Technical Reference

Tektronix

MTS400 Series
MPEG Test Systems
Specifications and Performance Verification

071-1724-03

This document applies to firmware version 1.4 and above.

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.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating 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.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

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

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

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Powering Off. The power cord provides Mains disconnect.

Replace Batteries Properly. Replace batteries only with the proper type and rating specified.

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

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

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

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

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

Symbols and Terms

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

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

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

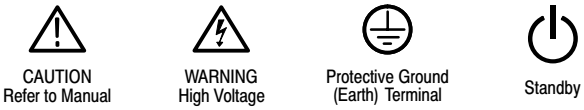
Terms on the Product. These terms may appear on the product:

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

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

CAUTION indicates a hazard to property including the product.

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



Service Safety Summary

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

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

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

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

To avoid electric shock, do not touch exposed connections.

Preface

This manual lists the electrical, mechanical, and environmental specifications, and the certification and compliance statements for the Tektronix MTS400 Series MPEG Test Systems instruments. Also provided are procedures for verifying the performance of the instrument.

***NOTE**. Text in this manual about the MPEG Player refers to the MPEG player application installed in the MTS400 Series systems (MTS400, and MTS430).*

The MTX100B MPEG Player and Recorder is described in the MTX100B user documentation.

Related Manuals

The following manuals are also available to use with the MTS400 Series MPEG Test Systems. These manuals are shipped with each system, and are also available on the Tektronix Web site.

- *MTS400 Series MPEG Test Systems Getting Started Manual* (Tektronix part numbers: 071-1505-xx, English; 071-1727-xx, Japanese). This manual describes the functions and use of the instrument, and provides software recovery and network troubleshooting information.
- *MTS400 Series MPEG Test Systems User Manual* (Tektronix part number 071-1507-xx). This manual provides in-depth operating information for the software applications included in the MTS400 Series system.
- *MTS400 Series MPEG Test Systems Programmers Manual* (Tektronix part number 071-1725-xx). This manual describes the remote control commands available for the MPEG Player application.
- *MTS400 Series MPEG Test Systems Release Notes* (Tektronix part number 071-1726-xx). This manual provides information about software problems and behaviors.

Specifications

This chapter contains specifications for the MTS400 Series MPEG Test Systems.

All specifications are guaranteed unless labeled “typical.” Typical specifications are provided for your convenience but are not guaranteed.

Unless otherwise stated, all specifications apply to both the MTS400 and MTS430 MPEG Test Systems.

To meet specifications, the following conditions must be met:

- The system must have been calibrated/adjusted in an ambient temperature between 20 °C and 30 °C (68 °F and 86 °F).
- The system must be kept within the environmental limits specified in this document.
- The system must be powered from a source maintaining voltage and frequency within the limits described in this document.
- The system must have been operating continuously for at least 20 minutes within the specified operating temperature range.
- The instrument must have had its signal-path-compensation routine last executed after at least a 20 minute warm-up period at an ambient temperature within 5 °C of the current ambient temperature.

Any conditions that are unique to a particular characteristic are expressly stated as part of that characteristic.

***NOTE**. The product calibration classification for this system is List 2; no calibration data reports are available. However, all measurement equipment used to establish or verify conformance of the product with published specifications is traceable.*

Electrical Specifications

The following tables list the published specifications for the MTS400 Series MPEG Test Systems.

Platform Characteristics

Table 1–1 lists the general characteristics of the MTS400 Series platform.

Table 1–1: Platform characteristics

Characteristic	Description
Operating system	Microsoft Windows XP Professional with Service Pack 2
Processor	P4, 2.8 GHz
Disk space	
Operating system and software applications	82 GB, Ultra ATA100 IDE hard drive
MPEG file storage	144 GB total (two, 72 GB SCSI hard drives, one for Playout and one for Record)
MPEG storage disk I/O port	SCSI-3 (Ultra 160), Micro D68 connector, 68 pin
RAM	1 GB (one SIM of DDRS memory)
CD-ROM drive	CD-R/W, DVD-R/RW, DVD+R/RW
Floppy disk drive	3.5 inch, 1.44 MB high density, double-sided (2HD)
Display	LCD, 1024 X 768, 10.4 inch
Ethernet	
10/100	One 10/100Base-T; RJ45 connector Supported protocol: Ethernet/IP/UDP/ MPEG-TS and VLAN When used in MPEG-TS protocol, the minimum and maximum link bit rates are 250 kbps and 100 Mbps respectively IP playout bit rate is typically up to 90 Mbps
10/100/1000 (GigE)	One 10/100/1000Base-T; RJ45 connector Supported protocol: Ethernet/IP/UDP/ MPEG-TS and VLAN When used in MPEG-TS analysis and record, the minimum and maximum link bit rates are typically 250 kbps and 100 Mbps respectively IP playout bit rate is typically up to 190 Mbps

Table 1–1: Platform characteristics (Cont.)

Characteristic	Description
Keyboard port	Mini DIN, PS-2, one on the rear panel and one on the left front side panel; not hot pluggable
Mouse port	Mini DIN, PS-2; one on the rear panel and one on the left front side panel; not hot pluggable
Printer port	IEEE P1284. Bidirectional parallel communications port
External VGA Output	15-pin, high density, Sub-D; resolution needs to be set to the same as the integral LCD display, 1024 x 768
COM port	RS-232
USB port	USB device connector

A11 and A12 Main MPEG I/O Board Characteristics

The electrical characteristics listed in Table 1–2 apply to both the A11 and A12 Main MPEG I/O boards.

Table 1–2: A11 and A12 Main MPEG I/O board electrical characteristics

Characteristic	Description
Internal reference clock, typical	27 MHz ± 1 ppm This clock is used for the following functions: output clock, PCR/PTS/DTS timing, packet operation timing, and TDT/STT timing
External reference / clock input	
Input connector type	BNC, 50 Ω, AC coupled
Frequency	
External reference input	8.12698 MHz, 10 MHz, 27 MHz
External clock input	160 kHz to 25 MHz (parallel clock) 1.28 MHz to 32 MHz (serial clock)
Amplitude	
External reference input, typical	0 ± 6 dBm (peak-to-peak, sine wave) 0.5 V to 3.0 V (square wave)
External clock input, typical	0.5 V to 3.0 V (square wave)
External TTL trigger input	
Input connector type	BNC, 1 kΩ
Threshold level	
High level	>3.5 V (maximum voltage limit is 7.0 V)
Low level	<0.8 V
PPL	
Frequency range	64 MHz to 128 MHz
Output clock	
Maximum rate	64 MHz (serial clock) 25 MHz (parallel clock)
Internal and external 27 MHz	Output clock = (X / (2 * Y * Z)) * 27 MHz 512 < X < 131071, 3400 < Y < 6000, 2 <= Z <= 65536 (second power)
External parallel clock	Output clock = 108 MHz * Y / X, 512 < X < 131071, 8 < Y < 16383
External serial clock	Output clock = 864 MHz * Y / X, 512 < X < 131071, 8 < Y < 16383
Output data rate	250 kbps minimum, 214 Mbps maximum
P/N and jitter (serial clock)	<–104 dBc/Hz, RBW = 300 Hz, @21.455707 MHz + 20 kHz

Table 1–2: A11 and A12 Main MPEG I/O board electrical characteristics (Cont.)

Characteristic	Description
DVB–SPI Interface	
Input/output configuration	Output only
Connector type	D-sub, 25-pin
Data rate	250 kbps to 108 Mbps (107 Mbps maximum in duplex mode)
Pin assignment	1 DCLK 2 Ground 3 to 10 DATA 7 to DATA 0 11 DVALID 12 PSYNC 13 Shield 14 /DCLK 15 Ground 16 to 23 /DATA 7 to DATA 0 24 /DVALID 25 /PSYNC
Output amplitude, typical	240 mV to 550 mV (BUS LVDS with 100 Ω termination)
Output offset	1.1 V to 1.5 V
Output impedance	100 Ω, between differential outputs with output off
Data delay	± 5 ns from DCLK falling edge
Input level	>200 mVpp, (RI+)–(RI–) with 100 Ω termination
Data hold time	T/2 ± T/10, T=1/f, data latch on DCLK rising edge

A170 LVDS/ASI/SMPTE310M Interface Board

Table 1–3 lists the electrical characteristics of the A170 LVDS/ASI/SMPTE310M Interface board.

Table 1–3: A170 LVDS/ASI/SMPTE310M Interface board electrical characteristics

Characteristic	Description
Internal reference clock, typical	27 MHz ± 1 ppm
ASI interface	
Connector type	BNC (common connector with SMPTE310M interface)
Bit rate	250 kbps to 213 Mbps (107 Mbps maximum in duplex mode)
Output	
Output impedance	75 Ω transformer coupled
Voltage	800 mV ± 10% into 75 Ω load
Jitter	≤ 0.2 UI
Maximum rise/fall time	≤ 1.2 ns, 20% to 80%
Return loss, typical	>17 dB (5 MHz to 270 MHz) into 75 Ω load
Transmission format	Packet mode or Burst mode
Input	
Input impedance	75 Ω transformer coupled
Voltage	200 mV to 880 mV (maximum limit: 3 V_{pp} @AC, 15 mA @DC)
Data format	Accepts both Packet mode and Burst mode ASI signals
Return loss, typical	>17 dB (5 MHz to 270 MHz) into 75 Ω load
SMPTE310M interface	
Connector type	BNC (common connector with ASI interface)
Bit rate	19,392,658.5 bps
Output	
Output impedance	75 Ω transformer coupled
Voltage	800 mV ± 10% into 75 Ω load
Jitter, typical	<2 ns p-p logic 0 rising edge when triggered on negative edge (EN50083-9.1998 Figure A.4) <1.4 ns p-p logic 1 rising edge when triggered on negative edge (EN50083-9.1998 Figure A.5)
Rise/fall time	0.4 ns ≤ X ≤ 5 ns, 20% to 80%
Return loss, typical	>30 dB (5 MHz to 38.785316 MHz) into 75 Ω load

Table 1–3: A170 LVDS/ASI/SMPTE310M Interface board electrical characteristics (Cont.)

