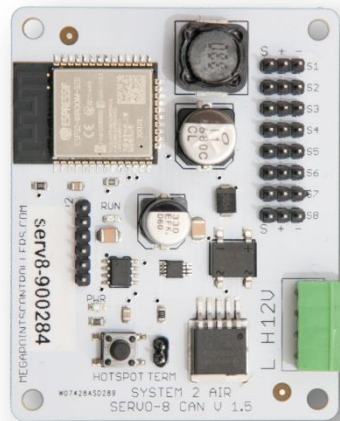


System2 Servo-8 User Reference

by MegaPoints Controllers

An 8 channel networked servo controller for your model railway.

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



User Guide

Revision 7 APR 2023 Status: Draft

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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 - Servo8 video that will demonstrate all the functions and use cases.

System2 Servo-8 Driver

Introduction

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

- Each servo is individually configurable for:
 - Speed
 - Range of motion
 - Personality
 - Points
 - Semaphore (with bounce)
 - Wig Wag

You will also need:

- 12 Volt DC regulated power supply.
 - 1.5A per Servo Controller.
- 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.

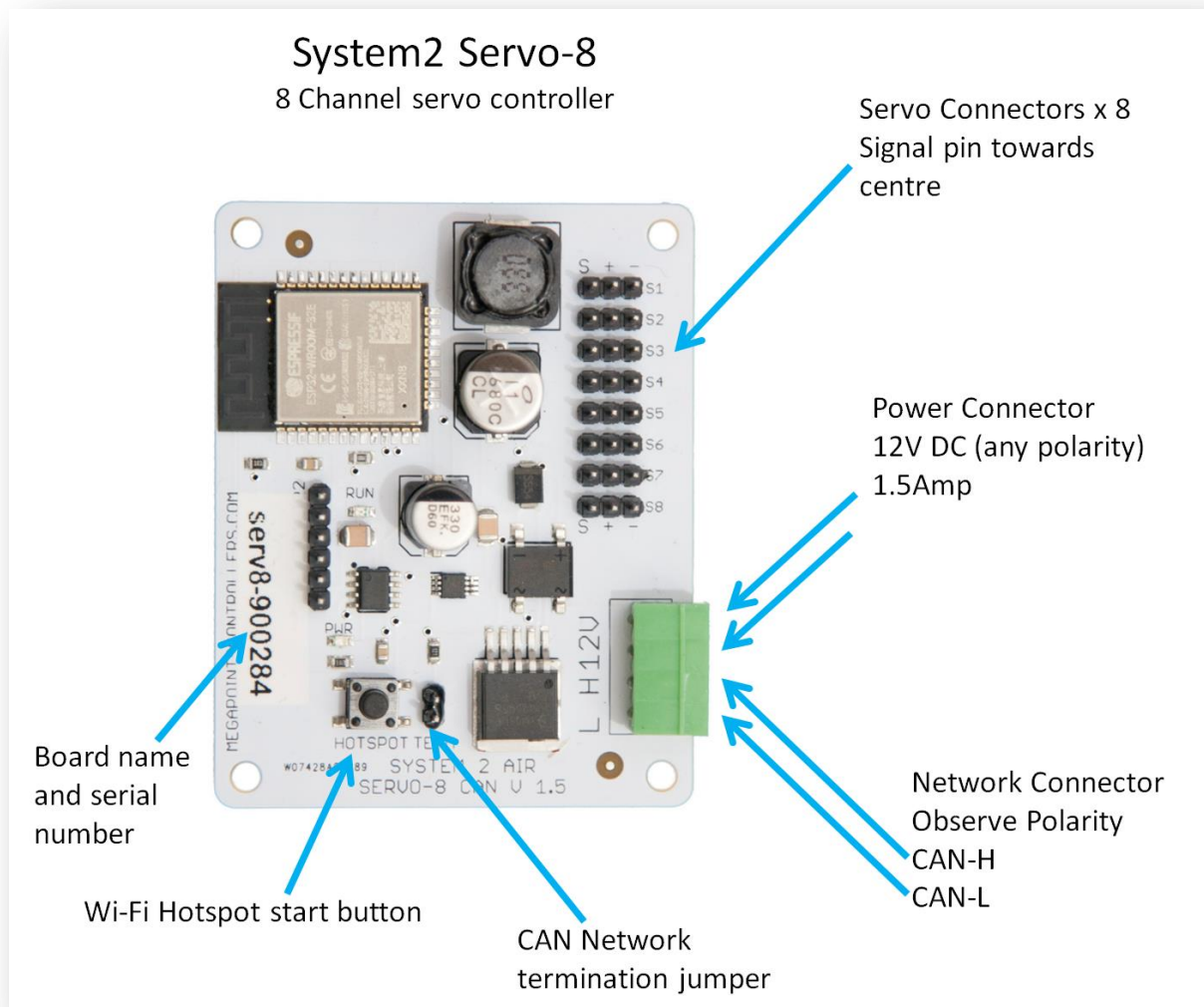
Avoid touching any components or the circuit printed on the bottom of the board.

