



2008 Global Test & Measurement  
Emerging Company of the Year Award



## VePAL TX150

### Handheld SONET Test Set

**SONET network testing simplified**  
VeEX™ VePAL TX150 is a next generation test solution for SONET networks transporting legacy and next generation services.

### Platform Highlights

- High resolution color touch-screen viewable in any lighting conditions fitted with protective cover
- Robust, handheld chassis packed with powerful and flexible features for demanding environments and test conditions
- Ethernet port connection for remote control, back office applications, workforce management and triple play service verification
- USB memory stick support and FTP upload capability for test result storage and file transfer respectively
- Maintain instrument software, manage test configurations, process measurement results and generate customer test reports using included ReVeal™ PC software
- Supports advanced IP testing; Ping, web browser, and FTP upload/download via Ethernet port

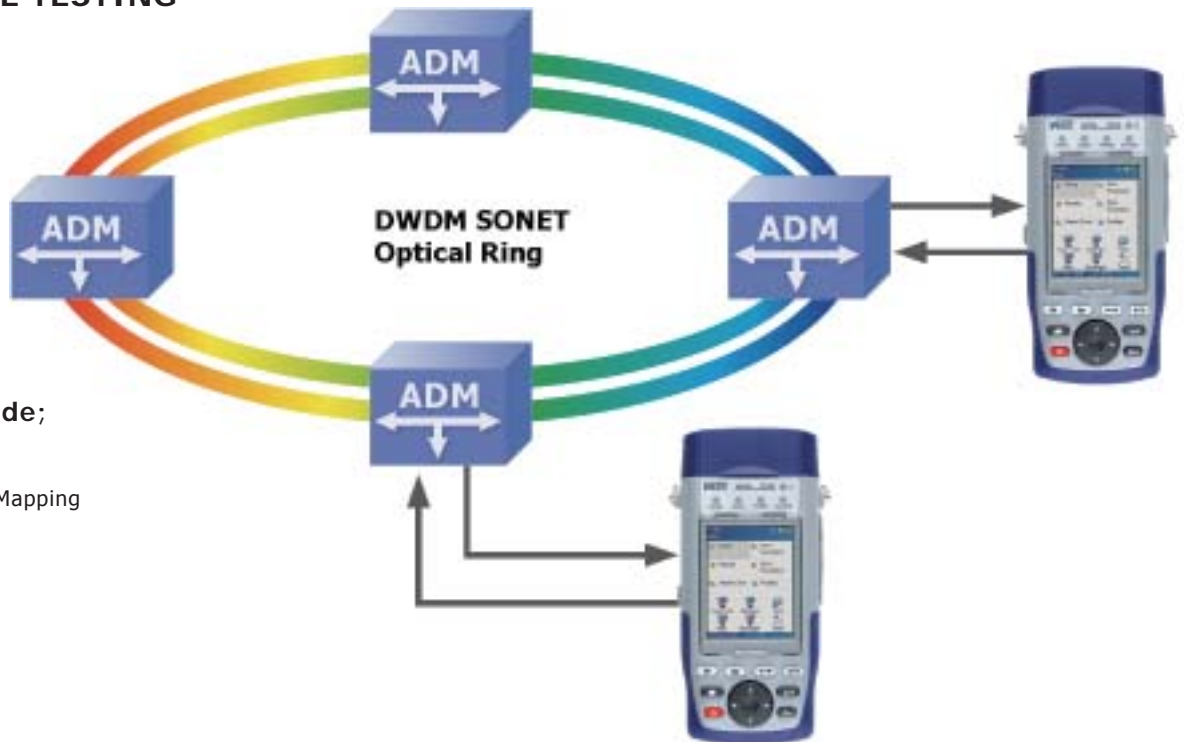
### Key Features

- DS1, DS3, OC-3, OC-12 and OC-48
- Full Rate DS1 and Fractional Nx56 or Nx64 kbit/s testing
- Flexible wavelength/bit rate options using industry standard SFPs conforming to the Multi Source Agreement (MSA)
- Optical Power, Level and Frequency measurements
- Configuration of network type, bit rate, line coding, framing, mapping, and test pattern
- Concatenated Payloads
- Bit Error and Performance Analysis
- Error and Alarm Generation and Analysis
- Histogram and Event analysis for errors and alarms
- Transmit Frequency Offset to stress clock recovery circuits
- Section and Path Overhead Monitoring and Byte decoding

## APPLICATIONS

Installation, commissioning, monitoring and maintenance of SONET networks simplified thanks to a combination of intuitive features and powerful test functions. When multiplexing several low order tributaries together, SONET signals are often compromised by various impairments in the process. Defining the type of anomaly or defect is crucial in isolating the network element or signal path causing the problem and reducing costly network downtime. Fast troubleshooting and comprehensive analysis of transmission problems can be performed using intrusive, non-intrusive and monitoring test modes.

