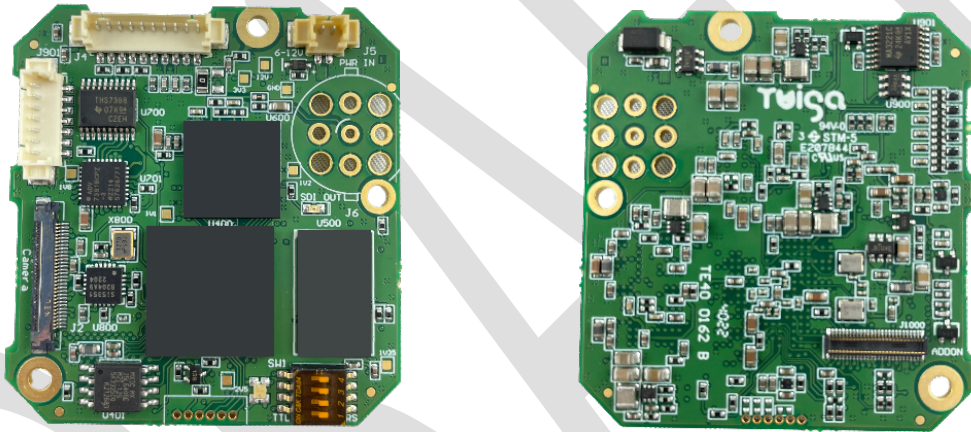




# 3G/HD-SDI Premium Technical Manual



**P/N – TV10 0090:** 3G/HD-SDI Premium interface board for LVDS zoom cameras

**P/N – TV50 0020:** Mounting kit for TV10 0090 / TV10 0096 - 3G/HD-SDI Neo - 3G/HD-SDI Premium I/F boards  
**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL/Analog output), 7-way cable (GPIOs), right angle black anodized bracket, screws and spacers

**P/N – TV50 0021:** Cable kit for TV10 0090 / TV10 0096 - 3G/HD-SDI Neo - 3G/HD SDI Premium I/F boards  
**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL/Analog output)

**Available connectors:** VOPTM02 (MCX connector), VOPTM03 (SMB connector), VOPTM04 (No connector)

## Table of content

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Table of content .....	2
Revision History .....	2
Key features.....	3
Overview.....	3
Application example .....	3
Block diagram .....	4
Accessing to the video .....	5
Step by step Quick plug .....	5
Video characteristics .....	6
LVDS video input resolutions supported .....	6
SDI video output .....	6
Analog video output .....	6
System configuration.....	7
Communication .....	7
Switches: communication and video format.....	8
GPIOs .....	8
Board Status .....	9
Connectors.....	9
Troubleshooting .....	10
Get hardware and software version.....	10
Update via UART.....	10
Common issues.....	10

## Revision History

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Date	Revision	Description	Modified by	Note
07/02/23	A	Creation of the document	CBO	

## Key features

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- 3G-SDI SMPTE 424M, HD-SDI 292 M
- Video resolution up to 1080p60
- Analog video output selectable:
  - Composite video (CVBS)
  - S-Video (Y/C)
  - Component video (YPbPr colorspace)
- PAL and NTSC compliant output with multiple format possibilities: Letter box, Squeeze or Crop
- Communication UART – RS232/TTL using VISCA
- Setup & Update via UART
- Video mode selection by DIP switches
- Power supply 7V-12VDC
- Automatic LVDS & format camera recognition
- Add-on connector for custom functionalities

## Overview

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3G-SDI technology is the first established standard providing sufficient bandwidth to transmit uncompressed high-definition video signals from camera to screen.

Using coaxial cables with very low power loss, enables video transmission over 100 meters. This distance can be increased up to 300 meters using equalization at the receiver.

Twiga 3G-SDI Premium converts the native LVDS video signal from camera blocks to 3G-SDI. It takes advantage of a high quality, low jitter and uncompressed SDI stream.

The Premium board has an additional analog output which is perfect to conserve your already-in-use analog system. The dual output 3G and Analog will significantly reduce the number of boards, improving the cost and time-to-market. The 3G-SDI Premium module is based on a FPGA associated with DDR3 memory. Combined with Twiga's expertise, complex image processing functions can be embedded on real time video flow such as colorimetry tests, measurements, reticules, contrast enhancement, ROI extraction, OSD and even more functions to fit your applications.

