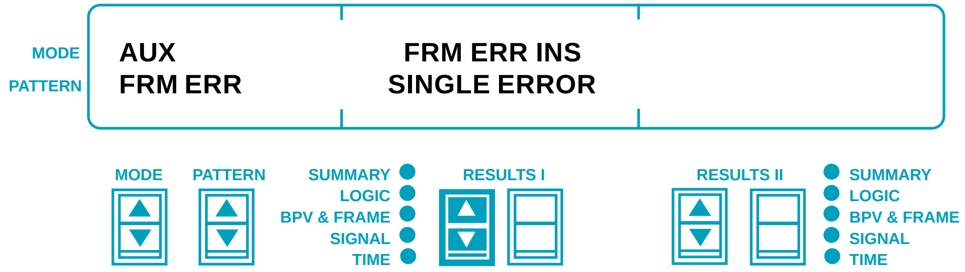
200 ms Burst to 25 ms Burst (in 25 ms Steps)— Inserts a BPV or logic error burst from 25 milliseconds to 200 milliseconds when the appropriate switch is pressed once.

NOTE: When testing FT1 circuits (FT1 D4 or FT1 ESF modes), a single error is only inserted within the selected FT1 bandwidth. Burst or continuous error insertion is applied over the entire T1 bandwidth.

The error rate during the burst is controlled through the AUX ER RATE function. Changing AUX ERR SEL does not restart the test.

NOTE: When the **ERROR INSERT** switches are pressed, held, and illuminated, errors are inserted continuously at the error rate selected from the AUX ER RATE function.

AUX FRM ERR — Frame Error Insertion Select



The AUX FRM ERR function selects the number of consecutive frame errors inserted into the framing pattern when the **FRAME ERROR INSERT** switch is pressed once.

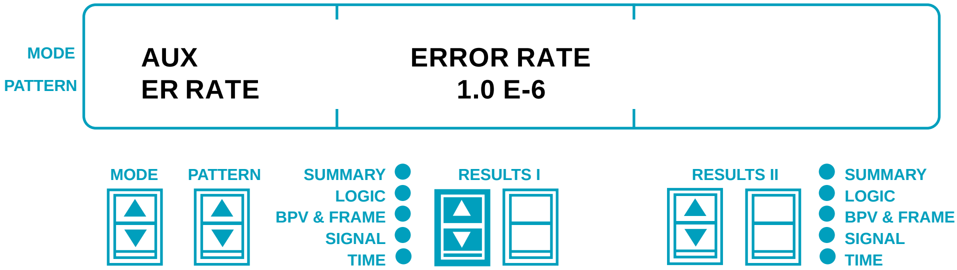
FRM ERR INS— Press the **RESULTS I Results** switch to select one of the following:

SINGLE ERROR— Inserts a single frame error.

2 to 6 CONSECUTIVE— Inserts 2 to 6 consecutive frame errors.

When the **FRAME ERROR INSERT** switch is pressed, held, and illuminated, the number of selected frame errors are inserted into the superframe or extended superframe format. AUX FRM ERR is not functional in T1, T1 LLB, T1C, or T1C TLB operating modes.

AUX ER RATE — BPV and Logic Error Insertion Rate

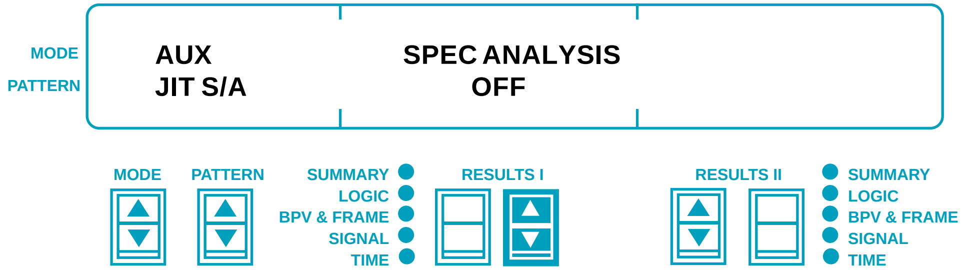


The AUX ER RATE function selects the BPV and LOGIC error insertion rate when a burst of errors is inserted or when continuous errors are inserted.

ERROR RATE — Press the **RESULTS I Results** switch to select an error rate from 1.0 E-2 to 1.0 E-9. Changing the error rate does not restart the test. The displayed error rates are interpreted as follows:

1.0 E-2 = 0.01 = 1 bit error in a 100 bits sent.
1.0 E-3 = 0.001 = 1 bit error in a 1000 bits sent.
1.0 E-4 = 0.0001 = 1 bit error in a 10,000 bits sent.
1.0 E-5 = 0.00001 = 1 bit error in a 100,000 bits sent.
1.0 E-6 = 0.000001 = 1 bit error in a 1 million bits sent.
1.0 E-7 = 0.0000001 = 1 bit error in a 10 million bits sent.
1.0 E-8 = 0.00000001 = 1 bit error in a 100 million bits sent.
1.0 E-9 = 0.000000001 = 1 bit error in a 1 billion bits sent.

AUX JIT S/A — Jitter Spectral Analysis Control (T-BERD 211 Only)



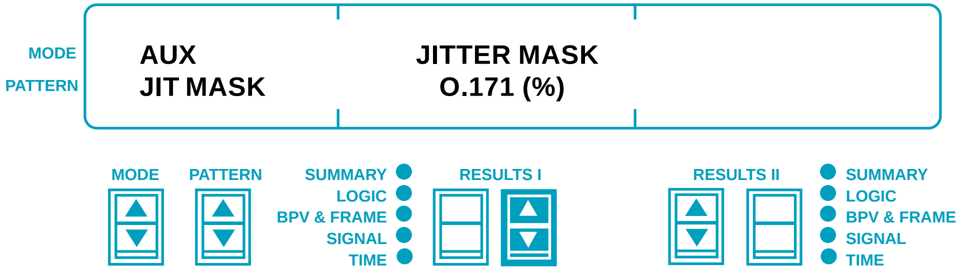
The AUX JIT S/A function controls the Jitter Spectral Analysis Option.

SPEC ANALYSIS— Press the **RESULTS I Results** switch to turn the Jitter Spectral Analysis Option ON and OFF.

Consider the following functions, modes, and JITTER & WANDER category results when testing for jitter:

- AUX JIT MASK
- AUX JIT TRIG
- AUX GRAPH
- Printer operation
- Jitter LED
- 88-SA P/F
- 89-SA FREQ
- 90-SA FREQ

AUX JIT MASK — Jitter Mask Select (T-BERD 211 Only)



The AUX JIT MASK selects the jitter mask specification the jitter is measured against when the Jitter Spectral Analysis Option is enabled. Appendix D shows a graph of the jitter masks.

JITTER MASK — Press the **RESULTS I Results** switch to select one of the following jitter masks:

NONE (UI) — The jitter measurements appear in UIs and are not compared to a jitter mask.

43801 (%) — The jitter measurement, made as a percentage, is compared to the AT&T Technical Reference PUB43801 jitter specifications.

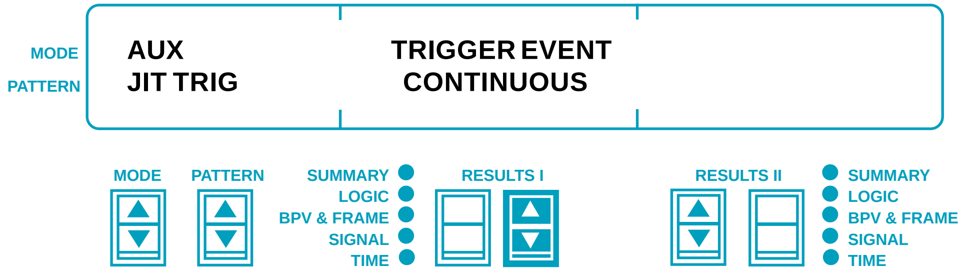
62411/1985 (%) — The jitter measurement, made as a percentage, is compared to the AT&T Technical Reference PUB62411, 1985 issue, jitter specifications.

62411/1983 (%) — The jitter measurement, made as a percentage, is compared to the AT&T Technical Reference PUB62411, 1983 issue, jitter specifications.

41451 (%) — The jitter measurement, made as a percentage, is compared to the AT&T Technical Reference PUB41451 jitter specifications.

O.171 (%) — The jitter measurement, made as a percentage, is compared to the CCITT Recommendation O.171 jitter specifications.

AUX JIT TRIG — Jitter Trigger Select (T-BERD 211 Only)

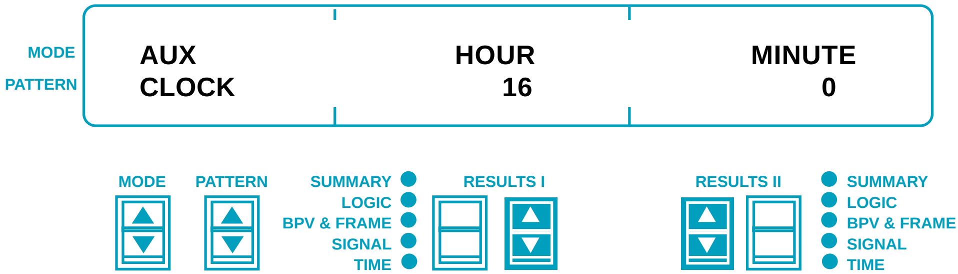


The AUX JIT TRIG function controls the selection of the jitter trigger when the Jitter Spectral Analysis Option is enabled. Jitter spectral analysis measurements can be made continuously, or can be triggered by a specific event.

TRIGGER EVENT — Press the **RESULTS I Results** switch to select one of the following trigger conditions:

> **CONTINUOUS —** Constantly measures the jitter spectrum in lieu of an event trigger. Data samples are taken at 30-second intervals, and peak values are continuously updated.
>
> **PATTN SYNC LOS —** Triggers a jitter snapshot on the loss of pattern synchronization.
>
> **FRAME SYNC LOS —** Triggers a jitter snapshot on the loss of frame synchronization.
>
> **ONES DENSITY —** Triggers a jitter snapshot on the violation of the pulse density criteria.
>
> **SEVERE ERROR —** Triggers a jitter snapshot on the occurrence of a severely errored second. This selection is only available when the G.821 Performance Analysis Option is installed.
>
> **ERROR EVENT —** Triggers a jitter snapshot on the occurrence of a bit error, frame error, CRC error, or BPV.

AUX CLOCK — Set Clock Time



The AUX CLOCK function sets the time (in 24-hour format) for the battery-backed clock.

HOUR — Press the **RESULTS I Results** switch to set the current hour from 0 to 23 hours.

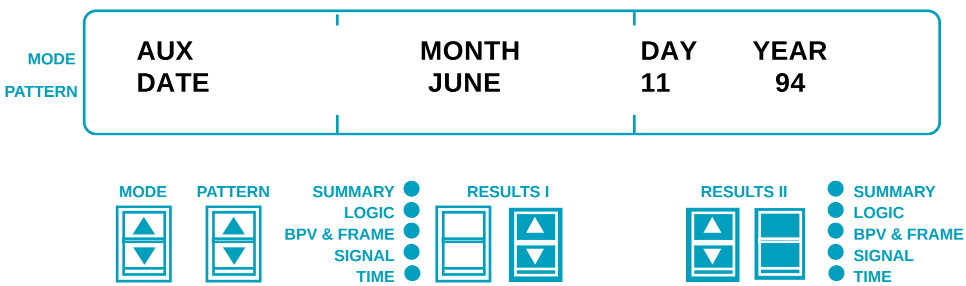
MINUTE — Press the **RESULTS II Results** switch to set the current minutes from 0 to 59 minutes.

The clock time appears on all printouts generated by the T-BERD 209A/211. The current time appears in the TIME category, 65-CLOCK TIME result.

Consider the following functions when changing AUX CLOCK:

- AUX DATE function
- Printer operation

AUX DATE — Set Date



The AUX DATE function sets the month and day for the battery-backed clock.

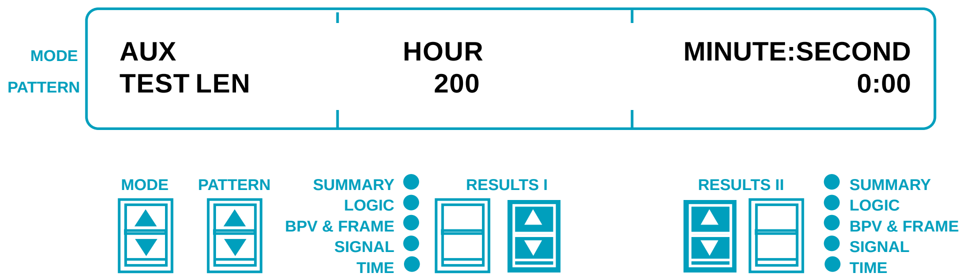
MONTH— Press the **RESULTS I Results** switch to set the current month from January to December.

DAY— Press the **RESULTS II Results** switch to set the current day of the month from 1 to 31.

YEAR— Press the **RESULTS II Category** switch to set the current year (last two digits only) from 00 to 99.

The month and day appear on all printouts generated by the T-BERD 209A/211. The current month and day appear in the TIME category, 66-DATE result.

AUX TEST LEN — Set Timed Test Length Duration



The AUX TEST LEN function sets the length of time for a timed test. The timed test is selected with the **TEST** switch.

HOUR— Press the **RESULTS I Results** switch to set the test length hours from 0 to 200 hours in 1 hour steps.

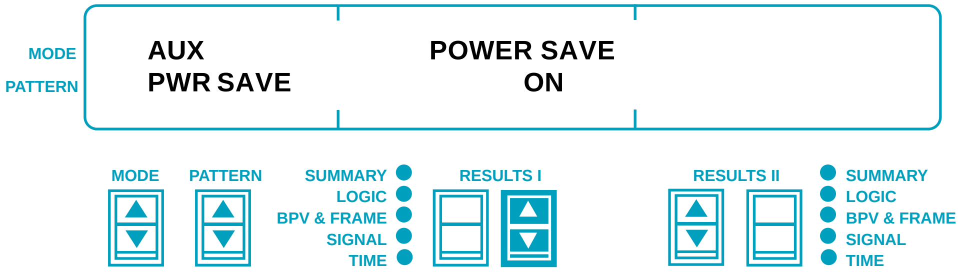
MINUTE:SECOND— Press the **RESULTS II Results** switch to set the test length minutes and seconds. If HOUR is set to 0, the range is from 0:00 to 1:00 minute in 15 second steps and 1:00 to 59:00 minutes in 1 minute steps. If HOUR is set to 1 or more, the range is from 1:00 to 59:00 minutes in 1 minute steps.

When TIMED TEST is selected with the **TEST** switch, AUX TEST LEN is enabled and the test is restarted.

Consider the following functions and TIME category results when changing AUX TEST LEN:

- **TEST** switch
- **RESTART** switch
- 62-TEST LENGTH
- 63-ELAPSE TIME
- 64-TEST END IN

AUX PWR SAVE — Battery Power Save Control (T-BERD 209A Only)



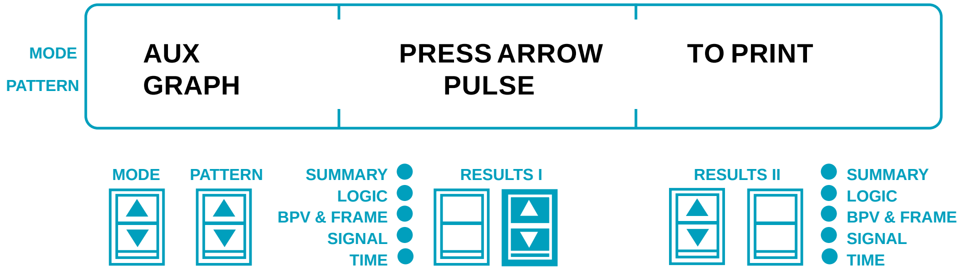
The AUX PWR SAVE function is used to prolong the battery charge by temporarily turning the display off when none of the switches have been pressed in over five minutes. This function can extend the battery charge up to 25% over normal use. It can also be used when AC power is applied.

POWER SAVE — Press the **RESULTS I Results** switch to turn the power saver on and off.

The T-BERD 209A continues to perform the current test even with the display turned off. To restore the display, press any switch once; this does not affect the switch setting.

When operating in the TDR mode with the power saver enabled and the display turned off, the **DISPLAY HOLD** switch LED illuminates indicating the instrument is in the power save mode.

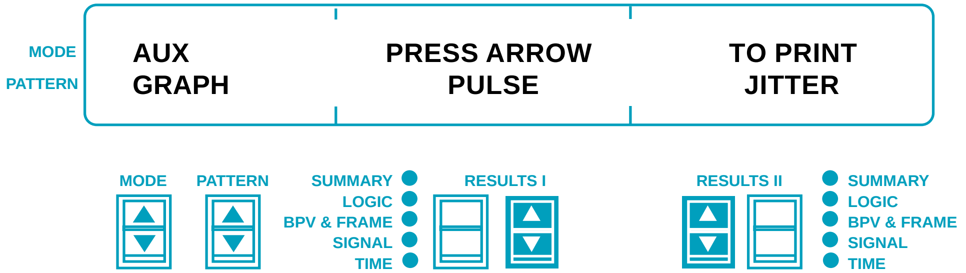
AUX GRAPH — Print Graph Function



PULSE— The AUX GRAPH function initiates a pulse shape printout when the **RESULTS I Results** switch is pressed.

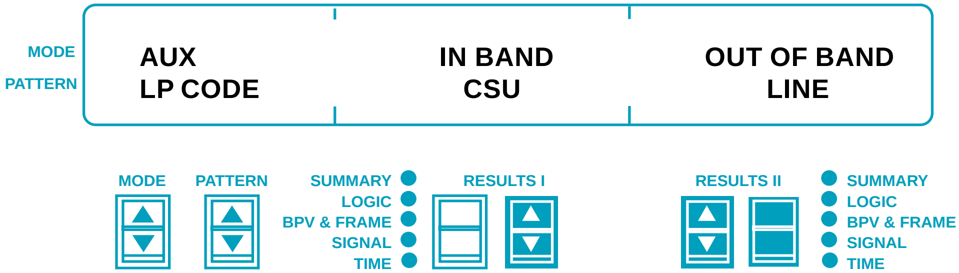
The pulse shape graph can only be generated on a graphics-compatible printer like the TTC PR-40A. The normalized amplitude pulse, related pulse shape results, and selected pulse shape mask appear on the printout. If the message *OUT OF RANGE* appears in the related results, printing the pulse shape graph causes the message *PULSE DATA NOT AVAILABLE* to be printed.

JITTER (T-BERD 211 Only)— When the Jitter Spectral Analysis Option is installed and AUX JIT S/A is set to ON, JITTER appears in the RESULTS II window.



Press the **RESULTS II Results** switch to initiate a jitter vs frequency graph on a graphics printer.

AUX LP CODE — Loop Code Select



The AUX LP CODE function selects the loop code (in-band or ESF out-of-band) transmitted when the **LOOP CODE** switches are pressed. These selections also determine which loop code cause the T-BERD 209A/211 to establish the AUTO LLB mode.

When the T1 ESF or FT1 ESF mode is selected, the in-band and ESF out-of-band loop code types are selected from the AUX ESF LOOP function.

Transmitting loop codes restarts the test. The loop code bit patterns shown in the following descriptions are transmitted in a left-to-right order.

IN BAND — In-band loop codes can be used in all operating modes. 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 T-BERD 209A/211 to establish a loopback with a compatible CSU or respond to a CSU loop code. CSU loop codes: loop up — 10000 and loop down — 100.
>
> **FAC1 —** The 4-bit facility or network (smart jack) loop codes allow the T-BERD 209A/211 to establish a loopback with a compatible facility interface or respond to a facility loop code. 4-bit Facility loop codes: loop up — 1100 and loop down — 1110.
>
> **FAC2 —** The 5-bit facility or network (smart jack) loop codes allow the T-BERD 209A/211 to establish a loopback with a compatible facility interface or respond to a facility loop code. 5-bit Facility loop codes: loop up — 11000 and loop down — 11100.

FAC3 — The facility or network (smart jack) loop codes allow the T-BERD 209A/211 to establish a loopback with a compatible facility interface or respond to a facility loop code. Facility 3 loop codes: loop up — 100000 and loop down — 100.

PGM — The 3- to 8-bit programmable loop codes allow the T-BERD 209A/211 to establish a loopback with any nonstandard device or respond to a nonstandard loop code. The loop codes are programmed through the AUX PGM LPUP and AUX PGM LPDN functions.

The following addressable repeater loop codes function in both in-band and ESF out-of-band. Press the **LOOP UP** switch to send the arming code and NIU loop-up code. Press the **LOOP DOWN** switch to send the disarming code and NIU loop-down code.

WESTELL ARM — Selects the Westell, or equivalent, T1 repeater arming/disarming code. Transmit the WESTELL ARM code from the CO toward the NIU. Press the **LOOP UP** switch to send the arming code and NIU loop-up code. Press the **LOOP DOWN** switch to send the disarming code and NIU loop-down code.

WESTELL-56 OR, REPEATER ADDR — Selects the Westell 3130-56 T1 office repeater loop codes. The repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the repeater address (1 or 2).

WESTELL-56 LR, REPEATER ADDR — Selects the Westell 3150-56 T1 line repeater loop codes. The repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the repeater address (1 to 20).

WESTELL-56, SEQUENTIAL LOOPBACK — Loops up and loops down the T1 line repeaters on the span in sequence starting with the repeater nearest the T-BERD 209A/211 and proceeding down the span, regardless of the repeater's address. Pressing the **LOOP UP** switch transmits the Sequential Loopback code.

The first time a repeater receives the sequential loop code, it loops up and the SUMMARY category displays the repeater address for the looped up repeater. The second time the sequential loop code is sent, the repeater loops down. Alternatively, the **LOOP DOWN** switch can be used to transmit the loop down code, which loops down the repeater. Regardless of which method is used to loop down the repeater, it ignores all subsequent sequential loop code transmissions until it is disarmed and re-armed.

WESTELL-56 QRY — Selects the Westell 3150-56 T1 line repeater query code. This function reveals which line repeater is in loopback mode. Press the **LOOP UP** or **LOOP DOWN** switch to send the query code.

WESTELL-56, AUTO TIMEOUT DISABLE — Selects the Westell 3150-56 T1 line repeater timeout disable function. This function disables the 30 minute loopback timeout function of the repeater. Establish the line repeater loopback first, then send the timeout disable function. The timeout function is reset when the loopback is deactivated remotely.

WESTELL-56, POWER QUERY— Selects the Westell 3150-56 T1 line repeater power loop query code. This function reveals if any line repeater is in power loop mode. Press the **LOOP UP** or **LOOP DOWN** switch to send the power loop query code.

WESTELL NIMS20, SWITCH ADDR — Selects the Westell 12-bit T1 Network Interface and Maintenance System (NIMS-20) maintenance switch command. The DS1 line card address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the switch address (01 to 28). Pressing the **LOOP UP** switch transmits the arming code for the NIMS, then sends the command to switch the addressed line card to the smart jack. Press the **LOOP DOWN** switch to reset.

WESTELL NIMS20, RAMP ADDR — Selects the Westell 12-bit T1 Network Interface and Maintenance System (NIMS-20) ramp command. The DS1 line card address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the ramp address (01 to 28). Pressing the **LOOP UP** switch transmits the arming code for the NIMS, then activates the ramp mode for the NIU/Performance Monitor. Press the **LOOP DOWN** switch to reset.

WESTELL NIMS60, SWITCH ADDR — Selects the Westell 16-bit T1 Network Interface and Maintenance System (NIMS-60) maintenance switch command. The DS1 line card address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the switch address (01 to 28). Pressing the **LOOP UP** switch transmits the arming code for the NIMS, then sends the command to switch the addressed line card to the smart jack. Press the **LOOP DOWN** switch to reset.

WESTELL NIMS60, RAMP ADDR — Selects the Westell 16-bit T1 Network Interface and Maintenance System (NIMS-60) ramp command. The DS1 line card address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the ramp address (01 to 28). Pressing the **LOOP UP** switch transmits the arming code for the NIMS, then activates the ramp mode for the NIU/Performance Monitor. Press the **LOOP DOWN** switch to reset.

TELTREND ARM— Selects the Teltrend, or equivalent, T1 repeater arming/disarming code. Transmit the TELTREND ARM code from the CO toward the NIU. Press the **LOOP UP** switch to send the arming code. Press the **LOOP DOWN** switch to send the disarming code.

TELTREND NEARM— Selects the Teltrend, or equivalent, T1 repeater near-end arming/ disarming code. Transmit the TELTREND NEARM code from the NIU toward the CO. Press the **LOOP UP** switch to send the arming code. Press the **LOOP DOWN** switch to send the disarming code.

TELTREND-LS, NEARM —Selects the Teltrend 7231 LS office repeater, or equivalent, near-end arming/disarming code. Transmit the codes from the NIU and toward the CO. Press the **LOOP UP** switch to send the arming code. Press the **LOOP DOWN** switch to send the disarming code.

TELTREND OR— Selects the Teltrend, or equivalent, T1 office repeater loop codes.

TELTREND-E OR, REPEATER ADDR —Selects the Teltrend 7231E, or equivalent, T1 office repeater loop codes. The office repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the office repeater address (1, 2, or 3). The Teltrend 7231E T1 office repeater has a rotary switch that is manually set to determine the office repeater's operating mode as follows:

> ***In Full T1 mode*** - (switch setting 0, 9, or 8) — the office repeater responds to the standard office repeater loop-up code with the repeater address set to either 1, 2, or 3.
>
> ***In NIU mode*** - (switch setting 7) —the office repeater responds to either the standard NIU loop-up code or Dual Loopback code.
>
> ***In FT1 mode*** - (switch settings 1-6) — the office repeater only responds to the office repeater loop-up code with the repeater address set to 1.

NOTE: In all cases, the office repeater responds to the loop-down code.

TELTREND LR, REPEATER ADDR— Selects the Teltrend, or equivalent, T1 line repeater loop codes. The repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the repeater address (1 to 20).

TELTREND, AUTO TIMEOUT DISABLE— Selects the Teltrend, or equivalent, T1 line repeater timeout disable function. This function disables the 30 minute loopback timeout function of the repeater. Establish the line repeater loopback first, then send the timeout disable code. The timeout function is reset when the loopback is deactivated remotely.

TELTREND-LC, AUTO TIMEOUT DISABLE— Selects the Teltrend Model ILR7239LC Intelligent T1 Line Repeater timeout disable function. This function disables the 30 minute loopback timeout function of the repeater. Establish the line repeater loopback first, then send the timeout disable code. The timeout function is reset when the loopback is deactivated remotely.

TELTREND PTHRU — Selects the Teltrend, or equivalent, T1 line repeater span power cut-thru code. This function forces the repeater that initiated the power loop to return to thru power mode, but it can only be activated from the DSX-1 side of the repeater. Press the **LOOP UP** or **LOOP DOWN** switch to send the power loop query code.

TELTR-LC PTHRU — Selects the Teltrend Model ILR7239LC Intelligent T1 Line Repeater span power cut-thru code. This function forces the repeater that initiated the power loop to return to thru power mode, but it can only be activated from the DSX-1 side of the repeater. Press the **LOOP UP** or **LOOP DOWN** switch to send the power loop query code.

TELTREND PWRLP — Selects the Teltrend, or equivalent, T1 line repeater power-loop codes. Press the **LOOP UP** switch to send the power loop-up code. Press the **LOOP DOWN** switch to return to thru power mode.

TELTREND QUERY — Selects the Teltrend, or equivalent, T1 repeater query code. This function returns a bit error value that corresponds to the address of the repeater that is in loopback. Press the **LOOP UP** or **LOOP DOWN** switch to send the query code.

TELTREND-LW AUTO QUERY — Selects the Teltrend-LW, or equivalent, T1 repeater automatic query code. Pressing the L**OOP UP** or **LOOP DOWN** switch transmits the Auto Query loop code, which sequentially causes each intelligent repeater on the span to return its address to the source (displayed in the form of bit errors that correspond to 10 times the address), loop down, then rearm itself. Each successive repeater repeats this process until all the repeaters have returned their addresses.

TELTREND-LS, MANUAL LEARN — Enables the 209A/211 to reassign addresses to line repeaters (Teltrend model 7239LS or 7239LW). Pressing the L**OOP UP** switch transmits the Manual Learn loop code, which simultaneously loops back each repeater in the span and prepares each repeater to receive a new address assignment. Select the TELTREND LR loop code type and program an address for the first repeater in the span, then press the **LOOP UP** switch to transmit the loop code. The first repeater accepts the loop code, reprograms itself to the new address, and loops itself down, so that the second repeater in the span is ready to receive its new address.

TELTREND-LW, AUTO-LEARN — Enables the 209A/211 to reassign addresses to line repeaters (Teltrend model 7239LW). Pressing the L**OOP UP** or **LOOP DOWN** switch transmits the Auto Learn loop code, which sequentially programs a new address for each repeater on the span. As each repeater in the span receives the Auto Learn loop code it loops up, programs itself with a new repeater address based on its position from the source, returns its new address to the source (displayed in the form of bit errors that correspond to 10 times the address), loops down, then rearms itself. Each successive repeater repeats this process until all the line repeaters are programmed (approximately 20 seconds per line repeater).

TELTREND PWRDN — Selects the Teltrend, or equivalent, T1 office repeater power-down code. Press the **LOOP UP** or **LOOP DOWN** switch to send the power-down code. The loop code is transmitted continuously until the **LOOP UP** or **LOOP DOWN** switch is pressed again.

TELTREND-E, CLEAR FT1 — If the Teltrend 7231E, or equivalent, office repeater is set for FT1 mode (see TELTREND-E OR discussion) and is already armed, this code temporarily sets the office repeater to Full T1 mode. Either the **LOOP UP** switch or **LOOP DOWN** switch can be used to transmit the Clear FT1 loop code.

TELTREND-E, FAR-END NIU— Unblocks an already armed near-end Teltrend 7231E, or equivalent, T1 office repeater to allow the appropriate NIU loop code to pass through. Pressing the **LOOP UP** switch or **LOOP DOWN** switch transmits the unblock code, which allows standard NIU loop up and loop down codes to pass through the office repeater to loop the far-end NIU.

