



## **SDH/PDH and Jitter/Wander Test Set**

### **CTS 850**

**This product is discontinued.**

#### **Features**

- STM-0, STM-1 and STM-4 Transmit and Receive
- STM-16 Transmit and Receive (with ST2400A)
- VC4-4c Concatenated Payload Testing
- 2, 8, 34 and 140 MB/s PDH Mux/Demux with N/Mx64 kb/s Testing
- 45 MB/s (DS3) Mapping/Demapping
- Complete Jitter and Wander Tests at all Equipped Line Rates from 2 MB/s to 622 MB/s in One Option Plus 45 MB/s. Exceeds New ITU-T O.172 Requirements
- Real-time Wander Analyst Application Software for MTIE, TDEV, Frequency Offset and Drift-rate Measurements
- Performance Analysis per G.821, G.826, G.827, M.2100 and New M.2101.1
- Full-band Jitter Measurements to 0.1 Hz with Variable High-pass Cutoff Frequencies
- Pointer Analysis and Test Sequences per G.783
- SDH/PDH Defect Generation and Analysis
- Manipulation of K1/K2 Bytes for MSP/APS Testing
- Field-interchangeable 1310 nm and 1550 nm Optical Interfaces
- AutoScan with Graphical Display of Signal Format and Payload
- Histogram Results, Correlated Alarms, Defects, Errors and Events to 1-Second Resolution
- Pass/Fail Tests Saved and Recalled via Floppy Disk
- Exclusive New Measurements for Digital Video Network Characterization



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## **Applications**

- Network Integrity Testing
- Mapping/Demapping
- MSP/APS Testing

## **Supports New ITU-T O.172 Conformance Test Set**

The CTS 850 is a versatile Analyzer for Broadband Network Testing. It has a powerful, yet uncomplicated, menu structure which allows both the novice and expert user to accurately configure measurements on SDH and PDH networks very quickly. All measurement connections are conveniently located directly on the front panel close to the signal status LEDs and easy-to-read display.

A field-interchangeable optical module and a floppy disk drive for retrieval of stored setups and results complete the front panel layout to create a "field-friendly" instrument.

## **SDH/PDH/Jitter and Wander Testing**

The CTS 850 creatively addresses growing concerns surrounding hybrid SDH/PDH networks in the area of timing and synchronization. Its industry-leading, DSP-based, Jitter and Wander measurement capability provides a high 300 UI jitter measurement range, handles all line rates from 2 MB/s to 622 MB/s via existing front panel connectors and introduces exclusive new measurements for digital video services.

The CTS 850 unlocks the power of the SDH frame structure by combining bit error testing with overhead analysis and payload mapping and demapping. It provides read/write access to overhead bytes, DCC add/drop and complete G.783 pointer test sequences.

The CTS 850 is optimized for installation and maintenance of both current and future SDH networks. Additional functionality, reflecting evolving standards such as new O.172, can be downloaded via the built-in disk drive.

One of the CTS 850's many powerful functions is error analysis and display. In addition to simple error counts and rate determination, the CTS 850 makes measurements according to G.821, G.826, G.827 and new M.2101.1 performance analysis and M.2100 error analysis so that network quality of service can be fully verified in or out of service.

Histograms boost the power of error analysis by enabling an easy correlation of time-critical events. Thus, time-consuming searches through long strips of error printouts are eliminated, freeing you to spend time fixing problems, not finding the cause.

### **PDH Testing**

Many networks have evolved from PDH to include SDH rings and long-distance, high-capacity trunks. The PDH network segments are commonly retained for access, service delivery and economic reasons. The CTS 850 Opt. 38, PDH Tributary card provides features for testing and accessing PDH sub-rates from 140 MB/s, 34 MB/s, 8 MB/s, 2 MB/s down to N/Mx64 kb/s. Additional PDH test features also include simultaneous multi-layer G.826, M.2100 results, Round Trip Delay, Voice Channel Monitor and Burst FAS Errors.

This option also empowers the CTS 850 with mapping and demapping of 2, 34 and 140 MB/s payloads in virtual containers and testing of TU-12, TU-3 and AU-4 overheads, making it ideal for testing hybrid networks.

### **Jitter and Wander Testing**

To support current and emerging ITU-T and ETSI standards, CTS 850 Opt. 14 for Jitter and Wander provides the most comprehensive, easy-to-use measurements for both SDH and PDH equipment and networks.

