ADIO-1

Manual

Revision History

Version	Date	Author	Reason
2.0	29.8.2018	J.Bullacher	ADIO only

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1   Regulatory Compliance Statements

Your Tritec product is marked to indicate its compliance class: A
Of the Federal Communications Commission (FCC) — USA

1.1   FCC Class A Notice

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:
1.This device may not cause harmful interference.
2.This device must accept any interference received, including interference that may cause undesired operation.
Note:
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses, and can radiate radio frequency energy, and if it is
not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

1.2   FCC Class B Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.
Note:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/television technician for help.

Modifications:
Any modifications made to this device that are not approved by Tritec Electronic AG, may void the authority granted to the user by the FCC to operate this equipment.

1.3 EC Declaration of Conformity

EG-Konformitätserklärung
nach EN 45014

EC Declaration of Conformity
according to EN 45014

Hersteller: TRITEC Electronic AG
Manufacturer: Carl-Zeiss-Straße 41
                                              D - 55129 Mainz
                                              Germany

Produktname: ADIO-1
Product Name:

Produkterweiterung: ADIO-1-PSU
Product Option:

Das bezeichnete Produkt ist konform mit den Vorschriften der
EMV Richtlinie 2004/108/EG, der RoHS Richtlinie 2011/65/EU und die
bezeichnete Produkterweiterung (Netzteil) ist konform mit den Vorschriften
zur elektrischen Sicherheit über Medizinprodukte gemäß der Richtlinie 2007/47/EG.

Die Konformität mit dieser Richtlinien wird dadurch nachgewiesen, dass bei
den bezeichneten Produkten folgende Normen eingehalten werden:

EN 55032:2012+AC:2013, Klasse B
EN 55024:2010
EN 60601-1 (3rd Edition)

The afore listed product conform to the regulations of
EMC Directive 2004/108/EC, the RoHS Directive 2011/65/EU and the
listed product option (power supply) is conform to the regulations
for electrical safety of medical devices accordingly 2007/47/EC.

The conformity with the instructions of these directives is proved by the
observation of the following standards:

EN 55032:2012+AC:2013, Klasse B
EN 55024:2010
EN 60601-1 (3rd Edition)

Jahr der CE-Kennzeichnung :   16
CE marking date :

Datum / Date: 23.06.2016

Unterschrift / Signature: _____

Name: Uwe Schmidt
Funktion / Function: Quality Manager

1.4 UL Notice

MEDICAL — GENERAL MEDICAL EQUIPMENT
AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY
IN ACCORDANCE WITH ANSI/AAMI ES60601-1: A1:2012, C1:2009/(R)2012
and A2:2010/(R)2012, CSA CAN/CSA-C22.2 NO. 60601-1:14

File Number E489277

2 Safety Agency Compliance Statements

Read this section and the caution statements at the unit before beginning any procedure. The following text provides safety precautions to follow when installing a Tritec Electronic AG product.

If the unit begins to emit smoke, smells like something is burning, or makes strange noises, disconnect all power connections immediately and contact your local representative for advice. Attempting to use a malfunctioning unit may result in fire, electric shock, or equipment damage.

Safety Precautions
For your protection, observe the following safety precautions when setting up your equipment:

Follow all cautions and instructions marked on the equipment.
Ensure that the voltage and frequency of your power source match the voltage and frequency printed on the equipment's electrical rating label.
Never push objects of any kind through openings in the equipment.
Dangerous voltages may be present.
Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Caution
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Connections
The device must be connected to IEC 60601 approved equipment within patient environments.
The device must be connected either to IEC 60601 or IEC 60950 approved equipment.

Do not open the cabinet or modify the unit.
Opening the cabinet or modifying the unit may result in fire, electric shock, or burn.

Modifications to Equipment
Do not make mechanical or electrical modifications to the equipment. Tritec Electronic AG is not responsible for regulatory compliance of a modified Tritec product.

Use the unit in an appropriate location.
- Not doing so may result in fire, electric shock, or equipment damage.
- Do not place outdoors.
- Do not place in a dusty or humid environment.
- Do not place near heat generating devices or a humidifier.

- Do not place in an in flammable gas environment.
- Do not place in environments with corrosive gases (such as sulphur dioxide, hydrogen sulphide, nitrogen dioxide, chlorine, ammonia, and ozone).
- Do not place in environments with dust, components that accelerate corrosion in the atmosphere (such as sodium chloride and sulphur), conductive metals, and so on.

Use the enclosed AC adapter.
The enclosed AC adapter is for use with this product only. Do not use the AC adapter with other equipment. Connecting to power sources that do not match the power ratings of the AC adapter may result in fire or electric shock.
Place the AC adapter in a position that it can be disconnected quickly.

Use power cords compliant to your country's' standard only.
 Be sure to remain within the rated voltage of the power cord. Not doing so may result in fire or electric shock. Power supply: 100-120/200-240VAC 50/60Hz

To power off the unit, unplug the mains power cord from the wall outlet.
The unit has no separate power switch.

The power adapter and power cord must be placed in such way that the user can reach it anytime to disconnect the power cord.

For electrical safety, do not connect or disconnect the power cord in the presence of patients.

Caution–Not all power cords have the same current ratings.
Do not use the power cord provided with your equipment for any other products or use. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Tritec product.

The following caution applies only to devices with multiple power cords:
Caution–For products with multiple power cords, all power cords must be disconnected to completely remove power from the system.

Caution-Do not attempt to repair this product yourself as opening or removing covers may result in electric shock, or equipment damage.

Caution–Before connecting or removing any input or output connectors unplug the mains power cord.

2.1 Product Markings

Read this manual and the caution statements at the unit before beginning any procedure.
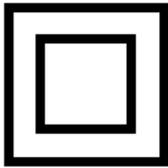
This product is a Class II product according to IEC 60601.

Caution Class 1 Laser Information

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure

This device is classified as a Class 1 Laser product per IEC60825-1:2007 and IEC60825-1:2014. This device contains a laser that could be damaged during repair or disassembly, which could result in hazardous exposure to infrared laser emissions that are not visible. This equipment should be serviced by Tritec Electronic only.

European Union—Disposal Information

The symbol above means that according to local laws and regulations your product and/or its battery shall be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. The separate collection and recycling of your product and/or its battery at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

CE

EU conformity mark in accordance with the provisions of Council Directive 93/42/EEC and 2011/65EU.

Manufacturer and date of manufacturing.

AC

Alternating current.

DC

Direct current.

Functional Earth.

Caution:

Mind that the unit and the AC adapter become hot during use.
Do not cover or place anything on top of the unit. Do not place the unit on top of things that trap heat such as carpets, blankets, etc. Keep the unit away from direct sunlight and heat sources such as heaters. Not doing so may result in fire.
Do not touch with bare hands. Doing so may result in burns.
Before moving the unit and AC-adapter, be sure to disconnect the power plug from the power outlet, and wait until it has cooled completely.

Unplug the unit before cleaning it.
Cleaning the unit while it is plugged into a power outlet may result in electric shock.

If you plan to leave the unit unused for an extended period, disconnect the power cord from the wall socket after turning off the power switch for the safety and the power conservation.

This product is only suitable for a patient environment, but not for contact with a patient.

Cleaning:

Do not use chemicals on a frequent basis. Chemicals such as alcohol and antiseptic solution may cause gloss variation, tarnishing, and fading of the cabinet.