TELTREND-E, DUAL LPBK — **Dual Loopback** — After a Teltrend 7231E, or equivalent, T1 office repeater has been programmed for the NIU mode (see TELTREND-E OR discussion) and has been looped up from the DSX-1 side, this command creates a second loopback of the near-end side of the office repeater. The office repeater has been placed in dual loopback mode with a loopback toward the CO and a loopback toward the Customer Premises. Either the **LOOP UP** switch or **LOOP DOWN** switch can be used to transmit the Dual Loopback code.

TELTREND DS1MS, ARM/DISARM— Selects the Teltrend DS1 Maintenance Switch System arm/disarm command. Pressing the **LOOP UP** switch transmits the arming code for the DS1 Maintenance Switch. If loop up is successful, the DS1 Maintenance Switch returns 1350 bit errors every 20 seconds. Pressing the **LOOP DOWN** switch sends the loop down code.

TELTREND DS1MS, SWITCH ADDR— Selects the Teltrend DS1 Maintenance Switch System switch command. Press the **RESULTS II Results** switch to select the DS1 line card address (01 to 06 and 09 to 16). Pressing the **LOOP UP** switch transmits the switch code for the DS1 Maintenance Switch. Pressing the **LOOP DOWN** switch sends the abort code, which can be used to abort a switch during the 15 second window after a switch command was sent.

TELTREND DS1MS, RESTORE — Selects the Teltrend DS1 Maintenance Switch System restore command. Either the **LOOP UP** switch or **LOOP DOWN** switch can be used to transmit the restore code.

WESCOM OFFICE, REPEATER ADDR-FROM OFFICE SIDE— Selects the Wescom Request Loop Up Office code. The repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the repeater address.

WESCOM FIELD, REPEATER ADDR - FROM CUST. SIDE — Selects the Wescom Request Loop Up Field code. The repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the repeater address.

XEL LOOP — Selects the XEL, or equivalent, T1 line repeater codes. The exchange and location repeater address appears in the RESULTS II window. Press the **RESULTS II Results** switch to select the four-digit EXCHange code (1 to 9999). Press the **RESULTS II Category** switch to select the three-digit LOCATION code (1 to 999). Press the **LOOP UP** switch to send the loop-up code. Press the **LOOP DOWN** switch to send the loop-down code.

XEL EXTEND — XEL, or equivalent, T1 line repeater time-out extension code. The location repeater address appears in the RESULTS II window. Press the **RESULTS II Category** switch to select the three-digit LOCATION code (1 to 999). Press the **LOOP UP** switch to send the time-out extension code to extend the repeater loopback another 20 minutes. Press the **LOOP DOWN** switch to transmit the loop-down code.

NOTE: The T-BERD 209A/211 does not respond to the addressable repeater loop codes when the AUX RESPONSE function is set to AUTO RESPONSE.

OUT OF BAND — Out-of-band loop codes only apply to T1 ESF and FT1 ESF operating modes. 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 T-BERD 209A/211 to establish a loopback with a compatible terminal or respond to a line loop code. ESF out-of-band line loop codes: loop up — 1111 1111 0111 0000 and loop down — 1111 1111 0001 1100.

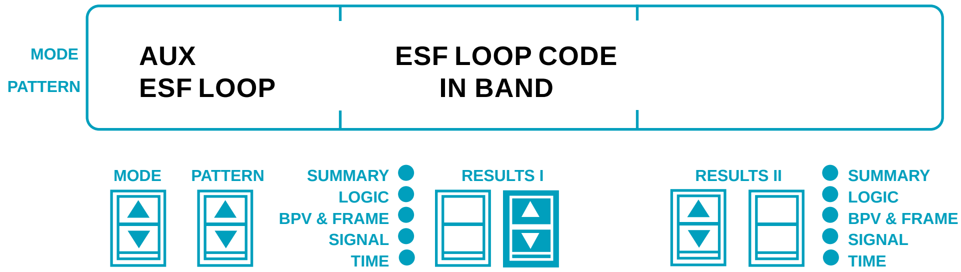
NETWORK — The network loop codes allow the T-BERD 209A/211 to establish a loopback with a compatible terminal or respond to a network loop code. ESF out-of-band network loop codes: loop up — 1111 1111 0100 1000 and loop down — 1111 1111 0010 0100.

PAYLOAD — The payload loop codes allow the T-BERD 209A/211 to establish a loopback with a compatible terminal. However, the T-BERD 209A/211 does not respond to payload loop codes. ESF out-of-band payload loop codes: loop up — 1111 1111 0010 1000 and loop down — 1111 1111 0100 1100.

Consider the following functions and modes when sending and receiving loop codes:

- AUX ESF LOOP
- AUX PGM LPUP
- AUX PGM LPDN
- AUX RESPONSE
- **LOOP CODE** switches

AUX ESF LOOP — ESF Loop Code Select



The AUX ESF LOOP function selects the loop code type that is transmitted when the **LOOP CODE** switches are pressed.

This selection also determines which loop code type causes the T-BERD 209A/211 to establish the AUTO LLB mode.

ESF LOOP CODE — Press the **RESULTS I Results** switch to select the method of transmitting the loop code in the following manner:

> **IN BAND —** The in-band loop codes (CSU, PGM, FAC1, FAC2, and FAC3) are transmitted or responded to in place of the data or test pattern. When FT1 modes (Fractional T1 Option required) are selected, the T-BERD 209A/211 only sends in-band loop codes within the selected FT1 channel bandwidth. However, the T-BERD 209A/211 does not respond to FT1 or addressable repeater loop codes.
>
> **OUT OF BAND —** The out-of-band loop codes (LINE, PAYLOAD, and NETWORK) are transmitted or responded to over the ESF datalink.

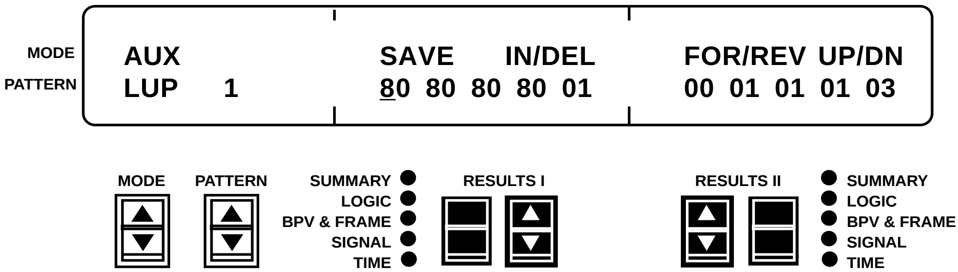
AUX ESF LOOP is only used when testing ESF or FT1 ESF formatted circuits.

The specific loop code is selected from the AUX LP CODE function. Transmitting loop codes restarts the test even when the loop is not accomplished.

Consider the following functions and modes when sending and receiving loop codes:

- AUX LP CODE
- AUX PGM LPUP
- AUX PGM LPDN
- AUX RESPONSE
- **LOOP CODE** switches and LEDs

AUX LUP — Programmable Long User Pattern



The AUX LUP function enables a 1- to 2000-hexadecimal (byte) user-programmable test pattern to be entered. This allows the T-BERD 209A/211 to transmit specific character patterns to test circuit sensitivity to the pattern.

Both sets of **RESULTS** switches are used to create or modify LUP.

SAVE— Press the **RESULTS I Category** switch to SAVE the current LUP pattern and cursor position.

IN— Press the **RESULTS I Results** switch up arrow to INsert "00" (00 in hex) at the cursor position. Press the switch continuously to INsert "00" to the right of the cursor.

DEL— Press the **RESULTS I Results** switch down arrow to DELete the character at the cursor position. Press the switch continuously to DELete characters to the right of the cursor.

FOR— Press the **RESULTS II Results** switch up arrow to move the cursor FORward from left to right.

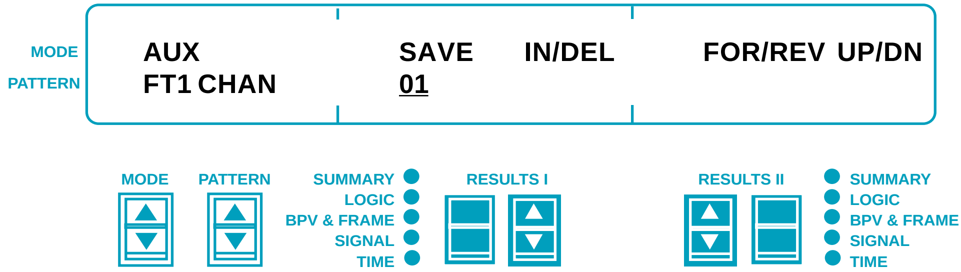
REV— Press the **RESULTS II Results** switch down arrow to move the cursor in REVerse from right to left. The cursor location appears in the PATTERN window (1 to 2000).

UP/DN— Press the **RESULTS II Category** switch to scroll the flashing digit UP or DowN to increment or decrement the digit from 0 to F in hexadecimal. Refer to Appendix C for a hexadecimal-to-binary conversion table.

The programmed test pattern is transmitted when LUP is selected with the **PATTERN** switch. A test restart occurs when LUP is being transmitted and the pattern is changed.

The pattern is entered in hexadecimal form. The pattern is transmitted starting from the LSB (Least Significant Bit) to the MSB (Most Significant Bit) of each hexadecimal character (see Appendix C).

AUX FT1 CHAN — Fractional T1 Channel Bandwidth



The AUX FT1 CHAN function selects the FT1 channel bandwidth being tested in FT1 circuits. The AUX FT1 CHAN function is only active in the FT1 operating modes (FT1 D4, and FT1 ESF).

Both sets of **RESULTS** switches are used to create or modify the FT1 channel bandwidth.

SAVE— Press the **RESULTS I Category** switch to SAVE the current FT1 channels.

IN— Press the **RESULTS I Results** switch up arrow to INsert a channel number at the cursor position.

DEL— Press the **RESULTS I Results** switch down arrow to DELete the channel number at the cursor position. Press the switch to continuously DELete channel numbers to the right of the cursor. As each number is deleted, the number to the right takes the place of the deleted number. Channel numbers can be INserted between numbers that are not consecutive; a channel number cannot be INserted between consecutive numbers.

FOR— Press the **RESULTS II Results** switch up arrow to move the cursor FORward from left to right.

REV— Press the **RESULTS II Results** switch down arrow to move the cursor in REVerse from right to left.

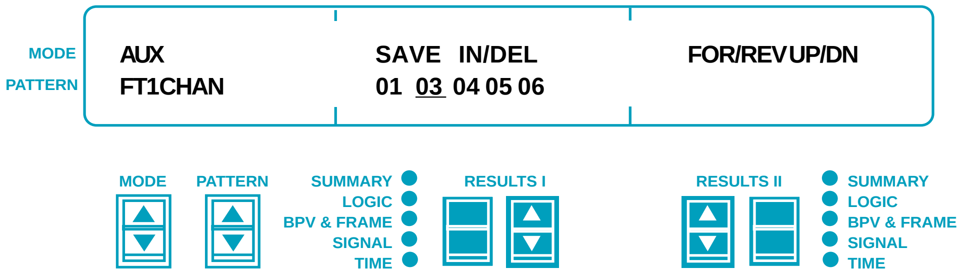
You can select all 24 channels. When the number of channels selected exceeds 10, the display acts as a sliding window. Press the **RESULTS II Results** switch to move the channel numbers past the display. When the cursor moves past the last channel number to the right, the cursor becomes a flashing dash (——). This allows a new channel number to be appended to the end of the current numbers; except when the last number is 24.

UP— Press the top part of the **RESULTS II Category** switch to scroll the flashing channel number UP from 01 to 24.

DN— Press the bottom part of the **RESULTS II Category** switch to scroll the flashing channel number down from 24 to 01.

The range of the channel numbers that can be scrolled is determined by the channel numbers on either side of the cursor. For example, if the cursor is positioned between channel numbers 05 and 15, the channel numbers that can be scrolled are 06 through 14 inclusive.

When scrolling the channel number UP and DowN and not INserting channel numbers, all of the channel numbers to the right are incremented and decremented sequentially. For example, the channel numbers 01 to 05 are displayed and the cursor is placed at channel 02. Press the top part of the **RESULTS II Category** switch to increment channels 02, 03, 04, and 05 to 03, 04, 05, and 06, respectively.



Press the bottom part of the **RESULTS II Category** switch to decrement channels 03, 04, 05, and 06 to 02, 03, 04, and 05, respectively. The channel numbers cannot be decremented past channel 01.

The highest available channel number is 24; any channel forced to be greater than 24 is deleted. The channel numbers are indicated in logical order corresponding to the selected framing mode. Contiguous FT1 channels are entered in sequential order starting with the first DS0 channel and ending with the last DS0 channel. Table 5-1 lists the FT1 channel bandwidths for the two available DS0 data rates, 64, 64xN and 56xN (N = 1 to 24). "N" is the number of DS0 channels that make up the FT1 channel.

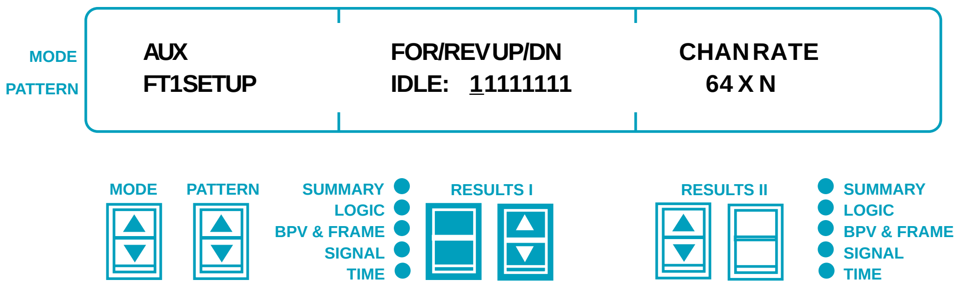
Consider the following functions when changing AUX FT1 CHAN:

- AUX FT1 SETUP function
- FT1 operating modes

Table 5-1
Fractional T1 Bandwidths

64xN							
N	**Bandwidth**	**N**	**Bandwidth**	**N**	**Bandwidth**	**N**	**Bandwidth**
1	64 kHz	7	448 kHz	13	832 kHz	19	1216 kHz
2	128 kHz	8	512 kHz	14	896 kHz	20	1280 kHz
3	192 kHz	9	576 kHz	15	960 kHz	21	1344 kHz
4	256 kHz	10	640 kHz	16	1024 kHz	22	1408 kHz
5	320 kHz	11	704 kHz	17	1088 kHz	23	1472 kHz
6	384 kHz	12	768 kHz	18	1152 kHz	24	1536 kHz
56xN							
N	**Bandwidth**	**N**	**Bandwidth**	**N**	**Bandwidth**	**N**	**Bandwidth**
1	56 kHz	7	392 kHz	13	728 kHz	19	1064 kHz
2	112 kHz	8	448 kHz	14	784 kHz	20	1120 kHz
3	168 kHz	9	504 kHz	15	840 kHz	21	1176 kHz
4	224 kHz	10	560 kHz	16	896 kHz	22	1232 kHz
5	280 kHz	11	616 kHz	17	952 kHz	23	1288 kHz
6	336 kHz	12	672 kHz	18	1008 kHz	24	1344 kHz

AUX FT1 SETUP — Fractional T1 Idle Code and Channel Rate



The AUX FT1 SETUP function sets the FT1 idle code and channel rate. The AUX FT1 SETUP function is only active in the FT1 operating modes (FT1 D4, and FT1 ESF). The idle code is transmitted on those channels not selected by the AUX FT1 CHAN function. Bit 1 (the left-most bit) is transmitted first.

FOR/REV— Press the **RESULTS I Category** switch to move the cursor FORward or REVerse in the idle code.

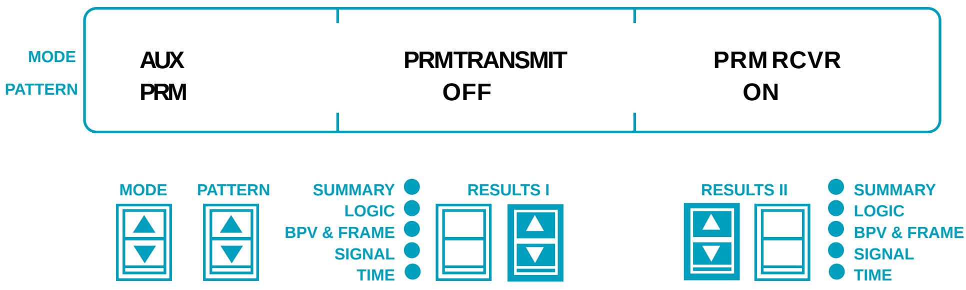
UP/DN— Press the **RESULTS I Results** switch to TOGGLE the selected bit to 0 or 1.

CHAN RATE— The channel rate determines the DS0 data rate. Press the **RESULTS II Results** switch to select either 56xN (56 kb/s DS0 data rate by "N" number of channels) or 64xN (64 kb/s DS0 data rate by "N" number of channels). When the channel rate is set for 56xN, the LSB, Bit 8, is set to a logic 1.

Consider the following functions when changing AUX FT1 SETUP:

- AUX FT1 CHAN function
- FT1 operating modes

AUX PRM — Performance Report Message Control



The AUX PRM function determines how the PRM is transmitted and whether the PRM results are accumulated. The AUX PRM function is only active when an ESF operating mode (T1 ESF or FT1 ESF) is selected with the **MODE** switch.

PRM TRANSMIT— Press the **RESULTS I Results** switch to select one of the following as to how the PRM is transmitted.

EMUL CUSTOMER— Emulates the customer PRM. Selecting EMUL CUSTOMER sets the PRM C/R bit to 0.

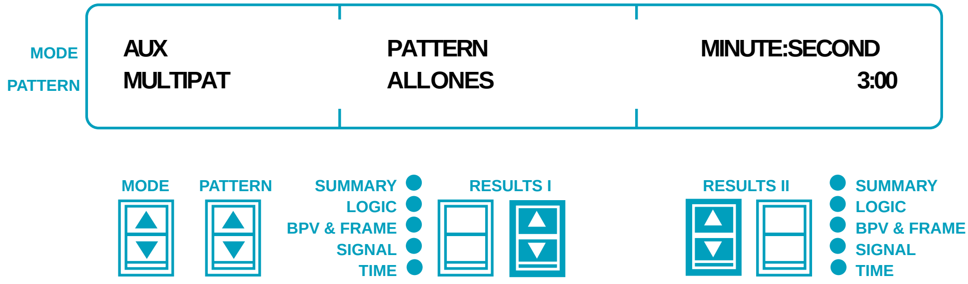
EMUL CARRIER— Emulates the carrier PRM. Selecting EMUL CARRIER sets the PRM C/R bit to 1.

OFF— Disables the PRM transmitter.

When transmitting the PRM, the PRM SE bit is set to 1 when the T-BERD 209A/211 detects and counts frame loss seconds in the received signal. The PRM SL bit is set to 1 when one or more timing slips occur. The PRM LB bit is set to 0.

PRM RCVR— Press the **RESULTS II Results** switch to turn the PRM receiver on or off. When the PRM receiver is on, the T-BERD 209A/211 reports on the PRM status in the BPV & FRAME category results.

AUX MULTIPAT — MULTIPAT Pattern Selection and Duration



The AUX MULTIPAT function controls the duration of each of the MULTIPAT test patterns.

PATTERN— Press the **RESULTS I Results** switch to select each of the test patterns: ALL ONES, 1:7, 2 IN 8, 3 IN 24, and QRSS.

MINUTE:SECOND— Press the **RESULTS II Results** switch to set the duration of the selected test pattern. The setting 0:00 turns the selected pattern off. The range 0:00 to 1:00 sets the duration in 15 second steps. The range 1:00 to 15:00 sets the duration in one minute steps.

The MULTIPAT pattern can be used in a loopback configuration, or in an end-to-end configuration with the other test set configured with the same MULTIPAT patterns and durations.

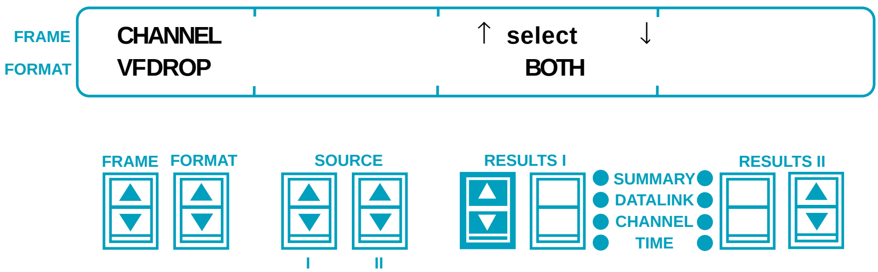
5.3 DLC ANALYZER OPTION — AUXILIARY FUNCTIONS

Pressing the **AUX** switch illuminates the switch LED and displays the T-BERD DLC Analyzer Option auxiliary functions. Pressing the **AUX** switch a second time, extinguishes the switch LED and returns the display to the current operating mode.

When the AUX switch is illuminated:

- Press the **FRAME** switch to scroll through the three auxiliary groups: CHANNEL, TRANSMIT, and TIME. The auxiliary group name appears in the FRAME window.
- Press the **FORMAT** switch to scroll through the auxiliary functions within a selected auxiliary group. The auxiliary function name appears in the FORMAT window.
- Press the **RESULTS I Results** or **RESULTS II Results** switch to select or modify the auxiliary function.

CHANNEL/VF DROP — T1 Source for Channel VF Drop



The T1 Source for Channel VF Drop auxiliary function selects the T1 input source for the channel dropped to the speaker, VF OUT jack, and 2-WIRE VF interface. The auxiliary function also determines which input source(s) has active DTMF digit decoding and VF measurements.

Select— Press the **RESULTS I Results** switch to select one of the following:

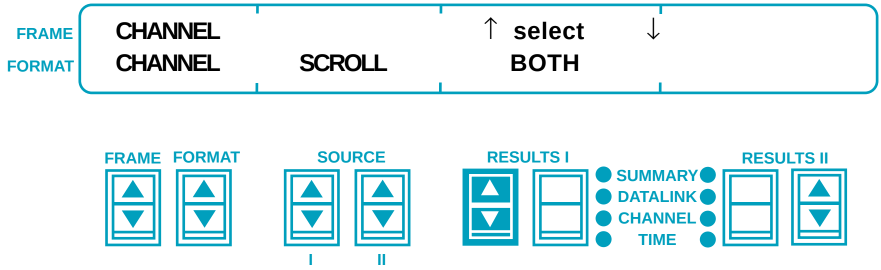
PRIMARY— The DS0 channel is dropped from the PRIMARY RECEIVE jack.

SECONDARY— The DS0 channel is dropped from the SECONDARY RECEIVE jack.

BOTH — The DS0 channel is dropped from the PRIMARY and SECONDARY RECEIVE jacks.

The CHANNEL category VF LEVEL, VF FREQ, and DTMF SEQ results measure the VF level and frequency and report the DTMF sequence for the selected line. When BOTH is selected, the VF FREQ result is not applicable.

CHANNEL/CHANNEL SCROLL — Channel Scroll



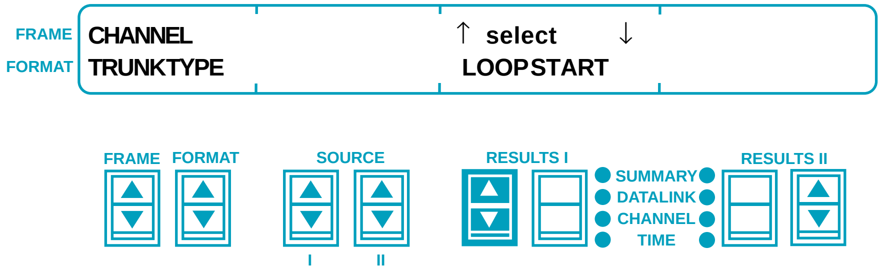
The Channel Scroll auxiliary function determines how the **PRIMARY CHANNEL** and **SECONDARY CHANNEL** switches scroll through the channel or timeslot numbers.

Select— Press the **RESULTS I Results** switch to select one of the following:

BOTH — Pressing either switch changes both channel or timeslot numbers simultaneously.

SEPARATE— The two switches operate independently of each other.

CHANNEL/TRUNK TYPE — Channel Trunk Type



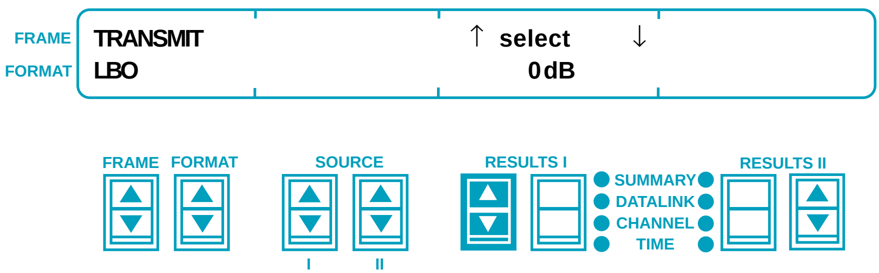
The Channel Trunk Type auxiliary function selects the trunk type signaling generated by the **ON HOOK, OFF HOOK,** and **RING** switches. The T-BERD DLC Analyzer Option is only configured to simulate the station end of a circuit and assumes the far end is sending office supervision signaling. The **RING** switch transmits office signaling.

Select— Press the **RESULTS I Results** switch to select one of the following:

LOOP START— Enables the T-BERD DLC Analyzer Option to emulate or monitor standard signaling between a telephone and switch.

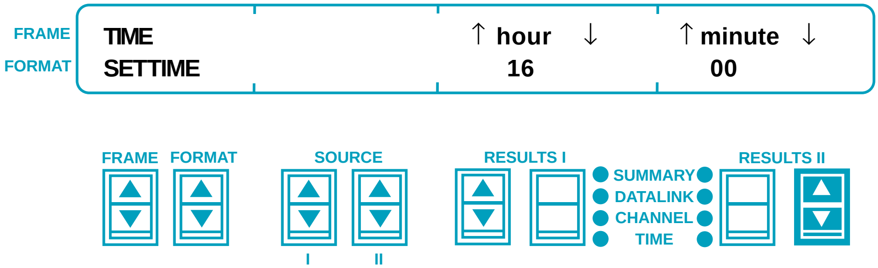
GND START— Enables the T-BERD DLC Analyzer Option to emulate or monitor a ground start foreign exchange or a DLC circuit.

TRANSMIT/LBO — T1 Transmitter Line Build-Out



The T1 Transmitter Line Build-Out (LBO) auxiliary function sets the transmitter LBO. Press the **RESULTS I Results** switch to select 0 dB, -7.5 dB, or -15 dB.

TIME/SET TIME — Set Time of Day

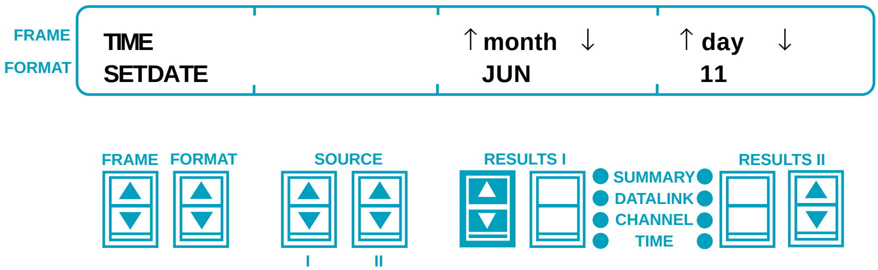


The Set Time of Day auxiliary function sets the time (in 24-hour format) for the battery-backed clock. The current time appears in the TIME category, TIME result.

Hour — Press the **RESULTS I Results** switch to set the current hour from 0 to 23 hours.

Minute — Press the **RESULTS II Results** switch to set the current minutes from 0 to 59 minutes.

TIME/SET DATE — Set Date



The Set Date auxiliary function sets the month and day for the battery-backed clock. The current month and day appear in the TIME category, DATE result.

Month — Press the **RESULTS I Results** switch to set the current month from JAN to DEC.

Day — Press the **RESULTS II Results** switch to set the current day of the month from 1 to 31.

TEST RESULTS

6.1 MAINFRAME — TEST RESULTS

The measurements and test results are displayed in the RESULTS windows. This allows two different results to be displayed at the same time. The categories are selected with the **RESULTS I** and **II Category** switches. Pressing the **RESULTS I** or **II Category** switch illuminates the category LED and displays the most recent test result in that category. The category results are displayed by pressing the **RESULTS I** and **II Results** switches.

6.2 MAINFRAME — SUMMARY CATEGORY

The SUMMARY category displays key non-zero, out-of-specification, or PRM test results without having to scroll through all of the categories to find them.

00-BITERRORS

Bit Errors — A count of received bits which have a value opposite that of the corresponding transmitted bits (Mark or Space) after pattern synchronization is achieved.

09-SLIPS

Pattern Slips — A count of the total number of pattern slips since the beginning of the test.

17-FARFRMES

Far-End Frame Error Seconds — A count of the seconds in which one or more frame errors occurred in the received signal at the far end. This result reports on the PRM Frame-Synchronization-Bit Error Event Bit (FE = 1) status.

18-FARFRMSES

Far-End Severely Errored Framing Seconds — A count of the seconds in which two or more frame errors occurred in less than 3 ms in the received signal at the far end. This result reports on the PRM Severely-Errored Framing Event Bit (SE = 1) status.

19-FARBPVSEC

Far-End BPV Seconds — A count of the seconds in which one or more BPVs occurred in the received signal at the far end. This result reports on the PRM Line-Code Violation Event Bit (LV = 1) status.

20-FARSLPSEC

Far-End Controlled Slip Seconds— A count of the seconds in which controlled slips occurred in the received signal at the far end. This result reports on the PRM Controlled-Slip Event Bit (SL = 1) status.

22-FARCRCERR

Far-End CRC Error Events— A count of the minimum number of CRC errors reported in the following 22-FCRC results. A “>” (greater than) preceding the count indicates that the Bins 2 through 6 are non-zero. This result reports on the PRM CRC Error Event Bits (G1 to G6) status.

25-VIOLATIONS

Bipolar Violations Count — A count of BPVs detected since the start of the test (excluding intentional violations found within B8ZS codes).

