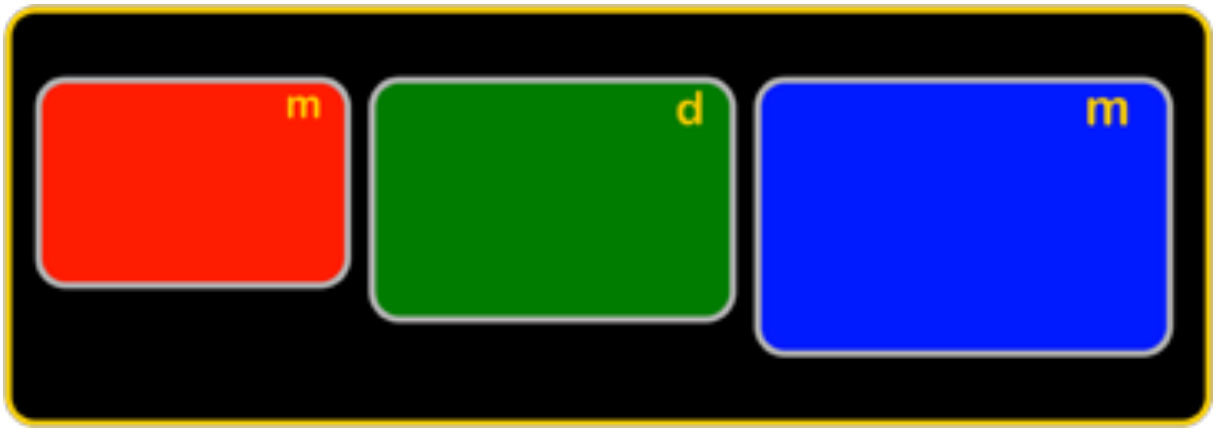
Installation Guide

Multi-Window-Manager (MDM-2)

Configuration: Model D & Model EL

Type Reference MDM-1



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Version history

2.0		J.Bullacher	Changes for Model D, removed older models
2.1	11.1.2019	J.Bullacher	Added chapter 9 Maintenance / Service Added chapter 10 trouble shooting Added French precautions. Added chapter 4.7.1 and Table 2.
2.2	17.1.2019	J.Bullacher	Added chapter 4.13
2.3	27.10.2020	J.Bullacher	Changed the EC Declaration of conformity

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1. Copyright Note

2. Regulatory Compliance Statements

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

2.1 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.

2.2 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.

2.3 EC Declaration of Conformity

CE

EG-Konformitätserklärung

EC Declaration of Conformity

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

Wir bestätigen, dass das IT Gerät:
We certify that the IT product:

Produktname: Product Name:	**Multi Display Manager** **MDM-1**

die grundlegenden Anforderungen der EMV Richtlinie 2014/30/EU,
der Niederspannungsrichtlinie 2014/35/EU und der RoHS Richtlinie 2011/65/EU erfüllt.

is conform to the regulations of the EMC Directive 2014/30/EU,
the Low Voltage Directive 2014/35/EU and the RoHS Directive 2011/65/EU

Die Konformität mit diesen Richtlinien wird dadurch nachgewiesen, dass bei
dem bezeichneten Produkt folgende harmonisierte EU-Normen eingehalten werden:

EN 55032:2012, Klasse B
EN 55024:2010+A1:2015
EN 62368-1:2014

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

EN 55032:2012, Class B (CISPR 32:2012)
EN 55024:2010+A1:2015 (CISPR 24:2010)
EN 62368-1:2014 (IEC 62368-1:2014)

Jahr der CE-Kennzeichnung: CE marking date:	12

Datum / Date:	14.10.2020
Unterschrift / Signature:	U. Schmidt
Name:	Uwe Schmidt
Funktion / Function:	Quality Manager

3. Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Tritec Electronic AG product.

3.1 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 inscribed 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.

3.2 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.

3.3 Placement of a Tritec Product

Caution–Do not block or cover the openings of your Tritec product. Never place a Tritec product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Tritec product.

3.4 Power Cord Connection

Caution– Tritec products a redesigned to work with power systems that have a grounded neutral (grounded return for DC-powered products). To reduce the risk of electric shock, do not plug Tritec products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.

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 Tritec product.

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

3.5 Battery Warning

Caution–There is a danger of explosion if batteries are mishandled or incorrectly replaced. On systems with replaceable batteries, replace only with the same manufacturer and type, or equivalent type, recommended by the manufacturer per the instructions provided in the product service manual. Do not disassemble batteries or attempt

to recharge them outside the system. Do not dispose of batteries in fire. Dispose of batteries properly in accordance with the manufacturer's instructions and local regulations. Note that on a Tritec CPU board, there is a lithium battery.

3.6 System Unit Cover

Removal of the MDM cover can only be performed by a Tritec Authorized Service Center. Unauthorized removal voids the warranty. Warning: Power Off the System prior to removing the cover.

Caution–Do not operate Tritec products without the cover in place. Failure to take this precaution may result in personal injury and system damage.

3.7 Rack System Warning

The following warnings apply to Racks and Rack Mounted systems:

Caution–For safety considerations, equipment should always be loaded from the bottom up. For example, install the equipment that will be mounted in the lowest part of the rack first, then the next higher systems, etc.

Caution–To prevent the rack from tipping during equipment installation, the anti-tilt bar on the rack must be installed and in place.

Caution–To prevent extreme operating temperature within the rack insure that the maximum temperature does not exceed the product's ambient rated temperatures.

Caution–To prevent extreme operating temperatures due to reduced airflow, consideration should be made to the amount of airflow that is required for a safe operation of the equipment.

3.8 Security

The software shipped with the system is standard software. When connected to other computers, viruses or other harmful software may attack the software of this product. It is the sole responsibility of the user to protect this system against viruses and attacks from the Internet or other input devices of this system.

⚠ AVERTISSEMENT

Si de la fumée provient du moniteur, que celuici sent le brûlé ou émet des bruits anormaux, débranchez immédiatement tous les cordons secteur et prenez contact avec votre représentant local. Il peut être dangereux d'utiliser un système au fonctionnement défectueux.

Ne démontez pas la carrosserie et ne modifiez pas le système. Le démontage de la carrosserie ou la modification du système peut causer un choc électrique ou une brûlure.

Confiez toute intervention à un technicien qualifié. Ne tentez pas de dépanner vous-même cet appareil, l'ouverture ou la dépose des capots vous expose à un risque d'incendie, de choc électrique ou de dégâts à l'appareil.

Eloignez les petits objets ou les liquides de l'appareil. L'introduction accidentelle de petits objets ou de liquide dans les fentes de ventilation de la carrosserie peut entraîner un choc électrique, un incendie ou des dégâts à l'appareil. Si un objet tombe dans la carrosserie ou si du liquide se répand sur ou à l'intérieur de l'appareil, débranchez immédiatement le cordon secteur. Faites contrôler l'appareil par un technicien qualifié avant de l'utiliser à nouveau.

ATTENTION II y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

Mise en garde - Pour mettre un système équipé de plusieurs cordons d'alimentation hors tension, il est nécessaire de débrancher tous les cordons d'alimentation.

Instructions de montage en rack

La mise en garde suivante s'applique aux racks et aux systèmes montés en rack.

Température ambiante de fonctionnement élevée: en cas d'installation dans un châssis fermé ou contenant plusieurs appareils, la température ambiante de fonctionnement au niveau du rack peut être supérieure à la température ambiante de la pièce. En conséquence, il convient de veiller à installer le matériel dans un environnement compatible avec la température ambiante maximale (Tma), spécifiée par le fabricant.

Débit d'air réduit: l'installation du matériel dans un rack doit être effectuée de façon à ne pas compromettre le débit d'air nécessaire pour un fonctionnement sûr de ce matériel.

Charge mécanique: le montage de l'équipement en rack doit être réalisé de manière à éviter toute situation dangereuse résultant d'une charge déséquilibrée.

Surcharge de circuit: il convient de prendre les précautions nécessaires pour la connexion du matériel au circuit d'alimentation et de réfléchir aux conséquences d'une éventuelle surcharge des circuits sur la protection de surintensité et sur le câblage d'alimentation. En l'occurrence, les valeurs nominales de la plaque signalétique du matériel doivent être prises en compte.

