AVProconnect

User Manual

AC-MXMV122-UHD

Multi-format Seamless 4 x 2 Matrix with 4K Quad Split and PIP

Introduction

The AC-MXMV122-UHD is a sophisticated HD/ UHD Quad Multi-view Video Processor controller, designed to handle and control multiple video signals exceeding 1920 × 1080 HD. The video sources to be displayed in

1. **Full–screen,**
2. **Dual-view,**
3. **Tri-view,**
4. **Quad-view**

Each of these modes can be viewed on High Definition (HD) and Ultra High Definition UHD (4K) video screens. The most common analogue and digital video / audio inputs are supported as signal sources, these include: AV (CVBS), YPbPr, VGA, and HDMI from 480i up to full-HD (on Consumer CEA) and WUXGA (VESA).

The AC-MXMV122-UHD is a single unit that is ideal for applications requiring up to 4 separate video sources on a single display in applications such as Digital Signage, Teleconferencing, Highway checkpoint Control Rooms, Multi-View outdoor advertising display management, indoor public advertisement for almost all public places such as airports, ferry stations, banks, government halls, hotel lobbies, railway station, hospitals and wherever fast switching with multiple content on single screen is required.

Product Overview

Each video input channel supports all consumer HD/SD Digital and HD/SD Analog video standards. The AC-MXMV122-UHD is can be easily cascaded and its control signal can be daisy-chained to allow the creation of a large and easy to control seamless switching or a Multi-View system environment of almost any size (for example, Multi-View of 8 x 4 (32) windows (video inputs) to a single TV screen or 16 x 8 semi-seamless Matrix switcher by cascading and daisy-chaining AC-MXMV122-UHD units.

The AC-MXMV122-UHD has two HDMI output ports for showing the multi-view image on two independently controllable HD/UHD A/V channels simultaneously.

The AC-MXMV122-UHD is a 3 in 1 HD/UHD Video Processing Device that can work in one of three different modes depending on the application requirement and system configuration:

1)   **UHD 4K Multi-View Video Processor**
This mode displays the four inputs as a quad view or from a single input to the HDMI outputs independently and in any combination as 4K UHD video output signals. Each output can have a different display setting.
2)   **Full HD Multi-View Video Processor**
This mode displays all four either inputs as a quad view or from a single input to the HDMI outputs independently as high quality HD video output signals. Both outputs show the same image display.
3)   **Seamless 4:2 Matrix mode**
Each input can be switched and routed to any of the two HDMI output ports without any

blanking or picture freezing. Each output can display any of the input signals as a single image.

Features

- **The AC-MXMV122-UHD is a powerful Video Processing device in a 1U rack-mount chassis, with low power consumption (less than 20W).**
- **Four video inputs, widely compatible to any SD/HD Digital (HDMI/DVI) and SD/HD Analog in AV (CVBS) /YPbPr and VGA input.**
- **Each viewer window parameter is completely customizable including layer priority; window positions, window size, background transparency, Border colour including Border pixel width and much more.**
- **Three operating modes**
    1. **UHD 4K Multi-View Video Processor**
    2. **Full HD Multi-View Video Processor**
    3. **Seamless 4:2 Matrix**
- **Two independent HDMI output ports. When quad mode is selected, user can choose the HDMI output to be 4K or Full HD.**
- **UHD 4K quad Multi-View mode, the HDMI output will present 4 x Full HD signals that will only be visible on a 4K display and each section of 4 x Full HD signal is pixel by pixel displayed on a large 4K UHD panel without any down scaling degradation.**
- **The switching time in the Seamless Matrix mode is one of the fastest in industry due to the very unique switching algorithm used.**
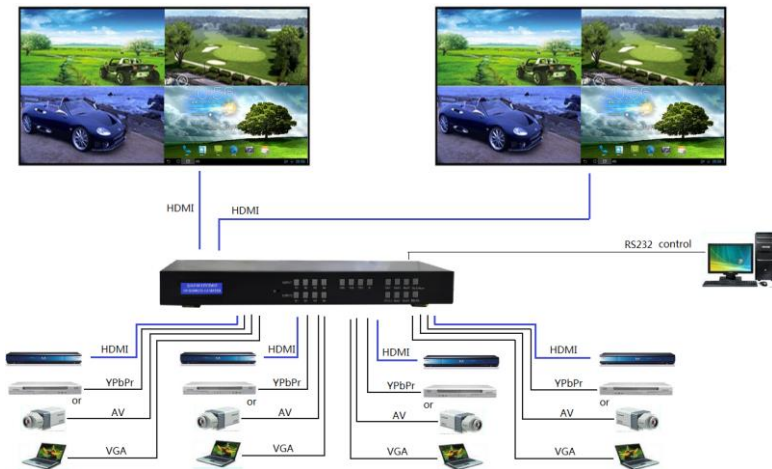
Specification

