

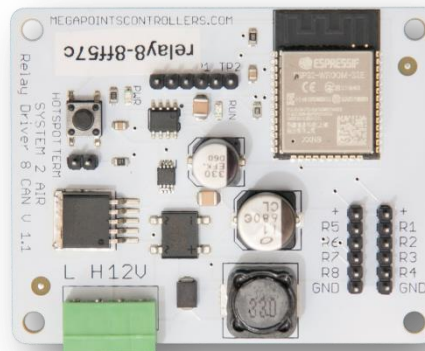
System2

Relay-8 User Reference

by MegaPoints Controllers

An 8 channel networked relay driver for your model railway. Suitable for DC and DCC frog polarity switching or general purpose use.

All the convenience of Wi-Fi configuration with a robust bullet-proof, wired CAN bus two wire network.



User Guide

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Email: info@megapointscontrollers.com

Table of contents

What is System2 Air?	3
How to use this document	3
System2 Relay-8 Driver	4
Introduction	4
First use	5
Network cabling	6
Connecting relay modules	6
Frog wiring	7
Relay Terminals	7
Getting your first board on your local Wi-Fi network	8
Admin Interface	9
Board Location	10
V-Ports	10
Feedback V-Port	11
Reversing a relay channel	11
Board level configuration	12
EasyConfig setting	12
Locate Board	12
CAN ID management	14
Wi-Fi credential sharing	17
Actions	18
Reset to defaults	19
Save Changes	20
Reload Values	20
Erase WiFi Credentials	21
Update Firmware	21
Reboot	23
Reload Page	24
Documentation	24
Network Monitor	24
Status area	27
Board Type (1)	27
SW Rev (2)	28
Templates (3)	28
IP Address (4)	28
Board Name and serial (5)	28
SSID(6)	28
In conclusion	28
Contacting us	29

What is System2 Air?

System2 is our new generation of model railway accessory bus products that feature our V-Port protocol (virtual port) and can address up to 60,000 devices. You can scale an installation from a single Servo-8 Controller (8 V-ports) right up to a huge layout as your needs grow. Flexibility is baked in and as we announce new modules that will work right alongside other System2 modules.

The “Air” in System2 refers to how you configure the system. It’s done wirelessly using Wi-Fi. This means you can configure a device using your PC, tablet or phone and replaces the need for buttons, flashing lights and extension cables to reach under baseboard locations.

We use Wi-Fi for configuration and a CAN network for data. This offers high speed, low latency and above all else reliability. You can even shut down the Wi-Fi network when your configuration is complete making your system secure and robust. It’s not required for operation at all.

Software for all System2 Air modules can be updated over the air if your network allows Internet access. A single button push is all that’s needed to download and install the latest version. This means as new ideas and features are introduced everyone gets to benefit from them. You can even see the changes that have been introduced since your last update and choose whether to install or not. You won’t get nagging reminders to update. It’s flexible and entirely up to you when or if you decide to do it.

System2 has been real world tested on some of the largest exhibition model railway layouts in the UK for over a year before launching, so you can be confident it’s fit for your needs and fit for purpose.

Each of our System2 boards has the administrative core baked in. You can connect to any board’s admin web page and from there manage your entire network. There’s no central point of control (or failure) as they are all peers in their own right.

We use standard web protocols for configuration so that your browser can connect and perform all administrative tasks without requiring any special apps and app permissions. This leaves you in control of your network.

System2 Air, for the smallest to the largest layouts and everything in between.

In order to use System2 you’ll need a Wi-Fi router configured for DHCP with optional Internet access. This is the standard router configuration as supplied by your Internet Service Provider.

Designed and manufactured in Cheshire, England.

How to use this document

Treat this guide as a reference. All settings are documented and examples given where appropriate. It is designed to accompany the System2 Air – Relay8 video that will demonstrate all the functions and use cases.

System2 Relay-8 Driver

Introduction

The Relay-8 is an 8 channel relay driver for System2 networks. It features a Wi-Fi based intuitive configuration from the comfort of your PC, tablet or phone.

- Each relay is individually configurable for:
 - Normal switched operation
 - Pulsed operation
 - Pulse duration 50ms to 60 sec

You will also need:

- Relay modules and cables (see website).
- 12 Volt DC regulated power supply.
 - 500mA per Relay driver.
- Network cable (twisted pair).
 - Telephone cable
 - Alarm cable
 - Such as CW1109B/Y supplied by CPC/Farnell . See website for cable links. Non twisted pair cable is OK for testing purposes, not for installation.

To use the network features of this board you will require:

- A Wi-Fi Router that is configured for:
 - DHCP (default enabled on most routers)
 - An active internet connection (only required for software updates).
- A current browser that supports HTML5.

This is a 12 Volt device and should be connected to a minimum of 2 Amp regulated power supply.

MegaPoints Controllers use static sensitive components that must be handled with care.

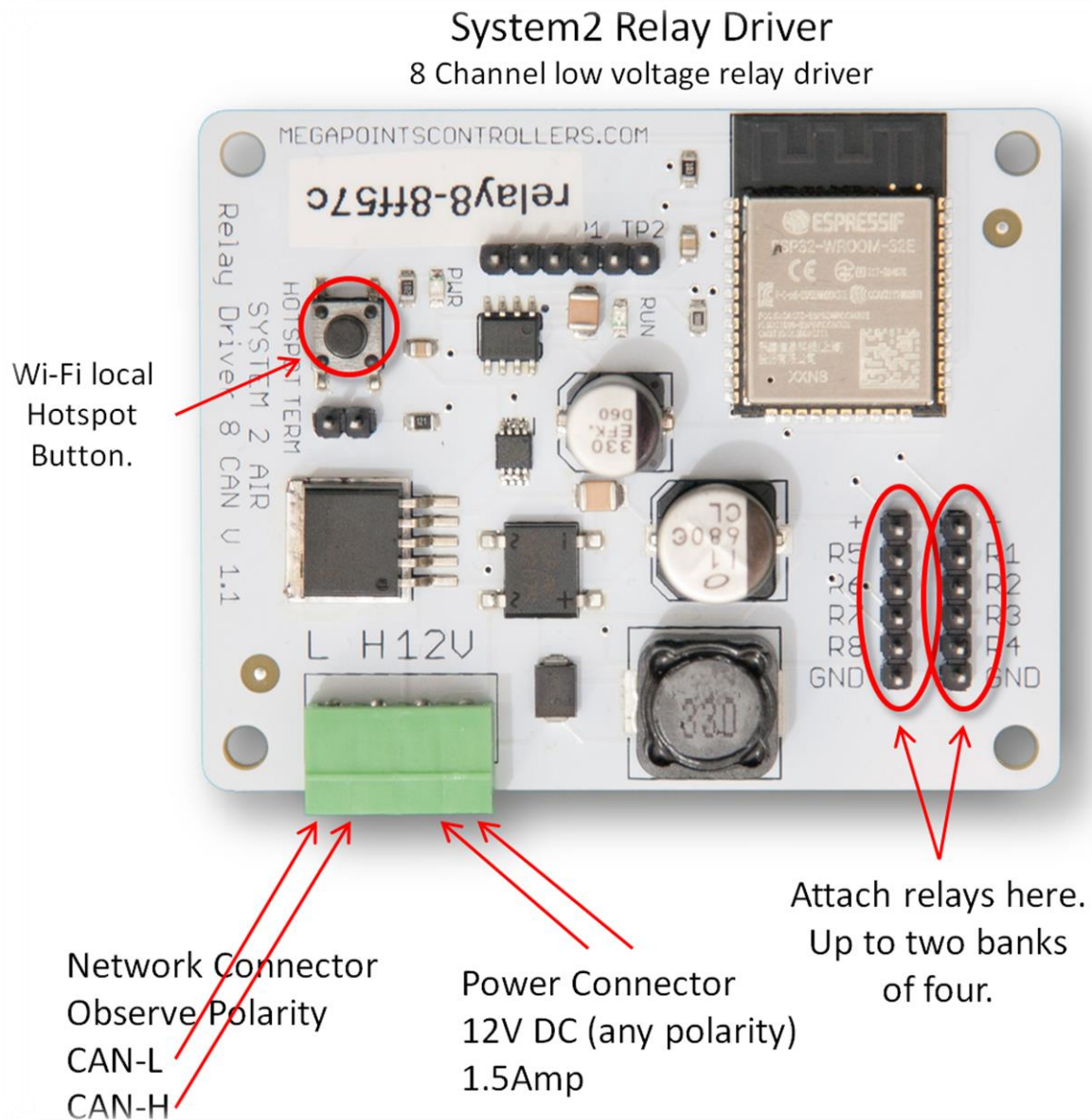
Avoid touching any components or the circuit printed on the bottom of the board.

