

**It's no trick...
it's a vision system**



**Vision
Components®**

The Smart Camera People

VC20XX Operating Manual

**Hardware Specifications and special Software Functions of
VC20XX Smart Cameras**

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Foreword and Disclaimer

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References











Since the VC4XXX smart camera family employs a TI processor, the programming environment and functions for the VC20XX cameras can be used for this camera.

Further References under "Support + Download" on www.vision-components.com:

„**Support News**“ – for up to date information on VC Software and Documentation.

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“**Download Areas**” for all documentation and Software downloads – refer to the following table:

| Description | Title on Website | Download Area |
|--|--|--|
| Schnellstart VC  |  Schnellstart VC Smart Kameras | Registered User Area ▶ Getting Started VC SDK TI |
| Getting Started VC Smart Cameras  |  Getting Started VC Smart Cameras | Registered User Area ▶ Getting Started VC SDK TI |
| Introduction to VC Smart Camera programming |  Programming Tutorial for VC20XX and VC40XX Cameras | Registered User Area ▶ Getting Started VC SDK TI |
| Demo programs and sample code used in the Programming Tutorial |  Tutorial_Code | Registered User Area ▶ Getting Started VC SDK TI |
| VC4XXX Hardware Manual |  VC4XXX Smart Cameras Hardware Documentation | Public Download Area ▶ Hardware Documentation VC Smart Cameras |
| VCRT Operation System Functions Manual |  VCRT 5.0 Software Manual | Registered User Area ▶ Software documentation VC Smart Cameras |
| VCRT Operation System TCP/IP Functions Manual |  VCRT 5.0 TCP/IP Manual | Registered User Area ▶ Software documentation VC Smart Cameras |
| VCLIB 2.0 /3.0 Image Processing Library Manual |  VCLIB 2.0/ 3.0 Software Manual | Registered User Area ▶ Software documentation VC Smart Cameras |



The Light bulb highlights hints and ideas that may be helpful for a development.



This warning sign alerts of possible pitfalls to avoid. Please pay careful attention to sections marked with this sign.

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1 General Information



The VC20xx Series smart cameras are compact, light-weight black-and-white or color video cameras with video memory and an image processor.

They integrate a high-resolution CCD sensor with one of the fastest 32 bit image-processing signal processors (TMS320C6211). SDRAM memory is used to store program code, data and video images. Interfaces allow communication with the outside world. The cameras set standards for performance and integration density.

These cameras are built for industrial deployment. High goals were set as regards the image resolution, the computational speed, the sturdiness of the casing, and the electromagnetic compatibility, as mere examples. The cameras are insensitive to vibrations and shocks, while permitting precise measurements and tests. They are ideally suited as OEM cameras for mechanical engineering applications.

Only one supply voltage is required to operate the cameras (24 volts). An image processing system or a PC with a frame grabber board is not necessary. Simple control problems can even be implemented with the integrated process interfaces. For more complex control tasks, the cameras can be connected to a PLC.

This documentation describes the camera hardware. However, in many cases the software documentation is decisive. For this, please consult the software manuals.

1.1 Overview Camera Types

All VC20XX Cameras contain the following features:

- 16 MB SDRAM
- 2 MB Flash Eprom
- 8 bit overlay (translucent overlay possible)
- integrated 4 Digital Inputs, 4 Digital Outputs, 24V
- Texas Instruments CPU TMS 320C62XX; 1200MIPS
- Low speed shutter up to 10 seconds
- Programmable gain and offset
- 24V Power Supply

The following table shows the different features of each camera model:

| VC20XX SELECTION TABLE | VC2028 | VC2038 VC2038E | VC2048E | VC2065 VC2065E | V2065C VC2065CE | VC2066 VC2066E | VC2068 VC2068E |
|---|--------|-------------------|---------|-------------------|--------------------|-------------------|-------------------|
| Sony 1/3" Progressive Scan CCD640x480 pixel | ✓ | ✓ | | | | | |
| Kodak 1/3" Progressive Scan CCD 640x480 pixel | | | ✓ | | | | |
| Sony 1/2" Progressive Scan CCD 782x582 pixel | | | | ✓ | ✓ | | |
| Sony 1/3" Progressive Scan CCD 1024x768 pixel | | | | | | ✓ | |
| Sony 1/2" Progressive Scan CCD 1280x1024 pixel | | | | | | | ✓ |
| 14 Hz full Frame, 28 Hz 2x Binning | | | | | | | ✓ |
| 17 Hz full Frame, 34 Hz 2x Binning | | | | | | ✓ | |
| 25 Hz full Frame | ✓ | | | | | | |
| 40 Hz full Frame | | ✓ | | | | | |
| 45 Hz full Frame | | | | ✓ | ✓ | | |
| 110 Hz full Frame | | | ✓ | | | | |
| Color | | | | | ✓ | | |
| 16 MB Multimedia Card | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SVGA (800x600 Pixel) output, noninterlaced | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| SXVGA (1280x1024 Pixel) output, noninterlaced | | | | | | ✓ | ✓ |

| VC20XX SELECTION TABLE | VC2028 | VC2038 VC2038E | VC2048E | VC2065 VC2065E | V2065C VC2065CE | VC2066 VC2066E | VC2068 VC2068E |
|--|--------|-------------------|---------|-------------------|--------------------|-------------------|-------------------|
| integrated Fast Trigger contact (external contact) | 1) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| High speed shutter down to 33 microseconds | ✓ | ✓ | | | | | |
| High speed shutter down to 9 or 10 microseconds | | | | | | ✓ | ✓ |
| High speed shutter down to 5 microseconds | | | ✓ | ✓ | ✓ | | |
| RS232 up to 115.200 Baud (optional) | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Fast Ethernet 100MBit (optional) 2) | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Size: 110x50x36mm+foot/ Weight: 488g | ✓ | ✓ | 3) | ✓ | ✓ | ✓ | ✓ |

- 1) The use of the VC2028 is recommended for imaging static (non moving) objects only.
- 2) If ordering a camera with Ethernet interface please add the suffix "/E" to the camera name (i.e. VC38/E, VC2065/EC).
- 3) Dimension of housing VC2048: 111x80x36 + mounting plate, weight: 516g

2 Basic Structure

The image is formed by a high-resolution progressive scan CCD sensor. One or two channels of video output are digitized. An input lookup-table is available for basic pixel-preprocessing. The image is stored in SDRAM memory using one of the 16 DMA channels (EDMA).

The video and graphics display on the monitor is performed in a very similar way: Data is stored in the main SDRAM memory, either due to a previous video capture or to computing by the DSP. Graphics data is then transferred to the graphics refresh buffer (SGRAM). This may happen periodically or on demand. The SGRAM is read out at a fast refresh rate to provide a high-quality, flickerfree display. A dual 3x256x8 output lookup-table gives you abundant choices for the appearance of images and graphics.

The video capture and graphics output channels are completely independent. The storage area for each may be chosen to be identical (necessary for live image display) or completely different. If the latter is chosen, you may capture an image "in the background" while displaying a completely different one.

The TMS320C6211 DSP is one of the fastest 32 DSPs. It features a RISC-like instruction set, up to 8 instructions can be executed in parallel, two L1 cache memories (4KBytes each) and a 64 KByte L2 cache on chip. Its high speed 16-channel DMA controller gives additional performance. The DSP uses fast external SDRAM as main memory. A flash EPROM and a built-in multi-media card provide non-volatile memory.

See [Appendix A: Blockdiagram VC20XX Smart Cameras](#).

3 Boards

The electronic circuitry of the camera contains four printed circuit boards (PCB).

The following presents an overview of the boards:

| Description | Designation | Function |
|----------------------|--|---|
| Sensor boards | C6SEN084, C6SEN204 C6SEN205, C6SEN311 C6SEN415 | CCD sensor, driver & controller, digitization of the video signal, black-and-white and color versions |
| CPU board | C6CPU | TMSC6211 signal processor with SDRAM, FLASH memory, multi-media card adaptor |
| DAC board | C6DAC | SVGA quality video output with graphics memory, video capture, interfaces (RS232, etc.) |
| Power board | C6PWR | Power supply, PLC interfaces |

3.1 Sensor Boards

| Camera Type | Sensor Board |
|-------------|--------------|
| VC2028 | C6SEN084 |
| VC2038 | C6SEN084 |
| VC2038/E | C6SEN084 |
| VC2048/E | C6SEN311 |
| VC2065 | C6SEN415 |
| VC2065/E | C6SEN415 |
| VC2065/C | C6SEN415 |
| VC2065/EC | C6SEN415 |
| VC2066 | C6SEN204 |
| VC2066/E | C6SEN204 |
| VC2068 | C6SEN205 |
| VC2068/E | C6SEN205 |

3.1.1 C6SEN084

This board takes the picture. It is used in the VC2028, VC2038 and VC2038/E. The CCD sensor 1/3" SONY ICX424AL (B/W) is used. The board controls the CCD sensor and processes the analog signal.

