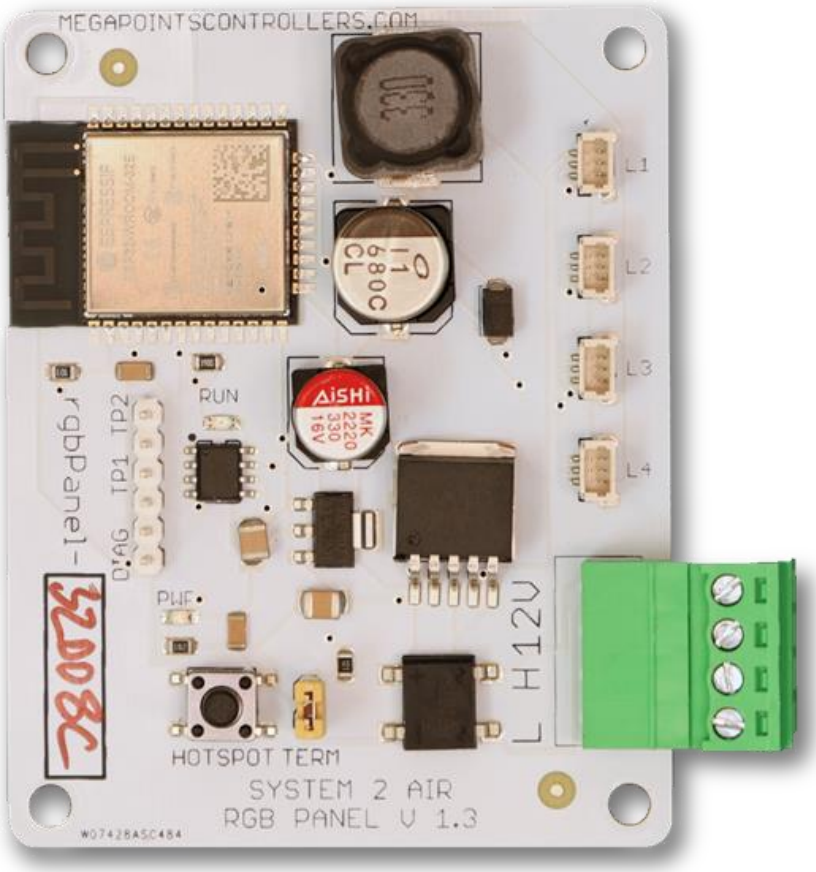
System2
OUT-64 User Reference
MegaPoints Controllers

Drives up to 64 RGB addressable WS2812B LEDs in your mimic panel.

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



User Guide

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Documentation revisions

This document is for the OUT-64 software version 2 or later. If your board has access to the Internet it will report when a new version of the software is available for download. See the download section for details.

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 vPorts) 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 – Panel Controller video that will demonstrate all the functions and use cases.

Caution

Treat the LED connectors with the care you would any scale locomotive.

- Do not twist or apply sideways pressure to the socket.
- Remove the cable by pulling on the leads in a straight out manner.
- Do not force any of the miniature connectors.

This is a 12 Volt device and should be connected to a minimum of 1 Amp regulated power supply.

Do NOT twist or apply any angular force when removing LED cables. Grip the LED cable and pull straight up perpendicular from the board.

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

System2 OUT-64

Introduction

The System2 OUT-64 supports up to 64 colour addressable LEDs in four strings of 16 LEDs each.

Each LED is software configurable with its purpose not being constrained by physical location within any of the four strings of LEDs.

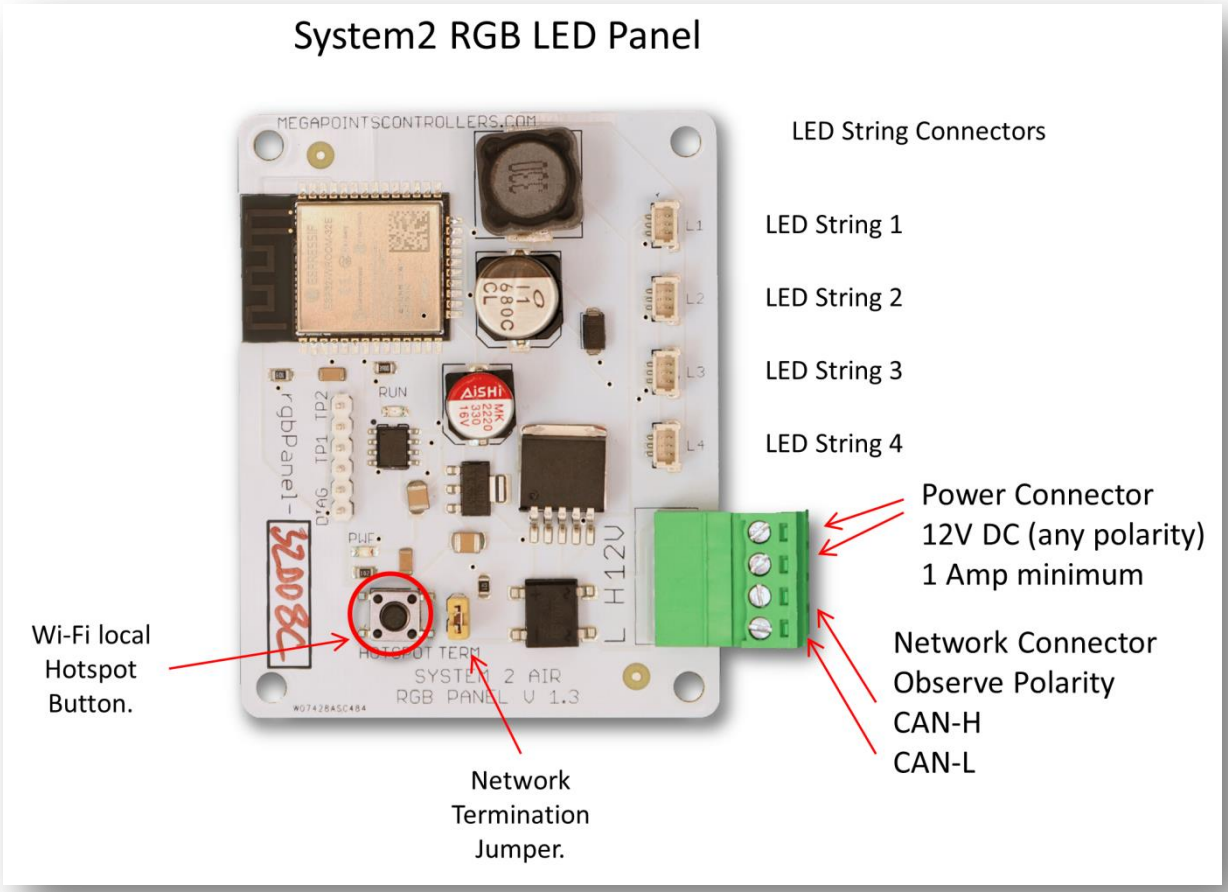
The OUT-64 is perfectly matched with the IN-32 as well as the Panel Controller, Mini Panel Controller and Route Processor and will provide a full colour panel display to your mimic panel.

The OUT-64 has the following use cases:

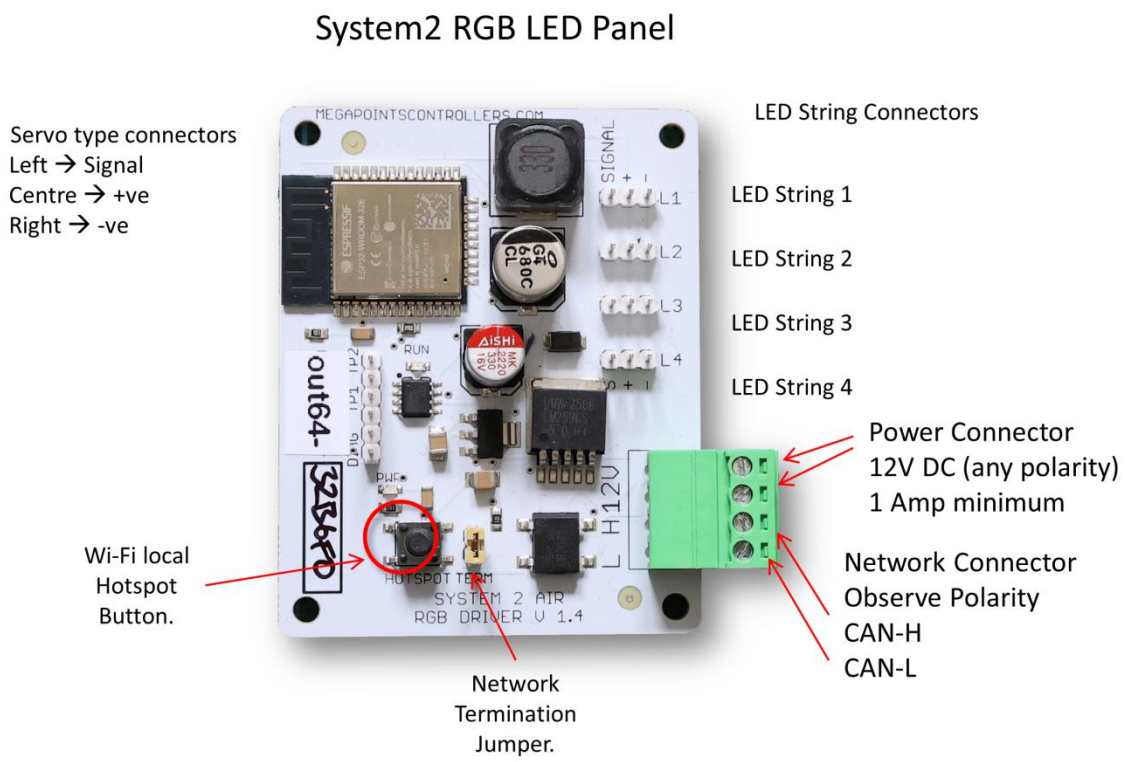
- Single LED ON and OFF at any colour.
- Switching an LED pair ON and OFF to indicate turnout position.
- Indicating and superimposing block occupancy in conjunction with block data.
- Indicating the power state of a DCC section.
- Providing in building adjustible lighting that can be triggered by button, switch or layout event.
- Having a bespoke colour set from a Panel Controller or OUT-32 board.

First use

See the image below for connection details. There are two connector types. The micro JST connectors have been phased out in favour of servo type connectors.



Board fitted with micro JST type connectors.



Board fitted with servo type connectors.

LED outputs (x4) and type

The OUT-64 drives WS2812B addressable LEDs. Micro JST type connectors connector pins are defined as:

Pin	Purpose
Top	Positive
Centre	Negative
Bottom	Signal

Servo type connectors connector pins are defined as:

Pin	Purpose
Top	Positive
Centre	Negative
Bottom	Signal

Pin orientation is as shown above.

Pre wired test RGB LED strips are available from our web shop.

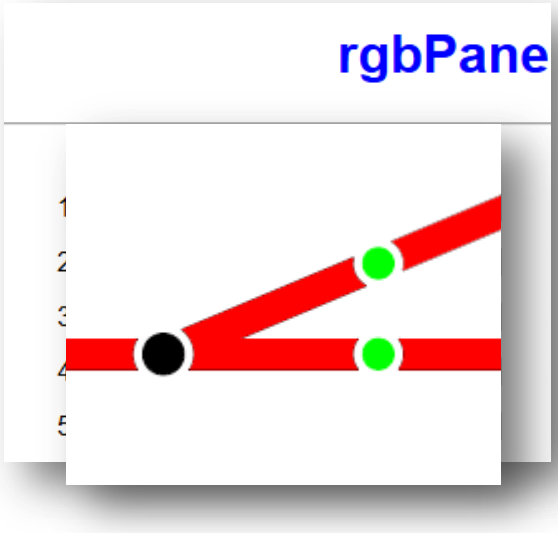
Example configurations

For the examples we assume a test LED strip is attached to String 1 and String 2 connecting 32 LEDs. A Panel Controller configured either as a toggle switch or stateful switch type is configured. Driving the LEDs from a pushbutton is a suitable getting started example; however, see the "Indicating useful information" at the end of this section for correct configuration and how to read your track.

Foreground and Background Colours Explained

The background colour (BG) column shows normal information such as turnout position, switch activation or the state of some other monitored device on the layout. These are set as ON/OFF with white being the default colour.

The foreground colour is an override that will replace any displayed background colour if it is set. This is useful when you have a route illuminated say in white with a red occupied block on top of it. When the foreground colour is switched off, the background colour will be displayed if it is still enabled.



ON / OFF Single LED

This is an indicator for a single LED on and OFF. We'll assign the vPort to 1 and drive it from a Panel Controller, though it can be driven from a Route Processor, DCC Module or track sensor.

Enter the vPort 1 in the BG 1 column for the top position (LED #1) and TAB or click out of the box to save. With the panel controller set to any switch type other than "stateless" and "start of day".

Pressing the button will toggle the LED on and off with the default colour of white.

ON / OFF LED Pair

Building on the previous example, we'll use a pair of LEDs to indicate points position similar to the standard green/green LED cable pair used in the System2 Mini Panel and Panel Controllers. See diagram opposite -->

Set the BG1 LED #1 to vPort 1 and the second LED also to vPort1. If you are tempted to press the button now you'll have the most useless points indicator as they will both come on and off at the same time. (We'll leverage this later to great use though.)

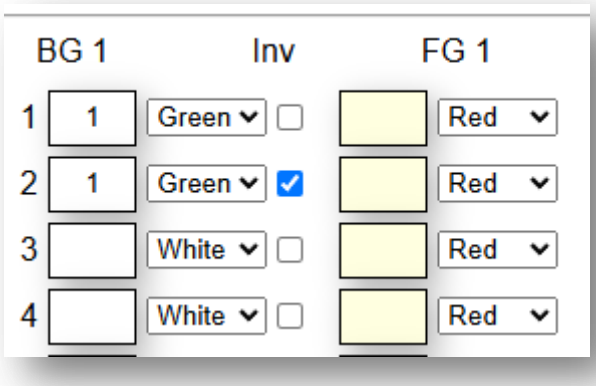
On LED #1 tick the “Inv” box. Pressing the button shows they are now working as a complimentary pair and indicate the chosen points direction. If you need to reverse the logic swap the “Inv” ticks.

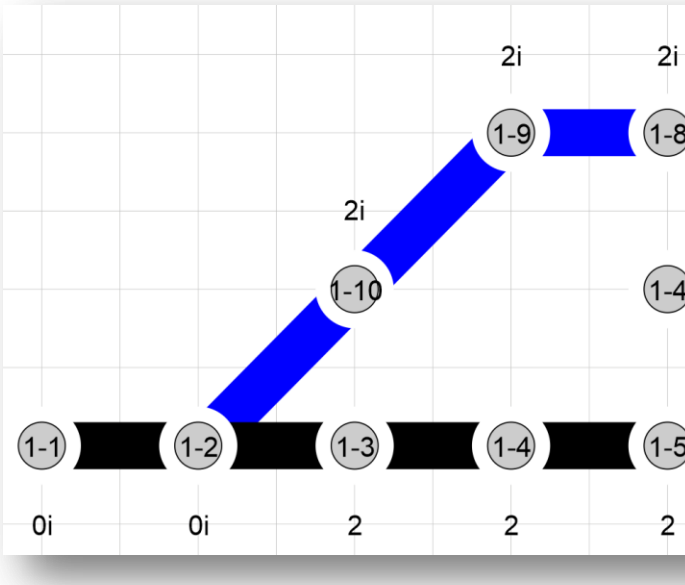
Let’s go green!

On the dropdown selector for the first two LED’s, select green for both LEDs. You now have green LEDs or whatever colour you chose.

Route Indication

We can further develop the points position idea further by lighting the entire track so that it will illuminate when selected. Refer to the diagram below. The blue road diverges from the black main line. The numbers in the circles refer to the string and LED position. These are all on string 1.





- Set LEDs 3 – 10 to vPort 2.
- Set the LEDs 7 – 10 Inverted.

Operating the button or switch on vPort 2 will now switch the roads so that one or the other is illuminated.

The first two LEDs on the black line look left out. We’ll set these to be always on by inverting them and not setting a vPort.