Characteristic	Description
SMPTE310M interface (cont.)	
Input	
Input impedance	75 Ω transformer coupled
Voltage	200 mV to 880 mV (maximum limit: 3 V_{pp} @AC, 15 mA @DC)
Data format	Bi-phase coded, compliant with SMPTE310M
Input bit rate	19,392,658.5 bps
Return loss, typical	>17 dB (5 MHz to 38.785316 MHz) into 75 Ω load
DVB-SPI interface	
Input/output configuration	Input only
Connector type	D-sub, 25-pin
Data rate	250 kbps to 108 Mbps (107 Mbps maximum in duplex mode)
Pin assignment	1 DCLK 2 Ground 3 to 10 DATA 7 to DATA 0 11 DVALID 12 PSYNC 13 Shield 14 /DCLK 15 Ground 16 to 23 /DATA 7 to DATA 0 24 /DVALID 25 /PSYNC
Data delay	± 5 ns from DCLK falling edge
Input level	>200 mVpp, (RI+)-(RI-) with 100 Ω termination
Input impedance	100 Ω, between differential inputs
Clock pulse width	T/2 ± T/10, T=1/f (f = byte clock frequency)
Data hold time	T/2 ± T/10, T=1/f, data latch on DCLK rising edge

Baseband Board Characteristics

Table 1–4 lists the electrical characteristics of the MTM400 Baseband board.

Table 1–4: Baseband board electrical characterisics

Characteristic	Description
ASI interface	
Connector type	BNC (common connector with SMPTE310M interface)
Bit rate	250 kbps to 155 Mbps
ASI Input	Accepts both Burst mode and Packet mode ASI format
Signal amplitude	2.0 V peak-to-peak, maximum
Input impedance	75 Ω transformer coupled
Return loss, typical	10 dB minimum, 5 MHz to 270 MHz
Link rate, typical	270 Mbaud ± 100 ppm
ASI Output	
Signal amplitude	1.0 V peak-to-peak, maximum 600 mV peak-to-peak, minimum into 75 Ω load
Output impedance	75 Ω transformer coupled
Return loss, typical	10 dB @ 270 MHz
SMPTE310M interface	
Connector type	BNC
Bit rate	19,392,658.5 bps ± 2.8 ppm
SMPTE Input	
Input impedance	75 Ω transformer coupled
Data format	Bi-phase coded, compliant with SMPTE310M
Signal amplitude	2.0 V peak-to-peak, maximum 200 mV peak-to-peak minimum
Return loss, typical	10 dB minimum @ 20 MHz
SMPTE Output	
Signal amplitude	600 mV minimum, 1.0 V maximum into 75 Ω load
Output impedance	75 Ω transformer coupled
Return loss, typical	10 dB minimum @ 20 MHz

QPSK/8PSK Board Characteristics

Tables 1–5 and 1–6 list electrical characteristics of the QPSK/8PSK board.

Table 1–5: QPSK/8PSK interface board electrical characteristics with a QPSK input

Characteristic	Description
Input frequency range	950 MHz to 2150 MHz with 1 MHz step size
Input signal amplitude range	–60 dBm to –30 dBm for a CBER of $<1e^{-6}$
Modulation format	QPSK in accordance with ETSI EN 300 421
Modulated baud rate	1 MBaud min, 30 MBaud max
Viterbi values supported	1/2, 2/3, 3/4, 5/6, 6/7, 7/8
FEC	In accordance with ETSI EN 300 421
Turbo viterbi values supported	1/2, 2/3, 3/4, 5/6, 7/8
Turbo FEC	Turbo code
Connector style	F-style
Input termination impedance	75 Ω nominal
Input return loss	4 dB min, 950 MHz to 2050 MHz
LNB supply voltage	Selectable; 13.0 V ± 1.5 V or 18.0 V ± 1.5 V, with 100 Ω, 5 watt resistor load
LNB supply maximum current	200 mA maximum
LNB 22 kHz signaling frequency	17.6 kHz min, 26.4 kHz max (22 kHz ± 20%)
LNB 22 kHz signaling amplitude	600 mV p-p with a 100 Ω load
Ultimate modulation error ratio (with equalizer)	26 dB with an equalizer

Table 1–6: QPSK/8PSK interface board electrical characteristics with an 8PSK input

Characteristic	Description
Input frequency range	950 MHz to 2150 MHz with 1 MHz step size
Input signal amplitude range	–60 dBm to –30 dBm for a CBER of $<1e^{-6}$
Modulation format	Turbo 8PSK
Modulated baud rate	1 MBaud min, 30 MBaud max
Turbo viterbi values supported	2/3, 3/4 (2.05), 3/4 (2.1), 5/6, 8/9
Turbo FEC	Turbo code
Connector style	F-style
Input termination impedance	75 Ω nominal

Table 1–6: QPSK/8PSK interface board electrical characteristics with an 8PSK input (Cont.)

Characteristic	Description
Input return loss	4 dB min, 950 MHz to 2050 MHz
LNB supply voltage	Selectable; 13.0 V ± 1.5 V or 18.0 V ± 1.5 V, with 100 Ω, 5 watt resistor load
LNB supply maximum current	200 mA maximum
LNB 22 kHz signaling frequency	17.6 kHz min, 26.4 kHz max (22 kHz ± 20%)
LNB 22 kHz signaling amplitude	600 mV p-p with a 100 Ω load
Ultimate modulation error ratio (with equalizer)	26 dB with an equalizer

8PSK and QPSK Measurements

Table 1–7 lists electrical characteristics for 8PSK and QPSK measurements.

Table 1–7: 8PSK and QPSK measurements

Characteristic	Description
RF lock	RF lock is indicated by LED and Status
Input level (signal strength)	Range: -60 dBm to -30 dBm Resolution: 1 dBm Accuracy: ± 5 dBm
EVM (Error Vector Magnitude)	Display Range: ≤ 4.0% to ≥ 30.0% rms Resolution: 0.1% Accuracy: ± 20% of reading
MER (Modulation Error Ratio) with an equalizer	Display Range: 10 dB to 26 dB with an equalizer Resolution: 1 dB Accuracy: ± 2 dB for range 10 dB to 20 dB
SNR (Signal-to-Noise Ratio)	Display Range: 5 dB to 35 dB Resolution: 1 dB Accuracy: ± 2 dB for range from 5 dB to 30 dB
Pre Reed Solomon (RS) BER (Bit Error Rate)	Pre-RS BER is displayed
Post RS BER and TEF (Transport Error Flag)	Post Reed Solomon BER (TEF ratio), TEF rate, and number of Transport Error Flags (TEF count) are displayed
Constellation	RF constellation is displayed

COFDM Board Characteristics

Table 1–8 lists electrical characteristics for the COFDM interface board.

Table 1–8: COFDM interface board electrical characteristics

Characteristic	Description
Input frequency range	50 MHz to 858 MHz (to include low VHF)
Input signal amplitude range	The receiver delivers QEF (Quasi Error Free) operation over the following signal power ranges: QPSK (4QAM): -85 dBm to -15 dBm (24 dBuV to 94 dBuV) 16QAM: -80 dBm to -15 dBm (29 dBuV to 94 dBuV) 64QAM: -72 dBm to -15 dBm (37 dBuV to 94 dBuV) QEF operation is equivalent to a post Viterbi BER of $2x10^{-4}$ or better
Compliance	COFDM (DVB-T) receptions and demodulation are compliant with ETSI EN300-744, 2 K, and 8 K transmission modes
Tuning resolution	166.7 kHz or smaller increments
Tuning accuracy	Better than $\pm$ 50 ppm
Channel bandwidth	7 MHz and 8 MHz (software selectable)
Connector style	F-style
Input termination impedance	75 Ω nominal
Input return loss	7 dB minimum, 50 MHz to 858 MHz
Modulation schemes supported	QPSK (4QAM), 16QAM, and 64QAM modulation
Transmission modes	2 K carriers, and 8 K carriers
Hierarchical modulation	All hierarchies will be supported, to include no hierarchy, and alpha = 1, 2 and 4.
Viterbi puncture rates	1/2, 2/3, 3/4, 5/6, 7/8
Guard intervals	1/32, 1/16, 1/8, 1/4
Spectrum polarity	The receiver will operate with both inverted and normal spectral polarity
Ultimate modulation error ratio, with equalizer	$\geq$ 37 dB with an equalizer

COFDM Board Measurements

Table 1–9 lists the electrical characteristics for the COFDM measurements.

