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Documentation

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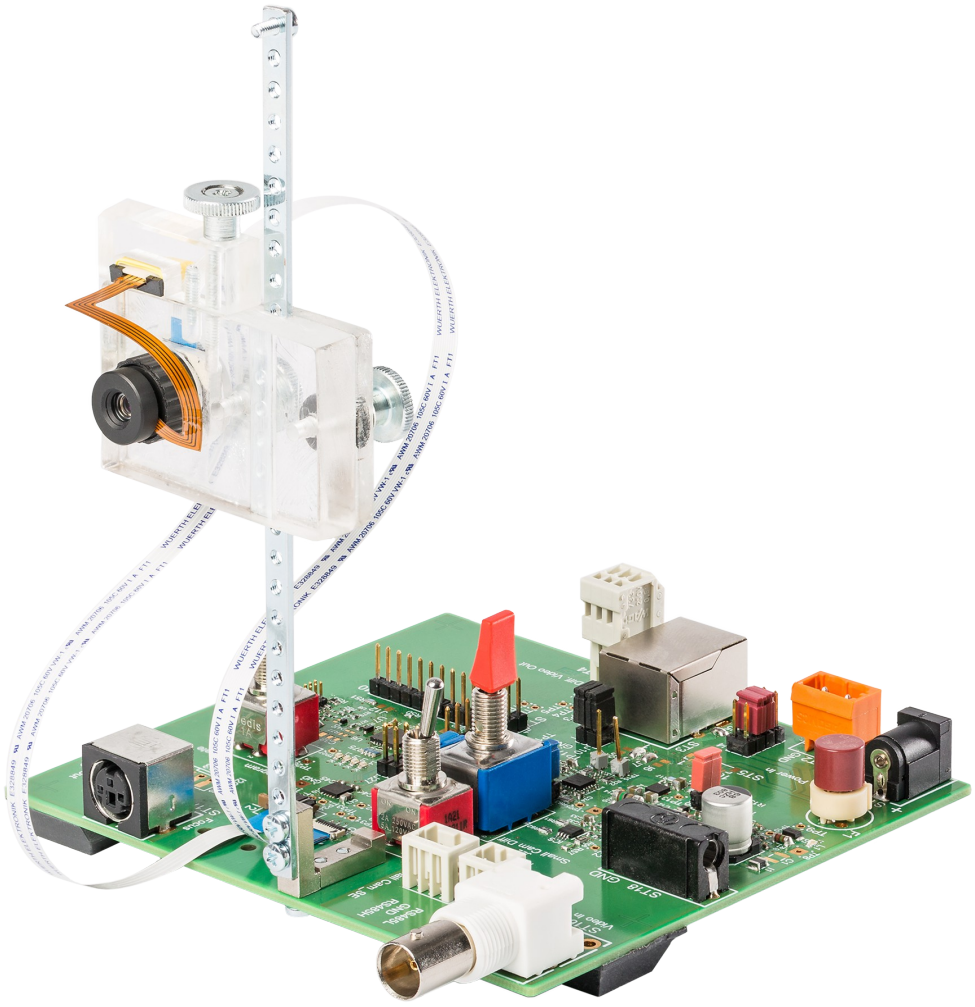
AHD-EVAL-1 Video Evaluation Board



AHD-EVAL-1 prototype board with camera 21C14 from Skoopia and liquid lens optics from Varioptic (the camera with optics, connecting cables and holder are not supplied with the board)

