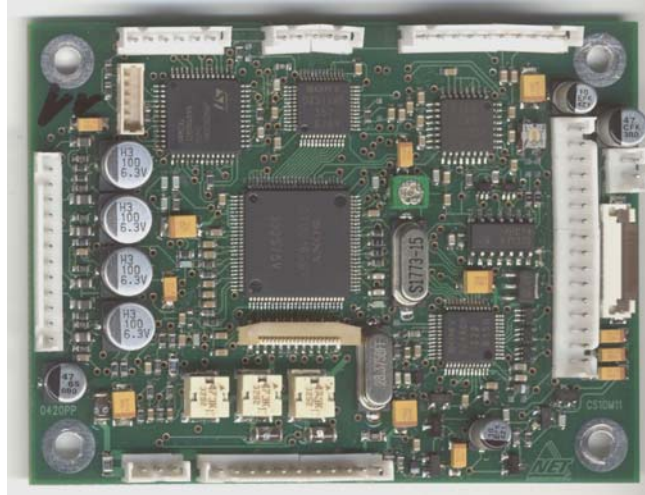


KS 600

10 bit Digital 1-CCD Color-Videocamera



Operation Manual

Preliminary Version

Rev. 1.03



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Glossary

DSP	Digital Signal Processor
OSD	On Screen Display
CCD	Charge Coupled Device
AWB	Auto White Balance
AGC	Automatic Gain Control
A/D	Analog / Digital Converter (ADC)
AMP	
MWB	Manual White Balance
ATW	Auto Tracking White Balance
K	Kelvin
μP	Microprocessor

Product Description

The OEM digital single board camera was designed for easy integration into custom systems. The video signals are processed by a Digital Signal Processor (DSP).

The KS600 includes an OSD and a microcontroller which controls the camera system and can be customized. Adjustment parameters can be adjusted via a PC-compatible program.

The KS600 is a very economical video solution. Its features and the various adaptable CCDs enable the KS600 to be used in a wide range of applications, especially in the medical field.

- Endoscopy, Dental
- Dermatology, Ophthalmology
- Image processing, Visualisation