30-FRMERRORS

Frame Errors— A count of the frame errors detected since the start of the test. For D4-compatible framing, frame errors are counted if either an F_t or an F_s frame bit is in error. For ESF framing, frame errors are counted on FPS bits. In T1 SLC mode, frame errors are counted only if an error is found on an F_t bit.

32-CRCERRORS

CRC Errors— A count of CRC errors detected. CRC errors are counted only when ESF framing is present in the received T1 data.

34-FRMLOSCNT

Frame Loss Count— A count of discrete losses of frame synchronization that occurred during the test.

40-RXFREQ,Hz

Receive Frequency in Hz— The frequency of the clock recovered from the received data.

44-PULSESHAPE

Pulse Shape— A PASS/FAIL result which shows whether the T1 pulse shape is within the boundary of the specified pulse mask.

51-TIMINGSLIP

Controlled Timing Slips— Timing slips are counted when the RECEIVER input has slipped ±193 bit time periods from the T1 REF input. Single bit slips are displayed graphically next to timing slips.

In addition to the test results, the following status messages appear in the SUMMARY category as required.

ALL RESULTS OK — When all summary results are error-free or meet specification boundaries (e.g., RX FREQ, Hz and PULSE SHAPE), this message appears in the display.

ALL RESULTS UNAVAILABLE — Displayed at test restart when the instrument has not synchronized with the received signal.

SIGNAL LOSS — The received signal has been lost. The receiver status LEDs are not illuminated, and the Alarm status LEDs are illuminated.

FAILED PATTERN — Indicates the failed test patterns when performing a BRIDGTAP or MULTIPAT test. The failed pattern is also indicated.

B8ZS DETECTED — Indicates the presence of B8ZS coding in the received signal when the **CODE** switch is set to the AMI position.

NOT B8ZS COMPATIBLE — Indicates the received signal is not B8ZS compatible when transmitting B8ZS encoded ALL ZEROS.

6.3 MAINFRAME — LOGIC CATEGORY

The following LOGIC category results are based on a bit error count. The results are updated each time a bit error is detected in the currently selected data pattern. When pattern synchronization is lost, the bit error count continues or halts based on the AUX HALT/CONT function setting.

00-BITERRORS

Bit Errors — A count of received bits which have a value opposite that of the corresponding transmitted bits (Mark or Space) after pattern synchronization is achieved.

01-ASYNCERRSEC

Asynchronous Error Seconds — A count of test seconds where one or more bit errors occurred.

04-BITERRRT

Bit Error Rate — The ratio of bit errors to received pattern data bits.

05-ERFREESEC

Error-Free Seconds— A count of the seconds during which pattern synchronization is maintained through the entire second and no bit error occurred.

06-%EFS

%Error-Free Seconds— The ratio, expressed as a percentage, of error-free seconds to the total number of seconds during which pattern synchronization is present.

07-SYNERRSEC

Synchronized Error Seconds — A count of errored seconds synchronized to the occurrence of an error (the count and time interval begin with the occurrence of an error).

08-OUTSYNSEC

Out-of-Synchronization Seconds— A count of the total number of seconds, since the beginning of the test, during which pattern synchronization was not maintained for the entire second.

09-SLIPS

Pattern Slips— A count of the total number of pattern slips since the beginning of the test.

10-SEVERRSEC

Severely Errored Seconds— A count of seconds during which the bit error ratio was worse than 10^{-3} within the available time.

11-%SEVERSEC

% Severely Errored Seconds — The ratio, expressed as a percentage, of severely errored seconds to the number of available seconds.

12-DEGRMIN

Degraded Minutes— A count of minutes during which the bit error ratio was worse than 10^{-6}.

13-%DEGRMIN

%Degraded Minutes— The ratio, expressed as a percentage, of degraded minutes to the number of available minutes.

14-UNAVLSEC

Unavailable Seconds— A count of unavailable time.

15-%AVLBILITY

%Availability— The ratio, expressed as a percentage, of available seconds to the number of test seconds.

16-CSES

Consecutive Severely Errored Seconds— A count of the number of groups of three or more contiguous severely errored seconds in which an error rate worse than 10^{-3} was found in each second.

6.4 MAINFRAME — BPV & FRAME CATEGORY

The following BPV & FRAME category results monitor the T1 signal for BPVs, frame errors, ESF CRC errors, and the ESF datalink PRM. In this category, all test results are derived from bipolar violation (BPV) counts and frame error counts.

NOTE: 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. The message *UNAVAILABLE* appears in the far-end PRM results until either the ESF or FT1 ESF mode is selected and the first PRM is received.

17-FARFRMES

Far-End Frame Error Seconds— A count of the seconds in which one or more frame errors occurred in the received signal at the far end. This result reports on the PRM Frame-Synchronization-Bit Error Event Bit (FE = 1) status.

18-FARFRMSES

Far-End Severely Errored Framing Seconds— A count of the seconds in which two or more frame errors occurred in less than 3 ms in the received signal at the far end. This result reports on the PRM Severely-Errored Framing Event Bit (SE = 1) status.

19-FARBPVSEC

Far-End BPV Seconds— A count of the seconds in which one or more BPVs occurred in the received signal at the far end. This result reports on the PRM Line-Code Violation Event Bit (LV = 1) status.

20-FARSLPSEC

Far-End Controlled Slip Seconds— A count of the seconds in which controlled slips occurred in the received signal at the far end. This result reports on the PRM Controlled-Slip Event Bit (SL = 1) status.

21-FARPRMSEC

Far-End Performance Report Seconds— A count of the total number of seconds, since test restart, in which a valid PRM was received.

22-FARCRCERR

Far-End CRC Error Events— A count of the minimum number of CRC errors reported in the following 22-FCRC results. A “>” (greater than) preceding the count indicates that the Bins 2 through 6 are non-zero. This result reports on the PRM CRC Error Event Bits (G1 to G6) status. When the result is displayed and the indicated count is an approximation of the actual CRC error count, a “>” (greater than) sign precedes the result count.

22-FCRC1

Far-End CRC 1 Bin— A count of the seconds with only one CRC error reported in the received signal at the far end. This result reports on the first PRM CRC Error Event Bit (G1 = 1).

22-FCRC2-5

Far-End CRC 2 to 5 Bin— A count of the seconds with 2 to 5 CRC errors reported in the received signal at the far end. This result reports on the second PRM CRC Error Event Bit (G2 = 1).

22-FCRC6-10

Far-End CRC 6 to 10 Bin— A count of the seconds with 6 to 10 CRC errors reported in the received signal at the far end. This result reports on the third PRM CRC Error Event Bit (G3 = 1).

22-FCRC11-100

Far-End CRC 11 to 100 Bin— A count of the seconds with 10 to 100 CRC errors reported in the received signal at the far end. This result reports on the fourth PRM CRC Error Event Bit (G4 = 1).

22-FCRC101-319

Far-End CRC 101 to 319 Bin— A count of the seconds with 101 to 319 CRC errors reported in the received signal at the far end. This result reports on the fifth PRM CRC Error Event Bit (G5 = 1).

22-FCRC>319

Far-End CRC 320 to 333 Bin— A count of the seconds with 320 to 333 CRC errors reported in the received signal at the far end. This result reports on the sixth PRM CRC Error Event Bit (G6 = 1).

23-PAYSRC

Far-End Payload Source/Loopback— Identifies the direction of the PRM according to the PRM Command/Response Bit (C/R) and the Payload Loopback Activated Bit (LB). In end-to-end applications, a customer generated PRM is indicated as CUST (C/R = 0 and LB = 0) and a carrier generated PRM is indicated as CARR (C/ = 1 and LB = 0) in the display. In payload loopback applications, the customer generated PRM is indicated as CUST LOOP (C/R = 0 and LB = 1) when the customer is looped back and the carrier generated PRM is indicated as CARR LOOP (C/R = 1 and LB = 1) when the carrier is looped back.

25-VIOLATIONS

Bipolar Violations Count — A count of BPVs detected since the start of the test (excluding intentional violations found within B8ZS codes).

26-BPVSECONDS

BPV Seconds — A count of the seconds within which one or more BPVs occurred.

27-BPVRATE

BPV Rate — The ratio of BPVs to the number of data bits received.

28-FRMERRSEC

Frame Errored Seconds — A count of the seconds during which one or more frame errors occurred.

29-FRAMESES

Frame Severely Errored Seconds — A count of the seconds during which the total number of frame errors equaled 12 or more (D4 framing only).

30-FRMERRORS

Frame Errors — A count of the frame errors detected since the start of the test. For D4-compatible framing, frame errors are counted if either an F_t or an F_s frame bit is in error. For ESF framing, frame errors are counted on FPS bits. In T1 SLC mode, frame errors are counted only if an error is found on an F_t bit.

31-FRMERRATE

Frame Error Rate — The ratio of frame errors to the number of analyzed framing bits.

32-CRCERRORS

CRC Errors — A count of CRC errors detected. CRC errors are counted only when ESF framing is present in the received T1 data.

33-CRCERRSEC

CRC Errored Seconds — A count of seconds within which one or more CRC errors are detected.

34-FRMLOSCNT

Frame Loss Count — A count of discrete losses of frame synchronization that occurred during the test.

35-FRMLOSSEC

Frame Loss Seconds — A count of seconds since initial frame synchronization during which one or more frame synchronization losses occurred or during which frame synchronization could not be achieved.

36-CRCSES

CRC Severely Errored Seconds — A count of seconds during which the total number of CRC errors and frame synchronization losses equaled 320 or more.

37-CRCERRRT

CRC Error Rate — A count of CRC errors divided by the total number of ESF superframes analyzed.

6.5 MAINFRAME — SIGNAL CATEGORY

The following SIGNAL category test results analyze the input signal characteristics. The test results include received frequency, receive level, pulse shape, timing slip, and simplex current measurements.

40-RXFREQ,Hz

Receive Frequency in Hz — The frequency of the clock recovered from the received data.

41-RXLEVELdBdsx

Receive Level in dBdsx — The level of the received signal in dB relative to a standard 3-volt base-to-peak signal (DSX level).

42-RXLEVELdBm

Receive Level in dBm — The power level of an all-ones signal (applicable only when all ones is detected).

43-RXLEVELVp-p

Receive Level in Volts — The level of the received signal in peak-to-peak volts. The signal level is displayed as V or mV when it is higher or lower than 1 volt, respectively.

44-PULSESHAPE

Pulse Shape — A PASS/FAIL result which shows whether the T1 pulse shape is within the boundary of the specified pulse mask.

45-PULSEWIDTH

Pulse Width — The pulse width of a T1 pulse, displayed in nanoseconds. This measurement is not available in T1C mode.

46-RISETIME

Pulse Rise Time — The time interval between the 10% and 90% points of the rising edge of the T1 pulse, displayed in nanoseconds. This measurement is not available in T1C mode.

47-FALLTIME

Pulse Fall Time — The time interval between the 10% and 90% points of the falling edge of the T1 pulse, displayed in nanoseconds. This measurement is not available in T1C mode.

48-UNDERSHOOT

Undershoot — The level difference from the minimum point to the 0% point of the T1 pulse. UNDERSHOOT is displayed as a percent of the normalized pulse where the normalized pulse height equals 100%.

49-OVERSHOOT

Overshoot — The level difference from the maximum point to the 100% point of the T1 pulse. OVERSHOOT is displayed as a percent of the normalized pulse where the normalized pulse height equals 100%.

Measuring Pulse Shapes

The T-BERD 209A/211 can be used to determine if a DS1 pulse is within specification by comparing the pulse shape to a pulse mask like the one shown in Figure 6-1. The T-BERD 209A/211 is equipped with two such masks, which are selectable through the AUX PLS MASK function:

DSX (CB 119)— Selects the pulse mask conforming to AT&T Compatibility Bulletin 119 and ANSI T1.102 specifications. This mask is used to analyze the pulse shape at a DSX cross-connect.

NI (ANSI)— Selects the pulse mask conforming to the ANSI T1.403 Network Interface specification. This mask is used to analyze the pulse shape at the network interface.

If desired, the DS1 pulse can be evaluated without comparing it to a mask by setting the AUX PLS MASK function to NONE. The T-BERD 209A/211 is also equipped to output the pulse shape and mask to a graphics printer. The pulse shape printout is initiated by selecting the AUX GRAPH function and pressing the **RESULTS I Results** switch. Note that when NONE (no pulse mask) is specified, the pulse shape is printed without the pulse mask.

50-SPXCURRENT

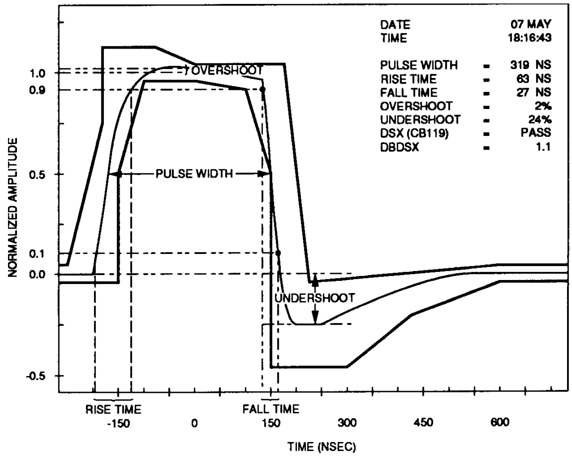
Simplex Current— The magnitude of the simplex current flowing between the transmit output tip and ring and the receive input tip and ring.

51-TIMINGSLIP

Controlled Timing Slips— Timing slips are counted when the RECEIVE input has slipped ±193 bit time periods from the T1 REF input. Single bit slips are displayed graphically next to timing slips (see functional description).

53-SLPANASEC

Timing Slip Analysis Seconds — A count of test seconds during which Timing Slip Analysis has been performed.



EXPECTED PULSE SHAPE PARAMETERS

PARAMETER	MASK	
	DSX	NETWORK INTERFACE
Pulse Width	350 ± 56 ns	350 ± 56 ns
Rise Time	< 140 ns	< 152 ns
Fall Time	< 117 ns	< 125 ns
% Overshoot	< 15%	< 20%
%Undershoot	< 45%	< 45%

Figure 6-1
Pulse Shape and Pulse Mask Specifications

Measuring Timing Slips

The T-BERD 209A/211 timing slip measurement (51-TIMING SLIP) identifies frequency deviations which cause uncontrolled and controlled clock slips. When measuring timing slips, a received T1 signal is compared with a reference T1 signal. The signal reference is taken from either the source attached to the side-panel EXT CLK IN connector or the front-panel T1 REF jacks. This comparison allows the T-BERD 209A/211 to count the number of times that the edges of the received signal move past the edges of the reference signal (see Figure 6-2).

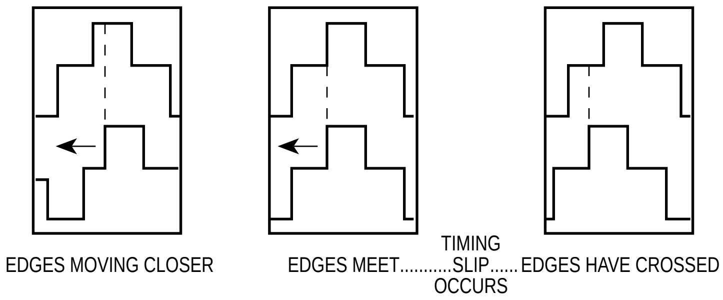


Figure 6-2
Timing Slips

The 51-TIMING SLIP result is displayed in three sections (see Figure 6-3): a numeric value, a bar graph, and a moving *wheel*.

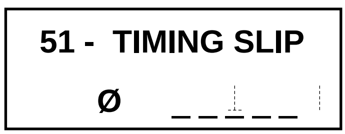


Figure 6-3
Timing Slips Results Display

The numeric value (range 0 to 9999) represents the total number of frame slips (1 frame slip = 193-bit slips). The bar graph represents partial frame slips in increments of one bar per 16 bit slips (one wheel rotation); each time the bar moves to the end of the graph, it is reset to the middle position and the frame slip count is incremented. The wheel is used in conjunction with the bar graph to graphically display the direction, rate, and magnitude of timing slips. Figure 6-4 shows the values assigned to each position of the bar graph and the wheel.

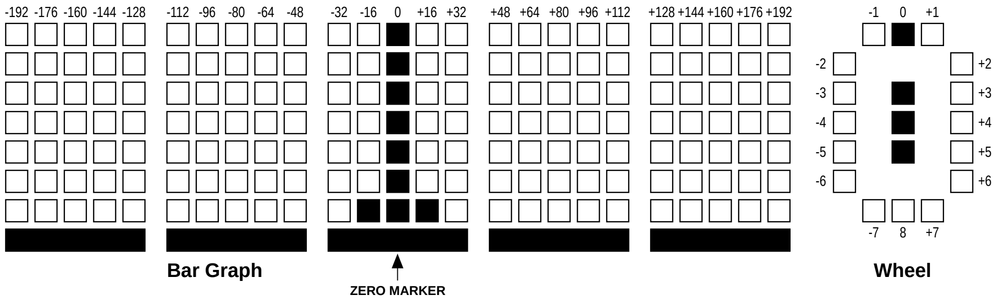
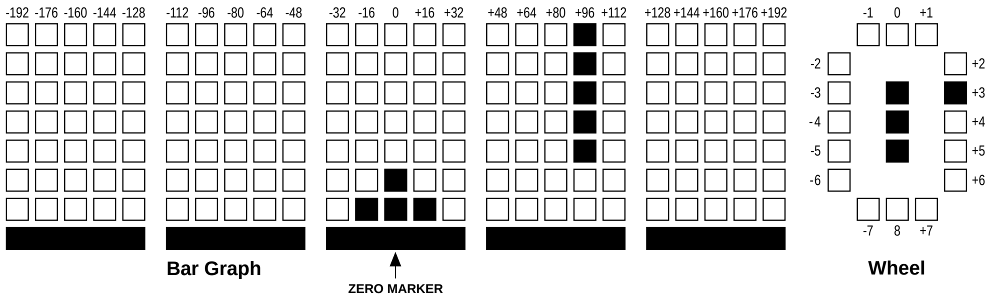
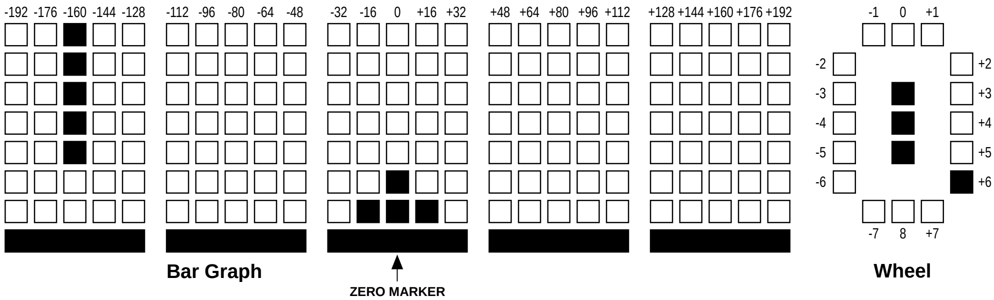


Figure 6-4
Bar Graph and Wheel Values

The magnitude of a timing slip is determined by adding the magnitude of the number indicated by the wheel position to the corresponding bar graph value. For example, if the display shows:



the bar graph value is +96 and the wheel value is +3; adding these two values results in a timing slip of +99 bits. That is, 99 more clock cycles have been received at the RECEIVE input than at the T1 REF input, or the RECEIVE input is receiving a higher frequency than the T1 REF input. If the display shows the bar graph value is -160 and the wheel value is +6, resulting in a timing slip of -154 bits.



6.6 MAINFRAME — TIME CATEGORY

The TIME category offers time-related measurements such as signal loss seconds, test length, time remaining in a test, and current time and date.

60-SIGLOSSEC

Signal Loss Seconds— A count of test seconds during which the signal was not present or during which one or more signal losses occurred.

61-ALARMEDSEC

Alarmed Second— A count of test seconds during which a Yellow, All Ones, Excess Zeros, or Ones Density alarm was detected.

62-TESTLENGTH

Length of a Timed Test— The currently set test length for a timed test, in HHH:MM format.

63-ELAPSETIME

Elapsed Time— The number of hours, minutes, and seconds (1) since a proper frequency and level has been detected or (2) since the last major switch change.

64-TESTENDIN

Time Remaining in Timed Test— Time remaining in a timed test, in HHH:MM:SS format.

65-CLOCKTIME

Clock Time of Day— The time of day in HH:MM:SS format.

66-DATE

Date— The date in DD MMM format.

6.7 MAINFRAME—JITTER (T-BERD 211 ONLY) & WANDER CATEGORY

The wander test results are available only for T1 signals, and require the presence of a T1 reference signal taken from either the side-panel EXT CLK IN connector or from the front-panel T1 REF jack. Wander is measured in UIs; 1 UI is equivalent to a single T1 time slot or one bit space in a buffer. When measuring wander, the primary goal is to ensure that the amount of wander on the T1 signal is not exceeding an amplitude for which terminal buffers cannot compensate.

The following peak-to-peak wander measurements appear in the T-BERD 209A WANDER category and the T-BERD 211 JITTER & WANDER category.

70-WANDER+PK

Maximum Positive Peak Wander— The maximum positive peak wander deviation since the beginning of the test, defined in Unit Intervals (UIs).

71-WANDER-PK

Maximum Negative Peak Wander— The maximum negative peak wander deviation since the beginning of the test, defined in UIs.

72-P-PWANDER

Peak-to-Peak Wander— The total deviation of positive-to-negative peak wander since the beginning of the test, defined in UIs.

73-15mWANDER

Maximum Peak-to-Peak Wander Over 15 Minutes— The maximum peak-to-peak wander deviation over the last 15 minutes of the test. This result is unavailable for the first 15 minutes of the test and is updated once per minute thereafter.

74-24hWANDER

Maximum Peak-to-Peak Wander Over 24 Hours— The maximum peak-to-peak wander deviation over the last 24 hours of the test. This result is unavailable for the first 24 hours of the test and is updated once per hour thereafter.

75-TIEWANDER

Time Interval Error Wander— The variation in time delay of a given timing signal with respect to the T1 reference signal or external clock source over the test interval. Valid range is + 99999 UI.

The wideband and highband jitter measurements on a received T1 signal are made in conformance with CCITT O.171 specifications. The wideband result measures jitter over a 10 Hz to 40 kHz range; the highband result measures jitter over a 8 kHz to 40 kHz range.

The following wideband and highband jitter, and spectral jitter versus jitter mask analysis appear in the T-BERD 211 JITTER & WANDER category.

80-WB/HBJIT

Wideband and Highband Jitter— A pass/fail measurement of wideband and highband jitter on a received T1 signal when compared to the CCITT O.171 jitter mask. (Pass/Fail criteria: wideband jitter > 5 UI; highband jitter > 0.1 UI.)

81-WBJITTER

Peak-to-Peak Wideband Jitter— The current amount of peak-to-peak wideband jitter, defined in UIs, updated once per second.

82-HBJITTER

Peak-to-Peak Highband Jitter— The current amount of peak-to-peak highband jitter, defined in UIs, updated once per second.

84-MAXWBJIT

Maximum Peak-to-Peak Wideband Jitter— The maximum amount of peak-to-peak wideband jitter since the last test restart, defined in UIs.

85-MAXHBJIT

Maximum Peak-to-Peak Highband Jitter— The maximum amount of peak-to-peak highband jitter since the last test restart, defined in UIs.

88-SAP/F

Spectral Analysis Content— A pass/fail comparison between the spectral content of each frequency band and the jitter mask selected in the AUX JIT MASK function.

89-SAFREQ

Relative Jitter in All 40 Frequency Bands— The relative amount of jitter present in all 40 frequency bands. Each frequency band and result are automatically scrolled in the display.

90-SAFREQ

Relative Jitter in Each Frequency Band— The relative amount of jitter present in each of the 40 frequency bands. Each frequency band is displayed manually by pressing the **RESULTS I** or **II Results** switch.

Performing Jitter Spectral Analysis (T-BERD 211 Only)

In addition to the other measurements mentioned, the Jitter Spectral Analysis Option provides jitter versus jitter mask results over 40 frequency bands which can be displayed in UIs or as a percentage between the spectral jitter response and the selected jitter mask (%MASK). Appendix D provides a graph of the jitter mask specifications that are selectable from the AUX JIT MASK function. Table 6-1 lists the Spectral Analysis results and how they are displayed with reference to the AUX JIT S/A and AUX JIT MASK functions.

Table 6-1
Spectral Analysis Results

Results	Displayed Information	Auxiliary Function	Selection
88-SA P/F 89-SA FREQ 90-SA FREQ	N/A UNAVAILABLE (not shown)	AUX JIT S/A AUX JIT MASK	OFF NONE
88-SA P/F 89-SA FREQ 90-SA FREQ	N/A Frequencies and UI Frequencies and UI	AUX JIT S/A AUX JIT MASK	ON NONE
88-SA P/F 89-SA FREQ 90-SA FREQ	Pass/Fail/Unavailable Frequencies and % Mask Frequencies and % Mask	AUX JIT S/A AUX JIT MASK	ON Mask
88-SA P/F 89-SA FREQ 90-SA FREQ	UNAVAILABLE UNAVAILABLE (not shown)	AUX JIT S/A AUX JIT MASK	OFF Mask

6.8 TEST RESULTS — DLC ANALYZER OPTION

The T-BERD DLC Analyzer Option performs a variety of measurements and provides a number of channel and datalink results. The measurements and test results are displayed in the RESULTS windows. This allows two different results to be displayed at the same time.

The categories are selected with the **RESULTS I** and **II Category** switches. Pressing the switch illuminates the category LED and displays the previously displayed category result. The category results are displayed by pressing the **RESULTS I** and **II Results** switches.

Most messages and results are preceded with either a “P” or “S” to indicate the input source, PRIMARY RECEIVE or SECONDARY RECEIVE.

6.9 DLC ANALYZER OPTION — SUMMARY CATEGORY

The SUMMARY category displays flashing messages, current alarm messages, and key non-zero test results without having to scroll through all the categories to find them.

Flashing Messages

Flashing messages appear in the RESULTS I window indicating a signal loss, switching failure, or an option not installed. When a full-screen result appears, the flashing messages are not displayed. Depending on the message, some flash in the display once, while others flash until the condition is resolved.

P/SSIGNALLOSS

Signal Loss — Indicates the T1 signal has been lost after initial signal presence on the indicated receiver. The message flashes until the signal returns (T1 Pulses LED illuminated).

P/SDATALINKSYNCLOSS

Datalink Synchronization Loss — Indicates that datalink synchronization has been lost after initial datalink synchronization. The message flashes until datalink synchronization is regained.

SWPROTFAILED

Switch to Protection Line Failed— Indicates a switch to protect request cannot be completed. The message flashes once with each occurrence.

OPTIONNOTINSTALLED

Option Not Installed— An option is not currently installed or available. The message flashes once with each attempt.

Alarm Messages

Alarm messages only appear in the SUMMARY category as they occur. The following alarm messages also appear in the DATALINK category as a current and historical record. The alarms are listed in a prioritized order. Higher priority messages supersede the lower priority messages.

P/SMAJORSHELFx

Major Alarm on Shelf x— Indicates a system state that is characterized by a loss of service to the subscribers served by a shelf or shelf group (x = A, B, C, or D).

P/SMAJORNOSHELF

Major Alarm, No Shelf— Indicates a system state that is characterized by a loss of service to the subscribers with no associated shelf alarm.

P/SALARMSHELFx

Shelf Alarm on Shelf x— Indicates a system state that is characterized by a loss of service to the subscribers served by the indicated shelf (x = A, B, C, or D).

P/SSHELFxONPROT

Shelf x on Protection Line— Indicates that one of the shelves has switched to the protection line (x = A, B, C, or D).

P/SFELOOPSHELFx

Far-End Loop on Shelf x— Indicates that a request is being sent to the far end to loop one of the four shelves (x = A, B, C, or D).

P/SFELOOPPROTECT

Far-End Loop on Protection Line— Indicates that a request is being sent to the far end to loop the protection line.

P/SMINOR

Minor Alarm **—** Indicates a system state that is characterized by a non-service affecting fault.

P/SPWR/MISC

Power/Miscellaneous Alarm **—** Indicates a power loss, high temperature, smoke, high water, open door, or other defined condition exists.

Maintenance Test Messages

These messages indicate a maintenance test is being performed. They appear in the DATALINK category as a historical record of the test. These messages are suppressed in SLC Mode 2.

P/SMAINTHOOK/SEIZE

On-Hook/Seize Maintenance Message **—** Indicates a maintenance test is being initiated or the bypass pair is being released.

P/SMAINTPROCEED

Proceed Maintenance Message **—** Indicates the bypass procedure is in progress.

P/SMAINTTESTALARM

Test Alarm Maintenance Message **—** Indicates the bypass procedure has failed.

T1 Signal Errors

These signal errors only appear in the SUMMARY category when one or more errors are detected. These results remain in the SUMMARY category until a test restart occurs.

P/SVIOLATION

Bipolar Violation Count **—** A count of BPVs detected since the start of the test (excluding intentional violations found within B8ZS encoding).

P/SCRCERROR

CRC Errors **—** A count of CRC errors detected. CRC errors are counted only when ESF framing is present in the received T1 data.

P/SFRMERROR

Frame Errors **—** A count of the frame errors detected since the start of the test. For D4 or D1D framing, frame errors are counted if either an F_t or an F_s frame bit is in error. For ESF framing, frame errors are counted on FPS bits. For SLC-M1 or SLCM2 framing, frame errors are counted only if an error is found on an F_t bit.

6.10 DLC ANALYZER OPTION — DATALINK CATEGORY

The following DATALINK category results act as a current and historical record of the alarm and maintenance messages that are received from the SLC datalink. The current and historical alarm and maintenance messages are cleared when the **HISTORY RESET** switch is pressed or a test restart occurs. This category is only available when the **FRAME** switch is set to SLC-M1 or SLC-M2, and initial frame and datalink synchronization have occurred.

Alarm Messages

The datalink alarm field identifies conditions that cause disruptions in customer service, changes in signal quality, changes in signal path, and mechanical integrity of the system. The alarms are generally classified as major and minor alarms. Major alarms indicate system failures that cause disruptions in customer service. These failures include excessive BPVs, frame loss, and continuous signal loss. Minor alarms indicate system conditions that occur to prevent a major alarm or identify a far-end loop. The following alarm messages also appear in the SUMMARY category.