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Introduction

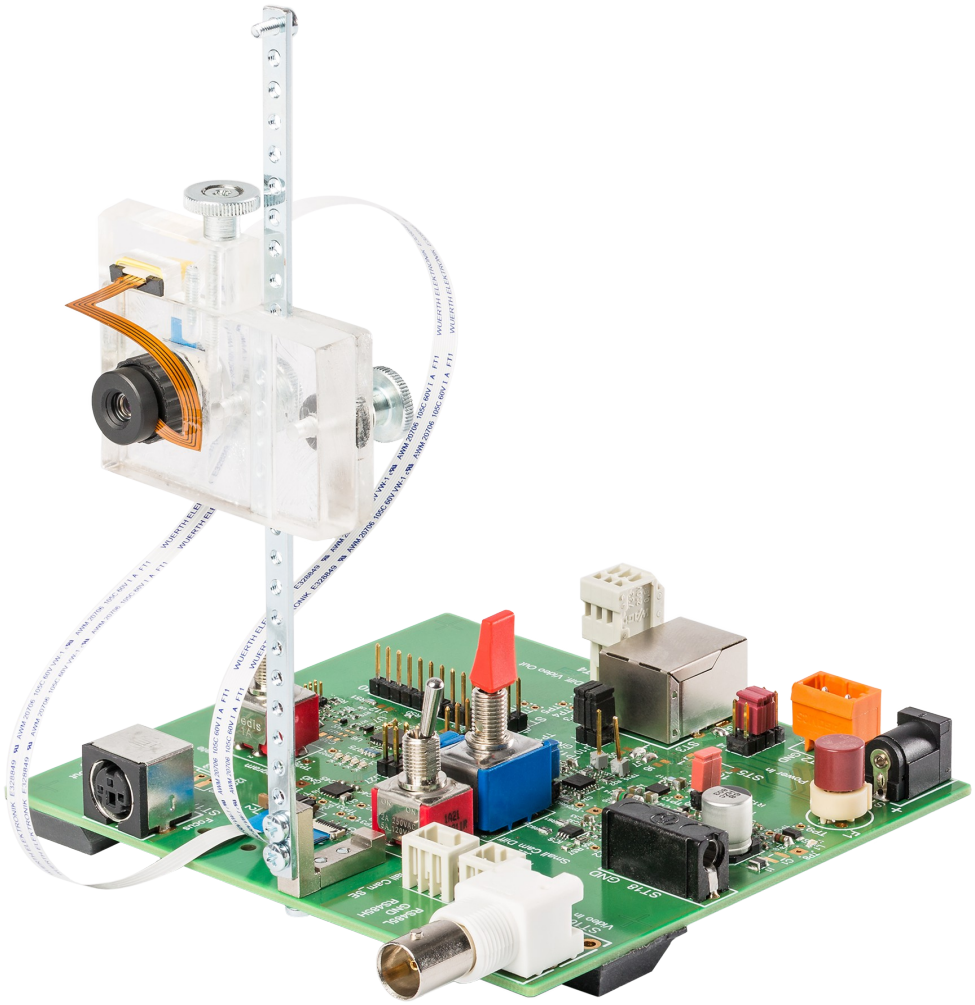

Fig. 1 AHD-EVAL-1 prototype board with camera 21C14 from Skoopia and liquid lens optics from Varioptic

The image above shows the first prototype of the board with the camera 21C14 completely mounted with liquid lens optics both connected to the evaluation board over an FFC. This shows the main purpose of the component board, which is to quickly evaluate our components for transmitting an AHD video signal over a copper cable and the communication interface. For this purpose, several circuit parts were integrated on the board:

- a switching power converter for power supply of cameras and onboard components
- a connector for the FFC from the camera 21C14 from Skoopia (power supply, video single ended and symmetrical and I2C-interface lines) on the front side
- three connectors for the Skoopia camera 20Z10S (AHD video, power supply and RS485 interface) on the front side
- an unbalanced to balanced video converter for the zoom camera module 20Z10S and for the single ended output of the camera module 21C14 (the camera module 21C14 features both single ended and symmetrical video outputs)
- the line driver circuit identical to our board AHD-LD-1 with balanced video input and output
- a micro controller for receiving remote commands over the outgoing video lines for the settings of the camera (over I2C-interface for the camera 21C14 or over the RS485-

interface for the camera 20Z10S) and for the control of the liquid lens optic (this offers double use of the video lines not only for transmitting the camera signal from the camera to the control unit but also for controlling the camera and liquid lens from the control unit)

- the input for the power supply for the cameras and all other circuitry on the board from a single 12VDC power converter on the back side over two different connectors
- the video signal output on the back side again over two different connectors
- two switches for camera and video signal selection and one extra switch for programming the onboard micro controller

