



<https://www.model-railway-signalling.co.uk/>

© DCC Model Railway Signalling. All Rights Reserved.

## DCC Signalling System Setup Guide

Version 3.0 – June 2024

This guide is intended to walk you through the initial setup of your DCC Signalling System, and provide some top tips for the getting the best out of the Raspberry Pi.

For information on how to use the signalling application, refer to the separate application quickstart guide, available for download from <https://www.model-railway-signalling.co.uk/>.

### Table of Contents

Unpacking.....	2
Initial setup.....	3
Powering up the system.....	4
Connecting to your Wi-fi network.....	4
Changing the default password.....	4
Powering off the system – Important!.....	5
Updating the operating system.....	5
Updating the signalling application.....	5
Backing up your files.....	6
Backing up your system.....	6
Running up the Signalling application.....	6
Connecting to the DCC accessory bus.....	7
Connecting external train sensors.....	7
Useful Links.....	9

# Unpacking

The *DCC Signalling System* is supplied as a pre-assembled and pre-configured unit comprising:

- A Raspberry Pi 4 single-board computer, providing a “windows-like” user experience (and versions of all the usual applications you would expect to find on a personal computer, such as web-browser, email, office-type applications etc).
- A Pi-SPROG3 DCC programmer controller, providing the interface to the DCC ‘accessory bus’ for control of points and signals out on the layout.
- A GPIO terminal breakout 'HAT' (Hardware Attached on Top) providing an easy means of connecting (normally open / closed when active) track sensors to provide train detection.
- Pre-installed Model Railway Signalling application and documentation

The *DCC Signalling System* is supplied with:

- A Raspberry-Pi USB-C UK power supply
- A DCC power supply (for powering the DCC accessory bus)
- A micro-HDMI to HDMI lead for connecting to your monitor
- A screw terminal connector for the DCC 'accessory bus’ output

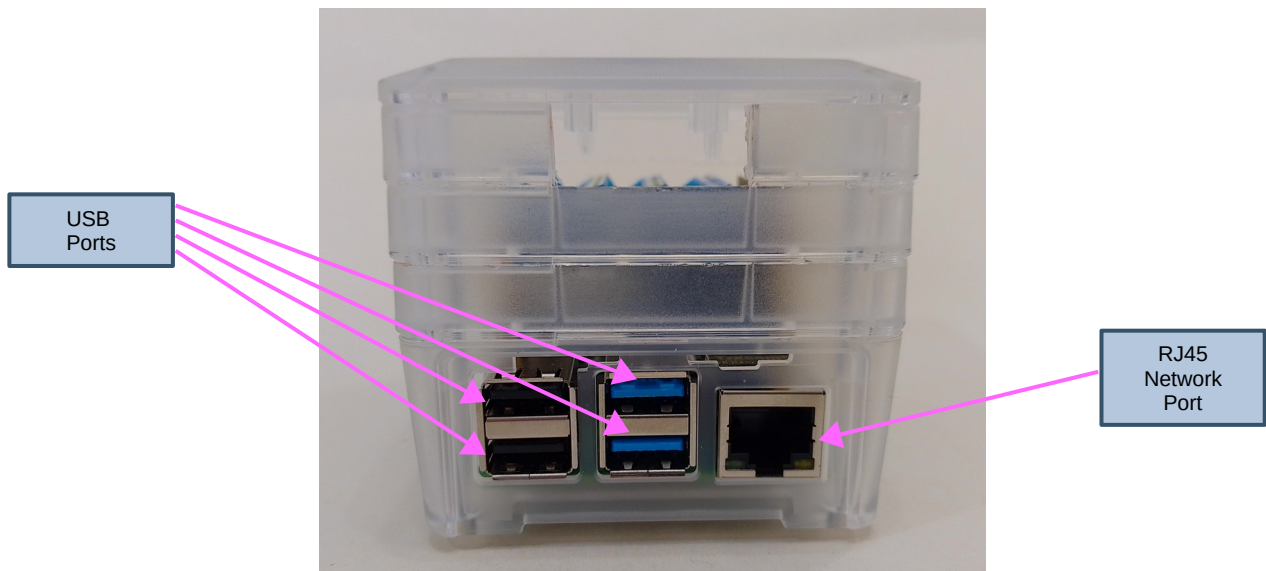


**Before proceeding, inspect all of the components carefully for damage (especially the power supplies). If you suspect damage then contact DCC Model Railway Signalling immediately to arrange an exchange (see <https://www.model-railway-signalling.co.uk/> for contact details).**

