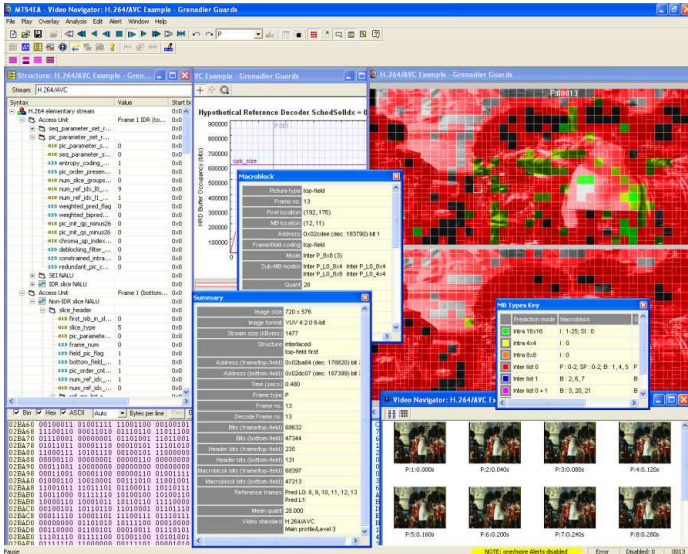


MTS4EAB Elementary Stream Analyzer

Compressed Video and Audio Analysis Software Data Sheet



- Buffer Analysis with Graphical Plots – Spatial Bits/MB, MV Histogram, Quantization, DCT Frequency, MB Coded Frequency, Intra-coding Frequency
- Video Differencing and Fidelity Analysis
- Bitstream Editor for Making Changes, Reanalyzing the Stream, then Saving
- Exports Data for Detailed Graphical Analysis (requires Microsoft Excel®)
- Comprehensive Batch Mode for Automated Regression Testing with Log Reports
- YUV Decoded Video Output for Baseband Video Analysis
- Audio Compression Analysis (Option)
- AV Delay Measurement (Option)
- Built-in Help and Tutorials

Features & Benefits

- Video and Audio Decode and Analysis
- Verification of the Stream's Compliance with the Encoding Standard
- Extraction of Elementary Streams from Containers
- Comprehensive Stream Navigation and Tracking to Follow All Aspects of the Decoding Process
- Multiple Displays and Overlays of Codec Information
- Synchronized Video, Audio, and Data Views for Instant Cross Reference
- Wide Range of Frame and Macroblock Statistics, Syntax Traces – Bitstream, Interpret, Alerts, Frame, Macroblock, Transform, Pixel Level, Fidelity Traces

Intended Users and Applications

- Equipment Manufacturers
 - Video Codec Software and Hardware Developers
 - Semiconductor Device Designers and Manufacturers
 - STB, PVR, DVD Consumer Electronics Developers for Cable, Satellite, Terrestrial, and IP
 - Video Conferencing and Communications Equipment Developers
 - Mobile Video Infrastructure and Handset Developers
- Video Content Transmission and Distribution
 - CODEC and Equipment Evaluation and Comparison in Cable, Satellite, Terrestrial, and IP Applications
 - Network Operators and Network Equipment Providers
 - Application and Service Providers and Streaming Media Applications
 - Broadcasters for Checking AV Delay

Elementary Stream Analysis

MTS4EAB Elementary Stream Analyzer is a powerful PC-based software package for the deferred time analysis of encoded audio and video elementary streams. Supported video standards include H.264/AVC, VC-1, MPEG-2, MPEG-4 part 2, and H.263. Supported audio standards include MPEG-2 audio, AAC, and AC-3.

MTS4EAB is available for stand-alone or networked PCs, and for Tektronix MTS4000 MPEG Test Systems.

Video compression standards are complex and involve many elements which are vitally important to the efficiency and interoperability of compressed video in different applications. MTS4EAB provides verification of the compliance of the stream against the compression standard, detailed analysis and statistics of the video and audio streams, tools for editing and debugging the stream, fidelity comparison against the original uncompressed stream, and checking for any video and audio delay. Analysis of intermediate H.264/AVC transform values is included, as well as ARIB TR-B14 compliance verification. It enables equipment and systems developers to test and bring new designs rapidly to market, and video users to test compliance, interoperability, and performance of compression products. Streams can be outputted for use with the Tektronix PQA600 Picture Quality Analyzer.

