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T-BERD DLC ANALYZER OPTION OPERATING MANUAL

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GENERAL INFORMATION

1.1 INTRODUCTION

The purpose of this operating manual is to provide information about the physical features, functional operation, and specifications of the Telecommunications Techniques Corporation (TTC) T-BERD DLC Analyzer Option 209A-96 or 211-96 (Model 42170).

1.2 INSTRUMENT OVERVIEW

The T-BERD DLC Analyzer Option is a portable test instrument that can test Digital Loop Carrier (DLC) systems during circuit installation, acceptance testing, and troubleshooting applications. It can monitor and generate alarms, far-end loops, switch to protection events, and maintenance test sequences over the DLC datalink. The T-BERD DLC Analyzer Option also has the capability of monitoring the channel signaling on all 24 DS0 channels, and test the channel signaling of individual DS0 channels.

1.3 STANDARD FEATURES

The T-BERD DLC Analyzer Option provides the following standard features:

Tests circuits that have either T1 D4, T1 D1D, T1 ESF, or T1 SLC™-96 (Mode 1 and 2) framing.

Drops and inserts DLC datalink and T1 channel information.

DLC datalink major, minor, and power/miscellaneous alarms are reported on the front panel and can be generated to test terminal alarm circuits.

Automated maintenance test procedure can be initiated and monitored from the T-BERD DLC Analyzer Option.

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GENERAL INFORMATION

Far-end loopbacks can be established over a given shelf or protection line. The selected shelf is automatically switched to the protection line when placed in loopback.

Switch to protection line can be initiated for a given shelf.

On-hook, off-hook, and ringing conditions can be generated from dedicated front-panel switches.

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

SLC-96 Mode 2 timeslot channel assignments can be monitored from the front panel.

VF outputs enable DS0 channels or timeslots to be analyzed by external TIMS test sets or listened to over a built-in speaker.

VF signal level and frequency can be measured for individual DS0 channels or timeslots.

404, 1004, and 2804 Hz tones can be inserted into individual DS0 channels or timeslots.

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

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

1.4 CABLES

The following cables provide an interconnection between the T-BERD DLC Analyzer Option, other test sets, and the network.

Part No.	Description
10420	WECO 310 plug to WECO 310 plug (10').
10558	WECO 310 plug to alligator clips (10').
10559	WECO 310 plug to bantam plug (10').
10598	WECO 310 plug to WECO 310 plug (4').
10599	WECO 310 plug to bantam plug (4').
30697	WECO 310 plug to mini-test clips (6').

1.5 ORDERING INFORMATION

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

SECTION 1
GENERAL INFORMATION

INSTRUMENT CHECKOUT AND SERVICE

2.1 UNPACKING AND INITIAL INSPECTION

The T-BERD DLC Analyzer Option 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. Procedures for checking the electrical performance of the instrument are found in Section 2.5. If the contents of the shipment are incomplete, or the T-BERD DLC Analyzer Option does not pass the performance test, notify TTC. 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

The following equipment should be present when the T-BERD DLC Analyzer Option is received and unpacked.

- T-BERD DLC Analyzer Option
- Operating manual

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.

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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-BERDDLC Analyzer Option receives power from the T-BERD 209A/211 through the coiled interface cable. The cable plugs into the 15-pin D Network Interface connector on the T-BERD 209A/211 or an external power supply (Model 12445) to supply power to the T-BERD DLC Analyzer.

2.5 INSTRUMENT SELF-TEST/CHECKOUT

Perform the following checkout procedure to verify the operation of the T-BERD DLC Analyzer Option.

1. T-BERD 209A/211 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 the 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 1 A, 250 V, Slo-Blo fuse (Littlefuse #218001 or equivalent). Always use correct fuse size.

INSTRUMENT CHECKOUT AND SERVICE**2. T-BERD 209A/211 AC Power switch or external power supply**

If the T-BERD 209A/211 is used, press this switch to apply power. When the instrument is powered up, an automatic self-test is initiated. Refer to the *T-BERD 209A/211 Reference Manual* for information on what happens during the self-test sequence.

If external power supply is used, connect AC power to power supply.

3. T-BERD DLC Analyzer Option coiled cable

If power is supplied by the T-BERD 209A/211, connect the coiled cable to the T-BERD 209A/211 Network Interface connector (15-pin D connector).

If power is supplied by the external power supply, connect the coiled cable to the external power supply 15-pin D connector.

4. T-BERD DLC Analyzer Option power-up sequence

When the instrument is powered up, an automatic self-test is initiated testing the following:

- Illuminates all front-panel and switch LEDs.
- Checks the position of all switches. If a switch is stuck, the message *STUCK SWITCH DETECTED* appears in the display.
- The nonvolatile RAM (NOVRAM) is checked and the front-panel switches are restored to the previous settings selected before the last power-down. If any changes are found, the factory default settings are reloaded and the message *RELOADING NOVRAM* is displayed.
- If it becomes necessary to restore all switch settings to the factory defaults, turn the power off, then press and hold the **RESTART** switch while power is turned on. The display and all the LEDs illuminate and the message *RELOADING NOVRAM* appears in the display. The T-BERD DLC Analyzer Option remains fully functional even though the switch settings may not be saved during

SECTION 2

INSTRUMENT CHECKOUT AND SERVICE

the power cycle. While the instrument may be used, contact the TTC Customer Service Department at (800) 638-2049.

- The instrument RAM, EPROM, and microprocessor are also checked during the self-test. If any error is found, the messages *RAM FAILURE 186*, *ROM FAILURE 186*, *RAM FAILURE 188*, and *ROM FAILURE 188* appear. In such instances, contact the TTC Customer Service Department at (800) 638-2049. There are no user-serviceable parts within the T-BERD DLC Analyzer Option.

5. AUX switch

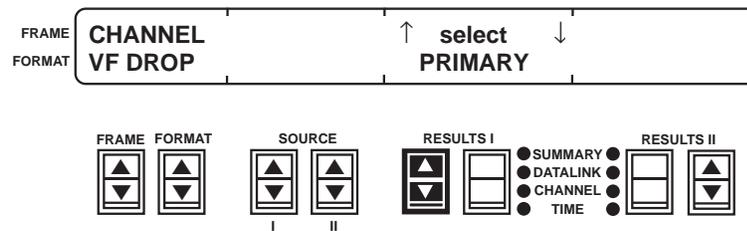
Press this switch to select the auxiliary functions.

6. FRAME switch

Press this switch to select the CHANNEL auxiliary group.

7. FORMAT switch

Press this switch to select the CHANNEL/VF DROP auxiliary function and press the **RESULTS I Results** switch to set which T1 line the DS0 channel is dropped from. Set the auxiliary function for PRIMARY to drop the DS0 channel from the PRIMARY RECEIVE T1 signal.



8. FORMAT switch

Press this switch to select the CHANNEL/CHANNEL SCROLL auxiliary function and press the **RESULTS I Results** switch to set the **PRIMARY** and **SECONDARY CHANNEL** switch control to BOTH.

INSTRUMENT CHECKOUT AND SERVICE



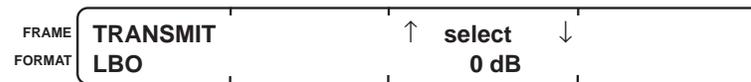
9. **FORMAT switch**

Press this switch to select the CHANNEL/TRUNK TYPE auxiliary function and press the **RESULTS I Results** switch to set the signaling protocol to either LOOP START or GND START.



10. **FRAME switch**

Press this switch to select the TRANSMIT/LBO auxiliary function. Press the **RESULTS I Results** switch to set the LBO level to 0.0 dB.



11. **AUX switch**

Press this switch to exit the auxiliary functions.

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12. CODE switch

Press this switch to select the appropriate line coding, either AMI or B8ZS.

13. FRAME switch

Press this switch to select the SLC-M1 mode.

14. FORMAT switch

Press this switch to select the DATLINK format.

15. SOURCE I switch

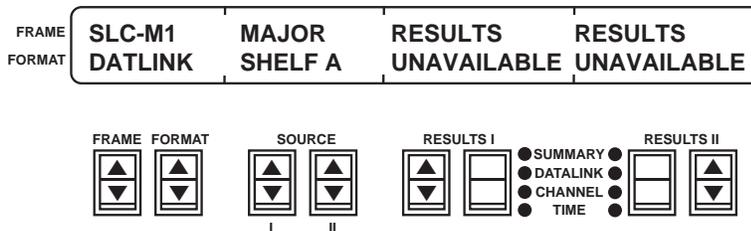
Press this switch to select MAJOR.

16. SOURCE II switch

Press this switch to select SHELF A.

17. RESULTS I and II Category switches

Press these switches to select the SUMMARY category. The yellow LED labeled SUMMARY next to the switch illuminates when the SUMMARY category is selected.



18. RECEIVE INPUT switch

Press this switch to select the TERM receive input level. This switch sets the input level for both RECEIVE input jacks.

19. TRANSMIT and PRIMARY RECEIVE jacks

Connect a cable between these two jacks. Press the RESTART switch.

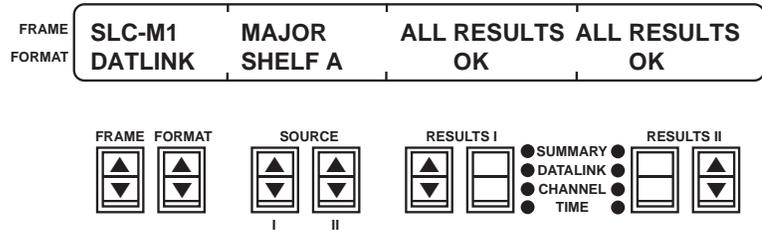
20. PRI T1 Pulses and Frame Sync LEDs

The green LEDs should be illuminated. If these LEDs do not illuminate, verify that the cable is properly connected between the TRANSMIT jack and the PRIMARY RECEIVE jack.

INSTRUMENT CHECKOUT AND SERVICE

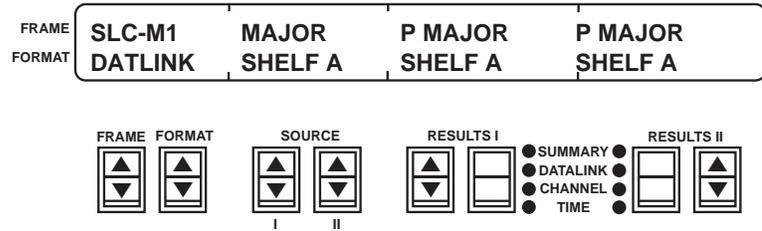
21. RESULTS I and II SUMMARY category test results

When the cable is connected in the previous step, the displayed result message should change to the following.



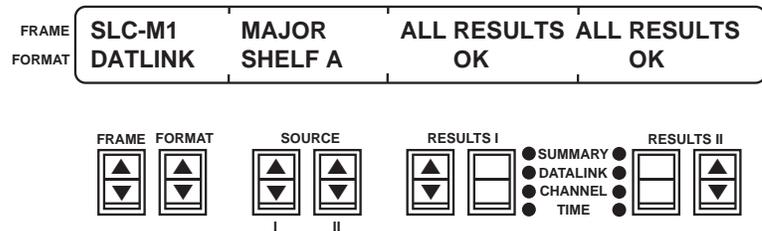
22. INSERT switch

Press this switch. The internal switch LED flashes for three seconds then illuminates. When the switch illuminates, the following message should appear in the RESULTS I and II displays.



23. INSERT switch

Press this switch. The internal switch LED goes out. When the switch is not illuminated, the following message should appear in the display.



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24. **FORMAT switch**

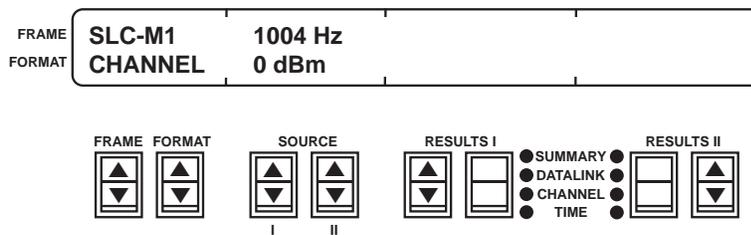
Press this switch to select the CHANNEL format.

25. **SOURCE I switch**

Press this switch to select 1004 Hz.

26. **SOURCE II switch**

Press this switch to select 0.0 dBm.



27. **VOLUME control**

Adjust this switch to mid range.

28. **PRIMARY CHANNEL switch**

Press this switch to change the display from “— —” to “01”. The channel number appears in both **CHANNEL** switch displays.

29. **INSERT switch**

Press this switch. The internal switch LED flashes for three seconds then illuminates. When the switch illuminates, the 1004 Hz tone should be heard through the speaker.

30. **RESULTS I and II Category switches**

Press these switches to select the CHANNEL category. The yellow LED labeled CHANNEL next to the switch illuminates when the CHANNEL category is selected.

31. **RESULTS I and II Results switches**

Press these switches to select the P VF LEVEL and P VF FREQ test results. The VF level should be 0.0 dBm \pm 0.1 dB. The VF frequency should be 1004 Hz \pm 1 Hz.