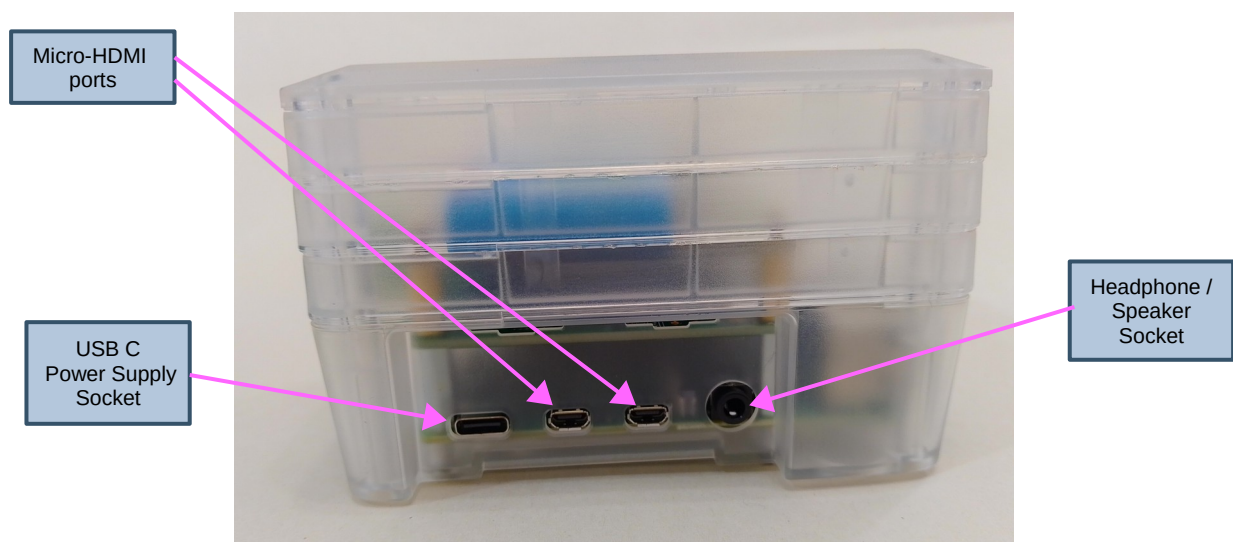
# Initial setup

For the initial setup you will need a PC monitor (with a HDMI input port), a USB keyboard and a USB mouse (connecting to the DCC bus and track sensors is covered in later sections).

- 1) Connect your keyboard and mouse to the USB ports (there are 4 USB ports in total – any of which can be used for the keyboard and mouse).



