

T-BERD 224 PCM ANALYZER

USER'S MANUAL

JUNE 1998



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20400 Observation Drive, Germantown, Maryland 20878
USA 1-800-638-2049 • +1-301-353-1550 • FAX +1-301-353-0234
Canada 1-888-689-2165 • +1-905-507-4117 • FAX +1-905-507-4120
www.ttc.com

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A handwritten signature in black ink that reads "John Peele". The signature is written in a cursive, flowing style.

John Peele
President and CEO

TTC Worldwide Contacts

| Organization | Contact |
|-------------------------------|---|
| TTC Headquarters | <p>34405 Observation Drive Germantown, Maryland 20876-4923 USA Toll free: 1-800-537-2549 In Maryland: 1-301-353-1550 Fax: 1-301-353-0731 Web: www.ttc.com <i>Technical Assistance Center (TAC) for technical questions</i> Toll free: 1-800-537-2549 Phone: 1-301-353-1560, ext. 2700/2331 Fax: 1-301-353-1209 E-mail: tac@ttc.com <i>Customer Care Center (CCC) for product repair and orders</i> Toll free: 1-800-673-2549 Phone: 1-301-353-1560, ext. 2850 Fax: 1-301-353-9216 E-mail: is@ttc.com (customer repair) custserv@ttc.com (customer service) <i>Technical Training for private technology partners</i> Toll free: 1-800-673-3309, ext. 2151 (USA West) Phone: 1-314-660-3804, ext. 592 (USA West) Fax: 1-314-353-0121</p> |
| TTC Asia Pacific Ltd. | <p>Room 4205, Tower B, Metaplexa 133 Hing Fong Road, Kwun Chong New Territories, Hong Kong Phone: 811 852 2892 (900) Fax: 811 852 2892 (770)</p> |
| TTC Australia Melbourne | <p>41 Stamford Road Oakleigh, 3106 Victoria, Australia Phone: 011 61 3 9563 4500 Fax: 011 61 3 9563 4930</p> |
| TTC Australia, Sydney | <p>Suite 3, Level 11 101 Walker Street North Sydney, 2060 NSW, Australia Phone: 011 61 2 9926 1447 Fax: 011 61 2 9926 0101</p> |
| TTC Belgium Brussels | <p>Bertaelstreetweg 455b 2040 Brussels, Belgium Phone: 011 32 1528 7686 Fax: 011 32 1528 7687</p> |
| TTC Canada, Toronto Office | <p>234 Matheson Boulevard East Mississauga, Ontario L4T 1X1, Canada Toll free: 1-888-686-2155 Phone: 1-905-507-4117 or 4178 Fax: 1-905-507-4126</p> |

TTC Worldwide Contacts (Continued)

| Organization | Contact |
|----------------------------------|--|
| TTC Canada, Vancouver Office | 3665 Kingsway, Unit 530 Vancouver, B.C. V5R 5K7, Canada Phone: +604-430-3855 Fax: +604-439-5711 |
| TTC Canada, Montreal Office | TTC Canada Ltd. 4150, Boulevard-Martin Ouest Laval, Quebec, H7E 1C1, Canada Phone: +454-688-6669 Fax: +454-688-5242 |
| TTC China | TTC Beijing Room 402, Qing An Building No. 27 Xian Xian Road Changyng District Beijing, 100027, China Phone: +86 10 6460 5258 Fax: +86 10 6460 5256 |
| TTC France | Division of Dynamic Microsystems Batiment GMA 6, Rue Ariste 78284 Guyancourt Cedex, France Phone: +33 1 30 48 82 90 01 (0) Fax: +33 1 30 48 08 46 |
| TTC Germany, Frankfurt Office | TTC Deutschland Max-Planck-Str. 23 6381 Friedr. Engels, Germany Phone: +49 6172 581105 Fax: +49 6172 72065 |
| TTC Germany, Munich Office | TTC Deutschland Röhner Str. 55a 81829 München, Germany Phone: +49 89 907874 Fax: +49 89 907087 |
| TTC United Kingdom | TTC UK Ltd Marborough House 3-5 Winton Drive Winton Garage Reading, RG2 0YU, Hants, England Tel/Fax: +44 (0) 1441 891 887/888/77 Phone: Phone: +44 1441 891 890/896 Fax: +44 1441 891 887/892 Email: europe@tcc.com |

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SECTION 1 GENERAL INFORMATION

1.1 INSTRUMENT OVERVIEW

The T-BERD 224 PCM Analyzer is a T1 BER test set that provides comprehensive, full-duplex, T1 channel access. It performs test and monitor applications such as Full T1, Fractional T1, DDS, Signaling, Switched 56, VF, SS7, PRI, Caller ID, SLC and TR-707 from virtually any T1 access point. Dual filter capabilities allow users to observe or listen to live voice and data traffic. Bi-directional insert capabilities allow users to insert test tones or data into a channel(s) in either T1 transmission direction to perform out-of-service channel tests. With its two T1 receivers and two T1 transmitters, the T-BERD 224 can be placed in line to provide drop and insert capability in either direction on a T1 line. SONET/SDS Analyzer Ed is also available for high speed access and testing.

1.2 STANDARD FEATURES

Easy to use front panel controls and indicators allow test setups to be confirmed at a glance.

AUTO mode automatically configures the T-BERD 224 transmitters and receivers to the incoming T1 signal framing.

SUMMARY Results Category displays key pass/fail or out-of-specification results.

Custom results prints and displays only the results you want.

Timing slip analysis detects differences in system timing between two T1 inputs.

Dual T1 receivers compatible with D1D, D2, DVB4, ESF, and SLCM-96 (Mode 1 and 2) framing format provide simultaneous BIPV, frame, and CRC error results, as well as received frequency and signal level measurements for both T1 inputs.

Full-duplex drop and insert capabilities allow out-of-service tests in either T1 transmission direction.

Split ESF/D4 mode capability enables the T-BERD 224 to monitor T1-ESF framing on one line and T1-D4 framing on the other line.

Traffic analysis displays the signaling bits of all 24 channels for one or both T1 transmission directions.

Front-panel speaker carries the tone to transmit VF transmissions in one or both directions.

Side panel interfaces provide an interface channel access to an external device on the system's serial or parallel interface.

Signaling bit controls allow users to enable signaling for and receive signaling on both T1 channels.

VF signal analysis measures tone level and frequency within a VF channel.

AMI or Bipolar B-Zero Substitution (BZS) transmit capability.

Options

ISO 9000 registered.

UL approved and listed.

CSA approved and listed.

1.3 OPTIONS

1.3.1 SONET/DS3 Analyzer Option — Model 226-1

Dual STS-1/DS3 receivers provide analysis of the received signal.

STS-1/DS3 transmitter enables the T-BERD 224 to insert a DS1 signal into a DS3 or STS-1 output.

Drops DS1 (VT1.5) channels to the T-BERD 224 from the STS-1/DS3 input signals for DS1 and DS3 analysis.

Inserts DS1 (VT1.5) channels from the T-BERD 224 to the STS-1/DS3 output to test specific DS1 signals.

Lid provides user interface control to qualify STS-1 and DS3 (M13 and C-Bit framing) circuits with appropriate test patterns.

STS-1/DS3 Error and Alarm insertion enables the T-BERD 224 to test and verify network continuity and integrity.

DS1 BITS clock input provides an external connection for a STS-1 transmitting reference.

1.3.2 Primary Rate ISDN Option — Model 12709

Monitors all messages on the Primary Rate ISDN D channel, (Layer 2 (LAPD)).

Provides test results for counting packets, CRC errors, packets discarded, Information and Receiver Ready frames.

Isolates transmission and protocol problems between the network and user for Primary Rate ISDN.

Monitors all layer 3 (Q.931) call processing messages that correspond to that call. Reports in real time the call state and other important information about the traced call.

Accesses the Primary Rate ISDN service from any TE Access point, from a Channel Bank, or a DCE terminal.

1.3.3 SS7 Call Trace Option — Model 12710

(DSP Option Board Required (47659))

Monitors and reports on all layer 3 (Q.931) call processing messages corresponding to a specifically traced call on certain SS7 links.

Monitors and reports on all layer 2 link statistics such as number of packets, errored packets, and percent of utilization.

1.3.4 T1 BERT Option — Model 4301

Tests T1 circuits with over 15 different test patterns.

Transmits in-band and out-of-band (OSF) loop codes.

Provides automated MULTIPAT pattern testing with a 15-minute test that includes standard AT Chrs, 1,7, 2, 3N x, 2 IN 2L, and QRSS test patterns.

Performs automated BRIDGTAP pattern testing to evaluate T1 circuits for bridge taps using 24 different test patterns.

Inserts single, burst, or variable rate logic errors, BIPVs, frame errors, and yellow alarm.

Emulates T1 CSUs and Smart Jacks by terminating the T1 span, auto-responding to T1 loop codes, passing complex current, and receiving signal levels down to -35 dBm.

Measures simplex current.

Bleeps when the BER result is displayed and an error is severe, loss of pattern synchronization, or test completion is detected.

Measures round trip path delay of a T1 circuit.

1.3.5 Fractional T1 Option — Model 13406

↳ BERT Option Required (4301)

Tests Fractional T1 circuits with over 20 different test patterns.

Tests and loops contiguous and non-contiguous fractional T1 bandwidths.

Tests 64 x N and 56 x N Fractional T1 circuits.

Measures the round trip path delay of any group of channels at the T1 circuit.

1.3.6 DDS Option

↳ Model 15457

↳ T1 BERT Option Required (4301)

↳ Model 4301

Tests DDS circuits with over 20 different test patterns.

Generates alternating and latching DDS loop codes for analyzing and troubleshooting DDS circuits.

Tests both DS0A and DS0B terminated DDS circuits at rates from 2.4 kbps to 64 kbps. A selected DS0B channel can be tested without affecting other channels.

Displays the logic states of the received byte for one or both dropped channels.

Tests DDS Primary and Secondary channels.

Controls MJQ operations in the DDS network from a single T1 access point.

Measures the round trip path delay of any channel within the T1 circuit.

1.3.7 **Advanced Stress Patterns Option — Model 12042**

T1 BER1 Option Required (45016)

Stresses DDS and T1 networks with eight additional test patterns.

1.3.8 **G.821 Performance Analysis Option — Model 12041**

T1 BER1 Option Required (45016)

Evaluates long-term system performance using the CCITT Recommendation G.821 standard.

1.3.9 **Enhanced ESF/SLC Option — Model 11704**

Monitors and transmits T1.403 Performance Report Messages (PRMs) on ESF and ESFz framed circuits.

Monitors and transmits SLC-96 circuit alarms for Mode 1 and Mode 2, such as major shelf, minor shelf, and power/miscellaneous.

Monitors and transmits SLC-96 automated maintenance test sequences for Mode 1 only.

Monitors and transmits the SLC-96 switch to protection line function for Mode 1 and Mode 2.

Monitors and transmits the SLC-96 far-end shell loopback for Mode 1 and Mode 2. The far-end loop command automatically switches the selected shell to the protection line if it is available.

Monitors and transmits SLC-96 idle signal for Mode 1 and Mode 2.

1.3.10 **Smart Loopback/Command Codes Option — Model 12050**

T1 BER1 Option Required (45016)

Adds intelligent network equipment loop codes that enable the T1 BER1-224 to control intelligent network equipment.

Adds maintenance switch commands that enable the T1 BER1-224 to activate maintenance switch ring and switch branches.

Adds Smart NCU commands to enable the T1 BER1-224 to query, remove, and reinsert T1 circuit sections obtained by the performance monitor feature of the Westel NCU Performance Monitor.

1.3.11 **VF Option — Model 41502**

DSP Option Board Required (47659)

Tests VF circuits at the T1 access points.

Qualifies voice-grade VF circuits by measuring Signal-to-Noise ratio (SNR), C-Message, C-Notch, Echo Return Loss (ERL), and Singly Return Loss (High and Low - SRL-HI and SRL-LO)

Tests data-grade VF circuits with Peak-to-Average Ratio (PAR), 3 kHz Flat, and 3 kHz Notch noise.

Performs automated frequency sweeps.

Provides VF THRU Capability.

1.3.12 Signaling Option — Model 41934

DSP Option Board Required (#2856)

Originates calls by sending complex sequences of DTMF, MF, or DP digits to switches/PBXs

Terminates calls by receiving digits from a switch/PBX, by sending supervision events, and by providing a dial tone

Monitors in-service switch-to-switch, and switch-to-PBX communications by automatically selecting digit type (DTMF, MF, or DP)

Automatically scans signaling activity and monitors ERL data on pre-selected channels or on all 24 channels of a T1 circuit. All digit/supervision events are recorded for the seized channel

Measures wink delay and duration

Dials and tests Switched 56 circuits (DMS Option required)

1.3.13 Digit Analysis Option — Model 12701

Signaling Option Required (#4934)

Measures DTMF and MF tone frequencies (high and low tones) and levels for individual digits captured while monitoring DSP channel activity.

Measures dial tone (key, duration, frequency, and level)

Measures digit or end-of-line

1.3.14 Caller ID Option — Model 10704

DSP Option Board Required (#2856)

Monitors Caller ID frequency shift key (FSK) data at a T1 access point by displaying and recording the Caller ID number, area code, extension, and display of caller ID status (on or off) as well as a result log file for the DSP channel activity.

Automatically scans for Caller ID activity by monitoring ERL data on pre-selected channels or all 24 channels of a T1 circuit and locking onto the first channel with ringing activity. Then, it decodes the FS data on that channel

Emulates Caller ID Customer Premises equipment by sending Caller ID activation and deactivation commands to the switch

1.3.15 IEEE-488 Remote Control Option — Model A1243

Provides automated IEEE-488.1 (HP-113) remote control ability.

Enables testing in engineering and manufacturing environments where multiple test equipment/people are operated via a master controller.

1.3.16 TR-303 Option — Model 14875

DSP Option Board Required (42651)

Monitors TR-303 link statistics messages (Layer 2 LAPD) over the Timeslot Management Channel (TMC) or Labeled Operations Channel (LOC).

Provides test results for encoding packets, L2S created packets, disk I/O packets, information and RR frames.

Monitors all layer 3 TMC call processing messages corresponding to a specifically traced call.

Supports both BRITE and TR-303 applications.

1.3.17 RS-232/V.35 DSU-DP Data Port Option — Model 41249

Provides full-duplex drop and insert access to synchronous data at a variety of customer data rates, including DS0A-Framed DDS, DS0B-Framed DDS, Clear Channel, Fractional T1, and CSU datalink.

Multiplexes/demultiplexes RS-232, RS-449, and V.35 electrically formatted signals into the T1 bit stream.

Connects external test equipment or data terminal equipment directly to the T-BERD 224 to analyze channels within the T1 bit stream.

1.3.18 RS-232/RS-449 DSU-DP Data Port Option — Model 41441

Provides full-duplex drop and insert access to synchronous data at a variety of customer data rates, including DS0A-Framed DDS, DS0B-Framed DDS, Clear Channel, Fractional T1, and CSU datalink.

Multiplexes/demultiplexes RS-232, RS-449, and V.35 electrically formatted signals into the T1 bit stream.

Connects external test equipment or data terminal equipment directly to the T-BERD 224 to analyze channels within the T1 bit stream.

1.3.19 RS-232/V.35/RS-449 DSU-DP Data Port Option — Model 11772

Provides full-duplex drop and insert access to synchronous data at a variety of customer data rates, including DS0A-Framed DDS, DS0B-Framed DDS, Clear Channel, Fractional T1, and CSU datalink.

Multiplexes/demultiplexes RS-232, RS-449, and V.35 electrically formatted signals into the T1 bit stream.

Connects external test equipment or data terminal equipment directly to the T-BFRD 224 to analyze channels within the T-1 bit stream.

1.3.20 ZBTSL Framing Option -- Model 11425

Tests and analyzes ZBTSL clear channel extended T-1 lines.

1.4 ACCESSORIES

Table 1-1 shows the list of accessories available for the T-BFRD 224.

Table 1-1 Accessories

| Part No. | Description |
|----------|---|
| 10986 | Thermal printer paper |
| 10997 | Thermal 80-column LED printer |
| 21200 | System control case |
| 21401 | MSX 2858 cover plate |
| 21444-01 | Rack control PCB for T-BFRD 224 |
| 21444-02 | Rack control extension PCB to 25" or 4" (14.01" required) |
| 21455-02 | Rack control extension PCB to 25" or 4" (28" required) |
| 22135 | Rack control for Signaling Option 04094 (required) |
| 51120 | BU data terminal mounting ring |
| 51120 | WFCO data terminal connector plug |
| DTM | TTC Distributed Test Manager Software |
| ME11387 | Replacement operating manual set |
| PR-35 | Rack mounted thermal printer (40 x 60 mm) |
| PR-35A | Thermal data terminal graphics printer with built-in carrying case, battery, and AC operation |
| RTM | Rack Test Manager Software |

1.5 CABLES

Table 1-2 shows the list of cables available for the T-BFRD 224:

Table 1-2. Cables

| Part No. | Description |
|----------|---|
| 10200 | RS-232C cable (15-pin D male to female) (10') |
| 10202 | WFCO 15-pin D male to 21-pin D male (10') |
| 10217 | RS-232C cable (male to female) |
| 10218 | RS-232C cable (male to female) |
| 10219 | RS-232C cable (male to female) (10') |
| 10218 | RS-232 cable (male to female) (10') |
| 10220 | WFCO 15-pin plug to WFCO 21-pin plug (10') |
| 10255 | WFCO 15-pin plug to 21-pin plug (10') |
| 10250 | WFCO 15-pin plug to 21-pin plug (10') |

SECTION 1 - GENERAL INFORMATION

Cables Information

Table 1-2. Cables (Continued)

| Part No. | Description |
|----------|--------------------------------------|
| 0508 | WFOC 510 plug to WFOC 500 plug (4) |
| 0509 | WFOC 510 plug to banana plug (1) |
| 0510 | Banana plug to banana plug (1) |
| 0518 | Banana plug to banana plug (10) |
| 0501 | 5-pin D male to 5-pin audio male (1) |
| 05011 | 5-pin D male to 5-pin audio male (1) |
| 0597 | Extender cable for 5d pin connector |
| 0111 | Dual Data RS-232 protocol adaptor |
| 0112 | Dual Data RS-485 protocol adaptor |
| 0113 | Dual Data 0/35 protocol adaptor |
| 012001 | V.35 DB male to male (5) |
| 012002 | V.35 DB male to male (10) |
| 0105 | Dual banana plug to RJ-45 |
| 0106 | Dual banana plug to RJ-45 |
| 0108 | Dual banana plug to 15-pin D male |
| 0109 | Dual banana plug to 15-pin D female |
| CR-0508 | 445A to 445A (1) |
| CR-0512 | 445A to 445A (1) |
| CR-0599 | 445A to 445A (1) |
| CR-5101 | 445A male to 258 female (8) |
| AD-0501 | 445A to BNC adapter piece |

1.6 ORDERING INFORMATION

Contact TTE Customer Service Department at 800-638-2649 for information on ordering options, accessories, or cables.

SECTION 2 INSTRUMENT CHECKOUT AND SERVICE

2.1 UNPACKING AND INITIAL INSPECTION

Inspect the T-BERD 224 shipping container for damage when it is received. If the shipping container or material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. If the contents are incomplete, or if the T-BERD 224 does not pass the performance tests (see Section 2.5), notify TTC. If the shipping container is damaged, notify the carrier as well as TTC, and keep the shipping container and material for the carrier's inspection.

2.2 EQUIPMENT INCLUDED

The following equipment should be included when the T-BERD 224 PCM Analyzer shipment is received and unpacked:

- T-BERD 224 PCM Analyzer
- Power cord
- Reference Manual and Users Guide
- Front cover
- Snap-on power
- Help cards (Inside Users Guide)

2.3 WARNINGS AND CAUTIONS

Observe the following cautions 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 for an incident failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an approved three-prong electrical outlet or used with a three-conductor to two-conductor adapter with the grounding wire firmly connected to an electrical ground of the power cord.

KEEP AWAY FROM LIVE VOLTAGES

Do not remove the instrument cover or insert fingers or other objects into the side panel slots while power is applied to the device.

DO NOT OPERATE IN AN AMBIENT TEMPERATURE ABOVE 50 °C

2.4 POWER REQUIREMENTS

The T-BERD 224 is designed to operate with a single phase 48 to 66 Hz power source at 90-135 VAC. With a factory installed option, the T-BERD 224 can be reconfigured to operate with a single phase 50 Hz power source at 195-240 VAC.

AC Power Connector The T-BERD 224's power cord is plugged into this receptacle to provide line voltage to the unit. The safety ground connection is wired directly to the T-BERD 224 chassis.

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

AC Line Fuse The AC Line Fuse compartment is located between the AC Power connector and the AC Power switch. A spare fuse is located inside the fuse compartment. The T-BERD 224 requires a 1.6 Amp, 250 V, SLO-Blow fuse, installed (Littelfuse type #31801.5, or its equivalent).

AC Power Switch The Power switch is located on the side panel above the AC receptacle and fuse holder. The Power switch is marked with an "I" for the ON position and a "O" for the OFF position.

2.5 INSTRUMENT SELF-TEST/CHECKOUT

1. AC Power cord

Insert the power cord in the power connector on the side panel.

2. AC Power switch

Press the side panel switch to the ON (I) position to apply power to the unit. Powering on the unit initiates an automatic self-test.

- Momentarily illuminates all front panel and switch LEDs.
- Checks to see if any front-panel switches are stuck in an active position.
- Verifies the data stored in Non-Volatile RAM (NOVRAM) is uncorrupted since the last power down. If changes are found in the NOVRAM data, a failure message is displayed, and the factory settings are reloaded. The T-BERD 224 remains fully functional, and while the instrument may be used, PTC should be called for service.
- Momentarily press the **RESTART** switch during power-up to clear the T-BERD 224 NOVRAM and serial switch configurations to the factory default settings listed in Appendix A.
- Checks for critical components. If a system error message is displayed, the display window will read "Error: system fault #22, see manual." The unit will power on, but will only operate in "Power On" mode, except for the Maintenance menu on the display panel.

3. RECEIVE INPUT switches

Select "Off" for all.

4. LINE 1 & LINE 2 jacks

Connect a cable from the LINE 1 TRANSMIT jack to the LINE 2 RECEIVE jack.

5. MODE switch

Select T1-T3F.

6. **CHANNEL FORMAT switch**
Select VI.
7. **SOURCE CONFIGURATION I switch**
Select 100 Hz.
8. **LINE 1 and LINE 2 CHANNEL switches**
Select channel 01.
9. **RESULTS I & II Blank switches**
Select SUMMARY category.
10. **DROP (RX) switch**
Select LINE 2.
11. **INSERT (TX) switch**
Select LINE 1.
12. **RESTART switch**
Press to clear alarms and begin the test. Verify LINE 2 Signal and Frame Sync LEDs illuminate and SUMMARY category results read **NO TEST DEF**.
13. **Volume**
Adjust to maximum volume level. Verify the presence of a 100 Hz tone on the side-panel speaker for the Line 2 dropped channel (Channel 01).
14. **SIGNALING INSERT switches**
Press A, B, C, and D switches and verify the corresponding signaling LED illuminates for Line 2.
15. **BPV ERROR INSERT switch**
Press this switch three times. Three BPVs should register in the n25 BPVS results.
16. **RESTART switch**
Press **RESTART** switch to clear alarms and begin the test.
17. **FRAME ERROR INSERT switch**
Press this switch three times. Three frame errors should register in the n30 F-SM ERR result.
18. **RESTART switch**
Press **RESTART** switch to clear alarms and begin the test.
19. **YELLOW ALARM ERROR INSERT switch**
Press this switch. Verify the LINE 2 Yellow Alarm Local Status LED illuminates. Press the switch again to turn on the Yellow Alarm. Verify the Yellow Alarm Local Status LED illuminates.
20. **INSERT (TX) switch**
Select NONE.
21. **LINE 1 & 2 jacks**
Remove the cable connected from the LINE 1 TRANSMIT jack to the LINE 2 RECEPTIVE jack. Connect a cable from the LINE 1 TRANSMIT jack to the LINE 1 RECEPTIVE jack.
22. **RESTART switch**
Press **RESTART** switch to clear alarms and begin the test.

23. Repeat steps 10 to 19 (transposing LINE 1 and LINE 2)

After determining that the T-BERD 224 LINE 1 and LINE 2 interfaces are functioning properly, disconnect the cables. The T-BERD 224 is ready for testing.

2.6 IN CASE OF DIFFICULTY

If the T-BERD 224 fails to operate and no front-panel indicators are illuminated:

- Check the AC power cord to ensure that it is securely connected.
- Make sure that the power supply is operating by plugging another electrical device into the electrical outlet used by the T-BERD 224.
- Verify a proper working AC line fuse is installed.

If the T-BERD 224 still fails to operate, contact TIC's Customer Service Department at 1-800-538-2040.

If the front-panel indicators illuminate, but the instrument does not operate properly, note the procedures that failed and contact TIC for assistance.

2.7 AC LINE FUSE REPLACEMENT

The T-BERD 224 AC line fuse is located in the AC fuse compartment just below the Power switch. If the fuse is blown, it should be replaced with a 1.6 Amp, 250V, Slow-Blow (Time-Delay) fuse (Littelfuse #21801.6 or its equivalent). A spare fuse is located inside the fuse compartment. Always use the correct fuse rating.

1. Disconnect the power cord from the power receptacle.
2. Locate the tab on the power switch receptacle.
3. Using a small screwdriver or similar instrument, gently pry the fuse cover open.
4. Remove the old fuse and install a new fuse of the correct size.
5. Press the plastic fuse holder securely back into place.

SECTION 3 INSTRUMENT DESCRIPTION

3.1 INTRODUCTION

Use this section as a test reference and as a guide to understanding the functions of the T-BERD 224. The controls, indicators, and connections of the mainframe and each of the options are described in the following order (see Figure 3-1):

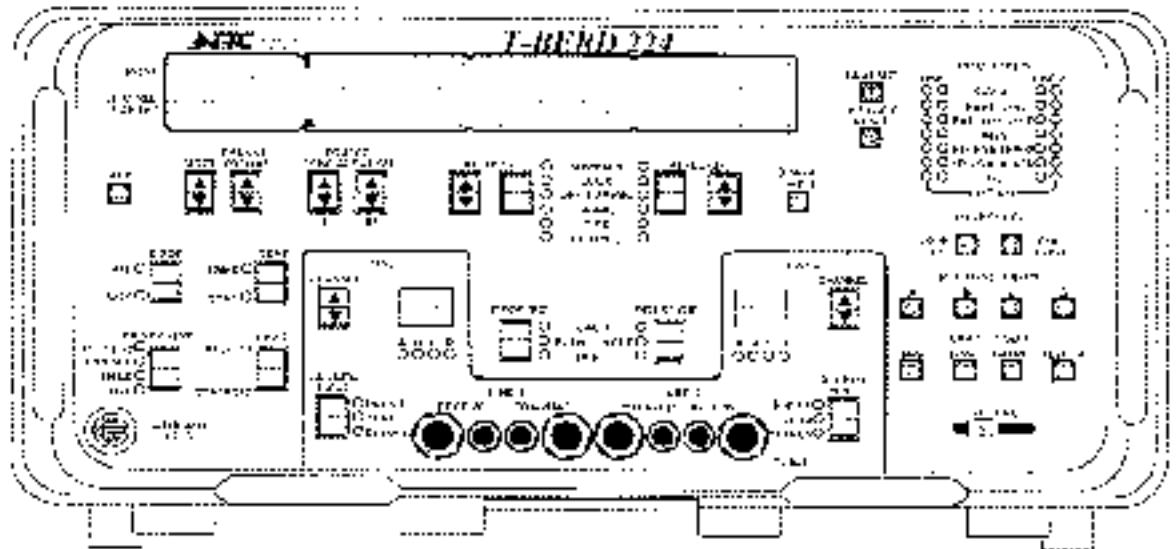


Figure 3-1. T-BERD 224 Front Panel

- Mainframe and T1-BERD Option
- Fractional T1 Option
- DDS Option
- SLC Option
- ESE² Option
- Smart Loopback/Command Codes Option
- VF Option
- Signaling Option
- Call-ID Option
- Analog Bearer (ASB) Option
- SST Option
- TRM Option
- Selective Call Forwarding (SCF) Option
- QSI/SP Option
- ZBT/SI Option

NOTE

Unless indicated, the capabilities of the mainframe T-BERD 224 are applicable to the options.

The controls, indicators, and connections are grouped into the following functional areas:

Test Setup --- Describes the switches used to configure the (BIRD 22) for testing.

Circuit Connections --- Describes the connections and switches used to provide access to the circuit being tested.

Results Verification --- Explains how to start a test and how to view, adjust, and analyze the test results.

Troubleshooting Controls --- Describes the switches that are used to troubleshoot the circuit.

Printer Controls --- Explains how to manually or automatically generate printouts.

NOTE

Throughout this section, a number appears in brackets () after each control name. These numbers match the callouts in the figures. Use these numbers to quickly locate switches, indicators, and connections on the front panel.

MAINFRAME AND T1 BERT OPTION

3.2 TEST SETUP

Test setup switches configure the T-GERD 224 for T1 testing (see Figure 3-2).

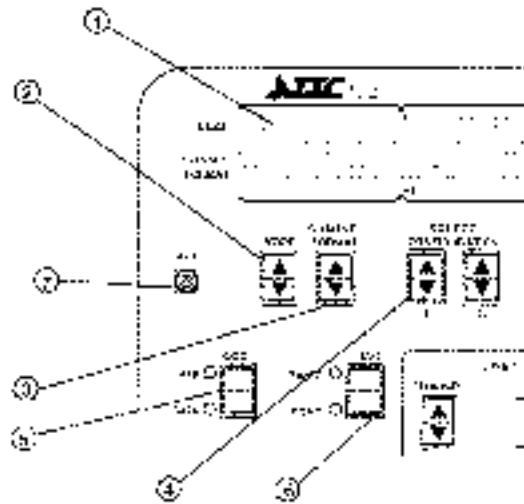


Figure 3-2 Test Setup Controls

Table 3-1 shows the available **MODE**, **CHANNEL FORMAT**, and **SOURCE CONFIGURATION (SRC)** switch settings.

Table 3-1. Mainframe and T1 BERT Switch Configuration

| Switch | Configuration | |
|----------------|---|---|
| MODE | AUTO, T1, T1-DUAL, T1-DUAL-D4, T1-E8T, SLC-D7D, SLC-M2, T1SLC76, T1 T1.5, T1 FLB, EN1EN | |
| CHANNEL FORMAT | VF | FEET T1 |
| SRC | 10B11z, VF INTL, DROP CHAN | AUTO, MULTIP, BRIGGAR, ALL ONES, ALL ZEROS, OVER, MIN MAX, 2500, 2520, 255 L, 255-INV, QRSS, 2 IN 8.2 IN 24, 27 |

NOTE

A top panel is located in the storage bench. Use the help card as a quick test reference.

3.2.1 Front-Panel Display [1]

The front-panel display is an 80-character, green vacuum fluorescent display used to view instrument setups, test results, and auxiliary functions. It is divided into four windows. The first window is controlled with the **MODE** and **CHANNEL FORMAT** switches, the second with the **SOURCE CONFIGURATION** switches, and the two remaining with the **RESULTS** switches. Auxiliary functions use all four windows.

3.2.2 **MODE Switch [2]**

The **MODE** switch configures the T-BERT 224 to the framing on the line (see Table 3-1). Modifying the **MODE** switch selection:

- Causes a test reset.
- Changes the frame synchronization parameters and the transmitted frame pattern.
- Disables the insert function for 3 seconds if the **INSERT (TX)** switch is set to LINE 1 or LINE 2.

The **MODE** switch selections include:

AUTO — Automatically configures the unit receivers and transmitters to incoming framed and unframed T1 signals.

In **AUTO** mode, *sync* is displayed while the unit identifies the received framing mode. If frame synchronization is as needed, the detected mode is displayed in lowercase letters as indicated in Table 3-2.

Table 3-2. AUTO Mode Selection

| T1 Signal Format | AUTO Mode Selection |
|------------------|---------------------|
| DD | dd |
| DC | dc |
| DI | di |
| DSF | dsf |
| ZBTM | zbtm |
| SLC 96 | slc96 |
| SLC 96 | slc96 |
| Unframed | U |

AUTO mode is performed concurrently on LINE 1 and LINE 2. The T-BERT 224 tries to synchronize to the LINE 1 input. If framing synchronization is achieved, the green LINE 1 Frame Sync LED illuminates, the detected mode appears in lowercase letters, and the T-BERT 224 tries to synchronize to the same frame format on LINE 2. If LINE 2 frame format is not the same as LINE 1, then the green LINE 2 Frame Sync LED does not illuminate. If the T-BERT 224 does not achieve synchronization with LINE 1, LINE 2 is analyzed for framing synchronization. If synchronization is achieved with LINE 2, the green LINE 2 Frame Sync LED illuminates and the detected mode appears in lowercase letters. If synchronization is not achieved for either line, *sync* continues to appear on the display. This process continues until synchronization is achieved or **AUTO** mode is exited.

NOTE

When an interface signal is recognized, *U* appears in the Mode display and *P11171* appears in the Channel Format display.

T1 — Enables the T-BERT 224 to transmit and receive unframed T1 data for testing unframed T1 circuits or those with proprietary framing formats.

When the **T1** mode is selected, *P11171* appears in the CHANNEL FORMAT display and all other channel formats are disabled.

NOTE

When testing unframed T1 lines, the following controls and indicators are disabled: Frame Sync LED, Yellow Alarm LED, **FRAME ERROR INSERT** switch, **YELLOW ALARM INSERT** switch, and signaling drop and insert test points and switches.

- T1-D1D** — Provides standard D4 framing used for channel banks with D1D channel sequencing.
- T1-D2** — Provides standard D4 framing used for channel banks with D2 channel sequencing.
- T1-D4** — Provides standard D4 framing used for channel banks with D4 channel sequencing.
- T1-ESF** — Uses an extended superframe (24 frames) to provide a Cyclic Redundancy Check (CRC) for improved in-service testing.
- SLC-D1D** — Operates with the B, C, and D shelves of Model 1 SLC-96 systems.
- T1SLC96** — Operates on the A shelf using SLC-96 formatting. When the T-BFRD 224 is used as the signal source, the datalink bits are all set to zero. The datalink can be analyzed further with the Enhanced ESD/SIC Option.
- SLC-M2** — Operates on the A shelf using Model 1 SLC-96 formatting. When the T-BFRD 224 is used as the signal source, the datalink bits are all set to zero. The datalink can be analyzed further with the Enhanced ESD/SIC Option.
- ESF/D4** — Provides independent Line 1 and Line 2 monitoring of signals across an ESD/D4 converter. Enables the T-BFRD 224 to monitor an ESD signal on Line 1 and simultaneously monitor a D4 signal on Line 2. This mode can be used to verify the conversion from ESD to D4 (or D4 to ESD) framing is successful. When in the ESD/D4 mode, the **CODE** switch allows **BWZ** coding to be removed or inserted. Unframed data can be accepted, but frame errors and yellow alarms cannot be inserted into the unframed data stream.
- T1-TLB (Test Loopback)** — Loops data from each line receiver to the opposite line transmitter while monitoring each input for D4 and channel results. In this mode, the T-BFRD 224 source incoming BFWs and does NOT allow the T-BFRD 224 to insert test signals. However, the T-BFRD 224 can insert BFWs, frame errors, and yellow alarms into one of the framed data streams. The **CODE** switch allows **BWZ** coding to be removed or inserted. Unframed data can be accepted, but frame errors and yellow alarms cannot be inserted into the unframed data stream.
- T1-LLB (Line Loopback)** — Loops data from each line receiver to the opposite line transmitter. Each input is monitored for D4 and channel results, but data is unaffected by the T-BFRD 224. In this mode, BFWs are not striped and errors cannot be inserted.
- In TLB and LLB modes the T-BFRD 224 attempts to synchronize to a framing format, but it does not indicate the framing format. If the T-BFRD 224 recognizes a framing format, the Frame Sync LED illuminates.

3.2.3 CHANNELFORMAT Switch [10]

The **CHANNELFORMAT** switch selects the voice or data channel format. Pressing **CHANNELFORMAT** allows to select either voice or data channel formats.

Modifying the **CHANNELFORMAT** switch selection:

- Causes a test restart.
- Disables the insert function for 2 seconds if the **INSERT (TX)** switch is set to LIN E1 or LIN E2.
- May change the available **SOURCE CONFIGURATION I and II** switch selections.

Channel format selections are:

FULL T1 — Enables the T-BERT 224 to test the full T1 signal to any male

VF (Voice Frequency) — Use when testing voice frequency circuits. This selection enables the internal speaker, **SIGNALING INSERT** switches, VF channel measurements, and specific drop and insert source configurations.

3.2.4 SOURCE CONFIGURATION I Switch, [4]

The **SOURCE CONFIGURATION I** switch selects specific tones/data to be inserted into the specified channels (see Table 3-1).

Modifying the **SOURCE CONFIGURATION I** switch selection:

- Causes a test restart.
- Modifies the drop and insert source for the channels selected using the **CHANNEL**, **DROP (RX)**, and **INSERT (TX)** switches.

In VI, the **SOURCE CONFIGURATION I** switch selects the signal, internal or external, to be analyzed. The channel(s) are selected with the **CHANNEL**, **DROP (RX)** and **INSERT (TX)** switches. **SOURCE CONFIGURATION I** selection availability depends on the **MODE** and **CHANNELFORMAT** switch selections. The selections are:

1004 Hz — Allows the insertion of a digitally-encoded 1004 Hz, 9-dBm sine wave that is suitable for VF testing.

VF INTF (VF Interface) — Enables the side panel 2- or 4-wire VF interface as the drop and insert source. A selected drop channel is decoded and output to the side panel connector. Tones from the external VF signal source are inserted into the selected channel.

DROP CHAN (Dropped Channel) — Provides a channel loopback and allows a channel which is dropped from one line to be re-inserted into a selected channel on the opposite line. The dropped channel is provided to the side panel 2-wire and 4-wire VF interfaces. When **DROP CHAN** is selected and the **CHANNEL** switch for the dropped line is set to ALL, true slot 1 is dropped.

In FINE T1, the **SOURCE CONFIGURATION I** switch selects test patterns. All patterns, except BRIDGEPAT and MULTIPAT, can be used in any framed or unframed operating mode. No patterns are transmitted in the T1 T1B, or T1 L1B modes. However, logic results can be obtained for these modes if frame and pattern synchronization are achieved. Changing test patterns always causes a test restart. The selections are:

AUTO — **Automatic Pattern Search** — Enables the T-BERT 224 to automatically search for and identify a known test pattern on the dropped line. If the **DROP (RX)** switch is set to DOTS, only LINE 1 is searched. If a pattern match occurs, the pattern name appears in the **SOURCE CONFIGURATION I** display in lower case characters. While displaying AUTO, the T-BERT 224 transmits a callow pattern. Once the received pattern is recognized, the T-BERT 224 transmits the pattern on the inserted line. If the received pattern is not recognized or the signal received is MUTE, MUTE is replaced with the word MUTE.

When testing DCIS circuits, the AUTO mode only applies when it is receiving live data.

MULTIPAT — Transmits five consecutive test patterns: ALL ONES, 17 7 IN8, 3 IN24, and QRSS. This automated test pattern sequence is used during the acceptance testing of a new T1 span or while troubleshooting an existing T1 span.

When MULTIPAT is selected, a test restart occurs and the pattern is transmitted. As each pattern is transmitted, it is identified in the display in lowercase letters. The MULTIPAT test takes approximately 15 minutes with one pattern transmitted for three minutes. MULTIPAT is only available in the FULL T1 channel format.

BRIDGTAP — Transmits 21 one-second test patterns: ALL ONES, 1:1, 1:3, 1:5, 1:6, 1:7, 2:8, 2:9, 2:10, 2:11, 2:12, 2:13, 2:14, 3 IN 8, 3 IN 18, 3 IN 19, 3 IN 20, 3 IN 21, 3 IN 22, 3 IN 23, 3 IN 24, and QRSS. This automated test pattern sequence is used during initial installation to identify bridge taps or stress the T1 span during routine maintenance. When a bridge tap exists on the line, reflections occur during the transmission of data which interfere with the performance of the T1 span. BRIDGTAP.

When BRIDGTAP is selected, a test restart occurs and the pattern is transmitted. As each pattern is transmitted, it is identified in the display in lowercase letters. The BRIDGTAP test takes approximately ten minutes. BRIDGTAP is only available in the FULL T1 channel format.

ALL ONES — Provides a fixed test pattern of all ones (AMJ pulse). This pattern is generally used to stress span repeater current regulator circuits. It can also be used as an AIS in unframed circuits, a keep alive signal, or a idle code. This pattern is required to measure the T1 signal power in dBm (in 42 KX LVL results).

ALL ZEROS — Activates the BERD 224 to test T1 circuits for B8ZS clear channel capability (CCC). The CODE switch would be set for B8ZS when sending the ALL ZEROS pattern. The pattern can be transmitted framed or unframed, or with the T1 Sby mode selected.

USER — **User Programmable Bit Pattern** — Enables the BERD 224 to transmit a 3- to 24-bit user programmable test pattern, which can be used to test a circuit's sensitivity to a particular pattern. The pattern is entered in binary form using a MAX 15 USER function.

MIN/MAX — **Minimum/Maximum Density Stress Pattern** — Generates rapid transitions from low one density words to high one density words. This pattern is used to test the ability of repeaters to adjust to rapid changes in one density.

2²³-1 — **8,388,607-Bit Pseudorandom Pattern** — Generates a maximum of 23 sequential zeros and 23 sequential ones. The pattern exceeds cycle zeros and does not meet the minimum ones density requirements for T1 applications.

2²⁰-1 — **1,048,575-Bit Pseudorandom Pattern** — Generates a maximum of 19 sequential zeros and 19 sequential ones. The pattern exceeds cycle zeros and does not meet the minimum ones density requirements for T1 applications.

2¹⁵-1 — **32,767-Bit Pseudorandom Pattern** — Generates a maximum of 14 sequential zeros and 15 sequential ones. The pattern provides a maximum number of zeros allowed for framed, non-B8ZS testing. The pattern does not meet the minimum ones density requirement.

2¹⁵-1 INV — **Inverted 32,767-Bit Pseudorandom Pattern** — Generates a maximum of 15 sequential zeros and 14 sequential ones. The pattern provides a maximum number of zeros allowed for framed, non-B8ZS testing. The pattern does not meet the minimum ones density requirement.

QRSS — **T1 Quasi-Random Signal Source Pattern** — Simulates real T1 data. The QRSS is a variation of 2²³-1 pseudorandom bit code and allows a maximum of 15 sequential zeros and 23 sequential ones. The **DATA DENSITY TESTED** message is visible when this pattern is transmitted.

2 IN 8 — **Two Ones in 8-Bits Pattern** — Provides a fixed test pattern of 0010000001. This pattern is generally used to test mis-spliced equipment for B8ZS encoding. The pattern is aligned with the framing (0) bits as indicated.

3 IN 24 — **Three Ones in 24-Bit Pattern** — Stresses the minimum ones density (1.2%) and the maximum zeros (3.9%) problem of T1 circuits. 3 IN 24 is a fixed test pattern of 000000000000000000000001. The pattern is aligned with the framing (0) bits as indicated. When the pattern is framed at least three ones must appear in three 8-bit words where n = 1 to 23.

T17 — A One and Seven Zeros Pattern — Stresses the minimum 12.5% ones density requirement for T1 circuits using AMI coding. T17 is a fixed test pattern of F010990000... The pattern is aligned with the framing. F0 bits are unencoded.

The following patterns are available through the Advanced Stress Patterns Option:

T1-2/TRIP — Provides a fixed 96-octet HEX pattern used to stress test T1 circuits and equipment.

T1-3 — Provides a fixed 54-octet HEX pattern used to stress test T1 circuits and equipment.

T1-4 — Provides a fixed 126-octet HEX pattern used to stress test T1 circuits and equipment.

T1-5 — Provides a fixed 55-octet HEX pattern used to stress test T1 circuits and equipment.

T1-6/55 OCT — Provides a fixed unframed 55-octet HEX pattern and a variant of the MIN/MAX repeat stress pattern used to test the repeaters' ability to lock onto the incoming clock when the data changes from high ones density to low ones density.

T1-BALY — Provides a fixed framed 55-octet HEX pattern used with framed T1 circuits without causing excess zeros (excess zero is more than 15 consecutive zeros). This pattern is a variant of T1-5.

3.2.5 CODE Switch [5]

The **CODE** switch selects the line coding the T-BERT 224 uses when transmitting or receiving a T1 signal. The LEDs to the left of this switch flash once to indicate the selected coding.

NOTE

When in the LSI-D1 mode, the **CODE** switch is disabled. The code must be set using the AUX 321X CODE function for each of the lines.

AMI (Alternate Mark Inversion)

B8ZS (Bipolar with 8 Zero Substitution) — When receiving a T1 signal, B8ZS decoding is automatic, regardless of the **CODE** switch selection, but if B8ZS code is received while set for AMI, **B8ZS DETECTED** flashes on the display.

3.2.6 TEST Switch [6]

The **TEST** switch controls test duration. CONTINUOUS selects an unlimited test duration. TIMED enables the user to conduct a time-limited test of up to 200 hours, 59 minutes, 45 seconds.

NOTE

Changing from CONT to TIMED causes a test reset and displays 00:00:00 on the **STOP/AVAIL/TEST/TIME/HH:MM:SS** LED. To set a test duration, set the test mode applicable to CONT or TIMED, change the CONT or TIMED to CONT or TIMED, and then use the **TEST** switch to set the test duration.

3.2.7 AUX Switch...172

Press the **AUX** switch to access the auxiliary functions, which allow access to parameters that are less frequently used and do not have dedicated switches. The LED within the switch illuminates when the auxiliary functions are accessed. Press the **MODE** switch to scroll through the auxiliary functions.

Refer to Section 4 for detailed information on the following mainframe and T1 BERT auxiliary functions. There are, however, auxiliary functions listed without specific options indicated by parenthesis (e.g., SS7 Call Trace). For clarification of those auxiliary functions within those options, refer to their sections within the referenced manual:

- AUX 01 CLEAR FREQ — Clear Front FREQ
- AUX 02 TIM PRI — Timed Print Event
- AUX 03 TTS LEN — Timed Test Length
- AUX 04 TIM DAY — Clock Time and Date
- AUX 05 LBO — Line Band Out
- AUX 06 BACK TM — Backup Timing Source
- AUX 07 DSO TM — DSO Interface Timing (*DSU DP Option*)
- AUX 08 RS 232 — RS 232 Configuration
- AUX 09 488 MODR — 488 Mode and Address (also *T1 Bert Option*)
- AUX 10 N-CONTG — Non Continuous Channel (*DSU DP* and *Functional T1 Option*)
- AUX 11 ANL CHA — DSO DP Analysis Channel (*DSU DP Option*)
- AUX 12 ERR COR — DSOA Error Correction (*DSU DP* and *DDS Option*)
- AUX 13 TRRRT — Error Rate (*T1 Bert Option*)
- AUX 14 FRM ERR — Frame Error Insertion (*T1 Bert Option*)
- AUX 15 USER — User Programmable Test Pattern (*T1 Bert Option*)
- AUX 16 PGM LSP — Programmable Loop Codes (*T1 Bert Option*)
- AUX 17 LOP CD — Loop Codes (*T1 Bert Option*)
- AUX 18 AUT RES — Automatic Loop Code Response (*T1 Bert Option*)
- AUX 19 DDS CHN — DDS Analysis Channel and Secondary Channel Pattern (*Model Option*)
- AUX 20 PRM TX — PRM Transmission (*Functional T1 Option*)
- AUX 21 VF SWEEP — Sets Sweep Parameters of VF Burst Function.
- AUX 22 VF BURST — Sets Frequency and Level of VF Burst Function.
- AUX 23 PRG OPT — Print Option for Frequency Sweep
- AUX 24 TRK DEF — Trunk Type Definition (*Signaling Option*)
- AUX 25 DIG MAR — Digit Marking (*Signaling Option*)
- AUX 26 DIAL SEQ — Dial Sequence (*Signaling Option*)
- AUX 27 REC SEQ — Receive Sequence (*Signaling Option*)
- AUX 28 DEF SUPV — Define Supervision Events (*Signaling Option*)
- AUX 29 CHN ANSL — Channel Signaling Setup Selection (*Signaling Option*)
- AUX 30 S-ANSL — Channel Signaling Setup Selection (*SS7 Option*)
- AUX 31 DSO CHN — DSO Analysis Channel and Secondary Channel Pattern (*DDS Option*)
- AUX 32 CHN ID — Channel ID Signaling Selection (*SS7 Option*)
- AUX 33 SUPV DEF — Supervision Event Coding
- AUX 34 CUSRUM — Custom Results
- AUX 35 TRC RES — Sets Trace Result (*SS7 Call Trace Option*)
- AUX 36 TRC CR — Sets Call Trace Criteria (*TR-503 Option*)
- AUX 37 PRI TRC — Sets Call Trace Criteria (*Error Rate ENO Option*)
- AUX 38 SS7 TRC — Sets Call Trace Criteria (*SS7 Option*)
- AUX 39 HELP — Describes Custom Message (*TR and TR-503 Option*)

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3.3 CIRCUIT CONNECTIONS

The circuit connections control's configure the T-Block 224 for T1 testing (see Figure 3-3).

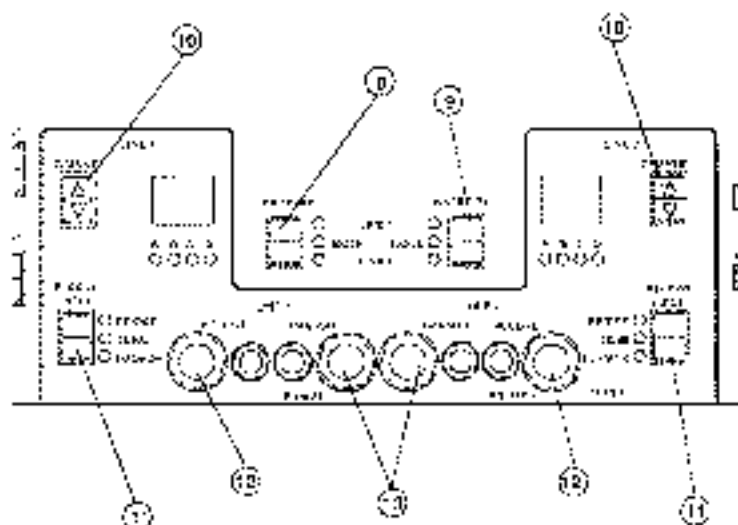


Figure 3-3. Circuit Connections Controls

3.3.1 DROP (RX) Switch [8]

The **DROP (RX)** switch selects the T1 source(s) to be received for testing. The illuminated LED to the right of the **DROP (RX)** switch indicates the T1 line selected. Modifying the **DROP (RX)** switch selection causes a test restart. **DROP (RX)** switch selections are:

- LINE 1** — Selects LINE 1 as the source from which the data is received.
- BOTH** — Selects both lines as the source to be received.
- LINE 2** — Selects LINE 2 as the source from which the data is received.

3.3.2 INSERT (TX) Switch [9]

The **INSERT (TX)** switch selects the T1 line in which data and errors are transmitted. The illuminated LED to the left of the **INSERT (TX)** switch indicates the selected T1 line. After a power loss, the **INSERT (TX)** switch is always reset to NONE. **INSERT (TX)** switch selections are:

- LINE 1** — Selects LINE 1 for insertion of data and errors.
- NONE** — Selects neither line for data and error insertion.
- LINE 2** — Selects LINE 2 for insertion of data and errors.

If the **INSERT (TX)** switch is set to NONE, no test data is transmitted. If the **INSERT (TX)** switch is set to LINE 1 or LINE 2, the data is transmitted into the selected line and an idle code (ALL ONES) is transmitted into the opposite line. The T1 data clock is defined in the AUX 96 BACK IM function.

NOTE

The T1 BURD 224 cannot act as the T1 signal source if a T1 signal is being received (RECEIVED) on the line selected by the **INSERT (TX)** switch.

Changing the **INSERT (TX)** switch selection from NONE to LINE 1 or LINE 2 inserts data, user-selected errors, and signaling bits (if applicable) three seconds after the switch is released. During this 3-second delay, the selected channel number flashes on the **CHANNEL** switch display. Changing the **MODE**, **CHANNEL FORMAT**, **SOURCE CONFIGURATION I** and **II**, **INSERT (TX)**, and **CHANNEL** switches for the line being inserted on (LINE 1 or LINE 2) causes the insertion to be reset and also disables insertion for 3 seconds. Changing the **INSERT (TX)** switch from LINE 1 or LINE 2 to NONE immediately aborts the insert function.

3.3.3 LINE 1 & 2 CHANNEL Switches [10]

The **LINE 1** and **LINE 2 CHANNEL** switches are available on the **VF CHANNEL FORMAT** and select the channel to be monitored or tested. The selected channel number is visible in one of the two seven-segment **CHANNEL** displays. Pressing the up arrow increments the displayed channel number; pressing the down arrow decrements the channel number. If a **CHANNEL** switch is pressed and held for more than one second, the channel number scrolls until the switch is released. **LINE 1** and **LINE 2 CHANNEL** switch selections are:

1 to 24 — Displays the channel number selected for testing.

ALL — Available only for the **LINE 2 SOURCE CONFIGURATION I** switch selection. Inserts the 1934 Hz tone in all channels (1-24) on the line set with the **INSERT (TX)** switch.

When the **CHANNEL FORMAT** switch is set to **TULI, TL**, the **CHANNEL** switch number is displayed as "—".

3.3.4 LINE 1 & 2 RECEIVE INPUT Switches [11]

The **LINE 1** and **LINE 2 RECEIVE INPUT** switches determine the input impedance and signal conditioning for the corresponding receiver. Modifying the **RECEIVE INPUT** switch selection causes a test restart.

RECEIVE INPUT switch selections are:

BRIDGE — Select when the monitored line is already properly terminated. When **BRIDGE** is selected, greater than 1000 ohms input impedance and **ALBO** (Automatic Line Build Out) compensation is provided. **ALBO** automatically adjusts for up to 35 dB of cable loss.

TERM — Select when the monitored line is terminated to the **RECEIVED** 112 ohm **RECEIVED** impedance, 160 ohm input impedance and **ALBO** compensation is provided. **ALBO** automatically adjusts for up to 35 dB of cable loss.

DSX MON — Select when a new signaling signal at DSX signaling is used. **ALBO** compensation is provided. **ALBO** automatically adjusts for up to 35 dB of cable loss. **ALBO** compensation is provided. **ALBO** automatically adjusts for up to 35 dB of cable loss.

3.3.5 LINE 1 & 2 RECEIVE Jacks [12]

Two **RECEIVE** jacks are provided for each line: a WECC 310 and a banana. The connectors can be used simultaneously to accept a T1 signal input.

3.3.6 LINE 1 & 2 TRANSMIT Jacks [13]

Two TRANSMIT jacks are provided for each line: a WECO 304 and a hamper. The connectors simultaneously provide transmit output. The transmitted signal is passed through a switchable line build-out circuit. The AUX 05 LBO function determines the amount of line build-out applied.

3.3.7 Side-Panel Connections

The following connectors, illustrated in Figure 3-4, are located on the T-BERT 224 side panel.

3.3.7.1 DS0 INTF Jacks

The DS0 INTF jack provides two output jacks for external access to bipolar, 64 kbps DS0 signals within the T1 bit stream data. The T-BERT 224 requires the DDS Option to use this interface. The TX IN jack is used to insert a 64 kbps DS0 signal into a channel designated by the front panel **INSERT (TX)** and **CHANNEL** switches. The RX OUT jack is used to drop a 64 kbps DS0 signal from a T1 as designated by the front panel **DROP (RX)** and **CHANNEL** switches. These jacks are commonly used by external KS-type test sets for testing DDS circuits from a T1 access point. The DS0 interface is electrically identical to DS0-DP interfaces on channel bank cards.

3.3.7.2 TEST PTS. Connector

The 37-pin D-type TEST PTS. connector provides TTL access to 22 test points. The test points have a one-to-one correspondence to the front panel indicators and can be used to trigger external equipment when alarm conditions occur. For additional information on the TEST PTS. connector pin designations, refer to Section 8.

3.3.7.3 4-WIRE VF Interface Jacks

Two WECO 304 jacks with 60 ohm termination provide 4-wire VF access to a digitally encoded VF channel. This interface allows analog VF test sets, which were traditionally only used at analog test points, to access VF information at a T1 access point. The 4-WIRE VF interface converts analog signals received at the input connector into digital signals suitable for transmission on the T1 span. VF channels from the digital T1 bit stream are converted into analog VF signals at the output connector.

3.3.7.4 VF 2-WIRE INTF Terminals

These two barrel type tests provide 2-wire test access to a digitally encoded VF channel. Using an external hub set, users can connect to the interface, send DTMF digits, and talk to another party.

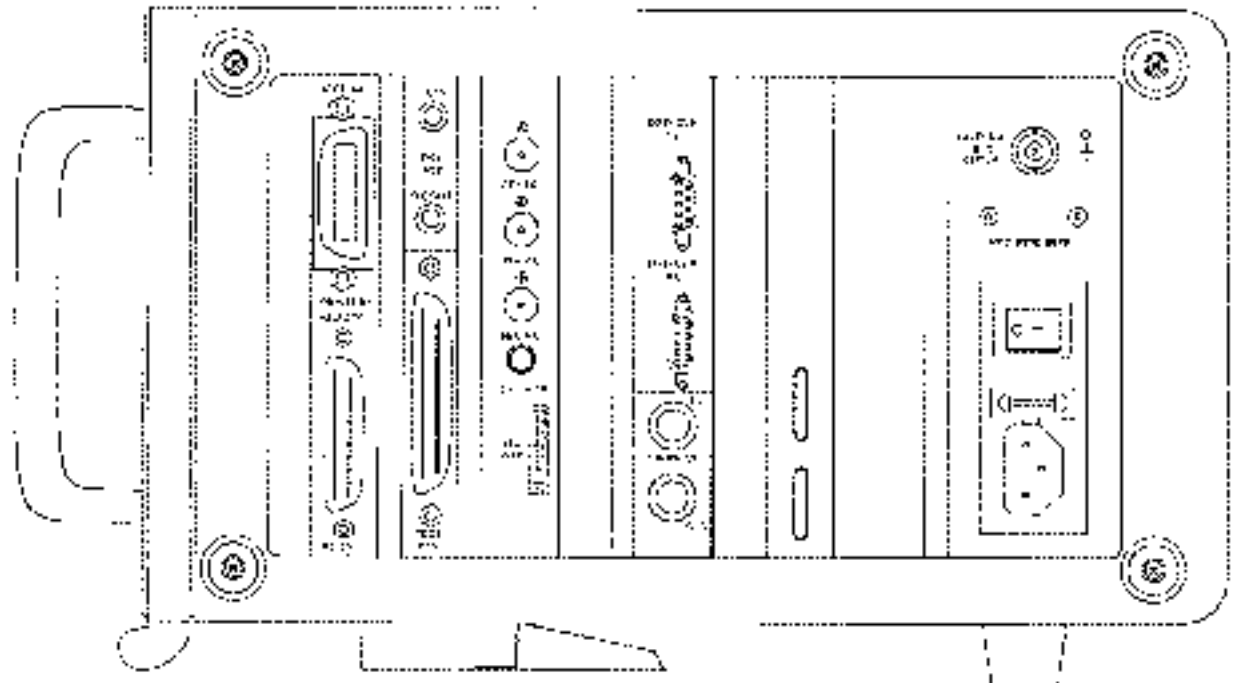


Figure 3-4. Side-Panel Connections

3.3.7.5 EXTERNAL BNC CLOCK Connector

This BNC connector provides an AC-coupled input impedance of 75 ohms for an external T-1 clock source. Often you provide the reference clock source for measuring timing slips. The backup clock source is selected via the AUX BACK 1M function.

3.4 RESULTS VERIFICATION

Once the T-BERD 224 is configured and connected to the circuit, use the following switches and LEDs to initiate the test and collect test results (see Figure 3-5).

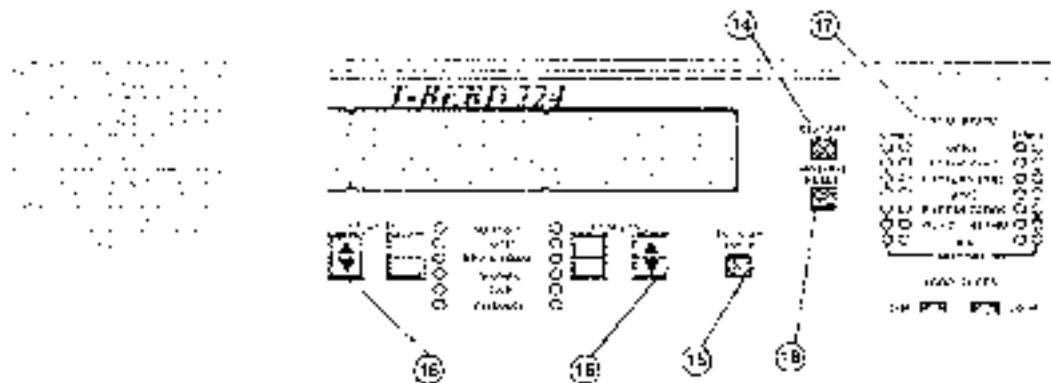


Figure 3-5. Results Verification Controls and Indicators

3.4.1 RESTART Switch [14]

The **RESTART** switch initializes all logical stages and history LEDs and resets all results to zero. Pressing and holding this switch during a power-up clears Non-Volatile RAM (NOVRAM) and sets all the parameters to their default factory settings, as listed in Appendix A.

The following actions cause a test restart:

- Pressing a major switch: **MODE**, **CHANNELFORMAT**, **RECEIVE INPUT**, **DROP (RX)**, and **CHANNEL**
- Changing the **TEST** switch from **CONT** to **TIMED**
- Changing the **AUX** or **TEST/EN** function when the **TEST** switch is set to **TIMED**

3.4.2 DISPLAY HOLD Switch [15]

The **DISPLAY HOLD** switch freezes the displayed results, Logic Status LEDs, and History LEDs. The switch LED illuminates when it is enabled. During a display hold, the **RESULTS** switches can be used to scroll through the results; the results continue to accumulate in the background, a test restart can be performed, and a results printout can be generated to report the current values. When display hold is disabled, the results and LEDs are updated to reflect their current values. When display hold is enabled the **HISTORY RESET** switch is disabled.

3.4.3 RESULTS Switches [16]

The **RESULTS I** and **II** windows allow two sets of test results to be displayed simultaneously. Below each **RESULTS** window is a corresponding pair of **RESULTS** switches that select the category and test result. Results for LINE 1 or LINE 2 can be displayed in either **RESULTS** window.

Each pair of **RESULTS** switches consists of two rocker switches. The **RESULTS I** and **II Blank** switches select between the six result categories. The Illuminance LED next to a category label indicates that it has been selected. The **RESULTS I** and **II Arrowed** switches scroll through and display individual test result within the selected category.

A result number is assigned using an **XX** (X) iteration, **XX** is the LINE number (1 or 2) and **XX** (X) is the result number (00 to 110) for the indicated LINE. Refer to Section 2 for detailed descriptions of each category and test result.

NOTE

Changing **RESULTS** switches during a test will affect the test parameters.

3.4.4 Logic Status LEDs [17]

Four columns of LEDs, two columns for LINE 1 and two columns for LINE 2, indicate each TI input bus. The two inside columns provide the current status of the incoming TI signal; the two outside columns display the history status. The LEDs are color coded according to the message. Green LEDs indicate positive conditions (e.g., Beam by act) and red LEDs indicate history, alarm, or failure conditions (e.g., Signal Lost).

The Logic Status LEDs illuminate for a least 100 ms to indicate a condition. This short time allows users to see transient events. All status and alarm LEDs are frozen at the end of a timed test.

The Local Status LEDs indicate the following four conditions:

Both LEDs On — No occurrence of the corresponding condition, past or present.

Only Local Status LED On — The corresponding condition is presently occurring.

Only History LED On — The corresponding condition occurred but is not occurring now.

History LED On, Local Status LED On — The corresponding condition is occurring now and has also occurred in the past.

The following list identifies the conditions that illuminate the Local Status LEDs.

Signal — This green LED illuminates when the T-BERT 224 detects a T1 signal with frequency equal to $1.544000\text{ Hz} + 5000\text{ Hz}$ and a level greater than -35 dBm-0. The LED indicates at which RECEIVE input (LINE 1 or LINE 2) the signal is detected. The red History LED illuminates when no signal is detected for a period of 150 ms.

Frame Sync — This green LED illuminates when the T-BERT 224 achieves frame synchronization with the received T1 data stream. The LED indicates at which RECEIVE input (LINE 1 or LINE 2) the signal is detected. The red History LED illuminates when two out of four received frame bits are in error.

Pattern Sync — This green LED illuminates when the received test pattern is recognized by the T-BERT 224 and pattern synchronization is achieved on the dropped line. Pattern synchronization depends on receiving a given number of consecutive error-free bits for the specific test pattern.

NOTE

If the **DROP (RX)** switch is set to **BOTH**, only the Line 1 Local Status Pattern Sync LEDs are functional.

BZS — This green LED illuminates when the T-BERT 224 detects Bipolar 8 Zero Substitution (BZS) clean-channel coding. The LED indicates which receive input (LINE 1 or LINE 2) detected the BZS coding. The red History LED illuminates when the BZS code is no longer detected at the corresponding input. If the **CODE** switch is set to **AMI**, **BZS DETECT LED** flashes in the display when BZS coding is detected.

Excess Zeros — This red LED illuminates when the T-BERT 224 detects 15 or more consecutive zeros. The LED indicates at which RECEIVE input (LINE 1 or LINE 2) the excess zeros are detected. The red History LED illuminates when excess zeros are no longer detected.

Yellow Alarm — This red LED illuminates when the T-BERT 224 detects a yellow alarm. The LED indicates at which receive input (LINE 1 or LINE 2) the yellow alarm is detected. The red History LED illuminates when a yellow alarm is no longer detected. Neither the Status nor the History LEDs illuminate if the BERT 224 is not in frame synchronization with the received signal.

AIS — This red LED illuminates when the T-BERT 224 detects an AIS signal. The LED indicates at which receive input (LINE 1 or LINE 2) the AIS signal is detected. The red History LED illuminates when AIS is no longer detected.

3.4.5 HISTORY RESET Switch [18]

The **HISTORY RESET** switch clears all illuminated History LEDs. This switch does not restart a test, affect any of the current Local Status LEDs, or affect any accumulated test results.

3.5 TROUBLESHOOTING CONTROLS

During T1 circuit testing, it is often necessary to isolate problem (see Figure 3-6). Use the following switches to help sectionalize the span.

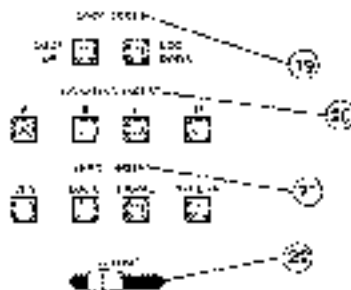


Figure 3-6. Troubleshooting Controls

3.5.1 LOOP CODES Switches. [19]

The **LOOP CODES** switches transmit loop-up and loop-down codes from the T-BERD 224 to terminals that can respond to T1 in-band and T1 out-of-band loop codes. The loop codes are used to establish an out-of-service loopback at specific terminals along the span. The loop code type is configured in the AUX17 LOOP CD function.

The **LOOP CODES** switches are disabled when the T1 T1B and T1 T1E modes are selected, the **INSERT (TX)** switch is set to NONE; the CHANNEL number display is flashing during the three second insert wait time; the T-BERD 224 is automatically responding to a loop code; the channel format is set to VP or T1 frame synchronization is not active.

The **LOOP CODES** switches perform the following functions:

LOOP UP switch Controls the transmission of the selected loop-up code. When the switch is pressed (LED ON), the loop code is transmitted until an appropriate response is detected, a pre-determined time-out interval is exceeded, or the **LOOP UP** switch is pressed again (LED OFF). During loop code transmission, the loop code name appears on the SOURCE CONFIGURATION LED SOURCE CONFIGURATION Displays. In-band T1 and DDS loop-up codes overwrite the selected data pattern. ESB out-of-band loop codes are transmitted in the datalink channel and do not overwrite the test pattern.

LOOP DOWN switch Controls the transmission of the selected loop-down code. When the switch is pressed (LED ON), the loop code is transmitted until the loop code is no longer received, a pre-determined time-out interval is exceeded, or the **LOOP DOWN** switch is pressed again (LED OFF). During loop code transmission, the loop code name appears on the SOURCE CONFIGURATION LED and SOURCE CONFIGURATION LED displays. In-band T1 and DDS loop-down codes overwrite the selected data pattern. ESB out-of-band loop codes are transmitted in the datalink channel and do not overwrite the test pattern.

3.5.2 SIGNALING INSERT Switches... [20]

The four **SIGNALING INSERT** switches control the logic state (one or zero) for each of the A, B, C, and D signaling bits transmitted in the selected insert channel. Pressing the **SIGNALING INSERT** switch illuminates the switch LED and causes a binary one to be inserted in the corresponding signaling bit position. Pressing the same signaling switch again extinguishes the LED and inserts a binary zero into the corresponding bit position. The following list describes the signaling bits associated with each operating mode.

- A and B signaling bits — T1-D10, T1-702, T1-D1, T1SLC96, and SLIC-D10
- A, B, C, and D signaling bits — T1-ESF and T1-ESF+
- Channel 6 — SLIC-M2

The **SIGNALING INSERT** switches are only applicable when the **CHANNEL FORMAT** switch is set to V1. They are disabled when the **INSERT (TX)** switch is set to NONE and when in the SLIC-M2 mode.

In T1SLC96 and SLIC-D10 modes, the T-BERD 224 provides three signaling insert states: *on*, *off*, and *toggle on and off*. If the **SIGNALING INSERT** switch is *off*, pressing it once for less than a second turns the switch *on*, sets the signaling bit to a logic one, and illuminates the LED continuously. Pressing and holding the switch on for more than a second places the signaling bit in the *toggle on* state and illuminates the LED intermittently. In the *toggle on* state, the signaling bit toggles between logic one and logic zero with every other superframe. Pressing the **SIGNALING INSERT** switch a second time inserts a logic zero into the signaling bit and extinguishes the LED. Modifying the selection of the **SIGNALING INSERT** switch does not affect the test in progress.

3.5.3 ERROR INSERT Switches... [21]

The functions of the **ERROR INSERT** switches include the following list. The LED illuminates to indicate when errors are being inserted.

- Single BPV (gap) and/or frame error insertion
- Burst or BPV (and/or logic errors) at specified lengths and insertion rates
- Continuous BPV (gap) and/or frame error insertion at specified insertion rates
- Consecutive frame error insertion
- Yellow Alarm insertion

The **ERROR INSERT** switches are disabled in the T1-LCB and AUTO LCB modes and when the **INSERT (TX)** switch is set to NONE. The **ERROR INSERT** switches perform the following functions:

BPV ERROR INSERT Switch — Inserts bipolar violations (BPV) of 100 ns or less into the data stream. If the BPV is inserted at the specified length and rate by the outgoing framing bit (T1-ESF/ESF+), the **BPV ERROR INSERT** switch performs the following functions:

Single BPV error insertion — If the AUX 15 ERROR KE function is set to SING, pressing the **BPV ERROR INSERT** switch for less than one second momentarily illuminates the LED and inserts a single BPV into the T1 data stream.

Burst of BPV errors — If the AUX 15 ERROR KE function is set to BURST, pressing the **BPV ERROR INSERT** switch for less than one second momentarily illuminates the LED and inserts a single burst of BPVs into the T1 data stream. The burst length and insertion rate are set by the AUX 15 ERROR KE function.

Continuous BPV error insertion — Pressing the **BPV ERROR INSERT** switch for more than one second illuminates the LED and inserts continuous BPVs into the TI data stream at the selected insertion rate. Pressing the **BPV ERROR INSERT** switch again disables the BPV error insertion (LED OFF). The error insertion rate is set by the AUX 13 ERR RT function.

LOGIC ERROR INSERT Switch — Inserts logic errors into the data stream of the selected TI line. Logic errors are inserted on any transmitted bits of the selected test pattern. In frame, operating modes with the FEED-TX channel format selected, unframed TI errors are present on the entire bandwidth (data and training bits). Frame synchronization is required at the TI level before logic errors can be inserted. In DDS, errors are only inserted on the selected test bandwidth. The **LOGIC ERROR INSERT** switch performs the following functions:

Single logic error insertion — If the AUX 13 ERR RT function is set to SINGLE, pressing the **LOGIC ERROR INSERT** switch for less than one second flashes the LED on and inserts a single logic error into the selected test bandwidth.

Burst of logic errors — If the AUX 13 ERR RT function is set to BURST, pressing the **LOGIC ERROR INSERT** switch for less than one second flashes the LED on and inserts a single burst of logic errors into the selected test bandwidth. The burst length and insertion rate are set by the AUX 13 ERR RT function.

Continuous logic error insertion — Pressing the **LOGIC ERROR INSERT** switch for more than one second illuminates the LED and inserts continuous logic errors into the selected test bandwidth at the selected insertion rate. Pressing the **LOGIC ERROR INSERT** switch again disables the logic error insertion (LED OFF). The error insertion rate is set by the AUX 13 ERR RT function.

NOTE

Logic errors and BPVs are inserted without regard to BSZS sequences. This may cause the same error multiplication (one inserted error causing multiple errors) that occurs on a repeat spot.

FRAME ERROR INSERT Switch — Inserts frame errors on the transmitted framing bits in the data stream of the selected TI line. The **FRAME ERROR INSERT** switch performs the following functions:

Single frame error insertion — If the AUX 14 FRM ERR function is set to SINGLE, pressing the **FRAME ERROR INSERT** switch for less than one second momentarily illuminates the LED and inserts a single frame error into the TI signal framing bits.

Burst of consecutive frame errors — If the AUX 14 FRM ERR function is set for two or six CONSECUTIVE frame errors, pressing the **FRAME ERROR INSERT** switch for less than one second momentarily illuminates the LED and inserts a single burst of consecutive frame errors into the TI signal framing bits.

Continuous frame error insertion — Pressing the **FRAME ERROR INSERT** switch for more than one second illuminates the LED and inserts continuous frame errors into the TI signal framing bits. Pressing the **FRAME ERROR INSERT** switch again disables the frame error insertion (LED OFF). The number of inserted frame errors is controlled by the AUX 14 FRM ERR function.

