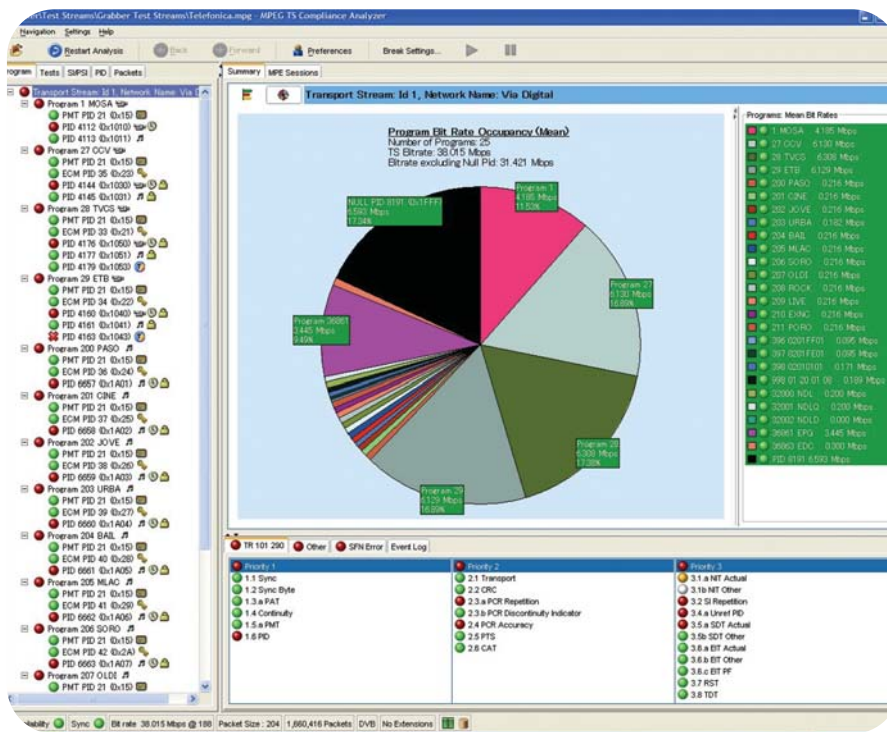


# MPEG Test Systems

## ► MTS4SA PC-based MPEG Analysis Tools



## ► Features & Benefits

The MTS4SA Software Is Purchased to Run Stand-alone on Computers with Microsoft Windows NT 4.0, Windows 2000, or Windows XP Operating Systems

Separate Packages Are Available for Deferred Time Transport Stream Compliance Analysis, Real-time Video over IP Transport Stream Compliance Analysis, Transport Stream Multiplexing, Elementary Stream Analysis, PES and Buffer Analysis, Data Broadcast Carousel Analysis and Data Broadcast Carousel Generation

Both Transport Stream Compliance Analyzer Packages offer the CaptureVu™ Technology and PCR Measurement and Graphing Capabilities. The CaptureVu Technology Captures and Analyzes System Events in Real Time (IP only) and Deferred Time to Debug the Intermittent and Complex Problems that Traditional Analyzers Miss

Real-time Video Over IP Analysis and Recording

Analyzes Stored Transport Streams at Up to 400 Mbps to Greatly Reduce Analysis Time

Innovative "Program Centric" User Interface Brings Expert Power to the Novice User

Broadest and Deepest Range of Analysis of Legacy and Next Generation Compressed Standards Including MPEG-2, D10 (SMPTE 386M), MPEG-4, H.264, VC-1, 3GPP & DVB-H

Customizable Scripting Supports the Broadest Range of Ratified and Evolving Worldwide DTV Standards (ATSC, DVB and ISDB) and Includes Local Language Service Information

## ► Applications

### **Solution for Equipment Manufacturers - Research and Development**

CaptureVu Technology Allows Rapid Isolation and Debugging of Equipment and System Faults

### **Solution for Equipment Manufacturers - Manufacturing Test**

Multiplexer/Remultiplexer Allows Custom Test Stream Creation for Equipment Stress Testing

### **Solution for Broadcasters and Network Operators**

CaptureVu Technology Allows Isolation of Intermittent Network Problems that Other Analyzers Would Not be Capable of Isolating

