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ArtistaMedia-IIIB-BB-00

Base Board for Raspberry Pi Compute Module 1, 3 and 3+ with on-board Display Controller

AR-02-206



Version 1.1

08.02.2023

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1 Revision History

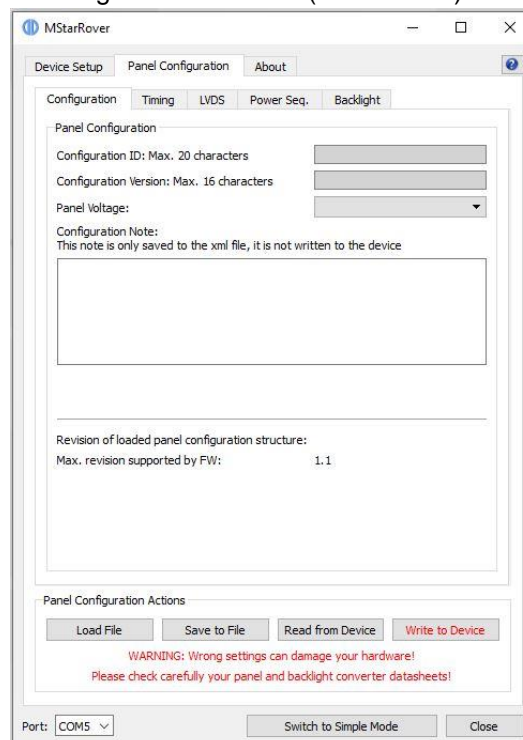
Date	Rev.No.	Description	Page
19.01.2023	1.0	Initial release	All
08.02.2023	1.1	Correction Chapter 6.4: 0.9VRMS	11

2 Overview

ArtistaMedia-IIIB Base Board is Distec's TFT controller board based on the TSUMOP88CDT9-1 graphic and scaler chip (also called "Mstar"). It holds the ARM based Raspberry Pi Compute Module as internal video source and is designed for a wide range of TFT displays, multimedia- and HMI applications.

Key Features:

- Supports Raspberry Pi Compute Module 1, 3 and 3+ (with up to 32GB eMMC on-board flash memory)
- 10/100-Mbit/s Ethernet
- 2x USB 2.0 Type A Host Connectors (2x Extern)
- 1x USB 2.0 internal Host Connector
- Mini USB 2.0 Type B Connector for programming the Raspberry Pi firmware
- MicroSD Card Reader
- I2C Touch Sensor support
- 3x UART
- 2x I2C
- 10x GPIOs
- Four-button external OSD - keypad interface and on-screen menus allow adjustments to the system
- Supports I/R sensor/ remote control (optional accessory available)
- Supports temperature sensor (optional accessory available)
- Auto Brightness regulation in combination with an ambient light sensor (optional accessory available)
- PWM controlled fan interface provides MOSFET-Switched +12VDC and control signal using a non-standard small-size connector
- Audio Line Out
- HDMI 1.3 (compatible with HDMI 1.4) and DVI 1.0 compliant receiver
- Real Time Clock (RTC)
- LVDS interface for TFT panels
- Backlight control interface for TFT panels
- Wide Range Power Input 12V~28V DC
- Support OSD Rotation 0, 90, 180, 270 degree
- Fully Customizable through the configuration software (MstarRover)



3 Supported Raspberry Pi Compute Modules

3.1 Raspberry Pi Compute Module 1 (CM1), 3 (CM3) and 3+ (CM3+) Supported

The ArtistaMedia-IIIB Base Board is designed to support the Raspberry Pi Compute Module 1 (CM1), Compute Module 3 (CM3) and the Compute Module 3+ (CM3+). These have 4GB, 8GB, 16GB or 32GB eMMC flash memory on-board which is used to boot the Raspberry Pi SoC.

These Compute Modules are available with the following order numbers:

PC-02-014	Raspberry Pi Compute Module (CM1)
PC-02-015	Raspberry Pi Compute Module 3 (CM3)
PC-02-018	Raspberry Pi Compute Module CM3+/8GB
PC-02-019	Raspberry Pi Compute Module CM3+/16GB
PC-02-020	Raspberry Pi Compute Module CM3+/32GB

3.2 Raspberry Pi Compute Module 3 Lite (CM3L) and 3+ Lite (CM3+ Lite) Not Supported

The Raspberry Pi Compute Module 3 Lite (CM3L) and 3+ Lite (CM3+ Lite) are currently not directly supported by ArtistaMedia-IIIB Base Board. The reason is, that the Lite versions of the Compute Module don't have an eMMC flash memory device on-board to boot from.

Further the SD card reader of ArtistaMedia-IIIB Base Board is connected to the secondary SD card interface of the Raspberry Pi SoC.

Currently there is no firmware support available from Raspberry Pi to boot from the secondary SD card interface or an USB mass storage device out of box.

4 Electrical Characteristics

All measurements are done at 25°C ambient temperature.

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Note	
Supply Voltage	V_{in}		10.8	12.0 24.0	28	V		
Supply Current	I_{in}	12V V_{in}	Power Off	-	41	50	mA	
			Sleep Mode		44	55		
			Board only +external HDMI		105	115		
			Board incl. CM3+	-	TBD	-		1
		24V V_{in}	Power Off		20	45		
			Sleep Mode		22	45		
			Board only +external HDMI		53	80		
			Board incl. CM3+	-	TBD			1

Note (1): The Compute Module is playing a FHD video, microSD card inserted, no panel and no other peripheral devices connected.

*CPU running with max. frequency (CPU cooled to prevent throttling), all 4 cores incl. GPU busy.

5 Absolute Maximum Ratings

Permanent damage of the device may occur if maximum values are exceeded.

5.1 Electrical Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage	V_{in}	-0.2	30	V	1
Max. Backlight Current	$I_{bkl(12V)}$	-	3	A	3
	$I_{bkl(5V)}$	-	2	A	2
Max. Panel Current	$I_{panel(12V)}$	-	2.6	A	3
	$I_{panel(5V)}$	-	2.6	A	2
	$I_{panel(3.3V)}$	-	1.5	A	
Max. USB Current per Port	I_{USB}	-	0.5	A	2
Max. Fan Current	I_{FAN}	-	1.0	A	3

Note (1): Within operating temperature range.

Note (2): Permissible current depends on general 5V power consumption. The 5V power rail can provide max. **5.1A**, this current is available for backlight, panel supply and USB. Example: If 2A backlight current and 2A panel current is needed, only two of the three available USB ports can be loaded with the max. USB current of 0.5A.

Note (3): Total Current drawn from +12V ($I_{BKL(12V)}$, $I_{PANEL(12V)}$ and I_{FAN}) must not exceed 6A

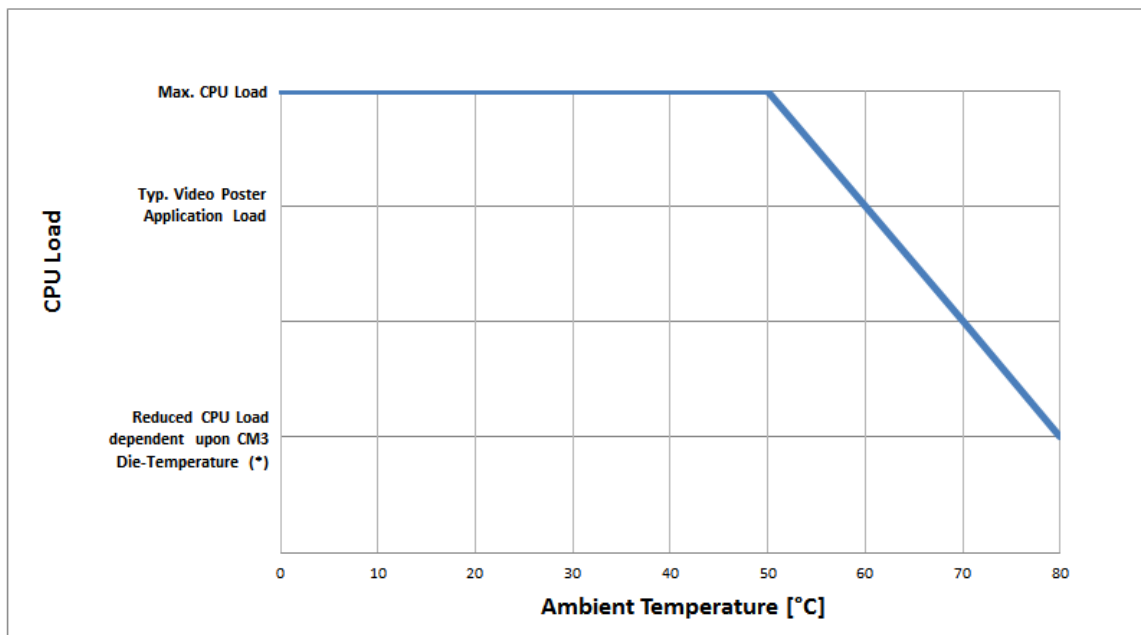
5.2 Environmental Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T _{st}	-35	+85	°C	1
Operating Temperature	T _{op}	-25	+70	°C	1, 2