The add-on connector on the bottom side offers an infinity of new functionalities. The 3G-SDI Premium can be directly mounted into your system/end-products (plug-in) or connected to custom designed add-on board. Integrated RTC, audio embedded to SDI, second video input are some examples of the new possibilities / range of functionalities.

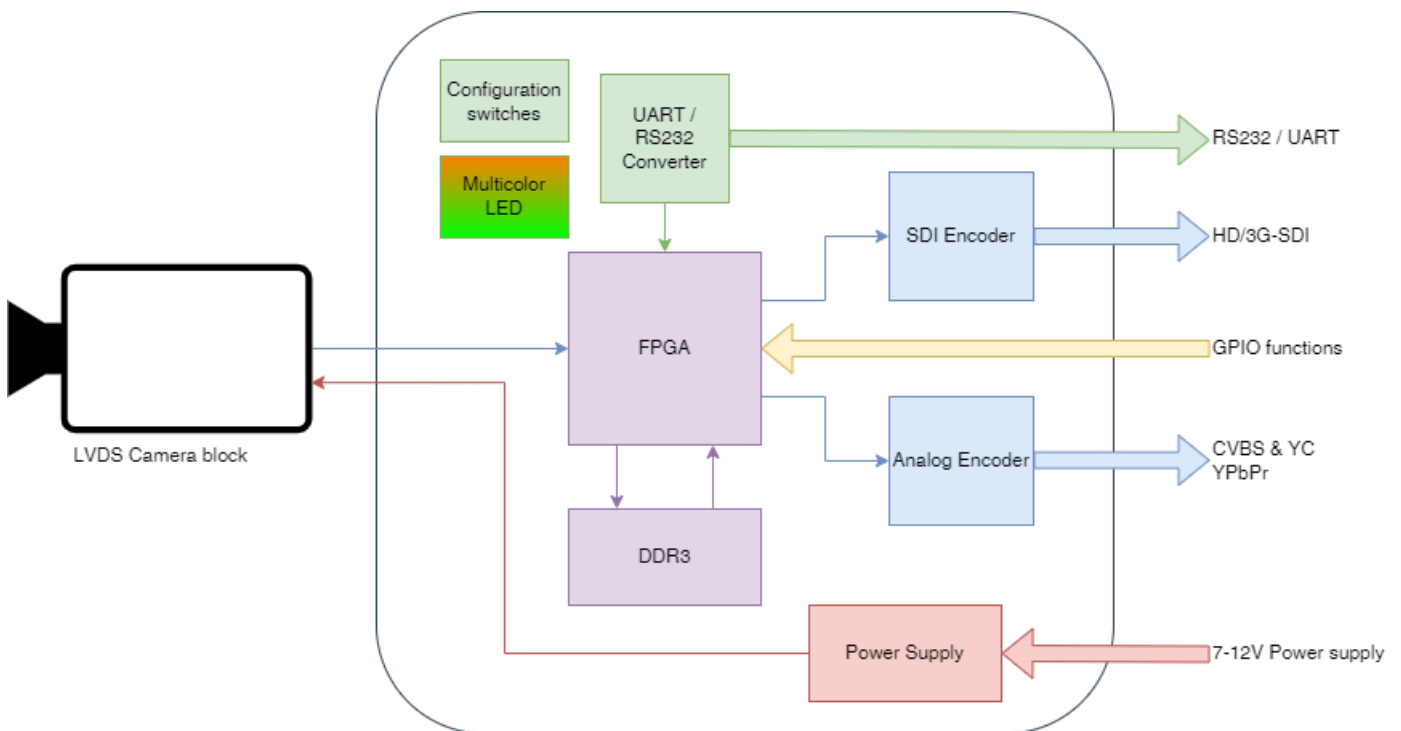
## Application example

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The 3G-SDI Neo module can be closely fitted to the back of a LVDS camera module to facilitate the system integration. It enables the customer to harvest the full advantage of this robust solution in their integrated systems in different kinds of application such as:

- medical cameras
- surveillance
- machine vision
- inspection

## Block diagram



### Rich input/output:

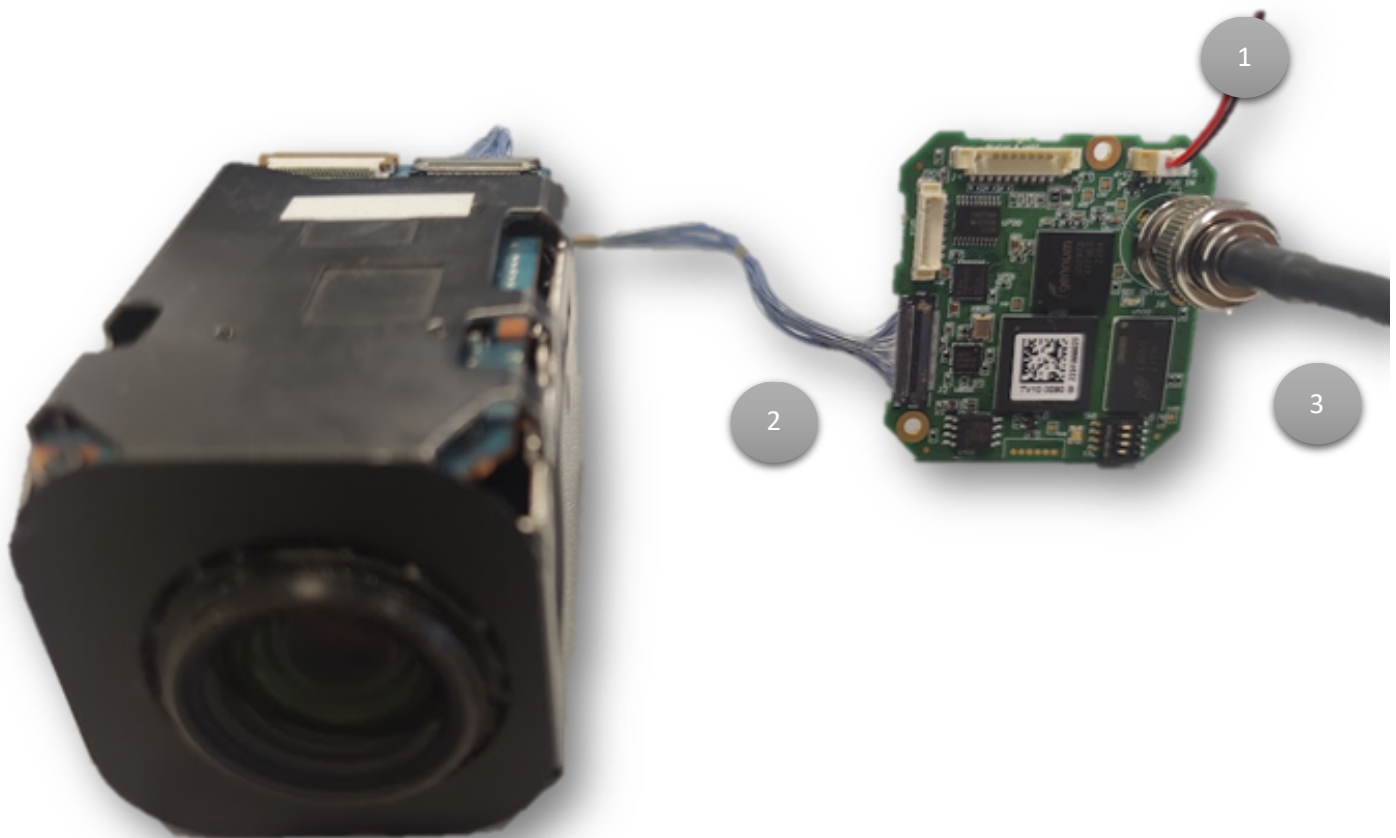
- *Communication:*
  - Configuration switches for video format & RS232 communication level setting.
  - RS232 and UART TTL (3.3V) VISCA compatible communication.
  - Multicolor LED to easily check the board status.
- *Video:*
  - LVDS camera input with no latency deserialization.
  - HD to 3G-SDI video output.
  - Analog video with CVBS, Y/C and YPbPr
    - Realtime scaling to allow 4:3 SD video in Letterbox, Squeeze or Crop mode.
  - Available DDR3 for high-speed image processing.
- *Power supply*
  - 7V to 12V voltage input.
  - Protected against shortcut.
  - Protected against reversed cables.

## Accessing to the video

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### Step by step Quick plug

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#### Installation steps:

- 1 Connect 2 ways cables power supply (J5)  
Red: +12V  
Black: GND
- 2 Connect KEL cable (J2) between board and camera.
- 3 Connect SDI cable (J6) to the SDI monitor.

## Video characteristics

### LVDS video input resolutions supported

	25	29.97	30	50	59.94	60
1280x720	√	√	√	√	√	√
1920x1080	√	√	√	√	√	√

### SDI video output

The output is an 8-bit SDI signal 800mV pp with 75-ohm impedance. It is compliant to SMPTE 424M (3G-SDI) and SMPTE 292M (HD-SDI). The output video format is the same as the camera.