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FRAME	SLC-M1	1004 Hz	P VF LEVEL	P VF FREQ
FORMAT	CHANNEL	0 dBm	0.0 dBm	1004 Hz



2.6 IN CASE OF DIFFICULTY

If the T-BERD DLC Analyzer Option fails to operate and front-panel indicators are not illuminated:

- Check the coiled cable to ensure that it is securely connected to the T-BERD 209A/211 or external power supply.
- Make sure that the power supply is uninterrupted by plugging another electrical device into the electrical outlet used by the T-BERD 209A/211 or external power supply.
- Verify that a proper, working AC line fuse is installed in the T-BERD 209A/211.

If the T-BERD DLC Analyzer Option fails to operate after the AC power cord, power supply, and fuse are found to be in proper working order, contact the TTC Customer Service Department at (800) 638-2049.

If the front-panel indicators illuminate, but the instrument does not operate properly, note the areas where the instrument has failed, then contact TTC for assistance at (800) 638-2049.

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INSTRUMENT CHECKOUT AND SERVICE

2.7 WARRANTY

2.7.1 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.

2.7.2 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 2.8. 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.

2.7.3 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.

2.8 EQUIPMENT RETURN INSTRUCTIONS

To all equipment returned for repair, the customer should 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.

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- The name and telephone number of the person to contact regarding questions about the repair.
- The Return Authorization (RA) number.

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

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit; 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 describes the T-BERD DLC Analyzer Option (see Figure 3-1) which attaches to the T-BERD 209A/211 and provides SLC-96 system (Mode 1 and 2) and DS0 channel testing capabilities.

3.2 FUNCTIONAL DESCRIPTION

The T-BERD DLC Analyzer Option can generate and report on the status of datalink alarm, far-end loopback, maintenance, and switch to protection line messages. Alarm messages indicate various system conditions that cause failures in signal quality, loss, or line backup capabilities. Far-end loopback messages indicate which DS1 line is looped back (Shelf A, B, C, D, or protection line). The maintenance messages indicate the messages being transmitted when the maintenance test procedure is performed. Protection line switch messages indicate which of the primary DS1 lines has been switched to the protection line.

When configuring the T-BERD DLC Analyzer Option to transmit and receive DLC datalink signals, the T-BERD DLC Analyzer Option automatically frames to either the received 16-bit datalink alarm message format for the Network Office Terminating Equipment (NOTE) and WP1B Alarm Control Unit (ACU) or the 13-bit datalink alarm message format for the WP1 ACU. The available alarm messages for the NOTE, WP1B ACU, and WP1 ACU are listed in Table 3-1. The T-BERD DLC Analyzer Option transmits whatever alarm message format it receives.

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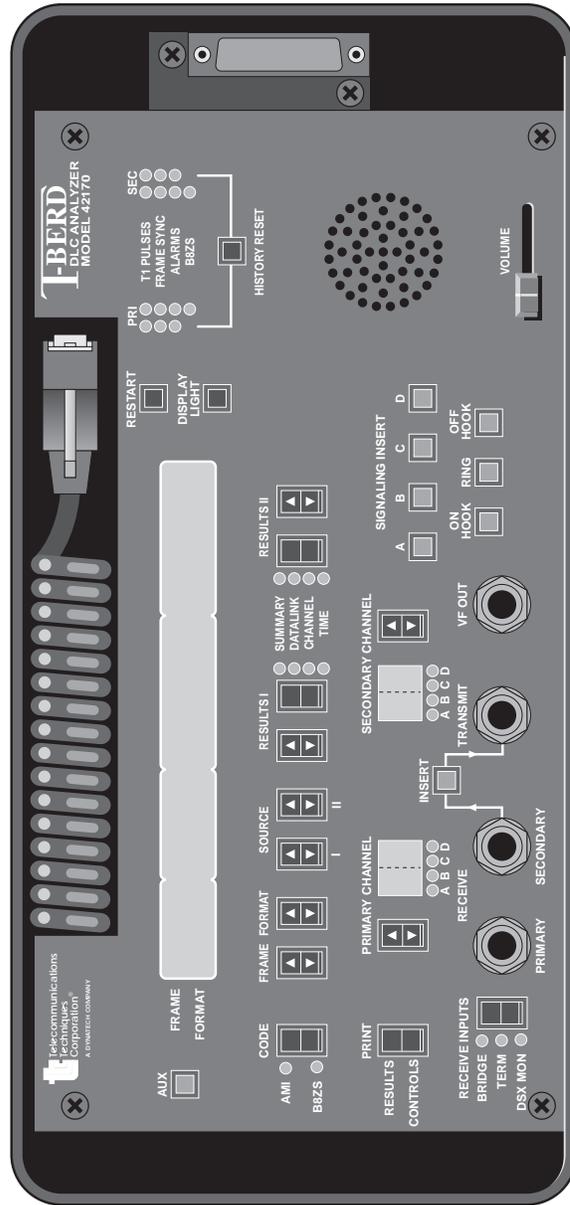


Figure 3-1
T-BERD DLC Analyzer Option Front Panel

Table 3-1
NOTE and ACU Alarm Messages

NOTE	WP1 ACU	WP1B ACU
Major Alarm	Major Alarm	Major Alarm
Shelf A Alarm	Minor Alarm	Minor Alarm
Shelf B Alarm	Power/Misc. Alarm	Power/Misc. Alarm
Shelf C Alarm	Shelf A Alarm	Shelf A Alarm
Shelf D Alarm	Shelf B Alarm	Shelf B Alarm
	Shelf C Alarm	Shelf C Alarm
	Shelf D Alarm	Shelf D Alarm
	Shelf A Far-End Loop	Shelf A Far-End Loop
	Shelf B Far-End Loop	Shelf B Far-End Loop
	Shelf C Far-End Loop	Shelf C Far-End Loop
	Shelf D Far-End Loop	Shelf D Far-End Loop
	Protection Line Far-End Loop	Protection Line Far-End Loop

The alarm messages are categorized as major and minor alarms. Major alarms identify system failures that prevent subscriber access to the network; i.e., signal loss, datalink failure, loss of frame synchronization, and power/miscellaneous alarms identified as major alarms. Minor alarms identify protection line failure, power/miscellaneous alarms identified as minor alarms, and shelf loopback conditions.

The T-BERD DLC Analyzer Option can also initiate and monitor the Mode 1 automated maintenance test procedure. The received maintenance messages indicate the sequence that takes place when a customer loop is requested to be connected to the bypass pair on Shelf A only.

Channel signaling (on hook, off hook, and ring) can be generated and monitored when the T-BERD DLC Analyzer Option is connected to a DLC shelf and an individual channel is selected. The individual signaling bits (A, B, C, and D) can be manipulated individually through front-panel switches, or through dedicated on-hook, off-hook, and ringing control switches.

Additionally, the T-BERD DLC Analyzer Option can decode Mode 2 timeslot channel assignments being transmitted from the COT.

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INSTRUMENT DESCRIPTION

3.3 CONNECTING TO T-BERD 209A/211

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

3.4 TEST SETUP

The following controls and indicators (see Figure 3-2) are described in the order that you would normally use them to set up the T-BERD DLC Analyzer Option to test a circuit from a DSX-1 access point.

- Front-panel display ①
- **DISPLAY LIGHT** switch ②
- **AUX** switch ③
- **CODE** switch ④
- **FRAME** switch ⑤
- **FORMAT** switch ⑥
- **SOURCE I** and **II** switches ⑦
- **PRIMARY CHANNEL** switch ⑧
- **SECONDARY CHANNEL** switch ⑨

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 display is also backlighted for easier viewing in subdued lighting.

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.

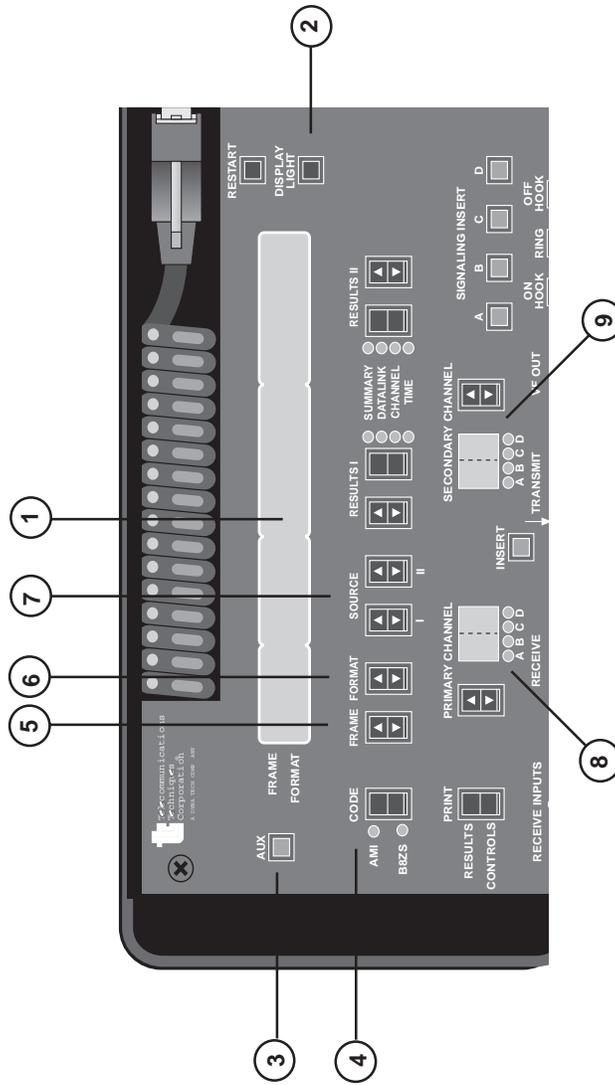


Figure 3-2
Test Setup Controls and Indicators

SECTION 3

INSTRUMENT DESCRIPTION

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 just below the window. The RESULTS II window is controlled by the two **RESULTS II** switches just below the window. 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 4 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 3-2 lists the available switch selections to test a Mode 1 SLC-96 (SLC-M1) circuit from the Shelf A datalink. Table 3-3 lists the available switch selections to test a Mode 2 SLC-96 (SLC-M2) circuit from either the Shelf A or C datalink. Table 3-4 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 3-2
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	

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INSTRUMENT DESCRIPTION

**Table 3-3
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 B SHELF C SHELF D PROTECT	SHELF A SHELF B SHELF C SHELF D	

**Table 3-4
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 SLC-96 (Mode 1) signal.

SLC-M2 — Configures the T-BERD DLC Analyzer Option to transmit and receive a SLC-96 (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.

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INSTRUMENT DESCRIPTION

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.

INSTRUMENT DESCRIPTION

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.

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.

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INSTRUMENT DESCRIPTION

- The system has detected a problem and taken over to switch a 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, T-BERD DLC Analyzer Option can only select channels 1 to 24 on Shelf A.

The T-BERD DLC Analyzer Option displays the following *lowercase* messages in the SOURCE II line when waiting for message responses from the RT and *upper-case* messages appear in the SUMMARY and DATALINK categories which report on the status of the messages transmitted from the RT:

- 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 TESTALARM* 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 and SHELF C 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.

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INSTRUMENT DESCRIPTION

MAINT Messages — During the automated maintenance test, the maintenance test sequence messages appear automatically in lower-case 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 3-5 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 select 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.

**Table 3-5
SLC-96 Channel Numbering Scheme**

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

* In Mode 2 operation where single circuit plug-ins are used, the asterisk indicates the channel number that is assigned to the timeslot.

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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

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timeslot is not selected. Select the desired channel or timeslot before plugging into a shelf. Table 3-5 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 select 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.

3.5 CIRCUIT CONNECTIONS

The front-panel connections allow the T-BERDDL Analyzer Option to receive two T1 signals simultaneously and transmit one T1 signal. Additional connections allow for VF inputs and outputs. Figure 3-3 illustrates the location of the following connections and switches.

- PRIMARY RECEIVE jack (10)
- SECONDARY RECEIVE jack (11)
- **RECEIVE INPUT** switch (12)
- TRANSMIT jack (13)
- **INSERT** switch (14)
- 4-wire VF OUT jack (15)
- 2-wire VF posts (16)

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INSTRUMENT DESCRIPTION

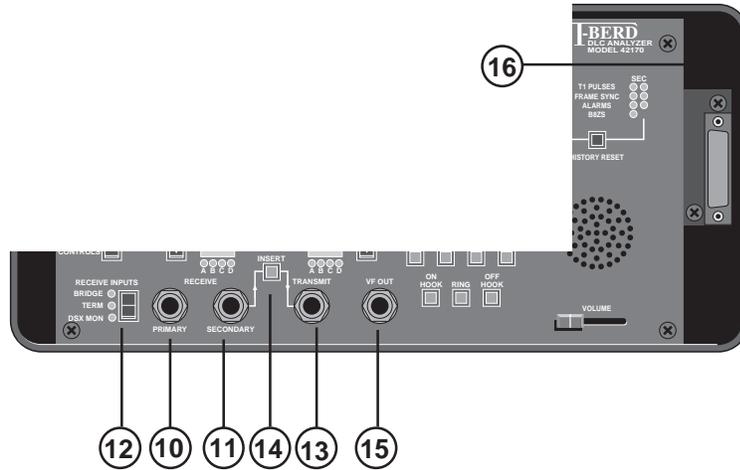


Figure 3-3
T-BERD DLC Analyzer Option Circuit Connections

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 at the TRANSMIT jack. 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. The output can be transmitted in one of the following forms:

- An unaffected T1 signal from the SECONDARY RECEIVE jack when the **INSERT** switch is not illuminated.
- A T1 signal from the SECONDARY RECEIVE jack with a source test signal inserted into a selected DS0 channel or timeslot when the **INSERT** switch is illuminated and the CHANNEL format is selected. The datalink information passes through unaffected.
- A T1 signal from the SECONDARY RECEIVE jack with a datalink signal inserted into the DLC datalink when the **INSERT** switch is illuminated and the DATLINK format is selected. The DS0 channel or timeslot data and signaling pass through unaffected.