Standards Supported

Video

- H.264/AVC/MPEG-4 Part 10 – Baseline, Extended, Main, High 10, High 4:2:2, and High 4:4:4 profiles all levels 1 to 5:1
- H.264/AVC Intra profiles, High10, High422, High444, and CALVC at levels 1 to 5.1
- H.264/AVC Scalable Video Coding (SVC) Extensions – Baseline, High, and High Intra profiles at levels 1 to 5.1
- MPEG-2 – Main Profile at Main, High, and High 1440 levels, 4:2:2 Profile at Main and High levels
- VC-1 – All profiles at all levels
- MPEG-4 Part 2 – Simple Profile at levels 0 to 5 and Advanced Simple Profile at levels 0 to 5
- H.263 Baseline
- Uncompressed YUV, RGB, or Grayscale Color Models, 8 to 16 bit Sample Depth, various Chroma Subsampling Formats

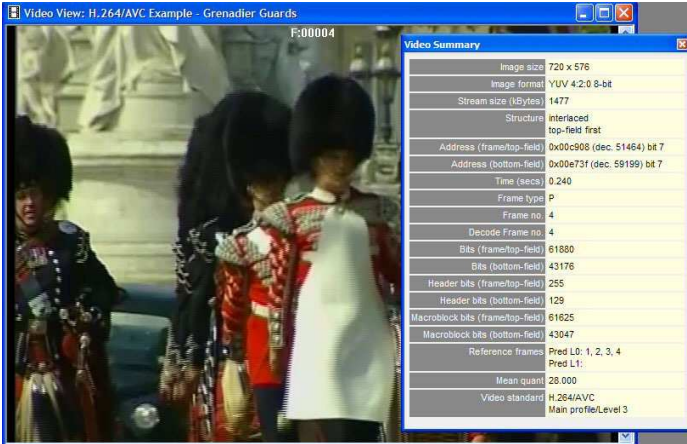
Audio

- MPEG-1 Part 3 Layers I and II
- MPEG-2 Part 3 Layers I and II
- MPEG-2 Part 7 (AAC) Main (Excludes LC and SSR)
- MPEG-4 Part 3 (HE-AAC) AAC Main, AAC LC (Low Complexity, AAC LTP (Long-term Prediction), SBR (Spectral Band Replication))
- Dolby Digital (AC-3) Baseline Standard, Annex D: Extended/Alternate Bit Stream (Playback and Waveform only)

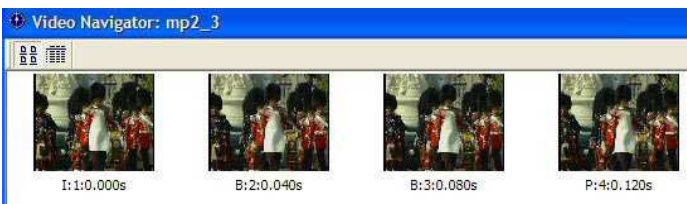
System Layer

Elementary Streams contained within:

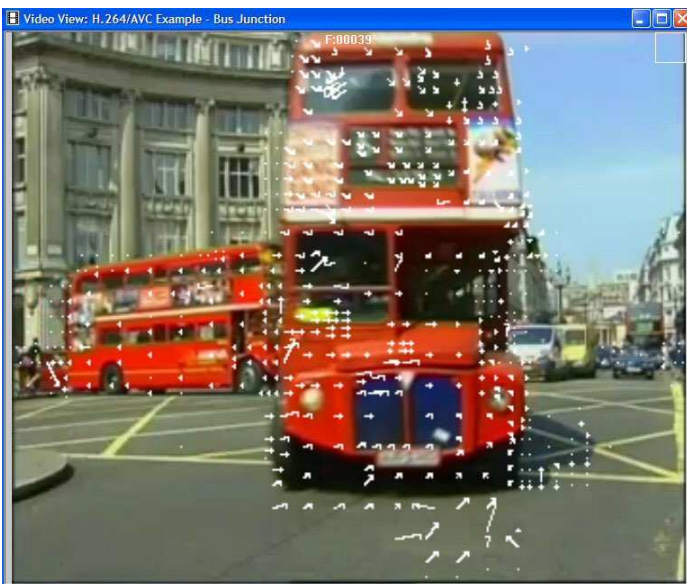
- MPEG-2 Transport/Program Streams
- MP4 Parts 1, 12, and 15
- ASF
- 3GPP
- DVD VOB
- Quicktime MOV



