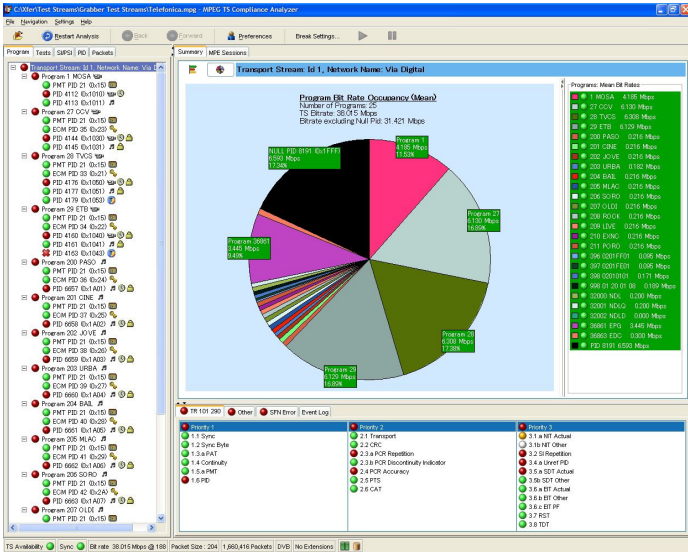# MTS400 Series MPEG Analysis Tools

Transport Stream Compliance Analyzer Data Sheet

Features & Benefits

- Cross-layer Timing provides At-a-Glance View of Timing across Multiple Layers, enabling Rapid Time to Insight when used with RF or IP Interfaces to Diagnose at which Layer a Fault was Introduced

- CaptureVu™ Technology Captures and Analyzes System Events in Real or Deferred Time

- Data Summaries, Automated Filters, and Packet Search Simplify the Analysis of Complex Transport Streams

- Easy Program-centric UI Quickly Isolates Information of Interest

- In-depth Analysis of Transport Streams Conformance to MPEG, ATSC, DVB, and ISDB Standards

- Analysis of Streams using the Proprietary Sky XSI Standard (Approved customers only)

- TR 101 290 and A/78 Prioritized Tests

- Analysis of SFN, MPE, and DVB-H SI Contents

- Syntax Analysis and Display Supported for ISDB-T, ISDB-TB (Brazil), TMCC, and IIP Data, including One Segment Support

- ARIB TR-B14 Consistency Checks Performed between SI, TMCC, and IIP Data

- ATSC Closed Caption Support and Consistency Checking

- Proprietary PSI/SI Syntax Section Rate Error Testing

- Statistical Display of IP Packet Interarrival Time (Histograms)

- Analysis of IP Packet and TS Data within Industry Standard PCAP Files, as used by Wireshark (Ethereal)

- Format for use with Wireshark (Ethereal)

- Unicode Support enables Service Information to be Displayed in Japanese, Chinese, or Other Languages

- Batch Mode for Integration into Automated Regression Test Systems

Tektronix®
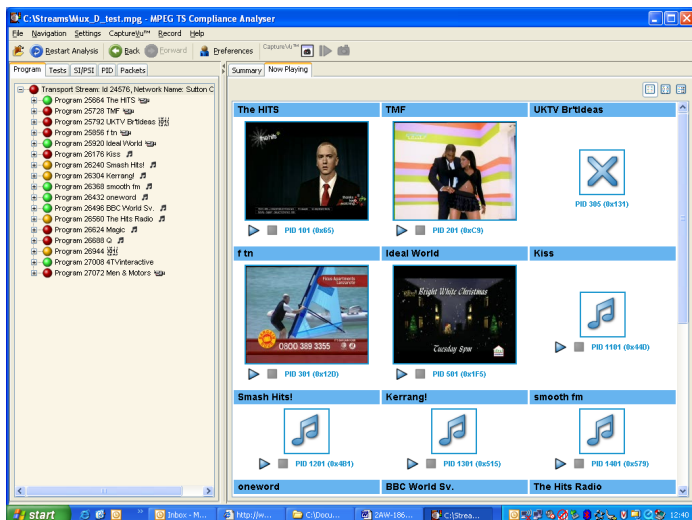
Video Decode.

Characteristics

Applications

The MPEG Transport Stream Compliance Analyzer (TSCA) enables monitoring and interpretation of the contents of real-time, previously recorded, or synthesized Transport Streams using the latest ATSC, DVB, ISDB-S, ISDB-T, ISDB-TB (Brazil), and MPEG standards. The proprietary Sky XSI standard is also supported.

The analyzer is specifically designed to enable you to quickly locate and identify problems within a Transport Stream using a minimum number of mouse clicks. By quickly identifying the problem areas, the TSCA software helps you save time during the development and test of equipment, networks, and services.

Users can configure the TSCA software to display stream information in user-selected fonts. This feature enables you to view stream information in your local language or to use custom fonts.

