



**MTSA-HW and MTSA-PC  
MPEG Test Systems  
Quick Start User Manual**

**Warning**

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

Supports MTSA firmware v3.3.2 and above.

[www.telestream.net](http://www.telestream.net)

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For product information, sales, service, and technical support:

Worldwide, visit [www.telestream.net/telestream-support/video/support.htm](http://www.telestream.net/telestream-support/video/support.htm) to find contacts in your area.

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# Important compliance and safety information

## United States of America Compliance Notices

### Class A Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

### Safety

UL 61010-1: 2012 R4.16: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

### Environmental

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 [dtsc.ca.gov/perchlorate/](http://dtsc.ca.gov/perchlorate/) for additional information.

## Canada Compliance Notices

### Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

### Règlement sur le brouillage radioélectrique du Quadstère des Communications

Cet appareil numérique respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du Quadstère des Communications du Canada. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

### Safety

CAN/CSA-22.2 NO. 61010-1-12 + Gil + GI2:: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

## Sécurité

CAN / CSA-22.2 NO. 61010-1-12 + Gil + GI2 :: Exigences de sécurité pour l'électricité  
Matériel de mesure, de contrôle et d'utilisation en laboratoire - Partie 1: Généralités  
Exigences.

# European Union and European Free Trade Association (EFTA) Compliance Notices

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, ICELAND, LICHTENSTEIN, NORWAY, SWITZERLAND

## Declaration of Conformity

Marking by the "CE" symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU

This equipment meets the following conformance standards:

## Safety

EN 61010-1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements  
Low Voltage Directive 2014/35/EU

## Emissions

EN 55032: 2012 + AC: 2013, CISPR 32: 2015, EN 61000-3-2: 2014,  
EN 61000-3-3: 2013

## Immunity

EN 55103-2: 2009, EN 61000-4-2: 2009,  
EN 61000-4-3: 2006 + A1: 2008 + A2: 2010, EN 61000-4-4: 2004 + A1: 2010,  
EN 61000-4-5: 2006, EN 61000-4-6: 2009, EN 61000-4-11: 2004  
Environments: E2

## Warnings



Warning! This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.



Achtung! Dieses ist ein Gerät der Funkstorgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.



Attention! Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartient alors à l'utilisateur de prendre les mesures spécifiques appropriées.

### Notes:

1. For Compliance with the EMC standards listed here, high quality shielded interface cables should be used.

- Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

### Environmental Compliance

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. 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 on the product or its packaging indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic - equipment (WEEE) and batteries.

It also indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

#### *Battery Recycling*

This product may contain a rechargeable battery, which must be recycled or disposed of properly. Please properly dispose of or recycle the battery according to local government regulations.

#### *Transporting Batteries or products with Batteries in them*

The capacity of the lithium ion secondary battery shipped with this product is under 100 Wh. The lithium content of the installed primary battery is under 1 g. Each battery meets the applicable requirements of UN Manual of Tests and Criteria Part III Section 38.3. Battery quantity is under the limit for shipment according to Section II of the relevant Packing Instructions from the IATA Dangerous Goods Regulations. Consult your air carrier for applicability and determination of any special lithium battery transportation requirements.

#### *Restriction of Hazardous Substances*

This product is classified as an industrial monitoring and control instrument, and is not required to comply with the substance restrictions of the RoHS 3 Directives 2011 /65/EU and EU 2015/863 until July 22, 2021. This product does, however, comply with the RoHS 2 Directive 2011/65/EU.

## Korea Compliance Statement

<p>사용자 안내문</p>
<p>이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 <u>전파간섭의</u> 우려가 있습니다.</p>

## Taiwan Compliance Statement

警告使用者：  
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Japan Compliance Statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016). If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

## Important Safety Information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.  
To safely perform service on this product, see the Service safety summary that follows the General safety summary.

### General Safety Summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

### Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

### The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

### 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. Do not use the provided power cord for other products.

*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. Do not disable the power cord grounding connection.

*Power disconnect:* The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

*Observe all terminal ratings:* To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

*Do not operate without covers:* Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

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

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

*Disable the product if it is damaged.* Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

**Use only specified replacement parts.**

Do not operate in wet/damp conditions: Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry: Remove the input signals before you clean the product.

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

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment: Always place the product in a location convenient for viewing the display and indicators.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use only the Telestream rackmount hardware specified for this product.



## Service Safety Summary

The Service safety summary section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this Service safety summary and the General safety summary before performing any service procedures.

*To avoid electric shock:* Do not touch exposed connections.

*Do not service alone:* Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

*Disconnect power:* To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

*Use care when servicing with power on:* Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

*Verify safety after repair:* Always recheck ground continuity and mains dielectric strength after performing a repair.

## Terms in the Manual

*These terms may appear in this manual:*



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



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

## Terms on the Product

*These terms may appear on the product:*

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

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

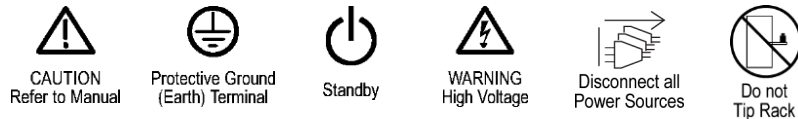
**CAUTION** indicates a hazard to property including the product.

## Symbols on the Product



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

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



## General Safety Product Specific Statements

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual. The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.



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**WARNING.** *In the instrument, only the line conductor is fused for over-current protection. The fuse is internal and not user replaceable. Do not attempt to replace the fuse. If you suspect the fuse has blown, return the unit to an authorized service center for repair.*

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**CAUTION.** *To minimize the risk of damage to the instrument, we strongly recommend you connect the power cord to the instrument before the power cord is connected to the AC power source.*

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**CAUTION.** *To prevent instrument damage from overheating, maintain at least two inches (5.1 cm) of clearance at the rear and sides of the instrument cabinet when locating the instrument on a bench. When the instrument is mounted in an equipment rack, maintain at least 3 inches (7.6 cm) of clearance from the back wall of the rack.*

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**CAUTION.** *To reduce the risk of fire and shock, ensure that the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.*

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# Preface

This manual describes the functions and use of Telestream MTSA-HW and MTSA-PC MPEG Test Systems.

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**NOTE.** *These naming conventions are used in this manual:*

- *MTSA-HW – for information that applies to only the MTSA-HW instrument*
  - *MTSA-PC – for information that applies to only the standalone software*
  - *MTSA – for information that applies to both the MTSA-HW and MTSA-PC products*
- 

The MTSA family of MPEG Test Systems provides comprehensive MPEG transport stream (TS) analysis and interoperability testing. Its deep analysis of the TS, PES (Packetized Elementary Stream), and elementary streams helps track down sources of picture anomalies and identify transport streams with syntax errors. Its ability to capture events for deep analysis is also critical to identifying the root cause of problems.

The MTSA can be delivered as a rack mountable 1RU full rack instrument (MTSA-HW) or as standalone software (MTSA-PC). The MTSA has a high-speed analysis engine that enables reduced time to insight, rapid development, evaluation, deployment, and diagnostics of next generation DTV and IPTV systems and services.

## Key features

- Perform analysis of key regional DTV standards - The MTSA supports the DVB, ATSC, ISDB, and ISDB-TB (Brazil) regional standards and the specific SI (Service Information) for terrestrial, cable, and satellite transmission
- Connect to the most important physical interfaces used for transmission - A range of RF and IP interfaces and analysis capabilities provide the necessary connectivity to diagnose problems anywhere in the network environment, whether it is transmission links (RF or IP layer) or content processing (TS layer)
- Analyze content using the common DTV compression technologies - the MTSA tools support H.265 (HEVC), H.264, VC1, MPEG 2 and MPEG 1 compression standards
- Test and analyze the structure of the TS and the content contained within that stream - A full range of tools enables QoS (Quality of Service) and QoE (Quality of Experience) with logging for fault diagnosis and reduced time to insight for both constant and variable bit rate streams (CBR and VBR). <sup>1</sup> Using CaptureVu® technology lets engineers capture and analyze system events in real time and deferred time to debug intermittent and complex problems that traditional analyzers miss
- Perform custom parametric testing and analysis - The MTSA options include a versatile Multiplexer and Generator that can be used to provide stimulus with parametric capabilities and IP multisession replication to characterize behavior of network or the Device Under Test (DUT)
- Perform in depth, repeatable, objective Picture Quality Analysis - the MTSA PQ software can be used to perform full reference Picture Quality Analysis based on the Human Vision Model allowing users to assess CODEC performance and troubleshoot picture issues in their content. The MTSA PQ option is the award-winning PQA software

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<sup>1</sup> Some timing related measurements are not possible with VBR streams.

# Applications

## Equipment manufacturers - research and development

- CaptureVu® technology allows rapid isolation and debugging of equipment and system faults
- High-performance Gigabit Ethernet (GbE) IP connectivity and integrated cross-layer analysis enable diagnosis of complex timing problems in video over IP and IPTV network equipment
- Multiplexer/Remultiplexer allows flexible test stream creation and modification
- Rapid and in-depth analysis of selected elements of transport streams to confirm functionality and compliance to standards
- Set-top box buffer testing and verification
- Elementary stream analysis option for codec design and optimization High-accuracy picture quality analysis based upon the Human Vision Model for device design optimization and fault diagnosis

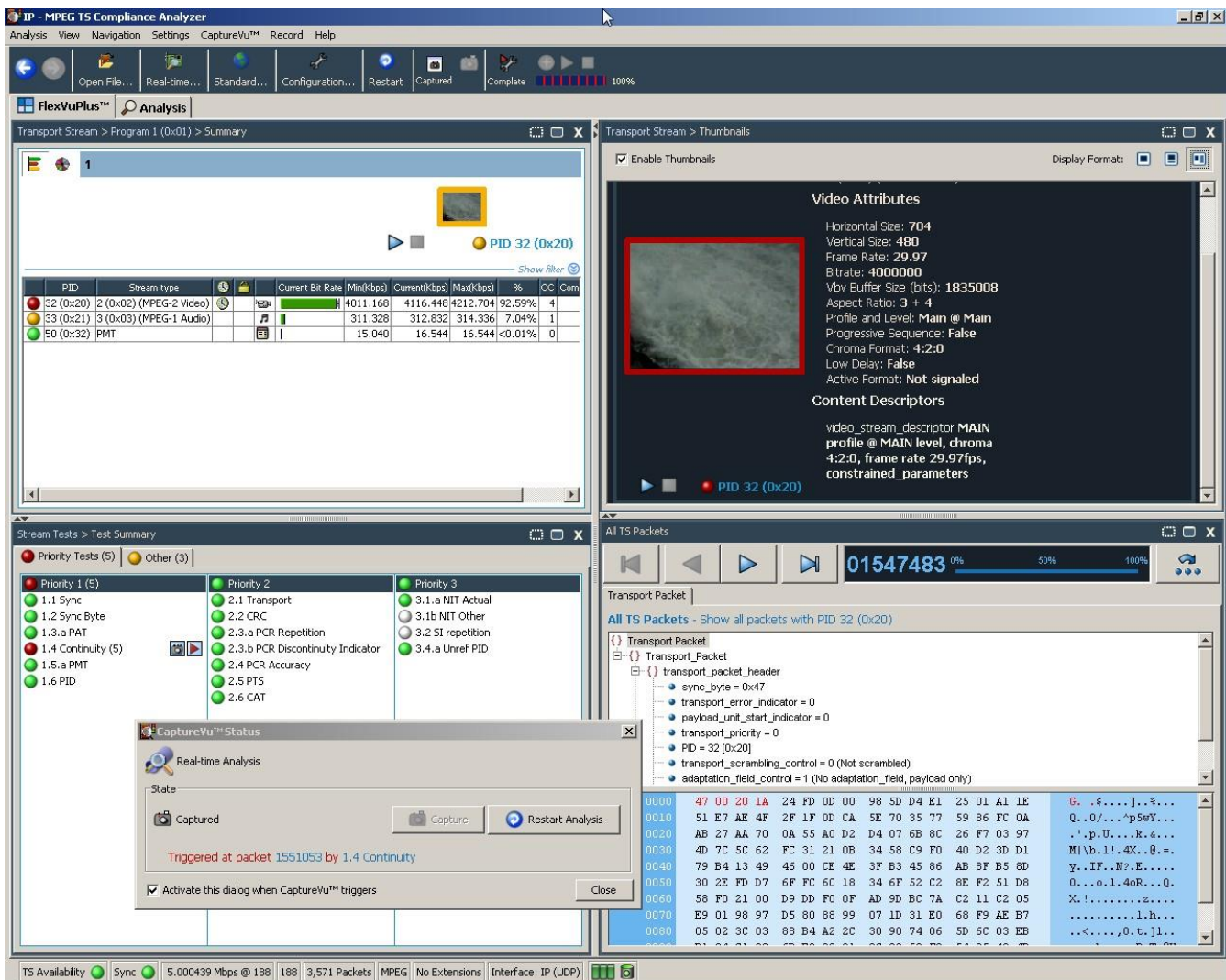


Figure 1: MTSA CaptureVu®

### **Equipment manufacturers - manufacturing test**

- Tclips Test Streams together with the Multiplexer/Remultiplexer allow custom test stream creation and editing for fast and flexible equipment stress testing
- Stream playout and recording provide a repeatable test source with seamless looping and continuous time-stamping for test and alignment of STBs, IRDs, and modulators
- Multiport ASI and IP interfaces allow multiple devices to be tested simultaneously
- Duplex operation allows end-to-end testing of system network elements

### **Broadcaster and network operator engineering**

- RF and IP connectivity and analysis provide a single-box solution for broadcast system troubleshooting at any point in the network
- Integrated cross-layer fault analysis and logging for network fault diagnosis reduces time to insight when troubleshooting and removes the need for additional IP- or RF-specific diagnostic equipment
- CaptureVu® technology allows for the isolation of intermittent network problems that other analyzers are not capable of isolating
- Video and audio quality analysis that help distinguish between impairments resulting from network distribution versus artifacts resulting from compression
- Elementary stream compliance option for evaluating different vendors' compression equipment and diagnosing faults

# Installation

The installation information is divided into sections for each of the installation types:

- **MTSA-HW system hardware.** This section describes how to install the MTSA-HW system hardware, how to use the controls and connectors, how to power-on and power-off the instrument, and how to connect the instrument to your local Ethernet network. See MTSA-HW system hardware installation on page MTSA-HW system hardware installation4.
- **MTSA-PC standalone system.** This section describes how to install the MTSA-PC standalone system software. See MTSA-PC standalone system installation on page 12.
- **VLC Media Player.** This section describes how to download and install the latest version of the VLC Media Player, which enables you to view video in the Transport Stream Compliance Analyzer (TSCA) application. See VLC media player installation on page 23.

## MTSA-HW system hardware installation

This section describes how to install the MTSA-HW system hardware and how to connect the system to your local network.

### Before installation

Inspect the product when you receive your instrument.

1. Inspect the shipping carton for external damage, which indicates possible damage to the instrument.
2. Remove the MTSA-HW instrument from the shipping carton.
3. Check that the instrument has not been damaged in transit. The exterior should not have any scratches or impact marks. Before shipment, the instrument is thoroughly inspected for mechanical defects.

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**NOTE.** Save the shipping carton and packaging materials for instrument repackaging in case shipment becomes necessary. See *Returning the instrument for service* on page 69.

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4. Verify whether you received the standard accessories and any optional accessories that you ordered. See [Accessories](#) on page 64.

### Operating requirements

This section provides the environmental and power operating requirements for the instrument.

**Environmental operating requirements.** Check that the location of your installation has the proper operating environment as listed in Table 1.



**CAUTION.** Damage to the instrument can occur if this instrument is powered on at temperatures outside the specified temperature range.


**Table 1: Environmental requirements**

Parameter		Specification
Temperature	Operating	0 °C to + 40 °C
	Non-operating	-20 °C to + 60 °C
Cooling	Ventilation	Internal fans provide forced air circulation. Do not block ventilation openings
	Bare instrument	To ensure proper airflow, there must be at least 2 inches of clearance on both sides of the instrument, at least 2 inches of clearance from the rear of the instrument, and at least a 1/2 inch of clearance from the top of the instrument.
	Rackmount kit	Use only the factory Rackmount Slides and Rails Kit (MTSA-HW RACK) to install this instrument in an equipment rack. To ensure proper airflow when installing the instrument in a closed rack with solid walls, there must be at least 2 inches of clearance from both sides of the instrument chassis to the rack side walls, at least 3 inches of clearance from the rear of the instrument to the rack's back wall, and at least a 1/2 inch of clearance from the top of the instrument to another installed instrument. The rack intake air to the side vents must not exceed 40 °C.

**Electrical power requirements.** The instrument operates from an AC power input. Check that your location provides the proper electrical power requirements as listed in Table 2.

Use the proper power cord with the instrument. [Standard accessories](#) on page 64. Table 2 lists the power requirements for the instrument.

**Table 2: Electrical requirements**

Requirement	Specification
Line voltage range	100 to 240 V <sub>AC</sub>
	 <b>CAUTION.</b> To reduce the risk of fire and shock, ensure that the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.
Line frequency	50/60 Hz
Power consumption	100 W typical 200 W maximum



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**WARNING.** In the instrument, only the line conductor is fused for over-current protection. The fuse is internal and not user replaceable. Do not attempt to replace the fuse. If you suspect the fuse has blown, return the unit to an authorized service center for repair.

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## Controls and connectors

This section describes the MTSA-HW system instrument controls and connectors. The analysis functions (if enabled) can be used with no installation other than providing power and making a transport stream available on the hard disk of the instrument. The monitoring and real-time analysis functions similarly require power, but also require connection to an external transport stream.

The MTSA-HW system is configured with the software and hardware options that you ordered at the time of purchase. MTSA-HW system options can be added using upgrade kits available from Telestream.



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**CAUTION.** To prevent instrument damage from overheating, maintain at least two inches (5.1 cm) of clearance at the rear and sides of the instrument cabinet when locating the instrument on a bench. When the instrument is mounted in an equipment rack, maintain at least 3 inches (7.6 cm) of clearance from the back wall of the rack.

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**CAUTION.** Do not supply power to the instrument until all other connections have been made.

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**Front panel controls and connectors.** The figure and table illustrate the MTSA-HW front panel controls and connectors.

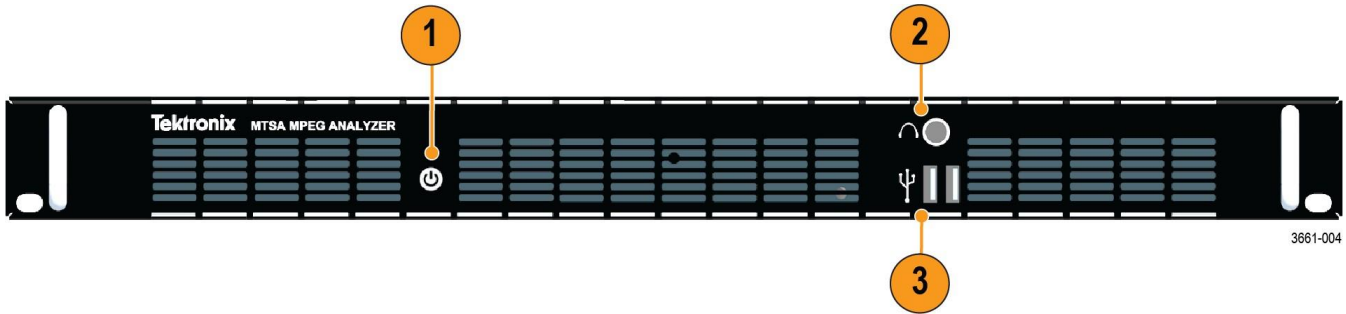

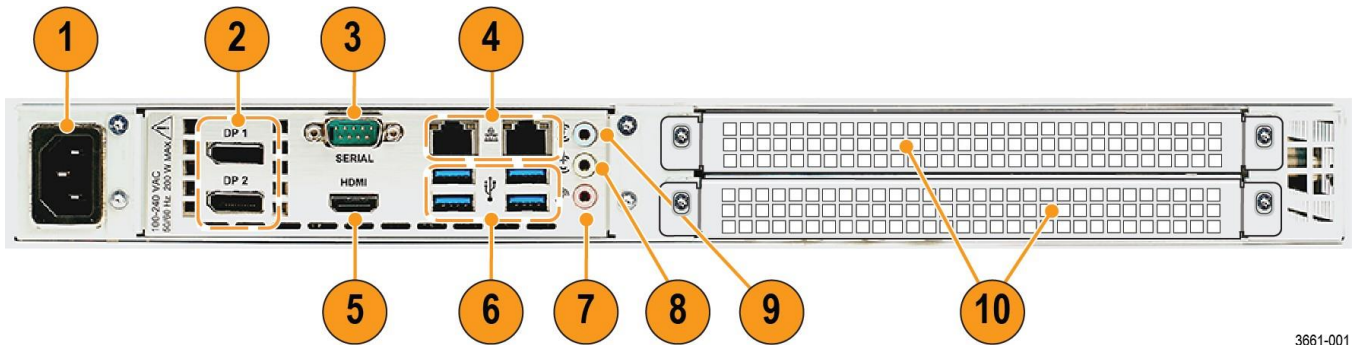


Figure reference	Description
1	<p><b>Power / Standby button.</b> Press the button to turn the instrument on or off. To completely remove power from the instrument, remove the power cord.</p>
	<p><b>CAUTION.</b> To prevent data loss, it is strongly recommended that you first shut down the instrument using the power button before disconnecting the power cord.</p>
2	<p><b>Headphone jack.</b> 1/4 inch headphone jack for listening to the selected video.</p>
3	<p><b>USB ports.</b> Two USB 3.0 ports for connecting a mouse and keyboard, upgrading the instrument firmware, or saving screen and stream captures.</p>

Rear panel connectors. The figure and table illustrate the MTSA-HW system connectors.







3661-001

Figure reference	Description	Figure reference	Description
1	<b>AC power input.</b> Connector for AC power source. Ensure that you use the proper power cord for your location.	6	<b>USB ports.</b> Four USB 3.0 ports for connecting a mouse and keyboard, upgrading the instrument firmware, or saving screen and stream captures.
2	<b>DisplayPort (DP).</b> Two DisplayPort outputs for external monitors.	7	<b>Mic input.</b> This connector is for future use.
3	<b>SERIAL.</b> The Serial Interface 9-pin connector is not used.	8	<b>Audio output.</b> 3.5 mm line out port for using headphones to listen to the selected video.
4	<b>Ethernet ports.</b> Standard RJ-45 connector for 10/100/1000Base-T (GigE) Ethernet cable used for video input; identical port for control. It is recommended to use the left port for control and the right port for video.	9	<b>Audio input.</b> This connector is for future use.
5	<b>HDMI port.</b> HDMI port output for an external monitor.	10	<b>Interface card bays.</b> Two bays for the optional interface cards.