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Once frame synchronization is achieved on the received signal, the T-BERD DLC Analyzer Option regenerates framing for the output signal. If the signal is not present at the SECONDARY RECEIVE jack, a framed all ones pattern is transmitted. If the signal is lost after having it present at the SECONDARY RECEIVE jack, an unframed all ones (AIS) pattern is transmitted. If the signal is received but frame synchronization is not achieved, the complete signal is passed through unaffected.

The output level is controlled through the TRANSMIT/LBO auxiliary function and terminated into 100 ohms. 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 from the T-BERD DLC Analyzer Option.

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. The insert mode is functional only when the T-BERD DLC Analyzer Option has frame synchronization.

The following conditions cause the **INSERT** switch to flash for three seconds in which time the T-BERD DLC Analyzer Option is reconfigured and the new selection is inserted into the T1 signal.

- Pressing the **INSERT** switch when it is not illuminated.
- Changing the **FORMAT** switch selection.

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- 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.

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INSTRUMENT DESCRIPTION

3.6 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 3-4).

- Primary and Secondary Status LEDs (17)
- **HISTORY RESET** switch (18)
- **VOLUME** control (19)
- SUMMARY category messages

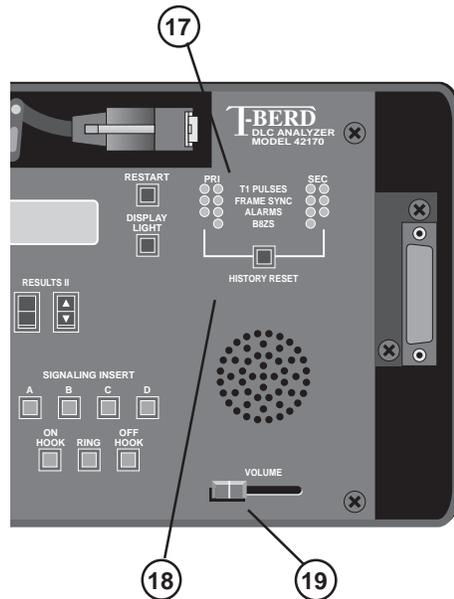


Figure 3-4
Signal Verification Controls and Indicators

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, are used to indicate the current and history status of the received signal. The two inside

INSTRUMENT DESCRIPTION

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 at the present 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

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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.

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.

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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.

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INSTRUMENT DESCRIPTION

3.7 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. Figure 3-5 illustrates the switches and indicators required to verify the results.

- **RESTART** switch (20)
- **RESULTS** switches (21)
- Collecting test results

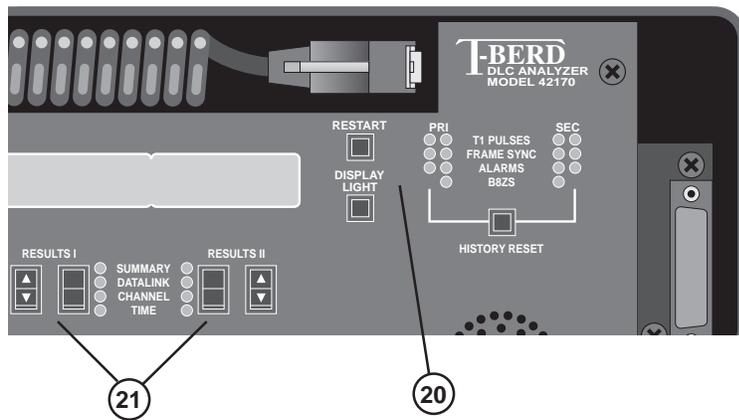


Figure 3-5
Controls to Start Tests and Collect Results

RESTART Switch (20)

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.

P/S ALARM SHELF x	P/S MAINT TEST ALARM
P/S SHELF x ON PROT	
P/S FE LOOP PROTECT	Datalink Results
P/S FE LOOP SHELF x	P/S SLC A SEC
P/S MINOR	P/S DATALINK BITS
P/S PWR/MISC	P/S ALM FIELD

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

Channel Signaling	VF Results
P/S TRAFFIC CHANNEL AB	P/S VF LEVEL
P/S TRAFFIC CHANNEL ABCD	P/S VF FREQ
P/S TRAFFIC TIMESLOT AB	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

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INSTRUMENT DESCRIPTION

3.8 TROUBLESHOOTING CONTROLS

During circuit testing, it is often necessary to control the channel signaling bits of the individual channels. Figure 3-6 illustrates the following **SIGNALING INSERT** switches used to control channel signaling.

- **ABCD** switches (22)
- **ON HOOK** switch (23)
- **RING** switch (24)
- **OFF HOOK** switch (25)

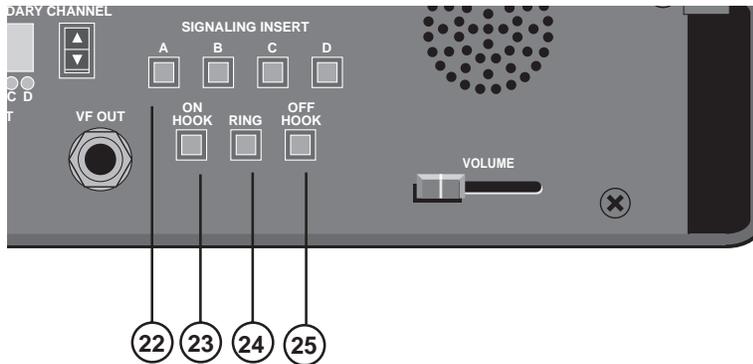


Figure 3-6
Signaling Insert Controls and Indicators

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 3-6 provides the signaling bit patterns that can be used to control D4, D1D, and SLC channel banks. Table 3-7 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.

Table 3-6
D1D and SLC Framed Signaling States

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

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INSTRUMENT DESCRIPTION

**Table 3-7
T1 ESF Signaling States**

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

NOTE: Only the **AB** switches are functional in the SLC-M2 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.

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INSTRUMENT DESCRIPTION

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.

3.9 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

4.1 INTRODUCTION

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, causes the switch LED to go out and the display to return to the normal operating display.

When the AUX switch is illuminated, use the following switches to select and set the auxiliary functions:

- 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.

Table 4-1 lists the T-BERD DLC Analyzer Option auxiliary functions.

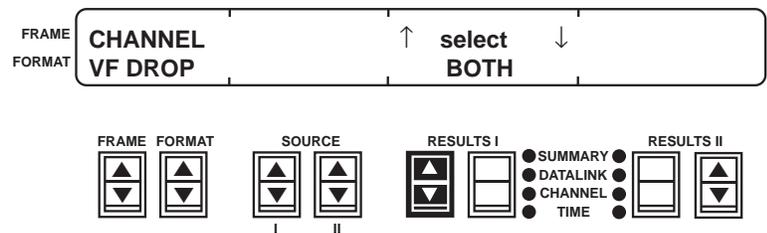
SECTION 4

AUXILIARY FUNCTIONS

Table 4-1
T-BERD DLC Analyzer Option Auxiliary Functions

Auxiliary Function	Description
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

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:

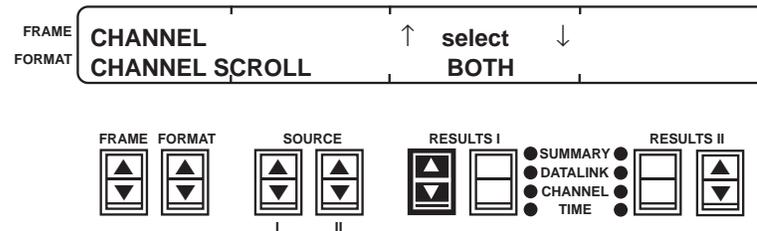
PRIMARY — The DS0 channel is dropped from the PRIMARY RECEIVE input.

SECONDARY — The DS0 channel is dropped from the SECONDARY RECEIVE input.

BOTH — The DS0 channel is dropped from both the PRIMARY and SECONDARY RECEIVE inputs.

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



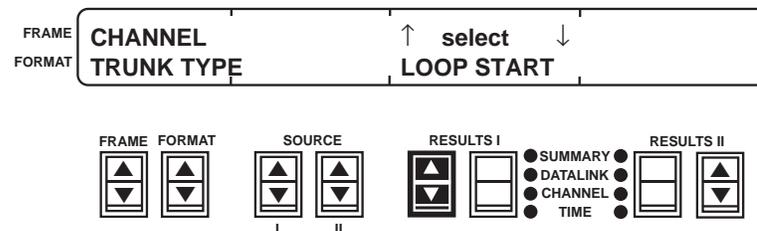
The Channel Scroll auxiliary function determines how the **PRIMARY CHANNEL** and **SECONDARY CHANNEL** switches scroll through the channel or timeslot numbers.

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



SECTION 4

AUXILIARY FUNCTIONS

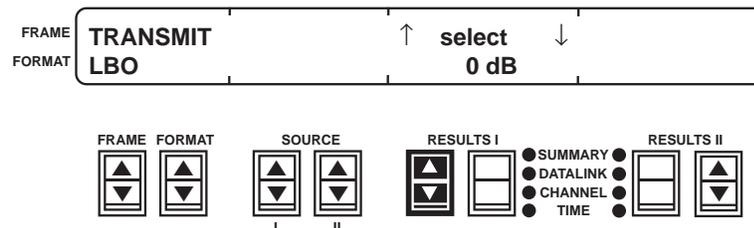
The Channel Trunk Type auxiliary function selects the trunk type signaling generated by the **ON HOOK**, **OFF HOOK**, and **RING** switches. The T-BERD DLC Analyzer Option is only configured to simulate the station end of a circuit and assumes the far end is sending office supervision signaling. The **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.

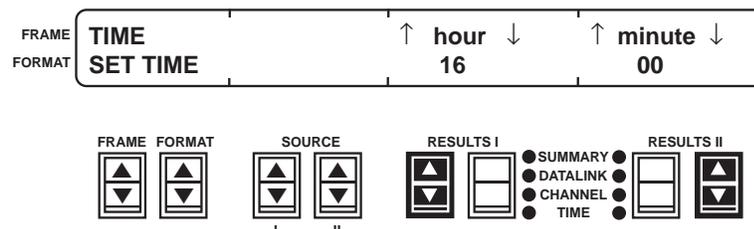
GND START — Enables the T-BERD DLC Analyzer Option to emulate or monitor a ground start foreign exchange or a DLC circuit.

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

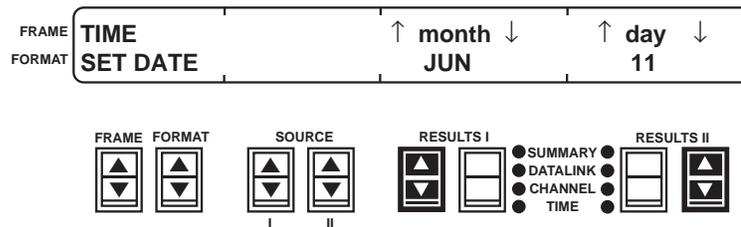


The Set Time of Day auxiliary function sets the time (in 24-hour format) for the battery-backed clock. The current time appears in the TIME category, TIME result.

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.

SECTION 4
AUXILIARY FUNCTIONS

TEST RESULTS

5.1 INTRODUCTION

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 simultaneously.

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.

The four categories and the available messages and results are listed as follows:

SUMMARY Category

Flashing Messages

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

Maintenance Messages

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

Current 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

Results Messages

ALL RESULTS OK
ALL RESULTS UNAVAILABLE

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TEST RESULTS

DATALINK Category

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

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

TIME
DATE
P/S SIG L SEC

5.2 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/S SIGNAL LOSS

Signal Loss — This message 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/S DATALINK SYNC LOSS

Datalink Synchronization Loss — This message indicates that datalink synchronization has been lost after initial datalink synchronization. The message flashes until datalink synchronization is regained.

SW PROT FAILED

Switch to Protection Line Failed — This message indicates a switch to protect request cannot be completed. The message flashes once with each occurrence.

OPTION NOT INSTALLED

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.

SECTION 5

TEST RESULTS

P/S MAJOR SHELF x

Major Alarm on Shelf x — This message 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/S MAJOR NO SHELF

Major Alarm, No Shelf — This message indicates a system state that is characterized by a loss of service to the subscribers with no associated shelf alarm.

P/S ALARM SHELF x

Shelf Alarm on Shelf x — This message 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/S SHELF x ON PROT

Shelf x on Protection Line — This message indicates that one of the shelves has switched to the protection line (x = A, B, C, or D).