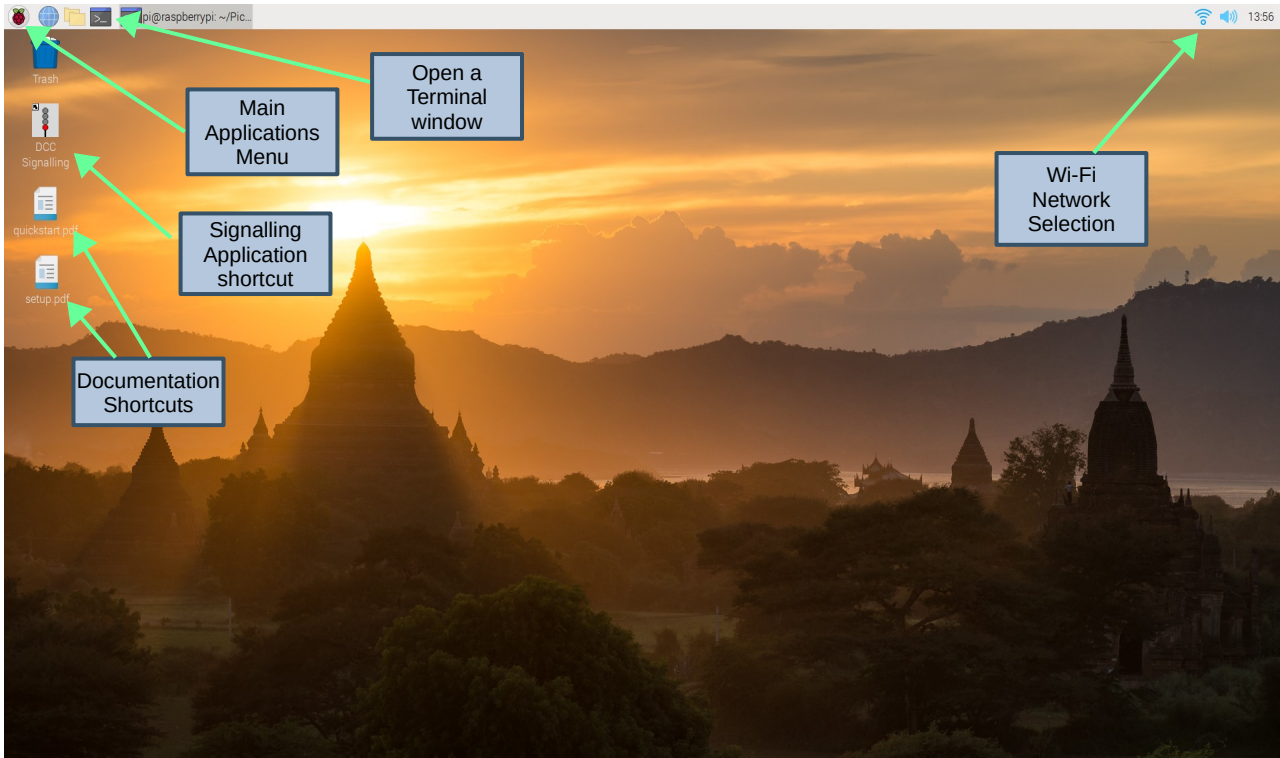
- 2) Connect the power supply to the USB power supply socket
- 3) Connect the HDMI lead into the left hand Micro HDMI port and connect the other end to your monitor (the right hand socket can be used for driving a second monitor if required, but you will need another Micro-HDMI to HDMI lead for this).



**Only ever use the power supply that comes with the system (or another official Raspberry-Pi USB-C power supply) – use of non compatible power supplies may damage the system.**

## Powering up the system

Once everything is connected, apply power to the system and wait for it to boot up into the desktop. Desktop shortcuts are provided for the signalling application and the associated documentation (including this setup guide). Note that your desktop wallpaper may be different.



## Connecting to your Wi-fi network

To connect to your home Wi-Fi network:

1. Click on the Network icon on the top right of the screen.
2. Select your Wi-Fi network from the list of available networks.
3. Enter your wireless password and click OK to connect.

## Changing the default password

All systems are shipped with a default password of 'password1234' but are configured to boot-up into the desktop without requiring this to be entered, To change the default password:

1. Click on the “Raspberry Pi” icon in the top left hand corner of the screen to bring up the Main Applications Menu.
2. Select **Preferences** and then **Raspberry-Pi Configuration**.
3. On the System tab, select **Change Password**, enter and confirm the new password.
4. To prompt for the password at boot time set the Auto login to **Disabled**.

## Powering off the system – Important!

Like all computers, you should never just remove power without shutting down as it may corrupt the underlying operating system (rendering the system unusable). To power-off the system:

1. Click on the “Raspberry Pi” icon in the top left hand corner of the screen to bring up the Main Applications Menu.
2. Select **Shutdown** from the drop-down list to bring up the Shutdown Menu.
3. Select **Shutdown** from the pop-up menu and wait for the system to shut down.
4. After a few seconds, the power can then be removed from the system.

## Updating the operating system

Like Windows (and other operating systems), the system should be regularly updated to keep it in the best condition but, unlike Windows, there is no automatic update facility and you therefore have to update the system manually. Do not fear, this is not complicated:

1. Click on the icon to open a Terminal window (top left corner of the screen next to the “Raspberry Pi” icon) .
2. Type the following commands (pressing enter after each):
  - `sudo apt update` - To get the list of available updates
  - `sudo apt upgrade` - To perform the update (acknowledge when prompted)
  - `sudo reboot` - Reboot the machine
3. Wait for the system to re-boot, and then open up another terminal window .
4. Type the following commands (pressing enter after each):
  - `sudo apt autoremove`
  - `sudo apt clean`
5. The terminal window can now be closed.

## Updating the signalling application

The signalling application is subject to ongoing development, and you are always encouraged to use the latest version to benefit from any new features and bug fixes.

