20T1 Hand-Held T1 Span Verifier and Tester

**DESCRIPTION**

The 20T1 is a compact, feature packed T1 handheld test sets that can be used for in-service or out-of-service testing. It has been designed to evaluate the integrity, configuration and performance of a T1 facility by locating complete failures in a transmission line or a piece of equipment, verifying network performance, isolating faulty DTE or DCE and determining faulty transmission channels. Complete end-to-end testing may be performed at any point in the span by utilizing industry standard loop codes. The unit may be used at the DSX-1 cross connect jack panel, bridged onto the span or can be a substitute for transmission equipment for real world testing.

**Main features of the product include:**

- Performs Bit Error Rate Testing (BERT)
- Measures DS1 level and frequency in volts and dB
- Detects timing problems, such as clock slips
- Measures DS0 level and frequency
- Determines T1 framing and BERT patterns of the incoming signal
- Automatically configures itself to the received frame, BERT pattern and line coding of the incoming signal
- Displays DS0 data and signaling
- Indicates standard T1 alarms
- Displays major T1 performance parameters
- Indicates AMI or B8ZS line coding
- Allows you to monitor voice using the internal speaker
- Injects single bit errors and selectable error rates
- Transmits standard, HDSL and Smart Repeater T1 loop codes.
- Operating modes include Automatic, Normal, Fractional T1, Half duplex Drop & Insert, Test Loopback, Local Loopback, Tone Insert, BTP (Bridge Tap Testing), MPT (Multi-pattern Testing), NIU & CSU Emulation and Loop Delay Measurement.
- Performs BERT on one of 17 standard stress patterns and two user definable 64-bit patterns.
- Determines T1 framing and BERT patterns
- Transmits standard, HDSL and Smart Repeater T1 loop codes
- Low power, high contrast 4X20 LCD display with EL backlight for low light use
- Half-duplex Drop & Insert testing can insert a BERT pattern or a 404Hz, 1004Hz, 2804Hz, or a 3 tone swept frequency in the selected Transmit DS0. Each tone may be transmitted at one of the following user selected levels: +3dB, 0dB, -3dB, -5dB, -7dB, -10dB, -13dB, -15dB, -17dB and -20dB.
- Test summary detects only error results.
- Timed testing or continuous testing (up to 8 hours).
- Stores and recalls up to four test routines.
- Logic, BPV and Frame Single and Error Rate Inject.
- Detects DTMF digits.
- G821 performance analysis.
- Flash port allowing software upgrades
- Expanded suite of test patterns.
- Loop delay measurements
- Printer port.
APPLICATIONS
Telco Installation and Maintenance personnel of Private Networks and Service Providers who are responsible for turning-up and maintaining their DS1 and HDSL spans are perfect candidates for the 20T1. 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 20T1.

The unit’s durable construction and long battery life is suited for applications in a hostile environment such as in a manhole or on a telephone pole.

FEATURES AND BENEFITS
- Intuitive, user friendly interface. There are no buried menus or parameters to confuse the operator.
- Its small size allows the unit to be unobtrusively clipped to a belt for use up a utility pole, down a manhole, or just about anywhere else you might need to test.
- A full work shift of testing can be performed by the long lasting and rechargeable NiMH batteries. A full recharge typically takes 4 to 6 hours on fully drained battery.

SPECIFICATIONS
Physical
Dimensions
1.75 H x 5 W x 9 D in.
(44 H x 127 W x 229 D mm)
Weight
1 lb, 10 oz (46 kg)
Environmental
Operating Temperature
-40 to +122° F (-20 to +50° C)
Storage Temperature
-40 to +158° F (-20 to +70° C)
Humidity
95% maximum, noncondensing
Power
Batteries
3.6 V 4 Ah NiMH
Battery Life
Up to 8 hours of continuous operation (in monitor mode measuring clock slips, DS0 Drop on full speaker volume with a fully-charged battery)
Low Battery Indicator
Red LED flashes if voltage is below 3.55 V, indicating approximately 30 minutes of operation remaining
Auxiliary Power
12 V dc, 1100 mA

RX T1 Receiver
Input Impedance
Bridge > 1000 ohms
Term = 100 ohms ± 5%
Monitor = 100 ohms ± 5%
Range
Bridge = +6 to -36 dB
Term = +6 to -36 dB
Monitor = -15 to -24 dB
Compatibility
ANSI T1.403, AT&T Pub 62411
Framing
None, D4, ESF, SLC® 96
Line Coding
AMI, B8ZS
Patterns
63, 511, 2047, REV2047, 2×15, 2×20, 2×23, QRSS, 1 IN 8, 1 IN 16, 2 IN 8, 3 IN 24, All Zeros, All Ones, 1:1, OCT55, DALY55, two 64-bit user patterns
Status/History
Test Summary, AMI, B8ZS, Frame Sync, Pattern Sync, Signal Present, Out of Frame, Pattern Sync Loss, Blue Alarm, AIS), Ones Density, Excess Zeros, Yellow Alarm, DS1 Idle Signal, Pattern Sync Loss
Pattern Sync Loss
100 bit errors in 1000 bits
Pattern Sync Gain
0 bit errors in N + 1200 bits, N = 20 for QRSS, N = pattern length for the other pattern
Signal Present
Absent when 192 consecutive zeros (no pulses) have been detected
Out of Frame
D4, SLC® 96: 2 out of 4 FR bits in error
ESF: 2 out of 4-FPS bits in error
Blue Alarm (AIS)
Unframed all ones per TR-TSY-000191 (no framing and 14 or less zeros in 13, 895 bits)
Ones Density
< N ones in 8 (N+1) bits, N = 1 to 23 per ANSI T1.403
Excess Zeros
>15 consecutive zeros per ANSI T1.403
Yellow Alarm
D4: >255 consecutive DS0 channels with bit 2 = 0
ESF: 16 repetitions of “00FFh” on 4 kbps data link
DS1 Idle
All 24 DS0 channels contain 00010111 per ANSI T1.403-1995
DS0 Drop
Selected DS0 channel to 8 data-bit LEDs and speaker
DS0 Signaling Types
ROBBED BIT, CCIS
DS0 Signaling Bits
A, B, C, D
**Result Types**

