

The logo consists of three stylized 'z' characters stacked vertically, with the top one being the largest and the bottom one the smallest. 

# Expert Sleepers

**ES-9**

**Firmware v1.0**

**User Manual**

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## Table of Contents

Introduction.....	<a href="#">4</a>	MIDI "Low-Voltage Signaling".....	<a href="#">11</a>
Installation.....	<a href="#">4</a>	MIDI System Exclusive (SysEx).....	<a href="#">12</a>
Power requirements.....	<a href="#">4</a>	SysEx Header.....	<a href="#">12</a>
Connecting to a host (computer/tablet/etc.)..	<a href="#">4</a>	Received SysEx messages.....	<a href="#">12</a>
Connecting expansion modules.....	<a href="#">5</a>	22H – Request version string.....	<a href="#">12</a>
Jumpers.....	<a href="#">5</a>	23H – Request configuration dump.....	<a href="#">12</a>
Inputs and Outputs.....	<a href="#">6</a>	24H – Request save.....	<a href="#">12</a>
Channel numbering.....	<a href="#">6</a>	25H – Request restore.....	<a href="#">12</a>
Controls.....	<a href="#">7</a>	26H – Request wipe.....	<a href="#">12</a>
LEDs.....	<a href="#">7</a>	31H – Set HPF.....	<a href="#">13</a>
Configuration Tool.....	<a href="#">7</a>	40H to 43H – Set Inputs.....	<a href="#">13</a>
Tool Setup.....	<a href="#">8</a>	50H to 53H – Set Outputs.....	<a href="#">13</a>
Saving and restoring.....	<a href="#">8</a>	60H to 67H – Set Mix.....	<a href="#">13</a>
Input DC Blocking.....	<a href="#">8</a>	Sent SysEx messages.....	<a href="#">13</a>
Routing.....	<a href="#">9</a>	10H – Configuration dump.....	<a href="#">13</a>
Mixer.....	<a href="#">10</a>	32H – Message.....	<a href="#">13</a>
5-pin DIN MIDI I/O.....	<a href="#">10</a>	Firmware Updates.....	<a href="#">14</a>
Connections.....	<a href="#">11</a>	Where to get help.....	<a href="#">14</a>

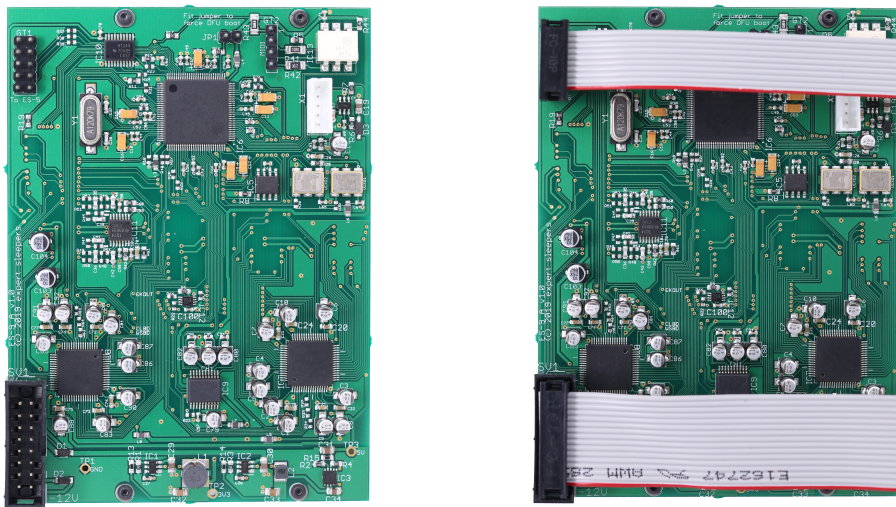
## Introduction

Congratulations on your purchase of an Expert Sleepers ES-9. Please read this user manual before operating your new module.

## Installation

House the module in a Eurorack case of your choosing. The power connector is [Doepfer standard](#)<sup>1</sup>. If using the power cable supplied with the module, the red edge of the cable is closest to the bottom edge of the PCB, and carries -12V. ("-12V" is marked on the PCB itself next to this end of the connector.) Be sure to connect the other end of the power cable correctly, again so -12V corresponds to the red stripe on the cable.

The photos below show the back of the ES-9 with and without the power cable attached. The second, smaller cable is for the ES-5 expansion.