P/SMAJORSHELFx

Major Alarm on Shelf x — Indicates a system state that is characterized by a loss of service to the subscribers served by a shelf or shelf group (x = A, B, C, or D).

P/SMAJORNOSHELF

Major Alarm, No Shelf — Indicates a system state that is characterized by a loss of service to the subscribers with no associated shelf alarm.

P/SALARMSHELFx

Shelf Alarm on Shelf x — Indicates a system state that is characterized by a loss of service to the subscribers served by the indicated shelf (x = A, B, C, or D).

P/SSHELFxONPROT

Shelf x on Protection Line — Indicates that one of the shelves has switched to the protection line (x = A, B, C, or D).

P/SFELOOPSHELFx

Far-End Loop on Shelf x — Indicates that a request is being sent to the far end to loop one of the four shelves (x = A, B, C, or D).

P/SFELOOPPROTECT

Far-End Loop on Protection Line — Indicates that a request is being sent to the far end to loop the protection line.

P/SMINOR

Minor Alarm — Indicates a system state that is characterized by a non-service affecting fault.

P/SPWR/MISC

Power/Miscellaneous Alarm — Indicates a power loss, high temperature, smoke, high water, open door, or other defined condition exists.

Maintenance Test Messages

The datalink maintenance field controls customer maintenance testing between the central office and remote terminal (RT). The maintenance test lasts approximately two seconds. These messages are suppressed in SLC Mode 2. The following messages occur when you are performing a maintenance test or when the system is running a maintenance test.

P/SMAINTHOOK/SEIZE

On-Hook/Seize Maintenance Message — Indicates a maintenance test is being initiated or the bypass pair is being released.

P/SMAINTPROCEED

Proceed Maintenance Message — Indicates the bypass procedure is in progress.

P/SMAINTTESTALARM

Test Alarm Maintenance Message — Indicates the bypass procedure has failed.

Datalink Status Results

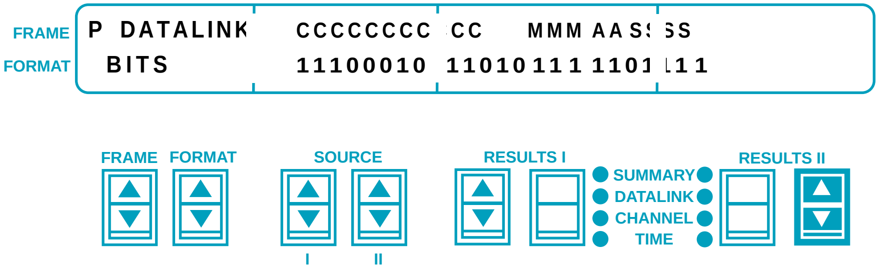
The following datalink status results indicate the number of seconds that alarms are detected, the datalink bit stream, and the alarm field format.

P/SSLCASEC

SLC Alarmed Seconds — The number of test seconds during which datalink alarms, maintenance tests, or switch to protection line messages were detected.

P/SDATALINKBITS

SLC Datalink Bits — This result displays the individual datalink bits. The display indicates the concentrator (CCCCCCCCCCC), maintenance (MMM), alarm (AA), and protection line switch (SSSS) fields. This result is only available when the T-BERD DLC Analyzer is frame synchronized in the SLC-M1 or SLC-M2 mode. The spoiler bits are shown without characters above them.



P/S ALM FIELD

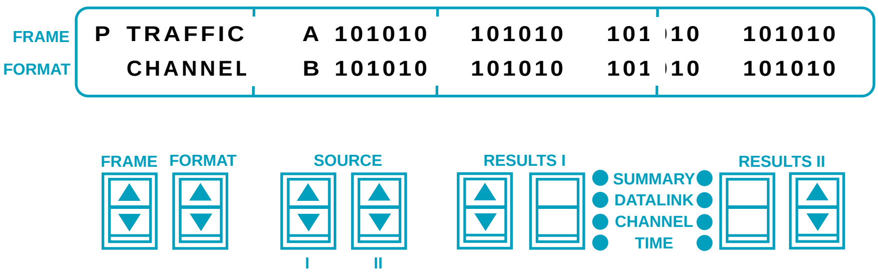
Alarm Field Format— Identifies the received datalink alarm field format as either 13 bit or 16 bit.

6.11 DLC ANALYZER OPTION — CHANNEL CATEGORY

The following CHANNEL category displays results for all 24 DS0 timeslot or channel signaling bits, data bits, and channel assignments for both primary and secondary receiver inputs. The results are only available after initial frame synchronization is achieved. The timeslot or channel signaling bit results require the entire display. The VF, data bit, and DTMF results are displayed in a single RESULTS window.

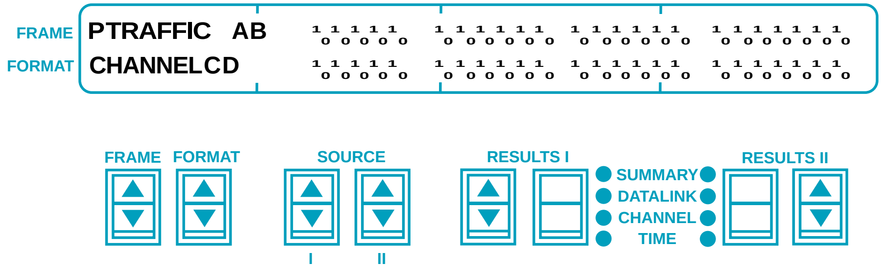
P/S TRAFFIC CHANNEL

AB Traffic Channel Signaling Bits— This result displays the A and B signaling bits in all 24 channels. This result is available in the SLC-M1, T1 D1D, T1 D4, and AUTO frame modes, but not SLC-M2 or T1 ESF.



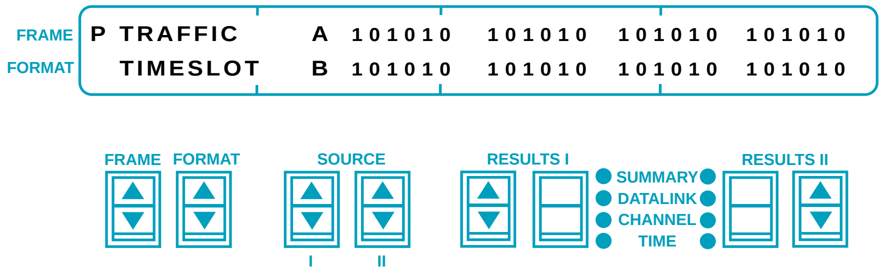
P/STRAFFICCHANNEL

ABCD Traffic Channel Signaling Bits — This result displays the A, B, C, and D signaling bits in all 24 channels. This result is only available in the T1 ESF frame mode.



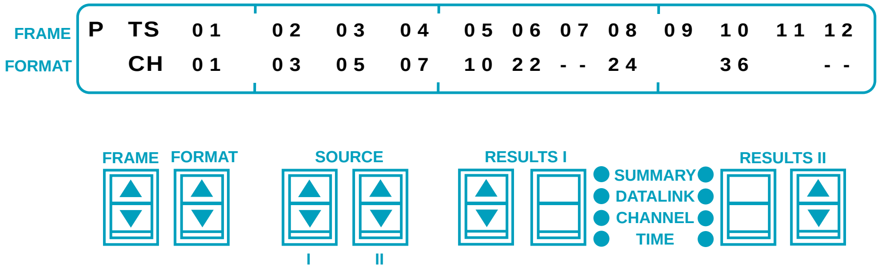
P/STRAFFICTIMESLOT

Traffic Signaling Bits for SLC-M2 Timeslots — This result displays the A and B signaling bits in all timeslots from a single receiver input. This is only available in the SLC-M2 frame mode.



P/STSCHAN

SLC-M2 Timeslot Channel Assignments— This result displays the timeslot channel assignments of a Mode 2 SLC-96 circuit. An unassigned timeslot is indicated by two dashes (——). An unknown timeslot assignment is left blank. This result is available only in the SLC-M2 frame mode and is valid only when the signal is received from the LDS.



P/SVFLEVEL

Received VF Signal Level in dBm— A measurement of signal power in the currently selected DS0 channel.

P/SVFFREQ

Received VF Frequency— The VF frequency, measured in Hertz, of the received VF data in the currently selected DS0 channel.

P/SDATABITS

DS0 Channel Data Bits— Displays the binary values of the selected DS0 channel.

DTMFSEQ

Dual-Tone Multi-Frequency Sequence— Displays 11 digits of the received telephone number in the currently selected DS0 channel. The input to this display is based on the CHANNEL/VF DROP auxiliary function (PRI, SEC, or BOTH).

6.12 DLC ANALYZER OPTION — TIME CATEGORY

The TIME category presents the current time, date, and the signal loss seconds results for the T-BERD DLC Analyzer.

TIME

Time of Day— The current time of day in HH:MM:SS format. This is set with the SET TIME auxiliary function.

DATE

Date— The current date in MMM DD format. This is set with the SET DATE auxiliary function.

P/S SIGLSEC

Signal Loss Seconds— A count of test seconds during which the signal was not present or during which one or more signal losses occurred after the initial signal detection.

PRINTER OPERATION

7.1 COMPATIBLE PRINTERS

The T-BERD 209A/211 can generate printouts to an RS-232 serial printer such as the TTC PR-40A Thermal Printer. The T-BERD 209A/211 RS-232 interface is configured to operate with the PR-40A without having to change any of the settings on either device.

7.2 RS-232 PRINTER OPERATION

The RS-232 Printer/Remote Control Interface enables you to obtain hard-copy printouts of pulse shape, jitter (T-BERD 211 only), and TDR graphs, test results, alarm messages, and front-panel set-ups. The T-BERD 209A/211 stores the printouts in NOVRAM, which enables the printouts to be printed at any time during or after the test.

The RS-232 connector is configured to function as Data Communications Equipment (DCE); it may be directly connected to Data Terminal Equipment (DTE). Connection to other DCE is possible with the use of an adaptor cable. This RS-232 connector is a 25-pin female D connector located on the T-BERD 209A/211 right side-panel. Auxiliary functions are used to select the baud rate, parity, and line terminator. Table 7-1 shows the selections available for configuring the RS-232 connector.

Table 7-1
RS-232 Printer/Controller Interface Configurations

Function	Selections
Baud rate	300, 1200, 2400, 4800
Word length*	7 bits (odd or even parity) 8 bits (no parity)
Line terminator	CR or CRLF
Column length	80 characters

* Word length is controlled by the parity selection, see AUX PARITY function.

The following Auxiliary functions are used to configure the RS-232-C interface (see Section 5):

AUX BAUD — Sets the RS-232 interface baud rate.

AUX PARITY — Sets the RS-232 interface parity.

AUX TERM — Sets the RS-232 interface line terminator.

7.3 CONNECTING THE PRINTER

Perform the following procedure to connect the TTC PR-40A printer to the T-BERD 209A/211.

1. **AC power**
   Before connecting the printer to the T-BERD 209A/211, verify that the power is turned OFF.

2. **Connect the printer to the T-BERD 209A/211**
   Use a 25-position, D-type connector, cable with the pin assignments as described in Section 9.

3. **AC power**
   Turn the T-BERD 209A/211 ON first, then the printer. If this step is reversed and the printer is ON LINE, the first printout can be garbled.

4. **Place the printer ON LINE**
   The PR-40A must be placed ON LINE manually (see the *PR-40A Thermal Printer Operating Manual*). When the printer is placed ON LINE the T-BERD 209A/211 immediately sends any printouts stored in memory.

   NOTE: When connecting a compatible printer to the T-BERD 209A/211, connect the printer to the T-BERD 209A/211, turn the printer power ON first, and place the printer OFF LINE before turning the T-BERD 209A/211 ON.

7.4 GENERATING A PRINTOUT

Printer operation is controlled through the front-panel **PRINT** and **PRINT EVENT** switches.

PRINT Switch — Press this switch to manually generate either a results or controls printout. The results printout is a hard-copy list of current test results. The controls printout is a hard-copy list of the T-BERD 209A/211 current switch and auxiliary function settings.

PRINT EVENT Switch — This switch selects the event that automatically initiates a results printout. The labeled LEDs adjacent to the switch illuminate to reflect the current position of the switch. The switch positions and their functions are as follows:

OFF — No status or alarm messages are printed; all other positions enable the printing of status and alarm messages. Only manual prints can be initiated using the **PRINT** switch. When the **PRINT EVENT** switch is changed from one setting to OFF, all printer buffers are cleared; any previously stored test results or messages are not printed.

TEST END — If the T-BERD 209A/211 is set for a timed test (selected by the **TEST** switch), the results are printed when the test interval has expired. The test interval is controlled through the AUX TEST LEN function.

ERROR — Results are printed when any of the following events occur: Logic errors, CRC errors, frame errors, BPVs, or changes in alarm conditions.

SEV ERR SEC — Results are printed when the bit error rate exceeds 10^{-3}. This selection is only available when the G.821 Performance Analysis Option is installed.

NOTE: A 6-hour backup printout is provided for both the ERROR and SEV ERR SEC positions. The printout is labeled BACKUP PRINT and occurs only if the print criterion has not been satisfied for six hours.

2 HR — Results are printed every two hours.

15 MIN — Results are printed every 15 minutes.

7.5 TYPES OF PRINTOUTS

The T-BERD 209A/211 can generate four types of printouts: results, controls, messages, and graphic. Each printout is identified by a header and is time- and date-stamped.

7.5.1 Results Printouts

The T-BERD 209A/211 generates three types of results printouts: standard, BRIDGTAP, and MULTIPAT results printouts. In addition, result overflow and the printer squelch function are also discussed.

With the Enhanced ESF Option installed, the T-BERD 209A/211 can retrieve T1 circuit performance statistics from an NIU/Performance Monitor. The results are available in the form of a SMART NIU results printout.

Standard Results Printouts

The standard results printouts are hard-copy lists of current test results in various formats. Using the AUX PRNT FMT function, you can select one of the following results printout formats.

SHORT FORMAT— This results printout lists a standard set of results with additional results that are mode specific. The results that are printed in the short form for each mode are as follows:

All Modes	D4 and SLC Framing	ESF
TIME and DATE BPV BPV SEC BPV RT SIG L SEC ALARMS BIT ERR ERR SEC BER OUT SYN SEC SLIPS	FRM ERR FRM ER RT FRM L CNT FRM L SEC TEST LEN ELAP TIM	CRC ERR CRC ERR SEC FRM L CNT FRM L SEC

SUMMARY PRINT— This results printout lists SUMMARY category results.

NORMAL FORMAT— This results printout lists all test results.

All three types of results printouts list any alarm LEDs that are illuminated at the time the printout is initiated. Figure 7-1 is an example of a normal results printout.

```
RESULTS PRINT               15:47:20       30 APR
BIT ERR               0     ASYN E SEC          0
BER             0 E-07      EFS                40
%EFS           100.00%      SY ERR SEC          0
OUT SY SEC            0     SLIPS               0
SES                   0     %SES           00.00%
DEGR MIN              0     %DEGR MIN      00.00%
UNAVL SEC             0     %AVL          100.00%
CSES                  0     BPV ERR             0
BPV ER SEC            0     BPV RATE       0 E-07
FRA ER SEC            0     FRA ERR             0
F E RATE              0     E-06  CRC ERR       0
CRC ER SEC            0     FRA LOS             0
FRA LS SEC            0     CRC SES             0
CRC E RT        0 E-06      FREQ Hz       1544000
RX LVL      - 0.2dBdsx      RX VOLT    5.85 V p-p
SPX CUR     UNDER 10mA      TIMING SLIPS       *0
BIT SLIPS          +  0     SLP ANA SEC        40
SIG LS SC             0     ALARM SEC           0
TEST LEN      200:00:00     ELAP TIM     00:00:00
TEST END           ****     WANDER +PK       0 UI
WANDER -PK         0 UI     P-P WANDER       0 UI
TIE WANDER         0 UI     *WB/HB JITT      PASS
*WB JITTER      0.01 UI     *HB JITTER    0.01 UI
*MAX WB JIT     0.02 UI     *MAX HB JIT   0.02 UI

    ALARM/STATUS
T1                   ON     PATTERN SYNC    ON
FRAME SYNC           ON
```

* T-BERD 211 only.

Figure 7-1
Results Printout

```
  15MIN PRINT         18:04:50  12 MAR
BIT ERR         1340   ASYN E SEC     802
BER       9.96 E-07    OUT SY SEC       0
SLIPS              0   BPV ERR          0
BPV ER SEC         0   BPV RATE    0 E-09
FRA ER SEC         3   FRA ERR          3
F E RATE      4 E-07   FRA LOS          0
FRA LS SEC         0   SIG LS SC        0
ALARM SEC        372   ELAP TIM  00:15:00
  MULTIPAT RESULTS
PATTERN      BIT ERR   ERR SEC   SYNC SEC
ALL ONES         260   168            175
1:7              271   175            175
2 IN 8           270   167            175
3 IN 24          269   158            175
T1-QRSS          270   134            175
   ALARM/STATUS
ONE DEN HIST      ON   EX ZERO HIST    ON
ALL ONE HIST      ON   T1              ON
PATTERN SYNC      ON   FRAME SYNC      ON
```

Figure 7-2
Simulated Multipattern Results Printout

BRIDGTAP Test Results Printouts

The BRIDGTAP results printout includes the bit errors (BIT ERR), errored seconds (ERR SEC), and pattern synchronization seconds (SYNC SEC) for each of the 21 patterns in the BRIDGTAP test pattern (see Figure 7-3).

When bit errors are not detected, BIT ERR and ERR SEC remain at zero and SYNC SEC indicates the number of seconds the synchronized pattern was received and monitored for errors. Each synchronized pattern is monitored for only 23 seconds during each cycle of the BRIDGTAP test.

In Figure 7-3, the 15-minute print event printout shows the ALL ONES to 2:10 patterns being monitored a second time (46 seconds), the 2:11 pattern is being repeated as the printout is generated (24 seconds), and the 2:12 to T1-QRSS patterns have been monitored once during the BRIDGTAP test. The 00-BIT ERRORS result equals the sum of the 21 BRIDGTAP test pattern bit errors. The 01-ASYN ER SEC result equals the sum of the 21 BRIDGTAP test pattern errored seconds. When pattern synchronization is lost, the SYNC SEC results are not counted.

MULTIPAT Test Results Printouts

The MULTIPAT results printout includes the bit errors (BIT ERR), errored seconds (ERR SEC), and pattern synchronization seconds (SYNC SEC) for each of the five patterns in the MULTIPAT test pattern (see Figure 7-3).

When bit errors are not detected, BIT ERR and ERR SEC remain at zero and SYNC SEC indicates the number of seconds the synchronized pattern was received and monitored for errors. The AUX MULTIPAT function controls the duration of each selected MULTIPAT test pattern from 0 to 15 minutes.

The 00-BIT ERRORS result equals the sum of the five MULTIPAT test pattern bit errors. The 01-ASYN ER SEC result equals the sum of the five MULTIPAT test pattern errored seconds. When pattern synchronization is lost, the SYNC SEC results are not counted.

Test Results Overflow

A results print is also automatically initiated when a result counter overflows. Labeled OVERFLOW PRINT, the printout also describes the reason for the overflow. Each time a result counter overflows, the test result is preceded by a double asterisk (**) on the printout, indicating an *immediate overflow* condition (i.e., the results counter overflowed during the last second). Subsequent printouts of the overflowed result are preceded by a single asterisk (*) to indicate a *previous overflow* condition. All asterisks are cleared at test restart.

Printer Squelch Control

When 20 or more printouts are generated in 60 seconds, the printer squelch is turned on temporarily halting the printouts. The squelched printouts include alarm, error, and severely errored second conditions that occur during a test. The twentieth printout indicates the squelch is turned on by printing the time-stamped message *SQUELCH ON*. When the printouts drop to five or less in 60 seconds, the time-stamped message *SQUELCH OFF* is printed and a squelch summary results printout is generated. The squelch summary printout provides the cumulative results when the squelch is turned off. The printer squelch does not affect messages indicating the squelch state, timed print requests (e.g., 6-hour backup print), manual print requests, and the *TEST COMPLETE* message. The printer squelch is reset when a test restart occurs.

15MIN PRINT 18:04:50 12 MAR

BIT ERR	225423	ASYN E SEC	74
BER	2.13 E-0	OUT SY SEC	0
SLIPS	0	BPV ERR	32301
BPV ER SEC	10	BPV RATE	3.02 E-05
FRA ER SEC	97	FRA ERR	1525
F E RATE	2.12 E-04	FRA LOS	0
FRA LS SEC	0	SIG LS SC	0
ALARM SEC	164	ELAP TIM	00:15:00

BRIDGTAP RESULTS

PATTERN	BIT ERR	ERR SEC	SYNC SEC
ALL ONES	0	0	46
1:1	0	0	46
1:3	0	0	46
1:5	0	0	46
1:6	16123	6	46
1:7	16124	5	46
2:8	0	0	46
2:9	0	0	46
2:10	0	0	46
2:11	0	0	24
2:12	0	0	23
2:13	0	0	23
2:14	0	0	23
3 IN 18	54600	18	23
3 IN 19	27903	10	23
3 IN 20	44112	14	23
3 IN 21	49785	16	23
3 IN 22	0	0	23
3 IN 23	16776	5	23
3 IN 24	0	0	23
T1-QRSS	0	0	23

ALARM/STATUS

ONE DEN HIST	ON	EX ZERO HIST	ON
ALL ONE HIST	ON	T1	ON
PATTERN SYNC	ON	FRAME SYNC	ON

Figure 7-3
Simulated Bridge Tap Results Printout

SMART NIU Results Printout (Enhanced ESF Option only)

The SMART NIU results printout lists the statistics retrieved from the NIU/Performance Monitor at the end of a standard results printout. A complete SMART NIU results printout includes up to eight days of T1 circuit performance statistics as retrieved from the NIU/ Performance Monitor. These results include results for the current hour (CURRENT HOUR), each of the previous 23 hours (HISTORY HOUR 01 through HISTORY HOUR 23), the current day (CURRENT DAY), and the previous week (HISTORY DAY 01 through HISTORY DAY 07) in a four-column format (refer to Section 3.23).

7.5.2 Controls Printout

The controls printout lists the current setting of all front-panel switches and auxiliary functions. A controls printout is initiated by pressing the **PRINT** switch to the CONTROLS position. Figure 7-4 is an example of a controls printout.

```
  CONTROLS PRINT          16:13:03    27 OCT
MODE:        SELF TEST    PATTERN:     ALL ONES
TIMED/CONT:      TIMED    DIS HOLD:         OFF
TIMING:            INT    CODE:             AMI
ERR INS BPV:       OFF    ERR INS LOG:      OFF
ERR INS FRM:       OFF    RCV INPUT:       TERM
TX LBO:            0dB    PRI EVNT:         OFF
LP CD SELECT:CSU  LP UP   CD:             10000
LP DN CD:          100    RESPONSE:     NO AUTO
PARITY:           NONE    BAUD RATE:       2400
CR/CR-LF:           CR    FORMAT:         SHORT
INS RATE:1.0 E-6  BURST   LNGTH:            0mS
FRM ERR:        SINGLE    PULSE SEL:       NONE
HALT/CONT:        HALT    *JIT/SA:          OFF
*JIT MASK:       0.171    *JIT TRIG:   CONTINUE
```

*T-BERD 211 only.

Figure 7-4
Controls Printout

7.5.3 Alarm Messages

Unless the **PRINT EVENT** switch is set to OFF, alarm messages are initiated automatically to inform you of any important developments related to your ongoing test. The alarm messages are described in Appendix B. The alarm messages include the date, time, and alarm message in the following format:

```
HH:MM:SS DD:MM alarm message name
```

7.5.4 Graphic Printouts

When using a graphics compatible printer, it is possible to obtain a printout of the current pulse shape graph, optional spectral analysis jitter vs. frequency graph (T-BERD 211 only), or optional TDR graph. Up to seven graphs can be stored in memory when a printer is not connected to the T-BERD 209A/211.

NOTE: To properly initiate a graphic printout, set the AUX PARITY function to NONE and the AUX TERM function to CR.

Pulse Shape Graph

The pulse shape graph printout is initiated using the AUX GRAPH function. Figure 7-5 shows a sample pulse shape printout. The pulse shape waveform can be compared to two different specifications, ANSI T1.403 Network Interface and ANSI T1.102. The pulse shape mask is selected through the AUX PLS MASK function.

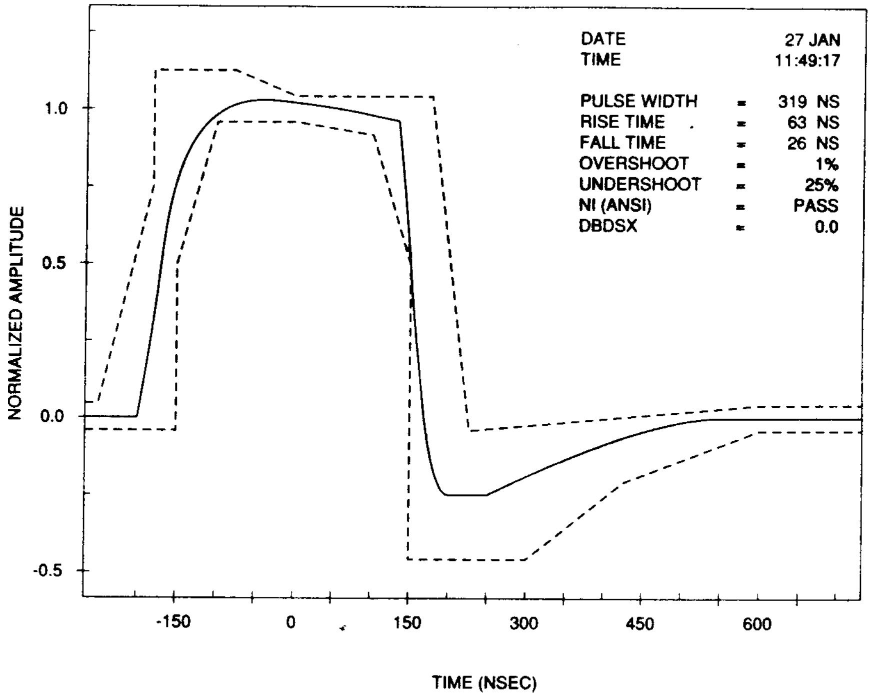


Figure 7-5
Sample Pulse Shape Printout

Jitter vs Frequency Graph
(T-BERD 211 only)

When the Jitter Spectral Analysis Option is installed, the spectral analysis jitter vs frequency graph printout is also initiated using the AUX GRAPH function. Figure 7-6 shows a sample jitter vs frequency graph printout. The spectral analysis performed by the T-BERD 211 can be compared to five jitter measurement specifications or shown in Unit Intervals (UI). When the AUX JIT S/A function is set to OFF, the graph cannot be printed.

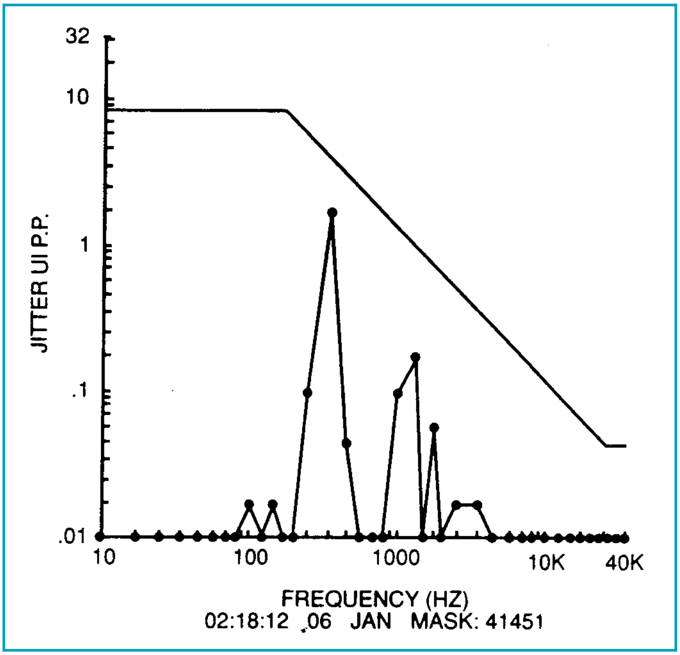


Figure 7-6
Sample Jitter vs Frequency Graph

Printing TDR GRAPHs

Printing a TDR GRAPH is controlled through the **RESULTS II Category** switch. This switch performs two functions: setting up whether the graph printout generates one or two traces and initiating a TDR graph printout. The TDR graph printout can present the entire TDR trace with all the faults indicated or individual faults can be selected and printed. A graphics compatible printer, e.g., TTC PR-40A Thermal Printer, is required to print the TDR GRAPH.

Single and Dual Trace TDR Graphs

When the TDR RESULTS appear, the **RESULTS II Category** switch is labeled PRINT GRAPH which allows the TDR GRAPH to be printed. When NO REF appears in the TDR SETUP menu and the **RESULTS II Category** switch is pressed in the TDR RESULTS display, a single trace is printed from the current test results. When REF STORED appears in the TDR SETUP menu and the **RESULTS II Category** switch is pressed in the TDR RESULTS display, the current and reference trace are printed at the same time on the same graph.

Figures 7-7 and 7-8 illustrate the two types of graphs (single and dual trace) that are printed in the TDR mode. The single trace GRAPH in Figure 7-7 shows the reflection signature of a short charted against voltage and distance. The type of fault (if known), distance, and the TDR set-up parameters are also indicated on the printout. The numbered vertical bar in the graph indicates the position of the fault listed in the current TDR RESULTS. The dual trace graph shown in Figure 7-8 identifies the reference trace as the dotted line and the current trace appears as the solid line. The vertical bar indicates the fault on the current trace.

