

MTS400 Series MPEG Analysis Tools

MTS400P Portable MPEG Test System Data Sheet



Features & Benefits

- Industry's Fastest Analysis Engine enables Reduced Time to Insight, Rapid Development, Evaluation, Deployment, and Diagnostics of Next-generation DTV and IPTV Systems and Services
- A Wide Range of DTV Standards are Supported, including MPEG, DVB, ATSC, ISDB, and ISDB-TB (Brazil). Specific SI for Terrestrial, Cable, and Satellite, plus Regional Variations of these Standards are Also Supported

- Range of Analysis Capabilities provide the Necessary Connectivity to Diagnose Problems Anywhere in the Network Environment
- Integrated Cross-layer Fault Analysis and Logging provides One-box Solution for Fault Diagnosis, Reducing Time to Insight when Troubleshooting
- Analyze both Constant and Variable Bit Rate Streams (CBR and VBR)*1
- Playout Functionality provides Stimulus with Parametric Capabilities and IP Multisession Replication to Characterize Behavior of Network or Device Under Test
- CaptureVu™ Technology Captures and Analyzes System Events in Real Time and Deferred Time to Debug the Intermittent and Complex Problems that Traditional Analyzers Miss
- Innovative "Program-centric" User Interface brings Expert Power to the Novice User
- FlexVuPlus allows the User to Bookmark up to 4 Screens of Particular Interest for Quick and Easy Access
- H.264 Buffer Analysis, Multiplexing, and ES Compliance Checking provide the Most Powerful Suite of Tools for Creation and Analysis of Transport Streams Containing H.264 Content
- Both Buffer Analysis and Multiplexing are Now Available for MPEG-4 AAC, a Mandatory ISDB-TB Audio CODEC. These Compliment the Existing MPEG-4 AAC ES Compliance Checking
- Portable Platform for Field-based Use
- **Try Before You Buy:** Demo Versions of the TSCA, Multiplexer, and Buffer Analyzer are Available to Download

Applications

Broadcasters and Network Operators

- Analysis of Transport Streams to Confirm Correct System Operation and Isolate Faults During Installation and Commissioning
- ASI, SMPTE310M, LVDS, and IP Connectivity and Analysis provide Single-box Solution for Broadcast System Troubleshooting
- Integrated Cross-layer Fault Analysis and Logging for Network Fault Diagnosis Reduces Time to Insight when Troubleshooting and Removes the Need for Additional IP-specific Diagnostic Equipment
- Tests Contribution Feeds or Encoder Outputs, Multiplexer Inputs/Outputs, Head End Modulators, and IP Encapsulators
- Tests PCR Insertion, Recovery, and Regeneration Equipment
- Compliance Checker helps Diagnose CODEC-related Interoperability Problems. This is Especially Valuable when Migrating from MPEG-2 to AVC/H.264 Video

Equipment Manufacturers – Manufacturing Test

- Stream Playout and Recording provides Repeatable Test Source with Seamless Looping and Continuous Time Stamping for Test and Alignment of STBs, IRDs, and Modulators
- Equipment Test is Simplified and Faster with CaptureVu™ and High-speed TS Analysis
- Multiplexer/Remultiplexer Option allows Custom Test Stream Creation for Fast and Flexible Equipment Stress Testing
- Duplex Operation allows End-to-End Testing of System Network Elements^{*2}

^{*1} Some timing-related measurements are not possible with VBR streams.

