basicCON 4121
Video Dragon

User Manual
(Translation of Original docu)
Document Version 1.7

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1 Installation and Warranty

1.1 Scope of Delivery

The following parts belong to a delivery of your **GOEPEL electronic Video Dragon basicCON 4121**:

- 1x **Video Dragon** basic device
- 1x **Media Interface Module** (according to your order, already installed)
- Power supply Unit
- CD with Driver, Software and Manual
- LAN cable
- USB cable
- Video cable (the type depends on the installed **Media Interface Module**)

1.2 Hardware Installation

1.2.1 Connect the Video Dragon

Having unpacked your **Video Dragon** completely, please check whether the type of the **Media Interface Module** corresponds with your order.
Then check if the module is fixed mounted at the **Video Dragon**.

Please make absolutely certain that all of the hardware installation procedures described below are carried out with your system switched off.

We recommend to install/ update the device driver software for USB before connecting the **Video Dragon** to the PC/ Laptop (see Driver Installation/ USB).

Hardware installation for **Video Dragon basicCON 4121** means only to connect the attached power supply unit to the **Power** socket (see Figure 2-4), and the USB or Ethernet cable to the control PC/ Laptop.

Please use the supplied USB cable to connect your **Video Dragon** to the USB interface of the PC/ Laptop.
Other cables may be inapplicable.

Then, connect the **Media Interface Module** of the **Video Dragon** to the device to be tested (the UUT).

All other connections are not required for video transmission.
Please use them only when needed.
Look for a description of these interfaces in chapter Mainboard.

1.2.2 Module Change

Media Interface Modules enable your **Video Dragon** to perform a multitude of different Test tasks; and they are compatible to diverse systems. Therefore it can be required to install a new **Media Interface Module** for a new Test task.

Please make absolutely certain that all of the hardware installation procedures described below are carried out with your system switched off.

Please proceed as follows to change a **Media Interface Module**:

- To remove an already installed module, loosen both knurled screws (see figure below) completely. Then extract the module from the **Video Dragon** by touching it at the knurled screws.
- Plug the new module into the **Video Dragon** (within the guide rails, that way that all labels have the same direction). Press the module finally with a little power to the inside connector. Then fasten manually both knurled screws.

Figure 1-1: Module change

1.3 Driver Installation

1.3.1 USB

To install the **GOEPEL electronic** USB drivers on your system, execute the **G-USB** driver setup.
For this, start the *G-USB-Setup-*.exe* setup program (the asterisk stands for the version number) of the delivered CD, and follow the instructions.

Your **Video Dragon basicCON 4121** can be operated under Windows® XP as well as under Windows® 7/ 32 Bit and Windows® 7/ 64 Bit.

Before connecting the **Video Dragon basicCON 4121** stand-alone hardware to a USB port of your PC/ laptop, please ensure that the external power supply of the device is connected and ready for operation (**Video Dragon's** hardware can NOT be supplied via USB). Then, connect the device by the supplied USB cable to a USB port of your PC or laptop (see Hardware Installation).

Due to the plug and play capability of Windows®, the operating system will recognize the device automatically. As soon as it has been detected, Windows® informs you with the "Found New Hardware wizard" and guides you through the device driver installation process.
Select the "Install the software automatically (Recommended)" option and click "Next" to continue.

On completion of the installation process, Windows® will request you to reboot your computer.
For safe and reliable operation this step is strongly recommended.

After the installation, you can check by the Windows® Device Manager whether the unit is properly embedded by the system.

As an example, the following figure shows the successful embedding of one **basicCON 4121** device:

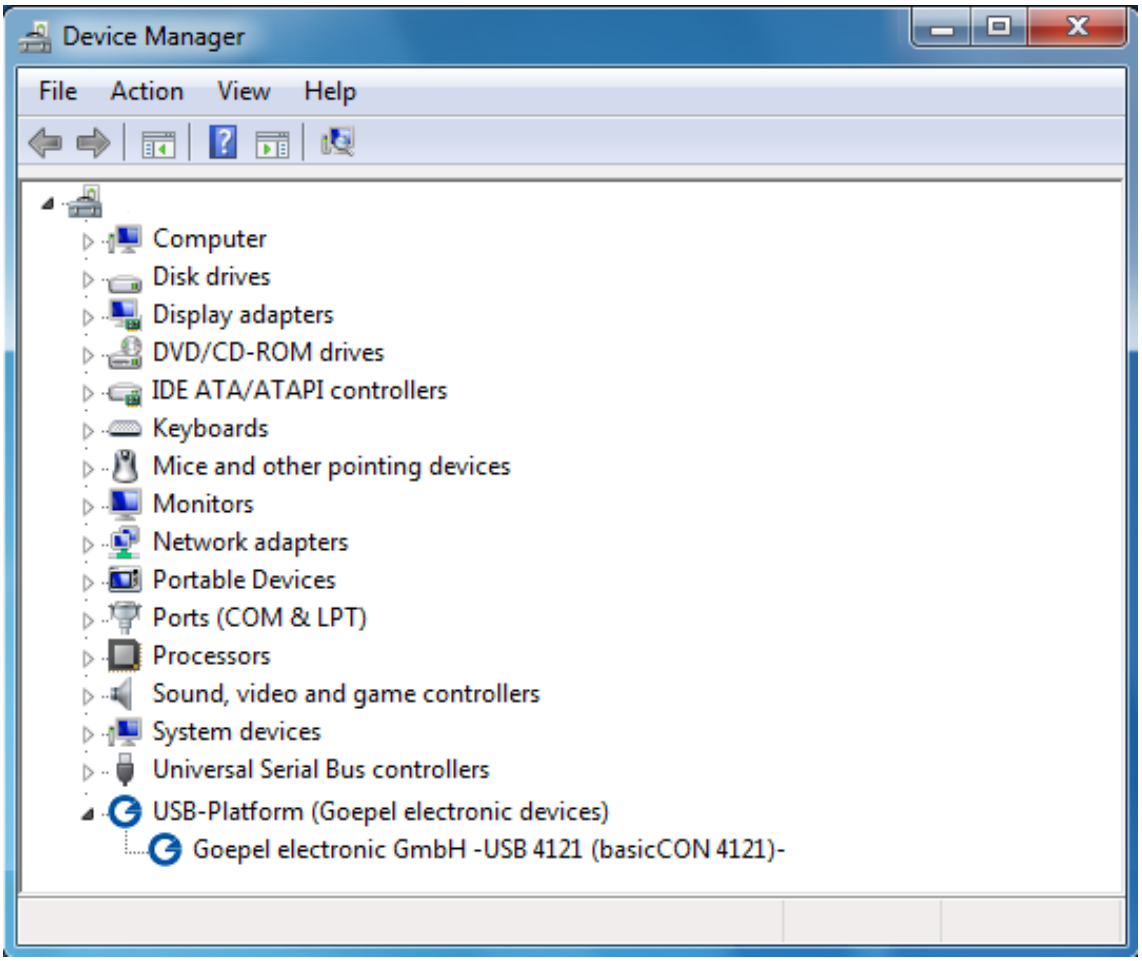

Figure 1-2: An installed basicCON 4121 in the Windows® Device Manager

Please note that the Device Manager shows ALL USB controllers supported by this driver.

1.3.2 Ethernet

If the Ethernet interface is used for communication with the control PC or laptop, there is no driver installation required.

Nevertheless, to address the **Video Dragon basicCON 4121**, you need a network device that is set up with a valid **IP Address** and proper **subnet mask**. Otherwise the control PC or laptop will not be able to communicate with the **basicCON 4121** in the network.

This setup needs to be done only once, independent of the number of **basicCON 4121** devices you are willing to use.

For setting up, you have to open the Network Connection Properties dialog of the appropriate network device:

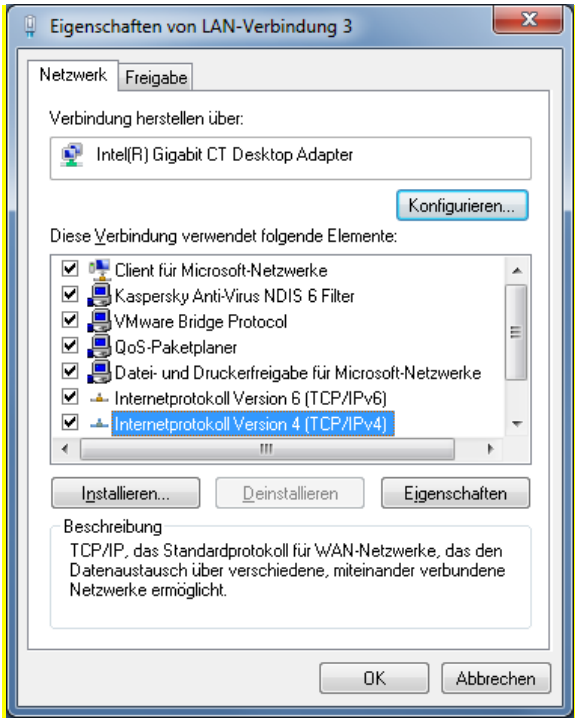

Figure 1-3: Network Connection Properties

Select the "Internet Protocol Version 4 (TCP/IPv4)" properties.
A new window opens where you set the **IP Address** and **subnet mask** to fixed values (i.e., your **Video Dragon** has a static **IP Address**) regarding the following rules:

- The **IP Address** of the network device has to be different from that of the **basicCON 4121**.
- The **subnet mask** has to be set to such a value, that both **IP Addresses** (of network device and **basicCON 4121**) are in the same subnet.

Example:

The default **IP Address** of the **basicCON 4121** is **192.168.1.62.**
You can set up your network device for example to the **IP Address 192.168.1.100** and the **subnet mask** to **255.255.255.0,** since both devices are now in the same subnet **192.168.1.xx.**

If the network device has been set up right, after the Hardware Installation, the **Video Dragon** can directly be addressed via the **IP Address** (see also Addressing).
This **IP Address** can be changed by the **HardwareExplorer.**
The newly set **IP Address** becomes effective after a restart of your **Video Dragon.**

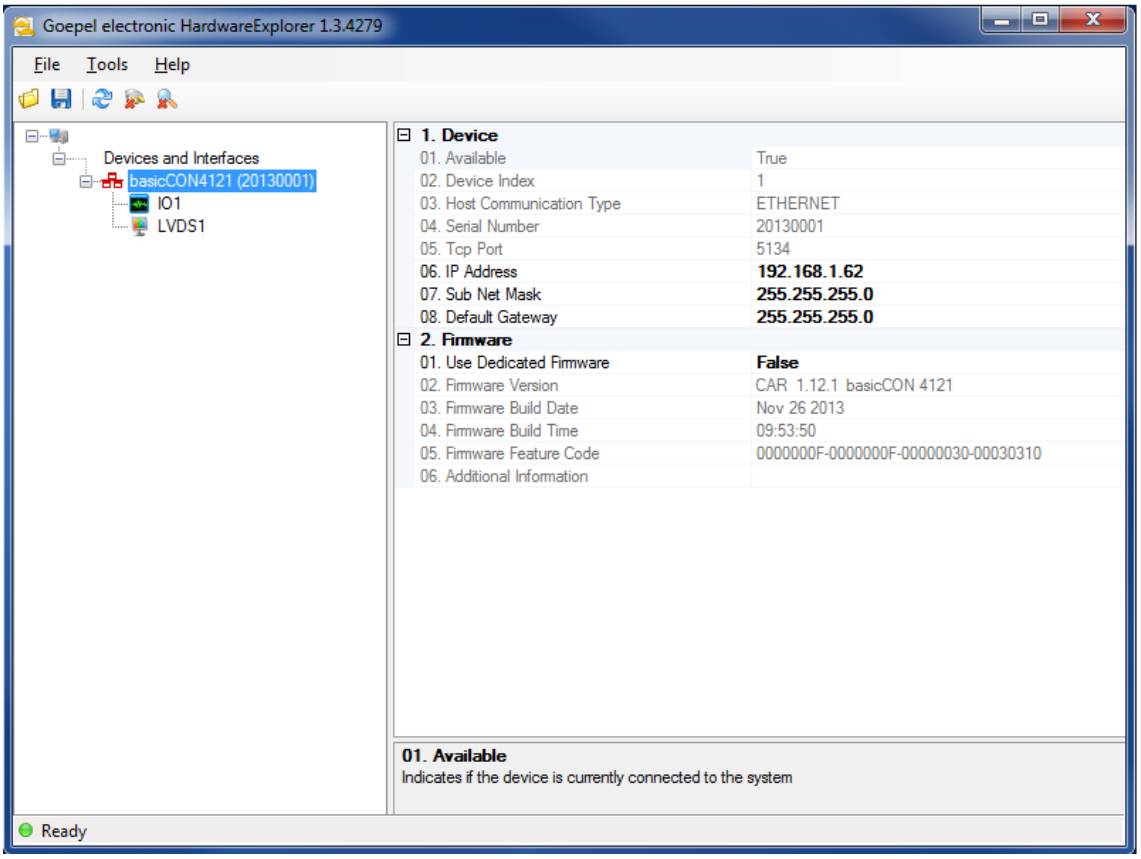

Figure 1-4: IP Address in the GOEPEL electronic HardwareExplorer

Changing the static **IP Address** is required then if you want to operate several **Video Dragon** devices in the same network.
In this case, always connect initially only the device for that you have to change the **IP Address.**
Then change the corresponding **IP Address.**
If all **Video Dragon** devices have different **IP Addresses**, you can operate them jointly in the same network.

