

# BT-1

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## 1. DESCRIPTION

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The BT-1 BERT tester is a digital RS-232 test set for modems, DSUs, line drivers, multiplexers, terminals, printers, etc. Test functions include:

- Bit and block error rate tests
- Polling tests
- Timing tests
- Synchronous and asynchronous operation

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## 2. SPECIFICATIONS

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### 2.1 General

DTE Interface with DB-25 male connector  
Input pins: 3, 5, 6, 8, 22, 15, 17  
Output on pins 2, 4, 11, 20, 24 (pin 11 is tied to pin 20)  
Test voltages: +v on pin 9, -v on pin 10  
32 character LCD display (16 characters per line, 2 lines)  
16 character keypad

### 2.2 DTE Timing

Asynchronous speeds of 50, 75, 110, 300, 600, 1200, 1800, 2400,  
4800, 7200, 9600, 14,400, 19,200, and 38,400 bps  
Synchronous speeds to 64,000 bps

### 2.3 Physical/Electrical

4" W x 1.75" D x 7" H  
120 VAC, 18 Watts  
External 9 VDC, 500 ma power supply

### 2.8 Environmental

Operation: 0 to 65° C, 10 to 85% relative humidity  
Storage: -40 to 85° C, 10 to 85% relative humidity

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## 3. INSTALLATION

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### 3.1 Unpacking

The following is included with each BT-1:

- BT-1 test set
- External power supply, 9vdc, 500 MA
- DB-25 female to DB-25 male/female ribbon cable
- manual

### 3.2 Location

Place the BT-1 in an area where you can reach the front panel keypad and where you can reach to connect the cables. The BT-1 has an external power supply that is plugged into a 120 VAC outlet. The power cord length is about 6 feet.

### 3.3 Setup

The BT-1 is setup using the 16 key keypad. The first step is typically to set the operating parameters (speed, parity, etc) selected by using the "SET PARM" key. Then the test is selected using the "SET TEST" key.

Move around the screen using the arrow keys. The parameter to be changed will flash on the LCD screen. Values are changed using the "INCR" and "DECR" keys.

Some screens have the ">" character on the bottom right hand side. This indicates the screen choices are more than 16 characters wide. Use the right or left arrow keys to view the extended screen.

The BT-1 can often be used to perform a test right out of the box. The defaults are as follows:

9600 bps, 8 data bits, one stop bit, no parity  
Bert test: async, QBF message, CTS flow control

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## 4. CONTROLS AND INDICATORS

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RE- SET	RUN	WAIT	STOP
SET PARM	SET TEST	DONE	CLR/ ZERO
DECR	↑	INCR	ERR INJ
←	↓	→	PROM CHK

BT-1 Keypad

### 4.1 Keypad

#### TOP ROW OF KEYS:

RESET      Resets the unit  
RUN        Starts running a test  
WAIT       Halts a test without stopping it. "Wait" toggles the test off and on.  
STOP       Stops the test

#### SECOND ROW OF KEYS:

SET PARM   Selects test parameters  
SET TEST   Selects test to run  
DONE       Press to return from "Set Parm" to the selected test  
CLR/ZERO   Clears counters while test is running

#### THIRD ROW OF KEYS:

DECR       Decrements a value  
UP ARROW   Move up a line on the LCD display  
INCR       Increments a value  
ERR INJ    Injects an error while a bert test is running

#### BOTTOM ROW OF KEYS:

LEFT ARROW   Move left on the LCD display  
DOWN        Move down a line on the LCD display  
RIGHT ARROW   Move right on the LCD display  
PROM CHK    Press, after RESET, to view eprom checksum

## 4.2 LCD Display Screen

The LCD screen is 2 lines, 16 characters per line. Most settings fit on a single screen. There are, however, a few double wide screens. Under SET PARM, the RTS HOLDOVER screen is double wide. The polling set ups for both the master and the slave units, under SET TEST, are also double wide. The Bert test results and the Polling test results also use double wide screens. These screens have the “>” character at the bottom of the screen. Use the right or left arrow to get to the second half of the double wide setup screens.

### 4.2.1 Getting Started

Most functions of the BT-1 are done with just a few keys. The SET PARM is used to set the speed, parity, word length, and test duration. The SET TEST key selects the test to be performed. The ARROW keys get you around the screen. The INCR and DECR keys change the values on a screen. For example, the speed is changed using the INCR and DECR keys. RUN initiates the test, WAIT halts the test, STOP stops any test.