Board Connectors Position

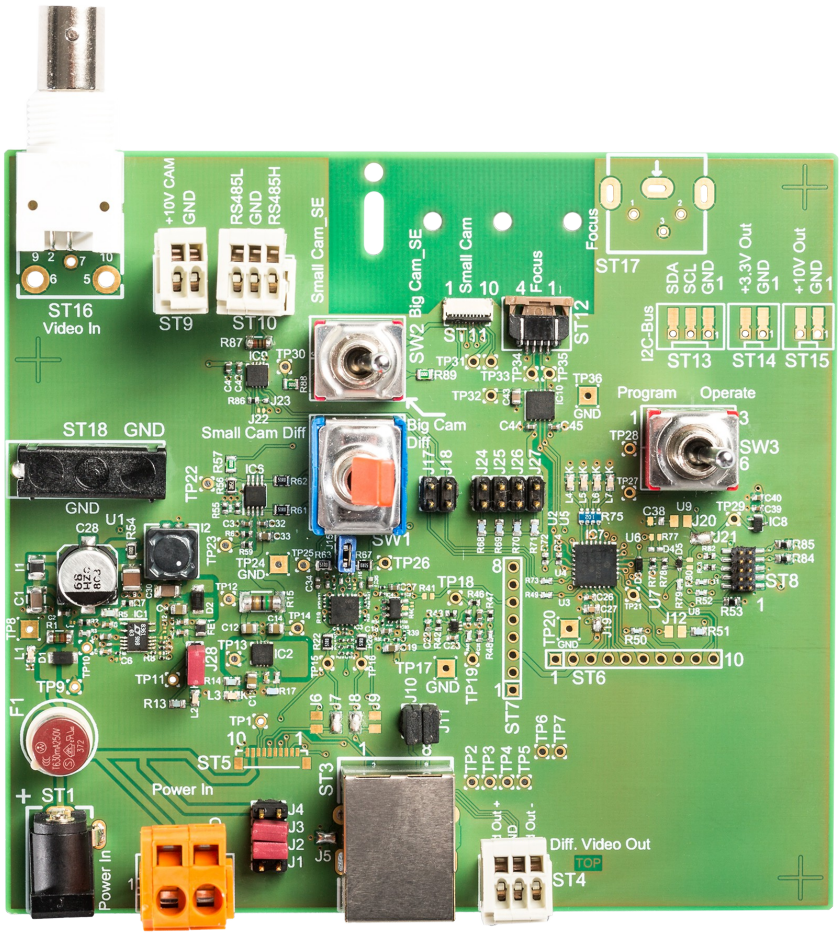

Fig. 2 AHD-EVAL-1 top view of production board

In fig. 2 all function relevant connectors can be seen. On the top side (front side in fig. 1) are the camera connectors

- ST16 - single ended AHD video signal input from zoom block camera 20Z10S
- ST9 - power supply output to zoom block camera 20Z10S
- ST10 - RS485 interface connector for communication to and from zoom block camera 20Z10S
- ST11 – FFC connector to camera 21C14
- ST12 – FFC connector to liquid lens optics

On the bottom side (back side in fig. 1) are the connectors for power supply and video output

- ST1 - power supply input 12VDC
- ST2 – alternate power supply input 12VDC
- ST3 – RJ45 connector for symmetrical video output to STP cable
- ST4 – alternate connector for symmetrical video output to STP cable

Board Connectors Pinout

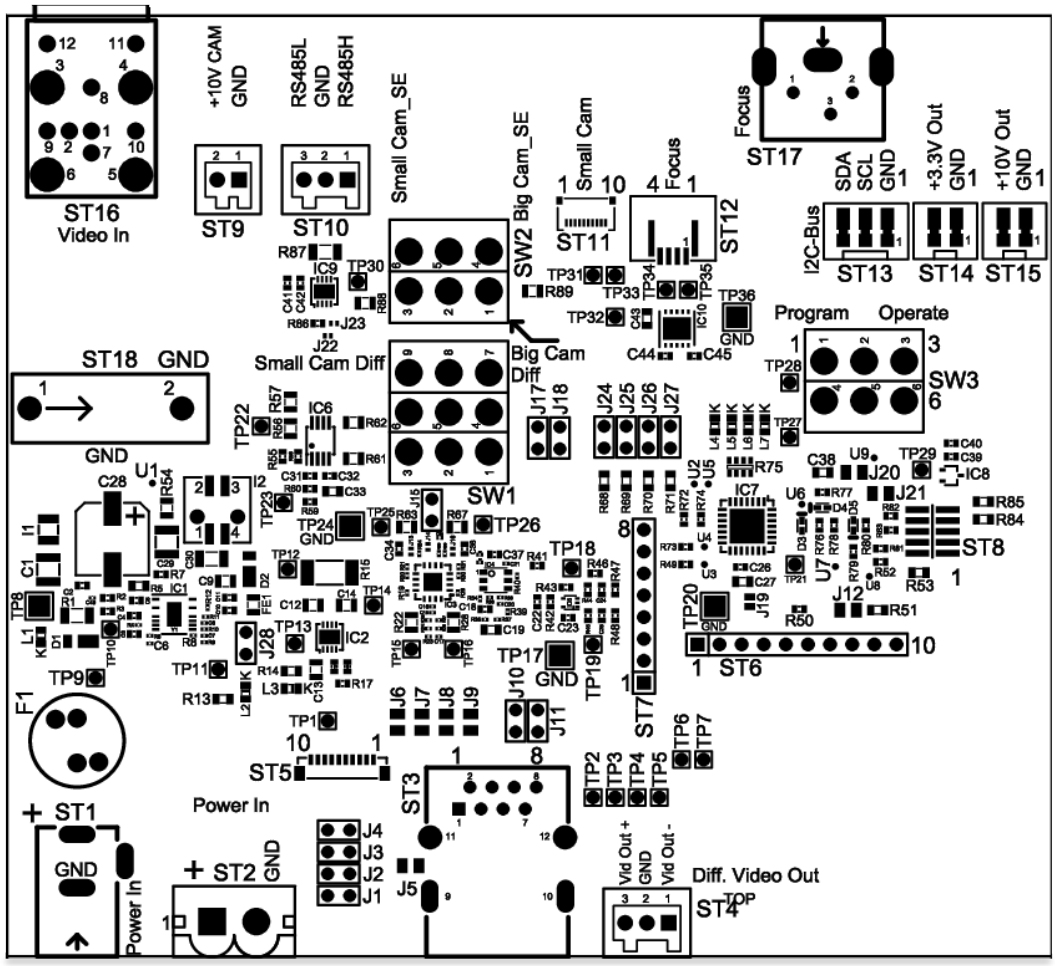

Fig. 3 Component placement on board

Fig. 3 shows the component placement for better readability of the text for the connectors used and the text and positions of the individual pins.

