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Multi Channel VideoControl Manual



Imprint

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1 Welcome to the Multi Channel VideoControl

The Multi Channel VideoControl is the video acquisition software of the Multi Channel Suite package. The Multi Channel Experimenter is for online data acquisition, the Multi Channel Analyzer is for offline data analysis, and the Multi Channel DataManager is for data conversion. Please read the following chapters to understand the general concept of the Multi Channel Suite before starting.

2 Before Your Start

2.1 Terms of Use

You are free to use Multi Channel VideoControl for its intended purpose. You agree that you will not decompile, reverse engineer, or otherwise attempt to discover the source code of the software.

2.2 Limitation of Liability

Multi Channel Systems MCS GmbH makes no guarantee as to the accuracy of any and all tests and data generated by the use of the Multi Channel VideoControl software. It is up to the user to use good laboratory practice to establish the validity of his findings. To the maximum extent permitted by applicable law, in no event shall Multi Channel Systems MCS GmbH or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, without limitation, injuries, damages for data loss, loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use Multi Channel VideoControl or the provision of or failure to provide Support Services, even if Multi Channel Systems MCS GmbH has been advised of the possibility of such damages.

2.3 Important Safety Advice



Warning: Make sure to read the following advices prior to install or to use Multi Channel VideoControl. If you do not fulfil all requirements stated below, this may lead to malfunctions or breakage of connected hardware, or even fatal injuries. Obey always the rules of local regulations and laws. Only qualified personnel should be allowed to perform laboratory work. Work according to good laboratory practice to obtain best results and to minimize risks. Make always sure to validate your findings. Prepare backup copies on a regular basis to avoid data loss.

The operator is obliged to ensure that Multi Channel VideoControl is only be used for its intended purpose and that it is only used by qualified personnel.



Warning: Multi Channel VideoControl software is developed for Multi Channel Systems MCS devices. MCS devices are not intended for medical uses and must **not be used on humans**, especially not for uses that could impair health. MCS assumes no responsibility in any case of contravention.

3 Installation and Updates

One of the following Microsoft Windows® operating systems is required: Windows 10, 8.1 (English and German versions supported) with the NT file system (NTFS). Other language versions may lead to software errors. If a computer was acquired from MCS, the Multi Channel Suite will be preinstalled. **Updates** are available for free download on a regular basis from the [MCS web site](#). It is recommended always to install the latest software version. To install the software download and start the respective *.exe file and follow the instructions on the screen.

3.1 Recommended Operating System Settings

The following automatic services of the Windows operating system interfere with the data storage on the hard disk and can lead to severe performance limits in Multi Channel VideoControl. These routines were designed for use on office computers, but are not very useful for a data acquisition computer.

- Turn off Screen Saver
- Turn off Windows Indexing Service. Only important for data hard drive
- Manual management of automatic Windows Update
- Power Options: Power scheme: Never turn off monitor, hard disk and system standby

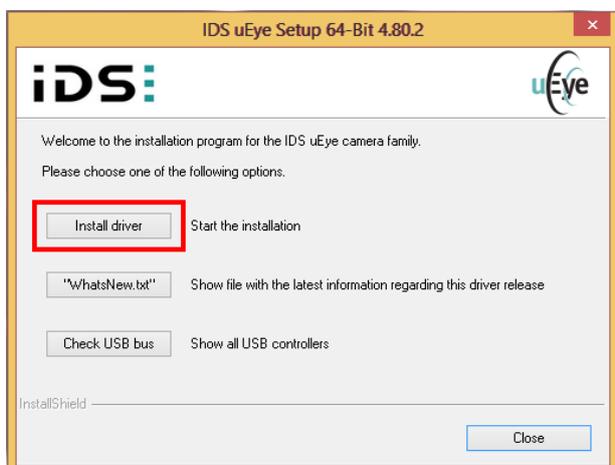
It is also not recommended to run any applications in the background when using Multi Channel VideoControl. Remove all applications from the Autostart folder. Be careful when using a Virus Scanner.

3.2 Driver Installation

The Multi Channel VideoControl software is free and can be installed on any computer. However, it can only be used to operate cameras from [IDS](#), distributed by Multi Channel Systems MCS GmbH as part of the W2100-Video-System. Therefore, it is necessary to install the latest IDS camera drivers in addition to the VideoControl Software. The uEye software and driver packages from IDS are distributed by MCS on a CD with the W2100-Video-System, updates can be downloaded from the [IDS homepage](#). Versions for 32 or 64 bit operating systems are available:

uEye32_48002_WHQL.exe
uEye64_48002_WHQL.exe

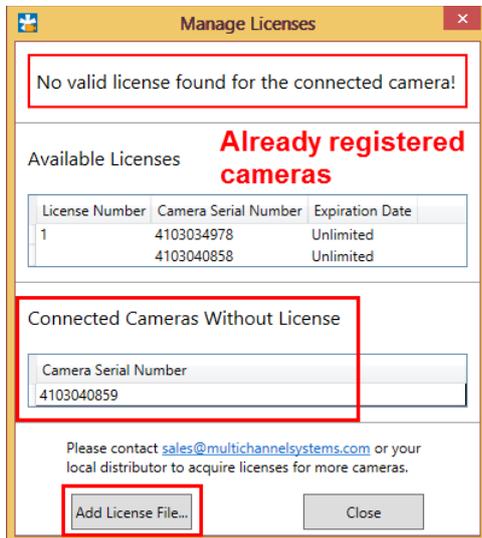
Start the *.exe and follow the instructions on the screen. Select the **Install driver** option.



This will install the camera drivers and the **IDS uEye software** on your computer. Using the uEye software is not necessary to work with the W2100-Video-System, but uEye offers much more control options for the camera if need be.

3.3 Camera License Keys

IDS cameras distributed by MCS require a **license key** to operate with the Multi Channel VideoControl software. The license is individual for each camera and is **stored on the computer**, but the same license can be used on any computer for the matching camera. If a camera is not yet registered on the computer it is connected to, the following window will come up automatically once the VideoControl software is started.



The Add License File button brings up a file browser. Look for the *.lic file for your camera, which is on a USB stick included in each W2100-Video-System. This procedure has to be done once for every camera on each computer. The same *.lic file will work for the respective camera on any computer. If you cannot find the USB stick, contact Support@multichannelsystems.com and provide the serial number of your camera, as shown in the window above, to get the license file.

3.4 Hardware Setup

3.4.1 Single Camera

For the video synchronization to work properly, please make sure:

- The camera is connected to a **USB 3.0 port**. They are labeled in blue, or with SS USB (super speed).
- The **Digital IO port** of the camera is connected to the Interface Board of the W2100-System with the provided cable. One Lemo connector must be connected to a Digital Out and the other Lemo connector to a Digital In on the W2100 Interface Board. The connectors are labeled accordingly. Digital In and Out port 1 must be used for **receiver A1**, and Digital In and Out port 2 must be used for **receiver B2**. The respective Digital Out must assigned to the Video Control function in the Experimenter (see [Multi Channel Experimenter manual](#), chapter 5.3.5.1, Digital Out Bit Selection).



3.4.2 Multiple Cameras in Single Headstage Mode

If two receivers are connected to one Interface Board, **two headstages** can be operated **independently** in Single Headstage Mode. If one W2100 Video System is used with each headstage, the cameras are also independently controlled with one instance of the Multi Channel Video Control each. Similar to the hardware setup for a single camera, both cameras must be attached to USB 3.0 ports. **Do not use USB hubs**, one port on the PC does not provide sufficient bandwidth for all cameras.