**Optional interface card connectors.** The MTSA-HW system can be configured with up to two optional cards that support various transport streams, networks, and peripheral devices. This section describes each of the available option cards and their connectors.

See the *MTSA-HW MPEG Test System Specifications and Performance Verification Technical Reference* for more detailed information about each connector and signal input and output formats for each of the option cards.

**Table 3: Optional interface cards and connectors**

<p><b>Multiport ASI Interface (Option ASI)</b> Four input/output connectors (BNC, 75 Ω)</p>	 <p style="text-align: right;">3661-009</p>
<p><b>Dual Input DVB-S/S2 Interface (Option DS2)</b> Two RF input connectors; two ASI output connectors (BNC, 75 Ω). Supports DVB-S QPSK and DVB-S2 QPSK, 8PSK, 16APSK and 32APSK demodulation. Includes level, BER, MER, SNR, constellation points.</p>	 <p style="text-align: right;">3661-007</p>
<p><b>Multifunction SDR RF Interface (Option SDR)</b> One RF input connector. Supports DVB-T, ISDB-T/Tb, QAM A/B/C and 8VSB. Includes level, BER, MER, constellation points.</p>	 <p style="text-align: right;">3661-008</p>
<p><b>10GBase-SR Dual Optical Port 10Gb/s NIC (Option 10GS)</b> Includes Short Reach SFP+ Modules (850 nm).</p>	 <p style="text-align: right;">3661-006</p>

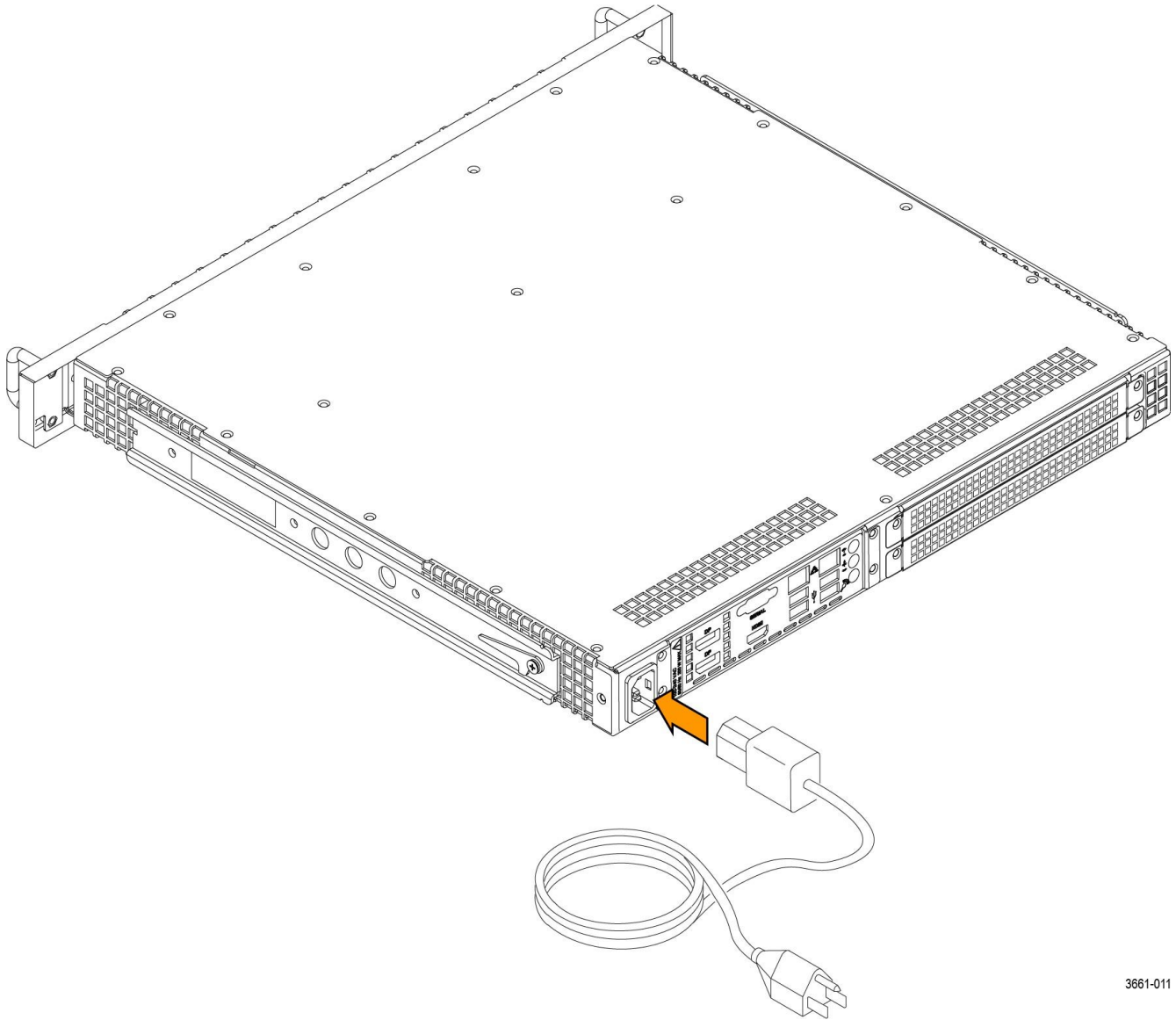
**Power-on and power-off procedures**

This section describes how to apply power to the instrument and how to power-on and power-off the instrument.

**Power cord installation.** This instrument is powered by an AC power source. Connect the power cord to the power connector on the rear panel of the instrument as shown. The power connector is keyed to be directional, with the flat portion of the power cord housing facing the left of the instrument (as viewed from the rear). When fully inserted, the power cord housing latches onto the instrument power connector.



**CAUTION.** To minimize the risk of damage to the instrument, we strongly recommend you connect the power cord to the instrument before the power cord is connected to the AC power source.



3661-011

**Figure 2: Connecting the power cord to the instrument**

### Power-on procedure.

1. Apply power to the instrument.

---

**NOTE.** If the MTSA-HW instrument was previously powered off by a power interruption or by removing the power cord from the rear of the instrument, the instrument will power on when power is reapplied.

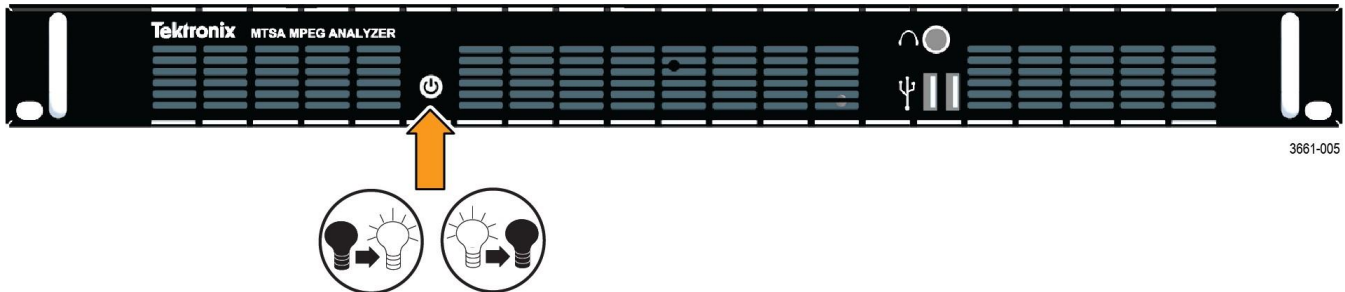
---

2. Press the **Power/Standby** button on the instrument front panel to turn the instrument on.

---

**NOTE.** The Power/Standby button illuminates during the power-on sequence and then turns off during normal instrument operation.

---



### Power-off procedure.

1. Press the **Power/Standby** button on the instrument front panel to put the instrument in standby mode. Power off the instrument using the Windows shutdown process (select **Start > Power > Shut down...**). The system (including applications) will shut down automatically.



---

**CAUTION.** To prevent data loss, we strongly recommend you first shut down the instrument before disconnecting the power cord.

---

2. To completely remove power from the MTSA-HW, disconnect the power cord from the instrument. The power cord has a locking mechanism to keep it attached to the instrument. Push the button on the cord housing to release the locking mechanism.

### Network installation

The MTSA-HW system can be attached to a computer network. Refer to your Network Administrator for details of the correct network configuration. For installation and operating instructions, refer to the documentation supplied with your network hardware and software.

**Network troubleshooting.** Networks are based on standards; however, there are many unique characteristics of each network (LAN or WAN) that make it difficult to troubleshoot without a thorough knowledge of the specific network. Consequently, an expert who knows your network characteristics should perform in-depth network troubleshooting.

This section provides some basic procedures that can eliminate some of the more common sources of network errors. If you cannot resolve problems using these procedures, contact your network administrator.

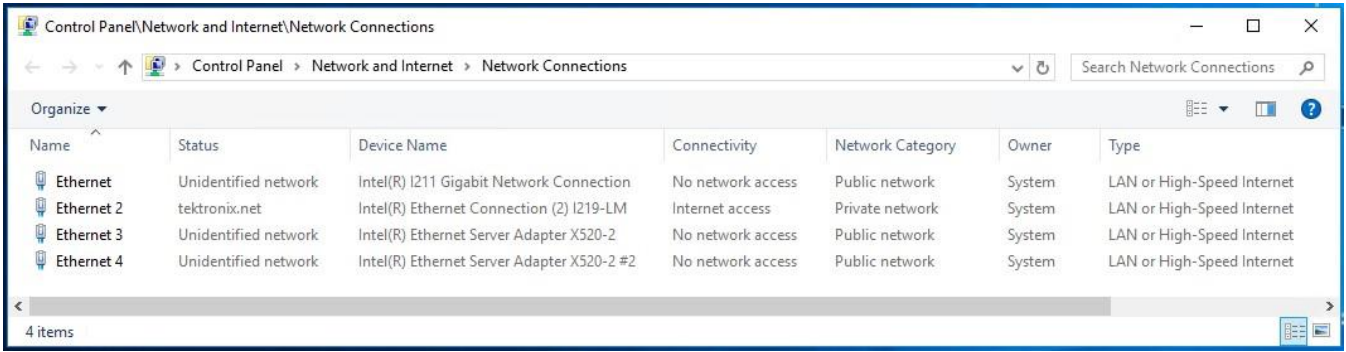
**Basic requirements.** Before troubleshooting your host machines:

- Configure your system for use on your network. Contact your network administrator for details. The MTSA-HW NICs are set to DHCP for auto address setup.
- Ensure that any applications that you may have loaded on your test system since receiving it are not using the ports assigned to the test system components.

**IP parameters.** The illustrations in this section show how each IP parameter (IP address, subnet mask, and default gateway) can negatively affect network connectivity.

**Common troubleshooting procedures.** Many of the procedures in these sections are common tasks.

**NIC bandwidth limitations.** The MTSA-HW platform provides two CAT5 Network Interface Cards (NICs) for analyzing IP signals. See [Rear panel connectors](#) on page 8. As shown, you can use the Control Panel > Network and Internet > Network Connections view to see the available network connections.



The I/O bandwidth limitations for both 1 Gbps NICs are:

- MPEG Player output of up to 250 Mbps
- TSCA IP input of up to 600 Mbps

**Option 10GS interface.** The Option 10GS (10 Gbps) interface card has a device name of Intel X520 and the I/O bandwidth limitations are:

- MPEG Player output of up to 300 Mbps
- TSCA IP input of up to 600 Mbps

## MTSA-PC standalone system installation

The MTSA-PC standalone system makes the MTSA-HW system applications available on a PC.

If you ordered Option ESA or ALZRPK (MTS4EAV7 HEVC / AVC Video and Compressed Audio Analyzer), use the installation procedure provided in the *MTS4EAV7 User Manual*.

If you ordered Option PQ, use the installation procedure provided in the *PQA Picture Quality Analyzer User Manual*.

### System requirements

This minimum PC configuration is recommended for installing the MTSA standalone system:

Parameter	Requirement
Operating system	Microsoft Windows 10, 64 bit
Processor	Intel i7-7700T or better
Memory	At least 16 GB RAM
Screen resolution	1920×1080
Hard disk size	At least 512 GB SSD recommended

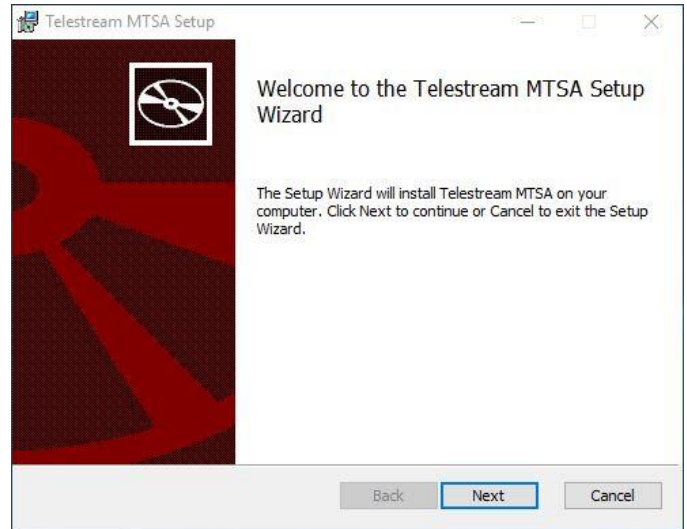
## Install the MTSA software

1. If you are upgrading an existing installation, it is required that you first uninstall the MTSA application using the Windows Control Panel.
2. Download the MTSA Application Software download package from the Telestream website to your PC.

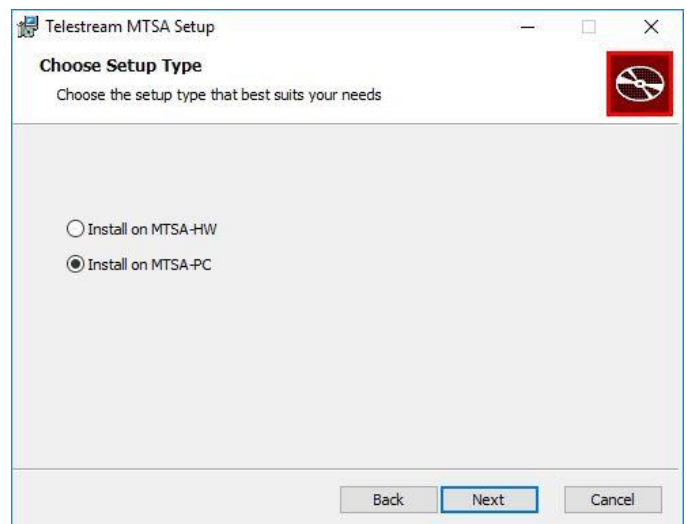
Locate the MTSA\_Setup.exe file in the download package. Be sure to right-click and select Run as administrator.

The installation program will start and display a Welcome screen.

3. In the installation Welcome screen, select **Next**.
4. Read the End-User License Agreement. Accept the agreement and select **Next**.



5. In the **Choose Setup Type** screen, select **Install on MTSA-PC** to install the MTSA software.
6. Select **Next**.

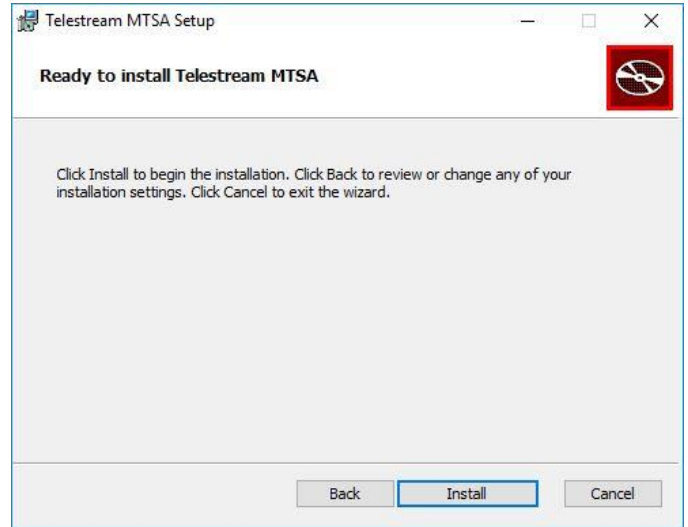


7. In the **Ready to Install** screen, select **Install**.

---

**NOTE.** A number of installation message boxes may display during the installation process. Normally, no user intervention is required.

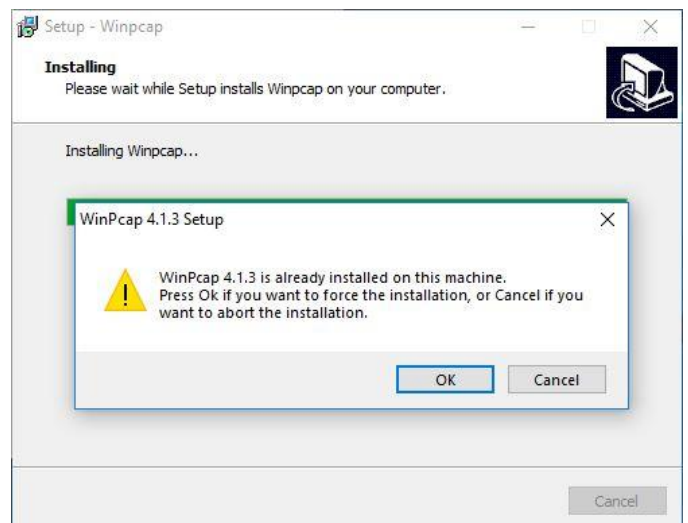
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8. When the WinPcap installer displays, select **Next**.

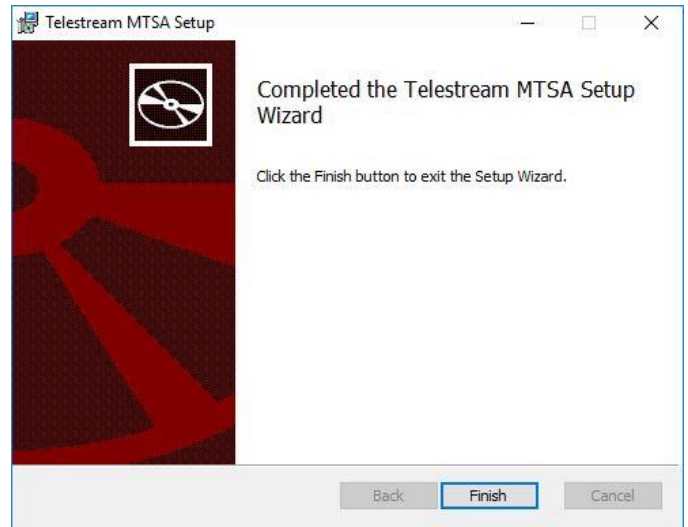


9. If WinPcap is already installed, a WinPcap warning will be displayed. Select **Cancel** to continue the installation without reinstalling WinPcap.





10. When the installation is complete, select **Finish** and reboot the PC before entering the license key or using the applications.

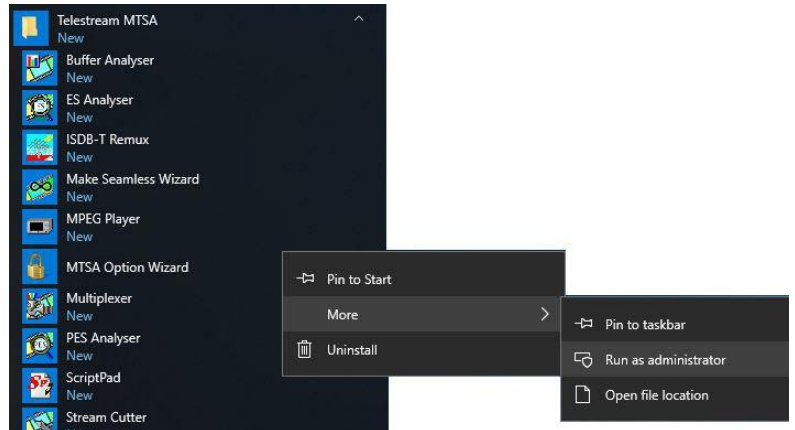


## Activate the MTSA software license

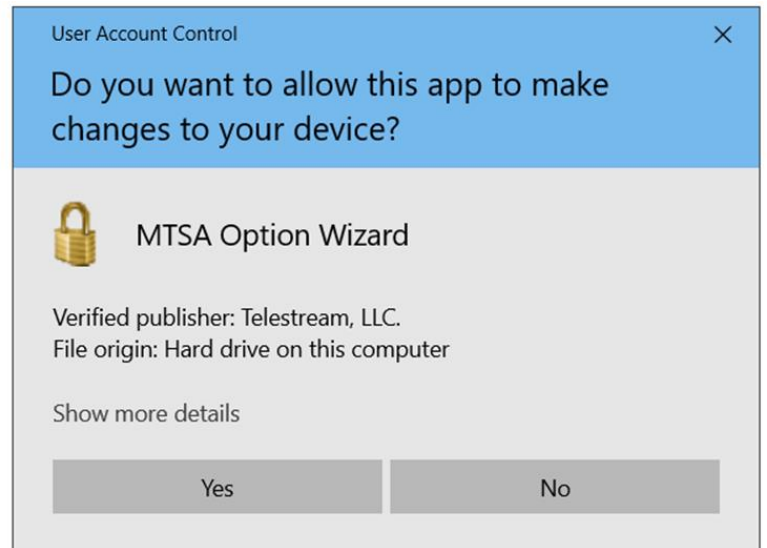
You should have received an email that includes information about your order as well as the Software Serial Number (SSN) required to activate your product. Contact your Sales Representative or Technical Support if you don't have this information.

License activation is performed using the MTSA Option Wizard. Perform the following steps to activate your license.