The progressive scan type CCD sensor used is ideally suited for industrial machine vision tasks. In contrast to the conventional technique it provides the following features:

- 1/3" sensor
- resolution: 640x480 pixels
- square pixel format, 7.4(H) x 7.4(V) μm
- full-frame shutter
- can be triggered externally (**except VC2028**)
- sensor read out in full-frame mode (non-interlaced)
- shutter speed down to 30,80,... μsec in steps of 50 microseconds up to 20 sec
- 40fps @ 640x480 (**VC2028 : 25fps@640x480**)
- CCD processors providing CDS, programmable gain and offset, auto black level compensation and 10 bit AD-conversion

The diverse features of this board (high-speed and low-speed shutter, external trigger, etc.) are configured via software.

For the exact setting of the configuration, refer to the description of the configuration program in the **software documentation**.

3.1.2 C6SEN204

This board takes the picture. It is used in the VC2066 and VC2066/E. The CCD sensor ICX204AL (B/W) is used. The board controls the CCD sensor and processes the analog signal.

The progressive scan type CCD sensor used is ideally suited for industrial machine vision tasks. In contrast to the conventional technique it provides the following features:

- 1/3" sensor
- higher resolution: 1024x768 pixels
- square pixel format, 4.64 μm
- full-frame shutter
- can be triggered externally
- sensor read out in full-frame mode (non-interlaced)
- shutter speed down to **10 μsec** and up to 20 sec
- 16fps @ 640x480 or 2 x binning @ 32fps
- CCD processors providing CDS, programmable gain and offset, auto black level compensation and 10 bit AD-conversion

The diverse features of this board (high-speed and low-speed shutter, external trigger, etc.) are configured via software.

For the exact setting of the configuration, refer to the description of the configuration program in the **software documentation**.

3.1.3 C6SEN205

This board takes the picture. It is used in the VC2068 and VC2068/E. The CCD sensor ICX205AL (B/W) is used. The board controls the CCD sensor and processes the analog signal.

The progressive scan type CCD sensor used is ideally suited for industrial machine vision tasks. In contrast to the conventional technique it provides the following features:

- 1/2" sensor
- higher resolution: 1280x1024 pixels
- square pixel format, 4.65 μm
- full-frame shutter
- can be triggered externally
- sensor read out in full-frame mode (non-interlaced)
- shutter speed down to **9 μsec** and up to 20 sec
- 13,75fps @ 1280x1024 or 2 x binning @ 27,5fps
- CCD processors providing CDS, programmable gain and offset, auto black level compensation and 10 bit AD-conversion

The diverse features of this board (high-speed and low-speed shutter, external trigger, etc.) are configured via software.

For the exact setting of the configuration, refer to the description of the configuration program in the **software documentation**.

3.1.4 C6SEN311

This board takes the picture. It is used in the VC2048/E. The CCD sensor KAI0330D (B/W) is used. The board controls the CCD sensor and processes the analog signal.

The progressive scan type CCD sensor used is ideally suited for industrial machine vision tasks. In contrast to the conventional technique it provides the following features:

- 1/2" sensor
- resolution: 640x480 pixels
- square pixel format, 9(H) x 9(V) μm
- full-frame shutter
- can be triggered externally
- sensor read out in full-frame mode (non-interlaced)
- shutter speed down to 18,36,72, μsec then steps of 36 microseconds up to 20 sec
- **112fps @ 640x480 !!!**
- CCD processors providing CDS, programmable gain and offset, auto black level compensation and 10 bit AD-conversion

The diverse features of this board (high-speed and low-speed shutter, external trigger, etc.) are configured via software.

For the exact setting of the configuration, refer to the description of the configuration program in the **software documentation**.

3.1.5 C6SEN415

This board takes the picture. It is used in the VC2065, VC2065/E, VC2065/C and VC2065/EC. The CCD sensor ICX415AL (black-and-white) or ICX415AK (color) is used. The board controls the CCD sensor and processes the analog signal.

The progressive scan type CCD sensor used is ideally suited for industrial machine vision tasks. In contrast to the conventional technique it provides the following features:

- 1/2" sensor
- higher resolution: 782x582 pixels
- square pixel format
- full-frame shutter
- can be triggered externally
- sensor read out in full-frame mode (non-interlaced)
- shutter speed down to **5 µsec** and up to 20 sec
- double speed video capture @ 45fps
- CCD processors providing CDS, programmable gain and offset, auto black level compensation and 10 bit AD-conversion

The diverse features of this board (high-speed and low-speed shutter, external trigger, etc.) are configured via software.

For the exact setting of the configuration, refer to the description of the configuration program in the **software documentation**.

3.2 CPU Board

The "C6CPU" Board

The TMS320C6211 DSP is one of the fastest 32 bit DSPs. It features a RISC-like instruction set, up to 8 instructions can be executed in parallel. Furthermore it features two L1 cache memories (4KBytes each) and a 64 KByte L2 cache on chip.

The DSP uses fast external SDRAM as main memory. Up to 4 memory banks can be permanently open providing fast access without unnecessary RAS commands.

A flash EPROM and a built-in multi-media card provide for non-volatile memory.

Most of the I/O functions (graphics display, video capture, etc.) are performed by Vision Components' proprietary DMA Hardware without overhead for the CPU.

The location of the SDRAM buffers for graphics display, overlay display and video capture can be selected independently.

Identical SDRAM buffers for graphics display and video capture may be chosen to produce live video display.

| | |
|--------------------------|---|
| Board | C6CPU |
| processor | TMS320C6211 150MHz |
| SDRAM | 16 Mbytes (400 MB/sec) |
| Flash-EPROM | 2 Mbytes (16bit wide) |
| Multi-Media Card Adaptor | 8-256 MBytes |
| Clock | Real time clock, battery backed-up |
| DMA | 16 independent DMA channels (EDMA) 1 very high speed DMA (QDMA) |
| special features | on-board temperature sensor |

3.3 DAC Board

The "C6DAC" Board

The "C6DAC" board is practically the periphery for the CPU board. Here, the digital video signal from the sensor board is the input using an input lookup-table and buffered with FIFO memory.

The board is also responsible for the SVGA graphics output. Graphics (8 bits per pixel) and overlay data (8 bits per pixel) are stored in the on-board SGRAM. 2 independent lookup-tables for graphics and overlay data together with a 3x8 bits D/A converter produce the RGB analog video for the SVGA output.

The 8 bit pixel-mask register allows for individual selection of overlay planes.

Overlay data have priority over graphics data. Graphics pixels are displayed only if all unmasked overlay bits for that pixel are zero.

Functions of the board:

- video capture with input LUT, FIFO buffer
- graphics and overlay display with 16 Mbytes refresh memory,
- 2 independent LUTs for graphics and overlay, 8bit overlay mask register
- 3x8bit video D/A (SVGA output)
- UART and driver for RS232 (Ethernet versions : Ethernet PHY)
- UART receiver for VC Keypad (9600 baud)
- Trigger In/Out signals
- PLC communication interface
- Status & Control Register
- Interrupt controller for CPU
- DMA Controller

The technical specifications for the SVGA output signals :

| | | | |
|-----------------------|------------|------------------|------------|
| Horizontal frequency: | 45.072 kHz | VBP: | 32 lines |
| Vertical frequency: | 67.68 Hz | VFP: | 46 lines |
| Resolution SVGA: | 600x800 | HSYNC width: | 120 pixels |
| Resolution eff. hor.: | 752 | HBP: | 94 pixels |
| Resolution eff. ver.: | 582 | HFP: | 74 pixels |
| VSYNC width: | 6 lines | Pixel frequency: | 46.875 MHz |
| Polarity HSYNC: | positive | Polarity VSYNC: | positive |

The technical specifications for the SXGA output signals :

| | | | |
|-----------------------|-----------|------------------|------------|
| Horizontal frequency: | 64 kHz | VBP: | 37 lines |
| Vertical frequency: | 60 Hz | VFP: | 2 lines |
| Resolution SXGA: | 1280x1024 | HSYNC width: | 130 pixels |
| Resolution eff. hor.: | 1280 | HBP: | 487 pixels |
| Resolution eff. ver.: | 1024 | HFP: | 55 pixels |
| VSYNC width: | 3 lines | Pixel frequency: | 125 MHz |
| Polarity HSYNC: | positive | Polarity VSYNC: | positive |

3.4 Power Board

The "C6PWR" Board

This board contains the power supply for the entire camera. It is also responsible for the galvanic separation of the signals, and tailors the levels of the PLC-signals (4 inputs, 4 outputs).

