

TX50e

Handheld 2Mbps Test Set

The TX50e is a feature rich hand-held solution for testing and evaluating 2 Mbps and 64 kbps digital circuits. A unique combination of signal quality measurements including ITU-T compliant BER performance analysis makes the unit a perfect choice for technicians installing, maintaining or troubleshooting 2 Mbps networks.

Platform Highlights

- High resolution, 3.5" color LCD with intuitive menu structure
- Tri-color LED's for real-time monitoring of circuit status
- Compact and robust design optimized for field applications
- Durable membrane keypad for reliable operation in all weather conditions
- Dual receiver enabling bi-directional protocol analysis via PC
- High capacity rechargeable battery allowing 6 hours continuous operation
- USB to PC interface for remote control and report generation
- Voice channel monitoring and access via external headset and microphone

Key Features

- In-Service and Out of Service measurements
- 2 Mbps and N x 64Kbps support
- Frequency and Level measurements
- Line rate offset
- Round Trip Delay
- Error and alarm insertion/measurements
- PRBS, fixed and user defined test patterns
- Analysis per G.821, G.826 and M.2100
- Timeslot contents and activity monitor
- Pulse shape analysis per G.703 mask and limits
- Oscilloscope function to view 2 Mbps signal
- Jitter measurement and generation to ITU 0.171
- Maximum Jitter Tolerance (MTJ)
- Jitter Transfer Function (JTF) analysis
- Voice frequency generation and analysis
- Headset port for VF functions
- Protocol capture for PC analysis via USB port

User Interface

Intuitive menu structure enables rapid configuration and accessibility of the instrument. Signal, error and alarm status and conditions are reported visually using a set of tri-color LEDs. Alarm and error history conditions can be reset easily using a dedicated front panel key.



Frame and TS Monitoring

A complete overview of the framing status and timeslot activity is provided. All bits of the PDH frame are monitored, and their associated values are displayed in real time in Binary, Hexadecimal, or ASCII formats. Monitoring includes FAS, MFAS and NFAS words including Si, Sa and E-bits. Channel Associated Signalling (CAS) bits of all 30 channels are displayed in real time with idle or busy indication.

USB/9V -5-V -0.7dB 10:59:54

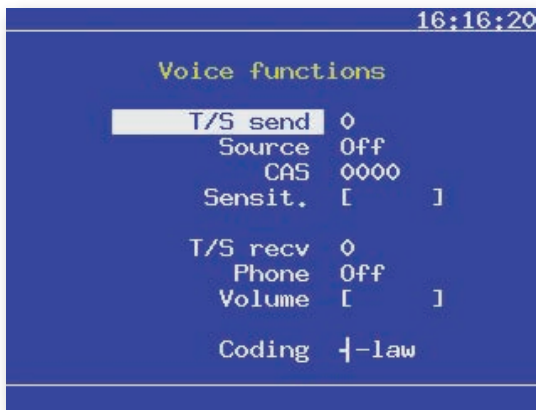
Frame Monitoring

TS	BINARY	HEX	ASCII
0	00011011	1B	()
1	11100101	E5	(E)
2	01111110	7E	(")
3	01011111	5F	(_)
4	00000101	05	()
5	11000010	C2	(6)
6	00011100	1C	()
7	10001100	8C	()

Pause

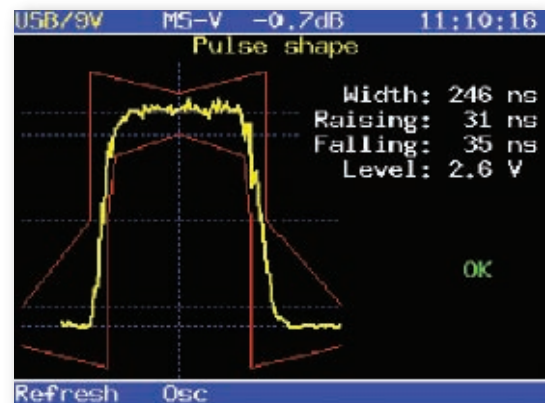
Voice Frequency Testing

Channels can be tested and monitored in-service for level and quality using different techniques. A built-in PCM codec and an external headset and microphone connected to the analogue port provide the capability to insert or listen to voice in user selectable timeslots. Alternatively, digital tones can be generated internally and inserted into user selectable N x 64 kbps timeslots enabling more advanced audio analysis of level and frequency response.