P/S FE LOOP SHELF x

Far-End Loop on Shelf x — This message 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/S FE LOOP PROTECT

Far-End Loop on Protection Line — This message indicates that a request is being sent to the far end to loop the protection line.

P/S MINOR

Minor Alarm — This message indicates a system state that is characterized by a non-service affecting fault.

P/S PWR/MISC

Power/Miscellaneous Alarm — This message 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.

P/S MAINT HOOK/SEIZE

On-Hook/Seize Maintenance Message — This message appears when either the on-hook or seize message is received.

P/S MAINT PROCEED

Proceed Maintenance Message — The maintenance bypass procedure continues or has succeeded.

P/S MAINT TEST ALARM

Test Alarm Maintenance Message — The maintenance 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/S VIOLATION

Bipolar Violation Count — A count of BPVs detected since the start of the test (excluding intentional violations found within B8ZS encoding).

P/S CRC ERROR

CRC Errors — A count of CRC errors detected. CRC errors are counted only when ESF framing is present in the received T1 data.

P/S FRM ERROR

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 SLC-M2 framing, frame errors are counted only if an error is found on an F_t bit.

5.3 DATALINK CATEGORY

The following DATALINK category results act as a current and historical record of the alarm and maintenance messages that are received

SECTION 5

TEST RESULTS

from the DLC 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/S MAJOR SHELF x

Major Alarm on Shelf x — This message 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/S MAJOR NO SHELF

Major Alarm, No Shelf — This message indicates a system state that is characterized by a loss of service to the subscribers with no associated shelf alarm.

P/S ALARM SHELF x

Shelf Alarm on Shelf x — This message 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/S SHELF x ON PROT

Shelf x on Protection Line — This message indicates that one of the shelves has switched to the protection line (x = A, B, C, or D).

P/S FE LOOP SHELF x

Far-End Loop on Shelf x — This message 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/S FE LOOP PROTECT

Far-End Loop on Protection Line — This message indicates that a request is being sent to the far end to loop the protection line.

P/S MINOR

Minor Alarm — This message indicates a system state that is characterized by a non-service affecting fault.

P/S PWR/MISC

Power/Miscellaneous Alarm — This message 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. The following messages only occur when the maintenance test is being performed.

P/S MAINT HOOK/SEIZE

On-Hook/Seize Maintenance Message — This message appears when either the on-hook or seize message is received.

P/S MAINT PROCEED

Proceed Maintenance Message — The maintenance bypass procedure continues or has succeeded.

P/S MAINT TEST ALARM

Test Alarm Maintenance Message — The maintenance 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.

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TEST RESULTS

P/S SLC A SEC

SLC Alarmed Seconds — The number of test seconds during which datalink alarms, maintenance tests, or switch to protection line messages were detected.

P/S DATALINK BITS

SLC Datalink Bits — This result displays the individual datalink bits. The display indicates the concentrator (CCCCCCCCCC), maintenance (MMM), alarm (AA), and protection line switch (SSSS) fields. This result is only available when the T-BERD DLC Analyzer Option is frame synchronized in the SLC-M1 or SLC-M2 mode. The spoiler bits are shown without characters above them.

FRAME	P	DATALINK	C	C	C	C	C	C	C	C	C	MMM	AA	SSSS	
FORMAT	BITS		1	0	1	0	1	0	1	0	1	010	011	11	01111



P/S ALM FIELD

Alarm Field Format — Identifies the received datalink alarm field format as either 13 bit or 16 bit.

5.4 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

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 (except ESF) frame modes, but not in the SLC-M2 or T1 ESF mode.

FRAME	P TRAFFIC	A	101010	101010	101010	101010
FORMAT	CHANNEL	B	101010	101010	101010	101010



P/S TRAFFIC CHANNEL ABCD

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.

FRAME	P TRAFFIC	AB	1 0 1 1 1 1 1 1	1 0 1 1 1 1 1 1	1 0 1 1 1 1 1 1	1 0 1 1 1 1 1 1
FORMAT	CHANNEL	CD	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0



P/S TRAFFIC TIMESLOT AB

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.

FRAME	P TRAFFIC	A	101010	101010	101010	101010
FORMAT	TIMESLOT	B	101010	101010	101010	101010



P/S TS CHAN

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 (—). This result is only available in the SLC-M2 frame mode. The result is only valid when the timeslot information is received from the central office.

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FRAME	P	T	S	01	02	03	04	05	06	07	08	09	10	11	12
FORMAT	CH	AN	01	03	05	07	10	22	--	24	--	36	--	--	--



P/S VF LEVEL

Received VF Signal Level in dBm — A measurement of signal power in the currently selected DS0 channel.

P/S VF FREQ

Received VF Frequency — The VF frequency, measured in Hertz, of the received VF data in the currently selected DS0 channel.

P/S DATA BITS

DS0 Channel Data Bits — Displays the binary values of the selected DS0 channel.

DTMF SEQ

Dual-Tone Multi-Frequency Sequence — Displays 11 digits of the received telephone number in the currently selected DS0 channel.

5.5 TIME CATEGORY

The TIME category presents the current time, date, and the signal loss seconds results for the T-BERD DLC Analyzer Option.

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 SIG L SEC

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.

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TEST RESULTS

APPLICATIONS

6.1 INTRODUCTION

This section describes several applications that the T-BERD DLC Analyzer Option can be used in. They include:

- Monitoring DLC shelf operation
- Testing Shelf A far-end loop and switch to protect operation
- Testing remote terminal datalink operation
- Testing Shelf B, C, D, or Protect bit error rate performance
- Verifying ring generation
- Verifying channel unit signaling
- Checking DLC Mode 2 timeslot mapping

6.2 MONITORING DLC SHELF OPERATION

- Perform non-intrusive monitoring of the DLC shelf datalink and DS0 channels.
- Monitor the datalink traffic between the Central Office Switch (COS) or Central Office Terminal (COT), and the Remote Terminal (RT) for major, minor, and power/miscellaneous alarms, as well as switch to protect and maintenance tests.
- Monitor DS0 channel signaling in both directions and capture DTMF dialed digits.

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APPLICATIONS

Figure 6-1 illustrates the T-BERD DLC Analyzer Option monitoring the DLC Shelf A T1 datalink and DS0 channels from the DSX-1 access point.

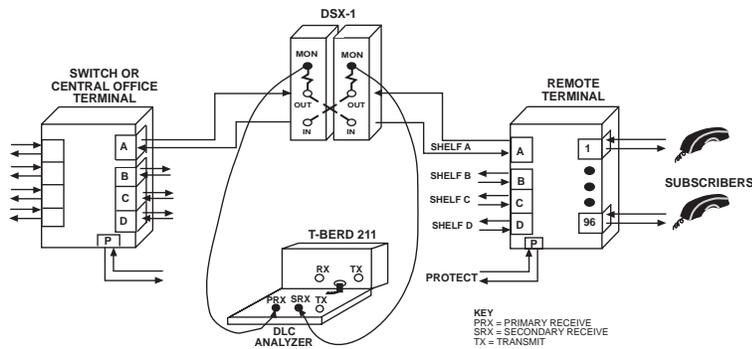


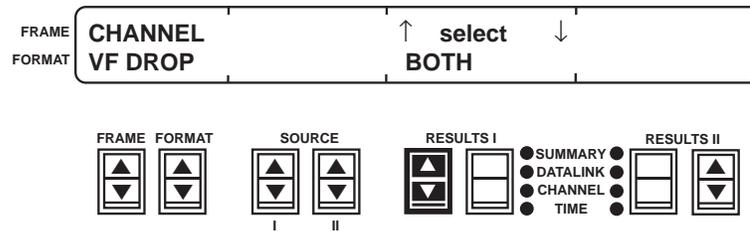
Figure 6-1
Monitoring DLC Shelf Operation

Connect DLC Analyzer Option To T-BERD 209A/211

1. **T-BERD 209A/211 or external power supply — turn power ON**
2. **Connect coiled cable**
Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.
3. **INSERT switch**
Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.

T-BERD DLC Analyzer Option Test Setup

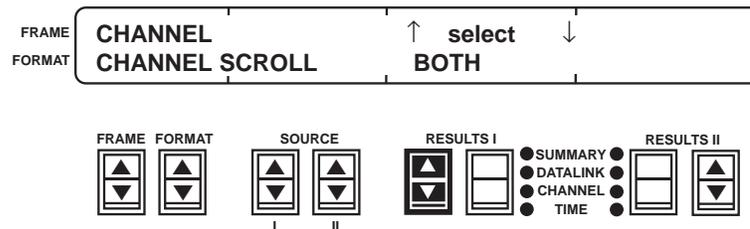
4. **AUX/FRAME/FORMAT switch**
Select the CHANNEL/VF DROP auxiliary function to set which T1 line the DS0 channel is dropped from.



Set for PRIMARY to drop the DS0 channel from the PRIMARY RECEIVE T1 signal. Set for SECONDARY to drop the DS0 channel from the SECONDARY RECEIVE T1 signal. Set for BOTH to drop the DS0 channel from both T1 signals.

5. FORMAT switch

Select the CHANNEL/CHANNEL SCROLL auxiliary function to set the PRIMARY and SECONDARY CHANNEL switch control.



Set for BOTH to scroll the PRIMARY and SECONDARY CHANNEL switch numbers simultaneously. Set for SEPARATE to scroll the switch numbers independently.

6. AUX switch

Exit the auxiliary functions.

7. FRAME switch

Select AUTO mode.

8. CODE switch

Select the appropriate coding.

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9. RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level and connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

10. SECONDARY RECEIVE jack

Connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

11. RESTART switch

Clear the results and start the test.

12. FRAME/FORMAT window

Verify that the framing format is detected and recognized.

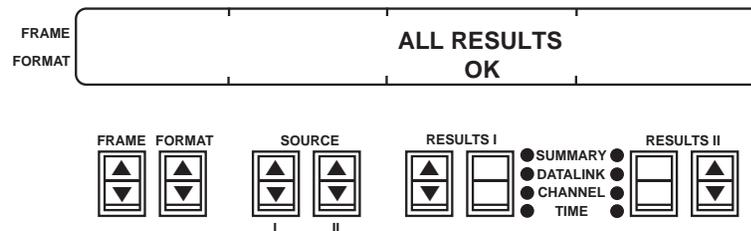
NOTE: When synchronizing to the SLC-96 framing in AUTO mode, the T-BERD DLC Analyzer Option automatically defaults to the SLC-M1 mode. The SLC-M2 mode must be selected manually with the **FRAME** switch.

13. Status LEDs

These LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

14. RESULTS I switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.



15. Datalink results interpretation

Flashing Messages — P/S DATALINK SYNC LOSS

This message occurs when the T-BERD DLC Analyzer

Option loses datalink synchronization. This message only appears in the SUMMARY category.

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

These alarms provide information on the condition of the shelves. These messages also appear in the DATALINK category as a historical record of the indicated events.

Maintenance Test Messages — P/S MAINT HOOK/SEIZE, P/S MAINT PROCEED, and P/S MAINT TEST ALARM

These messages occur when maintenance test messages are detected. These messages also appear in the DATALINK category as a historical record of the indicated events.

16. T1 signal results interpretation

P/S SIGNAL LOSS, P/S VIOLATION, P/S FRM ERROR, and P/S CRC ERROR (ESF only)

These errors typically indicate a local T1 span problem caused by a faulty repeater, span line noise, crosstalk, poor cabling, defective DSX jacks, or faulty multiplexer. Electrical noise, generated near the metallic span can also contribute to errors received at the instrument. These messages only appear in the SUMMARY category.

17. PRIMARY CHANNEL or SECONDARY CHANNEL switch

Press either switch to select a DS0 channel.

18. DS0 channel results interpretation

P/S VF LEVEL, P/S VF FREQ, P/S DATA BITS, and DTMF SEQ

Verify that the VF signal level and frequency are within specifications. Verify that a data bit is not stuck. Monitor the DTMF dialing sequences. The availability of these results is determined by the CHANNEL/VF DROP auxiliary function.

P/S TRAFFIC CHANNEL AB, P/S TRAFFIC CHANNEL ABCD, P/S TRAFFIC TIMESLOT AB, and P/S TS CHAN

For all framing formats except SLC-M2, monitor the channel signaling bits. For the SLC-M2 framing format, monitor the timeslot signaling and the timeslot channel assignments.

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APPLICATIONS

19. **VOLUME control**

Adjust the control to monitor the selected DS0 channel(s) through the speaker. Verify the setting of the CHANNEL/VF DROP auxiliary function.

20. **VF OUT jack**

Connect a TIMS test set to the T-BERD DLC Analyzer Option to perform additional testing and analysis on the selected DS0 channel. Verify that the CHANNEL/VF DROP auxiliary function is set for PRIMARY or SECONDARY, not BOTH.

6.3 TESTING SHELF A FAR-END LOOP AND SWITCH TO PROTECT OPERATION

- Verify switch to protection line capabilities of Shelf A at the remote terminal (RT).
- Verify the far-end loopback capability at the Shelf A RT.

Figures 6-2 and 6-3 illustrate the T-BERD DLC Analyzer Option testing the RT from the DSX-1 access point.

