Trend Communications

Features and Benefits

Victoria Jitter/Wander

Docnum: FBVAJW20E

1 Introduction and Positioning

Victoria Jitter/Wander is a handheld measuring device for performing analysis and generation in SONET (STS-1 and STS-3), SDH (STM-1, STM-0, G.832 SDH in 34 Mbit/s), PDH (all hierarchical levels) and DSn (1.5 and 45 Mbit/s) and Jitter/Wander measurements up to 155Mbit/s. It is ideal for:

1. Installation and acceptance tests for SDH and SONET devices (multiplexers, ADM, cross-connects, line regenerators). Jitter and wander measurements in all these fields can be performed by using the complete set of Victoria Jitter/Wander capabilities.
2. Bringing-into-service of digital paths.
3. In-service maintenance (rapid localization of failures and performance evaluation). Line and tributary jitter and wander measurements included in the maintenance procedures can be performed by Victoria Jitter/Wander.
4. Synchronization: wander arbitrary modulation, TIE, MTIE and TDEV measurements in real time are some of the Victoria Jitter/Wander capabilities to be used in this application field.
5. Video: some measurements such as frequency offset and frequency drift assess the video decoder requirements in video services transported in plesiochronous inside synchronous signals. Victoria Jitter/Wander includes these measurements too.

The clock recovery circuits of the network elements are not capable of following high frequency jitter. Subsequently, the sampling instants are wrong and the sampling of bits is incorrect, causing bit errors. In addition, with very large jitter amplitudes the bit errors are accumulated and produce the loss of data frames (LOF). Due to these effects, jitter in network elements (NE) has to be limited and quantified in order to compare it with the limits defined by the corresponding recommendations. Victoria Jitter/Wander includes all the necessary measurement capabilities for performing the appropriate tests on the NE regarding their behavior when faced with Jitter.

As wander is a slow phase variation, timing circuitry is capable of performing a correct sampling of bits and thus wander does not produce bit errors directly as is the case with jitter. However, a network element (NE) cannot filter wander and this is accumulated in the synchronization chain. There may be significative wander between the different signals reaching a NE, which has to provide large enough buffers to cope with this. At SDH/SONET network nodes, the pointer mechanism allows the buffers to be relatively small but produces pointer jitter at tributary outputs, and therefore bit errors. However, excessive jitter can produce overflow, and the corresponding slips. Payload jitter also produces degradation in video signals transported in PDH tributaries. At the exchange nodes, the only way to cope with buffer overflow is through controlled slips. Although loss of data frames synchronization or FAS errors are avoided, these slips produce error bursts. Due to these effects, wander at network elements (NE) has to be limited and quantified in order to compare it with the limits defined by the corresponding recommendations. Victoria Jitter/Wander includes all the necessary measurement capabilities to perform the appropriate tests on the NE regarding their behavior when faced with wander.

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 basic transmission rate between low capacity multiplexers (with plesiochronous interfaces) and high capacity multiplexers (622 Mbit/s, 2.5 Gbit/s, etc.) is 155 Mbit/s. Likewise, 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 (for example, those covering urban areas) are subsidiaries of the higher level rings (for example, those covering regional areas). The interconnection between these rings takes place in many cases at 155 Mbit/s. All of this creates a need for a measuring device like Victoria Jitter/Wander that can take the place of analyzers/generators for field applications up to 155 Mbit/s.

The liberalization of telecoms around the world has brought about the need to interconnect SDH and SONET networks. SDH networks now have to accept DS1 and DS3 payloads and multiplex them in accordance with the ITU-T recommendation G.707. At the same time, there are DXC in international overheads that switch SDH and SONET signals directly and as a result have interfaces from both hierarchies. Tests on these instruments require hybrid devices like Victoria Jitter/Wander.

What's more, 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 in Victoria Jitter/Wander.

2 Key Benefits

A benefit becomes a sales argument when it satisfies a need that 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. O.172 and O.171: J/W reliable measurements according to ITU standards
2. Arbitrary modulations for J/W can be generated to simulate all possible real situations
3. Jitter full band measurements (0.1Hz) to quantify low-frequency high amplitude jitter components
4. Great variety of J/W standard and programmable masks for pass-fail tests
5. Synchronization and video timing quality measurements as frequency offset and drift calculated from TIE
6. As a handheld device, it is easy to transport and handle.
7. Ease of use and low learning curve thanks to its user-friendly GUI.
8. All events displayed instantly by SoftLEDs, thus enabling the user to perform the appropriate corrective action at the moment when the event occurs.
9. Versatility: Measurements can be performed in the vast majority of SDH/SONET paths, all PDH paths, and DSn 1.5 and 45 Mbit/s paths.
10. Modular interfaces: interchangeable optical micromodules.
11. Saves time: The fact that Victoria carries out measurements simultaneously means 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.
12. 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).
13. Quick and easy programming of the device and display of results with a large color touch-screen.
14. Quick and accurate localization of events with the fastscan function for errors and alarms.
15. The production of complete and accurate reports is made easy by the possibility of downloading results to PC.
16. The user can analyze measurements carried out over a long period of time thanks to the option of storing results files.
17. Analyzing network performance is made easy by the use of histograms and time plots, which provide a great deal of information about measurement results in a compact way.