The TSCA software may be purchased as part of a MTS400 Series Test System or separately as MTS4SA to run stand-alone on a PC with either the Microsoft Windows XP or Windows Vista operating system. Separate packages are available for Deferred-time Analysis and Real-time Video over IP Analysis. Both packages

offer **CaptureVu™** technology, and IP and TS measurement, logging, and graphing capabilities.

Feature Details

Summary of Displays

- Program-centric summary screen with go/no-go error indication of user-specified tests.

- SD and HD video thumbnails and real-time video and audio decode – H.264 and MPEG-2 supported

- CaptureVu™ technology/trigger views

- Hierarchical tests display

- PCR, PTS, and IP Packet Interarrival Time (PIT) graphing and measurement display

- SI/PSI/PSIP display

- Real-time and deferred-time EPG display

- Packet view for TS Packets, TS Sections, and IP Packets

- RF (MTS415 and MTS430 only) and IP interface displays

- Real- and deferred-time analysis share the same displays and user interface

Deferred- and Real-time Modes

The TSCA can be run in deferred time or real time for analysis of compressed video streams carried over IP, RF, or ASI/SMPTE310M/DVB Parallel interfaces. Deferred-time analysis mode is available on any recommended platform (including users' own PCs). In deferred-time analysis mode, a stored stream can be analyzed and viewed at any time. Real-time analysis is available as standard with the MTS400 Series Test Systems. Using real-time analysis, live streams can be monitored on a continuous basis and can also be paused for more detailed deferred-time analysis. Real-time analysis can be resumed at any time. Real-time video and audio decode enables the user of the analyzer to select a program from within a Transport Stream and display the decoded video for viewing or listen to the audio. Video thumbnails with video wall, summary, and ES header information views enable users to choose whether to see many channels' thumbnails simultaneously or view detailed descriptions of one at a time.

Note that real-time analysis is only available on the MTS4SA through the IP interface.

TSCA User Interface

The TSCA software uses a single main program summary window with different context-sensitive views contained within tabbed frames. This provides the maximum amount of useful information while keeping the screen from appearing cluttered. From the main window, you can access the following views:
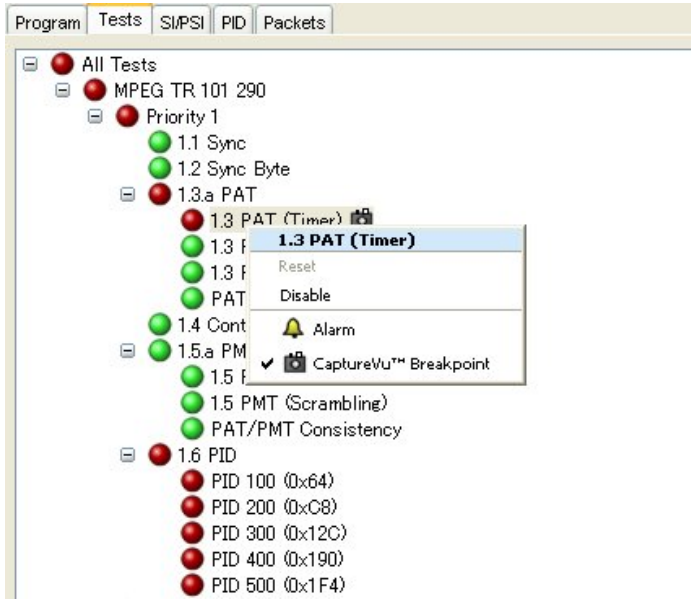

Enabling CaptureVu.
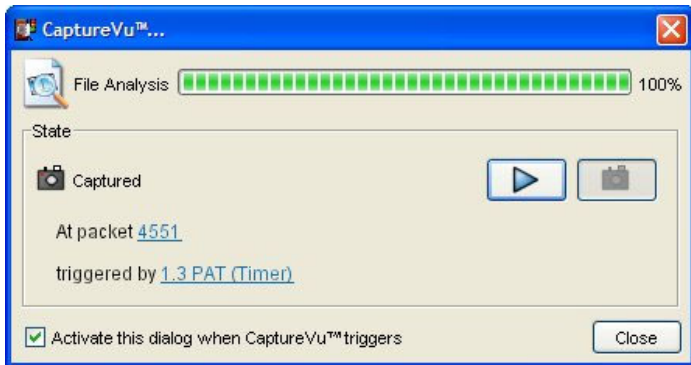
CaptureVu trigger display.
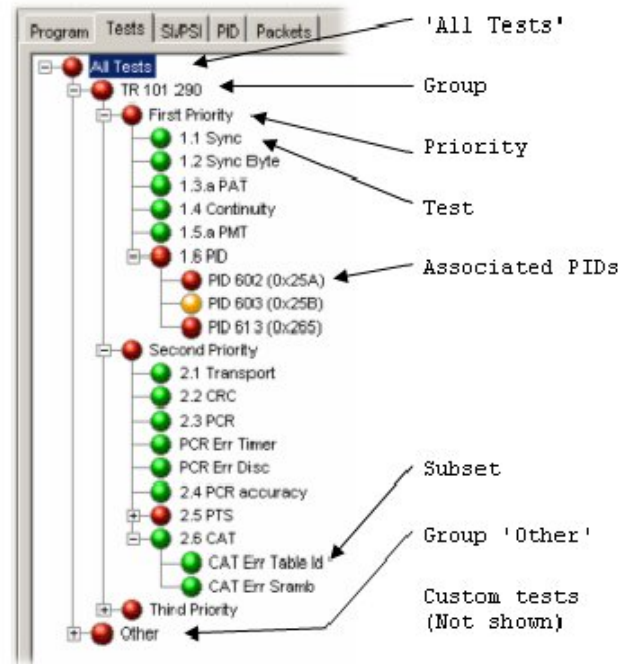
Tests display description.

