Documentation
Version 0.2

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CSU9600BP

Operations Instruction and Technical Documentation

V 0.2
03.09.2002

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Preliminary Remarks

For a better understanding of some of the camera functions see also documentation “specialist knowledge“, which details most of the technical terms (not available yet).
The following abbreviations are used throughout this document:

Abbreviation	Meaning	Description
IR	Infra-red	Invisible, long –waved part of the light, coming from a light source or daylight. Influencing strongly the impression of the picture taken by a CCD-camera, so that normally an IR-filter has to be placed in front of the sensor.
CCD	Charge Coupled Device	Picture sensor
WB	White Balance	
AWB	Auto White Balance	
ATW	Auto Track White	
DSP	Digital Signal Processor	
ALC	Automatic Light Control	Brightness regulation for the whole working sphere (AGC and ELC) of the camera
AGC	Automatic Gain Control	Automatic amplification regulation for the working sphere with little light.
ELC	Electric Light Control	Automatic shutter regulation for the working sphere with much light.
U	Voltage	Signal level
L	Light density	Brightness
RG	Reset Gate	Output Amplifier of a CCD
Pixel	Pixel	Photo sensitive zone of a CCD

General description of the camera

Description

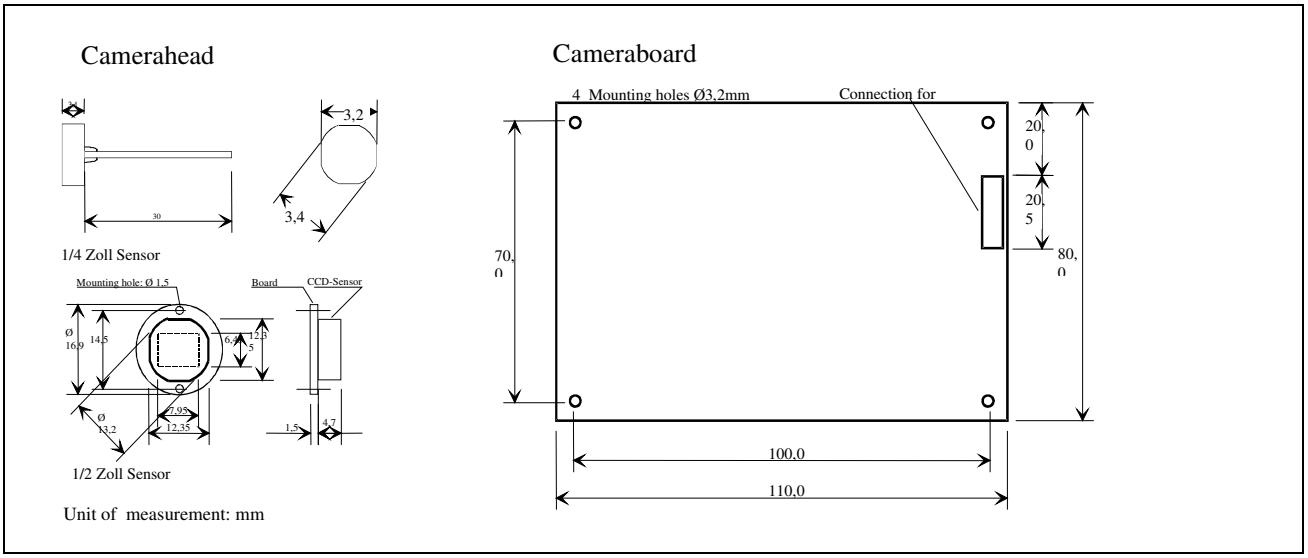
This DSP-onboard-camera for OEM applications was developed for a simple and easy integration into customized systems. The adjustment of the camera is realized digital using the optional available Control-Software. All necessary parameters can be adjusted and stored in user memory (EEPROM) using WINDOWS. The signal processing is done with an 8- or 10 -Bit Analog-to-Digital Converter.