The camera is supplied with a nominal voltage of 24 V (+/- 20%). An electronic stabilization of the supply voltage is not necessary. The camera is internally galvanically separated from the supply voltage by means of a DC/DC converter, to avoid common ground loops and electromagnetic interference. A reverse-voltage protection diode protects the camera in case the supply voltage poles are swapped.

An I/O processor performs PLC I/O , and also monitors PLC voltage failures and overcurrent.

4 PLC I/O Signals

The camera has four optically decoupled inputs and four decoupled outputs for controlling machines and processes.

An I/O processor is responsible for the handling of the PLC I/O signals.

The PLC-compatible inputs (24-V level, the positive signal is connected) include input protection circuits. A minimum voltage of 14V is required to reliably sense a logic high signal.

The PLC outputs feature a highly integrated MOSFET, high-side switch with built-in protection. It is possible to switch inductive or capacitive loads. The protective feature of the outputs will produce pulses on the outputs, if the limiting values are exceeded.

A protective diode ensures, the poles of the supply voltage from the power supply of the PLC can not be swapped. It is important to connect both the external supply voltage of the outputs (+24V) as well as GND (GNDIn) of the power supply of the PLC.

The complete circuitry, including the I/O processor, is galvanically separated from the rest of the camera electronics.

If DC failure of the PLC power is detected, this information is forwarded to the DSP (PLC power failure interrupt)

Output drivers feature short circuit and thermal overload protection

For additional protection of the output drivers, the I/O processor monitors the total PLC current, and switches off all outputs if the maximum threshold value is exceeded.

Technical data of the I/O signals:

Inputs

Outputs

Trigger input and trigger output

4.1 Input Signals

| | |
|---------------------------|---|
| Nominal voltage: | 24 V +/- 20% |
| Absolute maximum voltage: | voltages greater than 40 V can destroy the inputs |
| Type: | galvanically separated by optocoupler (PLC communication interface) |
| Input current: | 1 mA @ 24V |
| Threshold value: | 14 V |
| Internal signal delay: | 100 µsec (signal) + 0..200 µsec (polling) + DSP interrupt latency |

4.2 Output Signals

| | |
|-------------------------------------|--|
| Operating voltage: | 24 V +/- 20%, external source |
| Absolute maximum voltage: | voltages greater than 40 V can destroy the outputs |
| Type: | galvanically separated by MOSFET optocouplers |
| Switching voltage: | positive switching |
| Current: | max. 400 mA per output |
| Absolute maximum current: | total currents greater than 1000 mA can destroy plugs and cables Always consider the total sum of all output currents |
| Switching power: | max. 9.6 W (24 V * 400 mA) per output |
| Reverse voltage protection | yes, for external voltage |
| Protection against inductive loads: | yes |
| Resistance when switched on: | 0.2 - 0.8 Ohm |
| Short circuit protection: | full protection |

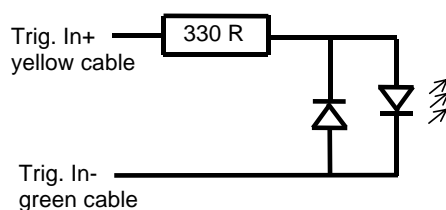
4.3 Trigger input and trigger output

The board features a dedicated fast TTL trigger input (for use as image capture trigger) and a fast TTL trigger output (as strobe-light trigger). Since both signals are fast at a very low noise margin, it is recommended to keep the cable as short as possible. Use twisted pair or even coaxial cable for this purpose. The trigger input has a built-in photocoupler to eliminate ground loops with the external circuitry. The trigger output, however, is not galvanically separated. The receiving circuit should, therefore, have a photocoupler of its own.

Please note that input and output are not protected against overcurrent. The output is neither protected against short circuit nor reverse voltage spikes from inductive loads. Trigger input assures constant delay without jitter.

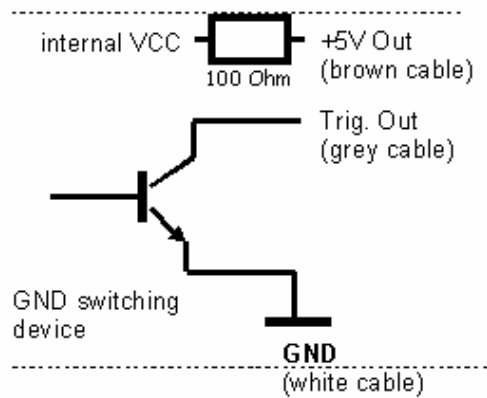
Technical data of trigger input:

| | |
|-----------------------------|--------------------------------|
| input voltage: | 3-5 V (TTL, CMOS) |
| input current: | 5mA @ 3V / 11mA @ 5V |
| limiting resistor: | built in, 330 Ohm |
| knee voltage: | 1.5 V |
| reverse voltage protection: | shunt diode |
| switching delay: | max. 2µsec + interrupt latency |



Technical data of trigger output:

| | |
|-------------------|----------------------------------|
| output voltage: | max. 7V |
| output current: | max. 50mA |
| pull-up resistor: | none, external resistor required |



5 Pin Assignments Camera Interfaces

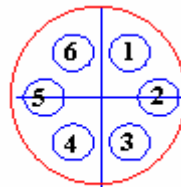
The cameras have four connectors on the rear side:

| | | |
|-------------------------------|----------------|---------------------------------|
| RS232(V24) or 100MBd Ethernet | HR10A-7R-6PB | 6-pin Hirose plug pin contact |
| Trigger / Keypad | HR10A-7R-6SB | 6-pin Hirose plug jack contact |
| SXGA/SVGA/Video | HR10A-10R-10SB | 10-pin Hirose plug jack contact |
| DC IN/PLC-I/O | HR10A-10R-12PB | 12-pin Hirose plug pin contact |

5.1 Pin Assignment Trigger / Keypad Plug Signal

| Signal | Pin |
|--------------|-----|
| GND | 3 |
| 5V Out | 2 |
| Trigger IN - | 1 |
| Trigger IN + | 6 |
| Trigger Out | 5 |
| Keypad IN | 4 |

rear view (jack):

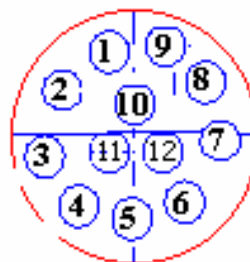


They **Keypad IN** operates with 3.3V TTL @9600 baud / 8 / N / 1

5.2 Pin Assignment for the I/O Plug

| Signal | Pin |
|-----------------|-----|
| IN0 | 12 |
| IN1 | 4 |
| IN2 | 11 |
| IN3 | 10 |
| 24V IN / Cam | 2 |
| GND IN (common) | 3 |
| 24V IN/ PLC | 1 |
| 24V IN/ PLC | 9 |
| OUT0 | 8 |
| OUT1 | 7 |
| OUT2 | 6 |
| OUT3 | 5 |

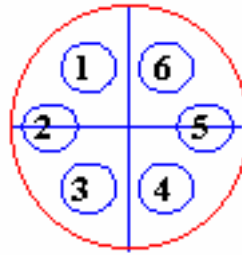
Rear view: (pin)



5.3 Pin Assignment for the RS232 (V24)

Rear view: (pin)

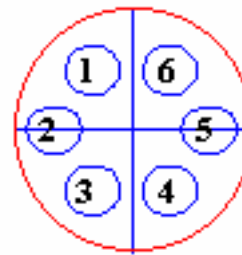
| Signal | Pin |
|---------|-----|
| V24 RTS | 1 |
| V24 TxD | 2 |
| V24 GND | 3 |
| NC V24 | 4 |
| V24 CTS | 5 |
| RxD | 6 |



5.4 Pin Assignment LAN/Ethernet

Rear view: (pin)

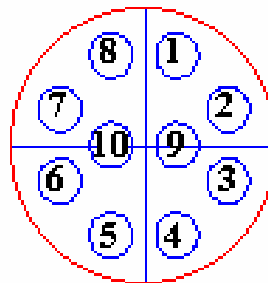
| Signal | Pin |
|--------|-----|
| T- | 1 |
| T+ | 2 |
| - | 3 |
| - | 4 |
| R- | 5 |
| R+ | 6 |