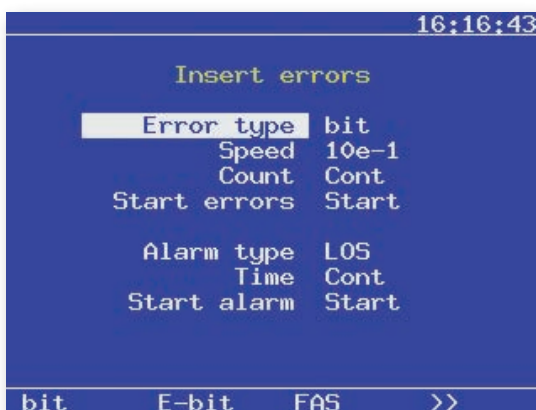
Pulse Shape Analysis

Impedance mismatches and jitter degrade network performance and problems are often linked to pulse distortion and level. The Pulse Shape feature helps to identify these physical abnormalities by capturing, displaying, and verifying the 2 Mbps Pulse according to limits defined in G.703 recommendations.



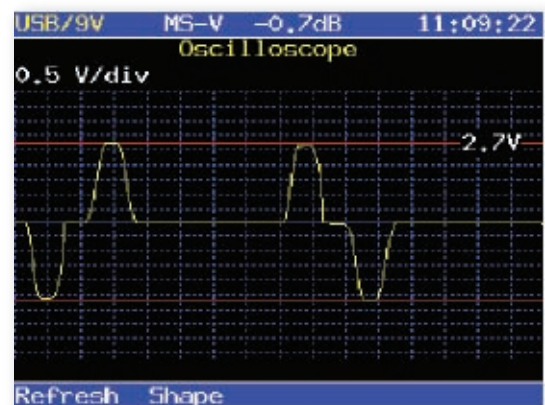
Bit Error Rate Testing

PRBS and fixed test patterns including user programmable bit sequences (words) are provided. BER measurements can be performed using either framed or unframed signals, AMI or HDB3 line coding or at 2 Mbps or fractional N x 64 kbps rates. Error and alarm generation allow the user to stimulate and examine the responses of the network.



Oscilloscope Function

A snapshot of positive and negative pulse train comprising the 2 Mbps signal can be analyzed using the oscilloscope mode. This measurement capability ensures the signal is properly terminated and is often used in combination with the Pulse Mask feature to detect and rectify signal distortion.



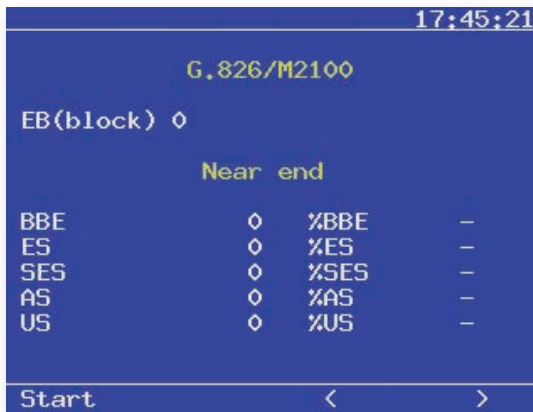
Performance Analysis

Performance analysis according to G.821, G.826 and M.2100 recommendations is provided.

Out of-service G.821 analysis can be performed on either 64 kbps sub-rate or 2 Mbps full rate signals using a selection of test patterns.

