

# MPEG Over IP Real-Time Monitor With Channel Polling

## ► MTM400 with GbE Interface and Option 7



## ► MTM400 MPEG transport stream monitor - right content, right place, right time.

### Technical Overview

Increasingly, monitoring of Gigabit Ethernet and RF transmission is becoming essential for efficient MPEG network operations and proactive fault prevention. The MTM400 is the industry-leading solution for 24x7 MPEG network monitoring, and with both RF and IP interfaces, is ideally positioned for monitoring trunk IP feeds and RF drops to the end customer. The Gigabit Ethernet interface, which was announced to the market in August 2006, has successfully provided full TR 101 290 Priority 1, 2 and 3 monitoring on a single session within an IP stream.

The new polling capability for the MTM400 probe, combined with RF and IP interfaces allows up to 200 RF channels or IP sessions (discovering up to 500 IP sessions) to be monitored in a repeating cyclic measurement process. Control and configuration of the polling is undertaken using flexible XML scripting. This

polling ability, combined with the ability to construct and manage multicast groups using IGMP, makes a single MTM400 probe a broader tool, monitoring large numbers of network points in a time-sampled measurement mode.

Enhancements included in the new firmware also provide incremental functional performance within the core product, as well as flexibility offered by the polling capability.

The MTM400 GE with Option 7 provides:

- Broad but shallow IP, and narrow and deep MPEG monitoring in a single solution
- RF and IP polling capability to cost effectively monitor multiple RF and IP channels
- Monitoring across both the IP and MPEG layers
- Optional RF measurement interfaces for network edge monitoring
- Downloadable remote GUI
- Integrates via SNMP with large network control systems

<sup>\*1</sup> Separate data sheet is available.

<sup>\*2</sup> Sync Byte, Sync Error and Continuity Count.

## ► Features & Benefits<sup>\*1</sup>

Multilayer, Multichannel, Remote Monitoring and Measurement at IP, R, and Transport Layers to DVB (TR 101 290), ATSC, DigiCipher<sup>®</sup> II (DCII) and ISDB-T (Terrestrial and Mobile) Standards

Comprehensive Confidence Monitoring of Video Over IP With Optional Gigabit Ethernet Electrical and Optical Interfaces, IP Protocol Support Including UDP, RTP, with IGMP, ARP and ICMP (Remote Ping)

Session Monitoring Support for:

- Discovery of All Sessions/Flows on the Link with RTP/UDP and TS Present Indicators
- Session Bit Rate Monitoring
- IP Packet Error and Transport Stream Layer Error<sup>\*2</sup> Status of All Sessions

IP Measurements and Alarming, Including Total Traffic Bit Rate, Instantaneous TS Rate, Errored Packets, RTP Dropped Packets, RTP Out-of-Order Packets and Packet Inter-arrival Timing (PIT)

MTM400 with IP or RF Interface Can Switch Between IP or RF Monitoring and Transport Stream Monitoring Within the One Probe

DPI (SCTE-35) Local Content Insertion Monitoring

DigiCipher<sup>®</sup> II (DCII) Protocol Support

User-defined Template Monitoring Option to Ensure Right Content at the Right Place at the Right Time While Content Ratings Checking Ensures Only Appropriate Content Broadcast

Remote Recording Allows Capture and Analysis of Stream Events for Expert Offline Analysis to Diagnose Difficult and Intermittent Problems, Requiring No Engineer Site Visits

Scalable, Upgradeable Monitoring Capability Provides Extended Confidence Monitoring, Where You Buy the Capability You Need When You Need It

In-field Upgrades Minimizes Upgrade Time

Simple User Interface Minimizes Staff Familiarization Time

## ► Applications

Contribution and Primary Distribution

- Terrestrial Distribution
- Cable Headend Monitoring
- DTH or Network Operator Satellite Uplink Monitoring

IPTV

Edge Network Monitoring

- ASI to RF
- IP to RF (Requires Two MTM400 Units)
- IP to ASI

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### Features and Benefits

The MTM400 uses a single transport stream processor platform packaged in a 1 RU rackmount chassis to provide monitoring of a transport stream at data rates up to 155 Mbps.<sup>3</sup> The platform is used to provide an extended confidence monitoring product that, with the addition of software options, provides diagnostic monitoring capabilities.