Mise à la terre fiable: une mise à la terre fiable du matériel monté en rack doit être assurée. Une attention toute particulière est requise pour les raccordements d'alimentation autres que ceux effectués directement sur le circuit principal (par exemple, en cas d'utilisation de blocs multiprises).

4. Multi Window Manager Technical Details

The MDM products ship in various hardware variations:

- **Chassis versions:**
  - Two different versions of 4U 19’ rack mount chassis
  - Deskside chassis
  - With or without redundant power supply.
- **Inputs:**
  - One input card version: 9 inputs
  - Two card version: 18 inputs
  - Three card version: 26 inputs
- **Input cards either:**
  - MDI-5: with 2 analogue inputs and 7 digital single link inputs per board or
  - MDI-7: with 9 digital inputs
  - Boards cannot be mixed
- 7 or (14) USB connections (may need ADIO extensions)
- **Outputs are either:**
  - up to 3 DP connectors and one HDMI connector and one Dual Link DVI connector.
  - For more details refer to chapter 7.2.5 Output Monitor Connection
  - Ships with a license for one 8 MP display. Additional output licenses are available as an optional purchase.
- **Power Breakout Board (PBB)**
  - Optional PBB support power deliver to 5VDC power for up to 7 devices / optical receivers etc. Note: only one PBB can be added to the MDM systems.
- **Keyboard & Mouse Switch board (KMS)**
  - Optional KMS board allowed supports remote control of up to 7 PCs. Note: only one KMS can be added to the MDM systems.

4.1 Power Supply 4U System (redundant)

Power supply 4U system	Type	MRW-6400P-Dual redundant 400W
	Input Voltage	90 - 264VAC
	Input Frequency	47 to 63Hz
	Inrush Current	60A max. @115VAC / 80A max. @230VAC
	Isolation	Input to output 1500VAC
	Leakage Current	3.5mA max.
	Input Connector	IEC320/C14 per Module
	Efficiency	>63% / 115VAC
	Input Current	Max. 8A@115VAC / 4A @ 230VAC Typ. 3A@115VAC / 1.5A@230VAC
	Power Consumption	Typ. 340W
		Max. 380W with one Power Breakout Board fully loaded or 10 ADIOs connected to MDI-7
		The current consumption in summary is independent of whether one or both power supply modules are in operation (automatic load sharing).

Power switch		Two power switches at the back, no other hardware power off/on switch.

4.2 Power Supply 4U System (non-redundant)

Power supply 4U system	Type	BEA-540H 400W
	Input Voltage	90 - 264VAC
	Input Frequency	47 to 63Hz
	Inrush Current	20A max. @115VAC / 40A max. @230VAC
	Isolation	Input to output 3100VAC
	Leakage Current	< 1.5mA, 250VAC
	Input Connector	IEC320/C14
	Efficiency	>80%
	Input Current	Max. 6A@115VAC / 3A @ 230VAC Typ. 3A@115VAC / 1.5A@230VAC
	Power Consumption	Typ. 340W
		Max. 380W with one Power Breakout Board fully loaded or 10 ADIOs connected to MDI-7
Power switch		Power switch at the back, no other hardware power off/on switch.

4.3 Mechanical Details 4U Rack Mount Model

Mechanical	Size unpacked	Width: 430mm; Height: 172mm; Depth: 450mm; / 350mm;
	Weight	20kg
	Size packed	Inside width: 650mm; outside width 780mm Inside height: 310mm; outside height 460mm Inside depth: 610mm; outside depth 790mm
	Weight	25kg

4.4 Video Output Model D

Video output	Output Connectors	Marked as: **1A, 1B, 1C:** 3x DisplayPort 2.0, standard connector **1D:** HDMI (max. 600MHz) **1E:** Dual Link DVI
	Output resolution	**8MP 3840x2160:** either as DP, HDMI, 2x DVI Dual Link or as 4x DVI Single Link **4MP 2560x1600:** either as DP, HDMI or DVI Dual Link **1920x1200, 1920x1080 and lower resolutions:** either as DP, HDMI or DVI Special adapters may be need.
	Max. number of displays	Software and license dependent. In total 5 connectors can be used: 3x DP, 1x HDMI 2.0, 1x DVI DL.

		Max. 2x 8MP and 2x 4MP and 1x HD displays can be used or any other combination with less resolution i.e. 1x 8MP, 3x 4MP and 1x HD
	More details can be found in the browser interface, in the 'display arrangements' tab. The number of enabled license can be found in the 'About' tab.	

4.5 Video Output Model EL

Video output	Output Connectors	Marked as: **1A, 1B:** 2x DisplayPort 2.0 DP++, standard connector **1C:** HDMI (max. 600MHz)
	Output resolution	**8MP 3840x2160:** either as DP, HDMI, 2x DVI Dual Link **4MP 2560x1600:** either as DP, HDMI **1920x1200, 1920x1080 and lower resolutions:** either as DP, HDMI Special adapters needed.
	Max. number of displays	Software and license dependent. Max. 1x 8MP or 2x 4MP or 3x 1 HD displays can be used.
	More details can be found in the browser interface, in the 'display arrangements' tab. The number of the enabled licenses can be found in the 'About' tab.	

4.6 Video Inputs with MDI-5 Input board

Video Inputs	Digital per board	Input 1: DVI input with DVI connector, 165Mhz Input 3, 4, 5, 6, 7, 8: DVI input with HDMI connector, 165Mhz
	Analog per board	Input 2: analog VGA inputs, VGA connector, 140Mhz Input 9: analog VGA inputs, VGA connector, 170Mhz
	Shared input	None.
	Total number of inputs	9 inputs can be displayed
	Rotation	Each input can be rotated by 0, 90, 180, 270 degrees
Input resolution		Any, as long as below specifications are obeyed.
	EDID	The input resolution can be set by programmable EDID data.
Input Video timing	Per Input Channel	
	H-Display	Min. 320 max. 2560Pixel
	V-Display	Min. 200 max. 2560 Lines
	Pixel-Clock	Min. 16MHz max. 140/165/170MHz
	H-Blank	Min. 8 pixel

	V-Blank	Min. 4 lines
	Interlace	Non interlace only, progressive
Input Bandwidth	Per Input Board	The aggregated bandwidth of all input channels per MDI-5: max. 620MPx/s
	Per System	With MDI-5 boards 1,500MPx/s

4.7 Video Inputs with MDI-7 Input board

Video Inputs	Digital per board	Input 1: HDMI input, up to 550Mhz pixel clock Input 2,3,4,9: HDMI input, up to 165Mhz pixel clock Input 5,6,7,8: DVI inputs with HDMI connector, up to 165Mhz pixel clock.
	Total number of inputs	9 inputs can be displayed
	Rotation	Each input can be rotated by 0, 90, 180, 270 degrees
	EDID	The input resolution can be set by programmable EDID data.
Input Video timing	Per Input Channel	
	H-Display	8x min. 320 max. 2560Pixel 1x min. 320 max. 4096Pixel
	V-Display	Min. 200 max. 2560 Lines
	Pixel-Clock	Min. 16MHz max. 165/550MHz
	H-Blank	Min. 8 pixel
	V-Blank	Min. 4 lines
	Interlace	Non-interlace only, progressive
Input Bandwidth	Per Input Board	The aggregated bandwidth of all input channels per MDI-7: max. 1,200MPx/s
	Per System	With MDI-7 boards 2,000MPx/s

4.7.1 MDI-7 Technical Details

MDI-7 boards have two different technical solutions for the input channels.
Input 1, 2, 3, 4 and 9 use HDMI input connectors and HDMI signals handled by the onboard FPGA core.
Inputs 5, 6, 7, and 8 use HDMI connectors but DVI signals and these are handled by legacy DVI receivers (as with MDI-5 boards).
Although HDMI signals should be downward compatible to DVI signals that is not always true. DVI signals from older graphics boards, onboard graphics GPU or analog to digital converted signals show a behaviour that cannot be handled by the HDMI signal inputs. Symptoms are flickering inputs or even 'No Signal' inputs. In these cases, use the inputs 5, 6, 7, or 8 and 14, 15, 16 or 17 and 24, 25 or 26 with the legacy DVI receiver chips.

In 3-input board Model 'D' MDMs inputs 1 and 10 can handle 8MP (4K) inputs. Input 19 cannot handle 8MP inputs.

Due to bandwidth limitations input board 3 should not be used for two many high bandwidth input channels.

