# MTX100B Portable MPEG Test System

## MTS400 Series MPEG Analysis Tools Data Sheet



- **New**: Integrated IPTV and Video over IP Stress Test Generation for Hybrid STB Test, or Migration from RF to IP Interface Technology

- **New**: Suite of Test Streams Provided as Standard and Optional Multiplexer Software Provides Complete Stream Creation and Generation Tool Set

- Analyzes Stored Transport Streams at up to 400 Mb/s to Greatly Reduce Analysis Time. Real-time Transport Stream Analysis Available from 500 Kb/s to 214 Mb/s

- Playout and Record at Speeds up to 120 Mb/s from Local Disk and 200 Mb/s from RAM

- Innovative *Program Centric* User Interface Brings Expert Power to the Novice User

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

## Features & Benefits

- The MTS400 Series MPEG Analysis Tools are Now Available on the MTX100B Portable Platform

- Separate Options are Available for Real Time*1 and 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™ Feature and PCR Measurement and Graphing Capabilities. CaptureVu™ Feature Captures and Analyzes System Events in Real Time and Deferred Time to Debug the Intermittent and Complex Problems that Traditional Analyzers Miss

- Real-time Video over IP Generation, Analysis, and Recording

## Applications

### Intended Applications

- The addition of the MTS400 MPEG analysis toolset to the MTX100B platform provides a complete solution for stream creation, editing, generation, and analysis on a highly portable platform. Ideally suited for in-field installation, commissioning, and debug of complex MPEG transmission systems, the analysis options offered with the MTX100B provide both real-time and offline Transport Stream analysis capability with ASI, SMPTE310M, and IP interface options. Additional options provide offline multiplexing, PES and buffer analysis, elementary stream analysis, and data broadcast analysis.

*1 Interfaces available include ASI, SPI (DVB Parallel), and SMPTE310M.

**Tektronix**®

## Introduction/Overview

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 MTS400 Series MPEG tools can be applied anywhere at any level, to diagnose and solve the most subtle, complex, and intermittent DTV problems in the minimum time.

The MTS400 Series MPEG tools provide 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 though built-in 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.

## Player and Recorder

The MTX100B MPEG-2 Recorder and Player offers a flexible, affordable solution for design evaluation and conformance testing of digital video products using MPEG-2 technology. The MTX100B records and plays out MPEG-2 Transport Streams compliant with ATSC, DVB, and ISDB standards at the high data rates needed to verify and troubleshoot designs for high-performance video products and systems. The large internal storage, USB 2.0, and Ethernet download capability help you build and maintain a large library of test streams.

The MTX100B offers continuous, error-free Transport Stream looping for long duration playout, and PCR Jitter insertion for stressing designs. Users can continuously loop all sample streams, including updating of all time stamps, continuity counters, time tables (TDT, TOT, and STT), Normal Play-time Reference, and ISDB-T Reed Solomon FEC, without fear of buffer under- or overflow.

An Ethernet network remote control functionality enables control of functions such as Play, Record, Clock Rate, and Jitter Insertion using the SCPI (Standard Control for Programmable Instruments) command set.

The MTX100B can play any Transport Stream files, including custom Transport Streams created with offline multiplexers in the Tektronix MPEG Analysis Tools. In addition, the MTX100B can play data files in other formats, including elementary streams and files in DSS format.
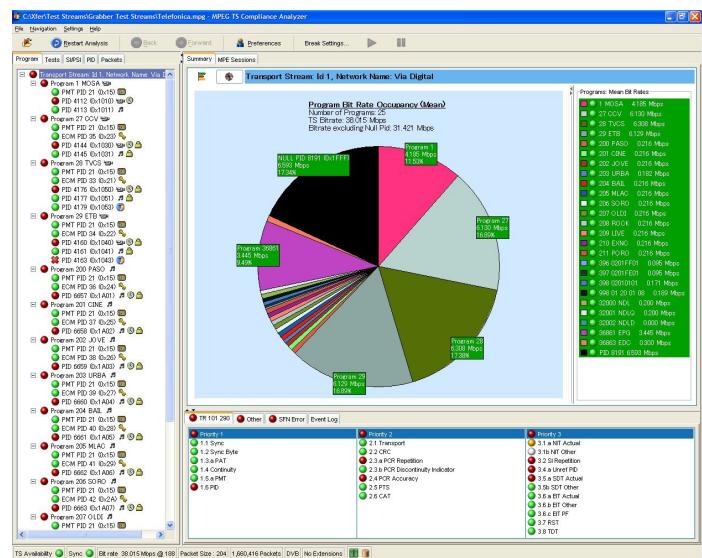


## Summary of Analyzer Options

## Transport Stream Compliance Analyzer (TSCA, TSCX)

The MPEG Transport Stream Compliance Analyzer (TSCA) is a new class of software-based analysis tool, the world's first Compressed Digital Video Debugger/Analyzer that introduces the CaptureVu™ feature, a new-to-market capability that captures and analyzes system events to debug the intermittent and complex problems that traditional software-based analyzers miss.

