

ML10835-02
Rev. -

T-BERD 305
DS3 ANALYZER
OPERATING MANUAL

MAY 1988



© Telecommunications Techniques Corporation 1988

444 NORTH FREDERICK AVENUE
GAITHERSBURG, MARYLAND USA
(301) 258-5011 TELEX: 908736

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	General Information	1-1
1.1	Introduction	1-1
1.2	Instrument Overview	1-1
1.3	Summary of Key Features	1-1
2.0	Instrument Description	2-1
2.1	Introduction	2-1
2.2	Operating Modes	2-1
2.3	Front Panel	2-2
2.4	Measurements and Auxiliary Functions	2-10
2.5	Rear Panel	2-17
2.6	Pull-Out Reference Card	2-21
3.0	Preparation For Use	3-1
3.1	Introduction	3-1
3.2	Unpacking	3-1
3.3	Equipment Included	3-1
3.4	Instrument Checkout	3-1
4.0	Test Procedures	4-1
4.1	Introduction	4-1
4.2	Out-Of-Use Testing	4-1
4.3	In-Service Monitoring	4-5
5.0	Printer/Remote Control Interfaces	5-1
5.1	Introduction	5-1
5.2	Interface Description	5-1
5.3	Printer Operation	5-2
5.4	Remote Control Operation	5-8
5.5	Remote Control Commands	5-18
6.0	Maintenance and Service	6-1
6.1	Introduction	6-1
6.2	Maintenance	6-1
6.3	Service	6-2
7.0	Specifications	7-1
7.1	Introduction	7-1
7.2	General Specifications	7-1
7.3	Input Specifications	7-1
7.4	Output Specifications	7-2
7.5	Front Panel Specifications	7-3

<u>Section</u>	<u>Title</u>	<u>Page</u>
7.6	Pattern Specifications	7-5
7.7	DS3 Framing	7-6
7.8	Measurement Specifications	7-7
7.9	Connectors	7-9
7.10	Grounding	7-9
7.11	Optional Measurements	7-9
8.0	Options and Accessories8-1
8.1	Introduction	8-1
8.2	Options	8-1
8.3	Accessories	8-2
Appendix A	T-BERD 305 On-Line Help Manual	A-1
Appendix B	Conditions Affecting Results	B-1
Functional Index	I-1

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
2-1	T-BERD 305 Front Panel	2-3
4-1	Typical DS3 Access Points	4-4
5-1	Results Print	5-5
5-2	Controls Print	5-6

LIST OF TABLES

Table	Title	Page
2-1	Displayed Results—Logic Category	2-11
2-2	Displayed Results—BPV Category	2-12
2-3	Displayed Results—Parity Category	2-13
2-4	Displayed Results—Frame Category	2-14
2-5	Displayed Results—Signal Category	2-15
2-6	Displayed Results—Time Category	2-15
2-7	Auxiliary Function Parameters	2-16
2-8	Baud Rate Selections	2-18
4-1	DS3 Signal Level Definitions	4-2
4-2	T-BERD 305 and RX Level Settings	4-3
5-1	RS-232 Printer/Controller Interface Configurations	5-2
5-2	PR-40 Printer Configuration	5-2
5-3	RS-232 Pin Configuration	5-3
5-4	Front Panel Switch Commands	5-10
5-5	Rear Panel Switch Commands	5-11
5-6	Control Commands	5-11
5-7	BERD-BASIC Program Commands	5-12
6-1	Fuses	6-2
7-1	Input Jitter Tolerance	7-2
7-2	DS3 Framing Format	7-6
7-3	RS-232 Pin Configuration	7-10

SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides information on the physical and functional features, operation, and specifications of Telecommunications Techniques Corporation's (TTC) T-BERD 305 DS3 Analyzer.

1.2 INSTRUMENT OVERVIEW

The T-BERD 305 is a comprehensive DS3 analyzer that conducts simultaneous error and performance analysis. The T-BERD 305 is used for out-of-service testing or in-service monitoring, and is suited for testing DS3 communications across any medium, including coaxial cable, fiber optic cable, and microwave systems.

The T-BERD 305 features a simultaneous array of logic, bipolar violation, frame, and parity error measurements. The ability to simultaneously measure error conditions means that the user can obtain a complete set of measurements in a single test. These measurements can also be viewed without interrupting a test in progress.

The T-BERD 305 is packaged in a rugged aluminum case weighing less than 15 pounds, ensuring portability for use in the field.

1.3 SUMMARY OF KEY FEATURES

The following list describes the T-BERD 305's features and characteristics.

- **Simultaneous Result Accumulation** of error measurements, performance measurements, and signal measurements allows testing time to be minimized without compromising the thoroughness of the test.
- **Frame and Parity Error Counting** can be performed on live data, providing the user with the capability to conduct in-service monitoring.
- **Threshold Error Seconds** is a count of the number of seconds in which the error rate exceeds a user-defined threshold, from 10^{-2} to 10^{-9} . This

feature allows unmanned and long-term testing when exception reporting only is desired. The threshold can be defined for logic, BPV, and frame error rates.

- **Error Measurements** include logic, bipolar, and frame errors as well as associated error rate, errored second, and percent error-free seconds calculations. An optional remote control interface additionally provides remote testing capabilities.
- **Pattern Slips Count** correlates slips and error bursts. When a slip is detected, the T-BERD 305 counts the slips and the resultant errors, but instantaneously resynchronizes to the input pattern. By maintaining synchronization and keeping the slips and errors count, the T-BERD 305 allows quick isolation of pattern slips as the source of errors.
- **The Insertion of Single and Burst Errors** simulates live traffic conditions and tests the recovery time of DS3 equipment. The burst characteristics are user-defined and the burst error rate can be set from 10^{-2} to 10^{-9} . The burst duration can be set from 0.025 seconds to 5 seconds in 0.025 second increments.
- **A Signal Analysis Option** is used in conjunction with error and performance analysis. Complete with signal level, signal power, and frequency measurements, this option can be used to check DS3 signal level during installation and to correlate error bursts with level dropouts or frequency variations.
- **A DS1 Drop Option** allows simultaneous monitoring of the DS3 signal and any one of the DS1 signals within it. The DS1 signal is presented at a rear panel WECO 310 connector, which interfaces with a variety of DS1 test instruments.
- **Extended-Length Pseudorandom Patterns** support thorough stress-testing of DS3 equipment and systems.
- **A Printer Interface** permits automatic printouts to be initiated by test completion, errored seconds, or regular time intervals.
- **Remote Control Option** enables unmanned testing or long-term monitoring from a remote site.
- **Thru Data Error Insertion** permits burst errors to be inserted on live traffic, thus testing the tolerance and recovery time of receiving equipment, and exercising system alarms and protection switching.

SECTION 2 INSTRUMENT DESCRIPTION

2.1 INTRODUCTION

This section describes the T-BERD 305 DS3 Analyzer's operating modes; front panel switches, indicators, and connectors; rear panel DIP switches; and measurement capabilities. A discussion of the T-BERD 305's pull-out reference card is available at the conclusion of the section.

2.2 OPERATING MODES

The T-BERD 305 offers modes of operation that accommodate all DS3 testing needs.

2.2.1 Framing Modes

The DS3 framing modes include:

- Unframed mode for full bandwidth DS3 testing on circuits where framing is not required.
- Framed mode for testing circuits which include cross-connect switches that require framed data. Framed mode must be used when performing in-service monitoring for parity or framing errors.

2.2.2 Result Accumulation Modes

There are two modes which affect the way in which results are accumulated:

- Halt mode
- Continuous mode

In Halt mode, a frame or pattern synchronization loss stops any appropriate results from being accumulated. If there is a pattern synchronization loss, all logic

results are frozen until pattern synchronization is reacquired. If there is a frame synchronization loss, the frame, parity, and logic results are frozen. Frame and parity results resume when frame synchronization is reacquired; logic results resume when pattern synchronization is reacquired. A signal loss freezes all of the results including those in the BPV category.

In Continuous mode, errors are accumulated during periods of synchronization loss. Error counting starts after the first "sync-up" or after a test restart and continues through any subsequent synchronization losses. A signal loss is the only event that stops error accumulation.

The selection of Halt or Continuous mode is made by setting DIP Switch 9 (ACTION ON SYNC LOSS), located on the rear panel of the unit (see Section 2.5.1, DIP Switches).

2.3 FRONT PANEL

This section describes the T-BERD 305's front panel switches, indicators, and connectors. Figure 2-1 depicts the front panel. The numbers for each item in the figure correspond to the numbered descriptions which follow in Sections 2.3.1 through 2.3.3.

2.3.1 Switches

The T-BERD 305 features two types of switches:

- Single-function pushbutton switches
- Electronic slide switches

Single-function pushbutton switches control functions without associated indicators on the T-BERD 305.

An electronic slide switch features a set of labeled indicators positioned above (or next to) a pushbutton switch. Pressing and releasing the pushbutton switch advances the indicator to the next position. When the switch is held down, the sequence continues until the switch is released. In all slide switch operations, except the CATEGORY and RESULT switches, the current position of the indicator is not implemented until the switch is released.

Certain combinations of contradictory front panel switch settings (called **switch contentions**) are considered invalid by the T-BERD 305. If a front panel

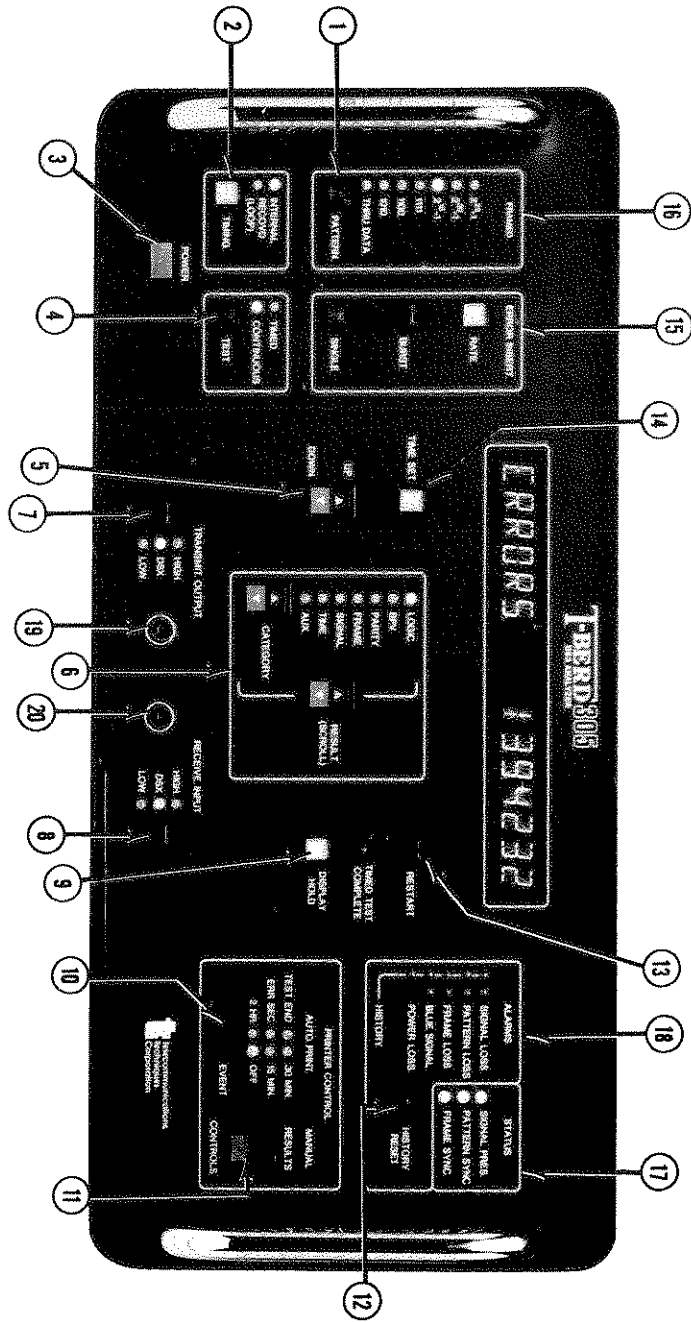


Figure 2-1
T-BERD 305 Front Panel

switch is set to a position that causes a switch contention (signified by the flashing of contending switch positions), the contention must be resolved before continuing. Switch contentions represent invalid combinations of switch settings and result in a "lock-out" of all switches not involved in the contention. The switch contentions are resolved by changing the position of any of the contending switches.

The switches available on the T-BERD 305 front panel are:

1. PATTERN

This seven-position switch either selects one of six data patterns (1010, 1100, 1111, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$), or THRU DATA. Any pattern selected must first be received by the T-BERD 305 for the unit to acquire synchronization. Pattern definitions are as follows:

- $2^{23}-1$: Pseudorandom pattern with length of $2^{23}-1$ bits. This pattern is in conformance with CCITT Recommendation O.151.
- $2^{20}-1$: Pseudorandom pattern with length of $2^{20}-1$ bits. This pattern is in conformance with Bell Compatibility Bulletin No. 114.
- $2^{15}-1$: Pseudorandom pattern with length of $2^{15}-1$ bits (PRBS). This pattern is in conformance with CCITT Recommendation O.151.
- 1111: Fixed pattern consisting of Marks only.
- 1100: Fixed pattern of two Marks followed by two Spaces.
- 1010: Fixed pattern of one Mark and one Space.

THRU DATA retransmits received data on the transmit circuit, allowing the insertion of logic errors and BPVs on a DS3 line. In Thru Data mode:

- The T-BERD 305 monitors the framing and parity bits for errors in framed data.
- Bipolar violations which are not in B3ZS codes are removed and error insertion can be performed on the data.
- Logic errors can be analyzed only if the last pattern selected before entering thru Data mode matches the receive data. This is accomplished by first selecting with the PATTERN switch the data pattern expected. The PATTERN switch should then be pressed and held until THRU DATA is selected. The PATTERN switch can then be released, and the T-BERD 305 will declare synchronization if the receive data matches the expected pattern.

2. TIMING

This pushbutton switch selects the transmit timing source. When the INTERNAL position is selected, the transmitted data is generated using the T-BERD 305's internal crystal oscillator. In the RECOVD position, the transmit timing source is taken from the clock recovered from the received data. If no valid clock is present at the selected source, a red indicator inside the switch is illuminated.

3. POWER

This pushbutton switch applies power to and removes power from the T-BERD 305.

4. TEST

This two-position switch controls the test duration. In the CONTINUOUS position, a tests run for an unlimited duration of time. In the TIMED position, tests run for the duration specified by the user. The length of a test is set and displayed using the TIME function of the CATEGORY switch. At the end of a timed test, all results and indicators are frozen.

5. UP/DOWN

This pushbutton switch is used in conjunction with the AUX and TIME functions of the CATEGORY switch. When used with the AUX function, the UP/DOWN switch changes the parameters of the auxiliary functions. When used with the TIME function, the UP/DOWN switch is used with the TIME SET feature to set the time, date, or the length of a timed test.

6. CATEGORY and RESULT

The CATEGORY switch selects any display category. The RESULT switch is used to scroll through the results in the displayed category. Display categories and their associated measurements are described in Section 2.4.1.

7. TRANSMIT OUTPUT

This pushbutton switch selects one of three DS3 signal levels for the transmitted data: HIGH, DSX, or LOW. Specifications for each of these levels are available in Section 7.4 or Table 4-1. Note that this switch controls the output levels for the Multiple Outputs Option as well as the front panel output.

8. RECEIVE INPUT

This pushbutton switch prepares the receiver for the expected DS3 signal at the input. Like the TRANSMIT OUTPUT switch, the user may select HIGH, DSX, or LOW.

9. DISPLAY HOLD

When the DISPLAY HOLD switch is pressed during a test, all displayed indicators and results are frozen so that results may be examined. This feature does not affect the test in progress; all results continue to accumulate. During a DISPLAY HOLD, a red indicator inside the switch is illuminated. Pressing the switch again releases the display hold feature; the T-BERD 305 resumes its normal mode of operation, and the display is updated with the current results.

10. EVENT

This switch determines the events which automatically initiate a printout. When the switch is set to the OFF position, no status or alarm messages are printed; however, all other positions enable the printing of status and alarm messages. The print event selections are listed below:

- 15 minutes—Results are logged to the printer every 15 minutes of the test.
- 30 minutes—Results are logged to the printer every 30 minutes of the test.
- 2 hours—Results are logged to the printer every 2 hours of the test.
- ERR SEC—Results are logged to the printer every errored second. An errored second is a 1-second interval during which one or more errors occur. If no errored seconds have occurred within the hour, the T-BERD 305 initiates an hourly results printout as a backup.
- TEST END—If the T-BERD 305 is set for a timed test, results are logged to the printer when the test interval is complete. An hourly results printout is initiated as a backup.

11. RESULTS/CONTROLS

This two-position switch generates a printout whenever either position is pressed. Pressing the pushbutton switch to the RESULTS position generates a printout of up-to-the-minute test results. Pressing the switch to the CONTROLS position generates a printout of the current configuration of the unit. CONTROLS generates a printout regardless of the setting of the EVENT switch.

12. HISTORY RESET

This pushbutton switch clears the alarm history indicators.

13. RESTART

This switch clears all results, causes a resynchronization, and restarts the test.

14. TIME SET

This switch is used in conjunction with the TIME position of the CATEGORY switch to set the time, date, or length of a timed test. A red indicator inside the switch is illuminated when the switch is in use; during this time the CATEGORY, RESULT, and DISPLAY HOLD switches are disabled. Conversely, the TIME SET switch is not functional when the DISPLAY HOLD switch has been pressed.

To set the time of day, do the following:

- (1) Set the CATEGORY switch to the TIME position.
- (2) Press the RESULT switch to place the time into the display.
- (3) Press the TIME SET switch to flash the hours display; increment or decrement hours using the UP/DOWN switch.
- (4) Press TIME SET again to flash the minutes display; increment or decrement minutes using the UP/DOWN switch. When the minutes display changes, seconds are automatically set to zero.
- (5) Press the TIME SET switch again or press the RESTART switch to end the time set function.

15. ERROR INSERT

This block of three pushbutton switches controls the insertion of errors in the transmitted data. The RATE switch enables or disables the insertion of logic errors into the transmitted data stream at a predefined rate. The error rate (ranging from 10^{-2} to 10^{-9}) is set using the ERR INS RT auxiliary function. A red indicator inside the switch is illuminated when error insertion is enabled, and the error rate momentarily appears in the display.

The BURST switch inserts a burst of logic errors into the transmitted data stream each time it is pressed. The errors are inserted at a user-defined rate for a predefined duration. The duration is set using the BURST DUR auxiliary function and ranges from 0.025 seconds to 5 seconds. The error rate used is identical to the value specified for the ERR INS RT auxiliary function. If the BURST switch is pressed before a previous burst is finished, it is immediately retriggered.

The SINGLE switch inserts one logic error and one bipolar violation (BPV) into the transmitted data stream. (These errors may or may not occur on the same bit.) BPVs are not inserted into B3ZS sequences.

If the indicator within the RATE switch is illuminated (indicating that error insertion is enabled), and either the BURST or SINGLE switch is pressed, error rate

insertion is disabled. Logic errors are inserted before B3ZS encoding is performed. Logic errors are also inserted on both data and framing bits (if FRAMED mode is selected) after the parity is calculated.

2.3.2 Indicators

The T-BERD 305 front panel features several alarm and status indicators. Green indicators show positive conditions, while yellow indicators provide configuration information, and red indicators signal alarm conditions. The indicators are described in the paragraphs immediately following; the numbers preceding the descriptions correspond to the numbers in Figure 2-1.

16. FRAMED/UNFRAMED

This indicator consists of two backlit panel labels that indicate framing status. If framing is on, the FRAMED label is illuminated. If framing is off, the UNFRAMED label is illuminated.

17. STATUS

These three green indicators are illuminated for a period of at least 100 ms when the required conditions are satisfied, as follows:

- SIGNAL PRES—is illuminated when a valid DS3 signal is received.
- PATTERN SYNC—is illuminated when pattern synchronization is achieved and goes out when pattern synchronization is lost. See Section 7.6.2 for pattern synchronization specifications.
- FRAME SYNC—is illuminated when framing synchronization is achieved and the T-BERD 305 is in FRAMED mode, and goes out when framing synchronization is lost or when the T-BERD 305 is in UNFRAMED mode. See Section 7.7.2 for frame synchronization criteria.

18. ALARMS

These five red indicators are illuminated for a period of at least 100 ms during the occurrence of specific alarm conditions, as follows:

- SIGNAL LOSS—is illuminated when a signal had been detected but is no longer present.
- PATTERN LOSS—is illuminated when losing pattern synchronization, if pattern synchronization had previously been achieved. See Section 7.6.2 for specifications.

- **FRAME LOSS**—is illuminated when frame synchronization is lost, if frame synchronization had previously been achieved. See Section 7.7.2 for specifications.

NOTE: When a frame synchronization loss occurs, a pattern synchronization loss is also declared.