Never use any thinner, benzene, wax, and abrasive cleaner, which may damage the cabinet or panel.
Do not let chemicals come into direct contact with the unit.
Gently wipe off any dirt on the cabinet or panel surface with a soft cloth soaked in a small amount of water or one of the chemicals listed below.

Chemicals that may be used for cleaning

Material name	Product name
Ethanol	Ethanol
Isopropyl alcohol	Isopropyl alcohol
Glutaral	Sterihyde
Glutaral	Cidex Plus28
Chlorhexidine	Hibitane

3 General

ADIO-1 is an **A**nalog-**D**igital-video-**I**nput-**O**ptical converter, which converts one DVI, HDMI, SDI, VGA or analog video input to a HDMI video output.
It has an USB input for keyboard and mouse and service tool connection.
It can extend the signals up to 36m with optical isolation bundle.
It has built in repeaters and buffers.

This document should be used to install ADIO-1 products.

ADIO-1 is available with different optional inputs and outputs. This document describes the ADIO version with all options installed. Table 1: Order numbers and options shows a list of available options and order numbers.

Order Number	Optical Isolation	Output Connector	Repeater Outputs	Inputs	Packaging list
ADIO-1H-AH	No	HDMI	yes	HDMI, VGA, analog	ADIO-1H TX Unit
ADIO-1H-AHDUS	No	HDMI	yes	DVI, DP, HDMI, VGA, analog, USB, SDI	ADIO-1H-AHDUS TX Unit
ADIO-1H-VHDS	No	HDMI	no	DVI, DP, HDMI, VGA, SDI	ADIO-1H-VHDS TX Unit
ADIO-1O-AH	yes	HDMI	yes	HDMI, VGA, analog	ADIO-1H TX Unit, Optical Bundle[1]
ADIO-1O-AHDUS	yes	HDMI	yes	DVI, DP, HDMI, VGA, analog, USB, SDI	ADIO-1H-AHDUS TX Unit, Optical Bundle[1]
ADIO-1O-VHDS	yes	HDMI	no	DVI, DP, HDMI, VGA, SDI	ADIO-1H-VHDS TX Unit, Optical Bundle[1]
ADIO-1-PSU				Power supply for Tx unit	One power supply with adapter cable

Table 1: Order numbers and options

[1] Optical bundle includes:
- Power Supply for ADIO Unit
- Optical Transmitter
- 36m of Optical Cable
- Optical Receiver
- Cable to supply Optical Receiver with power from MDM Power Break Out Board
- Cable to connect the Optical Receiver to the MDM HDMI input connector with lock

Other customer dependent option available.

For technical details of the Inputs refer to Table 2: Technical details of input connectors.

Figure 1: ADIO-Tx digital connectors (Model ADIO-1H-AHDUS)
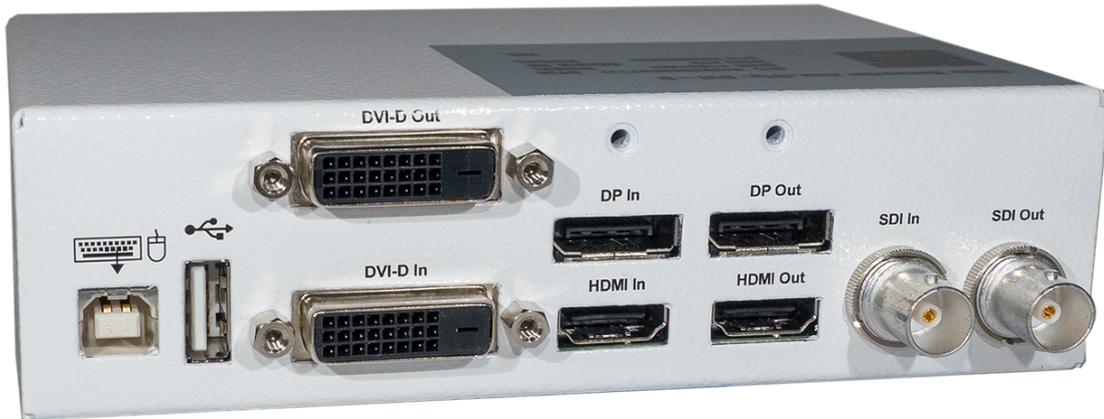
Figure 2: ADIO-Tx analog connections and output side (Model ADIO-1H-AHDUS)

Figure 3: ADIO-Tx input connector side (Model ADIO-1H-VHDS)
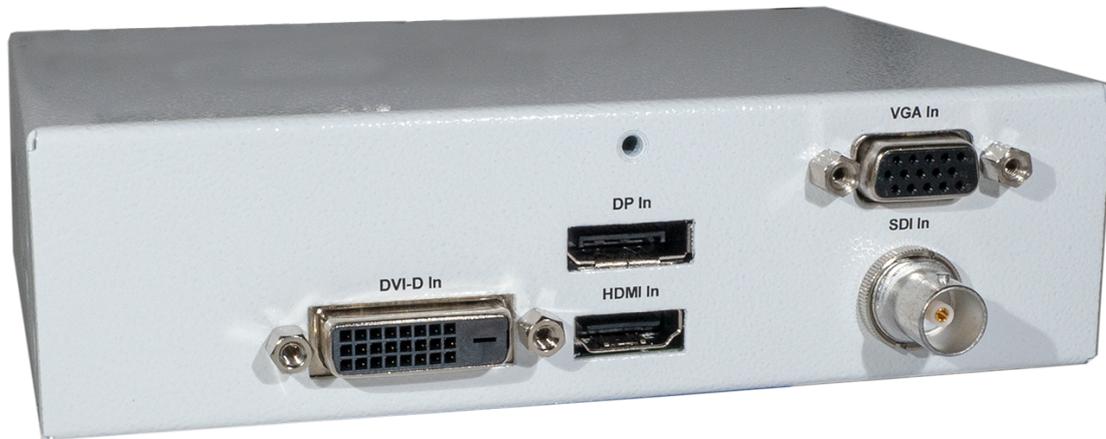
Figure 4: ADIO-Tx analog output side (Model ADIO-1H-VHDS)