Features

- Digital Signal Processor (DSP)
- ¼’’,1/3’’ or ½’’ camera head removable
- Shutter speed up to 1/100.000sec
- Adjustable via Windows
- AGC ON/OFF switchable
- White Balance AUTO/SET
- ELC ON/OFF switchable
- Adjustment of camera parameters via Software, executable under WIN95/NT
- Color adjustment possible via adjustment of the single vectors

Specifications

	CS9600SB	CS9600PSB
TV Norm	NTSC	PAL
Picture Capture	Interline transfer CCD	
Active Pixels	758(H)x492(V)	752(H)x582(V)
Active plane	4,8(H)x3,7(V)mm (equivalent to 1/3’’)	
Scanned lines	525	625
Scanning method	2:1 Interlaced	
Sync System	intern	
Horizontal Frequency	15,743kHz	15,625kHz
Vertical Frequency	59,94Hz	50Hz
Aspect ratio	4 : 3	
Scene illumination	Standard: 2500lx F8(3000K) Minimum: 3lx F1,4(AGC,ON)	
Video Output NTSC or PAL	FBAS , Y/C (S-VHS)	
Horizontal Resolution	470 Lines	470 Lines
Vertical Resolution	350 Lines	430 Lines
Signal-to-Noise Ratio	>46 dBp-p	
Electronic Shutter	Automatic Shutter control ON/OFF Maximum Shutter Speed. Is 1/100.000sec	
White Balance	FULL : automatic White Balance MANU: manual White Balance	
Amplification	ON/OFF, 0-18dB adjustable	
Power supply	+12VDC, ±10%	
Power consumption	ca.300mA	
Environmental Conditions	Temp. Cameraboard : 0 to + 40°C relative humidity : 30 to 90%	
Measurements (WxHxD)	Camera board : ca.110x80x20mm	
Weight	Camera board : ca.100g	



Camera datasets

ATTENTION:

The data sets for the camera CSU9600P are only conditionally or not at all compatible with the ones for the camera CSU9600BP. The adoption of old data sets should be reviewed with NET GmbH.

See also documentation NET CAM CONTROL V2.0.

Connection Layout

The camera CSU9600BP is entirely compatible to CSU9600P. The position of the electrical connections and their layout is described in the Annex.

Switch- und Potentiometer Layout

The camera CSU9600PB contains different switches and potentiometers to adjust some of the basic functions. Normally, all functions are adjusted ex works to fit the corresponding application.

Switch- and Potentiometer Positions

Top view

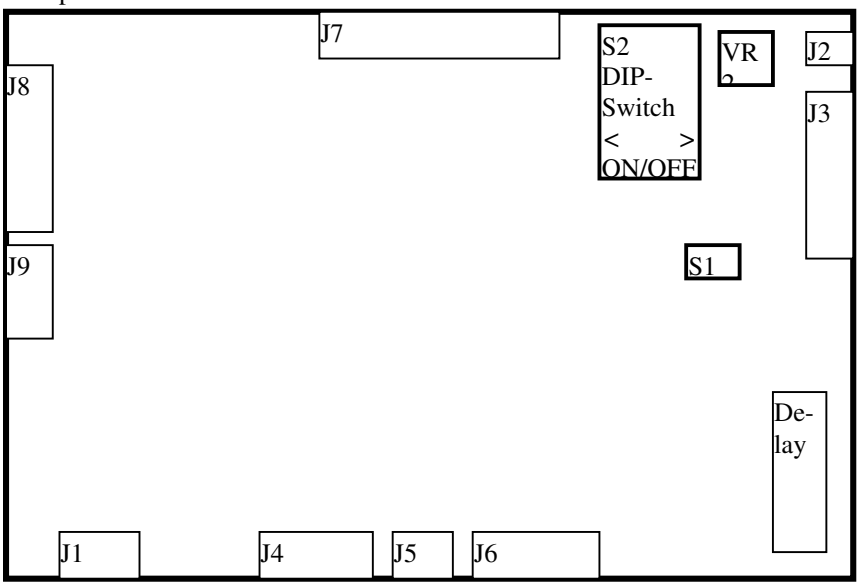


Figure 1: Connection-, switch- and potentiometer position

ATTENTION:

Only the potentiometers and switches, described in this document should be manipulated as required. The operation of other adjustment possibilities might result in malfunctions, which can only be readjusted at the factory.

