

RADIG Digital LED Controller - User Manual



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1. Introduction

The RADIG Digital LED Controller receives Art-Net or sACN/E1.31 over Ethernet or Wi-Fi and maps DMX channels to eight pixel outputs. The running firmware supports WS2811, WS2812B, and APA102 output selection. Configuration and live status are available through a responsive web interface.

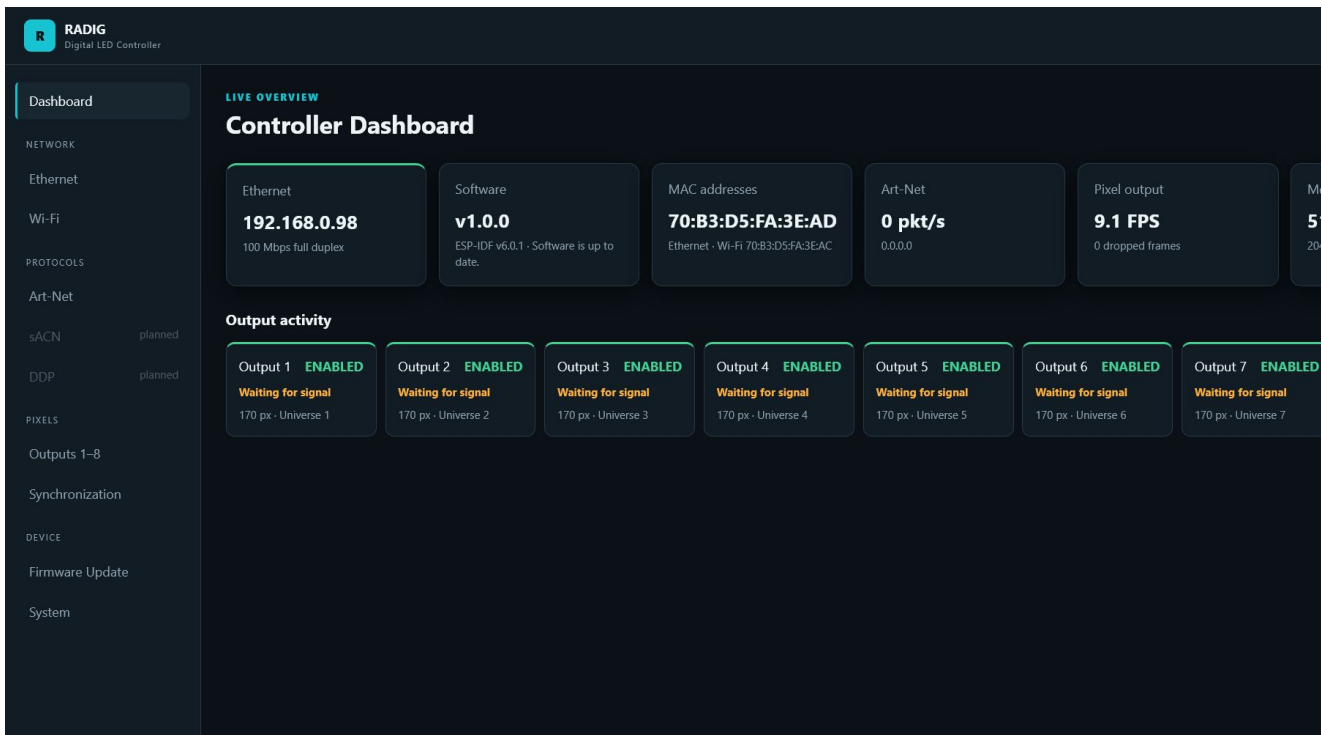
The interface uses a persistent navigation bar. On a narrow screen, open it with the hamburger button. The half-circle button in the header switches between dark and light themes.

CAUTION

Pixel strips require a suitable external power supply. Do not power a strip through a data pin, and do not change wiring while powered.

NETWORK SECURITY

Operate the controller only within your own trusted and isolated local network. The device must not be directly reachable from the Internet. Do not configure port forwarding, expose it through a public IP address, or connect it directly to a public or third-party network. Remote access is permitted only through a network connection secured by the operator, such as a VPN with access control.



2. Hardware overview

The controller is based on an ESP32-S3 with 16 MB flash and PSRAM. Its Ethernet interface operates at 100 Mbps full duplex.

The controller requires a **12 V DC** supply. Its own current consumption is no more than **150 mA**. Connected LED strips and pixels require a separate supply and are not included in this value.

Network interfaces:

Interface	MAC address	Typical address assignment
Ethernet	70:B3:D5:FA:3E:AD	192.168.0.234 (DHCP)
Wi-Fi	70:B3:D5:FA:3E:AC	0.0.0.0 (disabled)

Eight logical outputs are available. APA102 is offered on Outputs 1, 3, 5, and 7 because it uses a data output plus the following output as its clock pair. The corresponding even output is therefore not offered as an APA102 starting point.

NOTE

Connector pin numbers, maximum LED load current, and enclosure wiring are not shown by the running web interface. Use the product label and supplied hardware wiring information; do not infer a pinout from this manual.

3. Getting started

1. Connect the controller by Ethernet to your own isolated local network. Do not provide direct Internet access or configure port forwarding.
2. Power the controller and wait for the link to come up.
3. Open the assigned IP address in a modern browser, for example `http://192.168.0.234/`.
4. Confirm the Ethernet address, software version, and all eight Output activity cards on the Dashboard.
5. Open **Outputs 1-8** and configure input protocol, LED protocol, pixel count, universes, channel order, and synchronization.
6. Send Art-Net or sACN to the configured IP address and universes.

