

QAM400A
DTV Monitor
Quick Start User Manual



**QAM400A
DTV Monitor
Quick Start User Manual**

This document supports firmware version 4.6 and above.

www.tektronix.com

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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 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.

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

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

Power disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do not operate without covers. Do not operate this product with covers or panels removed.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

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

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

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 manual's installation instructions for details on installing the product so it has proper ventilation.

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.*

Symbols and 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.

The following symbol(s) may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal

Compliance Information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC Compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 55103:1996. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use.^{1 2}

- Environment E4 – controlled EMC environment
- Part 1 Emission
 - EN 55022:1987 Class A radiated and conducted emissions
 - EN 55103-1:1996 Annex A. Radiated magnetic field emissions
- Part 2 Immunity
 - IEC 61000-4-2:2001. Electrostatic discharge immunity
 - IEC 61000-4-3:2006. RF electromagnetic field immunity
 - IEC 61000-4-4:2004. Electrical fast transient/burst immunity
 - IEC 61000-4-5:2005. Power line surge immunity
 - IEC 61000-4-6:2003. Conducted RF Immunity
 - IEC 61000-4-11:2004. Voltage dips and interruptions immunity
 - EN 55103-2:1996 Annex A. Radiated magnetic field immunity
 - EN 55103-2:1996 Annex B. Balanced ports common mode immunity

EN 61000-3-2:2006.. AC power line harmonic emissions

EN 61000-3-3:1995.. Voltage changes, fluctuations, and flicker

European Contact.

Tektronix UK, Ltd.
Western Peninsula
Western Road
Bracknell, RG12 1RF
United Kingdom

¹ This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

² Inrush current not to exceed 7 amps.

Australia / New Zealand Declaration of Conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- EN 55022:1987. Radiated and conducted emissions, Class A, in accordance with EN 55103-1:1996.

Safety Compliance

EC Declaration of Conformity – Low Voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities:

Low Voltage Directive 2006/95/EC.

- EN 61010-1: 2001. Safety requirements for electrical equipment for measurement control and laboratory use.

U.S. Nationally Recognized Testing Laboratory Listing

UL 61010-1:2004, 2nd Edition. Standard for electrical measuring and test equipment.

Canadian Certification

- CAN/CSA-C22.2 No. 61010-1:2004. Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1.

Additional Compliances

- IEC 61010-1: 2001. Safety requirements for electrical equipment for measurement, control, and laboratory use.

Equipment Type

Test and measuring equipment.

Safety Class

Class 1 – grounded product.

Pollution Degree Description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution Degree

Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.

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.



This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2002/96/EC and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Perchlorate Materials. This product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive.

Preface

This manual describes the QAM400A DTV Monitor, which provides a complete solution for remote real-time monitoring of cable broadcast signals. The comprehensive QAM RF and SI/PSI/PSIP confidence-monitoring capabilities provide a powerful and cost-effective solution for monitoring HFC (hybrid fibre-coaxial) cable headends. An in-depth, real-time MPEG analysis option allows diagnostics to be performed on live ATSC signals without having to use deferred-time analysis of captured streams.

QAM400A Key Features

- Observe RF and transport stream integrity on a QAM channel with the ability to tune to any QAM channel for verification and diagnostics. This makes the QAM400A ideal for monitoring the output of headend SEM or Edge QAM devices at the RF combiner, with support for both MPEG-2 and H.264 at either constant bit rate (CBR) or variable bit rate (VBR)
- The in-depth, real-time MPEG analysis option allows you to perform diagnostics on live payload without always having to use labor-intensive deferred-time analysis of captured streams
- No additional analysis software is required - Carry out all confidence and diagnostic analysis with the QAM400A















Applications

- Contribution and primary distribution
 - Terrestrial distribution
 - Cable headend monitoring
 - DTH or network operator satellite uplink monitoring
- IPTV
- (See page 63, *Product Options and Upgrades*.)
 - Edge network monitoring
 - ASI to RF
 - IP to RF (requires two MTM400A Units)
 - IP to ASI

Product Documentation

The following table lists the product documentation for the QAM400A DTV monitor and shows the location(s) where you can find the documents: printed manual, product documentation CD-ROM, or the Tektronix Web site.

Table i: QAM400A product documentation

Item (Tektronix part number)	Purpose	Location
QAM400A DTV Monitor Quick Start User Manual (071-2784-XX)	Provides installation and high-level operational overviews (this manual)	 +  +  www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Technical Reference (077-0175-XX)	Provides in-depth operating information	 +  www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Specifications and Performance Verification Technical Reference (077-0176-XX)	Provides complete product specifications and a procedure for verifying the operation of the instrument	 +  www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Read This First (071-2654-XX)	Describes late breaking product information and operational issues	 +  www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Test Parameter and Configuration File Technical Reference (077-0177-XX)	Provides information about using test parameters and configuration files	 www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Programmer Manual (077-0178-XX)	Provides information about remote command syntax	 www.Tektronix.com
MTM400A, IPM400A, QAM400A, and RFM300 Declassification and Security Instructions (077-0179-XX)	Provides instructions for removing your proprietary information from the instrument	 www.Tektronix.com
QAM4UP Upgrade Instructions (075-1012-XX)	Provides instructions for installing software and hardware upgrades	 +  www.Tektronix.com

Related Products

MTM400A DTV Monitor

The MTM400A DTV Monitor provides a complete solution for multilayer, multichannel, remote monitoring of DVB, ATSC, DCII, and ISDB-T/Tb standards with content-checking support for MPEG-2 and H.264/AVC. Optional RF measurement interfaces provide a powerful and cost-effective solution for monitoring DVB-T transmitter sites or DVB-S/S2 uplinks and downlinks. An in-depth, real-time MPEG analysis option allows diagnostics to be performed on live broadcast signals without having to use deferred-time analysis of captured streams.

Refer to the *MTM400A DTV Monitor Quick Start User Manual*, Tektronix part number 071-2492-XX.

IPM400A DTV Monitor

The IPM400A DTV Monitor is a powerful solution for remote monitoring of IP video national and regional headends. The IPM400A simultaneously verifies both IP and TS integrity on all IP Video flows (sessions) on a GbE link. It is ideal for monitoring networks which carry both Multi-Program Transport Streams (MPTS) or Single-Program Transport Streams (SPTS), at either constant bit rate (CBR) or variable bit rate (VBR). An in-depth, real-time MPEG analysis option allows diagnostics to be performed on live payload without having to use deferred-time analysis of captured streams.

Refer to the *IPM400A DTV Monitor Quick Start User Manual*, Tektronix part number 071-2698-XX.

RFM300 DTV Monitor

The RFM300 DTV Monitor provides a complete solution for remote real-time DTV monitoring of ATSC signals. The comprehensive 8VSB RF and PSIP confidence-monitoring capabilities provide a powerful and cost-effective solution for monitoring DTV transmitter sites, including contribution and distribution feeds at local and national operation centers for FCC compliance. An in-depth, real-time MPEG analysis option allows diagnostics to be performed on live ATSC signals without having to use deferred-time analysis of captured streams.

Refer to the *RFM300 DTV Monitor Quick Start User Manual*, Tektronix part number 071-2700-XX.

VQNet™ Element Management System

VQNet is a Tektronix Video Monitoring EMS that supports all Tektronix IP Video and DTV Monitor probe types to alert, locate, and diagnose video network problems. It is a software product which will run on a server (not Tektronix supplied) to aggregate and report on the status of broadcast signals measured by up to 500 distributed probes across a video distribution network, providing alarms, logs, trending and reporting of key performance metrics.

For further information, refer to the *VQNet Quick Start User Manual*, Tektronix part number 071-2699-XX.

VQS1000 Video Quality Software

VQS1000 is a Video Quality Software application for single-ended, objective QoE analysis of video and audio content. It is designed for use with all current Tektronix IP Video and DTV Monitor probes that use private backhaul video and audio. It can also be used standalone for file analysis. Combined with physical transport alarms from the Tektronix probes, operators can determine if the source of a problem is in the content (for example, over-compression) or in network distribution layers.

Refer to the *VQS1000 Video Quality Software Quick Start User Manual*, Tektronix part number 077-0489-XX.

Product Documentation

You can find a complete list of product related user documentation in the *DTV Monitor Technical Reference*, Tektronix part number 077-0175-XX.

Firmware Upgrades

Updates to the QAM400A DTV monitor firmware are released to the Tektronix Web site when software problems are fixed or when new product features are introduced. (See page 64, *Upgrading the Firmware Version*.)

To check for firmware upgrades, go to the Tektronix Web site (www.tektronix.com/products/video_test/mtm400_support.html).

The Sun Java RTE (run time environment) Version 1.6.0_20 or later must be installed on your PC for the MTM400A monitor RUI v3.1 to operate successfully. If the current release of Java is not present on the PC, an opportunity to download it is offered when the RUI is first opened.

Manual Conventions

The term "RUI" will appear throughout the DTV monitor product documentation. The controls of the DTV monitor are accessed using a PC connected to the same network as the instrument. Since the instrument does not have a front-panel display device, the DTV monitor display shown on the PC is referred to as the Remote User Interface (RUI).

Installation

This section includes instructions for installing the DTV monitors, connecting signal cables to the instruments, powering the instruments on and off, connecting the instruments to a network, and applying the Option Key.

Some of the installation instructions require you to use the DTV monitor RUI. If you are unfamiliar with the RUI, refer to the following sections in this manual before installing the instrument:

- *Getting Acquainted with Your Instrument* (See page 24.)
- *Starting the RUI* (See page 32.)

Before Installation

Unpack the instrument and check that you have received all of the standard accessories. (See page 2, *Standard Accessories*.) If you ordered software or hardware options with your instrument, any accessories shipped with those options are listed at the end of this manual. (See page 63, *Product Options and Upgrades*.) Check the DTV monitor pages of the Tektronix Web site (www.tektronix.com) for the most current product accessory information.

Standard Accessories

The following table lists the standard accessories that are shipped with the DTV monitor.

Table 1: QAM400A standard accessories

Accessory	Tektronix part number
External grounding kit	020-2852-XX
Tektronix authorization key certificate	063-3158-XX
MTM400A, IPM400A, QAM400A, and RFM300 DTV Monitor Product Documentation CD-ROM	063-4135-XX
MTM400A, IPM400A, QAM400A, and RFM300 DTV Monitor Application Firmware CD-ROM	063-4136-XX
QAM400A DTV Monitor English Quick Start User Manual (Option L0 only)	071-2784-XX
Rackmount slide assembly	351-0751-XX

Power cords. DTV monitors are shipped with one of the following power cord options. Power cords for use in North America are UL listed and CSA certified. Cords for use in areas other than North America are approved by at least one authority acceptable in the country to which the product is shipped.

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

Options

Licensed software options and hardware upgrades are available for the DTV monitors. (See page 63, *Product Options and Upgrades*.)

Operating Considerations

The following table lists the electrical operating requirements for the DTV monitors. The complete electrical operating requirements of the DTV monitors are listed in the *MTM400A*, *IPM400A*, *QAM400A*, and *RFM300 DTV Monitor Specifications and Performance Verification Technical Reference*.

Table 2: 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 A
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

Hardware Installation

This section provides instructions for installing a QAM400A DTV monitor in an equipment rack.

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 metalically connected to interfaces that connect to the outside plant or its wiring.*

A grounding and bonding strap for use in Central Office RBOC applications is supplied as a standard accessory with each DTV monitor. The instructions for installing the grounding strap are included in the rack mounting instructions.

Rack Mounting the DTV Monitor



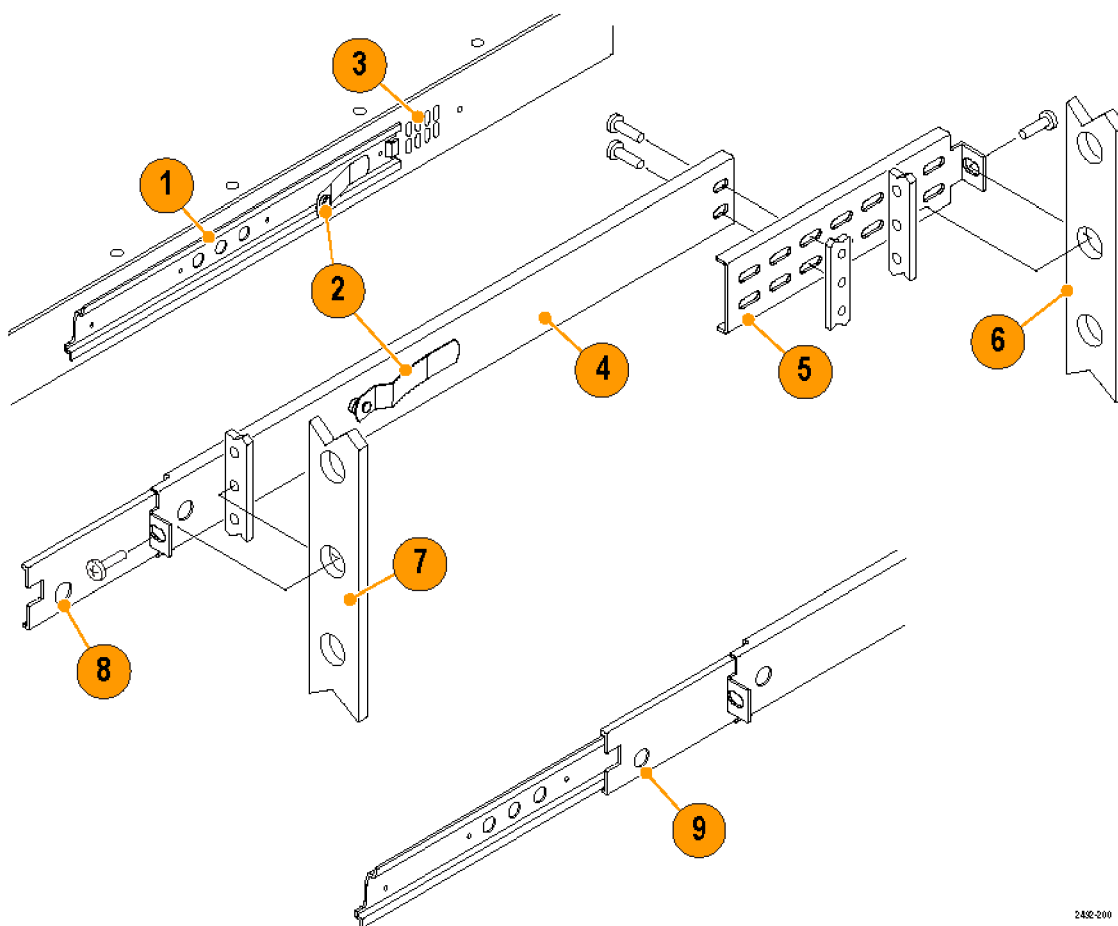
CAUTION. *To avoid fire hazard, the monitor must be installed in the rack only as specified, and proper ventilation must be maintained. The right side rack slide must be mounted correctly so that it does not obstruct the adjacent air vent.*

Efficient cooling will be maintained in a rack-mounted instrument only if the air temperature at all intake air vents (inside the equipment rack) does not exceed 40 °C.

The DTV monitor is designed to be mounted in a standard 19-inch equipment rack: a rack-mounting kit is shipped as a standard accessory with each instrument. The chassis components of the rack slides are shipped from the factory attached to the instrument as shown in the following figure.

Perform the following steps to install the instrument in an equipment rack.

1. Install the rack-mounting brackets in a desired location in the equipment rack as shown in the following figure. You can adjust the position of the rear rack mounting to suit the depth of the rack. Approximately six inches of clearance is required between the rear panel of the instrument and any rear cabinet panel to allow for connector space and adequate air circulation.



2482-200

Table 3: Rack adapter components

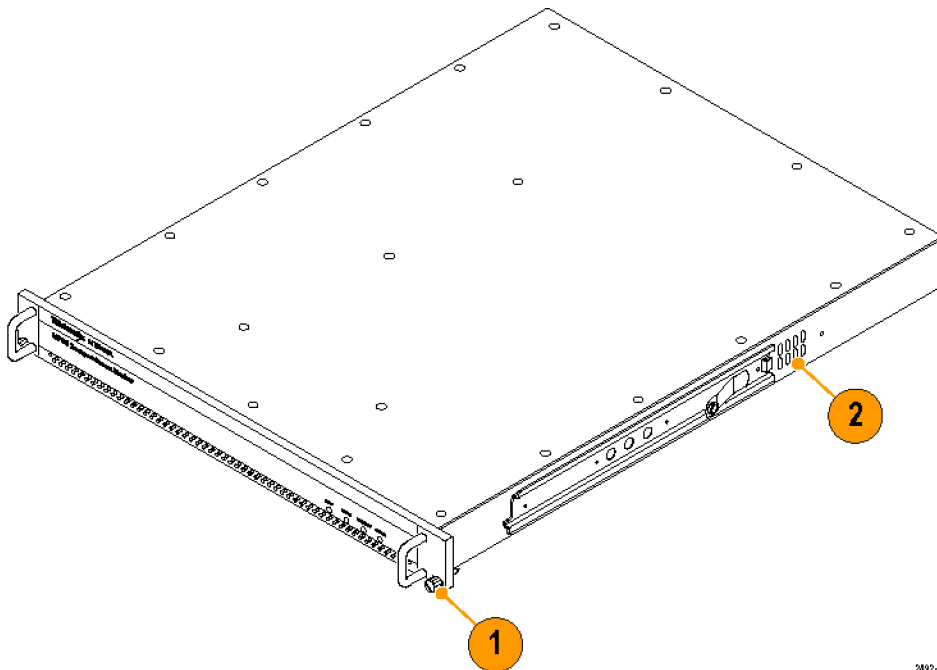
Figure element	Item	Description
1	Chassis section	Mounted to chassis of monitor
2	Latches	-
3	Air vents	Do not block the air vent holes
4	Stationary section	-
5	Rear rack mounting	-
6	Rear rack upright	-
7	Front rack upright	-
8	Stop latch hole	-
9	Stop latch	-

- After you install the rack-mounting hardware, pull the slide-out tracks out to the fully extended position.



WARNING. To prevent the instrument from falling and causing personal injury and damage to the instrument, support the instrument until it is secured in the equipment rack.

3. Insert the rack slides on the DTV monitor chassis into the extended slide-out tracks.
4. Press the stop latches shown in the following figure, and then push the instrument toward the equipment rack until the latches snap into their holes.
5. Press the stop latches again and push the instrument fully into the equipment rack.
6. Adjust the rack slides as necessary. (See page 8, *Adjusting the rack slides*.)
7. If you are installing the instrument in a Central Office RBOC application, install the grounding strap. (See page 6, *Installing the grounding strap*.)
8. Tighten the retaining screw on the right side of the front-panel to secure the instrument in the equipment rack.



2802-001

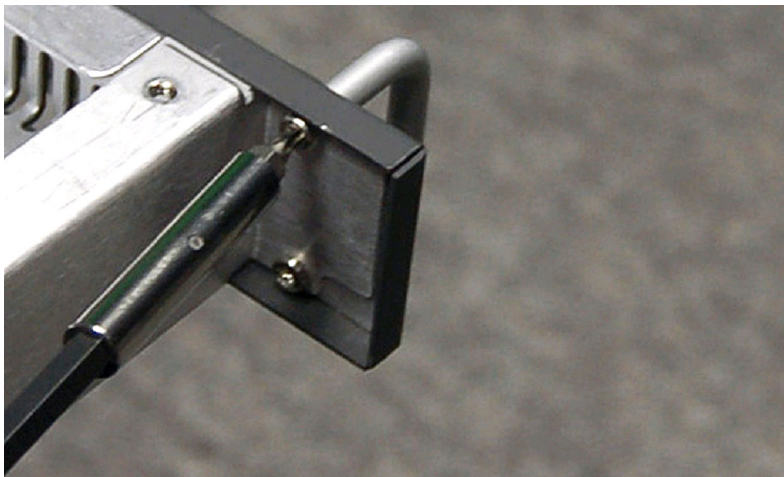
Installing the grounding strap. A grounding and bonding strap kit (Tektronix part number 020-2852-XX) for use in Central Office RBOC applications is supplied as a standard accessory with each DTV monitor.



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.

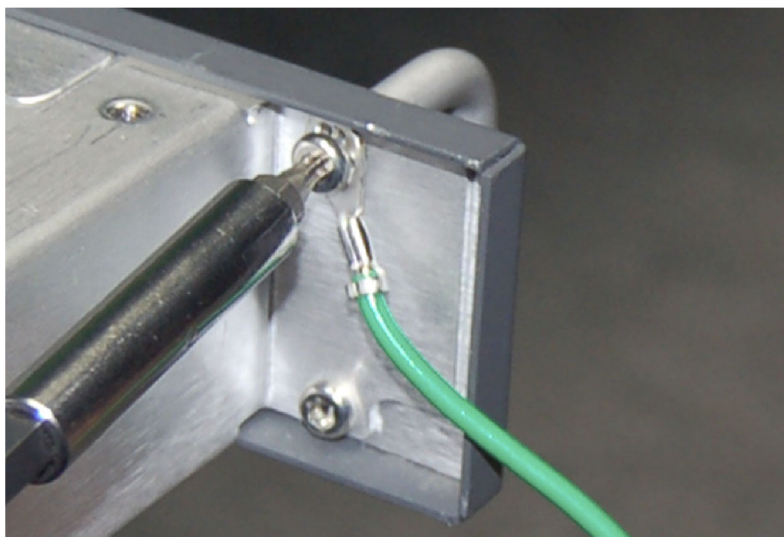
Perform the following steps to install the grounding strap:

1. After you install the instrument in an equipment rack, pull the instrument out to the extended position on the rack slides. Depending on your installation location, it may be necessary to remove the instrument from the rack to remove the screw in the following step. (See page 8, *Removing the DTV monitor from the equipment rack*.)
2. Use a screwdriver with a T-15 TORX tip to remove the top, front-left handle retaining screw (6-32 x 0.375) as shown in the following figure.