## 4.3 Setting Parameters

Use the SET PARM key to set parameters for timing, character length and parity, RTS Holdover/TXD Holdoff, test time, and Xon/Xoff value. Press the SET PARM to toggle from one parameter to the next. Use the ARROW keys to navigate around the screen and use the INCR and DECR keys to change values

### 4.3.1 Timing

The timing parameter sets the asynchronous speed from 50 to 38,400 bps, or to external clock. External clock is used when connecting the BT-1 to synchronous communications devices (synchronous modems, DSUs, etc.). Use the INCR and DECR keys to change the speed. Note that it is possible to run a BERTA (async bert) test using external clock.

### 4.3.2 Character

Character length can be 5, 6, 7 or 8 data bits. Parity can be even, odd or none. Stop bits can be 1, 1.5 or 2 per character. Use the INCR and DECR keys to change values.

#### 4.3.3 RTS Holdover/TXD Holdoff

The RTS holdover value keeps RTS on all the time if set to Constant ON. If one of the values (from 0 to 100 milliseconds) is picked, then RTS will turn off after each poll response or between each Bert message, at the end of the message plus the millisecond time value. An example of the use of this function is when testing modems, DSU's or line drivers in switched carrier mode to determine if the modem, DSU or line driver is dropping carrier detect during the transmission of the last character of a message.

Transmit holdoff is the period of time between turning RTS on and sending the Bert message or a poll. The value of the holdoff ranges from 0 to 100 milliseconds.

#### 4.3.4 Stop Test

The stop test parameter can be disabled to allow constant sending of data, or the test can run for from 10 seconds to 30 minutes, or until there is an error. The stop on error will stop a Bert test when the BT-1 sees a receive data error. The stop on error function is an excellent tool to use along with a data line monitor to trap data errors when debugging equipment.

#### 4.3.5 Xon/Xoff

The Xon/Xoff parameter allows for changing the flow control characters of Xon/Xoff from the typical hex 11 and hex 13 to other values.

#### 4.4 Setting tests (SET TEST)

Use the SET TEST key to select the BertA, BertS, Poll as master, Poll as slave, or Timing tests. Press the SET TEST key to toggle from one test to the next.

#### 4.4.1 BertA Test

The BertA is the asynchronous bert (bit error rate test). This test is used to determine if there are bit and/or block errors. Parameters include:

**QBF** – A “Quick brown fox” message

**QBF#** - “Quick brown fox” with a block number at the end, where the block number ranges from 001 to 999, then starts again at block number 001.

**ABC** – Sends all printable characters

**MBit** - This test has two options: 4-byte (4BYT), the default, and 1-byte (1BYT) test message length. The delay between test messages can be set in 1ms increments between 2ms, the default, and 9ms.

**ALT** – Sends alternate mark/space character (“U”)

**63** – Sends 63 bit pseudo random word

**511** – Sends 511 bit pseudo random word

**2047** – Sends 2047 bit pseudo random word

**ALL** – Sends all 256 hex values of an 8 bit character, hex 00 to hex FF

**HP2H** – Sends a QBF message ending with Esc, ?, D1 (Xon), expects a response of D1 (Xon)

**HP2T** – Sends a response of D1 (Xon) after getting a message ending with Esc, ?, D1 (Xon).

**HP1H** – Sends a message ending with the ENQ character, expects a response of the ACK character

**HP1T** – Sends a response of ACK after receiving a message ending with the ENQ character

The bert test pattern selected can be sent continuously (CONT), at a 25%, 50%, or 75% duty cycle, or just once.

Flow control can be set to Clear to Send (CTS), Xon/Xoff, or inverted Clear to Send (CTS-H). These are choices for having the output of the BT-1 halted by the attached communications equipment.

Input flow control can be set to NONE, Busy High, Busy Low, or Xon. Frequency for the bert to stop incoming data can be set to intermittent (INTMT is about 8 seconds off, 2 seconds on in a repetitive cycle), or to frequent (FRQNT is about 2 seconds on, 2 seconds off).

