



ESP Damper

4-ch

Damper Controller

v1.0

User Manual

Revision	Author	Description
Rev 1	Dmitry K.	Initial release

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1 Overview

The HVAC Damper Controller is a DIY device designed to monitor and control HVAC dampers using the TAC-910 infrared protocol.

It is based on the ESP32 microcontroller and supports multi-channel IR (wired) communication, Wi-Fi connectivity, MQTT integration, and a built-in Web UI for configuration and maintenance.

The controller is intended for advanced hobbyists and DIY home automation enthusiasts who want to integrate HVAC damper control into platforms such as Home Assistant.

2 Key Features

Integration with existing TAC-910 controller

The device connects in parallel with an existing TAC-910 controller.

This allows the ESP32 to:

- Listen to infrared commands received by the TAC-910 controller
- Transmit its own infrared commands to control the dampers

This setup enables monitoring and control without replacing the original HVAC controller.

Wi-Fi and MQTT Communication

The controller connects to the local Wi-Fi network and communicates with a home automation system using MQTT.

This enables:

- Real-time reporting of damper state
- Remote control of dampers via Home Assistant or other MQTT-compatible platforms

Web-Based User Interface

A built-in Web UI is accessible via the device's IP address (assigned by router DHCP service).

The Web UI allows basic configuration and maintenance.

Over-The-Air (OTA) Firmware Updates

Firmware updates can be performed directly from a web browser using the device's Web UI.

This allows easy upgrades without physical access to the device or external programming tools.

3 System Operation

Startup Behavior

On power-up, the controller performs the following steps:

1. Connects to the configured Wi-Fi network
2. Connects to the configured MQTT broker
3. Initializes internal modules
4. Enters receive (RX) mode and begins listening for IR commands on all configured channels

IR to MQTT (Monitoring)

When an IR command is received from the remote controller:

1. The command is decoded
2. The decoded information is published to MQTT
3. The home automation system can track damper activity and state changes
4. In parallel the command is transferred to the TAC-910 controller

MQTT to IR (Control)

When a control command is received via MQTT:

1. The message is converted into the TAC-910 IR protocol format
2. The relevant channel switches temporarily to transmit (TX) mode
3. The command is sent to the TAC-910 controller
4. The channel then returns to receive (RX) mode
5. The command is then sent back to MQTT as verification of successful transmission

4 Factory Reset

Factory reset clears all stored user configuration and reboots the controller into Wi-Fi Access Point (AP) mode for initial setup.

The reset can be triggered in two ways:

1. **Via Web UI**
Use the “Factory Reset” option in the Web interface.
2. **Via Hardware Button**
Press and hold the **Reset** button for 5 seconds.
Release the button when the status LED begins blinking at 1-second intervals.

After reset, the device starts in Wi-Fi Access Point mode, allowing reconfiguration from a browser.

5 Configuration via Web UI

The Web UI is accessed by entering the device's IP address into a web browser.

AP mode – default IP address is **192.168.50.1**

STA mode – IP address is assigned by the router's DHCP service.

Available configuration options:

3. **Device Name**

Sets the device identifier used in Wi-Fi and MQTT communication.

4. **Wi-Fi Credentials**

Configure SSID and password for network access.

5. **MQTT Settings**

Configure broker address, port and RX/TX topics.

6. **Channel Group Selection**

Select which set of channels is serve:

a. Channels 0–3

b. Channels 4–7

7. **Communication Status**

Displays basic information about Wi-Fi and MQTT connectivity.

8. **Firmware Update**

Upload and install new firmware images via the browser.

9. **Factory Reset**

Reset all stored configuration and return the device to initial setup mode.

6 Status LED Indications

The status LED provides visual feedback on the device state:

LED Behavior	Device State
Slow blinking (1 second interval)	Wi-Fi Access Point mode is active
Medium blinking (250 ms interval)	Connecting to configured Wi-Fi network
Fast blinking (100 ms interval)	Connected to Wi-Fi, but internal module initialization failed
Steady ON	Wi-Fi connected and device operating normally