5.5 Pin Assignment for the XGA/SVGA Video Output

rear view (jack):

| Signal | Pin |
|--------|-----|
| G GND | 1 |
| G Out | 2 |
| R GND | 3 |
| R Out | 4 |
| VS GND | 5 |
| VS Out | 6 |
| HS GND | 7 |
| B GND | 8 |
| B Out | 9 |
| HS Out | 10 |



6 Technical Specifications VC20XX Smart Cameras

Technical Specifications VC2028

Technical Specifications VC2038

Technical Specifications VC2065

Technical Specifications VC2065/C

Technical Specifications VC2066

Technical Specifications VC2068

Technical Specifications VC2038/E

Technical Specifications VC2048/E

Technical Specifications VC2065/E

Technical Specifications VC2065/EC

Technical Specifications VC2066/E

Technical Specifications VC2068/E

6.1 Technical Specifications VC2028

| | |
|-----------------------|--|
| Sensor: | 1/3" SONY ICX424AL |
| eff. no. of pixels: | 640(H) x 480(V) |
| Pixel size: | 7.4(H) x 7.4(V) μm |
| Chip size: | 5.79(H) x 4.89(V) mm |
| High-speed shutter: | 30,80,... microseconds in steps of 50 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | with 15msec delay, program-controlled ; full-frame / 25 frames per second, no external highspeed trigger ¹ |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 40 full-size images in format 640x480 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Not available |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |



¹ Use VC2038 instead of VC2028 for imaging moving objects.

6.2 Technical Specifications VC2038

| | |
|-----------------------|---|
| Sensor: | 1/3" SONY ICX424AL |
| eff. no. of pixels: | 640(H) x 480(V) |
| Pixel size: | 7.4(H) x 7.4(V) μm |
| Chip size: | 5.79(H) x 4.89(V) mm |
| High-speed shutter: | 30,80,... microseconds in steps of 50 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 40 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 40 full-size images in format 640x480 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.3 Technical Specifications VC2038/E

| | |
|-----------------------|---|
| Sensor: | 1/3" SONY ICX424AL |
| eff. no. of pixels: | 640(H) x 480(V) |
| Pixel size: | 7.4(H) x 7.4(V) μm |
| Chip size: | 5.79(H) x 4.89(V) mm |
| High-speed shutter: | 30,80,... microseconds in steps of 50 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 40 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 40 full-size images in format 640x480 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet interface: | 100 MBit |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.4 Technical Specifications VC2048/E

| | |
|-----------------------|---|
| Sensor: | 1/2" KODAK KAI-0330D |
| eff. no. of pixels: | 640(H) x 480(V) |
| Pixel size: | 9(H) x 9(V) μm |
| Chip size: | 7.3(H) x 5.52(V) mm |
| High-speed shutter: | 18,36,72, microseconds in steps of 36 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 112 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 2 x 24 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 40 full-size images in format 640 x 480 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet interface: | 100Mbit Ethernet |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.5 Technical Specifications VC2065

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX415AL |
| eff. no. of pixels: | 782(H) x 582(V) |
| Pixel size: | 8.3(H) x 8.3(V) μm |
| Chip size: | 7.48(H) x 6.15(V) mm |
| High-speed shutter: | 5,10,15,20, microseconds in steps of 40 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 45 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 24 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 35 full-size images in format 782 x 582 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.6 Technical Specifications VC2065/C

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX415AK color sensor |
| eff. no. of pixels: | 782(H) x 582(V) |
| Pixel size: | 8.3(H) x 8.3(V) μm |
| Chip size: | 7.48(H) x 6.15(V) mm |
| High-speed shutter: | 5,10,15,20, microseconds in steps of 40 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 45 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 24 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 35 full-size images in format 782 x 582 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.7 Technical Specifications VC2065/E

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX415AL |
| eff. no. of pixels: | 782(H) x 582(V) |
| Pixel size: | 8.3(H) x 8.3(V) μm |
| Chip size: | 7.48(H) x 6.15(V) mm |
| High-speed shutter: | 5,10,15,20, microseconds in steps of 40 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 45 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 24 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 35 full-size images in format 782 x 582 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet Interface | 100Mbit Ethernet |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.8 Technical Specifications VC2065/EC

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX415AK color sensor |
| eff. no. of pixels: | 782(H) x 582(V) |
| Pixel size: | 8.3(H) x 8.3(V) μm |
| Chip size: | 7.48(H) x 6.15(V) mm |
| High-speed shutter: | 5,10,15,20, microseconds in steps of 40 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 45 frames per second |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 24 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 35 full-size images in format 782 x 582 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet interface: | 100Mbit Ethernet |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SVGA 800x600 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 45.072 kHz |
| Vertical frequency: | 67.68 Hz |
| Resolution SVGA: | 600x800 |
| Pixel frequency: | 46.875 MHz |

6.9 Technical Specifications VC2066

| | |
|-----------------------|---|
| Sensor: | 1/3" SONY ICX204AL |
| eff. no. of pixels: | 1024(H) x 768(V) |
| Pixel size: | 4.65(H) x 4.65(V) μm |
| Chip size: | 5.8(H) x 4.92(V) mm |
| High-speed shutter: | 10,20,30,45 μsec , then steps of 78 μsec (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 16.5 frames per second (2x binning @ 33fps) |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 20 full-size images in format 1024x768 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SXVGA 1280x1024 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 64kHz |
| Vertical frequency: | 60Hz |
| Resolution SXGA: | 1280x1024 |
| Pixel frequency: | 125MHz – when using a TFT, ensure the monitor is cablable of 125Mhz pixel frequency (i.e. TFT's with 80Hz image frequency). |



6.10 Technical Specifications VC2066/E

| | |
|-----------------------|---|
| Sensor: | 1/3" SONY ICX204AL |
| eff. no. of pixels: | 1024(H) x 768(V) |
| Pixel size: | 4.65(H) x 4.65(V) μ m |
| Chip size: | 5.8(H) x 4.92(V) mm |
| High-speed shutter: | 10,20,30,45 microseconds, longer in steps of 78 microseconds (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 16.5 frames per second (2x binning @ 33fps) |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 20 full-size images in format 1024x768 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet Interface: | 100 Mbit |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SXVGA 1280x1024 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 64Khz |
| Vertical frequency: | 60Hz |
| Resolution SXGA: | 1280x1024 |
| Pixel frequency: | 125MHz – when using a TFT, ensure the monitor is cablable of 125Mhz pixel frequency (i.e. TFT's with 80Hz image frequency). |



6.11 Technical Specifications VC2068

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX205AL |
| eff. no. of pixels: | 1280(H) x 1024(V) |
| Pixel size: | 4.65(H) x 4.65(V) μm |
| Chip size: | 7.60mm (H) 6.20mm (V) |
| High-speed shutter: | 9,17,26,33, .. μsec , then steps of 69 μsec (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 13.75 frames per second (2x binning @ 27.5fps) |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 14 full-size images in format 1280x1024 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Serial interface: | V24 (RS232) max. 115200 baud |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SXVGA 1280x1024 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 64kHz |
| Vertical frequency: | 60Hz |
| Resolution SXGA: | 1280x1024 |
| Pixel frequency: | 125MHz – when using a TFT, ensure the monitor is cablable of 125Mhz pixel frequency (i.e. TFT's with 80Hz image frequency). |



6.12 Technical Specifications VC2068/E

| | |
|-----------------------|---|
| Sensor: | 1/2" SONY ICX205AL |
| eff. no. of pixels: | 1280(H) x 1024(V) |
| Pixel size: | 4.65(H) x 4.65(V) μm |
| Chip size: | 7.60mm (H) 6.20mm (V) |
| High-speed shutter: | 9,17,26,33, .. μsec , then steps of 69 μsec (full-frame shutter) |
| Low-speed shutter: | up to 20 sec. adjustable integration time |
| Integration: | full-frame |
| Picture taking: | without delay, program-controlled or triggered externally; full-frame / 13.75 frames per second (2x binning @ 27.5fps) |
| Clamping: | zero offset digital clamping |
| A/D conversion: | 15.625 MHz / 10 bit, |
| Input LUT | 1024x8 bit (10bit \rightarrow 8 bit) |
| Image display: | black-and-white, Pseudo Color from color lookup table 3x8Bit RGB:live image, still image, graphics |
| Overlay: | 8-bit overlay with LUT, maskable |
| Processor: | Texas Instruments TMS320C6211 signal processor 150 MHz |
| RAM: | 16 MBytes SDRAM (synchronous dynamic RAM) |
| Display memory: | 16 MBytes SGRAM (synchronous graphics RAM) |
| Memory capacity: | 14 full-size images in format 1280x1024 |
| Flash EPROM: | 2 MBytes flash EPROM (nonvolatile memory) for programs and data,in-system programmable, 16 bit wide |
| MMC: | Multi-Media Card Adaptor with 16 Mbyte of Card Flash Memory |
| Process interface: | 4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x400 mA |
| Ethernet interface: | 100 Mbit |
| Video output: | RGB, 3x75 Ohm, 1 Vpp, SXVGA 1280x1024 output, HSYNC, VSYNC separate |
| Horizontal frequency: | 64kHz |
| Vertical frequency: | 60Hz |
| Resolution SXGA: | 1280x1024 |
| Pixel frequency: | 125MHz – when using a TFT, ensure the monitor is cablable of 125Mhz pixel frequency (i.e. TFT's with 80Hz image frequency). |