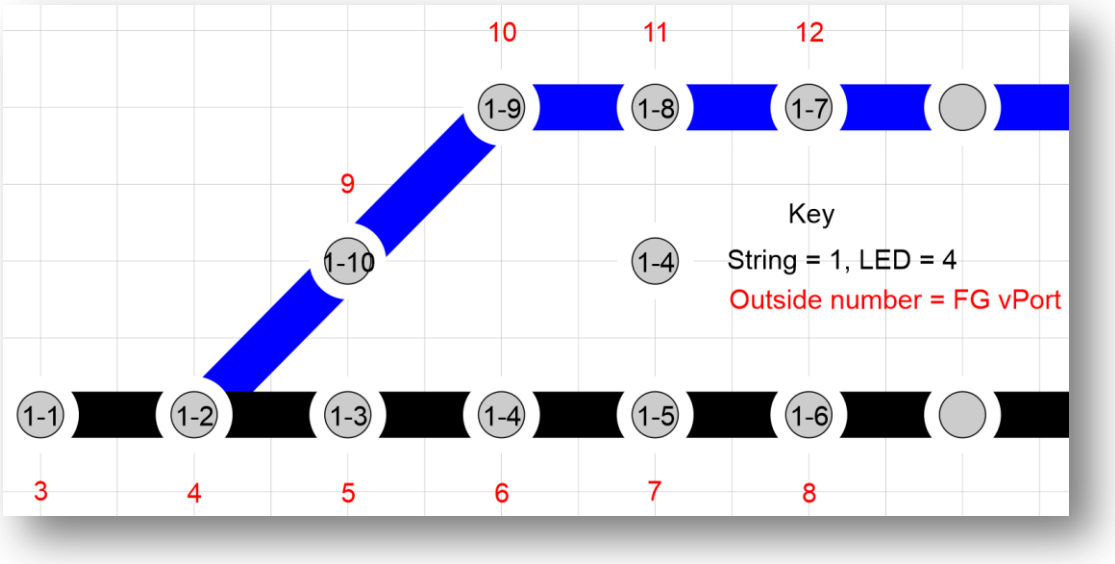
- Set LEDs 1-2 Inverted (*vPort should be wither 0 or blank*).

If all that white is too bright adjust with the Brightness slider.

We now have roads illuminated to show which direction the points are set and we've only used a single vPort (2) to set the entire display.

Block Occupancy

Building on from the previous example, let's assume every LED is connected to a block detector and each LED represents one block. We need to see where our trains are! (*In this example we'll use the buttons or switches to simulate the block detector, so no need to track wire the example.)*



Add the corresponding FG vPorts (shown in red numbering) in the above diagram.

Operate each of the block vPorts in turn (3-12) and observe the red block occupied indicator as it travels down the line. Occupied blocks will return to the white colour when the blocks clear. You can have occupied track in an unselected road. These will return to off when the blocks clear.

Leave the settings from the previous example unchanged, we'll be building on these.

Always ON LED

In the Route Indication example we set LEDs 1-2 Inverted with a blank or 0 vPort.

- The blank vPort means that it can't ever be selected.
- Inverting it means it's always on.

This provides the facility to leave LEDs permanently on if desired.

DCC Power Monitor

On a well-known layout we've implemented an eight district power monitor. This indicates on all four mimic panels the state of the DCC power for that section using RED for OK and RED for power fail.

It's really easy to configure using on e vPort per power disctict. Follow below to create an example power monitor.

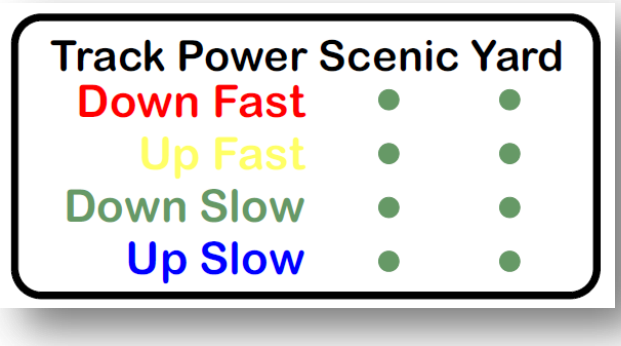
First off, clear out the previous settings by:

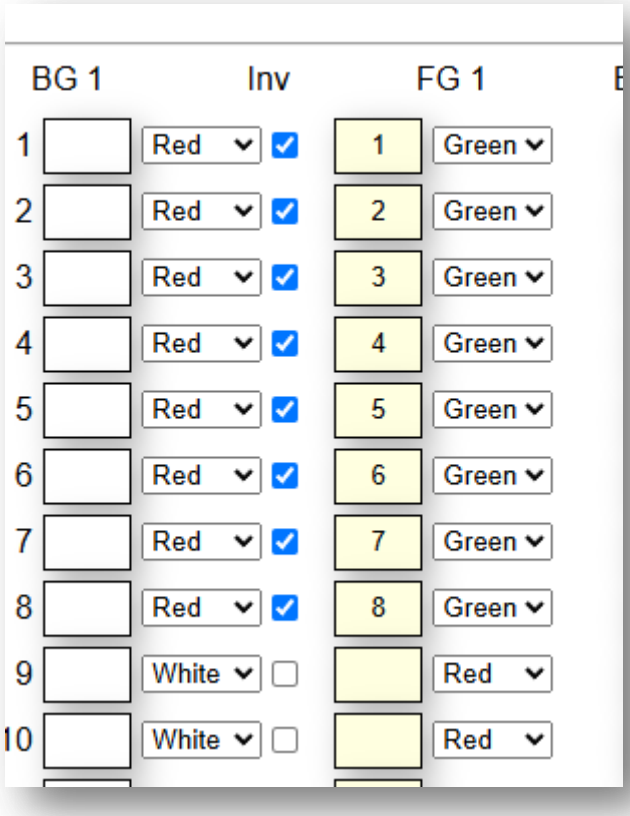
- Reset to defaults
- Save Changes
- Reboot

For each LED on string 1 LED 1-8 set the following:

	Background			Foreground	
LED	vPort	Invert	Colour	vPort	Colour
1-1	0	YES	RED	1	GREEN
1-2	0	YES	RED	2	GREEN
1-3	0	YES	RED	3	GREEN
1-4	0	YES	RED	4	GREEN
1-5	0	YES	RED	5	GREEN
1-6	0	YES	RED	6	GREEN
1-7	0	YES	RED	7	GREEN
1-8	0	YES	RED	8	GREEN

Your settings should like this screenshot:





You should now have all RED LEDs indicating power failure (default setting).

Switch on any of the vPorts 1-8 and the indicator will change to green simulating track power.

In place of the switches, connect a Points Position Indicator to the input terminal of the Panel Controller and the sense wires across the DCC bus. It will go green when power is detected.

Panel Controller Colour Override

The Panel Controller and Mini Panel Controller have the ability to override any colour when used via the CAN network. This feature is not available via MQTT.

Reset the OUT-64 to its default state with:

- Reset to defaults
- Save Changes
- Reboot

Set LED 1 to vPort 1 for the BG1 column.

Switch on and observe the white foreground colour.

From the Panel Controller config screen set the following RGB values for vPort 1:

Red: 255, Green: 0, Blue 255.

When the button is turned on you will see the chosen colour displayed on the LED.

Each individual Panel Controller input can have its own colour override if desired.

Custom Colours

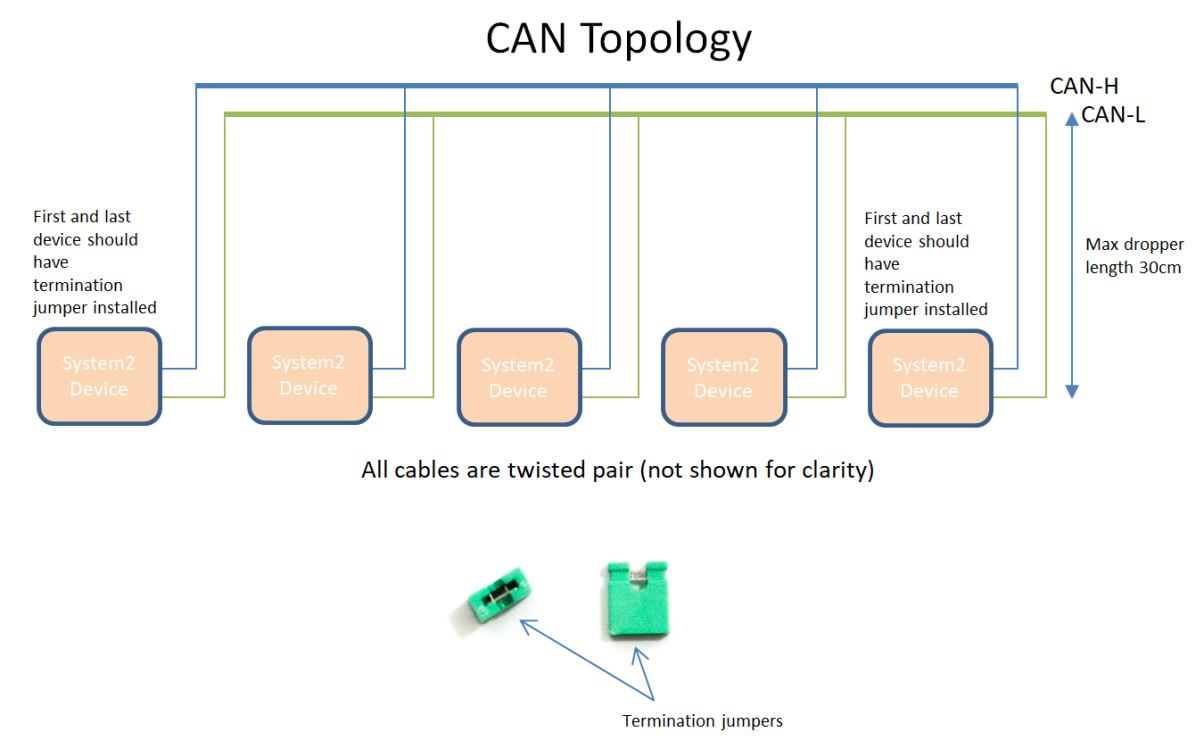
The rdbPanel can has an internal range of eight colours selectable from the drop down selector.