Table 1–9: COFDM measurements

Characteristic	Description
Overall receiver lock status	Overall receiver lock status is indicated by an LED on the rear panel
Transmission coding parameters	The receiver reports the current status of the following transmission parameters: - QPSK/16, QAM/64, QAM encoding - 2K/8K Transmission mode - Hierarchy status (hierarchy on/off, alpha value) - Viterbi puncture rate - Guard Interval Value - Gross bit rate in the channel - Spectrum polarity (inverted/non-inverted)
Input level (signal strength)	Ranges, High Sensitivity mode: QPSK (4QAM): -85 dBm to -10 dBm (24 dBuV to 99 dBuV) 16QAM: -80 dBm to -10 dBm (29 dBuV to 99 dBuV) 64QAM: -72 dBm to -13 dBm (37 dBuV to 96 dBuV) Ranges, High Resolution mode: QPSK (4QAM): -45 dBm to -10 dBm (64 dBuV to 99 dBuV) 16QAM: -45 dBm to -10 dBm (64 dBuV to 99 dBuV) 64QAM: -45 dBm to -13 dBm (64 dBuV to 96 dBuV) Resolution: 1 dBm Accuracy: ± 3 dBm
RF carrier offset	Accuracy: ± 50 ppm of the tuned frequency
SNR (Signal to Noise Ratio)	Display Range: 6 dB to 40 dB for QPSK (4QAM) 11 dB to 40 dB for 16QAM 16 dB to 40 dB for 64QAM Resolution: 1 dB Accuracy: ± 1 dB to 30 dB SNR (measured at -30 dBm input in high resolution mode)

Table 1–9: COFDM measurements (Cont.)

Characteristic	Description
EVM (Error Vector Magnitude)	Display Range: ≤ 1% to ≥ 30% rms, for QPSK ≤ 1% to ≥ 20% rms, 16QAM ≤ 1% to ≥ 8.5% rms, 64QAM Resolution: 0.1% Accuracy: 1% (1 EVM unit), and an additional ± 20% of the reading
MER (Modulation Error Ratio) with an equalizer	Both MER Peak and MER Average are displayed as measured across all carriers Display Range: 6 dB to 37 dB for QPSK (4QAM) 11 dB to 37 dB for 16QAM 16 dB to 37 dB for 64QAM Resolution: 0.1 dB Accuracy: ± 1 dB to 30 dB (Measured at –30 dBm input in High Resolution mode). For best MER accuracy, use High Resolution mode, and maintain the input signal level between –45 dBm and –15 dBm.
Carrier power distribution	Carrier-by-carrier signal-to-noise power ratio is displayed Channel Flatness in dB can be viewed from the spectrum display Tilt in dB can be viewed from the spectrum display
Channel equalization status	Channel estimate I and Q values for each carrier are displayed
Constellation	The RF constellation is displayed
BER	Pre-Viterbi BER and Pre Reed-Solomon BER values are displayed
Post RS BER and TEF (Transport Error Flag)	Post Reed Solomon BER (uncorrectable error count) and number of Transport Error Flags are displayed

8VSB Board Characteristics

Table 1–10 lists the electrical characteristics for the 8VSB board.

Table 1–10: 8VSB board electrical characteristics

Characteristic	Description
Input frequency range	54 MHz to 860 MHz, VHF/UHF channels 2 to 69 (to include low VHF frequencies)
Input signal level	-72 dBm to -6 dBm (-23 dBmV to +43 dBmV) ≥ -50 dBm to ensure compliance to IEC 61000-4-3 immunity
Modulation format	8VSB in accordance with ATSC A/53B
Receiver bandwidth	6 MHz
Input termination impedance	75 Ω nominal
Connector type	F-type
Input return loss	5 dB minimum
Ultimate equivalent MER, with an equalizer	≥ 31 dB with an equalizer

8VSB Measurements

Table 1–11 lists the electrical characteristics for the 8VSB measurements.

Table 1–11: 8VSB measurements

Characteristic	Description
RF Lock	RF lock is indicated by LED and Status
Input level (signal strength)	Display Range: -72 dBm to -2 dBm relative to 75 Ω (-23 dBmV to +47 dBmV) Resolution: 1dB Accuracy: ±3dB
EVM (Error Vector Magnitude)	Display Range: ≤3.0% to ≥12.5% rms Resolution: 0.1% Accuracy: ±20% of reading
Equivalent MER (Modulation Error Ratio) with Equalizer	Display Range: 17 dB to 31 dB with Equalizer Resolution: 0.1 dB Accuracy: ±1 dB for MER >25 dB; ±3 db for MER 25 dB to 31 dB (Measured at -30 dBm input. For best MER accuracy, maintain the input signal level between -50 dBm and -15 dBm.)
SNR (Signal to Noise Ratio)	Display Range: 15 dB to 35 dB Resolution: 1 dB Accuracy: ±1 dB for SNR < 25 dB; ±3 db for SNR 25 dB to 35 dB

Table 1–11: 8VSB measurements (Cont.)

Characteristic	Description
BER	Pre-RS BER, SER 1 second and 10 seconds windows values are displayed.
TEF (Transport Error Flag)	Transport Error Flags (uncorrectable error count) in a 1 second window and 10 second window are displayed
Constellation diagram	The 8VSB constellation diagram is a display of I-data history with histograms (the IQ constellation is not available). This is displayed as Symbol Distribution in the user interface
Echo profile	Equalizer filter tap information is displayed. Display Echo Level range: Normalized real tap values over the range of -1 to 1 Display Delay range: -6.7 μs to 45.5 μs

QAM Annex B Board Characteristics

Table 1–12 lists electrical characteristics for the QAM Annex B board.

Table 1–12: QAM Annex B board characteristics

Characteristic	Description
Input frequency range	88 MHz to 858 MHz
Input signal level	-64 dBm to -19 dBm (45 dBuV to 90 dBuV relative to 75 Ω) With either a 64 or 256 QAM input, there are five or fewer Transport Error Flags in 11 seconds, which corresponds to a post FEC rate of $1e^{-8}$ $\geq$ -40 dBm when operated in an electromagnetic field of 3 V/m or more
Modulation format	64QAM, 256QAM (compliant with ITU J-83 Annex B)
Interleaving mode	Level 1 and Level 2 interleaving support compliant with all ITU J-83 Annex B, excluding I, J = (128,7) and (128,8), and in 256 QAM excluding (8, 16) and (16, 8)
Modulation baud rate	64 QAM: 5.056941 Mbaud/s 256 QAM: 5.360537 Mbaud/s
Spectrum polarity	Demodulates both Normal and Inverted IF Spectrum.
Receiver bandwidth, QAM B	6 MHz nominal
Connector type	F type
Input termination impedance	75 Ω nominal

Table 1–12: QAM Annex B board characteristics (Cont.)

Characteristic	Description
Input return loss	5 dB minimum
Ultimate Modulation Error Ratio with equalizer	≥ 37 dB with an equalizer

QAM Annex B Board Characteristics

Table 1–13 lists electrical characteristics for the QAM Annex B measurements.

Table 1–13: QAM Annex B measurements

Characteristic	Description
RF lock	RF lock is indicated by LED and Status
Input level (signal strength)	Range: -64 dBm to -19 dBm (45 dBuV to 90 dBuV relative to 75 Ω) Resolution: 1 dB Accuracy: ± 3 dB
EVM (Error Vector Magnitude)	Display Range for 64 QAM: ≤ 1% to ≥ 5% rms Display Range for 256 QAM: ≤ 1% to ≥ 2.5% rms Resolution: 0.1% Accuracy: ± 1%
MER (Modulation Error Ratio) with Equalizer	Display Range: 64 QAM: 22 dB to 37 dB 256 QAM: 28 dB to 37 dB Resolution: 0.1 dB Accuracy: ± 1 dB for MER < 25 dB; ± 3 db for MER 25 dB to 34 dB (measured at -30 dBm input)
SNR (Signal to Noise Ratio)	Display Range: 64QAM: 22 dB to 37 dB 256QAM: 28 dB to 37 dB Resolution: 1 dB Accuracy: ± 1 dB for SNR < 25 dB; ± 3 db for SNR 25 dB to 34 dB
BER (Bit Error Ratio)	Pre-RS BER is displayed
TEF (Transport Error Flag)	Transport Error Flags (uncorrectable error count) in a 1 second window and 10 second window are displayed
Constellation	The RF constellation is displayed

Video Over IP Electrical Characteristics

Table 1–14 list the general and electrical characteristics for the Video Over IP board.

Table 1–14: Video Over IP board - Ethernet Electrical Port

Characteristic	Description
Standard	10/100/1000BASE-T IEEE 802.3
Connector type	RJ-45
Data Format 10/100 Base T	NRZ
Data Format 1000 Base T	Trellis encoded, PAM5 symbols, full-duplex on 4-pair Cat-5 UTP per IEEE 802.3ab

Video Over IP Optical Characteristics

Table 1–15 list the general and optical characteristics for the Video Over IP board.

Table 1–15: Video Over IP board - Ethernet Optical port

Characteristic	Description
Ethernet Optical Transmitter - General Characteristics	
Optical operating mode	Single mode or Multimode
Connector type	Duplex data link MSA compliant SFP connector
Standard	1000 BASE-X
Data format	NRZ
Ethernet Optical Transmitter - Single mode 1550 nm using Tektronix supplied SFP module	
Output power	–2 dBm to +4 dBm
Center wavelength - 1550 nm	1530 nm Min, 1550 nm typical, 1570 nm max
Total jitter (peak-to-peak)	$<$ 170 ps
Extinction ratio	$\geq$ 9.0 dBm
Ethernet Optical Receiver - Single mode 1550 nm using Tektronix supplied SFP module	
Optical input power	–26 dBm to –3 dBm, BER 1 X 10^{-12}
Input wavelength	1270 nm = λ = 1610 nm

Table 1–15: Video Over IP board - Ethernet Optical port (Cont.)