Each camera must be connected to a Digital In and a Digital Out connector. Digital In and Out port 1 must be used for the camera assigned to **receiver A1**, and Digital In and Out port 2 must be used for the camera assigned to **receiver B2**. The respective Digital Out must assigned to the Video Control function in the Experimenter (see [Multi Channel Experimenter manual](#), chapter 5.3.5.1, Digital Out Bit Selection).

Two cameras plus the W2100-System can usually be handled by a single, high performance PC. However, it's also possible to run cameras and a W2100-System on separate PCs, to avoid performance problems.



3.4.3 Multiple Cameras in Multiple Headstage Mode

If one receiver is connected to the Interface Board, up to **four headstages** can be operated **simultaneously** in Multiple Headstage Mode. If one W2100 Video System is used with each headstage, all cameras are also running simultaneously, and are controlled with a single instance of the Multi Channel Video Control. A maximum of four cameras can be handled by one Interface Board. Similar to the hardware setup for a single camera, all cameras must be attached to USB 3.0 ports. **Do not use USB hubs**, one port on the PC does not provide sufficient bandwidth for all cameras.

Each camera must be connected to a Digital Out connector. All respective ports must be assigned to the Video Control function in the Experimenter (see [Multi Channel Experimenter manual](#), chapter 5.3.5.1, Digital Out Bit Selection). The **first camera**, which acts as a master, needs to be connected **Digital Out 1** and to a **Digital In port**, too. The Dig In connectors coming from the other cameras are not used. Four cameras and the W2100-System can be too much for a single PC, depending mostly on the frame rate and resolution of the camera feeds. It is recommended to connect the cameras to a **dedicated USB PCI Express card** instead of the Mainboard USB slots. However, it's also possible to run cameras and a W2100-System on separate PCs, to avoid performance problems.



4 Software Features

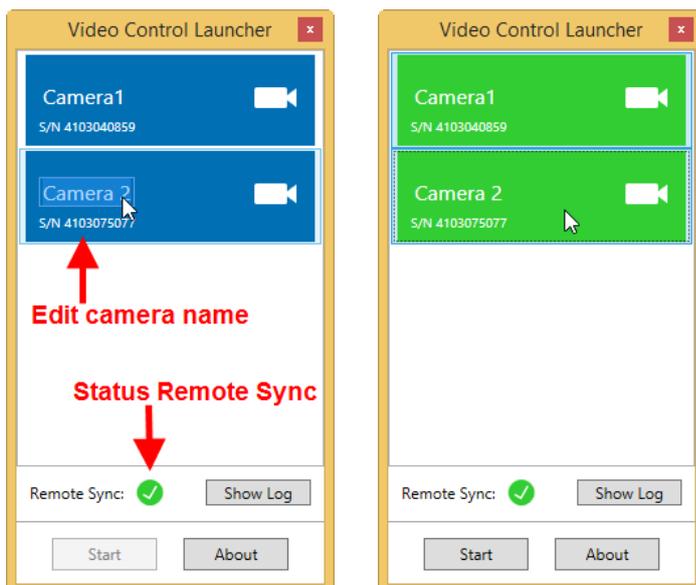
The [Multi Channel Suite](#) consists of four parts: the **Multi Channel Experimenter** for online data acquisition, the **Multi Channel Analyzer** for offline data analysis, the **Multi Channel DataManager** for data conversion, and the **Multi Channel VideoControl** for controlling a video camera. Many features and concepts apply to all parts.

4.1 Description and Purpose

The Multi Channel VideoControl software can be used to record a video file which is frame-by-frame synchronized to the electrophysiological data recorded with the W2100-System simultaneously. The software is **free to download** and install on an unlimited number of computers, but only works with IDS cameras provided by MCS (please see chapter 3.3, Camera License Key).

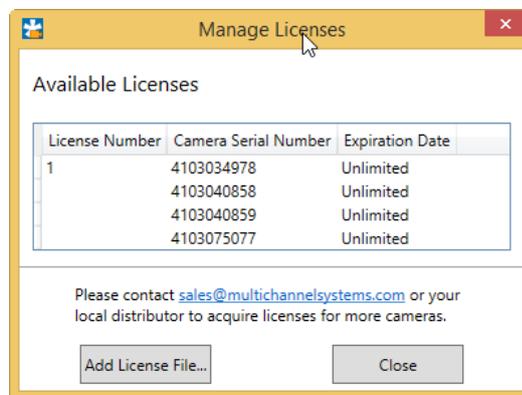
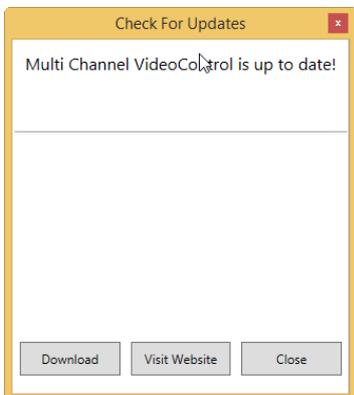
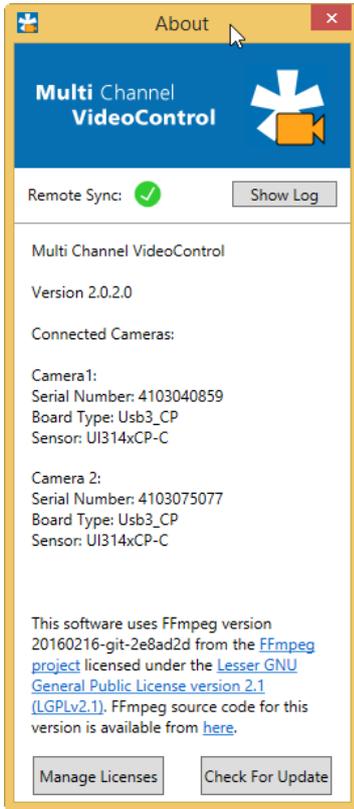
4.2 Video Control Launcher

If you open the VideoControl software, the Video Control Launcher window will come up, and show all available cameras with serial number and camera name. The serial number is fixed, but the **camera name** can be changed. Click on the camera icon to select it for the current instance of the VideoControl software. Up to **four cameras** can be opened in a single instance of the software. Selected cameras are shown in green, inactive cameras in blue.



All cameras opened in a **single instance** are operated **simultaneously**. This is usually the case when operating the corresponding wireless headstages in Multiple Headstage Mode (see chapter 5.3). If cameras are supposed to operate independently, open one instance of the VideoControl software for each camera, and launch only one camera in each instance (see chapter 5.2).

The **About** dialog shows the software version and information about the connected cameras. It also allows opening the **Manage Licenses** dialog (see chapter 3.3), and automatically check for software updates.



Under **Show log**, it is possible to monitor the remote synchronization between the VideoControl and Multi Channel Experimenter software. See next chapter for details.

