

DMD Extender

Installation and Usage Instructions Stern White Star

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Important

 Please check Appendix A for details of machines that are compatible with the DMD Extender. It is important to note that the Extender has not been tested on all of these machines – it is the responsibility of the user to make a final decision about the suitability of this system for use on a particular pinball machine.

The user installs the DMD Extender entirely at their own risk – Dr Pinball cannot accept responsibility for damage or other problems caused by this system or its use.

The installation instructions are given purely as a guide. The user must exercise caution when performing the installation.

 The Raspberry Pi receives its power from the pinball machine itself. Do not connect an external 5V supply to the Raspberry Pi power socket.

Introduction

 This is a preliminary document – the pictures may not correctly represent a Stern White Star system pinball machine although the guide is accurate with respect to electrical connections.

Thank you for purchasing the DMD Extender by Dr Pinball. This system allows a pinball machine equipped with a compatible Dot Matrix Display (DMD) and Screen Controller to mirror that display on an external screen, monitor or projector.

The system uses a Raspberry Pi computer and interfaces to the pinball data and power systems.

The DMD Extender comprises:

- 1 X Extender Interface Board complete with Adhesive Mounts and Support Post
- 1 X 14 way Ribbon Cable Assembly
- 1 X 6 way Power Cable Assembly
- 1 X 6 way Power Cable Splice
- 1 X SD Card containing the DMD Extender software
- 1 X Cable Tie to secure the HDMI video lead

Please ensure you have received the items above before proceeding.

The user must supply the following items to complete the system:

- 1 X Raspberry Pi computer
- 1 X HDMI video cable
- Or
- 1 X Composite video cable

The following sections take you through the installation of the Extender and also how to configure the system to match your monitor and personal preferences.

Installation

⚠ Installation must only be attempted by a competent person who understands basic principles of safe operation of electronic devices. You must ensure the pinball machine is switched off and the power cable removed from the wall socket prior to installation.

Please read all of the instructions before performing the installation.

Firstly, please familiarise yourself with the components of the system.

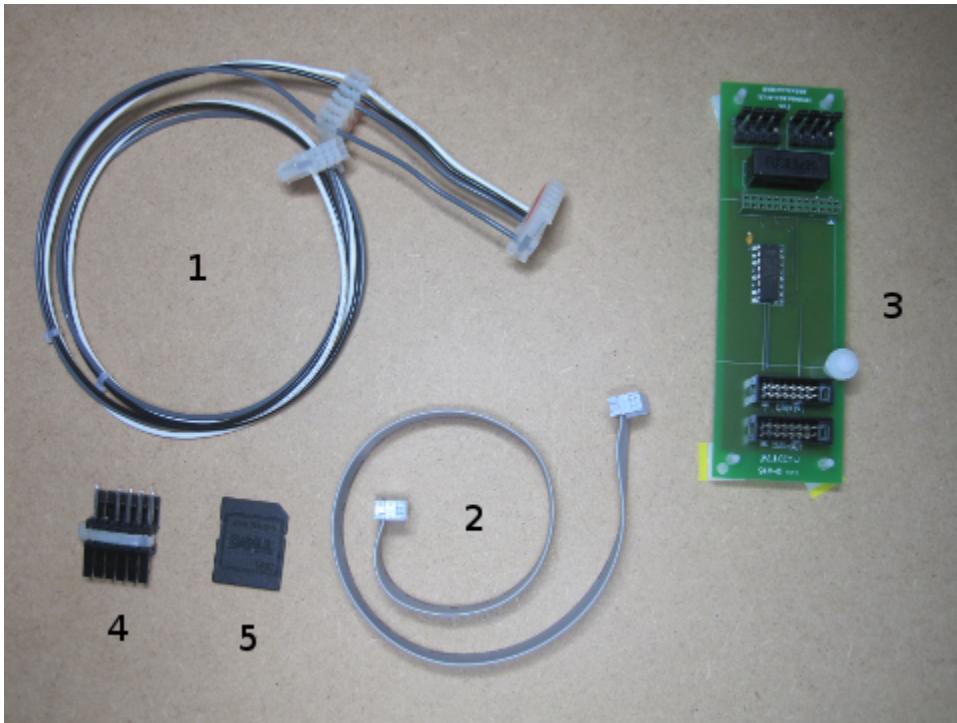


Figure 1 – DMD Extender components

As shown in Figure 1:

1. Power Cable Assembly – allows connection of the DMD Extender to the CPU / Sound Board
2. Ribbon Cable Assembly – allows connection between the Pinball DMD Screen and the Extender Interface Board
3. Extender Interface Board
4. Power Cable Splice – allows connection of the CPU / Sound Board power cable to the Power Cable Assembly
5. SD Card – Extender software for Raspberry Pi.

Also included is a cable tie to secure an HDMI video cable to the Extender Interface Board.

The Extender Interface Board in detail comprises the items shown in Figure 2.