1.4 Warranty

Warranty Conditions

GOEPEL electronic GmbH guarantees the Test system's faultlessness for 24 months, beginning with its delivery.

Warranty is NOT granted for faults resulting from inappropriate use, modifications or unintended use.

Designation of Warranty cases

We may ask you to designate cases of warranty clearly. Repairing orders without the notification of a warranty claim are initially executed with costs.

Of course, we repair your Test system if necessary even in the case our warranty duty has expired, after submitting an offer and your order.

1.5 EMC

To meet the required conditions of Electromagnetic compatibility, the Test system may only be operated in the as-delivered condition. Mechanical or electrical modifications, regardless of type, are not permitted.

2 Video Dragon Hardware

2.1 General Characteristics

Video Dragon basicCON 4121 is a **GOEPEL electronic GmbH** test system with USB 3.0 and Gigabit Ethernet Interface to transmit or receive video data. The test system has been especially adapted to the requirements and transmission standards of the automotive industry. This way, in addition to the video data, also audio data and control data can be handled.

The **Video Dragon** stands out by its easily changeable **Media Interface Module**, by that the system can be quickly adapted to current test tasks. So, the **Video Dragon** is transformed to a Frame Grabber from a Frame Generator or vice versa by a few actions only. Moreover, it supports a multitude of different transmission standards.

With this, the **GOEPEL electronic Video Dragon** is optimally prepared for executing present and future Test tasks.

The following performance characteristics make the **Video Dragon** to be an extremely multifunctional Video test system:

- High-Performance ARM Cortex A8 Processor with three Video Coprocessors
- 1 GByte DDR3 operating memory
- 128 MByte NAND Flash
- USB 3.0 and Gigabit Ethernet interfaces for control and data exchange with the PC (see USB and LAN/ Ethernet chapters)
- HDMI 1.3 compatible Monitor output for checking the live stream of the video data, and with this also for the configuration of the entire test structure (see HDMI Output chapter)
- external SATA II interface to connect external mass storage devices (see eSATA chapter)
- S/PDIF Audio output for checking Audio data (see S/PDIF Output chapter)
- Media Interface Slot for inserting a **Media Interface Module** for the technical system adaptation to the test object (see Media Interface Module chapter)
- Currently available **Media Interface Modules** support the APIX, FPD-Link, GMSL and HDMI standards for transferring video, audio or control data
- Universal, digital IO interface for triggering or status output as well as for the interaction with test objects (see Digital IO/ CAN chapter)
- CAN interface for configuration or restbus simulation of the test environment (see Digital IO/ CAN chapter)
- Status Visualization by four LEDs (see LEDs/ Status display chapter)
- Real Time Clock for time synchronization
- 0°C … +55°C operating temperature range (with passive cooling)

Video Dragon basicCON 4121 is a stand-alone device to be connected to a PC or laptop. It was developed for applications out of complex test systems.

Figure 2-1:
Video Dragon – Front view

Figure 2-2:
Video Dragon – Rear view

2.2 Technical Data

2.2.1 Dimensions

(Length x Width x Height):

- 203mm x 172mm x 66mm (without **Media Interface Module**)
- 216mm x 172mm x 66mm (with **Media Interface Module**)

2.2.2 Electrical Characteristics

The following table shows the electrical characteristics of the device-specific interfaces (without mentioning the standardized interfaces like HDMI, Ethernet, USB, eSATA and S/PDIF as well as the interfaces depending on the **Media Interface Module**; these are described in the Media Interface Modules chapter).

Symbol	Property	Min.	Typ.	Max.	Unit	Annotation
	Power supply					
V_{SS}	Supply voltage	7	12	28	V DC	
I_{SS}	Supply current		1200	1600	mA	at 12V DC
P_{SS}	Power consumption			20	W	
	Digital Inputs					
N	Number		4			
V_{IH}	High level input voltage	2.3		28	V	
U_{IL}	Low level input voltage			0.8	V	
f_{MAX}	Maximal switching frequency			1	MHz	at 28V
	Digital Outputs					
N	Number		6			
V_{OH}	High-level output voltage	5		27	V	Depends on V_{Bat} (ext. V_{supply})
I_O	Output current			10	mA	per channel
f_{MAX}	Maximal switching frequency			10	kHz	at 28V
	UUT Supply (optionally)					
U_{UUT}	UUT Supply Voltage			22	V DC	
I_{UUT}	UUT Supply Current			1000	mA	
	CAN / CAN FD (optionally)					
C	Transmission rate			5	MBaud	at High Speed
V_{BATint}	Internal battery voltage		12		V	disengageable
V_{BAText}	External battery voltage			27	V	depending on the transceiver
R_A	Terminating resistor High Speed transceiver		120		Ω	disengageable
R_A	Terminating resistor Low Speed transceiver			10	kΩ	

2.3 Mainboard

2.3.1 Structure

By its open hardware concept (see Figure 2-3), the **GOEPEL electronic Video Dragon basicCON 4121** with its changeable **Media Interface Module** and the following FPGA is optimally prepared for executing a multitude of current and future test tasks.

Video Dragon consists of a mainboard in a passively cooled box and a changeable **Media Interface Module** supporting the different transmission standards. So the **Media Interface Module** offers the possibility that the **Video Dragon** acts as a transmitter or receiver of Multimedia data. The focus of the supported Standards concentrates clearly on the automotive industry.

There are two Module classes, which have influence over the functionality and the flow of data of the **Video Dragon**.

By a "Generator Module", the **Video Dragon** becomes a transmitter/ generator of Multimedia data. This can be used, for example, for the output of stored pictures or videos to check a connected display.

The "Grabber Module" converts the **Video Dragon** to a receiver of Multimedia data, for checking the functionality of Video sources, for example DVD players or combi-instruments.
Moreover, "Grabber Modules" can route through the received data to the real receiver (a display, for example). Thereby the system structure has not to be changed.

The **Video Dragon** automatically detects the inserted Module and its type and preconfigures itself accordingly.

Each **Media Interface Module** contains a special IC different from the others required for the corresponding transmission standard. Generally the **Video Dragon** supports all functions for video, audio and data transmission offered by the corresponding IC.

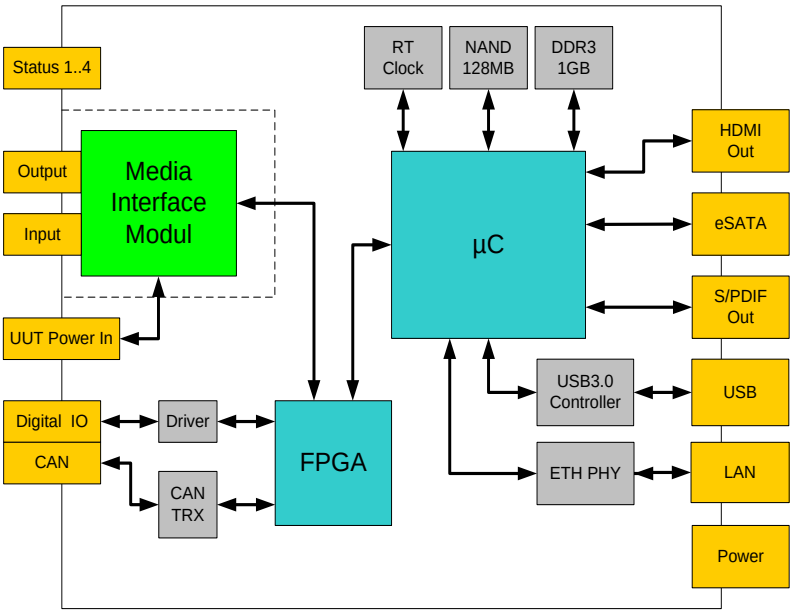

Figure 2-3: Video Dragon – Block diagram

The components on **Video Dragon's** mainboard are identical for Generator operation as well as for Grabber operation.
Please find more information in the following chapters.

2.3.2 Connections

The following two figures show all connections of the **Video Dragon**:

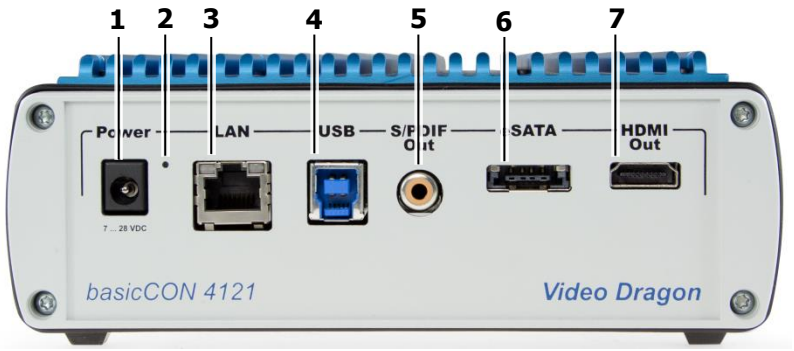

Figure 2-4: Connections – Rear side

(1) Power
Power supply input (7 to 28V DC)

(2) IP Reset
Reset button for resetting the IP address

(3) LAN
Gigabit Ethernet connector for connection to the control PC

(4) USB
USB connector for connection to the control PC

(5) S/PDIF Out
S/PDIF output for audio recording with external devices

(6) eSATA
eSATA II connection to connect an external hard disk

(7) HDMI Out
HDMI 1.3 output for monitor connection
or for video recording by external devices

On the front side, you find the following elements:

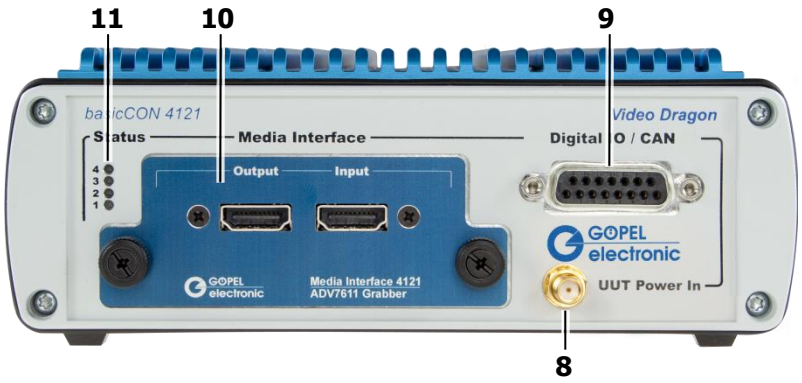

Figure 2-5: Connections – Front side

(8) UUT Power In

UUT Supply – depending on the Media Interface Module

(9) Digital IO/ CAN

15-pole DSUB socket for connecting the digital I/Os as well as the integrated CAN bus

(10) Media Interface

Media Interface Module included in the Media Interface Slot

(11) Status

four Status LEDs

2.3.3 Power supply

Power supply of the **Video Dragon** is provided via the **Power** (1) connector by a coaxial power plug (2.1 x 5.5mm/ plus polarity inside). The device can be supplied via the delivered power supply unit or an own voltage source.