Avoid placing the board on any metallic surfaces including track.

DO NOT connect any part of this device directly to your track bus.

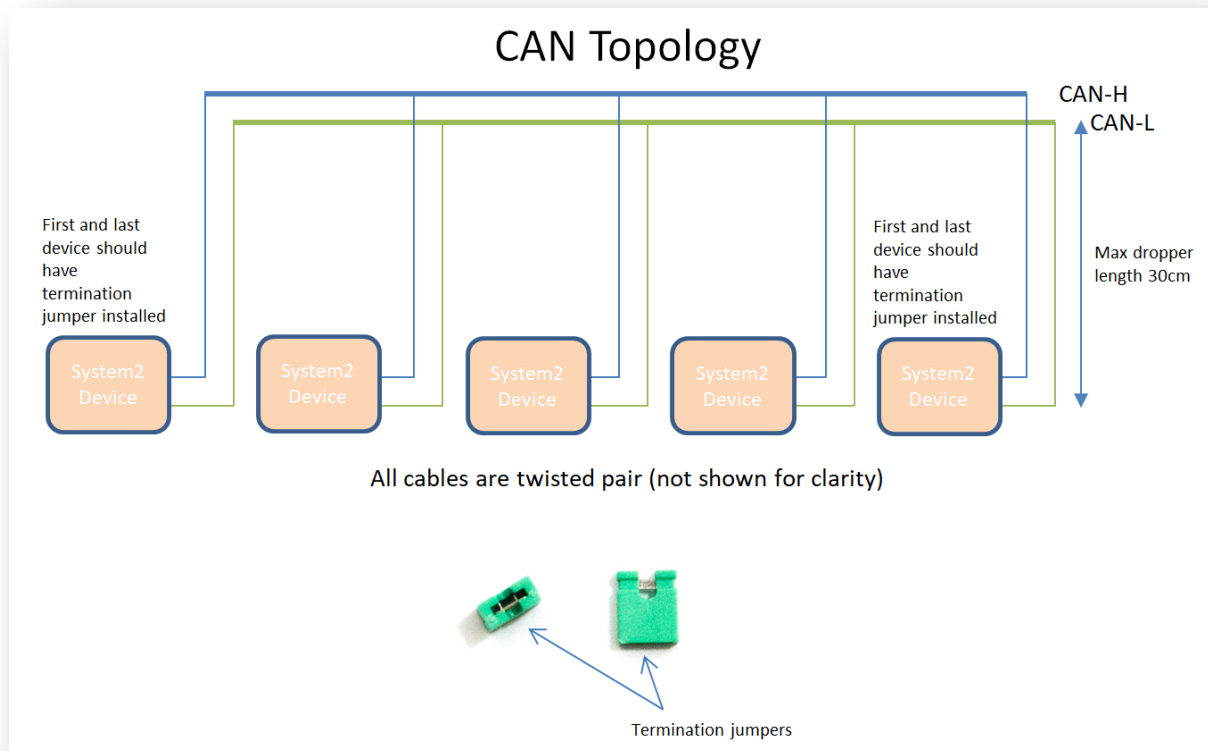
First use

See the image below for connection details.



- Connect each board to a 12 Volt regulated power supply, minimum 500mA per Relay8.
- Connect the network cable to the two screw terminals. Observe the 'H' and 'L' terminals. Ensure all the 'H' and 'L' wires connect to each other respectively.
- Attach the relay cables to each row observing the + (positive) and - (negative) at the top and bottom. Red lead to +, black lead to -.
- With a Relay driver configured as board 1A, operate the Panel Controller push buttons and observe the relays switch on and off.

Network cabling



You can fit the termination jumpers to the first and last board on your network if not already fitted (see above two diagrams).

See the above diagram for network cabling. All cables should be a twisted pair signal cable. Fit any termination jumpers (supplied as part of a starter kit) to the boards at the ends of the network for a maximum of two jumpers per network.

You can use droppers to a main bus much like DCC or connect boards to each other in daisy chain fashion. Ensure the CAN-H and CAN-L connects to the same terminal in all cases.

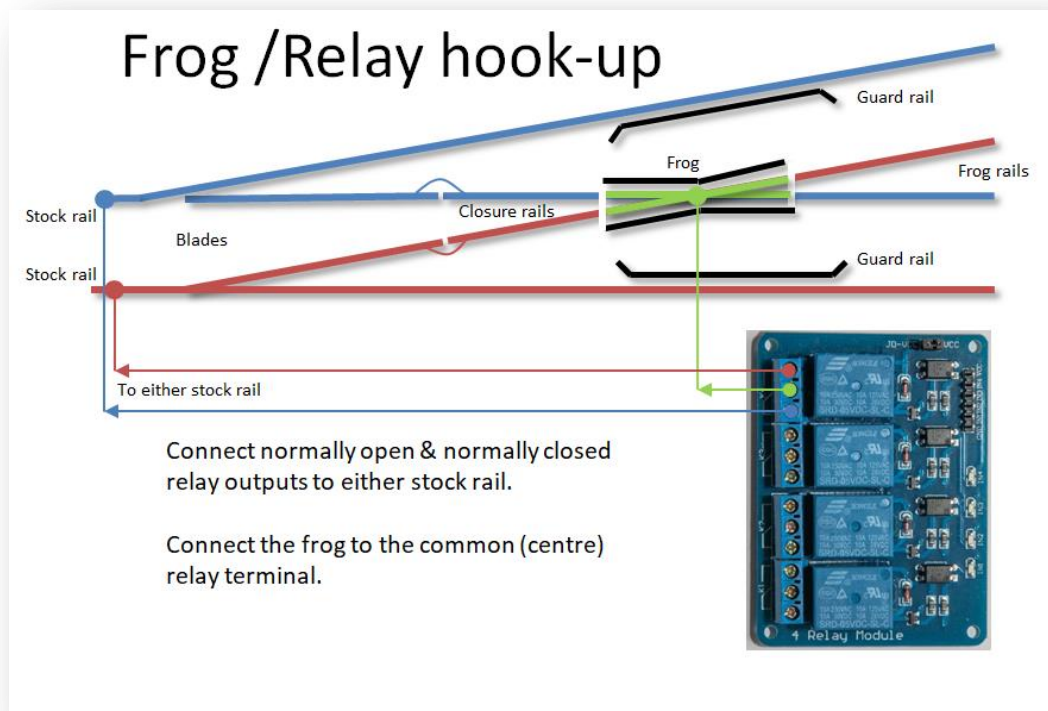
Connecting relay modules

The System2 relay driver can control up to 8 relays (2 x relay modules each containing 4 individual relays) and is supplied with cables to attach to the System2 Relay Driver.