## Power requirements

The ES-9 draws up to 451mA on the +12V rail, and 133mA on the -12V rail (at 96kHz, slightly less at 44.1/48kHz).

It does not use the 5V rail.

## Connecting to a host (computer/tablet/etc.)

Connect the host via the ES-9's USB C socket. Note that this does not require the host to have a USB C socket, or to support USB 3.0. For hosts without a USB C socket, use a 'Type A to type C' cable, specified for USB 2.0 or USB 3.0.

The ES-9 does not draw power from the USB connection.

When a USB host is connected and successfully communicating with the ES-9, the LED immediately below the USB socket will light.

No driver is required for operation with macOS, iOS, or Linux. A Windows audio driver is available from the Expert Sleepers [downloads page](#)<sup>2</sup>.

<sup>1</sup> [http://www.doepfer.de/a100\\_man/a100t\\_e.htm](http://www.doepfer.de/a100_man/a100t_e.htm)

<sup>2</sup> <https://expert-sleepers.co.uk/downloads.html>

Select the ES-9 in your DAW's preferences as required.

## **Connecting expansion modules**

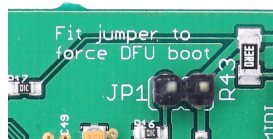
Connect an ES-5 module via the header on the back of the ES-9 marked “GT1 – To ES-5”, using the 10-way cable provided. The red stripe should be oriented down on both modules, as shown in the photo above, and in the [ES-5 user manual](#)<sup>3</sup>. By default, the ES-5 will be controlled by channels 7-8 in your DAW.



Connect a MIDI breakout to the header on the back of the ES-9 marked “GT2 – MIDI”. See the MIDI I/O section below.

## **Jumpers**

There is one jumper header on the ES-9 marked “JP1 – Fit jumper to force DFU boot”.

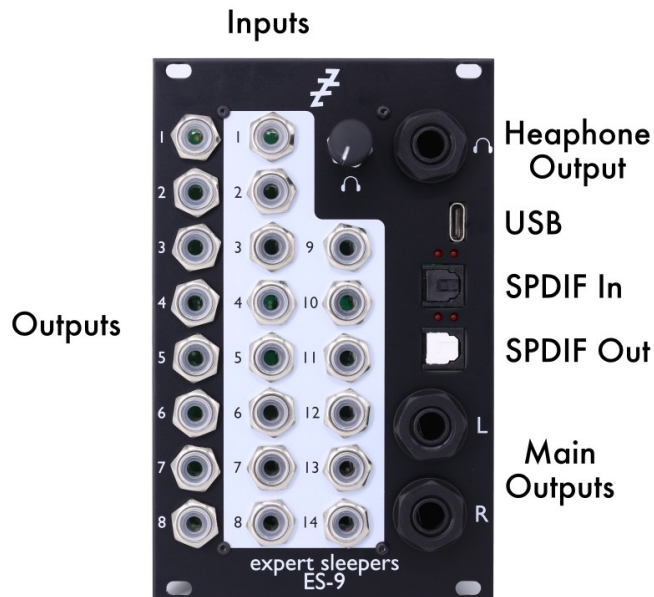


Fitting a jumper here forces the module to boot up in DFU (Device Firmware Update) mode, in case the firmware has somehow become corrupt and it is impossible for the host computer to cooperatively get the module to boot into this mode. It should not be necessary in normal usage.

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<sup>3</sup> <https://expert-sleepers.co.uk/es5usermanual.html>

## Inputs and Outputs



The ES-9 has fourteen analogue inputs on 3.5mm TS jack sockets. These are designed to cope with any Eurorack signal, and are DC coupled, so can be used for CVs as well as audio. An input voltage of approximately  $\pm 10V$  will give a 0 dBFS level in your DAW.

The input ADCs (analogue to digital converters) have optional DC Blocking filters, which can be switched on or off in pairs. It is recommended to have these on if the input is being used for audio, to maximise dynamic range and to avoid pops due to DC offsets in the recorded audio. The filter must be turned off in order to use the input for CV.

The module has twelve analogue output channels. Eight of these are Eurorack-style 3.5mm TS jack sockets, with a maximum output voltage of approximately  $\pm 10V$ , and which are DC coupled. They can be used for audio or CVs.

In addition, the ES-9 has a pair of 1/4" TRS balanced outputs, and a 1/4" stereo headphone output. The balanced outputs are not DC coupled, and are designed to connect to monitor speakers or a mixing desk. The headphone output is DC coupled.

