

MTS4EAV7
HEVC / AVC Video and Compressed Audio Analyzer
Installation and Safety Instructions



071-3435-00

Tektronix

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HEVC / AVC Video and Compressed Audio Analyzer
Installation and Safety Instructions

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Compliance information

Environmental considerations

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

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

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



This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Preface

The MTS4EA HEVC / AVC Video and Compressed Audio Analyzer is a powerful real-time analytical tool for the investigation of compressed video and audio data that has been encoded using the H.265/HEVC, H.264/AVC, H.264/SVC, MPEG-1/2, MPEG-4 (including AAC and HE-AAC), VC-1, AC-3, and H.263 video standards.

The MTS4EA operates as a standalone software application for use on a personal computer (PC) in a Windows environment. It can also be installed on Tektronix MTS4000 MPEG Test Systems.

Product naming conventions

Although the order code for this product is MTS4EAV7, the product is generally referred to as MTS4EA throughout the software and documentation.

User manual and tutorials

The information in this manual is also provided in the MTS4EA Help system (press F1).

The PDF version of the *MTS4EAV7 User Manual* can be also accessed from MTS4EA Help menu > User manual (PDF).

The PDF version of the user manual is provided:

- Because it is sometimes easier/clearer to navigate through a PDF document than the standard Windows Help system
- So that you can easily print out additional copies of the manual

Tutorials are supplied as a separate PDF file accessible through the Help menu.

The PDF version of this manual and the tutorials are also on the installation CD-ROM.

Software, hardware, and user prerequisites

This section lists the various software, hardware, and user prerequisites for operating the MTS4EA software.

Windows operating system prerequisites

The MTS4EA software has been tested to run on the Microsoft Windows 7 operating system.

The MTS4EA software is not supported under any other operating system.

Audio playout prerequisites

In order to extract and play audio streams in the MTS4EA, the PC requires an audio device, correctly configured.

Computer prerequisites

The MTS4EA software will work satisfactorily on relatively modest PC systems (for example 800 MHz).

To decode and display CIF (Common Intermediate Format) video streams in real time the following minimum PC configuration is recommended:

- Windows 7, 64-bit operating system
- Processor speed >2.5 GHz
- Memory at least 4 GB RAM
- Screen resolution at least 1024x768
- 250 GB minimum hard disk space

When writing trace information to the hard disk, the limiting factor is the speed of the hard disk (regardless of the video standard), so the faster the better. Also, the video and Trace files can be large (hundreds of MB) so a large hard disk is needed:

- Hard disk speed: at least - 7200 rpm
- Hard disk size: as required for high-speed access to the video files to be analyzed plus Trace information

Trace file writing/RAM disk

The real limitation on speed is when the trace information is being written to disk. This is the slowest operation; roughly 2 MB to 4 MB of data are written per video frame for the more extensive trace functions. For H.265/HEVC video, if all of the options are selected, 800 MB to 1 GB of data are written per video frame.

For most customers, this is not a problem, but if you want to have the highest speed when playing video and writing the trace files, a RAM disk can be used. This uses some of the system memory to emulate a disk drive.

There are several software products that offer this functionality; search on the Internet for 'RAM disk'.

If a RAM disk is used, a memory configuration of at least 512 MB is recommended, with approximately 200 MB of RAM reserved for the RAM disk. This would allow a 200 MB Trace file to be saved on the RAM disk.

User prerequisites

The MTS4EA is sophisticated analysis software, which presents detailed information relating to the video and audio standards.

It therefore assumes that you understand these audio and video standards in significant detail and can therefore interpret the information presented by the MTS4EA.

A list of references are provided in the *MTS4EAV7 User Manual*.

MTS4000 MPEG Test Systems

You can install version 7.0 and above of the MTS4EA software on Tektronix MTS4000 Series MPEG test systems.

Installation and licensing

This chapter describes the MTS4EA license type and the installation of the MTS4EA software and license server.

License type

The MTS4EA software is provided with a floating license, which uses a software key located on a license server or local machine to provide the license key.

This means that in order to run the MTS4EA software, you must have the MTS4EA software key installed on the computer or server running the software.

NOTE. *The software key is very important as it contains the MTS4EA license and therefore embodies the value of the MTS4EA product. If the software key is lost, you will have to purchase another software key, which may be at full list price of the software.*

All product options are visible in the installed MTS4EA menus. Options that are not enabled by the license will be unavailable (grayed out). The status and scope of the license can be checked at any time by clicking on the License manager option in the Help menu.

License server requirements

The floating license uses a software key located on a license server or local machine to provide the license key.

Note the following system requirements:

- The software key will require a USB connection on the remote server or local machine.
- If installed on a remote server, a license server process must be run on the server machine (this process has modest requirements for CPU load).
- If installed on a remote server, clients require TCP/IP access to the server (this could be provided via VPN between remote sites).

MTS4EA software installation

The MTS4EA software installer provides two setup choices: Local machine and Remote server. If you are going to install the MTS4EA software on a remote server, the server that is to host the license software must be set up first.

The MTS4EA floating license system enables a single software key (the DES DK2 dongle) to serve up licenses to multiple users connected over a network. The software key is pre-programmed with licenses before shipment.

To install the floating license system on the network, you must:

- Install the DK2 Network Server software on a server (the license server).
- On every client that is to use the floating license, install the MTS4EA software that also installs the DK2 client software.

If you are going to install the MTS4EA software only on a local machine, proceed to *Install the MTS4EA software*. (See page 6.)

Install the license server

A license server hosts the software key, which contains one or more licenses. It is possible to have several license servers on the network, each with their own software key, forming a pool of licenses for the clients to use. It is also relatively easy to have a machine acting as both a server and a client.