Different output connector type are available: BNC, SMB or MCX. Please specify the connector you need in the order.

### Analog video output

The analog video output is selectable. You can get Composite video (CVBS), S-video (Y/C) or Component video (YPbPr). The selection is done via internal registers. The analog video output is available on a 10-pin molex connector.

3 modes can be selected to convert HD 16:9 to SD 4:3:

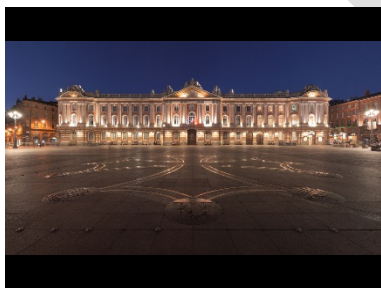


Figure 1: Letterbox

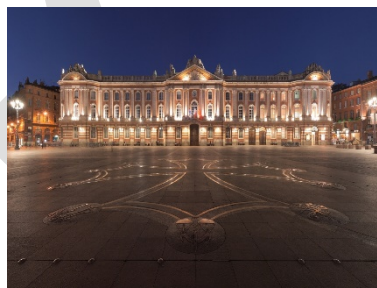


Figure 2: Squeeze



Figure 3: Crop

Selection of the Video mode can be done on by the UART communication ([See paragraph communication](#))

## System configuration

### Communication

Communication with the camera can be done through J4 with the following pins:

- RX
- TX
- GND

Communication can be set to either RS232 mode (according to EIA RS-232 specification) or TTL mode (UART with 3.3V compatibility).

Selection between both mode is done by SW1 switch ([See paragraph Switches](#))

The camera communication use VISCA protocol and will follow camera specifications, please check the camera datasheet to address all available commands.

The board parameters are also accessible from this connector with VISCA protocol at Address 0x82.

Command name	Visca command	Comments	Inquiry Command	Inquiry Answer
ADD_WIDTH_L	0x82 0x01 0x06 0x02 0x0y 0x0y 0xFF	Detected Width of video	0x82 0x09 0x06 0x02 0xFF	0xA0 0x50 0x02 0x0y 0x0y 0xFF
ADD_WIDTH_H	0x82 0x01 0x06 0x03 0x0y 0x0y 0xFF	Detected Width of video	0x82 0x09 0x06 0x03 0xFF	0xA0 0x50 0x03 0x0y 0x0y 0xFF
ADD_HEIGHT_L	0x82 0x01 0x06 0x04 0x0y 0x0y 0xFF	Detected Height of video	0x82 0x09 0x06 0x04 0xFF	0xA0 0x50 0x04 0x0y 0x0y 0xFF
ADD_HEIGHT_H	0x82 0x01 0x06 0x05 0x0y 0x0y 0xFF	Detected Height of video	0x82 0x09 0x06 0x05 0xFF	0xA0 0x50 0x05 0x0y 0x0y 0xFF
ADD_FPS_L	0x82 0x01 0x06 0x06 0x0y 0x0y 0xFF	Detected frame interval (μs)	0x82 0x09 0x06 0x06 0xFF	0xA0 0x50 0x06 0x0y 0x0y 0xFF
ADD_FPS_H	0x82 0x01 0x06 0x07 0x0y 0x0y 0xFF	Detected frame interval (μs)	0x82 0x09 0x06 0x07 0xFF	0xA0 0x50 0x07 0x0y 0x0y 0xFF
ADD_FLASH_SIZE	0x82 0x01 0x06 0x20 0x08 0x0y 0x0y 0xFF	Flash size	0x82 0x09 0x06 0x20 0x08 0xFF	0xA0 0x50 0x08 0x0y 0x0y 0xFF
ADD_VERSION_L	0x82 0x01 0x06 0x1E 0x0y 0x0y 0xFF	FW Version	0x82 0x09 0x06 0x1E 0xFF	0xA0 0x50 0x1E 0x0y 0x0y 0xFF
ADD_VERSION_H	0x82 0x01 0x06 0x1F 0x0y 0x0y 0xFF	FW Version	0x82 0x09 0x06 0x1F 0xFF	0xA0 0x50 0x1F 0x0y 0x0y 0xFF
ADD_ANA_FORMAT	0x82 0x01 0x06 0x20 0x0y 0x0y 0xFF	Format SD 0x00: CVBS / S-VIDEO 0x01: YPbPr	0x82 0x09 0x06 0x20 0xFF	0xA0 0x50 0x20 0x0y 0x0y 0xFF
ADD_SD_FORMAT	0x82 0x01 0x06 0x22 0x0y 0x0y 0xFF	Conversion Ratio 0x00: Crop 0x01: Letter box 0x02: Squeeze	0x82 0x09 0x06 0x22 0xFF	0xA0 0x50 0x22 0x0y 0x0y 0xFF

## Switches: communication and video format

4 DIP switches are available.

Switch 1: to select the communication standard between RS232 and TTL.