Figure 5: ADIO with Optical Isolation

ADIO Optical Bundle

ADIO Power Supply

any ADIO Model

Optical Transmitter

Optical Receiver

HDMI with lock to MDM

Power from Power Break Out Board

36m Optical Cable
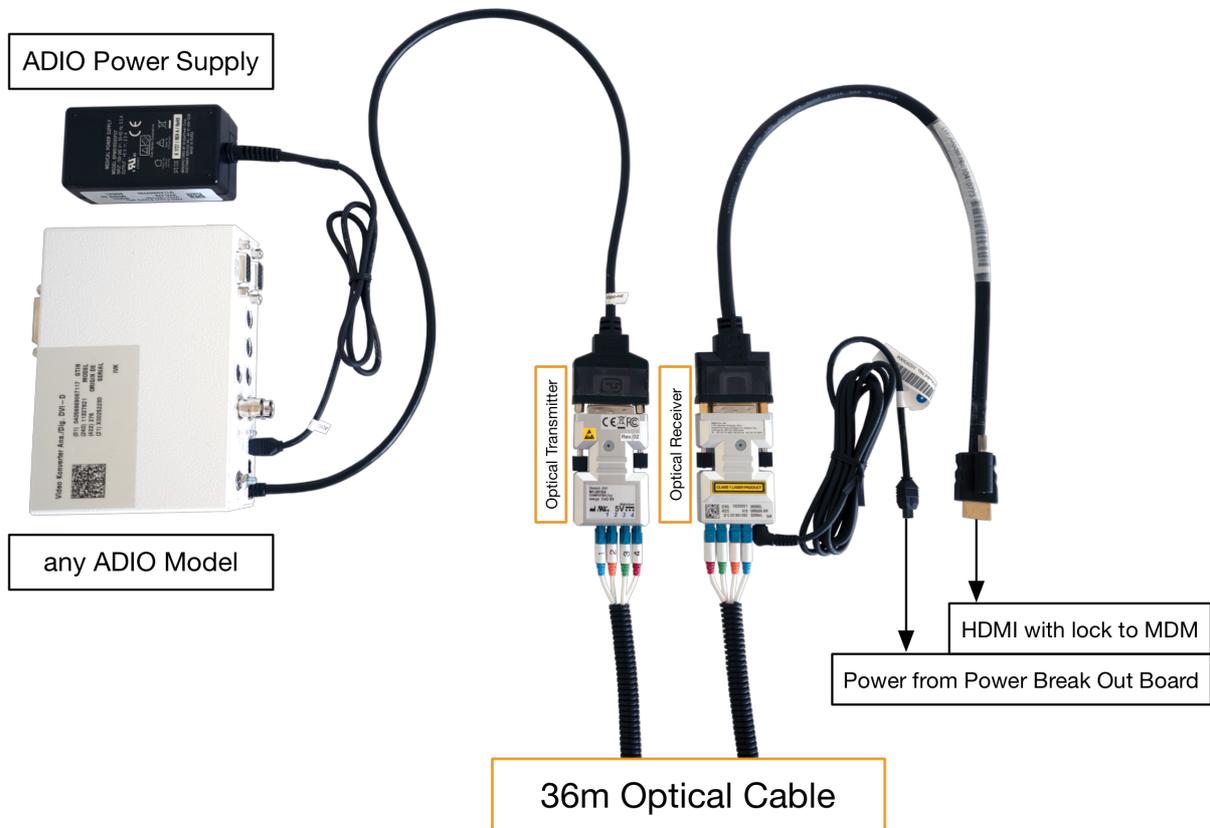
4   Usage of ADIO-1

The following figures show the typical use of the ADIO-1.
Refer to Table 2: Technical details of input connectors to find which video sources and USB versions are supported.

Figure 6: ADIO connection to MDM
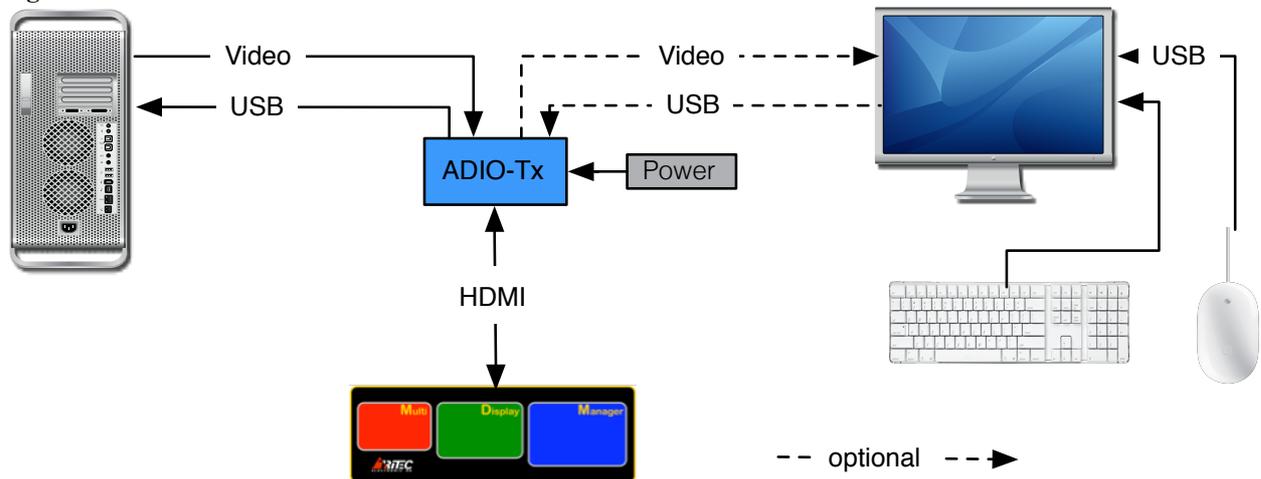
	Digital Inputs				Analog Inputs				USB
	DVI	HDMI	Display-Port	SDI	VGA	Com-ponent	S-Video	CVBS	USB
Supported Standards	DVI SL	HDMI 1.1	Display Port 1.1	3G SDI HD SMPTE 292M, 424M	Analog	YPbPr	S-Video	CVBS/ FBAS	USB 1.1 Keyboard & mouse device
Connector Type	DVI-I	HDMI	Display-Port	BNC	D-Sub VGA	7 pin mini DIN, Adaptor to cinch included	4 pin mini DIN	BNC	USB Type A
Input signal equalizer	yes	yes	yes	yes	-	-	-	-	HUB
Repeater output	yes, cable driver	yes, cable driver	yes, cable driver	yes, reclocked cable driver	yes, buffered	yes, buffered	yes, buffered	yes, buffered	yes, USB Type B
max . pixel clock [MHz]	165	165	165	3,000	165	165	-	-	n/a
Max. Resolution @60Hz	1920x 1200	1920x 1200	1920x 1200	-	1920x 1200	-	-	-	n/a
Color Formats	RGB	RGB, YCbCr	RGB	YCbCr	RGB	YPbPr	YC	-	n/a
Video Format	-	up to 1080p	-	up to 1080p progressive only	up to 1080p		PAL, SECAM, NTSC, 525i, 625i		n/a

Table 2: Technical details of input connectors

Notes:
- Details may vary depending on the ADIO version.
- Only one input can be active.
- Input pixel clocks above 165Mhz are available only when the connected video capture card can handle these resolutions.
- When a repeater cable is connected to a monitor, EDID data is provided by the monitor otherwise from ADIO.
- ADIO will use the input signal of the first connector plugged in.

5   Hardware Installation

This part of the installation refers to ADIO with all options installed.
Mounting points to fix ADIO-1 mechanically can be found
for the Tx unit in: Figure 8 Mounting Brackets, Dimension and Figure 9: ADIO-Tx
Mechanical Dimensions

For the technical details and the marking of all inputs and output refer to chapter 7 Technical
Specifications.

5.1   Minimum installation for ADIO connection

The minimum connections for ADIO connection are:
- Connect the HDMI cable (marked with 'Link') of the ADIO-Tx unit to the input of the frame grabber or MDM.
- Connect the provided power supply to one of the ADIO-Tx unit power inputs (DC 1in and/or DC 2in). The second input is not necessary for normal operation; it's for redundant systems only. If a Tx unit model ADIO-1H-AH is connected to an MDI-7 board no external power supply is needed.

⇨ The 'Link' LED should light orange or green.
⇨ The MDM or frame grabber should display a test pattern (**Tx**1920) of a resolution of 1920x1080. See: Figure 7: Test Pattern ADIO Tx unit 1920x1080

- Connect the video output of the PC or modality to the equivalent video input type of the ADIO-Tx unit.
⇨ The 'Video in' LED should light green.
⇨ The MDM or frame grabber should display the image of the connected input.