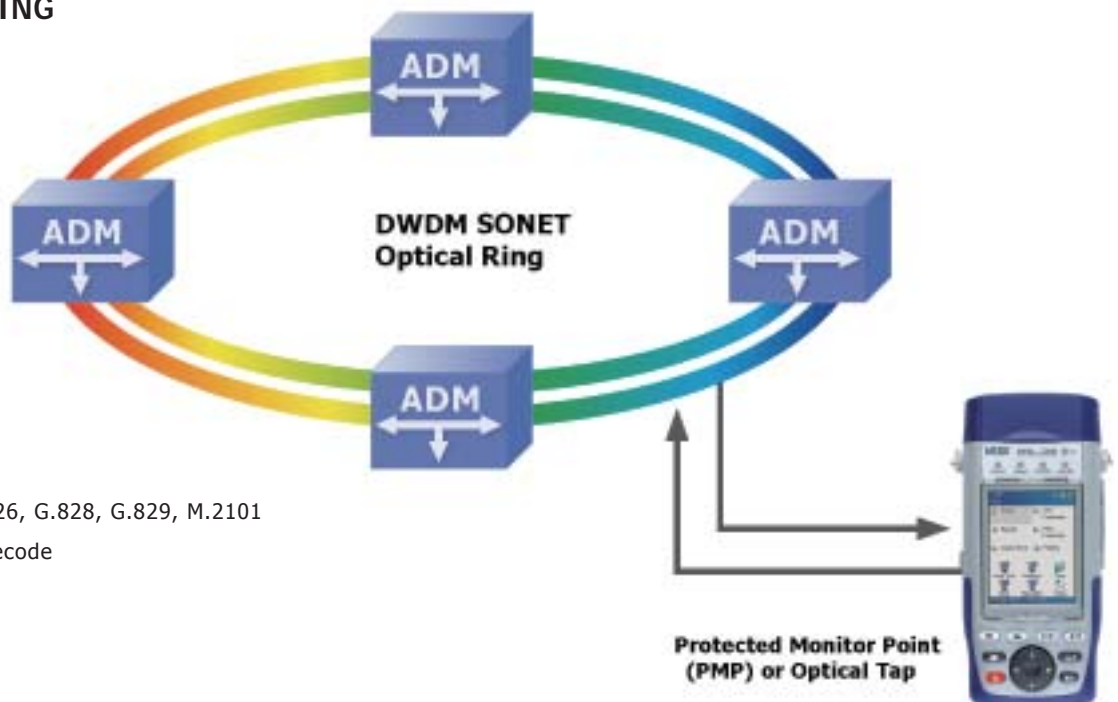
### OUT OF SERVICE TESTING



#### Applications include;

- End-to-end BERT
- Tributary Mapping/de-Mapping

### IN-SERVICE MONITORING



#### Applications include;

- Optical Power and Frequency
- Tributary Scanning
- Performance Analysis per G.826, G.828, G.829, M.2101
- Overhead Byte Control and Decode

# SPECIFICATIONS

## ELECTRICAL INTERFACES

Bantam (100 ohm)

Rates and line code:

- 1,544 Mbit/s, AMI & B8ZS

BNC (75 ohm unbalanced)

Rates and line code:

- 44,736 Mbit/s, B3ZS

Compliant to ITU-T G.703, G.823, G.824, G.825, G.772 and ANSI T1.102 recommendations where applicable

## CLOCK SYNCHRONIZATION

Internal: ± 3.5 ppm

Recovered:

External reference via SMA connector

- Clock: 1,544 MHz (sine wave or TTL)
- Signal: 1,544 Mbit/s (AMI or HDB3)

Tx Frequency Offset:

- Up to 25,000 ppm in steps of 0.1 ppm for both optical and electrical interfaces

## OPTICAL INTERFACES

Small Form Factor Pluggable (SFP) transceivers compatible with Multi Source Agreement (MSA)