Ethernet uses DHCP in the factory configuration. Find its current address in the DHCP lease list or through Art-Net discovery.

TIP

Configure one output and a short strip first. Use **Identify** before connecting a full installation.

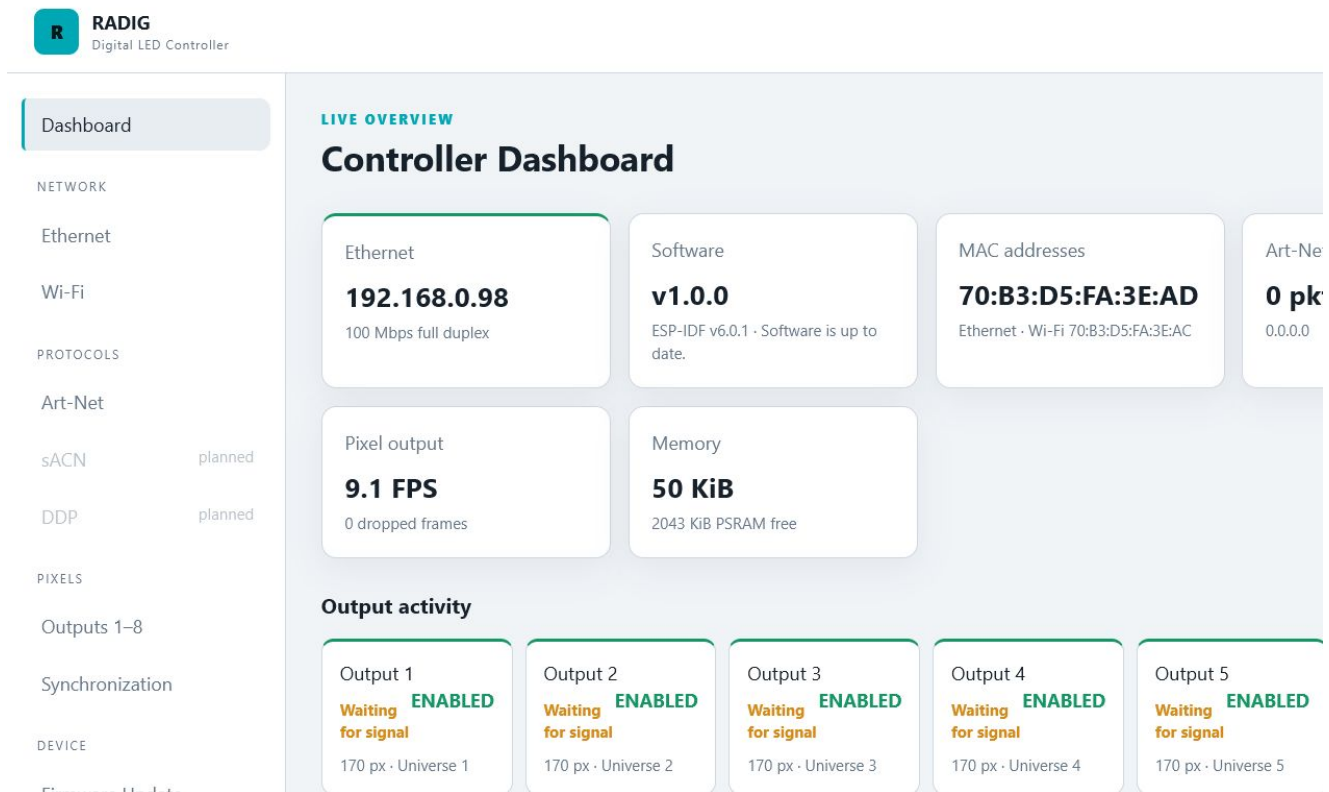
4. Dashboard

The Dashboard is a live overview; it does not contain editable fields.

Card	Meaning	Live example
Ethernet	Current IP, link speed, and duplex	192.168.0.234, 100 Mbps full duplex
Software	Firmware, ESP-IDF, update-check result	v1.1.0, ESP-IDF v6.0.1, software up to date
MAC addresses	Ethernet and Wi-Fi hardware addresses	...:AD and ...:AC
Art-Net	Valid packet rate and active source	0 pkt/s, No active source with no sender
sACN	Valid E1.31 packet rate and active source	Packet/source state matching the sACN page
Pixel output	Current output frame rate and dropped frames	9.1 FPS, 0 dropped during capture
Memory	Free internal memory and PSRAM	about 50 KiB and 2043 KiB PSRAM free