The **FRAME ERROR INSERT** switch is disabled when the **INSERT (TX)** switch is set to NONE. The **FRAME ERROR INSERT** switch requires frame synchronization.

YELLOW ALARM ERROR INSERT Switch — Inserts a continuous yellow alarm into the selected TI line. The LED momentarily illuminates when the switch is pressed. Pressing the switch again disables the yellow alarm insertion (LED OFF). For D10, D12, D4 and SEC 06 (Mode 1 and 2) training, bit 2 of every OSD is set to zero. For DST training, a repetitive pattern of eight ones and eight zeros is generated in the data link. The **YELLOW ALARM ERROR INSERT** switch requires frame synchronization.

3.5.4 VOLUME Control [22]

The **VOLUME** control adjusts the audio level of the T-BERD 224 internal speaker. Sliding the switch to the right increases the volume. The speaker is used to listen to voice or tone on a stopped channel.

The T-BERD 224 provides an audible beep when the **NO BIT ERR** or **NO ASYNCS** results are displayed and an entered second cycle error or loss of pattern synchronization occurs; or the **NO BLK** result is displayed and the timed test interval is complete.

3.6 PRINTER CONTROLS

The T-BERD 224 can generate a manual or automatic printout that provides a hard copy of the test results and the test set configuration. The following switches and connection are used to generate printouts (see Figure 3-7):

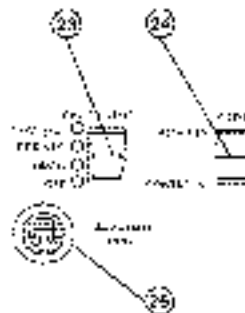


Figure 3-7. Printer Controls

3.6.1 PRINT EVENT Switch [23]

The **PRINT EVENT** switch selects the event that triggers an automatic results printout. All of the print event selections, except for **OFF**, print a status message if an alarm condition changes.

TEST END — If the **TEST** switch is set to **end**, this selection generates a time- and date-stamped results printout at the end of a timed test. The **AUX 03 TEST LEN** function sets the timed test length.

ERR SEC — Generates a time- and date-stamped results printout on the occurrence of **JMPV**, frame error, or **CR** error. If the selected error is disabled in the **AUX 35 CUSTOM** function, a results print is **NOT** generated.

TIMED — Generates a time- and date-stamped results printout if the specified time interval (**AUX 34 TIMED INT**) is selected. The message **NEW MESSAGE TO NEW PRINT EVENT TIME** is displayed in the right-most window. **AUX 03** sets the time interval for the printout.

OFF — Prevents generation of automatic results printouts. This selection does not affect the **PRINT** switch operation.

3.6.2 PRINT Switch [24]

The **PRINT** switch initiates a results or control printout. For more information regarding printer operation, refer to Section 6.

RESULTS - Pressing the switch up generates a date- and time-stamped printout of the current test results.

CONTROLS - Pressing the switch down generates a date- and time-stamped printout of the current test set configuration.

3.6.3 AUXILIARY PORT [25]

The **AUXILIARY PORT** 8-pin connector provides the serial data port that supplies power and signaling leads to the optional End Printer and signaling Orion Keypad L2L. It is connected in parallel to the RS-232 Printer/Control Interface, allowing data to be directed to both the side panel (RS-232) and the front panel connector (AUX port). The THERM 224 polls the connectors to determine which one has a device connected to it before initiating a printout.

3.6.4 PRINTER/REMOTE RS-232 Connector

The **PRINTER/REMOTE RS-232** connector is a 25-pin female D-type connector. It is configured as data communications equipment (DCE) to connect the THERM 224 to an external printer, terminal, modem, computer, or other asynchronous communications equipment. The AUX RS-232 function sets up the interface.

NOTE

A VTECCE crossover cable may be required to operate the THERM 224 with a modem.

FRACTIONAL T1 OPTION

3.7 INTRODUCTION

The T-BERD 224 Fractional T1 Option offers the following features and capabilities:

- Tests Fractional T1 circuits with over 20 different test patterns.
- Tests 64xN and 56xN Fractional T1 circuits.
- Transmits and receives to fixed and programmable Fractional T1 loop codes.
- Inserts single, burst, or continuous logic errors across Fractional T1 bandwidth.
- Measures round trip delay of any group of channels in the T1 circuit.
- Transmits enable code (AUX ONE) in the selected bandwidth at the opposite line to prevent inadvertent loopbacks.
- Enables the T-BERD 224 to replace and emulate a Fractional T1 CSF.
- **T1 BERT Option Required**

NOTE

Unless indicated, the capabilities of the mainframe and T1 BERT Option for the T-BERD 224 are applicable to the Fractional T1 Option.

3.8 TEST SETUP

The following test setup controls and indicators are affected by the Fractional T1 Option (see Table 3-3).

Table 3-3. Fractional T1 Option Switch Configurations

| Switch | Configuration |
|----------------|---|
| MODE | AUTO, T1 D, T1 ONE, T1 BUR, T1 LTB |
| CHANNEL FORMAT | 56xN, 64xN |
| SET | AUTO, ALL, ONE, ALL, ZI, ROS, USER, MIN/MAX, 2/23/2, 2/20/1, 2/15/1/2, 5/LIN, Q/NS, 1/NS, 3/IN 20, 1/3, 6/3, 7/1, 2/4, 1/NS, 1/NS, 1/NS, 1/NS |
| SET | N=1-24, N/A, CONTROL |

3.8.1 CHANNEL FORMAT Switch

In addition to the mainframe channel format code, the following codes are available:

56xN or 64xN — a set of monitoring or testing Fractional T1 circuits. Diagram and readback are available to 1 to 2 bits (56xN) or 1 to 8 bits (64xN) of any combination of contiguous or non-contiguous NSB channels. AUX TUN CONTROL function is applicable.

3.8.2 SOURCE CONFIGURATION.I Switch

The **SOURCE CONFIGURATION.I** switch selections include all the FULL T1 selections except BRDDC.FAP and MULTIPAT, which are only available in FULL T1. In addition, the Fractional T1 Option adds patterns 63, 511, 2047, DDS1, DDS2, DDS3, DDS4. No patterns are transmitted in the FULL T1B mode, but logic results can be obtained if frame synchronization is achieved and the received pattern matches the selected test pattern.

3.8.2.1 Fractional T1 Option Patterns

63 — 63-Bit Pseudorandom Pattern — is used when testing 56 kbps circuits with secondary channel to verify the transmission of an all zeros network byte. The 63-bit ($2^{2^3}-1$) pseudorandom pattern generates a maximum of five sequential zeros and six sequential ones.

511 — 511-Bit Pseudorandom Pattern — is generally used to test DDS and other circuits operating below 9.6 kbps. The 511-bit ($2^{2^3}-1$) pseudorandom pattern generates a maximum of eight sequential zeros and nine sequential ones.

2047 — 2047-Bit Pseudorandom Pattern — is generally used to test DDS and other circuits operating between 9.6 and 56 kbps. The 2047-bit ($2^{2^3}-1$) pseudorandom pattern generates a maximum of 10 sequential zeros and 11 sequential ones.

DDS1 — DDS 1 Stress Pattern — is generally used to provide a minimum and maximum ones density which can stress the DDS circuit signal recovery capability. DDS1 is a repeating pattern of 100 octets of 11111111 and 100 octets of 00000000.

DDS2 — DDS 2 Stress Pattern — is generally used to provide a minimum ones density and to simulate bit-error rate protocol files (e.g., HDLC) to ensure that the DDS circuit can pass the signal properly. DDS2 is a repeating pattern of 100 octets of 01111110 and 100 octets of 00000000.

DDS3 — DDS 3 Stress Pattern — is generally used to provide a median ones density and simulates a typical signal transmitted over the DDS circuit. DDS3 is a continuous series of octets of 01001100.

DDS4 — DDS 4 Stress Pattern — is generally used to provide a low ones density. DDS4 is a continuous series of octets of 01000000.

3.8.2.2 Advanced Stress Pattern Option Patterns

NOTE

See Appendix D for the bit pattern sequence.

DDS5 — DDS 5 Stress Pattern — is a mask method to test circuits with bit error rate DDS stress patterns. DDS5 is not detected in the AUTO mode.

DDS6 — DDS 6 Stress Pattern — is useful for simulating a DDS signal transition from FULL mode to DUAL mode and aids in detecting margining equipment. Subsequent application of DDS6 is a seven-octet word pattern of 11111110 followed by a zero octet of 11111111.

3.8.3 SOURCE CONFIGURATION.II Switch

When the **CHANNELFORMAT** switch is set to either 56 x N or 64 x N, the available **SOURCE CONFIGURATION II** switch selections are:

N = (1 - 24) — select the number of contiguous DDSs to analyze as a single T1 channel bandwidth. Use the **LINE 1** and **LINE 2 CHANNEL** switches to select the first channel of the T1 bandwidth.

NOTE

DSOs may *wrap around* the bandwidth. For example, if $N = 4$ and CHANNEL = 23, then channels 23, 24, 1, and 2 are analyzed.

NON CONTIG — Analyze non-contiguous DSO channels as a single non-contiguous FFT bandwidth. Pressing the **AUX** switch automatically accesses the AUX 10 N-CONTG function. Enter the desired DSO channel numbers for the non-contiguous FFT channel bandwidth.

NOTE

The same number of channels must be selected for both lines, but the actual channels selected can be different. See Section 4.5 for more information on setting the AUX 10 N-CONTG function.

3.8.4 AUX Switch

The Fractional T1 Optimizer adds the following auxiliary function:

- **AUX 10 N-CONTG** — Non-Contiguous Channel

Refer to Section 4 Auxiliary Functions for a complete description of this auxiliary function.

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DDS OPTION

3.9 INTRODUCTION

The T-BERT 224 DDS Option offers the following features and capabilities:

- Test DDS channels with over 70 different test patterns
- Measures round trip delay of any channel within the T1 circuit
- Displays the received frame logic states of bits 1 through 8 of fork/clapped channels
- Tests DS0A and DS0B formatted DDS circuits
- Transmits alternating and latching DDS loop codes
- Control MUX operations in the DDS network from a single T1 access point
- Transmits an off-line mode (A²L ON)S) in the selected channels by of the opposite line to prevent mutual interference.

NOTE

Unless indicated, the capabilities of the mainframe and T-BERT Option for the T-BERT 224 are applicable to the DDS Option.

3.10 TEST SETUP

The following test setup controls and indicators are affected by the DDS Option. Table 3-4 illustrates the additional configurations.

Table 3-4 DDS Option Switch Configurations

| Switch | Configuration | | | |
|-------------------|---|---------|---------|---------|
| MODE | AUTO, T1 D/E, T1 E2, T1 D4, T1 E4, S1, S2, D/E, T1 S1, C, S, T, T1 B, T1 E, B | DS0A24 | DS0A4.8 | DS0A8.6 |
| CHANNEL FORMAT | | DS0A24 | DS0A4.8 | DS0A8.6 |
| | | DS0A9.6 | | |
| | | DS0A192 | | |
| | | DS0B192 | | |
| | | DS0A36 | | |
| | | DS0B4 | | |
| SC1 | AUX12ERRCOR, AUX19DDSCHN, DS0A24, DS0A4.8, DS0A8.6, DS0A9.6, DS0B192, DS0A36, DS0B4, DS0A24, DS0A4.8, DS0A8.6, DS0A9.6, DS0B192, DS0A36, DS0B4, DS0A24, DS0A4.8, DS0A8.6, DS0A9.6, DS0B192, DS0A36, DS0B4 | | | |
| SC2 | | CH0S121 | CH0S122 | CH0S123 |

3.10.1 CHANNELFORMAT Switch

In addition to the mainframe and T-BERT Option channel format sections, the following are also available:

- **DS0A24, DS0A4.8, DS0A8.6** — Use when monitoring or testing DS0A-formatted DDS data at 2.4, 4.8, or 9.6 kbs. The AUX12ERRCOR and AUX19DDSCHN functions are applicable.

DS0A192 — Use when monitoring or testing DS0A-formatted DDS data at 19.2 kb/s. Data is inserted in bytes 2 and 3, while EMC codes are placed in bytes 1, 4, and 5. AUX 19 DDS CHN is applicable.

DS0B192 — Use when monitoring or testing Channel 1 of DS0B-formatted DDS data at 19.2 kb/s. Data is inserted in bytes 2 and 3, while bytes 1, 4, and 5 pass through unaffected. If no 11 signal is received, EMC codes are placed in bytes 1, 4, and 5. Subrate frame synchronization must be acquired before the T-BERD 224 can insert test data. AUX 19 DDS CHN is applicable.

DS0A56 — Use when monitoring or testing DS0A-formatted DDS data at 56 kb/s. AUX 19 DDS CHN function is applicable.

DS064 — Use when monitoring or testing 64 kb/s DS0 data circuits.

DS0B2.4, DS0B4.8, DS0B9.6 — Use when monitoring or testing DS0B formatted DDS data at 2.4, 4.8, or 9.6 kbs. Use the **SOURCE CONFIGURATION** (I) switch to select one of 20 DS0B2.4, 10 DS0B4.8, or 5 DS0B9.6 channels to be analyzed. AUX 19 DDS CHN function is applicable. Subrate frame synchronization must be acquired before the T-BERD 224 can insert test data.

3.10.2 SOURCE CONFIGURATION (I) Switch

The additional **SOURCE CONFIGURATION** (I) switch selections are:

63 — 63-Bit Pseudorandom Pattern — is used when testing 56 kb/s circuits with secondary channel to avoid the introduction of an all-zeros network byte. The 63-bit (2⁶-1) pseudorandom pattern generates a maximum of five sequential zeros and six sequential ones.

511 — 511-Bit Pseudorandom Pattern — is generally used to test DDS and other circuits operating between 9.6 kb/s. The 511-bit (2⁹-1) pseudorandom pattern generates a maximum of eight sequential zeros and nine sequential ones.

2047 — 2047-Bit Pseudorandom Pattern — is generally used to test DDS and other circuits operating between 9.6 and 56 kb/s. The 2047-bit (2¹¹-1) pseudorandom pattern generates a maximum of 10 sequential zeros and 11 sequential ones.

DDS1 — DDS 1 Stress Pattern — are generally used to provide a minimum and maximum ones density which can stress the DDS circuit signal recovery capability. DDS1 is a repeating pattern of 100 octets of 11111111 and 100 octets of 00000000.

DDS2 — DDS 2 Stress Pattern — is generally used to provide a minimum ones density and to simulate bit-oriented protocols (e.g., HDLC) to ensure that the DDS circuit can pass the signal properly. DDS2 is a repeating pattern of 100 octets of 01111111 and 100 octets of 10000000.

DDS3 — DDS 3 Stress Pattern — is generally used to provide a medium ones density and simulate a typical signal transmitted over the DDS circuit. DDS3 is a continuous series of octets of 01001110.

DDS4 — DDS 4 Stress Pattern — is generally used to provide a low ones density. DDS4 is a continuous series of octets of 01011010.

3.10.2.1 Advanced Stress Pattern Option

See Appendix 1 for menu options.

DDS5 — DDS 5 Stress Pattern — is a quick method to test circuits with the first four DDS stress patterns. DDS5 is not allowed in the AUTO mode.

DDS6 — DDS 6 Stress Pattern — is useful in simulating a DDS signal transition from HDLC mode to DVLA mode and also in detecting margin equipment in multipoint applications. DDS6 is a seven-bit repeated pattern of 11111000 followed by one more of 11111111.

3.10.2.2 Additional SOURCE CONFIGURATION I Switch Selection

With the CHANNELFORMAT switch set to DS000, the additional SOURCE CONFIGURATION I switch selections are:

DS0 INTF (DS0 Interface) — Enables the side panel DSO interface as the drop and insert source. A selected drop channel specified by the DROP (RX) and CHANNEL switch settings is output to the side panel connector. Data from the external KS-type test set is inserted into a selected channel. Data is transmitted using 5-bit and byte blocks output from the side panel connector.

DROP CHAN (Dropped Channel) — Provides a channel loopback and allows data from a channel which is dropped from one line to be inserted into a selected channel on the opposite line. The dropped channel is provided to the DSO Interface. When DROPCCHAN is selected and the CHANNEL switch for the dropped line is set to All, the line slot is dropped.

3.10.3 SOURCE CONFIGURATION II Switch

The SOURCE CONFIGURATION II switch augments the SOURCE CONFIGURATION I switch selections. The availability of SOURCE CONFIGURATION II switch selections depends on the MODE, CHANNEL FORMAT, and SOURCE CONFIGURATION I switches.

Modifying the SOURCE CONFIGURATION II switch selection causes a test restart.

When the CHANNELFORMAT switch is set to either DS0B7-4, DS0B7-8, or DS0B9, the available SOURCE CONFIGURATION II switch selections are:

CHAN - (1 - 5, 1 - 10, or 1 - 20) — Select one of the five 9.6 kb/s, ten 4.8 kb/s, or twenty 2.4 kb/s DSO channels to analyze. The remaining 5, 9, or 19 DSO channels are unselected.

3.10.4 AUX Switch

The DSO Option adds the following auxiliary functions:

- AUX 07 DSO TIM — DSO Interface Timing
- AUX 12 ERROR COR — DSO Error Correction
- AUX 19 DSO CHN — DSO Analysis Channel
- AUX 30 MDL — DSO MDU Control

Refer to Section 4 Auxiliary Functions, for a complete description of the auxiliary functions.

3.11 RESULTS VERIFICATION

The following section identifies the controls available by the DSO Option.

3.11.1 RESTART Switch

Changing the AUX 07 DSO TIM function causes a test restart when set to DS0 INTF.

3.12 TROUBLESHOOTING CONTROLS

The following troubleshooting controls are affected by the DDS Option.

3.12.1 LOOP CODES Switches

When configured for any DDS channel format, except DS0A192, transmission of the selected loop up or loop down code occurs over the selected bandwidth for that channel format. When configured for the DS0A192 channel format, transmission of the selected loop code follows the guidelines outlined in the industry standard, ANSI T1.107b-1991 (transmit loop code in bytes 2 and 3 of the 5-byte subrate framing scheme, with byte 3 (bits 3 to 6) reported in bytes 4 and 5, and byte 4 of the next subrate frame).

3.12.2 LOGIC ERROR INSERT Switch

- When testing DS0A channel formats, logic errors are only inserted in the DS0A bytes of the selected DS0A data rate.
- When testing DS0B channel formats, subrate frame synchronization is required before logic error can be inserted.

SLC OPTION**3.13 INTRODUCTION**

The SLC Option is part of the ESI/SLC Option package.

NOTE

Unless indicated otherwise, the capabilities of the mainframe T-BIRD 224 are applicable to the Enhanced ESI/SLC Option.

The SLC Option enables the T-BIRD 224 to generate commands and report the status of the SLC datalink alarm, far-end loopback, maintenance test, and switch to protection line messages. The SLC Option sends and monitors the following:

- SLC-98 (Mode 1 and 2) circuit alarms** -- Indicate varying system conditions that cause failures or signal quality loss, or line backup capabilities. These alarms include major, minor, shelf, and power/miscellaneous.
- SLC-96 (Mode 1) automated maintenance test procedures** -- Indicate the status of the circuit during test and the sequence of events that occur when a maintenance loop is connected to the bypass port.
- SLC-95 (Mode 1 and 2) switch to protection line function** -- Indicates which of the primary DS1 data links has been switched over to the protection line.
- SLC-95 (Mode 1 and 2) far-end shelf loopback** -- Indicates which DS1 line is looped back (A, B, C, D, or Protection). The far-end loop command automatically switches the selected shelf to the protection line if it is available.
- SLC-96 (Mode 1 and 2) idle signal** -- Indicates the data line (transmit only) is not carrying information.
- Tri-state SLC-96 A and B signaling bits** -- Indicate on, mark, or off signaling conditions.

3.13.1 Functional Description

When configuring the T-BIRD 224 to transmit and receive SLC-96 datalink signals, the T-BIRD 224 automatically frames by either the received Network Object Terminating Equipment (NOTE) and WPIB Alarm Control Unit (ACU) 16-bit datalink alarm message format, or the WPI-ACL 13-bit datalink alarm message format. The NOTE alarm message format provides framing, major alarm, and A, B, C, and D shelf alarm. Indicators include WPIB and WPI-ACL alarm messages for status, signal quality, busy, alarm, minor alarm, power/miscellaneous alarm, A, B, C, and D shelf alarm, and A, B, C, D, and protection line loss of lock.

The T-BIRD 224 automatically alerts the terminal receiver. For alarm messages, NOTE is used if the ACU is installed on the system. The WPI-ACL 13-bit datalink message is used if no ACU is present.

The alarm messages are categorized as major, minor, and power/miscellaneous. Major alarms identify service-affecting system failures, signal loss, datalink failure, loss of frame synchronization, and power/miscellaneous alarms. Due to the severity of the alarm condition, the shelf where the alarm occurs is reported. Minor alarms identify non-service-affecting failures, protection line switching, far-end loop, and power/miscellaneous alarms. Power/miscellaneous alarms identify a power failure, open door, fan failure, high water, or similar condition at the remote terminal.

Channel signaling (on hook, off hook, and ring) can be generated and monitored when the T-BIRD 224 is connected to a SLC shelf (Mode 1 only) and an individual channel is selected. The signaling bits (A, B, C, and D) can be manipulated individually with fuse-panel switches or the Signaling Option keypad.

3.14 TEST SETUP

The SLC portion of the Enhanced ESI-SLC Option affects the following test setup controls and indicators (see Table 3-5):

Table 3-5. SLC Option Switch Configurations

| Switch | Configuration | | |
|-------------------|--|--|---|
| MODE | T1SLC96 and SLC-M2 | | |
| CHANNEL FORMAT | DATLINK | | |
| SET | F END LOOP | MAJOR ALRM (or FSW PROT) | MINOR ALRM, POWERMISC, HOLE, and MMINT |
| SET | SHELL A SHELL B ¹ SHELL C SHELL D ¹ PROTECTION | SHELL A SHELL B ¹ SHELL C SHELL D ¹ | |

¹Only available in T1SLC96 mode.

3.14.1 CHANNELFORMAT Switch

In addition to the on-hook and T-BIRD Option channel formats, the following is also available:

DATLINK — Configures the T-BIRD 224 to transmit information on the SLC-96 Datalink. The **CHANNEL** switch display is set to " " when selecting the DATLINK channel format. The T-BIRD 224 must be connected to the A shell to perform this function.

3.14.2 SOURCE CONFIGURATION I and II Switches

The following **SOURCE CONFIGURATION I** switch selections are available when the DATLINK channel format and T1SLC96 or SLC-M2 operating mode are selected. The **SOURCE CONFIGURATION II** switch selects the type of shell or protection line message transmitted by the T-BIRD 224 over the datalink:

MAJOR ALM — Select the MAJOR ALRM source configuration to transmit a major alarm message. Press the **SOURCE CONFIGURATION II** switch to select SHELL A, B, C, or D shell or protection message.

MINOR ALRM — Select the MINOR ALRM source configuration to transmit a minor alarm message to the far end.

POWERMISC — Select the POWERMISC source configuration to transmit a power/miscellaneous alarm message to the far end.

F END LOOP — Select the F END LOOP to transmit a far end loop code. Press the **SOURCE CONFIGURATION II** switch to select either the A, B, C, or D shell, in protection loopback code. When the **INSERT (TX)** switch is changed to LINE 1, the appropriate alarm bits are set on LINE 1 to request the selected shell or protection line to loop the transmitter to the receiver. The alarm bits on LINE 2 are forced to indicate an idle condition (no loop or alarm). When the **INSERT (TX)** switch is changed to

LINE 2, the LINE 2 datalink alarm bus carry the log of alert request and the LINE 1 datalink alarm bus carries an idle condition. No other detailed tests can be performed until the far-end loop is released.

SW PROT -- Select SW PROT to switch the selected shell to the protection line. Press the **SOURCE CONFIGURATION** F switch to select Shell A, B, C, or D. If the switch to the protection line is successful, the message **LA SEC ALM (CON PROT)** appears in the SUMMARY category. If the switch to the protection line fails, **SW PROT FAILED** flashes on the display. If another line is already on the protection line when the command is sent, the THERD 224 flashes **SW PROT FAILED** and waits until the protection line is cleared to switch the selected shell to the protection line.

MAINT -- Emulates the central office equipment by sending the associated maintenance test sequence on Shell A. The test sequence messages are displayed in the SOURCE CONFIGURATION B section of the display. Responses to the test sequence can be monitored in the SUMMARY category. Select the desired DSU channel to be tested with the **CHANNEL** switch and set to the appropriate line with the **INSERT (IX)** switch. This capability is not available in the SEC-M2 mode.

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.

Depending on the NOTE or ACU used at the far end, the THERD 224 will transmit the appropriate alarm message (see Table 3-6).

Table 3-6. NOTE and ACU Alarm

| NOTE | WP1 ACU and WP1B ACU |
|---------------|------------------------------|
| Major Alarm | Major Alarm |
| A shell Alarm | Minor Alarm |
| B shell Alarm | Power/Misc. Alarm |
| C shell Alarm | A shell Alarm |
| D shell Alarm | B shell Alarm |
| | C shell Alarm |
| | D shell Alarm |
| | A Line Far-end Loop |
| | B Line Far-end Loop |
| | C Line Far-end Loop |
| | D Line Far-end Loop |
| | Protection Line Far-end Loop |

3.15 RESULTS VERIFICATION

The following results verification systems and indicators are activated by the SEC OPTION:

3.15.1 RESULTS For 4-B Switches

The THERD 224 monitors and reports on the SEC-06 datalink maintenance, alarm, and protection line switch. The maintenance and alarm messages are set in the SUMMARY category as datalink Maintenance (M1 to M3), Alarm (A1 and A2), and Protection Line switch (S1 to S4). The messages are removed from the SUMMARY category when frame synchronization is lost (frame sync LFD err). For more information, see Section 5.

NOTE

The DALLINK channel format does not need to be selected to monitor for SLC-96 local link alarms and messages.

3.15.2 Local Status LEDs

Yellow alarms are reported through the Yellow Alarm LEDs. Only SLC systems operating in Mode III transmit yellow alarms.

3.16 TROUBLESHOOTING CONTROLS

The following troubleshooting controls are affected by the SLC Option.

3.16.1 A and B SIGNALING INSERT Switches

The SLC A and B signaling bits can be set to a logic one, logic zero, or toggled between a logic one and zero by pressing the **A** and **B SIGNALING INSERT** switches while in the VF mode. The toggling state is only applicable in SLC-1013 and 13SLC-96 modes. Press the **SIGNALING INSERT** switch for less than one second to set the signaling bit to a logic one (LED ON). Press the switch again to set the signaling bit to a logic zero (LED OFF). Press the switch for more than one second to toggle the signaling bit continuously (LED flashes). The signaling bits are toggled every other super-frame. The received signaling bits are monitored through the SIGNAL category 55-TRAFFIC result (see Table 3-7).

Table 3-7. Signaling States for SLC-96 System Channel Units

| Channel Unit Type | Customer State | Bits Sent To the LDS | | Bits Sent To the RT | | Channel State |
|---------------------------------------|----------------|----------------------|---|---------------------|----|-----------------|
| | | A | B | A | B | |
| Single Port | On Hook | 0 | 0 | 1 | 1 | Channel Test |
| | Off Hook | 1 | 0 | 1 | 0 | Free Band 2Ring |
| | Unoccupied | 1 | 1 | 1 | 0 | Idle |
| | Unoccupied | 1 | 1 | 1 | 10 | Key Alarm |
| Frequency Selective Ringing Multiplex | On Hook | 0 | 0 | 0 | 1 | Channel Test |
| | Off Hook | 0 | 1 | 1 | 0 | Free Band 1Ring |
| | On Hook | 1 | 0 | 1 | 1 | Idle |
| | Unoccupied | 1 | 1 | 1 | 10 | Free Band 2Ring |
| | Unoccupied | 1 | 1 | 0 | 0 | Free Band 1Ring |
| | Unoccupied | 1 | 1 | 0 | 10 | Free Band 3Ring |
| Frequency Selective Ringing Multiplex | On Hook | 0 | 0 | 0 | 1 | Channel Test |
| | Off Hook | 1 | 0 | 1 | 1 | Idle |
| | Unoccupied | 1 | 1 | 1 | 10 | Free Band 2Ring |
| | Unoccupied | 1 | 1 | 0 | 0 | Free Band 1Ring |
| | Unoccupied | 1 | 1 | 0 | 10 | Free Band 3Ring |

Table 3-7. Signaling States for SLC-96 System Channel Units (Continued)

| Channel Unit Type | Customer State | Bits Sent To the LDS | | Bits Sent To the RT | | Channel State |
|-----------------------|----------------|----------------------|---|---------------------|---|---------------|
| | | A | B | A | B | |
| Coin | On Hook | 0 | 0 | 0 | 0 | Loop Make |
| | Coin Gnd | 0 | 1 | 0 | 1 | Channel Busy |
| | Off Hook | 1 | 0 | 1 | 0 | Loop Make |
| | Unenergized | 1 | 1 | 1 | 1 | Divert Start |
| | Unenergized | | | 0 | 0 | 4 Digit Class |
| | Unenergized | | | 1 | 0 | RR Night |
| | Unenergized | | | 1 | 0 | 4 Digit Class |
| | Unenergized | | | 1 | 1 | 4 Digit Class |
| Universal Voice Grade | On Hook | 0 | 0 | 0 | 0 | Divert Start |
| | Ring Ground | 0 | 1 | 0 | 1 | Channel Busy |
| | Off Hook | 1 | 0 | 1 | 0 | Loop Make |
| | Unenergized | 1 | 1 | 0 | 0 | Idle |
| SMD DP | Normal | 0 | 0 | 0 | 0 | Loop Open |
| | Reverse | 1 | 1 | 1 | 1 | Loop Make |
| | Reverse | | | | | Loop Open |

ESF OPTION

3.17 INTRODUCTION

The ESF Option is part of the ES1551C Option package.

NOTE

Unless indicated otherwise, the capabilities of the manufacturer T-BERD 224 are applicable to the enhanced ESF/SLC Option.

The ESF Option enables the T-BERD 224 to report and send out the Performance Report Messages (PRM) on the Datalink. The ESF Option:

- Displays the ESF of 1 kb/s and ESF of 2 kb/s - datalink ANSI 11-103 PRMs.
- Enables the T-BERD 224 to transmit ESF-Link, a bit-oriented protocol (BOP) command response messages.
- Enables the T-BERD 224 to transmit and respond to out-of-band datalink loop-backs if the T-BERT Option is installed.
- Enables the T-BERD 224 to bit error rate test the ESF datalink if the T-BERT Option is installed.

3.17.1 Functional Description

When the T-BERD 224 is connected to the ESF datalink and the AFX 20 PRM TX function is set to AUTO in the PRM TRANS selection, the T1 signal and Datalink PRM flow through the T-BERD 224. This process is illustrated in Figure 3-8 and explained in the following steps:

1. The T1 signal on LINE 1 RECEIVE is analyzed and retransmitted on LINE 1 TRANSMIT.
2. The T1 signal analysis is reported in the RESULTS display and on a PRM encoded into the datalink and inserted on LINE 2 TRANSMIT.
3. The datalink PRM on LINE 2 RECEIVE is decoded and the results are displayed in the BPP & FRAME category results. The PRM from LINE 1 RECEIVE is of the same as the PRM on LINE 2 TRANSMIT.

NOTE

When the AFX 20 PRM TX function is set to ON for the PRM TRANS selection, the signal of PRM TX is forwarded to the PRM system on the T-BERD 224 as a normal datalink signal. When PRM TRANS is set to OFF, the T-BERD 224 receives and does not generate PRM.

ES1551C
ESF OPTION
Introduction
3.17 INTRODUCTION
3.17.1 Functional Description
NOTE
NOTE

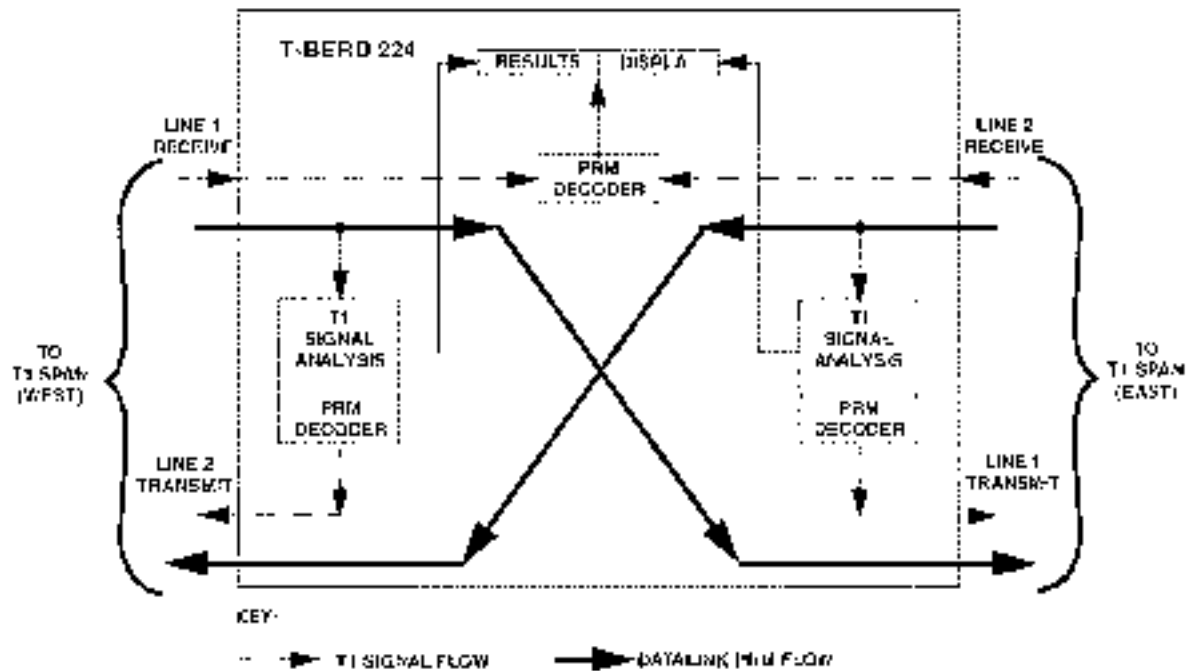


Figure 3-8. T1 and Datalink PRM Signal Flow

In the T1-LER mode, the received out-link PRM and T1 channels are retransmitted as they are received. However, in the T1-T1B mode, the received datalink PRM is only reported in the BPM & EXAM category results and not retransmitted. The T-BERD 224 in turn analyzes the received T1 signal to determine what it has seen and transmits the appropriate PRM back to the source of the received signal.

3.18 TEST SETUP

The following test setup controls are affected by the ESF Option (see Figure 3-8).

Table 3-3. ESF Option Switch Configurations

| Switch | Configuration |
|-----------------|---------------|
| MODE | T1-T1B |
| CHANNEL FORWARD | DATALINK |

3.16.1 MODE Switch

Set the control operating mode to receive the T1-T1B datalink.

3.18.2 CHANNELFORMAT Switch

In addition to the maintenance and TUBERJ Option channel format, the following is also available:

DATLINK - To analyze the LSI datalink select any channel format except DATLINK. Selecting DATLINK enables the TUBERJ 37.5 to insert on the 4 Kbps datalink itself using any of the available source configurations.

3.19 TROUBLESHOOTING CONTROLS

3.19.1 YELLOW ALARM ERROR INSERT Switch

When the LSI mode is selected, the **YELLOW ALARM ERROR INSERT** switch sends the yellow alarm over the datalink. The yellow alarm is a priority message that overrides any messages already on the datalink.



SMART LOOPBACK/COMMAND CODES OPTION

3.20 INTRODUCTION

The T-BERD 224 Smart Loopback/Command Codes Option provides the following features and capabilities:

- Transmits intelligent network equipment loop codes to control intelligent network equipment.
- Sends maintenance switch commands to activate maintenance switch ring and switch functions.
- Retrieves stored Ethernet performance data from an NIP Performance Monitor and clears the NIP Performance Monitor memory, so that it is available to store new data.
- Sets the time and date on an NIP Performance Monitor to match the time and date of the T-BERD 224.

NOTE

Unless indicated, the capabilities of the T-BERD 224 maintenance are applicable to the Smart Loopback/Command Codes Option.

3.21 TEST SETUP

The following controls and procedures are affected by the Smart Loopback/Command Codes Option.

3.21.1 MODE Switch

In addition to the mainframe mode selections, the following is also available with the Smart Loopback/Command Codes Option:

SMARTNIU — Span NIP Performance Monitor mode configures the T-BERD 224 to query the Performance Monitor portion of the Westell coordinated NIP Performance Monitor equipment for the 15 span statistics it recorded. When this mode is enabled, all maintenance functions are disabled, framing is set to T1/ESF, framing is set to FULL/T1, and the transmitted pattern is set to L1. The SMARTNIU mode enables three functions: Query, Clear Results, and Set Clock.

3.21.2 CHANNELS/STATS Switch

When the SMARTNIU mode is enabled, the following **CHANNELFORMAT** switch is available:

RESULTS — Configures the Query function of the SMARTNIU mode with parameters, activates, and stores the actual traffic and test statistics. Only one complete set of performance monitor statistics can be stored at a time, so previously stored statistics are cleared by the Query.

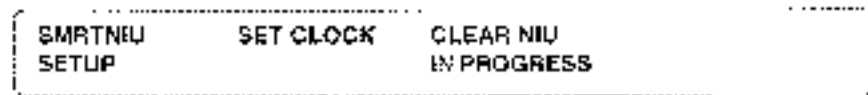
SETUP — Activates the Set Clock function and the Clear Results function. The Set Clock function (SET CLOCK) is used to set the time and date of the NIP Performance Monitor to match the T-BERD 224 time and date according to the parameters set in the AUX04TIMDAY function. NIP Performance Monitor time and date are maintained internally and recorded with each alarm and error message. The Clear Results function (CLEAR NIP) clears recorded statistics from the NIP Performance Monitor, which is usually performed after the results are retrieved.

3.21.3 SOURCE CONFIGURATION Switches

When the SMARTNU mode is enabled and the CHANNELFORMAT switch is set to SETUP, the following source configuration action is available:

SET CLOCK -- The Set Clock function sets the NIC Performance Monitor time and date to match the EBERD 224 time and date (set in the AUX DUTIMONY function). Pressing the **SOURCE CONFIGURATION** switch initiates the set clock function. It should take approximately 30 seconds to complete the Set Clock function. During this time, the **SET CLOCK IN PROGRESS** message is displayed.

Upon completion, one of two messages appears for 5 seconds: **CLOCK SET** (Set Clock function was successful) or **SET CLOCK FAILED**. A failure could be the result of poor connections. Check the FI circuit connections and try again.



3.21.4 AUX Switch

The Smart Loopback/Command Codes Option adds intelligent network equipment loop codes to the AUX 17 LOOP CD function. Refer to Section 4, Auxiliary Functions, for a detailed description.

3.21.5 TEST Switch

In SMARTNU mode, the **TEST** switch selection is limited to CONFIRMS.

3.22 CIRCUIT CONNECTIONS

The following switches are affected by the Smart Loopback/Command Codes Option:

3.22.1 LINE 1 & 2 CHANNEL Switches

The **LINE 1** and **LINE 2 CHANNEL** switches are available in the **VF CHANNELFORMAT** and select the channel to be monitored or tested. The selected channel number is visible in one of the two seven-segment displays (page 1).

When the **CHANNELFORMAT** switch is set to **TEST** and the **MODE** switch is set to **MON**, the **CHANNEL** switch number is displayed in the **MON** display.

3.23 RESULTS VERIFICATION

The following switches are affected by the Smart Loopback/Command Codes Option.

3.23.1 BESTARI Switch

When in the SMARTNU mode with the RESULTS position selected, pressing the **RESTART** switch activates the Query function, which retrieves the T1 span performance statistics from the NIU Performance Monitor. The T1 BERD 224 initially displays the following message:

QUERY IN PROGRESS## OF ### RECEIVED — Indicates the Query function is continuing and has retrieved a portion of the total messages stored in the NIU Performance Monitor, where ## is the number of messages retrieved and ### is the number of messages stored in the NIU Performance Monitor.

The T1 BERD 224 retrieves the Performance Indication Ratio (PIR) statistics first. Once the PIR result is available, it is displayed in place of the *QUERY IN PROGRESS* message until the query is complete.

| | | | | |
|---------|-----|-------|----|-----------|
| SMARTNU | ### | PIR | ## | 10 OF 793 |
| RESULTS | ### | AZ/ZA | ## | RECEIVED |

The PIR displays represent the following:

AZ — Indicates the direction from the NIU to the Central Office.

ZA — Indicates the direction from the Central Office to the NIU.

— Indicates the percent of error-free seconds in the AZ direction.

— Indicates the percent of error-free seconds in the ZA direction.

— Indicates the percent of time that all status indicator bits were clear in the AZ direction.

— Indicates the percent of time that all status indicator bits were clear in the ZA direction.

When the Query function stops, one of the following messages is displayed to indicate the results:

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

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

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

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

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

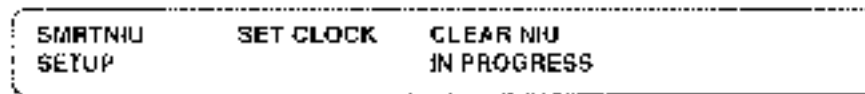
3.23.2 RESULTS Switches

In the SMRTNIU mode, the **RESULTS 4 Blank**, **RESULTS 4 Blank**, and **RESULTS 4 Arrowed** switches are disabled.

In the SMRTNIU mode with the **SETUP** position selected, pressing the **RESULTS 4 Arrowed** switch activates the Clear Results function. The message **CLEAR NIU IN PROGRESS** is displayed in the RESULTS 4 window for approximately 5 seconds, which indicates the Clear Results function is activated. When the Clear Results function stops, one of the following messages is displayed to indicate the results:

CLEAR NIU FAILED — Indicates the Clear Results function failed to clear the NIU Performance Monitor of all messages. This could be the result of poor connections. Check the ETU rear connections and try again.

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



3.23.3 DISPLAY HOLD Switch

In the SMRTNIU mode, the **DISPLAY HOLD** switch is disabled.

3.24 TROUBLESHOOTING CONTROLS

The following switches are affected by the Smart Loopback/Command Codes Option.

3.24.1 LOOP CODES Switches

When in the SMRTNIU mode, the **LOOP UP** and **LOOP DOWN** switches are disabled unless the AUX 17 LOOP CT function is set to **WFSSTEP1-NIM570** or **WFSSTEP1-NIM560** in the ENVIRONMENT selection.

3.24.2 SIGNALING INSERT Switches

When in the SMRTNIU mode, the **SIGNALING PROGRAMMABLE** switches for control of the AUX 17 signaling bus are disabled.

3.24.3 ERROR INSERT Switches

When in the SMRTNIU mode, the **BPV LOGIC FRAME** and **YELLOW ALARM ERROR INSERT** switches are disabled.

3.25 PRINTER CONTROLS

In the SMARTNIU mode, the **PRINT EVENT** switch is disabled.

With the Smart Leopard Command Codes Option, press the **PRINT** switch to generate the SMART NIU RESULTS DATA printer (see Figure 3-9). A complete SMART NIU RESULTS DATA printer lists merged results for the current hour (CURRENT HOUR), each of the previous 24 hours (HISTORY HOUR 1 through HISTORY HOUR 24), the current day (CURRENT DAY), and the previous week (HISTORY DAY 1 through HISTORY DAY 07) in the format shown.

```

SMART NIU RESULTS DATA COLLECTED AT
1/3/88              15:10:29

May 1988 (STAT 000)
.....
1 - Loop Back
2 - Data Telephone
3 - Data or Signal
4 - Closed
5 - Power Loss
6 - ZEN
7 - Yellow Alarm
8 - Other Error

AN-CTR-APP: 0000      AN-CTR-STAT: 0000
CA-CTR-LIN: 0000      CA-CTR-STAT: 0000

CURRENT HOUR      15:00      05-03-88
AN-PWR          : 1788          AN-PWR          :      14
AN-TEMP         :      "        AN-TEMP         :      6
AN-CUR          : 1766          AN-CUR          :      14
AN-ALARM        :      0        AN-ALARM        :      0
AN-STAT         :      0        AN-STAT         :      0
AN-STAT        :      "        AN-STAT        :      0

AN-PWR          : 1788          AN-PWR          :      20
AN-TEMP         : 30          AN-TEMP         :      28
AN-CUR          : 4367          AN-CUR          :      "
AN-ALARM        : 0          AN-ALARM        :      0
AN-STAT         : 0          AN-STAT         :      28
AN-STAT        : 0          AN-STAT        :      28

HISTORY HOUR 01      14:00      05-03-88
AN-PWR          :      0        AN-PWR          :      0
AN-TEMP         :      0        AN-TEMP         :      0
AN-CUR          :      0        AN-CUR          :      0
AN-ALARM        :      0        AN-ALARM        :      0
AN-STAT         :      0        AN-STAT         :      0
AN-STAT        :      0        AN-STAT        :      0

HISTORY HOUR 02      13:00      05-03-88
AN-PWR          :      0        AN-PWR          :      0
AN-TEMP         :      0        AN-TEMP         :      0
AN-CUR          :      0        AN-CUR          :      0
AN-ALARM        :      0        AN-ALARM        :      0
AN-STAT         :      0        AN-STAT         :      0
AN-STAT        :      0        AN-STAT        :      0

HISTORY DAY 01      00:00:00
AN-PWR          : 1788          AN-PWR          :      0
AN-TEMP         : 0          AN-TEMP         :      0
  
```

Figure 3-9. Sample Smart NIU Results Printout

VF OPTION

3.26 INTRODUCTION

The T-BERD 224 VF Option provides the following features and capabilities:

- Measures Echo Return Loss (ERL) and Standing Wave Ratio (SWR, SWR₁₀ and SWR₅₀).
- Measures C-message noise and C-switch noise for qualifying voice grade communications.
- Measures 3 kHz flat noise and 3 kHz notch noise for qualifying analog on-grade circuits.
- Computes signal-to-noise ratio (SNR Rate).
- Measures DC offset.
- Determines Peak-to-Average Ratio (PAR).
- Generates and transmits a VF frequency tone between 30 Hz and 3900 Hz (default frequency of 1000 Hz).
- Adjusts the VF frequency tone level from -30 dBm to +30 dBm (default level of +10 dBm).
- Provides a VF burst (VF BURST) to disable the echo canceller prior to a return loss measurement.
- Automatically sweeps a user-defined range of frequencies to analyze frequency response of an analog circuit.
- **DSP Board Required**

NOTE

Unless indicated, the capabilities of the mainframe T-BERD 224 are applicable to the VF Option.

3.27 TEST SETUP

The following controls and indicators are affected by the VF Option (see Table 3-9):

Table 3-9. VF Option Switch Configuration

| Switch | Configuration | | | | | | |
|----------------|--|------------------|-----------|-------|-------|-------------|------------------|
| MODES | AUTO, 21-DIG, 11-DIG, 11-D4, 21-BSK, 11M4, 90, SEC, D, U, S, C, ME, U, T, R, U, T, I, G, L, E, Y | | | | | | |
| COMPACT SOURCE | VF or VF (1-807) | | | | | | |
| SC1 | 0.0001 100 Hz | 0.0001 100 Hz | ERL dB | SWR | 30 dB | 20 dBSE Max | 0.0001 100 Hz |
| SC11 | 20 Hz to 3900 Hz | +30 dBm | ERL dB | 40 dB | 20 dB | 20 dB | 0.0001 100 Hz |

3.27.1 CHANNEL FORMAT Switch

In addition to the mainframe and TIBERT Option format selections, the following is also available:

VF THRU (Voice Frequency Through Signaling) — Use when testing or monitoring voice circuit without disrupting the channel signaling states. This selection enables the internal speaker, VF channel measurements, and speech drop and insert source configurations. In this mode the **SIGNALING INSERT** switches are disabled.

3.27.2 SOURCE CONFIGURATION I and II Switches

The following source configuration selections are available with the VF Option. The selections for the **SOURCE CONFIGURATION II** switch depend upon the **SOURCE CONFIGURATION I** switch selection. No **SOURCE CONFIGURATION II** switch selections are available with the **SHL-HI**, **SRI-LD**, **THRU TH**, **VIN-TR**, **DRGPHAN**, or **QUIET SOURCE CONFIGURATION I** switch selections.

FREQ (Frequency) — Transmits a single tone at an output level set in the **LEVEL** source configuration. The frequency of the tone appears in the display. Press the **SOURCE CONFIGURATION II** switch to modify the frequency of the transmitted tone from 30 Hz to 3400 Hz.

LEVEL — Selects a transmit level for the tone generated by the **FREQ** source configuration. The output level of the tone appears in the display. Press the **SOURCE CONFIGURATION II** switch to modify the level of the transmitted frequency from +0.0 dBm to +3.0 dBm in 0.1 dBm increments.

SWEEP (Frequency Sweep) — Automatically steps through a user-selected range of frequencies. This test is used to analyze operational distortion and frequency response on a VF circuit. Once sweep is selected, the message *SEE A/C 22 TO SET SWEEP PARAMS* is displayed. Press the **SOURCE CONFIGURATION II** switch to modify the level of the transmitted frequencies from +0.0 dBm to +3.0 dBm. A Frequency Sweep protocol is generated if selected in the **A/CN 23 PRT OPT** function.

NOTE

Changing the level setting for the frequency sweep function changes the VC tone level setting and vice versa.

ERL (Echo Return Loss) — Transmits a band filtered noise to measure return loss on VF circuits. The transmit level for return loss signals is fixed at +10.0 dBm. Once **ERL** is selected, the message *SEE A/C 22 TO SET BURST PARAMS* is displayed. If **VF burst** is ON, the previous parameters for burst frequency and burst level will be used to transmit a tone to disable any echo cancellers.

SRL-HI (Singing Return Loss High) — Transmits band filtered noise to simulate high frequency voice tone operation and measures the return loss. The level for return loss signals is fixed at +10.0 dBm. Once **SRL-HI** is selected, the message *SEE A/C 22 TO SET BURST PARAMS* is displayed. If **VF burst** is ON, the previous parameters for burst frequency and burst level will be used to transmit a tone to disable any echo cancellers.

SRL-LD (Singing Return Loss Low) — Transmits band filtered noise to simulate low frequency voice tone operation and measures return loss. The level for return loss signals is fixed at +10.0 dBm. Once **SRL-LD** is selected, the message *SEE A/C 22 TO SET BURST PARAMS* is displayed. If **VF burst** is ON, the previous parameters for burst frequency and burst level will be used to transmit a tone to disable any echo cancellers.

PAR (Peak to Average Ratio) — Transmits a complex waveform with a spectral content consisting of 16 non-harmonically related tones, with a known envelope shape that approximates a data signal. This test measures the combined effects of envelope delay, amplitude distortion, and return loss on a VF circuit. Press the **SOURCE CONFIGURATION II** switch to multiply the level of the transmitted frequency from -80.0 dBm to -10.0 dBm. The default level is -15.0 dBm.

1004 Hz — Allows the insertion of a 1004 Hz, 0 dBm sine wave that is suitable for VF testing.

VF INTF (VF Interface) — Enables the side panel 2- or 4-wire VF interface as the drop and insert switch. A selected drop channel is identified and output to the side panel connector. Lines from the external VF signal source are inserted into the selected channel.

DROP CHAN (Dropped Channel) — Provides a channel loopback, and allows data from a channel which is dropped from one line to be re-inserted into a selected channel. The dropped channel is provided to the side panel 2-wire and 4-wire VF interfaces. When **DROP CHAN** is selected and the **CHANNEL** switch for the dropped line is set to **ALFA**, line slot 1 is dropped.

3-TONE SLP (3-Tone Slope) — Transmits one of three frequencies at an output level set in the **LEVEL**, source configuration. This test obtains a quick measure of the channel amplitude distortion. Press the **SOURCE CONFIGURATION II** switch to select the transmitted frequency (408 Hz, 1009 Hz, or 2808 Hz).

2713 — Transmits a 2713 Hz tone at an output level set in the **LEVEL**, source configuration. This test loops the analog loopback (S29) devices on 4-wire VF circuits. Press the **SOURCE CONFIGURATION II** switch to turn this feature **ON** or **OFF**.

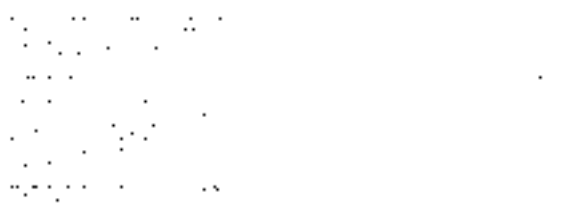
QUIET — Transmits an idle code. This position is used to measure absolute noise levels on the VF circuit.

3.27.3 AUX Switch

The following additional auxiliary functions are available with the VF option.

- AUX 21 SWEEP — Sweep Parameters
- AUX 22 VOLT RST — Volt Bias Parameters
- AUX 23 PELOPE — Print Option

Refer to Section 4 for descriptions of the auxiliary functions.



VF OPTION

Teil 8-100

SIGNALING OPTION

3.28 INTRODUCTION

The T-BURB 224 Signaling Option works in conjunction with the VE Option. The Signaling Option provides the following features and capabilities:

- Send complex sequences of Dual-Tone Multi-Frequency (DTMF), Multifrequency (MF), or Dual-Pulse (DP) digits to switches/PBXs to test the switching equipment ability to handle incoming calls.
- Receive digits from a switch/PBX and send supervision events to test voice services on a PBX.
- Monitor call detail on any DS0 channel and automatically detect digit type (DTMF, MF, or DP).
- Dial-up and BERT (BDS Option required) Switched 56 circuits from either the customer premise or central office.
- Automatically scan signaling activity on any of the 24 channels of a T1 circuit and monitor traffic on selected channels. Once a channel is seized, all digit/supervision events are recorded for that channel.
- **DSP Board Required**

The Digit Analysis Option adds the following digit analysis capabilities to the Signaling Option:

- Measure DTMF and MF tone frequencies and levels (high and low tones and levels) for each individual number that is captured.
- Measure interdigit timing (delay and duration).
- Measure dia-tone delay, duration, frequency, and level.

NOTE

Unless indicated, the capabilities of the T-BURB 224 mentioned are applicable to the Signaling Option.

3.28.1 Functional Description

Signaling is the term used to describe the addressing, control, and supervisory functions necessary for a call to be completed through a switching network. These functions include call initiation, address information for call routing, call setup from the terminal side. They can be arranged into the following categories:

- **Supervisory signals** — Inform a request for service, hold a conversation, or terminate a call session.
- **Address signals** — Provide information of the call originator (as illustrated above) or the digit entered as either DTMF, MF, or DP.
- **Call progress tone** — Provide information to the calling party about the progress of the call. The information is provided with tones such as dial tone and busy tone.
- **Alerting signals** — Inform the caller and the called party that there is an incoming call.
- **Control signals** — Provide additional information such as party identification.

The Signaling Option includes a Keypad Unit. The Signaling Keypad Unit is used to enter and receive signaling sequences and to analyze test result sequences.

3.29 TEST SETUP

The following controls and indicators are affected by the Signaling Option.

3.29.1 CHANNELFORMAT Switch

In addition to the mainframe, T-BERD Option, and VF Option channel format selections, the following are also available with the Signaling Option.

SIGNALNG (Signaling) -- Configures the T-BERD 224 to send, monitor, and receive digit sequences.

SWI-56 (Switched 56) -- Configures the T-BERD 224 to send or receive digits and then transmit BERT patterns repeats DDS Option on the selected time-out.

3.29.2 SOURCE CONFIGURATION Switches

The following source configuration selections are available with the Signaling Option. The **SOURCE CONFIGURATION I** switch selections depend upon the **CHANNEL FORMAT** switch selection. The **SOURCE CONFIGURATION II** switch selections depend upon the **SOURCE CONFIGURATION I** switch selection (see Table 3-10).

Table 3-10. Signaling Option Switch Configuration

| Switch/Alt. Function | Configuration | | | | | |
|----------------------|--|------------|----------|----------|------------|------------|
| MODEL | AUTO T-BERD, T-BERD, T-480 T-BERD, T-480 T-BERD, S61, DDD, T-ISEL, S6, S61, H2, T-1, T-2, T-1, T-2 | | | | | |
| CHANNEL FORMAT | Lab | | | | | |
| | SIGNALNG | | | SWI 56 | | |
| SET | REC SEQ | DIAG SEQ | MONITOR | SCAN | ALU SEQ | DIAG SEQ |
| | SEQ I - 10 | SEQ I - 10 | ORG = L1 | ORG = L1 | SEQ I - 10 | SEQ I - 10 |
| SOB | | MAN DTM | ORG = T2 | ORG = T2 | | MAN DTM |
| | | MAN DP | | AUTO | | MAN DP |
| | | MAN MI | | | | MAN MI |

3.29.2.1 SIGNALNG- Signaling Channel Format

The **CHANNELFORMAT** switch configures the T-BERD 224 to send, monitor, and receive digit sequences as follows:

REC SEQ -- Configures the T-BERD 224 to receive digit sequences and send supervision events. The **SOURCE CONFIGURATION II** switch determines which digit sequence is received and what a given state does (see Table 3-10).

SEQ I - 10 -- Selects one of the predefined signaling sequences, where 10 is programmed into the AUTO T-BERD function. The **MAN - T-BERD DEL** function defines the clock type of the received sequence. The sequence defines the number of digits, the type of inputs, the digit rate, supervision events, and the related signaling supervision events.

The **DROP (RX)** and **CHANNEL** switches select the source of the received digits. The **INSERT (TX)** and **CHANNEL** switches select the destination of the supervision events transmitted. After a complete sequence is received, the VF interface is enabled to provide a talk path with a buffer connected to the software interface on the side of the T-BERD 224. The **RESTART** switch clears the display, transmits an ON HOOK for two seconds to clear the line, and prepares the T-BERD 224 to receive a new sequence.

DIAL SEQ -- Select one of the ten pre-defined signaling sequences, or manually send originating supervision events and digit sequences and receive terminating supervision events. The **SOURCE CONFIGURATION** II switch determines the sequence transmitted.

SEQ 1 - 10 -- Select one of ten pre-defined digit sequences. The **AUX 24 TRK DEF** function defines the trunk type. The sequences are programmed in the **AUX 26 DIAL SEQ** function. Up to 96 digits/supervision events may be programmed in a sequence. The digit sequence is transmitted by pressing the **RESTART** switch.

MAN DTMF - Manual Dual Tone Multi-Frequency -- The T-BERD 224 transmits DTMF digits from the signaling keypad. These digits simulate dialing from a touch tone telephone and are generally used in signaling between the telephone and the central office.

MAN DP - Manual Dial Pulse -- The T-BERD 224 transmits DP digits from the signaling keypad. These digits simulate dialing from a rotary telephone.

MAN MF - Manual Multifrequency -- The T-BERD 224 transmits MF digits from the signaling keypad. These digits are normally used to signal between central office switches. When MF digits are configured in the dial sequence, they must be preceded by a Key Pulse (KP) and terminated with a Start Signal (ST) or Start Signal Prompt (SPRST2P515P).

MONITOR -- Configures the T-BERD 224 to receive both digit sequences and supervision events. The T-BERD 224 automatically distinguishes between DTMF, MF, and DP digit types. When the **SOURCE CONFIGURATION** I switch is set to **MONITOR**, the **DROP (RX)** switch is automatically set to **BOTH** and the **INSERT (TX)** switch is set to **NONE**. The T-BERD 224 monitors the originating side for digit and originating supervision events, and monitors the terminating side for terminating supervision events. The **SOURCE CONFIGURATION** II switch selects the originating line.

ORG = L1 -- Configures the T-BERD 224 to monitor LINE 1 for digits and originating supervision events, and monitor LINE 2 for terminating supervision events.

ORG = L2 -- Configures the T-BERD 224 to monitor LINE 2 for digits and originating supervision events, and monitor LINE 1 for terminating supervision events.

NOTE

For loop-start or ground-start trunks, the originating tone is interpreted as the station or office selected in the **AUX 24 TRK DEF** function. Supervision events are mapped into particular ADICD signaling bit status in this auxiliary category.

SCAN -- Configures the T-BERD 224 to scan both lines on selected channels (1 to 20) for channel seizing. The **DROP (RX)** switch is automatically set to **BOTH**, the **INSERT (TX)** switch is set to **NONE**, and the Channel Number display reads " " when scan is selected. A channel is seized on an **ON HOOK** or off **HOOK** transition or ringing on one line, since the channel is always in received mode. The channel number is displayed, and the T-BERD 224 receives both line 1 and signaling information and digits. When busy tone returns to the **ON HOOK** state or a time-out occurs, the T-BERD 224 resumes scanning the selected channels for channel seizing. The **AUX 26 SCAN AT 30** function sets the scan rate to 1/30. The scan rate can be re-scanned for signaling activity. Scan rate is also resumed by pressing the **RESTART** switch. The **SOURCE CONFIGURATION** II switch selects the originating line.

ORG = L1 -- Configures the T-BERD 224 to monitor LINE 1 for an **ON HOOK** to **OFF HOOK** transition and for digits. LINE 2 is monitored for supervision events only.

ORG = L2 -- Configures the T-BERD 224 to monitor LINE 2 for an **ON HOOK** to **OFF HOOK** transition and digits. LINE 1 is monitored for supervision events only.

NOTE

For loop start or ground start, select the station or office to originate the call in the AUX 24 TRK DEF function. Exit the auxiliary functions and select the appropriate originating line or number to call.

AUTO — The line which first goes OFF HOOK becomes the originating line and is monitored for digits. Automatic is only valid when the AUX 24 TRK DEF function is set to STD (R&M) or DELINED for the trunk type.

VF INTF — Establishes a talk path to verify the continuity of the channel. After a sequence is completely sent or received, the T-BERD 224 automatically switches the drop and insert source to the VF interface. VF INTF provides the same functionality applicable to DIAL SEQ and REC SEQ.

VF Testing Source Configurations — When the CHANNEL FORMAT switch is set to SIGNLING, the VF source configurations are available to test the dial tone.

3.29.2.2 SWI-56 - Switched 56 Channel Format

REC SEQ — Configures the T-BERD 221 to receive digit sequences and send supervision events. The SOURCE CONFIGURATION II switch determines which digit sequence is expected and what supervisory events are transmitted.

SEQ 1 - 10 — Select one of ten predefined signaling sequences programmed in the AUX 24 REC SEQ function. The AUX 24 TRK DEF function defines the trunk type of the receive sequence. The sequence defines the number of digits, the type of digit to be received, the originating supervision events to be received, and the terminating supervision events to be transmitted.

The DROP (RX) and CHANNEL switches select the port of the received digits. The INSERT (TX) and CHANNEL switches select the destination of the supervisory events transmitted. After a complete sequence is received, the VF interface is enabled to provide a talk path with a bit set connected to the 4-wire interface on the side of the T-BERD 221. The RESTART switch causes the display, transmit, or ON HOOK for two seconds to clear the line, and prepares the T-BERD 224 to receive a new sequence.

DIAL SEQ — Selects one of the ten predefined signaling sequences or manually originate supervisory events and digit sequences, and receive terminating supervisory events. The SOURCE CONFIGURATION II switch determines the sequence transmitted.

SEQ 1 - 10 — Select one of ten pre-defined digit sequences. The AUX 24 TRK DEF function defines the trunk type. The sequences are programmed in the AUX 24 DIAL SEQ function. Up to 30 digits/supervision events may be programmed in a sequence. The digit sequence is transmitted by pressing the RESTART switch.

MAN DTMF - Manual Dual Tone Multi-Frequency — The T-BERD 221 transmits DTMF digits to a bit set on the keypad. These digits are used to signal between touch tone telephone and any other all-trunk signaling between the telephone and the central office.

MAN DT - Manual Dial Pulse — The T-BERD 221 transmits DT digits to a bit set on the keypad. The digits are used to signal between the phone and the central office.

MAN MF - Manual Multi-Frequency — The T-BERD 221 transmits MF digits to the signaling keypad. These digits are normally used to signal between central office switches. When MF digits are configured in the dial sequence, they must be preceded by a Key Pulse (KF) and terminated with a Start Signal (S1) or Start Signal Prompt (ST1, ST2, ST3P).

BERT Patterns — When the VDS Option is installed, and the CHANNEL FORMAT switch is set to SWI-56, a BERT pattern may be selected after a call is established. The transmit signaling state maintains the call.

NOTE

Set AUX 27 VFBURST function to ON to enable any echo suppressors present.

3.29.3 TEST Switch

When the **SOURCE CONFIGURATION** 1 switch is set to DIAL, SEQ, REC SEQ, MONITOR, or SCAN the **TEST** switch is forced to the UPLD position.

3.29.4 AUX Switch

The following auxiliary functions are added with this Signaling Option. The auxiliary functions are only available when the **CHANNEL FORMAT** switch is set to either SIGNALING or SWB-56. The Signaling Keypad 141 is required to configure the auxiliary functions. Refer to Section 4, Auxiliary Functions, for descriptions of the auxiliary functions.

- AUX 24 TRK DEF — Track Defined
- AUX 25 DIG MAR — Digits Marking
- AUX 26 DIAL SEQ — Dial Sequence
- AUX 27 REC SEQ — Receive Sequence
- AUX 28 SUPV DEF — Supervisor Definitions
- AUX 29 SCANSET — Channel Signaling Scan Setting

3.29.5 Signaling Keypad

The Signaling Option includes an attachable Keypad. The Keypad is used to edit signaling sequences, to manually dial, and then to analyze test result sequences. (see Figure 3-10)



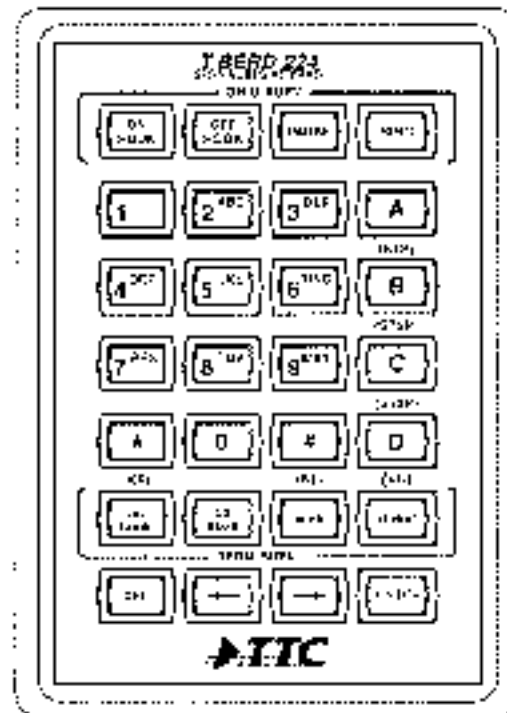


Figure 3-10. Signaling Keypad

3.29.5.1 TERM SUPV

The Terminating Supervision events are sent by the device receiving a call. Lowercase letters specify terminating supervision events.

wink (w) — A temporary OFF HOOK (approximately 200 ms) sent in response to the originating end. It indicates that the terminating end is ready to receive digits.

d-dial (d) - Delay-dial — This supervision event is very similar to a wink. If d-dial and wink are specifically programmed to different parameters in the AFX 28 SUP DEL function, the TMR (0) 224 can distinguish between the two events. The d-dial event is sent as soon as the terminating switch goes from on-hook to off-hook, while the wink is sent a few mill seconds before sending the digits.

on hook (o) — Indicates that the equipment is releasing the line.

off hook (h) — Response to the originating equipment seizing the line of the receiving machine.

dial tone (D) — A tone generated by the PUX indicating the PUX is ready to accept digits.

3.29.5.2 ORIG SUPV

The originating supervision events are sent by the device initiating a call. Capital letters specify the originating supervision events.

MARGINAL DIGIT (M) — Identifies an event similar to a recognized frequency, but that can not be specifically determined.

ON HOOK (O) — Indicates that the equipment is releasing the line.

OFF HOOK (H) — Indicates that the equipment is seizing the line.

PAUSE (P) — A one second wait before the next event is sent. Single or multiple pauses can be input.

RING (R) — A signal sent from the central office to the station, telling the station to ring the telephone.

GROUND ON RING (G) — A signal sent from the PBX to the far end channel back, which is translated by the switch into signaling bus.

3.29.5.3 Keypad

The keypad is grouped as a telephone keypad except for the A, B, C, and D keys.

0-9 # * — These digits are available in all address types.

A B C D — These characters are only available in the DTMF address type.

KP ST STP ST2P ST3P — These characters are only available in the MF address type.

3.29.5.4 Cursor

Digits and supervision events entered on the keypad are inserted into the sequence at the cursor position. The sequence to the right of the cursor shifts to the right as new digits and events are entered.

DEL — Press this key to remove an event or digit at the cursor position and cause the sequence to the right of the cursor to shift left.

Arrow Keys — Press the right and left arrow switches on the keypad to scroll through the received sequence using the cursor. When the cursor is under the desired event, the **RESULTS II Arrowed** switch is used to view the desired result.

3.29.5.5 Enter

Press this key to save the entire sequence regardless of the cursor position.

3.30 CIRCUIT CONNECTIONS

The following circuit connection controls are affected by the Signaling Option.

3.30.1 DROP (RX) Switch

When the T-BIRD 22- is configured to MONITOR or SCAN the **DROP (RX)** switch is set to BOTH.

3.30.2 INSERT (TX) Switch

When the T-BIRD 22- is configured to MONITOR or SCAN the **INSERT (TX)** switch is set to OFF.

3.30.3 CHANNEL SWITCHES

When the T-BIRD 22- is configured to SCAN the **CHANNEL** switch number is displayed as 00000000. The T-BIRD 22- controls the channel selection. After a channel is seized, the channel number is displayed. The channel number is always the same for LINE 1 and LINE 2.

3.31 RESULTS VERIFICATION

The Signaling Option adds five results to the CHANNEL category: 00 DELAY, 0101 DUR, 0102 ADDR, 0104 QLEVEL, and 0105 QLEVEL. The 0104 QLEVEL and 0105 QLEVEL results are only available with the Digit Analysis Option.

The results require the entire display window. To exit the result display, the corresponding **RESULTS Blank** or **Arrowed** switch must be pressed.

Example: DIAL SEQ

| | | | |
|--------------|-------|------------|-------|
| H w 3531550h | | 11000HR | |
| DIAL | SEQ 1 | STD (E&M)1 | 50 ms |

The top line of the Results display shows the transmitted digit sequence. The sequence number is displayed in the bottom of window two. The rightmost window displays results and their measured values. The result selected may be changed by pressing the **RESULTS II Arrowed** switch.

Press the Signaling keypad arrow keys to cause the cursor to appear and move left or right. The cursor indicates the event to be analyzed. Only received supervision events (small letters) may be analyzed. If the sequence has not been sent or is in the process of being sent, the display beneath the test will read UNAVAILABLE. When the sequence is complete, the RESULTS window displays the result of the last received supervisory command. If an expected supervision event is not received, the channel result displays an error message.

Press the **SOURCE CONFIGURATION II** switch to send a different digit sequence or manually enter the digits without exiting the result display.

Press the **RESTART** switch or toggle from ON HOOK back to OFF HOOK to clear the selected results and prepare the THERM 224 to re-send digits.

3.32 TROUBLESHOOTING CONTROLS

The following troubleshooting controls are affected by the Signaling Option.

3.32.1 LOOP DOWN Switches

The LOOP UP and LOOP DOWN switches are only available when the CHANNEL FORMAT setting is set to SWB and the SOURCE CONFIGURATION control is set to a III RT pattern.

3.32.2 SIGNALING INSERT Switches

The SIGNALING INSERT switches are disabled but provide a visual indication of the signaling bits transmitted by the Dial Sequence and the Reverse Sequence. The internal switch LED illuminates when a binary one is transmitted and is extinguished when a binary zero is sent.

3.32.3 ERROR INSERT Switches

When the **CHANNELFORMAT** switch is set to SWI 56 and the DDS Option is installed, all of the **ERROR INSERT** switches are available. When the **CHANNELFORMAT** switch is set to SIGNALING only the **BPV**, **FRAME**, and **YELLOW ERROR INSERT** switches are available.

3.32.4 VOLUME Control

When the TBFED 234 is configured to SCMN for a channel, the speaker is muted until the channel is seized.

3.33 PRINTER CONTROLS

With the Signaling Option, four new results printouts are available: **DIAL SEQ**, **REC SEQ**, **MONITOR**, and **SCAN**. See Section 6 for an explanation of the printouts.

A results printout is generated automatically when the **PRINT EVENT** switch is set to any setting except OFF. A **MONITOR** and **SCAN** results printout is generated when both lines have returned to the ONHOOK state. **DIAL SEQ** and **REC SEQ** printouts are generated when the sequence has completed.

VALUETRONICS
CORPORATION
10000 VALUETRONIC DRIVE
FARMINGTON, CT 06032
(203) 673-3333
TELEX: 370033

VALUETRONICS
CORPORATION
10000 VALUETRONIC DRIVE
FARMINGTON, CT 06032
(203) 673-3333
TELEX: 370033

CALLER ID OPTION

3.34 INTRODUCTION

The T-BIRD 224 Caller ID Option provides the following features and capabilities:

- Monitors a channel for Caller ID activity.
- Decodes and displays Caller ID Frequency Shift Key (FSK) information, including Caller ID name and/or number.
- Scans for signaling activity on pre-selected channels of a T1 circuit or on all 24 channels and locks onto the first channel that exhibits ringing activity. Once a channel is selected, all Caller ID data is decoded for that channel.
- Emulates the Caller ID activation and deactivation codes sent by Customer Premises Equipment (CPE).

NOTE

Unless indicated, the capabilities of the T-BIRD 224 mainframe are applicable to the Caller ID Option.

3.35 TEST SETUP

The following controls and indicators are affected by the Caller ID Option.

3.35.1 MODE Switch

When CALL ID is the channel format selection, the mode selections are limited to AUTO, 71-DIGIT, 402, T-01, T-ES, SEC BID, and T1SLC's.

3.35.2 CHANNELFORMAT Switch

In addition to the mainframe channel format selections, the following is also available:

- **CALL ID** - Configurable T-BIRD 224 feature
 - Monitors the FSK Caller ID messages.
 - Scans selected channel for the Caller ID name and number.
 - Emulates a 09 or other ID tone to the network stage.

3.35.3 SOURCE CONFIGURATION Switches

The following source configuration selections are available. The **SOURCE CONFIGURATION I** switch selections depend upon the **CHANNELFORMAT** switch selection. The **SOURCE CONFIGURATION II** switch selections depend upon the **SOURCE CONFIGURATION I** switch selection (see Table 3-11).