The ES-9's 3.5mm jack sockets are illuminated, lighting red for positive voltage and blue for negative voltage. (Audio appears purple, since it is a rapid alternation of positive and negative.)

Finally, the ES-9 has a pair of optical (TOSlink) sockets, which carry digital audio in the S/PDIF standard.

### ***Channel numbering***

The default channel numbering in your DAW will appear as follows, though this can be reconfigured as required.

Main outputs: 1/2

Headphone output: mix of 1/2 & 3/4

S/PDIF output: 5/6

ES-5 output: 7/8

3.5mm outputs: 9-16

3.5mm inputs: 1-14

S/PDIF input: 15/16

## Controls

The ES-9 has a single control, which is a volume knob for the headphone output.



The knob also has a push-button function, but this is unused in this firmware revision.

## LEDs

There are four LEDs on the ES-9's panel. Refer to the image below:



LED A should be on constantly when the ES-9 is powered up.

LED B indicates a successful USB connection to a host.

LED C lights when MIDI is received from the host and output to the breakout.

LED D lights when MIDI is received from the breakout and output to the host.

At startup all four LEDs should flash twice rapidly, followed by them lighting one at a time in sequence D, C, B, A.

## Configuration Tool

A GUI tool is provided to configure the ES-9. Please find the version appropriate to your firmware version on the [firmware download page](https://expert-sleepers.co.uk/es9firmware.html)<sup>4</sup>.

A standalone version is provided for macOS and Windows, as well as a platform-independent browser-based version. This last uses the Web MIDI API, which at the time of writing will work only in browsers based on Google's Chromium (which includes Chrome).

All is well if the tool shows Web MIDI status: OK

If it shows Web MIDI status: No MIDI support in your browser then you need to use a different browser.

In general, changes made in the tool are reflected immediately in the hardware.

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<sup>4</sup> <https://expert-sleepers.co.uk/es9firmware.html>

## Tool Setup

The tool needs a MIDI connection to the ES-9. It is most convenient to connect the ES-9 directly to the computer running the tool via its USB C port, but it will work just as well connected indirectly via the MIDI breakout.

At the top of the tool are these controls:

Send to MIDI port:  Listen on MIDI port:

The Send to/Listen on MIDI port menus should say “ES-9 MIDI Out” (or “In”) if the ES-9 is connected directly, or whichever MIDI device leads to the ES-9 if it is connected indirectly.

The Request ES-9 Version button sends and receives short SysEx messages to report the ES-9's firmware version. It is useful to quickly test the connection. It will look something like this, in the tool's status boxes:

11:58:31: sent config request to ES-9 11:58:39: sent config request to ES-9 11:58:39: received sysex (267 bytes) 11:58:49: sent version request to ES-9 11:58:49: received sysex (13 bytes)	11:58:49 F0 00 21 27 19 22 F7	11:58:49 F0 00 21 27 19 32 31 2E 30 2E 30 00 F7 ----- 1.0.0
---	----------------------------------	--

The left box is a log of messages reported by the tool. The centre box shows the last SysEx message sent by the tool. The right box shows the last SysEx message received by the tool, and in the case of the Message SysEx message, the actual message as plain text (“1.0.0” in the example above).

The Request Config button asks the ES-9 to return a dump of its current state. This should happen automatically in most cases so should not be necessary.

## Saving and restoring

The large buttons at the top deal with saving and restoring the ES-9's configuration.

The Save to Flash button stores the ES-9's current configuration into flash memory, meaning it will return to this configuration at power up.

The Restore from Flash button manually recalls the stored configuration, if changes have been made that you want to discard.

The Reset to Defaults button wipes the stored configuration and replaces it with the defaults.