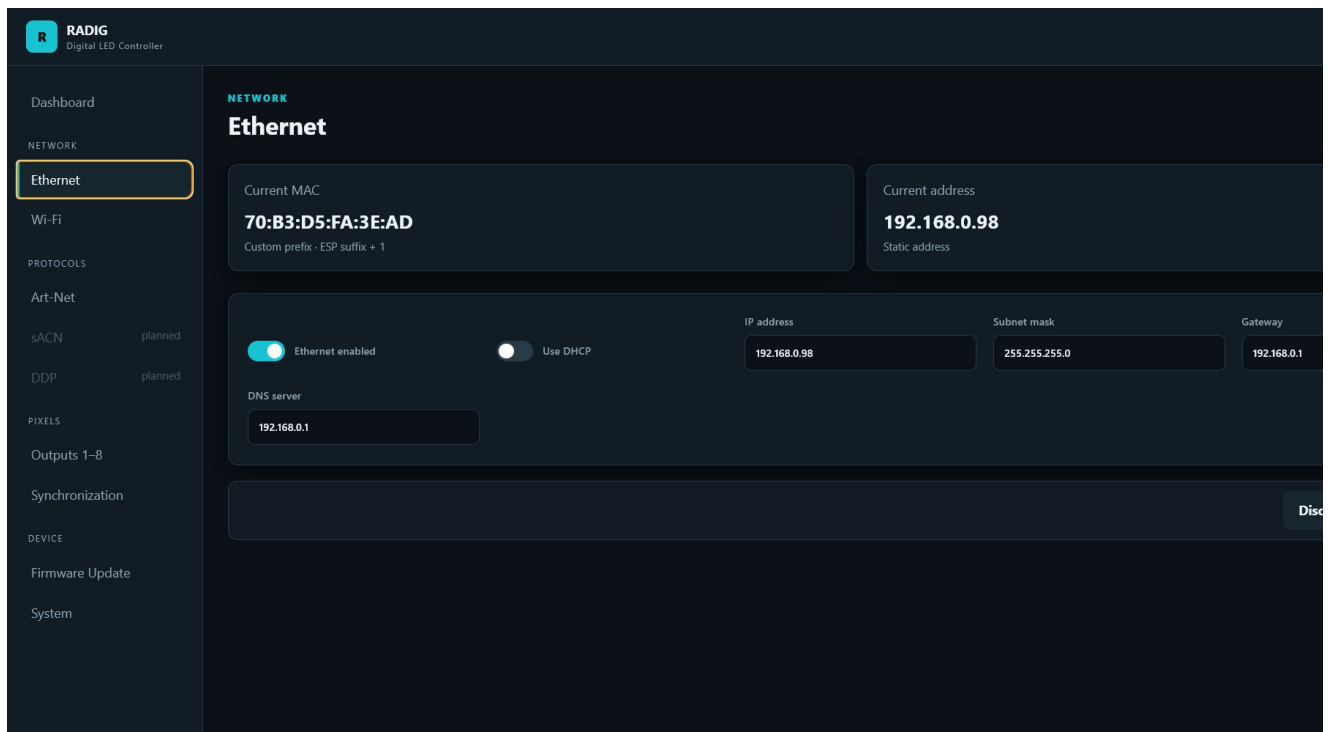
Each Output activity card shows the output number, enabled state, signal state, pixel count, and first universe. An enabled output displays **Waiting for signal** until matching input data arrives.

The software card checks for updates at startup. If no newer release is available, it displays **Software is up to date**. When an update is available, the interface shows the corresponding release information.



On mobile, the cards stack vertically and the navigation is opened with the hamburger button. The controls remain identical in content to the desktop view.

5. Ethernet



Field	Description	Values / default	Effect / example
Ethernet enabled	Enables the wired interface	On/Off; default On	Off removes wired network access.

Field	Description	Values / default	Effect / example
Use DHCP	Obtains settings from a DHCP server	On/Off; default On	On uses a leased address; Off enables the static fields.
IP address	Static address or current lease display	IPv4; live 192.168.0.234	Browser, Art-Net, and sACN destination address.
Subnet mask	Defines the local subnet	IPv4 mask; example 255.255.255.0	Matches a typical /24 LAN.
Gateway	Router used outside the subnet	IPv4; example 192.168.0.1	Required for destinations outside the local LAN.
DNS server	Name-resolution server	IPv4; example 192.168.0.1	Used for host names and online version checks.

Save becomes active after a change. **Discard changes** restores values that were loaded from the controller. After a successful save, the interface displays *Settings saved*. A restart is required to apply network changes.

WARNING

Saving an incorrect static address can make the web interface unreachable. Record the new address before saving and keep a direct recovery connection available.

6. Wi-Fi

RADIG
Digital LED Controller

NETWORK
Wi-Fi

Current MAC
70:B3:D5:FA:3E:AC
70:B3:D5:FA + ESP suffix

Current address
0.0.0.0
Disabled / scan ready

Mode: **Disabled**

SSID:

Password: (Leave blank to keep current)

☒ Use DHCP in station mode

IP address: (0.0.0.0)

Subnet mask: (0.0.0.0)

Gateway: (0.0.0.0)

DNS server: (0.0.0.0)

Scan networks searches for available Wi-Fi networks and displays their signal strength. Selecting a result copies its SSID into the field but does not save it yet. Leaving the page with an unsaved SSID opens a confirmation dialog before the change is discarded.

Field	Description	Values / default	Effect / example
Mode	Wi-Fi operating mode	Disabled, Access Point, Station; default Disabled	Station joins an existing WLAN; Access Point creates one; Disabled keeps Wi-Fi off but scanning remains available.
SSID	Network name	Text or scan result; empty when loaded	Example: Linksys .
Password	WLAN password	Text; blank means keep current	Enter only when setting or changing credentials.
Use DHCP in station mode	Address assignment in Station mode	On/Off; default On	On requests current address data from the WLAN DHCP server.
IP address	Static Station address	IPv4; disabled while DHCP is on	Displays 0.0.0.0 while Wi-Fi is disabled.
Subnet mask	Static Station mask	IPv4	Used only for static Station configuration.
Gateway	Static Station router	IPv4	Used only for static Station configuration.
DNS server	Static Station DNS	IPv4	Used only for static Station configuration.

The current Wi-Fi MAC address is shown at the top of the page.

CAUTION

Do not disclose or screenshot WLAN passwords. A blank password field intentionally preserves the stored password.

