

User Manual



MTM400 **MPEG Transport Stream Monitor** **071-1224-08**

This document supports software version 2.6.x and above.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Ground the Product. This product is grounded through the grounding conductor of the mainframe power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Ground Equipment Connected to the Product. Ensure that any equipment connected to this product is grounded and at the same potential.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the manual for further ratings information before making connections to the product.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Use only Tektronix approved components when servicing the unit.

Environmental Considerations

This section provides information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



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This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead, cadmium, and hexavalent chromium.

Preface

This manual describes the functions and use of the Tektronix MTM400 MPEG Transport Stream Monitor. The manual is organized into the following sections:

- *Getting Started*
An overview of the MTM400, installation instructions, starting the unit, and the remote user interface.
- *Operating Basics*
A basic guide to the MTM400 user interface(s).
- *Reference*
A complete reference to all of the MTM400 features as accessed through the user interface.
- *Appendix A: Networking*
Details on configuring the instrument for network operation.
- *Appendix B: Maintenance*
General care and service procedures.
- Glossary
- Index

Two other documents are available on the Tektronix Web site (www.tektronix.com):

- *MTM400 MPEG Transport Stream Monitor Technical Reference*
(071-1560-xx)
This manual provides product specifications, test parameters, configuration file syntax, and hardware maintenance procedures.
- *MTM400 MPEG Transport Stream Monitor Programmer Manual*
(071-1375-xx)
This manual specifies the remote control and status monitoring interfaces available to a management application.

Related Material

Additional documentation, such as Read Me files, may be included on the installation disks.

The following URLs access the Web sites for the standards organizations listed (the URLs listed were valid at the time of writing):

- MPEG-2 standards (International Organization for Standards)
Web address: <http://www.iso.ch/>
- DVB standards (European Technical Standards Institute)
Web address: <http://www.etsi.org/>
- ATSC standards (Advanced Television Systems Committee)
Web address: <http://www.atsc.org/>
- ISDB/ARIB standards (Association of Radio Industries and Businesses)
Web address: <http://www.arib.or.jp/english/>
- SCTE Society of Cable Television Engineers
Web address: <http://www.scte.org/>

Manual Conventions

Naming conventions for the interface elements are based on standard Windows naming conventions. Naming conventions for MPEG-2, ATSC, and DVB structures follow the conventions derived from the standards organizations listed above. In addition, the following formatting conventions apply to this manual:

- Mono-spaced text can indicate the following:
 - Text you enter from a keyboard
Example: Enter the network identity (`http://TSMonitor01`)
 - Characters you press on your keyboard
Example: Press CTRL+C to copy the selected text.
 - Paths to components on your hard drive
Example: The program files are installed at the following location:
`C:\Program Files\Tektronix\`



Getting Started

Getting Started

This section provides details of installing and powering up the Tektronix MTM400 MPEG Transport Stream Monitor.

Overview

The MTM400 is a single-stream, extended-confidence, MPEG-2 protocol, monitoring device. It is used to monitor a single transport stream in MPEG-2, DVB, ISDB and ATSC environments. The MTM400 is a rack-mounted device.

The basic MTM400 provides confidence monitoring by making key measurements and comparing them with preset parameters; inconsistencies can be reported as varying levels of error. Integrated flexibility allows the software to be upgraded with diagnostic capabilities and to supply detailed information to enable fault identification and analysis. Unencrypted MPEG-2 video content can be monitored using the thumbnail feature.

The user interface is accessed through a Remote User Interface (RUI). The RUI allows the status of the MTM400 to be determined from anywhere in the world and provides remote control of the measurements and configuration to the administrator. The RUI is accessed through Microsoft Internet Explorer (Version 6 SP 1); the Microsoft Java Virtual Machine (Version 5.00.3809) must also be installed.

The user interface can also be accessed by the Multi-Layer Monitor (MLM1000) and the Web Monitoring Systems Manager (WebMSM), which are available from Tektronix. The WebMSM is a Java application that is installed on any personal computer; as for the RUI, Microsoft Java Virtual Machine (Version 5.00.3809) must be available. The installation, configuration, and operation of the WebMSM are described in the *WebMSM User Manual* (071-1239-xx).

The RUI and the WebMSM communicate with the MTM400 through the open standard Simple Network Management Protocol (SNMP) and Hypertext Transfer Protocol (HTTP).

ASI (Asynchronous Serial Interface) and SMPTE 310M (Society of Motion Picture and Television Engineers, 19.392 Mbps only) interfaces are provided as standard. QAM (Quadrature Amplitude Modulation), COFDM (Coded Orthogonal Frequency Division Modulation), QPSK (Quadrature Phase Shift Keying) (L-Band), 8PSK (Eight level Phase Shift Keying) and 8VSB (Eight level Vestigial Side Band), and Gigabit Ethernet interfaces are available as options.

Options and Accessories

The tables in this section list the options and accessories available for the MTM400 MPEG Transport Stream Monitor.

Options

Tables 1-1 and 1-2 list the options that are available for the MTM400.

Table 1-1: MTM400 options

Nomenclature	Description	Deliverables
Opt. 01	Recording Capability.	Enabled using license key.
Opt. 02	Transport Stream Service Information Analysis (PSI/SI/PSIP/ISDB structure view and repetition graphs).	Enabled using license key.
Opt. 03	Template Testing with Template Scheduling (for user-defined service plan testing).	Enabled using license key.
Opt. 04	PCR Analysis with Graphical Results views.	Enabled using license key.
Opt. 05	Bit rate testing including PID groups and PID variability.	Enabled using license key.
Opt. 06	Service logging.	Enabled using license key.
Opt. 07	Automatic channel changing for polling multiple streams.	Enabled using license key.
Opt. QA	QAM Annex A Interface.	QAM (Annex A) Interface Card with associated cabling.
Opt. QB2	QAM Annex B Interface (Level 1 and Level 2 Interleave).	QAM (Annex B II) Interface Card with associated cabling.
Opt. QC	QAM Annex C Interface.	QAM (Annex C) Interface Card with associated cabling.
Opt. QP	QPSK (L-Band) Interface.	QPSK Interface Card with associated cabling.
Opt. CF	COFDM Interface.	COFDM Interface Card with associated cabling.
Opt. VS	8VSB Interface.	8VSB Interface Card with associated cabling.
Opt. EP	8PSK Interface.	8PSK Interface Card with associated cabling.
Opt. GE	Gigabit Ethernet (GigE) Interface with 10/100/1000 BASE-T RJ45 electrical port.	GigE Interface Card with associated cabling.

Table 1-1: MTM400 options (continued)

Nomenclature	Description	Deliverables
Opt. SX	1000BASE-SX Short Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Multi Mode 850 nm).	SFP module.
Opt. LX	1000BASE-LX Long Wavelength Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1310 nm).	SFP module.
Opt. ZX	1000BASE-ZX Optical port with LC connector for MTM400 Gigabit Ethernet Interface (Single Mode 1550 nm).	SFP module.
Opt. L0	User Manual (English).	
Opt. L5	User Manual (Japanese).	
Opt. R3	3 year extended warranty.	-
Opt. R5	5 year extended warranty.	-

Table 1-2: MTM400 power cord options

Nomenclature	Description
A0	North America Power
A1	Universal Euro Power
A2	United Kingdom Power
A3	Australia Power
A4	240 V North America Power
A5	Switzerland Power
A6	Japan Power
A10	China Power
A11	India Power
A99	No Power Cord

Accessories

Tables 1-3 and 1-4 list the standard and optional accessories that are shipped with the MTM400.

Table 1-3: Standard MTM400 accessories

Part number	Description
071-1224-xx	Option L0 User Manual (English).
071-1538-xx	Option L5 User Manual (Japanese).
063-3889-xx	Documentation CD-ROM (including User Manual (English and Japanese), Release Notes, Video Glossary, Firmware upgrade instructions).
071-1564-xx	Release Notes.
063-3719-xx	Firmware, CD-ROM, Version 2.6.1, MTM400 Series.
351-0751-xx	Slide assembly.
063-3158-xx	Software option key authorization certificate.
020-2852-xx	External Grounding Kit.

Table 1-4: Optional MTM400 accessories

Option	Part number	Description
MTM400 LX	131-7957-xx	Optical gigabit ethernet/fibre channel 1310 nm SFP SFF, 1.25/1.0625 Gbaud, 3.3 V, safety controlled
MTM400 SX	131-7834-xx	Optical gigabit ethernet/fibre channel 850 nm SFP SFF, 1.25/1.0625 Gbaud, 3.3 V, safety controlled
MTM400 ZX	131-7958-xx	Optical gigabit ethernet/fibre channel 1550 nm SFP SFF, 1.25/1.0625 Gbaud, 3.3 V, safety controlled
MTM400 CF	-	COFDM interface
	015-0688-xx	Adapter, RF, BNC Jack to F Plug
	174-5135-xx	Cable Assy, RF, BNC to BNC, 75 ohm
MTM400 EP	174-3891-xx	Cable Assy, RF, Coaxial, RFD, 1, 75 ohm, RG179, 7.25 L
	-	8PSK interface
	174-5135-xx	Cable Assy, RF, BNC to BNC, 75 ohm
MTM400 QB2	174-3891-xx	Cable Assy, RF, Coaxial, RFD, 1, 75 ohm, RG179, 7.25 L
	-	QAM Annex B
	174-5135-xx	Cable Assy, RF, BNC to BNC, 75 ohm
	174-3891-xx	Cable Assy, RF, Coaxial, RFD, 1, 75 ohm, RG179, 7.25 L

Table 1-4: Optional MTM400 accessories (continued)

Option	Part number	Description
MTM400 VS	-	8VSB interface
	015-0688-xx	Adapter, RF, BNC Jack to F Plug
	174-5135-xx	Cable Assy, RF, BNC to BNC, 75 ohm
	174-3891-xx	Cable Assy, RF, Coaxial, RFD, 1, 75 ohm, RG179, 7.25 L

Field Upgrade Kits

Field upgrade kits contain hardware and software that can be installed by a user. Table 1-5 lists the Field Upgrade kits that are available for the MTM400.

Table 1-5: MTM400 field upgrade kits

Product	Option	Description
MTM4UP	01	Field upgrade kit to add Recording Capability.
	02	Field upgrade kit to add Transport Stream Service Information Analysis (PSI/SI/PSIP/ISDB structure view and repetition graphs).
	03	Field upgrade kit to add Template Testing With Template Scheduling (for user-defined service plan testing).
	04	Field upgrade kit to add PCR Analysis with Graphical Results views.
	05	Field upgrade kit to add Bit rate testing including PID groups and PID variability.
	06	Field upgrade kit to add Service Logging.
	07	Field upgrade kit to add automatic channel changing for polling multiple streams.
MTM4FQA	-	Field upgrade kit to add QAM Annex A Interface.
MTM4FQB2	-	Field upgrade kit to add QAM Annex B (Level 1 and Level 2 interleave) Interface.
MTM4FQC	-	Field upgrade kit to add QAM Annex C Interface.
MTM4FQP	-	Field upgrade kit to add QPSK (L-Band) Interface.
MTM4FVS	-	Field upgrade kit to add 8-VSB Interface.
MTM4FCF	-	Field upgrade kit to add COFDM Interface.
MTM4FEP	-	Field upgrade kit to add 8PSK Interface.

Table 1-5: MTM400 field upgrade kits (continued)

Product	Option	Description
MTM4FGE	-	Field upgrade kit to add Gigabit Ethernet components.
	SX	Field upgrade kit to add 1000BASE-SX Short Wavelength Optical port with LC connector (Multi Mode 850 nm).
	LX	Field upgrade kit to add 1000BASE-LX Long Wavelength Optical port with LC connector (Single Mode 1310 nm).
	ZX	Field upgrade kit to add 1000BASE-ZX Optical port with LC connector (Single Mode 1550 nm).
	IFC	One-time installation of all selected options and functional verification for one product.

Licensing

Options and upgrades are enabled using a License Key. A License Key is an encrypted code that unlocks and enables functions that have been installed on the Real-Time Monitoring (RTM) device. Using this method, upgrading an RTM device may simply require the entry of a new License Key.

For new RTM devices, the appropriate License Key is applied during production. However, it is also supplied as part of the product documentation.

When field upgrade options are installed, you must apply a new license key; this will be supplied as part of the field upgrade kit documentation.

This user manual describes all available options including field upgrades. The basic product (with no licensed options) includes the following transport stream features:

- Test monitoring (DVB, ATSC, and ISDB)
- Custom classification of tests
- Basic program and PID analysis and monitoring
- Basic PCR analysis
- SFN and TMCC monitoring (where present in the stream)
- Stream Log

Table 1-6 (parts 1 and 2) summarizes the available stream options:

Table 1-6: MTM400 options summary (part 1 of 2)

Feature	Default *	Opt. 01 Recording Capability	Opt. 02 SI Analysis	Opt. 03 Template Testing
SFN	✓			
TMCC	✓			
PCR OJ, DR and FO testing	✓			
SI View			✓	
SI Graphs			✓	
PID and program bit rate limit testing				
PID Groups				
PID variability				
Templates				✓
Template tree view				✓
Automatic template generation				✓
Scheduling				✓
Recording		✓		
PCR graphs				
Service log				
RF confidence measurement	✓			
Logging DPI section arrival	✓			
Basic syntax checking of DPI sections	✓			
Alarm events on interface card metrics	✓			
DPI (SCTE35 Digital Program Insertion) monitoring	✓			
Interface measurement testing	✓			
Warning events on RF metrics	✓			
Scripted channel polling				
Thumbnails	✓			

* Confidence or no option license key required.

Table 1-6: MTM400 options summary (part 2 of 2)

Feature	Opt. 04 PCR Analysis	Opt. 05 Bit rate Testing	Opt. 06 Service Logging	Opt. 07 Automatic Channel Polling
SFN				
TMCC				
PCR OJ, DR and FO testing				
SI View				
SI Graphs				
PID and program bit rate limit testing		✓		
PID Groups		✓		
PID variability		✓		
Templates				
Template tree view				
Scheduling				
Recording				
PCR graphs	✓			
Service log			✓	
RF Confidence Measurement				
Logging DPI section arrival				
Basic syntax checking of DPI sections				
Alarm Events on RF metrics				
DPI (SCTE35 Digital Program Insertion) Monitoring				
RF Measurement Testing				
Warning Events on RF metrics				
Scripted channel polling				✓
Thumbnails				

The Device application does not change with licensing.

An overview of the Streams and Device applications is given in the *Operating Basics* section.

Installing the MTM400

This section describes how to install the MTM400 unit. It includes the following instructions:

- Installing the unit in a rack.

Includes requirements in the Central Office RBOC (Regional Bell Operating Companies) for a ground bonding strap.

- Making the electrical connections necessary to begin monitoring transport streams.
- Integrating the unit into a network.

The operation is described in the following sections.

Hardware Installation

The MTM400 is designed for rack-mounted operation. The rack-mounting kit is shipped as a standard accessory with each MTM400 unit. Installing the rack-mounting kit is described in the *MTM400 MPEG Transport Stream Monitor Technical Reference* and in *Appendix B* of this manual.



WARNING. *To avoid fire hazard, the MTM400 must be installed in the rack only as specified and proper ventilation must be maintained at all times.*

Central Office Installation.



CAUTION. *The intra-building interfaces of this platform, including the Gigabit Ethernet interface, are suitable for connection to intra-building or unexposed wiring or cabling only with shielded and grounded cables at both ends. The intra-building ports or the equipment must not be metallically connected to interfaces that connect to the outside plant or its wiring.*

A grounding and bonding strap to be used in Central Office RBOC applications is supplied as a standard accessory with each MTM400 unit. Installing the rack-mounting kit and the grounding strap is described in *Appendix B* of this manual.

Electrical Installation

The electrical operating requirements of the MTM400 are summarized in Table 1-7; see the *MTM400 MPEG Transport Stream Monitor Technical Reference* for more detailed electrical characteristics.

Table 1-7: Electrical operating requirements

Requirement	Specification
Temperature, operating	+5 °C to +40 °C
Altitude, operating	0 m to 3000 m (9800 ft)
Source Voltage	100 VAC to 240 VAC, 50 Hz/60 Hz
Power Consumption (maximum)	1 Amp
Peak Inrush Current	7.2 A peak at 240 VAC, 50 Hz
Fuse Rating	Mains fuse is 3.15 A, 250 V, Fast; Not operator replaceable. Refer servicing to qualified service personnel.
Overvoltage Category	II (as defined in IEC61010-1)
Pollution Degree	2 (as defined in IEC61010-1) Rated for indoor use only.

Use the following procedure to make electrical, signal, and network connections:

1. After the MTM400 has been mounted in the rack, connect the power cord (provided with the unit) to the power connector on the rear panel. Connect the power cord plug to a properly grounded outlet.

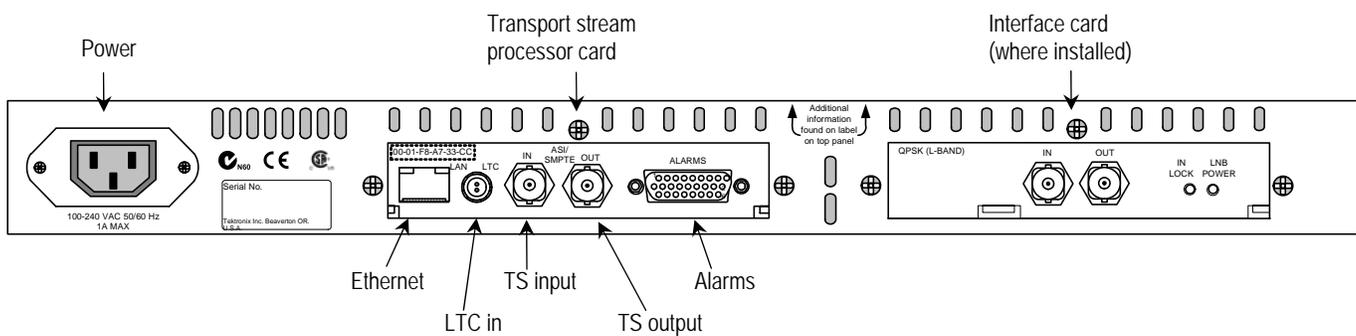


Figure 1-1: MTM400 connectors (shown with QPSK interface)



CAUTION. To ensure compliance with specified EMC standards and directives, use only high quality shielded cables with this product. Equipment performance can be affected. Typically, the cables are braid and foil types that have low impedance connection to shielded connectors at both ends.

2. Make the necessary transport stream, network, and peripheral device connections using the connectors at the rear of the unit.

Table 1-8 summarizes the transport stream, network, and peripheral device connectors; (see the *MTM400 MPEG Transport Stream Monitor Technical Reference* for more detailed information about each connector and the associated signals).

Table 1-8: Transport stream Processor card connectors

Connector	Description
Ethernet	10/100Base-T; RJ-45
LTC In	Longitudinal time code input
Transport Stream input / output	75 ohm, transformer coupled, BNC connectors for the following signal formats:
ASI input (BNC)	• Accepts Burst and Packet mode ASI formats and M2S.
ASI output (BNC)	• An active loop-through of the corresponding input.
SMPTE310M input	• Compliant with SMPTE310M (19.392 Mbps only).
SMPTE310M output	• An active loop-through of the corresponding input.
Alarms	(Digital input/output) 26-pin D-type connector for alarm relays and TTL outputs; also recording trigger input.

The Alarms connector provides connections for five relays. Each relay is configured through the user interface (see *Tests Screen*, page 3-23 and *Custom Screen*, page 3-26); the three TTL outputs are configured in a similar manner.

ASI Loop-Through (QAM (Annex B), COFDM, 8VSB, and 8PSK only)

To monitor ASI and RF signals, (for example, both the input and output of a modulator):

- Connect the ASI signal from the modulator to the interface card **ASI In**.
- Connect the **ASI Out** terminal on the interface card to the **ASI In** connector on the Transport Stream Processor card.

Select the signal to be monitored from the configuration view (see page 3-74).

The ASI signal from QAM (Annex A and C) and QPSK (L-Band) interface cards is looped to the Transport Stream Processor card internally.

Network Installation

The MTM400 is designed to operate in a networked (TCP/IP) environment. The network or system administrator may have already configured the TCP/IP parameters (including the network identity) for the MTM400. If this is not the case, refer to *Appendix A: Network Installation* for procedures to configure the TCP/IP parameters.

Setting the Font Used By the RUI

If the RUI does not show the program names and logs in the correct character set, first ensure that the correct standard is selected for the broadcast being monitored. If the characters are still incorrect, you must configure the RUI to use a font that supports the characters in use.

1. Locate the file **MTM400.INI**. This is typically in the Java folder inside the Windows folder or in your home directory.

This file is formatted in Unix text. If a Unix file-format compatible text editor (for example, PFE) is not available, edit file in Notepad. Be careful not to add any new lines; only edit what is there.

2. Within the MTM400.INI file, change **UnicodeOn=false** to **UnicodeOn=true**, save the file, and restart the RUI.
3. The RUI will attempt to select a suitable font installed on the system. If the displayed characters are still incorrect, close the RUI and reopen MTM400.INI.
4. Change the **UnicodeFont=Arial Unicode MS** section to the name of the TrueType font you want to use, for example **UnicodeFont=MS Gothic**. Save the file and restart the RUI.

The default Arial Unicode MS is shipped with many Microsoft products and operating systems; it includes the whole Unicode character set. This font provides the best compromise to display the non-English program names and the English elements of the user interface. If this font is unavailable, similar fonts are commercially available, for example from Bitstream Inc. (www.bitstream.com).

The preceding instructions relate to running the RUI under the Microsoft Java Virtual Machine. Some users choose to run the WebMSM under the Sun Java Virtual Machine, however, this is an unsupported configuration. In this case, the user should see the Sun documentation relating to modifying font properties. The exception is when the RUI is integrated into the MLM1000. In this case, refer to the user manual (Tektronix part number 071-1433-xx) that accompanies the MLM1000.

Installing Font Extensions on Your PC

The ARIB specifications for ISDB make use of private extensions to the standard Unicode character set [0xE000-0xF8FF]. These extensions provide additional characters and non-standard proprietary characters; they are used to extend an existing font. Check with the transport stream broadcaster for the availability of any font extension set for their transport stream. Because these font extension files are specific to the broadcaster, they are not supplied by Tektronix.

The extension sets are provided as TrueType Extension files (*.tte). Any extension sets should be installed using the Private Character Editor, which is supplied as part of the standard Windows installation.

The following paragraphs describe the general procedure required to install an extension set:

1. Select **Start > Run**.
2. Enter **eu`dc`edit** and select **OK**.
3. The Private Character Editor is opened. Close the **Select Code** dialog box.
4. Select **File > Font Links...**
5. In the Font Links dialog box, select the **Link with selected fonts** option. (If **Link with all fonts** is selected, the following actions will overwrite any existing extension sets.)
6. In the **Select Fonts** box, find and highlight the font to which the extension is to be made; this font should be the one used in the RUI.
7. Select **Save As.....**
8. Browse to the supplied TrueType extension file (*.tte) and select **Save**.
9. In the **Font Links** dialog box, select **OK**.
10. Close the Private Character Editor.

To check that the extension has been successfully installed:

1. Open the Character Map application (Select **Start > Run** and enter **charmap**).
2. Select **font name (Private Characters)** and note the extended character set.
3. Close the Character Map application.

The extended character set is now available for use when the font is selected.

Powering Up the MTM400

After the connections have been made to the unit, all that is required to power up the MTM400 is to apply power. Connect the power cord to a properly grounded outlet. Connect the other end of the cord to the product's power input (see *Figure 1-1*).

There is no mains disconnect switch. Initialization will begin as soon as power is connected to the power input. The LEDs on the front panel will indicate activity (see *Local Indicators*, page 2-2). Initialization can take up to 60 seconds.

Disconnect the power cord to remove power.

The Remote User Interface

The Remote User Interface (RUI) provides a means of accessing the MTM400 configuration and monitoring features. The RUI can be run on any personal computer (client PC) that meets the minimum specification and has network access to the MTM400 unit. The full specification is given in the *MTM400 MPEG Transport Stream Monitor Technical Reference*.

Logging on

To access the configuration and monitoring features of the MTM400, use the following procedure:

1. At a networked PC, launch Microsoft Internet Explorer.
2. In the browser address bar, enter the network identity or IP address of the MTM400 unit, for example:

`http://TSMonitor01` or `http://192.201.121.231`.

When the Enter key is pressed, a Java applet is downloaded from the MTM400 unit and launched. The file size is approximately 1.5 MB; the download time will depend on the network speed and traffic.



CAUTION. *The Java applet will not run unless a temp directory is properly configured on the PC.*

The Java applet will not run unless the Microsoft Java Virtual Machine is installed. Type `jview` at the command prompt to verify that it is installed and that the version is 5.00.3809 or greater. If it is not installed, obtain the installation file from the Tektronix Web site.

If the Sun Virtual Machine has also been installed, the Sun Virtual Machine must not be set as the default in the Java control panel or Internet Explorer options, advanced tab.

The Login Details dialog box will appear.

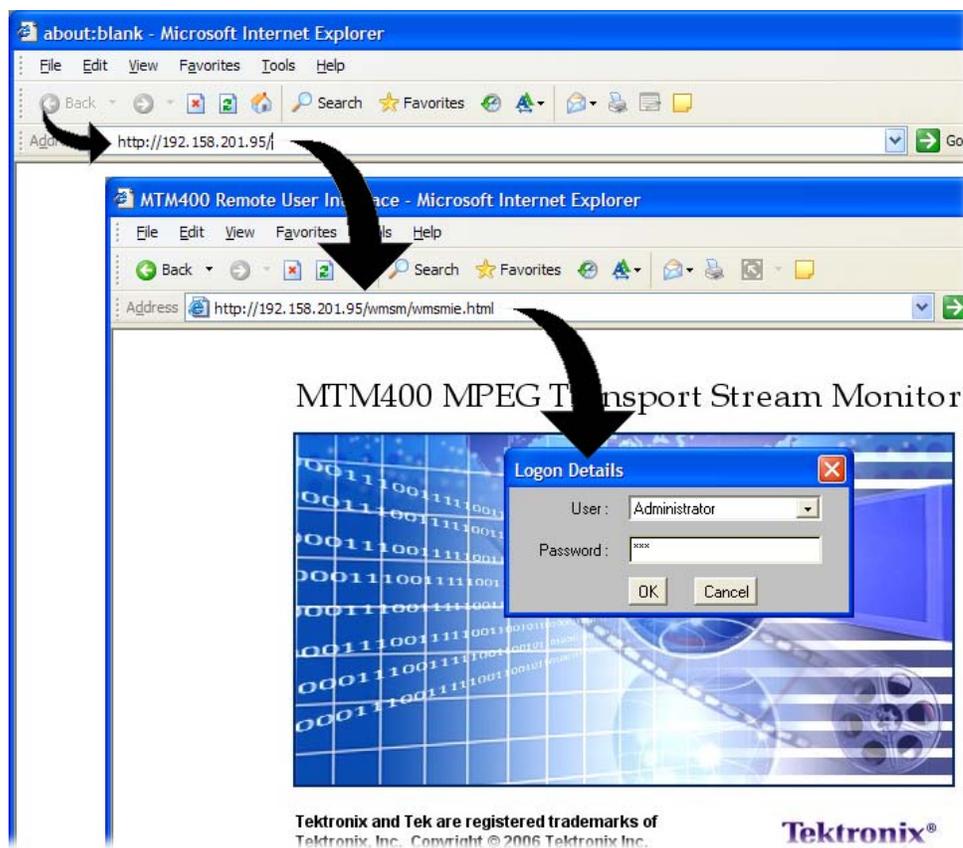


Figure 1-2: Logging on

3. Select the User name (Administrator or User from the drop-down list).

Two User Names are available at installation: Administrator and User.

Administrator: Gives full read/write access to all views and settings, including options where installed.

User: Gives read only access to all views and settings, including options where installed. You can also reset alarms.

4. Enter the password. The default password for Administrator is tek; no password is allocated to User. You can change the passwords; see page 3-13.

Select **OK** to accept the details. Select **Cancel** to close the dialog box.

(To redisplay the **Logon Details** dialog box, either reenter the network identity of the MTM400 or select the **Refresh** button in the browser.)

5. The Hotspot and Stream views are displayed.

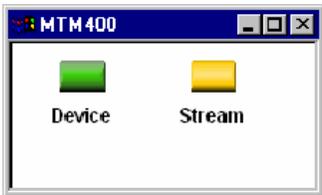


Figure 1-3: Hotspot view

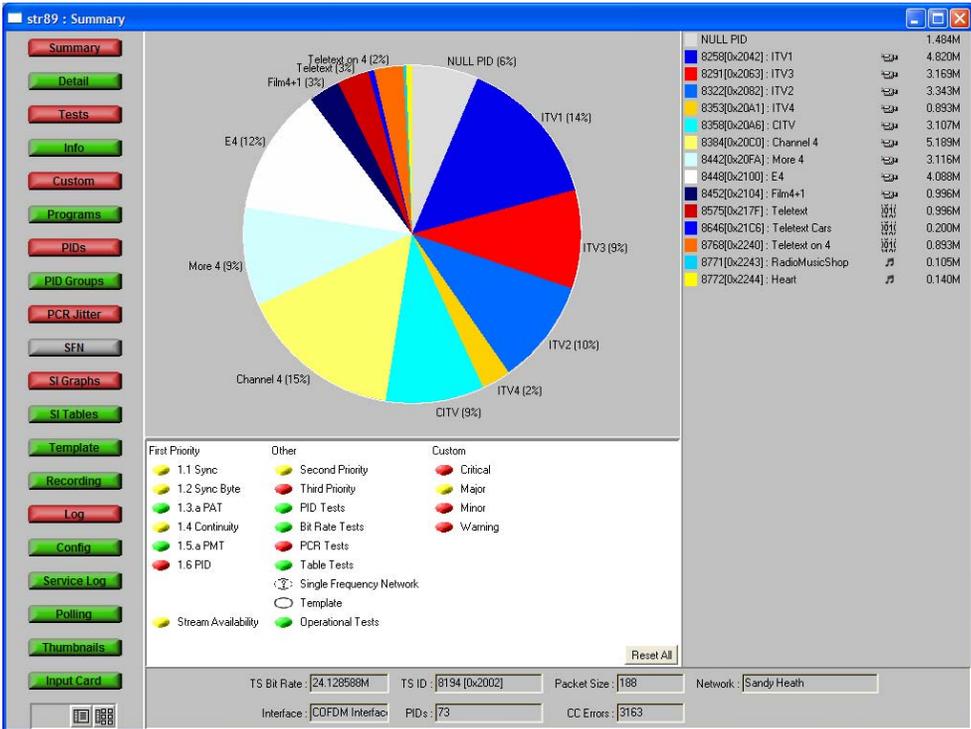


Figure 1-4: Summary view

The Hotspot view provides access to the device and stream monitoring views of the MTM400 being accessed.

High Level Monitoring

The Hot Spot view allows the overall state of the MTM400 device and the stream to be viewed; each hotspot is appropriately labeled.

The color of the Hot Spot button indicates the error status of the item to which it is linked (see *Color Coding*, page 2-11).

In the Hot Spot view, the error state of the linked item is as follows:

- Device - the highest error state of the MTM400 device
- Stream - the highest error state of the stream

When you left-click a hot spot, the appropriate view opens: Device or Stream.

A detailed description of the user interface is provided in the Reference section of this manual.

Closing the Remote User Interface (RUI)

Closing the original Internet Explorer window closes the RUI; the application windows close simultaneously.

Video Thumbnail Support

Before thumbnails can be viewed using the RUI, thumbnail support must be installed on the client PC. If thumbnail support is not installed, a message is displayed when the Thumbnails button is selected in the Stream view.

The thumbnail support software is an executable file on the Firmware CD-ROM included with the MTM400 monitor or downloaded from the Tektronix Web site (www.tektronix.com/software).

The MTM400 thumbnail support software is based on modified open source material. The modified code is included in the executable file, and can be copied to the client PC and inspected if required.

Installing thumbnail support. Before installing the thumbnail support, the MTM400 RUI must have been opened at least once.

1. Close the Internet Explorer (if open). This will close the MTM400 RUI also. The installer will not proceed if the Internet Explorer is not closed.
2. Open the executable file

The thumbnail support installation wizard Welcome screen is displayed.

3. Click Next and follow the instructions given in the subsequent screens.
4. In the Setup Type screen, choose Typical.

If you want to inspect the open source code that forms the thumbnail support package, choose the Custom setup type and enable the Source Code option in the following screen (Select Components). Click Next to continue.

5. When all stages of the thumbnail support installation wizard are completed, the MTM400 thumbnail feature is operational.

NOTE. *The thumbnail feature must be enabled in the Stream view - Configuration screen (see Configuration Screen, page 3-74)*



Operating Basics

Operating Basics

This section provides an overview of the basic operation of the system; details and background material are found in the Reference section.

The monitoring activity of the MTM400 can be observed in three ways:

- Local indicators
- Remote User Interface (RUI)
- WebMSM

Options are available to the RUI and the WebMSM to upgrade the monitoring from simple conformance checking to full diagnostic capability using license keys. The following sections describe all available options; your MTM400 may not have all options enabled.

Local Indicators

The MTM400 is an MPEG monitor for use in remote situations and does not have a local graphical user interface display. However, a local interface, consisting of four front-panel LEDs, can assure you that the MTM400 unit is functioning.

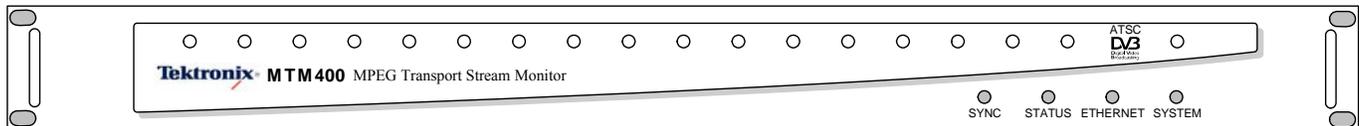


Figure 2-1: Front panel

These LEDs indicate the following:

- | | |
|-----------------|---|
| SYNC | Indicates that a valid MPEG transport stream is connected to the unit. |
| STATUS | Indicates the combined state of the tests currently being performed on the stream. The test reported by the STATUS LED corresponds to the Any Stream Error in the RUI (see <i>Device Status</i> , page 3-2). |
| ETHERNET | Indicates the state of the Ethernet physical link. |
| SYSTEM | State of all non-stream items (hardware, time sources). The test reported by the SYSTEM LED corresponds to the Any Box Error in the RUI (see <i>Device Status</i> , page 3-2). |

Each LED can show one of three colors:

- Green indicates that the monitor is passing the test.
- Red indicates that the monitor is failing the test.
- Yellow indicates that the monitor is passing the test, but has failed since the last system reset.

The Ethernet LED never shows yellow.

Remote User Interface

The Remote User Interface (RUI) allows you to configure and monitor the MTM400. The RUI can be run on any personal computer (client PC) that meets the minimum specifications (refer to *MTM400 MPEG Transport Stream Monitor Technical Reference*) and that has access to the MTM400 unit.

You can open the RUI of more than one RTM device by opening a new browser window each time; however, this may place an excessive processing load on your PC.

With the RUI accessed through your PC browser, three primary screens (or views) are provided to enable monitoring and configuration of the MTM400: Hot Spot View, Device View, and Stream View.

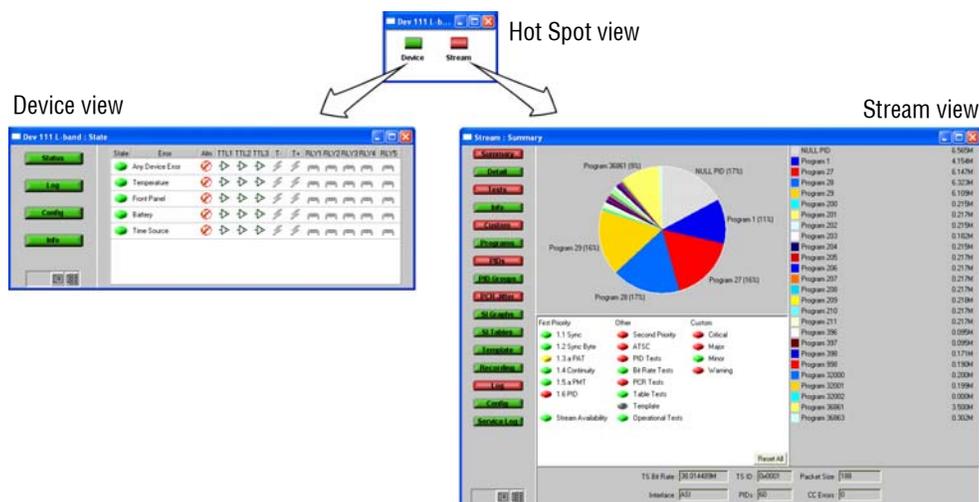


Figure 2-2: RUI overview

To close the Remote User Interface, close the original Web browser window. All associated windows will close.

Hot Spot View

The Hot Spot view lets you see the overall state of the MTM400 and the stream; each hotspot is appropriately labeled.

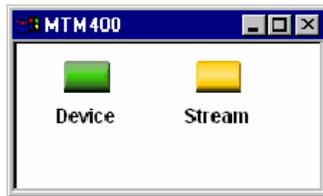


Figure 2-3: Hotspot view

The color of the Hot Spot button indicates the error status of the item to which it is linked (see *Color Coding*, page 2-11).

For example, in Figure 2-3, the **Device** button is green and the **Stream** button is yellow. This indicates that no errors have occurred on the device; an error has been noted on the stream, but it is currently OK.

The color (or state) of the Device and Stream hot spots corresponds to the Any Box Error and Any Stream Error tests in Device and Stream views.

If you click on a hot spot, the appropriate MTM400 view will open.

Device View

The Device view allows you to monitor and set parameters specific to the MTM400 device. The view contains a menu bar with various buttons, and an information view. You can choose the information that appears in the view by pressing the appropriate button. The button color indicates the overall state of the information in the corresponding view (see *Color Coding*, page 2-11).

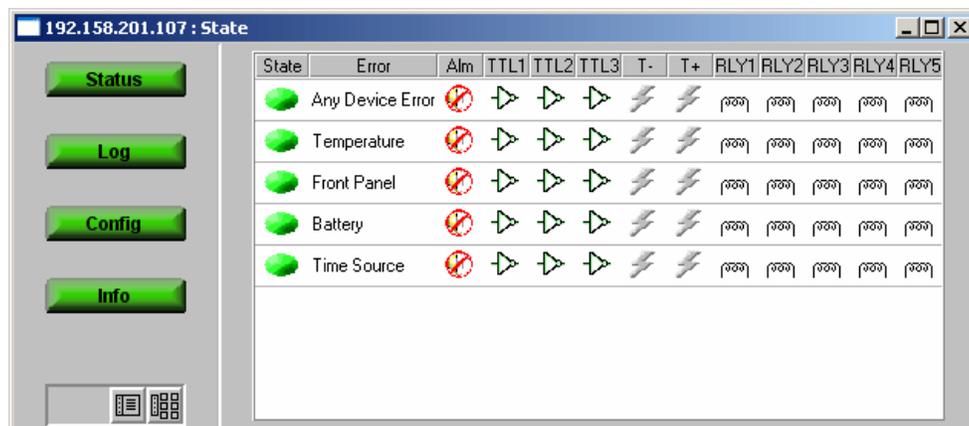


Figure 2-4: Device view

The title bar displays the name of the device to which you are connected (the name you set in the Device Configuration view) and the current view type. The screens provided are:

- Status** Displays the state of hardware items on the MTM400. It also allows administrators to configure alarms and relays and parameters associated with each item.
- Log** Displays the MTM400 device log, which includes non-stream events such as 'Device Start'.
- Config** Displays general configuration parameters for the MTM400. Administrators can modify certain parameters.
- Info** The Information view details the software and hardware build state of the MTM400.

Stream View

The Stream view allows you to monitor and set parameters specific to the stream being monitored.

As with the Device view, the screen consists of a menu bar with various buttons, and an information view. You can choose the information that appears in the view by pressing the appropriate button. The color of the button shows the overall state of the information that will be shown in the corresponding view (see *Color Coding*, page 2-11).

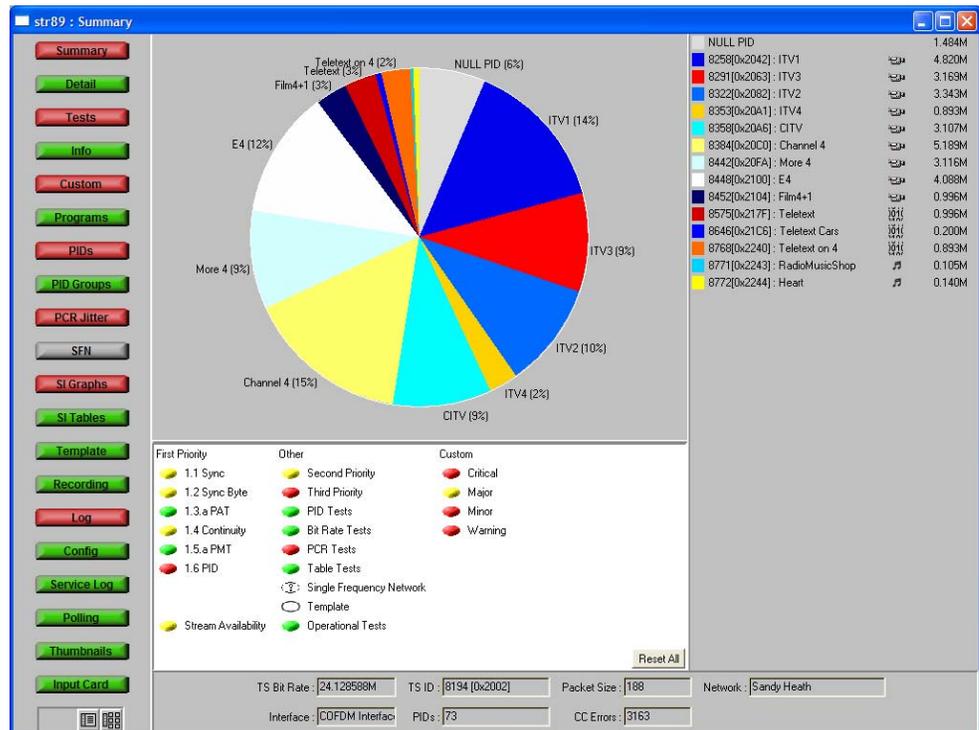


Figure 2-5: Stream view

The title bar displays the name of the device to which you are connected (the name you set in the Device Configuration view) and the current view type.

The information takes the form of a series of screens; a brief summary of each follows:

Summary

A dynamic visual overview of the stream and monitoring status. The information is updated at regular intervals. (See page 3-20.)

Detail	Displays the detailed information about the stream according to SI tables, PIDs, or Program. (See page 3-22.)
Tests	Displays the state of the tests applied to the stream. It also allows users with read-write permissions (Administrators) to configure alarms and relays and parameters associated with each test. (See page 3-23.)
Information	Displays events not normally logged in the Stream log; for example, PAT/PMT version changes. (See page 3-28.)
Custom	Displays the state of the tests in the same way as the Tests view, but categorized as Critical, Major, Minor or Warning. The allocation of tests to categories is preconfigured, but you can override the settings at run time. However, the settings will not be saved when the RUI is closed (using the WebMSM allows permanent configurations to be saved). (See page 3-26.)
Programs	Displays the programs that are being transmitted on the stream along with bit rate and the minimum and maximum bit rates that are observed. Administrators can set bit rate limits for each program if the bit rate limits option is licensed. (See page 3-30.)
PIDs	Displays the PIDs that are being transmitted on the stream along with bit rate and the minimum and maximum bit rates that are observed. Administrators can set bit rate limits for each PID if the bit rate limits option is licensed. (See page 3-34.)
PID Groups *	Displays the PID groups that you have created. The displayed information includes the error state and the bit rate. (See page 3-41.)
PCR Jitter *	Displays the following PCR graphs: Inaccuracy, Arrival, Overall Jitter, Frequency Offset, and Drift Rate. (See page 3-48.)
SFN	Displays the Single Frequency Network (SFN) information when available. (See page 3-55.)

TMCC	Displays the Transmission and Multiplexing Configuration Control (TMCC) and IIP information when available. (Only available for ISDB streams) (See page 3-56.)
SI Graphs *	Displays information about repetition rates of SI tables and subtables in graphical format. (See page 3-57.)
SI Tables *	Displays the SI Information for the stream. (See page 3-60.)
Template *	Displays the structure and status of templates applied to the stream. (See page 3-66.)
Recording *	Displays the Triggered Recording setup screen. (See page 3-69.)
Log	Displays the stream log. (See page 3-70.)
Config	Displays general configuration parameters for the stream. Administrators can modify certain parameters. Scheduling, triggered recording, and interface setup are configured here. (See page 3-74.)
Service Log	Displays the Service Log. Service logging allows packet counts for specified PIDs (range: 0 to 100) to be collected at a user-definable interval. (See page 3-79.)
Polling *	Displays status and allows control of polling. (See page 3-93.)
Thumbnails	Displays thumbnail views of the video channels being monitored. (See page 3-84.)
Input Card *	Displays the relevant graphs and setup of any installed interface card. (Only displayed if an interface card is present.) (See page 3-113.)

* - licensed options (see Table 1-2: *MTM400 options* and Table 1-5: *MTM400 options summary*).

Device and Stream View Manipulation

The manipulation of the Device and Streams views is similar. Each view consists of a Button bar and an information window. The two view elements can be displayed either combined (a single window with the Button bar on the left) or as separate elements (the Button Bar and the information window are displayed separately). When displayed as separate windows, multiple information windows can be opened. The choice is made by selecting one of the two buttons at the bottom of the Button bar.

Combined View. Figure 2-6 illustrates the combined Device view; the Streams view is similar. Each time a button is selected, the adjoining view changes.

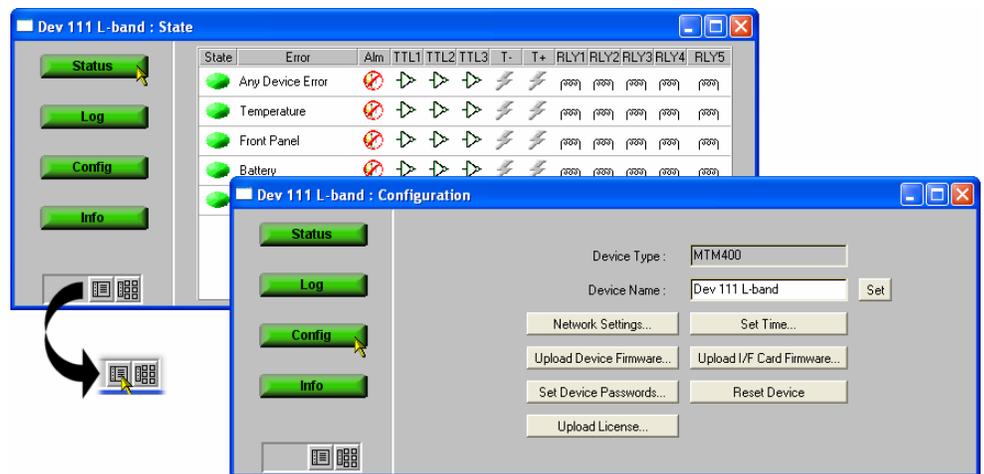


Figure 2-6: Combined view

Multiple View. Figure 2-7 illustrates the multiple Device view; the Streams view is similar. Each time you select a function button, a new window opens.