- **BLUE SIGNAL**—is illuminated when a blue signal (alarm indication signal) is detected. DIP Switch 12 (**BLUE SIGNAL CRITERIA**) is used to select one of two blue signal criteria (see Section 2.5.1).
- **POWER LOSS**—is illuminated when the T-BERD 305 is powered up or after the unit experiences an AC power loss. This is a **HISTORY ONLY** indicator; it remains illuminated until the **HISTORY RESET** switch is pressed or until the test is restarted.

All five alarms feature associated **HISTORY** indicators. These indicators provide a visual record of the occurrence (and clearing) of an alarm condition during any given point in a test. **HISTORY** indicators are illuminated when the alarm condition has terminated, and they remain illuminated until the **HISTORY RESET** switch is pressed or until the test is restarted.

For example, if pattern synchronization is lost the **PATTERN SYNC** indicator goes out and the **PATTERN LOSS** indicator is illuminated. When synchronization is reacquired, the **PATTERN LOSS** indicator goes out and the **PATTERN LOSS HISTORY** and **PATTERN SYNC** indicators are illuminated. If synchronization is lost again, the **PATTERN LOSS** indicator is illuminated.

2.3.3 Connectors

The T-BERD 305 has two connectors on its front panel. These connectors are described below; the numbers preceding the descriptions correspond to the numbers in Figure 2-1.

19. TRANSMIT OUTPUT

This connector is a WECO 560A jack that mates with 440A plugs. When the Multiple Outputs Option is installed, five additional outputs are available on the rear panel.

20. RECEIVE INPUT

This connector is a WECO 560A jack that mates with 440A plugs.

2.4 MEASUREMENTS AND AUXILIARY FUNCTIONS

2.4.1 Measurements

The T-BERD 305 performs a variety of measurements that are divided into six categories: LOGIC, BPV, PARITY, FRAME, SIGNAL, and TIME. The CATEGORY switch selects any category. The RESULT (SCROLL) switch displays the results within the selected category.

LOGIC test results are based on a count of pattern errors. All logic results are dependent upon the T-BERD 305's obtaining initial pattern synchronization to the received data pattern. If pattern synchronization is subsequently lost, the pattern bit error count either stops or continues to accumulate based on the position of DIP Switch 9 (ACTION ON SYNC LOSS) on the unit's rear panel (see Section 2.5.1). Table 2-1 lists all available results in the LOGIC category.

BPV test results are based on a count of bipolar violations (BPVs). A BPV is counted whenever successive DS3 pulses of the same polarity are detected (except those pulses which are part of a B3ZS code). BPV results are only accumulated when a signal is present. Table 2-2 lists the test results available in the BPV category.

PARITY category includes those test results which use parity errors as their base. The parity error and average error rates are calculated as either bit or block rates depending upon the position of DIP Switch 11 (PARITY ERROR RATE) on the unit's rear panel (see Section 2.5.1). Parity results are accumulated after initial frame synchronization, and are only available if the T-BERD 305 is operating in Framed mode. Table 2-3 lists the test results available in the PARITY category.

FRAME test results are based on the count of framing errors after initial frame synchronization. These results are only available if the T-BERD 305 is operating in Framed mode. Table 2-4 lists the test results available in the FRAME category.

SIGNAL test results include signal loss seconds and alarm seconds. Alarm seconds is a count of the number of seconds during which a frame synchronization loss or a blue alarm is present. Additional results describing signal characteristics such as signal power and level, and receiver and transmitter clock frequency are available when the T-BERD 305 Signal Analysis Option is installed. The SIGNAL category results are accumulated after initial signal detection. Table 2-5 lists the test results available in the SIGNAL category.

Results in the TIME category are listed in Table 2-6. These results include time of day, date, elapsed test time, test length, and test time remaining.

**Table 2-1
Displayed Results—Logic Category**

<u>Result</u>	<u>Description</u>
ERRORS	A count of received bits (accumulated after initial pattern synchronization), which have a value opposite that of the corresponding transmitted bits.
ERR RT	Error rate—the ratio of pattern bit errors to the number of received pattern bits over the previous block of 10 ⁶ data bits.
AV E RT	Average error rate—the ratio of the number of pattern bit errors to the total number of received pattern bits accumulated since initial pattern synchronization.
ERR SEC	Errored seconds—a count of seconds during which one or more bit errors occurred since initial pattern synchronization.
%EFS	Percentage of error-free seconds—The ratio, expressed as a percentage, of seconds during which no errors were detected to the total number of seconds during which (1) pattern synchronization was present (in Halt mode), or (2) the signal was present after initial pattern synchronization (in Continuous mode).
TH ER SEC	Threshold errored seconds—a count of the number of seconds in which the error rate exceeded or equaled the user-defined threshold.
SYN E SEC	Synchronous errored seconds—the count of errored seconds synchronized to the occurrence of an error (the count and the 1-second time interval begin with the occurrence of an error).
SYN L SEC	Synchronization loss seconds—a count of test seconds after initial pattern synchronization during which pattern synchronization was lost for the entire second.
SLIPS	A count of the number of added, deleted, or repeated bits. When a slip is detected, the T-BERD 305 instantly resynchronizes; thus, no synchronization loss is declared.

Table 2-2
Displayed Results—BPV Category

<u>Displayed Name</u>	<u>Description</u>
ERRORS	A count of bipolar violations (BPVs) detected since test start, excluding intentional violations found within B3ZS codes.
ERR RT	Error rate—the ratio of BPVs to the number of data bits received over the previous block of 10^8 bits.
AV E RT	Average error rate—the ratio of BPVs to the total number of received data bits since the beginning of the test.
ERR SEC	Errored seconds—a count of asynchronous test seconds during which one or more BPVs occurred.
% EFS	Percentage of error-free seconds—the ratio, expressed as a percentage, of error-free seconds during which a signal was present and no BPVs occurred to the total number of seconds during which a signal was present.
TH ER SEC	Threshold errored seconds—a count of the number of seconds in which the error rate exceeded or equaled the user-defined threshold.

**Table 2-3
Displayed Results—Parity Category**

<u>Displayed Name</u>	<u>Description</u>
ERRORS	A count of parity errors detected since test start and after initial frame synchronization.
ERR RT	Error rate—the ratio of parity errors to (1) the number of bits over which the parity was calculated (in Bit mode), or (2) the number of M frames received (in Block mode). The error rate is calculated over the previous block of 10 ⁸ bits. This result is calculated as a bit or block error rate based on the setting of DIP Switch 11 (PARITY ERROR RATE).
AV E RT	Average error rate—the ratio of total parity errors to either: (1) the total number of bits over which the parity was calculated (in bit mode), or (2) the number of M frames received (in block mode). This result is calculated as either a bit or block error rate based on the setting of DIP Switch 11 (PARITY ERROR RATE).
ERR SEC	Results are accumulated from the start of the test. Errored seconds—a count of test seconds during which one or more parity errors occurred.
% EFS	Percentage of error-free seconds—the ratio, expressed as a percentage, of error-free seconds to the total number of seconds during which: (1) frame synchronization was present (in Halt mode), or (2) a signal was present since initial frame synchronization (Continuous mode).

Table 2-4
Displayed Results—Frame Category

Displayed Name	Description
ERRORS	A count of frame errors detected since test start (following initial frame synchronization).
ERR RT	Error rate—the ratio of frame errors to the number of framing bits received. This error rate is calculated over the previous block of 10 ⁸ bits.
AV E RT	Average error rate—the ratio of frame errors to the total number of received frame bits since test start.
ERR SEC	Errored seconds—a count of test seconds during which one or more frame errors occurred.
% EFS	Percentage of error-free seconds—the ratio, expressed as a percentage, of error-free seconds to the total number of seconds during which: (1) frame synchronization was present (in Halt mode), or (2) signal was present after initial frame synchronization (in Continuous mode).
TH ER SEC	Threshold error seconds—a count of the number of seconds in which the error rate equaled or exceeded the user-defined threshold.

**Table 2-5
Displayed Results—Signal Category**

<u>Displayed Name</u>	<u>Description</u>
ALARM SEC*	Alarm seconds—a count of test seconds during which frame synchronization is lost or a blue signal is detected.
SIG L SEC	Signal Loss Seconds—a count of test seconds in which the signal was not present (after an initial signal present condition), or during which one or more signal losses occurred.
TX FREQ**	Transmit frequency—the frequency of the transmit clock in Hz.
RX FREQ**	Receive frequency—the frequency of the clock recovered from the received data measured in Hz.
POWER**	The power level of the received DS3 signal measured in dBm.
LEVEL**	A measure of the level of the received signal in volts peak.

* Available only when the T-BERD 305 is operating in Framed mode.

** These results are only available when the T-BERD 305 Signal Analysis Option is installed.

**Table 2-6
Displayed Results—Time Category**

<u>Displayed Name</u>	<u>Description</u>
TIME	The time of day in HH:MM:SS format.
DATE	The date in DD MON YY format.
ELA TM	Elapsed time—the elapsed time since the last test restart. It is displayed in HH:MM:SS format.
TEST LENG	Test length—the currently set test length for a timed test in HH:MM format.*
TM LFT	Time left—the time remaining in a timed test, in HH:MM:SS format.*

* These results are only available in Timed Test mode.

2.4.2 Auxiliary Functions

Auxiliary functions are test parameters that are set by the user. Test parameters are available for error insertion, framing mode, X bit value, and DS1 channel select.*

The valid test parameters for each auxiliary function are listed in Table 2-7. Functions are displayed by pressing the UP/DOWN switch, which displays new parameters each time the switch is pressed; holding the switch down enables continuous scrolling through the parameters.

*Each auxiliary function may be entered into the display by pressing the RESULT (SCROLL) switch.

Table 2-7
Displayed Results — AUXILIARY Category

<u>Displayed Name</u>	<u>Description</u>
Error Insertion Rate (ERR INS RT)	Values within the range 1E-2 through 1E-9.
Framing	ON or OFF.
Burst Duration (BURST DUR)	Values within the range 0.025 through 5.0 seconds.
Error Threshold (ERR THR)	Values within the range 1E-2 through 1E-9.
X Bits	0 or 1.
DS1 Channel Select* (DS1 DROP)	Channels 1-28 and all ones indicator.

* This function is available only when the DS1 Drop Option is installed.

The parameters for the ERROR INSERT RATE and BURST switches are selected through the ERR INS RT and BURST DUR auxiliary functions. The error insertion rate is 10^{-n} , where "n" may be set from 2 through 9. The value of "n" is set by selecting the ERR INS RT auxiliary function and using the UP/DOWN switch to increment or decrement the exponential value. The error rate specified is used for both the RATE and BURST switches. The length of the BURST duration is selected through the BURST DUR auxiliary function using the UP/DOWN switch.

The logic, BPV, and frame threshold errored seconds results count those errored seconds which have an error rate equal to or greater than the error rate threshold selected in the ERR THR auxiliary function. The error rate threshold is 10^{-n} , where "n" may be set from 2 through 9. The threshold chosen is applied to all three categories in determining each of the threshold errored seconds results.

The FRAMING auxiliary function enables (ON) or disables (OFF) framed pattern generation. The X BIT auxiliary function is applicable when in Framed mode and permits the user to specify if the transmitted X bits should be zeros or ones. When data is being received by the T-BERD 305 in Framed mode, this auxiliary function also displays the value of the X bits being received.

The DS1 Channel Select Option selects a DS1 channel to be demultiplexed (dropped) from the DS3 bit stream. The UP/DOWN switch selects any one of channels 1 through 28. When an unframed all-ones signal is detected on the channel, an astrisk (*) will be displayed next to the channel number. Note that this function is available only when the DS1 Drop Option is installed.

2.5 REAR PANEL

2.5.1 DIP Switches

Sixteen DIP switches, numbered 1 to 16, are located on the T-BERD 305 rear panel. The up position of each switch is the preset position. The following list describes each of the switches; the switches are numbered as they appear on the T-BERD 305 rear panel.

(1) and (2) BAUD RATE

These two DIP switches control the baud rate of the RS-232 interface.

Table 2-8 shows the baud rate selections and the corresponding switch positions.

**Table 2-8
Baud Rate Selections**

<u>Baud Rate</u>	<u>Switch 1</u>	<u>Switch 2</u>
300	Down	Down
1200	Down	Up
2400	Up	Up
4800	Up	Down

(3) PARITY

This switch controls the parity bit of the RS-232 interface. The EVEN (up) position selects even parity; the ODD (down) position selects odd parity. Even is the preset position.

(4) TERMINATOR

This switch controls the terminating sequence transmitted at the end of each line of data by the RS-232 interface. The CR (up) position terminates each line with a carriage return character. The CRLF (down) position terminates each line with a carriage return/line feed sequence. CR is the preset position.

(5) PRINT OUT WIDTH

This switch selects between 80-column print format (up) and a 20-column print format (down). The 80-column print format can be used for 40-column printers such as TTC's PR-40 Printer, which wraps around any print beyond 40 characters. The 80-column print format is the preset position.

(6) PRINT SPEED

This switch selects the printout speed to be fast (up) or slow (down). The fast position must be selected if TTC's PR-40 printer is used.

(7) DATA BITS

This switch selects 7 (up) or 8 (down) data bits for the RS-232 interface. Parity is enabled when 7 data bits are selected; it is disabled when 8 data bits are selected. The 7 data bit format is the present position.

(8) SPARES

(9) ACTION ON SYNC LOSS

This switch controls the T-BERD 305's reaction to a loss of pattern or frame synchronization. The HALT (up) position freezes certain results when pattern or frame synchronization losses occur; the test resumes when synchronization is reacquired. Refer to Appendix B for a detailed description of each

result. The CONTINUOUS (down) position causes all results to accumulate continuously after initial synchronization and throughout any synchronization loss (except during a signal loss). HALT is the preset position. Changing this switch during a test causes a test restart.

(10) PATTERN SYNC LOSS THRESHOLD

This switch controls the error threshold at which a loss of pattern synchronization occurs. The FAST (up) position selects a pattern synchronization loss threshold of 1024 or more errors in 32,767 bits received. The SLOW (down) position selects a slower pattern synchronization loss threshold of 250,000 or more errors in 1,000,000 bits received. FAST complies with Bell Specification KS-21424, DS-3 Test Set (Receiver) Specifications, and is the preset position for this switch.

(11) PARITY ERROR RATE

This switch defines how the parity error rate (PER) and the average parity error rate (AVG PER) are calculated. The BLOCK ERROR RATE* (up) position calculates parity error rate and average parity error rate as a block error rate:

$$\text{PER} = \frac{\text{Total Parity Errors in } 10^6 \text{ Interval}}{\text{No. F Bits in } 10^6 \text{ Interval}/28} \quad \text{AVG PER} = \frac{\text{Total Parity Errors}}{\text{Total F Bits}/28}$$

The APPROXIMATE BIT ERROR RATE (down) position calculates the PER and the AVG PER as an approximate bit error rate:

$$\text{PER} = \frac{\text{Total Parity Errors in } 10^6 \text{ Interval}}{\text{No. F Bits in } 10^6 \text{ Interval} \times 168} \quad \text{AVG PER} = \frac{\text{Total Parity Errors}}{\text{Total F Bits} \times 168}$$

BLOCK ERROR RATE is the preset position.

(12) BLUE SIGNAL CRITERIA

This switch defines the criteria for detecting a blue signal. The FRAMED, STUCK C BITS (up) position causes a blue signal to be declared if the

*Complies with BELLCORE Technical Reference TR-TSY-000009 of May 1986, *Asynchronous Digital Multiplexer Requirements and Objectives*.

incoming signal has valid framing, valid parity, and all stuffing indicator "C" bits set to zero.* The FRAMED, 1010 (down) position causes a blue signal to be declared if the incoming signal is framed and has a 1010 . . . data pattern for at least 1000 bits. This is for compatibility with existing equipment. FRAMED, STUCK C BITS is the preset position.

(13) FRAME SYNC LOSS THRESHOLD

This switch controls the frame synchronization loss threshold. The FAST (up) position selects a frame synchronization loss threshold to be 3 out of 15 framing (F) bits in error. The SLOW (down) position selects a frame synchronization loss threshold to be 6 out of 15 F bits in error. FAST is the preset position.

(14) DS1 LINE CODE

This switch controls the DS1 Drop Option's transmit line code. The AMI position (up) selects alternate mark inversion (AMI) coding for the demultiplexed T-1 line. The B8ZS (down) position selects bipolar 8 zero substitution (B8ZS) clear channel coding for use on channels that need clear circuit capability. AMI is the preset position.

(15) and (16) SPARES

2.5.2 Connectors

A power receptacle, one DS3 output, and one 25-pin connector are featured on the T-BERD 305's rear panel. The following paragraphs describe these connectors.

- A 3-pin receptacle is provided for 50/60 Hz operation. The unit was configured at the factory for 115 VAC or 230 VAC operation. The safety ground connection is wired directly to the chassis; the line fuse compartment is located directly above the 3-pin receptacle and contains a spare fuse.

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

*Complies with BELLCORE Technical Reference TR-TSY-000191 of May 1986, *Alarm Indication Signal Requirement and Objectives*, and AT&T Technical Advisory TA80 of May 1983, *Blue Signals in the Bell System*.

CAUTION: The T-BERD 305 should be operated with the correct fuse installed. Always use the correct fuse size.

- A female 25-pin D connector is provided and configured with DCE pin assignments to connect the T-BERD 305 to a printer, terminal, or computer.
- The T-BERD 305 is equipped with one DS3 output in its standard configuration. The Multiple Outputs Option is a plug-in module which provides five additional DS3 outputs on the T-BERD 305's rear panel.

2.6 PULL-OUT REFERENCE CARD

The T-BERD 305 features a pull-out reference card which furnishes quick reference information including: (1) a list of the available test measurements in each display category; (2) instructions for setting the timer for a timed test and setting the real-time clock and calendar; (3) a list of available auxiliary functions; (4) a list of the available error insertion options.

The pull-out reference card is stored in the bottom right corner of the unit. To pull out the card, locate the flap under the TTC logo and slide the card straight out. The card remains attached to the instrument but is hinged so that it may be folded down for better visibility when the instrument is resting on its back panel.

SECTION 3 PREPARATION FOR USE

3.1 INTRODUCTION

This section provides information on preparing the T-BERD 305 for use. Specifically included are instructions for unpacking and inspecting the instrument, a list of the equipment that should be contained in the shipment, and an instrument checkout procedure.

3.2 UNPACKING

The T-BERD 305's shipping container should be inspected for damage when it is received. If the shipping container or shipping material is damaged, keep the shipment until its contents have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking the electrical performance of the instrument are given in Section 3.4. If the contents are incomplete, or if the T-BERD 305 does not pass the performance tests, notify TTC. If the shipping container is damaged, notify the carrier as well as TTC, and keep the shipping container and materials for the carrier's inspection.

3.3 EQUIPMENT INCLUDED

The following is a list of the equipment that should be present when the T-BERD 305 shipment is received and unpacked.

- (1) T-BERD 305 DS3 Analyzer
- (2) AC Line Cord
- (3) Operating Manual
- (4) Loopback Cable

3.4 INSTRUMENT CHECKOUT

As recommended in Section 3.2, the T-BERD 305 should be checked mechanically and electrically upon unpacking. To verify proper electrical operation, perform the following steps.

(1) Remove the front cover of the T-BERD 305 by unsnapping the metal latches on each side of the instrument. Turn the cover upside down and access the AC line cord compartment by simultaneously compressing the squeeze latches on the compartment panel and lifting the panel out of the cover.

(2) Check the label above the T-BERD 305's AC receptacle (rear panel) to verify if the unit is configured for 115 VAC or 230 VAC operation.

(3) Insert the AC line cord into the AC receptacle on the T-BERD 305's rear panel and plug the other end of the cord into a 115 VAC power source.

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

CAUTION: The T-BERD 305 should be operated with the correct fuse installed. Always use correct fuse size. (See Section 6 for fuse replacement instructions.)

(3) Apply power to the T-BERD 305 by pressing the POWER switch. All front-panel indicators will be illuminated for approximately 1 second; the displays, the POWER LOSS indicator, and those indicators noting current switch positions will remain illuminated after the 1-second lamp test. The POWER LOSS indicator can be turned off by pressing the HISTORY RESET switch.

(4) Place the T-BERD 305 in loopback by plugging one end of the provided cable in the TRANSMIT OUTPUT jack and the other end in the RECEIVE INPUT jack located on the front panel. Set the front-panel switches to the following positions:

FRAMING	=	UNFRAMED
PATTERN	=	2 ²³ -1
TIMING	=	INTERNAL
TEST	=	CONTINUOUS
ERROR INSERT RATE	=	OFF
TRANSMIT OUTPUT	=	HIGH
RECEIVE INPUT	=	HIGH
CATEGORY	=	LOGIC
RESULT	=	ERRORS

- (5) Verify that the SIGNAL PRESENT and PATTERN SYNC indicators are illuminated. Verify that both the logic error and BPV results are valued at zero (0). Press the SINGLE switch in the ERROR INSERT block and verify that one logic error and one BPV are inserted.
- (6) Set the CATEGORY switch to the AUX position. Press the RESULT switch to scroll FRAMING into the display. Press the UP/DOWN switch to set framing ON. Verify that the FRAME SYNC indicator is illuminated and verify that there are no frame or parity errors.
- (7) If the Signal Analysis Option is installed move to the SIGNAL category and verify that the TX FREQ and RX FREQ are both between 44,735,553 Hz and 44,736,447 Hz. Verify that the LEVEL is between 0.8 V Pk and 1.0 V Pk.
- (8) Remove the cable from the front panel Transmit and Receive jacks. Verify that the SIGNAL LOSS, PATTERN LOSS, and FRAME LOSS alarm indicators are illuminated. Verify that the SIGNAL PRESENT, PATTERN SYNC, and FRAME SYNC indicators are off.
- (9) If the Multiple Outputs Option is installed, repeat steps 4 through 8 for each of the five additional outputs connected to the front panel receive input.