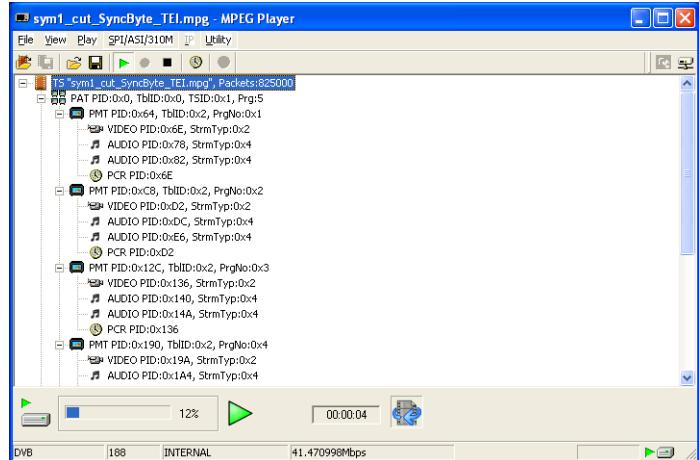
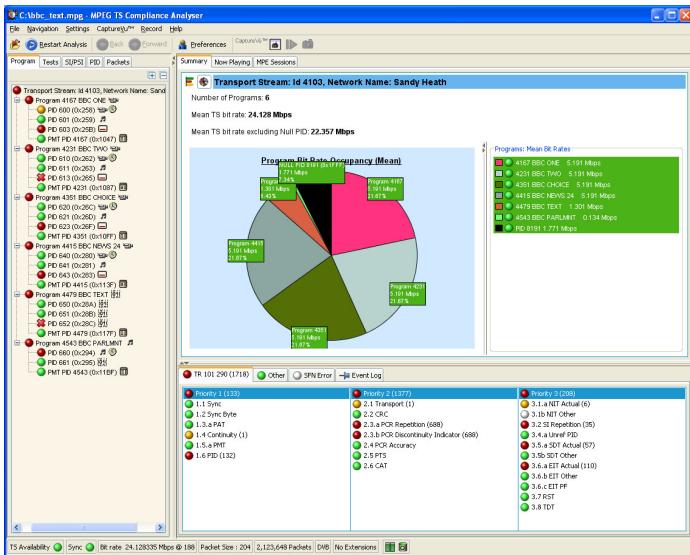
^{*2} Duplex is not available for Transport Streams over IP.

Summary of Standard MTS400P Tools

Standard Tools	Optional Tools
Real Time Transport Stream Compliance Analyzer	Deferred Time Transport Stream Compliance Analyzer
TS Editor and Cutter	Player
	Multiplexer
	T-STD Buffer Analyzer
	PES Analyzer
	Carousel Analyzer
	Carousel Generator
	MPEG-2 ES Analyzer ^{*3}
Standard Interfaces	Optional Interfaces
ASI	IP Video (10/100/1000BASE-T, 1000BASE-SX, LX, ZX)
LVDS (DVP Parallel)	
SMPTE310M	
Ethernet IP (10/100/1000BASE-T) Use with Player only	

Further details are available by selecting the option header or from the Product Information.

^{*3} For MPEG-4, H.264, and VC-1 analysis, please refer to the MTS4CC ES Compliance Checker or MTS4EA ES Analyzer.



Creating, Editing, and Resizing Transport Streams

Two direct stream manipulation packages are supplied as standard with the MTS400. TS Cutter allows resizing of Transport Streams. TS Editor allows direct editing of Transport Streams using a hexadecimal view as well as a header interpretation guide.

Summary of MTS400P Optional Tools

Player

The Player tool provides a Transport Stream stimulus for a device under test through the ASI, SMPTE310, LVDS (DVB Parallel), or IP stream interfaces. Continuous playout of looped streams is possible at up to maximum ASI rate of 214 Mb/s with automatic updating of time stamps. Playout rate can be automatically determined from file PCRs or manually set. Simultaneous playout and recording (duplex operation) for end-to-end system test is supported with the ASI/SMPTE310M and LVDS interfaces.

Playout through the IP interface provides stimulus with parametric capabilities and multisession replication to characterize behavior of a network or device under test. This capability enables equipment manufacturers developing hardware or software solutions for video distribution over IP and IPTV to ensure quality and performance of products, resulting in reduced development costs and accelerated rollout of next-generation IP broadcast services.

Transport Stream Compliance Analyzer (TSCA)

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 used in next-generation DTV and IPTV systems and services.

The TSCA also provides real-time analysis of Transport Streams received through the MTS400's stream interfaces, including an optional IP Video interface. The real-time analysis includes cross-layer time-correlated IP and TS measurements, alarms, and error logging together with stream recording.