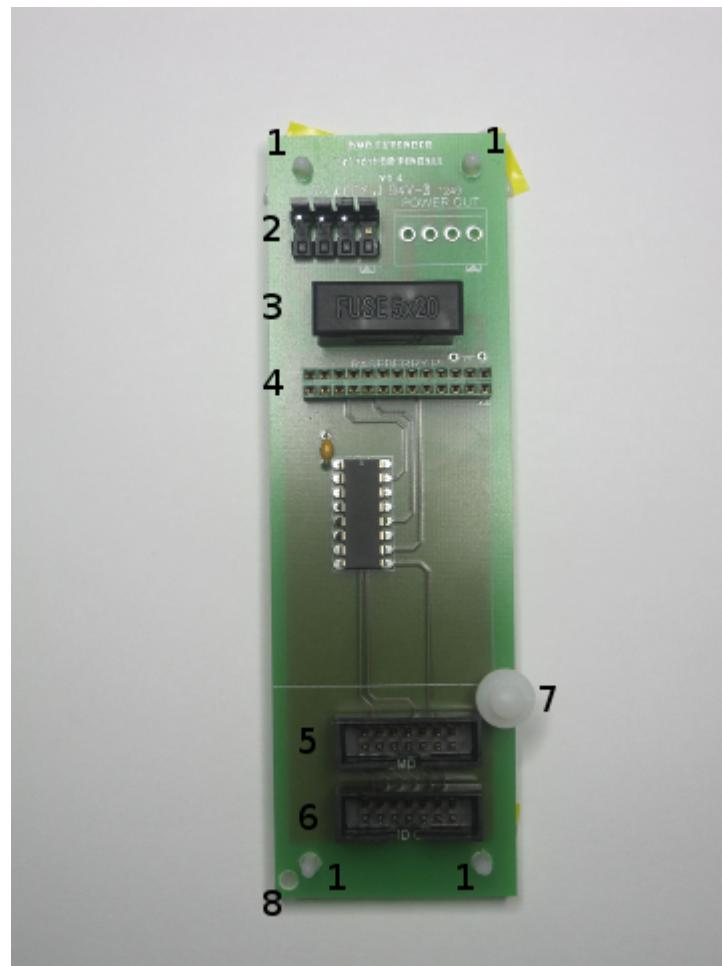


Figure 2 – Extender Interface Board

1. Adhesive Mounts X 4
2. Power In connector – labeled 'POWER IN'
3. Fuse – 500 milliamp 20mm cartridge type
4. Raspberry Pi In connector – 26 way for connection to P1 on Raspberry Pi, labeled 'RASPBERY PI'
5. DMD In connector – 14 way for connection to the DMD controller board, labeled 'DMD IN'
6. DMD Out connector – 14 way for connection to the Pinball DMD Screen, labeled 'DMD OUT'
7. Support Post – provides physical support for the Raspberry Pi
8. Cable Tie Anchorage Point.

Step 1 – Connect the Raspberry Pi

Mount the Raspberry Pi onto the Extender Interface Board by connecting P1 of the Raspberry Pi to the 26 way connector on the Extender Interface Board labeled 'RASPBERRY PI'.

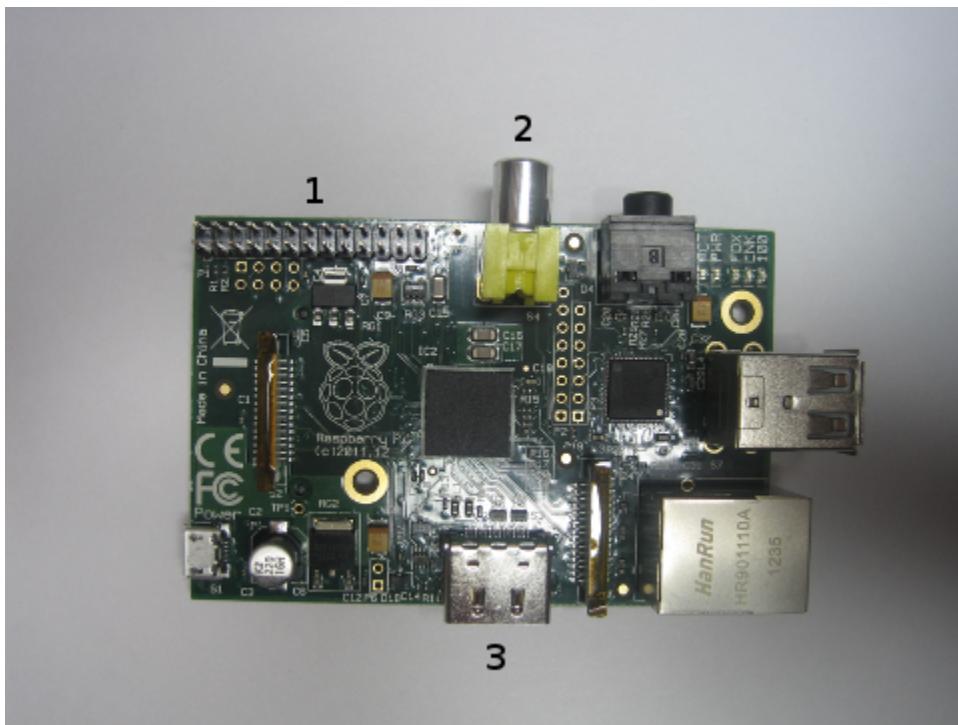


Figure 3 – Raspberry Pi connector P1 location

Figure 3 shows the location of P1 on the Raspberry Pi – it is a set of 26 connection pins marked as '1'.

Also marked are the video connections for Composite – 2, and HDMI – 3.

⚠ It is important that the Raspberry Pi and Extender Interface Board are correctly mounted i.e. ensure the 26 pins correctly align with the 26 holes in the socket. Failure to correctly locate the pins could result in damage to the Raspberry Pi.