The T-BERD 305 conducts a self-test during power-up. During this self-test, non-volatile RAM (NOVRAM) is checked to recover the switch settings that were specified when the unit was last powered-down. If any errors are found, the factory settings are reloaded and the message NOVRAM LOST is displayed. The T-BERD 305 remains fully functional even though switch settings may not have been saved during the power cycle. Although the instrument can be used, TTC should be called for service.

During power-up, the instrument's RAM, EPROM, and switches are also checked. If an error is detected, the appropriate message (RAM FAILURE, ROM FAILURE, or SWITCH STUCK) is displayed. In such instances, TTC should be called for service.

SECTION 4 TEST PROCEDURES

4.1 INTRODUCTION

This section describes how the T-BERD 305 tests the performance of DS3 lines. Step-by-step instructions are provided for conducting both in-service and out-of-service testing. The following procedures assume that the user is familiar with the location and operation of the T-BERD 305's front panel controls; those unfamiliar with these controls should refer to Section 2 (Instrument Description).

4.2 OUT-OF-SERVICE TESTING

4.2.1 DS3 Link Performance

To test the error performance of a DS3 link that is out of service, use the following procedure:

- (1) Press the POWER switch to apply power to the T-BERD 305.
- (2) Select a timing source for the transmitter using the TIMING switch. The INTERNAL position selects an internal clock oscillator to provide the timing. The RECOVD (LOOP) position selects a clock that is recovered from and synchronized to the received data.
- (3) Select a data pattern using the PATTERN switch. For most applications, the $2^{23}-1$ position is recommended. This selection provides a repeating pseudorandom bit pattern that is $2^{23}-1$ (8,388,607) bits long.
- (4) Use the TEST switch to specify whether the error results are to be accumulated continuously (CONTINUOUS position) or accumulated based on a preset test length (TIMED position).
- (5) If a TIMED test was specified in Step (4), define the test length by setting the CATEGORY switch to the TIME position and using the RESULT (SCROLL) switch to select the TEST LENG display. The TIME SET and UP/DOWN switches can be used to set the test length.
- (6) Verify that error insertion is OFF by ensuring that the RATE switch is not illuminated.

- (7) Specify framed or unframed operation by setting the CATEGORY switch to the AUX position. Use the RESULT (SCROLL) switch to select the FRAMING auxiliary function, and press the UP/DOWN switch to select ON or OFF.
- (8) Set the transmit signal level to HIGH, LOW, or DSX using the TRANSMIT OUTPUT switch. Refer to Table 4-1 for a definition of these levels.
- (9) Set the receiver input for the expected reception level using the RECEIVE INPUT switch. Refer to Table 4-2 for a description of how these levels are defined.
- (10) Connect cables from the TRANSMIT and RECEIVE jacks to the circuit to be tested. See Figure 4-1 for typical DS3 access points.
- (11) Establish a loop at the far end of the link or set up another T-BERD 305 at the far end to complete a circuit.
- (12) Begin the test by pressing the RESTART switch to clear all results.

Table 4-1
DS3 Signal Level Definitions

<u>Signal Level</u>	<u>Definition</u>
HIGH	This signal consists of rectangular pulses of approximately 0.9 volts peak.
LOW	This signal is the same as the HIGH level but is attenuated by 13.8 dB flat loss to produce pulses of approximately 0.19 volts peak. The LOW level is used to stress test DS3 receiving equipment.
DSX	This signal must meet the requirements set forth in AT&T Compatibility Bulletin 119 for use at a DS3 Digital Cross Connect (DSX-3). It is equivalent to the HIGH level passed through 450 ft. of 728A coaxial cable. The pulses have a sawtooth shape, with an amplitude of approximately 0.5 volts peak.
DSX MON	This signal appears at the monitor jack of a DSX-3 and is the DSX signal with approximately 20 dB of flat loss. This produces a pulse amplitude of approximately 50 mV peak.

**Table 4-2
T-BERD 305 and RX Level Settings**

<u>ACCESS</u>	<u>POINT DESCRIPTION</u>	<u>T-BERD 305 RX INPUT</u>	<u>T-BERD 305 TX OUTPUT</u>
1. Mux Output	A) This signal may be at HIGH level if there is 450 ft. of cabling to the cross-connect.	Set to HIGH	Set to HIGH
	B) If the cable interconnections are short, this signal is a DSX level.	Set to DSX	Set to DSX
2. Demux Input	This signal typically originates from a DSX-3 bay at the DSX level, modified by any interconnecting cable attenuation.	Set to DSX	Set to DSX
3. Digital Cross Connect (DSX-3)	The signal at the IN and OUT jack is at the DSX level. At the MON jack the signal has been attenuated 20 dB.	Set to DSX	Set to DSX
4. Trans Equip Input	The signal is at the DSX level modified by any attenuation from interconnecting cable.	Set to DSX	Set to DSX
5. Trans Equip Output	A) This signal may be a HIGH level if there is 450 ft. of cabling to the cross-connect.	Set to HIGH	Set to HIGH
	B) If the cable interconnections are short, this signal is a DSX level.	Set to DSX	Set to DSX

When performing in-service testing, please note the following:

- Ensure that the SIGNAL PRESENT and PATTERN SYNC indicators are illuminated. If FRAMED operation is selected, the FRAME SYNC indicator should also be illuminated.
- Set the CATEGORY switch to the LOGIC position and use the RESULT (SCROLL) switch to view the desired error result. All results are accumulated simultaneously and can be viewed during testing without disrupting the test.
- If bit errors are calculated with no parity errors, it is likely that the parity is being recalculated at a given point in the link. The bit errors are counted prior to reaching the point where parity is being recalculated.
- If slips are detected, it indicates that bits are being added or deleted from the pseudorandom data pattern. This can be caused by high amounts of jitter or from data buffer overflow.

4.2.2 Power Measurement

If the Signal Analysis Option is installed, a power measurement can be performed on the received signal as follows:

- (1) Establish a loopback at the far end of the circuit under test.
- (2) Set the PATTERN switch to the 1111 pattern.
- (3) Using the AUX position of the CATEGORY switch, set the FRAMING auxiliary function to OFF.
- (4) Set the CATEGORY switch to the SIGNAL position and scroll the POWER result into the display.

At a DS3 cross-connect point, the power level must lie between +5.7 dBm and -1.8 dBm. Lower power levels may cause bit errors.

4.3 IN-SERVICE MONITORING

4.3.1 DS3 Monitoring

In-service monitoring of a DS3 circuit at a DSX patch bay can be performed with a T-BERD 305. To perform in-service monitoring, use the following procedure.

- (1) Apply power to the T-BERD 305 by pressing the POWER switch.
- (2) Set the RECEIVE INPUT switch to the DSX position.
- (3) Using the AUX position of the CATEGORY switch, set the FRAMING auxiliary function to ON.
- (4) Set the TEST switch to the CONTINUOUS position.
- (5) Connect a cable from the RECEIVE INPUT jack on the T-BERD 305 to the MONITOR jack of the DSX patch bay.
- (6) Press the RESTART switch to clear all result counters.
- (7) Verify that the SIGNAL PRES and the FRAME SYNC status indicators are illuminated.
- (8) Set the CATEGORY switch to the PARITY position to observe the parity error results. BPV and FRAME errors can also be monitored on a live circuit.
- (9) If the Signal Analysis Option is installed, the received signal level and frequency can be measured by setting the CATEGORY switch to the SIGNAL position and scrolling the LEVEL result into the display. At a DSX monitor jack, the signal level should nominally be 0.05 volts peak.

Next, scroll to the RX FREQ result. The reading should be $44,736,000 \pm 880$ Hz. A frequency out of this range could potentially cause problems for the DS3 transmission equipment in the circuit.

4.3.2 DS1 Monitoring (DS1 Drop Option)

When the DS1 Drop Option is installed, any DS1 line imbedded in the DS3 signal under test can be demultiplexed (dropped) for monitoring or testing with a T-BERD 105 or T-BERD 209. To set up the T-BERD 305 for DS1 monitoring, follow the procedure outlined in Section 4.3.1, then perform these steps.

- (1) Select the AUX position of the CATEGORY switch and scroll to the DS1 DROP function.
- (2) Use the UP/DOWN switch to select the desired DS1 channel (valid range: 1 to 28) for testing or monitoring. If an unframed all-ones signal is present on the DS1 channel an asterisk (*) will be displayed next to the channel number.

- (3) Connect a DS1 test instrument such as the T-BERD 209 to the rear panel jack labeled DS1 DROP OUTPUT.
- (4) Set up the DS1 test set for the type of DS1 framing used (D4, Extended Super Frame (ESF), or SLC*-96).
- (5) Ensure that the DS1 test set has acquired frame synchronization and is not reading frame errors.
- (6) The DS1 channel is ready to be monitored for frame errors and CRC errors (for ESF framing). The DS1 channel may also be monitored for frequency, all ones, timing, and slips measurements.

If required, the DS1 channel can be demultiplexed to the DS0 level (64 kb/s) or the sub-rate level (e.g., 2400 baud) using TTC's Model 124 Drop and Insert unit.

*SLC is a registered trademark of AT&T Technologies.

SECTION 5 PRINTER/REMOTE CONTROL INTERFACES

5.1 INTRODUCTION

The T-BERD 305 DS3 Analyzer features a standard printer interface and an optional remote control interface. Both are available through an RS-232 Interface that combines the ability to obtain printouts of results, alarm messages, and front panel setups with the ability to remotely control the T-BERD 305 from a computer or dumb terminal.

Sections 5.2 and 5.3 discuss the printing facilities that are available with the T-BERD 305. A detailed description of remote control capabilities (including command formats and on-line help functions) begins in Section 5.4.

5.2 INTERFACE DESCRIPTION

The RS-232 connector on the rear panel is configured to function as data communications equipment (DCE); it may be directly connected to data terminal equipment (DTE). Using an adaptor cable, connection to other DCE is also possible. This RS-232 connector is a 25-pin female D connector located to the left of the DIP switches on the T-BERD's rear panel. DIP switches control baud rate, parity, line termination, printout width, and print speed.

Table 5-1 shows the selections available for configuring the RS-232 Printer/Remote Control Interface.

Table 5-2 describes the appropriate RS-232 interface selections for configuring the PR-40 Printer.

5.2.1 RS-232 Pin Configuration

To provide maximum operating flexibility, the use of the RS-232 signaling leads has been minimized. The interface monitors the Data Terminal Ready (DTR) line of the device to which it is connected. When this line is set true by the device, the T-BERD 305 assumes that the device is ready to accept a byte of data. The T-BERD asserts Clear To Send (CTS) true whenever it is ready to accept a byte of data from an external controller. Table 5-3 shows the RS-232 pin configuration.

**Table 5-1
RS-232 Printer/Controller Interface Configurations**

Data format:	Serial asynchronous format with one start bit, seven or eight ASCII data bits, and one or two stop bits
Baud rate:	300, 1200, 2400, 4800
Line terminator:	Carriage return (CR) or carriage return/line feed (CRLF) sequence
Fast Print:	Faster than 1 character per 10 ms
Slow print:	Fastest is 20 characters per 1 second

**Table 5-2
PR-40 Printer Configuration**

Baud rate:	2400 baud
Word length:	1 start bit, 7 ASCII data bits, and 2 stop bits
Parity:	Even
Line terminator:	Either CR or CRLF
Print speed:	Fast

5.3 PRINTER CONTROL

Printouts are controlled by the MANUAL and AUTO PRINT EVENT switches in the PRINTER CONTROL block on the T-BERD 305 front panel. The MANUAL switch has two positions: RESULTS and CONTROLS. Pressing the switch to one of these positions causes the immediate generation of a results or controls print, respectively. Each results or controls print message is 20 characters long; thus, in 80-Column mode, each print line contains four results (messages). (TTC's optional PR-40 Printer operates with the T-BERD 305 set for 80-column prints.) All printouts are time-stamped and labeled with a reason for their occurrence.

Table 5-3
RS-232 Pin Configuration

PROT GND (Pin 1):	Connected to chassis ground.
TX DATA (Pin 2):	The T-BERD 305 receives data.
RCV DATA (Pin 3):	The T-BERD 305 transmits data.
RTS (Pin 4):	This lead is an input from outside, currently unused.
CTS (Pin 5):	This lead is driven to the ON state whenever the T-BERD 305 is ready to receive a character.
DSR (Pin 6):	This lead is an output from the T-BERD 305, currently unused. (After power-up, this lead is always ON, e.g., LOGIC 1.)
SIGNAL GROUND (Pin 7):	Connected to chassis ground.
RLSD (Pin 8):	This lead is an output from the T-BERD 305, currently unused. (After power-up, this lead is always ON, e.g., LOGIC 1.)
POSITIVE DC TEST VOLTAGE (Pin 9):	This lead provides positive 5V DC test voltage.
NEGATIVE DC TEST VOLTAGE (Pin 10):	This lead provides negative 5.2V DC test voltage.
DTR (Pin 20):	Data is only output by the T-BERD 305 when this line is held in the ON condition by the receiving device.

The EVENT switch consists of a pushbutton switch and six associated LED indicators that show the current switch position. This switch also controls the printing of alarm messages, which are generated when the switch is in any position other than OFF. The switch positions and their functions are described below.

- The OFF position sends no data to the RS-232C connector and clears the printer buffer. Results and controls prints are still available through the MANUAL switch. No alarm messages are printed unless they are specified using the ALARM command (via remote control).

- The 15 MIN position initiates a results printout every 15 minutes and allows alarm messages to print whenever a displayed alarm condition changes.
- The 30 MIN position initiates a results printout every 30 minutes and allows alarm messages to print whenever a displayed alarm condition changes.
- The 2 HR position initiates a results printout every 2 hours and allows alarm messages to print whenever a displayed alarm condition changes.
- The ERR SEC position initiates a results printout for each second containing a logic, BPV, parity, or framing error. Alarm messages are printed if a displayed alarm condition changes.
- The TEST END position initiates a results printout at the end of a timed test and allows alarm messages to print whenever an alarm condition occurs.

NOTE: A one-hour backup printout is provided for the TEST END and ERR SEC positions. The printout is labeled BACKUP PRINT and occurs only if the print criterion has not been satisfied for one hour.

5.3.1 Results Print

The results print is an up-to-the-minute list of applicable test results. In addition to test results, a results print also contains a list of all currently illuminated status and alarm LED indicators under the headings STATUS LEDS and ALARM LEDS, respectively.

A results print is also automatically generated by a result counter overflow and is labeled OVERFLOW PRINT. In the overflow print, the overflowed result is preceded on the printout by a double asterisk (**). Subsequent printings of the overflowed result are preceded by a single asterisk (*) to indicate a previous overflow. All such asterisks are cleared at test restart.

A results print can be initiated manually by setting the MANUAL switch to the RESULTS position, or automatically using the EVENT switch.

Additional results are available under the SIGNAL category if the Signal Analysis Option is installed. Framing and parity results are only included when the T-BERD 305 is operating in Framed mode. Figure 5-1 depicts a results print with both framing and signal analysis measurements.

MANUAL PRINT
09:07:50 17 SEP 87

LOGIC:
 ERRORS: 110
 ERR RT: 1.0E-07
 AV E RT: 9.93E-08
 ERR SEC: 25
 %EFS: 0.0%
 TH ER SEC: 25
 SLIPS: 0
 SYN E SEC: 22
 SYN L SEC: 0

BPV:
 ERRORS: 0
 ERR RT: 0. E-08
 AV E RT: 0. E-09
 ERR SEC: 0
 %EFS: 100.00%
 TH ER SEC: 0

SIGNAL:
 SIG L SEC: 0
 ALARM SEC: 0
 TX FREQ: 44736030
 RX FREQ: 44736030
 POWER: 4.3 DBM
 LEVEL: 0.96 V PK

TIME:
 TM LFT: 00:00:35
 ELA TM: 00:00:25
 TEST LENG: 00:01

PARITY:
 ERRORS: 111
 ERR RT: 4.8 E-04
 AV E RT: 4.71E-04
 ERR SEC: 25
 %EFS: 96.00%

FRAME:
 ERRORS: 1
 ERR RT: 0. E-05
 AV E RT: 2. E-07
 ERR SEC: 1
 %EFS: 96.00%
 TH ER SEC: 1

STATUS LEDES:
 SIG PRES: ON
 PAT SYNC: ON
 FRM SYNC: ON

ALARM LEDES:
 PWR LOS HIST: ON

Figure 5-1
Results Print

5.3.2 Controls Print

The controls print lists the current position of all of the front panel switches, auxiliary functions, and rear panel DIP switches. A controls print is generated by setting the MANUAL switch to the CONTROLS position. Figure 5-2 is an example of a controls print.

```
CONTROLS PRINT
09:08:42 17 SEP 87
  FRONT PANEL
PATTERN:      2 23-1
TIMING:       INTERNAL
ERROR INSERT: ON
ERR INS RATE: 1E-7
TEST:         TIMED
CATEGORY:     LOGIC
RESULT:       ERRORS
TX OUTPUT:    HIGH
RCV INPUT:    HIGH
DISPLAY HOLD: OFF
PRI EVNT:     OFF
TEST LENG:   00:01
FRAMING       ON
XBIT:         RX=0  TX=0
ERR THRESH:   1E-9
BURST DUR:    4.0 SEC
  REAR PANEL
ACT SYNC LOS: HALT
SYNC LOS THR: FAST
PER CALC:     BLOCK
BLUE SIGNAL:  F1010
FRA LOS THR:  FAST
RS232 BAUD:   300
RS232 PARITY: EVEN
RS232 TERM:   CRLF
PRINT WIDTH:  20
PRINT SPEED:  FAST
DATA BITS:    7
```

Figure 5-2
Controls Print

5.3.3 Alarm And Status Messages

Alarm messages inform the user of important developments related to any ongoing test. Unless the EVENT switch is set to OFF, alarm messages are initiated automatically; when a displayed alarm condition changes, a message is printed out immediately. The events that trigger alarm conditions are discussed in Section 2.

The format for an alarm message is:

[alarm message name]
[time and date]

Alarm messages are categorized as follows:

- (1) FRM SYNC LOSS, PATT SYN LOSS, SIGNAL LOSS—These messages are followed by a count of the number of such occurrences during the test.
- (2) FRM SYNC ACQUIRED, PATT SYNC ACQUIRED—These messages are printed when synchronization is acquired.
- (3) TEST COMPLETE—When in Timed Test mode, this message is printed when a timed test is complete.
- (4) TEST RESTART—This message is initiated by pressing the RESTART switch or any of the other major switches.
- (5) NEW CONFIGURATION—This message indicates a major switch change.

NOTE: Major switches include: PATTERN, TIMING, TEST, RESTART, RECEIVE INPUT; front panel switches, TEST LENG, FRAMING ON/OFF and ERROR THRESHOLD auxiliary functions, FRAME SYNC LOSS THRESHOLD, ACTION ON SYNC LOSS, PATTERN SYNC LOSS THRESHOLD, and PARITY ERROR RATE DIP switches.
- (6) BLUE SIGNAL DETECT, SIGNAL PRESENT—These messages indicate that a certain condition has been detected.
- (7) BUFFER FULL—This message is printed when the print buffer overflows. Note that data may be lost under such conditions.
- (8) LAST POWER DOWN, POWER UP—These messages are printed when power has been restored after a power loss.

(9) SELF TEST FAIL—This message is printed when one of the self-test procedures fails at power-up.

5.4 REMOTE CONTROL OPERATION

5.4.1 Command Formats and On-Line HELP Functions

The T-BERD 305's Remote Control Interface Option adds remote control and data retrieval capability via a computer or dumb terminal to the standard printer function. The general format for a remote control command is as follows:

`command_name [parameter]`

The `command_name` entry names the command to be executed. (Section 5.5 fully describes all remote control commands.) Where possible, commands which are identical to a front or rear panel switch function have been abbreviated to reflect the first three letters of the switch name. Control commands have no front panel equivalent, and may either be abbreviated or spelled out.

The `[parameter]` entry specifies any optional parameter(s) associated with the command. If a parameter is entered, it should be separated from the command name by at least one space. The command/parameter string is followed by a carriage return or carriage return/line feed sequence.