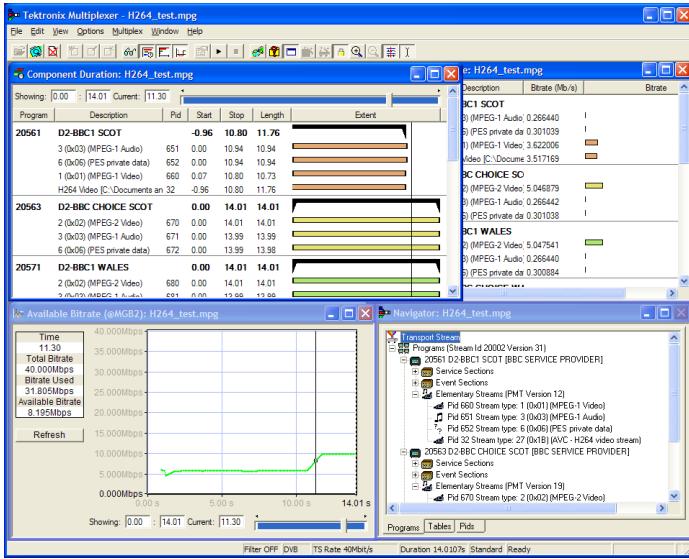
The TSCA includes the CaptureVu™ technology and PCR measurement and graphing capabilities. CaptureVu™ technology captures and analyzes system events in real time and deferred time to debug the intermittent and complex problems that traditional analyzers miss.

Standards compliance is ensured through 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, ISDB-TB (Brazil), and MPEG. To maintain compatibility with the latest standards, 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.

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.

Note: Only real-time TSCA is included as standard, deferred-time operation is an option.

Data Sheet



Multiplexer

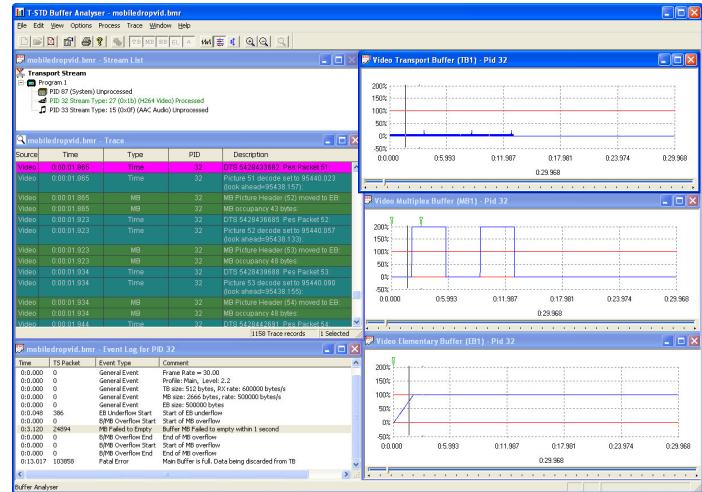
When testing network elements or set-top boxes, a Transport Stream of the representative type needed is often not available. Even if there is a similar one, vital components within it may be missing or suffer from a lack of SI (Service Information) or other tables, or are multiplexed to the incorrect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

Use the Multiplexer/Remultiplexer/Demultiplexer application to create and modify multiprogram Transport Streams with custom SI/PSI/PSIP information for DVB, ATSC, ISDB^{*4}, and MPEG compliant Transport Streams.

Video and audio Elementary Streams may also be multiplexed into a Transport Stream. H.264 streams, both with and without SEI timing messages, are supported. Bit rate and frame rate auto-detection features aid the import process.

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.

The **Make Seamless** wizard is provided with the Multiplexer. When looping a Transport Stream to simulate continuous playout, errors can be generated



