Datasheet

PMD1.0
Professional Monitor Device

The product and it's Spezifications could be changed without notice. Please for the latest Specification to ensure the product satisfies your requirements.

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Table of contents

Summary of changes

Date	Description	Software version	Hardware version
24.09.12 009	Description of J230, pin 12: pull up required.		HW1.1
24.07.12 008	Added descriptions of input modules and IM-HD3G / IM-DualHD3G (page 35). Dimension drawing of Dual HD3G	232V7IB/ 008V7IB	HW1.1
05.07.12 007	Added CINCH female connector dimensions to the dimension drawing. Added proposal for BNC connector hole. Corrected allocation for J1,J2,J3,J4.	227V7IB/ 007V7IB	HW1.1
20.06.12 006	The specificed dimensions for BNC connectors on the PMD-STD-xB input module were wrong. Corrected the distance from the hole centre to the upper edge of the circuit board from 6mm to 8.2mm.	227V7IB/ 007V7IB	HW1.1
04.04.12 005	Added the "RS232/Ethernet Communication" chapter. Updated the RS232 / Ethernet instruction set Added supported TCP/IP protocols	227V7IB/ 007V7IB	HW1.1
15.09.11 004	Data-PMD1.0-Deu-004 The allocation for J200 on pages 8 and 13 was wrong.		HW1.1
01.07.11 003	Data-PMD1.0-Deu-003 Revised OSD description Modified the brightness control description. New functions: UMD + tally + broadcast licence + automatic signal search. 005V7IB HW1.1	005V7IB	HW1.1
01.12.10 002	Data-PMD1.0-Deu-002 Revised the detailed descriptions. Modified J200, J210.		HW1.0
09.09.10 001	Data-PMD1.0-Deu-001		HW0.9

Roadmap

Not all advertised functions are available yet. The following roadmap provides an overview of planned additions. We are currently (as of December 2010) delivering PMD1.0 in the V0.2 hardware version. Starting from March 2011 this will be superseded by hardware version V1.0. Starting from July 2011, we'll introduce version V1.1, which fixes various bugs present in V1.0. Please take this into account for any future approval procedures.

Hardware versions:

V0.2: from mid-2010
V1.0: from March 2011
V1.1: from July 2011 (modified V1.0)
V1.2: from late 2011/early 2012 (planned)

Function	PMD	Planned availability
1x DVI, 1x VGA, 3x FBAS (alternatively as YCrCb with Tri Level Sync) 1x Y/C	Basic	ready
1x single/dual LVDS up to 1920x1200	Basic	ready
RS232	Basic	ready
Fan (control and monitoring)	Basic	ready with hardware version V1.1
Automatic input search / signal monitoring	Basic	ready with hardware version V1.1
2x DVI, 2x VGA	Basic + LIK, PRO	ready
2x HD3G	Basic + LIK, PRO	ready
10 Bit LVDS output	Basic + LIK, PRO	ready
2x single/dual LVDS up to 1920x1200 or 1x quad LVDS (QXGA/QSXGA etc...) or 100/120 Hz	Basic + LIK, PRO	ready
Video wall function	Basic + LIK, PRO	ready
24 GPIs / 32 LEDs	Basic + LIK, PRO	ready
Brightness sensors (internal/external)	Basic + LIK, PRO	ready with hardware version V1.0
Ethernet	Basic + LIK, PRO	ready
Web server	Basic + LIK, PRO	Q4/2012
Calibration	Basic + LIK, PRO	ready
HV Shift	Basic + BCL, Pro + BCL	ready
Marker	Basic + BCL, Pro + BCL	ready
UMD	Basic + BCL, Pro + BCL	ready
Closed Caption	Basic + BCL, Pro + BCL	Q4/2012
Timecode	Basic + BCL, Pro + BCL	ready
WSS	Basic + BCL, Pro + BCL	ready
Tally	Basic + BCL, Pro + BCL	ready

Pro = Professional LIK = Licence Key BCL = Broadcast Licence (annual fee)

Features

High-resolution displays (2560x1440, 2048x2048)
For 100/120 Hz displays
For 10-bit displays
270Mbps 1.485Gbps 2.970Gbps SDI

The PMD1.0 model is our high-end display interface. The most modern components and technologies ensure top reliability and performance.

- Full 10-bit processing
- High-performance interlacer and downscaler
- Multiple inputs: 2x DVI, 2xVGA, 3xFBAS, Y/C, YCrCb
- Best analogue quality at 170MHz for VGA
- SOG (incl. serrations) composite sync analogue+digital clamp
- Composite video and Y/C: Edge Enhancement, DNR, LTI, CTI
- YCrCb with Trilevel from 480i to 1080p

PMD1.0 is scalable. You can use licence keys to obtain a solution that perfectly fits your requirements.

Basic: The basic version. Expandable via licence keys (LICs).
Pro: The professional version. Includes all LICs of the basic version.
Broadcast: Special broadcast functions are activated with an annual licence.
Licence keys: 2nd DVI/VGA input, SDI, GPIOs, WALL etc...

Inputs: 2xDVI, 2xVGA (with SOG, CSync), 3xFBAS (alternatively as YCrCb with TriLevel Sync), 1x Y/C, 2x HD3G for SDI, HDSDI and HD3G signals (PMD-HD3G input module required).

100Hz&10Bit: 4 LVDS ports with 5 channels each allow the control of 100/120Hz displays with 10-bit colour depth or high-resolution displays (e.g. 2048x2048, 2560x1440 etc.). Hence, all commonly available displays are supported.

HD3G: A new HD SDI input board (2x4cm) with active loop allows the input of SDI, HDSDI and HD3G signals. The new input board doesn't require the installation of additional software!

Interlacing&Scaling: Considerably improved scaling for interlaced signals.

smartOSD: All input selection, display and colour reproduction parameters are summarised on a single OSD page. Further pages contain "nice to have" features, setup and BIOS settings.

Ethernet: Receipt of UDP packets via RJ45 for the presentation of UMD/tally and control options. A graphic interface for external operation is available as an "on-board" web page. All popular browsers are supported (e.g. Internet Explorer, Firefox, Opera).

Input module: All connectors (DVI, VGA, CINCH, RJ45 etc.) are located on a separate board detachable from the interface card. Depending on the specific model, the input module can be plugged in the interface card at an angle of 90°, 180° or 270°.

Compatibility: The size (180x116mm), the hole pattern and the **"Hamburg" input module** ensure an easy installation in existing systems.

Control: RS232, RJ45 (Ethernet), OSD panel, up to 6 digital ports and 24 GPIOs. In addition, the PMD can control the temperature/brightness of the monitor by means of additional brighness sensors.

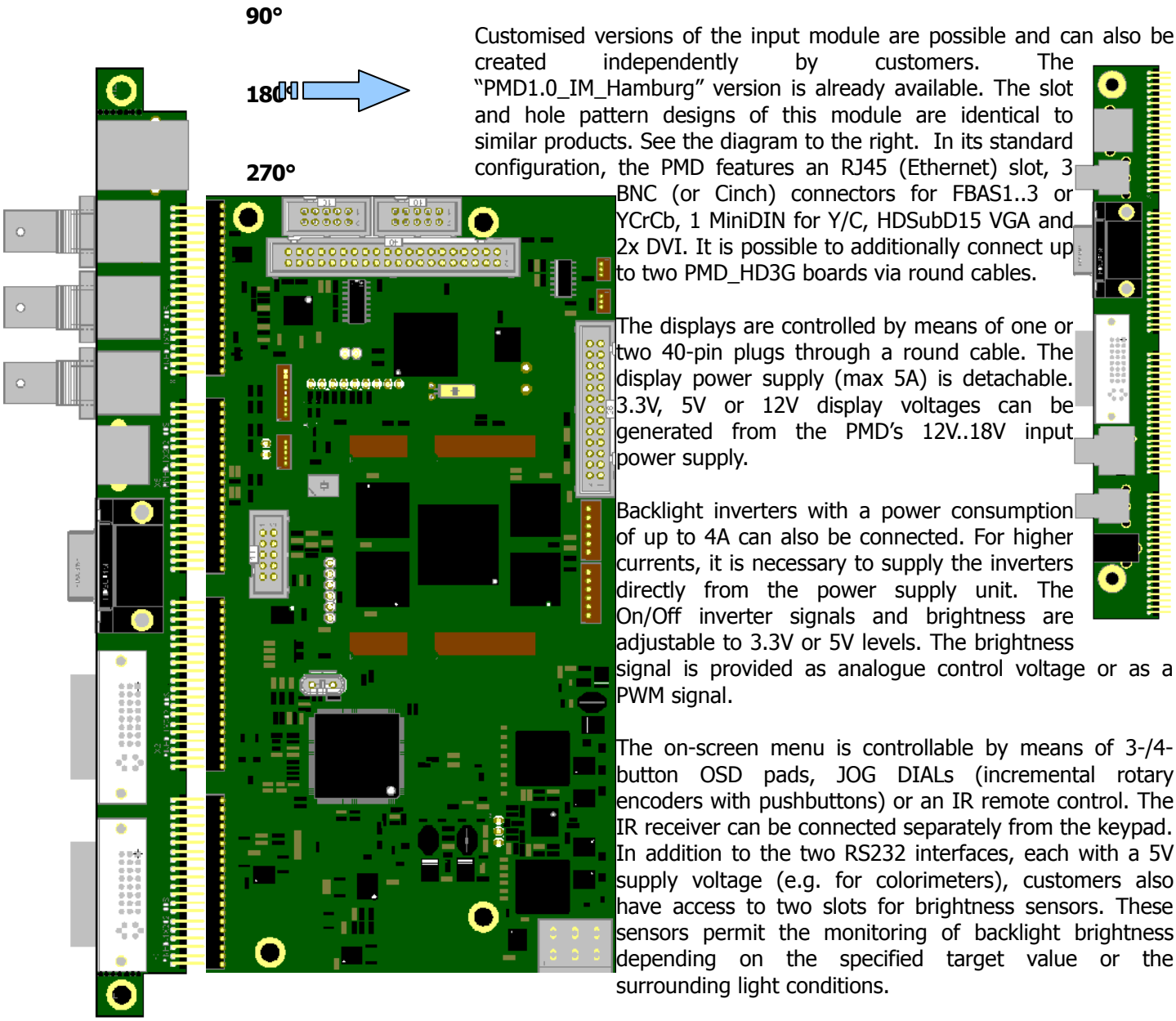
Calibration: The PMD can perform a calibration independently; users don't need to install third-party software or test pattern generators. Supported colour-measuring devices include DK-Audio PM5639/94, Konica Minolta CS200 and Jeti Specbos1211.

Lifetime: Since we do not use any components with natural aging properties (such as electrolytic capacitors), the product can be assumed to have a correspondingly long lifetime.

Function	Description
Inputs	VGA1 VGA2 FBAS1 FBAS2 FBAS3 YCrCb 1) Y/C DVI1 DVI2 SD/HD/3G SDI1 SD/HD/3G SDI2
Synchronisation	Sync on Green (also with serration impulses), Composite Sync, separately H/V Sync
Formats VGA/DVI FBAS YCrCb SDI	 < 640x480 .. >1920x1200 PAL (625i) NTSC (525i) SECAM (625i) 525i 625i 720p50/60 1080i50/59.97/60 1080p25/30 525i 625i 720p50/60 1080i47.97/48/50/59.97/60 1080p24.97/25/30/50/59.97/60 YUV4:2:2
LVDS single dual quad	 3/4/5 Ch LVDS for 6/8/10 Bit 6/8/10 Ch LVDS for 6/8/10 Bit 12/16/20 Ch LVDS for 6/8/10 Bit
TTL	18/24 TTL signals for 6/8 Bit RGB
Output timing	2560x1440 40..120 Hz
Sync signals (output)	H/V/DE, GPIO1/GPIO2/GPIO3/GPIO4
Display voltage	3.3V/5V/12V max 5A
RS232	Control, configuration via the ASCII protocol
Ethernet	Software update ("Update Engine" program for PC), control (see RS232) and UMD protocols are supported.
Input voltage	12..18V
Gamma	Native, DICOM, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.35, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2
Colour temperature K	Native, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000, 4200, 4400, 4800, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6504, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7600, 7800, 8000, 8200, 8400, 8600, 8800, 9000, 9200, 9300, 9400, 9600, 9800, 10000, 10200,10400,10600, 10800, 11000, 11200, 11400, 11800, 11800 Red Green Blue White Point (Gain) and Black Point (Bias)
Scaling	Fullscreen, 1:1: 2:1, User-defined, Zoom1, Zoom2, Overscan, Underscan
Output formats	4:3, 16:9, 14:9, Auto, Fullscreen, User
Input geometry	Pixels, Lines, Clock, Phase, H/V Offset, H Mirroring, V Mirroring, Auto
Output geometry	Formats (see above), Pixels, Lines, H/V Offset
Image parameters	Gamma, Colour temperature, Brightness, Contrast, Saturation, Hue, Backlight Brightness, R/G/B On/Off, Black/White, Inverse
Colour calibration	21 levels (0%, 5% .. 100%, red, green, blue, yellow, cyan, magenta, white)
OSD	8 colour schemes, 0%, 25%, 50% 100% transparency, position (top left, top centre, top right, centre left, centre, centre right, bottom left, bottom centre, bottom right) Automatic brightness adjustment of the OSD to the backlight.
Languages	German, English, French, Spanish
Video wall function	Up to 16x16 monitors

General information

The illustration below shows the interface with the "Standard" input module (Left: PMD1.0_IM_Standard, Right: PMD1.0). Depending on the orientation of the input module's pin headers (bent, straight from top, straight from bottom), the PMD can be installed at 90°, 180° and 270° angles.



Customised versions of the input module are possible and can also be created independently by customers. The "PMD1.0_IM_Hamburg" version is already available. The slot and hole pattern designs of this module are identical to similar products. See the diagram to the right. In its standard configuration, the PMD features an RJ45 (Ethernet) slot, 3 BNC (or Cinch) connectors for FBAS1..3 or YCrCb, 1 MiniDIN for Y/C, HDSubD15 VGA and 2x DVI. It is possible to additionally connect up to two PMD_HD3G boards via round cables.

The displays are controlled by means of one or two 40-pin plugs through a round cable. The display power supply (max 5A) is detachable. 3.3V, 5V or 12V display voltages can be generated from the PMD's 12V..18V input power supply.

Backlight inverters with a power consumption of up to 4A can also be connected. For higher currents, it is necessary to supply the inverters directly from the power supply unit. The On/Off inverter signals and brightness are adjustable to 3.3V or 5V levels. The brightness signal is provided as analogue control voltage or as a PWM signal.

The on-screen menu is controllable by means of 3-/4-button OSD pads, JOG DIALs (incremental rotary encoders with pushbuttons) or an IR remote control. The IR receiver can be connected separately from the keypad. In addition to the two RS232 interfaces, each with a 5V supply voltage (e.g. for colorimeters), customers also have access to two slots for brightness sensors. These sensors permit the monitoring of backlight brightness depending on the specified target value or the surrounding light conditions.

A 40-pin header is equipped with inputs for 24 control buttons (or switches) as well as outputs for 32 LEDs (multiplexed 8 x 4 rows). The LED drivers must be installed on the LED circuit board. A 30-pin header provides connections for up to 6 further JOG DIALs. Each one of these inputs and outputs is fully configurable via the BIOS section of the OSD.
A terminal strip permits the easy and safe connection of supply voltage. A high-performance output is capable of operating a fan unit. Fan operation can be controlled through a temperature sensor or monitored manually.

Connections

Connector positions, display

Overview

No.	Description	Type
J1..J4	Connections to the input module	4x 20-pin RM2.0 socket strips
J100	1st VGA (analogue RGB) input	15-pin HD Sub D
J101	2nd VGA (analogue RGB) input	Molex, 53047-0810, 8-pin
J110	1st DVI input	DVI-I socket
J111	2nd DVI input	DVI-I socket
J120	1st composite video / Y input	Cinch socket
J121	2nd composite video / Cr input	Cinch socket
J122	3rd composite video / Cb input	Cinch socket
J123	--	
J130	Y/C video input	4-pin Mini Din SVHS socket
J140	2nd HD3G Board	JST, SHLDP 20
J141	1st HD3G Board	JST, SHLDP 20
J150	*Ethernet*	*RJ45 socket*
J160	RS232 to PC (requires R4-003-40)	Molex, 53047-0410, 4-pin
J161	RS232 for colour sensors	Molex, 53047-0410, 4-pin
J200	OSD PAD/JOG DIAL	Molex, 53047-0910, 10-pin
J201	*Jumper: JOG DIAL Select*	*2-pin RM2.54 pin header*
J210	OSD PAD IR	Molex, 53047-0510, 5-pin
J220	GPIOS	Pin connector socket, 2-row, 40-pin, RM2.54
J230	JOGDIALS	Pin connector socket, 2-row, 34-pin RM2.54

J300	1st Dual LVDS display connector	JST, SHLDP 40
J301	2nd Dual LVDS display connector (100Hz only)	JST, SHLDP 40
J310	1st inverter connector	JST, PHR-6, 6-pin
J311	2nd inverter connector	JST, PHR-6, 6-pin
J320	Jumper for display voltage selection (3.3, 5V, 12V)	3-pin RM2.54 pin header
J400	Supply voltage	2-pin terminal block
J410	Fan connection for equipment cooling	JST, PHR-3, 3-pin
J411	Fan connection for CPU cooling	Molex, 53047-0310, 3-pin
J420	Brightness sensor for backlight control	Molex, 53047-0310, 3-pin
J421	Brightness sensor for control of ambient brightness	Molex, 53047-0310, 3-pin
J430	*Output*	*Molex, 53047-0810, 8-pin*

1: Plug connections to the input module

J1..J4: **Connections to the input module**
Pin header 1x20-pin, RM2.0

J1		J2		J3		J4	
Pin		Pin		Pin		Pin	
1	USB_GND	1	Y (FBAS1)	1	VGA1_HSYNC	1	GND
2	USB_GND	2	Pb(FBAS2)	2	GND	2	GND
3	Reserved (USB_5V)	3	Pr (FBAS3)	3	VGA1_VSYNC	3	GND
4	Reserved (USB_5V)	4	GND	4	GND	4	GND
5	n.c.	5	GND	5	VGA1_Blau	5	n.c.
6	USB_D+	6	GND	6	VGA1_Grün	6	VCC_SUPPLY
7	USB_D-	7	FBAS4	7	VGA1_Rot	7	VCC_SUPPLY
8	ETH_RD-	8	GND	8	GND	8	n.c.
9	ETH_RD+	9	YC_C	9	DVI1_RX0-	9	DVI2_RX0-
10	ETH_TD-	10	YC_Y	10	DVI1_RX0+	10	DVI2_RX0+
11	ETH_LINK_LED	11	GND	11	DVI1_RX1-	11	DVI2_RX1-
12	ETH_TD+	12	GND	12	DVI1_RX1+	12	DVI2_RX1+
13	ETH_ACT_LED	13	GND	13	DVI1_RX2-	13	DVI2_RX2-
14	3.3V	14	VGA2 Red	14	DVI1_RX2+	14	DVI2_RX2+
15	3.3V	15	VGA2 Green	15	DVI1_DDC_SCL	15	DVI2_DDC_SCL
16	3.3V	16	VGA2 Blue	16	DVI1_DDC_SDA	16	DVI2_DDC_SDA

17	3.3V	17	GND	17	DVI1_RXCLK-	17	DVI2_RXCLK-
18	3.3V	18	VGA2 VSYNC	18	DVI1_RXCLK+	18	DVI2_RXCLK+
19	3.3V	19	GND	19	DVI1_HP_DET	19	DVI2_HP_DET
20	3.3V	20	VGA2 HSYNC	20	DVI1_DDC_5V	20	DVI2_DDC_5V

100s: Input signals

J100: **1st VGA connection** 15-pin HD-SubD female connector					
Pin		Pin		Pin	
1	R	6	GND	11	
2	G	7	GND	12	
3	B	8	GND	13	HSYNC
4		9		14	VSYNC
5		10	GND	15	

J101: **2nd VGA connection** 8-pin, Molex 53047-0810			
Pin		Pin	
1	R	2	GND
3	G	4	GND
5	B	6	GND
7	HSYNC	8	VSYNC