ROHS compliant and Lead Free per Directive 2002/95/EC

Operating temperature range: -10°C to 70°C

Safety: Class 1, per FDA/CDRH, EN (IEC) 60825 eye safety and EN (IEC) 60950 electrical safety regulations

Compliant to ITU-T G.957 – Optical interfaces and systems relating to SDH (VeEX supplied SFPs only)

Optical Power Measurement: ± 2dB accuracy, 1dB resolution (VeEX supplied SFPs only)



SFP optical transceiver selection table (Refer to ordering options)

Specifications		OC-3/12			OC-3/12/48		
		301-01-004G	301-01-005G	301-01-006G	301-01-007G	301-01-008G	301-01-009G
<b>General</b>	Optical option	1310	1310	1550	1310	1310	1550
	Wavelength (nm)	15	40	80	15	40	80
	Range (km)	Up to 622	Up to 622	Up to 622	Up to 2488	Up to 2488	Up to 2488
	Line rate (Mbps)	LC duplex	LC duplex	LC duplex	LC duplex	LC duplex	LC duplex
	Connector	NRZ	NRZ	NRZ	NRZ	NRZ	NRZ
<b>Transmitter</b>	Laser type	Fabry Perot	DFB	DFB	DFB	DFB	DFB
	Wavelength range (nm)	1274 to 1356	1280 to 1335	1480 to 1580	1270 to 1360	1280 to 1335	1500 to 1580
	Spectral width (nm)	2.5	1	1	1	1	1
	Output power (dBm)	-15 to -8	-3 to +2	-3 to +2	-5 to 0	-2 to +3	-2 to +3
<b>Receiver</b>	Detector type	PN	PN	PN	PN	APD	APD
	Sensitivity (dBm)	-28 to -8	-28 to -8	-28 to -8	-23 to -10	-30 to -15	-30 to -15
	@ 155 Mbps	-28 to -8	-28 to -8	-28 to -8	-22 to 0	-29 to -9	-29 to -9
	@ 622 Mbps	N/A	N/A	N/A	-18 to 0	-27 to -9	-28 to -9
	@ 2.488 Gbps	1260 to 1600	1260 to 1600	1260 to 1600	1270 to 1600	1270 to 1600	1270 to 1600

# SONET FUNCTIONS

## OPERATING MODES

Terminated mode

Monitor mode

Intrusive Through mode

- Modification of selected SOH bytes
- Alarm Generation and Error Insertion of selected defects and anomalies respectively

Non-Intrusive Through mode

- Pass entire signal through without modification of section and line overhead bytes

## PATTERNS

The following test patterns can be generated:

- PRBS:  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ ,  $2^{31}-1$ : normal or inverted
- Fixed: 0000, 1111, 1010, 1000 and 1100
- User programmable word: user defined up to 24 bits

## ERRORS

Insertion of;

- FAS, B1, B2, MS-REI, B3, HP-REI, LP-REI, LP-BIP, slips and bit errors

Insertion mode:

- Single and rate ( $1 \times 10^{-3}$  to  $5 \times 10^{-6}$ )

Detection of;

- FAS, B1, B2, MS-REI, B3, HP-REI, LP-BIP, LP-REI, and bit errors

## ALARMS

Generation of;

- LOS, LOF, MS-AIS, MS-RDI, RS-TIM, AU-LOP, AU-AIS, HP-UNEQ, HP-PLM, HP-RDI, HP-TIM, TU-LOM, TU-LOP, TU-AIS, LP-UNEQ, LP-PLM, LP-RDI, LP-RFI, LP-TIM, 2M AIS, 2M LOF, 2M RDI

Insertion mode: Static (Enable/Disable)

Monitoring and simultaneous detection of;

- LOS, LOF, OOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-UNEQ, HP-PLM, HP-TIM, HP-RDI, TU-LOM, TU-AIS, TU-LOP, LP-UNEQ, LP-PLM, LP-TIM, LP-RDI, LP-RFI

## OVERHEAD ANALYSIS AND GENERATION

Analysis – Decode and display;

SOH/POH bytes in hexadecimal, binary or ASCII formats;

- S1 synchronization status
- C2 HP signal label
- J0 trace identifier (16 bytes) in ASCII format
- J1 trace identifier (16 or 64 bytes) in ASCII format
- J2 trace identifier (16 or 64 bytes) in ASCII format
- K1, K2 APS Control
- V5 LP signal label