The extended confidence monitor provides the key MPEG tests; this basic level of functionality and low cost enables widespread deployment throughout a transmission network, facilitating rapid fault isolation. The diagnostic monitoring options provide more in-depth analysis of the MPEG transport stream including recording capability, PSI/SI/PSIP/ARIB analysis and unique user-defined template tests to ensure right content, right place, right time. Deployed at key network nodes, the MTM400 equipped as a diagnostic monitor enables the cause of faults to be pinpointed and solved.

The Gigabit Ethernet Interface allows monitoring and measurement of key IP parameters. Designed for monitoring networks which carry Multi Program Transport Streams (MPTS) or Single Program Transport Streams (SPTS) over Gigabit Ethernet networks. MTM400 Opt. GE provides:

- Simultaneous monitoring of both IP and MPEG layers to enable rapid fault isolation
- Comprehensive confidence monitoring of video over IP with optional Gigabit Ethernet electrical and optical interfaces, IP Protocol support including UDP, RTP, with Internet Group Management Protocol (IGMP), Address Resolution Protocol (ARP) and Internet Control Message Protocol (ICMP Remote ping)

IP Session monitoring support for:

- Discovery of all sessions/flows on the link with RTP/UDP and TS present indicators
- Session bit rate monitoring
- Simultaneous IP packet error and TS error<sup>2</sup> status of all sessions

### Flexible and Upgradeable

The MTM400 provides a flexible solution with an upgrade path, including diagnostic monitoring features that enable customers to build a cost-effective monitoring system to suit their individual requirements. Diagnostic capability can be added to the key monitoring points where transport streams are manipulated while extended confidence monitoring probes can be installed throughout the network:

- Triggered recording enables problems to be captured and analyzed in greater depth using offline analysis tools such as the Tektronix MPEG Test System Standalone Software<sup>1</sup>
- PSI/SI/PSIP/ARIB SI Analysis and repetition rate graphing allows broadcasters to determine that the system information is present and correct in the transport stream
- Template testing checks a number of key parameters to ensure that the transport stream has been constructed as the broadcaster intended. These parameters include the Transport Stream ID and Network ID, the number of programs in the multiplex, that each program has all of its components (Video, Audio, Data, Teletext, Subtitles) and Conditional Access (CA) status
- Bit rate testing determines whether PIDs, programs, services or user-defined groups of PIDs are within user-definable limits to ensure correct multiplex operation. Tektronix-proprietary PID variability test gives indication of PID bit rate variation to assess effects of statistical multiplexing

- In-depth PCR analysis with graphical results views enable timing and jitter measurements to be made to ensure correct operation of the network
- Service logging enables verification of service-level agreements to ensure that contractual obligations are met
- Offline analysis software applications for in-depth deferred time analysis of streams captured using the MTM400 gives Tektronix the most powerful MPEG monitoring diagnostics available in the world today<sup>4</sup>

In addition, key enhancements provided by the **v.2.5.x** firmware release and new Option 7 are as follows:

- **Channel Polling:** Allows up to 200 channels to be polled sequentially from either the IP or the RF interface (requires Option 7 enabled)
- **Monitoring up to 500 IP Sessions:** Wide but shallow IP monitoring of key MPEG parameters, including Continuity Count, Sync Loss, Sync byte and Packet Inter-arrival Time (PIT)
- **Logging and Trap Enhancements:** Provide logging and SNMP trap support for all identified streams to include TS and IP errors
- **Multi-channel IGMP:** Manually construct and manage groups of multicast (IGMP) streams for monitoring
- **Automatic Template Generation:** Simple automated template generation from reference stream for exception monitoring
- **Filtered Error Logs for All IP Sessions:** Locked session only and all error entries

<sup>1</sup> Separate data sheet is available.