To allow a machine to act as a license server, the following procedure should be repeated on each machine:

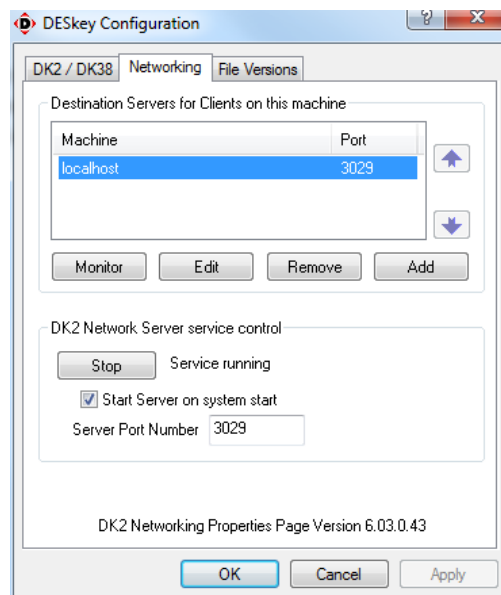
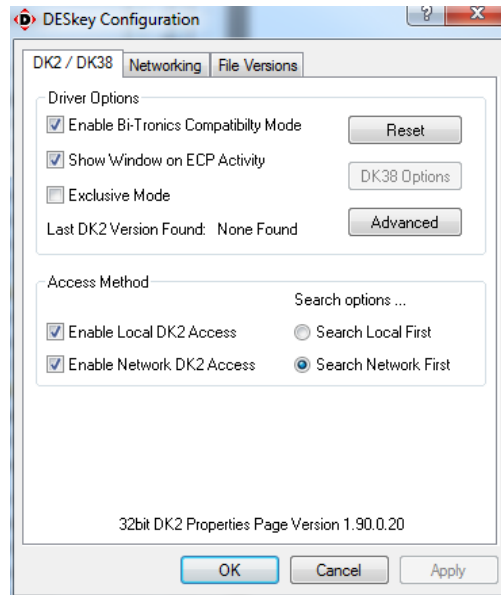
1. Select a server machine and connect the software key (either via the USB port or parallel port depending on software key type).
2. On the server machine, insert the MTS4EA installation CD.

NOTE. *When the CD is inserted, the MTS4EA setup screen will be displayed. Select the Close button at the bottom of the window to terminate the MTS4EA installation program.*

3. Using Windows Explorer, locate and open the DES directory. Run the program named `dnsv32.exe`. During the installation process, accept the default entries.
4. Reboot the server machine if requested to do so at the end of the installation process.

5. Open the Control Panel (Windows Start > Settings > Control Panel) and select the DESkey icon. This will show the DESkey Configuration dialog, the first two tabs of which are shown in the following illustrations (note the version numbers shown near the bottom may vary).

NOTE. For the server installation, the DK2/DK38 tab and the top half of the Networking tab can be ignored; these refer to the client installation that shares the same configuration dialog.



6. Select the Networking tab. The field at the bottom labeled Server Port Number shows the port to be used for communication with any clients; the default is 3029. Press the OK button to finish.

Depending on the policy of your IT department, port 3029 may be blocked by the network firewall, in which case you will need to consult your network administrator for another unrestricted port. Enter the new port and click the Apply button. You may then get a prompt asking about restarting the server; select Yes – this will stop and start the network server service using the new port. When the port has been applied, press the OK button to finish. This does not cause the server to reboot; it only restarts the license server.

Install the MTS4EA software

If the MTS4EA is to be installed on a remote server, ensure that the following information is available:

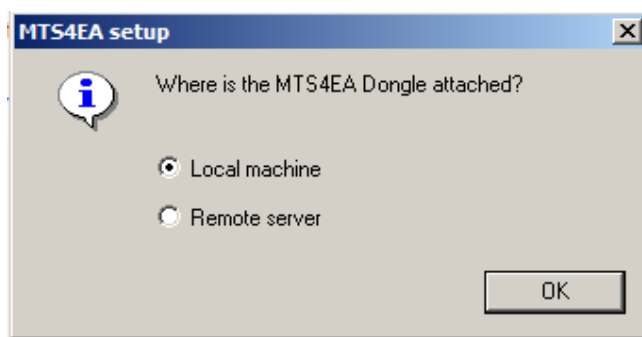
- The network identity of the floating license server
- The server port number

These parameters are set up in the *Install the license server* section. (See page 4.)

7. Insert the MTS4EA installation CD.

NOTE. *If the installation process does not start automatically, run setup.exe from the root directory of the installation CD.*

8. At the bottom of the window showing the readme file, click the Install button to start the installation.
9. Select the desired MTS4EA setup option.