Table 3-11. Caller ID Option Switch Configuration

| Switch | Configuration | | |
|----------------|--|------------------|--|
| MODE | AUTO, T1-DIG, T1-B2, T1-DL, T1-ESF, SLC-DIG, FINECNG | | |
| CHANNEL FORMAT | CALL ID | | |
| SCI | CID MON | CID SCAN | CPE EMUL |
| SCII | SWI=L1 SWI=L2 | SWI=L1 SWI=L2 | DTMF ACT DTMF DEACT DP ACT DP DEACT |

CID MON — Configures the T-BERD 224 to decode and display the USX Caller ID data that is sent from the SPX'S to the CPX during the silent interval between the first and second ringing cycle on a known T1 channel.

SWI=L1, SWI=L2 — Use the **SOURCE CONFIGURATION II** switch to select the line coming from the switch (SWI=L1 or SWI=L2). The selection depends upon the test connections.

When the **SOURCE CONFIGURATION I** switch is set to **CID MON**, the **DROP (RX)** switch is automatically set to **BOOTH**, and the **INSERT (TX)** switch is set to **NEINE**. The **CHANNEL** switches must be set to the exact channels to monitor. The **RECEIVE INPUT** switches must be set to **DSX MON**. The **AUX 31 CALL ID** auxiliary function must be set to the signaling format of the circuit equipment being monitored (SLC or FX).

CID SCAN — Configures the T-BERD 224 to scan the pre-selected channels (see **AUX 29 SCANSET** function of the T1 line from the switch) and decodes the USX Caller ID data on the first channel that exhibits ringing activity. After locating a channel with ringing activity, the T-BERD 224 locks onto that channel and functions the same as in **CID MON**. While scanning the channels selected, the display shows two dashes in place of the channel until it locks onto a channel with activity. Then the channel number appears.

A time-out period can be set using the **AUX 29 SCANSET** function, so the T-BERD 224 resumes scanning after monitoring the active channel for the time-out period.

SWI=L1, SWI=L2 — The **SOURCE CONFIGURATION II** switch selects the line coming from the switch (SWI=L1 or SWI=L2). The selection depends upon the test connections.

When the **SOURCE CONFIGURATION I** switch is set to **CID SCAN**, the **DROP (RX)** switch is automatically set to **BOOTH**, and the **INSERT (TX)** switch is set to **NONE**. The **CHANNEL** switch always change to "----" while scanning. The **RECEIVE INPUT** switches must be set to **DSX MON**. The **AUX 31 CALL ID** auxiliary function must be set to the signaling format of the circuit equipment being scanned (SLC or FX).

CPE EMUL — Configures the T-BERD 224 to emulate Customer Premises Equipment (CPE). The **DTMF** keypad creates the T1-RX 224 transmission of pre-selected Caller ID sequences or destructive (885) tones or post-ring (DP) or (DPDE) tones in continuous sequences or by using the keypad as the keypad. **Call ID Signaling** displays the signaling method being used.

DTMF ACT or DTMF DEACT — The **SOURCE CONFIGURATION II** switch selects the appropriate stored sequence of DTMF digits for the activation code (865) or the deactivation code (885).

DP ACT or DP DEACT — The **SOURCE CONFIGURATION II** switch selects the appropriate stored sequence of DP digits for the activation code (1165) or the deactivation code (1185).

When the **SOURCE CONFIGURATION** switch is set to CPE EMUL., the **INSERT (TX)** switch must be set to the line that is connected to the IN jack on the DSX-1 patch panel (towards the switch). The **CHANNEL** switches must be set to the correct channel to emulate. The **RECEIVE INPUT** switches must be set to DSX MON. The AUX 31 CALLID auxiliary function must be set to the signaling format of the circuit equipment being emulated (SLC or TX).

3.35.4 AUX Switch

The following auxiliary functions are added or affected by the Caller ID Option. The AUX 31 CALLID auxiliary function is only available when the **CHANNEL FORMAT** switch is set to CALLID.

- AUX 31 CALLID → Caller ID Signaling Selection
- AUX 29 CHANNEL → Channel Signaling Scan Setting
- AUX 35 CUSTOM → Custom Results

Refer to Section 4, Auxiliary Functions, for descriptions of the auxiliary function.

3.35.5 Signaling Keypad

The Caller ID Option does not include a signaling Keypad (Signaling Option required). However, the Keypad can be used to send Caller ID activation and deactivation codes.

3.36 CIRCUIT CONNECTIONS

The following circuit connections controls are affected by the Caller ID Option.

3.36.1 DROP (RX) Switch

When the T-B7RD 224 is configured for CTD MON or CTD SCAN, the **DROP (RX)** switch is set to BOTH.

3.36.2 INSERT (TX) Switch

When the T-B7RD 224 is configured for CTD MON or CTD SCAN, the **INSERT (TX)** switch is set to NONE.

3.36.3 CHANNEL Switches

When the T-B7RD 224 is configured for CTD SCAN, the **CHANNEL** switch permits a drop of call to call. The T-B7RD 224 controls the channel selection. When a channel is selected, the channel number will be used as the extension number (always the same for LINE 1 and LINE 2).

3.37 RESULTS VERIFICATION

The Caller ID Option adds results to the CHANNEL category: n100 DELAY, n101 CRJ CM LIG7 MSG DUR, n108 MK LVI, n109 MK FRQ, n110 SP LVI, and n111 SP FRQ.

The captured Caller ID results are displayed in a scrolling display window. To view the complete Caller ID captured data the **MODE** switch is used as a cursor key. If the Signaling Lid keypad is installed, either the **MODE** switch or the **Cursor** keys on the keypad can be used to scroll to the results.

Example: CID MON Mode Captured Data (Scrolled results display)

```

o O R (George Smith 042514      1100 DEL
CID MON SWI=L1SLC             550 ms
.....

ith 042514533013531550) R R.    1100 DEL
CID MON SWI=L1SLC             550 ms
.....

```

The top line of the Results display shows the received Caller ID data. The CPT (lowercase *o*), and switch (uppercase *O*) identify on-hook conditions. The first ringing signal (uppercase *R*), was sent from the switch. The first parenthesis (*(*) represents channel seize. The next 12 characters are the calling name of the originating party (up to 15 characters can be displayed). These characters are followed by four digits that represent the date. The first two digits represent the month, then the next two digits represent the day. These four digits are followed by another four digits that represent the time in military format (hour (2 digits) and minute (2 digits)). The time is followed by the calling number (up to 11 digits). The final parenthesis (*)* represents the channel and the conclusion of the PSK data. The second ring (uppercase *R*) and off-hook (lowercase *o*) denote the end of the message.

The second line displays the test function (CID MON), the originating switch line (SBL1), and the trunk type (normal SLIC).

The rightmost upper and lower line characters are the Delay result for time (550 millise) and delay from first ring to the start of the Caller ID information.

NOTE

If the Caller ID service does not support Caller Name, the T3BTR0 224 display is the same, except the calling name is not displayed.

3.36 PRINTER CONTROLS

With the Caller ID Option, an additional results outcome is available. CALID is the last line outcome for an explanation of a printer.

A results printer is generated automatically when the **POINT EVENT** switch is in the setting except for CID. A printer case for results generation is generated when the second ring from the originating switch is received on the printer. The printer is in a mode to receive data. Figure 3-11 shows a sample of CID 224 results printer.


```
CALLER ID PRINT          3:51:04  Jan 11  
A T T (12345678) 10000011000010000100001000010000  
Example # 11  
SESSION OF          1000 00K 0000 00  
MARK  PRG          1000 10K          MARK  LVL  10.0 0000  
SESSION TSC        1000 10K          SESSION LVL  10.0 0000  
MARKET            DEL  
  1  
  4      N/A  
  0      0  
  2      1000  
  7      00  
  1      00  
  2      1000  
  5      0000
```

Figure 3-11. Caller ID Results Printout

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SS7 CALL TRACE OPTION

3.39 INTRODUCTION

The SS7 Call Trace Option allows the T-BERD 224 to non-intrusively monitor link statistics over Signaling System 7 (SS7) and enables SS7 call tracing over the link. This feature enables the user to look onto a specific call and monitor all call processing messages (SS7 ISUP messages) that correspond to that call. While tracing the call, it reports, in real time, the call data and other important information about the traced call. The T-BERD 224 SS7 Call Trace Option provides the following features and capabilities:

- Accesses the SS7 facility link from a DSI access point
- Non-intrusively monitors SS7 link statistics
- Traces calling number, called number, OPC, and TOC values
- Quickly retrieves and displays link statistics information
- Isolates transmitter and protocol problems between SSPs IP and SCP
- Sectionalizes transmission problems on the link

NOTE

This option requires the DSP Based Option when the access to protocol is from a DSI access point.

3.40 FUNCTIONAL DESCRIPTION

3.40.1 Monitoring SS7 Protocol — Link Statistics

SS7 protocols are is of signaling information using an HDLC packet format. Its protocol uses CCITT standard Q.700 and the local exchange switch acts as a translation between the SS7 call status messages and non-responder ISDN messages.

The basic elements of the SS7 network can be described as follows:

Service Switching Point (SSP) — Performs all the functions of the SP and can also query SCPs.

Signaling Transfer Point (STP) — Serves as a switching point for the signaling and database query messages generated by SSPs and SCPs. STPs are always in a group of three.

Service Control Point (SCP) — Contains a central database for providing access to enhancements. SCPs are usually deployed in pairs for data redundancy and are always accessed through STPs.

SS7 Links (DSOs) — Provide a path with a set of signaling links between terminals within the network. The links, labeled A through E, are deployed in pairs throughout the network and operate at a maximum data rate of 2.048 Mbps. Traffic congestion occurs on one of the pairs. The utilization maximizes at 90%.

SS7 is a unique protocol structure signaling OSI Layer 2 protocol carrying bidirectional signal units. The T-BERD 224 decodes the Layer 2 packets (signal units). There are three types of signal units:

Message Signal Unit (MSU) — Contains vital call setup and messaging information.

Link Status Signal Units (LSSUs) — Carry the health of the signaling link between terminals.

Fill-In signal Units (ISUs) Keep the signal "busy" when no other information is being transmitted.

3.40.2 SS7 Link Statistics

The option enables the T-BERD 224 the ability to monitor all Layer 2 (OSI) messages on the SS7 link. Test results are provided that count the error-free packets (i.e., Message Signal Units, Link Status Signal Units, and Fill-In Signal Units) on the SS7 link and classifies them as good, CRC errored, or discarded, as well as reporting CRC errored seconds and error rate. In addition, it counts the Backward Indicator Bit field state transitions, indicates the percent of MSU Utilization, and monitors SS7 link status messages (e.g., busy, processor outage, out of service, etc.).

3.40.3 SS7 Call Trace

The T-BERD 224 starts an SS7 call trace by searching for a SETUP message that meets a specified trace criterion (set through AUX 46). When a call is detected, the call reference value is extracted and all related messages are captured and processed; all other messages are ignored. A call trace is automatically restarted when a preset call state condition occurs (set through AUX 41). Test results provide the necessary information to track a call (call state, called number, calling number, call type, call OPC code, call DPC code, and cause value).

The T-BERD 224 restarts the SS7 Call Trace after a specified call state is detected (set through AUX 41). The restart occurs on one of the following events: CONNECTED, PROCEEDING, ALERTING, or RELEASED. If the detected call state corresponds to the AUX 41 restart event setting, then the T-BERD 224 starts searching for a new call after a specified delay (also set through AUX 41). All results remain valid during the delay.

There are two types of restart delays set with AUX 41: release and event. The release delay is used when the RELEASED state is detected. The event delay is used when other call states are detected and the restart event is set to something other than RELEASED.

3.41 TEST SETUP

The following test setup events are affected by the SS7 Option (see Table 3-12).

Table 3-12. SS7 CallTrace Option Switch Configurations

| Switches | Configuration |
|----------------|--------------------------------|
| NR40 | MESSAGE TYPE CONTROL UNIT TEST |
| Channel Format | PROTOCOL |
| 40 | LINK STATE |
| 41 | LINK STATE |

3.41.1 CHANNELFORMAT Switch

In addition to the mainframe channel format selections, the SS7 Call Trace Option adds the following:

PROTOCOL Configures the T-BERD 224 to monitor SS7 Call Trace or SS7 messaging links. The appropriate channel format is B8ZS (mainframe) and AMI (line code).

3.41.2 SOURCE CONFIGURATION I Switch

The following source configuration selections are available when the PROTOCOL channel format is selected:

SS7 MON -- Monitor SS7 signaling and messaging link information on a 56 Kbps DDS link.

3.41.3 SOURCE CONFIGURATION II Switch

The following selections are available when the SOURCE CONFIGURATION II switch is selected:

CALL TRACE -- Monitors call processing of a selected call over the SS7 channel.

LINK STAT -- Monitors all OSI Layer 2 (LAPD) signaling units over the SS7 channel.

3.41.4 SS7 Call Trace Controls and Indicators

SS7 call tracing is configured by setting the CHANNELFORMAT switch to PROTOCOL, the SOURCE CONFIGURATION I switch to SS7 MON, and SOURCE CONFIGURATION II TO CALL TRACE.

Pressing the **RESTART** switch abandons the current call trace and restarts the search for a new call.

When call tracing is selected, the **DROP** switch is forced to BOTH and the **INSERT** switch is forced to NONE.

Select the desired DS0 channel with the **LINE 1** and **LINE 2 CHANNEL** switches (D channel typically appears on DS0 #24).

3.41.5 SS7 Link Statistics Controls and Indicators

Monitoring an SS7 link statistic is configured by setting the CHANNELFORMAT switch to PROTOCOL, the SOURCE CONFIGURATION I switch to SS7 MON, and the SOURCE CONFIGURATION II switch to LINK STAT (see Table 3-12).

When monitoring SS7 link statistics, the **DROP** switch is forced to BOTH and the **INSERT** switch is forced to NONE.

Select the desired DS0 channel with the **LINE 1** and **LINE 2 CHANNEL** switches (D channel typically appears on DS0 #24).

3.41.6 SS7 Call Trace / Link Statistics Feature Interaction

Within the SS7 channel format, the call trace feature will not interfere with the link statistics feature, provided and configured. However, the E-TRK2 is a basic 11 monitoring features, the errors and alarms can operate concurrently with the SS7 Call Trace feature.

3.42 CIRCUIT CONNECTIONS

3.42.1 SS7 Call Trace Connections

To perform SS7 Call Trace, the T-BERD 221 must be connected to **LINE 1 RECEIVE** and **LINE 2 RECEIVE** on both sides of the DS1 line to monitor calls. Set the operating mode (tracking) to **MOOE** switch, and line code to **CODE** switch for the line being used.

3.42.2 SS7 Link Statistics Connections

Link statistics can be monitored from either direction, individually or simultaneously through the **LINE 1** and **LINE 2 RECEIVE** connections.

3.43 AUXILIARY FUNCTIONS

The following auxiliary functions enable the T-BERD 221 to perform call traces over SS7.

3.43.1 AUX 41 TRC RST -- Set SS7 Call Trace Restart Criteria



The **AUX 41 TRC RST** function sets the SS7 call trace restart criteria. A test restart consists of abandoning the existing call trace and starting a new call trace. Press the **RESULTS | Arrowed** switch to select the following:

RLS DELAY Sets the release delay criterion. Press the **RESULTS | Blank** switch to select the following release delays: **NONE**, **1 SECOND**, **2 SECONDS**, **3 SECONDS**, **10 SECONDS**, **30 SECONDS**, or **FOREVER**.

Changing the settings releases a test restart.

NOTE

The **TRC** and **Priority Rate (SRV)** settings are assigned to **AUX 41 Trace Restart** function. Even after the user will be able to access the **503 AUX 41** function or the **PRI AUX 41** function to change SS7 mode and vice versa. However, there is no **LV5 N2** terminal in the T-BERD 221.

Table 3-13 contains the factory default settings that are stored in memory for **AUX 41 SS7 Call Trace Restart** (factory default setting: **AUX 41** sets the call trace criteria for SS7). The T-BERD 221 controls can be forced to their default settings by clearing the **NOVRAM**. As soon as the **SOFTWARE REVISION** message is visible while the unit is being powered up, manually press the **RESTART** switch. The message **CLEARING NOVRAM** appears on the **RESULTS** display. Below are the following default values:

Table 3-13. Default Settings for Aux 41 and 46

| Parameter | Default Setting |
|---|-----------------|
| AUX 41 *TRSDelay | 10 SECONDS |
| AUX 46 *DISDLY 20:00 | *CALLEDNUMBER |
| AUX 46 *CALLEDNUMBER | ANY |
| AUX 46 *CALLEDNUMBER (SELECT setting) | |
| AUX 46 *CALLINGNUMBER | ANY |
| AUX 46 *CALLINGNUMBER (SELECT setting) | |
| AUX 46 *OPC | ANY |
| AUX 46 *OPC (SELECT setting) | |
| AUX 46 *DPC | ANY |
| AUX 46 *DPC (SELECT setting) | |

3.49.2 AUX 46 SS7 TRC — Set SS7 Call Trace Criteria

| | |
|---------|---------------|
| AUX 46 | *CALLEDNUMBER |
| SS7 TRC | SELECT |

The AUX 46 SS7 TRC function configures the SS7 call trace filters. The filter sets for origination point code, destination point code, called numbers, and calling number. The test instrument can only trace one call at a time. This auxiliary function is only available when the AUX switch is pressed in the SS7 call trace mode.

Press the **SOURCE CONFIGURATION** switch to select the following auxiliary function options:

***OPC** — Sets the call trace originating point code. Press the **SOURCE CONFIGURATION I** switch to select one of the following:

ANY — Call trace looks for any OPC.

SELECT — Enter a specific OPC from 0 to 9 digits with the Signaling Option keypad. Only the following keys are active for this function: 0 to 9, DELETE, ENTER, and left/right arrow keys. All or part of a number can be entered. Press the **RESULTS II Arrowed** switch to select the previously saved number.

***DPC** — Sets the call trace destination point code. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

ANY — Call trace looks for any DPC.

SELECT — Enter a specific DPC from 0 to 9 digits with the Signaling Option keypad. Only the following keys are active for this function: 0 to 9, DELETE, ENTER, and left/right arrow keys. All or part of a number can be entered. Press the **RESULTS II Arrowed** switch to select the previously saved number.

***CALLING NUMBER** — Sets the calling number to be traced. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

ANY — Call trace looks for any calling number.

SELECT -- Enter a specific calling number from 0 to 12 digits with the Signaling Option keypad. Only the following keys are active for this function: 0 to 9, DEL, CLR, ENTER, and left/right arrow keys. All or part of a number can be entered. Press the **RESULTS** || **Arrowed** switch to select the previously saved number.

***CALLED NUMBER** -- Sets the calling number to be traced. Press the **SOURCE CONFIGURATION** || switch to select one of the following:

ANY -- Call trace looks for any called number.

SELECT -- Enter a specific called number from 0 to 12 digits with the Signaling Option keypad. Only the following keys are active for this function: 0 to 9, DEL, CLR, ENTER, and left/right arrow keys. All or part of a number can be entered. Press the **RESULTS** || **Arrowed** switch to select the previously saved number.

Changing the settings raises a test restart. Table 3-14 shows an example of SS7 ATX 16 results.

Table 3-14. SS7 CallTrace Restart Results

| Result | Label(s) |
|------------------------|--|
| Call State | CALL STATE |
| Called Number | CALLED NM ₁ CALLED NM ₂ CALLED NM ₃ |
| Calling Number | CALLING N ₁ CALLING N ₂ |
| Call Type | CALL TYPE |
| Originator Point Code | OPC |
| Destination Point Code | DPD |
| Cause | CAUSE |

The **RESULTS** display can report the *Call State* to determine where the call originated from as well as the following information messages listed in Table 3-15.

Table 3-15. SS7 Call State Results

| Message(s) | Call State Result |
|------------|-------------------|
| IAM | INIT. ANSWER |
| ACM | ADDR. COMP. |
| AN | ANSWERED |
| RFI | RECEIVED |
| RFI | REPLY. COMP. |

NOTE

When using the SS7 ATX 16, you must be logged with the T1000 user name on the Signaling Option software must be installed on the T-REX® 224 to enter the calling and called numbers.

3.44 TEST RESULTS

Refer to Section 5.7.3 for SS7 Call Trace Option test results regarding Link Statistics and Section 5.7.4 for SS7 Link Statistics test results.

3.45 PRINTOUTS

If the **PRINT EVENT** switch is set to **TEST END**, the call trace test results are printed when the call state is **RELEASED**. The SS7 results printout is only available when the front panel display configuration is set for SS7 Call Trace as shown below in Figure 3-12.

| | |
|------------------|----------------------|
| CALL TRACE TEST: | 10:25:37 AM 05/24/06 |
| CALL NUMBER: | UNRECORDED |
| CALLER NUMBER: | 8004491144 |
| CALLING NUMBER: | 8004491144 |
| CALL TYPE: | OUTGOING |
| CALL: | UNRECORDED 10:25:37 |
| STATE: | UNRECORDED 10:25:37 |
| CAUSE: | UNRECORDED |

Figure 3-12. SS7 Call Trace Printout

3.45.1 SS7 Call Trace Controls Printout

When the system is configured for SS7 Call Trace, the following block of print will be added to the end of the **CONTROLS** printout. The data printed is based on the AUX function settings specified above. The printout is formatted as shown in Figure 3-13.

| | |
|---------------------|--|
| SS7 CALL TRACE: | |
| DIR: | ANY IN/OUT |
| DIR: | ANY IN/OUT |
| CALLER NUMBER: | ANY (1) (2) (3) (4) (5) (6) (7) (8) (9) (0) |
| CALLING NUMBER: | ANY (1) (2) (3) (4) (5) (6) (7) (8) (9) (0) |
| SS7 TRACE RESTART: | |
| RELEASE DELAY TIME: | NONE FOR ALL LINKS (0) (1) (2) (3) (4) (5) (6) (7) (8) (9) |

Figure 3-13. SS7 Call Trace Controls Printout

PRIMARY RATE ISDN OPTION

3.46 INTRODUCTION

Primary Rate ISDN Option allows the T-BERD 224 to non-intrusively monitor link statistics over the Primary Rate Integrated Services Digital Network systems. It also enables ISDN call tracing over the primary ISDN D channel. The T-BERD 224 Primary Rate ISDN Option provides the following features and capabilities:

- Accesses the ISDN facility link from any T1 access point.
- Non-intrusively monitors Primary Rate ISDN link statistics.
- Quickly retrieves and displays link statistics information.
- Sectionalizes transmission problems on the link.

Primary Rate ISDN protocols transmit signaling information using an HDLC packet format. Its protocol uses CCITT standard Q.931.

3.47 FUNCTIONAL DESCRIPTION

3.47.1 Primary Rate ISDN Link Statistics

The operation of the T-BERD 224 the ability to monitor all layer 2 (LAPD) messages on the Primary Rate ISDN D channel. Test results are provided that count packets on each line and classifies them as good, CRC errored, or discarded, as well as reporting CRC error counts and error rate. In addition, Information frames and Receiver Ready Frames are also counted.

3.47.2 Primary Rate ISDN Call Trace

The T-BERD 224 starts a Primary Rate ISDN call trace by searching for a SETUP message that meets a specific trace criteria set through AUX 41. When a call is detected, the call reference value is extracted and all related messages are captured and processed; all other messages are ignored. A call trace is automatically restarted when a preset call state condition occurs (set through AUX 41). Test results provide the necessary information to track a call (call state, called number, calling number, call type, interface and channel, network identification, call origination source, call disconnect source, and cause value).

The T-BERD 224 starts the call trace after a specific call state is detected (see the page AUX 41). The primary call state is one of the following events: CONNECTED, PROCEEDING, CALLING, or RELEASED. If the detected call state corresponds to the AUX 41 restart event, then the T-BERD 224 starts searching for a new call. The expected delay delay set through AUX 41. All other events are called by the delay.

There are two types of restart delay set with AUX 41: release and event. The release delay is used when the RELEASED state is detected. The event delay is used when other call states are detected and the restart event is set to something other than RELEASED.

3.4.8 TEST SETUP

The following test setup controls are affected by the Primary Rate ISDN Option (see Table 3-16).

Table 3-16. Primary Rate ISDN Option Switch Configurations

| Switches | Configuration |
|----------------|--|
| MODE | AUTO, T1-DID, T1-D2, T1-D3, T1-D4, SE, T1-RS19, T1-SL06, SL0-DID, T1-TFR, T1-UB |
| CHANNEL FORMAT | PROTCL |
| SCL | PRIMON |
| SCU | CALL TRACE LINK STAT |

3.4.8.1 CHANNEL FORMAT Switch

In addition to the multiplexed channel format selections, the Primary Rate ISDN Option adds the following:

PROTCL - Configures the T1-RS19/24 to monitor Primary Rate ISDN Trks. This channel format is available in all Terminal modes.

3.4.8.2 SOURCE CONFIGURATION I Switch

The following source configuration selection is available when the PROTCL channel format is selected:

PRIMON - Monitor Primary Rate ISDN signaling and messaging link on a 64 kb/s D channel.

3.4.8.3 SOURCE CONFIGURATION II Switch

The following selections are available when the SOURCE CONFIGURATION I switch is set to PRIMON:

CALL TRACE - Monitor call processing of a selected call over the Primary Rate ISDN D channel.

LINK STAT - Monitor layer 2 link statistics over the Primary Rate ISDN D channel.

3.4.8.4 Primary Rate ISDN Call Trace Controls and Indicators

Primary Rate ISDN call tracing is configured by setting the CHANNEL FORMAT switch to PROTCL, the SOURCE CONFIGURATION I switch to PRIMON, and the SOURCE CONFIGURATION II switch to CALL TRACE or LINK STAT.

Pressing the **RESTART** switch disables the current call trace and resets the trace to the source selected.

When call tracing is active, the **EXPRES** indicator is active on BOTH and the **INSTR** indicator is active on NONE.

Select the desired DSI channel with the **LINE 1** and **LINE 2 CHANNEL** switches (D channel typically appears on DSI #24).

3.48.5 Primary Rate ISDN Link Statistics Controls and Indicators

Monitoring a Primary Rate ISDN link statistics is configured by setting the **CHANNELFORMAT** switch to **PROTECT**, the **SOURCE CONFIGURATION I** switch to **LINK MON**, and the **SOURCE CONFIGURATION II** switch to **LINK SIA I** (see Table 3-13).

When monitoring Primary Rate ISDN link statistics, the **DROP** switch is forced to **NOINT** and the **INSERT** switch is forced to **NOINT**.

Select the desired ISDN channel with the **LINE 1** and **LINE 2 CHANNEL** switches. (Channel typically appears on DISC 024).

3.49 CIRCUIT CONNECTIONS

3.49.1 Primary Rate ISDN Call Trace Connections

To perform Primary Rate ISDN call trace, the T-BIRD 224 must be connected (LINE 1 RECEIVE and LINE 2 RECEIVE) to both sides of the ISDN line to monitor calls. Set the operating mode (framing **MODE** switch) and line code (**CODE** switch) for the line being used.

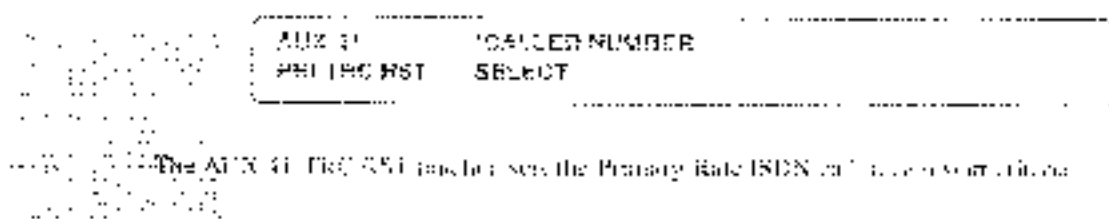
3.49.2 ISDN Link Statistics Connections

Link statistics can be monitored from either direction, individually or simultaneously through the LINE 1 and LINE 2 RECEIVE connectors.

3.50 AUXILIARY FUNCTIONS

Primary Rate ISDN Custom Results are part of the auxiliary functions of Auxiliary 35, Custom Results. Refer to Section 4-2-3 for detailed description of that function.

3.50.1 AUX 41 TRC RST — Set Primary Rate ISDN Call Trace Restart Criteria



SELECT -- The user selects the results available in the display and included in a results printout.

RLS DELAY -- Set the release delay criteria. Press the **RESULTS I** Blank switch to select one of the following release delays: NONE, 1 SECOND, 2 SECONDS, 5 SECONDS, 10 SECONDS, 30 SECONDS, or FOREVER.



PRIMARY RATE ISDN OPTION

Auxiliary Functions

***EVENT** → Sets the result event criteria. Press the **RESULTS I Blank** switch to select one of the following result events: **PRODUCING**, **ALERTING**, **CONNECTED**, or **RELEASED**. Press the **RESULTS II Arrow** switch to select one of the following event delays: **NONE**, **1 SECOND**, **2 SECONDS**, **5 SECONDS**, **10 SECONDS**, **30 SECONDS**, or **FOREVER**.

Changing the settings causes a test restart.

3.50.2 AUX 43 PRI TRC — Set Primary Rate ISDN Call Trace Criteria

```
AUX 43      *CALLED NUMBER
PRI TRC     SELECT
```

The **AUX 43 PRI TRC** function configures the Primary Rate ISDN call trace filters. The filter sets the origination source, call type, called number, and calling number. The test instrument can only trace one call at a time. For example, trace a voice call that originates from the network and with a called number starting with 234. This auxiliary function is only available when the **AUX** switch is pressed in the Primary Rate ISDN call trace mode.

Press the **SOURCE CONFIGURATION I** switch to select the following auxiliary function options:

***SELECT** → The user selects the results variable to be displayed and included in a results printout.

***SOURCE** → Sets the call trace origination source criteria. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

NETWORK → Call trace looks for a call from the network.

USER → Call trace looks for a call from the user.

ANY → Call trace looks for a call from either of sources.

***CALL TYPE** → Sets the call trace call type criteria. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

VOICE → Call trace looks for a voice call (speech or 3.1 kHz music).

DATA → Call trace looks for a data call.

ANY → Call trace looks for any type call.

***CALLED NUMBER** → Sets the called number to be traced. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

ANY → Call trace looks for any called number.

SELECT → Enter a specific called number (less than 15 digits with the Secondary Option keypad). Only the following keys are active for this function: **0-9**, **DELETE**, **UNDEF**, and **left/arrow** keys. All other numbers can be entered. Press the **RESULTS II Arrow** switch to select the primary rate number.

***CALLING NUMBER** → Sets the calling number to be traced. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

ANY → Call trace looks for any calling number.

SELECT Enter a specific calling number from 0 to 12 digits with the Signaling Option keypad. Only the following keys are active for this function: 0-9, DP, FFF, ENTER, and left/right arrow keys. All or part of a number can be entered. Press the **RESULTS If Arrowed** switch to select the previously saved number.

NOTE

The called or calling number string represents the minimum number of digits necessary to activate a trace. If the selected number matches the beginning of the number, the call is traced.

Changing the settings causes a test restart.

NOTE

If the T-BIRD 224 is being remotely controlled with the TDC DTMF software, the Signaling Option software must be installed on the T-BIRD 224 to enter the calling and called numbers.

3.51 TEST RESULTS

Refer to Section 3.4.13 for Primary Rate ISDN Option test results regarding Link Statistics and Section 3.7.12 for Primary Rate ISDN Option Call Trace test results.

3.52 PRINTOUTS

If the **PRINT EVENT** switch is set to TEST/END, the call trace test results are printed when the call state is RELEASED. Select PRIMARY TRACE ON a printout as shown in Figure 3-14.

```

.....
CALL TRACE PRINT 10 03:07:00 23 20
CALL STATE:          RELEASED
CALLING PARTY:       8765432100
CALLED PARTY:        01234567
CALL DURATION:       00:00:00
CALL CHARGE:         00 00
CALLER NUMBER:       00000000
CALLER NAME:         TRAC 000
CALLER EXTENSION:   00000000
.....

```

Figure 3-14 Primary Rate ISDN Call Trace Printouts

3.52.1 Primary Rate ISDN Controls Printout

When the system is configured for PRI Call Traces, the following block of print will be added to the end of the CONTROLS printout. The data printed shall be based on the ACX function settings specified above. The printout appears as shown in Figure 3-15.

```

.....
CALL TRACE PRINT 10 03:07:00 23 20
CALL STATE:          RELEASED
CALLING PARTY:       8765432100
CALLED PARTY:        01234567
CALL DURATION:       00:00:00
CALL CHARGE:         00 00
CALLER NUMBER:       00000000
CALLER NAME:         TRAC 000
CALLER EXTENSION:   00000000
.....

```

PRIMARY RATE ISDN CONTROL

Printout

```
ISDN CALL TRACE:
  STATE:                UNKNOWN, THREE/10/84
  CALL TYPE:            UNKNOWN, THREE/10/84
  CALLED NUMBER:        12148674901234567890
  CALLING NUMBER:       12148674901234567890
  REASON FOR DISCONNECT:
  EVENT TYPE:           UNKNOWN, THREE/10/84
  EVENT START TIME:     NONE, THREE/10/84
  RELEASE DELAY TIME:   NONE, THREE/10/84
```

Figure 3-15. Primary Rate ISDN Controls Printout

DSU-DP OPTION

3.53 INTRODUCTION

The DSU-DP Option allows the T1-BIRD 224 to drop a channel(s) of the DSU-DP interface for analysis by an external test set. The T1-BIRD 224 DSU-DP Option provides the following data channel applications:

- Decode and analyze DS0A, DS0B, or fractional T1 circuit protocol using the DSU-DP Option and an external data scope or protocol analyzer.
- Verify bidirectional signaling of 557 and primary rate ISDN circuits with an external data scope or protocol analyzer after identifying a problem.
- Replace fractional T1 CSU/DSUs by terminating the T1 span and connecting customer DTE to the T1-BIRD 224's DSU-DP.

When analyzing fractional T1 data, 24-N channels, the remaining 24-N channels are passed through the test set without being disrupted.

NOTE

Unless indicated, the capabilities of the receiving T1-BIRD 224 are applicable to the DSU-DP Option.

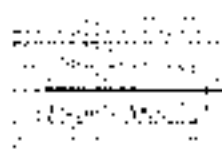
3.54 TEST SETUP

The following controls and indicators are affected by the DSU-DP Option (see Table 3-17).

Table 3-17. DSU-DP Option Switch Configurations

| Switch | Configuration | | | |
|----------------|--|---------|---------|--|
| MODE | 54-D0, T1-D0, 1143, T1-D4, T1-EN, SEC-D 12, 5-EN, 5A, SEC-ME, T1-IL3, 1-113 | | | |
| CHANNEL FORMAT | DS0A24 DS0A48 DS0A96 DS0A192 DS0B192 DS0A56 DS0B56 DS0A56K ¹ | DS0B24 | DS0B48 | DS0B96 56K ² 64K ² |
| SPAN | | DSU-DP | | |
| SCN | | CHAN 1 | CHAN 2 | CHAN 3 CHAN 4 CHAN 5 SPAN |
| | | CHAN 21 | CHAN 20 | CHAN 5 SPAN |
| | | | | NON-PROMISE |

¹ DS0A56K facility is available in the T1-ESF mode.
² 56K and 64K are only available in the T1-D0 or T1-ESF modes.



3.54.1 CHANNELFORMAT Switch

In addition to the main frame channel format, we return the following are also available with the DSU-DP Option:

- DS0A2.4, DS0A4.8, DS0A9.6** — Use when monitoring or testing DS0A formatted DDS data at 2.4, 4.8, or 9.6 kHz. Drop and insert access to unformatted 2.4, 4.8, or 9.6 kHz data is provided via the DSU-DP Option interfaces. AUX 11 ANI, CIA, and AUX 12 TRR CGR functions are applicable.
- DS0A192** — Use when monitoring or testing DS0A formatted DDS data at 19.2 kHz. Drop and insert access to unformatted 19.2 kHz data is provided through the DSU-DP Option interfaces. Data is inserted in bytes 2 and 3, while LMC codes are placed in bytes 1, 4, and 5. AUX 11 ANI, CIA is applicable.
- DS0B192** — Use when monitoring or testing Channel 1 of DS0B formatted DDS data at 19.2 kHz. Drop and insert access to unformatted 19.2 kHz data is provided through the DSU-DP Option interfaces. Data is inserted in bytes 2 and 3, while bytes 1, 4, and 5 pass through unformatted. If no FI signal is received, LMC codes are placed in bytes 1, 4, and 5. Substrate frame synchronization must be acquired before the THERIO 224 can insert test data. AUX 11 ANI, CIA is applicable.
- DS0A56** — Use when monitoring or testing DS0A formatted DDS data at 56 kHz. Drop and insert access to unformatted 56 kHz data is provided via the DSU-DP Option interfaces. AUX 11 ANI, CIA function is applicable.
- DS064** — Use when monitoring or testing 64 kHz data. Drop and insert access to clear channel data is provided via the DSU-DP Option interfaces.
- DS0B2.4, DS0B4.8, DS0B9.6** — Use when monitoring or testing DS0B formatted DDS data at 2.4, 4.8, and 9.6 kHz. Drop and insert access to an unformatted data channel is provided via the DSU-DP Option. Use the **SOURCE CONFIGURATION II** switch to select one of the 20 DS0B2.4, 10 DS0B4.8, or 5 DS0B9.6 channels to be analyzed. AUX 11 ANI, CIA functions are applicable. A message flashes in the RESULTS display to indicate the primary or secondary channel is being analyzed under this configuration. Substrate frame synchronization must be acquired before the THERIO 224 inserts test data.
- 56xN and 64xN** — Use when monitoring or testing Fractional FI channels. Drop and insert access to bit 17 (56xN) or bit 7-8 (64xN) of any combination of contiguous or noncontiguous DS0 channels via the DSU-DP Option interfaces. AUX 10 N CONFIG is applicable. This selection is only available when the **MODE** switch is set to 31, 04 or T1-ESF.
- DATLINK** — Use when monitoring or testing the ESF data link.

3.54.2 SOURCE CONFIGURATION I Switch

The DSU-DP SOURCE CONFIGURATION I switch selection is coded as the DSU-DP Option 11.

- DS0056** — Use when monitoring or testing DS0B formatted DDS data at 56 kHz. Drop and insert access to the unformatted insert signal. Data is transferred at the rate associated in the CHANNEL FORMAT II display.

3.54.3 SOURCE CONFIGURATION II Switch

The **SOURCE CONFIGURATION II** switch selections are only available for the following settings:

When the **CHANNELFORMAT** switch is set to DS0B2.4, DS0B4.8 or DS0B9.6, the available **SOURCE CONFIGURATION II** switch selections are:

CHAN = (1-5, 1-10, or 1-20) — selects one of the 5 (9.6 kHz), 10 (19.2 kHz), or 20 (38.4 kHz) DDS (DSOs) channels to analyze. The remaining 4, 9, or 19 channels are unaffected.

When the **CHANNEL FORMAT** is set to **SEVN** or **DATA**, the available **SOURCE CONFIGURATION II** switch selections are:

N = (1-24) — select the number of contiguous DSOs to analyze as a single FFT bandwidth. Use the **LINE 1** and **LINE 2 CHANNEL** switches to select the first channel of the FFT bandwidth.

NOTE

DSOs may *wrap around* the frame bit. For example, if **N = 4** and **CHANNEL = 23**, then channels 23, 24, 1, and 2 are analyzed.

NON CONTIG — analyze non-contiguous DSO channels as a single FFT bandwidth. Pressing the **AUX** switch automatically accesses the **AUX 10 N-CONTG** function. Enter the desired DSO channel numbers for the non-contiguous FFT bandwidth.

NOTE

The same number of channels must be selected for both lines, but the actual channels selected can be different. See Section 4 for more information on setting the **AUX 10 N-CONTIG** function.

3.54.4 CHANNEL Switches

When the **SOURCE CONFIGURATION II** switch is set to **NON CONTIG** the channel number is displayed as "----" because the channels to be used are defined by **AUX 10 N-CONTG** function. The **LINE 1** and **LINE 2 CHANNEL** switches are not available.

3.54.5 AUX Switch

The following auxiliary functions are added with the DSU-DP Option:

- **AUX 10 N-CONTG** — Non-contiguous Channel
- **AUX 11 ANAL CHA** — DSU-DP Analysis Channel
- **AUX 15 ERROR COR** — DSOs Error Correction

NOTE

Refer to Section 4, Auxiliary Functions, for a complete description of the auxiliary functions.

3.55 CIRCUIT CONNECTIONS

The DSU-DP Option side panel connections are shown in Figure 3-16. There are three versions of the DSU-DP Option: RS-232C/35, RS-232/RS-449, and RS-232C/35/RS-449. All three versions provide unique interfaces with identical functions. Refer to Section 8, Specifications, for details on the DSU-DP pin configuration.

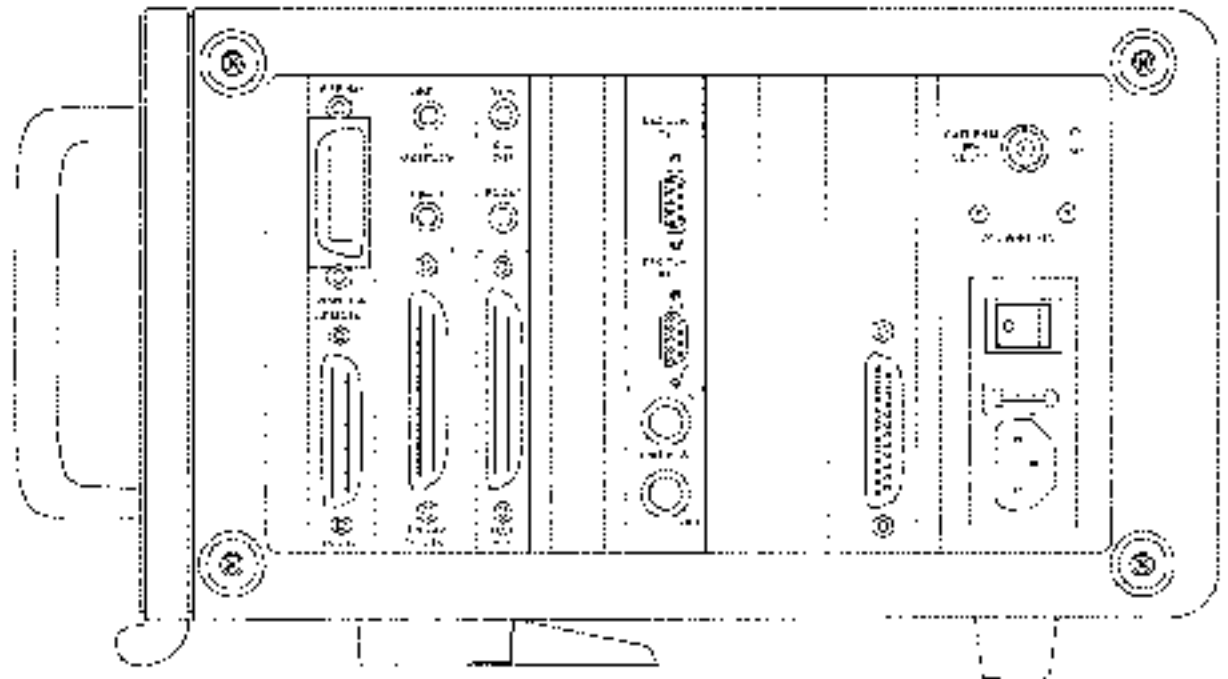


Figure 3-16. DSU-DP Side-Panel Connector

3.55.1 Connection To A Protocol Analyzer

3.55.1.1 Control Bit Monitoring on a DDS Circuit

With a DSU-DP Option (after March 1992), the T-BIRD 221 takes a majority rule of the last three control bits and drops the status of the control bit from each line to the RLSD leads on each communications interface. If the majority of the signal is negative, RLSD for that line is active. The control bit frequency is speed (bits/line) x 2. The output to the RLSD pin is active (1-K). If the **DROP (RX)** switch is set to **LINE 1**, the control bit output is the RLSD pin and the control bit is LINE 2. If a pin is designated as **LINE 1** or **LINE 2**, it is active (1-K).

Table 3-16. Control Bit Access -- DROP (RX) Switch **LINE 1** or **LINE 2**

| Interface | Pin Assignment(s) | Pin Name(s) |
|------------|-------------------|-------------|
| V.35 | F | RLSD |
| RS-422/422 | 15(a), 3, 14 | RRx, b- |
| RS-232 | 8 | RLSD |

Table 3-19. Control Bit Access — DROP (RX) Switch BOTH

| Interface | LINE 1 | | LINE 2 | |
|------------|-------------------|-------------|-------------------|--------------------|
| | Pin Assignment(s) | Pin Name(s) | Pin Assignment(s) | Pin Name(s) |
| V.35 | F | K, SD | 11 | Reserved |
| RS-449/422 | 1 (pin 31-in) | | RR(a,b) | 22(a, 24-b)/SS, NS |
| RS-232 | A | R, SD | 12 | See RJSD |

3.5.5.1.2 Terminal Emulation On A DDS Circuit

The DSU-DP Option allows the BFRD 224 to emulate a CSU/DSU/OLU combination. The test set insert Control Mode File (CMF) when RFS is inactive and customer data when RFS is active. This is available in the AUX CHANNEL function when DSU CHAN is set to PRIMARY and the CTRL BIT is set to RFS INSERT.

3.5.5.2 DSU-DP Cable Connections

For simplex drop and insert, use a straight-through, male-to-male cable to connect an external test set to a DSU-DP Option interface. This setup is used to monitor a circuit in one transmission direction or to perform a cut of service channel test. Data transmitted toward the external test set is selected using the INSERT (TX) switch: LINE 1 or LINE 2. Data received from the external test set is inserted into the T1 circuit selected by the DROP (RX) switch: LINE 1 or LINE 2.

Table 3-20 through Table 3-22 provide detailed pin assignments for cable connections to an external test set/ITE.

Table 3-20. RS-232 Male-to-Male Adaptor Cable

| Signal Name | To 224 (Male) | To Monitor (Male) | Signal Name |
|-------------|---------------|-------------------|-------------|
| PROT GND | 1 | 1 | PROT GND |
| SEC RX DATA | 1b | 2 | TX DATA |
| RX DATA | 3 | 3 | RX DATA |
| SEC RLSD | 12 | 4 | RFS |
| SEC RLSD | 12 | 5 | RTS |
| DSR | 6 | 6 | DSR |
| SIG GND | 7 | 7 | SIG GND |
| TX SD | 8 | 8 | TX SD |
| TX S | 9 | 9 | TX S |
| TX A | 10 | 10 | TX A |
| SEC RX CLK | 13 | 15 | RX CLK |
| RX CLK | 14 | 17 | RX CLK |

Table 3-21. V.35 Male-to-Male Adaptor Cable

| Signal Name | To 224 (Male) | To Monitor (Male) | Signal Name |
|-----------------|------------------|----------------------|-------------|
| PROT GND | A | A | PROT GND |
| SIG GND | B | B | SIG GND |
| SEC RLS/D | 11 | C | RTS |
| NR RLS/D | 11 | D | CTS |
| DSR | F | E | DSR |
| RLSD | F | F | RLSD |
| TX DATA (A) | DB | P | TX DATA (A) |
| RX DATA (A) | R | R | RX DATA (A) |
| SEC RX DATA (B) | 11 | S | TX DATA (B) |
| RX DATA (B) | 1 | T | RX DATA (B) |
| SCR (A) | V | V | SCR (A) |
| SCR (B) | X | X | SCR (B) |
| SEC SCR (A) | 11 | Y | SCR (A) |
| SEC SCR (B) | KK | YA | SCR (B) |

Table 3-22. RS-449 Male-to-Female Adaptor Cable

| Signal Name | To 224 (Male) | To Monitor (Female) | Signal Name |
|-------------------|------------------|------------------------|-----------------|
| PROT GND | 1 | 1 | PROT GND |
| SEC RX DATA (A) | 2 | J | SEND DATA (A) |
| SEC RX TIMING (A) | 16 | 5 | SEND TIMING (A) |
| RX DATA (A) | 6 | 6 | RX DATA (A) |
| SEC SCR (A) | 22 | 7 | RTS (A) |
| RX TIMING (A) | 8 | 8 | RX TIMING (A) |
| SCR (B) (A) | 23 | 9 | CTS (A) |
| DM (A) | 11 | 11 | DM (A) |
| RR (A) | 13 | 13 | RR (A) |
| SIG GND | 19 | 19 | SIG GND |
| RX COMMON | 20 | 20 | RX COMMON |
| SEC RX DATA (B) | 21 | 21 | SEND DATA (B) |
| SEC RX TIMING (B) | 33 | 23 | SEND TIMING (B) |
| RX DATA (B) | 71 | 24 | RX DATA (B) |
| SEC SCR (B) | 34 | 25 | RTS (B) |
| RX TIMING (B) | 76 | 26 | RX TIMING (B) |
| SCR (B) | 34 | 27 | CTS (B) |
| DM (B) | 77 | 28 | DM (B) |
| RR (B) | 79 | 29 | RR (B) |
| SEND COMMON | 37 | 31 | SEND COMMON |

ZBTSI FRAMING OPTION**3.56 INTRODUCTION**

The ZBTSI Framing Option allows the T-BERD 224 to test and analyze TI-FSK circuits that use ZBTSI encoding. ZBTSI encoding is typically used to transmit clear-channel data over TI-AMT-encoded lines. ZBTSI encoding permits the use of long-haul equipment (e.g., repeaters, multiplexers, line protection equipment, etc.) that is not FSX compatible for clear channel applications.

NOTE

Unless otherwise indicated, the capabilities of the current-line T-BERD 224 are applicable to the ZBTSI Option.

3.57 FUNCTIONAL DESCRIPTION

ZBTSI encoding reorganizes the 576 octets (726 groups of eight bits) that form the 24-ESI frames into six groups of 96 octets (540 frames) each. These 96 octets are then rearranged, depending on the data content of each octet.

ZBTSI encoding follows the following process:

1. The data is combined with a pseudorandom pattern to break up long strings of ones and zeros.
2. The data is loaded into a buffer, one octet at a time, until 96 octets are stored in the buffer and numbered field 1 to 96.
3. The contents of all 96 octets are examined for an all-zero condition. If no all-zero octets exist, the 96 octets exit the buffer and the next 96 octets are loaded into the buffer.
4. If non-zero octets exist, they are altered; a gap is created at the front of the first octet.
5. An address byte is inserted at the 8-bit gap. The first seven of the eight bits of this octet provide a binary address indicating the previous location of the octet. Bit 8 is used to indicate whether there are additional all-zero octets following. (If bit 8 is set to a zero, more all-zero octets follow; if bit 8 is set to one, no other all-zero octets follow.)
6. When ZBTSI encoding is used, the 24 framing bits are assigned as follows: six Frame Pattern Sequence (FPS) bits, six Cyclic Redundancy Check (CRC)-60 bits, six datalink (DL) ones, and six Zero (Z) bits. Half of the original ESI overhead is used to provide the Z bits, which indicate ZBTSI's reordering of the next 96 octets following.

The 96 octets exit the buffer



3.58 TEST SETUP

The following test setup controls are affected by the ZBTSI Option (see Table 3-23).

Table 3-23. ZBTSI Option Switch Configuration

| Switch | Configuration |
|--------|---------------|
| MODE | TESTSIZ |

3.58.1 MODE Switch

TESTSIZ - Configures the T-BURD 224 to transmit and receive ZBTSI-encoded LSIz framed T1 data. This enables the T-BURD 224 to test ZBTSI-encoded circuits. In TESTSIZ operating mode, the T-BURD 224 adds an additional four times of transmission delay (500 microseconds) to the 19 bits of delay typically encountered in other modes. In TESTSIZ, the T-BURD 224 can monitor and test the 2-Kbps LSIz datalink (CHANNELFORMAT switch set to **DATLINK**). If the LSIz Option is installed, the T-BURD 224 reports and sends the Performance Report Messages (PRMs) on the TESTSIZ 2-Kbps datalink - ANSI T1-603 PRMs.

3.59 TROUBLESHOOTING CONTROLS

The following troubleshooting controls are affected by the ZBTSI Option.

3.59.1 ERROR INSERT Switches

YELLOW ALARM ERROR INSERT Switch - In TESTSIZ framing, a repetitive pattern of eight ones and eight zeros is generated in the datalink each time this switch is pressed (LED illuminates).

FRAME ERROR INSERT Switch - In LSIz framing, this switch is enabled in T1 LINK AUTO LINK and T1 modes.

TR-303 OPTION**3.60 INTRODUCTION**

The TR-303 Option allows the T-BERD 224 to monitor link statistics and perform call tracing over Integrated Digital Loop Carrier (IDLC) systems from a DS1 access point. The option supports Transport Management Channel (TMC) Layer 2 and 3 protocols and Embedded Operations Channel (EOC) Layer 2 protocols as defined in the Bellcore specification, TR-NWT-000303 (commonly referred to as TR-303).

NOTE

This option requires the DSP Board Option.

3.61 FUNCTIONAL DESCRIPTION**3.61.1 TR-303 Call Trace**

The T-BERD 224 starts a TR-303 call trace by searching for a SETUP message that meets a specific trace criteria (set through AUX 42). When a call is detected, the call reference value is extracted and all related messages are captured and processed; all other messages are ignored. A call trace is automatically resumed when a preset call state condition occurs (set through AUX 41). Test results provide the necessary information to track a call (call state, call reference value, call type, DS-DSM, cause for disconnect, origination source, and disconnect source).

The T-BERD 224 restarts the call trace after a specified call state is detected (set through AUX 41). The restart occurs on one of the following events: CONNECTED or RELEASED. If the detected call state corresponds to the AUX 41 restart event setting, then the T-BERD 224 starts searching for a new call after a specified delay (also set through AUX 41). All results remain valid during the delay.

There are two types of restart delays set with AUX 41: release and event. The release delay is used when the RELEASED state is detected. The event delay is used when other call states are detected and the restart event is set to something other than RELEASED.

3.61.2 TR-303 Link Statistic

The option enables the T-BERD 224 the ability to monitor all Layer 2 (L2) EOC messages on the TMC and EOC. Test results are processed for control packets on each line and also includes message good/bad, call in/disconnect, as well as signaling call error messages and errors. In addition, information transmitted (Receive) and received (Transmit) packets can be counted based on their S&P (L2) addresses through each call.

3.62 TEST SETUP

The following test setup controls are affected by the TR-303 Option (see Table 3-24).

Table 3-24. TR-303 Option Switch Configurations

| Switches | Configuration |
|----------------|--|
| MODE | AUTO, TI-3010, TI-302, TI-304, TI-305, TI-306, TISLC36, SEC-DID, TI-303, TI-300 |
| CHANNEL FORMAT | PROTOCL |
| SCI | 303 MON |
| SCII | CALL TRACE LINK STAT |

3.62.1 CHANNEL FORMAT Switch

In addition to the mainframe channel format selections, the TR-303 Option adds the following:

PROTOCL — Configures the T-BFRD 224 to monitor TR-303 links. This channel format is available in all framed modes.

3.62.2 SOURCE CONFIGURATION I Switch

The following source configuration selections are available when the PROTOCL channel format is selected:

303 MON — Monitor signaling and messaging link information on the TMC or TOC.

3.62.3 SOURCE CONFIGURATION II Switch

The following selections are available when the SOURCE CONFIGURATION I switch is set to 303 MON:

CALL TRACE — Monitor call processing of a selected call over the TMC.

LINK STAT — Monitor layer 2 link statistics over the TMC or TOC.

3.62.4 TR-303 Call Trace Controls and Indicator

TR-303 call tracing is controlled by setting the CHANNEL FORMAT switch to PROTOCL, the SOURCE CONFIGURATION I switch to 303 MON, and the SOURCE CONFIGURATION II switch to CALL TRACE (see Table 3-24).

Pressing the **RECALL** switch at any time causes the control terminal call trace and test data to stop for a few calls.

When TR-303 call tracing is selected, the **DIGIT** switch is locked in **BCD** and the **INSERT** switch is locked to **NONE**.

Select the desired DSU channel with the **LINE 1** and **LINE 2 CHANNEL** switches (TMC) typically appears on DSU #24).

3.62.5 TR-303 Link Statistics Controls and Indicators

Monitoring TR-303 link statistics is configured by setting the **CHANNEL FORMAT** switch to **PROTOCOL**, the **SOURCE CONFIGURATION I** switch to **SOURCE**, and the **SOURCE CONFIGURATION II** switch to **LINK STAT** (see Table 3-24).

When monitoring TR-303 link statistics, the **DROP** switch is forced to **BOTH** and the **INSERT** switch is forced to **NONE**.

Select the desired DS0 channel with the **LINE 1** and **LINE 2 CHANNEL** switches (RXC typically appears on DS0 #12 and TXC appears on DS0 #24).

3.63 CIRCUIT CONNECTIONS

3.63.1 TR-303 Call Trace Connections

To perform a TR-303 call trace, the T-BIRD 224 must be connected (LINE 1 RECEIVE and LINE 2 RECEIVE) to both sides of the DS0 line to monitor calls. Set the operating mode framing (**MODE** switch) and line code (**CODE** switch) for the line being used. TR-303 DLI users must use ENE framing and 4825 line coding.

3.63.2 TR-303 Link Statistics Connections

TR-303 link statistics can be monitored from either direction, individually or simultaneously through the **LINE 1** and **LINE 2 RECEIVE** connectors.

3.64 AUXILIARY FUNCTIONS

3.64.1 AUX.40 LNK SEL — Set TR-303 SAPI/TEI Link Selection Filter

The **AUX.40 LNK SEL** function sets the **SAPI/TEI** filter when **LINK STAT** is selected with the **SOURCE CONFIGURATION II** switch. Press the **RESULTS I** (Arrowed) switch to select one of the following:

- ***SAPI** — Sets the SAPI filter. Press the **RESULTS I** (Blank) switch to select one of the following conditions: **ANY** (all valid TR-303 SAPIs), **ALL** (packets to be counted regardless of valid SAPI), or **AS A** (specific SAPI packet to be counted). Press the **RESULTS II** (Arrowed) switch to select the SAPI value, scroll to 00 in the **RESULTS II** window (hold switch down to accelerate scrolling).
- ***TEI** — Sets the TEI filter. Press the **RESULTS I** (Blank) switch to select one of the following conditions: **ANY** (SAPI 4825, 4827 or other all packets to be counted), **ANY SAPI 4825** (any SAPI 4825 packets to be counted), or **AS A** (specific TEI packet to be counted). Press the **RESULTS II** (Arrowed) switch to select the TEI value, scroll to 007 in the **RESULTS II** window (hold switch down to accelerate scrolling).

Changing the settings causes a test result.

3.64.2 AUX 41 TRC RST — Set TR-303 Call Trace Restart Criteria

The AUX 41 TRC RST function sets the TR-303 call trace restart criteria. Press the **RESULTS I Arrowed** switch to select one of the following:

***RLS DELAY** — Sets the release delay criteria. Press the **RESULTS I Blank** switch to select one of the following release delays: NONE, 1 SECOND, 2 SECONDS, 5 SECONDS, 10 SECONDS, 30 SECONDS, or FOREVER.

***EVENT** — Sets the restart event criteria. Press the **RESULTS I Blank** switch to select one of the following restart events: CONNECTED or RELEASED. Press the **RESULTS II Arrowed** switch to select one of the following event delays: NONE, 1 SECOND, 2 SECONDS, 5 SECONDS, 10 SECONDS, 30 SECONDS, or FOREVER.

Changing the settings causes a test restart.

3.64.3 AUX 42 303 TRC — Set TR-303 Call Trace Criteria

The AUX 42 303 TRC function configures the TR-303 call trace filters. The filter sets the origination source, call type, and call reference value (CRV). The test instrument can only trace one call at a time. For example, trace a voice call that originates from the CO and with a CRV of 234. This auxiliary function is only available when the AUX switch is pressed in the TR-303 call trace mode.

Press the **SOURCE CONFIGURATION I** switch to select the following auxiliary function options:

***SOURCE** — Sets the call trace origination source criteria. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

CO — Call trace looks for a call from the central office.

RT — Call trace looks for a call from the remote terminal.

ANY — Call trace looks for a call from either direction.

***CALL TYPE** — Sets the call trace call type criteria. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

POTS — Call trace looks for a POTS call.

ISDN — Call trace looks for a Basic Rate ISDN call.

ANY — Call trace looks for any type call.

***LINE (CRV)** — Sets the call trace subject line call reference value criteria. Press the **SOURCE CONFIGURATION II** switch to select one of the following:

ANY — Call trace looks for any CRV.

SELECT — Press the **RESULTS I Blank** switch to select a line CRV from 1 to 256 (all other CRVs are disabled).

Changing the settings causes a test restart.

3.65 TEST RESULTS

Refer to Section 5.7.6 for TR-303 Link Statistics test results and Section 5.7.7 for TR-303 Call Trace test results.

3.66 PRINTOUTS

If the **PRINT EVENT** switch is set to **TEST END**, the TR-303 Call Trace test results are printed when the call state is **RELEASED** as shown in Figure 3-17.

```
CALL TRACE PRINT 10:15:37 AM 23 96
CALL STATE: RELEASED
LINE COST: 1188
DURATION: 27 Sec
CALL TYPE: RPT
SERV ACCT: 27 000
LINE SFC: 00 000
DCHNL: 18
```

Figure 3-17. TR-303 Call Trace Test Results Printout

.....
.....
.....
.....
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SONET/DS3 ANALYZER OPTION

3.67 INTRODUCTION

This section describes the installation and operation for the SONET/DS3 Analyzer Option (Model 224-1) for the T-BERD 224 which provides the following features:

Dual STS-1/DS3 receivers provide analysis of the received signal.

STS-1/DS3 transmitter enables the T-BERD 224 to insert a DS1 signal into a DS3 or STS-1 output.

Drops DS1 (VT1.5) channels from the T-BERD 224 from the STS-1/DS3 input signals for DS1 and DS0 analysis.

Inserts DS1 (VT1.5) channels from the T-BERD 224 to the STS-1/DS3 output to test specific DS1 signals.

Lid provides user interface control to qualify STS-1 and DS3 (M12 and C-Bit) frame elements with appropriate test patterns.

Field installable printed circuit board provides dual WLC0 509A receive connections and one WLC0 509A transmit connection for STS-1 or DS3 signals, and a Bantam input connection for the DS1 BITS clock.

STS-1/DS3 Error and Alarm insertion enables the T-BERD 224-1 to test and verify network continuity and integrity.

Status LED identify the condition of the received STS-1/DS3 signals.

3.68 INSTALLATION

This section describes how to install and check the T-BERD 224 SONET/DS3 Analyzer Option.

3.68.1 Installing Hardware

Perform the following procedure to install the SONET/DS3 Analyzer Option Lid and printed circuit board (PCB) if the Signaling Option Keypad I.D. is installed; a replacement Keypad is supplied that interfaces to the SONET/DS3 Analyzer Option Lid.



This PCB contains sensitive devices, including static sensitive devices, and should be handled with care when handling the EPROM and Processor PCBs. Always use an ESD kit when a properly grounded wrist strap and mat is used. The PCB is not ESD safe.

3.68.1.1 Installing SONET/DS3 Analyzer Option PCB

1. Remove power and power lead from the T-BERD 224.
2. Remove top cover.
3. Remove SONET/DS3 Analyzer Option PCB from plastic bag.

4. Remove screw and side-panel slot cover from Slot 5 (count from front panel).
5. Slide PCB into slot with left edge in PCB guide and PCB bracket screw slot over side-panel screw hole.
6. Press gently but firmly on PCB until PCB connector snaps into motherboard connector. PCB should be even with the other PCBs.
7. Secure PCB with screw previously removed with side-panel slot cover.

3.68.1.2 Removing Processor PCB

1. Locate Processor PCB in slot 8 and remove Phillips-head screw from bracket flange. Save screw.
2. Pull Processor PCB out of chassis by alternately lifting it from ejector handle and top flange of bracket until PCB is freed from motherboard connector.
3. Lay Processor PCB down on a flat surface with component side up.

3.68.1.3 Replacing EPROM PCB

1. Locate EPROM PCB on upper middle of Processor PCB. Remove Phillips-head screw and washer securing EPROM PCB to Processor PCB. Save screw and washer.
2. Dislodge EPROM PCB by pushing card forward with your thumbs.
3. Remove new EPROM PCB from its wrapper and slide it into connector on Processor PCB with component side up. EPROM PCB snaps into place when downward pressure is applied.
4. Secure EPROM PCB to Processor PCB with previously removed Phillips-head screw and washer.
5. The old EPROM PCB is not recyclable. Dispose of it in accordance with local solid waste requirements.

3.68.1.4 Installing Processor PCB

1. Slide Processor PCB into Slot 8 until bottom edge connectors are aligned with, but only resting on, motherboard connector. Ensure the left side of PCB is in left side card guide. The bracket slot guide fits in slot at bottom of chassis.



Do not force Processor PCB bottom edge connectors into motherboard connector. Connector pins can be bent or broken if PCB is improperly inserted.

2. Press gently but firmly on PCB ejector handle and bracket flange until bottom edge connectors are fully seated into motherboard connector. Slot 8 bracket flange should be flush with chassis and flange screw slot should be aligned with screw hole in chassis. The ejector handle should be level with other PCB ejector handles.
3. Secure bracket flange with Phillips-head screw that was previously removed.
4. Replace slot cover.

3.68.1.5 Installing SONET/DS3 Analyzer Option Lid

1. If necessary, remove center lid option from instrument by disconnecting AUXILIARY PORT cover, then compressing large clips and rotating them up toward front panel to release lid from test instrument.
2. Remove SONET/DS3 Analyzer Option lid from plastic bag.
3. Compress large clips of lid to snap up to secure lid to instrument lid position.

4. Align the hinge pins with test instrument hinges.
5. Release hinge clips to allow hinge pins to latch into test instrument hinges.
6. Verify lid swings freely. Plug aid cable into side panel connector of installed PCB, marked LID INTF.
7. Remove optional Signaling Keypad from plastic bag.
8. Slide Signaling Keypad onto left side of SONET/DSS Option Pd and plug cable into Auxiliary Port (see Figure 3-18).

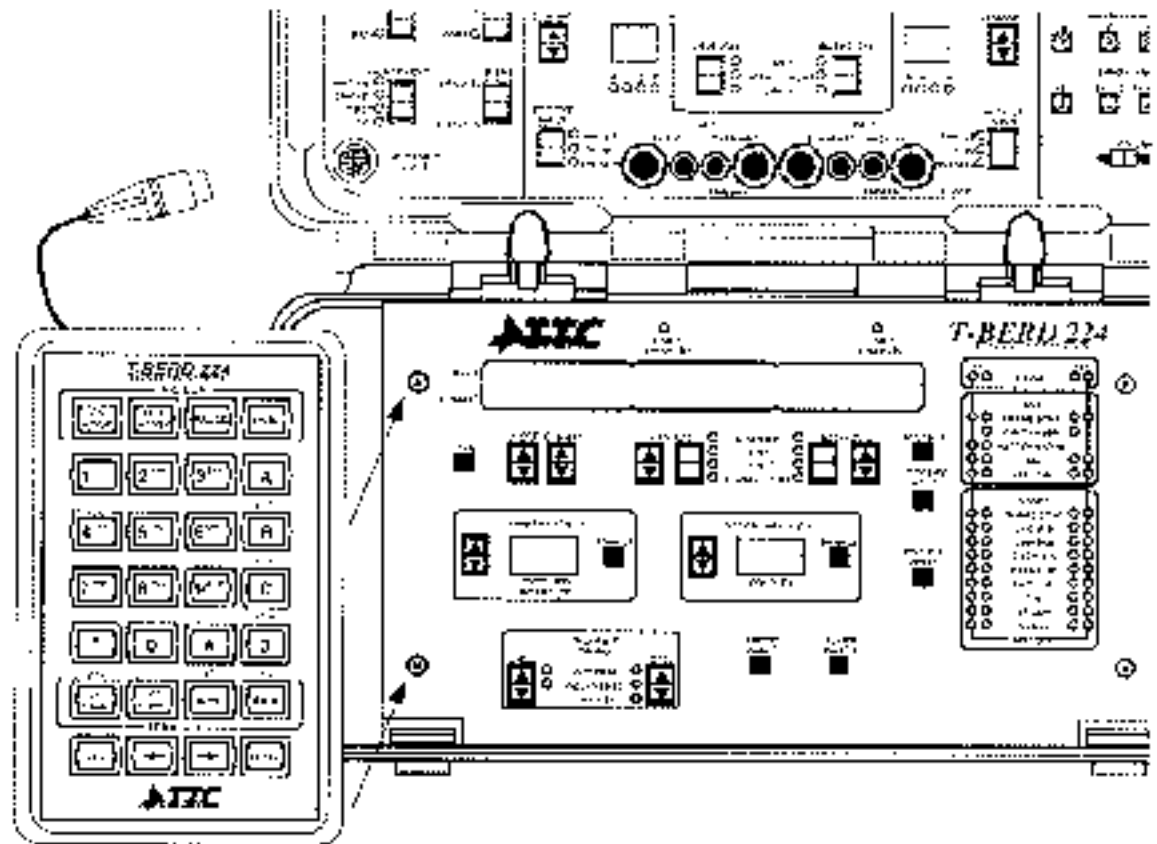


Figure 3-18. Installing Signaling Keypad

3.55.2 Option Checkout

Before the factory proceeds to deliver the SONET/DSS Analyzer Option:

1. Reconnect power and turn power on.

2. Verify the following self test and initialization sequence occurs on the Lcd:

- a. The message **Testing RAM...** appears.
- b. After several seconds the message **Testing RAM... PASS/FAIL** appears. If the RAM test passes, the sequence continues with Step c.

If the RAM test fails, the test instrument resets itself or attempts to test RAM again. Contact TIC Customer Service if the test fails again.

- c. The message **SW VERSION: A (c) TTC 3/15/97** (date identifies release date) appears for 4 seconds and all of the LEDs illuminate for visual verification until the end of the initialization sequence.
- d. The message **Testing Mainframe Comm Link . . .** appears for up to 60 seconds while the mainframe is initializing, to test the communications link between the mainframe and Lid.
- e. The message **Testing Mainframe Comm Link . . . PASS** appears when communications between the mainframe and Lid occurs; the sequence continues with Step f.

If the message **ERROR: 0C02 SQIS: (0000) Mainframe Communications Fault** appears, the communications link test failed. However, the Lid can still be used to test SONET/DS3 signals except it cannot perform DSI Drop and Insert functions with the mainframe. Contact TTC Customer Service if the test fails.

- f. The Lid switches are tested. If the message **xxx Key Stuck** does not appear and the mode, pattern, and results appear, the Lid is ready for testing.

If the message does appear, the indicated switch **xxxx** may be pressed, perceived as stuck, or broken. After 3 seconds the message disappears and the Lid is ready for testing, with the exception of the indicated switch. Contact TTC Customer Service if the test fails.

The **Key Stuck** message applies to all front-panel switches, except the **RESTART** switch. Pressing the **RESTART** switch during power-up causes the Lid to reload NOVRAM with the factory defaults and display CLEARING NOVRAM.

3.69 INSTRUMENT DESCRIPTION

The SONET/DS3 Analyzer Option provides the T-BERD 221 with the ability to connect to either an STS-1 or DS3 test access point. This section describes the controls, indicators, and connections for the option to drop and insert a DS3 channel through a DS3 or STS-1 test access point, as well as transmit DS3/STS-1 test patterns and analyze DS3/STS-1 level errors and alarms. The option replaces the standard T-BERD 224 lid. The SONET/DS3 Analyzer Option lid is shown in figure 3-9 with the controls and indicators marked with numbered callouts. Table 3-75 describes the controls and indicators.