Avoid placing the board on any metallic surfaces including track.

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

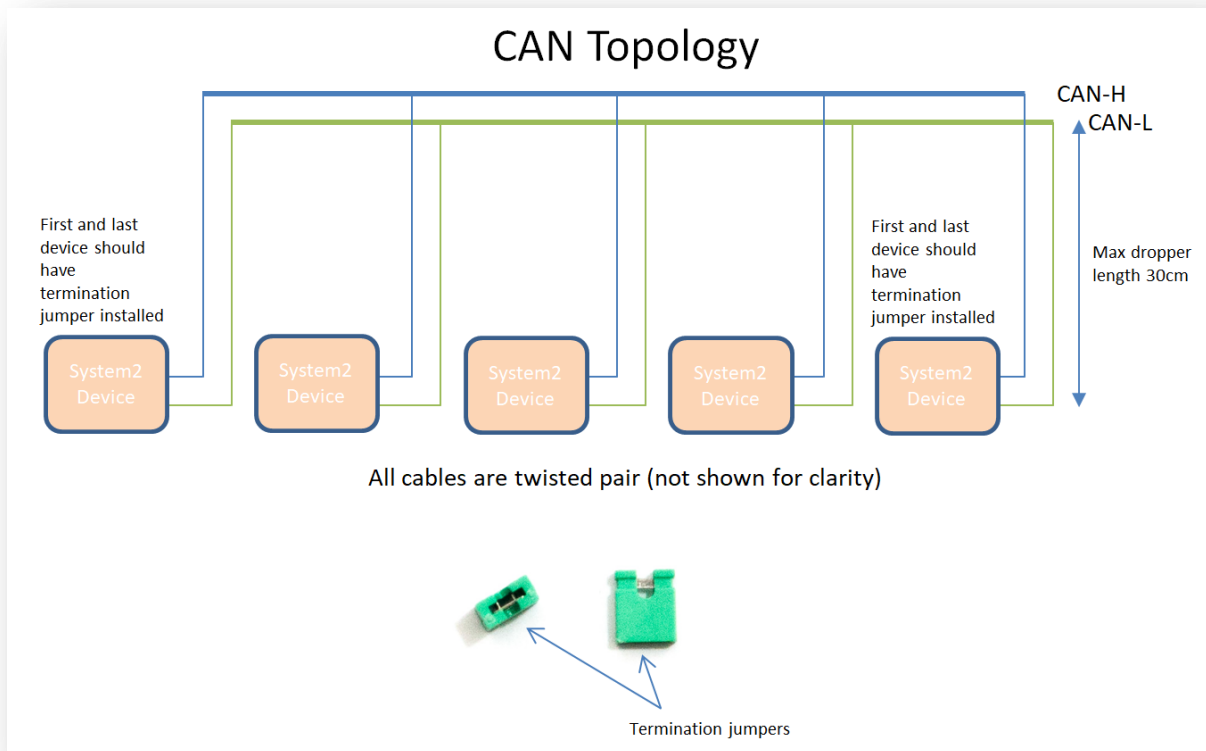
First use

See the image below for connection details.



- Connect each board to a 12 Volt regulated power supply, minimum 1.5A per servo-8.
- 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.
- If your board was part of a starter kit it will be configured as board '1A' or '1B'. This will correspond to the first or last 8 buttons on your Panel Controller.
- Attach a servo to any of the S1-S8 positions. Ensure correct polarity with the signal lead to the inside of the board (usually light brown, yellow or white on the servo lead).
- Operate the Panel Controller push button and observe the servo move.
- There you have it, working servos from a remote panel.

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.

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 Servo-8. Each board on the System2 network has its own management web page.

MegaPoints Controllers
serv8-8ffd4c

System 2 Air
Location: 12-B Test bench

Servo Port Configuration

Servo	V-Port	Range Low	Range High	Speed	Type	Reversed	Trigger V-Port	Feedback V-Port	Range Low	Range High	Speed
S1	1	500	500	50	Points	<input type="checkbox"/>	321	161	<input type="range"/>	<input type="range"/>	<input type="range"/>
S2	2	500	500	50	Points	<input type="checkbox"/>	322	162	<input type="range"/>	<input type="range"/>	<input type="range"/>
S3	3	500	500	50	Points	<input type="checkbox"/>	323	163	<input type="range"/>	<input type="range"/>	<input type="range"/>
S4	4	500	500	50	Points	<input type="checkbox"/>	324	164	<input type="range"/>	<input type="range"/>	<input type="range"/>
S5	5	500	500	50	Points	<input type="checkbox"/>	325	165	<input type="range"/>	<input type="range"/>	<input type="range"/>
S6	6	500	500	50	Points	<input type="checkbox"/>	326	166	<input type="range"/>	<input type="range"/>	<input type="range"/>
S7	7	500	500	50	Points	<input type="checkbox"/>	327	167	<input type="range"/>	<input type="range"/>	<input type="range"/>
S8	8	500	500	50	Points	<input type="checkbox"/>	328	168	<input type="range"/>	<input type="range"/>	<input type="range"/>