1. Check the latest published version at: <https://pypi.org/project/model-railway-signals/>.
2. Check the currently installed version by opening the application and selecting **Help** and then **About** from the main menubar at the top of the application window.
3. If there is a newer version available then you can upgrade by opening a Terminal window (double click on the Terminal icon top left corner of the screen next to the “Raspberry Pi” icon) and typing in the following command:
  - `sudo python3 -m pip install --upgrade model-railway-signals`



## Backing up your files

Files on your system can be easily backed up (or copied between computers) using USB memory sticks. When a USB stick is plugged into the system, a pop-up window will appear asking if you want to open the device in a file manager window. Once open, files can then be copied as required.

**Warning – one major difference to Windows is that you should never just unplug a USB stick as this may corrupt the files on the device. Memory sticks should first be 'ejected' by clicking on the 'eject' icon (that will appear at the top of the screen whenever a USB stick is inserted). Once ejected, the USB stick can be safely unplugged.**

## Backing up your system

As with all computers, it is good practice to make regular backups of the entire system for disaster recovery purposes (so you can restore it in the unlikely event of fatal system crashes).

To back up your system we would recommend that you use 32GB Micro-SD cards (which are relatively inexpensive and widely available). In the event of a failure, the internal Micro-SD card (running the system) can then simply be swapped out for the backup Micro-SD card, to get you back up and running in the shortest possible time.

To perform a backup, you will also need a USB Micro-SD reader/writer (so you can connect the Micro-SD card to one of the USB ports). To perform the backup.

1. Close all open applications.
2. Plug the backup Micro-SD card into the USB adaptor and plug the USB adaptor into one of the USB ports.
3. Click on the “Raspberry Pi” icon in the top left hand corner of the screen to bring up the Main Applications Menu.
4. Select **Accessories** and then **SD Card Copier** to open the copier application.
5. For the 'copy from device', select the internal Micro-SD – this will normally appear at the top of the drop-down list as 'Y016U (/dev/mmcblk0)' or similar.
6. For the 'copy to device', select the new Micro-SD card.
7. Perform the backup – and then keep the backup in a safe place.

In the unlikely event you ever need to restore the system, contact DCC Model Railway Signalling (<https://www.model-railway-signalling.co.uk/>) for advice.

## Running up the Signalling application

Just double click on the desktop icon to open the application.

For more information on using the application, refer to the separate application quickstart guide (<https://www.model-railway-signalling.co.uk/>).

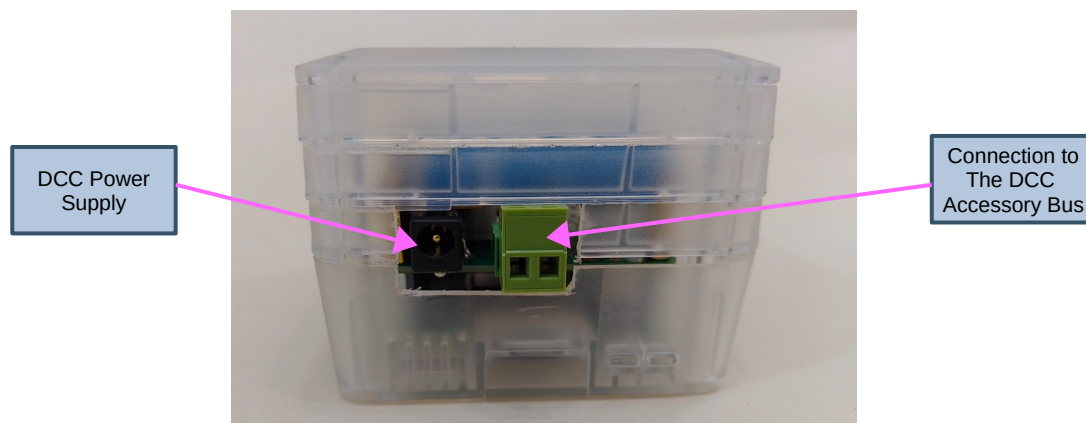
## Connecting to the DCC accessory bus

The DCC Signalling System uses a DCC 'accessory bus' for control of the signals and points out on the layout. This should be routed around the layout as required and **only** connected to the DCC-enabled signals and points on your layout (and/or appropriate DCC accessory decoders).