⚠ The Raspberry Pi receives its power from the pinball machine itself. Do not connect an external 5V supply to the Raspberry Pi power socket.

Figure 4 shows the correct installation.



Figure 4 – Correct installation of the Raspberry Pi

When locating the connection pins ensure the corner of the Raspberry Pi fits into the Support Post marked '1' in figure 4.

Figure 5 shows a close up of the Support Post.

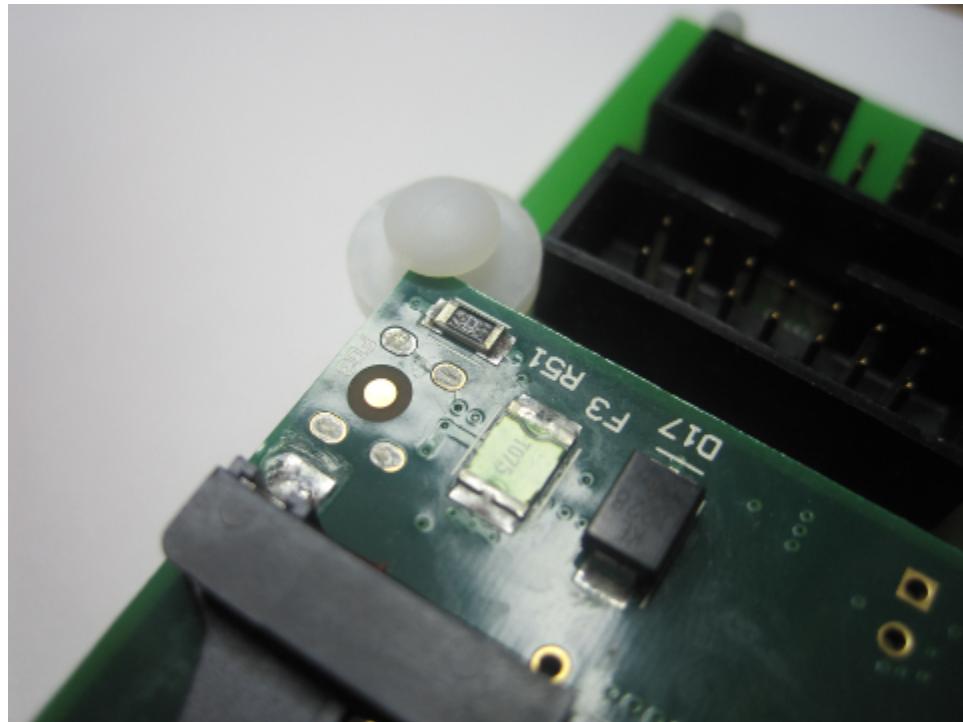


Figure 5 – Support Post close up

Step 2 – Mount DMD Extender into the Pinball Machine

Mount the Raspberry Pi and Extender Interface Board into the pinball machine. To do this remove the backbox translite glass and the speaker panel to gain access to the backbox interior. Open the backbox lighting door.

The DMD Extender is designed to fit onto the dot matrix screen plate next to the Dot Matrix controller board.

To mount the Extender Interface Board remove the Adhesive Mount protective paper and carefully locate on to the rear plate of the dot matrix screen. Figure 6 shows the correct location.



Figure 6 – Mounting location

Figure 7 shows in more detail the location required.

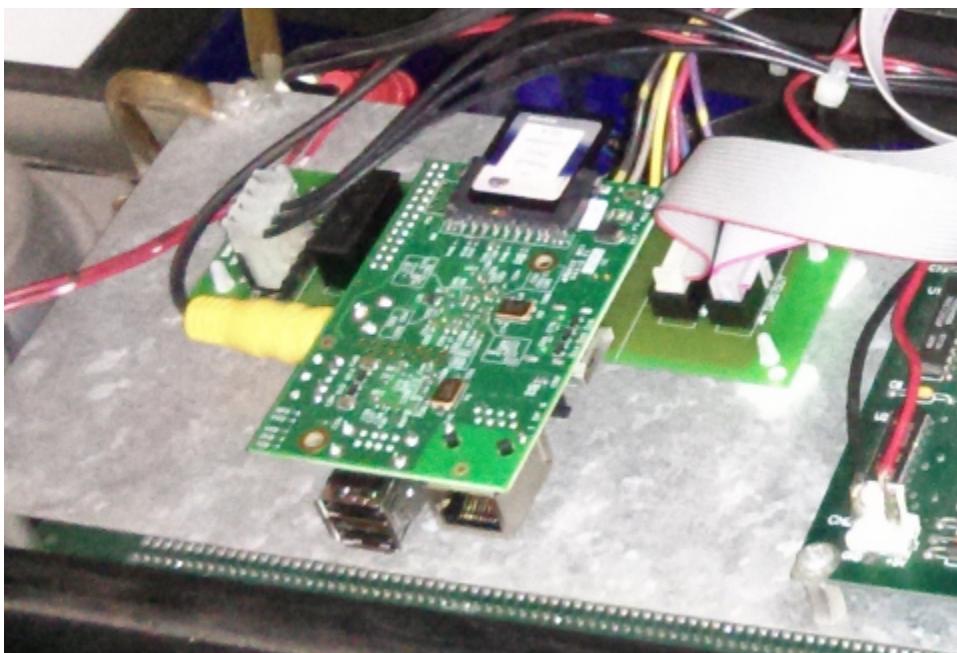


Figure 7 – Mounting location close up

When the Extender Interface Board has been mounted, insert the SD Card into the Raspberry Pi.