CAUTION. To limit corrosion, 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.

3. Using the screw that was removed in step 1, attach the smaller #6 ring terminal of the grounding strap to the top, front-left handle position as shown in the following figure. Torque the screw to 10 in-lbs to so that the terminal provides good ground contact.



4. If necessary, reinstall the instrument in the equipment rack. (See page 4, *Rack Mounting the DTV Monitor*.)



CAUTION. All mating surfaces must be cleaned and treated with an antioxidant before being joined. In an (IBN), the requirements of Telcordia document TR-NWT-000295, Isolated and Mesh Bonding Networks, apply.

5. Using the Phillips thread-forming screw (10-32 x 0.500) supplied in the grounding strap kit, attach the larger #10 ring terminal of the grounding strap to the frame of the equipment rack as shown in the following figure (a DTV monitor is shown). Attach the grounding strap to the equipment-rack frame at an open unused hole in the frame as close to the DTV monitor as possible. Torque the screw to 10 in-lbs to so that the terminal provides good ground contact.



Adjusting the rack slides. After installation, if the slide tracks are not properly adjusted, they may bind. Perform the following steps to adjust the slide tracks:

1. Slide the instrument out of the equipment rack about 10 inches.
2. Slightly loosen the screws holding the slide tracks to the front rails, and allow the tracks to seek an unbound position.
3. Retighten the screws and check the slide tracks for smooth operation by sliding the instrument in and out of the equipment rack several times.
4. Once the instrument is in place within the rack, tighten the knurled retaining screw to secure the instrument in the equipment rack.

Removing the DTV monitor from the equipment rack. Perform the following steps to remove the instrument from the equipment rack:

1. Disconnect all signal and power cables from the instrument.
2. Loosen the retaining screw on the right side of the front panel that secures the instrument to the equipment rack.
3. If installed, remove the retaining screw for the grounding strap from the front of the equipment rack.
4. Pull the instrument out of the equipment rack until the stop latches snap into the holes on the rack slides.
5. Press the stop latches, and then remove the instrument from the rack slides.

Maintaining the rack slides. The slide tracks do not require lubrication. The dark gray finish on the tracks is a permanent, lubricated coating.

Connecting to the Instrument

The external connectors are all located on the rear panel of the instrument. See the *MTM400A*, *RFM300*, *IPM400A*, and *QAM400A DTV Monitor Specifications and Performance Verification Technical Reference* for more detailed information about each connector and the associated signal requirements.

Perform the following procedure to make electrical, signal, and network connections to the DTV monitor:

1. After you install the DTV monitor in an instrument rack, connect the power cord that was provided with the instrument to the power connector on the rear panel. Connect the power cord plug to a properly grounded electrical outlet.



CAUTION. To be sure of 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 a low impedance connection to shielded connectors at both ends.

2. Use the following figure and table to make the necessary transport stream, network, and peripheral device connections using the standard connectors at the rear of the instrument.

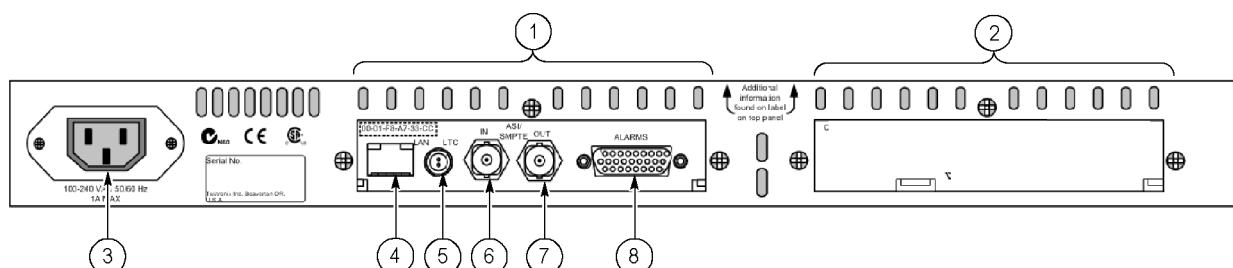


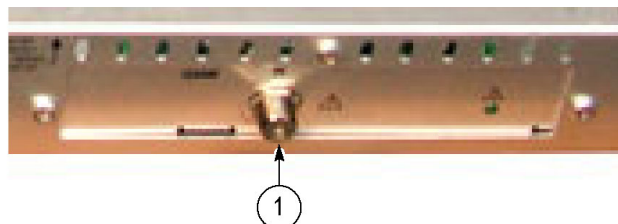
Table 4: Standard external connectors

Figure element	Item	Description
1	Transport Stream Processor card	Standard hardware
2	Interface card	Optional hardware (See Table 5.)
3	Power	Power input
4	Ethernet	10/100Base-T; RJ-45
5	LTC In	Longitudinal time code input
6	Transport stream input (ASI/SMPTE) ¹	75 Ω , transformer coupled, BNC connectors for the following signal formats: <ul style="list-style-type: none"> ■ Accepts Burst and Packet mode ASI formats and M2S ■ An active loop-through of the corresponding input ■ Compliant with SMPTE310M (19.392 Mbps only) ■ An active loop-through of the corresponding input
7	Transport stream output (ASI/SMPTE) ¹	
8	Alarms	
		(Digital input/output) 26-pin, D-type connector for five alarm relays, three TTL outputs, and a recording trigger input. The relays and the TTL outputs are triggered by test failures. The triggers are set using the RUI.

¹ ASI/SMPTE Input/Output are software selectable.

3. When an interface card is installed, use the following figure and table to make the necessary transport stream connections at the rear of the instrument.

QAM (Annex A)
QAM (Annex C)



QAM (Annex B2)

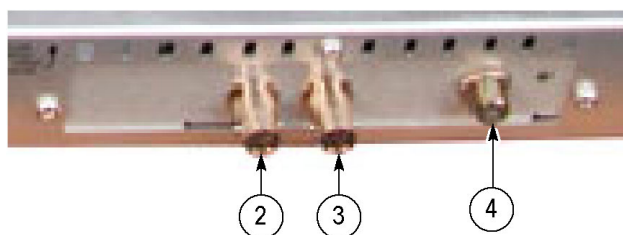


Table 5: QAM400A interface card external connectors

Interface card	Figure element	Connector	Description
QAM (Annex A) QAM (Annex C)	1	ASI/SMPTE310M input/output	Type F connector
QAM (Annex B2)	2	ASI/SMPTE310M input	BNC connector
	3	ASI/SMPTE310M output	BNC connector
	4	RF input	Type F connector

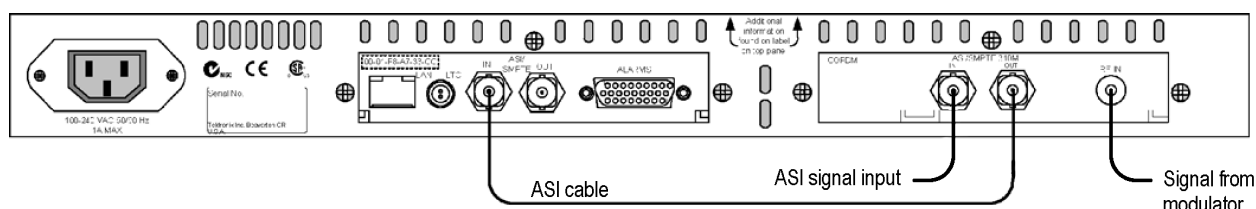
Installing the ASI Cable

The QAM (Annex B2), 8PSK/QPSK, DVB-S2, 8VSB, and COFDM interface cards are each shipped with an ASI cable that enables you to monitor ASI and RF signals (for example, both the input and output of a modulator). To make transport stream measurements on an RF input, the RF signal must be made available to the Transport Stream Processor card by looping the interface card ASI output to the Transport Stream Processor card ASI input.

NOTE. The QAM (Annex A) and QAM (Annex C) interface cards do not need an external cable connection because these interface cards are connected to the Transport Stream Processor card inside the instrument.

Perform the following procedure to install the ASI cable:

1. For the QAM (Annex B2), 8PSK/QPSK, DVB-S2, 8VSB, and COFDM interface cards only, perform the following steps:
 - a. Connect an ASI signal to the interface card ASI In connector as shown in the following figure.
 - b. Connect the output from a modulator to the interface card RF In connector.
 - c. Connect the ASI cable supplied with the interface card between the ASI/SMPTE310M Out connector on the interface card and the ASI In connector on the Transport Stream Processor card.



2. Use the Interface dialog box to configure the instrument to use the installed interface card and to select which signal input to monitor.

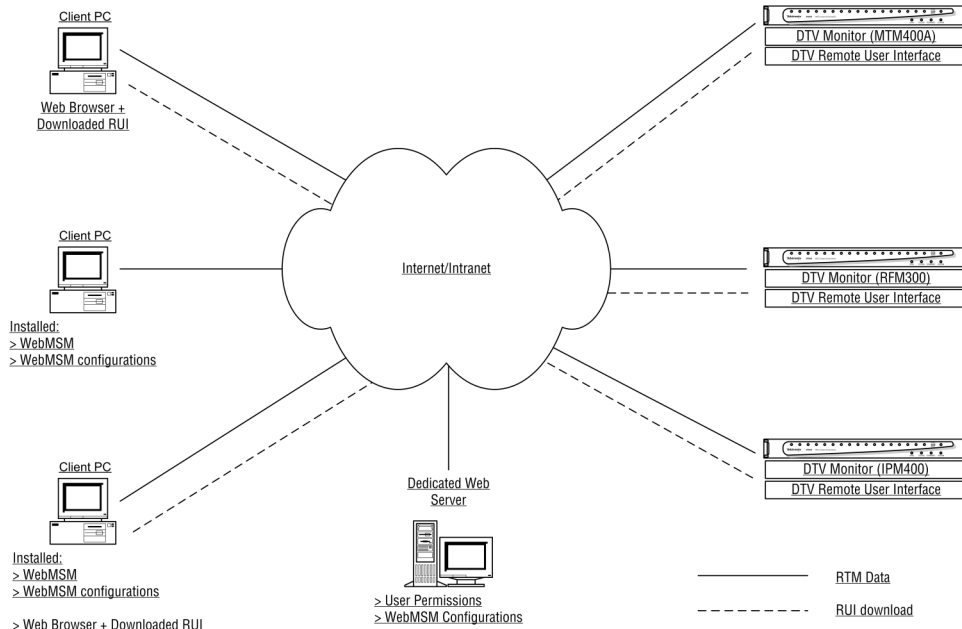
Powering the Instrument On and Off

The DTV monitors do not have external power switches. To power on the instrument, connect the power cord that was provided with the instrument to the power connector on the rear panel. Connect the power cord plug to a properly grounded electrical outlet. To power off the instrument, remove the power cord from the instrument.

Network Installation

A major feature of a DTV monitor is its configuration versatility. Although the monitor always operates within a client-server architecture, the following configuration options are available as shown in the following figure:

- You can leave the instrument unattended. The front panel LEDs and any configured external alarms will indicate monitoring test failures.
- You can monitor the instrument from a PC over an Ethernet network or the Internet using the RUI.
- The RUI software is downloaded and accessed from the DTV monitor using a browser (Microsoft Internet Explorer with Sun Java 1.6.0_20 or later software installed) on 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, make sure that the following information is available:

- DTV monitor MAC address: xx-XX-xx-xx-xx-xx
 - Location 1: rear panel label adjacent to the Ethernet connector
 - Location 2: main circuit board (internal)
 - Location 3: instrument top cover (optional)
- DTV monitor IP address: yyy.yyy.yyy.yyy
 - Assigned by network administrator
- DTV monitor software license: zzzzz-zzzzz-zzzzz-zzzzz
 - Location 1: instrument top cover (optional)

MAC Address

The Transport Stream Processor card in the DTV monitor is assigned a unique MAC (Media Access Control) address; this is also used as the unique address of the complete instrument. The MAC address is printed on labels attached to the Transport Stream Processor card and the instrument.

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 instrument to be able to function within a network.

IP Address

An IP address is assigned to each DTV monitor 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 instrument to be able to function within a network.

New DTV monitors are shipped with the IP address set to 0.0.0.0; this is because the IP address that you will use is unknown at that time. In this situation, follow the steps below to associate the proper IP address with the MAC address. (See page 15, *Setting Up the Network*.)

If the IP address is unknown, it must be reset to 0.0.0.0 and set up with a new IP address before the instrument can be used.

Resetting the IP Address

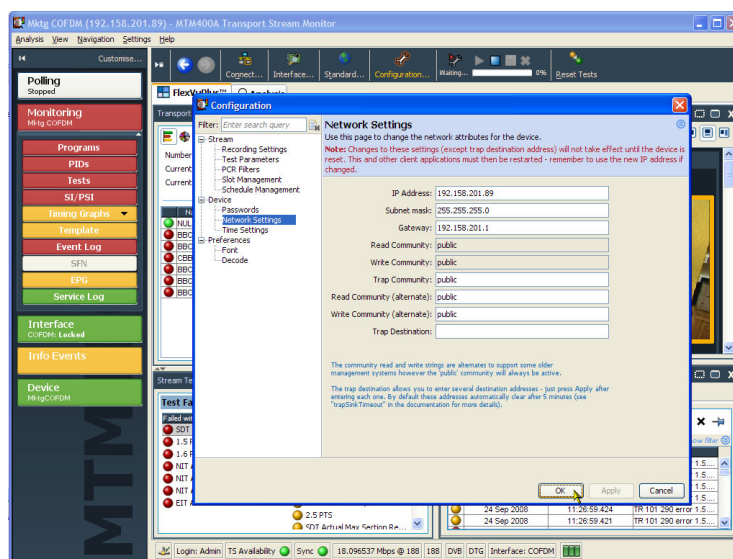
Reset the IP address of a DTV monitor to 0.0.0.0 (factory default) in one of the following two ways:

Method 1. If the current IP address of the instrument is known, you can reset the address using the DTV monitor user interface.

Method 2. If the current IP address of the instrument is unknown, reset the address by clearing the nonvolatile RAM on the Transport Stream Processor card. Clearing the RAM resets all configuration data, including the IP address and the software option license (option key), to the factory defaults.

Resetting the IP address using the user interface. Perform the following steps after you power on the DTV monitor and connect to a network that recognizes the current IP address of the monitor. The following procedure assumes you know how to start the RUI. (See page 32, *Starting the RUI*.)

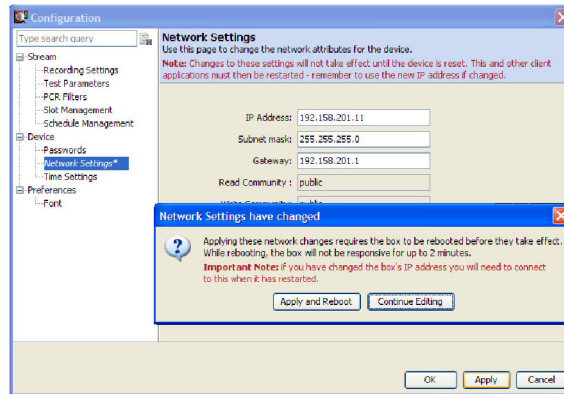
1. Start the RUI, select the administrator login type, enter the administrator password, and click **Run**.
2. Select **Configuration (toolbar) > Device > Network Settings**.
3. Make the necessary changes.
If necessary, obtain the Gateway and Subnet Mask values from the Network Administrator.
4. When you complete the changes, click **Apply**.



5. In the **Network Settings have changed** message box, click **Apply and Reboot**.

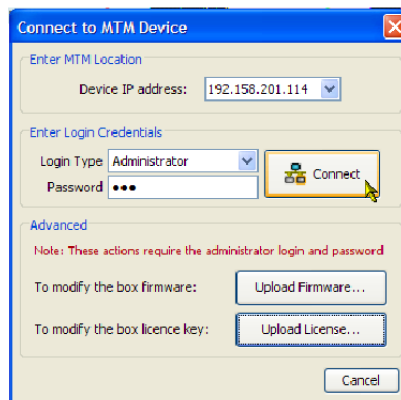
The DTV monitor is rebooted. This may take up to two minutes.

When the DTV monitor emits a beep, the instrument will respond to the new network settings. The **Connect to MTM Device** dialog box is displayed.



6. Enter the new IP address.
7. Enter your Login Type and Password. Click **Connect**.

The DTV monitor will download and display the RUI, indicating that you are connected to the instrument using the new IP address.



Resetting the IP address by clearing the NVRAM. If the IP address of a DTV monitor is unknown, you can reset the IP address to the factory default value (0.0.0.0) by resetting the battery-backed, NVRAM on the Transport Stream Processor card. When you clear the NVRAM, all configuration data is reset to the factory default values, including the IP address.



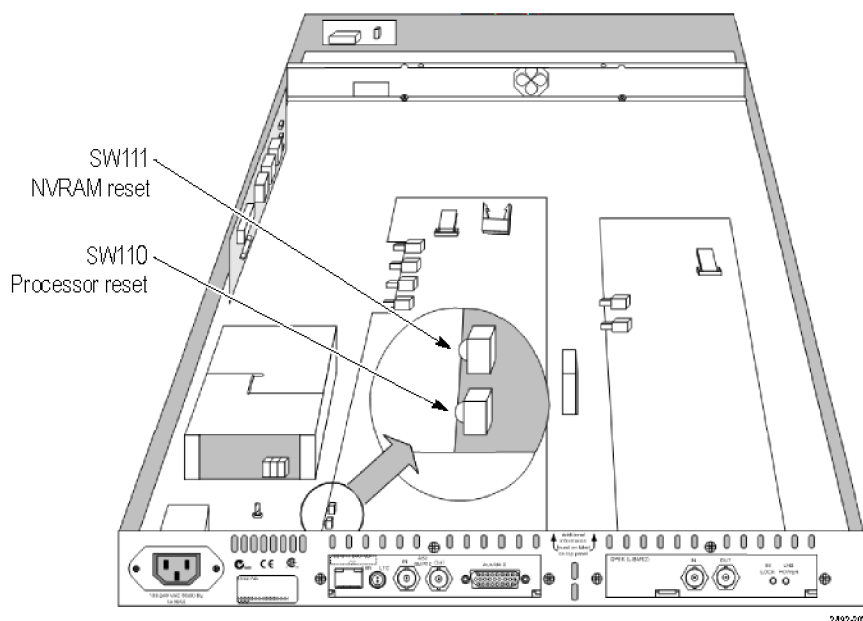
CAUTION. When you reset the NVRAM, the software licensing information for the instrument is lost. You will not be able to access all of the options that you purchased until you re-enter the software license (option key) after you reset the IP address.

Perform the following steps to reset the NVRAM:



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.

1. If necessary, disconnect the power cord and remove the instrument from the equipment rack. (See page 8, *Removing the DTV monitor from the equipment rack*.)
2. Remove the 21, T-10 TORX retaining screws from the instrument cover, and then lift the cover from the instrument.
3. Use the following figure to locate SW111, and then reset the NVRAM by pressing the NVRAM Reset switch. This action clears the current configuration and resets the instrument IP address to 0.0.0.0.



4. After you reset the NVRAM, make sure that all components are in place and that all connections are secure, and then position the cover in place and install the 21 retaining screws. Tighten the screws uniformly.
5. Set up a static ARP (Address Resolution Protocol) entry and test the reset IP address. (See page 15, *Setting Up a Static ARP Entry*.)
6. Assign the instrument a desired IP address using the user interface. (See page 13, *Resetting the IP address using the user interface*.)
7. Re-enter the software license (option key) that was provided with the instrument or upgrade. (See page 21, *Entering an Option Key*.)

Setting Up the Network

Setting up a DTV monitor for use on a network requires that the instrument and the PC are powered on and attached to the same Ethernet network. They should also be attached to the same subnet, if present.

Setting Up a Static ARP Entry

To associate the MAC address with the IP address, perform the following steps to make an entry in the ARP (Address Resolution Protocol) table:

1. On the client PC, open a Command Prompt window (Start > All Programs > Accessories > 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

NOTE. *The DTV monitor must receive a ping packet before the instrument will configure and store a new IP address.*

The ARP command cannot be used if the instrument already has an IP address; it will only work if the IP address of the DTV monitor is 0.0.0.0.

