

# ***SPROG DCC***

## ***SPROG-Nano DCC Booster Interface User Guide V4.x firmware***



<b>Introduction</b> .....	<b>4</b>
<b>Requirements</b> .....	<b>4</b>
<b>Features</b> .....	<b>4</b>
<b>Specification/Operating Conditions</b> .....	<b>5</b>
<b>Booster Interface</b> .....	<b>5</b>
<b>Bipolar Interface</b> .....	<b>6</b>
<b>Unipolar interface</b> .....	<b>6</b>
<b>Installation</b> .....	<b>7</b>
<b>Install DecoderPro</b> .....	<b>7</b>
<b>Install SPROG Nano USB drivers</b> .....	<b>7</b>
<b>Drivers for Windows 2000, XP or Vista (with some variations)</b> 7	
<b>Identify the connection Port</b> .....	<b>11</b>
<b>Driver Installation for Windows 7</b> .....	<b>13</b>
<b>Driver Installation for Windows 8</b> .....	<b>18</b>
<b>Driver Installation for MacOS</b> .....	<b>18</b>
<b>Driver Installation for Linux</b> .....	<b>18</b>
<b>Setting Preferences</b> .....	<b>18</b>
<b>Connect the Booster</b> .....	<b>20</b>
<b>Getting Started With DecoderPro</b> .....	<b>21</b>
<b>Layout Control with SPROG Nano</b> .....	<b>22</b>
<b>SPROG Nano Command Station Mode</b> .....	<b>22</b>
<b>Short (one byte) Versus Extended (two byte) Addressing</b> ....	<b>23</b>
<b>How Many Locos Can Be Controlled?</b> .....	<b>24</b>
<b>Determining the SPROG Nano Firmware Version</b> .....	<b>25</b>
<b>The SPROG Console</b> .....	<b>26</b>
<b>Title Bar</b> .....	<b>27</b>

<b>Command History</b> .....	<b>27</b>
<b>Send Command</b> .....	<b>28</b>
<b>Selecting SPROG Operating Modes</b> .....	<b>28</b>
<b>Speed Step Modes</b> .....	<b>28</b>
<b>Current Limit</b> .....	<b>28</b>
<b>Set ZTC Mode</b> .....	<b>28</b>
<b>Set Blueline Mode</b> .....	<b>28</b>
<b>Unlock Firmware</b> .....	<b>28</b>
<b>Save</b> .....	<b>28</b>
<b>Updates to the SPROG Nano Firmware</b> .....	<b>29</b>
<b>Returning Your SPROG Nano for Update</b> .....	<b>29</b>
<b>Firmware Update Using the Bootloader</b> .....	<b>29</b>
<b>Connecting SPROG Nano to SBOOST Boosters</b> .....	<b>33</b>
<b>Example 1</b> .....	<b>33</b>
<b>Example 2</b> .....	<b>34</b>
<b>Connecting SPROG Nano to Other boosters</b> .....	<b>35</b>
<b>Troubleshooting</b> .....	<b>36</b>
<b>Useful Links</b> .....	<b>37</b>
<b>References</b> .....	<b>37</b>

## Introduction

SPROG Nano is a DCC interface for connection between the USB port of a personal computer or similar device and a DCC booster. SPROG Nano transforms a DCC booster into a computer controlled DCC command station by formatting data packets from USB (sent by appropriate software running on the computer) into correctly timed DCC data packets.

SPROG Nano is **not** a decoder programmer, although “ops-mode” or “on-the-main” programming is still possible depending on the features of the controlling software.

SPROG Nano is **not** a booster and a separate booster is required between the Nano and the track.

SPROG Nano is supported by JMRI project (<http://jmri.sourceforge.net/>) which, by use of the java programming language, allows platform independent support of a wide range of DCC hardware. The JMRI software is shareware available as a free download.

## Requirements

- DecoderPro from <http://jmri.sourceforge.net/> or the CD-ROM (supplied)
- USB A to Mini B cable (supplied)
- DCC booster and power supply with NMRA bipolar input input (supplied by user)

## Features

- USB powered – no external power supply required for the SPROG Nano
- USB interface for easy connection to PC
- USB activity LED shows communication with the PC
- Cross-platform support – Windows, Linux, MAC with appropriate software

## Specification/Operating Conditions

Parameter	Minimum	Nominal	Maximum	Units	Note
DCC Output voltage		+/-10V		V	1,2
Operating Temperature Range	0	25		°C	

*Table 1 Specification/Operating Conditions*

Notes:

1. DCC output voltage depends upon the load imposed by the booster input(s).
2. DCC output is a differential (bipolar in NMRA terminology) signal very similar to that output by a DCC booster but without the current drive capability of a booster

## Booster Interface

The DCC output of the SPROG Nano is via the 3-pin pluggable terminal block. The connections are shown in Figure 1 and Table 2.



*Figure 1 SPROG Nano Connectors*

Terminal Block Pin	Signal
1	DCC A
2	DCC B
3	0V reference

*Table 2 DCC Output Connector*

Only two of the three terminals are used to connect to a booster.

The SPROG Nano support both bipolar and unipolar booster interfaces as described in NMRA standard S-9.1.2 Power Station Interface

### ***Bipolar Interface***

This uses the DCC A and DCC B signals and is required by some boosters (e.g. Hornby) that require both phases of the DCC signal to function correctly.

This is the generally recommended connection method for the SPROG Nano.

### ***Unipolar interface***

This uses either DCC A or DCC B and the 0V reference.

- The 0V of the host PC will be connected to the booster 0V input.
- The 0V connection to the SPROG Nano is intended as a reference only. It is connected to the host PC by the USB cable and must not be relied upon to provide a booster “common” or “home ground”.

## Installation

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

- Install DecoderPro 3.8 or later
- Install SPROG Nano USB drivers
- Edit DecoderPro preferences
- Connect the booster

This document gives brief installation instructions for the Windows Operating System, versions 2000, XP, 7 and 8, or for MacOS 10.4 and newer. For further instructions and for instructions to install the JRE and DecoderPro on Linux, please refer to the Install Guides on the JMRI website at <http://jmri.sourceforge.net/download>

### *Install DecoderPro*

DecoderPro should be installed from the CD-ROM or a downloaded copy. The CD includes a recent stable “production” release version.

A newer version of DecoderPro than that supplied on the CD-ROM may be available from the JMRI download page <http://jmri.sourceforge.net/download>

This user guide assumes you are using version 3.0, or later.

To install from the CD-ROM, browse to the directory specific to your operating system to find the JMRI installer. For example, if your CD-ROM drive is D: on Windows, double click on the file D:\Windows\JMRI.3.x-rxxxxx.exe.

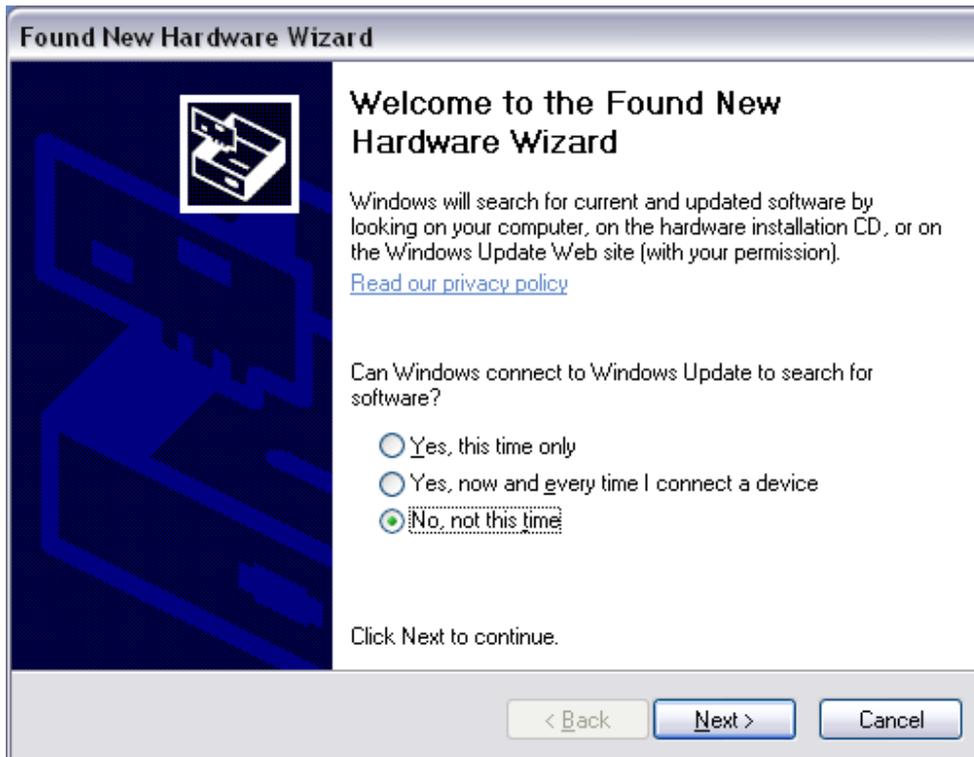
### *Install SPROG Nano USB drivers*

Use the supplied USB cable to connect SPROG NANO to the host computer. The power LED should be lit.

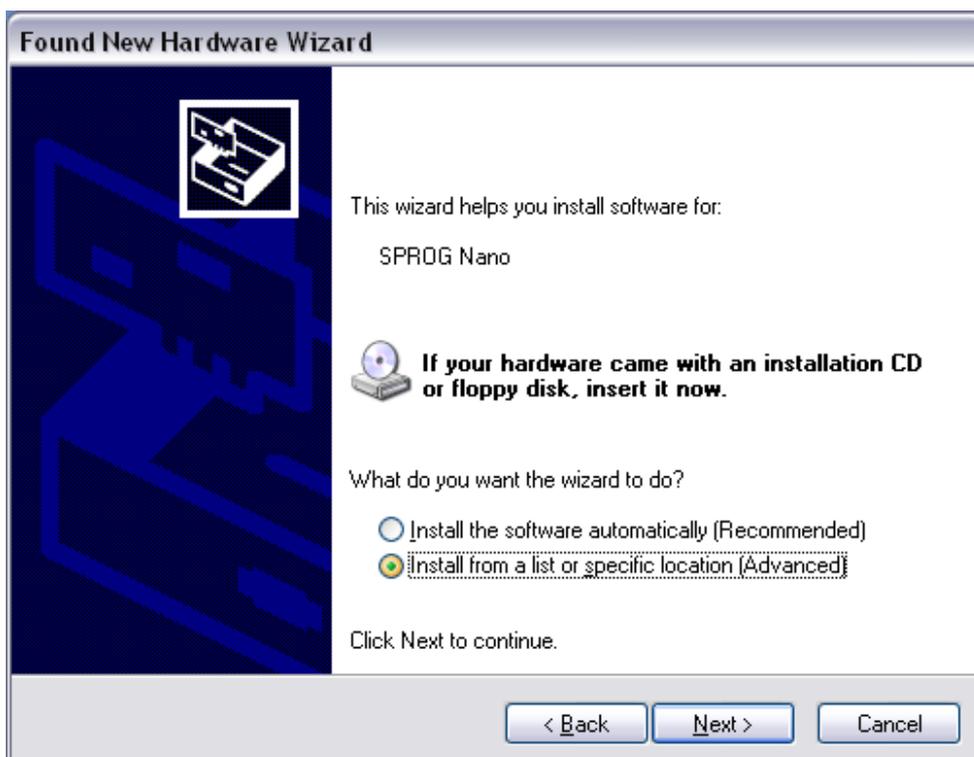
There are four possible choices set out below, for earlier Windows systems, Windows 7, MacOS 10.4 and later, or Linux. Select the right section for your computer and operating system.