EasyConfig (Base address) Select board Num Locate Board ☐

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

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

Servo-8 S/W Rev: 3 | Templates: 3 | IP Address: 192.168.0.66 | Name: serv8-8ffd4c | SSID: Megapoints

Status Log

Firmware update available, release date: 13-DEC-2022
Web client connected.

From the main page you can see the following information:

- Device name and serial number
- Servo configuration for each servo port (1-8) including
 - Movement range
 - Movement speed
 - Movement type (Points, Semaphore, Wig Wag etc.)
 - Movement direction (reversed or normal)
 - V-Port assignment
 - Input and output V-Ports (yes even servos can generate events)
- 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 (Servo-8)
 - 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 servo 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

Servo Port Configuration											
Servo	V-Port	Range Low	Range High	Speed	Type	Reversed	Trigger V-Port	Feedback V-Port	Range Low	Range High	Speed
S1	1	500	500	50	Points	<input type="checkbox"/>	321	161	<input type="range"/>	<input type="range"/>	<input type="range"/>
S2	2	500	500	50	Points	<input type="checkbox"/>	322	162	<input type="range"/>	<input type="range"/>	<input type="range"/>

The Feedback V-Port will generate an event from the servo controller:

- When the servo begins to move
- When the servo has arrived

This is useful in multiple ways:

After a button is pressed on a Panel Controller the servo will indicate that it has begun to move. The panel controller can be configured to have its position LEDs flash to indicate movement is in progress.

After a servo has arrived at its destination indicating to the Panel Controller movement has completed and the servo is at its commanded position.

This gives a closed loop operation proving the communication from the button to the servo and back was completed.

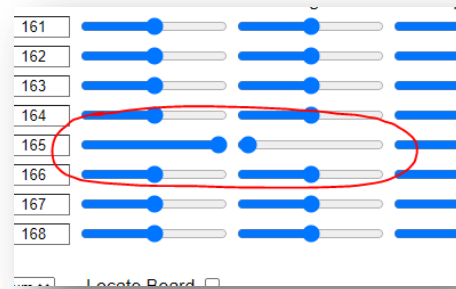
Trigger V-Port

The Trigger V-Port will fire when the servo is at the half way mark. This is particularly useful to trigger a relay for frog polarity (works with analogue DC and DCC) when the blades are halfway. On some N gauge points this is desirable to prevent short circuits.

Servo control

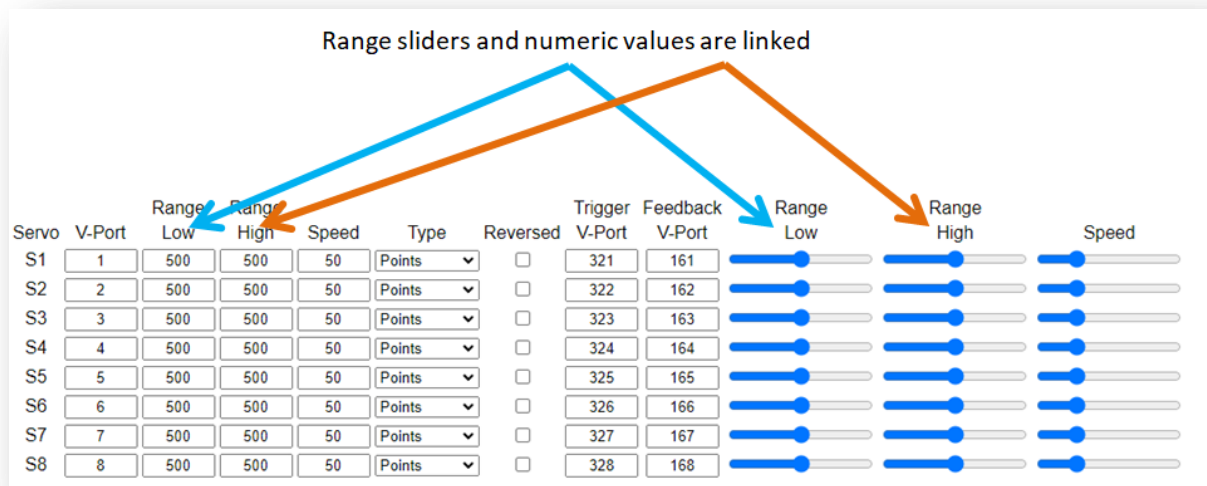
Centre Servos

To centre a servo move both range sliders towards each other. The servo will immediately respond and move to the centre position. You should now make any mechanical adjustments to the servo horn prior to fitting the retaining screw.



