



# VePAL UX400

## Universal Test Platform

### Next Generation Modular Platform for Transport, Carrier Ethernet, Mobile Backhaul, and Legacy Testing

VeEX® UX400 is the industry's most flexible, compact, and future-proof test solution for OTN, SDH, SONET, PDH, T-Carrier, Carrier Ethernet, Mobile Backhaul, Core, and Storage Area Networks<sup>1</sup>.



VeEX UX400 is the first truly robust portable chassis to offer test capabilities ranging from DS1/E1 to 100GE and beyond, allowing any combination of test modules tailored for each particular application or set of requirements.

Its versatile and flexible hardware and software architecture optimize configurations to meet users' specific needs. This includes transport applications at rates ranging from DS1/E1 to OC-768/STM-256/OTU3 and OTU4 to Carrier Ethernet Transport applications from 10M to 40GE/100GE, Fibre Channel from 1G to 16G and beyond<sup>1</sup>.

Its modular architecture allows for up to six independent test modules and up to twelve concurrent tests or combination of tests. It also allows simultaneous users to share the platform and run independent tests, maximizing the use of resources.

A large bright 10.4" TFT color LCD with touch panel offers enhanced viewing and operation, while an intuitive graphical user interface simplifies menu navigation, accelerates test setup, and enhances presentation of results.

<sup>1</sup> Test interfaces, data rates, mappings, transmission protocols, and features depend on the availability of individual test modules

## Platform Highlights

- Intuitive Multi-user graphical user interface (GUI) with touch screen control
- Multi-test. Up to 12 independent concurrent tests
- Field exchangeable test modules
- Robust, portable chassis packed with powerful and flexible features for demanding environments and test conditions
- SCPI scripting/remote control and VNC™ support
- Fast and efficient test result transfer to USB memory stick or FTP upload
- Built-in optical power meter and visual fault locator option
- Built-in GPS receiver for system clock synchronization option
- Built-in Atomic clock option, which can be disciplined and calibrated by the GPS signal
- Industrial grade SSD (Solid State Disk) with up to 32 GB of storage space
- High-capacity Li-ion battery pack for uninterrupted testing and added portability
- Portable with weight less than 10 kg including battery pack
- Rack mount version available
- Built-in VGA monitor port for external monitor or projector connection
- Operate with USB mouse and keyboard
- Maintain instrument software, manage test configurations, process measurement results and generate customized test reports using included ReVeal™ software

### Multi-port, Multi-tasking, Multi-user

A powerful combination offering a high density of test ports with the flexibility of individual or combined concurrent tests for local and remote users, in a portable package. It can replace a rack full of stationary test gear.



Up to 12 independent test ports: Six test modules with up to two independent test ports each, provide great flexibility by allowing virtually any combination of technologies and rates.

### Available Test Modules\*

The UX400 modules, with all their physical interfaces and data rates, are a perfect complement to the UX400 Platform, enabling a full range of link and service testing capabilities for a complete DS1/E1 to OTU4, 10 Mbps to 100 GE, and 1G to 16G FC in a single compact unit.

The modules can be housed in the UX400 Platform for portable, field test applications or can be mounted into a UX400R 19" rack-mount chassis for R&D lab or production environments where battery operation or display is not required. When equipped with dual port test option, up to two users can configure and run separate/simultaneous tests at different rates enabling more efficient use of the equipment.

*\*Check individual module data sheet for details*

#### 100G & 40G OTN and Ethernet (UX400-100G)

The UX400 100G module offers physical interfaces for OTU3, OTU4, 40G and 100G Ethernet testing.

Installation, commissioning, monitoring and maintenance of OTN and Ethernet networks is simplified thanks to a combination of intuitive features and powerful test functions.

Fast troubleshooting and comprehensive analysis of transmission problems can be performed using an intuitive interface. Novice users will benefit from the easy-to-use GUI, while experienced users will appreciate the array of advanced features such as OTL/PCS, CAUI/XLAUI Lane BERT, overhead monitoring and byte control, Tandem Connection Monitoring, capturing and decoding, traditional BERT and throughput test, and much more.