Perform the following steps to test that the network recognizes the IP address of the instrument:

1. On the client PC, in the Command Prompt window, enter:

```
C:\> ping <IP address>
```

for example, C:\> ping 192.168.201.19

2. 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
```

```
Reply from 192.168.201.19: bytes=32 time<10ms TTL=128
```

```
Reply from 192.168.201.19: bytes=32 time<10ms TTL=128
```

```
Reply from 192.168.201.19: bytes=32 time<10ms TTL=128
```

3. The IP setup is now complete. Close the Command Prompt window.
4. With the IP address successfully set up, the network settings can be completed. (See page 13, *Resetting the IP address using the user interface.*)

Network Naming

If a DTV monitor is to be accessed by a network name rather than the IP address, the relationship between the IP address and the network name must 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 assistance.

When the IP address has been set up, if the DTV monitor 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 assistance. The Gateway IP address and the Subnet Mask values are set up in the **Configuration** (toolbar) > **Stream** > **Network Settings** page. The DTV monitor must be restarted for the settings to take effect.

Network Latency

Where access to a remote DTV monitor uses several internet/intranet links of varying speeds, the initial RUI download may be initiated successfully, but occasionally the process stops. The network speed is outside of the control of Tektronix, but it may be possible to change some of the local network settings to alleviate the problem. Contact Tektronix Support for assistance.

RUI Platform Requirements

You can run the RUI on any personal computer (PC) that meets the following requirements. (See Table 6.)

Table 6: RUI platform requirements

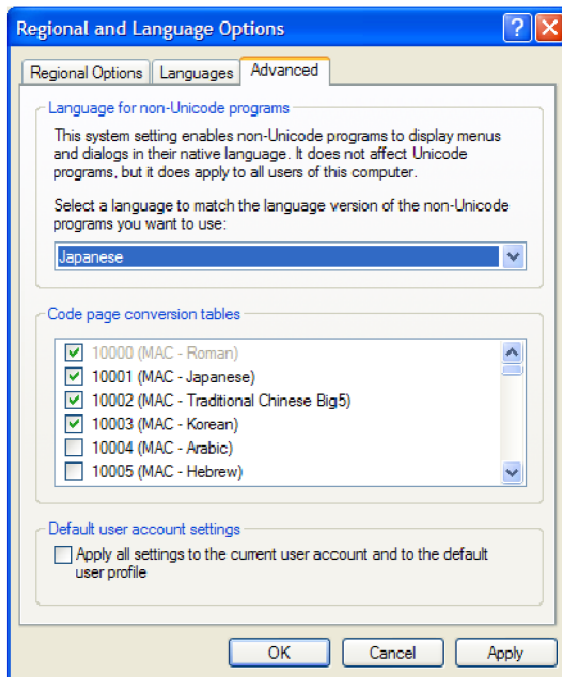
Characteristic	Description
Minimum Specification	1.2 GHz Intel Pentium Processor (Preferred: 2 GHz)
Operating System	Microsoft Windows operating systems Windows 2000, Windows XP, and Windows Vista (Recommended: Windows XP Pro)
Disk space	2 GB free disk space
Ethernet	10/100-base T
Installed software	Microsoft Internet Explorer, Version 7.0 minimum; Sun Java Runtime Environment Version 6 Update 7 minimum (1.6.0_20)
RAM	1 GB
CD-ROM Drive	8x
Display	1024 x 768 pixel video monitor with 16 bit (65000) available colors

Installing Japanese Font Extensions on your PC

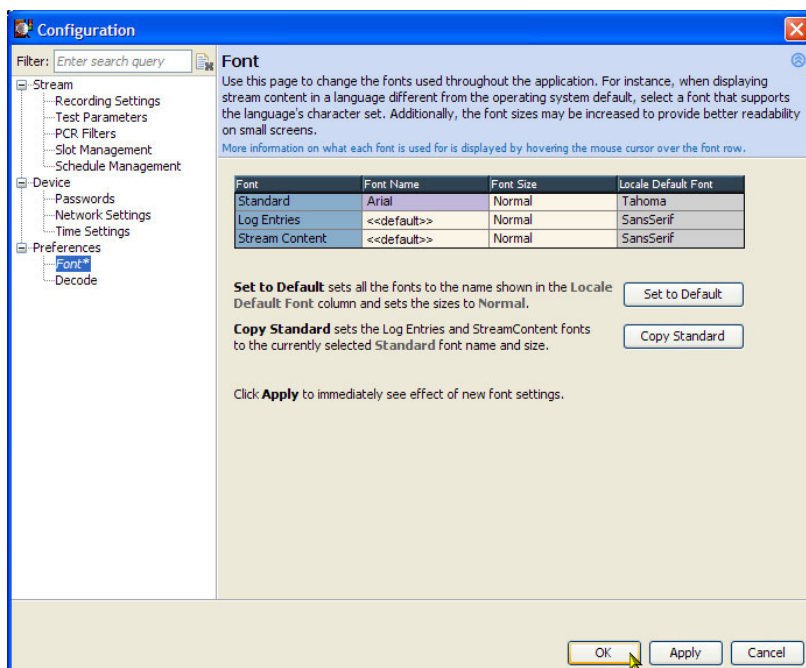
The ARIB specifications for the ISDB standard make use of private extensions to the standard Unicode character set [0xE000-0xF8FF]. These extensions allow you to add additional characters and nonstandard proprietary characters to an existing font, or as a system-wide default. The extension sets are provided as TrueType Extension files (*.tte). Any extension sets should be installed using the Private Character Editor, which is supplied as part of the standard Microsoft Windows operating system.

The RUI can display these private character extensions when the operating system on the PC is correctly configured. If the operating system on your PC was not configured to display private character extensions, perform the following steps:

1. Open the Control Panel on your PC and select **Regional and Language Options**.
2. Select the **Advanced** tab in the Regional and Language Options dialog box, and select **Japanese** from the drop-down list as shown in the following figure.



3. Click **Apply** to accept the setting change. After you apply the language setting change, Windows might display a message stating it must reboot. If this message appears, allow the PC to reboot.
4. Rename the TrueType Extension file (*.tte) file that you want to use to **eudc.tte**, and then copy the file to the following directory: C:\WINDOWS\Fonts.
5. Select **Run** from the Start menu, type **eudcedit** in the Run dialog box, and click **OK** to run the Microsoft Windows Private Character Editor. The editor window will appear briefly and then exit. This action makes the appropriate changes to the registry to register eudc.tte as the system default character extension font.
6. Launch the DTV monitor RUI on your PC.
7. Open the Font Configuration page shown in the following figure by selecting **Configuration > Preferences > Font** from the toolbar.



8. If necessary, set the Font Name for Log Entries and Stream Content to <<default>>. The RUI will now display private characters correctly by getting them from the font supplied in the eudc.tte file.

Video Thumbnail Support

Before thumbnails can be viewed using the RUI, thumbnail support software must be installed on the client PC and the feature must be enabled in the RUI. If thumbnail support is not installed, a message is displayed when you attempt to view thumbnails.

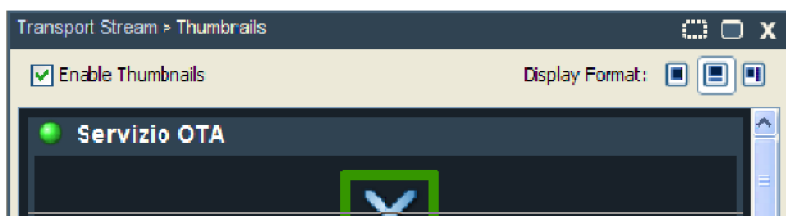
The thumbnail support software for the DTV monitor is based on modified open source material. The modified code is included in the executable file, and can be copied to the client PC and inspected if required.

Perform the following steps to install the thumbnail support software:

1. Close the RUI and any instance of Internet Explorer.
2. Locate the Thumbnail Support Package on the DTV Monitor Application Firmware CD-ROM that was supplied with the instrument (Tektronix part number 063-4136-XX). You can also download the software package from the Tektronix Web site (Tektronix part number 066-0945-XX).
3. Open the executable file (Tektronix part number 066-0945-XX). The Welcome screen of the thumbnail support installation wizard is displayed. Click **Next** and follow the instructions given in the subsequent screens.
4. In the Setup Type screen, select **Typical**.

NOTE. To inspect the open source code that forms the thumbnail support package, select the Custom setup type and enable the Source Code option in the Select Components screen. Click Next to continue.

5. When all stages of the thumbnail support installation wizard are completed, the thumbnail display feature will be available when the RUI is opened.
6. To enable the thumbnail display, use the RUI **Configuration** (toolbar) > **Stream** page, or click **Enable Thumbnails** on any of the thumbnail views as shown in the following figure.



Licensing

Software options on DTV monitors are enabled using an Option Key. The Option Key is an encrypted code that unlocks and enables software and hardware functions that are installed on the instrument. Each option key is unique and is generated for a specific DTV monitor using the serial number and MAC address of that monitor. An option key that is generated for one monitor will not work when applied to another monitor.

The serial number identifies a specific DTV monitor. The MAC address identifies the Transport Stream Processor board that is installed in the monitor. If there is a hardware failure and the Transport Stream Processor board is replaced, a new option key must be issued because the monitor will then have a different MAC address. The MAC address is printed on the label on the top cover of the monitor and above the network port on the rear panel.

The DTV monitor is shipped from the factory with the appropriate Option Key already applied to support all of the functions that were ordered. The Option Key is documented on the Tektronix Authorization Key Certificate that is shipped with the instrument and on the top cover label of the instrument.

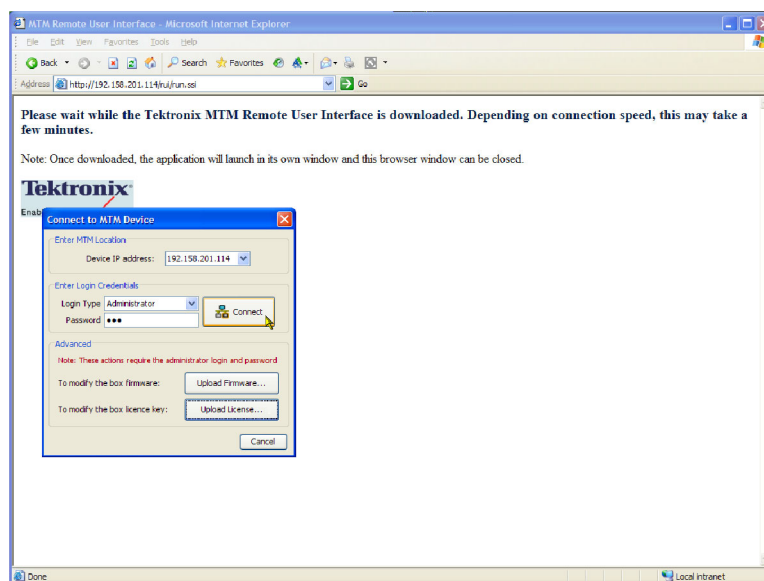
NOTE. If the battery-backed RAM in your DTV monitor is reset, you must reapply the option key to reenables any of the software options that were purchased for your monitor.

When you purchase an upgrade to add software options to your instrument, a new Option Key is supplied with the upgrade kit. You must apply the new Option Key to enable the additional functions you purchased. The original Option Key that was shipped with the instrument will still be valid. However, it will only enable the functions originally purchased with the instrument.