7. Protocols

The running interface has a **PROTOCOLS** navigation group with separate status pages for Art-Net and sACN.

Entry	Running state
Art-Net	Available and configurable
sACN / E1.31	Available; unicast and universe multicast on UDP 5568
DDP	Disabled and marked planned

The input protocol is selected per output. Art-Net and sACN use the same one-based **Universe 1-4** fields, so universe numbers do not need to be maintained twice. The sACN page displays the active source, universe, priority, packet data, and active multicast memberships.

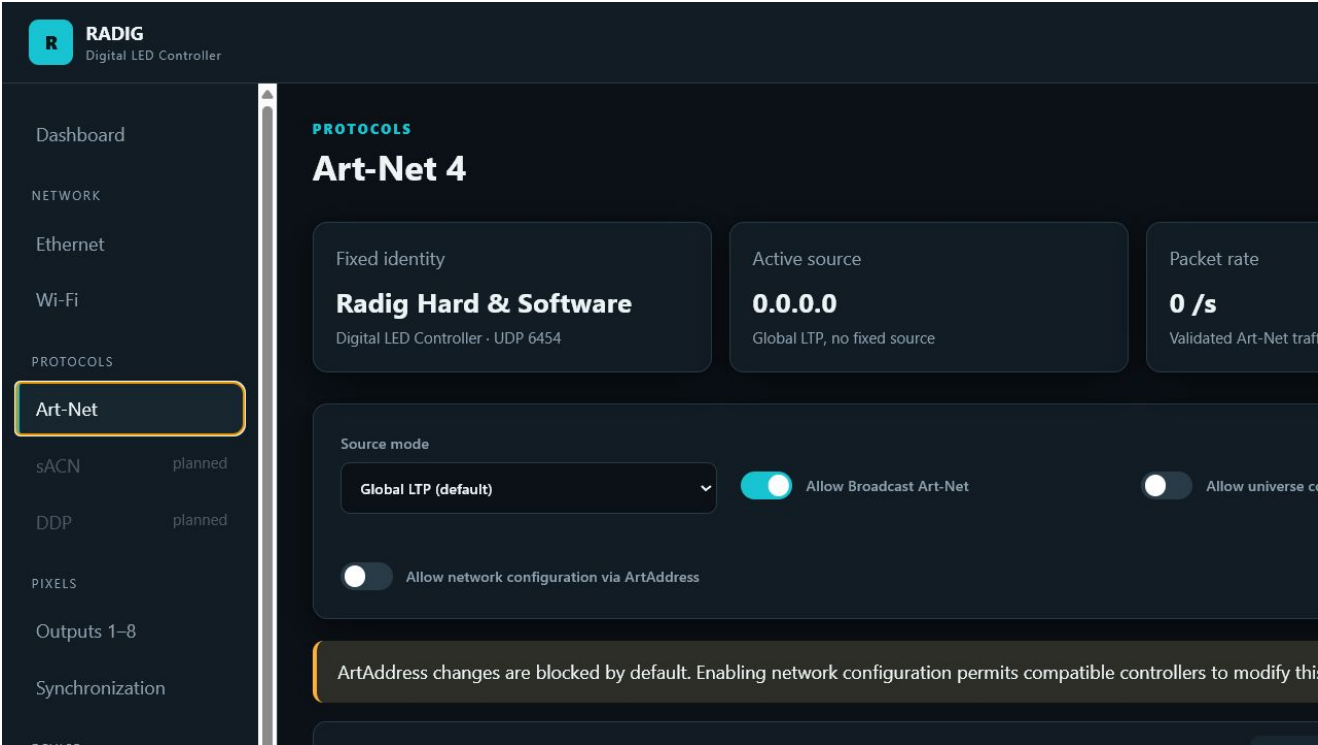
sACN / E1.31

sACN receives DMX data on UDP port 5568. Unicast is sent to the controller's current IP address. For multicast, the firmware automatically joins the standard group 239.255.<Universe-High>.<Universe-Low> for every enabled sACN universe. The highest E1.31-priority source is selected per universe; an equal or lower priority source does not replace it before the source timeout.

Supported behavior includes E1.31 data packets with start code 0, Universes 1-32768, 1-512 DMX slots, sequence checking, preview suppression, stream termination, source timeout, unicast, and multicast. Invalid lengths, vectors, start codes, priorities, and universe numbers are rejected and counted. E1.31 synchronization packets are detected and counted as unsupported; they intentionally do not release output. Use **Automatic**, **Manual**, or **Immediate** for sACN, not **Art-Net Sync**.

The hardware load test sent 16 universes at 44 network frames/s: 3,520 of 3,520 packets were received and 1,760 of 1,760 output frames were committed with no packet, sequence, frame, or DMA loss.

8. Art-Net



The page identifies the node as **Radig Hard & Software - Digital LED Controller** and uses Art-Net UDP port 6454. Live cards show the active source and validated packet rate.

Field	Description	Values / default	Effect / example
Source mode	Chooses how multiple senders are handled	Global LTP (default), HTP Merge, LTP Merge	Global LTP follows the latest active source without fixing an address. HTP keeps the highest value when merging; LTP keeps the latest value.
Allow Broadcast Art-Net	Accepts broadcast Art-Net	On/Off; default On	Useful for broad compatibility, but unicast to the controller IP is preferred.
Allow universe configuration via ArtAddress	Allows remote universe changes	On/Off; default Off	Enable only if the controller application must reconfigure universes.
Allow network configuration via ArtAddress	Allows remote IP changes	On/Off; default Off	Compatible controllers may change the device's network settings.