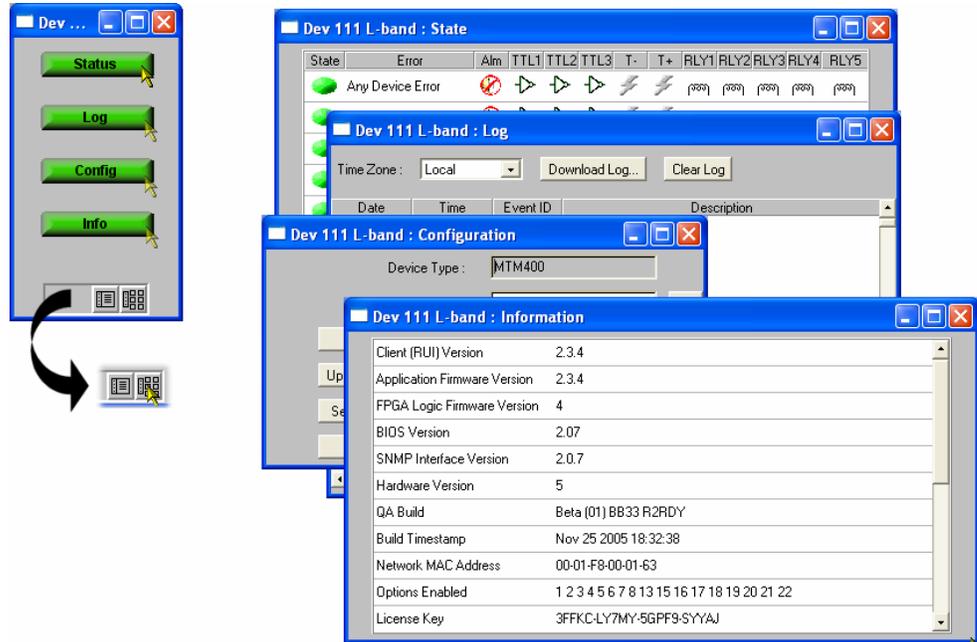
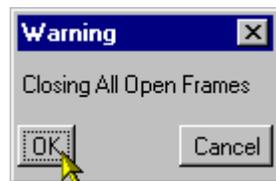


Figure 2-7: Multiple view

When switching from multiple view to combined view, you will be asked to acknowledge that all the function windows will close before the combined view window can be displayed.



The individual Device and Streams function windows are described in the *Reference* section of this manual.

Color Coding

In the RUI Hot Spot View, the Device and Stream buttons use the color scheme shown in Table 2-1.

Table 2-1: Button colors - Hot Spot views

Icon	Color	Meaning
 Device	Green	Operation normal — no error detected.
 Device	Red	Error detected and still present.
 Device	Yellow	Transient error, which has now corrected itself.
 Device	Gray	The corresponding test has been disabled (or is unavailable). All buttons gray indicates that connection to a device has been lost.

In the Stream and Device views, the buttons and icons use the color-coded error scheme shown in Table 2-2.

Table 2-2: Button colors - Device and Stream views

Icon	Color	Meaning
	Green	Operation normal — no error detected.
	Red	Error detected and still present.
	Yellow	Transient error, which has now corrected itself.
	Gray	The corresponding test has been disabled (or is unavailable). All buttons are gray indicates that connection to a device has been lost.
	White	Test not applicable.
	Clear / ?	Test unknown or incomplete (for example, during a measurement settling time).
	Black	Maintenance mode.

Where buttons represent a collection of elements (for example, for the Status button), the color indicates the highest error state of the elements.

Using WebMSM

If you have a system consisting of MTM400 units, you can expand your monitoring capabilities by using the WebMSM Monitoring System Manager.

The WebMSM software is effectively an installed version of the RUI. The WebMSM software provides additional functionality by allowing you to create hierarchical network views of your systems using the WebMSM Configuration Editor, and monitor and control multiple devices. The WebMSM user interface is similar to the RUI.

For further information concerning installing and configuring the WebMSM, refer to the *WebMSM User Manual* (Tektronix part number 071-1239-xx).

Using MLM1000

If you have a system with a number of Tektronix monitoring devices, which are not limited to MTM400 units, you can enhance your monitoring capabilities by using the MLM1000 Multi-Layer Monitoring software.

The MLM1000 software manages a hierarchical network of MTM400 units, waveform monitors, RF monitors and other instruments. Like the WebMSM software, it is installed on the PC; the MTM400 interface is identical to the RUI.

For further information concerning installing and configuring the MLM1000 software, refer to the *MLM1000 Multi-Layer Monitoring Software User Manual* (Tektronix part number 071-1433-xx).

User Interface Version

The software version of the user interface (RUI or WebMSM) is shown on the device information screen (page 3-1). Ensure that the RUI version is the same as the FW version installed in connected MTM400 monitors.

Time Zones

An inevitable consequence of allowing the RTM device user interface to be accessed across networks is the crossing of time zones. Various features of the user interface display timing information, including the Log files. You need to know the time source being used to record events. Also, when scheduling the loading of configuration files, time zones must be taken into account (see *Scheduling*, page 3-99).

Figure 2-8 shows a typical setup in which an MTM400 is located in Denver and is monitored from Portland. In local time, Portland is one hour behind Denver. In this example, the Universal Coordinated Time (UTC) is 10 p.m. Therefore the local times in Portland and Denver are 2 p.m. and 3 p.m., respectively.

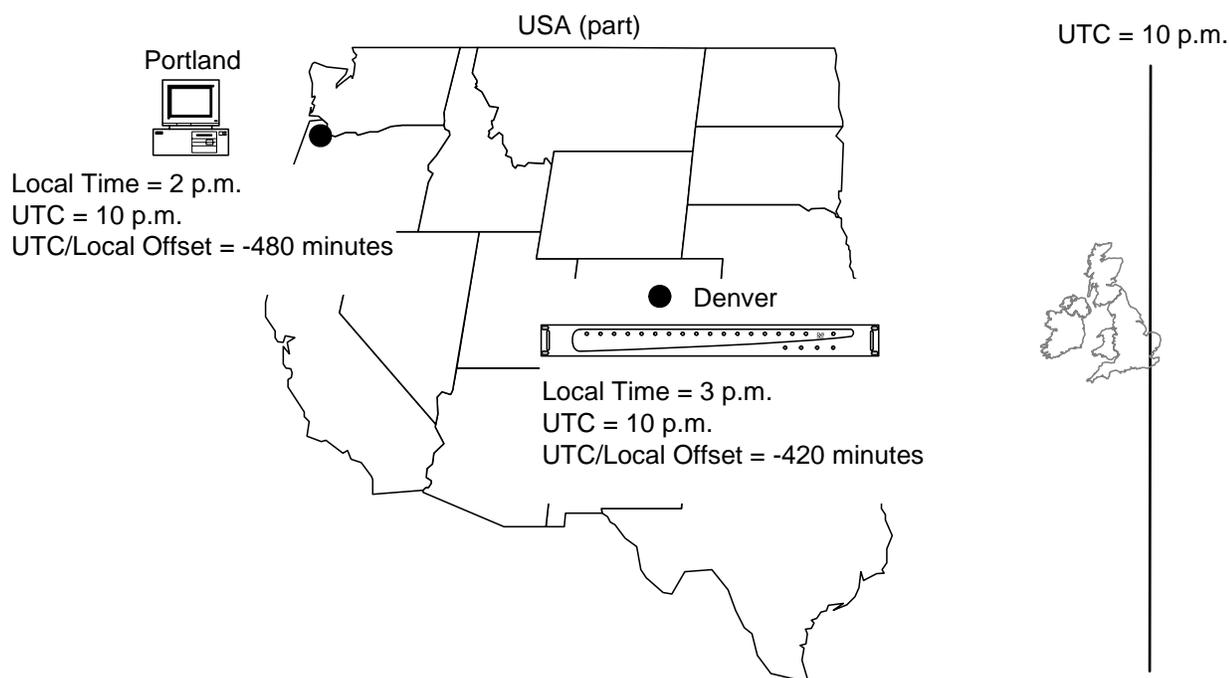


Figure 2-8: Time zones - illustration

The MTM400 user interface allows you to coordinate times of the system elements and to choose the local reference time zone; UTC, local time at the client PC, or local time at the RTM device. All times are calculated with respect to Universal Coordinated Time. (See *Device Configuration - Set Time*, page 3-9.)



Reference

Device View

The Reference section provides a detailed description of each of the views available in the RUI. The descriptions are given in the order in which they appear in the two primary views: Device and Streams.

The Device view allows you to monitor and set parameters specific to the MTM400 unit. The view consists of a menu bar with various buttons, and an information view. You can choose the information that appears in the view by pressing the appropriate button. The color coding of buttons is explained in the previous section (see *Color Coding*, page 2-11.)

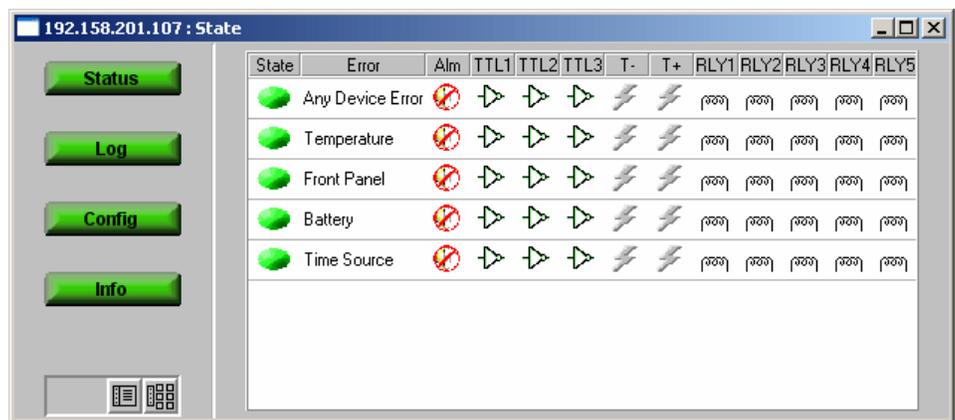


Figure 3-1: Device view

The title bar displays the Device Name and the current view type.

The screens provided are:

- Status** Displays the state of hardware items that are installed on the MTM400. It also allows administrators to configure alarms and relays and parameters associated with each item. (See page 3-2.)
- Log** Displays the MTM400 device log. (See page 3-4.)
- Config** Displays general configuration parameters for the MTM400. Administrators can modify certain parameters. (See page 3-6.)
- Info** The Information view details the software and hardware build state of the MTM400. (See page 3-15.)

Device Status

The Device Status option displays a screen that shows the status of MTM400 device events (as opposed to stream events).

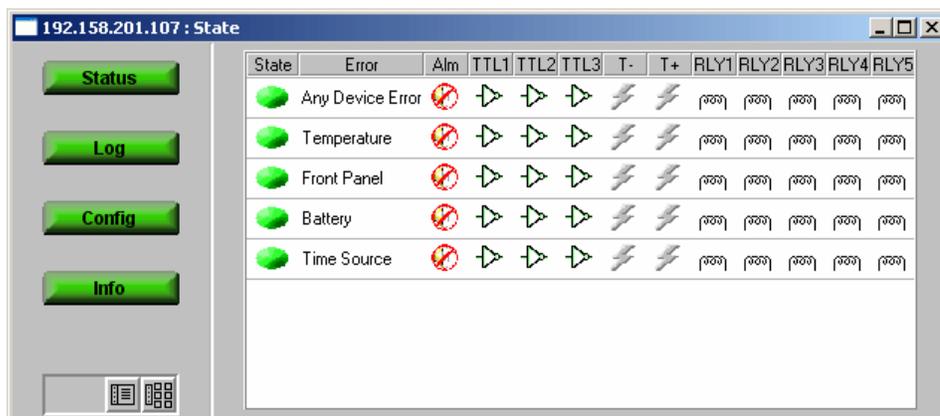


Figure 3-2: Device view - Status

The events displayed will depend on the RTM device type; those currently shown for the MTM400 are as follows:

Any Device Error Provides an overview of the device error state, which includes the events shown in this panel.

Temperature When active, indicates that the maximum temperature monitored at the front panel and the processor board has exceeded the safe operating limit.

Front Panel When active, indicates that either the temperature at the front panel has exceeded the safe operating limit, one or more of the LEDs has failed, or the audible alarm is faulty.

Battery When active, indicates that the configuration backup battery on the TS Processor board has failed. In this case, all configuration settings will be lost when power is removed from the unit.

Time Source When active, indicates that the time source selected in the **Set Time...** section of the Device Configuration (see page 3-9) has failed.

Typical display elements are described in the following paragraphs:

State A button showing the **State** of the event.
(See *Color Coding*, page 2-11.)



A right-click on the button will open a pop-up menu that allows you to reset the error or enable/disable the event monitoring. Double-clicking the button will toggle event monitoring between enabled and disabled.

Error Name of the **Error** event (for example, Fan).

Alm An icon indicating whether an audible alarm (**Alm**) will sound when an error of the type occurs. Double-clicking the icon will toggle its state: enabled or disabled.

 - Disabled;  - Enabled

(See the *MTM400 MPEG Test Technical Reference* for additional details.)

TTLn An icon indicating whether the TTL (**TTLn**) will activate when an error occurs. Double-clicking the icon will toggle its state: enabled or disabled.

 - Disabled;  - Enabled

(See the *MTM400 MPEG Test Technical Reference* for additional details.)

SNMP (**T-** and **T+**) Indicates whether SNMP trap messages should be sent when a specific event starts and finishes.

 - Off (gray);  - On (yellow)

RLYn An icon indicating whether the relay (**RLYn**) will activate when an error occurs. Double-clicking the icon will toggle its state: enabled or disabled.

 - Disabled;  - Enabled

(See the *MTM400 MPEG Test Technical Reference* for additional details.)

View Device Log

The Device Log records device-specific events associated with the selected MTM400. Logged events are displayed in a scrolling list. The Date, Time, Event ID and a description of each event is displayed.

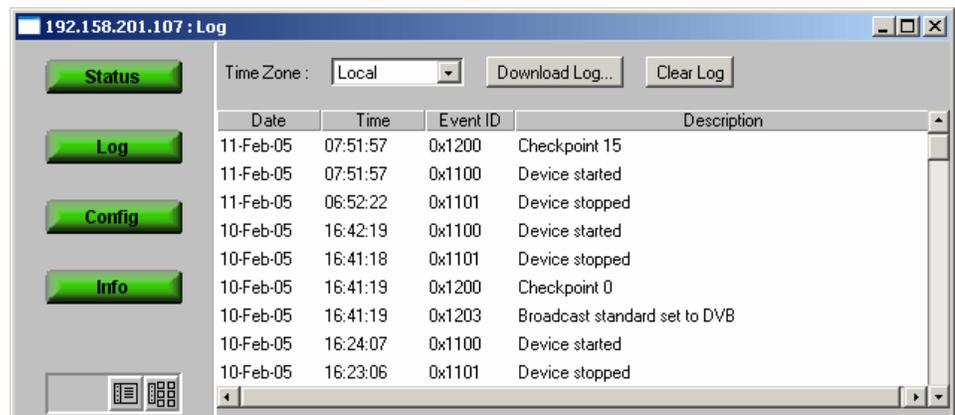
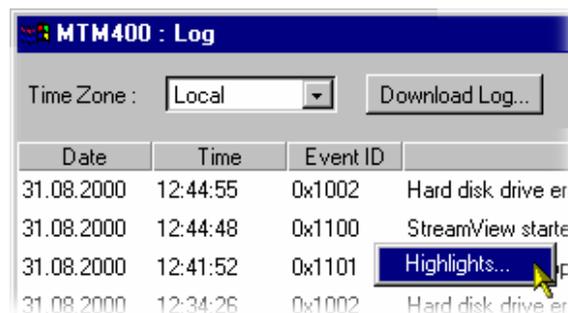
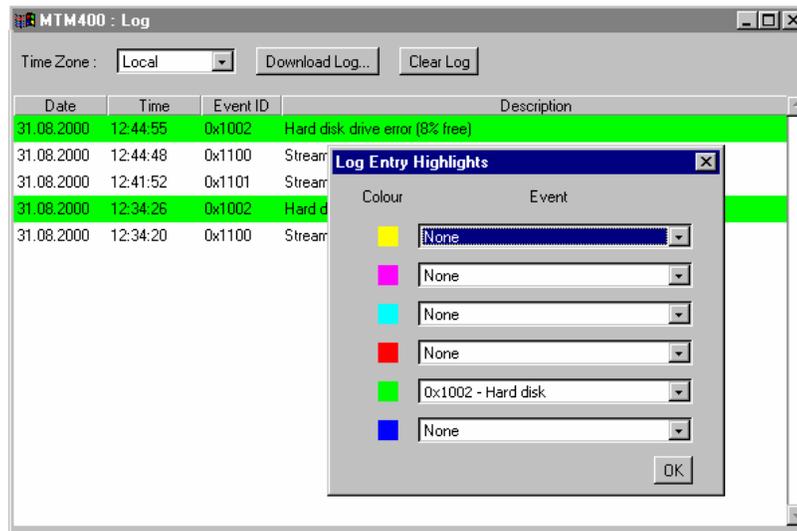


Figure 3-3: Device view - Log

Highlighting Log Entries

To open a pop-up menu from which log entry highlight coloring can be initiated, right-click anywhere within the listing.





Using the Log Entry Highlights dialog box allows specific types of entries to be highlighted in a selected color. Select the **Event** type to be highlighted from the drop-down list adjacent to the **Color** required; hex values are shown in the event list. Select **OK** to close the dialog box and implement the highlighting.

Saving the Device Log

The Device Log can be saved using the **Download Log...** button. In the **Log Download** dialog box, select (or enter) a filename and path and select the **Start** button. Select the **Close** button when the operation has finished or to terminate the process early.

The resulting downloaded log file is saved in CSV (comma separated values) format.

Clearing the Device Log

Select **Clear Log** to clear the current log entries.

Time Zone

Monitoring devices across time zones may cause some confusion with respect to the timing of events. The displayed times at which log events occurred can be adjusted by making a selection from the **Time Zone** drop-down list at the top of the window. The following options are available:

- Local** The time local to the machine on which MTM400 Remote User Interface is currently running.
- UTC** Universal Coordinated Time.
- RTM Device** The time local to the RTM device being monitored.

Device Configuration

The Device Configuration screen allows you to configure items specific to the MTM400 unit being monitored.

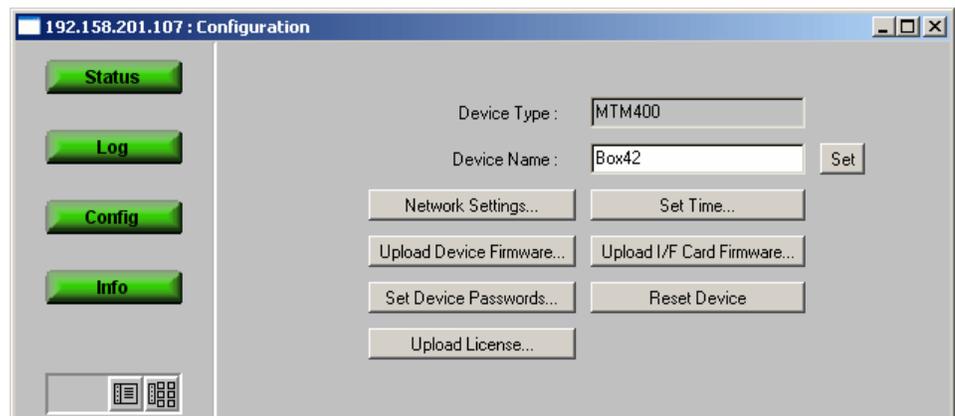


Figure 3-4: Device view - Configuration

Device Type: Displays the monitoring device type; this information is read from the unit being monitored.

Device Name: You can give the monitoring device a name, which is then displayed in the title bar of all screens. You need not enter a Device Name if the IP address of the device is displayed.

Enter the required name and select **Set** to activate it.

Network Settings...

Allows the network settings of the device to be reconfigured. (See *Network Settings*, page 3-7.)

Set Time... Allows the RTM device time to be set.
(See *Set Time*, page 3-9.)

Upload Device Firmware...
Allows new firmware to be uploaded to overwrite the existing device firmware.
(See *Firmware Upload*, page 3-11.)

Upload I/F Card Firmware...
Allows new firmware to be uploaded to overwrite the existing interface card firmware.
(See *Firmware Upload*, page 3-11.)

Set Device Passwords
Allows the RUI passwords to be set.
(See *Passwords*, page 3-13.)

Reset Device Resets the MTM400 by rebooting. The configuration is reloaded from non-volatile RAM; any configuration settings not saved before the reset will be lost.
(See *Device Reset*, page 3-13.)

Upload License...
Allows the License Key details to be entered.
(See *Upload License*, page 3-14.)

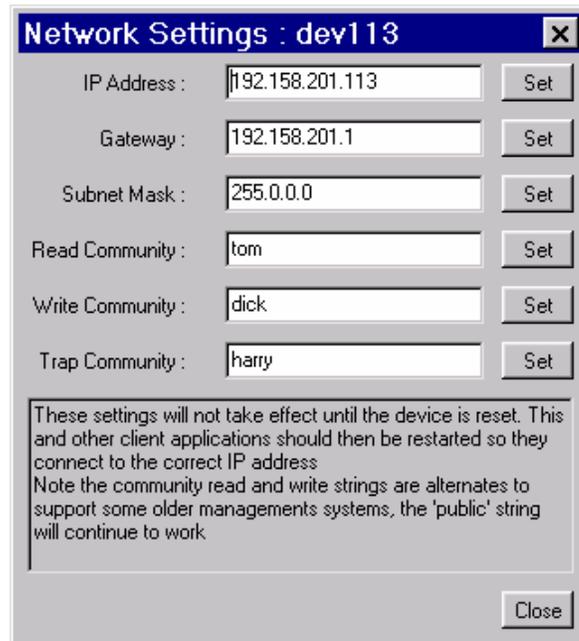
Network Settings

Although the MTM400 network identity is initially set up during installation, it can be changed subsequently through the **Network Settings** dialog box.

SNMP community strings can also be set using the **Network Settings** dialog box.

In all cases, when the values have been changed as required, select the adjacent **Set** button to store the new settings in the MTM400.

To open the **Network Settings** dialog box, select **Network Settings** from the Device Configuration dialog box.



The image shows a dialog box titled "Network Settings : dev113". It contains several input fields, each with a "Set" button to its right:

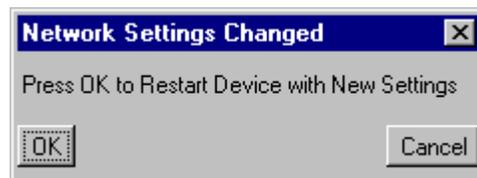
- IP Address : 192.158.201.113
- Gateway : 192.158.201.1
- Subnet Mask : 255.0.0.0
- Read Community : tom
- Write Community : dick
- Trap Community : harry

Below the input fields is a text box containing the following text:

These settings will not take effect until the device is reset. This and other client applications should then be restarted so they connect to the correct IP address
Note the community read and write strings are alternates to support some older managements systems, the 'public' string will continue to work

At the bottom right of the dialog box is a "Close" button.

When the network settings have been changed and set and **Close** is selected, the following dialog box is displayed:



The image shows a dialog box titled "Network Settings Changed". It contains the following text:

Press OK to Restart Device with New Settings

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

For the network settings to take effect, select **OK** to restart the device. Select **Cancel** if a restart is not required. The new settings will not take effect until the unit is restarted.

If necessary, obtain the IP Address, Gateway and Subnet Mask values from the Network Administrator.

NOTE. *If the Network Settings are changed and the MTM400 is restarted, the PC that is running the RUI will be unable to communicate with the MTM400, since the browser is trying to communicate with the previous network identity. It will be necessary to close the RUI by closing the Internet Explorer. Internet Explorer can then be reopened and the MTM400 accessed using the new network identity.*

This is true of any WebMSM system configuration, which must be revised using the WebMSM Configuration Editor (refer to the WebMSM user manual).

Set Time

You can coordinate the time used by the RTM device and/or the remote user interface. (For a general description of the timing model, see *Time Zones*, page 2-13.)

Three time sources are available to the MTM400 from the **Time Source** drop-down menu.

Real Time Clock The MTM400 internal clock.

LTC (Longitudinal Time Clock) An analog format time clock often available from a centralized source.

SNTP (Simple Network Time Protocol) A UTC-synchronized time clock available over the internet. Appropriate IP addresses of time servers should be available from the System Administrator.

- **Local** time is the time being used by the remote user interface; it is the local PC time. It is referenced to UTC (Coordinated Universal Time) and may be offset to allow for local time variations, for example, British Summer Time = +60 minutes. The adjusted time is shown. Local time corresponds with the current Windows clock and time zone parameters.
- **RTM Device** time is the time being used by the RTM device; this may be in a completely different time zone. It is referenced to UTC (Coordinated

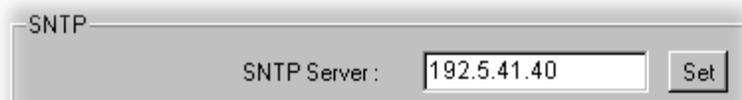
Universal Time) and may be offset to allow for local time variations, for example, British Summer Time = +60 minutes. The adjusted time is shown.

With **Real Time Clock** selected from the **Time Source** drop-down list, the RTM device can be synchronized to local PC time using **Sync with Local**. Any offset required (for a different time zone) is entered in the **UTC to Time Zone Offset** field in minutes (range: ± 12 hours) and activated using **Set**.

NOTE. *There may be a slight delay between the RTM device time displayed and the actual time on the device due to network delays incurred in retrieving the time. This is most likely to be seen if you apply **Sync with Local** and observe that the **Local and RTM Device times are slightly out of step.***

With either **Longitudinal Time Code** or **Simple Network Time Protocol** selected from the **Time Source** drop-down list, the RTM device takes its time from the respective input. Any offset required (for a different time zone) is entered in the **UTC to Time Zone Offset** field (in minutes) and activated using **Set**.

To use a remote time server, **Simple Network Time Protocol** should be selected from the **Time Source** drop-down list, and the IP address of a suitable SNTP server entered in the **SNTP** field.



The image shows a graphical user interface element for configuring the SNTP server. It consists of a rectangular box with a light gray background. On the left side of the box, the text "SNTP" is displayed. In the center, the text "SNTP Server :" is followed by a text input field containing the IP address "192.5.41.40". To the right of the input field is a small, rectangular button labeled "Set".

The network Gateway and Subnet Mask must be set up for the remote server to be able to communicate (see *Network Settings*, page 3-7).

Firmware Upload

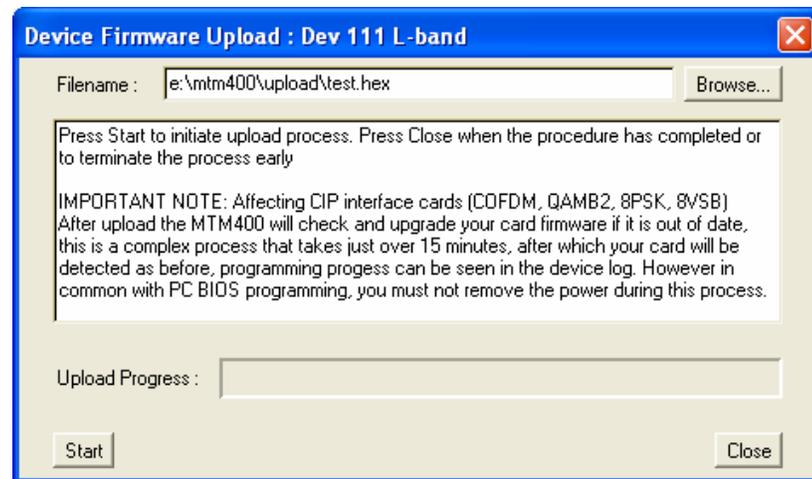
If new device or interface card firmware is available, this function allows you to upload it to the respective device. The firmware filename format is *.hex.

Device Firmware Upload.



CAUTION. *The Device Log must be cleared immediately before uploading the firmware.*

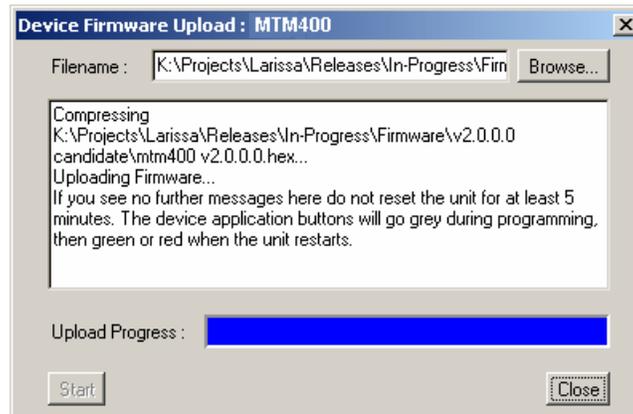
1. Clear the Device Log.
2. Select **Upload Device Firmware.**



3. Identify the firmware file either by entering the path and filename or by using **Browse.**
4. Select **Start** to upload the firmware.



CAUTION. *If the instrument contains a CIP interface card (COFDM, QAMB2, 8PSK, 8VSB), the upload process can take up to 15 minutes to complete. The operation will fail if power is removed during this process.*



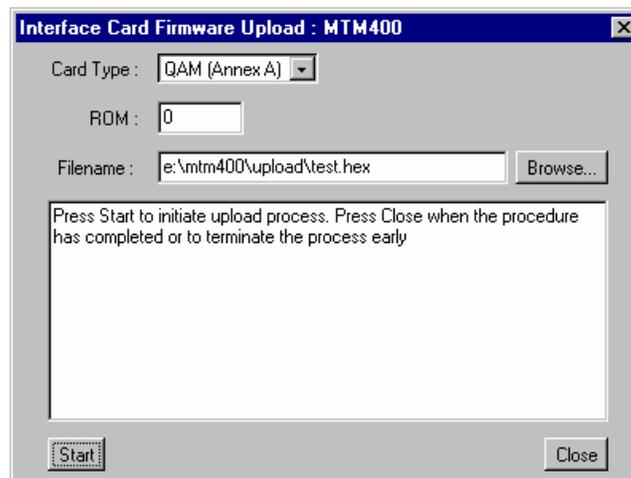
5. Select **Close** when the process has completed or to terminate the process.

Interface Card Firmware Upload.

NOTE. *This feature will only be used for interim updates of the Interface Card Firmware. The update will contain up to three files. Documentation specifying Card Type and ROM number to be used will be supplied with the firmware files.*

The firmware is uploaded to non-volatile RAM on the card. If this firmware becomes corrupted and the device needs to be reprogrammed, the original firmware from the MTM400 will be used; the updated firmware will have to be reapplied.

1. To upload interface card firmware, select **Upload I/F Card Firmware**.



2. Select the **Card Type** to which the firmware is to be uploaded from the drop-down list.
3. Enter the **ROM** number (0, 1 or 2).

4. Identify the firmware **Filename**: (either by entering the path and filename or using **Browse**).
5. Select **Start** to upload the firmware.
6. Select **Close** when the process has completed or to terminate the process.

Passwords

Use the Password feature in the device configuration to change the current password. This is the password that will be required when you access the device through the RUI. The password file created is stored on the RTM device.

Note that only users with administrator access can change the RUI passwords.



The screenshot shows a 'Set Passwords' dialog box with the following fields and values:

- Administrator**
 - Password: xxxx
 - Verify Password: xxxx
- User**
 - Password: xxx
 - Verify Password: (empty)

Buttons: OK, Cancel

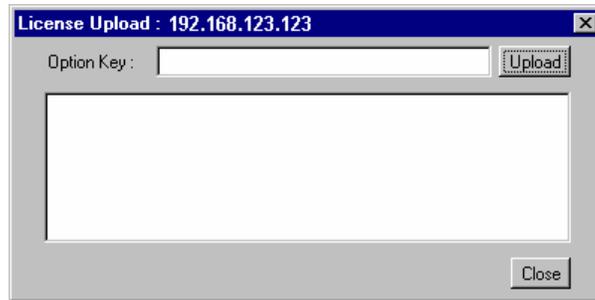
1. For Administrator, enter a password in the **Password** field. Verify it by entering it again in the **Verify Password** field.
2. Repeat for User.
3. Select **OK** to confirm the passwords.

Device Reset

Selecting **Reset Device** resets the RTM device; it is equivalent to removing and reinstating power. The configuration is reloaded from non-volatile RAM. Any configuration settings applied in the preceding few seconds may not be saved, so if you have changed settings, wait a few seconds before resetting the box. The device configuration is reloaded from non-volatile RAM upon restart.

Upload License

A license key is applied to each RTM device to enable functionality. When new or upgraded functions are added, for example as part of a field upgrade, you will receive a new license key with the upgrade kit. Use the **License Upload** dialog box to apply the new license key.



Enter the new license key; this will accompany the upgrade documentation. Select **Upload**. The result will be displayed.

The license key will be stored on the RTM device. Note that licensing is specific to a single RTM device.

Device Information

The Info view details the software and hardware build state of the MTM400. (The values shown in this example will differ from the values shown on your display.) This information may be required if you request technical support from Tektronix.

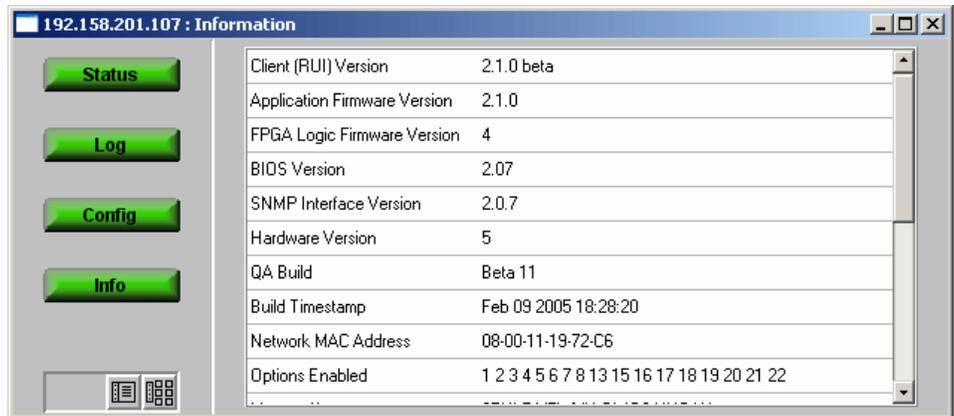


Figure 3-5: Device view - Information

SNMP

The MTM400 Simple Network Management Protocol (SNMP) agent is a software process that responds to queries using the SNMP to provide status and statistics about the MTM400. This enables development of management applications that can access MTM400 units remotely across a network using SNMP.

Each of the events available from the MTM400 is kept in a database described by a Management Information Base (MIB). The various values that can be retrieved from the MIB are called *MIB variables*. These variables are defined in the MIB for the MTM400. Each MIB variable is named by an *Object Identifier* (OID).

The MTM400 MIB is documented in the *MTM400 MPEG Transport Stream Monitor Programmer Manual*, Tektronix part number 071-1375-xx. (A PDF version of the Programmer manual can be downloaded from the Tektronix Web site at www.tektronix.com/manuals.)

The MTM400 MIB definition files can be downloaded from the MTM400 using <http://address/mib/adsys.mib> and <http://address/mib/admpeg.mib>.

Communities

An SNMP Community String is like a password. It is sent along with each SNMP request and allows (or denies) access to the MTM400. Most agents accept a default password of “public”. Alternative community strings can also be used to enhance security. The MTM400 uses the standard community string “public”. However, it allows a secondary community string to accommodate older systems that use different values and cannot be changed. Even if these values are changed, the “public” community string can still be used. Read and Write community strings can be set in the **Network Settings** dialog box (see page 3-7).

SNMP Traps

An SNMP Trap is an unsolicited message from an MTM400 to an SNMP agent that an event has occurred. Traps provide an immediate notification for an event that might only be discovered during occasional polling using normal SNMP techniques.

SNMP traps have a default community string of “public”. An alternative community string can be assigned in the **Network Settings** dialog box (see page 3-7).

Stream View

The Stream view provides information about the monitored stream.

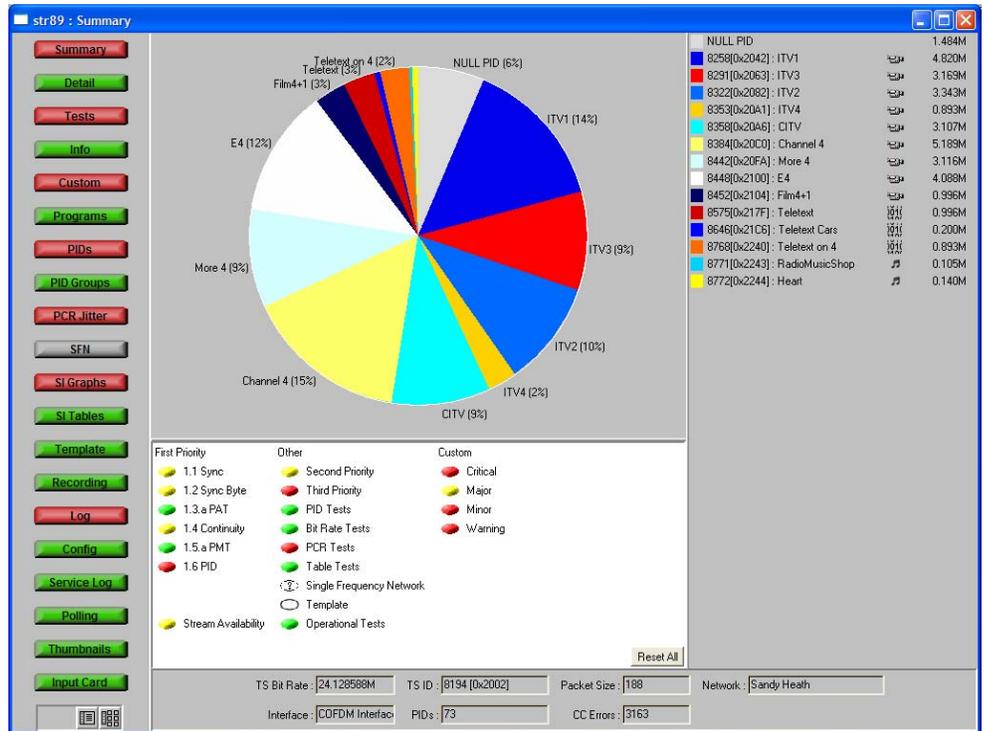


Figure 3-6: Stream view

The title bar displays the Stream Name (configured by the user), and the current view type.

The information takes the form of a series of screens; a brief summary of each follows:

Summary A dynamic visual overview of the stream and monitoring status. The information is updated at regular intervals. (See page 3-20.)

Detail Displays the detailed information about the stream according to SI tables, PIDs, or Program. (See page 3-22.)

Tests	Displays the state of the tests applied to the stream. It also allows users with read-write permissions (Administrators) to configure alarms and relays and parameters associated with each test. (See page 3-23.)
Information	Displays events not normally logged in the Stream log; for example, PAT/PMT version changes. (See page 3-28.)
Custom	Displays the state of the tests in the same way as the Tests view, but categorized as Critical, Major, Minor or Warning. The allocation of tests to categories is preconfigured, but you can override the settings at run time. However, the settings will not be saved when the RUI is closed (using the WebMSM allows permanent configurations to be saved). (See page 3-26.)
Programs	Displays the programs that are being transmitted on the stream along with bit rate and the minimum and maximum bit rates that are observed. Administrators can set bit rate limits for each program if the bit rate limits option is licensed. (See page 3-30.)
PIDs	Displays the PIDs that are being transmitted on the stream along with bit rate and the minimum and maximum bit rates that are observed. Administrators can set bit rate limits for each PID if the bit rate limits option is licensed. (See page 3-34.)
PID Groups *	Displays the PID groups that you have created. The displayed information includes the error state and the bit rate. (See page 3-41.)
PCR Jitter *	Displays the following PCR graphs: Inaccuracy, Arrival, Overall Jitter, Frequency Offset, and Drift Rate. (See page 3-48.)
SFN	Displays the Single Frequency Network (SFN) information when available. (See page 3-55.)
TMCC	Displays the Transmission and Multiplexing Configuration Control (TMCC) and IIP information when available. (Only available for ISDB streams) (See page 3-56.)

SI Graphs *	Displays information about repetition rates of SI tables and subtables in graphical format. (See page 3-57.)
SI Tables *	Displays the SI Information for the stream. (See page 3-60.)
Template *	Displays the structure and status of templates applied to the stream. (See page 3-66.)
Recording *	Displays the Triggered Recording setup screen. (See page 3-69.)
Log	Displays the stream log. (See page 3-70.)
Config	Displays general configuration parameters for the stream. Administrators can modify certain parameters. Scheduling, triggered recording, and interface setup are configured here. (See page 3-74.)
Service Log	Displays the Service Log. Service logging allows packet counts for specified PIDs (range: 0 to 100) to be collected at a user-definable interval. (See page 3-79.)
Polling *	Displays status and allows control of polling. (See page 3-93.)
Thumbnails	Displays thumbnail views of the video channels being monitored. (See page 3-84.)
Input Card *	Displays the relevant graphs and setup of any installed interface card. (Only displayed if an interface card is present.) (See page 3-113.)

* - licensed options (see Table 1-2: *MTM400 options* and Table 1-5: *MTM400 options summary*).

Monitoring Overview Screen (Summary Screen)

This screen provides a dynamic visual overview of the stream and monitoring status. The information is updated at regular intervals.

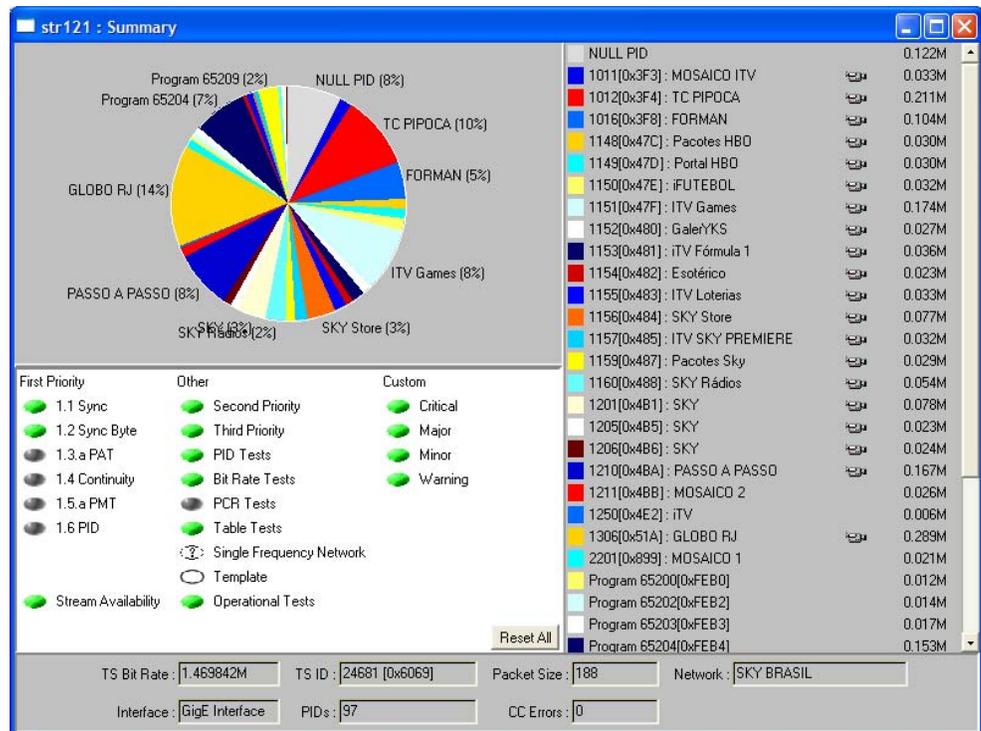


Figure 3-7: Stream view - Overview

The upper half of the Overview screen displays service information in the form of a pie chart and a list. Services are named and color coded to allow correlation between the pie chart and the list. The pie percentage value of the NULL PID relates to the stream bitrate. The services are divided pro-rata over the total effective bitrate of all the active services in the stream (due to PID reuse the total effective bitrate may be greater than the transmitted stream bitrate), this ensures that the NULL PID bitrate shows the true available bandwidth. Bit rates of individual services are given in the service list. The icons in the service list give an indication of the program content: video, audio or data.

The lower half of the screen displays an overview of the tests applied to the stream. The tests are grouped as follows:

First Priority: Lists the first priority tests in DVB, ISDB, or ATSC order.

Other: Summarizes all test groups except First Priority. The groups are derived from the Tests screen (see page 3-23).

Custom: Represents the highest error state present in the events associated with the category. (These can be edited on the *Custom Screen*; see page 3-26.)

The button to the left of the test name shows the current error status of the individual test or, in the case of test groups, the highest error state reported by any test within that group (see also *Color Coding*, page 2-11).

All tests can be reset using **Reset All**.

The Stream State summary table shows the overall status of the stream in terms of error severity and event classification.

A summary of stream statistics is provided at the bottom of the screen. The fields are as follows:

TS Bit Rate:	Overall bit rate of stream.
TS ID:	Transport stream identity; derived from the Program Association Table (PAT).
Packet Size:	Transport stream packet size (188/204).
Network:	Network name; derived from the Network Information Table (NIT) in the stream.
Interface:	Indicates the selected interface. (see <i>Configuration Screen</i> , page 3-74.)
PIDs:	Number of Packet Identifiers (PIDs) in the transport stream.
CC Errors:	Continuity count errors (since the last reset).
BER:	Bit Error Rate (Only displayed with L-Band (QPSK) or QAM interfaces).

Detail Screen

This screen provides a dynamic, detail view of the stream PIDs. The information is updated at regular intervals.