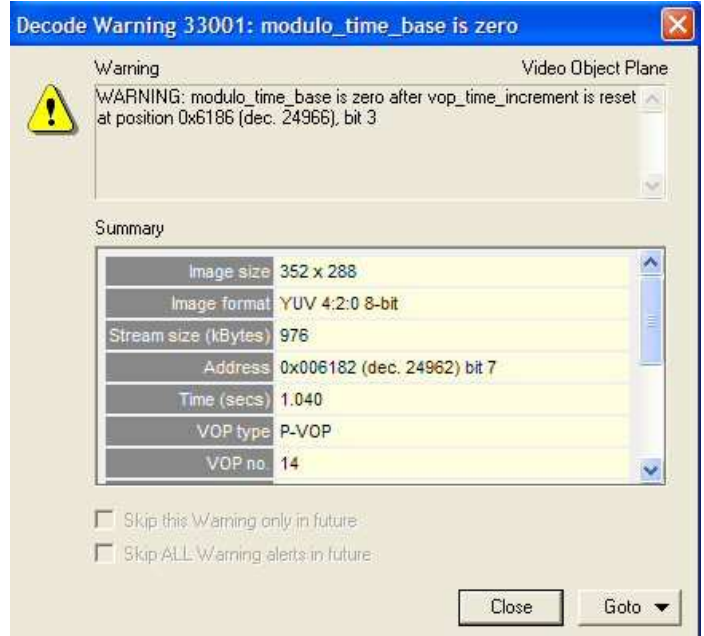
Frame Summary



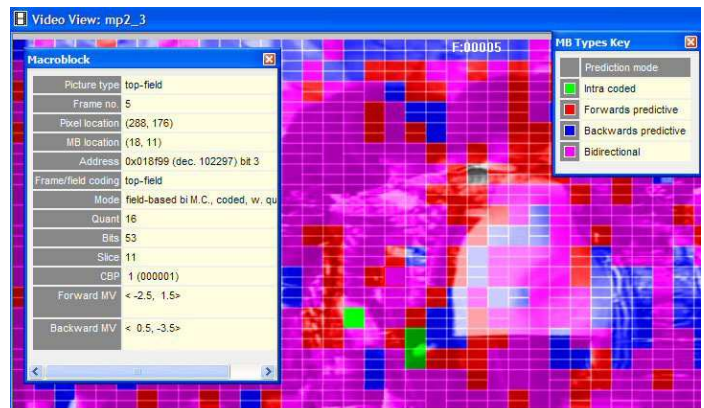
Video Navigator



Motion Vectors

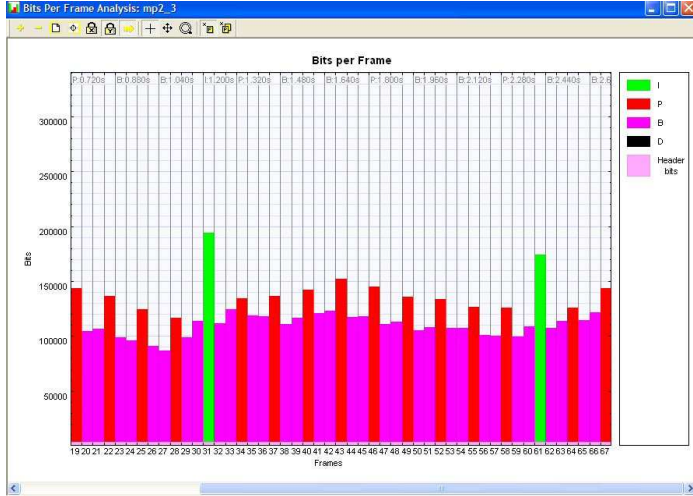


Real-time compliance testing and Error Alerts



Macroblock Overlays and statistics

Data Sheet



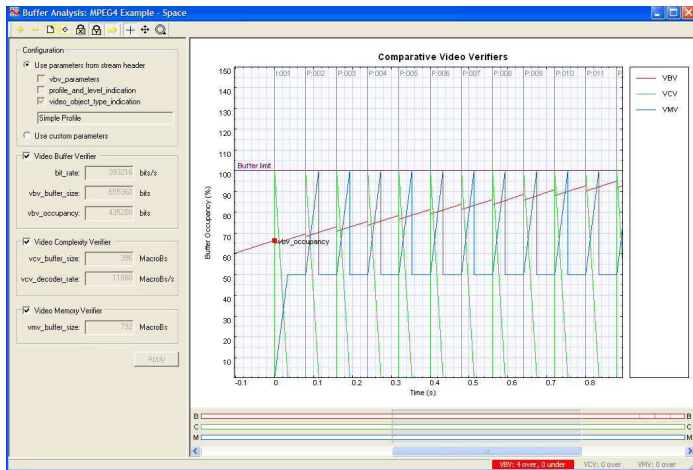
Frame Statistics

Structure: H.264/AVC Example - Grenadier Guards (video)

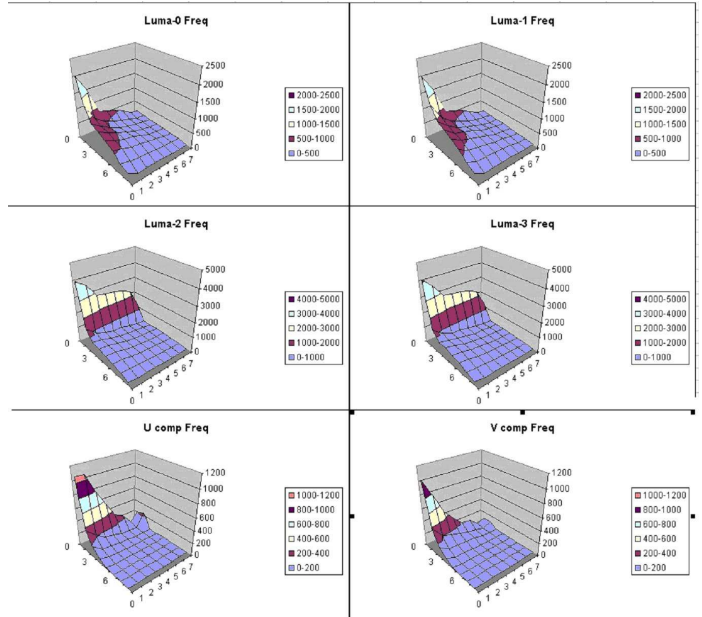
Stream: H.264/AVC

Syntax	Value	Start bit	Size (bits)
H.264 elementary stream		0x000000,7	12097552
Access Unit	Frame 1 IDR (to...)	0x000000,7	149592
seq_parameter_set_r...		0x000005,7	234
pic_parameter_set_r...		0x00002a,7	24
01X pic_parameter_s...	0	0x00002a,7	1
01X seq_parameter_s...	0	0x00002a,6	1
123 entropy_coding_...	1	0x00002a,5	1
123 pic_order_presen...	1	0x00002a,4	1
01X num_slice_groups...	0	0x00002a,3	1
01X num_ref_idx_l0_...	9	0x00002a,2	7
01X num_ref_idx_l1_...	1	0x00002b,3	3
123 weighted_pred_flag	0	0x00002b,0	1
123 weighted_bipred...	0	0x00002c,7	2
01X pic_init_qp_minu...	0	0x00002c,5	1
01X pic_init_qs_minu...	26	0x00002c,4	1
01X chroma_qp_index...	0	0x00002c,3	1
123 deblocking_filter...	0	0x00002c,2	1
123 constrained_intra...	0	0x00002c,1	1
123 redundant_pic_c...	0	0x00002c,0	1
sei_rbsp		0x000033,7	144
sei_message		0x000033,7	72
101 last_payload...	0x0	0x000033,7	8
101 last_payload...	0x7	0x000034,7	8
buffering_per...		0x00003b,6	49
101 bit_equal_to...	'1'	0x00003b,6	1