The last three choices relate to custom colours. You can set the RGB values for each of these in the Custom Colour section just above the brightness slider.

Indicating useful information

The examples above provide a flavour of what is possible.

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). The jumpers may have been pre-installed to all boards, remove all except the first and last System2 boards on the network.

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.

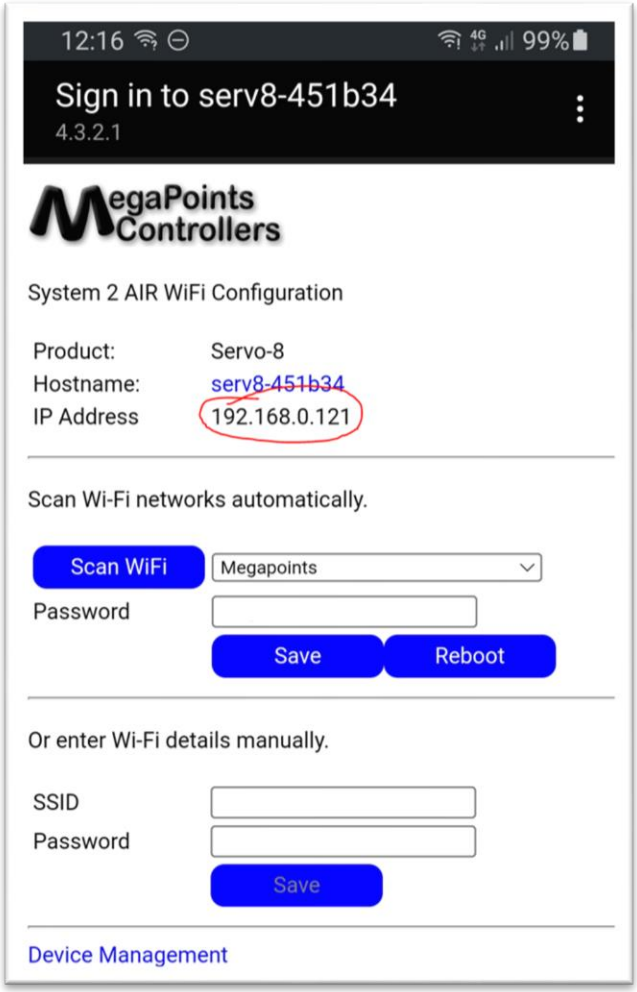
Getting your first board on your local Wi-Fi network

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.

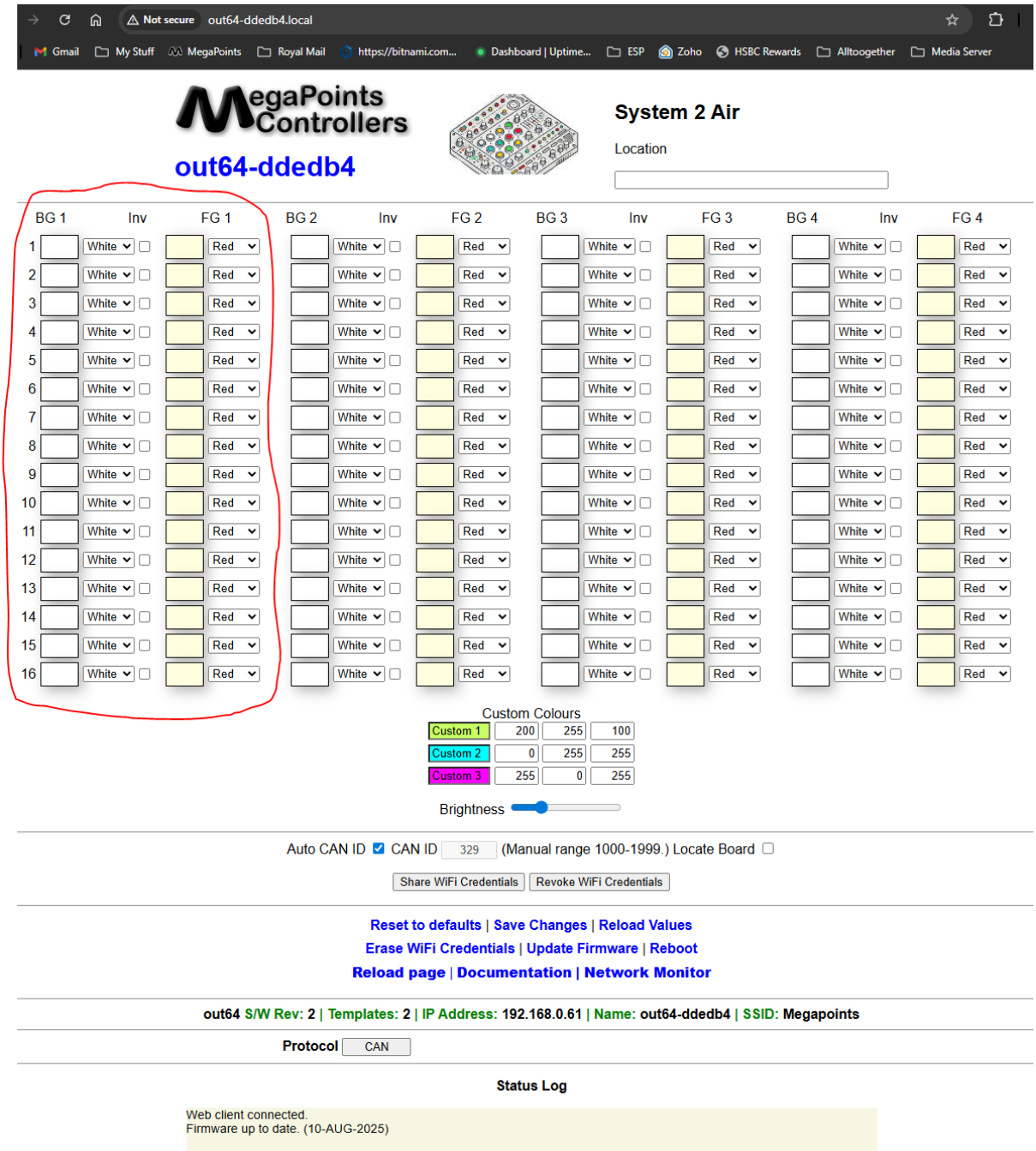
Broadly speaking, here's how to connect to your Wi-Fi:

- 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.



Admin Interface

The admin web page is shown on the page below. It is the place where you will change any settings for the OUT-32. Each board on the System2 network has its own management web page and is unique to the board type and features.



OUT-64 specific fields

The main area has eight columns that are arranged into four pairs corresponding to a string of LEDs on the outputs 1-4. The red band indicates the columns that control LEDs on the first output socket.

On the left, the numbers from 1-16 indicates the LED position within the connected string.

Columns are labelled BG and FG for background and foreground.

The foreground column will override the background if it is triggered.

Setting the BG to a vPort will cause the LED to respond what that vPort is triggered. NOTE: It won't respond to a stateless push to make, so set for toggle switch, stateful or one of the sensor types.

When the vPort is triggered the default while colour will be displayed.

Setting the foreground vPort will trigger a default red LED and override any background colour when the vPort is set.

The background column can be inverted ("Inv"), the foreground cannot.

Colours can be selected from the appropriate drop down box for both foreground and background. A default colour palette is offered. Underneath the vPort configuration you can define up to three custom colours.

If colour data is configured from a Panel Controller it will override any colour data set.

