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VIAVI Solutions 5G

Enabling Australia's Field Technicians to build, troubleshoot and maintain better communications networks.

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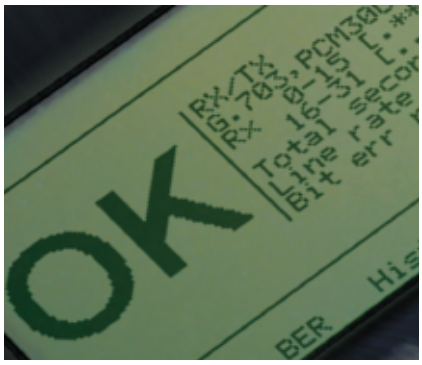
PA-25, PFA-35, EST-125, and EDT-135
Enhanced testing options for E1 and Data Testers



Key Features

- **Maximize functionality and minimize downtime with easy-to-download software options**
- **Add value to a proven JDSU testing infrastructure**
- **Enables engineers to configure and upgrade test instruments to meet changing demands**
- **Improve business performance by enhancing flexibility and reducing response times**
- **Range of enhanced testing options for E1 physical layer, E1 quality of service, E1 services, subrate multiplexing, data testing**

The JDSU E1 and Data Testers are valued as a complete test solution for telecommunications and data circuits up to 2048 kbps. These rugged, portable instruments maximize efficiency and reliability during commissioning, maintenance, and troubleshooting. They are highly cost-effective, requiring relatively low capital investment while minimizing training, installation, maintenance, and commissioning timescales.

In addition, JDSU has developed a range of enhanced testing options to further improve the functionality and flexibility of its PA-25, PFA-35, EST-125, and EDT-135 E1 and Data Testers. These easy-to-download software options minimize downtime and maximize efficiency. They enable installation, testing, and commissioning engineers to configure and upgrade instruments according to changing circumstances. This creates greater flexibility and reduces response times, both vital factors in improving overall business performance.

Standard Options

G.826 option

The G.826 option allows in-service, quality of service (QoS) testing on 2 Mbps links to ITU-T recommendation G.826. Block-based measurements allow both near-end and far-end testing to be performed simultaneously. The easy-to-use option automatically calculates pass/fail limits based on the performance objective ratio and the percentage allocation of the link under test. Results can be displayed and printed in both histogram and numeric formats.

Technical specification

Results analysis in accordance with ITU-T Draft Rec. G.826 (July 1995)

M.2100 option

The ITU-T M.2100 series of recommendations provides operators with a clear and consistent set of limits and procedures to use when bringing circuits into service or when monitoring circuits for maintenance purposes. Testing to this recommendation offers significant improvements over other recommendations because out-of-service measurements are minimized and parameters are the same for all plesiochronous data rates. This easy-to-use option provides test result analysis to ITU-T M.2100 and automatically calculates pass, fail and uncertain limit values based on the performance reference objective ratio and the allocation of the link under test.

Technical specification

Results analysis in accordance with ITU-T Rec. M.2100 (Jul 95) and M.2110 (Oct 92)

Extended PRBS option

The ITU-T recommends various PRBS patterns that simulate "real" traffic when testing networks. To test through a network correctly, the length of the test pattern should increase with size as the transmission bit rate increases (see table). The PRBS option adds the PRBS patterns of 2^{20}–1 and 2^{23}–1, allowing the instrument to be used for testing through a network.

2^{9}–1	Error measurement on data circuits at bit rates up to 14400 bps
2^{11}–1	Error and jitter measurements at bit rates of 64 kbps and n x 64 kbps
2^{15}–1	Error and jitter measurements at bit rates of 1544, 2048, 6132, 8448, 32064 and 44736 kbps
2^{20}–1	Error measurements on data circuits at bit rates up to 72 kbps
2^{23}–1	Error and jitter measurements at bit rates of 34368 and 139264 kbps

Technical specification

PRBS patterns in accordance with ITU-T Rec. O.151, O.152 and O.153

E1 Testing Options

E1 Level Measurement option

The Level Measurement option provides a troubleshooting tool for E1 circuitsthat helps users determine if poor network performance is caused by low-level signals. During installation, this option allows losses through network elements and cable installations to be easily determined.