Note (1): This is the temperature range of the ArtistaMedia-IIIB Base Board without Compute Module.

Note (2): Thermal Derating Characteristic of Compute Module 3

The maximum allowed ambient temperature of Compute Module 3 highly depends on the CPU load. The thermal derating characteristic shown in the diagram below is the result of internal load and temperature tests. All tests were done without airflow and without any additional cooling elements. By applying airflow or a passive heat sink to the Compute Module, the maximum allowed ambient temperature can be increased. For further details concerning temperature limitations please refer to the original datasheet of the Raspberry Pi Compute Module 3.



(*) The standard Raspberry Pi OS includes a mechanism that throttles the performance of the CM3 at high temperatures. It is the responsibility of the user to make use of this mechanism and to monitor and limit the Die-Temperature of the CPU.

6 Interfaces

6.1 Display Power Supply and LVDS Data Output

ArtistaMedia-IIIB-BB is designed to drive almost every available TFT panel with LVDS interface. The display connectors follow the Distec standard, therefore a huge range of TFT panels and matching cables are available. All display parameters can be set by Distec upon request or by the optional available configuration software MstarRover. For eDP panels an optional LVDS-to-eDP interface is available too.

Features of the LVDS interface:

- 18 bit or 24 bit per pixel
- Conventional (JEIDA) or non-conventional (VESA) data mapping
- Single channel or dual channel configuration
- Supports panel resolutions up to WUXGA (1920 x 1200 @ 60Hz)

The display interface has 4 general purpose option pins controlled and sequenced by firmware with 0V, 3.3V or 5V level. These pins can be used to configure display options like data mapping, scan direction or pixel depth.

Supported display power supply levels (configured by firmware):

- +3.3V
- +5.0V
- +12.0V

6.2 Backlight Power Supply and Backlight Control Signals

The backlight power and control port directly connects to a LED power supply for the display backlight. Additional control lines for switching the backlight on/off and to regulate the display brightness are available.

- +12V backlight supply voltage
- +5V backlight supply voltage
- Brightness DC control voltage in the range of 0V to 5V (actual range can be configured by firmware)
- Brightness PWM control with 3.3V or 5V level, 0 ... 100% duty cycle and 100 Hz ... 56 kHz frequency (configured by firmware)
- Backlight enable signal with 3.3V or 5V level (configured by firmware)

6.3 HDMI Video Input Port

For external video sources a standard HDMI 1.3 input port is provided. It has the following capabilities:

- Single Link TMDS Rx for up to 12-bit 1080p
- Captures up to 225MHz
- CEC (on request)
- No HDCP support
- Supported input resolutions: VGA (640x480) up to WUXGA (1920x1200)
- Variable zoom scaling: Up-scaling is possible from any of the supported input resolutions to any supported output resolution.

6.4 Audio Input and Line Out

- Audio input via standard HDMI input
- Audio Line Out: Single-ended 0.9VRMS ground centered analog outputs supporting loads down to 1kOhm per pin (left and right channel)

6.5 Ethernet Port

- Support for 100BASE-TX and 10BASE-T with RJ-45 connector
- Half-duplex and full-duplex operation
- Auto-negotiation and parallel detection

6.6 Two USB Host Connectors (Type A)

- On-board USB 2.0 Host for high speed (480Mbit/s), full speed (12Mbit/s) and low speed (1.5Mb/s) operation
- Two USB type A ports on front side

6.7 Mini USB Connector (Type B)

- Used to access the eMMC flash memory on the Raspberry Pi Compute Module with a PC as mass storage device for firmware installation

6.8 MicroSD Card Reader

- Supports microSD and microSDXC cards (tested up to 128 GB)

6.9 I2C and USB Touch Screen Interface

- Support of USB-HID touch screen controller
- Support of I2C touch screen controller. Project based firmware adaption required.

6.10 General Purpose Interfaces

- One I2C interface connects to the Raspberry Pi Compute Module (for touch screen etc.)
- One I2C interface connects to the scaler chip (can be used for a light sensor to automatically adjust the panel backlight)
- One UART connects directly to the Compute Module (for debug console)
- Two UARTs connect to the Compute Module via an USB-to-UART bridge
- 10 GPIOs of the Compute Module accessible via pin header connector

6.11 Scaler OSD Interface

- The On Screen Menu of the scaler chip is used to adjust display parameters like sharpness, contrast, color temperature and many more. It can be controlled with an I/R remote control and with an external 4-button keypad (both available from Distec).