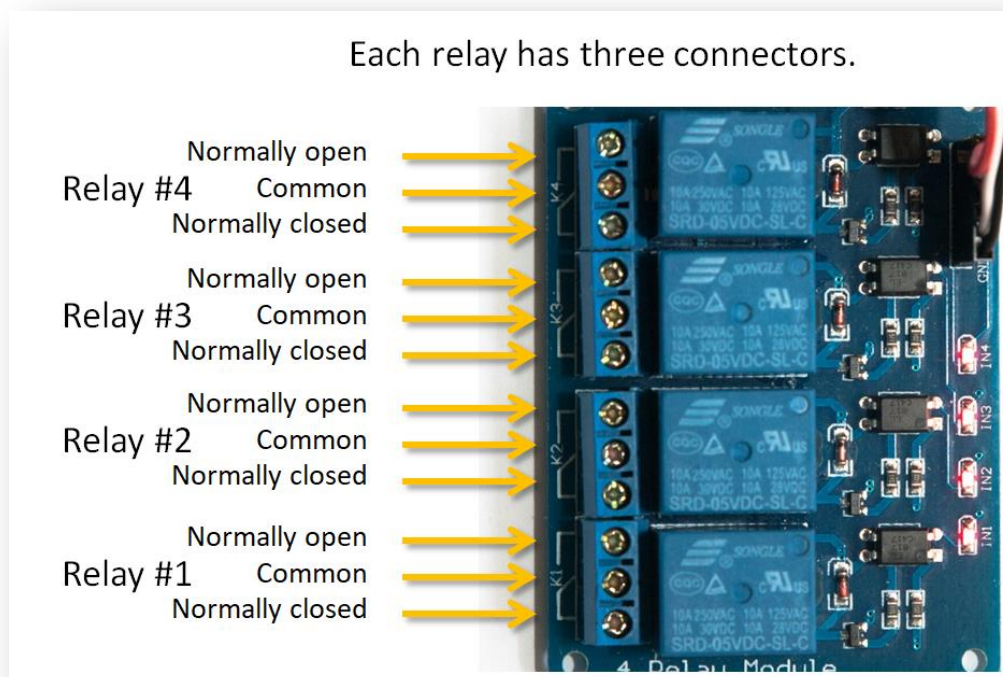
Connect the six pin connector to the relay module and relay driver board. Ensure the GND and '+' connectors match at either end. The colour of the cables does not matter as long as GND goes to GND and '+' goes to '+' or VCC connectors on the relay module.

The relays are suitable for general purpose switching as well as frog polarity switching on both DCC and analogue installations. In particular they are suited to easy installation on regular and three way points. Follow the wiring diagrams below for frog polarity switching.

Frog wiring



Relay Terminals



Getting your first board on your local Wi-Fi network

There's a dedicated YouTube video demonstrating this. Follow this link to view: <https://youtu.be/G3ajZazycP4>. It will probably be easier than going through the following text.

With your updated software the procedure here overrides that in the Starter Kit Quick Start Guide. It has changed slightly making it more intuitive and easier. The very first board on from your System-2 Air should be configured for your Wi-Fi. This will allow you to connect and adjust the board settings such as servo movement type, speed or range adjustment as well as download future software updates and change port addresses. We suggest using the Panel Controller for this example.

Broadly speaking, here's how to connect to your Wi-Fi:

- Apply 12 DC regulated power to the Panel Controller.
- Observe the RUN LED flashing about once per second (may take up to 30 seconds on first time boot..)
- Hold the HOTSPOT button for 1 second; observe the RUN LED flash rate increase to double.
- From your phone, tablet or other Wi-Fi device scan for Wi-Fi networks and locate the hotspot network for the panel controller (it will be the device name/serial number on the sticker) such as "panel-xxxxxx" or "serv8-xxxxxx".
- Connect to this network hotspot network. You may receive a warning stating this network does not connect to the Internet. This is OK.
- If your device states "sign-in required", select this option and go to the sign-in page.
- If your device does not offer a sign-in page, navigate your browser to "4.3.2.1/admin".
- Enter the SSID and password for your local network. Note case sensitivity (screenshot below).
- Press the "Scan WiFi" button. After a few seconds the adjacent text box will populate with scanned networks. Select the appropriate network (strongest signals towards the top).
- Enter a password (case sensitive) and press the save button.
- Your devices IP address will now be displayed near the top (red band). Make a note of this.
- Press the reboot button when ready and access the device via your usual network using the IP address obtained previously.

12:16 4G 99%

Sign in to serv8-451b34
4.3.2.1

MegaPoints Controllers

System 2 AIR WiFi Configuration

Product: Servo-8
Hostname: serv8-451b34
IP Address: 192.168.0.121

Scan Wi-Fi networks automatically.

Scan WiFi Megapoints

Password

Save Reboot

Or enter Wi-Fi details manually.