#### *Drivers for Windows 2000, XP or Vista (with some variations)*

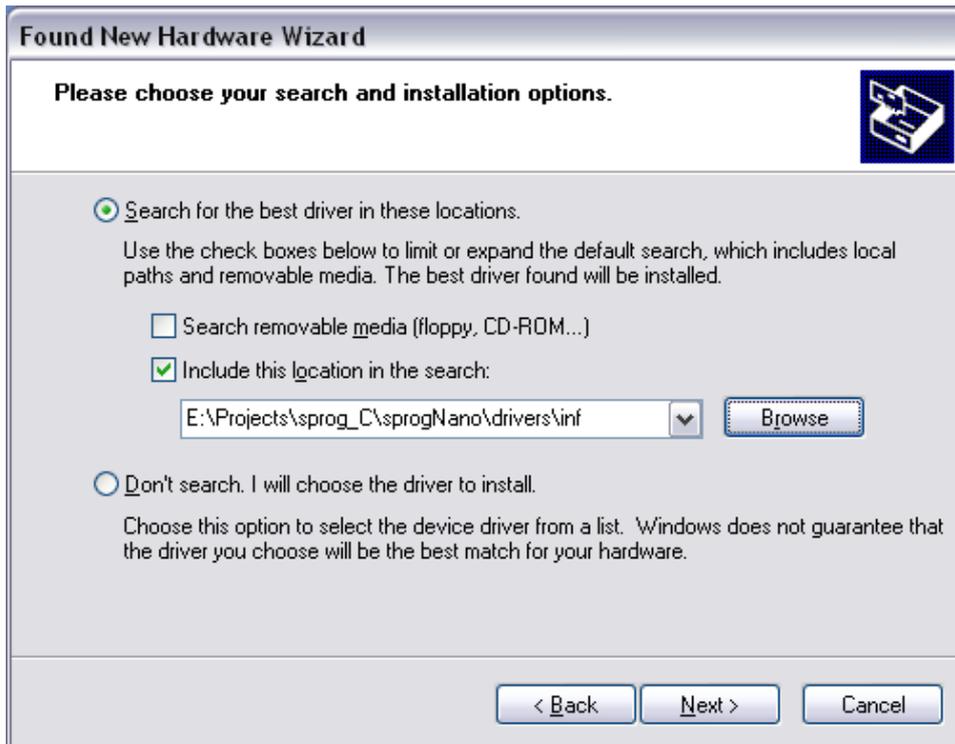
The first time you connect the SPROG Nano you should see the “Found new Hardware Wizard”. Follow the steps below to install the SPROG NANO drivers.



Click “No, not this time” then click “Next >”.



Click “Install from a list or specific location” then click “Next >”.



Click “Search for the best driver in these locations” then “Include this location in the search” and then click the Browse button to find the driver directory on the CD-ROM supplied with SPROG NANO.

If your CD-ROM drive is E:\, for example, this directory will be E:\USB\sprogNano\inf

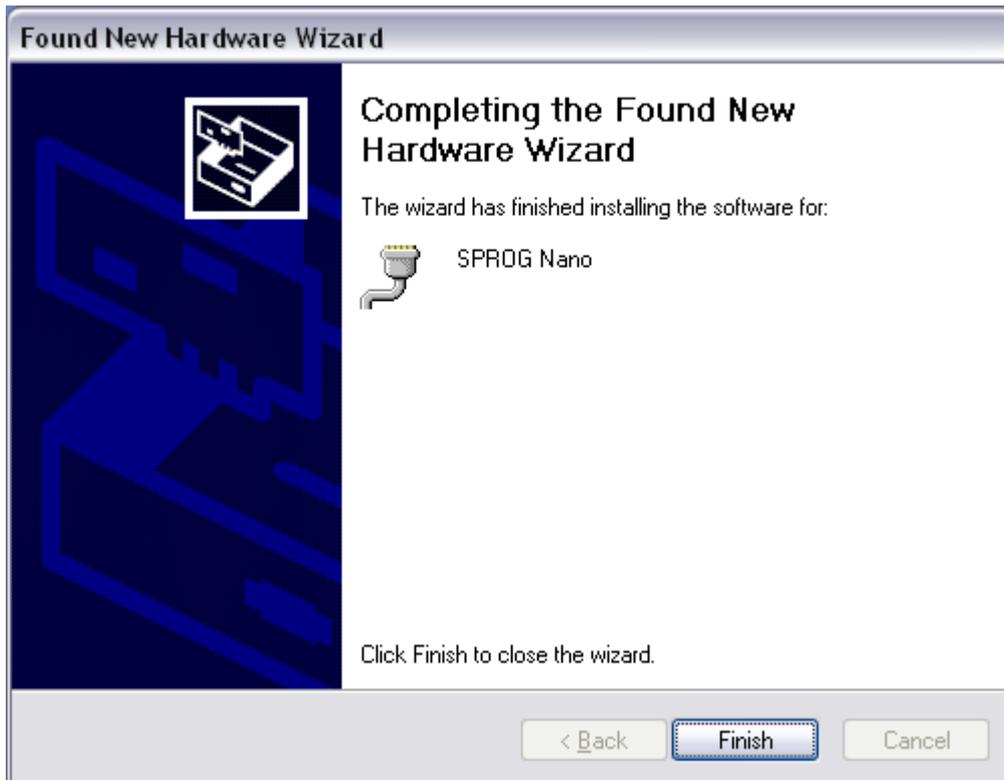
Click “Next >”.



The base drivers are fully compatible with WindowsXP. To make them SPROG Nano specific, the .inf files are edited which, unfortunately, causes this dialogue to appear.

Click “Continue Anyway” and wait for the installation to complete.





Click “Finish”

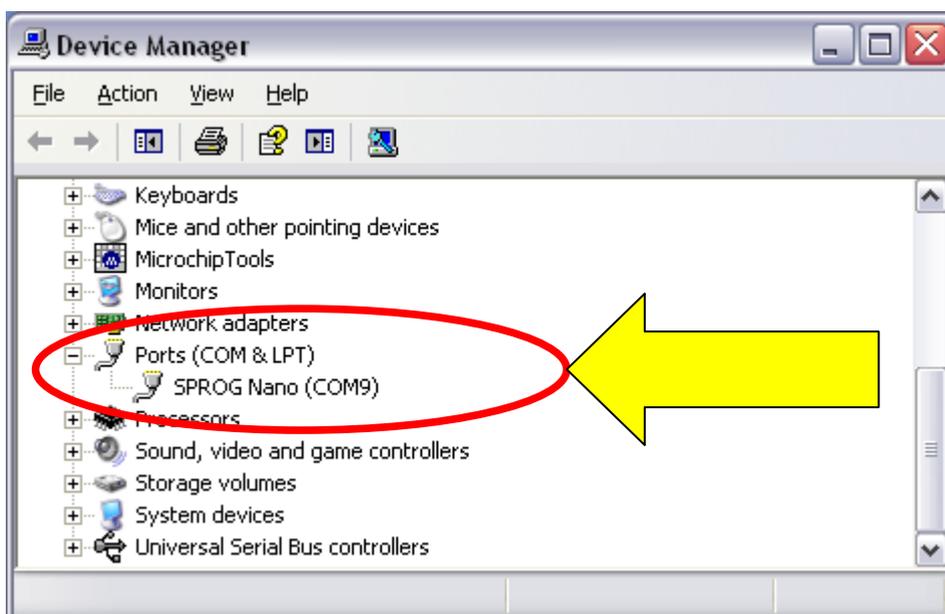
### ***Identify the connection Port***

The next step is to ascertain which COM port was assigned to SPROG NANO during the driver installation. Open the System Properties from the Windows Control Panel (you may need to switch to classic view in Control Panel). Alternatively, right click on the Desktop “My Computer” Icon and select Properties.

Select the Hardware tab:



Click “Device Manager”

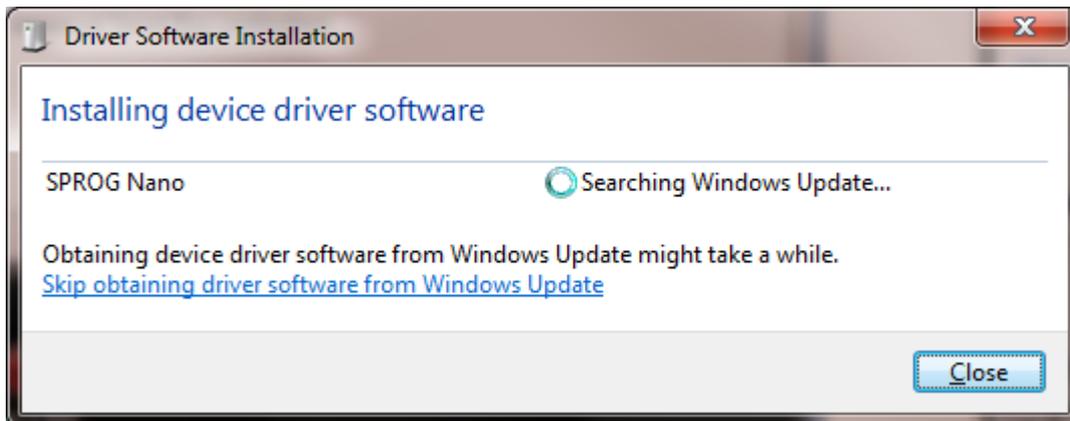


Click the “+” to open the Ports (COM & LPT) category and note the COM port assignment for the SPROG NANO (COM9 in this example).

Your install steps are now all completed, and it is time to start the software and use your SPROG NANO. Go on to the next major section of this Guide “Setting Preferences”.