J110(J111): **1st DVI connection (2nd DVI connection)** 24+6-pin DVI-I female connector					
Pin		Pin		Pin	
1	RX-2	9	RX-1	17	RX-3
2	RX+2	10	RX+1	18	RX+3
3	Shield	11	Shield	19	Shield
4		12		20	
5		13		21	
6	DDCSCL	14	5V	22	Shield
7	DDCSDA	15	GND	23	TX+C
8		16	Hotplug	24	TX-C
C1		C2		C3	
C4		C5	GND	C6	GND

J120(J121)(J122): **FBAS1 (FBAS2)(FBAS3)** **Y (Cr) (Cb)** Cinch female connector	
Pin	
Centre	FBAS Signal 1Vpp
Shield	GND

J130: **S-Video** 4-pin Mini Din	
Pin	
1	GND
2	GND
3	C
4	Y

J140 (J141): **HD LVDS 1 & 2** (for HD3G input) 20-pin JST SHLDP20			
Pin		Pin	
1	GND	2	GND
3	HDINIO0(2)	4	HDINIO1(3)
5	SDA	6	SCL
7	3.3V	8	3.3V
9	HD0+	10	HD0-
11	HD1+	12	HD1-
13	HD2+	14	HD2-
15	HDClk+	16	HDClk-
17	HD3+	18	HD3-
19	HD4+	20	HD4-

J150: **Ethernet connection** RJ45 female connector (8P8C)			
Pin		Pin	
1	TX+	2	TX-
3	RX+	4	
5		6	Rx-
7		8	

J160 (J161): **RS232** Molex MicroBlade 4-pin			
Pin		Pin	
1	5V	2	TxD
3	RxD	4	GND

200s: OSD PAD, IR, OPERATING CONTROLS

J200: **(OSD control panel) / User Interface** 10-pin Molex 53047-1010			
Pin		Pin	
1	VCCOSD (3.3V)	2	GND
3	GND	4	MINUS
5	PLUS	6	EXIT
7	MENU	8	POWER
9	LED PWR (GRN)	10	LED STBY (RED)

J201: **Selection buttons vs. JOG DIAL** 2-pin header RM2.54	
Pin	
open	OSD PAD with buttons
1 - 2	OSD PAD with JOG DIAL

J210: **OSD IR Receiver** 5-pin Molex 53047-0510			
Pin		Pin	
1	3.3V	2	IR Signal
3	GND	4	LED3
5	LED4		

J220: **GPIOs & LEDS** 2x20-pin connector socket RM2.54			
Pin		Pin	
1	GPI21	2	GPI22
3	GPI23	4	GPI24(INT)
5	3.3V	6	GND
7	GPI1	8	GPI17
9	GPI2	10	GPI18
11	GPI3	12	GPI19
13	GPI4	14	GPI20
15	GPI5	16	LED_ROW0
17	GPI6	18	LED_ROW1
19	GPI7	20	LED_ROW2
21	GPI8	22	LED_ROW3
23	3.3V	24	LED0
25	GPI9	26	LED1
27	GPI10	28	LED2
29	GPI11	30	LED3
31	GPI12	32	LED4
33	GPI13	34	LED5
35	GPI14	36	LED6
37	GPI15	38	LED7
39	GPI16	40	LED8

J230: **additional JOG DIALs** 2x13-pin connector socket RM2.54			
Pin		Pin	
1	GND	2	1.8V
3	JOG1_BUTTON	4	JOG4_BUTTON
5	JOG1_S0_m	6	JOG4_S0_m
7	JOG1_S1_p	8	JOG4_S1_p
9	GND	10	GND
11	JOG2_BUTTON	12	JOG5_BUTTON (1)
13	JOG2_S0_m	14	JOG5_S0_m
15	JOG2_S1_p	16	JOG5_S1_p
17	GND	18	GND
19	JOG3_BUTTON	20	JOG6_BUTTON
21	JOG3_S0_m	22	JOG6_S0_m
23	JOG3_S1_p	24	JOG6_S1_p
25	GND	26	GND

1: Up to HW1.2: JOG5_BUTTON (Pin 12), 4k7 Pull Up required after 3.3V.

300s: Display & Inverter

J300 (& J301):**single/dual LVDS Displayport** JST SHLDP 40-pin			
Pin		Pin	
1	GND	2	GND
3	GPIO0	4	GPIO2
5	GPIO1	6	GPIO3
7	Odd(1) Tx3+	8	Odd(1) Tx3-
9	Odd(1) TxClk+	10	Odd(1) TxClk-
11	Odd(1) Tx2+	12	Odd(1) Tx2-
13	Odd(1) Tx1+	14	Odd(1) Tx1-
15	Odd(1) Tx0+	16	Odd(1) Tx0-
17	Odd(1) res+	18	Odd(1) res-
19	DE	20	HSYNC
21	VSYNC	22	DCLK
23	Even(2) res+	24	Even(2) res-
25	Even(2) Tx0+	26	Even(2) Tx0-
27	Even(2) Tx3+	28	Even(2) Tx3+
29	Even(2) TxClk+	30	Even(2) TxClk-
31	Even(2) Tx2+	32	Even(2) Tx2-
33	Even(2) Tx1+	34	Even(2) Tx1-
35	VCC_TFT	36	VCC_TFT
37	VCC_TFT	38	VCC_TFT
39	GND	40	GND

J300 (&J301): **as 24bit TTL Displayport** JST SHLDP 40-pin			
Pin		Pin	
1	GND	2	GND
3	GPIO0	4	GPIO2
5	GPIO1	6	GPIO3
7	R0	8	R1
9	R2	10	R3
11	R4	12	R5
13	R6	14	R7
15	G0	16	G1
17	G2	18	G3
19	G4	20	G5
21	G6	22	G7
23	B0	24	B1
25	B2	26	B3
27	B4	28	B5
29	B6	30	B7
31	DE	32	HSYNC
33	VSYNC	34	DCLK
35	VCC_TFT	36	VCC_TFT
37	VCC_TFT	38	VCC_TFT
39	GND	40	GND

J310 & (J311): **Inverter Supply & Control** JST PHR 6-pin			
Pin		Pin	
1	GND	2	GND
3	Brightness	4	On/Off
5	VCC_INV	6	VCC_INV

J320: **Selection of display voltage** 3-pin header RM2.54	
Pin	
open	3.3V
1 - 2	5V
2 - 3	12V

400s: Internal device connections

J400: **Supply voltage** 2-pin PTR spring force terminals, horizontal connection, RM 5mm	
Pin	
1	GND
2	VCC_SUPPLY

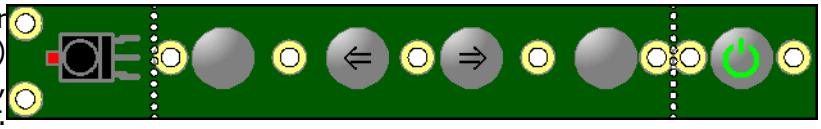
J410: **Device fan** 3-pin JST PHR 6-pin	
Pin	
1	VCC_SUPPLY_FAN (controllable)
2	Sens
3	GND

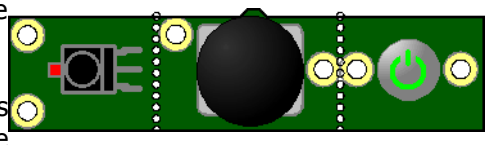
J411: **CPU fan** 3-pin Molex 53047-0310	
Pin	
1	GND
2	Sens
3	5V

J420: **Brightness sensor (internal)** J421: **Brightness sensor (external)** 3-pin Molex 53047-0310	
Pin	
1	GND
2	V-Sens adjustable via P420 (P421)
3	3.3V

J430: **(Audio Extension)** 9-pin Molex 53047-0910			
Pin		Pin	
1	I2S_OUT_2	2	I2S_OUT_1
3	I2S_OUT_0	4	I2S_OUT_LRCLK
5	I2S_OUT_SCLK	6	SCL
7	SDA	8	3.3V
9	GND		

Operation and OSD

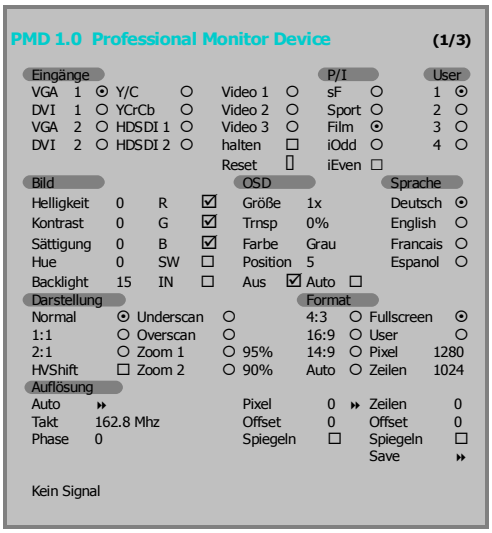




The device can be switched on and off via a power button. Two dual LEDs (power button, IR receiver) can signal the operating conditions for POWER ON, STANDBY and IR-ACK independently of each other. This enables the easy setup of the PMD for compliance with typical device requirements 1).

Navigation within the OSD ("On Screen Display") requires at least 3 buttons ([Plus], [Minus], [Select/Unselect]). A fourth button [Exit] facilitates the navigation because it allows users to leave the selected menu item directly; this button is however not essential.
Alternatively, the OSD can also be navigated by means of an incremental rotary encoder with pushbutton (JOG DIAL). The fourth button [Exit] is not available here. One major JOG-DIAL advantage consists in the fact that it doesn't require the user to constantly switch between the individual operating elements.
The operation via IR remote control is implemented by means of five buttons ([Left], [Right], [Up], [Down], [Select/Unselect]).

The number of buttons and keypad type (OSD PAD) used as well the behaviour of the dual LEDs can be configured in the BIOS. Due to compatibility reasons, the selection of JOG DIAL or OSD PAD is done through the J201 jumper (open: OSD PAD, closed: JOG DIAL).



The first page of the OSD is shown to the left. It is clearly visible how individual menu items ("ITEMS", e.g. Brightness, Contrast...) are organised in separate groups ("GROUPS", e.g. Image). An OSD page always consists of one or several groups and the page number ("PAGE", e.g. "1/3").

When the **OSD** is **activated** with the [Select/Unselect] button, the OSD is positioned on the **PAGE LEVEL**. The [Plus] and [Minus] buttons retrieve the next or previous OSD page.

If the user presses the [Select/Unselect] button again, the cursor of the OSD is moved to the **GROUP LEVEL**. It is now possible to select the group using the [Plus] and [Minus] buttons.

After group selection is completed (e.g. the "Format" or "Image" group has been selected), users can proceed to the **ITEM LEVEL** by confirming their choice with [Select/Unselect]. The [Plus] and [Minus] buttons are also used here for the selection of the desired menu item.

Once the cursor is moved to the menu parameter to be changed, the user can again use the [Select/Unselect] button to either activate/deactivate a checkbox or to proceed to the **ADJUST LEVEL**. The ADJUST LEVEL lets users adjust the value for the selected menu item by pressing the [Plus] / [Minus] buttons; after completing the adjustment, users can return to the **ITEM LEVEL** at any time by pressing the [Select/Unselect] button again.

In order to leave the ITEM LEVEL, users must use the [Plus] and [Minus] buttons to position the CURSOR on the respective group identifier. By pressing [Select/Unselect], users can then switch back to the **GROUP LEVEL**.

The return to the **PAGE LEVEL** is implemented identically to the return to the GROUP LEVEL. Users must position the OSD cursor on the currently selected page and then press the [Select/Unselect] button.

Depending on the current cursor position, the **OSD** can be **closed** by pressing and holding the [Select/Unselect] button for three seconds.

If the keypad has a fourth [Exit] button, it is possible to return to a higher level from every position inside the OSD.

Device operation via an IR remote control is implemented through [Plus], [Minus], [Up] and [Down] buttons for navigation in the desired direction (to the right, left etc...). [OK] selects the menu item. [OK] can be pressed again to leave the ADJUST LEVEL.

OPEN OSD ↔ PAGELEVEL ↔ GROUPLEVEL ↔ ITEMLEVL ↔ ADJUSTLEVEL ↔ ITMLEVLE ↔ GROUPLEVLEL ↔ PAGELEVEL ↔ CLOSE OSD

1)
As a rule, a **monitor** signals the POWER ON state with a green LED and STANDBY mode with an orange LED.

In contrast, **television sets** usually do not actively signal the POWER ON state while the STANDBY mode is signalled with a red LED. When the device is switched on, the STANDBY LED is switched off. The receipt of an IR signal is acknowledged via a red STANDBY LED.

OSD areas: USER, SERVICE and BIOS

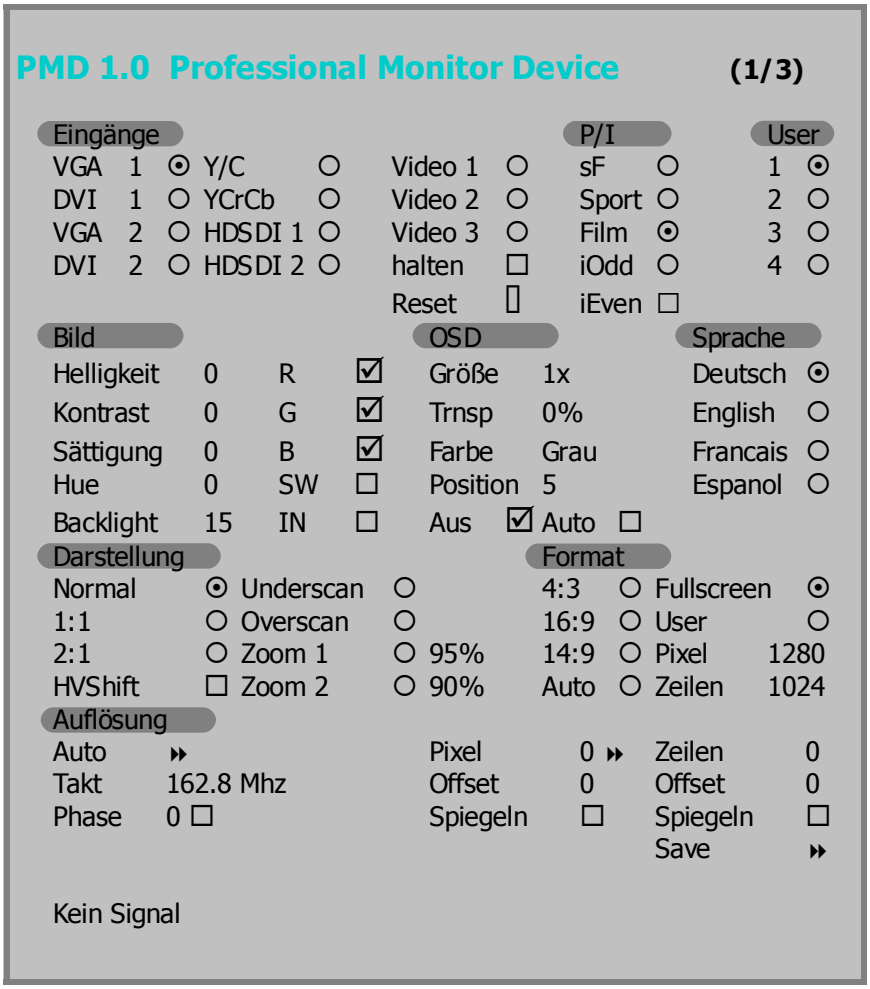
All parameters of the device can be configured through the OSD. To make this process easier, OSD menus are grouped into three areas; access to each area can be restricted through a password:

Area	OSD pages	Default password
LOGIN	Login page	--
USER	1 - 2	„000000" open
SERVICE	3 (or 4)	„000000" open
BIOS	5 - 9	„222222" locked

The OSD is composed of the following pages:

Page	Default description	Level / Description
0	PMD1.0 Login	LOGIN / Login Page The login page is opened by holding the menu button (for approx. 6 seconds).
1	PMD1.0 Professional Monitor Device	USER / 1st User Page
2	PMD1.0 Professional Monitor Device	USER / 2nd User Page
3	PMD1.0 Service	SERVICE / 1st Service Page
4	PMD1.0 Service & Advanced	SERVICE / 2nd Service Page for GPIO settings. Activated in the BIOS.
5	PMD1.0 BIOS	BIOS / Device settings
6	PMD1.0 BIOS OSD Captions	BIOS / Captions
7	PMD1.0 BIOS GPIOS	BIOS / 1st GPIO Page
8	PMD1.0 BIOS GPIOS	BIOS / 2nd GPIO Page
9	PMD1.0 BIOS DDC Data	BIOS / DDC data set processing and E²Proms description.

OSD Page 1 – 1st User Page



Inputs:
Selection of the desired input signal.
Unavailable inputs are marked in grey and cannot be selected. "**Hold**" corresponds to a still image or pause function.
"**Reset**" resets all user-level settings to the predefined values.

P/I:
Progressive / Interlaced.
The menu items in this group are not available for progressive input images.
For interlaced signals, this menu allows users to set up how the fields are mixed.
"**Film**" is generally the optimum mode because it uses the most sophisticated deinterlacing procedure. The picture is shown without motion artefacts, yet considerably smoother as compared to Sport Mode.
In "**Sport**" mode, even one-pixel-sized objects are recognised as moving image content and reproduction can therefore be more uneven.
"**sF**" (sequential frame) is the optimum setting for the appropriately recorded formats. The individual fields are combined by means of the so-called "static-mesh" procedure.
"**iOdd**" and "**iEven**" allow the presentation of the odd or even field. The other fiel dis hidden and replaced by black lines.

Users:
Custom configurations on the user level can be saved for up to 4 separate users. When the user settings are reset, the device loads the default data set for the currently selected user. Other users are not affected by this reset and their settings remain unchanged.

Image:
Contains the classic settings such as "**Brightness**", "**Contrast**" etc...
"**R**" "**G**" "**B**" colours can be activated separately.
A black/white mode ("**SW**") is also available.
The brightness values of the input signal can be inverted with the "**IN**" checkbox.
"**Saturation**" and "**Hue**" settings are also available for all inputs (including RGB).

OSD:
Here users can modify the values for "**Size**", "**Transparency**", "**Colour scheme**" etc.
"**Position**" extends from 1 to 9 from top left (1), centre (5) to bottom right (9).
"**Off**" determines whether the OSD should be closed after a certain time.
"**Auto**" lowers the brightness of the OSD whenever the backlight is set to a darker level. This is particularly useful for night-time operation.

Languages:
The currently available OSD languages are "**German**", "**English**", "**French**" and "**Spanish**".

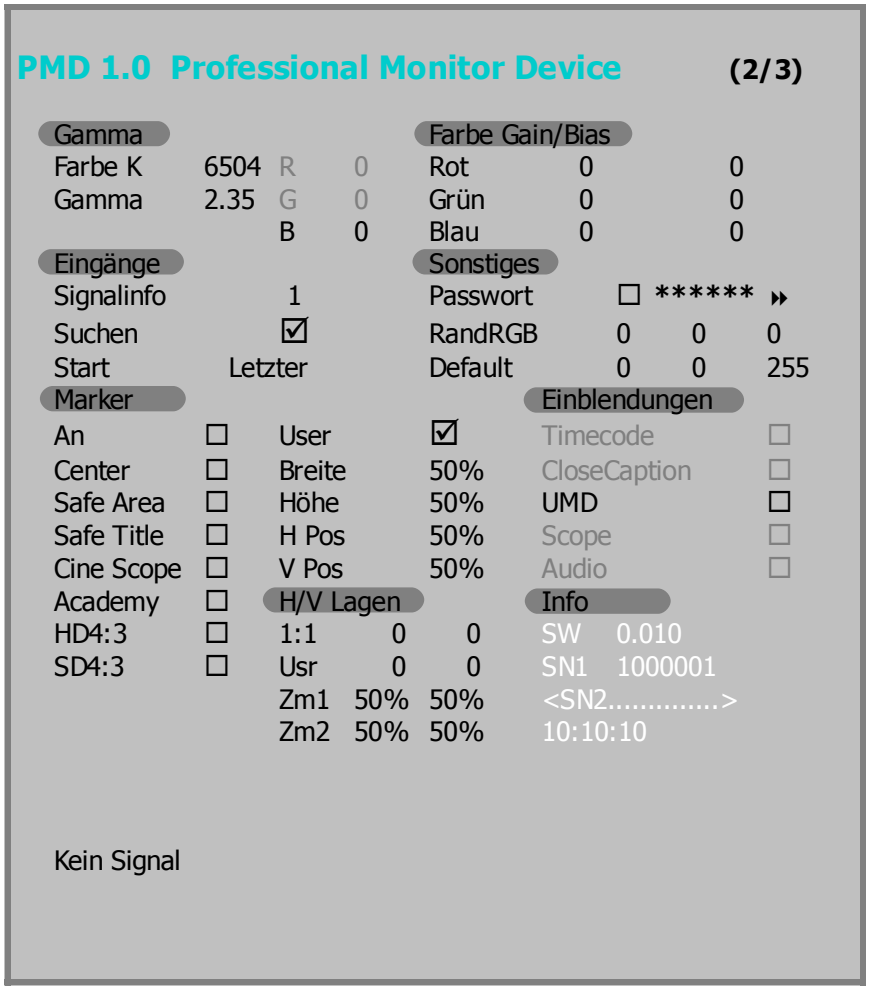
Display:
This item allows the selection of various display modes.
"**Normal**" means that the input image is shown as defined under "Format".
"**1:1**" forces a precise pixel-by-pixel display, which might cut off parts of the image content or add edges if the input picture is smaller or larger than the screen. The colour of the edges can be defined on page 2 of the OSD.
"**2:1**" operates according to the same principle as "1:1". In this case, however, the pixels are doubled in the x and y directions to ensure that even comparatively small input formats are sufficiently reproduced on large screens.
"**Underscan**" does not show the entire area of the input image.
"**Overscan**" also shows the blank area.
"**Zoom 1**" and "**Zoom 2**" allow users to zoom into the input image. The zoom level can be established separately for the two settings. At 100% the input image is shown completely. A 50% zoom level means that only 50% of the input image will be shown on the screen. This corresponds to a magnification factor of 2.