#### General

- Double-slot test module
- CFP port compliant to MSA standards
- Up to two 100G modules in one UX400 can be coupled for full bidirectional testing

#### OTN

- OTN testing for OTU4 and OTU3
- Complete Mapping/Multiplexing
- ODU0 and ODUflex
- Ethernet over OTN
- Service Disruption and APS measurements
- Tandem Connection Monitoring
- Overhead monitoring and byte decoding
- Payload and Line through monitoring
- Per-lane optical power and frequency measurements

#### Ethernet

- 100G and 40G Ethernet Testing
- Optical Lane BERT
- CAUI/XLAUI Lane BERT
- PCS Layer Testing with Skew generation/monitoring
- Service Disruption Measurements
- Throughput, latency, jitter, frame loss, and back-to-back measurements per industry-standard RFC2544
- Multi-stream testing with up to 32 fully independent and configurable streams
- IPv4 and IPv6 traffic generation
- Q-in-Q (VLAN stacking) and multiple MPLS tag support
- BER testing at Layer 2 and Layer 3 with or without VLAN and MPLS tags
- Smart Loop mode for Layer 2 and Layer 3 with all key measurements on received traffic provided on the loopback port
- 1-way latency measurement between remote devices (with GPS synchronization or 2 modules in the same unit)
- Line rate packet capture with Wireshark™ decode

#### 40G OTN/SDH/SONET (UX400-40G)

The UX400-40G module offers physical interface for OTU3, STM-256 and OC-768 testing.

Installation, commissioning, monitoring and maintenance of OTN, SDH, SONET client side interfaces are simplified thanks to a combination of intuitive features and powerful test functions.

Fast troubleshooting and comprehensive analysis of transmission problems can be performed using intrusive, non-intrusive and monitoring test modes. Novice users will benefit from the easy-to-use auto-configuration and tributary scan test modes, while experienced users will appreciate the array of advanced features such as overhead monitoring and bytecontrol, pointer test sequences, path trace generation, Tandem Connection Monitoring and much more.

- Single-slot test module
- UX400 platform supports two UX400-40G modules operating simultaneously
- OTN testing for OTU3 client interfaces
- SDH/SONET testing for STM-256/OC-768 client interfaces
- Single BERT
- Service Disruption and APS measurements
- Round trip delay measurements
- Path trace and pointer generation and analysis

- Overhead monitoring and byte decoding
- Tandem Connection Monitoring
- OTU2 with SDH/SONET payloads
- SDH/SONET mapping down to VC12/VT2 and VC11/VT1.5
- Transmit frequency offset
- SDH/SONET Payload through and monitoring modes

### 10G OTN/SDH/SONET/Ethernet (UX400-10G)

The UX400 10G module offers physical interfaces for OTU2, STM-64, OC-192, 10G Ethernet, 8G/10G Fibre Channel testing.

Installation, commissioning, monitoring and maintenance of OTN, SDH, SONET, Ethernet and Fibre Channel networks is simplified thanks to a combination of intuitive features and powerful test functions.

Fast troubleshooting and comprehensive analysis of transmission problems can be performed using intrusive, non-intrusive and monitoring test modes. Novice users will benefit from the easy-to-use GUI, while experienced users will appreciate the array of advanced features such as test profiles, service disruption, VLAN and tributary scans, round trip delay, one-way latency and much more.

#### General

- Single-slot test module
- Dual XFP optical ports
- Up to two independent tests per module

#### OTN/SDH/SONET

- OTU2 testing with SDH/SONET and PDH/DSn payloads
- EoOTN Testing: OTU1e/2e with Bulk and Ethernet payloads
- STM-64/OC-192 testing with mapping down to VC12/VT2 and VC11/VT1.5
- PDH (E1, E3), DS1, DS3 payload analysis
- Single or Dual BERT
- External clock interfaces and TX frequency offset
- Optical power and frequency measurement
- Round trip and port 1 to port 2 one way delay measurements
- Service Disruption and APS measurements
- Path trace and pointer generation and analysis
- Overhead monitoring and byte decoding
- Tandem Connection Monitoring
- Bi-directional payload through and monitoring