Step 3 – Connect Ribbon Cables

Remove the Pinball DMD Screen ribbon cable, this is marked as '1' in figure 8. N.B. Dot matrix screen plate and driver board removed for clarity.

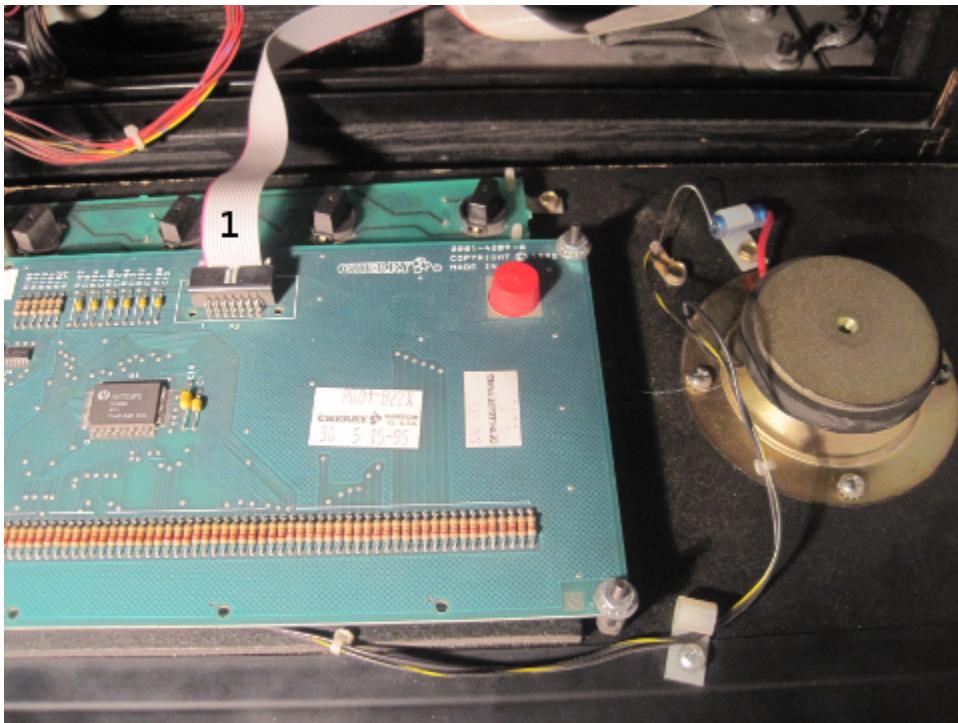


Figure 8 – DMD Ribbon Cable

Now insert the Pinball DMD Screen ribbon cable into the Extender Interface Board – socket marked 'DMD IN' as shown in figure 9.

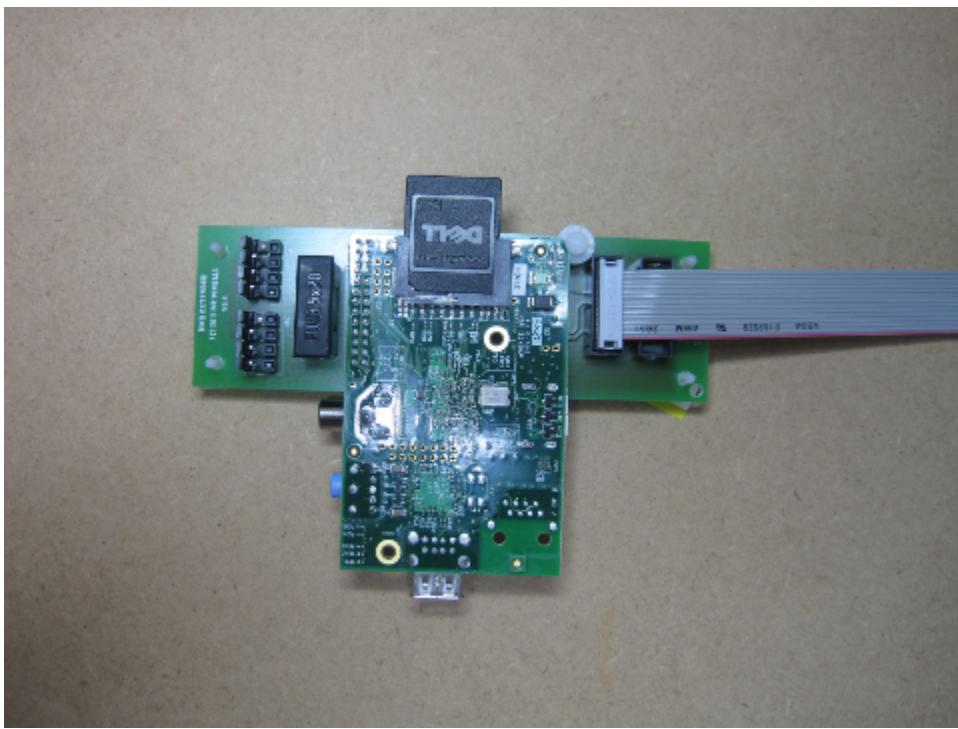


Figure 9 – Pinball DMD Screen ribbon cable into 'DMD IN'

 The Pinball DMD Screen ribbon cable does not have a key and can be inserted incorrectly. Ensure the plug is correctly oriented in the socket – the red wire on the cable must be on the left of the socket. Failure to observe this may result in damage to your pinball machine. Figure 10 shows the correct installation of the Pinball DMD Screen ribbon cable.