3 Features / Functions / Benefits

3.1 General

Feature	Function	Benefit
Hybrid device for SDH/SONET/PDH/T-Carrier (I)	Perform measurements in European and North American synchronous and plesiochronous 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. 45M)
Hybrid device for SDH/SONET/PDH/T-Carrier (II)	Perform measurements in European and North American synchronous and plesiochronous hierarchies in a single instrument	Eliminates the financial cost of needing different instruments to measure in each hierarchy when the network elements under test convert from one hierarchy to another (e.g. DXC)
Hybrid device for SDH/SONET/PDH/T-Carrier (III)	Perform measurements in European and North American synchronous and plesiochronous hierarchies in a single instrument	Reduces time needed both for learning to use the instrument and for programming measurements, since a single device is capable of programming the specific tests for each hierarchy
Hybrid device for SDH/SONET/PDH/T-Carrier (IV)	Perform measurements in European and North American synchronous and plesiochronous hierarchies in a single instrument	Saves time when programming macros and remote control commands, since there is a common programming syntax for all measurements in each hierarchy, whether it is European or North American.
Handheld	Concentrate measuring capabilities in a small instrument	Ease of handling and transport
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 (incorporated)	Device can run without being connected to the mains	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	Guarantee features recommended by the ITU for SDH instruments	Provides user with all capabilities needed for measuring in STM-1
Large color touchscreen	Eliminate the need for a keyboard and provide a bigger screen	Increases legibility while keeping instrument small
Graphical User Interface (GUI)	Make programming the instrument easier	Easy to learn and use
Ten tricolor SoftLEDs	Visual display of events detected	User sees all 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	User can see the mapping rate being selected in the SDH or SONET map both quickly and clearly
Wide range of optical interfaces available through interchangeable micromodules that are powered from the instrument itself (I)	Enable connection to all types of optical interfaces in network elements and measurement of optical power	Versatility: users do not need to always have access to electric interfaces for measurements to be performed, and will always have the necessary optical interfaces
Wide range of optical interfaces available through interchangeable micromodules that are powered from the instrument itself (II)	Enable connection to all types of optical interfaces in network elements and measurement of optical power	Smart modules: you only change what is strictly necessary (the type of optical interface)
Wide range of optical interfaces available through interchangeable micromodules that are powered from the instrument itself (III)	Enable connection to all types of optical interfaces in network elements and measurement of optical power	Small and lightweight, making it easier to carry than other devices whose modules are much larger and heavier

3.2 Jitter/Wander generation

Feature	Function	Benefit
O.171 and O.172 compliance	Victoria is a jitter/wander measurement instrument for synchronous and plesiochronous networks as defined by ITU	The user has an instrument which includes all the requirements defined by the newest international recommendations so all the necessary capabilities to perform complete and reliable tests and measurements
Jitter sinusoidal modulation from 0.1 Hz	Minimum frequency value of the sinusoidal jitter modulation signal is 0.1 Hz	Some ETSI recommendations contains masks with frequency values below 10Hz so the user has the possibility to perform measurements according to ETSI requirements
Editable arbitrary modulation (EDISA)	To generate non-sinusoidal modulation signals by using EDISA and import the signal from a PC to Victoria	The user can simulate real situations in which the jitter does not track a sinusoidal shape modulation but other shapes related to physical effects.
Editable arbitrary modulation (EDISA)	To generate non-sinusoidal modulation signals by using EDISA and import the signal from a PC to Victoria	The user can perform special measurements as those defined in ETSI recommendations about ONP for jitter tolerance or wander transfer in a SEC. In those measurements the jitter modulation stimulus is not defined as sinusoidal signal.
Editable arbitrary modulation: files (20 for jitter + 20 for wander)	To have available on files previously programmed modulation signals	The user only has to edit the arbitrary signal once. The edited signal is saved in a file that is always available for future measurements.
External modulation input	The possibility to introduce in Victoria an externally generated jitter/wander modulation signal	A PRBS-type modulation signal requires a memory size that has to be external to the equipment (external memory module). With this setup a sophisticated measurement can be performed.
External modulation input	The possibility to introduce in Victoria an externally generated jitter/wander modulation signal	An A/D converter can be connected to allow analog modulation signals to be used