The CTS 850 is the first test set to fully conform to the requirements of the new ITU-T O.172 (Jitter/wander test for SDH networks). So for the first time, measurements of pointer jitter can be made reliably and accurately. Widely variable results are a thing of the past.

With its wide-ranging and comprehensive generation, analysis, pointer movement, automated jitter output, transfer and tolerance testing, the CTS 850 is the complete solution for your current and future test requirements.

Also included in Opt. 14 is Real-time Wander Analyst application software for MTIE and TDEV parameter analysis. Now you can fully test and qualify the timing and synchronization of your new SDH/PDH equipment and networks. Jitter history histograms can be correlated with simultaneously-acquired Wander TIE data so troublesome conditions can be quickly diagnosed.

## Video Service Performance and 45 MB/s Mapping and Demapping

Digital video services demand a more stringent level of SDH/PDH timing and synchronization performance than many other services. The CTS 850 Opt. 14 provides exclusive new measurements at the network interface to assess video service performance. Also, CTS 850 Opt. 55, provides the ability to test 45 MB/s Mapping and Demapping, including Jitter and Wander testing, to bring the CTS 850's advanced benefits to Video Service Measurement.

## Flexible and Easy-to-Use

Graphical display of AU/TU payload and alarms (AutoScan)	Provides the fastest signal identification. Allows quick identification of incorrect provisioning and easy location of the customer's signal path
Pass/fail tests can be created, stored and executed in the field	Ensures a uniform test methodology in an increasingly diverse network. Allows faster installation and responsive maintenance
3.5" Floppy Disk Drive	Distribute firmware updates in the field. Archive Pass/Fail tests and test results. Document operating- and result-screen bitmaps
Measurement Histograms with up to 1-second resolution	Allows visual presentation of measurement results to customers. Correlate alarms, errors, pointer movements, etc.
Cleanly structured menu system	Enables all users (technicians, experts and occasional users) to be immediately productive
Large, bright CRT user interface	Easy-to-see in low lighting conditions. Histogram resolution is clearly visible

## SDH Testing

STM-0, STM-1 and STM-4 Transmit and Receive	STM-0 (51 MB/s) is becoming more prevalent in radio links/ subsystems and SDH access systems
STM-16 Transmit and Receive (with ST2400A)	Test STM-1/4 payloads in STM-16 ring
Performance analysis to G.821, G.826 and new M.2101.1, M.2100 error analysis on all SDH/PDH layers simultaneously	Simplified testing for correct error performance compliance on both in-service and out-of-service systems
Pointer test sequences exceed requirements of G.783	Thoroughly stress the margins of equipment performance
SDH/PDH Defect generation and analysis	Verify correct network response at all layers
Set and detect K1/K2 bytes. Generate Linear and Ring messages to G.841 and G.783	Send standard network messages and monitor network response. Verify protection switching system
Interchangeable 1310 nm and 1550 nm optical interfaces	Swap between Long Haul/Short Haul trunk testing
VC4-4c testing for concatenated payloads	Efficiently qualify transport of concatenated 622 MB/s data for IP and ATM applications

### 45 MB/s (DS3) Testing

45 MB/s (DS3) Mapping/Demapping and Jitter/Wander Testing	Focus on new 45 MB/s services and Video quality testing
	Complete set of jitter and wander conformance tests with specification limits

### PDH Testing

Test 2, 8, 34, 140 MB/s directly at each line rate	Make traditional PDH measurements when necessary
Map unique test patterns into TU-12, TU-3 and AU-4 containers	Verify correct provisioning and payload integrity
Test PDH signals dropped from SDH rates	Monitor PDH services to verify tariffed performance
Add/Drop external 2, 34 and 140 MB/s signals to/from SDH containers and induce timing impairments.	Generate SDH test signals using customer-generated PDH traffic. Add pointer sequences, test pointer hit tolerance of terminals and desynchronizers
Mux/Demux N/Mx64 kb/s and sub-rate PDH signals into/out of higher-speed PDH signals	Verify correct PDH multiplexer/demultiplexer service configuration for data and video conferencing
Round trip delay testing	Measure round-trip delay for data and voice services
2 MB/s Channel Associated Signaling	Verify channel-busy occupancy and utilization