Format:
Determines which area of the screen is to be used as the active area. Depending on the native screen resolution, the resultant image may add blank edges to the top/bottom or left/right. The colour of these edges can be set on page 2 of the OSD. "**4:3**", "**16:9**", and "**14:9**" result in an active area with the corresponding aspect ratio. No distortion will occur if the input image is in the same format.
"**Auto**" detects the aspect ratio of the input signal automatically and sets the monitor's ratio accordingly. In this way, the input image is shown in the same original format without any distortion.
"**Fullscreen**" selects the native resolution of the display.
"**User**" allows users to freely adjust the active area by modifying "**Pixels**" and "**Lines**". The position can be set on page 2 of the OSD under H/V positions.

Resolution:
Defines the active area of the input image.
"**Auto ⏩**" performs the automatic configuration of all geometry values (pixel clock, phase position, offset, pixels and lines).
"**Pixel clock**" is the sampling clock of the input signal.
"**Phase**" corresponds to the phase position of the sampling clock to the horizontal synchronisation impulse of the input signal (H-Sync). The precise definition of the phase has a substantial effect on the resulting image quality. The checkbox activates a continuous retrieval of all phase positions in the range 0..31. This is very useful if it becomes necessary to find an unknown pixel clock when the image content is not freely selectable.
"**Pixels**" defines the number of active pixels in the horizontal direction.
"**Offset**" defines the starting offset for pixels in the horizontal direction.
"**Mirroring**" permits the horizontal mirroring of the input image.
"⏩" is also an auto-adjust command, but it does not modify any already configured pixels and lines. The pixel clock, the phase position and the offsets are calibrated based on the pixel and line parameters. Hence, this option may be useful in configuring rare/unusual formats automatically.
"**Lines**" defines the number of active lines in the vertical direction.
"**Offset**" defines the starting offset for active lines in the horizontal direction.
"**Mirroring**" permits the vertical and horizontal mirroring of the input image.

Status line:
The bottom line shows the active resolution and frame rate for the input image. If no input image is available, it shows the message "No signal".

OSD Page 2 – 2nd User Page



Gamma:
Configuration of the gamma value.
"**Native**" means that the display is operated without any changes to the gamma values.
"**DICOM**" means that the gamma values of the display are compliant with the DICOM Standard.
"**1.8**.."**2.35**.."**2.6**": the monitor is operated with the corresponding gamma correction. If no measurement value table is available, it is assumed that the monitor has an optimum gamma value of 2.2, and this setting is implemented accordingly.

Colour temp K:
The white point of the monitor can be set to the desired colour temperature. If no measurement values are available, the display assumes the CIE xy coordinates (0.313,0.329).
"**Native**" means that the display is operated without any changes to the colour values.
"**User**" allows users to define their own white point by adjusting the "**R**", "**G**", "**B**" values.
"**2400**" .. "**11400**" selects the corresponding colour temperature. The value is configured in 100K increments between 5000K and 7300K and in 200K increments beyond that range.

Colour Gain/Bias:
In addition to colour temperature, users can also set the white point (R-Gain, G-Gain, B-Gain) and black level value (R-Bias, G-Bias, B-Bias). This setting overrides all colour temperature settings except for "User". If these settings are modified, the configured colour temperature will no longer correspond to the actual colour temperature.

Inputs:
"**Signal info**" enables the display of an on-screen message whenever the input signal is changed. This setting allows the configuration of 9 different message positions based on standard OSD offsets. It is also possible to deactivate this function from here.
"**Scan**": "Scan" enables the automatic scanning of all inputs for an active signal. This function will only become active with the release of hardware version V1.1.
"**Start**": Defines which input should be selected first after the display is switched on. "**Last**" means that the display will start with the last selected input.

Miscellaneous:
"**Password**" allows users to set passwords for their user areas. If the default password value ("000000") remains unchanged, the respective user area will be accessible without password.
The **checkbox** next to the password field determines whether the passwords are shown in plain text. Users are also able to hide the password as they enter it (*******).
"»" resets the password to the default value. More information is available under "OSD levels / passwords and login".
"**Edge RGB**" determines the red, green and blue values for the target colour of display edges, which might become visible due to custom settings under the "Display" and "Format" menus.
"**Default**" defines the red, green and blue values for the target colour of the default screen when no signal is available.

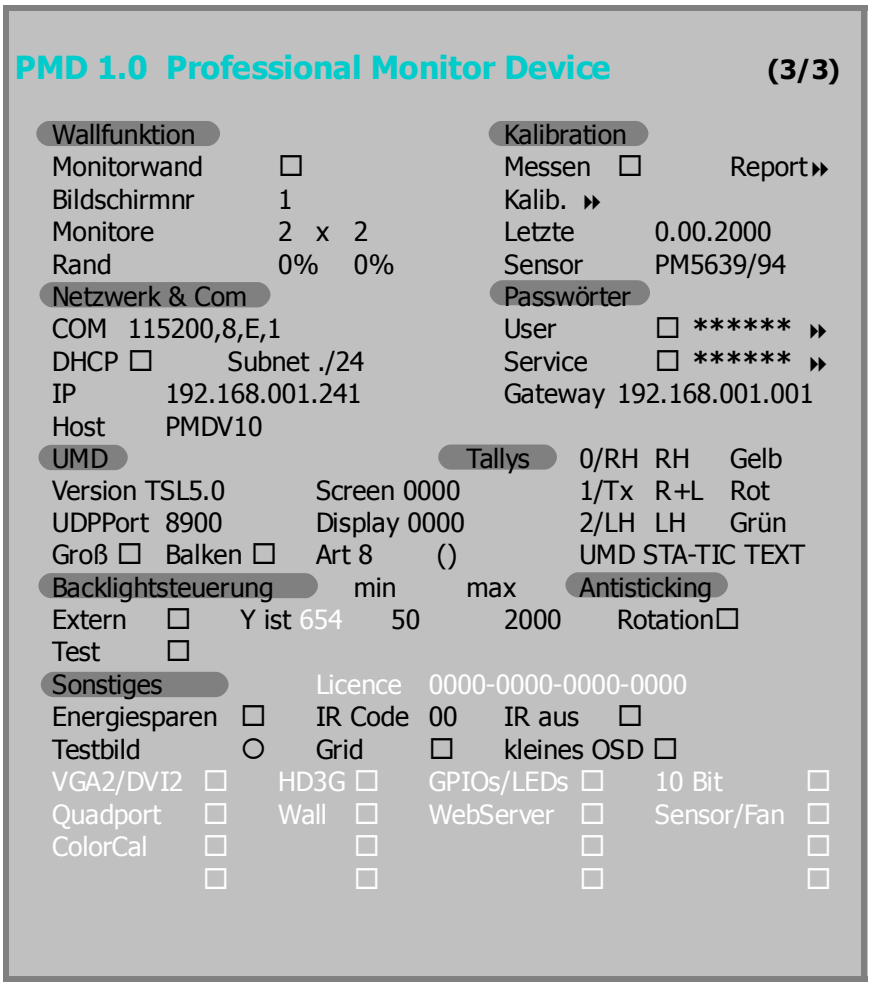
Marker:
Permits the selection and activation of marker lines for "**Centre**", "**Safe Area**", "**Safe Title**", "**Cinecope**", "**Academy**", "**HD4:3**" and "**SD4:3**". For 4:3 signals, "**HD4:3**" assumes that the source image is formatted as 16:9 and only shows the 4:3 portion of the image.
"**User**" is a marker with the following configurable values: "**Width**", "**Height**" and "**Position**".

Captions: still unavailable.

H/V positions:
Defines the position of the active image area for "Display->1:1", "Display->Zoom1", "Display->Zoom2" and "Format->User".

Info:
"**SW**" shows the current firmware version of the display.
"**SN1**" shows the initial manufacturer serial number, an additional serial number (if applicable) and the current operating time.

OSD page 3 – 1st Service Page



Video wall function:
"**Video wall**" allows the activation/deactivation of the video wall function without modifying the remaining parameters.
"**Monitors**" defines the number of monitors (horizontal x vertical) in the video wall.
"**Display No.**" defines the position of the display within the video wall. This number is counted from left to right and then from top to bottom.
"**Edge**" represents the distance between two displays in the horizontal and vertical directions. The image is zoomed out slightly as if it were stretching over the edges between displays. Although this action leads to the loss of image content, it also ensures that the transitions between two displays are uninterrupted. If no "Edge" value is set, any diagonal lines running over several monitors would appear to have stair-like transitions. The corresponding functionality to prevent this is already built in the associated scaling algorithm.

Calibration:
"**Measurement**" When the "Measurement" function is activated, users are shown a separate OSD. This OSD allows the configuration of all parameters related to gamma and colours. At the same time, the screen displays the current measurement values of the connected colour sensor. The normal OSD and the "Measurement" OSD can now be activated alternatively as long as this function is active.
"**Reports**" This also opens a separate OSD showing the measurement and test values for each calibrated greyscale.

"**Calib.**" launches the OSD used to start monitor calibration. Please follow the on-screen instructions. Before calibration, the device must have been operational for at least 1h at a brightness of 100-120cd/m². Enter the current date. After that, you can start the calibration. The display creates test reports after each calibration. The reports can be retrieved from the "Reports" submenu or transferred to a PC via RS232. The values can also be shown graphically in a custom Excel data sheet.

Sensor:
Permits the selection of the colourimeter used for the creation of the measurement values table as mentioned under "Calibration". Currently eligible colourimeters include **PM5639/94** of DK-Audio, **CS200** of Konica Minolta and **Specboss 2011** of Jeti; the latter two have USB interfaces for connection to the monitor via a PC.

Passwords:
This area is used for the configuration of passwords at the "User" and "Service" levels. As usual, the checkbox determines whether the password is shown or not. The "Reset" command resets the corresponding password.

Network & COM:
Deals with the setup of the serial interface and all relevant Ethernet settings.
"**COM**" defines the serial interface. Possible values include "9600,8,E,1", "57600,8,E,1", "115200,8,E,1" and "460800,8,E,1".
"**DHCP**" activates / deactivates the dynamic allocation of an IP address.
The "**MAC**" address is only shown for information purposes.
The "**IP**" address can be input here if static addresses are used. The subnet mask can be input after the slash. E.g.: /24 means that the first 24 bits of the IP address represent the address space in which the device is located.
The "**Gateway**" must also be specified if users intend to establish communication with the PMD from outside the local address space.
"**Host**" allows the assignment of a unique name for the PMD inside the network.

UMD and tallies:

These groups are used to configure the UMD appearance. UMD data (text + tally bit) can be transmitted as UDP packets via the Ethernet connection.

"**Version**" Selection of the pack frame. The available choices here are TSL3.1 TSL4.0 and TSL5.0
"**UDP Port**" An essential component of the UDP packet. Only UDP packets from the selected port are received.
"**Screen**" Configuration of the screen number for TSL5.0 or the UMD address for TSL4.0 and TSL3.1
"**Display**" Configuration of the display number for TSL5.0
"**Large**" Large-size UMD.
"**Bar**" Activates a "bar" in the background of the OSD area (as shown above). If the "Bar" item is deactivated, the area between the tallies and the text is transparent.
"**Type**" Adjusts the width of the tallies in stages from 1 to 8. These can be shown as small dots (stage 1) up to a size occupying the entire area around the UMD text.
"**( )**": Configures the shape of the edges of the tallies and text boxes. Possible choices here include round, sharp and square.
"**UMD STATIC TEXT**": A static text can be entered here. This text will remain active until another text is received via UDP.

Tallies

Since several programs - such as VSM – only implement the TSL protocol to a limited extent, it is possible to configure the individual tally bits here.

"**0/RH**" configures the effect of tally bit 0 for the TSL3.1 protocol or the RH (Right Hand) information for TSL4.0 and TSL5.0
"**1/Txt**" configures the effect of tally bit 1 for the TSL3.1 protocol or the Tx (Text) information for TSL4.0 and TSL5.0
"**2/LH**" configures the effect of tally bit 2 for the TSL3.1 protocol or the LH (Left Hand) information for TSL4.0 and TSL5.0
The following options for the three tally bits are available:

Off: The tally bit is ignored
Auto: The received colour value is passed through (only TSL4.0 and 5.0). 0: Off 1: Red 2: Green 3: Yellow
RH: Right tally
LH: Left tally
R+L: Right and left tally
ALL: Right, left tally and text background

Red, Green, Blue: Any set tally bit or colour information other than "Off" is shown in the selected colour. In the event of conflicting settings, the colour red has the highest priority, otherwise the order is: RH, Txt, LH (highest).

Backlight control:
This menu item is used for backlight adjustment according to the ambient light conditions.

"**External**" activates the brightness sensor on J421. After a reference measurement is performed, it is possible to configure backlight brightness in Lumen, Lux or Candela. Thus, backlight brightness is controlled depending on the brightness of the surrounding environment.

"**Factor**" Calibration parameter of the sensor for a reference measurement. This value must be adjusted so that the current measurement value shown under "**Y**" (in the "External" section) corresponds to the value of the reference measurement device.

"**Min**" and "**Max**" are the environmental brightness values used to set the backlight brightness to minimum / maximum.

"**Test**" This checkbox considerably accelerates the 5 min reaction times. This setting is intended primarily for functional tests at the factory.

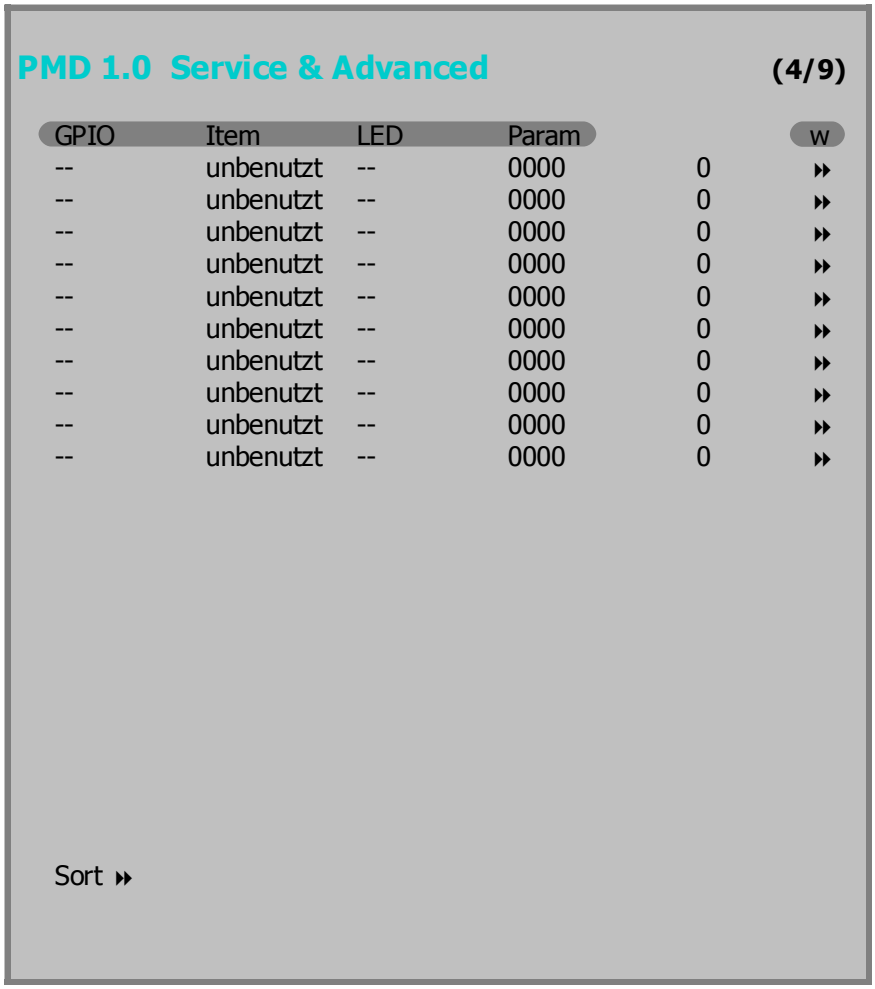
Anti-sticking:
"**Rotation**" Reduces the burn-in effects of static image content by shortening the image by 8 pixels both horizontally and vertically and then rotating the resulting image through the top-left, top-right, bottom-right and bottom-left positions. The next position is selected after 2 minutes. If the input format corresponds to the selected display format, some pixels are truncated. This ensures that the remaining pixels are still shown 1:1. If the input format is different from the display format, i.e. if the input image is already being scaled, only the scaling is changed.

Miscellaneous:
The "**Energy saving**" mode causes the display to go into standby if no signal is available for 30 seconds.
"**IR Code**" defines a two-digit number, which must be received by the IR remote control before the monitor reacts to IR commands. The receipt of any code other than this predefined IR Code deactivates the display's reaction to further IR commands. IR Code 00 deactivates this function.
"**IR off**" stops monitor control via IR remote altogether.
"**Test image**" starts up the integrated test image generator.
"**Grid**" is an option of this test image generator and activates a grid, which is superimposed over the actual test image.
"**small OSD**" is used to replace the "normal" 2-page OSD with a simplified OSD version, which only contains a concise summary of the most important functions.

"**Chip**" is the chip ID of the monitor. This ID and the "**SN1**" serial number are required for the purchase of additional licence keys. Licence keys are used for activating the optional functions of the PMD. The functions available through the currently installed licence key are shown at the end of this OSD page.

OSD page 4 – 2nd service page for customer GPIOs (only available if activated in BIOS)

Note:
This page is only displayed if the "ExtGPIOs" function is activated from BIOS - System Setup.

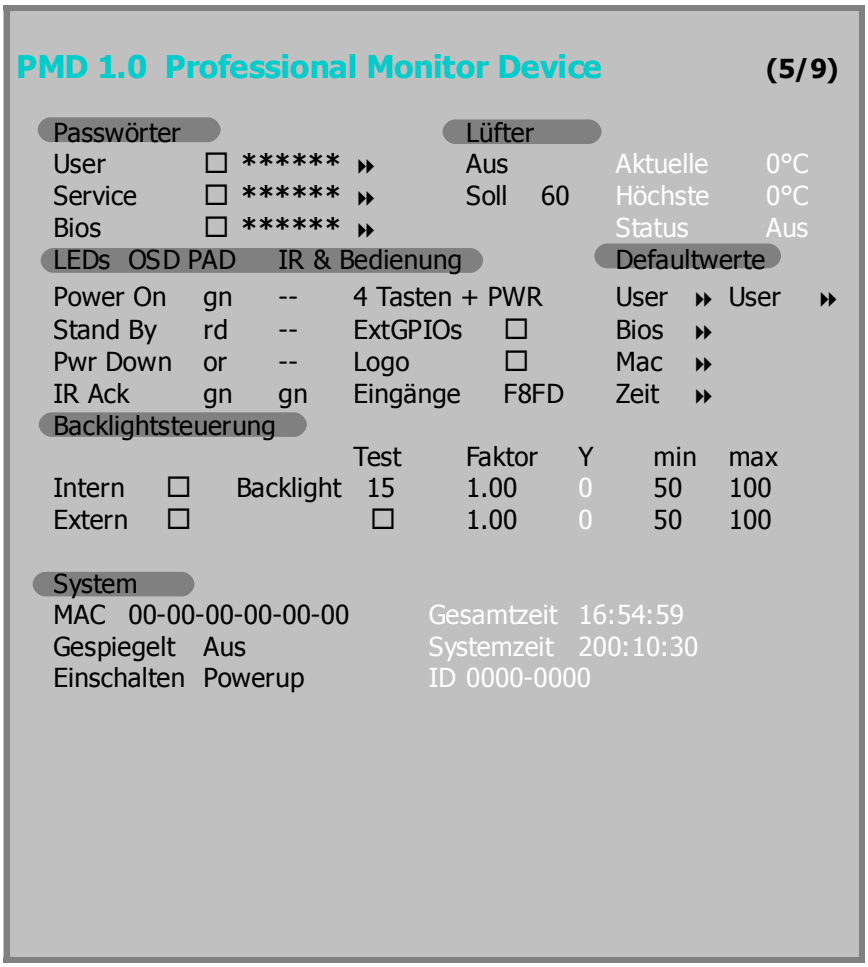


GPIOS:
This page can be used by customers to assign hotkeys to OSD or GPI (General Purpose Input) keys or to freely connect LED outputs to custom functions. Up to ten configurations are available here.