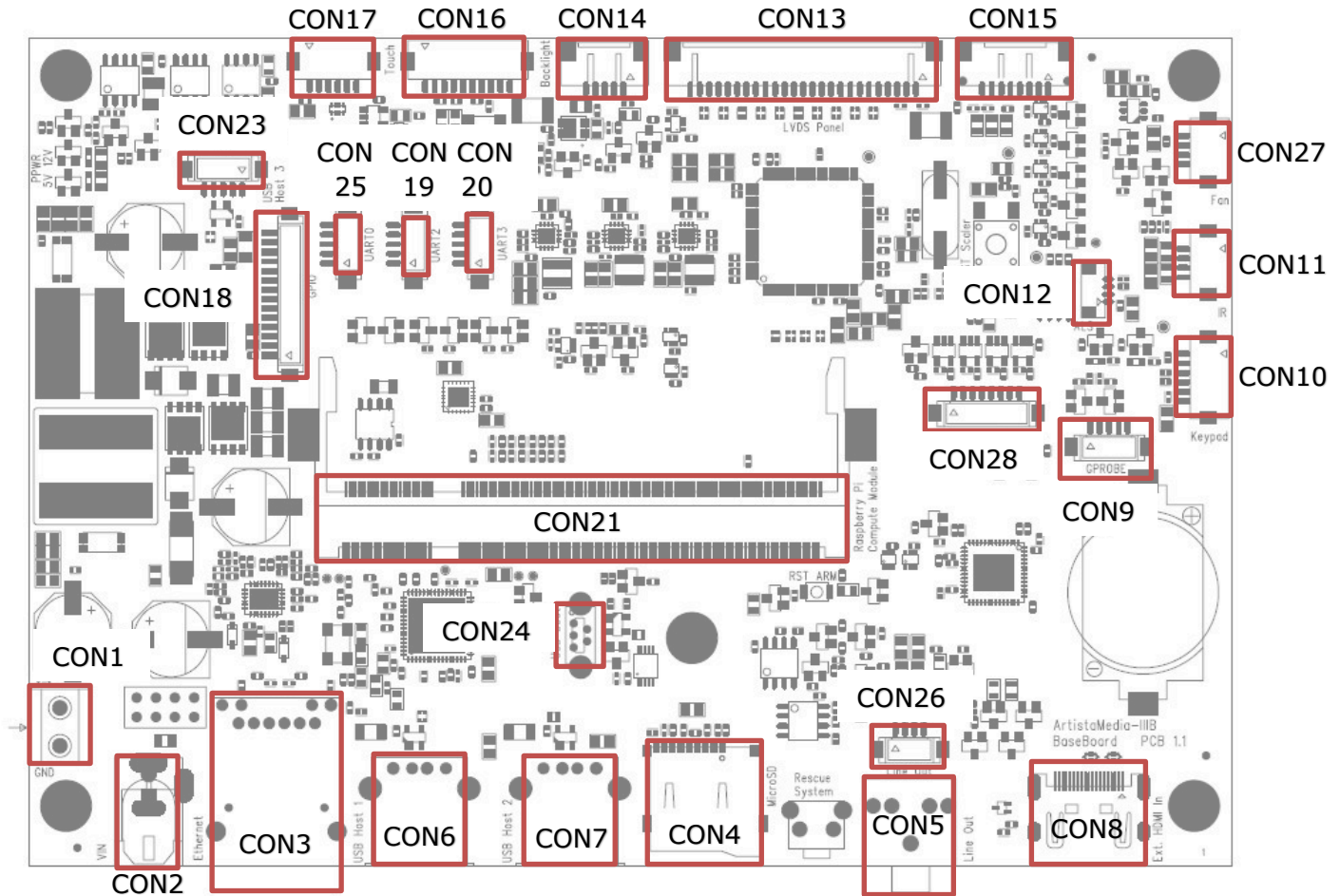
6.12 Light Sensor Connector

- Interface for ambient light sensor for Auto Brightness regulation
- Interface for temperature sensor in combination with FAN control

6.13 FAN Connector

- Interface for PWM controlled fan (DC 12V)

7 Connector Overview



Connector	Description	Type	Manufacturer
CON1	Internal Power Input Screw terminal block, 5mm, 2 pins	20.879.102	WECO
CON2	External Power Input DC Power Jack (5A / 2mm pin)	PJ-002AH	CUI Inc.
CON3	Ethernet RJ45	47F-121ADOD2W4NL	Nexus Components
CON4	MicroSD Card Reader	0201D	Nexus Components
CON5	External Audio Line Out 3.5mm Stereo Jack	STX-3200-5NB	Kycon
CON6	External USB Host 1, Type A	3862RJW	Nexus Components
CON7	External USB Host 2, Type A	3862RJW	Nexus Components
CON8	External HDMI Input	3600HFR	Nexus Components
CON9	UART1 (GPROBE)	DF13-5P-1.25V	Hirose
CON10	Keypad for Scaler (OSD)	DF13-6P-1.25H	Hirose
CON11	I/R for Scaler (OSD)	DF13-4P-1.25H	Hirose
CON12	Light Sensor (ALS) for Scaler (I2C)	501331-0407	Molex
CON13	Dual LVDS Output	DF14-25P-1.25H	Hirose
CON14	LVDS Power & Options	DF14-5P-1.25H	Hirose

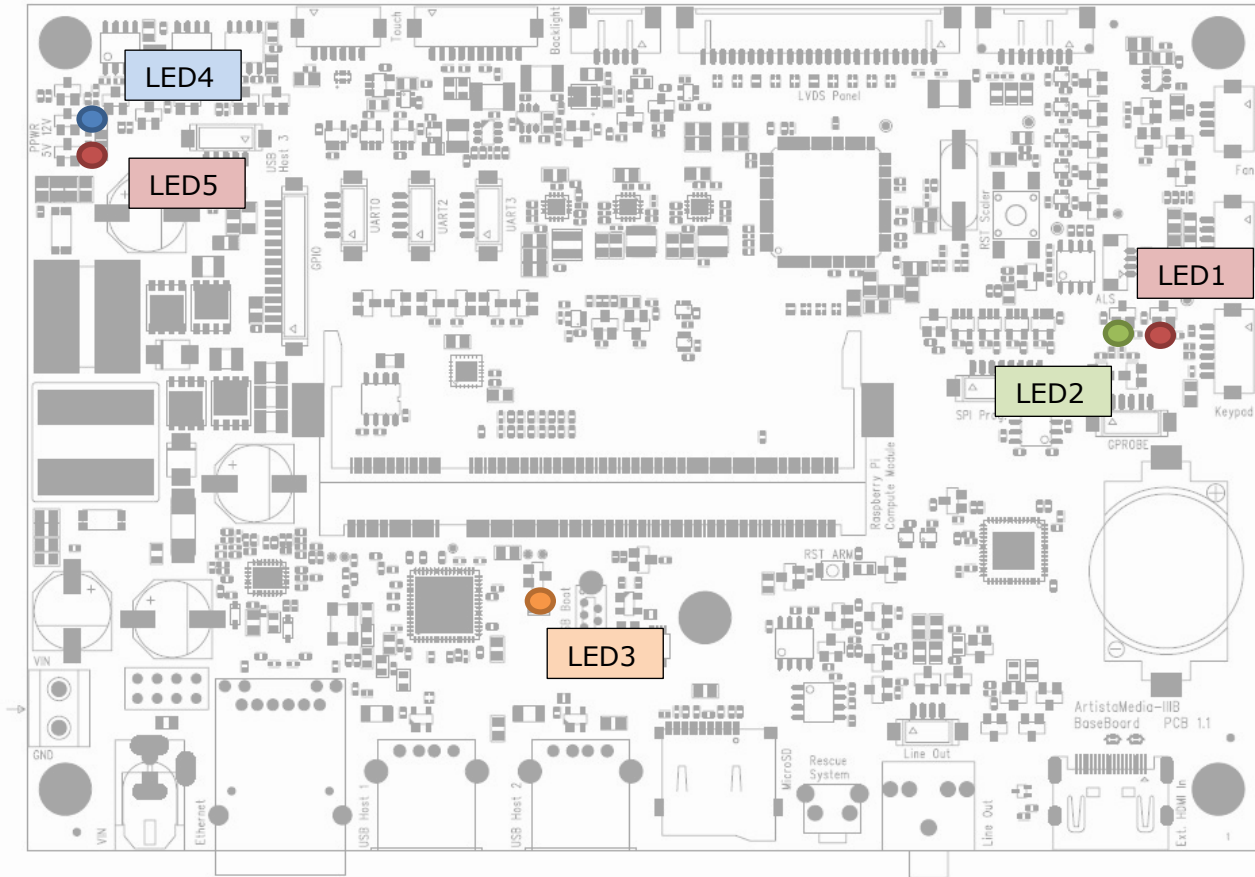
CON15	LVDS Options	DF14-8P-1.25H	Hirose
CON16	Backlight Power Supply	DF13-10P-1.25H	Hirose
CON17	I2C Touch	DF13-6P-1.25V	Hirose
CON18	I2C + 10xGPIOs	DF13-14P-1.25V	Hirose
CON19	UART2 (ARM)	DF13-5P-1.25V	Hirose
CON20	UART3 (ARM)	DF13-5P-1.25V	Hirose
CON21	DDR2 SODIMM Socket for Raspberry Pi Compute Module	1612618-4	TE Connectivity
CON23	Internal USB Host 3	DF13-5P-1.25V	Hirose
CON24	Internal USB Slave: Mini USB 5 Pin, Type B, Top Entry	3856SJBY	Nexus Components
CON25	UART0 (ARM Debug)	DF13-5P-1.25V	Hirose
CON26	Internal Audio Line Out	DF13-4P-1.25V	Hirose
CON27	FAN connector	DF13-4P-1.25H	Hirose
CON28	SPI Programming	DF13-8P-1.25V	Hirose

8 Buttons

SW1	Rescue System	1301.9501	Schurter
SW2	Reset ARM (optional)	B3U-1000P	Omron
SW3	Reset Scaler (optional)	B3U-1000P	Omron

9 Status LEDs

Location of LEDs:



LED	Color	Status	Description
LED1	Red	On	On-board scaler is in standby/sleep mode because no input signal was detected
		Flashing	Blank or corrupted panel configuration, please contact Distec support
LED2	Green	On	On-board scaler synched to input signal and processing it
		Flashing	On-board scaler is searching for an input signal
LED3	Yellow	On	LCD panel power supply is switched on
		Off	LCD panel power supply is switched off
LED4	Blue	On	12V panel power supply selected (1)
		Off	Either 3.3V or 5V panel power supply selected (1)
LED5	Red	On	5V panel power supply selected (1)
		Off	Either 3.3V or 12V panel power supply selected (1)

(1): If neither LED4 nor LED5 is ON then 3.3V panel power supply is selected

10 Connector Pinout

10.1 CON1 – Internal Power Supply Connector

Connectors CON1 and CON2 are connected in parallel. Use either CON1 or CON2.