4.8 Other Inputs / Outputs

Networking	Ethernet	10/100/1000Mbit/s Ethernet twisted pair.
	Connector	RJ45
USB	4U chassis and USB	In a 4U chassis there are 4 USB type A connections for 4 displays with mouse and keyboard (MDM-KVM mode). They are clearly marked as ‘Display 1’ etc..

4.9 Optional Power-Break-Out Board (PBS)

Hirose Power Connector	Connector	Hirose power connectors, Model 10501971
	Number of connectors	7
	Max. load	5VDC, 1A

4.10 Optional Keyboard-Mouse-Switch (KMS) Board

USB Inputs from hosts	Connector	USB type B connector
	Number of connections	7

4.11 Standby / Sleep Mode

Front LED	Green LED when power is turned on.
Standby Mode	MDM can be programmed to go to ‘Standby’ when no input signal is active for a given time. ‘not active’ means no +5VDC is connected to HDMI DDC input. See also notes below. Delay to enter MDM standby mode programmable from 0 to 999 minutes. Delay to exit standby mode: appr. 30s
Sleep Mode	MDM can be programmed to send a monitor to sleep/ power down when no mouse and keyboard activity is detected. Delay to enter monitor sleep mode programmable from ‘no’ to 999 minutes. Delay to exit sleep mode: < 1s (is monitor dependent)

4.12 Important Notes and Restrictions

Notes MDM-2 Model D:
The MDM-2 system, when configured with 3 input boards can have either one KMS board or one Power-Break-Out board.
A system with 2 input boards can have one KMS board and one Power-Break-Out board.
A system can never have more than one KMS board.
A system can never have more than one Power-Break-Out board.
Do not use Display Converter from previous MDM versions, they don’t work with the new graphics board.
‘Standby Mode’ is not supported with MDI-5 boards.

Not more than 10 ADIO converters with power supplied by MDI-7 are allowed. Use external power supply for more ADIO converters.

Notes MDM-2 Model EL:
A system can never have more than one KMS board.
A system can never have more than one Power-Break-Out board.
Do not use Display Converter from previous MDM versions, they don't work with the new graphics board.
'Standby Mode' is not supported with MDI-5 boards.

4.13 Approved Combinations of Input Channels, connected Displays and MDM Functions

MDM Model ‘D’ and model ‘EL can be used in many different variations. To get an overview how may displays can be used with input channels and certain functions, Tritec tested the following combinations. These combinations do not show any overruns of inputs or other problems. Other combinations are possible as well, but they should be tested under full load for safe usage.

Model ‘EL’

Displays Connected	Input channels	MDM-KVM function.	On-Screen	Annotations
1x8MP + HD mirror	4x HD	Yes	Yes	Yes
2x4MP	2x 4x1280x1024	Yes	Yes	Yes

Model ‘D’

Displays Connected	Input channels	MDM-KVM function.	On-Screen	Annotations
1x8MP + 1x HD mirror	4x HD	Yes	Yes	Yes
2x8MP + 1x 8MP mirror	2x4xHD	Yes	Yes	Yes
3x8MP independent	3x 4xHD	Yes	No	No
1x8MP + 1x4MP	4x HD, 4x1280x1024	Yes	Yes	Yes
1x8MP + 2x4MP	4x HD, 2x 4x1280x1024	Yes	Yes	Yes

Notes:
Displays Connected:
it doesn’t matter if displays are connected via DP to DL-DVI converter or directly. The displays are handled independently; except for mirrors.

Input channels:
4 inputs with a resolution HD of 1920x1080 fill the entire screen of an 8MP output display without overlapping. It doesn’t matter if 4x HD are used or 6x 1280x1024 or any other combination. Tests with 2 or more displays use different input channels for each monitor.

MDM-KVM functionality:
MDM or MDM-with KVM can be used as long as ‘onscreen user interface’ is not activated.

On-Screen user interface:
If ‘onscreen user interface’ is activated in the ‘Display Settings’ the bandwidth is reduced due to the additional drawing of the user interface onscreen.

Annotations:
Annotations do need more bandwidth due to the additional drawing of the annotations onscreen.

4.14 Environmental Specifications

Environmental Requirements		
Unpackaged Operating	Temperature	Temperature 40 °C according EN 60068-2-2. Temperature 5 °C according EN 60068-2-1
	Humidity:	Damp heat, 25°C, 10 to 80% RH (non condensing) according EN 60068-2-38.
	Pressure:	700-1060 hPa (525 -795 mmHg) or up to 3050m (10,000ft).
Packaged Non-Operating (Storage, Transportation):	Temperature	Temperature +70°C according EN 60068-2-2. Temperature -20 °C according EN 60068-2-1
	Humidity:	+25°C 10 to 95% RH (non-condensing) according 60068-2-38.
	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.
	Drop Test:	according EN 24180-2.

5. Glossary

Input Channel

The physical input of a video stream. It is connected to the output of a PC or other video source. It is either a DVI or analog signal.

Output Monitor

When a ‘set’ is selected, it is the monitor on which all input channels are displayed during set-up and after arrangement.

Channel enable

When a channel is enabled and all parameters are set up, it is visible in the arrangement window and can be part of an arrangement (see also ‘Screen enable’).

Channel connected

Indicates the status of the input channel. When there is a stable input signal (h- and v-total are constant for several frames), then the channel is ‘connected’ or ‘online’.

Screen

An input channel can be displayed as 1 or 2 screens:

- Screen 1 is always enabled and is the original input channel stream.
- Screen 2 is a copy of the input channel. It may be cropped and positioned differently. It does not reduce the bandwidth.

Screen enabled

Enabled screens take part in the arrangement. If they are disabled they are not displayed in the arrangement window.

Arrangement

The way input channels are arranged on the output monitor.

Layout / Set

A saved arrangement. For each ‘layout’ or ‘set’, any input screen can vary in position, size, scaling and cropping. The input screens and layout configuration screens are limited only by bandwidth and output monitor resolution. A ‘layout’ or ‘set’ can be selected by the browser interface or a remote interface.

Default Layout /Set

The default layout / set displayed after booting, as long as no other layout / set is selected.

MDI-5, MDI-7

MDI-5 or MDI-7 are the names for the input boards. MDI-7 supports 4K input bandwidth.

- For details see the technical specification of the boards.

Display Settings

Each display can be used in several ways – with an MDM-like functionality, or with MDM-KVM-functionality for video streaming. Not all of the selections may be visible for certain displays.

MDM-like functionality

In ‘MDM-Mode’ the display is located in the OR room. Layouts are switched by a bedside Touch PC or Table etc. No keyboard and mouse can be used to arrange or switch the layouts for this display. Therefore, the arrangement of layouts, and the select and button assignments for this display are activated.

MDM-KVM-like functionality

In ‘MDM-KVM-Mode’ the display is located in the control room and keyboard and mouse can be used to arrange and switch layouts. The behavior is similar to the MDM-Mode but the windows can be moved and resized by the mouse. A double click connects keyboard and mouse to the attached PC. The layouts (grids) can be pre-arranged like in MDM mode.

Screenshot

Is a copy of the current content of the display to a storage device in .png format.

How to use MDM

MDM has two interfaces to use:
The Administration and Service interface and the User interface.
The Administration and Service interface needs to be used once during set up and in-service cases. It is accessed through a browser interface (Firefox, Chrome or Edge) and needs keyboard and mouse to be used. It is accessed at http://mdm-ip-address.
It is used for setting up: the network, the connected display, input channels, the user interface etc. For more details refer to the 'Help' tab in the browser interface.

The User interface is used by the end user to switch layouts.
There are several ways to implement a user interface:

- Through a touch monitor interface, or with a mouse and keyboard interface.
- With a tablet or any PC with a touch monitor or monitor and mouse.
- Via remote control commands sent via network with REST commands. For details see the document 'External Software Interface Definition' available from Tritec Electronic under NDA.

