TrendCommunications

Features and Benefits

Victoria STM-16/OC-48

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1 Introduction and Positioning

Victoria STM-16/OC-48 is a hand-held measuring device for performing analysis and generation in SDH (STM-16, STM-4, STM-1, STM-0, G.832 SDH in 34 Mbit/s), SONET (OC-48, OC-12, OC-3, STS-3, OC-1, STS-1), PDH (all hierarchical levels) and DSn (1.5 and 45 Mbit/s).

1. Installation and acceptance tests for SDH and SONET devices (multiplexers, ADM, cross-connects, line regenerators).
2. Bringing-into-service of digital paths.
3. In-service maintenance (rapid localization of failures and performance evaluation).

One of the most common tasks is the creation of both synchronous and plesiochronous digital transmission circuits (paths), for which a simple PASS/FAIL test must be performed in line with recommendations.

The structure of contemporary transmission networks is based on optical fiber rings. These rings are organized in levels, depending on the geographical area they are to serve. Lower level rings are subsidiaries of the higher level rings (for example, those covering regional areas). Victoria STM-16/OC-48 is an instrument that allows to test all levels in the SDH/SONET ring hierarchy up to 2.5 Gbit/s, starting from local rings running at 155 Mbit/s and arriving to high capacity national or international links at 622 Mbit/s or 2.5 Gbit/s.

In addition, some specific applications are performed at bit rates higher than 155 Mbit/s. A typical example would be ATM high capacity interfaces or IP over SDH/SONET. In this case, VC-4-4c and VC-4-16c virtual containers are used and therefore measurements at STM-4 and STM-16 must be performed. For this, Victoria STM-16/OC-48 is the right option.

The liberalization of telecoms around the world has brought about the need to interconnect SDH and SONET networks. There are international gateways that switch SDH and SONET signals directly and, as a result, have interfaces from both hierarchies. Tests on these network elements require hybrid devices, such as Victoria STM-16/OC-48. But ANSI interfaces are not only used at international gateways. In some European countries, the use of T-Carrier interfaces is starting to become common. These are North American plesiochronous hierarchies (specifically at 45 Mbit/s) and this growth in their use in Europe is due to the fact that they make better use of the bandwidth of the VC-3 used instead of mapping 34 Mbit/s signals, for applications such as the transport of video (MPEG). This is yet another reason for incorporating these interfaces into Victoria STM-16/OC-48.

2 Key Benefits

A benefit becomes a sales argument when it satisfies a need the purchaser has. Key benefits are related to the most outstanding characteristics of the instrument, since they can be used as sales arguments for a great number of situations. The key benefits outlined below are not listed in order of importance, as the purchasers themselves must determine the real importance of each point. In any case, these benefits are expanded on later in this document, in the tables showing features / functions / benefits.

1. As a true hand-held device (it can be held with one hand), it is easy to transport and handle.
2. Easy to use and learn, thanks to its user-friendly GUI.
3. All events are displayed instantly by SoftLEDs, thus enabling the user to perform the appropriate corrective action at the moment when the event occurs.
4. Versatility: Measurements can be performed in the vast majority of SDH/SONET paths, all PDH paths, and T-Carrier 1.5 and 45 Mbit/s paths. All ETSI and ANSI-defined interfaces in a single instrument.
5. Integrated multi-hierarchy optical interfaces: SDH/SONET standard optical interfaces at 155, 622 and 2488 Mbit/s share the same built-in optical connector.

6. Integrated multi-hierarchy electrical interfaces: PDH/T-Carrier standard electrical interfaces at 1.5, 2, 8, 34, 45, 140Mbit/s, and SDH/SONET standard electrical interfaces at 52 and 155Mbit/s share the same built-in electrical connector.
7. Saves time: The fact that Victoria carries out measurements simultaneously means that the user can avoid having to perform tests time and again, and also makes it easier to come up with a failure diagnosis by showing events detected during the period in which they occur.
8. The user can measure error characteristics and carry out the bringing-into-service of PDH and SDH networks, thanks to the performance measurements incorporated in the instrument (G.821, G.826, M.2100, M2101.1).
9. Quick and easy programming of the device and display of results, with a large color touch-screen.
10. Quick and accurate localization of events with the fastscan function for errors and alarms.
11. It is easy to produce complete and accurate reports, due to the possibility of downloading results to a PC.
12. The user can analyze measurements carried out over a long period of time by means of the option of storing results files.
13. Analyzing network performance is made easy by the use of histograms and time plots, in an advanced trace screen (events filtering capabilities before and after the measurement, variable resolution of the time axis, variable positioning of time plots and histograms on the screen, etc.) which provides a great deal of information about measurement results in a compact way.
14. Advanced features: Pointer sequences as per ITU G:783, TCM, offset insertion in asynchronous tributaries, insertion of M consecutive frames with alarm condition in a group of N frames to test the proper behavior of the multiplexers and other network elements (M, N are programmable).
15. Huge capability for storing events: transitional procedure in which no memory trace register is occupied if no events occur, providing memory for future registers and measurements.