The TSCA offers significant enhancements over traditional software-based deferred-time (stored streams) MPEG analyzers. The combination of an innovative high-speed analysis engine and built-in intelligence, allows ultrafast pinpointing and debugging of intermittent faults in MPEG Transport Streams.

The TSCX is a real-time version of the TSCA analyzer operating on all of the connected stream interfaces as well as IP through the Ethernet port. The real-time analysis also includes Cross Layer time-correlated IP and TS measurements, alarms, and error logging together with stream recording.

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.

Multiplexer and SI Table Editor
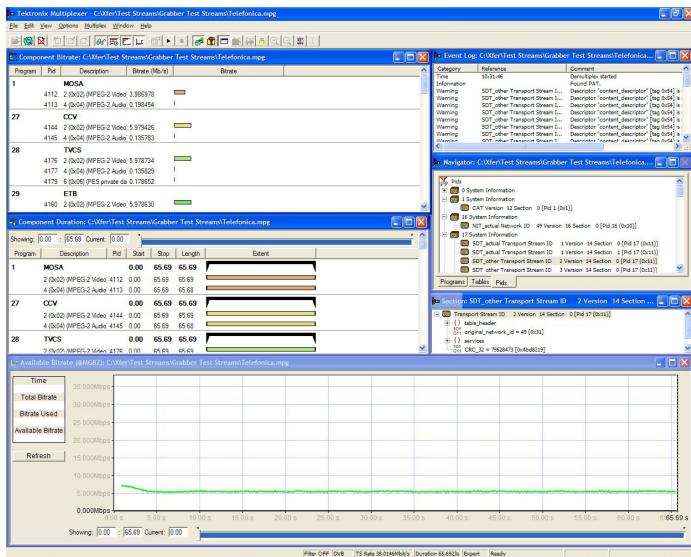


Packetized Elementary Stream (PES) Analyzer

## Multiplexer and SI 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 multiprogram Transport Streams with custom SI/PSI/PSIP information for DVB, ATSC, ISDB, and MPEG compliant Transport Streams. A new ISDB-T Single Segment mode is added in version 3.1.

H.264 Elementary Streams may also be multiplexed into a Transport Stream. H.264 streams, both with and without SEI timing messages, are supported. The PTS and DTS generated for non-SEI streams are based upon the POC (Picture Order Count) information. PTS/DTS generation may be suppressed for SEI streams. Bit rate and frame rate auto-detection features aid the import process. These may be overridden for non-SEI streams.
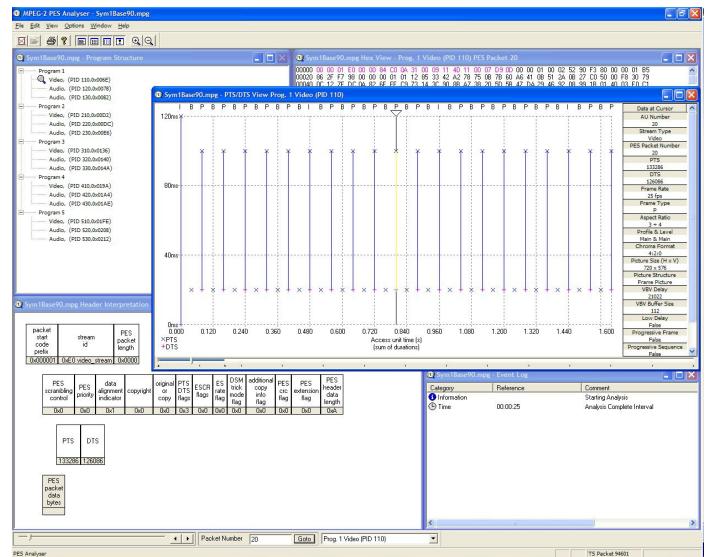
This enables the user to create their own test streams that they can use to validate and debug their designs more quickly, and also to create errored streams to perform parametric stress testing and ensure robustness and quality of their MPEG-2 or H.264 implementation.