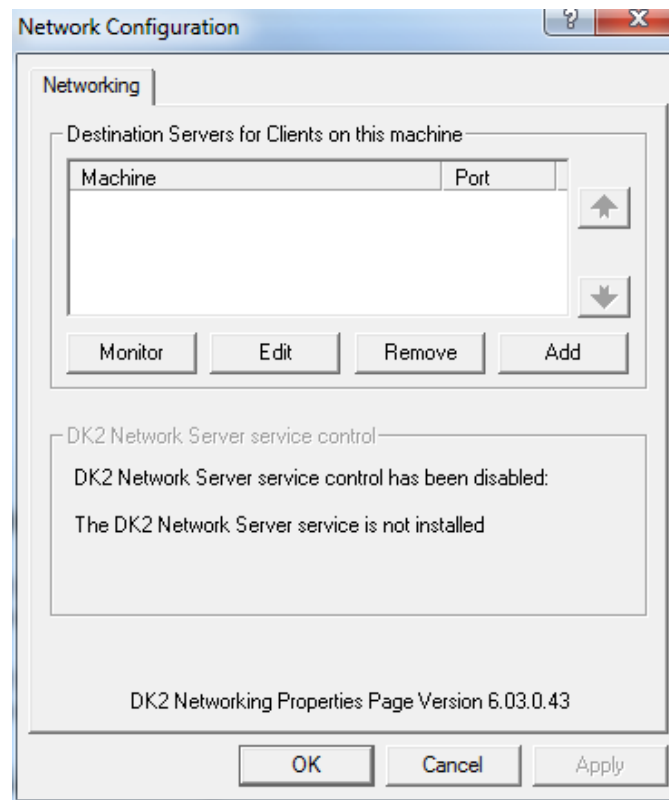


- a. Select **OK** to continue.
- b. If you selected the Local machine option, proceed to step 14.
- c. If you selected the Remote server option, proceed to the next step.

10. An initial dialog box is shown. Press **Next**. The DK2 software key driver is installed.

NOTE. If you have installed the license server on this machine, launching the client installation may show a dialog box titled *DK2 Driver/Server Object* that asks if you want to start the *DK2 Network Server* - attach the software key and select *Yes*.

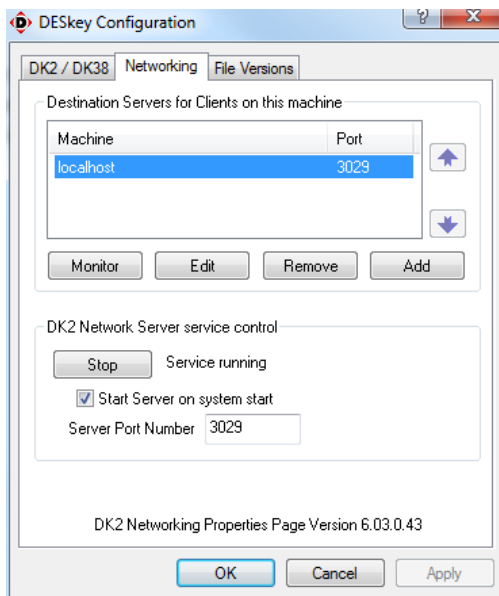
11. At the end of the driver installation setup, a Network Configuration dialog box will appear (shown below).



12. This enables the server(s) installed in the previous section to be added to the list of machines to query for licenses. If the required license server identity is not already listed, select **Add** and enter the required license server network identity and port number.

NOTE. If the DK2 installer detects a previous installation of the DK2 driver on this machine, the Network Configuration dialog box will not appear. In this case, allow the installation to proceed and complete. After installation, open the *DESkey Networking Configuration* dialog box (*Windows Start > Settings > Control Panel > DESkey > Networking tab*) and proceed as described below.

If you are installing the MTS4EA client software on the license server, the server name to add is localhost. This is shown in the Networking Tab diagram of the DESkey Configuration dialog box in the License Server section above. The actual name of the machine can be used if preferred.



NOTE. *Changes made to the Server list on the Networking tab will only take effect when the Apply button is pressed.*

13. Add all the servers that are to be accessible to this client, and then press the OK button to close the Network Configuration dialog box.



CAUTION. *At this stage, depending on the history of the machine, a prompt may ask to reboot. Select No, otherwise the MTS4EA installation will not complete correctly and need to be rerun.*

14. The MTS4EA installation will continue. When finished, reboot the machine.

Test the license server

To ensure that the previous installations were successful, perform the following steps:

15. If the MTS4EA software was installed on a remote server, remove any Tektronix DK2 software keys from the client machine and ensure the server machine has a suitably programmed software key connected.
16. Run the MTS4EA application using the desktop icon. If it starts, the license server is functioning correctly. If it does not start or displays the error message “DESkey dongle failure. Please see the manual for troubleshooting advice,” then check the following:

On the server machine, ensure the software key is inserted correctly and the DK2 Network Server service is running. The latter can be checked by opening the DESkey Configuration dialog box from the Control Panel. The Networking tab shows the status of the service - if it is not running, then start it and try the MTS4EA application again.

Troubleshooting the license server**If the service will not start**

Reboot the machine and try again. If it still does not work, it may be a faulty or disabled port. For a USB software key, check the Device Manager for a DESkey entry. (Open the Windows Control Panel, select the System icon, on the Hardware tab click the Device Manager button. Any problem will show up as a yellow triangle next to the DESkey entry.) For a parallel port software key, check that the port is enabled in the machine's BIOS settings. Try a different port connection if more than one is available.

It could also be a faulty software key, try connecting the software key to the client machine and run the MT4EA software again (ensure the Enable Local DK2 Access checkbox is selected in the DK2/DK38 tab of the DESkey configuration dialog box). If this works, the software key is working, so try another server machine. If this does not work, contact Tektronix Customer Support.

If the service starts but the MTS4EA will not run

Check with the network administrator that the port being used is not being blocked by a firewall. If it is either get it unblocked or choose another port, changing it in both the server and all clients; remember to press Apply in the associated dialog boxes before closing them.

On the client machine, check the machine name entered in the client server list is present and correct. If you entered it manually, try navigating to it using the Browse feature to confirm that it is correct.

Check that the port number specified by the server is the same as the port number specified in the client's server list.