10 entries on the service level and 40 entries on the BIOS level are available. The service-level entries can be used if the monitor has a GPIO interface.
The BIOS-level entries are designed for the definition of keys or rotary encoders that are part of the monitor.
The selection of GPIs and LEDs on the service level is restricted. This serves to ensure that both functions can be used in parallel, while preventing the user from overwriting BIOS definitions.

You can find more details in the BIOS GPIO description.

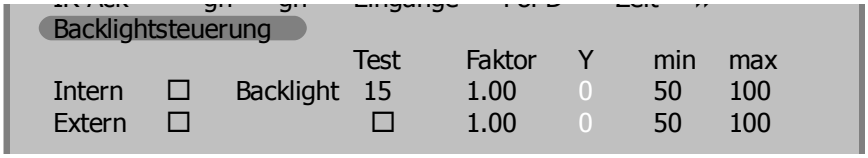
OSD page 5 – 1st BIOS Page



Passwords:
This section is used to set the passwords for the "**User**", "**Service**" and "**Bios**" levels. The checkbox makes passwords visible and the Reset command resets the passwords to the default values.

Fan:
If a fan is installed, this menu item can be used to configure its operation.
"**On**": The fan runs continuously.
"**Off**": The fan is always off.
"**Auto**": The fan is switched on if the interior temperature gets higher than the "**Target**" temperature. The fan is switched off upon reaching a hysteresis of 2°C.
"**Current**" shows the current, "**Highest**" the maximum interior temperature ever measured inside the device.
"**Status**" allows control of the fan e.g. via RS232. "Status Off" means that the fan is switched off. "Status On" means that the fan is switched on. "Status Error" indicates a malfunction of the fan.

LEDs OSD PAD IR&Control:
There are four operating conditions that can be signalled via LED on the OSD PAD, through the Power button or at the IR receiver.
"**Power On**" The device is switched on. "**Standby**" The device is switched on and is currently in energy-saving mode because no signal is available. "**Pwr Down**": The device has been switched off via the Power button (IR, or RS232 command).
"**IR Ack**": Upon activation of the IR remote control, the device acknowledges the received signal by briefly flashing an LED. For each operating condition, users can define the colour of the Power LED button in the first column and the colour of the IR remote control's LED in the second column. The following options are available for the colour of the Power button: "▫▫" (no indication), "**rd**" (red), "**or**" (orange), "**gn**" (green). For the colour of the OSD-PAD IR LED: "**--**" (no indication), "**or**" (orange), "**gn**" (green).
"**4 buttons+PWR**" configures the preferred OSD PAD mode. The available options without jumper J201 (JOG DIAL select) are: **3 buttons**, **3 buttons + PWR** (Power), **4 buttons**, **4 buttons+PWR**, **5 buttons** (PWR is the 5th button, Power On/Off is no longer available). With Jumper J201: **JOG** and **JOG+PWR**.
"**ExtGPIOs**" activates the service-level GPIO page for customers e.g. via a service connector. Please also refer to the detailed GPIO Setup description.
"**Logo**" enables the display of a corporate logo in the top left corner of the OSD. Also see the detailed description under "Logo". "**Inputs**" All inputs unavailable for the current device as per page 1 of the OSD can be disabled here.
Default values:
"**User**" resets all settings on pages 1 and 2 for the currently active user. The settings for other users remain unaffected. The reset is identical with the reset on page 1 of the OSD under "Inputs: Reset".
"**Bios**" practically resets the device to the factory settings of the interface card. Licence keys, MAC and system time remain unchanged.
"**MAC**" resets the MAC address to the original.
"**Time**" resets the operating time of the device (the time shown on page 2 of the OSD). The total operating time visible only on the BIOS level is not affected by this reset.



Backlight control:

"**Internal**" activates the sensor on J420. After a reference measurement, the backlight brightness can be configured in Lumen, Lux or Candela. Brightness changes attributable to temperature drift or the long-term loss of backlight brightness due to ageing components can thus be controlled automatically.

"**Factor**" Calibration parameter of the sensor for a reference measurement. This value must be adjusted so that the current measurement value shown under "**Y**" (in the "External" line) corresponds to the value of the reference measurement device.

"**Min**" and "**Max**" are now the lower and upper boundaries for backlight brightness as configurable in the "Backlight" menu item.

"**Backlight**" allows backlight configuration enabling the quick setup of the "**Min**" and "**Max**" values. To do this, users must first deactivate the internal control of backlight brightness; otherwise the "**Min**" and "**Max**" boundaries would already be set by the system. In order to ensure that reliable boundaries are maintained, it is advisable to allow for a certain backlight shut-off delay.

"**External**" activates the brightness sensor on J421. After a reference measurement is performed, the backlight brightness can be configured in Lumen, Lux or Candela. Backlight brightness is controlled depending on the brightness of the surrounding environment.

"**Factor**" Calibration parameter of the sensor for a reference measurement. This value must be adjusted so that the current measurement value shown under "**Y**" (the "External" line) corresponds to the value of the reference measurement device.

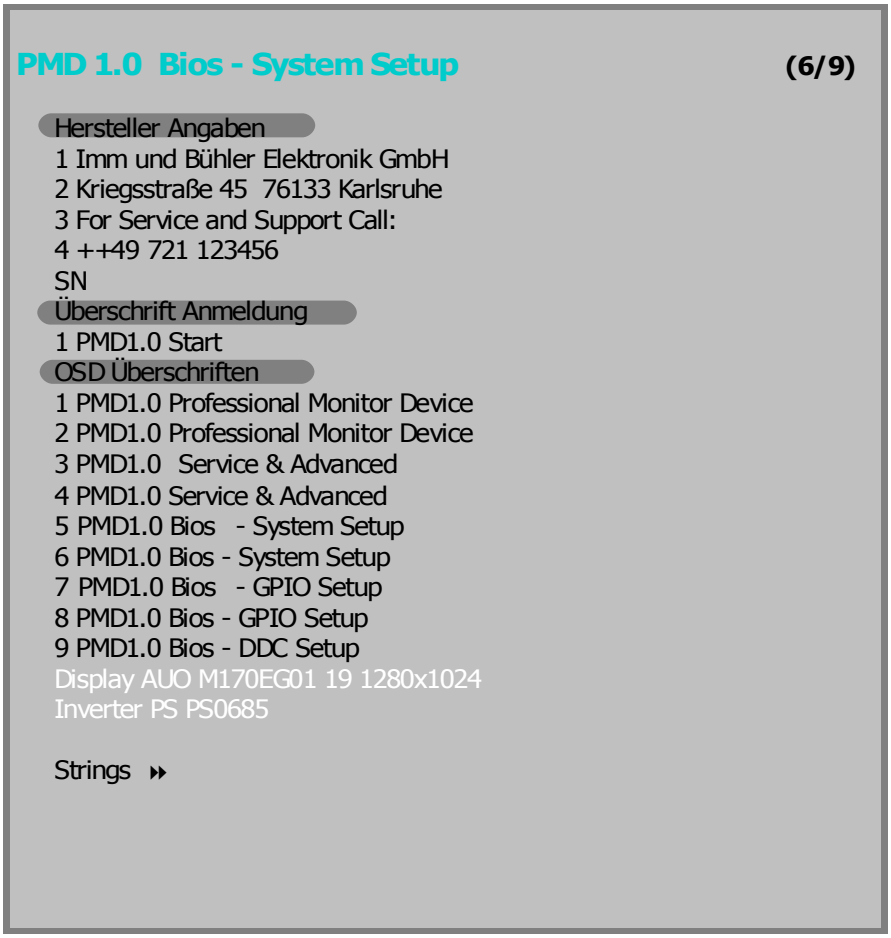
"**Min**" and "**Max**" are the values for ambient brightness which would set the backlight brightness to minimum or maximum levels.

"**Test**" This checkbox considerably accelerates the reaction time of approx. 5 min. This setting is intended primarily for functional tests at the factory.

The internal and external controls can also be used simultaneously. Depending on the ambient brightness, the display brightness is adjusted within the boundaries established under "**Internal Min Max**".

System:
If customers have their own specific MAC address space, they can assign custom MACs to the PMD by modifying the "**MAC**" field.
"**Mirroring**" provides the "**Off**", "**H**", "**V**", "**H+V**" options for individual or combined horizontal and vertical mirroring. This function can be used in cases where the display has been installed "upside down" at the factory. This installation type is sometimes applied e.g. to fulfil custom requirements for the viewing angles of displays.
"**Activation**" determines whether the device should be switched on immediately after the voltage supply is connected ("**Power Up**") or if the device has to remain inactive and wait until the "**Power**" button is pressed ("**on key press**").
"**Total time**" represents the full operational hours of the device. This time cannot be reset.
"**System time**" is the operating time of the device as shown on the OSD pages at the User level. This time can be reset.
"**ID**" is the unique digital identification number of the CPU.

OSD page 6 – 2nd Bios page headings

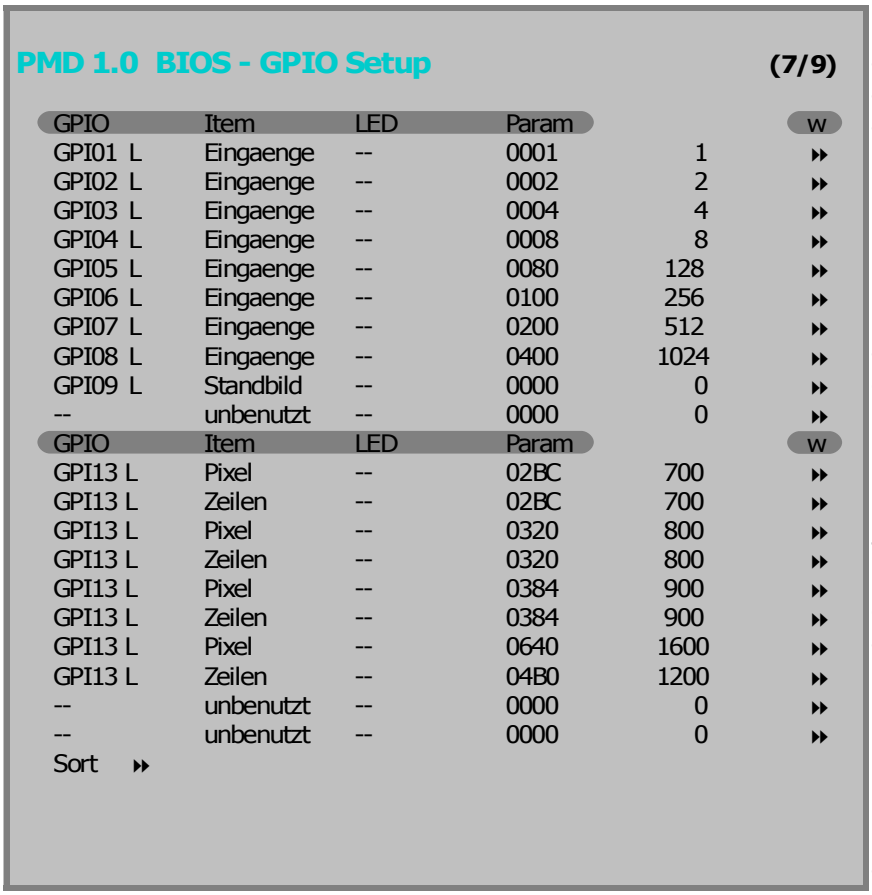


Manufacturer information:
This is the information displayed on the login page.

Login page heading:
This is the title of the login page.

OSD captions:
These are the titles of the respective OSD pages. Additional information included here shows the display and inverter designations.
"**Strings** ⏩" resets all caption data to the delivery status defaults.

OSD page 7 & 8 – 3rd/4th Bios page, GPIO Setup



If "ExtGPIOs" is activated, users can configure inputs 1...8 and LEDs 1...8 on their own at any time. In this regard, it is important to ensure that the inputs are not already being used in the BIOS area.

In the **GPIO** column, users can select the desired **G**eneral**P**urpose**I**nput (abbreviated as GPI).

"**Item**" selects the actual function or property to be modified by pressing a button. All functions of the user's OSD pages, ranging from "Still image" / "Input" switchover to "Brightness" and "Contrast", are selectable here.

The "**LED**" column specifies which LED (if any) should signal the activation of the selected function. The available choices here are LED1 through LED32. Similarly to GPI, users can choose whether the LED should be switched on ("LED1 *") or off "LED1 o" when the desired condition is reached.

Some functions can be refined additionally via "**Parameters**". For example, users may decide to restrict input selection to certain inputs or simply assign a fixed value for a particular setting. Depending on the individual functions, it can be reasonable to display the parameter as a hexadecimal or a decimal value. This is the reason why both numeral systems are shown here: the "Parameter" value is displayed in two columns.

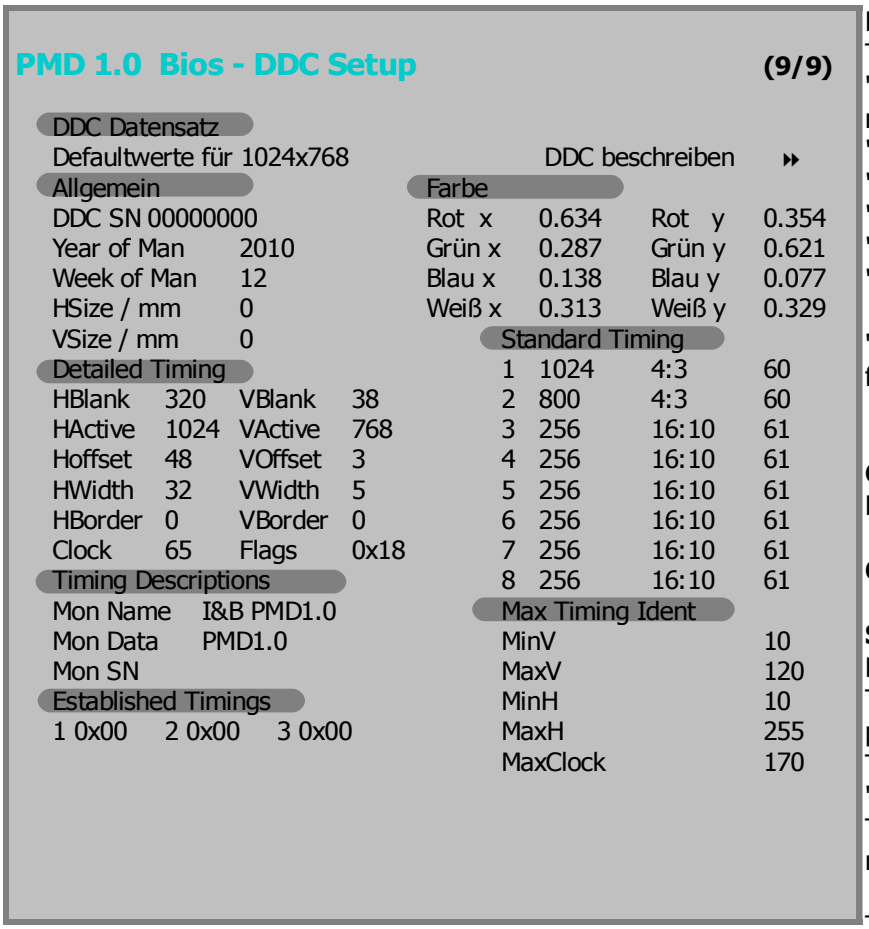
The "⏩" command in the last column permits the sorting of entries. If this command is selected, users can press the "OSD -" [Minus] button to add an empty line for new entries below the current line. The "OSD +" [Plus] button is used to swap the positions of the current line and the line below.

"**Sort**" sorts all entries according to the selected GPIs in ascending order.

There are no restrictions regarding the usage frequency of GPIs, properties, functions or LEDs. Theoretically, the same input condition can be used for all lines. The list is sorted from top to bottom, i.e. if a parameter is assigned different values for the same event over several entries, all values are set in succession and the bottom line remains active until the next event. The example above shows how several parameters can be configured via GPI13 with a single button click (pixels and lines)

You can find more information in the sections for GPIOs and GPIO wiring.

OSD page 9 Bios - DDC Setup



DDC data set:
This item is used to set the appropriate "**Default values for**" displays with the resolutions:
"1024x768", "1280x768", 1360x768", "1368x768", "1152x864", "1280x720", "1280x960", "1280x1024", "1600x1200", "1920x1080", "1920x1200" and "2560x1440".

"**DDC description**" describes the two EEProms for DVI inputs.

General:
Production data

Colour:

Standard Timings:
Describes the eight possible standard timings.
The first column contains the number of active pixels.
The second column shows the aspect ratio - "**4:3**", "**5:4**", "**16:9**" or "**16:10**".
The third column shows the display's refresh rate.

The "**256 16:10 61**" setting means that this data set is unused.

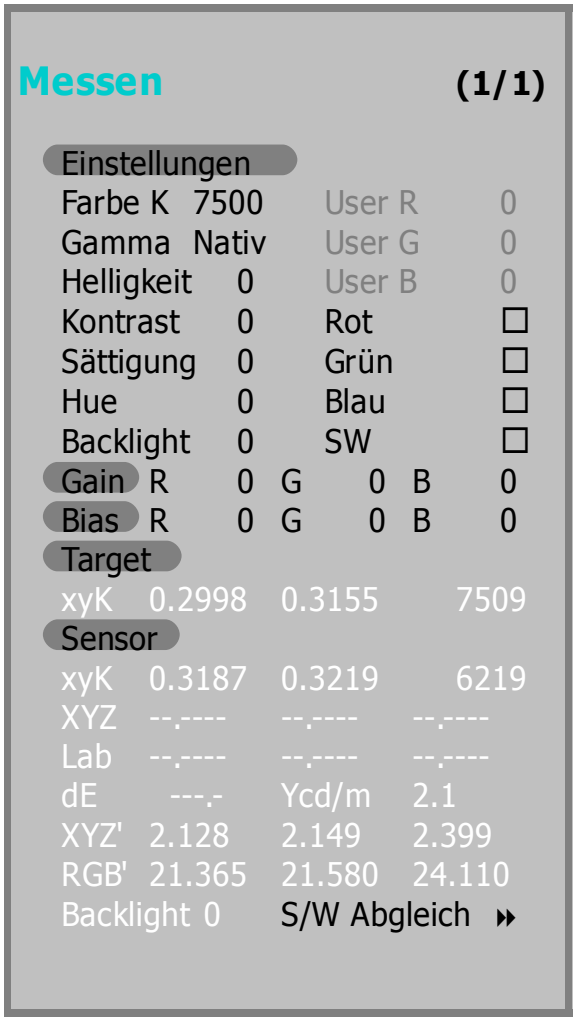
OSD Login page

The login page starts with displaying important information about service and support. These first few lines are manufacturer information and can be defined on page 6 of the OSD. Next, the page shows the **serial numbers**, the **software version** and the **operating hours**. Further down, the page contains information about the network settings including **DHCP** status, **MAC** address, **IP/Subnet mask**, **Gateway** and **Hostname**.

Login:
Users can log in here.
The **checkbox** can be used to show/hide the password during entry. The password can be entered in either mode.
"⏩" resets the password to the default value.