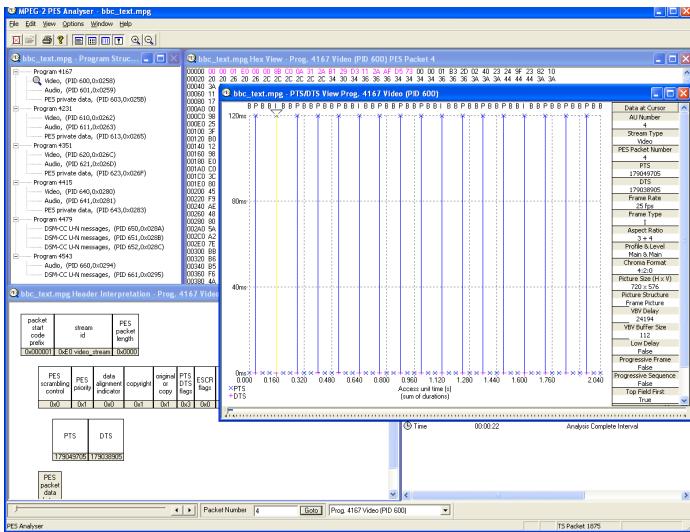
at the loop point caused by discontinuities in timing information. The Make Seamless wizard provides the opportunity of creating a seamless version of a Transport Stream file by adjusting SI and ES components within the stream.

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 among 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.

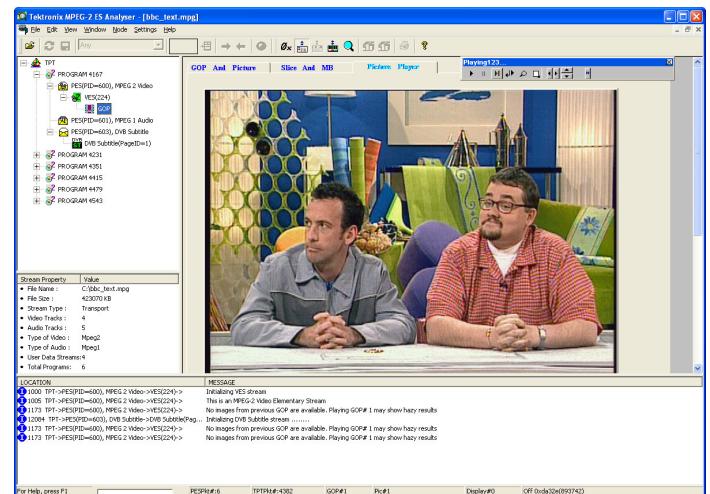
There are two types of buffer model; the one to use by the receiver is signaled within the Elementary Stream itself. The T-STD method is based upon the DTS values within the PES header and can be used for any contained CODEC type. Additionally, certain video CODECs such as MPEG-2 and H.264/AVC may signal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

^{*4} This includes ISDB-TB (Brazil) and a Single Segment mode.



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.

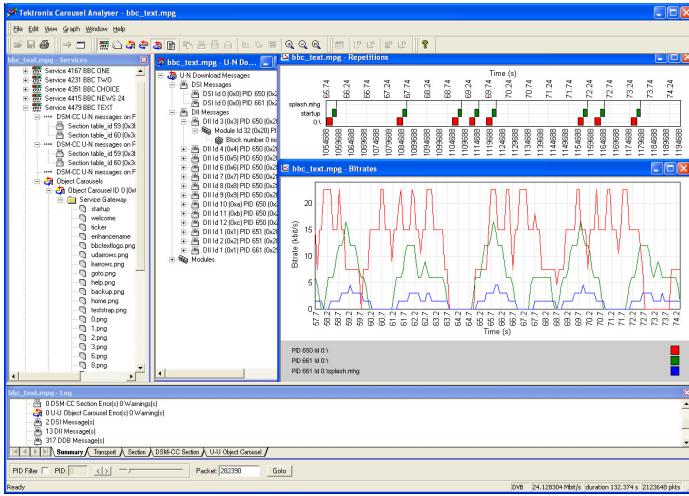


Elementary Stream (ES) Analyzer

The ES Analyzer is intended for CODEC design, optimization, and conformance purposes. It provides the ability to view the moving picture from within a PES stream and carry out a whole range of sophisticated tests on the lower layers of an elementary stream within a Transport Stream. In addition, it both analyzes and displays a range of extended media formats, including ATSC Closed Captions, DVB Subtitles, and Teletext associated with video Elementary Streams.

For analysis of MPEG-4, AVC/H.264, and VC-1 as well as MPEG-2 Elementary Streams, please refer to the MTS4EA data sheet (2AW-18069).