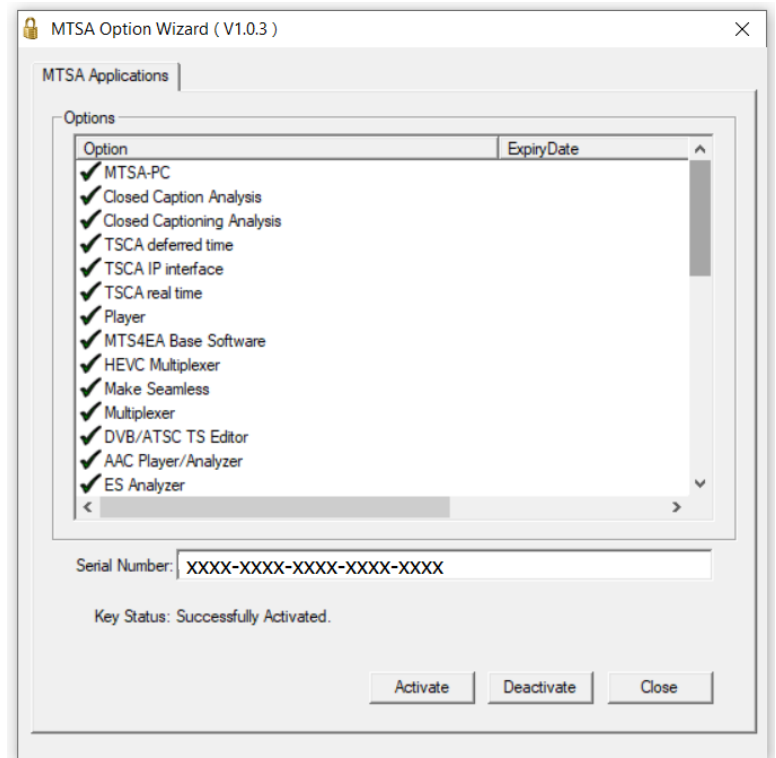
1. It is required to open the MTSA Option Wizard application in Administrator Mode.
  - a. From the Start Menu, go to **Telestream MTSA applications**
  - b. Right click on the **MTSA Option Wizard** application and select **More > Run as administrator**



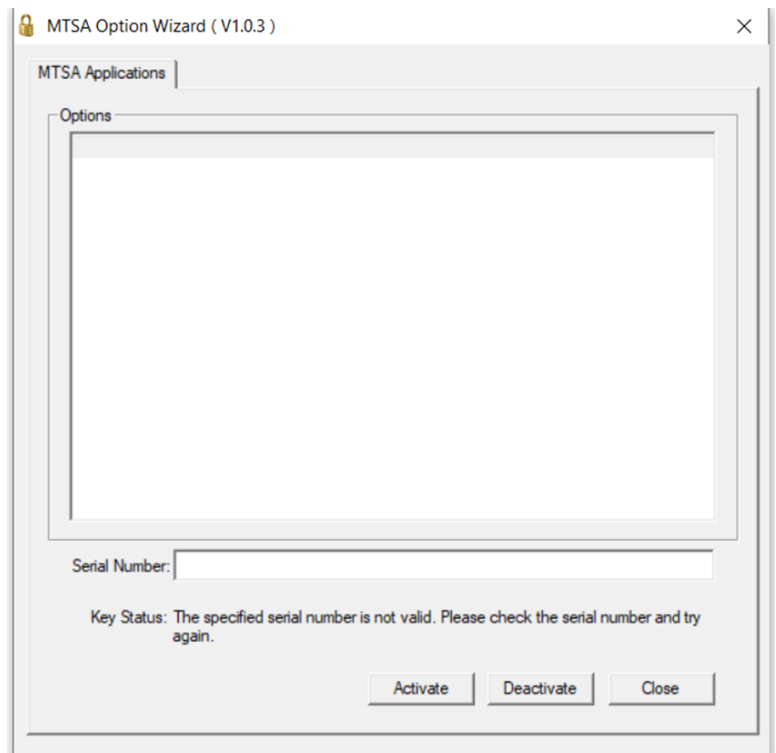
2. Select **Yes** when the application launches.



3. If there is an already activated license then the MTSA Option Wizard will show the existing options and the active Serial Number.



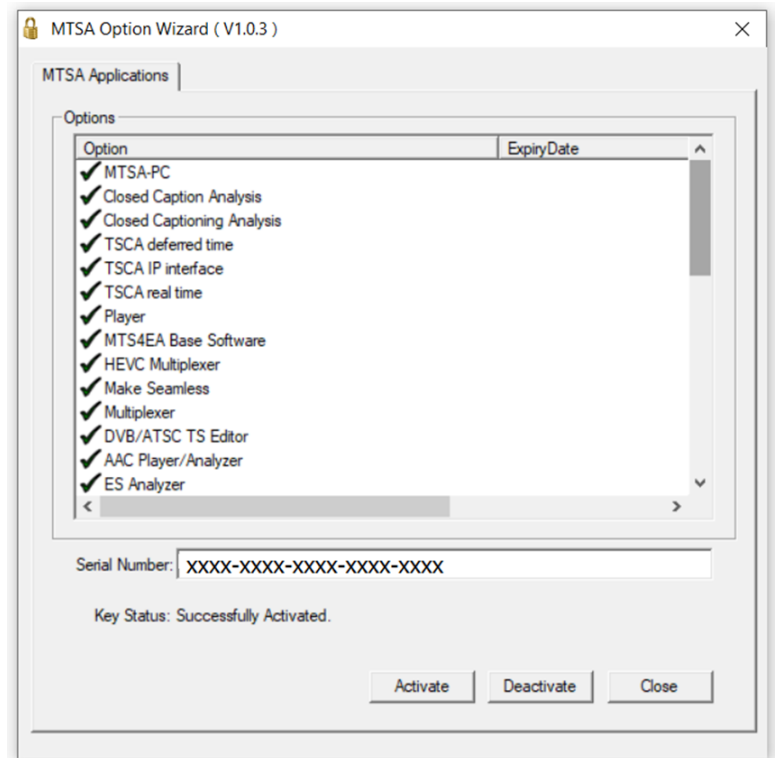
4. If license activation is being done for the first time, the MTSA Option Wizard will show no options or serial number.



5. Enter the Software Serial Number you received in the Serial Number box and click **Activate**.

**Online activation:** If the computer is connected to the internet, the license will be activated in Online Mode. If the specified serial number is activated successfully, the application will list all the enabled options and the key status will be updated to **Successfully Activated** as shown here.

Once this process is complete, you can close the MTSA Option Wizard and begin to use your product.



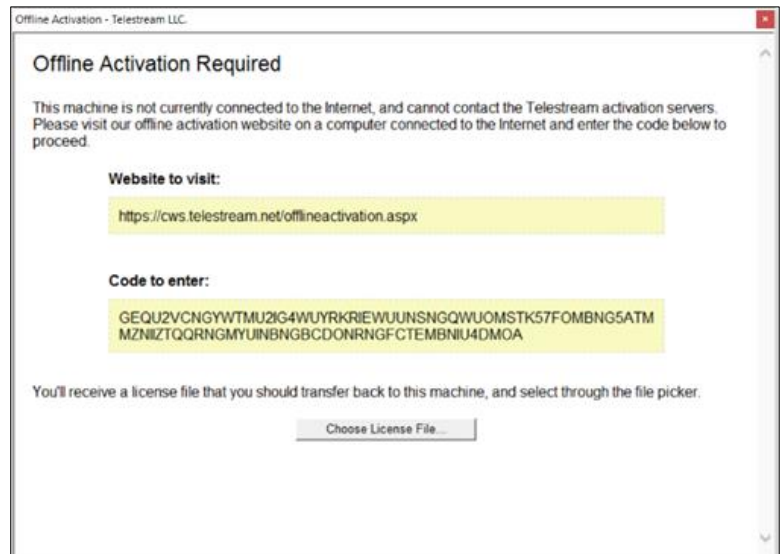
6. If the computer is not connected to the internet or if the computer is being blocked by a firewall, causing failure to connect to the Telestream license activation server, the application will prompt for offline activation.

---

**NOTE.** *If you are behind a firewall, please give access to CWS.Telestream.net and ports 80 and 443. That could resolve the online mode activation issue.*

---

If you want to proceed with offline activation, do not close this dialog, and perform the following steps.



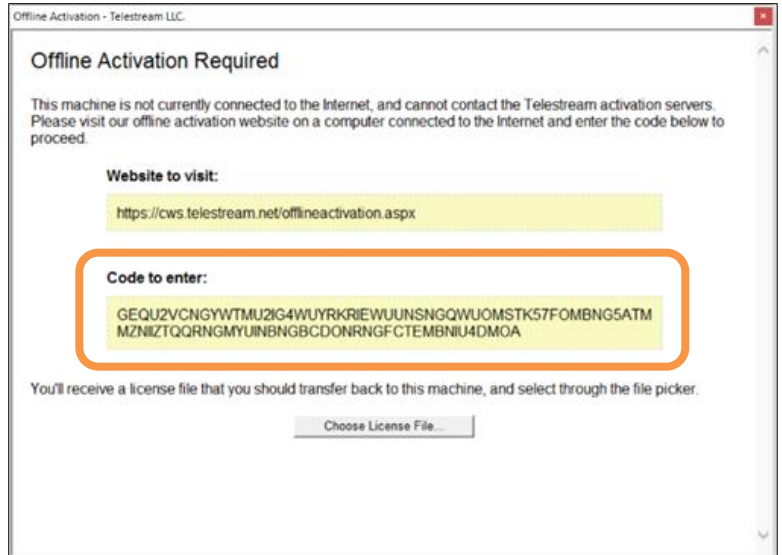
7. In offline mode, you need to manually activate the software using another computer that has internet access.

Open a text editor such as Notepad and copy the **Code to enter** code highlighted in the **Offline Activation Required** dialog. Save the text file and move the saved file onto a USB drive.

---

**NOTE.** The code highlighted in the **Offline Activation Required** dialog is linked to this computer. If you move the license to a new computer, you will need to generate a new **Offline Activation** code on that computer.

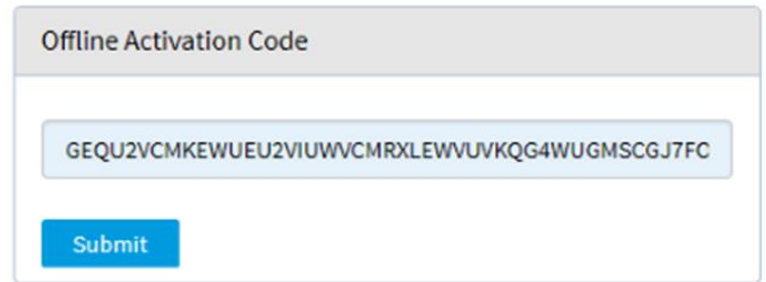
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8. Using another computer with internet access:
  - a. Copy the code from the USB drive and enter the offline activation code at:

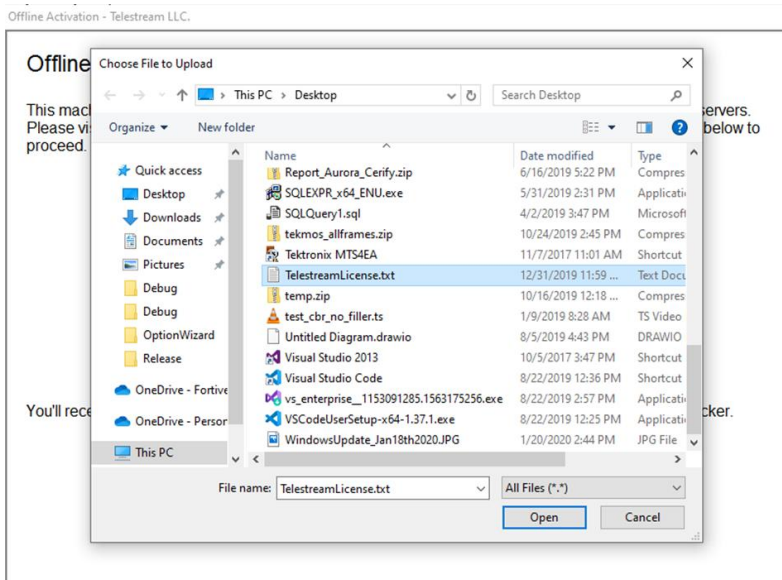
<http://cws.telestream.net/offlineactivation.aspx>

- b. After entering the code, select the **Submit** button to receive the license file.
- c. Once the license file is downloaded, place the file on a USB drive.



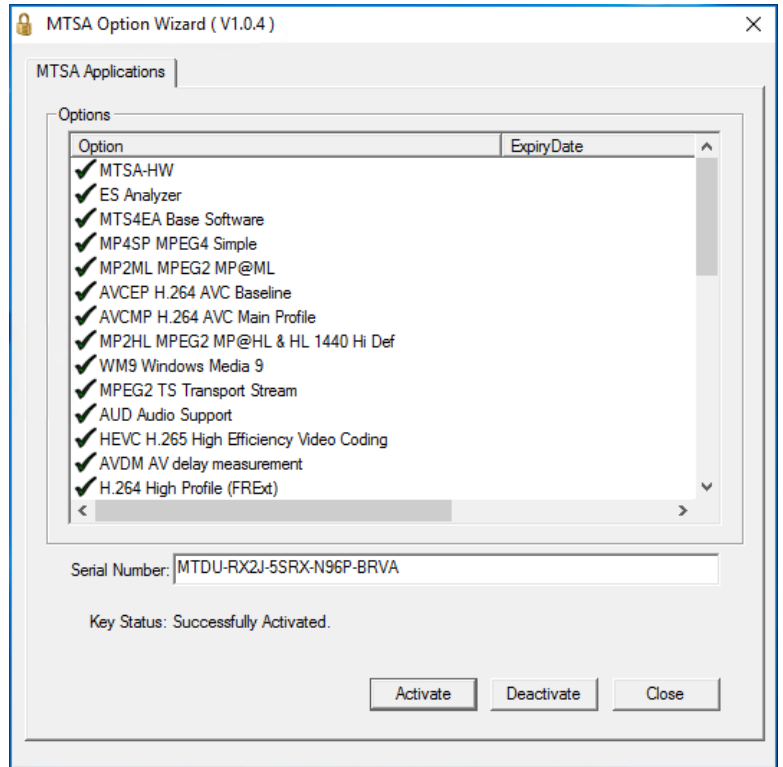
9. Go back to the **Offline Activation Required** dialog on the computer where the MTSA software is installed.

Select **Choose License File...** button and select the License file from the USB drive.



10. If the offline activation is successful, the list of options and the key status will be updated in the dialog as shown.

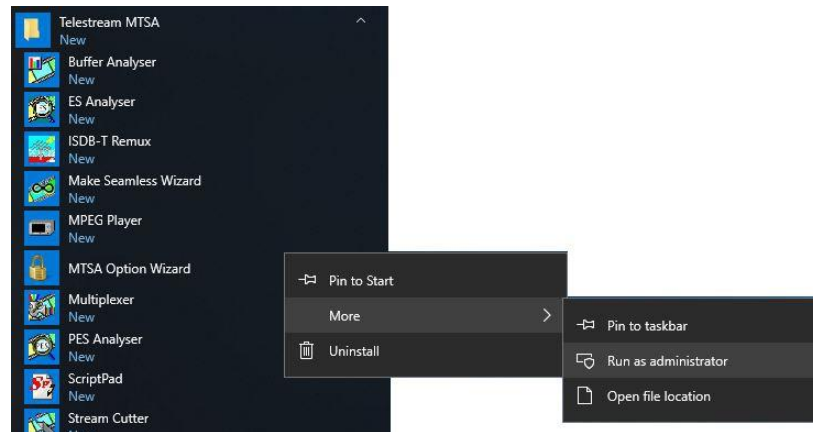
After activating the license, the enabled MTSA software applications can be used.



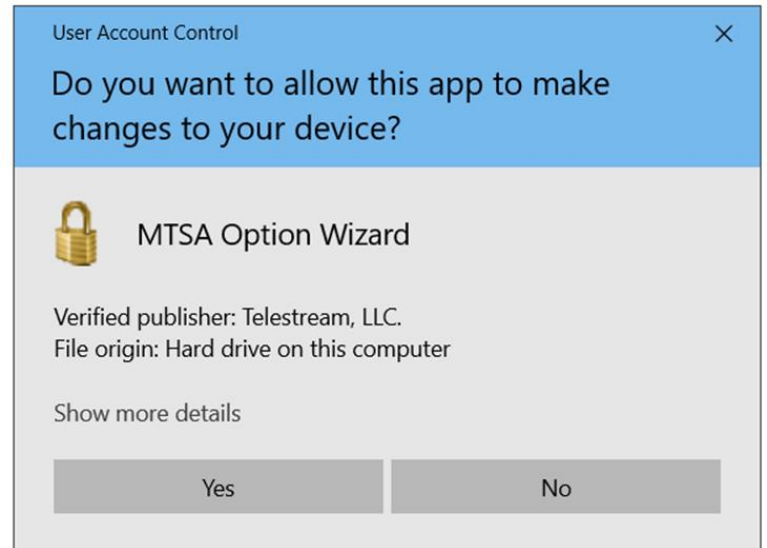
## Deactivate the MTSA software license

If you need to move your software to a different computer, you must first deactivate your existing license. License deactivation is performed using the MTSA Option Wizard. Perform the following steps to deactivate your license.

1. It is required to open the MTSA Option Wizard application in Administrator Mode.
  - a. From the Start Menu, go to Telestream MTSA applications
  - b. Right click on the **MTSA Option Wizard** application and select **More > Run as administrator**



2. Select **Yes** when the application launches.



3. Open the MTSA Option Wizard and click the **Deactivate** button.

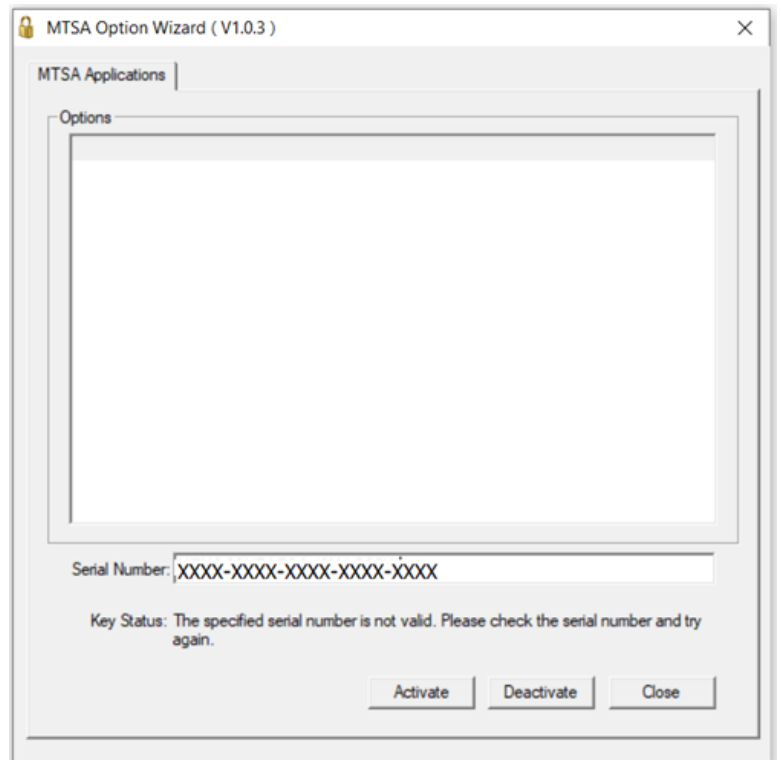
---

**NOTE.** *Deactivation will work only in the online mode when there is internet connection.*

---

After successfully deactivation, the options list will be emptied, and the key status will be updated.

If you are moving your software to a new computer, install the applications on the new computer and perform the **Activate the MTSA software license** procedure.

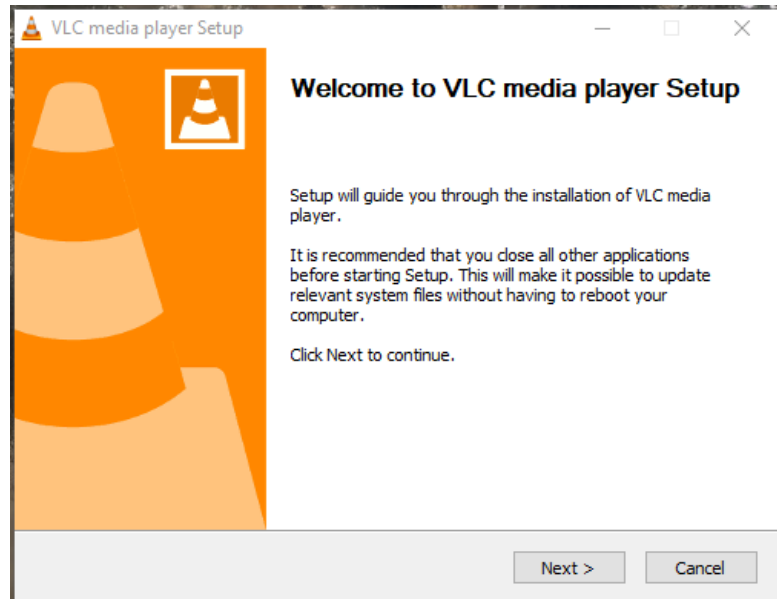




## VLC media player installation

To be able to view video in the Transport Stream Compliance Analyzer (TSCA), the latest version of the VLC Media Player must be downloaded from the VideoLAN Web site and installed.

1. Using an MTSA-HW instrument or PC with access to the internet, navigate to the VideoLAN home page ([www.videolan.org](http://www.videolan.org)).
2. Locate and download the Windows self-extracting VLC Media Player installer to your PC hard disk. It is recommended that you use the 64-bit version.
3. Locate the downloaded VLC Media Player file on your instrument and run it.
4. Select your preferred language. The Welcome / Setup screen appears.
5. Follow the setup procedure and install the VLC Media Player.