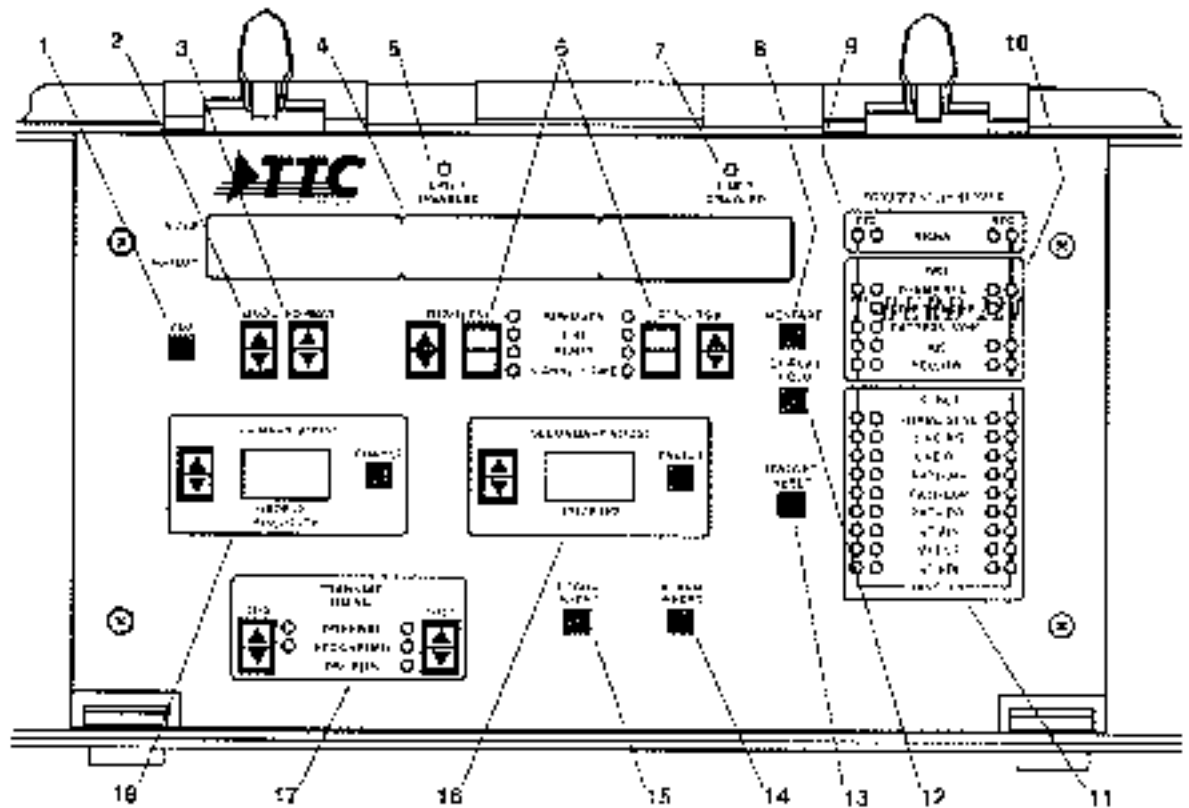


Figure 3-19. SONET/DS3 Analyzer Option Lid

Table 3-25. SONET/DS3 Option Lid Controls and Indicator

| Callout | Control/Indicator | Description |
|---------|---|---|
| 1 | AUX Switch | Press switch to display auxiliary functions (see Section 3.7). Switch illuminates when functioning. |
| 2 | MODE Switch | Press switch to select operating mode: DS3-MIB, DS3-RIB, DS3-DIFFERENTIAL, STS/US-MIB, STS/US-CUTS (EXT), and AUTO (see Section 2.9.1.1). When AUX switch is illuminated, press switch to select auxiliary functions. |
| 3 | FORMAT Switch | Press switch to select performance for operating mode: 272M, 272M1, 272M1, 3100 (D), 400, 400, 400S, 400-RIB (Ext), 400-RIB (Ext), 400-RIB (Ext), 400-RIB (Ext), and 400-RIB (Ext) (see Section 2.9.1.1). |
| 4 | CH Display | Displays selected operating mode. Press MODE switch to change operating mode. Press FORMAT switch to change and display test category. Press MODE switch to change selected operating mode. Press AUX switch to display auxiliary functions. |
| 5/7 | LINE 2 DISABLE LED | LINE 2 DISABLE LED illuminates when the LINE 2 connections on the THERMO 224 are disabled and the primary VTDSP expansion function is enabled. LINE 2 DISABLE LED illuminates when the LINE 2 connections on the THERMO 224 are disabled and the secondary VTDSP expansion function is enabled. |
| 6 | RESULTS I Arrowed Switches RESULTS II Blank Switches | Press RESULTS I Arrowed switch (or any two switches) to search test results within a selected category. Press RESULTS II Blank switch (or any two switches) to select test results categories if LED illuminates when category is selected. SUMMARY, BER, SNR, and SIGNAL TIME (see Section 3.4). When AUX switch is illuminated, press RESULTS I Blank switch to select category. Press RESULTS II Arrowed switch to select test results. |

Table 3-25. SONET/DS3 Option Lid Controls and Indicators (Continued)

| Callout | Control/Indicator | Description |
|---------|---------------------------|--|
| 8 | RESTART Switch | Press switch to clear status and alarm LEDs, restart AT-311 mode, when specified, and reset test results to zero on lid only. Press and hold switch during power-up to reset NVRAM to factory defaults and defaults. |
| 9 | PRESET SIGNAL LEDs | Indicates current (center LED) and historic (outer HISTORY LED) status of the presence of a received DS3 or SONET signal (primary and secondary sources) after initial signal detection (see Section 3.6.1.3). |
| 10 | PRESET DS3 Status LEDs | Indicates current (center LED) and historic (outer HISTORY LED) status of the received DS3 signal (primary and secondary sources) after initial signal detection and synchronization (see Section 3.6.1.4). |
| 11 | PRESET SONET Status LEDs | Indicates current (center LED) and historic (outer HISTORY LED) status of the received SONET signal (primary and secondary sources) after initial signal detection and synchronization (see Section 3.6.1.5). |
| 12 | DISPLAY HOLD Switch | Press switch if luminaries when enabled to freeze test result counts and status alarm LEDs on lid only. Press RESULTS switch to scroll through test results results continue to scroll in the background. Press switch again to release display and update results. |
| 13 | HISTORY RESET Switch | Press switch to clear HIST. RV LEDs on lid only. |
| 14 | ALARM INSERT Switch | Press switch to insert a DS3 and/or STS-1 alarm. Alarm illuminates when active. The alarm mode selector through IDV analyzing functions. Press switch again to halt alarm insertion. |
| 15 | ERROR INSERT Switch | Press switch to insert a valid, non-error bit stream when activated. |
| 16 | SECONDARY VT/DS1 Switches | Press SECONDARY VT/DS1 Allowed switch to select a VT number (1, 2, 3, 4) or DS1 channel (01, 02, 03, 04) for the STS-1 or DS3 source connected to the side-panel STS/DS3 jack. The ENABLE switch illuminates when active. To drop the selected VT number or DS1 channel to the T-DBRD-224 main frame for further testing, press ENABLE switch again to disable dropped signal. Table 3-26 lists the DS1 channel versus the VT group number. |
| 17 | TRANSMIT TIMING Switches | Press DS3 switch to select the DS3 transmit timing source: INTERNAL or RECOVERED LED illuminates for selected timing source. Press STS1 switch to select the SONET transmit timing source: INTERNAL , RECOVERED , or DS3 REFS . RECOVERED and DS1 BITS LEDs flash when selected and the appropriate signal is not present (up on a green to indicate timing path is not tested). |
| 18 | PRIMARY VT/DS1 Switches | Press PRIMARY VT/DS1 Allowed switch to select a VT number (1-4) or DS1 channel (01-04) from the STS-1 or DS3 source connected to the side-panel DS3/STS jack and/or DS3 or a generated DS1 signal into the main frame STS/DS3 signal from the side-panel PRI DS jack. Press the ENABLE switch to illuminate when active or to drop the selected VT number or DS1 channel. Press ENABLE switch again to illuminate the appropriate signal to be selected for DS3 channel versus VT group number. |

Table 3-26. DS1 Channel vs. VT Group Number

| DS1 Channel | VT Group Number | DS1 Channel | VT Group Number |
|-------------|-----------------|-------------|-----------------|
| 1 | 1.1 | 5 | 1.3 |
| 2 | 2.1 | 16 | 2.3 |
| 3 | 3.1 | 17 | 3.3 |
| 4 | 4.1 | 18 | 4.3 |
| 5 | 5.1 | 19 | 5.3 |
| 6 | 6.1 | 20 | 6.3 |

Table 3-26. DS1 Channel Vs. VT Group Number (Continued)

| DS1 Channel | VT Group Number | DS1 Channel | VT Group Number |
|-------------|-----------------|-------------|-----------------|
| 7 | 1.1 | 21 | 7.1 |
| 8 | 1.2 | 22 | 1.4 |
| 9 | 2.1 | 23 | 2.1 |
| 10 | 3.1 | 24 | 3.1 |
| 11 | 4.1 | 25 | 4.1 |
| 12 | 5.1 | 26 | 5.1 |
| 13 | 6.1 | 27 | 6.1 |
| 14 | 7.1 | 28 | 7.1 |

3.69.1 Test Setup

The following controls and indicators are described in greater detail. The number in the paragraph heading refers to the callout in Table 3-25 and Figure 3-19.

3.69.1.1 MODE Switch (2)

The **MODE** switch configures the test option to synchronize to and transmit the following framing modes or automatically synchronize to the received signal:

DS3-M13 — DS3 signal with M13 framing.

DS3-CBIT — DS3 signal with C-bit framing.

DS3-UNFRAMED — Unframed DS3 signal.

STS/DS3-M13 — STS-1 signal with a DS3 M13 framed payload.

STS/DS3-CBIT — STS-1 signal with a DS3 C-bit framing payload.

STS/VT1.5 — STS-1 signal with a VT1.5 (DS1) payload.

AUTO — Automatically detects and configures test instrument for the indicated signal format (steps and framing as well as the pattern). The detected signal format appears in the display **MODE** field. The following messages appear as the test set scans and configures itself for testing:

scan... — Scanning both primary and secondary inputs for a valid signal format. While scanning, the received signal is copied from **PRIMARY** receiver to the **PRIMARY** transmitter, and the **PRIMARY VT/DS1** and **SECONDARY VT/DS1** switches are disabled (— — —) appear in the displays.

When a valid signal is detected (Signal LED illuminates), the loop between the receiver and transmitter is removed and the signal transmits in the test set path. In the detected mode, also, the **PRIMARY VT/DS1** and **SECONDARY VT/DS1** switches can be enabled (by flipping the test mode). The test modes are unchangeable until a valid signal is detected. If the received pattern is a cross-clock or the signal is received, the test set will display **off** in the **MODE** field. If the received pattern is a signal, a signal mode is detected, the mode field changes to one of the following:

ds3-m13 — DS3 signal with M13 framing detected.

ds3-cbit — DS3 signal with C-bit framing detected.

ds3-unframed — Unframed DS3 signal detected.

sts/ds3-m13 — STS-1 signal with a DS3 M13 framed payload detected.

sts/ds3-cbit — STS-1 signal with a DS3 C-bit framing payload detected.

sts/vt1.5 — STS-1 signal with a VT1.5 (DS1) payload detected.

3.69.1.1.1 MODE Switch (2)

3.69.1.1.1.1 MODE Switch (2)

sts/live — STS-1 signal with an unsupported payload detected. The PRI receiver and transmitter remain powered.

live — None of the adjustable stress patterns (above) detected.

3.69.1.2 **FORMAT Switch (3)**

The **FORMAT** switch provides the following DS3 test patterns and DS1/VT1.5 drop and insert functionality. When performing a BER test, the LUT must receive the selected test pattern to provide the necessary error results.

2*20-1 — Generates a DS3 framed or unframed 20*1 test pattern.

2*20-5 — Generates a DS3 framed or unframed 20*5 test pattern.

2*15-7 — Generates a DS3 framed or unframed 15*7 test pattern.

1010 (BLUE) — Generates a DS3 framed Blue alarm.

1100 (IDLE) — Generates a DS3 framed Idle pattern.

ALL ONES — Generates a DS3 framed or unframed All Ones test pattern.

1100 — Generates a DS3 unframed 1100 pattern.

1010 — Generates a DS3 unframed 1010 test pattern.

DS1 DROPPING — Configures the LUT to drop a DS1/VT1.5 signal from both STS-1/DS3 inputs (PRI RX and SEC RX) jacks to the T-BERD 224 for analysis. If so configured, the LUT inserts a DS1 signal from the T-BERD 224 into the transmitted STS-1/DS3 signal (PRI TX jack). The function is available for all operating modes, except DS3-UNFRAMED. Individual DS1/VT1.5 signals are selected with the **PRIMARY VT/DS1** and **SECONDARY VT/DS1** switches. Only the DS1/VT1.5 signal under test is affected when inserting the test signal. The remaining 27 DS1 channels pass through the T-BERD 224 unaffected.

MUXED — Enables a selected DS1 channel to be dropped/inserted into a DS3 signal while the remaining 27 DS1 channels are filled with a framed all ones pattern.

LIVE — No pattern from the above series of tests was received or recognized.

3.69.1.3 **Signal LEDs (9)**

The Signal LEDs indicate the presence (green LED illuminates) of STS-1 or DS3 signal pulses in either receiver (PRI RX and SEC RX). Signal presence is declared (green LED illuminates) when there is a least 10 ones in 32 consecutive bits, and the input amplitude is greater than 25 mV. Signal loss occurs (red History LED illuminates) when the input amplitude is 1 dB below 25 mVpk, or there are 160 ± 12 consecutive zeros in the received signal. A red signal loss indicator LED always testing on begin.

3.69.1.4 **DS3 LEDs (10)**

The DS3 LEDs indicate the presence or loss of specific DS3 framing pattern syncs in addition to receiving a specific payload and about conditions such as loss of PRI RX and SEC RX. The LEDs include the following:

Frame Sync LEDs — Indicates the presence (green LED illuminates) of DS3 frame synchronization. A valid signal must be detected before testing can begin. When framing is no longer detected, the green LED goes out and the associated red History LED illuminates.

C-Bit Frame LEDs — Indicates the presence (green LED illuminates) of C-Bit framing.

Pattern Sync LEDs -- Indicates the presence (green LED illuminates) of pattern synchronization between the transmitted and received test pattern (PRLRX only). Pattern synchronization is only available from the PRLRX connection. When pattern synchronization is no longer detected, the green LED goes out and the associated red History LED illuminates.

AIS LED -- Indicates the presence (red LED illuminates) of an Alarm Indication Signal (AIS). When AIS is no longer detected, the LED goes out and the associated History LED illuminates.

Yellow LEDs -- Indicates the presence (red LED illuminates) of a Yellow alarm. When a Yellow alarm is no longer detected, the LED goes out and the associated History LED illuminates.

3.89.1.5 SONET LEDs (11)

The SONET LEDs indicate the presence or loss of specific SDH framing and alarm conditions on either receiver (PRLRX and SLCRX). SONET LEDs include the following:

Frame Sync LEDs -- Indicates the presence (green LED illuminates) of SDH frame synchronization. A valid signal and frame synchronization must be detected before testing can begin. When framing is no longer detected, the green LED goes out and the associated red History LED illuminates.

NOTE

When any of the following alarms is no longer detected, the indicated LED goes out and the associated History LED illuminates.

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

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

Path AIS LEDs -- Indicates the presence (red LED illuminates) of Path AIS alarm. It is declared after detecting an all ones pattern in the Line overhead pointer bytes (H1 and H2) for three consecutive frames. Path AIS is removed when a valid set of pointer bytes and active row data tags (RDTS) are received, or when a valid pointer value is observed in three consecutive frames. Path AIS alerts the downstream path terminating equipment (PTE) that an upstream failure has occurred.

Path LOF LEDs -- Indicates the presence (red LED illuminates) of Path Loss of pointer (LOF) alarm. It is declared when a valid pointer value cannot be determined from the Line overhead APS bytes (H1 and H2). Specifically, LOF alarm is declared if a valid pointer is not found in eight consecutive frames, or if eight consecutive frames (S + 8) are received without the corresponding correct pointer value. The Path LOF alarm is removed when a consistent pointer value or non-detection of that value is received for three consecutive frames.

Path RDI LEDs -- Indicates the presence (red LED illuminates) of Path RDI alarm (also known as RDI or Yellow Alarm). It is declared after detecting a one in Bit 5 of the Path status byte (G1) for five consecutive frames. SDH Path RDI is removed after Bit 5 of byte G1 contains a zero for five consecutive frames. Path RDI indicates to the upstream PTE that a downstream failure has been detected.

VT AIS LEDs --- Indicates the presence (red LED illuminates) of VT AIS alarm. It is declared after detecting an all ones pattern in the VT pointer bytes (V1 and V2) for three consecutive VT superframes. VT AIS is removed under two conditions: when a valid VT pointer, valid VT size, and the NDF (001 flag) are detected, or three consecutive VT superframes containing a valid VT pointer, valid VT size, and a normal NDF are detected. VT AIS alerts the downstream VT PLE of an upstream failure.

VT LOP LEDs --- Indicates the presence (red LED illuminates) of VT LOP alarm. It is declared when a valid pointer value cannot be determined from the VT Path overhead bytes (V1 and V2). Specifically, VT Path LOP is declared when a valid pointer is not found in eight contiguous VT superframes, or when eight contiguous VT superframes are detected with the VT NDF set to 1001. The VT Path LOP alarm is removed when a valid pointer is detected in three consecutive superframes with NDF set to 0110.

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

3.70 CIRCUIT CONNECTIONS

3.70.1 Front-Panel Connections

During drop and insert testing between the T-TERMIN 224 and the STS-1/DS3 connections, the T-TERMIN 224 front panel LINE 1 and LINE 2 connections are disabled, only when the **PRIMARY/SECONDARY VT/DS1 ENABLE** switch is enabled (switch illuminates when active). The LINE 1/2 DISABLING LEDs illuminate when a DS1 signal is being dropped and/or inserted indicating the T-TERMIN 224 connections are disabled.

3.70.2 Side-Panel Connections

The SONET/SDS Analyzer Option provides side-panel connections for two STS-1/DS3 receivers, one SONET/SDS transmitter connection, DS1 BITS clock input connection, and a Lid interface connection as shown in Figure 3-70.

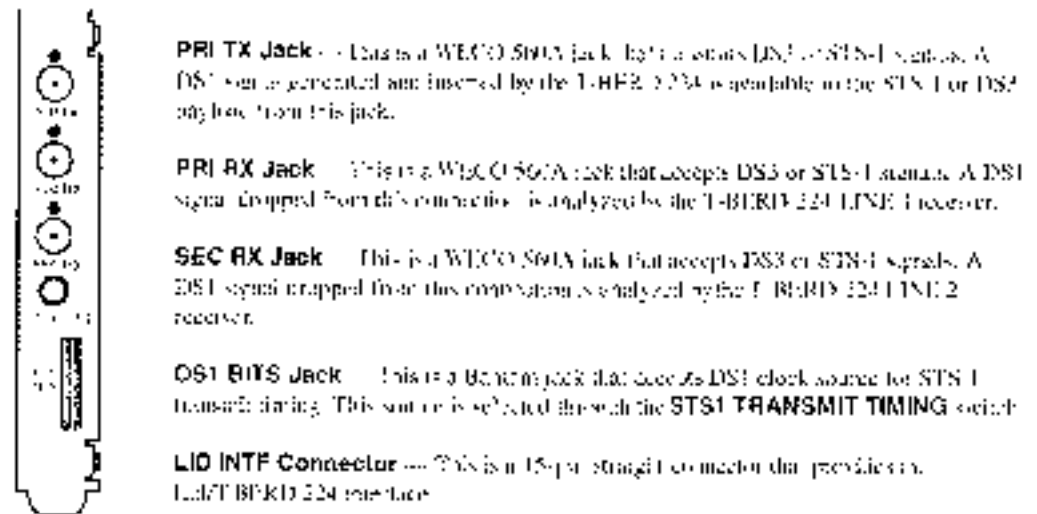


Figure 3-20. SONET/DS3 Analyzer Side-Panel Connections

3.71 AUXILIARY FUNCTIONS

Auxiliary functions enable access to parameters that are not frequently used and do not have dedicated front-panel switches. The auxiliary functions appear when the **AUX** switch is pressed and illuminated. The individual auxiliary functions are selected by pressing the **MODE** switch. The auxiliary function parameters are selected by pressing the **RESULTS** blank switch. Refer to Section 3.0 for a description of the following auxiliary functions:

- AUX 10 DS3 ALARM
- AUX 11 DS3 ERR INS
- AUX 20 STS1 ALARM
- AUX 21 STS1 ERR INS
- AUX 22 PATH TRACE

3.72 TEST RESULTS

The active DS3 Analyzer Option provides full test result capabilities. **BER/ERRORS**, **DS3**, **TEST**, and **ACTUAL** items. Refer to Section 3.0 for detailed information on the available test results.

SECTION 4 AUXILIARY FUNCTIONS

4.1 INTRODUCTION

Auxiliary functions allow access to parameters that are not frequently used and do not have dedicated switches. Press the **AUX** switch to access the auxiliary functions. The switch LED illuminates (LED on) when the auxiliary functions are active and is extinguished (LED off) when the auxiliary functions are not active. The auxiliary functions require the use of the entire display and the corresponding switches.

Table 4-1 lists the auxiliary functions and groups them according to the option required to access the auxiliary function.

Table 4-1. Auxiliary Function

| Option | Message | Description |
|--------------------------------------|----------------------|---|
| MAINFRAME | AUX 01 CLK DIV | Clock Prescaler |
| | AUX 02 TIM PRE | Timed Prescaler |
| | AUX 03 TRS LEN | Timed Pres. Length |
| | AUX 04 TIM/DAY | Clock Time and Date |
| | AUX 05 LDC | Line Build Out |
| | AUX 06 BACK TM | Backup Timing Status |
| | AUX 08 RS 232 | RS 232 Port Configuration |
| | AUX 22 LN CODE | Independent Line Coding |
| | AUX 25 CUSTOM | Custom Results |
| IEEE 488 OPTION | AUX 09 IEEE 488 MODE | IEEE-488 Mode and Address |
| | AUX 09 IEEE 488 ADDR | IEEE-488 Mode and Address |
| TURTLE OPTION | AUX 11 BRRCT | Line Rate |
| | AUX 14 BRM BSR | Binary Line Rate |
| | AUX 15 USB4 | User Programmable Prescaler Division |
| | AUX 16 PGMLP | Programmable Loop Codes |
| | AUX 17 LOOP 1 D | Loop Codes |
| | AUX 18 AUT RES | Automatic Loop Code Response |
| | DSU DP OPTION | AUX 07 DSO TIM |
| AUX 10 N-CONTG | | N-Contiguous Channel |
| AUX 11 ANI CHA | | DSU DP Analysis Channel |
| PRM TRN 20/21 OPTION | AUX 10 N-CONTG | N-Contiguous Channel |
| | AUX 20 PRM TX | PRM Transmission |
| DDS OPTION | AUX 12 FRR CORR | FSM, Power Correction |
| | AUX 19 DDS CHN | DDS Access Channel and Secondary Channel Path |
| | AUX 20 MJD | DDS MJD Control |
| ENHANCED TEST/EUC OPTION | AUX 20 PRM TX | PRM Transmission |
| SMART LOG/BACK COMMANDS CODES OPTION | AUX 17 LOOP 4 D | Loop Codes |
| | AUX 25 CUSTOM | Custom Results |
| VEE OPTION | AUX 21 SW LSP | Sweep Parameters |
| | AUX 22 VERT RST | VEE Reset |
| | AUX 23 PRE LOG | Pre-Log - Log File and Setup |

Table 4-1. Auxiliary Functions (Continued)

| Option | Message | Description |
|--|--------------------|---|
| SIGNALLING OPTION | AUX 24 TRK DEF | Trunk Type Definition |
| | AUX 25 DTMF MAR | DTMF Messaging |
| | AUX 26 DTMF SEQ | DTMF Sequence |
| | AUX 27 REC SEQ | Recall Sequence |
| | AUX 28 DTF SPV | Dialing Supervision Events |
| CALLER ID OPTION | AUX 29 SCANSET | Character Scanning Set/Setting |
| | AUX 30 SCANSET | Character Scanning Set/Setting |
| | AUX 31 CALL ID | Caller ID Signaling Selection |
| TRUSS OPTION | AUX 32 STORM | Storm Results for Caller ID |
| | AUX 33 HELP | Truss Help Cause Value |
| SS7 CALL TRACE OPTION | AUX 34 PATH TRACT | Identifies Valid Path Traces |
| | AUX 35 CUSTOM | Custom Results for SS7 |
| | AUX 36 TRC RST | SS7 Trace Results for SS7 |
| | AUX 38 SS7 TRC | SS7 Call Trace Criteria |
| PRIMARY RATE ISDN OPTION (PRI) | AUX 39 HELP | Describes Cause Value |
| | AUX 22 PATH TRACT | Identifies Valid Path Trace for PRI |
| | AUX 43 PRI TRC | SS7 Call Trace Criteria for PRI |
| | AUX 39 HELP | Describes Cause Value |
| SOME PD53 OPTION (grounded call option only) | AUX 40 D53 ALARM | Inserts Yellow Alarm |
| | AUX 41 D53 ERR INX | Inserts Three Types of D53 Errors |
| | AUX 42 S53 ALARM | Inserts S53 Alarm |
| | AUX 43 S53 ERR INX | Inserts Four Types of S53 Errors |
| | AUX 22 PATH TRACT | Identifies Valid Path Trace for SOME PD53 |

4.2 AUXILIARY FUNCTIONS

The auxiliary functions are listed in numerical order. An example and description of each auxiliary function is provided.

4.2.1 AUX 01 CLR FIFO — Clear Print FIFO Buffer

AUX 01 CLR FIFO
YES? PRESS SRC CONFIG 2 SWITCH

The AUX 01 CLR FIFO function allows the user to clear the print FIFO buffer.

Press the **SOURCE CONFIGURATION** II switch to reset the printer squelch feature. The message **CLR FIFO** flashes in the display when the print buffer is empty.

4.2.2 AUX 02 TIM PRI — Set Timed Print Event Duration

| | | | |
|-------------------|----------------------------|---------|---------|
| AUX 02 TIM PRI | TIMED PRINT EVENT 6 HRS | 00 MINS | 00 SECS |
|-------------------|----------------------------|---------|---------|

The AUX 02 TIM PRI function sets the time interval for results intervals. The interval is active when the **PRINT EVEN** switch is set to TIMED. The timed interval can vary from 15 seconds up to 6 hours.

Press the **SOURCE CONFIGURATION** H switch to set the hours, the **RESULTS** I Blank switch to set the minutes, and the **RESULTS** I Arrowed switch to set the seconds.

4.2.3 AUX 03 TES LEN — Set Timed Test Length Duration

| | | | |
|-------------------|------------------------------|--------|---------|
| AUX 03 TES LEN | TIMED TEST LENGTH 200 HRS | 0 MINS | 00 SECS |
|-------------------|------------------------------|--------|---------|

The AUX 03 TES LEN function sets the time interval for a timed test. The interval is active when the **TEST** switch is set to TIMED. During a timed test, changing the test length causes a test restart. The timed interval can vary from 15 seconds up to 200 hours, 59 minutes, and 45 seconds.

NOTE

The **TEST** switch default setting in SWI-50 and SIG-LEN1 applications is **CONT** (On).

Press the **SOURCE CONFIGURATION** H switch to set the hours, the **RESULTS** I Blank switch to set the minutes, and the **RESULTS** I Arrowed switch to set the seconds.

4.2.4 AUX 04 TIM/DAY — Clock Time and Date

| | | | |
|-------------------|------------------------------|--------|-------|
| AUX 04 TIM/DAY | CLOCK TIME and DATE 12HRS | 30MINS | JAN 1 |
|-------------------|------------------------------|--------|-------|

The AUX 04 TIM/DAY function allows the user to set the real time and local calendar date.

Press the **SOURCE CONFIGURATION** H switch to set the hour and the **SOURCE CONFIGURATION** B switch to set the minutes. The date is based on a Julian military calendar.

Press the **RESULTS** I Arrowed switch to set the month and the **RESULTS** I Blank switch to set the day. Press the **RESULTS** I Arrowed switch to set the year.

4.2.5 AUX 05 LBO — Line Build-Out Level

| | | |
|---------------|----------------|------------------|
| AUX 05 LBO | LINE 1 0 dB | LINE 2 -15 dB |
|---------------|----------------|------------------|

The AUX 05 LBO function allows the user to emulate one of three different cable losses (0 dB, -7.5 dB, or -15 dB) for LINE 1 and LINE 2 transmitted outputs.

Press the **SOURCE CONFIGURATION** **H** switch to set the line build-out for LINE 1 and the **RESULTS I Blank** switch to set the line build-out for LINE 2.

4.2.6 AUX 06 BACK TM — Backup Timing Source

| | | |
|-------------------|--------------------|---------------------|
| AUX 06 BACK TM | LINE 1 INTERNAL | LINE 2 RECOVERED |
|-------------------|--------------------|---------------------|

The AUX 06 BACK TM function sets the transmit timing source for LINE 1 and LINE 2. If a clock is recoverable from the line received input, this auxiliary function is ignored. However, if the input clock is lost for either line, this auxiliary function determines the timing source for that line.

Press the **SOURCE CONFIGURATION** **H** switch to select the LINE 1 backup timing source.

Press the **RESULTS I Blank** switch to select the LINE 2 backup timing source. The following transmit timing sources are available for each line.

INTERNAL — Selects the fixed, internal, crystal oscillator (operating at a nominal 20 MHz) as the backup transmit timing source.

BNC — Selects the EXTERNAL BNC CLOCK connector, located on the right side panel, as the backup transmit timing source. If no timing source is connected to the EXTERNAL BNC CLOCK connector, a message EXT CLOCK LOSS is flashed in the results display indicating that no transmit timing source is present at the connector.

RECOVERED — Selects the recovered clock from the opposite received signal. If the received signal is not present from the opposite line receiver, then the internal crystal oscillator is used as the transmit timing source.

NOTE

The auxiliary function does not affect the 10 dBm, 10 dB, and AUX 02 and AUX 03 levels when only recovered timing is used.

4.2.7 **AUX 07 DSO TM — DSO Interface Timing**

| | |
|--------------------------------|--|
| AUX 07 DSO TM | DSO INTERFACE TIMING COMMON |
|--------------------------------|--|

The **AUX 07 DSO TM** function sets the DSO interface transmit and receive clocks. Note that if the **CHANNEL FORMAT** switch is set to **DS064**, changing this selection causes a test result.

Press the **SOURCE CONFIGURATION II** switch to configure the DSO clock connector.

COMMON — Configures the two side panel DSO clock connectors to provide a mutually phased clock. This setting is used when timing slips do not occur between the two TI inputs.

SEPARATE — Configures each side panel DSO clock connector to be individually synchronized to its respective TI clock signal source. This setting is used when timing slips do occur between the two TI inputs.

NOTE

Two external DSO test sets are required when **SEPARATE** is selected, since the transmit bit and byte clocks are not in phase with the receive bit and byte clocks.

4.2.8 **AUX 08 RS 232 — Printer/Remote RS-232**

| | | | |
|--------------------------------|------------------------------|----------------------------|--------------------------------|
| AUX 08 RS 232 | PARITY NONE | BAUD 9600 | TERMINATOR CR |
|--------------------------------|------------------------------|----------------------------|--------------------------------|

The **AUX 08 RS 232** function sets the parity, baud, and line terminator for the side panel RS 232 printer/remote control port.

Press the **SOURCE CONFIGURATION II** switch to set the RS 232 interface **PARITY** to **NONE**, **EVEN**, or **ODD**.

NONE — data is sent using 8 bits

EVEN or **ODD** — data is sent using 7 bits

Press the **REQUEST BINARY** switch to set the **BAUD** rate to 300, 1200, 2400, 4800, or 9600.

Press the **REQUESTS II Arrowed** switch to set the **TERMINATOR** character for the printer/remote device to **CR**, **LF**, or **CR LF**. The default termination character **CR** allows the test set to respond with the optional **CR** printed, as well as the popular **CR-LF** printer.



4.2.9 AUX 09 488MODE - IEEE-488 Mode and Address

| | | | |
|-------------------|-------------------|-----------------------|--------|
| AUX 09 488MODE | IEEE-488 ADDR: | MODE and ADDRESS 0 | SRQ: 0 |
|-------------------|-------------------|-----------------------|--------|

The AUX 09 488MODE function selects between the Addressable or Talk-Only operating mode. In the Addressable mode, the bus address and the Service Request (SRQ) function are also set.

Press the **SOURCE CONFIGURATION II** switch to select the desired interface operating mode.

Talk-Only Mode — Select this mode when the T-BERD 221 is connected to an IEEE-488 compatible instrument panel.

Addressable Mode — Select this mode when the T-BERD 224 is connected to an IEEE-488 bus. The Addressable mode allows the T-BERD 224 to be assigned a unique bus address, which is used by the IEEE-488 controller to identify the devices connected to the IEEE-488 bus. The SRQ status is also selected in this mode. Press the **RESULTS I Blank** switch to select the desired bus ADDRESS (up to 30). The bus address must be unique for each device connected to the same bus.

Press the **RESULTS II Arrowed** switch to turn the SRQ function ON or OFF. With the SRQ set to ON, an SRQ is generated when an erroneous command is received or data is ready to be sent.

4.2.10 AUX 10 N-CONTG - Non-Contiguous Channel Drop and Insert

| | | | |
|-------------------|----------------------|-------------|-----------|
| AUX 10 N-CONTG | LINE | CHN UP/DWN. | ENTR/DEL. |
| | L1:10 12 13 15 18 20 | | |

The AUX 10 N-CONTG function selects the non-contiguous channels to be tested on each line. The channel numbers 1 to 24 must be entered in increasing order. The cursor must end to the right of the last number to save the sequence.

Press the **SOURCE CONFIGURATION II** switch to select the TEST LINE input to be configured for non-contiguous channels, L1 (LINE 1) or L2 (LINE 2).

Press the **RESULTS I Blank** switch to select the channel number above the flashing cursor. Press the switch up to increment the channel number and press down to exit among the channel numbers.

Press the **RESULTS II Arrowed** switch to increment or decrement channel selection. The channel number is set, and the cursor automatically moves one position to the right for another channel number selection. The cursor must end to the right of the last number entered to save the sequence. Press the **RESULTS II Arrowed** switch to increment the displayed channel number above the cursor. The cursor will automatically move one position to the left.

NOTE

The same number of channels must be selected for LINE 1 and LINE 2. If not, the selected configuration is not saved, and the message *LINE 01, # OF CHANNELS
CONFLICTS WITH LINE 02* is displayed. The newly selected and saved channels are

enabled when the user seeks to transfer auxiliary functions is the AUX mode (371) OFF. If the T-BERD 225 is set to NON CONTIG, changing this auxiliary function causes a test restart.

4.2.11 **AUX_11 ANL CHA — DSU-DP Analysis Channel**

| | | |
|----------------|-----------------|-----------------|
| AUX 11 | DSU CHAN | CTRL BIT |
| ANL CHA | PRIMARY | RTS INS |

The AUX 11 ANL CHA function determines whether to display and insert the PRIMARY or SECONDARY DSU channel.

Press the **SOURCE CONFIGURATION II** switch to select PRIMARY or SECONDARY.

SECONDARY — Provides test access to the secondary channel data of the D50A or D50B channel. When SECONDARY is selected, TRANSMITTING ON SECONDARY CHANNEL ANALYZING SECONDARY CHANNEL flashes in the display.

PRIMAR — Provides test access to the primary channel data of the D50A or D50B channel.

Press the **RESULTS I Blank** switch to set bit 8 to RTS INS or THIRD. RTS INS inserts bit 8 with RTS. THIRD allows bit 8 to pass unaffected.

NOTE

If the T-BERD 225 is configured to test D50A2-4, D50A3, D50A5,6, D50A192, D50A56, D50B2-4, D50B4-8, or D50B192, changing this auxiliary function causes a test restart.

4.2.12 **AUX_12 ERR COR — DS0A Error Correction**

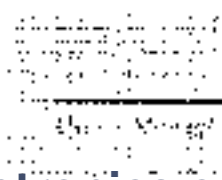
| | |
|----------------|------------------------------|
| AUX 12 | DS0A ERROR CORRECTION |
| ERR COR | OFF |

The AUX 12 ERR COR function determines whether or not digital error correction is performed on subrate DS0A data. Subrate error correction is performed on DS0A frame data rates of 6.0 kbps, 8.0 kbps, and 12.0 kbps by the majority vote method.

Press the **SOURCE CONFIGURATION II** switch to choose whether DS0A error correction is ON or OFF.

On — Provides test access to subrate DS0A data which has been error corrected.

OFF — Provides test access to subrate DS0A data which has been selected from every fifth (9.6 kbps), tenth (4.8 kbps), or twentieth (2.4 kbps) frame.



| | | |
|---------------|-------------------|-------------------|
| AUX 13 | ERROR RATE | ERROR TYPE |
| ERR RT | 1.0 E-6 | SINGLE |

The **AUX 13 ERR RT** function sets the BPV and logic error insertion, type, rate, and burst length for the **BPV** and **LOGIC ERROR INSERT** switches.

Press the **SOURCE CONFIGURATION** **0** switch to set the **ERROR RATE** from 1.0 E-9 to 1.0 E-2 for random errors or burst errors. The error rate is interpreted as $1.0 \text{ E-2} = 0.01 = 1 \text{ bit error in } 100 \text{ bits total}$.

Press the **RESULTS** **Blank** switch to set the **ERROR TYPE** to **SINGLE** or **BURST**. This determines how errors are injected into the transmitted data when the **BPV** and **LOGIC ERROR INSERT** switches are pressed for less than 1 second.

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

BURST — Inserts a burst of errors when the **BPV** or **LOGIC ERROR INSERT** switch is pressed once. When **BURST** is selected, the **BURST LEN** is displayed.

| | | | |
|---------------|-------------------|-------------------|------------------|
| AUX 13 | ERROR RATE | ERROR TYPE | BURST LEN |
| ERR RT | 1.0 E-6 | BURST | 20 mss |

Press the **RESULTS** **Arrowed** switch to set the **BURST LEN** from 20 ms to 5.0 sec. The burst length is incremental as follows:

- 20 ms to 170 ms in 50 ms steps.
- 170 ms to 200 ms in 30 ms step.
- 200 ms to 300 ms in 50 ms steps.
- 300 ms to 1.0 sec in 100 ms steps.
- 1.0 sec to 1.5 sec in 100 ms steps.
- 1.5 sec to 5.0 sec in 500 ms steps.

NOTE

Pressing the **ERROR INSERT** switches for less than 1 second (1.1D04) inserts errors continuously at the selected error rate.

4.2.14 **AUX 14 FRM ERR** — Consecutive Frame Error Insertion

| | |
|----------------|---------------------------|
| AUX 14 | FRAME ERROR INSERT |
| FRM ERR | SINGLE |

The AUX 14 ERM ERR function selects the number of consecutive frame errors inserted into the 71 framing pattern when the **FRAME ERROR INSERT** switch is pressed. When the **FRAME ERROR INSERT** switch is pressed, the 14 bits in F1-D11, F1-D2, F1-D4, F1-SEC96, and SEC-D11 framing modes and the 125 bits in the 153 framing mode are errored. This auxiliary function is only applicable in framed operating modes.

Press the **SOURCE CONFIGURATION II** switch to select either SINGLED or 2 to 6 CONSECUTIVE frame errors.

NOTE

Pressing the **FRAME ERROR INSERT** switch for more than 1 second (LED ON), inserts errors continuously.

4.2.15 AUX 15 USER — User Programmable Test Pattern

| | | | |
|----------------|---------------|----------|--------|
| AUX 15 USER | 1700. | FWD/REV! | END! |
| | 100001 010101 | 101010 | 010101 |

The AUX 15 USER function enters a 24-bit user programmable test pattern to be entered. This enables the TBERD 224 to transmit specific bit patterns for testing. When the appropriate operating mode is displayed and USER is selected with the **SOURCE CONFIGURATION I** switch, the pattern is transmitted from left to right as displayed. A test restart occurs if a user pattern is being saved while another user pattern is being transmitted.

Press the **SOURCE CONFIGURATION II** switch up to change the current bit to a 1 or down to change the current bit to a 0. Changing the value of the bit moves the cursor to the right.

Press the **RESULTS I Blank** switch up to move the cursor right or down to move the cursor left.

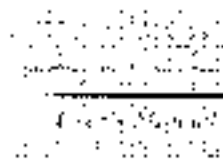
Press the **RESULTS II Arrowed** switch up to save and END the displayed bit pattern. Any bits to the right of the cursor are deleted, and the cursor returns to the left-most bit position. The first three bits cannot be deleted.

4.2.16 AUX 16 PGM LP — User Programmable Loop Codes

| | | | |
|------------------|-----------|-----------|-----|
| AUX 16 PGM LP | 1700. | FWD/REV! | END |
| | UP: 10000 | DOWN: 100 | |

The AUX 16 PGM LP function enters a 4- to 8-bit user programmable loop code to be entered. The loop code is available for transmission when the 11 PROGRAM test code is selected from the AUX 17 LOOP CD function. The loop code is transmitted from left to right as displayed.

Press the **SOURCE CONFIGURATION II** switch up to change the current bit to a 1 or down to change the current bit to a 0. Changing the value of the bit moves the cursor to the right.



Press the **RESULTS I Blank** switch up to move the cursor forward or DOWN to move the cursor backward. This switch also moves the cursor between the loop-UP code and loop-DOWN code positions.

Press the **RESULTS II Arrowed** switch up to save and END the displayed loop-up and loop-down patterns. If the cursor is positioned in the UP bit pattern and the **RESULTS II Arrowed** switch is pressed, any UP bits to the right of the cursor are deleted, the bits to the left are saved, and all the displayed DOWN bits are saved. If the cursor is positioned in the DOWN bit pattern and the **RESULTS II Arrowed** switch is pressed, any DOWN bits to the right of the cursor are deleted, the bits to the left are saved, and all the displayed UP bits are also saved.

4.2.17 AUX 17 LOOP CD — Loop Codes

| AUX 17 LOOP CD | TYPE | EQUIP |
|-------------------|------|-------|
| | T1 | CSU |

The AUX 17 LOOP CD function selects the loop code type, equipment, and location that is transmitted when the **LOOP CODES** switches are pressed. This function also selects the T1 loop code for automatic response (see AUX 18 ACT RES).

NOTE

In-band loop codes are transmitted only in the bandwidth selected by the **CHANNEL FORMAT** and **CHANNEL** switches. For loop T1 CSUs, intelligent network equipment, and smart jacks, the channel format selector must correspond to a full T1 bandwidth.

Press the **SOURCE CONFIGURATION II** switch to select either T1, DDS-ALT, or DDS-LAT as the TYPE of loop code transmitted.

NOTE

If the Smart Loopback/Command Codes Option is installed, an asterisk (*) appears to the left of TYPE to indicate there is an additional selection. Pressing the **SOURCE CONFIGURATION I** switch toggles between the *TYPE display and the *SMARTNET display.

Press the **RESULTS I Blank** switch to select the desired EQUIP menu to be looped. Table 4-2 lists the available equip. locations and loop code types.

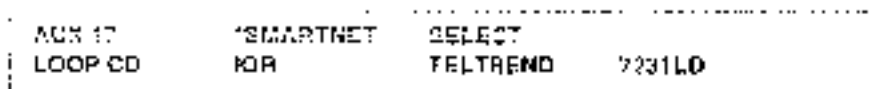
Press the **RESULTS II Arrowed** switch to set the LOCATION of the loop code, with the EQUIP, TYPE, and DISCOVER EQUIP are selected.

Table 4-2. Loop Code

| Type | Code | Description |
|---------|---------------------------------------|--|
| T | ESC | Escorted Service Unit loop codes |
| | FAC1 | Smart Jack loop codes in band 4-in facility of network. |
| | FAC2 | Smart Jack loop codes in band 5-in facility of network. |
| | FAC3 | Smart Jack loop codes in band 6-in facility of network. |
| | PROGRAM | 3-to-8-out programmable loop code |
| | ESP-4 IN | ESP out-of-band Lane loop codes. |
| | ESP-4AY | ESP out-of-band Payoff loop codes. |
| | ESP-NET | ESP out-of-band Network loop codes. |
| DSS-SET | ACT | Alternating Office Channel Unit loop code |
| | ACT-RE-06 | Alternating Office Channel Unit loop code (channel 6) (IL 568Y) |
| | IL568Y | Alternating IL 568Y Office Channel Unit loop code |
| | DSU | Alternating Data Service Unit loop code. |
| | CHANN-1 | Alternating Channel Service Unit (channel one) loop code |
| | CHANN-1B | Alternating Channel Service Unit (channel two) repeaters loop code |
| | CHANN-1E | Alternating Channel Service Unit (channel two) repeaters loop code |
| | CHANN-1F | Alternating Channel Service Unit (channel two) repeaters loop code |
| DSS-LAT | ACT | Latching Office Channel Unit loop code. |
| | CHANN-1 | Latching Channel Service Unit loop code |
| | DSU DP | Latching DSU Data port loop code |
| | EXTRACTION | When more than one DSU DP is present, select the last set of the DSU DP from 1 to 8. |
| | LSI | Latching Lane Side Interface (LSI) loop code |
| | MJU | Latching Main Junction Unit loop code |
| | MSI | Latching Encrypted T1 loop code (do not use for loop switched 56 circuits) |
| | NET-106 | Latching Network Element Interface and Administration loop code. |
| DSU | Latching Data Service Unit loop code. | |

If the Smart Loopback/Command Codes Option is installed, the AUX17 LOOP CD function also selects the intelligent equipment type (SMARTNET). Loop code type (LOR, KOR, etc.) (commercial and programmable command (if any)).

An asterisk (*) appears to the left of the L Yrth selection to indicate that it is an available selection. Pressing the **SOURCE CONFIGURATION** (F5) switch toggles between the "L Yrth" and "loop code" (if "SMARTNET" is not intelligent equipment selection display).



When *SMARTNET is selected, press the **SOURCE CONFIGURATION** (F5) switch to scroll through the list of supported intelligent network equipment type (KOR, ILR, DSI, MSW) and select one.

Then, press the **RESULTS** (Blank) switch to scroll through the specific manufacturers models. The first TRIPRO 274 supports (see Table 4-3).

Table 4-3. Intelligent Network Equipment

| Manufacturer | Equipment Type |
|------------------------|-------------------|
| ADTRAN | ITU-C and ITU-R |
| Pair Gain | ITU-C and ITU-R12 |
| Tellabs | ITU-C and ITU-R |
| Telrad (72317290) | IOR and IIR |
| Telrad (72317290A) | IOR and IIR |
| Telrad (72317290D) | IOR and IIR |
| Telrad (72317290E) | IOR and IIR |
| Telrad (72317290S) | IOR and IIR |
| Telrad (72317290W) | IOR and IIR |
| Telrad (72317290) | IOR and IIR |
| Telrad 7231E | IIR only |
| Telrad 7231E | IIR only |
| Telrad H-S MSW | Management Switch |
| TEPNET | ITU-C and ITU-R |
| Wescor (E-Series) | IOR and IIR |
| Westell (3150-3150-50) | IOR and IIR |
| Westell (3151-36) | IIR only |
| Westell (3150-3150-80) | IOR and IIR |
| Westell (3150-81) | IIR only |
| Westell (3150-11) | IOR and IIR |
| Westell (NMS-20) | Management Switch |
| Westell (NMS-25) | Management Switch |
| Westell (NMS-30) | Management Switch |
| NEL (7859-000) | IIR only |
| NEL (7851-000) | IIR only |

Press the **SOURCE CONFIGURATION II** switch to set INT EQUIP as the TYPE of loop code transmitted. The SMARTNET equipment manufacturer and model selection determines what loop code choices are available for each intelligent equipment type.

| AUX 17 | TYPE | SELECT | ADDRESS |
|---------|-----------|--------|---------|
| LOOP CD | INT EQUIP | ILR | 20 |

Press the **RESULTS** (Blank) switch to select one of the following:

- IIR (intelligent office repeater)
- IIR (intelligent line repeater)
- IORCMD (intelligent office repeater commands)
- IIRCMD (intelligent line repeater commands)
- IORPGM (intelligent office repeater programmable commands)
- IIRPGM (intelligent line repeater programmable commands)

- DS MISWITCH (DSI Maintenance Switch)
- DS MISRAMP (DSI Maintenance Switch Ramp)
- DS MISCMD (DSI Maintenance Switch commands)

| AUX 17 LOOP CD | *TYPE INT EQUIP | SELECT DS1MSWITCH | ADDRESS 01 |
|-------------------|--------------------|----------------------|---------------|
|-------------------|--------------------|----------------------|---------------|

For X17 intelligent repeaters, the **RESULTS If Blank** switch is used to set the Exchange Code. For X18 intelligent repeaters, the **RESULTS If Arrowed** switch is used to set the Location Code.

| AUX 17 LOOP CD | *TYPE INT EQUIP | SELECT IER LOC | EXCH:LOC 0001:001 |
|-------------------|--------------------|-------------------|----------------------|
|-------------------|--------------------|-------------------|----------------------|

Press the **RESULTS If Arrowed** switch to go through the IER or IOR commands (see Table 4-4).

| AUX 17 LOOP CD | *TYPE INT EQUIP | SELECT IORCMD | COMMAND ARM/DSARM |
|-------------------|--------------------|------------------|----------------------|
|-------------------|--------------------|------------------|----------------------|

Table 4-4. IOR and ILR Command

| Command | Description |
|----------------------|---|
| Address Change | Manually reassign addresses to individual line repeaters. Press the LOOP UP switch to send the Address Change command. The IER responds with its address or address code. Then, transmit an IER (up) with the new address. The IER returns in feedback and responds with its new address or address code. |
| ALS Disable | Disable the automatic ALS transmits on for a looped-up repeater. Press the LOOP UP or LOOP DOWN switch to send the command. |
| Arm/Disarm | Selects the arm or disarm mode. The disarm mode (LOOP UP switch) opens the NIU and prepares line repeaters to respond to address lock modes. The disarm mode (LOOP DOWN switch) closes down the NIU and the repeaters. |
| Auto Learn | Reassigns addresses to line repeaters automatically based on their position in the span. Press the LOOP UP or LOOP DOWN switch to send the command. |
| Auto Query | Queries each line repeater for its address or address code (if enabled). Press the LOOP UP or LOOP DOWN switch to send the command. If 555 is displayed, the repeater has an auto-learn failure. |
| Clear FTs | Resets the FTs (repeaters) to the FT mode (normal). Press the LOOP UP or LOOP DOWN switch to send the command. |
| CPM Arm | Selects the CPM (control) mode code. The CPM mode code (LOOP UP switch) sends the mode code toward the Central Office (CO). The disarm mode (LOOP DOWN switch) loops down all the span repeaters. |
| Data LPBK | Activates the data loopback mode. If the loopback mode is looped up, press the LOOP UP switch in feedback the office repeater to send side. Press the LOOP DOWN switch to loop down the line repeater. |
| Far End NIU Activate | Enables an active Far End NIU office repeater, which allows standard NIU loop-up and loop-down codes to pass through to the far-end NIU. Press the LOOP UP or LOOP DOWN switch to send the command. |

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Table 4-4. IOR and ILR Commands (Continued)

| Command | Description |
|---------------------|---|
| Issue Query | Queries the repeater type and issue. Press the LOOP UP switch to send the command. ILR in a loopback returns its type and is an 11 for example, a loop 2 ILR would return a code of 20 where 100 = ILR and issue 20 = Issue 20. |
| Manual Learn | Assigns addresses to the repeater manually. Press the LOOP UP switch to clear the current addresses, loop back each repeater, and program each repeater to receive a new address. Select the ILR command and program an address, then press the LOOP UP switch to send the command. The first repeater accepts the address and loops down, so the second repeater is ready for its address. |
| Repeaters On | Selects 1 to a number of range (a program code). When testing for the K.U. toward block 30, press the LOOP UP switch to program the repeater to respond to addresses and loop codes. The command code (LOOP DOWN switch) loops down the spare repeaters. |
| Option Query | Queries the option status of a repeater in loopback. Press the LOOP UP switch to send the command. The repeater returns its address or an address code. The option status is: <ul style="list-style-type: none"> • Frame Mode = Auto Test or LST • Loopback Code Detection = Synchronized or Asynchronous • AIS = Enabled or Disabled • CPU Autoop Code Block = Enabled or Disabled • Automatic Complex = manual = Enabled or Disabled • Repeater Status = Programmed or Original Settings |
| Power Down | Removes power from the line during transmission and for five seconds after it is stopped. Press the LOOP UP or LOOP DOWN switch to send the command. |
| Power Loop Query | Queries for and loops up the system in power loopback. Press the LOOP UP switch to send the command. Press the LOOP DOWN switch to loop down the first repeater that is looped up. |
| Power Thru | Returns the first repeater in power loopback to the power mode, but only if sent from the DSX-1 to 6. Press the LOOP UP or LOOP DOWN switch to send the command. |
| Query | Queries the address or address code of the first repeater in loopback. Press the LOOP UP or LOOP DOWN switch to send the command. If "55" is displayed, the repeater does not have an assigned address. |
| Sequential Loopback | Loops up the repeaters on the span in sequence starting with the furthest repeater. Press the LOOP UP switch to send the command. The repeater loops up and returns its address or address code. The next in the code is sent on the LOOP DOWN switch is pressed; the repeater loops down. After looping down, the repeater receives the sequential loop code and it is dismantled and returned. |
| Time out Disable? | Disables/enable the automatic loopback time out function. Loop up the repeater first, then send the time out disable function. The time out function is set when the loopback is deactivated. |
| Time out Enable? | |

The program in this section is available to all users of the various functions of our system. The time line repeat. Remote programming can only be done from the control. Once side while the repeater is in loopback. Press the **RESULTS** button to search for program code. The IOR programmable command (see table 4-3). Press the **RESULTS** button to set the ILR programmable command. The parameter or address, as applicable. Press the **LOOP UP** switch to return the selected programming command to the repeater.

| AUX 17 | *TYPE | SELECT | COMMAND |
|---------|-----------|--------|--------------|
| LOOP CD | INT EQUIP | IORPGM | ARM FRM DUAL |

Table 4-5. IOR and ILR Programmable Command

| Command | Description |
|----------|---|
| AUDR | Assigns an address to a repeater. Press the RESULTS II Arrowed switch to assign the address from 0 to 2559. |
| ARM CD: | Selects the arming code the repeater in loopback recognizes. Press the RESULTS II Arrowed switch to select the NE or CFB arming codes. |
| ARM FRM: | Selects the framing mode the repeater recognizes (AI, FI, BI, AI, or PSI) <ul style="list-style-type: none"> In AUTO mode, the repeater automatically recognizes the received framing as ZNF or SF framing. If SF framing, the repeater only arms to the in-band arming code. If ZNF framing, it only arms to the data-link arming code. In DU AI mode, the repeater arms to an in-band arming code in both SF and ZNF modes. If SF framing, the repeater also arms to the data-link out-of-band arming code. In PSI mode, the repeater only arms to the data-link out-of-band arming code. |
| ALS | Enables or disables the Alarm Indication Signal (AIS). When AIS is enabled, the repeater sends an all ones code toward the Customer Premises Equipment (CPE) indicating the repeater is in loopback. Press the RESULTS II Arrowed switch to select ENABLE or DISABLE. |
| BLK CPE: | Enables or disables the CPE arming code block, which prevents further arming of the span from the CPE side when the repeater is in loopback. Press the RESULTS II Arrowed switch to select ENABLE or DISABLE. |
| CODE RX | Selects the error detection, which determines if the repeater responds to any combinations of synchronous loop codes. Press the RESULTS II Arrowed switch to select ASYNC or SYNC. NOTE: The F-RSFD 24 Status reports synchronous loop codes. |
| RESLI | Resets the programmable features to either the factory default settings or the settings prior to the current loopback session. Press the RESULTS II Arrowed switch to select MASTER Default or SESSION prior. |
| TIMEOUT | Disables or enables the automatic loopback timeout function of the repeater. Press the RESULTS II Arrowed switch to select ENABLE or DISABLE. |

Press the **RESULTS II Arrowed** switch to scroll through the DS1 maintenance switch commands (see Table 4-6).

| AUX 17 LOOP CD | TYPE INT EQUIP | SELECT DS1MSCMD | COMMAND ARM/DISARM |
|----------------|----------------|-----------------|--------------------|
|----------------|----------------|-----------------|--------------------|

Table 4-6. DS1 Maintenance Switch Command

| Command | Description |
|------------------|---|
| Arm/Disarm | Selects the maintenance switch arming/disarming code. The arming code (0100) if selected is set to arm the maintenance switch upon receipt of any in-band loop codes on the port spanning the loopback. The disarming code (0101) will disarm the maintenance switch. |
| Query | Receives the maintenance switch status in loopback mode. If in loopback, the switch will send a bit stream equal to the address times 25, plus 1000. If it is not in loopback, the switch will send a bit stream equal to 1000. Press either the LOOP UP or LOOP DOWN switch to send the command. |
| Reset | Keeps down the maintenance switch and restores normal operation. Press either the LOOP UP or LOOP DOWN switch to send the command. |
| Time-out Disable | Disables the automatic timeout function of the maintenance switch. Press the maintenance switch to send the in-band disable function. |

The intelligent network's equipment loop codes configuration is displayed in a control panel as follows:

| | | | |
|---|----------------|---------|-----------|
| LOOP CODE (code) <code> EQ EQUIP (code) <code> | | | |
| INTELLIGENT NETWORK CONFIGURATION: | | | |
| TOE | <manufacturer> | <code> | <address> |
| TIR | <manufacturer> | <code> | <address> |
| CHANS | <manufacturer> | <model> | <address> |

4.2.16 AUX 18 AUT RES— Automatic T1 Loop Code Response

| | |
|---------|--------------------------------|
| AUX 18 | AUTO RESPONSE TO T1 LOOP CODES |
| AUT RES | NO RESP |

The AUX 18 AUT RES function determines when the T-BERD 224 enters an automatic late loopback (AUTO LTB) mode in response to a received in-band or out-of-band T1 loop code. The instrument only responds to T1 loop codes matching the code selected from the AUX 17 LOOP CODE function. Press the **SOURCE CONFIGURATION** switch to set the loop code response to either **NO RESPONSE** or **AUTO RESPONSE**.

NO RESP — The T-BERD 224 does not respond to received loop codes.

AUTO RESP — The T-BERD 224 automatically responds to the received T1 loop codes by entering either the AUTO LTB, AUTO PLB, or T1 LTB mode. The AUTO LTB mode indicates the T-BERD 224 has responded to either a CSU, FAC1, UAC2, PROGRAM, ESF, LTN, or ESF-NET loop code. The AUTO PLB mode indicates the T-BERD 224 has responded to the ESF-PAN loop code. The T1 LTB mode indicates the T-BERD 224 has responded to a loop code when the channel format is set to 6B, 6C, or 6X.

In AUTO RESPONSE mode, the T-BERD 224 emulates a CSU in loopback and functions the same as the T1 LTB operating mode. In this mode, the T-BERD 224 automatically responds to the received T1 loop codes after receiving five seconds of an in-band loop-up code or after receiving seven out-of-band ESF out-of-band loop-up codes. In the T1 LTB mode or SMARTNET (Smart Loopback/Command Codes Oper) installed mode, the T-BERD 224 does not respond to the received loop codes. The T-BERD 224 does not respond in AUTO RESPONSE mode after receiving the in-band or ESF out-of-band loop-down code. When the loopback is disabled, the instrument returns to the previous selected operating mode.

4.2.18 AUX 19 DDS CHN— DDS Analysis Channel 1 and Secondary Channel Configuration

| | | |
|---------|----------|---------|
| AUX 19 | TRANSMIT | ANALYZE |
| DDS CHN | PRIMARY | PRIMARY |

The AUX 19 DDS CHN function determines how the T-BERD 224 tests the DDS primary and secondary channels.

Press the **SOURCE CONFIGURATION II** switch to select which DDS channel will be a transmit pattern: PRIMARY, SECONDARY, or BOTH.

When the TRANSMIT selection is set to BOTH, press the **RESULTS I Blank** switch to select which channel is being analyzed: PRIMARY or SECONDARY.

When the TRANSMIT selection is set to SECONDARY or BOTH, press the **RESULTS II Arrowed** switch to select the SEC CH PAT (secondary channel test pattern): 511 or 2047.

| | | | |
|-------------------|-----------------------|----------------------|-------------------|
| AUX 19 DDS CHN | TRANSMIT SECONDARY | ANALYZE SECONDARY | SEC CH PAT 511 |
|-------------------|-----------------------|----------------------|-------------------|

The THERM 274 can transmit data on either the primary channel, the secondary channel, or on both channels simultaneously. It can analyze the data on one channel at a time. Table 4-7 indicates the possible transmit, analysis, and secondary channel pattern configurations.

Table 4-7. Testing DDS Channel I

| Transmit | Analyze | Secondary Pattern | INSERT Switch | Messages |
|-----------|-----------|-------------------|---------------|---|
| Primary | Primary | All codes | I.1 or I.2 | |
| Both | Primary | 511 or 2047 | I.1 & I.2 | Transmitting On Both Channels Analyzing Primary Channel |
| Both | Secondary | 511 or 2047 | I.1 or I.2 | Transmitting On Both Channels Analyzing Secondary Channel |
| Secondary | Secondary | 511 or 2047 | I.1 or I.2 | Transmitting On Secondary Channel Analyzing Secondary Channel |
| Both | Secondary | 511 or 2047 | None | Analyzing Secondary Channel |
| Secondary | Secondary | 511 or 2047 | None | Analyzing secondary Channel |

NOTE

When performing DDS alternating loopback testing, the AUX 19 DDS CHN function, TRANSMIT and ANALYZE selections must be set to PRIMARY.

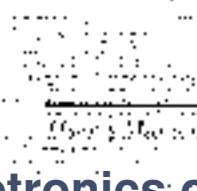
4.2.20 AUX 20 PRM TX — ESE Datalink PRM Transmission Control



| | | | |
|------------------|------------------------|-----------------------|------------------|
| AUX 20 PRM TX | L1 EMULATE CUSTOMER | L2 EMULATE CARRIER | PRM TRANS OFF |
|------------------|------------------------|-----------------------|------------------|

The AUX 20 PRM TX function determines how the PRM is transmitted and evaluated on LINE 1 and LINE 2 in L1 and L2 operating modes. The PRM is transmitted over the datalink to the far end and reports on the quality and performance of the received signal from the far end.

Press the **SOURCE CONFIGURATION II** switch to select the PRM emulation (L1 EMULATE) for LINE 1, or press the **RESULTS I Blank** switch to select the PRM emulation (L2 EMULATE) for LINE 2.



AUX 21 SWEEP — Frequency Sweep Parameter

CUSTOMER — The transmitted PRM emulates the customer-generated PRM. Selecting CUSTOMER sets the PRM CR bit to 0. The logging line should be set to CARRIER for normal testing.

CARRIER — The transmitted PRM emulates the carrier-generated PRM. Selecting CARRIER sets the PRM CR bit to 1. The logging line should be set to CUSTOMER for normal testing.

Press the **RESULTS II Arrowed** switch to determine whether the PRM is transmitted.

AUTO — The T-BERD 224 automatically determines whether it should transmit PRM. The LINE 1 and LINE 2 datalinks are tested to determine which received datalink is active or inactive. An inactive datalink is defined as idle, e.g., the line receiver is not connected to the circuit, or a Bit Oriented Protocol (BOP) or message-oriented protocol (MOP) idle code is received. The datalink is considered active if four consecutive non-idle BOP or MOP messages are received. If the datalink is inactive, the T-BERD 224 generates PRMs until activity is detected.

ON — The T-BERD 224 transmits the PRM on both lines simultaneously. If LINE 1 and LINE 2 are receiving data, the transmitted PRM on LINE 1 is the PRM generated from the received data on LINE 2. Likewise, the transmitted PRM on LINE 2 is the PRM generated from the received data on LINE 1.

OFF — Disables the PRM transmission function. However, the received PRM is still reported in the RCV & FRAMM category PRM results.

4.2.21 **AUX 21 SWEEP** — Frequency Sweep Parameter

| | | | |
|--------------|-----------|-----------------|-----------------|
| AUX 21 SWEEP | END-POINT | START 100 Hz | STOP 2500 Hz |
|--------------|-----------|-----------------|-----------------|

The AUX 21 SWEEP function allows the user to set the Frequency Sweep parameters.

NOTE

The END-POINT contains the range of three possible selections.

Press the **SOURCE CONFIGURATION I** switch to select one of the three displayed parameters, END-POINT STEP, or SKP.

END-POINT — Sets the START and STOP frequencies for the monitored frequency band. Press the **RESULTS I Blank** switch to modify the START frequency from 20 Hz to 3000 Hz. Press the **RESULTS II Arrowed** switch to modify the STOP frequency from 20 Hz to 3004 Hz.

NOTE

If the START frequency is high (0.1 or 0.15 MHz frequency), the sweep code is always the same as it goes up and down.

| | | | |
|--------------|------|---------------------|------------------------|
| AUX 21 SWEEP | STEP | STEP-SIZE 100 Hz | STEP-INTVL 2.0 SECS |
|--------------|------|---------------------|------------------------|

STEP - Selects the step size and time spent at each frequency (STEP-SIZE and STEP-INTVL). Press the **RESULTS I Blank** switch to modify the STEP-SIZE frequency from 10 Hz to 1000 Hz. Press the **RESULTS II Arrowed** switch to modify the STEP-INTVL (Frequency Step Interval) from 1.5 seconds to 0.9 seconds.

| | | | |
|--------|-------|---------|---------|
| AUX 21 | *SKIP | SKIP-HI | SKIP-LO |
| SWEEP | | 2750 Hz | 2450 Hz |

SKIP - Allows the user to block a portion of the frequency band. This avoids (time) the transmission of frequency tones that can be interpreted as loopback tones. The SKIP interval is determined by establishing high and low frequencies ranges (SKIP-HI and SKIP-LO). Press the **RESULTS I Blank** switch to modify the SKIP-HI frequency from 20 Hz to 3600 Hz. Press the **RESULTS II Arrowed** switch to modify the SKIP-LO frequency from 20 Hz to 3600 Hz. SKIP-LO should always be set lower than the SKIP-HI frequency.

4.2.22 AUX 22 VFBURST — Voice Frequency Burst Parameters

| | | | |
|---------|-------|---------|-----------|
| AUX 22 | BURST | FREQ | LEVEL |
| VFBURST | ON | 2125 Hz | +10.0 dBm |

The AUX 22 VFBURST function allows the user to set the frequency and level of the VF burst function. The burst is used before a return loss measurement or Switched 50 BURST to disable the active amplifier or the channel. The duration of a burst is 2700 us.

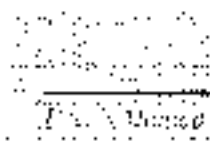
- Press the **SOURCE CONFIGURATION II** switch to toggle between burst ON and burst OFF.
- Press the **RESULTS I Blank** switch to set the burst frequency parameter from 20 Hz to 3600 Hz.
- Press the **RESULTS II Arrowed** switch to set the burst level parameter from -10 dBm to +30 dBm.

4.2.23 AUX 23 PRT OPT — Frequency Sweep Print Option

| | |
|---------|----------|
| AUX 23 | FREQ SWP |
| PRT OPT | ON |

The AUX 23 PRT OPT function allows the user to toggle the Frequency Sweep printout ON or OFF. When SWEEP is selected by the **SOURCE CONFIGURATION I** switch, the I REFTr 22a generates a frequency vs. level chart (see figure 4.1).

Press the **SOURCE CONFIGURATION II** switch to set the Frequency Sweep printout ON or OFF with a default value of OFF.



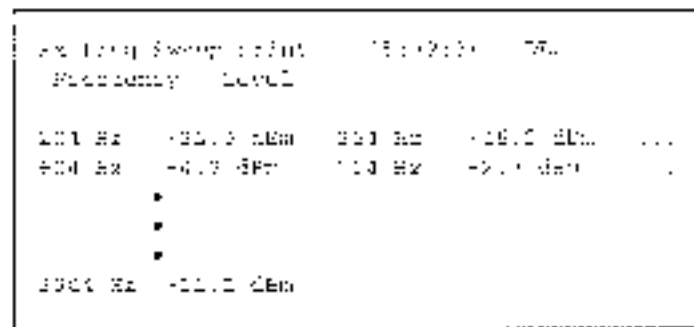
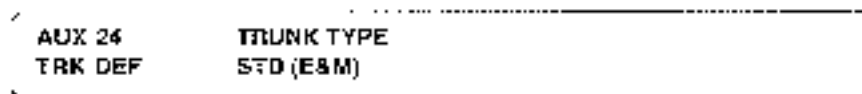


Figure 4-1. Frequency Sweep Printout

4.2.24 **AUX 24 TRK DEF** — Trunk Type Defined



The **AUX 24 TRK DEF** function defines the ON HOOK and OFF HOOK signaling status for the A, B, C, or D signaling bus used in STD (E&M) and SWI-56 channel formats.

Press the **SOURCE CONFIGURATION II** switch to select the trunk type.

STD (E&M) — Selects the signaling E & M signaling structure used on trunks between switches in the public switched telephone network.

GROUND ST — Enables the T-BERD 224 to test a ground start foreign exchange or a SLC circuit.

Press the **RESULTS I** Blank switch to emulate a service configuration on either end of the trunk:

FXS — Foreign Exchange Station

FXO — Foreign Exchange Office

SLC STATION — SLC Station

SLC OFFICE — SLC Office

LOOPSTART — Enables the T-BERD 224 to emulate or monitor standard signaling between telephone and switch.

Press the **RESULTS I** Blank switch to emulate a component on either end of the trunk:

FXS — Foreign Exchange Station

FXO — Foreign Exchange Office

SLC STATION — SLC Station

SLC OFFICE — SLC Office

DEFINED — Enables the user to program the events sent or received by the T-BERD 224.

Press the **RESULTS I** Arrowed switch to select ON HOOK or OFF HOOK defaults.

Press the **RESULTS II** Blank switch to move the cursor between the A, B, C, or D signaling bus.

Press the **RESULTS** **Arrowed** switch to scroll the value of the set between the following values:

0 - Logic zero

1 - Logic one

X - Don't Care State. A logic one is transmitted by default.

T - Toggles between logic zero and logic one. Toggling is invalid in DSI and DSF modes, and is treated as an X (Don't Care).

4.2.25 AUX 25 DIG MAR — Digit Margining (Interdigit Timing)

The AUX 25 DIG MAR function defines the parameters of the DTMF/MF and DP digits used in SIGNAL and SWI 56 channel formats.

Press the **SOURCE CONFIGURATION** **Blank** switch to select the address type for the digits.

| AUX 25 DIG MAR | TYPE DTMF/MF | DIGIT ON 70 ms | DIGIT OFF 70 ms |
|-------------------|-----------------|-------------------|--------------------|
|-------------------|-----------------|-------------------|--------------------|

DTMF/MF — Dual Tone Multifrequency/Multifrequency

Press the **RESULTS** **Blank** switch to set the length of time the digits are transmitted. **DIGIT ON** ranges from 13 ms to 250 ms.

Press the **RESULTS** **Arrowed** switch to set the length of time between transmitted digits. **DIGIT OFF** ranges from 3 ms to 250 ms.

DP — Dial Pulse

Press the **RESULTS** **Blank** switch to set the number of pulses per second. **PPS** ranges from 7 to 21 PPS.

Press the **RESULTS** **Arrowed** switch to set percentage of time the digit pulse will be in the **ON** (HOOK state). **% BREAK** ranges from 10 to 68.

| AUX 25 DIG MAR | TYPE DP | PPS 10 | % BREAK 60 |
|-------------------|------------|-----------|---------------|
|-------------------|------------|-----------|---------------|

4.2.26 AUX 26 DIAL SEQ — Dial Sequence

4.2.26 AUX 26 DIAL SEQ — Dial Sequence

4.2.27 AUX 27 DIAL SEQ — Dial Sequence

| AUX 26 DIAL SEQ | H w KP 3531550 ST h SEQ 1 | DP | 01 |
|--------------------|------------------------------|----|----|
|--------------------|------------------------------|----|----|

The AUX 26 DIAL SEQ function, which supports the SIGNAL and SWI 56 modes, allows users to program and store up to 40 different digit sequences. The sequences define the events and digits the T-BIRD 221 transmits and the events expected in response.

4.2.28 AUX 28 DIAL SEQ — Dial Sequence

4.2.29 AUX 29 DIAL SEQ — Dial Sequence

4.2.30 AUX 30 DIAL SEQ — Dial Sequence

Press the **SOURCE CONFIGURATION** Π switch to select a SEQUENCE number from 1 to 10.

Press the **RESULTS** Π **Blank** switch to set the address of the selected digit.

Signaling Keypad — Use the Signaling Keypad to enter the sequence to be transmitted.

Cursor Keys — Press to position the cursor and edit the sequence (ME, DTME, DP). The position of the cursor is identified by the number in the lower right corner of the **RESULTS** Π window.

TERM SUPV — Select events the T-BERD 224 expects to receive (lowercase letters).

ORG SUPV — Select events the T-BERD 224 will transmit (uppercase letters).

Keypad — Program the telephone number to be transmitted.

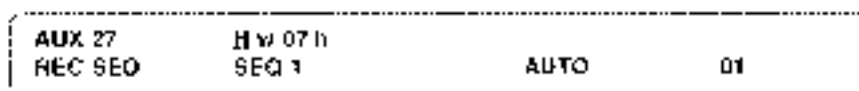
ENTER Key — Press to save the current sequence.

NOTE

When the sequence has been altered, the prompt **RECALL SEQ** appears in the **RESULTS** Π window. This indicates that a change has been made and gives you the opportunity to recall the previous sequence by pressing the **RESULTS** Π **Arrowed** switch. The sequence is automatically saved when the auxiliary function is exited.

If more than 80 events and digits are entered, the message **SIGNALING SEQUENCE IS FULL** is displayed.

4.2.27 AUX 27 REC SEQ — Receive Sequence



The AUX 27 REC SEQ function, which supports the SIGNALING and SWEEP modes, allows users to program and store up to ten different sequences. The sequences define the events and digits the T-BERD 224 expects to receive and the terminating supervised events (digits) that.

Press the **SOURCE CONFIGURATION** Π switch to select a SEQUENCE number from 1 to 10.

Press the **RESULTS** Π **Blank** switch to set the address of the expected digits (ME, DTME, DP, or ACTION). In **SWEEP** mode, the T-BERD 224 will automatically select the first available digit type.

Signaling Keypad — Use the Signaling Keypad to enter the sequence to be transmitted.

Cursor Keys — Press to position the cursor and edit the sequence. The position of the cursor is identified by the number in the lower right corner of the **RESULTS** Π window.

TERM SUPV — Select events the T-BERD 224 will transmit (lowercase letters).

ORG SUPV — Select events the T-BERD 224 expects to receive (uppercase letters).

Keypad — Program the number of digits expected to be received. The digits are entered in pairs. If a single digit is pressed, it is converted to a pair when a non-digit is entered following the single digit.

ENTER Key — Press to save the current sequence.

NOTE

When the sequence has been altered, the prompt RECALL SEQ appears in the RESULTS # window. This indicates that a change has been made and gives you the opportunity to recall the previous sequence by pressing the **RESULTS # Arrowed** switch. The sequence is automatically saved when the auxiliary function is exited.

Up to 16 events may be programmed.

4.2.28 AUX 28 SPV DEF — Transmit Supervision

| AUX 28 SPV DEF | SUP EVENT WINK | DELAY 70 ms | DURATION 200 ms |
|-------------------|-------------------|----------------|--------------------|
|-------------------|-------------------|----------------|--------------------|

The AUX 28 SPV DEF function, which supports SCANNING and SWP-56 channel formats, defines the parameters of the transmitted WINKS and delay-dial events.

Press the **SOURCE CONFIGURATION #** switch to select either a WINK or DELAY DIA...

Press the **RESULTS # Blank** switch to set the DELAY. DELAY determines the time between the receipt of the last digital supervision event and the start of the wink or delay-dial.

- The WINK DELAY ranges between 50 ms and 1 second.
- The DELAY DIAI DELAY ranges between 30 ms and 15 seconds.

Press the **RESULTS # Arrowed** switch to determine the length of the wink or delay dial.

- The WINK DURATION ranges between 30 ms and 600 ms.
- The DELAY DIAI DURATION ranges between 30 ms and 16 seconds.

4.2.29 AUX 29 SCANSET — Channel Signaling Scan Setting

| AUX 29 SCANSET | CHAN 1 ID... | FWG... | ... | ... | ... |
|-------------------|--------------|--------|--------|--------|-----|
| | 110111 | 109078 | 109311 | 111100 | |

The AUX 29 SCANSET function allows the user to select which ID channel to scan and transmit the signaling activity on that line. This auxiliary function appears when the SWP-56 channel format or AN source configuration are selected (Signaling Option required) or when the CALEX ID channel format and CID SCAN source configuration are selected (Caller ID Option required).

NOTE

When an asterisk (*) appears to the left of an item, it indicates that it is one of two possible selections.

110111 109078
 109311 111100

Press the **SOURCE CONFIGURATION I** switch to select either the 'CHAN' selection display or the 'TIMEOUT' display.

CHAN — Press the following switches to set the flag for the channels to be scanned. The bits or flag currently represent the DSO channels 1 to 20 from left to right on the display.

| | | | | | |
|-------------------|-------------|------------|--------|--------|--------|
| AUX 29 SCANSET | *CHAN 1 [0] | FWD [REV.] | 100011 | 100011 | 111100 |
|-------------------|-------------|------------|--------|--------|--------|

Press the **SOURCE CONFIGURATION II** switch up to change the current flag from 1, which selects the channel for scanning, or down to change the current flag to 0, which deselects the channel. The cursor advances to the right when the flag is changed.

