Channel Recorder

Administrator's Guide

Product Version 1.0

February 2, 2017

Contents

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Last Updated

February 2, 2017

1 Introduction

This is the Administrator's Guide for the **Channel Recorder**, containing details regarding the installation, configuration and operation of Channel Recorder.

Channel Recorder is a service that creates video clips, using an SDI or IP stream as source. It can be controlled using an arbitrary set of commands, or by remote applications utilizing the Multiport Video Computer Protocol (MVCP).

This section contains information on the following topics:

See Also

- Channel Recorder Control Commands

1.1 Customer Feedback and Suggestions

We encourage suggestions and feedback about our products and documentation.

To give feedback and suggestions, please identify your local Vizrt customer support team at www.Vizrt.com.

1. Click on **Contact** (top of page).
2. The Vizrt office which is nearest to your location will be shown, or select from the list of Vizrt offices.
3. Click on the Contact button for the office you want.
4. Complete the required details in the window that opens.

Note: If this message is for Customer Support, and there is a Support Contract in place, then click on the 'For support requests, please visit our support portal' link in the message window.

A Vizrt representative will contact you as soon as possible.

1.2 Customer Support Request

Support Requests are supported by Vizrt if Customers have a valid Service Agreement in operation. Customers who do not have a Service Agreement and would like to set up a Service Agreement should contact their regional sales representative (see Customer Feedback and Suggestions).

When submitting a Support Request relevant and correct information should be given to Vizrt Support, to make sure that Vizrt Support can give the quickest and best solution to your Support Request.

This section contains information on the following topics:

1.2.1 Before Submitting a Support Request

Before a Support Request is submitted make sure that you:

Read:

- The relevant User Guide or Guides (see Customer Feedback and Suggestions).
- The release notes.

and Check:

- That the system is configured correctly.
- That you have the specified hardware, tested and recommended versions

Always refer to your Vizrt Service Level Agreement document.

1.2.2 Submitting a Support Request

When completing a Support Request, add as much information as possible.

This section contains information on the following topics:

Content of a Support Request

The report should contain information about these topics:

- **Problem description:** Include a good description of what the problem is and how to reproduce it. Remember to use simple English.
- **Screen shots and illustrations:** Use to simplify the message.
- **System log files:** Send the System Log Files.
- **System dump files:** Send the system dump files from the crash (e.g. Viz Artist program folder <Viz install directory>).

  Note: Check: If the operating system is Windows 7 and up, dump files can be stored at: <userdir>\AppData\Local\VirtualStore\<Viz install directory> (check user rights).

- **System Configuration file:** Send the system configuration file (e.g. Viz Artist program folder <Viz install directory>).

  Note: If the operating system is Windows 7 and up, the configuration file can be stored at: <userdir>\AppData\Local\VirtualStore\<install_directory> (check user rights).

- **Software configuration:** Add exact versions of software (build) used.
- **Hardware configuration:** Add exact versions of hardware used.
- **System setup:** Describe differences in the installation, if any, from the recommended setup.
- **System Network:** Add a description of how the network, bandwidth, routers, and switches are configured.

Always refer to your Vizrt Service Level Agreement document.

To submit a Support Request

1. On the www.Vizrt.com page, click on Support.
2. Click on **Report a case**.
3. Click on **LOG IN** to login to the Customer and Partner portal.
4. At the top of the Case Management page, click on **Report a Case**.
5. In the online form complete the required minimum information (shown by a red asterisk) and click **SAVE**.
6. In the saved Support Case that opens, complete the various text boxes and upload any required documents, files, etc. (see Content of a Support Request).

To **track the status** of open support tickets, login to the Customer and Partner portal. Add information or communicate about the cases directly with the support team.

1.2.3 System Log Files

Log files provide important information when dealing with an error situation or when diagnosing performance issues. Consult your customer representative when deciding which logs files to attach. As a general rule: the more log files the better. Always try to include log files for:

- The actual software/hardware configuration in use, as detailed as possible.
- The relevant Viz Artist/Engine log files.

1.3 Related Documents

- Viz Artist User's Guide: Contains information on how to create graphics scenes in Viz Artist.
- Viz Engine Administrator's Guide: Contains information on how to install the Viz Engine software and supported hardware.

2 Hardware and Software Requirements

This section contains information on the following topics:

- Hardware Requirements
- Software Requirements

See Also

- References and Specifications

2.1 Hardware Requirements

The Channel Recorder can be run on the following machines:

- HP Z840
- Dell R7910 (2U) Rack Server

Please refer to the Viz Engine Administrator's Guide for a detailed description of these machines. The Channel Recorder can only be used with either of the following Video Cards:

- Matrox X.mio3 IP
- Matrox X.mio3
- Matrox DSX LE4

The Channel Recorder requires Matrox DSX.utils version 9.7.0.21679.