## Introduction /Overview

The MTS4SA Transport Stream Compliance Analyzer is a new class of analysis tool, the world's first Compressed Digital Video Debugger/Analyzer that introduces the CaptureVu™ technology, a new-to-market capability that captures and analyzes system events in real time to debug the intermittent and complex problems that traditional analyzers miss. The MTS4SA Transport Stream Compliance Analyzer offers significant enhancements over traditional software based MPEG analyzers when operating in deferred time (stored streams). The combination of an innovative high-speed analysis engine and built-in intelligence allows ultra-fast pinpointing and debugging of intermittent faults in MPEG transport streams.

The MTS4SA Series also introduces Real Time Video over IP analysis and recording with users' own Microsoft Windows PCs equipped with a standard 10/100 or Gigabit Ethernet Network Interface Card (NIC). Tektronix' industry leadership offers the broadest (across multiple standards and

video layers) and deepest (in depth of generation and analysis) solution for compressed video test. The MTS4SA series of stand-alone software products can be applied anywhere at any level to diagnose and solve the most subtle, complex and intermittent DTV problems in the minimum time.

The MTS4SA provides a comprehensive suite of analysis tools including Transport Stream (TS) compliance, buffer, PES, compressed video and audio elementary stream analyzers, together with TS editor, multiplexer and Data Broadcast applications for stream creation, analysis and error-injection.

Standards compliance is ensured through in-built customizable scripting supporting the broadest ranges of ratified and evolving DTV standards, including ATSC, DVB-C, DVB-H, DVB-S, DVB-T, ISDB-S, ISDB-T and MPEG. To keep analysis up to date, flexibility is the key. New standards and proprietary tables can easily be catered for by loading Tektronix supplied updates or creating your own custom scripts.

## MPEG Test Systems

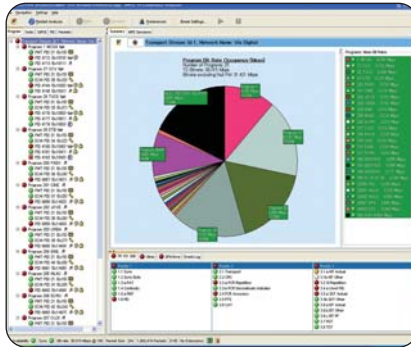
### ► MTS4SA PC-based MPEG Analysis Tools

#### Technical Features

- **CaptureVu™** technology captures and analyzes system events in real time (IP only) and deferred time
- New analysis engine that can analyze at up to 400 Mbps offers greatly reduced deferred analysis time (up to 90% reduction compared with traditional analyzers)
- Powerful TS compliance analyzer with **CaptureVu** technology – both in real time and deferred time
- Video over IP Analysis with **CaptureVu** technology and Video over IP Recording (specified to 100 Mbps)
- Powerful user definable scripting offers flexibility to adapt product for customers' own protocols
- Elementary Stream Analysis support (including H.264, VC-1, MPEG-2, MPEG-4 and 3GPP)
- PES and Buffer Analysis, Multiplexer and Data broadcast Generation and Analysis support
- MPE, SFN and DVB-H table support
- H.264, VC-1, MPEG-2, MPEG-4 and DVB-H signaling and bit-rate support as standard
- Comprehensive PCR graphing and measurement (Accuracy, Arrival Interval, Overall Jitter, Frequency Offset and Drift Rate)
- PTS distance/arrival time graphing and measurement
- Bit rate measurements to TR 101 290 MGB2 Profile
- Unicode support displays service information in the user's local language (including double byte character sets such as Chinese and Japanese)
- Error logs can be output in CSV or XML formats for compatibility with office applications
- Transport Stream Editor, Transport Stream Cutter and Transport Stream Make Seamless applications
- MTS4SA Standalone Software supports Windows NT 4.0, 2000 and XP Operating Systems

#### Applications

##### Transport Stream Compliance Analyzer



##### Summary of Displays

- Program Centric summary screen with go/no-go error indication of user-specified tests.
- CaptureVu technology/trigger views
- Tests display
- PCR and PTS graphing and measurement display
- SI/PSI/PSIP display
- Real time and deferred time EPG display
- Section and Packet view
- Real and deferred time analysis share the same displays and user interface

The MTS4SA MPEG Transport Stream Compliance Analyzer (TSCA) enables you to monitor and interpret the contents of real-time IP streams or previously recorded or synthesized transport streams using the latest ATSC, DVB, ISDB-S, ISDB-T and MPEG standards. 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. You 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.