Generic fields

From the main admin page you can see the following information that's generic to all System2 boards:

- Device name and serial number
- Device graphic
- User definable text description or location
- Locate Board: Will cause the LED on the selected board to flash fast helping you to locate the board if you have many.
- 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 (Panel Controller)
    - 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 (SSID)

- 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 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

The location will be added to reports in a future software update. This will be truncated to the first few characters (report formatting) so it's much more useful to state a location such as "B2" or"C12" than the word "Baseboard".

Panel Controller V-Ports

RGB Configuration

The RGB section requires an RGB output board.

Each Red, Green or Blue column can have the values from 0 – 255. The Colour column will show the colour of the RGB values entered.

Phys. Port	vPort	Latch Time	Switch Type	Invert Switch	Red	Green	Blue	Colour	B/G
1	1	500	Push to make (stateless)	☐	255	0	0		☐
2	2	250	Push to make (stateful)	☐	0	255	0		☐
3	3	700	Toggle switch	☐	255	255	0		☐

Background colours are written underneath foreground colours. This allows you to illuminate a route automatically as read from a points position sensor, say in white and then impose a foreground colour on top from a block occupancy detector.

In the image above you can see physical port 1 is triggering V-Port 1 with a red foreground colour.

Physical port 3 is triggering a yellow colour on vPort 3.

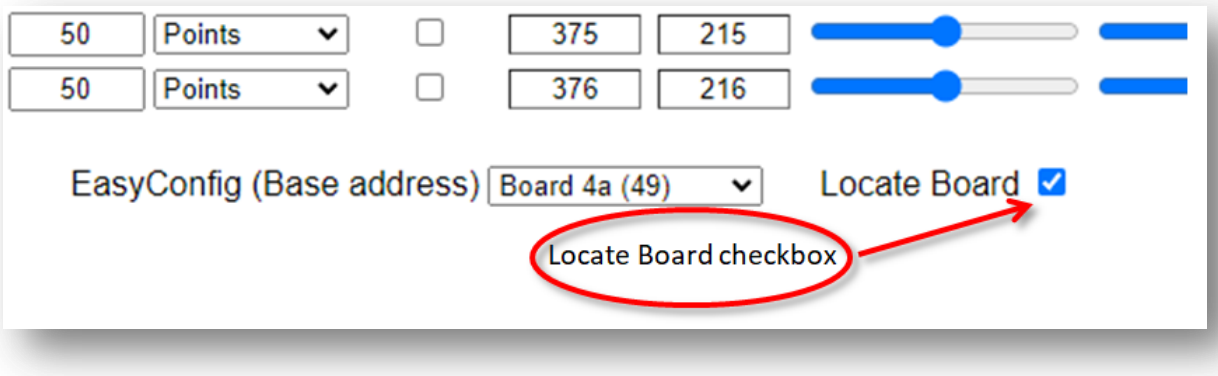
The B/G column is used to set a foreground colour or background colour. For example you could set white to a series of LEDs vPorts indicating a route, and using a colour setting for a block detector set a red colour as foreground to show occupancy on top of a route display.

Board level configuration

This section is common to all System2 boards and features examples from the servo8 driver.

Locate Board

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



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.

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.

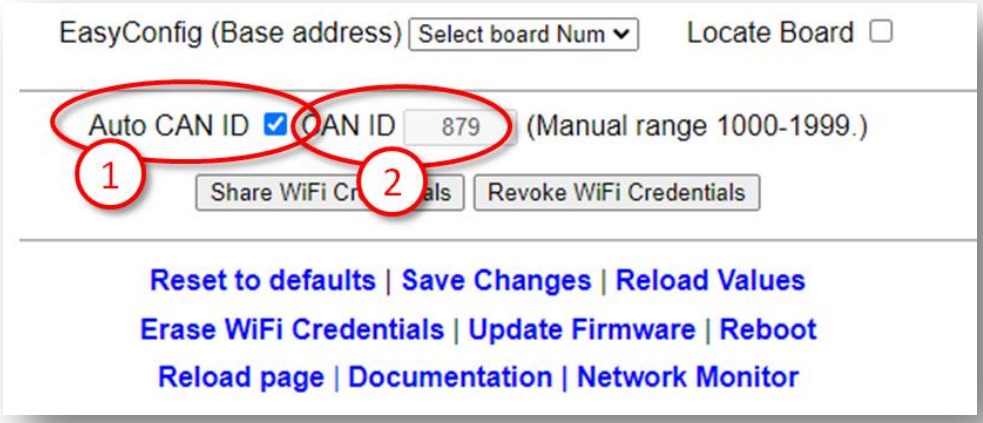
2 x Panel Controller, ID’s 493 and 340 with their respective IP addresses showing they are connected to Wi-Fi.

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.

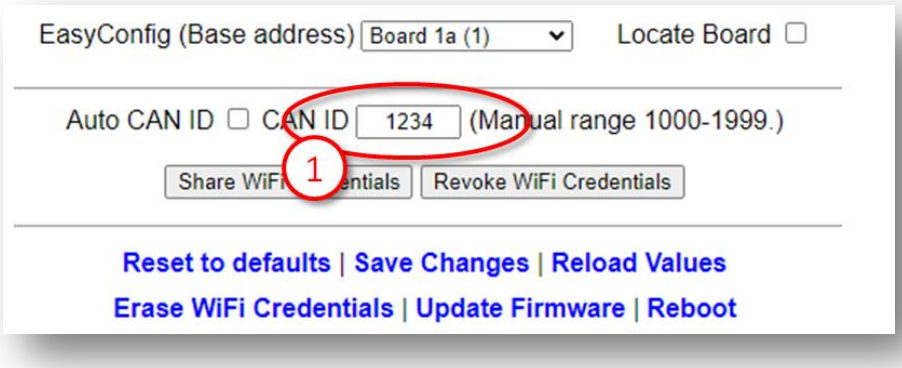


1 Auto CAN ID – Normally left selected (default). This will allow the board to automatically assign its CAN address and if a duplicate is detected may automatically reassign to a vacant address.

2 The current boards CAN ID. Showed greyed out if auto enabled (default).

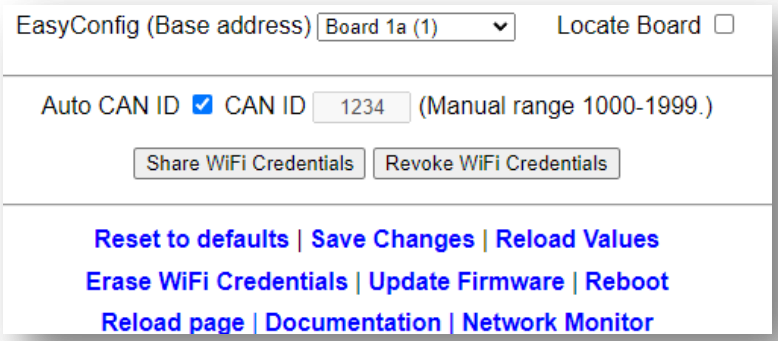
Automatic range: The automatic range for the CAN ID is 1 – 9999. If a duplicate is detected and Auto CAN ID is enabled either this or the other board with a duplicate ID will seek out a vacant CAN ID and update its configuration. When Auto CAN ID is selected do not expect CAN IDs to be persistent as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

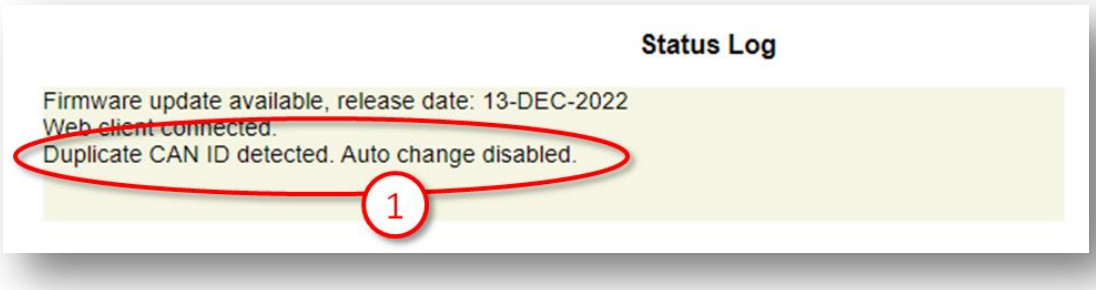


Manual CAN ID selection: We must ask why? There's no possible benefit we can think of, so it's included for edge use cases. Not recommended to change this. Manual range is 1000 – 1999.