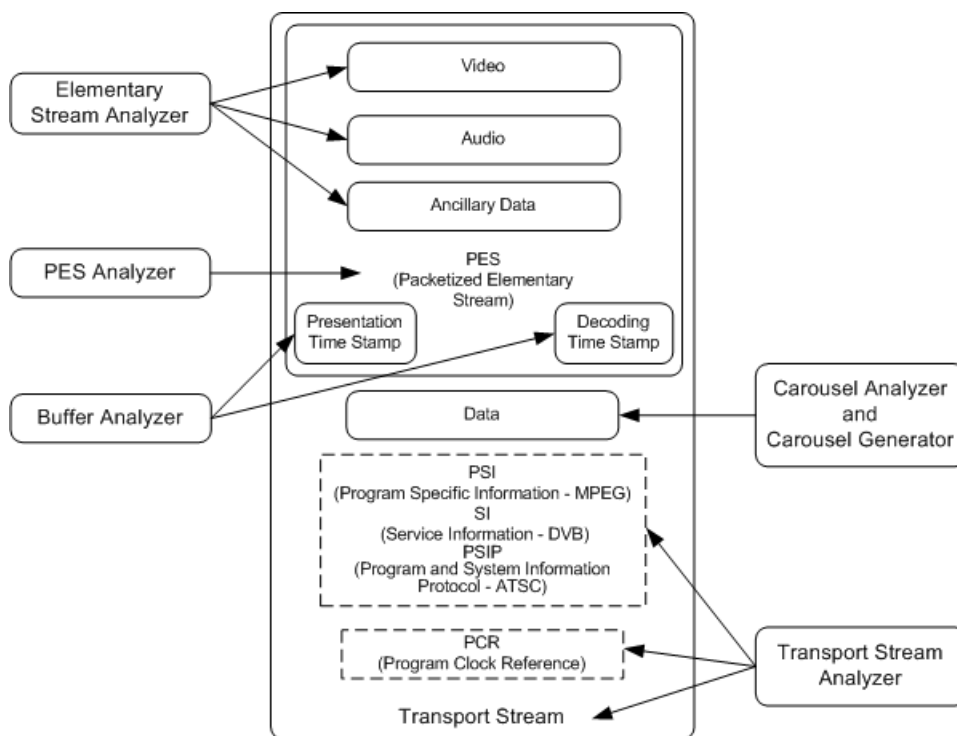
No further activity is required. The VLC Media Player will be used by the TSCA application as required.

# Operation

## Product description

The MTSA-HW and MTSA-PC MPEG Test Systems provide a comprehensive and integrated suite of real-time and deferred (offline) analysis tools. The tools include TS (transport stream) compliance, buffer, PES, MPEG2, and MPEG4 video and audio elementary stream analyzers. Also included are an editor and a multiplexer to create stream content, and test and error-stressing streams.

The applications in the MTSA analysis toolset are targeted at a specific aspect or layer of a transport stream. The figure illustrates this principle in simplified form.








The *Procedures* section tells you how to start the application, how to analyze a test stream, and what results are presented. The procedures do not tell you how to interpret the results.







Standards compliance is ensured through built-in customizable scripting, which supports a broad range of ratified and evolving DTV standards. New standards and proprietary tables can easily be implemented by loading Telestream-Vodep supplied updates, or creating your own custom scripts.

## Software applications

This section provides an overview of the software applications that make up the MTSA MPEG Test Systems. Note that some options might not be enabled. Detailed descriptions of all applications can be found in the MTSA application user manuals.

Application		Icon <sup>1</sup>
<b>Analyzers</b>		
Transport Stream Compliance Analyzer (TSCA) – Real-time and Deferred time transport stream analysis with user-selectable MPEG-2, DVB, and ATSC conformance tests. Shows transport structure, header contents, hexadecimal packet contents, PCR timing /transport rate graphs and error message logs.	The first RF/IP card installed in the MTSA-HW Test System is accessed using the TS Compliance Analyzer icon located in the Real Time Analyzers folder on the desktop and in the Start menu.	 TS Compliance Analyzer
Packetized Elementary Stream (PES) Analyzer – PES analysis with selectable test options. Shows PES program structure, header contents, packet contents, PTS/DTS timing graphs and analysis reports.		 PES Analyser
Transport Stream – System Target Decoder (T-STD) Buffer Analyzer analyzes program streams modeling their behavior in, and their conformance to, the MPEG-2 T-STD Buffer Model. Includes a trace facility.		 Buffer Analyser
Elementary Stream – Analyzer Elementary Stream analysis at video picture and audio level. This includes vector graphs and macroblock picture quality.		 ES Analyser
<b>Generators</b>		
ISDB-T Remux – Remultiplexes an existing 188- or 204-byte transport stream file into an ISDB-T/Tb (ARIB STD-B31) compliant file (204 bytes per packet). The created file extension is .RMX and includes TMCC and IIP sections.		 ISDB-T Remux

<sup>1</sup> If installed and licensed.

Application	Icon <sup>1</sup>
<p>Multiplexer – Multiplexes table information and packetized elementary streams together to synthesize new transport streams. A fine level of control is provided to allow nonconformances and test cases to be specified for new transport streams.</p>	 <p>Multiplexer</p>
<p>TS Editor – Viewing and editing of transport stream packets, using a hexadecimal view of the packet contents and semantic interpretation of the header. Provides facilities to remap PIDs, recalculate PCR values and introduce PCR inaccuracies.</p>	 <p>TS Editor</p>
<b>Players</b>	
<p>MPEG Player – Plays MPEG-2 transport streams.</p>	 <p>MPEG Player</p>
<b>Utilities</b>	
<p>Make Seamless Wizard – Guides the user through the process of creating an MPEG-2 transport stream file for use by Stream Player in continuously looped operation.</p>	 <p>Make Seamless Wizard</p>
<p>Stream Cutter – Extracts sections of MPEG-2 transport stream files to new files.</p>	 <p>Stream Cutter</p>
<p>Script Pad – Enables users to create and modify System Information (SI) scripts.</p>	 <p>ScriptPad</p>

<sup>1</sup> If installed and licensed.

## Starting an application

All applications are started from Start > All Programs > Telestream MTSA menus or from the shortcuts in the desktop folders (Real Time Analyzers, Deferred Time Analyzers, Generators, Player, or Utilities).

The MTSA application user manuals provide full descriptions of all applications. The table shows the applications that display in the Windows 10 Start menu.

Start menu	Application	Function
Telestream MTSA >	Option Key Wizard	Product licensing
	Buffer Analyzer	Analyzers
	ES Analyzer	
	PES Analyzer	
	TS Compliance Analyzer	
	TSCA with real time capabilities	
	ISDB-T Remux	Generators
	Multiplexer	
	TS Editor	
	MPEG Player	Player
	Make Seamless Wizard	Utilities
	ScriptPad	
	Stream Cutter	

---

**NOTE.** Applications appear in alphabetical order in the Start menu. All applications are shown in the Start menu, but you can only open those options that have been purchased and licensed.

---

## Duplex operation

The MTSA-HW instrument can be operated in duplex mode (ASI or IP only). For example, while the Player is playing out a stream, the Transport Stream Compliance Analyzer (TSCA) can be analyzing a separate stream or, if the output is looped back to the input, the output of the Player can be monitored by the TSCA.

## Setting up loopback

With loopback in operation you can:

- Use the MPEG Player to play out a stream
- Loop the instrument output back to the input (For example, with the ASI card, loop ASI-4 back to ASI-3. With the 10G card, loop the output back to the input using an LC multimode jumper cable.)
- Monitor/analyze the incoming stream using the TSCA

Before starting:

- Identify the stream to be played out (in this example, the sym1.mpg test stream is used).
- Choose the output/input interface (ASI) and make the necessary connections (loop between the connectors).

In the example, the stream is looped back using the ASI interface and the stream is looped in the player (to play continuously).

### MTSA-HW setup.

Connect a cable from the ASI-4 connector to the ASI-3 connector.

### MPEG player setup.

1. Open the MPEG Player: **Telestream MTSA > MPEG Player**.
2. Open a stream: **File>Open...> Sym1.mpg**.

---

**NOTE.** The *Sym1.mpg* file is provided for use to help understand the MTSA applications. The file is on the hard drive of the MTSA-HW (C:\Streams\Tclips\MTS400 TestStreams)

---

3. Use these settings in the **Play** menu:

- Interface: ASI
- Packet size: 188
- Update: On
- Loop: On
- Other: Standard: DVB

4. Use these settings in the **ASI** menu:

- ASI Out: ASI-4

### TSCA setup.

1. Open the TSCA: **Telestream MTSA > TS Compliance Analyzer**.
2. In the start-up dialog box (**Open Transport Stream...**), select **Change...** in Stream Interpretation and select the DVB base standard with no extensions. Close the Stream Interpretation dialog box.
3. Select **Real-time Analysis** and select **ASI-3** from the **Interfaces** drop-down list.
4. Select **OK**.

### Start the playout and analysis.

1. Return to the MPEG Player window and play the stream by selecting: **Play>Start/Stop** or use the toolbar button.
2. In the Player window, note that the status bar is now displayed and that playout has started.
3. Return to the TSCA window and note that analysis has started.

The MPEG Player is now playing out the sym1.mpg transport stream and, through the ASI input and output on the instrument connector panel, the TSCA is monitoring and analyzing the stream.

For detailed descriptions of the MPEG Player and the TSCA, refer to the *MTSA-HW and MTSA-PC Generator Applications User Manual*.

## Interface card status LEDs

The rear panel on the optional ASI and DVB-S2 (Option DS2) interface cards have LEDs to indicate the status of the input and output signals. Tables 4 and 5 list the possible status conditions.

**Table 4: ASI and DVB-S2 outputs**

LED pattern	Description
Short orange flashes	No output is generated
Long orange flashes	Null-packet stuffing only (no real data)
Solid orange	Generating live output

**Table 5: ASI and DVB-S2 inputs**

LED pattern	Description
Short green flashes	No carrier/signal detected
Long green flashes	Carrier detected but no data
Solid green	Valid signal detected
Solid red	Wrong signal connected
Five short red flashes quickly after each other	Code violations

# Procedures

## Using the Multiplexer

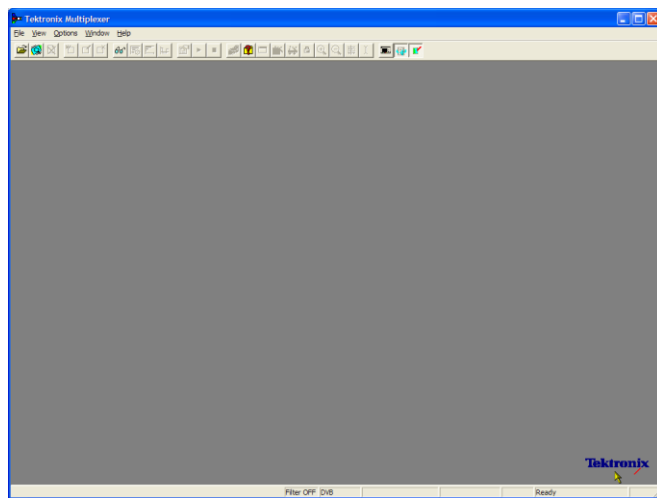
The application example describes using the Multiplexer to create a new transport stream and add elementary streams to the transport stream.

The new transport stream created with this procedure (named TestMux.mpg) is used to complete some of the additional procedures in this manual.

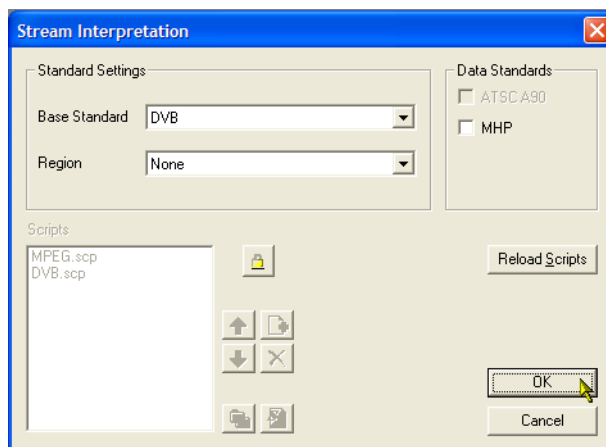
### Create a new stream using the Multiplexer

In this section of the application example, you will create a new transport stream using the Multiplexer application. You will introduce one error so you will be able to observe it in a later section of the application example.

1. Open the Multiplexer application.  
**Telestream MTSA > Multiplexer.**

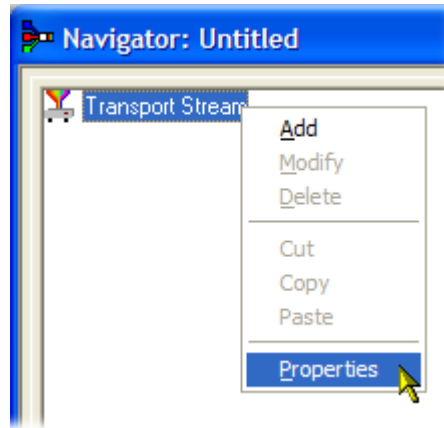


2. Select **View > Interpretation.**
3. In the Stream Interpretation dialog box, ensure that the selected Base Standard is DVB and that the Region is None.
4. Select **OK** to close the Stream Interpretation dialog box.



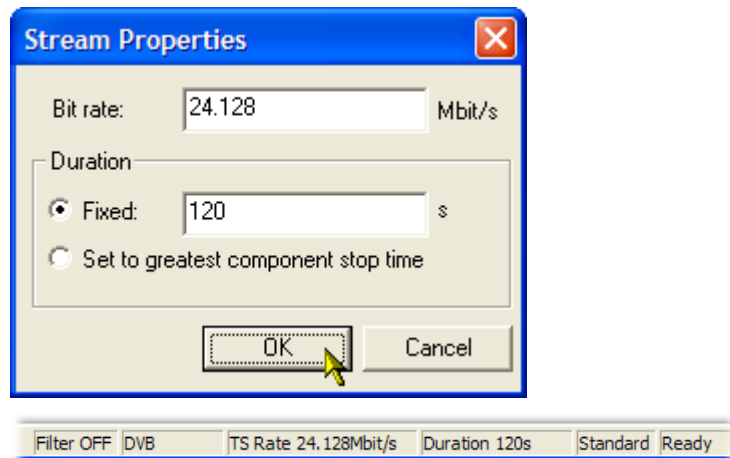


5. Select **File > New**.
6. In the Navigator window, highlight the Transport Stream node and select **Properties** from the context menu.

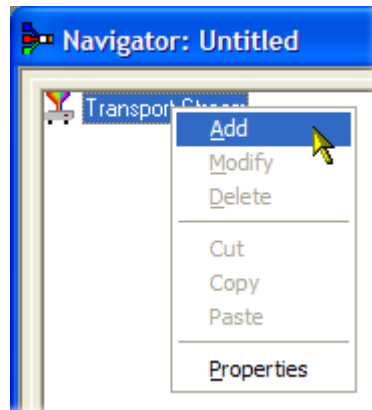


7. In the Stream Properties dialog box, enter a bit rate of 24.128 Mbit/s and a fixed duration of two minutes (120 seconds). Select OK.

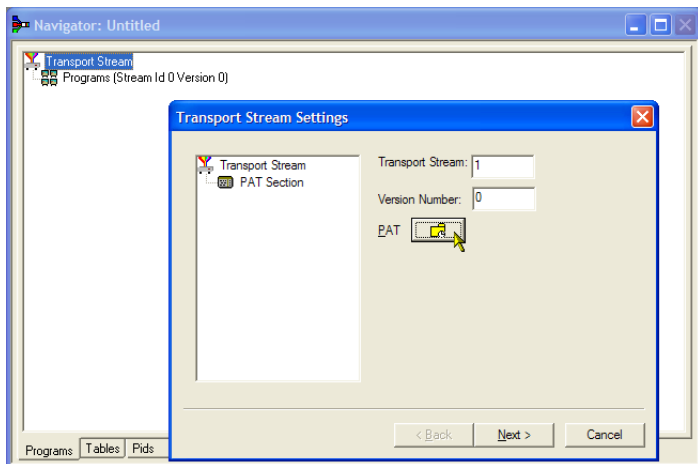
Note that the two values are displayed in the status bar.



8. In the Navigator window, highlight the Transport Stream node and select **Add** from the context menu.

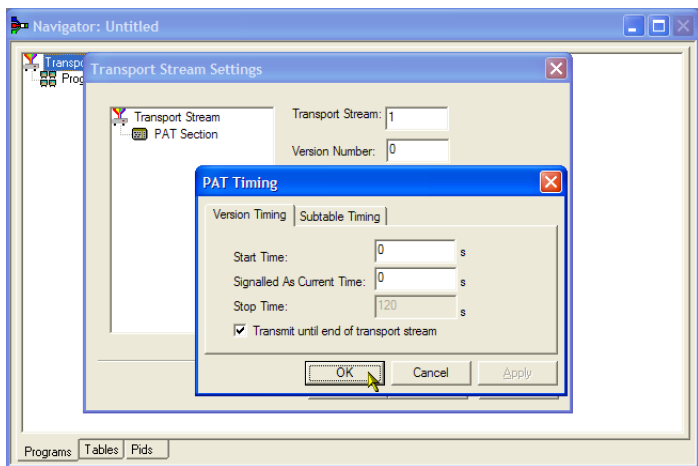


9. In the Transport Stream Settings dialog box, enter 1 as the Transport Stream identity.
10. Select the **PAT** (Program Allocation Table) folder icon button to open the PAT Timing dialog box.

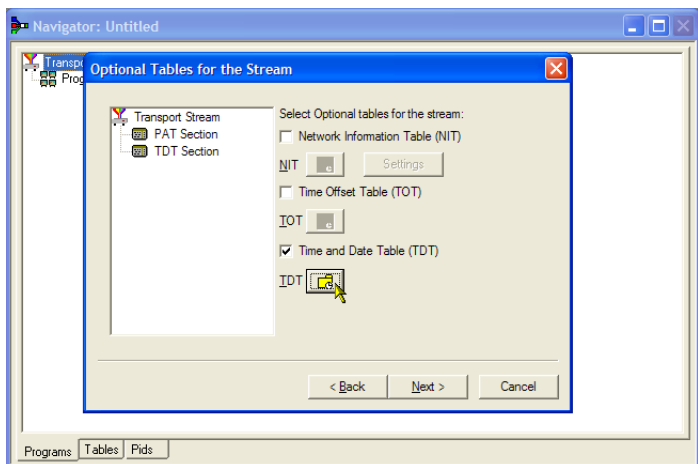


In the Version Timing tab window, note that the PAT timing Start time (0 s) and Stop time (120 s) mean that the PAT will be transmitted for the stream duration.

11. Select **OK** to close the PAT Timing dialog box.
12. In the Transport Stream Settings dialog box, select **Next**.



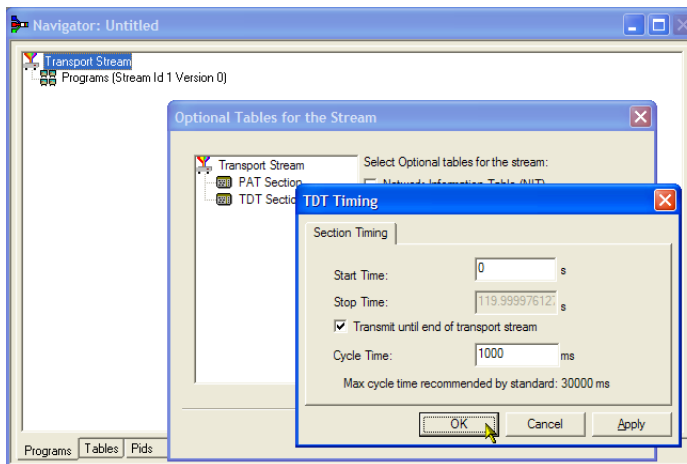
13. In the Optional Tables for the Stream dialog box, select the **TDT** (Time and Date Table) check box and select the **TDT** folder icon button.



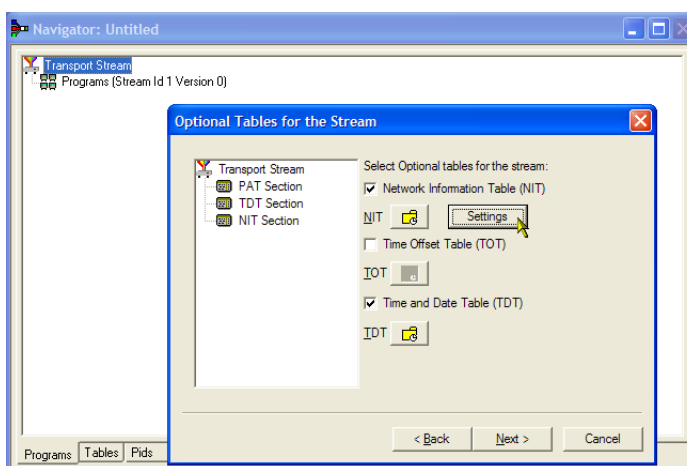
In the TDT Timing dialog box, confirm that the Start Time is zero and the Stop Time is the same as the duration previously set.

Note that the duration may have been adjusted by an insignificant amount. In this example, the set duration of 120 s is now displayed as 119.999976127.

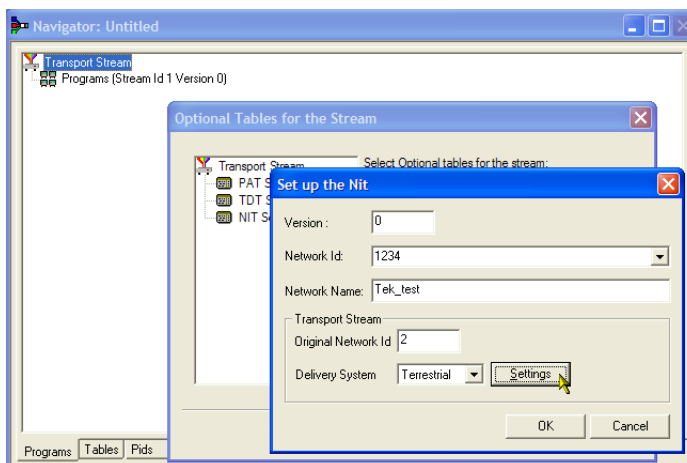
14. Enter a Cycle Time of 1000 ms.
15. Select **OK** to close the TDT Timing dialog box.



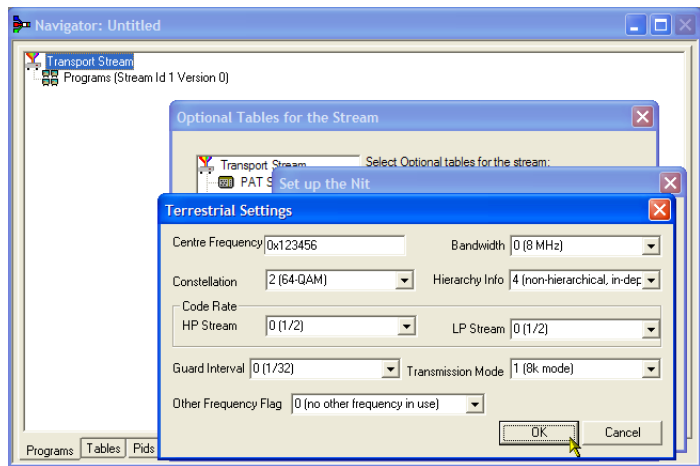
16. In the Optional Tables for the Stream dialog box, select the **NIT** (Network Information Table) check box and select the **NIT Settings** button.