Test results are on 2 screens. The right and left arrow keys are used to move between the screens. Test results are as follows:

SENT	RCVD	SYNC	BLKERR	BITER	SEC
#####	#####	GOOD or LOSS >	##### <	#####	###

#### 4.4.2 BertS Test

The BertS is the synchronous bert (bit error rate test). This test is also used to determine if there are bit and/or block errors. The BertS test choices for the BertS tests are the same as the BertA, except the BertS tests do not include the HPxxx selections.

The BertS tests require the clock set using SET PARM to Timing EXT (external). BertS character patterns for QBF, QBF# and ABC are externally clocked but use the start and stop bits on the data. The ALT, 63, 511 and 2047 tests do not include the start and stop bits.

Test results for the BertS tests are the same as for the BertA tests.

#### 4.4.3 Poll: MST (Master)

The polling tests require one unit be set as the master unit. The setup screen is another double wide screen, where the 2 halves of the setup screen are accessed using the right and left arrow keys.

**MST-XX** selects the number of remotes to poll, ranging from 01 to 16.

**NORM or CD OFF** sets a parameter where the master will continue to poll the drops regardless of the state of Data Carrier Detect (NORM), or only when Data Carrier Detect is off (CD )FF).

**xxxM** set the time in milliseconds for the master to poll another drop after getting a correct response from a polled remote slave. This parameter is used to simulate processing time between polls in a host computer.

**xSy** is used to set the polling to async (ASY) or to set the number of sync characters at the front end of synchronous polling (2Sy to 6 Sy)

**Timeout** can range from 0 milliseconds to 6 seconds. Timeout is how long the master will wait for a poll response before continuing to poll other drops. A timeout typically occurs when a remote unit fails to respond to a poll, usually due to a data error.

**Retry** is the number of consecutive times the master will try and poll a remote device before giving up and dropping the remote from the polling sequence.

Test results are as follows:

POLL	RESP	RTRY	POLxx	RESP	RTRY
###	###	###	###	###	###
		>	<		

The right hand side of the screen shows the results for each slave unit that is being polled. In the above example, the POLxx refers to one of the drop numbers, which can range from 01 to 15.

#### 4.4.4 Poll: SLV (Slave)

Up to 16 slave units can be set up for polling. Each slave gets a separate number, ranging from 01 to 16.

**SLV=xx** sets the slave, or drop number.

**xx Msg** set the slave to respond to a poll with NO message, a short message of 16 bytes once every 93 polls (SI), a 16 byte message once every 45 polls, a 16 byte message once every 7 polls, a long message of 290 bytes once every 93 polls (LI), a 290 byte message once every 45 polls (LM) or a long message once every 7 polls (LF).

**xxxM** set the time in milliseconds for the master to poll another drop after getting a correct response from a polled remote slave. This parameter is used to simulate processing time between polls in a host computer.

**xSy** is used to set the polling to async (ASY) or to set the number of sync characters at the front end of synchronous polling (2Sy to 6 Sy)

**NORM or CD OFF** sets a parameter where the slave will respond to a poll regardless of the state of Data Carrier Detect (NORM), or only when Data Carrier Detect is off (CD)FF).

Test results are as follows:

POL <sub>xx</sub>	RESP	RTRY
XX	XX	XX

#### 4.4.5 Time Tests

Time tests are a collection of measurements, ranging from Request to Send/Clear to Send delay measurements, to round trip echo timing, to character counting. The results of the tests are in milliseconds, number of characters or positive or negative (high/low) signal levels. The test are as follows:

**RTS+/CTS+** measures the time from the BT-1 asserting RTS (pin 4) unit CTS (pin 5) is returned from the attached communications equipment.

**RTS-/CTS-** measures the time from when the BT-1 turns RTS off unit CTS is turned off by the attached communications equipment.

**DCD+/RXD+** measure the time from the BT-1 senses Data Carrier Detect (pin 8) turning on until the BT-1 receives incoming data (pin3).

**RXD-/DCD-** measure the time from the BT-1 sensing Data Carrier Detect turning off until the BT-1 senses receive data going idle.

**XOFF/RXD-** measure the time from the BT-1 asserting Xoff unit receive data goes idle.

**BSY HI/RXD-** measure the time from BT-1 asserting busy high until receive data goes idle.

**BSY LO/RXD-** measure the time from the BT-1 asserting a busy low signal until receive data goes idle.

**ECHO 1 CHAR** measures the time it takes for a single character to be sent from the BT-1 and echoed back to it.

**ECHO CONT** measure the time it takes for characters to be send from the BT-1 and echoed back to it.

**CHAR COUNT** counts the number of characters received over a number of seconds.

**CHAR LOOP** counts the number of characters received on the RXD input and keeps track of the number of parity and framing errors detected.