### ***Driver Installation for Windows 7***

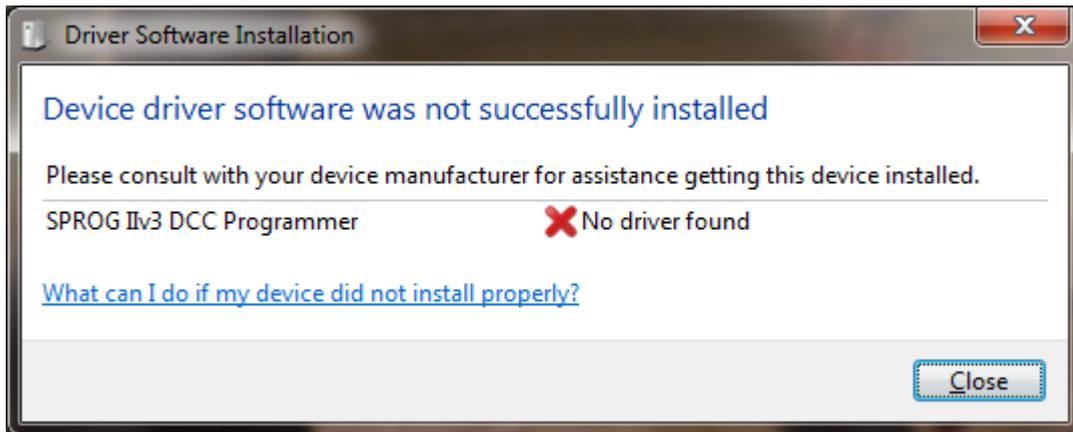
When the SPROG Nano is first plugged into a USB port you should see a bubble appear in the lower left corner of the screen “Installing device driver – click here for status”. If you click then a further status window opens.



Click “Skip...” to skip this step.

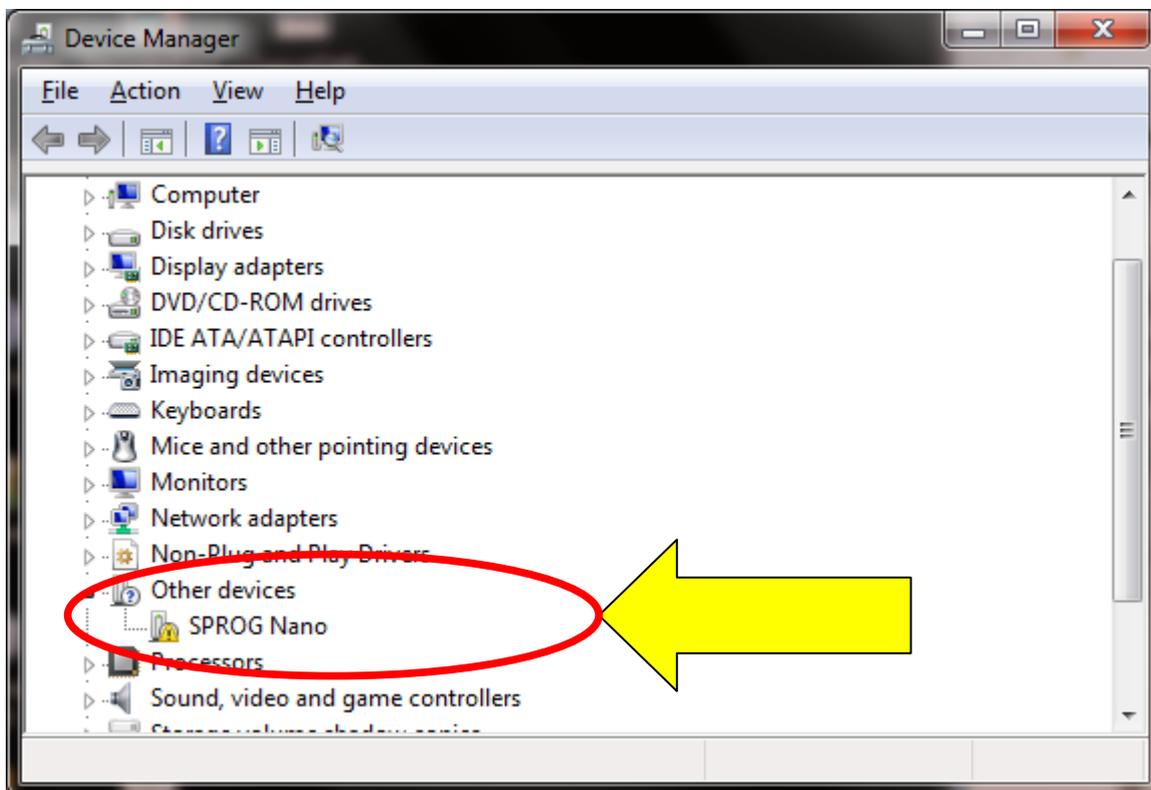


Click “Yes”.

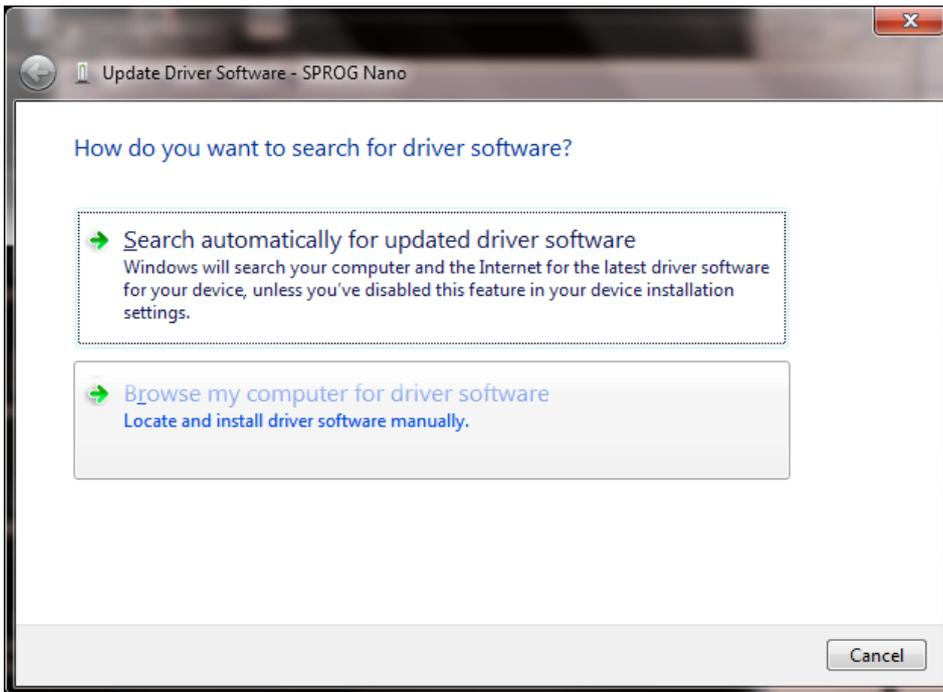


Click "Close"

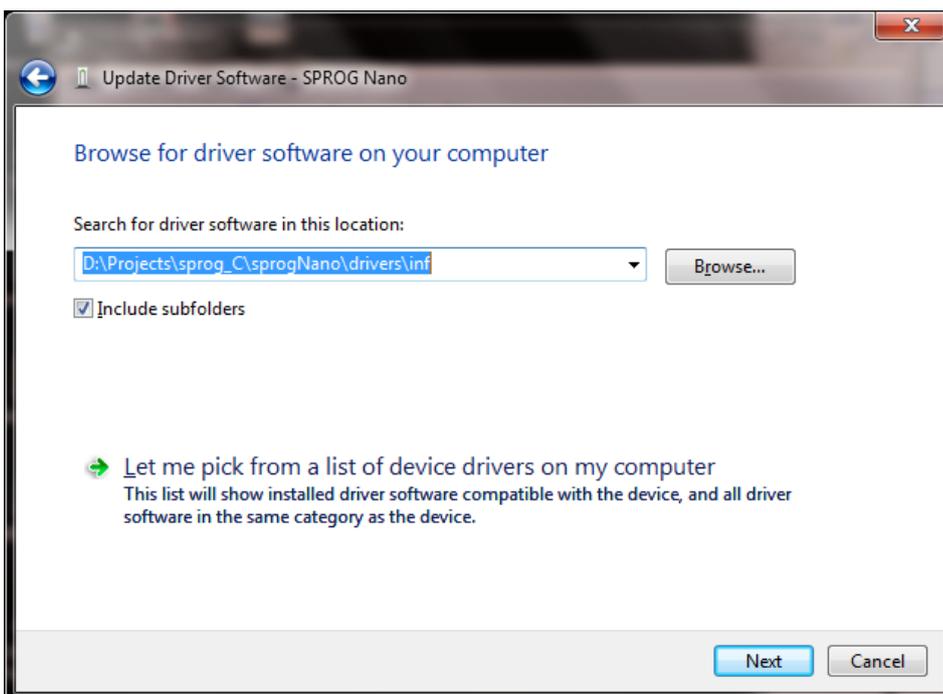
Open the Device Manager (Start -> Control Panel -> Device Manager) and expand the display of "Other device" where you should see the SPROG Nano:



Point to the SPROG Nano entry and press the Right mouse button. Select "Update Driver Software", or select Properties, and under the Drivers tab, click "Update Drivers".



Click “Browse my computer for driver software”, and then click the Browse button to find the drivers on the CD-ROM supplied with your SPROG NANO. If your CD-ROM drive is D:, for example, browse to the directory D:\USB\sprogNano\inf, as shown:



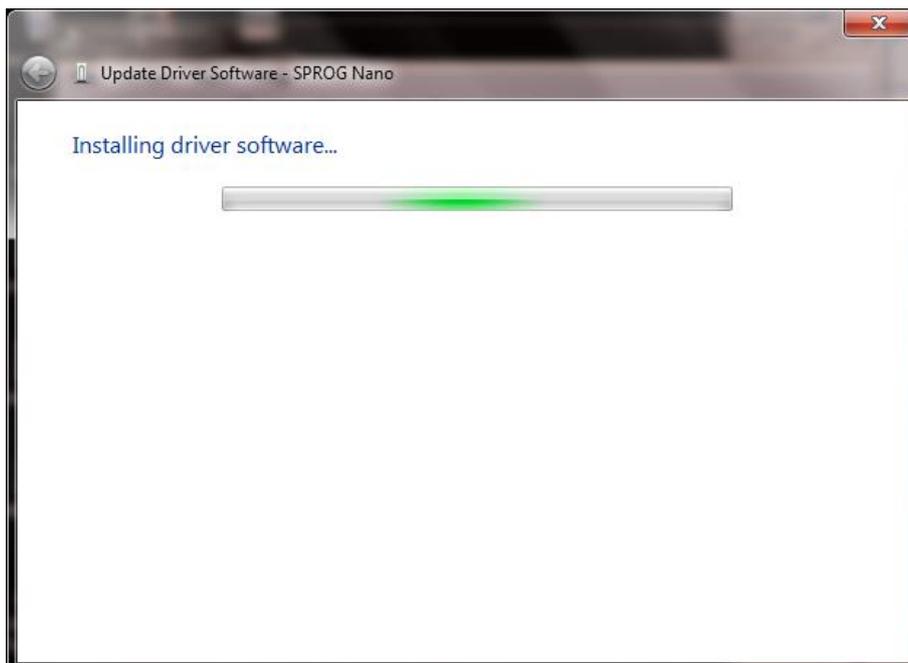
Check the "Include subfolders" box.  
Click the “Next” button.