See Also

- Viz Engine Administrator's Guide

2.2 Software Requirements

Before installing the Channel Recorder, make sure you have done the following:

- Remove any previous version of the Channel Recorder
- Download the latest Channel Recorder installer from Vizrt's FTP server:

  ftp://download.vizrt.com/

3 Installation and Configuration

This section describes the installation requirements and procedure required to use the Channel Recorder. It contains information on the following topics:

3.1 Installation of the Channel Recorder

Channel Recorder runs as a Windows Service. In case of an upgrade, however, the installer will check for existing services and stop and restart them if located in the selected installation folder. Because the installer application for Channel Recorder does not register or unregister Windows Services, the installation consists of three parts;

1. Running the Channel Recorder Setup Wizard.
2. Installing the Visual C++ Redistributable for Visual Studio 2015.

   Note: The installation file for vcredist_x64/x86 is included with the Channel Recorder and can be started automatically by the Channel Recorder installer.

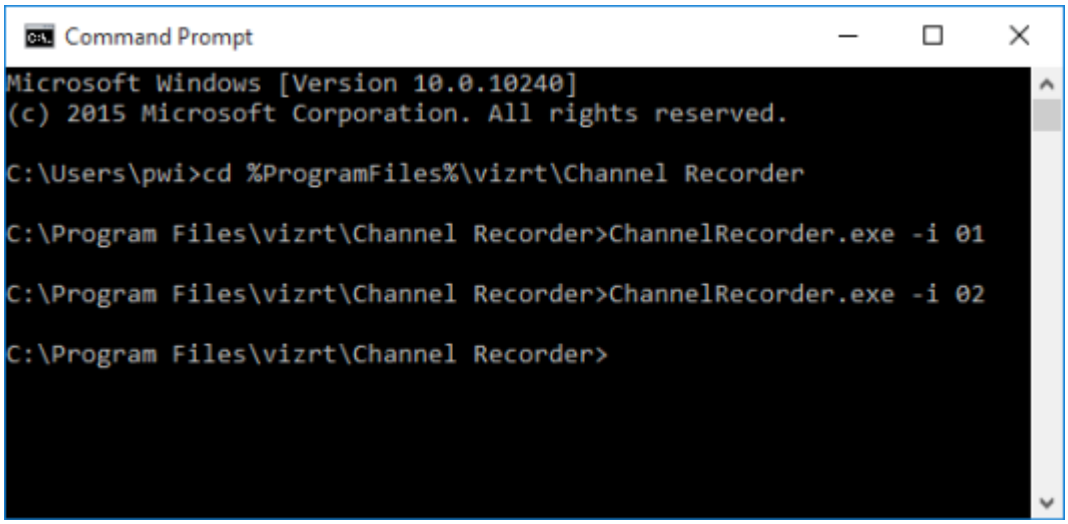
3. Manually registering the Channel Recorder as a Windows Service.

Before installing the Channel Recorder, please make sure to acquire the latest Channel Recorder installer from Vizrt's FTP server:

ftp://download.vizrt.com/

To install the Channel Recorder

1. Login to the computer as a Computer Administrator.
2. Run the Viz Channel Recorder Setup Wizard.
3. Click **Finish**. The installer will discover if the **Microsoft VC++ 2015 Redistributable** is already installed on the system. If not, the Visual C++ Redistributable for Visual Studio 2015 installation wizard starts automatically.
   - Complete the steps of the VC Redistributable installation wizard if required.
4. Proceed to register the Channel Recorder as a Service:



a. Open a Command Prompt Window.

b. Change to the Channel Recorder installation directory:

```
%ProgramFiles%\vizrt\Channel Recorder
```

c. Run the following command to register the Channel Recorder as a Windows Service:

```
ChannelRecorder.exe -i <ID>
```

`<ID>` references the two-digit, zero-padded unique service number, which should consecutively increase. The service uses this `<ID>` to determine which is the correct configuration file name. By registering Channel Recorder using the `-i <ID>` flag, the provided ID is added to the service name.

The Channel Recorder service will now automatically start at windows startup.

Upgrading or Repairing an Existing Installation

The Channel Recorder Setup Wizard is used when upgrading or repairing an existing installation of the Channel Recorder service.

When upgrading or repairing, the installer checks for any running services installed in the selected installation folder. If any such services are found, the installer will temporarily stop the service(s). If these services can not be stopped by the installer, an Error Message will be displayed and the Setup Wizard will close without making any changes. After a successful upgrade or repair operation, any previously running services stopped by the Setup Wizard will be restarted.

Please note that when upgrading, the Setup Wizard will check for any registered services manually installed in an installation folder different from the target folder. If any such service is detected, a Warning Message will be displayed stating that these services should be unregistered before continuing the installation, and the upgrade will be canceled.

See Also

- Channel Recorder Configuration
- Example Configuration File

- Removing Channel Recorder
- Channel Recorder Command Line Options
- Files and Directories

3.2 Channel Recorder Configuration

At startup, the program reads the configuration file:

```
%ProgramData%\vizrt\Channel Recorder\ChannelRecorder_startup_<ID>.conf
```

<ID> represents the zero-padded two-digit channel number. For example, the filename for channel 1 is `ChannelRecorder_startup_01.conf`.

A basic configuration would set the communication port:

```
COMMAND_HANDLER PORT SET 6810
```

then select a board identified by its serial number:

```
MAIN BOARD SELECT A100001
```

and finally set up the capture channel:

```
MAIN CONNECTOR SELECT A
```

This will set up a Channel Recorder for input A on a Matrox board with the serial number `A100001`.