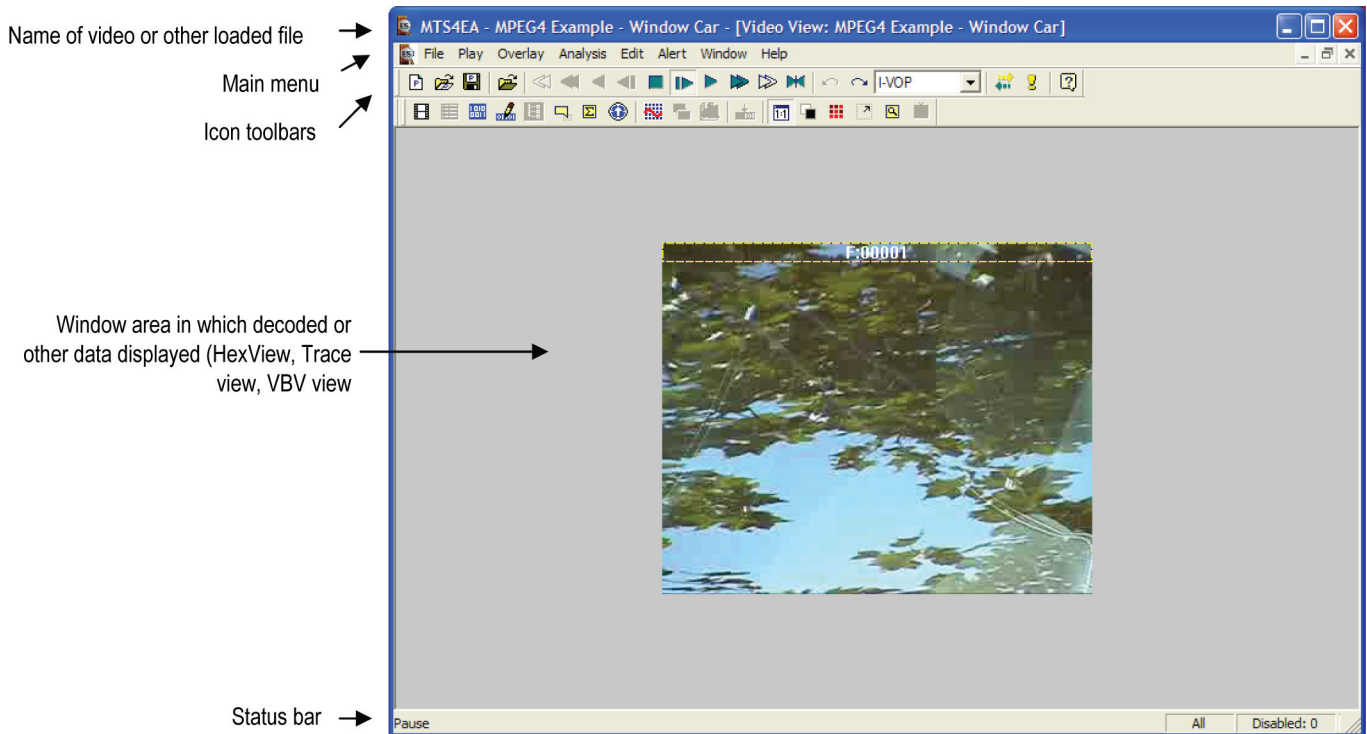
On the client machine, ensure the Enable Network DK2 Access checkbox is ticked on the DK2/DK38 tab of the DESkey Configuration dialog.

How to use the MTS4EA

This section:

- Describes the elements of MTS4EA display window.
- Tells how to start using MTS4EA display. (See page 12.)
- Summarizes the functions for each of the main menus. (See page 22.)

Window elements

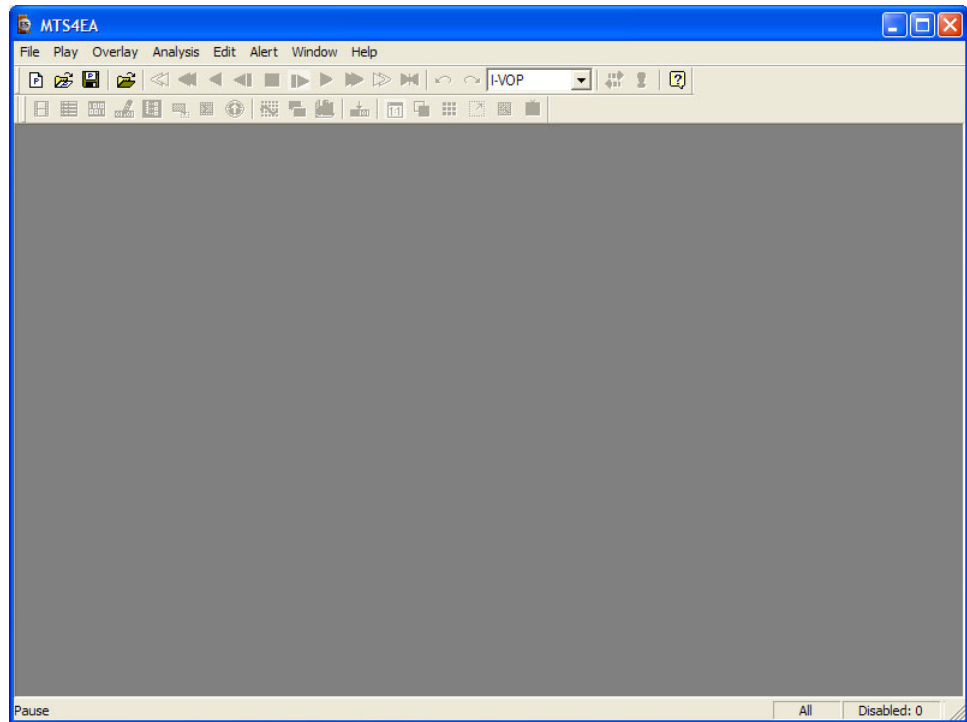


NOTE. The above screenshot was taken with the MTS4EA running under Windows XP.