## Input DC Blocking

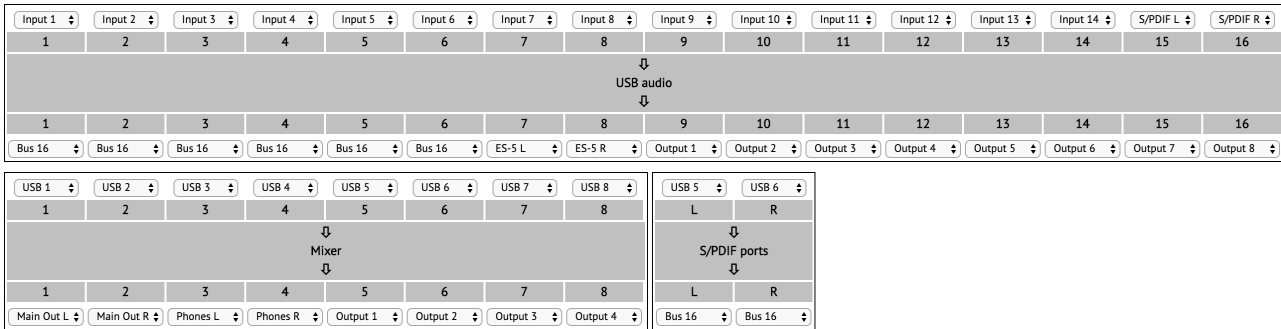
This section controls the DC-blocking filters on the analogue inputs.

Input DC Blocking  
Inputs 1/2  Inputs 3/8  Inputs 4/5  Inputs 6/7  Inputs 9/10  Inputs 11/12  Inputs 13/14

The filters are turned on and off in pairs. A check mark in the UI indicates that the filter is on (appropriate for audio usage).



## Routing



This section controls the routing of audio signals into, out of, and within the module. It is worth taking the time to understand this before attempting to make changes, as you can easily end up with audio going nowhere, and there is often more than one way to achieve the same goal.

Conceptually the ES-9 contains three “processing blocks”, which are:

- USB audio – the part that sends and receives audio to/from the DAW.
  - 16 inputs and outputs.
- Mixer – an internal 8x8 crosspoint mixer.
  - 8 inputs and outputs.
- S/PDIF ports – the part that handles the S/PDIF connectors.
  - 2 inputs and outputs.

All inputs to the processing blocks can be chosen from the following:

- Hardware inputs 1-14
- Internal bus 1-16
- USB (DAW) outputs 1-16
- Mixer outputs 1-8
- S/PDIF processor outputs 1-2 (i.e. the signal from the hardware S/PDIF input).

There are 16 internal mono summing busses available for passing audio between blocks, though because each block can directly read the outputs of other blocks, these are often not required. In the default configuration, only bus 16 is used as a kind of 'dummy' destination.

All outputs from the processing blocks can be chosen from the following:

- Main Out L/R
- Phones L/R
- ES-5 L/R
- Hardware (3.5mm) outputs 1-8
- Internal bus 1-16

It is instructive to look at how the default channel routings are achieved. Starting with the USB audio block, its inputs 1-14 are set to the 14 hardware inputs, so the hardware inputs are routed directly to the USB section and sent to the DAW. Likewise inputs 15-16 are set to the outputs of the S/PDIF processor (i.e. the hardware S/PDIF input is routed to DAW inputs 15-16).

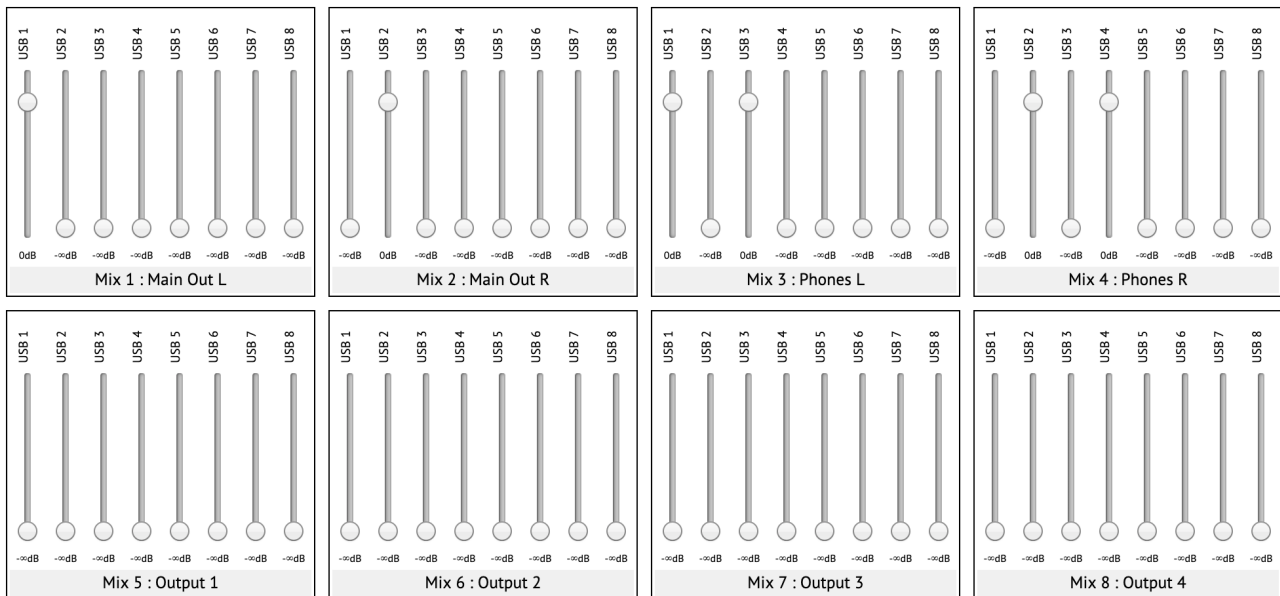
The outputs of the USB audio block might at first glance appear confusing. Outputs 9-16 are straightforward, since they're set to hardware outputs 1-8 i.e. DAW channels 9-16 drive the 3.5mm outputs. Likewise DAW 7-8 goes to the ES-5. However outputs 1-6 of the USB audio block are all set to Bus 16. This is because USB (DAW) channels 1-6 are handled by the mixer and S/PDIF processor, and so are not directly driven by the USB audio block. The outputs have to go somewhere though, so we set them to Bus 16 as a kind of 'dead end'.