SSID

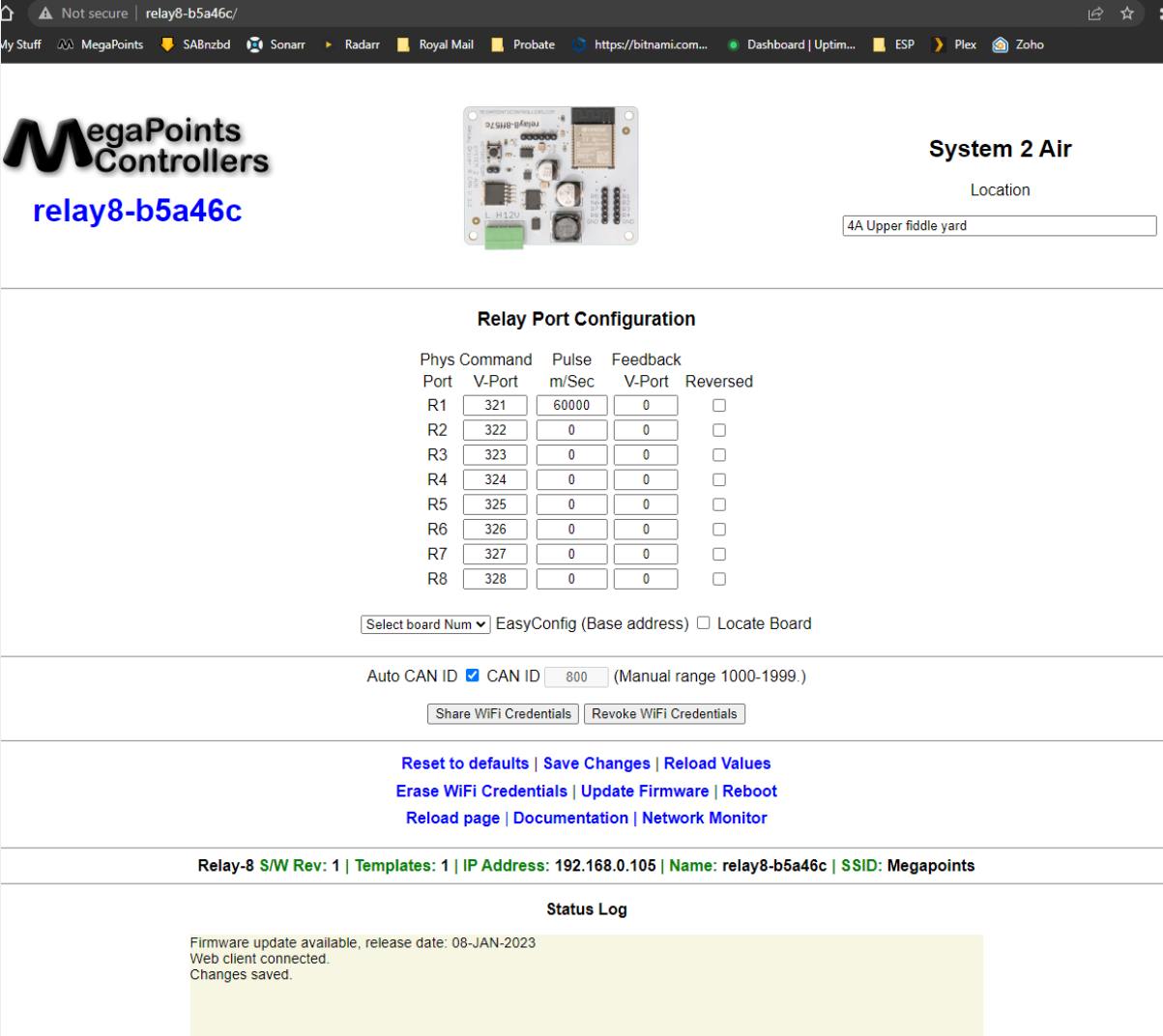
Password

Save

Device Management

Admin Interface

The admin web page is shown on the page below. It is the place where you will change any settings for the Relay-8. Each board on the System2 network has its own management web page.



MegaPoints Controllers
relay8-b5a46c

System 2 Air
Location
4A Upper fiddle yard

Phys Port	Command V-Port	Pulse m/Sec	Feedback V-Port	Reversed
R1	321	60000	0	<input type="checkbox"/>
R2	322	0	0	<input type="checkbox"/>
R3	323	0	0	<input type="checkbox"/>
R4	324	0	0	<input type="checkbox"/>
R5	325	0	0	<input type="checkbox"/>
R6	326	0	0	<input type="checkbox"/>
R7	327	0	0	<input type="checkbox"/>
R8	328	0	0	<input type="checkbox"/>

Select board Num EasyConfig (Base address) ☐ Locate Board

Auto CAN ID ☒ CAN ID 800 (Manual range 1000-1999.)

Share WiFi Credentials Revoke WiFi Credentials

[Reset to defaults](#) | [Save Changes](#) | [Reload Values](#)
[Erase WiFi Credentials](#) | [Update Firmware](#) | [Reboot](#)
[Reload page](#) | [Documentation](#) | [Network Monitor](#)

Relay-8 S/W Rev: 1 | Templates: 1 | IP Address: 192.168.0.105 | Name: relay8-b5a46c | SSID: Megapoints

Status Log

Firmware update available, release date: 08-JAN-2023
 Web client connected.
 Changes saved.

From the main page you can see the following information:

- Device name and serial number
- Relay configuration for each relay port (1-8) including:
 - V-Port assignment
 - Pulse duration (50mS to 60 sec), 0 to disable.
 - Reversed option
- EasyConfig (if selected)
- Locate Board: Will cause the LED on the selected board to flash fast helping you to locate the board if you have many.
- User definable text description or location
- Auto CAN ID. You can override the CAN ID if required.

- Share and revoke Wi-Fi credentials with all boards on the network
- Control buttons (shown in blue text) to:
 - Reset the board
 - Save changes you've made
 - Reload changes (resyncs the web page with board)
 - Erase this boards Wi-Fi credentials (will immediately leave the network)
 - Select the firmware update (requires internet connection)
 - Reboot the board (throws out any unsaved changes if you made a mess)
 - Reload the web page
 - Link to online documentation and support videos
 - A CAN network monitor (for those who prefer watching network packets to trains).
- The next line shows:
 - Product name (relay8)
 - Software version
 - Templates version (should usually match the software version)
 - The local IP address
 - The device network name and serial number
 - The Wi-Fi name you are connected to
- The last item is a status log (light yellow background). This provides a real time status such as up to date software, or boards joining the network, whether you saved (or should) save your changes etc.

Board Location

The board location field (top right) should be used to enter meaningful information to help you locate a specific board. We are planning an update for this feature in a future release that will display the first few characters as part of a report when you request all boards to report in (covered later in this document).

We therefore suggest you begin the text with the most meaningful information such as a baseboard number or location for example:

Suggested entry types	B2 Fiddle Yard 12 Station throat A3 Scenic
Avoid	Baseboard B2 Main approach on the left

V-Ports

System2 is an event driven system. This means when a button is pressed an event is generated on the network. This event is visible to all connected boards and will be acted on by those boards listening for that event.

At the heart of the system is the "V-Port" or virtual port. The system will allow V-Ports in the range 1 – 60,000 which should be big enough for the largest and most sophisticated layouts.

When you set a V-Port address under the “V-Port” column you are saying that the relay is to listen for events on this V-Port and take commanded action if appropriate.

A corresponding V-Port should be configured on an output channel such as a Panel Controller, PC or DCC interface.

Feedback V-Port

Relay Port Configuration				
Phys Port	Command V-Port	Pulse m/Sec	Feedback V-Port	Reversed
R1	<input type="text" value="321"/>	<input type="text" value="60000"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R2	<input type="text" value="322"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R3	<input type="text" value="323"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R4	<input type="text" value="324"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R5	<input type="text" value="325"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R6	<input type="text" value="326"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R7	<input type="text" value="327"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>
R8	<input type="text" value="328"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>

The Feedback V-Port will generate an event from the relay driver to indicate its position.

The feedback V-Port is normally configured when the relay is not being used to switch frog polarity.

When used as a frog polarity switch with a servo driver the servo driver will usually generate the feedback event on the feedback V-Port.

Reversing a relay channel

Selecting the reverse box (indicated by a tick) will cause the relay to immediately reverse. Clicking it again will undo the action.

Board level configuration

EasyConfig setting

The power of System2 allows individual adjustment of every channel including the V-Port ranges. This allows for maximum flexibility when required. To speed installation we've pre mapped the first 20 Relay boards for you into a logical address space on the V-Port addresses.

Refer to the screen shot below for a detailed explanation.

The screenshot shows the 'Relay Port Configuration' web interface. It features a table for configuring 8 relay ports (R1-R8). Annotations highlight specific settings:

- Command V-Port range:** An arrow points to the 'V-Port' column under 'Phys Command' for R1-R8, which are set to 321-328. Text: "Command V-Port range set to match trigger V-Port range on servo8, ensuring relays fire at midpoint."
- Feedback V-Port:** An arrow points to the 'V-Port' column under 'Feedback' for R1-R8, which are set to 0. Text: "Feedback V-Port disabled (0) by default."
- EasyConfig Selection:** A red circle highlights the 'Board 1a (1)' dropdown menu. Text: "EasyConfig Selection".

The interface also includes a 'Locate Board' checkbox, a 'CAN ID' field (800), and a 'Status Log' section at the bottom.