Figure 7: Test Pattern ADIO Tx unit 1920x1080

5.1.1 LED information for ADIO-1 without optical connection

When power is turned on the following LED lights should be visible:
- Link LED:
  - Green if connected to a Tritec MDM input board MDI-7 or higher (communication from MDM to ADIO-Tx is possible)
  - Orange if connected to any other video input board, without communication.
  - Red   if the HDMI output cable is not connected to a PC.
- Video in LED:
  - Green if the video input has a valid input signal and is transmitted to the video output
  - Orange if the video input has a valid input signal but is not transmitted to the video output
  - Red   no valid video input signal
- DC in 2 LED:
  - Off   if power is not connected
  - Green if power is connected
- DC in 1 LED: same as DC in 2 LED

When both LEDs ('Link' and 'Video in') are blinking, the input channel where this ADIO is connected to has been selected in the MDM 'Administration' tab.
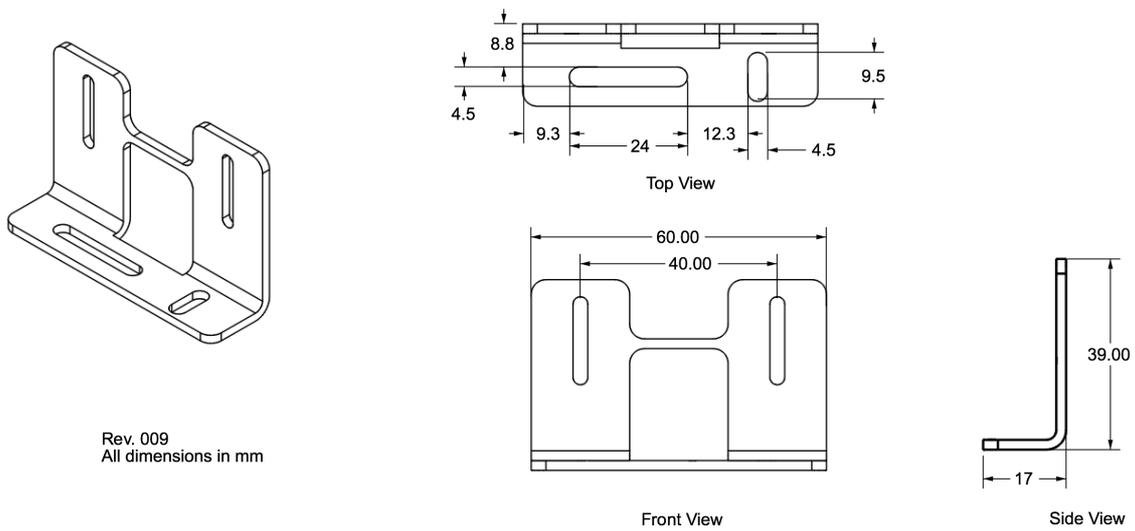
Rev. 009
All dimensions in mm

Top View

Front View

Side View

Figure 8 Mounting Brackets, Dimensions

Chassis for TX-Module

Mechanical dimensions

Front view – digital video connectors

Right side view

Rear view – analog video connectors

Left side view – MiniUSB Service port
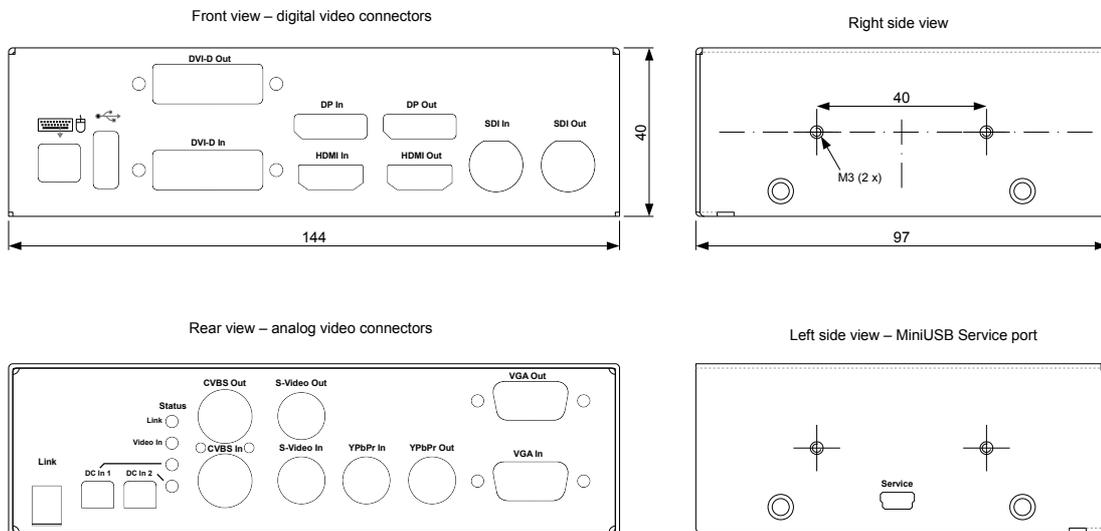
Figure 9: ADIO-Tx Mechanical Dimensions

5.2 Additional connections for ADIO

5.2.1 Video repeater output

In addition to the video input connection a video output connection to a monitor can be made. The video input of the ADIO-Tx unit is repeated to the equivalent video output.

- Connect the video output of the ADIO-Tx unit to the monitor. <u>The connected video output must be of the same type as the input video source. ADIO-Tx does not convert any video input signal to any other video type at the repeater output</u>. It converts any video input signal to the HDMI cable output only.

5.2.2 USB connection

This connection can be used with MDM and MDI-7 input boards only. USB keyboard and mouse information are sent from MDM to the attached PC or modality.

- Connect a USB cable between the PC ('normal USB connector type') and the ADIO-Tx unit USB connector marked with ⌨🖱 ('square USB-B connector type).
- Optionally a repeater type USB connection can be made from the ADIO-TX unit to a mouse and/or keyboard ⇇ (a USB hub may have to be added). In this case, the MDM 'mouse' and the directly connected mouse work are working parallel.

5.3 Important to know

For proper working please obey the following rules:

- Connect only one video source at a time. If you want to switch from one video input type to another first disconnect all video inputs, then reconnect the desired video input.
- Check that ADIO Tx has a valid video input signal. The 'Video in' LED must be green.
- The source of the EDID data (available resolutions) depends on various parameters:
  - o If a display is connected to the video repeater this attached display provides the EDID data.
  - o If the repeater output is not connected; ADIO-Tx provides the EDID data.
    - If not connected to a MDI-7 board the maximum preferred timing depends on the possibility of the frame grabber / MDI board. The preferred timing can be changed with 'ADIO-Service-Tool'.
    - If connected to a MDI-7 board the preferred timing can be select in the administration part as usual.

For more details of the EDID data refer to chapter 7.8

5.4 Features available with MDM and MDI-7 input board

The following features are available only if the ADIO is connected to an MDI-7 board of a MDM. (If not connected to MDI-7 refer to chapter: 6.1 Features available with the 'ADIO-Service-Tool'). For more details, refer to the MDM manual.