CaptureVu™ Technology

CaptureVu™ technology captures and analyzes system events in real time and deferred time to debug the intermittent and complex problems that traditional analyzers miss. CaptureVu technology lets the user set a breakpoint on a specific test or event, and, when the breakpoint occurs, a dialog will show the breakpoint condition and exact location of the packet within the Transport Stream. CaptureVu technology automatically prebuffers the last 200 MB of the signal, pauses the analysis, and launches an in-depth deferred-time analysis that lets the user drill down into the problem. The captured stream can also be permanently stored on the hard disk for subsequent re-analysis with the deferred-time TSCA application. This powerful debug mode enables fast debugging of troublesome intermittent problems. CaptureVu technology also supports triggering events based upon IP or RF Layer measurements providing integrated cross-layer fault analysis and logging in a single box solution for network fault diagnosis.
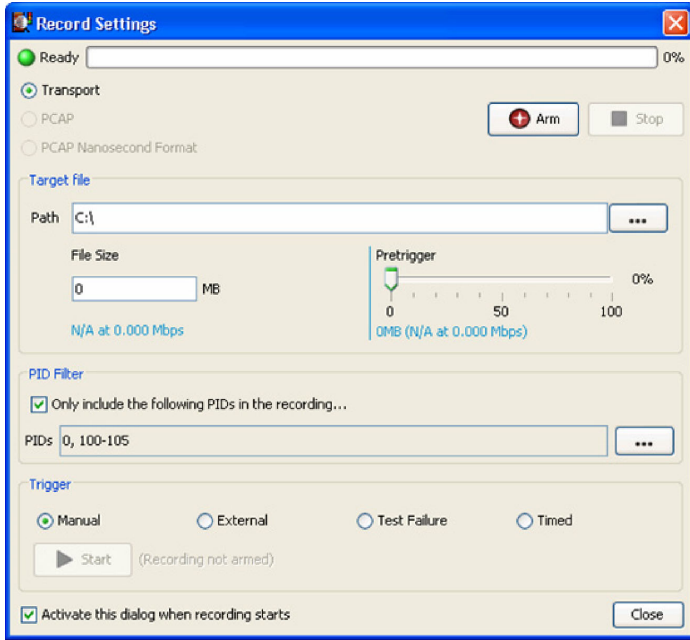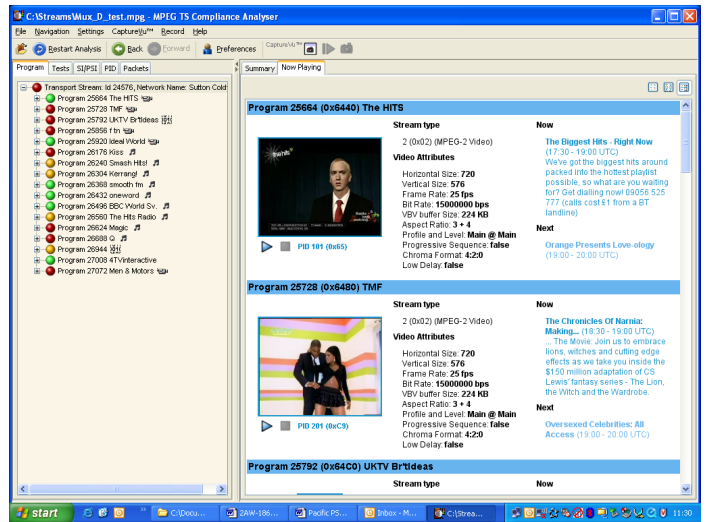
Recording Settings dialog.

Program View details display.