## Packetized Elementary Stream (PES) Analyzer

When developing professional and consumer equipment, particularly encoders and set-top boxes, the characteristics of the test streams being either generated or used as stimulus need to be ascertained. The header associated with each PES packet is of particular interest, as it contains the decode and presentation time stamps (DTS and PTS) for the contained Elementary Stream. Errors in these time stamps may cause resets or picture freeze problems at the receiver in extreme cases. They are more typically the cause of lip sync problems where the time stamps of associated video and audio streams are not synchronized. The PES Analyzer is designed to help address these problems as well as verify conformance of the PES header contents to the MPEG, DVB, and ATSC standards.
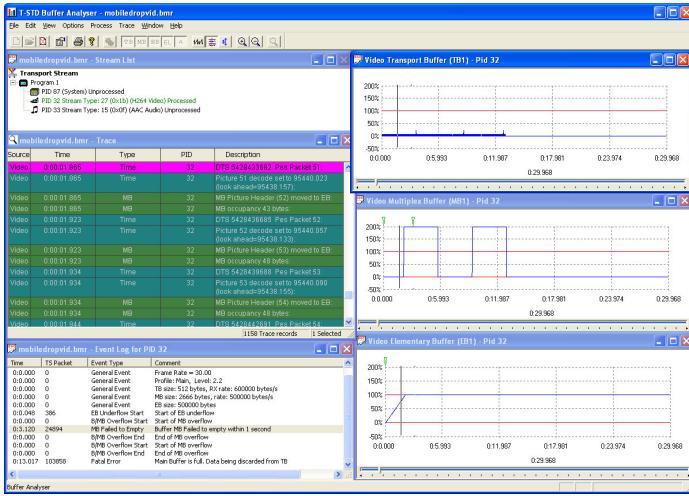
Buffer Analyzer

## Buffer Analyzer

When developing professional and consumer equipment, particularly encoders and set-top boxes, the characteristics of the test streams being either generated or used as stimulus need to be ascertained. Of critical importance amongst these characteristics is adherence to the buffer model. That is, when the stream is processed by a receiver, will any of the internal buffers be caused to either under- or overflow. Consequences of these conditions will be freeze frames and receiver resets.

There are two types of buffer model; the one to use by the receiver is signaled within the Elementary Stream itself. The T-STD method is based upon the DTS values within the PES header and can be used for any contained CODEC type. Additionally, certain video CODECs such as MPEG-2 and H.264/AVC may contain buffer parameters within the ES itself. The Buffer Analyzer verifies conformance of a stream to the T-STD model. Verification of the H.264/AVC HRD method is covered by the MTS4EA product.

## Carousel Analyzer

When developing either data or object carousels for interactive applications, designers not only need to verify the content of carousels, but also whether they are compliant with the relevant standards, and to optimize the settings between transmission bandwidth and responsiveness of the user experience. These settings are mainly concerned with the repetition rates of the various carousel groups. The Carousel Analyzer is designed to address all of these needs for a Transport Stream file containing carousel components.
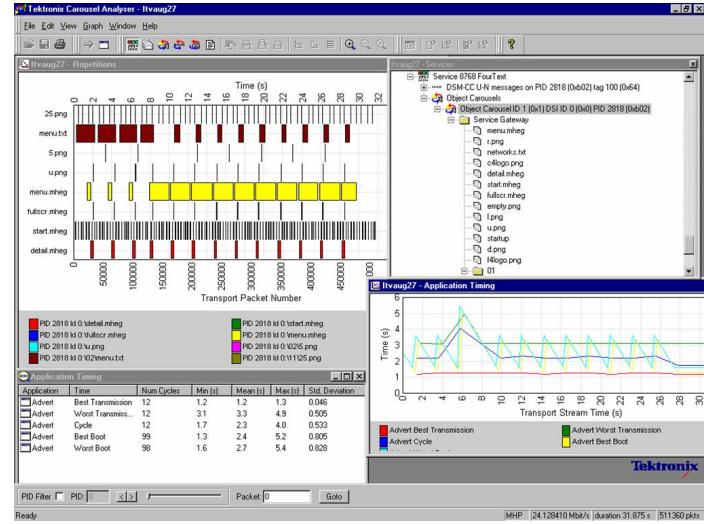