17. In the Set up the NIT dialog box, enter the Network Id 1234 and the Network Name Tek\_test.
18. Set the Original Network identity to 2 and select **Terrestrial** from the Delivery System drop-down list.
19. Select the Delivery System Settings button.



20. In the Terrestrial Settings dialog box, enter 0x123456 in the Centre Frequency field.
21. Select **2 (64-QAM)** from the Constellation drop-down list.
22. Select **4 (non-hierarchical, in-depth interleaver)** from the Hierarchy Information drop-down list.
23. Select **1 (8k mode)** from the Transmission Mode drop-down list.
24. Select **OK** to close the Terrestrial Settings dialog box.

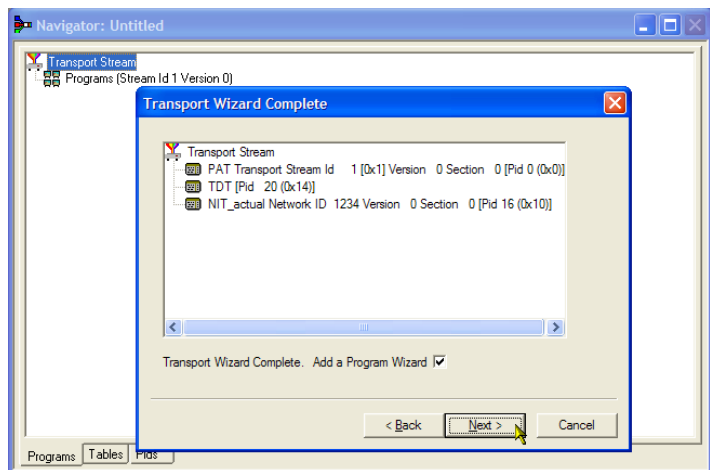


25. Select **OK** to close the Set up the NIT dialog box.

26. In the Optional Tables for the Stream dialog box, select **Next** to display the Transport Wizard Complete dialog box.

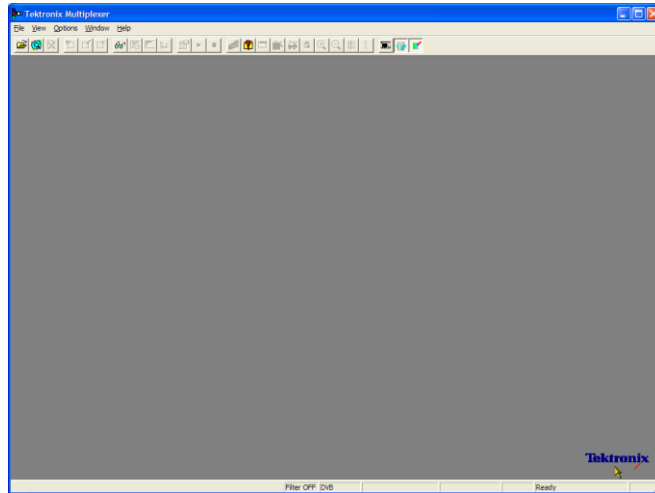
The transport stream set up is complete. Now you need to add some content in the form of video and audio elementary streams.

Do not close the Transport Wizard Complete screen.

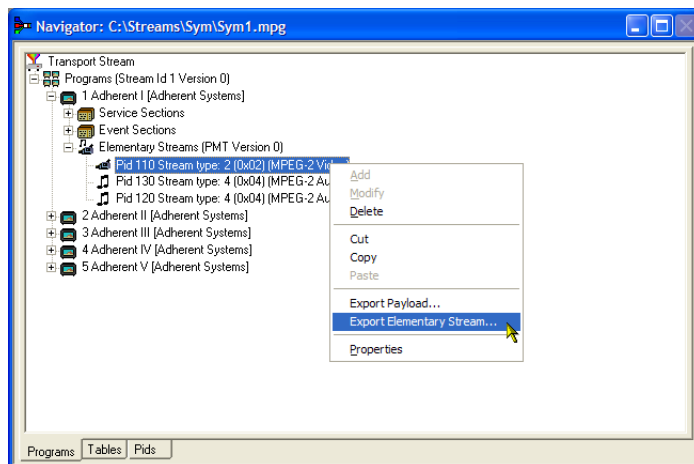


**Elementary stream acquisition.** For this example, you need to add a video and an audio elementary stream to the transport stream that you have created. You can extract suitable streams from one of the sample transport streams supplied with the MTSA installation. The stream used in this example is Sym1.mpg. This file is available on the hard drive of the MTSA-HW and the Tclips MPEG Test Streams DVD.

1. Open a second instance of the multiplexer. **Telestream MTSA > Multiplexer.**
2. Select **File > Open.**
3. In the Set MPEG File to Edit dialog box, locate and open sym1.mpg.



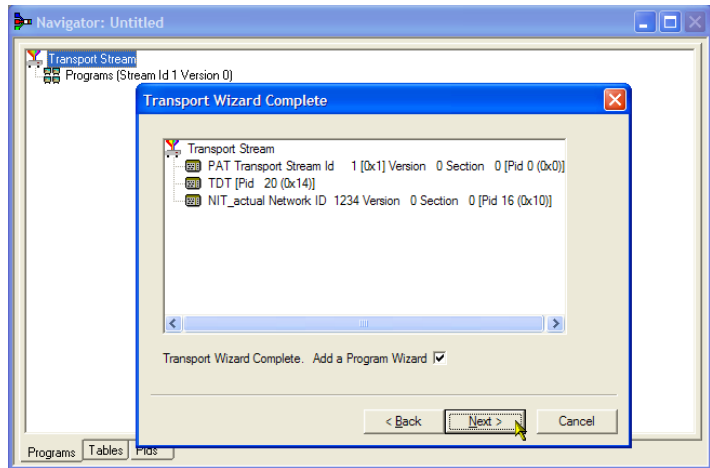
4. Expand the program 1 node and the dependent Elementary Streams node.
5. Highlight the PID 110 node. This PID is carrying an MPEG-2 video elementary stream.
6. Select **Export Elementary Stream** in the context menu.
7. In the Save As dialog box, enter a file name (Sym1pid110.es) and save the file to a suitable location.
8. Repeat the action for PID120. Name the file Sym1pid120.es.
9. Select **File > Exit** to close this instance of the Multiplexer.



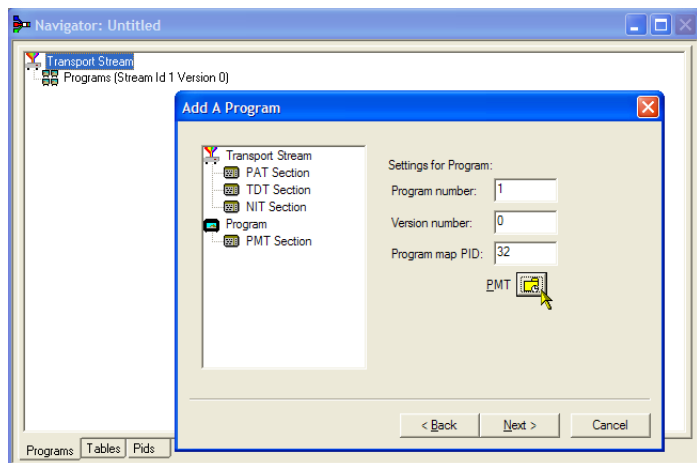
This completes the extraction of the video and audio elementary streams. You can continue with the multiplexing task.

**Add elementary streams.** Now you can return to the original multiplexer instance and add the elementary streams that you have just created.

1. Ensure that **Add a Program Wizard** is checked and select **Next**.



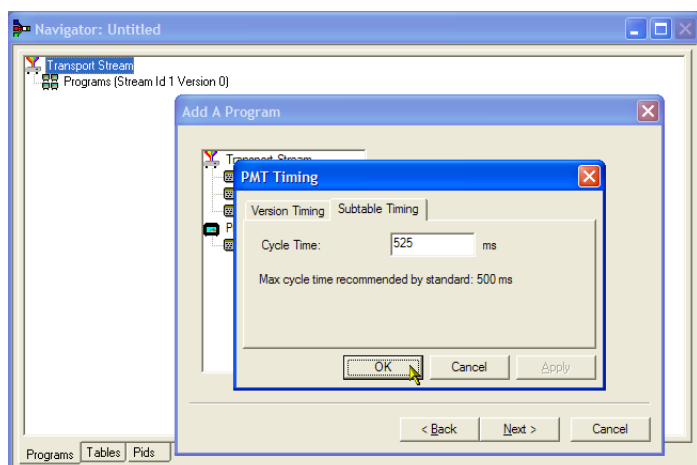
2. In the Add a Program dialog box, enter 1 as the program number.
3. Select the PMT folder icon.



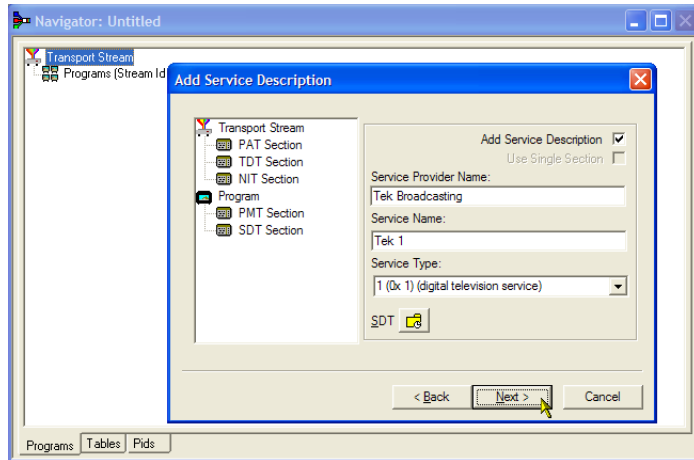
4. In the PMT Timing dialog box, select the Subtable Timing tab.

The subtable timing cycle time is the period over which a table is repeated in the stream. The maximum cycle time for the PMT in the DVB standard is 500 ms.

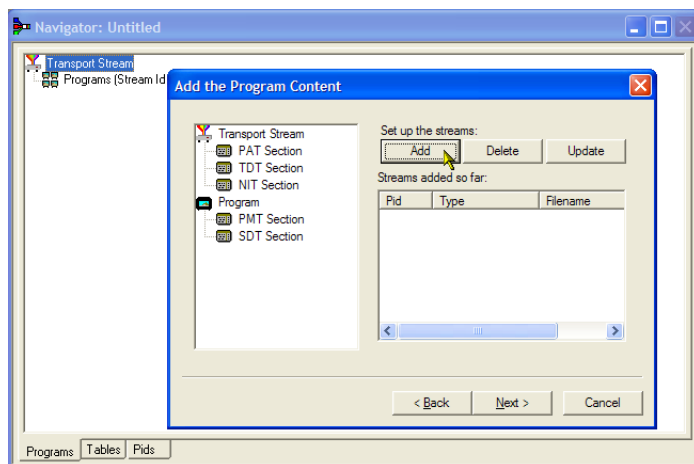
5. For this example stream, set the cycle time to 525 ms.
6. Select **OK** to close the PMT Timing dialog box.
7. In the Add a Program dialog box, select **Next**.



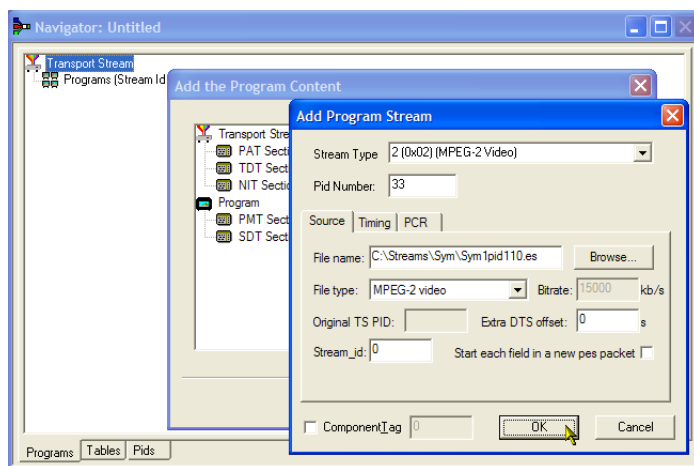
8. In the Add Service Description dialog box, select the **Add Service Description** check box.
9. Enter a **Service Provider Name**, for example, Telestream Broadcasting.
10. Enter a **Service Name**, for example, Telestream1.
11. Enter a **Service Type**, for example, 1 (0x1) (digital television service).
12. Select **Next**.



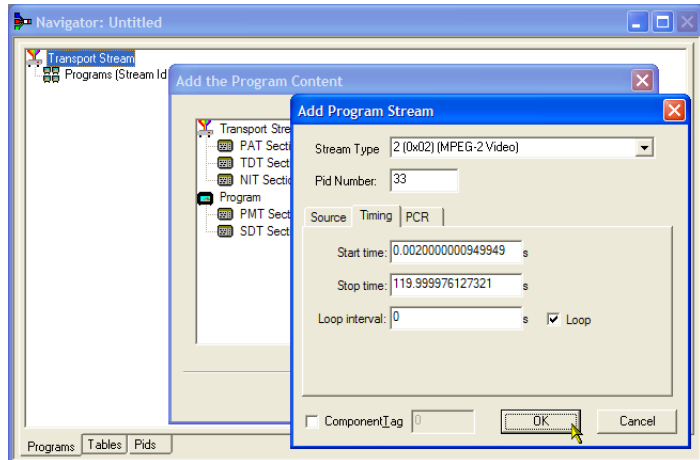
13. In the Add the Program Content dialog box, select **Add** to add a video elementary stream.



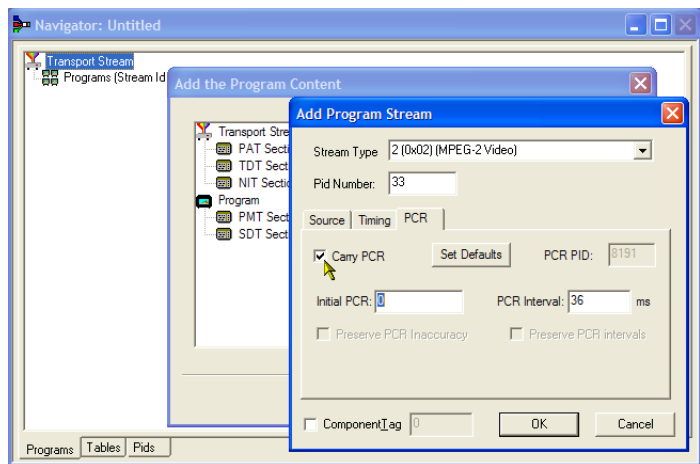
14. In the Add Program Stream dialog box, select 2 (0x02) (MPEG-2 Video) from the Stream Type drop-down list.
15. Ensure that the Source tab is selected.
16. Enter a File Name, or use **Browse** to locate the video elementary stream previously set up (Sym1pid110.es).
17. Select MPEG-2 video from the File type drop-down list. Note that the file bit rate has been entered automatically.



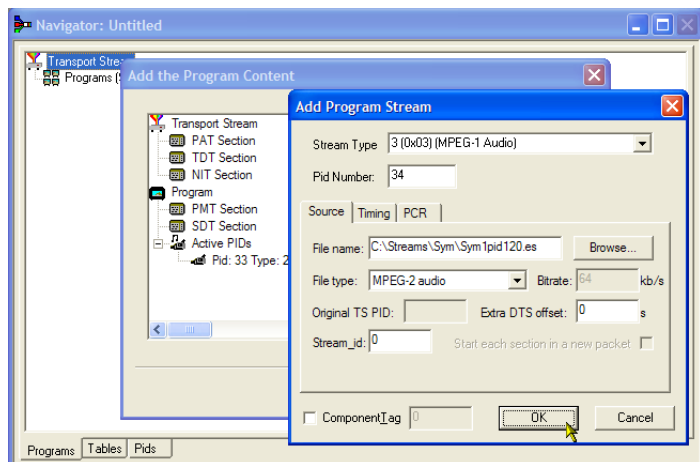
Select the Timing tab. Note that the elementary stream is going to run for the length of the stream previously set, that is, 120 s.



18. Select the PCR tab. Ensure that the **Carry PCR** check box is selected.

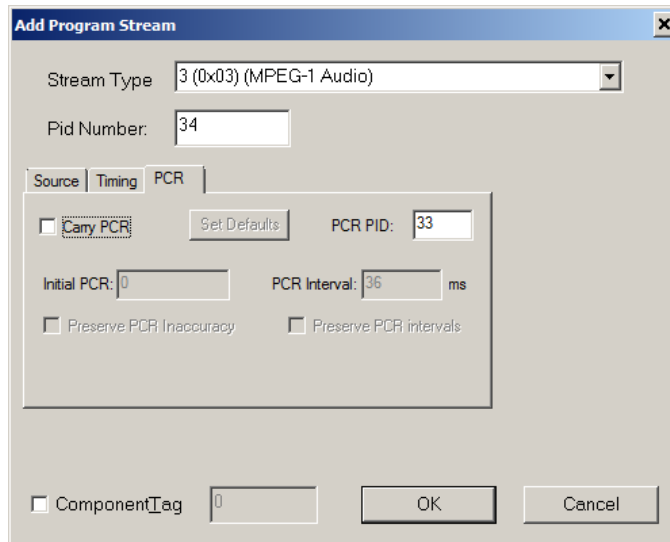


19. Select **OK** to close the Add Program Stream dialog box.
20. In the Add the Program Content dialog box, select **Add** again to add an audio elementary stream.
21. Select **3 (0x03) (MPEG-1 Audio)** from the Stream Type drop-down list.
22. In the Add Program Stream dialog box, ensure that the Source tab is selected.
23. Enter a File Name, or use the Browse button to locate the audio elementary stream previously set up (Sym1pid120.es).
24. Select **MPEG-2 audio** from the File type drop-down list. Note that the file bit rate has been entered automatically.

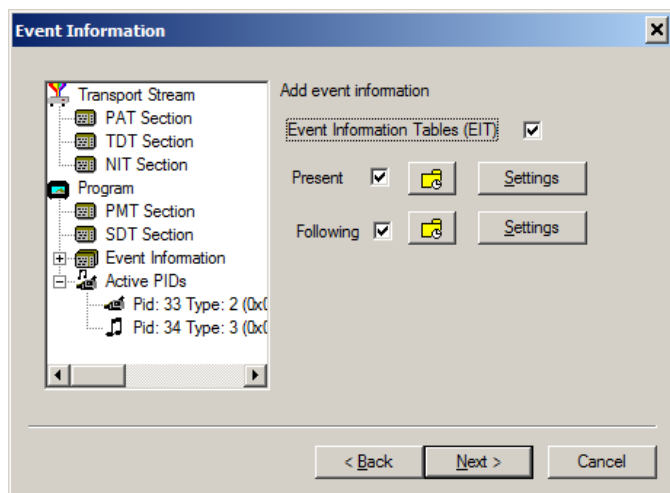




25. Select the **Timing** tab. Note that the elementary stream is going to run for the length of the stream previously set, that is, 120 s.
26. Select the **PCR** tab. Ensure that the Carry PCR check box is cleared.
27. Enter 33 in the PCR PID field. This is the PID that will carry the PCR information – also the video es, Carry PCR.
28. Select **OK** to close the Add Program Stream dialog box.
29. Select **Next**.



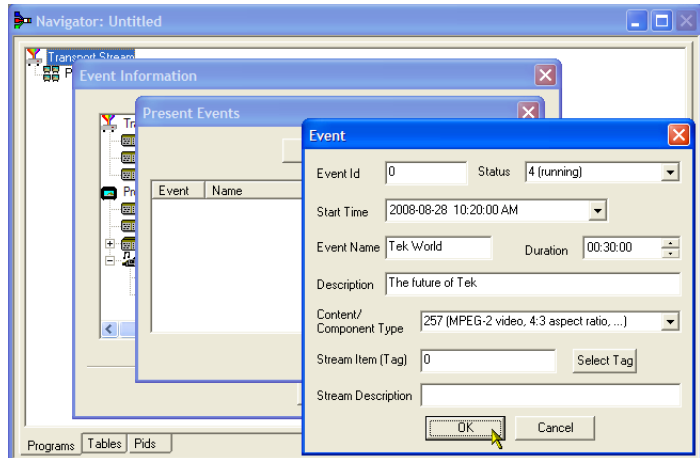
30. In the Event Information dialog box, select the Event Information Tables (EIT) check box.
31. Ensure that the Present check box is selected.
32. Select **Present Settings**.



33. In the Present Events dialog box, select **Add** to set up the present event information, that is, the time of this broadcast. In the Event dialog box, select 4 (running) from the Status drop-down list.

34. Set the Start Time to 2008-08-28 10:20:00 AM.

You can change the time and date by highlighting the individual field and entering the required value.



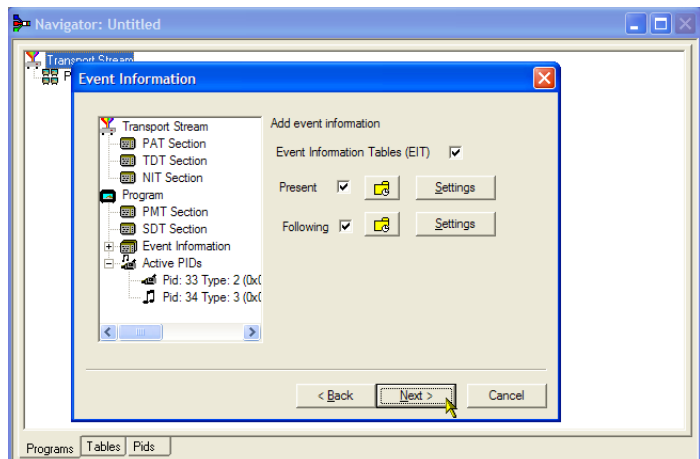
35. Enter an **Event Name**, for example, Telestream World.
36. Enter a **Description**, for example, The future of Telestream.
37. Enter a **Duration**, for example, 30m (00:30:00).
38. Select **257 (MPEG-2 video, 4:3 aspect ratio, ...)** from the Content/Component Type drop-down list.
39. Select **OK** to close the Event dialog box.
40. Select **OK** to close the Present Events dialog box.

41. Select the **Following** check box.
42. Select **Following Settings**.
43. Select **Add** to set up the information for the event after the present event.
44. In the Event dialog box, enter 1 in the Event Id field.