Tip: The serial number on Matrox video boards can be found in the hardware tab of Matrox X.info, and, as seen in the above example, `A100001`, usually starts with an A.

To activate MVCP add the following line to the configuration file:

```
MVCP PORT 5250
```

This will open MVCP communication on port 5250.

IMPORTANT! To enable MVCP control of the Channel Recorder service, make sure to set the port for the MVCP communication. If this command is not passed to the Channel Recorder, MVCP will not be initialized.

The default file location for recorded clips is `v:\`. This can be changed with

```
CONFIG SET CLIP_ROOT v:/path/to/clips
```

Note: Any command which is recognized by the service is also valid in the configuration file.

See Also

- Channel Recorder Control Commands
- Channel Recorder Command Line Options
- Example Configuration File

3.3 Example Configuration File

A basic configuration file could look like this:

```
COMMAND_HANDLER PORT SET 6810

MAIN BOARD SELECT A100001

MAIN CONNECTOR SELECT A

MVCP PORT 5450

CONFIG SET CLIP_ROOT V:/Production/SDI-Recordings/Clips
```

See Also

- Channel Recorder Control Commands
- Channel Recorder Configuration

3.4 Integration with Other Services

The Channel Recorder can be integrated with other services.

Viz Dart

The Viz Dart video acquisition tool can be configured to acquire assets using the Channel Recorder. Integration of the Channel Recorder with Viz Dart is based on the MLT Video Control Protocol, or MVCP. In order to integrate with Viz Dart, the only required step is to activate MVCP:

```
MVCP PORT SET [port]
```

For further information on how to configure Viz Dart, or how to operate it on a Video Disk Recorder, refer to the Viz Dart documentation.

Coder

Coder is the next generation transcoder that can be used as a standalone component with Viz Engine, or in a MAM environment using Viz One. To setup the Channel Recorder to output to Coder, issue the following command:

```
OUTPUT START Coder [SHM-name] [proxy hostname] [proxy port]
```

For further information on the configuration and operation of Coder, refer to the Media Service documentation.

See Also

- Media Service documentation
- Viz One documentation for Viz Dart
- Channel Recorder Configuration
- References and Specifications

3.5 Removing Channel Recorder

The Channel Recorder can be removed by running the Channel Recorder Setup Wizard, which will check for any registered Channel Recorder services in the selected installation folder. If any such service(s) are found, a message will be displayed stating that these services must be unregistered prior to removing the Channel Recorder.

Before removing the Channel Recorder, the service needs to be unregistered. This is done by issuing the command

```
ChannelRecorder.exe -r all
```

from the **Command Prompt**. This will unregister any registered Channel Recorder services. After unregistering the service, proceed with the regular removal process. Please observe that if the installation path is active in the Command Prompt while executing the procedure, the process will be unable to remove the directory. This will need to be removed manually.

See Also

- Channel Recorder Command Line Options

4 Operation and Troubleshooting

The application **Viz Send**, included in **Viz Artist** installations, can be used to communicate with Channel Recorder. Please connect the tool to the port specified in the **Channel Recorder** configuration file.

This section describes a typical work-flow when using the Channel Recorder, as well as troubleshooting information. It contains information on the following topics:

4.1 Using the Channel Recorder

When starting the Channel Recorder, it will initialize to allow for normal operation. In the following section, the initialization phase is detailed. After this, an example workflow is outlined:

Channel Recorder Initialization

1. First, which ID the instance should operate with is determined:
   - When running as a console application, the ID is derived from the provided command line argument. If no ID is provided, the application will not do anything.
   - When running as a service, the ID is derived from the registered service name. The service name and it's ID can be looked up in the **Windows Service Manager.**
2. The provided ID determines which configuration file will be used. The most important part of the configuration file is the command interface communication port, specified with `COMMAND_HANDLER PORT SET [port]`. If this is omitted, there is no way to communicate with the service. When running as a command line application, commands can be entered directly in the console.
3. All commands in the configuration file are executed.

If no connector is selected, either in the configuration file or through the command interface or console, Channel Recorder does nothing. To start capturing from a connector, the `MAIN CONNECTOR SELECT [connector]` command needs to be provided. When selecting a connector, Channel Recorder checks first whether a board has already been selected using the `MAIN BOARD SELECT [serial]` command. If not, Channel Recorder queries for all supported Matrox boards in the system. If there are more than one, the first one is selected. For systems with more than one Matrox board installed, it is therefore recommended to always select a board.

When a valid board is found, the Channel Recorder queries for the genlock signal. In order to operate correctly, the board requires a correctly configured genlock. Otherwise, Channel Recorder will refuse to setup the input. The next step is to detect the input signal on the specified connector. If the input signal cannot be detected, the initialization stops here.

Next, the Channel Recorder compares the genlock frequency to the signal frequency. The signal frequencies need to be from the same frequency family, for example, `25i` and `50p` frequencies will match, but `29.97i` and `50p` will not.