**Warning – Never connect the system to the DCC track bus (if you are already using DCC on your layout). The DCC accessory bus must be kept electrically isolated from the DCC track control bus, so the DCC Signalling system does not interfere with your command station.**

The green connector, contains two screw terminals for connection to the DCC accessory bus (the connector must be removed from the unit to access these connections). The other connection is for the DCC power supply.

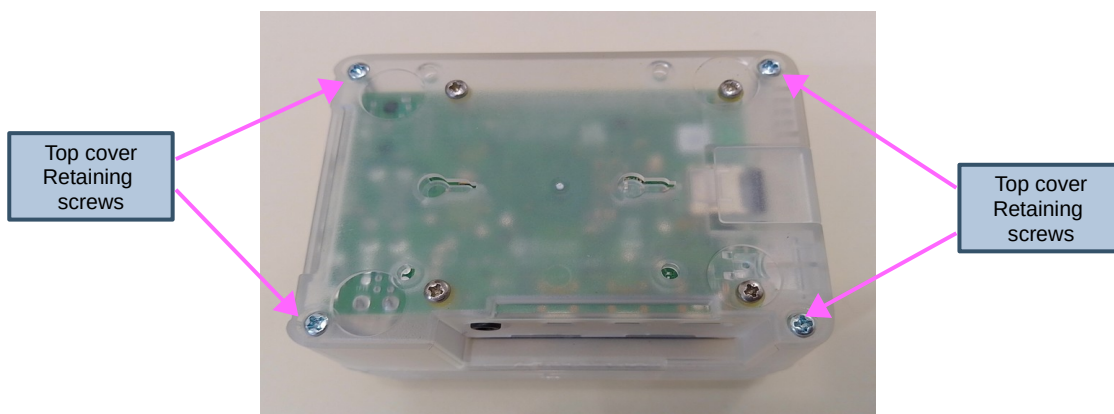
**Warning - Only ever use the DCC power supply that comes with the system – use of non compatible power supplies may damage the system.**



## Connecting external train sensors

Sensors providing a 'normally-open' output (momentarily closed when triggered) can be connected directly to the appropriate GPIO screw terminals. To access the GPIO screw terminals, the top cover must first be removed by removing the 4 retaining screws on the base of the unit.

**Warning – Only sensors with a normally open (closed when active) output should be connected directly to the system. Sensors providing a switched voltage should never be connected or this could (most likely will) damage the system irreparably.**