Carousel Analyzer
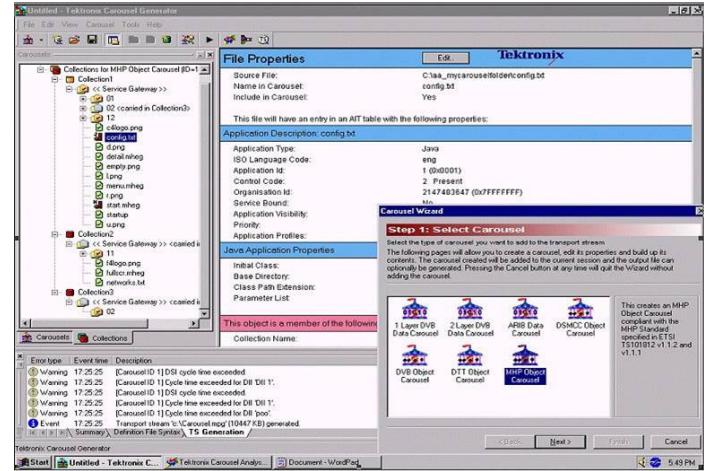


Carousel Generator

## Carousel Generator

The Carousel Generator product is used for creating object carousel contents within an output Transport Stream. This is particularly useful in test situations where the effects of varying parameters, such as individual repetition intervals, may be quickly ascertained. The generator will create object carousels conforming to the MPEG-2, DVB, DTT (MHEG-5), or MHP standards.

# Characteristics

## System Characteristics

| Characteristic | Description |
|---|---|
| MPEG Stream Source | Supports MPEG-2, DVB, ATSC, ISDB, and IPTV protocols. Records and plays out MPEG streams in multiple formats. Error-free looping. PCR Jitter insertion |
| Packet Length | 188, 204, or 208 bytes, and non-TS |
| ASI Maximum Data Rate | |
|     Memory | 200 Mb/s |
|     Disk | 120 Mb/s |
|     Maximum Individual File Size | 100 GB |
| ASI Minimum Data Rate | 500 Kb/s |
| Number of Input/Output Interfaces | One DVB SPI I/O standard, with a second I/O available. One IP output standard |
| IP Generation | Supports IPv4, IPv6, RTP, UDP, Unicast, IGMP Multicast and Broadcast modes, TTS |
| Available Optional Interfaces | Asynchronous Serial Interface (ASI) required for Real-time Transport Stream analysis (Opt. TSCX). IP Interface option required for Real-time Transport Stream analysis (Opt. IPE) |
| Internal Reference Clock | 27 MHz ±1 ppm |
| External Reference Input | 27 MHz ±1 ppm (recommended) |

## Transport Stream Interfaces

| Characteristic | Description |
|---|---|
| DVB Synchronous Parallel Interface (Standard) | Connector: 25-pin D-sub Maximum data rate: 200 Mb/s |
| SMPTE310M / ASI / SPI Interface (Option 07) | |
|     SMPTE310M Connector | BNC, Data rate: 19.39 Mb/s |
|     ASI Connector | BNC, Maximum data rate: 200 Mb/s |
|     SPI In Connector | 25-pin D-sub, Maximum data rate: 200 Mb/s |
| IP Playout Interface (Standard) | 10/100/1000BaseT RJ45 network interface |
| IP Maximum Data Rate | |
|     Single Session | 160 Mb/s |
|     Session Replication | 300 Mb/s |
| IP Interface | 10/100/1000BaseT RJ45 network interface |

## Platform Characteristics

| Characteristic | Description |
|---|---|
| Operating System | Microsoft Windows XP |
| Disk Space | System: 19.5 GB MPEG storage: 182 GB |
| RAM | 1024 MB |
| Display | 1024×768, color LCD |
| Character Input | Keypad |
| Keyboard and Mouse | Standard |
| Interfaces | VGA output, printer port, serial port, USB 2.0, 1000Base-T Ethernet, IEEE1394b |

## Environmental

| Characteristic | Description |
|---|---|
| Temperature | |
|     Operating | +5 °C to +40 °C |
|     Nonoperating | -20 °C to +60 °C |
| Humidity | |
|     Operating | 20% to 80% (noncondensing) |
|     Nonoperating | 5% to 90% (noncondensing) |
| Altitude | |
|     Operating | Up to 3 km |
|     Nonoperating | Up to 12 km |

## Regulatory

| Characteristic | Description |
|---|---|
| EMC | EN61326-1 |
| Safety | UL61010-1, CAN/CSA C22.2 No. 61010-1-04, EN61010-1 |
| Australia Declaration of Conformity | AS/NZS 2064 |

## Power Requirements

| Characteristic | Description |
|---|---|
| Mains Voltage Range | 100 to 240 VAC |
| Mains Frequency | 50/60 Hz |
| Power Requirements | 180 VA max |

## Physical Characteristics

| Dimension | mm | in. |
|---|---|---|
| Height | 132 | 5.2 |
| Width | 214 | 8.4 |
| Depth | 435 | 17 |
| **Weight** | **kg** | **lb.** |
| | 6.2 | 13.7 |

## Ordering Information

MTS400 software options for the MTX100B platform.