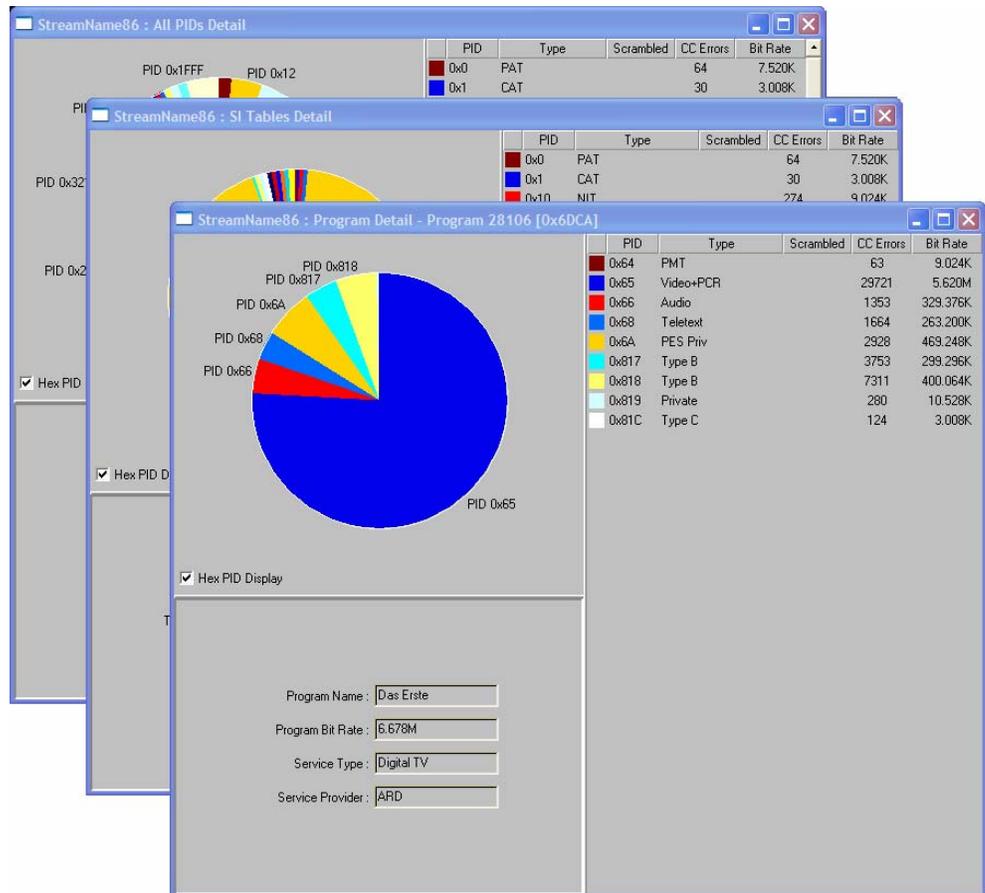


Figure 3-8: Stream view – Detail

The Detail screen button offers three options. **All PIDs** displays details of all the PIDs in the stream. **SI Tables** displays details of only those PIDs that are carrying service information table information. **Programs...** allows you to select a single program and display details of the associated PIDs.

Tests Screen

The Tests screen displays the results of tests on the current stream grouped in DVB, ISDB, or ATSC priority order. Additional proprietary tests are grouped by function; for example, Bit Rate tests and PID Tests.

State	Error	Alm	TTL1	TTL2	TTL3	T-	T+	RLY1	RLY2	RLY3	RLY4	RLY5	Rec
Red Circle	Any Stream Error	Red X	Green Arrow	Red Circle									
Green Circle	Transport Stream Available	Red X	Green Arrow	Green Circle									
First Priority													
Green Circle	1.1 Sync	Red X	Green Arrow	Green Circle									
Yellow Circle	1.2 Sync Byte	Red X	Green Arrow	Green Circle									
Green Circle	1.3.a PAT	Red X	Green Arrow	Green Circle									
Yellow Circle	1.4 Continuity	Red X	Green Arrow	Green Circle									
Yellow Circle	1.5.a PMT	Red X	Green Arrow	Green Circle									
Red Circle	1.6 PID	Red X	Green Arrow	Green Circle									
Second Priority													
Yellow Circle	2.1 Transport	Red X	Green Arrow	Green Circle									
Green Circle	2.2 CRC	Red X	Green Arrow	Green Circle									
Green Circle	2.3.a PCR Repetition	Red X	Green Arrow	Red Circle									
Green Circle	2.3.b PCR Discontinuity Indicator	Red X	Green Arrow	Green Circle									
Yellow Circle	2.4 PCR Accuracy	Red X	Green Arrow	Green Circle									
Green Circle	2.5 PTS	Red X	Green Arrow	Green Circle									
Green Circle	2.6 CAT	Red X	Green Arrow	Green Circle									
Third Priority													
Yellow Circle	3.1.a NIT Actual	Red X	Green Arrow	Green Circle									
White Circle	3.1.b NIT Other	Red X	Green Arrow	Green Circle									
Red Circle	3.2 SI Repetition	Red X	Green Arrow	Green Circle									

Figure 3-9: Stream view - Tests

A full list of tests and their associated parameters is given in the *MTM400 MPEG Transport Stream Monitor Programmer Manual*.

The Tests and Custom screens provide the same information prioritized in different ways.

In addition to providing an overview of the stream status, up to four types of alarm can be activated when an error on a test occurs. The alarm types are:

	An internal audible alarm.
	A TTL output on the rear of the unit, allocated to the stream.
	An SNMP (Simple Network management Protocol) trap event.
	One or more relay outputs on the rear of the unit, allocated to the stream.

The alarm output specifications are given in *MTM400 MPEG Transport Stream Monitor Technical Reference Manual*.

Each test can be enabled/disabled by double-clicking the appropriate icon.

Only administrators can set parameters, enable and disable tests, and set alarms.

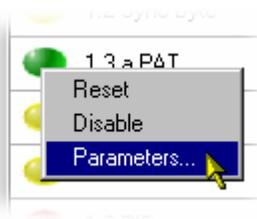
The button (State) to the left of the test name (Error) shows the current status of the test (see *Color Coding*, page 2-11).

The screen contains the following information:

Title Bar The title bar of the screen displays the name of the stream under test. (Assigned on the Stream Configuration screen, page 3-72).

State Icon showing the state of the event:

When you right-click on this icon, it will open a pop-up menu that will allow you to reset the error, disable/enable monitoring of this event, or adjust the parameters of the test.



Double-clicking the icon will disable/enable the event monitoring.

Error Name of the event (for example, 1.1 Sync). The names are those allocated by the standards (DVB, ASTC, ISDB or proprietary).

Alarm (Alm) Off - ; On - ;
Indicates whether an audible alarm will sound when an error occurs. Double-click this icon to toggle its state: enabled or disabled.

TTL (TTL1, TTL2 and TTL3) Off - ; On - ;
Indicates whether a TTL output will activate when an error occurs. Double-click this icon to toggle its state: enabled or disabled.

SNMP (T- and T+) Off - (gray); On - (yellow);
Indicates whether SNMP trap messages should be sent when a specific event starts and finishes.

Relay (RLY1 to RLY5) Off - ; On - ;

Indicates whether a relay will activate when an error occurs. Double-click the icon to toggle its state: enabled or disabled. Five relays are available (**Rly1**, **Rly2**, **Rly3**, **Rly4** and **Rly5**). The relay connections are given in the relevant RTM device user guide.

Rec Off - ; Set - ;

This icon, when active, indicates that the test has been selected as a trigger for recording a stream. To select a test, double-click the icon in the Rec column; an activated icon is red; an inactive icon is a clear circle.

This icon is only displayed if Triggered Recording (Option 01) is licensed for use.

The Triggered Recording parameters are set up in the *Configuration Screen* (see page 3-74).

Test Parameters

Many tests are associated with parameters recommended by the standard (DVB, ATSC, ISDB) being applied to the stream. The parameters can be adjusted to suit local conditions (although the test result may then not conform to the standard).

The parameters dialog boxes are accessed by right-clicking on the error **State** icon of the required test and selecting **Parameters...**. An example dialog box is shown below:



Tests and Parameters are described in the *MTM400 MPEG Transport Stream Monitor Technical Reference Manual*.

Custom Screen

State	Error	Alm	TTL1	TTL2	TTL3	T-	T+	RLY1	RLY2	RLY3	RLY4	RLY5	Rec
Critical Events													
●	Any Stream Error	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	1.2 Sync Byte	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	2.1 Transport	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	3.1.a NIT Actual	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	PCR Jitter	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	Processing Overwhelmed	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
Major Events													
●	2.2 CRC	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	2.4 PCR accuracy	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
○	3.1.b NIT Other	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	3.5.a SDT Actual	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	3.6.b EIT Other	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○
●	Transport Stream Occupancy	⊘	▶	▶	▶	⚡	⚡	⊞	⊞	⊞	⊞	⊞	○

Figure 3-10: Stream view - Custom

The Tests and Custom screens provide the same information prioritized in different ways. In the Custom screen, test results for the current stream are grouped in Event Classification order. Setting up the Event Classification is described on page 3-27.

All fields in the view are as described in the *Test Screen* section (page 3-23).

Only users logged on as Administrators can set parameters, enable and disable tests, and set alarms.

Stream Event Classification

The Stream Event Classification dialog box is opened by selecting the **Custom Classifications...** button in the Custom view.



The dialog box allows the associated Event Classification file to be temporarily modified. All changes made will be lost when the current session is ended by closing the MTM400. (When accessed via the WebMSM, these changes are saved.)

The dialog box allows each error event to be designated in one of four categories: Critical, Major, Minimal or Warning. The list of events presented in the dialog box will reflect the stream standard (DVB, ISDB and ATSC) notified by the RTM device. Some proprietary tests may also be listed. The classifications set are used in the stream summary screen to show the overall status of the stream.

Select the **Close** button to retain the temporary settings and close the dialog box.

Information Screen

The Information screen displays stream events and messages.

Stream events and messages may be logged but do not constitute a test failure; for example, a version change of a table carried in the SI/PSI is reported in the stream log but is not subject to a standard test. The only place that these stream events are recorded is in the stream logs. This screen collects these all in one place and allows their recording in the stream log to be enabled or disabled. Alarms can be raised when a message occurs.

This screen also shows errors that have been generated by all IP sessions when a Gigabit Ethernet interface is fitted.

The messages to be displayed are set at the factory; interface cards can also generate messages.

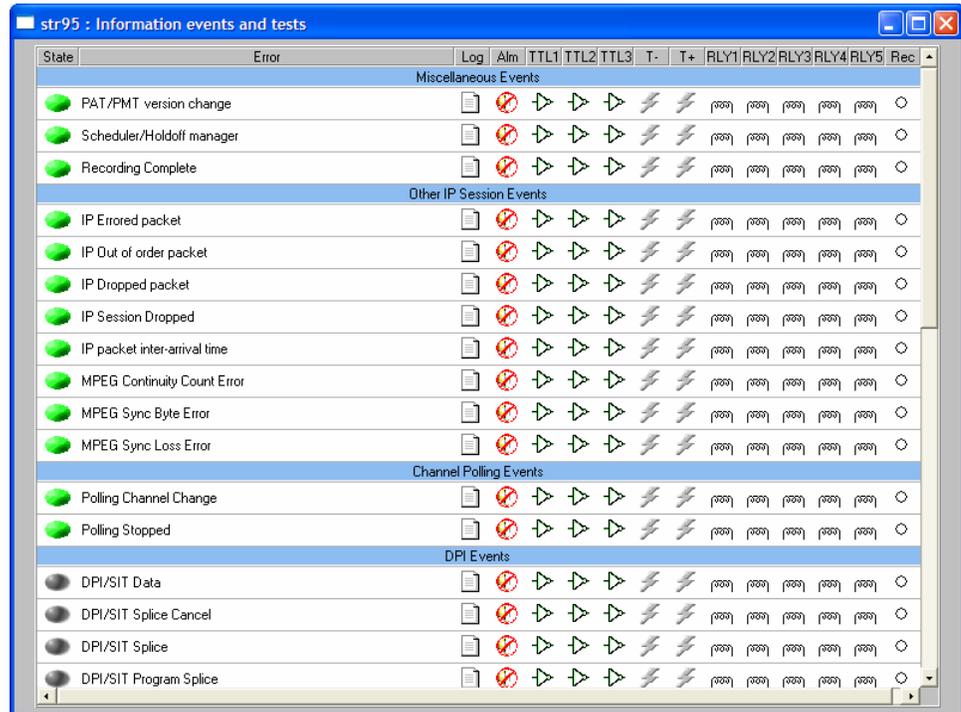


Figure 3-11: Stream view - Information

The layout and functionality is similar to the Tests screen; a single column of icons is added, that is **Log**.

Log Off - ; On - ;
 Enables/disables message recording in the stream log.
 Double-click this icon to toggle its state: enabled or disabled.

Right-click the error LED to set parameters, enable and disable tests and set alarms.

State Icons

The State icons used in the Information screen are as shown in Table 3-1:

Table 3-1: Button colors - Information view

Icon	Color	Meaning
	Green	Idle - the event is not happening at this time.
	Blue	Event detected and still present.
	Yellow	Transient event, which has now ended.
	Gray	The event has been disabled (or is unavailable). All buttons gray indicates that connection to a device has been lost.
	White	Test not applicable. For example, PCR tests when the program clock reference is not carried by any PIDs in the stream.
	Clear / ?	Test state unknown or incomplete. For example, during an RF measurement settling period.
	Black	Maintenance mode.

Programs Screen

The Programs screen provides an overview of the program contents of a transport stream.

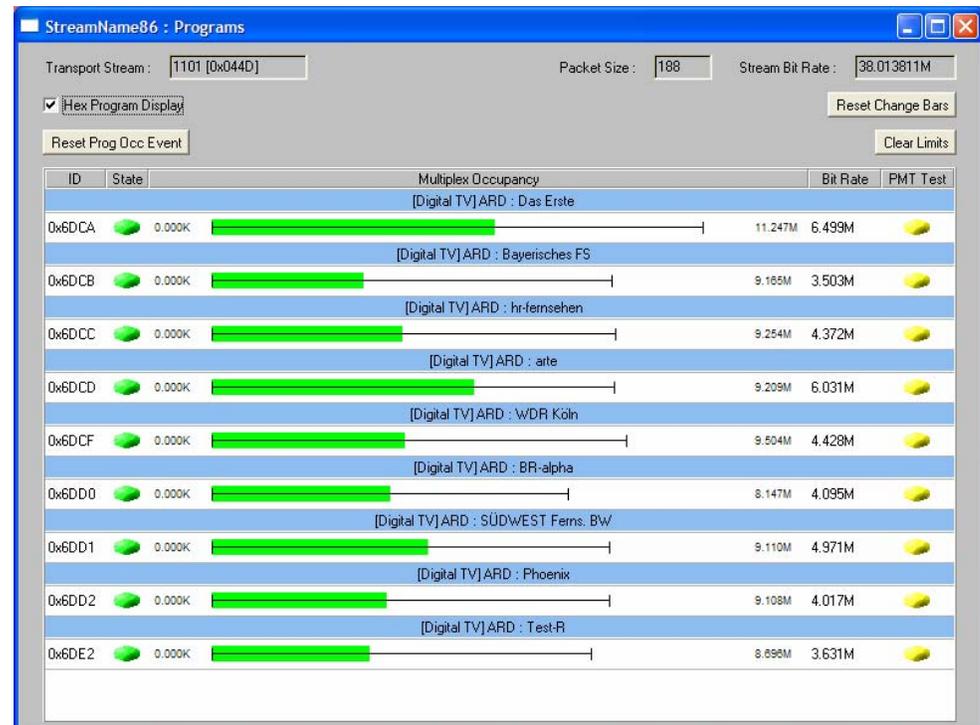


Figure 3-12: Stream View - Programs

In this view, all the programs detected in the incoming transport stream are displayed. Each displayed program is accompanied by:

- Program name (Divider bar)
- Program ID
- Error state (only displayed if Bit Rate Testing - Option 05 - is licensed for use)
- Program bit rate (graphically and numerically)
- PMT Test

Also displayed, at the top of the view, are the transport stream ID, the packet size, and the total stream bit rate.

The view contains the following elements (more detailed descriptions follow):

Title Bar The title bar of the screen displays the name of the stream under test (assigned on the *Configuration Screen* (see page 3-74).

Transport Stream: The transport stream identity (decimal and hex format).

Packet Size: The transport stream packet size.

Stream Bit Rate: The total bit rate of the stream.

Hex Display If enabled, the program ID is displayed in hex format. If disabled, it is displayed in decimal format.

Table:

Program ID (ID): The program number.

Program Occupancy Status (State):*
Indicates the Program Occupancy test error state for the program.

Program Bit Rate (Multiplex Occupancy):*
A graphical representation of the program bit rate. The bar color indicates the error status of the program bit rate. Superimposed on the bar are the Change Bar and (where set) the limits (see **Clear Limits** below). The minimum and maximum bit rate values are displayed at either end of the program bar. Resting the cursor over the program bar will display the maximum and minimum bit rates for that program.

Program Bit Rate (Bit Rate): The program bit rate in bits per second.

PMT Test: Shows the PMT Test result (see page 3-33).

Buttons:

Reset Change Bars * Resets the Change Bars of all programs.

Reset Prog Occ Event *

Resets the proprietary Program Occupancy test normal state (no error).

Clear Limits * Resets and disables the Bit Rate Limits of all programs.

* - only displayed if Bit Rate Testing (Option 05) is licensed for use.

Only administrators can adjust bit rate limits.

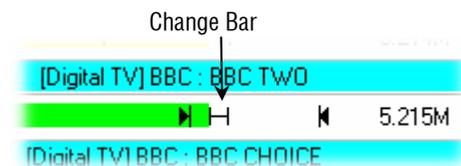
Bit Rates

The program bit rate (**Bit Rate**) shows the sum of the individual bit rates for all the PIDs that make up the program.

NOTE. *It is possible that in certain transport streams, different programs may reference a single PID; for example, programs may reference one PCR PID. In these cases, the PID bit-rate will be included in all the programs from which the PID is referenced. Therefore the total bit-rate of all the programs may add up to more than the total stream bit rate displayed at the top of the window.*

Change Bar

The Change Bar indicates the variation of bit rates in each program. The ends of the Change Bar show the maximum and minimum values of the bit rate since monitoring started or since the change bars were last reset.

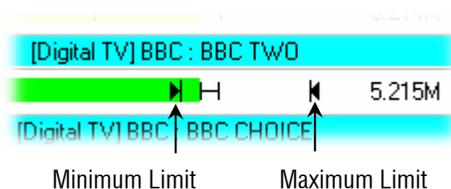


The Change Bar on *all* programs can be reset by selecting the **Reset Change Bars** button at the top of the Programs screen.

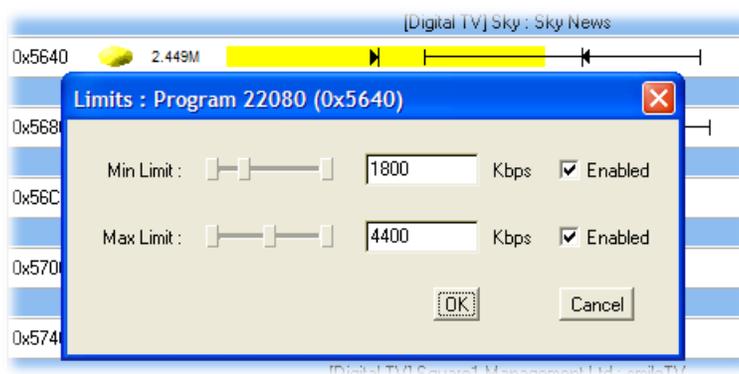
Bit Rate Limits

For each program, it is possible to set a minimum (M) and maximum (M) bit rate limit. If the incoming bit rate falls outside the values that have been set, an alarm is indicated on the screen by a color change in the graphical bit rate bar; the Program Occupancy test and state icon on the Tests view are also set. This test can also

activate the external alarm outputs. When enabled, the limits appear as in the preceding diagram shown above.



The maximum and minimum bit rate limits are set in the **Limits** dialog box. Click the program bar to open the dialog box:



Only users logged on as Administrator can adjust bit rate limits. Users logged on as **User** can only view the limits.

The maximum and minimum values can be set either by using the appropriate slider bar or by entering a value in the numeric field. Values are expressed in kilobytes per second. The **Enabled** checkbox must be selected before the limit will be implemented. To confirm the settings select the **OK** button; to discard any changes, select the **Cancel** button.

The Bit Rate Limits of *all* programs in a stream can be disabled and reset by selecting the **Clear Limits** button at the top of the Programs screen.

PMT Test

The PMT column shows the results of the PMT test (MPEG Test 1.5) for specific programs; green indicates a pass, red indicates a fail, and yellow indicates a previous fail. Normally the test is enabled for all of the programs in a stream, but programs with known problems can be excluded by right-clicking the test button and selecting **Disable**; the button is colored gray.

PIDs Screen

The PIDs screen provides an overview of the PIDs contained in a transport stream sorted by program.

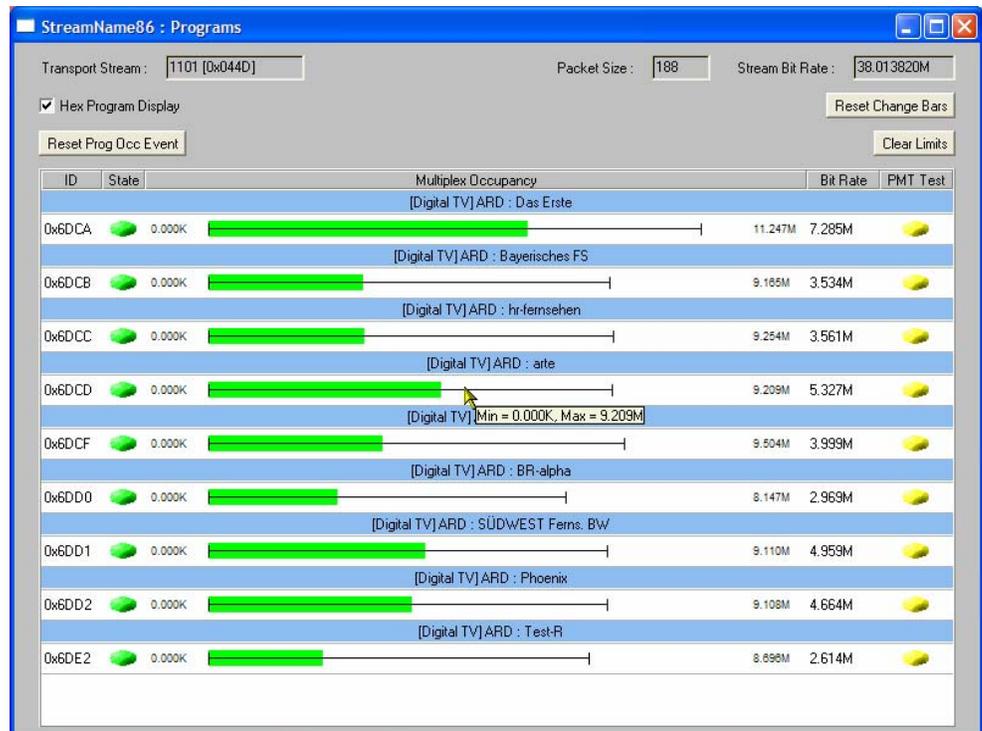


Figure 3-13: Stream view - PIDs

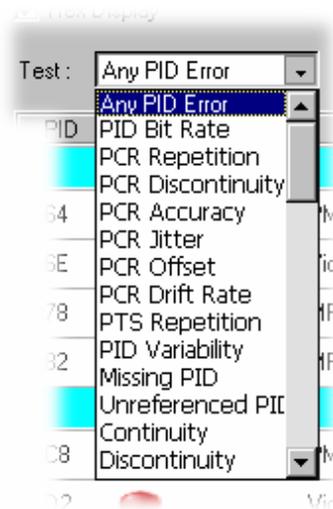
In this view, all the PIDs detected in the incoming transport stream are displayed. The PIDs are grouped by program; PIDs not associated with specific programs are displayed in numerical order below the program listings under the section title **Other PIDs in the Multiplex**.

The view contains the following elements (a more detailed description follows where necessary):

- Title Bar** The title bar of the screen displays the name of the stream under test (assigned on the *Configuration Screen*, page 3-74).
- Transport Stream:** The transport stream identity (decimal and hex format).
- Packet Size:** The transport stream packet size.

Stream Bit Rate:	The total bit rate of the stream.
Hex Display	If enabled, the program ID is displayed in hex format. If disabled, it is displayed in decimal format.
Test:	Allows specific tests, selected from the drop-down list, to be applied to all of the PIDs in the stream. The state of the test is indicated for each PID by the Test icon. If a test is not relevant to a PID, the test is disabled for that PID; the Test icon indicates this.

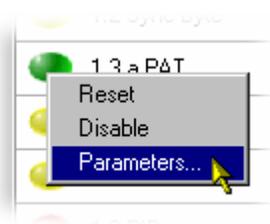
The tests shown below are those that can be applied to each PID where appropriate:



(See *Test Selection*, page 3-40)

Table

PID	The PID number carrying the data.
Test	Icon showing the state of the currently selected PID test: Right-click this icon to open a pop-up menu that allows you to reset the error, disable or enable monitoring of this event, or adjust the parameters of the test.



Double-clicking the icon will disable/enable the event monitoring.

Scrambled

A key icon  is shown adjacent to conditional access tables, for example, EMM/ECM.

A padlock icon  is shown if the PID is scrambled.

Type

The data type carried by the PID, for example, Video+PCR, MPEG Audio.

Multiplex Occupancy

A graphical representation of the PID bit rate. The bar color indicates the error status of the PID. Superimposed on the bar are the Change Bar and (where set) the limits (see **Clear Limits** below). The minimum and maximum bit rate values are displayed at either end of the program bar. Resting the cursor over the program bar will display the maximum and minimum bit rates for that program.

Note that the graphical representation and section Title bar is changed when PID Variability is selected (see *Test Selection*, see page 3-40).

Bit Rate

The PID bit rate in bits per second.

Buttons

Reset Change Bars Resets the Change Bars of all programs.

Clear Limits * Resets and disables the Bit Rate Limits of all programs.

User PIDs Allows you to add PIDs to the displayed list.

Reset All Resets the selected test for all PIDs.

* - only displayed if Bit Rate Testing (Option 05) is licensed for use.

The **Stream Bit Rate** shows the sum of the individual PID bit rates that make up the stream. The PID bit rate (**Bit Rate**) shown for each PID is that for the individual PID.

Only users logged on as Administrators can adjust bit rate limits.

Change Bar

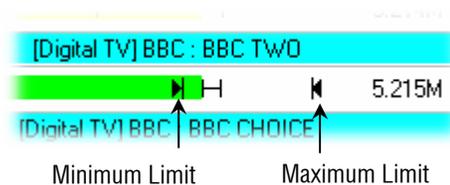
The variation of bit rate in each PID is indicated by a Change Bar (except when PID Variability is selected). The ends of the Change Bar show the maximum and minimum values of the bit rate since monitoring started or since the change bars were last reset.



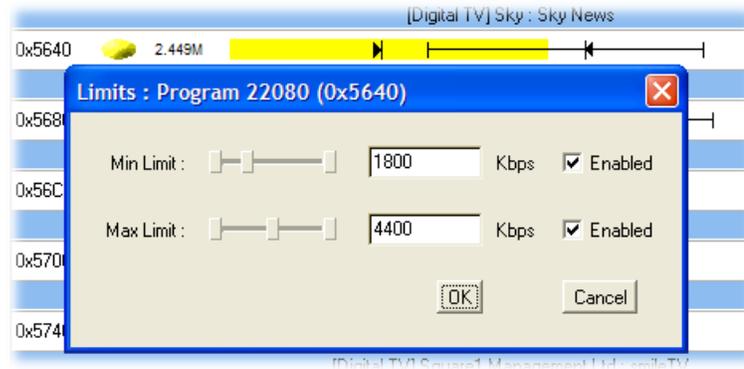
The Change Bar on *all* PIDs can be reset by selecting the **Reset Change Bars** button at the top of the PIDs screen.

Bit Rate Limits

For each PID, you can set a minimum (M) and maximum (M) bit rate limit. If the incoming bit rate falls outside the values that have been set, an alarm is indicated on the screen by the graphical bit rate bar changing from green to red or yellow; the PID Occupancy test on the Tests view is also set. This test can also activate the external alarm outputs. When enabled, the limits appear as in the following diagram:



The maximum and minimum bit rate limits are set in the **Limits** dialog box. Click the program bar to open the dialog box:



The maximum and minimum values can be set either using the appropriate slider bar or by entering a value in the numeric field. Values are expressed in kilobytes per second. The **Enabled** checkbox must be selected before the limit will be tested.

The Bit Rate Limits of *all* PIDs in a stream can be disabled and reset by selecting the **Clear Limits** button at the top of the PIDs screen.

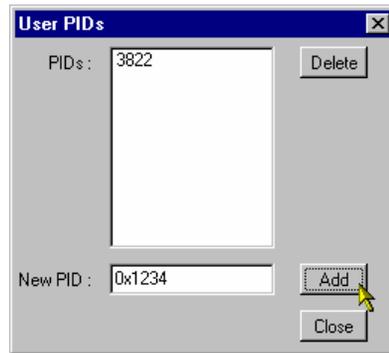
User PIDs

You can add PIDs that are not automatically recognized in the stream to the display. The additional PIDs will appear in the **Other PIDs in the Multiplex** section of the display.

Adding a User PID.

1. From the PIDs screen, select **User PIDs...**

The **User PIDs** dialog box is displayed.



2. Enter the PID ID in the **New PID:** field.

The PID ID can be entered in either Hex (0xnxxx) or decimal (xxxx) format.

3. Select **Add**.

The PID ID will be displayed in the **PIDs:** list and subsequently in the PIDs view. It will be displayed in decimal format.

Deleting a User PID.

1. From the PIDs screen, select **User PIDs...**

The **User PIDs** dialog box is displayed.

2. In the **PIDs:** list, highlight the PID to be deleted.
3. Select **Delete**.

The selected PID will be removed from the list and subsequently from the main PIDs view.

Test Selection

The **Test:** drop-down list allows the user to select and apply specific tests to the PIDs in the stream. Tests on those PIDs to which the selected test is not applicable are disabled.

The following PID tests can be selected from the **Test:** drop-down list:

- Any PID Error
- PID Bit Rate *
- PCR Repetition
- PCR Discontinuity
- PCR Accuracy
- PCR Overall Jitter **
- PCR Frequency Offset**
- PCR Drift Rate **
- PTS Repetition
- PID Variability *
- Missing PID
- Unreferenced PID
- Continuity
- Discontinuity

* Require Bit Rate Testing to be licensed (License Option 05, Table 1-1: MTM400 options).

** Require PCR Testing to be licensed (see Table 1-1: MTM400 options).

The results of the tests are indicated by the **Test** icons. Where the test is inapplicable, the icon will be white.

For most of the tests, the parameters applied to each PID can be varied by right-clicking on the **Test** state button and selecting the **Parameters...** option.

Each of these tests and the associated parameters are described in the *MTM400 MPEG Transport Stream Monitor Programmer Manual*.

The results of tests applied here are not reflected in the PID Groups.

PID Groups Screen

PIDs can be grouped together to enable composite bit rate and test reporting of user-selected PIDs, perhaps carrying similar information. Up to 32 PID Groups can be formed. A maximum of 128 PIDs can be included in each of these 32 groups.

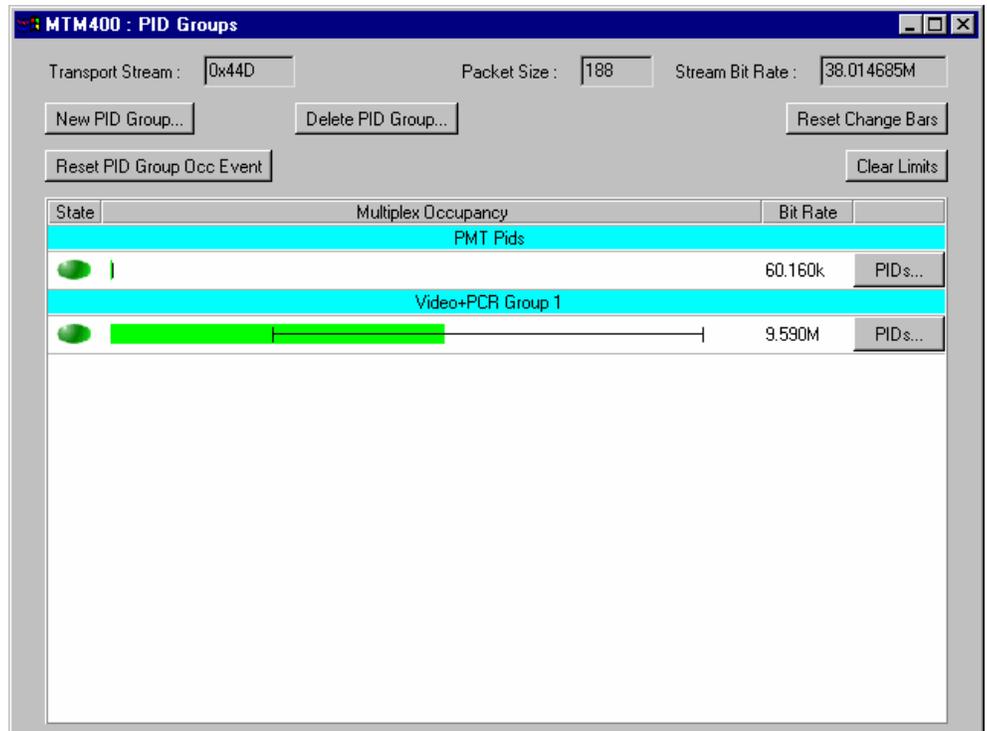


Figure 3-14: Stream view - PID groups

In this view, the PID Groups set up for the incoming transport stream are displayed. PID Group editing is performed using this screen. Only users logged on as Administrator can adjust bit rate limits and modify the PID Groups.

The view consists of the following elements (a more detailed description follows where necessary):

- Title Bar** The title bar of the screen displays the name of the stream under test (assigned on the *Configuration Screen*, page 3-74).
- Transport Stream:** The transport stream identity.
- Packet Size:** The transport stream packet size.
- Stream Bit Rate:** The total bit rate of the stream.

Table

Each PID Group formed displays a title bar carrying the allocated name of the group. Each PID Group displays the following information:

State Icon showing the state of the PID Group (whether the bit rate limits are exceeded).

Multiplex Occupancy:

A graphical representation of the total bit rate of the PID Group. The bar color indicates the error status of the PID Group. Superimposed on the bar are the Change Bar and (where set) the limits (see below). The graphic is displayed in the color according to whether there are any PID Group errors (that a set limit has been exceeded). The minimum and maximum bit rate values are displayed at either end of the PID Group bar. Resting the cursor over the bar will display the maximum and minimum bit rates for that PID Group.

Bit Rate: The PID bit rate in bits per second.

Buttons**New PID Group...**

Opens a new (empty) PID Group, after a name has been allocated.

Delete PID Group...

Displays a list of all PID Groups and allows one or more to be deleted.

Reset Change Bars

Resets the Change Bars of all programs.

Reset PID Group Occ Event

Resets all PID Group errors. Note that this also resets the individual PID errors.

Clear Limits Resets and disables the Bit Rate Limits of all programs.

PIDs... (See *PID Group Management*, page 3-43.)

The **Stream Bit Rate** shows the sum of the individual PID bit rates that make up the stream. The bit rate (**Bit Rate**) shown for each PID group is the sum of the grouped PID bit rates.

PID Group Management

This section describes how to add, edit, and remove PID Groups. Only an Administrator can add and delete PID Groups.

Adding a New PID Group. PID Groups are created in three stages:

- Identify the PIDs to be grouped.
- Create a new, named PID Group.
- Populate the new PID Group.

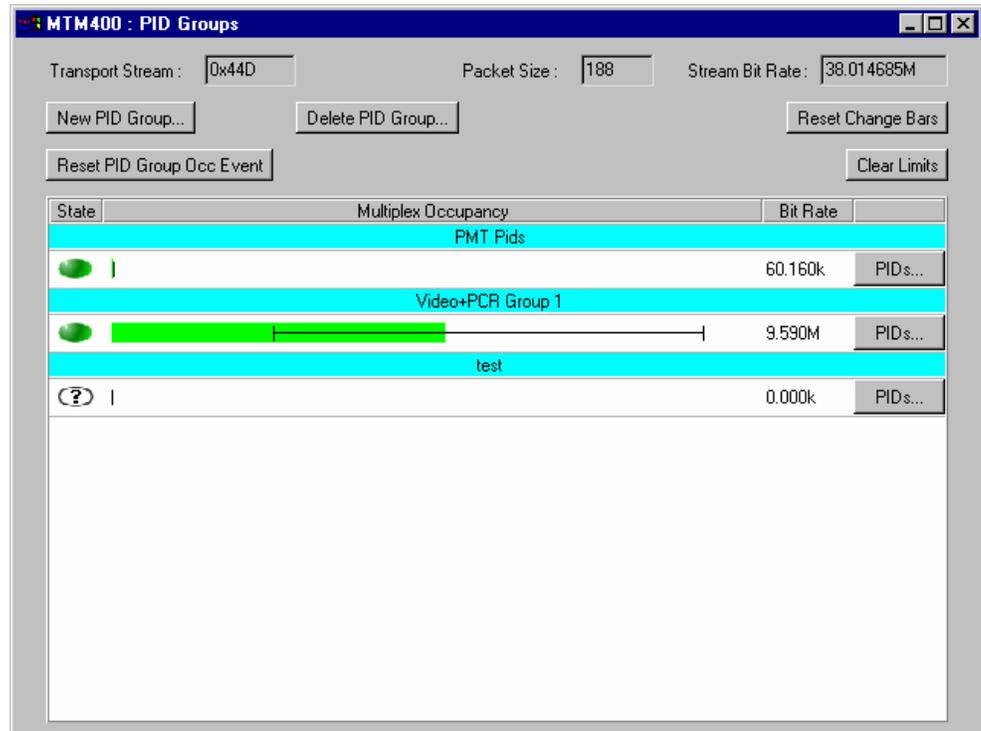
The procedure is as follows:

1. Use the PID screen to identify the PIDs to be grouped. The hex or the decimal PID can be used.
2. In the PID Group screen, select **New PID Group....**
3. Enter the PID Group name.



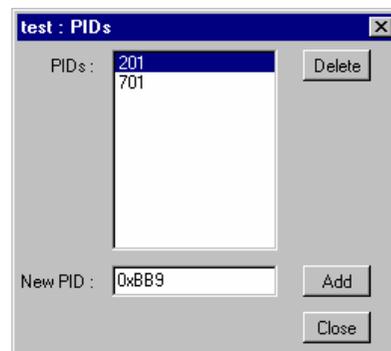
4. Select **OK**. Selecting **Cancel** will end the PID Group creation.

- The new PID Group is displayed in the PID Group screen:



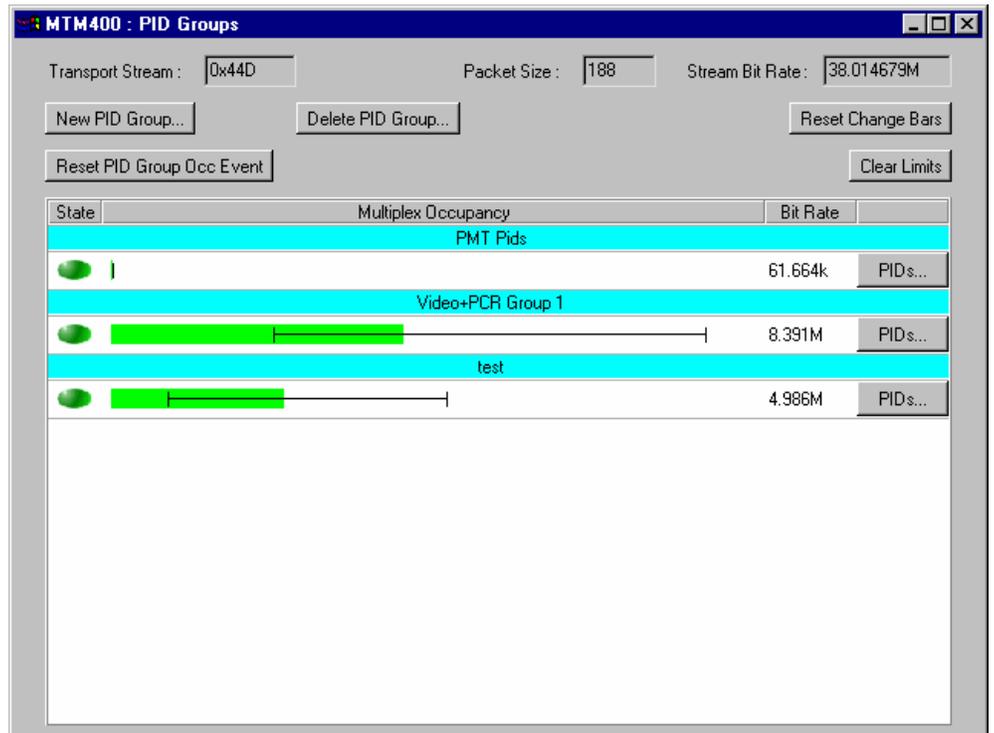
The new PID Group is empty and must be populated with PIDs.

- Select **PIDs...** from the new group title bar.

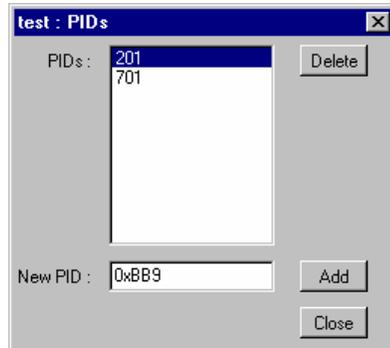


- In the **PIDs** dialog box and in the **New PID:** field, enter the identity of one PID in either hex (0xnxxx) or decimal (nnn) format.
- Select **Add**.
The PID is added to the **PIDs:** field.

9. Repeat the previous steps until all the PIDs to be included in the group have been added and are listed.
10. Select **Close** to close the dialog box. Display will begin immediately, confirming that the PID Group is operational.



Editing a PID Group. To add or remove a PID from a PID Group, select **PIDs...** from the PID Group title bar.

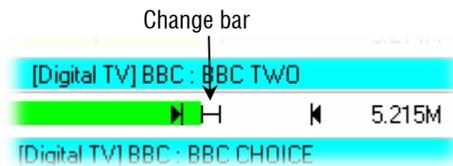


Delete removes the PID highlighted in the **PIDs:** field.
The PID is removed from the **PIDs:** field.

Add adds the PID identified in the **New PID:** field to the PID Group.
The PID is added to the **PIDs:** field.

Change Bar

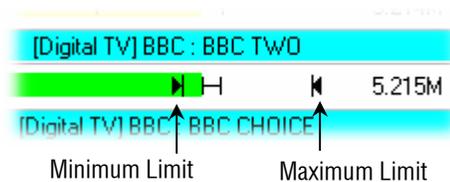
The variation of bit rate in each PID is indicated by a change bar. The ends of the change bar show the maximum and minimum values of the bit rate since monitoring started or since the change bars were last reset.



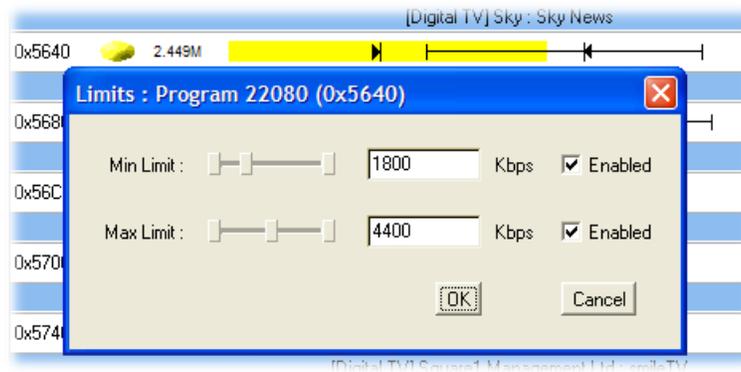
The change bar on *all* PID Groups can be reset by selecting the **Reset Change Bars** button at the top of the PID Groups screen.

Bit Rate Limits

For each PID Group, you can set a minimum (⏪) and maximum (⏩) bit rate limit. If the incoming bit rate falls outside the values that have been set, an alarm is indicated on the screen by the graphical bit rate bar changing from green to red or yellow; the corresponding **State** icon is also set to the correct color. This test can also activate the external alarm outputs. When enabled, the limits appear as in the following diagram:



The maximum and minimum bit rate limits are set in the **Limits** dialog box; click on the program bar to open the dialog box:



The maximum and minimum values can be set either by using the appropriate slider bar or by entering a value in the numeric field. Values are expressed in kilobytes per second. The **Enabled** checkbox must be selected before the limit will be implemented.

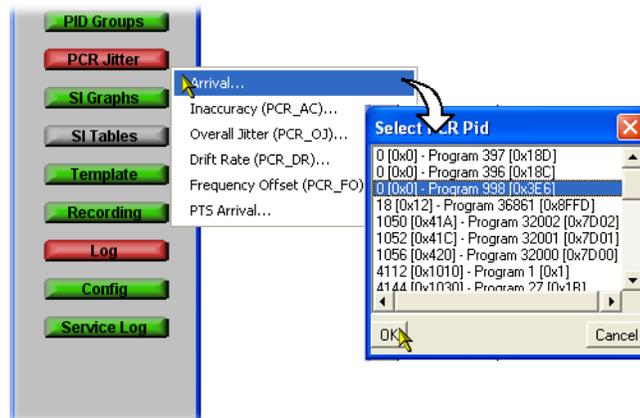
The Bit Rate Limits of *all* PID Groups can be disabled and reset by selecting the **Clear Limits** button at the top of the PID groups screen.

PCR Jitter Screen

Real time analysis is performed on PCRs and displayed in graphical format. The following options are available:

- PCR Arrival
- PCR Inaccuracy (PCR_AC)
- PCR Overall Jitter (PCR_OJ)
- PCR Drift Rate (PCR_DR)
- PCR Frequency Offset (PCR_FO)
- PTS Arrival

Selecting the **PCR Jitter** button displays a pop-up menu from which the graph type can be selected.



The PCR to be displayed can then be selected in the **Select PCR PID** dialog box. PID numbers are displayed in decimal and hex form.

Common Elements

Statistical information for each graph is shown at the bottom of each graph. When enabled, the **View Limits** checkbox ensures that the parameter limits are shown on the Y-axis. When disabled, the data is allowed to expand to fill the available screen. Limits are set using the parameter function on the Test and PID screens.

PCR Inaccuracy (PCR_AC)

The PCR Inaccuracy graph shows the difference between the actual and expected values for each PCR on the y-axis. Expected PCR values are calculated from the byte index of the PCR and the overall bitrate derived from the PCR.