The range of the supply voltage should be between 7 and 28V DC, the provided power should be 20 Watts at least.

2.3.4 LEDs/ Status display

The LEDs (11) indicate the current operating status of the **Video Dragon** according to the following table:

LED1	LED2	LED3	LED4	Annotation
Alternately blinking				Bootloader software runs
	blinking			Firmware runs
ON (shortly)				Execution of a Firmware command
		ON		Ethernet connection established
			ON	Video output active (Generator mode) Video lock active (Grabber mode)

2.3.5 Addressing

The **Video Dragon** has an Ethernet and a USB interface, alternatively used for the control. Addressing for several connected devices is effected as follows:

In the case the **Ethernet** interface (3) is used, the device can be addressed by the **Default IP Address 192.168.1.62, Port 5134** (see chapter Ethernet). If you want to operate two or more devices in the same network, then their IP Addresses have to be changed. For this, connect always one device to the **Video Dragon** and change the corresponding IP Address.

Generally, there are two ways for this:

- HardwareExplorer: Select the **Video Dragon** device, under **Device** set the required **IP Address**; the new **IP Address** is active after restart
- G API command **G_Common_Ethernet_IpAddress_Set**; the new **IP Address** is active after restart

This procedure is required for all devices. Please do not forget to write down the new IP Addresses and the belonging Serial numbers.

Only when all devices have different IP Addresses, you can operate them jointly in the same network.

Addressing via **USB** (4) is effected exclusively via the serial numbers: The device with the LEAST serial number is always the device with the number **1** (that means, **DeviceNumber** = **1**.)

2.3.6 LAN/ Ethernet

For configuration and control, a PC or laptop can be connected to the **Video Dragon** by a standard network cable (CAT-5e or better) via the RJ45 socket **LAN** (3).

The **Video Dragon** is compatible to networks of type 10/100/1000Base-T,
and it supports the IEEE 802.3, 802.3u and 802.3ab standards.

2.3.7 USB

For configuration and control, a PC or laptop can be connected to the **Video Dragon** also via USB.

For this, a cable with USB B plug has to be connected to the **USB** socket (4).
You may use a USB2.0 cable as well as a USB3.0 cable, as both Standards are fully supported.

2.3.8 S/PDIF Output

To be able to output/ record audio data received or transmitted by the **Media Interface Module** via an external audio sink (for example a sound system) plug a coaxial cable with cinch plug to the **S/PDIF Out** audio output (5).

The cable should have an impedance of 75 Ohms. It can be connected to any digital audio input (**S/PDIF**).

2.3.9 eSATA

By means of the **Video Dragon**, input data can be recorded, and output data can be buffered on an externally connected hard disk. Thereby, the **Video Dragon** can be operated without a control PC.

Hard disks of SATA I/II/III types can be connected. But best performance results when connecting a SATA II type hard disk, as the interface is designed for that.

The connector is an 11 pole eSATAp plug, providing also the supply of the connected hard disks additionally to the SATA interface. But only hard disks with 5V DC voltage and a maximal current consumption of 350mA can be supplied (usually 2.5" devices.

The eSATAp connector combines a USB plug, whereby the hard disk is supplied, with an eSATA connector for data transmission.

The pin assignment is as follows:

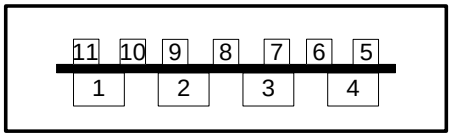

Figure 2-6: eSATAp Plug structure

USB			**eSATA**	
Pin	**Signal**		**Pin**	**Signal**
1	5V DC		5	Ground
2	not connected		6	A+TX
3	not connected		7	A-TX
4	Ground		8	Ground
			9	B-RX
			10	B+RX
			11	Ground

2.3.10 HDMI Output

For the display of video data live streamings received or transmitted by the **Media Interface Module**, a monitor can be connected to the **HDMI Out** (7) video output of the **Video Dragon**.

2.3.11 UUT Supply

The **UUT Power In** UUT supply connector (8) is used for UUT supply via the connectors of the Media Interface Module. This connector is an SMA socket, having the Plus (+) contact inside and the Ground outside. It is a voltage input, and the supply is to be provided by the user. The fed in voltage is 22 V at most, while the current consumption of the UUT must not exceed 1 A.

According to the **Media Interface Module**, the UUT is supplied via the connector of the module via different pins. Please get more information from the corresponding description of the modules (see Media Interface Modules).

At present, the following **Media Interface Modules** support the UUT supply:

- INAP375T MII
- INAP375R MII
- DS90UB925
- DS90UB926
- DS90UB914A (Coax version)
- MAX9271
- MAX9272 (Coax version)

We recommend to check the connecting conditions carefully prior to UUT supply via the **Video Dragon**.

2.3.12 Digital IO/ CAN

The **Digital IO/ CAN** connector (9) includes all signals independent of the **Media Interface Module** for communication and interaction with the test object. With this, universal digital inputs and outputs are available for the user, as well as optionally one CAN port.

Find the Electrical Characteristics of the interfaces in the corresponding chapter.

The following table shows the pin assignment of the connector (9):

Pin	Signal		Pin	Signal
1	CAN High		9	CAN Low
2	V_{Bat} (isolated)		10	Ground (isolated)
3	Digital Output 0		11	Digital Input 0
4	Digital Output 1		12	Digital Input 1
5	Digital Output 2		13	Digital Input 2
6	Digital Output 3		14	Digital Input 3
7	Digital Output 4		15	+5V DC Output (isolated)
8	Digital Output 5			

These interfaces are galvanically isolated from the mainboard (see the Galvanic Isolation chapter). They can be supplied internally by the **Video Dragon** as well as externally via **V_{Bat}** (5 ... 28V DC).

An overview regarding power supply of the interfaces is given with the following figure:

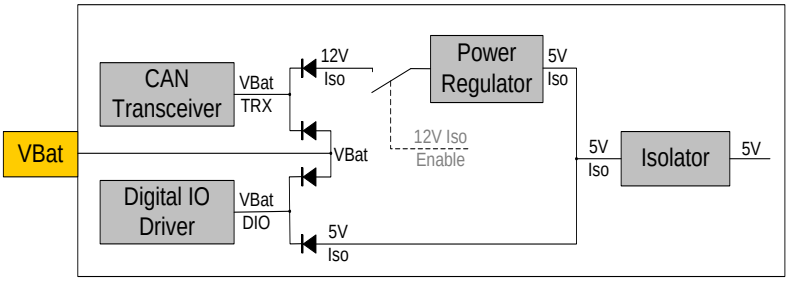

Figure 2-7: Power supply Digital IO/ CAN

The drivers of the digital outputs are always supplied with the internal isolated 5V, but they can also be supplied in parallel to that via the external battery voltage **V_{Bat}**. In this case, the "VBat DIO" voltage of the digital outputs follows the higher one of both voltages.

The bus level for CAN follows the "VBat TRX" voltage. This can be supplied internally via a switchable 12V supply or also in parallel to that via the external battery voltage **V_{Bat}**. If the external voltage is used, the internal supply should be switched off.

The six digital outputs can be used to output states or to control the test installation.

The four inputs can realize the **Video Dragon's** control via external devices.

For CAN, a plug-in transceiver board is used. This transceiver board is an optional accessory and can be installed also subsequently. For this, the **Media Interface Module** has to be removed (see Module Change), and the board must be plugged to its plug-in position (see the following Figure):

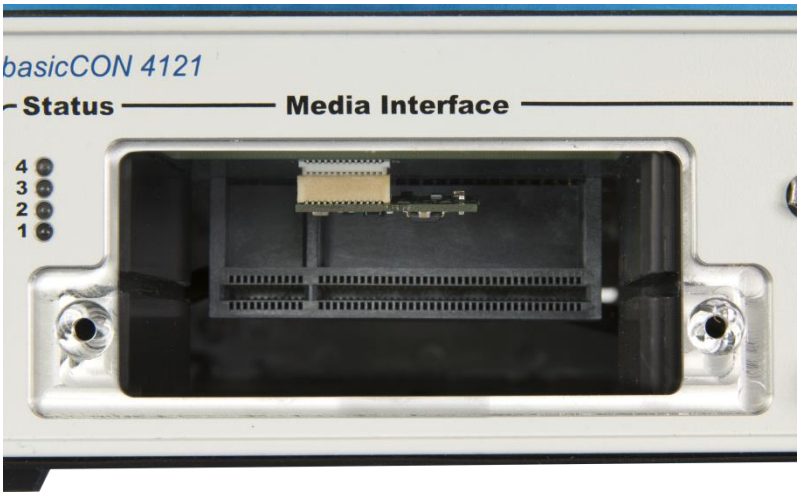

Figure 2-8:
Position of Transceiver

Then, the **Media Interface Module** has to be placed again.

This interface can be used for the communication with the UUT, in case this is configured via CAN interface.

Currently the following transceiver boards are available:

Designation	Bus and Transceiver types
CAN TJA1044GT	CAN FD high speed Transceiver
CAN TJA1054	CAN low speed Transceiver
CAN TJA1041A	CAN high speed Transceiver
CAN NCV7356D1G	CAN single wire Transceiver

The different communication buses are using the following terminating resistors:

- CAN high speed:
  The 120Ω bus terminating resistor mounted on the transceiver board can be deactivated by software:
  (G-API **G_CAN_Node_BusTermination_Disable** command, reapplication by **G_CAN_Node_BusTermination_Enable**).
- CAN low speed:
  These boards have terminating resistors of 10kΩ.

2.3.13 Galvanic Isolation

Electric surges can harm expensive test equipment and lead to unreliable test results. Electric isolation protects against electric surges and can help to suppress dangerous electrical transients. It also eliminates ground loops, responsible for data errors due to ground potential differences.

For the **Video Dragon**, all back side connectors as well as the Media Interface are electrically separated from the signals of connector (9). This includes the CAN communication interface as well as the digital inputs and outputs.

When using the galvanically separated interfaces on connector (9), please ensure to interconnect the separated Ground (isolated) potential on pin 10, see Digital IO/ CAN, with the UUT ground.

2.3.14 Video signal Routing

The high flexibility of our **Video Dragon basicCON 4121** requires a configurable routing of the Video signals. Reason for that are the different types of the Media Interface Modules, having different color depths or control signals. Additionally, there is no agreement regarding the assignment of the Video signals at the transceiver circuitries at the **Media Interface Module**.

The video bus used internally of the **Video Dragon** is a parallel 24bit RGB bus with the appropriate pixel clock and the control signals (VSync, HSync, DE). For the adaptation of the pin assignment and the color space an FPGA is used, to be configured accordingly.

For configuration, the knowledge of the following parameters of the system to be tested is required:

- Color depth and color space – e.g. 24Bit RGB
- Synchronization signals and their polarity
- Assignment of these signals at the transmitting or receiving circuitry of the test system

The following section shows an example assignment of the Video signals on the internal video bus.

For example, we act on the assumption of an APIX2 system with an 18bit RGB video source, which outputs the video via an INAP375, and a **Video Dragon** with INAP375R Interface Module.