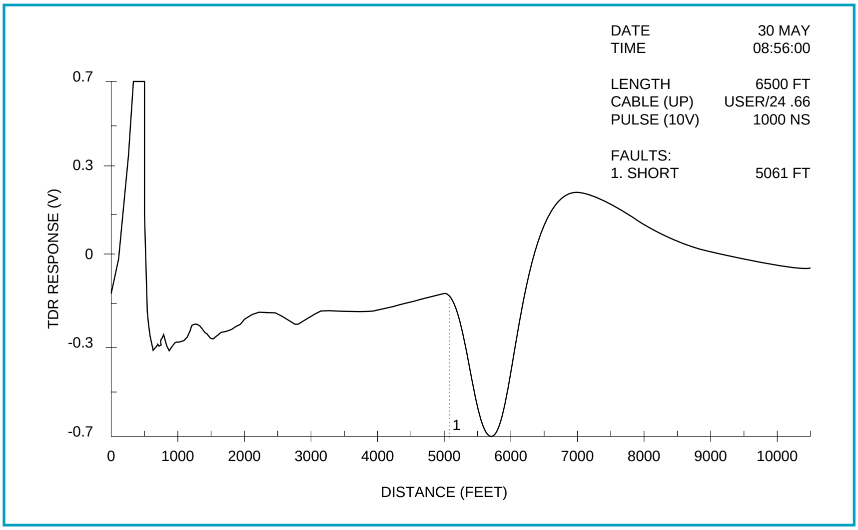


Figure 7-7
Single Trace TDR GRAPH

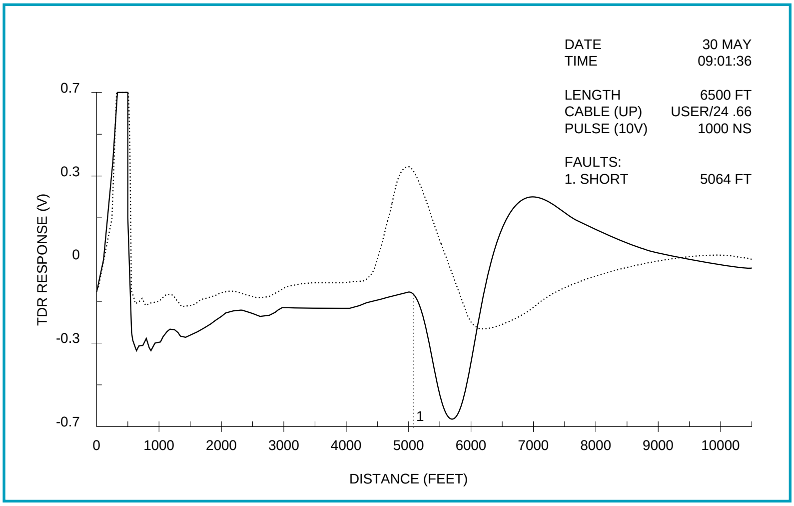


Figure 7-8
Dual Trace TDR GRAPH

Magnified TDR Graph

When more than one fault is detected and reported in the TDR RESULTS, each fault can be selected, magnified, and printed individually. This enables individual faults past the first fault to be better analyzed when the instrument detects the fault as UNRECognized in the initial printout. To print an individual fault, press the **RESULTS I Results** switch to select the desired fault in the TDR RESULTS display. After the fault is selected, press the **RESULTS II Category** switch to print the individual fault. The selected fault is enlarged and the distance scale adjusted in the printout.

REMOTE CONTROL OPERATION

8.1 INTRODUCTION

This section describes the T-BERD 209A/211 remote control capabilities when either a dumb terminal or computer is connected to the RS-232-C interface.

8.2 REMOTE CONTROL SETUP

During normal operation, the T-BERD 209A/211 can be setup and controlled through an RS-232-compatible remote control device. This section describes the remote control capabilities, auxiliary functions, and setup procedure needed to configure the T-BERD 209A/211 for remote control operation. Table 8-1 lists the interface capabilities available with the T-BERD 209A/211.

Table 8-1
T-BERD 209A/211 Interface Capabilities

Function	Capabilities
Remote Interface	RS-232, female 25-pin D connector.
Data Rates	300, 1200, 2400, or 4800 bps.
Character Length	Seven bits with parity or eight bits without parity.
Line Terminator	CR or CRLF.
Flow Control	DTR/CTS or in-band XON/XOFF supported.
Parity	Odd, even, or none.
Interface Configuration	DCE.
Start Bits	One bit.
Stop Bits	Two bits on transmit, one or more on receive.
Column Width	80.
Timing	Asynchronous.
Character Format	ASCII.

8.2.1 Auxiliary Functions for Remote Control Setup

Table 8-2 lists the auxiliary functions used to configure the RS-232-C interface for remote control operation. The presentation of the T-BERD 209A/211 test result, front-panel controls, and alarm and status message printouts sent to the remote control device are described in Section 7.

Table 8-2
Auxiliary Function Parameters

Auxiliary Function	Definition Selections	
AUX BAUD	RS-232 Printer/Remote Control Baud Rate Select	300, 1200, 2400, or 4800
AUX PARITY	RS-232 Printer/Remote Control Parity Select	EVEN, ODD, or NONE
AUX TERM	RS-232 Printer/Remote Control Line Terminator	CR or CRLF

8.2.2 Remote Control Setup Procedure

Prior to entering remote control mode, you must first set baud and parity so that the T-BERD 209A/211 is configured to communicate with the remote controller. Baud and parity can be configured in two ways:

- Manually using the AUX BAUD and AUX PARITY functions.
- Automatically using the Auto Baud function.

Manual Setup Procedure

The following setup procedure applies to configuring the RS-232 interface for remote control operation. The following settings should match the configuration of the remote control device.

1. **MODE switch**
   Select the AUX mode.

2. **Press the PATTERN switch to select the AUX BAUD function**
   Press the **RESULTS I Results** switch to select one of the following baud rates: 300, 1200, 2400, or 4800.

3. **Press the PATTERN switch to select the AUX TERM function**
   Press the **RESULTS I Results** switch to select one of the following line termination characters: CR or CRLF.

4. **Press the PATTERN switch to select the AUX PARITY function**
   Press the **RESULTS I Results** switch to select one of the following parity functions: 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.

Auto Baud Setup Procedure

The Auto Baud function allows baud, data bits, and parity values to be automatically configured. The Auto Baud function offers possible baud rate settings of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. Possible parity settings are even, odd, or none.

NOTE: Baud, parity, and data bit settings return to their original values when control of the T-BERD 209A/211 is returned to the front panel.

To establish communication with the remote control unit through the Auto Baud function, perform the following steps at the remote control unit.

1. **BREAK key**
   Press the BREAK key three times slowly (once per second). On some terminals, the CTL key and the BREAK key must be pressed simultaneously.

2. **SPACEBAR**
   Press and hold the SPACEBAR until the message *Auto-baud achieved. Press ESCAPE to continue* appears. If the SPACEBAR does not have an auto-repeat function, press the SPACEBAR repeatedly until the message appears.

3. **ESCAPE key**
   Press the ESCAPE key and the message *Character format determined* appears.

   NOTE : Between each of the above steps, the T-BERD 209A/211 waits for 30 seconds. If no key is pressed within the 30-second period, the Auto Baud function is aborted, and the message *Auto-baud aborted* is transmitted at the original baud, parity, and data bit settings.

Once the T-BERD 209A/211 is configured to communicate with the controller, remote control mode may be entered by typing a valid remote control command or a period (.). The period sets the T-BERD 209A/211 for terminal (CRT) control.

8.3 ERROR MESSAGES

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** , and the message indicating the problem. The error and warning messages are described in Appendix B.

8.4 REMOTE CONTROL COMMAND FORMAT

This section describes the format, types of remote control commands, and the input and output sequence used to control the T-BERD 209A/211 from a remote control device.

8.4.1 Command Formats and Entry Sequence

The general format for any remote control command is:

commandname[parameter]

The **command name** entry specifies the name of the command to be executed. Where possible, commands which represent a front-panel switch or auxiliary function activity are abbreviated to reflect the first three characters of the switch or function. Control commands have no front-panel equivalent, and may either be abbreviated or spelled out. You only need to enter the capitalized letters/characters for a command. If the abbreviation you use is similar to another command, the message *DO YOU MEAN "<command name>" (Y/N)?* is displayed.

The **[parameter]** entry specifies any optional parameter(s) associated with the command. If a parameter is entered, it should be separated from the command name by at least one space. The **command name [parameter]** string should always be followed by a carriage return or carriage return/line feed sequence.

Most remote control commands can be used to select a new command state or to display the current command state (without changing it). To select a new command state, enter both the command name and the desired parameter on the command line. To display the current state, enter the command name only. Note, however, that some commands (e.g., **CLS**) are *executable only* and have no current or changeable state.

8.4.2 Front-Panel Switch Commands

Switch commands control the functions normally associated with the T-BERD 209A/211 front panel. Mnemonics represent the first three characters of the switch name or switch position as it appears on the T-BERD 209A/211 front panel and in the display. Exponents are lowered to become the last digit of the number (e.g., 10^{-6} becomes 10-6).

Table 8-3 lists the switch commands along with their equivalent front-panel switch names. Brackets to the right of the switch name indicate the availability of associated parameters. The parameters associated with each command are described in Section 8.5.

Table 8-3
Front-Panel Switch Commands

Command Name	Equivalent Front Panel Switch
CODe [ ]	CODE
CONTROLS	CONTROLS PRINT
DISplay HOLd [ ]	DISPLAY HOLD
ERRor INSert BPV [ ]	BPV ERROR INSERT
ERRor INSert FRM [ ]	FRAME ERROR INSERT
ERRor INSert LOGic [ ]	LOGIC ERROR INSERT
HIStory RESet	HISTORY RESET
LOOp DOWn [ ]	LOOP DOWN
LOOp UP [ ]	LOOP UP
MODe [ ]	MODE
PATtern [ ]	PATTERN
PRInt [ ]	PRINT
PRInt EVEnt [ ]	PRINT EVENT
RECeive INPut [ ]	RECEIVE INPUT
RES 1 [ ]	RESULTS I Display
RES 2 [ ]	RESULTS II Display
RESTART	RESTART
RESULTS	RESULTS PRINT
TEST [ ]	TEST
TIMing [ ]	TIMING
TRAnsmit OUTput [ ]	TRANSMIT OUTPUT

8.4.3 Auxiliary Function Commands

Auxiliary commands control the functions normally associated with the T-BERD 209A/211 AUX mode. Table 8-4 lists the auxiliary function commands along with their equivalent AUX mode names. Brackets following the command name indicate the command has associated parameters. The parameters associated with each command are fully described in Section 8.5.

Table 8-4
Auxiliary Function Commands

Command Name	Equivalent Auxiliary Function
Mainframe	
BAUD	AUX BAUD
BURST LENgth [ ]	AUX ERR SEL
CLOCK [ ]	AUX CLOCK
DATA BITS	AUX PARITY
DATE [ ]	AUX DATE
ERROR RATE [ ]	AUX ER RATE
FRM ERRor LENgth [ ]	AUX FRM ERR, FRM ERR INS
GRAPH [ ]	AUX GRAPH
HISTory CLR	AUX HIST CLR
LOOp	AUX ESF LOOP
LOOP CODE [ ]	AUX LP CODE
PARITY	AUX PARITY
PGM LPDN [ ]	AUX PGM LPDN
PGM LPUP [ ]	AUX PGM LPUP
PGMPAT 1 [ ]	AUX USER1
PGMPAT 2 [ ]	AUX USER2
PRInt FMT [ ]	AUX PRNT FMT
PULSE MASK [ ]	AUX PLS MASK
RESPONSE [ ]	AUX RESPONSE
SYNc LOSs ACTion [ ]	AUX HLT/CONT
TERM 232 [ ]	AUX TERM
TIMe SET [ ]	AUX TEST LEN

Table 8-4
Auxiliary Function Commands (Continued)

Command Name	Equivalent Auxiliary Function
Fractional T1 Option	
FT1 CHAnnel [ ] FT1 IDLe [ ] FT1 RATe [ ]	AUX FT1 CHAN AUX FT1 SETUP, IDLE CODE AUX FT1 SETUP, DATA RATE
Battery Option (T-BERD 209A Only)	
PWR SAVE [ ]	AUX PWR SAVE
Jitter Spectral Analysis Option (T-BERD 211 Only)	
JITter MASK [ ] JITter TRIGger [ ] SPECTRUM [ ]	JIT MASK JIT TRIG AUX JIT S/A
Advanced BERT Option	
LUP [ ]	AUX LUP
Enhanced ESF Option	
PRM EMUlate [ ] PRM RCV [ ]	AUX PRM, PRM TRANSMIT AUX PRM, PRM RCVR

8.4.4 Remote Control-Only Commands

The remote control-only commands have no front panel or auxiliary function equivalent. These commands are used to obtain information from the T-BERD 209A/211 or to modify the remote control/printer protocol. Table 8-5 lists the remote control-only commands. Brackets following the command name indicate that the command has associated parameters. The parameters associated with each command are fully described in Section 8.5.

NOTE: With the exception of the **HELLO** and **LEDs** commands, all commands without brackets are *executable only* and have no status to return.

Table 8-5
Remote Control-Only Commands

Command	Description
ALARM [ ]	Alarm Message Prints
BEEP	Sound the Remote Control Unit's Beeper
CLEAR FIFO	Clear the Print FIFO
CLS	Clear the Terminal Screen
DATA BITS	Display RS-232 Data Bits Setting
DEVICE CLEAR	Clear Device
DISPLAY [ ]	Front-Panel Display Mode
ECHO [ ]	Echo Mode
FACTORY DEFault	Factory Default
FIRST P.U.	First Power-Up
FORMAT	Formatted Printouts
HELLO	Display T-BERD 209A/211 Software Revision Level
HELP [ ]	On-Line Help Function
HOLD	Hold All Printer Outputs
LEDS	Display the State of Front-Panel LEDs
LOCAL (/)	Return the T-BERD 209A/211 to Local Mode
MESSAGES [ ]	Enable or Disable Error Message Printing
PRINT [ ]	Display a Single Result Value
PROMPT [ ]	Remote Control Command Prompt
RELease	Release All Printer Output
REMOTE	Remote Control Entry
SUMMARY	Generate a Summary Printout
TERMINAL (.)	T-BERD 209A/211 Remote Control Configuration
UNFORMAT	Unformatted Printouts

8.4.5 BERD-BASIC Commands

The T-BERD 209A/211 remote control interface offers you the ability to create a BERD-BASIC program. A BERD-BASIC program is simply a sequence of commands that instruct the T-BERD 209A/211 to perform desired functions. By taking control of the T-BERD 209A/211, a BERD-BASIC program can be executed (possibly many times) without the presence of a remote user.

A BERD-BASIC program line is composed of a remote control command and a line number. The command tells the T-BERD 209A/211 what to do; the line number (any value between 0 and 29779) determines the order in which the commands are executed. Program lines may be entered in any sequence; the T-BERD 209A/211 automatically sorts them in ascending order. A program is executed starting with the lowest numbered line and proceeding, in sequence, to the highest numbered line. Any line number that is not followed by a command is deleted.

Table 8-6 lists the BERD-BASIC commands. Each BERD-BASIC command is fully described in Section 8.5.

Table 8-6
BERD-BASIC Commands

Command	Description
CONT	Resume BERD-BASIC Program Execution
END	End a BERD-BASIC Program
GOTO	Transfer Program Execution to a Specified Line
INPUT	Enter User Input Into a Macro
LIST	List the Working BERD-BASIC Program
LPRINT	Print a Literal Text String
MACRO	Set or Display User Macros
NEW	Enter a New BERD-BASIC Program
REMark	Remark or Comment
RUN	Execute a BERD-BASIC Program
STOP	Suspend Execution of a BERD-BASIC Program

8.4.6 TDR Commands

TDR commands control the functions normally associated with the TDR Option. Table 8-7 lists the commands, their equivalent front-panel display names, and related switches. Brackets to the right of the switch name indicate the availability of associated parameters. The parameters associated with each command are described in Section 8.5.

Table 8-7
TDR Commands

Command Name	Related Switch or Function
CABle [ ]	CABLE
GRAPH [ ]	PRINT GRAPH
LENgth [ ]	LENGTH
MODe [ ]	**MODE** Switch
PRINT [ ]	**PRINT** Switch
REFerence [ ]	**RESULTS II Category** Switch
RESTART	**RESTART** Switch
VELocity [ ]	USER PR. VEL

8.4.7 Input Sequence

A remote control command consists of an ASCII character string followed by either a carriage return (CR) or a carriage return/line feed (CR/LF) sequence. When specifying a remote control command, the following rules apply:

- Commands may be entered in lower or uppercase.
- Spaces may be inserted before (or after) the command name. Spaces must be inserted between the command name and a parameter.
- Entering a CTL C (Control C) or a CTL X (Control X) prior to issuing a CR or LF cancels the input line.
- Entering a CTL H (Control H) or BACK SPACE erases the last character entered.
- Up to 20 previously entered commands can be recalled using the ESC key. When the number of previously entered commands exceeds 20, the earliest command entries are overwritten.

After receiving a carriage return or a carriage return/line feed sequence, the T-BERD 209A/211 analyzes the data in its input buffer. If a parity error, overrun error, framing error, input buffer overflow, program memory overflow, or any syntax error is detected, the appropriate error message is returned to the controller. If no errors are detected, the command is decoded and the appropriate response is generated.

If the **ECHO** is enabled, the entered characters are echoed back to the controller. If the **PROMPT** command is enabled, the default prompt (>) or a user-defined prompt (a single character or a string) indicates that previous commands have been processed and that the T-BERD 209A/211 is ready to receive additional commands. Note that the **TERMINAL** command automatically enables the **ECHO** and **PROMPT** commands when entering remote control mode. When either the **PROMPT** or **ECHO** command is enabled, any characters used to cancel a line (e.g., CTL C) are echoed to the remote control unit.

8.4.8 Output Sequence

The following rules apply for output sequence:

- If the **ECHO** command is enabled, echoed outputs have higher priority than the printer outputs. This means that printer output is suspended if there are any echoed outputs available (include user inputs or error messages) at the end of each line of printer output. Printer output resumes when the echo FIFO is empty.

- The **HOLD** command suspends printer output until the **RELease** command is specified. When the **HOLD** command is specified, the prompt character automatically changes to a plus (+) sign to remind you that data is waiting to be printed. After the **RELease** command is entered, the default prompt (>) or the user-defined prompt is returned.

- CTL S suspends printer output without changing the prompt character. Entering CTL Q (Control Q), a carriage return, or CTL S a second time releases printer output suspended by CTL S.

- Entering CTL C (Control C) clears the entire printer FIFO.

SPECIFICATIONS

9.1 INTRODUCTION

This section contains the specifications for the T-BERD 209A/211 T-Carrier Analyzer mainframe and options.

9.2 MAINFRAME — GENERAL SPECIFICATIONS

9.2.1 Physical

Size:	6.0"H x 13.5"W x 8.5"D (15.3 cm x 34.4 cm x 16.5 cm) including cover.
Weight:	10 pounds (4.5 kg), T-BERD 211 and T-BERD 209A without Battery Option.
	15.7 pounds (7.1 kg), T-BERD 209A with Battery Option.

9.2.2 Operational

Operating Temperature Range:	32°F to 113°F (0°C to 45°C).
Storage Temperature Range:	-4°F to 158°F (-20°C to 70°C).
Power:	115 VAC or 230 VAC (factory option only), ±10%, 50/60 Hz.
Fuse:	1 A, 250 V Slo-Blo (Littlefuse #218001 or equivalent).

9.3 MAINFRAME — INPUT SPECIFICATIONS

9.3.1 Receive Input

Input Connectors:	WECO 310 jack, bantam jack, and 15-pin network interface D connector.
Input Frequency:	T1 — 1,544,000 Hz ±5000 Hz.
	T1C — 3,152,000 Hz ±5000 Hz.
Input Impedance:	BRIDGE — 1000 ohms or greater.
	TERM — 100 ohms ±5%.
	DSX-MON — 100 ohms ±5%.
Operating Range:	BRIDGE — T1: +6 dBdsx to -35 dBdsx. T1C: +3 dBdsx to -6 dBdsx. (ALBO compensates for cable loss.)
	TERM — T1: +6 dBdsx to -35 dBdsx. T1C: +3 dBdsx to -6 dBdsx. (ALBO compensates for cable loss.)
	DSX-MON — T1 or T1C: +6 dBdsx to -24 dBdsx. No ALBO provided; resistive loss compensation only.

9.3.2 T1 REF (TDR) Input

Input Connectors:	WECO 310 and bantam jacks.
Input Frequency:	1,544,000 Hz ±1000 Hz.
Input Impedance:	100 ohms ±5%.
Operating Range:	+6 to -24 dBdsx resistive loss.

9.4 MAINFRAME — OUTPUT SPECIFICATIONS

Output Connectors:	Selectable line build-out in T1 of 0 dB, -7.5 dB, and -15 dB is provided on WECO 310 jack, bantam jack, and 15-pin network interface D connector. Three additional DSX-level 310 jack outputs are provided.
Output Line Build-out Tolerance:	±1 dB attenuation at 772 kHz.
Pulse Shape:	With output terminated in 100 ohm resistive load and 0 dB line build-out selected, the T-BERD 211 meets CCITT Recommendation G.703; AT&T Publications CB113, CB119, CB132, CB143, and PUB62508; and AT&T PUB62411 pulse shape specifications.
Internal Oscillator Accuracy:	±5 ppm.
Jitter Attenuation:	Per Figure A-5 of AT&T PUB62411, October 1985 Revision.
Line Codes:	Bipolar (pseudoternary); AMI, B8ZS, or ZBTSI (optional) selectable.

9.5 MAINFRAME — ALARM CRITERIA

Signal Loss:	150 ms without input pulses after valid frequency and level are detected.
Pattern Sync Loss:	250 errors detected in 1000 or fewer bits.
Frame Sync Loss:	D4 — 2 out of 5 Ft bits in error. ESF — 2 out of 5 frame bits in error. SLC — 2 out of 5 Ft bits in error.

Excess Zeros:	T1 — AMI: 16 consecutive zeros. B8ZS: 8 consecutive zeros.
	T1C — 34 consecutive zeros.
Yellow Alarm:	D4 — Bit 2 is a 0 for 255 consecutive channels.
	ESF — 256 bits ±16 bits of a repetitive (1111 1111 0000 0000 …) pattern received in the 4 kb/s datalink.
	SLC — Bit 2 is a 0 for 255 consecutive channels.
All Ones:	T1 or T1C unframed — 2048 consecutive ones.
	T1 framed — 256 consecutive DS0 channels with all ones.
Ones Density:	Less than n ones in 8(n+1) bits, where n = 1 to 23 per AT&T PUB62411 and ANSI T1.403. Disabled when receiving a T1-QRSS pattern or any T1C signal.
Pulse Shape:	Received pulse shape exceeds selected pulse shape mask specification.
Jitter: (T-BERD 211 only)	Without Jitter Spectral Analysis Option — Wideband jitter exceeds 5 UI or highband jitter exceeds 0.1 UI.
	With Jitter Spectral Analysis Option — Off: wideband jitter exceeds 5 UI or highband jitter exceeds 0.1 UI. On: measured jitter exceeds selected jitter mask. Disabled when Jitter Spectral Analysis is on and no jitter mask is selected.
Low Battery: (T-BERD 209A only)	Approximately 15 minutes of battery life remaining.

9.6 MAINFRAME — PATTERN SYNC DETECTION CRITERIA

Fixed Patterns:	30 consecutive error-free bits.
Pseudorandom Patterns:	30 + n consecutive error-free bits for a pattern length of 2n-1. For QRSS, n = 20.

9.7 MAINFRAME — LOOP CODES

9.7.1 Generation and Detection Patterns

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.
	Facility 3 — Loop up: 100000; loop down 100.
	Programmable — 3- to 8-bit repeating code independently selectable for loop-up and loop-down codes. Factory default: loop up — 10000 (CSU loop-up); loop down — 100 (CSU loop-down).
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.

NOTE: Generated codes may be sent unframed or framed. When framing is selected, in-band loop codes are overwritten by the framing bit.

9.7.2 Loop Code Detect Criteria

In-band Loop Codes:	At least 185 error-free bits of the selected repetitive pattern must be received (Loop Up and Loop Down).
ESF Out-of-Band Loop Codes:	Datalink monitored every 125 ms for loop codes (Loop Up and Loop Down).

9.8 MAINFRAME — MEASUREMENTS

9.8.1 Frequency

Accuracy:	±5 ppm.
Resolution:	1 Hz.
T1 Range:	1,544,000 Hz ±5000 Hz.
T1C Range:	3,152,000 Hz ±5000 Hz.

9.8.2 Level

The designation dBdsx is a voltage measurement; a 3-volt base-to-peak signal is defined as 0 dBdsx. Measurements for dBm are available only when all ones is detected.

dBdsx Level Range:	+6 dBdsx to -40 dBdsx.
dBdsx Level Accuracy:	±1 dB between +6 dBdsx and -10 dBdsx. ±2 dB between -10 dBdsx and -20 dBdsx. ±3 dB between -20 dBdsx and -40 dBdsx.
dBdsx Resolution:	0.1 dB between +6 dBdsx and -6 dBdsx. 0.5 dB between -6 dBdsx and -40 dBdsx.
dBm Level Range:	+22.5 dBm to -23.5 dBm.
dBm Level:	±5%.
dBm Resolution:	0.1 dB between +22.5 dBm and +10.5 dBm. 0.5 dB between +10.5 dBm and -23.5 dB.
Vp-p Range:	60 mV to 12.0 V.

9.8.3 Simplex Current

Range:	10 mA to 180 mA.
Resolution:	1 mA.
Accuracy:	±5%.
Simplex Voltage Drop:	8.5 volts (nominal) at 60 mA.

9.8.4 Pulse Shape

Sample Interval:	2.75 ns.
Analysis Interval:	648 ns from rising edge of pulse.
Availability:	TERM & BRIDGE — +4 to -4 dBdsx.
	DSX-MON — -16 to -24 dBdsx.
Horizontal Accuracy:	±5%.
Vertical Accuracy:	±8%.
Resolution:	Pulse Width — 2.75 ns.
	Rise Time — 1 ns.
	Fall Time — 1 ns.
	Undershoot — 1%.
	Overshoot — 1%.

9.8.5 Timing Slips

Resolution:	1 frame slip.
Range:	0 to 9999 frame slips.
Bar Graph Resolution:	16 bit slips.
Bar Graph Range:	±192 bit slips.
Wheel Resolution:	1 bit slip.
Wheel Range:	±16 bit slips.
Frame Slip Printout Resolution:	1 frame slip.
Frame Slip Printout Range:	0 to 9999 frame slips.
Bit Slip Printout Resolution:	1 bit slip.
Bit Slip Printout Range:	±192 bit slips.
Slip Analysis Seconds Resolution:	1 second.
Slip Analysis Seconds Range:	0 to 99999999 seconds.

9.8.6 Wander

Resolution:	1 UI.
Accuracy:	1 UI.

9.8.7 Wideband and Highband Jitter (T-BERD 211 Only)

Resolution:	0.01 UI.
Accuracy:	±5%.
Offset:	0.035 UI.

9.9 MAINFRAME — CONNECTORS

9.9.1 EXT CLK IN

Connector:	BNC.
Input Configuration:	AC-coupled. Outer conductor is signal ground; inner conductor is signal.
AC Input Impedance:	50 ohms ±10%.
Sine-Wave Clock Waveform:	5 Vp-p minimum; 10 Vp-p maximum. 1.0 MHz minimum; 4.0 MHz maximum.
Square-Wave Clock Waveform:	1 Vp-p minimum; 20 Vp-p maximum. 1.0 MHz minimum; 4.0 MHz maximum.

9.9.2 Network Interface

Connector Pin Configuration:	See Table 9-1.

Table 9-1
Network Interface Pin Assignments

Pin	Name
1	TRANSMIT TIP
2, 4, 12	SIGNAL GROUND
3	RECEIVE TIP
5, 6, 7, 8, 10	NO CONNECTION
9	TRANSMIT RING
11	RECEIVE RING
13	RESERVED FOR FUTURE USE
14	RESERVED FOR FUTURE USE
15	+5 VDC

9.9.3 RS-232 25-Pin D Connector

Character Format:	7 (odd or even parity) or 8 (no parity) data bits (ASCII characters). 2 transmitted stop bits. Accepts 1 or more received stop bits.
Baud Rates:	300, 1200, 2400, 4800. (110, 600, 9600, and 19200 baud rates are available in autobaud mode only.)
Line Terminator:	CR or CRLF.
Print Width:	80 column.
Connector Configuration:	DCE.
Connector Pin Assignments:	See Table 9-2.

Table 9-2
RS-232 Pin Assignments

Pin	Designation	Description
1	FGND	Frame ground — connected to chassis ground.
2	TD	Transmit data — The T-BERD 209A/211 receives data on this lead.
3	RD	Receive data — Data is transmitted by the T-BERD 209A/211 on this lead.
4	RTS	Request to Send — This lead is terminated by the T-BERD 209A/211.
5	CTS	Clear to Send — This lead is driven to the ON state by the T-BERD 209A/211 whenever it is ready to receive a command. This lead may be ignored by the controller if, before issuing commands, it waits for the return of a prompt character from the T-BERD 209A/211 signifying the completion of the previous command.
6	DSR	Data Set Ready — This lead is driven to the ON state by the T-BERD 209A/211 whenever it has power applied.
7	SGND	Signal Ground — Connected to signal ground.
8	RLSD	Receive Line Signal Detect — Must be ON before the T-BERD 209A/211 will accept any data.
9	+V	+12 VDC.
10	-V	-12 VDC.
20	DTR	Data Terminal Ready — Data is only output from the T-BERD 209A/211 when this line is held in the ON condition by the receiving device.

9.10 MAINFRAME — GROUNDING

Chassis and Signal Grounds:	Isolated by 100 ohm, 1/2 watt resistor.
Bantam and WECO 310 Jacks:	Sleeves connected to chassis ground.
Power Cord:	Center pin connected to chassis ground.
RS-232 25-pin D connector:	Pin 1 to chassis ground. Pin 7 to signal ground.
Network Interface 15-pin D Connector:	Pins 2, 4, and 12 to signal ground.

9.11 BATTERY OPTION SPECIFICATIONS (T-BERD 209A ONLY)

Type:	Gelled lead-acid electrolyte.
Operating Period:	Without T1 Channel Monitor — Up to five hours. With T1 Channel Monitor — Up to three hours.
Storage Period:	@68°F, holds 85% of charge after six months. Requires recharging every six months.
Recharging Period:	Eight hours from full discharge.