File Structure



Buffer Analysis



Graphical Analysis

Trace: avc_3_video.vpt

```

Standard: H.264/AVC, Baseline profile/Level 3
Frame size: 352x288
Filesize: 631 kBytes

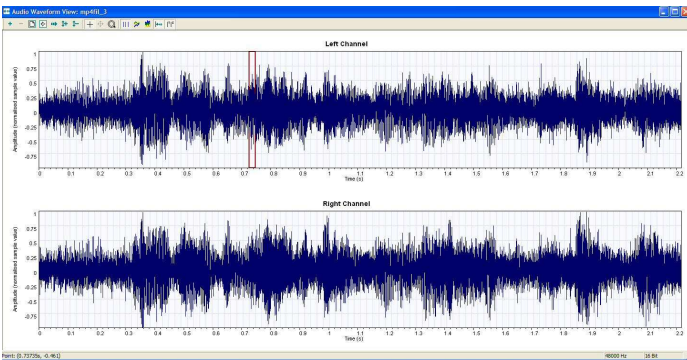
----- Frame=1 -----
(0x00000000,7) 0000 0000 ..... ZERO_BYTE
(0x00000000,7) [ES] zero_byte = 0x00
(0x00000001,7) 0000 0000 0000 0001 ..... START_CODE_PREFIX_ONE_BYTES
(0x00000001,7) [ES] start_code_prefix_one_bytes = 0x000001
(0x00000004,7) 0 ..... FORBIDDEN_ZERO_BIT
(0x00000004,7) [NAL] forbidden_zero_bit = 0
(0x00000004,6) 11 ..... NAL_REF_IDC
(0x00000004,6) [NAL] nal_ref_idc = 3 : Reference slice on SPS or PPS
(0x00000004,4) 0011 1 ..... NAL_UNIT_TYPE
(0x00000004,4) [NAL] nal_unit_type = 7 : Sequence Parameter Set (SPS)
(0x00000005,7) 0100 0010 ..... PROFILE_IDC
(0x00000005,7) [SPS] profile_idc = 66 : Baseline profile
(0x00000006,7) [SPS] constraint_set0_flag = 0 : May or may not obey A.2.1 constraints
(0x00000006,6) 0 ..... CONSTRAINT_SET1_FLAG
(0x00000006,6) [SPS] constraint_set1_flag = 0 : May or may not obey A.2.2 constraints
(0x00000006,5) 0 ..... CONSTRAINT_SET2_FLAG
(0x00000006,5) [SPS] constraint_set2_flag = 0 : May or may not obey A.2.3 constraints
(0x00000006,4) 0 ..... CONSTRAINT_SET3_FLAG
(0x00000006,4) [SPS] constraint_set3_flag = 0 : May or may not obey A.2.3 constraints
(0x00000006,3) 0000 ..... RESERVED_ZERO_4BITS
(0x00000007,7) 0001 1110 ..... reserved_zero_4bits = '0000'
(0x00000007,7) [SPS] level_idc = 30 : Level 3
(0x00000008,7) 1 ..... SEQ_PARAMETER_SET_ID
(0x00000008,7) [SPS] seq_parameter_set_id = 0 (bitstream values: length=1 bits, seq_parameter_set_id=0x1)
(0x00000008,6) 0010 1 ..... LOG2_MAX_FRAME_NUM_MINUS4
(0x00000008,6) [SPS] log2_max_frame_num_minus4 = 4 : MaxFrameNum = 256 (bitstream values: length=5 bits, log2_max_frame_num_minus4=0x6)
(0x00000008,1) 0 ..... PIC_ORDER_CNT_TYPE
(0x00000008,1) [SPS] pic_order_cnt_type = 0
(0x00000008,0) 0010 1 ..... LOG2_MAX_PIC_ORDER_CNT_LSB_MINUS4
(0x00000008,0) [SPS] log2_max_pic_order_cnt_lsb_minus4 = 4 : MaxPicOrderCntLsb = 256 (bitstream values: length=5 bits, log2_max_pic_order_cnt_lsb_minus4=0x6)
(0x00000009,3) 0011 0 ..... NUM_REF_FRAMES
(0x00000009,3) [SPS] num_ref_frames = 5 (bitstream values: length=5 bits, num_ref_frames=0x6)
(0x0000000A,6) 0 ..... GAPS_IN_FRAME_NUM_VALUE_ALLOWED_FLAG
(0x0000000A,6) [SPS] gaps_in_frame_num_value_allowed_flag = 0
(0x0000000A,5) 0000 1011 0 ..... PIC_WIDTH_IN_MBS_MINUS1
(0x0000000A,5) [SPS] pic_width_in_mbs_minus1 = 21 : PicWidthInMbs = 22 : PicWidthInSamplesI = 352; PicWidthInSamplesL = 352
(0x0000000B,4) 0000 1001 0 ..... PIC_HEIGHT_IN_MAP_UNITS_MINUS1
(0x0000000B,4) [SPS] pic_height_in_map_units_minus1 = 17 : PicHeightInMapUnits = 18 : (bitstream values: length=4 bits, pic_height_in_map_units_minus1=0x11)
(0x0000000C,3) 1 ..... FRAME_MBS_ONLY_FLAG
(0x0000000C,3) [SPS] frame_mbs_only_flag = 1 : Every picture is a coded frame with frame MBs only.
    
```