WARNING

Network configuration through ArtAddress can make the node unreachable and is blocked by default. When broadcast reception is enabled, a red warning indicates received broadcast traffic.

The Dashboard shows 0.0.0.0 when there is no active sender. Prefer unicast packets addressed to the current Ethernet or Wi-Fi IP.

9. Outputs

All eight output cards use the same field set. Settings can be edited independently and saved together with **Save all outputs**. **Discard changes** discards unsaved edits and reloads the stored values.

Field	Description	Values / default	Effect / example
Enabled	Activates the output	On/Off; default On	Disabled outputs do not drive pixels.
Input protocol	Selects the network receiver	Art-Net or sACN (E1.31)	The universe fields remain unchanged when switching protocols.
LED protocol	Electrical pixel protocol	WS2811, WS2812B, APA102 (data + clock pair); default WS2812B	APA102 starts only on Outputs 1, 3, 5, or 7 and consumes the next output for clock.
Color order	Maps incoming RGB channels	RGB, RBG, GRB, GBR, BRG, BGR; default RGB	Choose the order that makes red, green, and blue appear correctly.
Pixel count	Number of pixels	Positive integer; default 170	At RGB, 170 pixels use 510 channels.
Universe count	Universes combined for the output	1 or 2; 3 and 4 become APA102 choices	WS output can use up to two universes; APA102 can use two to four.
Universe 1-4	Shared Art-Net/sACN universe numbers	Numeric; defaults begin with Universes 1-8	Disabled universe fields become active when Universe count increases.
Start channel	First channel within Universe 1	Numeric; default 1	Example: channel 1 maps to the first component of Pixel 1.
Brightness limit	Global output limit	Percentage; default 100	50 limits all values to approximately half output.
Sync mode	Per-output frame rule	Automatic, Manual, Art-Net Sync, Immediate; default Automatic	Overrides the global default for this output.

Field	Description	Values / default	Effect / example
Trigger universe	Universe used to close/trigger a frame	Numeric; defaults to Universe 1	Used by the selected synchronization rule.
Frame timeout	Maximum wait for a frame	Milliseconds; default 40 ms	Releases or handles an incomplete frame after the wait.
Data timeout	Loss-of-data threshold	Milliseconds; default 1000 ms	Controls response when the selected input protocol stops.
Output incomplete frame	Allows incomplete output after frame timeout	On/Off; default On	Prevents indefinite waiting for a missing universe.
Keep previous missing data	Retains last data for missing sections	On/Off; default On	Avoids replacing missing sections immediately.
Reverse pixel order	Reverses logical strip direction	On/Off; default Off	Pixel 1 is mapped to the opposite physical end when enabled.

The validation strip under each card reports validity, total channels, received universe count, estimated frame time, maximum frame rate, and buffer size. With 170 WS2812B pixels it showed **Valid**, 510 channels, 1 of 1 universe, 5.18 ms, 193.1 max FPS, and 1020 B buffer.

Universe examples

- Eight WS2812B outputs with one universe each: Outputs 1-8 can use Universes 1-8, for example.
- Eight WS2812B outputs with two universes each: assign 16 unique universes in total. This was hardware-tested with sACN at 44 FPS without loss.
- APA102: select APA102 on an odd output, use the next physical output as clock, and select two, three, or four universes as required by the pixel count.

WARNING

Do not assign the same universe unintentionally to several outputs. Check the validation badges before saving.

10. Synchronization

The screenshot shows the RADIG Digital LED Controller web interface. The left sidebar contains a navigation menu with categories: Dashboard, NETWORK (Ethernet, Wi-Fi), PROTOCOLS (Art-Net, sACN, DDP), PIXELS (Outputs 1-8, Synchronization), and DEVICE. The 'Synchronization' option under PIXELS is highlighted with a yellow border. The main content area is titled 'PIXELS Synchronization'. It features two settings: 'Global default' set to 'Automatic' and 'WebSocket status rate' set to '1 Hz'. A yellow callout box contains the text: 'Each output can override the global mode. Automatic mode handles non-consecutive universes and duplicate packet boundaries.' At the bottom right of the main area is a 'Discard changes' button.