Product	AC-MXMV122-UHD
HDMI Version	HDMI1.4/DVI
HDCP	Yes
Input	4 HDMI, 4 YPbPr or AV, 4 VGA
Video Output	2 HDMI
Audio Output	2 S/PDIF
Control	Front panel button, IR or RS232
Power Consumption (max.)	20 Watts
Housing	Metal (steel sheet)
Dimension (mm)	L440 x W256 x H42 mm
Weight	2.85 kg

Application Examples

4K Multi-View Mode
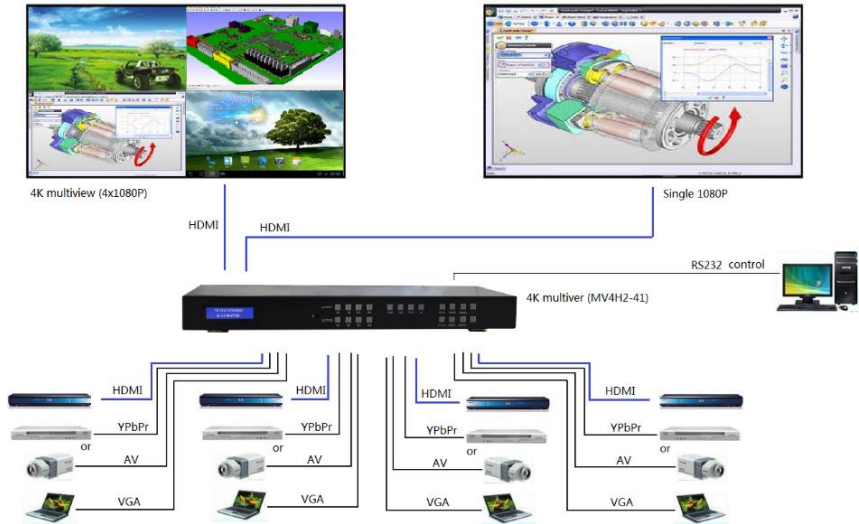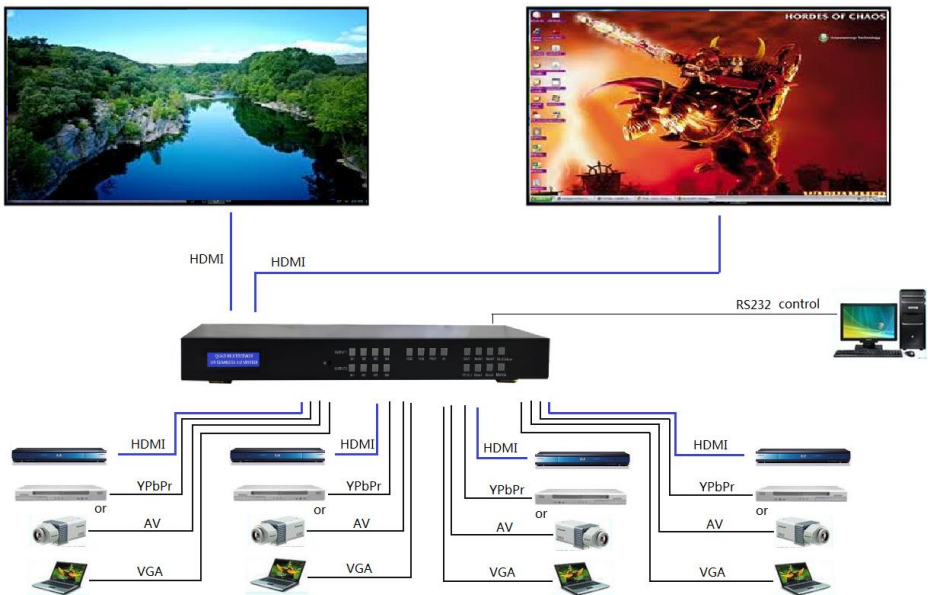

Full HD Multi-view mode

Multi-View Mode

Display input images on the Multi-View screen to both of the HDMI outputs using 4 window regions that can be configured, via the PC based control software, to any size and any position, including borders and prioritized visibility selection of any overlapped layer for the 4 inputs in the screen windows when using the Multi-View configuration.