Servo Range controls

Servo ranges may be set for both the left and right end points using the range sliders or numerical values in the range 1 – 1000. If the range slider is used and the servo is already at that end point it will move in real time in response to the range slider. For example, if the servo is to the left and the Range Low slider is moved you'll observe the servo moving.



To dynamically adjust the opposite side first move the servo to the other side using your Panel Controller or other connected controlling device. This activates the live adjustment feature for that side. This avoids uncontrolled high speed servo swings before they are adjusted.

When a range slider is moved the corresponding numerical value is updated in the numerical column.

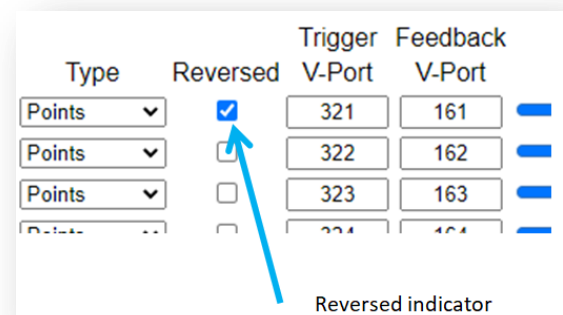
The range sliders are great for adjustments where you want fine grain adjustments. The numeric values can be used to duplicate the settings of a board quickly in a tabular format. You have the best of both worlds.

Servo Speed controls

Servo speed can be adjusted by moving the slider or entering a value between 1 to 200. Larger values increase speed and relates to a traversal time ranging between approximately 1.5 sec to 30 sec duration when set to the points type.

Reversing a servo channel

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



Type

Each servo channel can be one of three types.

Points

Selecting “Points” provides a generic servo operation suitable for a variety of operations including points, gates, barriers or doors and is adjustable from 1.5 sec end to end travel time to almost 30 seconds. The motion is not linear but smoothly accelerates from a start and decelerates to a stop. This simulated the speeding up and slowing down of a motor and provides a more organic feel.

Servo Port Configuration

Speed	Type	Reversed	Trigger V-Port	Feedback V-Port
50	Points	<input type="checkbox"/>	321	161
50	Points	<input type="checkbox"/>	322	162
50	WigWag	<input type="checkbox"/>	323	163
50	Semaphore	<input type="checkbox"/>	324	164

The points type triggers three network Feedback V-Port events. A “0” and “1” to indicate either end position and a “3” indicates it is in motion. The default application of the “3” is for flashing indicator lights on a mimic panel to show the points are in motion.

A Trigger V-Port event is also triggered when the servo crosses the centre position. Intended use is to trigger a frog switching relay when point blades are in the centre position thus avoiding a short circuit on some points such as N gauge where the frog may not be fully isolated.

Semaphore

Selecting Semaphore will produce a pleasing bounce at one end of the stroke. The pull back is linear. Using the speed and range sliders you are able to adjust the bounce feel to the desired level.

Use the Reversed check box to move the bounce to the opposite side of the movement range.

Type	Reversed	Trigger V-Port	Feedback V-Port
Points	<input type="checkbox"/>	321	161
Points	<input type="checkbox"/>	322	162
WigWag	<input type="checkbox"/>	323	163
Semaphore	<input type="checkbox"/>	323	163

In this mode only the Feedback V-Port events are produced and only for a “0” or “1” to indicate either end of the cycle. No event “3” is produced.

Wig Wag

The Wig Wag option will initially begin from the centre position and gradually build up an oscillation just like on an American railroad.

In this mode only the Feedback V-Port events are produced and only for a “0” or “1” to indicate either end of the cycle. No event “3” is produced.

Type	Reversed	Trigger V-Port	Feedback V-Port
Points	<input type="checkbox"/>	321	161
Points	<input type="checkbox"/>	322	162
WigWag	<input type="checkbox"/>	323	163
Semaphore	<input type="checkbox"/>	324	164

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 Servo-8 boards for you into a logical address space on the V-Port, Trigger V-Port and Feedback V-Port addresses.

Refer to the screen shot below for a detailed explanation. Numbers in red circles relate to paragraph number of text.