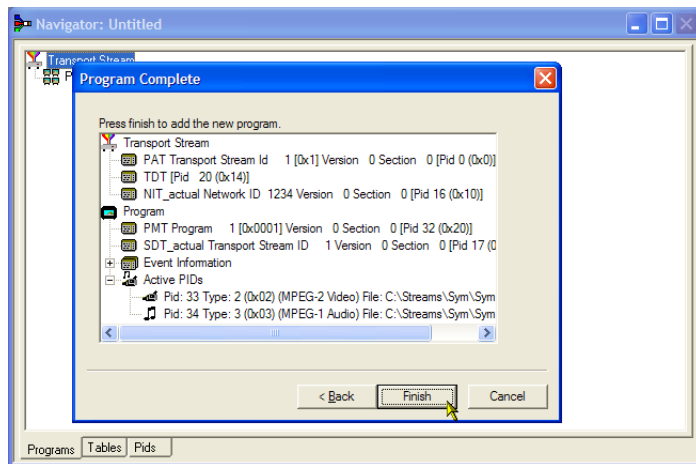
45. Select **1 (not running)** from the Status drop-down list.

46. Set the Start Time to 2008-08-28 10:50:00 AM.

47. Enter an **Event Name**, for example, Telestream News.



48. Enter a **Description** of the event, for example, All the latest news from Telestream.
49. Enter a **Duration**, for example, 30 m (01:00:00).
50. Select **257 (MPEG-2 video, 4:3 aspect ratio, ...)** from the Content/Component Type drop-down list.
51. Select **OK** to close the Event dialog box.
52. Select **OK** to close the Following Events dialog box.
53. Select **Next** in the Event Information dialog screen.
54. In the Program Complete dialog box, select **Finish**.



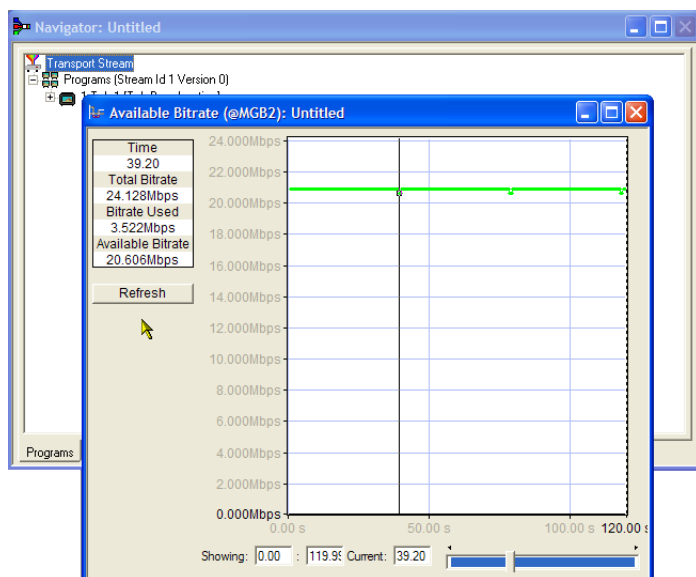
You have finished creating the structure and content of the proposed transport stream. You can now make a couple of checks to ensure that the stream will compile successfully.

55. Select **View > Available Bitrate**.

In the Available Bitrate graph, note that the bit rate remains within the required bitrate, that is, 124.128 Mbps.

You can examine the bit rate at any point on the graph, by clicking a point and reading the values from the adjacent table.

56. Close the Available Bitrate graph.



57. Select **Multiplex > Start** to start the multiplex.
58. In the Set TS Output File... dialog box, enter the name TestMux.mpg for the new multiplexed transport stream. (This new transport stream is used in other procedures.)

Watch the right side of the Status bar for the multiplexing progress; the progress bar may be hidden if the window is too small horizontally.

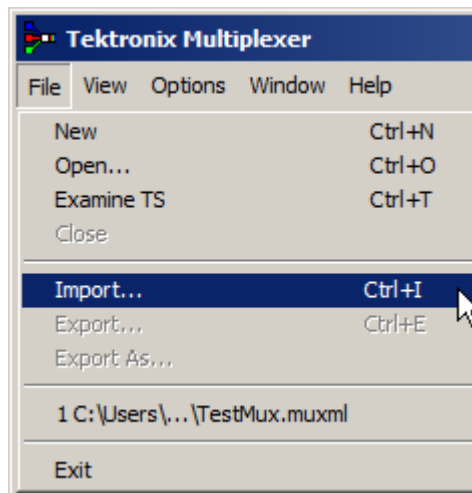
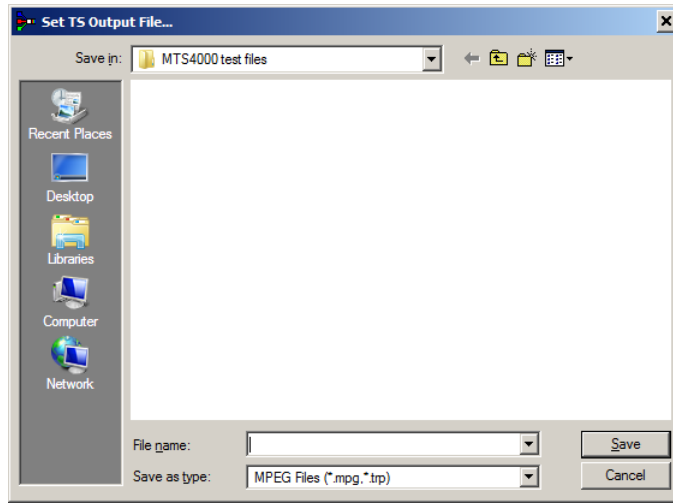
The elementary streams and structural information have now been multiplexed together to form the transport stream, TestMux.mpg.

59. It is a good idea to save the structure of the multiplex, so it can be recalled and more information added to it as required.

60. Select **File > Export...**

61. In the Export File dialog box, enter a name for the multiplex structure file, for example, TestMux.muxml and select a location to save the file. Note the muxml extension.

62. Using **File > Import**, the multiplex structure file can be reopened at any time to add elementary streams or structural information.



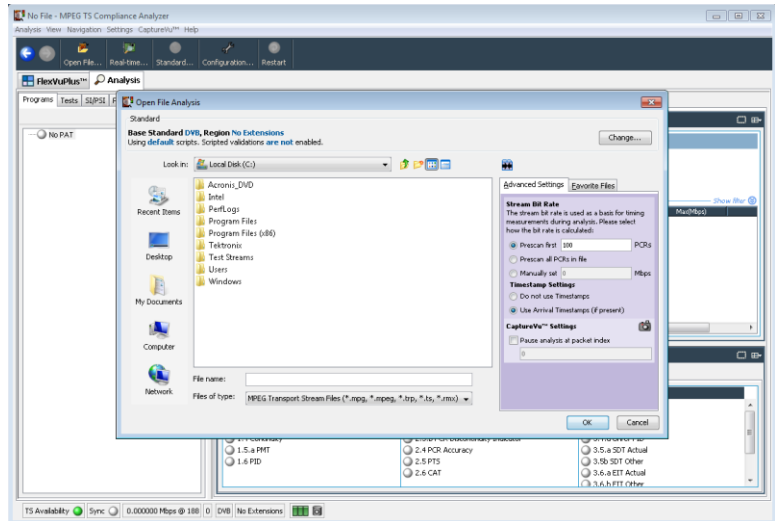
# Using the Transport Stream Compliance Analyzer

The procedure examines a transport stream off-line using the File Analysis mode of the Transport Stream Compliance Analyzer (TSCA) application. The procedure uses the transport stream (TestMux.mpg) created in the *Using the Multiplexer* procedure.

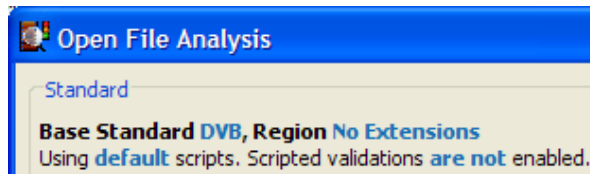
Use the Real-time Analysis to analyze live data. [Multiple input monitoring](#) on page 62

1. Open Transport Stream Compliance Analyzer. **Telestream MTSA > TS Compliance Analyzer.**

The Open File Analysis dialog box displays automatically. If not, select **File Analysis** in the TSCA Analysis toolbar.

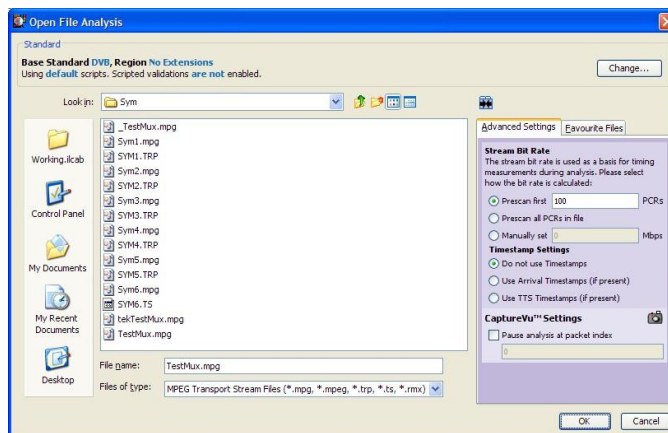


In the Open File Analysis dialog box, ensure that the Base Standard is DVB and the Region is No Extensions.

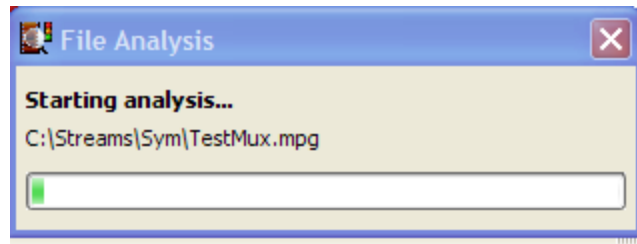


2. Locate and select the example stream, **TestMux.mpg**.

Ensure that in the Advanced Settings pane, the Stream Bit Rate and the Timestamp Settings are as shown.



- The analysis will take a moment to complete.

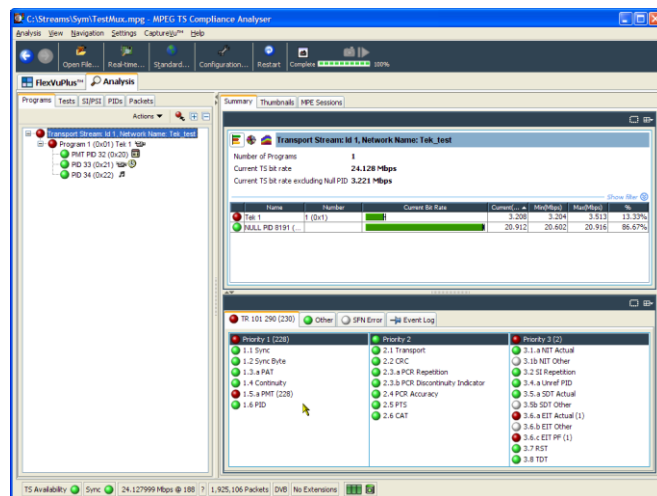


- Select the **Analysis** tab to display the navigation and related views.
- Select the **Programs** tab and expand the nodes in the navigation view by clicking the plus symbols.

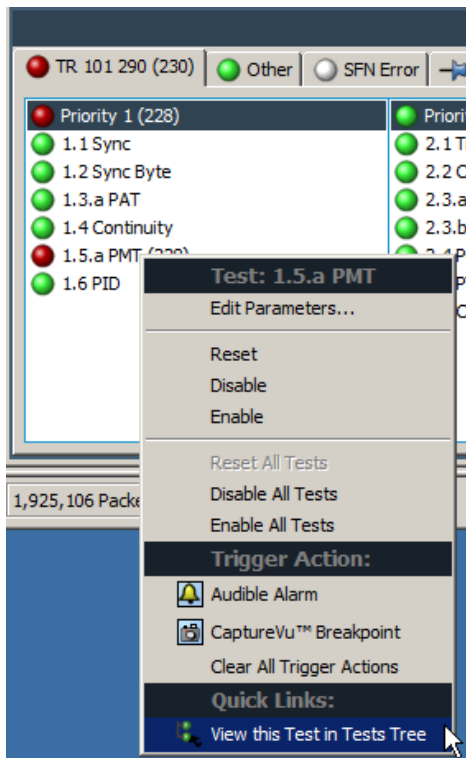
In the detail views, ensure that the Summary view and the Tests view are displayed.

The Transport Stream node and the Program node are both red. This shows that an error has occurred in the stream and is still active.

- Highlight the Transport Stream node. In the Tests Summary detail view, TR 101 290 tab, note that test 1.5.a PMT is indicating an error, that is, the associated LED is red.

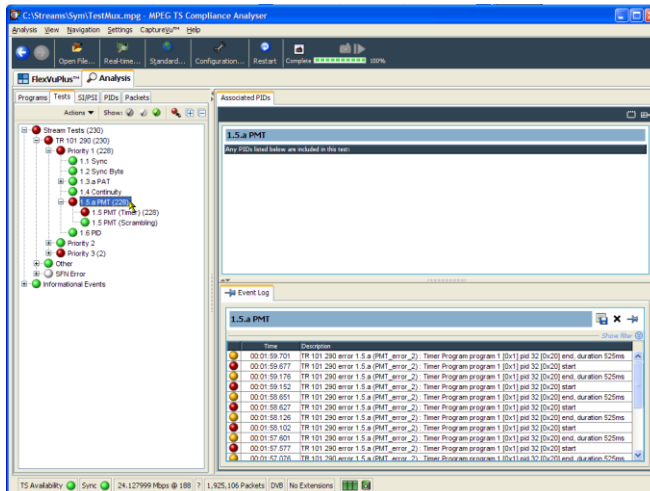


- Highlight test 1.5.a PMT and select **View this test** in the Tests tree from the context menu.

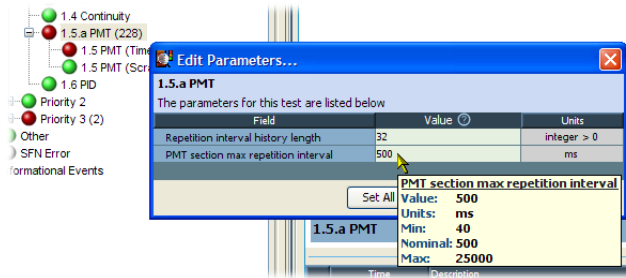


The Tests tab views are displayed. The navigation view is expanded to show the failed test. The detail view shows any PIDs associated with the highlighted test (none in this example) and the event log filtered to show only events for the highlighted test.

Examine the log entries for error information. Note that the error reports refer to a duration of 525 ms. This is the PMT section repetition rate; 525 ms was the value set in the example stream created earlier.



8. In the navigation view, highlight the 1.5 PMT (Timer) test and select **Edit Parameters** from the context menu.
9. In the Edit Parameters dialog box, note that for this stream the PMT section maximum repetition interval is set to 500 ms. Since the repetition rate found in this stream exceeds this value (525 ms), it is being reported as an error. However, by examining the maximum and minimum repetition rates shown in the Edit Parameters dialog box (hover the mouse pointer over the value field and refer to the tool tip), you can see that the rate of 525 ms is within the range recommended by the DVB standard, 40 ms to 25000 ms.



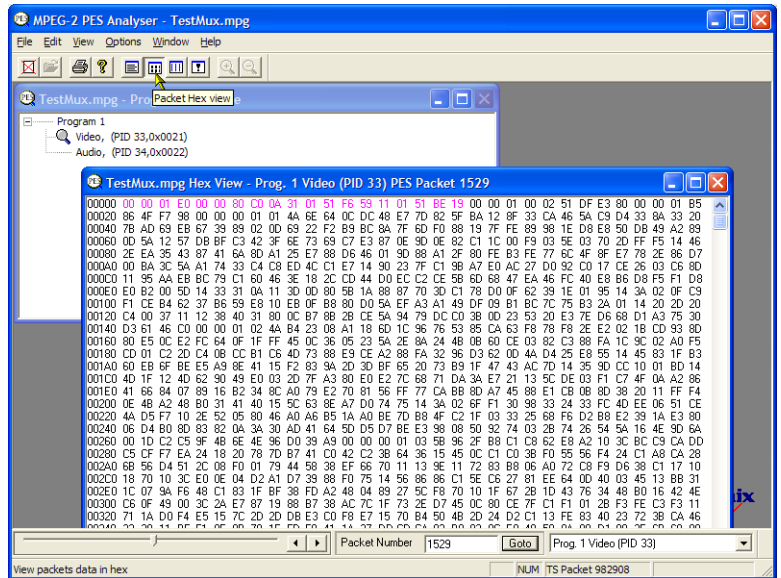




## Packet Hex View:

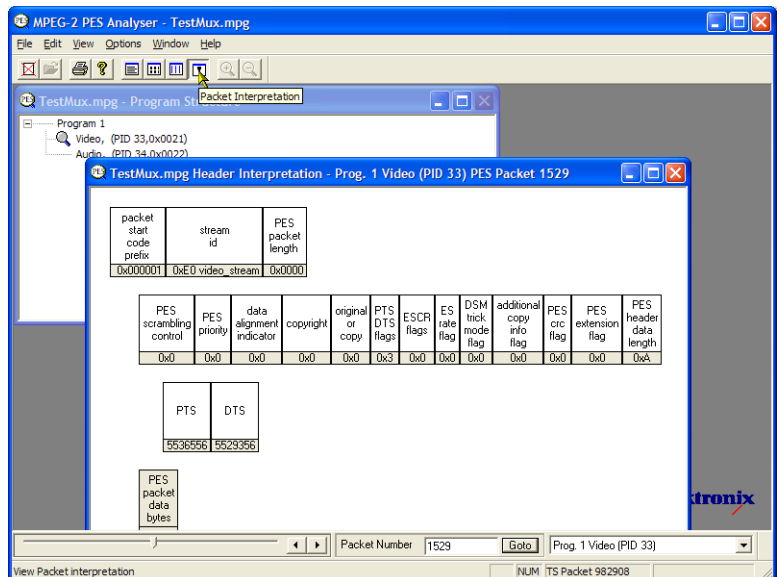
In this view, you can examine every byte in the PES.

- The four digit numbers in the left column are the addresses of the first byte in the row.
- The bytes displayed in magenta represent the PES packet header. You can view this as a graphical representation in the Packet Interpretation view.



## Packet Interpretation View:

This window interprets and displays a graphical representation of the header of the currently selected packet. The size of the header will vary depending on the packet content.

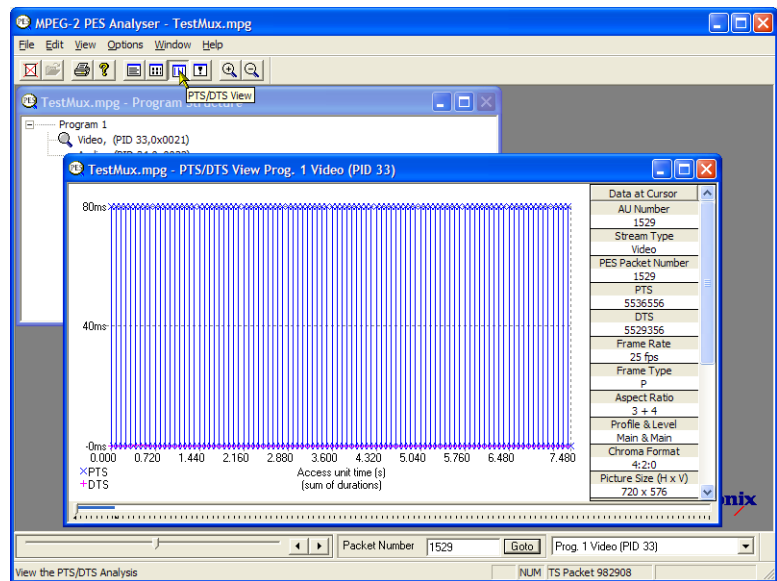


### PTS/DTS View:

This view shows a timing analysis of the selected stream. The X-axis shows the duration of the stream in seconds. The Y-axis shows the differences between the expected and actual DTS values. Vertical blue lines show the difference between the PTS and DTS for each access unit. Additional access unit information is shown in the side panel.

A compliant stream will show each DTS on the 0 ms Y-axis; streams with errors usually show a stepped graphical effect.

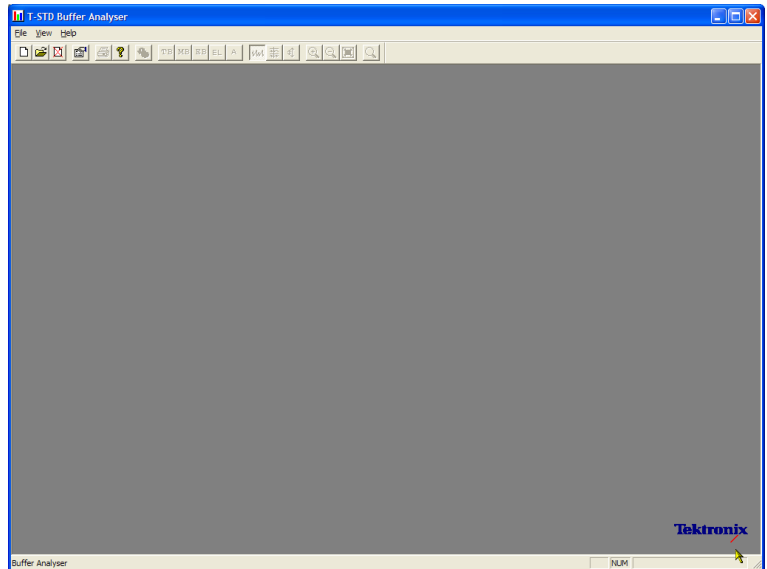
Select the toolbar magnifying glass and click on the view to zoom in and out of the graph. The slider at the bottom of this window indicates where the displayed packets are in relation to the rest of the file.