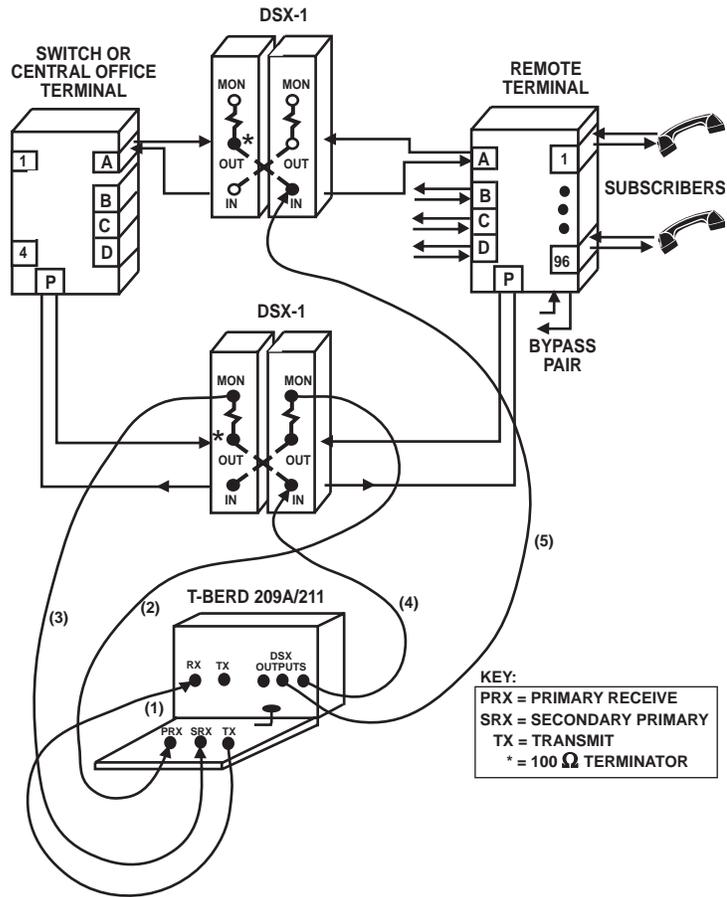


Figure 6-2
Testing Shelf A RT Operation

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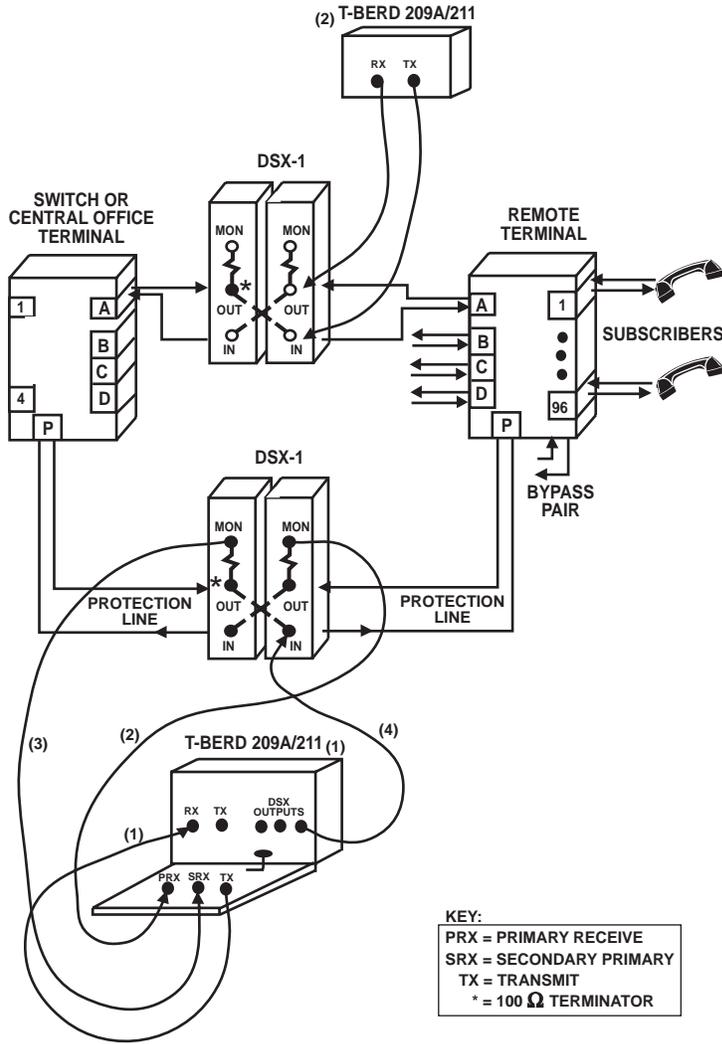


Figure 6-3
Testing Shelf A RT Operation

T-BERD 209A/211 Test Setup

1. **T-BERD 209A/211 — turn power ON**
2. **T-BERD 209A/211 — MODE switch**
Select T1 TLB mode.
3. **T-BERD 209A/211 — CODE switch**
Select appropriate coding, AMI or B8ZS, to match the T-BERD DLC Analyzer Option and T1 line coding.
4. **T-BERD 209A/211 — RECEIVE INPUT switch and jack**
Select the TERM input level and connect cable (1) between this jack and the T-BERD DLC Analyzer Option TRANSMIT jack.

T-BERD DLC Analyzer Option Test Setup

5. **Connect coiled cable**
Connect the T-BERD DLC Analyzer Option coiled cable to the T-BERD 209A/211 15-pin D connector after applying power to the T-BERD 209A/211.
6. **INSERT switch**
Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.
7. **AUX/FRAME/FORMAT switch**
Select TRANSMIT/LBO to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.



8. **AUX switch**
Exit auxiliary functions.

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9. FRAME switch

Select SLC-M1 or SLC-M2 mode.

10. FORMAT switch

Select DATLINK format.

11. CODE switch

Select the appropriate coding.

Connect T-BERD 209A/211/DLC Analyzer Option To Circuit

12. T-BERD DLC Analyzer Option — RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level. Connect cable (2) to this jack first, then to the T1 protection line as follows:

- If at the CO, connect cable (2) to the T1 protection line span-side DSX-1 MON jack.
- If at the RT, connect cable (2) to the T1 protection line equipment-side DSX-1 MON jack.

13. T-BERD DLC Analyzer Option — SECONDARY RECEIVE jack

Connect cable (3) to this jack first, then to the T1 protection line as follows:

- If at the CO, connect cable (3) to the T1 protection line equipment-side DSX-1 MON jack.
- If at the RT, connect cable (3) to the T1 protection line span-side DSX-1 MON jack.

14. Protection Line — 100 Ω terminator

Plug terminator into one of the following jacks:

- If at the CO, plug into the T1 protection line equipment-side DSX-1 OUT jack.

- If at the RT, plug into the T1 protection line span-side DSX-1 OUT jack.

15. T-BERD 209A/211 — DSX OUTPUTS jacks

Cable (4) — Connect cable (4) to the T-BERD 209A/211 first, then to the T1 protection line as follows:

- If at the CO, connect cable (4) to the T1 protection line span-side DSX-1 IN jack.
- If at the RT, connect cable (4) to the T1 protection line equipment-side DSX-1 IN jack.

NOTE: You may notice a brief glitch in the T1 signal when the cable is connected to the T1 protection line DSX-1 IN jack.

Cable (5) — Connect cable (5) to the T-BERD 209A/211 first, then to Shelf A as follows:

- If at the CO, connect cable (5) to the Shelf A span-side DSX-1 IN jack.
- If at the RT, connect cable (5) to the Shelf A equipment-side DSX-1 IN jack.

NOTE: Plugging the cable into Shelf A DSX-1 IN jack breaks the T1 line and causes a switch to protect sequence to occur. The switch to protection line messages should appear on the T-BERD DLC Analyzer Option.

16. Shelf A — 100 Ω terminator

Plug terminator into one of the following Shelf A jacks:

- If at the CO, plug into the Shelf A equipment-side DSX-1 OUT jack.

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- If at the RT, plug into the Shelf A span-side DSX-1 OUT jack.

17. T-BERD DLC Analyzer Option — RESTART switch

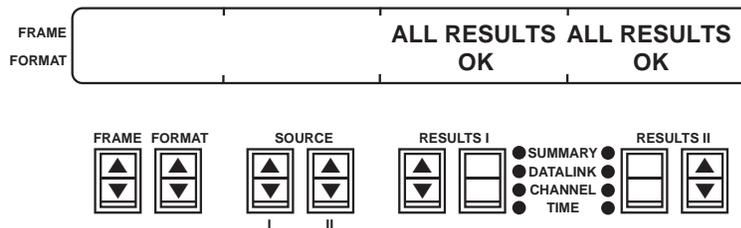
Clear the results and start the test.

18. T-BERD DLC Analyzer Option — Status LEDs

Both primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

19. T-BERD DLC Analyzer Option — RESULTS switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.



Verify Far-End Loopback Capability

20. SOURCE I and II switches

Set **SOURCE I** switch to FE LOOP and **SOURCE II** switch to SHELF A.

21. INSERT switch

Press this switch to send the FE LOOP command to the RT. The switch LED illuminates while in the insert mode.

NOTE: When the FE LOOP command is transmitted, it is automatically preceded by a switch to protection line command to prevent an interruption of the selected shelf.

22. Datalink results interpretation***P SHELF A ON PROT and SW PROT FAILED***

These alarms indicate that Shelf A has been switched to the protection line placed in a far-end loopback. These messages also appear in the DATALINK category as a historical record of the indicated events.

WARNING: If the *SW PROT FAILED* message appears, the switch to protection sequence failed, do not continue with the procedure.

23. Shelf A — 100 Ω terminator

Unplug terminator from DSX-1 OUT jack.

24. Shelf A — Cable (5)

Disconnect the cable from the Shelf A DSX-1 IN jack first. Then disconnect the cable from the T-BERD 209A/211.

25. Connect T-BERD 209A/211 (2) to Shelf A

Disconnect cable (5) from the DSX-1 IN jack. Connect a cable from the T-BERD 209A/211 TRANSMIT OUTPUT jack to the DSX-1 IN jack. Connect another cable from the T-BERD 209A/211 RECEIVE INPUT jack to the DSX-1 OUT jack. Configure the T-BERD 209A/211 to perform a loopback test on the shelf and verify that the far-end loop is successful.

26. Disconnect T-BERD 209A/211 (2) from Shelf A

Disconnect the cables from the DSX-1 patch panel and the T-BERD 209A/211.

27. T-BERD DLC Analyzer Option — INSERT switch

Press this switch to stop sending the command to the RT. The switch LED goes out and Shelf A should be released from the far-end loopback.

Disconnect T-BERD DLC Analyzer Option From Circuit**28. T-BERD DLC Analyzer Option — INSERT switch**

Verify that the switch LED is OFF before disconnecting the T-BERD DLC Analyzer Option from the circuit.

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29. Protection Line — 100 Ω terminator

Unplug terminator from DSX-1 OUT jack.

30. Protection Line — Cable (4)

Disconnect the cable from the protection line DSX-1 IN jack first. Then disconnect the cable from the T-BERD 209A/211.

31. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

32. Disconnect Cable (1)

Disconnect the cable from the T-BERD DLC Analyzer Option TRANSMIT jack and T-BERD 209A/211 RECEIVE INPUT jack.

6.4 TESTING REMOTE TERMINAL DATALINK OPERATION

- Verify the major, minor, and power/miscellaneous alarm response capabilities of the remote terminal (RT).
- Verify the switch to protect response capability on Shelves B, C, and D.
- Verify the maintenance test sequence capability on Shelf A.

Figure 6-4 illustrates the T-BERD DLC Analyzer Option testing the RT from the DSX-1 access point.

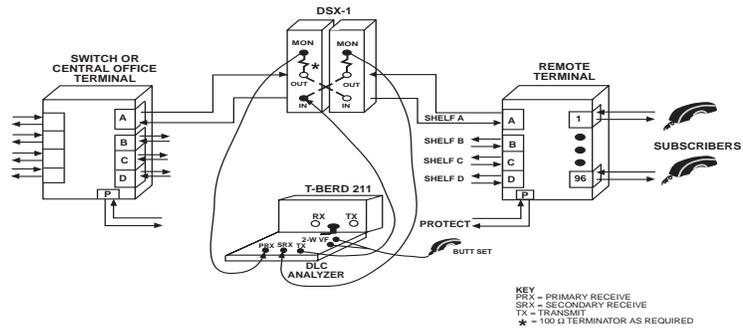


Figure 6-4
Testing Remote Terminal Datalink Operation

Connect DLC Analyzer Option To T-BERD 209A/211

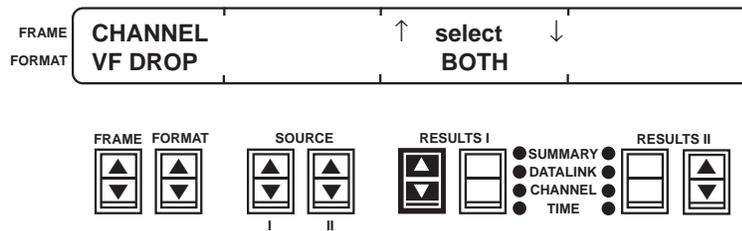
- 1. T-BERD 209A/211 or external power supply — turn power ON**
- 2. Connect coiled cable**
Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.
- 3. INSERT switch**
Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.