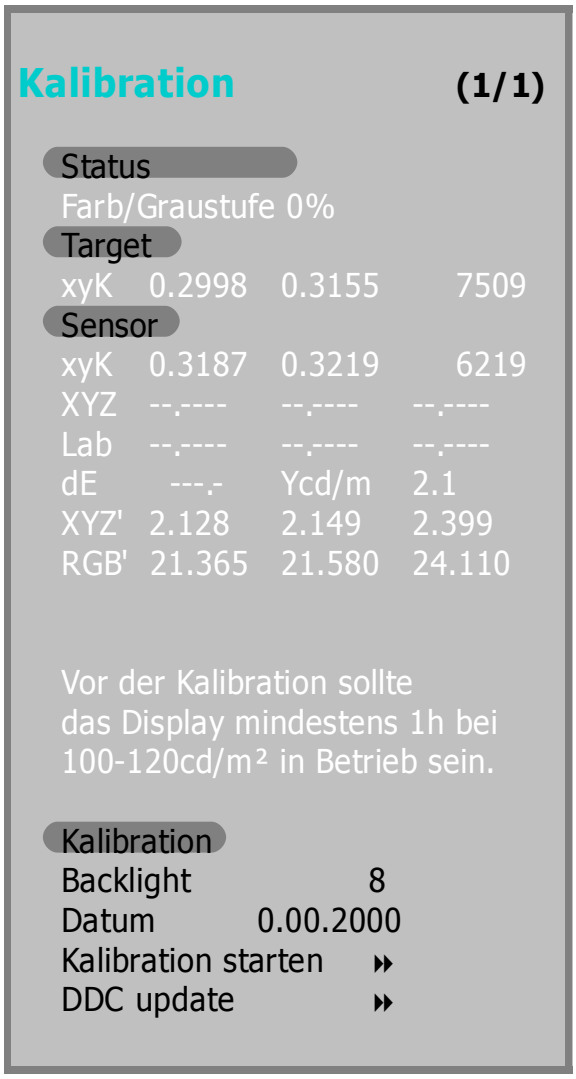
After the monitor is switched on, the login password is set to 000000, i.e. no password is set. The password is also reset after a timeout of approx. 30 seconds.

OSD colour calibration - measurement



The measurement menu is used to inspect the current display performance. All parameters related to the colour configuration of the display can be modified under Settings, Gain and Bias. The Target section shows the CIE1931 coordinates (xy) and the resulting colour temperature (K).
The current measurement values can be viewed under Sensor. In the first place, this section also includes the CIE1931 xy coordinates and the resulting colour temperature (K). A new adjustment (black/white calibration) has to be performed to ensure the correct display of follow-up values - XYZ, Lab and dE (deltaE). Note that it is desirable to place the measurement device as centred as possible in front of the screen during calibration. The calibration can be repeated several times (the calibration parameters remain unchanged). Among other things, display calibration also serves to normalise Y for the maximum display brightness (Y=100.).
Ycd/m² is the absolute brightness in Candela per square metre. The XYZ' and RGB' values represent the current sensor values.

OSD colour calibration - Calibration



The calibration menu is used for performing display calibration.
Since the brightness and colour temperature of the backlight vary extremely with temperature, it is recommended to initially operate the display without changing the settings for a certain time. The brightness can first be set to a value between 100 and 120cd/m² through the Backlight menu item. Subsequently the display should be operated for at least one hour without changing any backlight settings.
Users have the option to record the calibration date. The calibration process is started by pressing ***Start calibration***.

During the measurement process, users can monitor the target and actual values under the Target and Sensor sections.

Details (Functional description)

Input modules for J1, J2, J3, J4

A number of input modules are currently compatible with plug connectors J1-J4. To ensure correct operation, users must configure the respective input module in the OSD (OSD page 5, Group Leds OSD PAD & Controls).

Input module	Description	Configuration (in OSD)
PMD-IM-STD-AC	1x VGA, 1x DVI, 3x FBAS as Cinch, MiniDin, RJ45	PMD-IM-Std
PMD-IM-STD-AB	1x VGA, 1x DVI, 3x FBAS as BNC MiniDin, RJ45	PMD-IM-Std
PMD-IM-STD-BC	1x VGA, 2x DVI, 3x FBAS as Cinch, MiniDin, RJ45	PMD-IM-Std
PMD-IM-STD-BB	1x VGA, 2x DVI, 3x FBAS as BNC MiniDin, RJ45	PMD-IM-Std
PMD-IM-STD-DB	1x VGA, 1x DVI, 2x FBAS as BNC, MiniDIN	PMD-IM-Std
PMD-IM-HAM-A	1x VGA, 1x DVI, FBAS, MiniDIN, DC	PMD-IM-Ham
PMD-IM-HAM-B	1x VGA, 1x DVI, DC	PMD-IM-Ham
PMD-IM-HAM-C	1x VGA, 1x DVI, FBAS, MiniDIN, YcrCb, DC	PMD-IM-Ham
PMD-IM-REI	2x VGA, 2x DVI, 3x FBAS as BNC MiniDin, RJ45	PMD-IM-REI
PMD-IM-ECH	1x VGA as HDSUBD, 1x VGA with 5x BNC	PMD-IM-STD

SD/HD/3G SDI Input Modules for J140, J141

There are two input modules for SD/HD/HD3G signals:
1. PMD-IM-HD3G, with an active loop

The input module for the 1st SDI input is connected to J141 and the input module for the 2nd SDI input is connected to J140. If only one input module is used, it must be connected to J141 for all software versions up to version 232V7IB / 008V7IB.

2. PMD-IM-DualHD3G, without a loop with a second input. This configuration is supported as of software version 232V7IB / 008V7IB. Starting with this version, the input modules are recognised and assigned automatically. If only one input module is used, it can also be connected to J140 (recommended). If two input modules are used, the first should be connected to J141, the second to J140. The input modules can be installed in any sequence. The corresponding menu items in the OSD are activated automatically. In summary, this results in the following allocation:

J141 with IM-HD3G	HDSDI1	HDSDI1		
J141 with IM-DualHD3G 1st input			HDSDI1	HDSDI1
J141 with IM-DualHD3G 2nd input			HDSDI2	HDSDI2
J140 with IM-HD3G	HDSDI2		HDSDI3	
J140 with IM-DualHD3G 1st input		HDSDI2		HDSDI3
J140 with IM-DualHD3G 2nd input		HDSDI3		HDDSI4

Backlight Inverter Setup

Backlight inverters are usually controlled through an ON/OFF signal and a brightness signal. The brightness signal can be either analogue or a digital PWM signal. For analogue brightness signals, brightness is controlled steplessly between the minimum and maximum brightness. It is necessary to specify the minimum / maximum voltage values. Hence, users must define the following parameters for analogue-controlled inverters:

- Voltage level of the ON/OFF signal (3.3V or 5V)
- Polarity of the ON/OFF signal (backlight on for low or high polarity)
- Voltage value of the brightness signal for minimum backlight voltage
- Voltage value of the brightness signal for maximum backlight voltage

If a PWM signal is available, the brightness is controlled over a duty cycle. The following parameters are required for configuration:

- Voltage level of the ON/OFF and PWM signal (3.3V or 5V)
- Polarity of the ON/OFF signal (backlight on for low or high polarity)
- Duty cycle of the brightness signal for minimum backlight voltage
- Duty cycle of the brightness signal for maximum backlight voltage

This information can be obtained from the data sheet of the inverter.

These parameters are configured by means of special RS232 commands. The commands are sent to the PMD through a terminal program (see RS232 Commands and Realterm).

You can use the **`inv_?`** command to retrieve the current values for all inverter parameters:

```
inv_name=$AUO M170EG01 19 1280x1024
inv_ctrl=0x0011
inv_min=200
inv_max=0
inv_steps=15
inv_pdvalue=0
inv_frq= 180
```

BRIGHTNESS signal & inverter designation	
INV_NAME	Entry containing the inverter name. The name is set in this way: inv_name=$.....
INV_CTRL	Hexadecimal compound value for the inverter data as shown by the invctrl_? command Bits: 0-> ONOFF polarity: 0->NEG, 1->POS 1-> PWM/Analogue: 0->Analogue control voltage, 1->PWM Signal 2-> LVTTL or TTL level selection: 0->Brightness High 5V level, 1-> Brightness High 3.3V level 3-> Should power down value be used: 0->no, 1->yes 4-> 5-> PWM frequency to be used: 0->configured PWM frequency, 1-> triple vertical frequency
INV_MIN	Lowest brightness value 0 (0V) .. 500 (5V) for analogue control voltage 0 (0% Duty Cycle) .. 100 (100% Duty Cycle) for PWM signal
INV_MAX	Highest brightness value

	0 (0V) .. 500 (5V) for analogue control voltage 0 (0% Duty Cycle) .. 100 (100% Duty Cycle) for PWM signal
INV_STEPS	Number of backlight control steps; adjustable in the OSM. The standard is 15. This value can be increased accordingly if the backlight needs to be adjusted in finer increments.
INV_PDVALUE	PowerDown value. No ON/OFF signal is available for some backlight inverters. These inverters can often be switched off via the BRIGHTNESS signal. If this is the case, this value should be defined. The value can only be used if INVCTRL_USEPDVAL is set to 1. 0 (0V) .. 500 (5V) for analogue control voltage 0 (0% Duty Cycle) .. 100 (100% Duty Cycle) for PWM Signal
INV_FRQ	Frequency of the PWM signal. Usually 3 or 4 times the V frequency

Breakdown for the **invctrl_?** command:

```
INVCTRL_PWRPOL=POS
INVCTRL_MODE=Analogue
INVCTRL_LEVEL=5V
INVCTRL_USEPDVAL=No
```

ON/OFF signal	
INVCTRL_PWRPOL	Polarity of the On/Off signal 0->NEG: Negative polarity (If the inverter must be switched on, the signal is low) 1->POS: Positive polarity (If the inverter must be switched on, the signal is high)
INVCTRL_MODE	Selection between analogue control voltage or PWM signal. 0->Analogue 1->PWM
INVCTRL_LEVEL	0->5V: Brightness High at 5V level 1->3.3V: Brightness High at 3.3V level
INVCTRL_USEPDVAL	Use of the power down value: 0->no 1->yes

For example: You can enter the following commands via Hyperterminal or Realterm:

INVCTRL_PWRPOL=POS , INV_MIN=200 , INV_MAX=0, INVCTRL_LEVEL=5V

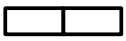
The ON/OFF signal is set to a max. level of 5V with positive polarity. The analogue control voltage is set in the range from 0V to 2V.

The **save?** command saves all implemented changes. You can use **`inv_?`** and **`invctrl_?`** to retrieve all INV_ and INVCTRL_ parameters for the current configuration.

Display adjustment

New display timings should be established according to the "typical" values in the Display Timing Specification. To ensure proper synchronisation for the fluid display of moving images, it is important to operate the display at a frequency slightly higher than 60Hz. The frame rate can be calculated using this equation: F [hz]= CLOCK / HTOTAL / VTOTAL.

Important: Check the display voltage (VCC_TFT) in the data sheet! It is essential to check the control voltage settings before connecting a new display. Control voltage is configured via a 3-pin row at jumper J320.


No jumper: 3.3V

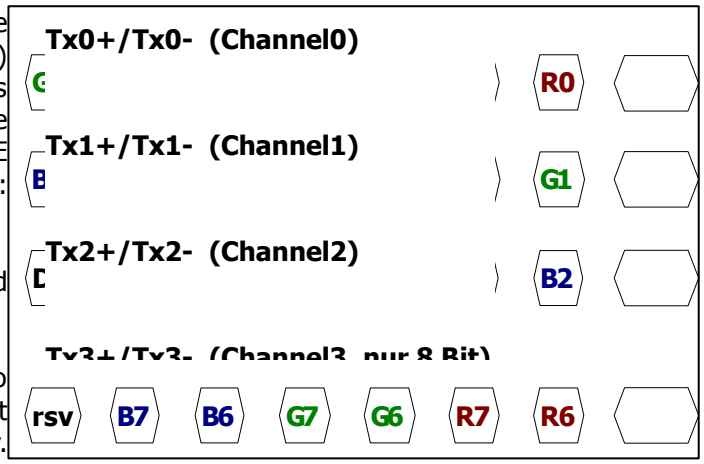

Jumper 1-2: 5V


Jumper 2-3: 12V

TFT displays generally have three types of interfaces:

TTL interface: The pixel data are sent to the display with 6 or 8 bits per each colour: red (*R7, R6,* R5, R4, R3, R2, R1, R0), green (*G7, G6,* G5, G4, G3, G2, G1, G0) and blue (*B7, B6,* B5, B4, B3, B2, B1, B0). The HSync, VSync, DE (Data Enable) and clock control signals are on additional pins. TTL displays require a different firmware compared to LVDS displays. The "TTL Firmware" files are named "xxxV7IBT.HEX" instead of "xxxV7IB.HEX".

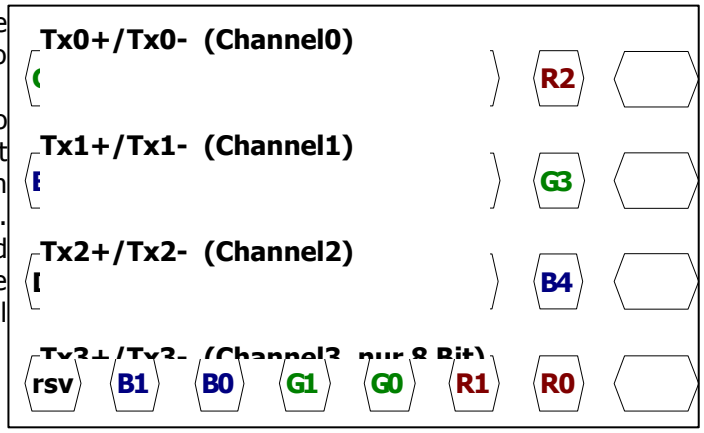
Single LVDS interface: The colour and control signals are transmitted serially on 3 differential channels (Tx2, Tx1, Tx0) and in one differential clock (TxClk+,TxClk-). The pixel clock is multiplied by a factor of 7. Correspondingly, the 6 bits for the three colours (red, green and blue) and the H, V, DE synchronisation signals are distributed across three channels: Tx2, Tx1 and Tx0.



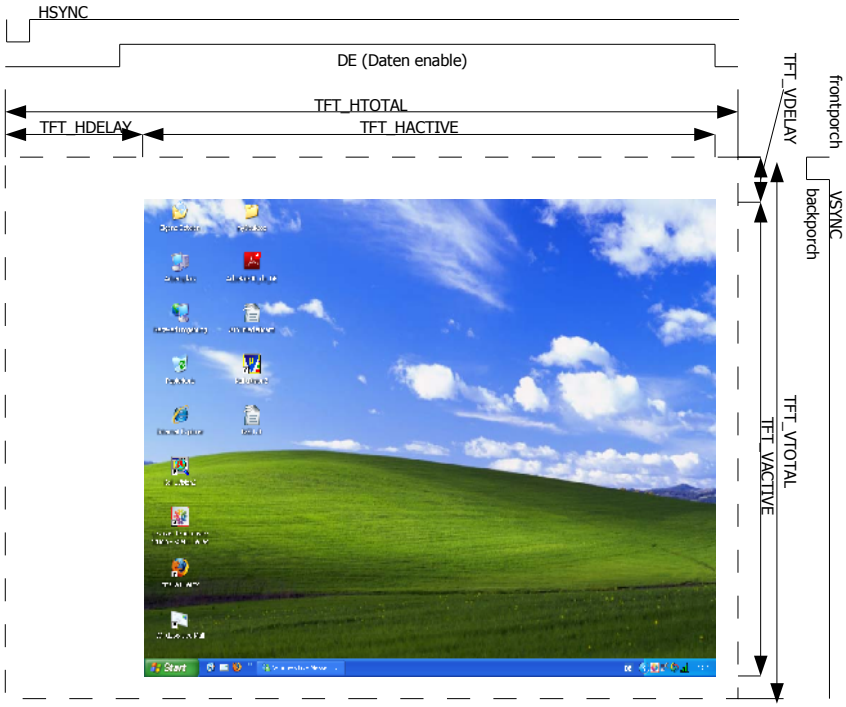
For 8-bit colour depth, the additional two bits are transmitted through a fourth channel: Tx3.

Of course, this channel can also be used to transfer the two LSBs (least significant bits) in addition to the MSBs (most significant bits). The distribution would then look differently. These two different types of bit distribution are part of what is referred to as **LVDS Mapping**. Some displays offer the capability of changing the LVDS Mapping through a control signal. The mapping can also be modified internally in the PMD (see `tftctrl_?`).

Dual LVDS interface: the maximum LVDS data transfer rate is 480MBit/s. Thus, it is possible to transfer resolutions up to XGA/WXGA on a single port.
A second LVDS port is necessary for higher resolutions. Two ports would double the bandwidth, which would be sufficient to transmit WUXGA signals. All even pixels are transferred on one LVDS port, all odd pixels on the other LVDS port. Unfortunately, this allocation is not always clearly defined because the notation depends on whether the pixels are counted from 0..1279 or from 1..1280. However, the usual procedure is to transfer the first pixel via the odd port.



Timing data



Similarly to inverter data, timing parameters are also transferred via RS232. Horizontal values are always specified in pixels, vertical values in lines. The **`tft_?`** command can be used to retrieve the current settings:

```
tft_name=$AUO M170EG01
tft_clock=1200
tft_pixel=1280
tft_lines=1024
tft_htotal=1688
tft_hs=40
tft_hdelay=300
tft_vtotal=1066
tft_vs=4
tft_vdelay=30
tft_ctrl=0x0250
tft_sync=1
tft_gpio0=N.C.
tft_gpio1=N.C.
tft_gpio2=N.C.
tft_gpio3=N.C.
```

`tft_clock:` Pixel rate in 1/10 Mhz. (1200 = 120.0Mhz).
`tft_pixel, tft_lines:` Active pixels and lines.
`tft_htotal, tft_vtotal:` Total pixels and lines.
`tft_hs, tft_vs:` Width of the Hsync and Vsync synchronisation signals.
`tft_hdelay, tft_vdelay:` Pixel/Line starting from which the 1st active pixel is displayed (DE Start).
`tft_ctrl:` TFT_CTRL contains a combination of several settings. The individual options can be queried with **`tftctrl_?`**:

```
tftctrl_hpol=LOW(0) [ HIGH(1), NEG(2), POS(3)]
tftctrl_vpol=LOW(0) [ HIGH(1), NEG(2), POS(3)]
tftctrl_de=POS(1) [ NEG(0)]
tftctrl_clock=NEG(0) [ POS(1)]
tftctrl_ports=DUAL(1) [ SINGLE(0), QUAD L/R(2), QUAD 1/2/3/4 (3)]
tftctrl_swp=SWAP(1), [ NOSWAP(0)]
tftctrl_map=A(0), [ B(1) C(2) D(3)]
tftctrl_dith=OFF(0) [ 6BIT(1) 8BIT(2)]
tftctrl_vcclvds=LVDS(0) [ VCC(1)]
```

`tftctrl_hpol, tftctrl_vpol:` Used to switch off the HSYNC and VSYNC signals and output permanent **LOW** / **HIGH**. The **NEG** / **POS** parameters activate negative / positive signal polarity.
`tftctrl_de:` Establishes the polarity of the DE signal as **NEG** or **POS**. The DE Signal cannot be switched off and must always remain positive for LVDS displays.
`tftctrl_clock:` Establishes the polarity of the clock signal as **NEG** or **POS**.
`tftctrl_ports:` Defines the "Width" of the LVDS connection. With quad displays, it is possible to decide whether the display is shown in left/right halves (QUAD L/R) or whether 4 consecutive pixels should be transferred simultaneously.
`tftctrl_swp:` Swaps the ports for odd and even pixels.
`tftctrl_map:` Defines LVDS Mapping.
tftctrl_map=A:

tftctrl_map=B:
tftctrl_map=C:
tftctrl_map=D:

NS National Semiconductor Tx3 → MSBs
JEIDIA 8Bit: Tx3 → LSBs 1,0 10 Bit: Tx3 -> Bit 3,2 Tx4 → Bit 1,0

`tftctrl_dith:` Permits the artificial increase of the colour depth through time-based dithering. The 6BIT setting extends a 6-bit display to 8-bit, the 8 BIT setting extends an 8-bit display to 10-bit.
`tftctrl_vcclvds:` Defines the Power Up Sequence. LVDS first generates a valid LVDS signal and then proceeds to activate the display's power supply, VCC first activates the display's power supply and then proceeds to generate the LVDS signal.