Trace Views

Stream edit: H.264/AVC Example - Bus Junction

Edit No.	Type	Edited address	Original address	Size (bits)	Data
04724	1	0	---	---	RESync ALIGNMENT_ZERO_BIT
04724	0	0	---	---	RESync ALIGNMENT_ZERO_BIT
04725	7	00000000	---	00	ZERO_BYTE
04726	7	00000000	00000001	00 00 01	START_CODE_PREFIX_ONE_3BYTES
04729	7	0	---	---	FORBIDDEN_ZERO_BIT
04729	6	10	---	---	NAL_REF_IDC
04729	4	00001	---	---	NAL_UNIT_TYPE
0472A	7	1	---	---	FIRST_MB_IN_SLICE
0472A	6	00110	---	---	SLICE_TYPE
0472A	1	1	---	---	FRAME_NUM
0472A	0	00000101	---	05	PIC_PARAMETER_SET_ID
0472B	0	00001010	---	0A	PIC_ORDER_CNT_LSB
0472C	0	0	---	---	NUM_REF_IDX_ACTIVE_OVERRIDE_FLAG
0472D	7	0	---	---	REF_PIC_LIST_REORDERING_FLAG_L0
0472D	6	0	---	---	ADAPTIVE_REF_PIC_MARKING_MODE_FLAG
0472D	5	00100000	00011001	00001001 10101110	20 19 09 AE
Frame 007					
04CE6	7	00000000	---	00	ZERO_BYTE
04CE7	7	00000000	00000001	00 00 01	START_CODE_PREFIX_ONE_3BYTES
04CEA	7	0	---	---	FORBIDDEN_ZERO_BIT
04CEA	6	00	---	---	NAL_REF_IDC
04CEA	4	00110	---	---	NAL_UNIT_TYPE
04CEB	7	00000001	---	01	LAST_PAYLOAD_TYPE_BYTE
04CEC	7	00000110	---	06	LAST_PAYLOAD_SIZE_BYTE
04CED	7	00000000	00000000	00000110	00 00 06
04CE0	7	00000000	00000000	00010011	00 00 13
04CF3	7	1	---	---	RESync STOP_ONE_BIT
04CF3	6	0	---	---	RESync ALIGNMENT_ZERO_BIT

