



M5STACK

Chain Captain

User Manual - FCC

1. Description

Chain Captain is a wireless control terminal based on the ESP32-S3R8 SoC with a dual-core 32-bit processor running up to 240 MHz. It supports 2.4 GHz Wi-Fi and Bluetooth Low Energy communication and integrates 16 MB Flash and 8 MB PSRAM. The device includes a 1.54-inch TFT display, three user function keys, RGB indication, infrared transmission and reception, a microphone, speaker, BMI270 motion sensor, BMM150 magnetometer, and RX8130 real-time clock. USB-C, GROVE, CHAIN, and expansion-header interfaces provide programming, power, and peripheral expansion. An integrated rechargeable lithium-ion battery and multi-stage power-management system support low-power operation and extended battery runtime.



2. Specifications

Specification	Parameters
SoC	ESP32-S3R8 @ dual-core 32-bit Xtensa LX7 processor, up to 240MHz
PSRAM	8 MB
Flash	16 MB
Wireless	2.4 GHz Wi-Fi + BLE
Display	1.54-inch TFT display
Sensors	BMI270 6-axis IMU; BMM150 3-axis magnetometer
Audio	ES8311 codec, microphone, audio amplifier and speaker
Infrared	Infrared transmitter and 38 kHz infrared receiver
Interfaces	USB-C, two GROVE ports, CHAIN interface and expansion header
Power Input	DC 5V / 1A USB input; rechargeable lithium-ion battery
Hardware version NO.	V1.0
Software version NO.	V1.0
Frequency Range	BLE 1M/2M: 2402-2480 MHz 2.4 GHz Wi-Fi: 2412-2462 MHz (channels 1-11)
Transmit Power	BLE 1M/2M:2.29dBm (Max. conducted peak power) 2.4 GHz Wi-Fi:17.43dBm (Max. conducted peak power)

3. Quick Start

3.1 Preparation

1. Install the ESP-IDF development environment by following the official tutorial:

- ESP-IDF Version: `release/v5.5`

https://docs.espressif.com/projects/arduino-esp32/en/latest/esp-idf_component.html

2. Compile the Wi-Fi scan example and flash it to the device:

<https://github.com/espressif/esp-idf/tree/master/examples/wifi/scan>

3. View the Wi-Fi scan results via the serial port.

```
(732) wifi:(88)enable busy check(0x18), disable idle check(0xaa)
(3242) scan: Max AP number ap_info can hold = 10
(3242) scan: Total APs scanned = 25, actual AP number ap_info holds = 10
(3242) scan: SSID          iNet
(3242) scan: RSSI          -43
(3242) scan: Authmode      WIFI_AUTH_WPA2_PSK
(3242) scan: Pairwise Cipher WIFI_CIPHER_TYPE_CCMP
(3252) scan: Group Cipher  WIFI_CIPHER_TYPE_CCMP
(3252) scan: Channel       6
(3262) scan: SSID          M5-WiFi-Test
(3262) scan: RSSI          -49
(3262) scan: Authmode      WIFI_AUTH_WPA_WPA2_PSK
(3272) scan: Pairwise Cipher WIFI_CIPHER_TYPE_TKIP_CCMP
(3272) scan: Group Cipher  WIFI_CIPHER_TYPE_TKIP
(3282) scan: Channel       6
(3282) scan: SSID          DIANJIXZ
(3282) scan: RSSI          -53
(3282) scan: Authmode      WIFI_AUTH_WPA_WPA2_PSK
(3292) scan: Pairwise Cipher WIFI_CIPHER_TYPE_TKIP_CCMP
(3292) scan: Group Cipher  WIFI_CIPHER_TYPE_TKIP
(3302) scan: Channel       11
(3302) scan: SSID          ocean
(3302) scan: RSSI          -55
(3302) scan: Authmode      WIFI_AUTH_WPA_WPA2_PSK
(3312) scan: Pairwise Cipher WIFI_CIPHER_TYPE_CCMP
(3312) scan: Group Cipher  WIFI_CIPHER_TYPE_CCMP
(3322) scan: Channel       1
(3322) scan: SSID          M5HomeLab
(3322) scan: RSSI          -55
(3332) scan: Authmode      WIFI_AUTH_WPA2_PSK
(3332) scan: Pairwise Cipher WIFI_CIPHER_TYPE_CCMP
(3332) scan: Group Cipher  WIFI_CIPHER_TYPE_CCMP
(3342) scan: Channel       11
(3342) scan: SSID          M5Stack-Guest
(3342) scan: RSSI          -57
(3352) scan: Authmode      WIFI_AUTH_WPA_WPA2_PSK
(3352) scan: Pairwise Cipher WIFI_CIPHER_TYPE_CCMP
(3362) scan: Group Cipher  WIFI_CIPHER_TYPE_CCMP
(3362) scan: Channel       1
```