#### TSCA Features

- Easy “program centric” UI quickly isolates information of interest
- CaptureVu technology captures and analyzes system events in real (IP only) or deferred time
- In-depth analysis of stored transport streams including support for MPEG, ATSC, DVB, ISDB-T and ISDB-S table types
- Data summaries and automated filters simplify the analysis of complex transport streams
- TR 101 290 Priority 1, 2 and 3 tests
- Syntax analysis and display supported for ISDB-T, TMCC and IIP data
- Consistency checks performed between SI, TMCC and IIP data
- Proprietary PSI/SI syntax section rate error testing
- Informational logging of detected errors
- Unicode support enables service information to be displayed in Japanese, Chinese or other languages

##### Deferred- and Real-time IP Modes

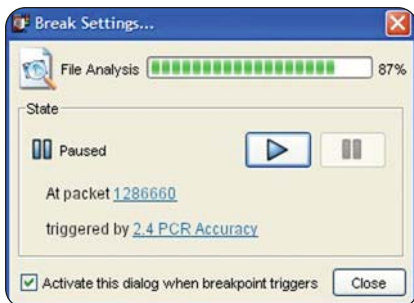
The TSCA can be run in deferred time. Deferred-time analysis mode is available on any recommended PC platform. In deferred-time analysis mode, a stored stream can be analyzed and viewed at any time. Real-time monitoring of video over IP is also available as a standalone application for running on a user's own PC. Using real-time IP analysis, live streams can be monitored on a continuous basis and can also be paused for more detailed deferred-time analysis. Real-time IP analysis can be resumed at any time.

##### 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:

**CaptureVu™ Technology**

The **CaptureVu** technology captures and analyzes system events in deferred time or IP streams in real time, to debug the intermittent and complex problems that traditional analyzers miss. The 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. The CaptureVu technology automatically pre-buffers 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.

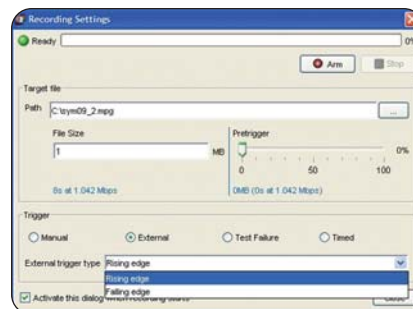


**IP Triggered Recording**

The MTS4SA Series also supports triggered recording of IP streams, allowing the user to set up a sophisticated trigger condition. When the trigger condition is met, the live Transport Stream is captured to disk, without stopping or pausing real-time analysis.

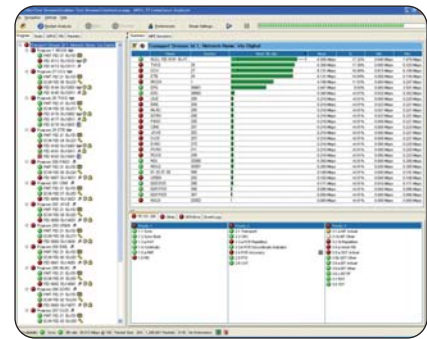
**Trigger sources and conditions**

- Any of the DVB TR 101 290 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> priority tests or ATSC and ISDB tests
- Multiplex occupancy outside of user-defined limits
- Date and time
- In triggered recording mode, the size of the pre-trigger buffer can be specified as a percentage of the overall file size range from 0 to 100%