Technical specification

	75Ω UnbalancedΩ	**120Ω Balanced**Ω
Measurement range (dB)	–15 to +2 dB	–15 to +2 dB
Error limit	±1 dB	±1 dB
Measurement range (V)	421 mV to 2.98 V	533 mV to 3.77 V
G.703 nominal level (0 dB)	2.37 V	3.00 V
Tapping loss at 1 MHz	0.23 dB	0.33 dB
Return loss	As defined in ITU-T G.703 10/98, Sect 9.3	

E1 Pulse Shape Analysis option

Incorrect pulse shape due to jitter or incorrectly terminated interfaces will cause poor network performance. The E1 Pulse Shape Analysis option will quickly assist in identifying network problems during installation, commissioning or trouble-shooting by comparing the pulse with the ITU-T G.703 pulse mask. The option averages and normalizes the received E1 pulse and automatically displays the result against the ITU-T mask. Comprehensive numeric results – including E1 signal level measurement – provide detailed information to assist further diagnosis.

Technical specification

Interfaces		
G.703 unbalanced (75Ω) and balanced (120Ω) signals		
Pulse level display range	–5 to +3 dB	–5 to +3 dB
Measurement range (dB)	–15 to +2 dB	–15 to +2 dB
Accuracy over measurement range	±1 dB	±1 dB
Measurement range	421 mV to 2.98 V	533 mV to 3.77 V
Tapping loss at 1MHz	0.23 dB	0.33 dB
Return loss	As defined in ITU-T G.703 10/98, Sect 9.3	

E1 Testing Options

Jitter option

The Jitter option implements a unique, patented, digital measurement technique for measuring and generating jitter. This technique makes jitter testing possible using a small handheld instrument. The ability to both analyze and transmit jitter signals makes it easy to determine important jitter characteristics of network elements. This option allows measurement of intrinsic jitter, maximum tolerable jitter, and jitter transfer to be made easily.

Technical specification	
Manual jitter measurement	
Rx accuracy	50 Hz to 100 Hz 0.1UI or 10%, whichever is greater 100 Hz to 100 kHz 0.05UI or 5%, whichever is greater
Rx resolution	0.01UI
Rx frequency range	50 Hz to 100 kHz
Tx accuracy	0.05UI or 5%, whichever is greater
Tx resolution	0.083UI
Tx frequency range (nominal)	20 Hz to 100 kHz
Maximum tolerable jitter measurement	
Tx accuracy	0.05UI or 5%, whichever is greater
Tx resolution	0.083UI
Tx frequency range (nominal)	0.083UI to >20UI
Number of measurement frequency points	12
Test patterns	2^9-1, $2^{11}-1$, $2^{15}-1$ (2 Mbps)
Results format	Tabular and graphical
Jitter transfer measurement	
Rx accuracy	50 Hz to 100 Hz 0.1UI or 10%, whichever is greater 100 Hz to 100 kHz 0.05UI or 5%, whichever is greater
Rx resolution	0.01UI
Rx frequency range	50 Hz to 100 kHz
Tx accuracy	0.05UI or 5%, whichever is greater
Tx resolution	0.083UI
Tx level	0.17 to 1.00UI
Tx frequency range (nominal)	20 Hz to 100 kHz
Number of measurement frequency points	12
Test patterns	2^9-1, $2^{11}-1$, $2^{15}-1$ (2 Mbps)
Results format	Tabular and graphical
Intrinsic jitter of instrument	<0.01UI
Results approximate to ITU-T G.823 and 0.171	

All Ones and All Zeros HistogramSoftware option

The All Ones and All Zeros Histogram option extends the histogram capability of the instrument. During long duration testing, this option allows the start and duration of these alarms to be easily identified.

Technical specification
Adds two histograms, all ones/zeros with resolution of 60 days to one hour's resolution, or 60 hours to one minute's resolution.

E1 Testing Options

Noise Measurement option

The Noise Measurement option enables full functional testing of multiplexer codecs during installation and commissioning. The option allows a digitally encoded sine wave of static or swept level and frequency to be injected into a user-selected time slot. Simultaneously, the level and frequency of encoded data in the received frame can be analyzed. Analysis features include measurements for weighted noise and total distortion. Total Distortion allows quantization and signal to total distortion ratio to be made, with user-selectable psophometric and notch filters.