Generation - Programmable Bytes

RSOH:

- J0 trace: 1 byte hexadecimal or 16 byte ASCII sequence with CRC-7

MSOH:

- K1, K2 APS bytes per ITU-T G.783 and G.841
- S1 synchronization status message

HO-POH (VC-4, VC-3):

- J1 trace: 16 byte ASCII with CRC-7 or 64 byte ASCII sequence
- C2 signal label
- H4 Sequence / Mutiframe Indicator
- G1 (bit 5) – End to end path status (RDI generation)
- K3 (bits 1-4) APS signaling

LO-POH (VC-3):

- J1 trace: 16 byte ASCII with CRC-7 or 64 byte ASCII sequence
- C2 signal label
- G1 (bit 5) – End to end path status (RDI generation)
- K3 (bits 1-4) APS signaling

LO-POH (VC-12, VC-11):

- V5 (bits 5-7) LP signal label
- J2 trace: 16 byte ASCII with CRC-7 or 64 byte ASCII sequence
- K4 (bits 3-4) LP APS signaling

## POINTER ANALYSIS/GENERATION

Analysis

- Current value, Increments, decrements, sum, difference
- New Data Flags (NDF)
- Tributary frequency offset (ppm of AU/TU)

Generation

- Single pointer, increment, decrement, or increment / decrement
- Programming of SS bits

## TRIBUTARY SCAN

Automatically scan VC-12s for errors, alarms and events using sequential BER

# DS1/DS3 FUNCTIONS

## OPERATING MODES

Terminated mode

Monitor mode

Bridge

## SIGNAL STRUCTURE

1,544 Mbit/s (DS1)

- Unframed or Framed SF (D4), ESF per ANSI and Telcordia standards where applicable
- Test signal in N x 64 kbit/s, N x 56 kbit/s where N=1 to 24

44,736 Mbit/s (DS3)

- Unframed or Framed M13 and C-Bit Parity

## PATTERNS

The following test patterns can be generated:

- PRBS:  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ ,  $2^{31}-1$ : normal or inverted
- Fixed: 0000, 1111, 1010, 1000 and 1100
- User programmable word: user defined up to 24 bits

## ERRORS

Insertion;

- 1,544 Mbit/s (DS1): Code, FAS, Bit, Frame, CRC
- 44,736 Mbit/s (DS3): Code, FAS, MFAS, P/C-Parity, Bit errors

Measurement:

- Code, FAS, MFAS, 2M CRC, P/C-Parity, Bit errors

## ALARMS

Generation:

- 1,544 Mbit/s (DS1): AIS, yellow, idle, LOS, LOF
- 44,736 Mbit/s (DS3): LOS, LOF, OOF, AIS, Parity

Measurement:

- LOS, AIS, LOF, OOF, IDLE, YELLOW and LSS

## MEASUREMENT FUNCTIONS

### TEST RESULTS

Error count, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS, and rate for all events: errors, alarms and pointer events

### PERFORMANCE ANALYSIS

Measurements according to:

- ITU-T G.821 recommendation: ES, EFS, SES, DM, and UAS with HRP 1% to 100%
- ITU-T G.826 recommendation: EB, BBE, ES, EFS, SES, UAS. HRP of 1% to 100%.
- In service measurement (ISM) using B1, B2, B3, FAS, CRC or Code (E1).

- Out of service measurement (OOS) using bit errors (TSE)
- ITU-T G.828 recommendation: ES, EFS, SES, BBE, SEP, UAS with HRP 1% to 100%
- ITU-T G.829 recommendation: ES, EFS, SES, BBE, UAS on RSOH (B1), MSOH (B2) or TSE
- ITU-T M.2100 recommendation: ES, EFS, SES, UAS with HRP 1% to 100%.
- User defined thresholds for Maintenance (MTCE) and Bringing into Service (BIS) objectives.
- ITU-T M.2101 recommendation: ES, EFS, SES, BBE, SEP, UAS with HRP 1% to 100%.
- User defined thresholds for Maintenance (MTCE) and Bringing into Service (BIS) objectives. In service measurements on both near and far ends of path using TSE, HP-BIP (B3), MS-BIP (B2), RS-BIP (B1) and LP-BIP (V5)

## COMMON FUNCTIONS AND MEASUREMENTS

### FREQUENCY MEASUREMENT

- Optical & Electrical Interfaces: Hz & bit/s in ppm
- Resolution: 1Hz

### EVENT LOGGING

Date and time stamped events in tabular format

### HISTOGRAMS

Available for all interfaces

- Display of Errors and Alarms versus time
- Resolution: Seconds, minutes, hours and days

### LED INDICATORS

- Fixed LEDs for Signal, Framing, Pattern and Errors/Alarms
- Soft LEDs for SDH/PDH Alarms/Errors displaying historical events and conditions.