6. Accessing the MDM via the Administration Interface

Please set up the MDM-1 in the following order:

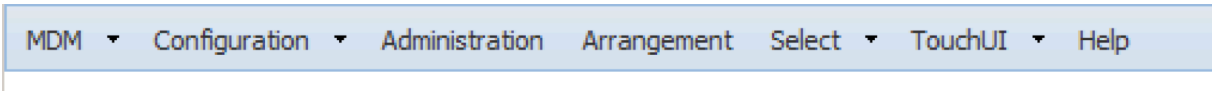
- Connect the power with either one or two power cords.
- Connect the network.
  - Either switch on the power supply. Connect to MDM via a browser connection (details see below) and read more details in the 'Help' menu.
  - Or proceed with the hardware set up.
- Connect the output and input cables. See chapter 7.2 Hardware connections.
- Switch on the power.
- Connect to MDM via a browser connection (details see below) and read more details in the 'Help' menu.

To open the administration interface from a remote browser, use the default IP address: 169.254.213.44. Netmask 255.255.255.0. This address can never be changed but a second IP address can be specified in the network settings.

Web Interface

The Web-Interface of the MDM has 7 tabs (see Figure 1: MDM-1 Web Interface Tabs below), which are used to set up and manage the MDM. Refer to the 'Help' tab for more information to set up MDM.

Figure 1: MDM-1 Web Interface Tabs



7. Setting up the Hardware

Please set up the MDM-1 in the following order:

- Connect the power with either one or two power cords.
- Connect the network.
  - Either switch on the power supply. Connect to MDM via a browser connection (details see chapter 6 'Accessing the MDM via the Administration Interface') and read more details about output connections to the displays in the 'Help' menu.
  - Or proceed with the hardware set up.
- Connect the output and input cables. See chapter 7.2 Hardware connections.
- Switch on the power.

7.1 Placing MDM-2 Systems

The operating temperature of MDM-2 systems is specified from 5ºC to 40ºC. With a strong airflow from back to front. Do not block these air inlets and outlets. A min. of 10cm in the front and back should be left open for the airflow. MDM-2 systems monitor their internal temperatures, when messages like 'temperature is now at xxxC' immediate actions should be taken to reduce the ambient temperature, check any filter or check the fans (see chapter 9 Maintenance / Service).

7.2 Hardware connections

7.2.1 Hardware Connections Model 'D'

The following images are giving an overview of the different options available with MDM-1 model 'D'.

Figure 2: Rear of MDM, chassis with redundant power supply, 3x MDI-5 input boards and KMS Board

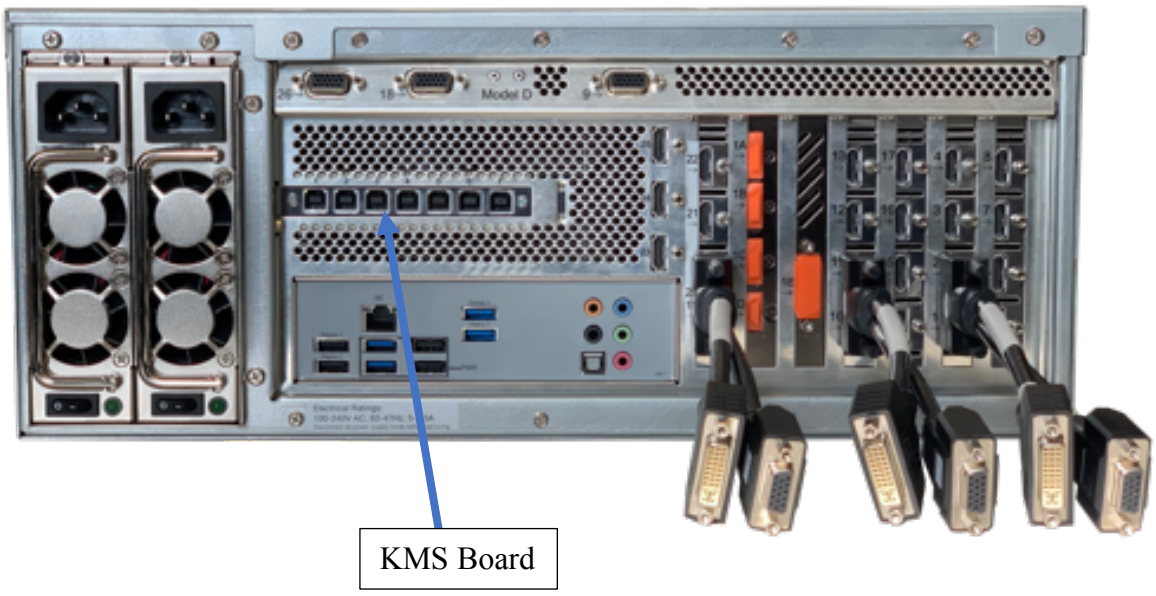


Figure 3: Rear of MDM, chassis with redundant power supply, 1x MDI-5 input board, Power Breakout Board and KMS Board

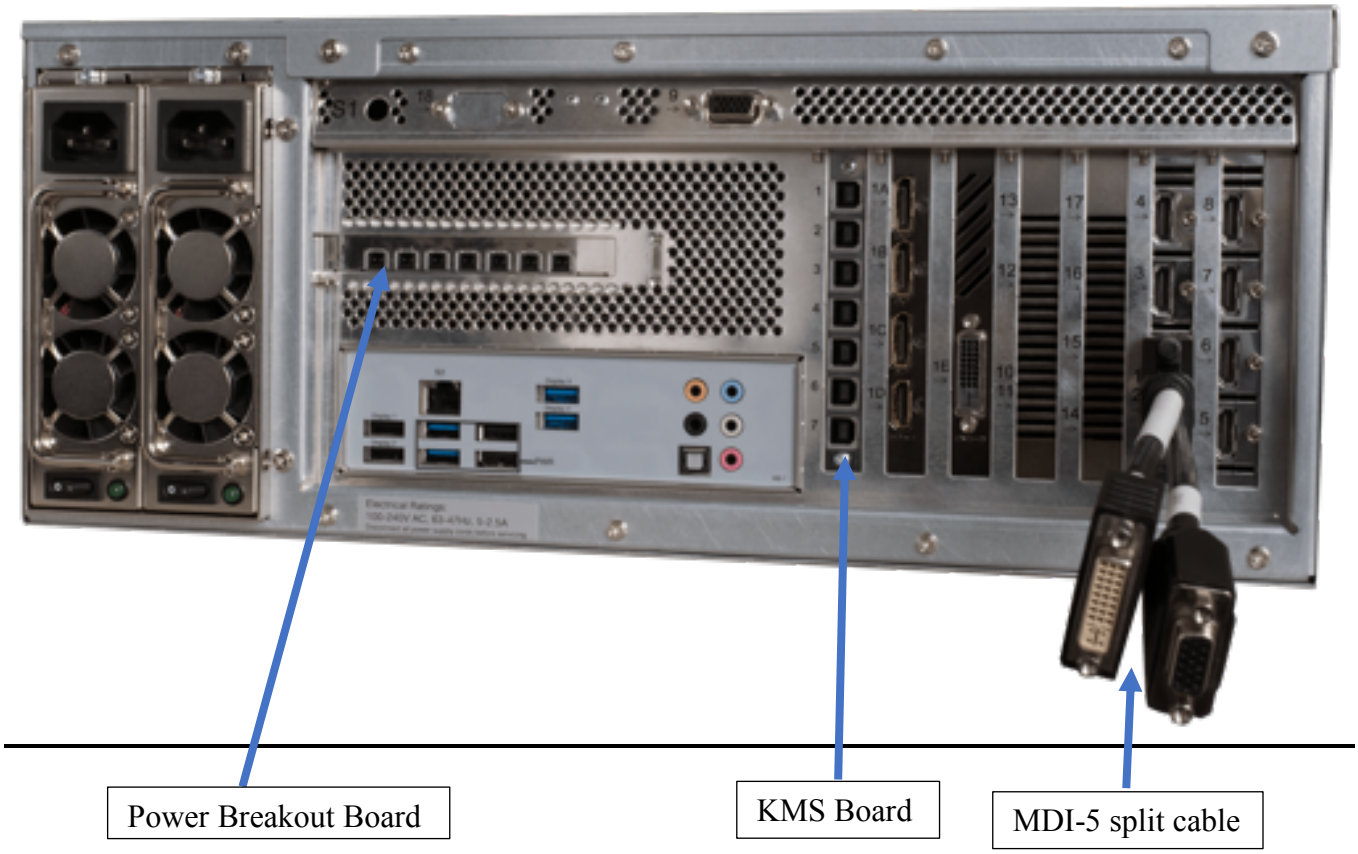
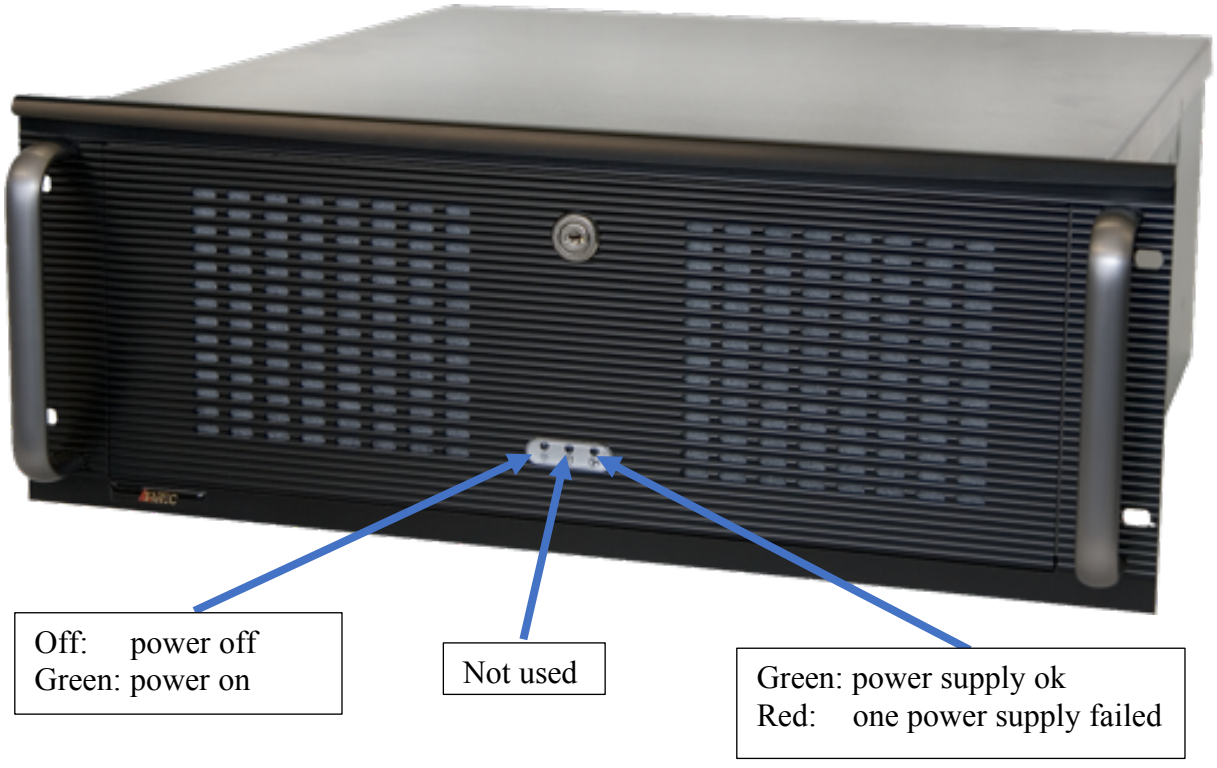