Characteristic	Description
Ethernet Optical Transmitter - Single mode 1310 nm using Tektronix supplied SFP module	
Output power	–11 dBm to –3 dBm
Center wavelength - 1310 nm	1270 nm Min, 1310 nm typical, 1355 nm max
Total jitter (peak-to-peak)	< 170 ps
Extinction ratio	≥ 9.0 dBm
Ethernet Optical Receiver - Single mode 1310 nm using Tektronix supplied SFP module	
Optical input power	–19 dBm to –3 dBm, BER 1 X 10^{-12}
Input wavelength	1270 nm = λ = 1610 nm
Ethernet Optical Transmitter - Multimode 850 nm using Tektronix supplied SFP module	
Output power	–9.5 dBm to –2 dBm
Center wavelength - 850 nm	830 nm Min, 850 nm typical, 860 nm Ma
Total jitter (peak-to-peak)	< 170 ps
Extinction ratio	≥ 9.0 dBm
Ethernet Optical Receiver - Multimode 850 nm using Tektronix supplied SFP module	
Optical input power	–17 dBm to 0 dBm, BER 1 X 10^{-12}
Input wavelength	770 nm = λ = 860 nm

AC Power Source Characteristics

Table 1–16 lists the electrical characteristics of the AC power source.

Table 1–16: AC power source electrical characteristics

Characteristic	Description
Source voltage	100 to 240 VAC ± 10% (90 to 264 VAC RMS)
Frequency range	50/60 Hz
Power consumption	4 A maximum (marked on rear panel)
Peak inrush current	13 A peak at 240 VAC, 50 Hz
Mains fuse value	T6.3AH, 250 V, Fast; not operator replaceable. Refer servicing to qualified service personnel.

Mechanical Characteristics

Table 1–17 lists the mechanical characteristics of the MTS400 Series platform.

Table 1–17: Mechanical characteristics

Characteristic	Description
Classification	Fixed location benchtop
Cooling airflow	Intake is from the front and sides of the instrument. Exhaust is to the bottom and rear of the instrument. For proper cooling, at least two inches (5.1 cm) of clearance is needed on the rear and sides of the instrument cabinet.
Overall dimensions	Height 226 mm (8.9 in), without bottom feet Width: 432 mm (17 in) Depth: 560 mm (22 in), with rear feet
Weight	17.7 kg (39 lb)
Shipping weight	27.3 kg (64.5 lb)

Environmental Characteristics

Table 1–18 lists the environmental characteristics of the MTS400 Series platform.

Table 1–18: Environmental characteristics

Characteristic	Description
Atmospherics	
Temperature	
Operating	+5 °C to +40 °C, 30 °C per hour maximum gradient; temperature of the intake air at the front and sides of the instrument
Non-operating	–20 °C to +60 °C, 30 °C per hour maximum gradient
Humidity	
Operating	20% to 80% relative humidity up to 29 °C. Above 31 °C, derate linearly to 22% at 50 °C
Non-operating	10% to 80% relative humidity, non-condensing
Altitude	
Operating	0 to 3000 m (9800 ft)
Non-operating	0 to 12,000 m (40,000 ft)
Dynamics	
Random vibration	
Operating	0.27 g_{rms} total from 5 to 500 Hz
Non-operating	2.28 g_{rms} total from 5 to 500 Hz
Sine vibration, operating	0.013 inch peak-to-peak displacement from 5 Hz to 55 Hz
Functional shock, non-operating	20 g, 11 ms half-sine
Transportation package material	Transportation package material meets recycling criteria as described in Environmental Guidelines for Package Design (Tektronix 063-1290-00) and Environmentally Responsible Packaging Handbook (Tektronix 063-1302-00)

Certifications and Compliances

Table 1–19 lists the certifications and compliances that apply to the MTS400 Series platform.

Table 1–19: Certifications and compliances

Category	Standards or description	
EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:	
	EN 61326	EMC requirements for Class A electrical equipment for measurement, control and laboratory use.
	IEC 61000-4-2	Electrostatic discharge immunity (Performance criterion B)
	IEC 61000-4-3	RF electromagnetic field immunity (Performance criterion A) [1]
	IEC 61000-4-4	Electrical fast transient / burst immunity (Performance criterion B)
	IEC 61000-4-5	Power line surge immunity (Performance criterion B)
	IEC 61000-4-6	Conducted RF immunity (Performance criterion A)
	IEC 61000-4-11	Voltage dips and interruptions immunity (Performance criterion B)
	EN 61000-3-2	AC power line harmonic emissions
	EN 61000-3-3	Flicker
Australia / New Zealand Declaration of Conformity – EMC	Complies with EMC provision of Radiocommunications Act per the following standard(s):	
	AS/NZS 2064.1/2	Industrial, Scientific, and Medical Equipment: 1992
FCC	Emissions are within FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A limits	
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:	
	Low Voltage Directive 73/23/EEC, amended by 93/68/EEC	
	EN 61010-1 : 2001	Safety requirements for electrical equipment for measurement control and laboratory use.
U.S. Nationally Recognized Testing Laboratory Listing	UL61010B-1 : 2003	Equipment for measurement use.
Canadian Certification	CAN/CSA C22.2 No. 1010.1 : 1992 and No. 1010.1 : 1997	Safety requirements for electrical equipment for measurement, control, and laboratory use.
Additional Compliance	ANSI/ISA S82.02.01:1999	Safety standard for electrical and electronic test, measuring, controlling, and related equipment.
	IEC61010-1:2001	Safety requirements for electrical equipment for measurement, control, and laboratory use.

[1] **Refer to the RF interface card specification for the minimum RF input level required to ensure EMC immunity performance.**

Table 1–19: Certifications and compliances (cont.)

Category	Standards or description	
Installation (Overvoltage) Category Descriptions	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:	
	CAT III	Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.
	CAT II	Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
	CAT I	Secondary (signal level) or battery operated circuits of electronic equipment.
Overvoltage Category	Overvoltage Category II (as defined in IEC 61010-1)	
Pollution Degree Descriptions	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.	
	Pollution Degree 1	No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
	Pollution Degree 2	Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
	Pollution Degree 3	Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
Pollution Degree	Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.	
Equipment Type	Test and measuring	
Safety Class	Class 1 (as defined in IEC 61010-1) – grounded product	

Performance Verification

The procedures in this section allow you to verify the performance of the following MTS400 Series MPEG Test System components:

- ASI, SMPTE310M, and SPI signal interfaces
- RF interfaces
- IP interface
- MPEG Player (play and record functions)
- TS Compliance Analyzer

Preparation

Before you begin the *Performance Verification* procedures, review the following information:

- Ensure that the procedures are performed only by qualified service personnel who have read the *General Safety Summary* at the front of this manual.
- Ensure that the service personnel are familiar with system operation (refer to the *MTS400 Series MPEG Test System Getting Started Manual*).

Required Equipment

The following equipment is required to perform the verification procedures:

- 75 Ω BNC-to-BNC cable (quantity of one)
  Tektronix part number 174-4954-00
- DB25-to-DB25 cable (quantity of one)
  Tektronix part number 174-4955-00
- A copy of the “sym1.mpg” transport stream file on the E:\ drive of the MTS400 Series system being tested

***NOTE**. The "sym1.mpg" transport stream file is supplied with every instrument in the following directory: E:\Test Streams.*

If this file has been deleted from the E:\ drive of the instrument, you will need to copy the file from the MTS400 Series MPEG Test System Recovery CD-ROM *(Tektronix part number 063-3851-xx) to the E:\ drive of the instrument to be able to perform these procedures. This CD-ROM is supplied as a standard accessory with the MTS400 Series system.*

Preparing the Instrument

Perform the following steps to prepare the instrument to be tested:

1. Make sure the dongle is securely installed on the parallel port.
2. Connect the keyboard and mouse to the appropriate side panel or rear panel connectors.
3. Connect the power cord to the rear-panel power input connector.
4. Make the following cable connections on the instrument (see Figure 2–1):
   - Connect the 75 Ω BNC-to-BNC cable between the ASI/SMPTE In connector and the ASI/SMPTE Out connector.
   - Connect the DB25-to-DB25 cable between the DVB/SPI In connector and the DVB/SPI Out connector.
5. Power on the MTS400 Series system by pushing the front panel ON/STBY switch.
6. After the Windows XP desktop appears, launch the Windows Explorer from the Start menu.
7. Use the Windows Explorer to locate the transport stream file named "sym1.mpg" in the E:\Test Streams directory. All instruments are shipped with this file.
8. Perform the following steps if the sym1.mpg transport stream file has been deleted from the instrument:
   a. Insert the *MTS400 Series MPEG Test System Recovery CD-ROM* into the DVD drive of the MTS400 Series system.
   b. Use the Windows Explorer to copy the transport stream file named "sym1.mpg" from the CD-ROM to a location on the E:\ drive of the MTS400 Series system.
9. Close the Windows Explorer.