Seamless Matrix Mode

Cascaded for 6x2 Full HD Multi-View mode
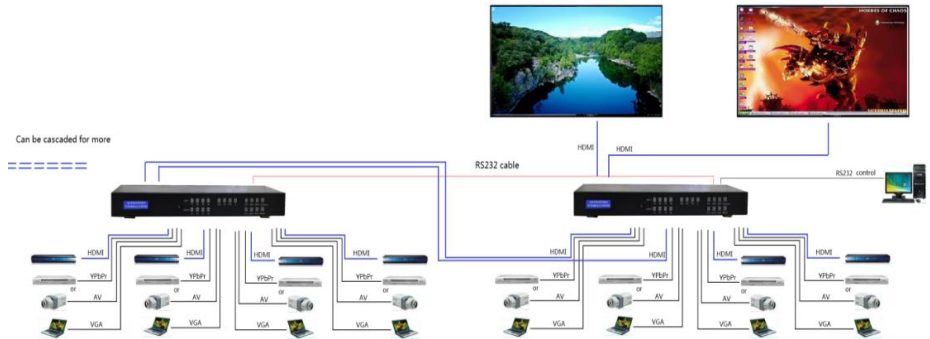
This mode allows the creation of matrix systems with more video inputs that can be routed to either of the two output screens. Note that in this mode, the first two HDMI inputs of the right-hand AC-MXMV122-UHD are used to cascade the outputs from the left-hand AC-MXMV122-UHD. For this mode to operate correctly, each SY-APOLLO-4K devices must be assigned a unique RS232 ID value prior to being connect to the installation.

Operation, Controls and Functions

1. Connect source devices to input ports of AC-MXMV122-UHD.
2. If needed, connect RS232 cable from PC RS232 port or USB-RS232 converter to AC-MXMV122-UHD.
3. Connect HDMI output port to TV or any other 4Kx2K HDMI sink devices.
4. Connect 12V/3A power supply to DC power socket.
5. Power on the AC-MXMV122-UHD, TV and other devices.

Controlling the AC-MXMV122-UHD

Front:

1. **To select the input for the desired output port:**
    Press any **IN1**, **IN2**, **IN3** or **IN4** button will seamlessly change the source of Output 1 or Output 2 to the selected input.

2. **To select source type for the input groups:**
    Press **HDMI** or **VGA** or **YPbPr** or **AV** and then press the input button **IN1**, **IN2**, **IN3** or **IN4**, and the input group will change the input to the selected **HDMI** or **VGA** or **YPbPr** or **AV** (CVBS) input.

3. Use the **2K QV** button to set the desired output port to output 1080P quad-view, or use the **4K QV** button to set both outputs to 4K quad-view on a 4K screen.

4. The 4 buttons (**A**, **B**, **C**, **D**) set both outputs to multi-viewer mode, with both displays showing the same image. These 4 buttons set the AC-MXMV122-UHD to output one main picture with the other three inputs shown in PIP mode. Repeated presses of the same button cycles the main and PIP images through the four inputs.

The AC-MXMV122-UHD can be cascaded to create a larger system such as an N input seamless switcher, Nx2 seamless matrix or MxN Multiviewer. The RS232 control signals can also be cascaded by using an RS232 cable from the pass through RS232 port to the RS232 input port of the next AC-MXMV122-UHD. When more than one AC-MXMV122-UHD connected in a cascaded RS232 control chain, each AC-MXMV122-UHD must have unique (different) Serial Communication address.
Each address can have a binding note, which has at most 10 characters. After the address table is saved, they can be selected using the address selection on main menu for control and management.

AC-MXMV122-UHD UART COMMANDS

UART SETTING

115200 bps, 8 data bits, no parity, 1 stop bit, no flow control.