## Using the T-STD Buffer Analyzer

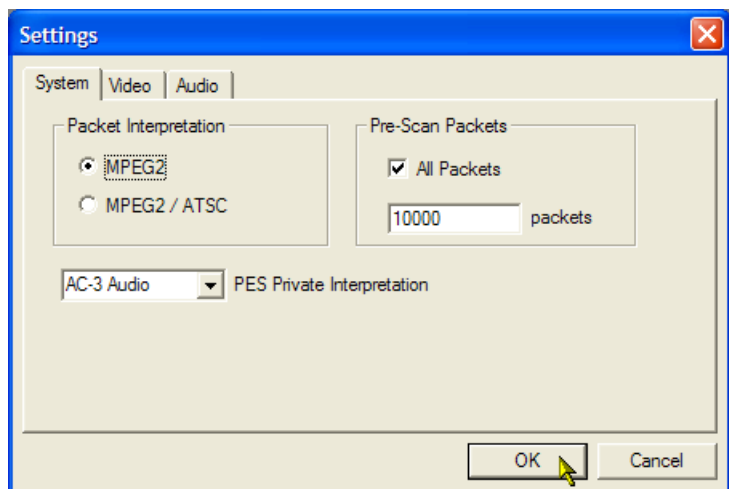
The T-STD Buffer Analyzer application models the behavior of the buffers in the hypothetical Transport Stream System Target Decoder, as specified in ISO/IEC 13818-1. It can process video, audio, and system control streams. The results of the analysis are displayed as graphs of the buffer capacity over time and a log of exceptions and noteworthy events. The consequences of non-conformance to the buffer model can include freeze frames and receiver resets.

1. Open the T-STD Buffer Analyzer.  
**Telestream MTSA > Buffer Analyzer.**

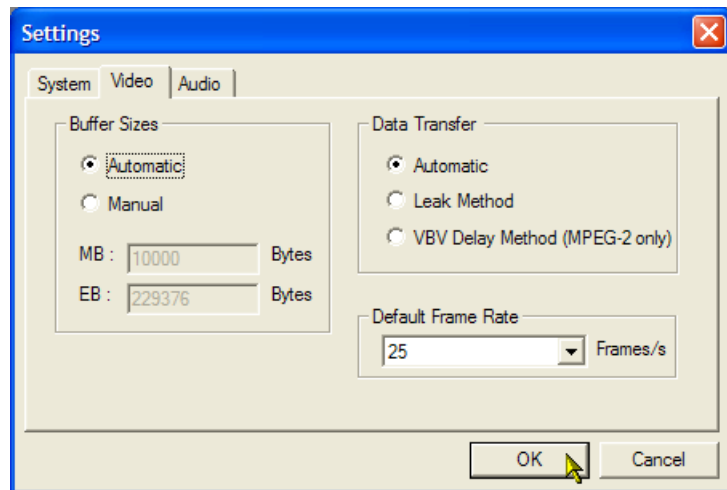


2. Review the configuration settings. **View > Settings.**

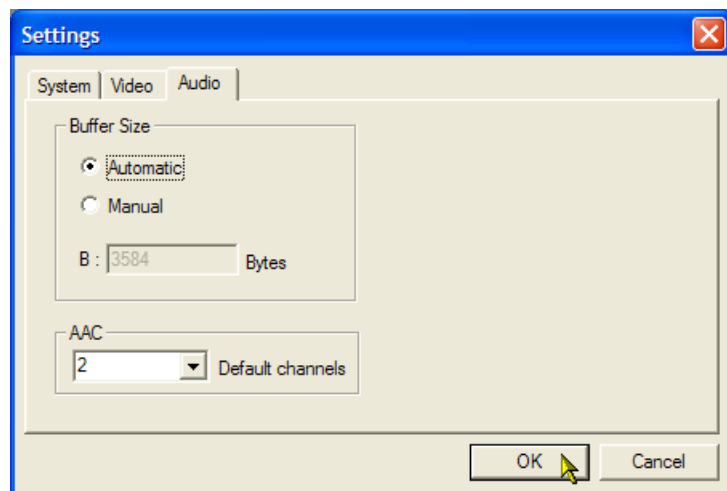
In the System tab of the Settings dialog box, select **MPEG2 Packet Interpretation** and select **Pre-Scan Packets All Packets**.



3. In the **Video** tab, select **Buffer Sizes**, **Automatic** and **Data Transfer**, **Automatic**.



4. In the **Audio** tab, select **Buffer Size**, **Automatic**.
5. Close the **Settings** dialog box.

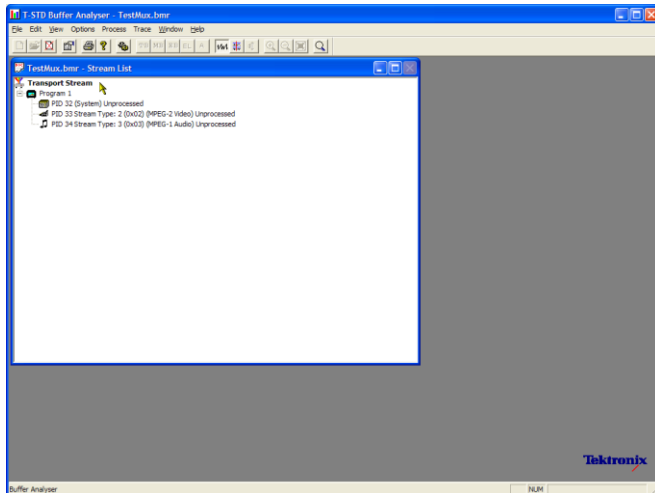


6. Select a file for analysis. **File > New**.
7. Locate and open an MPEG file. For example, the TestMux.mpg file created in the *Using the Multiplexer* procedure.

Another file selection dialog box is opened immediately. This is for you to name and open a buffer model results (BMR) file, which will hold the results of subsequent analysis.

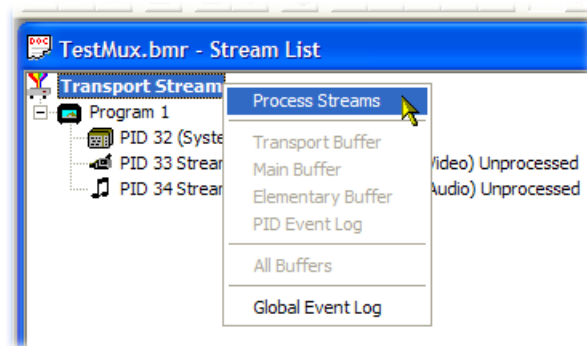
Accept the default name and open the file.

The program performs initial analysis to form a Stream List and calculate the mean transport rate. The stream list displays all of the programs and elementary streams in the file. All streams in the list are marked as Unprocessed, because no analysis has been performed on them in this session.



8. Select **Process Streams** from the transport stream context menu to start processing the stream.

Analysis progress is displayed in the status bar.



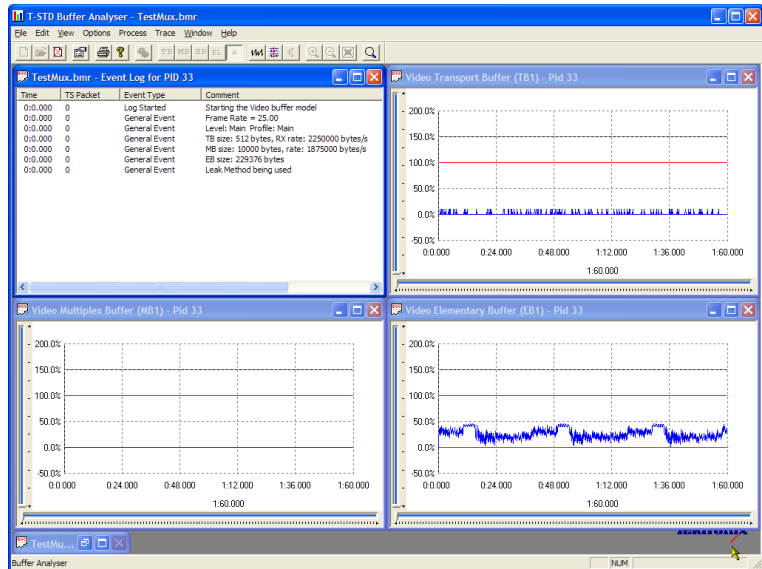
- Highlight PID 33 and select **All Buffers** from the context menu.

The windows are displayed for a video elementary stream: PID Event Log, Video Transport Buffer, Video Multiplex Buffer, and Video Elementary Buffer. (The Stream List window has been minimized.)

- Tile the resulting windows: **Window > Tile**.

#### PID Event Log:

You can open two event logs: a global event log (**View > Global Event Log**) that displays high level events occurring in the initial analysis process and a PID event log (**View > PID Event Log**) that displays events for each processed PID.



In the buffer graph views:

- Use the toolbar magnifying glass icons to zoom in and out of the selected graph. Zoom value can be reset using the Reset Zoom toolbar button.
- All open graphs can be viewed and manipulated separately. Use the Options > Synchronize Views to synchronize all views with the currently selected view.
- Red y-axis lines indicate the 0% and 100% limits.

#### Video Multiplex / Main Buffer:

In this view, for video streams, you can see the results of modeling a multiplex buffer. For audio and system control streams, you can see the results for the main buffer. The title bar shows the stream type.

#### Video Transport Buffer:

This view shows results of modeling the transport buffer for video, audio, or system control streams.

#### Video Elementary Buffer:

This view shows only applicable video elementary streams.





# Using the ES Analyzer

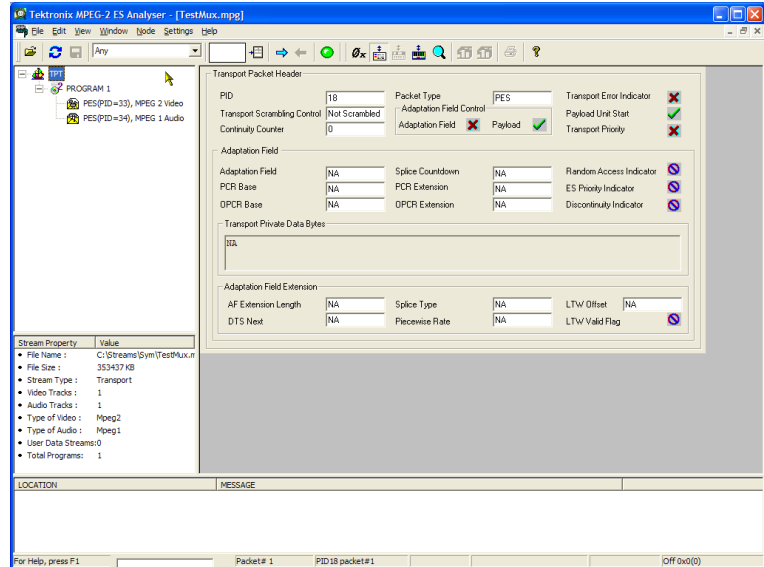
The ES (Elementary Stream) Analyzer application checks for compliance of CODECs to MPEG-2 and H.263 standards. Audio decode and waveform display of MPEG-2 audio (ISO/IEC 13818 parts 3 and 7), AC-3 and MPEG-4 AAC are also supported.

ES Analyzer is a complex application which you can use to analyze many aspects of video and audio streams. For this reason, the procedure shows you how to access some of the analysis screens; detailed explanation of their content and meaning can be found in the *MTSA-HW and MTSA-PC Analyzer Application User Manual*.

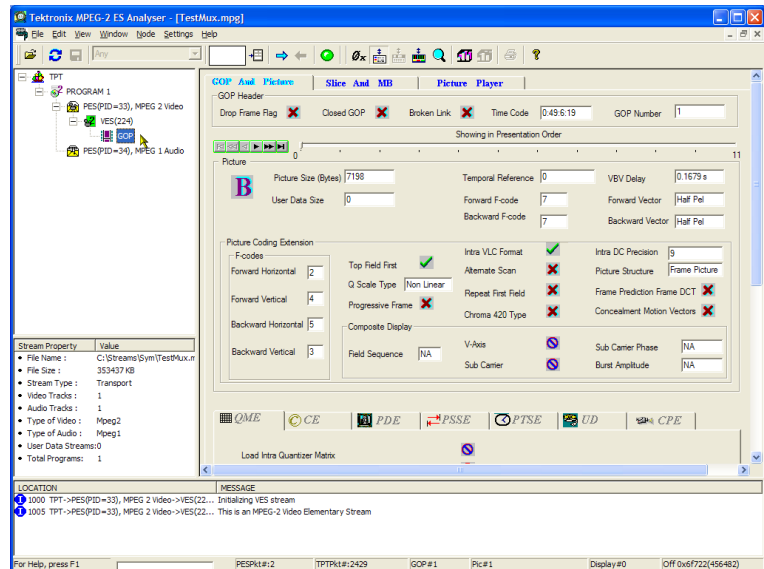
1. Open the ES Analyzer. **Telestream MTSA > ES Analyzer.**

2. Select a file for analysis. **File > Open.**

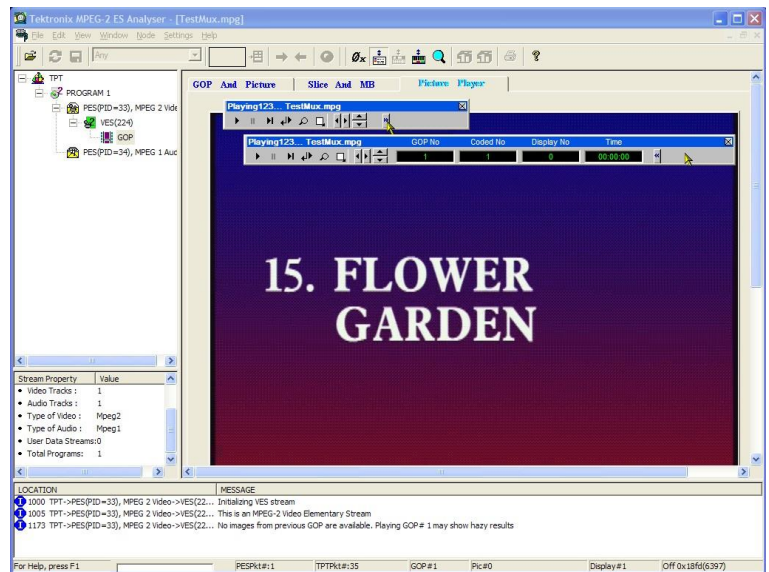
Locate and open an MPEG file. For example, the TestMux.mpg file created in the *Using the Multiplexer* procedure.



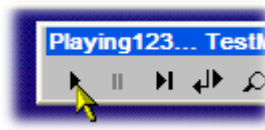
3. Click on each successive node in the navigation window until the GOP (Group of Pictures) is highlighted in the Program 1 / PES (PID 33), MPEG 2 Video branch.



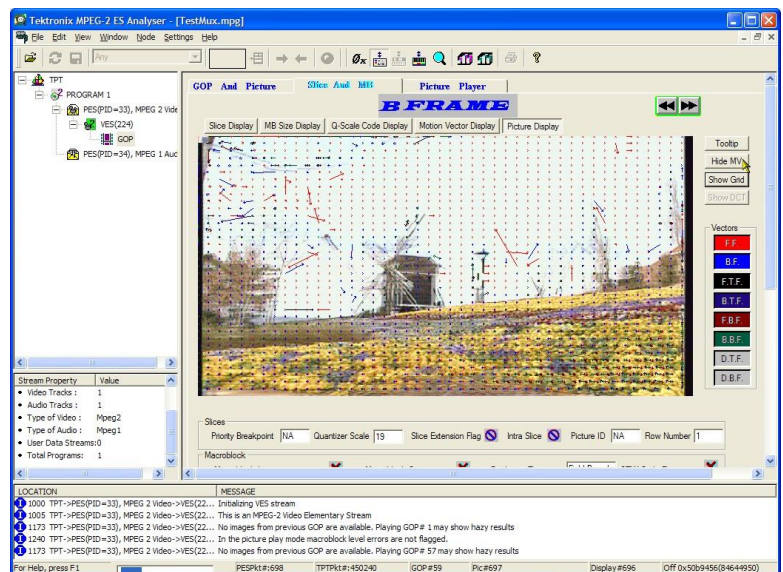
4. Select the Picture Player tab. Note that the Picture Player remote control is displayed.
5. Click the Show Information button to expand the control bar. The extra information shows the position in the file of the displayed picture; more information is shown in the status bar.



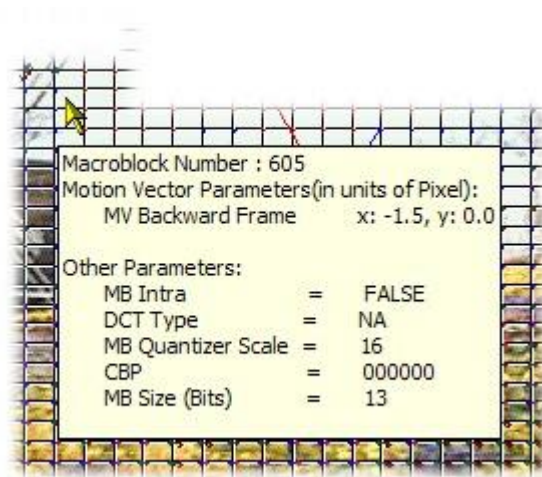
6. Start playing the stream by clicking the play button on the control bar.  
  
If you stop the playout, you can select the other GOP tabs (GOP and Picture, Slice and MB), and examine the characteristics of that frame.



7. For example, select the **Picture Display** on the **Slice and MB** tab. The picture will correspond to the picture in the Picture Player.
8. Click **Show MV** (motion vectors) on the right of the picture display. For B and P frames, the motion vectors will be displayed as colored arrows overlaying the picture.



Additionally, you can see the characteristics of any of the macroblocks that make up the picture by hovering the mouse over a picture macroblock.



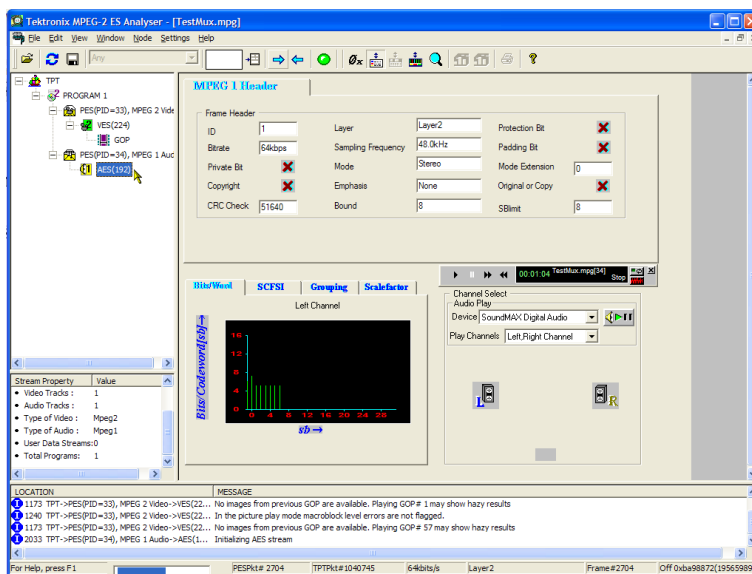
- Use the Previous Frame and Next Frame buttons to move backward and forwards in the stream and compare the motion vectors.



You can examine the characteristics of the audio stream in a similar manner.

- Click on each successive node in the navigation window until the GOP (Group of Pictures) is highlighted in the Program 1/PES (PID 34), MPEG 1 Audio branch.

Use the audio control bar to review the audio track. You will need to use headphones to hear the output.

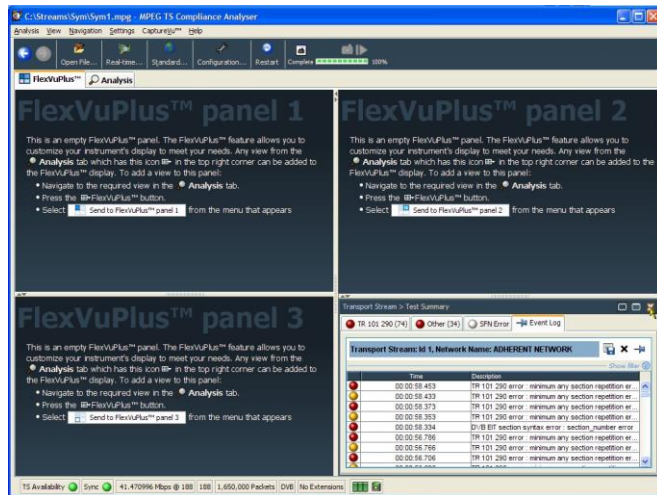


# TSCA FlexVuPlus display

In the Transport Stream Compliance Analyzer (TSCA), you can use the FlexVuPlus™ display to 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 this exercise, close each of the currently 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 procedure more easily as each panel is populated. Note that each of the four FlexVuPlus panels are numbered.



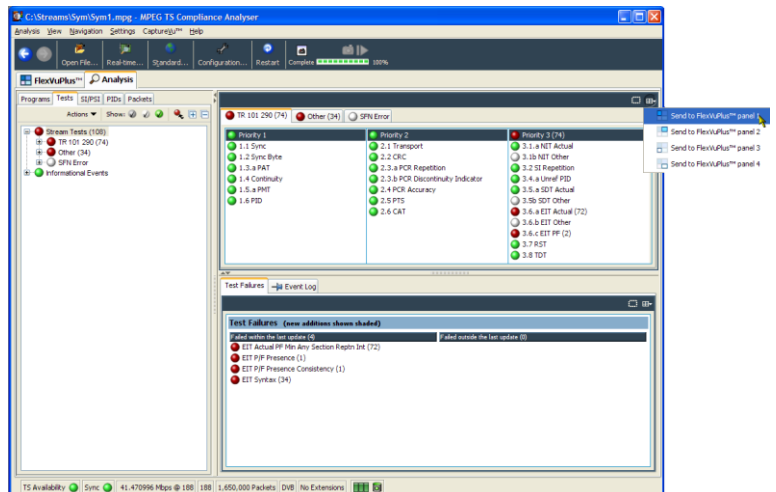
## Set up panel 1

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

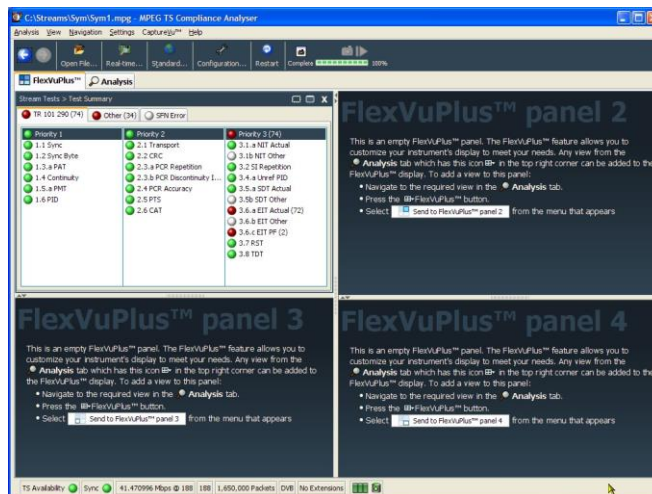


In the top right corner of all detail views is a FlexVuPlus panel select button. You can use this button to display a replica of the detail view in the selected FlexVuPlus panel.