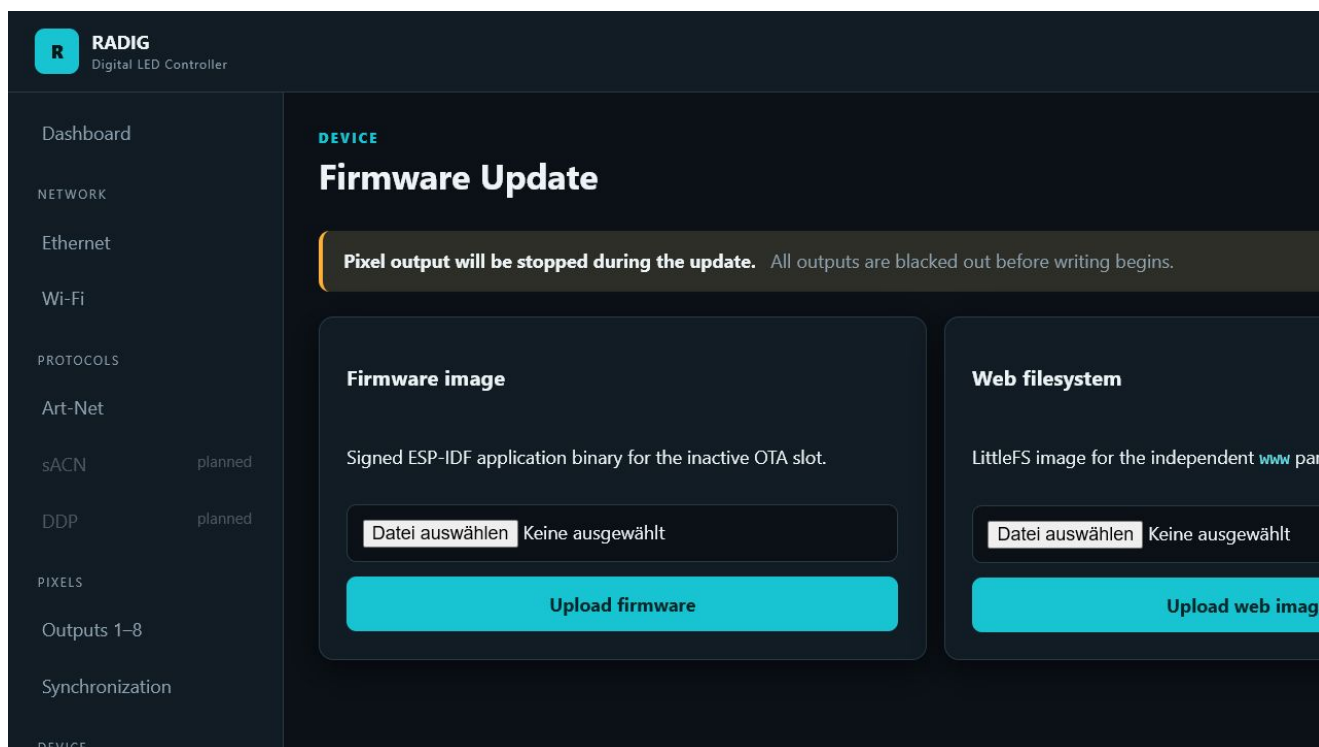
Field	Description	Values / default	Effect / example
Global default	Default frame synchronization	Automatic, Manual, Art-Net Sync, Immediate (diagnostic); default Automatic	Automatic handles non-consecutive universes and duplicate packet boundaries. Individual outputs may override it.
WebSocket status rate	Browser live-update frequency	1, 2, 3, 4, or 5 Hz; default 1 Hz	Higher rates refresh status more often and use more network/browser resources.

Discard changes discards a changed update rate and restores the stored value.

TIP

Start with Automatic. Use Art-Net Sync only for Art-Net when the sender transmits matching synchronization packets. For sACN use Automatic, Manual, or Immediate; E1.31 synchronization packets are not currently released to output.

11. Firmware Update



Two independent upload areas are present:

Area	Accepted purpose	Operation
Firmware image	Signed ESP-IDF application binary for the inactive OTA slot	Choose the firmware binary, then select Upload firmware .
Web filesystem	LittleFS image for the independent www partition	Choose the web image, then select Upload web image .

Selecting an upload button without choosing a file displays *Select a binary image first*.

WARNING

Pixel output is stopped and all outputs are blacked out before writing begins. Do not remove power, network, or close the browser while an upload is in progress. Use only images supplied for this controller and firmware line.

After a firmware update, wait for the controller to reboot, reload the Dashboard, and verify the displayed version. Update the web filesystem separately only when the release package includes a matching web image.

12. System

R

RADIG
Digital LED Controller

Dashboard

NETWORK

Ethernet

Wi-Fi

PROTOCOLS

Art-Net

sACNplanned

DDPplanned

PIXELS

Outputs 1–8

Synchronization

DEVICE

Firmware Update

System

LIVE

0

DEVICE

System

Device name

radig-digi-led-con

Hostname

radig-digi-led-con

Discard changes

Save

System control

A restart interrupts pixel and network output briefly.

Restart controller

Field/control	Description	Default / state	Effect / example
Device name	Human-readable controller name	Digital LED Controller	Shown in the interface and discovery information.
Hostname	Network host name	radig-digi-led-con	Used by network name services where supported.
Save	Stores changed System fields	Disabled until edited	Becomes active as soon as a valid value is changed.
Discard changes	Reloads stored values	Available after editing	Leaves the stored name unchanged.
Restart controller	Reboots the controller	Confirmation required	The restart begins only after confirmation.

CAUTION

Restarting briefly interrupts pixel and network output. Save required changes first.

The live save message indicates when a restart is required to apply network changes.

13. Factory Reset

The default configuration is restored with the hardware Default button. The web interface does not contain a Factory Reset button.

1. Leave the controller powered on.
2. Hold the button marked **Default** for at least five seconds.
3. Release the button and wait for the automatic restart.
4. Find the controller again through DHCP, then re-enter the required network and output settings.