Figure 4: Rear of MDM, low-cost chassis with power supply, 1x MDI-7 input board, Power Breakout Board and KMS Board

Figure 5: Rear of MDM including mounting harness

Figure 6: Front of MDM with Status LEDs



7.2.2 Hardware Connections Model EL

The following images are giving an overview of the different options available with MDM-1 model ‘EL’. The front view is the same as with model ‘D’.

Figure 7: Rear of MDM Model EL with MDI-7, Power Breakout Board and KMS Board

Figure 8: Detailed connector view of MDM Model EL

7.2.3 Power connection

On the left side are the power connectors and the main switches. With redundant power supplies connect both power connectors.
When the system is turned on, a green LED near the power on switch and on the front will light up. (Figure 6: Front of MDM with Status LEDs).

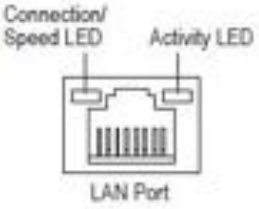
Power can be turned on/off at any time, as long as the logging mode is disabled.

7.2.4 Network connection

N1 is the network interface. Use N1 to connect an Ethernet connector to access the MDM by a browser or remote interface.

RJ-45 LAN Port

The Gigabit Ethernet LAN port provides Internet connection at up to 1 Gbps data rate. The following describes the states of the LAN port LEDs.



Connection/Speed LED:

State	Description
Orange	1 Gbps data rate
Green	100 Mbps data rate
Off	10 Mbps data rate

Activity LED:

State	Description
Blinking	Data transmission or receiving is occurring
Off	No data transmission or receiving is occurring

7.2.5 Output Monitor Connection

Output monitors are connected to connectors marked ‘1A’, ‘1B’, …, ‘1E’.
Planning the output connections to the monitor should be one of the first tasks after connecting the MDM to power and networking.
Model ‘D’:
In total 5 connectors can be used: 3x DP, 1x HDMI 2.0, 1x DVI DL.
Max. 2x 8MP and 2x 4MP and 1 HD displays can be used or any other combination with less resolution i.e. 1x 8MP, 3x 4MP and 1x HD.

Model ‘EL’:
In total 3 connectors can be used: 2x DP, 1x HDMI 2.0.
Max. 1x 8MP or 2x 4MP or 3x HD displays can be used.

The ‘Display arrangement’ tab in ‘Configuration’ in the browser interface shows which connector of the graphics board can be connected to a certain display depending on resolution, refresh rate and connection type (DP, DVI, HDMI etc.) and which type of converter has to be used.

Graphics boards with DisplayPort outputs may need a converter for DVI single link or dual link connections. Such converters are available Tritec (DP-to Dual Link DVI converter). This converter has two cables. One is the DisplayPort connector and is plugged into the graphics card and the other is a USB connector and that has to be plugged into the USB connectors of the motherboard marked with 'PWR' (Power). The Dual-Link DVI connecter is connected to the display.

7.2.5.1 Connecting HD Monitors

Graphics board 5xx can be connected to 5 HD monitors with DP to DVI cables (no converter needed), HDMI to DVI cable and DVI cable.

7.2.5.2 Connecting 4 Mega Pixel Monitors

Up to five 4MP monitors can be connected. Depending on the monitor input DP to dual-Link converters may be needed.
When using the extended desktop mode, the monitors must be of the same type, otherwise they may not be synchronized.

7.2.5.3 Connecting 8 MP Pixel Monitors

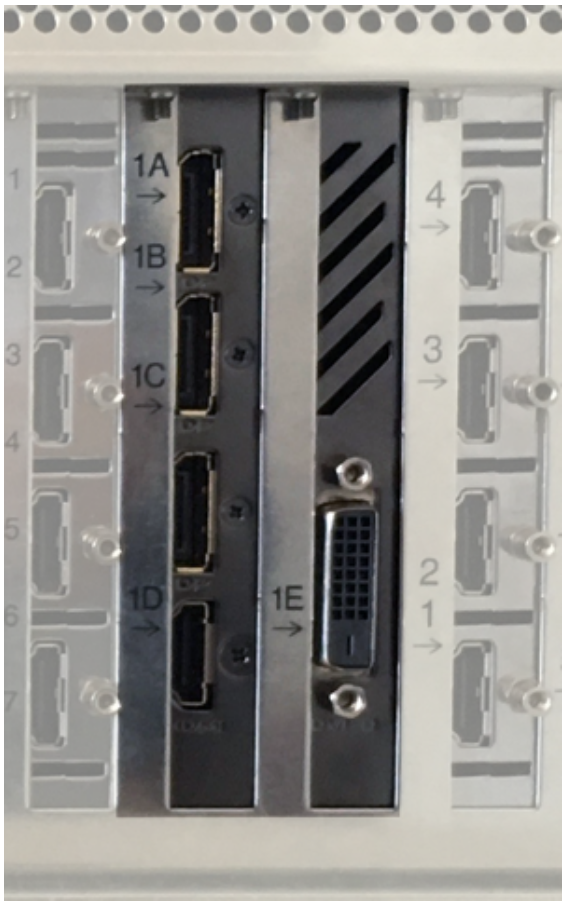
8MP monitors can be connected as single DP connections, Dual Link DVI connections or single link DVI connections.