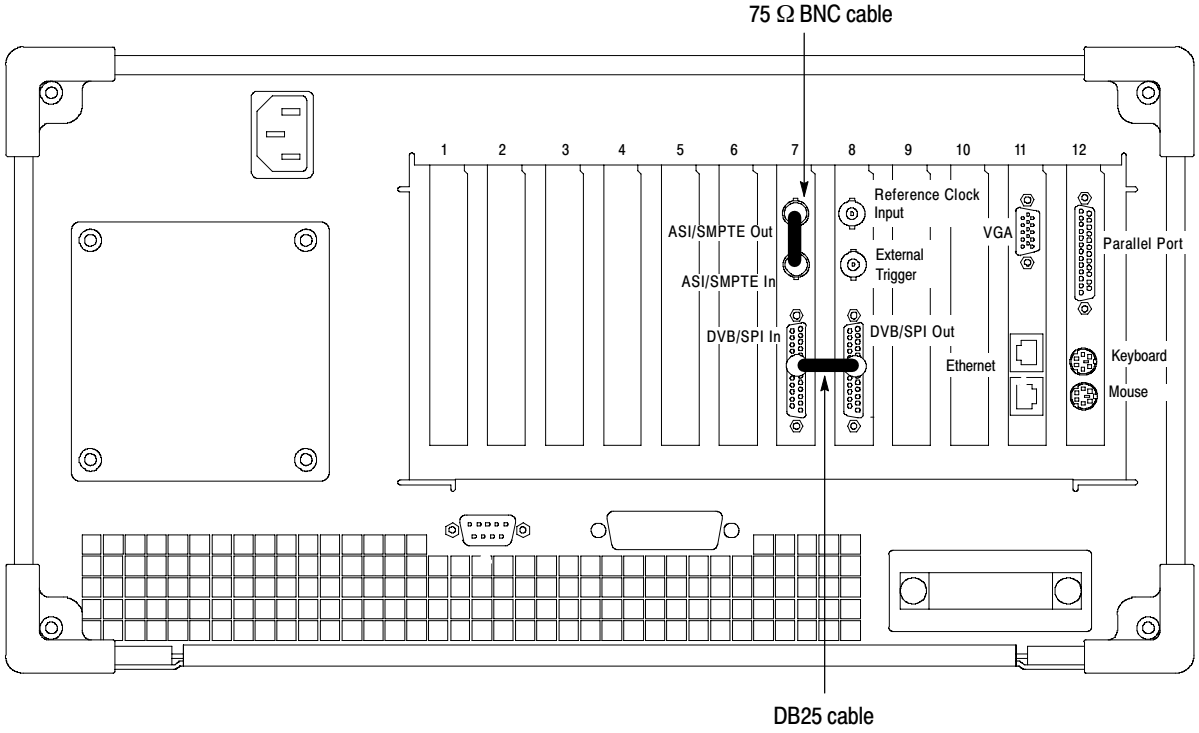


Figure 2–1: Cable connections on the MTS400 Series system

Verification Procedures

Perform the following steps to verify that the MTS400 Series system is operating properly. The steps are written with the assumption that you are performing all of the steps in order. If you start the procedures in the middle, you will have to review previous steps for instrument set up.

Verifying the ASI Interface

1. Start the MPEG Player by double clicking the 

icon on the desktop.
2. Make the following changes in the SPI/ASI/310M menu:
   a. Click BNC Port, and then click ASI.
   b. Click ASI Format, and then click Byte.

***NOTE**. In the SPI/ASI/310M menu, you do not need to make any setting changes to the Through Out parameter.*

3. Use the File menu to select the transport stream file to play:

   a. Click Open... to display the Open dialog box.

   b. Use the Open dialog box to navigate to the E:\ drive directory where the transport stream file named “sym1.mpg” is located.

   c. Select the sym1.mpg file, and click Open. The transport stream file name (sym1) will appear in the title of the MPEG Player window.

4. In the Play menu, verify that the Packet Size is set to 188.

***NOTE**. In the MPEG Player menus, a check mark appears next to the selected setting for some menu parameters.*

---

5. In the Play menu, click Clock... to open the Clock dialog box shown in Figure 2–2.

   a. Click Internal to set the Clock Source to internal.

   b. Verify that the Data Rate is set to 41.470998 Mbps as shown in Figure 2–2.

   c. If necessary, click the Fixed ES Rate box so that a check mark appears in the box.

   d. Click OK to close the Clock dialog box.

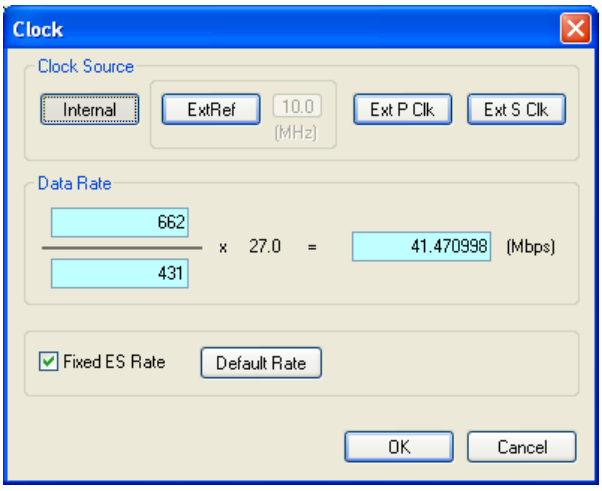


Figure 2–2: Clock settings dialog box

6. In the Play menu, click Update and then click On.
7. In the Play menu, click Sync and then click TS Packet.
8. In the Play menu, click PCR Initial Value... to open the dialog box shown in Figure 2–3.
   a. Enter 0 in the Base Value entry box.
   b. Enter 0 in the Extension Value entry box.
   c. Click OK to close the PCR Initial Value dialog box.

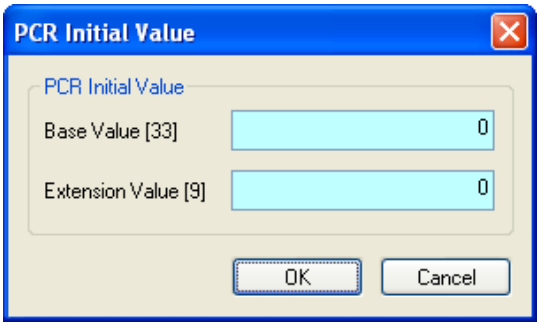


Figure 2–3: PCR Initial Value settings dialog box

9. In the Play menu, click Source and then click Disk.
10. In the Play menu, click Loop and then click On.
11. In the Play menu, click Auto Play and then click Off.

***NOTE**. In the Play menu, you do not need to make any setting changes to the Start/Stop parameters or to the Timer Play parameters.*

12. In the Play menu, click Other... to open the Others dialog box shown in Figure 2–4.

a. Use the Standard drop down list to select DVB.

b. Use the Numeric drop down list to select Hex.

c. Click on the SPI Output Enable box until a check mark appears. The Ext Play Start setting does not matter.

d. Click Update to open the Select Update Item dialog box shown in Figure 2–4.

- Click on Continuity Counter until a check mark appears.
- Click on PCR/PTS/DTS until a check mark appears.
- TDS/TOT/STT until a check mark appears.
- Click on NPT until no check mark appears.
- Click on Reed Solomon until no check mark appears.
- Use the Update Method drop down box to select Hardware.
- Click OK to close the Select Update Item dialog box.

e. Click OK to close the Others dialog box.

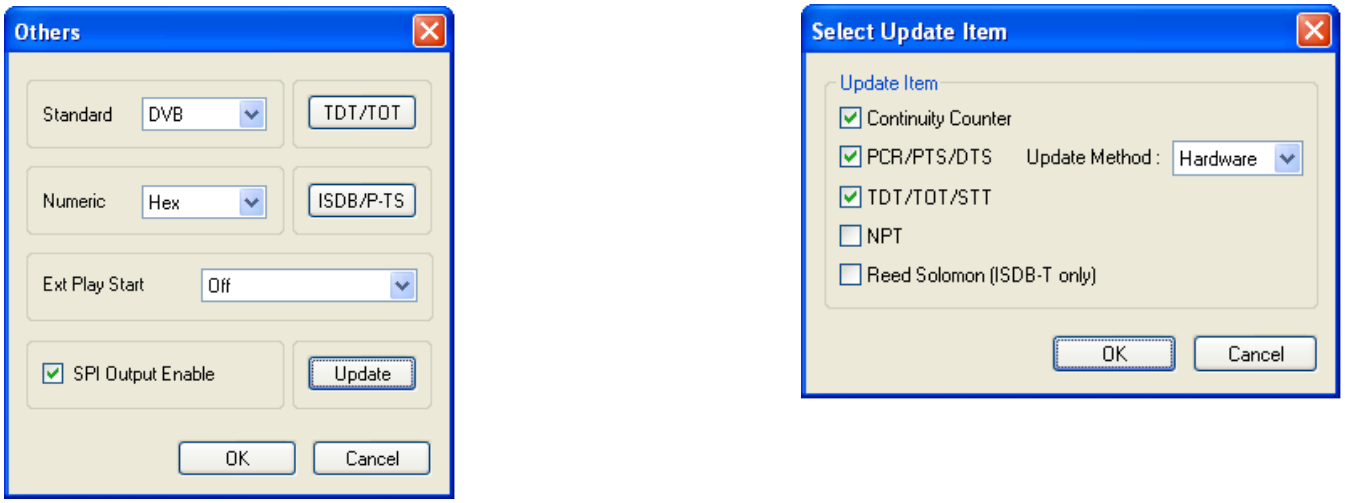


Figure 2–4: Others settings dialog box and Select Update Item settings dialog box

13. Start the TS Compliance Analyzer (TSCA) by double clicking the icon on the desktop.

14. In the MPEG Player tool bar, click the green Play arrow to start playing the transport stream file.

15. In the TSCA Open Transport Stream window, click Change... in the Stream Interpretation section.

16. Make the following setting changes in the Stream Interpretation display (see Figure 2–5).

a. Select DVB as the Base Standard.

b. Select No Extensions as the Region.