#### Ethernet

- 10GE-LAN and 10GE-WAN testing
- Single or Dual BERT
- BERT testing at Layer 1, 2, 3 and 4
- Throughput, latency, frame loss, and back to back measurement per RFC2544 and V-SAM (per ITU-T Y.1564)
- Multiple stream traffic generation and analysis for end-to-end QoS verification of multiple services
- Port 1 to Port 2 one-way latency measurement
- Service disruption measurement
- Transmit frequency offset to stress the network up to  $\pm 150$  ppm
- MPLS tagging
- MAC flooding and VLAN flooding
- VLAN stacking/Q-in-Q
- IP Testing
- Line rate packet capture with Wireshark™ decode

#### Fibre Channel

- 8G and 10G Fibre Channel
- Link verification for Storage Area Networks
- Layer 2 testing
- BERT, Throughput and RFC2544-based testing
- Buffer-to-buffer Credits
- Layer 1 and 2 Loopbacks

### 2.5G OTN/SDH/SONET/PDH/DSn (UX400-2.5G)

The UX400 2.5G module's lower rate physical interfaces for OTU1, SDH, SONET, legacy PDH and DSn/T-carrier interfaces, is a perfect complement to the UX400, enabling a full range of link testing capabilities from DS1/E1 to OTU4.

Installation, commissioning, monitoring and maintenance of OTN, SDH, SONET, PDH, DSn networks is simplified thanks to a combination of intuitive features and powerful test functions.

Fast troubleshooting and comprehensive analysis of transmission problems can be performed using intrusive, non-intrusive and monitoring test modes. Novice users will benefit from the easy-to-use auto-configuration and tributary scan test modes, while experienced users will appreciate the array of advanced features such as overhead monitoring and byte control, pointer test sequences, path trace generation, Tandem Connection Monitoring and much more.

- Dual SFP optical ports supporting OTU1, STM-0/1/4/16, OC-1/3/12/48 bit rates
- Dual unbalanced ports (BNC) for E1, E3, E4, DS1, DS3, STS-1, STM-0e and STM-1e
- Dual balanced ports (RJ48 or Bantam) for E1 and DS1
- Single or dual BERT capabilities
- Each port can be independently configured and operated
- Optical power, level and frequency measurements
- Concatenated payloads
- Full rate E1, DS1, fractional N/M x 64 kbps or 56 kbps testing
- Non-intrusive pulse mask analysis at E1, E3, DS1, DS3 bit rates
- Bit error and performance analysis per ITU standards
- Section and path overhead monitoring, byte decoding
- Path trace generation and analysis
- Tandem Connection Monitoring
- Pointer generation and analysis
- Service disruption testing and APS
- Round trip delay on all interfaces and payload mappings
- Jitter/Wander Analysis (E1, E3, DS1, DS3 and STM-1o, OC-3)

### 1G Ethernet (UX400-1G)

#### General

- Single-slot test module
- Up to two independent tests per module

#### Ethernet

- Dual 10/100/1000Base-T RJ45 ports, Dual 100Base-FX/1000Base-X SFP ports
- Throughput, latency, jitter, frame loss, and back-to-back measurements per industry-standard RFC2544
- V-SAM test suite compliant with ITU-T Y.1564 standard
- IPv4 and IPv6 traffic generation
- Q-in-Q (VLAN stacking) and multiple MPLS tag support
- MAC flooding and VLAN flooding
- BER testing at Layer 2, Layer 3 and Layer 4, with or without VLAN and MPLS tags

- Multiple stream traffic generation and analysis for end-to-end QoS verification of multiple services
- Peer-to-peer symmetrical or asymmetrical test to a remote VePal test set with measurements at each end
- Smart Loop mode for Layer 1, Layer 2, Layer 3, and Layer 4 with all key measurements on received traffic provided on the loopback port
- VLAN Scan
- Line rate packet capture with Wireshark™ decode

#### Packet Network Synchronization

- Supports IEEE 1588v2/PTP Master Clock and Slave clock emulation
- IEEE 1588v2/PTP protocol monitoring and decoding
- IEEE 1588v2/PTP PDV analysis
- ESMC SSM generation, monitoring, and decoding

#### Fibre Channel

- 1G/2G/4G Fibre Channel support for Storage Area Networks
- Terminate and Loopback operations mode
- FC-1 and FC-2 Layer testing
- RFC2544 compliance testing

### 16G Fibre Channel (UX400-16G)

The UX400 16G test module supports 1G, 2G, 4G, 8G, 10G and 16G Fibre Channel testing.