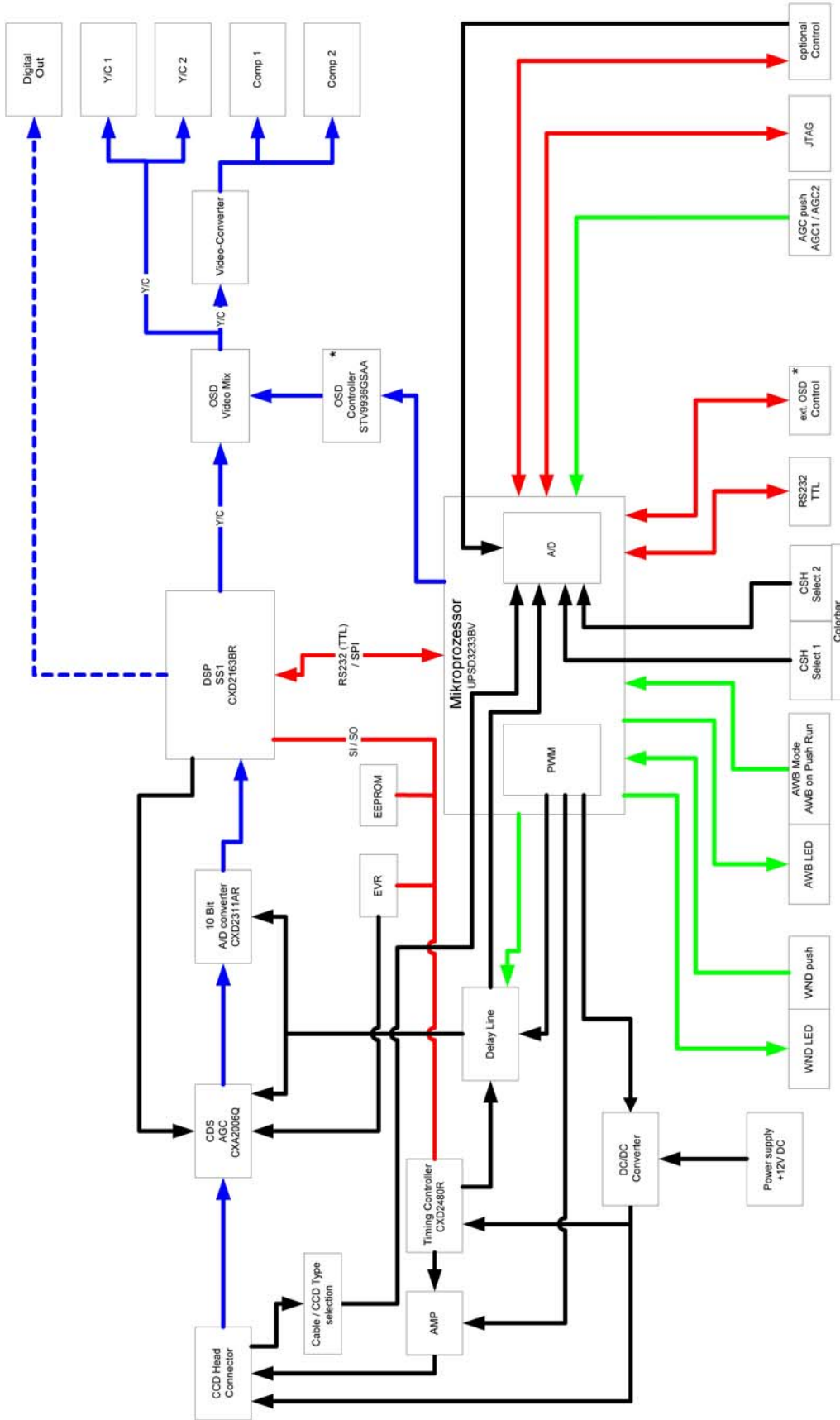
Features

- Digital Signal Processor (DSP)
- Microcontroller
- Compatible to SONY CCD / 1/2", 1/3", 1/4" and 1/6"
- Cable length up to 15m
- Autodetection of CCD type and cable length
- 10bit ADC
- OSD
- Video output CVBS and Y/C
- Blemish Compensation
- Shutter speed up to 1/100,000sec
- White Balance AUTO/SET up to 6,500K
- User memory
- All camera parameters adjustable via WIN 95/NT/2000/XP Software
- Single color vectors adjustable
- AGC1 / AGC2 switchable
- Window function switchable
- Built in colorbar generator
- Digital Video out

Specifications

	KS600N	KS600P
TV system	NTSC	PAL
Image sensor	IT 1/2" or 1/3" or 1/4" or 1/6" CCD	
Active Pixel	758(H)x492(V)	752(H)x582(V)
Active image area (H)x(V)mm	7.95x6.45 / 6.00x4.96 / 4.47x3.8 / 3.3x2.95	
Scanning Lines	525	625
Scanning system	2:1 Interlaced	
Sync. System	internal	
Scanning frequency horizontal	15.743kHz	15.625kHz
Scanning frequency vertical	59.94Hz	50Hz
Aspect ratio	4 : 3	
Illumination (1/2" CCD)	Standard: 1,400lx F11(3,000K) Minimum: 1lx F1.4 (AGC,ON) app. 50% Video level	
Video output	NTSC or PAL	FBAS, Y/C (S-VHS)
Resolution horizontal	470 Lines	470 Lines
Resolution vertical	350 Lines	420 Lines
Signal/noise ratio (SNR)	>46 dB p-p/rms	
Electronic light control (ELC, electronic shutter)	Automatic shutter control ON/OFF Maximum shutter speed 1/100,000sec	
White balance	FULL : automatic White balance MANU: manual White balance	
Automatic Gain Control (AGC)	ON/OFF, 0-22dB adjustable	
Power supply	+12 V DC, ±10%	
Power consumption	app. 400mA	
Environmental conditions	temperatue	: 0 to +40°C
	relative humidity	: 30 to 90%
Dimensions (WxD)	app.80x60mm	
Weight	app.35g	

Function



* If OSD Controller is not mounted on the PCB, the ext. OSD control can be used optional.
For this option a special microprocessor software is necessary.

The KS600 is a digital signal processing video system and is comprised from the following main function block.

