BERT 20E1
2.048 Mbps Network Tester

- **Complete in-service or out-of-service testing**
- **Continuous testing of up to 8 hours respectively**
- **Automatically recognizes and indicates received BERT pattern, Framing format and AMI or HDB3 Line coding**
- **Displays all major 2.048 Mbps Network performance standards**
- **User friendly interface simplifies operation**

DESCRIPTION

The BERT-20E1 is a fully-featured comprehensive handheld 2.048 Mbps, E1 Network test set that can be used for complete in-service or out-of-service stress testing. It is designed to easily evaluate the integrity, configuration, and performance of an E1 facility. Designed for ease of use, even the novice in the field or central office can quickly become a proficient tester and provide valued measurements.

Main features of the product include:

- DB-9 Serial Port for field software upgrades
- Handheld, battery-powered
- 4X20 LCD high contrast display with EL backlight
- Transmits standard E1 stress patterns
- Two 64-bit user programmable, non-volatile patterns
- Fractional (Nx56 and Nx64 kbps) BER testing
- Performs bit error rate testing (BERT)
- Logic error insert – single and user selectable rate
- BPV error insert – single and user selectable rate
- Frame error insert – single and user selectable rate
- CRC4 error insert
- Single channel insert for BERT patterns and analog tones
- Single channel analog tone insert for in-service or out-of-service testing
- LLB Mode – line loopback mode with error analysis
- TLB Mode – test loopback mode with error analysis
- Independent or standard transmitter and receiver functions
- Recognizes and indicates received BERT pattern
- Recognizes and displays E1 framing format
- Recognizes and displays AMI or HDB3 line coding
- Displays all standard E1 alarm conditions with history LEDs
- Displays all major E1 performance parameters
- Measures E1 frequency and level (Vp-p and dB)
- Displays ABCD signaling bits and Single channel 8-bit byte data
- Measures Single channel level and frequency
- Monitors voice with internal speaker
- Single Channel DTMF Digit Decode
- Full span primary receiver

- Measures clock synchronization problems (bit slips)
- Round trip loop delay measurement
- Non-Volatile test set configurations
- Store and recall four user defined test set configurations
- Test Summary for “Errored Only” results
- Printer port
- Battery condition indicator
- Weighs less than 2 lbs.
- Real time clock with day and date
- Timed or continuous tests
- G.821 performance analysis

APPLICATIONS

Telco Installation and Maintenance personnel of Private Networks and Service Providers who are responsible for turning-up and maintaining 2.048 Mbps, E1 Networks are perfect candidates for the Megger BERT-20E1. The unit is also used by end-users (ISPs and VPN) who lease lines from the telco to verify performance and aid in troubleshooting when problems arise.

Cellular providers who need to measure network delays associated with cellular service would also use the BERT-20E1.

The unit’s durable construction and long battery life is suited for applications in all environments; from the Exchange to the Field.

SPECIFICATIONS

Physical

Size: 1.75 H x 5 W x 9 D in. (44.45 H x 127 W x 228.6 D mm)
Weight: 0.6Kg (1.32 lbs.)

Environmental

Operating Temperature: -20° to 50° C (-4° to 122° F)
Storage Temperature: -20° to 70° C (-4° to 158° F)
Humidity: 95% maximum, non-condensing

Power

Batteries (rechargeable): (5), 1.2-V, Nickel Metal Hydride (NiMH); 4 Amp/hr
Battery Life: Approximately 8 hours of continuous operation (in Monitor mode measuring clock slips, Data Channel Drop on full speaker volume) with a fully-charged battery.
Battery Fuel Indicator: Green-to-Red Battery Fuel Gauge LED Bar. Flashing Red on LED Bar indicates approximately 30 minutes of operation remaining.
Auxiliary Power: 9 VDC, 1500 mA

Connectors

Receiver (Term/Monitor/Bridge): 75 ohm unbalanced BNC
120 ohm balanced via 6-pin circular DIN (Custom)
Transmitter: 75 ohm unbalanced BNC
120 ohm balanced via 6-pin circular DIN (Custom)
EXT CLOCK IN: 75 ohm BNC
Auxiliary Power: DC power jack (accepts 2.5 mm diameter female plug with center or tip “+” and outside “-”)

Receiver

Operating Modes:

- NORM (Tx follows Rx)
- AUTO (Auto-Configure Rx. Tx is independent and is set manually)
- Nx56 (Channels are configured on a contiguous or non contiguous basis)
- Nx64 (Channels are configured on a contiguous or non contiguous basis)
- D/I (Half Duplex Drop and Inser. Insert Tone or Datat)
- LLB (Local Loopback) Thru Mode, Rx data is passed to Tx without alteration
- TLB (Remote Loopback) Thru Mode, Rx data is passed to Tx retimed and BPV’s corrected
- DLY (Round-Trip Delay)
- CO64 (64 kbps co-directional interface)

Input Impedance

- Bridge = 1.2K ohms
- Term = 75 ohms and 120 ohms ± 5%
- Monitor = 75 ohms and 120 ohms ± 5%

Range

- Bridge = 3 to -40 dB
- Term = 3 to -43 dB
- Monitor = Gain of 12dB or 30dB

Compatibility: ITU-T G.703, G.704, G.706, G.823, G.732, and I.431
ETS 300 011, 300 233, and 300 166
CTR12 and CTR4.
Framing: NONE, PCM30, PCM30C, PCM31 and PCM31C
Line Coding: AMI, HDB3

Test Patterns

PRBS: 2^7-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1
Word: (2) User Defined 64-bit word, all ONES, all ZEROS, 1:1