- The MDM browser tab 'About' returns the firmware / hardware revision and serial number of each attached ADIO Tx and Rx board.
- The MDM browser tab 'Administration' returns or allows to change:
  - o 'ADIO connected' status
  - o 'USB connected' status
  - o Video input signal type and connection (DVI, VGA, etc)
  - o Setting of the analogue input values (phase, brightness, resolution)
  - o Setting of the preferred resolution (EDID data)
- When MDM 'Administration' tab selects an input, the connected ADIO LEDs start blinking. This helps to identify which ADIO is connected to which MDM input channel.
- Firmware update of the ADIO Tx and Rx units.
- USB connections for the KVM mode of the MDM. This saves an extra USB connection between MDM and PC.

6 Service

ADIO-1 has no serviceable parts.
No calibration is necessary.

In case of a defect, the unit has to be returned to the factory.

6.1 Features available with the 'ADIO-Service-Tool'

If ADIO is not connected to a Tritec MDI-7 board the 'ADIO-Service-Tool' can be used to:

1. Check the serial number and the firmware / hardware revision of the ADIO Tx-unit
2. Check which input connector is used and which resolution the input signal has
3. Check if the Tx-unit is connected to a host
4. Setting of the preferred resolution (EDID data).
5. Setting of the analogue input values (phase, brightness, contrast).
6. Setting of the position and size of S-Video and CVBS video signals.
7. Setup up to 8 customer timings for analog VGA inputs.
8. Firmware update of the ADIO Tx unit / Rx unit.
9. Save and restore parameter settings of the above-mentioned items (4. to 7.).

The service tool is available at:
https://www.multi-display-manager.com/download/adio_service_tool.zip

It needs a mini-USB to USB connection between the service port of the Tx-unit and any PC running Windows 7 or later.
For more details, refer to the 'Readme' file of the ADIO Service Tool.

6.2 Trouble Shooting

If one of the LEDs is not showing a green or orange light a problem may happen.
First check that at least one of the 'DC in' LED a shows green light. If not:
- Check the power supply and power cord.
- Check the power connectors

If no green light shows up either the power or the ADIO-1 unit is defect.
Remove the power cord and return the part to the manufacturer. Do not dispose it to household trash.

If the 'DC in' shows a green light check the 'Link' LED. If it's red, then
- Check plug connector at the PC side
- Check the PC is turned on
- check another input of the PC or connect it to a display with a HDMI input.

If no green or orange light shows up most likely the ADIO unit is defect. Remove the power cord and return the part to the manufacturer. Do not dispose it to household trash.

7 Technical Specifications

7.1 Video Input / Repeater Output Specifications

7.1.1 DVI Input

Input	
Marking	DVI-D input
Connector Type	DVI-D female connector
Signal Type	According to DVI with equalization and Pre-emphasis
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz for Single Link
Horizontal Display timing	Min. 640 Pixel; max 4096 Pixel
Vertical Display timing	Min. 480 Lines; max. 2560 Lines
Interlace	Non-interlace only, progressive
EDID Data	When no repeater plugged in provided internally. For details see separate table.

7.1.2 DVI Repeater Output

Repeater Output	
Marking	DVI-D output
Connector Type	DVI-D female connector
Signal Type	According to DVI with equalization and Pre-emphasis
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz for Single Link
EDID Data	When repeater plugged in provided by external display.

7.1.3 HDMI Input

Input	
Marking	HDMI in
Connector Type	HDMI female connector
Signal Type	According to HDMI standard 1.4b with equalization and Pre-emphasis
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz for Single Link
Horizontal Display timing	Min. 640 Pixel; max 4096 Pixel
Vertical Display timing	Min. 480 Lines; max. 2560 Lines
Interlace	Non-interlace only, progressive
EDID Data	When no repeater plugged in provided internally. For details see separate table.

7.1.4 HDMI Repeater Output

Repeater Output	
Marking	HDMI out
Connector Type	HDMI female connector
Signal Type	According to HDMI standard 1.4b with equalization and Pre-

	emphasis
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz for Single Link.
EDID Data	When repeater plugged in provided by external display.

7.1.5 DisplayPort Input

Input	
Marking	DP in
Connector Type	DisplayPort connector, with lock
Signal Type	According to DP v1.1 standard
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz; HBR data rates
Lanes	4 lanes
Streams	Single stream only.
Interlace	Non-interlace only, progressive
EDID Data	When no repeater plugged in provided internally. For details see separate table.

7.1.6 DisplayPort Repeater Output

Repeater Output	
Marking	DP out
Connector Type	DisplayPort connector, with lock
Signal Type	According to DP v1.1 standard
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165Hz; HBR2 data rates
EDID Data	When repeater plugged in provided by external display.

7.1.1 SDI Input

Input	
Marking	SDI in
Connector Type	BNC, 75Ohm
Signal Type	SDI, 3G, Level A only
Equalization	Equalized cable lengths up to 200m
Clock	2.97Gbps
Standards	HD, SMPTE 292M, 424M, progressive only

7.1.2 SDI Repeater Output

Repeater Output	
Marking	SDI out
Connector Type	BNC, 75Ohm
Signal Type	SDI, 3G, Level A only
Clock	2.97Gbps
Output Signal	Re-clocked cable driver
Standards	HD, SMPTE 292M, 424M, progressive only

7.1.3 VGA Input

Input	
Marking	VGA in
Connector Type	VGA female connector
Signal Type	R,G,B: 0,7 Vpp, 75 Ohm Separate Syncs: TTL 5V or Sync on Green (G): 1 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 170Mhz with 12-Bit ADC
Horizontal Display timing	Min. 640 Pixel; max. 1920 Pixel
Vertical Display timing	Min. 480 Lines; max. 1600 Lines
Interlace	Non-interlace only, progressive
EDID Data	When no repeater plugged in provided internally
Resolution settings	For analog input timing presets see chapter 7.9 Analog Pre-set Timings. When connected to MDI-7 additional timings can be added via the browser interface.

7.1.4 VGA Repeater Output

Repeater Output	
Marking	VGA out
Connector Type	VGA connector
Signal Type	Analog amplified input signal R,G,B: 0,7 Vpp, 75 Ohm Separate Syncs: TTL 5V or Sync on Green (G): 1 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 170Mhz
EDID Data	When repeater plugged in provided by external display.

7.1.5 S-Video Input

Input	
Marking	S-Video in
Connector Type	S-Video connector, 4 pin mini DIN
Signal Type	Y: 1,0 Vpp, 75 Ohm; Pb,Pr: 0,7 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Formats	525i, 625i with deinterlacer
Color	YC
Pixel Clock	Max. 170Mhz

7.1.6 S-Video Repeater Output

Repeater Output	
Marking	S-Video out
Connector Type	S-Video connector, 4 pin mini DIN
Signal Type	Analog amplified input signal Y: 1,0 Vpp, 75 Ohm; Pb,Pr: 0,7 Vpp, 75 Ohm

ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz

7.1.7 Component YPbPr Input

Input	
Marking	YPbPr in
Connector Type	7 pin mini DIN, Adaptor to cinch included
Signal Type	Y: 1,0 Vpp, 75 Ohm; Pb,Pr: 0,7 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Video Formats	525p, 625p, 720p, 1080p
Pixel Clock	Max. 170Mhz

7.1.8 Component YPbPr Output

Repeater Output	
Marking	YPbPr out
Connector Type	7 pin mini DIN, Adaptor to cinch included
Signal Type	Analog amplified input signal Y: 1,0 Vpp, 75 Ohm; Pb,Pr: 0,7 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz

7.1.9 CVBS Input

Input	
Marking	Video in
Connector Type	1x BNC
Signal Type	Analog, 1 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Video Formats	525i, 625i with deinterlacer
Pixel Clock	Max. 170Mhz

7.1.10 CVBS Repeater Output

Repeater Output	
Marking	Video out
Connector Type	1x BNC
Signal Type	Analog amplified input signal, 1 Vpp, 75 Ohm
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz

7.2 USB Input / Output

USB input works with MDI-7 boards only. No support for all other input MDI boards.
A build in USB hub is used for a local mouse & keyboard connection and to connect MDM remotely.