`tft_sync:` 0-> no synchronisation between input and output signals. 1->Active synchronisation, 2->Passive synchronisation, 3-> Optimised passive synchronisation with adjusted line length of the last line.
For the flawless reproduction of moving images, it is recommended that the input and output signals are synchronised with each other.

With **active synchronisation,** the device constantly monitors the phase between input vsync and output vsync. This phase is established so as to ensure that the output signal is displayed as soon as possible. In order to maintain this offset between input and output signals at all times, the PMD repeatedly adds a line (thereby slowing the timing) or removes a line (thereby accelerating the timing). The lines are added to/removed from the inactive area of the screen and therefore this process usually does not cause any issues. However, some displays do react very sensitively to such changes. The output image might then show artefacts. In such cases it is recommended to select passive synchronisation.

In **passive synchronisation,** the number of lines is calculated so as to ensure that the output has the same rate as the input as far as this is possible. However, since this calculation is comparatively coarse, the input and output rates tend to diverge approx. every 5 seconds. This means that 1 image out of 250 is displayed twice. This repetition is usually not perceivable visually.

With **optimised passive synchronisation,** the timing is optimised via the line length of the last line in such way that the input and output rates only diverge very infrequently. In comparison to "passive synchronisation", this method increases the divergence frequency from 5 seconds to 15..60 seconds. The optimisation is based on the adjustment of the last line; however, this approach can also lead to incorrect operation for some displays.

In each case the selected synchronisation type should be tested for 50Hz and 60Hz. The optimum type is (1) active Synchronisation. (2) is a good and safe compromise solution. For proper synchronisation, the output timing must be faster than the input signal.

`tft_gpio0,tft_gpio1,tft_gpio2,tft_gpio3:` The J300(J301) display connectors are equipped with 4 General Purpose I/Os (pins). These can be set to the values: N.C(0) → not connected, i.e. high-impedance, LOW(1) → 0V, HIGH(2) ->3.3V, GSEL 50/60 → Gamma select 50 /60 Hz (High for 50Hz, Low for 60Hz), GSEL /50 60 → Gamma select / 50 60 Hz (Low for 50Hz, High for 60Hz).

`save?` saves the configured values.

Example:
The relevant values in the examples shown below are highlighted in blue. It should also be noted that the horizontal data for dual LVDS displays is often specified for one channel only. I.e. 640 active pixels instead of 1280 and 62.5Mhz instead of 125Mhz.

Beispiel Timing 1: AUO M170EN04:

Signal	Item	Symbol	Min	Typ	Max	Unit
DTCLK	Freq	Fdck	50	67,5	70	MHz
DTCLK	Cycle	Tck	14,2	14,8	20	ns
+ V-Sync	Frame Rate	1/Tv	56,25	75	77	Hz
+ V-Sync	Cycle	Tv	13	13,33	17,78	ms
+ V-Sync	Cycle	Tv	1035	1066	2047	lines
+ V-Sync	Active lveel	Tva	3	3		lines
+ V-Sync	V-Back porch	Tvb	7	38	63	lines
+ V-Sync	V-front porch	Tvf	2	2		lines
+DSPTMG	V-Line	m	-	1024	--	lines
+ H-SYnc	Scan rate	1/Th	-	80,06	--	kHz
+ H-SYnc	Cycle	Th	800	844	1023	Tck
+ H-SYnc	Active Level	Tha(*1)	4	56		Tck
+ H-SYnc	Back porch	Thb(*1)	4	124		Tck
+ H-SYnc	Front porch	Thf	4	24		Tck
+ DSPTMG	Dispaly Pixels	n	-	640	-	Tck

Beispiel Timing 2: AUO M190EG02:

Item		Symbol	Min	Typ	Max	Unit
Data CLK		Tclk	40	54	67.5	MHz
H-Section	Period	Th	680	844	1024	Tclk
	Display Area	Tdisp(h)	640	640	640	Tclk
V-Section	Period	Tv	1028	1066	2048	Th
	Display Area	Tdisp(v)	1024	1024	1024	Th
Frame Rate		F	50	60	75	Hz

Beispiel Timing 3: CMO V420H1-L05:

Signal	Item	Symbol	Min	Typ	Max	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	74	80	Mhz	-
	Input cycle to cycle jitter	Trcl	--	-	200	ps	-
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	-
	Hold Time	Tlvhd	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr_5	47	50	53	Hz	-1
		Fr_6	57	60	63	Hz	-2
	Total	Tv	1115	1125	1139	Th	Tv=Tvd+Tvb
	Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	59	Th	-
Horizontal Active Display Term	Total	Th	2100	2200	2300	Tc	Th=Thd+Thb
	Display	Thd	1920	1920	1920	Tc	-
	Blank	Thb	180	280	380	Tc	-

Parameter	Bsp1	Bsp2	Bsp3	Timingspec
TFT_CLOCK	1350	1080	1480	Fdck, Tck, Tc * 2
TFT_PIXEL	1280	1280	1920	N, Tdisp(h) * 2, thd
TFT_LINES	1024	1024	1080	M, Tdisp(v), Tvd
TFT_HTOTAL	1688	1688	2200	Th * 2
TFT_HS	112	40	40	Tha, – , – 1)
TFT_HDELAY	248	400	200	Thb (backporch) – 2) Blank 2)
TFT_VTOTAL	1066	1066	1125	Tv
TFT_VS	3	5	5	Tva, –, – 3)
TFT_VDELAY	38	38	38	Tvb (backporch) –, 2) Blank 2)
TFT_CTRL				
TFT_SYNC				

1) Missing values can be estimated in most cases. 1/40 .. 1/20 of the total time can be assumed for H-Sync.
2) H / V Delay: 80%..100% of the inactive area.
3) V-Sync: Typically 5 lines

After all parameters have been configured, users can proceed to save them with the **`save?`** command.

Some displays have additional control signals, with some of the more common being **display mirroring signals**: DPS (Display Scan Direction), U/D (Up/Down Mirror), R/L (Right, Left Mirror), RPF (Display Rotation).

LVDS MAPPING:
LVDSMAP, SELLVDS, LCS (LVDS Mapping selection supported by the display, the function is similar to TFTCTRL_MAP)

8Bit / 6Bit selection:
FRC (NEC, Frame Rate Control i.e. 8Bit vs. 6Bit).
Note: Under normal conditions, the display should always be operated with the greatest available colour depth.

50/60Hz change-over:

FRC, ODSEL (Overdrive selection. I.e. colour reproduction is optimised for 50Hz / 60Hz).

Miscellaneous:
Display enable, or test pins which must be set to low or high.
Note: Display enable must be active at all times. The display is switched off via the supply voltage.

Auto-adjust, Signal identification, Default timing

The identification characteristics for one timing instance are represented by the horizontal frequency and the total number of lines. The measurement accuracy is sufficient for distinguishing between 74.25 MHz timing and 74.17 MHz timing (HD SDI). These parameters are used to retrieve the timing-specific settings (all settings in the "Resolution" group). If no timing has been saved yet, the PMD looks up a list of known timings to select an identical or similar timing and appropriately configure the geometry values (pixels, lines, offset, clock). The phase position continues to be detected automatically.
The "Autoadjust" command performs a full identification of all active and inactive areas, and then uses those to calculate the positions, clock and phase positions. Of course, the prerequisite for this procedure is that all edge areas in the input image are clearly identifiable. The procedure will not succeed if there is no image information about the edges of the active area.
The algorithm assumes that the number of active pixels and lines is known. This number is retrieved from a list of known resolutions. Furthermore, the algorithm can check whether the correct number of active pixels has been set. This allows for the automatic identification of widescreen displays. In other words, the PMD can distinguish between 1024x768, 1280x768, 1368x768 resolutions. However, it is not capable of independently identifying "new" formats, i.e. unknown resolutions.
This problem is solved by the second, "minor" Autoadjust function. Here, active pixels and lines can be configured preliminarily and the Autoadjust function "only" has to find the correct clock, positions and phase.

Brightness sensors

Two brightness sensors can be connected to the display.
The sensor on J420 is used to control backlight brightness. Once this sensor has been calibrated with a reference measurement via the „Factor" parameter, it is possible to configure the backlight brightness in Candela (cd/m²) as well as ensure that the display control can compensate for the loss of brightness due to aging CCFL tubes or LEDs. For more information, see the description of the OSD menu.

The sensor on J421 is used for controlling the backlight according to the ambient brightness. This sensor can be further calibrated in the "Backlight control/External" group via the "Factor" parameter. For more information, see the description of the OSD menu.

Colour Gamut

The following colour spaces are available:

Name	Red		Green		Blue		White	Gamma
	x	y	x	y	x	y		
ITUR-R BT709	0.640	0.330	0.300	0.600	0.150	0.060	D65	2.35
sRGB	0.640	0.330	0.300	0.600	0.150	0.060	6504	2.2
Adope RGB	0.640	0.330	0.210	0.710	0.150	0.060	6504	2.2
Apple RGB	0.625	0.340	0.280	0.595	0.155	0.070	6504	1.8
Colour Match RGB	0.630	0.340	0.295	0.605	0.150	0.075	D50	1.8
WideGamut RGB	0.735	0.265	0.115	0.826	0.157	0.018	D50	1.8
PAL/SECAM	0.640	0.330	0.290	0.600	0.150	0.060	D65	2.2
NTSC	0.670	0.330	0.210	0.710	0.140	0.080	C	2.2

The colour-specific parameters of the display must be configured properly to achieve a reasonably correct colour space reproduction. The parameters can be retrieved from the data sheet applicable for the respective display.

TFT_RED = 0.660 0.315

TFT_GREEN = 0.285 0.597

TFT_BLUE = 0.145 0.055

TFT_GAMMA = 1.9

Keep in mind that these values are too inaccurate for medical application (DICOM) and broadcast purposes. For such cases, it is recommended to calibrate the display using an appropriate Chroma Meter.

The "Native" setting means that the display/colour space properties remain unchanged.

Gamma, colour temperature

Gamma and colour temperature can be re-configured within the colour space. Similarly to gamut configuration, the correct reproduction of colours here is only possible after a successful calibration.

The following gamma curves are available:

Native, DICOM, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.35, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2

The following colour temperatures are available:

Native, A, B, C, D50, D55, D65, D75, E, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000, 4200, 4400, 4800, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6504, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7600, 7800, 8000, 8200, 8400, 8600, 8800, 9000, 9200, 9300, 9400, 9600, 9800, 10000, 10200,10400,10600, 10800, 11000, 11200, 11400, 11800, 11800

The "Native" setting means that the display/colour space properties remain unchanged.

Calibration

Before performing a colour measurement or calibration, it is necessary to establish a connection with the colour measurement device.

We currently support the following devices:

Konica Minolta CS200 (USB interface)
Jeti Specboss 2011 (USB interface)
DK-Audio PM5639/4 (RS232 interface)

Devices with an RS232 interface can be connected directly to the sensor interface of the monitor. Devices with a USB interface require a PC for the transmission of data between the USB and RS232 ports. For USB devices, the sensor interface of the monitor is connected to an RS232 interface of the PC. The measurement device is then connected to the PC via USB. This method requires that the software listed below is installed on the PC. To do this, users only need to drag and drop the file folder into the desired directory.

The following commands should be executed on the command line:

```
cs200 <COMPORT> <INTEGRATION TIME in seconds> <VERBOSE>
jeti_1211 <COMPORT> <INTEGRATION TIME in seconds> <VERBOSE>

cs200 2 2 v (v=verbose, i.e. enables the display of status messages,
optional)
```

An integration time of 2 seconds has been established as sufficient for CS200.
At lower brightness levels, the Jeti measurement device tends to ignore this requirement and the measurement can take considerably longer. The example above shows the establishment of a connection with the monitor via COM2 and the configuration of an integration time of 2 seconds for the measurement device.

The “Verbose” parameter allows users to view the communication between the monitor and the measurement device on their PCs.

Next it is necessary to set up the measurement device in the monitor’s OSD (OSD page 3). Finally, the calibration menu is opened and the calibration process is started.

GPIOs

GPIO: (General Purpose I/Os) Inputs and outputs for general use. Especially in the Broadcast area, it is common to use devices specifically designed with ease of operation in mind. These devices usually make the most important functions directly available via switches and potentiometers. In addition, the activation of functions is usually signalled via LED.

The following inputs and outputs are available here
24 GPIs for the connection of buttons and switches
32 LEDs
OSD keys: Plus, Minus, Exit (for leaving the OSD)
6 Incremental encoders

Please note that the LEDs are operated as a matrix, where transistors need to be implemented externally as line and column drivers. In addition, up to 6 incremental encoders are used to control parameters such as brightness, contrast etc....

The GPIOs are connected to GND via switches or buttons.

The entire "programming" of the GPIOs is done via the OSD. In this way it is possible to implement and test existing and new concepts in an easy and straightforward manner.
The BIOS area provides 40 "lines" for the realisation of the desired operating concept, and the service-level area provides users with 10 "lines".

Each "line" can be regarded as a line of programming code:

IF (*GPIO## Low/High*) THEN *ITEM* [is equal to parameter] [AND THEN *LED## ON* or *LED OFF]*

A code line is executed when the selected *GPIO* reaches the selected condition (*Low/High*). In this context, execution of the line means that the function specified under *ITEM* is processed or that an appropriate value is set. The use of *PARAMETERS* varies considerably and depends on the selected function. If an additional *LED* is connected, it will assume the defined state as soon as the *ITEM* value is true or equal to the parameter. The same applies even if no GPIO has been assigned to this line. In this way, it is possible for LEDs to e.g. signal which input has been selected via the OSD.
The same GPIO can be used several times in different lines and thus be associated with several functions. Similarly, the same function can be called in several lines by different GPIOs.

Possible GPIOs
GPI01Low, **GPI01H**igh, .. **GPI24H**igh, **JOG1WHL** (incremental rotary encoder on JOG1 S0 S1 see J230), **JOG1+-** (keys on JOG1 S0 S1 see J230), **JOG1L** to **JOG6L**ow, **OSD -** [Minus key] **OSD +** [Plus key] **OSD E** [Exit key]

There are four types of items:	
List selection	The assigned input selects the next available option in the list. The parameter allows the "removal" of individual options from the list.
Value selection	If this item is assigned to a JOGxWHL or JOGx+- input, the value is adjusted within the boundaries. If this item is assigned to a single input, the item is assigned the value in the parameter.
On/Off selection	The item is activated / deactivated. The parameter has no function assigned to it
Command	The command is executed. In certain cases parameters can influence command execution

Possible LEDs
LED1 off, **LED1 *** .. **LED32 *** (on)

Possible Items		
Function		Description and parameters
Inputs	List selection	VGA1 VGA2 FBAS1 FBAS2 FBAS3 Y/C YCrCb DVI1 DVI2 HD1 HD2 TBG
Still image	On/Off selection	
Deinterlacing	List selection	sF Sport Film Odd Even
Colour temperature	List selection	User 2400 3200 4800 5600 6500 9300
Gamma	List selection	Off 1.8 2.2 2.4 2.6 DICOM
Brightness	Value selection	
Contrast	Value selection	
Saturation	Value selection	
Hue	Value selection	
Backlight	Value selection	
RGB	List selection	"Only red" "Only green" "Only blue" and "RGB"
R	On/Off selection	
G	On/Off selection	
B	On/Off selection	
Black/White	On/Off selection	
Inverse	On/Off selection	
Format	List selection	1:1 2:1 Under Norm Over Zoom1 Zoom2
Aspect ratio	List selection	Org 4:3 14:9 16:9 16:10 User
Zoom1	Value selection	
Zoom2	Value selection	
HVShift	On/Off selection	
Auto	Command	
Pixels	Value selection	
Lines	Value selection	
X offset	Value selection	
Y offset	Value selection	
H mirroring	On/Off selection	
V mirroring	On/Off selection	
Marker on	On/Off selection	
Centre	On/Off selection	
Safe Area	On/Off selection	
Safe Title	On/Off selection	
Cine Scope	On/Off selection	
Academey	On/Off selection	
HD4:3	On/Off selection	
SD4:3	On/Off selection	
User marker	On/Off selection	
Power LED	On/Off selection	
Standby LED	On/Off selection	
IRACKLED	On/Off selection	
Tally0	On/Off selection	
Tally1	On/Off selection	
Tally2	On/Off selection	
User	List selection	User1 User2 User3 User4

GPIOs - wiring

GPI1 to **GPI16** are implemented internally through 4 AD channels. An appropriate resistor network permits the safe identification of the individual inputs; however, only buttons and switches should be connected here. Another thing to consider is that the cables used for external switches should not be too long. It is also not possible to use a LVTTL output for control purposes. If this functionality is required by users, the inputs should be connected to GND via transistors or FET.
GPI17 to **GPI20** are LVTTL inputs with internal pull-ups. Here the external wiring can also include longer cables or a LVTTL output.
LED1 to **LED32** are realised via a 8x4 matrix clocked at 1000Hz. The following table shows the allocation of the signals to LED numbers in the OSD. The driver power of the signals is very low (2mA) which means that it is essential to provide a transistor or FET for the LED_ROW signals.

Signal	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8
	LED_ROW0								LED_ROW1								LED_ROW2								LED_ROW3							
SW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

>> SBF circuit diagram

Security concept, licence keys

The PMD provides maximum protection for your product. The unauthorised replication of the PMD can be ruled out completely. After installation of the firmware, the PMD enters the so-called "production mode" which permits quality assurance actions but prevents the permanent operation or use of the equipment. The PMD only becomes fully operational after the card is activated with a unique key. Each key applies to one card only. This security mechanism is made possible thanks to the implementation of a digital DNA in the CPU. The same principle allows the distribution of unique licence keys. In conjunction with the digital DNA, it is possible to prepare a license key for a desired functional bit; this key would then only be applicable for one particular card. The **`id_?`** command can be used to display the Chip ID, the current licence key and the serial number of the card:

```
id_chip=89A5-302B
id_lickey=E28E-79CB-0000-0000
id_sn=00010000153
```

Of course, this information can also be viewed in the OSD (on the login page and on the 1st service page)

Broadcast Licences

From a technical and security perspective, the broadcast market certainly belongs to one of the most sophisticated sectors. Especially in this sector it is often imperative that our customers render a substantial contribution to obtain our product. By implementing the relatively high annual fee, we have created a certain barrier to prevent a situation where a „new" competitor gains access to the know-how collected by us over a decade for a unit price of just 220€. At the same time, this fund gives us the opportunity to actively pursue further developments in this area.

RS232 and Ethernet communication

Realterm

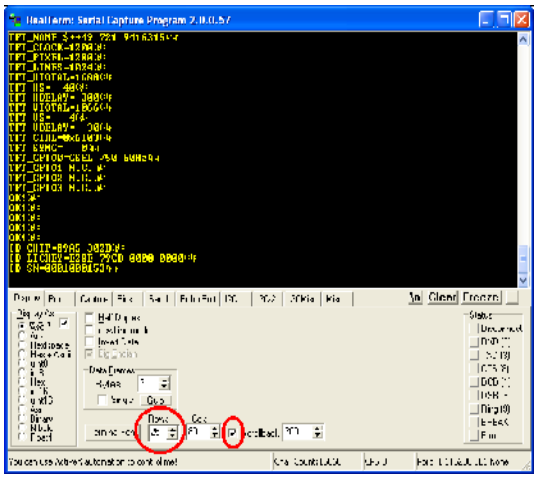
The RS232 protocol of the PMD is very easy to use. Commands are transfered in plain text. The terminal program must send <CR>+<LF> (#13, #10) at the end of the text. Users can choose from various terminal programs, such as e.g. Hyperterminal for Windows or Realterm. One of Hyperterminal's features makes it transmit each character immediately upon entry, which can cause timeout problems if the user takes too long to input the text. Due to this potential issue, we recommend the Realterm software as more straightforward and easier to use. See below for information on how to configure the program for communication with the PMD:

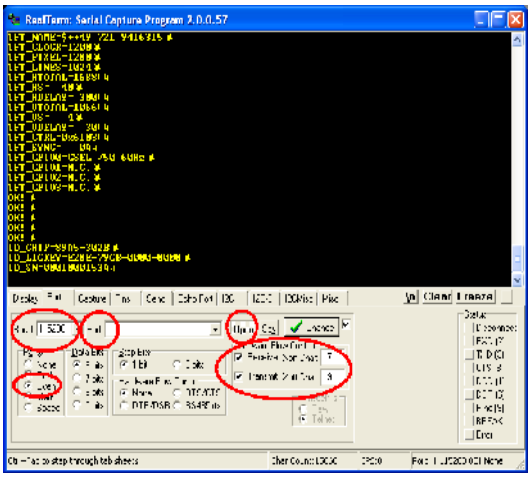
Display tab: Rows to 25, scrollback activated.