**SHORT BREAK** sends out a break, or positive voltage level, on the transmit data lead for 1/3 second.

**LONG BREAK** sends out a break, or positive voltage level, on the transmit data lead for 2 ½ seconds.

**MARK/SPACE** sends out a constant mark (negative voltage), space (positive voltage) or alternating mark/space. The INCR and DECR keys can be pressed while the test is running the change between the three values.

**RS-232 MON** shows the positive or negative state of these input leads (pins 3,5,6,8,22). The arrows change direction when the input goes from negative to positive. The RD lead toggles on for a quarter of a second upon receipt of a character. The other leads will default to on with nothing attached due to internal pull up circuits used to prevent floating inputs.

**HI/LO COUNT** counts the number of times that the inputs on pins 5, 6, 8 and 22 go from high to low. When used with a breakout box to isolate these input leads, the test is useful to capture the existence and frequency of glitches on data leads that should stay in a constant state.

**HI/LO ORDER** measure the order, or sequence, when the inputs on 5, 6, 8 and 22 change from positive to negative.

**#5+/#8+** measure the time in milliseconds between pin 5 going to a positive voltage until pin 8 goes to a positive voltage.

**#5+/#8-** measures the time in milliseconds between pin 5 going to a positive voltage until pin 8 goes to a negative voltage.

**#5-/#8+** measure the time in milliseconds between pin 5 going to a negative voltage until pin 8 goes to a positive voltage.

**#5-/#8-** measure the time in milliseconds between pin 5 going to a negative voltage until pin 8 goes to a negative voltage.

**MODEM RATE** measures the data rate of the clock input to pin 15, rounded off to the nearest typical modem speed. Typical speed results are 1200, 1800, 2400, 4800, 7200, 9600, 19200, 38400.

**CLOCK RATE** measures the data rate of the clock input to pin 15 based on a 100 microsecond internal timer. The BT-1 sends out a fixed number of characters, measure the time it takes to send them and then calculates the rate of speed. At 9600, the BT-1 gives a result of 9597 or 9606. At 1200 bps, the resolution is .14 bps, and at 56000 bps the resolution is 314 bps.

**BIT SLIP** is used to detect bit error in synchronous systems where the errors are the result of bit slippage. The test measure bit slip or bit gain. The BT-1 sends out a pattern of 001100110011, etc. and looks for a gain or loss of one of the bit pairs. The bit slip test can specifically isolate bit gain or slip. The bit slip test can be run in loopback or from one BT-1 to another.

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## 5. INTERFACE SIGNALS

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### 5.1 RS-232D / V.24 Interface (DB-25P)

<u>Pin</u>	<u>Signal Name</u>	<u>In/Out</u>
1	Frame Ground	---
2	Transmit Data	OUT
3	Receive Data	IN
4	Request to Send	OUT
5	Clear to Send	IN
6	Data Set Ready	IN
7	Signal Ground	---
8	Data Carrier Detect	IN
9	+ test voltage	OUT
10	- test voltage	OUT
11	Busy (tied to pin 20)	OUT
15	Transmit bit clock	IN
17	Receive bit clock	IN
20	Data Terminal Ready	OUT
24	External Transmit Clock	OUT

Note: Pin 24 external clock rate is 16 times the async rate set in the “Set Parm” menu. For example, if the async rate is set to 1200, then the clock rate on pin 24 is 16 times 1200, or 19200 bps.

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**6. WARRANTY**

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DCB products are warranted to be free of defects in materials and workmanship for two years. Data Comm for Business, Inc. will repair or replace any equipment proven to be defective within the warranty period. All warranty work is F.O.B. Dewey, IL. This warranty is exclusive of abuse, misuse, accidental damage, acts of God or consequential damages, etc. DCB liability shall not exceed the original purchase price.

All equipment returned for repair must be accompanied by a Returned Material Authorization (RMA) number. To receive an RMA number, call (217) 897-6600 between the hours of 8 AM and 5 PM central time. Equipment must be shipped prepaid to DCB and will be returned at DCB's expense.

Ship returned items to:

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