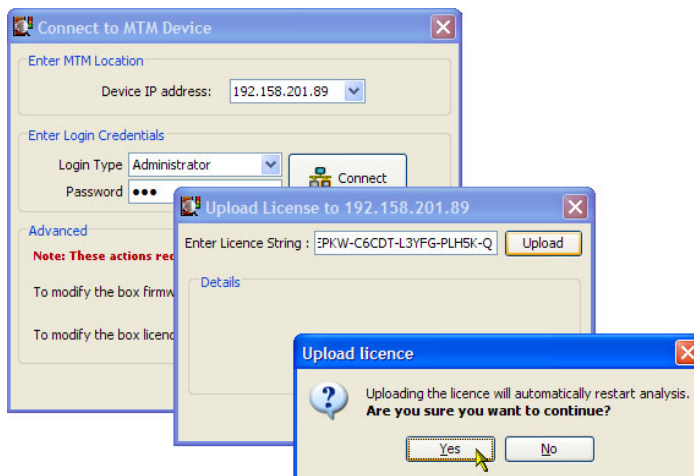
Entering an Option Key

Use the following procedure if you need to update or re-enter the Option Key on your DTV monitor.

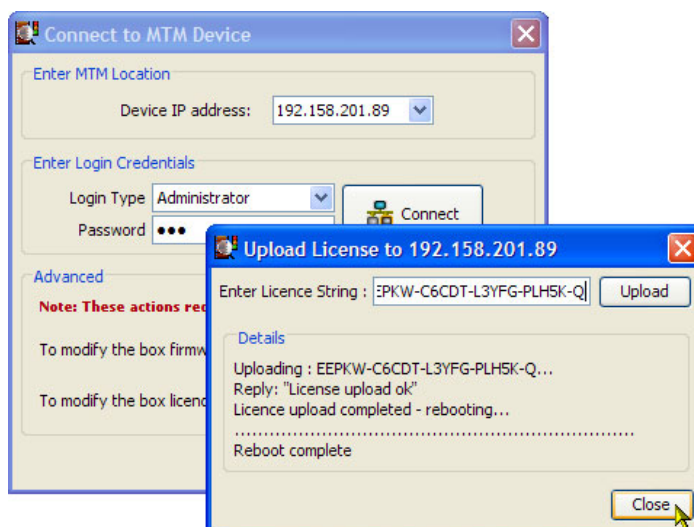
1. Close any Web browser windows that are connected to the DTV monitor.
2. Open a Web browser and enter the IP address or network name of the DTV monitor that you are updating in the browser address line.
3. In the Connect to MTM Device dialog box, select **Administrator** as the login type, enter the password, and then click **Upload License**.



4. In the Upload License dialog box, enter the license string that was supplied with your instrument or upgrade, and then click **Upload**.
5. Click **Yes** in the Upload License confirmation dialog box.
6. The instrument will now reboot. The reboot process takes approximately two minutes to complete.



7. Click **Close** in the Upload License dialog box after the Reboot complete message appears.

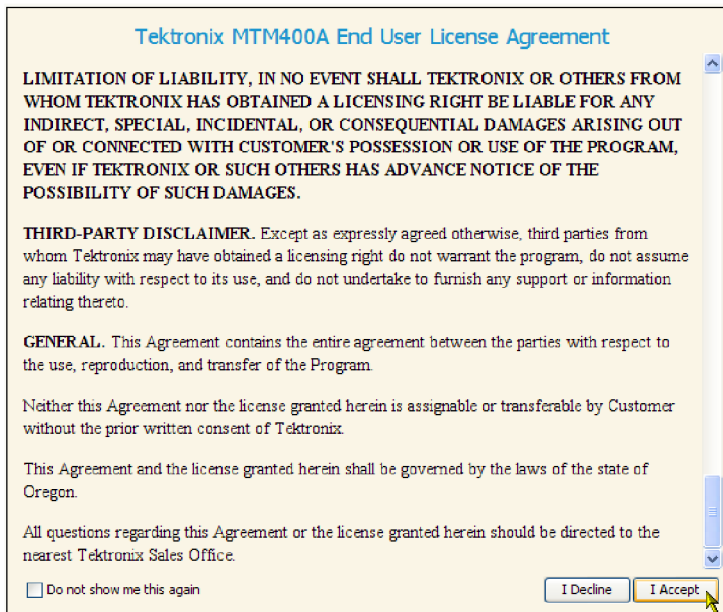


8. In the Connect to MTM Device dialog box, select **Administrator** as the login type, enter the password, and then click **Connect**.



9. Read the Tektronix MTM400A End User License Agreement and click **I Accept**.

10. The RUI will now appear.



Tektronix MTM400A End User License Agreement

LIMITATION OF LIABILITY. IN NO EVENT SHALL TEKTRONIX OR OTHERS FROM WHOM TEKTRONIX HAS OBTAINED A LICENSING RIGHT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR CONNECTED WITH CUSTOMER'S POSSESSION OR USE OF THE PROGRAM, EVEN IF TEKTRONIX OR SUCH OTHERS HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

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Operation

This section describes the front-panel indicators on the DTV monitor, the RUI display elements, and the various views that are available within the RUI.

Getting Acquainted with Your Instrument

Front Panel Indicators

Since the DTV monitors are designed to be operated remotely, the local interface is limited to four front-panel LEDs as shown in the following figure. The LEDs indicate the instrument status. (See Table 7.)

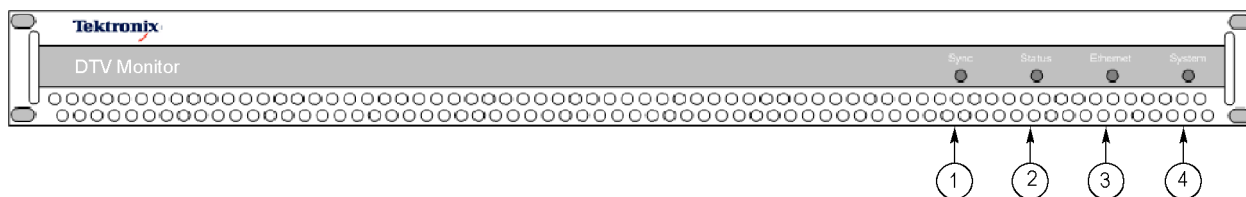


Table 7: Front panel LEDs

Figure element	LED name	Description
1	SYNC	Indicates that a valid MPEG transport stream is connected to the unit.
2	STATUS	Indicates the combined state of the tests currently being performed on the stream. The test reported by the STATUS LED corresponds to the Stream Tests status in the Analysis > Tests view.
3	ETHERNET	Indicates the state of the Ethernet physical link.
4	SYSTEM	State of all nonstream items (hardware, time sources). The test reported by the SYSTEM LED corresponds to the Device Tests status in the Analysis > Tests view.

Each LED can display one of the following three colors, except the Ethernet LED, which never displays yellow.

- 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.

RUI Display Elements

You can use the RUI to monitor real-time transport streams from your networked PC. (See page 32, *Starting the RUI.*) The following figure and table describe the main RUI display elements. The display elements are described in more detail in the *MTM400A, IPM400A, QAM400A, and RFM300 DTV Monitor Technical Reference*.

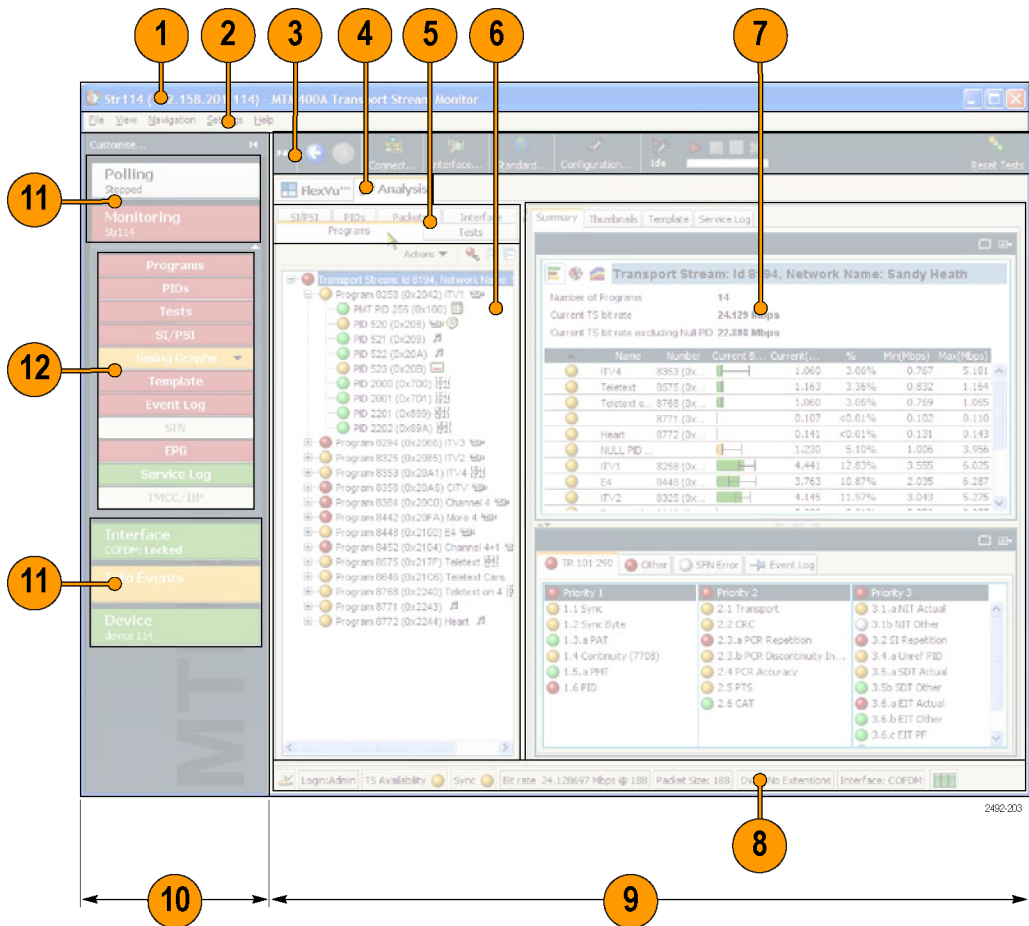


Table 8: RUI display elements

Figure element	Item	Description
1	Title bar	Displays the stream name (if specified) that is being monitored followed by the IP address or network name of the DTV monitor.
2	Menu bar	Provides access to a selection of system options using drop-down menus.
3	Toolbar	Provides shortcuts to often-used menu options.
4	Top-level tabs	Selects between the two major display views: FlexVuPlus™ and Analysis.
5	Summary tabs	Selects which Analysis view to display. The Summary tabs are displayed in Analysis mode.
6	Tree view	-
7	Detail view(s)	-
8	Status bar	Provides a summary of the monitoring status.
9	Main application view	-
10	Button bar	Provides shortcuts to major monitoring functions. You can hide the button bar if required.
11	Primary buttons	-
12	Monitoring group buttons	-

Color coding. The buttons and icons in the RUI use the color-coding described in the following table to indicate their status.

Table 9: Color coding

Color	Meaning
Green	Operation normal - no error detected
Red	Error detected and still present
Blue	Warning detected and still present
Yellow	Transient error, which has now corrected itself
Gray	The corresponding test is disabled (or is unavailable). All buttons gray indicates that connection to a device has been lost
White	Test not applicable
Black	Maintenance mode

RUI Displays

FlexVuPlus™ Display

The FlexVuPlus™ display enables the instrument to perform like a 4-in-1 monitor on a single incoming stream. The display allows you to select up to four concurrent views of a monitored stream and provides the ability to configure each of the four views independently. Each of the FlexVuPlus™ views is selected from views that are available under the Analysis tab.

Refer to *Setting up the FlexVuPlus™ Display* for information about selecting views for the FlexVuPlus™ display. (See page 35.)



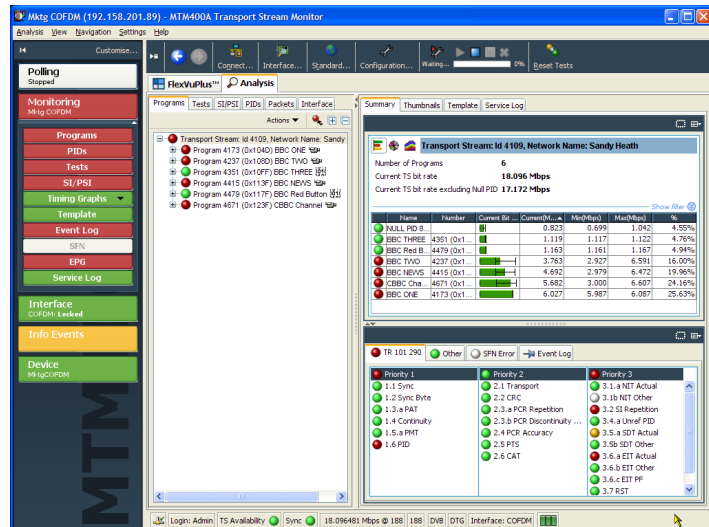
Analysis View

The Analysis view provides a single main program summary window with different context sensitive views contained within tabbed frames. This view is intended to provide the maximum amount of useful information while keeping the screen from appearing cluttered. From the Analysis view window, you can access the following views: Programs, Tests, Tables, PID, Packets, and Interface.

Analysis - Programs View. The Programs view provides a fast overview of the transport stream contents in terms of program content, bit rate use by each program, and TR 101 290 test results.

Red, amber, and green LEDs highlight errors associated with each program, or element of a program, within the transport stream. Red LEDs indicate that there are errors occurring in the stream, amber LEDs indicate that errors have occurred but are now clear, and green LEDs indicate that no errors have been detected.

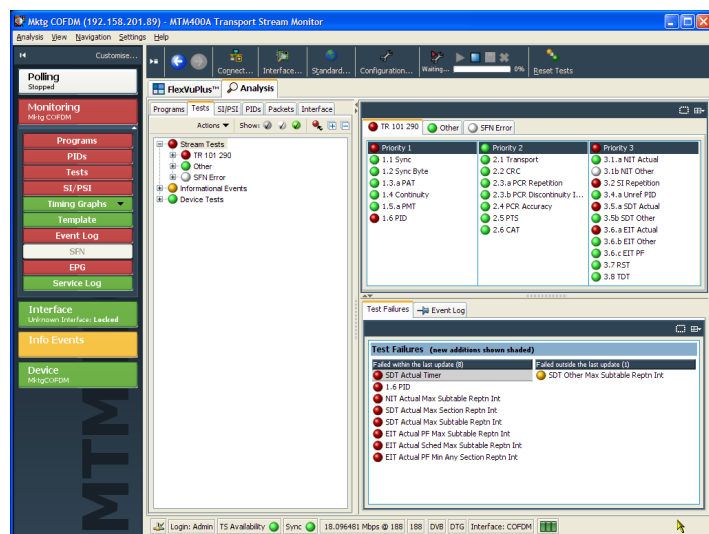
Errors that are detected at lower levels in the program stream hierarchy propagate up to the highest level. This allows you to monitor all of the programs in the stream at a high level, and then quickly go to lower levels as necessary to locate a problem.



Analysis - Tests View. The Tests view allows you to identify the tests that are indicating errors in a monitored stream. The error log is automatically filtered by the selected test, and can also be filtered by the Packet Identifier (PID).

In addition to the standard first, second, and third priority tests included in the TR 101 290 standard, tests are available for Program Clock Reference (PCR) jitter and program/PID bit rate. A variability test enables you to test the changes in the bit rate of a specific PID, and there are many tests that are specific to ISDB-T and ISDB-S streams.

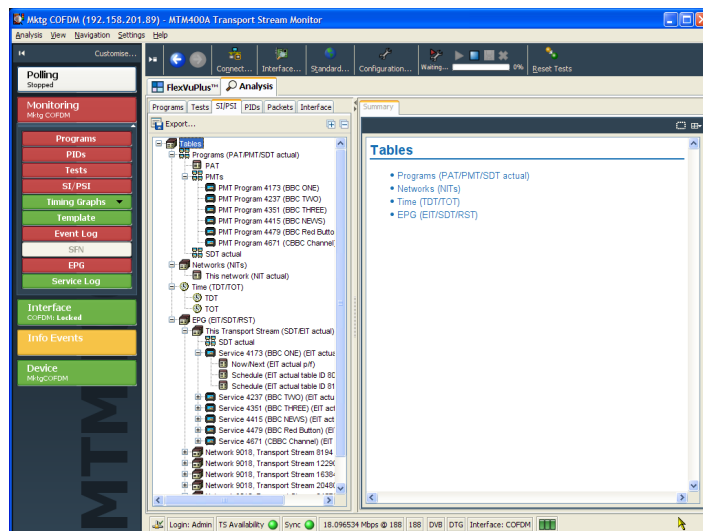
Also displayed in the Tests view are the results of tests related to the DTV monitor hardware. One example is the temperature of the system card.



Analysis - SI/PSI (Tables) View. The SI/PSI (Tables) view displays the service information tables from the analyzed stream that comply with the selected digital video standard.

This includes MPEG-specific program information, DVB service information, and ATSC, ISDB program, and system protocol information.

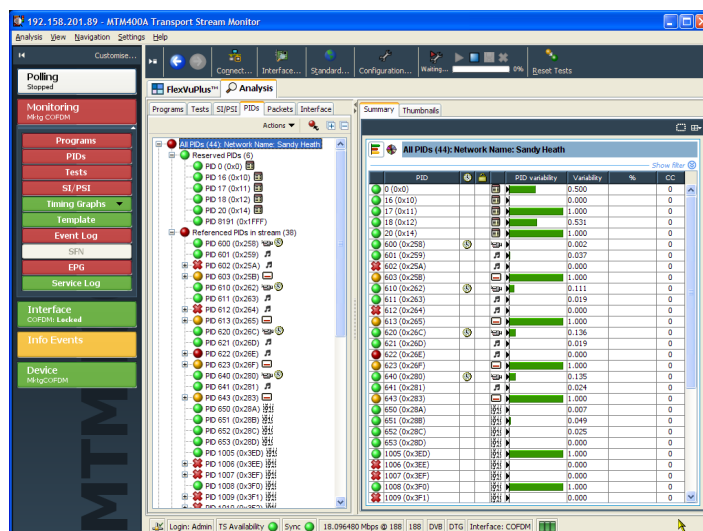
The tables are grouped together by function and hyperlinks enable you to quickly access related information within other tables.



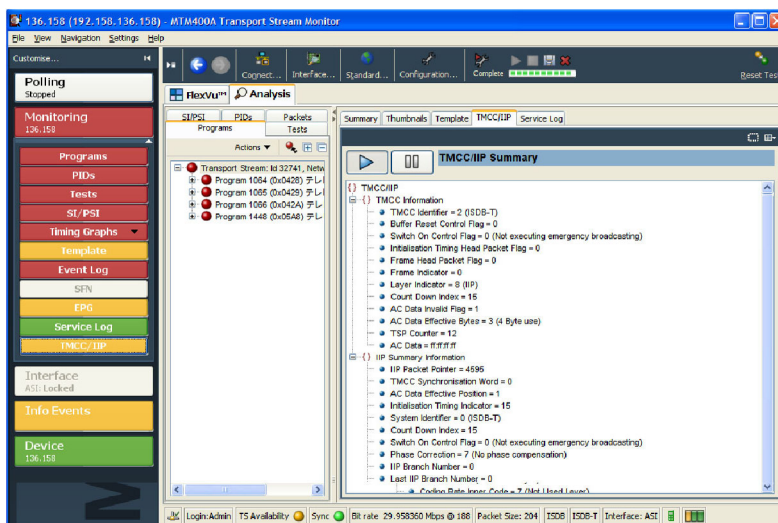
Analysis - PIDs View. The PIDs view displays information about all of the PIDs found in the transport stream. When you select the transport stream, the associated summary view provides a PID-oriented overview of the transport stream, displaying the relative data rates of all of the PIDs contained within the stream.