Switch 2- 3- 4: to select the video format. The board checks, when the camera power is on, if the camera video format corresponds to the switches, otherwise it sends a VISCA command to change the format. It can be changed dynamically; the system will automatically detect the format change and display the video in the format requested. An "External" mode is available to use the actual format of the camera, it does not change the video format of the camera.

SW1	SW2	SW3	SW4	Configuration
OFF	/	/	/	RS232
ON	/	/	/	TTL
/	OFF	OFF	OFF	Default camera format
/	OFF	OFF	ON	1080p30
/	OFF	ON	OFF	1080p25
/	OFF	ON	ON	1080p60
/	ON	OFF	OFF	1080p50
/	ON	OFF	ON	720p60
/	ON	ON	OFF	720p50
/	ON	ON	ON	720p50

Please note that video formats can depend on the camera model used.

## GPIOs

Six (6) GPIOs are available on J901 connector, each one is dedicated to a specific camera function:





Pin	Action	Control
<b>Ctrl1</b>	Press Release	Zoom + Zoom stop
<b>Ctrl2</b>	Press Release	Zoom – Zoom stop
<b>Ctrl3</b>	Press Release	Focus Auto / Manual
<b>Ctrl4</b>	Press Release	Focus near Focus stop
<b>Ctrl5</b>	Press Release	Focus far Focus stop
<b>Ctrl6</b>	Press Release	Image freeze End of freeze

To activate it you need to connect the pin to the ground. ESD filters and anti-bounce have been added. You can use existing keyboard to easily control them.

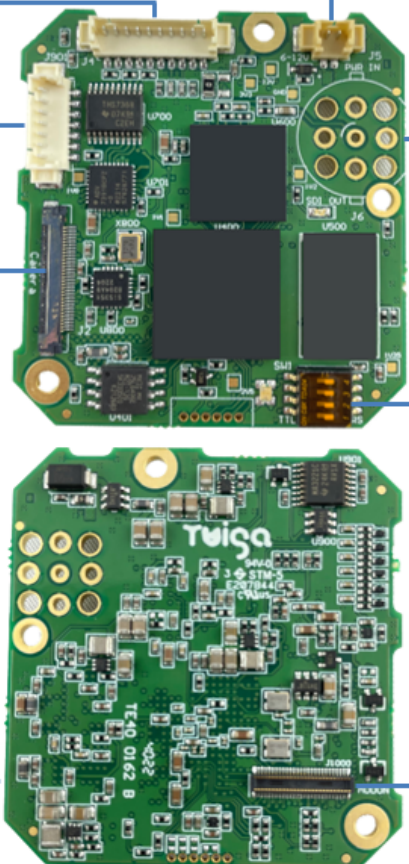
For the connector pinout please see [paragraph Connectors](#).



Board Status

LED color	Status
	Initialization
	Board started
	Update ongoing
	Error

Connectors



J4	Analogue HD/SD output + COM
1	CVBS OUT
2	GND
3	UART-RX
4	UART-TX
5	GND
6	Pr / SC OUT
7	GND
8	Pb / SC OUT
9	GND
10	Y / CVBS OUT

J5	External Power supply
1	GND
2	7 to 12V DC

J6	MCX / BNC / SMB compatibility			
<b>DIP switches</b>	<b>Configuration</b>			
1	2	3	4	
OFF	/	/	/	RS232
ON	/	/	/	TTL
/	OFF	OFF	OFF	External
/	OFF	OFF	ON	1080p30
/	OFF	ON	OFF	1080p25
/	OFF	ON	ON	1080p60
/	ON	OFF	OFF	1080p50
/	ON	OFF	ON	720p60
/	ON	ON	OFF	720p50
/	ON	ON	ON	720p30