In-service G.826 block based measurements evaluate near and far end parameters simultaneously to establish QOS conditions.

M.2100 test recommendations provide technicians a consistent set of procedures for bringing into service new networks according to defined performance objective ratios and thresholds.



The Jitter Transfer Function (JTF) on the other hand determines whether a network element amplifies or reduces jitter. Essentially, jitter is applied at various frequencies to the input of the network element or DUT and then compared to the jitter measured at the output. The logarithmic ratio between input and output is the Jitter Transfer Function. Similar to the Jitter Tolerance test, a tolerance mask for the Jitter Transfer Function is also provided.

Jitter Measurement

Jitter is the short term frequency deviation of the digital signal which can be caused by several factors including regenerators being affected by noise on the transmission line - multiplexing of lower rate PDH signals into higher rate PDH signals is another cause. The Jitter option implemented on the TX50e is a simple yet powerful tool to identify and test various clocking and synchronization problems occurring in a PDH network.



Jitter Generation

Maximum Tolerable Jitter (MTJ) and the Jitter Transfer Function (JTF) test capabilities identifies marginal network equipment.

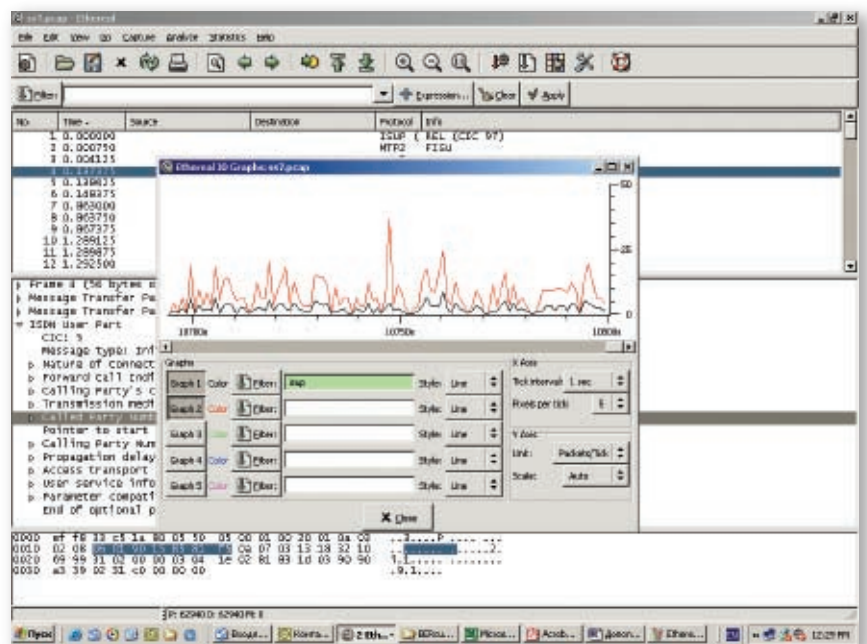
The Maximum Tolerable Jitter (MTJ) test function implemented on the Tx50e determines the maximum jitter amplitude that can be applied to a network element before bit errors are produced on the output signal. The MTJ test results are presented in both tabular and graphical formats - the graphical results can be superimposed and compared to a tolerance mask pre-defined by ITU standards.

Jitter measurement according to ITU 0.171 recommendations is performed on the actual 2 Mbps traffic flow by using proprietary algorithms. In and out-of-service measurements are available in monitor or terminated operating modes respectively.

Protocol Analysis

Powerful bi-directional protocol analysis is made possible thanks to innovative product design and popular post processing techniques.

Configured in passive monitoring mode, dual receivers proceed to capture and retrieve signaling information from selected time slots - internal circuits convert this data into an Ethernet™ compatible file format. Data transfer to a PC is achieved using a USB cable and the unit's built-in USB interface. Specially developed PC software preconfigured with timeslot and file storage settings, records the data for subsequent analysis. Ethernet™, a free open source software supporting a multitude of signaling protocols including ISDN, GSM, SS#7 and IP, can now be used to analyze the data.