I do not describe the exact pinout of ST16 for the single ended video input of the zoom camera block 20Z10S because it is a ready made coaxial connector.

ST9 - Power Supply Zoom Block Camera 20Z10S

Pin	Signal
1	power supply ground
2	+10VDC power supply voltage

ST10 - RS485 Interface Zoom Block Camera 20Z10S

Pin	Signal
1	RS485H high side
2	RS485 ground
3	RS485L low side

ST11 - 21C14 Camera Module Connector

Pin	Signal
1	+10VDV power supply voltage
2	ground
3	single ended AHD video output
4	ground
5	+balanced AHD video output
6	- balanced AHD video output
7	I2C clock line
8	I2C data line
9	not used
10	not used

ST12 – Liquid Lens Connector

Pin	Signal
1	ground
2	LL-out2
3	LL-out1
4	ground

ST1 - Connector for Power Supply

AC adapter with 2 pole coaxial power connector on the DC output side

Pin	Signal
1	power supply input 9-36VDC
2	not used
3	ground

ST2 – Alternate Connector for Power Supply

Pin	Signal
1	power supply input 9-36VDC
2	ground

ST3 – RJ45 Video Output Connector

Pin	Signal
1	+AHD video output
2	-AHD video output
3	ground
4	ground
5	power supply input 9-36VDC over cable and J2
6	power supply input 9-36VDC over cable and J3
7	ground power supply input over cable and J10
8	ground power supply input over cable and J11
9	ground over J5
10	ground over J5
11	ground over J5
12	ground over J5

The AHD-EVAL-1 board can be used with power supply over the camera/control unit cable. If a normal network cable is used as camera/control unit cable then two network cable leads are used parallel for ground and +9-36VDC to keep the cable resistance low.

ST4 – Alternate Video Output Connector

Pin	Signal
1	-AHD video output
2	ground
3	+AHD video output

Switching between Camera Modules

Two manual switches – SW1 and SW2 - are used to select one camera if both camera modules are connected to the AHD-EVAL-1 at the same time.

There are four possible switch settings with these two switches of which only three are used. In the table below I refer to fig. 2 AHD-EVAL-1 top view of production board!

SW1	SW2	Operation
left	left	balanced video output of camera module 21C14
right	right	single ended output of camera module 20Z10S
right	left	single ended output of camera module 21C14
left	right	not used

Setting up Operation with the AHD-EVAL-1 Board

In the following description I assume that you want to work with both camera modules 21C14 and 20Z10S from Skoopia alternately, a liquid lens from Varioptic and that you want to use the serial communication interface to control the focus setting of the liquid lens and the camera settings of the 21C14 camera module over the I2C interface.

The current version of the firmware of the onboard controller supports liquid lens and 21C14 camera settings only. The support of the VISCA interface of the camera 20Z10S is not yet implemented. It can be upgraded later on.

1. Camera 21C14 Connection

For the connection of the camera we just need to connect the flexible flat cable (FFC) from the camera to the board connector ST11 as you can see in fig. 1 on page 3 of this document.

Be careful and use as little as possible force to open and close the 10-pole FFC connector. It is primarily made for being small and high pole count and is quite fragile. The number of cycles for plugging and unplugging is comparably small compared to other connectors. Please take care not to kink the FFC.

2. Liquid Lens Optics Connection for Camera 21C14

For the connection of the liquid lens optics we just need to connect the flexible flat cable (FFC) from the liquid lens optics the board connector ST12 as you also can see in fig. 1 on page 3 of this document.

Be careful and use as little as possible force to open and close the 4-pole FFC connector, as it is similar to the 21C14 camera connector. Please take care not to kink the FFC.

3. Camera 20Z10S Connection

First connect the singe ended AHD video output of the camera to the connector ST16

Next connect the power supply lines of the camera to the two pole connector ST9.

If the polarity of the supply voltage is reversed, there is a high risk of damage to the camera.

As a third step you can connect the three lines of the RS485 interface of the camera to the three pole connector ST10.

If the polarity of the interface lines is not correct, there is a high risk of damage to the cameras RS485 driver component and/or the one of the AHD-EVAL-1 board.

4. Select Camera for Operation

Set the manual switches SW1 and SW2 as described in ***Switching between Camera Modules*** to select the camera you want to use.

Check SW3 to make sure that it is set to operate not program. The remote control interface is not working if it is set wrong!

5. Connection of Cable to Control Unit

Connect one end of the video transmission cable to either the RJ45 connector ST3 or the 3-pole connector ST4. The other end of the cable should be connected to the AHD video input connector of the AHD-VR-1 board and a monitor connected to the AHD video output of this board.

If the polarity of the interface lines is not correct, there is a high risk of damage to the RS485 driver component of the AHD-EVAL-1 board or the one at the control box end of the cable (normally the AHD-VR-1 board)

7. Power Supply of the AHD-EVAL-1 Board

For a first test it is best to supply the board with a separate voltage between 9-36VDC. You can use a ready made wall socket power supply 12VDC output with a coaxial connector and plug it into ST1.