The eight inputs of the mixer block are by default set to USB 1-8 i.e. the first eight outputs of the USB audio block, that is DAW outputs 1-8. The mixer outputs are set to Main Out L/R, Phones L/R, and 3.5mm outputs 1-4. Note it is fine to have both the mixer block and the USB audio block output to outputs 1-4. If both blocks output a signal to the same output they will simply be summed.

The S/PDIF block has its inputs set to USB 5-6 i.e. DAW outputs 5-6 get sent out to the S/PDIF output. The outputs of this block are set to Bus 16 – again, this is being used as a dummy output, since the actual routing of the S/PDIF input to the USB block is handled by the USB block's input routing.

## Mixer

The internal mixer can form eight individual mono mixes from eight inputs (that is, all eight mixes share the same eight possible inputs). In the default configuration, the mixer is used simply as a means of controlling the main output volume, and of providing a headphone mix of channels 1-2 with 3-4.



The eight 'Mix' boxes correspond to the eight outputs of the Mixer processing block above. Each mix, and each fader, is labelled with the input or output name as set in the routing controls.

In the default configuration, mixes 1 & 2 simply send USB channels 1-2 to the main outputs. Mixes 3 & 4 mix USB channels 1-2 with 3-4 and send them to the headphone outputs. Mixes 5-8 are silent (every fader is down).

## 5-pin DIN MIDI I/O

The ES-9 has an expansion header on the PCB which can be used to add a pair of traditional 5-pin DIN MIDI ports to the module (one input/one output). This is compatible with the Expert Sleepers

[MIDI breakout](#)<sup>5</sup>.

## Connections

The MIDI ports are exposed on a 4-pin expansion header (labelled GT2) on the rear of the module. All of the necessary electronics are on the PCB; all that needs to be added is the actual sockets.

The header pin-out is as follows (pin 1 is closest to the 'GT2' text):

Pin	Function
1	OUT pin 4
2	OUT pin 5
3	IN pin 5
4	IN pin 4

Pin numbers refer to the 5-pin DIN socket as in the [MIDI standard](#)<sup>6</sup>.

The header is a standard 0.1" pitch header compatible with e.g. typical IDC cable sockets.

When using the Expert Sleepers MIDI breakout, pin 1 of the breakout's header (GT1) corresponds to pin 1 of the ES-9's header (GT2). Orient the ribbon cable to match up these pins.

## MIDI "Low-Voltage Signaling"

When MIDI was first conceived, standard logic circuits ran at 5V, and the initial hardware reference designs worked on this assumption. However, there is nothing in the MIDI standard that actually requires a specific voltage, since it operates as a current loop via an opto-isolator.

Nowadays it is much more common for logic to run at 3.3V or lower. The MIDI Manufacturers Association has now released a reference hardware design based on 3.3V, which they call the "Low-Voltage Signaling" standard, and it is this that the ES-9 uses.

The ES-9 is therefore fully compatible with any device that adheres strictly to the MIDI specification, but may not be with devices that play fast and loose with the spec and assume 5V.