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T-BERD DLC Analyzer Option Test Setup

4. AUX/FRAME/FORMAT switch

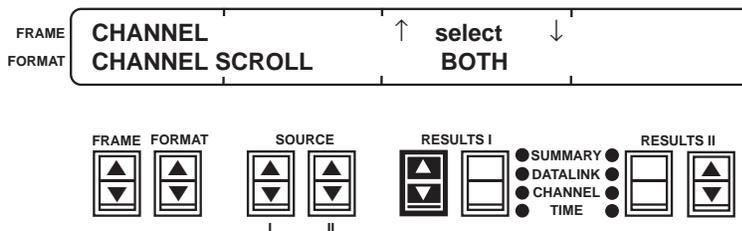
Select the CHANNEL/VF DROP auxiliary function to set which T1 line the DS0 channel is dropped from.



Set for PRIMARY to drop the DS0 channel from the PRIMARY RECEIVE T1 signal. Set for SECONDARY to drop the DS0 channel from the SECONDARY RECEIVE T1 signal. Set for BOTH to drop the DS0 channel from both T1 signals.

5. FORMAT switch

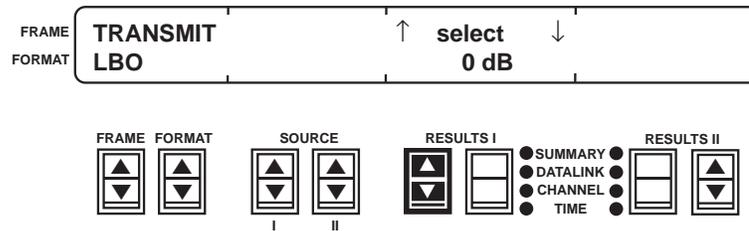
Select the CHANNEL/CHANNEL SCROLL auxiliary function to set the PRIMARY and SECONDARY CHANNEL switch control.



Set for BOTH to scroll the PRIMARY and SECONDARY CHANNEL switch numbers simultaneously. Set for SEPARATE to scroll the switch numbers independently.

6. FRAME switch

Select TRANSMIT/LBO to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.

**7. AUX switch**

Exit auxiliary functions.

8. FRAME switch

Select SLC-M1 mode.

9. FORMAT switch

Select DATLINK format.

10. CODE switch

Select the appropriate coding.

11. RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

12. SECONDARY RECEIVE jack

Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

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13. TRANSMIT jack

Connect the cable to the T-BERD DLC Analyzer Option first, then connect the cable as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 IN jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 IN jack.

NOTE: You may notice a brief glitch in the T1 signal when the cable is connected to the DSX-1 IN jack. If persistent errors are detected after the cable is connected, verify the resistor isolation at the DSX-1. If improper resistor isolation is determined, plug a 100 Ω terminator into the appropriate DSX-1 OUT jack simultaneously with the cable from the TRANSMIT jack.

14. RESTART switch

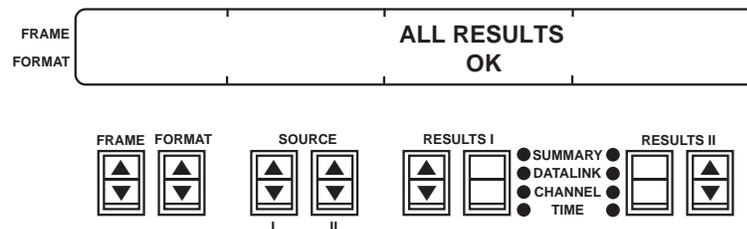
Clear the results and start the test.

15. Status LEDs

Both primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

16. RESULTS I switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.



Testing the Remote Terminal

The following procedures test the RT alarm detection, Shelf B, C, and D switch to protect, and Shelf A maintenance test capabilities.

Verify RT Alarm Detection

1. SOURCE I and II switches

Select one of the following alarms and shelves:

SOURCE I	MAJOR	MINOR	PWR/MISC
SOURCE II	SHELF A		
	SHELF B		
	SHELF C		
	SHELF D		
	NO SHELF		

2. INSERT switch

Press this switch to insert and send the selected alarm to the RT. The switch LED illuminates while in the insert mode. Repeat Step 1 as required.

3. Alarm Control Unit (ACU) results interpretation

Verify that the RT channel bank ACU status LEDs function properly.

4. Datalink results interpretation

P/S DATALINK SYNC LOSS

If this message appears during testing the Shelf A or C (Mode 2) testing has failed.

5. INSERT switch

Press this switch to stop sending the alarm to the RT. The switch LED goes out.

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Verify Switch to Protect Capability

1. SOURCE I and II switches

Select Shelf B, C, or D to test the switch to protect capability. Refer to Section 6.3 to test the switch to protect capability for Shelf A.

SOURCE I SW PROT

SOURCE II SHELF B
 SHELF C
 SHELF D

2. INSERT switch

Press this switch to insert and send the selected command to the RT. The switch LED illuminates while in the insert mode.

3. Datalink results interpretation

P/S SHELF x ON PROT and SW PROT FAILED

These alarms should be indicated at the RT and verified with the T-BERD DLC Analyzer Option. These messages also appear in the DATALINK category as a historical record of the indicated events. If the *SW PROT FAILED* message appears, the selected shelf failed the switch to protection sequence.

4. INSERT switch

Press this switch to stop sending the command to the RT. The switch LED goes out.

Verify Mode I Maintenance Test Sequence

NOTE: The following procedure can only be performed on Shelf A.

1. SOURCE I switch

Select the MAINT command to establish the automated maintenance test procedure.

2. SECONDARY CHANNEL switch

Select the desired DS0 channel from 1 to 24 only.

3. INSERT switch

Press this switch to insert and send the MAINT command to the RT. The switch LED illuminates while in the insert mode. The maintenance test is performed with the DS0 channel selected in Step 2.

4. Verify transmitted maintenance test sequence

Monitor the SOURCE II line during the test to verify that the proper sequence is performed. The T-BERD DLC Analyzer Option displays the following *lowercase* messages in the SOURCE II line when waiting for message responses from the RT and *upper-case* messages in the RESULTS window which report on the status of the messages transmitted from the RT:

- 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* appear.
- If the *abort* message appears and the RT only responds with a *P TEST ALARM* message, 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.

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- 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.

NOTE: The T-BERD DLC Analyzer Option emulates the maintenance test generated from the COT.

5. INSERT switch

Press this switch to stop sending the command to the RT. The switch LED goes out.

Disconnect the T-BERD DLC Analyzer Option

1. INSERT switch

Verify that the switch LED is OFF before disconnecting the T-BERD DLC Analyzer Option from the circuit.

2. TRANSMIT jack

Disconnect the cable from the DSX-1 jack first. Then disconnect the cable from the T-BERD DLC Analyzer Option. If the 100 Ω terminator is used, unplug the terminator from the DSX-1 OUT jack and DSX-1 IN jack cable simultaneously.

NOTE: You may notice a brief glitch in the T1 signal when the cable is disconnected from the DSX-1 IN jack.

3. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

6.5 TESTING SHELF B, C, D, OR PROTECT BIT ERROR RATE PERFORMANCE

- Verify the bit error rate performance, switch to protection, and far-end loop response capabilities of Shelf B, C, D, or PROTECT at the RT.

Figure 6-5 illustrates the T-BERD DLC Analyzer Option and T-BERD 209A/211 testing the RT from the CO DSX-1 access point.

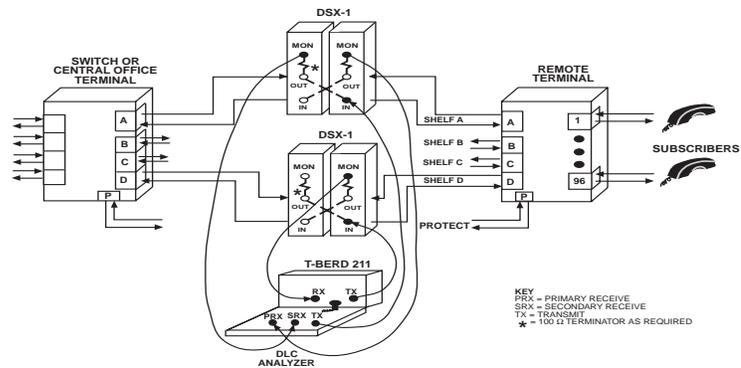


Figure 6-5
Testing Shelf B, C, D, or Protect Bit Error Rate Performance

Connect DLC Analyzer Option To T-BERD 209A/211

1. **T-BERD 209A/211 or external power supply — turn power ON**
2. **Connect coiled cable**
 Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.
3. **INSERT switch**
 Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.

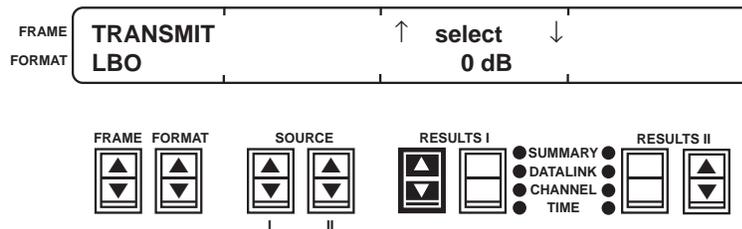
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T-BERD DLC Analyzer Option Test Setup

4. AUX/FRAME/FORMAT switch

Select TRANSMIT/LBO to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.



5. AUX switch

Exit auxiliary functions.

6. FRAME switch

Select SLC-M1 or SLC-M2 mode.

NOTE: Do not attempt to perform a far-end loop on Shelf B or D on a Mode 2 DLC system.

7. FORMAT switch

Select DATLINK format.

8. CODE switch

Select the appropriate coding.

9. RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

10. SECONDARY RECEIVE jack

Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

11. TRANSMIT jack

Connect the cable to the T-BERD DLC Analyzer Option first, then connect the cable as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 IN jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 IN jack.

NOTE: You may notice a brief glitch in the T1 signal when the cable is connected to the DSX-1 IN jack. If persistent errors are detected after the cable is connected, verify the resistor isolation at the DSX-1. If improper resistor isolation is determined, plug a 100 Ω terminator into the appropriate DSX-1 OUT jack simultaneously with the cable from the TRANSMIT jack.

12. RESTART switch

Clear the results and start the test.

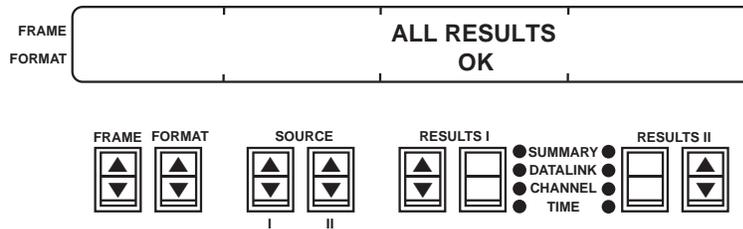
13. Status LEDs

Both primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

14. RESULTS I switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.

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15. **SOURCE I and II switches**

Select **SOURCE I** for FE LOOP and **SOURCE II** for either SHELF B, C, D or PROTECT.

16. **INSERT switch**

Press this switch to insert and send the far-end loop command to the RT. The switch LED illuminates while in the insert mode. SHELF B, C, or D is automatically switched to the protection line and the SHELF B, C, D or PROTECT T1 line is looped back.

NOTE: When the far-end loopback command is transmitted, the command is automatically preceded by a switch to protection line command to prevent an interruption of the selected shelf.

17. **Datalink results interpretation**

P SHELF D ON PROT and P FE LOOP SHELF D

These alarms indicate that SHELF B, C, or D is switched to the protection line and looped back to the CO.

WARNING: If the *SW PROT FAILED* message appears, the switch to protection sequence failed, do not continue with the procedure.

T-BERD 209A/211 Mainframe Test Setup

1. **MODE switch**

Select the T1 D4 (D1D, D2, or D3 framing) or T1 ESF mode.

2. **PATTERN switch**

Select the appropriate test pattern, e.g., T1-QRSS.

3. TIMING switch

Set to INT.

4. RECEIVE INPUT switch and jack

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf B, C, D, or PROTECT span-side DSX-1 OUT jack.
- If at the RT, connect a cable between this jack and the Shelf B, C, D, or PROTECT equipment-side DSX-1 OUT jack.

5. TRANSMIT OUTPUT switch and jack

Select the appropriate output level, and connect a cable between this jack and the T1 line as follows:

- If at the CO, set the output level to 0dB(DSX) and connect a cable between this jack and the Shelf B, C, D, or PROTECT span-side DSX-1 IN jack.
- If at the RT, set the output level to -15dB and connect a cable between this jack and the Shelf B, C, D, or PROTECT equipment-side DSX-1 IN jack.

6. Status LEDs

These LEDs should illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

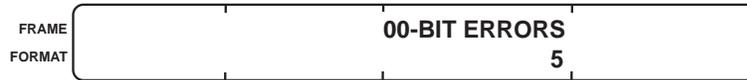
7. RESULTS I Category switch

Select the SUMMARY category.

8. LOGIC ERROR INSERT switch

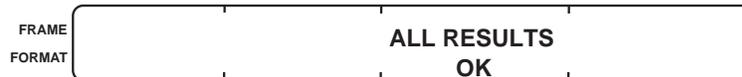
Press the switch five times to verify that the logic errors are received and the T1 circuit is looped back.