Most remote control commands can be used to select a new command state or to display the current command state (without changing it). To select a new command state, enter both the command name and the desired parameter on the command line. To display the current state, enter the command name only. Note, however, that some commands (such as CLS) are "executable-only" and have no current or changeable state. Other commands (such as BAUD) can display (but not change) the current state.

5.4.2 Switch Commands

Switch commands are mnemonics that usually reflect the first three characters of the switch name or switch position on the T-BERD 305. Using these commands, the user can change the position of a switch or inquire as to the state of a switch. The switch commands for the front and rear panel functions are described in the following sections.

5.4.2.1 Front Panel Switch Commands

Table 5-4 lists the front panel switch commands. Brackets following the command name indicate that the command has associated parameters.

When entering Remote Control mode, all of the switches on the front panel are disabled except the CATEGORY and RESULT switches. These two switches may be enabled or disabled using either the DISPLAY LOCAL (default) or DISPLAY REMOTE commands.

5.4.2.2 Rear Panel Switch Commands

Table 5-5 lists the rear panel switch commands. Brackets following the command name indicate that the command has associated parameters.

With the exception of the BAUD and PARITY commands, these commands override the setting of rear panel switches. (The BAUD and PARITY commands only return the state of the DIP switches and must be manually set on the rear panel.) When the T-BERD 305 is returned to local mode, all settings revert to the positions of the actual DIP switches.

5.4.3 Control (Non-Switch) Commands

Control commands have no front or rear panel equivalent. These commands are used to obtain information from the T-BERD 305 or to modify the controller interface protocol.

Table 5-6 lists the control commands. Brackets following the command name indicate that the command has associated parameters. With the exception of the HELLO and LEDS commands, all commands without brackets are “executable-only” commands and have no status to return.

5.4.4 BERD-BASIC Commands

The T-BERD 305 Remote Control Interface Option offers BERD-BASIC programming. A BERD-BASIC program is simply a sequence of commands that instruct the T-BERD to perform desired functions. Once written, a BERD-BASIC program can be executed (possibly many times) without the presence of a remote user. By “taking control” of the T-BERD 305, the BERD-BASIC program takes the place of the remote user.

**Table 5-4
Front Panel Switch Commands**

<u>Command</u>	<u>Corresponding Switch Name/ Command Description</u>
BUR DUR []*	Burst duration of logic error insertion
CAT []	CATEGORY
DATE []*	Date
DIS HOL []	DISPLAY HOLD
DSI DRO []	DSI Drop channel
ERR INS []	ERROR INSERT
ERR RAT []*	Logic error insertion rate
ERR THR []*	Error threshold
FRA []*	Framing on/off
HIS RES	HISTORY RESET
PAT []	PATTERN
PRI []	PRINTER CONTROL—MANUAL
PRI EVE []	PRINTER CONTROL—AUTO PRINT
PRINT []*	Print a single result
REC INP []	RECEIVE INPUT
RES []	RESULT
RESTART	RESTART
TES []	TEST
TES LEN []*	Test length
TIM []	TIMING
TIME []*	Time of day
TRA OUT []	TRANSMIT OUTPUT
TX X BIT []*	Transmit X Bit

* Obtained through auxiliary functions or through a combination of front panel switches.

**Table 5-5
Rear Panel Switch Commands**

<u>Command</u>	<u>Corresponding Switch Name</u>
ACT SYN LOS []	ACTION ON SYNC LOSS
BAUD	BAUD RATE
BLU SIG CRI []	BLUE SIGNAL CRITERIA
DATA BITS	DATA BITS
DS1 LIN COD []	DS1 LINE CODE
FRA SYN LOS THR []	FRAME SYNC LOSS THRESHOLD
PAR ERR RAT []	PARITY ERROR RATE
PARITY	PARITY
PRINT SPEED []	PRINT SPEED
PAT SYN LOS THR []	PATTERN SYNC LOSS THRESHOLD
TERM []	TERMINATOR
WIDTH []	PRINT OUT WIDTH

**Table 5-6
Control Commands**

ALARM []	HOLD []
BRAINS { }	LEDS
CLEAR FIFO	LOCAL
CLS	PROMPT []
DISPLAY []	RELEASE
ECHO []	REMOTE
FORMAT	TERMINAL
HELLO	UNFORMAT
HELP []	

A BERD-BASIC program line is composed of a command and a line number. A command tells the T-BERD 305 what to do, and is the same remote control command that would ordinarily be entered by the user. A line number (any value between 0 and 29779) sets the execution order of the commands. Program lines may be entered in any sequence; the T-BERD 305 automatically sorts them in ascending order. A program is executed starting with the lowest numbered line and proceeding, in sequence, to the highest numbered line. Any line number that is not followed by a command is deleted.

Table 5-7 briefly describes each BERD-BASIC program command.

Table 5-7
BERD-BASIC Program Commands

Command	Description
CONT	Continue program execution from a break.
END	End program execution.
GOTO	Transfer control to a specified line.
INPUT	Input a macro from a terminal or other input device.
LIST	List the existing program.
LPRINT	Print a string.
MACRO	Enter or display user-defined macros.
NEW	Erase the existing program.
REM	Non-executable commands.
RUN	Start program execution.
STOP	Break program execution.

5.4.5 Entering Remote Control Mode

Before entering Remote Control mode, the T-BERD 305 must be configured to communicate with the remote controller by setting its parity, baud rate, and data bits. Communication with the remote control unit can be achieved manually or through an Auto Baud function.

The T-BERD 305 is configured manually by adjusting DIP switches on the rear panel. DIP Switches 1 and 2 control baud rate, and DIP Switch 3 controls parity. For RS-232 operation, the T-BERD 305 is always set for 7 data bits. After setting the DIP switches, remote control mode is entered by typing a valid remote control command or a period (.) at the remote control unit.

The Auto Baud function offers possible baud rate settings of 110, 300, 600, 1200, 2400, 4800, 9600, and 19,200. Possible parity settings are even, none, or odd. To establish communication with the remote control unit through the Auto Baud function, perform the following steps at the remote control unit.

- (1) Press the BREAK key three times slowly. (On some terminals, the CTL key and the BREAK key must be pressed simultaneously.)
- (2) Hold the space bar down until the message "Auto-baud achieved. Press ESCAPE to continue" appears. (If the space bar does not have an auto-repeat function, press the space bar repeatedly until the message appears.)
- (3) Press the ESCAPE key—the message "Character format determined" is displayed.

NOTE: Between each of the above steps, the T-BERD 305 waits for 30 seconds. If no key is pressed within the 30-second period, the Auto Baud function is aborted.

Once the T-BERD 305 is configured to communicate with the controller, Remote Control mode may be entered by typing a valid remote control command or a period (.). Typing a period sets up the T-BERD 305 to control a terminal (CRT).

5.4.6 Input Sequence

A remote control command consists of an ASCII character string followed by either a carriage return (CR) or a carriage return/line feed (CRLF) sequence. When specifying a remote control command, the following rules apply:

- Commands may be entered in lower or upper case.
- Spaces may be inserted before (or after) the command name. Spaces must be inserted between the command name and a parameter.
- Entering a CTL C (Control C) or a CTL X (Control X) prior to issuing a CR or LF cancels the input line.

- Entering a CTL H (Control H) erases the last character entered.
- Up to 20 previously entered commands can be recalled using the ESC key. When the number of previously entered commands exceeds 20, the earliest command entries are overwritten.

After receiving a carriage return or a carriage return/line feed sequence, the T-BERD 305 analyzes the data in its input buffer. If a parity error, overrun error, framing error, input buffer overflow, program memory overflow, or any syntax error is detected, the appropriate error message is returned to the controller. If no errors are detected, the command is decoded and the appropriate response is generated.

If the ECHO feature is enabled, the entered characters are echoed back to the controller. If the PROMPT command is enabled, the default prompt (“>”) or a user-defined prompt (a single character or a string) indicates that previous commands have been processed and that the T-BERD 305 is ready to receive additional commands. Note that both the ECHO and PROMPT features are automatically enabled when remote control is entered.

When either the PROMPT or ECHO feature is enabled, any characters used to cancel a line (e.g., CTL C) are echoed to the remote control unit.

5.4.7 Output Sequence

The following rules apply for output sequence:

- If the ECHO feature is enabled, echoed outputs have higher priority than the printer outputs. This means that printer output is suspended if there are any echoed outputs available (include user inputs or error messages) at the end of each line of printer output. Printer output resumes when the echo FIFO is empty.
- Both the HOLD command and the CTL S (Control S) key sequence suspend printer output until the RELEASE command is specified. Once the HOLD command or CTL S is specified, the prompt automatically changes to a “+” to remind the user that data is waiting to be printed. Entering CTL Q (Control Q), a carriage return, or CTL S a second time resumes printer output. After the RELEASE command is entered, the default prompt (“>”) or a user-defined prompt is returned. Entering CTL C (Control C) clears the entire printer FIFO.

5.4.8 Error Messages

Most error messages are prefixed by the word ERROR and are terminated by a carriage return or a carriage return/line feed sequence. The following is a list of possible error messages.

ERROR: *Baud rate cannot be changed via remote control.*

The user attempted to change the baud rate of the T-BERD 305 by remote control. This is not allowed.

ERROR: *Can't continue.*

The user is attempting to continue either a built-in BERD-BASIC program or a user program that has been altered (that, is lines have been changed) since the last STOP command.

ERROR: *Characters after statement end.*

The T-BERD 305 found additional characters following the end of a legal command.

ERROR: *Command not allowed in a program.*

The user is attempting to execute a command in a BERD-BASIC program which can only be executed as a direct command from the remote controller.

ERROR: *Command only allowed in a program.*

The user is attempting to execute a command directly from the remote controller which can only be used as a command in a BERD-BASIC program.

ERROR: *Display hold is already off.*

The user attempted to remove a display hold when the display hold function was already "off".

ERROR: *Display hold is already on.*

The user attempted to specify a display hold when the display hold function was already "on".

ERROR: *DS1 Drop Option is not installed.*

The user specified a command (either DS1 DRO or DS1 LIN COD) which cannot be executed unless the DS1 Drop Option is installed.

ERROR: *Error rate insertion is already off.*

The user attempted to deactivate a prescribed rate of error insertion when the error insertion rate function was already "off".

ERROR: *Error rate insertion is already on.*

The user attempted to apply a prescribed rate of error insertion when the error insertion rate function was already "on".

ERROR: *Framing board is not installed.*

The user attempted to perform a function which requires the installation of the framing board (e.g., specifying FRA ON). No action is taken.

ERROR: *Illegal delimiter.*

A delimiter (e.g., "/") was expected in the command, but none was found.

ERROR: *Illegal line number.*

Either a non-existent BERD-BASIC program line was referenced (e.g., by a GOTO command) or the user attempted to enter a program line with a number greater than 29779.

ERROR: *Macros nested more than 5 deep.*

A macro is attempting to recall itself or another macro more than five times. This is not allowed.

ERROR: *Signal analysis board is not installed.*

The user attempted to perform a function which requires the installation of the Signal Analysis board (e.g., a measurement for LEVEL in the SIGNAL category).

ERROR: *Must be followed by a parameter.*

The user failed to specify a required parameter for the command.

ERROR: *Not in framing mode.*

The user attempted to perform a function which required the selection of Framed mode (e.g., specifying PRINT FRA ERR when framing is turned off).

ERROR: *Parity cannot be changed via remote control.*

The user attempted to change parity via remote control. This is not allowed.

ERROR: *Parameter is out of range.*

The user specified a value that was out of the valid range for the parameter (e.g., range for day of the month is 1 to 31).

ERROR: *Program memory overflow.*

The user attempted to enter a program that was too long to fit into memory.

ERROR: *Receiver buffer overflow.*

The T-BERD 305 detected a string that is too long to fit the receiver buffer.

ERROR: *Receiver framing error.*

The T-BERD 305 detected one or more RS-232C asynchronous framing errors in the input command. The controller's RS-232C data format may be different from that of the T-BERD 305.

ERROR: *Receiver overrun error.*

The controller is sending characters too quickly for the T-BERD 305 or is sending characters while the Clear To Send control signal is FALSE (indicating that the T-BERD 305 is not ready to accept more data). Solutions include responding to signaling and/or lowering the baud or data transfer rate.

ERROR: *Receiver parity error.*

The T-BERD 305 detected one or more RS-232C asynchronous parity errors in an input command.

ERROR: *Test is not in the Timed mode.*

The user initiated an activity which required that a test be performed in Timed mode (e.g., issuing the command PRINT TM LFT in Continuous Test mode).

ERROR: *There is no such page for help information.*

The user requested help information beyond the range of the number of pages available for the help activity. The command HELP 1 should be issued to learn how many pages of help information are currently available.

ERROR: *Unrecognized command.*

The T-BERD 305 did not recognize the command name entered in the command line. The spelling and syntax of the command name should be checked.

ERROR: *Unrecognized parameter.*

The T-BERD 305 recognized the requested command but could not interpret the associated command parameter. The spelling and syntax of the parameter should be checked.

A **WARNING** message alerts the user that the T-BERD 305 did something slightly out of the ordinary to process a command.

WARNING: *Framing board is not installed.*

The user attempted to perform a function which requires the installation of a framing board (e.g., specifying CAT FRA).

WARNING: *The parameter was rounded down to the valid interval.*

To be processed, the value entered with the command had to be rounded to the nearest allowable lesser value (see the BUR DUR command).

5.5 REMOTE CONTROL COMMANDS

This section presents all of the remote commands in alphabetical order. Each command is listed on a separate page; for ease of location, the command name appears in both the upper-left and upper-right corner of each page. Each page includes an explanation of the command, references to associated commands, and a brief example of command usage. Bold characters are used throughout this section to indicate the commands themselves as well as variables to be entered with the commands.



ACT SYN LOS

ACT SYN LOS

Action on Synchronization Loss

ACT SYN LOS :Display current mode status
ACT SYN LOS ON/HAL] :Set mode of synchronization loss

The **ACT SYN LOSS** command controls the T-BERD 305's reaction to synchronization loss. **ACT SYN LOS CON** causes all test results to accumulate continuously throughout a loss of synchronization. **ACT SYN LOS HAL** halts test results during a loss of synchronization. This command is identical in function to DIP Switch 9 (see Section 2).

EXAMPLE:

> **ACT SYN LOS** :display current action on synchronization loss
HAL :the T-BERD 305 is in Halt mode
> **ACT SYN LOS CON** :set action on sync loss to CON
>

ALARM

ALARM

Alarm Message Printing

ALARM :Display current alarm message status
ALARM [ON/OFF] :Enable or disable alarm message printing

The **ALARM** command controls the printing of alarm messages. **ALARM ON** enables alarm message printing. **ALARM OFF** disables alarm message printing. Alarm messages are printed only when **ALARM** is **ON** and the **EVENT** switch is in the **OFF** position (see Section 5.3.3).

EXAMPLE:

>**ALARM** :the status of the alarm messages
OFF :alarm message printing is currently OFF
>**ALARM ON** :enable alarm message printing
>



BLU SIG CRI

BLU SIG CRI

Blue Signal Criteria

BLU SIG CRI :Display the current blue signal criteria
BLU SIG CRI [FRA 1010/FRA STU C] :Set the blue signal criteria

The **BLU SIG CRI** command controls blue signal criteria. **BLU SIG CRI FRA 1010** sets the blue signal criteria to a framed 1010 (alternating Marks and Spaces) pattern. **BLU SIG CRI FRA STU C** sets the blue signal criteria to any framed data with stuck C bits. If a new blue signal criteria is specified during a test, a RESTART command is automatically invoked. This command is identical in function to DIP Switch 12 (see Section 2.5.1).

EXAMPLE:

```
>BLU SIG CRI FRA 1010 :set blue signal criteria to FRA 1010
. :if alarm messages are enabled, TEST
. :RESTART and NEW CONFIGURATION mes-
:sages are printed
>
>BLU SIG CRI :obtain the current blue signal criteria
FRA 1010
>
```

BRAINS

BRAINS

Sensitivity to Spelling Errors in Commands and Parameters

BRAINS :Display the current sensitivity to spelling errors
BRAINS [ASLEEP/AWAKE] :Set the sensitivity level

The **BRAINS** command determines the T-BERD 305's sensitivity to possible spelling errors within commands and parameters. **BRAINS AWAKE** sets the T-BERD 305's sensitivity level to **AWAKE**. When **BRAINS** are **AWAKE**, possible spelling errors in commands and parameters are identified, and the user is prompted for clarification. **BRAINS ASLEEP** sets the T-BERD 305's sensitivity level to **ASLEEP**. When **BRAINS** are **ASLEEP**, the spelling of commands and parameters must be precise to avoid receiving an error message.

EXAMPLE 1:

>**BRAINS** :display the current level for BRAINS
AWAKE :brains are awake
>**TIMM** :the TIM command is misspelled
Do you mean TIM (Y/N)? Y :the T-BERD 305 asks for clarification
INT :the timing switch status is displayed

EXAMPLE 2:

>**BRAINS** :display the current level for BRAINS
ASLEEP :brains are asleep
>**TIMM** :the TIME command is misspelled
ERROR: UNRECOGNIZED COMMAND
>

BUR DUR

BUR DUR

Burst Duration Time

BUR DUR :Display the current burst duration time
BUR DUR value :Set the burst duration time

The **BUR DUR** command controls the burst duration time interval. The valid range of burst duration times is 0.025-5.0 seconds. Any value specified without a decimal point is considered to be expressed as milliseconds, and thus must be in the range of 25-5000 milliseconds. Any value specified with a decimal point is considered to be expressed as seconds, and thus must be in the range of 0.025-5.0 seconds. When the burst duration time is in the range of 0.025-1.0, the value can be set in 0.025 (25 ms) increments. When the burst duration time is in the range 1.0-5.0, the value can be set in 0.1 (100 ms) increments. A value that is not one of the incremental values is always rounded to the nearest allowable lesser value. If a value has a decimal point, the digits after the third fractional position are ignored. This command is similar in function to the UP/DOWN switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
>BUR DUR 24 :the smallest allowed value is 25 ms
ERROR: PARAMETER IS OUT OF RANGE
>BUR DUR 5001 the largest allowed value is 5000 ms
ERROR: PARAMETER IS OUT OF RANGE
>BUR DUR 0.024 :the smallest allowed decimal value is 0.025
ERROR: PARAMETER IS OUT OF RANGE
>BUR DUR 5.001 :the largest allowed decimal value is 5.000
ERROR: PARAMETER IS OUT OF RANGE
>BURST DUR 3.0 :the user specifies a 3-second burst duration
>
```

CAT

CAT

Select Category

CAT :Display the current category setting
CAT category :Specify a new category

The **CAT** command controls category selection. This command is identical in function to the **CATEGORY** switch, located on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE 1:

```
>CAT :display the current category setting
BPV :the current category setting is BPV
>CAT LOG :change the current category to LOGIC
>
```

EXAMPLE 2:

```
>CAT FRA :there is no framing board
WARNING: FRAMING BOARD IS NOT INSTALLED
>
```

CLEAR FIFO

CLEAR FIFO

Clear Printer FIFO

CLEAR FIFO

The **CLEAR FIFO** command clears the printer FIFO queue, thus stopping any printer activity immediately after the command is entered.

EXAMPLE:

```
>PRI CON           :initiate a controls print
. . .             :controls print in progress
>CLEAR FIFO       :clear the FIFO queue
>                 :printing immediately stops
```

CLS

CLS

Clear the Screen

CLS

The **CLS** command clears the entire screen and places the cursor at the bottom of the screen by issuing 30 of the selected line terminator sequences.

EXAMPLE:

```
>CLS           :clear the screen
                :
                :
                :the entire screen is blank
                :
                :
>               :the cursor is positioned at the last line of the
                :screen
```


CONT

CONT

Resume Program Execution

CONT

The **CONT** command resumes the running of any BERD-BASIC program which has been suspended due to execution of a **STOP** command. Using the **STOP** and **CONT** commands, the user can temporarily suspend program execution and resume it at a later time. Program execution cannot be **CONT**inued if any existing line in a program has been changed, or if a program has reached its conclusion.

See also: **STOP**

EXAMPLE:

```
>10 LPRINT "FIRST HALF"      :this program runs in two halves ...
>20 STOP                    :...with a STOP in the middle
>30 LPRINT "SECOND HALF"
>40 END
>RUN                        :run the program
FIRST HALF                  :the program stops running ...
BREAK IN LINE 20           :...due to the STOP command in line 20
>CONT                       :continue running the program
SECOND HALF
*DONE*                      :the program is finished
>
```

DATE

DATE

Calendar Date

DATE

:Display the current date

DATE day:mon:year

:Set a new date

The **DATE** command prints the current date and sets a new date. When setting a new date, the symbol ":" may be replaced by a dash (-), comma (,), period (.), semi-colon (;) or slash (/). The valid ranges for each date value are:

day: 01 to 31

mon: 01 to 12

year: 0 to 99 (i.e., 1900 to 1999)

EXAMPLE:

>**DATE**

:view the current date

01 SEP 87

:the current date is September 1, 1987

>**DATE 25-11-88**

:set a new date

>**DATE**

:view the newly specified current date

25 NOV 88

:the new current date is November 25, 1988

>

DATA BITS

DATA BITS

Display the Current RS-232 Data Bit Setting

DATA BITS

The **DATA BITS** command is used to obtain the current setting for the remote RS-232 port on the T-BERD 305. This is an “inquire-only” command; the user cannot change the setting via remote control. The data bit setting is controlled by DIP Switch 7 on the rear panel or through the software’s auto-baud capability.

EXAMPLE:

```
>DATA BITS           :display current data bits
7
>
```

DISPLAY

DISPLAY

Front Panel Display Mode

DISPLAY :View current mode of display control
DISPLAY [LOCAL/REMOTE] :Set display control

The **DISPLAY** command determines whether the **CATEGORY** and **RESULT** switches are active when the T-BERD 305 is under remote control. Note that these are the only switches that may optionally be active on the T-BERD 305. **DISPLAY LOCAL** activates the **CATEGORY** and **RESULT** switches. (**DISPLAY LOCAL** is the default for Remote Control mode.) **DISPLAY REMOTE** disables the **CATEGORY** and **RESULT** switches.

See also: **REMOTE**
LOCAL

EXAMPLE:

```
>DISPLAY :view current mode of display control
LOCAL
>DISPLAY REMOTE :set display control to remote
>
```

DIS HOL

DIS HOL

Front Panel Results Display Hold

DIS HOL :Display the current status of DISPLAY HOLD
DIS HOL [ON/OFF] :Set DISPLAY HOLD

The **DIS HOL** command controls the front panel results display. **DIS HOL ON** freezes the results display. Note that when **DIS HOL ON** is enabled during a test, the T-BERD 305 continues to accumulate test results. **DIS HOL OFF** disables the DISPLAY HOLD function. This command is identical in function to the DISPLAY HOLD switch on the front panel of the T-BERD 305 (see Section 2.3.1).

EXAMPLE:

```
>DIS HOL :view current status of DISPLAY HOLD  
OFF  
>DIS HOL ON :the results display is frozen  
>
```

DS1 DRO

DS1 DRO

Drop a DS1 Channel

DS1 DRO :Display the channel that is currently demultiplexed

DS1 DRO value :Select the demultiplexed channel

The **DS1 DRO** command demultiplexes (drops) any of the 28 DS1 channels from the DS3 bit stream for purposes of testing or monitoring. **DS1 DRO value** selects the specific channel to be demultiplexed (within the valid range 1-28). This command is available only when the DS1 Drop Option is installed, and is identical in function to the DS1 DROP auxiliary function.

EXAMPLE:

```
>DS1 DRO :display the current DS1 channel selection
27 :channel 27 is currently demultiplexed
>DS1 DRO 5 :select DS1 channel five for demultiplexing
>
```

DS1 LIN COD

DS1 LIN COD

DS1 Line Coding

DS1 LIN COD :Display the current DS1 line code setting
DS1 LIN COD [AMI/B8ZS] :Select the DS1 line code

The **DS1 LIN COD** command controls the DS1 Drop Option's transmit line code. **DS1 LIN COD AMI** selects alternate mark inversion (AMI) code for the demultiplexed T-1 line. **DS1 LIN COD B8ZS** selects bipolar with 8 zero substitution (B8ZS) clear channel code for use on channels that need clear circuit capability. If AMI is specified, a binary 1 is represented by alternate positive and negative pulses, and a binary 0 is represented by no pulse at all. If B8ZS is specified, a sequence of eight zeros is replaced with a 8 bit sequence of ones and zeros. This command is available only when the DS1 Drop Option is installed, and is identical in function to DIP Switch 14 on the rear panel of the T-BERD 305 (see Section 2.5.1).

EXAMPLE:

```
>DS1 LIN COD :display the current DS1 line code  
B8ZS :the current line code is B8ZS  
>DS1 LIN COD AMI :select AMI line coding  
>
```

ECHO

ECHO

Echo Mode

ECHO :Display echo status
ECHO [ON/OFF] :Set echo mode

The **ECHO** command 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 echo, and inhibits the printing of characters entered from the remote control unit.

EXAMPLE:

```
>ECHO :view echo status  
ON  
>ECHO OFF :turns echo off  
>(TIME) :TIME is specified—but not echoed  
12:03:32 :the time is displayed  
>
```


END

END

End a BERD-BASIC Program

END

The **END** command marks the final statement of any BERD-BASIC program, terminating execution and causing the message ***DONE*** to be sent to the remote control unit. Note that the ***DONE*** message is sent whenever the end of a program is reached successfully (even if the **END** command is not specified).

EXAMPLE 1:

```
>10 LPRINT "HI"  
>RUN  
HI  
*DONE*
```

EXAMPLE 2:

```
>10 LPRINT "HELLO"  
>20 LPRINT "HOW ARE YOU"  
>30 END  
>RUN  
HELLO  
HOW ARE YOU  
*DONE*  
>
```

ERR INS

ERR INS

Logic Error Insertion

ERR INS	Display the current error insertion rate status
ERR INS RAT [ON/OFF]	:Insert logic errors into the data stream at a previously specified fixed rate
ERR INS BUR	:Insert a single burst of logic errors into the data stream at a previously specified fixed rate
ERR INS SIN	:Insert a single error into the data stream

The **ERR INS** command controls how errors are inserted into the data stream. **ERR INS RAT ON** inserts logic errors into the data stream at the rate specified in the **ERR INS RT** function of the AUX category. **ERR INS RAT OFF** stops the insertion of logic errors into the data stream. This command is identical in function to the ERROR INSERT RATE, ERROR INSERT BURST, and ERROR INSERT SINGLE switches on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
>ERR INS :display error insertion rate status
RAT OFF :error insertion rate is off
>ERR INS RAT ON :“turn on” error insertion rate
1E-4 :the current error insertion rate is 1E-4
>ERR INS SIN :insert a single error and end rate insertion
>ERR INS :view current error insertion rate status
RAT OFF
>ERR INS RAT OFF :try to turn error rate insertion off
ERROR: ERROR RATE INSERTION IS ALREADY OFF
>
```

ERR RAT

ERR RAT

Error Insertion Rate

ERR RAT :Display the current error insertion rate
ERR RAT rate-value :Set a new error insertion rate

The **ERR RAT** command controls the rate at which logic errors are inserted into the data stream. The range of valid error insertion rate values is 1E-2 through 1E-9.

EXAMPLE:

```
>ERR RAT :display the current error insertion rate  
1E-7 :the current error insertion rate is 1E-7  
>ERR RAT 1E-5 :change the error insertion rate to 1E-5  
>
```

ERR THR

ERR THR

Error Threshold

ERR THR :Display the current error threshold value
ERR THR value :Set a new error threshold rate

The **ERR THR** command controls the error threshold rate. The range of valid error threshold values is 1E-2 through 1E-9.

EXAMPLE:

>**ERR THR** :view the current error threshold value
1E-7 :the current error threshold rate is 1E-7
>**ERR THR 1E-5** :change the error threshold rate to 1E-5
>

FORMAT**FORMAT**

Formatted Printouts

FORMAT

The **FORMAT** command inserts blanks between words so that printed output from the T-BERD 305 is easy to read. The **FORMAT** command (as opposed to the **UNFORMAT** command) is the default for Remote Control mode; when the T-BERD 305 changes control mode (from local to remote or vice versa), the current setting remains unchanged.

See also: **UNFORMAT**

EXAMPLE 1:

```
>10 FORMAT :set formatted print
>20 LPRINT THERE ARE BLANKS
>RUN
THERE ARE BLANKS :formatted print from line 20
>
```

EXAMPLE 2:

```
>10 UNFORMAT :set unformatted print
>20 LPRINT THERE ARE NO BLANKS
>RUN
THEREARENOBLANKS :unformatted print from line 20
>
```

FRA

FRA

Framing

FRA :Display the current framing status
FRA [ON/OFF] :Select Framed or Unframed mode

The **FRA** command determines whether a given test is conducted in Framed or Unframed mode. **FRA ON** specifies Framed mode. **FRA OFF** specifies Unframed mode. This command is identical to the framing function of the AUX category.

EXAMPLE:

```
>FRA :display the current framing status
OFF
>FRA ON :select Framed mode
>
```

FRA SYN LOS THR

FRA SYN LOS THR

Framing Synchronization Loss Threshold

FRA SYN LOS THR :Display the current framing synchronization loss threshold
FRA SYN LOS THR [FAST/SLOW] :Set the current framing synchronization loss threshold

The **FRA SYN LOS THR** command controls the framing synchronization loss threshold. **FRA SYN LOS THR FAST** sets the framing synchronization loss threshold to FAST. **FRA SYN LOS THR SLOW** sets the current framing synchronization loss threshold to SLOW. This command is identical in function to DIP Switch 13 on the rear panel of the T-BERD 305. Refer to Section 2.5.1, DIP Switches, for a complete description of the frame synchronization loss threshold.

EXAMPLE:

```
>FRA SYN LOS THR :display the current threshold value  
SLOW  
>FRA SYN LOS THR FAST :set current threshold value to FAST  
>
```

GOTO

GOTO

Transfer Execution to a Specified Line

GOTO *linenumber*

The **GOTO** command alters the sequence in which the T-BERD 305 executes commands in a BERD-BASIC program. When encountered in a running program, the **GOTO** command transfers execution to the command associated with the specified line number (as opposed to the next line in sequence). This command is used in a BERD-BASIC program only.

EXAMPLE:

```
>10 LPRINT START HERE
>20 GOTO 40
>30 LPRINT THIS LINE IS NEVER PRINTED
>40 LPRINT JUMP TO HERE
>RUN
START HERE
JUMP TO HERE           :line 30 is skipped
*DONE*
>
```


HELLO

HELLO

Display T-BERD 305 Software Revision Level

HELLO

The **HELLO** command displays the T-BERD 305 software revision level.

EXAMPLE:

```
>HELLO :display the software revision level  
T-BERD 305 SOFTWARE REVISION F(C) TTC, 1 Jul 1995.  
>
```

HELP

HELP

On-Line Help Function

HELP	:Display summary help information
HELP HELP	:List an index of all help information
HELP !	:List all valid remote control commands
HELP command-name	:Display command syntax for command-name
HELP number	:Print a page of help information
	:Number: 1 to 7
HELP 1	:Equivalent of HELP

The **HELP** command provides access to the T-BERD 305's on-line help facility (see Appendix A). **HELP** offers summary on-line help information. **HELP HELP** provides an index to the various types of help information. **HELP !** lists all valid T-BERD 305 remote control commands. **HELP number** displays a specific page of help information related to the following:

- **HELP 1** Summary help information
- **HELP 2** Special characters
- **HELP 3** Front panel switch commands
- **HELP 4** Auxiliary function commands
- **HELP 5** Rear panel switch commands
- **HELP 6** BERD-BASIC
- **HELP 7** Special commands

HELP command-name briefly defines and displays the command syntax for any specified remote control command. The following conventions apply: (1) Command parameters are presented as upper case character strings (see Example 1). (2) Command parameters with a range of valid values are presented as upper case character strings surrounded by brackets ([]) (see Example 2). (3) Command and parameter summaries are preceded by three dashes (- -) (see Examples 2 and 3).

EXAMPLE 1:

>**HELP RES FRA**

ERR	:these are command parameters
ERR RT	:valid commands are RES FRAMING ERR
AV E RT	:RES FRAMING ERR RT, etc.
ERR SEC	
%EFS	
TH ER SEC	

HELP

HELP

On-Line Help Function (continued)

EXAMPLE 2:

>**HELP TIME**

HH:MM :these are parameters with valid ranges

HH-MM

HH,MM

HH.MM

HH;MM

HH/MM

--HH 0 TO 23 HOURS :these are the valid ranges

---MM 0 TO 59 MINUTES

EXAMPLE 3:

>**HELP NEW** :summarize the NEW command

--ERASE THE EXISTING BASIC PROGRAM.

HIS RES

HIS RES

Reset Alarm History LED Indicators

HIS RES

The **HIS RES** command resets all alarm history LED indicators. This command is identical in function to the HISTORY RESET switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
> HIS RES :clear history LED indicators
>
```

HOLD

HOLD

Hold All Printer Output

HOLD

The **HOLD** command temporarily holds all printer output (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 "+" to indicate that printer output is being held.

See also: **RELEASE**

EXAMPLE:

> HOLD	:hold all printouts for now ...
+ TIME	:... then print the time and date
+ DATE	:(note that nothing is printed)
+ RELEASE	:start printing ...
>	:... and the prompt is changed back to ">"
12:34:56	:the T-BERD 305 prints the time ...
14 APR 87	:... and date
>	

INPUT**INPUT**

Enter User Input Into a Macro

INPUT m :Prompt user with a question mark
INPUT m/prompt-string :Prompt user with string

The **INPUT** command is used to enter user input into a macro. A macro is a string of characters that are defined once and recalled using one or two key strokes. Note that the **INPUT** command is a BERD-BASIC command only. When running a program with input commands, the T-BERD 305 prompts the user with a string (**INPUT m/prompt-string**) or a question mark (**INPUT m**). (The parameter **m** is a number from 0 to 9.) The user may specify a response (to a maximum of 31 characters) which is stored as a macro.

See also: **MACRO**

EXAMPLE:

```
>10 INPUT 2
>20 INPUT 3/TIME RESULT CMD
>RUN
?RES LOG ERR :respond to "?" with RES LOG ERR
TIME RESULT CMD? RES TIM :respond to prompt with RES TIM
*DONE*
>&2 :call MACRO 2 (RES LOG ERR)
1211 :logical error results are displayed
>&3 :call MACRO 3 (RES TIM)
11:22:33 :the time is displayed
>MACRO 2 :display the contents MACRO 3
RES TIM
>
```

LEDS

LEDS

Display the State of Front Panel LEDS

LEDS

The **LEDS** command displays the state of various alarm and status LED indicators. When specified, this command displays the LED indicators as they appear on the front panel.

EXAMPLE:

—ALARMS—				—STATUS—	
ON	OFF	SIGNAL	LOSS	OFF SIGNAL	PRES
ON	OFF	PATTERN	LOSS	ON PATTERN	SYNC
OFF	OFF	FRAME	LOSS	ON FRAME	SYNC
OFF	OFF	BLUE	SIG		
ON		POWER	LOSS		

—HISTORY
OFF TEST COMPLETE

LIST

LIST

List the Working BERD-BASIC Program

LIST :List the entire program
LIST linenumber :List starting with specified line number

The **LIST** command lists the contents of the currently active BERD-BASIC program in ascending numerical order, and displays the number of unused bytes in program memory. If a line number is not specified, the listing starts with the first line of the program; otherwise, the listing starts with the specified line number.

EXAMPLE:

```
>10 TIME :enter TIME as line 10
>30 DATE :enter DATE as line 30
>20 CLS :enter CLS as line 20
>LIST
10 TIME
20 CLS
30 DATE
[489 BYTES FREE]
>
```


LOCAL

LOCAL

Return the T-BERD 305 to Local Mode

LOCAL

:Enter Local mode

/

:Alternate form of the **LOCAL** command

The **LOCAL** command returns the T-BERD 305 to Local mode from Remote Control or Terminal mode. In Local mode, all front-panel switches are active regardless of the display mode. The T-BERD 305 will remain in Local mode until it receives a **REMOTE**, **TERMINAL**, period (.), or other valid remote control command from the remote control unit. Upon returning to Local mode, DIP switches are scanned and reset if they differ from the current status. If necessary, a test restart is performed (see Section 2.5.1, DIP Switches). When Local mode is specified, note that the remote control unit will be disabled if the baud rate settings of the remote control unit and the T-BERD 305 (set via DIP switches 1 and 2) do not match.

See also: **DISPLAY**
REMOTE
TERMINAL

EXAMPLE:

```
>LOCAL           :enter Local (front panel) mode ...
REMOTE         :...then return to Remote mode
>/              :quickly return to Local mode
```

LPRINT

LPRINT

Print a Literal Text String

LPRINT string

The **LPRINT** command sends a text string to the printer during the execution of a BERD-BASIC program. If the string is surrounded by double quotes, printing is inhibited for any succeeding string in the program line. If quotes do not surround the string, any consecutive number of spaces in the string are condensed to one space.

EXAMPLE:

>10 LPRINT "HELLO" THAT'S ALL

>20 LPRINT HI I'M LARRY

>30 LPRINT "I HAVE MORE SPACES"

>RUN

HELLO :words after second quote are omitted

HI I'M LARRY :spaces condensed (no quotes)

I HAVE MORE SPACES :spaces not condensed (quotes)

DONE

>

MACRO**MACRO**

Set or Display User Macros

MACRO	:Display all currently defined macros
MACRO number	:Display specified macro number
MACRO number/	:Clear specified macro number
MACRO number/string	:Define specified macro number as a string

The **MACRO** command displays and defines macros used as an aid in entering commands. A macro is a string of characters that are defined once and recalled using only one or two key strokes. Typically, they are used when a given command may need to be entered many times. **MACRO number** may range from 0-9; **MACRO string** may range from 1 to 80 characters in length. Macros are recalled by specifying an ampersand (&) followed by the macro number whenever the macro substitution takes place. Note that, although the command **INPUT** can also be used to define a macro, it can only be used in BERD-BASIC program; the **MACRO** command has no such restriction.

See also: **INPUT**

EXAMPLE:

> MACRO 1/TIME	:define macro 1 as TIME
> MACRO 2/DATE	:define macro 2 as DATE
> &1	:display the current time of day
20:07:13	
> &1 21:08	:set the time ahead one hour (TIME 21:08)
> &2	:display the current date (DATE)
15 JAN 87	
> MACRO 2	:display the contents of MACRO 2
DATE	
>	

NEW

NEW

Prepare To Enter a New BERD-BASIC Program

NEW

The **NEW** command clears the working program memory. It is used when entering a new program to ensure that no lines are left from a previous program. When the **NEW** command is specified, 511 bytes of memory (each byte approximately equivalent to one stored character) are freed for the new program.

EXAMPLE:

```
>10 INPUT 2
>20 DATE
>LIST
>
10 INPUT 2
20 DATE
[493 BYTES FREE]
>NEW           :purge the existing program
>LIST
>
[511 BYTES FREE]
```

PARITY

PARITY

Display Current Parity Setting

PARITY

The **PARITY** command is used to display the current RS-232C parity setting for the T-BERD 305. This is an "inquire-only" command; the user cannot change the parity setting via remote control. DIP Switch 3 on the rear panel is used to set odd or even parity. Since the software also provides auto-baud rate capability, the user may also obtain no parity. See Section 2.5.1, DIP Switches, and Section 5.4.4, Input Sequence, for a further description of parity.

EXAMPLE:

```
>PARITY :display the current parity setting
>
EVEN
>PARITYODD :try to set odd parity
ERROR: PARITY CANNOT BE CHANGED VIA REMOTE CONTROL
```

PAR ERR RAT

PAR ERR RAT

Parity Error Rate

PAR ERR RAT :Display current parity error rate setting
PAR ERR RAT BER :Set parity bit error rate
PAR ERR RAT BLK :Set parity block error rate

The **PAR ERR RAT** command determines the parity error rate calculation criteria. **PAR ERR RAT BER** sets parity bit error rate. **PAR ERR RAT BLK** sets parity block error rate. This command is identical in function to DIP Switch 11 (see Section 2.5.1).

EXAMPLE:

```
>PAR ERR RAT :display current parity error rate setting  
BER :bit error rate is currently set  
. :if alarm messages are enabled, TEST,  
. :RESTART and NEW CONFIGURATION  
. :messages are printed  
>PAR ERR RAT BLK :set block error rate  
>
```

PAT

PAT

Data Pattern

PAT :Display the current data pattern
PAT pattern :Set a new data pattern

The **PAT** command displays or sets the current data pattern generated by the T-BERD 305. The **pattern** selection may be one of the following:

2 ²³ -1	:2 ²³ -1 bit pseudorandom pattern
2 ²⁰ -1	:2 ²⁰ -1 bit pseudorandom pattern
2 ¹⁵ -1	:2 ¹⁵ -1 bit pseudorandom pattern
1111	:Fixed pattern of all Marks
1100	:Fixed pattern of two Marks followed by two Spaces
1010	:Fixed pattern of one Mark and one Space
THR DAT	:data looped back

EXAMPLE:

```
>PAT :display current data pattern
1100
>PAT 215-1 :set new data pattern
>
```

PAT SYN LOS THR

PAT SYN LOS THR

Pattern Synchronization Loss Threshold

PAT SYN LOS THR :Display the current synchronization loss threshold

PAT SYN LOS THR [FAST/SLOW] :Set the synchronization loss threshold

The **PAT SYN LOS THR** command controls the pattern synchronization loss threshold. **PAT SYN LOS THR FAST** sets the threshold to FAST. **PAT SYN LOS THR SLOW** sets the threshold to SLOW. This command is identical in function to DIP Switch 10 on the T-BERD 305 rear panel (see Section 2.5.1, DIP Switches).

EXAMPLE:

```
>PAT SYN LOS THR :display the current threshold
FAST
>PAT SYN LOS THR SLOW :set threshold to SLOW
>
```


PRI

PRI

Initiate Printout

PRI[CON/RES] :Select controls or results printout

The **PRI** command causes the specified printout to be generated. The **PRI RES** and **PRI CON** commands generate results printouts and controls printouts, respectively. This command is identical in function to the RESULTS/CONTROLS switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

>**PRI RES** :generate results print
:results print follows

>**PRI CON** :generate controls print
:controls print follows

PRI EVE

PRI EVE

Print Event

PRI EVE :Display the print event status
PRI EVE (event) :Select print event

The **PRI EVE** command controls the current print event setting. This command determines when the T-BERD 305 generates automatic test results prints. The **(event)** choices are the following.

OFF :Halt results prints, clear printer FIFO
15 MIN :Print results every 15 minutes
30 MIN :Print results 30 minutes
2 HR :Print results 2 hours
ERR SEC :Print results after every errored second
TES END :Print results at end of test
TIM H:MM :Print results at the time interval specified

Any setting other than **PRI EVE OFF** enables automatic results printouts when one or more alarm conditions change. When specifying **TIM H:MM**, the symbol ":" may be replaced by a dash (-), comma (,), period (.), or slash (/). The valid range for H (hours) is 0-5. The valid range for MM (minutes) is 0-59. This command is identical in function to the **EVENT** switch on the T-BERD 305 front panel (see Section 2.3.1), except that **TIMed** print events are only available in Remote Control mode.

EXAMPLE:

>**PRI EVE** :display status of print event
OFF
>**PRI EVE 15 MIN** :print results every 15 minutes
>

PRINT**PRINT**

Print the Single T-BERD 305 Result Value

PRINT (result) :Print the specified result value

The **PRINT** command is used to print the value of any T-BERD 305 result. Unlike the **RES** command, the front panel display does not change to reflect the specified result. To print results for the LOGIC, BPV, PARITY and FRAME categories, the category name (LOG, BPV, PAR, and FRA, respectively) must also be specified with the result name. To print results for the SIGNAL and TIME categories, only the result name need be specified. The **PRINT** command does not allow printing of auxiliary function (AUX) information. The valid result names are listed below.

ALA SEC	:Alarmed seconds
AVERT	:Average error rate
%EFS	:Error-free seconds (percentage of)
ELATM	:Elapsed time
ERR	:Errors
ERR RT	:Error rate
ERR SEC	:Errored seconds
LEV	:Signal level
POW	:Signal power
RX FRE	:Receive frequency in Hz
SIGL SEC	:Signal loss seconds
SLI	:Pattern slips
SYNE SEC	:Synchronized error seconds
SYNL SEC	:Synchronization loss seconds
THER SEC	:Threshold error seconds
TMLFT	:Time remaining in timed test
TX FRE	:Transmit frequency in Hz

See also: **RES**

EXAMPLE 1:

```
>PRINT LOG SLI      :print number of pattern slips
23
>
```

EXAMPLE 2:

```
>PRINT TM LFT      :print the time left in current timed test
00:35:14
>
```

PRINT SPEED

PRINT SPEED

Print Speed

PRINT SPEED :Display the current print speed
PRINT SPEED FAST/SLOW :Set print speed

The **PRINT SPEED** command controls print speed. **PRINT SPEED FAST** sets the print speed to FAST (maximum print speed). **PRINT SPEED SLOW** sets the print speed to SLOW. When SLOW is specified, the T-BERD 305 waits for 550 ms after transmitting each 20 characters. This command is identical in function to DIP Switch 6. (See Section 2.5.1 for further information regarding print speed.)

EXAMPLE:

```
>PRINT SPEED :display the current print speed  
FAST  
>PRINT SPEED SLOW :print speed set to SLOW  
>
```

PROMPT

PROMPT

Remote Control Command Prompt

PROMPT :Display status of prompt
PROMPT [ON/OFF] :Turn prompt on or off
PROMPT STRING (prompt-string) :Define a prompt

The **PROMPT** command controls the prompt symbol at the remote control unit. **PROMPT ON** enables the display of a ">" as the prompt symbol when the T-BERD 305 is ready to receive a command. **PROMPT OFF** "turns off" the prompt symbol. **PROMPT STRING** enables the user to define a prompt symbol (or prompt string). Note that the T-BERD 305 changes any current prompt symbol to "+" when the **HOLD** command is specified.

EXAMPLE:

```
> PROMPT :display prompt status
ON
> PROMPT STRING = :define "=" as prompt symbol
= PROMPT OFF :turn off the "=" prompt
TIME :display the time (no prompt)
10:33:04
PROMPT ON :turn on the "=" prompt
=
```

REC INP

REC INP

Receive Input

REC INP :Display the current **RECEIVE INPUT** setting
REC INP [HIG/DSX/LOW] :Set the current **RECEIVE INPUT** setting

The **REC INP** command sets up the T-BERD 305's DS3 receiver for the expected input level. This command is identical in function to the **RECEIVE INPUT** switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
>REC INP HIG :set RECEIVE INPUT to HIGH  
>REC INP :display the current RECEIVE INPUT setting  
HIG  
>
```

RELEASE

RELEASE

Release All Printer Output

RELEASE

The **RELEASE** command releases all output in the print buffer from **HOLD** status. When the release command is enabled, the prompt character changes from the "+" to the standard ">" (or user-specified prompt) to indicate that printer output is no longer being held.

See also: **HOLD**

EXAMPLE:

> HOLD	:hold all printouts for now ...
+ TIME	:... then print the time and date
+ DATE	:(note that nothing is printed)
+ RELEASE	:start printing ...
>	:... and the prompt changes to ">"
12:34:56	:The T-BERD 305 prints the time ...
14 APR 87	:... and date
>	

REM

REM

Remark or Comment

REM

The **REM** command is used to place a remark or comment in a BERD-BASIC program. Remarks are nonexecutable, and thus ignored by the T-BERD 305.

EXAMPLE:

```
>10 LPRINT LOOSE LIPS
>20 REM SHOULD BE TIGHTENED? :this command is ignored
>30 LPRINT SINK SHIPS
>RUN
LOOSE LIPS           :line 20 is non-executable
SINK SHIPS
>
```


REMOTE

REMOTE

Remote Control Entry

REMOTE

The **REMOTE** command places the T-BERD 305 in Remote Control mode from Local or Terminal mode. In Remote Control mode, all front panel switches are inactive (with the exception of the **CATEGORY** and **RESULT** switches). Unlike the **TERMINAL** command, the **REMOTE** command turns prompt and echo off.

See also: **LOCAL**
TERMINAL

EXAMPLE:

REMOTE

:enter Remote Control mode from Local mode
:user must enable prompt and echo

RES

RES

Result Display Control

RES (result)

The **RES** command controls the display results on the front panel of the T-BERD 305. Unlike the **PRINT** command, the front panel is updated to display the result. To display results for the LOGIC, BPV, PARITY and FRAME categories, the category name (LOG, BPV, PAR, and FRA, respectively) must also be specified with the result name. To display results for the SIGNAL, TIME, and AUX categories, only the result name need be specified. The valid result names are listed below.

ALA SEC	:Alarmed seconds
AVERT	:Average error rate
BUR DUR	:Burst duration
%EFS	:Error-free seconds (percent of)
ELA TM	:Elapsed time
ERR	:Errors
ERR INS RAT	:Error insertion rate
ERR RT	:Error rate
ERR SEC	:Errored seconds
ERR THR	:Error threshold
FRAMING	:Framing mode
LEV	:Signal level
POW	:Signal power
RXFRE	:Receive frequency in Hz
SIGL SEC	:Signal loss seconds
SLI	:Pattern slips
SYNE SEC	:Synchronization error seconds
SYNL SEC	:Synchronization loss seconds
THER SEC	:Threshold error seconds
TMLFT	:Time remaining in timed test
TXFRE	:Transmit frequency in Hz
XBIT	:Transmit X bit

See also: **PRINT**

EXAMPLE 1:

```
>RES LOG SLI          :display pattern slips on front panel
2 3
>
```

RES

(Continued)

RES

EXAMPLE 2:

>RESTMLFT

00:35:14

>

:display time left in current timed test

RESTART

RESTART

Test Restart

RESTART

The **RESTART** command restarts the T-BERD 305 test. This command is identical in function to the **RESTART** switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
> RESTART          :restart test  
>
```



RUN

RUN

Execute a BERD-BASIC Program

RUN :Execute a BERD-BASIC program
RUN linenumber :Execute a BERD-BASIC program beginning at
specified linenumber.

The **RUN** command enables the execution of the current BERD-BASIC program. Execution starts at the first line of the program unless the **linenumber** parameter is specified.

EXAMPLE:

>**10 LPRINT FRANKLIN**
>**20 LPRINT DELANO**
>**30 LPRINT ROOSEVELT**
>**RUN 30** :run starting at line 30
ROOSEVELT :only line 30 is executed
>**RUN** :run entire program
FRANKLIN
DELANO
ROOSEVELT

STOP

STOP

Suspend Execution of a BERD-BASIC Program

STOP

The **STOP** command suspends the execution of a running BERD-BASIC program. The user may resume program execution by specifying the **CONT** command. Note that the **STOP** command is a BERD-BASIC command only. Program execution cannot be resumed if any existing line in a program has been changed, or if a program has reached its conclusion.

See also: **CONT**

EXAMPLE:

```
>10 LPRINT "FIRST HALF"      :this program runs in two halves ...
>20 STOP                    :...with a STOP in the middle
>30 LPRINT "SECOND HALF"
>40 END
>RUN                        :run the program
FIRST HALF                  :the program stops running ...
BREAK IN LINE 20           :...due to the STOP command
>CONT                       :continue running the program
SECOND HALF
*DONE*                     :the program is finished running
>
```

TERM

TERM

Remote Control Line Terminator

TERM :Display current line terminator setting
TERM[CR/CRLF] :Set the line terminator

The **TERM** command controls the line termination on a printer or remote control unit. If **TERM CR** is specified, only a carriage return is transmitted at the end of each displayed line. If **TERM CRLF** is specified, each displayed line is followed by a carriage return and a line feed. This command is identical in function to DIP Switch 4 on the T-BERD 305 rear panel (see Section 2.5.1, DIP Switches).

EXAMPLE:

>**TERM** :display the current line terminator
CRLF
>**TERMCRLF** :select carriage return as line terminator

TERMINAL

TERMINAL

Set the T-BERD 305 To Talk to a Remote Control Unit

TERMINAL

.(period) :Alternate form of the **TERMINAL** command

The **TERMINAL** command configures the T-BERD 305 for use with a remote control unit. It sets the following commands:

ECHO ON	:turn echo on
PROMPT ON	:turn command prompts on
WIDTH 80	:printer width 80 columns
TERM CRLF	:line terminator of carriage return and line feed

This command is typically used as a log-in sequence just after the T-BERD 305 is powered up. The user need only type a period (.) to get the T-BERD 305's attention, enter Terminal mode, and have the default prompt (>) printed on the screen. When the **TERMINAL** command is specified, all front panel switches (except the **CATEGORY** and **RESULT** switches) are inactive.

See also: **LOCAL**
REMOTE

EXAMPLE:

> :assume that the T-BERD 305 has just been powered up; the user types a period (.) which the T-BERD 305 does not echo
:the T-BERD 305 responds with a prompt and is now in Terminal mode.

TES

TES

Test Duration

TES :Display the current test duration
TES [TIM/CON] :Set the test duration

The **TES** command controls the duration of a timed test. **TES TIM** sets the test mode to timed. If **TES TIM** is specified, the test is conducted for the length of time selected in either the **TEST LENG** function of the **TIME** category or the **TES LEN** command. **TES CON** sets the test mode to Continuous. This command is identical in function to the **TEST** switch on the T-BERD 305 front panel (see Section 2.3.1).

See also: **TES LEN**

EXAMPLE:

>**TES** :display the current test mode
TIM :test is **TIMED**
>**TES CON** :change test type to **CONTINUOUS**

TES LEN

TES LEN

Test Length

TES LEN :Display the current test length setting
TES LEN HHH:MM :Set new test length

The **TES LEN** command controls the length of a timed test. The parameter **HHH:MM** is given in hours and minutes, respectively. Hours or minutes may be specified separately (HHH: or :MM, respectively). 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:

HHH: 0-200 hours
MM: 0 to 59 minutes

This command is identical to the **TEST LENG** function of the **TIME** category (see Section 2.3.1).

See also: **TES**

EXAMPLE:

>**TES LEN** :display the current test length setting
12:35 :current test length is 12 hrs. 35 min.
>**TES LEN;6** :test length now is 6 minutes



TIM

TIM

Transmit Timing Source

TIM :Display the current transmit timing source
TIM [INT/REC or LOO] :Set the transmit timing source

The **TIM** command controls the transmission of the timing source. **TIM INT** sets the transmit timing source to **INTERNAL**. **TIM LOO** or **TIM REC** sets the transmit timing source to **RECOVERED**. This command is similar in function to the **TIMING** switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
>TIM :display the transmit timing source
INT :transmit timing source is INTERNAL
>TIM LOO :change transmit timing source to RECOVERED
>
```

TIME

TIME

Time of Day

TIME :Display the time of day
TIME HH:MM :Set the time of day

The **TIME** command displays or sets the time of day. The parameter HH:MM reflects hours and minutes, respectively. When setting a new time, the symbol ":" may be replaced by a dash (-), comma (,), period (.), semicolon (;), or slash (/). The valid ranges for each time value are:

HH: 0-23 hours
MM: 0 to 59 minutes

This command is identical to the TIME function of the TIME category (see Section 2.3.1).

EXAMPLE:

```
> TIME :display the current time
11:03:46
> TIME 23-32 :set time to 23:32
> TIME :display the current time once again
23:32:02
>
```



TRA OUT

TRA OUT

Select Transmit Output Level

TRA OUT :Display current transmitted signal level
TRA OUT [HIG/DSX/LOW] :Select transmitted signal level

The **TRA OUT** command controls the level of the T-BERD 305's transmitted DS3 output. This command is identical in function to the TRANSMIT OUTPUT switch on the T-BERD 305 front panel (see Section 2.3.1).

EXAMPLE:

```
>TRA OUT HIG :set the transmit output type to HIGH  
>TRA OUT :display the transmit output level  
HIG  
>
```

TX X BIT

TX X BIT

Transmitted X Bit

TX X BIT :Display the current X bit setting
TX X BIT [0/1] :Set the current X bit

The **TX X BIT** command sets the state of the transmitted X bit to 0 or 1. **TX X BIT 0** sets the current X Bit to 0. **TX X BIT 1** sets the current X Bit to 1. This command is available only when framing is on. See Section 7.7.1 for a description of the DS3 framing specifications.

EXAMPLE:

```
>TX X BIT :display the current X Bit transmission
0
>TX X BIT 1 :set X Bit transmission to 1
^
```



UNFORMAT

UNFORMAT

Unformatted Printouts

UNFORMAT

The **UNFORMAT** command suppresses the printing of blanks between words in printed output. The alternative is **FORMAT**, which makes printouts easier to read. See also: **FORMAT**

EXAMPLE 1:

```
>10 FORMAT :set formatted print
>20 LPRINT THERE ARE BLANKS
>RUN
THERE ARE BLANKS :formatted print from line 20
```

EXAMPLE 2:

```
>10 UNFORMAT :set unformatted print
>20 LPRINT THERE ARE NO BLANKS
>RUN
THEREARENOBLANKS :unformatted print from line 20
>
```

WIDTH

WIDTH

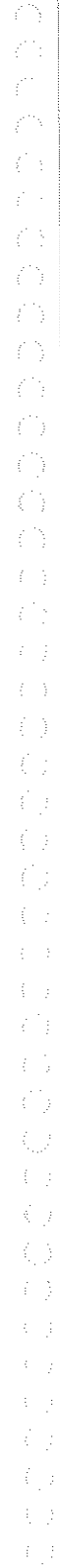
Display Line Width

WIDTH :Display the current line width
WIDTH [20/80] :Set the current line width

The **WIDTH** command controls the display width, and thus determines how the results and controls prints (as well as some **HELP** printouts) are printed across the screen or page. **WIDTH 20** sets the current width to 20 columns. **WIDTH 80** sets the current width to 80 columns. Note that a change in the width only affects those printouts which are loaded into the printer FIFO after the change is specified. This command is identical in function to DIP Switch 5 (see Section 2.5.1).

EXAMPLE:

>**WIDTH** :display the current width
20
>**WIDTH 80** :set to 80-column width



SECTION 6 MAINTENANCE AND SERVICE

6.1 INTRODUCTION

This section contains information on maintenance and service for the T-BERD 305. Specifically, it includes steps to take should the user experience difficulty operating the unit, information on replacing the AC line fuse, and a description of TTC's warranty and repair procedures.

6.2 MAINTENANCE

6.2.1 In Case of Difficulty

If the T-BERD 305 fails to operate and no front panel indicators are illuminated:

- (1) Check that the AC power cord is securely connected to the T-BERD 305 and ensure that the power supply is uninterrupted.
- (2) Verify that a proper, working AC line fuse is installed. Information on the AC line fuse and its installation is provided in Section 6.2.2.

If the AC power cord, power supply, and fuse are in proper working order, but the instrument fails to operate, contact the TTC Customer Service Department. If front panel indicators are illuminated, but the instrument does not appear to operate properly, use the Instrument Checkout Procedure in Section 3 as an aid to localizing the problem. If the instrument still fails to operate properly, note those areas in which the self-test failed and contact TTC for assistance.

6.2.2 AC Line Fuse Replacement Instructions

The AC Line Fuse can be found in the T-BERD 305's AC receptacle. If faulty, the fuse should be replaced with the correct fuse. Always use the correct fuse size (see Table 6-1). To replace the fuse, use the following procedure.

- (1) Locate the plastic fuse holder above the AC receptacle.
- (2) Using a screwdriver or similar instrument, gently pry the fuse holder out of the power receptacle.

NOTE: When shipped from the factory, the fuse holder contains a spare AC line fuse.

- (3) Remove the old fuse and install a new fuse of the correct size.
- (4) Press the plastic fuse holder securely back into place above the AC receptacle.

**Table 6-1
Fuses**

<u>Operating Voltage</u>	<u>Fuse Size</u>	<u>Fuse Type (Littlefuse or equivalent)</u>
90-135	2 amp, 250V slowblow	218002
195-250	1 amp, 250V slowblow	218001

6.3 SERVICE

6.3.1 Warranty Policy

All equipment manufactured by TTC is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

The T-BERD 305 DS3 Analyzer will be repaired or replaced (at our option) at no charge for a period of one (1) year after shipment to the customer. 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 TTC.
- (2) Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

6.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in Section 6.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Repair Department. The RA number should then appear on all paperwork and be clearly marked on the outside of the shipping container.

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

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department for specific information on the minimum out-of-warranty repair charge. The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started. A description of the labor and materials used will be provided in the Equipment Repair Report.

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

6.3.4 Equipment Return Instructions

To all equipment returned for repair, the customer should attach a tag that includes the following information.

- (1) Owner's name and address.
- (2) A list of the equipment being returned and the applicable serial number(s).
- (3) A detailed description of the problem or service requested.

(4) The name and telephone number of the person to contact regarding questions about the repair.

(5) The Return Authorization (RA) number.

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



SECTION 7 SPECIFICATIONS

7.1 INTRODUCTION

This section contains the specifications for the T-BERD 305 DS3 Analyzer.

7.2 GENERAL SPECIFICATIONS

7.2.1 Physical

- Size: 6" high x 13.5" wide x 11.5" deep (15.3 x 34.3 x 29.2 cm) including cover.
- Weight: 15 lbs. (approximately 6.8 kg.) without options.

7.2.2 Operational

- Operating Temperature: 32° F to 122° F (0° C to 50° C).
- Storage Temperature: 4° F to 158° F (-20° C to 70° C).
- Power: +10%—20%, 60 Hz; 70 watts nominal, 115 VAC or 230 VAC.
- Fuse: AC Metric (5mm x 20mm). See Table 6-1.

7.3 INPUT SPECIFICATIONS

- Input Connector: WECO 560 jack (mates with WECO 440A plug).
- Input Frequency Range: 44.736 MHz \pm 300 ppm.
- Input Jitter Tolerance: For 2¹⁵-1 pattern, see Table 7-1.*
- Input Level Range: DSX = up to 26 dB resistive loss or 6 dB cable loss (450 feet) from nominal DSX level.
HIGH or LOW = up to 6dB above nominal HIGH level or up to 26 dB resistive loss from nominal HIGH level.

*For 2¹⁵-1 pattern and DSX3 level, the T-BERD 305 meets or exceeds the mask specified in AT&T PUB 43802 and BELLCORE TR-TSY-000009.

**Table 7-1
Input Jitter Tolerance**

<u>Jitter Amplitude</u>	<u>Jitter Frequency Range</u>
5.0 U.I. p-p -24 dB/decade	10 Hz to 2300 Hz 2.3 kHz to 60 kHz
0.1 U.I. p-p	60 kHz to 300 kHz

- Input Impedance: 75 ohms, nominal unbalanced to ground.
- Line Code: B3ZS.