RX Status/History Indicators

- TEST SUMMARY
- AMI
- HDB3
- FAS SYNC
- OCTET SYNC
- MAS SYNC
- PATTERN SYNC
- SIGNAL PRESENT
- OUT OF FRAME
- PATTERN SYNC LOSS
- AIS
- FAS REMOTE ALARM
- MAS REMOTE ALARM
- CRC-4 DETECT

Pattern Sync Loss: 100 bit errors in 1000 bits
Pattern Sync Gain: 0 bit errors in N + 1200 bits, N = 20 for 2^15-1, N = pattern length for the other pattern
Signal Present: Absent when 255 consecutive zeros (no pulses) have been detected

Out of Frame

FAS Level - (3) consecutive incorrect FAS Frames received
CRC4 Level - 915 or more CRC4 code words out of 1000 received in error
CAS Level - Two consecutive MF alignment words received in error
Alarm Indication Signal (AIS): Unframed ALL ONES, more than (2) zero's in (2) frames (512 bits)
FAS Remote Alarm (RRA): Bit 3 of non-align frame set to zero for (3) consecutive occasions
MAS Remote Alarm (RDMA): Bit 6 in Timeslot 16 set to zero for (2) consecutive Multiframes
Timeslot Data Drop: Selected Timeslot to 8 data-bit LEDs and Speaker
Signaling Types: CCS and CAS
Digit Capture: DTMF
CAS Signaling Bits: A, B, C, D to (4) discrete LED's

EXT CLOCK IN

Input Impedance: 75 ohms ± 5%
Range: 0 to –43 dB
Compatibility: ITU-T G.703, G.704, G.706, G.823, G.732, and I.431
ETS 300 011, 300 233, and 300 166
CTR12 and CTR4

Transmitter

Line Code: AMI or HDB3
Framing: NONE, PCM30, PCM30C, PCM31 and PCM31C
Frequency: 2048000 Hz ± 2.5ppm

Test Patterns

PRBS: 2^7-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1
as per ITU-O.151, O.152, O.153
Word: (2) User Defined 64-bit word, all ONES, all ZEROS, 1:1
Voice Channel Insert: Data Pattern or Tone
Tone Frequency: 404Hz, 1004Hz, 2804Hz, 3-Tone Sweep
Tone Level: +3dB to –50dB in 1 dB increments

Error Insert

- **Single:** Bit, BPV, FAS, CRC4
- **Rate:** Bit, BPV, CRC4 (5E-2 to 9E-7); FAS (1 in 4, 2 in 4, 3 in 4, ALL)

LBO: dB (+6Vp-p, Mark Level) 120 ohms
dB (+4.74Vp-p Mark Level) 75 ohm
Pulse Shape: Complies with ITU G.703
Jitter Tolerance: Complies with ITU G.823

Results

Display: 4X20 Character LCD Display w/ EL Backlight
Results Type: NORM, SUMMARY, PERFORMANCE
Clock Slips: A positive number indicates that the reference clock is faster; a negative number indicates that the reference clock is slower.
Errors: Logic Errors, Logic Error Rate, BPV, BPV Error Rate, FAS Errors, CRC Errors, CRC Error Rate, E-Bit Errors, Errored Seconds, Error Free Seconds, Error Free Seconds %, Severely Errored Seconds
Maximum count: 2.8147E14
Signal: E1 FREQ; E1 LEVEL (p-p)
TS/Channel Freq.; TS/Channel Level
DTMF Capture Buffer: 16 digits
E1 Frequency Accuracy: ±2.5 ppm, 0 to 40° C
E1 Frequency Resolution: 1 Hz
E1 Frequency Range: 2048000 ± 10000 Hz
E1 Level Accuracy: 6 dB to -16 dB; ±1 dB;
-16 dB to -40 dB; ±3 dB
E1 Level Range: 6 dB to -40 dB
TS/Channel Frequency Accuracy: ±1.5 Hz
TS/Channel Level Accuracy: ±0.5 dB

Co-directional Interface

Transmitter

Rate: 64Kbps
Connector: 120 ohm Balanced via 6-pin circular DIN
Line Code: As per ITU-T G.703 section 1.2.1.1.5 (Reference 1)
Clock Source: Recover Timing (Rx), Internal (INT) and External (EXT)
Internal Clock Accuracy: 5 ppm
External Clock: 2.048MHz Clock complying with ITU-T G.703 Section 10 (reference 1)
Error Insertion: Bit
Rate: Single and 5E-2 to 1E-7

Receiver

Rate: 64Kbps
Connector: 120 ohm Balanced via 6-pin circular DIN
Line Code: As per ITU-T G.703 section 1.2.1.1.5 (Reference 1)
Alarms detected: Signal Loss, Octet Sync Loss and Pattern Loss
Measurement results: Bit Error Count

ORDERING INFORMATION

Item (Qty)	Cat. No.
BERT-20E1 2.048 Mbps Network Tester	BERT-20E1
Included Accessories	
Rubber Holster	5410-381
Holster Stand	5410-379
(2) Test lead 75 ohm BNC to BNC 1.25 m	6180-450
E1 Basics/Product Presentation CD	6111-703
AC to DC Charger	6180-451
Carry Bag	6420-139
User Manual	6172-871
Optional Accessories	
Test lead 75 ohm BNC to BT43, 1.25 m	6220-774
Test lead 120 ohm HIROSE to Bantam, 1.25 m	6220-775
Test lead 120 ohm HIROSE to RJ45, 1.25 m	6220-776
Test lead 120 ohm HIROSE to 4 mm jack, 1.25 m	6220-786
Test lead 120 ohm HIROSE to mini grabber, 1.25 m	6220-788

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ISO STATEMENT
Registered to ISO 9001:1994 Reg no. Q 09250
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