7.2.1 USB Input (internal hub connection to host PC)

Input / Output	
Marking	⌨️🖱️
Connector Type	USB type B connector (square)
Signal Type	USB version 1.1
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM

1.1.1. USB Output (internal hub connection to mouse)

Input / Output	
Marking	•⟵⟶
Connector Type	USB type A connector
Signal Type	USB version 1.1
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM

7.3 Video Output

This specification relates either to the ADIO-Tx, when no optical connection is used, or to the ADIO-Rx when optical isolation is used.

7.3.1 HDMI Output

Output	
Marking	Link
Connector Type	HDMI female connector, with lock and 1.6m cable length
Signal Type	According to DVI, no HDMI signaling
ESD Protection	8KV contact per IEC6100-4-2 and 2KV HBM
Pixel Clock	Max. 165MHz for Single Link
Horizontal Display timing	Min. 640 Pixel; max 4096 Pixel
Vertical Display timing	Min. 480 Lines; max. 2560 Lines
Interlace	Non-interlace, progressive only

7.4 Electrical Specifications

7.4.1 ADIO-Tx unit electrical input

Marking	DC in 1, DC in 2 (HRS RP 34L-5R-2PD)
Connector Type	Hirose 2 pin
Voltage	5VDC +/- 5%
Input current	1.9A typ. 2.1 A max. with all options 0.95A typ. 1.0 A max. with analogue and HDMI inputs only

7.4.2 Power supply for ADIO-Tx-unit

The power supply has to be ordered separately. One power supply is needed for each unit when not connected to a Tritec MDI-7 board. If connected to a Tritec MDI-7 board or 'Power Break Out board' the ADIO-1H-AH unit does not need a separate power supply.

Connector Type	IEC 320/C8
Input Voltage	100 - 240 VAC
Input Frequency	50/60Hz
Input current	Max. 0.6A@230VAC
Isolation	4KV AC
Output Voltage	5VDC
Output	Cable with Hirose connector (HRS RP 34L-5PA-2SC) length appr. 0.6m

7.4.3 Electrical Safety & EMC specifications

Electrical Safety	IEC60601, EN60601, UL60601
EMC	According EN55032 & EN55024
Radiated Emission	FCC class B
Immunity	IEC 610004 2-11
Markings	UL, CE, WEEE

7.5 Mechanical Specifications

ADIO-Tx Unit	
Unpacked Size	(w)140x(h)40x(d)99 mm plus optional HDMI cable
Unpacked Weight	0,65 kg

Power supply	
Unpacked Size	(w)110x(h)30x(d)50 mm
Unpacked Weight	0,17kg

ADIO-Tx Unit packed	
Packed Size	300 x 255 x 90 mm
Packed Weight	<0,5kg

7.6 Environmental Specifications

Environmental Requirements
Unpackaged Operating: Temperature 5 °C according EN 60068-2-1 Temperature 35 °C according EN 60068-2-2.
Unpackaged Operating Humidity: Damp heat, 25°C, 10 to 80% RH (non-condensing) according EN 60068-2-38.
Unpackaged Operating Pressure: 700-1060 hPa (525 -795 mmHg) or up to 3050m (10,000ft).
Packaged Non-Operating Temperature (Storage, Transportation): Temperature -20 °C according EN 60068-2-1 Temperature +70°C according EN 60068-2-2.
Packaged Non-Operating Humidity: +25°C 10 to 95% RH (non-condensing) according 60068-2-38.
Packaged Non-Operating Pressure: 500 -1060 hPa (375 -795 mmHg) or up to 5,050m (18,000 ft).
Packaged Tests Continuous Shock: according EN 60068-2-29 and EN60721-3-2, class 2M2.
Package Drop Test: according EN 24180-2.
Sound Noise Level: No noise emitted.

7.7 Reliability

ADIO-1H	85,000h
ADIO-1H-AHDUS	85,000h
External power supply	300,000h

7.8 EDID Timings

7.8.1 Standard EDID Timings

	Analog EDID for VGA input	Digital EDID for HDMI, DVI, DP
(EDID V1.3)		
Vendor ID / Product ID	TRT / 8213 (x2015)	TRT / 8213 (x2015)
Analog / Digital	Analog	Digital
Preferred timing mode	**x**	**x**
Established Timings:		
720x400x70	**x**	**x**
720x400x88	.	.
640x480x60	**x**	**x**
640x480x67	**x**	**x**
640x480x72	**x**	**x**
640x480x75	**x**	**x**
800x600x56	**x**	**x**
800x600x60	**x**	**x**
800x600x72	**x**	**x**
800x600x75	**x**	**x**
832x624x75	**x**	**x**
1024x768x87	.	.
1024x768x60	**x**	**x**
1024x768x70	**x**	**x**
1024x768x75	**x**	**x**
1280x1024x75	**x**	**x**
1152x870x75	**x**	**x**
Standard Timings:		
Timing ID #1	1152x864x60	1152x864x60
Timing ID #2	1280x720x60	1280x720x60
Timing ID #3	1280x800x60	1280x800x60
Timing ID #4	1280x960x60	1280x960x60
Timing ID #5	1280x1024x60	1280x1024x60
Timing ID #6	1400x1050x60	1400x1050x60
Timing ID #7	1440x900x60	1440x900x60
Timing ID #8	.	1600x900x60
Timing ID #9	1600x1200x60	1600x1200x60
Timing ID #10	1680x1050x60	1680x1050x60
Timing ID #11	1920x1080x60	1920x1080x60

7.8.2 Additional Progressive Video Timings for HDMI inputs

„progressive video"	
Common features:	Underscan, Audio, YcbCr 444, YcbCr 422
Video formats:	1920x1080p @ 59,94/60, 50, 29,97/30, 25, 23,98/24 Hz
	1280x720p @ 59,94/60, 50, 29,97/30, 25, 23,98/24 Hz
	720x480p @ 59,94/60 Hz
	720x576p @ 50 Hz
	640x480p @ 59,94/60 Hz
Audio:	L-PCM, 48kHz, 44,1kHz, 32kHz, 16bits
Deep Color:	36bit, 30bit, Y444
Max TMDS Clock:	165MHz
Content:	HDMI Video Present

7.8.3 Preferred Timing

These are the preferred timings; which can be selected in the MDM 'Administration' or the 'ADIO-Service-Tool'.

	Resolution name:	Note:
Standard timings:	640x480,60Hz	DMT
	800x600,60Hz	DMT
	1024x768,60Hz	DMT
	1152x864,60Hz	CVT
	1280x720,60Hz	CEA
	1280x800,60Hz	CVT
	1280x960,60Hz	DMT
	1280x1024,60Hz	DMT
	1400x1050,60Hz	CVT
	1440x900,60Hz	CVT
	1600x900,60Hz	CVT
	1600x1200,60Hz	DMT
	1680x1050,60Hz	CVT
	1920x1080,60Hz	CEA
	1920x1200,60Hz	CVT RB
	1536x2048,30Hz	special
	2048x2048,30Hz	special
	2048x2560,25Hz	special
	2560x1440,30Hz	CVT RB
	2560x1600,30Hz	CVT RB

7.9 Analog Pre-set Timings

The following table shows all factory pre-set analog timings.