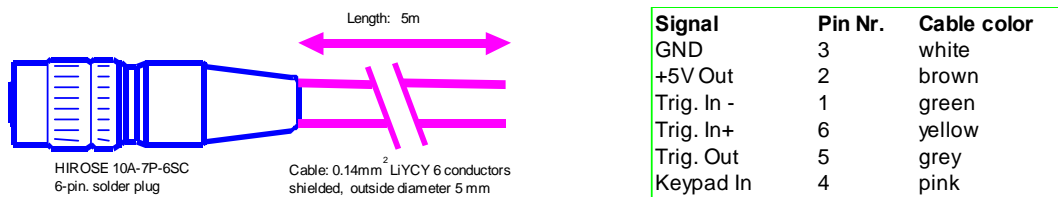
7 Accessories

- Trigger Cable
- V24 (RS232) Cable
- Ethernet patch cable
- Power / PLC Cable
- SVGA Monitor Cable
- Power adapter
- Power adapter for rail mounting
- VC Keypad C6
- Y-cable

Please refer to the VC website for the correct order numbers under:

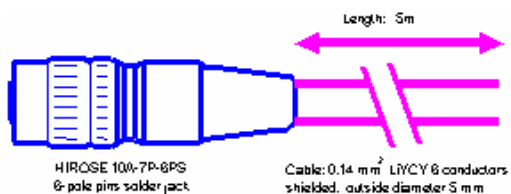
[“Products -> Hardware -> VC20XX Smart Cameras -> Accessories VC20XX Smart Cameras”](#)

7.1 Trigger Cable



Equipped on one end with a Hirose plug, length 5m, 10m or 25m

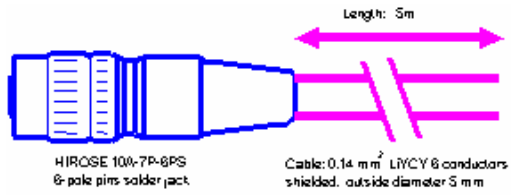
7.2 RS232(V24) Cable



Equipped on one end with a Hirose plug, length 5m, 10m or 25m

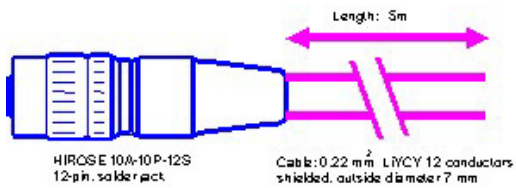
Please order "with 2nd connector", if you need a DSUB9 connector at the other end

7.3 Ethernet patch cable



| Signal | Pin (to cam.) | Pin (to PC) | Cable Color 20m patch cable | Cable Color 10m patch cable |
|--------|---------------|-------------|--------------------------------|--------------------------------|
| T+ | 2 | 1 | yellow | white/pink |
| T- | 1 | 2 | orange | pink |
| R+ | 6 | 3 | white/green | white/green |
| R- | 5 | 6 | green | green |
| - | 3 | NC | - | - |
| - | 4 | NC | - | - |

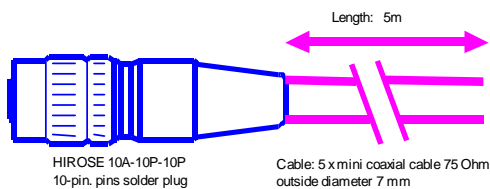
7.4 Power / PLC Cable



| Signal | Pin No. | Cable color |
|-------------|---------|-------------|
| OUT0 | 8 | white |
| OUT1 | 7 | brown |
| OUT2 | 6 | green |
| OUT3 | 5 | yellow |
| IN0 | 12 | grey |
| IN1 | 4 | pink |
| IN2 | 11 | blue |
| IN3 | 10 | purple |
| 24V IN Cam | 2 | red/blue |
| GND IN com. | 3 | black |
| 24V PLC | 1 | red |
| 24V PLC | 9 | grey /pink |

Equipped on one end with a Hirose plug jack, length 5m, 10m or 25m

7.5 SVGA Monitor Cable



| Signal | Pin No. | Connection |
|--------|---------|--------------|
| R Out | 4 | red signal |
| R GND | 3 | red shield |
| G Out | 2 | green signal |
| G GND | 1 | green shield |
| B Out | 9 | blue signal |
| B GND | 8 | blue shield |
| HS Out | 10 | white signal |
| HS GND | 7 | white shield |
| VS Out | 6 | gray signal |
| VS GND | 5 | gray shield |

Equipped on one end with a Hirose plug, length 5m, 10m and 25m.

Please order "with 2nd connector", if you need an DSUB15 connector at the other end.

7.6 Power adapter

input voltage 100 - 240VAC 50/60 Hz
output voltage DC 24 V +/-5%, max. 630 mA (15 W)

Equipped with 3 m connecting cable with a 12-pin Hirose plug, CE sticker

7.7 Power adapter for rail mounting

Input Voltage 100 - 240VAC 50/60 Hz
Output Voltage DC 24V +/-5%, max. 300 mA (7.5 W)

Equipped with connecting clamps for AC input and 24V output, CE certified

7.8 VC Keypad C6

VC Keypad includes the following keys:

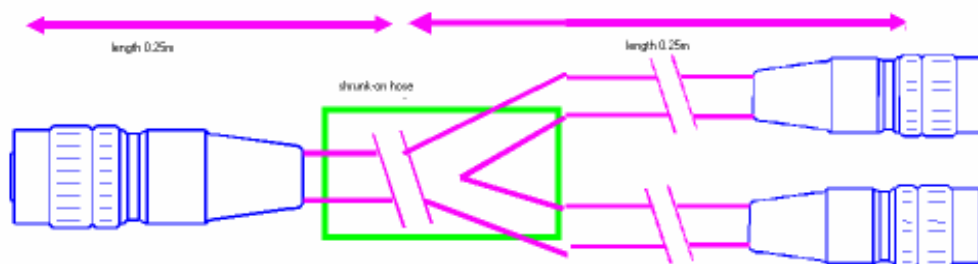
- 4 cursor keys,
- Esc, Return,
- F1, F2 keys

TTL version, 3m cable equipped with 6 pin Hirose connector.

No additional power source required.

Note: The RS232 version of the keypad, used for VCXX cameras is NOT compatible!

7.9 Y-cable



Connectors:

1x HR10A-7P-6P

2x HR10A-7J-6S

| Signal | HR...6P / Pin Nr. | cable color | 1. HR10A-7J-6S Pin Nr. | 2. HR10A-7J-6S Pin Nr. |
|----------|-------------------|-------------|---------------------------|---------------------------|
| GND | 3 | white | 3 | 3 |
| P5V | 2 | brown | 2 | 2 |
| Trig In | 1 | green | 1 | 1 |
| Trig InP | 6 | yellow | 6 | 6 |
| Trig Out | 5 | gray | 5 | 5 |
| RS IN | 4 | pink | 4 | 4 |

8 Connecting the Camera

- Connecting the camera power
- Single voltage, with or without PLC signals, no shutdown
- Dual voltage, with or without PLC signals, shutdown
- Connecting the RS232 Interface (non Ethernet Versions)
- Connecting a compatible PC with a 9-pin D sub plug
- Connecting a compatible PC with a 25-pin D sub plug
- Connecting the Ethernet Cable (Ethernet Versions)
- Connecting the VC keypad
- Connecting the external trigger

Also consult the “VC20XX Installation Manual” available on the VC Website under:

“Support -> Customer Download Area -> Getting Started VC20XX Smart Cameras ...”

8.1 Connecting the camera power

Power must be connected to the 12pin I/O connector. Note, that the voltage is **24V**.