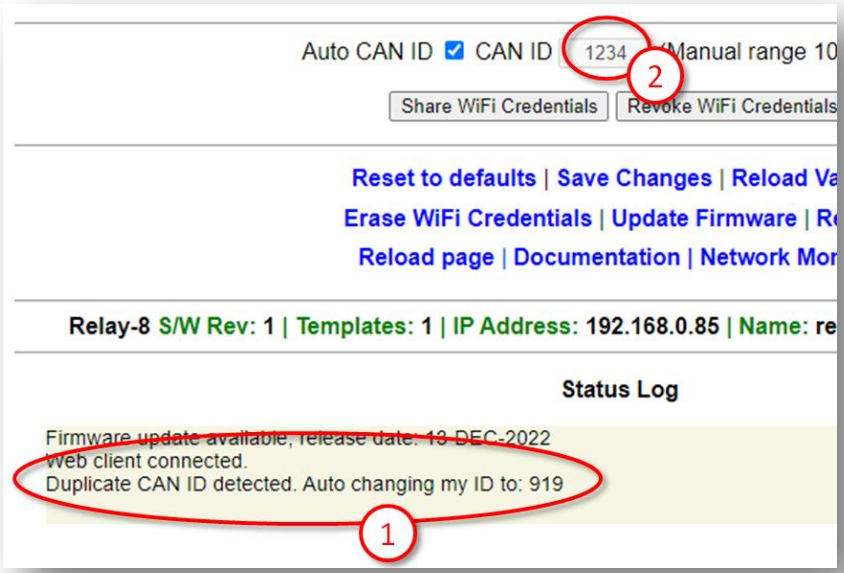
When reselecting Auto CAN ID, the current setting will remain until a collision is detected; whereupon the software will automatically reassign the ID (see below).



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.



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

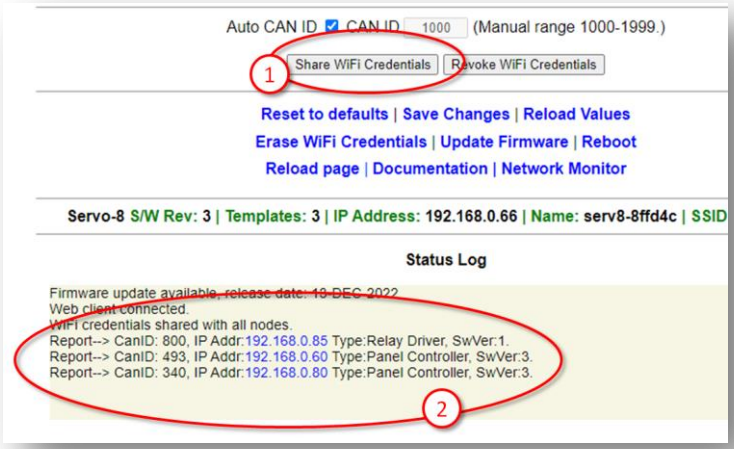
You may recall the procedure to connect the first board to your Wi-Fi network using your phone or tablet to connect to the boards local hotspot? You'll be pleased to know that you don't ever have to go through this again. In this section we'll cover how to share the Wi-Fi configuration with all boards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

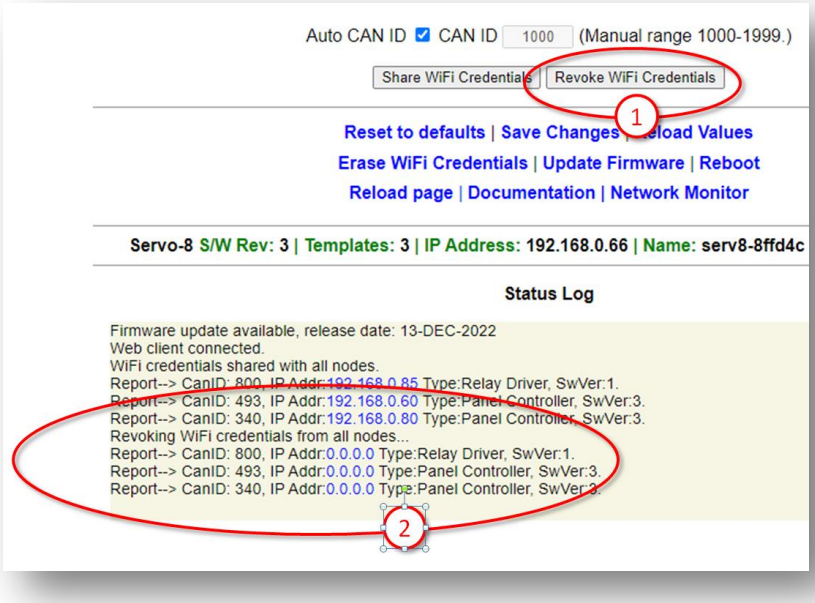
See the diagram below.

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):

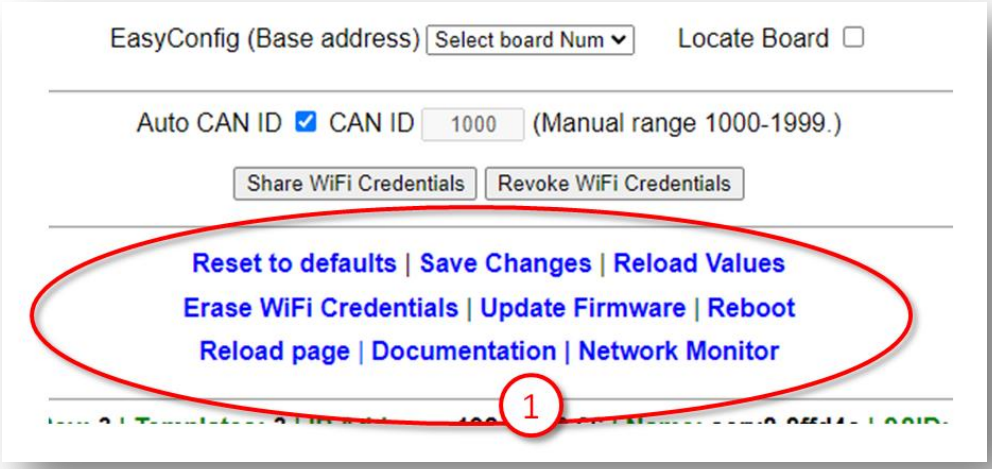


You will observe in the Status Log revocation messages. Each board will restart and show an IP address of “0.0.0.0” showing that it is not connected to any Wi-Fi network.

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.

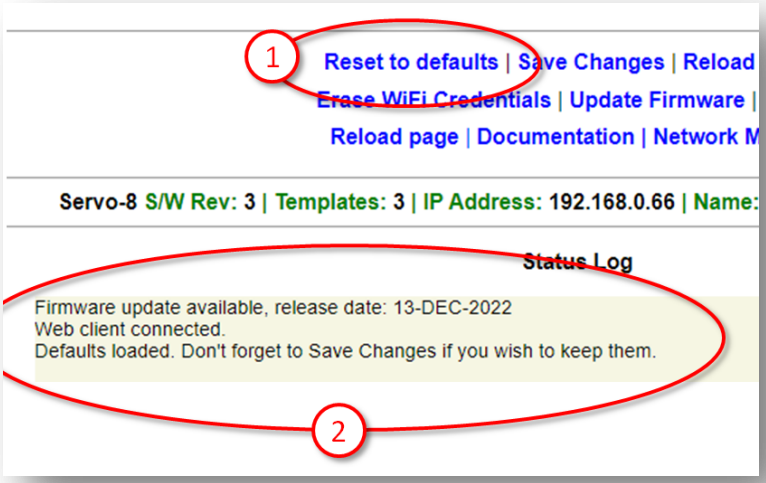
Actions

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.

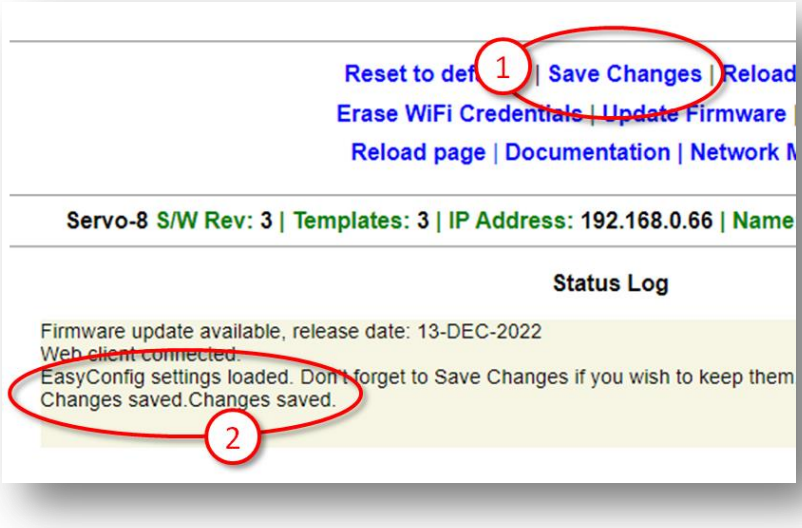
The following are not changed:

- 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.



