

SPROG DCC

Pi-SPROG One

***DCC Decoder Programmer and Command Station
for Raspberry Pi***

User Guide



| | |
|--|-----------|
| Introduction | 3 |
| Requirements | 3 |
| Features | 3 |
| Specification/Operating Conditions | 4 |
| Getting Started | 5 |
| Install the Operating System | 5 |
| Connect the Pi-SPROG One to your Raspberry Pi | 5 |
| Connect the Raspberry Pi Power Supply | 6 |
| Connect the Pi-SPROG One Power Supply | 6 |
| Connect an Optional Track Activity LED | 7 |
| Connect the Programming Track or Layout | 7 |
| Connecting an Additional Booster | 7 |
| Connecting to the Raspberry Pi Access Point | 7 |
| Accessing the Raspberry Pi Desktop | 8 |
| Changing the Connection Preference (Programmer or Command Station Mode) | 8 |
| GPIO Pass-Through Connector | 9 |
| Determining the Pi-SPROG One Firmware Version | 9 |
| The SPROG Console | 9 |
| Updates to the Pi-SPROG One Firmware | 9 |
| Useful Links | 11 |

Introduction

Pi-SPROG One is a DCC decoder programmer and command station for connection to a Raspberry Pi single board computer. Pi-SPROG One is supported by DecoderPro and PanelPro, both part of the JMRI project (<http://jmri.sourceforge.net/>).

Pi-SPROG One can supply up to 2.5A to the layout with a track voltage of 12 – 18 V recommended.

Note: The additional booster connector is no longer supported on current hardware.

Requirements

- Raspberry Pi
 - Pi 3 model B or Pi 2 model B recommended
- Raspberry Pi power supply
- Operating system and software on SD card
- Regulated DC Power Supply for Pi-SPROG One (see Table 1)

Features

- Programs virtually **all** NMRA compliant DCC decoders
- No extra hardware required for programming sound decoders (e.g. QSI, Soundtraxx, LokSound, etc.)
- Easy to use graphical interface with DecoderPro
- Solder pads for optional track power activity LED
- Supports WiThrottle and EngineDriver Android apps
- Compatible with recent Raspberry Pi models:
 - Pi 3 Model B
 - Pi 2 Model B with WiFi adapter
 - Pi 2 Model B via wired network connection to wireless router

Specification/Operating Conditions

| Parameter | Minimum | Nominal | Maximum | Units | Note |
|---------------------------------------|---------|---------|---------|-------|------|
| DC Input supply voltage | 10V | | 20V | V | 1 |
| Vin supply current – not programming | | 50 | | mA | |
| Vin supply current – programming | | 300 | | mA | 2 |
| Vin supply current – Operating Layout | | | 2.6 | A | 3 |
| Operating Temperature Range | | 25 | | °C | |
| Output Load - programming | | | 250 | mA | 2 |
| Output Load – Operating Layout | | | 2.5 | A | 3 |

Table 1 Specification/Operating Conditions

Notes:

1. When programming, the minimum supply voltage depends upon the requirements of the decoder being programmed. In general it is safer to use as low a voltage as possible in case of problems with a newly installed decoder.
2. Pi-SPROG One will remove track power if output current exceeds 250mA as measured 100ms after applying power. Surge current during decoder power-up may be considerably greater than this, but is allowed for.
3. Depends upon required DCC current.
4. Pi-SPROG One is protected against reverse polarity connection of the power supply but will not work unless the polarity is correct.

! Pi-SPROG One is not protected against track and power connections being interchanged.

Getting Started

The following steps are required to install Pi-SPROG One before you can use it for the first time:

Install the Operating System

Create an SD card image of the Raspberry Pi operating system and required software for your chosen application. Instructions for this are available from the SPROG DCC website download page:

[SPROG DCC download page](#)

You can follow the instructions to create your image, or purchase a pre-configured SD card from SPROG DCC.