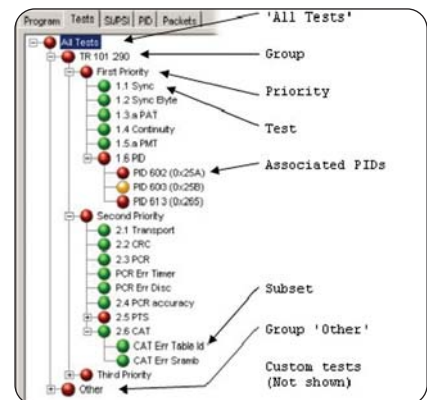
**Program View**

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, 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**

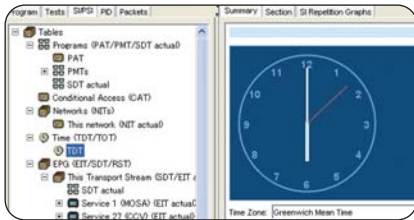
The Tests view enables you to isolate errors to the specific tests that have been applied to the transport stream. The error log is automatically filtered by the selected test, and can also be filtered by PID. In addition to the standard first, second, and third priority tests included in TR 101 290 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, ISDB-T, and ISDB-S streams.



# MPEG Test Systems

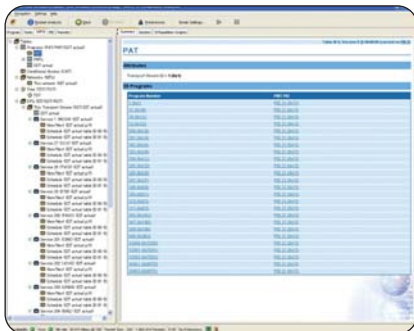
## ► MTS4SA PC-based MPEG Analysis Tools

### 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 and ISDB 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.



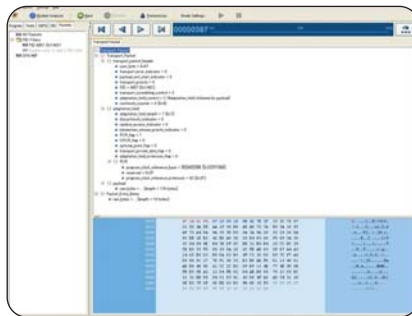
### PID View

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.

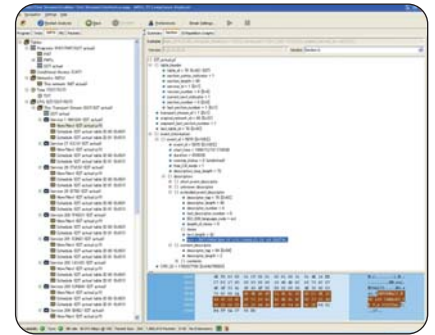
### Packet View

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 Mega-frame initialization packets (MIPs – DVB only), and information packets (IIPs – ISDB-T only). When you select a specific PID or MIP, only packets carrying that particular PID or MIP are displayed.



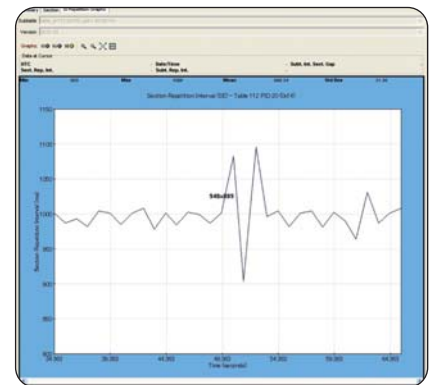
### Section View

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

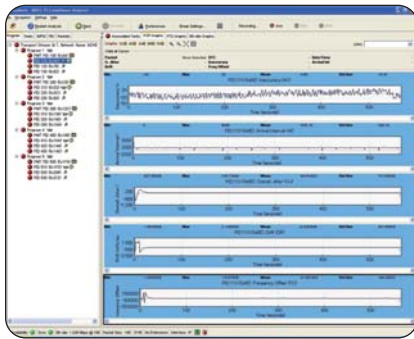


Sub-table intersection gap – This graph displays the interval between sections in a particular sub-table.