Phys Command Port	V-Port	Pulse m/Sec	Feedback V-Port	Reversed
R1	321	0	0	<input type="checkbox"/>
R2	322	0	0	<input type="checkbox"/>
R3	323	0	0	<input type="checkbox"/>
R4	324	0	0	<input type="checkbox"/>
R5	325	0	0	<input type="checkbox"/>
R6	326	0	0	<input type="checkbox"/>
R7	327	0	0	<input type="checkbox"/>
R8	328	0	0	<input type="checkbox"/>

Board 1a (1) EasyConfig (Base address) ☐ Locate Board

CAN ID 800 (Manual range 1000-1999.)

Fi Credentials [Revoke WiFi Credentials](#)

[Defaults](#) | [Save Changes](#) | [Reload Values](#)

[Credentials](#) | [Update Firmware](#) | [Reboot](#)

[e](#) | [Documentation](#) | [Network Monitor](#)

Address: 192.168.0.105 | Name: relay8-b5a46c | SSID: Megapoints

Status Log

Firmware update available. Web client connected. Changes saved. Defaults loaded. Don't forget to Save Changes if you wish to keep them. Changes saved.

All changes you have made are instantly live and useable, however not saved. This is great for testing and trying things out before committing. If you make a mess of things or want to revert you can select the "Reboot" option. This will revert to the last saved settings.

You may observe two horizontal grey lines separating the Relay Port Configuration above the text and below the EasyConfig. With the exception of the Locate Board tick box everything in this section relates to individual port configuration.

Locate Board

The Locate Board check box will cause two actions when selected.

R7	327	0	0	<input type="checkbox"/>
R8	328	0	0	<input type="checkbox"/>

Board 1a (1) EasyConfig (Base address) ☒ Locate Board

Locate Board checkbox

First, it will cause the flashing LED indicator on that board to flash rapidly. This helps locate and identify the board if you have multiple boards in one location.

Second, it will request that all CAN connected boards report in with their stats, assigned IP address, CAN ID, Board Type and software version.

Status Log

Firmware update available, release date: 13-DEC-2022
Web client connected.
Report--> CanID: 493, IP Addr:192.168.0.60 Type:Panel Controller, SwVer:3.
Report--> CanID: 340, IP Addr:192.168.0.80 Type:Panel Controller, SwVer:3.
Report--> CanID: 800, IP Addr:0.0.0.0 Type:Relay Driver, SwVer:1.

The blue IP address in the Status Log area is clickable and will take you to the management screen for that board.

Any boards not connected to the Wi-Fi will show an IP address of "0.0.0.0".

The above example shows three boards on the network in addition to the Relay board we are issuing the commands from. In summary we have:

The relay8 board we are connected to via the web browser.

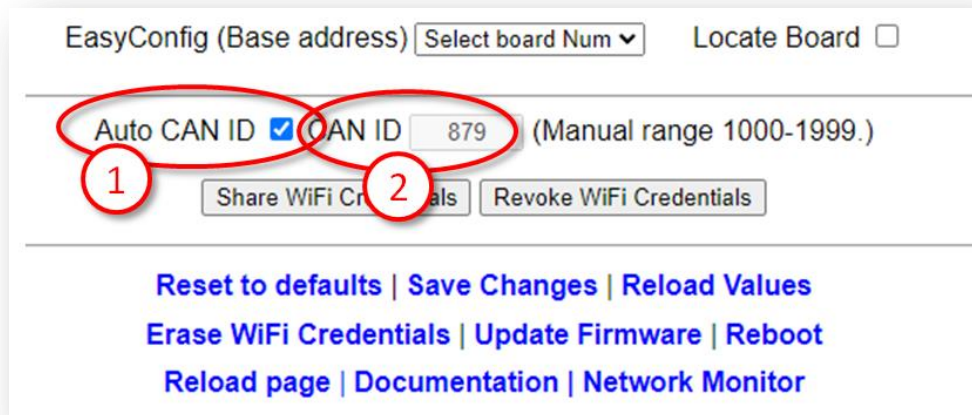
2 x Panel Controller, ID's 493 and 340 with their respective IP addresses showing they are connected to Wi-Fi.

1 x Relay Driver, ID 800 with an unassigned IP address (all zeroes) indicating this is not connected to your Wi-Fi.

Clicking the Locate Board checkbox again will remove the tick and stop the boards rapid flashing. This is reset upon reboot.

CAN ID management

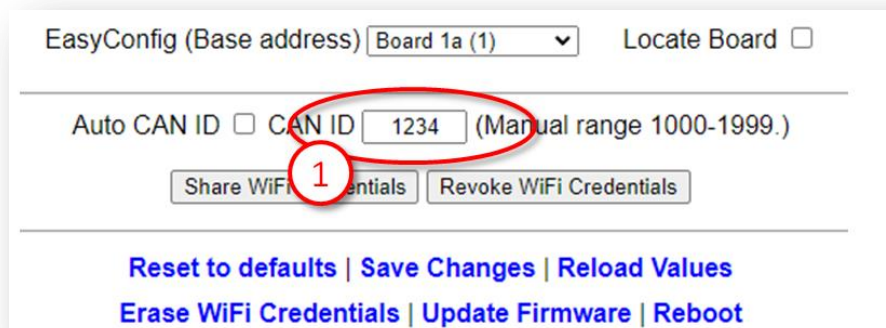
The next area down on the main configuration page concerns network parameters. Refer to the screenshot below and explanation text for details.



- 1 Auto CAN ID – Normally left selected (default). This will allow the board to automatically assign its CAN address and if a duplicate is detected may automatically reassign to a vacant address.
- 2 The current boards CAN ID. Shown greyed out if auto enabled (default).

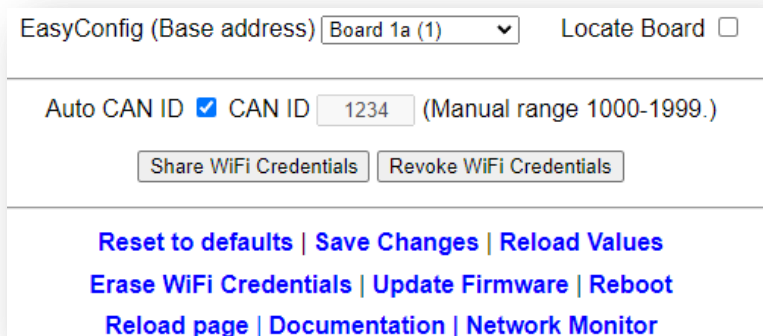
Automatic range: The automatic range for the CAN ID is 1 – 9999. If a duplicate is detected and Auto CAN ID is enabled either this or the other board with a duplicate ID will seek out a vacant CAN ID and update its configuration. When Auto CAN ID is selected do not expect CAN IDs to be persistent as they can change without notice. System2 is designed with this in mind and the board CAN ID is not relevant to operation.

The CAN specification requires all boards to have a unique CAN ID as part of the collision detection mechanism. Forcing duplicates is a bad idea and will lead to data errors.



Manual CAN ID selection: We must ask why? There's no possible benefit we can think of, so it's included for edge use cases. Not recommended to change this. Manual range is 1000 – 1999.

When reselecting Auto CAN ID, the current setting will remain until a collision is detected; whereupon the software will automatically reassign the ID (see below).



EasyConfig (Base address) Board 1a (1) ☐ Locate Board

Auto CAN ID ☒ CAN ID 1234 (Manual range 1000-1999.)

[Reset to defaults](#) | [Save Changes](#) | [Reload Values](#)
[Erase WiFi Credentials](#) | [Update Firmware](#) | [Reboot](#)
[Reload page](#) | [Documentation](#) | [Network Monitor](#)

If a duplicate ID is detected and the address manually configured you will observe a message in the Status Log (example below) warning of the duplicate address and that auto change is disabled. You need to manually reconfigure this.