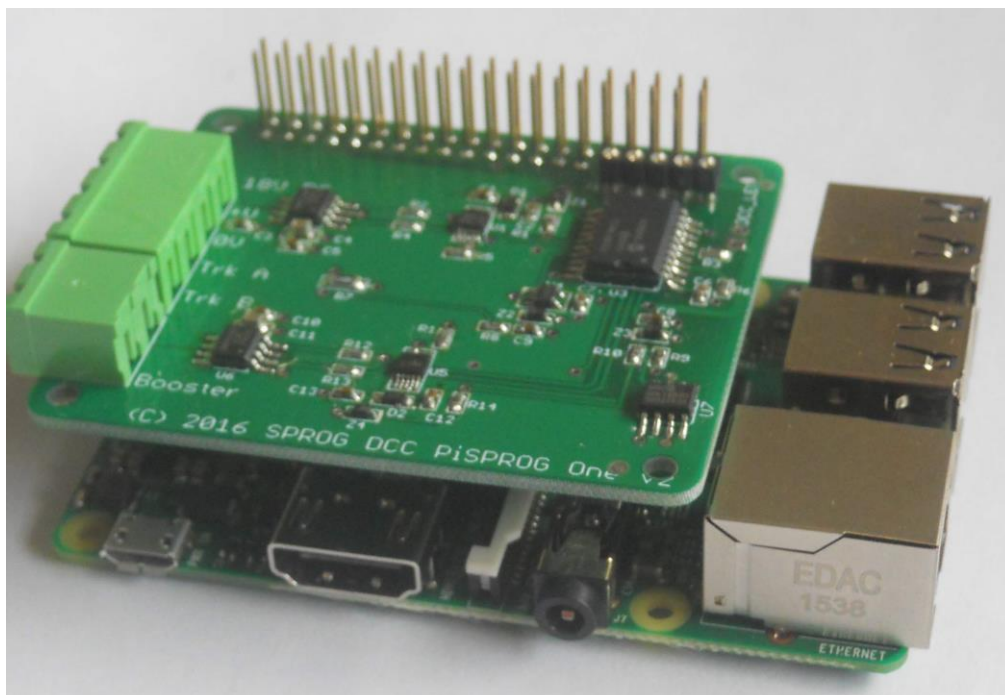
It is strongly recommended that you make a backup of your SD card, using a tool such as [win32diskimager](#)

Connect the Pi-SPROG One to your Raspberry Pi

Always shutdown the Raspberry Pi and remove the power connection before connecting or disconnecting the Pi-SPROG One.

The Pi-SPROG One should be plugged onto the 40 pin GPIO header, being careful to align the pins correctly.

If you wish to remove the Pi-SPROG One, do so carefully to avoid bending the connector pins on the Raspberry Pi.



Connect the Raspberry Pi Power Supply

Use a suitable power supply appropriate for your Raspberry Pi and any peripherals that may be attached and powered from the USB ports.