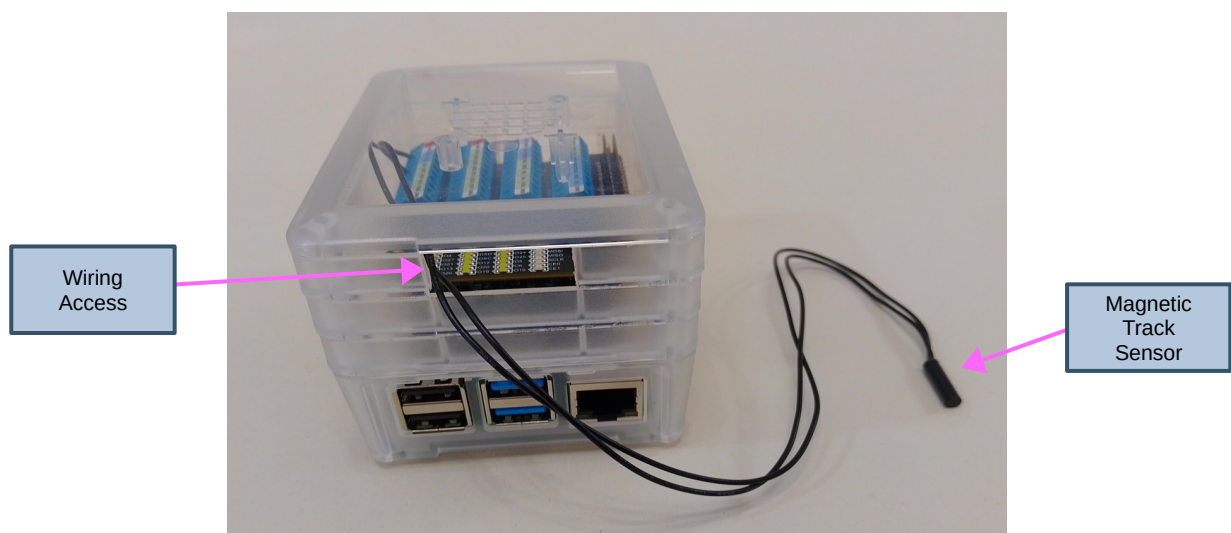
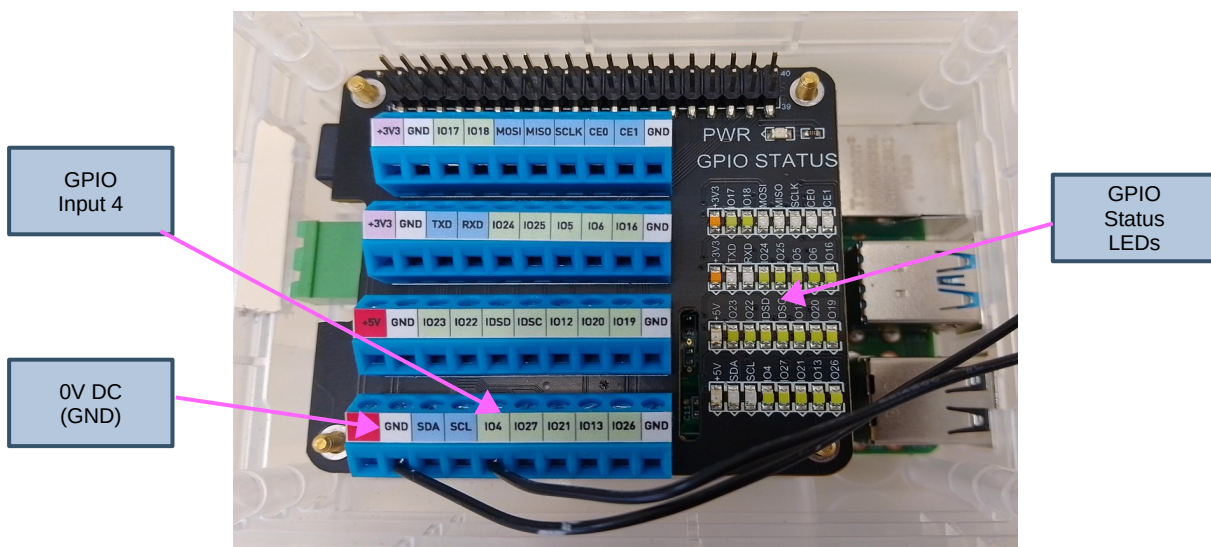


Once the top cover has been removed, the train sensors can then be wired between the appropriate GPIO input terminals and the 0V DC terminals.

Only a subset of the GPIO inputs are available for use by the signalling application (Open the application and select **Settings** and then **GPIO** to bring up a list of supported inputs).

**Never connect train sensors to the unsupported GPIO inputs (1, 2, 3, 14, 15, 16, 17) as this may have an adverse affect on the operation of the system. Also, never connect anything to the +5V terminals (red), the +3.3V terminals (pink).**

As an example, the following pictures show a DCC Concepts slim vertical mounted magnetic sensor connected between GPIO 4 and 0V DC (GND).





## Useful Links

1. <https://www.model-railway-signalling.co.uk/> - The homepage for the DCC Signalling System providing details of how you can about obtain further information and support.
2. <https://pypi.org/project/model-railway-signals/> - the Python Package Index page for the signalling application, providing details of the latest published version.
3. <https://signalbox.org/> - Comprehensive information on signal types and the 'Block System' and a vast library of signal box diagrams for you to draw inspiration.
4. [https://en.wikipedia.org/wiki/UK\\_railway\\_signalling](https://en.wikipedia.org/wiki/UK_railway_signalling) – A useful starting point for research to increase your knowledge of British railway signalling practice (its Wikipedia after all).
5. <http://www.railway-technical.com/signalling/> - A section of the Railway Technical Website covering signalling. There are many great resources on these pages including:
  1. <http://www.railway-technical.com/signalling/infopaper-6-basic-railway.pdf> – A useful paper (downloadable pdf format) on basic railway signalling.
  2. <http://www.railway-technical.com/signalling/british-signalling--what.pdf> – A useful paper (downloadable PDF) on “What the driver sees”.
6. <https://www.sprog-dcc.co.uk/> - The SPROG DCC web site containing details of their other products (the DCC signalling system uses the Pi-SPROG3-V2 for its DCC interface).