<sup>2</sup> Sync Byte, Sync Error and Continuity Count.

<sup>3</sup> Maximum transport stream bit rate is dependent on transport stream content and depth of analysis being performed. Depth of stream analysis is handled gracefully if SI/PSIP max content is exceeded to ensure critical measurements continue to be performed.

<sup>4</sup> MTS400 Series MPEG Test System offline software tools are available for use with the MTM400. These are stand-alone software applications intended to run on the MLM1000 control PC. Separate data sheet is available.

## Applications

### Contribution and Primary Distribution

Digital video contribution and distribution networks carry compressed video from many origination points to multiple delivery points over limited bandwidth links.

Delivery of the right content at the right place at the right time is key to efficient network operation and customer satisfaction. Failure to deliver video services at the appropriate Quality of Service (QoS) leads to potential loss of revenue if video content is not delivered per the service level agreement.

- ▶ MTM400's low-cost extended confidence monitoring enables widespread deployment
- ▶ High bit rate capability, up to 155 Mb/s,<sup>3</sup> for monitoring transport streams carried over GbE/ATM/OC3/SDH
- ▶ Bit rate testing and logging enables bandwidth usage to be monitored and Service Level Agreements to be verified

<sup>3</sup> Maximum transport stream bit rate is dependent on transport stream content and depth of analysis being performed. Depth of stream analysis is handled gracefully if SI/PSIP max content is exceeded to ensure critical measurements continue to be performed.

### MPEG Over IP Distribution

Internet Protocol distribution of MPEG-2, MPEG-4/AVC (H.264), and VC1 encoded material is increasing dramatically due to the low cost and ease of routing of packet-based transmission networks. While IP distribution has some clear advantages, it also brings its own challenges, particularly in terms of ensuring consistent quality of service. MTM400, with its IP interface option provides MSOs, broadcasters and network operators with the toolset required to monitor and diagnose complex transmission problems seamlessly across an IP to MPEG network.

With dedicated Gigabit Ethernet electrical and pluggable optical Small Format Pluggable (SFP) modules, the IP monitoring option on MTM400 provides all the industry standard interfaces required to connect to IP based MPEG transmission and distribution networks.

Additionally the Gigabit Ethernet interface provides an ASI/SMPTE 310M input and output allowing access to a direct de-packetized MPEG stream for analysis and recording. Input source on the Gigabit Ethernet card can be switched between Ethernet Electrical (RJ45), Ethernet Optical (SFP at Multi Mode 850 nm, Single mode at 1310 nm, Single Mode 1550 nm).

Protocols supported include:

- ▶ User Datagram Protocol (UDP)
- ▶ Real-Time Protocol (RTP)
- ▶ Internet Protocol (IP)
- ▶ Virtual Local Area Network (VLAN)
- ▶ Ethernet (10/100/1000 Mb/s)

With multicast and control support for:

- ▶ Address resolution Protocol (ARP)
- ▶ Internet Control Message Protocol (ICMP Remote ping)
- ▶ Internet Group Management Protocol (IGMP)

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## ▶ Characteristics

### Power Requirements

Power Consumption (nominal) – 40 VA.

Voltage – 100 to 240 V.

Frequency – 50/60 Hz.

### Monitoring

#### Data Rate

Maximum Data Rate – 155 Mbps.<sup>5</sup>

Minimum Data Rate – 250 kbps.

<sup>5</sup> Maximum transport stream bit rate is dependent on transport stream content and depth of analysis being performed. Stream analysis is handled gracefully if SI/PSIP max content is exceeded to ensure critical measurements continue to be performed.