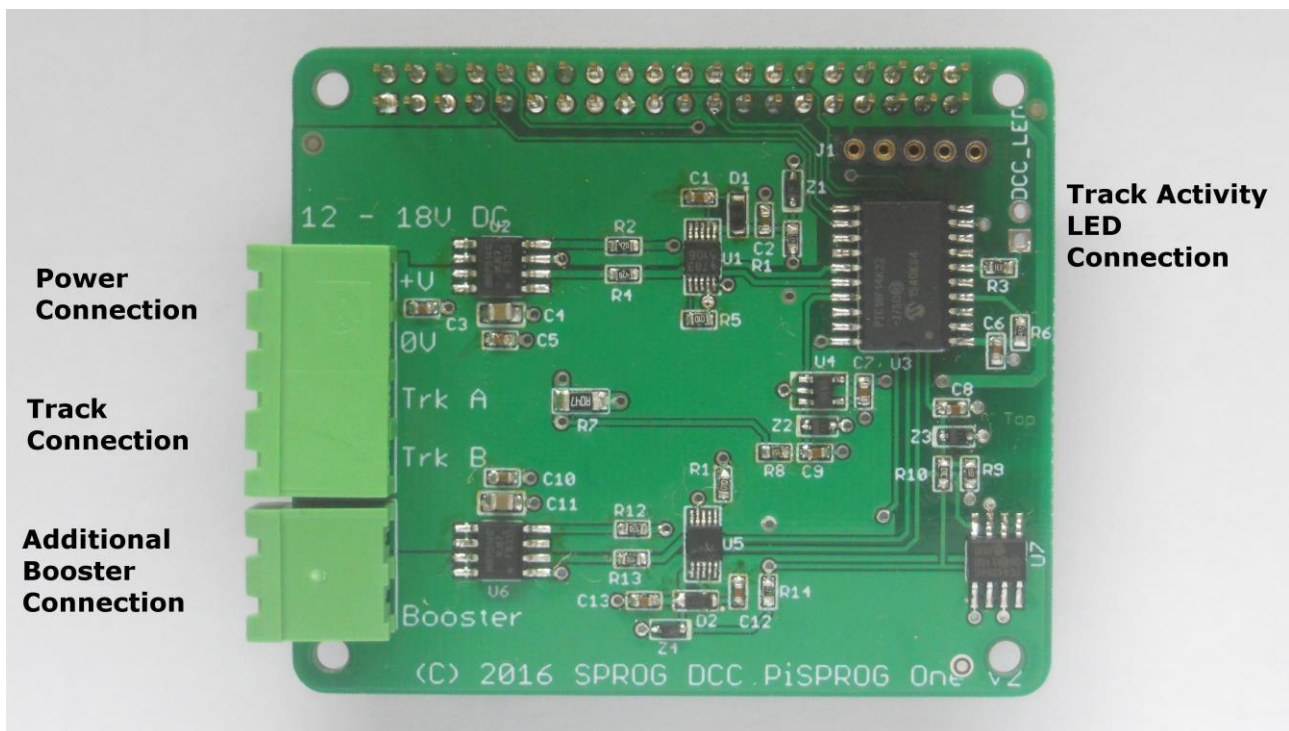
Connect the Pi-SPROG One Power Supply

Power supplies packaged with a Pi-SPROG One are already connected to the green pluggable terminal block.

For any other supply used, connect as described below.

- Cut off the low voltage DC plug
- Separate the two conductors for about 3cm
- Strip 6-8mm of insulation from each conductor and twist the copper cores of each conductor together
- Insert the positive conductor in the **+V** terminal and tighten the screw
- Insert the other conductor in the **0V** terminal and tighten the screw

Pi-SPROG One is protected against reverse polarity connection of the power supply but will not work unless the polarity is correct.



Connect an Optional Track Activity LED


You may connect an optional track activity LED (requires soldering) to the two holes shown in the annotated picture. A current limit resistor is included on the PCB suitable for a standard red LED. The LED anode should be connected to the square pad.

The LED will illuminate steadily when the DCC power is connected.

The LED will flash slowly when the track power is turned on, quickly when an overload is detected.

The LED is not provided by default as we felt some users may wish to mount their Pi-SPROG One in an inaccessible location and mount a remote LED on a front panel.

Connect the Programming Track or Layout

 **When using Pi-SPROG One as a programmer, the programming track MUST be isolated from all other DC or DCC control systems and connected only to the Pi-SPROG One. Damage may result to the Pi-SPROG One or other equipment if this rule is not followed.**

Connect the Pi-SPROG One to the programming track using the **Trk A** and **Trk B** terminals of the pluggable terminal block. There is no requirement to observe any particular polarity when connecting the programming track. The DCC output voltage will be approximately 1V below the power supply voltage, typically about 13V with the standard 14V power supply provided.

During programming the track current is sensed 100 milliseconds after the programming track is powered up. If the current exceeds 250 milliAmps then the programming track power is removed to avoid potential damage to an incorrectly installed decoder.

Connecting an Additional Booster

The special port is no longer available.

Connect boosters such as our SBOOST to the **Trk A** & **Trk B** terminals. See SBOOST documentation for more information.

Connecting to the Raspberry Pi Access Point

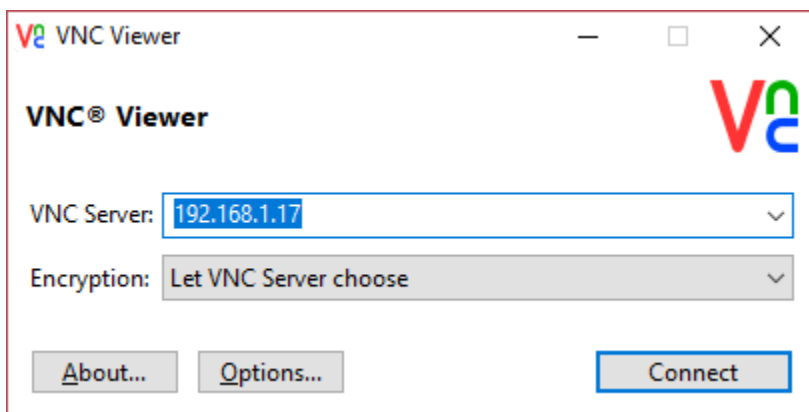
If you are using an SD card purchased from SPROG DCC, or have followed our instructions to create one, with a Raspberry Pi 2 and WiFi dongle or a Raspberry Pi 3 with built in WiFi, the default WiFi password is 'pi-sprog'.