In the following table, the pin assignment (example) of the INAP375T in the test object (UUT) is confronted with the pin assignment of the INAP375R in the **Video Dragon**:

INAP375T in the UUT			INAP375R in the Video Dragon	
Pin Name	**Connected Signal**		**Pin Name**	**Connected Signal**
PX1	Pixel Clock		PX1	Video PXCLK
PX2	HSync		PX2	Video Bit 2
PX3	VSync		PX3	Video Bit 3
PX4	Data Enable		PX4	Video Bit 4
PX5	R0		PX5	Video Bit 5
PX6	R1		PX6	Video Bit 6
PX7	R2		PX7	Video Bit 7
PX8	R3		PX8	Video Bit 8
PX9	R4		PX9	Video Bit 9
PX10	R5		PX10	Video Bit 10
PX11	G0		PX11	Video Bit 11
PX12	G1		PX12	Video Bit 12
PX13	G2		PX13	Video Bit 13
PX14	G3		PX14	Video Bit 14
PX15	G4		PX15	Video Bit 15
PX16	G5		PX16	Video Bit 16
PX17	B0		PX17	Video Bit 17
PX18	B1		PX18	Video Bit 18
PX19	B2		PX19	Video Bit 19
PX20	B3		PX20	Video Bit 20
PX21	B4		PX21	Video Bit 21
PX22	B5		PX22	Video Bit 22
PX23	not connected		PX23	Video Bit 23
PX24	not connected		PX24	Video Bit 24
PX25	not connected		PX25	Video Bit 25
PX26	not connected		PX26	Video Bit 26
PX27	not connected		PX27	Video Bit 27
PX28	not connected		PX28	Video Bit 28
PX29	not connected		PX29	Video Bit 29
PX30	not connected		PX30	Video Bit 30

Please take the assignment of **Video Dragon's Media Interface Modules** from the corresponding table in the Media Interface Modules chapter. The UUT assignment depends on the Test system. The user has to determine it by himself.

For finding the right routing settings, the signals connected to the same pins in UUT and **Video Dragon** have to be placed face to face with each other (see the table above). For the color bits, please pay attention that the **Video Dragon** bus must always have a color depth of 24bits.

In the case not all color bits are used in the UUT, always fill-up starting from the MSB, the highest value bit.

In the example, "HSync" is routed to "Video Bit 2".
"Video Bit 10", being the highest value "R5" UUT bit, is to be routed to the "R7" color bit, being the MSB in the **Video Dragon**.

The **Video Dragon** "R1" and "R0" color bits are not used, therefore they must not be assigned at all.

For this example, the routing table of the **Video Dragon** would look like this:

Pin-Name	Connected Signal
Vertical Synchron	Video Bit 3
Horizontal Synchron	Video Bit 2
Data Enable	Video Bit 4
R0	disabled
R1	disabled
R2	Video Bit 5
R3	Video Bit 6
R4	Video Bit 7
R5	Video Bit 8
R6	Video Bit 9
R7	Video Bit 10
G0	disabled
G1	disabled
G2	Video Bit 11
G3	Video Bit 12
G4	Video Bit 13
G5	Video Bit 14
G6	Video Bit 15
G7	Video Bit 16
B0	disabled
B1	disabled
B2	Video Bit 17
B3	Video Bit 18
B4	Video Bit 19
B5	Video Bit 20
B6	Video Bit 21
B7	Video Bit 22

Now, you can configure **Video Dragon's** routing according to the UUT, with this table and the polarity of the three control signals VSync, HSync and DE.

2.4 Media Interface Modules

2.4.1 Overview

The **Media Interface Module** cares for the adaption of the **Video Dragon basicCON4121** to the respective test object. By the multitude of transmission standards to exchange multimedia data used in the automotive industry, a universal link is not possible otherwise.

A transmission system always consists of a transmitter and a receiver suitable for that. The transmitter is also called "Serializer", as it is serializing the Video data created by a graphic chip mostly in parallel. This way the data can be transferred via a few wires.
The "Deserializer" (receiver) reconverts the serial data into a parallel data stream, to provide it e.g. to a display.

As described in chapter Structure, there are two module classes, making the **Video Dragon** either to a Video Generator (transmitter) or to a Video Grabber (receiver).

Therefore Generator modules always contain a Serializer, while Grabber modules always contain a Deserializer.

The following example shows a Grabber module:

Figure 2-9: INAP375R Top board

The connectors at this **Media Interface** have the following pinout:

Figure 2-10: Connector Assignment

In the following table, the currently available Generator modules and the supporting Standards are listed:

Module Name (Serializer)	Transmission Standard	Compatible Receiver ICs (Deserializers)
INAP375T	APIX 2	INAP375R, INAP378R
	APIX 1	INAP125R
INAP375T MII	APIX 2	INAP375R, INAP378R
DS90UB947	FPD-Link III	DS90UB926, DS90UH926*), DS90UB928, DS90UH928*), DS90UB948, DS90UH948*)
DS90UB925	FPD-Link III	DS90UB902, DS90UB904, DS90UB926, DS90UH926*), DS90UB928, DS90UH928*)
	FPD-Link II	DS90UR906, DS90UR908, DS90UR916
DS90UB913A (STP-Version)	FPD-Link III	DS90UB914A
DS90UB913A (Coax-Version)	FPD-Link III	DS90UB914A
DS90UR905	FPD-Link II	DS90UR906, DS90UR908, DS90UR916
	FPD-Link I	DS90C124, DS90UR124
MAX9275 (STP version)	GMSL	MAX9276, MAX9280*), MAX9278, MAX9282*), MAX9288, MAX9290*)
MAX9275 (Coax version)	GMSL	MAX9276, MAX9280*), MAX9278, MAX9282*), MAX9288, MAX9290*)
MAX9271 (STP-Version)	GMSL	MAX9240, MAX9272
MAX9271 (Coax-Version)	GMSL	MAX9240, MAX9272
MAX9259	GMSL	MAX9260, MAX9264*), MAX9266*), MAX9268, MAX9270
MAX9247	n.s.	MAX9218, MAX9248, MAX9250
RGB888T	RGB888	

*) On legal grounds, HDCP decryption can not be supported. Therefore, corresponding data can only be received or transmitted unencrypted.

In the following table, the currently available Grabber modules and the supporting Standards are listed:

Module Name (Deserializers)	Transmission Standard	Compatible Transmitter ICs (Serializers)
INAP375R	APIX 2	INAP375T, INAP378T
	APIX 1	INAP125T
INAP375R MII	APIX 2	INAP375T, INAP378T
DS90UB948	FPD-Link III	DS90UB925, DS90UH925*), DS90UB927, DS90UH927*), DS90UB947, DS90UH947*)
DS90UB926	FPD-Link III	DS90UB901, DS90UB903, DS90UB925, DS90UH925*), DS90UB927, DS90UH927*)
	FPD-Link II	DS90UR905, DS90UR907
DS90UB926+	FPD-Link III	DS90UB901, DS90UB903, DS90UB925, DS90UH925*), DS90UB927, DS90UH927*)
	FPD-Link II	DS90UR905, DS90UR907
DS90UB914A (STP-Version)	FPD-Link III	DS90UB913A
DS90UB914A (Coax version)	FPD-Link III	DS90UB913A
DS90UR906	FPD-Link II	DS90UR905, DS90UR907
	FPD-Link I	DS90C241, DS90UR241
MAX9276 (STP-Version)	GMSL	MAX9275, MAX9277, MAX9279*), MAX9281*)
MAX9276 (Coax version)	GMSL	MAX9275, MAX9277, MAX9279*), MAX9281*)
MAX9272 (STP-Version)	GMSL	MAX9271, MAX9273
MAX9272 (Coax-Version)	GMSL	MAX9271, MAX9273
MAX9260	GMSL	MAX9249, MAX9259, MAX9263*), MAX9265*)
MAX9248	n.s.	MAX9217, MAX9247
ADV7611	HDMI	All DVI or HDMI compatible sources*)
RGB888R	RGB888	

*) On legal grounds, HDCP decryption can not be supported. Therefore, corresponding data can only be received or transmitted unencrypted.

As you can see in the tables, most modules support several standards, as they often have a mode for backward compatibility to previous systems.

The modules have different connectors, more detailed described in the chapters regarding the corresponding module. As a rule, a Generator module has only one connector, used as video output. Mostly Grabber modules have two connectors, as they receive video data at the input for handling, and routing them through preferably unchanged to the output (to be further used by the system).

The ICs on the modules often have a lot of configuration registers, determining the transmit/ receive mode and including all parameters required for data transmission.

Generally this configuration depends on the test object and its parameter settings. For proper working of the **Media Interface Module**, the module configuration has to be executed by the user, and also the right Video signal Routing must be set (see Video signal Routing chapter).

The module configuration is described more detailed in chapter Video Dragon – First Steps by means of an example, or in the manual of the LvdsViewer tool.

2.4.2 INAP375T

The INAP375T interface module is a Generator module supporting the APIX 2 standard (Automotive Pixel Link).

It includes the INAP375T transmitter of Inova Semiconductors.

The module has the following characteristics:

- Backward compatible to APIX 1
- Downstream link with 3GBits/s band width
  for Video transmission with up to 2591 MBits/s
- Upstream link for Data transmission with up to 187.5 MBits/s
- HD Video resolution and Pixel clock frequency up to 120 MHz
- SPI interface

Data transmission is effected via two separated wire pairs for Downstream and Upstream channel. Thereby, the different data, like Video and SPI, use either only one channel or both channels.
The Video signal is always transferred via the Downstream.

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the connector:

Pin	Signal	Annotation
1	SD_DOWN_OUT_N	Serial data Downstream negative
2	SD_UP_IN_P	Serial data Upstream positive
3	SD_DOWN_OUT_P	Serial data Downstream positive
4	SD_UP_IN_N	Serial data Upstream negative

The electrical signal properties correspond to the APIX standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PX1	Video PXCLK
PX2	Video Bit 2
PX3	Video Bit 3
PX4	Video Bit 4
PX5	Video Bit 5
PX6	Video Bit 6
PX7	Video Bit 7
PX8	Video Bit 8
PX9	Video Bit 9
PX10	Video Bit 10
PX11	Video Bit 11
PX12	Video Bit 12
PX13	Video Bit 13
PX14	Video Bit 14
PX15	Video Bit 15
PX16	Video Bit 16
PX17	Video Bit 17
PX18	Video Bit 18
PX19	Video Bit 19
PX20	Video Bit 20
PX21	Video Bit 21
PX22	Video Bit 22
PX23	Video Bit 23
PX24	Video Bit 24
PX25	Video Bit 25
PX26	Video Bit 26
PX27	Video Bit 27
PX28	Video Bit 28
PX29	Video Bit 29
PX30	Video Bit 30

2.4.3 INAP375R

The INAP375R interface module is a Grabber module supporting the APIX 2 standard (Automotive Pixel Link).

It includes the INAP375R receiver of Inova Semiconductors and an INAP375T transmitter for routing through.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- Backward compatible to APIX 1
- Downstream link with 3GBits/s Band width for Video reception with up to 2591 MBits/s
- Upstream link for Data transmission with up to 187.5 MBits/s
- HD Video resolution and Pixel clock frequency up to 120MHz
- SPI interface

Data transmission is effected via two separated wire pairs for Downstream and Upstream channel. Thereby, the different data, like Video and SPI, use either only one channel or both channels.
The Video signal is always transferred via the Downstream.