Command format

	Header		Length	Group address	Device address	Key word	Parameter	Check sum
Value	AA/AB	Device ID	Number of all bytes after this parameter, including the checksum	See note(1)	See note(1)	See note(2)	Based on the keyword	Check sum See note (3)
Byte Count	1	2 (LSB first)	2 (LSB first)	1	1	2 (LSB first)	Based on the parameter	1

Table 1 - Command Format

Note:
    (1)   **Each AC-MXMV122-UHD in a cascaded system must be assigned a unique two byte address. The first byte is the Group Address, the second byte is the Device Address. The two values 0x00 and 0xff are invalid for both the Group Address and the Device Address respectively.**
    (2)   **The default Device ID is 0002H.**
    (3)   **All data values are transmitted in HEX mode.**
    (4)   **The checksum value is the negated sum of all values before the Checksum field.**

The first byte of the header denotes the type of data: AAH for a command to the AC-MXMV122-UHD, or ABH for a reply from the AC-MXMV122-UHD.

The next two header bytes are the device ID where:
          XX: is in the range 01H~FEH, and YY: is in the range 01H~FEH

The following table lists the ID values that should only be used for the described purpose:

Group Addr	Device addr	Description	Reply From
00H	FFH	Invalid	No reply
XXH	FFH	Broadcast to all the devices with the group address of XXH	No reply
FFH	FFH	Broadcast to all devices	No reply
00H	00H	Broadcast to all devices	All devices
XXH	00H	Broadcast to all the devices with the group address of XXH	All in group
FFH	00H	Invalid	No reply
00H	XXH	Invalid	No reply
FFH	XXH	Invalid	No reply
XXH	YYH	Send data to the device with the address XXYYH	One device

Table 2 - Addressing the SY-APOLLO-4K

Keyword	Description of Keyword	Length of Parameter	Description of Parameter	Note
		WRITE SETTINGS COMMANDS		
		The following commands can only be used while in MODE1 (HD MV)		
0000H	Set display parameter (top-left and bottom-right coordinates and display priority) for all 4 inputs	36 BYTES	Refer to Table 4	**Not recommended,** use the next 5 commands to set the parameters individually
0001H	Set display priority of the 4 input images.	4 BYTES	Refer to the data from 1 to 4 in Table 4	
0002H	Set the coordinate of the image with the highest priority	8 BYTES	Refer to the data from 5 to 12 in Table 4	
0003H	Set the coordinate of the image with the second priority	8 BYTES	Refer to the data from 12 to 20 in Table 4	
0004H	Set the coordinate of the image with the third priority	8 BYTES	Refer to the data from 21 to 28 in Table 4	
0005H	Set the coordinate of the image with the lowest priority	8 BYTES	Refer to the data from 29 to 36 in Table 4	
0050H	Set the transparency	1 BYTE	Refer to Table 5	
0051H	Background colour	3 BYTES	Refer to Table 6	
		The following commands can only be used while in MODE2 (4:2 MX)		
1000H	Set the source for the two output ports	2 BYTES	Refer to Table 7	
		The following commands can only be used while in MODE3 (4K)		
2000H	4KMV or the source of single 1080P output	2 BYTES	Refer to Table 8	
		The following commands can only be used while in MODE1 & MODE3		
2820H	Set audio route when in MV mode	2 BYTES	Refer to Table 9	
2852H	Color of the image border	3 BYTES	Refer to Table 6	
2853H	Width of the image border	1 BYTE	Refer to Table 10	
		The following commands can only be used while in MODE1 & MODE2 & MODE3		
3800H	Select input video source for the four inputs	4 BYTES	Refer to Table 11	

keyword	Description of keyword	Length of parameter	Description of parameter	Note
3810H	Select input audio source for the four inputs	4 BYTES	Refer to Table 12	
3838H	Program EDID for HDMI Input or VGA Input	256 BYTES	Refer to Table 13	
3840H	Select internal EDID for input HDMI or VGA	3 BYTES	Refer to Table 14	
3852H	Recall Demo Mode	1 BYTE	Refer to Table 21	
3857H	Save User screen mode (Type 2)	1 BYTE	Refer to Table 19	
3858H	Recall User screen mode (Type 2)	1 BYTE	Refer to Table 19	
3859H	Set Demo Mode list	22 BYTES	Refer to Table 20	
The following commands can be used in ALL MODES				
7800H	Set the system operating mode	1 BYTE	Refer to Table 15	
7801H	Set the device address	2 BYTES	Refer to Table 16	
7820H	HDCP DEBUG	1 BYTE	Refer to Table 18	
7802H	Factory reset settings	0 BYTES		
READ STATUS COMMANDS				
The following commands can only be used while in MODE1				
8000H	Read coordinate and display priority of 4 images	0 BYTES		MCU will reply base on Table 4
8050H	Read transparency	0 BYTES		MCU will reply base on Table 5
8051H	Read background	0 BYTES		MCU will reply base on Table 6
The following commands can only be used while in MODE2				
9000H	Read source of the two output ports	0 BYTES		MCU will reply base on Table 7
The following commands can only be used while in MODE3				
A000H	Read 4K/single 1080P source	0 BYTES		MCU will reply base on Table 8
The following commands can only be used while in MODE1 & MODE3				
A820H	Read audio route when in MV mode	0 BYTES		MCU will reply base on Table 9
A852H	Read colour of image border line	0 BYTES		MCU will reply base on Table 6