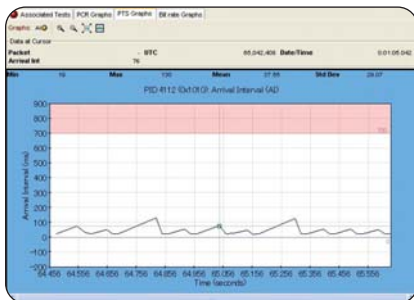
Sub-table repetition interval – This graph displays the time between receiving one complete sub-table and receiving the next complete sub-table.

**PCR Analysis**

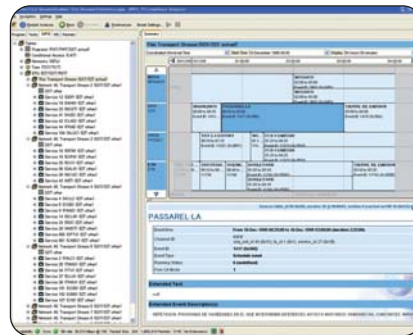
The MTS4SA Series supports comprehensive PCR measurements to the TR 101 290 standard. When the selected elementary stream PID contains PCR information, PCR trend analysis views are available, displaying graphs of: PCR accuracy, PCR arrival interval, PCR overall jitter, PCR frequency offset and PCR drift 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 timestamp 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 MTS4SA Series is also able to display PTS Arrival Interval graphing in real time or deferred time as shown.



**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 and ISDB EPGs are supported.

**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 tool-tip) 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

**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

# MPEG Test Systems

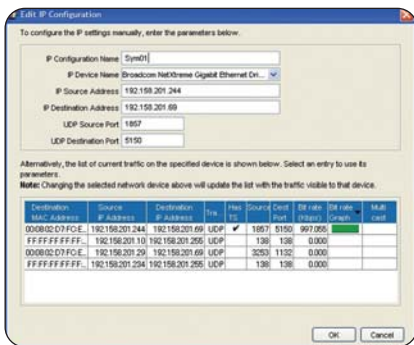
## ► MTS4SA PC-based MPEG Analysis Tools

### 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

The Ethernet port fitted as standard to most PCs running the MTS4SA analyzer will provide 10/100Base-T or Gigabit Ethernet interfaces for monitoring IP streams carrying MPEG video. This allows connection to a streaming IP video source for Video over IP analysis with CaptureVu™ technology. The analyzer allows the selection of any current UDP session on a LAN segment for subsequent analysis and extraction to disk.\*1



UDP sessions carrying MPEG TS traffic are indicated and may be selected for analysis and recording. Transport Stream packets are time-stamped as they are received from any Network Interface Card, allowing PCR measurements and graphing to be supported both on the MTS4SA Series instruments and on a user's own PC.

\*1 Network traffic loading is specified to 100 Mbps maximum bit rate.

### Log Entry Format

Each log entry consists of Time stamp taken from the 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

### IP Recording

Time-stamped transport stream recording can be made with packet arrival time information stored for offline PCR timing analysis. The maximum record length is limited only by available disk space. It is not necessary to pre-allocate a file before recording.

### IP Triggered Recording

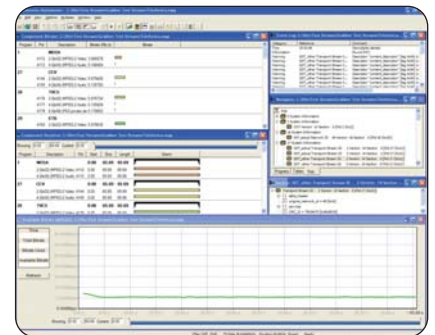
It is possible to make either an immediate or triggered recording, with the user definable pre-trigger buffer being used to capture stream before, during, or after the trigger point.

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.

### Multiplexer and DVB/ATSC Table Editor

When testing network elements or set-top boxes, a transport stream of the representative type needed is often not available. Even if there is a similar one, vital components within it may be missing or suffer from a lack of SI (system information) or other tables, or are multiplexed to the incorrect transport stream rate for the application.

Use the Multiplexer/Remultiplexer/ Demultiplexer application to create multi-program Transport Streams with custom SI/ PSI/PSIP information for DVB, ATSC, ISDB and MPEG compliant Transport Streams.