Camera power is regulated and galvanically separated inside the camera, so only an unregulated power source of 24 V +/- 20% is required. The camera is, however, very sensitive to power supply interruption. Please make sure, that the voltage never exceeds the limits of +/- 20% even for a short period of time. In case of trouble it is recommended to backup the power supply by a capacitor or a battery large enough to prevent power interruptions.

The camera has several internal circuits to detect and protocol power failures. Used correctly the camera is even able to perform a correct shutdown and close all open buffers (see below). This feature is for emergency only and is not designed to handle very frequent interruptions.

There are **different options** for the connection of the power supply:

- Single voltage, with or without PLC signals, no shutdown
- Dual voltage, with or without PLC signals, shutdown

For details refer to the following sections.

8.1.1 Single voltage, with or without PLC signals, no shutdown:

| Signal | Pin No. | color | connect to |
|-------------|---------|-----------|------------------|
| 24V IN Cam | 2 | red/blue | 24V power supply |
| 24V PLC | 1 | red | 24V power supply |
| 24V PLC | 9 | blue/pink | 24V power supply |
| GND IN com. | 3 | black | GND power supply |

Pins 1 and 9 are internally connected. Since one connector pin shows a maximum current rating of 500mA, connect both pins if drawing higher currents from the PLC outputs!



This cabling option does not provide shutdown. Programmer must implement their own procedures for fail-safe operation.

8.1.2 Shutdown Function for VC20XX Smart Cameras



VC20XX Smart Cameras incorporate a circuit to detect and protocol power failures. If the PLC output power supply (12-24V PLC, Pin 1 and 9) of the cameras is interrupted, the system variable "POWFAIL" is set to "1". In case the PLC outputs are supplied, the status of "POWFAIL" is "0" (refer to the sysvar.h).

This behaviour, that can also be checked using the shell command "ht", can be used to perform a controlled camera shutdown in case of a power failure.

Connecting the PLC/ Power interface for using this feature:

| Signal | Pin No. | color | connect to |
|-------------|---------|-----------|---|
| 24V IN Cam | 2 | red/blue | 24V backup supply (supplying power at least 100ms longer than grid supply in case of a power failure) |
| 24V PLC | 1 | red | 24V standard power (grid) supply |
| 24V PLC | 9 | grey/pink | 24V standard power (grid) supply |
| GND IN com. | 3 | black | GND power supply |

Here, the PLC voltage (24V PLC) is connected directly to the power (grid-) supply. The main camera power supply at Pin 2 should remain high for at least 100ms longer than the power supplied to the PLC supply. This can be done for instance with help of a suitable capacitor.

If a power failure occurs or if the main power supply is turned off, the camera detects this signal not being present and the POWPLC status is changed from 0 to 1.

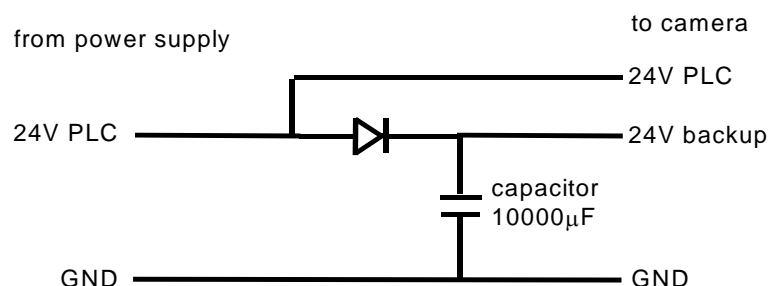
The system variable can be polled from time to time using the getvar(POWFAIL) function. This can be best done using a background task.

The following procedures can be performed:

1. Stopping the operation of all programs and interrupts (no pictures will be taken any longer).
2. Saving all buffers (to multi-media card or flash EPROM).
3. Protocol time and date of the shutdown.
4. The procedure then waits for the backup voltage to disappear or main power to re-establish. If the latter happens the program might be able to continue where it has stopped. (In this case there may be some lost images = some parts not checked correctly)



Note that this feature is for emergency use only and is not designed to handle frequent interruptions. The backup voltage must be able to supply the specified voltage for a period of at least 100 msec (in addition to the polling delay).



Sample Circuit for using the "power fail detect shutdown function"

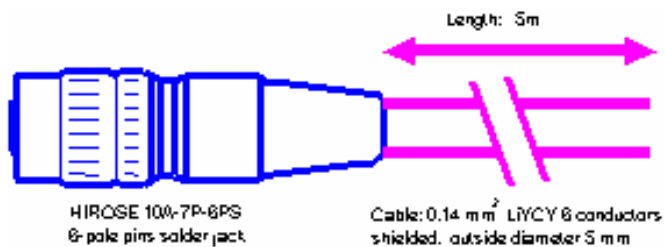
8.2 Connecting the RS232 Interface

8.2.1 Connecting a compatible PC with a 9-pin D sub plug

| Pin (PC) | | Name | cable color | Pin (camera) |
|----------|-----|---------------------|-------------|--------------|
| 1 | DCD | Data Carrier Detect | - / - | - / - |
| 2 | RxD | Receive Data | brown | 2 |
| 3 | TxD | Transmit Data | white | 6 |
| 4 | DTR | Data Terminal Ready | - / - | - / - |
| 5 | GND | Ground | gray | 3 |
| 6 | DSR | Data Set Ready | - / - | - / - |
| 7 | RTS | Request to Send | green | 5 |
| 8 | CTS | Clear to Send | yellow | 1 |
| 9 | RI | Ring Indicator | - / - | - / - |

Pink cable should always be left open

8.3 Connecting the Ethernet Cable



| Signal | Pin (to cam.) | Pin (to PC) | Cable Color 10/ 20m patch cable | Cable Color 5m patch cable |
|--------|---------------|-------------|---------------------------------|----------------------------|
| T+ | 2 | 1 | yellow | white/pink |
| T- | 1 | 2 | orange | pink |
| R+ | 6 | 3 | white/green | white/green |
| R- | 5 | 6 | green | green |
| - | 3 | NC | - | - |
| - | 4 | NC | - | - |

8.4 Connecting the VC keypad

The **VC keypad C6** can be connected directly to the Trigger/Keypad ("Trig.") Plug.

Please order the **5V** version (**VC keypad C6**) of the keypad.

For details see : VC Keypad C6

The RS232 version of the keypad is NOT compatible

see Connecting the external trigger and the VC keypad

8.5 Connecting the external trigger

Connect the external trigger input/output directly to the Trigger/Keypad ("Trig.") Plug.

Please order "Trigger cable C6". Lengths available are 5m, 10m and 25m

For details see Trigger / Keypad Cable

see Connecting the external trigger and the VC keypad

8.6 Connecting the external trigger and the VC keypad

You may wish to connect both the keypad and the external trigger at the same time.

In this case you should use a special, short Y-cable with 1:1 connections of all the pins.

You may then proceed as mentioned in

Connecting the VC keypad

Connecting the external trigger

9 Programming

The cameras are programmed in C with the aid of a cross development system. Any commercially available PC can be used. The minimum required configuration is a Pentium, 4 MB of extended RAM (8 MB recommended), Win98 or or higher, hard disk, VGA graphics, HD and mouse

The original cross development system supplied by Texas Instruments includes the following IDE Code Composer Studio:

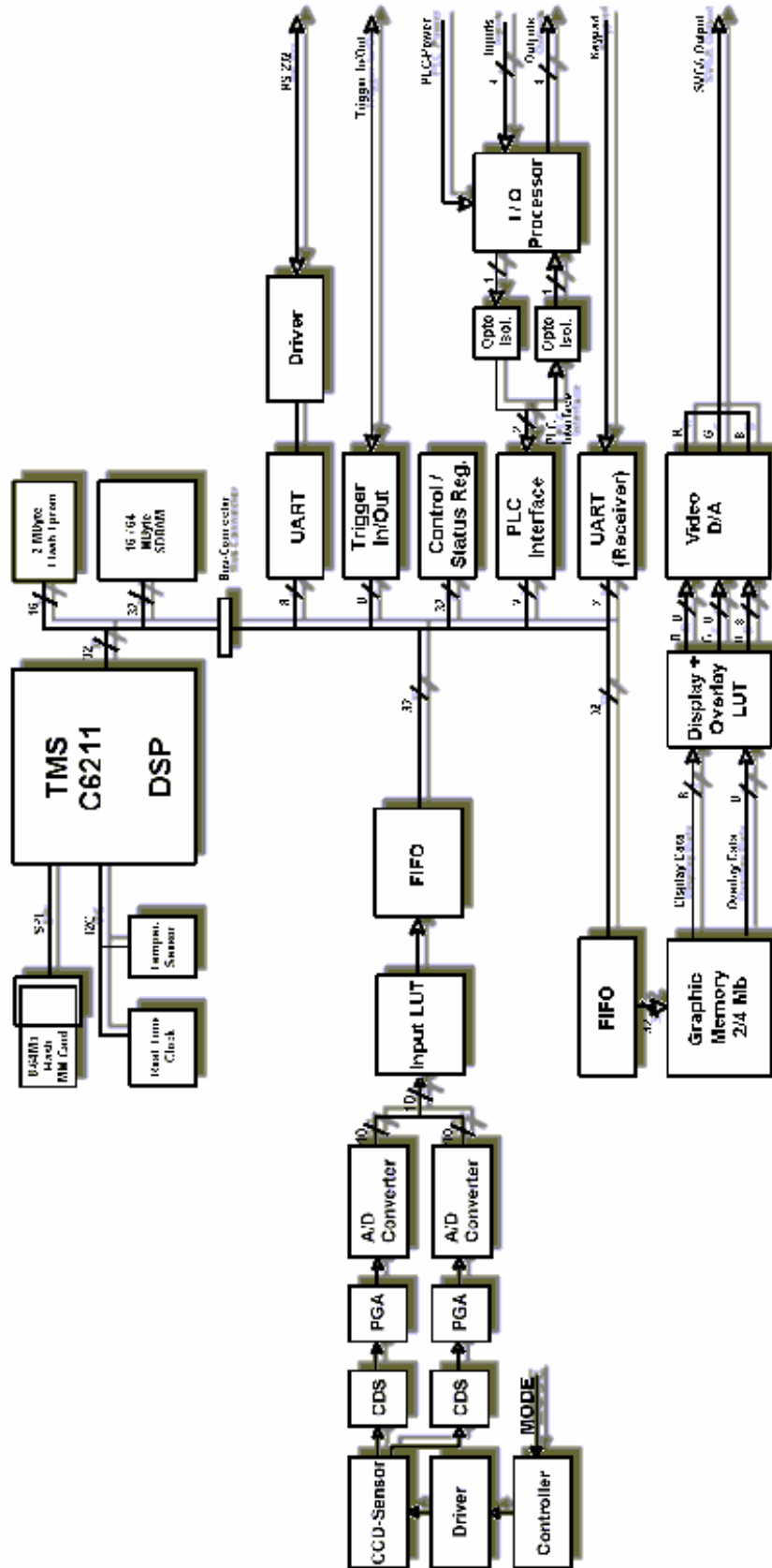
- ANSI C / C++ compiler
- C runtime library
- C source debugger
- TMS assembler
- TMS simulator
- Linker
- Librarian
- Project Manager
- numerous example programs

The following libraries and aids are also available:

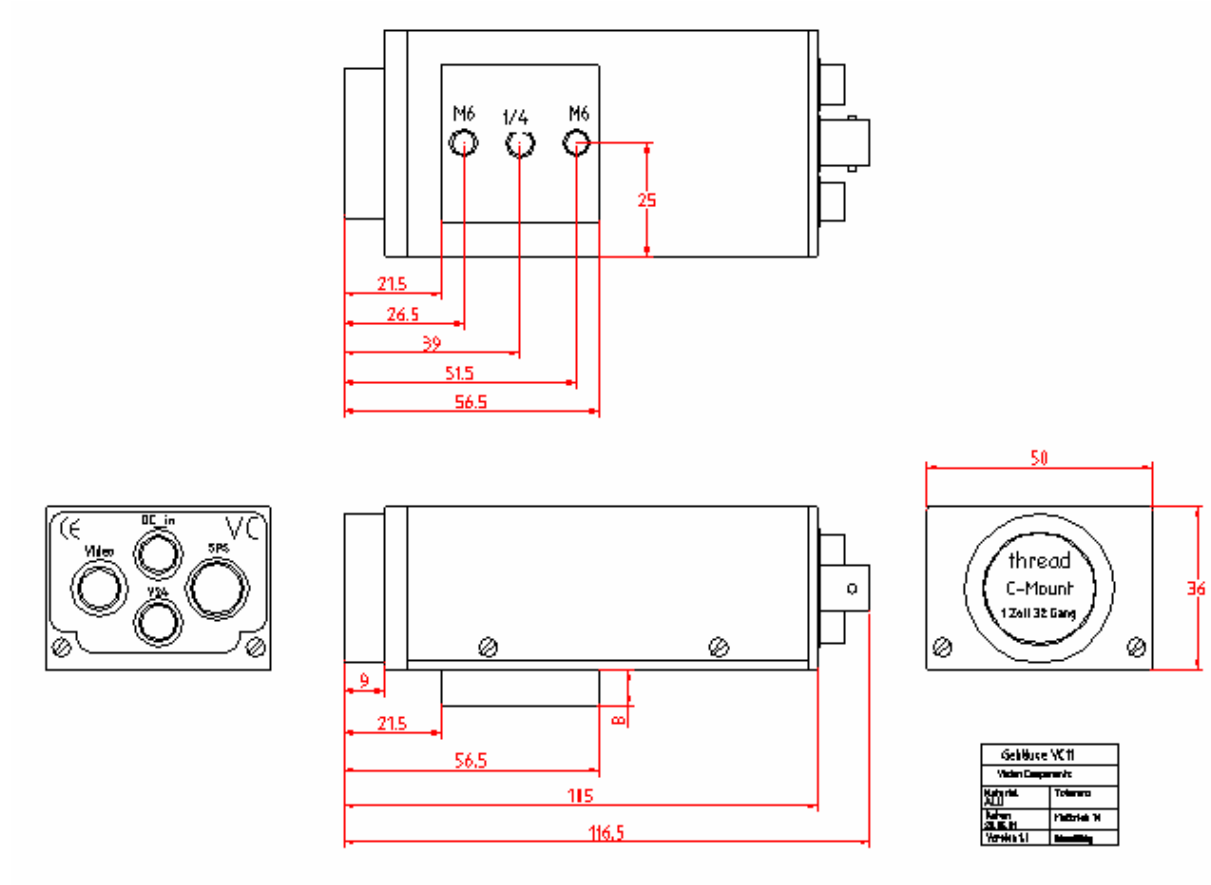
- Real-time operating system for VC cameras with control of video I/O signals, control of serial interface and of PLC I/O signals, file management system for flash EPROM and Multi Media Card. (Ethernet Versions : Ethernet control by SW)
- In-circuit emulator
The emulator is connected to the parallel serial interface of a PC. The camera housing must be opened and the emulator cable must be connected to the diagnosis plug of the camera. The emulator supports debugging in C and assembly language.
- Standard image processing library
Filters (e.g. Sobel, Median, Laplace, 3x3, ...), imaging operations (addition, subtraction, etc.), transformations (FFT, etc.) image averaging and noise filters, fast binary image processing with run-length code (AND, OR, XOR, segmentation, morphological operations), feature extraction (area, center of gravity, momentum, etc.), graphic functions and much more.
- JPEG image compression
compression and decompression of images according to JPEG standards
- Measurement library *)
Subpixel sampling, compensation of optical properties and diffraction effects, auto-focus, best straight line, best circle