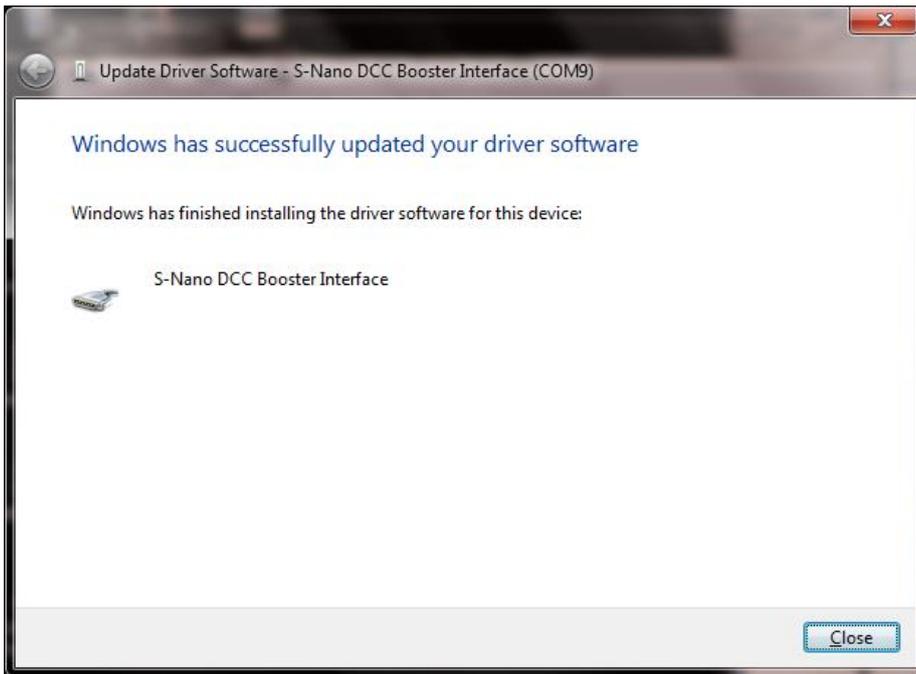
The wizard will take a short time to find and verify the drivers in this location. You will then see a warning window similar to this:



The base drivers are fully compatible with Windows7, and those supplied on the CD are the latest drivers. To make them SPROG NANO specific, the .inf files are edited which, unfortunately, causes this dialogue to appear.

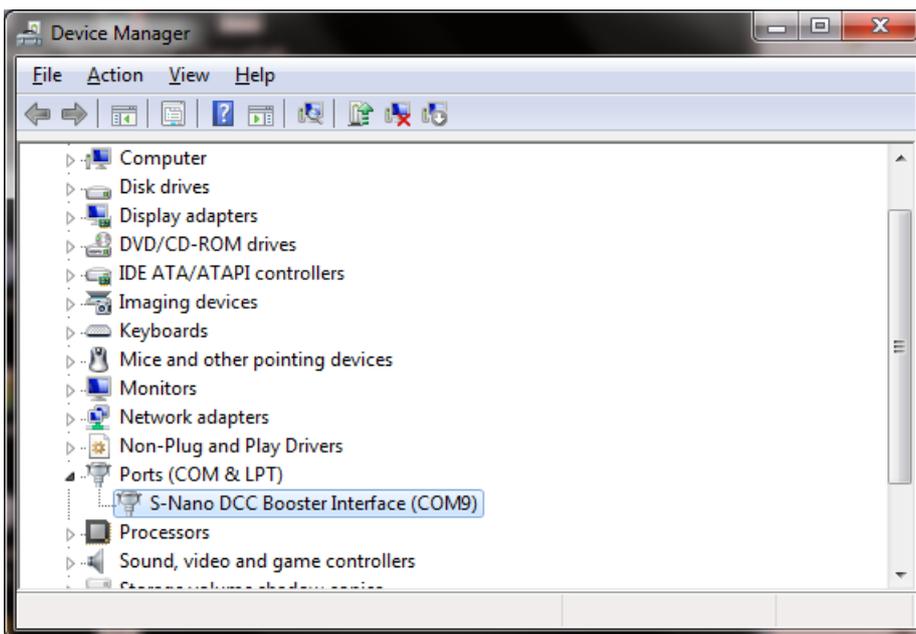
Click "Install this driver software anyway".





Click “Close”.

Now return to the Device Manager, and the entry will have changed. The SPROG Nano will be listed under “Ports (COM & LPT)”:



Make a note of the COM port assignment (COM9 in the example above) and close the device manager and control panel windows.

Driver installation is now complete, and it is time to start the software and use

your SPROG NANO. Go on to the next major section of this Guide “Setting Preferences”.

### ***Driver Installation for Windows 8***

Driver signature enforcement must be disabled to install the drivers on Windows 8 or Windows 8.1. Please refer to the supplementary instructions that can be found on our website <http://www.sprog-dcc.co.uk/downloads/Win8Installation.pdf> or on the CD-ROM supplied with the SPROG Nano.

### ***Driver Installation for MacOS***

TBD

### ***Driver Installation for Linux***

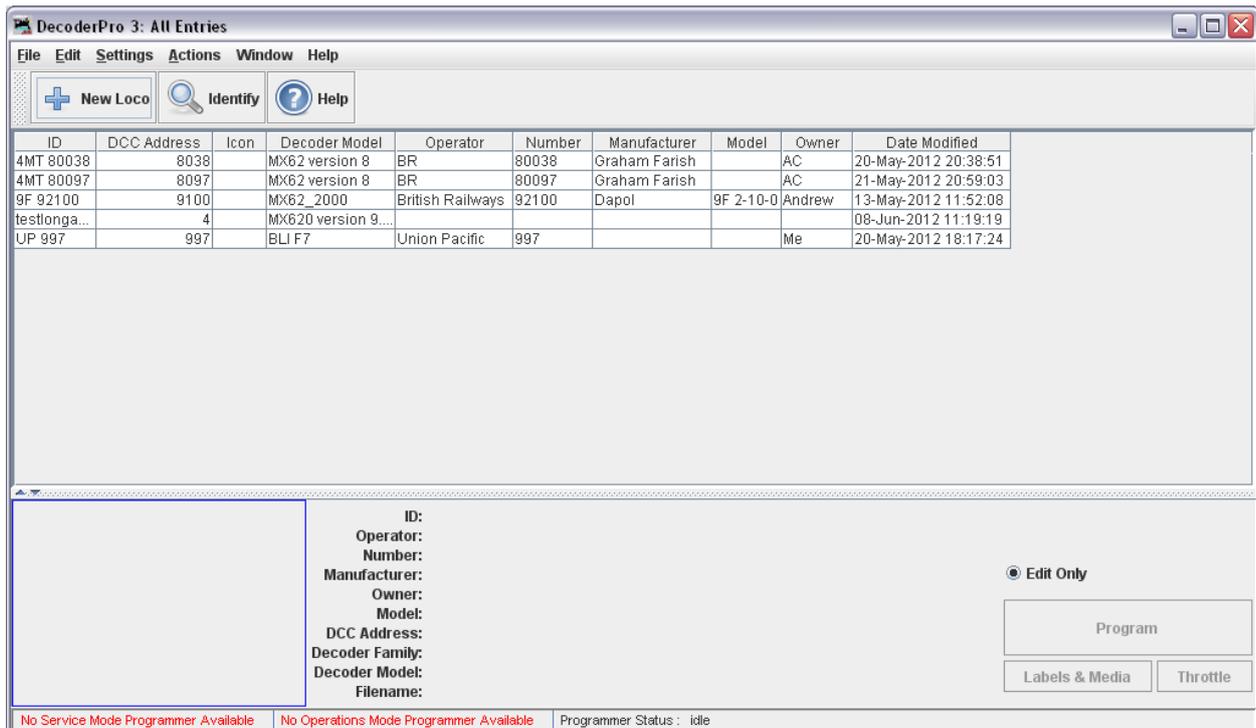
For Linux, there are many variations of Linux system installations, and variations in installing the USB support will be encountered. For recommendations and many helpful supporters, see the Linux Support pages on the JMRI website.

## **Setting Preferences**

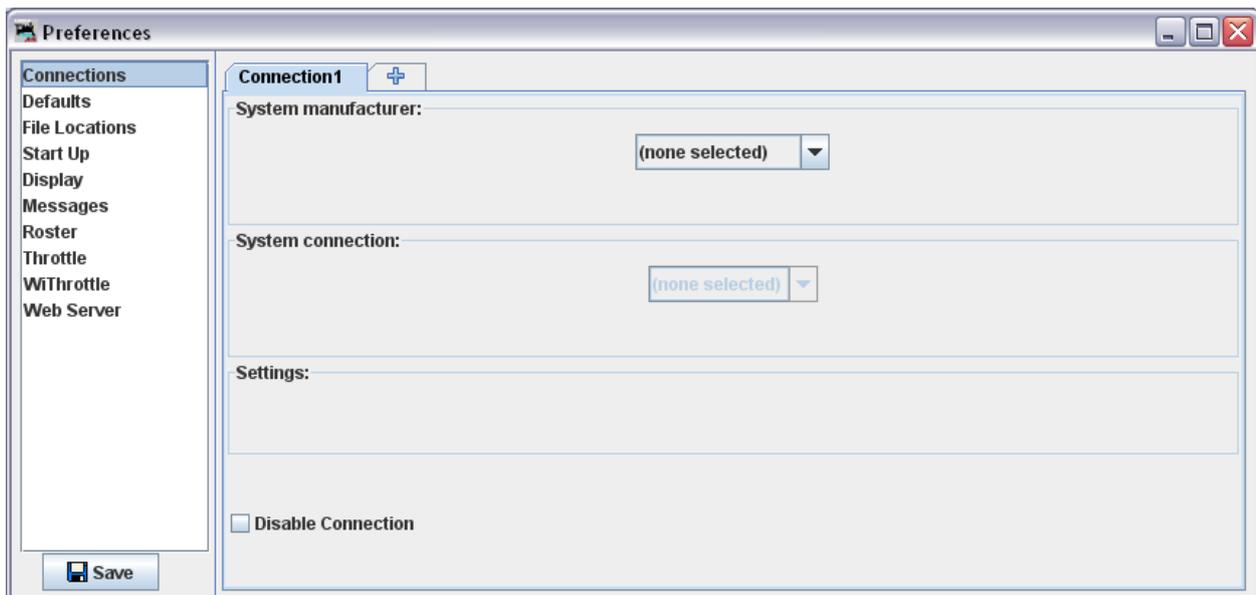
Now start DecoderPro by double clicking the icon that was placed on the Windows desktop during the installation.