Triggered Recording

The TSCA offers both immediate and triggered recording, with the user-definable pretrigger buffer being used to capture streams before, during, or after the trigger point. When the trigger condition is met, the live input stream is captured to disk, without stopping or pausing real-time analysis.

Complete Transport Streams are recorded, with recorded file parameters being displayed upon completion. These include file size, bit rate, number of packets, trigger conditions, trigger position, and time. The maximum record length is limited only by available disk space.

Trigger Sources and Conditions

- DVB TR 101 290 1st, 2nd, 3rd priority tests, ATSC A/78, ISDB, or proprietary tests

- IP Layer measurements, including PIT tests, RTP dropped packet count and rate, out-of-order packets count, and rate (not all available on MTS4SA)

- RF Layer measurements including MER, EVM, SNR, BER limit or drift rate, failure, or warning levels (MTS400 only)

- Multiplex occupancy outside of user-defined bit rate limits

- External TTL trigger (MTS400 only)

- Date and time

- In triggered recording mode, the size of the pretrigger buffer can be specified as a percentage of the overall file size range from 0 to 100%

## Program View

The Program view provides a fast overview of the Transport Stream contents in terms of program content, bit rate use by each program, and ATSC A/78, DVB TR 101 290, or ISDB test results. Red, amber, and green LEDs highlight errors associated with each program or element.

Errors that are detected at lower levels in the program stream hierarchy propagate up to the highest level. This allows you to monitor all of the programs in the stream at a high level and then quickly go to lower levels as necessary to locate a problem.

Tests View

The Tests view enables you to isolate errors to the specific tests that have been applied to the Transport Stream. The error log is automatically filtered by the selected test, and can also be filtered by PID. In addition to the standard 1st, 2nd, and 3rd priority tests included in the TR 101 290 standard, tests are available for PCR jitter and program/PID bit rate. A variability test enables you to test the changes in the bit rate of a specific PID. In addition to TR 101 290, there are many tests that are specific to ATSC A/78, ISDB-T, ISDB-TB (Brazil), and ISDB-S streams.
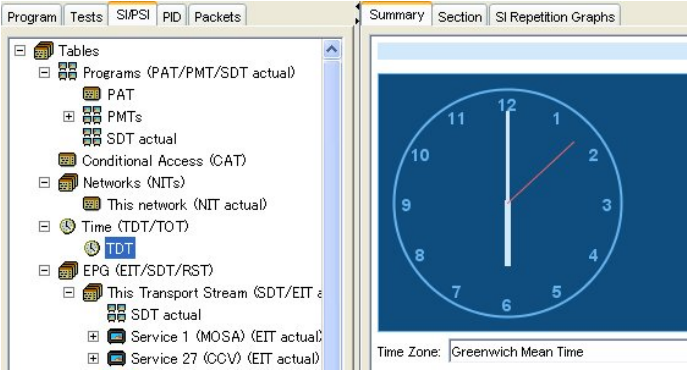
SI/PSI and PSIP display.
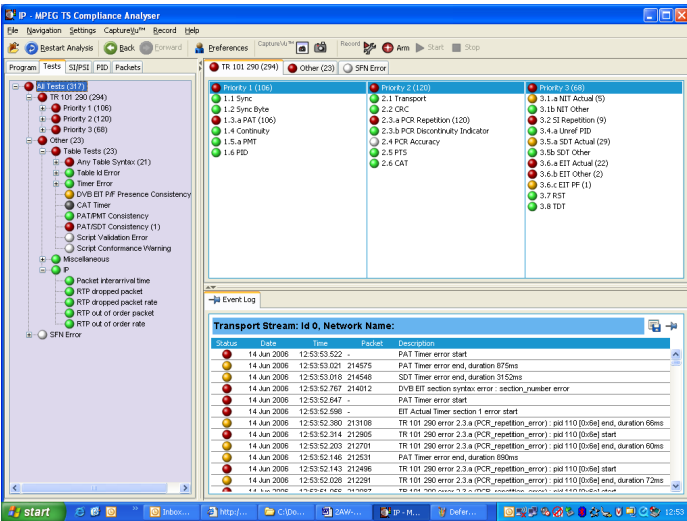
Tests display.

SI/PSI and PSIP (Tables) View

The SI/PSI and PSIP table view displays the service information tables contained in the analyzed stream which comply with the selected digital video standard. This includes ATSC PSIP, DVB, ISDB, and proprietary Sky XSI Service Information, and MPEG program-specific information.