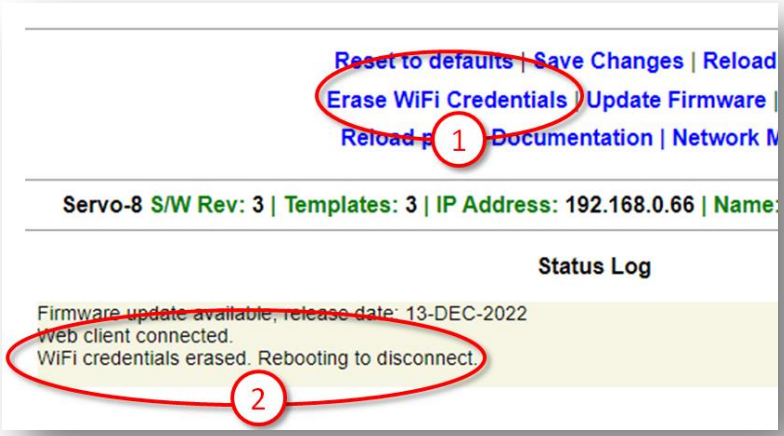
Reload Values

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.



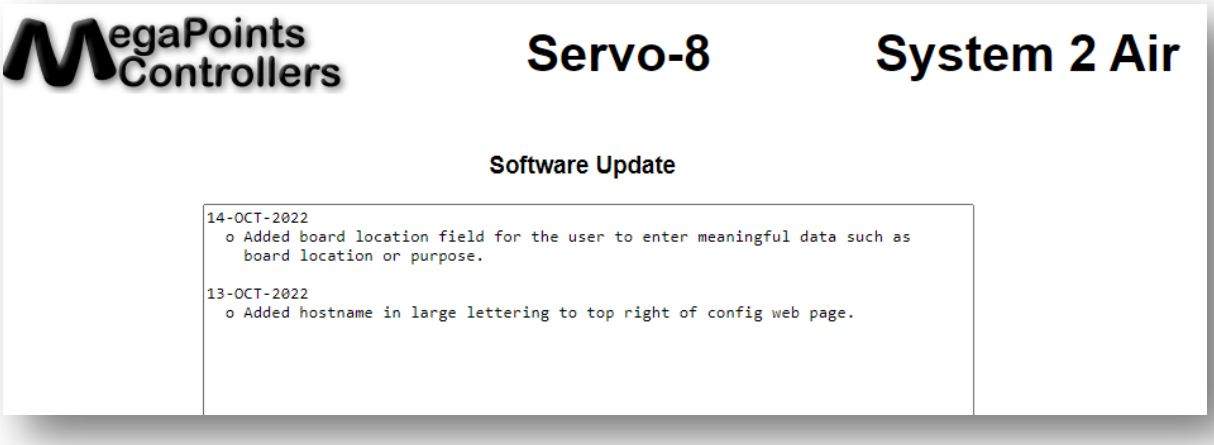
Update Firmware

This section is generic to all System2 boards and uses the Servo8 controller in the examples.

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:

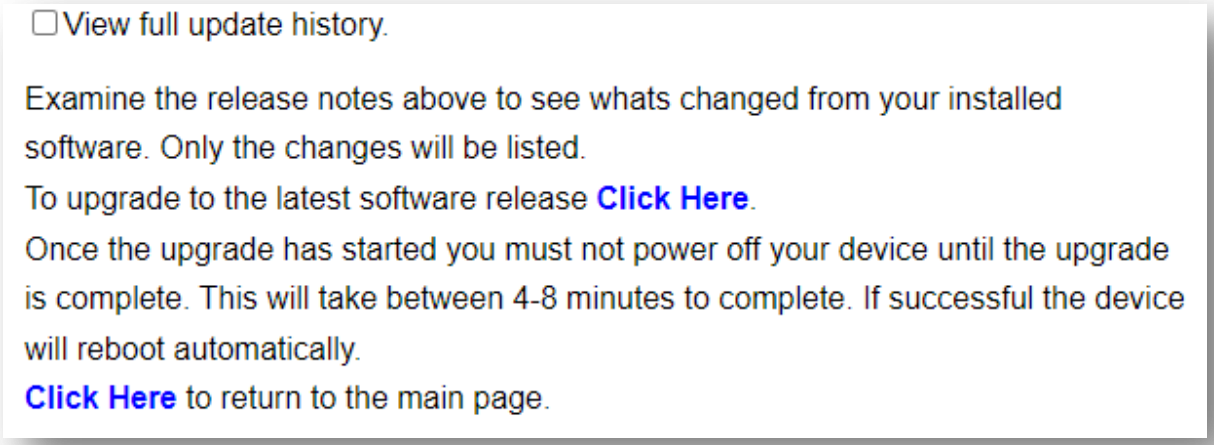
Click on the Update Firmware to begin the dialogue. You will be taken to a new page.

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.



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 were 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.



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.

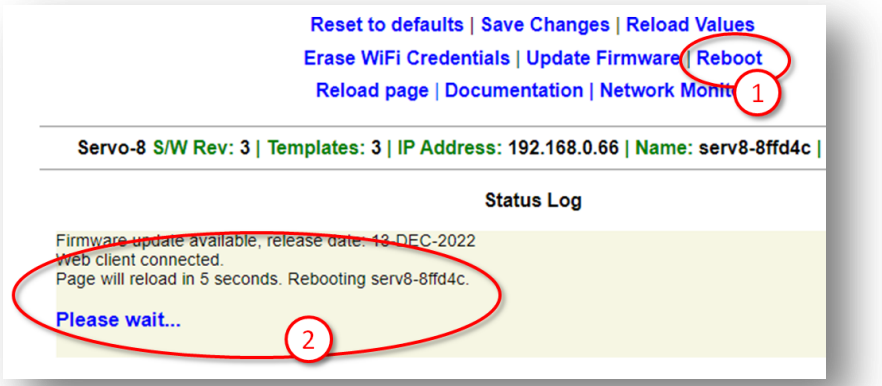
All your configuration data remains unchanged and is preserved across updates.

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.

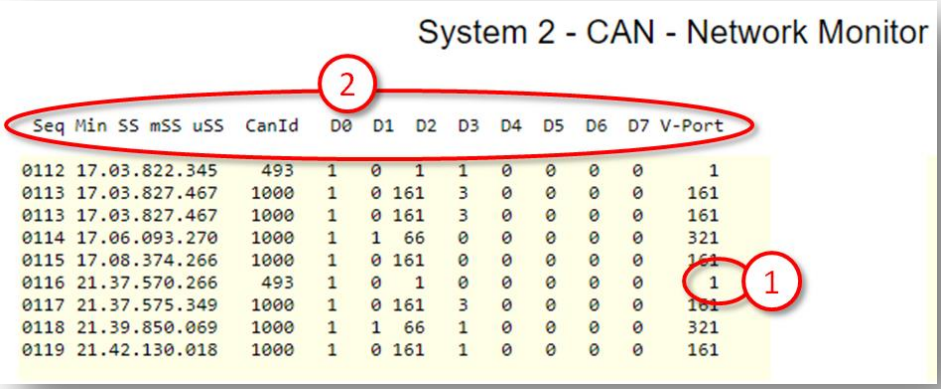
Network Monitor

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.



The V-Port the packet is intended for is decoded n 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.

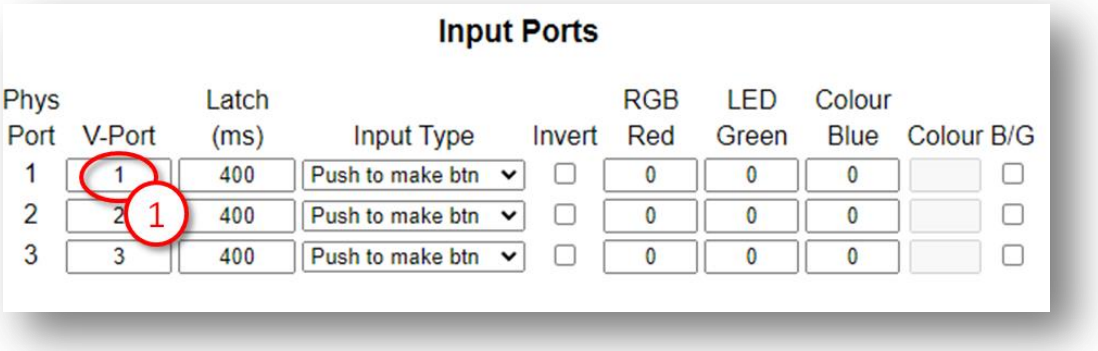
The data fields (D0-7) will be covered in separate documentation and are data type dependent.