Pin	Signal	Description
1	Vin	+12V~28V DC Input (max. 7A)
2	GND	Ground

10.2 CON2 – External Power Supply Connector

Connectors CON1 and CON2 are connected in parallel. Use either CON1 or CON2.

Pin	Signal	Description
1 (center tap)	Vin	+12V~28V DC Input (max. 5A)
2	GND	Ground
3	GND SW	Ground

10.3 CON3 – RJ45 Ethernet Connector

Pin	Signal	Description
1	TCT	Transmitter Center Tap
2	TD+	Transmitted Data +
3	TD-	Transmitted Data -
4	RD+	Received Data +
5	RD-	Received Data -
6	RCT	Receiver Center Tap
7	SPEED LED C	Orange LED Cathode
8	SPEED LED A	Orange LED Anode
9	LINK LED C	Green LED Cathode
10	LINK LED A	Green LED Anode

10.4 CON4 – MicroSD Card Reader

Pin	Signal	Description
1	DAT2	SD Serial Data 2
2	DAT3	SD Serial Data 3
3	CMD	Command
4	VDD	3.3V Power Supply
5	CLK	Clock
6	VSS	Ground
7	DAT0	SD Serial Data 0
8	DAT1	SD Serial Data 1
9	SDCARD_DETECT	SD Card Detection
10	GND	Ground

10.5 CON5 – External Stereo Audio Line Out Connector

Connectors CON5 and CON26 are connected in parallel. Both can be used at the same time, if the impedances are considered accordingly.

Pin	Signal	Description
1	GND	Ground
2	LINE ROUT	Right Channel Line Out
3	nc	Not connected
4	nc	Not connected
5	LINE LOUT	Left Channel Line Out

10.6 CON26 – Internal Stereo Audio Line Out Pin Header

Connectors CON5 and CON26 are connected in parallel. Both can be used at the same time, if the impedances are considered accordingly.

Pin	Signal	Description
1	GND	Ground
2	LINE ROUT	Right Channel Line Out
3	LINE LOUT	Left Channel Line Out
4	MUTE_N	Mute Signal (active low): Open drain output with 47.5kOhm pull up resistor to 3.3V. This pin is pulled low in mute mode and can be used to mute an external audio device.

10.7 CON6 – External USB Host 1 Type A Connector

Pin	Signal	Description
1	+5V	5V Power Output for external device (max. 0.5A, fuse protected)
2	D-	USB Data - Line
3	D+	USB Data + Line
4	GND	Ground

10.8 CON7 – External USB Host 2 Type A Connector

Pin	Signal	Description
1	+5V	5V Power Output for external device (max. 0.5A, fuse protected)
2	D-	USB Data - Line
3	D+	USB Data + Line
4	GND	Ground

10.9 CON8 – HDMI Input Connector

Pin	Signal	Description
1	TMDS2+	Differential TMDS Data 2+
2	GND	Ground
3	TMDS2-	Differential TMDS Data 2-
4	TMDS1+	Differential TMDS Data 1+
5	GND	Ground
6	TMDS1-	Differential TMDS Data 1-
7	TMDS0+	Differential TMDS Data 0+
8	GND	Ground
9	TMDS0-	Differential TMDS Data 0-
10	TMDSCLK+	Differential TMDS Clock+
11	GND	Ground
12	TMDSCLK-	Differential TMDS Clock-
13	CEC	Consumer Electronic Control
14	Reserved	Not connected
15	HDMI SCL	DDC Clock
16	HDMI SDA	DDC Data
17	GND	Ground
18	HDMI VCC	+5V Input
19	HPD	Hot Plug Detection

10.10 CON9 – UART1 Pin Header Connector (GPROBE & ARM)

This connector is only used for scaler debugging. Do not use in normal operation.

Pin	Signal	Description
1	UART1 TX	Serial Output from Scaler
2	UART1 RX	Serial Input to Scaler
3	+3.3V	3.3V Power Output
4	+5V	5V Power Output
5	GND	Ground

10.11 CON10 – Keypad Connector

Keypad connector for the scaler chip. When an external keypad is connected to CON10, the OSD menu of the scaler chip can be used to adjust panel brightness, sharpness and many other parameters. See chapter 13.1 for more details.

Pin	Signal	Description
1	KEY DATA	Analog Keypad Signal
2	GND	Ground
3	LED RED	Status LED – Red (Sleep Mode)
4	LED GREEN	Status LED – Green (Sync Mode)
5	GND	Ground
6	+3.3V	3.3V Power Output

10.12 CON11 – Infrared Sensor Connector

I/R input connector to the scaler chip. When an I/R sensor is connected to CON11, the OSD menu of the scaler can be operated with an I/R remote control to adjust panel brightness, sharpness, and many other parameters. See chapter 13.2 for more details.

Pin	Signal	Description
1	IR DATA	Data Input from IR Sensor
2	+3.3V	3.3V Power Output
3	+5V	5V Power Output
4	GND	Ground

10.13 CON12 – I2C Light Sensor Connector

I2C input connector of the scaler chip. When a light sensor is connected to CON12, the scaler automatically adjusts the panel brightness according to the ambient light. See chapter 13.3 for more details.

Pin	Signal	Description
1	+3.3V	3.3V Power Output
2	GND	Ground
3	SCL	I2C Clock
4	SDA	I2C Data

10.14 CON13 – Dual LVDS Output Connector

Pin	Signal	Description
1	SVCC	Switched panel power supply: 12V, 5V or 3.3V, configured by firmware
2		
3	GND	Ground
4		
5	TXA3+	LVDS data 1st pixel
6	TXA3-	LVDS data 1st pixel
7	TXACL+	LVDS clock 1st pixel
8	TXACL-	LVDS clock 1st pixel
9	TXA2+	LVDS data 1st pixel
10	TXA2-	LVDS data 1st pixel
11	TXA1+	LVDS data 1st pixel
12	TXA1-	LVDS data 1st pixel
13	TXA0+	LVDS data 1st pixel
14	TXA0-	LVDS data 1st pixel
15	TXB3+	LVDS data 2nd pixel
16	TXB3-	LVDS data 2nd pixel
17	TXBCL+	LVDS clock 2nd pixel
18	TXBCL-	LVDS clock 2nd pixel
19	TXB2+	LVDS data 2nd pixel
20	TXB2-	LVDS data 2nd pixel
21	TXB1+	LVDS data 2nd pixel
22	TXB1-	LVDS data 2nd pixel
23	TXB0+	LVDS data 2nd pixel
24	TXB0-	LVDS data 2nd pixel
25	BKLT_EN	Backlight Enable Signal, 3.3V or 5V, configured by firmware

10.15 CON14 – LVDS Power & Option Connector

Pin	Signal	Description
1	LVDS_OPT_0	LVDS Option Signal 0 (3.3V, configured by firmware) Function depends on panel and cable
2	SVCC	Switched panel power supply: 12V, 5V or 3.3V, configured by firmware
3		
4	GND	Ground
5	GND	Ground

10.16 CON15 – LVDS Option Connector

Pin	Signal	Description
1	GND	Ground
2	nc	Not connected
3	nc	Not connected
4	nc	Not connected
5	nc	Not connected
6	LVDS_OPT_1	LVDS Option Signal 1 (0V or 3.3V, configured by firmware) Function depends on panel and cable
7	LVDS_OPT_2	LVDS Option Signal 2 (0V or 3.3V, configured by firmware) Function depends on panel and cable
8	LVDS_OPT_3	LVDS Option Signal 3 (0V, 3.3V or 5V, configured by firmware) Function depends on panel and cable

10.17 CON16 – Backlight Power Supply Connector

Pin	Signal	Description
1	+12V_BKLT	12V backlight power supply
2	GND	Ground
3	BKLT_EN	Backlight Enable Signal: 3.3V or 5V, configured by firmware
4	BRT_ADJ	Backlight Dimming: Analog (DC) or PWM, configured by firmware
5	+5V_BKLT	5V backlight power supply
6	+5V_BKLT	5V backlight power supply
7	+12V_BKLT	12V backlight power supply
8	+12V_BKLT	12V backlight power supply
9	GND	Ground
10	GND	Ground

10.18 CON17 – I2C Touch Connector

This connector can be used to connect an I2C touch or any other I2C device to the Compute Module.