A summary view displays key values for each table in a meaningful way. The view includes hyperlinks enabling you to quickly access related information within other tables and views.
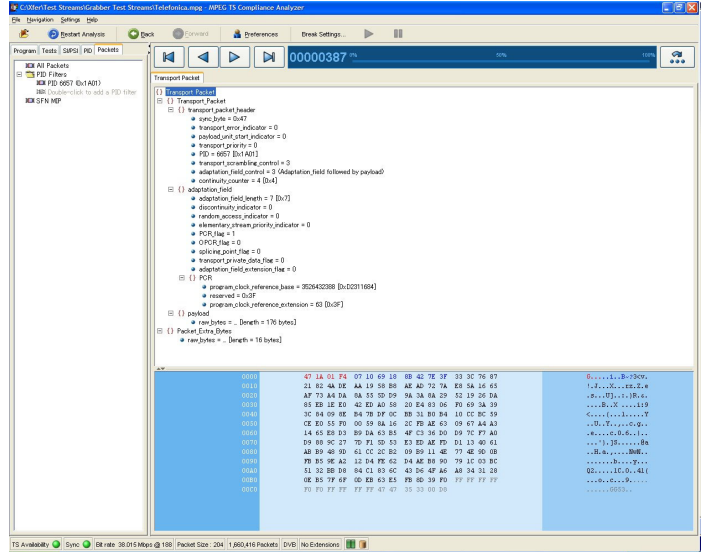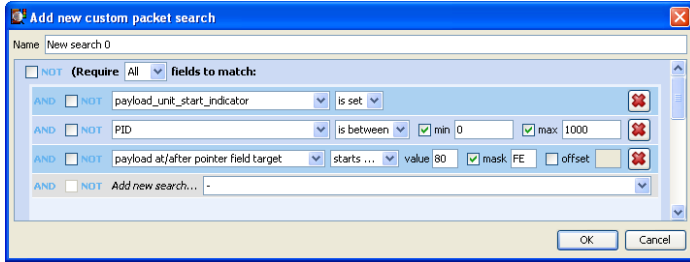

Packet View display.

PID View

The Packet Identifier (PID) view displays information about all of the PIDs found in the Transport Stream. When you select a PID, the associated summary view provides a PID-orientated overview of the Transport Stream, displaying the relative data rates of all of the PIDs contained within the stream. The information can be displayed as either a bar chart or as a pie chart. Pop-up menus enable fast limit selection.

When one or more tests fail, each failed test will be listed under the relevant PID. Specific PIDs can be selected to display a summary of all the associated tests. A specific test can be selected to display its event log and parameters.

Packet View

The Packet view displays information about all of the packets found in the Transport Stream grouped according to content. These groups include PID value, SFN Megaframe Initialization Packets (MIPs – DVB only), and Information Packets (IIPs – ISDB-T and ISDB-TB (Brazil) only). When you select a specific PID or MIP, only packets carrying that particular PID or MIP are displayed. Individual TS Packet header and adaptation fields may also be specified for more complex search patterns.
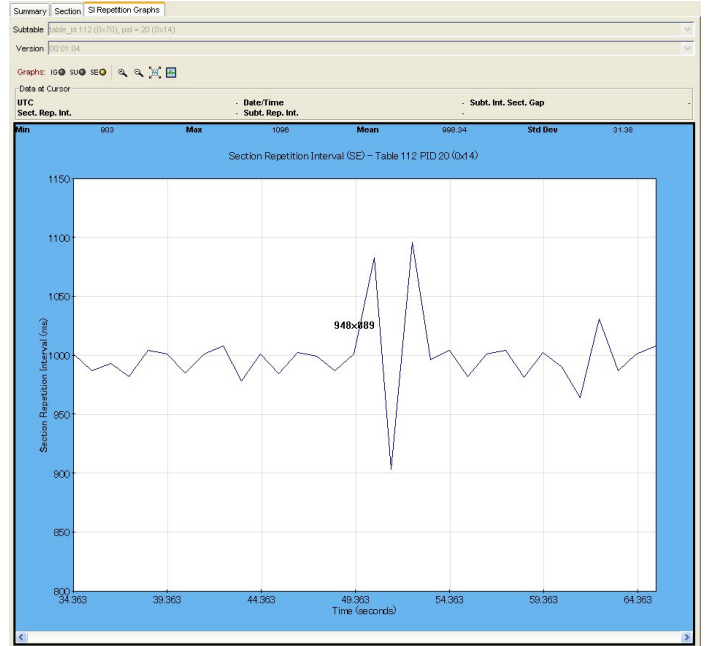
Custom TS Packet search dialog.
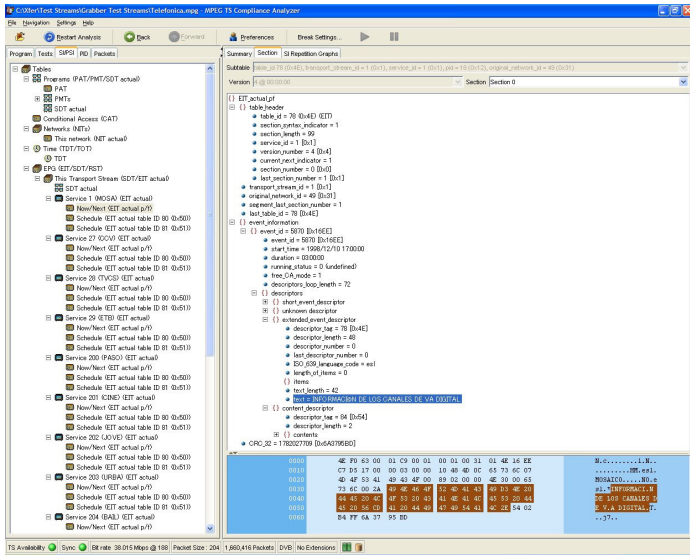
Section View display.