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Input" connector:

Pin	Signal	Annotation
1	SD_UP_OUT_N	Serial data Upstream negative
2	SD_DOWN_IN_P	Serial data Downstream positive
3	SD_UP_OUT_P	Serial data Upstream positive
4	SD_DOWN_IN_N	Serial data Downstream negative

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_DOWN_OUT_N	Serial data downstream negative
2	SD_UP_IN_P	Serial data upstream positive
3	SD_DOWN_OUT_P	Serial data downstream positive
4	SD_UP_IN_N	Serial data upstream negative

The electrical signal properties correspond to the APIX standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PX1	Video PXCLK
PX2	Video Bit 2
PX3	Video Bit 3
PX4	Video Bit 4
PX5	Video Bit 5
PX6	Video Bit 6
PX7	Video Bit 7
PX8	Video Bit 8
PX9	Video Bit 9
PX10	Video Bit 10
PX11	Video Bit 11
PX12	Video Bit 12
PX13	Video Bit 13
PX14	Video Bit 14
PX15	Video Bit 15
PX16	Video Bit 16
PX17	Video Bit 17
PX18	Video Bit 18
PX19	Video Bit 19
PX20	Video Bit 20
PX21	Video Bit 21
PX22	Video Bit 22
PX23	Video Bit 23
PX24	Video Bit 24
PX25	Video Bit 25
PX26	Video Bit 26
PX27	Video Bit 27
PX28	Video Bit 28
PX29	Video Bit 29
PX30	Video Bit 30

2.4.4 INAP375T MII

The INAP375T MII interface module is a Generator module supporting the APIX 2 standard (Automotive Pixel Link).

It includes the INAP375T transmitter of Inova Semiconductors.

Via an Ethernet Switch, the MII side band of APIX is coupled in or out.

The module has the following characteristics:

- Downstream link with 3GBits/s band width
  for Video transmission with up to 2591MBits/s
- Upstream link for Data transmission with up to 187.5 MBits/s
- HD Video resolution
  and Pixel clock frequency up to 120 MHz
- MII interface for the transmission of Ethernet data
- UUT supply

The transmission of the APIX data is effected via two separated line pairs for Downstream and Upstream. The different channels like Video and MII are using either one channel or both channels.
The Video signal is always transmitted via the Downstream.

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The also existing RJ45 socket can be connected via Ethernet with a Personal computer for handling the MII side band.

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_DOWN_OUT_N	Serial Data Downstream negative
2	SD_UP_IN_P	Serial Data Upstream positive
3	SD_DOWN_OUT_P	Serial Data Downstream positive
4	SD_UP_IN_N	Serial Data Upstream negative

The electrical signal properties correspond to the APIX-Standard.

For UUT supply, a phantom supply is used. The Plus pole (**+**) is applied to pins 1 and 3, the Minus pole (**–**) to pins 2 and 4.

The following table shows the assignment of the "ETH over APIX" connector:

Pin	Signal	Annotation
1	TX1+	Pos. TX signal of ETH Port1
2	TX1-	Neg. TX signal of ETH Port1
3	RX1+	Pos. RX signal of ETH Port1
4	Res	Reserved
5	Res	Reserved
6	RX1-	Neg. RX signal of ETH Port1
7	Res	Reserved
8	Res	Reserved

The electrical signal properties correspond to the IEEE802.3 standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PX1	Video PXCLK
PX2	Video Bit 2
PX3	Video Bit 3
PX4	Video Bit 4
PX5	Video Bit 5
PX6	Video Bit 6
PX7	Video Bit 7
PX8	Video Bit 8
PX9	Video Bit 9
PX10	Video Bit 10
PX11	Video Bit 11
PX12	Video Bit 12
PX13	Video Bit 13
PX14	Video Bit 14
PX15	Video Bit 15
PX16	Video Bit 16
PX17	Video Bit 17
PX18	Video Bit 18
PX19	Video Bit 19
PX20	Video Bit 20
PX21	Video Bit 21
PX22	Video Bit 22
PX23	Video Bit 23
PX24	Video Bit 24
PX25	Video Bit 25
PX26	Video Bit 26
PX27	Video Bit 27
PX28	Video Bit 28
PX29	Video Bit 29
PX30	Video Bit 30

2.4.5 INAP375R MII

The INAP375R MII interface module is a Grabber module supporting the APIX 2 standard (Automotive Pixel Link).

It includes the INAP375R receiver of Inova Semiconductors and an INAP375T transmitter for routing through.

Via an Ethernet Switch, the MII side band of APIX is coupled in or out.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- Downstream link with 3GBits/s band width for Video reception with up to 2591MBits/s
- Upstream link for Data transmission with up to 187.5MBits/s
- HD Video resolution and Pixel clock frequency up to 120MHz
- MII interface for the transmission of Ethernet data
- UUT supply

The transmission of the APIX data is effected via two separated line pairs for Downstream and Upstream. The different channels like Video and MII are using either one channel or both channels.
The Video signal is always transmitted via the Downstream.

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through. The also existing RJ45 socket can be connected via Ethernet with a Personal computer for handling the MII side band.

The following table shows the assignment of the "Input" connector:

Pin	Signal	Annotation
1	SD_UP_OUT_N	Serial Data Upstream negative
2	SD_DOWN_IN_P	Serial Data Downstream positive
3	SD_UP_OUT_P	Serial Data Upstream positive
4	SD_DOWN_IN_N	Serial Data Downstream negative

For UUT supply, a phantom supply is used. The Plus pole (**+**) is applied to pins 2 and 4, the Minus pole (**–**) to pins 1 and 3.

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_DOWN_OUT_N	Serial Data Downstream negative
2	SD_UP_IN_P	Serial Data Upstream positive
3	SD_DOWN_OUT_P	Serial Data Downstream positive
4	SD_UP_IN_N	Serial Data Upstream negative

The electrical signal properties correspond to the APIX Standard.

The following table shows the assignment of the „ETH over APIX" connector:

Pin	Signal	Annotation
1	TX1+	Pos. TX Signal of ETH Port1
2	TX1-	Neg. TX Signal of ETH Port1
3	RX1+	Pos. RX Signal of ETH Port1
4	TX2-	Neg. TX Signal of ETH Port2
5	TX2+	Pos. TX Signal of ETH Port2
6	RX1-	Neg. RX Signal of ETH Port1
7	RX2+	Pos. RX Signal of ETH Port2
8	RX2-	Neg. RX Signal of ETH Port2

The electrical signal properties correspond to the IEEE802.3 standard.

The module can be connected via an Ethernet port or via two ports (separated for both directions when routing through).

For the connection via two Ethernet ports we offer an Adaptor with two seperate RJ45 sockets.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PX1	Video PXCLK
PX2	Video Bit 2
PX3	Video Bit 3
PX4	Video Bit 4
PX5	Video Bit 5
PX6	Video Bit 6
PX7	Video Bit 7
PX8	Video Bit 8
PX9	Video Bit 9
PX10	Video Bit 10
PX11	Video Bit 11
PX12	Video Bit 12
PX13	Video Bit 13
PX14	Video Bit 14
PX15	Video Bit 15
PX16	Video Bit 16
PX17	Video Bit 17
PX18	Video Bit 18
PX19	Video Bit 19
PX20	Video Bit 20
PX21	Video Bit 21
PX22	Video Bit 22
PX23	Video Bit 23
PX24	Video Bit 24
PX25	Video Bit 25
PX26	Video Bit 26
PX27	Video Bit 27
PX28	Video Bit 28
PX29	Video Bit 29
PX30	Video Bit 30

2.4.6 DS90UB947

The DS90UB947 interface module is a Generator module supporting the FPD-Link III standard (Flat Panel Display Link).

It includes the DS90UB947Q transmitter of Texas Instruments.

The module has the following characteristics:

- 1-lane or 2-lane FPD-Link III interface
- 1080p Video resolution and Pixel clock frequency up to 170MHz
- I2C interface

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the connector:

Pin	Signal	Annotation
1	SD_OUT1_N	Serial Data Output Lane 1 negative
2	SD_OUT2_N	Serial Data Output Lane 2 negative
3	SD_OUT1_P	Serial Data Output Lane 1 positive
4	SD_OUT2_P	Serial Data Output Lane 2 positive
Shield	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0/ DIN0	Video Bit 0
R1/ DIN1	Video Bit 1
R2/ DIN2	Video Bit 2
R3/ DIN3	Video Bit 3
R4/ DIN4	Video Bit 4
R5/ DIN5	Video Bit 5
R6/ DIN6	Video Bit 6
R7/ DIN7	Video Bit 7
G0/ DIN8	Video Bit 8
G1/ DIN9	Video Bit 9
G2/ DIN10	Video Bit 10
G3/ DIN11	Video Bit 11
G4/ DIN12	Video Bit 12
G5/ DIN13	Video Bit 13
G6/ DIN14	Video Bit 14
G7/ DIN15	Video Bit 15
B0/ DIN16	Video Bit 16
B1/ DIN17	Video Bit 17
B2/ DIN18	Video Bit 18
B3/ DIN19	Video Bit 19
B4/ DIN20	Video Bit 20
B5/ DIN21	Video Bit 21
B6/ DIN22	Video Bit 22
B7/ DIN23	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.7 DS90UB948

The DS90UB948 interface module is a Grabber module supporting the FPD-Link III standard (Flat Panel Display Link).

It includes the DS90UB948Q receiver of Texas Instruments.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- 1-lane or 2-lane FPD-Link III interface
- 1080p video resolution and Pixel clock frequency up to 170MHz
- I2C interface

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the „Input" connector:

Pin	Signal	Annotation
1	SD_IN2_P	Serial Data Input Lane 2 positive
2	SD_IN1_P	Serial Data Input Lane 1 positive
3	SD_IN2_N	Serial Data Input Lane 2 negative
4	SD_IN1_N	Serial Data Input Lane 1 negative
Shield	Ground	Ground

The following table shows the assignment of the „Output" connector:

Pin	Signal	Annotation
1	SD_OUT1_N	Serial Data Output Lane 1 negative
2	SD_OUT2_N	Serial Data Output Lane 2 negative
3	SD_OUT1_P	Serial Data Output Lane 1 positive
4	SD_OUT2_P	Serial Data Output Lane 2 positive
Shield	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0/ ROUT0	Video Bit 0
R1/ ROUT1	Video Bit 1
R2/ ROUT2	Video Bit 2
R3/ ROUT3	Video Bit 3
R4/ ROUT4	Video Bit 4
R5/ ROUT5	Video Bit 5
R6/ ROUT6	Video Bit 6
R7/ ROUT7	Video Bit 7
G0/ ROUT8	Video Bit 8
G1/ ROUT9	Video Bit 9
G2/ ROUT10	Video Bit 10
G3/ ROUT11	Video Bit 11
G4/ ROUT12	Video Bit 12
G5/ ROUT13	Video Bit 13
G6/ ROUT14	Video Bit 14
G7/ ROUT15	Video Bit 15
B0/ ROUT16	Video Bit 16
B1/ ROUT17	Video Bit 17
B2/ ROUT18	Video Bit 18
B3/ ROUT19	Video Bit 19
B4/ ROUT20	Video Bit 20
B5/ ROUT21	Video Bit 21
B6/ ROUT22	Video Bit 22
B7/ ROUT23	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.8 DS90UB925

The DS90UB925 interface module is a Generator module supporting the FPD-Link III standard (Flat Panel Display Link.

It includes the DS90UB925Q transmitter of Texas Instruments.

The module has the following characteristics:

- Backward compatible to FPD-Link II
- HD Video resolution and Pixel clock frequency up to 85 MHz
- I2C interface
- UUT supply

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial data output negative
2	V_{UUT}	Plus pole UUT supply
3	SD_OUT_P	Serial data output positive
4	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0/ DIN0	Video Bit 0
R1/ DIN1	Video Bit 1
R2/ DIN2	Video Bit 2
R3/ DIN3	Video Bit 3
R4/ DIN4	Video Bit 4
R5/ DIN5	Video Bit 5
R6/ DIN6	Video Bit 6
R7/ DIN7	Video Bit 7
G0/ DIN8	Video Bit 8
G1/ DIN9	Video Bit 9
G2/ DIN10	Video Bit 10
G3/ DIN11	Video Bit 11
G4/ DIN12	Video Bit 12
G5/ DIN13	Video Bit 13
G6/ DIN14	Video Bit 14
G7/ DIN15	Video Bit 15
B0/ DIN16	Video Bit 16
B1/ DIN17	Video Bit 17
B2/ DIN18	Video Bit 18
B3/ DIN19	Video Bit 19
B4/ DIN20	Video Bit 20
B5/ DIN21	Video Bit 21
B6/ DIN22	Video Bit 22
B7/ DIN23	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.9 DS90UB926

The DS90UB926 interface module is a Grabber module supporting the FPD-Link III Standard (Flat Panel Display Link).