Pin	Signal	Description
1	+3.3V	3.3V Power Output
2	SDA1	Touch Controller I2C Data
3	SCL1	Touch Controller I2C Clock
4	GND	Ground
5	INT_N	Touch Controller Interrupt
6	RESET_N	Touch Controller Reset

10.19 CON18 – GPIO Connector

General purpose connector of the Compute Module.

Pin	Signal	Description
1	+3.3V	3.3V Power Output
2	CLK0/GPIO4	ARM multi-purpose GPIO
3	CLK1/GPIO5	ARM multi-purpose GPIO
4	CLK2/GPIO6	ARM multi-purpose GPIO
5	CE1N/GPIO7	ARM multi-purpose GPIO
6	CE0N/GPIO8	ARM multi-purpose GPIO
7	MISO/GPIO9	ARM multi-purpose GPIO
8	MOSI/GPIO10	ARM multi-purpose GPIO
9	SCLK/GPIO11	ARM multi-purpose GPIO
10	PWM0/GPIO12	ARM multi-purpose GPIO
11	PWM1/GPIO13	ARM multi-purpose GPIO
12	SCL1	I2C Clock
13	SDA1	I2C Data
14	GND	Ground

10.20 CON19 – UART2 Connector

UART port from an internal USB-to-UART bridge. This bridge is connected via USB hub to Compute Module.

Pin	Signal	Description
1	UART2 TX	Serial Output from USB-to-UART bridge
2	UART2 RX	Serial Input to USB-to-UART bridge
3	+3.3V	3.3V Power Output
4	+5V	5V Power Output
5	GND	Ground

10.21 CON20 – UART3 Connector

UART port from an internal USB-to-UART bridge. This bridge is connected via an USB hub to the ARM controller/Compute Module.

Pin	Signal	Description
1	UART3 TX	Serial Output from USB-to-UART bridge
2	UART3 RX	Serial Input to USB-to-UART bridge
3	+3.3V	3.3V Power Output
4	+5V	5V Power Output
5	GND	Ground

10.22 CON23 – Internal USB Host 3 Pin Header Connector

Pin	Signal	Description
1	+5V	5V Power Output for external device (max. 0.5A, fuse protected)
2	GND	Ground
3	D-	USB Data -
4	D+	USB Data +
5	GND	Ground

10.23 CON24 – Internal Mini USB Type B Connector (Slave)

This connector is only used for firmware programming. Connecting an external host PC to this connector automatically resets the ARM controller and simultaneously disables the internal eMMC flash memory on the Compute Module. Thus the ARM controller falls back to booting from USB, allowing a firmware update by using for example the following USB Boot SW:

<https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md>

Pin	Signal	Description
1	VBUS	5V Power Input from an external host
2	D-	USB Data -
3	D+	USB Data +
4	ID	Not connected
5	GND	Ground

10.24 CON25 – UART0 Connector

ARM/Compute Module Debug Console.

Pin	Signal	Description
1	UART0 TX	Serial Output from ARM
2	UART0 RX	Serial Input to ARM
3	+3.3V	3.3V Power Output
4	+5V	5V Power Output
5	GND	Ground

10.25 CON27 – Fan Connector

PWM controlled fan interface.

Pin	Signal	Description
1	GND	Ground
2	+12VF	+12V MOSFET-Switched Fan Power Output
3	FAN_SENSE	Not connected
4	FAN_CONTROL	PWM Output (Open Drain)

10.26 CON28 – SPI Programming

SPI-Interface for Programming Scaler Firmware

Pin	Signal	Description
1	SPI_PROG_EN#	Enable Signal
2	SPI_CLK_FLASH	SPI Clock
3	SPI_SI_FLASH	SPI_SI
4	SPI_SO_FLASH	SPI_SO
5	SPI_CS_FLASH	SPI_CS
6	MSTAR_RESET_N	MSTAR_RESET_N
7	GND	GND
8	+3.3V Output	+3.3V Output

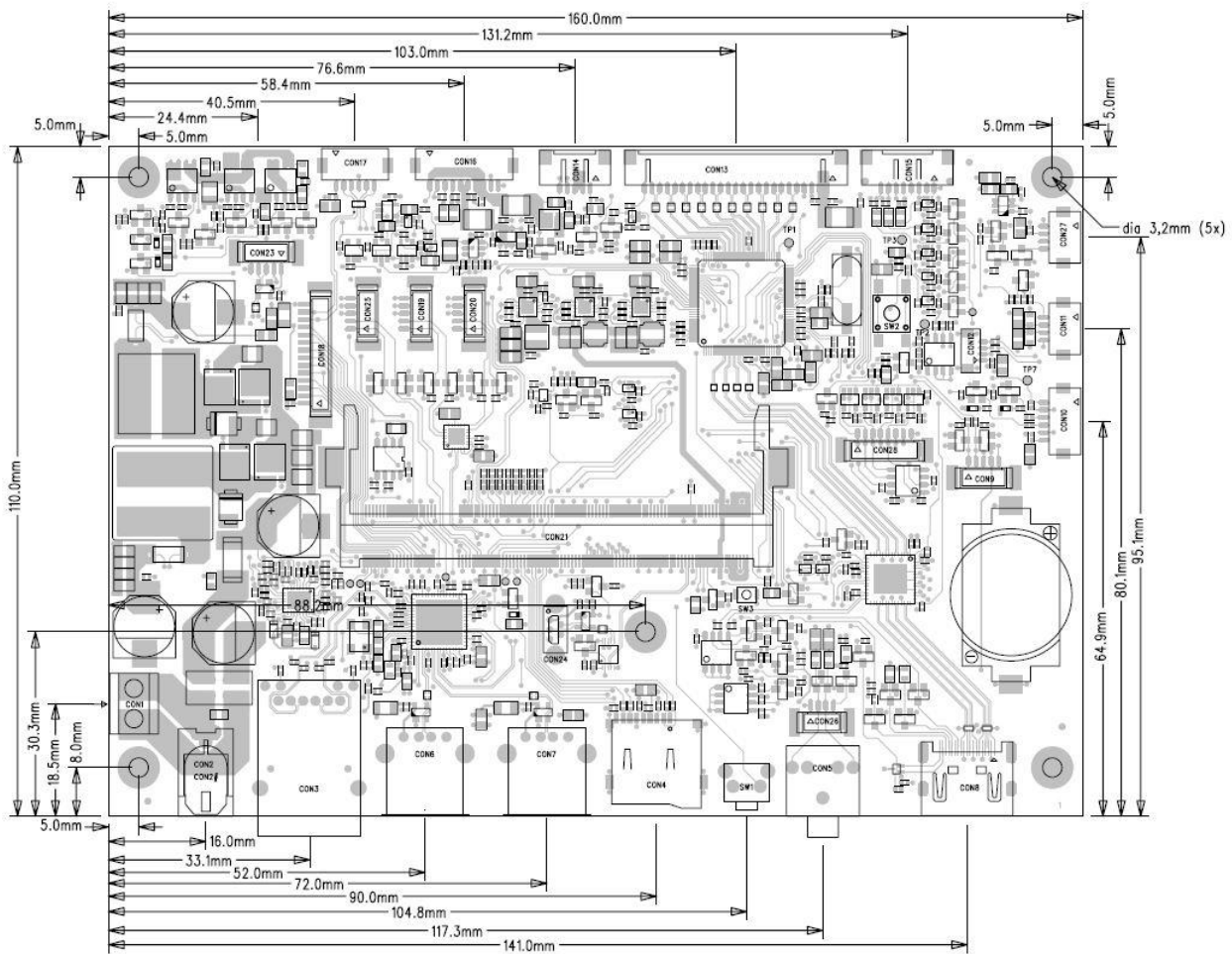
10.27 CON21 – Raspberry Pi Compute Module Connector