Download the full MIDI electrical specification [here](#)<sup>7</sup>.

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<sup>5</sup> <http://expert-sleepers.co.uk/dm4midibreakout.html>

<sup>6</sup> <https://www.midi.org/specifications/item/midi-din-electrical-specification>

<sup>7</sup> <https://www.midi.org/specifications/item/midi-din-electrical-specification>

## MIDI System Exclusive (SysEx)

The ES-9 supports a variety of features via MIDI System Exclusive messages. Mostly these are intended for use by the config tool.

### ***SysEx Header***

All SysEx messages are prefixed with a manufacturer's ID, which is a unique series of hex bytes assigned by the MIDI Manufacturers Association. The Expert Sleepers ID is 00H 21H 27H, so all SysEx messages relating to Expert Sleepers hardware will begin

```
F0 00 21 27
```

Messages for the ES-9 follow this with 19H:

```
F0 00 21 27 19
```

and then with a byte to identify the specific type of message e.g.

```
F0 00 21 27 19 10
```

### ***Received SysEx messages***

#### **22H – Request version string**

```
F0 00 21 27 19 22 F7
```

This causes the ES-9 to respond with a SysEx message containing the module's version string as text, using the '32H – Message' format, below.

#### **23H – Request configuration dump**

```
F0 00 21 27 19 23 F7
```

This causes the ES-9 to respond with a SysEx message containing its current state (using message 10H, below).

#### **24H – Request save**

```
F0 00 21 27 19 24 F7
```

This causes the ES-9 to save its current state to flash.

#### **25H – Request restore**

```
F0 00 21 27 19 25 F7
```

This causes the ES-9 to restore its state from flash.

#### **26H – Request wipe**

```
F0 00 21 27 19 26 F7
```

This causes the ES-9 to erase the state stored in flash, replace it with defaults, and then restore from these defaults.

### 31H – Set HPF

```
F0 00 21 27 19 31 <hpf> F7
```

Sets the current state of the DC-blocking filters.

### 40H to 43H – Set Inputs

```
F0 00 21 27 19 <40 + dsp ID 0-3> <8 bytes of input routing> F7
```

Sets the input routing of the four DSP blocks.

### 50H to 53H – Set Outputs

```
F0 00 21 27 19 <50 + dsp ID 0-3> <8 bytes of output routing> F7
```

Sets the output routing of the four DSP blocks.

### 60H to 67H – Set Mix

```
F0 00 21 27 19 <60 + mix ID 0-7> <channel 0-7> <3 bytes of value> F7
```

Sets a mixer fader.

## *Sent SysEx messages*

### 10H – Configuration dump

```
F0 00 21 27 19 10 00 00 <configuration data> F7
```

Contains the ES-9's complete configuration. Used to initialise the config tool with the module's current state.

### 32H – Message

```
F0 00 21 27 19 32 <NULL terminated ASCII string> F7
```

This message is transmitted in response to any request for a string e.g the version string, and also to give feedback on the success or otherwise of an operation e.g. saving the state to flash.

## Firmware Updates

The ES-9's firmware can be updated over USB.

You will need the 'ExpertSleepersDFU' tool, which you can download from the [ES-9 firmware update page](#)<sup>8</sup>.

The can go directly to any firmware version. You do not have to install them incrementally.

At the time of writing, Windows users will find it necessary to uninstall the custom Expert Sleepers audio driver before proceeding with the firmware update.

The process is as follows:

- Download the firmware from the Expert Sleepers website.
- Unzip the download. You should now have a file called 'es9\_v<version>.dfu'.
- Run the ExpertSleepersDFU tool.
- It will prompt you to locate the .dfu file. Find the file, select it and click 'Open'.
- All being well, the tool will say “Expert Sleepers Ltd: ES-9” and “Device in Runtime Mode...”.
- Click the 'REBOOT DEVICE' button.
- This will cause the ES-9 to reboot into DFU (Device Firmware Update) mode. The tool will now say “Expert Sleepers Ltd: ES-9 DFU” and “Device in DFU Mode...”.
- Click the 'UPDATE DEVICE' button.
- This will now install the firmware. The ES-9 will reboot again, and the tool will show it being back in Runtime Mode.

## Where to get help

Please see [this page](#)<sup>9</sup>.

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8 <https://expert-sleepers.co.uk/es9firmware.html>

9 <https://www.expert-sleepers.co.uk/contact.html>