Figure 10 – Pinball DMD Screen ribbon cable – red wire on the left marked with arrow

Insert one end of the Ribbon Cable Assembly supplied with the Extender into the Pinball DMD Screen. Insert the other end of the Ribbon Cable Assembly into the Extender Interface Board – socket marked 'DMD OUT'. Figure 11 shows the Ribbon Cable Assembly correctly installed.

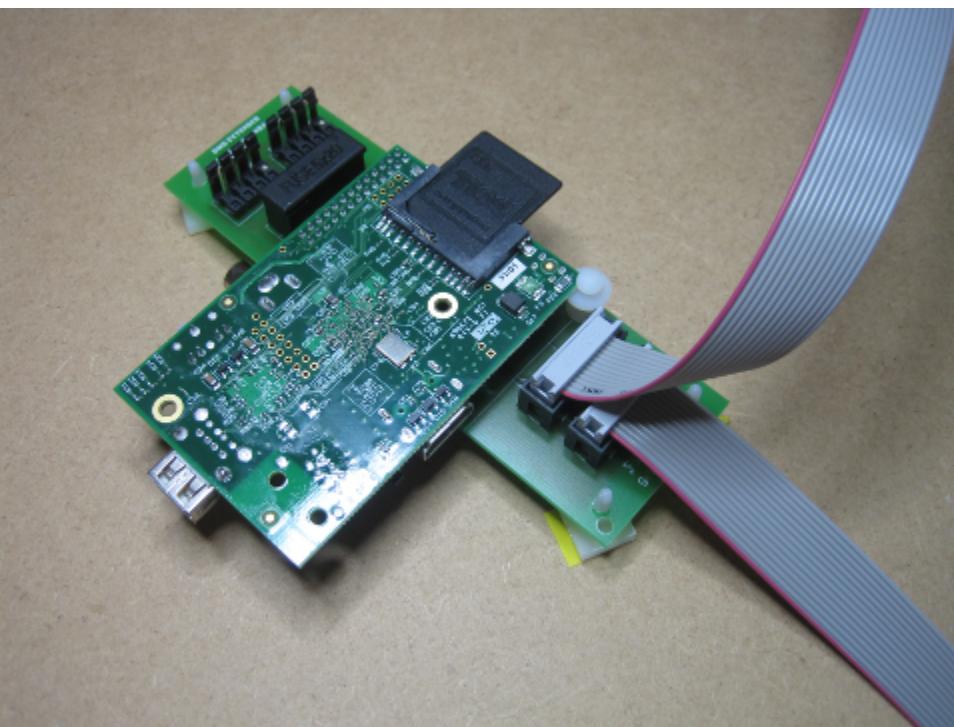


Figure 11 – Ribbon Cable Assemblies

Step 4 – Connect Power Cable Assembly

The Power Cable Assembly has a single plug at one end and two plugs at the other end, see figure 12.

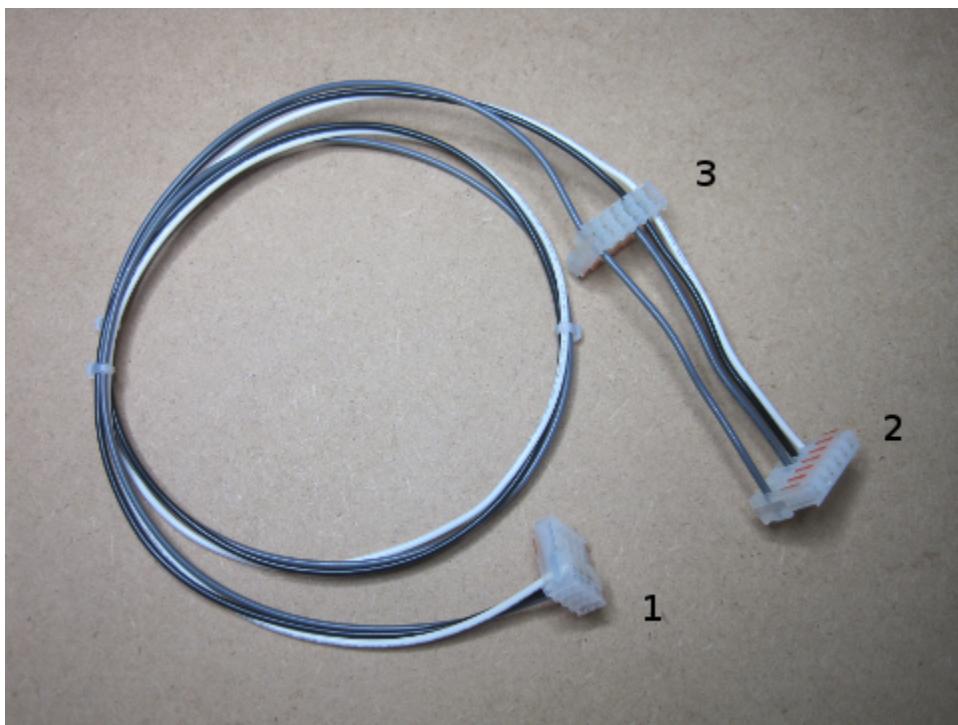


Figure 12 – Power Cable Assembly

Figure 12 shows the cable marked as follows:

1. Connect to the Extender Interface Board, socket labeled 'POWER IN'
2. Connect to the CPU / Sound Board, socket labeled CN2
3. Allows the Power Cable Splice to connect the cable that was removed when connecting 2.