Pin	Signal	Description
1, 7, 13, 19, 25, 26, 31, 32, 37, 38, 43, 44, 49, 50, 55, 56, 61, 62, 67, 68, 73, 74, 79, 80, 85, 86, 91, 92, 97, 98, 103, 104, 109, 110, 115, 116, 121, 122, 127, 133, 134, 139, 140, 145, 146, 151, 152, 157, 163, 164, 169, 170, 181, 182, 187, 188, 195, 196	GND	Ground
39, 40, 41, 42	GPIO_VREF	Connected to +3.3V Power Supply
183, 184, 185, 186	1V8	Connected to +1.8V Power Supply
189, 190	VDAC	Connected to +3.3V Power Supply
191, 192, 193, 194	3V3	Connected to +3.3V Power Supply
197, 198, 199, 200	VBAT	Connected to +3.3V Power Supply
2	EMMC_DISABLE_N	ARM will fail to boot from eMMC if this input pin is low and will fall back to booting from USB. This happens if a Host PC is connected to CON24.
3	EP5	Engineering test point
5	EP1	Engineering test point
52	INT_N	Touch Controller Interrupt (to CON17)
54	RESET_N	Touch Controller Reset (to CON17)
9	SDA1	I2C Data (to CON17 and CON18)
11	SCL1	I2C Clock (to CON17 and CON18)
15	CLK0/GPIO4	ARM multi-purpose GPIO (to CON18)
17	CLK1/GPIO5	ARM multi-purpose GPIO (to CON18)
21	CLK2/GPIO6	ARM multi-purpose GPIO (to CON18)
23	CE1N/GPIO7	ARM multi-purpose GPIO (to CON18)
27	CE0N/GPIO8	ARM multi-purpose GPIO (to CON18)
29	MISO/GPIO9	ARM multi-purpose GPIO (to CON18)
33	MOSI/GPIO10	ARM multi-purpose GPIO (to CON18)
35	SCLK/GPIO11	ARM multi-purpose GPIO (to CON18)
28	+5V_PWR_GOOD	+5V System Power Good Signal (input) LOW: 5V system power is OFF HIGH: 5V system power is ON
30	SDCARD_DETECT	SD Card Detection (to CON4, input) LOW: Card inserted HIGH: Card ejected
34	EP3	Engineering test point

36	LAN_RUN	LAN & USB Hub Enable Signal (output) LOW: LAN and all USB Host-Ports OFF HIGH: LAN and all USB Host-Ports ON
45	PWM0/GPIO12	ARM multi-purpose GPIO (to CON18)
47	PWM1/GPIO13	ARM multi-purpose GPIO (to CON18)
46	UART_TX	Serial output connected to Scaler input UART1 RX (and to CON9)
48	UART_RX	Serial input connected to Scaler output UART1 TX (and to CON9)
51	UART0_TX	Serial output (to CON25)
53	UART0_RX	Serial input (to CON25)
57	SCALER_RST	Reset output to scaler chip LOW: Scaler in normal operation HIGH: Scaler in hard reset
58	RESCUE_SYSTEM	Rescue System
59	SCALER_INT	Direct connection to scaler GPIO (function TBD)
63	CPU_INT	Direct connection to scaler GPIO (function TBD)
65	PPWR_GOOD	Panel Power Good Signal (input) LOW: Panel Power OFF HIGH: Panel Power ON
69	EP2	Engineering test point
71	EP4	Engineering test point
60	HW_CONFIG_0	HW coded BOM revision with HW_CONFIG_0 being the LSB (input)
64	HW_CONFIG_1	
66	HW_CONFIG_2	
70	HW_CONFIG_3	
72	HW_CONFIG_4	
76	HW_CONFIG_5	HW coded PCB revision with HW_CONFIG_5 being the LSB (input)
78	HW_CONFIG_6	
84	HW_CONFIG_7	
82	LAN_CLK	25MHz output for LAN chip
90	EP6	Engineering test point
88	HDMI_HPD	HDMI hot plug detect (input)
111	HDMI_RXC-	Differential TMDS Clock-
113	HDMI_RXC+	Differential TMDS Clock+
117	HDMI_RX0-	Differential TMDS Data 0-
119	HDMI_RX0+	Differential TMDS Data 0+
123	HDMI_RX1-	Differential TMDS Data 1-
125	HDMI_RX1+	Differential TMDS Data 1+
129	HDMI_RX2-	Differential TMDS Data 2-
131	HDMI_RX2+	Differential TMDS Data 2+
171	HDMI_CEC	HDMI CEC Bus

173	HDMI_SDA	HDMI DDC Data
175	HDMI_SCL	HDMI DDC Clock
165	USB_DP	Differential USB Data+
167	USB_DM	Differential USB Data-
168	USB_OTGID	Connected to 1kOhm pull-down resistor
177	CPU_RESET	Reset input connected to optional reset switch SW2
All other pins of the Compute Module are not connected.		

11 Mechanical Dimensions



	Min	Typ	Max
Weight	133g	136g	139g
Width	109.9 mm	110.0 mm	110.1 mm
Length	159.5 mm	160 mm	160.5 mm
Height	PCB	1.44 mm	1.6 mm
	Components on Top		15.0 mm
	Components on Bottom		2.5 mm

12 On-Screen-Menu

Please note: For technical reasons OSD menu is only available when horizontal output resolution(active) exceeds 696 pixels

12.1 Brightness/Contrast Tab



Brightness: Brightness of the image can be controlled using this function, with left and right buttons after the brightness slider is selected. This function modifies RGB data or Backlight brightness (depending on configuration) to change the brightness.

Contrast: Allows <Contrast> adjustment in the Y domain. The modification affects all color channels and all input types and is a direct multiplication of the Y data after YUV black level adjustment.

12.2 Color Settings Tab



Color Temp: Allows selection of different color temperature schemes, predefined and custom. Available if the color space of the input is RGB.

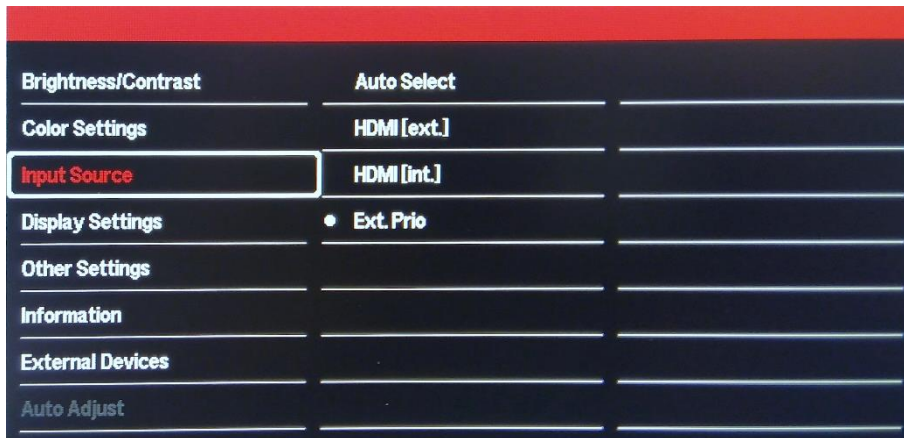
Red, Green, Blue: Control the amount of the corresponding color components in the displayed image.

Hue: Allows <Hue> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

Saturation: Allows <Saturation> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

Color Format: Switches between RGB and YUV color spaces.