Alternatively you can use the 2-pole connector ST2 with a lab power supply.

When the board is connected to power the leds L2 and L3 light up. Immediately thereafter the leds L4 to L7 light up shortly in bar fashion which is an indication that the processor has started up.

If the polarity of the supply voltage is reversed, there is a very high risk of damage to all components connected.

8. Power Supply of the AHD-VR-1 Board

For a first test it is best to supply the board with a separate voltage between 9-36VDC. You can use a ready made wall socket power supply 12VDC output with a coaxial connector and plug it into ST12.

Alternatively you can use the 2-pole connector ST9 with a lab power supply.

When the board is connected to power the leds L5 and L6 light up. Immediately thereafter the leds L1 to L4 light up shortly in bar fashion which is an indication that the processor has started up.

If the polarity of the supply voltage is reversed, there is a very high risk of damage to all components on the board.

You should have a picture on the monitor connected to the AHD-VR-1 board when you finally apply power to the video receiver board.

Switch off all power and check polarity of all connectors if it does not work.

Setup Software

We provide a free software for communication and setup of the board. The software is a multi purpose tool to communicate to a variety of our boards. One of the them is the AHD-VR-1. Basically it is not necessary to communicate with the board once it is installed and properly programmed. But in cases where the board is mounted without direct access to it, it is helpful if the board is programmable via a serial interface. You can use our USB-adapter board with ribbon cable connected to ST7 of the board as a virtual COM-port!

Connecting to the AHD-VR-1 Board

The program is delivered as a zip-archive file. Copy the two binaries into an empty folder on the hard disc of your computer to get started. Then start the main executable.

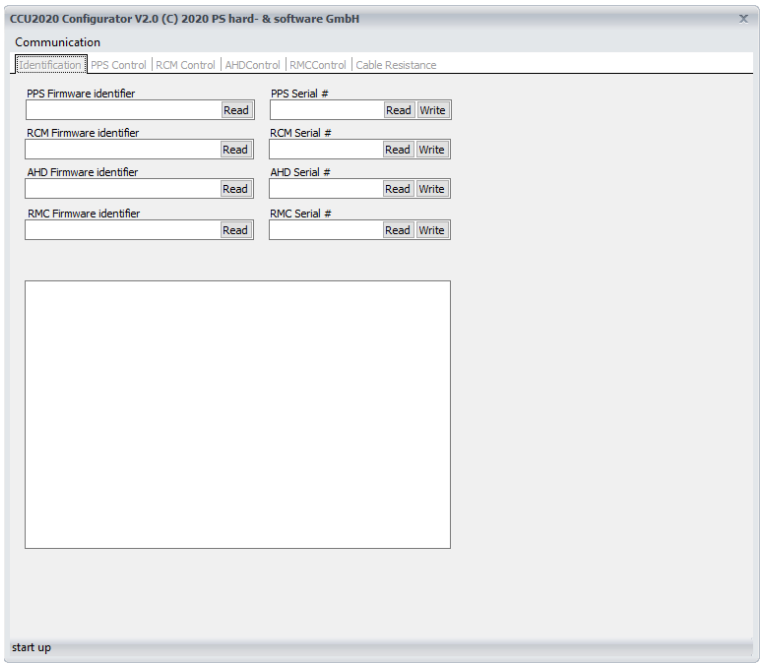

Fig. 4 Start Screen of PPSCONTROL.EXE

Proceed to the menu ***Connect*** and further to ***AHD-VR-1***.

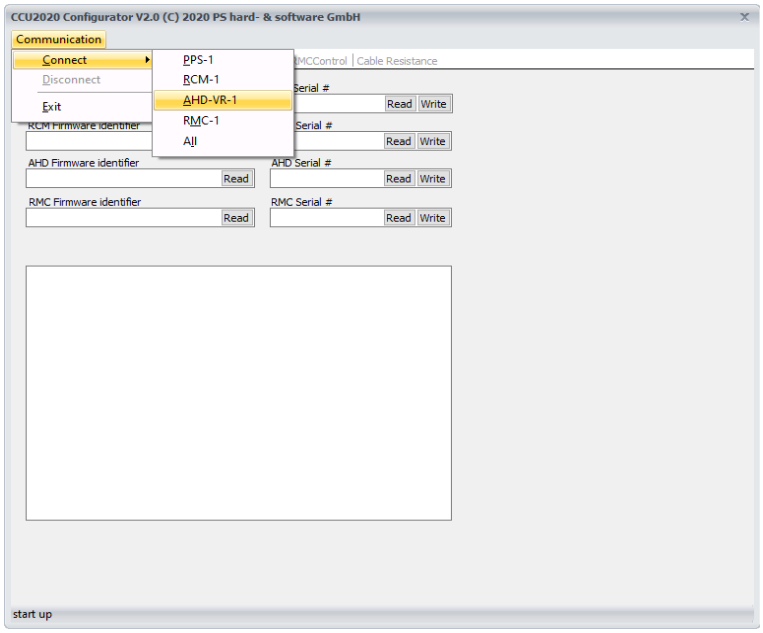

Fig. 5 Menu *Connect* AHD-VR-1

As a next step you have to select a serial port for the communication.