Data Sheet

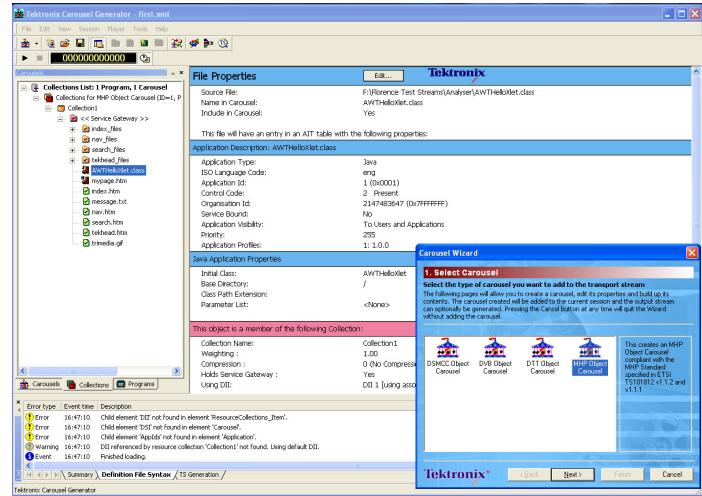


Carousel Analyzer

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. It analyzes carousels compliant with MPEG-2 DSM-CC, DVB (including MHP), DTT (MHEG-5), or ARIB standards.

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 DSM-CC, DVB, DTT (MHEG-5), or MHP standards.

Performance You Can Count On

Depend on Tektronix to provide you with performance you can count on. In addition to industry-leading service and support, this product comes backed by a one-year warranty as standard.

Characteristics

System Characteristics

Characteristic	Description
MPEG Stream Source	Supports MPEG-2, DVB, ATSC, and ISDB 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	
Play and record	256 Kb/s
MPEG analysis	500 Kb/s
IP generation	IPv4, IPv6, RTP, UDP, Unicast, IGMP Multicast and Broadcast modes, TTS
IP Maximum Data Rate	
Single session	160 Mb/s or 200 Mb/s with optional IP Video interface
Session replication	300 Mb/s
Input/Output Interfaces	DVB SPI, ASI, SMPTE310M I/O Ethernet IP (10/100/1000BASE-T)
Available Optional Interfaces	IP Video (10/100/1000BASE-T, 1000BASE-SX, LX, ZX)
Internal Reference Clock	27 MHz ± 1 ppm when manufactured
Stability	± 1 ppm over temperature range
Long-term Drift	± 0.5 ppm per year
External Reference Input	27 MHz ± 1 ppm (recommended)

Transport Stream Interfaces

Characteristic	Description
DVB Synchronous Parallel Interface	
Connector	25-pin D-sub
Maximum data rate	200 Mb/s
IP Interface	10/100/1000BASE-T RJ45 Network Interface
SMPTE310M/ASI/SPI Interface	
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 Video (Optional)	
Session Support Discovery of up to 500 IP sessions	
Simultaneous monitoring of key parameters including Continuity Count and Sync Byte	
Packet Interarrival Time (PIT) for all sessions	
RTP sessions are monitored for Out-of-Order and Dropped Packets	
Port options	
Opt. IPTVP	Gigabit Ethernet Interface with 10/100/1000BASE-T RJ45 electrical port
Optical SFP modules which plug into IP Video Card GE to provide optical connectivity:	
Opt. SX	1000BASE-SX Short-wavelength optical port with LC connector for Gigabit Ethernet Interface (Multi Mode 850 nm)
Opt. LX	1000BASE-LX Long-wavelength optical port with LC connector for Gigabit Ethernet Interface (Single Mode 1310 nm)
Opt. ZX	1000BASE-ZX Optical port with LC connector for Gigabit Ethernet Interface (Single Mode 1550 nm)
Maximum data rate	Line rate
ASI output	ASI compliant with specification EN 50083-9 ASI smoothing can be activated to compensate for bursty IP traffic
Protocol stack support	IPv4 and v6 support UDP/IP/Ethernet UDP/IP/VLAN/Ethernet RTP/UDP/IP/Ethernet RTP/UDP/IP/VLAN/Ethernet
Multicast and control support	IGMP v2 and v3 MLD v1 and v2 ARP ICMP (Inbound and Outbound ping)
IP packet support	7 Transport Stream packets per IP packet (188 byte packets) FEC (FEC is parsed but is not processed)