12.3 Input Source Tab

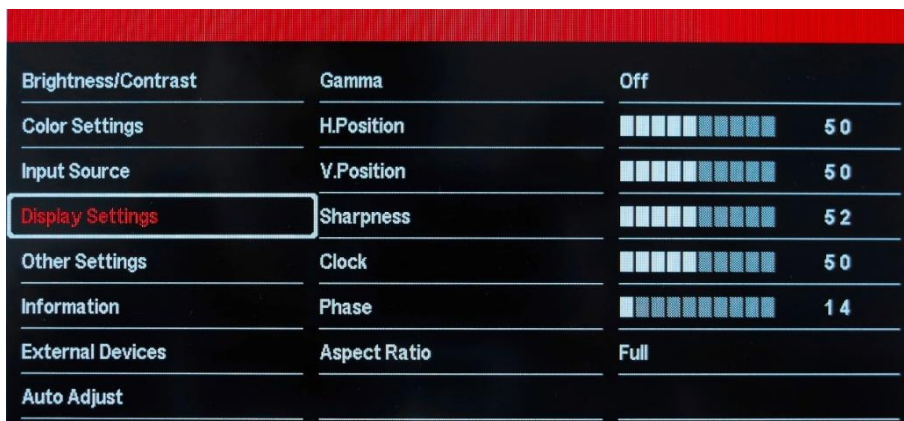


If “**Auto Select**” is selected, Mstar searches all ports and switches to the first port where a valid input signal is found.

If “**HDMI [ext.]**” or “**HDMI [int.]**” is selected, Mstar stays on this input port. If no valid input signal is found, Mstar goes into Standby Mode.

If **Ext. Prio** is selected, Mstar checking the 5V supply voltage injected by the external device. In this mode switching to another port is only possible if no external device is connected to the prioritized port or if the external device is powered off.

12.4 Display Settings Tab



Gamma: Enables or disables the gamma correction.

H.Position: NOT available

V.Position: NOT Available

Sharpness: Allows <Sharpness> adjustment of the image

Clock: NOT available

Phase: NOT available

Aspect Ratio: Allows adjustment of the display’s width to height proportions.

12.5 Other Settings Tab



Volume: Sets the volume of the sound

OSD Transparency: Sets the transparency level of the OSD Menu on the 0 to 5 scale (0 – not transparent, 5 – barely visible)

OSD H.Position: Sets the horizontal OSD Menu position on the screen (in percent of the horizontal screen resolution)

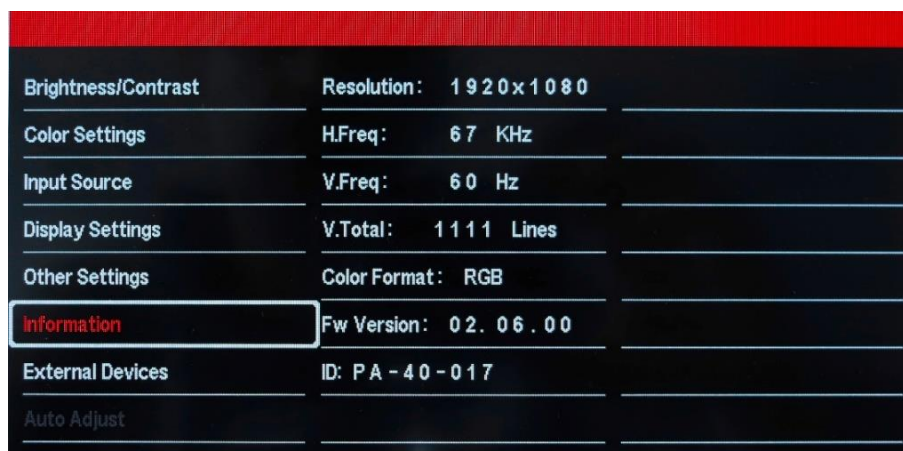
OSD V.Position: Sets the vertical OSD Menu position on the screen (in percent of the vertical screen resolution)

OSD Timeout: Selects how many seconds the OSD will remain active after the last action has been performed.

OSD Rotation: Rotates the OSD Menu by 90, 180 or 270 degrees.

Factory Reset: Resets the display settings to the default ones.

12.6 Information Tab



Shows Input Resolution and firmware revision and ID information.

12.7 External Devices Tab



12.7.1 Sub Menu “Ambient Light Sensor”:



Auto Brightness ON/Off: activates auto brightness function (available when optional [light sensor](#) is connected).

Br. Adjustment Interval[s]: sets the time of Brightness adjustment interval

For more information and activation of detailed settings refer to *“Manual_For_ALS_And_Temperature_Sensor_Integration”* or contact Distec customer service.

12.7.2 Submenu “Temperature Sensor”:



Temp. Ctrl ON/Off: activates temperature control (available when optional [temperature sensor](#) is connected)
Current Temp [°C]: displays current temperature

For more information and activation of detailed settings refer to “[Manual_For_ALS_And_Temperature_Sensor_Integration](#)” or contact Distec customer service.

12.7.3 Sub Menu “Controllers”:



Keypad: switches between 4 Buttons and 6 Buttons keypad.
IR Remote: activates remote control. (available when optional [I/R Sensor](#) is connected)

For more information and activation of detailed settings refer to “[Manual_For_ALS_And_Temperature_Sensor_Integration](#)” or contact Distec customer service.

12.7.4 Sub Menu “Fan Ctrl”:

Brightness/Contrast	Temp. Sensor	DS1631
Color Settings	Temp. Control	Off
Input Source	Safe Temp. [°C]	40
Display Settings	Critical Temp. [°C]	55
Other Settings	Min. Fan Speed [%]	40
Information	Max. Fan Speed [%]	100
External Devices	Temp. Sensor Read Interval [s]	60
Auto Adjust		

Temp.Sensor: displays sensor type (available when optional [temperature sensor](#) is connected).

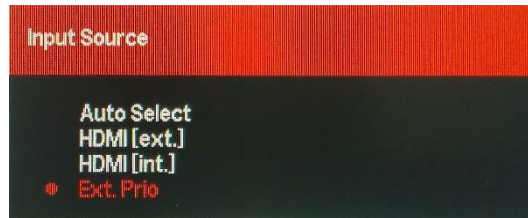
Temp. Control: activates temperature-controlled fan control (when optional fan is connected on CN 15)

For more information and activation of detailed settings refer to *“Manual_For_ALS_And_Temperature_Sensor_Integration”* or contact Distec customer service.

12.8 Auto Adjust Tab

NOT Available

12.9 Input Source Window



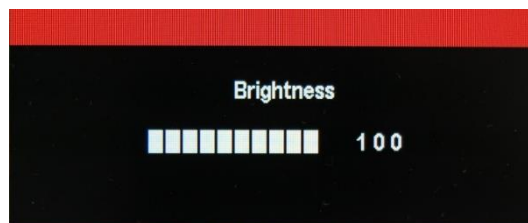
Select the input signal source without going into the main menu.

12.10 Volume Control



Controls the volume of the sound

12.11 Brightness Control

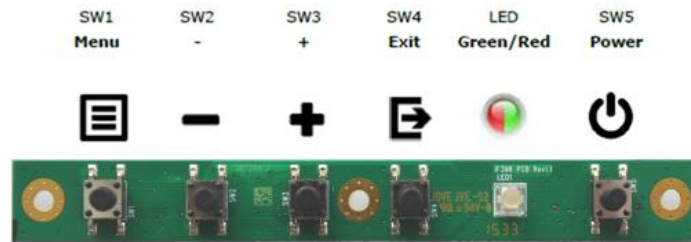


Controls the brightness of the display.