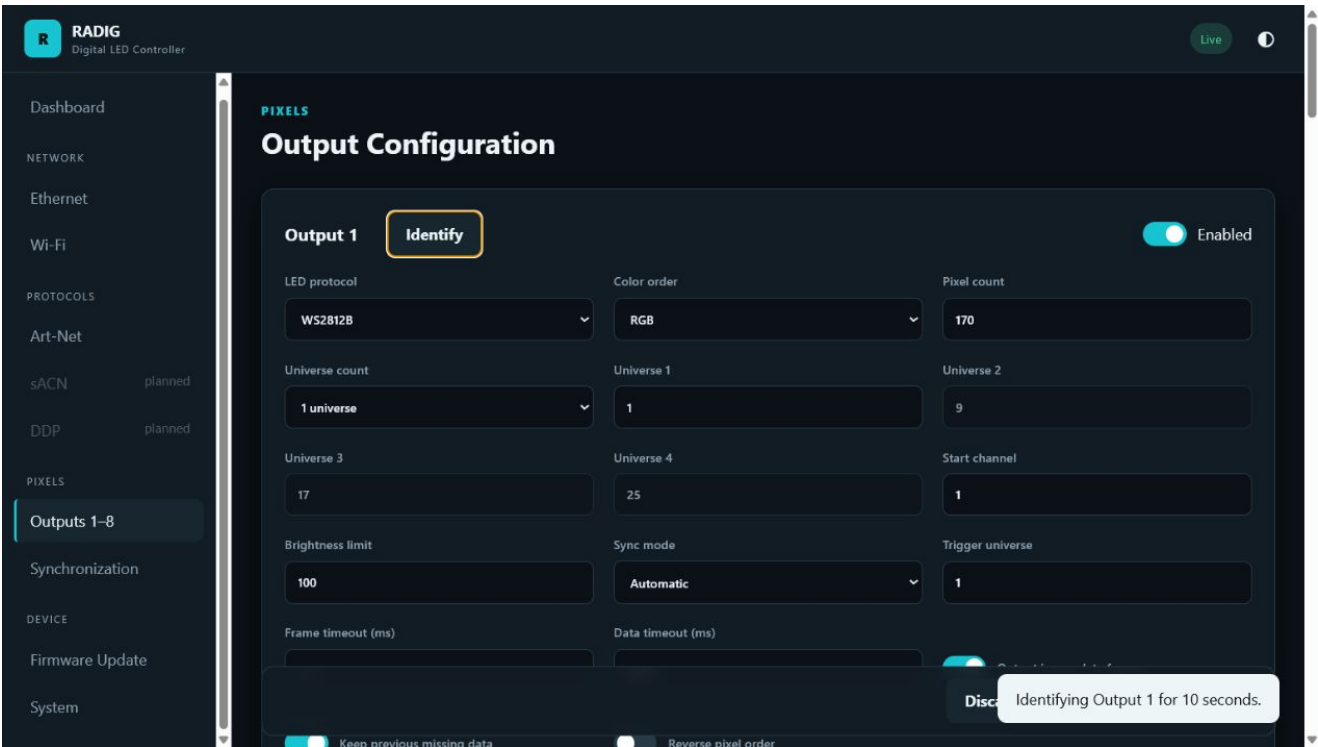
The reset deletes the stored settings and loads the default configuration. The controller then restarts automatically. Network defaults are: Ethernet enabled, DHCP enabled, Wi-Fi disabled, and hostname `radig-digi-led-con`.

WARNING

The Default button deletes the stored configuration. Record all required values first and do not perform the reset during a running show.

14. Identify Output

Every Output card has an **Identify** button. Pressing it displays a message such as `Identifying Output 1 for 10 seconds`. The button remains visibly active during identification.



Use Identify as follows:

1. Ensure the correct strip and power supply are connected.
2. Open **Outputs 1-8**.
3. Find the intended output card and press **Identify**.
4. Observe the physical strip for 10 seconds and match it to the card number.

CAUTION

Identify drives real pixels. Warn people nearby when bright or flashing LEDs could be distracting.

15. Status messages

Messages appear in the status area and remain visible while navigating. Possible messages include:

Message/state	Meaning / action
Settings saved. A restart is required to apply network changes.	Values were stored; restart when the changed network behavior must take effect.
Changes discarded.	Unsaved edits were restored.

Message/state	Meaning / action
Select a binary image first.	An upload was requested without a selected file.
Identifying Output 1 for 10 seconds.	The physical identification sequence is active.
Waiting for signal	Output is enabled but no matching Art-Net or sACN frame is available.
No active source	No sender is active for the selected input protocol.
Software is up to date.	Startup version check found no newer release.

An unsaved-change confirmation appeared when navigating away after a Wi-Fi scan result populated the SSID field. Confirm leaving to discard or remain on the page to save.

16. FAQ

1. **What address do I open?** Use the current Ethernet or Wi-Fi address shown by DHCP or discovery.
2. **Why is Art-Net or sACN showing 0 pkt/s?** No validated traffic is arriving for that protocol.
3. **Why does it say No active source?** No sender is currently active.
4. **Why do all outputs say Waiting for signal?** They are enabled but their configured universes are not arriving.
5. **How many outputs are available?** Eight logical output cards.
6. **Can all eight outputs be enabled?** Yes, all eight outputs can operate in parallel.
7. **Which LED protocols are selectable?** WS2811, WS2812B, and APA102 data/clock pair.
8. **Why is APA102 unavailable on an even output?** APA102 starts on an odd output and uses the following output as clock.
9. **Can one WS output use two universes?** Yes, the Universe count offers one or two.
10. **Can the controller be configured for 16 universes?** Yes. sACN was hardware-tested with 16 universes at 44 FPS without loss.
11. **Why are Universe 2-4 disabled?** Increase Universe count; Universes 3 and 4 are APA102 choices.
12. **How many channels do 170 RGB pixels use?** 510, as shown by the validation badge.
13. **How do I correct swapped colors?** Select the color order that matches the strip.
14. **How do I reverse a strip?** Enable Reverse pixel order on that output.
15. **What does Brightness limit do?** It caps all output values by a percentage.
16. **Which synchronization mode should I use?** Start with Automatic.
17. **When should I use Art-Net Sync?** When the sender supplies appropriate Art-Net synchronization packets.
18. **What is Immediate mode for?** It is labeled diagnostic in the interface.
19. **Can I identify a connected strip?** Yes, press Identify on its output card; the sequence lasts 10 seconds.
20. **Does the controller support DHCP?** Yes, separately for Ethernet and Wi-Fi Station mode.
21. **Can I use a static Ethernet address?** Yes; enter IP, mask, gateway, and DNS with DHCP off.
22. **Can the controller scan WLANs while Wi-Fi is disabled?** Yes, network scanning remains available.
23. **What does a blank password field mean?** Keep the currently stored password.
24. **Are sACN and DDP available?** sACN/E1.31 is available from firmware 1.1.0; DDP remains planned.
25. **Should I send broadcast Art-Net?** Unicast is preferred; broadcast acceptance can be enabled.
26. **Can ArtAddress change the IP?** Only if Allow network configuration via ArtAddress is enabled.
27. **How do I switch themes?** Use the half-circle button in the header.
28. **Can I update only the web interface?** Yes, through the separate Web filesystem upload using a matching supplied image.