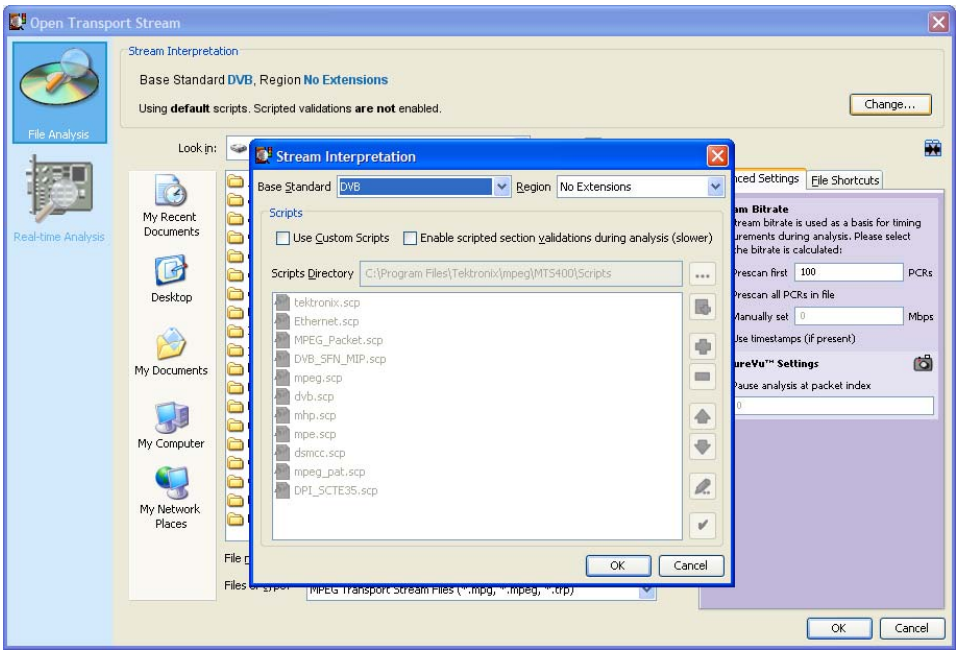


Figure 2–5: Stream Interpretation display in the Open Transport Stream window

17. In the Open Transport Stream window, click Real-time Analysis.

18. Make the following setting changes in the Real-time Analysis display (see Figure 2–6).

    a. In the Interfaces drop-down box, select ASI and check that all of the interface options for the unit are listed in the drop-down list.

    b. In the Interfaces Settings section, click on the Time Stamping box until a check mark appears.

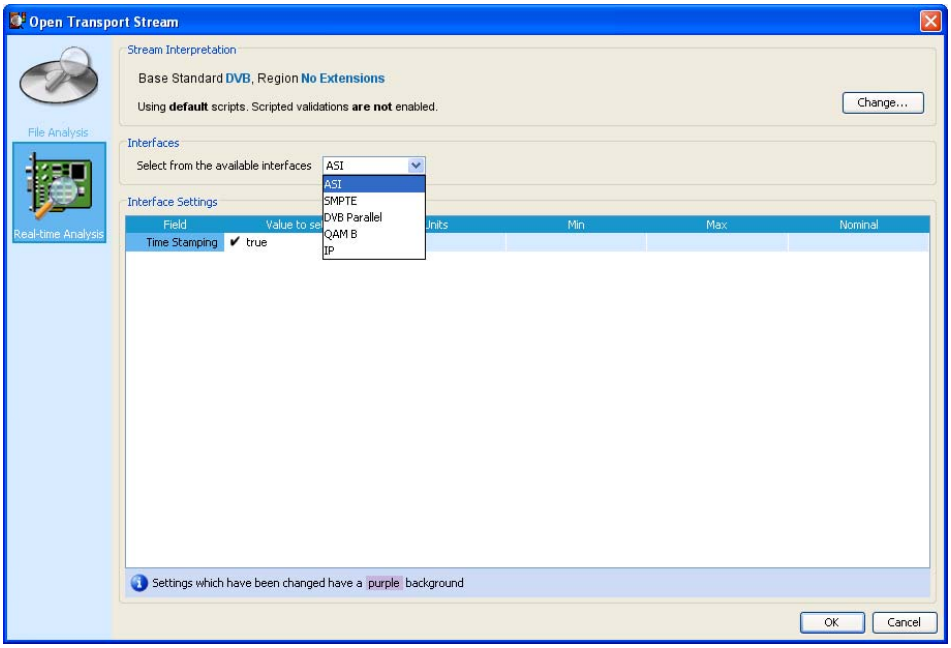


Figure 2–6: Real Time Analysis display in the Open Transport Stream window

19. Click OK to close the Open Transport Stream window.

    After a few seconds, the TS Compliance Analyzer window opens with the analysis results of the ASI transport stream (see Figure 2–7).

20. Verify the following in the analyzer window:

- The TS Availability and Sync indicators at the bottom left of the analyzer window are green.
- The bit rate readout at the bottom of the window reads 41.471 Mbps.

***NOTE**. It is normal if indicators other than the TS Availability and Sync turn red. This merely indicates that the software is operating and has detected errors in the transport stream.*

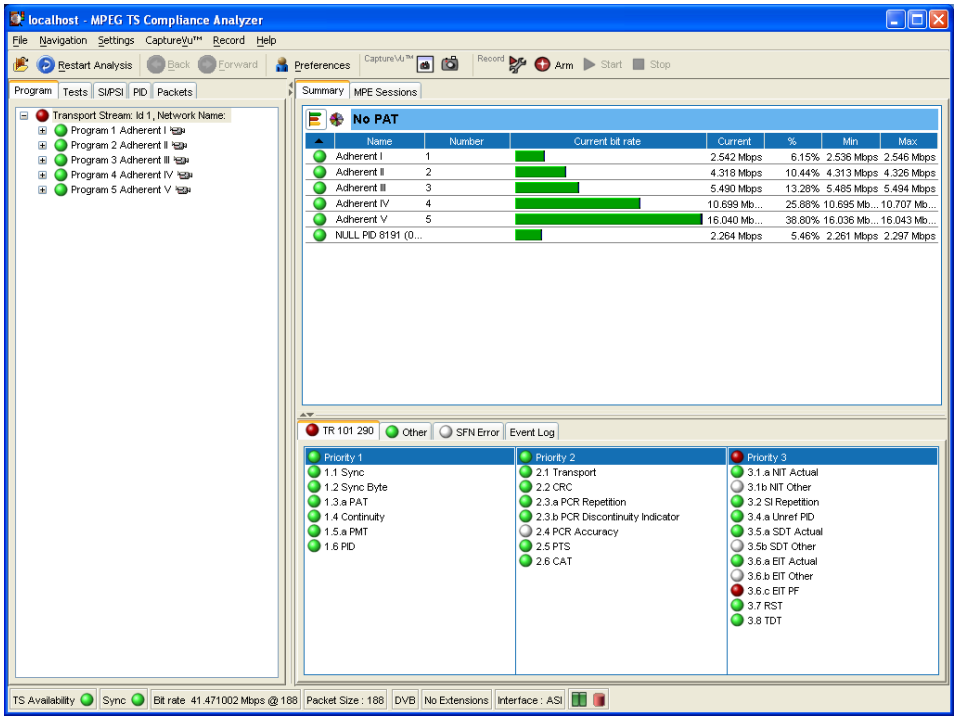


Figure 2–7: ASI interface analysis results

Verifying the MPEG Record Function

21. In the Record menu of the TS Compliance Analyzer, click Record Settings to open the dialog box shown in Figure 2–8. Make the following setting changes in the dialog box:

    a. Enable Transport source (a green dot appears next to the selected recording source).

    b. Click on the ellipse box at the far right of the Path entry box to open the Set Recording Name window.

    c. In the Set Recording Name window (not shown), navigate to the F:\ drive on the MTS400 Series system.

    d. In the File Name box, enter the following file name:

    record test.mpeg

    e. Click Save to close the Set Recording Name window.

    f. In the Record Settings window, enter 300 in the File Size entry box.

    g. Select Manual as the Trigger type (a green dot appears next to the selected trigger type).

    h. Click on the "Activate this dialog when recording starts" box until a check mark appears.

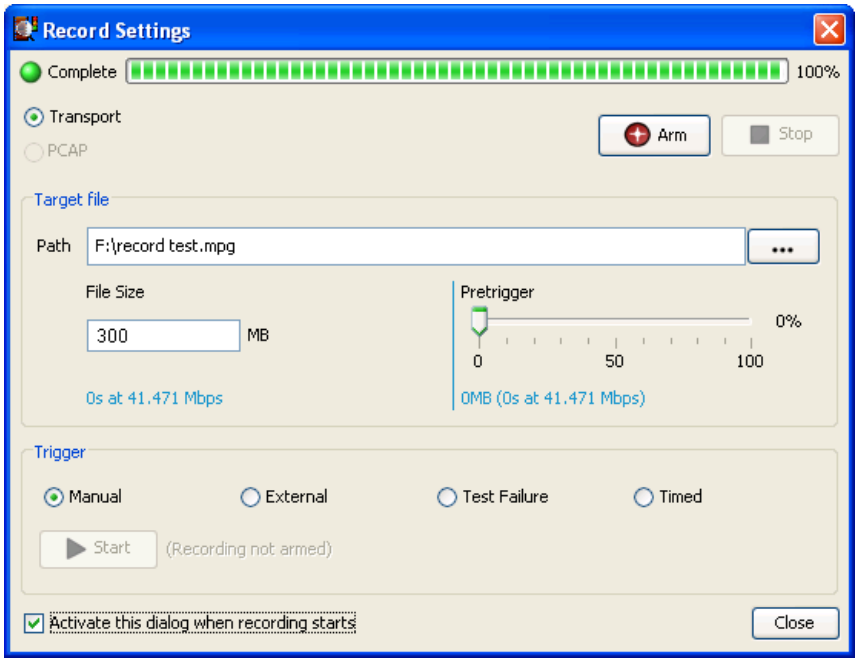


Figure 2–8: Record Settings dialog box

22. Click the Arm button. A red message appears in the Record Settings window stating that the recording function is armed (see Figure 2–9).