- 8MP @60Hz monitors with DP connection can be connected to either output 1A, 1B or 1C.
- Model EL only: 8MP @60Hz monitors with HDMI connection can be connected to output 1D.
- Model ‘D’ max. 4MP@60Hz monitors with HDMI connection can be connected to output 1D.

- 8MP @60Hz monitors with dual link DVI inputs must be connected either
  - to outputs ‘1A’ (right half of the display) and ‘1B’ (left half of the display). They need a DisplayPort to Dual Link DVI converter or
  - to outputs ‘1C’ (right half of the display) and ‘1E’ (left half of the display). Output 1C needs a DisplayPort to Dual Link DVI converter.

- 8MP @60Hz monitors with 4 single link inputs must be connected to outputs ‘1A’ (DP to single link DVI cable), ‘1B’ (DP to single link DVI cable), ‘1C’ (DP to single link DVI cable), and ‘1E’ (DVI cable).

Figure 9: Graphics Board 5xx



7.2.6 Mouse, Keyboard and USB stick connection

Connect mouse and keyboard to the USB type A connectors (the 'typical' mouse and keyboard connector) at the rear of the MDM marked with ‘Display 1’ …. ‘Display 4’.

- A USB hub has to be used to connect keyboard, mouse and USB stick.
- Keyboards, mice and USB sticks can be connected to 4 different displays.
- The ‘Display settings’ tab shows more details which MDM USB connector is related to which output display.

7.2.7 Input Video Channel Connection to host

The video inputs are marked with numbers from 1 to 26. The numbers correspond to the numbers found in the set up.

For MDI-5 boards:

- Inputs 1 and 2 use the supplied split cable. For details, refer to Figure 3.
- Input 1 is the digital input of the related DVI connector.
- Input 2 and 9 are analogue inputs with a VGA connector.
- Input 2 is an analogue input, with a max resolution of 1280 x 1024 @ 75Hz (135MHz).
- Input 9 is an analogue input, with a max resolution of 1920 x 1200@60Hz (170MHz).
- Inputs 3 to 8 are DVI inputs with HDMI connectors.

For MDI-7 boards:

- All input connectors are HDMI connectors
- Input 1 has a maximum pixel clock of 550Mhz. It can be connected to UHD outputs
- Input 2, 3, 4, 9 are compatible to HDMI signals of max. 165Mhz.
- Input 5, 6, 7, 8 are compatible to DVI signals of max. 165Mhz.

For all MDI boards:

- Any input refresh rate can be used. But the input refresh rate should be as close as possible to the output displays refresh rate. Otherwise the input and output windows are not fully synchronous. Frames will be dropped or inserted as necessary.
- The maximum number of input pixels horizontally is 4096/2560 for any input.
- Interlace signals are not supported.

7.2.7.1 Bandwidth Considerations

The MDM has some internal bandwidth limitations due to the very high data rates of the video streams. If video input data rates are used above the specified bandwidth, some output windows show no content but ‘overrun’.

7.2.7.2 Input Board Limitations

In the MDM, the throughput of a video stream is measured in Mega Pixel/s (MPx/s).
MDI-5 inputs boards have a limitation of 620MPx/s. This is the equivalent of appr. 4x HD inputs or 7x 1280x1024 inputs.
MDI-7 inputs boards have a limitation of 1,200MPx/s. This is the equivalent of 9x HD inputs.

7.2.7.3 Input Signal Validation

The input board has some logic integrated to detect a valid input signal for each input channel.

- A signal is detected as a valid signal to be displayed on the screen if all of the following conditions are met:
  - Digital Inputs:
    1. The pixel (TMDS) clock must be higher than 16MHz
    2. V-Display (active) is not zero
    3. V-Display is constant for more than 2 frames
    4. Number of pixels in any line is between 320 and 4096/2560 pixels.
    5. Number of lines in any frame is between 200 and 2560 lines.
    6. Once the signal is found valid the number of horizontal pixels is allowed to be up to 15 pixels longer or 2 pixels shorter without detecting an invalid status.

  - Analog Inputs (on MDI-5 boards):
    1. H-Frequency is higher than 20KHz
    2. V-Display (active) is not zero
    3. V-Display is constant for more than 2 frames
    4. Number of lines in any frame is between 200 and 2048 lines.

- A signal is immediately detected as invalid, and the 'No Signal' message is shown on the output window if one of the following conditions is met:
  - Digital Inputs:
    1. The pixel (TMDS) clock is less than 16MHz
    2. V-Display (active) is zero
    3. V-Display is different for sequential frames
    4. Number of pixel in any line is below 320 pixels and above 4096/3000 pixels.
    5. Number of lines in any frame below 200 lines and above 2560 lines.
    6. The input pixel clock is above 165/270Mhz

  - Analog Inputs (on MDI-5 boards):
    1. H-Frequency is less than 20KHz
    2. V-Display (active) is zero
    3. V-Display is different for sequential frames
    4. Number of lines in any frame below 200 lines and above 2048 lines.
    5. The input pixel clock is above 170Mhz

- If a signal is changing between valid and invalid for more than 20 times per second, the input signal has a problem. The input channel is set to invalid and the ‘Out of range’ string is shown. To activate the signal again, change the layout or the input channel.

7.2.8 USB host connections

MDM with keyboard & mouse host connection to inputs either need a KMS board installed or an external ADIO converter connected. The USB connection is set up in the ‘Administration’; ‘Channel x’; ‘Keyboard & Mouse’ tab.

7.2.8.1 USB host connection with KMS board

A KMS-board has 7 USB type B connectors to connect to the host USB keyboard and mouse input.

One USB connection is needed for mouse and keyboard only. The slot is marked with 'KMS-1' and the USB connectors are numbered from 1 to 7. The numbers correspond with the numbers used in the set up (see ‘Help’ tab in the browser).

Be sure to connect the USB connectors to the host as shown in Table 1 Factory default set up.

7.2.8.2 USB host connection with ADIO converter

ADIO is an extern ‘Analog-Digital Converter’, see separate data sheets. It can be used to connect analog, DP, HDMI, DVI or SDI video signals to an MDI-7 board. It includes a USB connection as well.
To setup the USB go to the ‘Administration’ ‘Keyboard & Mouse’ tab and follow the instructions found in the on-line help.

7.2.9 Connectors marked ‘PWR’

Connectors marked with ‘PWR’ are USB power connectors for the DisplayPort to DVI converter. They should not be used as USB connectors.

7.2.10 Other connectors

All other connectors should not be used and are not supported by software.

8. Software default set up

The MDM ships with a factory default setup with all input channels visible on screen. Connect a display with a resolution of at least 1920x1080 to output 1A to see the inputs.

Figure 10: MDM Output Monitor with Default Layout

Table 1 Factory default set up for input channels

Source / Name	Default resolution	Input Connector no.	USB Input no.	Priority 1 … high x … low	Desktop arrangement
Input 1	Auto resolution EDID: 1280x1024	1	no	1	auto
Input x	Auto resolution EDID: 1280x1024	x	no	x	auto

8.1 Software setup

Follow these rules to set up the system:

1. Chose the 'Display Arrangement' from the configuration tab.
    - This configures the number of displays, the resolution (8MP or lower) and the behavior (extended desktop).
    - During this set up the output connector numbers are shown to connect the displays correctly.
    - The system will reboot.
2. Chose the 'Display Settings' form configuration tab and follow the selections.
3. Change the network setting if necessary.
4. Set up the input channels.
5. Set up all other parameters.

8.2 Software Versions and their related Hardware Models

Following is a list of software versions and the hardware platform these run on.

Table 2: Hardware Models and related Software Versions

Software Version	Hardware Model			
	'B'	'C'	'D'	'EL'
1.x	Yes	Yes	No	No
2.0 to 2.3	yes	yes	No	No
2.4	No	Yes	Yes	No
2.5	No	No	Yes	Yes

9. Maintenance / Service

The MDM-2 system monitors several parameters and sends alerts when they out of range. These alerts are visible in the ‘messages’ tab of the browser in the top right corner (more details can be found in the related on-line ‘help’ tab). Besides messages of connected or unconnected inputs and output, there is a group of messages that require attention by service personnel to prevent further damage to the system. These messages are marked with a blue background.

Figure 11: Service Messages

There are three areas where the MDM-2 system can be serviced on-site.