In addition to the above toolbars/windows, there are multiple other toolbars that are visible when particular functions are enabled. Also, there are some toolbars, tooltips and menu items that are context-sensitive, depending on the video/audio standard being used and/or the explicit function being performed.

Starting to use the MTS4EA

When the MTS4EA starts, the display initially looks as below:

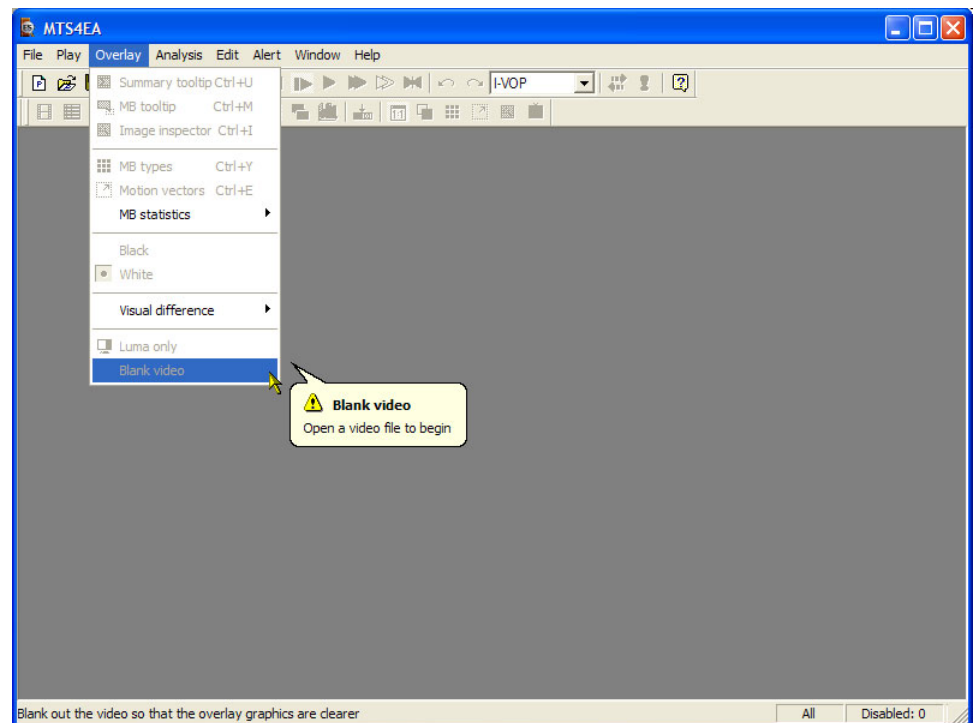


The gray background in the window indicates that no video or other files are loaded. The only icons on the toolbar that are currently enabled are the icons:

- For the Project (New Project , Open Project  and Save Project )
- Open stream 
- Help 


NOTE. Some features on some menus may stay permanently grayed out (unavailable). There are two possible reasons for this: the function or feature is never enabled or is not relevant to the standard you are using; or the existing license you have for MTS4EA does not allow all the features to be used - see *MTS4EA License Manager* in chapter 4 for more information.

When menu items are grayed out, leaving the mouse at the location of the grayed out menu item for a few seconds will display some popup text explaining why the menu item is disabled and/or how it can be enabled. The following example is on the Overlay menu, for the Blank video menu selection:



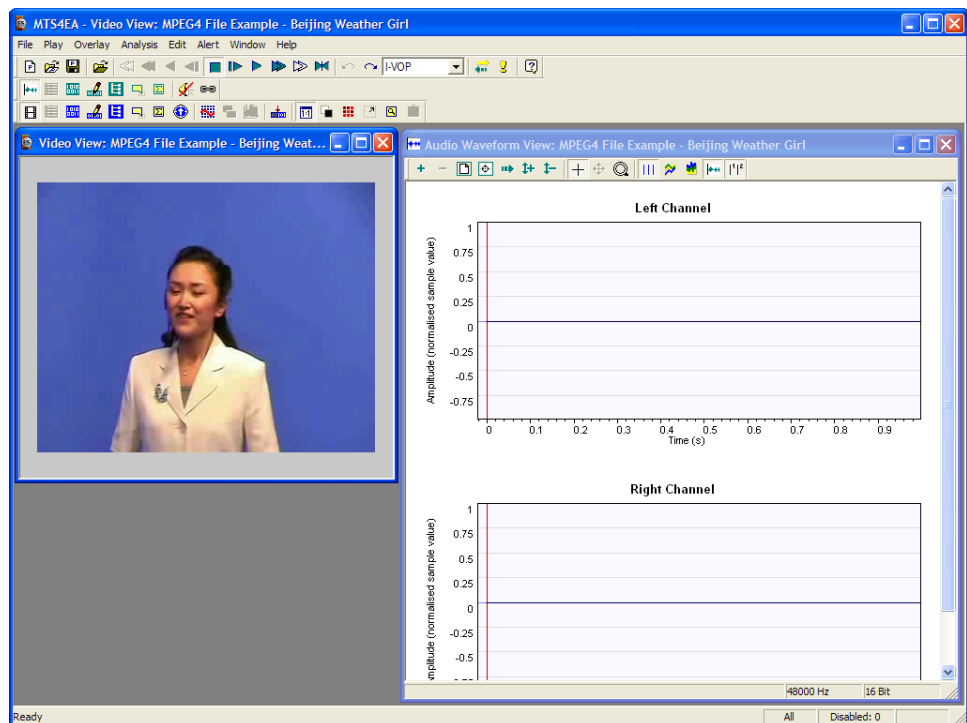
Opening a file

To open a file, do one of the following:

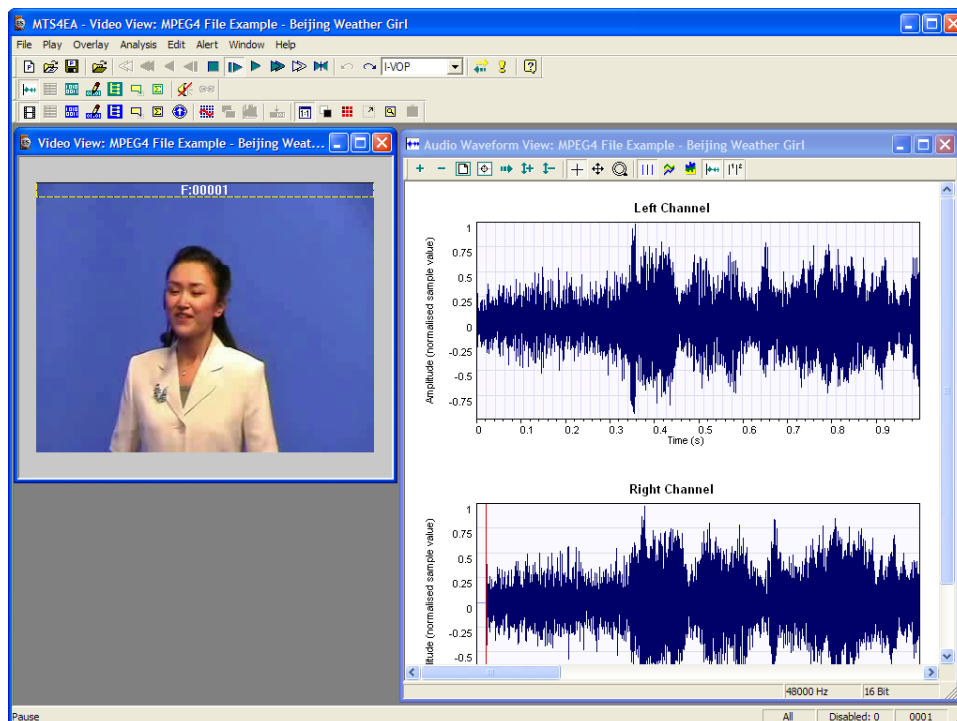
- Click on **File > Open stream**
- Click the Open file icon 
- Press Ctrl+O

When a stream is loaded, the first frame is decoded and displayed by the MTS4EA. While the first frame of the stream is displayed, the stream itself is not in Play mode, therefore Analysis options can be selected and configured.

In the following screenshot, the example file Beijing Girl is loaded with its first frame displayed, but as indicated by the Stop icon and the empty frame counter in the bottom right corner of the screen, the stream is yet to be played. Where there is audio content, the audio waveform view is also displayed.



If the loaded stream is initially advanced by one frame, the first frame is again decoded/played before entering the Pause mode. In this mode, Analysis options are not available. When stopped, the first frame reappears on the display until the stream is advanced/played further.



As is normal with Windows applications, the window can be dragged around within the frame of the application, resized, maximized, and minimized.

If another file is opened, then this replaces the file last opened; another window is not opened.

NOTE. You can open several copies of the MTS4EA to allow direct, side-by-side comparisons of multiple streams.

Playing mode restrictions

There are two Play modes: these are indicated at the lower left corner of the status bar:

- **Stop**: stream is stopped
- **Play**: stream is paused (after Pause/Step forward) or playing at normal speed, Fast forward, Blind, or Silent fast forward.

Certain actions can be performed only when the open file is in the appropriate Play mode. A few such examples are:

- The Trace enable and Graph enable options on the Analysis menu are only available in Stop mode.
- The real-time onscreen image overlays, such as MB types and motion vector overlay do not update the video window when in Stop mode

NOTE. See the *Audio/Video Synchronization* section in the *MTS4EAV7 User Manual* for further information and details on playing audio and audio-video synchronization.

MTS4EA projects

When working with the MTS4EA, the projects feature allows all current setups to be saved at any point and reloaded, for example, to allow work to recommence at exactly the same point. The project file includes information on the name of the file being analyzed, the open views and the location of these, plus many other items.

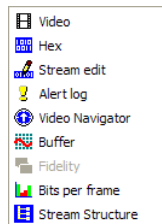
Synchronized views/navigating the views

When a video or audio stream is played, MTS4EA has many views of the video, audio and other data:

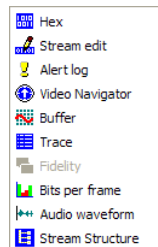
- Alert log
- Video view
- Audio/video hex, stream edit and navigator views
- Buffer analysis view
- Fidelity view (for example PSNR analysis)
- Bits per frame view
- Trace views
- Audio waveform, hex, alert, trace and stream edit views
- File structure view
- Excel graphs

Some of these views are linked. A right-click in one view will open a context menu with a Goto command that will take you to the corresponding location in another view (provided the file being played has both video and audio streams in order to bring up the Audio waveform view).