Switch-Functions

Switch S1

RG Voltage Adjustment. The adjustment has to be done in accordance with the CCD-model used. Standard 9V. The adjustment is done ex works.

S1	**a**	**b**
RG-Voltage Adjustment	+9V	+6V

This adjustment has to be done in accordance with the CCD-model used.

Switch S2-1,2: Cable-length-compensation *(not longer used 18th. June 2001)*

S2-1,2	**S2-1**	**S2-2**
Cable length 0-2m	OFF	OFF
Cable length 1-3m	OFF	ON
Cable length 2-4m	ON	OFF
Cable length 3-5m	ON	ON

Table 1: Cable length Compensation

The compensation adjustment is used to compensate for the cable running times of the different cables. This adjustment is tolerance afflicted. Ex works the camera is adjusted to compensate for a cable length of 2.25 m or in accordance with the customer application. Deviating adjustments must be done via single adjustment. In order to do so, the coarse adjustment is done via S2-1,2 and the fine-tuning with the Software NET CAM CONTROL V2.0 .
For correctness of adjustment of the cable length compensation, see also documentation " specialist knowledge".

Switch S2-3: VL - Voltage Adjustment

S2-3	**OFF**	**ON**
VL-Voltage Adjustment	-9V	-7,5V

This adjustment has to be done in accordance with the CCD-model used.

Switch S2-4: White Balance Mode

S2-4	**OFF**	**ON**
WB Mode	Fix	Auto

"Auto" means, that in conjunction with switch S2-5 an AWB can be performed.
In the switch position "Fix" a programmable White Balance Adjustment (Standard: 6300 Kelvin) will be used. See also documentation "specialist knowledge".
The switches and pins J7-9, J7-10, S2-5, S2-4 are used in combination. See chapter " White Balance".

Switch S2-5: Auto Tracking White Balance

S2-5	**OFF**	**ON**
ATW	Stop	Autotracking

In the switch position S2-4 = OFF an AWB can be performed. This is done be switching to ATW. In this switch position an AWB will run. As soon as a satisfactory result is reached the switch S2-5 should be set to the OFF position.
The switches and pins J7-9, J7-10, S2-5, S2-4 are used in combination. See chapter " White Balance".

Switch S2-5: Gamma

S2-6	**OFF**	**ON**
Gamma	ON	OFF

The Gamma-Correction can be switched on and off using S2-4. How the Gamma-Correction should work is adjusted with the Software NET CAM CONTROL.

Potentiometer Functions

Potentiometer VR2: Input Level

Using the CCD-Input-Level-Potentiometer an adjustment of the camera to different CCDs, with their typical output-levels can be performed. The adjustment is normally done ex works. Wrong or pure adjustments will have an adverse effect on the picture quality.

Operation of CSU9600BP via J7

The camera CSU9600BP presents the possibility, to change some of the basic functions via the Hardware without modification of the Software parameters. This is done using port J7 on the main-board. The adjusted states are permanently interrogated by the camera-DSP.

PIN-Layout of J7

PIN	Name	Function	Adjustment	
			A	B
J7/ 1	+12V=	+Ub DC int. Operation voltage	Not loadable !!!	
J7/ 2	AGC	Auto Gain Control	AGC High	AGC Low
J7/ 3	ELC	Electronic Light Control	man. Shutter	Auto Shutter
J7/ 4	WIND	ALC WINDOW	ALC all = Window off	ALC Window = Window on
J7/ 5	MGAIN	FIX MGAIN	60-120 IRE	100 IRE
J7/ 6	SMODE1*	Man. Shutter	(s. Table)	
J7/ 7	SMODE2*	Man. Shutter	(s. Table)	
J7/ 8	SMODE4*	Man. Shutter	(s. Table)	
J7/ 9	WB	WB-Method	Auto	Fix
J7/ 10	SET	SET of White Point	Set	ATW
J7/ 11	EWP	EEPROM Write Protect	Protect	Write
J7/ 12	GND			

Table 2: PIN Layout of Port J7

Pin Usage

J7-1: +12V DC

J7-1	**Voltage not loadable !**
+12V DC	

Please do not use for the selection of the inverted Port-J7-Functions.There +3.3 V DC will be used.