The information can be displayed either as a bar chart or as a pie chart. Pop-up menus enable limit selection and links.

Each PID is associated with several tests. When one or more tests fail, each failed test will be listed under the relevant PID. Select a specific PID to display a summary of all the associated tests. Select a specific test to display the Event Log and Parameters for only that test.



Analysis - Packets View. The Packets view displays SFN data when available in DVB mode, and information packets (IIPs) and TMCC data in ISDB-T mode.

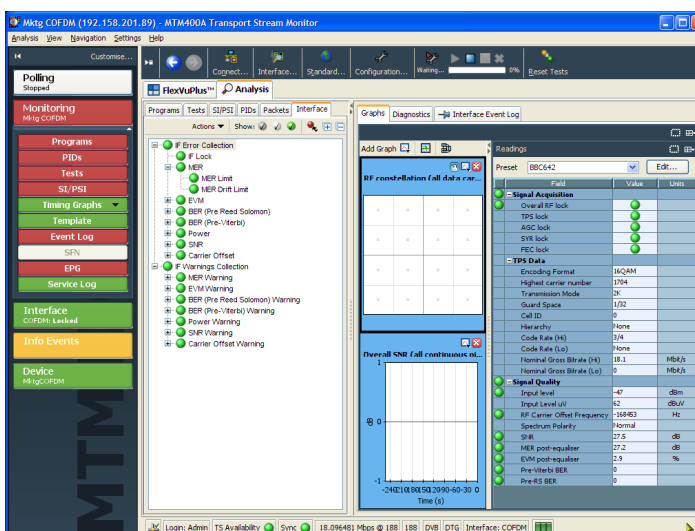


Analysis - Interface View. The Interface view tab and the Interface toolbar button are displayed only when the instrument detects that one of the optional RF interface cards or the IP video interface card is installed. When an interface card is not installed, you can use the Interface toolbar button to access the standard interfaces.

The Interface view provides a central location for information related to the RF and IP interface cards. The display includes the following information:

- Test results
- Graphical representation of specific RF or IP card measurements
- RF or IP card readings and control settings

The graphical views display a selection of graphs of instantaneous measurements and measurement trends. Also available are an Event Log and a Parameter view.



VQS1000 Video Quality Software Configuration

VQS1000 is a Video Quality Software application for single-ended, objective QoE analysis of video and audio content. It is used with all current Tektronix IP Video and DTV Monitor probes that use private backhaul video and audio. It can also be used standalone for file analysis. Combined with physical transport alarms from the Tektronix probes, operators can determine if the source of a problem is in the content (for example, over-compression) or in network distribution layers.

For the VQS1000 application to work in conjunction with the DTV Monitor, the VQS1000 player must be set up correctly in the DTV Monitor.

Setting Up the VQS1000 Player in the DTV Monitor

1. Open the DTV Monitor remote user interface (RUI).
2. Select Configuration on the Toolbar to open the **Configuration** dialog box.
3. In the dialog box, select **Preferences > Decode**.
4. In the Select Player panel, select the Tektronix VQS1000 player.

If the VQS1000 player is not present in the player list, refer to the *VQS1000 Quick Start User Manual*, Tektronix part number 077-0489-00, for installation instructions.

5. Select **OK** to enable the VQS1000 player.

Selecting a Stream for Analysis

Use the following steps to set up backhauling of a stream from a DTV Monitor.

1. Open the DTV Monitor Remote User Interface (RUI).
2. Select the **Analysis > Programs > Thumbnails** tabs to display thumbnails of the stream content.
3. Select the Play (▶) button below the thumbnail. The VQS1000 application will be opened and display analysis of the selected stream.

Procedures

This section provides you with example procedures for performing basic instrument operations. You can find detailed operational information in the *MTM400A, IPM400A, QAM400A, and RFM300 DTV Monitor Technical Reference*. The following procedures are provided:

- Starting the RUI
- Setting up the FlexVuPlus™ Display
- Saving and Using Configuration Files
- Capturing a Recording

Starting the RUI

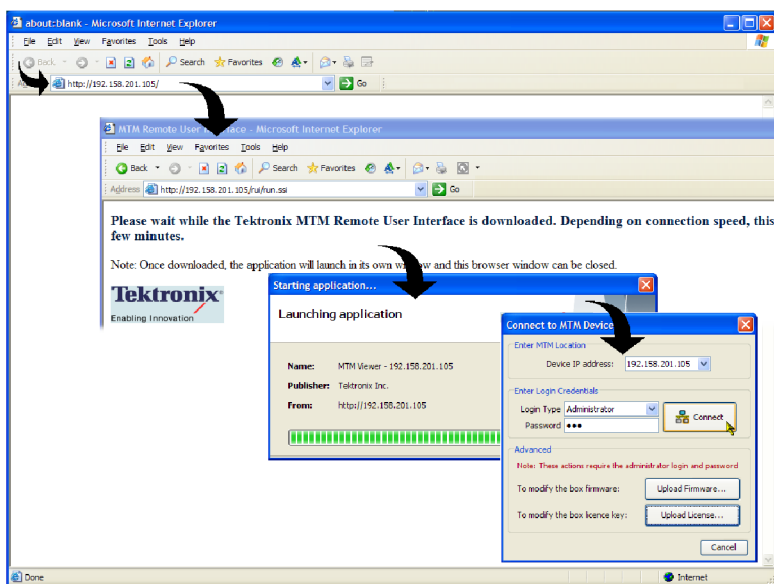
Using the RUI, you can monitor real-time transport streams from your networked personal computer (PC). The RUI software is downloaded from the DTV monitor to the PC each time the instrument is accessed. You can run the RUI on any PC that has network access to the DTV monitor and meets the minimum specifications.

If your PC does not have the minimum version of Java Virtual Machine, you must download the latest version from the Java Web site (www.java.com). When the instrument detects an older version, this process is started automatically during the RUI start-up. If necessary, consult your IT Administrator for further guidance. At the end of the Java update, you may need to close Internet Explorer and restart the RUI download.

Perform the following procedure to start the DTV monitor RUI:

1. On a networked PC, launch Microsoft Internet Explorer.
2. In the browser address bar, enter the network identity or IP address of the DTV monitor, for example: <http://TSMonitor01> or <http://192.201.121.231>.

When you press the Enter key, a Java applet is downloaded from the DTV monitor 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. A temp directory is set up by default in the Windows XP operating system; previous operating systems may require operator action.

The Java applet will not run unless the Sun Java Virtual Machine is installed. Type `java -version` at the command prompt to verify that it is installed and that the version is 1.6.0_20 or greater. If it is not installed, you can download the latest version from the Sun Web site, www.java.com/getjava.

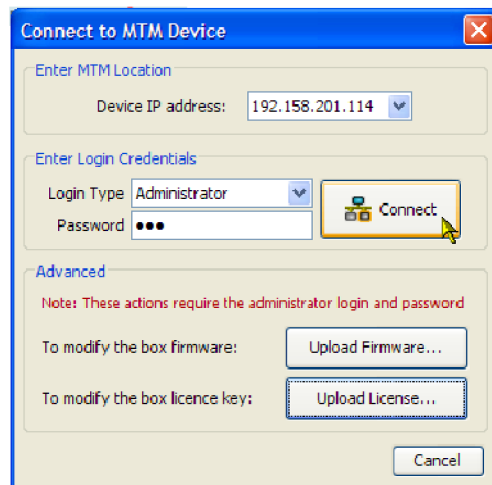
If you have to update the Java version on the PC, restart this procedure at step 2.

3. In the Connect to MTM Device dialog box, select the Login Type, Administrator or User, from the drop-down list.

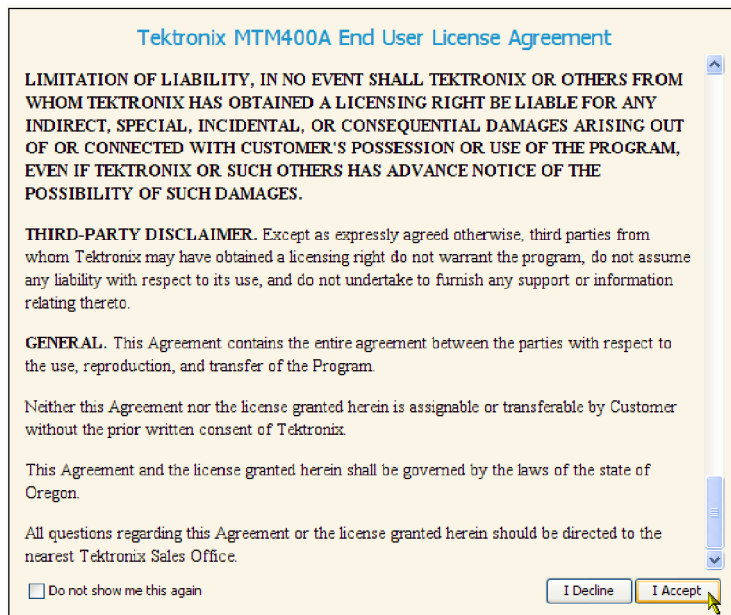
Administrator: Gives full read/write access to all views and settings, including options where installed.

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; refer to the DTV Technical Reference manual.
5. Select **Connect** to accept the details. Select **Cancel** to close the dialog box and exit the start process.



- Read the End User License Agreement, scroll to the bottom of the document and click **I Accept**.



- On starting, the FlexVuPlus™ view is displayed. For first use, a default set of views are displayed.
When you exit the RUI, your arrangement of views will be remembered the next time you access the RUI.
After you access the RUI, the PC remembers the connection and makes an entry in the Start > All Programs > Tektronix menu. The default name of the Start menu entry takes the following form: MTM Viewer - <IP Address>, where IP Address is the IP address of the DTV monitor to which you connected. You can change the default name of the Start menu entry by right-clicking on the menu entry and selecting Properties.

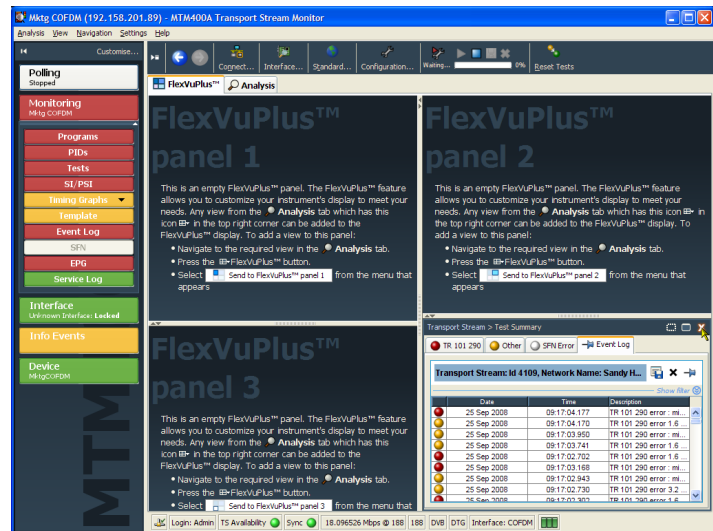


Setting Up the FlexVuPlus™ Display

Using FlexVuPlus™, you can select up to four views from the analysis detail views to be displayed together to facilitate basic transport stream monitoring or more detailed diagnostic monitoring, for example, monitoring the quality of an RF stream.

For this exercise, close each of the displayed FlexVuPlus™ panels by clicking the **X** in the top right corner of each panel.

This is not necessary, but it may help you visualize the following procedure more easily as each panel is populated. Note that each of the four FlexVuPlus™ panels are numbered.

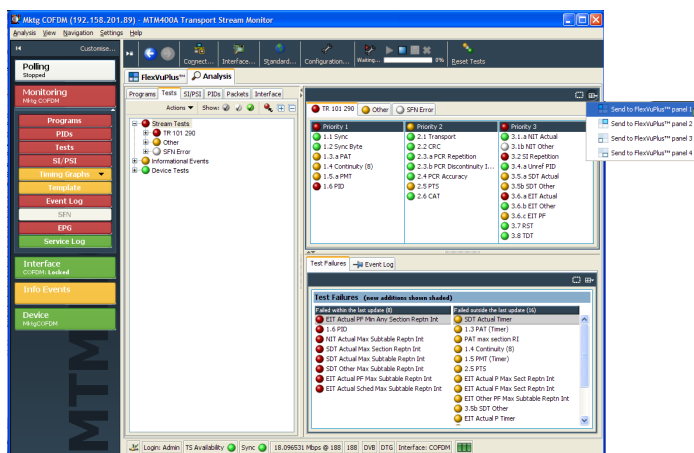


Set Up Panel 1

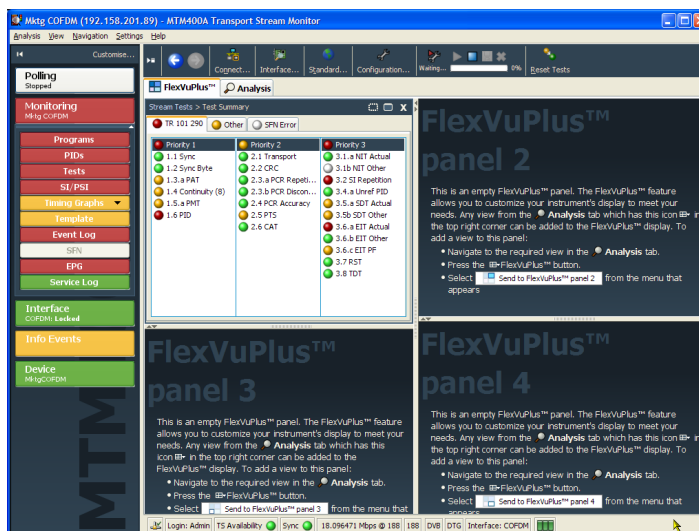
1. Select the **Analysis** tab and then the **Tests** tab.

In the top right corner of all detail views is a FlexVuPlus™ panel select button. You can use this button to display a replica of the detail view in the selected FlexVuPlus™ panel.

2. In the Test Summary view, use the FlexVuPlus™ panel select button to replicate the view in panel 1.

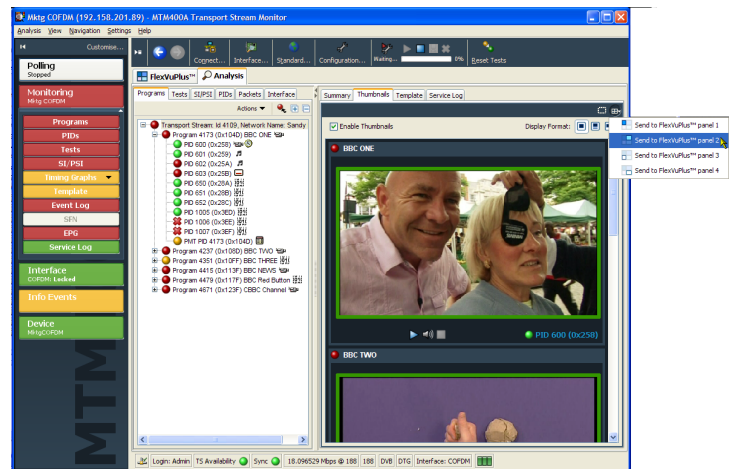


3. The FlexVuPlus™ display now contains the Test Summary view in panel 1.

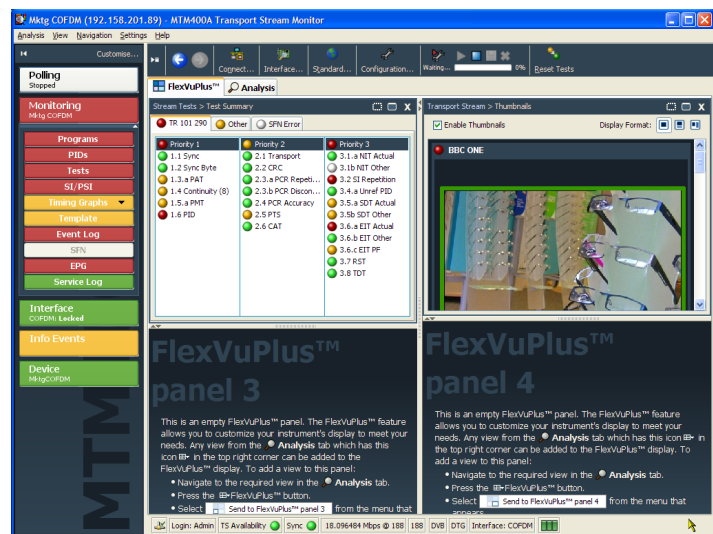


Set Up Panel 2

- Click the **Analysis** tab, and then click the **Programs** tab.
- In the **Thumbnails** view, use the FlexVuPlus™ panel select button to replicate the view in panel 2.



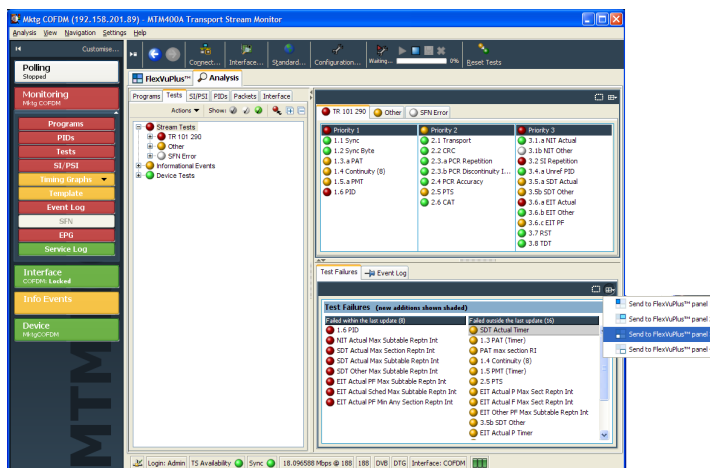
- The FlexVuPlus™ display now contains the Thumbnail view in panel 2.



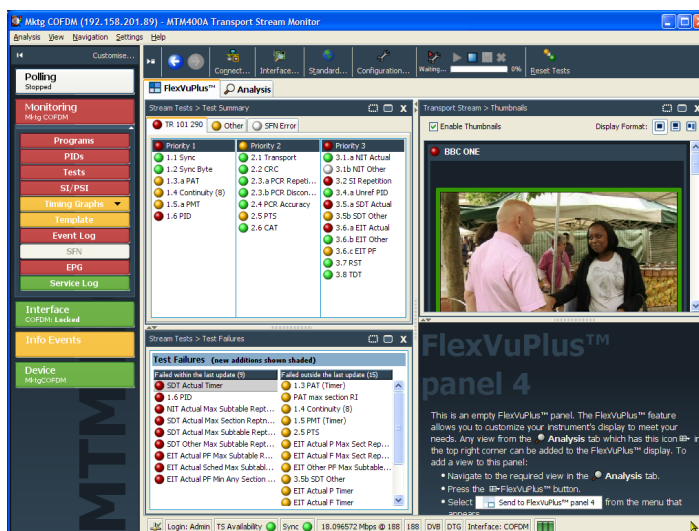
Set Up Panel 3

7. Select the **Analysis** tab, and **Tests** tab.