9.12 T-BERD T1 CHANNEL MONITOR OPTION SPECIFICATIONS

9.12.1 General Characteristics

Size:	13.5” L x 6” W x 2.8” D (34.3 cm x 15.2 cm x 7.1 cm).
Weight:	6.5 pounds (2.9 kg).
Operating Temperature:	0°C to 40°C (32°F to 113°F).
Operating Humidity:	90% Maximum non-condensing.
Storage Temperature Range:	-20°C to 70°C (-4°F to 158°F).
Storage Humidity:	5% to 95% non-condensing.
Input Power:	Supplied through coiled interface cable from T-BERD 209A/211.

9.12.2 Input Specifications

Input Connector:	Supplied through the coiled interface cable from the T-BERD 209A/211.
Framing Formats:	ESF, SLC, D3/D4, D2, and D1D.

9.12.3 Output Specifications

Signaling Status:	4 x 24 LED array displays the status of the channel signaling bits.
VF Outputs:	600 ohm WECO 310 jack and speaker.
VF Level:	-54 dBm to +3 dBm in 3 dBm steps.

9.12.4 RS-232 Interface

Connector:	RS-232 25-pin D connector.
Pin Assignments:	See Table 9-3.
Signal Outputs:	DS0 channel, SLC-96 datalink, or T1 ESF datalink.
Signal Input:	T1 ESF datalink.

Table 9-3
T1 Channel Monitor Option RS-232 Pin Assignments

Pin	Signal	Direction	Comments
1	PROT GND	—	Connected to chassis ground.
2	TD	IN	The T1 Channel Monitor receives data on this lead (ESF mode only).
3	RD	OUT	Data is transmitted on this lead; data is present when ESF, SLC, or CHANNEL is selected, and frame synchronization is achieved.
4	RTS	IN	This lead must be active to insert data.
5	CTS	OUT	This lead is active when RTS is active.
6	DSR	OUT	This lead is ON when power is applied.
7	SIGNAL GROUND	—	Connected to signal ground.
8	RLSD	OUT	This lead is ON when ESF, SLC, or CHANNEL is selected, and frame synchronization is achieved.
15	TX CLK	OUT	Synchronizes transmit data for datalink insert (4 kHz).
17	RX CLK	OUT	Clock for receive data (4 kHz).

9.13 T-BERD REPEATER POWER SUPPLY OPTION SPECIFICATIONS

9.13.1 Physical Characteristics

Size:	13.5” L x 6” W x 2.8” D (34.3 cm x 15.2 cm x 7.1 cm).
Weight:	6.5 pounds (2.9 kg).

9.13.2 Operational Requirements

Operating Temperature:	0°C to 40°C (32°F to 113°F).
Operating Humidity:	90% Maximum non-condensing.
Storage Temperature Range:	-20°C to 70°C (-4°F to 158°F).
Storage Humidity:	5% to 95% non-condensing.

9.13.3 Power Requirements

Input:	115 VAC ±10%, 60 Hz ±10%.
Fuse:	1-amp fast blow fuse (1 A AGC 3).

9.13.4 Safety Features

High Voltage Indicator:	On when voltage or current is applied to circuit.
Pulsed Current Mode:	On when circuit current is below 40 mA.
Constant Current Mode:	On when circuit current is above 40 mA.

Pulsed Current to Continuous Current Delay:	5 seconds nominal.
Continuous Current to Pulsed Current Delay:	2 seconds nominal.
Pulse Rate:	1.25 Hz nominal.
Pulse Duration:	10 ms.
Crowbar:	A 350 VDC crowbar circuit prevents runaway conditions due to loss of feedback.

9.13.5 Regulatory Compliance

Complies with UL1459, Telephone Equipment, 1st and 2nd Editions.

Complies with IEEE STD-743.

9.13.6 Connections

T1 Span:	Dual WECO 310 or dual bantam tip-to-tip connectors.
Mainframe Interface:	15-pin D connector.

Pin Assignments:

PinNumber	PinName
1	Transmit Tip
2, 4, 12	N/C
3	Receive Tip
5, 6, 7, 8, 10	N/C
9	Transmit Ring
11	Receive Ring
13, 14, 15	Reserved

9.13.7 Output Specifications

Repeater Power Current:	60 mA, 100 mA, 140 mA selectable ±5%.
Open Circuit Voltage:	260 VDC nominal, 350 VDC maximum.
Operating Voltage:	Determined by the load.

9.13.8 Measurements

Voltage Meter Accuracy:	0 - 399 VDC ±5%.
Current Meter Accuracy:	0 - 399 mA ±5%.

9.14 TDR OPTION SPECIFICATIONS

Connection:	Jack type — WECO 310 or bantam. Impedance — 167 ohms ±2%. Isolation Voltage Protection — 1000 Vmax.
Pulse Repetition Rate:	11.718 kHz, nominal.
Pulse Amplitude:	10.0 Vp, nominal.
Vertical Dynamic Range:	60 dB, minimum.
Resolution:	<9 feet.

Time Base Accuracy:	0.05%.
Test Range:	100 to 6500 ft. for identified faults and distance. 0 to 10,500 ft. for TDR trace printout.
Acquisition Time:	12 seconds average.
Data Presentation:	Front-panel display or printer.

9.15 T-BERD DLC ANALYZER OPTION SPECIFICATIONS

This section lists the specifications of the T-BERD DLC Analyzer Option.

9.15.1 General Specifications

Size:	6.0”H x 13.5”W x 2.5”D (15.3 cm x 34.3 cm x 6.4 cm).
Weight:	5 pounds (2.3 kg).
Operating Temperature Range:	32°F to 122°F (0°C to 50°C).
Storage Temperature Range:	-4°F to 158°F (-20°C to 70°C).
Power:	7 watts, maximum (power supplied by T-BERD 209A/211).

9.15.2 T1 Input Specifications

Input Connectors:	WECO 310 jacks for primary and secondary receivers.
Input Frequency:	1,544,000 Hz ±4000 Hz.
Input Impedance:	BRIDGE — 1000 ohms or greater. TERM — 100 ohms ±5%. DSX-MON — 100 ohms ±5%.

Input Signal Range:	BRIDGE — +6 dBdsx to -35 dBdsx (ALBO compensation for cable loss).
	TERM — +6 dBdsx to -35 dBdsx (ALBO compensation for cable loss).
	DSX-MON — +6 dBdsx to -24 dBdsx (resistive loss compensation only).
Framing Formats:	SLC Mode 1, SLC Mode 2, T1 D1D, T1 D4, T1 ESF, and Auto framing.

9.15.3 T1 Output Specifications

Output Connector:	WECO 310 jack.
Output Line Build-out:	0 dB, -7.5 dB, and -15 dB.
Pulse Shape:	With output terminated in 100 ohm resistive load and 0 dB line build-out selected, the T-BERD DLC Analyzer meets ANSI T1.403 pulse shape specifications.
Line Code:	AMI or B8ZS selectable.

9.15.4 VF Drop

VF Drop Sources:	Primary receiver, secondary receiver, or both receivers.
VF Drop Interfaces:	Built-in speaker, 2-terminal 2-wire VF interface, and WECO 310 4-wire VF interface.
VF Measurements:	VF level — -40 dBm to +3 dBm.
	VF frequency — in Hertz.
	DTMF sequence — displayed numerical values.

9.15.5 VF Insert

VF Insert Sources:	Internally generated tones — 404 Hz, 1004 Hz, and 2804 Hz.
	External input — 2-terminal 2-wire interface.
VF Tone Levels:	-16 dBm, -10 dBm, -3 dBm, 0 dBm, and +3 dBm.

9.15.6 Trunk Control

SLC Trunk Type:	Ground start and loop start.
Signal Controls:	A, B, C, and D signaling, and on-hook, off-hook, and ringing signaling.

9.15.7 SLC Transmitted Messages

SLC Alarms:	Major, Minor, Power/Misc, Far-End Loop, Switch to Protection, and Shelf Alarm.
SLC Maintenance:	Maintenance Proceed, Maintenance Hook/Seize, and Maintenance Test Alarm.

9.15.8 Test Results

SUMMARY Category:	Violations, frame errors, and CRC errors (ESF only) — Displayed with errors greater than zero.
DATALINK Category:	Alarms, maintenance, SLC alarmed seconds, datalink bits, and alarm field — Detected in the datalink channel.
CHANNEL Category:	Traffic channel ABCD signaling, Traffic timeslot ABCD signaling, VF level, VF frequency, data bits, and DTMF sequence.
TIME Category:	Signal loss seconds, time, and date.

FACTORY DEFAULT SETTINGS

A.1 MAINFRAME FACTORY DEFAULT SETTINGS

This appendix identifies the T-BERD 209A/211 factory default settings that are stored in nonvolatile memory (see Table A-1).

Table A-1
Factory Default Settings

Front Panel Switches	Default
MODE	SELF TST
PATTERN	ALL ONES
TIMING	INT
TEST	TIMED
CODE	AMI
PRINT EVENT	OFF
RESULTS I and II	SUMMARY
ERROR INSERT	
BPV	OFF
FRAME	OFF
LOGIC	OFF
DISPLAY HOLD	OFF
RECEIVE INPUT	TERM
TRANSMIT OUTPUT	0dB(DSX)
LOOP UP	OFF
LOOP DOWN	OFF

Table A-1
Factory Default Settings (Continued)

AUXFunction	Default
Mainframe	
USER1	1000000 (1:6)
USER2	100000 (1:5)
RESPONSE	NO RESPONSE
PGM LPUP	10000
PGM LPDN	100
BAUD	2400 bps
PARITY	NONE
HLT/CONT	HALT
PRNT FMT	SHORT FORMAT
TERM	CR
PLS MASK	NONE
RES HIST	NO RESULT PRNT EVNT AVAILABLE
HIST CLR	EMPTY
ERR SEL	SINGLE ERROR
FRM ERR	SINGLE ERROR
ER RATE	1.0 E-6
CLOCK	Current time
DATE	Current month, day, and year
TEST LEN	200:00:00
GRAPH	N/A
LP CODE, IN BAND	CSU
LP CODE, OUT OF BAND	LINE
ESF LOOP	IN BAND
MULTIPAT, PATTERN	ALL ONES
MULTIPAT, MIN:SEC	3:00 (all patterns)
ONES DENSITY, PATTERN	3 IN 24
ONES DENSITY, ALARM STATUS	ENABLE (all patterns)

Table A-1
Factory Default Settings (Continued)

AUX Function	**Default**
Battery Option (T-BERD 209A Only)	
PWR SAVE	ON
Jitter Spectral Analysis Option (T-BERD 211 Only)	
JIT S/A JIT MASK JIT TRIG	OFF 0.171 (%) CONTINUOUS
Advanced BERT Option	
LUP	MIN/MAX pattern
Fractional T1 Option	
FT1 CHAN FT1 SETUP, IDLE FT1 SETUP, CHAN RATE	01 11111111 64 X N
Enhanced ESF Option	
PRM, PRM TRANSMIT PRM, PRM RCVR	OFF ON
Setup Parameter	**Default**
TDR Option	
CABLE PR. VEL LENGTH REFERENCE	DEFAULT .66 AUTO NO REF

A.2 T-BERD DLC ANALYZER FACTORY DEFAULT SETTINGS

This appendix also identifies the T-BERD DLC Analyzer Option factory default settings that are stored in nonvolatile memory (see Table A-2).

Table A-2
T-BERD DLC Analyzer Factory Default Settings

Front Panel Switches	Default
CODE	AMI
FRAME	SLC-M1
FORMAT	CHANNEL
SOURCE I	1004Hz
SOURCE II	0dB
RESULTS I and II	SUMMARY
DISPLAY LIGHT	OFF
PRINT	N/A
RECEIVE INPUTS	DSX-MON
PRIMARY CHANNEL	— —
SECONDARY CHANNEL	— —
INSERT	OFF
SIGNALING INSERT	All OFF
Auxiliary Function	**Default**
CHANNEL/VF DROP	BOTH
CHANNEL/CHANNEL SCROLL	BOTH
CHANNEL/TRUNK TYPE	LOOP START
TRANSMIT/LBO	0dB
TIME/SET TIME	(Current Time)
TIME/SET DATE	(Current Date)

OPERATING MESSAGES

B.1 PRINTED MESSAGES

These messages are generated automatically when an important condition occurs. The **PRINT EVENT** switch must be set to a selection other than OFF to generate these messages. The alarm message includes the date, time, and message.

ALL ONES — Indicates whether the All Ones LED is ON or OFF.

*******BUFFER FULL***** —** Indicates that the print buffer has overflowed. This is the only message that is not date- and time-stamped. Print buffer overflow may result in lost information.

EX ZERO — Indicates whether the Excess Zeros LED is ON or OFF. This message is not applicable with the 2^20-1 or 2^23-1 pattern.

FRM SYNC ACQUIRED — Indicates frame synchronization is acquired.

FRM LOS — Indicates frame loss and is followed by a count of the number of such occurrences.

JITTER — Indicates whether the Jitter LED is ON or OFF.

LOOP DOWN DETECT — Indicates that the loop-down code is detected.

LOOP DOWN LOSS — Indicates that the loop-down code is lost.

LOOP UP DETECT — Indicates that the loop-up code is detected.

LOOP UP LOSS — Indicates that the loop-up code is lost.

NEW CONFIGURATION — Indicates a change in status of any major switch.

NOT B8ZS COMPAT — Indicates a piece of equipment that is not set to B8ZS or is not-compatible with B8ZS regenerated the transmitted ALL ZERO pattern when the **CODE** switch is set to the B8ZS position.

ONES DENSITY — Indicates whether the Ones Density LED is ON or OFF. This message is not applicable when the QRSS, 2^15-1, 2^20-1, 2^23-1, or 3 IN 24 data patterns are selected.

PAT LOS — Indicates pattern loss and is followed by a count of the number of such occurrences.

PATT SYNC ACQUIRED — Indicates pattern synchronization is acquired.

PULSE SHAPE — Indicates whether the Pulse Shape LED is ON or OFF.

SIG LOS — Indicates frame loss and is followed by a count of the number of such occurrences.

SIGNAL DETECT — Indicates that the signal is detected.

*******SIGNAL LEVEL OUT OF RANGE***** —** Indicates the signal level is out of specification for pulse shape measurements. This message is not time/date stamped.

TEST COMPLETE — Indicates when a timed test is completed (in lieu of printing an entire results print). This alarm message applies only when in TIMED TEST mode and the **PRINT EVENT** switch is in a position other than TEST END.

TEST RESTART — Indicates when the **RESTART** switch or any major switch is pressed.

NOTE: The term major switch applies to the **PATTERN, MODE, RESTART, POWER, TIMING,** and **RECEIVE INPUT** switches, and the AUX HLT/CONT and AUX RESPONSE functions.

YELLOW ALARM — Indicates whether the Yellow Alarm LED is ON or OFF.

B.2 REMOTE CONTROL MESSAGES

The following error and warning messages appear when entering commands and/or parameters incorrectly. Error messages are formatted with the prefix **ERROR** or **WARNING** and the message indicating the problem.

ERROR: ***BAUD is not an executable command.*** — You attempted to change the baud rate in remote control mode.

ERROR: ***Burst length set to single.*** — You attempted to insert a burst of logic or BPV errors with the ERR SEL auxiliary function set to SINGLE.

ERROR: ***Can't continue.*** — You attempted to continue a BERD-BASIC program that has been altered (i.e., lines have been changed) since the last **STOP** command.

ERROR: ***Characters after statement end.*** — The T-BERD 209A/211 found additional characters at the end of a valid command.

ERROR: ***Command not allowed in a program.*** — Your BERD-BASIC program contains a command which is only executable as a direct command from the remote controller.

ERROR: ***Command only allowed in a program.*** — You attempted to execute a command from the remote control which is only executable in a BERD-BASIC program.

ERROR: ***DATABITS is not an executable command.*** — You attempted to change the data bit setting in remote control mode.

ERROR: ***Illegal delimiter.*** — A delimiter (colon (:), comma (,), etc.) that is required in command syntax is not found.

ERROR: ***Illegal line number. Break in line xx*** — A non-existent BERD-BASIC program line is referenced (e.g., by a **GOTO** command), or you entered a program line with a value greater than 29779.

ERROR: ***Illegal value.*** — The value supplied with the command is outside the valid range for the function requested.

ERROR: ***Invalid format. Command not executed.*** — You specified an invalid format.

ERROR: ***Long pattern hardware option is not installed.*** — You attempted to enter a long user pattern without the required option being installed.

ERROR: ***Macros nested more than 5 deep.*** — A macro is attempting to recall itself or another macro more than five times.

ERROR: ***Must be specified by a parameter.*** — You did not specify a parameter that is required for command execution.

ERROR: ***Parameter is out of range.*** — You specified a parameter value that is outside the valid range (e.g., supplying the value 32 for the day of the month).

ERROR: ***PARITY is not an executable command.*** — You attempted to change parity value in remote control mode.

ERROR: ***Program memory overflow.*** — You entered a BERD-BASIC program that is too long to fit into memory.

ERROR: ***Result is not applicable to mode.*** — The T-BERD 209A/211 is in a mode in which the requested result is not applicable.

ERROR: ***Result is not available.*** — You requested a result whose value cannot be computed. This condition can occur when the T-BERD 209A/211 is out of frame or pattern synchronization and a result is specified that is only available when the T-BERD 209A/211 is in frame or pattern synchronization.

ERROR: ***RS-232 Receiver buffer overflow.*** — A command is greater than 512 characters in length or commands were entered too quickly.

ERROR: ***RS-232 Receiver framing error.*** — The T-BERD 209A/211 detects one or more asynchronous framing errors in the input command. This may occur if the controller's data format is different from that of the T-BERD 209A/211.

ERROR: ***RS-232 Receiver overrun error.*** — The remote control device is sending characters to the T-BERD 209A/211 while the Clear To Send (CTS) control signal is OFF (false), indicating that the T-BERD 209A/211 is not ready for more data. Solution: respond to signaling.

ERROR: ***RS-232 Receiver parity error.*** — The T-BERD 209A/211 received one or more characters with a parity error.

ERROR: ***Software error. -- Command function is out of range. ***Waiting... Recovered.**** — A software running error has occurred following the last remote control command.

ERROR: ***Spectrum analysis is turned off.*** — You attempted to execute a command that is disabled when Jitter Spectral Analysis Option is turned off.

ERROR: ***Spectrum analysis option not included.*** — You attempted to execute a command that requires the Jitter Spectral Analysis Option.

ERROR: ***TDR Option not installed.*** — You entered a TDR specific function, but the TDR Option is not installed.

ERROR: ***There is no such page for help information.*** — You requested information beyond the number of pages available for a HELP activity. Suggestion: issue the **HELP 1** command to learn how many pages of HELP information are currently available.

ERROR: ***Timing must be INT when in SELF TEST mode.*** — You attempted to change the timing source to a selection other than internal (INT) while in SELF TEST mode.

ERROR: ***Unrecognized command.*** — The T-BERD 209A/211 does not recognize the command name entered in the command line.

ERROR: ***Unrecognized parameter.*** — The T-BERD 209A/211 recognizes the requested command, but cannot interpret the specified command parameter.

ERROR: ***Invalid format. Command not executed.*** — You specified an invalid format.

*****Waiting… Recovered.***—** Function halted while waiting for response, then resumed when response received.

WARNING: ***External clock is not present.*** — Though specified in the **TIMing** command, an external clock source is not present. In such instances, timing is taken from the T-BERD 209A/211 internal clock source.

WARNING: ***Value has been rounded down.*** — To be processed, the command value that you entered has been rounded to the nearest allowable lesser value (see the **BURST LENgth** command).

STRESS PATTERNS

A hexadecimal-to-binary conversion table appears below. The following test pattern bit patterns and hexadecimal equivalents are indicated in this appendix.

- MIN/MAX
- T1-2/96
- T1-3/54
- T1-4/120
- T1-5/53
- 55 OCTET
- T1 DALY

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								

T1-2/96 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
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				

T1-3/54 Stress Pattern

01	02	03	04	05	06	07	08	09	10
01H	01H	01H	01H	01H	01H	00H	01H	01H	01H
0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 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
1000 0000	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						
01H	80H	01H	80H						
0000 0001	1000 0000	0000 0001	1000 0000						

T1-4/120 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
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

T1-4/120 Stress Pattern (Continued)

81	82	83	84	85	86	87	88	89	90
10H	10H	10H	10H	10H	10H	10H	10H	10H	10H
0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000
91	92	93	94	95	96	97	98	99	100
10H	10H	10H	10H	10H	10H	AAH	AAH	AAH	AAH
0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	1010 1010	1010 1010	1010 1010	1010 1010
101	102	103	104	105	106	107	108	109	110
10H	10H	10H	10H	10H	10H	10H	10H	10H	10H
0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000
111	112	113	114	115	116	117	118	119	120
10H	10H	10H	10H	10H	10H	10H	10H	10H	10H
0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000	0001 0000

T1-5/53 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							

55 OCTET Stress Pattern

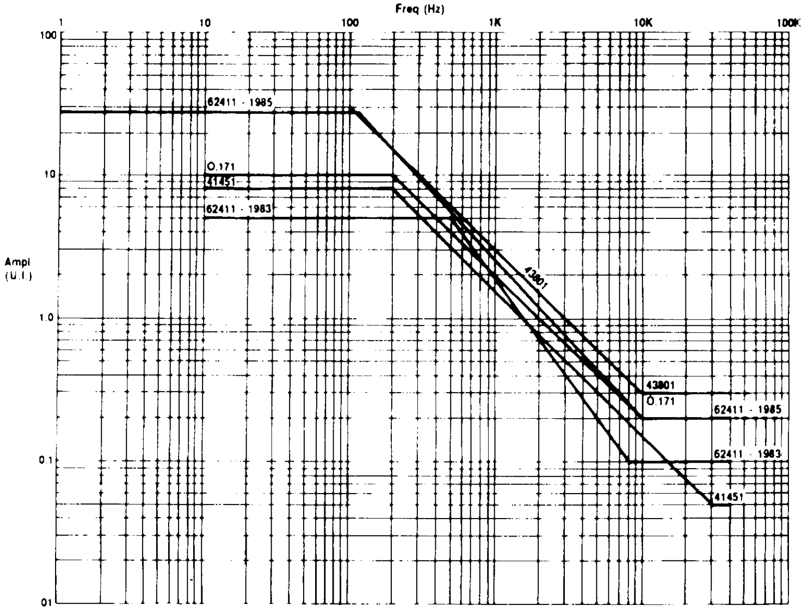
01	02	03	04	05	06	07	08	09	10
01H	01H	01H	01H	01H	01H	00H	01H	01H	01H
0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 0001	0000 0000	0000 0001	0000 0001	0000 0001
11	12	13	14	15	16	17	18	19	20
01H	01H	01H	03H	01H	01H	01H	01H	07H	01H
0000 0001	0000 0001	0000 0001	0000 0011	0000 0001	0000 0001	0000 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					

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					

JITTER MASKS

The following chart is a plot of the available T-BERD 211 jitter masks that are selectable through the AUX JIT MASK function.



REMOTE CONTROL COMMANDS

This appendix describes all of the remote control commands in alphabetical order. The command, parameters, related commands, and examples are provided for each command.

ALARM ALARM

Alarm Message Prints

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.

ALARM	:Print the alarm message printout status.
ALARM 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 has no effect.
ALARM OFF	:Disable the alarm message printout control. Alarm, status, and note messages are not printed when a print event is selected.

See also: **PRInt EVEnt**

BAUD

Display the Current Baud Rate Setting

This command prints the current RS-232 interface baud rate. This is an inquire-only command; the baud rate can only be changed from the front panel (AUX BAUD function).

BAUD	:Prints the current RS-232 interface baud rate.

EXAMPLE:

>BAUD	:Display the current baud rate setting.
1200	
>BAUD 2400	:Try to set a new baud rate.
ERROR: Baud is not an executable command.	
>	

BEEP

Sound the Remote Control Unit's Beeper

This command causes the remote control unit to sound a single short beep.

BEEP	:Sound a single beep.

BURST LENgth

BURST LENgth

Burst Duration For BPV and Logic Errors

This command sets or prints the logic error or BPV insertion burst duration from 25 ms to 5000 ms. If ERRor INSert BPV or ERRor INSert LOGic is set to SINgle, the burst length is automatically set to zero.

BURST LEN	:Print the current burst duration.
BURST LEN [0.025|0.050 to 0.20]	:Set the burst duration from 0.025 (25 ms) to 0.2 (200 ms) seconds in 0.025 (25 ms) second steps.
BURST LEN [0.25|0.3 to 0.5]	:Set the burst duration from 0.25 (250 ms) to 0.5 (500 ms) seconds in 0.05 (50 ms) second steps.
BURST LEN [0.6|0.7 to 1.5]	:Set the burst duration from 0.6 (600 ms) to 1.5 (1500 ms) seconds in 0.1 (100 ms) second steps.
BURST LEN [2.0|2.5 to 5.0]	:Set the burst duration from 2.0 (2000 ms) to 5.0 (5000 ms) seconds in 0.5 (500 ms) second steps.

NOTE: A value that is not one of the incremental values is always rounded to the nearest allowable lesser value. If a value has a decimal point, the digits after the third fractional position are ignored.

See also: **ERRor INSert BPV** and **ERRor INSert LOGic**

EXAMPLE:

>BURST LEN 0.024 :The smallest allowed decimal value is 0.025.
ERROR: PARAMETER IS OUT OF RANGE
>BURST LEN 5.001 :The largest allowed decimal value is 5.000.
ERROR: PARAMETER IS OUT OF RANGE
>BURST LEN 3.0 :A 3-second burst duration is specified.
>

CABle CABle

Select TDR Cable Type and Wire Gauge

This command sets or prints the TDR cable type and wire gauge to configure the TDR.

CAB	:Print the current TDR cable type and wire gauge.
CAB PIC/2x	:Select 2x gauge PIC (polyethylene insulated cable) wire, where x can be either 2, 4, or 6 for 22 gauge, 24 gauge, or 26 gauge.
CAB JELL/2x	:Select 2x gauge jelly-filled insulated wire, where x can be either 2, 4, or 6 for 22 gauge, 24 gauge, or 26 gauge.
CAB PULP/2x	:Select 2x gauge paper-pulp insulated wire, where x can be either 2, 4, or 6 for 22 gauge, 24 gauge, or 26 gauge.
CAB USER/2x	:Select 2x gauge generic wire, where x can be either 2, 4, or 6 for 22 gauge, 24 gauge, or 26 gauge. Select PR. VEL with the **VELocity** command.
CAB DEFAULT	:Select default wire parameters, while PR. VEL is set to .66.

See also: **GRAPH, LENgth, MODe, PRInt, REFerence, RESTART,** and **VELocity**

CLEAR FIFO

CLEAR FIFO

Clear the Print FIFO

This command clears the print FIFO of all printouts that are awaiting printing.

CLEAR FIFO	:Clear the print FIFO of all printouts.

CLOCK

CLOCK

Clock Time

This command sets or prints the clock time (time of day).

CLOCK	:Print the current clock time.
CLOCK hh:mm	:Set the clock time. The time is entered in 24-hour format; seconds are always set to zero when a new time is entered. In addition to a colon (:), a comma (,), period (.), semi-colon (;), forward slash (/), or dash (-) can be used as a delimiter to separate hours and minutes.

EXAMPLE:

> CLOCK	:Print the current clock time.
15:30:24	:Time is displayed in hours, minutes, and seconds.
> CLOCK 6:28	:Set clock time to 6:28 a.m.
>	

CLS

CLS

Clear the Terminal Screen

This command clears the terminal screen by sending 30 returns to the screen.

CLS	:Clear the terminal screen.

CODe

CODe

Select Code Type

This command sets or prints the code type used by the T-BERD 209A/211 transmitter.

COD	:Print the current code status.
COD AMI	:Set the coding for AMI.
COD B8Zs	:Set the coding for B8ZS encoding. Note that B8ZS decoding is always available on the receive side.

CONT CONT

Resume BERD-BASIC Program Execution

This command resumes the running of any BERD-BASIC program which has been suspended due to the **STOP** command. Using the **STOP** and **CONT** commands, you can temporarily suspend program execution and resume it at a later time. Program execution cannot be continued if any existing line in a program has been changed, or if a program has reached its conclusion.

CONT	:Continue BERD-BASIC program.

See also: **STOP**

EXAMPLE:

>10 LPRINT "FIRST HALF"	:This program runs in two halves ...
>20 STOP	: ...with a STOP in the middle.
>30 LPRINT "SECOND HALF"	
>40 END	
>RUN	:Run the program.
FIRST HALF	:The program stops running ...
BREAK IN LINE 20	: ...due to the **STOP** command in line 20.
>CONT	:Continue running the program.
SECOND HALF	
DONE	:The program is finished.
>	

CONTROLS CONTROLS

Generate a Controls Printout

This command generates a controls printout of all current T-BERD 209A/211 switch settings. This command performs the same function as the **PRInt CONtrol** command.

CONTROLS :Generate a controls printout.

EXAMPLE:

>CONTROLS :Generate a controls printout.

```
  CONTROLS PRINT      16:13:03    27 OCT
MODE:        SELF TST  PATTERN:  ALL ONES
TIMED/CONT:     TIMED  DIS HOLD:      OFF
TIMING:           INT  CODE:          AMI
ERR INS BPV:      OFF  ERR INS LOG:   OFF
ERR INS FRM:      OFF  RCV INPUT:    TERM
TX LBO:           0dB  PRI EVNT:      OFF
LP CD SEL:        CSU  LP UP CD:    10000
LP DN CD:         100  RESPONSE:  NO AUTO
PARITY:          NONE  BAUD RATE:    2400
CR/CR-LF:          CR  FORMAT:      SHORT
INS RATE:     1.0 E-6  BURST LNGTH:   0mS
FRM ERR:       SINGLE  PULSE SEL:    NONE
HALT/CONT:       HALT  JIT/SA:        OFF
JIT MASK:       0.171  JIT TRIG: CONTINUE
```

>

DATA BITS DATA BITS

Display the Current RS-232 Data Bit Setting

This command only prints the current data bit setting for the RS-232 interface on the T-BERD 209A/211. This is an inquire-only command; you cannot change the setting via remote control.

DATA BITS	:Print the current data bit setting for the RS-232 interface.

DATE DATE

Calendar Day and Month

This command sets or prints the current date from the T-BERD 209A/211.

DATE	:Print the current day and month.
DATE dd/mm	:Set the date with the day and month. In addition to a forward slash (/), a colon (:), comma (,), period (.), semi-colon (;), or dash (-) can be used as a delimiter to separate hours and minutes.