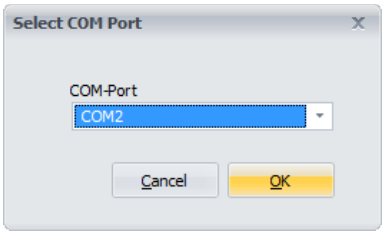

Fig. 6 Port Select Window

Click OK to proceed.

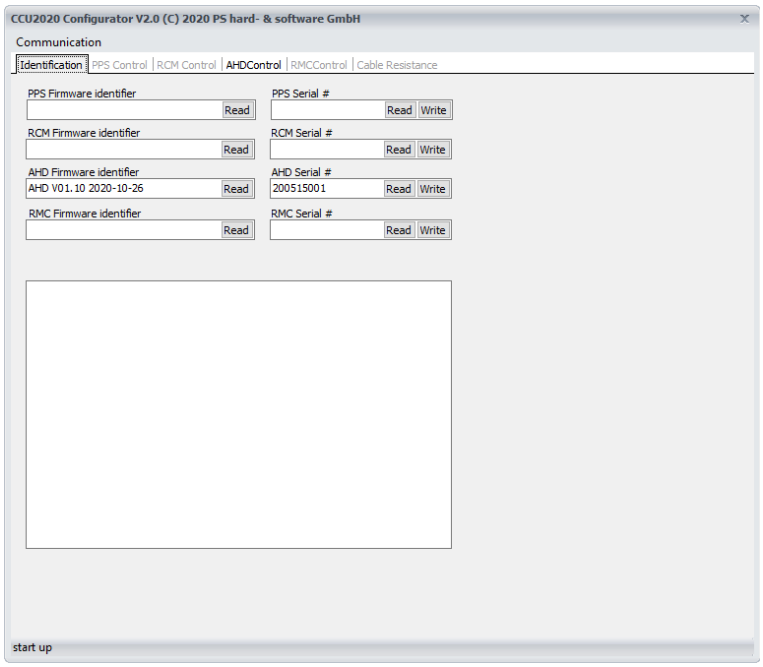

Fig. 7 Main Screen after Connecting

Elements of the Main Tab *AHDControl*

Tab Data - Filter Setup

Now proceed to the AHD-VR-1 tab clicking the ***AHDControl*** tab! In the new window there are four tabs ***Parameter***, ***Data***, ***Liquid Lense*** and ***21C14***.

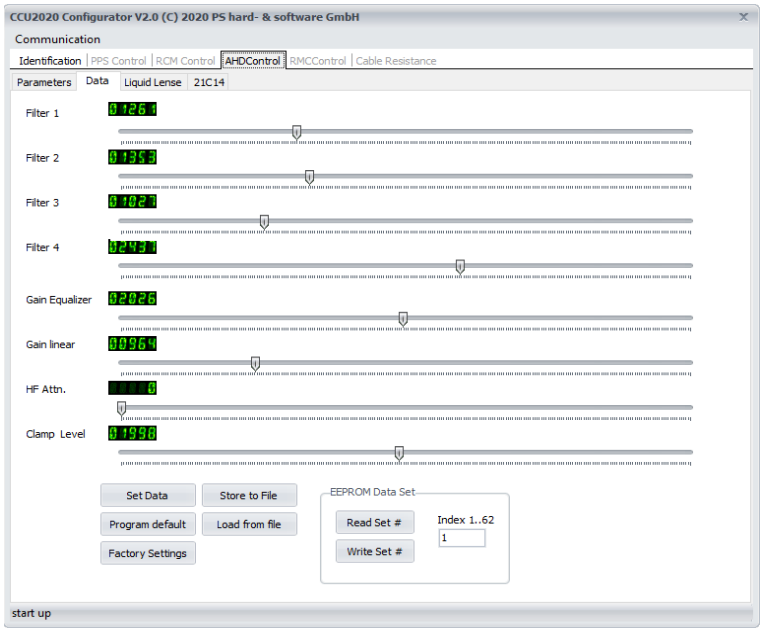

Fig. 8 *Data* Tab of the AHD-VR-1 Window

In this window you can set the configuration of the video processing core circuitry, you can store and read such configurations to and from files and you can program the EEPROM memory of the onboard processor. There is a default setting that is loaded and applied immediately after power up of the board. And there are up to 62 other settings in the EEPROM that can be used by you. The factory EEPROM settings #1 to #8 are preset with default values according to the table *below*!