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

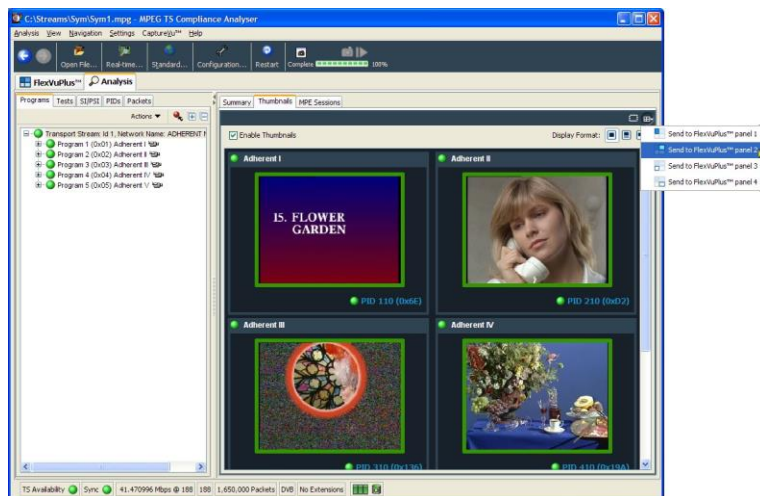


- The FlexVuPlus display now contains the Test Summary view in panel 1.

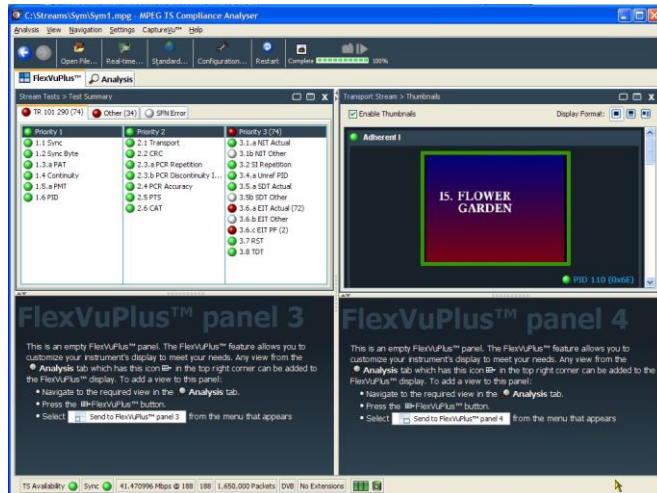


### Set up panel 2.

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

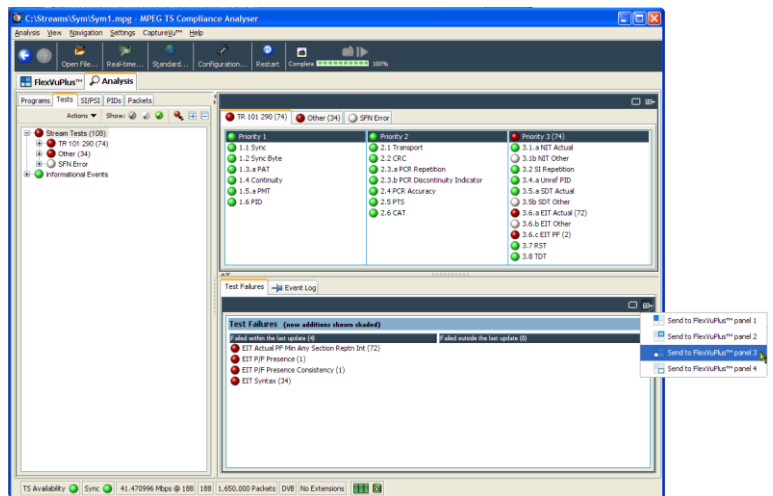


- The FlexVuPlus display now contains the Thumbnail view in panel 2.

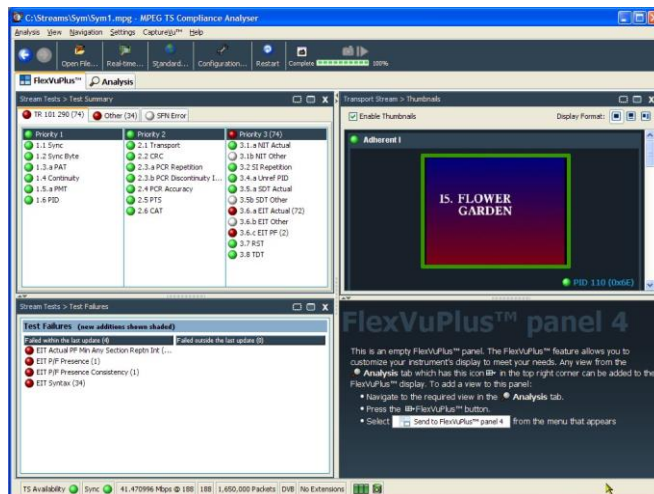


### Set up panel 3.

- Select the **Analysis** tab and then the **Tests** tab.
- In the **Test Failures** view, use the FlexVuPlus panel select button to replicate the view in panel 3.



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

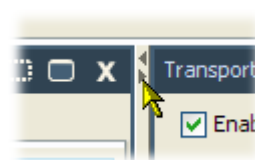


Since only three panels are used in this example, you can expand the thumbnails view to fill the right side of FlexVuPlus™.

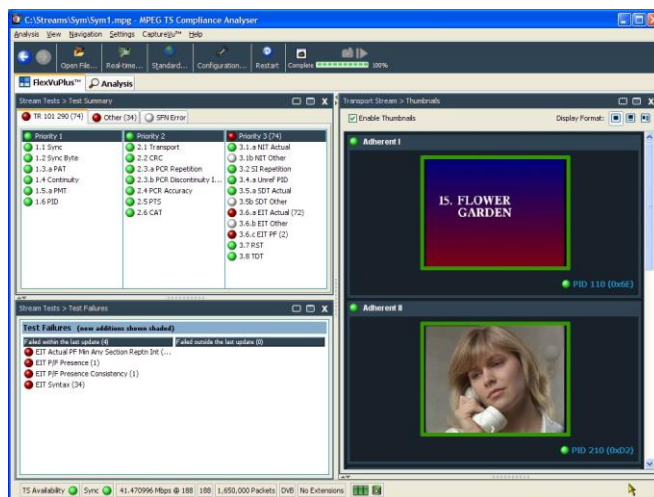
You can expand panel 2 vertically by selecting the panel expand button.



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



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



To summarize, in this view you can immediately see:

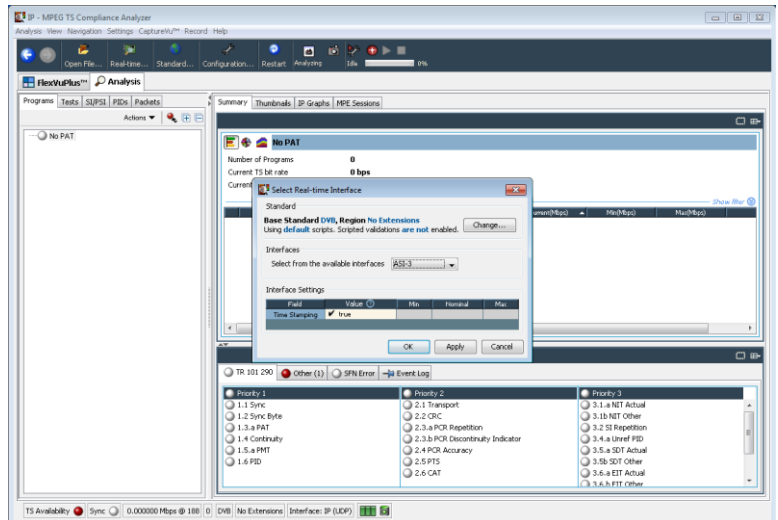
- In the Tests Summary view (FlexVuPlus panel 1), which tests have failed.
- In the Test Failures view (FlexVuPlus panel 3), which tests have failed most recently.
- In the Thumbnails view (FlexVuPlus panel 2), which elementary streams are currently carrying video content.

# Multiple input monitoring

The MTSA-HW system is capable of monitoring multiple transport streams (on separate 10 G or PC NIC ports) using multiple instances of the Transport Stream Compliance Analyzer.

1. Open Transport Stream Compliance Analyzer. **Telestream MTSA > TS Compliance Analyzer.**

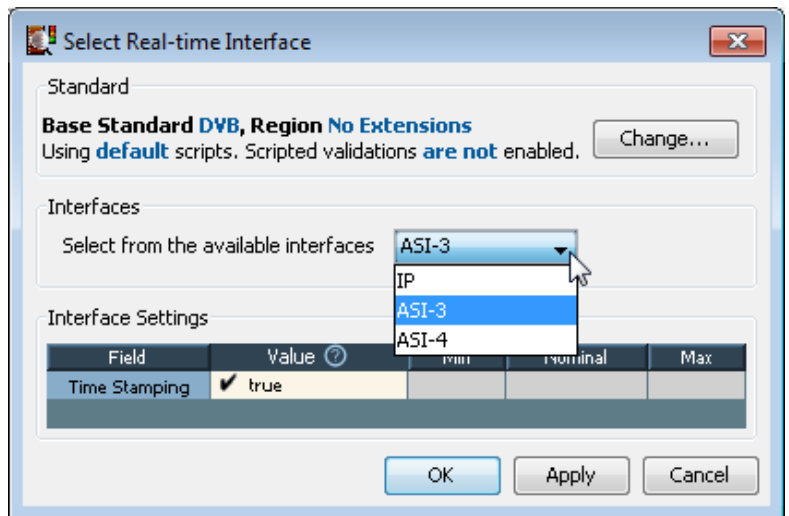
Select **Real-time Analysis...** in the TSCA Analysis toolbar.



2. In the Select Real-time Interface dialog screen, select an available input from the Interfaces pull-down menu.

In the example the, ASI-3 input is selected to monitor for this instance of the TS Compliance Analyzer application.

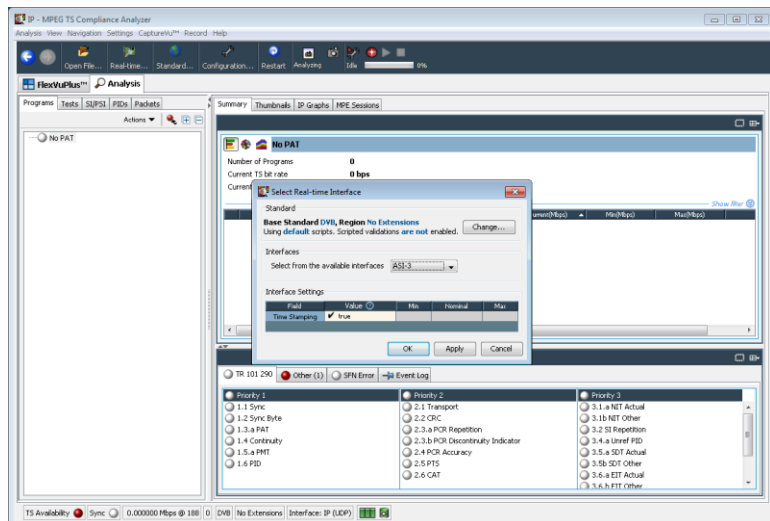
The choices available are dependent on the available optional inputs.





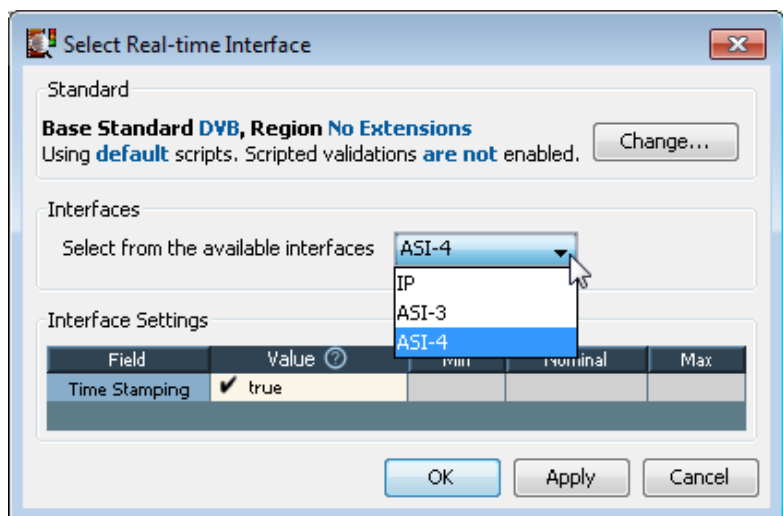
- Open a second instance of the Transport Stream Compliance Analyzer.  
**Telestream MTSA > TS Compliance Analyzer.**

Select **Real-time Analysis...** in the TSCA Analysis toolbar.



- In the Select Real-time Interface dialog screen, select an available input from the Interfaces pull-down menu.

For this instance of the TS Compliance Analyzer, ASI-4 input has been selected to monitor.



# Accessories

## Standard accessories

The table lists the standard accessories that are shipped with the MTSA-HW instrument and MTSA-PC software:

Description	Part number	MTSA-HW	MTSA-PC
MTSA-HW and MTSA-PC Quick Start User Manual	071-3731-XX	■	■
Power Cord (one of the listed options) <ul style="list-style-type: none"><li>■ Option A0 – North America</li><li>■ Option A1 – Universal Euro</li><li>■ Option A2 – United Kingdom</li><li>■ Option A3 – Australia</li><li>■ Option A4 – North America 240 V</li><li>■ Option A5 – Switzerland</li><li>■ Option A6 – Japan</li><li>■ Option A10 – China</li><li>■ Option A11 – India</li><li>■ Option A99 – No power cord</li></ul>	NA	■	

## Options and upgrades

### Options

The table lists the available hardware and software options that you can order with the MTSA-HW and MTSA-PC systems. Accessories included with the options are also listed.

Option		Description
Hardware options	MTSA-HW ASI	Add multiport ASI interface.
	MTSA-HW 10GS	Add 10 Gbase-SR dual optical port 10 Gb/s NIC. Includes short reach SFP+ modules (850 nm).
	MTSA-HW SDR	Add multifunction SDR RF interface with support for DVB-T, ISDB-T/Tb, QAM A/B/ C and 8VSB. Includes level, BER, MER, constellation points.
	MTSA-HW DS2	Add dual input DVB-S/S2 interface. Card supports dual port QPSK/8PSK or single port 16APSK/32APSK demodulation. Includes level, BER, MER, SNR, constellation points.
	MTSA-HW RACK	Add MTSA rackmount kit. Includes the rackmount slides and rails
Software Options	MTSA-HW TSCA MTSA-PC TSCA	Add real and deferred time Transport Stream Compliance Analyzer. Includes real and deferred time TSCA for MPEG-2, ATSC1.0, DVB, ISDB-S, ISDB-T, ISDB-TB. Closed Caption analysis, rendering and alignment to CEA608, CEA708 and SCTE20/21 control commands.
	MTSA-HW MUX MTSA-PC MUX	Add Stream Multiplexer and Generator. Includes TS and ISDB-T/Tb Multiplexer, ISDB-T Remux, TS Editor, Make Seamless, and Tclips Test Streams; also includes HEVC stream generation capabilities.
	MTSA-HW ESA MTSA-PC ESA	Add elementary stream analyzer. Includes support for VC1, AVC/H.264, MPEG-4, MPEG-2, H.263, HEVC/H.265. Closed Caption analysis, rendering and alignment to CEA608, CEA708 and SCTE20/21 control commands.
	MTSA-HW PBUFFA MTSA-PC PBUFFA	Add PES and T-STD Buffer Analyzers. Includes HEVC buffer analysis and PES with AVC, HEVC and AC-3 codec analysis.
	MTSA-HW PQ MTSA-PC PQ	Add Picture Quality Analysis Software, Single and Double Ended. Includes the PQA software with Option ESA to enable conversion of VC1, AVC/H.264, HEVC/H.265 source files to YUV for PQ Analysis.
	MTSA-HW ALZRPK MTSA-PC ALZRPK	Add Analyzer Software Bundle. Includes TSCA, ESA, MUX and PBUFFA.

## MTSA-UP upgrade kits

The MTSA-UP upgrade kits are available to enhance the capabilities of the instrument and software after you purchase an MTSA-HW or MTSA-PC system. Kits may contain software, hardware, or both.

Option		Description
MTSA-UP hardware upgrades	MTSA-UP ASI	Add multiport ASI interface.
	MTSA-UP 10GS	Add 10Gbase-SR dual optical port 10Gb/s NIC. Includes short reach SFP+ modules (850 nm).
	MTSA-UP SDR	Add multifunction SDR RF interface with support for DVB-T, ISDB-T/Tb, QAM A/B/ C and 8VSB. Includes level, BER, MER, constellation points.
	MTSA-UP DS2	Add dual input DVB-S/S2 interface. Card supports dual port QPSK/8PSK or single port 16APSK/32APSK demodulation. Includes level, BER, MER, SNR, constellation points.
	MTSA-UP RACK	Add MTSA rackmount kit. Includes rackmount slides and rails
MTSA-UP software upgrades	MTSA-UP TSCA	Add real and deferred time Transport Stream Compliance Analyzer. Includes real and deferred time TSCA for MPEG-2, ATSC1.0, DVB, ISDB-S, ISDB-T, ISDB-TB. Closed Caption analysis, rendering and alignment to CEA608, CEA708 and SCTE20/21 control commands.
	MTSA-UP MUX	Add Stream Multiplexer and Generator. Includes Multiplexer and Tclips Test Streams.
	MTSA-UP ESA	Add elementary stream analyzer. Includes support for VC1, AVC/H.264, MPEG-4, MPEG-2, H.263, HEVC/H.265. Closed Caption analysis, rendering and alignment to CEA608, CEA708 and SCTE20/21 control commands.
	MTSA-UP PBUFFA	Add PES and T-STD Buffer Analyzers. Includes HEVC buffer analysis and PES with AVC, HEVC and AC-3 codec analysis.
	MTSA-UP PQ	Add Picture Quality Analysis Software, Single and Double Ended. Includes the PQA software with Option ESA to enable conversion of VC1, AVC/H. 264, HEVC/H. 265 source files to YUV for PQ Analysis.
	MTSA-UP ALZRPK	Add Analyzer Software Bundle. Includes TSCA, ESA, MUX and PBUFFA.

# User maintenance

This section describes general care and service procedures for the MTSA-HW instrument.

- *Preventive maintenance* provides cleaning instructions
- *In case of problems* provides some hints for troubleshooting startup errors
- *Returning the instrument for service* gives instructions for repacking and shipping the instrument

## General care

Protect the instrument from adverse weather conditions. The instrument is not waterproof.



**CAUTION.** *To avoid damage to the instrument, do not expose it to sprays, liquids, or solvents.*

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Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

## Preventative maintenance

Check the electrical performance and verify that the instrument accuracy is certified (calibrated) once a year.

Preventive maintenance mainly consists of periodic cleaning. Periodic cleaning reduces instrument breakdown and increases reliability. You should clean the instrument as needed, based on the operating environment. Dirty conditions may require more frequent cleaning than computer room conditions.

### Cleaning the exterior

Clean the exterior surfaces of the instrument with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the instrument.



**CAUTION.** *Avoid getting moisture inside the instrument during external cleaning and use only enough solution to dampen the cloth or swab. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.*

*Do not wash the front-panel On/Standby switch. Cover the switch while cleaning the instrument.*

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## In case of problems

This section addresses problems that you may encounter while using the test system. This section does not identify specific problems related to performance verification or adjustments. The diagnostic procedures for the MTSA-HW system provided in this section can help you isolate problems. For a performance verification procedure, refer to the *MTSA-HW Specifications and Performance Verification Technical Reference*.

Power-on diagnostics run when you first power on the instrument to start the test system application. These diagnostics check the operating system and hardware for correct operation. If error messages occur during the power-on diagnostics, there may be a system error that prevents the MTSA-HW system software from starting.

The table lists some of the symptoms of hardware problems (related to the operating system and peripheral devices) and possible solutions.

Symptom	Possible causes and recommended actions
Instrument does not power on	Verify that the power cord is connected to the instrument and to the power source. Check that the instrument receives power when you push the On/Standby switch; check that fan starts. Check that power is available at the power source. Contact your local Telestream service center.
Instrument powers on but does not complete the power-on sequence	Make sure instrument boots from the hard disk drive.
Power-on diagnostics fail	Contact your local Telestream service center.
Instrument does not recognize accessories such as external monitor, printer, or keyboard	Check that accessories are properly connected or installed. Contact Telestream support: <a href="http://www.telestream.net/telestream-support/video/support.htm">www.telestream.net/telestream-support/video/support.htm</a> .
Instrument will not power off with On/Standby switch	Try powering off the instrument using the Windows 10 shutdown procedure. If the instrument still does not power off, use the task manager to close down tasks. Finally, try the hard shutdown procedure; push and hold the On/Standby switch for five seconds to power off the instrument.

### Software problems

Your MTSA-HW instrument comes with software already installed. For any suspected software problems, try to isolate the problem to the test system application software or to other installed software.

Many software problems are due to corrupt or missing software files. In most cases, the easiest way to solve software problems is to reinstall the software.

If you suspect networking problems, see [Network troubleshooting](#) on page 11 Network installation.

### Hardware problems

Hardware problems can have several causes. Review the installation instructions in this manual to verify that you have properly installed the instrument. There are no user serviceable parts in the MTSA-HW system, so you should contact support if you have a hardware problem: [www.telestream.net/telestream-support/video/support.htm](http://www.telestream.net/telestream-support/video/support.htm).

## Returning the instrument for service

When repacking the instrument for shipment, use the original packaging.

1. Seal the shipping carton with an industrial stapler or strapping tape. Before returning the instrument for service, contact the Service Center to get an RMA (return material authorization) number, and any return or shipping information you may need.
2. If the instrument is being shipped to a Telestream service center, enclose the information:
  - The RMA number.
  - The owner's address.
  - Name and phone number of a contact person.
  - Type and serial number of the instrument.
  - Reason for returning.
  - A complete description of the required service.
3. Mark the address of the Service Center and the return address on the shipping carton in two prominent locations.