Example of Goto view menus:



From Trace file



From video view

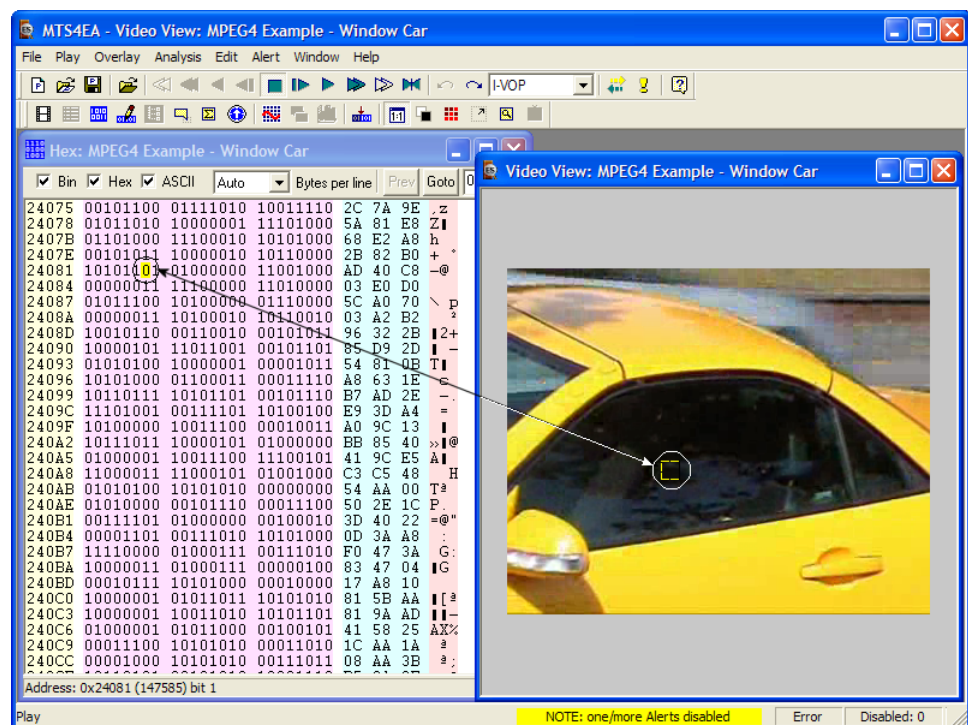
NOTE. When in the video or audio view, to make it easier to see which area of the window is providing the link to another view, there is always a small square or rectangle in the view that highlights the MacroBlock/CTU or frame for cross-referencing in the other view.

Example of moving between views. For example, when in the video view and using the MacroBlock/CTU tooltip, to see the hex/binary data for a specific MacroBlock/CTU, right-click at the MacroBlock/CTU location of interest and select Goto view from the context menu, and then select the HexView. The HexView window opens (if it is not already opened for this stream) and the first byte of the selected MacroBlock/CTU is highlighted.

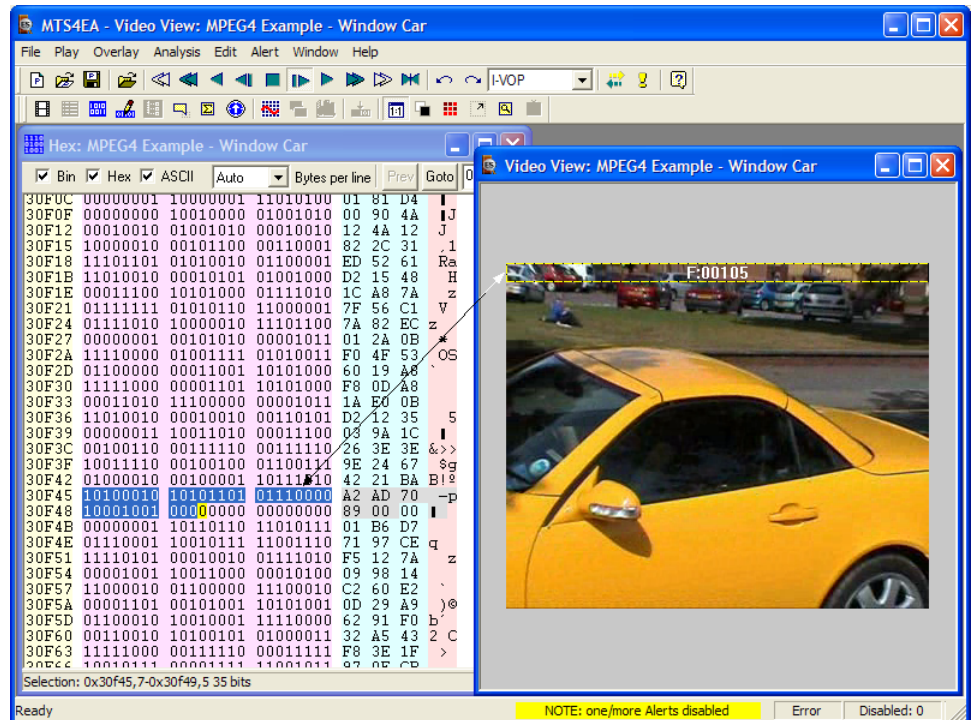
Selecting a specific byte in the HexView, and then using the right-click context menu to select the Video view will take the video window to the MacroBlock/CTU that contains the selected byte, with the MacroBlock/CTU highlighted. (See page 18, *Highlighting of selected areas in the video view.*)

Highlighting of selected areas in the video view. If a data area is selected in a view other than the video view, and the context menu is used to go to the video view, the corresponding area of the video view is highlighted, as follows:

- If the area can be resolved to a single MacroBlock/CTU, then a yellow and black dotted box is displayed around the MacroBlock/CTU concerned:





- If the area cannot be resolved to a single MacroBlock/CTU, then a yellow and black dotted rectangle is displayed surrounding the top row of MacroBlocks/CTUs in the video frame that contains the first selected area:



- If the selected area is in a frame or file header, not within a specific MacroBlock/CTU, then a yellow and black dotted rectangle is displayed surrounding the top row of MacroBlocks/CTUs in the video frame that immediately follows the frame or file header (see the preceding illustration: the data selected in the HexView window is in the VOP header, so the highlight rectangle is displayed across the top row of MacroBlocks/CTUs of the corresponding VOP).