Technical specification

Receiver measurements

Measurements	**Filters**	**ITU-T Recs.**
Standard (flat)	None	
Weighted noise	Psophometric	ITU-T 0.41
Quantization noise	1020 Hz/820 Hz notch plus Psophometric	ITU-T 0.132
Signal to total distortion ratio	1020 Hz/820 Hz notch plus Psophometric	ITU-T 0.132

Timeslot decode according to ITU-T G.711 A law

Level measurement accuracy (no filters selected)

	200 Hz	**3.5 kHz**
+3.14 dBm0 to –55d Bm0	±1.0 dB, ±1.0 Hz	±1.0 dB, ±1.0 Hz
	At 820 Hz	**At 1020 Hz**
+3.14 dBm0 to –50 dBm0	±0.2 dB, ±5 Hz	±0.2 dB, ±5 Hz
–50 dBm0 to –55 dBm0	±0.3 dB, ±5 Hz	±0.3 dB, ±5 Hz

Measurement rate: 2 per second

Noise measurement accuracy

	200 Hz	**3.5 kHz**
+3.14 dBm0 to –55 dBm0	±1.0 dB, ±1.0 Hz	±1.0 dB, ±1.0 Hz
–50 dBm0 to –55 dBm0	±2.0 dB	±2.0 dB

Measurement rate: 2 per second

Signal to total distortion ratio measurement accuracy

Signal to total distortion (SNR) ratio according to ITU-T Rec. 0.132 and ITU-T Rec. G.712, (1992) Section 12

Measurement rate: 1 per 4 seconds

Transmitter accuracy

	200 Hz	**3.5 kHz**
+3.14 dBm0 to –50 dBm0	±0.3 dB, ±5 Hz	±0.3 dB, ±5 Hz
–50d Bm0 to –55 dBm0	±0.4 dB, ±5 Hz	±0.4 dB, ±5 Hz
	At 820 Hz	**At 1020 Hz**
+3.14 dBm0 to –50 dBm0	±0.2 dB, ±2 Hz	±0.2 dB, ±2 Hz
–50 dBm0 to –55 dBm0	±0.4 dB, ±2 Hz	±0.4 dB, ±2 Hz

Subrate Testing Options

X.50 option

X.50 is a multiplexing structure used at 64 kbps to allow the transport of several lower rate data channels within the 64 kbps bandwidth. The X.50 option enables comprehensive testing of X.50 (64 kbps) and X.50 PCM (2 Mbps) systems.

Technical specification	
X.50 64 kbps modes	
Interfaces	X.21/V.11 DTE, V.35 DTE & DCE, V.36/RS449 DTE DCE, G.703 Codir.
Rx/Tx mode	
Framing	Division 2 and 3
Test Pattern insertion/evaluation	n x 600 bps, 19.2 kbps, 48 kbps
Idle code	1111, 0000, 2^7-1
Programmable housekeeping bits A to H	
Programmable Idle/BERT status bits	
Display of housekeeping and status bits	
X.50 frame analysis	
Through mode	
As Rx/Tx, with non-BERT octets connected through from receiver to transmitter.	
D and I mode	
As Through with non-Drop/Insert octets connected through from Rx to Tx	
Drop/Insert via sync V.24 with DCE emulation	
600 bps, 1.2, 2.4, 4.8, 9.6, 19.2 kbps	
Drop and insert bit rates equal	
MUX/DEMUX mode	
X.50 receiver/transmitter as for Rx/Tx mode	
Error analysis on BER pattern in selected octets	
Unframed transmitter/receiver on V.11, V.24, V.35 or V.36/RS449, with DTE emulation	
PCM 2 Mbps modes	
G.703 2 Mbps	75Ω unbalanced, 120Ω balanced, HDB3/AMI
Rx/Tx mode	
As X.50 Rx/Tx, with X.50 frame carried in one time slot of the G.704 framed 2 Mbps signal and independent selection X.50 transmit and receive time slots.	
MUX/DEMUX mode	
Receiver/transmitter as for X.50 PCM Rx/Tx mode	
Error analysis on BER pattern in selected octets	
Unframed transmitter/receiver on V.11, V.24, V.35 or V.36/RS449, with DTE emulation	

Subrate Testing Options

HCM option

The HCM option enables comprehensive testing of links carrying the Newbridge proprietary V.24 rate adaption and subrate high capacity multiplexing (HCM) scheme. The option allows configuration of network equipment to be checked end-to-end, and allows stress testing by insertion of various errors. Monitoring a line carrying traffic for alarms and control line status, carried within the HCM frame, allows rapid and focused troubleshooting.