Section View

The Section view uses customizable script files, which allow you to specify and view proprietary information.


Section Repetition Interval graph.

Tables and their data source are displayed. This shows the data bytes (in both hexadecimal number format and ASCII character format) for the selected table, version, and section. Tables and subtables are easily analyzed and directly traceable to packet data.

Section Graphing

Section Repetition Interval – This graph displays the interval between two sections of a table on a particular PID.

Subtable Intersection Gap – This graph displays the interval between sections in a particular subtable.

Subtable Repetition Interval – This graph displays the time between receiving one complete subtable and receiving the next complete subtable.

IP graphs display.
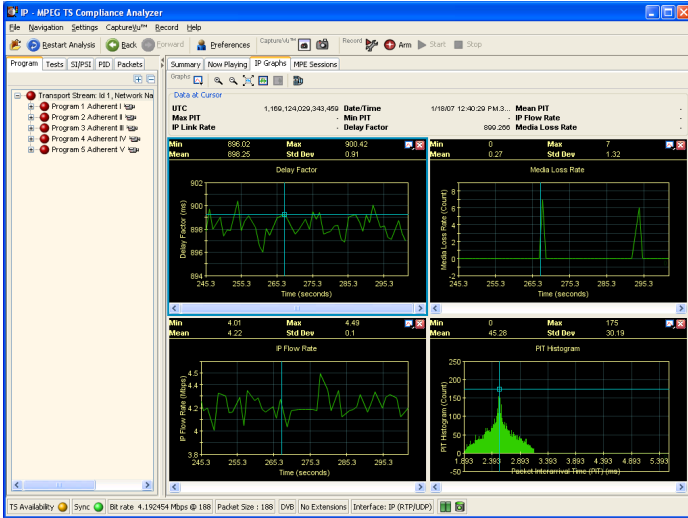
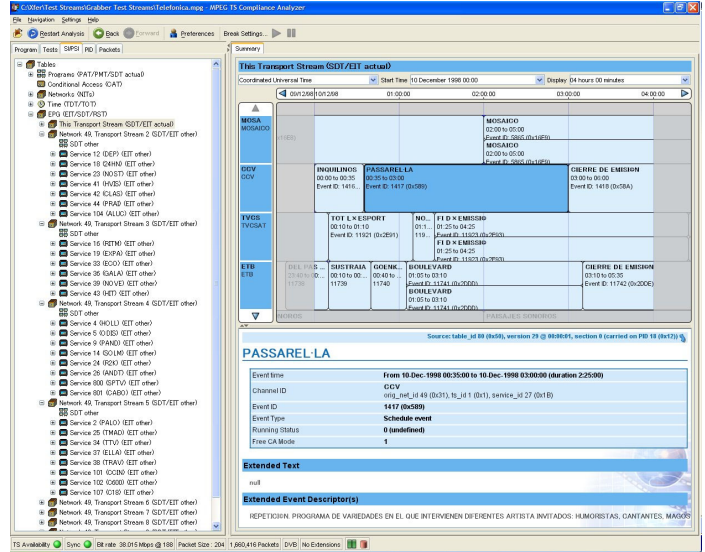
Electronic Program Guide display.

Timing Analysis

The TSCA supports comprehensive PCR measurements to the TR 101 290 and A/78 standards. When the selected Elementary Stream PID contains PCR information, PCR trend analysis views are available, displaying graphs of: PCR accuracy, PCR arrival interval, PCR overall jitter, PCR frequency offset, and PCR drift rate.

PCR graphs are available in real time and deferred time. Time stamping data ensure that these can be captured and viewed on stream recordings. This time stamp is compatible with recordings from other Tektronix equipment, including the MTM400 Transport Stream monitor. Selectable MGF filters provide maximum flexibility and compatibility in these important PCR measurements. The MTS400 Series is also able to display PTS Arrival Interval graphing in real time or deferred time. It also includes PTS-PCR and DTS-PCR graphs to detect possible Receiver buffer under- and overflow problems.

With the MTS400 Series, IP Layer timing can be analyzed using the Ethernet Packet Interarrival Time max, min, mean graphs or statistical display of Packet Interarrival Time (histograms).