Highlighting of selected areas in the audio view. Highlighting selected areas in the audio waveform view works in a similar manner to highlighting areas in the video view. (See page 18, *Highlighting of selected areas in the video view.*)

NOTE. An audio frame consists of a fixed number (per channel) of audio samples representing a fixed time length of decoded audio. Typically each iteration through the decode loop will output one audio frame of decoded audio.

Synchronization of views/Synchronize views icon.  When the Synchronize views icon  is pushed in, then all open windows automatically follow the selection that you made.

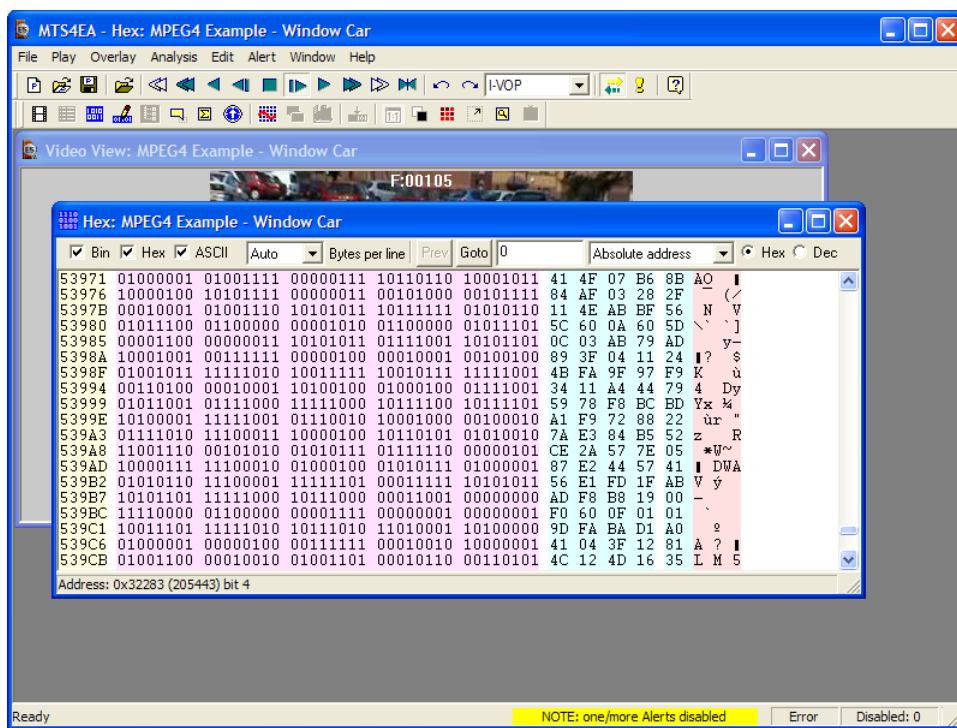
For example, if the Video Navigator and Hex views are both open at the same time as the Audio waveform view, and the Synchronize views icon is pushed in, and video is then played, all views display the same relative points in the stream at the same time.

NOTE. This can cause a delay when playing video for some views (such as the Trace views) or when the memory buffers used by the MTS4EA do not contain all the required data and therefore time is taken to decode and interpret the video and refill the buffers.

Opening multiple windows








Within the MTS4EA it is possible to open many windows at once. These can be:

- A video/audio window with another window, such as a HexView window with a video window (as shown in the following figure):




- Other combinations, such as the video/audio and HexView with the Trace file view and file structure view.

To open windows other than for video files (or files that contain video, such as MP4 or 3GPP files, or MPEG-2 Program/Transport Streams):

- For Trace views, do one of the following:
 - Select **File > Open other** (or click the icon ) to open a Trace file previously stored or associated with another video stream
 - Select **Analysis > View trace** (or Ctrl+V) to open the current trace file, as named in the Analysis menu - Trace tab
- To view the statistical graphs (in Excel), click on **Analysis > View graphs**
- For HexView, click on **Analysis > View stream hex** (or click the icon ) or press Ctrl+H)
- For the stream structure view, click on **Analysis > View file structure** (or click the icon ) or press Ctrl+R)
- For the buffer analysis view, click on **Analysis > View buffer analysis** (or click the icon )
- For the fidelity analysis, click on **Analysis > View fidelity analysis** (or click the icon )
- For the Alert Log, click on **Alert > View alert log** (or click the icon )
- For the Audio waveform view, click on the icon . (If there is audio content, the toolbar and the view will be displayed automatically when the video view is opened.)

NOTE. *The Audio waveform view is available only when an audio stream or file/project containing an audio stream or streams is open.*

- For the multi-caption buffer view (closed caption analysis), click the tooltip icon 

Main menus

The submenu options available under each main menu selection (for example, File, Play, Overlay) are described in detail in the *MTS4EAV7 User Manual*. A summary of each main menu item is given here.

Several of the common functions can be accessed through the icon toolbars and the Ctrl keys.

NOTE. *You can open more than one copy of MTS4EA to allow direct, side-by-side comparisons of multiple video streams.*

Functional summary for each main menu

Menu name	Principal functions/suboptions
File	Opening and saving files and projects, recent file list, example files, exit
Play	Play video and audio, stop, pause, fast forward, set decoder options
Overlay	Hide/show video/audio data and tooltips
Analysis	Set Trace and Graph options; view Trace, Graph files, Hex view, file structures, closed caption analysis, buffer analysis, fidelity analysis
Edit	Edit elementary video/audio stream, edit bitstream selection, save edited stream
Alert	Enable/disable/configure overall alert levels and individual alerts
Window	Arrange windows and toolbars, view settings, synchronize views, window list
Help	Help topics, PDF help and tutorials, license manager, version info

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