Technical specification	
HCM framing	HCM framing only, HCM-2 not supported
HCM data	Single D or T channel, Sync. or Async. modes
Sync mode	
Bit rate (D Channel)	n x 800 bps (n = 1 to 79)
Bit rate (T Channel)	n x 8 kbps (n = 1 to 7)
Async mode	
Bit rate (D Channel)	n x 800 bps (n = 1 to 79)
Bit rate (T Channel)	n x 8 kbps (n = 1 to 7)
Data+Stop Bits	7+1, 7+2, 8+1, 8+2
Parity	None, Even, Odd, Mark, Space
Error Injection	Bit, HCM FAS, HCM Signaling FAS, HCM AIS, SAIS
Results	H. frame sync loss, H. sig sync loss, H. sig loss, H. frame loss, H. frames, H. frame err, H. sig err, H. frame BER, H. sig BER

V.110 option

The V.110 protocol enables the multiplexing of data from V.24 terminals into ISDN frames. The V.110 option allows V.110 framed data to be transmitted and received via single time slots in the G.703 interface. It also allows data to be dropped from the V.110 frame to the V.24 and V.11 interfaces. Results screens are also provided showing the status of the transmitted and received E-bits and S-bits in the V.110 frame together with V.110 error statistics.

Technical specification	
V.110 Framing	To ITU-T V.110 (1988) with user configurable E, S and X bits
V.110 Data	600 bps to 56 kbps for sync. data or 600 bps to 19.2 kbps for async., with rate adaptation as per ITU-T V.110 and I.460
Results	E, S and X bits, V.110 frame sync., V.110 FAS error, V.110 FAS BER V. redundant bit errors, V.110 parity

Data Testing Options

V Interface Status Monitor option

The V Interface option provides additional results screens during data testing that display the status of both signaling and control lines. This information helps to speed the process of fault diagnosis when interfaces fail to operate satisfactorily. This option also allows softkey control of various control lines, depending on the interface and mode selected.

Technical specification	
Interfaces	X.21/V.11 – direct connection in DTE mode or K1505 in DCE mode V.24 – direct connection in DTE mode or K1539 in DCE mode V.35 – K1537 in DTE mode or K1538 in DCE mode

V Delay option

The V Delay option complements the built-in E1 Delay mode by allowing propagation delay over synchronous data circuits to be determined.

Technical specification	
Sync. interfaces	X.21/V.11, V.24 (RS232), V.35, V.36 (RS449), EIA-530
Baud rates	50 bps to 2048 kbps depending on interface
Max delay measurement	10s
Errors limit	±1µs ±baud rate^{-1}

Datacom option

The Datacom option provides the host instrument with additional functionality for testing V.24 asynchronous modems at baud rates up to 115.2 kbps. Hayes commands strings can be used to initialize, dial and hang-up a call prior to performing a BER test in either Half-Duplex or Full-Duplex modes. optional CTS handshaking can also be activated. Additional screens that display control lead status complement BER results, control lead timing and bias distortion information.

Technical specification	
Bit rates	50 to 38400 bps at a resolution of 1 bps, 115.2 kbps
Stop bits	1, 1.5, 2
Bits per character	6, 7, 8
Patterns	2^6–1, 2^9–1, 2^{11}–1, 2^{15}–1; 1111, 0000, 1010, 2048, QBF1, QBF2, QBF3, QBF4; User programmable byte
Line mode	Full duplex, half duplex
Tx disable	None, CTS
Modem dial up	Init. string, dial string, hang-up sequence (not 6 bits per char)
Control lead timing	Timing between transitions on two selectable control leads
Timing resolution	1 ms
Timing accuracy	±1ms
Bias distortion	(available when control lead timing is OFF)
Bias distortion resolution	1%
Bias distortion accuracy	±1% ±1 digit up to 9600 bps, ±5% ±1 digit over 9600 bps

E1 Services Testing Options

Frame Relay option

The Frame Relay option provides all the features required for installation, commissioning, and maintenance of frame relay circuits without complex protocol decoding and analysis. The powerful autoconfigure feature allows the instrument to autoconfigure to the network link management and start turn-up testing using a single keystroke. End-to-end connectivity and load testing of the circuit can be performed using the Ping and Fox test features.