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9. **RESTART switch**
Clear the results and start the test.

10. **RESULTS I switches**
Check SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, scroll through the SUMMARY category for specific errors. Check the other categories as required.



11. **Results interpretation**
00-BIT ERRORS, 25-VIOLATIONS, and 30-FRM ERRORS
These errors typically indicate a local T1 span problem caused by a faulty repeater, span line noise, crosstalk, poor cabling, defective DSX jacks, or faulty multiplexer. Electrical noise, generated near the metallic span can also contribute to errors received at the instrument.

- 40-RX FREQ, Hz***
The DS1 received frequency should be 1.544 MHz ± 75 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

41-RX LEVEL (dBdsx)

The received level should be +4 to -4 dBdsx at the terminated DSX-1 OUT jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED

The far end sends a Yellow Alarm to indicate that it is not receiving a T1 signal.

All Ones LED

An Alarm Indication Signal (AIS) indicates that equipment in the signal path is not receiving the T1 signal from the far end.

Disconnect the Test Sets**1. T-BERD 209A/211 — Disconnect the cables**

When the test is complete, disconnect the cables from the SHELF B, C, D, or PROTECT DSX-1 jacks.

2. T-BERD DLC Analyzer Option — INSERT switch

Press this switch to release SHELF B, C, D, or PROTECT from the far-end loopback and protection line.

3. TRANSMIT jack

Disconnect the cable from the DSX-1 jack first. Then disconnect the cable from the T-BERD DLC Analyzer Option. If the 100 Ω terminator is used, unplug the terminator from the DSX-1 OUT jack and DSX-1 IN jack cable simultaneously.

NOTE: You may notice a brief glitch in the T1 signal when the cable is disconnected from the DSX-1 IN jack.

4. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

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6.6 VERIFYING RING GENERATION

- Verify that the ring generator is functioning properly at the RT.

Figure 6-6 illustrates the T-BERD DLC Analyzer Option testing the RT ring generator from the DSX-1 access point.

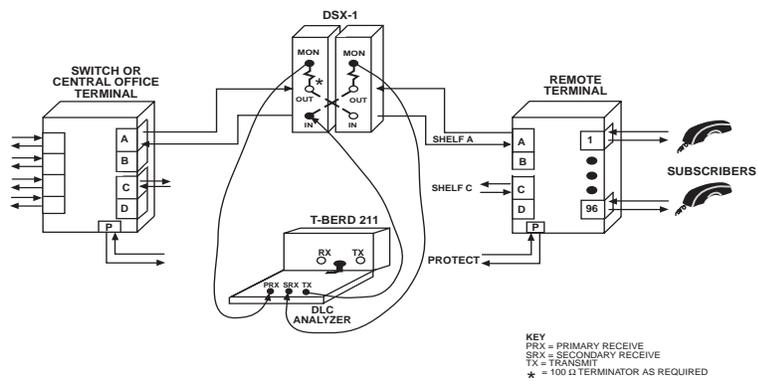


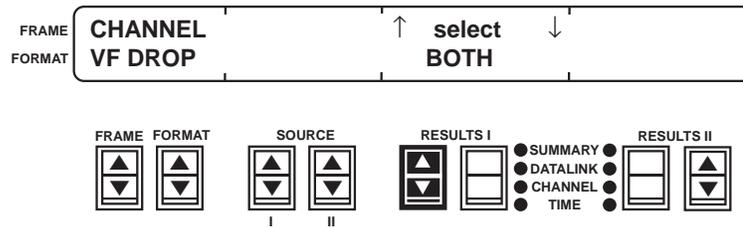
Figure 6-6
Testing Ring Generators

Connect DLC Analyzer Option To T-BERD 209A/211

1. **T-BERD 209A/211 or external power supply — turn power ON**
2. **Connect coiled cable**
Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.
3. **INSERT switch**
Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.

T-BERD DLC Analyzer Option Test Setup**4. AUX/FRAME/FORMAT switch**

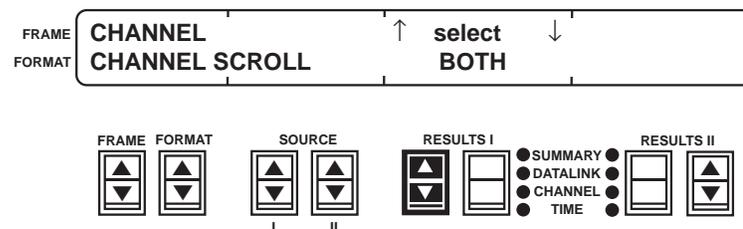
Select the CHANNEL/VF DROP auxiliary function to set which T1 line the DS0 channel is dropped from.



Set for PRIMARY to drop the DS0 channel from the PRIMARY RECEIVE T1 signal. Set for SECONDARY to drop the DS0 channel from the SECONDARY RECEIVE T1 signal. Set for BOTH to drop the DS0 channel from both T1 signals.

5. FORMAT switch

Select the CHANNEL/CHANNEL SCROLL auxiliary function to set the PRIMARY and SECONDARY CHANNEL switch control.

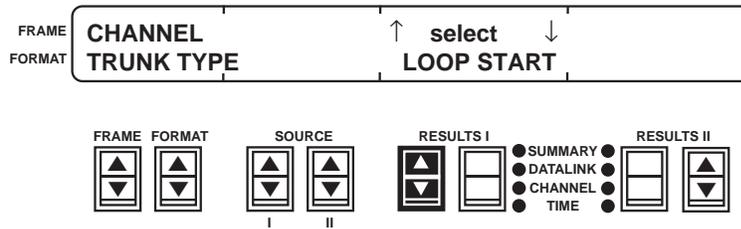


Set for BOTH to scroll the PRIMARY and SECONDARY CHANNEL switch numbers simultaneously. Set for SEPARATE to scroll the switch numbers independently.

6. FORMAT switch

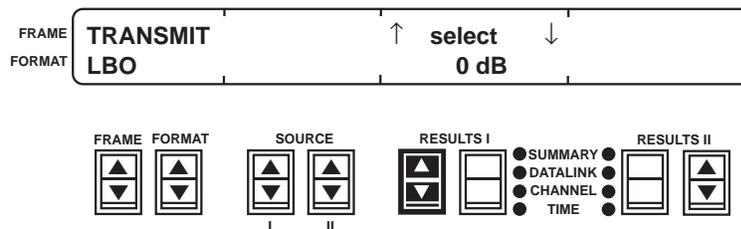
Select the CHANNEL/TRUNK TYPE auxiliary function to set the signaling protocol.

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7. **FRAME switch**

Select TRANSMIT/LBO to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.



8. **AUX switch**

Exit auxiliary functions.

9. **FRAME switch**

Select SLC-M1 mode.

10. **FORMAT switch**

Select CHANNEL format.

11. **CODE switch**

Select the appropriate coding.

12. **RECEIVE INPUT switch and PRIMARY RECEIVE jack**

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

13. SECONDARY RECEIVE jack

Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

14. TRANSMIT jack

Connect the cable to the T-BERD DLC Analyzer Option first, then connect the cable as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 IN jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 IN jack.

NOTE: You may notice a brief glitch in the T1 signal when the cable is connected to the DSX-1 IN jack. If persistent errors are detected after the cable is connected, verify the resistor isolation at the DSX-1. If improper resistor isolation is determined, plug a 100 Ω terminator into the appropriate DSX-1 OUT jack simultaneously with the cable from the TRANSMIT jack.

15. RESTART switch

Clear the results and start the test.

16. Status LEDs

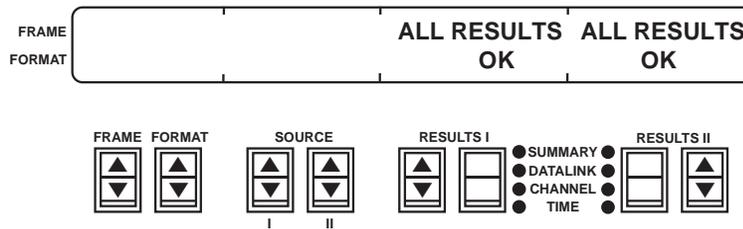
Both primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

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17. RESULTS switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.



Select one of the following CHANNEL category test results to monitor the channel signaling: P TRAFFIC CHANNEL AB, P TRAFFIC CHANNEL ABCD, P TRAFFIC TIMESLOT, or P TS CHAN.

18. SECONDARY CHANNEL switch

Select the desired DS0 channel.

19. INSERT switch

Press this switch to insert the ringing signal. The switch LED illuminates.

20. RING switch

Press this switch to ring the local subscriber loop. Note that the ring back signal is heard from the speaker. The switch LED illuminates while active and the **ABCD** switches are updated.

NOTE: The T-BERD DLC Analyzer Option emulates the central office terminal.

21. DS0 channel results interpretation

P/S TRAFFIC CHANNEL AB, P TRAFFIC TIMESLOT, and P TS CHAN

Monitor the channel signaling bits in both directions. If SLC-M2 framing is used, valid timeslot signaling can only be monitored from the CO.

Disconnect the T-BERD DLC Analyzer Option**22. TRANSMIT jack**

Disconnect the cable from the DSX-1 jack first. Then disconnect the cable from the T-BERD DLC Analyzer Option. If the 100 Ω terminator is used, unplug the terminator from the DSX-1 OUT jack and DSX-1 IN jack cable simultaneously.

NOTE: You may notice a brief glitch in the T1 signal when the cable is disconnected from the DSX-1 IN jack.

23. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

6.7 VERIFYING CHANNEL UNIT SIGNALING

- Test on-hook, off-hook, and dialing signaling on one or all 24 channels on a shelf.

Figure 6-7 illustrates the T-BERD DLC Analyzer Option testing the DTMF dialing capabilities from the DSX-1 access point.

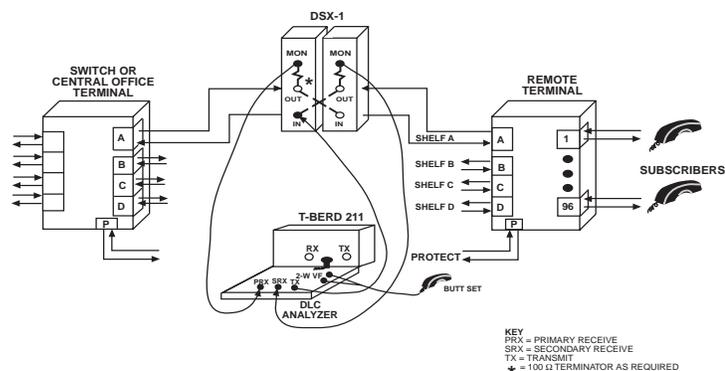


Figure 6-7
Verify Channel Unit Signaling

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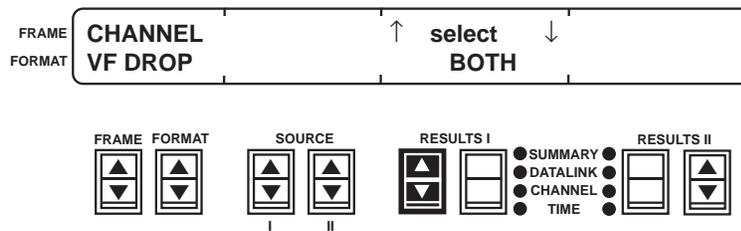
APPLICATIONS

Connect DLC Analyzer Option To T-BERD 209A/211

1. **T-BERD 209A/211 or external power supply — turn power ON**
2. **Connect coiled cable**
Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.
3. **INSERT switch**
Verify that the switch LED is OFF before connecting the T-BERD DLC Analyzer Option to the circuit.

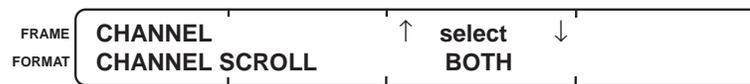
T-BERD DLC Analyzer Option Test Setup

4. **AUX/FRAME/FORMAT switch**
Select the CHANNEL/VF DROP auxiliary function to set which T1 line the DS0 channel is dropped from.



Set for PRIMARY to drop the DS0 channel from the PRIMARY RECEIVE T1 signal. Set for SECONDARY to drop the DS0 channel from the SECONDARY RECEIVE T1 signal. Set for BOTH to drop the DS0 channel from both T1 signals.

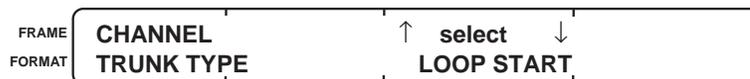
5. **FORMAT switch**
Select the CHANNEL/CHANNEL SCROLL auxiliary function to set the **PRIMARY** and **SECONDARY CHANNEL** switch control.



Set for BOTH to scroll the **PRIMARY** and **SECONDARY CHANNEL** switch numbers simultaneously. Set for **SEPARATE** to scroll the switch numbers independently.

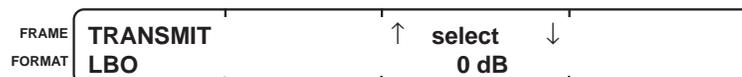
6. FORMAT switch

Select the CHANNEL/TRUNK TYPE auxiliary function to set the signaling protocol.



7. FRAME switch

Select TRANSMIT/LBO to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.



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8. AUX switch

Exit auxiliary functions.

9. FRAME switch

Select SLC-M1 mode.