 The power cable plugs are keyed to ensure correct orientation. It is important the key is correctly located when connecting plug to socket. Failure to correctly connect the plug may result in damage to your pinball machine.

Power for the DMD Extender comes from the pinball CPU / Sound Board; the location of the board is shown in figure 13, highlighted in red.

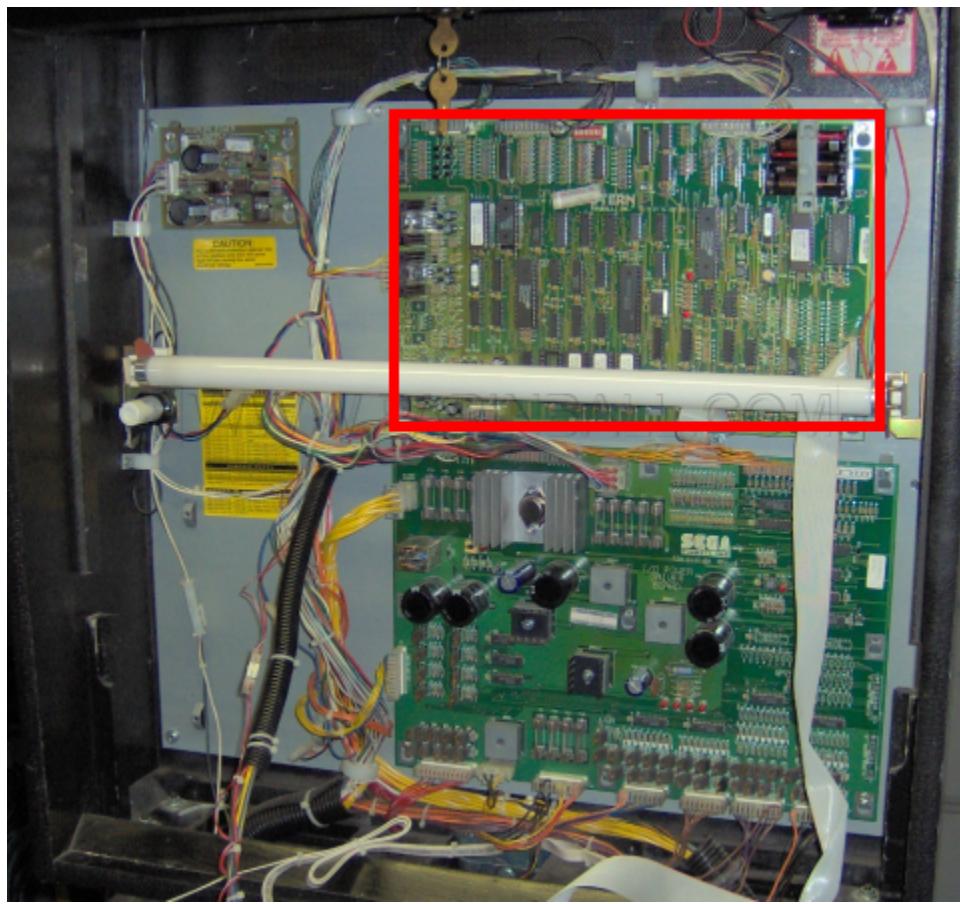


Figure 13 – Sound Board location in red

Locate connector CN2. Remove the existing connector first before inserting the Power Cable Assembly plug (Figure 12, plug 2).

Use the Power Cable Splice to reconnect the CPU / Sound Board power cable to the Power Cable Assembly (Figure 12, plug 3).

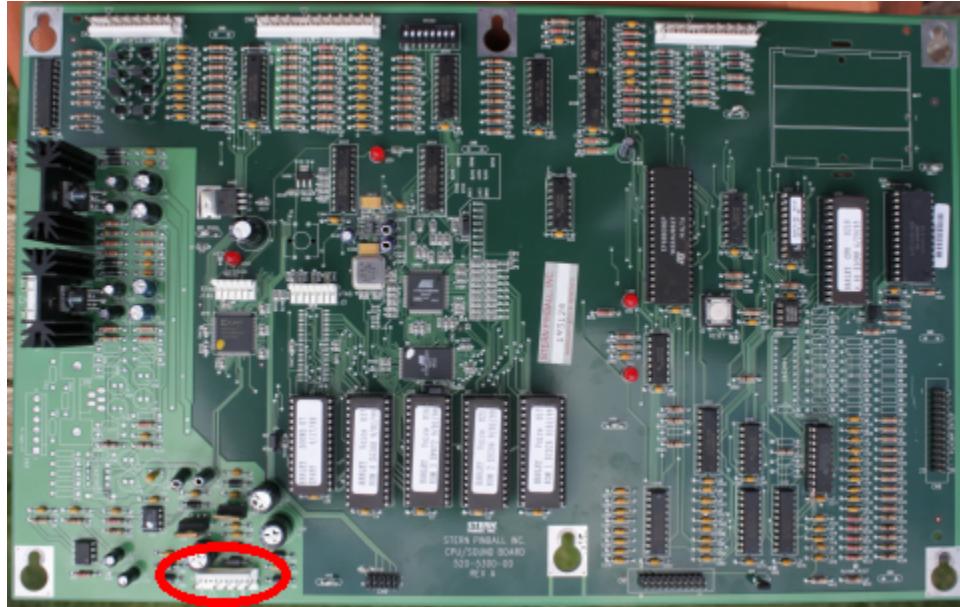


Figure 14 – CN2 location in red

Insert the Extender Power Cable plug (Figure 12, plug 1) into the Extender Interface Board - socket marked 'POWER IN' as shown in figure 16.