4. Intended Use and Operating Environment

4.1 Intended Use

Chain Captain is a wireless control terminal intended for desktop use only. It is placed on a desk or other stable surface and is operated by ordinary persons for development, control and interactive applications that use 2.4 GHz Wi-Fi and Bluetooth Low Energy.

4.2 Environment of Use

The device is intended for indoor use in residential, commercial and light-industrial environments. Use the device only within the following conditions:

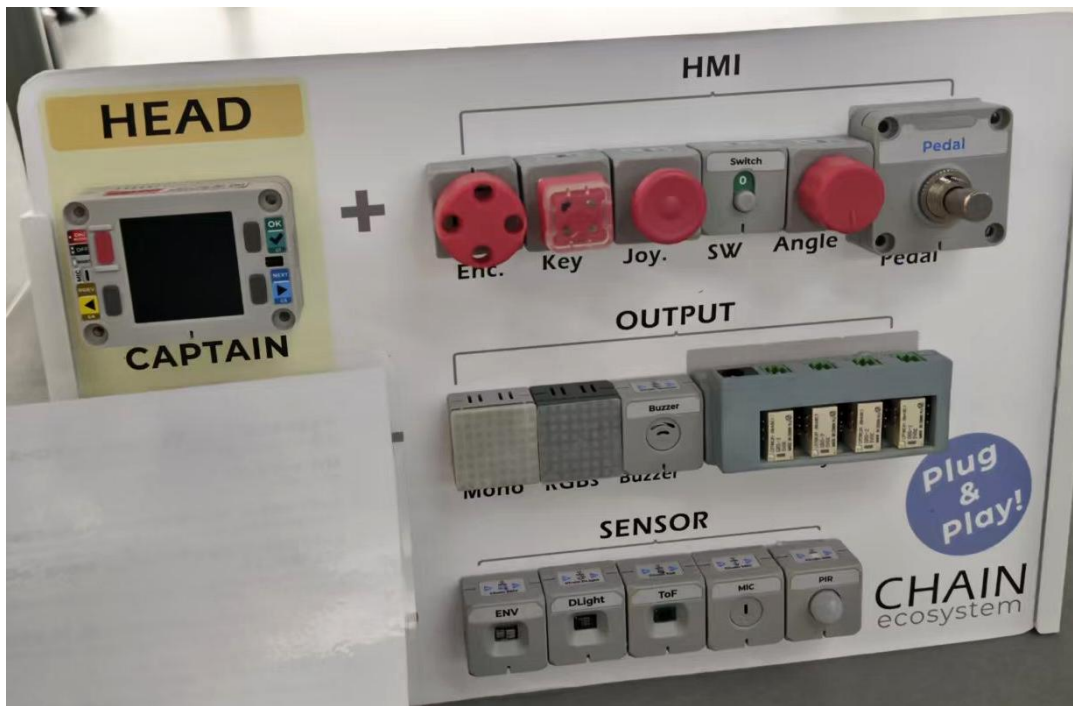
- Relative humidity: up to 85%, non-condensing
- Altitude: up to 2000 m above sea level
- Ingress protection: IPX0. The device is not protected against water or dust; keep it dry and away from liquids.
- Do not use the device outdoors, in explosive atmospheres, or close to strong sources of electromagnetic disturbance.

4.3 Radio-Frequency Exposure

Operate the device on a desk or other stable surface at a distance of at least 20 cm from the human body.

4.4 Chain Ecosystem Modules

Chain Captain is the head unit of the Chain ecosystem. Chain modules are connected to the head unit through the Chain interface and are recognised automatically (plug and play). The modules below are available in the ecosystem:



- HMI modules: Encoder, Key, Joystick, Switch, Angle, Pedal
- Output modules: Mono, RGBs, Buzzer, Relay (4-channel)
- Sensor modules: ENV, DLight, ToF, MIC, PIR

5. FCC Warning

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy.

If it is not installed and used according to the instructions, it may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, try one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.