J7-2: Auto Gain Control

J7-2	**1 = open = H**	**0 = GND = L**
AGC	AGC High	AGC Low

Using this pin the AGC will be switched. The camera contains to gain levels, which will be adjusted using the Parameter-Software package. Using this pin will switch between those levels, see also documentation " specialist knowledge".
The adjustments of the AGC will only be visible in case the camera is working in the corresponding light ratio.

J7-3: Electric Light Control [ELC]

J7-3	**1 = open = H**	**0 = GND = L**
AGC	Manual Shutter	Auto Shutter

Use this pin to switch ON or OFF the ELC (...the shutter...)
The function of the shutter will only be visible in case the camera is working in the corresponding light ratio. (see also documentation " specialist knowledge")

J7-4: Window

J7-4	**1 = open = H**	**0 = GND = L**
Window	ALC all = Window off	ALC Window = Window on

Using this pin the Window can be turned ON or OFF. The Window will influence the ALC- The basic adjustment of the Window will be performed using the Software NET CAM CONTROL. See the documentation “specialist knowledge” for a description of the functions of the Window.

J7-5: Fix Gain (currently not functioning)

J7-5	**0 = open = L**	**1=+3.3V = H**
FIX MGAIN	ALC 60-120 IRE	100 IRE fix

The ALC can be changed to values between 60 and 120 IRE using a parameter in hat e Software NET CAM CONTROL. Using this pin the ALC can be switched between a pre-allocated and a fixed value. This adjustment will be visible in case Pin J7-6 is switched to +3.3V and AGC as well as ELC =open. In case pin J7-6 is switched to +3.3V, the output signal level will be fixed to a value of 100 IRE. These functions operate within the working-area of the AGC (0-38dB).

- currently not defined, with a possibility to be changed.

J7-6..8: Manual Shutter

J7-6	**1 = open = H**	**0 =GND = L**
SMODEx	See Table	See Table

In case ELC = open = off (J7-3),an adjustment of the Shutter is possible with pins J7-6 through -8.

TV-Mode	**SMODE4**	**SMODE2**	**SMODE1**	**Shutter time [s]**
NTSC	0	0	0	1/60
	0	0	1	1/100
	0	1	0	1/250
	0	1	1	1/500
	1	0	0	1/1.000
	1	0	1	½.000
	1	1	0	¼.000
	1	1	1	1/10.000
PAL	0	0	0	1/50
	0	0	1	1/120
	0	1	0	1/250
	0	1	1	1/500
	1	0	0	1/1.000
	1	0	1	½.000
	1	1	0	¼.000
	1	1	1	1/10.000

Table 3: Shutter Settings

J7-9: White Balance Mode

J7-9	**1 = open = L**	**+3.3V= GND = H**
WB Mode	Auto	Fix

In this case “Auto” means an Automatic White Balancing [AWB] can be performed using pin J7-10 together with pin J7-11.
Using the position “Fix” will result in the usage of a fixed programmed White Balance value of ca. 6300 Kelvin.
The switches and pins J7-9, J7-10, S2-5 and S2-4 are used in a combination of each other. See also chapter White Balance.

J7-10: SET White Balance

J7-10	**1 = open = H**	**0 = GND = L**
WB SET	Set	ATW

Together with pin J7-11 = GND an AWB can be performed. This will happen after switching to AWB. With this switch setting the AWB will be performed. As soon as a satisfactory result is reached, pin J7-10 should be switched to H again.

The switches and pins J7-9, J7-10, S2-5 and S2-4 are used in a combination of each other. See also chapter White Balance.