### The Tektronix Multiplexer/ Remultiplexer/Demultiplexer Application Supports:

- MPEG-1 Video
- MPEG-1 Audio
- MPEG-2 Video
- MPEG-2 Audio
- AC-3 Audio
- AAC Audio
- All the above are supported in Elementary and PES formats
- PIDs from other transport streams can be imported including any format including H.264 and VC-1
- Other data – the bit rate must be specified

### The Solution

The multiplexer allows the user to collect together components from streams recorded off hard disk or CD/DVD-ROM, manipulate them in an unlimited manner, and then rebuild a fully compliant output stream. The software's built-in knowledge of table syntax and descriptors ensures compliance and high quality output of the final multiplexed transport stream.

### Demultiplex Existing Streams

The multiplexer accepts any recorded transport stream as an input source. The user can then demultiplex this transport stream into its component PES. The user can then save the resulting PES and ES streams onto disk. The de-multiplexer is elementary stream agnostic and can be used to extract H.264 and VC-1 Elementary Streams from a Transport Stream.

### Regroup Them with Stored Streams

These PES, or elementary video and audio streams, can be grouped together into logical groups – “Programs” of video, audio, and other associated data (such as Teletext/Closed Caption and MHP applications) with the original timing preserved. PIDs can be re-mapped as required.

### Component Views and Available Bandwidth View

The Component Bit Durations View graphically displays the durations as well as start and stop times for each video or audio content PID. Duration and start and stop times can be changed by “drag and drop” or numerical entry. The available bandwidth view clearly shows the user how much content can be added into a transport stream so user can expand or optimize.

### Map, Check and Rebuild Your Own Multiplex

Streams can then be rebuilt into a larger multiplex stream and new SI/PSIP tables can be customized and added safely with in-built compliance checks.

### Generate Compliant Timing and Output Bit Rates as Required

The multiplexer is able to insert PCRs at the correct repetition rate and also allows the user to specify the PCR repetition rate, if desired.

### Create, Add, or Modify PSIP/SI/PSI Flexibility

The multiplexer allows all the standard ATSC/DVB/ISDB and MPEG PSIP/SI and PSI tables and descriptors to be added or edited. Scripting allows new or custom tables to be added. The user is permitted to generate illegal conditions that allow stress of decoder or transmission chain equipment to verify its robustness.

### “Expert” and “Standard” Modes

Standard mode will calculate related fields and table pointers. Expert mode is also provided to allow the user to set these to illegal conditions for stress and robustness test of network elements and STB decoders.

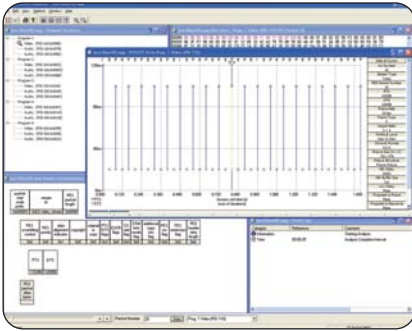
### Wizards for Common Tasks

- Create new transport streams
- Specify ATSC, DVB, ISDB, and MPEG standards
- Add programs
- Add events

## MPEG Test Systems

### ► MTS4SA PC-based MPEG Analysis Tools

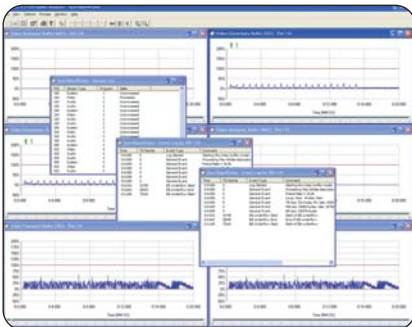
#### Packetized Elementary Stream (PES) Analyzer



- Analyzes PES headers
- Analyzes presentation and decode time stamps (PTS/DTS)
- Detects encoder drift against real-time errors

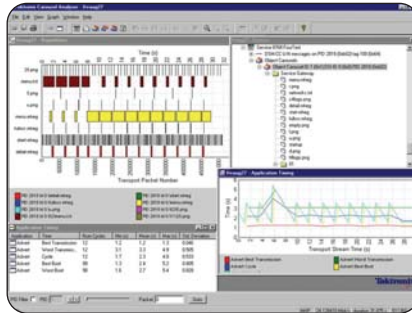
#### Buffer Analyzer

- Verifies encoder is correct using T-STD buffer analysis.