It includes the DS90UB926Q receiver of Texas Instruments and a DS90UB925Q transmitter for routing through in the (DS90UB926+) extended version.

The module is available as simple version (DS90UB926) without I2C support as well as extended version (DS90UB926+) with I2C support and UUT supply.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- Backward compatible to FPD-Link II
- HD Video resolution and Pixel clock frequency up to 85 MHz
- I2C interface (only extended + version)
- UUT supply (only extended + version)

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Input" connector for the simple version:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial data input positive
3	Through_In_Out	Routed trough from "Input" to "Output"
4	SD_IN_N	Serial data input negative

The following table shows the assignment of the "Input" connector for the extended + version:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	V_{UUT}	Plus pole UUT supply
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the "Output" connector for the simple version:

Pin	Signal	Annotation
1	SD_OUT_N	Serial data output negative
2	Through_In_Out	Routed through from "Input" to "Output"
3	SD_OUT_P	Serial data output positive
4	Ground	Ground

The following table shows the assignment of the "Output" connector for the extended + version:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	Res	Not connected if standard mounting
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0/ ROUT0	Video Bit 0
R1/ ROUT1	Video Bit 1
R2/ ROUT2	Video Bit 2
R3/ ROUT3	Video Bit 3
R4/ ROUT4	Video Bit 4
R5/ ROUT5	Video Bit 5
R6/ ROUT6	Video Bit 6
R7/ ROUT7	Video Bit 7
G0/ ROUT8	Video Bit 8
G1/ ROUT9	Video Bit 9
G2/ ROUT10	Video Bit 10
G3/ ROUT11	Video Bit 11
G4/ ROUT12	Video Bit 12
G5/ ROUT13	Video Bit 13
G6/ ROUT14	Video Bit 14
G7/ ROUT15	Video Bit 15
B0/ ROUT16	Video Bit 16
B1/ ROUT17	Video Bit 17
B2/ ROUT18	Video Bit 18
B3/ ROUT19	Video Bit 19
B4/ ROUT20	Video Bit 20
B5/ ROUT21	Video Bit 21
B6/ ROUT22	Video Bit 22
B7/ ROUT23	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.10 DS90UB913A

The DS90UB913A interface module is a Generator module supporting the FPD-Link III standard (Flat Panel Display Link).

It includes the DS90UB913A transmitter of Texas Instruments.

The module has the following characteristics:

- Pixel clock frequency up to 100 MHz at 10 bits Color depth and 75 MHz at 12 bits
- I2C interface
- Two connection versions – STP and Coax

In the STP (Shielded Twisted Pair) version, the module has a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the STP connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

In the coax version, the module has a „59S21B-40MT5" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the "Coax" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output
Shield	Shield	Shield

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
DIN0	Video Bit 0
DIN1	Video Bit 1
DIN2	Video Bit 2
DIN3	Video Bit 3
DIN4	Video Bit 4
DIN5	Video Bit 5
DIN6	Video Bit 6
DIN7	Video Bit 7
DIN8	Video Bit 8
DIN9	Video Bit 9
DIN10	Video Bit 10
DIN11	Video Bit 11
HS	Video Bit 24
VS	Video Bit 25

2.4.11 DS90UB914A

The DS90UB914A interface module is a Grabber module supporting the FPD-Link III standard (Flat Panel Display Link). It includes the DS90UB14A receiver of Texas Instruments and a DS90UB913A transmitter for routing through.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- Pixel clock frequency up to 100 MHz at 10 bits Color depth and 75 MHz at 12 bits
- I2C interface
- UUT supply (only for the coax version)
- Two connection versions – STP and Coax

In the "STP" version (Shielded Twisted Pair), the module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the STP "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	Through_In_Out	Routed trough from "Input" to "Output"
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the STP "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	Through_In_Out	Routed trough from "Input" to "Output"
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

In the Coax version, the module includes two "59S21B-40MT5" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Coax" connectors:

Pin	Signal	Annotation
1	SD_IN/UT	Serial Data Input or Output
Shield	Shield	Shield

For UUT supply via Coax, a phantom supply is used. The Plus pole (**+**) is applied to the inner pin, the Minus pole (**–**) to the shield.

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
DIN0	Video Bit 0
DIN1	Video Bit 1
DIN2	Video Bit 2
DIN3	Video Bit 3
DIN4	Video Bit 4
DIN5	Video Bit 5
DIN6	Video Bit 6
DIN7	Video Bit 7
DIN8	Video Bit 8
DIN9	Video Bit 9
DIN10	Video Bit 10
DIN11	Video Bit 11
HS	Video Bit 24
VS	Video Bit 25

2.4.12 DS90UB905

The DS90UB905 interface module is a generator module supporting the FPD-Link II (Flat Panel Display Link) standard.

It includes the DS90UB905Q transmitter of Texas Instruments.

The module has the following characteristics:

- Backward compatible to FPD-Link II
- 24 bits Color depth
- Pixel clock frequency up to 65 MHz

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0	Video Bit 0
R1	Video Bit 1
R2	Video Bit 2
R3	Video Bit 3
R4	Video Bit 4
R5	Video Bit 5
R6	Video Bit 6
R7	Video Bit 7
G0	Video Bit 8
G1	Video Bit 9
G2	Video Bit 10
G3	Video Bit 11
G4	Video Bit 12
G5	Video Bit 13
G6	Video Bit 14
G7	Video Bit 15
B0	Video Bit 16
B1	Video Bit 17
B2	Video Bit 18
B3	Video Bit 19
B4	Video Bit 20
B5	Video Bit 21
B6	Video Bit 22
B7	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.13 DS90UR906

The DS90UR906 interface module is a Grabber module supporting the FPD-Link II standard (Flat Panel Display Link).

It includes the DS90UBR906Q receiver of Texas Instruments.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- Backward compatible to FPD-Link I
- 24 bits Color depth
- Pixel clock frequency up to 65 MHz

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through

The following table shows the assignment of the "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	Through_In_Out	Routed through from "Input" to "Output"
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	Through_In_Out	Routed trough from "Input" to "Output"
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the FPD-Link standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK	Video PXCLK
R0	Video Bit 0
R1	Video Bit 1
R2	Video Bit 2
R3	Video Bit 3
R4	Video Bit 4
R5	Video Bit 5
R6	Video Bit 6
R7	Video Bit 7
G0	Video Bit 8
G1	Video Bit 9
G2	Video Bit 10
G3	Video Bit 11
G4	Video Bit 12
G5	Video Bit 13
G6	Video Bit 14
G7	Video Bit 15
B0	Video Bit 16
B1	Video Bit 17
B2	Video Bit 18
B3	Video Bit 19
B4	Video Bit 20
B5	Video Bit 21
B6	Video Bit 22
B7	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.14 MAX9275

The MAX9275 interface module is a Generator module supporting the GMSL standard (Gigabit Multimedia Serial Link).

It includes the MAX9275 transmitter of Maxim Integrated.

The module has the following characteristics:

- 3.12 GBits/s GMSL
- 24 bits or 32 bits transmission (colors and control signals)
- Resolution up to 1920x720
- Pixel clock frequency up to 104 MHz at 24 bits transmission
- UART or I2C interface
- Two connection versions – STP and Coax

In the "STP" version (Shielded Twisted Pair), the module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the "STP" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The following table shows the assignment of the "Coax" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output
Shield	Shield	Shield

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLKIN	Video PXCLK
DIN0	Video Bit 0
DIN1	Video Bit 1
DIN2	Video Bit 2
DIN3	Video Bit 3
DIN4	Video Bit 4
DIN5	Video Bit 5
DIN6	Video Bit 6
DIN7	Video Bit 7
DIN8	Video Bit 8
DIN9	Video Bit 9
DIN10	Video Bit 10
DIN11	Video Bit 11
DIN12	Video Bit 12
DIN13	Video Bit 13
DIN14	Video Bit 14
DIN15	Video Bit 15
DIN16	Video Bit 16
DIN17	Video Bit 17
DIN18/HS	Video Bit 18
DIN19/VS	Video Bit 19
DIN20/DE	Video Bit 20
DIN21	Video Bit 21
DIN22	Video Bit 22
DIN23	Video Bit 23
DIN24	Video Bit 24
DIN25	Video Bit 25
DIN26	Video Bit 26
DIN27	Video Bit 27
DIN28	Video Bit 28

2.4.15 MAX9276

The MAX9276 interface module is a Grabber module supporting the GMSL standard (Gigabit Multimedia Serial Link).

It includes the MAX9276 receiver of Maxim Integrated and a MAX9275 transmitter for routing through.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- 3.12 GBits/s GMSL
- 24 bits or 32 bits transmission (colors and control signals)
- Resolution up to 1920x720
- Pixel clock frequency up to 104 MHz at 24 bits transmission
- UART or I2C interface
- Two connection versions – STP and Coax

In the "STP" version (Shielded Twisted Pair), the module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the STP "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	not connected	
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the STP "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

In the Coax version, the module includes two "59S21B-40MT5" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Coax" connectors:

Pin	Signal	Annotation
1	SD_IN/UT	Serial Data Input or Output
Shield	Shield	Shield

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
LCC	Video PXCLK
DOUT0	Video Bit 0
DOUT1	Video Bit 1
DOUT2	Video Bit 2
DOUT3	Video Bit 3
DOUT4	Video Bit 4
DOUT5	Video Bit 5
DOUT6	Video Bit 6
DOUT7	Video Bit 7
DOUT8	Video Bit 8
DOUT9	Video Bit 9
DOUT10	Video Bit 10
DOUT11	Video Bit 11
DOUT12	Video Bit 12
DOUT13	Video Bit 13
DOUT14	Video Bit 14
DOUT15	Video Bit 15
DOUT16	Video Bit 16
DOUT17	Video Bit 17
DOUT18/HS	Video Bit 18
DOUT19/VS	Video Bit 19
DOUT20/DE	Video Bit 20
DOUT21	Video Bit 21
DOUT22	Video Bit 22
DOUT23	Video Bit 23
DOUT24	Video Bit 24
DOUT25	Video Bit 25
DOUT26	Video Bit 26
DOUT27	Video Bit 27
DOUT28	Video Bit 28

2.4.16 MAX9271

The MAX9271 interface module is a Generator module supporting the GMSL standard (Gigabit Multimedia Serial Link).

It includes the MAX9271 transmitter of Maxim Integrated.

The module has the following characteristics:

- 1.5 GBits/s GMSL
- 28 bits transmission (colors and control signals)
- Pixel clock frequency up to 100 MHz
- UART or I2C interface
- UUT supply
- Two connection versions – STP and Coax

In the "STP" version (Shielded Twisted Pair), the module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the STP connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	V_{UUT}	Plus pole UUT supply
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The following table shows the assignment of the Coax connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output
Shield	Shield	Shield

For UUT supply via Coax, a phantom supply is used. The Plus pole (**+**) is applied to the inner pin, the Minus pole (**–**) to the shield.