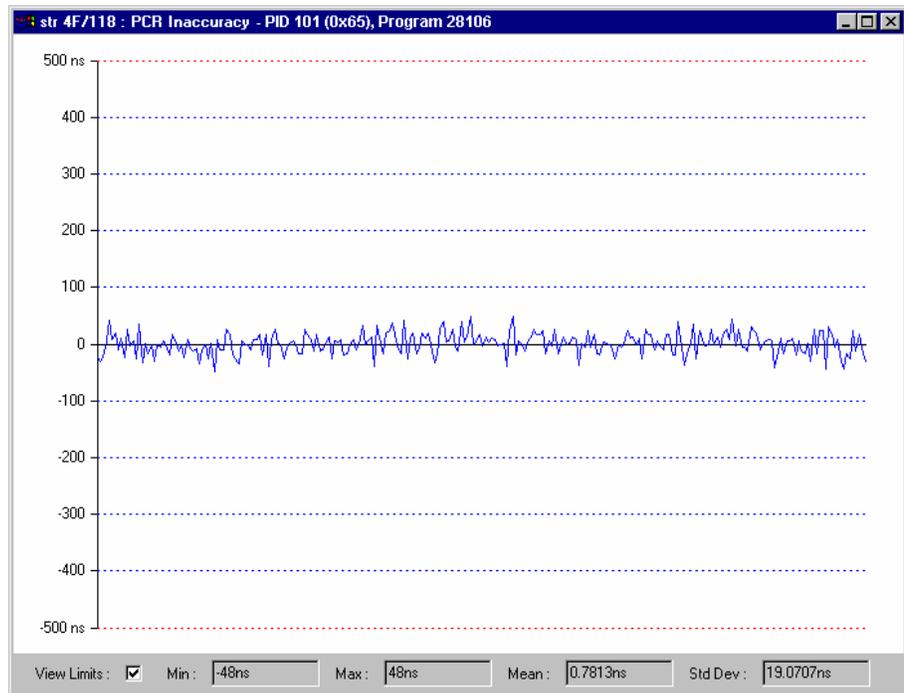


Figure 3-15: Stream view - PCR graph - PCR inaccuracy

The MPEG-2, DVB and ATSC standards specify that PCRs must be within ± 500 ns of the actual transport rate. By default, the scale is set to ± 500 ns. If the inaccuracy in any of the displayed PIDs is greater than ± 500 ns, the y-axis is drawn to show the complete range of values as full scale.

The Maximum PCR Accuracy Error can be adjusted for all PIDs as follows:

- **Tests screen** → **2.4 PCR Accuracy** parameter (right-click) → **Max PCR accuracy error**.

For individual PIDs:

- **PIDs screen** → **Test: select PCR Accuracy** → individual PID parameter (right-click) → **Max PCR accuracy error**.
- Right-click on the graph and set the limit for each PID.

PCR Arrival

The PCR Arrival graph provides a display of the time interval between successive PCRs. The interval is displayed on the y-axis. By default (with the **View Limits** checkbox enabled) the y-axis scale shows the conformance thresholds for the DVB, ATSC or MPEG-2 standards.

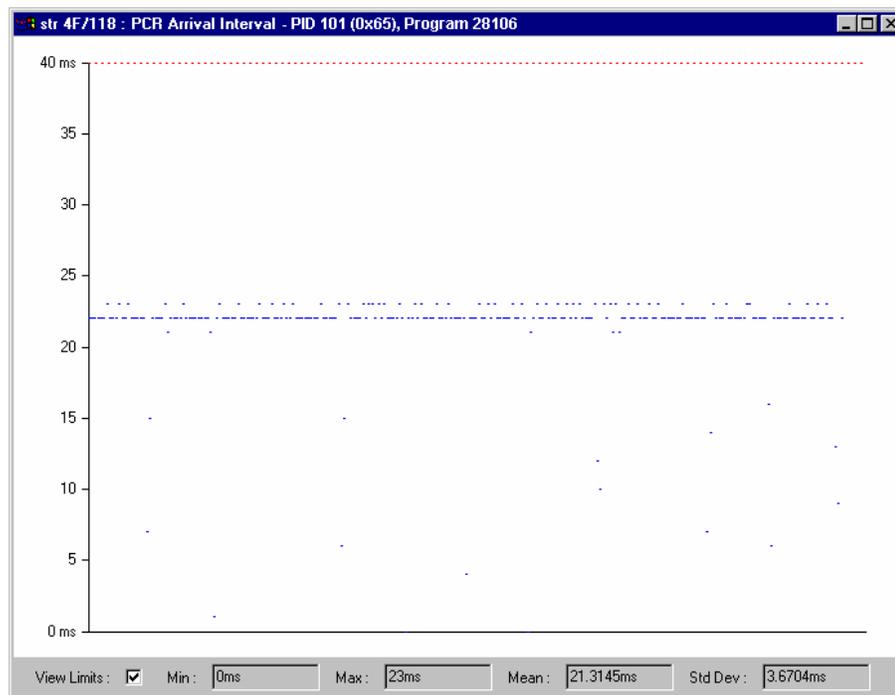


Figure 3-16: Stream view - PCR graph - PCR arrival

The PCR Arrival graph provides a display of the time interval between successive PCRs, during the last 256 PCRs. The interval is displayed on the y-axis. Points are color-coded with respect to the Maximum Repetition Period set in DVB test 2.3 (the DVB default value is 40 ms). Points are plotted in blue when they fall within the specified period. Any points that exceed the interval are plotted in red. If the interval exceeds the limits displayed on the screen, the scale is adjusted automatically as necessary to include the maximum displayed values.

The PCR Maximum Repetition Interval can be adjusted for individual PIDs as follows:

- **PIDs screen** → **Test:** select **PCR Repetition** → individual PID parameter (right-click) → **PCR max repetition interval**.
- Right-click on the graph and set the limit for each PID.

PCR Overall Jitter (PCR_OJ)

The PCR Overall Jitter graph shows the difference between the actual value of the PCR (expressed as a time) and its expected value based on its measured arrival time.

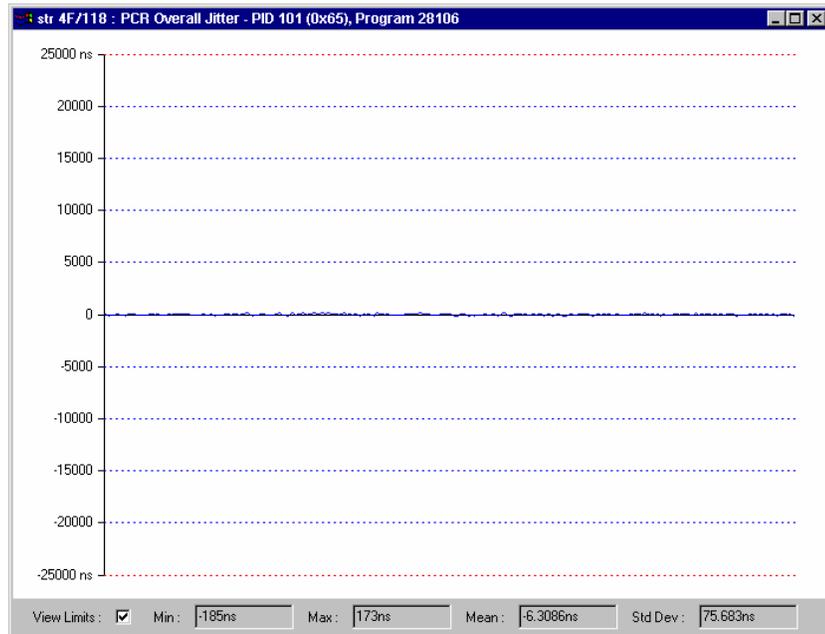


Figure 3-17: Stream view - PCR graph - PCR overall jitter

The Maximum PCR Accuracy Error can be adjusted for all PIDs as follows:

- **Tests screen** → **PCR Tests** section → **PCR Overall Jitter (PCR_OJ)** parameter (right-click) → **Max PCR overall jitter**.

For individual PIDs:

- **PIDs screen** → **Test**: select **PCR Jitter** → individual PID parameter (right-click) → **Max PCR overall jitter**.
- Right-click on the graph and set the limit for each PID.

PCR Frequency Offset (PCR_FO)

The Frequency Offset graph shows the difference between the program clock frequency and the nominal clock frequency (measured against a reference that is not PCR or transport stream derived).

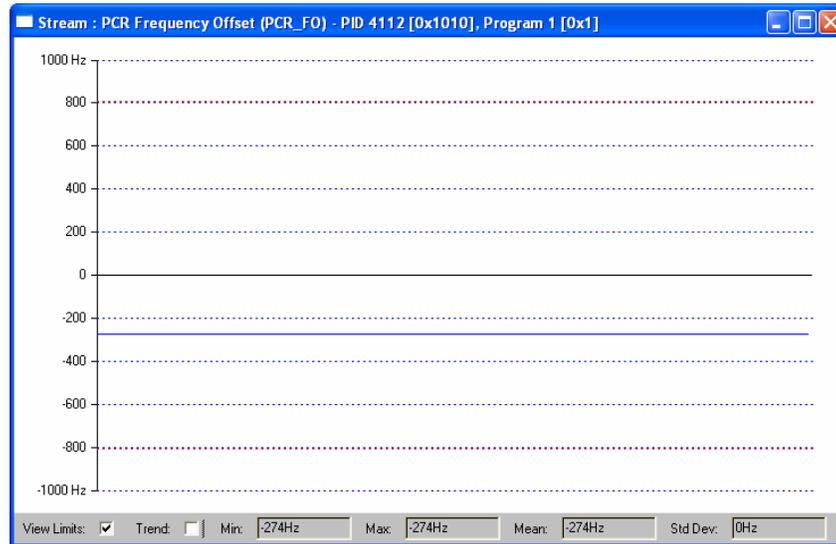


Figure 3-18: Stream view - PCR graph - PCR frequency offset

PCR Frequency Offset is a measurement of the error in the PCR frequency from the specified 27 MHz; the MPEG specification sets the limits at ± 810 Hz.

The Maximum PCR Frequency Offset can be adjusted for all PIDs as follows:

- **Tests screen → PCR Tests section → PCR Frequency Offset (PCR_FO) parameter (right-click) → Max PCR overall jitter.**

For individual PIDs:

- **PIDs screen → Test: select PCR Offset → individual PID parameter (right-click) → Max PCR frequency offset.**
- Right-click on the graph and set the limit for each PID.

PCR Drift Rate (PCR_DR)

This Drift Rate graph shows the rate of change of PCR Frequency Offset, which is often very small. It is calculated using PCR Frequency Offset measurements.

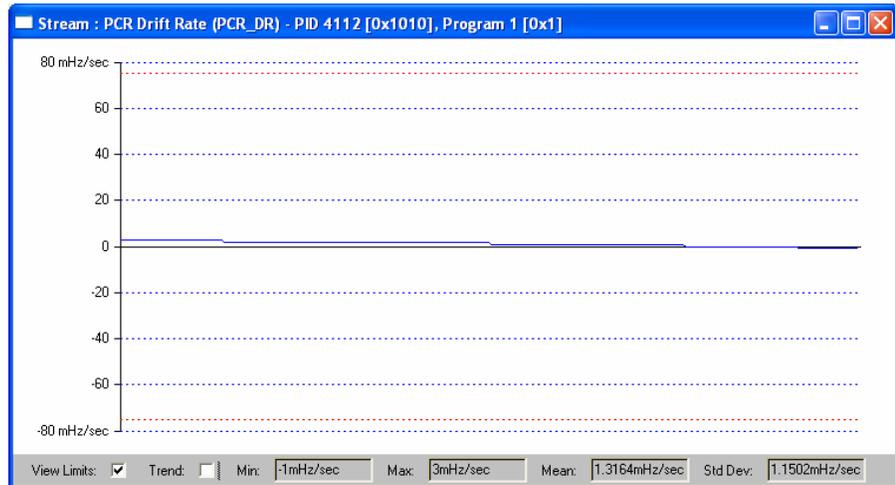


Figure 3-19: Stream view - PCR graph - PCR drift rate

The Maximum PCR Drift Rate can be adjusted for all PIDs as follows:

- **Tests screen → PCR Tests section → PCR Drift Rate (PCR_DR) parameter (right-click) → Max PCR frequency drift rate.**

For individual PIDs:

- **PIDs screen → Test: select PCR Drift Rate → individual PID parameter (right-click) → Max PCR frequency drift rate.**
- **Right-click on the graph and set the limit for each PID.**

PTS Arrival

The PTS Arrival graph shows the time interval between the successive PTSs.

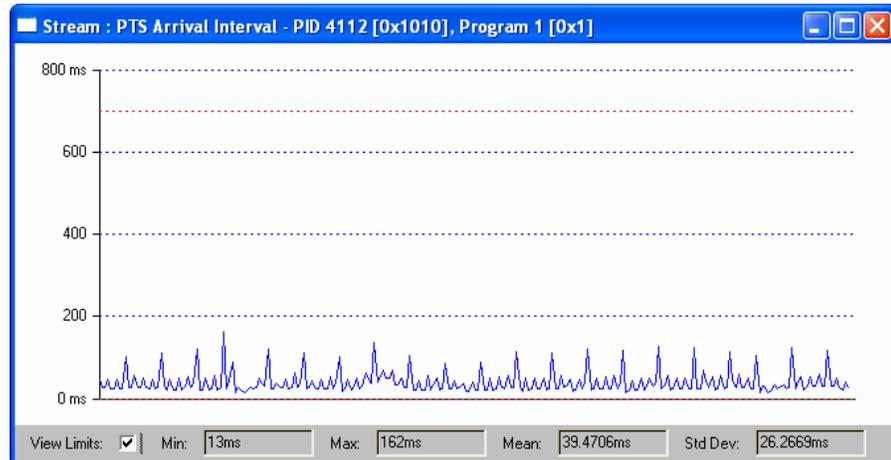


Figure 3-20: Stream view - PCR graph - PTS arrival

The Maximum PTS Repetition Interval can be adjusted for individual PIDs as follows:

- **PIDs screen** → **Test**: select **PTS Repetition** → individual PID parameter (right-click) → **Max PTS repetition interval**.
- Right-click on the graph and set the limit for each PID.

SFN Screen

Where Single Frequency Network (SFN) information is included in a stream, it can be viewed by selecting the SFN button. This action will open an SFN Information screen (see Figure 3-21).

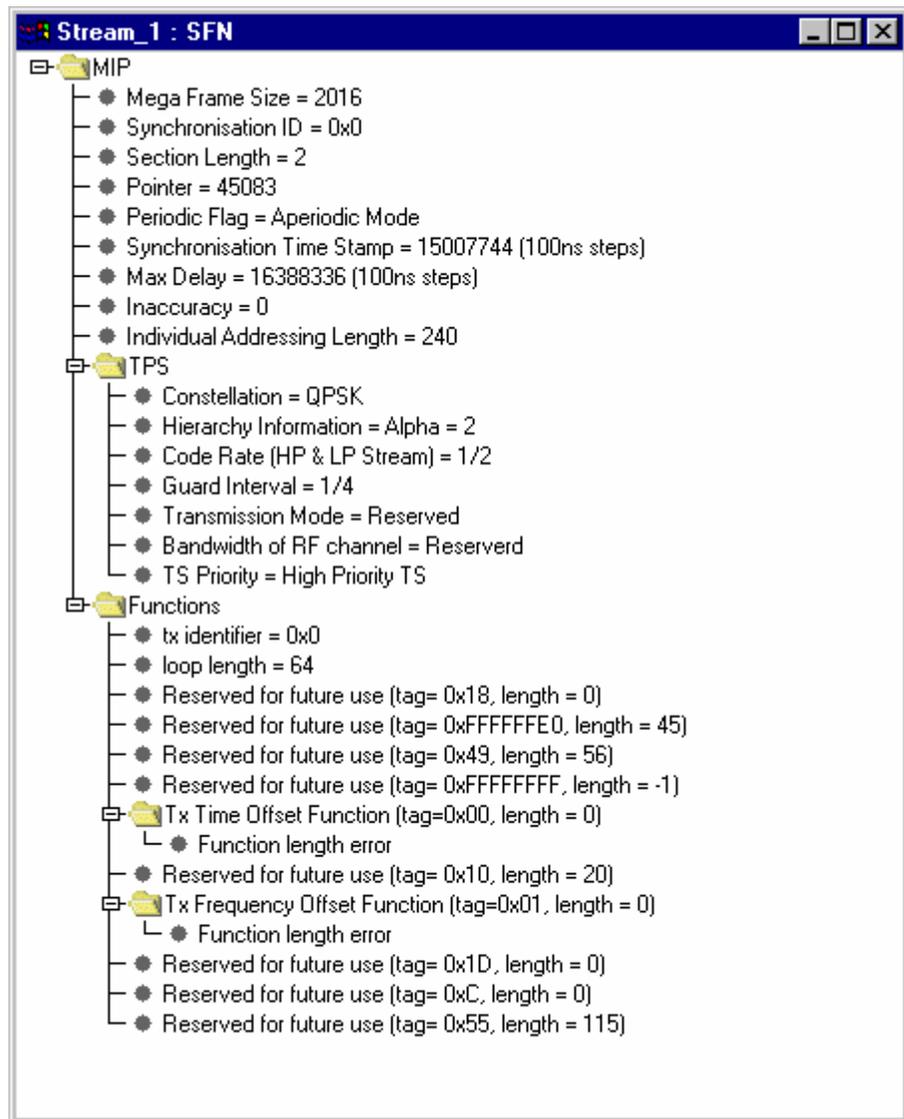


Figure 3-21: Stream view - SFN screen

The screen displays SFN Information when it is transmitted on PID 0x15. The screen displays a snapshot of the Mega Frame Initialization packet in a tree format similar to the SI Tables. The information is updated at regular intervals.

TMCC Screen

This screen shows the Transmission and Multiplexing Configuration Control (TMCC) content of the stream; it is updated in real time. The displayed screen (Satellite or Terrestrial) will depend on which standard is selected for analysis in the *Configuration Screen* (see page 3-74). In ISDB mode, summary IIP information is also shown. Detailed IIP information appears under the SI Tables view, if licensed.

The displayed information is that contained in the TMCC header blocks when that information is present in the transport stream. The information is read-only.

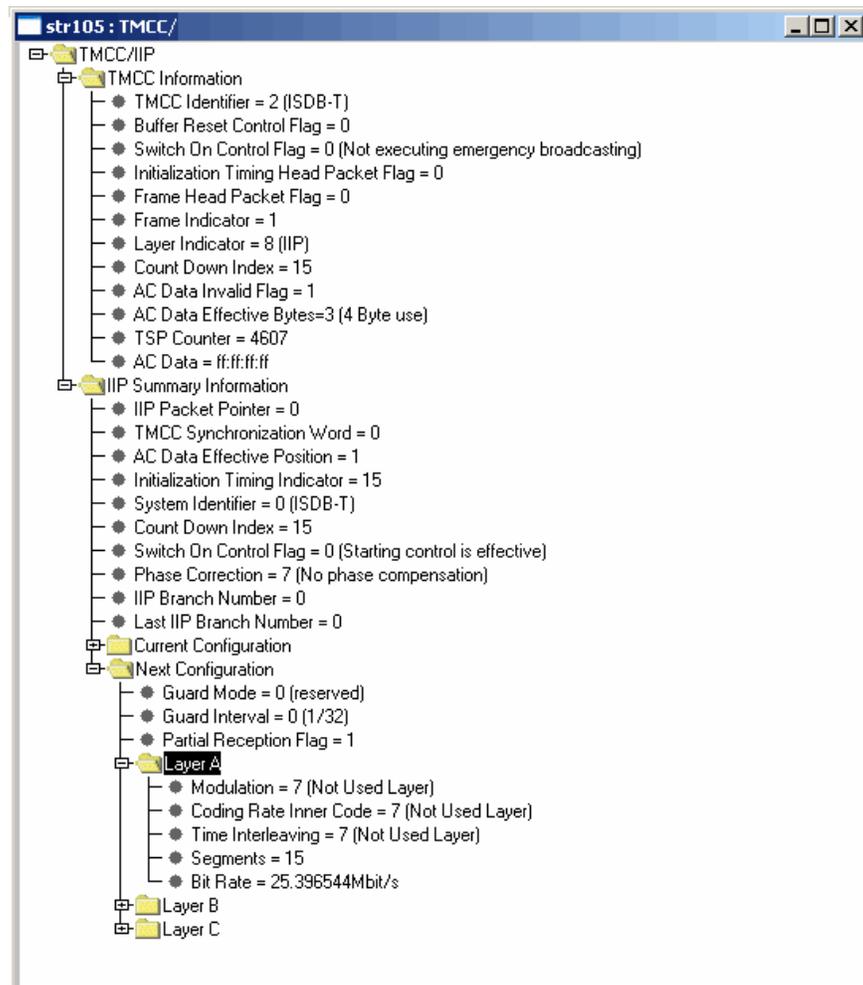


Figure 3-22: Stream view - TMCC screen

The TMCC screen is part of the basic installation; it is not a licensed option. If TMCC data is not present in the stream, the **TMCC** button will not be displayed.

SI Graphs Screen

The SI Graphs screens display information in graphical format about repetition rates of SI tables and subtables.

The following graphs can be displayed:

- Section Repetition Interval
- Subtable Inter Section Gap
- Subtable Repetition Interval
- Cycle Group Repetition Interval

Each graph type can be displayed for a selection of table types. The available graphs vary depending on which standard is selected.

Statistical information for each graph is shown at the bottom of each graph. When enabled, the **View Limits** checkbox ensures that the parameter limits are shown on the Y-axis. When disabled, the data is allowed to expand to fill the available screen. Limits are set using the parameter function on the Test screen and are dependent on the table type.

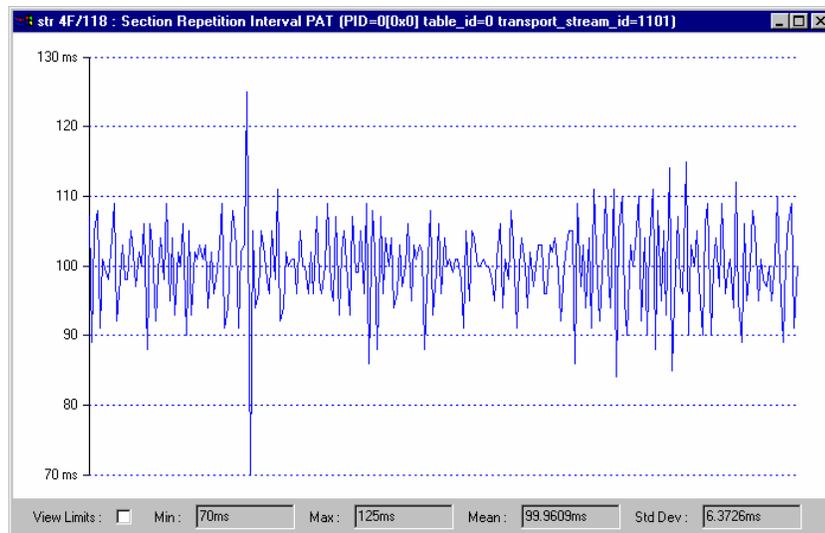


Figure 3-23: Stream view - SI graphs screen - Example

A brief explanation of each graph type follows:

Section Repetition Interval

On a specific PID, this is the interval between the arrival of a section with a specific table_id and the next section with the same table_id.

Subtable Inter Section Gap

This is the interval between the end of one section and the start of the next section in the same subtable. A PID, table_id and table_id extension usually define a subtable, but this varies with table type. (Not available for ATSC.)

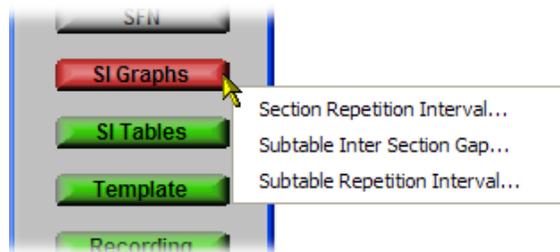
Subtable Repetition Interval

This is the repetition rate for complete subtables.

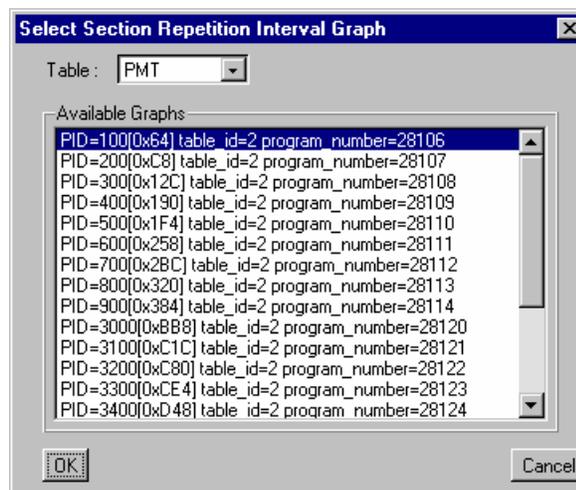
Graph Selection

All graphs are selected in the same way:

1. Select the **SI Graphs** button to display a pop-up menu from which the graph type can be selected.



2. In the **Select** dialog box, select a table type from the drop-down list.



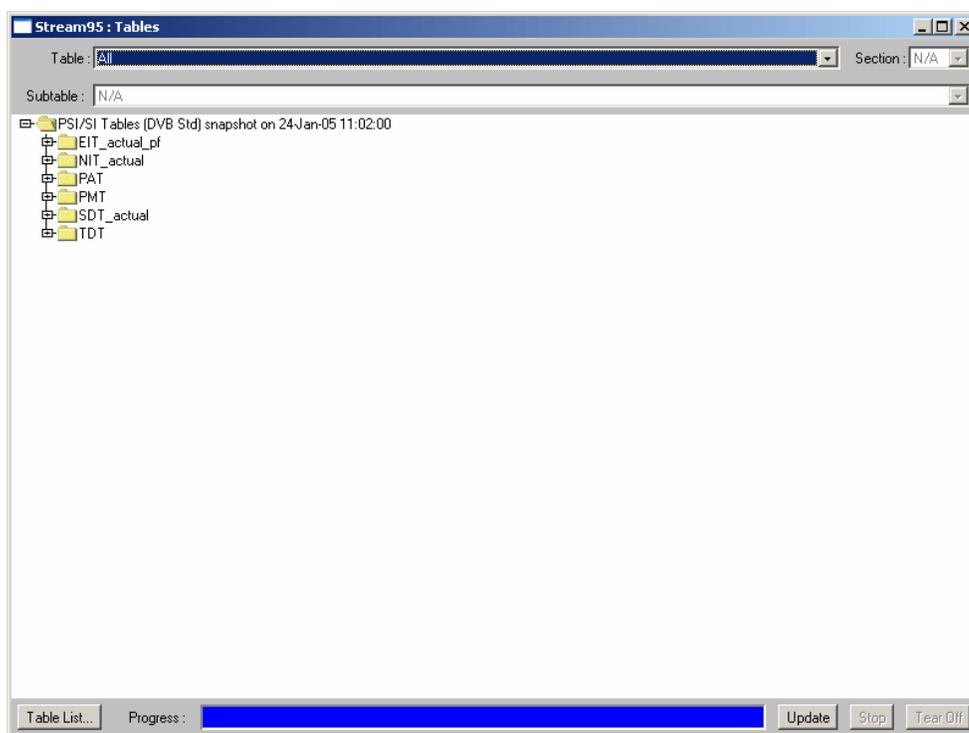
Only those table types for which the graphed information is relevant are available in the list. If the table type is not present in the stream, the message **No Graphs** is displayed.

A list of all PIDs carrying the selected table type is displayed.

3. Highlight the PID required and select **OK**.
4. The associated graph is displayed.

SI Tables Screen

This button displays the SI Tables screen; this shows the transport stream SI/PSI structure. A snapshot of the table structure is built and displayed. The progress bar indicates the progress of the analysis. The analysis can be stopped at any time before completion by selecting **Stop**; only the analyzed elements will be displayed. The structure can be refreshed at any time by selecting the **Update** button. The **Update** button is only enabled when new or changed information is detected in the stream.



For the DVB/ISDB information, the SI Tables view shows the structure of the Service Information (SI) and Program Specific Information (PSI), including their payload information.

In the DVB version, some of the DVB information displayed will depend on the Regional Setting in the Stream Configuration dialog box (see page 3-72), since there are regional variations in the specification of some of the descriptors.

Similarly, for ATSC information, the SI Tables view shows the structure of the Service Information (SI), Program Specific Information (PSIP), including their payload information and the Program Identifier Table (A/57).

The DPI table type may be displayed if the relevant license is displayed.

At Start-up, a set of default tables is displayed in the SI Tables view. The list can be changed and modified by selecting the **Table List...** button and selecting the required Tables.

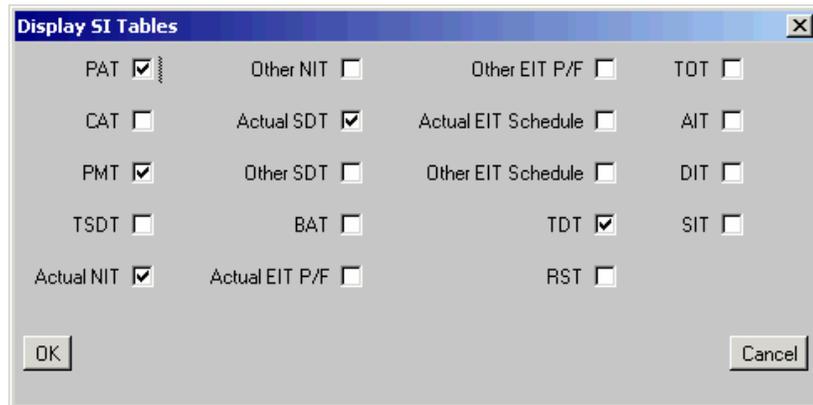


Figure 3-24: DVB SI Tables dialog box

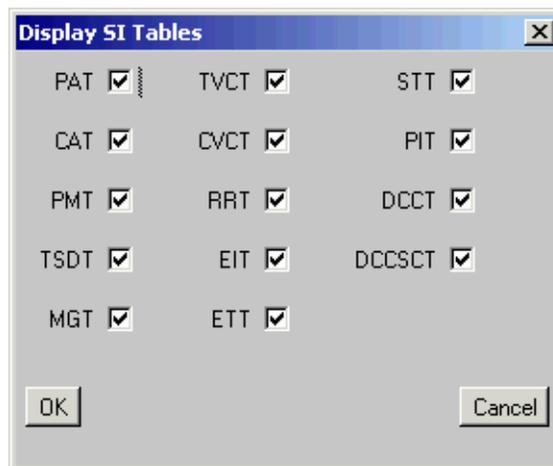


Figure 3-25: ATSC SI Tables dialog box

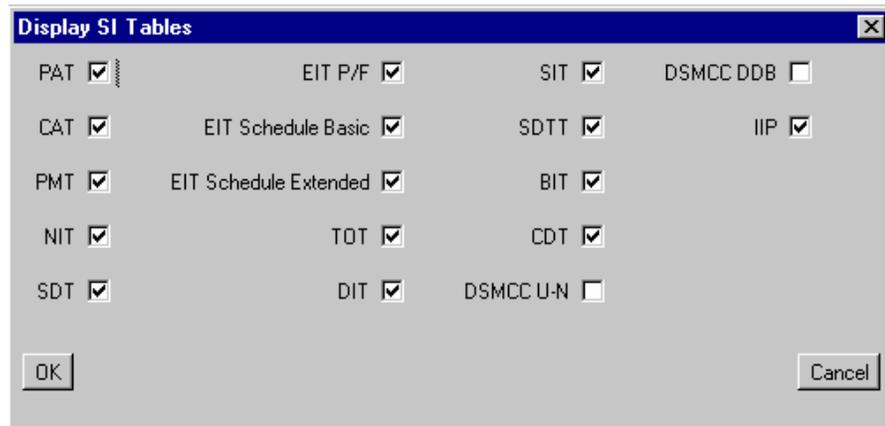


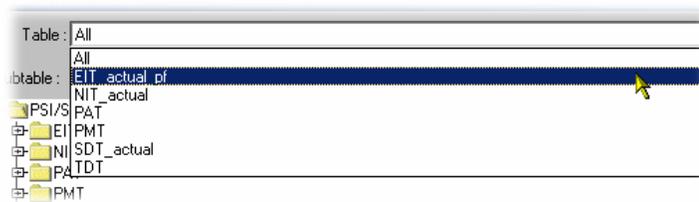
Figure 3-26: ISDB-T SI Tables dialog box

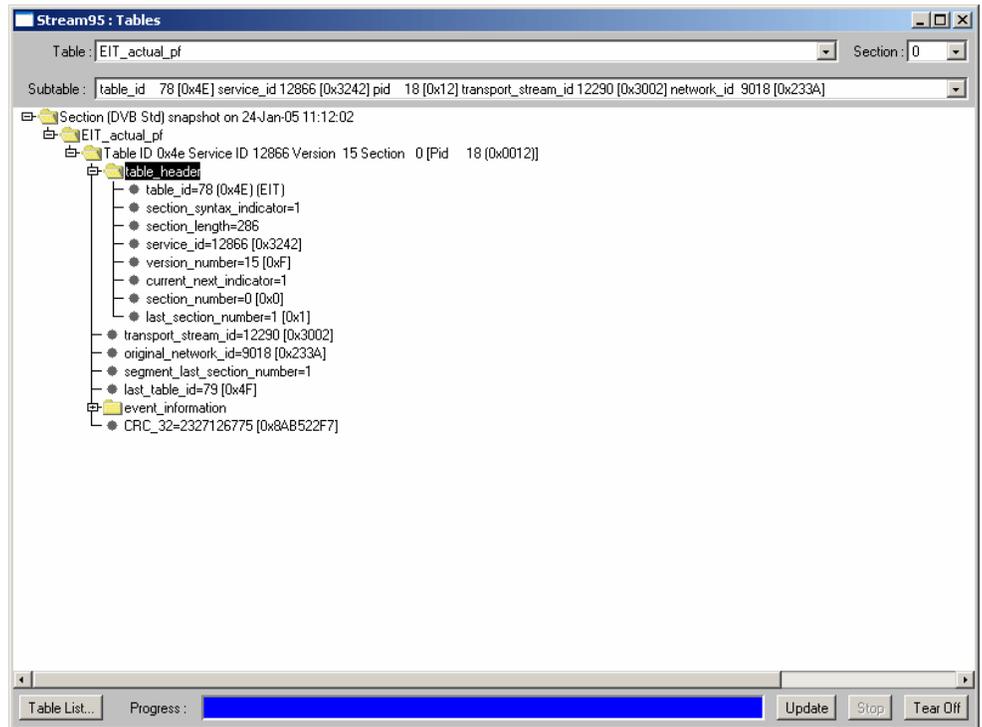
The selections do not take effect in the SI Tables view until the view is refreshed using the **Update** button. The speed of the update depends on the network speed, the SI/PSI complexity, and the selected table types.

A tree diagram, with the root node or highest level component at the top, is represented in this structure. A square box (or node) indicates components that contain more information below them in the structure. If the node has a minus sign in the box, the level of detail below it is already displayed. If the node contains a plus sign, there is another level contained by the node, which is currently hidden. The lower levels can be hidden or displayed by clicking on the node.

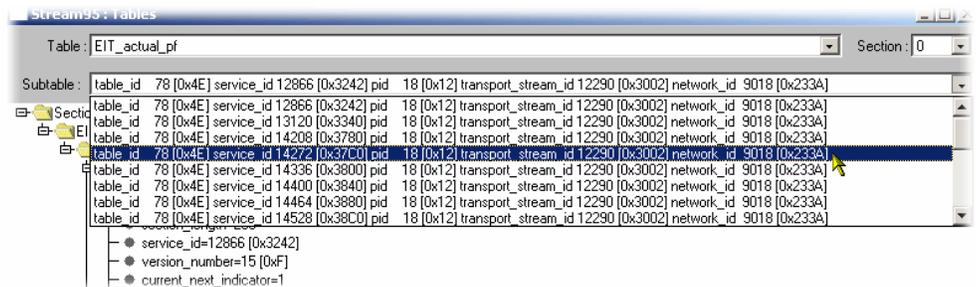
Components that are connected to a branch of the tree without a square box are leaf nodes. They display the lowest and finest level of detail.

The Table drop-down menu allows you to display all of the SI available in the stream or select a specific table type to be displayed. The drop-down menu lists only those tables found in the stream and enabled in the Table List (see the following illustrations).





When displaying a selected table type, if the table contains more than one subtable (for example, the EIT_actual_pf), a single subtable is displayed. Other subtables can be selected from the Subtable drop-down menu and displayed.



Similarly, when displaying a subtable, if the subtable contains more than one section, a single section can be selected from the Section drop-down menu and displayed.



Tear Off View

You can compare sections of a table by using the Tear Off view. Selecting the Tear Off button creates a snapshot of the current tables screen in a separate window. This action can be repeated as many times as required; each press of the button will create a separate window.

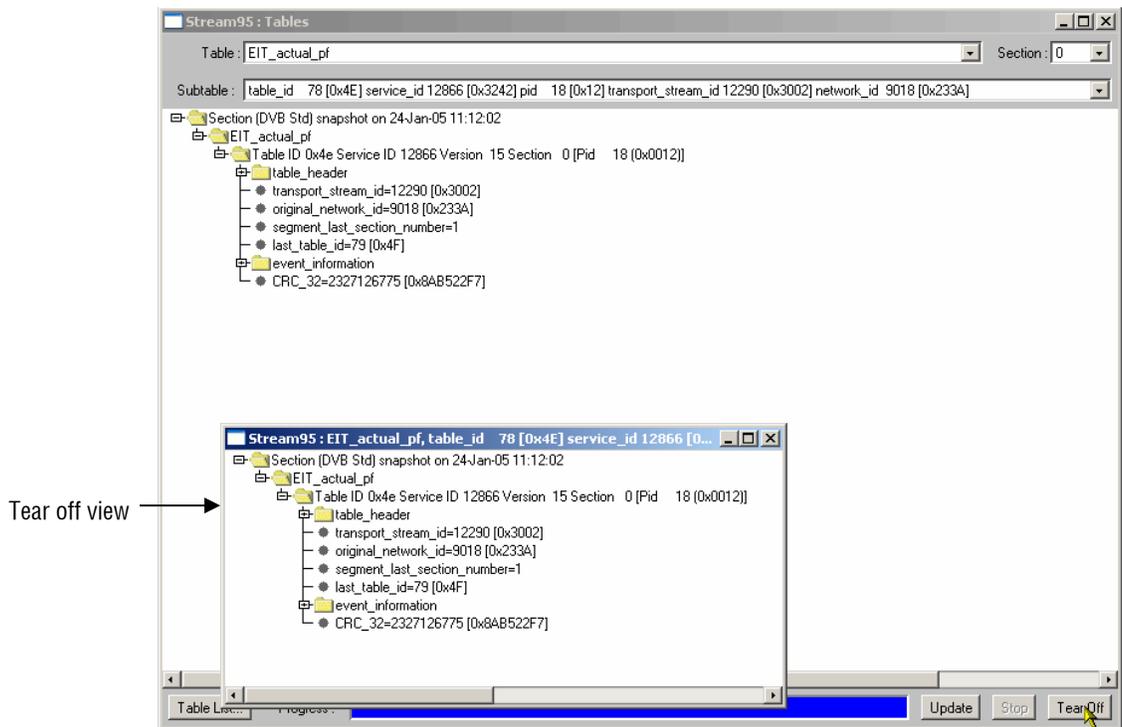
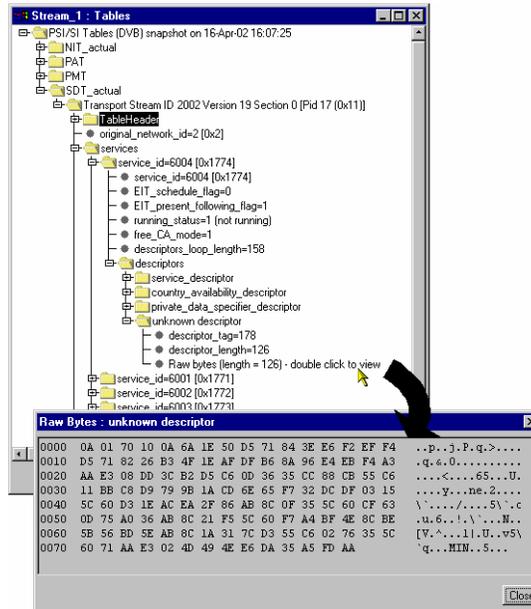


Figure 3-27: SI Tables view - Tear off view

Creation of the table display can be stopped at any time using the Stop button; only the elements analyzed up to that time will be displayed.

Raw Bytes View

Data that cannot be interpreted can be viewed in hex format. Sections that can be viewed in this way will be indicated in the SI Table screen (as shown in the following figure).



Severely errored tables, stuffing tables, and tables having non-standard identities are not included in the SI table display.

Templates

Monitoring the syntax of a Transport Stream according to TR101 290 is not enough to guarantee that the correct information is being delivered to the viewers' receiver. Ensuring that the contents of the Transport Stream are correct requires the monitoring equipment to have prior knowledge of what the broadcaster plans to transmit. A template in which the operator enters the values expected to be present in a Transport Stream can be compared with a transport stream to verify its content, and made to indicate any discrepancy.

The composition of a transport stream may vary during the day as daytime programming is replaced by the evening primetime and then the late night programs. You can schedule template changes to coincide with changes in the program content.

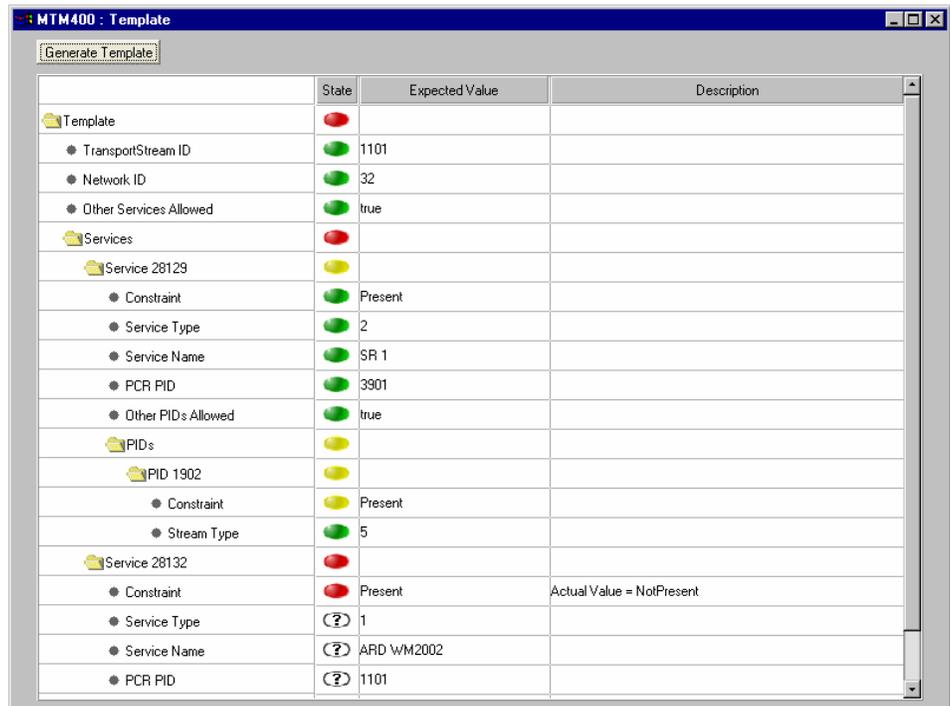
Among the items that can be checked using a template are the following:

- Transport stream identifier
- Services - presence, name
- PIDs in services
- PID types and scrambling state
- Service regional ratings

The template feature allows you to create a template can be applied to a stream (or streams) that is being monitored. If the stream does not conform to the template, the associated icon changes color (in the same way as the error icons) and an entry is made in the error log.

Initially, templates are stream-specific; a template will be created and applied to a specific stream. However, a template can subsequently be uploaded to any device.

In Figure 3-28, the presence of two services (Service 28129 and 28132) in transport stream 1101 is being checked. In addition, details of the service and associated PIDs are checked.



	State	Expected Value	Description
Template			
• TransportStream ID		1101	
• Network ID		32	
• Other Services Allowed		true	
Services			
Service 28129			
• Constraint		Present	
• Service Type		2	
• Service Name		SR 1	
• PCR PID		3901	
• Other PIDs Allowed		true	
PIDs			
PID 1902			
• Constraint		Present	
• Stream Type		5	
Service 28132			
• Constraint		Present	Actual Value = NotPresent
• Service Type		1	
• Service Name		ARD WM2002	
• PCR PID		1101	

Figure 3-28: Stream view - Template

The device and stream identities are shown in the title bar. The template currently in use is shown in the field at the top of the screen.

- The first column shows, in hierarchical and graphical form, the categories of template elements to be applied. Each category can be expanded by clicking on the folder icon (see *Template Manipulation* on page 3-69).
- If the element conforms to the template setting, the **State** icon will be green. Failure to conform is indicated by a red icon. If any elements fail to conform, the Template button will also be red.
- The **Expected Value** is the value provided in the template configuration file.
- A brief **Description** of the reason for failure may be given.

The template content is supplied in XML format as part of the configuration file. The template lists data whose presence and content is to be checked in the transport stream. The State icons indicate that an element listed in the template has conformed to the requirement.

The template section of the configuration file that resulted in the display shown in Figure 3-28 is given below:

```
<MTM400Configuration Name = "Template Example">
  <Streams>
    <Stream Number="1">
      <PS56>
        <TransportStreamId>1101</TransportStreamId>
        <NetworkId>32</NetworkId>
        <OtherServicesAllowed>1</OtherServicesAllowed>
        <ServiceList Update = "Incremental">
          <Service Number="28132">
            <Constraint>0</Constraint>
            <ServiceType>1</ServiceType>
            <ServiceName>ARD WM2002</ServiceName>
            <PCRPID>1101</PCRPID>
            <OtherPIDsAllowed>1</OtherPIDsAllowed>
            <PIDList Update = "Incremental">
              <PID Number="1102">
                <Constraint>0</Constraint>
                <StreamType>4</StreamType>
              </PID>
            </PIDList>
          </Service>
          <Service Number="28129">
            <Constraint>0</Constraint>
            <ServiceType>2</ServiceType>
            <ServiceName>SR 1</ServiceName>
            <PCRPID>3901</PCRPID>
            <OtherPIDsAllowed>1</OtherPIDsAllowed>
            <PIDList Update = "Incremental">
              <PID Number="1902">
                <Constraint>0</Constraint>
                <StreamType>5</StreamType>
              </PID>
            </PIDList>
          </Service>
        </ServiceList>
      </PS56>
    </Stream>
  </Streams>
</MTM400Configuration>
```

Template Manipulation

The categories of template elements are interpreted in a tree format, the branches of which can be expanded and contracted if the file is viewed in an XML editor or Microsoft Internet Explorer.