Accessing the Raspberry Pi Desktop

We recommend using remote access software from a host PC or other suitable device. SPROG DCC software images are pre-configured to run the built in VNC server.

We recommend VNC viewer, or similar, on your PC.

For wired network connections you will need to determine the IP address of the Raspberry Pi that is assigned by your router then connect to that IP address in VNC viewer, e.g.,



The default vnc username and password for SPROG DCC software images are 'pi' and 'sprog-pi', respectively

For wireless connection you must first connect to the access point using the wireless setup on your PC, just as you would to connect to a wireless router. The default IP address to connect to the SPROG DCC images is 192.168.6.1

If you prefer not to use remote access you can attach an LCD screen or HDMI monitor, along with a USB keyboard and mouse. You can log in to the Raspberry Pi and then start the desktop applications there.

You may need to do further configuration to set screen resolution to start on the Local display.

Changing the Connection Preference (Programmer or Command Station Mode)

The software images supplied by SPROG DCC from the BBM Group on microSD card are set to one of two modes (as specified upon purchase), controlled by "Profile" settings in the JMRI DecoderPro or PanelPro preferences.

See the documentation supplied with the images for more information.

Command Station mode allows multiple throttles to be used but restricts programming to “ops mode” or “on the main”. CV values cannot be read back in this mode.

To use a programming track in **Service Mode**, which allows CVs to be read, the DecoderPro connection preference must be changed, for which you need to access the Raspberry Pi desktop, and change the profile in Preferences in DecoderPro.

GPIO Pass-Through Connector

The Pi-SPROG One passes all Raspberry Pi GPIO pins through to a 40-pin header that allows further accessory boards (“hats”) to be connected. There are, however, some restrictions on using these pins.

The UART Rx and Tx pins (pins 8 and 10) are used by the Pi-SPROG One. No further connection should be made to these pins.

The SPI pins (pins 19, 21, 23 and 24) are connected on the Pi-SPROG One and reserved for possible future use. In the meantime, with the current firmware, they are connected to digital inputs and may safely be used.

Determining the Pi-SPROG One Firmware Version

From the SPROG item on the menus of DecoderPro, select “Get SPROG Firmware Version”.

Please download the SPROG Ilv3 User Guide from the SPROG DCC website for additional information. The procedure for obtaining the firmware is very similar to that described for the SPROG Ilv3.

The SPROG Console

Please download the SPROG Ilv3 User Guide from the SPROG DCC website for additional information. The procedure for using the SPROG console for the Pi-SPROG One is very similar to that described for the SPROG Ilv3.

Updates to the Pi-SPROG One Firmware

Please download the SPROG Ilv3 User Guide from the SPROG DCC website for additional information. The procedure for updating the Pi-SPROG One firmware is very similar to that described for the SPROG Ilv3.

At the time of writing no firmware updates are available and you should not attempt to use this option.

Troubleshooting

Before reporting any problems please check the Pi-SPROG One homepage for any bug reports or updates.

If you are experiencing intermittent faults with your SPROG, please ensure that you are using a good quality DC, regulated power supply, such as the one supplied with your SPROG purchase.

If you have problems with programming a decoder, or operating DecoderPro throttles, for instance, please use the SPROG console (found under the SPROG menu in DecoderPro), recreate the problem and send the output of the command monitor to sprog@sprog-dcc.co.uk or (for North American customers) sprog@bbmgroup.com with a description of the problem.

Useful Links

SPROG homepage <http://www.sprog-dcc.co.uk> for the latest information, updates, downloads, etc., for Pi-SPROG One.

North American distributor for Pi-SPROG One
<http://sprog.us>

SPROG DCC Yahoo group <http://groups.yahoo.com/group/sprog-dcc> for latest news and discussion of DecoderPro.

Java Model railroad Interface <http://jmri.sourceforge.net> for DecoderPro.

JMRI Yahoo group <http://groups.yahoo.com/group/jmriusers> for latest news and discussion of DecoderPro.

Raspberry Pi Forums <https://www.raspberrypi.org/forums/> You will find far more knowledge here than we are able to offer!