Press the **RESULTS I Blank** switch up to move the cursor right or down to move the cursor left without changing the flag.

TIMEOUT — Press the following switches to set the OFF HOOK and DISCONNECT timeout durations.

| | | | |
|-------------------|-----------|-------------|-----------|
| AUX 29 SCANSET | *TIMEOUTS | *DISCONNECT | 5 SECONDS |
|-------------------|-----------|-------------|-----------|

Press the **RESULTS I Arrowed** switch to select either the OFF HOOK or DISCONNECT timeouts.

OFF HOOK — Resumes scanning after either line is off hook for the indicated time.

DISCONNECT — Resumes scanning after both lines are on hook for the indicated time.

Press the **RESULTS I Blank** switch to select the timeout duration for either timeout function.

OFF HOOK — Set timeout from 5 seconds to 1 minute in 5 second steps, and from 1 to 5 minutes in 1-minute steps. Set message to NONE to resume scanning only after a disconnect or a reverse hook.

DISCONNECT — Set timeout from 1 to 15 seconds in 1-second steps. Resumes scanning after both lines are on hook.

4.2.30 AUX 30 M2U — MJU Controls

| | | | |
|---------------|-----------|--------|--------|
| AUX 30 M2U | OPERATION | REASON | HUB ID |
| | SELECT | ? | SEND? |

AUX 30 M2U allows the user to control DSS MJUs. The execution of the commands is through this auxiliary function. During the execution of the command, status messages appear on the display.

Press the **SOURCE CONFIGURATION II** switch to select the MJU operation.

SELECT — Access the selected branch. After a successful SELECT operation the HUB ID of the selected MJU is displayed.

REASON — Press the switch to see the reason for a failed attempt to connect to the

- UNBLOCK** – Unlocks the selected branch previously blocked.
- RESTORE** – Deletes the last SELECT/BLOCK or SELECT/UNBLOCK sequence.
- RELEASE** – Releases all branches to normal operation.

Press the **RESULTS I Blank** switch to select the BRANCH (1 to 4) for the operation.

Press the **RESULTS II Arrow** switch to SEND the command for the operation. During the MDU operation, the SEND prompt is overwritten with the name of the operation. When the MDU control operation is complete, the SEND prompt is restored.

NOTE

A user reset is performed at the beginning of each MDU transaction. The MDU operation is aborted after any user switch change.

4.2.31 AUX 31 CALLID – Caller ID Signaling Selection



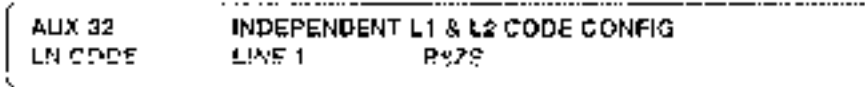
AUX 31 CALLID allows the user to select between loop start SLC and FX offices and sources for Caller ID testing.

Press the **SOURCE CONFIGURATION II** switch to select the CALLID format.

- SLC** – Subscriber Loop Carrier (SLC) offices.
- FX** – Foreign Exchange (FX) offices.

AUX 31 CALLID is only active in the CALLID channel format.

4.2.32 AUX 32 LN.CODE – Independent Line Coding



AUX 32 LN.CODE allows the independent selection of line coding (AM2 or R478) for Lines 1 or Line 2. This auxiliary function is only active in the ENI 301 mode and it only allows CODE operation in 2-line mode.

Press the **SOURCE CONFIGURATION II** switch to select either LINE 1 or LINE 2. Use the **RESULTS I Blank** switch to toggle between AM2 and R478 line coding.

4.2.33 AUX 35 CUSTOM - CUSTOM Results

| | |
|-----------------|-----------------|
| AUX 35 CUSTO | *CHANNEL ALL |
|-----------------|-----------------|

AUX 35 CUSTOM selects specific test results and Alarm LED conditions to be displayed on the front panel, included in a results printout, and returned by remote control.

NOTE

When an asterisk (*) appears to the left of CHANNEL, it indicates that it is one of six possible selections.

Press the **SOURCE CONFIGURATION** | switch to select the category from which the results are chosen: LOGIC (if EERT Option installed), BPVFRAME, SIGNAL, TIME, CHANNEL, ALARMS, and SONE1 and DS9 (if SONE1/DS9 Led Option installed).

Press the **SOURCE CONFIGURATION** | switch to select the condition of the category.

ALL --- All results in the selected category are displayed and included in a results printout.

NONE --- None of the results in the selected category are available on the display or are included in a results printout. When NONE is selected the message *RESULTS UNAVAILABLE* is displayed in the RESULTS window for the selected category.

NOTE

When the condition of the category is changed from ALL or NONE, the results previously SELECTED as ENABLED or DISABLED are active.

SELECT --- An operator selects the results available in the display and included in a results printout.

| | | |
|-----------------|--------------------|------------------------|
| AUX 35 CUSTO | *CHANNEL SELECT | 180 RCV BYT ENABLED |
|-----------------|--------------------|------------------------|

Press the **RESULTS** | **Approved** | switch to enable the result or condition on the display. The position of the selected switch depends on the options available.

Press the **RESULTS** | **Block** | switch to set the condition of the result.

ENABLE --- The selected result is available on the display and included in a results printout.

DISABLE --- The selected result is not available on the display and is not included in a results printout.

NOTE

When the LRC SRC is selected with a result disabled by AUX 35 CUSTOM, a results printout is not generated by the **PRINT EVENT** switch.

4.2.34 **AUX 35 CUSTOM — Primary Rate ISDN Custom Results**



AUX 35 CUSTOM selects specific test results and Alarm LED conditions to be displayed on the front panel, included in a results printout, and returned by remote control.

NOTE

When an asterisk (*) appears to the left of CHANNEL, it indicates that it is one of several possible selections.

SIGNAL INFORMATION test results are part of the CHANNEL category group within AUX 35.

Press the SOURCE CONFIGURATION I switch to select the category from which the results are presented: LOGIC, BPV/FRAME, SIGNAL, TIME, CHANNEL, or ALARMS.

Press the SOURCE CONFIGURATION II switch to select the condition of the category.

ALL — All results in the selected category are displayed and included in a results printout.

NONE — None of the results in the selected category are available in the display or are included in a results printout. When NONE is selected the message RESULTS DISABLE is displayed in the RESULTS window for the selected category.

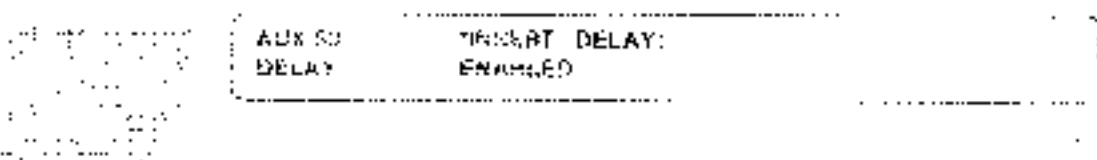
NOTE

When the condition of the category is changed from ALL or NONE the results previously SELECTED or DISABLED or DISABLED D. results.

4.2.35

4.2.35 **AUX 50 DELAY — Set Channel Insert Delay**

The AUX 50 DELAY function allows the user to enable or disable the 3-second channel insert delay. The default is ENABLE. Specific test results and Alarm LED conditions are displayed on the screen below:



4.3 **SONET/DS3 ANALYZER LIO OPTION AUX FUNCTIONS**

The following auxiliary functions are found on the SONET/DS3 Analyzer Lio Option.

4.3.1

4.3.2

4.3.3

4.3.4

4.3.1 **AUX 10 DS3 ALARM — Set DS3 Alarm Type**

AUX 10 allows the user to insert two types of DS3 alarm errors into the data stream individually or simultaneously: AIS (BLUE) and YELLOW. This testing capability provides time-specific, random, and/or continuous signal degradation across the entire DS3 signal.

| | |
|-----------------|---------------|
| AUX 10 | TYPE |
| DS3 ALAR | YELLOW |

The AUX 10 DS3 ALARM function selects the DS3 Alarm types within the DS3 and S1S/DS3 modes. Press the **RESULTS | Blank** switch to select one of the following:

(YELLOW) — DS3 Yellow alarm is transmitted.

AIS (BLUE) — DS3 AIS Blue alarm is transmitted.

NONE — None of the results in the selected category are available in the display or are included in a results printout. When NONE is selected the message **RESULTS UNAVAILABLE** is displayed in the **RESULTS** window for the selected category.

4.3.2 **AUX 11 DS3 ERR INS — Setting DS3 Error Insert Function**

The AUX 11 DS3 ERR INS function allows the user to insert three types of DS3 errors into the data stream individually or simultaneously: LOGIC BURST and FRAME. This testing capability provides time-specific, random, and/or continuous signal degradation across the entire DS3 signal.

The AUX 11 DS3 ERR INS function allows the user to control in-service monitoring and analysis, as well as out-of-service loopback or end-to-end test. Verifying a transmitted signal by inserting an error into the transmitted signal is an effective measure of identifying the problem. Execute the following commands by using the auxiliary function switches. During the execution of the following commands, status messages appear in the display.

Press the **RESULTS | Arrow** switch to select the following errors:

LOGIC BURST — Inserts logic errors in single, burst, or continuous streams into the transmitted DS3 data and overhead bits.

| | | |
|--------------------|---------------------|--------------|
| AUX 11 | %LOGIC BURST | RATE |
| DS3 ERR INS | 5.1 sec | 1E -2 |

BPV BURST — Inserts BPV errors in single, burst, or continuous streams into the transmitted DS3 signal.

| | | |
|--------------------|-------------------|--------------|
| AUX 11 | %BPV BURST | RATE |
| DS3 ERR INS | 5.0 sec | 1E -2 |

FRAME — Inserts frame errors in single, multiple, or continuous consecutive M frame errors into the transmitted DS3 framing bits.

| AUX 11 | FRAME |
|-------------|-------------|
| DS3 ERR INS | 1/M - FRAME |

NONE — None of the results in the selected category are available in the display or are included in a results printout. When **NONE** is selected the message *RESULTS UNAVAILABLE* is displayed in the **RESULTS** window for the selected category.

Press the **RESULTS | Blank** switch to scroll through the following **TIMING** options in **LOGIC BURST** or **BPV BURST**: **SINGLE**, 25ms, 50ms, 100ms, 500ms, 1.0 sec, 2.0 sec, 3.0 sec, 4.0 sec, and 5.0 sec.

Press the **RESULTS | Blank** switch to scroll through the following **FRAMING** options in **FRAME INS**:

1M-FRAME — Inserts a single frame error (the switch flashes once).

2M-FRAME — Inserts multiple consecutive frame errors (the switch flashes for 1 second).

Press the **RESULTS | Blank** switch to scroll through the following options in **LOGIC** or **BPV RATE** only: **1E-2**, **1E-4**, **1E-6**, and **1E-9**.

When **SINGLE** is selected with **RESULTS | Blank** switch, no rate is displayed. The LED illuminates continuously for the entire duration of the programmed period. If the duration is 500 ms or less, the LED illuminates for 500 ms. Note that the default setting is **SINGLE**. Parameters are not interchangeable; therefore, the user must press the **ERROR INSERT** switch to initiate a new rate setting.

4.3.3 AUX 20 STS1 ALARM — Setting STS-1 Alarms

The **AUX 20 STS1 ALARM** function allows the user to insert STS1 alarms into the data stream when the test set is in an STS1 mode.

| AUX 20 | TYPE |
|-----------|----------|
| STS1 ALAR | LINE AIS |

Press the **RESULTS | Blank** switch to scroll through the following **ERROR TYPE** options.

LINE AIS — Selects AIS (blue) alarm for insertion.

LINE R — Selects RDI (yellow) alarm for insertion.

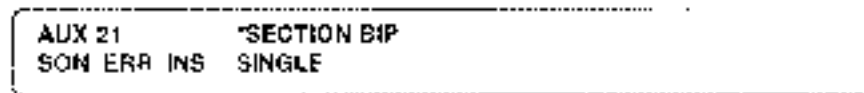
PATH AIS — Selects Path AIS alarm for insertion in the selected STS1 mode.

PATH INS — Selects Path INS alarm for insertion in the selected STS1 mode.

NONE — None of the results in the selected category are available in the display or are included in a results printout. When **NONE** is selected the message *RESULTS UNAVAILABLE* is displayed in the **RESULTS** window for the selected category.

4.3.4 AUX 21 SON ERR INS – Setting SONEI Error Insert Function

The AUX 21 SON ERR INS function allows the user to insert four types of SONEI errors into the data stream when the test set is in an STS-1 mode. It is important to note that when in an STS-1 mode, AUX 21 *overrides* AUX 11 unless NONE is selected with the RESULTS 1 Arrow switch. Only single SONEI errors can be inserted.



Press the RESULTS 1 Arrow switch to scroll through the following ERROR TYPE options:

SECTION BIP — Selects Section BIP errors for insertion.

LINE BIP — Selects Line BIP errors for insertion.

PATH BIP — Selects Path BIP errors for insertion in the selected STS ID.

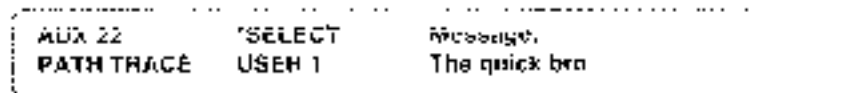
VT BIP — Selects VT BIP errors for insertion in the selected STS ID and DSL channel.

NONE — None of the results in the selected category are available in the display or are included in a results printout. When NONE is selected the message *RESULTS CATEGORY* is displayed in the RESULTS window for the selected category.

The LED illuminates for 500 ms each time **ERROR INSERT** switch is pressed.

4.3.5 AUX 22 PATH TRACE – Transmit Path Trace Messages

The AUX 22 PATH TRACE function allows the user to determine the origin of the signal and is a convenient method of determining path connectivity. Specific test results and Alarm LED conditions are displayed on the led opt out.



SELECT — The user shall use the RESULTS 1 BLANK switch to scroll through the following options:

NONE — No message transmitted.

USER 1 — The quick brown fox jumps over the lazy dog. (1214567890, 987654321)

USER 2 — Telecommunications Techniques Corporation, Texas Excellence

USER 3 — SURE 224, SONEI, DSXDS, DSXDS, Communications Analyzer

Since the entire message will not be visible on the screen, by using the up/down arrow keys, the RESULTS # Blank switch can be used to scroll the message from right to left.

Press the RESULTS # Blank switch up to move the display to the right.

Press the RESULTS # Blank switch down to move the display to the left.

Upon exiting the AUX function, the user message display will reset to the beginning.

SECTION 5 TEST RESULTS

5-1 INTRODUCTION

The T-BURD 224 test results are displayed in the RESULTS window. The available test results depend on the settings in the AUX55 CUSTOM function, the T-BURD 224 configuration, and the installed options. Categories where all results are unavailable display the message *RESULTS UNAVAILABLE*. Results that are applicable but not yet available display the message *UNAVAILABLE*. Results that are not applicable to the current mode display *N/A*.

The test results are numbered using an nXX format where n = the line number (1 for LINE 1 and 2 for LINE 2) and XX = the result number. If the displayed result count exceeds 99,999,999, a > (greater than sign) appears in the window, then the number rolls over and the count continues.

Table 5-1 lists the results categories and the section where they are discussed.

Table 5-1. Test Result Categories

| Category | Section |
|-------------|------------------------|
| Summary | section 5.2 on page 4 |
| Logic | section 5.3 on page 7 |
| RPS & Frame | section 5.4 on page 9 |
| Signal | section 5.5 on page 12 |
| Time | section 5.6 on page 13 |
| Channel | section 5.7 on page 14 |

5.2 SUMMARY CATEGORY

The test results are displayed in the RESULTS window. Press the **F1** function key to view the test results.

Results window

Table 5-2. SUMMARY Category

| Option | Message | Option | Message | |
|---------------------------------------|-------------------------|--------------------------|---------------------|-------------|
| Cable ID Test Results | n070CKSUM | Maintenance Test Results | n050PVS | |
| EDS Test Results | n060DESERR | | n060TRMERR | |
| Enhanced ESE/SLC Test Results | n170FRRES | | n070RTEERR | |
| | n180FTSLS | | n080RMLGS | |
| | n190RPNLS | | n090RPNQJ | |
| | n200SLPSS | n100TMSLE | | |
| Enhanced ESE/SLC Alarms | n220CRCE | Maintenance Status | n150SENSVSTATE | |
| | n040LINK SYNC LOSS | | n160SDETECTD | |
| | n050LOOP PROTECTION | | n170DPALVCCV | |
| | n060LOOP SUELEP | | n010BVS COMMVTRCT | |
| | n070ALARM MAJOR | | n180RLOSS | |
| | n080ALARM MINOR | | n190RSLGOK | |
| | n090ALARM ON PROI | | n200RSLGTSVAL | |
| | n100ALARM POWERMIS | | n210RSLGALOS | |
| | n110ALARM HELPFUL | | n220RSLGDOWN | |
| | n120ALARM HELP | | n230RSLGUP | |
| Enhanced ESE/SLC Maintenance Messages | n130MAINT HOOK STATE | Send Logbook Status | n240RSLGDOWN | |
| | n140MAINT PROTECTD | | n250RSLGUP | |
| | n150MAINT HSC ALB | | n260RSLGALOS | |
| N57 Process Alarms | n160SYSSTATS | | n270RSLGARM | |
| | n170DISC PKLS | | n280RSLGKUP | |
| | n180EMERGENCY ALIGNSTAT | | n290RSLGCODE | |
| | n190ERR PKARC | | n300RSLGME | |
| | n200NACKS | | n310RSLGPROG | |
| | n210NORMAL ALIGNSTAT | | V-Belt Test Results | n320RSLGERR |
| | n220OUT OF ALIGNMENT | | | n330RSLGOK |
| n230PROCESS MESSAGE | | | | |

The SUMMARY category allows quick access to key not zero and out-of-specification results without having to scroll through several categories. The results that appear in the SUMMARY category include:

5.2.1 Test Results

n050TRMERR

BY Error – A count of received bits that do not have opposite bit of the corresponding transmitted bits (i.e. pattern synchronization is achieved).

n090PATSLP

Pattern Slips – A count of the total number of pattern slips detected since the beginning of the test. The result is only valid when using pseudo random test patterns. A pattern slip is a difference (one or more bits are rising or falling) between the transmitted and received test patterns.

n170FRRES

Far-End Frame Error Seconds – A count of seconds in which one or more frame errors were received at the far end. This result is the FRM Error Synchronization failure count of the V-Belt Test.

n18F F SES

Far-End Severely Errored Framing Seconds— A count of seconds in which two or more frame errors were received in less than 3 ms at the far end. This result reads the PRM Severely Errored Framing Event Bit (SEF = 1) status.

n19F BPV S

Far-End BPV Seconds — A count of seconds in which one or more BPVs were received at the far end. This result reads the PRM Line-Clock Violation Event Bit (V = 1) status.

n20F GLP S

Far-End Controlled Slip Seconds — A count of seconds in which controlled slips were received at the far end. This result reads the PRM Controlled Slip Event Bit (SL = 1) status.

n22F CRC E

Far-End CRC Errored Events — A count of the minimum number of CRC errors reported in the nFSJ CRC to nFSY CRC results in the BPV & L2/L3/E categories. This result reports on the accumulated PRM CRC Error Event Bit (GE1 to GE6) results. A "0" greater than 1 preceding the count indicates that Bits 2 through 6 are nonzero.

n25 BPVS

Bipolar Violations — A count of BPVs since the start of elapsed time (excluding instant-on) violation found within BVS excess.

n30FRM ERR

Frame Errors — A count of frame errors detected since initial frame synchronization or the last test reset. For DDM, D2, and D4 (Slope) frame frame errors are counted if either an $\frac{1}{2}$ or $\frac{1}{4}$ frame bit is errored. For SLC 96 framing, frame errors are counted if 4 bits are errored. For E5E and E5E2 framing, frame errors are counted only if an error is found on the FFS bus. Frame errors are not detected on CRC or datapath bits.

n32CRC ERR

CRC Errors — A count of CRC errors detected since initial frame synchronization or the last test

reset. For DDM, D2, and D4 (Slope) framing, CRC errors are counted only when FFS framing is detected.

n34FRM LOS

Frame Losses — A count of discrete losses of frame synchronization since initial frame synchronization or the last test reset.

n40RX FREQ

Receive Frequency — The frequency of the clock recovered from the received carrier.

n51TM SLIP

Timing Slips — The frequency deviation or uncontrolled clock slips between two circuit elements measured in positive or negative slips in bit and frame positions.

n52DS F E

DSO Frame Errors — A count of the DSO frame errors. Frame synchronization must be established to display the result.

n106 CKSUM

Checksum — The result of the comparison between the received Carrier ID checksum and the embedded checksum contained within the captured Carrier ID message. Only displayed when a checksum error occurs (OK or ERROR).

n ER PKCRC

CRC Errored Packets — A count of packets with CRC errors detected since test restart. This result is available when SS7 MON or ISDNMON is selected.

n DISC PKTs

Discarded Packets — A count of discarded packets since test restart. Discarded packets include packets with seven successive (or more) laboris), terminating flag (out of alignment, not a multiple of 8 bits), packet too long, or packet too short. This result is available when SS7 MON or ISDNMON is selected.

n NACKs

Negative Acknowledgments — A count of Backward Indicator Bit (BIB) field state transitions since test restart. A NACK identifies a transmission error received in the far-end device. Only packets with good CRCs are used for this calculation. This result is available when SS7 MON is selected.

5.2.2 Status Message

In addition to test results, the following status messages appear in the SUMMARY category:

RESULTS OK

This message is displayed if a signal is detected and no errors are counted.

RESULTS UNAVAIL

This message is displayed if a signal has not been detected.

POWER LOSS

This message is displayed at power-up if the power has been turned off or when power to the unit has been interrupted. This message is cleared when power has been restored and a test restart is performed.

SIGNAL LOSS

This message is displayed if the cabling from the Line 1 or Line 2 jack is removed. This result replaces RESULTS OK when it occurs. This message is cleared when the signal has been restored and a test restart is performed.

NOT B8ZS COMPATIBLE

The received signal is not B8ZS compatible, occurs when transmitting B8ZS encoded M1/ZCRPS over a circuit containing equipment not optimized for B8ZS coding.

n 1st DENS VIOLATED

The 11 signal violates the line density criteria; there must be at least three 1s in 80-100ns.

FAILED PAT xxxxx

This message is displayed when a BRXRTM2 or MUX2PAT pattern fails. xxxxx is the failed pattern.

5.2.3 Maintenance Alarms and Messages

The NCU90 data link maintenance and alarm messages are also displayed in the SUMMARY category with the Enhanced DSPSLX Option installed.

The maintenance field (M1 to M3) controls customer loop testing between the Central Office Terminal (COT) and Remote Terminal (RT). This field links the Central Office (CO) pair gain controller access to the customer loop over a bypass pair which bypasses the DSL circuitry. The T-TRF0 224 can monitor the process. The following maintenance messages indicate that the bypass procedure is in progress.

n MAINT HOOK/SEIZE

SLC On-Hook/Seize RC Maintenance Message -- This message appears when either the On Hook or Seize RC message is received.

n MAINT PROCEED

SLC Proceed CR/ RC Maintenance Message -- Receiving the message from the COT, the COT is asking to proceed. Receiving the message from the RT, the RT is ready to continue.

n MAINT TEST ALARM

SLC Test Alarm CR/ RC Maintenance Message -- Either the COT or the RT has failed the bypass procedure.

These messages occur between the COT and RT in approximately 2 seconds. However, if the bypass sequence fails, the *Test Alarm CR/ RC* message is transmitted. When the pair gain controller initiates the bypass, the COT sends the *On-Hook* message to the RT. The RT removes the resistor loop in the bypass gain and returns the *On-Hook* message to the COT. The COT then sends the Channel Test A and B signal signaling pattern to the RT identifying the channel being bypassed. The RT in turn sends the *Seize RC* message to the COT indicating the channel has been switched. The COT receives the *Seize RC* message and sends a *Proceed CR* message to the RT asking if the bypass is complete. If the bypass is complete, the RT returns the *Proceed RC* message to the COT. The COT in turn notifies the pair gain controller that the bypass is complete and inquiring to proceed.

5.2.4 Major and Minor Alarms

The alarm field (AL and VFI) 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. Minor alarms indicate system conditions that need to prevent a major alarm or identify a far-end loop. The T-BERO 224 displays the following alarms:

n DATALINK SYNC LOSS

Datalink Synchronization Loss -- Datalink synchronization is lost on the indicated line.

n FE LOOP PROTECTION

SLC Protection Line Far-End Loop Alarm -- Indicates the protection line is in loopback.

n FE LOOP SHELF (x)

SLC Shelf Far-End Loop Alarm -- The indicated DSU is in loopback, by cabinet's shelf (shelf ID) (A, B, C or D) is looped.

n SLC ALM (x) DN PROT

SLC Shelf on Protection Line Alarm -- A shelf (DN) is switched to the protection line. The alarm is switched (A, B, C or D) is switched to the protection line.

n SLC ALM MAJOR

SLC Major Alarm -- A condition characterized by a loss of service to subscribers served by a shelf or shelf group. If a shelf alarm (for SLC ALM SHELF (x) (y)) is also reported, this result is not displayed.

n SLC ALM MINOR

SLC Minor Alarm -- A condition characterized by a non-service affecting fault. If a far-end loop alarm is reported for the same line (AL and VFI), this message is not displayed.

a SLC ALM POWER/MISC

SLC Power Miscellaneous Alarm — An RFI status in which power loss or miscellaneous conditions have occurred.

n SLC ALM SHELF (x)

SLC Shelf Alarm — A condition characterized by shelf loss of operational integrity. (x) indicates the shelf (A, B, C or D) generating the shelf alarm.

SW PROT FAILED

Switch to Protection Line Failed — During either a far-end loopback or a switch to protection line sequence the switch to protection line operation failed.

5.2.5 Smart Loopback Status and Alarms

The following messages only apply when the Smart Loopback Command Code Option is installed, and intelligent network equipment is being tested.

ILR UP/DOWN

Intelligent Line Repeater Looped Up/Looped Down — This message accompanies the address of the intelligent line repeater that is looped up or looped down.

IOR UP/DOWN

Intelligent Office Repeater Looped Up/Looped Down — This message accompanies the address of the intelligent Office repeater that is looped up or looped down.

IN PWR LP

Intelligent Line Repeater In Power Loop — This message accompanies the address of the intelligent line repeater that is keeping power.

PGM ARM

Programmable Repeater Arming Configuration — This message displays the programmable repeater arming configuration.

PGM CODE

Programmable Repeater Code Detection Configuration — This message displays the programmable repeater code detection configuration.

PGM AIS

Programmable Repeater AIS Configuration — This message displays the programmable repeater AIS configuration.

PGM BLK CP

Programmable Repeater CPE Arming Block Configuration — This message displays the programmable repeater CPE arming block configuration.

PGM TIME

Programmable Repeater Timeout Configuration — This message displays the programmable repeater timeout configuration.

RPTR PROG

Programmable Repeater Programmable Configuration — This message displays the programmable repeater programmable configuration.

5.2.6 SS7 Status and Alarms

The following messages only apply when the SS7 Option is installed and the channel for stat and SS7 MON service configuration are selected.

n BUSYSTATUS

Busy Status Alarm — Receiving end of the signaling link has detected traffic congestion and is sending a message to the opposite end. This message is sent to the transmitting end to distinguish between congestion and failures in the signaling link.

n EMERGENCY ALIGN STAT

Emergency Alignment Status Alarm — Signaling link is being realigned with the emergency alignment procedure. The message is sent, after having started an initial alignment, the out of alignment, normal alignment, or emergency alignment status indication is received and the termination in the emergency alignment procedure.

n NORMAL ALIGN STAT

Normal Alignment Status Alarm — Signaling link is being realigned with the normal alignment procedure. The message is sent, after having started an initial alignment, the out of alignment, normal alignment, or emergency alignment status indication is received and the termination in the normal alignment procedure.

n OUT OF ALIGNMENT

Out of Alignment Alarm — Signaling link is not aligned. The message is transmitted when the initial alignment has been started, and the out of alignment, normal alignment, or emergency alignment status indication has not been received from the signaling link.

n OUT OF SERVICE

Out of Service Alarm — Signaling link terminal is out of service. The message is transmitted when the terminal cannot transmit or receive MSUs. This message does not appear during a processor outage.

n PROCESSOR OUTAGE

Processor Outage Alarm — Local processor failure or maintenance occurred and a message is sent to the remote. This message is constructed by a local switch if the signaling messages cannot be transmitted to the terminal level 3 and/or 4.

5.3 LOGIC CATEGORY

Table 5-3 lists the results messages and the option that makes them available.

Table 5-3. LOGIC Category

| Option | Message | Option | Message |
|------------------------|------------|--|-------------|
| TEB<K> (EN) Results | n01311 TRB | GSL Performance Analysis Tool Results | n01312 |
| | n01312 TRB | | n11313 |
| | n01313 TRB | | n12 DLAGRN |
| | n01314 TRB | | n13 UNDFG6X |
| | n01315 TRB | | n14 UNAVSN |
| | n01316 TRB | | n15 UNAVBI |
| | n01317 TRB | | n16 CSES |

Logic errors are based on discrepancies between the transmitted and received bit stream. Logic errors are not available until pattern synchronization is obtained. If signal, frame, or pattern synchronization are lost during testing, the logic results stop accumulating.

5.3.1 Test Results, T1 BERT

n00BIT ERR

Bit Errors – A count of received bits that have a value opposite that of the corresponding transmitted bits after pattern synchronization is achieved.

n01ASYN ES

Asynchronous Errored Seconds – A count of test seconds where one or more bit errors occurred.

n04 BER

Bit Error Rate – The ratio of bit errors to received pattern data bits.

n05 EFS

Error-Free Seconds – A count of the seconds during which pattern synchronization was maintained through the entire second and no bit error occurred.

n06 % EFS

Percent Error-Free Seconds – The ratio, expressed as a percentage, of error-free seconds to the total number of seconds during which pattern synchronization is present.

n07 SYN ES

Synchronous Errored Seconds – A count of errored seconds synchronized to the occurrence of an error (the count and time intervals begin with the occurrence of an error).

n08DOS SEC

Out-of-Synchronization Seconds – A count of seconds during which pattern synchronization was not maintained for the entire second.

n09PAT SLP

Pattern Slips – A count of the total number of pattern slips detected since the beginning of the test. The result is only valid when using pseudorandom test patterns. A pattern slip is a difference (one or more bits are missing or added) between the transmitted and received test pattern.

5.3.2 Test Results, G.821 Performance Analysis

n10 SFS

Severely Errored Seconds – A count of seconds during which the bit error rate is greater than 10⁻⁵ within a second (10⁻⁵).

n11 %SEC

Percent Severely Errored Seconds – The ratio, expressed as a percentage, of severely errored seconds to the number of available seconds.

n12 DEG MN

Degraded Minutes – A count of minutes in which the bit error rate was greater than 10⁻⁶.

n13 %DEGMN

Percent Degraded Minutes --- The ratio, expressed as a percentage, of degraded minutes to the number of available minutes.

n14 UNAV S

Unavailable Seconds --- A count of unavailable time per CCITT G.821.

n15 %AVLBL

Percent Availability--- The ratio, expressed as a percentage, of available seconds to the number of test samples.

n18 CSES

Consecutive Severely Errored Seconds --- A count of the number of groups of three or more consecutive seconds in which an error rate greater than 10⁻³ was found in each second.

5.4 BPV & FRAME CATEGORY

Table 5-4 lists the results messages and the option that makes them available.

Table 5-4. BPV & FRAME Category

| Option | Message | Option | Message |
|--------------------------|-----------|--------------------------|-----------|
| Enhanced ESI/SLC Results | n17FFRES | Maintenance Test Results | n25BPVS |
| | n18FSES | | n26BPVSEC |
| | n19FBVNS | | n27BPVSE |
| | n20FSLPS | | n28FRMFS |
| | n21FRMFSM | | n29FRMSES |
| | n22FCURE | | n30FRMERR |
| | n23FVNSRC | | n31FRMERR |
| | n24FHCRC | | n32FCURE |
| | n25FSLPCT | | n33FRMERR |
| | n26FVDCRC | | n34FRMERR |
| n27FACHCRC | n35FRMERR | | |
| n28FSECC | n36FRMERR | | |
| n29FSLCRC | n37FCURE | | |

Bipolar violations and frame errors are available when monitoring T-Carrier signals that are transmitting live equipment test patterns.

5.4.1 Test Results, Enhanced ESI/SLC

n17FFRES

Far-End Frame Error Seconds --- A count of seconds in which one or more frame errors were received at the far end. This result reads the PRM Frame Synchronization-Bit Error Event Bit (FE = 1) status.

n18FSES

Far-End Severely Errored Framing Seconds --- A count of seconds in which two or more framing errors were received in less than 3 ms at the far end. This result reads the PRM Severely Framed Framing Event Bit (SE = 1) status.

n19F BPV S

Far-End BPV Seconds — A count of seconds in which one or more BPVs were received at the far end. This result reads the PRM Line Code Violation Event Bit (LV = 1) status.

n20F SLP S

Far-End Controlled Slip Seconds — A count of seconds in which controlled slips were received at the far end. This result reads the PRM Controlled Slip Event Bit (SL = 1) status. In addition, the TBERD 22+ transmits the PRM with the Controlled Slip Event Bit (SL) set to 0.

n21PRM TIM

Received Performance Report Time — A count of the total number of seconds since test restart in which a valid PRM was received.

n22F CRC E

Far-End CRC Error Events — A count of the minimum number of CRC errors reported in the PRM CRC bit in FSV CRC results in the BPV & FRAME category. This result reports on the aggregated PRM CRC Error Event Bit (GE in G6) results. A ">" (greater than) preceding the count indicates that bits 2 through 6 are nonzero.

n23PAY SRC

Far-End Payload Source Loopback — Identifies the direction of the PRM according to the PRM Command/Response Bit (CR) and the Payload Loopback Admitted Bit (LB). In carrier and applications, a customer generated PRM is indicated as CARR/CR = 0 and LB = 0 and a carrier generated PRM is indicated as CARR/CR = 1 and LB = 0 in the display. In payload loopback applications, the customer generated PRM is indicated as CARR/CR = 0 and LB = 1 in the display. In customer loopback, the carrier generated PRM is indicated as CARR/CR = 1 and LB = 1 in the display.

n F SI CRC

Far-End Single CRC Error Seconds — A count of seconds with only 1 CRC error received at the far end. This result reports on the first PRM CRC Error Event Bit (E1 = 1).

n F LO CRC

Far-End Low CRC Error Seconds — A count of seconds with 2 to 5 CRC errors reported in the signal received at the far end. This result reports on the second PRM CRC Error Event Bit (E2 = 1).

n F MD CRC

Far-End Medium CRC Error Seconds — A count of seconds with 6 to 10 CRC errors reported in the signal received at the far end. This result reports on the third PRM CRC Error Event Bit (E3 = 1).

n F MH CRC

Far-End Medium High CRC Error Seconds — A count of seconds with 10 to 100 CRC errors reported in the signal received at the far end. This result reports on the fourth PRM CRC Error Event Bit (E4 = 1).

n F HI CRC

Far-End High CRC Error Seconds — A count of seconds with 100 to 1000 CRC errors reported in the signal received at the far end. This result reports on the fifth PRM CRC Error Event Bit (E5 = 1).

n F SV CRC

Far-End Severe CRC Error Seconds — A count of seconds with 1000 to 10000 CRC errors reported in the signal received at the far end. This result reports on the sixth PRM CRC Error Event Bit (E6 = 1).

5.4.2 Test Results, Mainframe

n25 BPVS

Bipolar Violations — A count of BPVs since the last test restart (excluding intentional violations found within J8XZS correct).

n26BPV SEC

Bipolar Violation Seconds — A count of seconds within which one or more BPVs occurred since the last test restart.

n27 BPV RT

Bipolar Violation Rate — The ratio of BPVs to total bits.

n28 FRM ES

Frame Errored Seconds — A count of seconds during which one or more frame errors occurred since the last test restart.

n29FRM SES

Frame Severely Errored Seconds — A count of seconds during which 12 or more frame errors occurred (FH framing only).

n30FRM EAP

Frame Errors — A count of frame errors detected since initial frame sync. For D113, D17, and D4 (Superframe) frame errors are counted if either an L₁ or L₂ frame bit is errored. For SLC 96 framing, frame errors are counted if E₁ bits are errored. For ESC and ESCz framing, frame errors are counted only if an error is found on the frame bits. Frame errors are not detected on CRC or datalink bits.

n31FRM EAT

Frame Error Rate — The ratio of frame errors to the number of analyzed framing bits. See frame errors (FRM ERR) above.

n32CRC EAP

CRC Errors — A count of CRC errors detected since initial frame sync. For extended superframes, CRC errors are counted if any of the 16 bits are errored. For other framing, CRC errors are counted only when a non framing bit is errored.

n33 CRC ES

CRC Errored Seconds — A count of seconds within which one or more CRC errors were detected.

n34FRM LOS

Frame Losses — A count of discrete losses of frame synchronization since initial frame synchronization on the last test restart.

n35FR LS S

Frame Loss Seconds — A count of seconds within which frame synchronization was lost since test restart since initial frame synchronization on the last test restart. This includes seconds when a signal loss causes a frame synchronization loss.

n36CRC SES

CRC Severely Errored Seconds — A count of seconds during which the total number of CRC errors and frame synchronization losses equaled 320 or more.

n37CRC EAT

CRC Error Rate — The ratio of CRC errors to the number of extended superframes received.

5.5 SIGNAL CATEGORY

Table 5-5 lists the results messages and the option that makes them available.

Table 5-5. SIGNAL Category

| Option | Message |
|-------------------------------|-------------|
| Enhanced ESE/SLC Test Results | n110ALRM |
| | n40RX FREQ |
| | n41 RX LVL |
| | n42 RX LVL |
| | n43 RX LVL |
| Measurement Test Results | n51TM SLIP |
| | n52SP SPEC |
| | n55 TRAFFIC |
| | n56 TRAFFIC |
| TIBERT Test Results | n50PK CUR |
| | n53 DELAY |

Signal category results analyze the characteristics of the input signal.

5.5.1 Test Results, Enhanced ESE/SLC

n110ALRM

Alarm Field Format — Identifies the received SLC databank alarm field format as either 13 bit or 19 bit. This test result is only available when the Enhanced ESE/SLC Option is installed.

5.5.2 Test Results, Measurement

n40RX FREQ

Receive Frequency (Hz) — The frequency of the clock recovered from the received data.

n41 RX LVL

Receive Level (in dBdsv) — The level of the received signal in dB, relative to a standard 1 volt base-to-peak signal (DSX level).

n42 RX LVL

Receive Level (in dBm) — The power level of an unfiltered all-ones signal, available only when AIS₁ detection is on.

n43 RX LVL

Receive level (pp-p-p) — The level of the received signal in peak-to-peak volts. This signal level is displayed as volts (V) when the signal level is greater than 1 volt or as millivolts (mV) when the signal level is less than 1 volt.

n51TM SLIP

Timing Slips — The frequency deviation of uncorrected clock slips between two input signals measured in positive or negative shifts in bit and frame positions.

n52SLP SE

Slip Analysis Seconds — Amount of test seconds during which Timing Slip Analysis occurred

n55 TRAFFIC

Traffic Results — A display of the A and B signaling bits for all 24 channels of T1 on LINE 1 and LINE 2. This result uses the entire display to show the signaling bit states for each line of 24 channels in 4 fields of 6 channels each.

The TRAFFIC result uses the entire display window. To return to the normal display, press the appropriate **RESULTS Blank** or **Arrowed** switch.

n56 TRAFFIC

Traffic Results (I or LSI) and ZBISI Trained Signals — A display of the A, B, C, and D signaling bits for all 24 channels of T1 on LINE 1 or LINE 2. This result uses the entire display to show the signaling bit states for each line of 24 channels in 4 fields of 6 channels each.

The TRAFFIC result uses the entire display window. To return to the normal display, press the appropriate **RESULTS Blank** or **Arrowed** switch.

5.5.3 Test Results, T1 BERT

n50SPX CUR

Simplex Current — The magnitude of the simplex current flowing between the LINE 1 receiver and LINE 2 transmitter, or LINE 2 receiver and LINE 1 transmitter. The line number is determined by the DRIP switch setting. The result measurement range is 0 mA to 250 mA with an accuracy of ± 1 mA.

n53 DELAY

Round Trip Delay — The time it takes a user-determined test pattern to be transmitted and received in a loopback test. Consult the Test Pattern Technology Card or Section 4 of the T1 BERT 224 Reference Manual for the appropriate test pattern. The result measurement is test trip delay, from 0.177 ms to 10

ms, rounded to 0.001 ms.

5.6 TIME CATEGORY

Table 5-6 lists the results messages and the option that makes them available.

Table 5-6. TIME Category

| Option | Message | Option | Message |
|--------------------------|-------------|--------------------------|-------------|
| Maintenance Test Results | n50SPX CUR | Maintenance Test Results | n53 DELAY |
| | n5141 A SEC | | n55 TRAFFIC |
| | n5141 B SEC | | n56 TRAFFIC |
| | n52SLP SE | | n57SLP AS |
| | n53 DELAY | | |

Time-related measurements are available in this category.

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5.6.1 Test Results, Mainframe

n70SG LSS

Signal Loss Seconds -- A count of seconds during which signal synchronization was lost or not achieved since the last test restart.

n71ALM SEC

Alarmed Seconds -- A count of seconds during which a yellow alarm, red/orange alarm (MS) or excess zeros alarm was detected. Continues to count through signal loss once an alarm condition is detected.

n72TST LEN

Test Length -- The length for a timed test, in HH:MM:SS format. The test length is set using ATX03 TEST LEN function.

n73ELAP TM

Elapsed Time -- The time in hours, minutes, and seconds since the last test restart after a signal has been detected. Elapsed time continues to increment during signal losses.

n74TST END

Test Ends -- The time remaining in a TIMED test using the HH:MM:SS format. "99:59" is displayed when the T-BLRD 224 is in CONTINUOUS test mode.

n75 TIME

Clock Time -- The time of day using a 24-hour military clock in the HH:MM:SS format.

n76 DATE

Calendar Date -- The date in the MM/DD/YY format.

5.6.2 Test Results, Enhanced ESF/SLC

n79SLC A S

SLC Alarm Seconds -- A count of seconds during which a SLC Alarm condition is detected.

5.7 CHANNEL CATEGORY

Table 5-7 lists the results messages and the option that makes them available.

Table 5-7. CHANNEL Category

| Option | Result | Option | Result |
|-----------------------|-------------|------------------------------|-------------|
| After 40 Test Results | a70 LSS | On-Disk Systems Test Results | r79 SLC |
| | a71 ALM SEC | | r72 TST LEN |
| | a72 TST END | | r73 ELAP TM |
| | a73 ELAP TM | | r74 TST END |
| | a74 TST END | | r75 TIME |
| | a75 TIME | | r76 DATE |
| | a76 DATE | | r77 CHG |
| | a77 CHG | | r78 CHG |
| | a78 CHG | | r79 SLC |
| | a79 SLC | | r80 SLC |
| | a80 SLC | | r81 SLC |
| | a81 SLC | | r82 SLC |
| | a82 SLC | | r83 SLC |
| | a83 SLC | | r84 SLC |
| | a84 SLC | | r85 SLC |
| | a85 SLC | | r86 SLC |
| | a86 SLC | | r87 SLC |
| | a87 SLC | | r88 SLC |
| | a88 SLC | | r89 SLC |
| | a89 SLC | | r90 SLC |
| | a90 SLC | | r91 SLC |
| | a91 SLC | | r92 SLC |
| | a92 SLC | | r93 SLC |
| | a93 SLC | | r94 SLC |
| | a94 SLC | | r95 SLC |
| | a95 SLC | | r96 SLC |
| | a96 SLC | | r97 SLC |
| | a97 SLC | | r98 SLC |
| | a98 SLC | | r99 SLC |
| | a99 SLC | | r00 SLC |

Table 5-7. CHANNEL Category (Continued)

| Option | Result | Option | Result |
|----------------------------------|---------------|--------------------------------------|--------------|
| DPS Test Results | nPRIV_HYI | TR-Voice Trace Test Results | CALL STATE |
| | nPRIV_RECVI | | LINE |
| | nPRIV_DEST | | CALL TYPE |
| | nPRIV_INSR | | DIS/DISD |
| | nPRIV_QVAL | | ORIG SRC |
| Digit Analysis Test Results | nPRIV_QVAL | VI-Testing Test Results | DISC SRC |
| | nPRIV_QVAL | | CAUSE |
| NVCAT Trace Test Results | CALL STATE | | nPRIV_EAI |
| | CALL ID NUM | | nPRIV_NCI |
| | CALLING NUM | | nPRIV_VSI |
| | ORIG | nPRIV_NCIH | |
| | DISC | nPRIV_NCI | |
| SS7 Link Statistics Test Results | nPACKETS | Maintenance Test Results | nPRIV_DEP |
| | nMSGS | | nPRIV_AR |
| | nFISMS | | nPRIV_ARV |
| | nERR_PACKETS | | nPRIV_ERR |
| | nPKETS | | nPRIV_ERR_H |
| | nDISC_PACKETS | Signaling Test Results | nPRIV_ERR_C |
| | nPKT_ERR | | nPRIV_ERR_Q |
| | nNACKS | | nPRIV_ERR_V |
| | nERR_MSU | | nPRIV_DELAY |
| | nSET_ERR | | nPRIV_DUR |
| PRIVCAT Trace Test Results | nCLASS | PRIVSDN Link Statistics Test Results | nPRIV_ERR_Q |
| | CALL STATE | | nPACKETS |
| | CALL ID NUM | | nERR_PACKETS |
| | CALLING NUM | | nPRIV_ERR |
| | ORIG TYPE | | nPRIV_ERR_H |
| | EXTENSION | | nPRIV_ERR_C |
| | NETWORK ID | | nPRIV_ERR_Q |
| | ORIG SRC | | nPRIV_ERR_V |
| | DISC SRC | | nPRIV_DELAY |
| | CAUSE | | nPRIV_DUR |

Information on the selected channel is available in this category.

6.7.1 Test Results Under VI

n100 DELAY

Delay -- The period of time between the arrival of a digit or a digit at the busy event or digit.

n106 CKSUM

Checksum -- The result of the comparison between the received Caller ID checksum and the embedded checksum contained within the received Caller ID message. The result is displayed as either OK or ERROR. If an error is found, the result is also displayed in the SUMMARY category.

n107 MSG DUR

Message Duration — The total duration in milliseconds of the transmission of the FSK information. It is the difference between the time of channel seizure and the receipt of the character (end message).

n108 MKLVL

Mark Level — The average carrier level (in dBm) of a Mark (logical one).

n109 MK FRQ

Mark Frequency — The average frequency (in Hz) of a Mark.

n110 SPLVL

Space Level — The average carrier level (in dBm) of a Space (logical zero).

n111 SP FRQ

Space Frequency — The average frequency (in Hz) of a Space.

5.7.2 Test Results, DDS**n90RCV BYT**

DDS Received Byte — Displays the received 8-bit byte of the selected channel. If the received byte is normalized as a control code, the control code name is displayed in the n95 RCODE result.

n95 RCODE

Received DDS Control Code — Displays the name of the received DDS code item fed in the n90 RCV BYT result (see Table 5-11).

n96DDS F E

DDS Frame Errors — A count of DDS frame errors detected since the last test restart. Subrate DDS frame synchronization must be present.

n98%IN SP

Percent of In-Service Bits — The percentage of the DDS control bits in service. The control bit status is determined by successfully received frames and excludes those errors in service that change activity.

5.7.3 Test Results, DTMF Analysis

The following test results are only available when the Digit Analysis Option is installed.

n70FQMLVL

Lower DTMF Tone Frequency and Level — The lower DTMF tone frequency (Hz) and signal level (dBm). See Table 5-10 and Table 5-11 for the list of the DTMF and MF tone frequencies.

n70FQHLVL

Upper DTMF Tone Frequency and Level — The upper DTMF tone frequency (Hz) and signal level (dBm). See Table 5-10 and Table 5-11 for the list of the DTMF and MF tone frequencies.

5.7.4 Test Results, SS7 Link Statistics

The following test results are only available when the SS7 Call Trace Option is installed.

n PACKETS

Packets — The count of error-free packets (or signal units) detected on the link since test restart. Packets include Message Signal Units (MSUs), Link Status Signal Units (LSSUs), and Fill-In Signal Units (FISUs). This result is available when SS7 MON is selected.

n MSUs

Message Signal Units — The count of error-free MSC packets detected since test restart. MSUs contain messages and useful information. This result is available when SS7 MON is selected.

n FISUs

Fill-In Signal Units — A count of error-free FISU packets detected since test restart. FISUs keep the signaling link "alive" when no other information is being transmitted. This result is available when SS7 MON is selected.

n ER PKCRC

CRC Errored Packets — A count of packets with CRC errors detected since test restart. This result is available when SS7 MON is selected.

n PKT ES

Packet CRC Errored Seconds — A count of seconds with at least one errored packet detected since test restart. PKT ES help to determine if the error type is constant or intermittent. This result is available when SS7 MON is selected.

n DISC PKTs

Discarded Packets — A count of discarded packets since test restart. Discarded packets include packets with seven consecutive ones (0b0111111), terminating flag out of alignment, not a multiple of 8 bits, packet too long, or packet too short. This result is available when SS7 MON is selected.

n PKT ERT

Packet CRC Error Rate — A count of CRC Errored Packets (ER PKCRC) divided by the total number of packets (PACKETS) plus the total number of discarded packets (DISC PKTs) reported since test restart. This result is available when SS7 MON is selected.

n NACKs

Negative Acknowledgments — A count of Backward Indicator Bit (BIB) field state transitions since test restart. A NACK identifies a transmission error is received at the far end device. Only packets with good CRCs are used for this calculation. This result is available when SS7 MON is selected.

n ER MSU

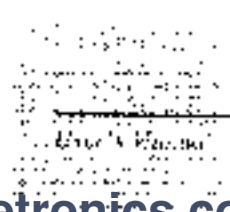
Errored Message Signal Units — A count of MSU packets with CRC errors detected since test restart. A packet is an MSU if the Length Indicator (LI) field is between 3 and 63. This result is available when SS7 MON is selected.

n % OF MSU

% of MSU Utilization — A count of good MSUs (MSUs) divided by the total number of packets (PACKETS) plus discarded packets (DISC PKTs) since test restart. This result is available when SS7 MON is selected.

n LSSUs

Link Status Signal Units — A count of error-free LSSU packets detected since test restart. LSSUs provide link status messages that indicate the "health" of the link. This result is available when SS7 MON is selected.



5.7.5 Test Results, SS7 Call Trace

The following test results are only available when the SS7 Call Tracer Option is installed. None of the following call trace test results appear in the SUMMARY category.

CALL STATE

Call State -- Displays state of the current call. During a search for a call, the message, SEARCHING, appears in either results display UNAVAILABLE. The following messages indicate the state of a traced call:

INIT ADDR - Initial Address message has been detected (call has been initiated).

ADDR COMP - Address Complete message has been detected (the receiver end has recognized the initial Address Message).

ANSWERED - Answered message has been detected (call has been received).

RELEASED - Release message has been detected (call has been terminated).

REL COMP - Release Complete message has been detected (call has been terminated at both ends).

Results do not display information on any other messages.

CALLED NM

Called Number -- Identifies called number contained in the Initial Address Message. Result only displays digits and not any other Called Number information elements (e.g., Type of Number and Numbering Plan Identification).

The result displays up to 26 digits of a number in 3 windows (NM₁ to NM₃) displayed as required at 10 digits (0 to 9, #, or *) each. Greater than (*) and less than (*) signs appear at either end of the result when the called number exceeds the window limit. UNAVAILABLE appears during the initial call trace search. NM₁ and NM₂ only appear when the number exceeds the previous window limit.

CALLING NM

Calling Number -- Identifies calling number contained in the Initial Address message. Result only displays digits and not any other Calling Number information elements (e.g., Type of Number, Numbering Plan Identification, and Presentation Indicator). It only appears at the beginning of a call. If the calling number is "presentation restricted", the statement checks Presentation Indicator field. The result is presented in the same manner as the CALLED NM result.

OPC

Origination Point Code -- Identifies the call origination source contained in the Initial Address message.

DDC

Destination Point Code -- Identifies the call destination source contained in the Initial Address message.

CAUSE

Cause Value -- Displays why or how the call was either abandoned or released. The cause value is a 3 to 8 digit number and is recovered from the Cause Information Element. The most recent cause value detected is displayed. (Press the **AUX** search to display AUX 99 on the help, which describes the indicated cause value.) Refer to Table 5-8 for more information on SS7 Cause Values.

Table 5-8. SS7 Cause Values

| Cause Value | Definition |
|-------------|--|
| 1 | Unallocated/Unassigned Number |
| 2 | No Route To Specified Hierarchy Network |
| 3 | No Route To Destination |
| 4 | Send Special Information Time |
| 5 | Miscellaneous Trunk Priority (No Procedure Specified For U.S. Networks) |
| 8 | Preemption |
| 9 | Preemption - Cause Reserved For Bonus |
| 16 | Normal Call Clearing |
| 17 | User Busy |
| 18 | No User Responding |
| 19 | User Alerted, No Answer |
| 30 | Subscriber Absent |
| 31 | Call Rejected |
| 32 | Number Changed |
| 33 | Redirected To New Destination |
| 37 | Destination Out Of Order |
| 28 | Invalid Number Format - Address Incomplete |
| 29 | Facility Rejected |
| 31 | Normal Unspecified |
| | Resource Unavailable |
| 34 | No Circuit Channel Available |
| 35 | Network Out Of Order |
| 36 | Temporary Failure |
| 37 | Service Unavailable - Congestion |
| 38 | Service Unavailable - Processor Disabled |
| 41 | Processor Disabled - Server Not Available |
| 42 | Processor Disabled - Busy |
| 43 | Resources Unavailable For Unspecified |
| | Service or Option Unavailable |
| 50 | Requested Facility Not Subscribed |
| 51 | Outgoing Call - Busy With CLG (No Procedure Specified For U.S. Networks) |
| 55 | Incoming Call - Busy With CLG (No Procedure Specified For U.S. Networks) |
| 57 | Requested Facility Not Authorized |
| 58 | Requested Facility Not Properly Activated |
| 62 | Requested Facility Unavailable - Access Restricted - Access Restricted - Access Restricted - Access Restricted |
| 63 | Requested Facility Not Available - Call Restricted |
| | Service Or Option Not Implemented |
| 65 | Requested Facility Not Implemented |
| 69 | Requested Facility Not Implemented |
| 70 | Only Requested Ingress Information - Header Capsule Is Available |
| 79 | Service Or Option Not Implemented - Call Restricted |
| | Invalid Message (For Example, Parameter Out Of Range) |
| 87 | User Not Member Of Hierarchy Network Specified For U.S. Networks |
| 88 | Incompatible Destination |
| 91 | Invalid Transit Network Selection |
| 95 | Invalid Message - Unspecified |

Table 5-8. SS7 Cause Values (Continued)

| Cause Value | Definition |
|-------------|---|
| | <i>Protocol Error (For Example, Unknown Message)</i> |
| 97 | Message Type Not-existent/Not Implemented |
| 99 | Information Element Not-existent/Or Not Implemented |
| 02 | Receiver Out of Sync |
| 03 | Parameter Not-existent/Or Not Implemented - Passed On |
| 10 | Message With Unrecognized Parameter Discarded |
| 11 | Protocol Error Unspecified |
| 25 | Interworking Unspecified |

5.7.6 Test Results_VB-303_Link_Statistics

The following test results are only available when the VB-303 option is installed.

n PACKETS

Packets — The count of error-free packets (or signal units) detected on the link since test restart. Packets include Message Signal Units (MSUs), Link Status Signal Units (LSSUs), and Path In Signal Units (PISUs).

n DISC PKTS

Discarded Packets — A count of discarded packets since test restart. Discarded packets include packets with seven successive errors (abused terminating flag out of alignment, not a multiple of 8 bits, packet too long, or packet too short).

n ER PKCRC

CRC Errored Packets — A count of packets with CRC errors detected since test restart.

n PKT ES

Packet CRC Errored Seconds — A count of seconds with at least one errored packet detected since test restart. This helps determine if the error type is constant or intermittent.

n PKT ERR

Packet CRC Error Rate — A count of CRC Errored Packets (ER PKCRC) divided by the total number of packets (PACKETS) plus the total number of discarded packets (DISC PKTS) detected since test restart. Counts errors regardless of AUX 00 string.

n INFO PKT

Information Packets — A count of all type 2 information packets received since test restart. This determines if type 2 information is being received.

n RR PKT

Receiver Ready Packets — A count of all type 2 receiver ready (RR) packets received since test restart. These messages are key to the receiver and determine if the link is capable of transferring information.

5.7.7 Test Results_VB-303_Call Trace

CALLSTATE

Displays state of the current call. During a search for a call, the message SEARCHING appears, all other results display UNAVAILABLE. The following messages indicate the state of a call: call.

Table 5-9. TR-303 Cause Value

| Cause Value | Definition |
|-------------|---------------------------------------|
| 16 | Normal Calling |
| 27 | Destitately Out Of Service |
| 30 | Response To Status Inquiry |
| 34 | Channel Unavailable |
| 41 | Temporary Failure |
| 44 | Line Limit Unavailable |
| 47 | Ring Failure |
| 61 | Invalid Cal. Reference |
| 66 | Mandatory Information Element Missing |
| 67 | Message Unimplemented |
| 69 | Information Element Unimplemented |
| 100 | Invalid Information Element Contents |

5.7.8 Test Results, VC Testing

n84 3KFLAT

3 kHz Flat Noise — A measure of the noise (dBm) weighted with a 3 kHz flat filter. Used when qualifying data grade events.

n85 3K NCH

3 kHz Notch Noise — A measure of the noise (dBm) against a weighted 3 kHz flat filter. A transmitted 1000 Hz tone is filtered out prior to the measurement for analog data-grade analysis. This measurement includes quantization noise caused by analog/digital conversion in the CODEC.

n86 C-MSG

C-Message Noise — A measure of the noise (dBmC) weighted with a C-Message filter for voice grade analysis. This measurement also accounts for the noise on an out-of-channel call.

n87 C-NCH

C-Message Notch Noise — A measure of the noise (dBmC) against a weighted C-message filter. Transmitted 1000 Hz tone is filtered out prior to the measurement for voice-grade analysis.

n88 SIN

Signal-to-Noise Ratio — The ratio (in dB) of received signal level to noise level. The noise level is measured with a C-message filter and the transmitted 1000 Hz tone is filtered out prior to measurement.

n89 DC-OFF

DC Offset — The average DC voltage level (in mV) of the received analog signal with respect to time. All signals should have DC offsets of approximately zero millivolts (0 mV).

n90 PAR

Peak to Average Ratio — The ratio (in PAVR units) of transmitted peak signal level of 16 non-harmonically related frequencies to the average received level of the signal. This measurement is only available when PAR is selected as the test.

n91 PARLV

Peak to Average Ratio Level — The RMS level (in dBm) of the received signal. This measurement is only available when PAR is selected as the test.

n92 ERL

Echo Return Loss --- The ratio (in dB) of the power transmitted by the T-BFRD 2.0 to the power reflected by the terminated circuit. $ERL = 10 \log [TX \text{ power}/RX \text{ power}]$

n93 SRL-HI

Singing Return Loss - High --- The ratio (in dB) of the noise power transmitted for a shaped high frequency band to the power reflected by the terminated circuit.

n94 SRL-LO

Singing Return Loss - Lo --- The ratio (in dB) of the noise power transmitted for a shaped low frequency band to the power reflected by the terminated circuit. Refer to Table 5-10 for Dual-Tone Multi-Frequency Codes and to Table 5-11 for Reportable DSO Control Codes.

Table 5-10. Dual-Tone Multifrequency Codes (DTMF)

| Low Frequency Tones (Hz) | High Frequency Tones (Hz) | | | |
|--------------------------|---------------------------|------|------|------|
| | 1209 | 1336 | 1477 | 1633 |
| 697 | 1 | 2 | 3 | A |
| 770 | 1 | 5 | 4 | B |
| 850 | 2 | 6 | 5 | C |
| 941 | 3 | 6 | 4 | D |

Table 5-11. Reportable DSO Control Code

| Code ID | Control Byte | Description |
|---------|--------------|---|
| AW | x00 (110) | Arbitrary Status Code. Generated by the CPU due to a signal loss (not a DSP/DSU) or the DSP/DSU user's manual (see Table 5-13). |
| BLOCK | x01 (111) | Block Code. |
| CHUTE | x02 (112) | Control Mode Idle. Transition to RPT (x03) or NID (x04) is required. The next byte is being expected. |
| OPEN | x03 (113) | Signaling Channel (SC) Disengage. |
| DOUBLE | x04 (114) | Data Mode Idle. Equivalent to RFS (x05) or ON, but no data is being sent by the CPU/DSU. |
| DSP | x05 (115) | Arbitrary DSP Feedback. |
| EPS | x06 (116) | End End Voice Byte. Last of the bytes sent inatching End up sequence. |
| FB | x07 (117) | Feedback Bytes. Third byte sent inatching End up sequence. |
| MS | x08 (118) | MR' Alert Code. Second byte sent during an MJU boot up sequence. |
| MAPO | x09 (119) | MAPO Code. Code that the DSP/DSU uses to indicate a DSP/DSU user's manual (see Table 5-13). |
| MAPI | x0A (120) | MAPI Code. Code that the DSP/DSU uses to indicate a DSP/DSU user's manual (see Table 5-13). |
| MSIN | x0B (121) | Multi-processor Control Synchronization. Sent by the DSP/DSU to the CPU/DSU to indicate a synchronization. |
| OCU | x0C (122) | Ascending OCU Feedback. |
| RELEASE | x0D (123) | MJU Release Code. |
| TA | x0E (124) | Test Alert. First byte sent during an MJU boot up sequence. |
| TEST | x0F (125) | Test Code. Sent in opposite direction during boot up. |

Table 5-11 Reportable DSO Control Codes (Continued)

| Code ID | Control Byte | Description |
|---|--------------|---|
| 11P | 0011 010 | Transition In Progress: 11 s bytes seen during a DSS channel load-up sequence. Also seen for DSS channel load-down. |
| 11M | 0011 010 | Low-speed Multiplex Channel Seen by DSO DP when no CCITT-DP installed in channel bank. |
| X = a start or training bit when the byte is transmitted or received as a DSSB signal. Training bit pattern determined by DSSB sequence. X = a start or training bit when the byte is transmitted as a DSSB subframe. X = a 1 when the byte is transmitted at a DSSA subrate. X = a 1 when control codes received (except JDF) are processed at the DSSA 56 kb/s rate. X = a 0 when control codes received (except JDF) are processed at the DSSA 56 kb/s rate. X = a 1 when the JDF process is transmitted or received at the DSSA 56 kb/s rate. X = a 0 when the JDF process is transmitted or received at the DSSA 56 kb/s rate. | | |

Refer to Table 5-12 for the Multifrequency Codes for the 4800B DSA.

Table 5-12. Multifrequency Codes (MFC)

| Frequencies (Hz) | | Multifrequency Signals | | | |
|------------------|------|------------------------|-------------------|-------------------|----------------|
| High | Low | Digit and Control | Expanded Inband | 1SPS Equal Access | CCITT System 5 |
| 500 | 700 | 1 | | | 1 |
| 1100 | 700 | 2 | Coin Collect | | 2 |
| 1100 | 900 | 3 | | | 3 |
| 1300 | 700 | 4 | | | 4 |
| 1500 | 900 | 5 | | | 5 |
| 1700 | 1100 | 6 | | | 6 |
| 1500 | 700 | 7 | | | 7 |
| 1500 | 1300 | 8 | Operator Released | | 8 |
| 1500 | 1100 | 9 | | | 9 |
| 1500 | 1500 | 0 | Operator Answered | | 0 |
| 700 | 1500 | | Reply Code | STP/STP | CCITT |
| 700 | 1500 | | | NP/STP | NP |
| 1500 | 1100 | KP | Coin Return | | KP |
| 1500 | 1300 | | | STP/STP | KPS |
| 1700 | 1500 | ST | Coin Collect | ST | S2 |
| | | | Operator Released | | |

5.7.9 Test Results, Frequency

m1VF FREQ

Voice Frequency The frequency (Hz) of a V tone within a selected DSO channel.

m2 VF LVL

VF Level The level (dBm) of a V tone within a selected DSO channel.

5.7.10 Test Results, Signaling

The following test results are only available when the Signaling Option is installed.

n100 DELAY

Delay -- The period of time between the indicated event or digit and the previous event or digit.

n101 DUR

Duration -- The length of time during which the indicated event or digit occurred.

n102 ADDR

Address -- The type of digit, DTMF, MF, or Dia Pulse.

5.7.11 Test Results, Primary Rate ISDN Link Statistics

The following test results are only available when the Primary Rate ISDN Option is installed.

n PACKETS

Packets -- The count of error-free packets (per signal units) detected on the line since test restart. Packets include Message Signal Units (MSUs), Link Status Signal Units (LSSUs), and FCI-B Signal Units (FISUs). This result is available when PRIM MON is selected.

n ER PKCRC

CRC Errored Packets -- A count of packets with CRC errors detected since test restart. This result is available when PRIM MON is selected.

n DISC PKTs

Discarded Packets -- A count of discarded packets since test restart. Discarded packets include packets with seven successive ones (aborts), terminating flag out of alignment, not a multiple of 8 bits, packet too long, or packet too short. This result is available when PRIM MON is selected.

n PKT ES

Packet CRC Errored Seconds -- A count of seconds with at least one error-free packet received since test restart. PKT ES helps determine if the error type is constant or intermittent. This result is available when PRIM MON is selected.

n PKT ERR

Packet CRC Error Rate -- A count of CRC Errored Packets (ER PKCRC) divided by the total number of packets (PACKETS) plus the total number of discarded packets (DISC PKTs) detected since test restart. This result is available when PRIM MON is selected.

n INFO PKT

Information Packets -- A count of all layer 3 Information (I) packets received since test restart. This determines if layer 3 information is being exchanged. This result is available when PRIM MON is selected.

n RR PKT

Receiver Ready Packets -- A count of all layer 2 Receiver Ready (RR) packets received since test restart. These messages are keep-alive messages and determine if the link is capable of transferring information.

5.7.12 Test Results, Primary Rate ISDN Call Trace

The following test results are only available when the Primary Rate ISDN Call Trace is installed. None of the following call trace test results appear in the SUMMARY category.

CALL STATE

Call State — Displays state of the current call. During a search for a call, the message SEARCHING appears; all other results display UNAVAILABLE. The following messages indicate the state of a traced call:

INITIATED - Call initiated (SETUP message detected).

PROCEEDING - Call proceeding (CALL PROCEEDING message detected).

ALERTING - Call alerted (ALERTING message detected).

CONNECTED - Call connected (CONNECT message detected).

DISCONNECT - Call disconnected (DISCONNECT message detected).

RELEASED - Call released (RELEASE or RELEASE COMPLETE message detected).

Results does not display information on any other messages.

CALLED NM₁, CALLED NM₂, CALLED NM₃

Called Number — Identifies called number from the Called Number information element in the initial SETUP message. Result only displays digits and not any other Called Number information elements (e.g., Type of Number and Numbering Plan Identification).

The result displays up to 26 digits of a number in 3 windows (NM₁ to NM₃, displayed as required) at 13 digits (0 to 9, *, or #) each. Greater than (>) and less than (<) signs appear on either end of the result when the called number exceeds the window limit. UNAVAILABLE appears during the initial call trace search. NM₁ and NM₃ only appear when the number exceeds the previous window limit.

CALLING NM₁, CALLING NM₂

Calling Number — Identifies calling number from the Calling Number information element in the initial SETUP message. Result only displays digits and not any other Calling Number information elements (Type of Number, Numbering Plan Identification, and Screening Indicator). A/B appears at the beginning of a number if the calling number is presentation restricted. An n in a checkmark Presentation Indicator will be visible as presented in the following examples: CALLING NM₁ = 1234567890A/B.

CALL TYPE

Call Type — Identifies the call type from the Presentation Transfer Capability, Information Transfer Rate, Rate Multiplier, and User Rate fields within the Bearer Capability information element in the SETUP message. The following messages appear indicating the detected call type:

SPEECH - Voice call being traced.

V18K AUDIO - 18 kHz audio call being traced.

D128K DATA - 128 kbps data call being traced.

DATA 32K - 32 kbps data call being traced.

DATA 64K - 64 kbps data call being traced.

DATA 128K - 128 kbps data call being traced.

DATA 256K - 256 kbps data call being traced (800 x 1600).

UNKNOWN - Call type is not recognized or not supported.

INTF CHAN

Interface/Channel — Identifies the interface (DS1) and channel (DS0) of the traced call from the Interface Identifier Present, Interface Identifier Number/Multiplex, and Channel Number fields within the Channel Identification information element of the following messages: SETUP, CALL PROCEEDING.

ALERTING, or CONNECT. The interface result displays 0 to 31. The channel result displays 1 to 24. * ** appears when the interface identifier is not present in the Channel Identification element. MAP appears when the channel number is not present and a slot map is present.

NETWORK ID

Network Identification — Displays the network identification (6 alphanumeric characters) from the Transit Network Selection information element or Network Specific Facility information element.

ORIG SRC

Call Origination Source — Identifies the call origination source (network or user) from the CIR bit in the Layer 2 information frame header carried in the original SETUP message. The T-DERD 224 line number, which the call was received on, is also indicated (I.1 or I.2). The following messages appear:

NETW (I.1) Call originated from the network on Line 1

NETW (I.2) Call originated from the network on Line 2

USER (I.1) Call originated from the user on Line 1

USER (I.2) Call originated from the user on Line 2

DISC SRC

Call Disconnect Source — Identifies the call disconnect source (network or user) from the CIR bit in the Layer 2 information frame header carried in the first DISCONNECT, REFUSED, or REFUSED COMPLETE message. The T-DERD 224 line number, which the call was received on, is also indicated (I.1 or I.2). The following messages appear:

NETW (I.1) Call disconnected from the network on Line 1

NETW (I.2) Call disconnected from the network on Line 2

USER (I.1) Call disconnected from the user on Line 1

USER (I.2) Call disconnected from the user on Line 2

CAUSE

Cause Value — Displays why or how the call was disconnected or released. The value appears as a 3 digit number, and is retrieved from the Cause Information Element. The most recent cause value detected is displayed. (Press the **AUX** switch to display AUX 99, on-line help, which describes the indicated cause value.) Refer to Table 5-13 for the coding of the Primary Rate ISDN Cause Values.

Table 5-13. Primary Rate ISDN Cause Values

| Cause Value | Definition |
|-------------|-------------------------------------|
| 1 | Unlabeled (Unassigned Number) |
| 2 | Number In Specified Access Network |
| 3 | No Facility To Destination |
| 6 | Called Party Busy |
| 7 | Number Unreachable |
| 17 | User Busy |
| 18 | No User Responding |
| 19 | User Alerted, No Answer |
| 21 | Call Rejected |
| 22 | Number Changed |
| 27 | Destination Out Of Order |
| 31 | Call Transfer From Another Facility |

SECTION 6 PRINTER OPERATION

6.1 COMPATIBLE PRINTERS

The T-BIRD 224 can generate printouts to either the thermal lid printer, an RS-232 compatible serial printer, or an IEEE-488 listen-only printer.

6.2 LID PRINTER OPERATION

The optional thermal lid printer is on the T-BIRD 224 front panel cover which mounts on the T-BIRD 224 with a hinge on its bottom front edge. The power, data, and control leads are supplied through the front panel 8-pin RS-232 serial port labeled AUXILIARY PORT.

The lid printer is a 40-column thermal dot matrix printer. The printer operates at 9600 bps with a character format of one start bit, eight data bits, and no parity.

NOTE

Do not operate the lid printer when the cover is closed.

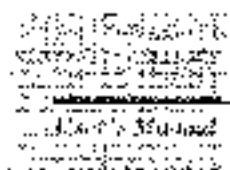
6.2.1 Lid Printer Controls and Indicators

The lid printer has two switches: **ON LINE** and **PAPER FEED**. The **ON LINE** switch illuminates green when the printer is ready to print. Press the **ON LINE** switch to take the printer on and off line. Press the **PAPER FEED** switch to advance the paper when the printer is off line. The lid printer automatically goes on line when the T-BIRD 224 is ready to take control.

6.2.2 Setup and Operation

To set up the lid printer for operation, perform the following steps.

- 1. Attach the lid printer to the T-BIRD 224**
Attach the lid printer hinge to the hinge on the T-BIRD 224 bottom front edge.
- 2. AUXILIARY PORT**
Plug the lid printer connector into the T-BIRD 224 AUXILIARY PORT located on the lower left side of the front panel.
- 3. Power switch**
Press to apply power to the T-BIRD 224.
- 4. ON LINE switch**
This switch should illuminate when power is first applied to the printer.



6.2.3 Loading Printer Paper

When the printer is out of paper the **PAPER FEED** switch illuminates red. A 4.5" wide roll of thermal paper fits inside the printer paper tray. The roll cannot exceed 1.36" in outside diameter and 70.5" in inside diameter. Perform the following procedure to load a new roll of paper.

1. **ON LINE switch**

This switch should not be illuminated.

2. **PAPER FEED switch**

Press this switch until the paper clears the print head.

3. **Remove paper tray cover**

Clarity: Lift the smoked plastic paper tray cover from the printer cover.

4. **Remove paper tube**

To release the retaining tube, push the two retaining arms out and to the front. Pull the paper tube and white retaining rod out of the paper tray. Slide the retaining rod out of the spool paper tube.

5. **Insert new paper tube**

Slide the new roll of paper over the white retaining rod and remove the tape from the end of the paper. Make sure the end of the paper has a clean square cut on it.

Position the roll of paper over the paper tray with the end of the paper coming from under the roll. When the roll is placed in the tray, the paper should come up through the front of the tray the shiny side of the paper facing out and the end of the paper pointed at the microframe front panel.

6. **Printer paper tray**

Place the roll of paper with the retaining rod in place into the printer tray. Press down on the end of the roll until the retaining rod snaps into place on each side of the paper tray.

Unroll about three inches of paper and tip the end of the paper tray slightly out of the printer. The shiny side of the paper should be facing up.

7. **Paper feed slot**

Look down inside the front edge of the paper tray and locate the paper feed slot located about 1" from the top of the printer cover. Slide the end of the paper into the slot.

8. **PAPER FEED switch**

Press this switch several times until the paper is protruding through the paper slot in the top of the printer.