4.3 Remote Synchronization with Multi Channel Experimenter

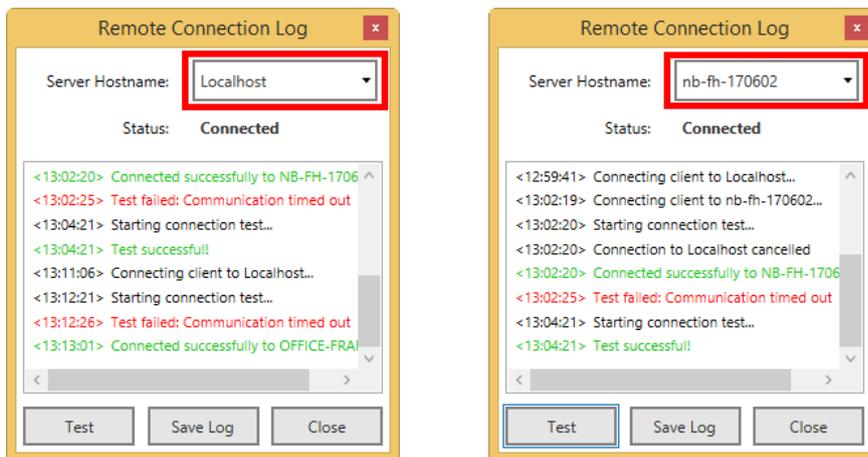
If **Enable Remote** function is active in the Multi Channel Experimenter, the Experimenter and the VideoControl software communicate via a pipe connection. Please see also the manual of [Multi Channel Experimenter](#) for details.

This works if both programs run on the same PC, but also if they run on **different PCs** which are in the **same network**. In any case, the connection is initiated in the Experimenter, not in the VideoControl software. To enable a connection, both programs must be running on the respective PC(s). By default, the Experimenter will attempt to connect to a VideoControl instance running on the same PC (**Localhost**).

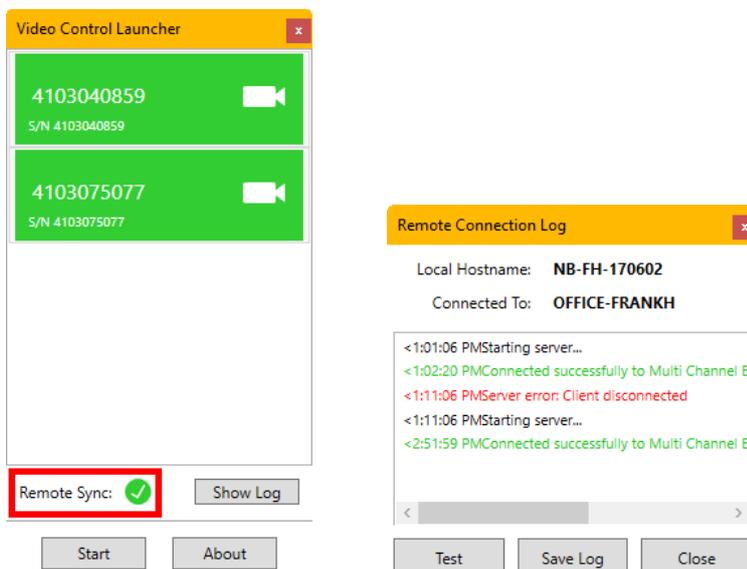
To connect to a different **PC in the network**, press the "Log" button in the Video Settings of the W2100 Data Source of the Experimenter software and select a different Hostname from the drop down list or enter a new one.

The hostname of a PC is the computer name shown in the **Windows Settings / System**.

If the connection is established, press "Test" for a quick check. The hostnames with successful connections are stored by the Multi Channel Experimenter software in the *.ini file and the last connected one will be used in the next session automatically.



In the VideoControl software, the Remote Sync status will become green, and the Log shows the connected computers.



If the connection is established, **VideoControl remotely controls** the Video **Frame Rate** setting, the **base file name** in the Recorder tool, and whether Video Sync is enabled in the Multi Channel Experimenter software. The Experimenter sends the ID stored in the W2100 data file via this connection to VideoControl software, so that the same ID can be stored in the VideoControl movie file. This ID identifies video files and recordings belonging together.

Known problems with pipe connections in Windows:

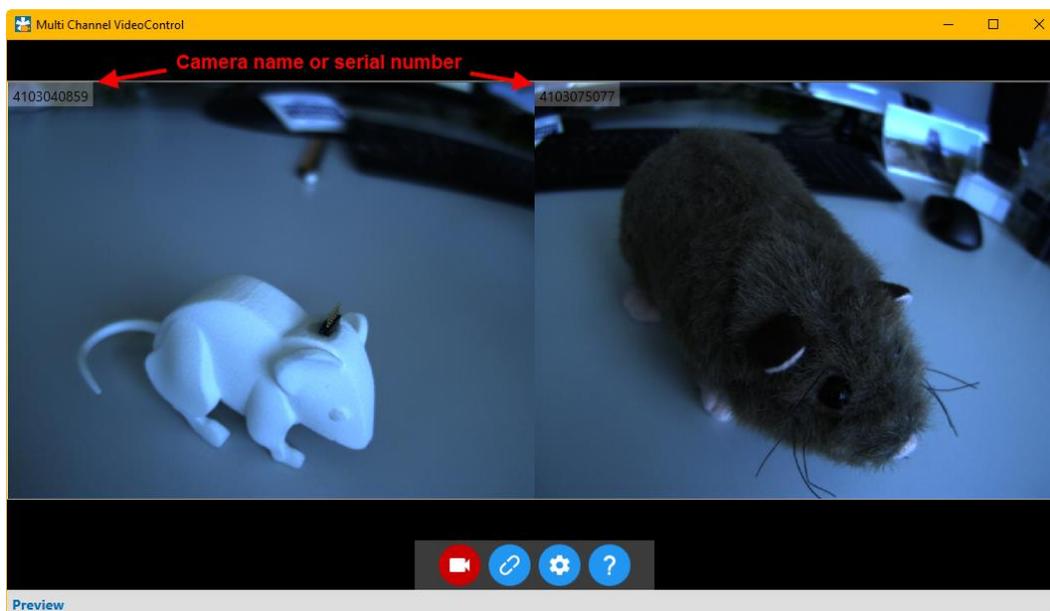
The windows firewall might interfere with the pipe connection. The connection uses UDP ports 137 and 139 and TCP port 445 for communication, so if these are blocked a connection to a remote PC might not work. More detailed info about pipe connections can be found [here](#).

4.4 Main Window

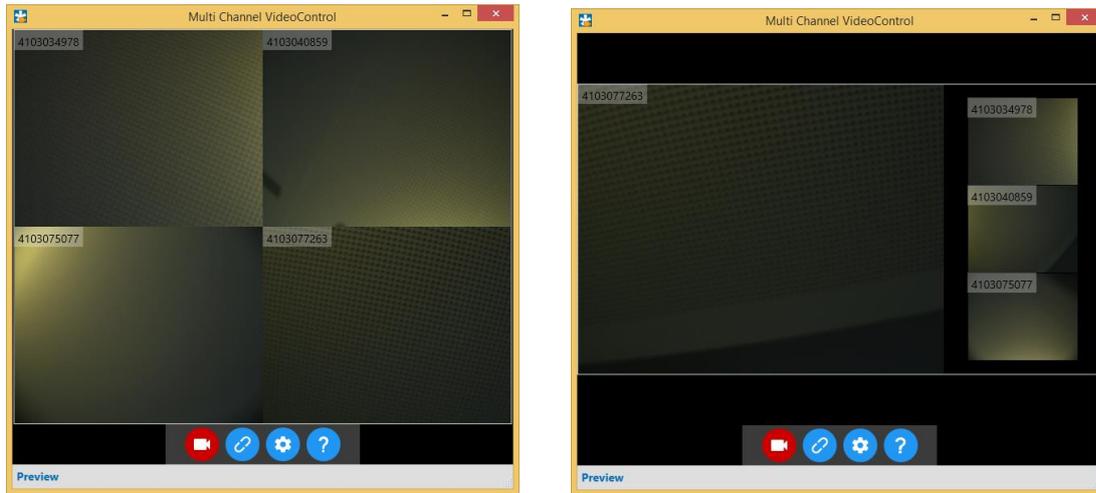
The main window shows the live feed from the camera, independently from the status of the W2100 recording system.