Data Sheet

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 V AC
Mains Frequency	50/60 Hz
Power Requirements	180 VA max

Physical Characteristics

Dimensions	mm	in.
Height	132	5.2
Width	214	8.4
Depth	435	17
Weight	kg	lb.
Net	6.2	13.7

Ordering Information

MTS400P Portable MPEG Test System

Real-time stream analysis and capture over LVDS (DVB SPI), ASI, and SMPTE310M interfaces, 512 MB RAM, 182 GB MPEG stream storage, USB keyboard and mouse, front cover, user manual, and one-year warranty.

MTS400P Options

Option	Description
Opt. TSCA	Deferred Time Transport Stream Compliance Analyzer with CaptureVu™ technology
Opt. PL	Player
Opt. MX	Multiplexer
Opt. PA	PES Analyzer
Opt. BA	Buffer Analyzer
Opt. ES	MPEG-2 ES Analyzer* ³
Opt. DB	Carousel Analyzer
Opt. CG	Carousel Generator
Opt. DBCG	Carousel Analyzer and Carousel Generator
Opt. IPTVP	IP Video Gigabit Ethernet Interface with 10/100/1000BASE-T RJ45 electrical port
Opt. SX	1000BASE-SX Short-wavelength optical port with LC connector (Multi Mode 850 nm) (requires Opt. IPTVP)
Opt. LX	1000BASE-LX Long-wavelength optical port with LC connector (Single Mode 1310 nm) (requires Opt. IPTVP)
Opt. ZX	1000BASE-ZX Optical port with LC connector (Single Mode 1550 nm) (requires Opt. IPTVP)

Repair Service

Option	Description
Opt. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years

Documentation

Option	Description
Opt. L0	English Manual
Opt. L5	Japanese Manual

International Power Plugs

Option	Description
Opt. A0	North America power cord
Opt. A1	Universal Euro power cord
Opt. A2	United Kingdom power cord
Opt. A3	Australia power cord
Opt. A4	240 V, North America power cord
Opt. A5	Switzerland power cord
Opt. A6	Japan power cord
Opt. A10	China power cord
Opt. A11	India power cord
Opt. A99	No power cord or AC adapter

Field Upgrade Kits

Item	Option	Description
MTS4UP	Opt. TSCA	Adds Deferred Time Transport Stream Compliance Analyzer with CaptureVu™ technology
MTS4UP	Opt. PL	Adds Player
MTS4UP	Opt. MX	Adds Multiplexer
MTS4UP	Opt. PA	Adds PES Analyzer
MTS4UP	Opt. BA	Adds Buffer Analyzer
MTS4UP	Opt. ES	Adds MPEG-2 ES Analyzer* ³
MTS4UP	Opt. DB	Adds Carousel Analyzer
MTS4UP	Opt. CG	Adds Carousel Generator
MTS4UP	Opt. DBCG	Adds Carousel Analyzer and Carousel Generator
MTS4UP	Opt. IPTVP	Adds IP Video Gigabit Ethernet Interface with 10/100/1000BASE-T RJ45 electrical port
MTS4UP	Opt. SX	Adds 1000BASE-SX Short-wavelength optical port with LC connector (Multi Mode 850 nm) (requires Opt. IPTVP)
MTS4UP	Opt. LX	Adds 1000BASE-LX Long-wavelength optical port with LC connector (Single Mode 1310 nm) (requires Opt. IPTVP)
MTS4UP	Opt. ZX	Adds 1000BASE-ZX Optical port with LC connector (Single Mode 1550 nm) (requires Opt. IPTVP)
MTS4UP	Opt. UPG	Upgrade to latest version of MTS400 Series base software and installed options. Includes CD and Manual

*³ For MPEG-4, H.264, and VC-1 analysis, please refer to the MTS4CC ES Compliance Checker or MTS4EA ES Analyzer.



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



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

Data Sheet

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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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