10. FORMAT switch

Select CHANNEL format.

11. CODE switch

Select the appropriate coding.

12. 2-Wire VF Interface

Connect a butt-set to the 2-wire VF posts on the right side near the RS-232 interface. Leave the butt-set **MON/TALK** switch in the MON or released position.

13. RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

14. SECONDARY RECEIVE jack

Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

15. TRANSMIT jack

Connect the cable to the T-BERD DLC Analyzer Option first, then connect the cable as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 IN jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 IN jack.

NOTE: You may notice a brief glitch in the T1 signal when the cable is connected to the DSX-1 IN jack. If persistent errors are detected after the cable is connected, verify the resistor isolation at the DSX-1. If improper resistor isolation is determined, plug a 100 Ω terminator into the appropriate DSX-1 OUT jack simultaneously with the cable from the TRANSMIT jack.

16. RESTART switch

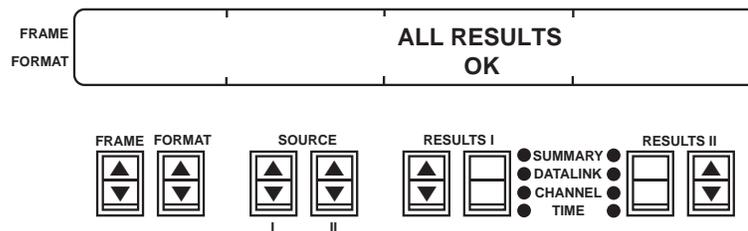
Clear the results and start the test.

17. Status LEDs

Both primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

18. RESULTS I switches

Check SUMMARY category. If errors or alarms are not detected, *ALL RESULTS OK* appears. If errors or alarms are detected, scroll through the SUMMARY category for specific errors or alarms. Check the other categories as required.



Select one of the following CHANNEL category test results to monitor the channel signaling: P/S TRAFFIC CHANNEL AB, P/S TRAFFIC CHANNEL ABCD, P/S TRAFFIC TIMESLOT, or P/S TS CHAN.

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19. SOURCE I switch

Set to VF INTF.

20. SECONDARY CHANNEL switch

Select the desired DS0 channel.

21. INSERT switch

Press this switch to test from the 2-wire VF interface. The switch LED illuminates while in the insert mode.

22. VOLUME control

Adjust the control to monitor the selected DS0 channel through the speaker. Verify that the line is idle.

23. OFF HOOK switch

Press this switch to place the channel off hook. Note that dial tone can be heard from the speaker. The switch LED illuminates while active and the **ABCD** switches are updated. The **ON HOOK** switch LED goes out and the **ABCD** switches indicate the change.

NOTE: If the dial tone is not heard, verify that the trunk type signaling protocol is properly set by the CHANNEL/TRUNK TYPE auxiliary function. Also check the volume level of the speaker.

24. Butt-set

Press the **MON/TALK** switch to the TALK position. Verify that dial tone is heard.

Dial the telephone number. Verify that ringing is heard and the telephone is answered.

Press the **MON/TALK** switch to the MON position.

25. ON HOOK switch

Press this switch to place the channel on hook. The switch LED illuminates while active and the **ABCD** switches are updated. Verify that the line is idle and dial tone is not heard from the butt-set.

26. DS0 channel results interpretation***P/S TRAFFIC CHANNEL AB, P TRAFFIC TIMESLOT, and P TS CHAN***

Monitor the channel signaling bits in both directions. If SLC-M2 framing is used, valid timeslot signaling can only be monitored from the CO.

Disconnect the T-BERD DLC Analyzer Option**27. TRANSMIT jack**

Disconnect the cable from the DSX-1 jack first. Then disconnect the cable from the T-BERD DLC Analyzer Option. If the 100 Ω terminator is used, unplug the terminator from the DSX-1 OUT jack and DSX-1 IN jack cable simultaneously.

NOTE: You may notice a brief glitch in the T1 signal when the cable is disconnected from the DSX-1 IN jack.

28. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

29. Butt-set

Disconnect from the 2-wire VF posts.

6.8 CHECKING SLC MODE 2 TIMESLOT MAPPING

- Verify the Mode 2 timeslot channel mapping.

Figure 6-8 illustrates the T-BERD DLC Analyzer Option testing the Mode 2 RT from the CO DSX-1 access point.

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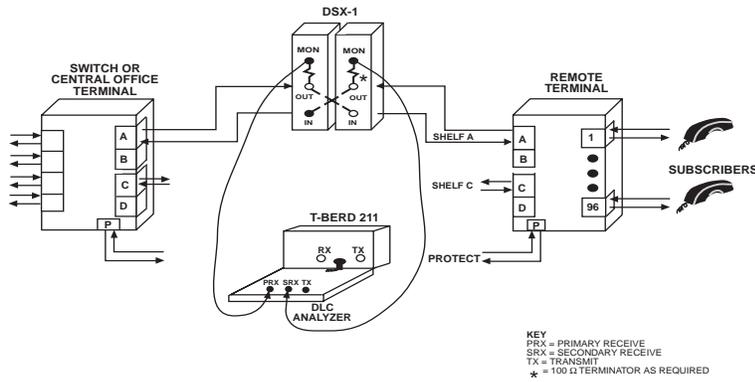


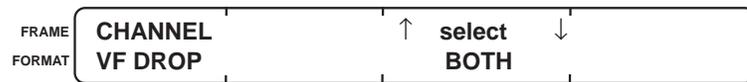
Figure 6-8
Checking SLC Mode 2 Timeslot Mapping

Connect DLC Analyzer Option To T-BERD 209A/211

1. T-BERD 209A/211 or external power supply — turn power ON
2. **Connect coiled cable**
 Connect the T-BERD DLC Analyzer Option coiled cable to either the T-BERD 209A/211 15-pin D connector or external power supply after applying power to the power source.

T-BERD DLC Analyzer Option Test Setup

3. **AUX/FRAME/FORMAT switch**
 Select the CHANNEL/VF DROP auxiliary function to set which T1 line the DS0 channel is dropped from.



Set for **PRIMARY** to drop the DS0 channel from the **PRIMARY RECEIVE T1** signal. Set for **SECONDARY** to drop the DS0 channel from the **SECONDARY RECEIVE T1** signal. Set for **BOTH** to drop the DS0 channel from both T1 signals.

4. **FORMAT switch**

Select the **CHANNEL/CHANNEL SCROLL** auxiliary function to set the **PRIMARY** and **SECONDARY CHANNEL** switch control.



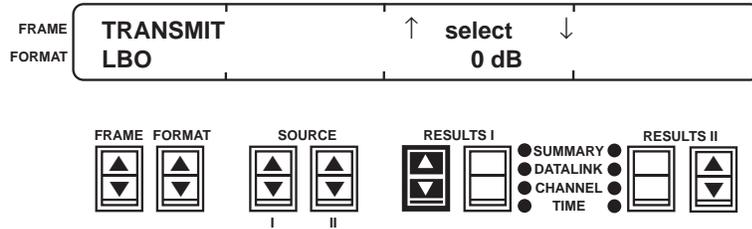
Set for **BOTH** to scroll the **PRIMARY** and **SECONDARY CHANNEL** switch numbers simultaneously. Set for **SEPARATE** to scroll the switch numbers independently.

5. **FRAME switch**

Select **TRANSMIT/LBO** to set the LBO level. If transmitting into the span, set the LBO for 0.0 dB. If transmitting into the equipment, set the LBO for -15.0 dB.

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6. AUX switch

Exit auxiliary functions.

7. FRAME switch

Select SLC-M2 mode.

8. CODE switch

Select the appropriate coding.

9. RECEIVE INPUT switch and PRIMARY RECEIVE jack

Select the DSX-MON input level. Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.

10. SECONDARY RECEIVE jack

Connect a cable between this jack and the T1 line as follows:

- If at the CO, connect a cable between this jack and the Shelf A span-side DSX-1 MON jack.
- If at the RT, connect a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.

11. RESTART switch

Clear the results and start the test.

12. Status LEDs

The following primary and secondary LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable). The Alarms LED may illuminate.

13. RESULTS I switches

Select the CHANNEL category P TS CHAN result. Determine which timeslot or channel you want to monitor. The timeslots are indicated across the top line. The active timeslots have the mapped channel number below it. The “— —” indicates an unassigned timeslot.

FRAME	P TS	01	02	03	04	05	06	07	08	09	10	11	12
FORMAT	CHAN	01	03	05	07	10	22	--	24	--	36	--	--



Press the **RESULTS I Results** switch to scroll to timeslots 13 to 24.

FRAME	P TS	13	14	15	16	17	18	19	20	21	22	23	24
FORMAT	CHAN	04	--	--	15	20	12	--	02	--	11	--	--



NOTE: Only valid timeslot channel assignments can be monitored from the CO.

14. PRIMARY CHANNEL switch

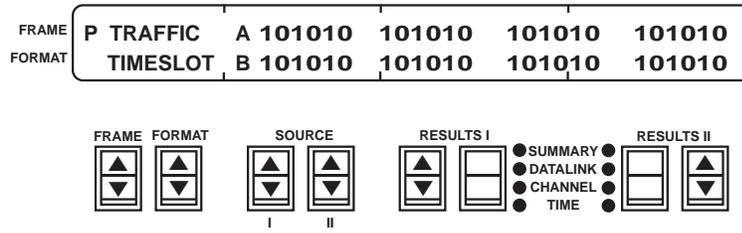
Select the channel you want to monitor by displaying the *timeslot* number in the channel display. For example, to monitor channel 04 above, press the **PRIMARY CHANNEL** switch to display timeslot 13, monitor channel 15 by displaying timeslot 16.

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15. RESULTS I Results switch

Select the CHANNEL category P/S TRAFFIC TIMESLOT AB result to monitor the timeslot signaling bits.



16. SLC-M2 channel results interpretation

P TS CHAN

The top row of numbers indicate the available timeslots. The bottom row of numbers identify the assigned channel of an active timeslot. An unassigned timeslot is indicated by two dashes (— —). An unknown timeslot assignment is left blank. The result is automatically updated as channels assignments and traffic change. Press the **RESULTS I Results** switch to display the PRIMARY (P) timeslot channel assignments.

P/S TRAFFIC TIMESLOT AB

This result displays the A and B signaling bits in all 24 timeslots from a single receiver input. Press the **RESULTS I Results** switch to display either the PRIMARY (P) or SECONDARY (S) signaling traffic.

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

Disconnect the T-BERD DLC Analyzer Option

17. PRIMARY RECEIVE and SECONDARY RECEIVE jacks

Disconnect the cables from the DSX-1 MON jacks, then the T-BERD DLC Analyzer Option.

SPECIFICATIONS

7.1 INTRODUCTION

This section lists the specifications of the T-BERD DLC Analyzer Option.

7.2 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 or external power supply).

7.3 T1 INPUT SPECIFICATIONS

Input Connectors:	WECO 310 jacks for primary and secondary receivers.
Input Frequency:	1,544,000 Hz \pm 4000 Hz.
Input Impedance:	BRIDGE — 1000 ohms or greater. TERM — 100 ohms \pm 5%. DSX-MON — 100 ohms \pm 5%.

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SPECIFICATIONS

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.

7.4 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-BERDDLDC Analyzer Option meets ANSI T1.403 pulse shape specifications.
Line Code:	AMI or B8ZS selectable.

7.5 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.

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VF Measurements: VF level — -40 dBm to +3 dBm.

VF frequency — in Hertz.

DTMF sequence — displayed numerical values.

7.6 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.

7.7 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.

7.8 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.

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7.9 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

FACTORY DEFAULT SETTINGS

This appendix identifies the T-BERD DLC Analyzer Option factory default settings for the switch positions and auxiliary functions that are stored in nonvolatile memory. To configure the T-BERD DLC Analyzer Option with the factory default settings, press the **RESTART** switch while applying power. Release the **RESTART** switch after power is applied. When the message *LOAD NOVRAM* appears, press **RESTART** again. Table A-1 lists the factory default settings.

Table A-1
T-BERD DLC Analyzer Option 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
RESTART	N/A
DISPLAY LIGHT	OFF
PRINT	OFF
RECEIVE INPUTS	DSX-MON
PRIMARY CHANNEL	— —
SECONDARY CHANNEL	— —
INSERT	OFF
SIGNALING INSERT	All OFF
Auxiliary Functions	Default
CHANNEL/VF DROP	BOTH
CHANNEL/CHANNEL SCROLL	BOTH
CHANNEL/TRUNK TYPE	LOOP START
TRANSMIT/LBO	0dB
TIME/SET TIME	(Time of software release)
TIME/SET DATE	(Date of software release)

APPENDIX A
FACTORY DEFAULT SETTINGS

CHANNEL TIMESLOT ASSIGNMENTS

The channel timeslot assignments determine which channel is actually dropped from a framed signal when a particular timeslot is selected. Since the T-BERD DLC Analyzer Option selects the dropped channel based on the primary usage of D4 and ESF framing, the timeslots for other D1D and SLC framing drop different data channels than the user may expect. Use Table B-1 to determine the correspondence between the selected channel number and the actual timeslot that is displayed.

**Table B-1
Channel Timeslot Assignments**

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

CHANNEL TIMESLOT ASSIGNMENTS

APPENDIX B