8. In the **Test Failures** view, use the FlexVuPlus™ panel select button to replicate the view in panel 3.

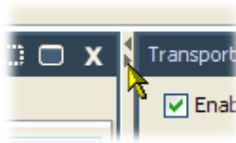


9. The FlexVuPlus™ display now contains the Test Failures view in panel 3.

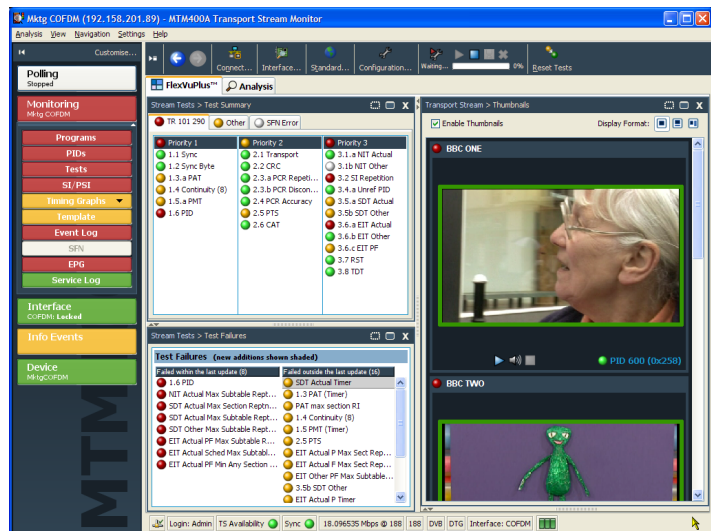


Since only three panels are used in this example, you can expand the thumbnails view to fill the right side of FlexVuPlus™. You can expand panel 2 vertically by selecting the panel expand button.

(Similarly, you can expand panels horizontally using the horizontal panel expand button.)



10. Expand panel 2 to display the complete FlexVuPlus™ basic monitoring view.



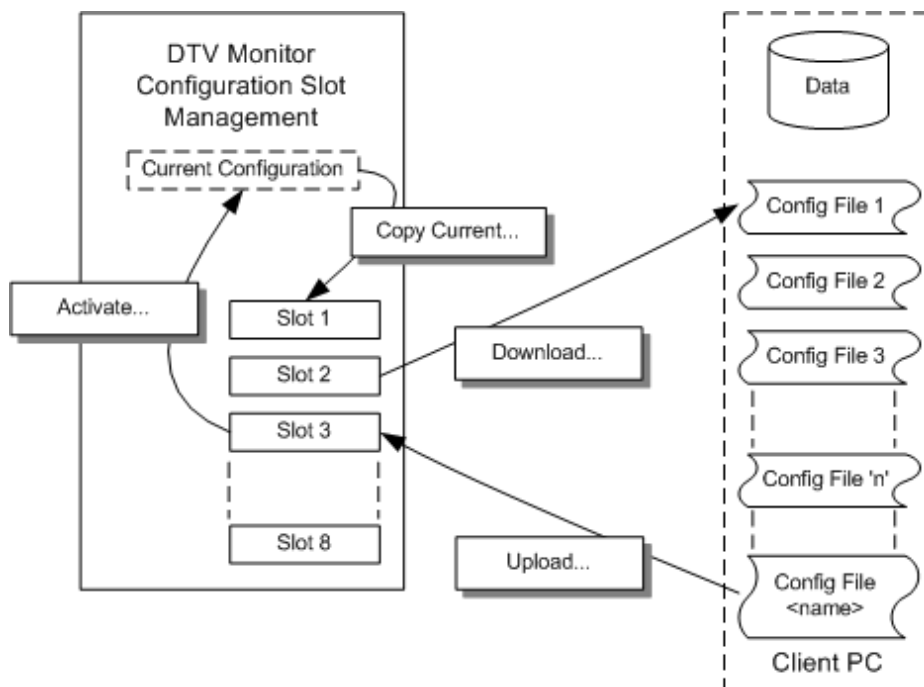
To summarize, in this view you can immediately see the following:

- Tests that have failed, in the Tests Summary view (FlexVuPlus™ panel 1)
- Tests that have failed most recently, in the Test Failures view (FlexVuPlus™ panel 3)
- Elementary streams that are currently carrying video content, in the Thumbnails view (FlexVuPlus™ panel 2)

Saving and Using Configuration Files

Configuration files provide a means of implementing and storing different monitoring configurations of the instrument. For example, you can save a specific setup on one instrument and subsequently upload it to other instruments. Refer to the *MTM400A, IPM400A, QAM400A, and RFM300 DTV Monitor Test Parameter and Configuration File Technical Reference* for more information.

In the DTV monitor, configuration settings files are held in storage slots; eight storage slots are available for each stream. Storage slots can be filled by either storing the current configuration or by uploading a configuration file from the client PC. To implement the setting held in a storage slot, the configuration file must be activated. The following diagram illustrates the handling of configuration files.



In the following procedure, you will complete the following steps:

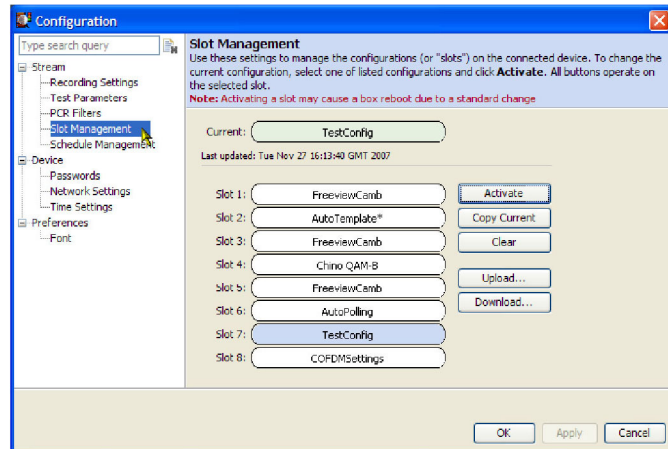
- Save the current configuration
- Download a saved configuration file to your PC
- How to upload a configuration file from your PC
- How to activate a configuration file

1. Click **Configuration** on the toolbar to open the Configuration dialog box.



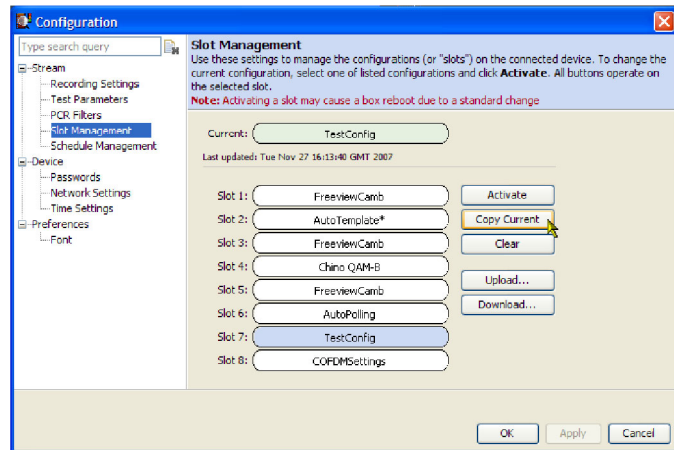
2. In the Configuration dialog box, select **Stream > Slot Management**.

The remainder of this procedure uses controls on the Configuration Slot Management page.



3. To save the active (current) configuration, highlight the slot that the file is to be saved into, for example, **Slot 7**.
(If you want to save the Current configuration, you must copy it to a slot first.)

4. Click **Copy Current**.



5. To download a configuration file from a slot to your PC (or the network), highlight the slot containing the file to be downloaded.

6. Click **Download**.

7. In the Save dialog box, specify the name and location of the saved file and click **Save**.

The name displayed in the Current and Slot fields is contained in the file header and does not necessarily correspond with the file name.

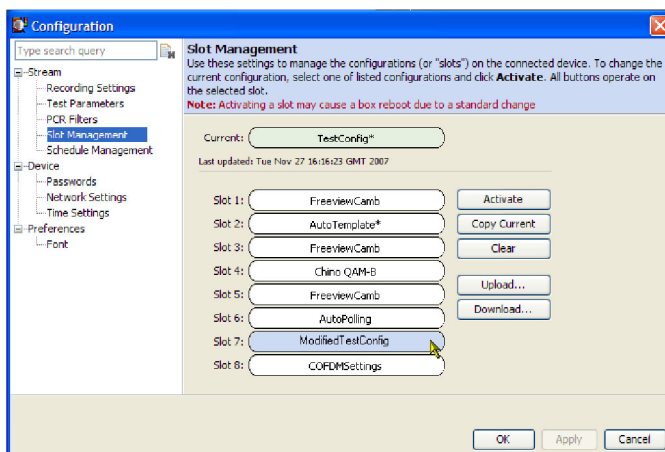
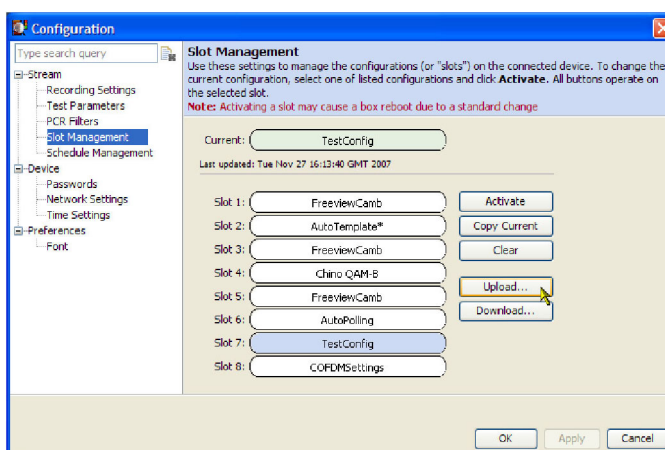
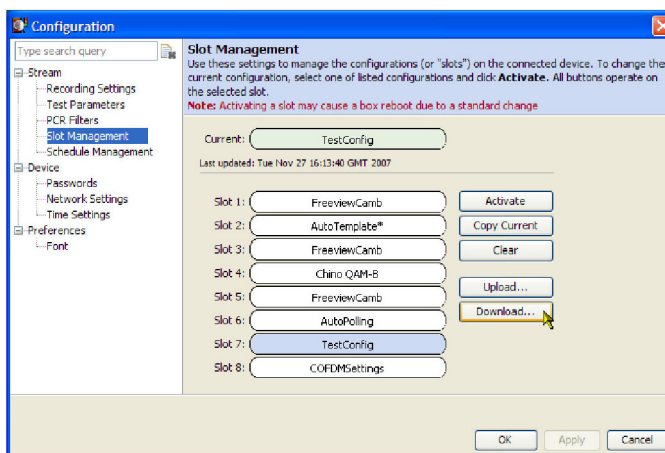
You can modify downloaded configuration files using a text editor or an XML editing program.

8. To upload a configuration file from your PC (or the network), highlight the slot containing the file to be uploaded, for example, **Slot 7**.

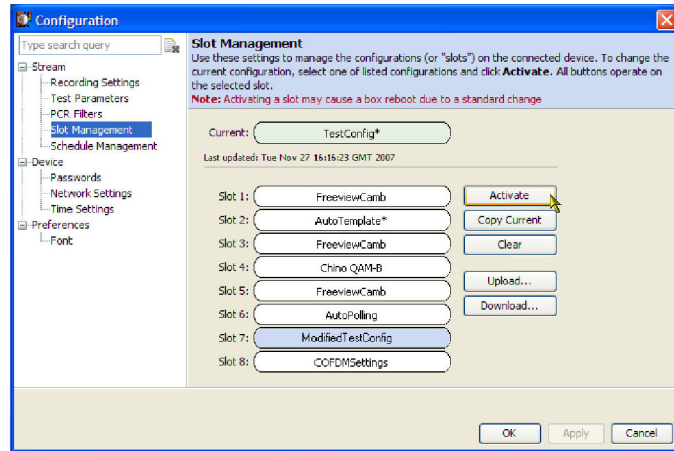
9. Click **Upload**.

10. In the Open dialog box, locate the configuration file to be uploaded and click **Open**.

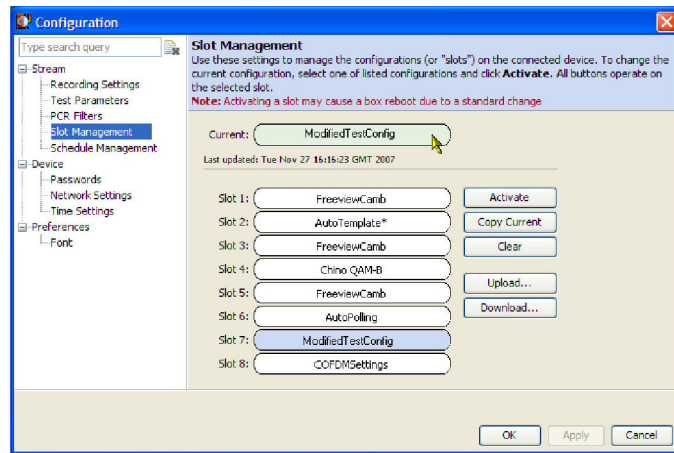
The file has been uploaded to the highlighted slot, that is, Slot 7.



11. To make a configuration file active, highlight the slot containing the file to be activated, for example, **Slot 7**.
12. Click **Activate**.



Note that the name in the highlighted slot, Slot 7, has been copied to the Current slot. The DTV monitor will be reconfigured in accordance with the activated configuration file.



Capturing a Recording

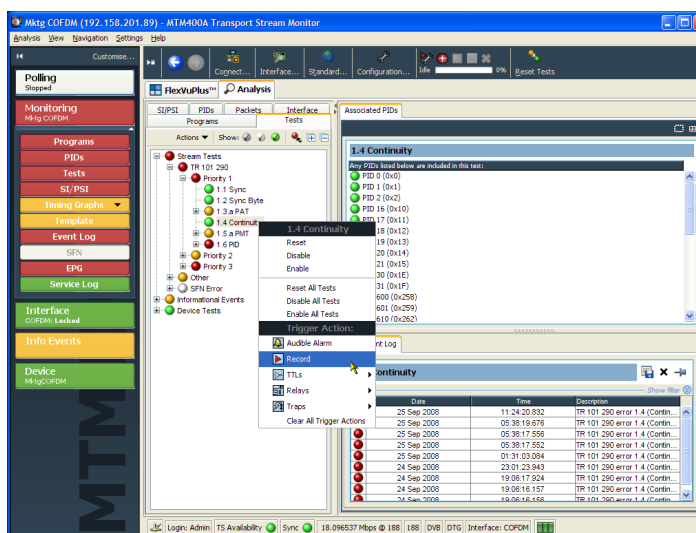
To be able to examine transport stream events in detail, you can make recordings. The onset of recording can be triggered by any of the following events:

- Manual - you start the recording
- External rising or falling signal edges - supplied using an external signal connection
- Test failures - you can specify which test failure will trigger recording

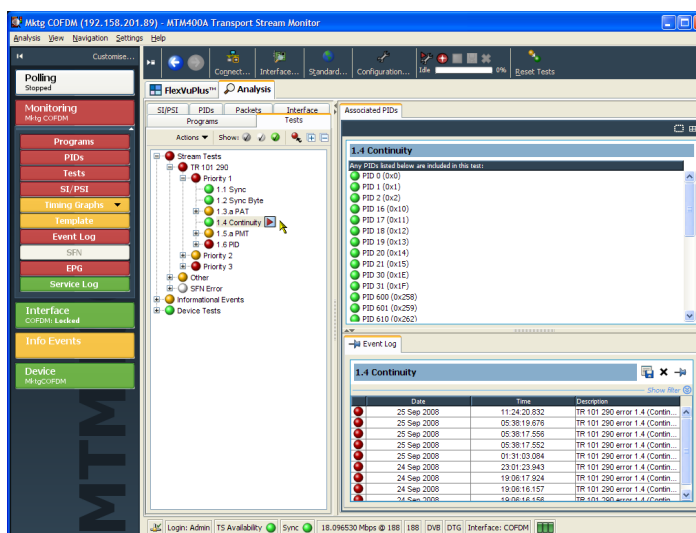
In this procedure, you will set up the DTV monitor to make a recording of the stream around the failure of a test, for example, the TR101 290, Priority 1, Continuity test.

Set a Record trigger action flag on the TR101 290, Priority 1, Continuity test.

1. Select **Analysis** tab, and the **Tests** tab.
2. In the Test tree view, highlight the Continuity test: **Stream Tests > TR101 290> Priority 1> 1.4 Continuity**.
3. From the context menu, (hover the mouse over the test name and click the right mouse button) select the **Record** trigger action.



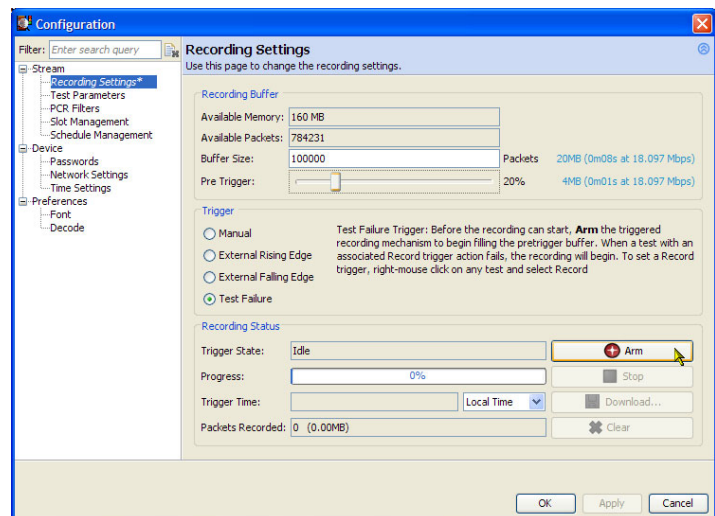
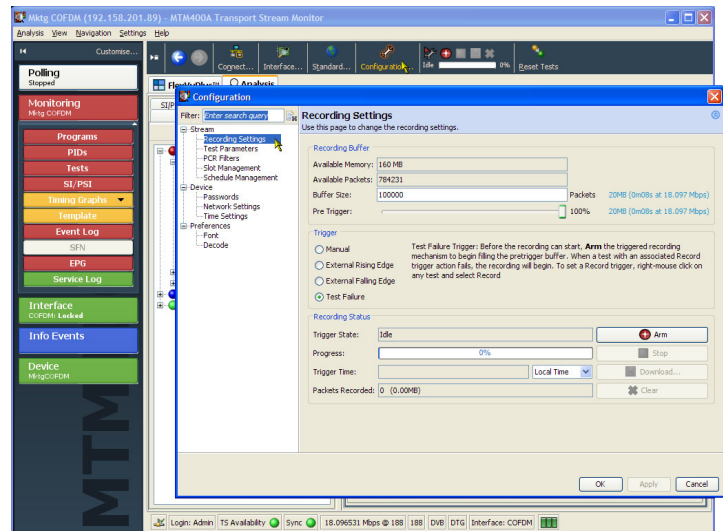
The Record trigger action icon is adjacent to the test name.



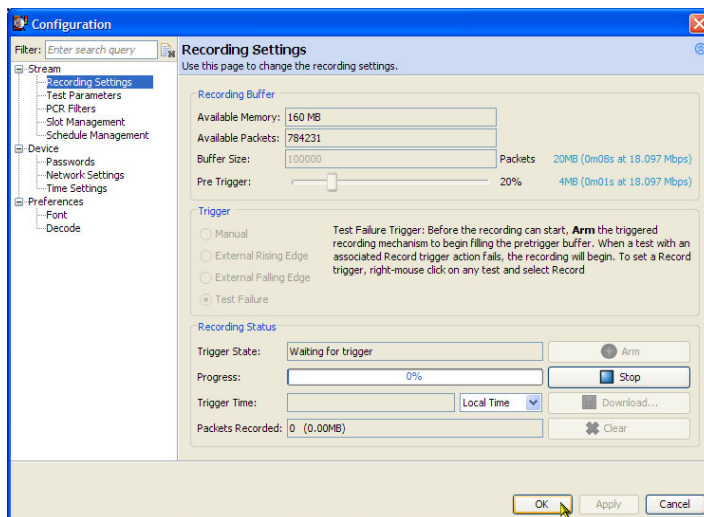
Open the Configuration dialog box and set the recording parameters.

4. On the toolbar, select **Configuration** to open the Configuration dialog box.
5. Select **Stream > Recording Settings** to open the Recording Settings panel.
6. In the Recording Buffer panel, you can set the size of the recording and the proportion of the total recording that is to be made before the trigger event occurs. For this example, set the **Buffer Size** to 100000 packets and the **Pre Trigger** value to 20% of the final recording.
Setting the pretrigger value ensures that a percentage of the final recording is made before the trigger event occurs. You can then view the trigger event in context.
7. Select **Test Failure** as the recording trigger. Any test with a record trigger action set will initiate recording on failure.
8. Click **Arm** to arm the recording function.

From this point, the pretrigger buffer is kept constantly full in readiness for true recording to start when a trigger action (test failure) occurs.

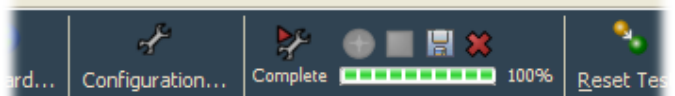
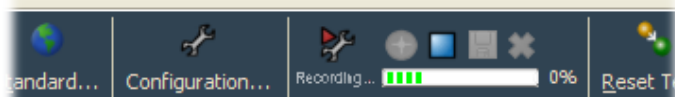
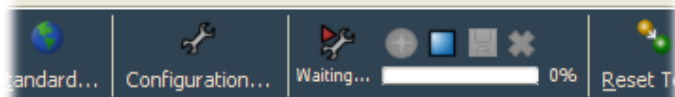


The **Trigger State** has changed from **Idle** to **Waiting**. The toolbar recording icons indicate the trigger state.



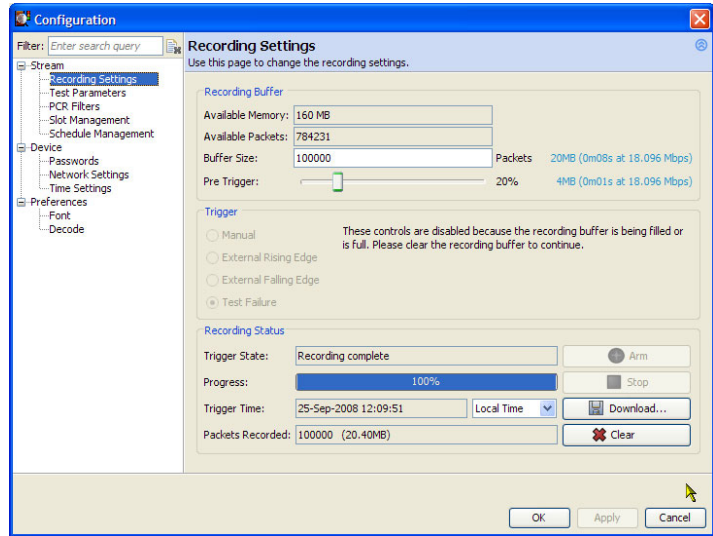
Recording will start when the trigger event occurs. You can close the Configuration dialog box. The toolbar recording icons will indicate the recording status.

9. When the trigger event occurs, the recording will be made.

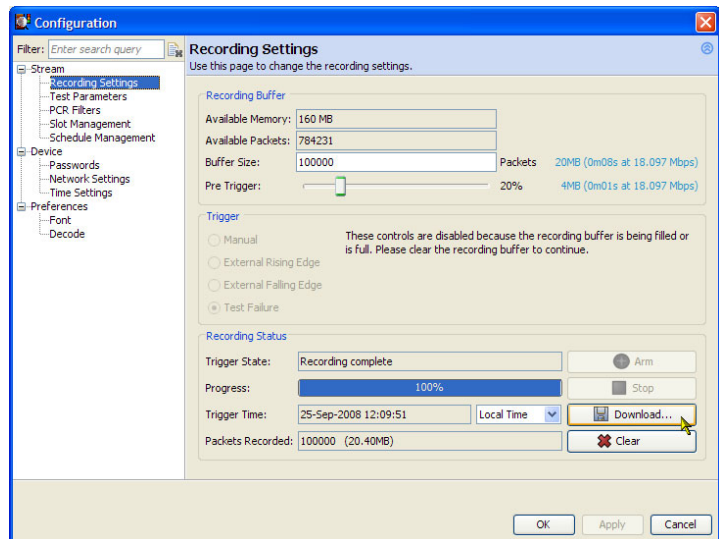


Save the recording when it is complete.

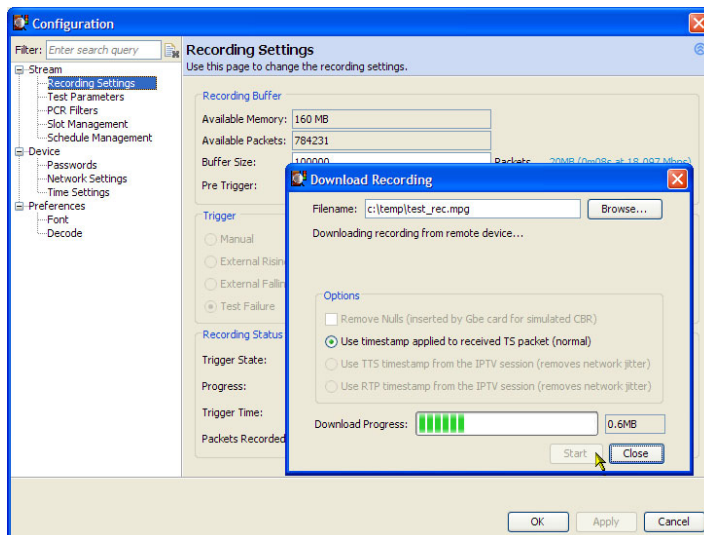
10. On the toolbar, select **Configuration** to open the Configuration dialog box.
11. Select **Stream > Recording Settings** to open the Recording Settings panel.
The Trigger State is now **Recording Complete**.



12. Click **Download** to save the recording to your PC (or the network).

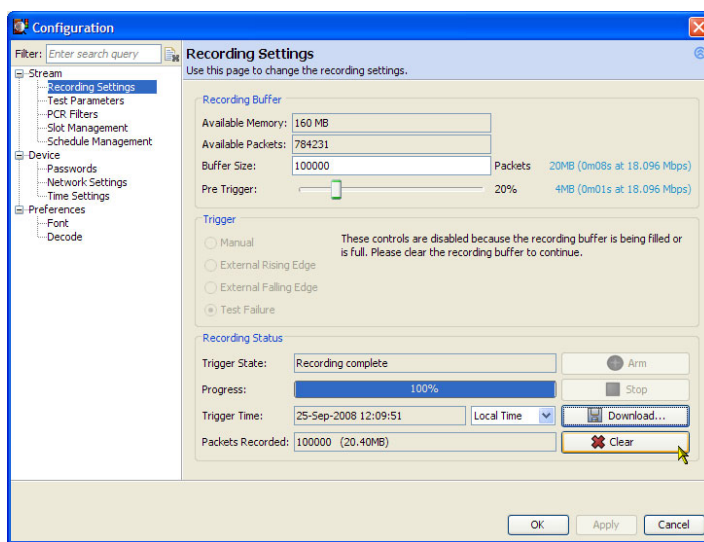


13. In the **Download Recording** dialog box, specify the name and location of the recording.



You must clear the recording from the recording buffer. You cannot make any further recordings until this is done.

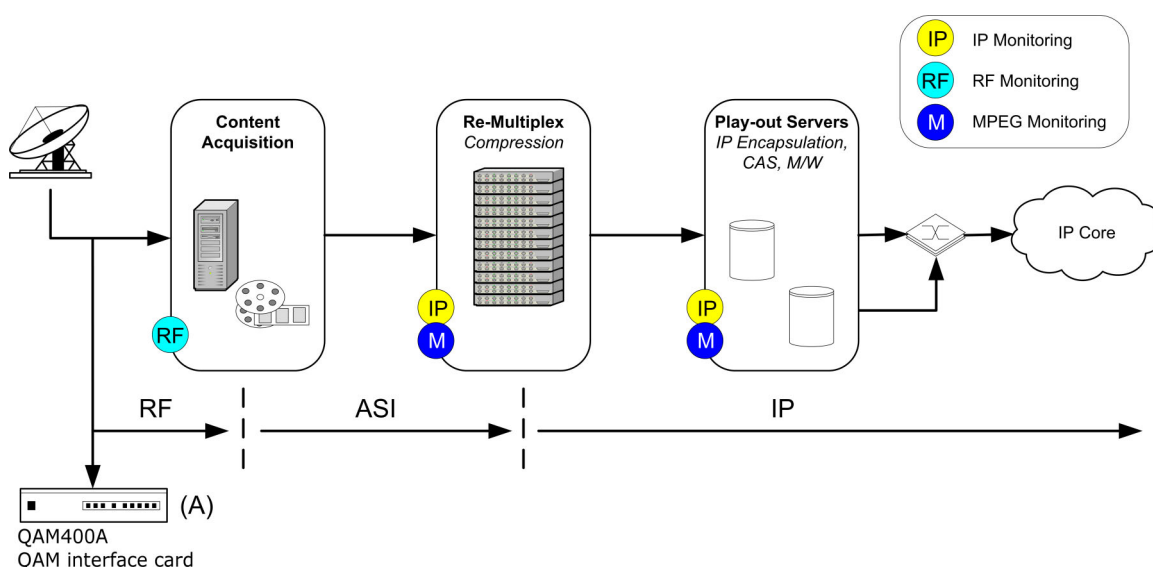
14. Click **Clear** to clear the recording buffer. The Trigger State will return to **Idle** and the Progress bar will be cleared.



Applications

This section provides you with some applications that the QAM400A monitor can be used for and example procedures for performing basic operations. Detailed operational information can be found in the *MTM400A*, *IPM400A*, *QAM400A*, and *RFM300 DTV Monitors Technical Reference*.

You can use the instrument to monitor RF signals at any point in the distribution network. The following figure illustrates a real-life application of the QAM400A DTV monitor.