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLKIN	Video PXCLK
DIN0	Video Bit 0
DIN1	Video Bit 1
DIN2	Video Bit 2
DIN3	Video Bit 3
DIN4	Video Bit 4
DIN5	Video Bit 5
DIN6	Video Bit 6
DIN7	Video Bit 7
DIN8	Video Bit 8
DIN9	Video Bit 9
DIN10	Video Bit 10
DIN11	Video Bit 11
DIN12	Video Bit 12
DIN13	Video Bit 13
DIN14/HS	Video Bit 14
DIN15/VS	Video Bit 15

2.4.17 MAX9272

The MAX9272 interface module is a Grabber module supporting the GMSL (Gigabit Multimedia Serial Link) standard.

It includes a MAX9272 receiver of Maxim Integrated and a MAX9273 transmitter for routing through.

The Module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- 1.5 GBits/s GMSL
- 28 bits transmission (colors and control signals)
- Pixel clock frequency up to 100 MHz
- UART or I2C interface
- UUT supply (only for Coax version)
- Two connection versions – STP and Coax

In the "STP" version (Shielded Twisted Pair), the module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the STP "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	not connected	
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the STP "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

In the "Coax" version, the module includes two „59S21B-40MT5" connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the Coax connector:

Pin	Signal	Annotation
1	SD_IN/UT	Serial Data Input or Output
Shield	Shield	Shield

For UUT supply via Coax, a phantom supply is used. The Plus pole (**+**) is applied to the inner pin, the Minus pole (**–**) to the shield.

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected Signal
PCLKOUT	Video PXCLK
DOUT0	Video Bit 0
DOUT1	Video Bit 1
DOUT2	Video Bit 2
DOUT3	Video Bit 3
DOUT4	Video Bit 4
DOUT5	Video Bit 5
DOUT6	Video Bit 6
DOUT7	Video Bit 7
DOUT8	Video Bit 8
DOUT9	Video Bit 9
DOUT10	Video Bit 10
DOUT11	Video Bit 11
DOUT12	Video Bit 12
DOUT13	Video Bit 13
DOUT14	Video Bit 14
DOUT15	Video Bit 15
DOUT16	Video Bit 16
DOUT17	Video Bit 17
DOUT18	Video Bit 18
DOUT19	Video Bit 19
DOUT20	Video Bit 20
DOUT21	Video Bit 21
DOUT22	Video Bit 22
DOUT23	Video Bit 23
DOUT24/HS0	Video Bit 24
DOUT25/VS0	Video Bit 25
DOUT26/HS1	Video Bit 26
DOUT27/VS1	Video Bit 27

2.4.18 MAX9259

The MAX9259 interface module is a Generator module supporting the GMSL standard (Gigabit Multimedia Serial Link).

It includes the MAX9259 transmitter of Maxim Integrated.

The module has the following characteristics:

- 24 bits or 32 bits transmission (colors and control signals)
- Resolution 1280x768 at most
- Pixel clock frequency up to 104 MHz at 24 bits transmission
- UART or I2C interface

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLKIN	Video PXCLK
DIN0	Video Bit 0
DIN1	Video Bit 1
DIN2	Video Bit 2
DIN3	Video Bit 3
DIN4	Video Bit 4
DIN5	Video Bit 5
DIN6	Video Bit 6
DIN7	Video Bit 7
DIN8	Video Bit 8
DIN9	Video Bit 9
DIN10	Video Bit 10
DIN11	Video Bit 11
DIN12	Video Bit 12
DIN13	Video Bit 13
DIN14	Video Bit 14
DIN15	Video Bit 15
DIN16	Video Bit 16
DIN17	Video Bit 17
DIN18	Video Bit 18
DIN19	Video Bit 19
DIN20	Video Bit 20
DIN21	Video Bit 21
DIN22	Video Bit 22
DIN23	Video Bit 23
DIN24	Video Bit 24
DIN25	Video Bit 25
DIN26	Video Bit 26
DIN27	Video Bit 27
DIN28	Video Bit 28

2.4.19 MAX9260

The MAX9260 interface module is a Grabber module supporting the GMSL standard (Gigabit Multimedia Serial Link).

It includes the MAX9260 receiver of Maxim Integrated and a MAX9259 transmitter for routing through.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- 24 bits or 32 bits transmission (colors and control signals)
- Resolution 1280x768 at most
- Pixel clock frequency up to 104 MHz at 24 bits transmission
- UART or I2C interface

The module includes two "D4S20D-40ML5-Z" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	Through_In_Out	Routed through from "Input" to "Output"
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	Through_In_Out	Routed through from "Input" to "Output"
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the GMSL standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLKOUT	Video PXCLK
DOUT0	Video Bit 0
DOUT1	Video Bit 1
DOUT2	Video Bit 2
DOUT3	Video Bit 3
DOUT4	Video Bit 4
DOUT5	Video Bit 5
DOUT6	Video Bit 6
DOUT7	Video Bit 7
DOUT8	Video Bit 8
DOUT9	Video Bit 9
DOUT10	Video Bit 10
DOUT11	Video Bit 11
DOUT12	Video Bit 12
DOUT13	Video Bit 13
DOUT14	Video Bit 14
DOUT15	Video Bit 15
DOUT16	Video Bit 16
DOUT17	Video Bit 17
DOUT18	Video Bit 18
DOUT19	Video Bit 19
DOUT20	Video Bit 20
DOUT21	Video Bit 21
DOUT22	Video Bit 22
DOUT23	Video Bit 23
DOUT24	Video Bit 24
DOUT25	Video Bit 25
DOUT26	Video Bit 26
DOUT27	Video Bit 27
DOUT28	Video Bit 28

2.4.20 MAX9247

The MAX9247 interface module is a Generator module including the MAX9247 transmitter of Maxim Integrated.

The module has the following characteristics:

- 18 bits Color depth
- Pixel clock frequency up to 42 MHz
- 9 bits for control signals

The module includes a "D4S20D-40ML5-Z" type connector of Rosenberger, marked as "Output". The Video signal is output via this connector.

The following table shows the assignment of the connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	not connected	
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the LVDS standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK_IN	Video PXCLK
RGB_IN0	Video Bit 0
RGB_IN1	Video Bit 1
RGB_IN2	Video Bit 2
RGB_IN3	Video Bit 3
RGB_IN4	Video Bit 4
RGB_IN5	Video Bit 5
RGB_IN6	Video Bit 6
RGB_IN7	Video Bit 7
RGB_IN8	Video Bit 8
RGB_IN9	Video Bit 9
RGB_IN10	Video Bit 10
RGB_IN11	Video Bit 11
RGB_IN12	Video Bit 12
RGB_IN13	Video Bit 13
RGB_IN14	Video Bit 14
RGB_IN15	Video Bit 15
RGB_IN16	Video Bit 16
RGB_IN17	Video Bit 17
DE_IN	Video Bit 18
CTRL_IN0	Video Bit 19
CTRL_IN1	Video Bit 20
CTRL_IN2	Video Bit 21
CTRL_IN3	Video Bit 22
CTRL_IN4	Video Bit 23
CTRL_IN5	Video Bit 24
CTRL_IN6	Video Bit 25
CTRL_IN7	Video Bit 26
CTRL_IN8	Video Bit 27

2.4.21 MAX9248

The MAX9248 interface module is a Grabber module including the MAX9248 receiver of Maxim Integrated.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- 18 bits Color depth
- Pixel clock frequency up to 42 MHz
- 9 bits for control signals

The module includes two "D4S20D-40ML5-Z2" type connectors of Rosenberger, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The following table shows the assignment of the "Input" connector:

Pin	Signal	Annotation
1	Ground	Ground
2	SD_IN_P	Serial Data Input positive
3	Through_In_Out	Routed through from "Input" to "Output"
4	SD_IN_N	Serial Data Input negative

The following table shows the assignment of the "Output" connector:

Pin	Signal	Annotation
1	SD_OUT_N	Serial Data Output negative
2	Through_In_Out	Routed through from "Input" to "Output"
3	SD_OUT_P	Serial Data Output positive
4	Ground	Ground

The electrical signal properties correspond to the LVDS standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin-Name	Connected signal
PCLK_OUT	Video PXCLK
RGB_OUT0	Video Bit 0
RGB_OUT1	Video Bit 1
RGB_OUT2	Video Bit 2
RGB_OUT3	Video Bit 3
RGB_OUT4	Video Bit 4
RGB_OUT5	Video Bit 5
RGB_OUT6	Video Bit 6
RGB_OUT7	Video Bit 7
RGB_OUT8	Video Bit 8
RGB_OUT9	Video Bit 9
RGB_OUT10	Video Bit 10
RGB_OUT11	Video Bit 11
RGB_OUT12	Video Bit 12
RGB_OUT13	Video Bit 13
RGB_OUT14	Video Bit 14
RGB_OUT15	Video Bit 15
RGB_OUT16	Video Bit 16
RGB_OUT17	Video Bit 17
DE_OUT	Video Bit 18
CTRL_OUT0	Video Bit 19
CTRL_OUT1	Video Bit 20
CTRL_OUT2	Video Bit 21
CTRL_OUT3	Video Bit 22
CTRL_OUT4	Video Bit 23
CTRL_OUT5	Video Bit 24
CTRL_OUT6	Video Bit 25
CTRL_OUT7	Video Bit 26
CTRL_OUT8	Video Bit 27

2.4.22 ADV7611

The ADV7611 interface module is a Grabber module supporting the HDMI 1.3a standard.

It includes the ADV7611 receiver of Analog Devices.

The module has a second connection and appropriate circuitry, enabling not only signal receiving, but also routing through.

By this, the Grabber module can be inserted into an existing system of transmitter and receiver without changing the system itself.

The module has the following characteristics:

- HD Video resolution and Pixel clock frequency up to 120 MHz
- I2C interface

The module includes two standard HDMI connectors, whereof the "Input" connector receives the signals, while the "Output" connector routes the signals through.

The connector assignment and the electrical signal properties correspond to the HDMI standard.

The pin assignment of the Video signals on the interface module, required for the Video signal routing (see chapter Video signal Routing), is as follows:

Pin Name	Connected signal
LCC	Video PXCLK
P0	Video Bit 0
P1	Video Bit 1
P2	Video Bit 2
P3	Video Bit 3
P4	Video Bit 4
P5	Video Bit 5
P6	Video Bit 6
P7	Video Bit 7
P8	Video Bit 8
P9	Video Bit 9
P10	Video Bit 10
P11	Video Bit 11
P12	Video Bit 12
P13	Video Bit 13
P14	Video Bit 14
P15	Video Bit 15
P16	Video Bit 16
P17	Video Bit 17
P18	Video Bit 18
P19	Video Bit 19
P20	Video Bit 20
P21	Video Bit 21
P22	Video Bit 22
P23	Video Bit 23
HS	Video Bit 24
VS	Video Bit 25
DE	Video Bit 26

2.4.23 RGB888T

The RGB888T Interface Module is a Generator module for video frames in RGB888 format.

The module has the following characteristics:

- 24 bits Color depth
- Pixel clock frequency up to 33 MHz
- 4 bits for control signals

The module includes a "046288050000846+" type 50 pole FFC socket with 0.5mm pitch of Kyocera. There can connect a FFC foil cable and lead out of the module, marked as "RGB Output". The video signal is output via this cable. All signals corresponds to 3.3V CMOS logic.