3 Features / Functions / Benefits

3.1 General

Feature	Function	Benefit
Hand-held	Concentrate measuring capabilities in a small instrument.	Ease of handling and transport.
VC-4-4c/STS-12c SPE, VC-4-16c/STS-48c SPE	622 Mbit/s and 2.5 Gbit/s concatenated containers.	Carries signals that do not fit in smaller containers (e.g., ATM high capacity interfaces and IP over SDH/SONET).
G.832 in 34 Mbit/s	Carry TU-12s in special frame at 34 Mbit/s.	Possibility of better control than in PDH, due to SDH overhead bytes. Applications in GSM.
Operates with rechargeable batteries (1 pack is included)	Device can run without being connected to the external power supply (it can also run connected to the mains with or without batteries).	The user is free to move to any measuring point.
For installation, acceptance, bringing-into-service and maintenance	Versatility of applications.	Satisfies all the user's measuring needs.
O.181 compliant	Guaranteed features recommended by the ITU for SDH instruments.	Provides the user with all capabilities needed for measuring in STM-N.
Large color touchscreen	Eliminates the need for a keyboard and provides a bigger screen.	Increases legibility while keeping the instrument small.

Feature	Function	Benefit
Graphical User Interface (GUI)	Makes it easier to program the instrument.	Easy to learn and use.
Ten tricolor SoftLEDs	Visual display of detected events.	The user sees all the events as and when they occur (and can distinguish them by their color), thus enabling corrective action to be taken immediately.
SDH and SONET map	Graphical selection of SDH and SONET mapping to be worked with.	The user can see the mapping rate being selected in the SDH or SONET map both quickly and clearly.
Integrated multi-hierarchy optical interfaces at 155 Mbit/s, 622 Mbit/s and 2,5 Mbit/s	STM-N/OC-M optical interfaces share the same optical connector.	You don't need to disconnect the FO cable from one connector and connect it to another one when changing the setup of the instrument (bit rate) .
Integrated multi-hierarchy electrical interfaces	PDH/T-Carrier and SDH/SONET 155Mbit/s interfaces share the same electrical connector.	You don't need to disconnect the cable from one connector and connect it to another one when changing the setup of the instrument (bit rate).
Up to two optical transmitters (separated) in the same instrument	Connection to 1310 nm optical interface Connection to 1550 nm optical interface.	You can carry out optical measurements at 1310 nm and 1550 nm with the same instrument and without any modification.
ST, SC, FC/PC and other connectors available for the optical interfaces	Provide versatility regarding optical connectors.	The instrument can be directly connected to the most commonly used standard optical connectors (no adapters are needed).
Hybrid device for SDH/SONET and PDH/T-Carrier	Perform measurements both in European and North American synchronous and plesiochronous (asynchronous) hierarchies in a single instrument.	In addition to the usual tests for each hierarchy, also allows tests to be carried out on equipment that converts between the signals from European and North American hierarchies found in international overheads, along with measurements at T-Carrier rates that are starting to be used in Europe (e.g., 45 M).

3.2 Generation

Feature	Function	Benefit
Programming of OH bytes	Assign user values to overhead bytes.	Allows assessment of how the multiplexer responds to the values programmed in the overhead bytes.
Generation of path trace messages	Allows the user to edit path trace messages.	Allows path trace message configuration tests to be performed on network elements.
Structure of synchronous generated signal: Pattern either by mapping or by filling the payload capacity	Provides two ways of inserting test signals in different signal containers.	Complies with test structures defined in recommendations (e.g., O.181).
PDH structure: Framed/unframed pattern G.751 (140 M, 34 M), G.742 (8 M) and G.704 (2 M) ANSI structure: Framed/unframed pattern at 45 M (M13, C-bit) and unframed at 1.5 M	Insertion of test signals in the payload of PDH/T-Carrier framed signals or in the whole of the available channel bandwidth (unframed signals).	The user is provided with BER test capabilities in unframed tests and also with assessment of other errors and alarms in framed tests.
Generation of PRBS in DCC and other OH bytes	Insert test patterns in overhead bytes.	Integrity tests can be carried out on overhead bytes of synchronous signals.
Insertion of errors and generation of alarms	Simulate real situations by producing events in the generated signal.	Response of network elements to the received events can be checked.
Generation of pointer actions	Introduce pointer movements (increments, decrements, sequences) in the generated signal.	Allows the user to perform stress tests on network elements under measurement.
Generation of frequency offset	Deviation of several ppm from nominal value for frequency of generated signal.	Allows the user to perform stress tests on network elements, as well as a number of acceptance tests.
Pointer sequences according to G.783	Selection and generation of pointer action sequences defined by the recommendation G.783.	Possibility to carry out sophisticated stress tests on pointer processing circuits in the network elements under test by simulating real situations (specially when using 87/3 sequences).
M/N alarms	Introduction of bursts of M frames with alarm followed by N-M frames without alarm, in a set of N frames.	For checking the alarm activation criteria in network elements.