The screenshot shows the 'Servo Port Configuration' web interface. It features a table for configuring 8 servo ports (S1-S8). Each port has settings for V-Port, Range Low, Range High, Speed, Type, and Reversed. Below the table is the 'EasyConfig' section, which includes a 'Select board Num' dropdown menu. The dropdown is currently open, showing a list of boards from 1a to 10a. The interface also includes fields for 'EasyConfig (Base address)', 'Auto CAN ID', 'CAN ID', 'Share WiFi Credentials', and 'Locate Board'. At the bottom, there are links for 'Reset to defaults', 'Erase WiFi Credentials', 'Reload page', and 'Doc'. A status bar at the bottom indicates 'Servo-8 S/W Rev: 3 | Templates: 3 | IP Address' and 'Firmware update available, release date: 13-DEC-2022 Web client connected.'

Numbered callouts in the image:

- 1: Points to the V-Port column in the Servo Port Configuration table.
- 2: Points to the Trigger V-Port column in the Servo Port Configuration table.
- 3: Points to the Feedback V-Port column in the Servo Port Configuration table.
- 4: Points to the 'Select board Num' dropdown menu in the EasyConfig section.
- 5: Points to the 'EasyConfig board number' label below the dropdown menu.
- 6: Points to the 'First V-Port address in EasyConfig board number' label below the dropdown menu.

- 4 To change the EasyConfig for this board, select the board from the drop down.
- 1,2,3 Upon mousing over the drop down box (4) you will observe the greyed out values in the green highlighted areas. This shows the values that are about to be changed.
- 5 The EasyConfig board number 1a – 10a (total 20).
- 6 The first V-Port address of the configuration.

After selecting EasyConfig Board 4a (49) you will observe the following:

The screenshot shows the 'Servo Port Configuration' web interface. It features a table for configuring 8 servos (S1-S8) with columns for V-Port, Range Low/High, Speed, Type, Reversed, Trigger V-Port, Feedback V-Port, and Range Low/High sliders. Below the table is a dropdown for 'EasyConfig (Base address)' set to 'Board 4a (49)', a 'Locate Board' checkbox, and an 'Auto CAN ID' section with a checked checkbox and a value of 879. At the bottom, there are links for 'Reset to defaults', 'Save Changes', 'Reload Values', 'Erase WiFi Credentials', 'Update Firmware', 'Reboot', 'Reload page', 'Documentation', and 'Network Monitor'. A 'Status Log' section at the bottom shows messages about a firmware update and a web client connection. Numbered callouts are placed as follows: 1 points to the V-Port column, 2 points to the Reversed checkbox, 3 points to the Feedback V-Port column, 4 points to the 'Locate Board' checkbox, and 5 points to the 'Save changes' button.

Servo	V-Port	Range Low	Range High	Speed	Type	Reversed	Trigger V-Port	Feedback V-Port	Range Low	Range High	Speed
S1	49	500	500	100	Points	<input type="checkbox"/>	369	209			
S2	50	500	500	50	Points	<input type="checkbox"/>	370	210			
S3	51	500	500	50	Points	<input type="checkbox"/>	371	211			
S4	52	500	500	50	Points	<input type="checkbox"/>	372	212			
S5	53	500	500	50	Points	<input type="checkbox"/>	373	213			
S6	54	500	500	50	Points	<input type="checkbox"/>	374	214			
S7	55	500	500	50	Points	<input type="checkbox"/>	375	215			
S8	56	500	500	50	Points	<input type="checkbox"/>	376	216			

EasyConfig (Base address) **Board 4a (49)** ☐ Locate Board

Auto CAN ID ☒ CAN ID (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](#)

Servo-8 S/W Rev: 3 | Templates: 3 | IP Address: 192.168.0.66 | Name: serv8-8ffd4c | SSID: Megapoints

Status Log

Firmware update available, release date: 13-DEC-2022
 Web client connected.
 EasyConfig settings loaded. Don't forget to Save Changes if you wish to keep them.

- 1,2,3 Values have been loaded and background returns to normal white.
- 4 EasyConfig board selection you just made.
- 5 Changes are not saved until you save them. See later for how to save.

All changes you have made including the reversing, range and speed 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 Servo 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.

50 Points ☐ 375 215

50 Points ☐ 376 216

EasyConfig (Base address) Board 4a (49) ☒ 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 Servo-8 board we are issuing the commands from. In summary we have:

The servo-8 board we are connected to via the web browser.