New technology drivers such as multi-core processors, high-density servers, server virtualization and SSD storage arrays are driving the need for increased performance and bandwidth in Storage Area Networks. Considering Fibre Channel's stringent performance requirements and the fact that SANs often cover large distances, it is important to test at each phase of network deployment to verify service levels.

The UX400 16G test module provides wire-speed traffic generation at all commercially available FC rates in a single, multi-rate test module and supports FC-2 BER testing for link integrity measurements. This flexible module also supports latency, and buffer-to-buffer credit measurements for complete SAN installation, commissioning, and troubleshooting tasks.

#### General

- Single-slot test module
- Dual SFP+ optical ports
- Up to two coupled or independent tests per module

#### Fibre Channel

- Full line-rate traffic generation/analysis at 1.0625, 2.125, 4.25, 8.5, 10.52 and 14.025 Gbps
- Traffic generation from 0.01% to 100%
- FC-1 and FC-2 BERT, and Throughput testing
- RFC2544 Verification – Throughput, Latency, Frame Loss, Burstability (Back-to-Back Frames)
- Performance Measurements – Delay, Packet Jitter, Sequencing
- Frame Length configuration up to 2148 bytes
- Traffic shaping: Constant, Ramp, and Burst profiles
- FC-2 Frame Header configuration
- Flow Control Support with configurable buffer-to-buffer credits
- Primitive Sequence Protocol support, link initialization, link reset, link failure
- Layer 1 and 2 Loopbacks including FC-2 Smart Loop mode
- Packet Capture and decode of error events with selectable triggers
- Automated Test Reports and Event Log based on Errors and Alarms
- Service Disruption Measurement

## Precision Time References

The UX400 platform offers two highly accurate and stable clock reference options to provide precise timing to all its test modules. The physical clock can be used as a reference for frequency and wander measurements and the UTC time of day (ToD) can be used for time-sensitive tests like one-way-delay measurements.

Disciplining and holdover: Combining the accuracy of the GPS option, the stability of the Atomic clock option and its battery operation, the UX400 offers precision clock source even in places where GPS is not available or can't be trusted (e.g. in-building or urban canyon applications).

#### Built-in GPS

The optional high-sensitivity GPS module provides precise UTC synchronization to the UX400 modules, in the form of internal 1PPS clock synchronized to the coordinated second and time stamps.

Frequency: L1, 1575.42 MHz

Channels: 20

Sensitivity:

- Cold start: -144 dBm
- Tracking: -159 dBm

Clock Output: 1PPS (internal)

Accuracy

- Time: 50 ns RMS
- Position: 5m

Acquisition Time

- Cold start: 35s
- Hot start: 1s

Recommended Antenna

- Type: Active
- Gain: >15 dBi
- Noise: <1.5 dB
- Connector: BNC, 50 Ohms
- Power: 3.3 Vdc, 30 mA

Temperature range: 0 to 45°C

#### Built-in Rubidium Atomic Clock

The optional Rb Atomic clock module provides a highly stable clock source to the UX400 modules, in the form of a 1PPS signal. The 1PPS phase can also be disciplined to UTC (requires GPS option) to be used in holdover mode for extended time (e.g. temporary holdover reference for indoor usage).

Accuracy: ±50 ns

Aging: < 3.0E-10/month

Warm-up time: <120s

Temperature range: 0 to 45°C

## Optical Tools

### Optical Power Meter

The optional OPM helps checking for proper output power from optical ports before safely making an optical connection or running a test.

Wavelength Range: 800 to 1700 nm

Calibrated Wavelengths

- MMF: 850 nm
- SMF: 1310, 1490, 1550 nm

Power Range: -50 to 23 dBm

Accuracy:  $\pm 0.5$  dB

Display Units: dBm

Fiber types: 9/125 to 100/140  $\mu$ m

Connector: Universal 2.5 mm adapter

### Visual Fault Locator

The optional built-in VFL provides a convenient tool for identifying fibers and checking them for bends, breaks or continuity.

Modes: CW and 1 Hz

Visible Wavelength: 650 nm

Power output: 5 mW / 7 dBm

Connector: Universal 2.5mm interface for quick and easy connection

### Digital Fiber Inspection Scope

Digital video microscope probes\* can connect directly to the UX400 platform through one of the USB2.0 ports. Featuring live video feed on the UX400 screen for visual analysis. It offers capture, compare (before and after), save and export files to USB flash drives.