Each category title is accompanied by a folder icon. Clicking on a folder will expand that category. Expanding a category may reveal the basic components of the category or it may reveal further sub-categories, which can also be expanded. A bullet icon is displayed adjacent to basic components. Selecting the folder icon of an expanded category will collapse the category.

XML files can be edited with an XML editor or a text editor (for example, Microsoft Notepad).

The MTM400 will automatically generate a template for you based on the stream being monitored. This template may be downloaded and edited if required. In Internet Explorer, enter `http://<boxaddress>/maketemplate.xml` and save the resulting xml file.

Templates and Schedules

The use of templates can be enhanced by scheduling their application and use. In this way a series of templates can be applied chronologically to a stream. *Scheduling* is described on page 3-99.

Recording

See *Triggered Recording*, page 3-105.

Log Screen

An error event log is maintained for the stream being monitored. Each log has a maximum capacity of 10,000 entries; when full, the oldest entries are dropped to make room for new entries.

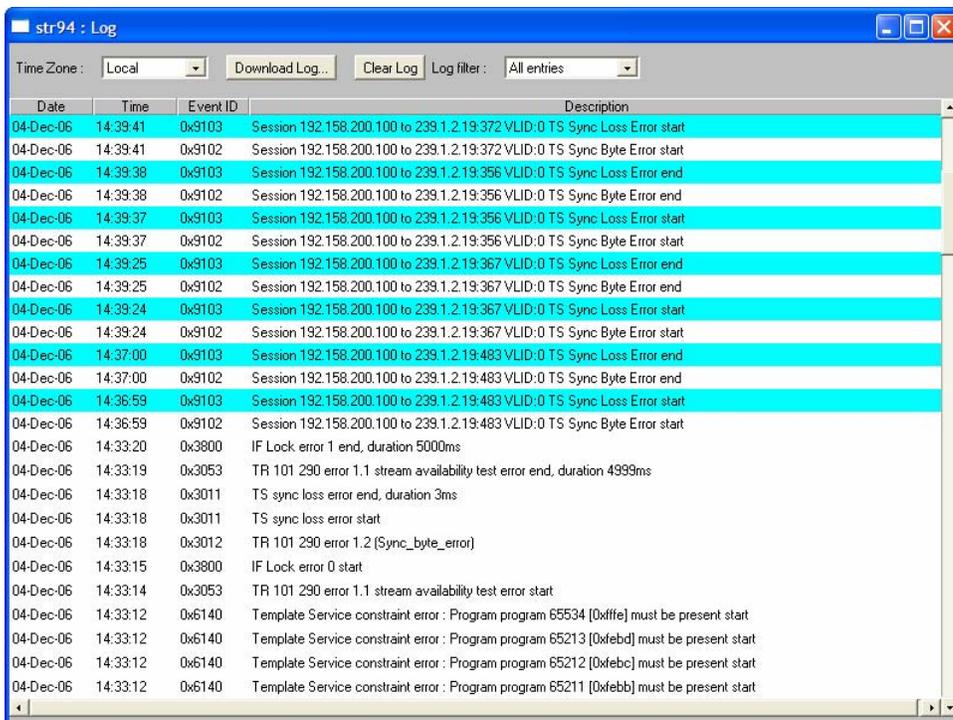


Figure 3-29: Stream view - Log

The title bar of the screen identifies the RTM device and the stream currently being monitored.

The **Log** button displays a screen that contains the events logged for the stream in a scrolling list. The list will have the following columns, each with a text heading:

- Date
- Time
- Event ID
- Error Description

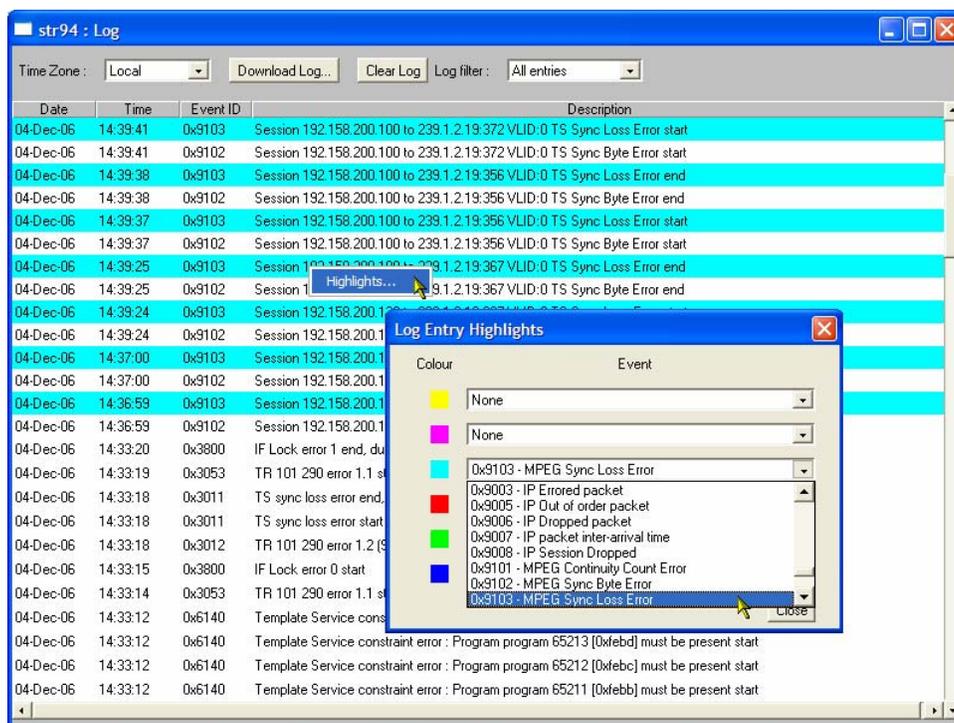
The displayed times at which log events occur is the local MTM400 time.

Manipulating the Log Display

When the log is first opened, the most recent events are displayed at the top of the screen; they are scrolled down as new events appear. Using the **Home** key on the keyboard displays the most recent events; similarly the **End** key will display the oldest events. In both cases, events will continue to scroll. If a single event is to be viewed, selecting the **PageDown** key will scroll and freeze the display. However, since events continue to be recorded, the event will eventually reach the bottom of the log and be lost; how quickly this happens will depend on the number and speed of events being displayed.

Log entry Highlights

A pop-up menu is available by right-clicking anywhere within the listing.



Using the Log Entry Highlights dialog box allows specific types of entry to be highlighted in a selected color. Select the **Event** type (Event ID) to be highlighted from the drop-down list adjacent to the **Color** required. Select OK to close the dialog box and implement the highlighting.

Saving the Stream Log

The Stream Log can be saved using the **Download Log...** button. In the **Log Download** dialog box, select (or enter) a filename and path and select the **Start** button. Select the **Close** button when the operation has finished or to terminate the process early.

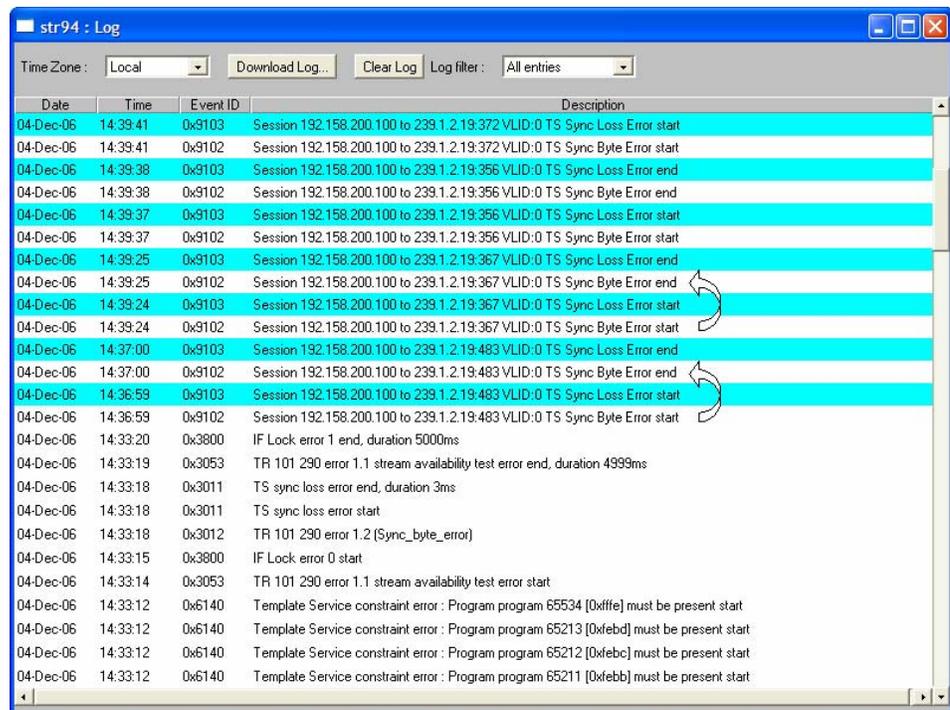
The resulting downloaded log file is saved in CSV (comma separated values) format.

Clearing the Stream Log

Select **Clear Log** to clear the current log entries.

Multiple Entries

Sometimes, errors of a specific type are generated many times. To avoid reporting excessive error entries (which could make the error log difficult to read), each time a new error is detected, the word **start** is added to the error message in the Log screen. No more occurrences of the same error are reported until the test is passed. At that point, a message will be displayed on the Log screen giving the error Event ID, and appending the word **end** to the message; the duration (ms) between the start (event fail) and end (event pass) message is also given where relevant.



Time Zone

The displayed times at which log events occurred can be adjusted by making a selection from the **Time Zone** drop-down list at the top of the window. The following options are available:

Local The time local to the machine on which MTM400 Remote User Interface is currently running.

UTC Universal Coordinated Time.

RTM Device The time local to the RTM device being monitored.

(For a general description of the timing model, see *Time Zones*, page 2-13.)

Log Filter

When a GigE interface card is installed, events can be generated by the monitored session or across all sessions. The log can be filtered to show events from either source, or both sources.

While the display is filtered, the Clear Log option is disabled.

Configuration Screen

The Stream Configuration screen allows you to configure various stream settings, triggered recording, and scheduling. The configuration settings available for DVB, ATSC and ISDB differ; each screen is shown below. The fields displayed are also dependent on the enabled options.

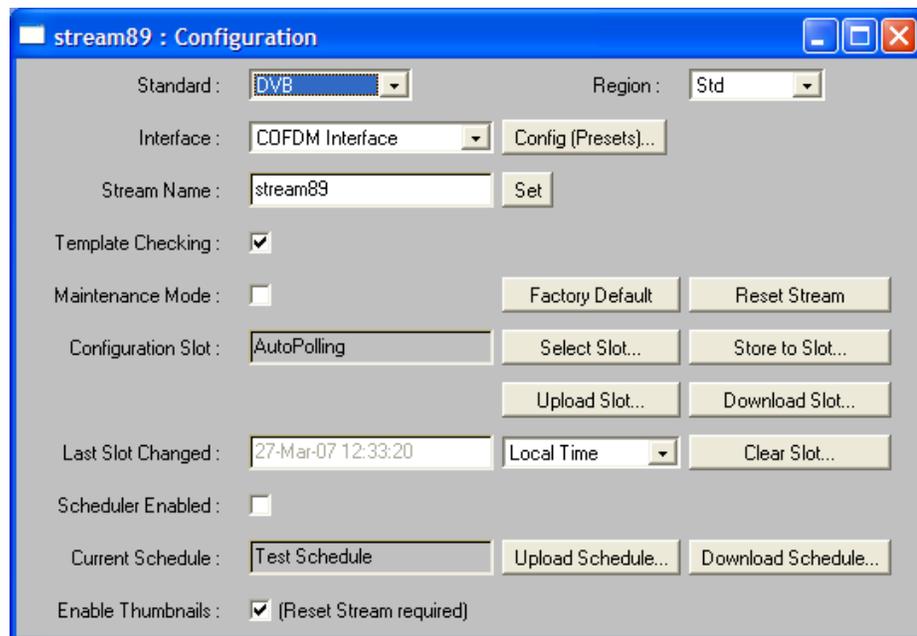


Figure 3-30: Stream view - Configuration (MTM400 DVB format)

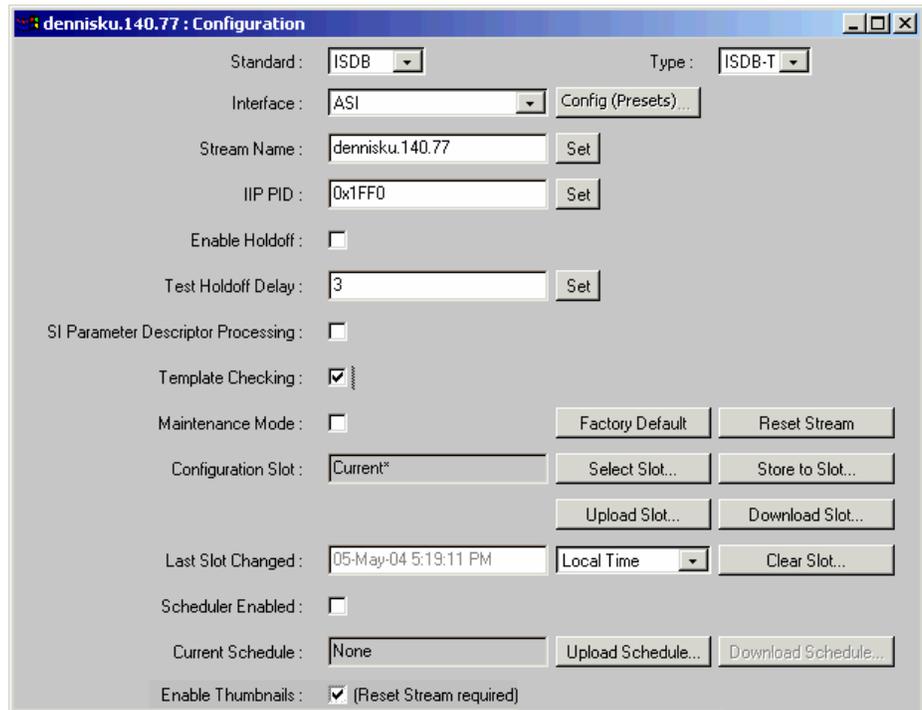


Figure 3-31: Stream view - Configuration (MTM400 ISDB format)

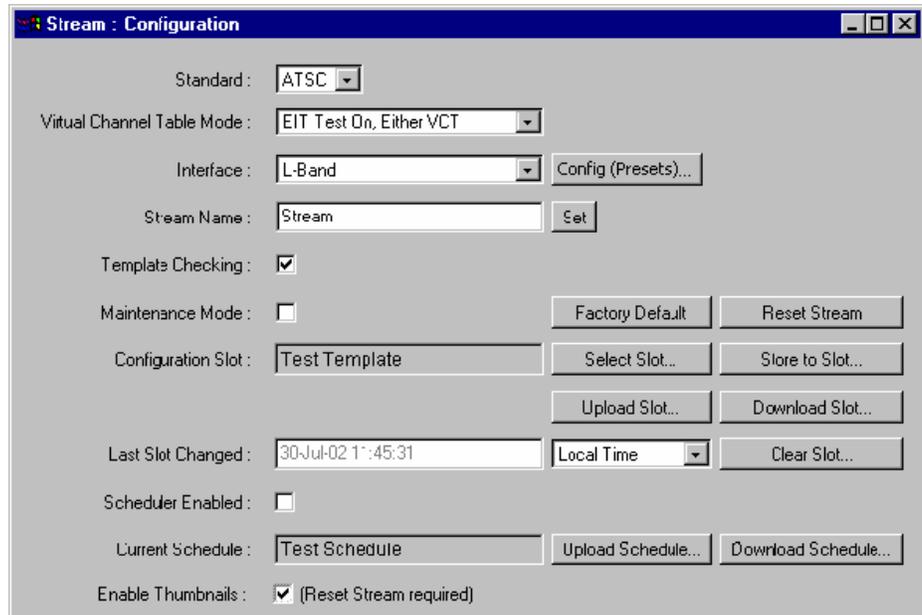


Figure 3-32: Stream view - Configuration (MTM400 ATSC format)

Standard Shows the MPEG broadcast standard selected for stream analysis: **DVB**, **ATSC**, **ISDB** or **Chinese**.

Region / Type This selection dictates the way in which regional variations in SI Tables view are interpreted. The available options are:

Table 3-2: DVB Regional options

DVB Region	Description
Std	Default setting uses standard DVB interpretation of descriptors.
DTG	DVB + DTG interpretations.
Nordig	DVB + Nordic interpretations.
Reserved	(Not Used.)
Aus	DVB + Australian interpretations.

No regional variants are available for the **ATSC** standard.

Table 3-3: ISDB Regional options

ISDB Region	Description
ISDB-S	Satellite setting (default).
ISDB-T	Terrestrial setting.
1 Segment	Partial reception (limited bandwidth devices).

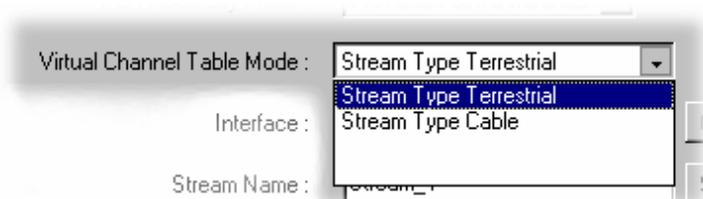
Table 3-4: Chinese Regional options

Chinese Region	Description
GY/Z 174-2001	DVB + GB2312 encoding.
GB2312	DVB + implied GB2312.

Changing either the **Standard** or the **Region/Type** restarts the MTM400 unit. A warning message, requiring confirmation, is displayed.

Virtual Channel Table Mode

(ATSC only) A drop-down list from which the Virtual Channel Table Mode can be selected. The options available are shown below:

**Interface**

A drop-down list for selecting the interface to be used for the stream. The available interfaces will depend upon the RTM device configuration.

Config (Presets)... button

Opens the configuration dialog box for the selected interface (see page 3-113).

Stream Name

Allows you to assign a name to the stream. The selected name will appear wherever the stream name is displayed, for example, in the title bar of all screens.

Enter the required name and select the **Set** button.

If you do not set a name, the default name, Stream, is used.

IIP PID

(ISDB only) Allows you to specify the packet number of the ISDB-T Information Packet.

The IIP PID value is predefined; to change it, enter the required value and select the **Set** button.

Enable Holdoff and Test Holdoff Delay

(ISDB only) Enables and sets how long after a PAT/PMT SI version change all tests are disabled.

SI Parameter Descriptor Processing

(ISDB Only) The MTM400 can process SI repetition rates tests against user definable parameters, or by taking dynamic test limits from the broadcast SI when available.

Template Checking*

When enabled, applies the current template to the stream.

Maintenance Mode

When enabled, no alarms (TTL, relays or audible) will be raised for the stream. The RTM device will continue to monitor the stream and errors will be logged. The action of enabling and disabling maintenance mode is also recorded in the log. In this mode, all buttons are colored black.

Reset Stream

This button returns the MTM400 to the initial state upon acquiring a stream; all tests are reset and all SI information is flushed. This is useful if you make a seamless switch between nearly identical streams. If there is no change in the SI identity and/or versions to inform the MTM400 that it is a new stream, you can reset the stream manually here.

Configuration Slot

See *MTM400 Configuration Files*, page 3-87.

Scheduling*

See *Scheduling*, page 3-99.

Enable Thumbnails

Enables thumbnail generation for viewing in the RUI (see *Thumbnails Screen*, page 3-84) or downloading to an external application.

Thumbnail support must be installed on the RUI client PC if the MTM400 RUI is to be used to view thumbnails (see *Video Thumbnail Support*, page 1-18).

Buttons

Factory Default

When selected, all stream configuration items for the current stream are reset to their factory defaults.

* - licensed options (see *Table 1-6: MTM400 options summary*, page 1-7).

Service Log

Each program in a transport stream can contain one or more elementary streams (for example, video, audio and control). The content of each elementary stream is carried as packets of data; each elementary stream is assigned a Packet Identifier (PID). Service Logging allows packet counts for specified PIDs (range: 0 to 100) to be collected at a user-definable interval.

Typically this information can be used by network operators to bill customers for transferred data. Network operators may want to present an itemized bill for packets of data carried in each time period.

The data is stored as a grid. After each time period, all the counts move down one position and a new count is started in the top row. The grid is 64 rows (time periods) deep and 100 PIDs wide. So up to 100 PIDs may be monitored, with a common timing resolution.

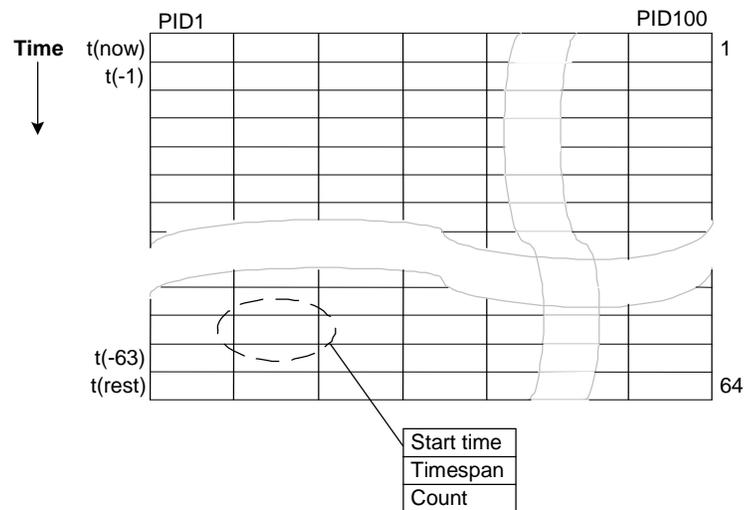


Figure 3-33: Service logging - Data storage

The timing resolution should not be set too fast or data may reach the bottom of the grid ($t(\text{rest})$) before it can be read. If data does reach the bottom of the grid, it is not lost but it is accumulated in the final row. Accumulated data is added to the bottom row for up to three days. After this time the data is discarded and the PID is no longer monitored.

When a service log is being monitored from multiple locations, only one location should be selected to consume entries. This will allow all locations adequate time to view or log the entries.

The customer must balance the level of detail required (the timing resolution) with the infrastructure that is required to collect, store, and collate the information. Typically the timing resolution is set for 1000 ms; in this case the grid cell will contain a value approximating to packets per second; to improve accuracy each count has an associated duration.

The screenshot shows the 'Stream : Service Log' window with the following configuration options:

- Consume Entries:
- Log Entries:
- Packet Counting Bin Duration (PS4): 100ms
- Log Filename: [Set]
- Number of Packet Counting Bins (PS6): 2 [Set]
- Max List Entries: 100 [Set]
- Timing Interval (PS4 * PS6 * 10): 2000ms [PIDs...]

The data table below shows the following columns: Time, Duration, PID 4176, PID 4178, PID 4180, PID 4182, PID 4184, PID 4186.

Time	Duration	PID 4176	PID 4178	PID 4180	PID 4182	PID 4184	PID 4186
15/07/03 08:15:11	2.002	7903	0	0	0	0	0
15/07/03 08:15:08	2.998	11968	0	0	0	0	0
15/07/03 08:15:06	2.002	7882	0	0	0	0	0
15/07/03 08:15:03	2.999	11971	0	0	0	0	0
15/07/03 08:15:00	2.999	11894	0	0	0	0	0
15/07/03 08:14:58	2.001	7924	0	0	0	0	0
15/07/03 08:14:55	2.999	11931	0	0	0	0	0
15/07/03 08:14:53	2.003	7921	0	0	0	0	0
15/07/03 08:14:51	1.998	7965	0	0	0	0	0
15/07/03 08:14:49	2.000	7953	0	0	0	0	0
15/07/03 08:14:47	2.003	7974	0	0	0	0	0
15/07/03 08:14:44	2.999	11970	0	0	0	0	0
15/07/03 08:14:42	2.002	7901	0	0	0	0	0
15/07/03 08:14:40	1.998	7981	0	0	0	0	0
15/07/03 08:14:38	2.002	7980	0	0	0	0	0
15/07/03 08:14:36	1.999	7915	0	0	0	0	0
15/07/03 08:14:34	2.002	7980	0	0	0	0	0
15/07/03 08:14:31	2.999	11915	0	0	0	0	0
15/07/03 08:14:29	2.001	7950	0	0	0	0	0
15/07/03 08:14:26	3.000	11951	0	0	0	0	0
15/07/03 08:14:23	2.999	11875	0	0	0	0	0
15/07/03 08:14:21	2.001	7981	0	0	0	0	0

Figure 3-34: Stream view - Summary

The following settings are available:

Consume Entries The data in the service log is not discarded once it is read; this means that more than one RUI may view the data. One RUI should be nominated to consume the entries. This RUI will then be guaranteed to get all of the data without another RUI consuming the data. Where the data is logged to disk, the logging RUI must be the consuming RUI.

Log Entries Select this checkbox if entries are to be logged to a file.

Log Filename Displays the log file name. A log file name can only be set when the **Consume Entries** checkbox is selected. The log file is written in CSV (comma separated values) format. In this format, it can be transferred to any suitable analysis program, for example, Microsoft Excel.

- Max. List Entries** This value sets the number of entries that are displayed. It does not affect the actual logging of counts. Enter a value in the field and select **Set**.
- PIDs button** Select this button to display the Service PIDs dialog box that lists the PIDs currently being logged. The dialog box also allows PIDs to be added and deleted.

The timing resolution of counts is controlled by configuration file parameter PS4 (**Packet Counting Bin Duration**) multiplied by PS6 (**Number of Packet Counting Bins**), typically PS4 * PS6 is set for 1000 ms.

PS4 is the τ (tau) value for the PID occupancy bit rate measurement as defined in TR 101 290. This value affects many measurements; in this case it ensures that the timespan is a whole multiple of the bit rate counting interval and reduces sampling errors. PS6 should be set to give the required count duration - **Timing Interval (PS4 * PS6 * 10)**.

Service Log Configuration

The Service Log parameters can also be set using the configuration file.

The example below shows how to monitor four PIDs. Note that the PIDs may be specified as separate elements or as a space delimited list.

```
<?xml version="1.0" encoding="UTF-8"?>
<MTM400Configuration Name="Service Log Config"
  xmlns:xsi="XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="config.xsd">
  <Streams>
    <Stream Number="1">
      <PS6>10</PS6>
      <PS4>100</PS4>
      <ServiceLog>
        <PIDS>301</PIDS>
        <PIDS>302</PIDS>
        <PIDS>304 410</PIDS>
      </ServiceLog>
    </Stream>
  </Streams>
</MTM400Configuration>
```

This configuration can be embedded in a full configuration file, or just uploaded as an incremental change (refer to *Configuration File Structure* in the *MTM400 MPEG Transport Stream Monitor Programmer Manual*).

Polling Screen

Channel Polling allows multiple user-defined channels to be polled sequentially. The channels polled correspond to the preset configurations selected in the Configuration screen. Setting up the preset configurations and the sessions to be polled and monitored is described in *Channel Polling*, page 3-93.

Channels to be polled can also be defined as part of the configuration file, see *MTM400 Configuration Files*, page 3-87.

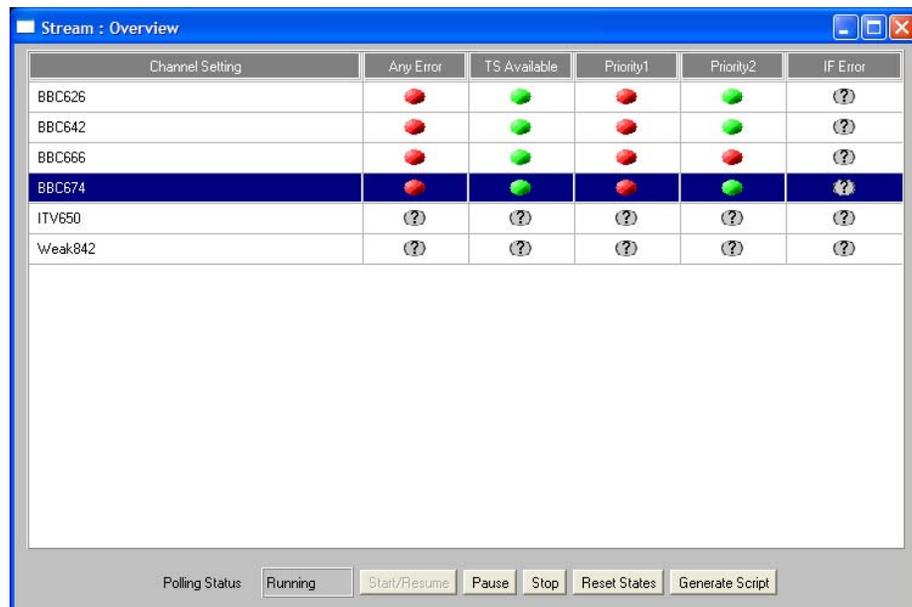


Figure 3-35: Stream view - Polling screen

Error states are maintained (remembered), even when another channel is being polled. So, a red state will be remembered until the next poll, even though the error might have cleared in the interim. When next polled, it would turn yellow to indicate that an error has occurred but has cleared.

Note that when a new configuration file is selected and made active, polling is stopped and the polling error states are reset. Polling must be restarted.

Columns:

Channel Setting The name allocated in the configuration file. This name can correspond to either an elementary stream in a transport stream (where a CIP interface card is fitted) or a session in an IP stream (where a GigE card is fitted).

Any Error and TS Available

Corresponds directly with tests (which can also be viewed on the Tests screen).

Priority 1, Priority 2 and Priority 3

An error on one of these tests corresponds to any error in a Priority 1, Priority 2, or Priority 3 category (which can also be viewed on the Tests screen).

IF Error

Corresponds to an error on any of the tests listed under Interface Card errors, which can also be viewed on the Tests screen.

Buttons:

Polling can be started (or restarted) by selecting the Start/Resume button. The current status is shown in the adjacent Polling Status field. The Pause and the Stop buttons are used to pause and stop polling respectively.

The Reset Status button resets the error status of all polled streams. It is advisable to reset the status after pausing and stopping polling to ensure an error-free restart.

Generate Script

Selecting the Generate Script button automatically generates a polling script and merges it into the current configuration (see also *MTM400 Configuration Files*, page 3-87).

The generated polling script accounts for the interface card that is present and all the currently defined preset card configurations. The script defaults to spending 60 seconds interrogating each preset and allowing 15 seconds settling time at the start of each channel change.

Thumbnails Screen

This screen displays thumbnail views of the video channels being monitored.

Three modes of thumbnail display are available: Thumbnails, Summary, and Details. Thumbnails provide a video view of each channel each being identified by its service name and PID. Summary and Details mode provide progressively more detailed information about each video channel.

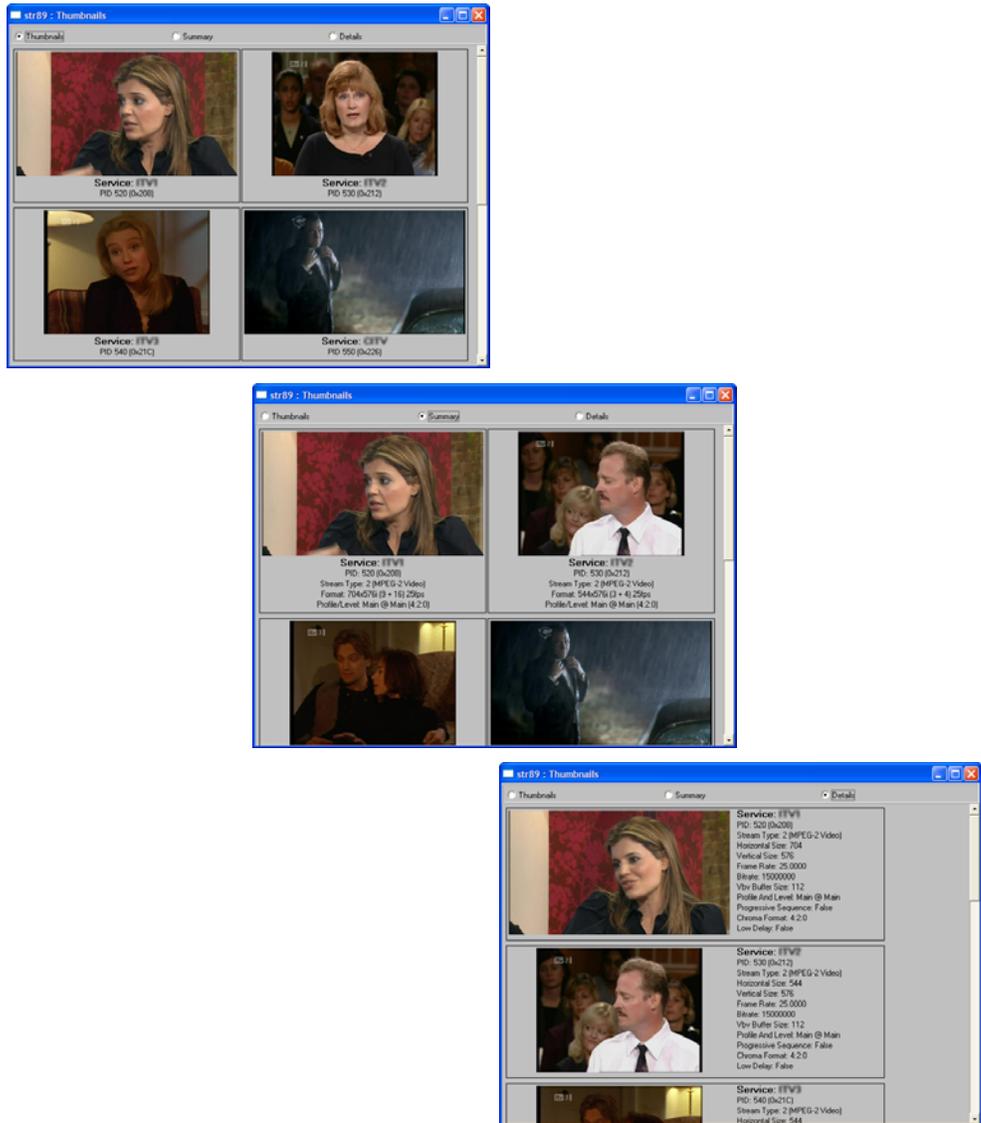


Figure 3-36: Thumbnail display

If the video channels being monitored are scrambled or undecodable, one of the following icons will be displayed:



Undecodable video: Video that cannot be decoded, or uses an unsupported or uninstalled CODEC shall be indicated with a blue cross type of icon.



Scrambled video channels are indicated with a lock.

MTM400 Configuration Files

Configuration files provide a means of supplying and storing all stream-related, user-definable parameters that are active in an RTM device. Configuration files may be complete, containing all parameters, or partial, containing only those parameters that require changing. The files are composed in XML (Extensible Markup Language) format and can contain sections relating to all aspects of configuration; template information can also be included. The files can be viewed in Internet Explorer or they can be viewed and edited in a text editor, for example, Microsoft Notepad. (See also *Configuration File Structure* in the *MTM400 MPEG Transport Stream Monitor Programmer Manual*.)

The concept of configuration files allows uniformity in setup to be achieved at a range of locations (RTM devices), especially where scheduling is supported. An additional facility allows weekly schedules to be written for each stream, which instructs the MTM400 to load configuration slots at specific times and days during the week (see *Scheduling*, page 3-99).

In MTM400, configuration settings are held in storage slots; eight storage slots are available for each stream. The contents of a storage slot must be applied to the active area (active configuration) before it is implemented.

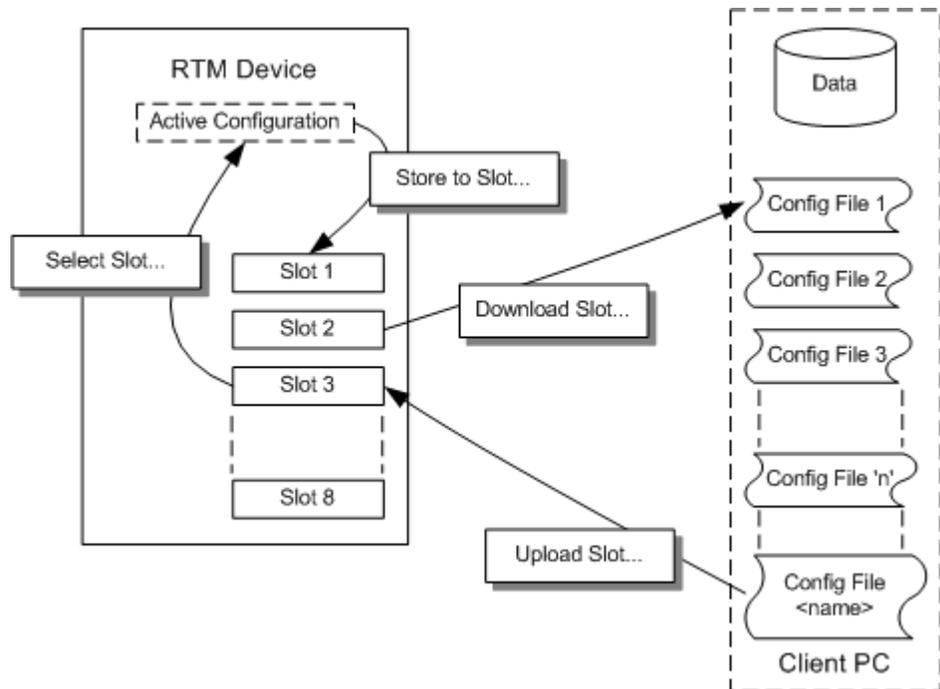


Figure 3-37: Configuration file handling

You can modify the active parameters during normal operation; these changes will only affect the active configuration. The active configuration is saved in non-volatile RAM as operational changes are made and will be recovered after the unit is reset or powered off.

The active configuration settings can also be saved to any of the storage slots. The contents of a storage slot can subsequently be downloaded to a file on a remote, networked PC. Similarly, a correctly configured file (or portion of a file) can be uploaded into any slot; where a portion of a file can be a correctly configured XML file that specifies a subset of the total configuration file.

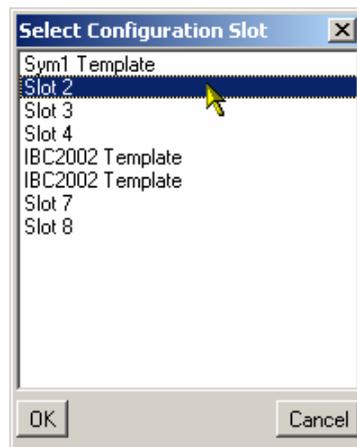
The default names allotted to the slots are **Slot 1 to Slot 8**; they are always displayed in the same order. When a configuration file occupies the slot, the name is changed to that of the configuration file; however, the position of the slot in the list remains the same.

Configuration File Management

Activating a Slot

For the settings stored in a slot to become active, the contents of a storage slot must be transferred to the active configuration.

1. From the Configuration view, select **Select Slot...**



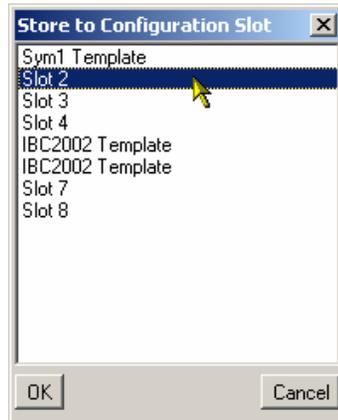
2. From the list, select the required slot.
3. Select **OK**.

The settings stored in the selected slot will be copied to the active configuration.

Storing Active Settings to a Slot

The settings currently held in the active configuration can be copied to any storage slot.

1. From the Configuration view, select **Store to Slot...**



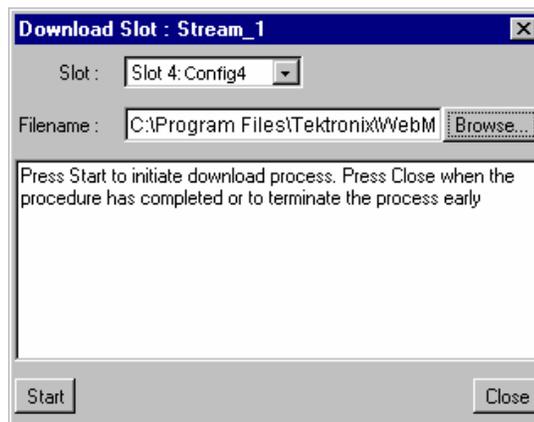
2. From the list, select the required slot.
3. Select **OK**.

The active configuration settings will be stored in the selected slot.

Downloading from a Storage Slot

The settings currently held in a storage slot can be copied to a file, for example, for modification.

1. From the Configuration view, select **Download Slot...**



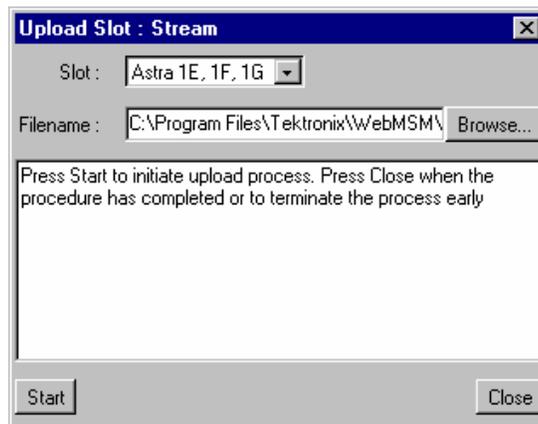
2. From the **Slot:** drop-down list, select the required slot.

3. Locate and select the configuration file or type in a new name; use the **Browse...** button if necessary.
4. Select **Start** to download the configuration setting from the selected slot.

Uploading to a Slot

Correctly prepared configuration files can be uploaded to a slot.

1. From the Configuration view, select **Upload Slot...**



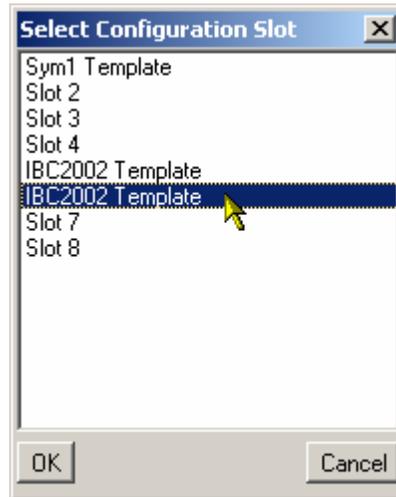
2. From the **Slot:** drop-down list, select the required slot.
3. Locate and select the configuration file to be uploaded or type in the path and name (*.xml); use the **Browse...** button if necessary.
4. Select **Start** to upload the configuration setting into the selected slot.

If the file is incorrectly formatted, the operation will fail and a message will be displayed in the dialog box.

Clearing a Slot

Slots can be cleared as follows:

1. From the Configuration view, select **Clear Slot...**



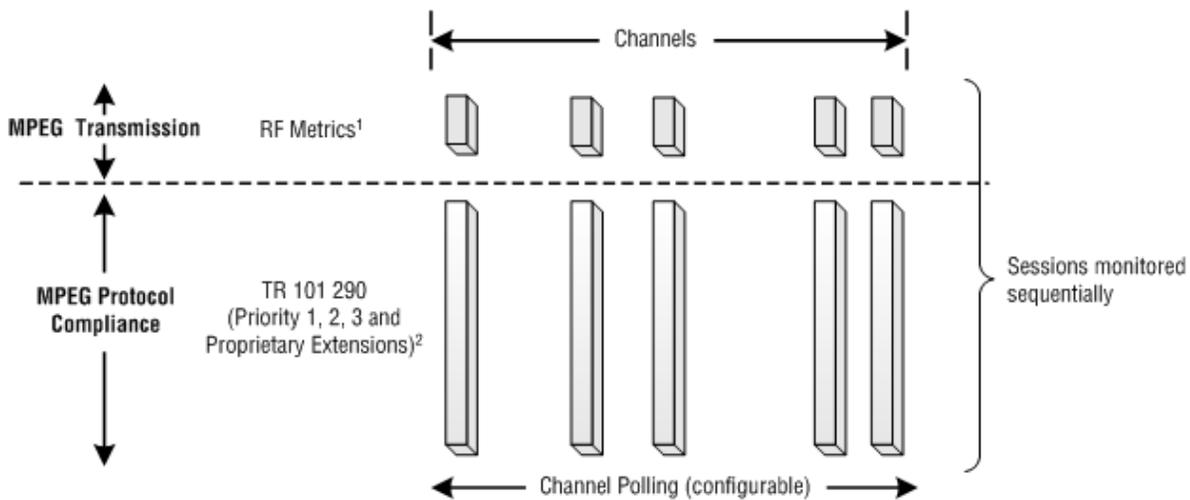
2. From the list, highlight the slot to be deleted.
3. Select **OK**.

The slot name is deleted from the dialog box and replaced with the slot number.

4. Select **Start** to upload the configuration setting into the selected slot.

Channel Polling

Channel polling allows multiple channels to be polled sequentially. This option will work with any of the interface cards. Figure 3-38 and Figure 3-39 provide overviews of the channel polling using an RF interface card and a GigE interface card respectively.

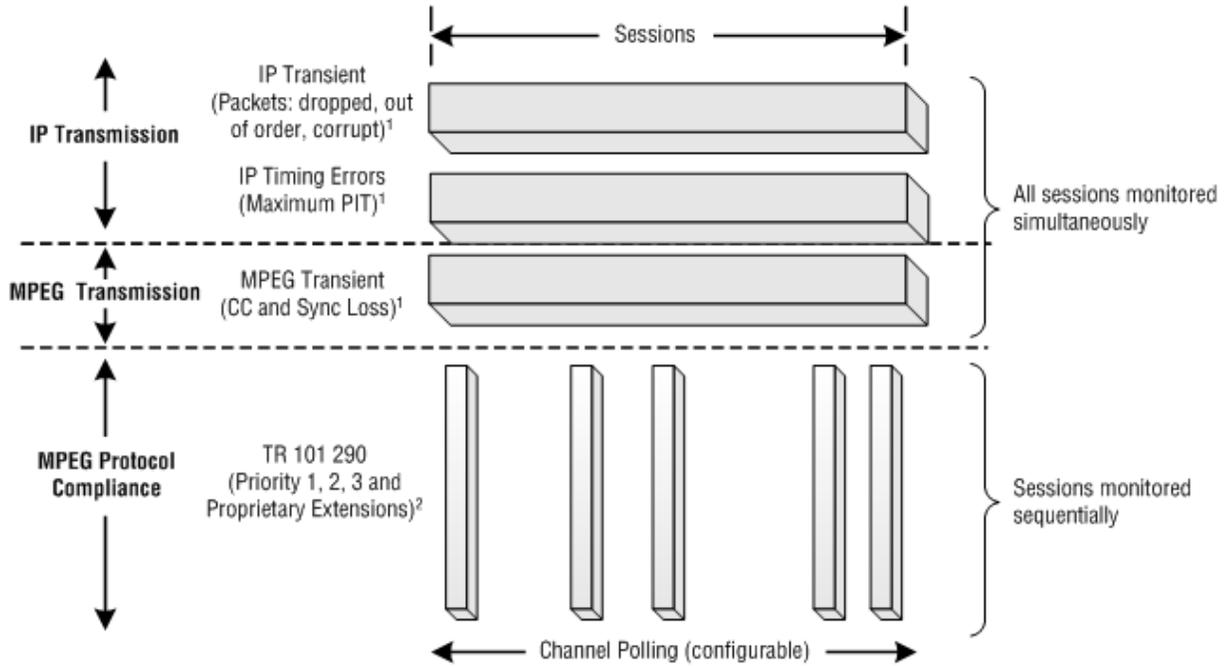


Footnotes:

¹ See Info screen

² See Polling screen and Tests screen

Figure 3-38: RF interface card channel polling overview



Footnotes:

¹ See Input Card screen Traffic graph and Info screen

² See Polling screen and Tests screen

Figure 3-39: GigE interface card channel polling overview

The results of the simultaneously monitored session tests are displayed in the Information screen. The results of the user-defined sequential tests are displayed in the Polling screen.