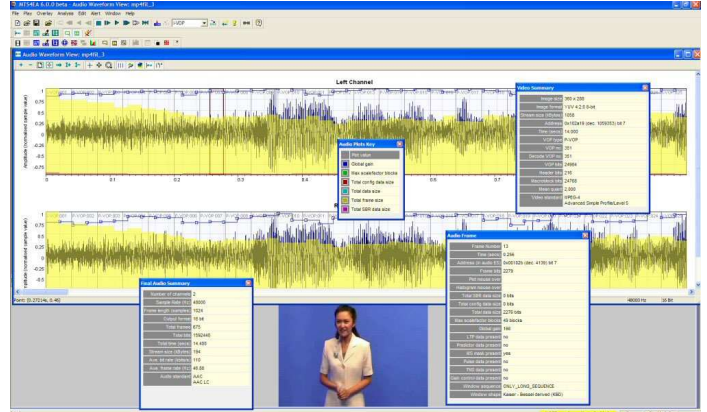
Stream HexView and Edit



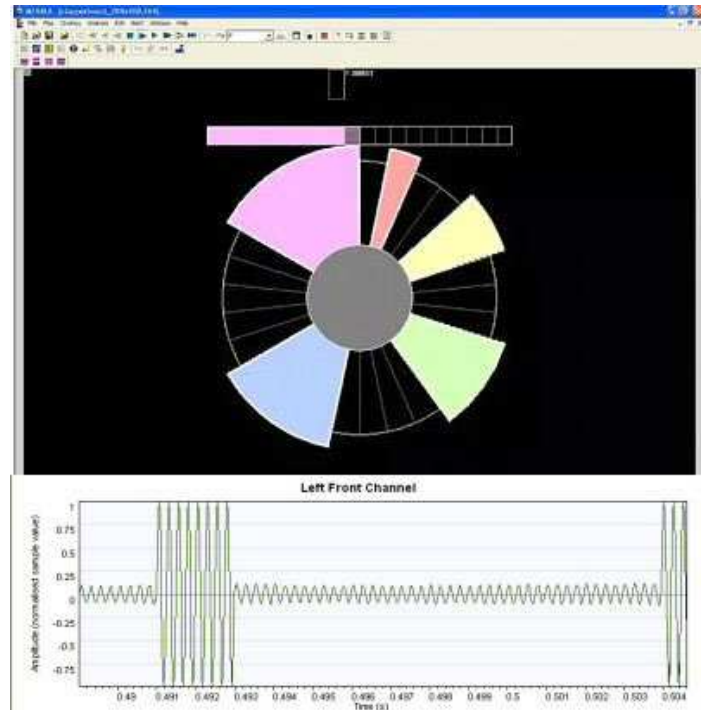
Audio channels

System Requirements

- Windows XP or 7
- Processor Speed > 1.5 GHz (2.5 GHz recommended)
- 512 MB or greater RAM
- 400 MB hard disk space



Audio Compression Analysis



Audio Video Delay Measurement

Ordering Information

Single-User Local License Version

MTS4EAB – Base software including: MPEG-2 Main Profile (Main, High, and High 1440 Levels) and 4:2:2 Profile at High Level, MPEG-4 Simple Profile, H.263, and TS Extraction.

Includes: English manual and CD.

Floating License Version

MTS4EAF – Base software including: MPEG-2 Main Profile (Main, High, and High 1440 Levels) and 4:2:2 Profile at High Level, MPEG-4 Simple Profile, H.263, TS Extraction, Floating License.

Includes: English manual and CD. This includes one license; for additional licenses, please order multiple copies.

Product Options

Option	Description
Opt. M4SP	MPEG-4 Advanced Simple Profile (Levels 0 to 5)
Opt. AVC	H.264/AVC Baseline, Extended, Main, and High Profiles with FRExT (10 bit, 4:2:2, 4:4:4), plus Intra and SVC Profiles
Opt. VC1	VC-1 (All Profiles, All Levels) and ASF Extraction
Opt. AUD	Audio Decode and Analysis (including MPEG-2 Layer 1 and 2, AAC, HE AAC), also includes AC-3 Decode
Opt. AVDM	AV Delay Measurement

Dongle Options

Option	Description
Opt. PPD	Parallel Port Dongle
Opt. USB	USB Dongle
Opt. LUD	Installation on a pre-existing MTS4000 dongle



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Contact Tektronix:

- ASEAN / Australasia** (65) 6356 3900
- Austria** 00800 2255 4835*
- Balkans, Israel, South Africa and other ISE Countries** +41 52 675 3777
- Belgium** 00800 2255 4835*
- Brazil** +55 (11) 3759 7627
- Canada** 1 800 833 9200
- Central East Europe and the Baltics** +41 52 675 3777
- Central Europe & Greece** +41 52 675 3777
- Denmark** +45 80 88 1401
- Finland** +41 52 675 3777
- France** 00800 2255 4835*
- Germany** 00800 2255 4835*
- Hong Kong** 400 820 5835
- India** 000 800 650 1835
- Italy** 00800 2255 4835*
- Japan** 81 (3) 6714 3010
- Luxembourg** +41 52 675 3777
- Mexico, Central/South America & Caribbean** 52 (55) 56 04 50 90
- Middle East, Asia, and North Africa** +41 52 675 3777
- The Netherlands** 00800 2255 4835*
- Norway** 800 16098
- People's Republic of China** 400 820 5835
- Poland** +41 52 675 3777
- Portugal** 80 08 12370
- Republic of Korea** 001 800 8255 2835
- Russia & CIS** +7 (495) 7484900
- South Africa** +41 52 675 3777
- Spain** 00800 2255 4835*
- Sweden** 00800 2255 4835*
- Switzerland** 00800 2255 4835*
- Taiwan** 886 (2) 2722 9622
- United Kingdom & Ireland** 00800 2255 4835*
- USA** 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

Updated 10 February 2011

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tektronix.com



Copyright © Tektronix, Inc. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks, or registered trademarks of their respective companies.

03 Jan 2012

2AW-18069-9