### MTX100B Options

| Option | Description |
|---|---|
| Opt. 07 | Add SMPTE310M / ASI / SPI Interface Module Option 07 is required to run Opt. TSCX and Opt. MTX10UP |
| Opt. IPE | Security Dongle key to add 10/100Base-T Video-over-IP electrical interface to MTX100B |
| Opt. TSCX | Security Dongle key to add Real Time Transport Stream Compliance Analyzer to MTX100B |
| Opt. TSCA | Security Dongle key to add Deferred Time Transport Stream Compliance Analyzer to MTX100B |
| Opt. MX | Security Dongle key to add Deferred Time Multiplexer to MTX100B |
| Opt. ES | Security Dongle key to add ES Analyzer to MTX100B |
| Opt. PA | Security Dongle key to add PES Analyzer to MTX100B |
| Opt. BA | Security Dongle key to add Buffer Analyzer to MTX100B |
| Opt. DB | Security Dongle key to add Carousel Analyzer to MTX100B |
| Opt. CG | Security Dongle key to add Carousel Generator to MTX100B |
| Opt. DBCG | Security Dongle key to add Carousel Analyzer and Carousel Generator to MTX100B |
| Opt. L0 | English printed manual |
| Opt. L5 | Japanese printed manual |
| Opt. L99 | Electronic manuals only (no printed manual) |

**Note:** Upgrade to add Standard Options after initial purchase of MTX100B platform

### MTXPAUP Options

| Option | Description |
|---|---|
| Opt. IPE | Upgrade to add Security Dongle key for 10/100Base-T Video-over-IP electrical interface to MTX100B |
| Opt. MX | Upgrade to add Security Dongle key for Deferred Time Multiplexer to MTX100B |
| Opt. ES | Upgrade to add Security Dongle key for ES Analyzer to MTX100B |
| Opt. PA | Upgrade to add Security Dongle key for PES Analyzer to MTX100B |
| Opt. BA | Upgrade to add Security Dongle key for Buffer Analyzer to MTX100B |
| Opt. DB | Upgrade to add Security Dongle key for Carousel Analyzer to MTX100B |
| Opt. CG | Upgrade to add Security Dongle key for Carousel Generator to MTX100B |
| Opt. DBCG | Upgrade to add Security Dongle key for Carousel Analyzer and Carousel Generator to MTX100B |
| Opt. TSCA | Upgrade to add Security Dongle key for Transport Stream Compliance Analyzer to MTX100B |
| Opt. TSCX | Upgrade to add Security Dongle key for Real Time Transport Stream Compliance Analyzer to MTX100B |
| Opt. UPG | Upgrade to add latest version of MTS4 Series analyzer application software |
| Opt. L0 | English Documentation for Portable Analyzer, printed (MTS400) |
| Opt. L5 | Japanese Documentation for Portable Analyzer, printed (MTS400) |
| Opt. L99 | Electronic manuals only (no printed manual) for Portable Analyzer (MTS400) |
| Opt. IF | One-time install of all selected options for one product |

### Service

| Option | Description |
|---|---|
| Opt. C3 | Calibration Service 3 Years |
| Opt. C5 | Calibration Service 5 Years |
| Opt. D1 | Calibration Data Report |
| Opt. D3 | Calibration Data Report 3 Years (with Opt. C3) |
| Opt. D5 | Calibration Data Report 5 Years (with Opt. C5) |
| Opt. R3 | Repair Service 3 Years |
| Opt. R5 | Repair Service 5 Years |

### Power Plug Options

| Option | Description |
|---|---|
| Opt. A0 | North America power |
| Opt. A1 | Universal EURO power |
| Opt. A2 | United Kingdom power |
| Opt. A3 | Australia power |
| Opt. A4 | 240 V, North America power |
| Opt. A5 | Switzerland power |
| Opt. A6 | Japan power |
| Opt. A10 | China power |
| Opt. A99 | No power cord |

### Optional Accessories

| Accessory | Description |
|---|---|
| 071-1754-xx | Service Manual |
| WFM7F05 Opt. NN | Rackmount Kit |
| 1700F06 | Blank Panel |

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.

**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**

06 Aug 2009                                                                                           25W-19987-3

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