Polling Setup

Setting up channel polling is described in the following paragraphs:

- Set up the preset configurations
- Generate the polling script
- Observe the polling process

Set up the preset configurations

1. In the Stream view, open the input card Interface Settings dialog box; **Configuration > Interface > Config (Presets)**.

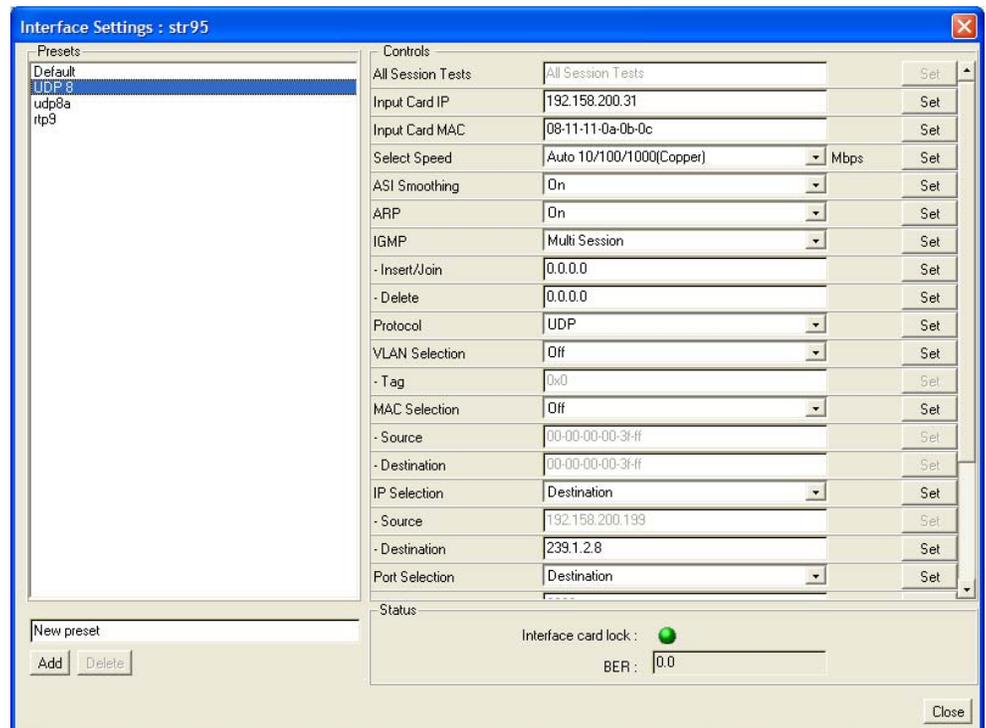


Figure 3-40: Interface Settings dialog box (example)

All defined preset configurations will be automatically added to the list displayed in the polling screen. Note that configurations with duplicated settings will not be accepted.

2. In the Preset text field, enter the new name.

3. Click Add to display the new name in the Preset list.
4. Select and highlight the new name in the Preset list.
5. Modify the interface settings, remembering to click Set to confirm each change.

The Interface Card Lock (or Front End Lock) LED should be green when the settings are successful.

6. Close the Interface Settings dialog box.

NOTE. *The Interface Settings dialog box is modal. You cannot open any other windows while it is open.*

GigE interface card setup. An alternative method, useful for setting up preset configurations on a GigE interface card, is as follows:

1. In the GigE interface card Interface Settings dialog box, add a new name to the list of presets.
2. Close the Interface Settings dialog box.
3. Open the Input Card screen.
4. In the Controls area, select the new preset name from the Preset drop-down list.
5. Select the Traffic table and select a session from the displayed list.

The session values are displayed in the Controls area. These values are now associated with the selected preset configuration.

Generate the polling script

1. Click Polling to open the Polling Overview screen.

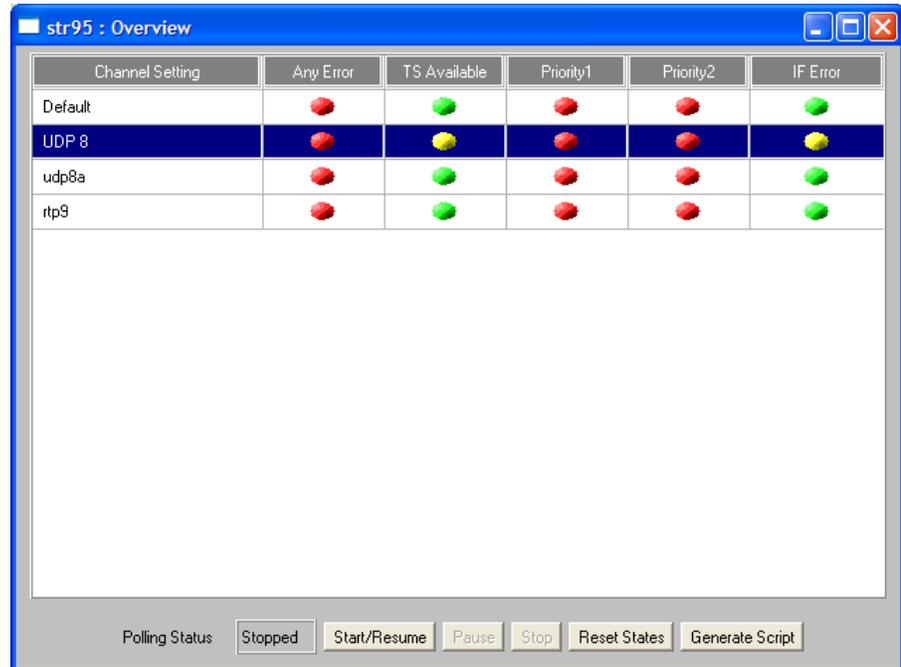


Figure 3-41: Polling Overview screen (example)

The preset configurations previously set up are listed in this screen, including deleted configurations (until the script is regenerated).

2. Before polling can be started, you must generate a configuration script. This is done automatically by clicking the Generate Script button.

This action will delete any redundant entries. A new script must be generated each time that a configuration is defined or deleted (in the Interface Setting dialog box).

When the Generate Script button is clicked, the Generate Polling Script dialog box is displayed. Set the Dwell time and the Acquire time and click OK.

3. Click the Start/Resume button to start polling.

Observe the polling process

The Polling screen and controls are described on page 3-82.

Scheduling

Configuration schedules allow information held in configuration slots (see page 3-78) to be activated at specified times and days of the week. Schedules operate on a weekly basis.

A schedule includes the following information:

- A schedule name. When the schedule is uploaded to the RTM device, the schedule name will be displayed in the **Current Schedule** field in the **Configuration** dialog box.
- UTC Offset (see *Scheduling and Time Zones*, page 3-103).

The schedule file can be uploaded to RTM devices in many time zones, ensuring that the configuration files will be activated at the same moment on each device.

The schedule file contains a number of schedule items, such as:

- Configuration Slot - the number of the stored slot (1 to 8) to copy to the 'active' slot
- Load Time - time configuration slot should be copied in the specified schedule time zone (HH:MM:SS)
- The days of the week when this is to be applied. This can be a single day, or a list of days (Mon | Tue | Wed | Thu | Fri | Sat | Sun).
- Start Error Reporting Holdoff Period (seconds)
- Stop Error Reporting Holdoff Period (seconds)
- Start Error Logging Holdoff Period (seconds)
- Stop Error Logging Holdoff Period (seconds)

Changing configurations may cause an excessive number of spurious errors to be generated. The Error Logging and Reporting Hold-Off Periods are provided so that logging and reporting of errors can be suspended before, during, and after the changeover, if required.

One schedule item must be specified as the baseline (the first item to be loaded). This allows the RTM unit to synchronize, for example, if the instrument is switched on in the middle of a weekly schedule.

The schedule will be specified in a text file using XML. An example of the schedule file format is shown below:

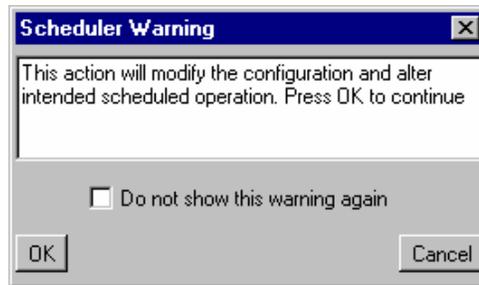
```
<Schedule Name="<name>" UTCOffset="<offset>">
<!--where <offset> = Local, or an offset from UTC time e.g. -60 -->
  <BaseScheduleItem>
    <!--Defines the base schedule item - there should only be one of these -->
    <ConfigurationSlot>1</ConfigurationSlot>
    <LoadTime>16:34:30</LoadTime> <!-- Load time specified in HH:MM:SS -->
    <LoadDay>Mon</LoadDay> <!-- Mon, Tue, Wed, Thu, Fri, Sat or Sun>
    <HoldOffPeriods>
      <StartErrorReporting>5</StartErrorReporting> <!-- Optional -->
      <StopErrorReporting>5</StopErrorReporting> <!-- Optional -->
      <StartErrorLogging>5</StartErrorLogging> <!-- Optional -->
      <StopErrorLogging>5</StopErrorLogging> <!-- Optional -->
    </HoldOffPeriods>
  </BaseScheduleItem>
  <ScheduleItem>
    <ConfigurationSlot>2</ConfigurationSlot>
    <LoadTime>15:00:00</LoadTime> <!-- Load time specified in HH:MM:SS -->
    <LoadDays>Mon | Tue | Wed</LoadDays>
    <!-- any combination of Mon, Tue, Wed, Thu, Fri, Sat, Sun>
    <HoldOffPeriods>
      <StartErrorReporting>5</StartErrorReporting> <!-- Optional -->
      <StopErrorReporting>5</StopErrorReporting> <!-- Optional -->
      <StartErrorLogging>5</StartErrorLogging> <!-- Optional -->
      <StopErrorLogging>5</StopErrorLogging> <!-- Optional -->
    </HoldOffPeriods>
  </ScheduleItem>
</Schedule>
```

In this example, both the BaseScheduleItem and the ScheduleItem have LoadDays entries; remember, if you copy and paste between the two sections, the BaseSchedule section entry is singular (LoadDay) and the ScheduleItem section entry is plural (LoadDays).

NOTE. *There should be only a single day listed in the LoadDay entry in the BaseScheduleItem section; there can be multiple days listed in the LoadDays entry in the ScheduleItem section.*

Scheduling Activities

NOTE. *If any changes are made to the configuration from the user interface, a warning message is displayed seeking confirmation of the action.*



Changes made may affect the configuration that is currently loaded by the scheduler. They may also affect or be affected by future scheduled configurations.

Select **OK** to continue and accept the change to the configuration. Select **Cancel** to close the message box; the intended change will revert to its previous setting.

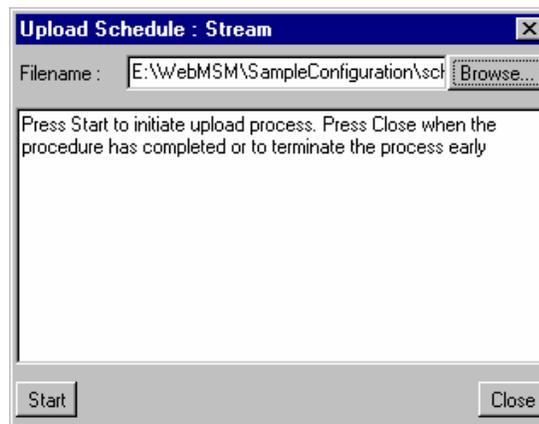
With a prepared schedule file available, the following activities can be performed from the stream Configuration dialog box:

Uploading a Schedule

A schedule file is uploaded from either the client PC or from a network location:

1. Select **Upload Schedule...** from the stream **Configuration** dialog box.

The Upload Schedule dialog box is displayed.



2. Enter or browse the filename of the schedule file to be uploaded to the MTM400 and select **Start**.
3. Select **Close** when the upload has finished or to terminate the process early.

The schedule name will be displayed in the **Current Schedule** field in the **Configuration** dialog box.

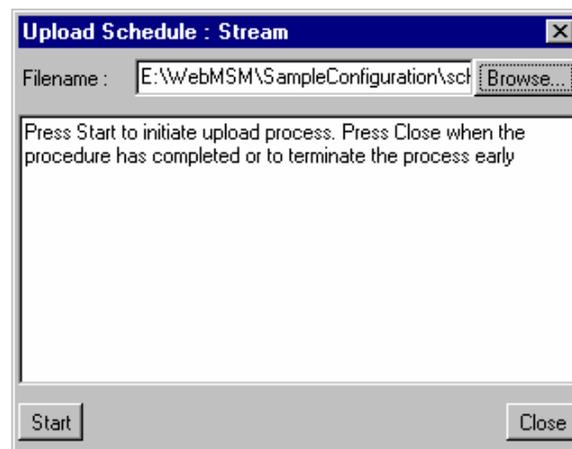
If the uploaded schedule is replacing a currently running schedule, the **Scheduler Enabled** checkbox in the **Configuration** dialog box should be cleared and then checked to allow the new schedule to take effect.

Downloading a Schedule

A schedule file is downloaded from the MTM400 to either the client PC or to a network location:

1. Select **Download Schedule...** from the stream **Configuration** dialog box.

The Download Schedule dialog box is displayed.



2. Enter or browse to the filename of the schedule file to be downloaded from the MTM400.
3. Select **Start**.
4. Select **Close** when the download has finished or to terminate the process early.

Enable Scheduling

Scheduling will not be enabled until the **Scheduler Enabled** checkbox is selected.

If an uploaded schedule is replacing a running schedule, the **Scheduler Enabled** checkbox in the **Configuration** dialog box should be cleared and then checked to allow the new schedule to take effect.

Scheduling and Time Zones

A schedule consists of a list of schedule items that specify the times when specific configuration slots should be loaded. The **UTC Offset** schedule attribute allows the times to be interpreted in different ways, as described below.

- Local

If you set the **UTC Offset** attribute to **Local**, then the schedule times represent the local times on the RTM device. For example, if the **UTC to Time Zone Offset** of the device is -360 minutes (6 hours behind UTC) and a schedule load time is specified as 13:00, then the appropriate configuration will be loaded at 13:00 in the local time zone of the RTM device, which is $13:00 + 360 \text{ minutes} = 19:00 \text{ UTC}$.

UTC to Time Zone Offset is set through **Device → Configuration → Set Time** (See page 3-8).

Having the **UTC Offset** attribute set to **Local** is useful where it is easier for the user to think of times in the time zone where the RTM device is installed. It is also useful where there are multiple RTM devices situated across different time zones, and configurations should be loaded in the local time of each RTM device.

Figure 3-42 shows the times at which configurations would be loaded if a schedule with the **UTC Offset** attribute set to **Local** containing a load time of 13:00 were used by RTM devices in several different time zones.

- User Defined Offset

You can also set the **UTC Offset** attribute to a numeric value specifying the time zone in which the schedule is written, and independent of the RTM device. **UTC Offset** represents the difference in minutes between the time zone that the schedule times are written in and the UTC. In other words, subtract the number of minutes from the times specified in the schedule to obtain UTC time.

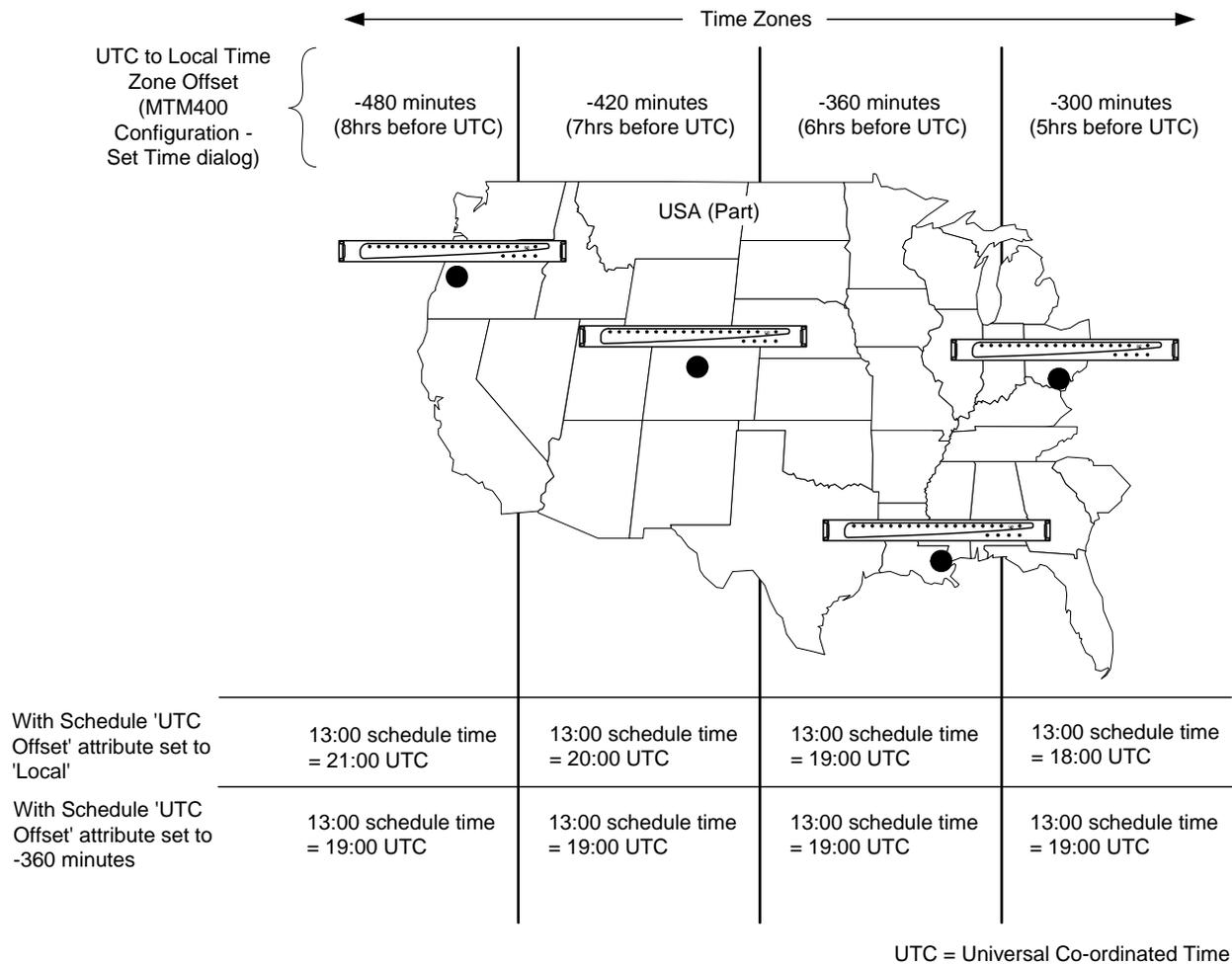


Figure 3-42: Scheduling and time zones

For example, if **UTC Offset** is set to 60, then schedule times defined are one hour ahead of UTC. This means that if a schedule time of 11:00 is specified, the appropriate configuration should be loaded at 11:00 - 60 minutes = 10:00 UTC.

This method of operation is useful where there are multiple RTM devices monitoring a transmission chain that spans several time zones, and configurations that check features of the transport stream have to be loaded by each RTM device at the same instant in time.

Triggered Recording

To examine offline events that occur in a stream, recordings can be made whose start is triggered by the event itself, manually, or by an alarm. The recording is held in RAM and can be downloaded from the MTM400 to the client PC for storage and further analysis. The file is stored as a valid MPEG file; however extra information is encoded in the file to allow Tektronix MPEG analysis products to reconstruct the real-time timing artifacts present at the time of recording.

The Triggered Recording setup is accessed by the **Recording...** button on the Stream button bar. The **Triggered Recording** dialog box contains two panels: **Settings** and **Operation**.

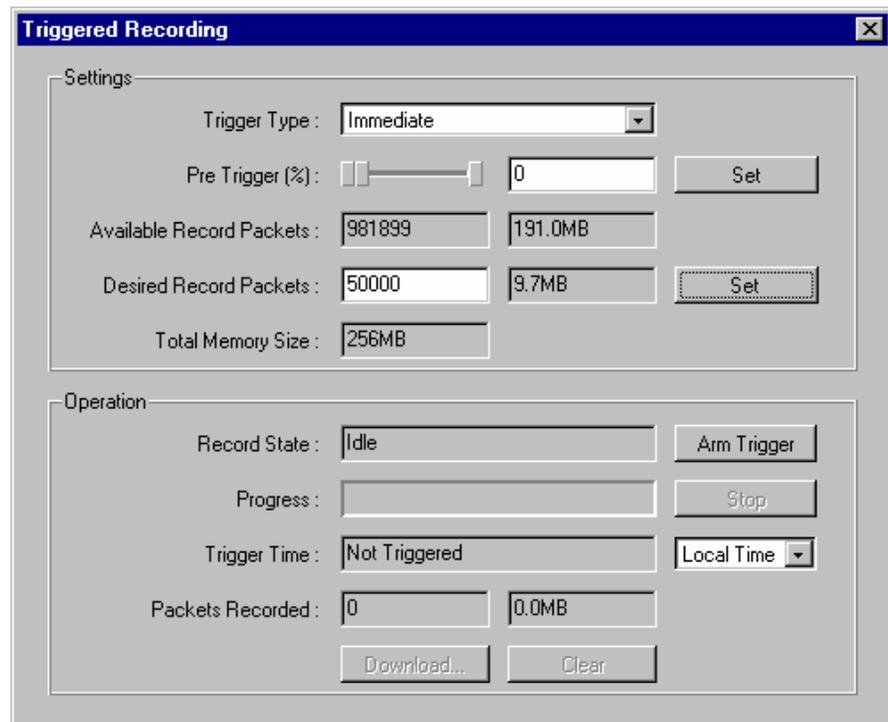
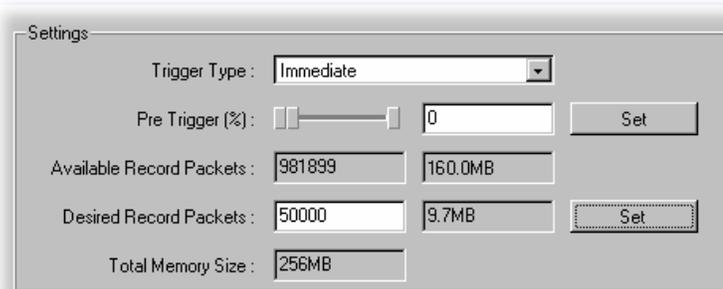


Figure 3-43: Triggered Recording dialog box

Triggered Recording Settings

The **Settings** section of the **Triggered Recordings** dialog box is used to set up the trigger event, including the pre-trigger properties and the amount of memory to be reserved for the recording.



The screenshot shows a dialog box titled "Settings" with the following controls:

- Trigger Type: A drop-down menu set to "Immediate".
- Pre Trigger (%): A slider and a text box containing "0", with a "Set" button to its right.
- Available Record Packets: A text box containing "981899" and a label "160.0MB".
- Desired Record Packets: A text box containing "50000" and a label "9.7MB", with a "Set" button to its right.
- Total Memory Size: A text box containing "256MB".

Trigger Type The event that triggers the recording can be one of four types, selected from the drop-down list.

Immediate

The trigger is set as soon as **Arm Trigger** is selected on the **Operations** section; in effect, recording will start immediately.

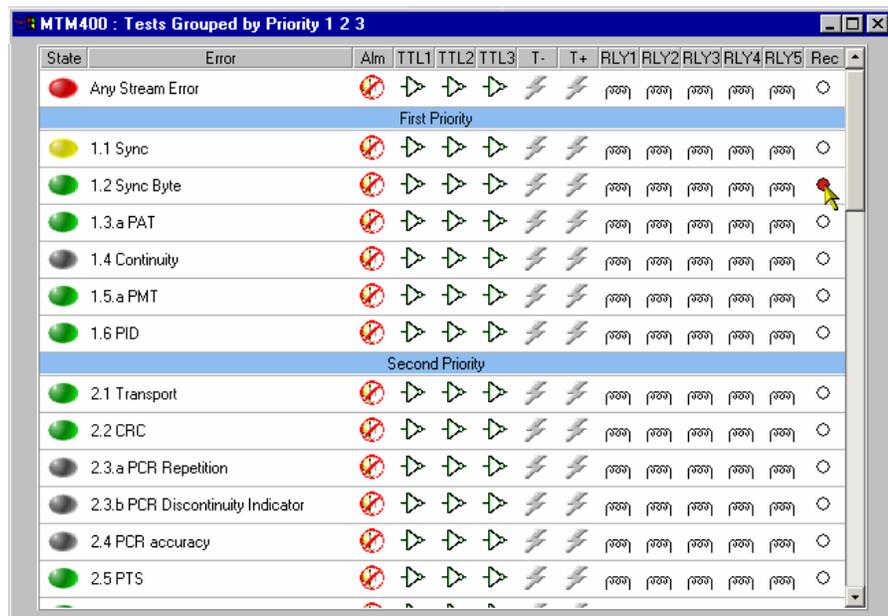
External Rising Edge / External Falling Edge

The trigger is set when **Arm Trigger** has been selected on the **Operations** section. Recording will start when a rising / falling edge is detected at the TTL input on the TS Processor, Alarms connector (see the *MTM400 Technical Reference* for specifications).

Event Alarm

The trigger is set when **Arm Trigger** has been selected on the **Operations** section. Recording will start when an error occurs on an event that has been flagged in the Tests or Custom views.

Trigger events are flagged in the Tests or Custom view by activating the **Rec** function associated with the event. In the following screen shot, test numbers 1.2 and 2.3a are set. With **Event Alarm** selected, recording will start if an error event occurs on either test.



The **Rec** icon is toggle action; it is activated/deactivated by double-clicking it.

Pre Trigger (%) A percentage of a stream can be recorded before a trigger event occurs. (See *Pre-Trigger Recordings*, page 3-108.)

Set or enter the percentage of the recorded file that is to be pre-recorded and select **Set** to confirm the setting.

Available Record Packets

Two fields indicating the maximum number of packets (at 204 bytes/packets) that can be recorded in the reserved memory and the amount of memory that will be used.

Desired Recording Packets

Two fields indicating the number of packets (at 204 bytes/packets) that are to be recorded in the reserved memory (**Total Memory Size**) and the amount of memory that will be used.

Enter the number of packets required and select **Set** to confirm the setting.

NOTE. Any value can be entered in the **Desired Record Packets** field. The required memory will be calculated and displayed, even if it exceeds the available memory. However, when recording actually starts, the entered value is automatically adjusted to reflect the available memory.

Total Memory Size

Displays the total available system memory.

Pre-Trigger Recordings

A percentage of a stream can be recorded before a trigger event as specified by the Pre-Trigger setting. The start of recording is dependent upon the selected trigger type. However, the stream is being recorded in memory at all times; the available memory is used as a circular buffer, in that it is filled and written over continuously until a trigger event occurs.

NOTE. A Circular Buffer is an area of memory that stores a continuous stream of data by starting again at the beginning of the buffer after reaching the end.

As soon as the trigger event occurs, recording will begin. Recording continues until the memory buffer is full. The recording will remain in memory until it is manually cleared, typically after it is uploaded to a client PC.

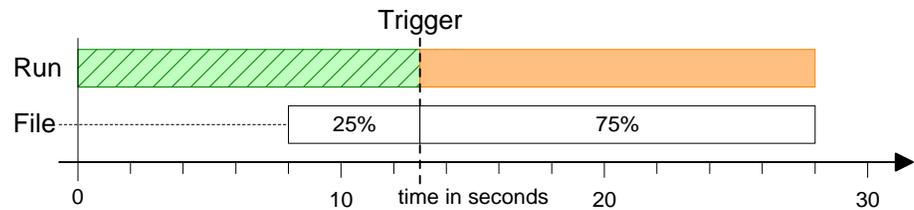
The Pre-trigger set up can be changed only when no recording activity is in progress.



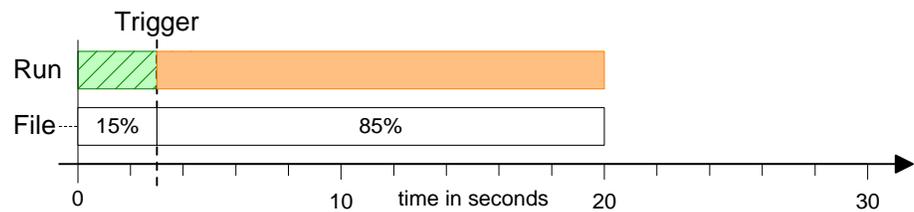
The Pre-trigger setting allows the proportion of data saved before a trigger event to be specified as a percentage of the final recorded file. Editing the value or dragging the slider in the tab can change the proportions.

The proportion of pre-trigger data may be less than specified if the trigger event occurred before enough packets were recorded in the circular buffer (particularly after clearing the buffer).

For example, if the available memory will hold a 20 second recording, with 25% pre-trigger specified and an event-triggered recording starting five seconds or more into the run, the contents of the recorded file will be:

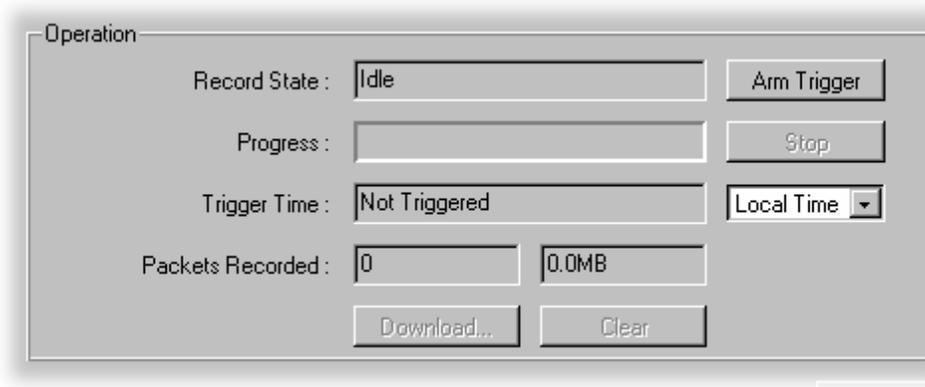


If the Trigger event was detected earlier than five seconds into the run, the 20 second file will contain all of the data up to the Trigger. If recording was triggered at three seconds only the first 15% of the file would hold pre-trigger data. The file contents would be:



Triggered Recording Operation

The **Operation** section of the **Triggered Recordings** dialog box is used to arm the trigger before recording and shows the status of the recording activity.



- Arm Trigger** Use this button to set or arm the trigger event set up in the Settings panel.
- Stop** Use this button to disarm the previously armed trigger or to stop the current recording. Any recording made up to the point when the button is pressed will be available for analysis.
- Record State** This field indicates the current state of the Pre-trigger function. Possible states are:
- Idle** - Pre-Trigger not armed.
 - Waiting to Trigger** - Armed and waiting for the trigger event to occur.
 - Recording in Progress...** - Trigger event has occurred and recording is in progress.
 - Recording complete** - The recording is complete and available for downloading and clearing.
- Progress** Displays the progress of recording.

- Trigger Time** Displays the time that the trigger event occurred.
- The time zone in which trigger times are presented can be selected from the drop-down list:
- Local** - the time local to the machine on which MTM400 Remote User Interface is currently running.
- UTC** - Universal Coordinated Time.
- RTM Device** - the time local to the RTM device being monitored.
- Packets Recorded** Displays the number of packets recorded and the amount of memory used.
- Download...** Select and enter the location to which the recorded stream is to be saved.
- Clear** Clears the current recording. Background recording (for the pre-trigger) will start again immediately.

Interface Configuration and Interpretation

This section describes the configuration and interpretation of results of the interface cards that may be installed in the MTM400.

The interface settings described are as follows:

- QPSK (L-Band) (see page 3-115)
- QAM (Annex A) (see page 3-120)
- QAM (Annex B II) (see page 3-124)
- QAM (Annex C) (see page 3-120)
- COFDM (Coded Orthogonal Frequency Division Multiplexing) (see page 3-128)
- 8PSK (Phase Shift Keying) (see page 3-135)
- 8VSB (Vestigial Side Band) (see page 3-132)
- Gigabit Ethernet (GigE) (see page 3-139)

The interface card options available for the MTM400 fall into two broad categories. Standard interface (serializer or SZ) cards and Common interface protocol (CIP) cards. The Standard interface cards include the QPSK (L-Band), QAM (Annexes A) and QAM (Annex C) cards. The Common Interface Protocol Cards include the QAM (Annex B), COFDM, 8PSK, 8VSB, and GigE IP cards.

Also available are the built-in SMPTE (Society of Motion Picture and Television Engineers) and ASI (Asynchronous Serial Interface) interfaces. No user settings are associated with either of these interfaces.

(Refer to the *MTM400 MPEG Transport Stream Monitor Technical Reference* for the interface technical specifications.)

The input card screen and configuration of the card will depend on which interface card is installed.

All cards can be configured from the interface configuration screen:

1. Select **Config...** button; the Configuration screen is displayed.
2. Select the interface card from the Interface drop-down list.
3. Select the adjacent **Config...** button; the Configuration screen is displayed.

Note. *CIP cards can also be configured from the Input Card screen.*

To summarize:

- All cards can be selected and configured using the configuration screen (use the Config button).
- The results and measurements of the installed card can be observed using the Input Card button.
- CIP card configuration, results and measurements can all be done using the Input Card button.

The Input Card button on the button bar will be inactive (dimmed) if an interface card is installed, but not selected in the Configuration screen. The button will not be present if no interface card is installed. Also, when active, the button will only display red and green states; this indicates the interface card stream lock status (also displayed on the configuration screen).

In the Input Card screen, the settings area (right side) contains two sub-areas. The Readings area displays values received from the card itself.

In the Readings area, the LED colors are as follows:

Green	On
Gray	Off or not applicable

The Readings background colors are as follows:

White	In range
Red	Out of range. For example, too much or too little power or out of order packets per second being greater than zero
Yellow	Not recently updated
Gray	Not applicable. For example, out of order packets not being available when the UDP protocol is selected

The Controls area contains user controls; values entered here will be applied to the card and affect its performance. These controls correspond exactly with those on the corresponding configuration screen. The background can be grayed out if the setting is not applicable; for example, when MAC Selection is set to Source, the MAC source setting is enabled and the MAC destination setting is disabled.

QPSK (L-Band)

The QPSK (L-Band) Interface option allows you to connect to QPSK equipment operating in the L-Band (950 MHz to 2150 MHz). It will internally I-Q demodulate the signal with its on-board AGC control, Viterbi decoder, and FEC decoder.

The module will tune the full Satellite IF band, which is considerably wider than the L-Band itself. LNB support is included, allowing the module to be used with a stand-alone TVRO (television receive only) dish.

The input to the interface card is looped through to the output connector, allowing subsequent processing of the input signal.

The L-Band Interface allows you to monitor and/or record the transport streams from within the L-Band signal.

Bit Error Rate (BER) values are available during operation.

Configuration - QPSK (L-Band)

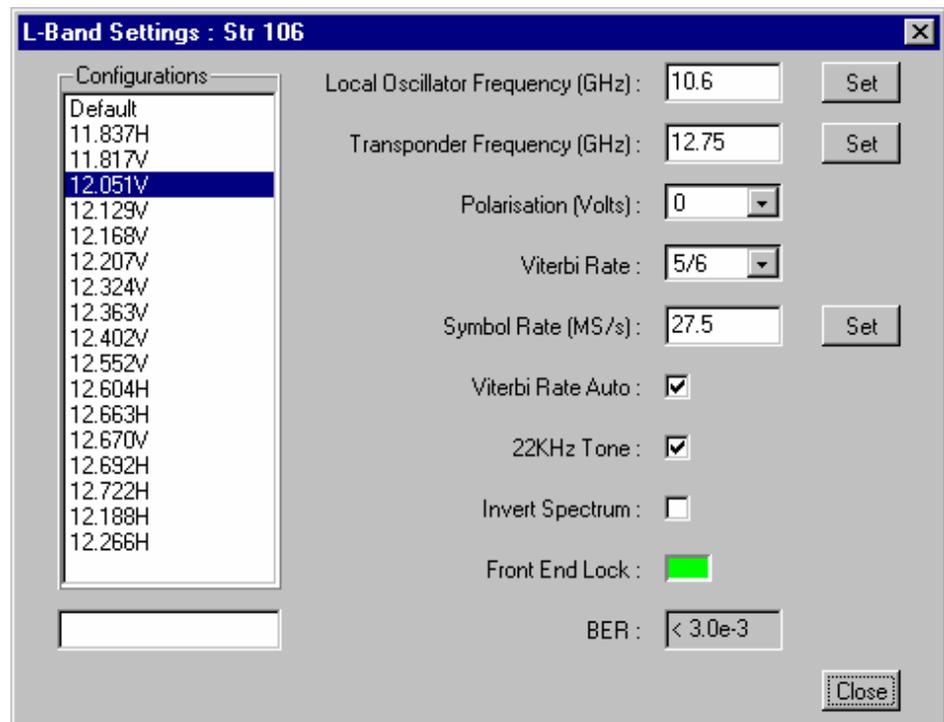


Figure 3-44: Interface configuration - QPSK (L-Band)

Configurations Allows you to select from a range of preset L-Band configurations.

The configurations are made available by the MTM400 configuration file (see *MTM400 Configuration Files*, page 3-87.).

You can activate an L-Band configuration by highlighting the name in the **Configurations** field; the field below will display the message 'Updating values' until the settings are recalled.

Local Oscillator Frequency (GHz)

The Local Oscillator (LO) frequency of the Low Noise Block (LNB) is dependent on the Transponder frequency and must be such that the difference falls within the input range of the receiver. Typically, these values are 10.6 GHz (Hi-Band) and 9.75 GHz (Lo-Band) when converting from KU band. The values are 5.7 GHz (Hi-Band) and 5.15 GHz (Lo-Band) respectively when converting from C-Band. This information should be confirmed for the specific type of LNBs used.

Enter the required value and select **Set**.

Transponder Frequency (GHz)

The IF frequency that is used to initialize the L-Band Interface card is calculated as follows:

$$\text{Transponder_Frequency} - \text{LO_Frequency.}$$

If you want to specify the IF frequency rather than the individual LO and Transponder frequencies, set the Local Oscillator Frequency to a value of 0 (zero) and specify the required IF frequency under this parameter. If the IF frequency is specified, it must be in the range 0.950 GHz to 2.150 GHz; the tuning increment is 125 kHz.

Enter the required value and select **Set**.

Polarisation (Volts)

This parameter selects the polarization by applying 13 V (vertical) or 18 V (horizontal) to the LNB (Low Noise Block). A value of 0 can be used if no voltage is to be applied from this card; for example, if the polarization voltage is being supplied from an external source.

Viterbi Rate Select the code rate from the drop-down list: 1/2; 2/3; 3/4; 5/6; 6/7; 7/8. Note that it may be overwritten if the Viterbi Rate Auto selection is enabled.

Symbol Rate (MS/s)

Symbol rate value in mega symbols per second.
Enter the required value and select **Set**.

Viterbi Rate Auto

When enabled, the L-Band adapter automatically establishes the Viterbi Rate when acquiring Front End Lock.

NOTE. *The Viterbi Rate Auto option will not work correctly if the Viterbi rate is 5/6. If this rate (5/6) is known, or suspected, then the Auto option should not be used.*

22KHz Tone

The Local Oscillator Frequency is selected by applying a 22 kHz tone.

Invert Spectrum

The sense of modulation may be inverted due to the number of mixing stages in the installation. Enabling the Invert Spectrum checkbox will invert the L-Band output.

Front End Lock

If the L-Band adapter Front End is able to acquire full lock onto the channel and is receiving the signal correctly, the **Front End Lock (FEL)** indicator will light up green. When a signal is present but no lock is achieved the indicator is red. When no signal is found, the indicator is gray.

BER

Bit Error Rate.

Input Card Screen - QPSK (L-Band)

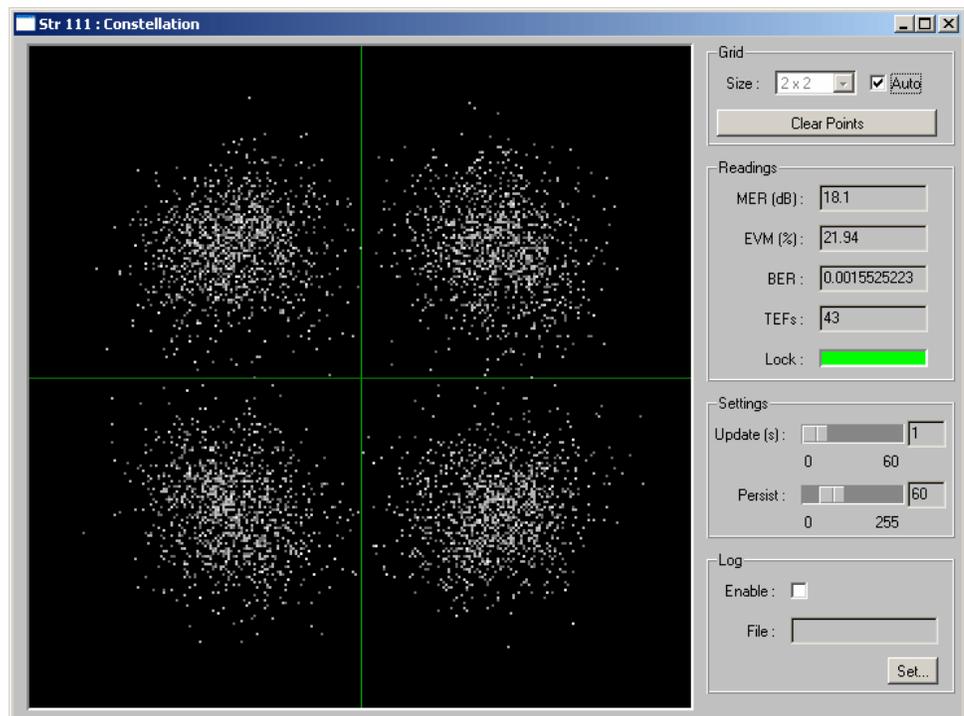


Figure 3-45: Input card screen - QPSK (L-Band))

The constellation display in the graphing area is a representation of the digitally modulated carrier's instantaneous phase and amplitude for each transmitted symbol. A good constellation will have well-defined dot clusters in tight formations; each cluster should be centered in a grid overlay square. The overall shape of the dot clusters should form a square as represented by the outer edges of the grid.

The Grid area of the screen contains the following controls:

- Size** This selection will be dictated by the installed interface card. If the **Auto** checkbox is selected, the grid size can be selected from the drop-down list.
- Clear Points** Clears all points from the display grid.

The Readings area of the screen contains the following controls:

- MER (dB)** (Modulation Error Ratio) Provides a single 'figure of merit' for received signal. It is the ratio of 'ideal signal vectors' to 'errored signal vectors' expressed in dB. MER is similar to a signal-to-noise measurement (ref: TR 101 290).

EVM (%)	(Error Vector Magnitude) Closely related to, and can normally be calculated from, MER. It is a ratio of 'errored signal vectors' to maximum signal amplitude expressed as a percentage (ref: TR 101 290 Annex).
BER	(Bit Error Rate) Provides an indication of the Forward Error Correction workload.
TEFs	(Transport Error Flag or TEI transport error indicator) Indicates the Forward Error Correction failure.
Lock	If the interface is able to acquire full lock onto the channel and is receiving the signal correctly, the Lock indicator will light up green. Red indicates that lock cannot be achieved. Gray indicates that a signal is not present.

The Settings area of the screen contains the following controls:

Update (s)	Allows you to set the period in seconds between samples of the incoming signal.
Persist	Allows you to set the time that the dots persist on the grid display.

The Log area of the screen contains the following controls:

File	Constellation data can be written to the file identified in this field; data is saved in csv format.
-------------	--

QAM (Annex A and Annex C)

The QAM Annex A and Annex C interfaces have common settings. The Annex A interface appears as shown in Figure 3-46:

Configuration - QAM (Annex A and Annex C)

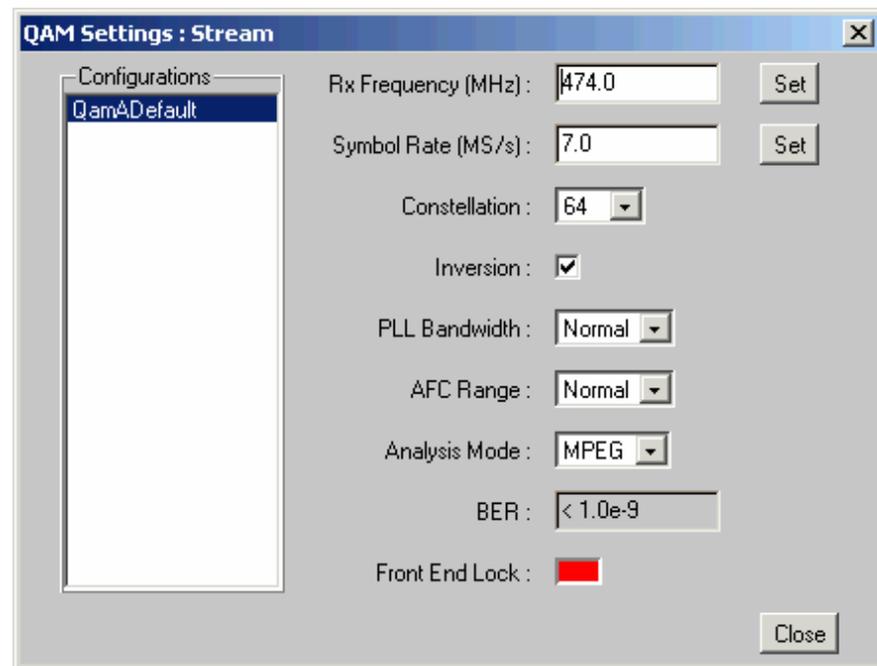


Figure 3-46: Interface configuration - QAM (Annex A and Annex C)

Configurations The **QAM Settings** dialog box provides an option to recall a number of settings configuration files. The configuration files are created and stored in the MTM400. To select a configuration file, highlight the required name in the list.