9.1 Redundant Power Supply

When the message ‘power supply failed’ is visible or when the right LED at the front turns red (see Figure 6: Front of MDM with Status LEDs) one of the redundant power supplies must be swapped against a new one.
Follow the instructions of the recommended spare part kit to swap the power supplies.

9.2 Fans

When the message ‘Case Fan…’ or ‘Additional Fan…’ is visible all of the fans must be swapped against new ones.
Follow the instructions of the recommended spare part kit to swap the fans.

9.3 Motherboard Battery

The motherboard battery has a lifetime of more than 8 years. Nevertheless, when the message ‘motherboard battery low’ is visible the motherboard battery must be replaced against a new one.

10. Trouble Shooting

10.1 Connection to Output Monitors

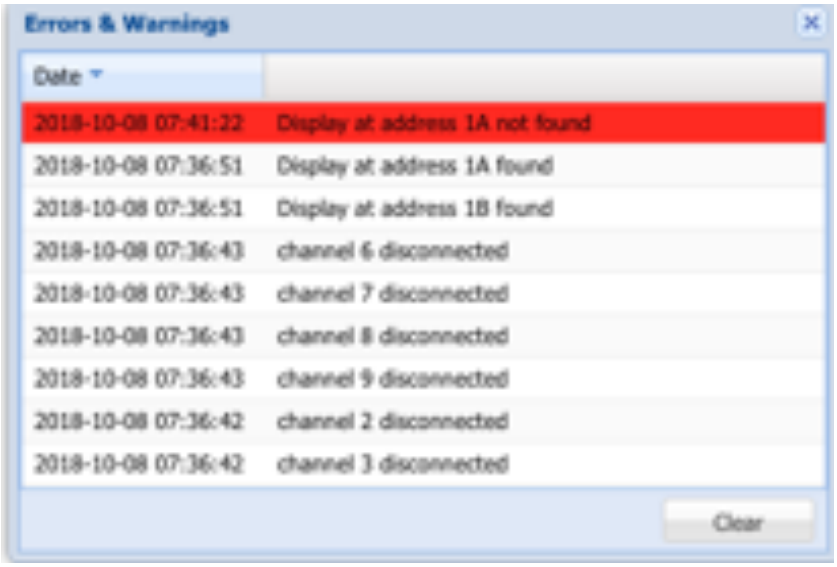
The MDM can be connected to several output monitors via different connection types lsuch as DP, DVI, etc. To help detect errors in the connection from the MDM to the monitors read the following chapters carefully.

Output monitor connections must be defined in the ‘Configuration’, ‘Display Arrangement’ tab in the browser interface. Only connectors and monitors defined there are initialised.
All defined output monitors (and DLSx2 Splitters) are monitored during booting and runtime if they are available or missing. To test the connection to the monitor the software tries to read the EDID data of the monitor every few seconds. If the data is not available or different from the last reading, an error message is shown like here: Figure 12: Error message: Display not found.
If any of the following ‘Display not found’ error messages are shown and the software version is older than 2.x.x, the MDM has to be rebooted in order to fix the issue. Newer software versions are hot plug capable.

10.1.1 Error Message ‘Display at address 1x not found’

There can be several reasons for an error message like this: Figure 12: Error message: Display not found

Figure 12: Error message: Display not found



For more details about the possible problem refer to the ‘MDM’, ‘Status’ tab.

Figure 13: Status with no connection at Output 1A

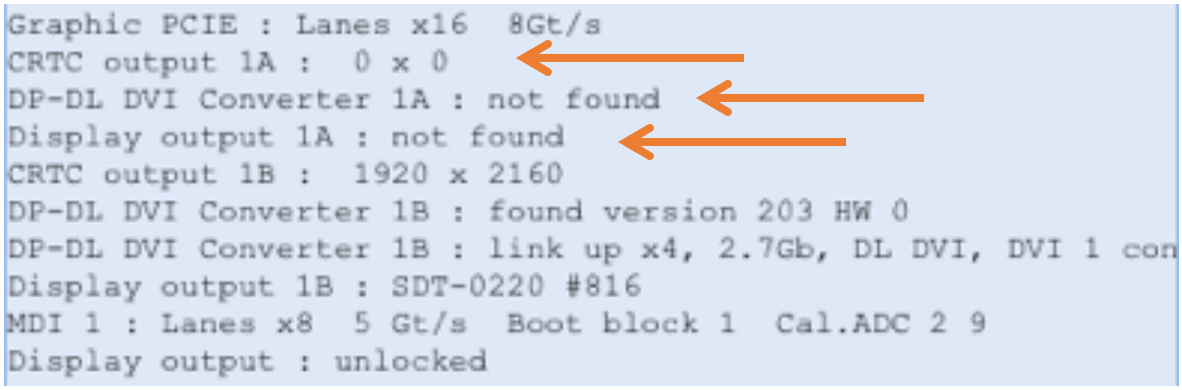


Figure 13: Shows a typical error message when nothing is connected to the MDM connector 1A. In this case in the 'Display Arrangement' an 8MP display with two DP to DL-DVI converters is defined. Therefore, the error message says 'No DP-DL DVI converter 1A found' is shown and the right side of the 8MP monitor is without content.
The reason can be:

a. The DP connection between MDM output 1A and the DP DL-DVI converter is missing.
b. The USB power connection to the DP DL-DVI converter is missing. Check the LEDs of the converter.
    - On the DP converter with the mini DP connectors: the LED closer to the cable is blinking red: USB power is missing.
    - On the DP converter with the standard DP connectors: If no LED is lit up power is missing.

Figure 14: Display resolution error

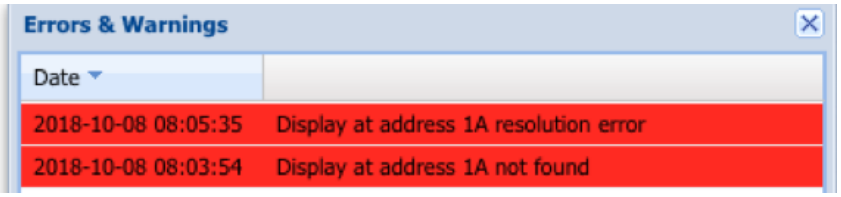


Figure 15: Status with DP converter but no DVI connection

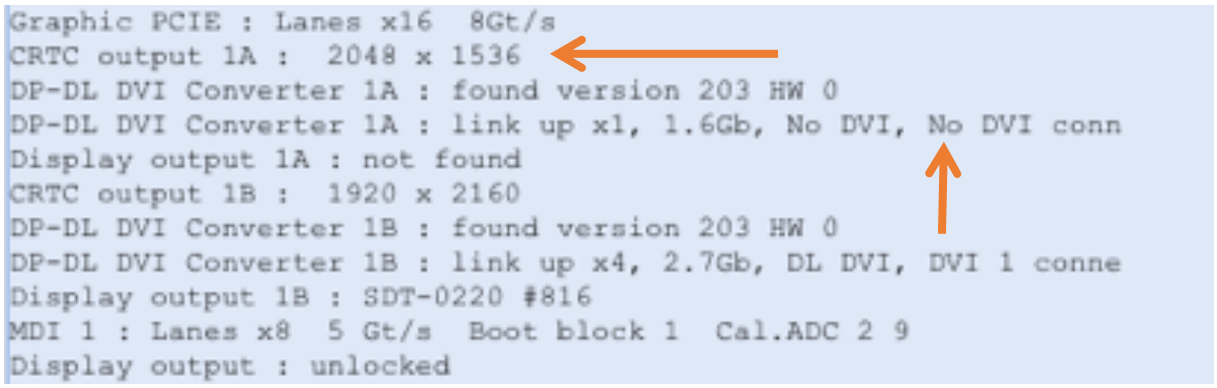


Figure 15: shows another output monitor error message 'resolution error'. The details of this error can be seen in Figure 15: Status with DP converter but no DVI connection.

In this case the DP DL-DVI converter was found but the next line shows that 'No DVI connector' was found. The status LED on the DP converter next to the DP cable is constant yellow.
The reason can be:

a. No DDC connection to the monitor, so no EDID data were found.
b. If an optical extension is used the transmitter module may not have any or corrupted EDID data.

The CRTC output 1A resolution of 2048 x 1536 is the internal default dummy resolution of the DP converter needed to keep the DP connection to MDM established.