The final step is to setup the input and start capturing from it. As long as not clip is recorded, the captured frames are thrown away. When recording start, these frames are written to the file. This is necessary, because otherwise it would 1) not be possible to provide instant recording when the command for recording arrives and 2) CR would not be able to listen to timecodes to schedule a recording based on them.

Workflow Example

1. Start the service. This can be done from the Windows Administrative Tools, or by running `services.msc`. Select the **Vizrt Channel Recorder Service** and click **Start**.

   The service can also be started and stopped by running the program executable from **Command Prompt**:

   ```
   ChannelRecorder.exe -s <ID>
   ```

   To stop the service from Command Prompt, run:

   ```
   ChannelRecorder.exe -k <ID>
   ```

   Note: `<ID>` references the two-digit, zero-padded unique service number. The service uses this `<ID>` to determine which is the correct configuration file name.

2. If the channel is not initialized using the configuration file, it can be done by sending the following command:

   ```
   MAIN CONNECTOR SELECT <label>
   ```

   where `label` references one of the input connector labels.

3. Next, set the file name to capture to:

   ```
   RECORD CLIP v:\path\to\capture_file
   ```

4. The capturing can be started or restarted, and paused, by sending the commands `RECORD START` and `RECORD PAUSE`.
5. To stop recording and finalize the file, send the command `RECORD STOP`.

To start another recording, a new file name has to be set.

See Also

- Channel Recorder Control Commands
- Channel Recorder Command Line Options

- Channel Recorder Configuration

4.2 Troubleshooting

The Service Reports *Access is denied* in the Log-file at Startup

This is due to access rights problems on some system. Currently, the only solution is to add the local **NETWORK SERVICE** user to the local **Administrators** group. This should allow the service to start up normally.

The Service Reports Timeout Errors

If the recorder reports timeout errors, try increasing the timeout value by sending the command `CONFIG SET TIMEOUT [timeout]`.

Example: `CONFIG SET TIMEOUT 3600`

Upgrading an Existing Installation Fails to Complete

If the installer application fails to upgrade an existing installation, manually unregister and then remove the Channel Recorder first. Then, do a new installation. Please refer to the procedures described in Removing Channel Recorder and Installation of the Channel Recorder for further details.

Channel Recorder Fails to Initialize

If no valid synchronization signal or input signal is connected to the Matrox video board, the Channel Recorder will fail to initialize. Make sure that the Matrox board is connected to an input and sync source.

Missing MSVCP140.dll Error Message

When starting the Channel Recorder, an error message appears stating that *"The program can't start because MSVCP140.dll is missing from your computer. Try reinstalling the program to fix this problem"*. This indicates missing or outdated redistributable dependencies. The correct version can be found in the installation folder. To resolve the issue, open the install folder location and run the `vcredist_x64.exe` file.

Recording UHD with XAVC Produces *Specified compression format is not supported* Error

UHD recording with XAVC requires a Matrox M264 board to be installed in the system. If the system does not have such a board installed, Channel Recorder will report that the specified compression format is not supported.

See Also

- Customer Feedback and Suggestions

- Customer Support Request
- Related Documents
- References and Specifications

5 References and Specifications

This section details references and specifications for the Channel Recorder.

This section contains the following topics:

See Also

- Hardware and Software Requirements
- Installation of the Channel Recorder
- Channel Recorder Configuration

5.1 Channel Recorder Command Line Options

The Channel Recorder program executable accepts the following set of command line options:

- `-i [ID]`: Install the program as a Windows service with `ID`
- `-r [ID | ALL]`: Remove the program with the specified `ID` from the Service Manager, or remove `ALL` instances of the program
- `-s [ID | ALL]`: Start the service with the specified `ID`, or start `ALL` registered Channel Recorder services
- `-k [ID | ALL]`: Terminate the service with the specified `ID`, or terminate `ALL` instances of the service
- `-d [ID]`: Debug; run as a regular application with `ID`

  `[ID]`: A numerical value representing the unique service number. The service determines the configuration file name by this `ID`.

Usage: `ChannelRecorder.exe -i [ID] -r [ID | ALL] -s [ID | ALL] -k [ID | ALL] -d [ID]`

Example: By running the command `ChannelRecorder.exe -i 01 -s 01` from the **Command Prompt**, Channel Recorder will be installed as a Windows service and

subsequently started. The command `ChannelRecorder.exe -k ALL` will terminate all instances of the service.

5.2 Channel Recorder Control Commands

The application **Viz Send**, included in **Viz Artist** installations, can be used to communicate with Channel Recorder. Please connect the tool to the port specified in the configuration file. The following commands are implemented in the service:

Channel Recorder Commands

Command	Description
`ABOUT GET`	Print license information of all libraries used in this software.
`COMMAND_HANDLER DUMP`	Prints this list of available commands.
`COMMAND_HANDLER PORT SET [port]`	Set the port of the command interface. A port can only be set once.
`CONFIG GET`	Get the current settings.
`CONFIG LIST [argument]`	List all available variables. The optional `[argument]` flag provides information specific to the applied argument. Known arguments are: `CONTAINER` – displays all known container types. `CODEC` – displays all known codec types. `DUMP` – displays the current dump file setting. `PRIORITY` – displays the current process priority setting.
`CONFIG SET [variable] [value]`	Set the `[variable]` to `[value]`. To get all available variables, call `CONFIG LIST`. Refer also to Variables and Values for CONFIG SET
`exit, EXIT`	Stop all channels, clean up the hardware and stop the service.
`MAIN BOARD GET`	Returns the selected boards.
`MAIN BOARD LIST`	List all available boards.
`MAIN BOARD SELECT [serial number]`	Select a board. The board is identified by the serial number. If the board with the given number is not found, the first board will be selected.
`MAIN CONNECTOR GET`	Returns the selected connector.
`MAIN CONNECTOR SELECT [connector number] ([address] [port])`	Select a connector. Connectors are labeled consecutively from A to H. The `[address]` and `[port]` parameters are required for IP boards only, and defines which IP address and UDP port the Channel Recorder will listen to for the input stream.
`MAIN CRASH [type]`	Crashes the service. [type] can either be omitted or be one of: `MAIN`: Crash the service (same as when omitted). `RECORD`: Crash the recording thread.
`MAIN VERSION`	Return application version.
`MVCP PORT [port]`	Set the port for the MVCP communication. This command is required to initialize MVCP.

Command	Description
`OUTPUT GET`	Lists the active target(s).
`OUTPUT LIST`	Lists available targets.
`OUTPUT START [target]`	Starts an output handler for the specified `[target]`. Several output handlers can be started in parallel, but only one is allowed for each target. Valid targets are: `VideoOut`: This target requires one additional parameter: `[connector]`. The `[connector] parameter` specifies the video output connector of the Matrox board. **Example:** `OUTPUT START VideoOut A` `Coder`: This target requires three additional parameters, `[SHM name]`, `[address]` and `[port]`. `[SHM name]` is the name of the shared memory area the fields will be written to. The name cannot contain whitespace characters. [address] denotes the IP address or host name of the proxy service, and [port] is used to specify which port the service is listening to. **Example:** `OUTPUT START Coder SHMCoder1 localhost 12345`
`OUTPUT STOP [target]`	Stops the output handler for the specified target.
`RECORD CLIP [clip name]`	Set the clip name and initialize the recorder. This command does not start recording (see `RECORD START`).
`RECORD DURATION`	If no duration parameter is applied to the command, it returns the recorded duration. If a duration parameter is applied, the duration of an ongoing recording is changed. The duration parameter can be specified as either a number of frames or a timecode (see Data Types).
`RECORD PAUSE`	Pause recording.
`RECORD RESOLUTION GET`	Returns the resolution the Channel Recorder is running at.

Command	Description
`RECORD START [duration] [start time] [end mode]`	Start or continue recording. The `[duration]`, `[start time]` and `[end mode]` parameters are optional, however, the parameters are interdependent as follows: If the parameter `[start time]` is provided, `[duration]` is also required. If the parameter `[end mode]` is provided, `[duration]` is also required. The format for both is **Timecode** (see Data Types). `[duration]` and `[start time]` can be zero timecode, which will then be ignored. `[end mode]` can either be `STOP`, which finalizes and closes the clip or `PAUSE` (default behavior), where the clip stays open and can be used for further recording.
`RECORD STATE`	Returns the state the Record Channel service is in.
`RECORD STOP`	Stops recording and flushes the recorder. A new clip needs to be set afterwards (see `RECORD CLIP`).
`VERSION GET`	Same as `MAIN VERSION`.

Variables and Values for CONFIG SET

Variable	Value
AUDIOCHANNELS [channels]	Set the number of audio channels to record. How many channels are actually recorded depends on the codec and the input signal.
BITRATE [rate]	Set the bitrate for the video encoding. The value can either be applied as bits per second or as Megabits per second. Not all codecs allow changes to the bitrate. In such cases, BITRATE will be ignored.
CLIP_ROOT [path]	Set the root folder for the captured files. If the filename in command RECORD CLIP does not contain a absolute path name, the CLIP_ROOT is prepended.
CODEC [codec type]	Sets the codec type of the recorded file. By setting the codec type, default values for bitrate and audio will also be set. These values can be changed (see below). Not all codec types are available with all container types. Available codec types are: Default DvCam DvCPro Dv50 IFrame XDCam AVCIntra50 AVCIntra100 ProRes **Note:** To utilize the TDIR capabilities of the **ProRes** codec with a **.mov** container in Viz Engine, the .Ref-file needs to be used.

Variable	Value
CONTAINER [container type]	Sets the container type of the recorded file. With the container type, a default codec is also set. By setting the container type, a valid recording can be started. Known container types are: Default AVCINTRAMXF – see note regarding audio and timecode support AVI DVCPROMXF – see note regarding audio and timecode support MOV MXF – see note regarding audio and timecode support XAVCMXF – Requires a Matrox M264 card in order to work. Also, see note regarding audio and timecode support. XDCAMMXF – see note regarding audio and timecode support **Note:** The MXF container type uses the **OP-Atom** format and does not include audio or timecode information. However, the AVCINTRAMXF, DVCPROMXF, XAVCMXF and XDCAMMXF container types all use the **OP1a** format, which features audio and timecode support. Refer to the Supported Codecs section for further details.
DISKACCESSSIZE [size]	Set the size of data blocks written to the disk in byte. Postfixes like KiB, Kb, k, etc., are allowed, but must not be separated from the value with a blank space (see example). The default value is **4 MiB** (4194304 bytes). The minimum value is **32 KiB** (32768 bytes). KiB and k multiplies the value by 1024. kb multiplies the value by 1000. The same works with m for mega and g for giga. **Example:** CONFIG SET DISKACCESSSIZE 1024KiB – sets the data block size to 1048576 bytes (one mebibyte).