9. **ON-LINE switch**

Press this switch to illuminate the LED and place the printer back online.

6.3 RS-232 PRINTER OPERATION

With the RS-232 PRINTER/REMOTE connector, the J-BFRD 224 can generate protocols to an RS-232 compatible serial printer. The RS-232 connector is located on the side panel of the J-BFRD 224. The connector is configured as Data Communications Equipment (DCE), which allows it to be directly connected to Data Terminal Equipment (DTE). Connection to another DCE, such as a modem, is possible with the use of a DTE/DCE adapter cable. Refer to Section 8.0.2 for the RS-232 pin assignments. The AUX DS RS-232

function configures the RS-232C PRINTER:REMOTE connector baud rate, parity, and line terminator. The column length is preset to 80 characters. The default settings for AUX 08 RS-232C function match the PR-40A parameters.

6.4 IEEE-488 PRINTER OPERATION

With the IEEE-488 interface Option installed and set to Talk Only mode, the T-BERD 224 can be connected directly to a IEEE-488 compatible lister-only printer through the IEEE-488 PRINTER:REMOTE connector.

To configure the T-BERD 224 to operate with an IEEE-488 compatible printer perform the following procedure:

1. **Power switch**
Press this switch to apply power to the T-BERD 224.
2. **AUX switch**
Press to access auxiliary functions (AUX ON).
3. **MODE and RESULTS II Arrowed switch**
Scroll to AUX 08 RS-232C using the **MODE** switch. Set the line terminator to CR, LF, or CR,LF using the **RESULTS II Arrowed** switch.

Scroll to AUX 09 488MODE. Select TALK-ONLY mode.
4. **MODE and SOURCE CONFIGURATION II switches**
Scroll to AUX 09 488MODE using the **MODE** switch. Select TALK-ONLY mode using the **SOURCE CONFIGURATION II** switch.

PRINTER:REMOTE IEEE-488 Interface

Connect the printer to the T-BERD 224 with an appropriate cable.

Printer Power switched.

Turn the printer ON; if necessary place the printer on line.

6.5 GENERATING A PRINTOUT

Results and controls printouts are generated with the front-panel **PRINT** and **PRINT EVENT** switches.

PRINT switch - Press this switch to manually generate a lister-only selection printout.

PRINT EVENT switch - When a print event is selected, a lister-only printout is generated. The selected **PRINT EVENT** switch and all other messages are additionally generated as a power-on reset printout. This generated printout also prints the selected function as well as all AUX 09 **PRINT EVENT** switch messages, except for G13, cause a status message to print if an alarm condition is charged, and cause a SIGNING SW3-56 results printout when the selected lister return to the ON-HOOK state.

TEST END - Initiates a results printout at the end of a manual test if the **TEST** switch is set to LINE. Use AUX 09 TEST LEN function to set the manual test length.

Types of Printouts

ERR SEC — Initiates a results printout for each second that a BPV, remote error, or CRC error occurs for either LINE 1 or LINE 2. A results printout is not generated if the selected error is disabled in the AUX 35 CUSTOM function.

TIMED — Initiates a results printout at the completion of a timed interval. The timed interval is set in the AUX 02 TIME PER function.

OFF — Automatic results printouts are not generated.

If a printer is not connected or is off-line at the time the printouts are generated, the T-BIRD 224 print buffer can store up to ten results and ten control printouts. In the event that a power loss occurs, a results printout is stored.

NOTE

Clear the printer buffer by selecting the AUX 01 CLEAR BUFFER function.

6.6 TYPES OF PRINTOUTS

The T-BIRD 224 can generate three types of printouts: results, controls, and messages. Each printout is identified by a header and is time- and date-stamped.

6.6.1 Results Printout

A results printout is a hard-copy listing of the accumulated test results (see Figure 6-1). The available results depend on the settings in the AUX 35 CUSTOM function, the T-BIRD 224 configuration, the installed options, and the presence of a signal on the lines. Each result printout is labeled indicating how the printout was generated.

The results printout alternates unbuffered results of test by prefixing the results with two asterisks (***) if it is buffered. All unbuffered results of the unbuffered results value and the results of the test are printed. The results of the test are printed.

| GENERAL OPTION | STATUS | PARAM. DEF. | UNBUFFERED | UNBUFFERED |
|----------------|--------|-------------|------------|------------|
| BPV 001 | OK | OK | UNBUFFERED | UNBUFFERED |
| LINE 002A | OK | OK | UNBUFFERED | UNBUFFERED |
| LINE 002B | OK | OK | UNBUFFERED | UNBUFFERED |
| AUX 003 | OK | OK | UNBUFFERED | UNBUFFERED |
| TIME 004 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 005 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 006 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 007 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 008 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 009 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 010 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 011 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 012 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 013 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 014 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 015 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 016 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 017 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 018 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 019 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 020 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 021 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 022 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 023 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 024 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 025 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 026 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 027 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 028 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 029 | OK | OK | UNBUFFERED | UNBUFFERED |
| ERR 030 | OK | OK | UNBUFFERED | UNBUFFERED |

Figure 6-1. Results Printout

6.6.2 Results— Signaling Option

When the TIBERD 774 is configured for SIGNLING, a signaling printout can be generated manually or automatically. Figure 6-2 illustrates how the dial tone and digit measurement results printout arranges the delay (DTR), duration (DCR), lower (LRQ1 and LVL1) and upper (URQ2 and LVL2) frequencies and levels of the received dial tone and digits. The URQ1, LVL1, URQ2, and LVL2 results are only available when the Digit Analysis Option is installed.

| EVENT | DTR | DCR | URQ1 | LVL1 | URQ2 | LVL2 |
|-------|------|-----|------|------|------|------|
| | 02 | 02 | 02 | 0200 | 02 | 0200 |
| 0 | 210 | 070 | 070 | 070 | 070 | 070 |
| 1 | 210 | 70 | 1700 | 70 | 1700 | 70 |
| 2 | 210 | 70 | 1400 | 70 | 1400 | 70 |
| 3 | 210 | 70 | 1300 | 70 | 1300 | 70 |
| 4 | 210 | 70 | 1100 | 70 | 1100 | 70 |
| 5 | 210 | 70 | 900 | 70 | 900 | 70 |
| 6 | 210 | 70 | 800 | 70 | 800 | 70 |
| 7 | 210 | 70 | 700 | 70 | 700 | 70 |
| 8 | 210 | 70 | 600 | 70 | 600 | 70 |
| 9 | 210 | 70 | 500 | 70 | 500 | 70 |
| T | 0200 | 070 | 070 | 070 | 070 | 070 |

Figure 6-2. Dial Tone and Digit Measurement Results Printout

6.6.3 Results— Printer Option for STS-1 and DS3 Testing

When the TIBERD 774 is configured for SIGNALING, a signaling printout can be generated manually or automatically. All of the STS-1 and DS3 RESULTS will be available on the printouts. In addition, the Time, Date, and all SIGNAL/TIME results will be available, as shown in Figure 6-3.

The user will also be able to select the ability to print only STS-1 and DS3 results through selection in AUX 35 on the TIBERD 774 mainframe. If these specific printouts are selected in AUX 35, they will be formatted as follows:

| INPUTS FRONT | CONDITION | STATUS |
|----------------|----------------|----------------|
| EXHAUST | | REORDER |
| YES | SIGNAL | NO |
| NO | | |
| YES | FRONT DOOR | UNSAFE |
| YES | OPEN | UNSAFE |
| | • | |
| | • | |
| | • | |
| 0 | PARALLEL | UNSAFE |
| 0 | COPY | UNSAFE |
| 0 | STOP | UNSAFE |
| 0 | 100 PPM | UNSAFE |
| YES | USE FRONT DOOR | UNSAFE |
| AGENT | | |
| NO | FRONT DOOR | NO |
| NO | TRAY | NO |
| | • | |
| | • | |
| | • | |
| 0 | NO | NO |
| 0 | NO | NO |
| 0 | NO | NO |
| CONTROL | | |
| 0 | FRONT DOOR | UNSAFE |
| 0 | TRAY | NO |
| 0 | FRONT DOOR | UNSAFE |

Figure 6-3. S1S-1/DS3 Results Printout

All LEDs and alarms will be denoted with either a "YES" or a "NO" to indicate active and inactive states.

6.6.4 Controls Printouts

The controls printout lists the state of setting of all front-panel switches and the readiness functions (see Figure 6-4). A controls printout is demanded manually by pressing the **PRINT** switch on the **CONTROL** position.

6.6.6 Alarm and Status Messages

Unless the PRINT EVENT switch is set to the OFF position, alarm and status messages are initiated automatically to inform you of any important developments related to your ongoing test. The format for an alarm message is:

```
alarm message name: EL 000:00:MM:SS
```

Possible alarm messages are shown in Table 6-1.

Table 6-1. Alarm Messages

| Message | Description |
|---------------------------|---|
| L102 SIGNAL LOSS X | All of the pulses are no longer present on the specified line. XX = a running count of signal losses for that line since the start of the test. |
| L012 TRM SYN LOSS XX | The training pattern is no longer present on the specified line. XX = a running count of frame sync losses for that line since the start of the test. |
| L012 YIELD ALARM ON | A yield alarm has been received on the specified line. |
| L012 YIELD ALARM OFF | A yield alarm is no longer being received on the specified line. |
| L112 EXCESS ZERO ON | More than 10 consecutive zeros have been received on the specified line. |
| L112 EXCESS ZERO OFF | Less than 10 consecutive zeros have been received on the specified line which previously detected excessive zero condition. |
| L112 A&S ON | The specified line has no zeros or if consecutive unidirectional logical ones (AMS) have been detected in the data stream input on the specified line. |
| L112 A&S OFF | A zero has been detected on the specified line. One or more zeros have been detected in the time previously marked as exceeding all logical ones (AMS). |
| L112 LUT PATTERN VIOLATED | This message is violated when the T1 signal violates the one-to-one ratio. |
| L112 PATTERN ZERO LOSS | This message is violated when loss of pattern synchronizer occurs. |

Possible status messages are shown in Table 6-2.

Table 6-2. Status Messages

| Message | Description |
|-----------------------|--|
| L112 SIGNAL DETECT | The pulses of a valid frequency and level are present on the specified line. |
| L112 TRM SYN ACQUIRE | The training pattern has been detected on the specified line. |
| L112 BBS DETECT | BBS line code is received on the specified line and the test set is configured for AMI. |
| RETRIEVE L1 | Retrieval of print out has been successful. At least one printout has been retrieved successfully. |
| PRINT SQUELCH ON | More than 20 data errors in 100 pulses have been generated by the transmitter. The printer squelch feature is enabled and no more messages will be printed. PRINT SQUELCH is active until print. |
| PRINT SQUELCH OFF | The error rate on the transmitter is below the printer squelch threshold and the printer will resume printing with a rate while the SQUELCH is ON unless SQUELCH is turned OFF. |
| TEST COMPLETE | The end of a test run has been reached. |
| TEST RESTART | A test restart occurred. |
| NEW CONFIGURATION | The current parameters of the T-BIRD 224 are updated and. |
| L112 PATTERN SYNCH ON | The T-BIRD 224 has found pattern synchronizer. |

6.7 AUTOMATIC SQUELCH FEATURE

The automatic squelch feature prevents more than 20 entered second results printouts or status and alarm messages from being generated in a full-second period. After the printing of the 20th message, a time-stamped message is printed indicating that the squelch feature is on. While the squelch feature is on, the *S-ECOND 22+* continues to monitor for entered events, but no automatic entered results printouts or status and alarm messages are generated or stored. The typed and manual printouts are not affected by the squelch feature.

The squelch feature is turned off when five or less entered events occur in a 60-second interval. When this condition is met, another time-stamped message is generated indicating that the squelch feature is off.

NOTE

The squelch feature is reset by clearing the AUX of CLEARD function, changing the **PRINT EVENT** switch selector, or completing a timed test.

```
0001: 0000 0000 0000 0000 0000 0000 0000 0000
0002: 0000 0000 0000 0000 0000 0000 0000 0000
0003: 0000 0000 0000 0000 0000 0000 0000 0000
0004: 0000 0000 0000 0000 0000 0000 0000 0000
0005: 0000 0000 0000 0000 0000 0000 0000 0000
0006: 0000 0000 0000 0000 0000 0000 0000 0000
0007: 0000 0000 0000 0000 0000 0000 0000 0000
0008: 0000 0000 0000 0000 0000 0000 0000 0000
0009: 0000 0000 0000 0000 0000 0000 0000 0000
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0025: 0000 0000 0000 0000 0000 0000 0000 0000
0026: 0000 0000 0000 0000 0000 0000 0000 0000
0027: 0000 0000 0000 0000 0000 0000 0000 0000
0028: 0000 0000 0000 0000 0000 0000 0000 0000
0029: 0000 0000 0000 0000 0000 0000 0000 0000
0030: 0000 0000 0000 0000 0000 0000 0000 0000
0031: 0000 0000 0000 0000 0000 0000 0000 0000
0032: 0000 0000 0000 0000 0000 0000 0000 0000
0033: 0000 0000 0000 0000 0000 0000 0000 0000
0034: 0000 0000 0000 0000 0000 0000 0000 0000
0035: 0000 0000 0000 0000 0000 0000 0000 0000
0036: 0000 0000 0000 0000 0000 0000 0000 0000
0037: 0000 0000 0000 0000 0000 0000 0000 0000
0038: 0000 0000 0000 0000 0000 0000 0000 0000
0039: 0000 0000 0000 0000 0000 0000 0000 0000
0040: 0000 0000 0000 0000 0000 0000 0000 0000
```

```
0041: 0000 0000 0000 0000 0000 0000 0000 0000
0042: 0000 0000 0000 0000 0000 0000 0000 0000
0043: 0000 0000 0000 0000 0000 0000 0000 0000
0044: 0000 0000 0000 0000 0000 0000 0000 0000
0045: 0000 0000 0000 0000 0000 0000 0000 0000
0046: 0000 0000 0000 0000 0000 0000 0000 0000
0047: 0000 0000 0000 0000 0000 0000 0000 0000
0048: 0000 0000 0000 0000 0000 0000 0000 0000
0049: 0000 0000 0000 0000 0000 0000 0000 0000
0050: 0000 0000 0000 0000 0000 0000 0000 0000
0051: 0000 0000 0000 0000 0000 0000 0000 0000
0052: 0000 0000 0000 0000 0000 0000 0000 0000
0053: 0000 0000 0000 0000 0000 0000 0000 0000
0054: 0000 0000 0000 0000 0000 0000 0000 0000
0055: 0000 0000 0000 0000 0000 0000 0000 0000
0056: 0000 0000 0000 0000 0000 0000 0000 0000
0057: 0000 0000 0000 0000 0000 0000 0000 0000
0058: 0000 0000 0000 0000 0000 0000 0000 0000
0059: 0000 0000 0000 0000 0000 0000 0000 0000
0060: 0000 0000 0000 0000 0000 0000 0000 0000
```

```
0061: 0000 0000 0000 0000 0000 0000 0000 0000
0062: 0000 0000 0000 0000 0000 0000 0000 0000
0063: 0000 0000 0000 0000 0000 0000 0000 0000
0064: 0000 0000 0000 0000 0000 0000 0000 0000
0065: 0000 0000 0000 0000 0000 0000 0000 0000
0066: 0000 0000 0000 0000 0000 0000 0000 0000
0067: 0000 0000 0000 0000 0000 0000 0000 0000
0068: 0000 0000 0000 0000 0000 0000 0000 0000
0069: 0000 0000 0000 0000 0000 0000 0000 0000
0070: 0000 0000 0000 0000 0000 0000 0000 0000
0071: 0000 0000 0000 0000 0000 0000 0000 0000
0072: 0000 0000 0000 0000 0000 0000 0000 0000
0073: 0000 0000 0000 0000 0000 0000 0000 0000
0074: 0000 0000 0000 0000 0000 0000 0000 0000
0075: 0000 0000 0000 0000 0000 0000 0000 0000
0076: 0000 0000 0000 0000 0000 0000 0000 0000
0077: 0000 0000 0000 0000 0000 0000 0000 0000
0078: 0000 0000 0000 0000 0000 0000 0000 0000
0079: 0000 0000 0000 0000 0000 0000 0000 0000
0080: 0000 0000 0000 0000 0000 0000 0000 0000
```


SECTION 7 REMOTE CONTROL OPERATION

7.1 INTRODUCTION

This section provides information on how to control the T-BIRD 224 from a terminal or a computer. These devices can access the T-BIRD 224 through the PRINTER/REMOTE RS-232 connector or the PRINTER/REMOTE IEEE-138 connector via an IEEE 209.

7.2 RS-232 REMOTE CONTROL OPERATION

The PRINTER/REMOTE RS-232 connector is a 25-pin female D connector located on the T-BIRD 224's right-side panel. The PRINTER/REMOTE RS-232 connector is configured as Data Communication Equipment (DCE) so it can be directly connected to Data Terminal Equipment (DTE). Connection to another DTE is possible with an adapter cable. Refer to Section 8.9.2 for the PRINTER/REMOTE RS-232 connector pin configuration.

7.2.1 Remote Control Modes

In RS-232 remote control, the T-BIRD 224 functions in three modes: terminal mode, remote mode, or computer mode.

In terminal mode, the T-BIRD 224 operates interactively with a dumb terminal or computer. The terminal mode provides a prompt character whenever the T-BIRD 224 is ready to receive a command, echoes all characters back to the remote device or the user types them, and displays error messages when an illegal operation or some error occurs.

In computer mode, a computer is send down commands and receives responses from the T-BIRD 224. The terminal mode provides all of the program functions, such as print, copy, and delete, and echoes back to the computer to require process responses.

The T-BIRD 224 powers up in LOCAL mode and remains in that mode until a remote control command is entered. If a remote control command is received that does not set one of the remote modes, the default remote control settings for **ECHO** and **PROMPT** are both set to OFF. Automatic print and copy messages are sent to the controlling device. In addition, the printer is turned OFF LINE. When the T-BIRD 224 is in a remote mode, the LOCAL terminal returns control to the front panel.

7.2.2 Setup Procedure

To enable the T-BIRD 224 to communicate with the remote control, you must first configure using the auxiliary functions. See the following:

7.2.2.1 Manual Setup for Remote Control Operation

1. **AUX switch**
Press to access auxiliary functions (LED ON).

2. **MODE, SOURCE CONFIGURATION II, and RESULTS switches**

Set the AUX DB RS 232 function using the **MODE** switch. Set the ODD, EVEN, or NONE for the PARITY using the **SOURCE CONFIGURATION II** switch. Set the BAUD rate to match the remote control device baud rate using the **RESULTS I Blank** switch. Set the line TERMINATOR to CR, LF, or CR/LF using the **RESULTS II Arrowed** switch.

| | | | |
|------------------|----------------|--------------|------------------|
| AUX DB RS 232 | PARITY NONE | BAUD 9600 | TERMINATOR CR |
|------------------|----------------|--------------|------------------|

3. **AUX switch**

Press to exit the auxiliary functions (LED OFF).

7.2.2.2 **Auto Baud Setup at a Computer for Remote Control Operation**

1. **BREAK key**

Slowly press the BREAK key several times (once per second). On some terminals, the CTRL key and the BREAK key must be pressed simultaneously.

2. **Space bar**

Press and hold the space bar until the message *Auto-baud is being Press ESCAPE to continue* appears on the screen. If the space bar does not have an auto-repeat function, press the space bar repeatedly until the message appears.

3. **ESCAPE key**

Press the ESCAPE key once the message *Character format determined* is displayed.

NOTE

The auto-baud function must be complete within 40 seconds. If auto-baud is not complete within the 40-second period, the auto-baud function is aborted and a message is printed.

7.2.3 **Remote Mode Operation**

Once the T-BERD 224 is properly configured to communicate with the controller, it can be placed into the remote mode. The remote mode is established by sending a valid remote command. Typing a period followed by a terminator (CR or CR/LF) as the T-BERD 224 for terminator (CR) control. The REMOTE command should be used to place the T-BERD 224 under control of a computer. Once a valid command is recognized by the T-BERD 224, it enters the remote mode, the message *UNDER REMOTE CONTROL* flashes on the left display window, and the front panel switches are disabled.

To terminate the usage of a specific character set, a prompt, or a message, the patterns are all disabled. Printing can be released by using the **REL** command. In the remote mode, the left printer is turned OFF LINE.

7.2.3.1 **Operating in Terminal Mode**

When operating in terminal mode, each line of input is prompted by either the default prompt (or a user-defined prompt), or a printer hold prompt. These prompts signify that the T-BERD 224 is ready to accept commands and is in an interactive terminal mode. In terminal mode, the prompt, echo, and other message functions are enabled. When this mode is enabled, the left printer is placed OFF LINE and the following message is displayed.

Received mode is entered.
Type "HELP" followed by a carriage return to get help.

Unless otherwise specified, sending a command that requires a response from the T-BIRD 224 causes the information to be printed. This includes the appropriate status messages, prompts, extra prefixes, character sets, or error messages.

Each command must have the proper syntax and line terminator before the command is accepted as being valid. The T-BIRD 224 prints an error message when it receives an invalid command.

7.2.3.2 Prompts in TERMINAL Mode

A user defined prompt (up to 100 characters) can be generated to replace the default prompt symbol. Sending the command **PROMPT STRING XXXX** (where XXXX are ASCII characters) defines the prompt. This command can also be used to create a prompt that identifies the T-BIRD 224 that is attached to the terminal. User-defined prompts are not saved when the T-BIRD 224 power is turned OFF.

The printer hold prompt is represented by the plus symbol (+). It indicates a **HOLD** command has been sent, and the printer buffer is not sending printouts to the terminal. The **REL** command releases the printer hold.

NOTE

Turning the power OFF also aborts the remote operating mode. The remote operating mode may be changed at any time by using one of the mode commands: **TERMINAL**, **COMPUTER**, or **REMOTE**.

7.2.4 Terminating Remote Control Operation

To terminate the T-BIRD 224 remote control and end any remote operating mode (RCC) session, the user must send a carriage return (CR) or a carriage return followed by a carriage release (CR/LF) to the T-BIRD 224. When the command is received by the T-BIRD 224, it will display the message "Remote Control Operation is no longer visible on display screen" and will return to the ready state.

7.3 IEEE-488 REMOTE CONTROL OPERATION

The optional **TRANSFER/REMOTE IEEE-488** controller allows the T-BIRD 224 to be connected to an IEEE-488 bus. The **ALX 09488MODE** function selects the IEEE-488 operating mode and address. The two IEEE-488 operating modes are talk-only and addressable.

Selecting talk-only automatically configures the T-BIRD 224 to be used as a listen-only device, such as a printer. If the **ALX 09488MODE** function is set to talk-only on an IEEE-488 port, it can be used by a controller. If the IEEE-488 port is selected as the printer port, otherwise, the **ALX 09488MODE** function will select addressable.

If the IEEE-488 addressable remote control mode is selected, the T-BIRD 224 bus address must be set between 0 and 30 to determine which device should be addressed by the controller. Using the T-BIRD 224 bus address, the controller commands the T-BIRD 224 to *listen* for or *send* remote commands or *load* (send data). The T-BIRD 224 responds to the IEEE-488 Device Clear (DC) command by performing another power-up.

The IEEE-488 bus requires that one device on the bus act as the controller. All other devices connected to the bus act as slaves to that controller. In addressable mode, the T-BERD 224 acts as a slave.

The following steps represent a typical remote control input sequence.

1. The controller device addresses the T-BERD 224 to listen, sends a valid remote control command, then sends a valid remote control line terminator.
2. Upon receiving the line terminator, the T-BERD 224 analyzes the remote command and performs the appropriate action.

When receiving characters, ASCII null and space characters are discarded and the remaining characters are saved until the line terminator is received. Upon receipt of the line terminator, the received command is analyzed. If no error is detected, the T-BERD 224 performs the appropriate action and then prepares to receive another command. However, if an error is detected in the command string and SRQ is on, an SRQ is issued, which sets the Least Significant Bit (LSB) of the serial port register. If a response is appropriate, the Most Significant Bit (MSB) is set and a service request (SRQ) is issued. If this response is not read by the controller before the next command is sent, the response is discarded.

7.3.1 IEEE-488 Setup Procedure

Prior knowledge of IEEE-488 controller programming and operation is recommended before operating the T-BERD 224 through the PRINTER/REMOTE IEEE-488 connector. The following procedure describes how to setup and operate the T-BERD 224 from an IEEE-488 controller.

1. **AUX switch**
Press to access auxiliary functions of HP-IB.
2. **MODE, RESULTS I Blank, and RESULTS II Arrowed switches**
Send to ADDRESS I (1) using the **MODE** switch. Select the appropriate location using the **RESULTS I Blank** switch. Select CR, LF, or CR LF using the **RESULTS II Arrowed** switch.

| AUX 08 | PARITY | BAUD | TERMINATOR |
|--------|--------|------|------------|
| RS 232 | NONE | 9600 | CR |

3. **MODE, SOURCE CONFIGURATION II, and RESULTS I Blank switches**
Send to AUX 09 (488MODE) using the **MODE** switch. Set or the ADDRESS mode using the **SOURCE CONFIGURATION II Arrowed** switch. Set the desired T-BERD 224 bus address from 0 to 99 using the **RESULTS I Blank** switch. The bus address must be unique for each device connected to the same bus. If SRQ is set to ON, the T-BERD 224 generates an SRQ if a service request command is received or when it has done a self-program. If the SRQ is set to OFF, the T-BERD 224 sets the appropriate serial port register but does not issue an SRQ.

| AUX 09 | IEEE-488 | MODE and ADDRESS |
|---------|----------|------------------|
| 488MODE | ADDR | 1 SRQ: ON |

4. **AUX switch**
Press to exit auxiliary functions (HP-IB).

5. T-BERD 224 IEEE-488 Interface

Connect the controller bus to the T-BERD 224 IEEE-488 interface.

6. IEEE-488 controller

Program the controller to gain access and control over the T-BERD 224. Refer to the IEEE-488 controller operating manual for the programming instructions.

7.3.2 IEEE-488 Programming Hints

Before attempting to read data from a device, it is necessary to know if the device has data to send. The controller has two ways of determining that the T-BERD 224 has data: if Bit 7 of the serial poll register (data) is set and if the SRQ function is set to ON in the AUX 09-DSMIO:OE function. If SRQ is set to ON, a service request is sent to the controller whenever data is available. An SRQ can also occur when a syntax error is entered.

The statement used to read data from the T-BERD 224 must terminate the read operation when the last character of the line is encountered. The most failproof way to detect the last character is by sensing the EOL signal.

7.3.3 Disallowed IEEE-488 Remote Control Command

The following remote control commands cannot be used when controlling the T-BERD 224 from an IEEE-488 controller. An error message occurs when using any of these commands. See Table 7-1.

Table 7-1. Disallowed IEEE-488 Commands

| Command | Description |
|--------------|--|
| CLAMP | Configure the terminal device |
| CLAMP:EX | Configure the T-BERD 224 for external initialization |
| INIT:INIT:SP | Initialize device |
| INIT | Test lock |
| PROMPT | Terminal remote control prompt |
| TERMINAL | Configure the T-BERD 224 for terminal mode |

7.4 REMOTE CONTROL FORMAT

This section presents the format and entry sequences for remote control commands and the three primary terminal types available with the T-BERD 224 remote control facility. The command types are:

Switch commands -- Set the T-BERD 224 from-panel switches.

Arbitrary commands -- Set the T-BERD 224 to any desired function.

Control commands -- Pertain exclusively to the RS-232C interface (see Control Interface

7.4.1 Command Formats And Entry Sequence

The general format for any remote control command is:

```
command_name [parameter]
or
command_name?
```

The **[parameter]** entry specifies any parameter(s) associated with the command. Any parameter should be separated from the command name by at least one space. The command name parameter string should always be followed by a carriage return or carriage return/line feed sequence.

The **command_name** entry specifies the name of the command to be executed. Where possible, commands that represent a front-panel or switch activity are abbreviated to the first three characters of the switch or function, where characters may be typed if desired. Control commands have no front panel equivalent. The switch help feature displays the required characters in upper case and the optional characters in lower case.

Most remote control commands can be used to select a new command state or to display the current command state (without changing it). To select a new command state, enter both the command name and the desired parameter on the command line. To display the current state, enter the command name followed by a question mark (?). Note that some commands (e.g., CLS) are *executable only* and have no current or changeable state.

7.4.2 Switch Command Formats

Switch commands control the functions associated with the I-IBIRD 224 front panel. The remote control commands use the first three characters of the switch name or switch position as they appear on the front panel and display.

Table 7-2 lists the mainframe switch commands with their equivalent front panel slot names. The brackets indicate a complete set of associated parameters. Each command is fully described in Appendix A.

Table 7-2. Mainframe Switch Command

| Command | Switch |
|---------------------------------|------------------------------|
| CHAnnel[Format] | CHANNEL FORMAT |
| COde[] | CODE |
| COntrols | CONTROLS |
| Display[Help] | DISPLAY [HELP] |
| StOp[] | STOP |
| REceive[ERR] | RECEIVE ERROR INSERT |
| ERRor[INSer]RAp[] | ERROR ERROR INSERT |
| ERRor[INSer]F[an]E[] | ERROR ERROR INSERT |
| ERRor[INSer]M[em]R[eg]H[and]L[] | ERROR MEMORY REGISTER INSERT |
| History[ReSet] | HISTORY RESET |
| INsert[] | INSERT |
| L1CHAnnel[] | LINE 1 CHANNEL |
| L2CHAnnel[] | LINE 2 CHANNEL |
| L1RECEive[INPut] | LINE 1 RECEIVE INPUT |
| L2RECEive[INPut] | LINE 2 RECEIVE INPUT |
| Loose[Down] | LOOSE DOWN |

Table 7-2. Mainframe Switch Commands (Continued)

| Command | Switch |
|------------------|-------------------------------|
| LOAD p i | LOADUP |
| MODx i | MODF |
| OFF HOOK | OFF HOOK Signaling Normal Led |
| ON HOOK | ON HOOK Signaling Normal Led |
| PRINT i | PRINT |
| PRINT nVEnt i | PRINT EVENT |
| RLSch 1 i | RESLTS I |
| RLSch 2 i | RESLTS II |
| RESTART | RESTART |
| RESULTS | RESULTS |
| Signal INSen i | SIGNALING INSERT |
| SOURCE 1 i | SOURCE CONFIGURATION I |
| SOURCE 2 i | SOURCE CONFIGURATION II |
| TEST i | TEST |
| VOLUME i | VOLUME |

7.4.3 Auxiliary Function Command Formats

Auxiliary commands control functions associated with the T-BERD 224 auxiliary functions. Table 7-3 lists the auxiliary function commands with their equivalent AUX function names. The brackets indicate parameters with the associated parameters. Each command is fully described in Appendix H.

Table 7-3. Mainframe Auxiliary Function Command

| Command | Auxiliary Function |
|----------------------|--------------------|
| TEST BUS i | AUX 0 (ASSM) DR |
| TEST BUS 1 i | AUX 0 (ASSM) DR PE |
| TEST BUS 2 i | AUX 2 (ASSM) DR |
| BACKUP TIMING i | AUX 0 (BACKUP) TM |
| BURST i | AUX 1 (BURST) FSI |
| BURST LENGTH i | AUX 1 (BURST) FSI |
| CALL INFORMATION i | AUX 3 (CALL) ID |
| CLEAR FIFO | AUX 6 (CLEAR) FIFO |
| CLK i | AUX 0 (CLK) ID |
| CLK 2 i | AUX 2 (CLK) ID |
| CODE i | AUX 3 (CODE) ID |
| CONF i | AUX 4 (CONF) ID |
| CONF 1 i | AUX 2 (CONF) DEF |
| CONF 2 i | AUX 3 (CONF) DEF |
| CONF 3 i | AUX 4 (CONF) DEF |
| CONF 4 i | AUX 5 (CONF) DEF |
| CONF 5 i | AUX 6 (CONF) DEF |
| CONF 6 i | AUX 7 (CONF) DEF |
| CONF 7 i | AUX 8 (CONF) DEF |
| CONF 8 i | AUX 9 (CONF) DEF |
| CONF 9 i | AUX 10 (CONF) DEF |
| CONF 10 i | AUX 11 (CONF) DEF |
| CONF 11 i | AUX 12 (CONF) DEF |
| CONF 12 i | AUX 13 (CONF) DEF |
| CONF 13 i | AUX 14 (CONF) DEF |
| CONF 14 i | AUX 15 (CONF) DEF |
| CONF 15 i | AUX 16 (CONF) DEF |
| CONF 16 i | AUX 17 (CONF) DEF |
| CONF 17 i | AUX 18 (CONF) DEF |
| CONF 18 i | AUX 19 (CONF) DEF |
| CONF 19 i | AUX 20 (CONF) DEF |
| CONF 20 i | AUX 21 (CONF) DEF |
| CONF 21 i | AUX 22 (CONF) DEF |
| CONF 22 i | AUX 23 (CONF) DEF |
| CONF 23 i | AUX 24 (CONF) DEF |
| CONF 24 i | AUX 25 (CONF) DEF |
| CONF 25 i | AUX 26 (CONF) DEF |
| CONF 26 i | AUX 27 (CONF) DEF |
| CONF 27 i | AUX 28 (CONF) DEF |
| CONF 28 i | AUX 29 (CONF) DEF |
| CONF 29 i | AUX 30 (CONF) DEF |
| CONF 30 i | AUX 31 (CONF) DEF |
| CONF 31 i | AUX 32 (CONF) DEF |
| CONF 32 i | AUX 33 (CONF) DEF |
| CONF 33 i | AUX 34 (CONF) DEF |
| CONF 34 i | AUX 35 (CONF) DEF |
| CONF 35 i | AUX 36 (CONF) DEF |
| CONF 36 i | AUX 37 (CONF) DEF |
| CONF 37 i | AUX 38 (CONF) DEF |
| CONF 38 i | AUX 39 (CONF) DEF |
| CONF 39 i | AUX 40 (CONF) DEF |
| CONF 40 i | AUX 41 (CONF) DEF |
| CONF 41 i | AUX 42 (CONF) DEF |
| CONF 42 i | AUX 43 (CONF) DEF |
| CONF 43 i | AUX 44 (CONF) DEF |
| CONF 44 i | AUX 45 (CONF) DEF |
| CONF 45 i | AUX 46 (CONF) DEF |
| CONF 46 i | AUX 47 (CONF) DEF |
| CONF 47 i | AUX 48 (CONF) DEF |
| CONF 48 i | AUX 49 (CONF) DEF |
| CONF 49 i | AUX 50 (CONF) DEF |
| CONF 50 i | AUX 51 (CONF) DEF |
| CONF 51 i | AUX 52 (CONF) DEF |
| CONF 52 i | AUX 53 (CONF) DEF |
| CONF 53 i | AUX 54 (CONF) DEF |
| CONF 54 i | AUX 55 (CONF) DEF |
| CONF 55 i | AUX 56 (CONF) DEF |
| CONF 56 i | AUX 57 (CONF) DEF |
| CONF 57 i | AUX 58 (CONF) DEF |
| CONF 58 i | AUX 59 (CONF) DEF |
| CONF 59 i | AUX 60 (CONF) DEF |
| CONF 60 i | AUX 61 (CONF) DEF |
| CONF 61 i | AUX 62 (CONF) DEF |
| CONF 62 i | AUX 63 (CONF) DEF |
| CONF 63 i | AUX 64 (CONF) DEF |
| CONF 64 i | AUX 65 (CONF) DEF |
| CONF 65 i | AUX 66 (CONF) DEF |
| CONF 66 i | AUX 67 (CONF) DEF |
| CONF 67 i | AUX 68 (CONF) DEF |
| CONF 68 i | AUX 69 (CONF) DEF |
| CONF 69 i | AUX 70 (CONF) DEF |
| CONF 70 i | AUX 71 (CONF) DEF |
| CONF 71 i | AUX 72 (CONF) DEF |
| CONF 72 i | AUX 73 (CONF) DEF |
| CONF 73 i | AUX 74 (CONF) DEF |
| CONF 74 i | AUX 75 (CONF) DEF |
| CONF 75 i | AUX 76 (CONF) DEF |
| CONF 76 i | AUX 77 (CONF) DEF |
| CONF 77 i | AUX 78 (CONF) DEF |
| CONF 78 i | AUX 79 (CONF) DEF |
| CONF 79 i | AUX 80 (CONF) DEF |
| CONF 80 i | AUX 81 (CONF) DEF |
| CONF 81 i | AUX 82 (CONF) DEF |
| CONF 82 i | AUX 83 (CONF) DEF |
| CONF 83 i | AUX 84 (CONF) DEF |
| CONF 84 i | AUX 85 (CONF) DEF |
| CONF 85 i | AUX 86 (CONF) DEF |
| CONF 86 i | AUX 87 (CONF) DEF |
| CONF 87 i | AUX 88 (CONF) DEF |
| CONF 88 i | AUX 89 (CONF) DEF |
| CONF 89 i | AUX 90 (CONF) DEF |
| CONF 90 i | AUX 91 (CONF) DEF |
| CONF 91 i | AUX 92 (CONF) DEF |
| CONF 92 i | AUX 93 (CONF) DEF |
| CONF 93 i | AUX 94 (CONF) DEF |
| CONF 94 i | AUX 95 (CONF) DEF |
| CONF 95 i | AUX 96 (CONF) DEF |
| CONF 96 i | AUX 97 (CONF) DEF |
| CONF 97 i | AUX 98 (CONF) DEF |
| CONF 98 i | AUX 99 (CONF) DEF |
| CONF 99 i | AUX 100 (CONF) DEF |

CONF 100 | i

CONF 101 | i

CONF 102 | i

CONF 103 | i

CONF 104 | i

CONF 105 | i

CONF 106 | i

CONF 107 | i

CONF 108 | i

CONF 109 | i

CONF 110 | i

CONF 111 | i

CONF 112 | i

CONF 113 | i

CONF 114 | i

CONF 115 | i

CONF 116 | i

CONF 117 | i

CONF 118 | i

CONF 119 | i

CONF 120 | i

CONF 121 | i

CONF 122 | i

CONF 123 | i

CONF 124 | i

CONF 125 | i

CONF 126 | i

CONF 127 | i

CONF 128 | i

CONF 129 | i

CONF 130 | i

CONF 131 | i

CONF 132 | i

CONF 133 | i

CONF 134 | i

CONF 135 | i

CONF 136 | i

CONF 137 | i

CONF 138 | i

CONF 139 | i

CONF 140 | i

CONF 141 | i

CONF 142 | i

CONF 143 | i

CONF 144 | i

CONF 145 | i

CONF 146 | i

CONF 147 | i

CONF 148 | i

CONF 149 | i

CONF 150 | i

CONF 151 | i

CONF 152 | i

CONF 153 | i

CONF 154 | i

CONF 155 | i

CONF 156 | i

CONF 157 | i

CONF 158 | i

CONF 159 | i

CONF 160 | i

CONF 161 | i

CONF 162 | i

CONF 163 | i

CONF 164 | i

CONF 165 | i

CONF 166 | i

CONF 167 | i

CONF 168 | i

CONF 169 | i

CONF 170 | i

CONF 171 | i

CONF 172 | i

CONF 173 | i

CONF 174 | i

CONF 175 | i

CONF 176 | i

CONF 177 | i

CONF 178 | i

CONF 179 | i

CONF 180 | i

CONF 181 | i

CONF 182 | i

CONF 183 | i

CONF 184 | i

CONF 185 | i

CONF 186 | i

CONF 187 | i

CONF 188 | i

CONF 189 | i

CONF 190 | i

CONF 191 | i

CONF 192 | i

CONF 193 | i

CONF 194 | i

CONF 195 | i

CONF 196 | i

CONF 197 | i

CONF 198 | i

CONF 199 | i

CONF 200 | i

Table 7-3. Mainframe Auxillary Function Commands (Continued)

| Command | Auxiliary Function |
|----------------------------|--------------------|
| ERRor RStc [] | AUX 17 RERR |
| EXtension SWLsp [] | AUX 27 SWERR |
| FRMERR Rstc [] | AUX 34 FRMERR |
| J1 LBO [] | AUX 05 LBO |
| J2 LBO [] | AUX 05 LBO |
| J1 PRMERR late | AUX 26 PRMERR |
| J2 PRMERR late | AUX 26 PRMERR |
| LOGp COIN [] | AUX 17 LOGP CO |
| MDV DR Acl [] | AUX 30 MDV |
| MDV EUD | AUX 30 MDV |
| MDV OP [] | AUX 30 MDV |
| MDV SPX [] | AUX 30 MDV |
| MDV CON Aggr [] | AUX 30 MDV CON AGG |
| PGM LPRaw [] | AUX 51 PGM LPR |
| PGM LPR [] | AUX 51 PGM LPR |
| PRIn SWLsp [] | AUX 24 PRIN SWLSP |
| PRIn SWLsp PRMERR late [] | AUX 24 SWLSP |
| PRIn II-terminator [] | AUX 28 PRIN II |
| PRMERR Rstc [] | AUX 30 PRMERR |
| REChase SEQ [] | AUX 32 RECHASE |
| RESPase [] | AUX 16 RESPASE |
| RStc [] | AUX 18 RSTC |
| SCAN [] | AUX 29 SCAN [] |
| TU1 LKsp [] | AUX 06 TU1 LKSP |
| UNCL PRIn [] | AUX 32 UNCL PRIN |
| USp [] | AUX 34 USP [] |
| VAL [] | AUX 15 VAL [] |
| VAL [] | AUX 15 VAL [] |

7.4.4 Control (Non-Switch) Command Formats

Control commands have no front panel or AUX equivalent. These commands are used to obtain information from the BERD 221 or to modify the remote control printer program. Table 7-4 lists the mainframe control commands. The brackets indicate commands with the associated parameters. Each command's full description appears on p. 77.

Table 7-4. Mainframe Control Command

| Command | Command |
|---------------|----------------------|
| RLSp [] | 12 RL Cnv. SIGal [] |
| CLS | LED |
| COMPator | LOCAL A |
| PRInP CLAR | MLSpag [] |
| DISp [] | PRIn SIGal |
| PCMS [] | PRInp [] |
| PRInp NUL [] | CLSpag |

Table 7-4. Mainframe Control Commands (Continued)

| Command | Command |
|-----------------|-----------------|
| PAR END (R) | REMore |
| FIRST Power (S) | SEFirst |
| GTI | SIC M Alarm |
| HELPA | SIC MAF (alarm) |
| HELP | SIC M alarm |
| HOLD | TERminal () |

7.4.5 Input Sequence

A remote command consists of an ASCII character string followed by either a carriage return (CR), a line feed (LF), or a carriage return/line feed (CR/LF). When specifying a remote control command, the following rules apply:

1. Commands may be entered in uppercase or lowercase.
2. A space must be inserted between the command name and a parameter.
3. Entering a CTL C (Control C) or a CTL X (Control X) prior to issuing a CR or LF cancels the input line. (CTL C also aborts all printing.)
4. Entering a CTL H (Control H) or a BACKSPACE erases the last character entered. This is available for RS-232 controllers only.
5. Up to 20 previously entered commands can be recalled by using the ESC key. When the number of previously sent commands exceeds 20, the earliest command entries are overwritten. This is available for RS-232 controllers only.

After receiving a carriage return or a carriage return/line feed sequence, the TBF key (2) only as the digital input buffer. It checks for detector parity errors, framing errors, and synchronization errors. If an error is detected, the appropriate error message is returned to the controller. If an error is detected, the error message is generated.

If ECHO is enabled, the entered character string is echoed back to the controller. If the PROMPT command is enabled, the default prompt (\$) or a user-defined prompt is used to indicate that the previous command has been processed and that the TBF (2) is ready to accept additional commands.

NOTE

The TBF command is available only when ECHO or PROMPT is enabled. The output of the TBF command is generated. With either the PROMPT or ECHO feature enabled, any characters sent to the terminal will be echoed to the remote control unit. The prompt and its function are only applicable for RS-232.

7.4.6 Output Sequence

The following rules apply for remote control and printer port outputs:

1. Remote control outputs have a higher priority than printer outputs. A printer output is halted (suspended) if a remote control output becomes available. Printer output resumes after the remote control output has been sent.
2. The HOLD command holds all printer output until the RELEASE command is received. It is only applicable for RS-232.

the **HOLD** command is sent and the prompt is **OK**, the prompt character changes to **CTC** to indicate that data is waiting to be printed. When the **REL** command is sent, the default prompt (P) or the user-defined prompt is retained. Note that the remote control output format field:

3. **CTL S** suspends all printer output. Sending a **CTL Q** releases the printer output suspended by the **CTL S**. These control characters only apply for RS-232.
4. Sending a **CTL C** clears the entire printer FIFO.

8.4.2 T1 Timing Slip

| Parameter | | Specification |
|----------------------|------------|------------------------------------|
| Count | Resolution | 1 frame slip |
| | Range | 0 to 999 frame slips |
| Bar Graph | Resolution | 16 bit slips |
| | Range | -192 bit slips |
| Wheel | Resolution | 1 bit slip |
| | Range | ±8 bit slips |
| Timing Slip Printer | Resolution | 1 frame slip |
| | Range | 0 to 999 frame slips |
| Slip Analysis Search | Resolution | 1 second |
| | Range | 0 to 99999.9 seconds (±1.1% delay) |

8.4.3 VF Frequency & Level

| Parameter | | Specification |
|---------------------------|------------|--|
| Frequency | Accuracy | ±1% Hz |
| | Resolution | 1 Hz |
| | Range | 20 Hz to 3904 Hz at ±0.0 dBm to -40 dBm 3100 Hz to 3904 Hz at ±0.0 dBm to -60 dBm |
| Level | Range | -5 dBm to -75 dBm |
| | Accuracy | ±0.5 dB |
| | Resolution | 0.1 dB |
| Level VF Option Installed | Accuracy | ±0.5 dB |
| | Resolution | 0.1 dB |
| | Range | -5 dBm to -70 dBm |
| Level VF Option Installed | Accuracy | ±0.5 dB |
| | Resolution | 0.1 dB |
| | Range | -5 dBm to -70 dBm |

8.4.4 VF Parameters — VF Option Installed

| Parameter | | Specification |
|-----------|------------|-------------------|
| Frequency | Accuracy | ±1% Hz |
| | Resolution | 1 Hz |
| | Range | 20 Hz to 3904 Hz |
| Level | Range | -5 dBm to -70 dBm |
| | Accuracy | ±0.5 dB |
| | Resolution | 0.1 dB |

8.4.5 VF Measurements — VF Option Installed

| Parameter | | Specification |
|---|-----------------|---|
| Signal-to-Noise Ratio | Accuracy | ±0.2 dB |
| | Resolution | 1 dB |
| | Range (minimum) | 0 dB to 45 dB |
| C Message Noise | Range (minimum) | -22 dBmC to 93 dBmC |
| | Accuracy | ±1 dBmC |
| C Noise Noise | Range (minimum) | 29 dBmC to 83 dBmC |
| | Accuracy | ±1 dBmC |
| 3 kHz Flat Noise | Range (minimum) | 29 dBm to 93 dBm |
| | Accuracy | ±1 dBm |
| 3 kHz-Satch Noise (not 100Hz-5470Hz (new only)) | Range | 20 dBm to 93 dBm |
| | Accuracy | ±1 dBm |
| Return Loss (RL) | Range | 3 dB to 50 dB |
| | Accuracy | ±0.5 dB |
| Standing Wave Ratio (Hybrid SWR) (HSRL-LD) | Range | 1.1 to 50 dB |
| | Accuracy | ±0.5 dB |
| | Range | 0.7 PAR ratio to 1.2 PAR ratio |
| Peak-to-Average Ratio (PAK) | Accuracy | ±2 PAR ratio between 40 PAR and 110 PAR and greater than 110 PAR |
| | Range | +4 PAR ratio between 0.3 PAR and 40 PAR |
| PAK Level | Range | +1.0 dBm to +60.0 dBm |
| | Accuracy | ±0.5 dBm between +31.0 dBm and +60.0 dBm |
| | Accuracy | ±0.7 dBm between +10.0 dBm and +31.0 dBm |
| DC Offset (not VFF 7.5) (new only) | Range | -120 mV to +120 mV |
| | Accuracy | ±10% error of display when less than 100 mV and ±10% error when greater than 100 mV |
| | Resolution | 1 mV |

8.4.6 Simplex Current — BERT Option Installed

| Parameter | Specification |
|---------------------|---------------------------|
| Range | 0 mA to 250 mA |
| Resolution | 1 mA |
| Accuracy | ±2% from 0 to 100 mA |
| | ±3% from 100 mA to 250 mA |
| Switch Voltage Drop | 0.00 to 0.05 V at 50 mA |
| | 0.00 to 0.20 mV at 10 mA |

8.4.7 Digit and Digits Frequency & Level Measurement

| Parameter | | Specification |
|-----------|------------|---|
| Frequency | Accuracy | ± 1 Hz or 0.1% |
| | Resolution | 1 Hz |
| | Range | ± 5 V |
| Level | Range | -45 to 35 dBm |
| | Accuracy | ± 0.5 dB |
| Level | Resolution | 0.1 dBm |
| | MF Range | ± 5 dB, high frequency over low frequency |
| Level | DCMF Range | +4.0 dB to -5.0 dB, high frequency over low frequency |

8.4.8 Caller ID Option Measurements

| Parameter | | Specification |
|--------------------|------------|---------------------------|
| Mark ID Frequency | Accuracy | ± 1 Hz or $\pm 0.1\%$ |
| | Resolution | 1 Hz |
| | Range | 1158 to 1212 Hz |
| Space ID Frequency | Accuracy | ± 1 Hz or $\pm 0.1\%$ |
| | Resolution | 1 Hz |
| | Range | 2188 to 2232 Hz |
| Mark ID Level | Range | -20 to -35 dBm |
| Space ID Level | Range | -10 to -25 dBm |
| Level | Resolution | 0.1 dBm |

B.5 ALARM CRITERIA

| Parameter | Specification |
|--------------|--|
| Signal Level | Signal is detected if a series of 150 consecutive zero bits are detected for DFD, B2, and D4 |
| Signal Level | Signal is detected if a series of 150 consecutive zero bits are detected for B2 |
| Signal Level | Signal is detected if a series of 150 consecutive zero bits are detected for B2 |
| BZS | BZS level is not detected for 150 ms |
| Excess Zeros | If 150 consecutive zeros are detected |

SECTION 8 - SPECIFICATIONS
Test Patterns -- T1 BERT Option

| | |
|-------------------|---|
| Yellow Alarm | If D3, D7, D4, and S17=0, a yellow alarm is declared when bit 2 set to '1' for 255 consecutive DSI channels. |
| Red Alarm | If FSI and PSI=0, a yellow alarm is declared when 255 bits of bit 4 in bit of a 60 bit row (FD00, 36) appears in the test link. |
| RES | 2.45 consecutive red-0's. |
| Pattern Sync Loss | 20 or more errors expected in 1000 or fewer bits. |

8.6 TEST PATTERNS -- T1 BERT OPTION

8.6.1 Pattern Definitions

| Pattern | Definition |
|------------------------|--|
| 117 | 10100101. Pattern is aligned with framing (F1) patterns as indicated. |
| 2 ¹⁵ -1 | 2 ¹⁵ -1 bit pseudorandom. |
| 2 ¹⁵ -1 INV | Inverted 2 ¹⁵ -1 bit pseudorandom. |
| 2 ²⁰ -1 | 2 ²⁰ -1 bit pseudorandom. |
| 2 ²³ -1 | 2 ²³ -1 bit pseudorandom. |
| 3 IN 24 | Four to thirty-two bit run-length limitation. Pattern's alignment with framing (F1) patterns as indicated. |
| 73 | 2 ⁷ -1 bit pseudorandom. |
| 5-1 | 2 ⁵ -1 bit pseudorandom. |
| 2047 | 2 ¹¹ -1 bit pseudorandom. |
| BRI32CAP | Automated 32-bit patterns sequence with varying density of ones and zeros (see Table 8-1). ALL QSSS, 1 in 1, 2 in 2, 3 in 3, 2 in 4, 2 in 5, 2 in 6, 2 in 7, 2 in 8, 2 in 9, 2 in 10, 2 in 11, 2 in 12, 2 in 13, 2 in 14, 2 IN 15, 2 IN 16, 3 IN 20, 3 IN 21, 3 IN 22, 3 IN 23, 3 IN 24, and QSSS. |
| MULTIPAT | Automated 8-pattern sequence that includes: ALL, QSSS, 1, 7, 2 IN 8, 3 IN 24, and QSSS. |
| ALL ONES | All ones (0111s). |
| ALL ZEROS | All zeros (1111s) except the first bit. BSZS ending in BSZS BPS sequence of 000123456789 pattern of 10 bits. ZBIS ending in ZBIS BPS sequence of 000123456789 pattern of 10 bits. |
| 2481 | 25% zero margin (one maximum ones density) |
| 1482 | 20% zero margin (one density) |
| 1483 | Single zero with medium ones density |
| 1184 | Single one with medium ones density |
| DD53 | Diode 1, 2, 3, and 4 |
| EDS6 | Five ones followed by one of 11111 followed by one cycle of 111111 |
| LQSS | QSSS pattern of 2 ¹⁵ -1 with zero suppression |
| U-PR | 2 ¹⁵ ones with pattern of 1 pattern factory default: 01600. |
| 318-MAX | 31 bit test vector sequence of 42989 bit test vector sequence (see Appendix D) |
| 11-27PRP | 40 octet HEX pattern (see Appendix D) |
| 11-3 | 54 octet HEX pattern (see Appendix D) |
| 11-4 | 120 octet HEX pattern (see Appendix D) |
| 11-5 | Unframed 84 octet HEX pattern (see Appendix D) |
| 11-12ALY | Frased 5 th octet HEX pattern (see Appendix D) |
| 11-12 OCT | Unframed 5 th octet HEX pattern (see Appendix D) |

8.6.2 Pattern Sync Detection Criteria

| Pattern | Definition |
|------------------------|--|
| Loop Pattern | 25 consecutive error-free bits (AT1, CINES, 1, 3, 3 IN 24, programmable 3- to 25-bit pattern - AT1, ZIR0, D050, D054, D055). |
| D051, D052, D056 | 8-20 consecutive error-free bits |
| MINMAX | 220 consecutive error-free bits |
| Randomization Patterns | 30 - 90 consecutive error-free bits for a pattern length of 25-1. For QRSS, n = 20 (QRSS, 02 - 3, 1, 2047, 2048-1, 2049-1, 2049-1, and 2049-1). |

8.7 LOOP CODES — T1 BERT OPTION

8.7.1 Loop Code Generation and Detection Patterns

| Type | Equip/Loc | Bit Pattern | | Description |
|----------|------------|-------------------|-------------------|---|
| | | Loop Up | Loop Down | |
| T1 | CSI | 10000 | 10 | Customer Service Unit loop codes. |
| | FAC1 | 1100 | 1111 | In-band 5-bit Facility or network or smart jack loop codes. |
| | FAC2 | 11000 | 1100 | In-band 5-bit Facility or network or smart jack loop codes. |
| | PROGRAM | 10001 | 110 | 3- to 8-bit programmable loop codes. |
| | INB-1LN | 01110000 | 01001110 | INB-in-band line loop codes. |
| | INB-1LN | 01110000 | 01001110 | INB-out-of-band line loop codes. |
| | INB-1LN | 01110000 | 01001110 | INB-out-of-band line loop codes. |
| | INB-6BIT | 100000 | 1000 | In-band 6-bit Facility or network or smart jack loop codes. |
| | INB-6BIT | 100000 | 1000 | In-band 6-bit Facility or network or smart jack loop codes. |
| | INB-6BIT | 100000 | 1000 | In-band 6-bit Facility or network or smart jack loop codes. |
| DSX-SFT | DSX | Note ¹ | Note ² | Interline Office Cross-Connect Codes. |
| | DSX-6BIT | Note ¹ | Note ² | Interline Office Loop, In-Connect Codes. |
| | DSX-6BIT | Note ¹ | Note ² | Interline Office Repeater Programmable Command Codes. |
| | IR | Note ¹ | Note ² | Integral Line Repeater Codes. |
| | IR-CMD | Note ¹ | Note ² | Integral Line Repeater Command Codes. |
| | IR-PRG | Note ¹ | Note ² | Integral Line Repeater Programmable Command Codes. |
| | DSX-SWITCH | Note ¹ | Note ² | DSX Maintenance Switch Switch Code. |
| | DSX-SWITCH | Note ¹ | Note ² | DSX Maintenance Switch Reset Code. |
| | DSX-SWITCH | Note ¹ | Note ² | DSX Maintenance Switch Command Codes. |
| | DSX-SWITCH | Note ¹ | Note ² | DSX Maintenance Switch Command Codes. |
| DSX-ALT | OCF | 0100101 | N/A | Alternating Office Channel Loop codes. |
| | IR-1LN-IR | 0100101 | N/A | Alternating Office Channel Loop codes. |
| | IR-6BIT | 0100101 | N/A | Alternating High-Speed Channel Loop codes. |
| | DSX | 0100100 | N/A | Alternating Data Service Unit Loop code. |
| | CHAN-IR | 0100100 | N/A | Alternating Channel Service Unit Loop code. |
| | CHAN-IR | 0100100 | N/A | Alternating Channel Service Unit Loop code. |
| | CHAN-IR | 0100100 | N/A | Alternating Channel Service Unit Loop code. |
| ISY-REPR | 1LN-REPR | N/A | | Alternating First Line Loop Repeater Loop code. |
| | 2LN-REPR | 0100100 | N/A | Alternating Second Line Loop Repeater Loop code. |

SECTION 8 - SPECIFICATIONS

Signaling Parameters - V/F/Signaling Option

| Type | Equip/Loc | Bit Pattern | | Description |
|---------|-----------------|-------------------|-------------------|--|
| | | Loop Up | Loop Down | |
| DCS-LAT | CL | Note ¹ | Note ¹ | Latching Office Closure - Use loop code |
| | CHGSM | Note ¹ | Note ¹ | Latching Channel Service Unit loop code |
| | DSO-D | Note ¹ | Note ¹ | Latching DSO-Dataset loop code |
| | LOCATION 1 to 5 | Note ¹ | Note ¹ | When more than one DSO-DP is present, select the location of the DSO-DP from 1 to 5. |
| | LSI | Note ¹ | Note ¹ | Latching Line Side Interface - J11 2220 loop code |
| | NI | Note ¹ | Note ¹ | Latching Network Elements Interface and Address TM repeater and loop code |
| | DS | Note ¹ | Note ¹ | Latching Data Service Unit loop code |

1. Same as Loopback/Command Codes - Option required per the manufacturer specifications.
2. x = success framing bit when the byte is transmitted or received as a DSOB or DSQA (9.2 kbit/s signal). Framing bit pattern determined by DSOB or DSQA (9.2 kbit/s data rate).
 x = a "0" in "x" mode when the byte is received at a DSQA or vice versa, except DSQA (9.2 kbit/s).
 x = a "1" when the byte is transmitted at a DSQA or vice versa, except DSQA (9.2 kbit/s).
 x = a "0" when control codes (except IDLE) are transmitted at the DSQA (56 kbit/s rate).
 x = a "0" in "x" mode when control codes (except IDLE) are received at the DSQA (56 kbit/s rate).
 x = a "1" when the IDLE code is transmitted or received at the DSQA (56 kbit/s rate).
3. As described in TR TSY900476, Issue 3, April 1987.
4. As described in TR OPT 900151.

8.7.2 Loop Code Detection Criteria

| Parameter | Specification |
|----------------------------|--|
| Loop Band Loop Codes | Each set of 17 codes received by the receiver within a period of 10 seconds per loop up and loop down. |
| TSP One of Band Loop Codes | Dual half-duplexed code - 25 ms (30 loop codes) loop up and loop down. |

8.8 SIGNALING PARAMETERS — V/F/SIGNALING OPTION

8.8.1 Digit Receiving Templates

| Parameter | Specification | |
|-----------|----------------|--------------------|
| DTMF | Frequency | ±0.1% accepted |
| | Level | ±0.2 dBm per tone |
| | Digit Duration | ±0.1 ms per tone |
| | DTF Timing | minimum 40 ms |
| MF | Frequency | ±0.1% accepted |
| | Level | ±0.25 dBm per tone |
| | Digit Duration | minimum 30 ms |
| | DTF Timing | ±0.1 ms per tone |

| | | |
|----|-------------------|-----------|
| | Pulses Per Second | 7 to 21 |
| HP | Break | 40 to 65% |
| | RI Timing | 2500 ns |

8.8.2 Receive Supervision Measurement Parameters

| Parameter | | Specification |
|-----------|----------|---------------------|
| Wink | Delay | 0 to 16 seconds |
| | Duration | 70 ns to 600 ns |
| Busy Dial | Delay | 0 to 16 seconds |
| | Duration | 80 ns to 600 ns |
| HP Break | Delay | 0 to 60 seconds |
| | Duration | Greater than 100 ns |

8.9 SIGNAL INTERFACES

8.9.1 External Clock Interface

| Parameter | Specification |
|---------------------|--|
| Connector Type | 4NC Pin Header, 1.27 mm |
| Logic Impedance | 75 ohms ±5% |
| Logic Configuration | pin 1 is ground, pin 2 is master is signal, pin 3 is slave is signal |
| Signal Voltage | 0.8 to 1.2 V |
| Signal Level | Level is standard 5V |
| Clock Width, Rise | 2.5 ps/pin maximum |
| | 20 ps/pin maximum |
| Clock Frequency | 1.50 MHz to 500 kHz |

8.9.2 RS-232 Printer/Remote Interface

| Parameter | Specification |
|--------------------------|---------------------------------|
| Connector Type | 9NC Pin Header, 2.54 mm |
| Connector Configuration | DTE |
| Connector Pin Assignment | See Table 8-1 |
| Character Format | 7 or 8 data bits (ASCII coding) |

Table 8-1. RS-232 Pin Assignment

| Pin No. | Signal Description | Function |
|---------|-----------------------------------|--|
| 1 | Protective Ground | Connected to chassis ground |
| 2 | Transmit Data (TXD) | T-BIRD 224 receiver data on this lead |
| 3 | Receive Data (RXD) Data | T-BIRD 224 transmits data on this lead |
| 4 | Request to Send (RTS) | This lead is ignored by the T-BIRD 224 |
| 5 | Clear to Send (CTS) | T-BIRD 224 sets this lead to the ON (HIGH) state when the unit is ready to accept another character from the transmitting device. Fast devices, like computers, need to monitor this line before transmitting additional data. |
| 6 | Data Set Ready (DSR) | T-BIRD 224 sets this line to the ON (HIGH) state whenever power is applied to it |
| | Signal Ground | Connected to signal ground |
| 8 | Receive Line Signal Detect (RLSD) | T-BIRD 224 sets this line to the ON (HIGH) state whenever power is applied to it |
| 9 | Pos. DC Test Voltage | This lead provides +12 Vdc (RS-232 ON) or use in strapamp signaling lead-ON. |
| 10 | Neg. DC Test Voltage | This lead provides -12 Vdc (RS-232 OFF) or use in strapamp signaling lead-OFF. |
| 12 | Sec. RTS | T-BIRD 224 sets this lead ON (HIGH) when sender data in its CPU is ready to print |
| 11 | Data Terminal Ready (DTR) | When this lead is set ON (HIGH) by the receiving device, the T-BIRD 224 transmits data |

8.9.3 Test Points

| Parameter | Specification |
|---------------------------------|--|
| Base Voltage (V _{BE}) | 0.7 V at 20 mA |
| Logic 0 Input (On Hook) | Close to ground |
| Logic 1 Input (Off Hook) | 0.5 V at 1.0 V |
| Logic 1 Input (On Hook) | Open circuit |
| Input Current | -1.5 mA maximum at 0 V +1.0 mA maximum at +3 V |
| Logic 1 Output (On Hook) | 0.0 V to 4.5 V |
| Logic 0 Output (On Hook) | +1.0 V source current (100 mA sink current) |
| Logic 1 Output (Off Hook) | +1.0 V source current (100 mA sink current) |
| Logic 0 Output (Off Hook) | +0.0 V sink current (100 mA source current) +0.9 V sink current (100 mA source current) |
| Comments | Apply Form 5, Designation S22, Table 8-2 for pin assignments |

Table 8-2. T-BERD 224 Test Points Pin Assignment

| Pin No. | Input/ Output | Pin Name | Description |
|---------|------------------|------------------------------|--|
| 1 | O | Line 1 Signaling Bit D | Active High |
| 2 | O | Line 1 Signaling Bit B | Active High |
| 3 | O | Line 1 Signaling Bit C | Active High |
| 4 | O | Line 1 Signaling Bit A | Active High |
| 5 | O | Line 1 RCV | One bit wide, active low |
| 6 | I | Insert Signaling Bit D | Active High (DSX) or Low (OFF) |
| 7 | I | Insert Signaling Bit C | Active High (DSX) or Low (OFF) |
| 8 | I | Insert Signaling Bit B | Active High (DSX) or Low (OFF) |
| 9 | I | Insert Signaling Bit A | Active High (DSX) or Low (OFF) |
| 10 | I | Enable Insert Signaling Bits | Active Low |
| 11 | O | Line 2 RCV | One bit wide, active low |
| 12 | NC | | |
| 13 | O | Line 1 VLS | Active Low |
| 14 | O | Line 1 Yellow Alarm | Active High |
| 15 | O | Line 1 Lane Sync | Active High |
| 16 | O | Line 1 CR Error | Active High for 7 + 1 insertion errors per each LRCU error |
| 17-19 | NC | | |
| 20 | O | Line 2 Signaling Bit D | Active High |
| 21 | O | Line 2 Signaling Bit C | Active High |
| 22 | O | Line 2 Signaling Bit B | Active High |
| 23 | O | Line 2 Signaling Bit A | Active High |
| 24-30 | NC | | |
| 31 | I | Line 2 RCV | Active Low |
| 32 | I | Enable Yellow Alarm | Active High |
| 33 | I | Line 2 Lane Sync | Active High |
| 34-36 | NC | | |
| 37 | | Signal Ground | |

8.9.4 VE 2-Wire & 4-Wire Interface

| Parameter | Specification |
|-----------------------|--------------------|
| Channels | Channels: 2 each |
| Loss (dB/ft) | 20 dB/100m |
| Maximum Loss in Cable | Greater than 20 dB |

VALUETRONICS
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MECHANICAL SPECIFICATIONS

Signal Interface:

| | | |
|------------------|----------------------------|--|
| VF 4 Wire Output | Connector | WLC70 319 jack |
| | Driver | 600 ohms with a minimum 28 dB return loss from 80 Hz to 3400 Hz |
| | Frequency Response | +20.25 dB @ 50 Hz to 3000 Hz +1.25 dB to -1.5 dB (3000 Hz to 3400 Hz) |
| | Tracking Distortion | +0.5 dB @ 1 dBm to -40 dBm |
| | Relative to 1000 Hz | +0.6 dB @ 40 dBm to -20 dBm |
| | Clipping Point | -1.6 dB @ 50 dBm to -2.5 dBm |
| VF 4 Wire Input | Connector | WLC70 319 jack |
| | Driver | 600 ohms with a minimum 28 dB return loss from 80 Hz to 3400 Hz |
| | Frequency Response | +20.25 dB @ 50 Hz to 3000 Hz +1.25 dB to -1.5 dB (3000 Hz to 3400 Hz) |
| | Tracking Distortion | +0.5 dB @ 1 dBm to -40 dBm |
| | Relative to 1000 Hz | +0.6 dB @ 40 dBm to -20 dBm |
| | Clipping Point | -1.6 dB @ 50 dBm to -2.5 dBm |
| VF 4 Wire Input | Transmission Level Points | 0 dBm to -10 dBm |
| | Clipping Point | +3 dBm to 0 dBm |
| | Signal to Distortion Ratio | 30 dB minimum to -20 dBm |
| | Harmonic Noise | 18 dBm @ maximum |

1. Relative to 1000 Hz, +10 dBm

2. Measured with G-message weighting and with G-message, 0.1 dB filter.

8.9.5 DS0 Bipolar Interface

| Parameter | | Specification |
|----------------|------------------------|---|
| Bipolar Logic | Connection | Bentley jacks |
| | Impedance | 75 Ω standard |
| | Operating Signal Level | 3.0 V to 5.0 V peak |
| | Cable Length | 1500 feet (457 meters) of 24-gauge maximum |
| Bipolar Output | Data Rate | 60 kbps |
| | Connection | Bentley jacks |
| | Test Load Impedance | 75 Ω ohms, resistive |
| | Power Available | 0.01 W (20.5 mW) @ 0 dBm (power available @ 0.25 V) |
| | Zero Current Level | 0.2 V, maximum |
| | High Level Impedance | 75 Ω ohms, minimum, 2.5 ohms maximum with a reflection coefficient of 0.2 power loss |
| | Low Level Impedance | 75 Ω ohms, minimum, 2.5 ohms maximum |
| Data Format | NRZ-L or NRZ | |

| | | |
|-----------|-------|---|
| Tx Clocks | Pin 1 | +5 V, at 19 mA maximum |
| | Pin 2 | Ground |
| | Pin 3 | Tx (User) Bit Clock (TTL level) into 50 ohms |
| | Pin 4 | Tx (User) Byte Clock (TTL level) into 50 ohms |
| | Pin 5 | Flashing |
| | Pin 6 | Tx (User) Byte Clock - differential |
| | Pin 7 | Rx (User) Byte Clock - differential |
| | Pin 8 | Rx (User) Bit Clock - differential |
| | Pin 9 | Rx (User) Bit Clock - differential |
| Rx Clocks | Pin 1 | +5 V, at 100 mA maximum |
| | Pin 2 | Ground |
| | Pin 3 | Rx (User) Bit Clock (TTL level) into 50 ohms |
| | Pin 4 | Rx (User) Byte Clock (TTL level) into 50 ohms |
| | Pin 6 | Rx (User) Byte Clock - differential |
| | Pin 7 | Rx (User) Byte Clock - differential |
| | Pin 8 | Rx (User) Bit Clock - differential |
| | Pin 9 | Rx (User) Bit Clock - differential |

8.9.6 IEEE-488 Printer Interface

| Parameter | Specification |
|---------------------------|---------------------------|
| Connector Type | 25-pin D type |
| Connector Configuration | As shown on the talk only |
| Connector Pin Assignments | As shown on the talk only |
| Maximum Transfer Rate | 100 Kbps |
| Connector Shielding | IEEE 488 - CR12 |

Table 8-3. PRINTER IEEE-488 Connector Pin Assignments

| Pin No. | Description | Pin No. | Description |
|---------|--------------------------|---------|----------------------------|
| 1 | Data In/Out 1 (DI/O1) | 13 | Data In/Out 5 (DI/O5) |
| 2 | Data In/Out 2 (DI/O2) | 14 | Data In/Out 6 (DI/O6) |
| 3 | Data In/Out 3 (DI/O3) | 15 | Data In/Out 7 (DI/O7) |
| 4 | Data In/Out 4 (DI/O4) | 16 | Data In/Out 8 (DI/O8) |
| 5 | Line Identify (LI) | 17 | Ready to Enable (RLE) |
| 6 | Data Valid (DV) | 18 | Ground - shield pin for 2 |
| 7 | Not Ready for Data (NRD) | 19 | Ground - shield pin for 3 |
| 8 | Not Data Accepted (NDA) | 20 | Ground - shield pin for 8 |
| 9 | Interrupt Request (IR) | 21 | Ground - shield pin for 6 |
| 10 | Service Request (SRQ) | 22 | Ground - shield pin for 10 |
| 11 | Attention (ATN) | 23 | Ground - shield pin for 11 |
| 12 | SELE0 | 24 | Shield Gnd |

8.9.7 DSU-DP Option Interfaces

8.9.7.1 RS-232 Interface

| Parameter | Specification |
|---------------------------|--|
| Connector | 25-pin D-type female |
| Connector Pin Assignments | See Table 8-4 |
| Data Rates | Primary: 24, 48, 96, 192, 384, or 768 cbs. Secondary: 0, 120, 240, 480, 960, or 1920 kbs. |
| Data Polarity | Mark (binary 1): +3 V to +25 V Space (binary 0): -3 V to -25 V |
| Drivers ¹ | Low level: -10 V to -5 V, typical High level: +9 V to +15 V, typical |
| Slew Rates ² | Clock and data: 0 V/nsec to 500 V/nsec Signal type: 0 V/nsec to 500 V/nsec, typical |
| Send Circuit Current | +12 mA, maximum |
| Receivers | Input impedance: 300 to 5000 ohms Input thresholds: -2 V and +1 V |
| Input Voltage | -25 V to maximum |

1. These data rates exceed the data rate limitations recommended by RS-232 and V.24. However, the RS-232 connector can still be used, but with results of increased line distortion and clock data skew.
2. Output levels into 300-ohm load.
3. Into 200-ohm resistor load.