Assuming this is the first time that you have started DecoderPro, you will see the DecoderPro main window and the Preferences window.

Main window:



If the Preferences window is not there, Open the Edit -> Preferences dialog from the menu; below is the Preferences window from JMRI 3.0 onwards:



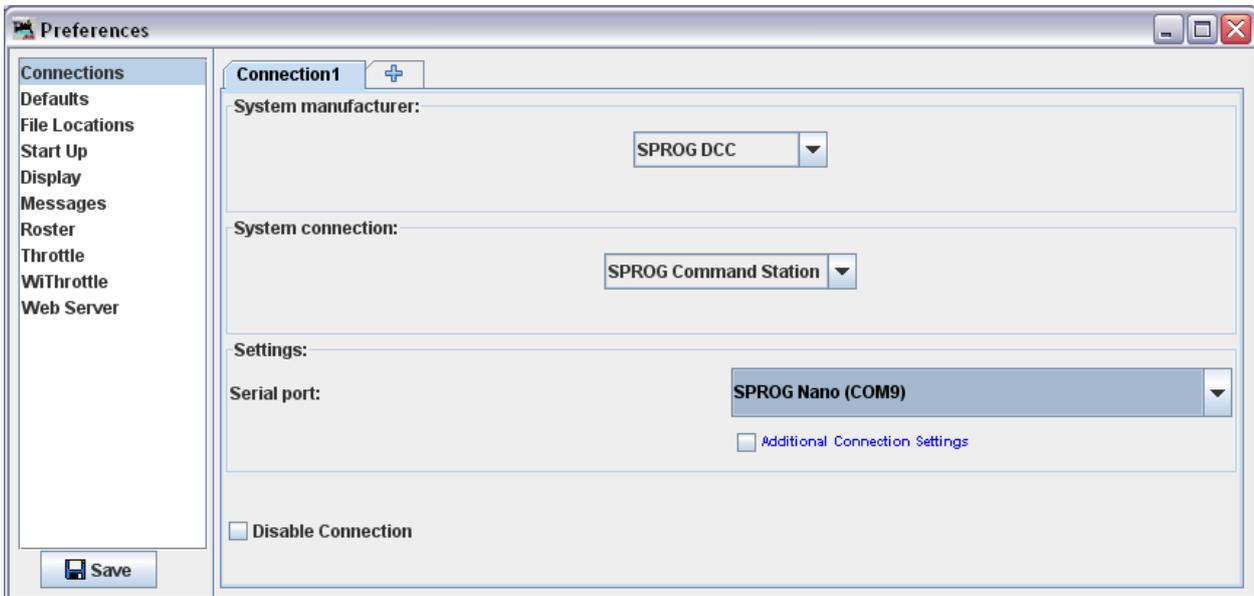
Click the arrow in the **System manufacturer** field and scroll down to select **SPROG DCC**.

Then in the **System connection** field, select **SPROG Command Station** (not SPROG).

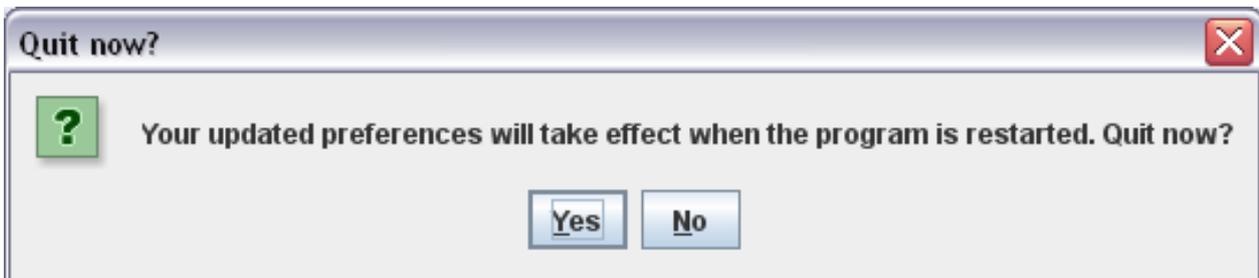
Click the arrow in the **Serial Port** field and select the COM port noted during

driver installation.

Do not select any other fields at this time. The window should look similar to the example below:



Click “**Save**” at the lowest left of the window.



Click “**Yes**”. DecoderPro will save the new settings and restart automatically.

### **Connect the Booster**

- ! The booster MUST be isolated from all other DCC command stations and connected only to the SPROG Nano. Damage may result to the**
- SPROG Nano or other equipment if this rule is not followed.**

Connect the SPROG Nano to the booster input using the pluggable terminal block. There is no requirement to observe any particular polarity when connecting the booster.

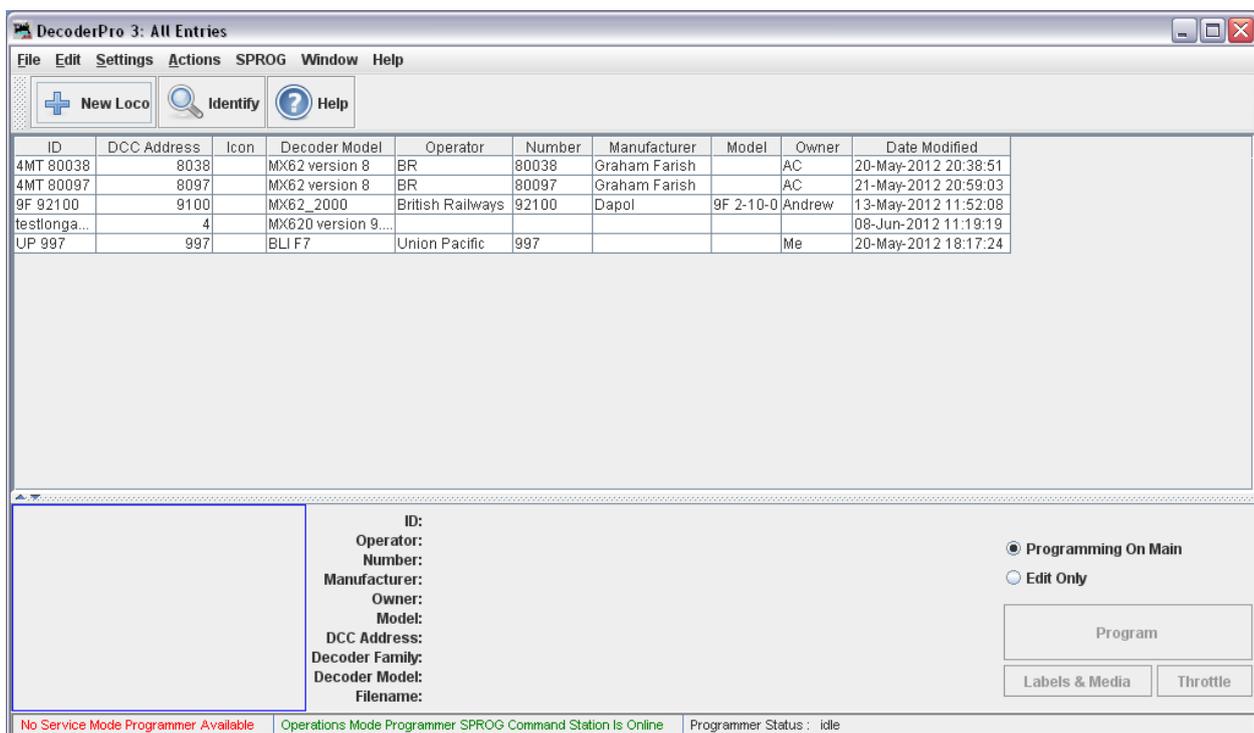
## Getting Started With DecoderPro

See the DecoderPro website <http://jmri.sourceforge.net> for any updates and latest information.

Join the JMRI Yahoo group <http://groups.yahoo.com/group/jmriusers> for help from other DecoderPro users and the team who develop it.

Ensure that all software and drivers are installed and that DecoderPro preferences have been setup in accordance with the previous steps.

Start DecoderPro. The main window will open and show the current connection method as “Operations Mode Programmer SPROG Command Station is Online”.



## Layout Control with SPROG Nano

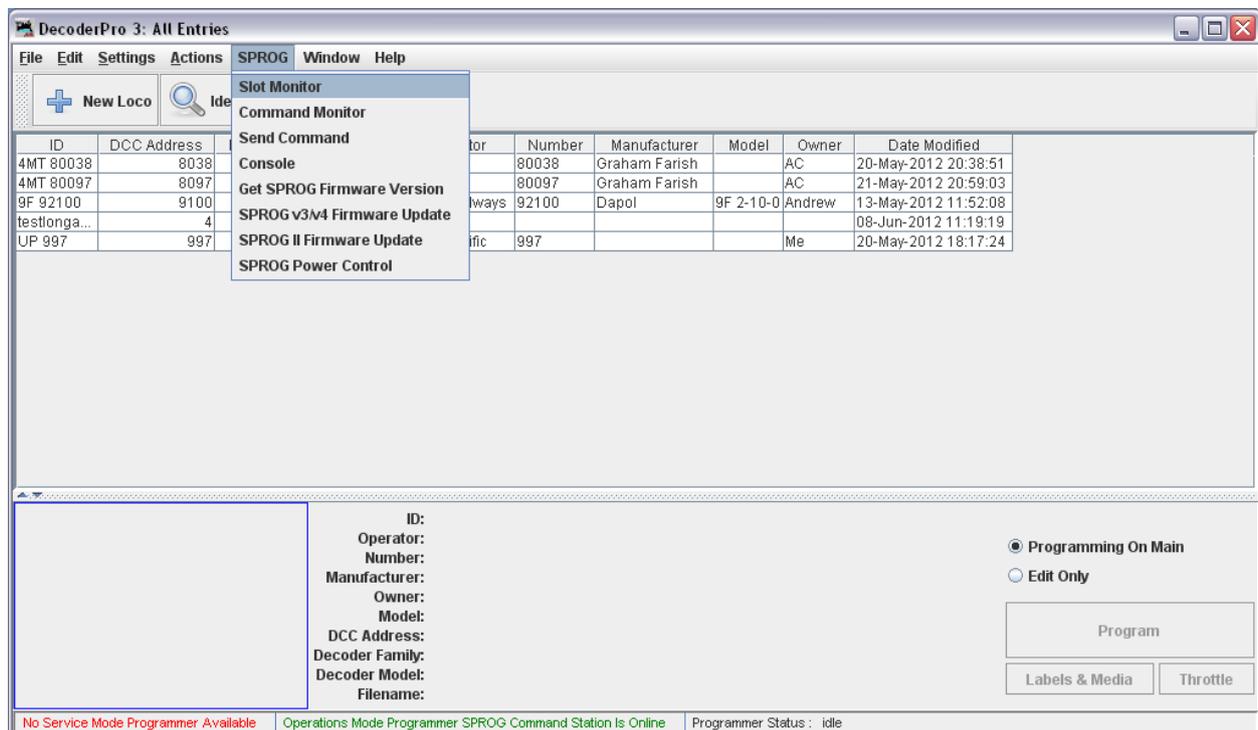
### SPROG Nano Command Station Mode

As well as operating a layout, SPROG Nano can write CVs in operations mode (also known as “on the main” programming) but the contents of CVs cannot be read back.