## ▶ TR 101 290 Tests and Measurements

1 <sup>st</sup> Priority Measurements	2 <sup>nd</sup> Priority Measurements	3 <sup>rd</sup> Priority Measurements
1.1 Ts_sync_loss	2.1 Transport error	3.1a NIT_actual_error
1.2 Sync_byte_error	2.2 CRC_error	3.1b NIT_other_error
1.3a PAT_error_2	2.3a PCR_repetition_error	3.2 SI_repetition_error
1.4 Continuity_count_error	2.3b PCR_discontinuity_indicator_error	3.4a Unreferenced PID
1.5a PMT_error_2	2.4 PCR_accuracy_error	3.5a SDT_actual_error
1.6 PID_error	2.5 PTS_error	3.5b SDT_other_error
	2.6 CAT_error	3.6a EIT_actual_error
		3.6b EIT_other_error
		3.6c EIT_PF_error
		3.7 RST_error
		3.8 TDT_error

## ▶ MPEG over Gigabit Ethernet (Gigabit Ethernet IP Option GE)

Interconnect Port Options	Opt. GE Gigabit Ethernet Interface with 10/100/1000Base-T RJ45 electrical port Optical SFP modules which plug into MTM400 Opt GE to provide optical connectivity Opt. SX 1000Base-SX Short Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Multi Mode 850 nm) Opt. LX 1000Base-LX Long Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1310 nm) Opt. ZX 1000Base-ZX Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1550 nm)
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## Environmental

### Temperature

**Operating:** – +5 °C to +40 °C.

**Non-operating:** – –10 °C to +60 °C.

### Humidity

**Operating:** –

Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C.

**Non-operating:** –

10% to 95% relative humidity, non-condensing.

### Altitude

**Operating:** – 0 m to 3000 m (9800 ft).

**Non-operating:** – 0 m to 12000 m (40,000 ft).

### Random Vibration

**Operating:** – 5 to 500 Hz,  $G_{RMS}=2.28$ .

**Nonoperating:** – .5 to 500 Hz,  $G_{RMS}=0.27$ .

### Functional Shock

**Operating:** – 30 G, half sine, 11 ms duration.

## Electromagnetic Compatibility

### EC Declaration of Conformity –

Meets EN55103. Electromagnetic environment E4.

### Australia/New Zealand Declaration of Conformity –

Meets AS/NZS 2064.

### FCC –

Emissions are within FCC CFR 47, Part 15, Subpart B, Class A limits.

### Safety

Meets 73/23/EEC, EN61010-1, UL3111-1 and CAN/CSA 22.2 No. 1010.1-92, IEC61010-1.

## Physical Characteristics

Dimensions	mm	in.
Height	44	1.73
Width	430	17.13
Depth	600	23.62
Weight	kg	lbs.
Net	6.0 <sup>6</sup>	13.3 <sup>6</sup>
Shipping	9.0 <sup>6</sup>	19.7 <sup>6</sup>
Required Clearance	mm	in.
Top	0	0
Bottom	0	0
Left side	Standard 19" rackmount	
Right Side	Standard 19" rackmount	
Front	Clearance for handles required	
Rear	Clearance for connectors required	

<sup>6</sup>Weight does not include optional interface cards.

# MPEG Over IP Real-Time Monitor With Channel Polling

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## ► Ordering Information

### MTM400

Single-stream extended confidence monitor packaged in 1 RU chassis.

**Includes:** 1 RU chassis fitted with transport stream processor card, manual, rack slides, power cord and license key certificate.