In this example, the QAM400A is monitoring the incoming RF signal at a local or national headend. Following ingest, this multiple-program transport stream may be de-multiplexed, transcoded, and encapsulated into single-program transport stream flows.

Procedures cited and described in this section for the QAM400A DTV monitor include the following:

- Selecting and configuring an RF interface card; for example, the QAM (Annex B2) interface card
- Monitoring RF stream quality

In addition, a further practical example of setting up the DTV monitor RUI for RF off-air performance monitoring is also provided.

Configuring the RF Interface Card

Use the following procedure to configure the QAM (Annex B2) RF interface card and save the settings for future use. Interface settings can be saved as Presets. Each Preset can contain a different set of interface values. In the Interface dialog box, the Preset name associated with the active set of values is displayed in bold text. The Preset can be directly modified or duplicated, modified and made active.

The following procedure uses an QAM (Annex B2) interface card as an example.

- Ensure that the interface card is selected
- Duplicate the currently active Preset
- Rename the preset and enter settings
- Make the preset active

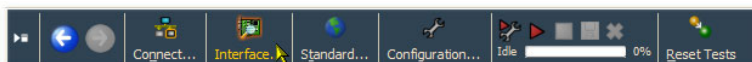
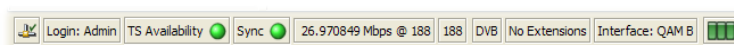
The following settings should be supplied by your network planner:

- Tuner frequency
- IF spectrum
- Channel state
- NTSC rejection filter
- Carrier lock
- Tuner phase noise
- Signal detection

NOTE. You can find detailed descriptions of all interface card settings in the MTM400A, IPM400A, QAM400A, and RFM300 Technical Reference.

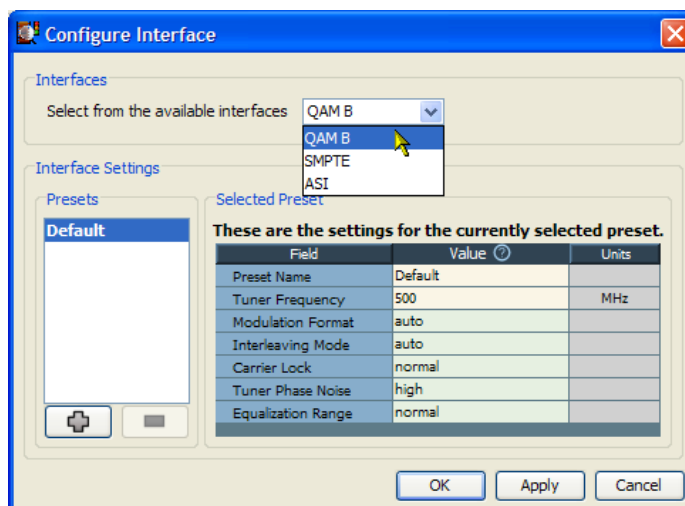
Select Interface Card

1. Check that the RF interface card is selected. This can be confirmed in the Status bar, for example, 8VSB. If the interface card is not active, either ASI or SMPTE is shown in the Status bar.
2. On the toolbar, select **Interface** to open the Configure Interface dialog box.



The ASI and SMPTE selections will always be present in the Interface dialog box. The RF interface selection will appear only when one of the optional interface cards is installed.

3. If the QAM (Annex B2) interface card is not active, select QAM (Annex B2) from the Interface drop-down menu in the Configure Interfaces dialog box.
4. Allow the display to stabilize; this can take up to 30 seconds. An indication that the display has stabilized is that the correct interface name is displayed in the RUI Status bar.

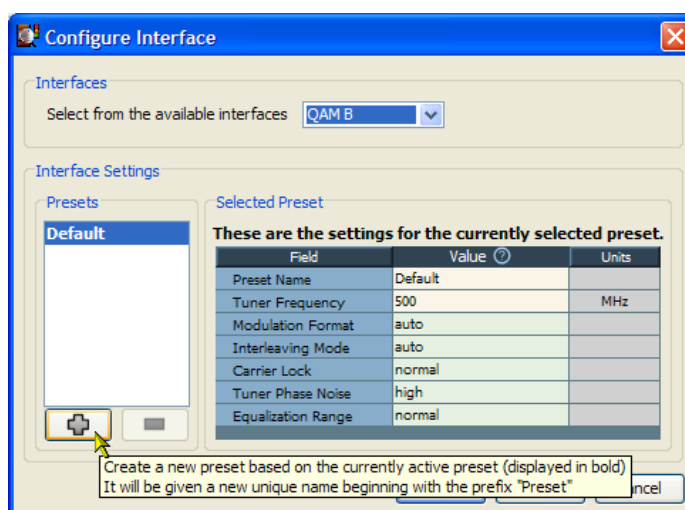


Duplicate the Preset

An Interface Settings Preset is a collection of preset values. The Preset name in bold text contains the active settings. The active preset can be modified directly or a duplicate preset can be made.

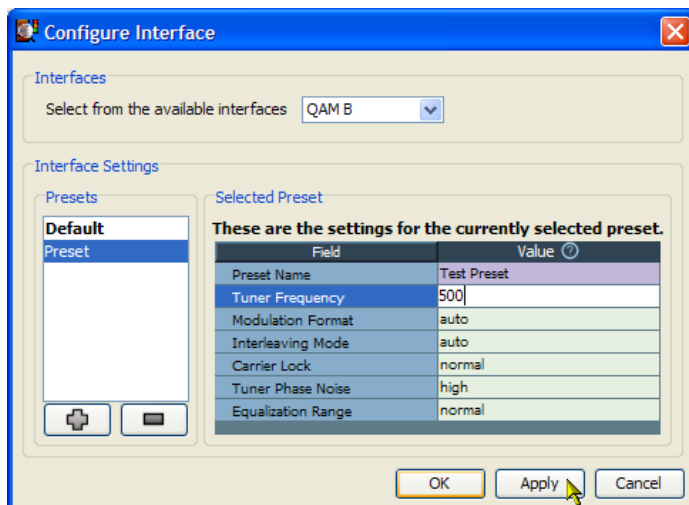
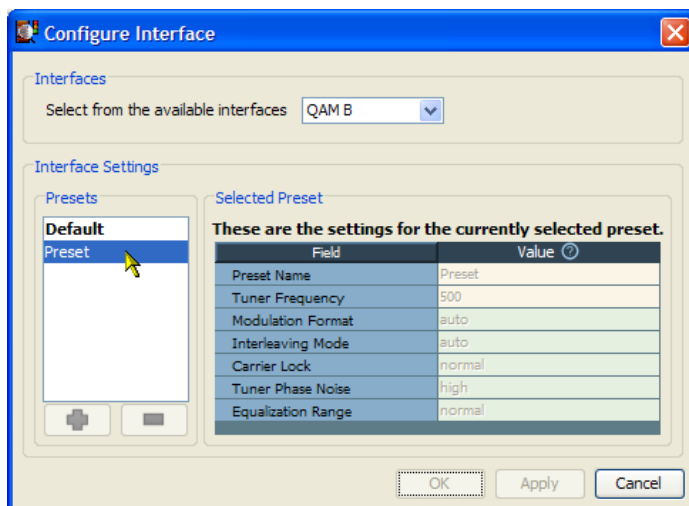
For this example procedure, you are going to duplicate the previously created active preset, **KOIN**, rename it, modify the settings, and make it the active preset.

5. Click the + button to duplicate the active preset.



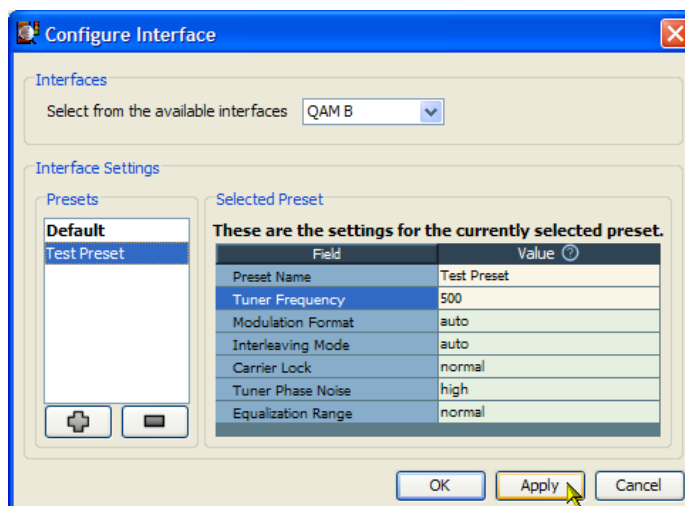
Rename Preset and Enter Changed Settings

6. The duplicated preset is named **Preset**; select and highlight the newly created preset.
7. In the Preset Name field, change the name from **Preset** to **Test Preset**.
8. Change the rest of the settings; use the values supplied by your network planner.
9. Click **Apply** to confirm the changed settings.



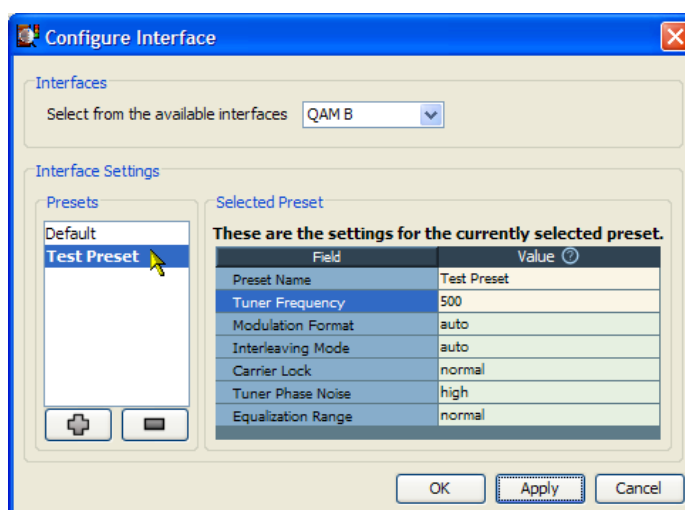
Activate Preset

10. Highlight the Preset (Test Preset) and click **Apply** to implement the newly created settings (or any of the other presets).



The selected and active preset name, **Test Preset**, is bolded.

11. Click **OK** to close the Configure Interface dialog box. Verify that monitoring is continuing satisfactorily.



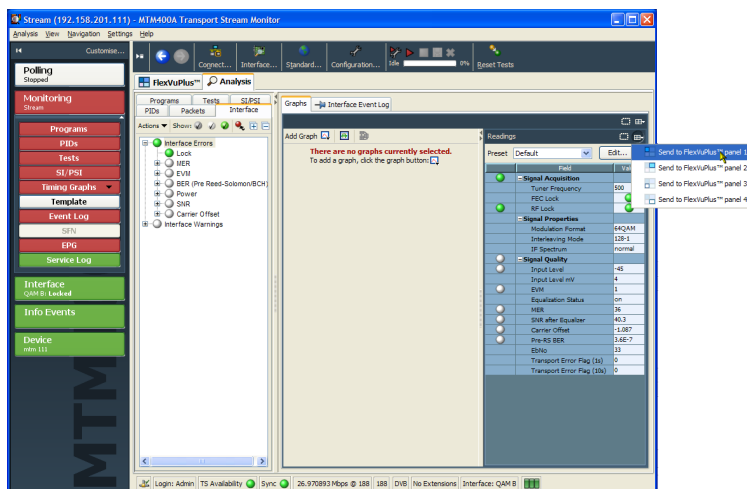
Monitoring RF Stream Quality

The process of populating FlexVuPlus™ is similar, whichever views you choose. This procedure uses elements from the Interface views. The selection and placement techniques are similar to those described previously. (See page 35, *Setting Up the FlexVuPlus™ Display*.)

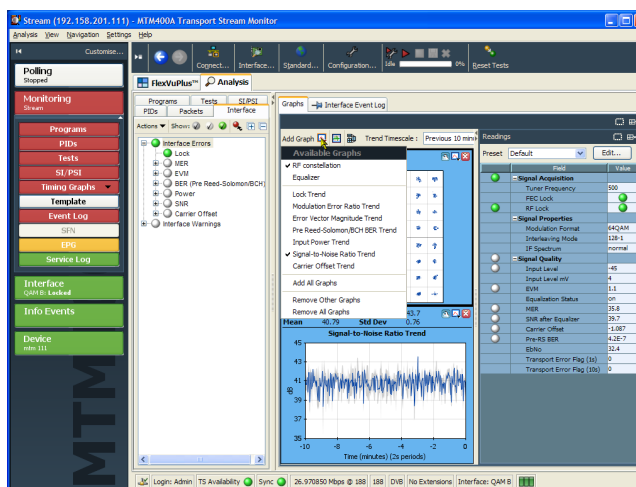
This procedure assumes that an 8VSB RF interface card is installed in the DTV monitor. The Analysis Interface tab will not be displayed if an interface card is not installed.

Select the **Analysis** tab and then the **Interface** tab.

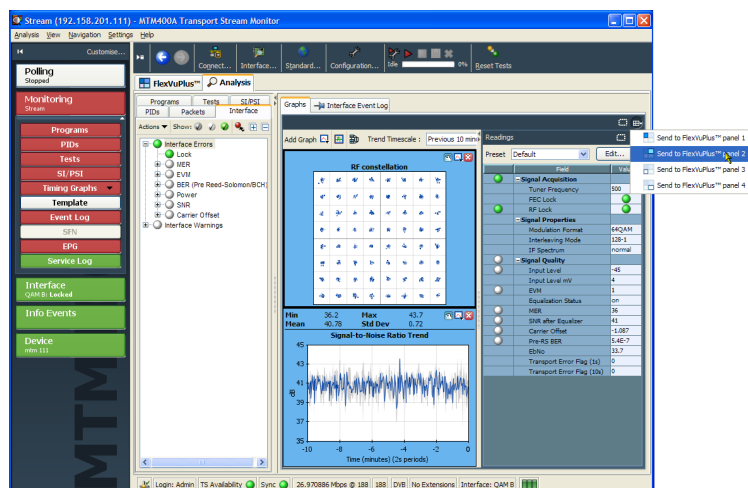
1. In the **Readings** section of the **Graphs** view, use the FlexVuPlus™ panel select button to replicate the view in panel 1.



2. In the **Graphs** view, select **Symbol distribution** from the **Add Graph** drop-down list.
3. Repeat the previous step, selecting the **Signal-to-Noise Ratio Trend** graph.

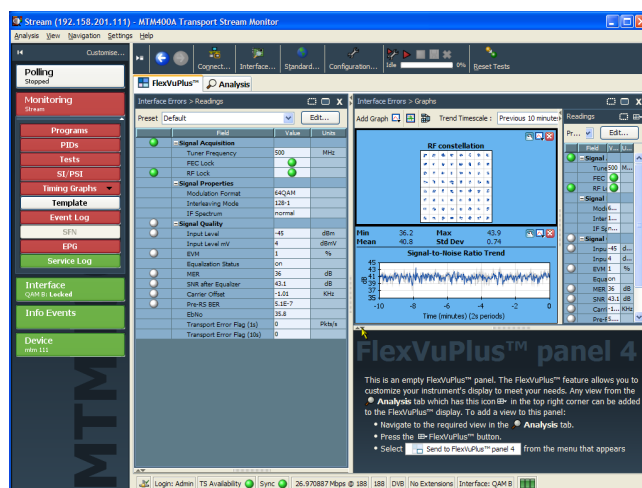


4. In the **Graphs** view, use the **FlexVuPlus™** panel select button to replicate the view in panel 2.



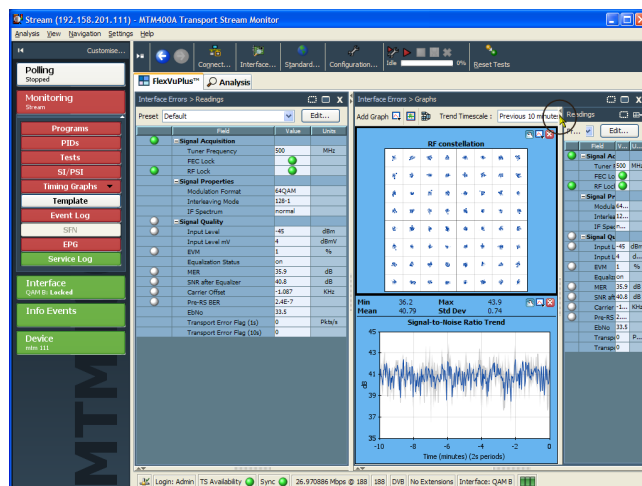
5. Select the **FlexVuPlus™** tab to display FlexVuPlus™.

Expand FlexVuPlus™ panels 1 and 2 vertically to provide a full display.

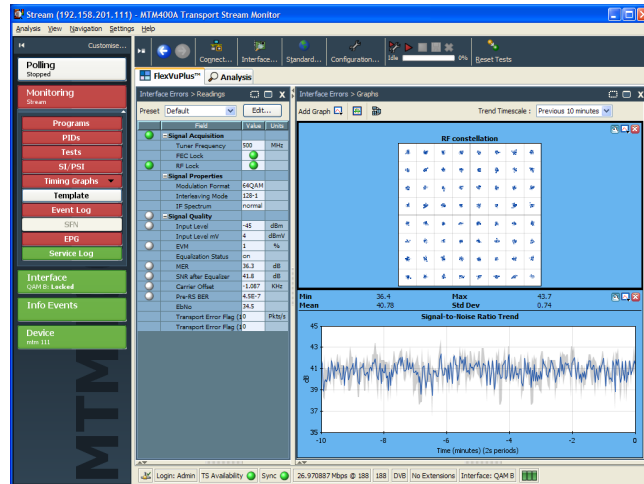


In FlexVuPlus™ panel 2, Graphs and Readings form a single panel.

6. Hide the readings panel in FlexVuPlus™ panel 2 by horizontally expanding the Graphs panel.



The final layout should appear as shown.



To summarize, in this view you can see the following:

- In the Interface Readings view (FlexVu™ panel 1), interface error values and error states.
- In the Interface Graphs view (FlexVu™ panel 3), the symbol distribution and signal-to-noise trends.

RF Off-Air Performance Monitoring

Scenario

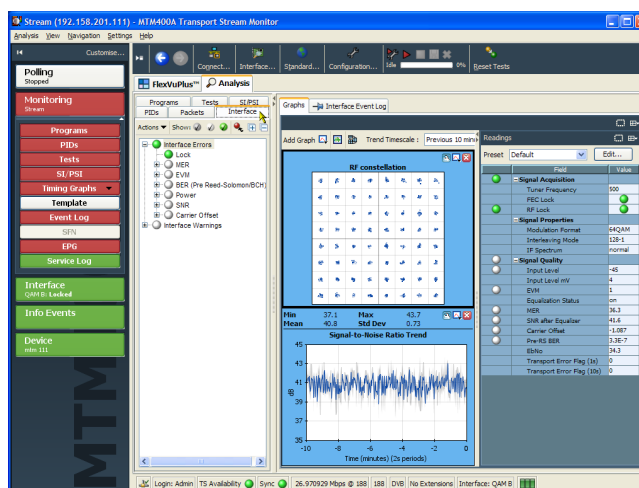
Heavy rain is forecast in your area. Previous experience suggests that this can cause problems with the RF performance. The power drop can cause the modulation error ratio (MER) to decrease and the error vector magnitude (EVM) to increase. The net result can be an increase in bit error rate and the resultant continuity count errors in the transport stream.

With this in mind, you can set up FlexVuPlus™ to display views that will indicate any deterioration in the RF performance. The following procedure shows you how to set up FlexVuPlus™ to monitor this scenario.

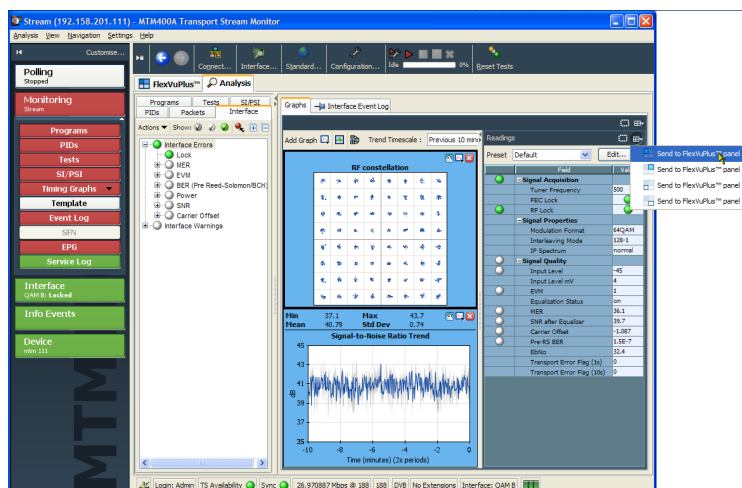
NOTE. The screen captures in the following procedure are representations of the scenario described; they may not correspond exactly with your setup.

Procedure

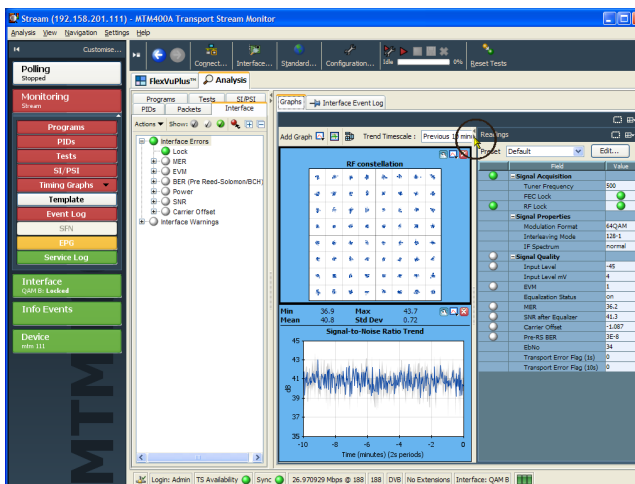
1. Select the **Analysis** tab, and the **Interface** tab.



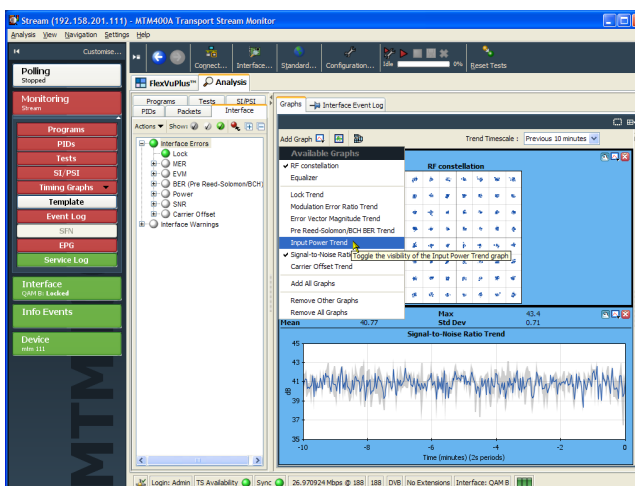
2. In the Interface view, select the Readings view and use the FlexVuPlus™ panel select button to replicate the view in panel 1.



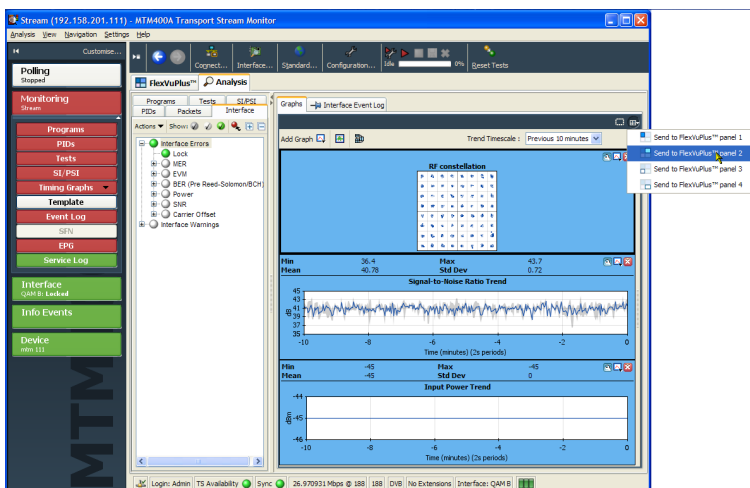
3. In the Interface view, select the Graphs view.



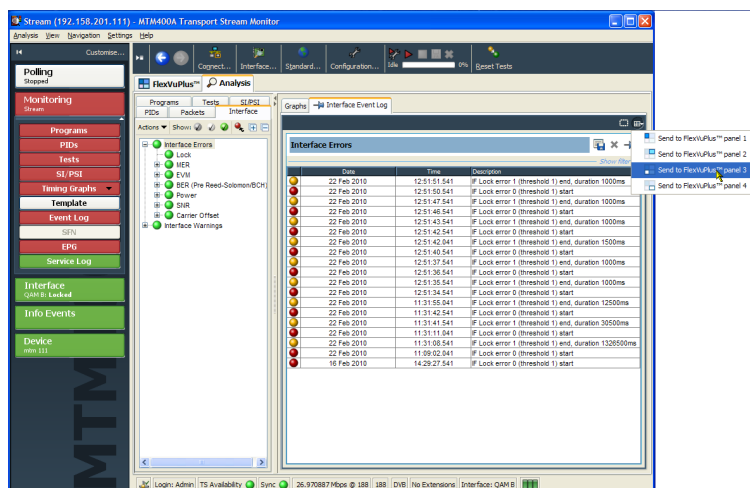
4. From the Add Graph drop-down list, select the **Symbol Distribution**.
5. Repeat the action twice more, selecting the **Input Power Trend** and **Signal-to-Noise Ratio Trend** graphs.



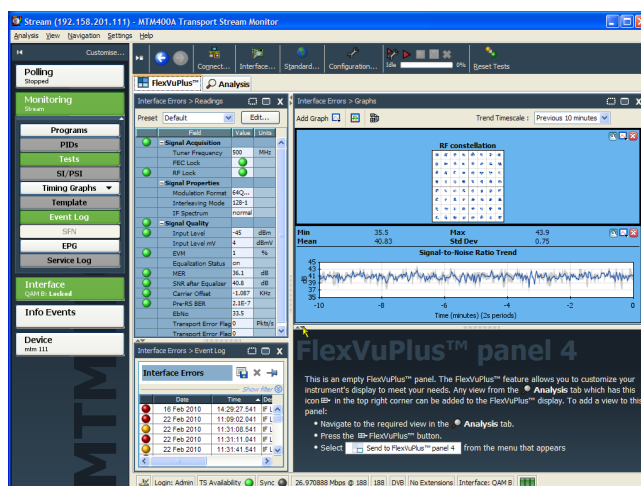
6. Use the FlexVuPlus™ panel select button to replicate the graphs view in panel 2.



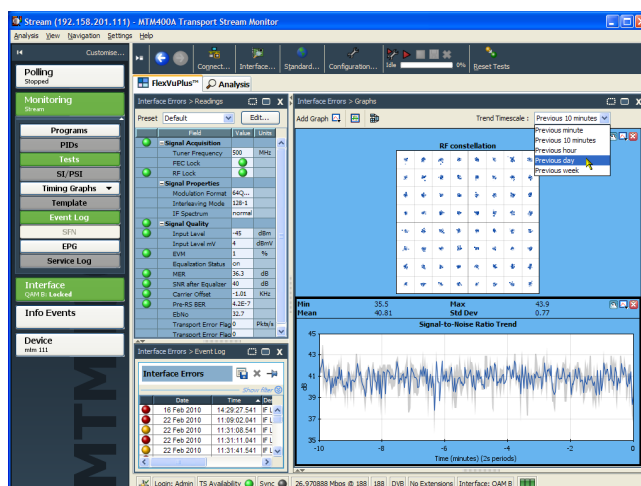
- In the Interface view, Interface Event Log tab, select the **IF Errors** (interface errors) view and use the FlexVuPlus™ panel select button to replicate the view in panel 3.



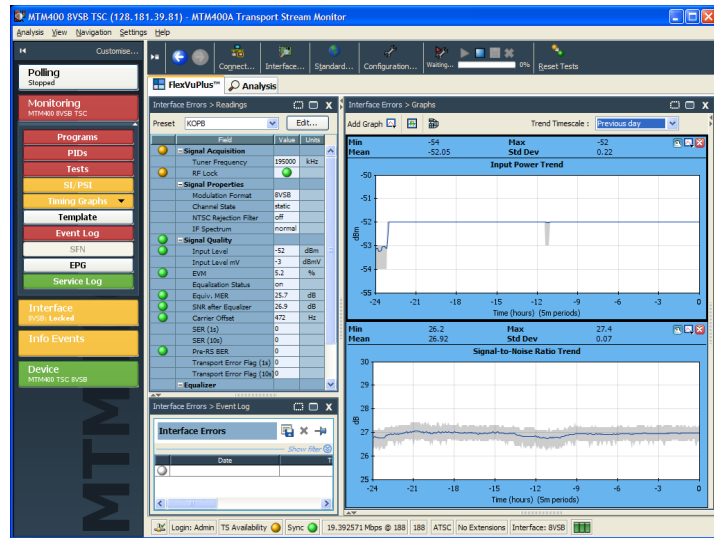
- Select the **FlexVuPlus™** tab to display the assembled views.
- You can expand panel 2 vertically by selecting the panel expand button.



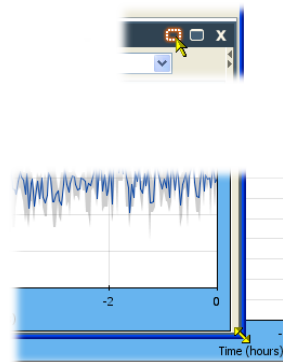
- To see a possible deterioration in the selected trend graphs, you can alter the sampling period (X axis).
For this scenario, select a sampling period of one day.



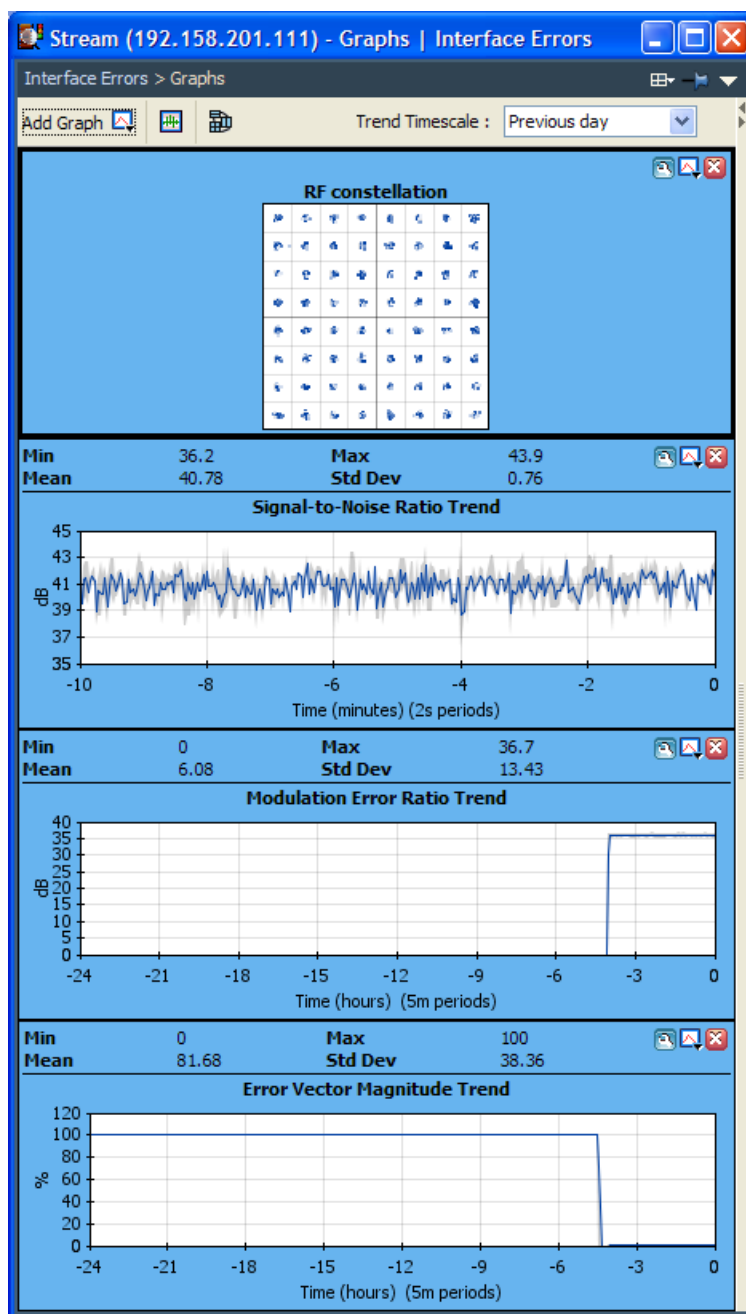