EEPROM Address	Description
Default	300m CAT7 for block camera
Set #01	1m CAT5 for block camera
Set #02	190m CAT5 for block camera
Set #03	300m CAT7 for block camera
Set #04	500m CAT7 for block camera
Set #05	1m CAT5 for camera 21C14AT
Set #06	190m CAT5 for camera 21C14AT
Set #07	300m CAT7 for camera 21C14AT
Set #08	500m CAT7 for camera 21C14AT

Since there is a vast variety of possible settings it is always helpful to start with one of the default settings provided by us. Just change one setting at the time and monitor the video output of our board with an oscilloscope or you might get lost in just no time. Please feel free to contact us if you need help or advice doing the adjustment. We can also offer you to measure the cable used by you and to deliver default settings for your cable. However for this purpose we need a sample of the used cable with the maximum length used in the application.

The button ***Set Data*** outputs the currently visible slider settings to the DAC of the board.

The button ***Program Default*** programs the current slider settings to the appropriate EEPROM address. These values are used for every new power up of the board.

The button ***Factory Settings*** is a reset of all EEPROM values , default and set #1 to set #8 as a

fallback in case the EEPROM contains invalid values.

The buttons ***Store to File*** and ***Load from File*** are used for storing and loading slider settings to and from files.

In the group box window the buttons ***Read Set #*** and ***Write Set #*** together with the field ***Index*** are used to read and write individual configuration sets to and from the EEPROM memory.

Tab Parameters – DAC Type and Specification

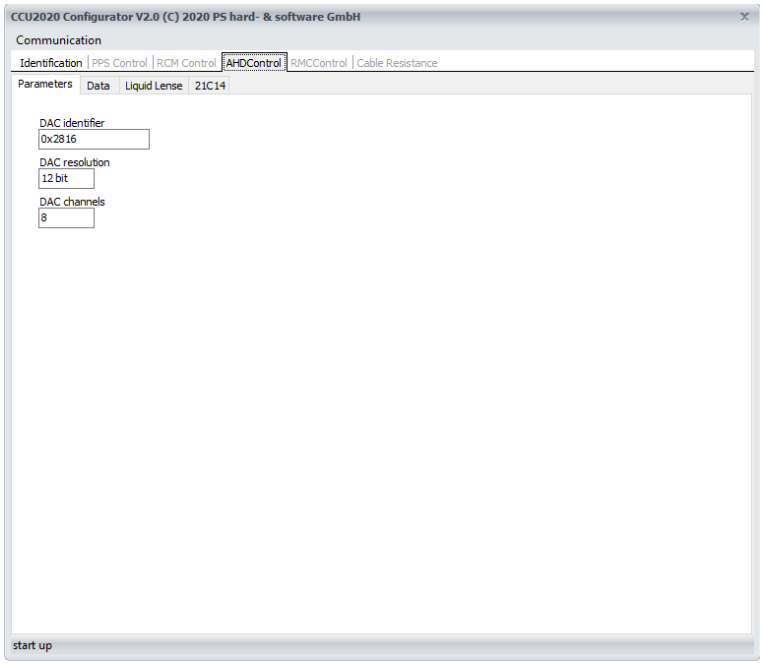

Fig. 9 *Parameter* Tab of the AHD-VR-1 Window

The tab ***Parameters*** serves as identification of the DAC component on the AHD.VR-1 board. It is sort of a left over from the development phase of the board when we were experimenting with different resolutions of this component. But is also helpful for diagnosis of the functions of the board.

The OEM version of the software is slightly different from the full version of the program that we only use internally. Therefore some of the program windows look also slightly different. Don't let that confuse you.

Tab Liquid Lens – Focus Setup

On this tab there are controls for setting the current focus by changing the slider position of the track bar. If you use the arrow keys on the keyboard instead of the mouse then you have the best resolution possible. For this the focus has to be set to the track bar by clicking on the track bar with the mouse. Thereafter you can use the keyboard to modify the value. The focus is displayed with a fine dotted line around the track bar.

The button ***Program default*** stores the current focus value into the EEPROM of the micro controller for subsequent power on sequences.

The data communication interface between the computer and the AHD-EVAL-1 board is unidirectional only because there is only a data channel from the AHD-VR-1 board to the AHD-EVAL-1 and not back. This means that we cannot read the current setting of the focus value. After restarting the software it will show a default value and not the formerly set value for the focus. This is also true for the camera settings.