Dirty connectors could damage or degrade the performance of expensive optical modules, or produce inaccurate results. Inspecting and cleaning patch cord and pluggable optics connectors before mating them is always recommended.

*\*Check with factory for supported models*

## Connectivity Tools

### IP Tools (Management Port)

Built-in 10/100/1000Base-T port

Supports connection profiles (save and retrieve)

Modes: IPv4, IPv6, PPPoE

MAC Address: Factory default or user configurable

Network

- VLAN: Up to two tags
- IP Modes: Static, DHCP
- DHCP Modes: Unicast, Broadcast
- Host Name: user configurable
- Client ID: Auto, Manual, Disabled
- Client FQDN: Auto, Manual, Disabled
- Vendor Class ID: User configurable

Ping testing

### Wi-Fi Wiz (Wireless LAN)

Optional 802.11b/g/n USB dongle

Access Point Scan and Connection

- SSID, Encryption, channel, frequency, signal strength, link quality, MAC address
- WEP, WPA, WPA2
- 2.4 and 5 GHz (USB dongle dependent)

Network

- VLAN: Up to two tags
- IP Modes: Static, DHCP
- DHCP Modes: Unicast, Broadcast
- Host Name: user configurable
- Client ID: Auto, Manual, Disabled
- Client FQDN: Auto, Manual, Disabled
- Vendor Class ID: User configurable

Ping testing

### Ping Test (Connectivity Check)

Configuration

- Supports test profiles (save and retrieve)
- Destination: IP address or URL (DNS)
- Packet Size: 46 to 1518
- # of Pings: 1 to 10000
- Ping Rate: 1 to 1000 ping/s
- Continuous generation (ON/OFF)

Ping Results

- Sent, Received, Missing, Unreachable

Round Trip Delay

- Current, Minimum, Maximum, Average
- Resolution: 0.001 ms

## Management & PC Tools

### ReVeal™ UX400

Included standard with each test set, ReVeal™ PC software provides an easy-to-use and intuitive interface that allows you to take full advantage of your UX400 test platform by providing the following productivity tools:

- Convenient test profile management
- Flexible test results management
- Powerful report generation

Compatible with Windows™ XP, Windows Vista and Windows 7, 32 bits or 64 bits operating systems.

### SCPI Remote PC Client & Command Builder

The optional multi-user remote control client and SCPI configuration generator provides an intuitive and complete interface to build test profiles and run independent tests. It also serves as the SCPI library reference tool to help users build individual typo-free commands as well as complete configuration batches that can be copied directly to scripting tools.

- Independent concurrent multi-user operation
- Individual user names and passwords
- Session management (start and release remote sessions)
- Assign and release test modules to a session
- Control individual parameters via user interface
- Generate SCPI commands
- Capture and copy SCPI commands
- Create test profiles
- Real-time results
- Save results
- Capture SCPI results

### VNC™ Server

The built-in VNC server provides easy and convenient remote operation with screen and mouse mirroring. Supports most common VNC clients providing platform-independent access from many PCs, tablets and mobile devices. Web browser client also supported (no VNC client installation required).

- Shared multi-user environment
- Shared passwords
- View-only client mode

## General

Display	TFT 10.4" full color touch-screen LCD
Interfaces	VFL - Visual Fault Locator (optional) OPM - Optical Power Meter (optional) 10/100/1000Base-T management port (RJ45) Wi-Fi 802.11b/g/n (optional USB dongle) Bluetooth 2.0 (optional USB dongle) 2x USB2.0; VGA monitor port
Audio	Standard headphone/microphone jacks (3.5 mm), Built-in speaker
Languages	Multiple languages can be supported
Battery	Li-ion smart battery; 8400 mAh 14.8VDC (optional)
AC Adaptor	Input: 100-240 VAC, 50-60 Hz Output: 19 VDC, 9.47 A
Size	360 x 270 x 180 mm (W x H x D) 14.2 x 10.6 x 7.1 in
Weight	Less than 10 kg (22 lb) with battery Less than 15 kg (33 lb) fully loaded with modules and battery
Operating Temperature	0°C to 45°C (32°F to 113°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% non-condensing
Ruggedness	Survives 0.5 m drop to concrete on all sides
Certifications	CE