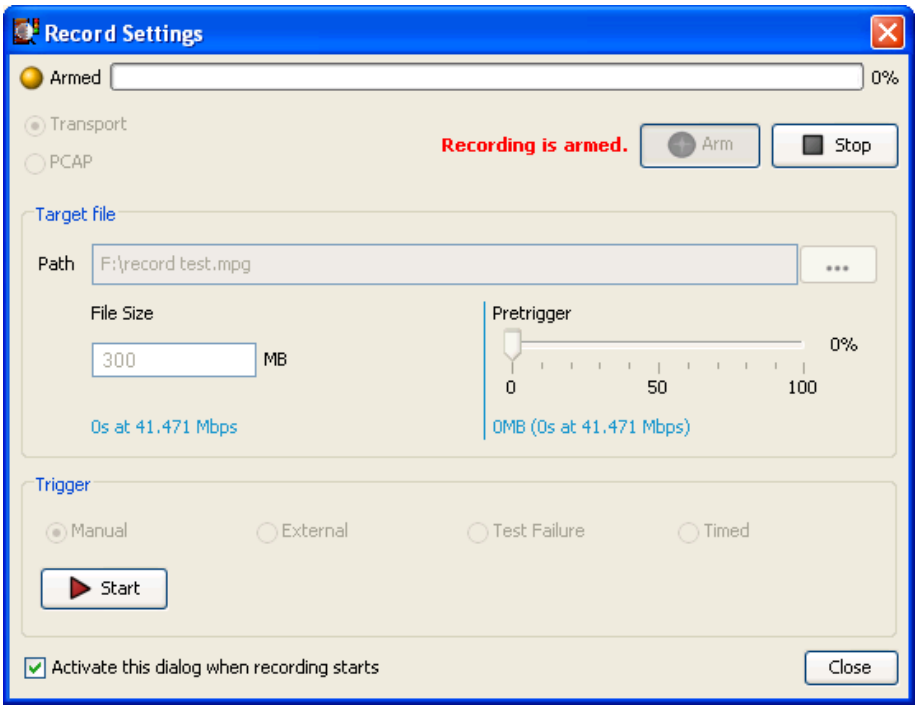


Figure 2–9: Record Settings window with the recording function armed

23. Click the Start button. A red message appears in the Record Settings window stating that the recording is currently in progress.

Observe the green bar showing the recording progress across the top of the window. The recording should take about 30 seconds to complete. When the recording is done, the progress bar says “Complete” as shown in Figure 2–8.

24. After the recording is finished, click Close to close the Record Settings window.

25. Perform the following steps to verify that the transport stream file was recorded to the F:\ drive of the instrument:

a. In the Record menu of the TS Compliance Analyzer, click Record Settings to open the dialog box shown in Figure 2–8 on page 2–10.

b. Click on the ellipse box at the far right of the Path entry box to open the Set Recording Name window.

c. In the Set Recording Name window, use the up arrow to navigate to the F:\ drive on the MTS400 Series system.

d. Verify that the following file name appears:

record test.mpeg

e. Click Cancel to close the Set Recording Name window.

f. Click Close to close the Record Settings window.

26. Close the TS Compliance Analyzer by clicking Exit in the File menu.

Verifying the SMPTE310M Interface

27. In the MPEG Player window, stop the player by clicking on the black Stop button on the tool bar.

28. In the SPI/ASI/310M menu, click BNC Port, and then click 310M 8VSB.

29. Start the TS Compliance Analyzer by double clicking the 

icon on the desktop.

30. In the MPEG Player tool bar, click the green Play arrow to start playing the transport stream file.

31. Verify that the TS rate displayed at the bottom of the MPEG Player window displays the SMPTE310M rate of 19.392658 Mbps (see Figure 2–10).

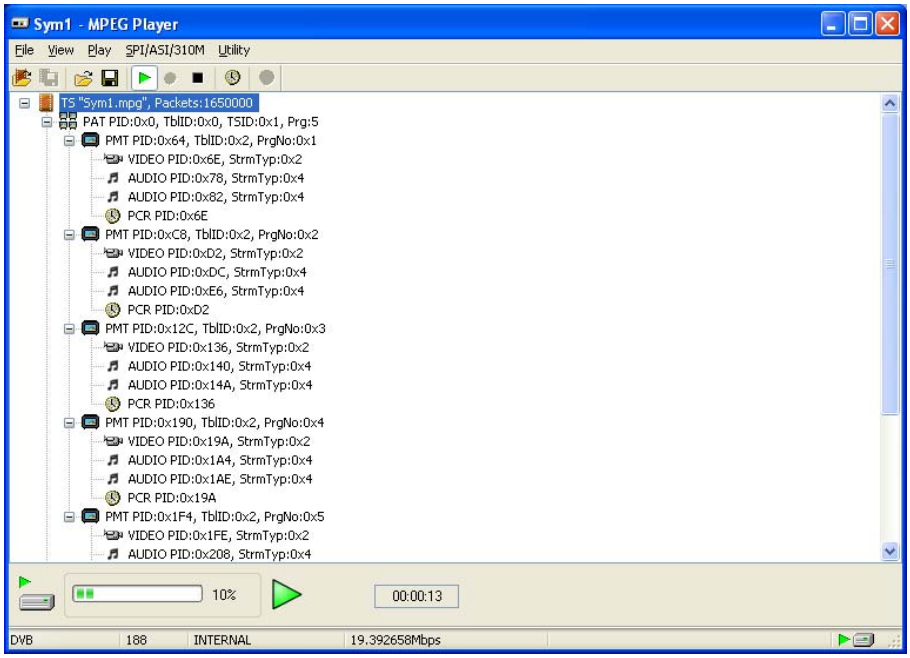


Figure 2–10: MPEG Player playing a SMPTE310M transport stream

32. In the Open Transport Stream window, click Real Time Analysis.

33. In the Interfaces drop-down box, select SMPTE.

34. Click OK to close the Open Transport Stream window.

After a few seconds, the TS Compliance Analyzer window opens with the analysis results of the SMPTE310M transport stream (see Figure 2–11).

35. Verify the following in the analyzer window:

- The TS Availability and Sync indicators at the bottom left of the analyzer window are green.
- The bit rate readout at the bottom of the window reads 19.393 Mbps.

***NOTE**. It is normal if indicators other than the TS Availability and Sync turn red. This merely indicates that the software is operating and has detected errors in the transport stream.*

36. Close the TS Compliance Analyzer by clicking Exit in the File menu.

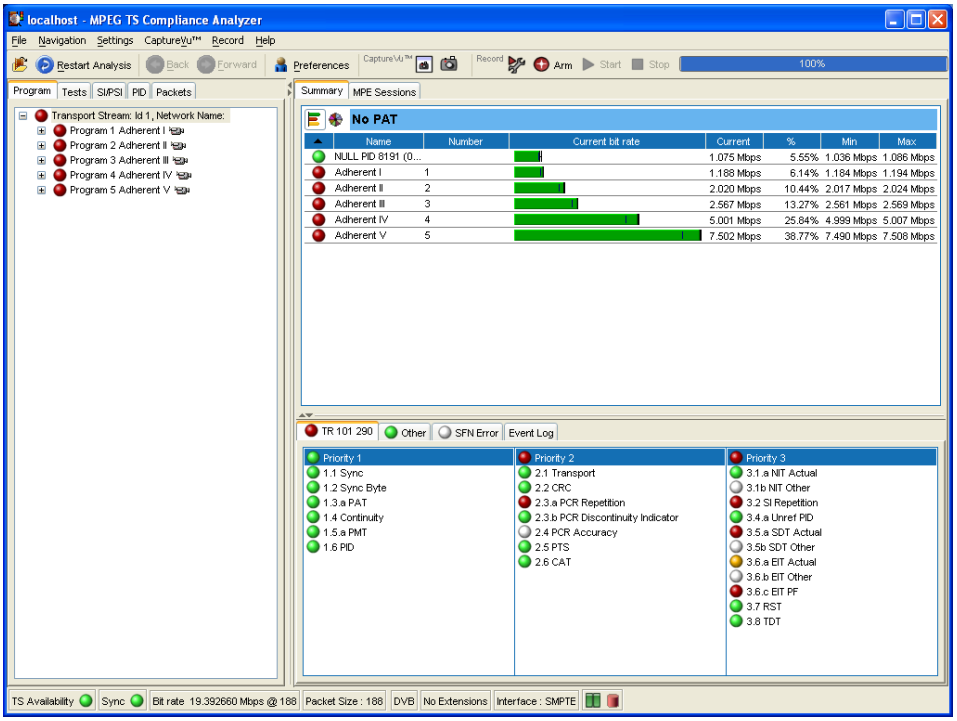


Figure 2–11: SMPTE310M interface analysis results

Verifying the SPI Interface

37. In the MPEG Player window, stop the player by clicking on the black Stop button on the tool bar.

38. Start the TS Compliance Analyzer by double clicking the 

icon on the desktop.