### Jitter/ Wander Testing

Exceeds new ITU-T O.172	Fully conforms with requirements of new ITU-T O.172 (jitter/wander test sets for SDH networks). DSP engine provides precise measurement filter characteristics - unlike previous O.171 test sets, pointer jitter is reliably and accurately measured
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SDH/PDH Jitter and Wander testing from 2 to 622 MB/s.	Most complete solution in one option supports installed interfaces for both generation and analysis (including 45 MB/s)
Automatic built-in conformance tests for output jitter, jitter tolerance, jitter transfer, pointer jitter	Perform all standard ITU-T SDH/PDH equipment and network jitter/wander tests with quick, simple Pass/Fail tests. Supports G.783, G.823, G.824, G.825, G.958, G.735 and G.751 specifications
New Video Timing Quality measurements: Frequency drift-rate (ppm/sec)	Allows characterization of SDH networks for video applications. Correlate SDH pointer activity with video sub-carrier and Hsync drift
DSP Jitter and Wander measurement technology.	Standards requirements can easily be updated in firmware and distributed on a floppy disk. Measurements are more repeatable and reliable between two test sets. Allows existing customers' test sets to be firmware-upgraded to support new O.172
Combined mapping and pointer jitter testing function	Allows testing of tributary jitter caused by G.783 SDH pointer test sequences together with PDH mapping frequency offset
Up to 100,000 UI wander and 300 UI jitter generation ranges exceed requirements of G.823, G.824, G.825 and new O.172	Enables full margin testing of low frequency jitter/wander and full input tolerance testing
300 UI jitter measurement range allows measurement of Pointer Hits	Test set stays in lock, identifies/logs Pointer Hits on PDH service when dropped from SDH network

SDH/PDH line/clock wander and frequency measurement on all installed interface rates	Allows diagnosis of network synchronization problems in the field
Full set of standard measurement filters in conformance with new O.172 plus measurements to 0.1 Hz	Ensures reliable and accurate measurements of pointer jitter, improves accuracy of line jitter measurements. Full-band jitter measurement (down to 0.1 Hz) allows characterization of phase transients that affect video, ATM and PDH service quality
MTIE and TDEV wander parameter analysis	Real-time Wander Analyst software provides pass/fail testing to the most recent ITU-T, ETSI, ANSI and Bellcore standards. Also provides frequency offset and drift-rate analysis

## Conformance to ITU-T new O.172 and O.171

### ITU-T New O.172

New O.172 provides requirements for SDH Jitter and Wander test sets and also new requirements for PDH tests, where necessary.

The prime purpose of new O.172 is to improve accuracy and consistency of Jitter and Wander measurements between different units.

A special focus is the accurate and reliable measurement of pointer jitter. Only test sets conforming with O.172 can provide the minimum acceptable performance level.

New O.172, together with O.171, recommendations establish test set requirements for:

- Jitter and Wander generation
- Jitter measurement ranges and accuracy
- Jitter measurement filters and frequency response
- Wander measurement filters and Wander measurement accuracy

### ITU-T O.171 Only



Legacy O.171 provides requirements for PDH Jitter test sets.

O.171 is not sufficient for SDH tributary test. This is because pointer jitter testing has new requirements;

The main limitations are:

- The measurement range is only 10 UI so overload can easily occur
- The measurement filter accuracy is not specified so results can vary widely
- As a consequence, the measurement error is too high

O.171 test sets are unable to guarantee reliable and accurate pointer jitter measurements. Therefore it is important for users to ensure that test sets conform to new O.172.

The Tektronix CTS 850 is the first Jitter and Wander test set to meet the new requirements of ITU-T O.172 (together with O.171).

CTS 850 performance easily exceeds O.172 with modern DSP-based Jitter and Wander measurement technology (old analog techniques typically provide less performance).

CTS 850 Jitter and Wander option conforms to O.172 and O.171, specific examples include:

- Wander generation of 100,000 UI exceeds the specified minimum requirement of 14,400 UI (STM-4)
- Jitter measurement range of 6 and 300 UI exceeds the specified minimum requirement of 200 UI (STM-4)
- Jitter measurement filter accuracy of better than 10% exceeds the specified minimum requirements of 10% (O.172)
- Jitter measurement filter performance to less than 0.1 Hz exceeds the tolerance requirements of O.172

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Tektronix Measurement products are manufactured in ISO registered facilities.



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