Power supply

The KS600 has a single Power Supply, which is supplied with +12V DC ($\pm 10\%$) and appx. 400 mA.

The power supply was realized with a DC/DC step down converter for protection against short circuit.

Following voltages are supplied for the complete circuit: +5V DC

+3,3V DC

VDD

VL

+D

VDD, VL and +D are variable power signals which are adjusted by PWM of the microprocessor. The adjustment depends from CCD-Typ and cable length.

Camera Head Connection

The camera head can be connected with wires to ELCO connector (J4 and J5) or with a flat cable to Molex connector (J6) on the KS600 unit.

All necessary signals for the specified Sony CCD's are available on these connectors.

The Timing Controller (**CXD2480R**) provides the vertical clock driver signal (V1/V2/V3/V4) directly for the CCD.

The horizontal clock driver signals (H1 / H2) and the reset gate pulse (RG) must be adjusted, because it depends from CCD-type and cable length. It is realized with the AMP which is adjust by the +D variable power signal (from DC/DC converter).

The timing controller supports also shutter pulse driver and electronic iris control.

Cable compensation / CCD selection

The cable / CCD type selection detected the correct CCD and cable length.

The KS600 can operate with every SONY CCD (resolution 752(H) x 582(V) for PAL or 768(H) x 494(V) for NTSC) and the camera head unit can be remote up to 15m cable.

The camera head has two defined resistors to specify the used CCD-type, cable and cable length. The μ P analyse the CSH select1 and select2 signal (J4 respectively J5) and load the correct parameters for these camera head typ.

The correct parameters are send to the DSP and DC/DC Converter, AMP and Delay line get the correct adjustment by the PWM of the μ P.

Please refer to table "cable / CCD Type selection" for the correct resistor value of CSH select1 and CSH select2.

CCD Camera Head Amplifier

The OS-Signal from the CCD will be delayed and fitted on the camera head amplifier (**CXA2006Q**).

The delay adjustment is regulated with μP by the delay line.

The EVR parameterized the CDS and AGC circuit of the camera head amplifier to get optimal video signal for the video operation on the DSP.

The IC also include a A/D converter interface circuit

10 Bit A/D converter

An external 10bit A/D converter (**CXD2311AR**) is used to get a better resolution.

The video signal from the A/D converter interface circuit of the CXA2006Q will be converted from analog to a digital video signal.

The delay line adjust the delay of the A/D converter.

Digital signal processing system

The digital signal processing system of the KS600 is based on the Sony SS-1M Chipset. It includes the **CXD2163BR**, **CXD2480R**, **CXA2006Q** and **CXD2311AR**.

The main component is the Video Signal Processor LSI (**CXD2163BR**).

After start up the DSP load all parameters from the EEPROM.

The DSP get a CDS digital signal with correct timing and signal form from the A/D converter.

The video output of the DSP is an analog Video signal (Y/C)

EEPROM

EEPROM is the memory for all DSP values.

The values of the DSP and EVR can be changed by the adjustment software for the KS600 and written into the EEPROM. This are read and reflected the next time the system is started up.

OSD

The analog Video signal is led to the OSD Video Mix. The OSD video mix gets an input signal from the OSD Controller (**STV9936GSAA**). These signals are combined with the Y/C signal.

The OSD Controller is controlled by the μP and shows all actually control functions on the screen.

On the standard version an OSD controller is mounted. Optional an external OSD controller can be controlled on J3.

In this case the original OSD controller must be dismantled, and a special customized setup of the μP must be done.

Video out

The Y/C video signal from the OSD-Video Mix must be filtered.

The D/A-Clock noise from the Y-Signal is filtered on the video filter.

The C-Signal is filtered and limited with a bandpass filter.

The KS600 provide two Y/C and two CVBS video out signals.

The CVBS video signal must be created from the Y/C video signal with a video converter (addition Y/C, Video level adjustment).

The CVBS output has two emitter-followers and is terminated with 75Ω.

CPU of the System

The camera KS600 are controlled by a microprocessor (**UPSD3233BV**) based on 8051.

The μP control the DSP via serial communication and static signals.

The OSD is only controlled via I²C communication.