Depending on how many cameras you selected in the Video Control Launcher, a single or multiple camera feeds (up to four) are shown in the same window. The different inputs are identified by the camera name. The default name of each camera is the respective serial number, but can be changed in the Video Control Launcher dialog (see chapter 4.2).



If multiple cameras are connected, their videos are shown in a grid simultaneously. Double clicking on one of the video feeds enlarges this feed and shows the others in smaller windows.



Clicking on one of the smaller feeds zooms in on this feed. Double clicking on the large feed switches back to the grid view.

4.4.1 Start and Stop Recording



The Start or Stop Recording button starts and stops the video recording, and also the data recording of the W2100-System, if the synchronization is enabled.

4.4.2 Video Synchronization



enabled



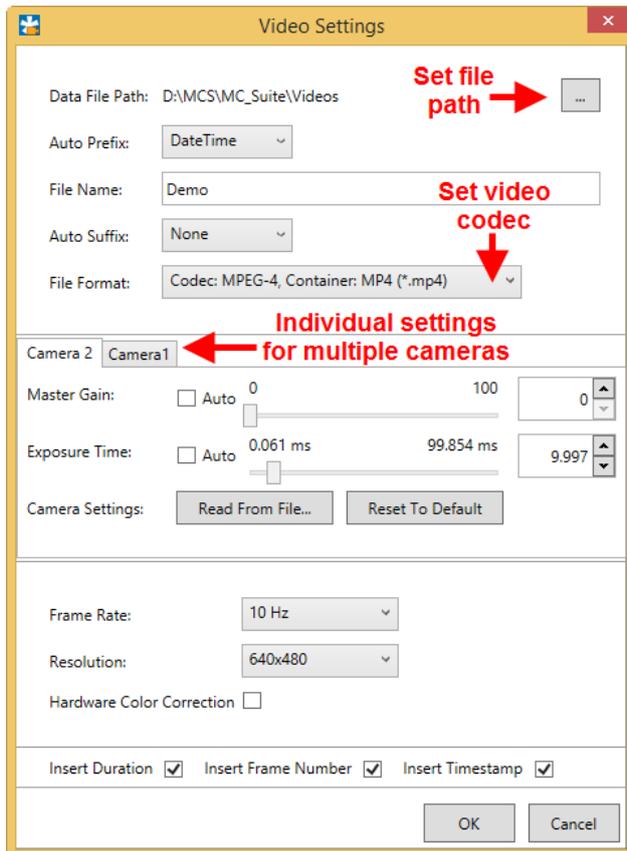
disabled

The Video Synchronization toggles the connection between the video and data recording with the W2100-System. If enabled, the Start or Stop function in the VideoControl also controls the data recording. If disabled, only the video is recorded.

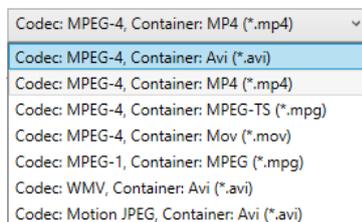
4.4.3 Video Settings



The Adjust Video Settings brings up a menu with the camera and video settings. **File path and name** for the videos can be selected. The file name consists of a Prefix, a Suffix and a user defined text string in between.



The video can be stored in a number of different **formats**, select one from the drop down menu. Currently, the following formats are available:



Gain and Exposure Time for the camera can be set automatically or manually via sliders or text entry.

The **Frame Rate** can be adjusted between 10 and 50 Hz.

The **Resolution** of the video can range from 649 x 480 pixel to 1280 x 1024 pixel. Be aware that higher resolution and high frame rate will generate large amounts of video data.

If **multiple cameras** are connected, Gain and Exposure can be set per camera along with several other settings that can be read from files generated by the uEye Cockpit for each camera in the respective tab. However, file name generation, video codec and format, frame rate and resolution can only be set on a globally for all cameras.

More detailed camera parameters can also be done in the uEye software provided by IDS (please see chapter 3.2). These settings can be saved in uEye and opened with the **Read from File** command:



Load a .ini file with camera parameters.
These parameters will be stored in the camera EEPROM
and used as default the next time the software is started.

Create this file from uEye Cockpit: File -> Save Parameters

5 Examples: Setting Up Synchronized Video and Data Recording

To synchronize the data acquisition with the W2100-System and the video recording, the **IFB** of the **W2100-System** and the W2100-Video-System **camera** must be connected as described in chapter 3.4, Hardware Setup.

The synchronization of W2100 and camera works by TTL pulses exchanged between the W2100 IFB and the camera. Both systems can run either on the same or **different computers**, that makes no difference for data quality or synchronization. The camera, controlled by the VideoControl software, is the master, the W2100, controlled by the Multi Channel Experimenter software, waits for the start command from the camera. While the video and data acquisition are running, the Experimenter will **trigger each frame** in the video file with a TTL from the IFB Digital Out, and generate a corresponding time stamp in the data file. This allows synchronization of both files with frame-by-frame precision.

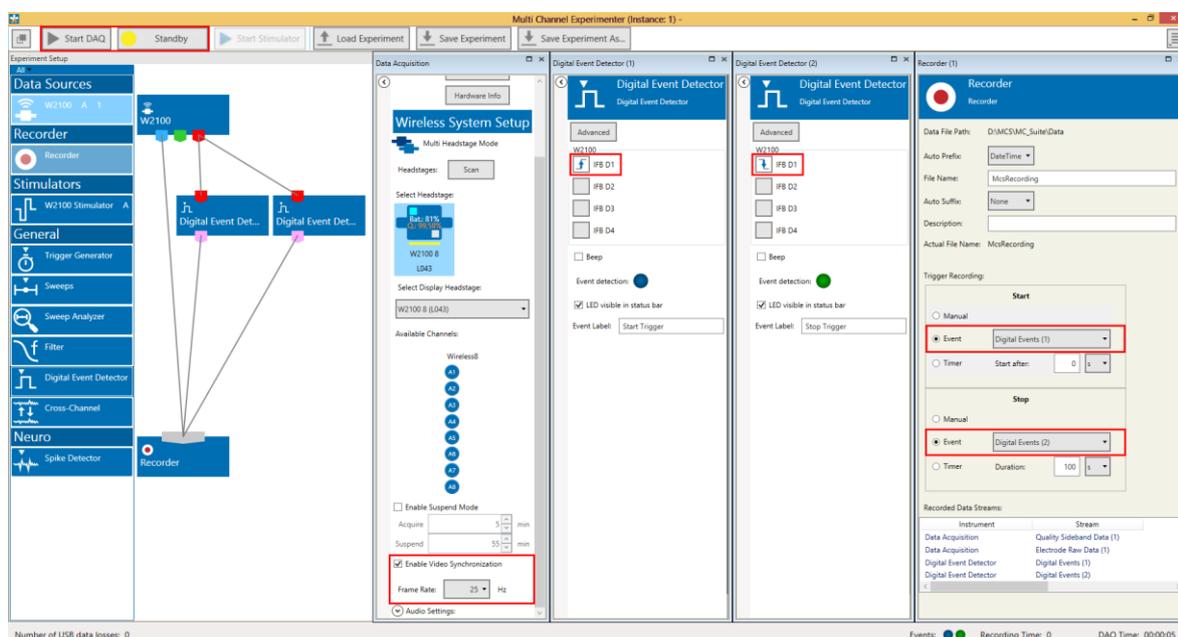
If **two cameras** are used independently on one IFB with **two receivers** running in single headstage mode connected, each camera needs to be connected to a Digital In and a Digital Out (see chapter 3.4.3). If **more than one camera** is used with a **single receiver** running in Multiple Headstage Mode, all cameras are running in parallel. Each camera needs a connection to a Digital Out, to receive the frame triggers from the IFB, but only the master camera needs to be connected to the Digital In, to provide the Start and Stop command for all cameras simultaneously (see chapter 3.4.2).