**Signal**
- DS1 FREQ, DS1 LEVEL, DS0 FREQ, DS0 LEVEL, CLK SLIPS
- **DS1 FREQ Accuracy**
  - ± 5 ppm, 0° to 40° C
- **DS1 FREQ Resolution**
  - 1 Hz
- **DS1 FREQ Range**
  - 1,544,000 ± 10,000 Hz
- **DS1 LEVEL Accuracy (DSX)**
  - +6 to -16 dB, ± 1 dB
  - -16 to -40 dB, ± 3 dB
- **DS1 LEVEL Range**
  - +6 to -40 dB
- **DS0 FREQ Accuracy**
  - ± 1.5 Hz
- **DS0 LEVEL Accuracy**
  - ±0.2 dBm

**DTMF Capture Buffer**
- 16 digits

**Errors**
- Logic Errors, Logic Error Rate, BPV, BPV Error Rate, Frame Errors, Frame Error Rate, CRC Errors, CRC Error Rate, Errored Seconds, Error Free Seconds, Error Free Seconds %, Severely Errored Seconds
  - **Maximum count:** 2.8147E14

**TX T1 Transmitter**

**Input Impedance**
- 100 ohms ± 5%

**Range**
- 0 to -36 dB

**Compatibility**
- AT&T TA24/CB113

**Line Coding**
- AMI, B8ZS

**Framing**
- None, D4, ESF, SLC® 96

**Frequency**
- 1,544,000 Hz ±5%

**Patterns**
- 63, 511, 2047, REV2047, 2-15, 2-20, 2-23, QRSS, 1 IN 8, 1 IN 16, 2 IN 8, 3 IN 24, All Zeros, All Ones, 1-1, OCT55, DALY55, two 32-bit user patterns

**Standard Loop Codes**
- CSU, NIU4, NIU5, NTWK, LINE, PYLD

**T1E1.4/92 Loop Codes**
- ARM, HTU-C, DOUB, HTU-R

**ADTRAN/ADC-Pair Gain HDSL Loop Codes**
- ARM, NLOC, NDU1, NDU2, NDU3, NDU4, NREM, CLOC, CDU1, CDU2, CDU3, CDU4, CREM

**Teltrend IOR9132 (GTE)**
- ARM/DISARM from DSX-1, ARM/DISARM from Network, Far End NIU Activate, Issue Query, Sequential Loopback, Loopback Timeout Disable, Loopback Query, Power Loopback Query, Power Down

**Teltrend ILR7238 (GTE)**
- ARM/DISARM from DSX-1, ARM/DISARM from Network, Loopback ILR, Loopback Timeout Disable, Loopback Query, Alt Loopback Query, Loopback ILR Power Loop, ILR Power Cut-Thru

**Teltrend ILR7239LG (GTE)**
- ARM/DISARM from DSX-1, ARM/DISARM from Network, Loopback ILR, Loopback Timeout Disable, Loopback Query, Auto Loopback Query, Issue Query, Open Power Loop Query, Sequential Loopback, Remote Sequential Address, Remote Random Address, Address Reset, Change Address, ILR Power Cut-Thru

**LBO**
- User Selectable at 0, -7.5, -15 dB

**Pulse Shape**
- Complies with AT&T Pub 62411 and ANSI T1.403

**Jitter Tolerance**
- Complies with AT&T Pub 62411

**Results**

**Display**
- 4 X 20 Character LCD display with EL Backlight

**Display Results Selection**
- NORM, SUMMARY, G.821

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**ORDERING INFORMATION**

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<th>Cat. No.</th>
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<td>Hand-Held T1 Span Verifier and Tester</td>
<td>INTERR-20T1</td>
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**Included Accessories**

- Bantam to Bantam cable, 5 ft (1.5 m) [2] 620036
- Power supply, 12 Vdc, 1000 mA [1] 561013
- Carry case [1] 684012
- Instruction manual and CD

**Optional Accessories**

- RJ48 to Bantam Y cable (pins 1, 2 and 7, 8) 620032
- RJ48 to Bantam Y cable (pins 1, 2 and 4, 5) 620029
- Bantam to dual alligator clip cable, 5 ft (1.5 m) 620030
- Bantam to RJ48 cable (pins 4, 5), 8 ft (2.4 m) 620031
- RJ45-F to Bantam Y cable (pins 1, 2 and 4, 5) 620033
- Bantam to DB15 male, 4 ft (1.2 m) 620034
- Bantam to mini-grabber cable, 6 ft (1.8 m) 620035