Byte number	Description of the parameter	Note
7	Low byte of the left-top corner Y coordinate of the highest priority image	
8	High byte of the left-top corner Y coordinate of the highest priority image	
9	Low byte of the right-bottom corner X coordinate of the highest priority image	
10	High byte of the right-bottom corner X coordinate of the highest priority image	
11	Low byte of the right-bottom corner Y coordinate of the highest priority image	
12	High byte of the right-bottom corner Y coordinate of the highest priority image	
13	Low byte of the left-top corner X coordinate of the second priority image	
14	High byte of the left-top corner X coordinate of the second priority image	
15	Low byte of the left-top corner Y coordinate of the second priority image	
16	High byte of the left-top corner Y coordinate of the second priority image	
17	Low byte of the right-bottom corner X coordinate of the second priority image	
18	High byte of the right-bottom corner X coordinate of the second priority image	
19	Low byte of the right-bottom corner Y coordinate of the second priority image	
20	High byte of the right-bottom corner Y coordinate of the second priority image	
21	Low byte of the left-top corner X coordinate of the third priority image	
22	High byte of the left-top corner X coordinate of the third priority image	
23	Low byte of the left-top corner Y coordinate of the third priority image	
24	High byte of the left-top corner Y coordinate of the third priority image	
25	Low byte of the right-bottom corner X coordinate of the third priority image	
26	High byte of the right-bottom corner X coordinate of the third priority image	
27	Low byte of the right-bottom corner Y coordinate of the third priority image	
28	High byte of the right-bottom corner Y coordinate of the third priority image	
29	Low byte of the left-top corner X coordinate of the lowest priority image	

Byte number	Description of the parameter	Note
30	High byte of the left-top corner X coordinate of the lowest priority image	
31	Low byte of the left-top corner Y coordinate of the lowest priority image	
32	High byte of the left-top corner Y coordinate of the lowest priority image	
33	Low byte of the right-bottom corner X coordinate of the lowest priority image	
34	High byte of the right-bottom corner X coordinate of the lowest priority image	
35	Low byte of the right-bottom corner Y coordinate of the lowest priority image	
36	High byte of the right-bottom corner Y coordinate of the lowest priority image	

Table 4 - Write Settings Command Details

Byte number	Description	Note
1	Transparency	0 = 0%，1 = 25%，2 = 50%，3 = 75%

Table 5 - Set Transparency Command

Byte number	Description	Note
1	R value	0-255
2	G value	0-255
3	B value	0-255

Table 6 - Set Colour for Background or Border

Byte number	Description	Note
1	The source INDEX of output port 1	1- No change 2- IN1 3- IN2 4- IN3 5- IN4
2	The source INDEX of output port 2	

Table 7 - Set Input Source for Both Outputs

Byte number	Description	Note
1	Output port 1 mode	1- No change 2- 4K Multi-View Mode 3- IN1 in Single Input Mode at 1080p 4- IN2 in Single Input Mode at 1080p 5- IN3 in Single Input Mode at 1080p 6- IN4 in Single Input Mode at 1080p
2	Output port 2 mode	

Table 8 - Set Quad-View or Single Input View

Byte number	Description	Note
1	Audio source for output port 1	**1-** No change **2-** IN1 **3-** IN2
2	Audio source for output port 2	**4-** IN3 **5-** IN4

Table 9 - Set Audio Source for Multi-View Mode

Byte number	Description	Note
1	Width of border line	Value: 0~15. 0-no border line

Table 10 - Set Image Border Width

Byte number	Description	Note
1	Video source of IN1	**1-** No change **2-** HDMI, **3-** VGA,
2	Video source of IN2	
3	Video source of IN3	**4-** YPBPR, **5-** AV
4	Video source of IN4	