5.1 Single Camera, No Remote Synchronization

A single camera is used, the VideoControl and Multi Channel Experimenter software are **not remotely synchronized** via pipe connections. The camera is connected to Digital In 1 and Digital Out 1 on the IFB of the W2100-System. One receiver (A1) is connected to port 1 of the IFB.

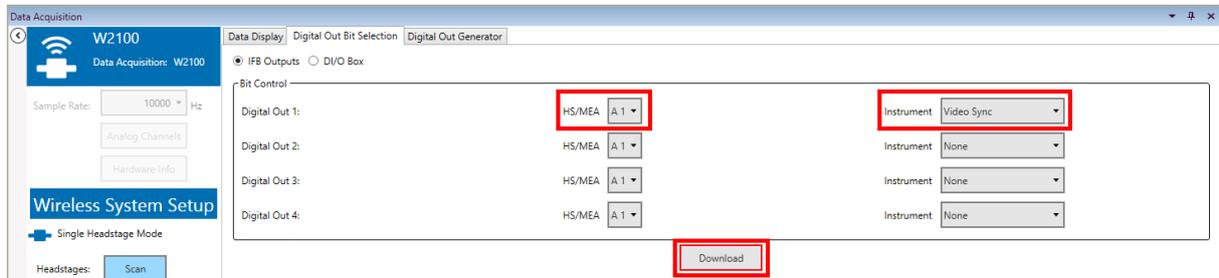
5.1.1 Multi Channel Experimenter Setup

For synchronized recording, a start or stop command for the data acquisition is generated **by the camera**. The camera sends a gate trigger to **Digital In 1** of the Interface Board, which goes HIGH as soon as the video acquisition starts, and LOW when the video stops.

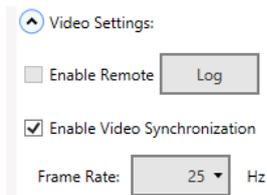


One Digital Event Detector generates an event on the **rising flank of the TTL**. This event starts the recording. A second Digital Event Detector generates an event on the **falling flank of the same TTL**, which stops the recording.

During recording, each frame of the camera is triggered by a **TTL coming from the IFB**. So, one Digital Out of the IFB needs to be connected to the camera, and the respective Digital Out must be assigned to the **Video Sync** function in the **Digital Out Bit Selection**.

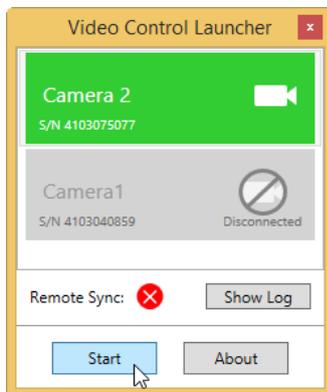


Make sure the **Video Synchronization function** in the W2100-System data acquisition tool is enabled, and the right **Frame Rate** is selected. The frame rate **MUST be identical** to the frame rate of the camera (please see chapter 5.1.2, Multi Channel VideoControl Setup). Set the recording to Standby and start the DAQ. As soon as the camera is started in Multi Channel VideoControl, the data recording in the Multi Channel Experimenter will begin.

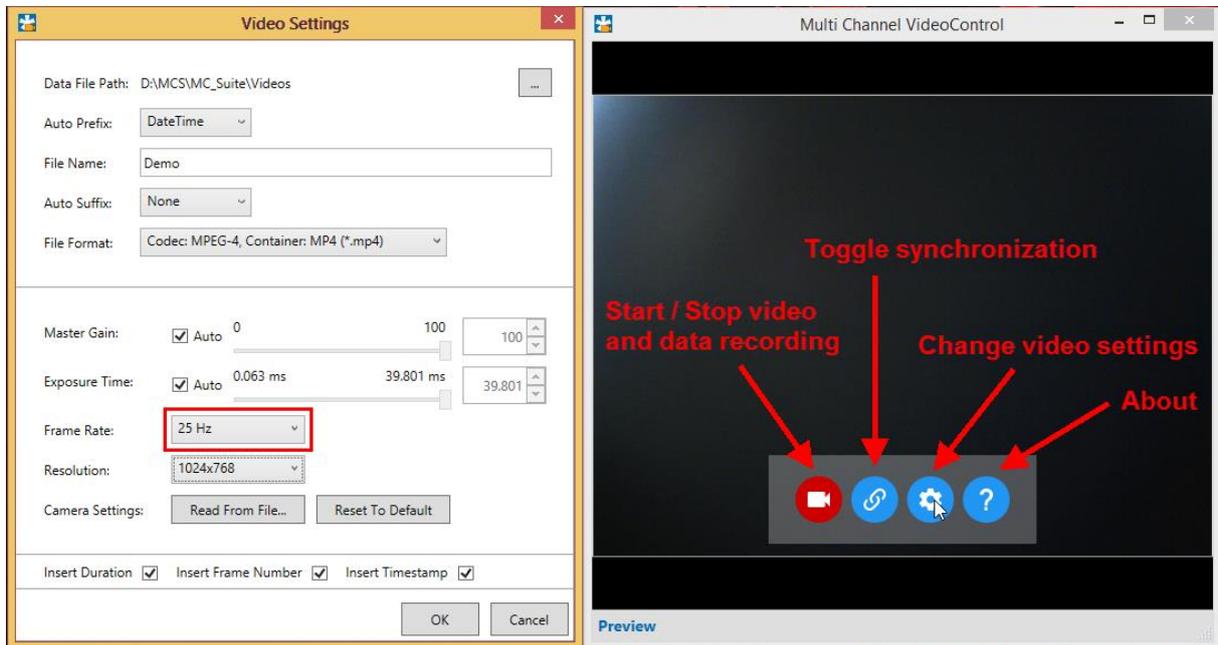


5.1.2 Multi Channel VideoControl Setup

Open Video Control and launch the camera. The camera name can be changed.



Make sure to **enable the synchronization** (see chapter 4.4.2, Video Synchronization). Open the Video Settings and adjust them as needed. It is mandatory that the **frame rate is identical** to the frame rate selected in the W2100-System data acquisition in the Multi Channel Experimenter. All other parameters can be changed at will.



File names in the Experimenter and the VideoControl software are independent, and must be edited manually. Start or Stop of the video recording will now also start and stop the data recording with the W2100-System.

5.2 Two Cameras, Two receivers, with Remote Synchronization

Two cameras are used, the VideoControl and Experimenter software are **remotely synchronized** via pipe connections while running on the **same PC**. One camera is connected to Digital In 1 and Digital Out 1 on the IFB of the W2100-System, the second camera is connected to Digital In 2 and Digital Out 2.

Two receivers, A1 and B2, are connected to port 1 and 2 of the IFB, respectively. Receiver A1 must be associated with the camera connected to Digital IN/OUT 1, and B2 must be associated with the camera connected to Digital IN/OUT 2, see below.



Important: To ensure that the respective instances of Experimenter and VideoControl connect to each other correctly (Instance 1 to Camera 1 and Instance 2 to Camera 2), open only the first instance of the Experimenter and only the first instance of the Video Control, and set up the remote connection. After the connection is established, open the second instances and repeat the procedure.