J7-11: EWP

J7-11	**1 = open = H**	**0 = GND = L**
EWP EEPROM Write Protect	protected	unprotected

This pin protects the EEPROM (camera internal parameter memory) to be overwritten. The EEPROM must be unprotected =GND to:

- Write data with NET CAM CONTROL to the camera.
- automatically save the White Balance results after an ATW

J7-12: GND

J7-12	**GND for selection of the Port J7 – Functions.**
GND	

White Balance

As described in the chapters above, the switches and pins J7-9, J7-10, S2-5 and S2-4 are used in a combination of each other.
The following logical circuitry is realized within the camera module

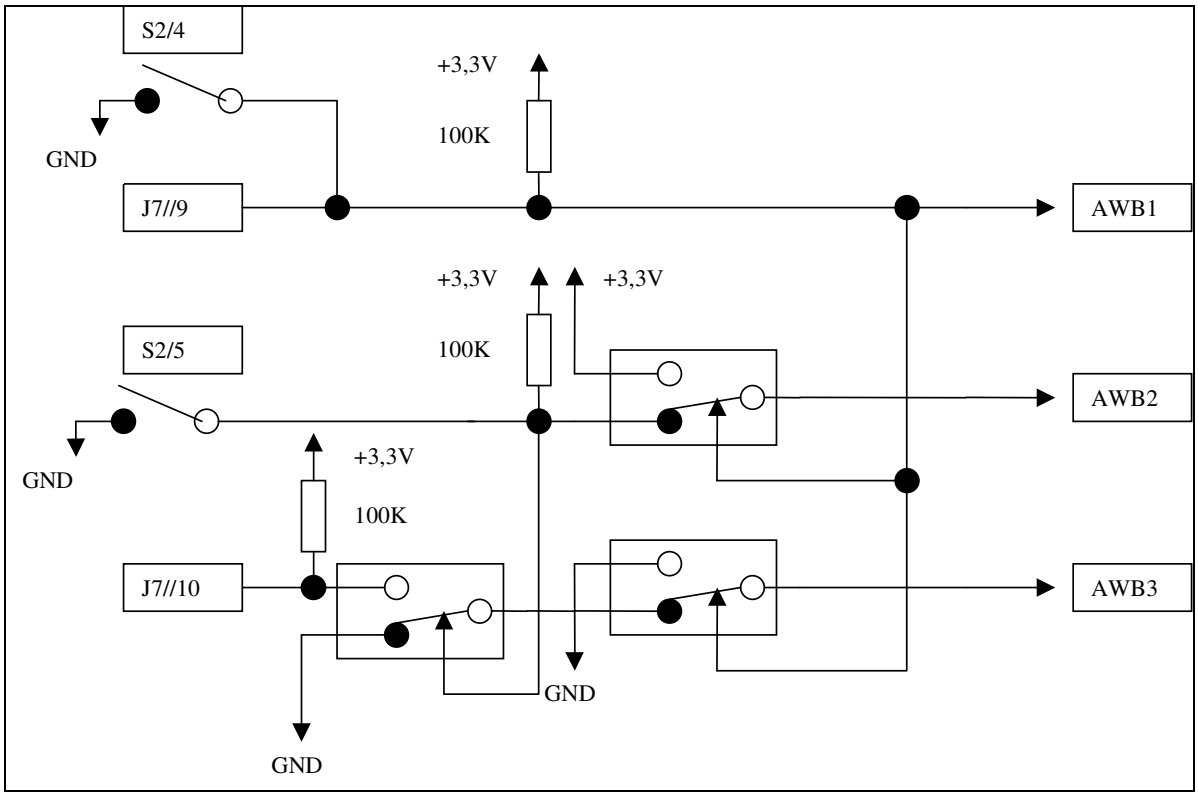


Figure 2: Logical circuitry, White Balance

The signal levels at the AWB-ports result in the following functions:

Mode	**AWB1**	**AWB2**	**AWB3**	**Remark**
ATW	0	0	0	(continuous White Balancing)
Push lock	0	1	0	White Balance start
Hold	0	1	1	White Balance stop, hold
Interior fixed value	1	0	0	3200 Kelvin
Artificial light fixed value	1	0	1	4200 Kelvin
Customer value	1	1	0	4700 Kelvin default
Day light	1	1	1	6300 Kelvin

Table 4: White Balance Mode