Table 11 – Input Video Source Select

Byte number	Description	Note
1	IN 1 audio source	**1**-No change **2**-HDMI audio **3**-From VGA audio **4**-From YPbPr audio
2	IN 2 audio source	
3	IN 3 audio source	
4	IN 4 audio source	

Table 12 - Input Audio Source Select

Byte number	Description	Note
1	Input group	1-IN1,2-IN2,3-IN3,4-IN4
2	EDID port	1-HDMI,2-VGA
2~257	EDID data	A Valid EDID Data Block (256 bytes)

Table 13 - Program EDID Data

Byte number	Description	Note
1	Input group	0-ALL,1-IN1,2-IN2,3-IN3,4-IN4
2	EDID port	1-HDMI,2-VGA
3	EDID number	Numbers start from 0

Table 14 - Select Internal EDID Data

Byte number	Description	Note
1	Mode Index	**1**-HD MV **2**-3:2 seamless matrix **3**-4KMV

Table 15 - Set System Operating Mode

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Byte number	Description	Note
1	Group address	01H~FEH
2	Device address	01H~FEH

Table 16 - Set Device Address

Byte number	Description	Note
1	Output channel	1-OUT1,2-OUT2

Table 17 - Read Sink EDID

Byte number	Description	Note
1	HDCP mode	Each bit represents one output port. Bit 0 = output 1, Bit 1 = output 2 When the bit is: 0 Set Debug Mode (HDCP OFF) 1 Set Normal Mode (HDCP ON)

Table 18 - Set HDCP Mode

Byte number	Description	Note
1	User screen index	1 to 20 for User 1 to User 20

Table 19 - User Screen Mode Index

Byte number	Description	Note
1	Demo Mode Index	0 = Demo Mode A 1 = Demo Mode B 2 = Demo Mode C 3 = Demo Mode D
2	Max. number of User Modes	0 = No changes will be made 1 to 20
3 - 22	User screen mode (Type 2) index	0 = No changes will be made 1 = User Mode 1 2 = User Mode 2 ~~ 20 = User Mode 20 21 = Fix Mode 1 ~~ 40 = Fix Mode 20 (for Fix Mode 1 to Fix Mode 20 the remaining values are Q1, Q2, Q3, Q4, L1 ~ L3, R1 ~ R4, T1 ~ T4, B1 ~ B4 Q = Quadrant input number 01 – 04 L = Left starting pixel position R = Right ending pixel position T = Top starting line position B = Bottom starting line position)

Table 20 - Demo Mode List Setting

Byte number	Description	Note
1	Demo Mode Index	0 = Demo Mode A
		1 = Demo Mode B
		2 = Demo Mode C
		3 = Demo Mode D

Table 21 - Recall Demo Mode

Safety Instructions

To ensure reliable operation of this product as well as protecting the safety of any person using or handling these devices while powered, please observe the following instructions.

1. **Use the power supplies provided. If an alternate supply is required, check Voltage, polarity and that it has sufficient power to supply the device it is connected to.**

2. **Do not operate either of this product outside the specified temperature and humidity range given in the above specifications.**

3. **Ensure there is adequate ventilation to allow this product to operate efficiently.**

4. **Repair of this equipment should only be carried out by qualified professionals as this product contains sensitive devices that may be damaged by any mistreatment.**

5. **Only use this product in a dry environment. Do not allow any liquids or harmful chemicals to come into contact with this product.**

After Sales Service

1. **Should you experience any problems while using this product, firstly refer to the Troubleshooting section in this manual before contacting AVProConnect Technical Support.**

2. **When calling AVProConnect Technical Support, the following information should be provided:**
   - **Product name and model number**
   - **Product serial number**
   - **Details of the fault and any conditions under which the fault occurs.**

3. **This product has a two year standard warranty, beginning from the date of purchase as stated on the sales invoice. Online registration of this product is required to activate the full three year extended warranty. For full details please refer to our Terms and Conditions.**

4. **AVProConnect Product warranty is automatically void under any of the following conditions:**
   - **The product is already outside of its warranty period**
   - **Damage to the product due to incorrect usage or storage**
   - **Damage caused by unauthorized repairs**
   - **Damage caused by mistreatment of the product**

5. **Please direct any questions or problems you may have to your local dealer before contacting AVProConnect Electronics.**