Technical specification	
Interfaces	G.703 Framed, X.21/V.11, V.24 (RS232), V.35
Modes	NNI, UNI DTE and DCE
Link management types	ANSI T1.617 Annex D, ITU-T Q.933 Annex A, LMI, None
Header lengths	2, 3, 4
Error injection	FCS Error, FCS Abort
Turn up test	
Measurements	Elapsed Time, Transmitted Frame Count, Received Frame Count
Alarms counts	No Signal, AIS, Frame Sync. Loss, No Clock, No Flags, No Response, No Request
Error counts	Bad Frame, FCS Error, Errored Frame, Status Enquiry Sequence Error, Status Response Sequence Error, FECN Frames, BECN Frame, DE Frame
Statistics	Average Tx and Rx Frame Rates, Peak Tx and Rx Frame Rates, Average Tx and Rx Utilization (%)
Fox test	
Frame size	64 to 4096 bytes
% Load	1 to 95%
Control bits (set/reset)	FECN, BECN, DE
Fox results	Available on completion and as for turn up test
Ping test (continuous pinging)	
Ping test parameters	IP source address, IP destination address
Ping encapsulation	IETF, Ether
Ping results	Max. and Min. round trip times, no response, Tx and Rx frame count

GSM option

The GSM option provides various enhanced operating modes required for the installation and front line maintenance of Abis and A interfaces within the GSM network. Testing modes permit monitoring or BER testing of both links and 16 k channels, while the comprehensive results screens display the content and status of individual channels on the link.

Technical specification	
Interface	G.703 (2 Mbps)
Framing	PCM31, PCM31CRC
Line codes	HDB3, AMI
GSM Traffic channel framing	TRAU frame to GSM 8.60 (Receive only)
Modes	
Rx	Alignment to TRAU uplink or downlink frames in single traffic channel. BERT on TRAU FAS, Frame Erasure Ratio indication
Rx/Tx	BERT on unframed data within 16 kbps channel. Drop or Insert 16 kbps channel via V.11
Through	G.703 frame passed through from receiver to transmitter. Features as Rx/Tx except drop and/or Insert 16 kbps channel. From Rx clocking only allowed
Status	Status page giving overview of all traffic channels/timeslots and their content
Results	Zoom-in pages for timeslot or channel showing states of 16 kbps channel or 64 kbps timeslot. Identification of LAPD or SS7 signaling in 64 kbps timeslots. Identification of LAPD signaling in 16 kbps traffic channels for DCS1800 systems. Recognition of EFR speech TRAU frames. Examination of TRAU bits and their status. Indication of the EFR speech sub channel CRCs in the form of an OK page. This gives an indication of the transfer quality, as any bit losses will cause the CRC to be invalid for that section

Specifications

Ordering information

	PA-25/PFA-35	EST-125/EDT-135
Standard options		
G.826 option	BN4534/00.34	BN4562/00.34
M.2100 option	BN4534/00.13	BN4562/00.13
Extended PRBS option	BN4534/00.36	BN4562/00.36
E1 Testing options		
E1 Level Measurement option	N/A	BN4562/00.52
E1 Pulse Shape Analysis option	N/A	BN4562/00.56
Jitter option	BN4534/00.42	BN4562/00.42
Large Frequency Offset option	BN4534/00.19	BN4562/00.19
All Ones/Zeros Histogram option	BN4534/00.20	BN4562/00.20
Noise Measurement option	BN4534/00.23	BN4562/00.23
Subrate Testing options		
X.50 options	BN4535/00.14	BN4562/00.14
V.110 options	BN4535/00.32	BN4562/00.32
HCM option	BN4534/00.38	BN4562/00.38
Data Testing options(1)		
V Interface Status Monitor option	BN4535/00.28	BN4562/00.28
V Delay option	BN4534/00.48	BN4562/00.48
Datacom option	BN4534/00.44	BN4562/00.44
Services Testing options		
Frame Relay option	BN4535/00.41(2)	BN4562/00.41(3)
GSM option	BN4534/00.15	BN4562/00.15

(1)PFA-35 and EDT-135 only
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