Figure 16: DP DL-DVI converter with valid connection

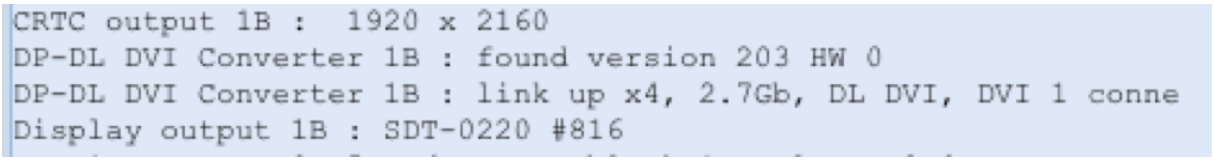


Figure 16: shows a good connection from MDM via a DP DL-DVI converter to the monitor.
Line 1 shows the output resolution used.
Line 2 shows the DP converter with its firmware and hardware versions.
Line 3 shows the DP link between MDM and DP converter is up with 4 lanes 2.7Gb, DVI 1 connector is connected.
Line 4 shows the name and serial number of the connected monitor as read from the EDID data.

Table 3: DP DL-DVI Converter Status LEDs

Status LED	Color	
Left, closer to DP cable	Off (with standard DP connector) Red blinking (with mini DP connector)	No USB power
	Yellow blinking	Overload at the DDC power of the DVI connector.
	Green	USB power ok
Right,	Yellow	No EDID at DVI connection found
	Yellow blinking	Resolution of DVO monitor out of range
	Green	Monitor connection ok.

10.1.2 8MP Monitor connected via DSLx2 Splitter

When in the 'Configuration', 'Display Arrangement' tab an 8MP monitor with DP to DL-DVI converter is selected and a Dual Link Splitter (DLSx2) is used the error monitoring can be extended to include the DLSx2 splitter and a possible monitor at the secondary output.
To include the monitoring of the DLSx2 the check box in the 'Configuration', Display Settings' tab 'Splitter' has to be selected.

- 'None': is without a splitter and the default value
- 'With secondary display': use this setting when a DLSx2 is connected and a display is connected to the secondary output of the DLSx2.
- 'Downscaler only, no secondary display': use this setting when a DLSx2 is connected but no display is connected to the secondary output of the DLSx2.

Figure 17: Enable monitoring of the DLSx2

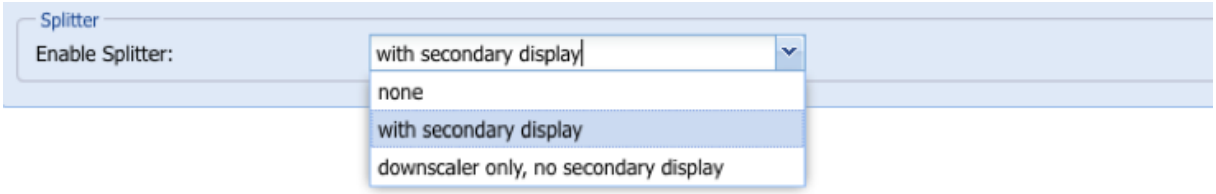
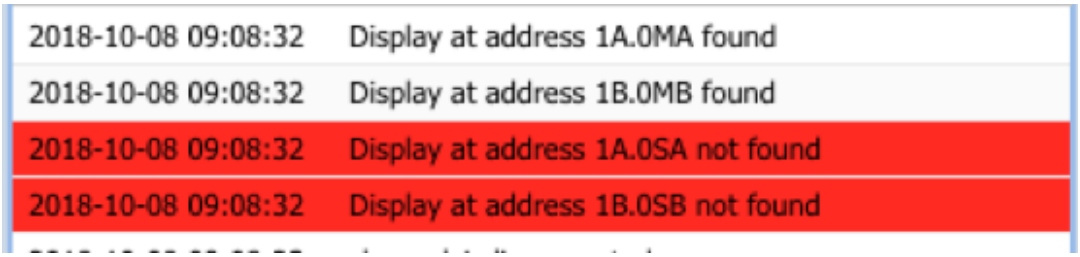


Figure 18: Error Message with DLSx2



This message shows that two displays were found at the MDM output 1A and 1B with a DLSx2 at address 0 (the rotary address switch at the DLSx2 must be set to 0) and displays connected to the 'Main' output of DLSx2.
The displays at the secondary output of the DLSx2 are not connected (the EDID data could not be read).
If the DLSx2 is used as down-scaler only without a secondary display this error message can be ignored.

10.2 Output Monitor Connection Test

The MDM has some functions built in to test the output connection to the monitors.
In order to use these tests, the output monitors with/without DP DL-DVI converter and DLSx2 must be set up as mentioned in the above chapter.
The tests can be found in the 'Configuration' 'System' tab.

Figure 19: Connection Tests

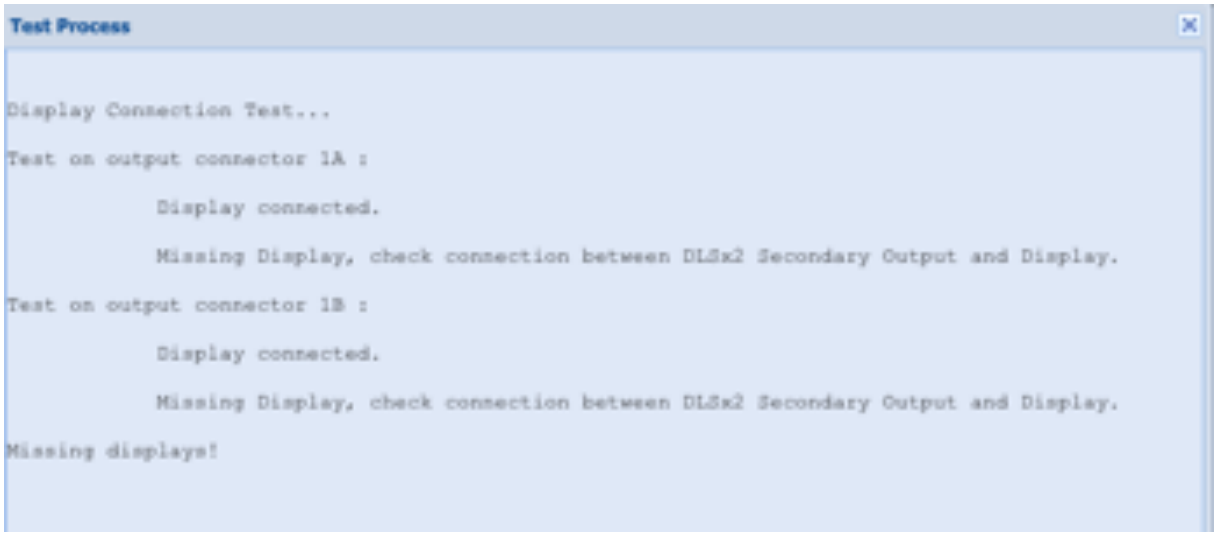
There are three 'Connection Tests' and one 'Video Quality Test'.

10.2.1 Connection Test

The 'Connection Tests' use the DDC communication channel (I2C) to detect which component is missing. Sometimes it might be helpful in noise environments or with very long cables to run this test for 10 minutes to see if there are any communication problems.

Figure 20: Shows the result of the ‘Connection Test’ of the problem shown in Figure 18: Error Message with DLSx2. The display connected to the ‘Main’ output was found without any problems. The ‘Secondary’ output display was not found and the problem was identified between DLSx2 and the display. The software found the DP DL-DVI converters and the DLSx2, but not the display at the ‘Secondary’ output.

Figure 20: Connection Test with errors



10.2.2 Video Quality Test

The ‘Video Quality Test’ tests the high-speed video signals. A random pattern is transmitted over the high-speed video connection from the MDM output to the displays and the DP DL-DVI converter and the DLSx2. Run the ‘Connection Test ‘before using this test to solve all connection related problems.
Figure 21: Shows the result of the ‘Video Quality Test’ of the same configuration as mention in the chapter ‘Connection Test’. The result shows that the connection between MDM and DP DL-DVI converter and the DLSx2 is excellent. The display does not have the capability to check the video quality up to the display.
Possible results are: ‘excellent’ (no error found), ‘good ‘(a few errors found, but still good enough to use the connection) and ‘poor’ (to many errors found).

Figure 21: Video Quality Test