The following table shows the assignment oft the connector:

Pin	Signal	Annotation
1	GND	Ground
2	RES	Reserved, do not connect
3	RES	Reserved, do not connect
4	NC	Not Connected
5	NC	Not Connected
6	GPI	General Purpose Input
7	GND	Ground
8	Video Bit 0	
9	Video Bit 1	
10	Video Bit 2	
11	Video Bit 3	
12	Video Bit 4	
13	Video Bit 5	
14	Video Bit 6	
15	Video Bit 7	
16	GND	Ground
17	Video Bit 8	
18	Video Bit 9	
19	Video Bit 10	
20	Video Bit 11	
21	Video Bit 12	
22	Video Bit 13	
23	Video Bit 14	
24	Video Bit 15	
25	GND	Ground
26	Video Bit 16	
27	Video Bit 17	
28	Video Bit 18	
29	Video Bit 19	
30	Video Bit 20	
31	Video Bit 21	

Pin	Signal	Annotation
32	Video Bit 22	
33	Video Bit 23	
34	GND	Ground
35	Video PXCLK	Video Pixelclock
36	GND	Ground
37	Video Bit 24	
38	Video Bit 26	
39	Video Bit 25	
40	NC	Not Connected
41	NC	Not Connected
42	NC	Not Connected
43	NC	Not Connected
44	GND	Ground
45	NC	Not Connected
46	NC	Not Connected
47	NC	Not Connected
48	NC	Not Connected
49	NC	Not Connected
50	NC	Not Connected

2.4.24 RGB888R

The RGB888R Interface Module is a Grabber module for video frames in RGB888 format.

The module has the following characteristics:

- 24 bits Color depth
- Pixel clock frequency up to 33 MHz
- 4 bits for control signals

The module includes a "046288050000846+" type 50 pole FFC socket with 0.5mm pitch of Kyocera. There can connect a FFC foil cable and lead out of the module, marked as "RGB Input". The video signal is input via this cable. All signals corresponds to 3.3V CMOS logic.

The following table shows the assignment oft the connector:

Pin	Signal	Annotation
1	GND	Ground
2	RES	Reserved, do not connect
3	RES	Reserved, do not connect
4	NC	Not Connected
5	NC	Not Connected
6	GPO	General Purpose Output
7	GND	Ground
8	Video Bit 0	
9	Video Bit 1	
10	Video Bit 2	
11	Video Bit 3	
12	Video Bit 4	
13	Video Bit 5	
14	Video Bit 6	
15	Video Bit 7	
16	GND	Ground
17	Video Bit 8	
18	Video Bit 9	
19	Video Bit 10	
20	Video Bit 11	
21	Video Bit 12	
22	Video Bit 13	
23	Video Bit 14	
24	Video Bit 15	
25	GND	Ground
26	Video Bit 16	
27	Video Bit 17	
28	Video Bit 18	
29	Video Bit 19	
30	Video Bit 20	
31	Video Bit 21	

Pin	Signal	Annotation
32	Video Bit 22	
33	Video Bit 23	
34	GND	Ground
35	Video PXCLK	Video Pixelclock
36	GND	Ground
37	Video Bit 24	
38	Video Bit 26	
39	Video Bit 25	
40	NC	Not Connected
41	NC	Not Connected
42	NC	Not Connected
43	NC	Not Connected
44	GND	Ground
45	NC	Not Connected
46	NC	Not Connected
47	NC	Not Connected
48	NC	Not Connected
49	NC	Not Connected
50	NC	Not Connected

3 Video Dragon – First Steps

Requirement for these steps is a proper installation of the **GOEPEL electronic G-API** and the **LvdsViewer** software (see separate manuals).

The **Video Dragon basicCON 4121** can be used with different **Media Interface Modules** (see the Media Interface Modules chapter).

For this First Steps chapter it is assumed that the DS90UB926 Grabber module is used and a compatible video source is already set up and ready to use.

3.1 Assembly of the System

- Install the corresponding Module (here the DS90UB926) in the Media Interface Slot. (Typically this step is not necessary, as one module is already installed on delivery of the device.)
- Connect the video source using the supplied video cable with the input connector of the **Media Interface Module.**
- Power up the **basicCON 4121** using the delivered power supply. (As soon as the device is ready to use, the status LED 2 starts blinking.)
- Connect the **basicCON 4121** hardware to your PC/ laptop either by using the supplied USB cable (when doing that for the first time, the Windows® system messages for driver installation appear) or by using an Ethernet cable.

3.2 Device Registration

Before using the **GOEPEL electronic Video Dragon basicCON 4121** for the very first time, the device must be registered at the **G-API**, which is responsible for all further communication between the control PC or laptop and the device.

This registration is simply done by starting the HardwareExplorer. The following figure shows a **Video Dragon basicCON 4121** with two interfaces:

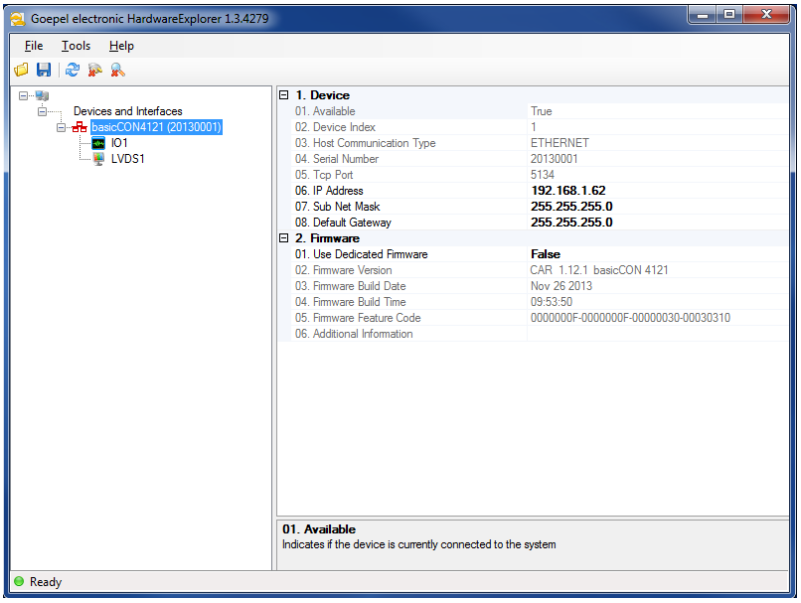

Figure 3-1: HardwareExplorer

The **basicCON 4121** is shown in the device list on the left side with its available software interfaces. If several devices are connected, the corresponding device can be identified by its serial number in parentheses. The name of the LVDS interface (i.e. "LVDS1", see the figure above) is important for the further steps.

3.3 Configuration

Before the capturing of frames is possible, the **basicCON 4121** needs to be configured, according to the actually transmitted Video signal.

1. Start the **GOEPEL electronic LvdsViewer** software.
2. Select the LVDS interface of the **basicCON 4121** by its name seen in the HardwareExplorer ("LVDS1" in our example).

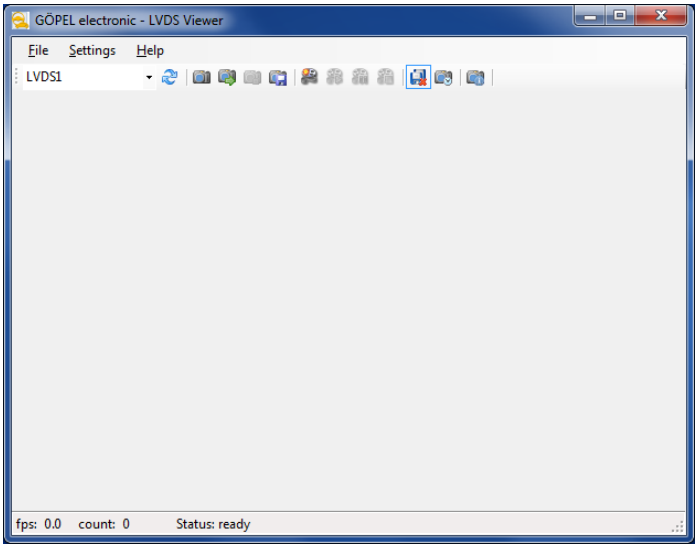

Figure 3-2: Interface Selection

3. Open the "Settings" dialog from the menu.

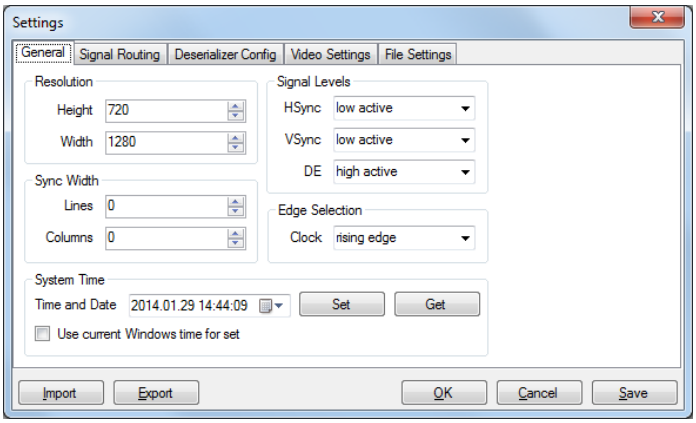

Figure 3-3: Settings Dialog

All settings regarding the **LvdsViewer** software as well as the **basicCON 4121** can be done in this dialog. For a description of all settings see the separate manual of the **LvdsViewer** software.
For starters it is enough to import settings from a settings file.

4. Click the "Import" button. A file dialog appears.
5. Search and open the *Init4121_DS90UB926_v11.xml* settings file from the delivered driver and software compact disc.
The "Init files" on CD are only examples for the respective interface modules configuration. Usually they do not fit to your system. If necessary, read the manual of the LvdsViewer tool to find the correct settings).
6. If necessary change the resolution of the frames to be captured, by setting the correct values in the "Height" and "Width" fields.

7. Click "OK" to close the settings dialog. Optionally you can click the "Save" button before, to save the settings for the selected LVDS interface permanently.
8. Click the LVDS info button ( ) in the main window.

   A window with information about the current hardware and software version of the **basicCON 4121** as well as about the Video signal appears:

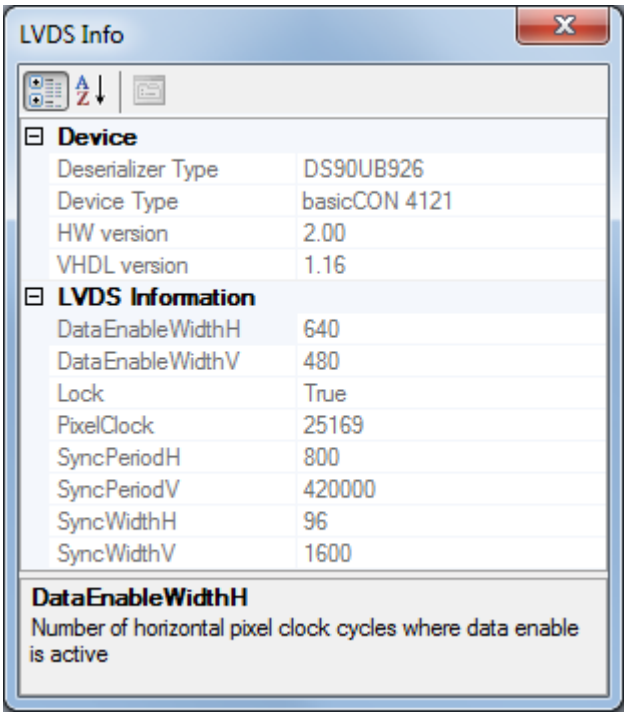

Figure 3-4: Information window

9. If the values of the Video signal width (presented as "DataEnableWidthH") and height ("DataEnableWidthV") are smaller than the set up frame resolution of step 6, the capturing will fail. Then open the settings dialog and start again with step 6, update the values accordingly, etc.
10. Close the information window.

The device is now set up and ready to capture frames.

3.4 Capturing

It is possible to capture either single frames or a sequence of frames.

By clicking the "Capture single frame" button () a single frame from the video stream will be captured and displayed in the frame area of the **LvdsViewer**.

The capturing of a frame sequence will be started by clicking the "Capture sequence" button (). After each captured frame the frame area of the **LvdsViewer** will be updated to display the currently captured frame.

For more functionality of the **LvdsViewer** software (saving frames, record (un-)compressed videos, adding timestamps, etc.) see the separate manual.

Your **Video Dragon basicCON 4121** offers a multitude of further functions.
This chapter was only giving you an idea how to operate the device.

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