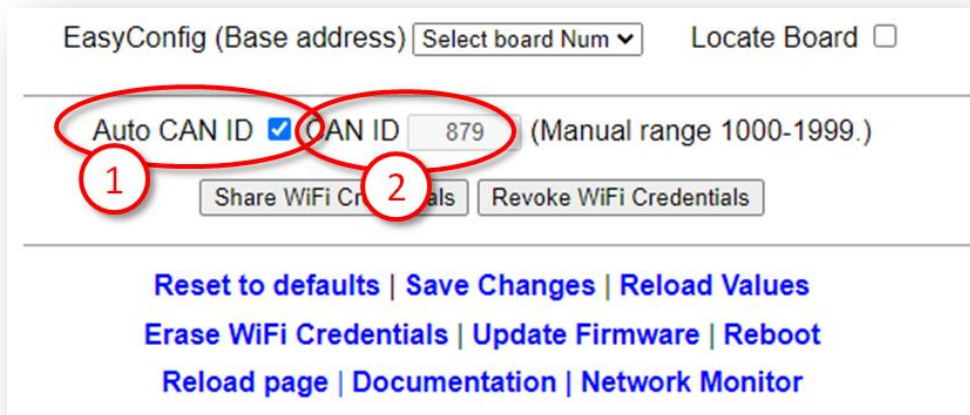
2 x Panel Controller, ID's 493 and 340 with their respective IP addresses showing they are connected to Wi-Fi.

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

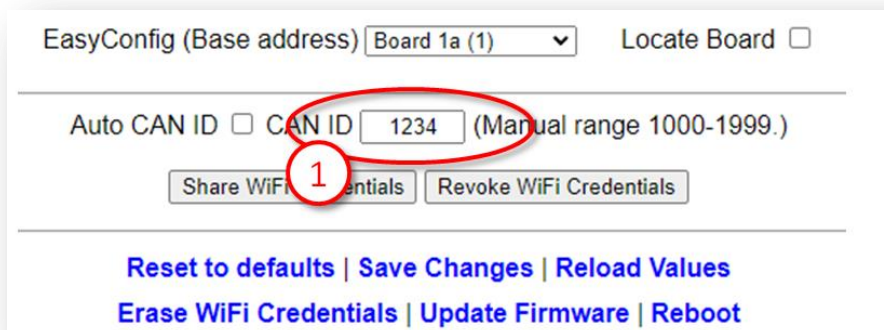
The next area down on the main configuration page concerns network parameters. Refer to the screenshot below and explanation text for details.



- 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).

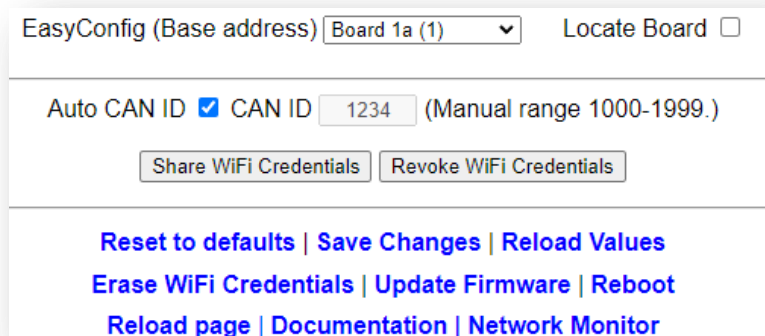
Automatic range: The automatic range for the CAN ID is 1 – 9999. If a duplicate is detected and Auto CAN ID is enabled either this or the other board with a duplicate ID will seek out a vacant CAN ID and update its configuration. When Auto CAN ID is selected do not expect CAN IDs to be persistent as 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.)

Share WiFi Credentials Revoke WiFi Credentials

[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.