See also: **YEAR**

EXAMPLE:

>DATE	:Print the current day and month.
4 SEP	
>DATE 18/9	:Set date to September 18.
>	

DEVICE CLEAR

DEVICE CLEAR

Clear Device

This command clears the T-BERD 209A/211 by executing the power-up procedure. The entire instrument is reinitialized — hardware and RAM.

DEVICE CLEAR	:Clear the T-BERD 209A/211.

NOTE: It also returns control of the T-BERD 209A/211 to the front panel. Remote control mode must be reestablished.

DISplay HOLd

DISplay HOLd

Freeze the Results Displays

This command sets or prints the display hold function.

DIS HOL	:Print the current status of the display hold function.
DIS HOL ON	:Enable the display hold function. The displayed test results are frozen, however, the test results continue to accumulate.
DIS HOL OFF	:Disable the display hold function. The displayed test results are unfrozen and updated.

DISPLAY DISPLAY

Front-Panel Display Mode

This command sets or prints the **RESULTS** switches display mode. These are the only switches that can be activated under remote control.

DISPLAY	:Print the **RESULTS** switches display mode status.
DISPLAY LOCAL	:Enable the front-panel **RESULTS** switches. This command is the default for remote control mode.
DISPLAY REMOTE	:Disable the front-panel **RESULTS** switches.

ECHO ECHO

Echo Mode

This command sets or prints the echo mode function.

ECHO	:Print the echo mode function status.
ECHO ON	:Enable the echo mode function. This allows the commands to be displayed on the remote control device.
ECHO OFF	:Disable the echo mode function. This prevents the commands from being displayed on the remote control device.

EXAMPLE:

>ECHO	:Print the echo mode function status.
ON	
>ECHO OFF	:Disable the echo mode function.
>	:Enter the **CLOCK** command. **CLOCK** is not displayed.
12:03:32	:However, the time is displayed.
>	

END

End a BERD-BASIC Program

This command marks the end and terminates a BERD-BASIC program. The message **DONE** is sent to the remote control device when the program is terminated. The message **DONE** is sent whenever the end of a program is reached successfully (even if the **END** command is not specified).

END	:End a BERD-BASIC program.

ERRor INSert BPV

BPV Error Insertion

This command sets or prints the BPV error insertion function.

ERR INS BPV	:Print the current BPV error insertion rate status.
ERR INS BPV RATE	:Continuously insert BPVs into the data stream. The **ERROR RATE** command determines the insertion rate.
ERR INS BPV BURST	:Insert a single burst of BPVs. The **ERROR RATE** command determines the insertion rate of the burst. The **BURST LENgth** command determines the burst duration. An error message is printed when the burst length is set to 0 ms (automatically set after a remote control single error insert is issued).
ERR INS BPV SIN	:Insert a single BPV. If continuous errors are being inserted, this command also stops the error insertion.
ERR INS BPV OFF	:Stop the insertion of BPV errors.

See also: **ERROR RATE** and **BURST LENgth**

ERRor INSert FRM — ERRor INSert FRM

Frame Error Insertion

This command sets or prints the frame error insertion function.

ERR INS FRM	:Print the current frame error insertion rate status.
ERR INS FRM CONT	:Continuously insert single or multiple consecutive frame errors into the data stream. The **FRM ERRor LENgth** command determines the number of frame errors inserted per D4/ESF/SLC frame.
ERR INS FRM MULTI	:Insert one round of single or multiple consecutive frame errors into the data stream. The **FRM ERRor LENgth** command determines the number of frame errors inserted consecutively.
ERR INS FRM SIN	:Insert a single frame error. If continuous errors are being inserted, this command also stops the error insertion.
ERR INS FRM OFF	:Stop the frame error insertion.

See also: **FRM ERRor LENgth** and **FRM ERRor TYPe**

ERRor INSert LOGic

ERRor INSert LOGic

Logic Error Insertion

This command sets or prints the logic error insertion function.

ERR INS LOG	:Print the current logic error insertion rate status.
ERR INS LOG RATE	:Continuously insert logic errors into the data stream. The **ERROR RATE** command determines the insertion rate.
ERR INS LOG BURST	:Insert a single burst of logic errors. The **ERROR RATE** command determines the insertion rate of the burst. The **BURST LENgth** command determines the burst duration. An error message is printed when the burst length is set to 0 ms (automatically set after a remote control single error insert is issued).
ERR INS LOG SIN	:Insert a single logic error. If continuous errors are being inserted, this command also stops the error insertion.
ERR INS LOG OFF	:Stop the insertion of logic errors.

See also: **ERROR RATE** and **BURST LENgth**

ERROR RATE

ERROR RATE

BPV and Logic Error Insertion Rate

This command sets or prints the error rate for the logic error and BPV insertion functions.

ERROR RATE	:Print the current error insertion rate.
ERROR RATE XX,y	:Set a new error insertion rate. The error rate is entered in an XX,y format, and is interpreted as X.X E-y. The error insertion rate range is 1.0 E-2 (10,2) to 1.0 E-9 (10,9). In addition to a comma (,), a colon (:), period (.), semi-colon (;), forward slash (/), or dash (-) can be used as a delimeter to separate the mantisa and exponent values.

See also: **ERRor INSert BPV** and **ERRor INSert LOGic**

EXAMPLE:

>ERROR RATE	:Print the current error insertion rate.
1.0 E-7	:The current error insertion rate is 1.0 E-7.
>ERROR RATE 10,5	:Change the error insertion rate to 1.0 E-5.
>	

FACTORY DEFault

FACTORY DEFault

Factory Default

This command resets NOVRAM to the factory default settings, initiates an autocalibration on the T-BERD 209A/211, and restarts the test set. The T-BERD 209A/211 is no longer in remote control mode after executing this command.

FACTORY DEF	:Reset NOVRAM to the factory default settings.

See also: FIRST P.U.

FIRST P.U.

FIRST P.U.

First Power-Up

This command resets NOVRAM to the factory default settings and initiates an autocalibration on the T-BERD 209A/211. The T-BERD 209A/211 is no longer in remote control mode after executing this command.

FIRST P.U. :Conduct first power-up.

NOTE: To continue beyond the reloading of NOVRAM, you must press the **RESTART** switch.

FORMAT

FORMAT

Formatted Printouts

This command inserts spaces between words so that output from the T-BERD 209A/211 is easy to read. The **FORMAT** command (as opposed to the **UNFORMAT** command) is the default for remote control mode; when the T-BERD 209A/211 changes control mode (from local to remote or vice versa), the current setting remains unchanged.

FORMAT :Format output with spaces between words.

See also: **UNFORMAT**

FRM ERRor LENgth

FRM ERRor LENgth

Frame Error Insertion Rate

This command sets or prints the number of consecutive frame errors that are inserted when the **ERRor INSert FRM** command is executed.

FRM ERR LEN	:Print the current number of consecutive frame errors being inserted.
FRM ERR LEN [1 | 2 | 3 | 4 | 5 | 6]	:Set the number of consecutive frame errors from 1 to 6.

See also: **ERRor INSert FRM** and **FRM ERRor TYPe**

EXAMPLE:

>FRM ERR LEN 5	:Change the number of consecutive frame errors to 5.
>	

FT1 CHAnnel

FT1 CHAnnel

Set Fractional T1 Channel Bandwidth

This command provides the capability of entering, editing, and printing the FT1 channels. The DS0 channel numbers can be entered in any order; the channel numbers are automatically sorted in memory. This command requires the Fractional T1 Option.

FT1 CHA SET hh hh ... :Enter two-digit DS0 channel numbers in contiguous or noncontiguous order. Previous channel numbers are deleted.

FT1 CHA ADD hh hh ... :Add channel numbers to the current channel numbers.

FT1 CHA DEL hh hh ... :Delete the current DS0 channel numbers.

FT1 CHA PRI :Print the current DS0 channel numbers.

NOTE: Spaces or commas can be used to separate the channel numbers when entered. DS0 channels 1 through 9 can be entered as single-digit numbers.

See also: **FT1 IDLe** and **FT1 RATe**

EXAMPLE:

>FT1 CHA SET 01 02 03 04 05 :Enter contiguous channel numbers.
>FT1 CHA SET 03 02 04 01 05 :Enter contiguous channel numbers in random order.

>FT1 CHA PRI :Print the current DS0 channel numbers.
01 02 03 04 05
>

FT1 IDLe

Set Fractional T1 Idle Code

This command sets or prints the programmed FT1 idle code. This command requires the Fractional T1 Option.

FT1 IDL	:Print the current FT1 idle code.
FT1 IDL (bbbbbbbb)	:Set programmable 8-bit idle code. The idle code (**bbbbbbbb**) is an 8-bit binary pattern (a sequence of 1s and/or 0s) with the left-most bit transmitted first.

See also: **FT1 CHAnnel** and **FT1 RATe**

EXAMPLE:

>FT1 IDL	:Print the current FT1 idle code.
01001001	
>FT1 IDL 10011000	:Set the programmable idle code to 10011000.
>	

FT1 RATe

Set Fractional T1 DS0 Data Rate

This command sets or prints the FT1 DS0 data rate. The default data rate is 64xN. This command requires the Fractional T1 Option.

FT1 RAT	:Print the current DS0 data rate.
FT1 RAT 56	:Select the 56 kb/s DS0 channel rate.
FT1 RAT 64	:Select the 64 kb/s DS0 channel rate.

See also: **FT1 CHAnnel** and **FT1 IDLe**

GOTO

GOTO

Transfer Program Execution to a Specified Line

GOTO [linenumber]

:This command alters the sequence in which the T-BERD 209A/211 executes commands in a BERD-BASIC program. When encountered in a running program, the **GOTO** command transfers execution to the command associated with the specified **linenumber** (as opposed to the next line in sequence).

EXAMPLE:

>10 LPRINT START HERE
>20 GOTO 40 :Go to line 40.
>30 LPRINT THIS LINE IS NEVER PRINTED
>40 LPRINT JUMP TO HERE
>RUN
START HERE
JUMP TO HERE :Line 30 is skipped.
DONE
>

GRAPH GRAPH

Initiate a Graphic Printout

This command generates a printout of a pulse shape graph, jitter vs frequency graph, or TDR trace.

GRAPH PULSE :Generate a pulse shape graph.

GRAPH JITTER :(T-BERD 211 only) Generate a jitter vs frequency graph. The **GRAPH JITTER** command is only available when the Jitter Spectral Analysis Option is installed.

GRAPH TDR :Generate a TDR trace. This command is identical to the PRINT GRAPH function in the TDR RESULTS display. The **GRAPH TDR** command is only available when the TDR Option is installed.

NOTE: The **GRAPH** command should only be used when the remote controller has graphics capability.

See also: PULSE — **PULSE MASK** and **TERM 232** .
JITTER (T-BERD 211 only) — **JITter MASK, JITter TRIGger, SPECTRUM,** and **TERM 232** .
TDR — **CABle, LENgth, MODe, PRInt, REFerence, RESTART, VELocity,** and **TERM 232** .

HELLO

HELLO

Display T-BERD 209A/211 Software Revision Level

This command prints the T-BERD 209A/211 hardware and software revision levels, as well as any options that are included in the instrument.

HELLO :Print T-BERD 209A/211 hardware and software revision levels and show installed options.

HELP

HELP

On-Line Help Function

This command provides access to the T-BERD 209A/211 on-line help facility.

HELP :Display introductory help information.

HELP HELP :Display an index to all help information.

HELP! :Display all valid remote control commands.

HELP <command-name> :Display **command-name** syntax. This command defines and displays the command syntax for any specified remote control command. The following conventions apply:

1. Command parameters are presented as uppercase character strings (see Example 1).
2. Command and parameter summaries are preceded by three dashes (- - -) (see Examples 2 and 3).

HELP 1 :Display page 1, introductory help information.

HELP 2 :Display page 2, special characters.

HELP 3 :Display page 3, front-panel switch commands.

HELP **HELP**

On-Line Help Function (Continued)

HELP 4	:Display page 4, auxiliary function commands, part one.
HELP 5	:Display page 5, auxiliary function commands, part two.
HELP 6	:Display page 6, special commands, part one.
HELP 7	:Display page 7, special commands, part two.
HELP 8	:Display page 8, BERD-BASIC commands.

EXAMPLE 1:

>HELP ERR INS BPV
OFF :These are the valid command parameters
RATE :for ERR INS BPV.
BURST
SIN

EXAMPLE 2:

>HELP CLOCK
HH,MM :These are the valid formats for the **CLOCK** command.

HH.MM
HH/MM
HH;MM
HH:MM
HH-MM

- - -HH 0 TO 23 HOURS :These are the valid ranges.
- - -MM 0 TO 59 MINUTES

EXAMPLE 3:

>HELP NEW :Summarize the **NEW** command.
- - -ERASE THE EXISTING BASIC PROGRAM.
>

HIStory RESet

HIStory RESet

Reset Alarm History LED Indicators

This command resets all alarm history LEDs.

HIS RES :Reset History LEDs.

HISTory CLR

HISTory CLR

Clear History and Printer Buffers

This command provides the ability to clear the history and print buffers.

HIST CLR :Clear the history and print buffers.

HOLD

Hold All Printer Outputs

This command temporarily holds all printer output (in the print buffer) until a **RELease** command is specified. While the **HOLD** command is enabled, the prompt character changes from the standard “**>**” (or user-specified prompt) to a “**+**” to indicate that printer output is being held.

HOLD	:Hold all printer output (in the print buffer).

See also: **RELease**

EXAMPLE:

>HOL	:Hold all printouts for now ...
+CLOCK	: ... then print the time and date.
+DATE	:(note that nothing is printed)
+REL	:start printing ...
>	: ... and the prompt is changed back to “>”.
12:34:56	:The T-BERD 209A/211 prints the time ...
14 APR	: ... and date.
>	

INPUT

Enter User Input Into a Macro

This command is used to enter user input into a macro. A macro is a string of characters that are defined once and recalled using one or two key strokes. When running a BERD-BASIC program with **INPUT** commands, the T-BERD 209A/211 prompts you with a string (**INPUT m/prompt-string**) or a question mark (**INPUT m**). The parameter m is a number from 0 to 9. You can specify a response (to a maximum of 31 characters) which is stored as a macro.

INPUT m	:Prompt user with a question mark.
INPUT m/prompt-string	:Prompt user with string.

See also: **MACRO**

EXAMPLE:

>10 INPUT 2	
>20 INPUT 3/TIME	:TIME is a prompt string for MACRO3.
>RUN	
?PRINT BIT ERRORS	:Respond to "?" with PRINT BIT ERRORS.
TIME?PRINT CLOCK TIME	:Respond to prompt with PRINT CLOCK TIME.
DONE	
>&2	:Call MACRO 2 (PRINT BIT ERRORS).
1211	:Bit error results are displayed.
>&3	:Call MACRO 3 (PRINT CLOCK).
11:22:33	:The clock time is displayed.
>MACRO 2	:Display the contents of MACRO 2.
PRINT BIT ERRORS	
>MACRO 3	:Display the contents of MACRO 3.
PRINT CLOCK TIME	
>	

JITter MASK

Spectral Analysis Jitter Mask Selection
(T-BERD 211 Only)

This command sets or prints the spectral analysis jitter mask selection. When a mask is selected, the jitter spectral analysis measurement is displayed as a percentage of the selected mask. This command requires the Jitter Spectral Analysis Option.

JIT MASK	:Print the current jitter mask.
JIT MASK 0.171	:Select the CCITT Recommendation 0.171 jitter mask.
JIT MASK 41451	:Select the AT&T Technical Reference PUB41451 jitter mask.
JIT MASK 62411/1983	:Select the AT&T Technical Reference PUB62411, 1983 issue jitter mask.
JIT MASK 62411/1985	:Select the AT&T Technical Reference PUB62411, 1985 issue jitter mask.
JIT MASK 43801	:Select the AT&T Technical Reference PUB43801 jitter mask.
JIT MASK NONE	:Disable the jitter mask selection. When NONE is selected, the jitter measurement is displayed in UIs.

See also: **SPECTRUM** and **JITter TRIGger**

EXAMPLE:

>JIT MASK	:Print the current jitter mask.
0.171	:Current jitter mask conforms to CCITT 0.171.
>JIT MASK 43801	:Select the AT&T PUB43801 jitter mask.
>	

JITter TRIGger

JITter TRIGger

Spectral Analysis Jitter Trigger Control
(T-BERD 211 Only)

This command sets or prints the spectral analysis jitter trigger selection. This command requires the Jitter Spectral Analysis Option.

JIT TRIG	:Print the current spectral analysis trigger.
JIT TRIG ERR EVE	:Perform spectral analysis on an error event. The jitter snapshot occurs on a bit error, frame error, CRC error, or BPV.
JIT TRIG SEV ERR	:Perform spectral analysis on a severely errored second. This command requires the G.821 Performance Analysis Option.
JIT TRIG ONE DEN	:Perform spectral analysis on a ones density violation. The jitter snapshot occurs when the pulse density rate falls below 12.5%.
JIT TRIG FRA ALA	:Perform spectral analysis on frame synchronization loss. The jitter snapshot occurs on the loss of frame synchronization.
JIT TRIG PAT SYN LOS	:Perform spectral analysis on pattern synchronization loss. The jitter snapshot occurs on the loss of pattern synchronization.
JIT TRIG CON	:Perform continuous spectral analysis. The jitter spectral analysis occurs continuously at 30-second intervals, and peak values are constantly updated.

See also: **SPECTRUM** and **JITter MASK**

EXAMPLE:

>JIT TRIG	:Print the current spectral analysis trigger.
ONE DEN	:Current jitter trigger is the ones density violation.
>JIT TRIG ERR EVE	:Select the error event trigger.
>	

LEDS LEDS

Display the State of Front-Panel LEDs

This command displays the state of the T-BERD 209A/211 alarm, status, and receive loop codes LEDs.

LEDS :This command displays the state of the T-BERD 209A/211 alarm, status, and receive loop codes LEDs.

EXAMPLE:

>LEDS

```
  OFF   OFF   SIGNAL LOSS     ON    T1 PULSES
  OFF   OFF   PATTERN LOSS    OFF   T1C PULSES
  OFF   OFF   FRAME LOSS      ON    PATTERN SYNC
  OFF   OFF   ONES DENSITY    OFF   FRAME SYNC
  OFF   OFF   EXCESS ZEROS    OFF   B8ZS
  OFF   OFF   YELLOW ALARM
  OFF   OFF   ALL ONES
  OFF   OFF   PULSE SHAPE
  OFF   OFF   LOW BATTERY
  OFF         POWER LOSS
    |
    |________ HISTORY


  -- RECEIVE LOOP CODES -
  OFF         PRE-EXIST LOOP
  OFF         LOOP UP
  OFF         LOOP DOWN
>
```

LENgth LENgth

Select TDR Cable Length

This command sets or prints the TDR cable length being tested.

LEN	:Print the current TDR cable length.
LEN 1000	:Select cable length of 1000 feet.
LEN 3000	:Select cable length of 3000 feet.
LEN 6500	:Select cable length of 6500 feet.
LEN AUTO	:Tests to the first fault or up to 6500 feet if no faults are detected.

See also: **CABle, GRAPH, MODe, PRInt, REFerence, RESTART,** and **VELocity**

LIST LIST

List the Working BERD-BASIC Program

This command lists the contents of the currently active BERD-BASIC program in ascending numerical order, and displays the number of unused bytes in program memory. If a line number is not specified, the listing starts with the first line of the program; otherwise, the listing starts with the specified line number.

LIST	:List the entire program.
LIST linenumber	:List program starting with specified **linenumber** .

EXAMPLE:

>10 CLOCK	:Enter CLOCK as line 10.
>30 DATE	:Enter DATE as line 30.
>20 CLS	:Enter CLS as line 20.
>LIST	:List current program.

```
10 CLOCK
20 CLS
30 DATE
[489 BYTES FREE]
>
```

LOCAL LOCAL

Return the T-BERD 209A/211 to Local Mode

This command returns the T-BERD 209A/211 to local front-panel control from remote control or terminal mode. In local mode, all front-panel switches are active regardless of the display mode. The T-BERD 209A/211 remains in local mode until **REMOTE** , **TERMINAL** , period (**.**), or another valid command is entered from the remote control device. When Local mode is specified, note that the remote control unit is disabled if the baud rate settings of the remote control unit and the T-BERD 209A/211 do not match.

LOCAL or / (slash)	:Enter local (front panel) mode.

See also: **PROMPT, ECHO, DISPLAY, REMOTE,** and **TERMINAL**

EXAMPLE:

>LOCAL	:Enter local (front panel) mode ...
REMOTE	: ... then return to remote control mode.
/	:Quickly return to local mode (prompt and echo are not enabled).

LOOp LOOp

Select ESF Loop Code Type

This command sets or prints the ESF loop code type: in-band or out-of-band. The **LOOp** command also determines which loop code type the T-BERD 209A/211 responds to (see **RESPONSE** command). The **LOOp** command is only used when testing ESF or FT1 ESF formatted circuits (see **MODe** command). The loop code is selected with the **LOOP CODE** command.

LOO	:Print the current ESF loop code type.
LOO IN	:Select the ESF in-band loop codes.
LOO OUT	:Select the ESF out-of-band loop codes.

See also: **LOOP CODE, LOOp DOWn, LOOp UP, RESPONSE, PGM LPUP,** and **PGM LPDN**

LOOp DOWn

Generate Loop-Down Code

This command sets or prints the transmission of the selected loop-down code.

LOO DOW	:Print the current transmission status of loop-down code.
LOO DOW ON	:Enable the loop-down code transmission. The transmission of the loop-down code continues until it is no longer detected or until the **LOOp DOWn OFF** command is issued.
LOO DOW OFF	:Disable the loop-down code transmission.

See also: **LEDS, LOOP CODE, LOOp, LOOp UP, RESPONSE, PGM LPUP,** and **PGM LPDN**

LOOp UP

Generate Loop-Up Code

This command sets or prints the transmission of the selected loop-up code.

LOO UP	:Print the current transmission status of loop-up code.
LOO UP ON	:Enable the loop-up code transmission. The transmission of the loop-up code continues until it is detected for 250 ms, or until the **LOOp UP OFF** command is issued.
LOO UP OFF	:Disable the loop-up code transmission.

See also: **LEDS, LOOP CODE, LOOp, LOOp DOWn, RESPONSE, PGM LPUP,** and **PGM LPDN**

LOOP CODE

LOOP CODE

Select Loop Code Pattern

This command sets or prints the loop code that is transmitted when the **LOOP CODE** switches are pressed. This selection also determines which loop code causes the T-BERD 209A/211 to establish AUTO LLB mode.

LOOP CODE	:Print the current loop code pattern selection.
LOOP CODE CSU	:Select the in-band CSU loop code pattern.
LOOP CODE FAC1	:Select the in-band facility 1 loop code pattern.
LOOP CODE FAC2	:Select the in-band facility 2 loop code pattern.
LOOP CODE FAC3	:Select the in-band facility 3 loop code pattern.
LOOP CODE PGM	:Select the in-band user-programmed loop code pattern. Program the loop codes with the PGM LPDN and PGM LPUP commands.
LOOP CODE TEL ARM	:Select the Teltrend, or equivalent, T1 repeater arming/disarming code. Use the **LOOp UP** command to send the arming code and NIU loop-up code. Use the **LOOp DOWn** command to send the disarming code and NIU loop-down code. Transmit the codes from the CO and toward the NIU.
LOOP CODE TEL LR <address>	:Select the Teltrend, or equivalent, T1 line repeater loop codes. The repeater <address> range is 1 to 20.
LOOP CODE TEL NEARM	:Select the Teltrend, or equivalent, T1 repeater arming/disarming code. Use the **LOOp UP** command to send the arming code. Use the **LOOp DOWn** command to send the disarming code. Transmit the codes from the NIU and toward the CO.
LOOP CODE TEL OR	:Select the Teltrend, or equivalent, T1 office repeater loop codes.

LOOP CODE

LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE TEL PTHRU :Select the Teltrend, or equivalent, T1 line repeater power-thru code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the power-thru code.

LOOP CODE TEL PWRDN :Select the Teltrend, or equivalent, T1 office repeater power-down codes. Use either the **LOOp UP** or the **LOOp DOWn** command to send the power-down code.

LOOP CODE TEL PWRLP :Select the Teltrend, or equivalent, T1 line repeater power-loop codes. Use the **LOOp UP** command to send the power-loop code. Use the **LOOp DOWn** command to loop down the repeater.

LOOP CODE TEL QUERY :Select the Teltrend, or equivalent, T1 repeater query code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the query code.

LOOP CODE TEL-LW AUTO QUERY :Select the Teltrend Model IOR7231LW/ ILR7239LW Intelligent T1 Repeater, or equivalent, T1 repeater automatic query code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the automatic query code.

LOOP CODE TEL TDIS :Select the Teltrend, or equivalent, T1 repeater automatic timeout disable code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the automatic timeout disable code.

LOOP CODE TEL-LC PTHRU :Select the Teltrend Model ILR7239LC Intelligent T1 Line Repeater, or equivalent, power-thru code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the power-thru code.

LOOP CODE

LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE TEL-LC TDIS	:Select the Teltrend Model IOR7231LC/ ILR7239LC Intelligent T1 Repeater, or equivalent, automatic timeout disable code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the automatic timeout disable code.
LOOP CODE WEST ARM	:Select the Westell, or equivalent, T1 repeater arming/disarming code. Use the **LOOp UP** command to send the arming code and NIU loop-up code. Use the **LOOp DOWn** command to send the disarming code and NIU loop-down code. Transmit the codes from the CO and toward the NIU.
LOOP CODE WEST-56 LR <address>	:Select the Westell Model 3150-56 Line Repeater, or equivalent, loop codes. The repeater <address> range is 1 to 20.
LOOP CODE WEST-56 OR Re**<address>**	:Select the Westell Model 3130-56 Office peater, or equivalent, loop codes. The repeater <address> is 1 or 2.
LOOP CODE WEST-56 SEQ	:Select the Westell Model 3150-56 Repeater Sequential Loopback code. Use the **LOOp UP** command to send the sequential-loopback code. Use the **LOOp DOWn** command to send the loop-down code.
LOOP CODE WEST-56 QUERY	:Select the Westell Model 3150-56 Repeater loopback query code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the query code.
LOOP CODE WEST-56 PQUERY	:Select the Westell Model 3150-56 Line Repeater Power loop query code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the power loop query code.

LOOP CODE LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE WEST-56 TDIS	:Select the Westell Model 3150-56 Repeater automatic timeout disable code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the automatic timeout disable code.
LOOP CODE WEST NIMS20 SW <address>	:Select the Westell Network Interface Maintenance System (NIMS-20) switch command. The line card <address> range is 1 to 28. Use the **LOOp UP** command to send the arming and switch command. Use the **LOOp DOWn** command to send the armin and reset code.
LOOP CODE WEST NIMS20 RAMP <address>	:Select the Westell Network Interface Maintenance System (NIMS-20) ramp command. The line card <address> range is 1 to 28. Use the **LOOp UP** command to send the arming and ramp command. Use the **LOOp DOWn** command to send the arming and reset code.
LOOP CODE WEST NIMS60 SW <address>	:Select the Westell Network Interface Maintenance System (NIMS-60) switch command. The line card <address> range is 1 to 28. Use the **LOOp UP** command to send the arming and switch command. Use the **LOOp DOWn** command to send the arming and reset code.
LOOP CODE WEST NIMS60 RAMP <address>	:Select the Westell Network Interface Maintenance System (NIMS-60) ramp command. The line card <address> range is 1 to 28. Use the **LOOp UP** command to send the arming and ramp command. Use the **LOOp DOWn** command to send the arming and reset code.
LOOP CODE WESCOM OFFICE <address>	:Select the Wescom T1 (office side) repeater loop codes. The<address> range is A thru H, J thru M, AA thru AH, AJ thru AM, 0, 1, 2, A0, A1, or A2.

LOOP CODE

LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE WESCOM FIELD <address>

:Select the Wescom T1 line (field side) repeater loop codes. The <address> range is A thru H, J thru M, AA thru AH, AJ thru AM, 0, 1, 2, A0, A1, or A2.

LOOP CODE XEL LOOP <exchange address> <location address>

:Select the XEL, or equivalent, T1 line repeater loop codes. The repeater <exchange address> range is 1 to 9999. The repeater <location address> range is 1 to 999.

LOOP CODE XEL EXTEND <location address>

:Select the XEL, or equivalent, T1 line repeater timeout extension code. The repeater <location address> range is 1 to 999. Use the **LOOp UP** command to send the timeout extension code. Use the **LOOp DOWn** command to send the loop-down code.

LOOP CODE TEL-LS NEARM

:Select the Teltrend Model IOR7231LS, or equivalent, T1 repeater arming/disarming code. Use the **LOOp UP** command to send the arming code. Use the **LOOp DOWn** command to send the disarming code. Transmit the codes from the NIU toward the CO.

LOOP CODE TEL-E OR <address>

:Select the Teltrend Model IOR7231E intelligent T1 office repeater, or equivalent, loop codes. The office repeater <address> range is 1 to 3.

LOOP CODE

LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE TEL-LS MANUAL LEARN

:Select the Teltrend Model IOR7239LS intelligent line repeater, or equivalent, manual learn code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the manual learn code that prepares the span repeaters to accept new addresses. Use the **LOOP CODE TELtrend LR** command to set the <address> for the individual line repeaters. Use the **LOOp UP** command to send the new address to the first repeater in the span and simultaneously loop it down, so the next repeater can receive its address. Continue using the **LOOP CODE TELtrend LR** and **LOOp UP** commands to send new addresses to each repeater on the span.

LOOP CODE TEL-LW AUTO LEARN

:Select the Teltrend Model ILR7239LW Intelligent T1 Line Repeater, or equivalent, T1 line repeater automatic learn loop code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the automatic learn loop code.

LOOP CODE TEL-E CLR FT1

:Select the Teltrend Model IOR7231E intelligent T1 office repeater, or equivalent, Clear FT1 loop code. Use either the **LOOp Up** or the **LOOp DOWn** command to send the Clear FT1 loop code.

LOOP CODE TEL-E FAR NIU

:Select the Teltrend Model IOR7231E Far-End NIU loop code. Use either the **LOOp UP** or the **LOOp DOWn** command to transmit the unblock code to an already armed office repeater.