7.4 OUTPUT SPECIFICATIONS

7.4.1 DS3 Output

- Output Connector: WECO 560 jack (mates with WECO 440A plug).
- Output Signal: Internal Frequency—44.736 MHz \pm 20 ppm.

LEVEL: HIGH—rectangular pulse.

Amplitude—0.91 volts peak \pm 1.2 dB.

Width (at half amplitude)—11.2 ns + 1.1 ns.

Rise and fall times (10% to 90% amplitude)—4.5 ns \pm 1.5 ns, overshoot or undershoot less than 10% pulse amplitude.

DSX—meets all specifications of CB 119, Table 8, and CCITT Recommendation G.703, Section 5.

LOW—rectangular pulse, new line Amplitude = 0.186 volts peak \pm 2 dB, equivalent to high pulse with 13.8 dB of resistive attenuation.

LINE CODE: B3ZS.

- Output Impedance: 75 ohms nominal, unbalanced to ground.

7.4.2 DS1 Output

- Output Connector: WECO 310 jack.

- Pulse Shape: With output terminated in 100 ohm resistive load, the T-BERD 305 meets pulse shape specifications given in CCITT Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and PUB62508; and AT&T PUB62411.
- Jitter Attenuation: * 0 to 100 Hz = +0.1, -1dB.
>350 Hz = 40dB/decade rolloff with attenuation \geq 24dB at 1800 Hz.
- Alarm Indication Signal: An alarm indication signal (AIS) is transmitted when the T-BERD 305 cannot achieve DS3 or DS2 frame synchronization. The DS1 AIS meets the criteria of BELLCORE TR-TSY-000191.
- Line Codes: Bipolar (pseudoternary); switch-selectable AMI or B8ZS.
- All ones indication: 2048 consecutive ones

7.5 FRONT PANEL SPECIFICATIONS

7.5.1 Switches

- PATTERN: Fixed—1111, 1100, 1010.
Pseudorandom— $2^{23}-1$, $2^{20}-1$ (PRBS), $2^{15}-1$.
Thru Data (received data).
- CATEGORY: LOGIC, BPV, FRAME, PARITY, SIGNAL, TIME, AUX.
- RESULT:
 - LOGIC: Errors, error rate, average error rate, errored seconds, percentage error free seconds, threshold errored seconds, synchronized errored seconds, synchronization loss seconds, slips.
 - BPV: Errors, error rate, average error rate, errored seconds, percentage error free seconds, threshold errored seconds.
 - FRAME: Errors, error rate, average error rate, errored seconds, percentage error free seconds, threshold errored seconds.
 - SIGNAL: Alarm seconds, signal loss seconds, transmit frequency, received frequency, power level, signal level.
 - TIME: Time, date, elapsed time, test length, time left.
 - AUX: Error insert rate, burst duration, framing, X bit, DS1 drop.

*Per Figure 8 of BELLCORE TR-TSY-000009.

- **ERROR INSERT:**
 - **RATE:** Logic errors at 10^3 to 10^9 fixed insertion rate.
 - BURST:** Logic errors at fixed rate for .025 to 5.0 second duration.
 - SINGLE:** One logic error and one BPV inserted.
- **TRANSMIT TIMING:** INTERNAL, RECOVERED (loop).
- **TEST LENGTH:** TIMED (1 minute to 200 hours and 59 minutes in 1 minute intervals), and CONTINUOUS.
- **TIME SET:** Used in conjunction with the TIME function in the TIME category.
- **UP/DOWN:** Used in conjunction with TIME and AUX functions.
- **TRANSMIT OUTPUT:** HIGH, DSX, LOW.
- **RECEIVED INPUT:** HIGH, DSX, LOW.
- **PRINTER CONTROL:** AUTO PRINT EVENTS—test end, error second, 2 hr., 30 min., 15 min., off; Manual—results, controls.
- **RESTART**
- **HISTORY RESET**
- **DISPLAY HOLD**

7.5.2 Indicators

- **Alarm Indicators:** SIGNAL LOSS, SIGNAL LOSS HISTORY, PATTERN LOSS, PATTERN LOSS HISTORY, FRAME LOSS, FRAME LOSS HISTORY, BLUE SIGNAL, BLUE SIGNAL HISTORY, and POWER LOSS HISTORY.
- **Status Indicators:** SIGNAL PRESENT, PATTERN SYNC, FRAME SYNC.
- **TIMED TEST COMPLETE.**

7.5.3 Alarm Criteria

- **SIGNAL LOSS:** 0.02 milliseconds without valid input pulses.

- PATTERN SYNC LOSS: Dip switch-settable—1,024 errors per 32,767 data bits in compliance with KS-21424, DS3 Test Set (Receiver) Specifications.
Alternate setting—250,000 errors per 1,000,000 bits.
- FRAME SYNC LOSS: Dip switch-settable—Three out of 15 F bits in error, or two out of three 010 M bit sequences in error, in compliance with KS-21424, DS3 Test Set (Receiver) Specifications.
Alternate setting—six out of 15 F bits in error.
- BLUE SIGNAL: Dip switch-settable—valid framing, valid parity, and all stuffing indicator "C" bits zero (per BELLCORE TR-TSY-000191).
Alternate setting—1000 data bits of 1010 pattern with framing.

7.6 PATTERN SPECIFICATIONS

7.6.1 Pattern Definition

- $2^{23}-1$: Pseudorandom pattern with length of $2^{23}-1$ bits. This pattern is in conformance with CCITT Recommendation O.151.
- $2^{30}-1$: Pseudorandom pattern with length of $2^{30}-1$ bits (PRBS). This pattern is in conformance with Bell Compatibility Bulletin No. 114.
- $2^{15}-1$: Pseudorandom pattern with length of $2^{15}-1$ bits. This pattern is in conformance with CCITT Recommendation O.151.
- 1111: Fixed pattern consisting of Marks only.
- 1100: Fixed pattern of two Marks followed by two Spaces.
- 1010: Fixed pattern of one Mark and one Space.

7.6.2 Pattern Synchronization Acquisition Criteria

- Pseudorandom Patterns: 60 + n consecutive error-free bits for pattern length 2^n-1 .
- Fixed Patterns: 64 consecutive error-free bits.

7.6.3 Pattern Synchronization Loss Criteria

Rear panel DIP switch selectable as either:

- FAST—1024 errors in less than 32,767 received bits.
- SLOW—250,000 or more errors in 1,000,000 received bits.

7.7 DS3 FRAMING

7.7.1 Format

The DS3 frame consists of seven subframes each with eight framing bits. There are 84 data bits between each of the framing bits. The DS3 Framing Format is shown in Table 7-2:

**Table 7-2
DS3 Framing Format**

X	F ₁	C ₁₁	F ₀	C ₁₂	F ₀	C ₁₃	F ₁	subframe 1
X	F ₁	C ₂₁	F ₀	C ₂₂	F ₀	C ₂₃	F ₁	subframe 2
P	F ₁	C ₃₁	F ₀	C ₃₂	F ₀	C ₃₃	F ₁	subframe 3
P	F ₁	C ₄₁	F ₀	C ₄₂	F ₀	C ₄₃	F ₁	subframe 4
M ₀	F ₁	C ₅₁	F ₀	C ₅₂	F ₀	C ₅₃	F ₁	subframe 5
M ₁	F ₁	C ₆₁	F ₀	C ₆₂	F ₀	C ₆₃	F ₁	subframe 6
M ₀	F ₁	C ₇₁	F ₀	C ₇₂	F ₀	C ₇₃	F ₁	subframe 7
F ₁ F ₀ F ₀ F ₁ = 1001			Subframe Alignment Bits					
M ₀ M ₁ M ₀ = 010			Frame Alignment Bits					
XX = 00 or 11			User-Defined (see Section 2.4.2)—X bits must be the same in a given frame and they should not change more than once a second.					
PP = 00 or 11			Parity Bits—Parity is calculated over the preceding frame of 4704 data bits. Parity equals 11 if the number of Marks is odd and 00 if the number of Marks is even.					
C _{n1} C _{n2} C _{n3} = 000 or 111			Stuff Indicator Bits—The stuff indicator bits remain the same for each frame and follow an 18 frame pattern: 001 001 001 001 001 011. This is only changed to transmit a blue alarm, when the C bits are all set to a zero.					

7.7.2 Frame Synchronization Detection Criteria

- 15 consecutive error-free F bits and 2 consecutive error-free M_0 M_1 M_0 sequences.

7.7.3 Frame Synchronization Loss Criteria

- FAST—three out of 15 F bits (Subframe Alignment Bits) in error or two out of three M_0 M_1 M_0 sequences in error.
- SLOW—six out of 15 F bits in error.

7.8 MEASUREMENT SPECIFICATIONS

7.8.1 Parity Error Rate Calculation

Two methods are available for calculation of the parity error rate: bit and block. The method used is determined by the position of the PARITY ERROR RATE DIP Switch on the rear panel.

- The block parity error rate (switch up) is calculated as the ratio of the total number of parity errors to the total number of M frames received.*
- The bit parity error rate is calculated as the ratio of the total number of parity errors to the total number of bits over which the parity was calculated (number of received F bits multiplied by 168).

7.8.2 %EFS Calculation

The %EFS result is calculated for each of the four main result categories: LOGIC, BPV, PARITY, and FRAME. The calculation of %EFS for LOGIC, PARITY, and FRAME categories is affected by the position of the ACTION ON SYNC LOSS DIP Switch on the rear panel.

*Complies with BELLCORE Technical Reference TR-TSY-000009 of May 1986, "Asynchronous Digital Multiplexer Requirements and Objectives".

HALT MODE:

- The LOGIC %EFS result is calculated as the ratio of the total number of seconds in which pattern synchronization was present for the entire second and no logic errors occurred to the total number of seconds in which pattern synchronization was present.
- The BPV %EFS result is calculated as the ratio of the total number of seconds in which a signal was present for the entire second and no BPV occurred to the total number of seconds in which a signal was present.
- The PARITY %EFS result is calculated as the ratio of the total number of seconds in which frame synchronization was present for the entire second and no parity errors occurred to the total number of seconds in which frame synchronization was present.
- The FRAME %EFS result is calculated as the ratio of the total number of seconds in which frame synchronization was present for the entire second and no frame errors occurred to the total number of seconds in which frame synchronization was present.

CONTINUOUS MODE:

- The LOGIC %EFS result is calculated as the ratio of the total number of seconds in which pattern synchronization was present for the entire second and no logic errors occurred to the total number of seconds in which a signal was present after initial pattern synchronization.
- The BPV %EFS result is calculated as the ratio of the total number of seconds in which a signal was present for the entire second and no BPV occurred to the total number of seconds in which a signal was present.
- The FRAME %EFS result is calculated as the ratio of the total number of seconds in which frame synchronization was present for the entire second and no frame errors occurred to the total number of seconds in which a signal was present after initial frame synchronization.
- The PARITY %EFS result is calculated as the ratio of the total number of seconds in which frame synchronization was present for the entire second and no parity errors occurred to the total number of seconds in which signal was present after initial frame synchronization.

7.8.3 Threshold Errored Seconds

This result is calculated for the LOGIC, BPV, and FRAME result categories.



- The error rate for the previous second is calculated and compared to the threshold error rate selected in the ERR THR auxiliary function.
- If the calculated error rate is greater than or equal to the threshold value, the count of threshold errored seconds is incremented for that result category.
- For FRAME threshold errored seconds, the minimum usable threshold is 10^{-6} . Since only 263,152 frame bits can be received in one second, the error rate calculation is limited to a minimum of 3.8×10^{-6} (one error in 263,152 bits). Lower thresholds (10^{-7} through 10^{-9}) are exceeded upon detection of one or more errors.

7.9 CONNECTORS

7.9.1 RS-232 25-Pin D

- Connector Pin Configuration: See Table 7-3.
- Character Format: 7 data bits (ASCII coding). Even or odd parity. 2 transmitted stop bits. Accepts 1 or more received stop bits.
- Baud Rates: 300, 1200, 2400, 4800.
- Terminator: CR, CRLF.
- Print Width: 20-column, 80-column.
- Connector Configuration: DCE.
- Connector: 25-Pin female D-subminiature.

7.10 GROUNDING

- Chassis and signal grounds are connected internally.
- WECO 560 jack sleeves connected to chassis ground.
- Power cord center ground pin connected to chassis ground.
- 25-Pin D Connector: Pin 1 and Pin 7 to chassis ground.

7.11 OPTIONAL MEASUREMENTS

7.11.1 Frequency

- Accuracy: ± 2 ppm.
- Resolution: 10 Hz.
- Range: 44.736 MHz \pm 1.5 MHz.

**Table 7-3
RS-232 Pin Configuration**

PROT GND (Pin 1):	Connected to chassis ground.
TX DATA (Pin 2):	Data is received by the T-BERD 305 on this lead.
RCV DATA (Pin 3):	Data is transmitted by the T-BERD 305 on this lead.
RTS (Pin 4):	This lead is an input from outside, currently unused.
CTS (Pin 5):	This lead is driven to the ON state by the T-BERD 305 whenever it is ready for receiving a character.
DSR (Pin 6):	This lead is an output from the T-BERD 305, currently unused. (After power-up, it is always ON, e.g., LOGIC 1.)
SIGNAL GROUND (Pin 7):	Connected to chassis ground.
RLSD (Pin 8):	This lead is an output from the T-BERD 305, currently unused. (After power-up, it is always ON, e.g., LOGIC 1.)
POSITIVE DC TEST VOLTAGE (Pin 9)	This lead provides positive 5V DC test voltage.
NEGATIVE DC TEST VOLTAGE (Pin 10)	This leads provides negative 5.2V DC test voltage.
DTR (Pin 20):	Data is only output from the T-BERD 305 when this line is held in the ON condition by the receiving device.

7.11.2 Level

The maximum peak voltage of the received signal is measured.

● Input Level	Accuracy
1.2 to 1.8 volts pk	± 0.2 volts
0.80 to 1.1 volts pk	± 0.1 volts
0.25 to 0.79 volts pk	± 0.03 volts
0.00 to 0.24 volts pk	± 0.02 volts

<u>Level</u>	<u>Resolution</u>
0.00 to 0.99 volts pk	0.01 volts
1.0 to 1.8 volts pk	0.1 volts

- Range—0.00 to 1.8 volts pk.

7.11.3 Power

An all ones pattern (1111) with no framing must be used to get the most accurate power reading. The value is expressed in dBm referenced to 75 ohms. 0dBm corresponds to a DS3 signal level of approximately 0.39 volts peak.

<u>Power Level</u>	<u>Accuracy</u>
10.0 to 13.4 dBm	± 2 dBm
-12.0 to 9.9 dBm	± 1 dBm
-26.0 to -12.1 dBm	± 2 dBm

- Resolution—0.1 dBm.
- Range—less than -26.0 to +13.4 dBm.

SECTION 8 OPTIONS AND ACCESSORIES

8.1 INTRODUCTION

This section describes the various options and accessories that are available for use with the T-BERD 305 DS3 Analyzer.

8.2 OPTIONS

8.2.1 DS1 Drop Option (305-1)

The DS1 Drop Option provides the capability for a user-selectable DS1 channel to be dropped out of the incoming DS3 signal and output to a rear panel WECO 310 jack.

8.2.2 Signal Analysis Option (305-2)

The Signal Analysis Option provides the capability for measuring the received signal power, voltage level, and frequency. It also measures the transmit frequency.

8.2.3 Multiple Outputs Option (305-3)

Five additional DS3 outputs can be provided with this optional, rear-panel, plug-in module. The signal level can be HIGH, LOW, or DSX and is set with the same switch used for the front-panel DS3 output. The optional outputs are 180° out of phase with the front-panel output. The connectors used are the WECO 440A type. Electrical specifications are contained in Section 7.4.

A version is also available with WECO 358A connectors (305-6).

8.2.4 Remote Control Interface Option (305-4)

The Remote Control Interface Option adds remote control and data retrieval capability via a computer or terminal to the standard printer function. The remote control program includes a HELP feature to assist the user in the set-up and operation of the T-BERD 305.

8.2.5 T-BERD 201 DS1 Analyzer Option

The T-BERD 201 DS1 Analyzer Option used with the DS1 Drop Option provides the user with a combined DS1/DS3 analyzer. All measurements of the DS3 and selected DS1 channel are made simultaneously.

8.3 ACCESSORIES

8.3.1 Rack Mount

Two rack mounts are available for the T-BERD 305. Model 40652-01 allows the T-BERD 305 to be mounted in a standard 19" equipment rack. Model 40652-02 allows the T-BERD 305 to be mounted in a 23" equipment rack. Each assembly requires 7" of vertical rack space. To install the T-BERD 305 in the rack mount, use the following procedure.

Lower the T-BERD 305 onto the rack mount tray. Slide the T-BERD 305 forward so that its front panel (including handles) protrudes through the opening in the front of the rack mount. The strikes on the sides of the T-BERD 305 will prevent it from being pulled through the opening. Align the four threaded holes on the bottom surface of the T-BERD 305 with the four clearance holes in rack mount tray.

Once the T-BERD 305 is properly aligned, install the four screws from the underside of the rack mount tray. Do not use substitutes for the screws supplied with the rack mount.

8.3.2 Cables and Adaptors

The following is a list of the accessory cables and adaptors that are available from TTC for use with the T-BERD 305.

	<u>MODEL</u>	<u>DESCRIPTION</u>
Cables	30598-01	WECO 440A to WECO 440A (10')
	30599-01	WECO 440A to WECO 358A (10')
	30667-01	WECO 358A to WECO 358A (10')
Adaptors	10830	WECO 440A to BNC
	10831	WECO 358A to BNC

8.3.3 PR-40 Printer

The PR-40 is an alphanumeric, thermal dot matrix printer. The PR-40 features 40-column printing in a self-contained housing, including complete control and interface electronics. The PR-40 is small and lightweight with outline dimensions of 8" wide x 4.6" deep x 1.7" high (20.3 x 11.6 x 4.3 cm), and a weight of only 14 ounces (400 g).

APPENDIX A T-BERD 305 ON-LINE HELP MANUAL

This section describes the information available using the T-BERD 305's on-line help facility. Each page in this section depicts the actual help information displayed at the remote control unit.

A.1 LISTING VALID REMOTE CONTROL COMMANDS (HELP !)

The HELP command is used to list all valid T-BERD 305 remote control commands.

EXAMPLE:

```
>HELP!  
>
```

ACTSYNLOS	ALARM	BAUD	BEEP
BLUSIGCRI	BRAINS	BURDUR	CAT
CLEARFIFO	CLS	CONT	CONTROLS
DATABITS	DATE	DISHOL	DISPLAY
DSIDRO	DSILINCOD	ECHO	END
ERRINS	ERRRAT	ERRTHR	FORMAT
FRA	FRA SYNLOS THR	GOTO	HELLO
HELP	HISRES	HOLD	INPUT
LEDS	LIST	LOCAL (/)	LPRINT
MACRO	NEW	PARERRRAT	PARITY
PAT	PAT SYNLOS THR	PRI	PRIEVE
PRINT	PRINT SPEED	PROMPT	RECINP
RELEASE	REM	REMOTE	RES
RESTART	RESULTS	RUN	STOP
TERM	TERMINAL (.)	TES	TESLEN
TIM	TIME	TRAOUT	TX X BIT
UNFORMAT	WIDTH		

A.2 DISPLAYING SUMMARY HELP INFORMATION (HELP/HELP1)

The HELP (or HELP 1) command is used to display summary help information.

EXAMPLE:

```
>HELP  
>
```

All commands sent to the T-BERD must consist of an ASCII character command followed by other optional ASCII parameters, and either a 'carriage-return' or a 'carriage-return and a linefeed'. Commands and parameters MUST be separated by blanks and may be entered in either UPPER or lower case.

- HELP!** — Print the list of all valid commands.
 - HELP 1/HELP** — Print this page.
 - HELP 2** — Print HELP information for special characters.
 - HELP 3** — Print HELP information for front-panel switch commands.
 - HELP 4** — Print HELP information for AUX functions.
 - HELP 5** — Print HELP information for rear-panel switch commands.
 - HELP 6** — Print HELP information for BERD-BASIC.
 - HELP 7** — Print HELP information for special commands.
-
- HELP** <command name> — Print the parameter syntax for a command.
 - <command name> — Print the current state of a command.
 - <command name> <parameter> — Set the present state of a command.

A.3 DISPLAYING INFORMATION ABOUT SPECIAL CHARACTERS (HELP 2)

The HELP 2 command is used to display information about the T-BERD 305's response to certain special characters.