## GENERAL SPECIFICATIONS

Size	210 x 100 x 55 mm (H x W x D) (8.25 x 3.75 x 2.25 in)
Weight	Less than 1 kg (less than 2.2 lbs)
Battery	Lilon Battery Pack, Operating time > 3 hours
AC Adapter	Input: 100-240 VAC, 50-60 Hz Output: 15VDC, 3.5A
Operating Temperature	-10°C to 50°C (14°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% non-condensing
Display	3.5"QVGA 320x240 full color touch screen
Ruggedness	Survives 1m (3 ft) drop to concrete on all sides
Water-resistance	May be used in heavy rain
Interfaces	USB 2.0 Host and Client, RJ45 10/100T Ethernet
Languages	Multiple languages can be supported

## ORDERING INFORMATION

Z04-00-003P VePAL TX150 Handheld SONET Test Set

### Interfaces/Test Options

499-05-046	APS/Service Disruption Measurement
499-05-047	Tandem Connection Monitoring
499-05-048	ITU-T G.783 Pointer Test Sequences
499-05-084	OC-3 Optical Testing (require SFP option)
499-05-085	OC-3/OC-12 Optical Testing (require SFP option)
499-05-086	OC-3/OC-12/OC-48 Optical Testing (require SFP option)
499-05-087	DS1 Pulse Mask Analysis
499-05-088	DS3 Pulse Mask Analysis
499-05-089	1.544Mbit/s and VT-1.5 mapping**
499-05-090	2.048Mbit/s and VT-2.0 mapping**
499-05-091	2.048Mbit/s Pulse Mask Analysis
499-05-092	2.048Mbit/s E1 testing**

\*\* Check factory for availability

### SFP Transceiver Options

301-01-004G	1310nm IR (15km), 155M/622M STM1/4 - OC3/12
301-01-005G	1310nm LR (40km), 155M/622M STM1/4 - OC3/12
301-01-006G	1550nm LR (80km), 155M/622M STM1/4 - OC3/12
301-01-007G	1310nm IR (15km), 155M/622M/2.5G STM1/4/16 - OC3/12/48
301-01-008G	1310nm LR (40km), 155M/622M/2.5G STM1/4/16 - OC3/12/48
301-01-009G	1550nm LR (80km), 155M/622M/2.5G STM1/4/16 - OC3/12/48

### Additional Options

499-05-001	Web Browser (require advanced IP option)
499-05-002	NetWiz
499-05-003	Remote Control
499-05-007	VoIP Expert
499-05-008	IPTV Expert
Z88-00-001G	WiFi Wiz, incl. USB WiFi Adaptor
Z88-00-001P	VoIP Call Expert, incl. VoIP USB Adaptor & Earplug
Z88-00-005G	Advanced IP, incl. Ethernet Cable

### Recommended Accessories

F02-00-010G	BNC to BNC Test Cable, 2 m
F02-00-011G	Bantam to Bantam Test Cable, 2m
F05-00-005G	LCPC to LCPC Duplex Optical Patchcord, 2 m
F05-00-006G	LCPC to SCPC Duplex Optical Patchcord, 2 m
F05-00-007G	LCPC to FCPC Duplex Optical Patchcord, 2 m

### Replacement Items

405-02-001G	Screen Protector
A01-00-001G	AC Adaptor
A02-00-001G	Car Adaptor
B02-03-001G	Battery Pack
C01-00-001G	Carrying Case (Basic)
C02-00-002G	Carrying Pouch
C03-00-001G	Shoulder Strap
F02-00-001G	Ethernet Cable RJ45 to RJ45 2 m (6 ft)
F04-00-001G	Power Cord - US 2 m (6 ft)
F04-00-002G	Power Cord - EU 2 m (6 ft)
F04-00-003G	Power Cord - UK 2 m (6 ft)
Z77-00-001G	Stylus (pack of 5)



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