### Options

**Opt. 01** – Triggered recording capability up to 160 MB.

**Opt. 02** – Transport stream service information analysis (PSI/SI/PSIP/ARIB view).

**Opt. 03** – Template testing (for user-defined service plan testing).

**Opt. 04** – In-depth PCR analysis with graphical result views.

**Opt. 05** – Bit rate testing functionality.

**Opt. 06** – Service logging.

**Opt. 07** – IP/RF Polling functionality.

**Opt. CF** – COFDM Interface.

**Opt. QB2** – QAM Annex B Level 1 and Level 2 Interface.

**Opt. EP** – 8PSK/QPSK Interface.

**Opt. VS** – 8VSB Interface.

**Opt. QA** – QAM Annex A interface.

**Opt. QC** – QAM Annex C interface.

**Opt. QP** – QPSK interface.

**Opt. GE** – Gigabit Ethernet Interface with 10/100/1000Base-T RJ45 electrical port.

**Opt. SX** – 1000Base-SX Short Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Multi Mode 850 nm).

**Opt. LX** – 1000Base-LX Long Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1310 nm).

**Opt. ZX** – 1000Base-ZX Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1550 nm).

### International Language Options

**Opt. L0** – English User Guide.

**Opt. L5** – Japanese User Guide.

### Complementary Products

**MTS4SA** – Stand-alone Deferred Time Software package.

**Opt. TSCL** – DVB/ATSC/ARIB TS Compliance Analyzer Software (TS file size limited to 192 Mb). For full details see separate data sheet.

### Service

**Opt. R3** – Repair service three years.

**Opt. R5** – Repair service five years.

### Power Connections

**Opt. A0** – North America power plug.

**Opt. A1** – Universal Euro power plug.

**Opt. A2** – United Kingdom power plug.

**Opt. A3** – Australia power plug.

**Opt. A4** – 240 V North America power plug.

**Opt. A5** – Switzerland power plug.

**Opt. A6** – Japan power plug.

**Opt. A10** – China power plug.

**Opt. A99** – No power cord or AC adapter.

### Field Upgrade Kits

**MTM4FQA** – Field Upgrade Kit to add QAM Annex A Interface to an existing probe.

**MTM4FQC** – Field Upgrade Kit to add QAM Annex C Interface to an existing probe.

**MTM4FQP** – Field Upgrade Kit to add QPSK Interface to an existing probe.

**MTM4FCF** – Field Upgrade Kit to add COFDM Interface.

**MTM4FQB2** – Field Upgrade Kit to add QAM Annex B Interface.

**MTM4FEP** – Field Upgrade Kit To Add 8PSK/QPSK Interface.

**MTM4FVS** – Field Upgrade Kit To Add 8VSB Interface.

**MTM4UP Opt. 01** – Field Upgrade Kit to add triggered recording capability up to 160 MB.

**MTM4UP Opt. 02** – Field Upgrade Kit to add transport stream service information analysis (PSI/SI/PSIP/ARIB view).

**MTM4UP Opt. 03** – Field Upgrade Kit to add template testing (for user-defined service plan testing).

**MTM4UP Opt. 04** – Field Upgrade Kit to add in-depth PCR analysis with graphical result views.

**MTM4UP Opt. 05** – Field Upgrade Kit to add bit rate testing functionality.

**MTM4UP Opt. 06** – Field Upgrade Kit to add service logging.

**MTM4UP Opt. 07** – Field Upgrade Kit to add IP/RF Polling functionality.

**MTM4FGE** – Gigabit Ethernet Upgrade Kit for MTM400. Requires appropriate options.  
Note 1: at least one option must be ordered.  
Note 2: Option GE is required if MTM400 does not already have GigE capability.

**MTM4FGE Opt. GE** – Upgrade Kit to add Gigabit Ethernet Interface With 10/100/1000Base-T RJ45 Electrical Port to MTM400.

**MTM4FGE Opt. SX** – Upgrade Kit to add 1000Base-SX Short Wavelength Optical port with LC connector (Multi Mode 850 nm) for MTM400 Gigabit Ethernet Interface.

**MTM4FGE Opt. LX** – Upgrade Kit to add 1000Base-LX Long Wavelength Optical port with LC connector (Single Mode 1310 nm) for MTM400 Gigabit Ethernet Interface.

**MTM4FGE Opt. ZX** – Upgrade Kit to add 1000Base-ZX Optical port with LC connector (Single Mode 1550 nm) for MTM400 Gigabit Ethernet Interface.

**MTM4FGE Opt. IFC** – One-time install of all selected options and calibration for one product.

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Our most up-to-date product information is available at:

[www.tektronix.com](http://www.tektronix.com)



Product(s) are manufactured in ISO registered facilities.

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

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