39. In the MPEG Player tool bar, click the green Play arrow to start playing the transport stream file.

40. In the Open Transport Stream window, click Real Time Analysis.

41. In the Interfaces drop-down box, select DVB Parallel.

42. Click OK to close the Open Transport Stream window.

After a few seconds, the TS Compliance Analyzer window opens with the analysis results of the SPI transport stream (see Figure 2–12).

43. Verify the following in the analyzer window:

- The TS Availability and Sync indicators at the bottom left of the analyzer window are green.
- The bit rate readout at the bottom of the window reads 19.393 Mbps.

***NOTE**. It is normal if indicators other than the TS Availability and Sync turn red. This merely indicates that the software is operating and has detected errors in the transport stream.*

44. Close the TS Compliance Analyzer by clicking Exit in the File menu.

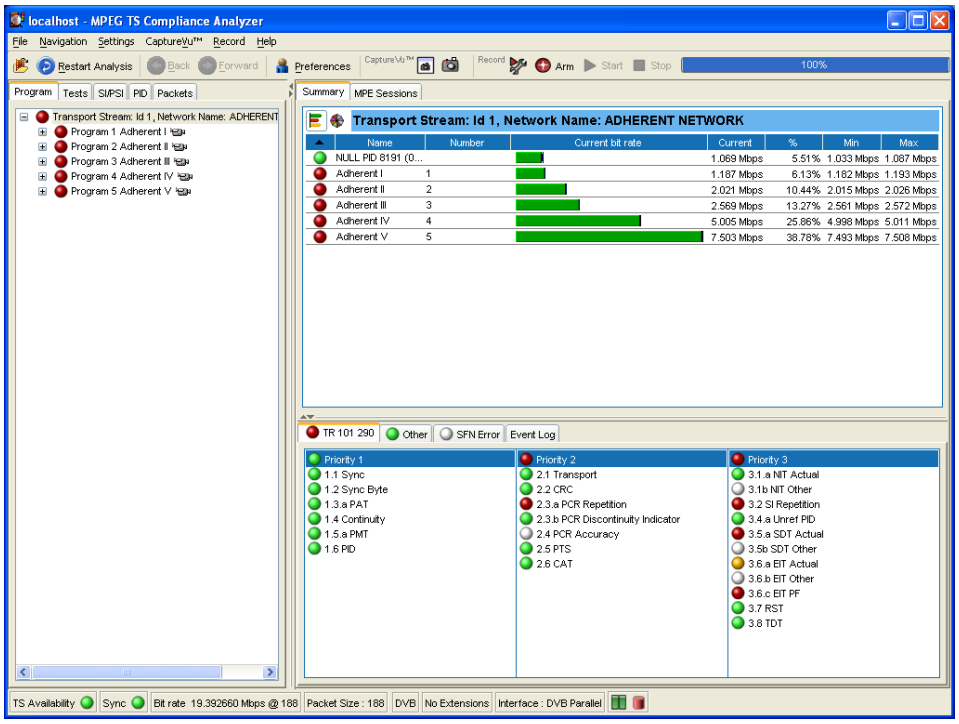


Figure 2–12: SPI interface analysis results

RF Interfaces

The following steps ensure that any RF interfaces installed in the instrument is available; only one interface can be installed at a time.

45. Start the TS Compliance Analyzer (TSCA) by double clicking the icon on the desktop.

46. In the TSCA Open Transport Stream window, click Change... in the Stream Interpretation section.

47. Make the following setting changes in the Stream Interpretation display (see Figure 2–5).

a. Select DVB as the Base Standard.

b. Select No Extensions as the Region.

48. In the Open Transport Stream window, click Real-time Analysis.

49. In the Interfaces drop-down box, select the RF interface, for example, as shown in Figure 2–13, PSK.

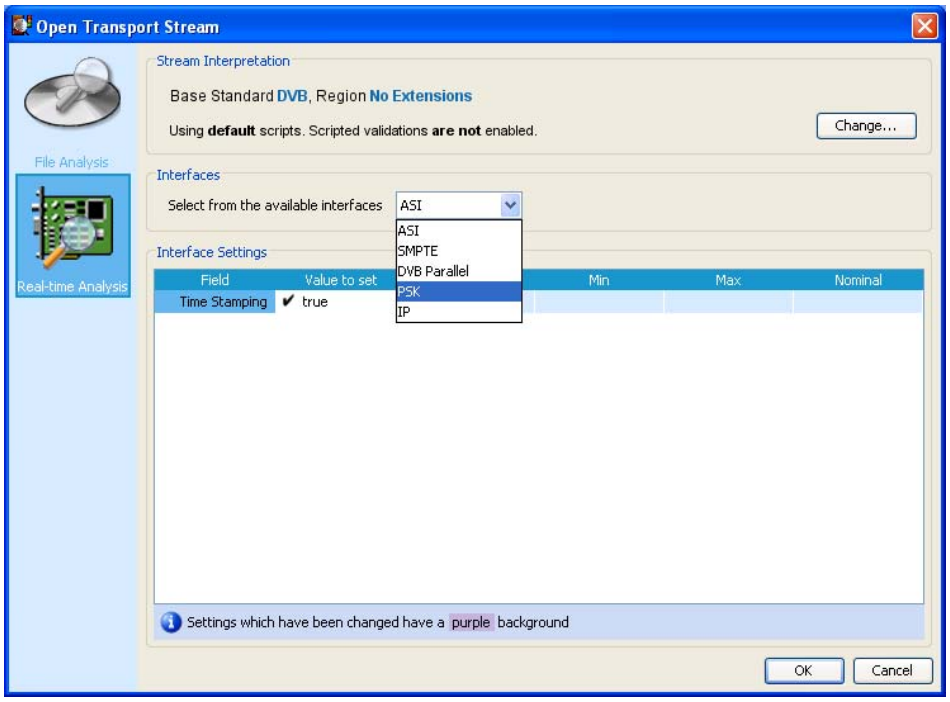


Figure 2–13: RF interface selection

50. Note that the Firmware version is current.

If the firmware version is not current, a message is displayed and the Update Firmware button is activated. Click Update Firmware and allow the update to complete.

51. Note that the Interface Settings are displayed. See Figure 2–14. If you want to proceed with analysis, you may need to change the settings to suit your local setup.

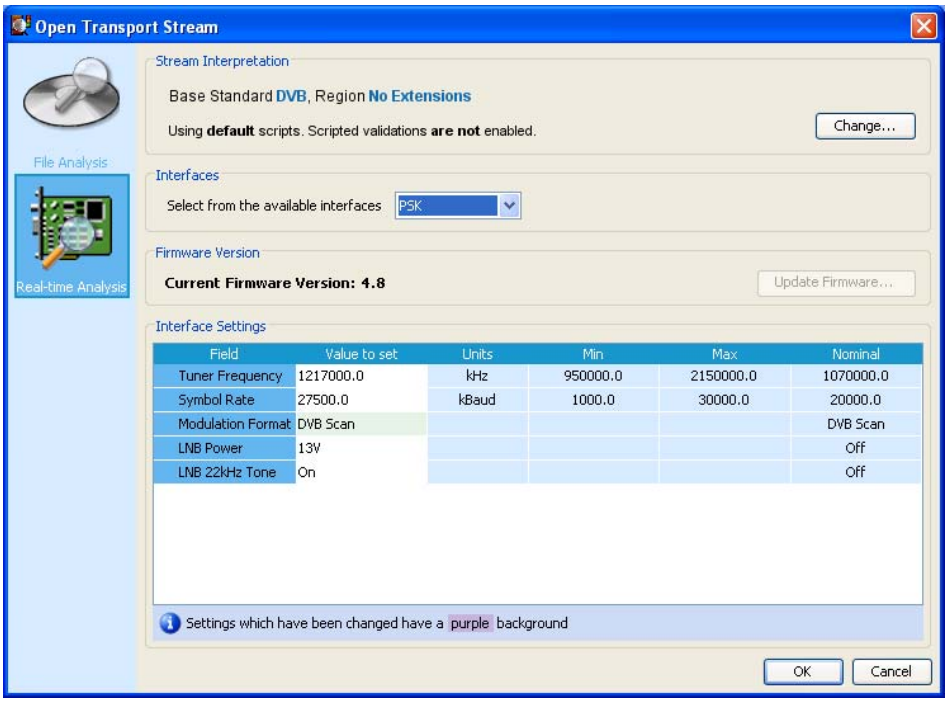


Figure 2–14: RF interface settings

52. Click OK to close the Open Transport Stream window and proceed with analysis.

After a few seconds, the TS Compliance Analyzer window opens with the analysis results of the ASI transport stream (see Figure 2–7).

Shutting Down the Instrument

53. After you have checked the SPI interface, you have completed the Performance Verification procedures. Perform the following steps to power down the instrument:

a. Select Shutdown from the Start menu. After the instrument shuts down, you will see a message saying its safe to turn off the instrument.

b. Use the front-panel power switch to turn the instrument off.

c. Remove the two signal cables from the rear panel of the instrument.

d. Remove the power cord from the instrument.