Specifications

Transmitter

Interface

Number of test ports: 1
Interface and Pulse Shape: Conforms to G.703
Bit rate: 2,048 Mbit/s
Impedance: 120Ω balanced or 75Ω unbalanced
Connectors: RJ45 or banana (120Ω) or BNC (75Ω)
Line coding: AMI, HDB3
Max. Output jitter: 0.015 UIpp (Conforms to G.823)

Clock source

Internal: 2,048 Mbps ± 3 ppm
External: 2,048 MHz or 2,048 Mbps
Recovered: From received signal
Offset ± 6 kHz in 1 Hz resolution

Signal Structure

PCM-30, PCM-31, PCM-30C, PCM-31C, Unstructured conforms to G.704
64 kbps, n x 64 kbps, contiguous or non-contiguous

Test patterns

PRBS: 2n-1 where n = 6, 9, 11, 15, 23
Fixed: All 1, All 0, 1010
User programmable: 24 bit words
Polarity: Normal or inverted

VF Testing

Code law: A-Law
Frequency generation: 1 kHz
Level: -3 dBm0
Headset/microphone interface for talk listen

Alarms and Errors

Generation modes: Single, continuous, user defined
Error rates: 1 x 10-n, where n= 2 to 7
Alarm types: LOS, AIS, LOF, LOM, RDI, RMA, LSS
Error types: Bit, E-bit, FAS, MFAS, CRC, REBE

General Specifications

Size	155 x 85 x 40 mm (H x W x D) (6.1 x 3.34 x 1.57 in)
Weight	Less than 0.5 kg (less than 1.1 lbs)
Battery	NiMH with 6 hours autonomy
AC Adapter	100 to 240 AC, 50/60Hz
Display	320x240 pixels, backlight color LCD
LED	SIG, AIS, FRM, MFR, RDI, SES, RMA, PAT
Remote Control	USB slave mode

Receiver

Interface

Number of test ports: 2 (Rx, Sync)
Interface: Conforms to G.703
Bit rate: 2,048 Mbit/s
Impedance: 120ohm balanced or 75ohm unbalanced
Sensitivity: Up to -36 dB in the long-haul mode
Maximum input jitter: Conforms to G.823

Clock signal

Recovered from received data stream

Signal structure and test patterns

Same as transmitter

Measurements

Alarms: LOS, AIS, LOF, LOM, RDI, RMA, LSS
Errors: Bit, code, FAS, MFAS, CRC, REBE

Performance Analysis

G.821: test pattern ES, SES, US, %ES, %SES, %US
G.826: ES, SES, BBE, US, %ES, %SES, %US.
M.2100: 2,048 Mbit/s with CRC, ES, SES, BBE, US,
%ES, %SES, %US.

Pulse shape Analysis

Rise time, fall time, pulse width, level measurement

Oscilloscope function (SW option)

Frequency passband: 0.01 to 10 MHz
Attenuation: 0dB, 6 dB, 12dB

Jitter measurement (SW option)

Measurement: Conforms to ITU O.171
Range: 0.05 to 10 UIpp
Accuracy: 0.02±5% UIpp

Ordering Information

Z04-00-001G	E1 handheld tester with Pulse Mask analysis Standard features and accessories: <ul style="list-style-type: none">▪ BERT, Pulse Mask analysis▪ Oscilloscope (positive & negative E1 pulses)▪ VF drop/insert with headset interface▪ User's manual and 1 year warranty▪ AC charger/adaptor and NiMH battery
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Replacement Items

Z88-00-002G	Jitter generation/measurement
Z88-00-003G	PC Software for protocol capture via USB
C01-00-001G	Carrying case
F02-00-004G	USB cable



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D05-00-011P A00 04/07