Table 8-4. DSU-DP RS-232 Connector Pin Assignment

| Pin No. | Signal Description | Signal Status |
|---------|-----------------------------|----------------|
| 1 | Control Ground | Control Ground |
| 2 | Parity Data | Input |
| 3 | Received Data | Output |
| 4 | Request to Send | Input |
| 5 | Clear to Send | Output |
| 6 | Data Set Ready | Output |
| 7 | Signal Ground | Signal Ground |
| 8 | Received Error Signal (ACK) | Output |
| 9 | +12 V | Output |
| 10 | +5 V | Output |
| 15 | Parity (New) and Data (New) | Output |
| 16 | Secondary Received Data | Output |
| 17 | Secondary Send Enable (New) | Output |
| 18 | Secondary Received Clock | Output |

1. Non-standard pin configuration.

8.9.7.2 V.35 Interface

| Parameter | | Specification |
|---------------------------|------------------------|--|
| Connector | | 34 pin female |
| Connector Pin Assignments | | See Table 8-5. |
| Data Rates | Primary | 2, 4, 8, 9.6, 19.2, 56, or 64 kbps |
| | Secondary | 6, 12, 18, 24, 36, 48, 72, 96, or 2,068 kbps |
| | 56xN | 56 kbps to 1,344 Mbps (x56 kbps increments) |
| | 64xN | 64 kbps to 5,300 Mbps (x64 kbps increments) |
| Control Polarity | 00b | "A" lead negative, with respect to the "B" lead |
| | 01b | "A" lead positive, with respect to the "B" lead |
| Data Polarity | Mark (binary 1) | "A" lead negative, with respect to the "B" lead |
| | Space (binary 0) | "A" lead positive, with respect to the "B" lead |
| Signaling Polarity | ON | Greater than +3 V |
| | OFF | Open, or less than -3 V |
| Data and Clock Drivers | Source Impedance | 70 ohms to 250 ohms |
| | Resistance | 20 ohms to 5 ohms |
| | Rise Time | Less than 40 nanoseconds (into a 100-ohm resistive load) |
| | Short-Circuit Current | Less than 100 mA, maximum |
| | Signal Swing | ±0.5 V into 100-ohm |
| Data and Clock Receivers | Input Impedance | 100 ohms to 10 ohms |
| | Resistance | 50 ohms to 5 ohms |
| | Input Hysteresis | 70 mV, typical |
| | Slew Rate | 50 V/ns (minimum) (into 100-ohm resistive load), typical |
| | Propagation Delay | 0.1 ns (maximum), plus 5 ns (connector) |
| Signaling Driver | High-Z Output Current | ±25 mA |
| | Gate Voltage Tolerance | 300 ohms typ. min |
| | Input Impedance | 300 ohms typ. min |
| Signaling Receivers | Input Impedance | 300 ohms typ. min |
| | Maximum Input Range | -25 V |

1. All pins should be tied to ground.

Table 8-5. DSU-DP V.35 Connector Pin Assignment

| Pin No. | Signal Description | Signal Status |
|---------|------------------------------|---------------|
| A | Positive ground | Common Ground |
| B | Transmit Data | Signal Input |
| C | Receive Data | Input |
| D | Control send | Output |
| E | Control receive | Output |
| F | Reverse time channel control | Output |
| G | See Table 8-5A | None |
| H | Receive data (A) | Output |
| S | Send data (B) | Input |
| I | Reverse data (B) | Output |
| V | Send clock receive (A) | Output |
| X | Send clock receive (B) | Output |
| Y | Send clock receive (C) | Output |

Table 8-5. DSU-DP V.35 Connector Pin Assignments (Continued)

| Pin No. | Signal Description | Signal Status |
|---------|---|---------------|
| a | Serial clock transmit (B) | Output |
| d | Secondary receive data (A) | Output |
| f | Secondary receive data (B) | Output |
| h | Secondary serial clock receive (V) | Output |
| k | Secondary serial clock receive (B) | Output |
| l | Secondary receive line signal indicator | Output |

1. See standard pin configuration.

8.9.7.3 RS-449 Interface

| Parameter | | Specification |
|---------------------------|------------------|--|
| Connector | | 15-pin D-type, female |
| Connector Pin Assignments | | See Table 8-6. |
| Impedance | | 110 ohms, minimum |
| Data Rates | Primary | 2.4, 4.8, 9.6, 19.2, 36, or 64 kbs |
| | Secondary | 0.143, 0.286, 0.571, 1.143, or 2.286 kbs |
| | 25°C | 56 kbs to 1.344 kbs in 56 kbs increments |
| | 0°C | 64 kbs to 1.536 kbs in 64 kbs increments |
| Polarity | Mark (logic 1) | A lead more negative than "B" lead |
| | Space (logic 0) | B lead more negative than "A" lead |
| Clock Polarity | Transmit (A) | "A" lead more negative than "B" lead |
| | Receive (B) | "B" lead more negative than "A" lead |
| Signaling Format | None | "A" lead more negative than "B" lead |
| | ON | "B" lead more negative than "A" lead |
| Impedance ¹ | | 95 ohms |
| Mean Circuit Current | | 1150 mA |
| Output Differential | Swing | 2 V minimum differential impedance (20% of lead) |
| | Rise Time | 20 nanoseconds (maximum) |
| Data and Clock Receivers | Input Resistance | 20 ohms ±10% |
| | Input Impedance | 20 ohms |
| | Input Voltage | ±25 V (additional) |

1. Data, Clock, and Signaling at 2000 bps.

Table 8-6. DSU-DP RS-449 Connector Pin Assignments

| Pin No. | Signal Description | Signal Status |
|---------|----------------------------|----------------|
| 1 | Shield | Class 1 Ground |
| 2 | Secondary receive data (A) | Output |
| 4 | Serial data (A) | Input |
| 5 | Serial timing (A) | Output |
| 6 | Receive data (A) | Output |

Table 8-6. DSU-OP RS-449 Connector Pin Assignment (Continued)

| Pin No. | Signal Description | Signal Status |
|---------|---|---------------|
| 1 | Request to send (A) | Input |
| 3 | Receive ready (A) | Output |
| 4 | Clear to send (A) | Output |
| 11 | Transmit ready (A) | Output |
| 17 | Receiver ready (A) | Output |
| 23 | Secondary receive data (A) ¹ | Output |
| 19 | Signal ground | Signal Ground |
| 29 | Receive enable | Signal Ground |
| 21 | Secondary receive data (B) ¹ | Output |
| 12 | Send data (B) | Input |
| 25 | Send enable (B) | Output |
| 24 | Receive data (B) | Output |
| 25 | Request to send (B) | Input |
| 26 | Receive enable (B) | Output |
| 27 | Clear to send (B) | Output |
| 29 | Data reset (B) | Output |
| 31 | Receiver ready (B) | Output |
| 32 | Secondary receive ready (A) | Output |
| 33 | Secondary receive enable (B) | Output |
| 34 | Secondary receive ready (B) | Output |
| 37 | Signal common | Signal Ground |

¹ Non-standard pin configuration

8-18. GROUNDING

| Location | Connection |
|----------------------------|--|
| Chassis and Signal Ground | Tied together. |
| Barric and 3-0 Rack Straps | Connected to chassis ground. |
| Power Cord Ground | Connected to chassis ground. |
| 25-pin D-type Connector | Pin 1 connected to chassis ground. Pin 7 connected to signal ground. |
| Optional RS3 Connector | Pin 1 connected to chassis ground. Pin 2 and 3 connected to signal ground. |
| Test Point Connector | Pin 1 connected to signal ground. |
| DSU Data Connector | Shield connected to chassis ground. Pin 2 connected to signal ground. |
| DSU RS-449 Connector | Shield connected to chassis ground. Pin 2 connected to signal ground. |
| HMI RS-449 Connector | Shield connected to chassis ground. Pin A connected to chassis ground. Pin B connected to signal ground. |

SECTION 8 - SPECIFICATIONS

SONET/DS3 Analyzer Option Specifications

| Location | Connection |
|----------------------|--|
| RS-449 Connector | Pin 1 connected to chassis ground Pin 15 connected to signal ground |
| 4-Wire A/B Connector | Shield connected to chassis ground |

B.11 SONET/DS3 ANALYZER OPTION SPECIFICATIONS

| Parameter | | Specification |
|---|--|--|
| Physical Characteristics | | |
| Dimensions | Lead | 15.5" H x 14.7" W x 5.0" D (393 mm H x 372 mm W x 127 mm D) |
| | Printer Circuit Board | 5.5" H x 9.75" W x 6.75" D (139 mm H x 247 mm W x 171 mm D) |
| Weight | Lead | 7.5 lbs (3.4 kg) |
| | Printer Circuit Board | 0.45 lbs (0.20 kg) |
| Environment Characteristics | | |
| Temperature Range | Operating | 32° F to 113° F (0° C to 45° C) |
| | Non-Operating | -40° F to 158° F (-40° C to 70° C) |
| Humidity | Operating | 10% to 90% noncondensing |
| | Storage | 5% to 95% noncondensing |
| Mechanical Vibration | MIL-STD Standard 743 | |
| Electrostatic Discharge Susceptibility | <p>Withstand at least 10 consecutive direct static discharges of 100 pF and 5 kV to any operable accessible surface or cable without malfunction. In and out of operation occur when the device is operated 1 meter distance from any object which receives at least 300 picoseconds of static discharges of the same polarity.</p> <p>No malfunction occurs when this device is exposed from any angle of 150 degrees to any polarity and code common mode voltage of 1000 volts AC for 500 microseconds to such sources as a typical operating environment. Each type of device.</p> | |
| Electromagnetic Interference Susceptibility | <p>Supplied by Federal MIL-STD through and international</p> | |
| STS-1/DS3 Input Signal | | |
| Connectors | WFCB 560V Jack (PRIMARY) and SMA (RX) | |
| Impedance | 75 Ω ± 5% unbalanced | |
| Level | DSX-3 | 0.3 Vp (450 mV) cable attenuation from a HIGH source |
| | Cable | +6 dB to -2 dB (450 mV) of cable (from average signal level) |
| | Resistive | +6 dB to -20 dB from nominal signal level |
| Frequency | 15.44 Ms | |
| Rise/Fall | 20% | 20 ps (60% rise) to 200 ps (90%) |
| | 80% | 50 ps (60% rise) to 200 ps (90%) |
| Eye Mask | 15% (7.7) (G.R. 77) Section 5.4 | |
| Power Supplies | <p>Meets or exceeds mask specified in MIL-STD-883C and the more restrictive MIL-STD-883C. The mask is 20 dB in mask is 20 dB with a margin of 3.0 dB (up from 10 Hz to 100 kHz) and slope is +0.4 dB/decade from 2.2 kHz to 60 kHz, and an amplitude of 0.1 dB (up from 60 kHz to 200 kHz).</p> | |
| STS-1/DS3 Output Signal | | |
| Connector | WFCB 560V Jack | |
| Impedance | 75 Ω ± 5% balanced | |
| Level | DSX-3 | Nominal 0.518 Vp (2.7) |
| Frequency | 15.44 Ms | |

| Parameter | | Specification |
|-----------------------|---|---|
| Frequency | DSS | 34.736 MHz centered 419.000 |
| | STX-1 | 7.840 MHz center, minimum 20 ppm, maximum ±1.00 ppm, and B1FS ±1.00 ppm. |
| Pulse Shape | DSS | Meets ANSI T-112 and related pulse specs. |
| | STX-1 | Meets ANSI T-102 1989, Table 5 and UCC111 Recommendation 4.203, Section 5, and meets TR-NWT-000251 eye diagram mask for STSX-1 interconnection. |
| DS1 BITS Clock | | |
| Connector | Bentley | |
| Input Impedance | DSX MON 175 Ω | |
| Line Code | AMF or B8ZS | |
| Level | ±0.1 Pulses to 24 dBfs. | |
| Frequency | 1.544 MHz ±100 ppm. | |
| Pulse Shape | LAW TR-NWT-000469. | |
| Jitter | AT&T Publication 62411 | |
| DS1 Signal | | |
| Input | Area T-BERK 224 with nominal DS1 timing | |
| Output | Area T-BERK 224 with nominal DS1 timing | |

10/10/00

10/10/00

10/10/00

10/10/00

SECTION 9 TTC CUSTOMER SERVICES

9.1 INTRODUCTION

TTC offers unmatched services to support purchased equipment, including a wide range of customer care, technical support, instrument maintenance, and training services. TTC customer service specialists are fully trained to help customers find the answers they are looking for. Call Customer Services for:

- Information on products and services, including upgrades, calibration, training, software enhancement agreements (SEAs), and product maintenance agreements. Our representatives can also provide assistance with product returns and repairs.
- Expert technical support, including help with product configuration, circuit qualification, and complete network trouble sectionalization. TTC is also available on a contractual basis to provide customized application development, network consulting and management services, software customization, and test procedure development.

All TTC products are backed by an industry-leading warranty that guarantees maintenance repair or replacement for 3 years and all other parts for 1 year.

9.2 CUSTOMER SERVICE LOCATIONS

For questions regarding TTC products and services, including return authorization and repairs, technical support, training, and all other available services, contact your local distributor or TTC Customer Service at one of the locations listed below. TTC Worldwide Contact Us at the beginning of the manual.

9.3 SERVICES

9.3.1 Instrument Service

To maintain your organization's long-term investment, TTC will structure a service plan to fit your network performance goals and budget. TTC understands the impact of equipment downtime on operations and is staffed to ensure a quick turnaround. Available services include:

Product Repair — All equipment returned for service is tested to the same rigorous standards as newly manufactured equipment. This ensures product quality and performance specifications, including any applicable product updates.

Calibration — TTC utilizes the methods and ISO 9000 approval of calibration with PM to ensure that each calibrated device is precisely calibrated to the accuracy of the calibration class.

Factory Upgrades — Any unit returned for a hardware feature enhancement will also receive applicable product updates and will be thoroughly tested, ensuring peak performance of the complete feature set.

Software Enhancement Agreements — These agreements assist in keeping equipment up to date with the latest software features, by providing automatic notification of any new software enhancements and changes to the equipment.

Product Maintenance Agreements — Yearly service and calibration maintenance agreements simplify billing and help ensure the equipment is always operating at optimum levels. Product maintenance agreements can be used to extend a current warranty or provide protection for out-of-warranty units.

Other Pricing Options — For out-of-warranty repairs, TTC offers two additional pricing options: time and material pricing and flat rate pricing. Under time and material pricing, customers are billed for the actual cost of the repair, making this a cost-effective method for minor repairs. Under flat rate pricing, customers pay a fixed service charge for per unit failures (excluding damage to asset), resulting in simplified paperwork and easier budgeting.

9.3.2 Product Enhancement Group

The Product Enhancement Group staff offers one of the broadest and most experienced resource portfolios in the communications testing industry. This team of professionals offers expertise in software development, test procedure development, and network consulting, as well as years of expert test knowledge. Support is available for all core TTC product lines:

Network Consulting and Management — Provides services such as productivity analysis, test strategy assessment, on-site applications assistance, and specialized training.

Software Customization — Develops scripts for feature and automated testing, statistics, and emulation.

Test Procedure Development — Creates procedures for automated testing, network testing, and compliance testing.

9.3.3 Test Systems Field Engineering and Installation

TTC offers a range of support services for our centralized test systems, designed around the needs of the customer's network. These services help provide the investment over the life of the equipment. Available services include:

Critical Services Program — Provides technical support at any time, 7 days a week, 24 hours a day. Replacement parts are guaranteed to arrive within 48 hours of contacting TTC.

Maintenance Contracts — Cost-effective management for networks with multiple test systems.

Out-of-Warranty Service Agreement — Covers the test system for failures after the warranty expires, including all time and material costs and normal shipping costs to the customer's site.

Field Engineering and Installation Service — Provides a variety of options for implementing the test system into the network, including installation, configuration, up, tasks, and on-site technical support.

9.3.4 Technical Training

By providing both experienced instructors and a hands-on atmosphere, TTC training is designed to optimize test strategies and employee development requirements. Available services include:

Customized Technical Training — Designed to incorporate real-life challenges technicians face daily, while addressing the customer's training requirements, TTC provides training at the customer's designated site, so the whole staff is trained at one time. Step-by-step reviews of current technologies and products enable new or experienced technicians to translate theory into practical, hands-on expertise.

Public Courses — Regularly scheduled, in-depth, hands-on product and technology courses are offered worldwide. Public courses provide a learning environment that allows individuals from different companies to share their knowledge and experience with their peers.

Computer-Based Training (CBT) — TTC's CBT complements our hands-on technical training. With CBT, customers can learn about emerging communications technologies at their own convenience — at work, at home, or while traveling. TTC's CBT courses cover technology topics such as ATM, frame relay, ISDN, LAN basics, and more.

Customized Multimedia Course Development — Multimedia courseware can be created to customer specifications, making it easier to learn new test instruments or applications. These custom packages provide consistent educational content and training for the entire staff. Students learn at their own pace on their own PC.

Consulting and Needs Analysis Services — TTC can help identify training needs and develop customized training curricula to maximize learning opportunities, all while providing a measurable return on investment.

9.4 WARRANTY INFORMATION

9.4.1 Warranty Policy

All equipment manufactured by Teknor Communications/Electronics Corporation (TEC) 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 TEC.

Warranty coverage will be provided for equipment purchased from TEC and used in accordance with the original manufacturer's specifications. All other equipment, including that obtained from a reseller, is not covered by this warranty. The reseller is responsible for providing the customer with a copy of a published one-year after sales service policy. However, contact TEC Technical Services to determine your equipment's warranty status.

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

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

No other warranty is expressed or implied. TEC is not liable for any direct, indirect, incidental, or consequential damages.

9.5 SERVICE AND REPAIR INFORMATION

9.5.1 In-Warranty Service

Equipment in warranty must be returned to the factory or authorized service center with shipping prepaid. The equipment should be packed and shipped in accordance with the *Equipment Return Instructions* on page 4. Before returning any equipment, the customer must obtain a return authorization (RA) number (reference number - European Customers) by contacting TFC Customer Service (see page 1) or the TFC office serving your region (call or visit our website for a current list of worldwide TFC locations). The RA or reference number should appear on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by TFC, it is tested to any table specifications and returned to the customer with shipping prepaid. A detailed description of the work performed and parts replaced will be provided with each repair.

9.5.2 Out-of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as the one used for equipment still in warranty. There is a minimum charge applied to each request for out-of-warranty service. The charge guarantees the customer an estimate of the repair costs and is used as credit against the actual repair costs should the equipment be repaired. There are three payment methods available for out-of-warranty service: service agreement, flat rate, and time and material. Contact TFC Customer Services or visit our website for more information on these options.

The customer will be requested to furnish a purchase order number before repair work can be started, and a copy of the purchase order must be received by TFC before the repair work begins. A detailed description of the work performed and parts replaced will be provided with each repair.

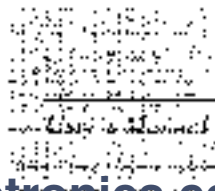
Once an out-of-warranty repair is made, the repaired part or component is warranted for one (1) year. The warranty applies only to the part or component that was repaired; other parts or components are not covered under the one (1) year repair warranty.

9.5.3 Equipment Return Instruction

For each piece of equipment returned to TFC, a return shipping label that includes the following information is provided:

- 1) Customer name, address, and telephone number.
- 2) The serial number, product type, and model.
- 3) Warranty status. If you are unsure of the warranty status of your instrument, contact TFC Customer Service.
- 4) A detailed description of the problem or service requested.
- 5) The name and telephone number of the person to contact regarding questions about the repair.
- 6) The return authorization (RA) number (US customers) or reference number (European Customers).

If possible, return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit; when needed, appropriate packing materials can be obtained by contacting TTC Customer Services. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC issued RA or reference number on the outside of the package and ship it prepaid and insured to TTC.



APPENDIX A FACTORY DEFAULT SETTINGS

A.1 MAINFRAME SETTINGS

Table A-1 contains the factory default settings that are stored in memory. The T-BIRD MM's controls can be forced to their default settings by clearing the NVRAM. As soon as the software revision message is visible while the unit is being powered up, momentarily press the **RESTART** switch. The message *CLEARING NVRAM* appears in the RESULTS display. If the **RESTART** switch is held down for too long, the unit considers the **RESTART** switch to be stuck and will ignore it from that time on.

Table A-1. Factory Default Settings

| Parameter | Default |
|----------------------|-------------------------|
| MODE | T-FILE |
| CHANNEL FORMAT | VF |
| SOURCE CONFIGURATION | 700110 |
| RESULTS & H | SUMMARY |
| DISPLAY HOLD | OFF |
| SIGNALING INSERT | OFF |
| ERROR INSERT | OFF |
| CODE | AMB |
| TEST | CONF |
| PRINT LAMT | OFF |
| RECEIVE INPUT LINE 1 | BRIDGE |
| RECEIVE INPUT LINE 2 | BRIDGE |
| LINE 1 | CONTROL |
| LINE 2 | CONTROL |
| LINE 3 | BRIDGE |
| LINE 4 | CONTROL |
| AUX 01 TIME PRI | 6 HRS 10 MINS 00 SECS |
| AUX 01 TIME SEN | 200 HRS 10 MINS 10 SECS |
| AUX 01 TIME GEN | N/A |
| AUX 05 LINE 1 | 0.00 |
| AUX 05 LINE 2 | 0.00 |
| AUX 06 RAM PROM | INTERNAL |
| AUX 06 RAM PROM | INTERNAL |
| AUX 07 DUE TIME | 11:00:00 |
| AUX 07 DUE TIME | Parity |
| AUX 07 DUE TIME | Stop |
| AUX 07 DUE TIME | Rate |
| AUX 07 DUE TIME | 115 |
| AUX 09 48V VOLT | NRQ |
| AUX 09 48V VOLT | OFF |
| AUX 09 48V VOLT | NONE |
| AUX 09 48V VOLT | LINE 1 |
| AUX 09 48V VOLT | LINE 2 |
| AUX 09 48V VOLT | PRIMARY |
| AUX 11 ANS CHA | DIS. CLEAN |
| AUX 11 ANS CHA | PRIMARY |
| AUX 11 ANS CHA | CONTROL |

Table A-1. Factory Default Settings (Continued)

| Parameter | | Default |
|-----------------|---------------|--------------|
| AUX 12 ERROR | | OFF |
| AUX 13 ERROR | ERROR RATE | 1 PER 10 |
| | ERROR TYPE | SINGLE |
| AUX 14 ERROR | | 30 ms |
| AUX 14 FRAM ERR | | SINGLE |
| AUX 15 USER | | 50000 |
| AUX 16 % MTP | UP | 5000 |
| | DOWN | 70 |
| AUX 17 LOOP CD | TYPE | F1 |
| | EQUIP | C51 |
| | SMARTEN | IF R. ADTRAN |
| AUX 18 ALL RES | | NO RESP |
| AUX 19 DIS CRN | FRANSAME | PRIMARY |
| | ANALYST | PRIMARY |
| AUX 20 PRM FN | L1 LIME ATT | CUSTOMER |
| | L2 LIME ATT | CUSTOMER |
| | PRM TRANS | OFF |
| AUX 21 SWLLP | START FREQ | 100Hz |
| | STOP FREQ | 375Hz |
| | STEP SIZE | 100Hz |
| | STEP INTERVAL | 2.0 Seconds |
| | SKIP HI | 2450 Hz |
| | SKIP LO | 2450 Hz |
| AUX 22 VIB TEST | TYPE | OFF |
| | CHAS | 2450 Hz |
| AUX 23 VIB TEST | TYPE | OFF |
| | CHAS | 2450 Hz |
| AUX 24 VIB TEST | | OFF |
| AUX 25 DIG MAR | | STD 13 M |
| AUX 25 DIG MAR | TYPE | DEMI/MF |
| | DEBIT ON | 75 ms |
| | DEBIT OFF | 75 ms |
| | IPS | 15 |
| AUX 26 MAL SEQ | | 60 |
| AUX 27 MAL SEQ | | NONE |
| AUX 28 MAL SEQ | | NONE |
| AUX 29 SPV DEL | SEQUENCE | WTRK |
| | DELAY | 200 ms |
| | DELTA ON | 150 ms |
| AUX 30 DEL | | DELAY ENH |
| AUX 31 DEL | | 150 ms |
| AUX 32 DEL | | 150 ms |
| AUX 33 SCANSFT | CHAN | ALL LINES |
| | OFF HOOK | None |
| | DISCONNECT | 3 Seconds |
| AUX 34 MAL | OPERATION | SPECT |
| | BRANCH | |
| AUX 35 CAL ID | | FORMAL SLA |

Table A-1. Factory Default Settings (Continued)

| Parameter | Default | |
|--------------------|---------|-------|
| AUX 32 LINES CODEP | LINE 1 | RS232 |
| | LINE 2 | AMI |
| | LOGIC | ALL |
| | NOV RAM | ALL |
| | SIGNAL | ALL |
| AUX 35 CUSTO | TIME | ALL |
| | CHANNEL | ALL |
| | ALARMS | ALL |
| | DS3 | ALL |
| | SONET | ALL |
| AUX SUPPLY | ENABLED | |

A.2 SONET/DS3 ANALYZER OPTION SETTINGS

Table A-2 lists the factory default settings for the SONET/DS3 Analyzer Option switch as an auxiliary function as when NOV RAM is reloaded at power up.

Table A-2. SONET/DS3 Analyzer Option Default Settings

| Switch/Auxiliary Function | Default Setting |
|----------------------------|-----------------|
| AUX Switch | Disabled |
| MODE Switch | DS3-MIS |
| PROM/EEPROM Switch | 27251 |
| RTN LTR LED Switches | SUMMARY Column |
| RTN LTR Switch | NO |
| ALARM 16 Switch | Disabled |
| DS3 60-10-SET Switch | NO |
| ALARM INSERT Switch | Disabled |
| ERROR INSERT Switch | Disabled |
| DS3 TRANSMIT TIMING Switch | INTERNAL |
| DS3 TRANSMIT TIMING Switch | INTERNAL |
| PRIMARY VTDS3 Switch | — |
| SECONDARY VTDS3 Switch | — |
| AUX 32-DS3 ALARM | SONET |
| AUX 35-DS3 ALARM | SONET |
| AUX 32-SONET ALARM | SONET |
| AUX 35-SONET ALARM | SONET |
| AUX 32-SONET ALARM | SONET |
| AUX 35-SONET ALARM | SONET |

APPENDIX B CHANNEL TIMESLOT ASSIGNMENTS

This appendix contains the T1 timeslot assignments for the T1 framing formats supported by the T-BFRD 224. Table B-1 lists the T1 timeslot numbers and the corresponding channel numbering for the selected framing format:

Table B-1. Channel Timeslot Assignment

| T1 Time Slot | T1-D1D T1-SLC95 | T1-D2 | T1-D4 T1-ESF T1-ESFz |
|--------------|--------------------|-------|----------------------------|
| 1 | 1 | 12 | 1 |
| 2 | 13 | 14 | 2 |
| 3 | 2 | 1 | 3 |
| 4 | 4 | 17 | 4 |
| 5 | 3 | 2 | 5 |
| 6 | 15 | 21 | 6 |
| 7 | 4 | 9 | 7 |
| 8 | 16 | 15 | 8 |
| 9 | 5 | 3 | 9 |
| 10 | 19 | 19 | 10 |
| 11 | 6 | 7 | 11 |
| 12 | 18 | 23 | 12 |
| 13 | 7 | 11 | 13 |
| 14 | 19 | 14 | 14 |
| 15 | 8 | 2 | 15 |
| 16 | 20 | 18 | 16 |
| 17 | 9 | 6 | 17 |
| 18 | 21 | 22 | 18 |
| 19 | 20 | 19 | 19 |
| 20 | 22 | 9 | 20 |
| 21 | 23 | 5 | 21 |
| 22 | 22 | 24 | 22 |
| 23 | 24 | 8 | 23 |
| 24 | 24 | 21 | 24 |

APPENDIX C OPERATING MESSAGES

C.1 INTRODUCTION

Operating messages are displayed to notify the operator of conditions that affect the test set. Some of these messages are displayed once and other messages are flashed until the cause of the condition is changed or corrected.

C.2 FRONT-PANEL MESSAGES

The following lists the T-BERD 224 operating messages in alphabetical order. Also included is a reason for each displayed message and a suggestion on how to correct, if necessary, the condition that caused the message to be displayed.

ALT LOOP DOWN COMPLETE — The T-BERD 224 is no longer receiving a DDS alternating loop-down code after the **LOOP DOWN** switch is pressed (LED ON).

ALT LOOP UP COMPLETE — The T-BERD 224 is receiving a DDS alternating loop-up code after the **LOOP UP** switch is pressed (LED ON).

ALT LOOP UP FAILED — The T-BERD 224 is not synchronized to the DDS alternating loop-up code pattern. This message appears after the **LOOP UP** switch is pressed (LED ON).

AUTO NOT VALID WITH THIS TRUNK TYPE SEE AUX 24 — Displayed when the T-BERD 224 is set to automatic and a Ground Station Loop Start Trunk type is selected.

COMMAND PORT FAILURE — A disconnection between the internal communication bus and the command port is observed and a code is displayed determining if repair is necessary.

LOOP FAILURE LOOP CODE ERROR — The test set is receiving a loop-up/down loop code error and the **LOOP UP** or **LOOP DOWN** switch is pressed (LED ON). Verify the loopback by checking for pattern synchronization or sending bit errors.

EXT CLOCK LOSS — AUX 06 BACK TM is set to BNC and no signal is detected at the side panel BNC connector. This message is cleared by setting AUX 06 BACK TM to INTERNAL or by connecting a 10 MHz clock source to the BNC connector.

FRAMING PATTERN UNKNOWN — The **MODE** switch is set to ST-10 and no framing pattern is received on the test set. This message will only appear when the "FRAMING" option is selected.

RFQ CLEARED — The **SOURCE CONFIGURATION B** switch will respond to responses of YES or NO. Press question CLEAR PRINT HEADS — PRESS SOURCE CONFIGURATION B SWITCH.

HUB ID — Displayed when the T-BERD 224 successfully completes a MIC SELECT operation.

LAT LOOP COMPLETE MAPI DROP SIDE — Displayed when the T-BERD 224 receives a DDS DSO DP latch loop code confirmation message from the selected DSO DP location. The message appears after the **LOOP UP** switch is pressed (LED ON). MAPI DROP SIDE indicates that the drop side of the DSO DP is looped.

LAT LOOP COMPLETE MAP0 LINE SIDE — Displayed when the T-BERD 224 is receiving a DDS DS0-D27 latching loop code confirmation message from the selected DS0-D27 location. The message appears after the **LOOP UP** switch is pressed (LED ON). *MAP0 LINE SIDE* indicates that only one side of the DS0-D27 is latched.

LAT LOOP DOWN COMPLETE/CONFIRMED — Displayed when the T-BERD 224 receives a confirmed DDS latching loop down code after the **LOOP DOWN** switch is pressed (LED ON).

LAT LP DN COMPLETE/NOT CONFIRMED — Displayed when the T-BERD 224 receives an unconfirmed DDS latching loop down code after the **LOOP DOWN** switch is pressed (LED ON).

LAT LOOP UP COMPLETE/CONFIRMED — Displayed when the T-BERD 224 receives a confirmed DDS latching loop up code (line and voice code detected) after the **LOOP UP** switch is pressed (LED ON).

LAT LP UP COMPLETE/NOT CONFIRMED — Displayed when the T-BERD 224 receives an unconfirmed DDS latching loop up code (line and voice code not detected) after the **LOOP UP** switch is pressed (LED ON). Check the loopback by verifying pattern synchronization or sending bit errors. If the response is positive, then the loopback is established.

LAT LOOP UP FAILED — Displayed when the T-BERD 224 is not synchronized to the DDS latching loop up code pattern after the **LOOP UP** switch is pressed (LED ON).

SLC DL ALARM — Displayed when the T-BERD 224 is in SLC-M7 or T-SLC-96 mode, monitoring the T1 circuit, and detects a SLC-96 datalink alarm. This message informs the operator that the alarm was detected and reported on the SUMMARY category in **LINE 1** or **LINE 2**.

LOOP DOWN ABORTED -- Displayed when the transmitted T1 loop down code is interrupted by pressing the **LOOP DOWN** switch (LED ON). This message is also displayed when either the T1 in-band loop down response is not received after a 30-second timeout or when the LSI out-of-band loop down response is not received after a 3-second timeout.

LOOP DOWN FAILURE — Displayed when the T-BERD 224 is not synchronized to the in-band or out-of-band loop down code pattern after the **LOOP DOWN** switch is pressed (LED ON).

LOOP DOWN SUCCESSFUL -- Displayed when the in-band loop down response is briefly detected or the out-of-band loop-down response is not detected for one second.

LOOP UP ABORTED — Displayed when the transmitted T1 loop up code is interrupted by pressing the **LOOP UP** switch (LED ON). This message is also displayed when the T1 in-band loop-up response is not received after a 30-second timeout or when the LSI out-of-band loop-up response is not received after a 3-second timeout.

LOOP UP FAILURE -- The T-BERD 224 is not synchronized to the in-band or out-of-band loop-up code pattern after the **LOOP UP** switch is pressed (LED ON).

LOOP UP SUCCESSFUL -- The in-band loop-up response is briefly detected or the out-of-band loop-up response is not detected for 1 second.

LOSS OF HOLDING TONE — Displayed during C-NCH noise, FRNCH noise, or SN testing. This message informs the operator that the expected holding tone that is filtered out in the notch range of 995 Hz to 1005 Hz (1004 Hz tone) is not detected. The operator should check the received signal VCFREQ (995 Hz to 1025 Hz) and VCFVL (greater than -18.0 dBm) are in the required ranges for valid test results.

MJU BLOCK COMPLETE — Displayed when the T-BLOCK 221 blocks the selected branch for transmitting or receiving data.

MJU OPERATION FAILED — Displayed when the T-BLOCK 224 is unable to complete the MJU operation selected in the AUX 30 MJU function.

MJU OPERATION ABORTED — Displayed when the selected MJU operation is aborted after being initiated from the AUX 30 MJU function.

MJU RELEASE COMPLETE — Displayed when an MJU RELEASE operation is completed after releasing all branches to normal operation.

MJU RESTORE COMPLETE — The T-BLOCK 224 successfully initiates the last SELECT-BLOCK or SELECT-UNBLOCK operation.

MJU SELECT FAILED — The T-BLOCK 224 is unable to access the selected branch.

MJU SELECT SUCCESSFUL — The T-BLOCK 224 accesses the selected branch.

MJU UNBLOCKED COMPLETE — The T-BLOCK 224 is able to unblock the branch previously blocked.

NO BYTE ALIGNMENT LINE 1/LINE 2/BOTH LINES — DSGA byte alignment cannot be achieved for LINE 1, LINE 2, or BOTH LINES (three separate messages). This message is applicable only when DSGA ERROR CORRECTION is set to ON in the AUX 12 ERR COR function and the CHANNELFORMAT switch is set to DSGA 2.4, DSGA 4.8, or DSGA 9.6.

NO SUBRATE FRAME SYNC LINE 1/LINE 2/BOTH LINES — DSGH framing synchronization cannot be achieved for LINE 1, LINE 2, or BOTH LINES (three separate messages). Synchronization must be achieved before being able to insert data on a subrate channel. This message is applicable only when the CHANNELFORMAT switch is set to a 1000b subrate.

ONLY FULL SCREEN AVAILABLE — Displayed when selecting the CHECK SCREEN function. This full screen will be used to display all functions and associated displays.

OPTION NOT INSTALLED — Displayed when an option, which is not currently installed, is required for a switch to operate properly.

OUT-OF-BAND CODES REQUIRE ESF or ESF2 — Displayed when an ESF out-of-band Exp code is sent and the T1-ESF or T1-ESF2 mode is not selected. Correct the condition by either changing the AUX 17 LOOP CH function to an equipment loop code other than ESF LINE/SPAY, or ESF NET, or changing the operating mode to T1-ESF or T1-ESF2.

SEE AUX 02 TO SET PRINT EVENT TIME — Displayed when the PRINT EVENT switch is set to the 1 (On) position. This reminds the operator that a time period must be set for the print event in the AUX 02 TIME PRINT function. If no new length is selected, the last valid time length entered for AUX 02 TIME PRINT is 02.5 (2.5 min).

SEE AUX 03 TO SET TEST LENGTH — Displayed when the TEST switch is set to the LIMITED position. This reminds the operator that a time period must be set for the test length in the AUX 03 TEST LEN function. If no new length is selected, the last valid time length entered for AUX 03 TEST LEN is the default test length.

SEE AUX 10 TO SET CHNL NUMBERS -- This message is displayed when the channel format is set to SFCN or NDCN and NONCONTIG is selected by the **SOURCE CONFIGURATION** H switch. Use the AUX 10 N-CONTG function to set the non-contiguous channels for LINE 1 and LINE 2. Refer to Section 4 Auxiliary Functions for assistance.

SEE AUX 17 TO SET LOOP CD TYPE -- Displayed as a reminder that the loop code type is set in the AUX 17 LOOP CD function. The message appears when the **LOOP CODES** switches are pressed to send a loop code signal. If no type is selected, the last valid type entered in AUX 17 LOOP CD is transmitted.

SEE AUX 19 TO SET SEC PATTERN -- Displayed as a reminder that the DDS secondary channel test pattern is selected from the AUX 19 DDS CHN function. The message appears when the operating mode and test pattern are displayed and the **SOURCE CONFIGURATION** I switch is pressed in an attempt to change the test pattern.

SEE AUX 21 TO SET SWEEP PARAMS -- Displayed when the **SOURCE CONFIGURATION** I switch is set to the SWEEP position. This reminds the operator that the frequency sweep parameters of START FREQ, STOP FREQ, STEP-SIZE, STEP-INVT, SKIP-HI, and SKIP-LO are set in AUX 21 SWEEP. If no sweep parameters are selected, the last valid sweep parameters entered for AUX 21 SWEEP will be used.

SEE AUX 22 TO SET BURST PARAMS -- The **SOURCE CONFIGURATION** F switch is set to any of the relative loss measurement: EREL, SREL-LO, or SREL-HI. This reminds the operator that the frequency band parameters of ON-OFF, FREQ, and TIME, are set in AUX 22 BURST. If no burst parameters are selected, the last valid parameters entered for AUX 22 BURST will be used.

SEE AUX 32 TO SET LINE CODE -- The front panel **CODE** switch is disabled in ESI-DA mode, because the line coding is selected for each line (LINE 1 and 2) via the AUX 32 LINE CODE auxiliary function.

SIGNAL LOSS IN DATA LINE 1/LINE 2/BOTH LINES -- The signal loss level entered in LINE 1, LINE 2, or BOTH LINES (in three separate messages).

SIGNALING SEQUENCE IS FULL -- More than 96 octets and digits are attempted to be programmed for the AUX 36 PROGRAMMING mode.

SKIP HIGH SMALLER THAN SKIP LOW -- Displayed after the AUX 21 SWEEP parameters have been set and the frequency sweep parameter of SKIP-HI is smaller than the SKIP-LO parameter. The T-BURST 224 automatically aborts all the parameters changes and restores the last valid parameters if the auxiliary function is exited. The operator must return and repeat the entire AUX 21 SWEEP parameter procedure to change the parameters.

SKIP RANGE TOO BIG -- Displayed after the AUX 21 SWEEP parameters have been set and the frequency sweep parameters of SKIP-HI and SKIP-LO are too far apart to interfere with either the STEP-SIZE, START FREQ, or STOP FREQ range. The T-BURST 224 automatically aborts all the parameters change and restores the last valid parameters if the auxiliary function is exited. The operator must return and repeat the entire AUX 21 SWEEP parameter procedure to change the parameters.

STEP SIZE TOO LARGE DOESN'T MATCH ENDPOINTS -- Displayed after the AUX 21 SWEEP parameters have been set and the frequency sweep parameters of START FREQ and STOP FREQ define too small a frequency band for the selected STEP-SIZE. The T-BURST 224 automatically aborts all the parameters changes and restores the last valid parameters if the auxiliary function is exited. The operator must return and repeat the entire AUX 21 SWEEP parameters procedure to change the parameters.

TIMED TEST COMPLETE — Displayed when a timed test is finished. This message alternates with the displayed results and operating status. This message is disabled by setting the **TEST** switch to **CONT.** or by pressing the **RESTART** switch to begin the test again.

TRANSMITTING ON BOTH CHANNELS ANALYZING PRIMARY CHANNEL — Displayed when the AUX 19 DDS CHN function is set to transmit on both channels and to analyze the primary channel.

TRANSMITTING ON BOTH CHANNELS ANALYZING SECONDARY CHANNEL — Displayed when the AUX 19 DDS CHN function is set to transmit on both channels and to analyze the secondary channel.

TRANSMITTING ON SECONDARY CHANNEL ANALYZING SECONDARY CHANNEL — The AUX 19 DDS CHN function is set to both transmit and analyze on the secondary channel.

UNDER REMOTE CONTROL — Flashed when the unit is under remote control. This message alternates with the displayed results and operating status. This message is disabled by exiting the remote control mode and returning to local control.

UNEQUAL # OF CHANNELS, CONFIGURATION NOT SAVED — Displayed when an unequal number of channels is entered in AUX 10 N-CONTG. Redisplaying the channel numbers for AUX 10 N-CONTG shows the last valid channels that were selected.

USE RESULTS III TO EXIT TRAFFIC — This message is displayed when a front panel switch (**MODE**, **CHANNEL FORMAT**, **SOURCE CONFIGURATION I**, or **SOURCE CONFIGURATION II**) is pressed while the traffic results (r55 or r56) is still visible in the display. This message is disabled by pressing the same **RESULTS I** or **II** Arrowed switch to display another result or the **RESULTS I** or **II** Blank switch to select another category.

VF LEVEL OUT OF RANGE — Displayed during a PVAR test if the signal level drops below -40.0 dBm. The operator should adjust the **RF** LEVEL to bring the signal level within this range.

VF OPTION FAILED — Displayed if the VF Option is not functioning and the operator attempts a test that requires the VF Option. This message is also displayed if the VF Option is not properly installed or if the PVAR test fails. The operator should call TFC Customer Assistance.

C.3 REMOTE CONTROL ERROR MESSAGES

The following remote control error messages are generated when an inappropriate command or parameter is executed. The number identifies the error message when the **ERROR NUMBER** parameter is used to request the list of error messages generated.

| | |
|----|---|
| 00 | INTERNAL ERROR: Unknown error code. |
| 01 | ERROR: Unrecognized command. |
| 02 | ERROR: Unrecognized parameter. |
| 03 | ERROR: Characters after statement end. |
| 04 | ERROR: Command not currently valid. |
| 05 | ERROR: RS-232 receiver parity error. |
| 06 | ERROR: RS-232 receiver overrun error. |
| 07 | ERROR: RS-232 receiver framing error. |
| 08 | ERROR: Receiver buffer overflow. |
| 09 | ERROR: Parameter is out of range. |
| 10 | ERROR: No such help page. |
| 11 | ERROR: Must be followed by a parameter. |

| | | |
|----|---|---------------------------|
| 12 | ERROR: Command not executable | Find with "?" for status. |
| 13 | ERROR: Command has no status | |
| 14 | ERROR: Invalid command for IEEE-488 remote control. | |
| 16 | ERROR: Section is not applicable | |
| 17 | ERROR: Option not installed. | |
| 18 | ERROR: DSU-DP Option not installed. | |
| 19 | ERROR: ADX50 Option not installed. | |
| 20 | ERROR: IEEE-488 Option not installed. | |
| 21 | ERROR: BERT Option not installed. | |
| 22 | ERROR: VF Option not installed. | |
| 23 | ERROR: SUCSEF Option not installed. | |
| 24 | ERROR: ZBSI Option not installed. | |
| 25 | ERROR: BERT or DSU-DP Option not installed. | |
| 26 | ERROR: Non-contiguous channel numbers must be in ascending order. | |
| 27 | ERROR: Non-contiguous channel lists must be the same length. | |
| 28 | ERROR: Channel number is out of range. | |
| 29 | ERROR: The other result window is currently displaying traffic. | |
| 30 | ERROR: Floating point number can have only one decimal digit. | |
| 31 | ERROR: BERT, DSU-DP or SUCSEF Option not installed. | |
| 32 | ERROR: Step size exceeds sweep range. | |
| 33 | ERROR: Skip low is greater than skip high. | |
| 34 | ERROR: Skip range exceeds sweep range. | |
| 35 | ERROR: No floating sign on insert line. | |
| 36 | ERROR: Equipment not valid for loop type. | |
| 37 | ERROR: No location for loop type. | |
| 38 | ERROR: Loop code transmitter is not allowed, unit already in unit loopback. | |
| 39 | ERROR: Change setting is not permitted, unit already in unit loopback. | |
| 40 | ERROR: Insert is not allowed, loopup or loopdown in progress. | |
| 41 | ERROR: Source 1 selection is not allowed, unit X is set to receiver. | |
| 42 | ERROR: Selection is not allowed with AUL-LOC. | |
| 43 | ERROR: Command not allowed during 3-second wait for reset. | |
| 44 | ERROR: Not allowed operation in setting. | |
| 45 | ERROR: Unit X does not have the option installed. | |
| 46 | ERROR: G821 Option not installed. | |
| 47 | ERROR: Signaling Unit not installed. | |
| 48 | ERROR: Signaling Sequence Syntax Error. | |
| 49 | ERROR: Recursive Sequence too long. | |
| 50 | ERROR: Parameter not of valid range. | |
| 51 | ERROR: Command line with max error. | |
| 52 | ERROR: Invalid result name. | |
| 53 | ERROR: Invalid category name. | |
| 54 | ERROR: Category not in Select mode. | |
| 55 | ERROR: The other results window is currently displaying signaling results. | |
| 56 | ERROR: SSGSDN Option not installed. | |
| 57 | ERROR: Some of the PROLOGUE options is installed. | |
| 58 | ERROR: The number of channels is not allowed. | |
| 59 | ERROR: Fractional J1 Option not installed. | |
| 60 | ERROR: DDS Option not installed. | |
| 61 | ERROR: Fractional J1 or DSU-DP Option not installed. | |
| 62 | ERROR: DDS or DSU-DP Option not installed. | |
| 63 | ERROR: DDS and SIGNALING Options required. | |
| 64 | ERROR: DDS or Fractional J1 Options not installed. | |
| 65 | ERROR: Adv. Stress Patterns and either DDS or Fractional J1 Options required. | |
| 66 | ERROR: The number of channels is not allowed. | |

- 67 ERROR: Smart Logback# name and Codes Option not installed
- 68 ERROR: Caller ID Option not installed
- 69 ERROR: Select or is not allowed with ISL104

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APPENDIX D STRESS PATTERNS

D.1 INTRODUCTION

The stress patterns are represented in a right to left format. When the pattern is transmitted in binary for the least significant bit is transmitted first (see Table D-1). This requires that the binary representation be mirrored over for transmission. Example: The binary representation of the hexadecimal value 01 would be 00000001. The stress patterns are provided with the Enhanced DSI Testing Option.

Table D-1. Hexadecimal-to-Binary Conversion

| H | B421 |
|---------|----------|
| 0 | 0000 |
| 1 | 0001 |
| 2 | 0010 |
| 3 | 0011 |
| 4 | 0100 |
| 5 | 0101 |
| 6 | 0110 |
| 7 | 0111 |
| 8 | 1000 |
| 9 | 1001 |
| A | 1010 |
| B | 1011 |
| C | 1100 |
| D | 1101 |
| E | 1110 |
| F | 1111 |
| Ex: MSB | LSB |
| 73 | 00000000 |

D.2 BRIDGTAP/MULTIPAT PATTERNS

Table D-2 and Table D-3 list the test patterns generated by the BRIDGTAP and MULTIPAT test patterns.

Table D-2. BRIDGTAP Patterns

| Pattern Name | Bit Pattern |
|--------------|-------------|
| 01010101 | 01010101 |
| 1 | 00000000 |
| 2 | 00000001 |
| 3 | 00000010 |
| 4 | 00000011 |
| 5 | 00000100 |
| 6 | 00000101 |
| 7 | 00000110 |
| 8 | 00000111 |
| 9 | 00001000 |
| A | 00001001 |
| B | 00001010 |
| C | 00001011 |
| D | 00001100 |
| E | 00001101 |
| F | 00001110 |
| G | 00001111 |

Table D-2. BRIDGTAP Patterns (Continued)

| Pattern Name | Bit Pattern ¹ |
|--------------|---|
| Z11 | F111000000000000 |
| Z12 | F110000000000000 |
| Z13 | F11000000000000 |
| Z14 | F110000000000000 |
| ZIN18 | F1100000000000000 |
| ZIN19 | F1100000000000000 |
| ZIN20 | F1100000000000000 |
| ZIN21 | F1100000000000000 |
| ZIN22 | F1100000000000000 |
| ZIN23 | F1100000000000000 |
| ZIN24 | F1100000000000000 |
| TI-GRSS | 2 ¹⁶ -1 pseudorandom pattern with 14-zero suppressor |

¹ F = Flanking bit, shown in relative position to test pattern.

Table D-3. MULTIPAT Patterns

| Pattern Name | Bit Pattern ¹ |
|--------------|---|
| ALLONES | F1111 |
| L7 | F0000000 |
| ZIN8 | F0000000 |
| ZIN24 | F00000000000000000000000 |
| TI-GRSS | 2 ¹⁶ -1 pseudorandom pattern with 14-zero suppressor |

¹ F = Flanking bit, shown in relative position to test pattern.

D.3 LUP OPTION TEST PATTERNS

The following LUP Option test patterns are only available when the option is installed:

- IBM80 (see Table D-4)
- IBM100 (see Table D-5)
- TI1 (see Table D-6)
- TI2 (see Table D-7)
- TI4 (see Table D-8)
- TI6 (see Table D-9)
- TI16 (see Table D-10)
- TI1251Y (see Table D-11)

Table D-4. IBM80 Test Pattern Sequence

| 03 | 02 | 03 | 04 | 05 | 06 | 07 | 08 |
|----|----|----|----|----|----|----|----|
| F3 | F4 | FB | FF | FE | AA | AA | AA |
| 21 | 10 | 05 | 75 | 03 | 14 | 75 | 18 |

Table D-4. 16M80 Test Pattern Sequence (Continued)

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 00 | 0C | 09 | 05 | 03 | 30 | 37 | 0E |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 30 | 0C | 29 | 3E | 33 | 35 | 32 | 3D |

Table D-5. MIN/MAX Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| 80H | 80H | 90H | 80H | 01H | 00H | 01H | 01H | 01H | 03H |
| 1000 0000 | 1000 0000 | 1050 0000 | 1020 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0001 | 0000 0001 | 0000 0011 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 80H | 31H | 30H | 01H | 01H | 80H | 01H | 22H | 00H | 20H |
| 1000 0000 | 0000 0001 | 1010 0000 | 0000 0001 | 0000 0001 | 1000 0000 | 0000 0001 | 0010 0010 | 0000 0000 | 0000 0000 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 20H | 30H | 00H | AAH | AAH | AA | AAH | AAH | 55H | 55H |
| 0000 0000 | 0000 0000 | 0010 0000 | 1210 1010 | 1010 1010 | 1010 1010 | 1010 1010 | 1010 1010 | 0101 0101 | 0101 0101 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 55H | 55H | AAH | AAH | AAH | AA | 55H | AAH | AAH | 55H |
| 0101 0101 | 0101 0101 | 1010 1010 | 1010 1010 | 1010 1010 | 1010 1010 | 0101 0101 | 1010 1010 | 1010 1010 | 0101 0101 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 55H | 55H | 80H | 80H | 80H | 77H | 11 | FFH | 80H | FFH |
| 0000 0001 | 0101 0101 | 1000 0000 | 1000 0000 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| FFH | FEH | FFH | FFH | 24H | 25H | 55H | 80H | 80H | 80H |
| 1111 1111 | 1111 1110 | 1111 1111 | 1111 1111 | 0010 0100 | 0100 0000 | 1001 0010 | 0000 1000 | 1000 1000 | 1000 1000 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 70H | 42H | 00H | 21H | 80H | 20H | 00H | 30H | 40H | 20H |
| 0001 0000 | 0100 0010 | 0000 1000 | 0010 0001 | 1000 0100 | 0000 0000 | 0000 0000 | 1000 0010 | 0100 0000 | 0010 0000 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 |
| 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 |

Table D-6. 14-271 HIR Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| FFH | FFH | FFH | FFH | 7FH | FFH | FF | FAH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 0111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 0111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 0111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 0111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | AAH | AAH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 0111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1010 1010 | 1010 1010 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| AAH | AAH | 00H | 01H | 80H | 01H | 80H | 01H | 00H | 01H |
| 1010 1010 | 1010 1010 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 0000 0001 | 0000 0001 | 1000 0000 | 0000 0001 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H |

Table D-6. T1-2/TRIP Test Pattern Sequence (Continued)

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 77 | 72 | 73 | 74 | 75 | 76 | 77 | 70 | 79 | 80 |
| 80H | 01H | AAH | AAH | AAH | AA | 80H | 01H | 80H | 01H |
| 1000 0000 | 0000 0001 | 1000 1010 | 1010 1010 | 1010 1010 | 0000 1010 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 87 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H |
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 97 | 92 | 93 | 94 | 95 | 96 | | | | |
| 80H | 01H | 80H | 01H | 80H | 01H | | | | |
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | | | | |

Table D-7. T1-3 Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| 01H | 01H | 01H | 01H | 01H | 01H | 00H | 01H | 01H | 01H |
| 1000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0000 | 0000 0001 | 0000 0001 | 0000 0001 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 01H | 01H | 01H | 00H | 01H | 01H | 01H | 01H | 01H | 01H |
| 1000 0000 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0111 | 0000 0001 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 01H | 01H | 01H | 00H | 00H | 00H | 00H | AAH | AAH | AAH |
| 0000 0001 | 0000 0001 | 0000 0001 | 0101 0101 | 0101 0101 | 0101 0101 | 0101 0101 | 1010 1010 | 1010 1010 | 1010 1010 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| AAH | 01H | 01H | 01H | 01H | 01H | 01H | FFH | FFH | FFH |
| 1010 1010 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 1111 1111 | 1111 1111 | 1111 1111 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| FFH | FFH | FFH | 00H | 01H | 00H | 01H | 00H | 01H | 00H |
| 1111 1111 | 1111 1111 | 1111 1111 | 1000 0000 | 1000 0000 | 1000 0000 | 0000 0000 | 0000 0000 | 0000 0000 | 0000 0000 |
| 51 | 52 | 53 | 54 | | | | | | |
| 01H | 00H | 01H | 00H | | | | | | |
| 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | | | | | | |

Table D-8. T1-4 Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| FFH | AAH | FFH | AAH | FFH | FFH | FF | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | FFH | FFH |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| FFH | FFH | FFH | FFH | FFH | | FF | AAH | AAH | FFH |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | FFH | AAH | FFH |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| FFH | FFH | FFH | FFH | FFH | AAH | FF | FFH | FFH | FFH |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| FFH | FFH | FFH | FFH | FFH | FFH | FF | AAH | FFH | FFH |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |

Table D-8. T1-4 Test Pattern Sequence (Continued)

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| FFH | FFH | FFH | FFH | FFH | FFH | FFH | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| FFH | FFH | AAH | AAH | AAH | AA | 10H | 10H | 10H | 10H |
| 1111 1111 | 1111 1111 | 1010 1010 | 1010 1010 | 1010 1010 | 1010 1010 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H |
| 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 10H | 10H | 10H | 10H | 10H | 10H | AAH | AAH | AAH | AAH |
| 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 1010 1010 | 1010 1010 | 1010 1010 | 1010 1010 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H |
| 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H | 10H |
| 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 | 0001 0000 |

Table D-9. T1-5 Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H |
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H |
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H | 80H | 01H |
| 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| FFH | FFH | 01H | 01H | 01H | 01H | FFH | FFH | FFH | FFH |
| 1111 1111 | 1111 1111 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 1111 1111 | 1111 1111 | 1111 1111 | 1111 1111 |
| 51 | 52 | 53 | | | | | | | |
| FFH | FFH | 01H | | | | | | | |
| 1111 1111 | 1111 1111 | 1100 1011 | | | | | | | |

Table D-10. T1-6/55 OCIE Test Pattern Sequence

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H |
| 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H | 01H |
| 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 01H | 01H | 01H | 55H | 55H | 55H | 55H | 55H | 55H | 55H |
| 0000 0001 | 0000 0001 | 0000 0001 | 0001 0101 | 0001 0101 | 0001 0101 | 0001 0101 | 1010 1010 | 1010 1010 | 1010 1010 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| AAH | 01H | 01H | 01H | 01H | 01H | 01H | FFH | FFH | FFH |
| 1010 1010 | 0000 0001 | 0000 0001 | 0001 0000 | 0000 0001 | 0000 0001 | 0000 0001 | 1111 1111 | 1111 1111 | 1111 1111 |
| 41 | 42 | 43 | 44 | 45 | 46 | | | | |

Table D-10. T1-6/55 OCTET Test Pattern Sequence (Continued)

| FFH | FEH | FFH | 32H | 31H | 60H | 61H | 60H | 61H | 60H | 61H | 60H |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1111 1111 | 1111 1111 | 1111 1111 | 0000 0000 | 0000 0001 | 0000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 0000 0000 | 0000 0001 | 1000 0000 |
| 51 | 52 | 63 | 54 | 55 | | | | | | | |
| 01H | 01H | 01H | 30H | 01H | | | | | | | |
| 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | | | | | | | |

Table D-11. T1-DALY Test Pattern Sequence

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01H | 01H | 11H | 01H | 01H | 11H | 00H | 01H | 01H | 01H |
| 0000 0001 | 0000 0001 | 0000 0001 | 0000 0011 | 0000 0001 | 0000 0001 | 1000 0000 | 0000 0001 | 0000 0001 | 0000 0001 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 01H | 01H | 11H | 03H | 01H | 01H | 01H | 01H | 03H | 01H |
| 0000 0001 | 0000 0001 | 0000 0001 | 0000 0011 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0011 | 0000 0001 |
| 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 100 |
| 01H | 01H | 11H | 03H | 55H | 55H | 55H | AAH | AAH | AAH |
| 0000 0001 | 0000 0001 | 0000 0001 | 0101 0101 | 0101 0101 | 0101 0101 | 0101 0101 | 1010 1010 | 1010 1010 | 1010 1010 |
| 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 100 |
| AAH | 01H | 01H | 01H | 01H | 01H | 01H | FFH | FFH | FFH |
| 1010 1010 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 0000 0001 | 1111 1111 | 1111 1111 | 1111 1111 |
| 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 100 |
| FFH | FFH | FFH | 00H | 01H | 60H | 01H | 40H | 01H | 00H |
| 1111 1111 | 1111 1111 | 1111 1111 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 |
| 11 | 22 | 33 | 44 | 55 | | | | | |
| 01H | 01H | 01H | 03H | 01H | | | | | |
| 0000 0001 | 1000 0000 | 0000 0001 | 1000 0000 | 0000 0001 | | | | | |

APPENDIX E TIMING SLIPS MEASUREMENT (N51 TM SLIP)

E.1 INTRODUCTION

This appendix describes how the T-BERD 224 measures timing slips between a timing reference clock and a received T1 signal.

E.2 FUNCTIONAL DESCRIPTION

The T-BERD 224 timing slips measurement (N51 TM SLIP) identifies frequency deviations that cause uncontrolled clock slips. When measuring timing slips, a received T1 signal (LINE 1) is compared to a reference T1 clock connected to either the T1 REF input (LINE 2) or to the side panel BNC connector. If a T1 clock reference is attached to the side panel BNC connector, timing slip analysis can be performed for both LINE 1 and LINE 2. The T-BERD 224 compares the T1 test signal(s) with the reference and counts the number of times the clock edge of the received signal moves past the edge of the reference signal, as indicated in Figure E-1.

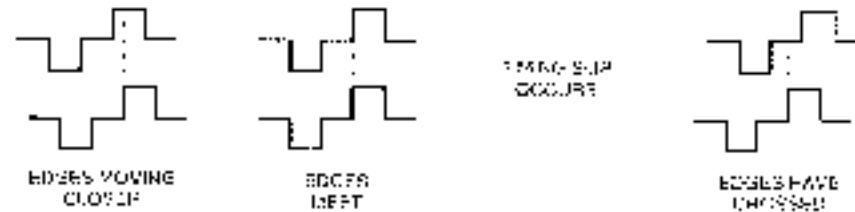


Figure E-1. Timing Slips

The N51 TM SLIP data is available on the SUMMARY and SIGNAL screens respectively. See the following table for details on the data available on each screen.

- A numeric value
- A bar graph
- A rotating "wheel"

51 - TIMING SLIP



Figure E-2. Timing Slips Results Summary

The numeric value is a range from 0 to 999. This value represents the total number of timing slips that have occurred since the test was started. 0-99 for slips.

The bar graph represents partial frame slips in increments of one bar for every 16-bit slips (one wheel rotation). Each time the bar moves to the end of the graph, it is reset to the middle position and the frame slip count is incremented.

The wheel is used along with the bar graph to graphically display the direction, rate, and magnitude of timing slips. Figure E-3 shows the values assigned to each position of the bar graph and the wheel.

APPENDIX F DISCUSSION OF CCITT RECOMMENDATION G.821

F.1 INTRODUCTION

This appendix discusses the concept of available time versus unavailable time as specified in CCITT Recommendation G.821. This discussion is provided to familiarize users with the results that may be obtained with the optional Performance Analysis Package.

F.2 FUNCTIONAL DESCRIPTION

CCITT Recommendation G.821 defines available and unavailable time as follows:

A period of available time begins when the interval error (BER) in each second is worse than 10^{-2} for a period of 10 consecutive seconds. These 10 seconds are considered to be unavailable time. The period of available time terminates when the BER in each second is better than 10^{-2} for a period of 10 consecutive seconds. These 10 seconds are considered to be available time.

Available and unavailable time are measured in seconds. All test seconds must fall into one of the two categories: total available seconds + total unavailable seconds = total test seconds.

At the beginning of a test, test seconds are considered to be available time; the available seconds begin counting. These seconds continue to be counted until 10 consecutive seconds occur each with a BER worse than 10^{-2} . A sliding window, 10 seconds in length, is used to detect this transition from available to unavailable time and vice versa.

As an example, the test may begin and continue to run for 28 seconds each with a BER worse than 10^{-2} . When the test starts, test seconds are considered to be available time. At the beginning of the 26th second, the BER becomes worse than 10^{-2} . In the 26th second, the BER is worse than 10^{-2} . All 28 seconds are a period of unavailable time and are counted as unavailable seconds.

| sec | sec | sec | sec | sec | sec | sec | sec | sec | sec |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| BER | BER | BER | BER | BER | BER | BER | BER | BER | BER |
| < 10^{-2} | < 10^{-2} | < 10^{-2} | < 10^{-2} | < 10^{-2} | < 10^{-2} | > 10^{-2} | > 10^{-2} | > 10^{-2} | > 10^{-2} |

Sliding Window After 29th Test Second
Still in Available Time

Even though there were 10 consecutive seconds (the 26th, 27th, and 28th) which each had a BER worse than 10^{-2} , such consecutive seconds are required to make the transition to unavailable time. These 10 test seconds are still available time and they are counted as available seconds.

The 3 seconds with a BER worse than 10^{-3} are also included in the count of severely errored seconds. A second in which pattern synchronization is lost is also considered to have a BER worse than 10^{-3} . Therefore, the current test result values for available seconds count = 29, the severely errored seconds (SES) count = 3, and the unavailable seconds count = 0.

The same test continues to run and remains in available time. In the 80th second, the BER for that second is worse than 10^{-5} . The BER for the 81st, 82nd, 83rd, 84th, and 85th seconds is also worse than 10^{-5} . In the 86th, 87th, and 88th seconds, pattern synchronization is lost. We now have 9 consecutive seconds with a BER worse than 10^{-5} . As each of these test seconds occurs, we are still in available time, so they are counted as available seconds and severely errored seconds. The transition has not been made from available time to unavailable time.

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 |
| BER | BER | BER | BER | BER | BER | BER | BER | BER | BER |
| > | > | > | > | > | > | > | > | > | > |

Sliding Window After 88th Test Second
 Still in Available Time

The 89th test second also has a BER worse than 10^{-5} . At this point, the available seconds count = 89, the SES count = 13, and the unavailable seconds count = 0. However, the sliding window now contains 10 consecutive seconds each of which has a BER worse than 10^{-5} . A transition is made to unavailable time.

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
| BER | BER | BER | BER | BER | BER | BER | BER | BER | BER |
| > | > | > | > | > | > | > | > | > | > |

Sliding Window After 89th Test Second
 Transition to Unavailable Time

These 10 seconds which had been counted as available seconds are deducted and are added to the unavailable seconds count. The available seconds count becomes 79, and the total available seconds count becomes 19. These same 10 seconds were also included in the SES count. However, since 10 seconds of only these seconds is available time which have a BER worse than 10^{-5} , therefore, 10 seconds must also be deducted from the SES count. The SES count is reduced to 3.

Once the transition occurs from available time to unavailable time, all test seconds are counted as unavailable seconds until 10 consecutive seconds occur each with a BER better than 10^{-5} . As the sample test continues, the 90th through 150th seconds each have a BER worse than 10^{-5} . We are still in unavailable time, so these seconds are counted as unavailable seconds now the total available seconds count = 79 and the total unavailable seconds count = 71.

Beginning with the 151st second, the BER for that second is $< 10^{-5}$. It is still counted as an unavailable second. A BER better than 10^{-5} also occurs for the 152nd through the 160th seconds. Since there are now 10 consecutive seconds with a BER less than 10^{-5} , the transition is made from unavailable time to available time.

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
| BER | BER | BER | BER | BER | BER | BER | BER | BER | BER |
| < | < | < | < | < | < | < | < | < | < |

Sliding Window After 160th Test Second
 Transition to Available Time

As each of these thirty 10-second intervals occurred, it was added to the unavailable seconds count (unavailable seconds = 8), available seconds = 78, and SES = 3. Since the last group of seconds has triggered the transition to available time, that group of seconds is deducted from the unavailable seconds count and added to the available seconds count. The unavailable seconds count = 71 and the available seconds count = 89.

The monitoring of available and unavailable time continues for the duration of the test.

Degraded minutes is an error analysis result that is affected by available and unavailable time. Degraded minutes is a count of the number of minutes during which an average BER worse than 10^{-6} , but better than 10^{-5} , occurs. The 7-minute intervals are derived by removing unavailable seconds and severely errored seconds (SES) from the total test time and then consecutively grouping the remaining seconds into blocks of 60. The average BER is calculated for the block of 60-seconds and, if it is worse than 10^{-6} , the block is counted as a degraded minute.

In the transition from available time to unavailable time, the degraded minutes result is unaffected. This is because a switch to unavailable time requires 10 consecutive seconds each, with a BER worse than 10^{-6} . Any second in available time with a BER worse than 10^{-6} is considered to be a severely errored second and, therefore, is not included in the determination of seconds used to calculate degraded minutes.

Moving from unavailable time to available time may affect the degraded minutes count. While in unavailable time, 10 consecutive seconds each with a BER better than 10^{-6} are required for the transition to available time. When this happens, those 10 seconds are subtracted from the unavailable seconds count and are added to the available seconds count. Since these seconds are now considered to be a part of available time and are not severely errored seconds, they are included in the calculation of degraded minutes.

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APPENDIX G TRUNK TYPE SUMMARY

| | | | | | |
|---|-----------------------------|-----|-----|-----|-----|
| STD (E&M) | TX ON HOOK | A=0 | B=0 | C=0 | D=0 |
| | TX OFF HOOK | A=1 | B=1 | C=1 | D=1 |
| | Rx ON HOOK | A=0 | B=X | C=0 | D=X |
| | Rx OFF HOOK | A=1 | B=X | C=1 | D=X |
| FXS (TX) FXO (RX) Ground Start | ON HOOK | A=0 | B=1 | C=0 | D=1 |
| | Ground on ring | A=0 | B=0 | C=0 | D=0 |
| | OFF HOOK (Coiled or tip) | A=1 | B=1 | C=1 | D=1 |
| FXS (RX) FXO (TX) Ground Start | ON HOOK (No tip ground) | A=1 | B=X | C=1 | D=X |
| | OFF HOOK (Coiled or tip) | A=0 | B=1 | C=0 | D=1 |
| | RINGING | A=0 | B=0 | C=0 | D=0 |
| SLC (A) (TX) SLC (B) (RX) Ground Start | ON HOOK | A=0 | B=0 | | |
| | Ground on ring | A=0 | B=1 | | |
| | OFF HOOK (Ground on tip) | A=1 | B=0 | | |
| | ESF, ESFz | | | | |
| SLC (A) (TX) SLC (B) (RX) Ground Start | ON HOOK | A=0 | B=0 | C=0 | D=0 |
| | Ground on ring | A=0 | B=1 | C=0 | D=0 |
| | OFF HOOK (Ground on tip) | A=1 | B=0 | C=1 | D=0 |
| | ESF, ESFz | | | | |
| SLC (A) (TX) SLC (B) (RX) Ground Start | ON HOOK | A=0 | B=0 | | |
| | OFF HOOK (No tip ground) | A=1 | B=0 | | |
| | RINGING | A=1 | B=1 | | |
| | ESF, ESFz | | | | |
| FXS (TX) FXO (RX) Loop Start | ON HOOK | A=0 | B=0 | C=0 | D=0 |
| | OFF HOOK (No tip ground) | A=1 | B=1 | C=1 | D=1 |
| | RINGING | A=1 | B=1 | C=1 | D=1 |
| FXS (RX) FXO (TX) Loop Start | ON HOOK | A=0 | B=1 | C=0 | D=1 |
| | OFF HOOK | A=1 | B=1 | C=1 | D=1 |
| | DI.F | A=0 | B=1 | C=0 | D=1 |
| SLC (A) (TX) SLC (B) (RX) Loop Start | RINGING | A=0 | B=0 | C=0 | D=0 |
| | DI.F | A=0 | B=1 | | |
| | RINGING | A=0 | B=0 | | |
| SLC (A) (TX) SLC (B) (RX) Loop Start | ESF, ESFz | | | | |
| | ON HOOK | A=0 | B=0 | C=0 | D=0 |
| | OFF HOOK | A=0 | B=0 | C=1 | D=0 |
| | DI.F | A=1 | B=1 | | |
| SLC (A) (TX) SLC (B) (RX) Loop Start | RINGING | A=1 | B=1 | | |
| | ESF, ESFz | | | | |
| | DI.F | A=0 | B=1 | C=1 | D=1 |
| SLC (A) (TX) SLC (B) (RX) Loop Start | RINGING | A=0 | B=1 | C=1 | D=0 |
| | ESF, ESFz | | | | |

APPENDIX H REMOTE CONTROL COMMANDS

H.1 INTRODUCTION

This appendix contains an alphabetical list of the Mainframe remote control commands. Each command is explained and referenced to associated commands, and an example is given.

For information on how to control the T-BERID 224 from a terminal or computer, refer to Section 7 Remote Control.

H.2 488 ADDRESS

488 ADDRESS

IEEE-488 Address

488 ADD?

Displays the current IEEE-488 address for the T-BERID 224. **488 ADDRESS** sets the T-BERID 224 address for the IEEE-488 controller to use when communicating across the bus. The address selected for the T-BERID 224 must be unique to any other device on the bus. This command is part of the ALX 09 488MODE function.

488 ADD <xx>

Sets the IEEE-488 address, where xx = 01 to 30.

488 MOD?

IEEE-488 mode

Displays the current mode for the IEEE-488 interface. **488 MOD** sets the mode for the IEEE-488 interface. This command is part of the ALX 09 488MODE function.

488 MOD TALK

Configures the IEEE-488 interface to the Talk Only mode.

488 MOD ADDRESS

Configures the IEEE-488 interface to the address only mode. In the address only mode the T-BERID 224 can collect data, but cannot send return information across the bus.

NOTE

This command is not available from the IEEE-488 remote control.

488 SRQ

IEEE-488 SRQ

488 SRQ?

Displays the current status for the IEEE-488 SRQ. Sets the IEEE-488 SRQ. This command is part of the ALX 09 488MODE function.

488 SRQ ON

Allows the THERD 224 to generate a SRQ when it has data to transmit and asserts bit 7 of the serial port status byte.

488 SRQ OFF

A SRQ is not asserted when data is ready to be transmitted, but bit 7 of the serial port status byte is still asserted.

H.3 ALARMS**ALArms****Alarms Message Prints****ALA?**

Prints the status of the alarms message. **ALArms** enables or disables alarms message prints. When the **PRINT EVENT** command is OFF, the **ALARMS ON** command has no effect because no printouts are enabled.

ALA ON

Alarms messages are printed.

ALA OFF

Disables the alarms messages, preventing alarms and status messages from being printed.

H.4 BACKUP TIMING**Backup Timing****Backup Timing****BAC TIM ?**

Displays the status of the backup timing for LINE 1 and LINE 2. **BACKUP TIMING** sets or returns the current backup timing source for the selected line. The backup timing source is used when the clock for the selected line is not recoverable. This command is part of the AFX ON BACK TIM function.

BAC TIM L1 BNC

Set the backup timing for LINE 1 to external BNC CLOCK.

BAC TIM L1 INTERNAL

Set the backup timing for LINE 1 to INTERNAL.

BAC TIM L1 RECovered

Set the backup timing for LINE 1 to recover the clock from LINE 2.

BAC TIM L2 BNC

Set the backup timing for LINE 2 to external BNC CLOCK.

BAC TIM L2 INTERNAL

Set the backup timing for LINE 2 to internal.

BAC TIM L2 RECovered

Set the backup timing for LINE 2 to recover the clock from LINE 1.

CLEAR FIFO

Clear the Print FIFO

CLEAR FIFO command clears the print FIFO of all printouts that are waiting to be printed. This command is part of the AUXiliary CLear FIFO function.

CLOCK

Clock Time

NOTE

If hours, minutes, and/or seconds are not entered, they are assumed to be "00".

CLOCK

Display the clock time (time of day). **CLOCK** sets or returns the clock time. The time is entered in 24-hour format. The command is part of the AUXiliary TIMEOfDay function.

CLOCK hh:mm:ss

Set the clock time. The symbols ":", ":", and "." may be replaced by a dash (-), comma (,), period (.), semicolon (;), or slash (/).

CLS

Clear the Terminal Screen

CLS enables your output (all of the selected line termination sequences (usually CR/LF for terminals) to your terminal. This has the effect of clearing the terminal screen of all previous outputs. This command is not available from the EXEC/EXEC mode.

CODE

Current Code Type

Display the current status of the **CODE** switch. **CODE** sets or returns the current code type used by the T-BUS/224 when transmitting a T1 signal.

CODE AMI

AMI coding is enabled.

CODE B8Zs

B8Zs coding is enabled. Note that reverse B8Zs signaling is not supported.

CODE L1 AMI

Set Line 1 coding to AMI.

CODE L1 B8Z

Set Line 1 coding to B8Zs.

CODE L2 AMI

Set Line 2 coding to AMI.

CODE L2 B8Z

Set Line 2 coding to B8Zs.

COMputer

Configure the T-BIRD 224 for Remote Control Operation

COMputer configures the T-BIRD 224 for computer remote control operation by automatically setting the following:

- ECHO OFF** — Turns echo off.
- PROMPT OFF** — Turns command prompts off.
- PRM TERM CR** — Line terminator set to carriage return and linefeed.
- HOLD** — Holds prompts.

This command is typically used when responses to queries are desired to be terminated. While in the computer mode, the next command aborts the output of any other command (e.g., TEST) that have not yet finished. This command is the default for HPE 488 operation.

CONtrols

Controls Printout

CONtrols displays the current status of the T-BIRD 224 switches and auxiliary functions. This allows you to initiate a printout of all current T-BIRD 224 switch and auxiliary function settings. This command is functionally identical to pressing the **CONTROLS** position of the **PRINT** switch on the T-BIRD 224s front panel. The effect of this command is identical to issuing the **PRINT CONTROLS** remote control command.

CUStom

Custom Results

CUS?

Displays the status of all selected test as **CUSTOM** selected test is **enabled** and when LED conditions are met for display and includes the name of results prompt. All other results may be selected. **SOME** of the results may be selected, or specific results may be **ENABLED** or **DISABLED**. The manual is available in X-TEST, CUSTOM function.

CUSSTATUS <results>

Displays the status of a selected test results.

CUS <category> ALL

All of the results in the selected category are displayed, included in a results prompt, and returned by remote copy.

CUS <category> NONE

None of the results in the selected category are displayed, included in a results prompt, or returned by remote copy.

CUS <category> Select

The results in the selected category can be disabled or enabled to determine if they are displayed or included in a results prompt.