The μP adjust the DC/DC converter, AMP and delay line via PWM.

The internal memory of the μP includes all necessary data.

After start up the μP samples the CSH select1 and CSH select2 input pins and load the correct adjustment data for the cable / CCD-type. If there is no camera head connected on J4/J5 or J6, a colorbar is shown.

The DSP and μP can be adjusted and controlled with a separate PC on J9 (RS232 / TTL).

For this configuration a special control and adjustment software for KS600 is necessary.

The standard functions of the KS600 can be seen under "Standard Function of Switches".

The microprocessor is customized programmable on J11.

Supported CCD Types

The KS600 supports the following CCD images sensors.

CCD Typ	Product name	Video System	Vsub	RG	H1/H2	VDD	VL	
760H	1/6"	ICX238EKW	NTSC	intern	3,3 V	3,3 V	15,0 V	- 7,5 V
		ICX239EKW	PAL					
		ICX238AKE	NTSC					
		ICX239AKE	PAL					
	1/4"	ICX208AK	NTSC	intern	3,3 V	3,3 V	15,0 V	- 7,0 V
		ICX209AK	PAL					
		ICX278AK	NTSC					
		ICX279AK	PAL					
		ICX228AK	NTSC				12,0 V	- 5,0 V
		ICX229AK	PAL					
		ICX228AKB	NTSC					
		ICX229AKB	PAL					
	1/3"	ICX058CK	NTSC	extern	5,0 V	5,0 V	15,0 V	- 8,5 V
		ICX059CK	PAL					
		ICX258AK	NTSC	intern				- 7,0 V
		ICX259AK	PAL					
		ICX408AK	NTSC					
		ICX409AK	PAL					
	1/2"	ICX038DNB	NTSC	intern	5,0 V	5,0 V	15,0 V	- 9,0 V
		ICX039DNB	PAL					
		ICX418AKB	NTSC					
		ICX419AKB	PAL					
		ICX428AKL	NTSC					
		ICX429AKL	PAL					

cable / CCD Type selection

The KS600 supports different cable / CCD Type configurations.

The configurations are being defined on the KS600 adjustment software.

A list of cable / CCD Type configurations does exist and can be selected with the CSH1 and CSH2 hardware configuration on the camera head connector. The camera checks the hardware configuration and selects the defined cable / CCD type configuration.

The autodetection must be selected on the KS600 adjustment software.

On the following table you can see the resistor configuration.

Cable Check Camera Head		
CSH2(MSB)	CSH1(LSB)	R-to GND
0	0	0R
1	1	1k
2	2	2k2
3	3	4k7
4	4	6k8
5	5	10k
6	6	15k
7	7	22k
8	8	39k
9	9	82k

Standard Function of Switches

WND Push

With this function the window can be switched between two different Window adjustments. The windows can be defined and saved with the special adjustment and control software. The following AE/AWB detection windows parameters can be defined:

- Weight adjustment of the 5 windows
- Windows size of 5 windows
- aperture

If more than two different window adjustments should be available, a customized setup is necessary.

A LED can be connected to J7 which shows the activity of the WND function.

AGC Push

With this function the AGC maximum gain can be switched between two types. The AGC1 and AGC2 setting value is adjusted by the adjustment software for the KS600

AWB

The AWB function can be operated with two different main modes (**AWB On Push Run** and **AWB Modes**). The main Mode can be selected with the KS600 Control Software.

AWB On Push Run

AWB Push Run function is the Automatic White Balance Run mode. Two different functions can be selected by the adjustment software for the KS600.

Function 1:

Operation is performed in AWB run mode when the button is pressed and shifts to AWB set mode when the button is released, allowing the white balance gain at that point to be written to the EEPROM.

Function 2:

Operation shifts to AWB run mode when the button is pressed and convergence operation continues even if the button is released. When convergence is automatically judged to be completed, the white balance gain at that point is written to the EEPROM.

A LED can be connected to J7 which shows the activity of the AWB run function.

AWB Modes

The eight modes shown in the table can be selected by switching AWB 1/2/3 on connector J7.