Variable	Value
DUMP [NORMAL | PRIVATE | FULL]	Set the dump file content to the specified value: NORMAL: Include just the information necessary to capture stack traces for all existing threads in a process. PRIVATE: Includes the contents of every readable and writable private memory page FULL: Include all accessible memory in the process.
DURATION [frames|timecode]	Set the default value for the recording duration. The initial value is 0. When applying a duration to the RECORD START command, the default value is ignored but not changed. Please refer to Data Types for information on time code formatting.
FILEEXTENSION [boolean]	Enables or disables automatically adding a file extension to the file name. If this feature is turned off, the client application has full control over the file name. The default value is ON. Please refer to Data Types for details on accepted boolean values.
PRIORITY [priority]	Sets the process priority class. The values correspond to the Windows process priority. Valid values for [priority] are: Default IDLE BELOW_NORMAL NORMAL = Default ABOVE_NORMAL HIGH REALTIME
RINGBUFFERSIZE [size]	Set the size of the capture ring buffer. The default value is 60.
STOPATEND [boolean]	Set the default behavior at the end of the recording. The default setting is NO/FALSE/OFF. Please refer to Data Types for details on accepted boolean values.
TDIRENABLE [boolean]	Set the default behavior of Time Delayed Instant Replay (TDIR). The default setting is ON.

Variable	Value
TDIRINTERVAL [time]	Set the interval of file header updates in TDIR recordings. The value is in seconds and fractions of seconds, meaning both 0.1 and 1.0 are considered valid values. Minimum allowed value is 0.001, which is interpreted by Channel Recorder as every frame. A typical value would be 10.0, the default value is 3.0. **IMPORTANT!** In order to secure proper operation with Viz Engine, this value must **not** exceed 10.0.
TIMECODE [source]	Specify the timecode source. Valid values for [source] are: Default ZERO_BASED: The timecode written to the file starts at 00:00:00:00. VITC = Default: Write the ATC/VITC from the input signal to the file. LTC: Write the ATC/LTC from the input signal to the file. TIME_OF_DAY: Write the current system time to the file. In order to get a proper time from the system, the system time must be synchronized using a time server.
TIMEOUT [timecode]	Set the timeout for the capture operation in milliseconds. If the recorder reports timeout errors, increasing the timeout could help. Please refer to Data Types for information on time code formatting.
UHD [bool]	Enable detection of UHDTV signals. When set to ON, the Channel Recorder scans the signal resolution on the four corresponding input connectors. If four 3G signals are detected, they are interpreted as one UHDTV signal. When set to OFF, the four connectors are treated as separate 3G signals. This flag must be set before selecting a connector (see MAIN CONNECTOR SELECT). The default value is OFF.

Variable	Value
V210 [bool]	Use the 10-bit surface format V210. This is needed to record XAVC. It also increases performance when for example recording ProRes. This flag must be set before selecting a connector (see MAIN CONNECTOR SELECT). The default value is OFF.

5.3 Data Types

Booleans

Booleans are a data type with only two possible values; true or false. The Channel Recorder accepts YES, NO, TRUE, FALSE, ON, or OFF as boolean values, where:

- YES, TRUE and ON are positive values switching a flag **on**, and
- NO, FALSE and OFF are negative values switching a flag **off**.

Timecodes

Timecodes in Channel Recorder have the form <hh>:<mm>:<ss>:<ff>, where

- <hh> represents the hour in 24 hour format,
- <mm> is minutes,
- <ss> is seconds, and
- <ff> refers to the frame number, according to the frame rate.

Example: A zero timecode looks like this: 00:00:00:00.

5.4 Files and Directories

The Channel Recorder uses various files and directories while running.

Description	Type	Location
Installation Directory	Directory:	<viz install folder>\ChannelRecorder
ProgramData Directory	Directory:	%ProgramData%\vizrt\Channel Recorder

Startup Configuration	File:	`ChannelRecorder_startup_<ID>.conf` `<ID>` refers to the two-digit channel number.
	Path:	`%ProgramData%\vizrt\ChannelRecorder\ChannelRecorder_startup_<ID>.conf` `<ID>` refers to the two-digit channel number.

See Also

- Installation and Configuration

5.5 Supported Multiport Video Computer Protocol (MVCP) Commands

The Channel Recorder supports the following sets of Multiport Video Computer Protocol (MVCP):

- Supported Global MVCP Commands
- Supported Unit MVCP Commands

Supported Global MVCP Commands

Command	Function
BYE	Closes the current connection.
MON	Event monitoring mode.
PLS	Returns the supported media ports.
UADD	Create a new unit.
ULS	Returns the existing VST units.