13 Accessories

13.1 OSD Keypad ZU-02-398

An OSD keypad can be used to control the On Screen Menu of the scaler chip.
Fitting cables to CON10: **KA-30-394** (80cm) or **KA-30-613** (45cm)



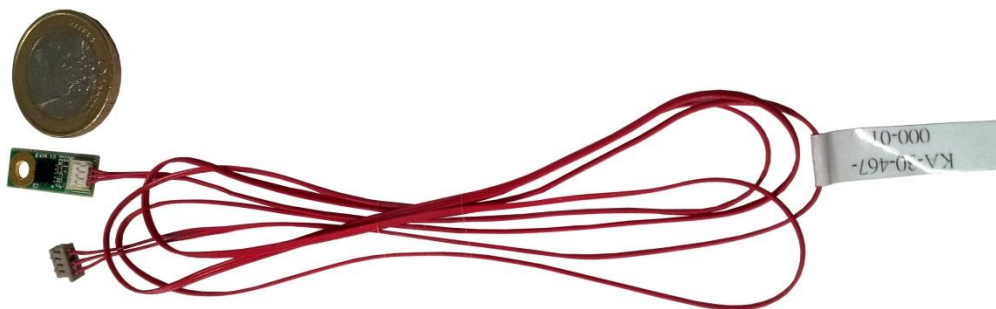
The following table gives an overview about the functionality.

	Menu	-	+	Exit	LED	Power
OSD closed	Open OSD	Hotkey Volume	Hotkey Brightness	Hotkey Input Select	Same as LED1+2 in chapter 9	Power ON/OFF
OSD open	Select	Down/Left/-	Up/Right/+	Exit/Back		

13.2 I/R Sensor ZU-02-406 and I/R Remote Control RC-10-006

As an alternative to the external keypad, the scaler chip can be controlled through infrared. IR sensor and IR remote control devices are provided by Distec.

Fitting cable to CON11: **KA-30-467**.



Customer ID code : **01FE**



Key	HEX	Function		
		General	OSD Closed	OSD Open
Power	01	Power on/off	-	-
Number Keys	00-0E	Not used	-	-
Number „0“	13	Not used	-	-
ID	19	Not used	-	-
Recall/Return	10	Not used	-	-
Disp	1D	Not used	-	-
Mute	12	Not used	-	-
Input	18	-	Input Select	-
Menu	41	-	Opens OSD	-
Exit	09	-	-	Exit /Back
Up	17	-	-	Up/+
Left	0D	-	Volume -	Left
OK	15	-	-	Select
Right	14	-	Opens Volume Menu Volume +	Right
Down	1A	-	-	Down/-

13.3 Light Sensor ZU-02-412

This light sensor can be connected to the scaler chip to automatically adjust the panel brightness according to the ambient light. Fitting cable to CON12: **KA-30-786**.



13.4 Temperature Sensor ZU-02-389

A temperature sensor is available to check the temperature of a TFT panel or any other hardware. Firmware support is provided upon request. Fitting cable to CON12: **KA-30-323**.



Remark: When both light and temperature sensors are used, please connect light sensor ZU-02-412 directly to temperature sensor ZU-02-389 via cable: **KA-30-959**

14 Programming, configuration and ROSD via serial port

Preconfigured (“ready to run”) HW is also available, please contact customer service for information.

The following instruction refers only to programming and configuration of Scaler.

Please refer to MStarRover Manual for details of configuration.

- If ArtistaMedia-IIIB is blank and without any firmware the DediProg SF100 SPI programmer is mandatory for initial flashing of firmware. After that Firmware can be flashed also via Serial/USB Port.
- For configuration of Display settings/EDID configuration or for usage of ROSD its sufficient to use the USB to Serial UART Converter IF430.

14.1 HW requirements

- Standard PC with Windows OS
- 1x USB port for serial programmer
- 1x USB port for DediProg SF100 SPI programmer

DediProg SF100 SPI Programmer (optional) *		
Part#	Part description	Additional info
KI-90-035**	DediProg SF100 USB-SPI Programmer	
	IF399-00-SPI Buffer interface for PIIIA	
	Cable SPI-Buffer-Interface 8pol. 150mm	Cable between SPI Buffer CON1 and SPI connector CON28

(*) mandatory for initial firmware flashing of blank ArtistaMedia-IIIB

(**) KI-90-035 consists of DediProg SF100 USB-SPI Programmer, buffer interface and cable (as shown below).



USB to serial adapter *		
Part#	Part description	Additional info
ZU-02-430	IF430-00 USB to Serial UART Converter	RS232 programming adapter
KA-30-101	Cable Service & Remote 80cm	Cable from RS-232 adapter to ArtistaMedia-III B (CON9)
KA-30-051	USB-Cable, Highspeed, type A/B m/m 2m	



14.2 ROSD Protocol

ArtistaMedia-III B can be fully controlled via Remote OSD Protocol.

Details can be found in "MStar-ROSD.pdf" or contact Distec customer service.

15 Hardware Information

Part Number	Description	Note
AR-02-206	ArtistaMedia-IIIB-BB-00 (Base Board)	

16 Reference Kits

16.1 Artista-IoT Starter Kits

The Artista-IoT Starter Kits are ready to use evaluation kits containing the ArtistaMedia-IIIB Base Board, the Raspberry Pi Compute Module 3+ (CM3+) with preinstalled Raspberry Pi OS, a 10.1" display, an I2C multi-touch sensor and further accessories like cables and adapters.

Artista-IoT is intended for developers who want to bring their own software applications on an industrial grade Raspberry Pi based product.

For further information please refer to the Artista-IoT User Manual.

Order numbers:

KI-53-000	10,1 Artista-IoT Starterkit TM
KI-53-002	10,1 Artista-IoT Starterkit AUO
KI-53-002_US	US-10,1 Artista-IoT Starterkit AUO

Main parts of the kit KI-53-000:

Part	Part Number	Part Description	Qty
Display (Tianma)	TI-01-001	TM101JDHG30-00 10,1/SFT/WXGA/500cd+C	1
Touch Sensor	TO-09-014R1.1	TP-DD1010-A04 (10.1w,PCAP,COF,I2C)	1
Artista-IoT Controller	PA-XX-XXX	TBD	1

Main parts of the kit KI-53-002 and KI-53-002_US:

Part	Part Number	Part Description	Qty
Display (AUO)	UP-02-096	G101EVN01.0 10,1/MVA/WXGA/300cd+C	1
Touch Sensor	TO-09-014R1.1	TP-DD1010-A04 (10.1w,PCAP,COF,I2C)	1
Artista-IoT Controller	PA-YY-YYY	TBD	1

Part list of the Artista-IoT Controllers PA-XX-XXX and PA-YY-YYY:

Part	Part Number	Part Description	Qty
Base Board (1)	AR-02-206	ArtistaMedia-IIIB-BB-00 (Base Board)	1
Compute Module 3+ (1)	PC-02-020	Raspberry Pi Compute Module CM3+/32GB	1
RTC Battery	ZX-42-281	Battery Murata CR2032X Blister -40+85	1

(1): The parts listed here are not programmed with any firmware. The parts must be ordered as assembly PA-XX-XXX or PA-YY-YYY to be flashed with Raspberry Pi OS firmware.

16.2 VideoPoster-IV Reference Kit

The VideoPoster-IV Reference Kit is a ready to use Media Player kit containing the ArtistaMedia-IIIB Base Board, the Raspberry Pi Compute Module 3+ (CM3+) with preinstalled VideoPoster-IV firmware, a 21.5" FHD display and further accessories like cables.

VideoPoster-IV is intended for developers who require a ready to use industrial grade media player platform.

For further information please refer to the VideoPoster-IV User Manual.

Order number:

KI-49-001 21,5 G215HVN01.0/VP-IV

Main parts of the kit:

Part	Part Number	Part Description	Qty
Display	UP-02-086R1.1	G215HVN01.0 (S03) 21,5/A-MVA/FHD/300cd+C	1
VideoPoster-IV Controller	PA-XX-XXX	TBD	1

Part list of the VideoPoster-IV Controller PA-XX-XXX:

Part	Part Number	Part Description	Qty
Base Board (1)	AR-02-206	ArtistaMedia-IIIB-BB-00 (Base Board)	1
Compute Module 3+ (1)	PC-02-020	Raspberry Pi Compute Module 3 (CM3)	1
RTC Battery	ZX-42-281	Battery Murata CR2032X Blister -40+85	1

(1): The parts listed here are not programmed with any firmware. The parts must be ordered as assembly PA-XX-XXX to be flashed with VideoPoster-IV firmware.

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