EXAMPLE:

```
>HELP 2
>
```

The T-BERD 305 responds to these special characters in the following way:

- <BREAK>** — (Three times slowly) enter auto-baud mode. Type spaces (" ") repeatedly (5 Hz) until auto-baud achieved, then **<ESCAPE>**.
- <ESCAPE>** — Used to determine the character format in auto baud mode.
- <CONTROL C>** — Abort—cancel the input line, clear the print FIFO, break any program execution, etc.
- <CONTROL H>** — Back space—deletes the previous character.
- <CONTROL Q>** — X-ON—Resume all printer outputs from X-OFF.
- <CONTROL S>** — X-OFF—Suspend/resume all printer outputs.
- <CONTROL X>** — Cancel—cancels the current input line.
- <ESCAPE>** — Recall up to 20 previously entered commands.
- <&n>** — Recalls the user macro #N (where N = 0 to 9).

PROMPT:

DEFAULT PROMPT—'>'

USER DEFINED PROMPT—any ASCII string

While command 'HOLD' is enabled, prompt is changed to '+'.

A.4 DISPLAYING INFORMATION ABOUT FRONT PANEL SWITCH COMMANDS (HELP 3)

The HELP 3 command is used to display information about the T-BERD 305's front panel switch commands.

EXAMPLE:

>HELP 3

>

These commands control switches or display the selected result.

BUR DUR	— Set or display the error burst duration time.
CAT	— Set or display the current result category.
DATE	— Set or display date.
DIS HOL	— Freeze or resume all results and LEDs in their current state.
DS1 DRO	— Set or display DS1 Drop channel.
ERR INS	— Insert errors, singly or in bursts.
ERR RAT	— Set or display error insertion rate.
ERR THR	— Set or display error threshold.
FRA	— Turn on/off or display framing.
HIS RES	— Clear all history indicators.
LEDS	— Display alarm and status LEDs.
PAT	— Set or display current data pattern.
PRI RES/CON	— Initiate a controls or results print.
PRI EVE	— Set or display print events.
REC IMP	— Set or display the expected input level.
RES	— Set and display current result.
RESTART	— Restart test, clear all results and history status LEDs.
TES	— Set or display current type of test.
TES LEN	— Set or display test length.
TIM	— Set or display transmit DS3 timing source.
TIME	— Set or display clock time.
TRA OUT	— Set or display transmit DS3 signal level.

A.5 DISPLAYING INFORMATION ABOUT AUXILIARY FUNCTIONS (HELP 4)

The HELP 4 command is used to display information about the T-BERD 305's rear-panel switch commands.

EXAMPLE:

>HELP 4

>

These commands set or display the AUX function's values.

BUR DUR	— Set or display the error burst duration time.
DS1 DRO	— Set or display the current selected DS1 drop channel.
ERR RAT	— Set or display error insertion rate.
ERR THR	— Set or display error threshold.
FRA	— Turn on/off or display framing.
TX X BIT	— Set or display transmit x bits.

A.6 DISPLAYING INFORMATION ABOUT REAR PANEL SWITCH COMMANDS (HELP 5)

The HELP 5 command is used to display information about the T-BERD 305's rear-panel switch commands.

EXAMPLE:

```
> HELP 5  
>
```

These commands control or display status of switches on the rear panel.

ACT SYN LOS	— Set or display the T-BERD 305's action upon a sync loss.
BAUD	— Display the current RS-232 baud rate setting.
BLU SIG CRI	— Set or display criteria for detecting a blue signal.
DATA BITS	— Display the current RS-232 data bit setting.
DS1 LIN COD	— Set or display the DS1 line code.
FRA SYN LOS THR	— Set or display the current frame synchronization loss threshold.
PAR ERR RAT	— Set or display the parity error rate as block or bit error rate.
PARITY	— Display the current RS-232 parity setting.
PAT SYN LOS THR	— Set or display the current pattern synchronization loss threshold.
PRINT SPEED	— Set or display the printer speed.
TERM	— Set or display the RS-232 terminating sequence.
WIDTH	— Set or display the current printer width.

A.7 DISPLAYING INFORMATION ABOUT BERD-BASIC COMMANDS (HELP 6)

The HELP 6 command is used to display information about BERD-BASIC commands.

EXAMPLE:

```
>HELP 6  
>
```

These commands are for BERD-BASIC programming only. These control commands cannot be used in the program:

CONT	— Continue program execution from a break or stop.
LIST	— List the existing program.
NEW	— Erase the existing program.
RUN	— Run the program.

These commands can be used only in a program:

END	— End the program execution.
GOTO	— Transfer the control to another line.
INPUT	— Input a macro from user.
LPRINT	— Print a string.
REM	— Remark statement.
STOP	— Stop the program execution at the specific line.

This command can be used in both cases:

MACRO— Define, display or erase macros.

A.8 DISPLAYING INFORMATION ABOUT SPECIAL COMMANDS (HELP 7)

The HELP 7 command is used to display information about the T-BERD 305's special commands.

EXAMPLE:

```
>HELP 7  
>
```

The following commands are available in remote control only.

ALARM	— Enable or disable alarm message printing.
BEEP	— Sound the beeper on the remote terminal.

BRAINS	— The sensitivity level of the command interpreter.
CLEAR FIFO	— Clear the printer FIFO.
CLS	— Clear the terminal screen.
DISPLAY	— Enable the front panel display switch mode.
ECHO	— Turn ON/OFF or display echo status.
FORMAT	— Select formatted print mode.
HELLO	— Print software version level.
HOLD	— Hold all printer output until RELEASE is received.
LOCAL (/)	— Return to the local mode.
PROMPT	— Set or display prompt function status.
RELEASE	— Resume all printer output (after a HOLD).
TERMINAL (,)	— Set T-BERD 305 to talk to a dumb terminal.
UNFORMAT	— Select unformatted print mode.



**APPENDIX B
CONDITIONS AFFECTING RESULTS**

<u>RESULT</u>	<u>SIGNAL LOSS</u>	<u>PATT SYNC LOSS</u>	<u>FRAME SYNC LOSS</u>
<u>LOGIC:</u>			
ERRORS	FREEZE	FREEZE*	FREEZE*
ERROR RATE	FREEZE	FREEZE*	FREEZE*
AVG ERR RATE	FREEZE	FREEZE*	FREEZE*
ERR SEC	FREEZE	FREEZE*	FREEZE*
% EFS	FREEZE	FREEZE*	FREEZE*
THR ERR SEC	FREEZE	FREEZE*	FREEZE*
<u>BPV:</u>			
ERRORS	FREEZE	NO EFFECT	NO EFFECT
ERROR RATE	FREEZE	NO EFFECT	NO EFFECT
AVG. ERR RATE	FREEZE	NO EFFECT	NO EFFECT
ERR SEC	FREEZE	NO EFFECT	NO EFFECT
% EFS	FREEZE	NO EFFECT	NO EFFECT
THR ERR SEC	FREEZE	NO EFFECT	NO EFFECT
<u>PARITY:</u>			
ERRORS	FREEZE	NO EFFECT	FREEZE*
ERR RATE	FREEZE	NO EFFECT	FREEZE*
AVG ERR RATE	FREEZE	NO EFFECT	FREEZE*
ERR SEC	FREEZE	NO EFFECT	FREEZE*
% EFS	FREEZE	NO EFFECT	FREEZE*
<u>FRAME:</u>			
ERRORS	FREEZE	NO EFFECT	FREEZE*
ERR RATE	FREEZE	NO EFFECT	FREEZE*
ERR SEC	FREEZE	NO EFFECT	FREEZE*
AVG. ERR RATE	FREEZE	NO EFFECT	FREEZE*
% EFS	FREEZE	NO EFFECT	FREEZE*
THR ERR SEC	FREEZE	NO EFFECT	FREEZE
CLOCK SLIPS	FREEZE	FREEZE*	FREEZE
ALARM SECS	NO EFFECT	NO EFFECT	DIRECT EFFECT
SIGNAL LOSS SECS	DIRECT EFFECT	NO EFFECT	NO EFFECT
SYNC LOSS SECS	NO EFFECT	DIRECT EFFECT	INDIRECT EFFECT**

* In CONTINUOUS mode, this would change to DIRECT EFFECT.

** A frame synchronization loss causes an immediate pattern synchronization loss, which in turn causes the SYNC LOSS SECS count to increment.

FUNCTIONAL INDEX

Here is a functional index that serves as an easy reference to the major activities and components associated with the T-BERD 305.

<u>SUBJECT:</u>	<u>TO:</u>	<u>GOTO PAGE(S):</u>
ACCESSORIES	Obtain a description	8-2
ACTION ON SYNC LOSS		
Continuous Mode	Select Continuous mode	5-19
Halt Mode	Select Halt mode	2-1, 5-19
ALARM MESSAGES		
Categorization	Learn how messages are categorized	5-7
Format	Review the alarm message format	5-7
Printing	Print alarm messages	5-20
ALARMS		
Conditions	Diagnose alarm conditions	2-8
Messages	Print alarm messages	5-20
AMI LINE CODING	Set AMI line coding	2-20, 5-35
AUTO PRINT EVENT SWITCH	Obtain a description	2-6, 5-2
AUXILIARY FUNCTIONS		
Burst Duration	Obtain a description	2-16, 5-25
DS1 Channel Select	Obtain a description	2-16
Error Insertion Rate	Obtain a description	2-16
Error Threshold	Obtain a description	2-16
Framing	Obtain a description	2-16
X Bits	Obtain a description	2-16
BAUD RATE	Set the baud rate	2-17, 5-21
BERD-BASIC PROGRAMS		
Alter	Alter execution sequence	5-44
Commands	View a general command list	5-9
Comments	Insert remarks or comments	5-68
Displaying	List a working program	5-52
Description	Obtain a general description	5-9
End	End a BERD-BASIC program	5-37
Execute	Run a BERD-BASIC program	5-73
New	Clear working program memory	5-56
Print	Print a literal text string	5-63
Stop	Suspend execution of a program	5-74
BIPOLAR VIOLATIONS (BPVs)		
Average Error Rate	Obtain a description	2-12
Errored Seconds	Obtain a description	2-12
Error-Free Seconds (%)	Obtain a description	2-12
Error Rate	Obtain a description	2-12
Errors	Obtain a description	2-12
Measurement Criteria	Review measurement criteria	2-10
Threshold Error Seconds	Obtain a description	2-12
BLUE SIGNAL CRITERIA	Set blue signal criteria	2-19, 5-23
BRAINS COMMAND	Find spelling errors within commands	5-24

BURST DURATION	Set burst duration time	5-25
B8ZS LINE CODING	Set B8ZS line coding	2-20, 5-35
CATEGORY SWITCH		
Associated Measurements	Obtain associated test measurements	2-10
Description	Obtain a general description	2-5
Remote Control	Set category via remote control	5-26
CLEAR FIFO COMMAND	Stop printer activity	5-27
CLS COMMAND	Clear the print screen	5-28
CONT COMMAND	Resume BERD-BASIC program execution	5-29
CONTINUOUS MODE		
Calculate %EFS	Learn how %EFS is calculated	7-8
Select	Select continuous mode	2-18, 5-19
CONTINUOUS TESTING	Conduct a continuous test	2-5
CONTROL COMMANDS	View a command list	5-11
CONTROLS PRINT	Obtain a controls print	5-2, 5-6, 5-61
DATA PATTERN	Set or display data pattern	2-4, 5-59
DATE COMMAND	Set calendar date	5-30
DIP SWITCHES		
Action on Sync Loss	Set action on synchronization loss	2-18
Baud Rate	Set the baud rate	2-17
Blue Signal Criteria	Set blue signal criteria	2-19, 5-23
DS1 Line Code	Set DS1 Line code	2-20
Frame Sync Loss	Set frame sync loss threshold	2-20
Parity	Set parity	2-18
Parity Error Rate	Set parity error rate	2-19, 5-57
Pattern Sync Loss	Set pattern synch loss threshold	2-19, 5-60
Printout Width	Set printout width	2-18
Print Speed	Set print speed	2-18
Terminator	Set line termination sequence	2-18, 5-75
DISPLAY CONTROL	Set current mode of display control	5-32
DISPLAY HOLD	Freeze display indicators	2-1, 5-33
DS1 LINE CODE	Set DS1 Line code	2-20
DS1 DROP OPTION		
Description	Obtain a general description	8-1
Line Code	Set transmit line code for T-1 line	2-20, 5-35
Monitoring	Monitor a DS1 channel	4-6, 5-34
DS3 MONITORING	Perform in-service monitoring	4-5
DS3 SIGNAL LEVELS		
DSX	Set DSX signal level	4-2, 5-66, 5-81
HIGH	Set HIGH signal level	4-2, 5-66, 5-81
LOW	Set LOW signal level	4-2, 5-66, 5-81
Power	Measure power of received signal	4-5
Remote Control	Set levels via remote control	5-66, 5-81
ECHO MODE	Set echo mode	5-36
ELECTRONIC SLIDE SWITCH	Operate an electronic slide switch	2-2
ERROR INSERTION	Insert logic errors	2-7, 5-38
ERROR MESSAGES	Obtain a list of error messages	5-15
ERROR RATE	Set error insertion rate	2-16, 5-39
ERROR THRESHOLD	Set error threshold	2-16, 5-40
EVENT SWITCH	Obtain settings	2-6, 5-2

FRAME SYNC LOSS	Set frame sync loss threshold	2-20 , 5-43
FRAME TEST RESULTS		
Average Error Rate	Obtain a description	2-14
Errored Seconds	Obtain a description	2-14
Error-Free Seconds (%)	Obtain a description	2-14
Error Rate	Obtain a description	2-14
Errors	Obtain a description	2-14
Measurement Criteria	Review measurement criteria	2-10
Threshold Error Seconds	Obtain a description	2-14
FRAMING		
Format	Obtain framing format specs.	7-6
Status	Set framing status	2-16 , 5-42
FRONT PANEL		
Specifications	Obtain front panel specs.	7-3
Switches	View front panel switches	2-3
FUSES	Replace a fuse	6-1
HALT MODE		
Calculate %EFS	Learn how %EFS is calculated	7-8
Select	Select Halt mode	2-18 , 5-19
HELP	Obtain on-line help information	5-46 , App. A
INPUT FREQUENCY	Obtain input frequency specs.	7-1
INPUT LEVEL	Obtain input level specs.	7-1
JITTER TOLERANCE	Review input jitter tolerance	7-2
LINE TERMINATION	Set line termination sequence	2-18 , 5-75
LOCAL MODE	Return to local mode	5-53
LOGIC TEST RESULTS		
Average Error Rate	Obtain a description	2-11
Errored Seconds	Obtain a description	2-11
Error-Free Seconds (%)	Obtain a description	2-11
Error Rate	Obtain a description	2-11
Errors	Obtain a description	2-11
Measurement Criteria	Obtain measurement criteria	2-10
Slips	Obtain a description	2-11
Synchronous Errored Seconds	Obtain a description	2-11
Synchronous Loss Seconds	Obtain a description	2-11
Threshold Errored Seconds	Obtain a description	2-11
MACROS	Enter user macro input	5-50
MACRO	Set or display user macros	5-55
MANUAL Switch	Obtain a description	5-2
MEASUREMENTS (OPTIONAL)		
Frequency	Obtain frequency level specifications	7-9
Level	Obtain level specifications	7-10
Power	Obtain power specifications	7-11
MULTIPLE OUTPUTS OPTION	Obtain a general description	8-1
OUTPUT IMPEDANCE	Obtain output impedance specs.	7-2
OUTPUT SIGNAL	Obtain output signal specs.	7-2

PARITY		
Display	Display current parity setting	5-57
Error Rate	Set parity error rate	5-58
Set	Set odd or even parity	2-18
PARITY ERROR RATE		
Calculation	Learn how error rate is calculated	7-7
Set	Set parity error rate	5-58
PARITY TEST RESULTS		
Average Error Rate	Obtain a description	2-13
Errored Seconds	Obtain a description	2-13
Error-Free Seconds (%)	Obtain a description	2-13
Error Rate	Obtain a description	2-13
Errors	Obtain a description	2-13
Measurement Criteria	Review measurement criteria	2-10
PATTERNS	Review available patterns	2-4, 7-5
PATTERN SYNCHRONIZATION		
Acquisition	Obtain criteria for acquisition	7-5
Loss	Obtain criteria for loss	7-5
PATTERN SYNC LOSS	Set or display pattern sync loss	2-19, 5-60
POWER MEASUREMENTS	Obtain power measurements	4-5
PRINTING		
Events	Select or display print events	2-6, 5-62
Hold	Hold printer output	5-49
Initiate	Initiate a printout	2-6, 5-61
Release	Release all printer output	5-67
Results	Print results values	5-63
Speed	Set print speed	2-18, 5-64
Width	Set printout width	2-18, 5-84
PR-40 PRINTER		
Configure	Configure the PR-40 Printer	5-2
Description	Obtain a general description	8-2
PULSE SHAPE	Obtain pulse shape specs.	7-3
RECEIVE LEVEL		
Digital Cross-Connect	Set receive level	4-3
Demux Input	Set receive level	4-3
Mux Output	Set receive level	4-3
Trans. Equip. Input	Set receive level	4-3
Trans. Equip. Output	Set receive level	4-3
REMOTE CONTROL MODE	Enter remote control mode	5-12
REMOTE CONTROL OPERATION		
Command format	View remote control command format	5-8
Error Messages	Obtain a list of error messages	5-15, 5-18
Remote control mode	Enter remote control mode	5-12, 5-69
REMOTE CONTROL OPTION	Obtain a general description	5-8
RESTART	Restart a test	2-6, 5-72
RESULTS PRINT	Obtain a results print	5-2/5-5, 5-61
RESULT SWITCH	Obtain a general description	2-5
RS-232 INTERFACE		
Action on Sync Loss	Select Halt or Continuous mode	2-18
Baud Rate	Select a Baud rate	2-18, 5-21
Blue Signal Criteria	Define detection criteria	2-19
Control Commands	View a command list	5-9
Description	Obtain a general description	5-1

DS1 Line Code	Set transmit line code for T-1 line	2-20
Frame Sync Loss	Set frame sync loss threshold	2-20
Line Termination	Select line termination sequence	2-18
Parity	Set ODD or EVEN parity	2-18
Parity Error Rate	Define parity error rate	2-19
Pattern Sync Loss	Set pattern sync loss threshold	2-19
Pin Configuration	Obtain RS-232 pin configuration	5-1
Switch Commands	View a command list	5-10
SIGNAL ANALYSIS OPTION	Obtain a general description	8-1
SIGNAL TEST RESULTS		
Alarm Seconds	Obtain a description	2-15
Level	Obtain a description	2-15
Measurement Criteria	Review measurement criteria	2-10
Power	Obtain a description	2-15
Receive Frequency	Obtain a description	2-15
Signal Loss Seconds	Obtain a description	2-15
Transmit Frequency	Obtain a description	2-15
SINGLE FUNCTION SWITCH	Operate a single function switch	2-2, 2-4
SPELLING ERRORS	Find spelling errors within commands	5-24
STATUS INDICATORS	Review status indicators	2-8
STATUS MESSAGES		
Categorization	Learn how messages are categorized	5-7
Format	Review the status message format	5-7
SWITCH COMMANDS		
Front Panel	View a command list	5-10
Rear Panel	View a command list	5-11
SWITCH CONTENTIONS	Resolve a switch contention	2-2
SWITCHES		
Front Panel	Obtain a description	5-10
Rear Panel	Obtain a description	5-11
SYNCHRONIZATION LOSS	Set action on synchronization loss	2-18, 5-19
T-BERD 305		
Difficulty	Test in the event of failure	6-1
Equipment	View a list of shipped equipment	3-1
Front Panel	View the front panel switches	2-3
Return	Return a unit for repair	6-3
Unpacking	Unpack the T-BERD 305	3-1
Warranty	Review warranty policy	6-2
TESTING		
Continuous	Conduct a continuous test	2-5, 5-71
In-Service	Perform in-service testing	4-5, 4-7
Out-of-Service	Perform out-of-service testing	4-1, 4-5
Timed	Conduct a timed test	2-5, 5-77
TEST MEASUREMENTS	Review available test measurements	2-11, 2-15
TEST SWITCH		
Description	Obtain a general description	2-5
Remote Control	Set test duration via remote control	5-78
TIME	Set the time of day	2-7
TIME TEST RESULTS		
Date	Obtain a description	2-15
Elapsed Time	Obtain a description	2-15
Test Length	Obtain a description	2-15
Time	Obtain a description	2-15
Time Left	Obtain a description	2-15

TIMED TESTING	Conduct a timed test	2-5, 5-77
TIMING	Select transmit timing source	2-5, 5-79
TRANSMIT LEVEL		
Digital Cross-Connect	Set transmit level	4-3
Demux Input	Set transmit level	4-3
Mux Input	Set transmit level	4-3
Trans. Equip. Input	Set transmit level	4-3
Trans. Equip. Output	Set transmit level	4-3
TRANSMIT OUTPUT SWITCH		
Description	Obtain a general description	2-5
Remote Control	Set via remote control	5-81
Specifications	Obtain transmit output specs.	4-3, 7-4
UNPACKING	Unpack the T-BERD-305	3-1
UP/DOWN SWITCH	Obtain a general description	2-5
WARNING MESSAGES	Obtain a list of warning messages	5-17