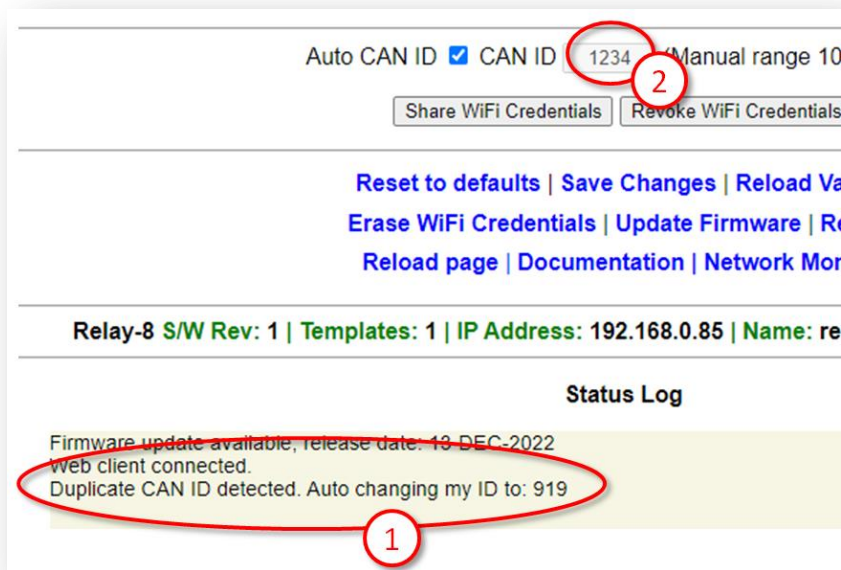


Status Log

Firmware update available, release date: 13-DEC-2022
Web client connected.
Duplicate CAN ID detected. Auto change disabled.

1

With Auto CAN ID enabled the message is slightly different (see below):



The CAN ID was automatically changed to an unused ID. When the board is rebooted or the web page refreshed the CAN ID field will update to the new value.

Wi-Fi credential sharing

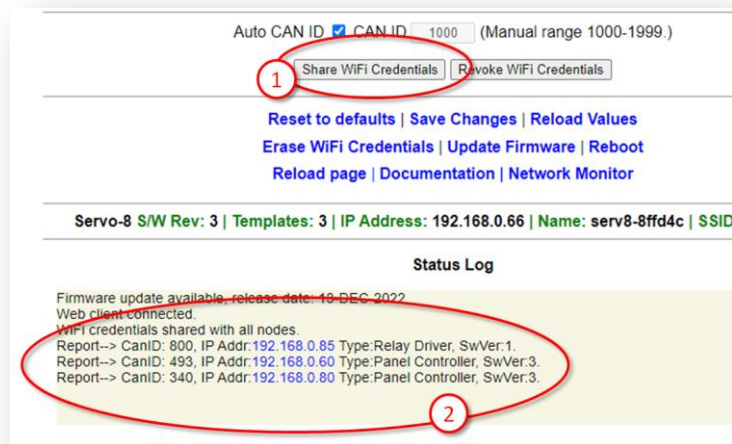
You may recall the procedure to connect the first board to your Wi-Fi network using your phone or tablet to connect to the boards local hotspot? You'll be pleased to know that you don't ever have to go through this again. In this section we'll cover how to share the Wi-Fi configuration with all boards on your CAN bus.

Connect to a System2 board using your browser. Obviously you'll only be able to connect to a board that is connected to your local Wi-Fi.

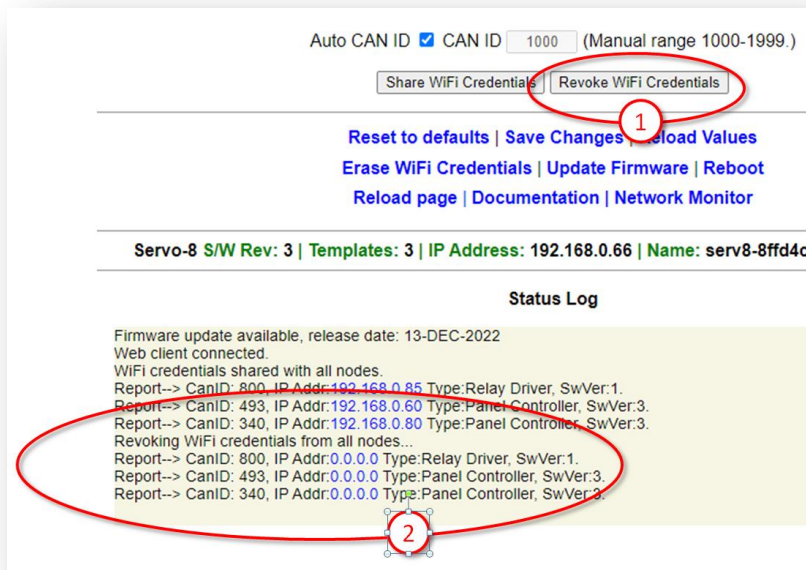
See the diagram below.

Click the "Share WiFi Credentials" button (1).

You will observe all boards on the CAN bus reporting in (Status Log) (2) with an IP address. These boards will now be accessible via a web browser from the same Wi-Fi network.



To revoke Wi-Fi access for all connected boards click the “Revoke WiFi Credentials” (1) button (see below):

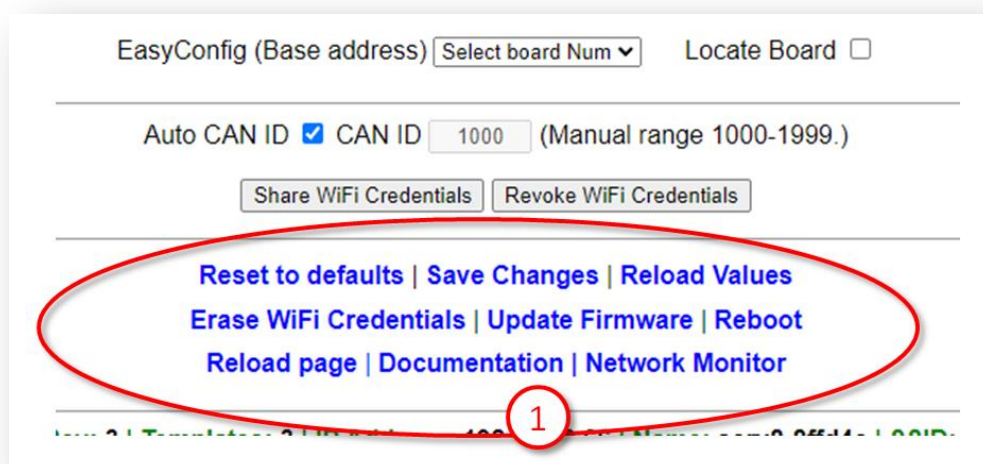


You will observe in the Status Log revocation messages. Each board will restart and show an IP address of “0.0.0.0” showing that it is not connected to any Wi-Fi network.

The board you are issuing the commands from is not affected by this and will remain connected to Wi-Fi until specifically revoked. This is covered later in this guide.

Actions

The action area (1 below) contains blue text that behaves just like buttons. This section covers each in turn.



Reset to defaults

This will reset most of the board values to defaults. Observe the message in the Status Log (2). You have reset to defaults and the default values are live, however will revert back to previous settings upon a reboot unless specifically saved. Particularly useful for testing and reverting.