You may open multiple throttles, one for each loco you wish to control. See below for a note on the limit to the number of locos that can be controlled.

Use the power control in any of the throttles to turn the track power on or off.

An additional feature in Command Station mode is the slot monitor which is accessed from the SPROG menu in the main DecoderPro window



The top portion of the slot monitor contains a checkbox to control whether unused slots are displayed, a button to force an emergency stop of all locos and the output current being supplied by the SPROG Nano.

The output current reading will not be valid for SPROG Nano.

The remainder of the slot monitor is the list of slots, at least one slot is associated with each throttle (see below).

Slot	Address	Speed	Use	Dir
0	997	29	In Use	Rev
1	54	84	In Use	Fwd
2	0	0	Free	Fwd
3	0	0	Free	Fwd
4	0	0	Free	Fwd
5	0	0	Free	Fwd
6	0	0	Free	Fwd
7	0	0	Free	Fwd
8	0	0	Free	Fwd
9	0	0	Free	Fwd
10	0	0	Free	Fwd
11	0	0	Free	Fwd
12	0	0	Free	Fwd
13	0	0	Free	Fwd
14	0	0	Free	Fwd
15	0	0	Free	Fwd

In this example, a loco with address 997 is running in reverse at speed step 29 and a loco with address 54 is running forwards at speed step 84

When you use a function button on a throttle, you will see an extra slot occupied momentarily with the address of the loco on that throttle and speed 0. This indicates that the function command is being sent to the loco. To allow for errors in reception, function commands are repeated three times. After the third copy is sent, the slot will be cleared.

### ***Short (one byte) Versus Extended (two byte) Addressing***

The DCC specification allows two forms of loco address:

- Short addresses in the range 1 – 127
- Extended addresses in the range 1 – 10239

Most DCC system impose their own arbitrary limits on these address ranges. In SPROG Command Station mode the allowable address ranges are:

- Short addresses 1 - 127
- Long addresses 128 - 10239

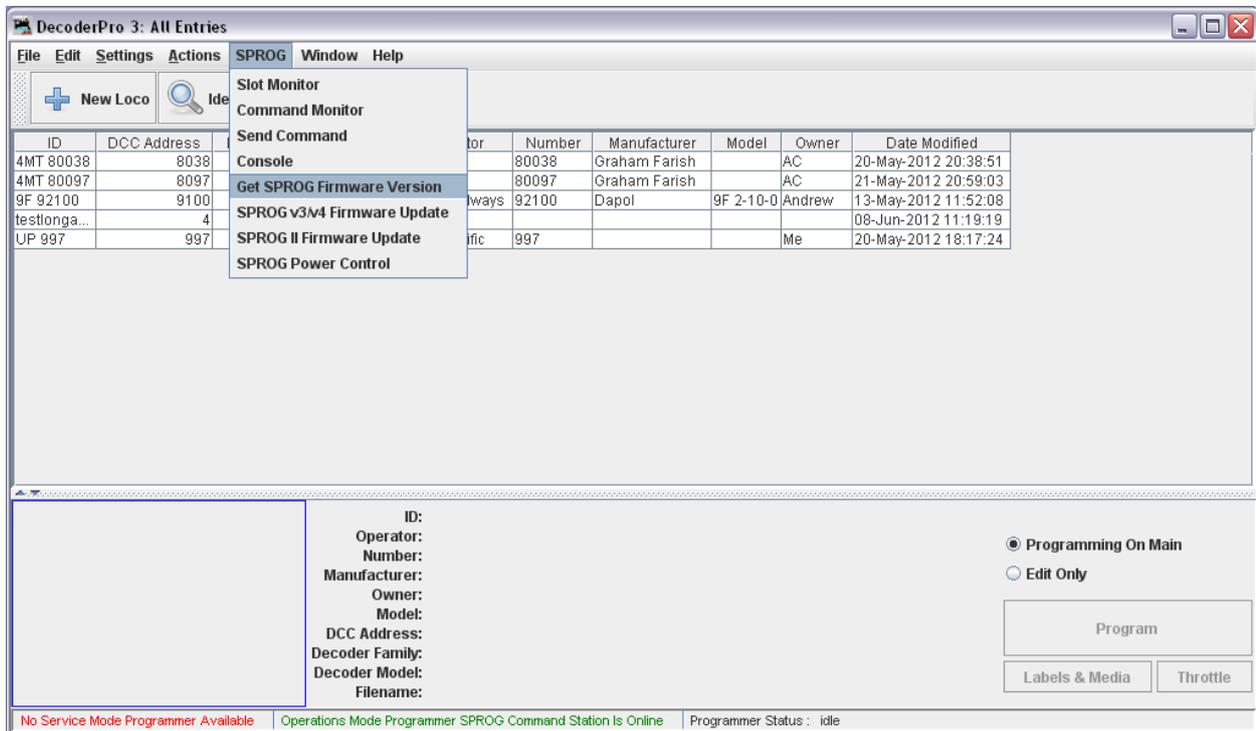
### ***How Many Locos Can Be Controlled?***

Sixteen slots are available for simultaneous control of multiple locos. Other locos may be parked on the layout.

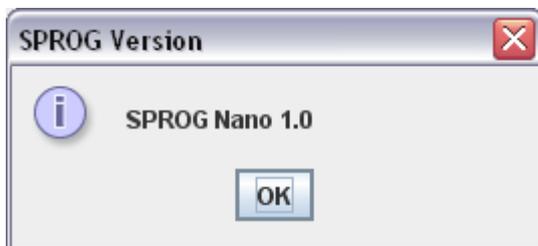
Some slots should always be left free for sending function control commands. These free will be shared between throttles as required, it is not necessary to have a free slot for every throttle.

## Determining the SPROG Nano Firmware Version

Select “Get SPROG Firmware Version” from the SPROG menu



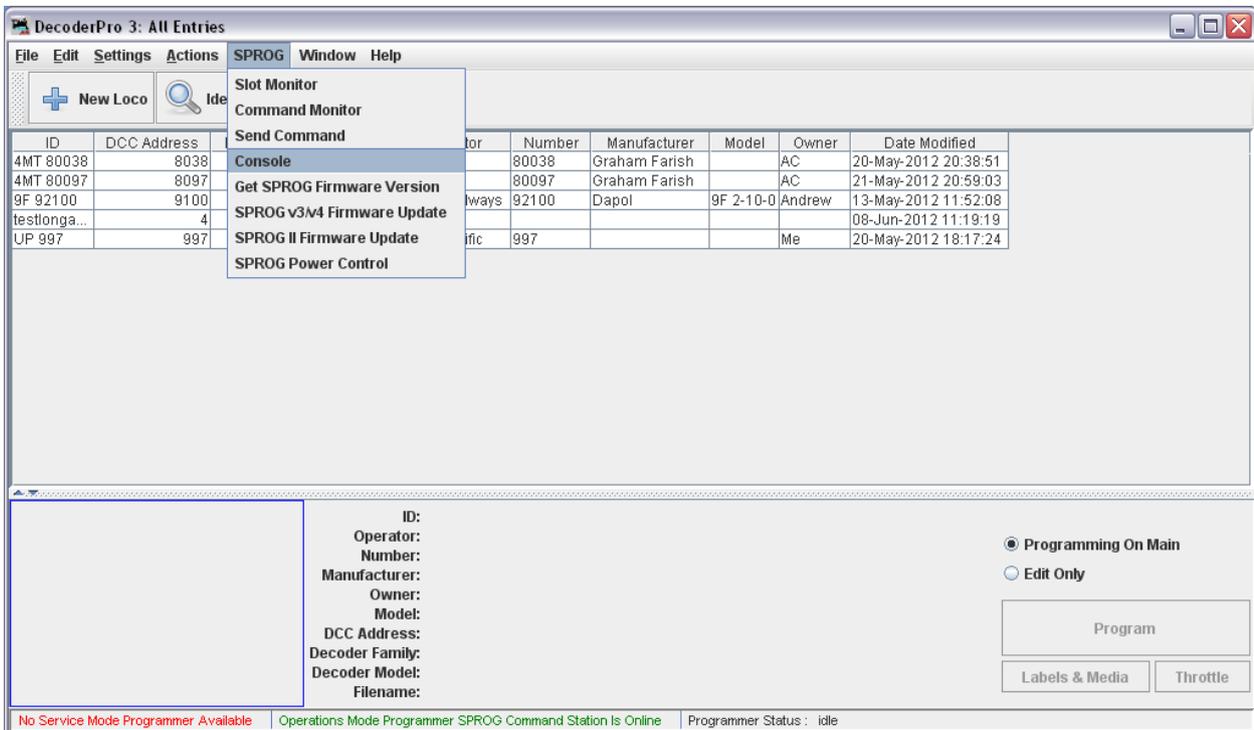
The SPROG Nano firmware version will be displayed in a new window.