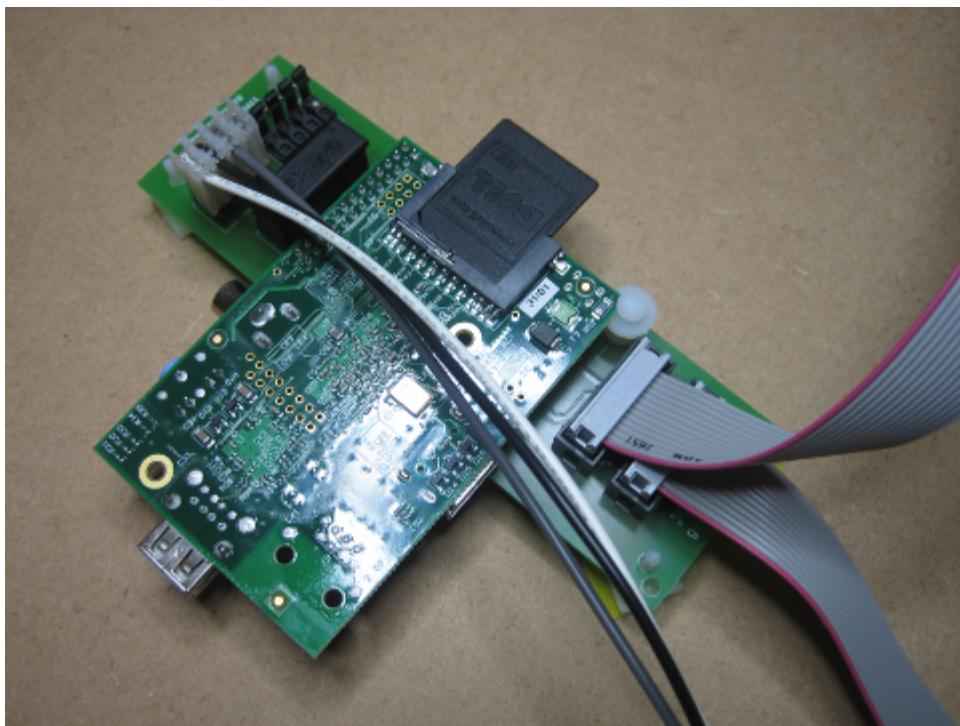


Figure 16 – Power Cable Assembly into 'POWER IN'

Figure 17 shows how to connect the Power Cable Splice.

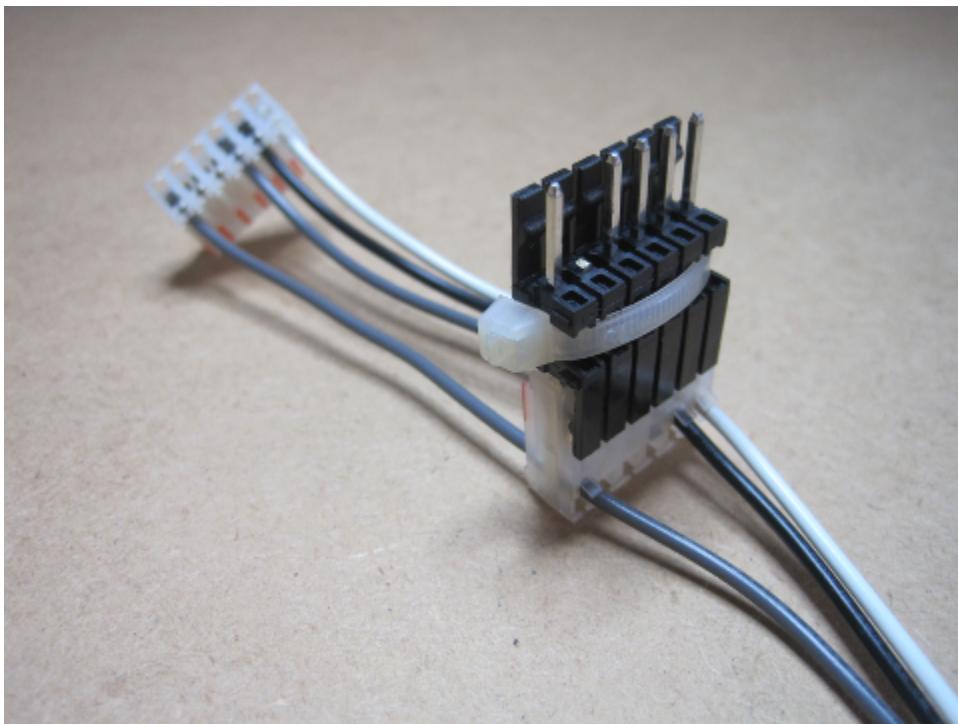


Figure 17 – Power Cable Splice

Step 5 – Install the Video Cable

Connect either an HDMI or Composite video lead to the Raspberry Pi – figure 3 shows the location of the connectors.