		AWB1	AWB2	AWB3
ATW		H	L	L
MWB		H	L	H
AWB Run		H	H	H
AWB Set		H	H	L
Indoor Mode	3200 K (fixed value)	L	L	L
Fluorescent Mode	4200 K (fixed value)	L	L	H
User mode	4700 K	L	H	L
Outdoor Mode	6300 K (fixed value)	L	H	H

ATW is the Auto Trace White balance mode.

ATW is a feedback system that automatically aligns the white balance by detecting the R-G and B-G before gamma correction processing.

The convergence point can be shifted by the adjustment software for the KS600.

Following items can be adjusted:

- Luminance specific integration ON/OFF selection
- Luminance specific integration lower limit level selection
- Luminance specific integration minimum high luminance area selection

MWB is the Manual White Balance mode.

The adjustment (R gain and B gain) must be done by the adjustment software for the KS600.

The adjustable color temperature side rang is from 2500K to approximately 6500K.

The adjustment is written to the EEPROM on the same addresses as the adjustment of the AWB Set Mode.

AWB Run is the Automatic White Balance Run mode.

It is performed at a faster operation speed than ATW without operation frame or other limitations.

However, the response time, an operation frame and others cannot be selected.

The conventional system or trigger system can be selected by the adjustment software for the KS600.

It can be combine with AWB Set mode.

AWB Set is the Automatic White Balance Set mode.

In this mode, convergence operation stopped when shifting to this mode and the R,G and B gains at that point are written to the EEPROM.

AWB run and set mode can be combined to realize the AWB Run / Set mode.

It has become possible to switch between the conventional AWB set mode and the MWB mode.

Indoor mode is a fixed value with a color temperature of approximately 3200K

Fluorescent mode is a fixed value with a color temperature of approximately 4200K

User mode is a not fixed value. The gain can be adjusted by the adjustment software for the KS600 and is written to the EEPROM. This gain is read and reflected the next time the system is started up.

Outdoor mode is a fixed value with a color temperature of approximately 6300K

Option

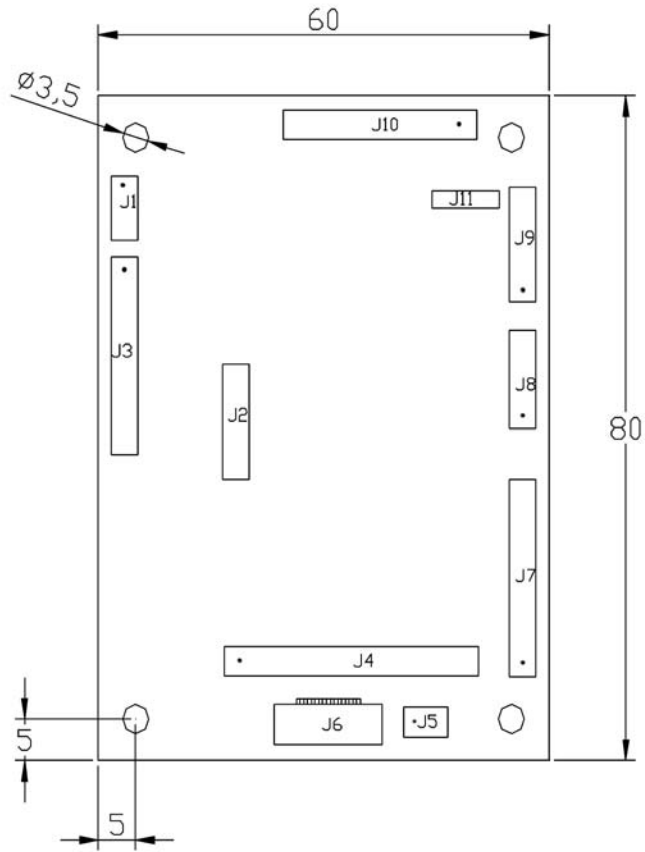
With a customized setup of the microprocessor firmware different function can be programmed and controlled on J7 and J8.

For example:

- Brightness + / -
- Aperture
- Exposure
- Window – On/Off, Size + / -
- White Balance – AWB On/Off/Set, red / blue shift
- Different Camera setting
-

All these parameters can be controlled by the standard OSD menu. In this case there is no function on J7 and J8 necessary.