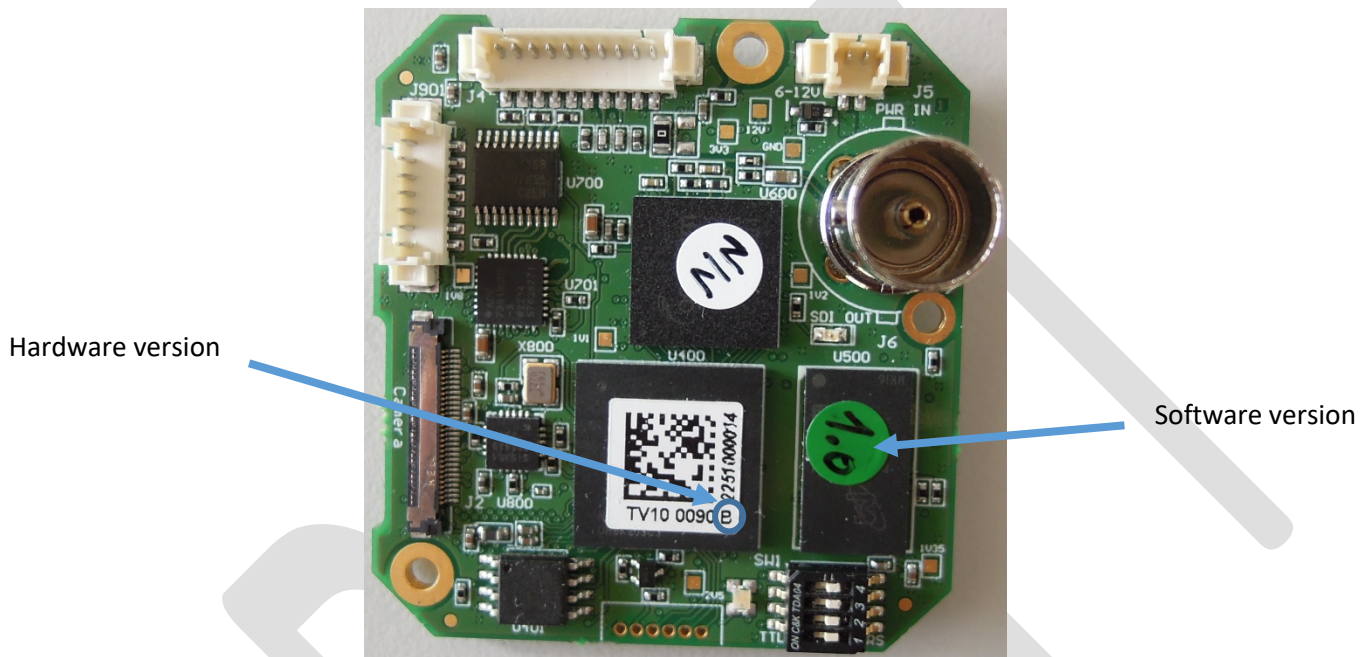
J901	GPIOs
1	GND
2	Zoom +
3	Zoom -
4	Focus Auto/Manual
5	Focus Near
6	Focus Far
7	Freeze On/Off

J2	LVDS camera block input
J1000	Board to board connector
Extended functionalities	

## Troubleshooting

### Get hardware and software version

The hardware version is a letter written close to the reference of the board TV10 0090. The software version is written on a green sticker stuck on the top side of the board. Be careful, the 3G/HD-SDI can be updated by the customer, in this case the green sticker can be not at the correct version. You can still read internal registers to get the correct version.



### Update via UART

An update of the board is possible by distance, you need an UART connection with the board and a Java application made by Twiga. You can find the application and the different available software version on [www.twiga-support.com](http://www.twiga-support.com) where a changelog file gives you all the information about the features updated in each version. If you do not have an account on our support website, please register and send us a mail at [info@twiga-web.com](mailto:info@twiga-web.com) specifying which board you are working with. This way we will give the rights to have access to our different documentations and software.

### Common issues

If you have any problem getting the video, here some points you need to check:

- Power supply is correctly connected to the board, no consuming issue or overheating of the board
- No damaged cable, you can check using other 30-way Kel cable, if possible, check the output cable used to get the video
- The video format of the camera is correct and supported by the board
- Try with another LVDS compatible camera to be sure the issue is not coming from the camera
- You can check on our support website that there is no new software version solving your issue

If you are not able to find the cause of the issue, please contact us at [info@twiga-web.com](mailto:info@twiga-web.com) and we will give you support. Explain us the problem you are facing with as much details as possible and please add the hardware and software version of your board.