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:

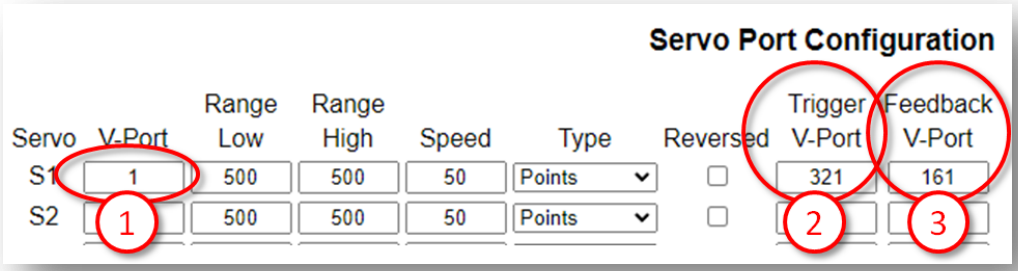


So we know what created the packet, a button on physical port 1.

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.

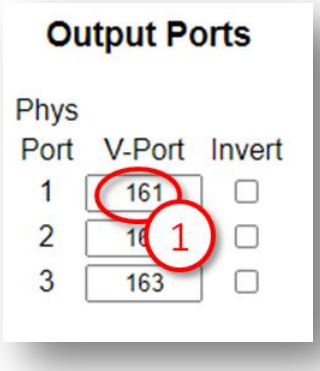
The Servo-8 port configuration is reported as:



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?

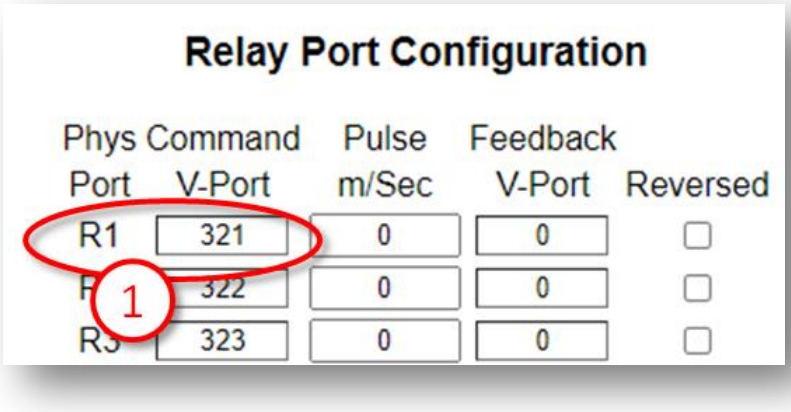


The Output Ports section of the Panel Controller (1 left) matches the Feedback V-Port of the Servo-8. It is this port that is listening for the event.

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:

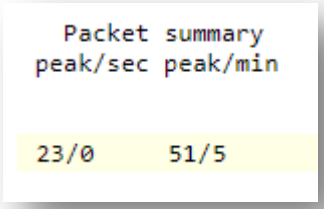


Relay R1 is configured for events on V-Port 321 and will trigger when the Servo-8 is halfway.

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 its 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.



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 right most column shows the sae data over a one minute interval.

Status area

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

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!

Appendix A: Software release notes

Version 10 – Release Date: 29-SEP-2023

NOTICE:

> Before updating, save a screenshot of your button type configuration. This update introduces new button types so they will likely change during the update and you may need to reset them. This applies to the button type dropdown box only. vPorts are unaffected.
>
> You should apply the 02-OCT-2023 patch to Servo Drivers before applying this update.

Patch Notes:

- If you are updating from a previous version the default pushbutton type has changed to stateless. If you want to use the previous behaviour (stateful) you must go into the switch type and reconfigure it as 'stateful'.
- To use stateless (the default option from this point on), update your driver boards to 01-OCT-2023 version or later.
- Updated driver boards will support both types of push to make button transparently and also work well with older revision Panel Controllers.
- Common code across Panel Controller, IN-32 and OUT-32 boards. The board personality (type) is set using compile time options.
- Pushbuttons (push to make) are mow stateless.
  - Instead of sending a '0' or '1' they send a '2' indicating the button has been pressed. The Panel Controllers and OUT-32 boards no longer store the state.
- Servo driver must be updated to SEPT-2023 or later to recognise the stateless mode when using push buttons.
- Toggle switches and sensors remain unaffected.
- JMRI mode via MQTT only recognises 'THWOWN' or 'CLOSED' for turnouts. Therefore use toggle switches when using JMRI mode. Sensors remain unaffected.
- Start of day messages only send sensors and toggle switch states. Stateless mode do not send status, else they would toggle any attached motors.
- Updated CAN library. Now detecting bus resets and buss off messages. Takes appropriate action to recover the CAN controller when necessary.
- Added start of day option to the type column. Assigning a button to start of day will force a synchronization event across all boards. This builds a board list over 1 second, then queries each for its status.
- This has the effect of synchronizing all boards across the network even if they missed the initial boot up messages. Particularly useful for the larger installations where all boards can be synchronized once everything has had time to start up.
- Set proper product image at configuration page header.

CAN Network Monitor

- Deduplicated packets.
- Deduplicated the status log web display area.

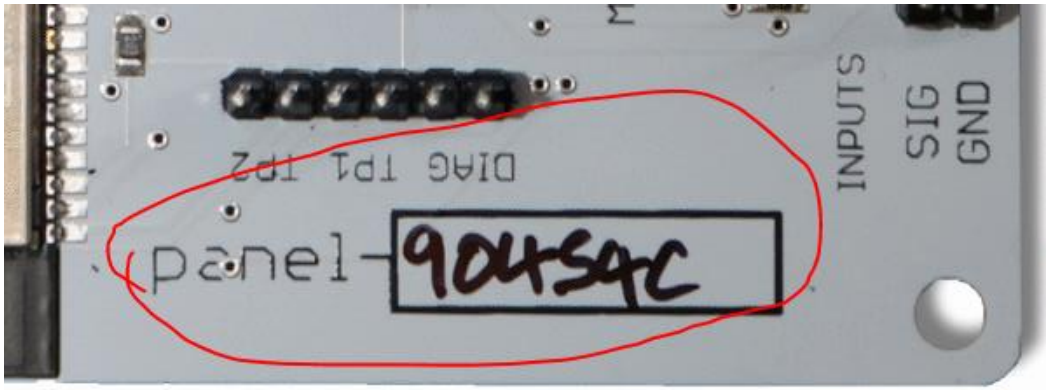
- Removed vPort decode from non vPort traffic types (management data).

Making life easier

During the initial connection to your Wi-Fi you will have gone through the process of teaching your first System2 board how to access your Wi-Fi. On the initial connection you would have probably used the devices IP Address to connect. IP Addresses are numeric and not very meaningful.

Use the devices name to connect

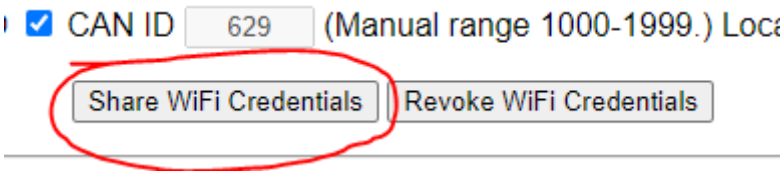
Each device has a name printed on the top of the PCB. Look at the example image below.



The device name is “panel-90454c”. Use this name to connect to your device. In your browser address bar (not search bar or google search) enter “`http://panel-90454c.local`” and your network should locate the device for you. You won’t need to enter the IP address again. In the above example substitute your devices name and serial number.

Use the share Wi-Fi credentials for all other boards

Once you have one board connected to your network, use the share Wi-Fi credentials button to bring all connected boards into your Wi-Fi.



Use the Revoke Wi-Fi button to remove boards from your Wi-Fi. We use these options all the time. Therefore you only need one central admin board connected to your network until it suits you.

Bookmark your devices

Instead of manually maintaining a list of your boards network names, create a bookmark folder within your browser. You can add all the device names to the bookmark folder instead of having to manually enter.

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.