5.2.1 Multi Channel Experimenter Setup

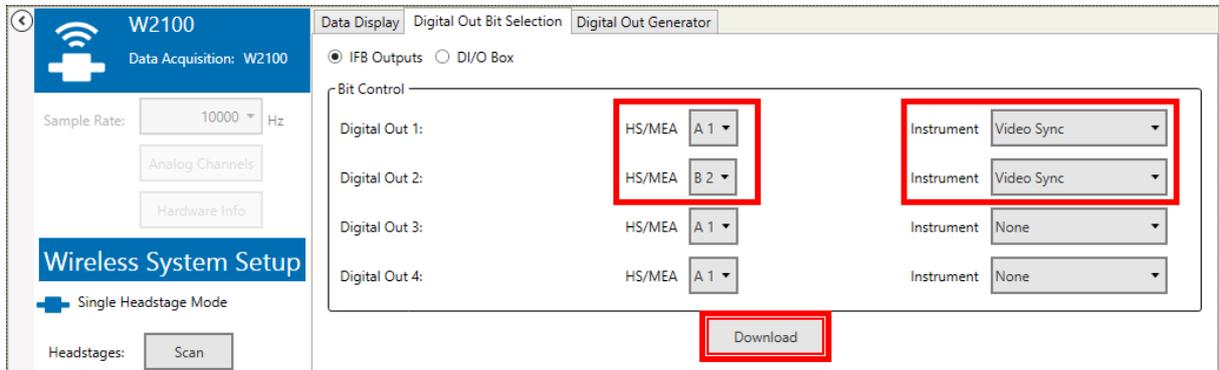
Both receivers run on two individual instances of the Experimenter. For synchronized recording, a start or stop command for the data acquisition in each instance is generated **by the respective camera**. The camera sends a gate trigger to **Digital In 1 or 2** of the Interface Board, which goes HIGH as soon as the video acquisition starts, and LOW when the video stops.

One Digital Event Detector generates an event on the **rising flank of the TTL**. This event starts the recording. A second Digital Event Detector generates an event on the **falling flank of the same TTL**, which stops the recording.

The screenshot displays the Multi Channel Experimenter software interface. The main window is titled "Multi Channel Experimenter (Instance: 1) - VCManual". The interface is divided into several panels:

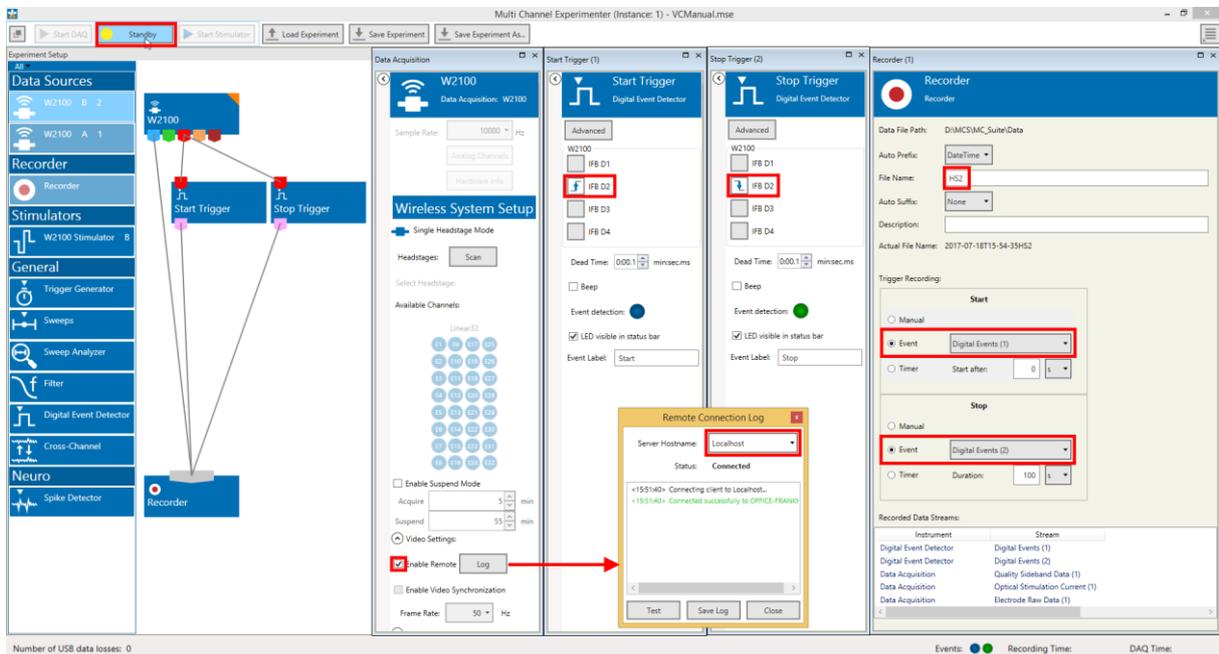
- Experiment Setup:** Shows a diagram of the system with two W2100 cameras connected to two Start Trigger and Stop Trigger units, which are in turn connected to a Recorder.
- Data Acquisition:** Displays the "Wireless System Setup" for the W2100 system, including hardware info, headstages, and available channels.
- Start Trigger (1) and Stop Trigger (2):** Two panels for configuring digital event detectors. The Start Trigger (1) is configured for IFB D1, and the Stop Trigger (2) is configured for IFB D1. Both are set to detect events on the rising and falling flanks of the TTL.
- Recorder (1):** Shows the recording configuration, including the data file path, file name (H51), and trigger recording settings. The "Start" event is set to "Digital Events (1)" and the "Stop" event is set to "Digital Events (2)".
- Remote Connection Log:** A pop-up window showing the status of the remote connection, which is "Connected". It lists several connection attempts, with the final one being successful.

During recording, each frame of the camera is triggered by a **TTL coming from the IFB**. So, one Digital Out of the IFB needs to be connected to the camera, and the respective Digital Out must be assigned to the **Video Sync** function in the **Digital Out Bit Selection** of the first Instance of the Experimenter. The other instance will show all changes, but not allow editing. Assign **Digital Out 1 to A1 and Digital Out 2 to B2**, and both to Video Sync.



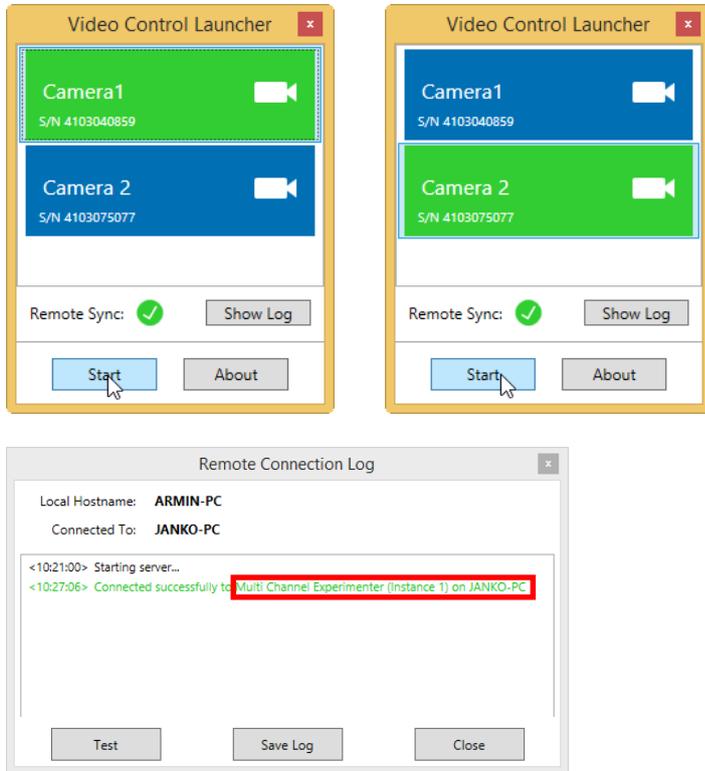
Make sure the **Remote Sync** in the W2100-System data acquisition tool is enabled, so the Video Control can remotely toggle the **Video Sync and set the frame rate**. The **core file name** in the Recorder is also set remotely to be the same as in VideoControl. Set the recording to **Standby** and start the DAQ. As soon as the respective camera is started in Multi Channel VideoControl, the data recording in the Multi Channel Experimenter will begin.