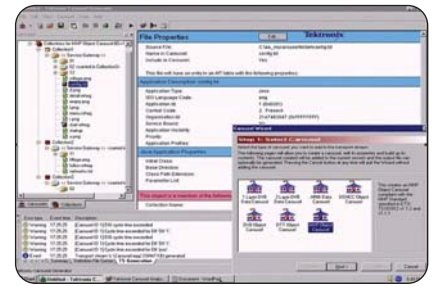
- Processes video, audio and system control streams to ISO/IEC 13818 parts 1-3, AC-3 (AS2) and AAC 13818 part 7.

#### Carousel Analyzer



- Analyzes stored Transport Streams
- Provides analysis and display of:
  - Carousel Signalling
  - Carousel Transport
  - Data Carousels (MPEG, DVB, and ARIB B24)
  - Object Carousels (MHP and MHEG-5)
  - View Objects (including GIF, JPEG, PCX, PNG, .txt and MPEG "I" frame backdrops)
  - Extract and Save Objects
- Drag and Zoom Graphing
  - Repetition rates
  - Carousel cycle times
  - Entity cycle times
  - PID and component Bitrates
  - Bandwidth
  - Application load timing statistics
- Comprehensive error reporting

#### Carousel Generator

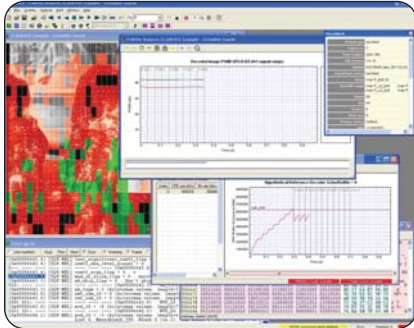


- Wizard helps easy stream generation
- Built-in multiplexer for easy video and audio insertion
- Variable delivery weightings to optimize carousel load times
- Generates all required SI tables for terrestrial, satellite, and cable applications
- Integrates with the Tektronix carousel analyzer for load time optimization



## Next Generation Video Elementary Stream Analyzer

(Order as MTS4EA)



### Applications

- Semiconductor manufacturers
- Developers of set top boxes, encoders and decoders
- Broadcasters, Mobile and Fixed Network Operators

### Standards

- MPEG-2
- MPEG-4 Part 2 and MPEG-4 Part 10 (H.264/AVC)
- VC-1
- H.263+, H.263, H.261
- Container/Wrapper format support includes: 3GP, MP4, ASF, Transport Stream and Program Stream

### Features

- Display motion vectors, variable-size macroblocks, and types
- Buffer analysis
- Powerful syntax checking alerts and macroblock semantic parsing and interpretation
- Picture thumbnail navigator
- Frame-by-Frame graphing
  - Bits per MacroBlock
  - Bits per coded MacroBlock
  - Motion vector histogram
  - DCT frequencies
  - Average quantization
  - Coding frequency
  - Intra-coding frequency
- Picture Fidelity Analysis
  - PSNR
  - Root Mean Square Error
  - Mean Square Error
  - Mean Absolute Difference
  - Sum Absolute Difference
- Powerful Batch Mode
  - Analyze from command-line/batch file/script file
  - Automatically test thousands of video files
  - Use for regression testing and algorithm comparison
  - Alert functions logging
  - Analysis trace logging
  - YUV decoding to a file

### Other Applications

#### Creating, Editing and Resizing Transport Streams

Two direct stream manipulation packages are supplied as standard with all MTS4SA products. TS Cutter allows re-sizing of Transport Streams, while TS Editor allows direct editing of Transport Streams using a hexadecimal view as well as a header interpretation guide. Users can remap PIDs, recalculate PCR values and deliberately introduce calibrated PCR inaccuracies, following several laws (Gaussian, Random, sine wave, etc.).

### Make Seamless

When looping a transport stream to simulate continuous playout, errors can be generated at the loop point caused by discontinuities in timing information. The Make Seamless module provides the opportunity of creating seamless Transport Streams.