Table 3 Analog Pre-set Timings

Pixel Clock	H-width	H-f. por	H-Sync	H-b. por	H-Total	H-syc pol	Vert. hight	V-f. por	V-b. por	V-blanc	V-Total	V-syn pol	Name
28.287.000	720	16	108	56	900	0	400	11	2	36	449	0	0 - 720x400@70Hz VGA BIOS
23.856.000	640	16	64	80	800	0	480	1	3	13	497	0	1 - 640x480@60Hz VESA GTF
25.680.000	696	16	64	80	856	0	480	10	3	7	500	0	2 - 696x480@60Hz SC 6000 EKG
24.000.000	640	16	64	80	800	0	480	3	4	13	500	0	3 - 640x480@60Hz VESA CVT
31.500.000	640	16	64	120	840	0	480	1	3	16	500	0	4 - 640x480@75Hz VESA DMT
30.722.400	640	24	64	88	816	0	480	1	3	18	502	0	5 - 640x480@75Hz VESA GTF
30.844.800	640	24	64	88	816	0	480	3	4	17	504	0	6 - 640x480@75Hz VESA CVT
35.713.600	640	32	64	96	832	0	480	1	3	21	505	0	7 - 640x480@85Hz VESA GTF
35.165.520	640	24	64	88	816	0	480	3	4	20	507	0	8 - 640x480@85Hz VESA CVT
25.000.000	640	6	88	66	800	0	480	0	2	32	514	0	9 - 640x480@60Hz SC 6802XL
25.200.000	640	16	96	48	800	0	480	10	2	33	525	0	10 - 640x480@60Hz VESA DMT
38.215.680	800	32	80	112	1024	0	600	1	3	18	622	0	11 - 800x600@60Hz VESA GTF
38.338.560	800	32	80	112	1024	0	600	3	4	17	624	0	12 - 800x600@60Hz VESA CVT
49.500.000	800	16	80	160	1056	0	600	1	3	21	625	0	13 - 800x600@75Hz VESA DMT
48.906.000	800	40	80	120	1040	0	600	1	3	23	627	0	14 - 800x600@75Hz VESA GTF
39.790.080	800	40	128	88	1056	0	600	1	4	23	628	0	15 - 800x600@60Hz VESA DMT
49.062.000	800	40	80	120	1040	0	600	3	4	22	629	0	16 - 800x600@75Hz VESA CVT
57.084.300	800	50	88	128	1066	0	600	1	3	26	630	0	17 - 800x600@85Hz VESA GTF
56.818.080	800	48	80	128	1056	0	600	3	4	26	633	0	18 - 800x600@85Hz VESA CVT
64.108.800	1024	56	104	160	1344	0	768	1	3	23	795	0	19 - 1024x768@60Hz VESA GTF
63.584.640	1024	48	104	152	1328	0	768	3	4	23	798	0	20 - 1024x768@60Hz VESA CVT
78.720.000	1024	16	96	176	1312	0	768	1	3	28	800	0	21 - 1024x768@75Hz VESA DMT
81.804.000	1024	56	112	168	1360	0	768	1	3	30	802	0	22 - 1024x768@75Hz VESA GTF
82.110.000	1024	64	104	168	1360	0	768	3	4	30	805	0	23 - 1024x768@75Hz VESA CVT
64.995.840	1024	24	136	160	1344	0	768	3	6	29	806	0	24 - 1024x768@60Hz VESA DMT
94.386.720	1024	64	112	176	1376	0	768	1	3	35	807	0	25 - 1024x768@85Hz VESA GTF
94.620.640	1024	72	104	176	1376	0	768	3	4	34	809	0	26 - 1024x768@85Hz VESA CVT
94.500.000	1024	26	128	142	1320	0	800	2	4	31	837	0	27 - 1024x800x84 DG2 SUN
101.250.000	1280	26	112	150	1568	0	800	3	7	36	846	0	28 - 1280x800x76 DG2 SUN
94.500.000	1152	50	128	198	1528	0	900	2	4	31	937	0	29 - 1152x900x66 DG2 SUN
108.000.000	1152	42	128	182	1504	0	900	2	8	33	943	0	30 - 1152x900x76 DG2 SUN
135.000.000	1440	50	160	230	1880	0	900	2	3	39	944	0	31 - 1440x900x76 DG2 SUN
135.000.000	1600	49	136	183	1968	0	1000	2	5	32	1039	0	32 - 1600x1000x66 DG2 SUN
108.883.200	1280	80	136	216	1712	0	1024	1	3	32	1060	0	33 - 1280x1024@60Hz VESA GTF
109.191.360	1280	80	136	216	1712	0	1024	3	7	29	1063	0	34 - 1280x1024@60Hz VESA CVT
107.964.480	1280	48	112	248	1688	0	1024	1	3	38	1066	0	35 - 1280x1024@60Hz VESA DMT
134.881.458	1280	66	192	222	1760	0	1024	0	3	39	1066	0	36 - 1280x1024@72Hz A02