The settings for the **second instance** of the Experimenter (controlling B2) are mostly identical, just set the Digital Event Detectors to the rising and falling flank of **Digital In 2**.

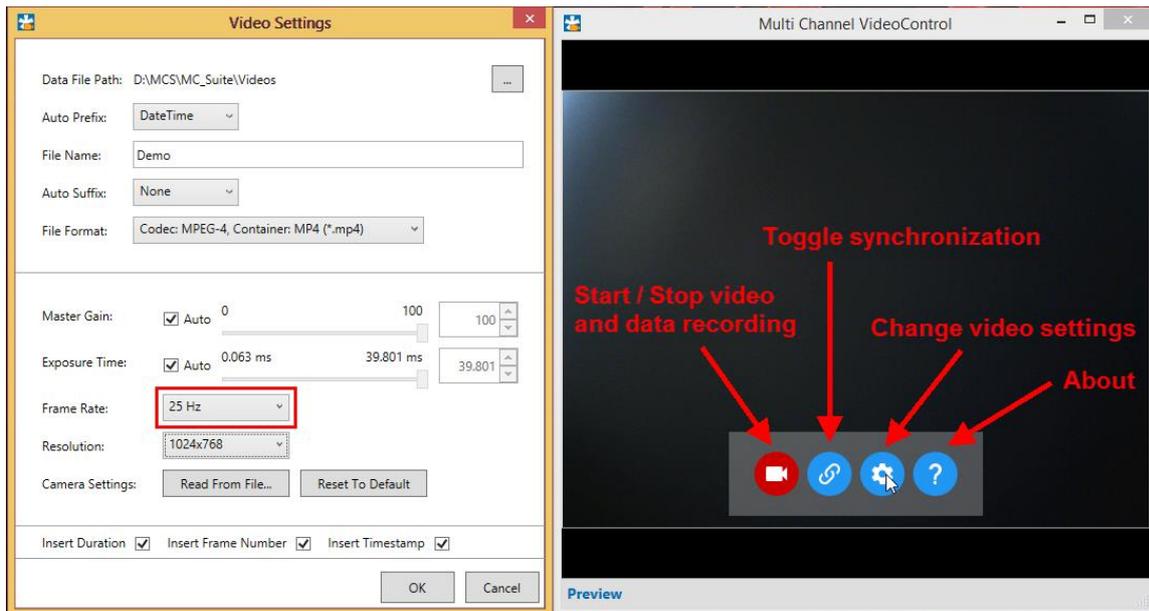


5.2.2 Multi Channel VideoControl Setup

Open Video Control twice, and launch one camera in each instance. The camera names can be changed. The **Show Log** function shows which Experimenter instance the respective VideoControl instance is connected to, which helps selecting the right camera.



Each VideoControl main window independently controls one camera. In both windows, make sure to **enable the synchronization** (see chapter 4.4.2, Video Synchronization). Open the Video Settings and adjust them as needed. The **frame rate** and **core file name** selected in each VideoControl window will be transferred to the respective instance of the Experimenter.



Start or Stop of one camera recording will now also **start and stop** the data recording with the respective receiver/headstage of the W2100. Both receiver / camera pairs operate independently from each other.

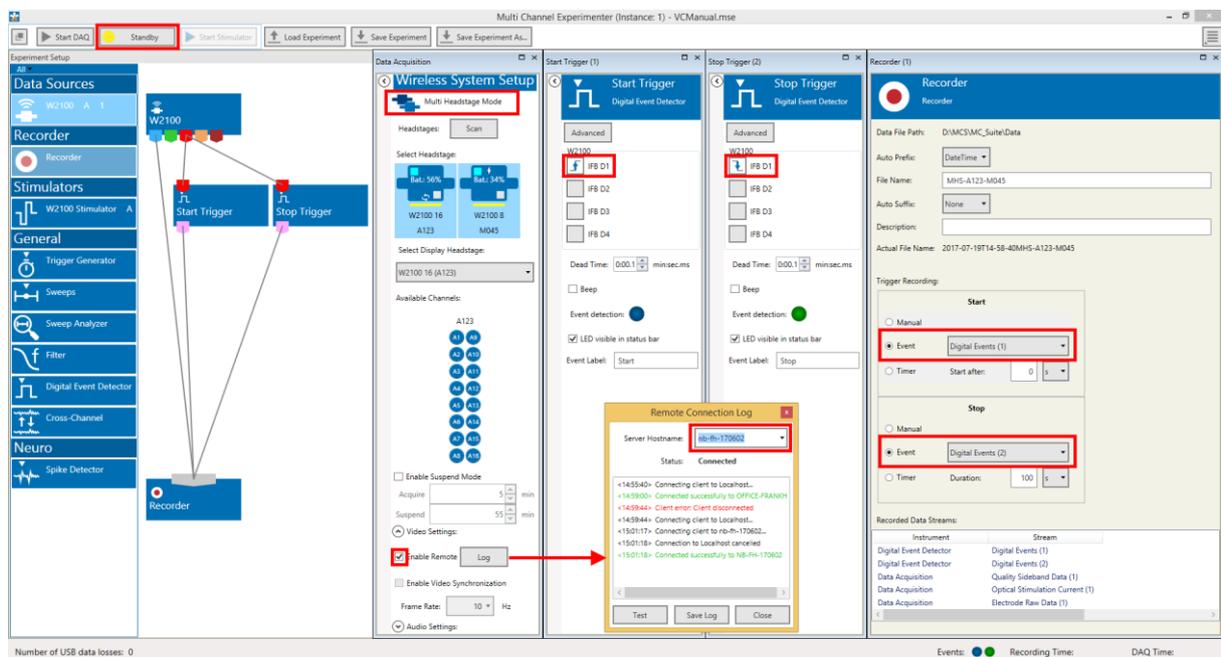
5.3 Two Cameras, One receiver, with Remote Synchronization

Two cameras are used, the VideoControl and Experimenter software are **remotely synchronized** via pipe connections while running on the **different PCs**. One camera is connected to Digital In 1 and Digital Out 1 on the IFB of the W2100 System, the second camera is only connected to Digital Out 2. **One receiver**, (A1) is connected to port 1 of the IFB. The receiver operates two headstages in **Multiple Headstage Mode**.