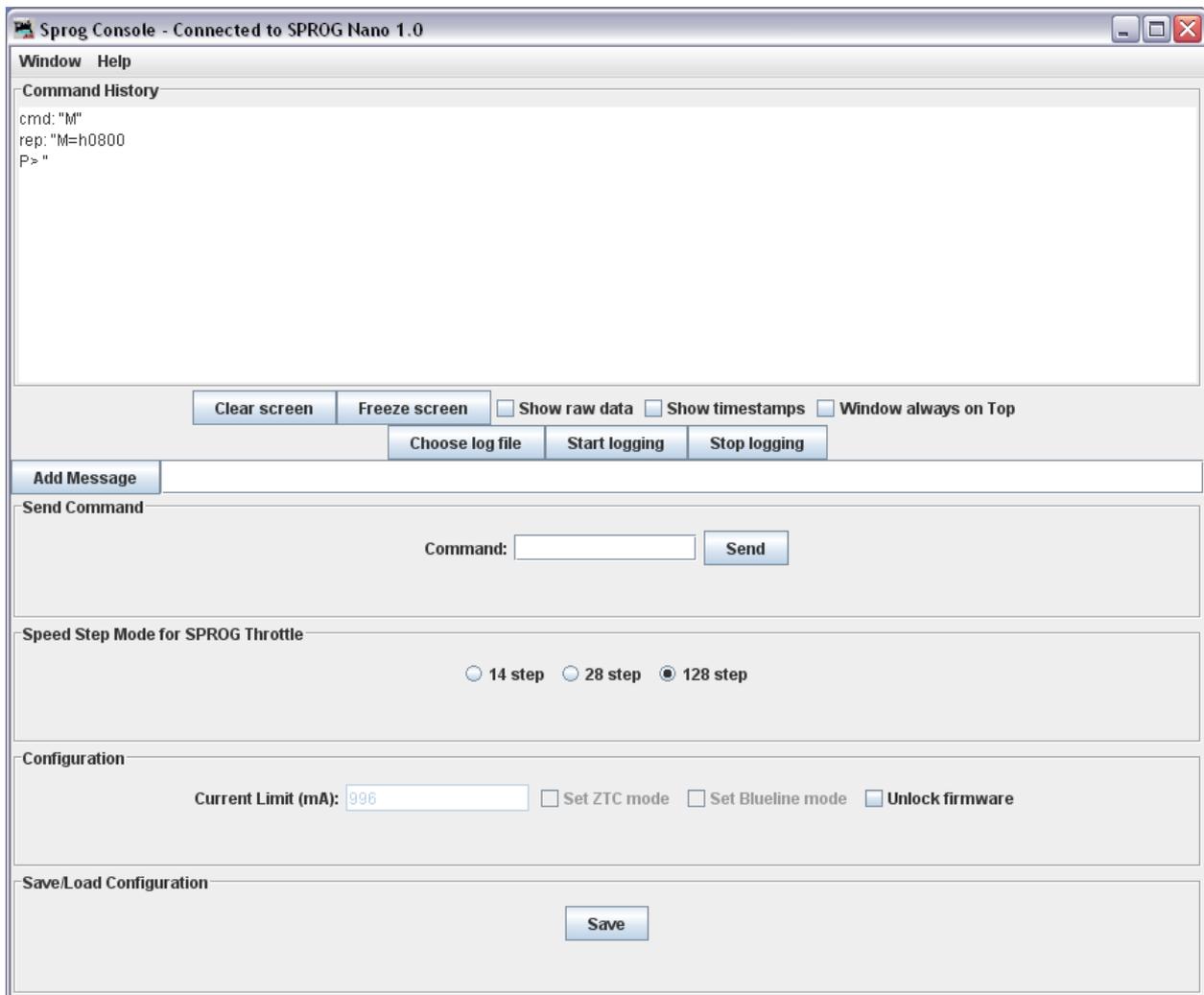
Click “OK” to close the window.

## The SPROG Console

The SPROG console allows optional SPROG features to be enabled and disabled. Select the SPROG Console from the SPROG menu



A typical console display is shown below. Some features may not be available, depending upon the firmware version of the SPROG Nano.



### **Title Bar**

The title bar includes the type and firmware version of the connected SPROG Nano, e.g SPROG Nano v1.0.

### **Command History**

The command history pane provides the same functionality as the basic Command Monitor (available on the SPROG menu) and captures commands to and replies from the SPROG Nano. The history may be saved to a file on the computer by first choosing a log file and then selecting "Start logging". The command history can be useful in diagnosing problems encountered in using the SPROG Nano.

The “Add Message” field can be used to add annotations to the command history.

### ***Send Command***

The “Send Command” field provides the same functionality as the basic Send command utility available on the SPROG menu. Enter a command in the Command field and press return on the keyboard or click the send button to send the command to the SPROG Nano.

### ***Selecting SPROG Operating Modes***

After changing any of the following modes, you should use the “Save” button to store the changes in the SPROG Nano.

#### ***Speed Step Modes***

Not applicable for SPROG Nano.

#### ***Current Limit***

Not applicable for SPROG Nano.

#### ***Set ZTC Mode***

Not applicable for SPROG Nano.

#### ***Set Blueline Mode***

Not applicable for SPROG Nano.

#### ***Unlock Firmware***

Select this option if you are about to update the SPROG Nano firmware using the bootloader. This mode is automatically canceled when the power is removed from the SPROG Nano.

### ***Save***

Always click this button after selecting a new mode. The selected modes (apart from “Unlock Firmware”) will be stored in the SPROG Nano, so that they are effective each time you use your it, even after the power has been removed.

## Updates to the SPROG Nano Firmware

The “firmware” is the small computer program that runs on the microprocessor at the heart of the SPROG Nano. Occasionally it may become necessary to update the SPROG Nano firmware to add new features or fix bugs.

The SPROG DCC philosophy is that all versions of our products are totally forwards and backwards compatible and that any new features and bug fixes for a particular product are made available to all existing users.

The firmware can be updated by returning your SPROG Nano to SPROG-DCC (or appointed representative) or by using the “bootloader” (see below).

### *Returning Your SPROG Nano for Update*

If you prefer, contact us to discuss returning your SPROG Nano for update. This is usually free of charge but return postage is always appreciated.

### *Firmware Update Using the Bootloader*

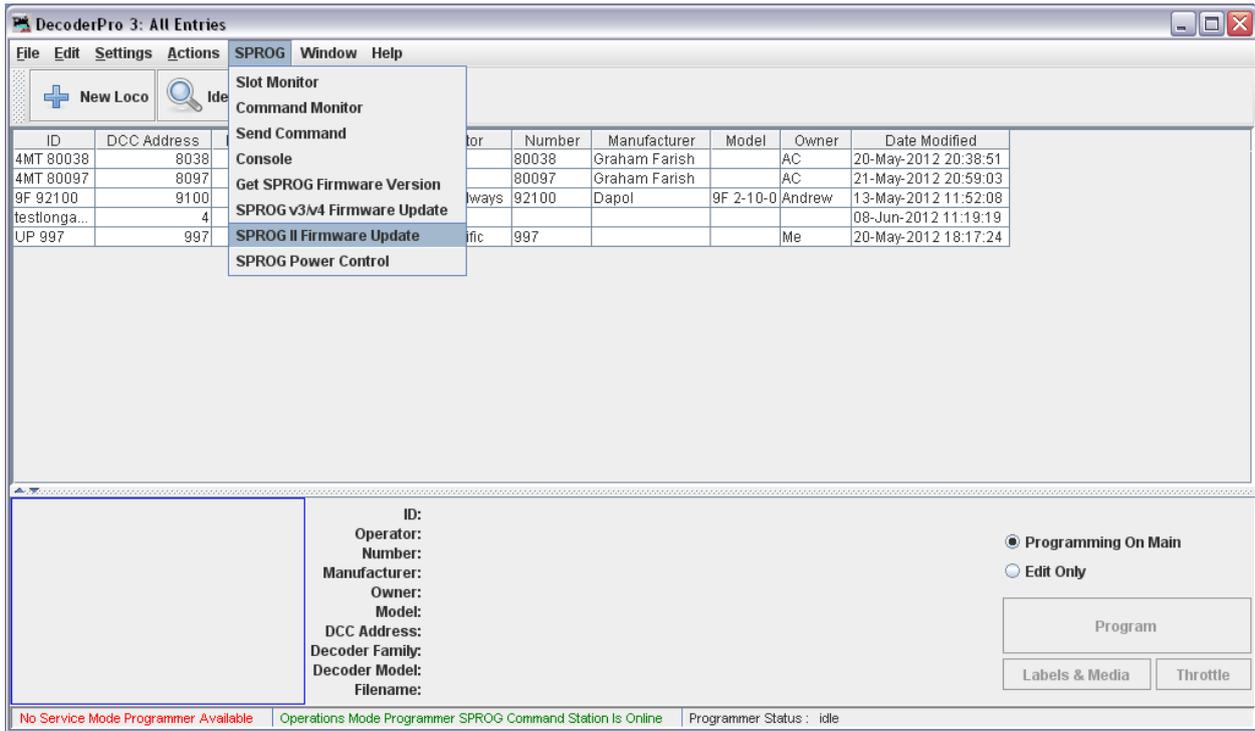
The “bootloader” is a feature of the SPROG Nano that allows new firmware to be downloaded via the normal USB connection.

Download the new firmware (if available) as a .hex file from the SPROG-DCC website and save it in a convenient place on your computer.

**!** If the bootloader download is interrupted for some reason (e.g. if power or USB connection are removed), the SPROG Nano may be left in an unusable state. In this case it will need to be returned for repair.

Follow the step-by-step instructions to download the new firmware:

1. Open the SPROG console in DecoderPro (see “The SPROG Console”).
2. Tick the “Unlock firmware” selection by clicking with the mouse.
3. Click “Save” and close the Console.
4. Select the “SPROG II/SPROG 3 Firmware Update” utility from the SPROG menu.



Click “Update” if you have the new firmware file available and are ready to proceed.



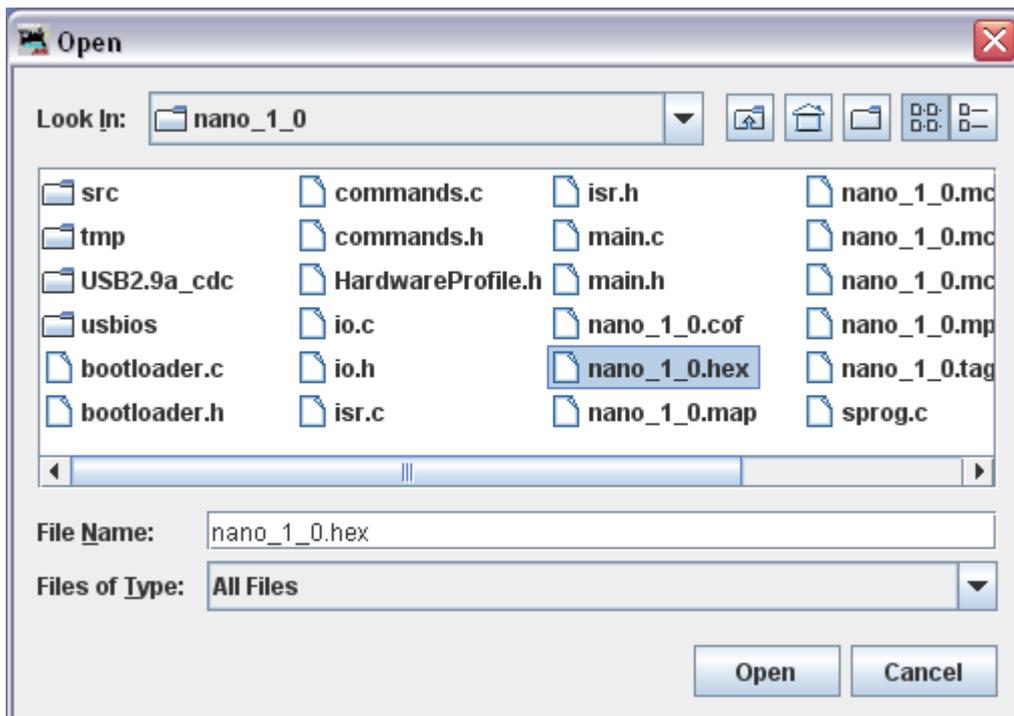
Click “Connect”



Click “Choose hex file” and navigate to the directory where you saved the downloaded .hex file.