Pixel Clock	H-width	H-f . por	H-Sync	H-b. por	H-Total	H-syc pol	Vert. hight	V-f. por	V-b. por	V-bla nc	V-Total	V-syn pol	Name
134.955.600	1280	16	144	248	1688	0	1024	1	3	38	1066	0	37 - 1280x1024@75Hz VESA DMT
134.810.624	1280	28	144	212	1664	0	1024	3	7	32	1066	0	38 - 1280x1024@76Hz PD81 76
135.000.000	1280	25	144	215	1664	0	1024	2	8	32	1066	0	39 - 1280x1024x76 DG2 SUN
117.000.000	1280	25	112	215	1632	0	1024	2	8	33	1067	0	40 - 1280x1024x67 DG2 SUN
135.007.988	1280	66	192	222	1760	0	1024	0	3	40	1067	0	41 - 1280x1024@72Hz A02
138.542.400	1280	88	136	224	1728	0	1024	1	3	41	1069	0	42 - 1280x1024@75Hz VESA GTF
138.931.200	1280	88	136	224	1728	0	1024	3	7	38	1072	0	43 - 1280x1024@75Hz VESA CVT
159.358.000	1280	96	136	232	1744	0	1024	1	3	47	1075	0	44 - 1280x1024@85Hz VESA GTF
159.802.720	1280	96	136	232	1744	0	1024	3	7	44	1078	0	45 - 1280x1024@85Hz VESA CVT
162.000.000	1920	66	104	102	2192	0	1200	2	6	24	1232	0	46 - 1920x1200@60Hz Custom
154.000.000	1920	48	80	32	2080	0	1200	2	7	26	1235	0	47 - 1920x1200@60Hz WUXGA
160.963.200	1600	104	176	280	2160	0	1200	1	3	38	1242	0	48 - 1600x1200@60Hz VESA GTF
161.352.000	1600	112	168	280	2160	0	1200	3	4	38	1245	0	49 - 1600x1200@60Hz VESA CVT
162.000.000	1600	64	192	304	2160	0	1200	1	3	46	1250	0	50 - 1600x1200@60Hz VESA DMT
163.745.280	1200	96	128	224	1648	0	1600	1	3	52	1656	0	51 - 1200x1600@60Hz VESA GTF
162.351.360	1200	88	128	216	1632	0	1600	3	10	45	1658	0	52 - 1200x1600@60Hz VESA CVT?
31.500.000	640	32	64	96	832	0	400	1	3	41	445	0	54 - 640 x 400 @ 85Hz
28.322.000	720	15	108	51	894	0	400	11	2	32	445	0	55 - 720 x 400 @ 70Hz
35.500.000	720	36	72	108	936	0	400	1	3	42	446	0	56 - 720 x 400 @ 85Hz
25.175.000	640	16	96	48	800	0	480	10	2	33	525	0	57 - 640 x 480 @ 60Hz
31.500.000	640	24	40	128	832	0	480	9	3	28	520	0	58 - 640 x 480 @ 72Hz
36.000.000	640	56	56	80	832	0	480	1	3	25	509	0	60 - 640 x 480 @ 85Hz
36.000.000	800	24	72	128	1024	0	600	1	2	22	625	0	61 - 800 x 600 @ 56Hz
40.000.000	800	40	128	88	1056	0	600	1	4	23	628	0	62 - 800 x 600 @ 60Hz
50.000.000	800	56	120	64	1040	0	600	37	6	23	666	0	63 - 800 x 600 @ 72Hz
56.250.000	800	32	64	152	1048	0	600	1	3	27	631	0	65 - 800 x 600 @ 85Hz
73.250.000	800	48	32	80	960	0	600	3	4	29	636	0	66 - 800 x 600 @ 120Hz CVT (Reduce
33.750.000	848	16	112	112	1088	0	480	6	8	23	517	0	67 - 848 x 480 @ 60Hz
75.000.000	1024	24	136	144	1328	0	768	3	6	29	806	0	69 - 1024 x 768 @ 70Hz
78.750.000	1024	16	96	176	1312	0	768	1	3	28	800	0	70 - 1024 x 768 @ 75Hz
94.500.000	1024	48	96	208	1376	0	768	1	3	36	808	0	71 - 1024 x 768 @ 85Hz
115.500.000	1024	48	32	80	1184	0	768	3	4	38	813	0	72 - 1024 x 768 @ 120Hz CVT (Reduc
108.000.000	1152	64	128	256	1600	0	864	1	3	32	900	0	73 - 1152 x 864 @ 75Hz
68.250.000	1280	48	32	80	1440	0	768	3	7	12	790	0	76 - 1280 x 768 @ 60Hz CVT (Reduce
79.500.000	1280	64	128	192	1664	0	768	3	7	20	798	0	77 - 1280 x 768 @ 60Hz
102.250.000	1280	80	128	208	1696	0	768	3	7	27	805	0	78 - 1280 x 768 @ 75Hz
117.500.000	1280	80	136	216	1712	0	768	3	7	31	809	0	79 - 1280 x 768 @ 85Hz
140.250.000	1280	48	32	80	1440	0	768	3	7	35	813	0	80 - 1024 x 768 @ 120Hz CVT (Reduc
71.000.000	1280	48	32	80	1440	0	800	3	6	14	823	0	81 - 1280 x 800 @ 60Hz CVT (Reduce
83.500.000	1280	72	128	200	1680	0	800	3	6	22	831	0	82 - 1280 x 800 @ 60Hz
106.500.000	1280	80	128	208	1696	0	800	3	6	29	838	0	83 - 1280 x 800 @ 75Hz
122.500.000	1280	80	136	216	1712	0	800	3	6	34	843	0	84 - 1280 x 800 @ 85Hz
146.250.000	1280	48	32	80	1440	0	800	3	6	38	847	0	85 - 1280 x 800 @ 120Hz CVT (Reduc
108.000.000	1280	96	112	312	1800	0	960	1	3	36	1000	0	86 - 1280 x 960 @ 60Hz
148.500.000	1280	64	160	224	1728	0	960	1	3	47	1011	0	87 - 1280 x 960 @ 85Hz
108.000.000	1280	48	112	248	1688	0	1024	1	3	38	1066	0	89 - 1280 x 1024 @ 60Hz
135.000.000	1280	16	144	248	1688	0	1024	1	3	38	1066	0	90 - 1280 x 1024 @ 75Hz
157.500.000	1280	64	160	224	1728	0	1024	1	3	44	1072	0	91 - 1280 x 1024 @ 85Hz

Pixel Clock	H-width	H-f . por	H-Sync	H-b. por	H-Total	H-syc pol	Vert. hight	V-f. por	V-b. por	V-blanc	V-Total	V-syn pol	Name
85.500.000	1360	64	112	256	1792	0	768	3	6	18	795	0	93 - 1360 x 768 @ 60Hz
148.250.000	1360	48	32	80	1520	0	768	3	5	37	813	0	94 - 1360 x 768 @ 120Hz CVT (Reduc
101.000.000	1400	48	32	80	1560	0	1050	3	4	23	1080	0	95 - 1400 x 1050 @ 60Hz CVT (Reduc
121.750.000	1400	88	144	232	1864	0	1050	3	4	32	1089	0	96 - 1400 x 1050 @ 60Hz
156.000.000	1400	104	144	248	1896	0	1050	3	4	42	1099	0	97 - 1400 x 1050 @ 75Hz
88.750.000	1440	48	32	80	1600	0	900	3	6	17	926	0	100 - 1440 x 900 @ 60Hz CVT (Reduc
106.500.000	1440	80	152	232	1904	0	900	3	6	25	934	0	101 - 1440 x 900 @ 60Hz
136.750.000	1440	96	152	248	1936	0	900	3	6	33	942	0	102 - 1440 x 900 @ 75Hz
157.000.000	1440	104	152	256	1952	0	900	3	6	39	948	0	103 - 1440 x 900 @ 85Hz
119.000.000	1680	48	32	80	1840	0	1050	3	6	21	1080	0	111 - 1680 x 1050 @ 60Hz CVT (Redu
146.250.000	1680	104	176	280	2240	0	1050	3	6	30	1089	0	112 - 1680 x 1050 @ 60Hz
138.500.000	1920	48	32	80	2080	0	1080	3	5	23	1111	0	122 - 1920 x 1080 @ 60Hz (Reduced B
148.500.000	1920	88	44	148	2200	0	1080	4	5	36	1125	0	123 - 1920 x 1080 @ 60Hz
154.000.000	1920	48	32	80	2080	0	1200	3	6	26	1235	0	124 - 1920 x 1200 @ 60Hz CVT (Redu
81.750.000	1152	64	120	184	1520	0	864	3	4	26	897	0	133 - 1152 x 864 @ 60Hz CVT
74.250.000	1280	110	40	220	1650	0	720	5	5	20	750	0	134 - 1280 x 720 @ 60Hz
118.250.000	1600	88	168	256	2112	0	900	3	5	26	934	0	135 - 1600 x 900 @ 60Hz CVT
30.234.000	640	64	64	96	864	0	480	3	3	39	525	0	136 - 640 x 480 @ 67Hz
57.283.000	832	32	64	224	1152	0	624	1	3	39	667	0	138 - 832 x 624 75Hz
136.384.994	1600	104	168	272	2144	0	1024	3	3	30	1060	0	140 - 1600 x 1024 @ 60Hz hsync: 63.6