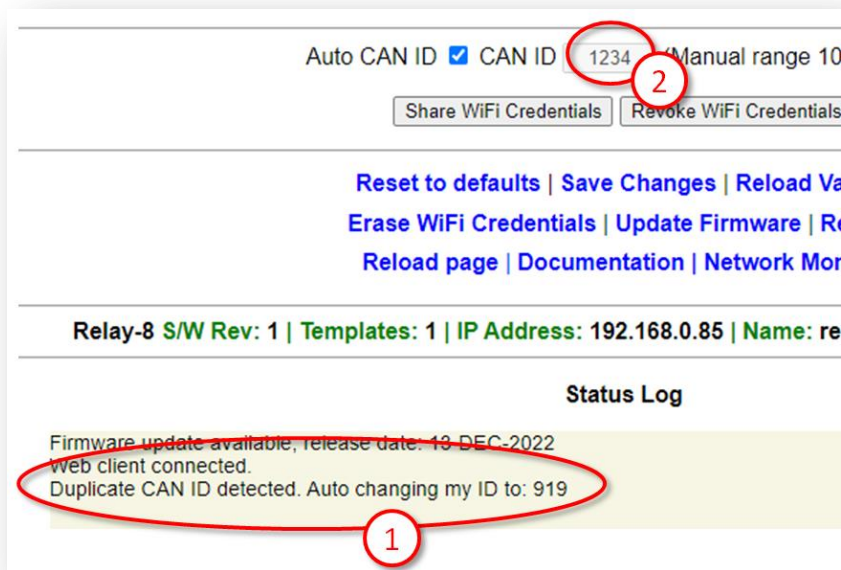


Status Log

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

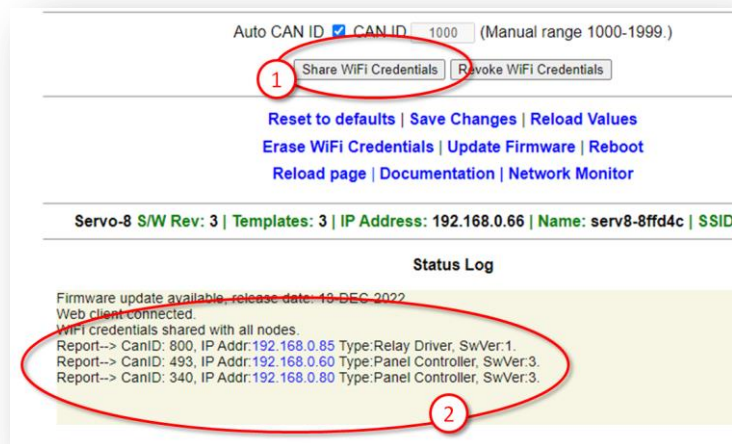
You may recall the procedure to connect the first board to your Wi-Fi network using your phone or tablet to connect to the boards local hotspot? You'll be pleased to know that you don't ever have to go through this again. In this section we'll cover how to share the Wi-Fi configuration with all boards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

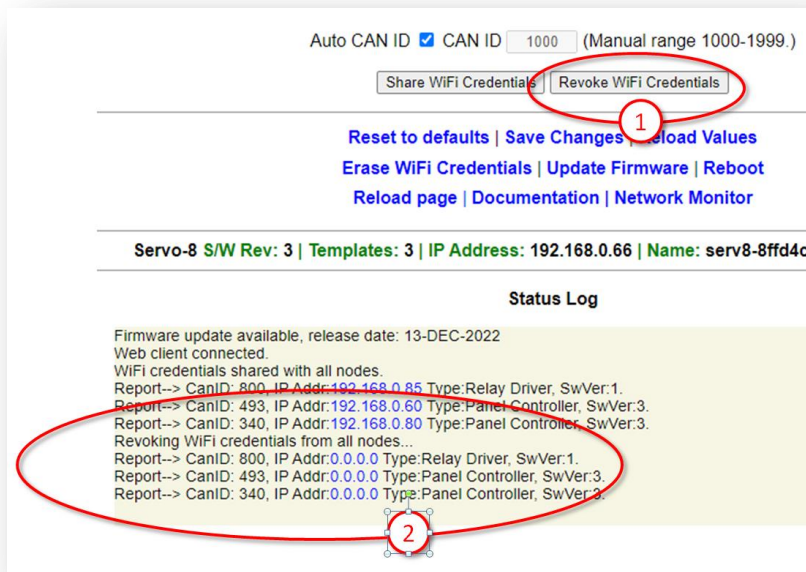
See the diagram below.

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):

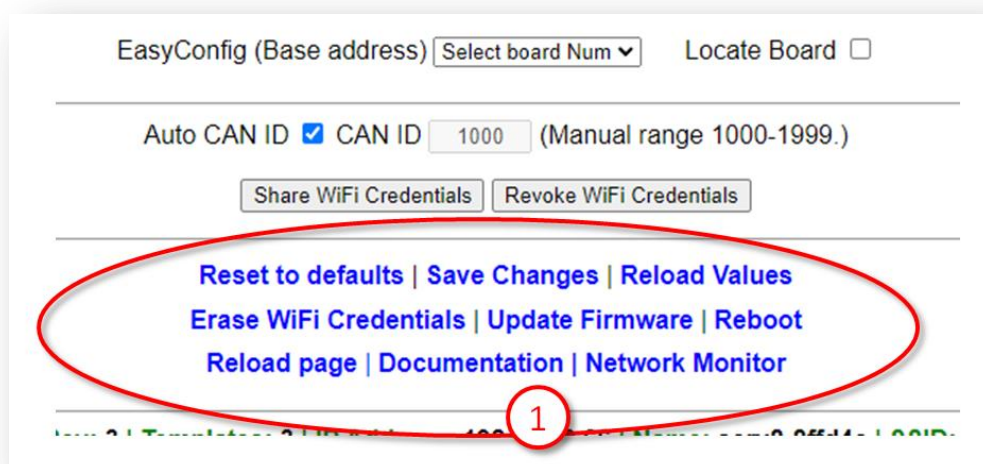


You will observe in the Status Log revocation messages. Each board will restart and show an IP address of “0.0.0.0” showing that it is not connected to any Wi-Fi network.