11. The trend graphs (Input Power Trend and Signal-to-Noise Ratio Trend) now show values for the last 24 hours; note the change in the X-axis values. The graph line indicates averaged values; the gray area above and below the averaged values indicates the actual values.



12. To examine the graphs more closely, click the tear-off icon. You can resize the tear-off window to make viewing the graphs easier.

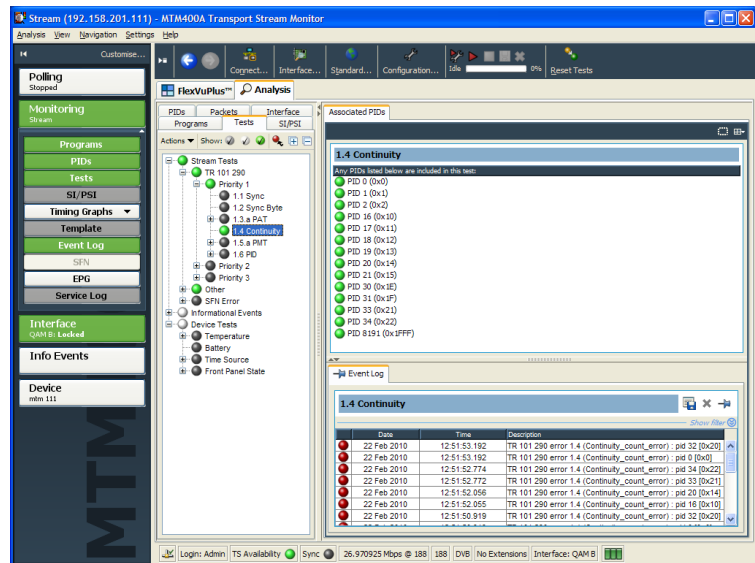


13. For this example, add the following graphs to the tear-off view: **Modulation Error Ratio Trend** and **Error Vector Magnitude Trend**.



14. Open the **Analysis > Tests** view and examine the **Event Log** for the Priority 1 test 1.4 Continuity.

For the period that input power was low, you might see a corresponding increase in the continuity count caused by out-of-order packets.



Product Options and Upgrades

Options

The following tables list the software and hardware options that you can order with QAM400A DTV monitors. Included are the part numbers of any accessories shipped with the options.

Table 10: QAM400A options and optional accessories

Option		Description
Hardware options		
QAM400A	QA	Configure QAM400A for ITU J.38 Annex A
	QB2	Configure QAM400A for ITU J.38 Annex B
	QC	Configure QAM400A for ITU J.38 Annex C
Software options		
QAM400A	DIAG	<ul style="list-style-type: none"> ■ Triggered recording capability up to 160 MB ■ Template testing (for user-defined service plan testing) ■ In-depth PCR analysis with graphical result views ■ Bit rate testing functionality ■ Service logging ■ IP/Rf Polling functionality

Field Upgrade Kits

Field upgrade kits are hardware and software upgrades that you can install after you purchase a QAM400A DTV monitor.

Table 11: QAM400A field upgrade kit

Option		Description
Software options		
QAM4UP	DIAG	<ul style="list-style-type: none"> ■ Triggered recording capability up to 160 MB ■ Template testing (for user-defined service plan testing) ■ In-depth PCR analysis with graphical result views ■ Bit rate testing functionality ■ Service logging ■ IP/Rf Polling functionality

Upgrading the Firmware Version

NOTE. *The following procedure is only for QAM400A DTV monitors.*



CAUTION. *The QAM400A uses a variant of the MTM400A firmware version 4.0 or later. Refer to the release notes to verify whether future release available from the Tektronix Web site are applicable.*

The QAM400A must not be downgraded beyond firmware version 4.0. If this is attempted, the unit may need to be returned to Tektronix for repair.

Updates to the DTV monitor firmware are released to the Tektronix Web site (www.tektronix.com/software) when software problems are fixed or when new product features are introduced. Perform the following steps to upgrade the firmware on your instrument to the latest version.

NOTE. *It is recommended that you initiate the firmware upgrade process from the Connect to MTM Device dialog box that appears before the RUI is launched. Only advanced users should use the Connect to MTM Device dialog box accessed from the Connect button in the RUI toolbar.*

1. Download the latest version of the DTV monitor firmware from the Tektronix Web site and save the file to a PC that is connected to the same network as the DTV monitor and meets the RUI platform requirements. (See Table 6 on page 17.)
The name of the firmware file should be of the following form: MTM400 <version number>.zip. This file contains a binary upgrade file (*.hex) and documentation files.

2. Unzip the upgrade file that you copied to your PC. The name of the unzipped upgrade file should be of the following form: MTM400 <version number>.hex. Take note of the location of the unzipped files.



CAUTION. *To prevent upgrade problems that might require the monitor to be returned to Tektronix service for reprogramming, disconnect all transport stream inputs and outputs from the monitor before performing the firmware upgrade procedure.*

3. Remove all transport stream inputs and outputs from the DTV monitor.
4. On the PC, launch the Microsoft Internet Explorer Web browser.
5. In the address bar of the Web browser, enter the network name or IP address of the DTV monitor that you are upgrading, for example: `http://TSMonitor01` or `http://192.158.201.105`.
6. Press **Enter**. A Java applet is downloaded from the DTV monitor and launched. The file size is approximately 1.5 MB; the download time will depend on the network speed and traffic.

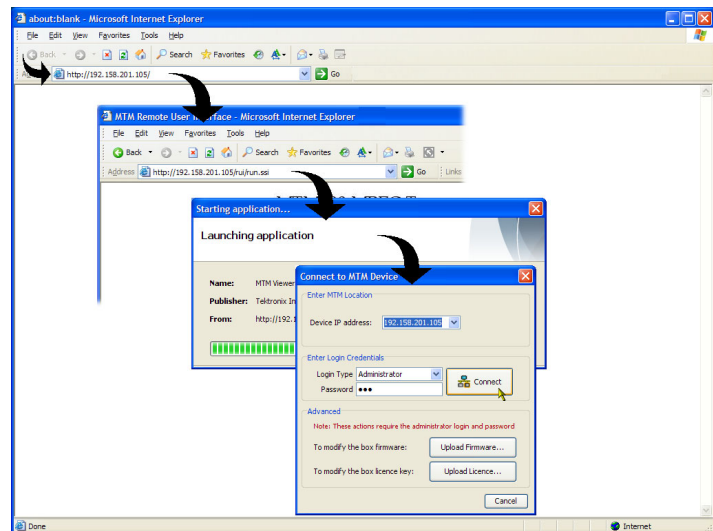


CAUTION. The Java applet will not run unless a temp directory is properly configured on the PC. A temp directory is set up by default in the Windows XP operating system; previous operating systems may require operator action.

The Java applet will not run unless the Sun Java Virtual Machine is installed. Type `java -version` at the command prompt to verify that it is installed and that the version is 1.6.0_20 or greater. If it is not installed, you can download the latest version from the web site, www.java.com/getjava.

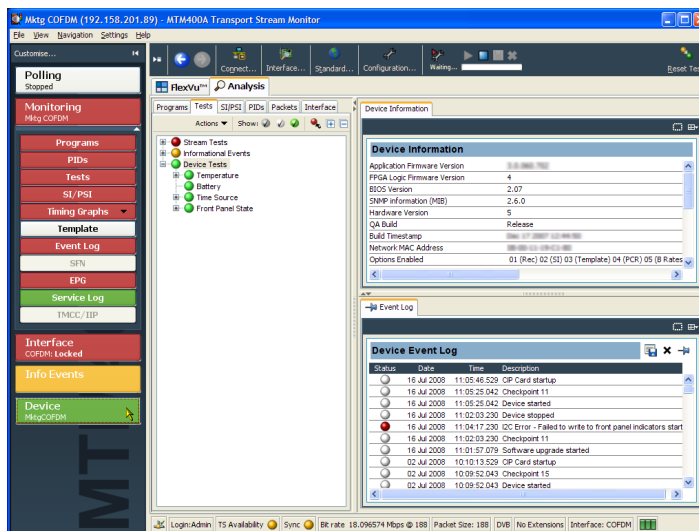
If you have to update the Java version on the PC, you will need to restart this procedure at step 4.

7. In the Connect to MTM Device dialog box, select the **Administrator** Login Type from the drop-down list, and then enter the password. The default password is "tek" for Administrator.



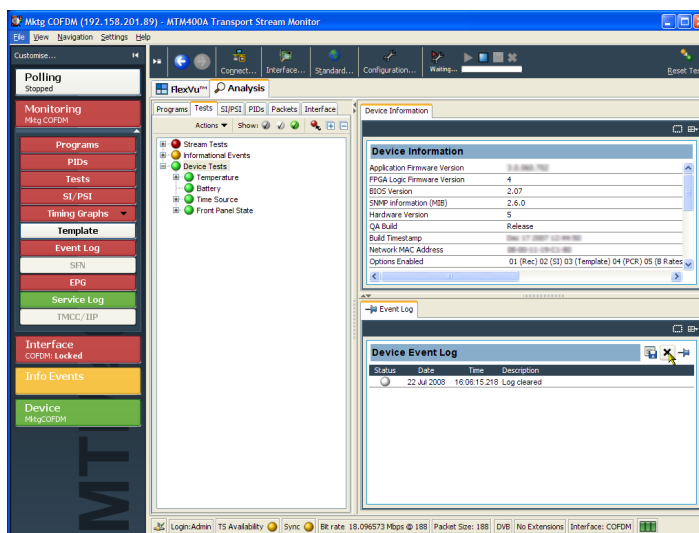
NOTE. You must log in to the DTV monitor using the Administrator login type. The User login type does not have sufficient permissions to upgrade the instrument firmware.

8. Click **Connect** to log in to the monitor and display the RUI window.
9. Click **Device** in the button bar of the RUI window to display the Device Information view.



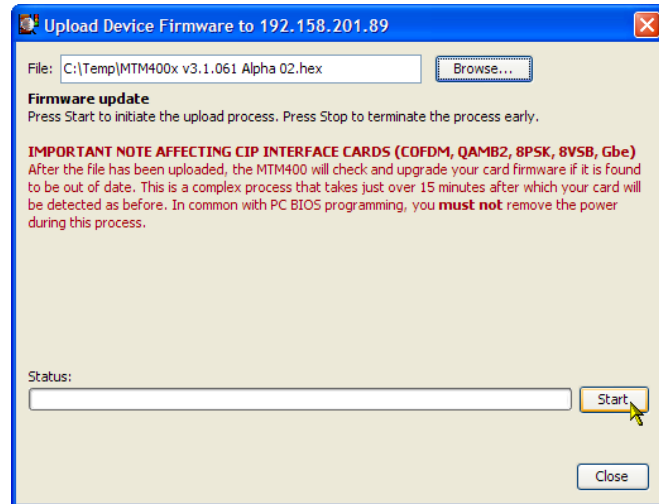
CAUTION. To prevent upgrade problems that might require the monitor to be returned to Tektronix service for reprogramming, you must clear the Device Log immediately before uploading the firmware.

10. Clear the device log by clicking the X in the Device Event Log window.

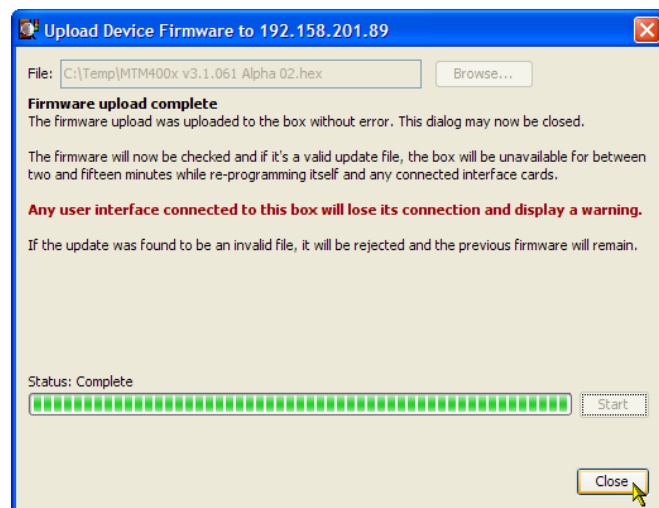


11. Select **File > Exit** to close the RUI and, if necessary, close the associated Explorer window.
12. Repeat steps 4 to 7 to reopen the Connect to MTM Device dialog box and enter the administrator's password.
13. Click **Upload Firmware** to open the Upload Device Firmware dialog box.

14. In the Upload Device Firmware dialog box, enter the path and name of the firmware file you saved in step 2 or use the Browse button to locate and select the firmware file. Click **Start** to initiate the firmware installation.



15. When the firmware upload to the instrument is complete, a Firmware upload complete message is displayed in the Upload Device Firmware dialog box.



16. As stated in the message, the uploaded firmware will be checked, and if valid, reprogramming of the instrument and any installed interfaces will start.



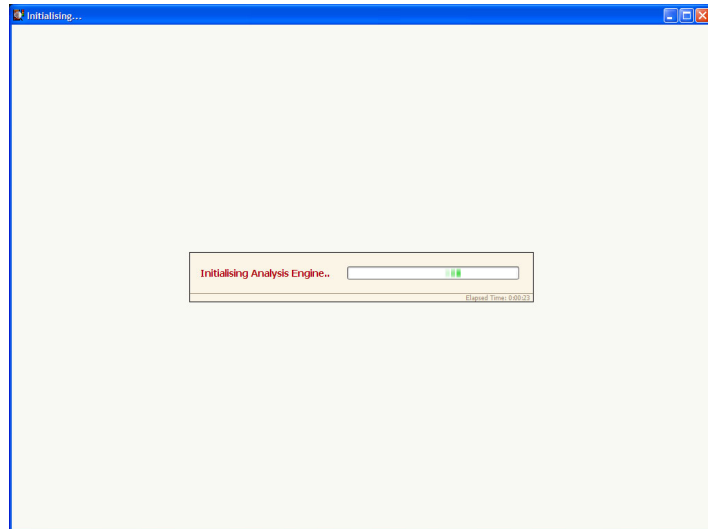
CAUTION. Do not remove power from the instrument during the reprogramming process. If power is removed during reprogramming, the instrument might be rendered unable to reboot, which will require that the instrument be returned to Tektronix for repair.

17. Close the upload device firmware dialog box and click **Connect** in the Connect to MTM Device dialog box.

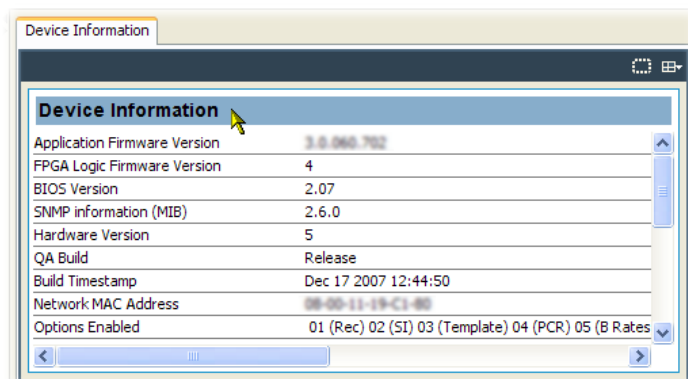
The Initializing dialog box is displayed for the duration of the reprogramming process.

The reprogramming process can take up to twenty minutes.

When the reprogramming process is complete, the user interface will be displayed.



18. Verify that the Application Firmware Version value matches the version of the upgrade file you used in step 1.



NOTE. The Device Information view details the software and hardware build state of the DTV monitor. The values shown in the above figure might differ from the values shown for your instrument.

The upgrade is complete.

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