3.3 Analysis

Feature	Function	Benefit
Analysis of events for SDH/SONET and PDH/DSn (errors, alarms and slips, power failure)	Classify and quantify events in the signal received.	Evaluates transmission quality.
Events detected simultaneously	Detect any combination of events occurring at the same time.	Saves time, as tests can be performed in parallel and not one after the other. This makes it easier to detect and identify failures during maintenance (determining where and why the problem has occurred, due to correlation of events).
Display of OH bytes	Shows the value of overhead bytes received at all times.	Allows the user to check overhead bytes against different stimuli at all times.
Measurement of frequency and offset compared to nominal value	Obtain frequency value of signal received and its deviation from nominal value in ppm.	Checks exact frequency of the signal received and whether this is within the expected limits.
Analysis of pointer events (pointer adjustments and corresponding frequency offsets in ppm and ns) - displayed graphically	Classify and quantify pointer events in signal received.	Allows the user to assess response of network elements to pointer events.
Display of path trace messages	Capture path trace message sent from the generating section.	Allows the user to check path integrity either for the SOH or for HP or LP overhead.
Quality performance analysis: G.821, G-826, M.2100 and M.2101.1	Measurement of the error performance parameters defined by these ITU recommendations.	The user can program all types of pass/fail performance tests in SDH and PDH.
Quality performance objectives	Program user values for quality performance objectives.	Flexibility: Carry out measurements according to the specific requirements of each individual user.
Results trace	The detected events are displayed as histograms and time plots.	Result tracing is the most convenient way for the user to display the results of measurements carried out over a long period of time (e.g. ISM).
Analysis of signal structures generated by the transmitter	Classify and quantify events in signals from different hierarchies.	Duality with generation capabilities of said structures for carrying out integrity tests or BER tests.
Analysis of PRBS in DCC and other OH bytes	Classify and quantify events in overhead bytes.	Lets the user carry out integrity tests on the overhead channels of synchronous signals.
Measurement of optical power	Obtain level in dBm of optical signal analyzed.	Allows the user to check that the signal is received with minimum level of power required by the network.
Through mode	The incoming signal is sent out again exactly as received.	Allows in-service analysis to be carried out when no monitoring point or attenuating probes are available.
Tandem Connection Monitoring (TCM)	Generation and analysis of TCM events.	Allows TCM mechanism to be checked, identifying the origin of events detected in connections in which several carriers take part.

3.4 Functions

Feature	Function	Benefit
DCC transparency test	Check whether the signal introduced in the overhead of a synchronous signal (in this case in the DCC channel) is not degraded in an out-of-service loop measurement.	Lets the user check that the system maintains the integrity of the DCC channels of the synchronous signal.
Autoconfiguration	The instrument programs itself automatically in order to be able to analyze the incoming signal.	Any unknown signal can be identified and analyzed.
Fastscan	Ensure an event-free transmission in plesiochronous and synchronous signals.	Fast and accurate detection of events in plesiochronous signals and synchronous tributaries.
Round Trip Delay (RTD) measurement (I)	Measure the propagation delay both in transmission circuits and in network elements.	Allows measurements to be made in long transmission paths (such as satellite links or network backbones) in which the RTD is an important parameter.

Feature	Function	Benefit
Round Trip Delay (RTD) measurement (II)	Measure the propagation delay both in transmission circuits and in network elements.	Allows for measuring the delay introduced by a single network element (DXC, ADMs, etc.).
TIE measurements	Measure TIE by counting pointer adjustments.	Helps diagnose the cause of problems in synchronization sources.
APS measurements	Quantify APS switching time.	Lets the user check that the protection system implemented by the network meets recommendations.