*) in preparation

Appendix A: Blockdiagram VC20XX Smart Cameras

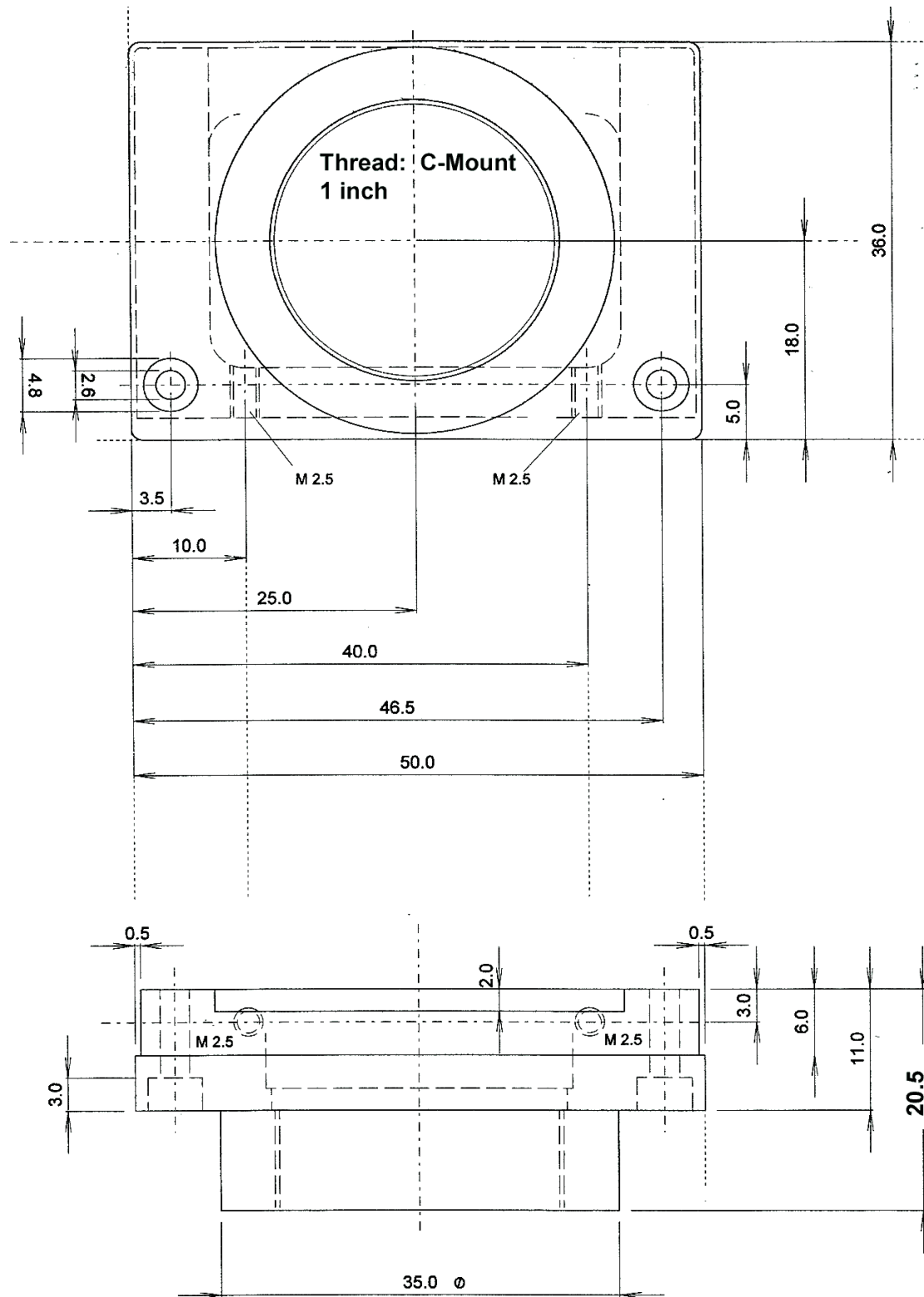


Appendix B: Housing Dimensions VC20XX Smart Cameras



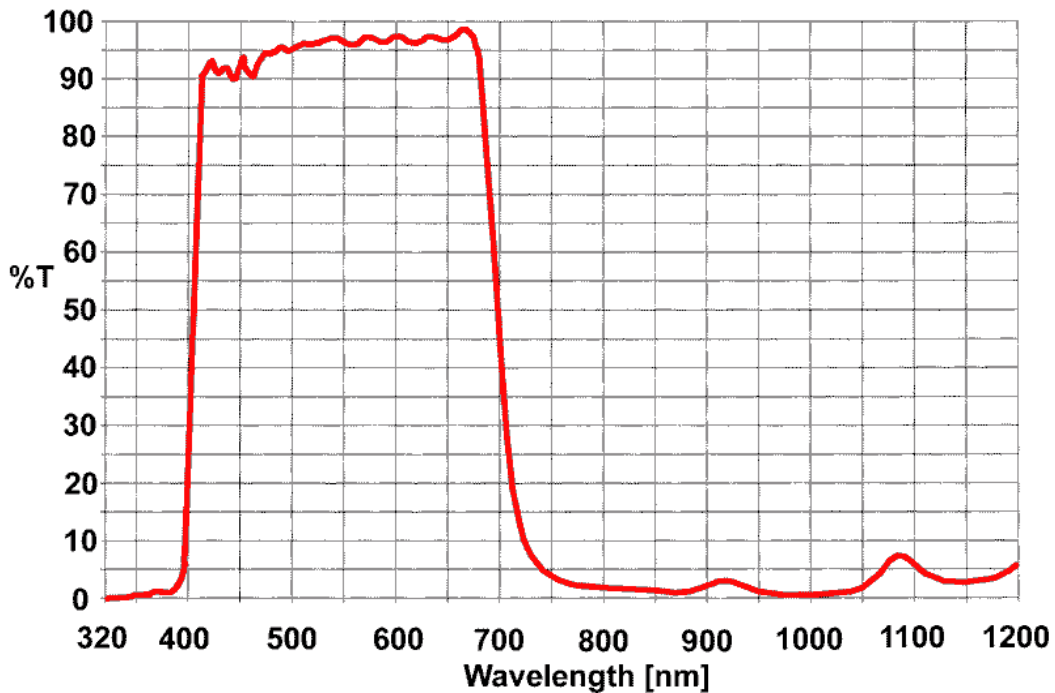
The housing of the VC2048 has 15mm deep cooling fins left and right of the camera body, making it 80mm wide.

Appendix E: Drawing Camera Head VC40XX



Appendix C: Spectral Transmission of IR Filter

Transmission Curve IR Filter



Note:

This IR cut filter is incorporated in every VC20XX camera. The IR filter can be removed if required without losing Vision Component's manufacturers warranty. In this case, special care must be taken not to damage the CCD sensor.

If the camera is used without IR filter it is important to replace it by a clear glass filter of the same size. The C-mount flange distance from the CCD is accurately adjusted for the use of the IR filter – removing the filter decreases the length of the optical path and it may become impossible to focus some lenses to a larger working distance.



If the IR filter is not to be used, please order your camera with a clear glass filter or contact Vision Components for obtaining a glass filter.

The order numbers for the clear glass filter is: EK000624

The order number for the IR cut filter (standard) is: EK000625

Appendix D: CE Compliance of VC20XX Smart Cameras

The cameras are CE compliant. It certifies that numerous measurements were made proving the device complies with the appropriate EC regulations. Only electromagnetic compatibility was decisive for this product.

This means that the cameras are not permitted to radiate electromagnetic waves in excess of a boundary value laid down in the standard. They must also be insensitive to external radiation (e.g. from cellular telephones). They must not be sensitive to static discharges, etc.

Unfortunately, it is not possible to limit the question of electromagnetic compatibility to just one device or component. The entire system must always be considered.

Thus, the accessories such as cables, power supplies, etc., play a significant role for the VC series cameras.

The manufacturer guarantees the boundary values for CE compliance only if the original accessories are used.

CE Declaration of Compliance

The CE declaration of compliance for the VC20xx has the following wording. Corresponding declarations also exist for the other camera models.

CE Declaration of Compliance

This certifies that the product designated as follows:

Machine Vision Camera Types
VC2028 / VC2038 / VC2038/E / VC2048/E,
VC2065/C, VC2065/EC, VC2065 / VC2065/E /
VC2066, VC2066/E, VC2068, VC2068/E

complies with the essential protection demands stipulated in the guideline on electromagnetic compatibility of the Council for Harmonizing Legal Regulations of the Member States (89/336/EWG). This declaration is valid for all examples manufactured according to the attached manufacturing drawings, which are part of this declaration.

The following standards were utilized in judging the electromagnetic compatibility of this product:

EN 50081-2 : 1993
EN 50082-2 : 1993

This declaration is submitted by

Mr. Michael Engel, owner of the company named below

for the manufacturer

Vision Components
Ottostr. 2
76275 Ettlingen

Karlsruhe, 01.11.2003

.....
(legal signature)

Enclosures:

- schematic diagrams
- mechanical drawings (outside dimensions)
- Records of tests conducted by the certified test laboratory

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| Products VC Smart Camera Overview | Product Overview: VC44XX High End Camera Series VC40XX Standard Camera Series VC4016 / 18 Entry Level Cameras VC4002L Line Scan Camera VCSBC Single Board Cameras VC20XX Smart Cameras VCSBC Board Cameras VCM + Viscube Camera Sensors |
| VC Smart Camera Software VC Software Development Kit Ti: | VCRT Operating System VCLIB Image Processing Library |
| VC Special Libraries: | M200 Data Matrix Code Reader VCOCR Text Recognition Library Color Lib |
| Support: Support News (User Registration required) Knowledge Base / FAQ (User Registration required) Download Area | Tech News – new SW and Documentation Searchable FAQ Database with programming Examples and Demo Code |
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