Resetting to defaults changes the following:

- EasyConfig 1a is selected.
- V-Ports including trigger and feedback set for 1a (above).
- Reversed checkbox cleared.

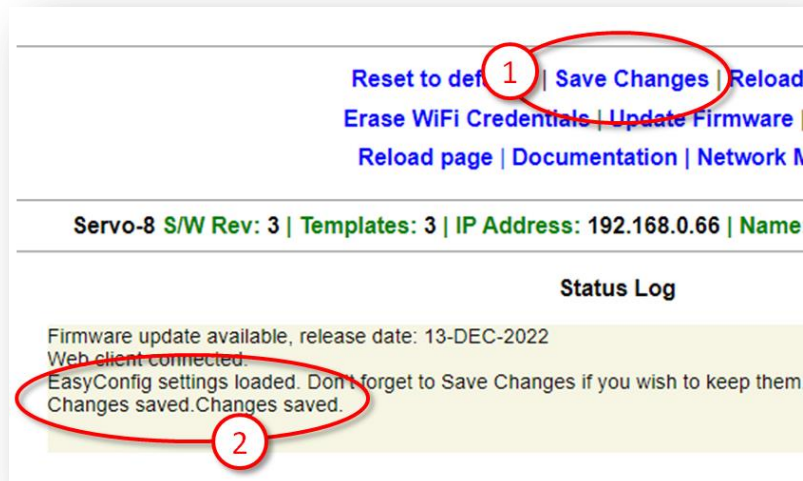
The following are not changed:

- Board location description (upper left of page).
- CAN ID
- IP Address
- Wi-Fi configuration
- Speed

Save Changes

As suggested by the description, this will save all uncommitted changes to non-volatile memory and be retained after reboots.

After saving you'll see the confirmation message (2) in the Status Log below.



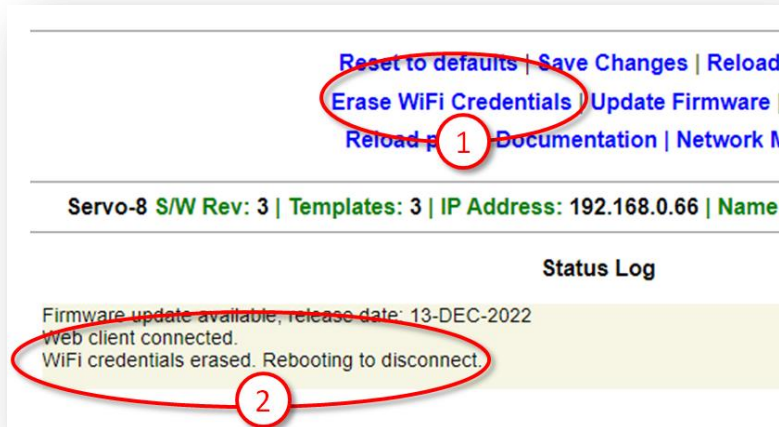
Reload Values

The Reload Values button will reset the parameters to the saved version. This will undo any changes that have not been saved. The browser page will refresh as part of the process.

Erase WiFi Credentials

Erasing the WiFi Credentials will remove the Wi-Fi details and reboot the board you are connected to. This action applies to the board you are connected to only. Other networked boards are unaffected.

If you wish to remove all boards from Wi-Fi see the Wi-Fi Credential Sharing section.



Update Firmware

If your board is connected to your Local Wi-Fi and that Wi-Fi has access to the Internet then you can update firmware. If a new firmware is available a message will be presented in the Status Log area:



Click on the Update Firmware to begin the dialogue. You will be taken to a new page.

Any changes that are available since your last update will automatically be listed in the Software Update section along with the dates they were released.



Servo-8

System 2 Air

Software Update

- | |
|--|
| <p>14-OCT-2022</p> <ul style="list-style-type: none">o Added board location field for the user to enter meaningful data such as board location or purpose. <p>13-OCT-2022</p> <ul style="list-style-type: none">o Added hostname in large lettering to top right of config web page. |
|--|

You can see the release dates and what's in each release. If you select to update you'll get all the changes right up to the latest version. The update is not mandatory. Installation is up to you.

In this example we're going to select the firmware update. It should complete within 10 minutes. During the update you'll see progress on the web page and the on board LED will flash erratically showing data transfer.

☐ [View full update history.](#)

Examine the release notes above to see what's changed from your installed software. Only the changes will be listed.

To upgrade to the latest software release [Click Here](#).

Once the upgrade has started you must not power off your device until the upgrade is complete. This will take between 4-8 minutes to complete. If successful the device will reboot automatically.

[Click Here](#) to return to the main page.

Below is an example log displayed during the software update process:

```
Update initiated.
Beginning firmware update. Two downloads will be processed.
Onboard LED will flash erratically indicating data transfer.
The update will take between 4-8 minutes to complete.
An active internet connection is required for success.
Please wait, do not reboot! Update in progress...
Download (1/2). Connecting to update server.
Received 926816 bytes from the update server.
Written only: 0/926816. Please Retry.
Received 926816 bytes from the update server.
Wrote: 926816 bytes successfully.
File (1/2) has been updated.
File (1/2) download complete.
Download (2/2). Connecting to update server.
Received 1507328 bytes from the update server.
Wrote: 1507328 bytes successfully.
File (2/2) has been updated.
Rebooting. Please return to the main web page.
```

When complete the board will automatically reboot and re-join the network.

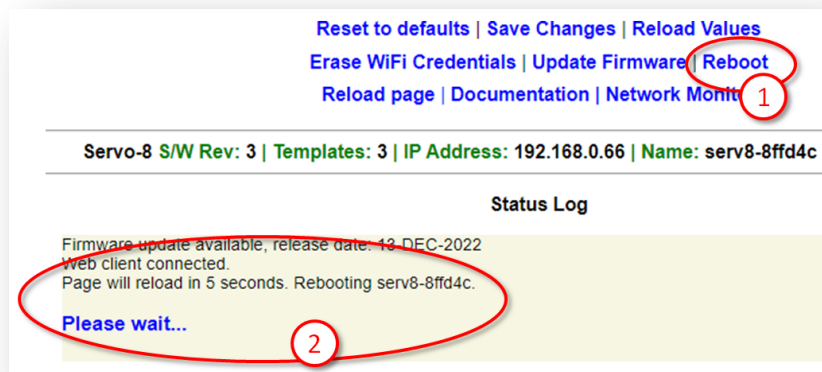
All your configuration data remains unchanged and is preserved across updates.

The update will fail safe. This means that if you interrupt the connection or power off during an update you can return to the update screen and begin the process again though it's not recommended to interrupt the update process.

Select the "Click Here" on the bottom line to return to the main configuration page and not perform any update.

Reboot

Clicking the reboot text will cause the board to immediately restart. You will observe a message in the Status Log that the page will reload automatically after a few seconds along with a "Please wait ..." in blue.



Reload Page

This option reloads the web page and resets the Status Log area. Useful for clearing garbage from the log and confirming you are connected to the board.

Documentation

Clicking the Documentation link will open a new window in your browser and take you to the product page for the board you clicked from. On the product page you'll find links to the relevant documentation and video guides for this product along with recommended accessories.

This option requires an Internet connection.

Network Monitor

WARNING! This section may send you to sleep and is not required reading.

The Network Monitor option takes you to a CAN bus network monitor.

The Network Monitor should be considered experimental, though we relied on it heavily during development.

The Network Monitor will provide a real time display of the traffic on your CAN bus.