Cross-layer Timing

Provides the user with an at-a-glance view of timing at IP, TS, and PES Layers. This functionality addresses tough unsolved timing problems introduced by the use of Video and Audio over IP technologies. This enables rapid time to insight when diagnosing at which layer a fault was introduced.

Real-time and Deferred-time Electronic Program Guide (EPG) View

The EPG view allows at-a-glance checking across many EIT tables and can be set to any time zone from local time, UTC, or the Transport Stream time itself. The number of days of EPG events displayed are broadcaster dependent, but are not limited by the analyzer. When a Transport Stream EPG is selected, a panel shows the names of the services currently displayed in the event panel. The services displayed will depend on the node selected in the navigation view. ATSC, DVB, ISDB, and Sky XSI EPGs are supported. ATSC Rating and Closed Caption signaling information are also displayed in this view.

Event Panel

This panel shows the events for one or more services, depending on the node selected. Individual events are color coded and shown as blocks; each block (and its associated tooltip) displays event information extracted from the EIT. When a block is selected, the complete event information is shown in the event detail panel, including a link to the section carrying the information.

Events are Color Coded as Follows:

Red	Present event
Green	Following event
Blue	Schedule event
Yellow	(ISDB only) After event
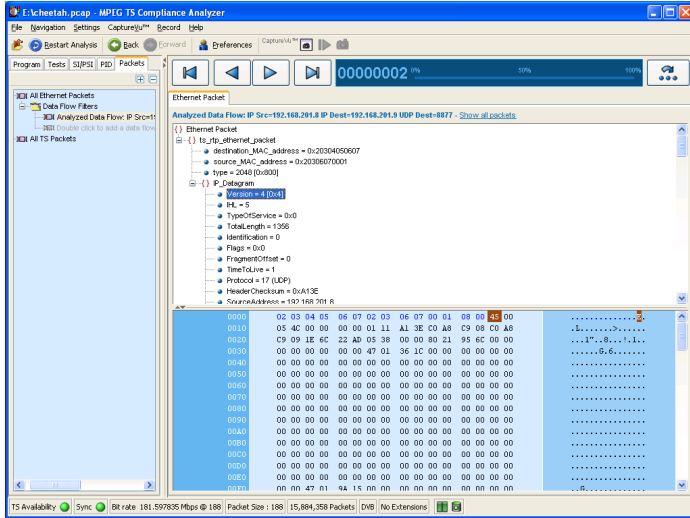
IP Packet Interpretation display.

MPE/IP View Data Broadcast

MPE data (internet IP sessions over MPEG TS) can be viewed as a separate entry for each MPE session, either detected within the TS or manually signalled since the view became active.

Information displayed for each session includes:

- PID
- MAC address
- Network Layer source and destination IP addresses
- Transport Layer protocol and port numbers
- Total data transmitted by the session so far since monitoring commenced
- Instantaneous bit rate using MGB1 profile

DVB SFN

For real time, data contained in the most recently received MIP will be interpreted and displayed in a view depicting each field value. TPS MIP, STS time stamps, and other detailed information are available in navigator views.

Video over IP Analysis and Recording

MTS400 Series

A high-performance Video over IP interface supporting GigE electrical and optical interfaces is available for the MTS400 Series instruments. This interface has high-resolution hardware time stamping, enabling precise cross-layer timing analysis. The GigE Interface option enables configuration (or upgrade) of MTS400 Series instruments for high-performance applications by guaranteeing deterministic performance on fully loaded links. Precise time stamp information is retained during IP session analysis providing deferred-time timing diagnostic capability. The comprehensive suite of deferred-time analysis tools for compressed video can therefore be used with captures of complete IP sessions. The analyzer displays all current UDP or UDP/RTP sessions on a LAN segment and indicates those carrying TS traffic. UDP or UDP/RTP sessions carrying TS traffic may be selected for analysis or capture for subsequent analysis.

- Statistical display of IP Packet Interarrival Time (histograms)
- Deferred-time analysis of Transport Streams within industry-standard PCAP files (IPv4 only)
- H/W packet filtering enables use with up to full line rate traffic on GbE link
- Can be used simultaneously with ASI or RF interface
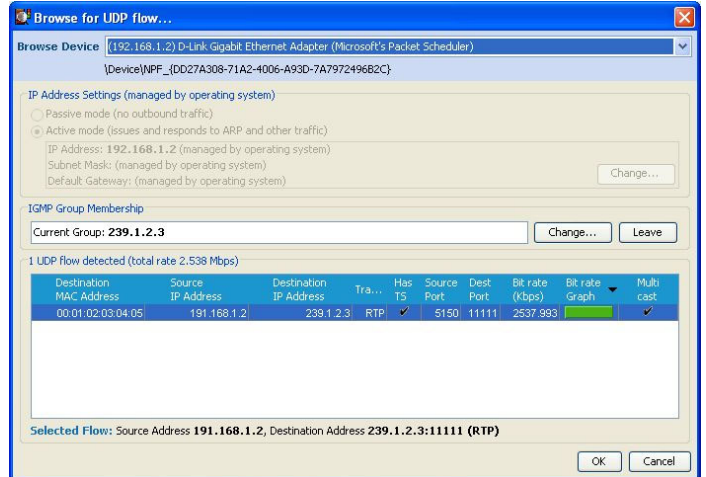
IP Traffic Sessions display.