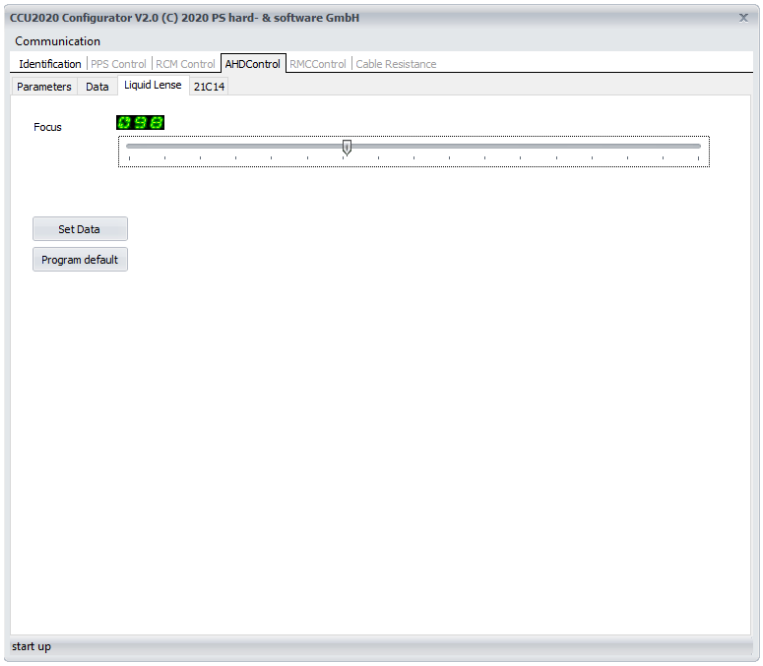

Fig. 10 *Liquid Lens* Tab of the AHD-VR-1 Window

Tab 21C14 – Camera 21C14 Setup

On this tab there are several groups of radio buttons available each with a ***SET*** button to send the command according to the radio button selected to the camera.

The groups are

- AGC
- Brightness
- Shutter
- AWB
- Sharpness
- DNR
- Saturation
- Contrast
- Day/Hight
- Mirror
- FPS
- Format
- WDR
- Reticle/OSD
- Colorbar
- Save

Each group has its own choice of possible commands. Thus the system built in camera can be adapted to different working environments with the computer over the video cable lines through the video receiver module AHD-VR-1 all the way to the camera module using an I2C-interface.

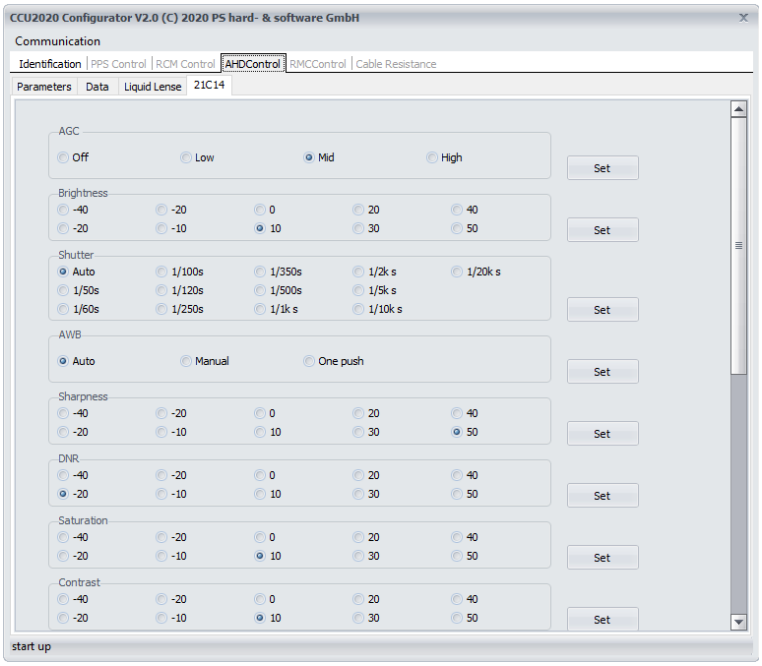

Fig. 11 *21C14* Tab first part of the AHD-VR-1 Window

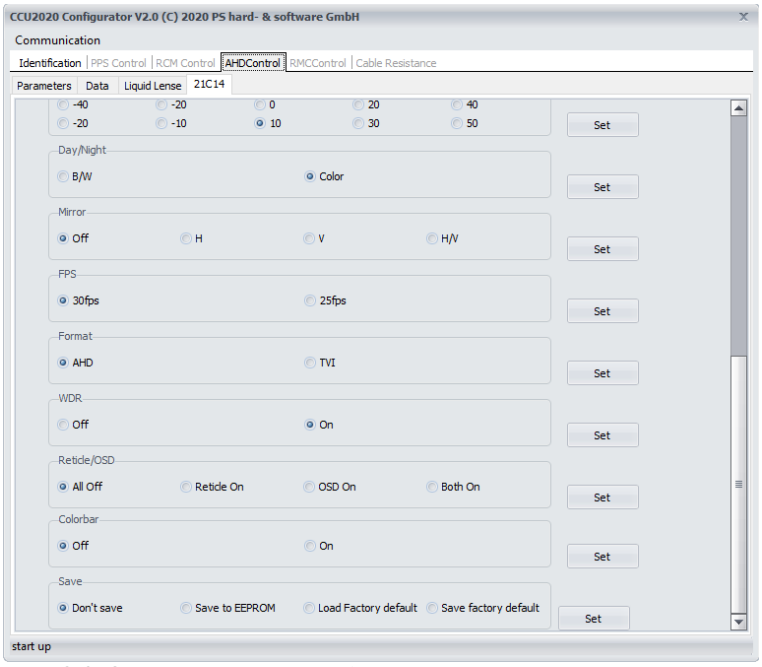

Fig. 12 *21C14* Tab second part of the AHD-VR-1 Window