7 Controller board details

Board top view

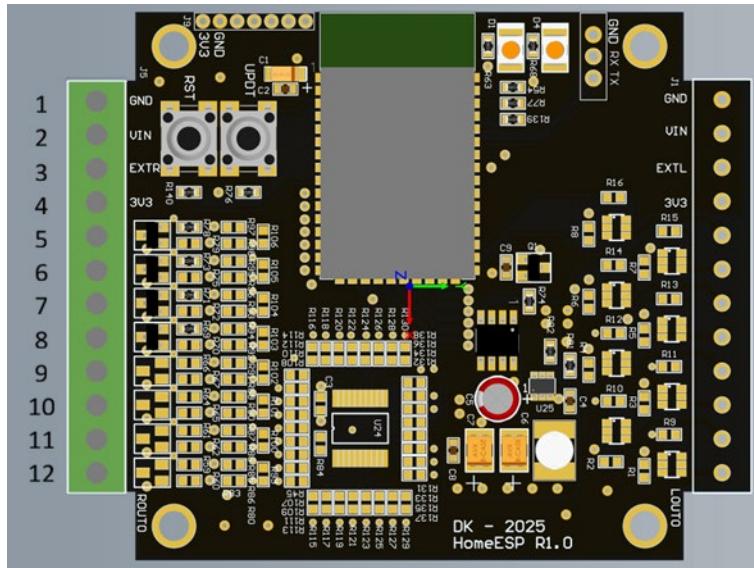


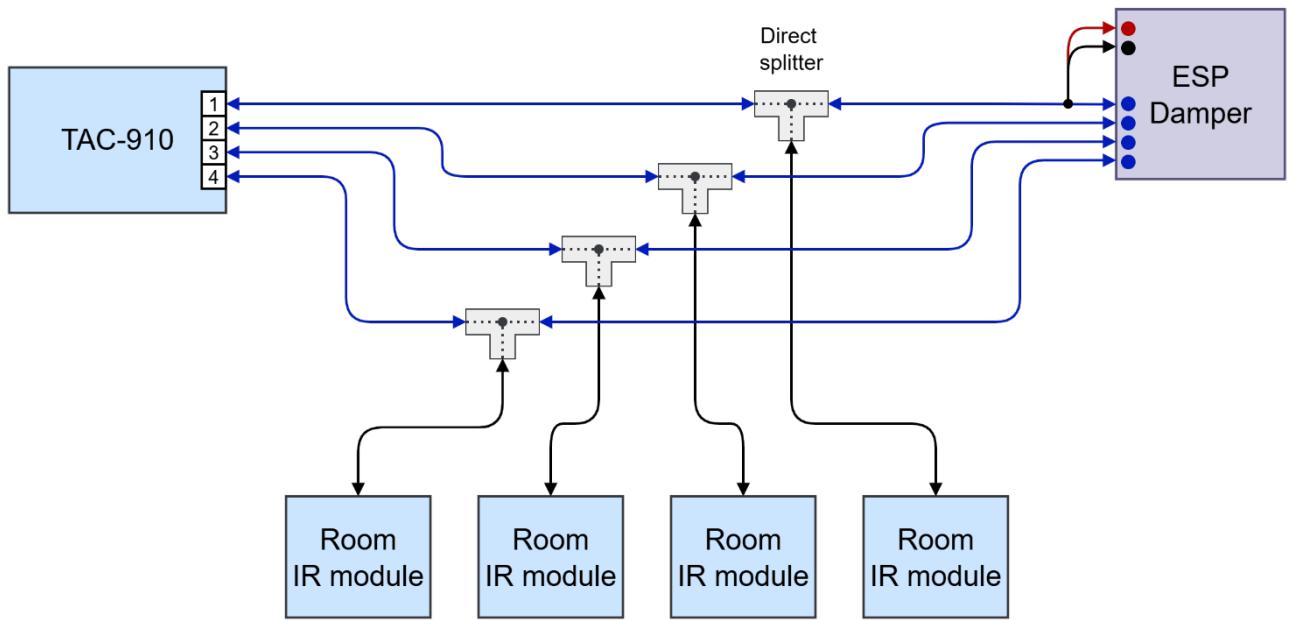
Figure 1 Damper controller board view

Outputs mapping

Pin	Pin name	Description
1	GND	Ground
2	VIN	Vin from 5V to 15V
3	EXTR	Reference voltage (Not required when external PU used)
4	3V3	3.3V output voltage (For external low current use)
5	CH0/4	IR (wired) channel 0 or 4
6	CH1/5	IR (wired) channel 1 or 5
7	CH2/6	IR (wired) channel 2 or 6
8	CH3/7	IR (wired) channel 3 or 7
9	NC	Not connected
10	NC	Not connected
11	NC	Not connected
12	NC	Not connected

- Channels 0-3 or 4-7 are configurable via Web UI.

Connection diagram



TAC-910 to ESP - RJ45 pinout

Pin	Color	Description
1		
2		
3		
4		
5	Blue/White	Vcc – 12V
6	Green	Ground
7		
8	Brown	Wired IR data – open drain