LOOP CODE TEL-E DUAL LPBK

:Select the Teltrend Model IOR7231E Dual Loopback loop code. Use either the **LOOp UP** or the **LOOp DOWn** command to send the dual loopback loop up code to an already armed office repeater.

LOOP CODE

LOOP CODE

Select Loop Code Pattern (Continued)

LOOP CODE TEL DS1MS ARM :Select the Teltrend DS1 Maintenance Switch System Arm/Disarm code. Use the **LOOp Up** command to send the arming code. Use the **LOOp DOWn** command to send the disarm code.

LOOP CODE TEL DS1MS SW <address> :Select the Teltrend DS1 Maintenance Switch System Switch code. The switch code address range is 1 to 6 and 9 to 16. Use the **LOOp Up** command to send the switch code. Use the **LOOp DOWn** command to send the abort code.

LOOP CODE TEL DS1MS RES :Select the Teltrend DS1 Maintenance Switch System Restore code to reset the maintenance switch. Use the **LOOp UP** or **LOOp DOWn** command to send the restore code.

The following commands only apply to the T1 ESF or FT1 ESF operating mode. Select the loop code type with the **LOOp OUT** command.

LOOP CODE LINE :Select the out-of-band line loop code pattern.

LOOP CODE NETWORK :Select the out-of-band network loop code pattern.

LOOP CODE PAYLOAD :Select the out-of-band payload loop code pattern.

See also: **LOOp** , **LOOp DOWn** , **LOOp UP** , **RESPONSE** , **PGM LPUP** , **PGM LPDN**

EXAMPLE 1:

>LOOP CODE :Print the current loop code pattern selection.
CSU
>LOOP CODE PGM :Select user-programmable loop code.
>

LOOP CODE **LOOP CODE**

Select Loop Code Pattern (Continued)

EXAMPLE 2:

>LOOP CODE TEL-LC LR 9	:Print the current loop code pattern selection.
>LOOp DOWn	:Transmit the loop-down code for the repeater assigned address 9.
>LOOP CODE TEL-LC LR 10	:Select Teltrend Model ILR7239LC Intelligent T1 Line Repeater loop codes for repeater assigned address 10.
>LOOp UP	:Transmit the loop-up code.
>LOOP CODE TEL-LC TDIS	:Select Teltrend Model IOR7239LC/ILR7239LC Intelligent T1 Repeater automatic timeout disable code.
>LOOp UP	:Transmit the timeout disable code.
>	

LPRINT

LPRINT

Print a Literal Text String

This command sends a text string during the execution of a BERD-BASIC program. If the string is surrounded by double quotes, printing is inhibited for any succeeding string in the program line. If quotes do not surround the string, any consecutive number of spaces in the string are condensed to one space.

LPRINT string	:Print the text string.

EXAMPLE:

```
>10 LPRINT "HELLO" THAT'S ALL
>20 LPRINT HI   I'M   LARRY
>30 LPRINT "I   HAVE   MORE   SPACES"
>RUN
```

HELLO	:Words after second quote are omitted.
HI I'M LARRY	:Spaces condensed (no quotes).
I HAVE MORE SPACES	:Spaces not condensed (quotes).
DONE	
>	

LUP LUP

Enter/Modify Long User Pattern

This command provides the capability of entering, editing, deleting, and printing the long user pattern. This command requires the Advanced BERT Option.

LUP SET hh hh ...	:Enter hexadecimal characters (**hh** = 00H to FFH), up to 45 characters at a time.
LUP APP hh hh ...	:Append pattern by adding characters to the end of the message.
LUP REP pp hh hh ...	:Replace portions of pattern starting at position **pp** .
LUP INS pp hh hh ...	:Insert new characters into pattern starting at position **pp** .
LUP DEL pp dd	:Delete a specific number of bytes **dd** from the message starting at position **pp** .
LUP SIZ	:Print the number of characters in the message.
LUP PRI pp dd	:Print **dd** bytes of the message starting at position **pp.** Without **pp** and **dd** entered, the entire message is printed. With **pp** and no **dd** , the message is printed from **pp** to end of message.

NOTE: **hh** is a 1-byte hexadecimal number from 00H to FFH. **pp** and **dd** are integers from 1 to 2000.

See also: **PATtern**

MACRO

Set or Display User Macros

This command displays and defines macros used to enter commands. A macro is a string of characters that are defined once and recalled using only one or two key strokes. Typically, they are used when a given command may need to be entered many times.

Macros are recalled by specifying an ampersand (&) followed by the macro number whenever the macro substitution takes place. Although the **INPUT** command is also used to define a macro, it can only be used in a BERD-BASIC program; the **MACRO** command has no such restriction.

MACRO	:Print all currently defined macros.
MACRO number	:Display specified macro number from 0 to 9.
MACRO number/	:Clear specified macro number.
MACRO number/string	:Define specified macro number as a string from 1 to 80 characters in length.

See also: **INPUT**

EXAMPLE:

>MACRO 1/CLOCK	:Define macro 1 as CLOCK.
>MACRO 2/DATE	:Define macro 2 as DATE.
>&1	:Display the current time of day.
20:07:13	
>&1 21:08	:Set the time ahead one hour (TIME 21:08).
>&2	:Display the current date (DATE).
15 JAN	
>MACRO 2	:Display the contents of MACRO 2.
DATE	
>	

MESSAGES MESSAGES

Enable or Disable Error Message Printing

This command sets or prints the error messages sent to the remote control device.

MESSAGES	:Print current status for printing error messages.
MESSAGES ON	:Enable the printing of error messages when the appropriate conditions exist. This command is the default at power-up.
MESSAGES OFF	:Disable the printing of error messages under such conditions.

MODe MODe

Transmit and Receive Mode

This command sets or prints the transmit and receive line rate and data format.

MOD	:Print the current transmit and receive line rate and data format.
MOD AUT	:Select the automatic configuration mode.
MOD FT1 D4	:Select the D4 superframe fractional T1 mode. Requires the Fractional T1 Option.
MOD FT1 ESF	:Select the Extended superframe fractional T1 mode. Requires the Fractional T1 Option.

MODe MODe

Transmit and Receive Mode (Continued)

MOD SEL TST	:Select the Self-Test mode using T1 ESF.
MOD T1	:Select the T1 line rate unframed.
MOD T1 D4	:Select the T1 rate with D4 framing.
MOD T1 ESF	:Select the T1 rate with ESF framing.
MOD T1 LLB	:Select the T1 rate in Line Loopback mode.
MOD T1 SLC	:Select the T1 rate with SLC-96 framing.
MOD T1 TLB	:Select the T1 rate in Test Loopback mode.
MOD T1C	:Select the T1C line rate unframed.
MOD T1C TLB	:Select the T1C rate in Test Loopback mode.
MOD TDR	:Configure as a Time Domain Reflectometer. Requires the TDR Option.
MOD SMA	:Select the SMARTNIU operational mode.

NOTE: The auxiliary functions are selected and modified using separate commands.

See also: Fractional T1 Option — **FT1 CHAnnel, FT1 IDLe,** and **FT1 RATe** .
Enhanced ESF Option — **PRM EMUlate** and **PRM RCV** .
TDR Option — **CABle, LENgth, PRInt, REFerence, RESTART, VELocity,** and **TERM 232** .

NEW NEW

Enter a New BERD-BASIC Program

This command clears the working memory of any BERD-BASIC program. It is used when entering a new program to ensure that no lines are left from a previous program. When this command is specified, 511 bytes of memory are freed for the new program.

NEW	:Purge existing BERD-BASIC program.

EXAMPLE:

>10 INPUT 2	
>20 DATE	
>LIST	
>	
10 INPUT 2	
20 DATE	
[493 BYTES FREE]	
>NEW	:Purge the existing program.
>LIST	
>	
[511 BYTES FREE]	

PARITY PARITY

Display Current Parity Setting

This command prints the current T-BERD 209A/211 parity setting. This is an inquire-only command; you cannot change the parity setting through remote control.

PARITY	:Print the current parity setting.

PATtern

Set Test Pattern

This command sets or prints the test pattern generated by the T-BERD 209A/211.

PAT	:Print current test pattern status.
PAT 1:1	:Select the alternating ones and zeros pattern.
PAT 1:7	:Select the one and seven zeros pattern.
PAT 2 IN 8	:Select the two ones in 8-bits pattern.
PAT 2^15-1	:Select the 32,767-bit pseudorandom pattern.
PAT 2^20-1	:Select the 1,048,575-bit pseudorandom pattern.
PAT 2^23-1	:Select the 8,388,607-bit pseudorandom pattern.
PAT 3 IN 24	:Select the three ones in 24-bits pattern.
PAT 55 OCTET	:Select the 55 OCTET test pattern. Requires the Advanced BERT Option.
PAT ALL ONE	:Select the all ones pattern.
PAT ALL ZERO	:Select the all zeros pattern.
PAT BRIDGTAP	:Select the bridge tap detection test pattern.
PAT LUP	:Select the programmable long user pattern. Program the pattern with the **LUP** command. Requires the Advanced BERT Option.
PAT MIN/MAX	:Select the minimum/maximum stress test pattern. Requires the Advanced BERT Option.
PAT MULTIPAT	:Select the multipattern test pattern.
PAT T1 DALY	:Select the T1 DALY test pattern. Requires the Advanced BERT Option.

PATtern PATtern

Set Test Pattern (Continued)

PAT T1-2/96	:Select the T1-2/96 test pattern. Requires the Advanced BERT Option.
PAT T1-3/54	:Select the T1-3/54 test pattern. Requires the Advanced BERT Option.
PAT T1-4/120	:Select the T1-4/120 test pattern. Requires the Advanced BERT Option.
PAT T1-5/53	:Select the T1-5/53 test pattern. Requires the Advanced BERT Option.
PAT T1-QRSS	:Select the T1 Quasi-Random Signal Source pattern.
PAT T1C-QRSS	:Select the T1C Quasi-Random Signal Source pattern.
PAT 63	:Select the 63-bit fractional T1 and DDS pattern. Requires Fractional T1 Option.
PAT 511	:Select the 511-bit fractional T1 and DDS pattern. Requires Fractional T1 Option.
PAT 2047	:Select the 2047-bit fractional T1 and DDS pattern. Requires Fractional T1 Option.
PAT USER1	:Select the User 1 programmable 3- to 24-Bit pattern. Program the bit pattern and pattern name with the **PGMPAT 1** command.
PAT USER2	:Select the User 2 programmable 3- to 24-Bit pattern. Program the bit pattern and pattern name with the **PGMPAT 2** command.

See also: **PGMPAT 1, PGMPAT 2,** and **LUP**

PGM LPDN PGM LPDN

Program Loop-Down Code

This command sets or prints the in-band programmable loop-down code. Select the loop code with the **LOOP CODE PGM** command. Transmit the loop code with the **LOOp DOWn ON** command. The command also determines which loop code the T-BERD 209A/211 responds to (see **RESPONSE** command).

PGM LPDN	:Print the in-band programmable loop-down code.
PGM LPDN [bbb to bbbbbbbb]	:Set in-band programmable loop-down sequence. The loop-down code sequence is a 3- to 8-bit binary pattern (a sequence of 1s and/or 0s) with the left-most bit transmitted first.

See also: **LOOP CODE, LOOp, LOOp DOWn, LOOp UP, RESPONSE,** and **PGM LPUP**

EXAMPLE:

>PGM LPDN	:Print the in-band programmable loop-down code.
01001001	
>PGM LPDN 100	:Set programmable loop-down code to 100.
>	

PGM LPUP PGM LPUP

Program Loop-Up Code

This command sets or prints the in-band programmable loop-up code. Select the loop code with the **LOOP CODE PGM** command. Transmit the loop code with the **LOOp UP ON** command. The command also determines which loop code the T-BERD 209A/211 responds to (see **RESPONSE** command).

PGM LPUP	:Print the in-band programmable loop-up code.
PGM LPUP bbbbb..b	:Set in-band programmable loop-up sequence. The loop-up code sequence is a 3- to 8-bit binary pattern (a sequence of 1s and/or 0s) with the left-most bit transmitted first.

See also: **LOOP CODE, LOOp, LOOp DOWn, LOOp UP, RESPONSE,** and **PGM LPDN.**

EXAMPLE:

>PGM LPUP	:Print the in-band programmable loop-up code.
01001001	
>PGM LPUP 100	:Set programmable loop-up code to 100.
>	

PGMPAT 1 AND 2

PGMPAT 1 AND 2

Programmable Data Pattern

This command sets or prints the USER1 and USER2 test patterns and changes the pattern name. The programmed pattern is selected and transmitted with the **PATtern** command. The user-defined label and pattern are stored in nonvolatile memory.

PGMPAT 1 :Print the current programmable data pattern 1.

PGMPAT 2 :Print the current programmable data pattern 2.

PGMPAT [1 | 2] bbb...b :Set programmable data pattern bit sequence. The data pattern (**bbb...b**) can be a 3- to 24-bit binary pattern (a sequence of ones and/or zeros); when generated, the left-most bit is transmitted first. The default PGMPAT 1 bit pattern is 1000000 (1:6). The default PGMPAT 2 bit pattern is 100000 (1:5).

PGMPAT [1 | 2] yyyyyy,bbb...b :Set programmable data pattern name (**yyyyyy**) and bit sequence (**bbb...b**). The USER1 and USER2 names can be changed by entering a name with a maximum of seven alphanumeric characters (**yyyyyyy**). Specifying a new name is optional when programming a bit sequence. However, if a name is specified, it will appear in the PATTERN window when front-panel control is returned to the T-BERD 209A/211.The PGMPAT 1 default name is USER1 and the PGMPAT 2 default name is USER2.

See also: **PATtern**

EXAMPLE:

>PGMPAT 1 :Print the current programmable data pattern 1.
USER1 1000000 :This is the default name and bit sequence.
>PGMPAT 1 TESTIT, 101011100000000111010
:Select the name and bit sequence.
>PGMPAT 1, 11010101110000 :Select the bit sequence and retain the name.
>

PRInt PRInt

Initiate Printout

This command generates either a controls, results, or summary printout.

PRI CON	:Generate a controls printout.
PRI RES	:Generate a results printout.
PRI SUM	:Generate a SUMMARY category results printout.

NOTE : In the optional TDR mode, only the **PRInt CONtrols** and **PRInt RESults** commands are available to print controls and results printouts.

PRINT PRINT

Display a Single Result Value

This command displays the value of the indicated test result on the remote control device. Unlike the **RES 1** and **RES 2** commands, the front panel does not change to the specified result.

PRINT result name	:Select the result by name and print the test result value.
PRINT result number	:Select the result by number and print the test result value.

NOTE: Printing Result 22 lists all of the CRC bins.

Refer to Section 6 for a list of valid **result names** and **result numbers.**

See also: **RES 1** and **RES 2**

EXAMPLE:

>PRINT SLIPS	:Print the number of pattern slips.
SLIPS 23	
>	

PRInt EVEnt

PRInt EVEnt

Print Event

This command determines when (if at all) the T-BERD 209A/211 generates automatic test result printouts. Any setting other than the **PRInt EVEnt OFF** command enables automatic results printouts when one or more alarm conditions change.

PRI EVE	:Print the current print event status.
PRI EVE OFF	:Halt results printouts and clear the printer FIFO.
PRI EVE END TES	:Print results at end of test.
PRI EVE ERR	:Print results on logic, BPV, or frame error.
PRI EVE SEV ERR SEC	:Print results on severely errored second.
PRI EVE 2HR	:Print results every two hours.
PRI EVE 15M	:Print results every 15 minutes.
PRI EVE TIM h:mm	:Print results at the time interval specified. The colon symbol (:) may be replaced by a dash (-), comma (,), period (.), semi-colon (;), or slash (/). The valid range for **h** (hours) is 0 to 5. The valid range for **mm** (minutes) is 0 to 59. This command is only available in remote control mode.

PRInt FMT

Results Print Format

This command sets or prints the results printout format.

PRI FMT	:Print the current results printout format.
PRI FMT NORMAL	:Provide a printout of all the results.
PRI FMT SHORT	:Provide a short printout of only those results which are specifically applicable to the current mode, plus the two results currently displayed on the front panel.
PRI FMT SUM	:Provide all results in the SUMMARY category.

PRM EMUlate

Set PRM Transmission Control

This command sets or prints the PRM transmission control emulation.

PRM EMU	:Print the status of PRM transmission control.
PRM EMU CAR	:Set the transmitted PRM to emulate a carrier transmitted PRM (PRM C/R Bit = 1).
PRM EMU CUS	:Set the transmitted PRM to emulate a customer transmitted PRM (PRM C/R Bit = 0).
PRM EMU OFF	:Disable the PRM transmission capability.

See also: **PRM RCV**

PRM RCV

PRM Results Analysis Control

This command controls the PRM results displayed in the BPV & FRAME category.

PRM RCV	:Print the status of the PRM results analysis control.
PRM RCV ON	:Enable the ability to report on the received PRM.
PRM RCV OFF	:Disable the PRM results.

See also: **PRM EMUlate**

PROMPT

Remote Control Command Prompt

This command controls the prompt symbol at the remote control unit.

PROMPT	:Print the status of the prompt.
PROMPT ON	:Enable the "**>**" or another user-defined symbol as the prompt symbol when the T-BERD 209A/211 is ready to receive a command.
PROMPT OFF	:Turn off the prompt symbol.
PROMPT STRING prompt-string	:Define a **prompt-string** .

NOTE: The prompt symbol changes to a "**+**" when the **HOLD** command is specified.

EXAMPLE:

>PROMPT	:Print the status of the prompt.
ON	
>PROMPT STRING =	:Define the **prompt-string** as an "**=**" symbol.
=PROMPT OFF	:Turn off the "**=**" prompt.
CLOCK	:Print the time (no prompt).
10:33:04	
PROMPT ON	:Turn on the "**=**" prompt.
=	

PULSE MASK

Pulse Mask Specification

This command sets or prints the pulse mask specification selection.

PULSE MASK	:Print the current pulse mask specification.
PULSE MASK NI	:Select the Bell T1.403 Network Interface pulse mask specification.
PULSE MASK DSX	:Select the AT&T Compatibility Bulletin 119 pulse mask specification.
PULSE MASK NON E	:No pulse mask specification is selected; no mask appears on the pulse shape printout.

PWR SAVE

Battery Power Save Control
(T-BERD 209A Only)

This command sets or prints the battery power save control function.

PWR SAVE	:Print the current battery power save control function.
PWR SAVE ON	:Enable the battery power save control function.
PWR SAVE OFF	:Disable the battery power save control function.

RECeive INPut

RECeive INPut

Receive Input

This command sets or prints the input impedance and signal conditioning. Also note that this command causes a test restart.

REC INP	:Print the current receive input status.
REC INP BRI	:Set the receive input for a bridged input. This provides an input impedance greater than 1000 ohms for lines already terminated.
REC INP TER	:Set the receive input for a terminated input. This provides 100 ohms impedance.
REC INP DSX	:Set the receive input for a DSX-level input. This provides both 100 ohms impedance and amplification of the signal.

REFerence

Select TDR Reference Trace

This command sets or prints the TDR reference trace condition.

REF	:Print the current TDR reference trace status.
REF STORE	:Store the current TDR trace results in memory. Any succeeding PRINT GRAPHs will print with the reference trace and the current trace. This command performs the same function as pressing the **RESULTS II Category** switch with NO REF displayed in the TDR SETUP menu or pressing the same switch twice with REF STORED displayed.
REF CLEAR	:Clear the reference trace from memory. Any succeeding PRINT GRAPHs will only print the current trace. This command performs the same function as pressing the **RESULTS II Category** switch with REF STORED displayed in the TDR SETUP menu.

See also: **CABle, GRAPH, LENgth, MODe, PRInt, RESTART,** and **VELocity**.

RELease RELease

Release All Printer Output

This command releases all output in the print buffer from the **HOLD** command. When the **RELease** command is specified, the prompt character changes from the "**+**" to the standard "**>**" (or user-specified prompt) to indicate that the printer output is no longer held.

REL	:Release the print buffer and start printing.

See also: **HOLD**

EXAMPLE:

>HOLD	:Hold all printouts for now ...
+CLOCK	: ... then print the time and date
+DATE	:(note that nothing is printed).
+REL	:Release the print buffer and start printing ...
>	: ... and the prompt changes to "**>**".
12:34:56	:The T-BERD 209A/211 prints the time ...
14 APR	: ... and date.
>	

REMark REMark

Remark or Comment

This command is used to place a remark or comment in a BERD-BASIC program. Remarks are nonexecutable, and thus ignored by the T-BERD 209A/211.

REM	:This line is a remark. Do not execute this line.

EXAMPLE:

>10 LPRINT LOOSE LIPS	
>20 REM SHOULD BE TIGHTENED?	:This line is a remark and is ignored.
>30 LPRINT SINK SHIPS	
>RUN	
LOOSE LIPS	:Line 20 is nonexecutable.
SINK SHIPS	
>	

REMOTE

Remote Control Entry

This command places the T-BERD 209A/211 in remote control mode from either local or terminal mode. In remote control mode, all front-panel switches are inactive (except for the **RESULTS** switches). Unlike the **TERMINAL** command, the **REMOTE** command turns the prompt and echo off.

REMOTE	:Enter remote control mode from local mode.

See also: **LOCAL, PROMPT, ECHO,** and **TERMINAL**

RES 1 and 2

Result Display Control

These commands control the display results on the T-BERD 209A/211 front panel. Unlike the **PRINT** command, the front panel is updated to reflect the result specified; additionally, the value of the specified result is not displayed at the remote control device.

RES 1 result name	:Select the result by name and display the test result in the RESULTS I window.
RES 2 result name	:Select the result by name and display the test result in the RESULTS II window.
RES 1 result number	:Select the result by number and display the test result in the RESULTS I window.
RES 2 result number	:Select the result by number and display the test result in the RESULTS II window.

RES 1 and 2

RES 1 and 2

Result Display Control (Continued)

Refer to Section 6 for a list of valid **result names** and **result numbers.**

See also: **PRINT**

EXAMPLE:

>RES 1 66	:Display the 66 - DATE result in the RESULTS I window.
>RES 2 35	:Display the 35 - FRM LOS SEC result in the RESULTS II window.
>	

RESPONSE

RESPONSE

T-BERD 209A/211 Loop Code Response

This command controls how the T-BERD 209A/211 responds to loop codes.

RESPONSE	:Print the current loop code response status.
RESPONSE AUTO	:Set the T-BERD 209A/211 to respond to loop codes by emulating a CSU. If five seconds of an in-band loop-up code are received, the T-BERD 209A/211 automatically enters AUTO LLB mode; and the instrument repeats all transmitted data until a valid loop-down code is sent. After receiving a loop-down code, the T-BERD 209A/211 exits AUTO LLB mode and reenters the mode indicated by the current setting of the **MODe** command.
RESPONSE NONE	:Set the T-BERD 209A/211 to remain in its current mode when detecting a loop code.

See also: **LOOp, LOOp DOWn, LOOp UP, LOOP CODE, PGM LPUP,** and **PGM LPDN**

RESTART RESTART

Test Restart

This command performs a test restart on the T-BERD 209A/211. It also starts the TDR testing when the **MODe TDR** command is selected. It also activates the SMARTNIU query function when the **MODe SMArtniu** command is selected.

RESTART	:Restart the test. Clear all test results, alarms, and timers.

RESULTS RESULTS

Generate a Results Printout

This command generates a results printout of the current T-BERD 209A/211 test results. This command is identical to the **PRInt RESults** command.

RESULTS	:Generate a results printout.

See also: **PRInt RESults**

RUN

Excute a BERD-BASIC Program

This command executes a BERD-BASIC program.

RUN :Execute the entire BERD-BASIC program.

RUN linenumber :Execute the BERD-BASIC program beginning at the specified **linenumber** .

EXAMPLE:

>10 LPRINT FRANKLIN	
>20 LPRINT DELANO	
>30 LPRINT ROOSEVELT	
>RUN 30	:Execute the program starting at line 30.
ROOSEVELT	:Only line 30 is executed.
>RUN	:Execute the entire program.
FRANKLIN	
DELANO	
ROOSEVELT	
>	

SMArtniu

Select SMARTNIU Set-up Function

This command selects the SMARTNIU mode set-up function when the SMARTNIU mode is activated. The **SMArtniu** commands the T-BERD 209A/211 to perform the desired function.

SMA CLEAR :Clears the circuit performance statistics from the NIU/Performance Monitor.

SMA CLOCK :Resets the NIU/Performance Monitor's date and time to match the T-BERD 209A/211's date and time.

See also: **MODe, RESTART**

SPECTRUM

SPECTRUM

Spectral Analysis Control
(T-BERD 211 Only)

This command controls the operation of the jitter spectral analysis function. This command requires the Jitter Spectral Analysis Option.

SPECTRUM	:Print the current jitter spectral analysis function status.
SPECTRUM ON	:Enable the jitter spectral analysis function.
SPECTRUM OFF	:Disable the jitter spectral analysis function.

See also: **JITter MASK** and **JITter TRIGger**

STOP

STOP

Suspend Execution of a BERD-BASIC Program

This command suspends the execution of a running BERD-BASIC program; execution of a BERD-BASIC program is resumed by issuing the **CONT** command. Program execution cannot be resumed if any existing line in a program has been changed, or if a program has reached its conclusion.

STOP	:Stop program execution.

See also: **CONT**

SUMMARY SUMMARY

Generate a Summary Printout

This command generates a summary results printout. This command is identical to the **PRInt SUM** command.

SUMMARY	:Generate a summary results printout.

SYNc LOSs ACTion SYNc LOSs ACTion

Action on Synchronization Loss

This command sets or prints the action on synchronization loss function.

SYN LOS ACT	:Print the current action on synchronization loss function status.
SYN LOS ACT CONT	:Set action on synchronization loss to continuous. This causes all test results to accumulate continuously throughout a loss of synchronization.
SYN LOS ACT HALT	:Set action on synchronization loss to halt. This causes test results to halt accumulation during a loss of synchronization.

TERM 232 TERM 232

Remote Control Line Terminator

This command sets or prints the RS-232 line termination character(s).

TERM 232	:Print the current line terminator character(s).
TERM 232 CR	:Set the line terminator character to a carriage return.
TERM 232 CRLF	:Set the line terminator characters to a carriage return and a linefeed.

TERMINAL TERMINAL

T-BERD 209A/211 Remote Control Configuration

This command places the T-BERD 209A/211 in terminal mode from either local or remote mode. In terminal mode, all front-panel switches are inactive (except for the **RESULTS** switches). Unlike the **REMOTE** command, the **TERMINAL** command automatically sets the following conditions:

ECHO ON	:Turn echo on.
PROMPT ON	:Turn prompts on.
WIDTH 80	:Set printer width for 80 columns.
TERM 232 CRLF	:Set line terminator to carriage return and linefeed.

This command is typically used as a log-in sequence just after the T-BERD 209A/211 is powered up. You need only type a period (.) to get the T-BERD 209A/211's attention, enter terminal mode, and have the default prompt (>) printed on the screen.

See also: **ECHO, PROMPT, TERM 232, LOCAL,** and **REMOTE**

EXAMPLE:

	:Assume the T-BERD 209A/211 has just powered up; type a period (.) which the T-BERD 209A/211 does not echo.
>	:The T-BERD 209A/211 responds with a prompt and is now in terminal mode.

TEST TEST

Test Results Accumulation

This command sets or prints the test duration criteria for accumulating test results.

TEST	:Print the current test duration criteria.
TEST TIMED	:Set the test duration for a timed test. The duration is set with the **TIMe SET** command.
TEST CONT	:Set the test duration for a continuous test.

See also: **TIMe SET**

TIMing TIMing

Transmit Timing Source

This command sets or prints the transmit timing source.

TIM	:Print the current transmit timing source.
TIM EXT	:Set the transmit timing to either the T1 REF jack or the EXT CLK IN connector.
TIM INT	:Set the transmit timing to the internal clock source.
TIM REC	:Set the transmit timing source to the recovered clock signal from the received data.

TIMe SET

TIMe SET

Test Length

This command sets or prints the test length for a timed test.

TIM SET	:Print the current test length setting.
TIM SET HHH:MM:SS	:Set the new test length in hours (HHH), minutes (MM), and seconds (SS). The colon (:) may be replaced by a dash (-), comma (,), period (.), semicolon (;), or slash (/). The valid ranges for each time value are:

HHH	:0 to 200 hours
MM	:0 to 59 minutes
SS	:0 to 59 seconds

See also: **TEST**

EXAMPLE:

>TIM SET	:Print the current test length setting.
12:35:00	:The current test length is 12 hours. 35 min.
>TIM SET ; 6 ;	:Set the test length for 6 minutes.
>	

TRAnsmit OUTput

TRAnsmit OUTput

Transmit Output

This command sets or prints the transmit output level.

TRA OUT	:Print the current transmit output level.
TRA OUT -7.5	:Set the transmit output for -7.5 dBdsx.
TRA OUT 0	:Set the transmit output for 0.0 dBdsx.
TRA OUT -15	:Set the transmit output for -15.0 dBdsx.

UNFORMAT

Unformatted Printouts

This command suppresses printing spaces between words in the printed output. The alternative is the **FORMAT** command, which inserts the spaces to make printouts easier to read.

UNFORMAT	:Set to print without the spaces.

See also: **FORMAT**

VELocity

Select TDR Propagation Velocity

This command sets or prints the TDR USER propagation velocity (PR. VEL).

VEL	:Print the current TDR propagation velocity.
VEL 0.40 to 0.99	:Set the TDR PR. VEL from 0.40 to 0.99 in 0.01 steps. Setting this command automatically places the CABLE type in the previous USER selection (see **CABle** command). This command is identical to the USER PR. VEL function in the TDR SETUP menu. The default PR. VEL is 0.66.

See also: **CABle, GRAPH, LENgth, MODe, PRInt, REFerence,** and **RESTART**.

EXAMPLE:

>VEL	:Print the current TDR propagation velocity.
0.46	
>VEL 0.75	:Set the TDR PR. VEL to 0.75.
>	

YEAR YEAR

Calendar Year

This command sets or prints the current year from the T-BERD 209A/211.

YEAR	:Print the current year.
YEAR xx	:Set the last two digits of the year.

See also: **DATE**

EXAMPLE:

>YEAR	:Print the current year.
94	
>YEAR 95	:Set year to '95.
>	

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Symbols

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