5.3.1 Multi Channel Experimenter Setup

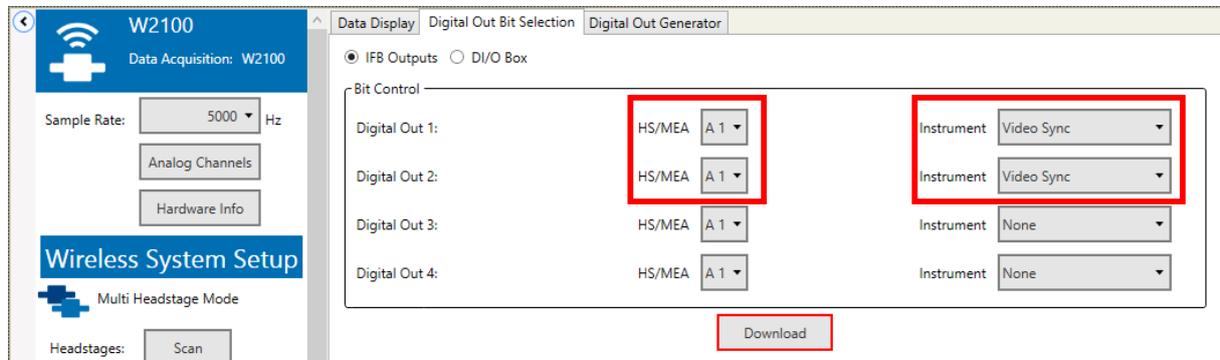
Both headstages run on the same instance of the Experimenter software, in Multi Headstage Mode. For synchronized recording, a start or stop command for the data acquisition is generated **by the camera connected to the Digital In 1**. The camera sends a gate trigger to **Digital In 1** of the Interface Board, which goes HIGH as soon as the video acquisition starts, and LOW when the video stops.

One Digital Event Detector generates an event on the **rising flank of the TTL**. This event starts the recording. A second Digital Event Detector generates an event on the **falling flank of the same TTL**, which stops the recording.



Open the **Log dialog**, and connect to the second PC, running the cameras by typing in the computer name (see chapter 0). This must be done only once, the Experimenter will automatically try to connect to the same remote PC on the next start.

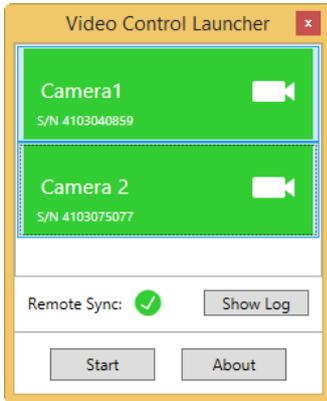
During recording, each frame of the camera is triggered by a **TTL coming from the IFB**. So, one Digital Out of the IFB needs to be connected to the camera, and the respective Digital Out must be assigned to the **Video Sync** function in the **Digital Out Bit Selection** of the Experimenter. Assign **Digital Out 1** and **Digital Out 2** to Video Sync.



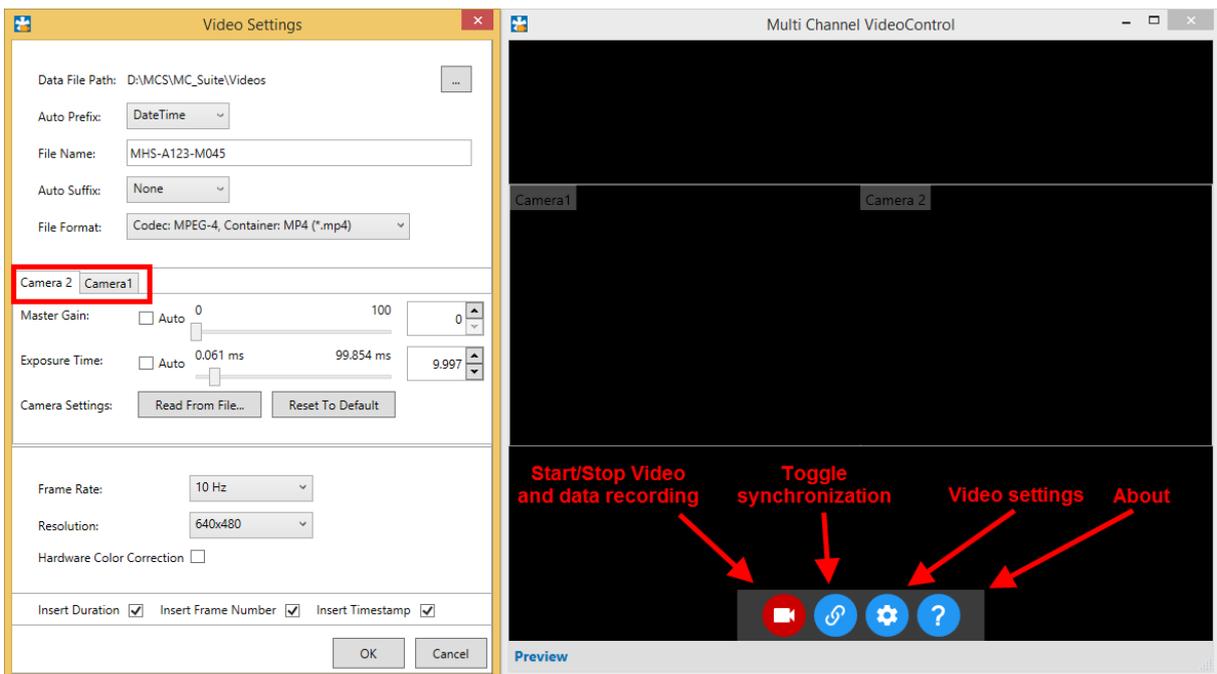
Make sure the **Remote Sync** in the W2100-System data acquisition tool is enabled, so the Video Control can remotely toggle the **Video Sync** and **set the frame rate**. The **core file name** in the Recorder is also set remotely to be the same as in VideoControl. Set the recording to **Standby** and start the DAQ. As soon as the respective camera is started in Multi Channel VideoControl, the data recording in the Multi Channel Experimenter will begin.

5.3.2 Multi Channel VideoControl Setup

Open Video Control, and launch both cameras in the same instance. The camera names can be changed.



The VideoControl main window controls both cameras. Make sure to **enable the synchronization** (see chapter 4.4.2, Video Synchronization). Open the Video Settings and adjust them as needed. The **frame rate** and **core file name** selected in each VideoControl window will be transferred to the Experimenter. Some video settings are global, while gain and exposure time can be set individually for each camera.



Start or Stop of the cameras will now also **start and stop** the data recording with the W2100. Both headstage / camera pairs operate simultaneously.

6 Support and Troubleshooting

The Multi Channel Suite is a software under development, so bugs may occur more frequently than usual. Also, new software versions are released in short intervals. The software development team of Multi Channel Systems MCS GmbH is very grateful for all reported bugs. Due to the modular nature of the software, it is impossible to test all possible configurations for each new release, and any customer feedback is much appreciated to find all problems.

Please report all bugs, feature requests or other issues to Support@multichannelsystems.com. We can only fix things we know about.

In case of problems, please check first whether your **software version** is up to date. The latest release can always be found in the [Downloads](#) section of the MCS web site. Maybe the problem has already been solved. If not, reboot the software and power cycle the recording device.

If the problem persists, report it together with the **video file** and the corresponding **data file**, if applicable. An upload option for the files will be provided if need be.

7 Contact Information

Local retailer

Please see the list of official [MCS distributors](#) on the MCS web site.

User forum

The Multi Channel Systems MCS GmbH [user forum](#) provides the opportunity for you to exchange your experience or thoughts with other users worldwide.

Mailing list

If you have subscribed to the [newsletter](#), you will be automatically informed about new software releases, upcoming events, and other news on the product line. You can subscribe to the newsletter on the contact form of the MCS web site.

www.multichannelsystems.com