29. **How do I restore the default configuration?** Hold the hardware Default button for at least five seconds and wait for the automatic restart.
30. **How do I restart safely?** Save changes, stop show-critical output, press Restart controller, and confirm the dialog.

17. Troubleshooting

Symptom	Check	Corrective action
Web page cannot be opened	Link, IP, subnet, DHCP lease	Use the current address; reconnect locally if a static address was entered incorrectly.
Ethernet card has no useful address	Cable and DHCP/static fields	Enable Ethernet and correct the address configuration.
Wi-Fi remains at 0.0.0.0	Mode, SSID, password, DHCP	Select Station or Access Point as intended, enter credentials, save, and restart if requested.
Scan finds no networks	Antenna/location and retry	Move closer to the access point and scan again; network scanning remains available while Wi-Fi is disabled.
Art-Net rate stays at 0	Sender destination, UDP 6454, firewall, universe	Send unicast to the current controller IP and configured universes.
sACN rate stays at 0	Input protocol, UDP 5568, universe, unicast/multicast	Select sACN on the output; send unicast to the controller IP or use the E1.31 standard multicast group.
sACN multicast groups stays at 0	No enabled sACN output	Enable an output, select sACN, and save a valid universe.
Wrong colors	Color order	Try the six selectable orders with a known RGB test pattern.
Pixels stop early	Pixel count and universe count	Increase pixel/universe count without exceeding the installation wiring and power limits.
Output remains Waiting for signal	Enabled state and universe mapping	Match sender universe, start channel, and trigger universe.
Frames tear or update unevenly	Sync mode and missing universes	Use Automatic first; verify all expected universes and frame timeout.
Data disappears after a pause	Data timeout and missing-data settings	Review Data timeout, Output incomplete frame, and Keep previous missing data.
APA102 cannot be selected	Output number	Start APA102 on Output 1, 3, 5, or 7 and reserve the paired clock output.
Save button is disabled	No field has changed	Edit a valid field; the button activates only for changes.
Upload says select a binary	No file selected	Choose the correct binary first.
New UI does not appear after update	Web image not updated/cache	Upload the matching web filesystem image if supplied and reload the browser.
Unexpected restart interruption	Restart was confirmed	Wait for boot, reload the address, and verify Dashboard status before resuming output.
Device is not reachable at its old IP after a Default reset	DHCP was re-enabled	Find the new address in the DHCP server or through Art-Net discovery.

WARNING

Stop and remove power if hardware becomes hot, smells unusual, or wiring is damaged. Software settings cannot correct unsafe power distribution.

18. Technical data

Item	Specification / function
Product	RADIG Digital LED Controller
Target	ESP32-S3
Supply	12 V DC
Controller current	Max. 150 mA, excluding connected LED loads
Flash image layout	16 MB, DIO, 80 MHz
PSRAM	Available; free memory is shown live on the Dashboard
Ethernet	100 Mbps full duplex
Ethernet MAC	70:B3:D5:FA:3E:AD
Wi-Fi MAC	70:B3:D5:FA:3E:AC
Art-Net	Art-Net 4 page, UDP port 6454
sACN / E1.31	Unicast and universe multicast, UDP port 5568; highest priority per universe
Logical outputs	8
Pixel protocols selectable	WS2811, WS2812B, APA102 data/clock pair
Color orders	RGB, RBG, GRB, GBR, BRG, BGR
Art-Net source modes	Global LTP, HTP Merge, LTP Merge
sACN hardware load test	16 universes, 44 FPS, 3,520/3,520 packets without loss
Global sync modes	Automatic, Manual, Art-Net Sync, Immediate (diagnostic)
Status update rates	1-5 Hz
Hardware Default button	Hold for five seconds; deletes stored settings and restarts
Web update partitions	Firmware OTA image and independent LittleFS www image

Permitted LED load current, connector pinout, operating temperature, and enclosure rating are specified by the product label and the supplied hardware documentation.

19. Licences and trademarks

Art-Net™ Designed by and Copyright Artistic Licence Engineering Ltd

Art-Net™ is a trademark of Artistic Licence. The Art-Net protocol and its associated documentation are protected by copyright. Artistic Licence makes the protocol available for implementation on a royalty-free basis, subject to the conditions published on the official Art-Net website.

The RADIG Digital LED Controller uses Art-Net OEM code 0x1110, registered to **Radig Hard Software – EDC 01**, and ESTA manufacturer code 0x0111.

Official information, specification, and licence conditions: <https://art-net.org.uk/>