Open the firmware file.



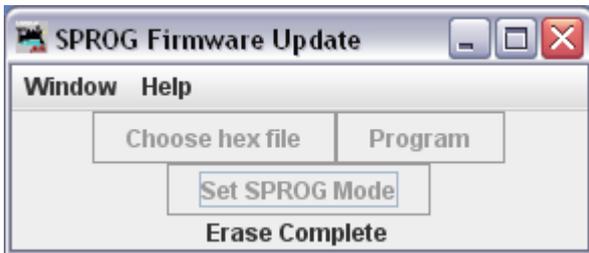
Click “Program”



First the old firmware will be erased, and then the new firmware will be written. Progress is reported in the status line of the window. If the Console is still open, you will also see the messages flowing between the computer and the SPROG Nano.

You may see a pause in activity with the message “Erase Complete”. This is

normal, do nothing at this point, the software is calculating where to begin writing the new firmware.



When "Write Complete" is displayed, click "Set SPROG Mode".



Close the window and the firmware update is complete.

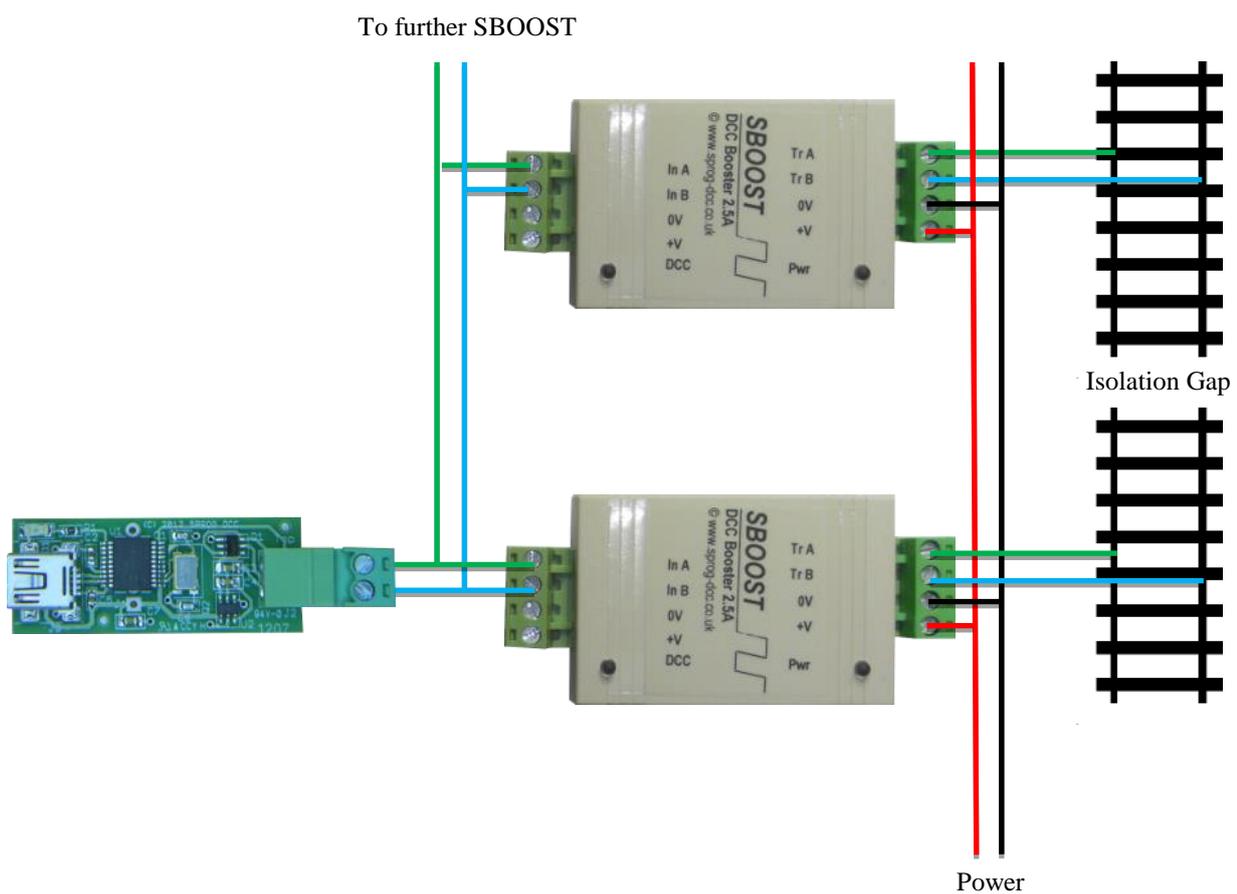
## Connecting SPROG Nano to SBOOST Boosters

### Example 1

SPROG Nano driving multiple SBOOST with common power supply.

The power supply must be able to supply the full rated current (e.g., at least 5 Amp for 2 x SBOOST).

Power districts must be separated by isolation gaps in both rails.



## Example 2

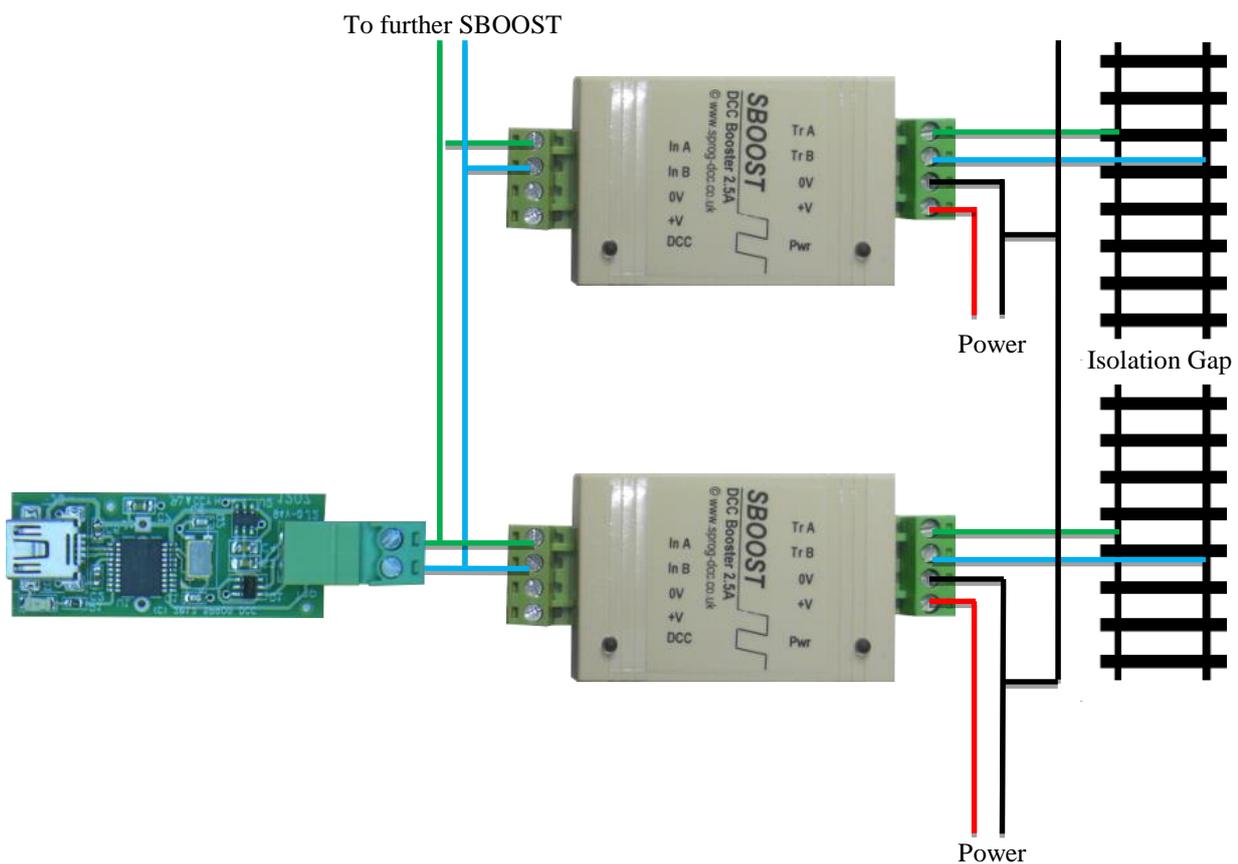
SPROG Nano driving multiple SBOOST with separate power supplies.

Each power supply should be the same voltage.

Each power supply must be able to supply the full SBOOST rated current, i.e. at least 2.5 Amp.

A common ground connection is required between the power supplies, as shown in the diagram below.

Power districts must be separated by isolation gaps in both rails.



## Connecting SPROG Nano to Other boosters

It is recommended that you use boosters with an opto-isolated input.

The following boosters have opto-isolated inputs, and have been tested with SPROG Nano:

- Hornby
- Tam Valley Depot DCC Booster
- Roco 10764
- Lenz LV102

The following boosters have opto-isolated inputs, and should work, but have not yet been tested with SPROG Nano:

- Bachmann
- Optional on Digitrax

## Troubleshooting

Before reporting any problems please check the SPROG DCC homepage for any bug reports or updates. There is a SPROG DCC FAQ page which will be updated to reflect the most common questions people have about SPROG.

One common problem is the configuration of the “Virtual COM Port” for SPROG Nanos. Please review the information in the section “Edit DecoderPro Preferences”.

If you have problems 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](mailto:sprog@sprog-dcc.co.uk) with a description of the problem.

## Useful Links

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

SPROG DCC Yahoo group <http://groups.yahoo.com/group/sprog-dcc> for help from other SPROG users.

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

JMRI Users Yahoo group <http://groups.yahoo.com/group/jmriusers> for user community help with DecoderPro.

## References

NMRA S-9.1.2 Power Station Interface

[http://www.nmra.org/sites/default/files/standards/sandrp/pdf/S-9.1.2\\_2012\\_07.pdf](http://www.nmra.org/sites/default/files/standards/sandrp/pdf/S-9.1.2_2012_07.pdf)