Rx Frequency (MHz)

Receive frequency.
Enter the required value and select **Set**.

Symbol Rate (MS/s)

Symbol rate value.
Enter the required value and select **Set**.

Constellation	Provides the option to set the modulation scheme: 4-QAM, 16-QAM, 64-QAM or 256-QAM. Select the required value from the drop-down list.
Inversion	The sense of modulation may be inverted due to the number of mixing stages in the installation. Enabling the Inversion checkbox will allow the demodulator to lock onto a received signal with an inverted spectrum.
PLL Bandwidth	This control modifies the bandwidth of the carrier phase recovery loop, which is responsible for de-rotating the incoming symbols to establish a steady constellation. Two settings are available: Normal and Wide . In Normal mode, the loop bandwidth is approximately 3 kHz, which gives optimum immunity to noise in the channel for most applications. In some cases, the loop bandwidth may be too narrow to follow the jittered signal, in which case the Wide bandwidth setting should be selected. This increases the loop bandwidth to about 10 kHz, which enables the MTM 400 to more easily acquire and track a jittered constellation, but makes the demodulator more susceptible to thermal noise. Normal is the default setting and is recommended for most applications.
AFC Range	Two carrier recovery ranges are available: Normal and Wide . In Normal mode, the range is approximately ± 150 kHz. In Wide mode, the range is increased to ± 500 kHz. Normal setting is the default setting and is recommended for most applications.
Analysis Mode	Two settings are available: MPEG mode and QAM mode . In MPEG mode, the lock condition is declared as “No Lock” if a valid transport stream cannot be detected. This prevents spurious streams from being fed to the MPEG processor for analysis. In QAM mode, the validity of the MPEG stream is ignored, possibly resulting in spurious MPEG analysis, but allowing lock to be asserted if the QAM receiver front end sees a valid QAM signal. This allows the display of RF data and constellations even if the MPEG data is not valid. In QAM mode, the MTM400 behaves more like a conventional QAM analyzer. MPEG mode is the default setting and is recommended for most applications. The range controls, PLL bandwidth and AFC range, are operable in both MPEG and QAM analysis modes.
BER	Bit Error Rate (pre Reed Solomon).

Front End Lock If full lock onto the channel is acquired and it is receiving the signal correctly, the **Front End Lock (FEL)** indicator will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

(Refer to the *MTM400 MPEG Transport Stream Monitor Technical Reference* for more details about the QAM interfaces.)

Input Card Screen - QAM (Annex A and Annex C)

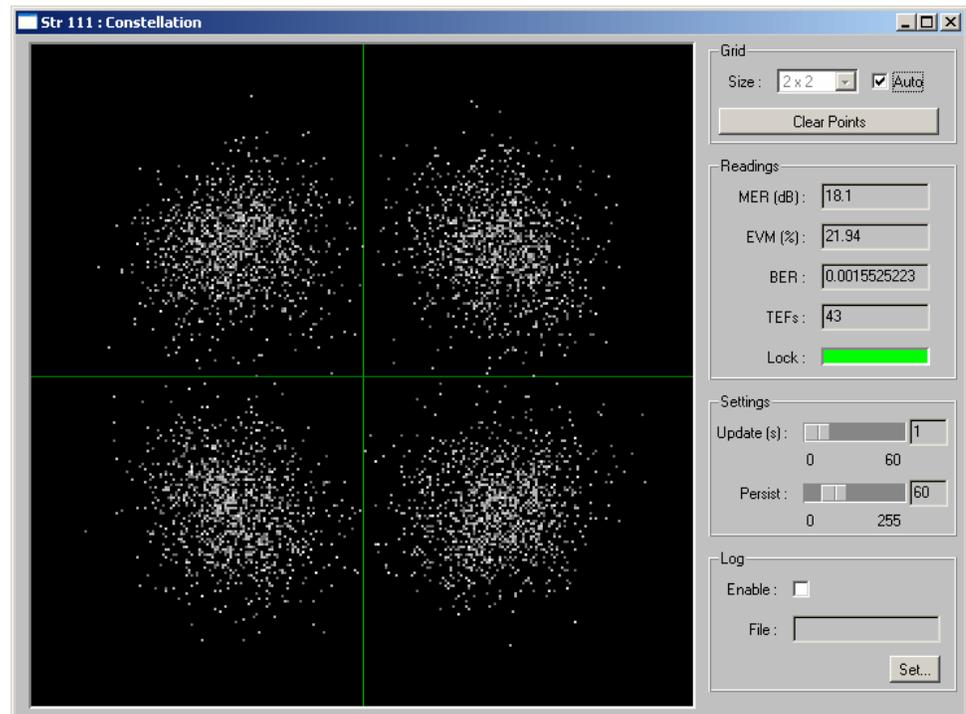


Figure 3-47: Input card screen - QAM (Annex A and Annex C)

The constellation display in the graphing area is a representation of the digitally modulated carrier's instantaneous phase and amplitude for each transmitted symbol. A good constellation will have well-defined dot clusters in tight formations; each cluster should be centered in a grid overlay square. The overall shape of the dot clusters should form a square as represented by the outer edges of the grid.

Grid

Size This selection will be dictated by the installed interface card. If the **Auto** checkbox is selected, the grid size can be selected from the drop-down list.

Clear Points	Clears all points from the display grid.
Readings	
MER (dB)	(Modulation Error Ratio) Provides a single 'figure of merit' for received signal. It is the ratio of 'ideal signal vectors' to 'errored signal vectors' expressed in dB. MER is similar to a signal-to-noise measurement (ref: TR 101 290).
EVM (%)	(Error Vector Magnitude) Closely related to, and can normally be calculated from, MER. It is a ratio of 'errored signal vectors' to maximum signal amplitude expressed as a percentage (ref: TR 101 290 Annex).
BER	(Bit Error Rate) Provides an indication of the Forward Error Correction workload.
TEFs	(Transport Error Flag or TEI transport error indicator) Indicates the Forward Error Correction failure.
Lock	If the QAM interface is able to acquire full lock onto the channel and is receiving the signal correctly, the Lock indicator will light up green. Red indicates that lock cannot be achieved. Gray indicates that a signal is not present.
Settings	
Update (s)	Allows the period in seconds between samples of the incoming signal to be set.
Persist	Allows the time that the dots persist on the grid display to be set.
Log	
File	Constellation data can be written to the file identified in this field; data is saved in csv format.

QAM (Annex B II)

The QAM (Annex B II) Settings dialog box is shown in Figure 3-48.

Configuration - QAM (Annex B II)

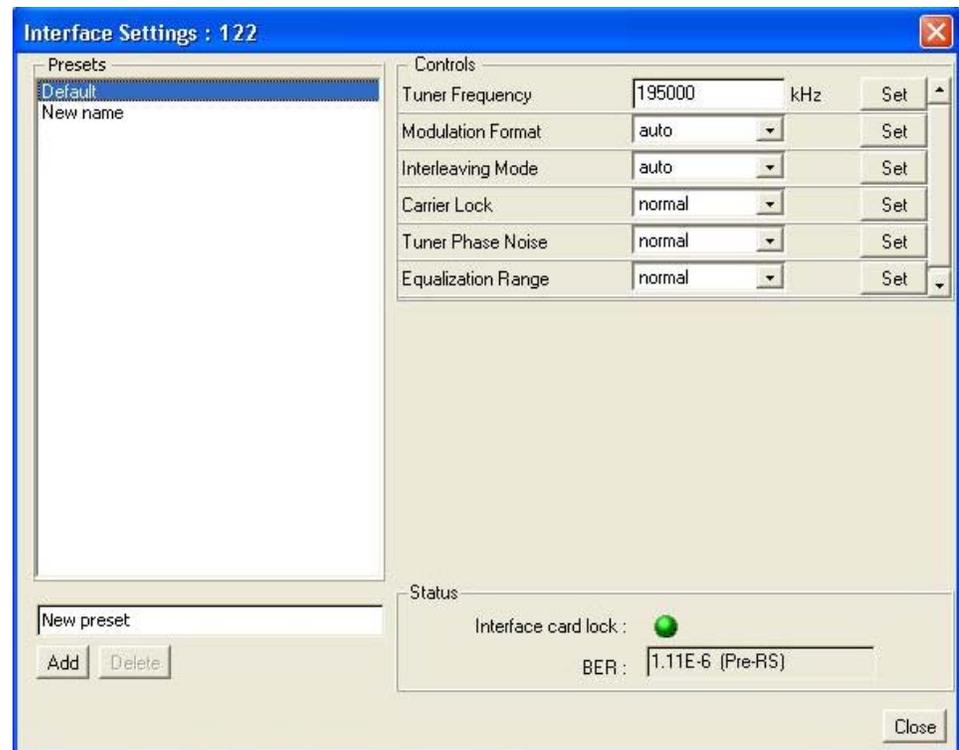


Figure 3-48: Interface configuration – QAM Annex B II

For each of the settings, enter the required change and select **Set** to apply the new value. The settings are as follows:

NOTE. *These settings can also be made from the Input Card screen.*

Configurations: The QAM Settings dialog box provides an option to recall a number of settings configuration files. The configuration files are created and stored in the MTM400. To select a configuration file, highlight the required name in the list.

Tuner Frequency (kHz):

This value, set in kHz units, is the center frequency of the channel to be received. Any frequency can be entered. There is no need to follow a channel plan. The frequency resolution is determined by the tuner step size of 62.5 kHz.

Modulation Format:

This drop-down list allows 64 QAM or 256 QAM operation to be selected. Note that SCTE07 and ITU-Tj83 annex B specify exact symbol rates for the two modulation formats, so there is no dialog box to enter the symbol rate separately.

Interleaving Mode:

Interleaving assists in the correction of burst noise induced errors. All interleaving modes mentioned in SCTE 07 are supported, including all Level II modes up to $I = 128$ $J = 6$.

Carrier Lock:

This allows the carrier lock range to be increased from the normal ± 150 kHz to approximately ± 500 kHz. This is useful if you are attempting to lock on to badly mistuned or wandering carriers.

Tuner Phase Noise:

This control modifies the carrier loop bandwidth to allow the acquisition of nosiy carriers. Normal mode is recommended for general use.

Equalization Range:

The channel equalizer can be configured to give a long equalization range, at the expense of equalizer resolution, or, in normal mode, optimized for typical cable environments. Normal mode is recommended for general use.

Interface Card Lock

If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

BER (Pre-RS)

Bit Error Rate after the FEC block. The Pre-RS BER is calculated by counting the number of errored blocks, that can not be corrected by the FEC.

Input Card Screen - QAM Annex B II

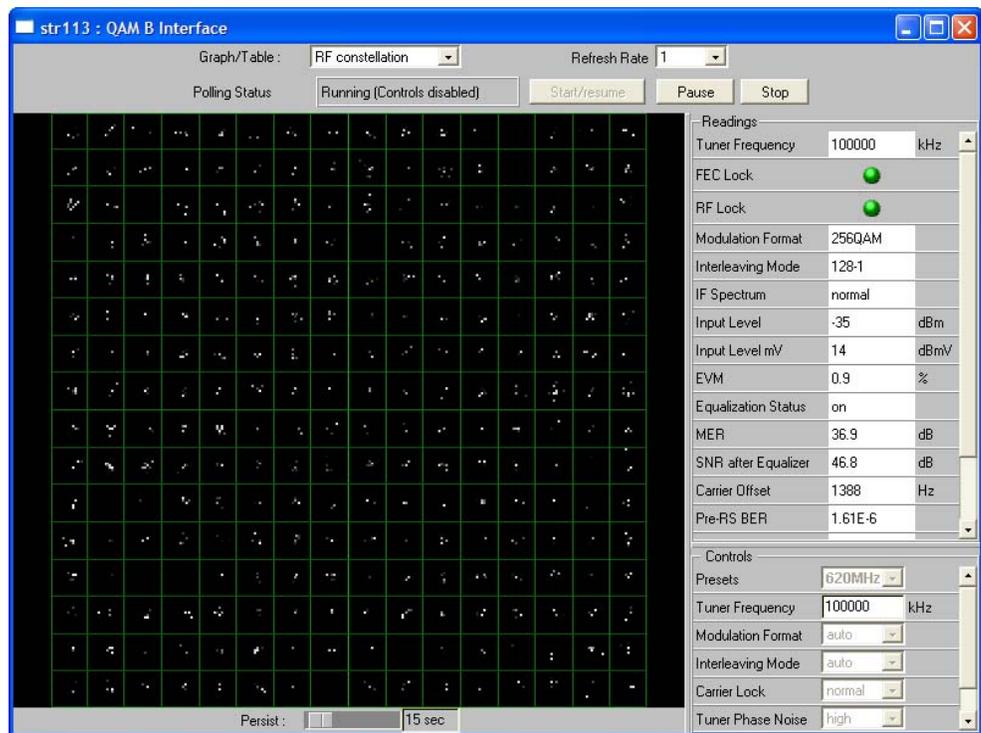


Figure 3-49: Input card screen - QAM Annex B II (example)

Two LED indicators are available on the Readings section of the screen:

- FEC Lock** Forward Error Correction Lock, which displays the status of the deinterleaver and Reed Solomon decoder.
- RF Lock** If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

The following graphs, which can be selected from the **Graph** drop-down list, are available when the QAM (Annex B) interface card is installed:

- RF Constellation** I and Q data are collected from the QAM front end and displayed as a conventional constellation of 256 points by 256 points. The samples collected are not real time, so there is some dwell (delay) before a complete constellation is displayed. The persistence of the display can be varied using the **Persist** slider control at the bottom of the graph.

MER and EVM calculations are performed on the constellation data according to the formulas given in ETR290-101.

SNR after equalizer

This graph represents the signal-to-noise ratio over time, typically over 256 seconds. It is useful for examining signal-to-noise trends; for example, if an alarm condition has been breached, the graph can be used to examine trends in the signal-to-noise performance before the alarm occurred.

Equalizer

This graph shows the status of the equalizer taps, and gives an estimate of the channel state. If there are echoes or other time related distortions on the signal, the Equalizer display will display the amplitude of the corresponding tap correction values versus time.

NOTE. *The Equalizer graph amplitude values are approximate.*

MER

This graph gives a time record of MER over the last 255 seconds.

Select the graph to be displayed from the Graph drop-down menu.

Polling Status

Reports the status of channel polling. Polling can be started, paused, and stopped using the adjacent buttons (see page 3-82).

COFDM

The COFDM (Coded Orthogonal Frequency Division Multiplexing) Settings dialog box is shown in Figure 3-50.

Configuration - COFDM

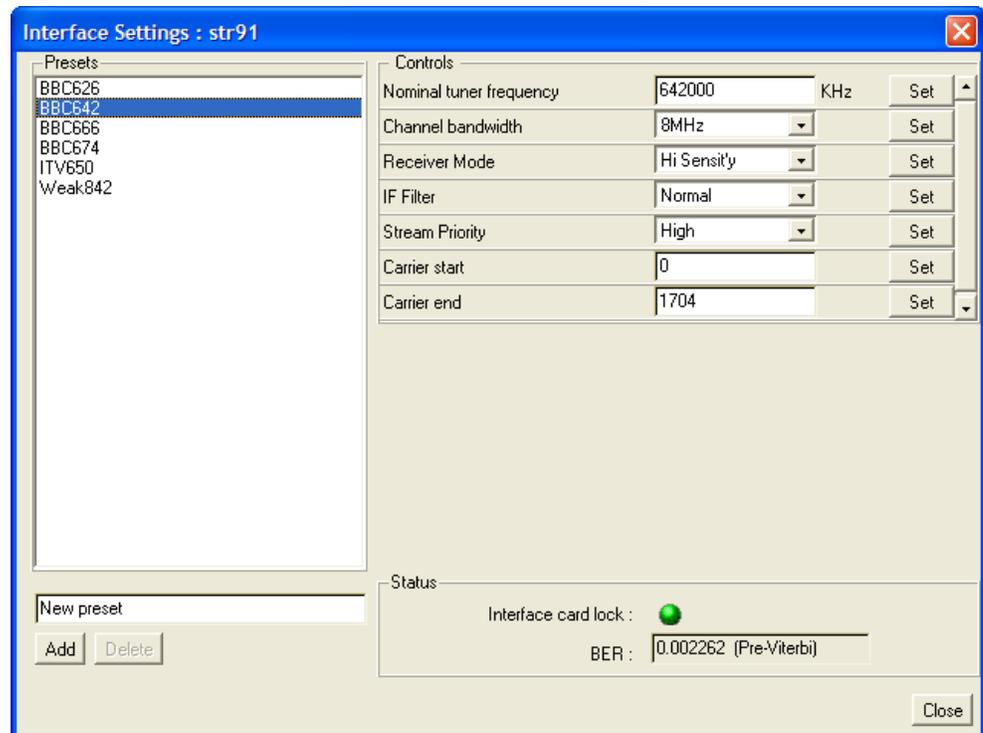


Figure 3-50: COFDM interface configuration (example)

For each of the settings, enter the required change and select **Set** to apply the new value.

NOTE. *These settings can also be made from the Input Card screen.*

Nominal Tuner Frequency:

This value, set in kHz units, is the center channel frequency of the DVB-T channel to be received. For example, to receive channel E21, set this value to 474000 kHz. Any frequency can be entered. There is no need to follow a channel plan. The frequency resolution is determined by the tuner step size.

Channel Bandwidth:

The COFDM interface card supports operation in 8 MHz, 7 MHz, and 6 MHz channels. Select the desired channel bandwidth from the drop-down menu.

Receiver Mode: To achieve high accuracy measurements, particularly for MER and SNR measurements, the COFDM IF card supports two modes of operation.

For conventional COFDM reception, a relatively low ultimate SNR is acceptable. For example at 64QAM, an ultimate receiver SNR of 30 dB can result in a reduction in system performance of only 0.5 dB. However, for more detailed analysis of COFDM constellations, a much higher ultimate SNR is required, preferably in excess of 40 dB. For this reason, two modes of COFDM operation are provided.

High Sensitivity mode gives the full dynamic range of a conventional COFDM receiver, but at the expense of ultimate SNR. The **High Resolution** mode modifies the signal path to dramatically reduce the noise generated in the receiver, giving a much higher ultimate SNR, but at the expense of receiver sensitivity. So for general purpose monitoring where the input signal may vary over a wide range, typically -75 dBm and lower, high sensitivity mode is preferred.

If the signal is consistently greater than -50 dB, high resolution mode provides better RF measurement performance.

IF Filter

The COFDM receiver incorporates two stages of selectivity. One of these can be bypassed in WIDE mode to give a more accurate representation of the input spectrum flatness (at the expense of overall selectivity).

Stream Priority

When hierarchical modulation is present, the transport stream priority, HIGH or LOW, can be selected for analysis by the MPEG analyzer tools. When no hierarchy is present, this defaults to HIGH priority.

Carrier start

When observing carrier amplitudes ahead of the channel equalizer, this value sets the numerical value of the first carrier to be displayed, and defaults to zero.

Carrier end

When observing carrier amplitudes ahead of the channel equalizer, this value sets the numerical value of the last carrier to be displayed, and defaults to the maximum carrier number in the COFDM signal (1704 for 2K, 6816 for 8K modes).

Interface Card Lock

If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

BER (Pre-Viterbi)

This indicator reads the BER in the channel, before any error correction is applied.

Input Card Screen - COFDM

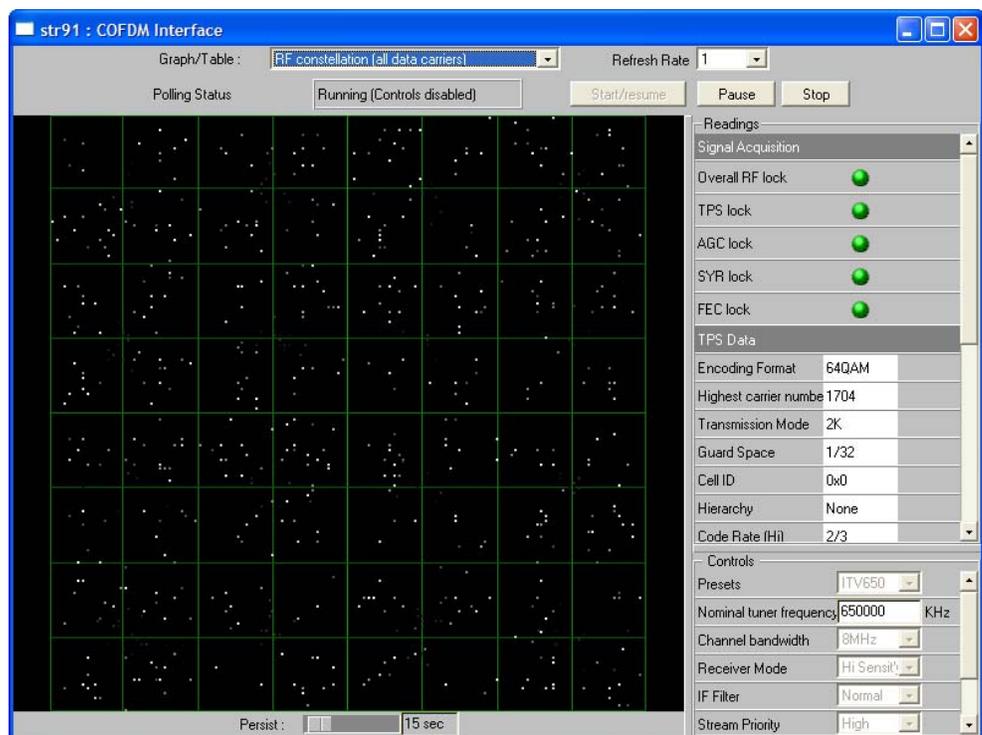


Figure 3-51: Input card screen - COFDM (Example)

Five LED indicators are available on the Readings section of the screen:

Overall RF Lock:

All the lock indicators are showing “in lock”, and the signal is being received normally.

TPS Lock

Transmission Parameter Lock, showing true if the ruggedly modulated TPS is being received.

AGC Lock

Automatic Gain Control lock, showing the received signal is within AGC control range.

- SYR Lock** Symbol Recovery Lock, showing that the FFT symbol recovery system is in lock, allowing constellation data to be extracted.
- FEC Lock** Showing the Reed Solomon Forward Error Correction system is in lock, and applying error correction to the received data.

The following graphs are available when the COFDM interface card is installed:

RF constellation (all data carriers)

When the receiver is in RF lock, the constellation points are displayed. According to ETR290, only the data pilots are used for MER and EVM calculation. The samples collected are not real time, so there is some dwell (delay) before a complete constellation is displayed. The persistence of the display can be varied using the Persist slider control at the bottom of the graph.

MER and EVM calculations are performed on the constellation data according to the formulae given in ETR290-101. This calculation specifically excludes the TPS carriers.

Overall SNR (all continuous pilots)

A time-line graph of measured Signal-to-Noise Ratio is displayed, over the preceding 255 seconds.

Overall MER (all data carriers)

A time-line graph of measured Modulation Error Ratio is displayed, over the preceding 255 seconds.

Linear Amplitude response (selected carriers)

A linear amplitude response is shown for the carriers selected using the carrier START and STOP controls. Allows you to view and zoom in on frequency-dependent amplitude distortions.

Impulse response

A channel response graph is shown, allowing time-related distortions, particularly echoes, to be displayed relative to the main signal. Echoes occurring before and after the main signal are displayed. The graph is derived from the linear amplitude response, transformed into the time domain.

8VSB

The 8VSB (Vestigial Sideband) Settings dialog box is shown in the following screenshot:

Configuration - 8VSB

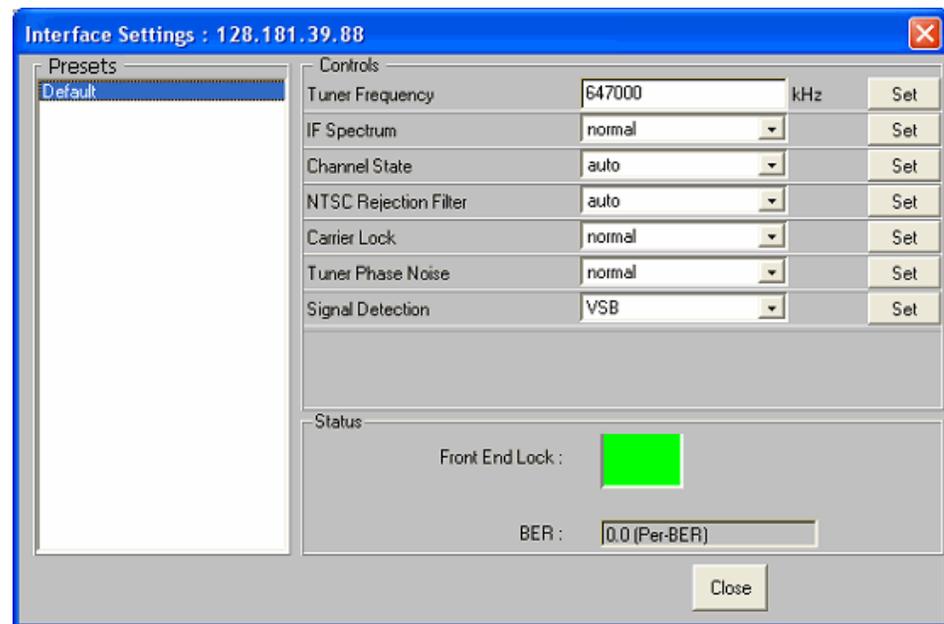


Figure 3-52: 8VSB interface configuration (example)

For each of the settings, enter the required change and select **Set** to apply the new value.

NOTE. *These settings can also be made from the Input Card screen.*

Configurations This dialog box provides an option to recall a number of settings configuration files. The configuration files are created and stored in the MTM400. To select a configuration file, highlight the required name in the list.

Tuner Frequency (kHz)

Enter the required tuned (channel) frequency. Remember to enter the center channel frequency, not the “pilot” frequency.

IF Spectrum

This can be set to **Normal** or **Inverse**, to allow for frequency conversions in the signal chain. Conversions that use difference frequencies invert the spectrum; additive conversions do not.

Channel State Available options are **auto**, **static**, **dynamic** and **fast dynamic**. Using these options you can match the receiver equalizer to the expected channel conditions. The recommended default setting is **auto**.

NTSC Rejection Filter

This setting gives you control over the integrated cochannel NTSC reject filter. Options are **on**, **off** and **auto**. The recommended default setting is **auto**.

Carrier Lock

This setting allows you to control the carrier lock range. The **Normal** setting allows lock over a ± 150 kHz range; **Wide** extends the range to ± 500 kHz. The recommended default setting is **Normal**.

Tuner Phase Noise

Normal and **High**. This control modifies the carrier loop bandwidth to allow the acquisition of nosiy carriers. Normal mode is recommended for general use.

Signal Detection **NTSC** (National Television Standards Committee) and **VSF** (Vestigial Side Band).

Front End Lock

If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

BER

BER is displayed, measured before the Reed Solomon forward error correction block.

Input Card Screen - 8VSB

One LED indicator is available in the Readings section of the screen:

RF Lock This indicates that all decoding systems are in lock and the signal is being decoded normally.

The following graphs are available when the 8VSB interface card is installed:

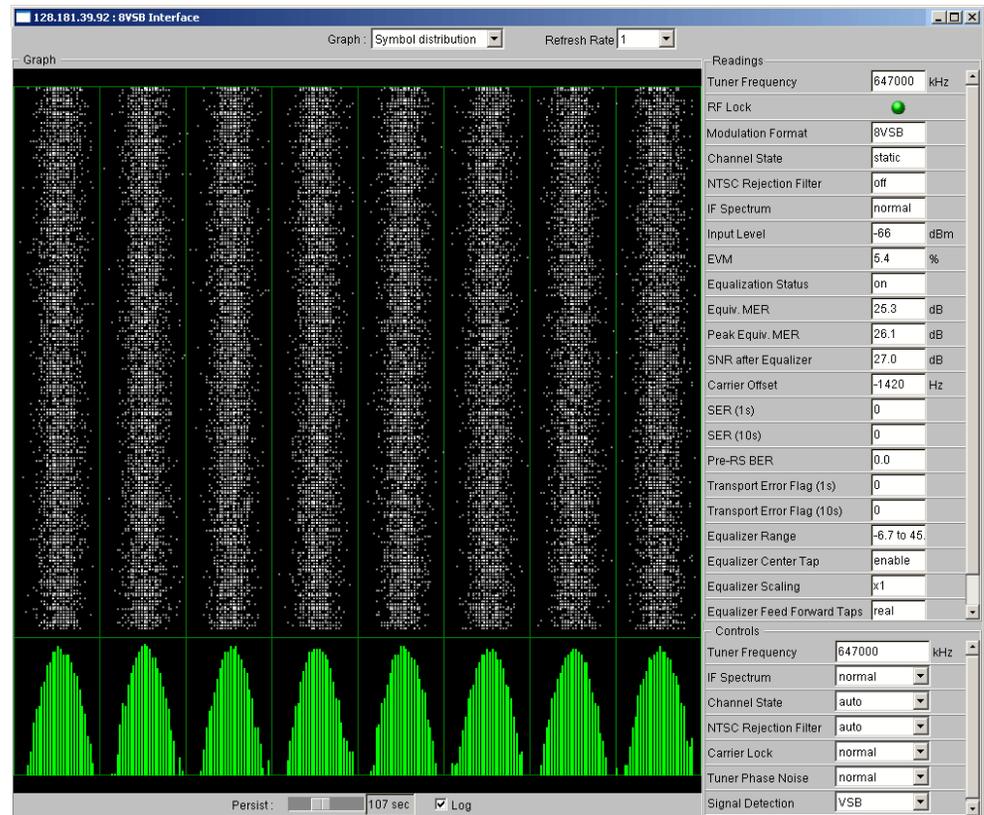


Figure 3-53: Input card screen - 8VSB (Example)

Symbol Distribution

This graph shows the samples received over time in a falling vertical line display. In a noise-free system, all samples would fall on one of the eight vertical lines. However, in normal systems the samples will be displayed distributed around the vertical lines. At the bottom of the graph display, the sample values are accumulated into a distribution histogram. The histogram can be displayed in a linear or logarithmic format.

Signal to Noise (SNR) (after equalizer)

The SNR values are plotted in a pen-trace style, giving a brief history of the collected values.

Equalizer

The equalizer coefficients are plotted across the graph display. The display illustrates the presence of multi-path echoes by indicating how the equalizer is adjusting to cancel them out.

NOTE. *The Equalizer graph amplitude values are only approximate.*

Equivalent MER An MER (Modulation Error Ratio) calculation is performed on the in-phase (I) data samples. The quadrature data samples are ignored in this calculation.

8PSK (Phase Shift Keying)

The 8PSK Settings dialog box is shown in the following screenshot:

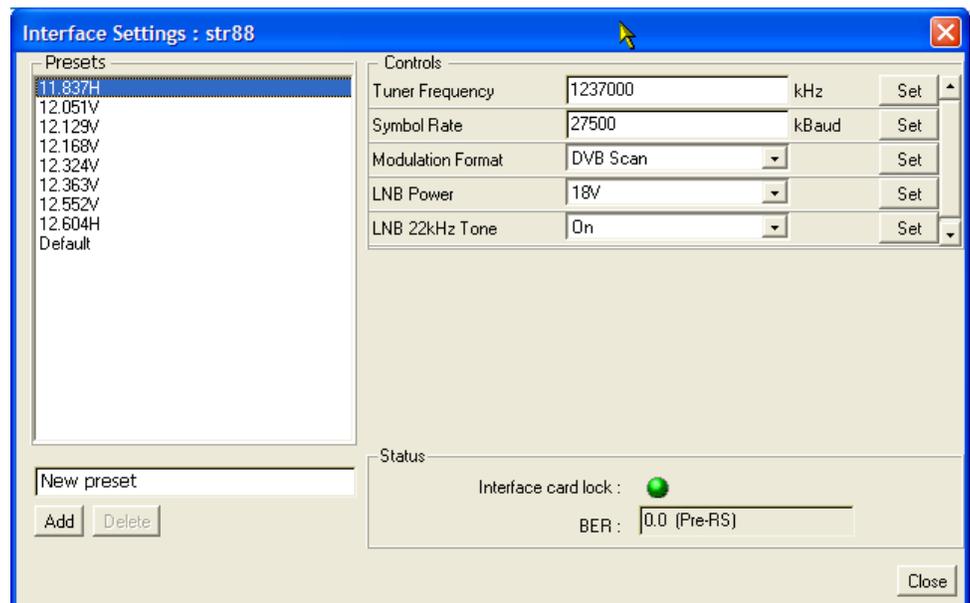


Figure 3-54: 8PSK interface configuration (example)

For each of the settings, enter the required change and select **Set** to apply the new value.

NOTE. *These settings can also be made from the Input Card screen.*

Configurations: This dialog box provides an option to recall a number of settings configuration files; for example, prestored transponder parameters. The configuration files are created and stored in the MTM400. To select a configuration file, highlight the required name in the list.

Tuner Frequency (kHz):

This value is the center frequency of the IF channel to be received (that is, after downconversion in the LNB where applicable). Any frequency can be entered; there is no need to follow a channel plan. The frequency resolution is determined by the tuner step size of 1 MHz.

Symbol Rate (kBaud):

This value is the symbol frequency (Baud rate) of the signal to be received, over a range of 1 to 30 MBaud. You need to enter the symbol rate to a typical accuracy of 1000 ppm to ensure successful lock.

Modulation Format:

The card supports a number of modulation formats: Turbo FEC 8PSK, Turbo FEC QPSK, DVB QPSK and Digicipher™ II. Enter the appropriate format and puncture rate (also known as the code rate) into the modulation dropdown dialog box. A **Scan** function is also provided, allowing automatic acquisition if the precise code rate is not known.

LNB Power:

The QPSK/8PSK card incorporates a regulated power supply for control of a LNB (Low Noise Block) or similar equipment. The supply voltage, using the drop-down dialog box, is selectable between **Off** (default), **13V** and **18V**. The output current is limited to 200 mA maximum, and is foldback limited to a low value in the event of an overload.

LNB 22kHz Tone:

A 22 kHz tone is provided for control of an LNB (Low Noise Block) or similar equipment. The tone, using the drop-down dialog box, is selectable between **Off** (default) or **On**.

Interface Card Lock

If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

BER

The Bit Error Rate ahead of the FEC is displayed.

Input Card Screen - 8PSK

The following LES indicators are available in the Readings section of the screen:

- RF Lock** Indicates when the RF receiver sections are in lock and receiving normally.
- FEC Lock** Indicates when the Forward Error correction (DVB or turbo coded) is in lock and the data is being processed to give Transport Streams.

The following graphs are available when the 8PSK interface card is installed:

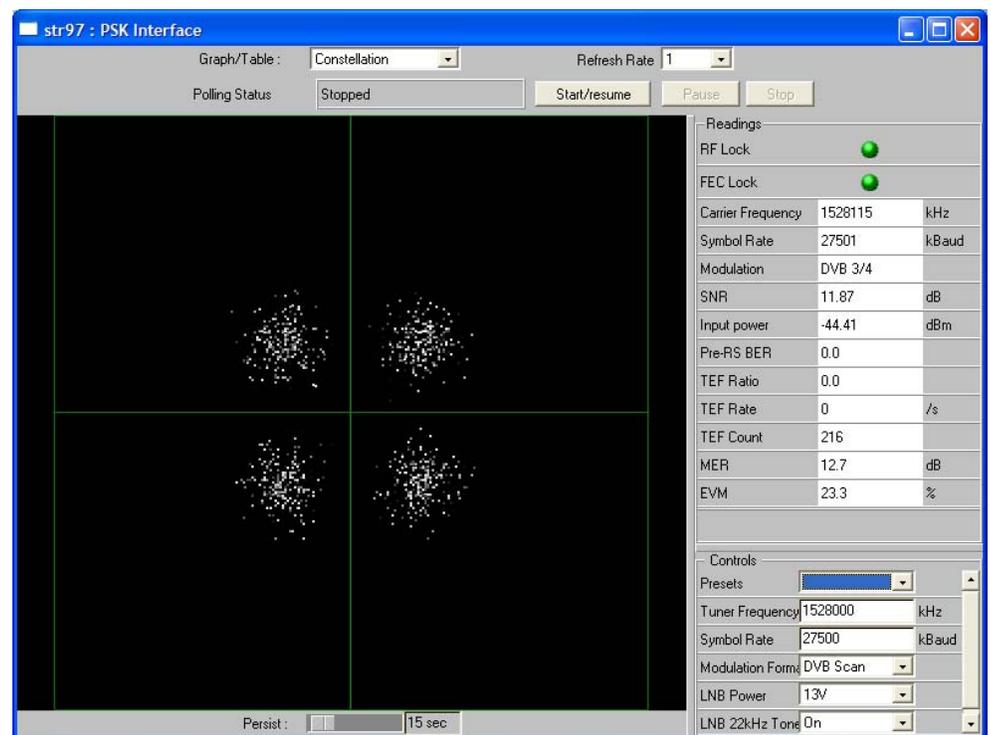


Figure 3-55: Input card screen (example - 8PSK)

- Constellation** I and Q data are collected from the QAM front end and displayed as a conventional constellation of 256 points by 256 points. The collected samples are not real time, so there is some dwell (delay) before a complete constellation is displayed. The persistence of the display can be varied using the Persist slider control at the bottom of the graph.

MER and EVM calculations are performed on the constellation data according to the formulas given in ETR290-101

SMPTE310 Settings

There are no user settings associated with the SMPTE (Society of Motion Picture and Television Engineers) interface.

(Refer to the *MTM400 MPEG Transport Stream Monitor Technical Reference* for more details about the SMPTE interface.)

ASI Settings

There are no user settings associated with the ASI (Asynchronous Serial Interface) interface.

(Refer to the *MTM400 MPEG Transport Stream Monitor Technical Reference* for more details about the ASI interface.)

Gigabit Ethernet Interface

The Gigabit Ethernet (GigE) interface allows customers to remotely monitor and measure the quality of their video over IP networks. This includes a time correlated IP and MPEG error log that allows quick association of MPEG errors with underlying IP network problems.

The GigE settings dialog box is shown in Figure 3-56.

Configuration - GigE

The screenshot shows the 'Interface Settings : str121' dialog box. On the left, there is a 'Presets' list with 'ip1' and 'ip2'. Below it are 'Add' and 'Delete' buttons. The main area is titled 'Controls' and contains a list of configuration parameters, each with a text field and a 'Set' button. At the bottom right, there is a 'Status' section with a green indicator for 'Interface card lock' and a 'BER' field showing '0.0'. A 'Close' button is at the bottom right corner.

Parameter	Value	Action
All Session Tests	All Session Tests	Set
Input Card IP	192.158.200.45	Set
Input Card MAC	08-00-11-99-88-77	Set
Select Speed	Auto 10/100/1000(Copper) Mbps	Set
ASI Smoothing	Off	Set
ARP	On	Set
IGMP	Multi Session	Set
- Insert/Join	0.0.0.0	Set
- Delete	0.0.0.0	Set
Protocol	UDP	Set
VLAN Selection	Off	Set
- Tag	0x0	Set
MAC Selection	Off	Set
- Source	00-00-00-00-3f-ff	Set
- Destination	00-00-00-00-3f-ff	Set
IP Selection	Both	Set
- Source	192.158.200.199	Set
- Destination	239.1.2.8	Set
Port Selection	Both	Set
- Source	2203	Set
- Destination	4354	Set
Ping Control	Ping Control	Set
- Ping IP	192.0.0.255	Set
- Subnet Mask	255.255.255.0	Set
- Gateway	192.0.0.255	Set

Status: Interface card lock : ● BER : 0.0

Figure 3-56: Interface configuration – GigE

For each of the settings, enter the required change and select **Set** to apply the new value. If an invalid entry is made, the previous setting will be displayed.

NOTE. *These settings can also be made from the Input Card screen.*

All Session Tests Not applicable on the config screen; operational control rather than configuration.

Interface Card Configuration:

Input Card IP Enter the IP address of the GigE card, for example, 128.181.39.3.

Input Card MAC

Enter the MAC address of the GigE card, for example, 01-0a-02-0b-03-0c-04. The card is set with a unique MAC address in the factory, this should not be changed.

Select Speed Select the line speed from the drop-down list:

- Force 10 (Copper)
- Force 100 (Copper)
- Force 1000 (Copper)
- Force 1000 (Optical)
- Force 1000 (Optical Rx)
- Auto 10/100/1000 (Copper)
- Auto 1000 (Optical)

The term ‘Force’ means that the GigE card will not negotiate a line speed; the linked device will have to be set in the specified forced speed mode for this to work. For the Auto 10/100/1000 (Copper) mode, the GigE card will attempt to negotiate with the linked device for the fastest available speed denoted by the number following the word “Auto”.

NOTE. *The GigE card does not support hubs under any speed setting; connecting to a hub can cause undesired effects.*

There are two types of interface on the GigE card: copper and optical. The copper interface supports speed settings at 10 Mbps, 100 Mbps and 1000 Mbps. The optical interface supports 1000 Mbps only.

The Force 1000 (Optical Rx) mode is a special mode that can work in conjunction with a network splitter. In this mode, the receive laser needs to be connected into a valid optical link between two other devices using an optical splitter. This enables the GigE card to monitor the communication between other devices.

ASI Smoothing Select On/Off to enable/disable ASI smoothing. If a network problem occurs so that ASI smoothing cannot be performed properly, this setting will automatically be set to off.

ARP (Address Resolution Protocol) A TCP/IP protocol for determining the hardware (or physical) address of a node on a local area network.

Select On to allow the card to respond to ARP messages from the network. When this option is turned Off, all functions involving outgoing traffic from the GigE card will not work properly because the network will not be able to determine the MAC address of the unit.

IGMP and Ping will not work if the ARP control is turned off.

IGMP Configuration:

IGMP (Internet Group Management Protocol) An internet protocol used by IP hosts to report their host group memberships to immediately neighboring multicast routers. Select Off, Multi Session, or Single Session.

Insert/Join: When you have selected a Single Session, enter an IP address. The GigE card will exit any existing IGMP session and join the new session.

When you have selected Multi Session and entered a new IP address, the address is added to the session list and the session is joined.

The list of multi session addresses is restored after the MTM400 is restarted. Also, you must allow five seconds between each IP address entry, to allow the software to record the last entry.

Delete: In Multi Session mode, enter an IP address to unsubscribe from a session.

The status of the IGMP Sessions is displayed on the IGMP Sessions Table in the Input Card screen.

Session Selection Information:

Protocol Select UDP (User Datagram Protocol) or RTP (Real-time Transport Protocol) mode to match the monitored network.

VLAN Selection (Virtual Local Area Network) A logical grouping of two or more network nodes, which are not necessarily on the same physical network segment, but which share the same network number.

With the VLAN Selection turned on, if the packet carrying the transport stream contains a VLAN identity, the system will attempt to extract the transport stream from the first IP stream that fits the current control settings.

- **ID**: The desired VLAN ID in hex number format.

Stream Selection. There may be more than one network session on the monitored networks. Using the following **MAC**, **IP**, and **Port** selections, a single session can be identified. If all selections are set to Off, no stream will be received.

MAC Selection Select the MAC Selection filter: None, Source, Destination, or All. When a value other than None is selected, the system will extract the transport stream from the first IP stream that fits the Source and/or Destination settings.

Source: Input source MAC address to filter.

Destination: Input destination MAC address to filter.

Example MAC address: 01-0a-02-0b-03-0c-04.

IP Selection Select the IP Selection filter: None, Source, Destination, or All. When a value other than None is selected, the system will extract the transport stream from the first IP stream that fits the Source and/or Destination settings.

Source: Input source IP address to filter.

Destination: Input destination IP address to filter.

Example IP address: 128.181.39.3.

Port Selection Select the Port Selection filter: None, Source, Destination, or All. When a value other than None is selected, the system will extract the transport stream from the first IP stream that fits the Source and/or Destination settings.

Source: Input source port address to filter.

Destination: Input destination port address to filter.

Input port number in integers between 0 and 65535.

Diagnostics:

Ping Control Allows you to send four outgoing pings to a target IP address. Enter the target IP address, subnet mask, and gateway and then click Send. The graph will automatically switch to Ping Result and display the result. The preset time to wait for each reply is three seconds.

Ping will not work if the ARP setting is set to Off.

Ping IP: Destination IP address for the ping packet.

Subnet Mask: The subnet mask used to determine if the ping packet is destined remote or local network.

Gateway: Gateway IP address for forwarding ping to devices outside of the subnet.

Interface Card Lock

If full lock onto the channel is acquired and it is receiving the signal correctly, the LED will light up green. When a signal is present but no lock is achieved, the indicator is red. When no signal is found, the indicator is gray.

BER The Bit Error Rate ahead of the FEC is displayed.

Input Card Screen - GigE

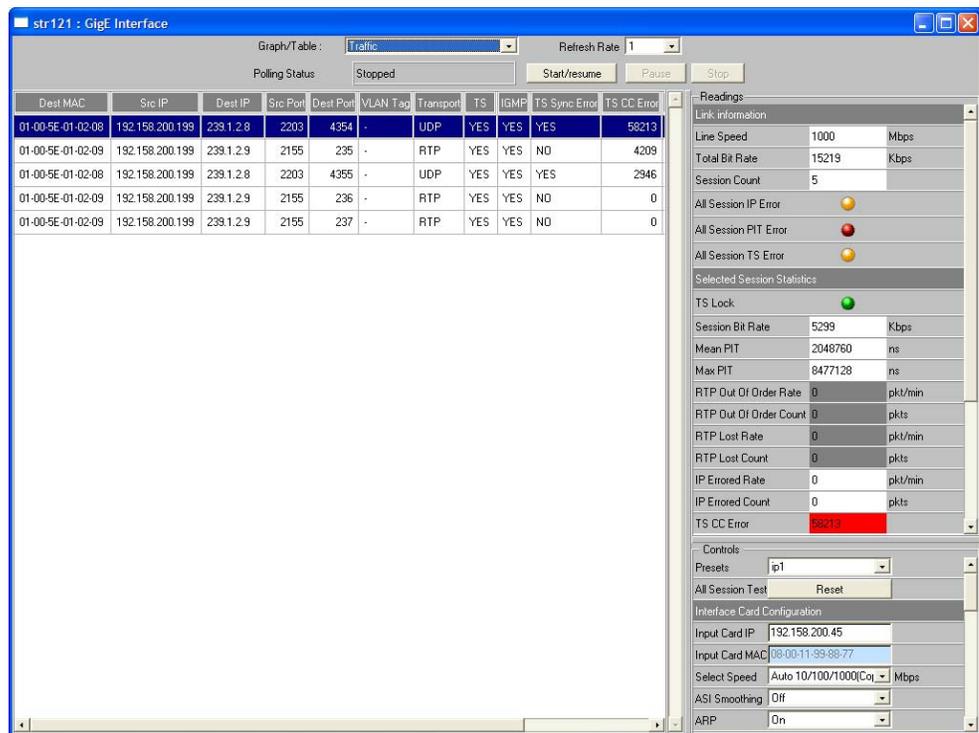


Figure 3-57: Input card screen - GigE (Example)

Readings. The following readings are displayed in the GigE input card screen:

Link Information:

Line Speed (Mbps) Current negotiated line speed - 10, 100, 1000, 1000 (Optical), N/A.