System 2 - CAN - Network Monitor

2

Seq	Min	SS	mSS	uSS	CanId	D0	D1	D2	D3	D4	D5	D6	D7	V-Port
0112	17.03.822.345		493		1	0	1	1	0	0	0	0		1
0113	17.03.827.467		1000		1	0	161	3	0	0	0	0		161
0113	17.03.827.467		1000		1	0	161	3	0	0	0	0		161
0114	17.06.093.270		1000		1	1	66	0	0	0	0	0		321
0115	17.08.374.266		1000		1	0	161	0	0	0	0	0		161
0116	21.37.570.266		493		1	0	1	0	0	0	0	0		1
0117	21.37.575.349		1000		1	0	161	3	0	0	0	0		161
0118	21.39.850.069		1000		1	1	66	1	0	0	0	0		321
0119	21.42.130.018		1000		1	0	161	1	0	0	0	0		161

1

The V-Port the packet is intended for is decoded in the right column (1).

The headers (2) contain the following details:

Header	Description
Seq	Packet sequence as observed by the board the Network Monitor is running on.
Min	Number of minutes since starting. Rolls over at 99.
SS	Seconds within the previous minute.
mSS	Millisecond within the previous second.
uSS	Microsecond within the previous millisecond.
CanId	The CAN ID that created the packet.

D 0-7	Data field of the packed (D0 – D7).
V-Port	Decoded V-Port the message is intended for.

The Network Monitor will only display packets created by remote boards. It will not display packets that are locally transmitted.

The local board that is running the packet monitor remains fully operational while the packet monitor is running. It will respond to events in its usual manner.

The data fields (D0-7) will be covered in separate documentation and are data type dependent.

In the above screen shot you can see network packets that were triggered by a button being pushed twice, once to turn on and again to turn off.

Under the V-Port column observe the following events that occurred at minute 17:

Header	Description
1	An event addressed to V-Port 1 is initiated from CAN ID 493.
161	An event is addressed to V-Port 161 from CAN ID 1000 (packet duplicated).
321	An event is addressed to V-Port 321 from CAN ID 1000.
161	An event is addressed to V-Port 161 from CAN ID 1000 (packet duplicated).

CAN ID 493 is a Panel Controller and looking at its configuration we observe V-Port 1 is a push button attached to physical port 1:

Input Ports									
Phys Port	V-Port	Latch (ms)	Input Type	Invert	RGB Red	LED Green	Colour Blue	Colour B/G	
1	1	400	Push to make btn	<input type="checkbox"/>	0	0	0		<input type="checkbox"/>
2	2	400	Push to make btn	<input type="checkbox"/>	0	0	0		<input type="checkbox"/>
3	3	400	Push to make btn	<input type="checkbox"/>	0	0	0		<input type="checkbox"/>

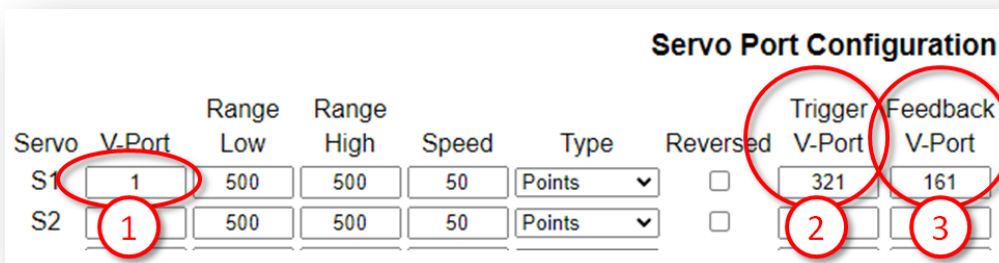
So we know what created the packet, a button on physical port 1.

The next packet was created by Can ID 1000. Looking at the Status Log (below) we can see (1) this is a Servo-8 board:



We are also presented with the IP address of the board (2), so clicking on the blue IP address takes us to the Servo-8 management portal.

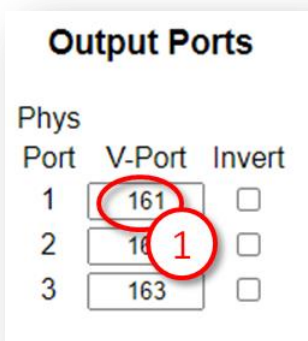
The Servo-8 port configuration is reported as:



The V-Port (1) is 1 meaning channel S1 (servo 1) is listening for this address (V-Port).

Remember this board has a CAN ID of 1000, and it generated a packet to V-Port 161. This is the configured Feedback V-Port at the marker (3).

If we look at the packet under column D3 you'll observe a "3" in the data byte. Where is this going?



The Output Ports section of the Panel Controller (1 left) matches the Feedback V-Port of the Servo-8. It is this port that is listening for the event.

The data value of "3" indicates to flash. This will cause the panel Controller to flash the LEDs on physical port 1 and is used to indicate a motor in motion.

When the centre of motion for the servo has been reached another event is triggered to V-Port 321. Look at the Servo Port Configuration above. See the Trigger V-Port is configured for 321. The trigger fires when the servo is at its centre position. Particularly useful for firing a frog when the point blades are dead centre.

Looking at the relay driver port configuration (below) we observe:

Relay Port Configuration

Phys Port	Command V-Port	Pulse m/Sec	Feedback V-Port	Reversed
R1	321	0	0	<input type="checkbox"/>
R2	322	0	0	<input type="checkbox"/>
R3	323	0	0	<input type="checkbox"/>

Relay R1 is configured for events on V-Port 321 and will trigger when the Servo-8 is halfway.

This can be freely changed to respond to the same ports as the push button or any other device. It can also provide feedback data of its own, however setting the Feedback V-Port to "0" disables feedback from the relay.

Finally on the Network Monitor we observe the last packet at minute 17. It's addressed to V-Port 161 and this time contains a 0 in the D3 column. This tells the Panel Controller to stop flashing as the servo has reached its final position.

Skipping ahead to the last packet on the report you can see it's to V-Port 161 and contains a 1 under the D3 column. This is the polar opposite of the previous paragraph and indicates the servo has reached the opposite end of motion and sets the Panel Controller indicator appropriately.

Packet summary	
peak/sec	peak/min
23/0	51/5

At the bottom of the network monitor page are some packet statistics. The leftmost column indicates the peak and current number of packets per second. The rightmost column shows the same data over a one minute interval.

Status area

The status area shows information at the board level and is display only.

Servo-8	SW Rev: 3	Templates: 3	IP Address: 192.168.0.66	Name: serv8-8ffd4c	SSID: Megapoints
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Board Type (1)

This tells you what the board is. In this case a servo-8.

SW Rev (2)

The current software version loaded.

Templates (3)

Displays the current version of loaded templates. Normally this will match the software version above.

IP Address (4)

The current IP address of the board as allocated from your Wi-Fi.

Board Name and serial (5)

The board serial number. Each is unique and is a combination of the board type and last 3 hexadecimal digits of the MAC address.

SSID(6)

The network name of the configured Wi-Fi network.

In conclusion

We hope you'll agree, System2 Air is a powerful, flexible model railway control system. Future updating is baked in through a trivial firmware update process and new boards are under development to expand the capabilities of the range.

If you've made it this far through the user reference then you'll understand just how much this board is capable of.

Happy railroading!

Contacting us

Web: megapointscontrollers.co.uk

Email: info@megapointscontrollers.com

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If you have any product improvement suggestions we'd be very pleased to hear from you.

NOTE: We operate on a policy of continuous improvement. Colours, specifications and even the placement of components may vary from time to time.