### Standalone Software System Requirements

- PC with Genuine Intel Pentium class 1.2 GHz processor
- Intel or 100% compatible motherboard chipset
- Windows NT 4.0, Windows 2000 or Windows XP Operating System
- Internet Explorer 5.0 or above
- 256 MB of RAM
- 500 MB of available hard disk space for the applications and documentation
- Additional space will be required for storage of captured video streams
- SVGA (800x600) resolution video adapter and monitor (XVGA 1024x768 or higher-resolution recommended)
- CD-ROM or DVD drive
- 3.5" Floppy Disk drive
- Keyboard and Microsoft Mouse or compatible pointing device
- Video over IP Analysis option requires a standard network interface card (NIC)
- Detailed Graphical Displays provided by the next generation compressed video analyzer (MTS4EA) require Microsoft Excel

## MPEG Test Systems

► MTS4SA PC-based MPEG Analysis Tools

### ► Ordering Information

#### ► Standalone Software for Installation on a User's Own PC

Item	Option	Description
MTS4SA		Stand Alone Deferred Time Software Package for installation on a user's own PC (see minimum system requirements)
MTS4SA	USB	USB Security dongle supplied with Stand Alone Software Package
MTS4SA	PPD	Parallel Port Security dongle supplied with Stand Alone Software Package
MTS4SA	TSCA	Security Dongle key to add Deferred Time Transport Stream Compliance Analyzer with CaptureVu™ technology
MTS4SA	TSCL	Security Dongle key to add Deferred Time Transport Stream Compliance Analyzer with CaptureVu technology (file size limited to 200 MB)
MTS4SA	TSCR	Security Dongle key to add Real Time Video over IP Transport Stream Compliance Analyzer with CaptureVu technology (for use with a standard network interface card)
MTS4SA	MX	Security Dongle key to add Deferred Time Multiplexer
MTS4SA	ES	Security Dongle key to add ES Analyzer
MTS4SA	PB	Security Dongle key to add PES and Buffer Analyzer
MTS4SA	DB	Security Dongle key to add Carousel Analyzer
MTS4SA	CG	Security Dongle key to add Carousel Generator
MTS4SA	DBCG	Security Dongle key to add Carousel Analyzer and Carousel Generator
MTS4SA	L0	English Documentation
MTS4SA	L5	Japanese Documentation

► Upgrade or Add Standard Options After Initial Purchase of MTS4SA

Item	Option	Description
MTS4UP		MTS4SA Series Field Upgrade Kit
MTS4UP	DDP	Dongle Upgrade Disk – Parallel
MTS4UP	DDU	Dongle Upgrade Disk – USB
MTS4UP	TSCA	Upgrade to add Deferred Time Transport Stream Compliance Analyzer (available for MTS4SA only)
MTS4UP	TSCL	Upgrade to add Deferred Time Transport Stream Compliance Analyzer File Size Limited to 200 MB (available for MTS4SA only)
MTS4UP	TSCR	Upgrade to add Real Time Video over IP Transport Stream Compliance Analyzer (available for MTS4SA only)
MTS4UP	IPE	Upgrade to add Real Time Video over IP Analysis (available for MTS4SA only)
MTS4UP	MX	Upgrade to add Deferred Time Multiplexer (available for MTS4SA only)
MTS4UP	PB	Upgrade to add PES and Buffer Analyzer (available for MTS4SA only)
MTS4UP	ES	Upgrade to add ES Analyzer to any MTS4SA Series product
MTS4UP	DB	Upgrade to add Carousel Analyzer to any MTS4SA Series product
MTS4UP	CG	Upgrade to add Carousel Generator to MTS4SA series
MTS4UP	DBC	Upgrade to add Carousel Analyzer and Carousel Generator to MTS4SA series
MTS4UP	UPG	Upgrade to latest version of MTS4SA Series base software and installed options. Includes CD and Manual (does not include upgrades to MTS4EA software)

## MPEG Test Systems

### ► MTS4SA PC-based MPEG Analysis Tools

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Our most up-to-date product information is available at:  
[www.tektronix.com](http://www.tektronix.com)

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