Supported Unit MVCP Commands

Command	Function
CUER	Cue recording of the unit's currently loaded clip.
LOAD	Load a clip into a unit.
SET	Set controls for the unit: **vtr.media.clip.format**: Allowed values: [movie/stream/mxf] **vtr.media.video.input.compression.type** [mpg2] **vtr.media.mpeg.bit_rate**: Set the recording bitrate. **vtr.media.mpeg.imx**: Enable IMX recording. **vtr.media.audio.input.channels**: Set the number of audio channels to record. **vtr.media.audio.input.sample.width**: Set audio bits per sample. **vtr.media.video.standard**: The command is understood, however, as the video standard is determined by the input signal, it does not get changed. **vtr.media.input.trigger.duration.out**: Set the duration of the recording. **vtr.media.clip.start.mode**: Allowed values: [time-of-day]
STOP	Stop playback or recording.
UCLS	Close a unit.
UNLD	Unloads the unit's currently loaded clip.
USTA	Returns the status of a unit.

See Also

- The Video Server Toolkit Developer's Guide on ftp.sgi.com.

5.6 Supported Codecs

This section describes the containers and codecs supported by the Channel Recorder. It contains information on the following topics:

- PAL Codecs
- NTSC Codecs
- 720p50 and 720p59.94 (60M) Codecs
- 1080i25 and 1080i29.97 (30M) Codecs
- 1080p50 and 1080p59.94 (60M) Codecs
- 2160p50 and 2160p59.94 (60M) Codecs

5.6.1 PAL Codecs

This section contains the following topics:

- MPEG-IFrame
- DVCAM
- DVCPRO
- XDCAM
- Uncompressed

MPEG-IFrame

Container	Codec	Features	Audio
.avi	MPEG2-IFrame422 720x576	Alpha: No Bitrate: 10-50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

DVCAM

Container	Codec	Features	Audio
.avi	DV/DVCAM 4:2:0 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCAM 4:2:0 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	DVCAM 4:2:0 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	No Audio

DVCPRO

Container	Codec	Features	Audio
.avi	DVCPRO 4:1:1 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz; - 4 ch: 24 in 32bit; 48kHz; - 8 ch: 24 in 32bit; 48kHz; - 16 ch: 24 in 32bit; 48kHz
.avi	DVCPRO 50 4:2:2 720x576	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO 4:1:1 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO 50 4:2:2 720x576	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	DVCPRO 4:1:1 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	DVCPRO 50 4:2:2 720x576	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

Container	Codec	Features	Audio
.mxf Panasonic P2 (OP-Atom)	DVCPRO 4:1:1 720x576	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio
.mxf Panasonic P2 (OP-Atom)	DVCPRO 50 4:2:2 720x576	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

XDCAM

Container	Codec	Features	Audio
.mxf XDCAM (OP1a)	D10 (IMX) 4:2:2 720x608	Alpha: No Bitrate: 50 Bit depth: 10 VBI: required Timecode: required TDIR: Yes	AES3 - 4ch: 24 in 32bit; 48kHz

Uncompressed

Container	Codec	Features	Audio
.avi	Uncompressed YUYV 4:2:2 720x576	Alpha: No Bitrate: 160 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

5.6.2 NTSC Codecs

This section contains the following topics:

- MPEG IFrame
- DVCAM

- DVCPRO
- XDCAM
- Uncompressed

MPEG IFrame

Container	Codec	Features	Audio
.avi	MPEG2-IFrame422 720x480	Alpha: No Bitrate: 10-50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

DVCAM

Container	Codec	Features	Audio
.avi	DV/DVCAM 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCAM 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	DVCAM 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: N/A	No Audio

DVCPRO

Container	Codec	Features	Audio
.avi	DVCPRO 4:1:1 720x480	Alpha: No; Bitrate: 25; Bit depth: 8; VBI: N/A; Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz; - 4 ch: 24 in 32bit; 48kHz; - 8 ch: 24 in 32bit; 48kHz; - 16 ch: 24 in 32bit; 48kHz
.avi	DVCPRO 50 4:2:2 720x480	Alpha: No; Bitrate: 50; Bit depth: 8; VBI: N/A; Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO 50 4:2:2 720x480	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	DVCPRO 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	DVCPRO 50 4:2:2 720x480	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

Container	Codec	Features	Audio
.mxf Panasonic P2 (OP-Atom)	DVCPRO 4:1:1 720x480	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio
.mxf Panasonic P2 (OP-Atom)	DVCPRO 50 4:2:2 720x480	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

XDCAM

Container	Codec	Features	Audio
.mxf XDCAM (OP1a)	D10 (IMX) 4:2:2 720x512	Alpha: No Bitrate: 50 Bit depth: 10 VBI: Required Timecode: Required TDIR: Yes	AES3 - 4 ch: 24 in 32bit; 48kHz

Uncompressed

Container	Codec	Features	Audio
.avi	Uncompressed YUYV 4:2:2 720x486	Alpha: No Bitrate: 160 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

5.6.3 720p50 and 720p59.94 (60M) Codecs

This section contains the following topics:

- XDCAM HD
- AVC-Intra
- ProRes
- Uncompressed

MPEG-IFrame

Container	Codec	Features	Audio
.avi	MPEG2-IFrame422 1280x720	Alpha: No Bitrate: 50-300 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

DVCPRO HD

Container	Codec	Features	Audio
.avi	DVCPRO HD 1280x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO HD 960x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: N/A	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	DVCPRO HD 960x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	DVCPRO HD 960x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

XDCAM HD

Container	Codec	Features	Audio
.mxf XDCAM (OP1a)	XDCAM HD422, IBP HD 4:2:2, 1280x720	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: N/A	PCM: - 8 ch: 24 in 32bit; 48kHz

AVC-Intra

Container	Codec	Features	Audio
.mxf (OP1a)	AVCIntra Class 50 960x720	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	AVCIntra Class 100 1280x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 50 960x720	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

Container	Codec	Features	Audio
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 100 1280x720	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

ProRes

Container	Codec	Features	Audio
.mov	I-Frame 4:2:2 1280x720	Alpha: No Bitrate: 100 (LT), 147, 220 (HQ) Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes, with `.Ref` file	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

Uncompressed

Container	Codec	Features	Audio
.avi	Uncompressed YUYV 4:2:2 1280x720	Alpha: No Bitrate: 700 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

5.6.4 1080i25 and 1080i29.97 (30M) Codecs

This section contains the following topics

MPEG-IFrame

Container	Codec	Features	Audio
.avi	MPEG2-IFrame422 1920x1080	Alpha: No Bitrate: 50-300 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

DVCPRO HD

Container	Codec	Features	Audio
.avi	DVCPRO HD 1920x1080 *(1080i25)* 1260x1080 *(1080i29.97)*	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mov	DVCPRO HD 1280x1080 *(1080i25)* 1260x1080 *(1080i29.97)*	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	DVCPRO HD 1280x1080 *(1080i25)* 1260x1080 *(1080i29.97)*	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio
.mxf (OP1a)	DVCPRO HD 1280x1080 *(1080i25)* 1260x1080 *(1080i29.97)*	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 4 ch: 24 in 32bit; 48kHz

XDCAM HD 422

Container	Codec	Features	Audio
.mxf (OP1a)	XDCAM HD, IBP HD 4:2:2, Elementary, Program, Transport 1920x1080	Alpha: No Bitrate: 25 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 8 ch: 16 in 16bit; 48kHz

AVC-Intra

Container	Codec	Features	Audio
.mxf (OP1a)	AVCIntra Class 50 1440x1080	Alpha: No Bitrate: 50 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	AVCIntra Class 100 1920x1080	Alpha: No Bitrate: 100 Bit depth: 8 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 50 1440x1080	Alpha: No Bitrate: 50 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

Container	Codec	Features	Audio
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 100 1920x1080	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

ProRes

Container	Codec	Features	Audio
.mov	I-Frame 4:2:2 1920x1080	Alpha: No Bitrate: 100 (LT), 147, 220 (HQ) Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes, with `.Ref` file	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

Uncompressed

Container	Codec	Features	Audio
.avi	Uncompressed YUYV 4:2:2 1920x1080	Alpha: No Bitrate: 800 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

5.6.5 1080p50 and 1080p59.94 (60M) Codecs

This section contains the following topics

AVC-Intra

Container	Codec	Features	Audio
.mxf (OP1a)	AVCIntra Class 50 1440x1080	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf (OP1a)	AVCIntra Class 100 1920x1080	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: Yes TDIR: Yes	PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 50 1440x1080	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio
.mxf Panasonic P2 (OP-Atom)	AVCIntra Class 100 1920x1080	Alpha: No Bitrate: 100 Bit depth: 10 VBI: N/A Timecode: N/A TDIR: Yes	No Audio

MPEG-IFrame

Container	Codec	Features	Audio
.avi	MPEG2-IFrame422 1920x1080	Alpha: No Bitrate: 50-300 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

ProRes

Container	Codec	Features	Audio
.mov	I-Frame 4:2:2 1920x1080	Alpha: No Bitrate: 100 (LT), 147, 220 (HQ) Bit depth: 8, 10 VBI: N/A Timecode: N/A TDIR: Yes, with `.Ref` file	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

Uncompressed

Container	Codec	Features	Audio
.avi	Uncompressed YUYV 4:2:2 1920x1080	Alpha: No Bitrate: 2000 Bit depth: 8 VBI: N/A Timecode: N/A TDIR: Yes	No Audio PCM: - 2 ch: 24 in 32bit; 48kHz - 4 ch: 24 in 32bit; 48kHz - 8 ch: 24 in 32bit; 48kHz - 16 ch: 24 in 32bit; 48kHz

5.6.6 2160p50 and 2160p59.94 (60M) Codecs

This section contains the following topics:

- XAVC

XAVC

Container	Codec	Features	Audio
.mxf (OP1a)	MPEG2-IFrame422 3840x2160	Alpha: No Bitrate: 300, 480, (VBR/CBR) Bit depth: 10 VBI: N/A Timecode: Yes TDIR: N/A	PCM: - 16 ch: 24 in 32bit; 48kHz