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).
- Type reset to "Points".
- Reversed checkbox cleared.

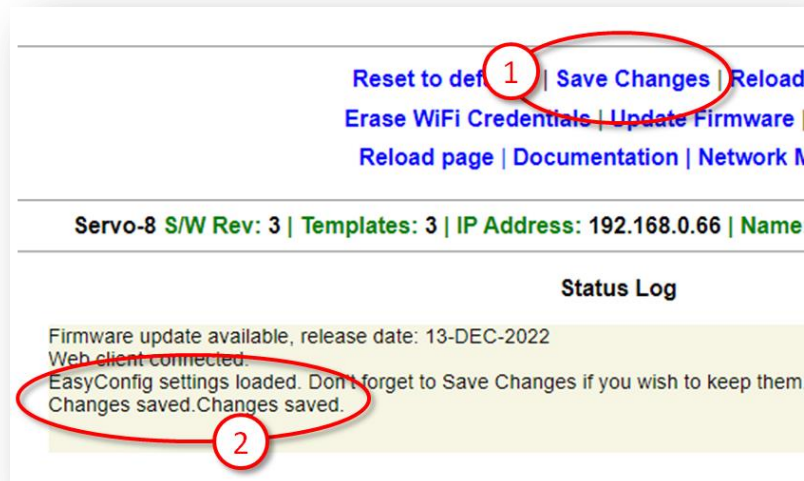
The following are not changed:

- 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.



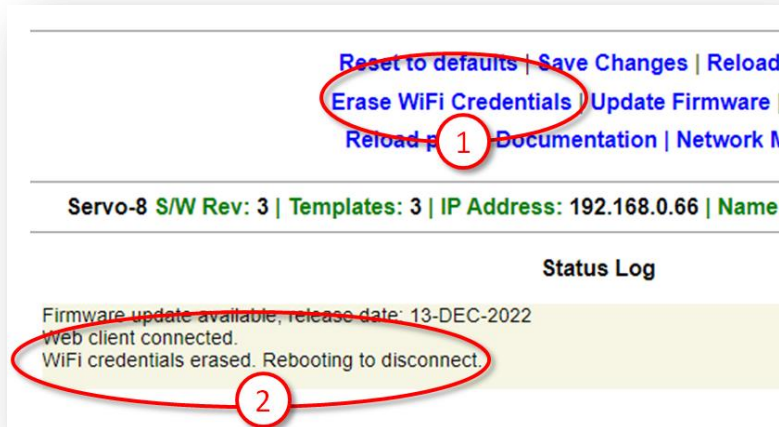
Reload Values

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.

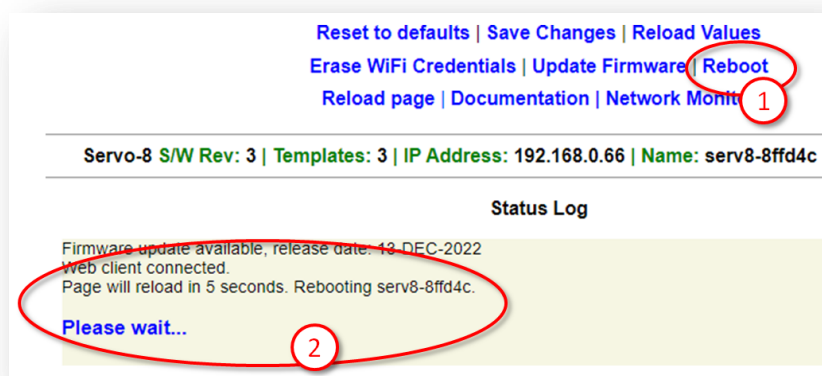
All your configuration data remains unchanged and is preserved across updates.

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:

```

web client connected.
WiFi credentials shared with all nodes.
Report--> CanID: 493 IP Addr: 192.168.0.68 Type: Panel Controller, SwVer:3.
Report--> CanID: 1000 IP Addr: 192.168.0.66 Type: Servo-8 Driver, SwVer:3.
Report--> CanID: 900 IP Addr: 192.168.0.65 Type: Relay Driver, SwVer:1.

```

1

2

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:

Servo Port Configuration									
Servo	V-Port	Range Low	Range High	Speed	Type	Reversed	Trigger V-Port	Feedback V-Port	
S1	1	500	500	50	Points	<input type="checkbox"/>	321	161	
S2		500	500	50	Points	<input type="checkbox"/>			

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?

Output Ports		
Phys Port	V-Port	Invert
1	161	<input type="checkbox"/>
2	162	<input type="checkbox"/>
3	163	<input type="checkbox"/>

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
1	2	3	4	5	6

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

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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.