When using an HDMI cable it may be necessary to use the Cable Tie to secure the cable to the Cable Tie Anchorage Point on the Extender Interface Board. Do not over tighten the Cable Tie.

You must decide how the video cable will exit from the pinball machine. Suitable places are via the vents at the top of the backbox or the vents in the rear of the main cabinet.

Remove screws as necessary to allow the cable to pass around the vent grille and outside of the machine.

It is possible to use the following types of video cable:

1. Composite – to suit older televisions and projectors
2. HDMI to HDMI – to suit modern televisions, monitors and projectors
3. HDMI to DVI – to suit modern monitors.

Remember to use a lead long enough – you will need at least 1 metre of cable just to exit from the machine.

 Please remember to switch on the monitor first before switching on the pinball machine. The Raspberry Pi will not send a video signal without first seeing a screen device attached.

Step 6 – Check All Connections

Before completing the installation please check all connections made for correct insertion and orientation.

Replace the speaker panel and backbox translite glass ensuring no cables are pinched.

Step 7 - Configuration

Use the DMD Extender Configuration Utility to configure the system for use with your screen. Please refer to the Configuration Utility manual for instructions on how to use.

Start Up

When the pinball machine is switched on it will also start the DMD Extender. Ensure that the monitor is switched on before the pinball machine.

At start up you will be presented with a splash screen whilst the DMD Extender performs its initialisation.

If a problem occurs during initialisation an error message will be displayed and the splash screen will remain in place.

If a warning occurs the warning message will be displayed but the DMD Extender will continue to display the DMD output.

Appendix B details all of the error and warning messages that could occur.

Configuration

To configure the DMD Extender you must use the DMD Extender Configuration Utility DmdExtConfig.exe found on the SD Card.

Please refer to the Configuration Utility manual for instructions on how to use.

Appendix A

 This appendix gives details of machines that are compatible with the DMD Extender. It is important to note that the Extender has not been tested on all of these machines – it is the responsibility of the user to make a final decision about the suitability of this system for use on a particular pinball machine.

The user installs the DMD Extender entirely at their own risk – Dr Pinball can accept no responsibility for damage or other problems caused by this system.

If your machine is not listed below please contact us at info@drpinball.co.uk.

Sega White Star

Apollo 13

Goldeneye

Twister

Independence Day

Space Jam

Star Wars Trilogy

The Lost World Jurassic Park

The X Files

Starship Troopers

Viper Night Driving

Lost in Space

Godzilla

Harley-Davidson

South Park

Stern White Star

Striker Xtreme

Sharkey's Shootout

High Roller Casino

Austin Powers

Monopoly

NFL

Playboy

Roller Coaster Tycoon

The Simpsons Pinball Party

Terminator 3: Rise Of The Machines

The Lord Of The Rings

Ripley's Believe It Or Not

Elvis

Grand Prix

The Sopranos

NASCAR

Appendix B

Error Messages

Error Message	Comment
CONFIG0001 - Config file not found	The configuration file pinball.txt could not be found in the root directory of the SD Card
CONFIG0002 - Invalid parameter name	The name of a parameter is not a numeric value
CONFIG0003 - Invalid parameter value	The parameter value does not match the expected parameter content
CONFIG0004 - Unknown parameter name	The parameter name is not recognised as a valid parameter
CONFIG0005 - Param 1002 greater than 384 pixels	Screen height cannot exceed 384 pixels
CONFIG0006 - Param 1001 too large	DMD offset is too large – the DMD would be displayed off the screen
CONFIG0007 - Param 2001 too large	Colour values range from 000000 to FFFFFF
CONFIG0008 - Param 2002 too large	Colour values range from 000000 to FFFFFF
CONFIG0009 - Param 2003 too large	Colour values range from 000000 to FFFFFF
CONFIG0010 - Param 2004 too large	Colour values range from 000000 to FFFFFF
CONFIG0011 - Param 2005 too large	Colour values range from 000000 to FFFFFF
CONFIG0012 - Param 2006 DMD Type invalid	DMD Type can be: 1 – Bally / Williams 2 – Data East / Sega 3 – Sega Large 4 – Stern SAM 5 – Stern White Star
CONFIG0013 - Param 2007 DMD Effect invalid	DMD Effect can be: 1 – Normal dots 2 – Horizontal CRT effect 3 – Vertical CRT effect 4 – ZX Speccy
CONFIG0014 - Param 1002 less than 96 pixels	Screen height cannot be less than 96 pixels
MMC0001 - CMD0 error occurred	An internal SD Card error occurred
MMC0002 - CMD8 error occurred	An internal SD Card error occurred
MMC0003 - CMD55 error occurred	An internal SD Card error occurred
MMC0004 - CMD41 error occurred	An internal SD Card error occurred
MMC0005 - CMD2 error occurred	An internal SD Card error occurred
MMC0006 – CMD3 error occurred	An internal SD Card error occurred
MMC0007 - CMD7 error occurred	An internal SD Card error occurred
MMC0008 - CMD17 error occurred	An internal SD Card error occurred
SECURITY0001 - Invalid Key	The product keys found in parameters 9001, 9002, 9003 and 9004 are invalid

If an error message occurs please contact info@drpinball.co.uk quoting the full error message and any other values displayed.