CUS ENABLE <result names>

The selected result is available on the display and is included in a results prompt.

CUS DISABLE <result names>

The selected result is not available for display and is not included in a results prompt.

Valid entries for <category> include:

| | |
|---------------|------------------------|
| LOG : | BPV & frame |
| SIGnal | CHAnnel |
| ALArms | TIME |
| FRAME | |

Valid entries <result names> for the selected category include the following. n = 1 (LINE 1) or 2 (LINE 2).
The result names from a results printout may also be used for the <result names>.

LOGIC

| | |
|------------|------------------------------------|
| ASY Err | (Asynchronous Errored Seconds) |
| AVAILB n | (Availability) |
| BER n | (Bit Error Rate) |
| BER Err | (Bit Errors) |
| CSM n | (Consecutive Severely Errored Sec) |
| DEGR MIN n | (Degrades Minutes) |
| DEGR MIN n | (Degrades Minutes) |
| EFS n | (Error Free Seconds) |
| EFS n | (Error Free Seconds) |
| OOB Sec | (Out Of Sync Seconds) |
| PA. Slip | (Pattern Slip) |
| SES n | (Severely Errored Seconds) |
| SES n | (Severely Errored Seconds) |
| SYN Err | (Synchronous Errored Seconds) |
| UNAK Sec | (Unavailable Seconds) |

BPV & FRAME

| | |
|-----------------|----------------------------------|
| BPV n | (BPV n) |
| BPV SEC n | (BPV Seconds) |
| BPV Rate | (BPV Rate) |
| CRC Errors | (CRC Errors) |
| CRC Err Rate | (CRC Error Rate) |
| CRC Err Sec | (CRC Errored Seconds) |
| CRC SEV Err Sec | (CRC Severely Errored Seconds) |
| E BPV Sec | (E BPV Seconds) |
| F CRC Err | (F CRC Errors) |
| F Err Sec | (F Frame Error Event Seconds) |
| F SEV Err | (F Frame Severely Errored Sec) |
| F SLIP Sec | (F Slip Seconds) |
| FRM Err Sec | (Frame Error Seconds) |
| FRM Err n | (Frame Errors) |
| FRM L. Sec | (Frame Loss Seconds) |
| FRM L. n | (Frame Losses) |
| FRM SEV Sec | (Frame Severely Errored Seconds) |
| FRM SEV n | (Frame Severe Errors) |
| H CRC n | (Far High CRC Errors) |
| L CRC n | (Far Low CRC Errors) |
| M CRC n | (Far Medium CRC Errors) |
| MH CRC n | (Far Medium High CRC Errors) |
| PAY SRC n | (Far Pay Source) |
| PRM LIM n | (Far PRM Time) |
| SH CRC n | (Single CRC errors) |
| SS CRC n | (Severe CRC) |

SIGNAL

| | |
|-----------|--|
| ALRM11No | (SLC Alarm Field Format) |
| DL1AYn | (Roundtrip Delay) |
| RCV LBMn | (Receive Level dBm) |
| RCV DBXn | (Receive Level dBdsv) |
| RCV TRFn | (Receive Frequency) |
| RCV VPPn | (Receive Vp-p) |
| SL1 SECn | (Slip Seconds) |
| SPX CR1 | (Simplex Current) |
| TM SL2n | (Timing Slip) |
| TRAF ESTn | (Traffic Bits for EST, EST2) |
| TRAFFIC | (All Traffic Bits for Display and Results Print) |

CHANNEL

| | |
|-----------|---------------------------------------|
| C MSGn | (C Message Noise) |
| C NCHn | (C Message Noise Noise) |
| DC OFFn | (DC Offset) |
| DDS 1 Err | (DDS Frame Error) |
| DIG LVL1 | (Lower DTMF Tone Frequency and Level) |
| DIG LVL2 | (Upper DTMF Tone Frequency and Level) |
| ELRr | (Echo Return Loss) |
| ERR SRVn | (Error Service Bits) |
| 3K FLAn | (3 kHz Flat Noise) |
| 3K NCHn | (3 kHz Notch Noise) |
| PARn | (Peak to Average Ratio) |
| PAR LEVn | (Peak to Average Ratio Level) |
| RCV BYZn | (Receive Busy) |
| RCV CLNn | (Receive Clean) |
| SG ADDR | (Signal Address) |
| SG DEL | (Signal Delay) |
| SG DURn | (Signal Duration) |
| SG NCH | (Signal Noise Noise) |
| SRL Err | (Single Return Loss Error) |
| SRL LDR | (Single Return Loss Level) |
| 7.5 TILn | (7.5 of MSU Distortion) |
| VF FREQn | (VF Frequency) |
| VF LFN | (VF Level) |

ALARMS (Printer and Remote)

| | |
|----------|---------------------------------------|
| ALN OFF | (Alarm Indication Signal) |
| ALN ON | (Alarm Indication Signal) |
| BZS OFF | (Buzzer Buzzer Substitution Detected) |
| EX BLK | (Excess Delay) |
| EX Z OFF | (Excess Zeroes) |
| EX Z ON | (Excess Zeroes) |
| NET BZS | (Net Bipolar * Zero Substitution) |
| YLD OFF | (Yellow Alarm Off) |
| YLD ON | (Yellow Alarm On) |

TIME

| | |
|----------|-------------------|
| ALV SECn | (Alarmed Seconds) |
| DATE | (Calendar Date) |
| PLA TIME | (Time and Date) |

| | |
|---------|-----------------------|
| SGTSSn | (Signal Loss Seconds) |
| SICASSn | (SIC Alarm Seconds) |
| TESTEND | (Test Ends) |
| TESTLEN | (Test Length) |
| TIM | (Clock Time) |

See also: **PRINT RESULT 1** and **2**, and **RESULTS**

H.6 DATE

DATE **Calendar Date**

DATE?

Display the date. **DATE** determines set the calendar date. This command is part of the AUX 04 TIME/DATE function.

DATE MMM-DD

Sets the calendar date, where MMM (1 to 12) is the month and DD (1 to 31) is the day. An invalid date settings generates the error message *ERROR: Parameter is out of range*. The dash () symbol may be replaced by a slash (/), period (.), comma (,), or space.

DDIAL

Delay Dial

DDIAL?

Displays the status of the delay dial. Defines the parameters of the delay dial, which is used to delay the output during receive sensor transactions. This command is only valid to the MAX 18 sensor interface.

DDIAL Delay <xxx>

Set the length of time for a delay dial. Valid range for <xxx> is between 30 μ s to 990 μ s in 10 μ s intervals and 1.0 to 16 seconds in 0.1 second intervals. Enter time in seconds as xxx.

DDIAL DURATION <xxx>

Set the length of the duration of the delay dial. Valid range for <xxx> is between 30 μ s to 990 μ s in 10 μ s intervals and 1.0 to 16 seconds in 0.1 second intervals. Enter time in seconds as xxx.

DDS ANALYSIS

DDS Channel Analysis

DDS ANA?

Displays the current DDS Channel Delay and the DDS ANALYSIS. The user can select to analyze either the DDS secondary or primary channel. This command is part of setting the DDS analysis channel with the AUX 19 DDS CHN ANALYZE function.

DDS ANA PRIMARY

Selects the DDS PRIMARY channel to be analyzed.

DDS ANA SECONDARY

Selects the DDS SECONDARY channel to be analyzed.

NOTE

If the DDS primary channel is being analyzed, the test pattern is selected with the **SOURCE** command. If the DDS secondary channel is being analyzed, the test pattern is selected with the **DDS SECondary** command.

See also: **DDS SECondarypat** and **DDS TRAnsmit**

DDS SECondarypat **Select DDS Secondary Channel Pattern**

DDS SEC?

Displays the current DDS secondary channel test pattern. **DDS SECondarypat** selects the DDS secondary channel test pattern. This command is part of setting the DDS secondary channel test pattern with the AUX 19 DDS CHN. SECondarypat function.

DDS SEC 511

Selects the 511 test pattern to be transmitted on the DDS secondary channel.

DDS SEC 2047

Selects the 2047 test pattern to be transmitted on the DDS secondary channel.

See also: **DDS ANALysis** and **DDS TRAnsmit**

DDS TRAnsmit **Select Transmitted DDS Channel**

DDS TRA?

Displays the currently transmitting DDS channel. **DDS TRAnsmit** enables the 14-bit FIDDDS to which is assigned the DDS secondary channel to be used. This command is part of setting the DDS channel to be used with the AUX 19 DDS CHN. TRAnsmit function.

DDS TRA PRImary

Selects the DDS primary channel to be transmitted.

DDS TRA SECondary

Selects the DDS secondary channel to be transmitted.

DDS TRA OFF

Selects both DDS channels to be transmitted.

See also: **DDS ANALysis** and **DDS SECondarypat**

DEVICE CLEAR **Reinitialize Device**

DEVICE CLEAR clears the TBLRD 224 by executing the power-up procedure. The entire instrument is reinitialized - hardware and RAM. NOVRAM is not cleared. Executing this command causes a test result.

NOTE

When specified, this command returns control of the T-BURD 221 to the front panel of the instrument. Remote control mode must be reestablished.

DIAL SEQUENCE DEFINE**Dial Sequence Definition****DIA SEQ DEF <##>?**

Display the digit sequences for the selected dial sequence. The sequence number <##> ranges from 1 to 10. **DIAL SEQUENCE DEFINE** allows the user to program and store up to ten different digit sequences.

The digit sequence is transmitted when the T-BURD 221 is configured for Signaling or SWI 26 testing and the Source Configuration 2 is set to DIAL SEQ. This command is part of the AUX 26 DIAL SEQ.

DIA SEQ DEF <##><digits>

Program and store up to ten different digit sequences. The sequence number <##> ranges from 1 to 10. The sequence digits <digits> can consist of up to 80 characters. Valid characters include:

| | | | |
|--------|--------|------|--------|
| 0 to 9 | [H] | [I] | [ST] |
| * | [E] | [O] | [STP] |
| # | [C] | [P] | [STSP] |
| A | [W] | [R] | [STAP] |
| B | [DTMF] | [KP] | [DP] |
| C | [MF] | | |
| D | | | |

NOTE

[H] indicates lowercase, which represents a lowercase digit.

PROGRAMMING NOTES

Program the address type of a number preceding the number with one of the appropriate address type: **ADP**,

{DTMF} or **{MF}**. If the number is not preceded by an address type the address type **DTMF** is assigned to that number.

A, B, C, D, #, and * will be ignored if they appear with a **DP** or **MF** address type.

If any of the following characters, **A, B, C, D, #, and ***, appear in a **DP** or **MF** dialing sequence, the entire sequence is rejected.

DIAL SEQUENCE DEFINE cannot use **[KP]**, **[ST]**, **[STP]**, **[STSP]**, and **[STOP]** as valid characters in dialing sequences. If these characters are used in dialing sequences, they must be defined as **ALL** or **INVALID**.

Brackets () and **!** characters inside them will not be counted to the 80 character sequence length limit.

DIGIT**Digit****DIG?**

Display all of the current settings of the dial sequence digits. **DIGIT** defines the characteristics of the transmitted **DTMF**, **MF**, and **DP** digits for the dial sequence transactions. These commands are identical

to those used in the AUX 26 DIAL SEQ.

DIG %BReak?

Display the current setting of **%BReak**.

DIG %BReak <xxx>

Set the % mouse/break value. Valid range for <xxx> is between 40 to 68%.

DIG DURation?

Display the current setting of **DURATION**.

DIG DURation <xxx>

Set the length of the duration for MIDDLE digit ON time. Valid range for <xxx> is between 13 to 250ms.

DIG INT DURATION?

Display the current setting of **INT DURATION**.

DIG INT DURATION <xxx>

Set the length of the duration for MIDDLE digit OFF time. Valid range for <xxx> is between 13 and 250ms.

DIG PPS?

Display the current setting of **PPS**.

DIG PPS <xxx>

Set the value for pulse per second. Valid range for <xxx> is between 7 and 21.

DISplay

Front-Panel Display Mode

DIS?

View current display mode of display panel. **DISplay** determines if the **RESULTS** and **RESULTS It High** and **Arrow** switches are active when the **LOCAL** is enabled. Remote control, web, and command switches are always inactive when in remote control.

DIS LOCAL

Activates the **RESULT** switches.

DIS REMOTE

Deactivates the **RESULT** switches.

DISplay HOld

Freeze the Results Displays

DIS HOld?

Display the current status of **DISPLAY HOLD** switch. **DISplay HOLD** controls the front panel results displays. This command is identical in function to the **DISPLAY HOLD** switch on the front panel of the T-BERD 274.

DIS HOld ON

Freezes the results displays. Note that when **DIS HOld ON** is enabled during a test, the T-BERD 274 continues to accumulate test results.

DIS HOL OFF
Disables the display hold function.

DROp **Drop Channel**

DRO?
Display the status of the **DROP CHANNEL** switch. **DROp** returns or selects from which (1) signal a channel(s) is to be dropped for testing. Modifying this command causes a test restart.

DRO L1
Selects LINE 1 as the source from which the data is dropped.

DRO L2
Selects LINE 2 as the source from which the data is dropped.

DRO BOTH
Selects LINE 1 and LINE 2 as the source from which the data is dropped.

DS0 ERRor CORRection **DS0A Error Correction**

DS0 ERR COR?
Displays the current status of the DS0A error correction. **DS0 ERRor CORRection** determines if mandatory error correction is performed on the separate DS0A data. This command is part of A11X 12 ERR COR.

DS0 ERR COR ON
Checks error correction on by using majority rule error correction.

DS0 ERR COR OFF
Checks error correction off by disabling error correction.

DS0 INTerface TIMing **DS0 Interface Timing**

DS0 INT TIM?
Display the status of the DS0 interface timing. **DS0 INTerface TIMing** controls the selection of the DS0 interface timing and receive checks. This command is part of the A11X 17 DS0 INT TIM function. Modify this command causes a test restart if the **CHANNELFORMAT** switch is set to DS0.

DS0 INT TIM SEPARate
Selects separate checks for drop and insert.

DS0 INT TIM COMBine
Selects a single check for both drop and insert.

DSU ANALysis CHANnel

DDS Channel Analysis

DSU ANA CHA?

Displays the current DSU analysis channel. **DSU ANALysis CHANnel** selects or returns the current DDS channel analyzed for performance results. Modifying this command causes a test result if the **CHANNEL FORMAT** switch is set in a DS0A or DS0B rate. This command is identical to the **ANALYSIS CHANNEL** function.

DSU ANA CHA PRImary

Selects the primary DS0A or DS0B channel for analysis. See bit 5 with the **DSUDp Bit8** command.

DSU ANA CHA SECOndary

Selects the secondary DS0A or DS0B channel for analysis.

NOTE

If the DDS primary channel is being analyzed, the test pattern is selected with the **SOURCE 1** command. If the DDS secondary channel is being analyzed, the test pattern is selected with the **DDS SECOndary** command.

See also: **DSUDp Bit8**

DSUDp Bit8

DSU-DP Primary Channel Bit 8 Setting

DSUD B ?

Displays the current DDS primary channel bit 8 setting. **DSUDp Bit8** sets the DSU-DP primary channel. This command is set to 8 when the **DSU ANALysis CHANnel** command is set to Primary. This command is identical to the **ANALYSIS CHANNEL PRIMARY CTRL BIT** function.

DSUD B Test

Selects test pattern for analysis. **TESTP=113** (MEX14)

DSUD B Bit Insert

Select to insert Bit 8 with RPS

See also: **DSU ANALysis CHANnel**

H.7 ECHO

ECHO

Echo Mode

ECHO ?

Displays the echo status. **ECHO** determines whether characters entered from the remote control unit are displayed.

ECHO ON

Enables all characters entered from the remote control unit to be displayed.

ECHO OFF

Disables the printing of characters entered from the remote control and ECHO is not available from the HCL-488 port.

ERRor INSerI BPV

Initials BPV Error Insertion

ERR INS BPV?

Displays current BPV error insertion status. **ERRor INSerI BPV** controls the insertion of BPVs into the data stream. This command is identical to pressing the **BPV ERROR INSERT** switch. The command cannot be set when the **INSerI** command is set to **NONE**.

ERR INs BPV RATE

Inserts continuous BPVs into the data stream. The error rate is controlled through the **ERRor RATE** command.

ERR INS BPV BURst

Inserts a single burst of BPVs. The burst error rate and burst length are controlled through the **ERRor RATE** and **BURst LENGth** commands.

ERR INS BPV SINGLE

Inserts a single BPV. It can also turn off continuous error insertion.

ERR INS BPV OFF

Stops continuous BPV error insertion.

See also: **ERRor RATE** and **BURst LENGth**

ERRor INSerI FRAMe

Initials Consecutive Frame Error Insertion

ERR INS FRA?

Displays current consecutive frame error insertion status. **ERRor INSerI FRAMe** controls the insertion of consecutive frame errors into the framing bits of the data stream. This command is identical to pressing the **FRAME ERROR INSERT** switch. The command cannot be set when the **INSerI** command is set to **NONE**.

ERR INS FRA CONTInuous

Inserts continuous single or multiple consecutive frame errors (2 to 6) into the framing bits. The number of frame errors is controlled through the **FRAM ERRor LENGth** command.

ERR INS FRA SINGLE

Inserts a single frame error into the framing bits. It can also turn off consecutive frame errors.

ERR INS FRA OFF

Stops continuous frame error insertion.

See also: **FRAM ERRor LENGth**

| | |
|---|--|
| ERRor INSErt LOGic | Initiate Logic Error Insertion |
| ERR INS LOG? | Displays current logic error insertion status. ERRor INSErt LOGic controls the insertion of logic errors into the data stream. This command is identical to pressing the LOGIC ERROR INSERT switch. The command cannot be set when the INSErt command is set to NONE . |
| ERR INS LOGRAte | Inserts continuous logic errors into the data stream. The error rate is controlled through the ERRor RATE command. |
| ERR INS LOG BURst | Inserts a single burst of logic errors. The burst error rate and burst length are controlled through the ERRor RATE and BURst LENGth commands. |
| ERR INS LOG SINGle | Inserts a single logic error. It can also turn off continuous error insertion. |
| ERR INS LOG OFF | Stops continuous logic error insertion. |
| See also: ERRor RATE and BURst LENGth . | |
| ERRor INSErt YELlow | Yellow Alarm Insertion |
| ERR INS YEL? | Displays current yellow alarm insertion status. ERRor INSErt YELlow controls the insertion of a continuous yellow alarm into the data stream. This command is identical to pressing the YELLOW INSERT switch. This command cannot be set when the INSErt command is set to NONE . |
| ERR INS YEL ON | Inserts continuous yellow alarms into the data stream. |
| ERR INS YEL OFF | Stops continuous yellow alarms into the data stream. |
| ERRor NUMBER | Error Number |
| ERRor NUMBER? | Displays the error number of the most recent remote control command error. Refer to Section C for the list of error message numbers and explanations. |
| ERRor RATE | Set BPV and Logic Error Insertion Rate |
| ERRRAT? | Displays current BPV and logic error insertion rate. ERRor RATE controls the burst and continuous BPV and logic error insertion rates. This command is part of setting the error rate with the ACX 12 ERR RT, ERRor RATE function. The maximum error rate can be set to 0.12 and the minimum error rate can be set to 0.015. |

ERRRAT *eX,X,Ys*

Sets new BPV and logic error insertion rate *eX,X,Ys*. The *X,X,Y* format represents the valid error rates from 1.0E-2 to 1.0E-9. *X,X* equals the whole number (1 to 9999) and *Y* equals the negative exponent (2 to 9). For example, 3.0E equals X1,6.

See also: **ERRor INSerT BPV** and **ERRor INSerT LOGic**

H.S FAR END LOOP

FAR END LOOP

Far-End Loopback Status

FAR END LOO ?

Displays the status of the shelf and protection line far-end loopbacks. **FAR END LOOP** command reports the status of the shelf and protection line far-end loopbacks of the selected line.

FAR END LOO L1?

Displays the status of the shelf and protection line far-end loopbacks for Line 1.

FAR END LOO L2?

Displays the status of the shelf and protection line far-end loopbacks for Line 2.

Possible status reports include:

SHELF A, B, C, or D — Shelf A, B, C, or D is in far-end loop.

PROTECTION — The protection line is in far-end loop.

UNVAL — The protection line is being received, e.g., frame sync is received, a protection line is in far-end loop, but the protection line is not connected to the span.

N/A — Command is not applicable to current configuration.

NONE — None of the DSI lines is looped back.

See also: **CHAnnel FORmat**, **PRInt**, **RESUR 1/2**, **SIGnal INSerT**, **SLC ALArm**, **SLC MAINTe-nance**, **SOURce 1**, and **SOURce 2**

FIRST Power Up

First Power-Up

FIRST Power Up converts factory settings into non-volatile memory for VME VM's and then initiates the power-up procedure. The instrument is reinitialized (hardware I/O), and NOVRAM (Non-Volatile Random Access Memory) is cleared.

NOTE

The unit is no longer in remote control mode after executing this command.

FREquency SWEEp

Set VF Frequency Sweep

FRE SWE ?

Display the current frequency sweep parameters. **FREquency SWEEp** sets the frequency sweep parameters. This command is identical in function to the AUX 21 SWEEP function.

NOTE

Enter a ? in place of the <parameters> in the following commands to display the current parameter.

FRE \$WEStArT FREquency <parameters>

Set the start frequencies for the frequency band to be spanned in a sweep. The valid parameter for **StArT** range from 20 Hz to 3994 Hz.

FRE SWE StOp FREquency <parameters>

Set the VF Frequency Sweep **StOp** frequency to the <parameters> value. The valid parameters for **StOp** range from 20 Hz to 3994 Hz.

FRE SWE StEp IntErval <parameters>

Set the time interval spent at each frequency during a sweep to the <parameters> value. The valid parameters for **StEp-IntErv** range from 1.5 seconds to 9.9 seconds.

FRE SWE StEp SizE <parameters>

Set the step size between each frequency during a sweep to the <parameters> value. The valid parameters for **StEp-SizE** range from 10 Hz to 1000 Hz.

FRE SWE SkIp HIGh <parameters>

Set the high end of the skip frequency during a sweep to the <parameters> value. The valid parameters for **SkIp-HIGh** range from 20 Hz to 3994 Hz.

FRE SWE SkIp LOW <parameters>

Set the low end of the skip frequency during a sweep to the <parameters> value. The valid parameters for **SkIp-LOW** range from 20 Hz to 3994 Hz.

NOTE

A restart must be performed to activate NEW FRE SWE parameters.

FRM ERRor LengTh

Set Consecutive Frame Error Length

FRM ERR LEN?

Display the current number of consecutive framing errors being ignored. **FRM ERRor LENgTh** controls the number of framing bits that are consecutively ignored in the framing pattern. This command is identical to setting the frame errors with the AUN 14 FRM ERR function.

FRM ERR LEN <ex>

Set the number of consecutive framing bits to be ignored in the framing pattern. <ex> can be set from 1 to 6.

See also: **FRM ERRor INStert FRAMe**

H.9 GTL

GTL

IEEE-488 Go To Local

GTL

Enter local mode from remote control. **GTL (Go To Local)** is an IEEE-488 bus command that returns the T-BERD 224 to local mode from remote control. In local mode, all of the T-BERD 224 front panel switches are active. The T-BERD 224 remains in Local mode until the user specifies any valid remote control command.

See also: See also: **488 ADD**, **488 MOD**, **488 SRQ**, and **LOCAL**

H.10 HELLO

HELLO

Display the T-BERD 224 Software Revision Level

HELLO? displays the T-BERD 224 hardware and software revision levels and any options that are included in the instrument as well as any self-test errors, such as **NOVARIANT**.

HELP

On-Line Help Function

HELP enters summary or function information and provides access to the T-BERD 224 system help facility. **HELP n**, **HELP** parameter indexes the various types of help information. **HELP ?** displays all valid T-BERD 224 system command names. **HELP numbers** display a specific page of help information. **HELP command-names** defines and displays the command syntax for any specified type of remote control. The following conventions apply:

1. Command and parameters are presented in a single column.
2. Command and parameter summaries are preceded by three dashes (---).
3. Command parameters are presented as upper-case character strings with optional characters in lower case characters.

The following help command line are available to view specific groups of remote commands:

| | |
|----------------|---|
| HELP 1 | Displays an index to the help information. |
| HELP 2 | Displays help information for numeric characters. |
| HELP 3 | Displays help information for ASCII commands. |
| HELP 4 | Displays help information for control commands. |
| HELP 5 | Displays help information for bus control commands. |
| HELP 6 | Displays help information for remote-only commands. |
| HELP 7 | Displays help information for switches. |
| HELP 9 | Displays help information for VI Option auxiliary functions. |
| HELP 10 | Displays help information for BERT Option auxiliary functions. |
| HELP 11 | Displays help information for DDS Option auxiliary functions. |
| HELP 14 | Displays help information for Signaling Option auxiliary functions. |
| HELP 15 | Displays help information for Co-Gen ID Option auxiliary functions. |

- HELP 16** .Displays help information for Smart Loopback Command Codes.
- HELP1** .Displays a list of all valid commands.

HISTory RESet **Reset Alarm History LED Indicators**

HISTory RESet clears all alarm history LED indicators for both lines.

HOLD **Hold All Printer Outputs**

HOLD temporarily holds printer outputs (in the print buffer) until a **RELease** command is specified. Note that while the **HOLD** command is enabled, the prompt character changes from the standard [>] or user-specified prompt to a [H] to indicate that the printer output is being held. Prompts held include result prompts, control prompts, alarm messages, and status information. However, responses to queries are returned as before.

See also: **RELease**

H.11 INSERT

INSer **Insert**

INS? .Displays the status of the INSERT switch. **INSer** requests the line on which [F] serial data stream errors are inserted.

INS L1 .Selects LINE 1 for channel insertion.

INS L2 .Selects LINE 2 for channel insertion.

INS NONE .Selects no channel for channel insertion.

H.12 L1 CHANNEL

L1 CHANnel **LINE 1 Channel Selection**

L1 CHA? .Display the selected channel. **L1 CHANnel** selects or returns LINE 1 channel to be analyzed or tested. Modifying this command causes a test return.

L1 CHAn n

Selects the channel number (where n is the channel number 1 - 24) for testing and analysis.

L1 CHA ALL

Selects the all channels for testing and analysis.

NOTE

Valid channel selections are determined by the current setup. This command is valid in the VF and DS0 channel formats.

L2 CHAnnel

LINE 2 Channel Selection

L2 CHA ?

Display the selected channel. **L2 CHAnnel** selects or retains LINE 2's channel to be monitored or tested. Modifying this command causes a test restart.

L2 CHA nn

Selects the channel number (where nn is the channel number 1 - 24) for testing and analysis.

L2 CHA ALL

Selects all channels for testing and analysis.

NOTE

Valid channel selections are determined by the current setup. This command is valid in the VF and DS0 channel formats.

L1 LBO

LINE 1 Line Build-Out

L1 LBO?

Displays the status of the line build-out for LINE 1. **L1 LBO** controls the current transmit output setting for LINE 1, allows the user to select emulation of three different cable losses, or ET rates. This command is identical to the ALX 05 LBO function.

L1 LBO [0 | -7.5 | -15]

Selects LINE 1 build-out setting. Selectable line build-out includes 0, -7.5, and -15.

L2 LBO

LINE 2 Line Build-Out

L2 LBO?

Displays the status of the line build-out for LINE 2. **L2 LBO** controls the current transmit output setting for LINE 2. This command is identical to the ALX 05 LBO function.

L2 LBO [0 | -7.5 | -15]

Selects LINE 2 build-out setting. Selectable line build-out includes 0, -7.5, and -15.

L1 RECEive INPut

LINE 1 Receive Input Termination

L1 REC INP ?

Display the status of the current receive input termination for LINE 1. **L1 RECEive INPut** selects input impedance and signal conditioning for the LINE 1 RECEIVE connector. Modifying this command causes a test result.

L1 REC INP BRIdge

Sets the LINE 1 RECEIVE connector to bridge.

L1 REC INP TERminate

Sets the LINE 1 RECEIVE connector to terminate.

L1 REC INP DSX

Sets the LINE 1 RECEIVE connector to DSX-median.

L2 RECEive INPut

LINE 2 Receive Input Termination

L2 REC INP ?

Display the status of the current receive input termination for LINE 2. **L2 RECEive INPut** selects input impedance and signal conditioning. Modifying this command causes a test result.

L2 REC INP BRIdge

Sets the LINE 2 RECEIVE connector to bridge.

L2 REC INP TERminate

Sets the LINE 2 RECEIVE connector to terminate.

L2 REC INP DSX

Sets the LINE 2 RECEIVE connector to DSX-median.

L1 RECEive SIGnal

LINE 1 Receive Signal Status

L1 RECEive SIGnal? Displays the logical state of the signaling bits on the channel received on LINE 1. The signaling bits are returned in the format XXXX, which corresponds to A/B/C/D; when X = 1, the logic state is active (ON) and when X = 0, the logic state is inactive (OFF).

NOTE

For this response to be returned, the selected CHANNEL FORMAT must be set to VCR or VCR/HR. The number of signaling bits is categorized by the current A/B/C/D setting. The bit quantity status of this category is a CC indicator located below the associated line.

L2 REcEive SIGnal

LINE 2 Receive Signal Status

L2 REcEive SIGnal? displays the logical state of the signaling bits received on the selected channel received on LINE 2. The signaling bits are returned in the format XXXX where X corresponds to ABCD; where X = 1, the logic state is active (ON) and where X = 0, the logic state is inactive (OFF).

NOTE

For this response to be returned, the selected CHANNEL FORMAT must be set to VFC or VFTERRU. The number of signaling bits is determined by the current MODE setting. The ABCD signaling status LEDs correspond to the indicators listed below the associated line.

LED

LED Status

LED?

Display the state of the TBERD 224 alarm and status LED indicators. When specified, this command displays the LED indicators as they appear on the front panel.

LED L1 ?

Display the state of the TBERD 224s alarm and status LED indicators on Line 1. When specified, this command displays the LED indicators as they appear on the front panel.

LED L2 ?

Display the state of the TBERD 224s alarm and status LED indicators on Line 2. When specified, this command displays the LED indicators as they appear on the front panel.

LOCAL

Return the TBERD 224 to Local Mode

LOCAL

Enter Local (front panel) mode. LOCAL returns the TBERD 224 to Local mode from remote control. In Local mode, all of the TBERD 224 front-panel switches are active. The TBERD 224 remains in Local mode until the user specifies any valid remote control command from the remote control unit.

Alternate form of the LOCAL command

See also: Display REMote, TERminal, COMputer, and GTL

LOOP CODE

Set Loop Code Type and Pattern

LOOP CODE?

Display current LL loop code type (FF, FDS alternating, and FDS latching) and selection. LOOP CODE sets the loop-up and loop-down codes that are transmitted when either **Loop Up ON** or **Loop Down ON** commands are initiated. The TBERD 224 can also respond to a selected LL loop code when the **RESPONSE AUTO** command is initiated. This command is identical to setting the loop code type and equipment selections with the AUX 1/1 LOOP CD function. The loop code configurations are described below.

DDS Alternating

| | |
|------------------------|--|
| LOO COD DDS_A CHAN+1R | Selects DDS alternating CHANNEL1 loop code with one repeater. |
| LOO COD DDS_A CHAN+2R | Selects DDS alternating CHANNEL1 loop code with two repeaters. |
| LOO COD DDS_A 1ST RPTR | Selects DDS alternating first repeater loop code. |
| LOO COD DDS_A 2ND RPT | Selects DDS alternating second repeater loop code. |
| LOO COD DDS_A CHANN | Selects DDS alternating CHANNEL2 loop code. |
| LOO COD DDS_A DSU | Selects DDS alternating DSU loop code. |
| LOO COD DDS_A HL96 | Selects DDS alternating HL96NY loop code. |
| LOO COD DDS_A OCU | Selects DDS alternating OCU loop code. |
| LOO COD DDS_A OCU+ | Selects DDS alternating OCU loop code with HL96NY. |

DDS Latching

| | |
|--------------------------|---|
| LOO COD DDS_L CHA | Selects DDS latching channel loop code. |
| LOO COD DDS_L DS0-DP (x) | Selects DDS latching DS0-DP loop code and function (x) equals 1 to 8. |
| LOO COD DDS_L LSI | Selects DDS latching LSI loop code. |
| LOO COD DDS_L OCU | Selects DDS latching OCU loop code. |
| LOO COD DDS_L DSU | Selects DDS latching DSU loop code. |
| LOO COD DDS_L MJU | Selects DDS latching MJU loop code. |
| LOO COD DDS_L NEVRPTR | Selects DDS latching NER loop code. |
| LOO COD DDS_L V.54 | Selects DDS latching fractional T1 V.54 loop code. |

T1

| | |
|--------------------|--|
| LOO COD T1 CSU | Selects T1 in-band CSU loop code. |
| LOO COD T1 ESF-LIN | Selects T1 ESF out-of-band Lin loop code. |
| LOO COD T1 ESF-NET | Selects T1 ESF out-of-band Network loop code. |
| LOO COD T1 ESFPAY | Selects T1 ESF out-of-band Payload loop code. |
| LOO COD T1 FAC1 | Selects T1 in-band 4-bit Facility 1 loop code. |
| LOO COD T1 FAC2 | Selects T1 in-band 4-bit Facility 2 loop code. |
| LOO COD T1 FAC3 | Selects T1 in-band 4-bit Facility 3 loop code. |
| LOO COD T1 PRG | Selects T1 in-band Programmable loop code. Note: This loop up and loop down codes are programmed through the PGM LPU and PGM LPU commands, not separately. |

T1 Intelligent Network Equipment

| | |
|----------------|---|
| LOO COD ICR | Selects intelligent line repeater loop code. |
| LOO COD IOR | Selects intelligent office repeater loop code. |
| LOO COD ILRC | Selects intelligent line repeater loop code commands. |
| LOO COD IORC | Selects intelligent office repeater loop code commands. |
| LOO COD ILRP | Selects intelligent line repeater programmable command address. |
| LOO COD IORP | Selects intelligent office repeater programmable command address. |
| LOO COD ILRPG | Selects intelligent line repeater programmable commands. |
| LOO COD IORPG | Selects intelligent office repeater programmable commands. |
| LOO COD DS1MS | Selects DS1MS Search loop code. |
| LOO COD DS1FSK | Selects DS1MS Search loop code. |
| LOO COD DS1MM | Selects DS1MS Search loop code commands. |

See also: **LOOP Down, LOOP Up, RESPONSE, PGM LPU, and PGM LPUd**

LOOP Down**Transmit Loop-Down Code****LOOP?**

Display current loop-down code transmission status. **LOOP Down** controls the transmission of the selected loop-down code which is selected with the **LOOP CODE** command. The transmission of the loop-down code continues until it is no longer detected at the receiver or until a **LOOP Down OFF** command is issued. This command is identical to pressing the **LOOP DOWN** switch.

LOOP ON

Enables the loop-down code transmission for loopbacks requiring a loop-down code to release the terminal loopback.

LOOP OFF

Disables the loop-down code transmission.

See also: **LOOP CODE**, **LOOP Up**, **RESPONSE**, **PGM LPUp**, and **PGM LPDn**

LOOP Up**Transmit Loop-Up Code****LOOP?**

Display current loop-up code status transmission. **LOOP Up** controls the transmission of the selected loop-up code which is selected with the **LOOP CODE** command. The transmission of the loop-up code continues until it is detected for 250 ms at the receiver or until a **LOOP Up OFF** command is issued. This command is identical to pressing the **LOOP UP** switch.

LOOP ON

Enables the loop-up code transmission for loopbacks requiring a loop-up code to release the terminal loopback.

LOOP OFF

Disables the loop-up code transmission.

See also: See also, **LOOP CODE**, **LOOP Down**, **RESPONSE**, **PGM LPUp**, and **PGM LPDn**

H.13 MESSAGE**MESSage****Enable or Disable Error Message Printing****MEG?**

Display current status of error message printing. **MESSage** enables or disables error message printing on your remote control unit.

MES O

Enables the printing of error messages when appropriate conditions exist.

MES OFF

Disables the printing of error messages under such conditions.

See also **ERR NUM**

MJU BRANCH

MJU Branch

MJU BRANCH?

Display the currently selected MJU branch. **MJU BRANCH** selects the MJU branch for the designated MJU operation. This command is similar to the AUX MJU 30 function.

MJU BRANCH [1 - 4]

Select an MJU branch for the MJU SELECT operation.

MJU HUB

MJU Hub Id

MJU HUB? Display the hub id of the currently selected MJU branch. This command is similar to the AUX MJU 30 function.

MJU OPERATION

MJU Operation

MJU OPE ?

Display the current MJU operation. **MJU OPERATION** selects the operation to be performed on the selected MJU branch. This command is similar to the AUX MJU 30 function.

MJU OPE BLOCK

Blocks the selected branch from transmitting or receiving data.

MJU OPE RELEASE

Releases all branches from being operating.

MJU OPE RESTORE

Deletes the last SELECT/BLOCK or SELECT/UNBLOCK sequence.

MJU OPE SELECT

Accesses the selected branch.

MJU OPE UNBLOCK

Unblocks the selected branch previously BLOCK.

MJU SEND

MJU Send

MJU SEND?

Display the status of the MJU operation. **MJU SEND** initiates the MJU operation setup with the **MJU OPERATION** command. This command is similar to the AUX MJU 30 function. This command is not valid when the INSERT switch is set at NONE.

MJU SEN

Initiates the selected MJU operation.

MODE Transmit and Receive Mode

MOD ?

Display current mode. **MODE** sets or returns the current transmit and receive line rate and data format. This command is identical in function to the **MODE** switch on the T-BERD 224s front-panel. Modifying this command causes a test restart and may change the current setup.

MOD (mode)

Selects a mode. The selected **(mode)** can be one of the following:

| | |
|---------------|--|
| T1 | Defaulted T1 |
| T1D1D | T1 rate with D1D framing |
| T1D2 | T1 rate with D2 framing |
| T1D4 | T1 rate with D4 framing |
| T1ESF | T1 rate with ESF framing |
| T1ESFZ | T1 rate with ESFz framing and ZBTST (optional) |
| T1SLC | T1 rate with SLC-96 framing |
| T1TLB | T1 rate in Test Loopback mode |
| T1LLB | T1 rate in Line Loopback mode |
| SLCD1D | Mode I SLC-96 systems |
| SLC-M2 | Mode II SLC-96 systems |
| SMART | SMARTLINE mode |
| AUTO | Automatic configuration mode |

H.14 NON CONTIGUOUS

NON CONTIGUOUS

Non-Contiguous Channel Selection

NON CON ?

Display current non-contiguous channel selection. **NON CON** allows the user to select which non-contiguous channel numbers are to be tested from each line. The channel numbers range from 1 to 24. The number of channels must be the same for each line and they must be in ascending order. Modifying this command causes a test restart if **SOURCE CONFIGURATION** 0 switch is set to **NON CONTIG**. This command is identical to the A: X 14 **NON CONTIG** function.

NON CON LI

Selects the channel numbers that are LINE I and LINE J. Specify channel numbers with a comma.

H.15 OFF HOOK

OFF HOOK

Off Hook

OFF HOOK sends the OFF HOOK signaling status for the A, B, C, and D signaling bits of the selected trunk. The trunk type is defined in the **TRUNK TYPE** command. This command is valid when the T-BERD 224 is configured for SIGNALING or SWI 56 except when **SOURCE CONFIGURATION** 3 switch is set **MONITOR SIGNALING**.

ON HOOK

On Hook

ON HOOK sends the ON HOOK signaling status for the A, B, C, and D signaling rates of the selected trunk. The trunk type is defined as the **TRUNK TYPE** parameter. This command is valid when the T-BIRD 224 is configured for SIGNLING in SW 5.86 except when **SCI** switch is set to **MONITOR** or **SCAN**.

H.16 PGM LPDOWN

PGM LPDown

Set Programmable Loop-Down Code

PGM LPDown?

Display current in-band programmable loop-down code. **PGM LPDown** enables a 3- to 8-bit user programmable in-band loop-down code to be entered. The programmable loop-down code is selected through the **LOOP CODE T1 PROGRAM** command and transmitted when the **Loop Down ON** command is initiated. **PGM LPDown** also determines which loop code the T-BIRD 224 responds to (see **RESP** command) when the **LOOP CODE T1 PROGRAM** command is set. This command is identical to setting the in-band programmable loop-down code with the AUX 16 PGM LP DOWN function.

PGM LPDown <bb...bb>

Sets in-band programmable loop-down code. <bb...bb> equals 3- to 8-bit binary code. The left-most bit is transmitted first.

See also **LOOP CODE**, **Loop Down**, **Loop Up**, **RESPONSE**, and **PGM LPUp**.

PGM LPUp

Set Programmable Loop-Up Code

PGM LPUp?

Display current in-band programmable loop-up code. **PGM LPUp** enables a 3- to 8-bit user programmable in-band loop-up code to be entered. The programmable loop-up code is selected through the **LOOP CODE** command and transmitted when the **Loop Up ON** command is initiated. **PGM LPUp** also determines which loop code the T-BIRD 224 responds to (see **RESPONSE** command) when the **LOOP CODE T1 PROGRAM** command is set. This command is identical to setting the in-band programmable loop-up code with the AUX 16 PGM LP UP function.

PGM LPUp <bb...bb>

Sets in-band programmable loop-up code. <bb...bb> equals 3- to 8-bit binary code. The left-most bit is transmitted first.

See also **LOOP CODE**, **Loop Down**, **Loop Up**, **RESPONSE**, and **PGM LPDown**.

PRINT

Initiate Printout

PRINT Controls

Initiates a control's printout. **PRINT** enables you to initiate a result or control's print. The **PRINT Controls** and **PRINT RESULTS** commands generate controls and results printouts respectively.

B.1 SOURCE CONFIGURATION

| PARAM | DEF | DEF | DEF | DEF | DEF | DEF |
|-------|-----|-----|------|------|-----|------|
| | 6A | 6A | 6A | 670 | 10 | 50 |
| 0 | 6A | 6A | 6A | 670 | 10A | 67A |
| 5 | 6A | 6A | 1035 | +1.1 | 670 | +7.0 |
| 5 | 6A | 6A | 1035 | +1.1 | 670 | +7.0 |
| 5 | 6A | 6A | 1035 | +1.1 | 670 | +7.0 |
| 1 | 6A | 6A | 1000 | +0.3 | 670 | +7.0 |
| 2 | 6A | 6A | 1035 | +1.0 | 670 | +7.0 |
| 1 | 6A | 6A | 1000 | +1.2 | 670 | +7.0 |
| 2 | 6A | 6A | 1035 | +1.0 | 670 | +7.0 |
| 2 | 6A | 6A | 1035 | +1.0 | 670 | +7.0 |
| 2 | 6A | 6A | 1035 | +1.2 | 670 | +7.0 |
| 0 | 6A | 6A | 670 | 67A | 67A | 67A |

Print SWEEP

Set Frequency Printout ON or OFF

Print SWEEP?

Display current status of the Frequency printout function. **Print SWEEP** sets the status of the Frequency Sweep printout to ON or OFF. The Frequency Sweep printout is generated a frequency vs. is identical to pressing the **SOURCE CONFIGURATION** switch while in **AUX 231RF100**.

Print SWEEP ON

Enables the Frequency printout.

Print SWEEP OFF

Disables the Frequency printout.

Print SWEEP Parameters

List the Frequency Sweep Parameters

Print SWEEP Parameters?

Displays the current status of the Frequency Sweep parameters and is identical to cycling the **SOURCE CONFIGURATION** switch through the three parameter screens, **ENDPOINT**, **STEP**, and **SKIP** while in **AUX 231SWEEP**.

Print TERMINATOR

Printer Terminator

Print TERMINATOR?

Display the current printer line terminator. **Print TERMINATOR** controls the line termination on a printer connected to the printer port. The command is identical to **AUX 091RS 231TER**.

Print CR

Each printed line is followed by a carriage return (CR) character.

Print CRLF

Each printed line is followed by a carriage return (CR) and a line feed (LF) character.

PRINTER LF

Each printed line is followed by a line feed.

PRM TRANSMIT

PRM Transmit Control

PRM TRA ?

Display current PRM transmission capability. **PRM TRANSMIT** determines whether and how PRMs are transmitted. This command is identical to the AUX 20 PRM TX, PRM TRANS function. Set the PRM emulation with the **L1 PRM EMULATION** or **L2 PRM EMULATION** command.

PRM TRA ON

Enables PRM transmission capability.

PRM TRA OFF

Disables PRM transmission capability.

PRM TRA AUTO

Configures automatic PRM transmission capability.

See also: **L1 PRM EMULATION** and **L2 PRM EMULATION**

PROMPT

Remote Control Prompt

PRO ?

Display of the prompt symbol. **PROMPT** controls the prompt symbol for the remote control. This command is not used when using the fully 488 Remote Control.

PRO ON

Enables the display of a ? as the prompt symbol when the **TRIGGER** command is used. This command.

PRO OFF

Turns off the prompt symbol.

PRO STRING <string>

Allows the user to define a remote symbol for prompt string of 100 characters. This custom prompt string is used when using the **TRIGGER** command.

NOTE

The **TRIGGER** command changes any current prompt symbol to ? when the **HOLD** compare is specified.

H.17 RECEIVE SEQUENCE DEFINE

RECEive SEQUENCE DEFINE

Receive Sequence Definition

REC SEQ DEF <##>?

Display the digit sequences for the selected receive sequence. The sequence number <##> ranges from 1 to 10. **RECEive SEQUENCE DEFINE** allows the user to program and store up to ten different digit sequences. The digit sequence is received when the F103RD 224 is configured for Signaling or SWI-56 testing and the **SOURCE CONFIGURATION I** switch is set to RxD S1-Q.

REC SEQ DEF <##> <digits>

Programs and stores up to ten different digit sequences. The sequence number <##> ranges from 1 to 10. The sequence digits <digits> can consist up to 32 characters/16 events. Valid characters include:

| | |
|--------|------|
| 0 to 9 | R |
| Q | *Q |
| H | *H |
| W | *D |
| {DTMF} | {DP} |
| {AUTO} | {MP} |

NOTE

* indicates lowercase letter/rating events.

Programming Notes

Program the address type of a number preceding the number with the appropriate address type (DP), (DTMF), (*H), or (*AUTO). If the number is not preceded by an address type the address type (AUTO) is assigned to that number. Address type is maintained until another type is detected.

Numbers greater than 99 are truncated down to 99. The digits 00-99 are entered in pairs. A space between digits is required. If a single digit is entered, it will be converted to 0X (X is the digit).

Brackets {} and the characters inside them will not be counted in the 32 character/16 event sequence length limit.

RELEase

Printer Hold Release

RELEase

Releases all output in the print buffer from HOLD status. When the **RELEase** command is specified, the prompt character changes from the (*) to the star character or user specified character to indicate that printer output is no longer held.

See also: **HOLD**

REMOte**Remote Control Entry****REMOte**

Places the T-BERD 224 in Remote Control mode. In Remote Control mode, all front panel switches are inactive with the exception of the **RESULTS** and **RESULTS** **Blank** and **Arrowed** switches. Unlike the **TERMINAL** command, the **REMOte** command does not turn probes, cables, and messages off.

See also: **LOCAL**, **TERMINAL**, **COMputer**, and **DISPlay**

RESPonse**Set Automatic T1 Loop Code Response****RESP?**

Display current T1 loop code response status. **RESPonse** confirms how the T-BERD 224 responds to T1 loop codes selected through the **LOOP CODE** T1 command. If five seconds of T1 in-band loop-up code are received, the T-BERD 224 automatically enters the **AUTO LFB** mode, the instrument repeats all transmitted data until a valid loop-down code is received. After receiving a loop-down code, the T-BERD 224 exits **AUTO LFB** mode and reverts to the previously selected operating mode indicated by the current setting of the **MODE** switch (or **MODE** command). This command is identical to setting the automatic loop code response with the **AUX 18 AUTO LFB** function.

RESP A

Enables the automatic T1 loop code response.

RESP NO

Disables the automatic T1 loop code response.

See also: **LOOP Down**, **LOOP Up**, **LOOP CODE**, **PGM LFDp**, and **PGM LFBp**

RESTART**Reset Results****RESTART**

Restarts the T-BERD 224 test by clearing all accumulated results to zero.

RESult 1 and 2**Result Display Control****RESult 1 2 ?**

When the display is set to show Results 1 or 2 display, **RESult 1** or **RESult 2** is displayed. When the display is set to show Results 1 and 2 displays, either the **PRINT** command, the **HELD** command, or the **RESult 1** or **RESult 2** command displays the specified result in the Results displays. The specified result is not displayed at the remote control location unless **RESult 1** or **RESult 2** is used. Refer to the **CUSTOM** command for information on changing the result name. **LINE 1** or **2** (**INT 1** or **2**) (**INT 1**). The result names from a results printout may also be used for the **result names**. **UNAVAIL** appears as the result when frame synchronization is not established. **N/A** appears as the result before establishing frame synchronization or command is not applicable to current configuration.

RES 1 <result name>

Displays the indicated result names on Results Display on LINE 1 or LINE 2.

RES 2 <result name>

Displays the indicated <result name> in Results II display.

See also: **Custom, PRIal, and RESULTS**

RESULTS

Results Printout

RESULTS

Causes a printout of the current result values.

RS232

RS-232 Parameters

RS232?

Displays the current status of the RS232 parameters. **RS232** only displays the current status of the RS232 interface baud rate, parity, and data bits, set in the AUX 08 RS232 function with exception of the line termination character (see **Print TERMINator**).

RS232 Baud?

Displays the current baud rate of the RS232 parameters.

RS232 Parity?

Displays the current parity of the RS232 parameters.

RS232 Data Bits?

Displays the current data bits of the RS232 parameters.

... See also: **Print TERMINator**

H.16 SETUP

SETup

Setup Summary

SETup?

Displays the current Y DIBRD 174 test set or GenAPD06 CHANNEL FORMATE 05.3 and VOL 8000 CON FIG (67500) and 10 values.

SCAN

Signaling Scan Set

SCA ?

Displays current channels being scanned and the times. **SCAN** sets or returns the DSB channels that are being scanned for signaling activity. It also sets or returns the disconnect and off hook timeouts that control the scanning. This command is only functional when **CHannel FORMat Signaling** and **SQUare 1 SCAN** are set. This command is identical to the AUX 29 SCANSET function.

SCA CHannels <channels>

Set channel numbers to be scanned. Enter <channels> in numerical order and separate by commas (,).
Example: 2,6,7,10.

SCA CHannels ALL

Set all channel numbers to be scanned.

SCA DISconnect <timeout>

Set disconnect timeouts from 1 to 15 seconds in 1 second steps.

SCA OFF hook <timeout>

Set off hook timeouts from 5 to 55 seconds in 5 second steps, or 1 to 5 minutes in 1 minute steps.

SCA OFF hook NONE

Set to resume scanning only after a disconnect or test restart occurs.

SCA CHannels ?

Display current channels being scanned.

SCA DISconnect ?

Display current disconnect timeout.

SCA OFF hook ?

Display current off hook timeout.

See also **CHannel FORMat SiGnaling** and **SOURCE 1 SCAN**.

SIGnal INsert

Channel Displaying SIGInsert

NOTE

The **INSERT** switch must not be set to NONE, and the insert line's channel number must not be 0 (power **CHANNEL FORMAT** must be set to VE and for signaling bits C and D the **MODE** switch must be set to FSI or FSI2).

SIG INS ?

Display the currently inserted signaling bit state. Signal insert sets in state. The bit state for signaling bit A to be transmitted for a selected channel. A logic 1 (ON) or 0 (OFF) entry is transmitted for the signaling bit. Signaling bits C and D are only set when the **MODE** switch is set to FSI or FSI2. When A is selected, all signaling bits (7 or 8) must be inserted on the set-over control.

SIG INS A [?]OFF|ON|FDG]

Sets the logical state for the inserted signaling bit A. Enter the ? to display the currently inserted signaling bit A state.

SIG INS B [?]OFF|ON|FDG]

Sets the logical state for the inserted signaling bit B. Enter the ? to display the currently inserted signaling bit B state.

SIG INS C [?]{OFF|ON}

Sets the logical state for the inserted signaling bit C. Enter the ? to display the currently inserted signaling bit C state.

SIG INS D [?]{OFF|ON}

Sets the logical state for the inserted signaling bit D. Enter the ? to display the currently inserted signaling bit D state.

SIG INS ALL [?]{<abc>}<abcd>}

Sets the logical state for the currently inserted signaling bit states. Enter the ? to display the currently inserted signaling bit states. Set the <abc> signaling bit states to 0, 1, or T for the 510, 102, 104, SLC-D10, or T1SLC96 training modes. Set the <abcd> signaling bit states to 0 or 1 for T1-E5F or T1-E5E7 training modes.

Perform the following steps before initiating the channel signaling bit insert function:

1. Set the **INSert** command to either **L1** or **L2**.
2. Set the **L1/2 CHAnnel** command to either the desired channel number (1 to 24) or **ALL**.
3. Set the **CHAnnel FORMat** command to **VF**.

Requesting the status of the **SIGNALING INSERT** switches can be performed at any time.

See also **CHAnnel FORMat**, **MODE**, **PRInt**, **REsult 1/2**, and **SOURce 2**.

SLC ALArms**SLC Alarm Status****SLC AL ?**

Display the current SLC alarm conditions on both lines. **SLC ALArms** reports the current SLC alarm condition for the selected line.

SLC AL L1 ?

Display the current SLC alarm conditions on Line 1.

SLC AL L2 ?

Display the current SLC alarm conditions on Line 2.

These alarms (as appear in the SUMMARY) on pages 575, following alarm conditions are reported:

SHELF A, B, C, or D — A shelf alarm occurred.

MAJOR — A major alarm occurred.

MINO — A minor alarm occurred.

POWER MISC — A power/fan/temperature alarm occurred.

A, B, C, or D ON PROT — The indicated shelf switched to the protection line.

FE LOOP SHELF A, B, C, or D — The allocated shelf is in a far-end loop.

FE LOOP PROTECTION — The protection line is in a far-end loop.

UNAVAIL — The T1 SLU96 mode is selected, but the datalink frame synchronization is not established.

N/A — The T1 SLU96 mode is not selected.

NONE — Appears when no alarms are reported.

See also: **CHAnnel FOrmat, FAR END LOOP, MODe, PRInt, RESult 1/2, SIGnal InSert, SLC MAINTe-nance, SOUrcE 1, and SOUrcE 2**

SLC MAIntenance

SLC Maintenance Message Status

SLC MAI ?

Reports on the status of the datalink maintenance messages for both lines. **SLC MAIntenance** reports on the status of the datalink maintenance messages for the selected line.

SLC MAI L1 ?

Reports on the status of the datalink maintenance messages for Line 1.

SLC MAI L2 ?

Reports on the status of the datalink maintenance messages for Line 2.

This command is only valid when the T1 SLU96 mode and the DATALINK channel format are selected and datalink frame synchronization is established. These messages also exist in the SUMMARY category. The following is a partial listing by line number:

BOOK/SEIZE — On-Hook/Seize ROCR message received.

PROCEED — Proceed ROCR message received.

TEST ALARM — Test alarm message received.

UNAVAIL — The T1 SLU96 mode is selected, but datalink frame synchronization is not established.

N/A — The T1 SLU96 mode is not selected.

NONE — None of the maintenance messages is reported.

See also: **CHAnnel FOrmat, FAR END LOOP, MODe, PRInt, RESult 1/2, SIGnal InSert, SLC MAINTe-nance, SOUrcE 1, and SOUrcE 2**

SMARtIU CLear

Clear Smart NIU/Performance Monitor Results

SMARtIU CLear

Initiates the Clear NIU function, which clears all stored T1 circuit performance data from the Smart NIU/Performance Monitor memory. In response to the command, one of the following messages appears on the console or on the local display:

NIU CLEARED -- Smart NIU/Performance Monitor TE circuit performance data was successfully cleared from memory.

CLEAR NIU FAILED -- Smart NIU/Performance Monitor TE circuit performance data was not cleared due to a communication problem.

SMARTnu CLOck

Set Smart NIU/Performance Monitor Date and Time

SMARTnu CLOck

Initiates the Set Clock feature to set the Smart NIU/Performance Monitor to match the T-BERID 224 date and time. In response to the command, one of the following messages appears on the remote terminal's display:

CLOCK SET -- Smart NIU/Performance Monitor date and time successfully changed to match the T-BERID 224 date and time.

SET CLOCK FAILED -- Smart NIU/Performance Monitor date and time were not changed due to a communication problem.

SMART NET

Intelligent Network Equipment Selection

SMART NET IOR <manufacturer & model>

Identifies intelligent office repeater type. **SMART NET** enables the user to identify the intelligent network equipment type and model. On the T-BERID 224 screen, this appears as follows:

SMART NET ILS <manufacturer & model>

Identifies intelligent line repeater type.

SMART NET MS <manufacturer & model>

Identifies DSI Maintenance Switch type.

SOURCE 1

Source Configuration 1

SOURCE 1

Displays the current selection for the **SOURCE CONFIGURATION 1** switch. **SOURCE 1** selects or returns the display of menu source, which is to be used while analyzing the selected circuit. Most menu options are available only in a fast test and may change the current setup.

SOU 1 <parameters>

Selects the setting on the **SOURCE CONFIGURATION 1** switch.

The following <parameters> are available with the mainframe:

| | |
|---------|---------------------------|
| F004 | 100 Hz tone |
| VF INT | Voice Frequency Interface |
| DS0 INT | DS0 Interface |
| DR0 CHA | Drop Channel |

The following <parameters> are available with the DSC-DP Option:

| | |
|---------------|------------------------------|
| DSU-DP | Selects DSC-DP configuration |
|---------------|------------------------------|

The following <parameters> are available with the VF Option:

| | |
|------------------|-----------------------------|
| 2713 | 2713 Hz Tone |
| 3 TON SLO | 3 Tone Slope |
| FRE | VF Signal Frequency |
| ERL | Echo Return Loss |
| LEV | VF Signal Level |
| PAR | Peak-to-Average Ratio (PAR) |
| QUT | Quiet Termination |
| SRL HIGH | Staging Return Loss - High |
| SRL LOW | Staging Return Loss - Low |
| SWE | Frequency Sweeper |

NOTE

These functions can also set the Source 2 parameter being selected. If no entry beyond the 3 character Source 1 parameter is made, then Source 2 will not be affected.

The following <parameters> are available with the Signaling Option:

| | |
|-----------------|------------------|
| DIAL SEQ | Dial Sequence |
| REC SEQ | Receive Sequence |
| SQA | Scan |
| M04 | Muster |

The following <parameters> are available with the BERT Option:

| | |
|-------------------|---|
| 1:7 | A One and Seven Zeros Pattern |
| 2^15:7 | 2,767-Bit Pseudorandom Pattern |
| 2^15-1 INV | Inverted 2,767-Bit Pseudorandom Pattern |
| 2^20-1 | 1,048,575-bit Pseudorandom Pattern |
| 2^23-1 | 8,388,607-bit Pseudorandom Pattern |
| 2 IN 8 | Two Ones In 8-Bits Pattern |
| 3 IN 24 | Three Ones In 24-Bits Pattern |
| 63 | 63-bit Pseudorandom Pattern |
| 511 | 511-bit Pseudorandom Pattern |
| 2047 | 2047-bit Pseudorandom Pattern |
| ALL ONE | All Ones Pattern |
| ALL ZER | All Zeros Pattern |
| AUTO | Automatic Pattern Selection |
| BRI | Busy Lip |
| DDS1 | DDS 1 Stress Pattern |
| DDS2 | DDS 2 Stress Pattern |
| DDS3 | DDS 3 Stress Pattern |
| DDS4 | DDS 4 Stress Pattern |
| DDS5 | DDS 5 Stress Pattern |
| DDS6 | DDS 6 Stress Pattern |
| QPS | Quasi-Random Signal Format 1/2 |

| | |
|-------------------|--------------------------------|
| MIN | Minimum Density Stress Pattern |
| MUL | Multitap |
| T1-2/TRIP | 96-octet HEX pattern |
| T1-3 | 84-octet HEX pattern |
| T1-4 | 120-octet HEX pattern |
| T1-5 | 55-octet HEX pattern |
| T1-6/55OCT | Unframed 55-octet HEX pattern |
| T1-DALY | Framed 55-octet HEX pattern |
| USE | User Programmable Bit Pattern |

The following <parameters> are available with the SLA Option:

| | |
|---------------------|---|
| FAR END LOOP | Far end loop command to the selected shell at Protection line |
| IDLE | Idle signal |
| MAINT | Automated maintenance test sequence |
| MAJ ALA | Major alarm to file selected shell |
| MINO ALA | Minor alarm |
| POW | Power miscellaneous alarm |
| SW PROT | Switch to protection line |

The following <parameters> are available with the Caller ID Option:

| | |
|----------------|-------------------------------|
| MONitor | Selects CID MON configuration |
|----------------|-------------------------------|

The following <parameters> are available with the Level 2 Protocol Monitor Option:

| | |
|---------------------|-------------------------------|
| SS7 MONitor | Monitor SS7 level 2 protocol |
| ISDN MONitor | Monitor ISDN level 2 protocol |

NOTE

Changing the source configuration causes a test restart and changes the current from model channel protocol to the previous configuration of the selected channel to system configuration, printed indicating the new setup.

SOURCE 2

Source Configuration II

SOU 27

Displays the current status of the **SOURCE CONFIGURATIONII** switch selection. **Source 2** requires the **SOURCE CONFIGURATION I** switch selection. **Source 2** selects or returns the group and insert source which is to be used when analyzing the selected channel(s).

SOU 2 <parameters>

Selects the setting for the **SOURCE CONFIGURATIONII** switch.

The following <parameters> are available for the DSL-DF Option:

| | |
|------------------------|---|
| CHAN <xx> | Displays the subrate channel number of a DSLDF-formatted channel (where x = 1 to 20, 1 to 10, or 1 to 5). |
| N = <xx> | Selects the number of channels of a fractional T1 signal (where x = 1 to 24). |

NON CON

(Selects non-configure channels for a fractional T1 signal. (The non-configure channels are defined by ALX/DUN/CON/16) or NO SCONfigurable remote command)

The following <parameters> are available with the V1 Option:

ON/OFF

When 2113 Hz is the **SOURCE CONFIGURATION** switch setting.

404/1004/2804 Hz

When 410NE/SLOPE is the **SOURCE CONFIGURATION** switch setting.

The following <parameters> are available with the Signaling Option:

SEQUENCE 1 to 10

Sequence 1 to 10

ORG L1

Originating Line 1

ORG L2

Originating Line 2

ORG AUTO

Originating AUTO

NOTE

Manual dialing is not available in remote control.

The following <parameters> are available with the Enhanced DS0/S1C Option:

CHAnnel <x>

Selects the DS0B channel (total subrate channel number, x_1 [x] = 1 to 20 for DS0B2.4, 1 to 10 for DS0B4.8, or 1 to 5 for DS0B9.6. This is only valid for **CHAnnel FORMat** command parameters DS0B2.4, DS0B4.8, and DS0B9.6.

SHeet [A] | [B] | [C] | [D]

Selects the sheet which indicates Sequence 1 FAULT (4) or Sequence 1 MAJ ALARM selection mode.

PRotection

Selects the **PRotection** type. The SEQUENCE 1 FAULT or MAJ ALARM selection indicates.

The following <parameters> are available with the Caller ID Option:

SWI=L1

Selects LINE 1 as the line from the switch.

SWI=L2

Selects LINE 2 as the line from the switch.

NOTE

Changing the switch configuration values will format and reprogram the switch line pair configuration to the previous configuration of the selected channel format. A warning is printed indicating the new settings.

SUMmary

Summary Results Print

SUMmary

Requests a results print for the results and messages in the Summary category.

H.19 TERMINAL

TERminal

Configure the TBERD 224 for Remote Control Operation

TER

Selects the Terminal control mode. **TERminal** is typically used as a log-in sequence when entering Remote Control mode from a dumb terminal. Typing a period (.) followed by a carriage return, places the TBERD 224 in Terminal mode and provides a default prompt (>) printed on the screen. When the **TER** command is specified, all front panel switches except the **RESULT** switches are inactive. This command is not available when using IEEE-488 Remote Control.

.(period)

Alternate form of the **TER** command.

The **TERminal** command automatically sets up the following:

| | |
|-------------|---|
| ECHO ON | Turn echo on |
| PROMPT ON | Turn command prompts on |
| TERM CR LF | Use the terminator of carriage return and line feed |
| MESSAGES ON | Causes error messages to be printed. |

See also: **LOCAL REMote**, **COMputer**, and **DISPlay**

TESt

Test Results Accumulation

TES ?

Display the current test type, **TESt** value (1-10), specify the duration (1-999).

TES TIME

The TBERD 224 conducts a timed test of the duration specified in the **TESt LENGTH** command.

TES TIME HH:MM:SS

Sets the TBERD 224 to timed test, and sets the duration (see **TESt LENGTH**).

TES CONTinuous

The TBERD 224 will conduct test results continuously.

NOTE

Changing from continuous and cause a test test.

See also: **TESt LENGTH**

TEST LENGTH

Test Length

TEST LEN ?

Displays the current test length setting. **TEST LENGTH** sets the length of a timed test. This command is identical to the AUX 03 TEST LEN function.

TEST LEN HHH:MM:SS

Sets new test length in hours, minutes, and seconds, in hours, minutes, and seconds. When setting a new test length, the symbol ":" may be replaced by a dash (-), comma (,) period (.), semicolon (;), or slash (/). The valid ranges for each time value are:

- HH: 0- 200 hours
- MM: 0- 59 minutes
- SS: 0- 45 seconds (in 15 second intervals)

NOTE

The test length may also be set using the **TEST TIME** command. If there is no entry for hours, minutes, and/or seconds, it is assumed to be zero.

See also: **TEST**

TIMED PRINT EVENT

Time Print Event

TIM PREVE ?

Displays the current time interval for results printouts. **TIMED PRINT EVENT** sets the time interval for results printouts. This command is identical to the AUX 03 TIM PREVE function.

TIM PREVE HHH:MM:SS

sets the time interval for results printouts in hours, minutes, and seconds. The hours, minutes, and seconds may be specified separately (H, MM, or SS). When setting a new test length, the symbol ":" may be replaced by a dash (-), comma (,) period (.), semicolon (;), or slash (/). The valid ranges for each time value are:

- H: 0-6 hours
- MM: 0-59 minutes
- SS: 0-45 seconds (in 15 second intervals)

NOTE

The printout time may also be set using the **PRINT EVENT** **TIMED** command. The printout time is set to 1:00 to have timed printouts generated. All commands are available in the menu. The hours, minutes and/or seconds are not needed. They are assumed to be zero (see **TEST LEN** paragraph).

See also: **PRINT EVENT**

TRUnk TYPE

Trunk Type

TRU TYP ?

Displays the current trunk type. **TRUnk TYPE** defines the trunk type simulation (ground start or loop start) and on- and off-hook signaling generated by the T-BURD 224. This command is identical to the ANX TRK DEF function.

TRU TYP DEFine OFFhook <abcd>

Enables the user defined off-hook signaling. Valid signaling bits <abcd> include: 0= off, 1= on, T= toggle, X= don't care, and ? Enter a signaling bit in each position, e.g., 01XX or 1T?0. Enter ? once to display the currently defined signaling bits.

TRU TYP DEFine ONhook <abcd>

Enables the user defined on-hook signaling. Valid signaling bits <abcd> include: 0= on, 1= on, T= toggle, X= don't care, and ? Enter a signaling bit in each position, e.g., 01XX or 1T?0. Enter ? once to display the currently defined signaling bits.

TRU TYP GROund STart <parameters>

Enables the T-BURD 224 to emulate a ground start circuit. Valid <parameters> are: FX0, FXS, SLC OFFice, SLC STATION, and ? Enter ? once to display the currently defined signaling bits.

TRU TYP LOOp STart <parameters>

Enables the T-BURD 224 to emulate a loop start circuit. Valid <parameters> are: FX0, FXS, SLC OFFice, SLC STATION, and ? Enter ? once to display the currently defined signaling bits.

TRU TYP STD

Enables the T-BURD 224 to emulate the standard L&M signaling used between switches in the public switched telephone network.

H.20 USER

USER

Set User Programmable Test Pattern

USER?

Displays current user programmable data pattern. **USER** enables a 3- to 24-bit user programmable test pattern to be entered. The test pattern is selected using the **SOURCE CONFIGURATION** switch. This command is identical to setting the user programmable pattern with the ANX 15 USER function.

USER <bb...bb>

Sets the user programmable data pattern. <bb...bb> equals 3- to 24-bit binary code. The leftmost bit is transmitted first.

See also: **SOURCE 1 USER**

H.21 VOLUME**VOLUME****Loudspeaker Control****VOL ?**

Displays the current status of the THERM 224 **VOLUME** switch. **VOL** enables or disables the radio speaker of the THERM 224 internal loud speaker. When set to **ON**, the actual audio level is controlled by the position of the front panel **VOLUME** slide control and the deagreed channels' currents are output to the side panel loudspeaker. **VOL OFF** turns off the loudspeaker.

VOL ON

Turns the speaker **ON**.

VOL OFF

Turns the speaker **OFF**.

NOTE

Each time the unit power is turned on and then on again, the status of this control is always set to **ON**.

H.22 WINK**WINK****Wink**

Displays the current wink status (1000 us). **WIN** is a name for a software function that performs a wink supervision event during the receive sequence. This command is identical to the wink control of the MUX 28 SPV DFP function.

WIN DELAY <length>

Set the wink delay to a length between 50 ns and 1000 us. Enter *l* to display current wink delay.

WIN DURATION <length>

Set the wink duration to a length between 50 ns and 1000 us. Enter *l* to display current wink duration.

See also: **DATA**

H.23 YEAR**YEAR****Calendar Year Selection****YEA ?**

Displays current year selection of the MUX 28 DFP.

YEA xx

Set last two digits of the year, where xx can be any number from 00 to 99.

APPENDIX I ACRONYMS

| | |
|---------|---|
| A-B-C-D | Signaling bus for robbed bit signaling with ESI; only A and B are available with other framing. |
| ACE | Alarm Control Unit |
| AIS | Alarm Indication Signal |
| ALBO | Automatic Line Build Out |
| AMI | Alternate Mark Inversion |
| BZS | Bipolar 8-Zero Substitution |
| BER | Bit Error Rate |
| BERT | Bit Error Rate Tester |
| BOP | Bit Oriented Protocol |
| BPV | Bipolar Violation |
| CCC | Clear Channel Capability |
| CCITT | Consultative Committee of International Telegraph and Telephone |
| CMI | Common Management Information |
| CP | Customer Premises |
| CPE | Customer Premises Equipment |
| CPU | Central Processing Unit |
| CRC | Cyclic Redundancy Check |
| CSU | Channel Service Unit |
| D3 | Third Generation Channel Bank, 24 channels on one T1 |
| D4 | Fourth Generation Digital Channel Bank, up to 48 channels on two T1s or one T3C |
| D/A | Digital to Analog |
| dBm | Decibel Level referenced to 1 mW |
| DCS | Digital Cross-connect System |
| DCE | Digital Communications Equipment |
| DDS | Digital Data System |
| DD | Direct Inward Dial |
| DI | Drop and Insert |
| DP | Dial Puls |
| DS0 | Digital Signal Level 0 (zero) |
| DS0A | Digital Signal Level 0 with a single rate adapted channel |
| DS0B | Digital Signal Level 0 with multiple channels for sub-rate multiplexed at DDS format |
| DS0 DP | Digital Signal Level 0 Data Port |
| DS1 | Digital Signal Level 1 (1.544 Mbps) |
| DS1A | Digital Signal Level 1 (1.544 Mbps) Seven DS0 signals digitally multiplexed |
| DS1B | Digital Signal Level 1 (1.544 Mbps) Seven DS0 signals digitally multiplexed |
| DS1C | Digital Signal Level 1 (1.544 Mbps) Seven DS0 signals digitally multiplexed |
| DS2 | Digital Signal Level 2 (6.312 Mbps) |
| DS2A | Digital Signal Level 2 (6.312 Mbps) Seven DS1 signals digitally multiplexed |
| DS2B | Digital Signal Level 2 (6.312 Mbps) Seven DS1 signals digitally multiplexed |
| DS2C | Digital Signal Level 2 (6.312 Mbps) Seven DS1 signals digitally multiplexed |
| DS2 DP | Data Service Unit - Data Port |
| DSX-1 | Digital Signal Cross-connect Switch (trunk) |
| DTL | Data Terminal Equipment |
| DTM | Distributed Test Manager |
| DTMF | Dual-Tone Multi-Frequency |
| E&M | Electromechanical Signaling |
| ERL | Echo Return Loss |
| ESF | Extended Superframe |
| ET | Erasing Tone |
| FSK | Frequency Shift Key |
| FTE | Functional Test Equipment |
| FX | Foreign Exchange |
| FXO | Foreign Exchange Office |
| FXS | Foreign Exchange Station |
| FR | Facility Reference Numbers |
| FRS | Facility Reference Separators |
| ISDN | Integrated Signal Digital Network |
| LBO | Line Build-Out |
| LID | Light Emitting Diode |
| LIC | Line Interface Unit |
| LLB | Line Loop Back |
| LSC | Line System Unit |
| M | SLC-96 Mule Formatting |
| M2 | SLC-96 Mule 2 Formatting |

| | |
|--------|---|
| MI | Multi-Mode III Formatting |
| MF | Multi-Frequency |
| MJC | Multiple Junction Unit |
| MON | Monitor |
| MOP | Message Oriented Protocol |
| MUX | Multiplexer |
| NETE | Network Office Terminating Equipment |
| OCU | Office Channel Unit |
| OCUDP | Office Channel Unit Data Port |
| PAR | Peak-to-Average Ratio |
| PBX | Private Branch Exchange |
| PCM | Pulse Code Modulation |
| PLB | Payback Loopback |
| POP | Point of Presence |
| PRI | Primary Rate Interface (SDN - 1.544 Mbps) |
| PRM | Performance Report Message |
| QCSS | Quasi-Random Signal |
| RL | Remote Terminal |
| RTS | Request to Send |
| SN | Signal to Noise |
| SLC | Subscriber Loop Carrier |
| SONET | Synchronous Optical Network |
| SRL-HI | Signal Return Loss - High |
| SRL-LO | Signal Return Loss - Low |
| SRQ | Service Request |
| SS7 | Signaling System 7 - Also known as CCS7 |
| SSU | Special Service Unit |
| TI | Transmission at DSL (1.544 Mbps) |
| TAD | TDM Access Group |
| TAM | Time Alignment Unit |
| TELCO | Telephone Company |
| TLB | Test Loopback |
| TRU | Transmit/Receive Unit |
| VF | Video Conferencing |
| ZBTSL | Zero-Bit Time Slot Interchange |

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