Dimensions



Pin assignment

J1 Power Supply

ELCO 00 8283 03 12 00 000

Compatible plug: ELCO 60-8283-3038-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J1 Elco	1	+12V DC
	2	NC
	3	GND

Refer to section “Specification” table, Power supply, Power consumption.

J2 Digital out

Molex 52559-2092

J2 Molex ZIF	1	GND
	2	DCK
	3	YO7
	4	YO6
	5	YO5
	6	YO4
	7	YO3
	8	YO2
	9	YO1
	10	YO0
	11	CO7
	12	CO6
	13	CO5
	14	CO4
	15	CO3
	16	CO2
	17	CO1
	18	CO0
	19	HD
	20	VD

The format of the digital output from the DSP is Y/U/V in the ratio of 4:2:2 for all CCD types. Two types of digital output are provided: straight output and ITU-REC601 output (supports SUP601).

The data is converted to the clock rate input to the DCK pin and output at the falling edge.

The digital output from the DSP must be configure by the adjustment software for the KS600.

If the digital output is used, analog output is not available further more.

Flat cable manufacturer:

Axon AXOJUMP
Fujikura TW-VF
PANTA ZIF-System

Flat cable data:

Pins 20
 Pitch 0.50mm
 Thickness 0.30mm

J3 OSD external

ELCO 00 8283 11 12 00 000

Compatible plug: ELCO 60-8283-3118-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J3 Elco	1	SDA
	2	SCL
	3	OSD DI
	4	OSD CLK
	5	OSD CS
	6	OSD W
	7	OSD B
	8	VD
	9	HD
	10	+5V DC
	11	GND

If the available OSD Controller on the KS600 is not mounted, an external OSD controller can be used. The external OSD can be controlled by I²C with the KS600 microcontroller. A customized setup of the microcontroller software is necessary.

J4 CCD Drive Pulse

ELCO 00 8283 16 12 00 000

Compatible plug: ELCO 60-8283-3168-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J4 Elco	1	V1
	2	V2
	3	V3
	4	V4
	5	Vsub
	6	H1
	7	H1 GND
	8	H2
	9	H2 GND
	10	RG
	11	RG GND
	12	+15V / +12V
	13	GND
	14	-9V / -7,5V
	15	CSH select 1
	16	CSH select 2

CCD Driver Signals and power supply for the CCD.

The signal CSH selection 1 and 2 are need for the cable and CCD Type selection.

The CSH selection is configured by two resistors with different values.

The correct resistor value is shown on a separate cable / CCD Type table.

J5 CCD OS Out

ELCO 00 8283 02 12 00 000

Compatible plug: ELCO 60-8283-3028-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J5 Elco	1	OS
	2	GND

CCD output signal to the digital camera system.

J6 CCD Drive Pulse / OS Out

Molex 52892-2090

J6 Molex Flexkabelstecker	1	V1
	2	Shield / GND
	3	Shield / GND
	4	V2
	5	V3
	6	V4
	7	Vsub
	8	H1
	9	H1 GND
	10	H2
	11	H2 GND
	12	RG
	13	RG GND
	14	+15V / +12V
	15	GND
	16	-9V / -7,5V
	17	CSH select 1
	18	CSH select 2
	19	OS
	20	OS GND

This connector J6 will provide same signals as J4 combined with J5.

Flat cable manufacturer:

Sumitomo	SML2SC (shielded)
Axon	AXOJUMP (shielded version)
Fujikura	TW-VF (shielded FFC version)
PANTA	ZIF-System (not shielded)

Flat cable data:

Pins	20
Pitch	0.50mm
Thickness	0.30mm

J7 User Interface

ELCO 00 8283 10 12 00 000

Compatible plug: ELCO 60-8283-3108-45-000

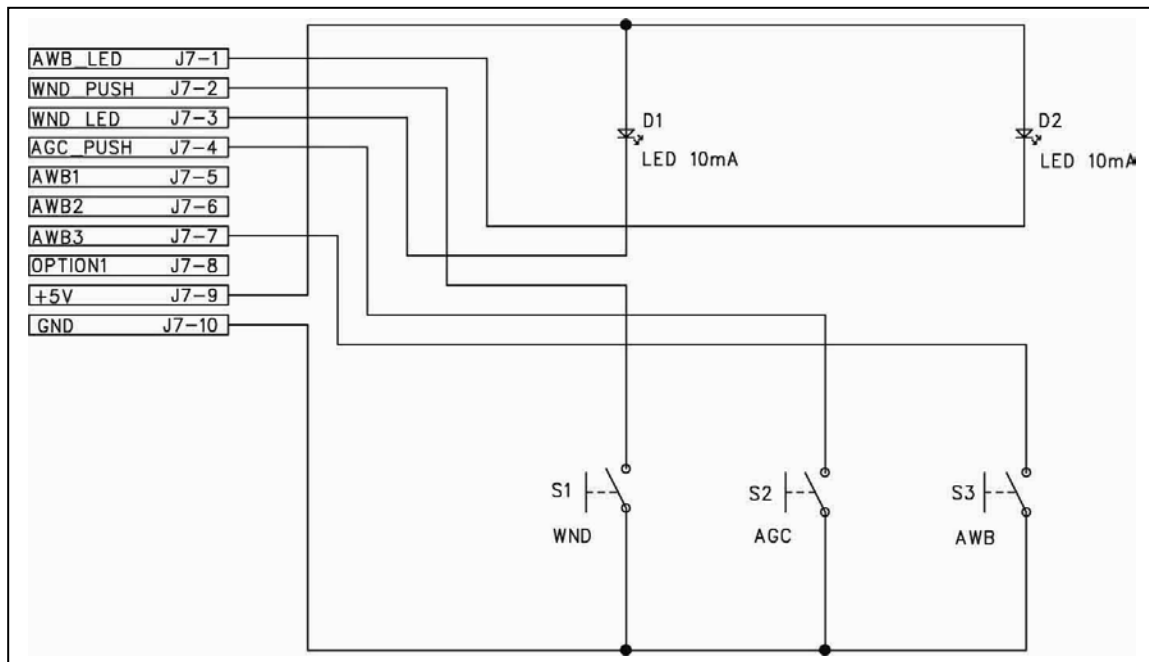
Compatible contact: ELCO 60-8283-0513-99-808

J7 Elco	1	AWB LED
	2	WND Push
	3	WND LED
	4	AGC Push
	5	AWB1
	6	AWB2
	7	AWB Push/ AWB3
	8	Option 1
	9	+5V DC
	10	GND

Description on point “Standard Function of Switches”

Pin 9 / +5V DC can only used for external LED Power supply (open collector).

Example for J7:



J8 Option

ELCO 00 8283 05 12 00 000

Compatible plug: ELCO 60-8283-3058-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J8 Elco	1	SDA
	2	SCL
	3	AD1
	4	+5V DC
	5	GND

If more control buttons are needed, an external frontpanel can be used.

After a customized setup of the microprocessor two different applications can be used.

- FPC with microprocessor (I²C communication)
- FPC with resistor network (AD1(J8) / AD2 (J9))

J9 external Communication

ELCO 00 8283 06 12 00 000

Compatible plug: ELCO 60-8283-3068-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J9 Elco	1	+5V DC
	2	RXD
	3	TXD
	4	+3,3V DC
	5	AD2
	6	GND

Interface connector for the control- and adjustment software of the KS600.

Technical datas:

Interface: RS232 (TTL)

Baudrate: 9600

Databits: 8

Stopbit: 1

Parität: no

J10 Video Out

ELCO 00 8283 12 12 00 000

Compatible plug: ELCO 60-8283-3128-45-000

Compatible contact: ELCO 60-8283-0513-99-808

J10 Elco	1	VBS1
	2	VBS1 GND
	3	VBS2
	4	VBS2 GND
	5	Y1
	6	Y1 GND
	7	C1
	8	C1 GND
	9	Y2
	10	Y2 GND
	11	C2
	12	C2 GND

J11 JTAG

Molex 53047-0610

Compatible plug: Molex 51021-0600

Compatible contact: Molex 50079-8000

J11 Molex	1	TDO
	2	TDI
	3	TCK
	4	TMS
	5	GND
	6	+3,3V DC

It is the interface to update the microprocessor with specially customized setups.

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