Two Ethernet ports are also fitted as standard to the MTS400 Series, one 10/100 and one 10/100/1000BASE-T. This allows connection to a corporate LAN while simultaneously using the second port for real-time Video over IP analysis[1].

[1] Network traffic loading is specified to 100 Mb/s maximum bit rate.

MTS4SA

The TSCA application ordered as a stand-alone software product, MTS4SA, can also be used with a standard PC Ethernet port for real-time Video over IP analysis. For Video over IP analysis using these PC Ethernet ports some timing measurements such as PCRs are not available due to nondeterministic nature of PC Ethernet ports, although mean PIT is included.

IP Recording

Time-stamped Transport Stream recording can be made with packet arrival time information stored for offline PCR timing analysis.

RF Interfaces (MTS400 Series only)

Terrestrial (DVB-T and ATSC), Cable (QAM Annex B), and Satellite (8/QPSK) interfaces are available as optional interfaces for the MTS400 Series instruments. RF Layer diagnostics combined with full TS Layer analysis and debug provide the user with rapid multilayer network fault diagnosis reducing time to insight when designing, deploying, and troubleshooting broadcast infrastructure.

Any one of the RF interfaces can be installed and operated simultaneously with ASI or IP inputs enabling measurements to be made of inputs and outputs at contribution, multiplexing, modulation, or IP encapsulation facilities.

- Superior RF performance
- Two-level RF tests (warning and fail)
- Drift rate alarms
- Innovative MER rings in constellation view
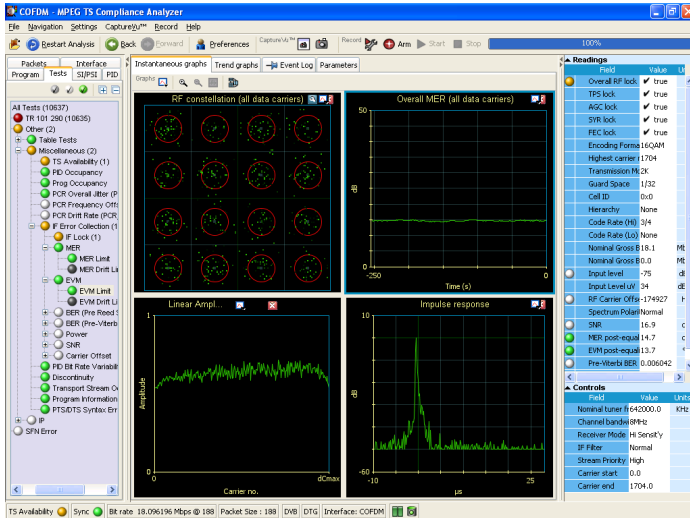
RF Layer diagnostics display.

Log Entry Format

- Each log entry consists of a time stamp from the system clock in real time and PCRs in deferred time

- Error Reference. This would normally be a PID or program

- Event description can be in local language

- Errors per stream and per PID. Circular log of 10k entries, with overwrite warning

- Logs can be viewed in entirety or filtered pertaining to PID, program test, or test and PID

- Log files can be saved in CSV or XML format for subsequent analysis

- TS Packet number (TS Packet and Ethernet Packet for deferred-time IP analysis) with shortcut to TS or IP Packet view

Stand-alone Software System Requirements (MTS4SA)

- PC with Genuine Intel Pentium class 1.2 GHz processor

- Intel or 100% compatible motherboard chipset

- Windows XP or Windows Vista operating system

- Internet Explorer 5.0 or above

- 256 MB of RAM

- 50 MB of available hard disk space for the application and documentation

- Additional space will be required for generated Transport Streams

- SVGA (800×600) resolution video adapter and monitor (XVGA (1024×768) or higher resolution recommended)

- CD-ROM or DVD drive

- Keyboard and Microsoft Mouse or compatible pointing device

- Video over IP Analysis option requires a standard Network Interface Card (NIC)

Ordering Information

Transport Stream Compliance Analyzer
This application is available on MTS400 Series analyzer instruments, as MTS4SA stand-alone software, and on MTX/RTX Series generator instruments.

CE

ISO 9001   Product(s) are manufactured in ISO registered facilities.

GPIB IEEE-488   Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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