Total Bit Rate (Kbps) Total bit rate on the currently selected copper/optical port including network headers.

Session Count The number of sessions present on the link.

All Session IP Error (LED)

Indicates the worst case Packet Error from all sessions present on the link (see Table 3-5, page 3-147).

All Session PIT Error (LED)

Indicates the worst case PIT Error from all sessions present on the link (see Table 3-5, page 3-147).

All Session TS Error (LED)

Indicates compliance checking and sync errors for all sessions present on the link.

NOTE. *The All Session IP/PIT/TS Error LEDs will only turn red when the related limits, defined on the Information screen, are exceeded.*

Selected Session Statistics:

TS Lock The LED icon is green when the signal is in sync and is being received normally.

Session Bit Rate (Kbps) Bit rate of currently selected stream including network headers.

Mean PIT (ns) Mean packet inter-arrival time (PIT) of the currently selected stream.

Maximum PIT (ns) Maximum packet inter-arrival time (PIT) of the currently selected stream.

RTP Out of Order Rate

(Packets/minute) The calculation is maintained per session on the interface card. The field displays a red background if the rate is greater than zero. This field is not applicable (gray) if protocol is set to UDP.

RTP Out of Order Count

(Packets) RTP out of order packet total count (since last reset). Count is maintained per session on the interface card, so the total presented when a stream is selected is since reset or startup, not since the session was selected. The field displays a red background if the count is greater than zero. This field is not applicable (gray) if protocol is set to UDP.

RTP Lost Rate (Packets/minute) The calculation is maintained per session on the interface card. The field displays a red background if the rate is greater than zero. This field is not applicable (gray) if protocol is set to UDP.

RTP Lost Count (Packets) Total lost RTP packets (since last reset). Count is maintained per session on the interface card, so the total presented when a stream is selected is since reset or startup, not since the session was selected. The field displays a red background if the count is greater than zero. This field is not applicable (gray) if protocol is set to UDP.

IP Errored Rate (Packets/minute) The calculation is maintained per session on the interface card. The field displays a red background if the rate is greater than zero.

IP Errored Count(Packets) Total IP packet error count (since last reset). Count is maintained per session on the interface card, so the total presented when a stream is selected is since reset or startup, since the session was selected. The field displays a red background if the count is greater than zero.

TS CC Error Total MPEG CC errors on this session since reset or startup. The field displays a red background if the count is greater than zero.

Locked Session Information:

Source IP Source IP address of the currently monitored transport stream.

Source Port The port that is currently receiving the transport stream.

Destination IP The destination IP address to which the transport stream is being sent.

Destination Port The destination port to which the transport stream is being sent.

TOS (Type of service) Type of service field of the transport stream IP packets.

Datagram Size (Bytes) Datagram size of the transport stream IP packets.

VLAN Tag (Virtual Local Area Network tag) VLAN tag displayed in hex format. This is a two byte value containing priority bit, canonical format indicator (CFI) and VLAN ID (VID).

Controls. The controls are duplicates of those found on the configuration screen (see page 3-139). The All Session Test Reset button resets all session tests.

Graphs/Tables Display. The following graphs, which can be selected from the **Graph/Table** drop-down list, are available when the GigE interface card is installed:

Traffic (See Figure 3-57) The Traffic table displays all traffic, including, for example, FTP traffic. available IP sessions with rates higher than five network packets per second on the currently selected interface (copper or optical). Clicking the entries in the table will automatically adjust the controls accordingly to capture the stream. Currently selected traffic will also be highlighted in this table. You cannot select network streams not carrying a transport stream. The individual columns are described in Table 3-5.

Table 3-5: GigE Traffic Table Column headings

Column heading	Description
Dest MAC	Session target MAC address
Src IP	Session source IP address
Dest IP	Session target IP address
Src Port	Session source IP port
Dest Port	Session target IP port
VLAN Tag	VLAN (Virtual Local Area Network) tag; "-" where not applicable. Includes all parts of the VLAN information not just the identity.
Transport	RTP or UDP (Others, such as FTP, are possible if there is a sustained flow of another kind on the network).
TS	Yes, if sync has been detected in this session. No, if sync has not been detected in this session.
IGMP	Yes, if it is an IGMP session Note that the session does not need to be locally configured as IGMP for it to be recognized as an IGMP session; the network switch is the controller in this case.
TS Sync Error	Yes, if any sync bytes or sync loss errors have been detected in the session since reset or startup.
TS CC Errors	MPEG CC (continuity count) error count in each session since reset or startup.
Pkt Error	Total count of IP corrupted, lost packets, and out of order packets in each session since reset or startup.
PIT Error	Yes, if the PIT (packet inter-arrival time) in each session has been greater than the user defined limit at any time since reset or startup.
Bit Rate (Kbps)	Session bitrate (not the same as the stream bitrate, this includes IP wrappers).

IGMP Sessions This table shows the status of the current IGMP sessions: Subscribed, Unsubscribed, and Suspended.

Click on an individual session to toggle between subscribed and unsubscribed when the IGMP configuration control is set to Multisession. Similarly, Click on an individual session to toggle between suspended and unsubscribed when the IGMP configuration control is set to Single Session or Off. Note that if a single IGMP session is selected, all sessions will be suspended except the one currently subscribed.

Ping Result This table displays ping results in the same format as the DOS ping program. The results include round trip time, TTL, and timeout messages. The results will be shown in this table after the Send button is clicked.

Session Bit Rate This graph displays the bit rate trend over a rolling 256 second period. The scale of the graph (in bits per second) is automatically adjusted according to the values to be displayed.

Mean IP Packet Interarrival Time

This graph displays the mean interarrival time between IP packets over a rolling 256 second period. The scale of the graph is automatically adjusted according to the values to be displayed.

Maximum IP Packet Interarrival Time

This graph displays the maximum interarrival time between IP packets over a rolling 256 second period. The scale of the graph is automatically adjusted according to the values to be displayed.

Minimum IP Packet Interarrival Time

This graph displays the minimum interarrival time between IP packets over a rolling 256 second period. The scale of the graph is automatically adjusted according to the values to be displayed.

Freeze Graph/Table

Selecting this graph allows you to freeze the most recently view graph or table. This allows time to analyze the data.

GigE Interface Operational Notes

The following notes are included to assist with the setup and operation of the GigE interface card:

- Before connecting to the network under test, enter a valid Input Card IP address on the Input Card or Config screen, otherwise any router or switch

that is connected may add an invalid IP address to its own ARP table (which may have a long timeout).

- If the Input Card IP is 0.0.0.0, you cannot be active on the network. Similarly, if the Input Card MAC is 08-00-11-0A-0B-0C, you cannot be active on the network. In the latter case, the GigE card may have been incorrectly configured.
- A MAC address is allocated to the GigE interface card during manufacture. If required, you can change it using the Configuration screen.
- It is recommended that the MAC and IP address of the GigE interface card be configured before any of the other GigE interface settings.
- The ARP option must be enabled (On) when trying to send or receive pings on the network or when acting as an endpoint for unicast traffic.
- IGMP Joins are not sent in the passive optical rx mode.
- Pings cannot be sent in the passive optical rx mode.
- An SFP (Small Format Pluggable) module is used to facilitate the Ethernet Optical interconnection feature. The GigE interface card has been tested with SFP module(s) ordered from Tektronix. SFP modules purchased from a supplier other than Tektronix are not warranted to work.
- Only optical SFPs are supported; copper SFPs are not supported.
- Only full duplex operation is supported by the GigE interface card.
- Traffic flows are displayed in the Traffic screen only if they have a total packet rate of > 5 network packets per second.
- The Traffic screen will show all traffic, for example, FTP. The MTM400 will perform IP level tests when a non-transport stream.
- Only transport streams can be selected for monitoring; transport streams are indicated by Yes in the TS column.
- If the Traffic graph is frozen, the column sort feature is also suspended.
- When subscribing for a specific multicast stream, the IGMP control must be turned on after the IP address is typed in the text box. The UDP port is not necessary to see the traffic on the traffic screen; the port is used to select the specific stream for analysis.

Input Card Configuration Presets

Multiple configuration settings can be set up for all interface cards, that is, QAM (Annex B II), COFDM, 8VSB, 8PSK and GigE. Preset configurations can be added by coding the parameters directly into the configuration file or by using the interface configuration screens.

If the active configuration is downloaded (configuration slot) – the name will be listed in the interface configuration window.

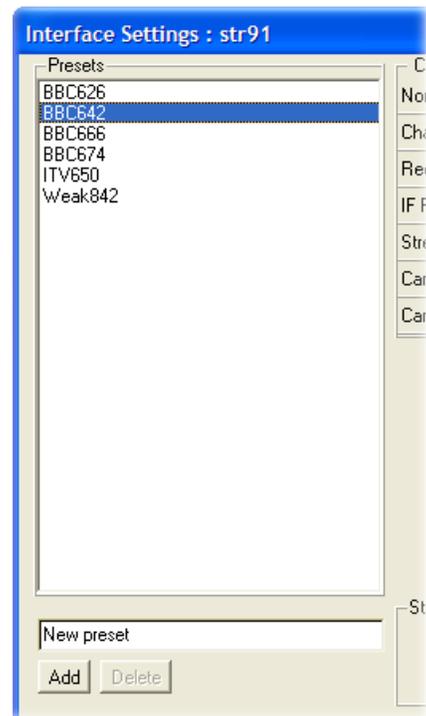


Figure 3-58: Preset settings (example)

The Add and Delete buttons act on the preset name entered in the adjacent text box not on the configuration name highlighted in the preset list.

To add a preset, enter a name in the text box and select Add. The name is added to the list of presets. The settings are copied from the current preset. Select the new name and review and amend the settings as required; remember to select the Set button for a value to take effect.

To delete a preset, ensure that the preset to be deleted is not selected (highlighted), enter the name in the text box and then select the Delete button (the Delete button will be inactive if the specified preset is currently selected). The specified preset is deleted from the list of presets.



Appendices

Appendix A: Network Installation

A major feature of the MTM400 MPEG Transport Stream Monitor is its versatility with respect to configuration. Although always operating within a client-server architecture, the following configuration options are available:

- The MTM400 can be left unattended. In this setup, the front panel LEDs and any configured external alarms will indicate monitoring test failures.
- The MTM400 can be monitored from a PC over an Ethernet or the Internet using the Web Monitoring Systems Manager (WebMSM), Multi-Layer Monitor (MLM1000) or the Remote User Interface (RUI).

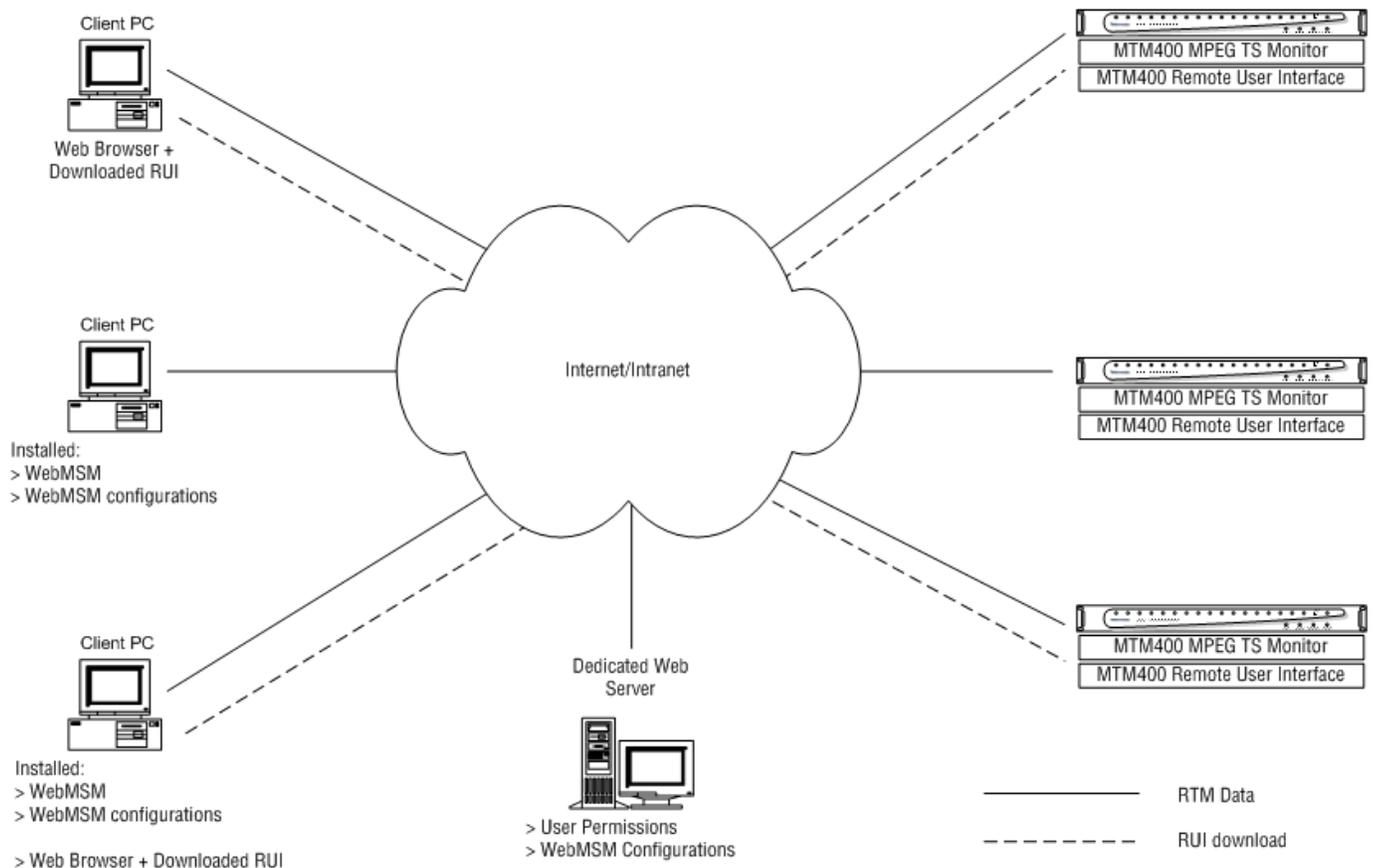


Figure A-1: Network setup - Example

- The WebMSM software is installed on a client PC and allows you to monitor and control the MTM400. The WebMSM can be used to monitor all compatible devices on a network (if the appropriate license is held).

- The Remote User Interface (RUI) software, based on the WebMSM, is downloaded and accessed from the MTM400 using a browser (Microsoft Internet Explorer with Microsoft Virtual Machine installed) of any networked personal computer.

The provided HTML file allows you to open the RUI by typing in the URL `http://<IP address>` or network identity on a Web Browser on a client PC. The user permissions are set up to allow an Administrator to have read-write permissions and a User to have read-only permissions.

When logging in, the default password for the Administrator is 'tek'; by default, the User does not require a password.

Before proceeding, ensure that the following information is available:

- MTM400 MAC address: `xx-xx-xx-xx-xx-xx`
 - Location 1: rear panel
 - Location 2: main circuit board (internal)
 - Location 3: instrument top cover (optional)
 - MTM400 IP address: `yyy.yyy.yyy.Yyy`
 - Assigned by network administrator
 - MTM400 software license: `zzzz-zzzz-zzzz-zzzz`
 - Location 1: instrument top cover (optional)
-

MAC Address

The Transport Stream Processor board in the MTM400 unit is assigned a unique MAC (Media Access Control) address; this is also used as the unique address of the complete unit. The MAC address is printed on labels attached to the Processor card and the unit.

The MAC address is written as six pairs of hex digits separated by hyphens, for example, '00-01-F8-A7-33-CC'.

The MAC address must be associated with an IP address for the unit to be able to function within a network.

IP Address

An IP address is assigned to each unit and acts as a unique identifier within a network. An IP address will be assigned by the Network Administrator.

IP addresses are written as four groups of up to three digits, with the groups separated by periods, for example, '119.183.115.11'.

The IP address must be associated with a MAC address for the unit to be able to function within a network.

New units are shipped with the IP address set to 0.0.0.0; this is because the IP address that will be used by a customer is unknown. In this situation, the steps described below must be followed in order to associate the proper IP address with the MAC address (see *Setting Up the Network*, page A-7).

If the IP address is not known, it must be reset to 0.0.0.0 and set up with a new IP address before the unit can be used.

Resetting the IP Address

There are two ways of resetting the IP address of an MTM400 unit to '0.0.0.0' (factory default).

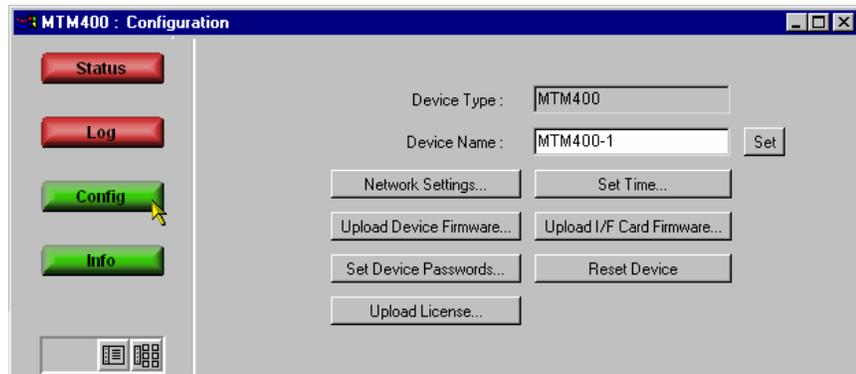
Method 1: If the current IP address of the unit is known, the address can be reset using the MTM400 user interface.

Method 2: If the current IP address of the unit is unknown, the address must be reset by clearing the non-volatile RAM on the Transport Stream Processor board. Clearing the RAM resets all configuration data, including the IP address and the option license, to the factory defaults.

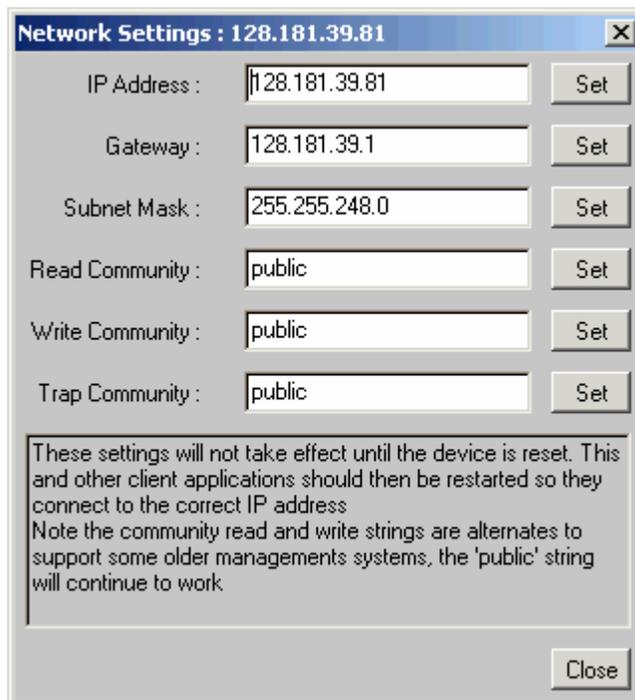
Resetting the IP Address using the User Interface

With the unit powered up and connected to the network in which its current IP address is recognized:

1. Open the user interface, logging on as Administrator.
2. From the Device view Configuration dialog box, select **Network Settings....**



The **Network Settings** dialog box is displayed.



3. When the values have been changed as required, select the adjacent **Set** button to store the new settings in the MTM400.

If necessary, obtain the Gateway and Subnet Mask values from the Network Administrator.

4. When the settings have been changed and set and **Close** is selected, the following dialog box is displayed:



Select **OK** to restart the device and for the settings to take effect. Select **Cancel** if a restart is not required (the settings will take effect the next time that the unit is restarted).

The unit will be restarted, but the current network will not be able to communicate with it. At this point the unit must be disconnected and moved to its new location. If the new IP address was correctly entered, it should be immediately available on the new network. However, if the new network is unable to communicate with the new unit, you may need to reset the unit and reenter the new IP address, as described.

Resetting the IP Address to Factory Default

An existing IP address can be reset to the factory default ('0.0.0.0') by resetting the battery-backed non-volatile RAM on the Transport Stream Processor board. Clearing the RAM resets all configuration data, including the IP address, to the factory defaults.

NOTE. *When you clear the non-volatile RAM, the licensing information is lost. You will not be able to access all of the options that you purchased. Reenter the license key after setting the IP address.*

Removing the Cover



WARNING. To avoid electric shock, disconnect the power cord from the mains power before removing the cover. Failure to do so could result in injury or death.

The unit cover is held in position by 21 x T10 Torx screws.

1. Remove and retain the 21 cover retaining screws.
2. Lift the cover from the unit.

Resetting the Non-Volatile RAM

- Locate and press the Non-Volatile RAM Reset switch (SW111). This action resets the non-volatile RAM and clears the current configuration. As part of this action, the IP address is reset to 0.0.0.0.

NOTE. When you clear the non-volatile RAM, the licensing information is lost. You will not be able to access all of the options that you purchased. Reenter the license key after setting the IP address.

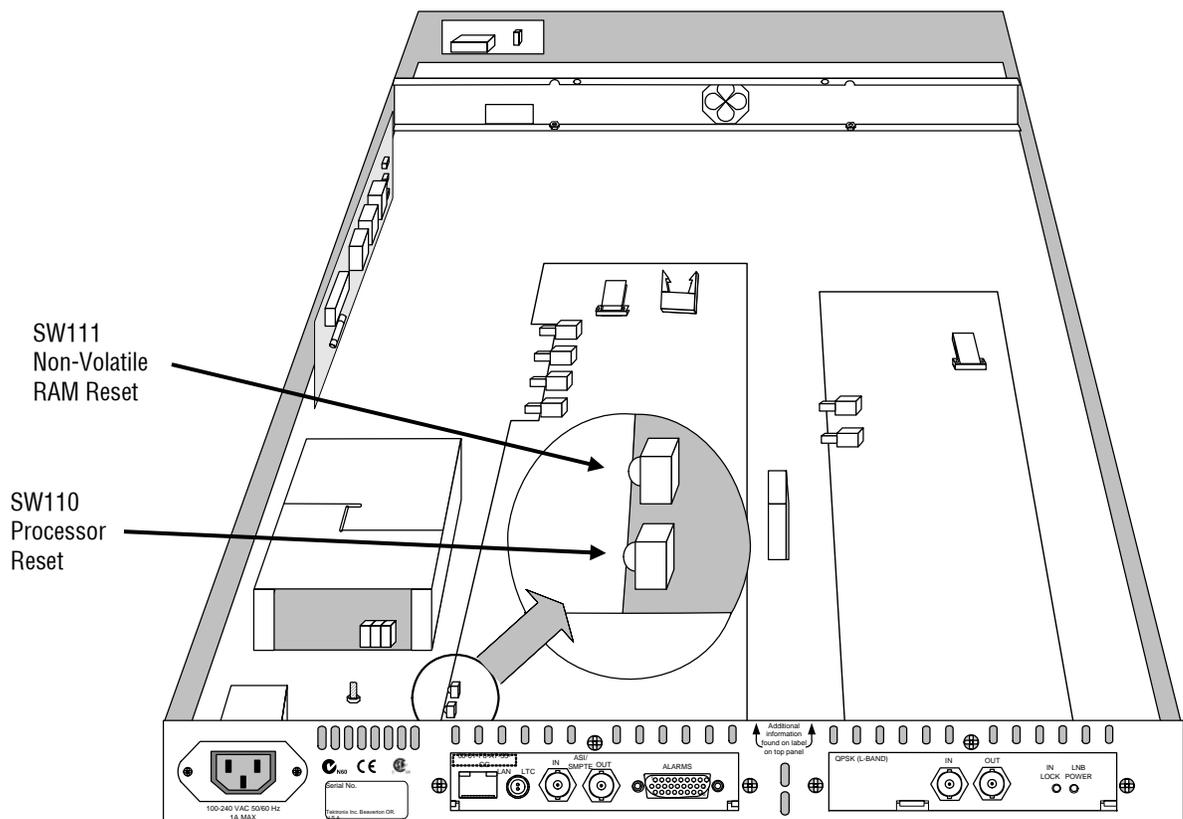


Figure A-2: Transport stream processor reset switches

Replacing the Cover

1. Before replacing the cover, ensure that all components are in place and that all connections are secure.
2. Replace the 21 cover retaining screws and ensure that they are uniformly tightened.

Proceed with setting up the required IP address.

Setting Up the Network

Setting up requires MS DOS on a client PC, with both the MTM400 and the client PC powered up and attached to the same Ethernet network. They should also be attached to the same subnet, if present.

Setting Up a Static ARP Entry

Associating the MAC address with the IP address involves making an entry in the ARP (Address Resolution Protocol) table. This is done as follows:

1. On the client PC, open a MS-DOS window (**Start > Programs > Command Prompt**).
2. Enter: `C:\> ARP -s <IP address> <Ethernet MAC address>`
for example, `C:\> ARP -s 192.168.201.19 00-01-F8-A7-33-CC`
3. If the command is successful, the prompt is redisplayed with no message.

Testing the IP Address

- On the client PC, in the MS-DOS window, enter:
`C:\> ping <IP address>`
for example, `C:\> ping 192.168.201.19`

The response should take the following form:

```
Pinging 192.168.201.19 with 32 bytes of data:
```

```
Reply from 192.168.201.19: bytes=32 time<10ms TTL=128
```

The IP set-up is now complete. Close the MS-DOS window. With the IP Address successfully set up, the network settings can be completed (refer to *Resetting the IP Address using the User Interface*, page A-4).

The ARP command cannot be used if the unit already has an IP address - it will only work if the IP is 0.0.0.0. (Refer to *Resetting the IP Address to Factory Default*, page A-5 if the IP address is to be reset.)

Network Naming

If the monitor is to be accessible by a network name rather than the IP address, the relationship between the IP address and the network name will need to be set up on a DNS (domain name server) server on the network. This is not the name that is set up in the Configuration screen. Contact your Network Administrator for help.

When the IP address has been set up, if the MTM400 is to be accessed from a different net or subnet, the Gateway IP address and the Subnet Mask must be set up. Contact your Network Administrator for help. The Gateway IP address and the Subnet Mask values are set up in the **Device Configuration > Network Settings...** dialog box. The MTM400 must be restarted in order for the settings to take effect.

Network Latency

It has been noted that where access to a remote MTM400 uses a number of internet/intranet links of varying speeds, the initial RUI download may be initiated successfully, but the process then ceases. The network speed is outside of the control of Tektronix, but it may be possible to alter some of the local network settings to alleviate the problem. Contact Tektronix support.

Appendix B: Maintenance

This appendix describes some general care and service procedures for the MTM400 MPEG Transport Stream Monitor and includes the following subsections:

- *Preventive Maintenance* provides cleaning instructions.
- *Rack Mounting* provides instructions for installing the unit in a 19-inch equipment rack.
- Gigabit Ethernet Interface – SFP Module Mounting and dismounting a Gigabit Ethernet Interface SFP module.

Preventative Maintenance

Protect the unit from adverse weather conditions. The unit is not waterproof.



WARNING. *To avoid damage to the instrument, do not expose it to sprays, liquids or solvents.*

Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone or similar solvents.

Preventive maintenance mainly consists of periodic cleaning. The unit should be cleaned as needed based on the operating environment.

Cleaning the Exterior



WARNING. *To avoid personal injury or damage to the instrument, do not allow moisture inside it. Use only enough cleaning solution to dampen your cloth or swab.*

Clean the exterior surfaces of the instrument with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. To rinse, repeat the same process using a cloth dampened with de-ionized water. A swab is useful for cleaning in narrow spaces around the connectors. Do not use abrasive compounds on any part of the unit.

Rack Mounting



WARNING. To avoid fire hazard, the MTM400 must be installed in the rack only as specified, and proper ventilation must be maintained. The right side rack slide must be mounted correctly so that it does not obstruct the adjacent air vent.

Efficient cooling will be maintained in a rack-mounted unit only if the air temperature at all intake air vents (inside the rack) does not exceed 40 °C.

The MTM400 can be mounted in a standard 19-inch equipment rack.

The chassis components of the rack slides are attached during manufacture as shown in Figure B-1:

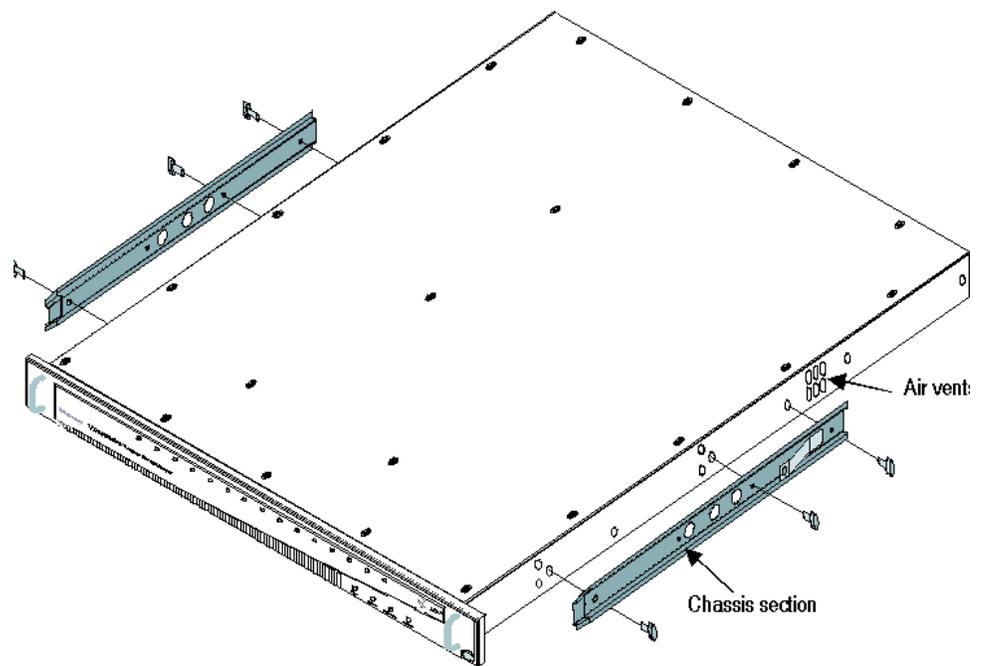


Figure B-1: Chassis section rack slides

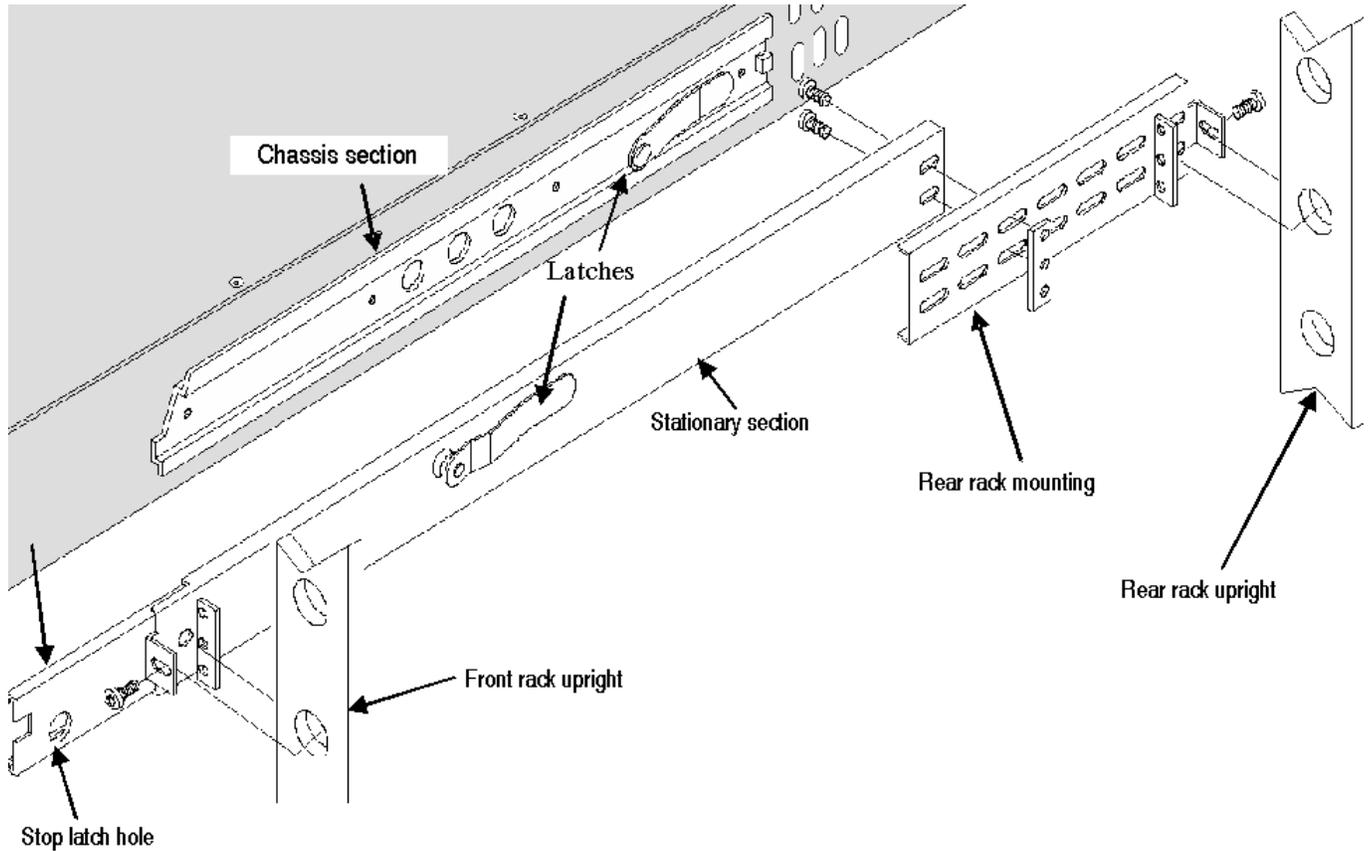


Figure B-2: Rack mounted sections

The chassis section is already installed on the unit. The position of the rear rack mounting can be adjusted to suit the depth of the rack. Approximately six inches of clearance is required between the rear panel of the unit and any rear cabinet panel to allow for connector space and adequate air circulation.

Installing the MTM400 Unit

Refer to Figure B-6 to install the unit in the rack.

1. Pull the slide-out track section to the fully extended position.
2. Insert the MTM400 chassis sections into the slide-out sections.
3. Press the stop latches and push the unit toward the rack until the latches snap into their holes.
4. Press the stop latches again and push the unit fully into the rack.
5. Tighten the front panel retaining screw.

Installation of Ground Strap



CAUTION. *The intra-building interfaces of this platform, including the Gigabit Ethernet interface, are suitable for connection to intra-building or unexposed wiring or cabling only with shielded and grounded cables at both ends. The intra-building ports or the equipment must not be metalically connected to interfaces that connect to the outside plant or its wiring.*

A grounding and bonding strap and accessories to be used in Central Office RBOC applications are supplied as a standard accessory (Tektronix kit number, 020-2852-00) with each MTM400 unit. To install the ground strap, use the following instructions:

1. Using a number 15 Torix tip screwdriver, remove the top front left handle-retaining screw (6-32 x 0.375), as shown in Figure B-3.



Figure B-3: Remove handle-retaining screw



CAUTION. *All mating surfaces must be cleaned and treated with an antioxidant before being joined. In an isolated bonding network (IBN), the requirements of Telcordia document TR-NWT-000295, *Isolated and Mesh Bonding Networks*, apply.*

2. Attach the smaller #6 ring tongue terminal to the top front left handle position using the screw removed in step 1. Torque the screw sufficiently for the terminal to provide good ground contact (recommended torque: 10 in-lbs).

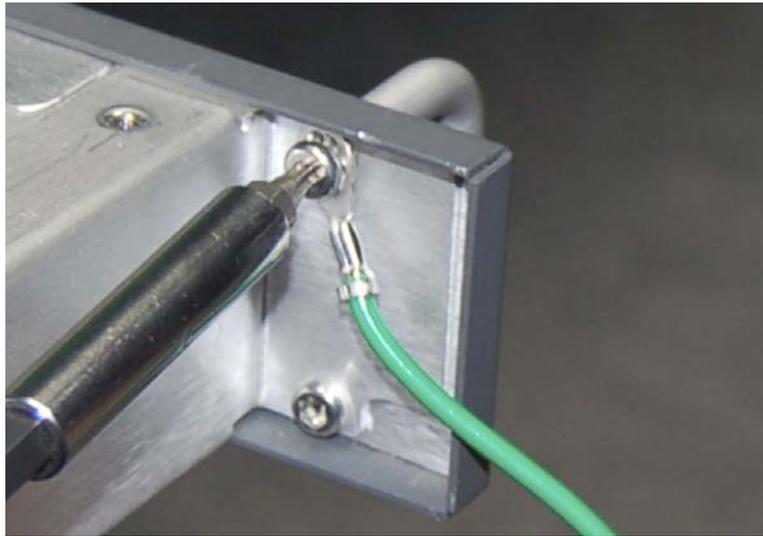


Figure B-4: Attaching the ground strap to the MTM400

3. Install the MTM400 in the rack; see page B-3.
4. Attach the larger #10 Ring Tongue Terminal to the Frame using the Phillips head thread-forming screw (10-32 x 0.500) supplied in the kit. Secure it to the rack frame at an open unused hole in the frame as close to the MTM400 as possible. All surfaces where ground contact is to be made must be cleaned to a bright finish and coated with an antioxidant solution to limit corrosion. Torque the screw sufficiently for the terminal to provide good ground contact (recommended torque: 10 in-lbs).



Figure B-5: Attaching the ground strap to the rack frame

Removing the MTM400 Unit

Refer to Figure B-6 to remove the unit from the rack.

1. Loosen the front panel retaining screw and pull the unit out until the stop latches snap into the holes.
2. Press the stop latches and remove the unit.

When removing the unit from the rack, be sure to disconnect all cabling.

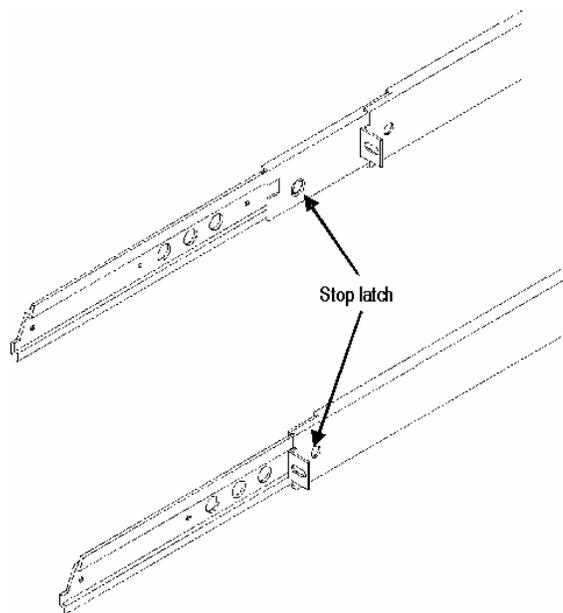


Figure B-6: Installing or removing the rack slides

Rack Adjustments

After installation, if the slide tracks are not properly adjusted, they may bind. To adjust the tracks, slide the instrument out about 10 inches, slightly loosen the screws holding the tracks to the front rails, and allow the tracks to seek an unbound position. Retighten the screws and check the tracks for smooth operation by sliding the instrument in and out of the rack several times.

Once the instrument is in place within the rack, tighten the knurled retaining screw to fasten it securely into the rack.

Rack Slide Maintenance

The slide-out tracks do not require lubrication. The dark gray finish on the tracks is a permanent, lubricated coating.

Gigabit Ethernet Interface – SFP Module

The Gigabit Ethernet (GigE) interface allows customers to remotely monitor and measure the quality of their video over IP networks. SFP (Small Format Pluggable) modules are used to facilitate different wavelengths for the Ethernet Optical interconnection feature.



CAUTION. *To prevent static discharge damage, service the product only in a static-free environment. Observe standard handling precautions for static-sensitive devices while installing this module. Always wear a grounded wrist strap, grounded foot strap, and static resistant apparel while installing this module.*



WARNING. *To avoid exposure to hazardous laser radiation, use only Class 1 lasers as defined in the USA Federal Regulations CDRH 21 CFR 1040 and IEC/EN 60825/A2:2001.*



Figure B-7: SFP module

Figure B-7 shows an SFP module and optical port plug. Table 1-5 on page 1-5 includes the available SFP module options.

NOTE. *The optical port plug must be in place when no fiber cable is connected.*

Use the plug to protect the optical interface when no cable is connected or the module is not in use.

The following paragraphs describe how to remove and install an SFP module.



CAUTION. *To avoid damage to the SFP module, remove power from the unit before removing or inserting a module.*

Removing an SFP Module

1. Disconnect the optical fiber cable. The connector is latched in position; press the top of the connector and withdraw it from the SFP module.
2. Flip down the SFP module retaining latch and withdraw the module from the unit, see Figure B-8.

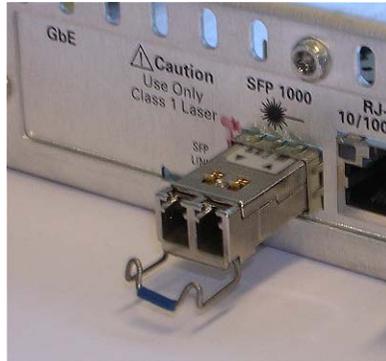


Figure B-8: SFP module - Dismounting

3. Relocate the retaining latch and insert the optical plug into the SFP module before storage.

Inserting an SFP Module

1. Insert the SFP module into the connector on the rear panel of the GigE interface board. When pushed in fully, the module is latched in position.



Figure B-9: SFP module - Mounted

2. Remove the optical plug (not shown) and insert the optical fiber cable into the SFP module. When pushed in fully, the cable connector is latched in position.

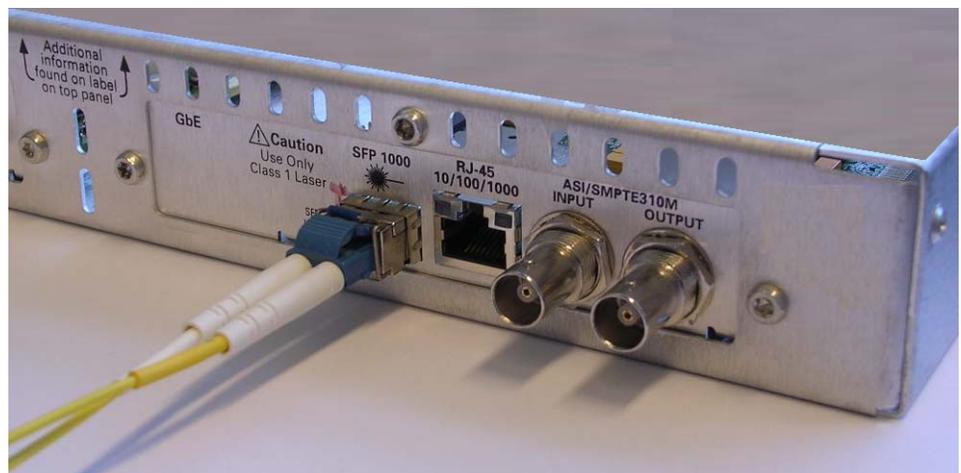


Figure B-10: SFP module - Connected



Glossary

Glossary

Program and Service: In this manual the terms program and service are interchangeable.

ARIB	Association of Radio Industries and Businesses
ARP	Address Resolution Protocol
ASI	Asynchronous Serial Interface
ATSC	Advanced Television Systems Committee
BAT	Bouquet Association Table
BER	Bit Error Rate
CAT	Conditional Access Table
CRC	Cyclic Redundancy Check
CSV	Comma Separated Values
CVCT	Cable Virtual Channel Table
DNS	Domain Name Server
DVB	Digital Video Broadcasting
EIT	Event Information Table
EMM	Entitlement Management Message
ETT	Extended Text Table
EVM	Error Vector Magnitude
Gbe	(see GigE)
GigE	Gigabit Ethernet
GMT	Greenwich Meantime
GPSI	General Purpose Serial Interface
IGMP	Internet Group Management Protocol
IIP	ISDB-T Information Packet
IP	Internet Protocol
ISA	Integrated Systems Architecture
ISDB	Integrated Services Digital Broadcasting

LNB	Low Noise Block
MER	Modulation Error Ratio
MGT	Master Guide Table
MHEG	Multimedia and Hypermedia Experts Group
MPEG	Moving Picture Experts Group
NIT	Network Information Table
PAT	Program Association Table
PCI	Peripheral Component Interconnect
PCR	Program Clock Reference
PID	Packet Identifier
PIT	Packet Inter-arrival Time
PMT	Program Map Table
PSIP	Program and System Information Protocol (ATSC)
PTS	Presentation Time Stamp
QAM	Quadrature Amplitude Modulation
QPSK	Quaternary Phase-Shift Keying (also known as Quadrature Phase-Shift Keying)
RRT	Rating Region Table
RTM	Real-Time Monitor
RTP	Real-time Transport Protocol
RUI	Remote User Interface
SDT	Service Description Table
SI	Service Information (DVB)
SMC	Sub Miniature Connector
SMPTE	Society of Motion Picture and Television Engineers
SNMP	Simple Network Management Protocol
SSI	Synchronous Serial Interface
STT	System Time Table
TEF	Transport Error Flag
TMCC	Transmission and Multiplexing Configuration Control (ISDB-S)
TOT	Time Offset Table

TSDT	Transport Streams Description Table
TVCT	Terrestrial Virtual Channel Table
TVRO	Television Receive Only
UDP	User Datagram Protocol
UTC	Coordinated Universal Time
VCT	Virtual Channel Table
VLAN	Virtual Local Area Network
VSF	Vestigial sideband
XML	Extensible Markup Language



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