3.5 Other features

Feature	Function	Benefit
Nx64kbit/s test	BER of Nx64kbit/s signals into a 2Mbit/s PCM30/31 structured signal, with contiguous and non-contiguous 64kbit/s time slots.	The user avoids the need for additional specialized testers in E1 applications.
CAS test	Analysis and generation of CAS in E1.	The user avoids the need for additional specialized testers in E1 applications.
Remote control from PC via RS-232 serial port	Program and retrieve data from the instrument in a remote location.	Comfort: The instrument can be in a remote location while the user remains in his/her usual place of work.
Printing of results via RS-232 serial port	Connection to external printer or PC.	Printout or dumping to file of measurement results for quick inclusion in reports.
Storage of performance results	Save the measurement results obtained during the periods specified.	Makes it easy to analyze the results, which are often obtained during long-term measurements.
Storage of events with a 1 second time-stamp	Save the information with high resolution.	Allows an in-depth analysis of the detected events to be carried out later with a high level of detail.
SCPI syntax-based macros (I)	Automation of measurements	Comfort: Presence of user not required (macros).
SCPI syntax-based macros (II)	Automation of measurements	SCPI is a high level programming language, so it is easy to generate macros.
SCPI syntax-based macros (III)	Automation of measurements	SCPI is an industry standard, and as such its macros are robust and reliable.
Transfer of results to PC under Windows[1]	Makes it possible to incorporate measurement results in reports and spreadsheets.	Allows the user to produce complete and accurate reports more quickly.
Storage of up to 30 macros	The instrument stores pre-programmed measurement procedures.	No need to reprogram often repeated measurements time and time again.
Storage of up to 30 measurement files (I)	The instrument stores the measurements performed.	The operator can review the measurements once they have finished and add them to reports or process, at a later date, the data they contain.
Storage of up to 30 measurement files (II)	The instrument stores the measurements performed.	Each measurement can be reviewed at a later date, thus reducing the possibility of errors in the interpretation of results by a single user.
Storage of up to 20 configuration files	The instrument stores different configuration files.	No need to reprogram often repeated configurations time and time again.
Editable text attached to files	The user can save a series of comments with the stored files.	Makes it easy for the operator to identify files saved a long time ago.
On-screen help (I)	Display of a glossary of acronyms used in the GUI.	The user can consult the meaning of an acronym at all times, without needing to carry documentation around.
On-screen help (II)	Display of a set of information regarding the model, serial number, SW version, installed SW options, etc.	The user can consult a set of information helping him to know the capabilities of his instrument.
Different languages	GUI available in English, French, German or Spanish.	The user receives information from the device in his/her own language.

1. Windows is a registered trademark of Microsoft Corporation in the USA and other countries.

3.6 Glossary

ADM: Add/Drop Multiplexer

BER: Bit Error Rate

DCC: Digital Communication Channels

DSn: Digital Signal-n (North American plesiochronous standard)

DXC: Digital Cross-connect

GUI: Graphical User Interface

MPEG: Moving Picture Experts Group (digital format for transmitting video)

PDH: Plesiochronous Digital Hierarchy (European standard)

RTD: Round Trip Delay

SCPI: Standard Commands for Programmable Instruments

SDH: Synchronous Digital Hierarchy (European standard)

SONET: Synchronous Optical Network (Standard in USA, Canada and Japan)

STM-1: Synchronous Transport Module-1 (first level signal in SDH, 155 Mbit/s)

STM-4: Synchronous Transport Module-4 (fourth level signal in SDH, 622 Mbit/s)

STM-16: Synchronous Transport Module (sixteenth level signal in SDH, 2.5 Gbit/s)

STS-1: Synchronous Transport Signal-1 (first level signal in SONET, 51.8 Mbit/s)

STS-3: Synchronous Transport Signal-3 (third level signal in SONET, 155.52 Mbit/s)

STS12c SPE: Synchronous Transport Signal-12c, Synchronous Payload Envelope (signal equivalent to a VC-4-4c in SONET)

STS48c SPE: Synchronous Transport Signal-48c, Synchronous Payload Envelope (signal equivalent to a VC-4-16c in SONET)

T-Carrier: Carrier of T-n signals (North American plesiochronous standard: T1/DS1; T2/DS2; T3/DS3)[1]

TCM: Tandem Connection Monitoring ❒

1.The use of the T2/DS2 signal (6M) has not become widespread and applications with T1/DS1 (1.5M) and T3/DS3 (45M) signals are what are mainly used instead.