3.3 Jitter analysis

Feature	Function	Benefit
O.171 and O.172 compliance	Victoria is a jitter/wander measurement instrument for synchronous and plesiochronous networks as defined by ITU	The user has an instrument which includes all the requirements defined by the newest international recommendations so all the necessary capabilities to perform complete and reliable tests and measurements
Full-band measurements from 0.1 Hz to 3.5 MHz	Jitter can be measured from low frequency components to the highest frequency components	Low frequency (0.1 to 10 Hz)-high amplitude components of pointer jitter can be measured to assess, for example, video timing quality (video is transmitted as PDH into SDH signals so pointer jitter is present in desynchronization process)
RMS jitter amplitude	Measurement of the RMS jitter amplitude value	It is useful to evaluate the jitter accumulation at the end of a regenerators chain, starting from the intrinsic jitter at the output of a single regenerator
Jitter hits	A threshold for jitter amplitude is programmed. Whenever this amplitude is surpassed a hit is counted	The user has a way to check that pointer jitter is below a programmed level in the tributaries under test in a combined/pointer jitter measurement (PDH payload desynchronization from an SDH payload in presence of pointer adjustments)
Jitter amplitude (UIpp) vs. time	Jitter amplitude is traced during the measurement	In long-term in-service or monitoring measurements jitter can be correlated with defects and anomalies measured to identify problems
Measurement filters	Filters limit the bandwidths in which jitter is measured. Victoria includes a full range of filters that can be programmed according ITU and ETSI recommendations.	The user can perform the jitter measurements in all the bandwidths defined by the recommendations to obtain reliable results according to standard measurement procedures
Transferable jitter amplitude and jitter RMS measured	The results can be transferred to a PC (CSV format) by using serial port communications. This makes it possible to incorporate measurement results in reports and spreadsheets	Allows the user to produce complete and accurate reports more quickly

3.4 Jitter tolerance function

Feature	Function	Benefit
Combined J/W tolerance	Tolerance is measured in a frequency range below and above 10 Hz	Both jitter and wander tolerances can be measured at a time so the user has a time-saving measurement
Fast tolerance measurement	The tolerance is checked vs. a pre-selected mask and the result is a pass/fail indication only	The user has a time-saving measurement when no other tolerance information is required
Tolerance masks: predefined	To be compared with the measurement result	The user can compare the result of the measurement with the limits defined by the corresponding recommendations to evaluate the behavior of his network
Tolerance masks: edited by the user	To be compared with the measurement result	The user can compare the result of the measurement with the limits he has defined to meet specific requirements
Programmable error to be detected	The amplitude of input jitter is registered in tolerance measurement when errors onset. The type of errors to be detected can be programmed choosing from various options	The user can register the tolerance when the network element detects not only bit errors but other type of errors. This supposes a more complete and versatile tolerance measurement
Tables and graphs	To display the measurement results	A table provides exact values measured and the graph provides a general result at a glance, and an easy way to compare these results with a previously selected mask
Transferable tolerance results and masks (50 results files and 40 masks files)	The results can be transferred to a PC (CSV format) by using serial port communications. This makes it possible to incorporate measurement results in reports and spreadsheets	Allows the user to produce complete and accurate reports more quickly

3.5 Jitter transfer function

Feature	Function	Benefit
Results of prior tolerance measurements	For every frequency value, the jitter amplitude used is the tolerance value at this frequency	The signal-to-noise ratio is better at the highest possible amplitudes so the jitter transfer measurement is more accurate
Transfer masks: predefined	To be compared with the measurement result	The user can compare the result of the measurement with the limits defined by the corresponding recommendations to evaluate the behavior of his network
Transfer masks: edited by the user	To be compared with the measurement result	The user can compare the result of the measurement with the limits he has defined to meet specific requirements
Programmable jitter generated signal	Jitter generated template can be predefined or user-defined	Starting from previous or modified tolerance results, the have a wide range of stimulus possibilities for transfer measurements, to check the transfer of diverse jitter from input to output (more realistic measurements)
Transferable transfer results and masks (50 results files and 40 masks files)	The results can be transferred to a PC (CSV format) by using serial port communications. This makes it possible to incorporate measurement results in reports and spreadsheets	Allows the user to produce complete and accurate reports more quickly