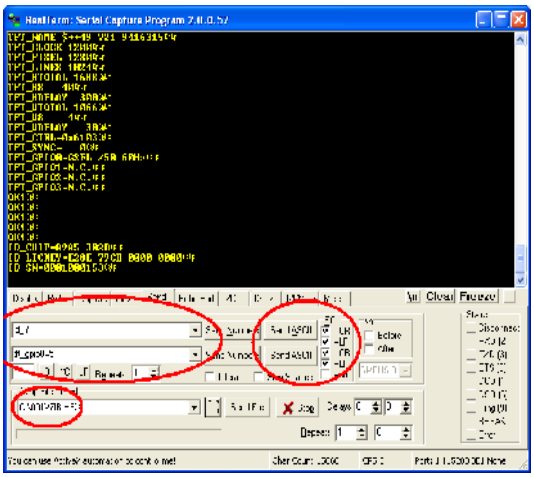
Port tab: Baud rate, Parity, Port, Software FlowControl Xon Char 17 Xoff Char 19; don't forget to activate Port Open. The PMD recognises the interface settings 9600,8,E,1 → 56700,8,E,1 → 115200,8,E,1 and 460800,8,E,1. The default is 115200,8,E,1.

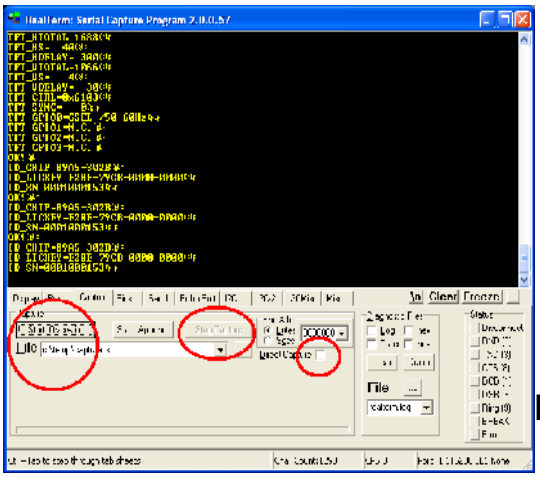
Send tab: The commands can be entered in the two text lines. Old commands can be selected from the list. The current line is transferred by pressing the "Send Ascii" button. Important! Activate the +CR +LF options in the EOL group! You can select the firmware file in the "Dump File to Port" section.

Capture tab: This tab can be used to save the captured data directly to a file. Specify the file path and name under "File". You can start the recording with "Start Overwrite"; the file is initially reset. The recording is stopped with "Stop Capture". In the meantime you can view the settings in the Send tab as usual. Deactivate "Direct Capture" if you wish to view the data being received on the screen.









RS232 settings

All PMD settings can be retrieved or set via the RS232 interface. Four interface parameters are available: 9600,8,E,1 57600,8,E,1 115200,8,E,1 and 460800,8,E,1. The default setting is 115200,8,E,1.

Ethernet Ports

Port	Type	Description	Protocol
8900 configurable	UDP	UMD/Tally Information	TSL3.1 TSL4.0 TSL5.0
7000	TCP	Default Remote Port	RS232 Parameter
7001	UDP	Alive Beacon	Proprietary. Monitor identification in the network.
7002	TCP	Firmware update	Proprietary

Port 7000 can be used to send the same commands as through RS232. This is also possible with Realterm. To do this, do not select COMx as port; instead, use the network IP address and the port 192.168.100.241:7000 or the hostname PMD:7000.

The protocol:

<Parameter>?<CR><LF>: Returns the value of the parameter.
<Parameter>=<Value><CR><LF>: Sets the value of the parameter. The value can be transferred as a decimal or hexadecimal number (e.g. 0xA5A5). Certain parameters require text rather than numeric information ("ON" "OFF" "3.3V" "5V" etc.). Such text can also be transmitted as configuration input. No distinction is made between uppercase/lowercase characters used in parameters or texts. To transfer a particular string (e.g. for OSD captions), users can place the dollar sign ($) before the text in order to prevent the conversion of the string to all-capital letters.
Each command ends with <CR>, <LF> or ",". The comma permits the transmission of several commands at once (tft_pixel=1280,tft_lines=1024<CR><LF>).
If the transmitted parameter is recognised, the PMD immediately responds with "OK!<CR><LF>". Each command must contain "?", "!" or "=".

Example: **`tft_pixel?<CR><LF>`**
Response:
`OK!<CR><LF>`
`tft_pixel=1280<CR><LF>`

`tft_pixel=1260<CR><LF>`
Response:
`OK!<CR><LF>`

`tft_pixel=1260<CR><LF>`
Response:

ERROR!<CR><LF>

Individual commands are grouped based on their names. All display parameters start with **tft_** , inverter parameters start with **inv_**, global settings start with **gbl_**. This offers the advantage that all parameters in a group can be retrieved by using a group query (**tft_?**). Some of the parameters are bit fields. Bit fields are often used to combine several parameters having very small value ranges (0 or 1 , or 0..3 etc.) in one single parameter. This saves storage space and sometimes provides more clarity. One example here is the **tft_ctrl** parameter in the Display data group. The individual bit fields can be retrieved with the **tftctrl_?** command and set with the bit field name (e.g. **tftctrl_hpol=pos**). The „**save?**" command is used to permanently save any modified settings.

save?	Saves the changes
loadfw?	Preparation for the transfer of firmware
loadlogo!	Preparation for the transfer of a logo.

Overview of parameter groups

The parameters are classified in groups to provide a better overview. All parameters of a group can be queried collectively via the group designation: **`col_?`**.

GBL_	(Global)	**COL_**	(Colour)	**IN_**	(Inputtiming)
SCL_	(Scaling)	**ASR_**	(Aspect Ratio)	**OSD_**	(On Screen Display)
MRK_	(Marker)	**OLY_**	(Overlay)	**UMD_**	(Under Monitor Display)
CAL_	(Calibration)	**SVO_**	(Save Options)	**WALL_**	(Monitorwalls)
CMD_	(Commands)	**COM_**	(Communication)	**SYS_**	(Systeminformations)
PW_	(passwords)	**ID_**	(Monitor ID)	**SNS1_**	(Brightness Sensor 1)
STR_	(Strings)	**BIOS_**	(BIOS)	**SNS2_**	(Brightness Sensor 2)
UGP_	(User GPIO)	**BGP_**	(Bios GPIO)	**DDC_**	(Display Data Channel)
TFT_	(TFT Timing)	**TFTCTRL_**	(Details of tft_ctrl)		
INV_	(Inverter)	**INVCTRL_**	(Details of inv_ctrl)		

The following commands are also available:

LOADFW? LOADLOGO? SAVE? SAVECAL? HELP?

Parameter overview

GBL_USER	**GBL_INPUT**	**GBL_BORDER**	**GBL_NOSIGNAL**
GBL_FREEZE	**GBL_TBGGRID**	**GBL_OMTIMING_HD**	**GBL_OMTIMING_DVI**
GBL_OMTIMING_ACK	**GBL_MIRH**	**GBL_MIRV**	**GBL_POWERON**
GBL_SEARCH	**GBL_ENERGYSAVE**	**GBL_ASMODE**	
COL_BRIGHTNESS	**COL_CONTRAST**	**COL_SATURATION**	**COL_HUE**
COL_BACKLIGHT	**COL_BW**	**COL_NEGATIVE**	**COL_GAMUT**
COL_GAMMA	**COL_COLORT**	**COL_USRTEMPR**	**COL_USRTEMPG**
COL_USRTEMPB	**COL_GAINR**	**COL_GAING**	**COL_GAINB**
COL_BIASR	**COL_BIASG**	**COL_BIASB**	
CAL_PROBE	**CAL_DATE**	**CAL_BACKLIGHT**	**CAL_GAMUT**
CAL_GAMMA	**CAL_TEMP**	**CAL_GRY**	**CAL_PRIM00**
CAL_PRIM01	**CAL_PRIM02**	**CAL_PRIM03**	**CAL_PRIM04**
CAL_PRIM05	**CAL_PRIM06**	**CAL_PRIM07**	**CAL_PRIM08**
CAL_PRIM09	**CAL_GREY00**	**CAL_GREY01**	**CAL_GREY02**
CAL_GREY03	**CAL_GREY04**	**CAL_GREY05**	**CAL_GREY06**
CAL_GREY07	**CAL_GREY08**	**CAL_GREY09**	**CAL_GREY10**
CAL_GREY11	**CAL_GREY12**	**CAL_GREY13**	**CAL_GREY14**
CAL_GREY15	**CAL_GREY16**	**CAL_GREY17**	**CAL_GREY18**
CAL_GREY19	**CAL_GREY20**	**CAL_GREY21**	**CAL_GREY22**
CAL_GREY23	**CAL_GREY24**	**CAL_GREY25**	**CAL_GREY26**
CAL_GREY27	**CAL_GREY28**	**CAL_GREY29**	**CAL_GREY30**
CAL_GREY31	**CAL_GREY32**	**CAL_3DLUT00**	**CAL_3DLUT01**
CAL_3DLUT02	**CAL_3DLUT03**	**CAL_3DLUT04**	**CAL_3DLUT05**
CAL_3DLUT06	**CAL_3DLUT07**	**CAL_3DLUT08**	**CAL_3DLUT09**
CAL_3DLUT10	**CAL_3DLUT11**	**CAL_3DLUT12**	**CAL_3DLUT13**
CAL_3DLUT14	**CAL_3DLUT15**	**CAL_3DLUT16**	**CAL_3DLUT17**
CAL_3DLUT18	**CAL_3DLUT19**	**CAL_3DLUT20**	**CAL_3DLUT21**
CAL_3DLUT22	**CAL_3DLUT23**	**CAL_3DLUT24**	**CAL_3DLUT25**
CAL_3DLUT26	**CAL_3DLUT27**	**CAL_3DLUT28**	**CAL_3DLUT29**

CAL_3DLUT30	CAL_3DLUT31	CAL_3DLUT32	CAL_3DLUT33
CAL_3DLUT34	CAL_3DLUT35	CAL_3DLUT36	CAL_3DLUT37
CAL_3DLUT38	CAL_3DLUT39	CAL_3DLUT40	CAL_3DLUT41
CAL_3DLUT42	CAL_3DLUT43	CAL_3DLUT44	CAL_3DLUT45
CAL_3DLUT46	CAL_3DLUT47	CAL_3DLUT48	CAL_3DLUT49
CAL_3DLUT50	CAL_3DLUT51	CAL_3DLUT52	CAL_3DLUT53
CAL_3DLUT54	CAL_3DLUT55	CAL_3DLUT56	CAL_3DLUT57
CAL_3DLUT58	CAL_3DLUT59	CAL_3DLUT60	CAL_3DLUT61
CAL_3DLUT62	CAL_3DLUT63		
SVO_BRIGHTNESS	SVO_CONTRAST	SVO_SATURATION	SVO_HUE
SVO_COLTEMP	SVO_USRCTRGB	SVO_RGBGAINOFS	SVO_SCLMODE
SVO_ZOOM12XYOFS	SVO_SCLASPECT	SVO_PANNING	SVO_SHARPNESS
ASR_FORMAT	ASR_PIXEL	ASR_LINES	ASR_XOFS
ASR_YOFS			
IN_CLOCK	IN_PHASE1	IN_PHASE2	IN_XOFS
IN_YOFS	IN_PIXEL	IN_LINES	IN_IMODE
IN_SIGNAL			
SCL_MODE	SCL_ORGXOFS	SCL_ORGYOFS	SCL_ZOOM1
SCL_ZOOM2	SCL_ZOOM1XOFS	SCL_ZOOM1YOFS	SCL_ZOOM2XOFS
SCL_ZOOM2YOFS	SCL_HVSHIFT		
OSD_LANGUAGE	OSD_HELP	OSD_COLOR	OSD_TRANSPARENCY
OSD_SIZE	OSD_POS	OSD_AUTOOFF	OSD_AUTO
MRK_MARKERON	MRK_CENTER	MRK_SAFEAREA	MRK_SAFETITEL
MRK_43	MRK_CINESCOPE	MRK_ACADEMY	MRK_43OF169SD
MRK_USER	MRK_WIDTH	MRK_HEIGHT	MRK_HOFS
MRK_VOFS			
OLY_ON	OLY_BIG	OLY_UMD	OLY_WSS
OLY_WSSGROUPS	OLY_VBIVITC	OLY_ANCVITC	OLY_ANCLITC
OLY_AFD	OLY_INFO	OLY_USER	OLY_INPUT
OLY_SIGINF	OLY_INFOPOS		
UMD_VERSION	UMD_SCREEN	UMD_DISPLAY	UMD_UDPPORT
UMD_BARS	UMD_SIZE	UMD_STYLE	UMD_RHCGF
UMD_TXCGF	UMD_LHCGF	UMD_RHCOL	UMD_TXCOL
UMD_LHCOL			
FAN_MODE	FAN_TEMP		
COM_IP	COM_SUBNET	COM_GATEWAY	COM_DHCP
COM_HOST	COM_USERNAME	COM_SERIAL	
CMD_USERDEFAULTS	CMD_INAUTO	CMD_INAUTOFAST	CMD_RELOADCAL
CMD_NEXTINP	CMD_RESTART		
PW_LOGIN	PW_USER	PW_SERVICE	PW_LOGINCLR
PW_USERCLR	PW_SERVICECLR		
SYS_TIME1	SYS_ACTTEMP	SYS_MAXTEMP	SYS_DEVICE
SYS_SWREV	SYS_IRCODE	SYS_IRLOCKED	SYS_IRLOGIN
SYS_PWR	SYS_FAN	SYS_SENS1DCT	SYS_SENS2DCT
SYS_IDLICKEY	SYS_OSDREDRAW	SYS_OSDON	
STR_VGA1	STR_VGA2	STR_FBAS1	STR_FBAS2

STR_FBAS3	**STR_YC**	**STR_YCRCR**	**STR_DVI1**
STR_DVI2	**STR_HDSDI1**	**STR_HDSDI2**	**STR_TBG**
STR_USER1	**STR_USER2**	**STR_USER3**	**STR_USER4**
DDC_DEFTIMING	**DDC_MFGID**	**DDC_PRODUCTID**	**DDC_SN**
DDC_MFGYEAR	**DDC_MFGWEEK**	**DDC_HSIZEMM**	**DDC_VSIZEMM**
DDC_REDX	**DDC_REDY**	**DDC_GREENX**	**DDC_GREENY**
DDC_BLUEX	**DDC_BLUEY**	**DDC_WHITEX**	**DDC_WHITEY**
DDC_ESTB1	**DDC_ESTB2**	**DDC_ESTB3**	**DDC_STI1**
DDC_STI2	**DDC_STI3**	**DDC_STI4**	**DDC_STI5**
DDC_STI6	**DDC_STI7**	**DDC_STI8**	**DDC_DT_CLOCK**
DDC_DT_HACTIVE	**DDC_DT_HBLANK**	**DDC_DT_VACTIVE**	**DDC_DT_VBLANK**
DDC_DT_HOFS	**DDC_DT_HWIDTH**	**DDC_DT_VOFS**	**DDC_DT_VWIDTH**
DDC_DT_HBORDER	**DDC_DT_VBORDER**	**DDC_DT_FLAGS**	**DDC_LM_MINV**
DDC_LM_MAXV	**DDC_LM_MINH**	**DDC_LM_MAXH**	**DDC_LM_MAXCLK**
DDC_MONSN	**DDC_MONDATA**	**DDC_MONNAME**	

Parameters with text values

Some parameters can contain text in addition to numerical values. For example, users can enter the following command to switch to DVI / HD SDI:

gbl_input=dvi1, gbl_input=hd1

However, since the text used in parameters is largely dependent on the configured language, it is recommended to instead use the corresponding numerical values for controlling the software.

BL_USER	0	User 1
	1	User 2
	2	User 3
	3	User 4
GBL_INPUT	0	VGA 1
GBL_POWERON	1	VGA 2
	2	FBAS 1
	3	FBAS 2
	4	FBAS 3
	5	Y/C
	6	YCrCb
	7	DVI1
	8	DVI2
	9	HD1
	10	HD2
	11	TBG
	15	Last
GBL_FREEZE	1	On
GBL_TBGGRID	0	Off

GBL_OMTIMING_ACK
GBL_MIRH GBL_MIRV GBL_SEARCH GBL_ENERGYSAVE GBL_ASMODE COL_BW COL_NEGATIVE SCL_HVSHIFT OSD_HELP OSD_AUTOOFF OSD_AUTO MRK_MARKERON
MRK_CENTER MRK_SAFEAREA MRK_SAFETITEL MRK_43 MRK_CINESCOPE MRK_ACADEMY MRK_43OF169SD MRK_USER OLY_ON OLY_UMD OLY_WSS OLY_WSSGROUPS OLY_VBIVITC OLY_ANCVITC OLY_ANCLITC OLY_AFD OLY_INFO OLY_USER OLY_INPUT OLY_SIGINF COM_DHCP SYS_IRLOCKED SYS_PWR SYS_OSDREDRAW

GBL_OMTIMING_HD	0	720p50
GBL_OMTIMING_DVI	1	720p60
	2	1080i48
	3	1080i50
	4	1080i60
	5	1080p24
	6	1080p25
	7	1080p30
	8	1080p50
	9	1080p60
	10	XGA
	11	SXGA
	12	UXGA
	13	WUXGA
COL_GAMUT	0	Native
CAL_GAMUT	1	ITU-R BT.709
	2	sRGB
	3	Adobe RGB
	4	Apple RGB
	5	ColorMatchRGB
	6	Wide GamutRGB
	7	PAL/SECAM
	8	NTSC
COL_GAMMA	0	Native
CAL_GAMMA	1	DICOM
	2	1.0
	3	1.1
	4	1.2
	5	1.3
	6	1.4
	7	1.5
	8	1.6
	9	1.7
	10	1.8
	11	1.9
	12	2.0
	13	2.1
	14	2.2
	15	2.3
	16	2.35
	17	2.4
	18	2.5
	19	2.6
	20	2.7
	21	2.8
	22	2.9
	23	3.0
	24	3.1
	25	3.2
	26	3.3
COL_COLORT	0	Native
CAL_TEMP	1	User

2	A
3	B
4	C
5	D50
6	D55
7	D65
8	D75
9	E
10	2400
11	2600
12	2800
13	3000
14	3200
15	3400
16	3600
17	3800
18	4000
19	4200
20	4400
21	4600
22	4800
23	5000
24	5200
25	5400
26	5500
27	5600
28	5700
29	5800
30	5900
31	6000
32	6100
33	6200
34	6300
35	6400
36	6504
37	6600
38	6700
39	6800
40	6900
41	7000
42	7100
43	7200
44	7300
45	7400
46	7500
47	7600
48	7700
49	7800
50	7900
51	8000
52	8200
53	8400
54	8600
55	8800
56	9000
57	9200