3.6 Wander analysis

Feature	Function	Benefit
MTIE/TDEV masks: predefined (40 masks files)	To be compared with the measurement result	The user can compare the result of the measurement with the limits defined by the corresponding recommendations to evaluate the behavior of his network
MTIE/TDEV masks: edited by the user	To be compared with the measurement result	The user can compare the result of the measurement with the limits he has defined to meet specific requirements

Feature	Function	Benefit
Transferable TIE, MTIE, TDEV (50 results files)	The results can be transferred to a PC (CSV format) by using serial port communications. This makes it possible to incorporate measurement results in reports and spreadsheets	Allows the user to produce complete and accurate reports more quickly
Real time evaluation of MTIE and TDEV without external PC	MTIE and TDEV results are displayed on the Victoria screen in real time	The user does not need neither external PC nor a software application to obtain these results. In addition, the results are obtained in real time; waiting time is avoided
MRTIE	Subtraction of frequency offset from TIE MTIE and TDEV measurements	The user avoid incorrect wander measurements when a frequency offset is present as a ramp TIE superimposed in the real TIE measurement
Frequency offset	Offset of the signal frequency when compared with its nominal value expressed in ppm	Standards specify frequency offset limits when a network element switches from a clock source to other or to holdover regime. The user is capable to perform this measurement to check for compliance with these standards
Frequency offset	Offset of the signal frequency when compared with its nominal value expressed in ppm	To assess the video timing quality the color subcarrier frequency offset is a key parameter that helps to select an appropriate video decoder to obtain the video signal from the PDH/T-Carrier signal (if the frequency offset is high a high-performance decoder is required)
Frequency drift	Drift of the frequency offset expressed in ppm/s	Standards specify frequency drift limits when a network element switches from a clock source to other or to holdover regime. The user is capable to perform this measurement to check for compliance with these standards
Frequency drift	Drift of the frequency offset expressed in ppm/s	To assess the video timing quality the color subcarrier frequency drift is a key parameter that helps to select an appropriate video decoder to obtain the video signal from the PDH/T-Carrier signal (if the frequency drift is high a high-performance decoder is required)

3.7 SDH/SONET/PDH/T-Carrier 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	Allow user to edit path trace messages	Allows path trace message configuration tests to be performed on network elements
Structure of synchronous signal generated: Pattern mapped or by filling the payload capacity	Provide 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 (140M, 34M), G.742 (8M) and G.704 (2M) ANSI structure: Framed/unframed pattern at 45M (M13, C-bit) and unframed at 1.5M	Allow the insertion of test signals in plesiochronous signals or in the whole of the channel available	User 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 signal generated	Response of network elements to events generated can be checked
Generation of pointer actions	Introduce pointer movements (increments, decrements, sequences) in the signal generated	Allows user to perform stress tests on network elements under measurement
Generation of frequency offset	Deviation of several ppm from nominal value for frequency of signal generated	Allows 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 recommendation G.783	Possibility to carry out sophisticated stress tests on pointer processing circuits in the network elements under test

Feature	Function	Benefit
Pointer sequences according to G.783	Selection and generation of pointer action sequences defined by recommendation G.783	Pointer sequences are necessary for pointer (combined) jitter measurement on tributary ports
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

3.8 SDH/SONET/PDH/T-Carrier analysis

Feature	Function	Benefit
Analysis of events for SDH/SONET and PDH/DSn (errors, alarms and slips, power failure)	Classify and quantify events in 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	Show value of overhead bytes received at all times	Allows 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 expect 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 user to assess response of network elements to pointer events
Display of path trace messages	Capture path trace message sent from generating section	Allows user to check path integrity either for the SOH or for HP or LP overhead
Quality performance analysis: G.821, G-826 and M.2100	Measure performance parameters defined by those recommendations cited	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	Present events detected in histograms and time plots	Results 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	Allows user to carry out integrity tests on the overhead channels of synchronous signals
Measurement of optical power	Obtain level in dBm of optical signal analyzed	Allows user to check that 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

3.9 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	Allows user to check that the system maintains the integrity of the DCC channels of the synchronous signal

Feature	Function	Benefit
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 in an important parameter
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	Allows user to check that the protection system implemented by the network meets recommendations

3.10 Other features

Feature	Function	Benefit
Remote control from PC via RS-232 serial port	Program and retrieve data from the instrument from 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]	Make 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	Avoids the need to reprogram often repeated measurements time and again
Storage of up to 10 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 the data they contain at a later date
Storage of up to 10 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	Avoids the need to reprogram often repeated configurations time and again
Editable text attached to files	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
Onscreen help	Display 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
Different languages	GUI available in English, French, German or Spanish	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.

3.11 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 (North American standard)

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

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.