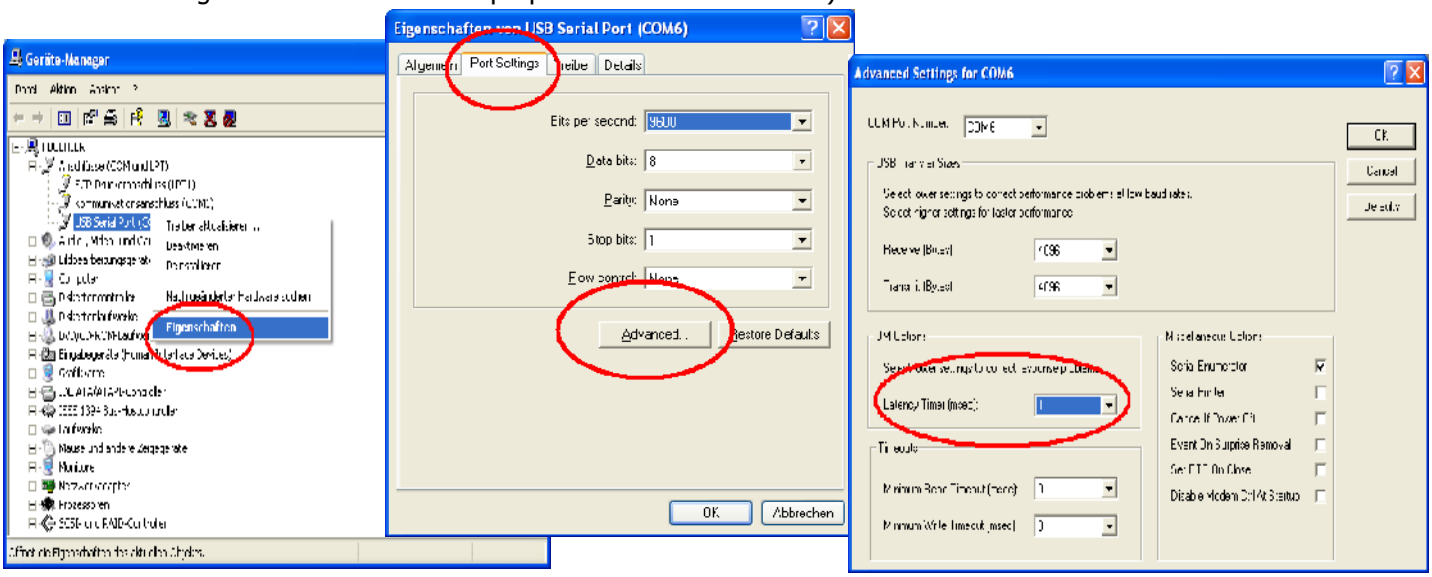
	58	9300
	59	9400
	60	9600
	61	9800
	62	10000
	63	10200
	64	10400
	65	10600
	66	10800
	67	11000
	68	11200
	69	11400
	70	11600
	71	11800
CAL_PROBE	0	PM5639/94
	1	CS200
	2	Empty
	3	Empty
SVO_BRIGHTNESS	0	only VGA 1
SVO_CONTRAST	1	only VGA 2
SVO_SATURATION	2	only FBAS 1
SVO_HUE	3	only FBAS 2
SVO_COLTEMP	4	only FBAS 3
SVO_USRCTRGB	5	only Y/C
SVO_RGBGAINOFS	6	only YCrCb
SVO_SCLMODE	7	only DVI1
SVO_ZOOM12XYOFS	8	only DVI2
SVO_SCLASPECT	9	only HD1
SVO_PANNING	10	only HD2
SVO_SHARPNESS	14	All
	15	Together
ASR_FORMAT	7	Fullscreen
	0	4:3
	3	14:9
	1	16:9
	8	21:9
	2	Auto
	5	User
IN_IMODE	0	sF
	1	iSport
	2	iFilm
	3	iOdd
	4	iEven
SCL_MODE	6	1:1
	7	2:1
	3	Underscan
	0	Normal
	4	Overscan
	1	Zoom1
	2	Zoom2

OSD_LANGUAGE	0	Deutsch
	1	English
	2	Français
	3	Español
OSD_COLOR	0	Grey
	1	Red
	2	Green
	3	Blue
	4	Yellow
	5	Cyan
	6	Magenta
OSD_TRANSPARENCY	0	0%
	1	25%
	2	50%
	4	100%
OSD_SIZE	0	1x
	1	2x
OSD_POS	0	Off
OLY_INFOPOS	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
UMD_VERSION	0	TSL3.1
	1	TSL4.0
	2	TSL5.0
UMD_SIZE	0	1
	1	2
	2	3
	3	4
	4	5
	5	6
	6	7
	7	8
UMD_STYLE	0	( )
	1	< >
	2	[ ]
UMD_RHCGF	0	Auto
UMD_TXCGF	1	RH
UMD_LHCGF	2	LH
	3	R+L
	4	All
	5	Off

UMD_RHCOL	1	Red
UMD_TXCOL	2	Green
UMD_LHCOL	3	Yellow
FAN_MODE	0	Off
	1	On
	2	Auto
COM_SERIAL	0	9600,8,E,1
	1	57600,8,E,1
	2	115200,8,E,1
	3	460800,8,E,1
SYS_DEVICE	1	MMIB1Ev1
	2	MMIB1Ev2
	3	MMIB2B
	4	ADVIIB2A
	5	MMIB3
	6	VIGRAF
	7	PMD1.0
SYS_FAN	0	Off
	1	On
	2	Error
SYS_SENS1DCT	1	Yes
SYS_SENS2DCT	0	No
SYS_IDLICKEY	0	Yes
	1	No
DDC_DEFTIMING	0	1024x768
	1	1280x768
	2	1360x768
	3	1368x768
	4	1152x864
	5	1280x720
	6	1280x960
	7	1280x1024
	8	1600x1200
	9	1920x1080
	10	1920x1200
	11	2560x1440
	12	2600x1600

Firmware update

For firmware updates, it is recommended to set the interface configuration to 460800,8,E,1. This will shorten the transfer time considerably. To ensure the maximum transmission speed, set the "Latency Time" to 1ms (the setting is located in the device manager's USB COM interface properties under "Advanced").



In Realterm, the firmware file to be sent can be selected by clicking on "Dump File to Port" under the Send tab. After the command **`loadfw?`** the PMD expects to receive the firmware file. Transmission of the firmware can be started with the "Send File" button. At a transmission rate of 460800 baud, the transfer duration is approximately 1 minute. During the transmission, the screen is filled with ACK Chars (0xFF). Once the firmware file has been sent completely, the PMD sends the response: **`3983999Bytes received. CRC ok`**. If the PMD does not reboot after 15 seconds, you can manually switch the device off and on.

Logo

The corporate logo of the manufacturer (96x32 pixels and 3 colours) can be inserted in the top left corner of the OSD. For this purpose, it is necessary to prepare a **16-colour bitmap file with 96x32 dimensions**. This corresponds to 8x2 characters (each character occupies 12x16 pixels). Two colours may be displayed in each 12x16 grid. The logo.bmp file can be created using Windows Paint or the freeware IrfanView software. The three colours used in this *.bmp should be the first RGB triplet defined in the *.bmp header; Irfan View is particularly suited for this purpose. All pixels with the colour of the 1st palette entry are shown in the background colour of the OSD.
The logo is transferred to the PMD via RS232. For this purpose, the BMP file must first be selected in the field "Dump File to Port". Receipt of the file is prepared with the **`loadlogo!`** command and the transfer is started by pressing the "Send File" button.

Grid: Only two colours may be used in a 12x16 cell.

12x16							

Technical data

Pos	Parameter	min	typical	max	Unit
	Supply voltage	9	12	18	V
	Power consumption (only PMD1.0, no displays)		tbd		mA
	With 1xPMD-IM-HD3G / 2xPMD-IM-HD3G		tbd		mA
	Display power supply		3.3 5 12		V
			15		W
	Storage temperature	0		60	°C
	Operating temperature	0		60	°C
	Difference of the reading in the OSD (if the board temperature is higher than the ambient temperature)		+8		°C
	Temperature CPU heatsink (above the ambient temperature)		+20		°C
	Temperature CPU heatsink			80	°C
	Signal voltage RGB/FBAS/YC/YCrCb		1		Vpp
	Sample rate, analogue, RGB	3.5		174.9	Mhz
	H frequency	14		--	KHz
	V frequency	20		85	Hz
	Clamp-Timing (see 1)		35		Takte
	DVI Pixel clock	--		165	Mhz
	GPIO (LED) output current			2	mA
	Display GPIOs		3.3		V
	Inverter control voltages	0	3.3	5	V
	PMD-IM-HD3G, cable lengths with BELDEN 1694A				
	2.97 Gbps		80		m
	1.485 Gbps		90		m
	270 Mbps		250		m

Notes:

1) For several timings having an unusually short backporch this can lead to the termination taking place within the active area resulting in near complete image loss or faulty colour reproduction. This issue can be resolved by doubling the sample rate and the active pixels – in this way, the time is reduced e.g. from 1.4 µs to 0.7µs for 25Mhz.

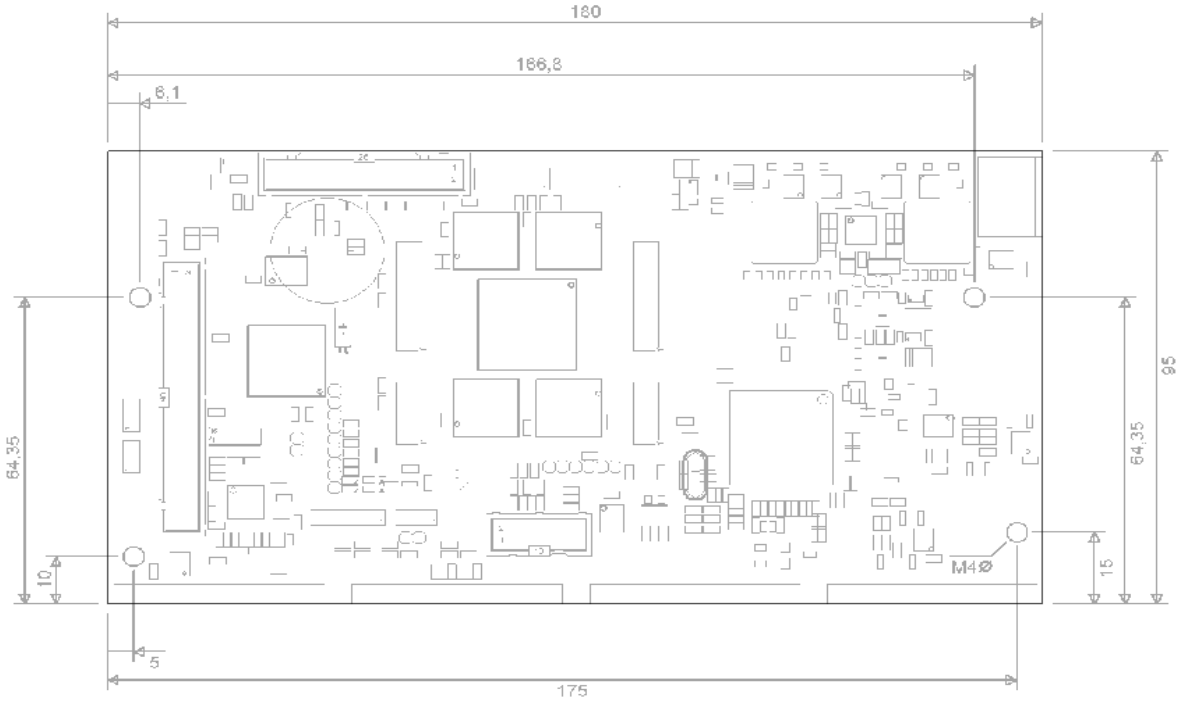
Tested input signals

Name	Resolution	Frequency/ Hz	H frequency/ Hz	Sync
CGA	320x200	143	31,500	SOG
CGA	320x200	143	31,500	H/V
	400x300	98,4	31,500	SOG
	400x300	98,4	31,500	H/V
EGA	640x350	70	31,500	SOG
EGA	640x350	70	31,500	H/V
DOSTEXT	720x400			
VGA	640x480	60	31,500	H/V
NTSC	720x480	29,76	15,625	SOG
NTSC	720x480	29,76	15,625	H/V
	1024x480	59,4	30,300	SOG
	1024x480	59,4	30,300	C
NTSC	720x488	34,7	18,229	SOG
NTSC	720x488	34,7	18,229	SOY
NTSC	720x488	29,97	15,736	SOY
NTSC	720x488	59,94	15,736	SOG
	720x500	60	31,540	SOG
	720x500	60	31,540	C
PAL	720x576	25	15,625	H/V
PAL	720x576	50	15,625	SOY
PAL	720x576	27	16,830	SOY
SVGA	800x600	60	37,900	H/V
	960x600	60	37,337	H/V
WXGA	1280x720	50	37,500	SOY
WXGA	1280x720	59,94	44,955	SOY
WXGA	1280x720	60	45,000	SOY
WXGA	1280x720	60	45,000	H/V
XGA	1024x768	60	48,400	H/V
XGA	1024x768	60	48,400	SOY
XGA	1024x768	57	45,660	SOG
XGA	1024x768	57	45,660	C
WXGA	1280x768	60	47,700	H/V
WXGA	1360x768	60	47,700	H/V
WXGA	1368x768			

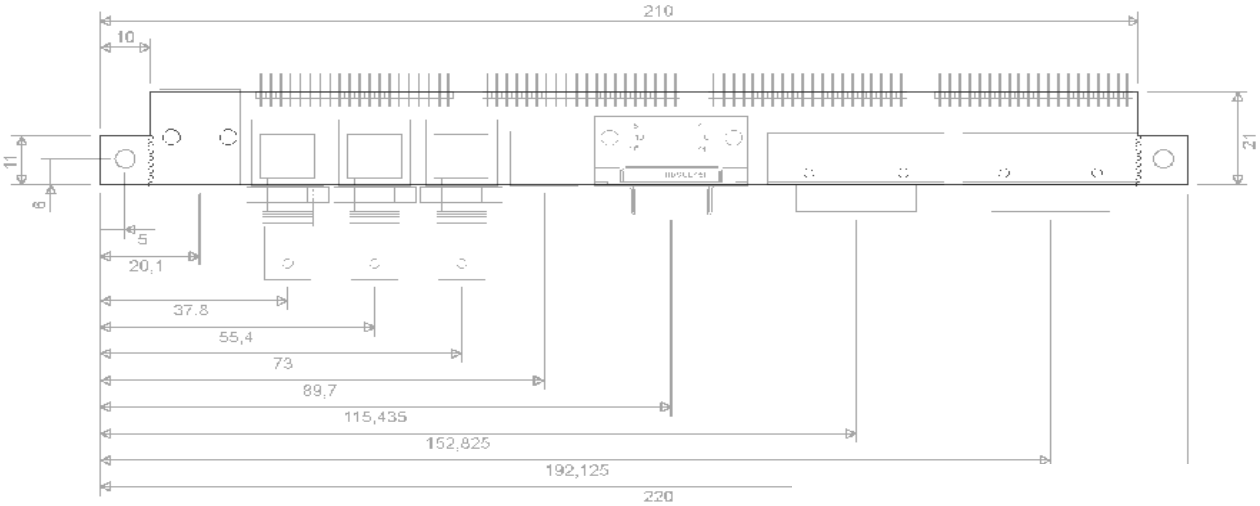
SXGA	1280x800	60	60,054	H/V
MVIEW NTSC	1440x948			
	720x1024	59,9	63,690	H/V
	720x1024	59,9	63,690	C
SXGA	1280x1024	60	34,032	SOY
SXGA	1280x1024	60	34,032	H/V
WSXGA	1600x1024			
SXGA+	1400x1050	60	65,396	H/V
WSXGA+	1680x1050	60	65,322	H/V
HD	1920x1080	23,98	26,981	SOY
HD	1920x1080	25	28,130	SOY
HD	1920x1080	29,97	33,725	SOY
HD	1920x1080	30	33,750	SOY
HD	1920x1080	50	56,270	H/V
HD	1920x1080	59	66,870	H/V
MVIEW PAL	1440x1140			
UXGA	1600x1200	60	75,042	H/V
UXGA	1600x1200	60	75,042	SOY
WUXGA	1920x1200			

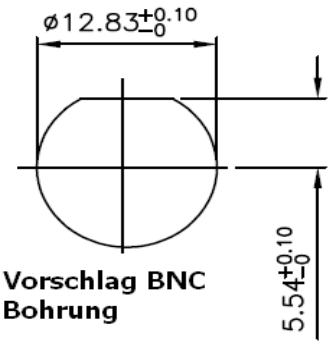
Dimensioned drawings

PMD1.0



PMD-IM-STD (BB)



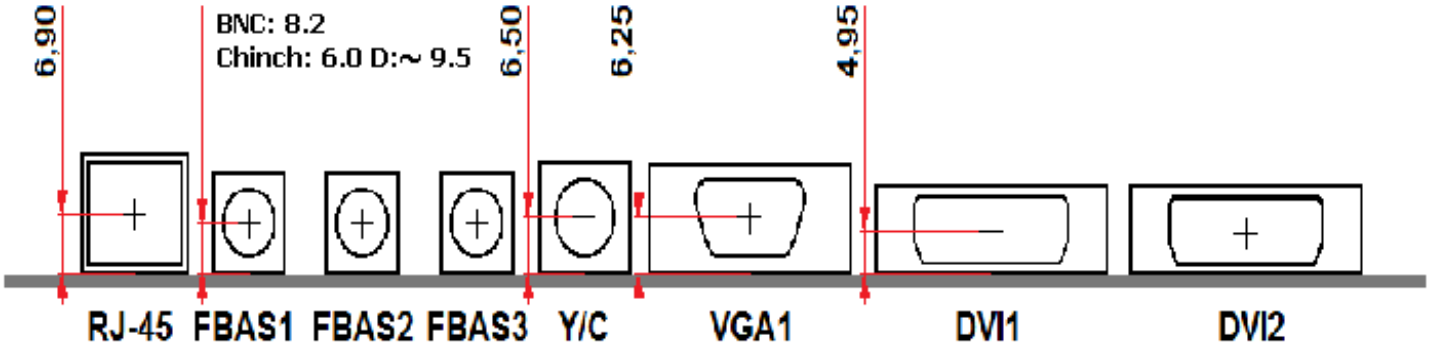


The model shown is PMD-IM-BB, DVI2 does not apply to PMD-IM-AC or -AB.

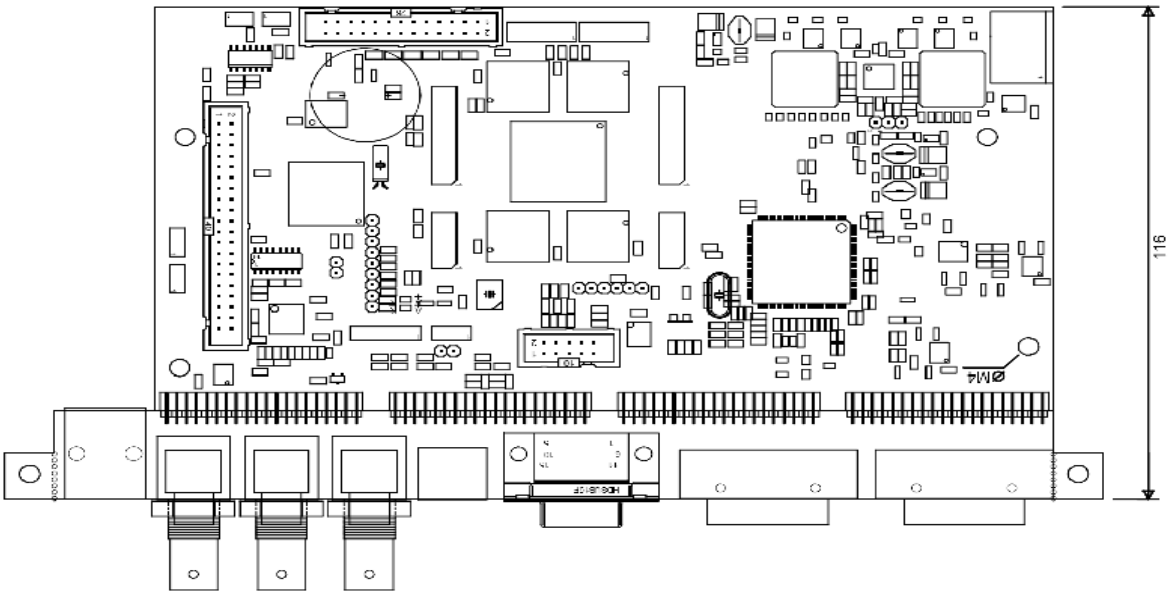
PMD-IM-ECH

Front view PMD-IM-STD (REI/ECH)

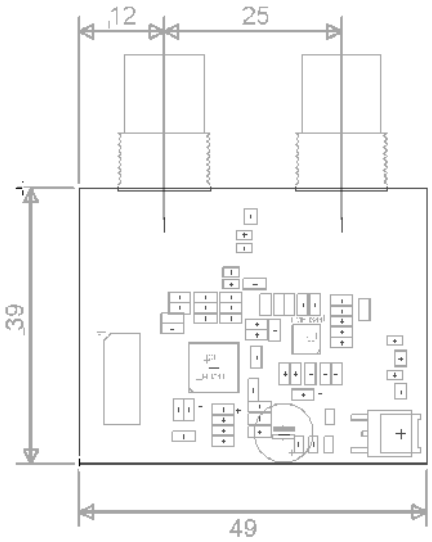
for an overview of the height dimensions



PMD1.0 & PMD-IM-STD (BB)



IM-HD3(



IM-DualHD3G