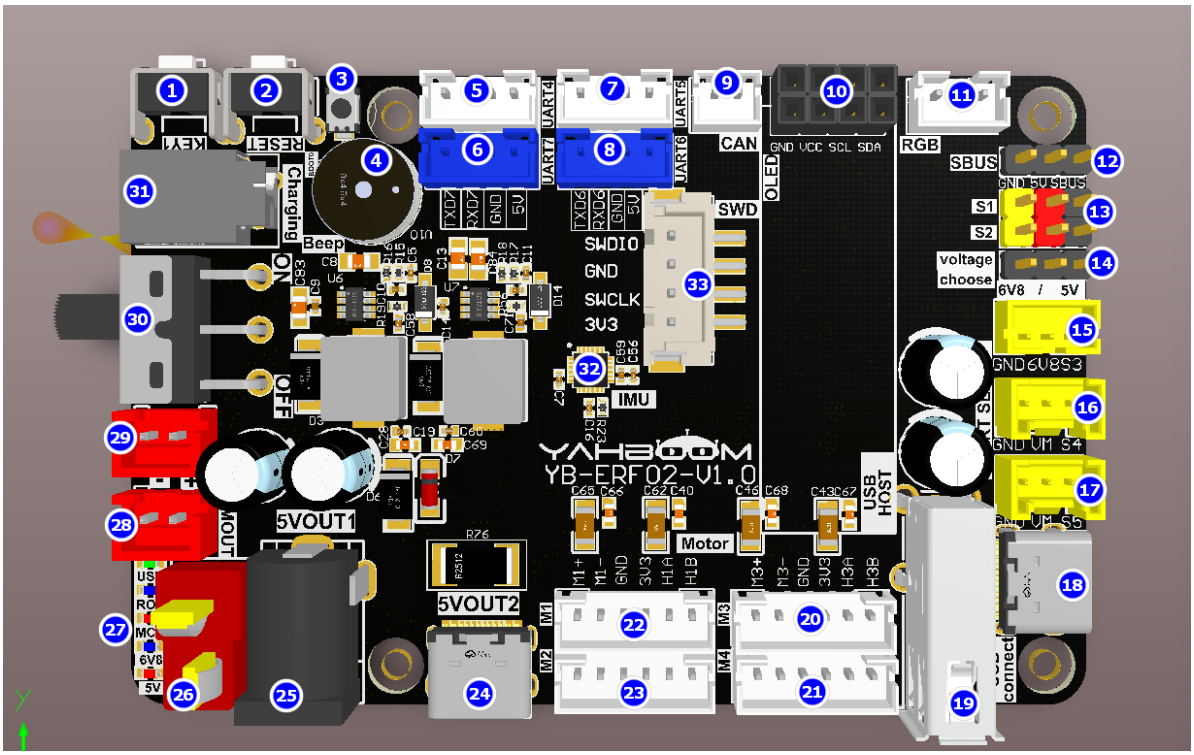
Introduction to the Control Board

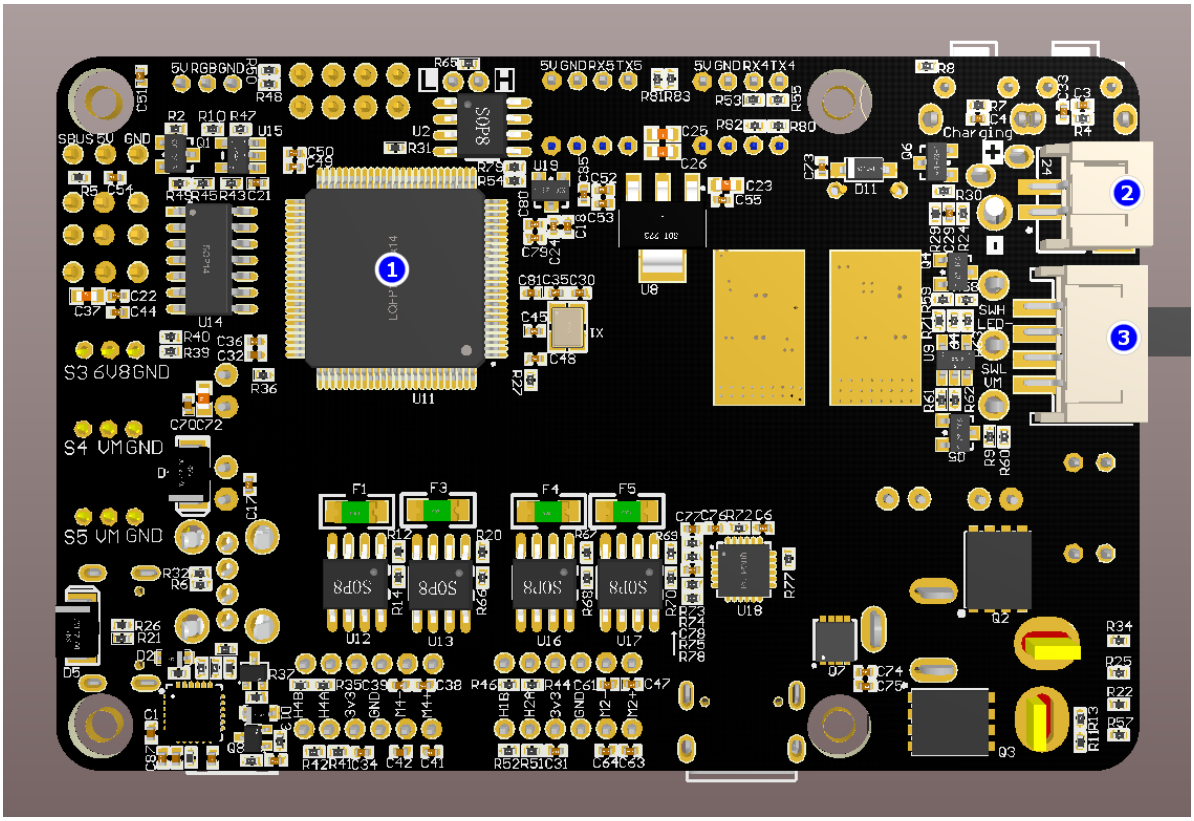
1. Component distribution diagram on the front of the control board



1. KEY1 key: User function key, which can realize customized functions through programming.
2. RESET button: reset the STM32 microcontroller.
3. BOOT0 key: used to enter the burning mode when burning STM32 firmware.
4. Active buzzer: whistle and low battery alarm functions.
5. Left radar interface: Serial port 4, connected to the left rear radar.
6. Debug interface: Serial port 7, can be connected to a TTL module to view log information.
7. Right radar interface: Serial port 5, connected to the right front radar.
8. Control interface: Serial port 6, can be connected to TTL module and send protocol to control the robot.
9. CAN interface: can be connected to CAN bus devices and send protocols to control the robot.
10. OLED screen interface: can display the status of the board
11. RGB light bar interface: displays the light bar color status
12. SBUS interface: connect to SBUS aircraft remote controller
13. PWM servo interface: connect to PWM servo
14. PWM servo voltage switch: PWM servo voltage can be selected as 5V or 6.8V
15. 6.8V serial servo interface: connect to 6.8V serial servo
16. 12V serial servo interface: connect to 12V serial servo

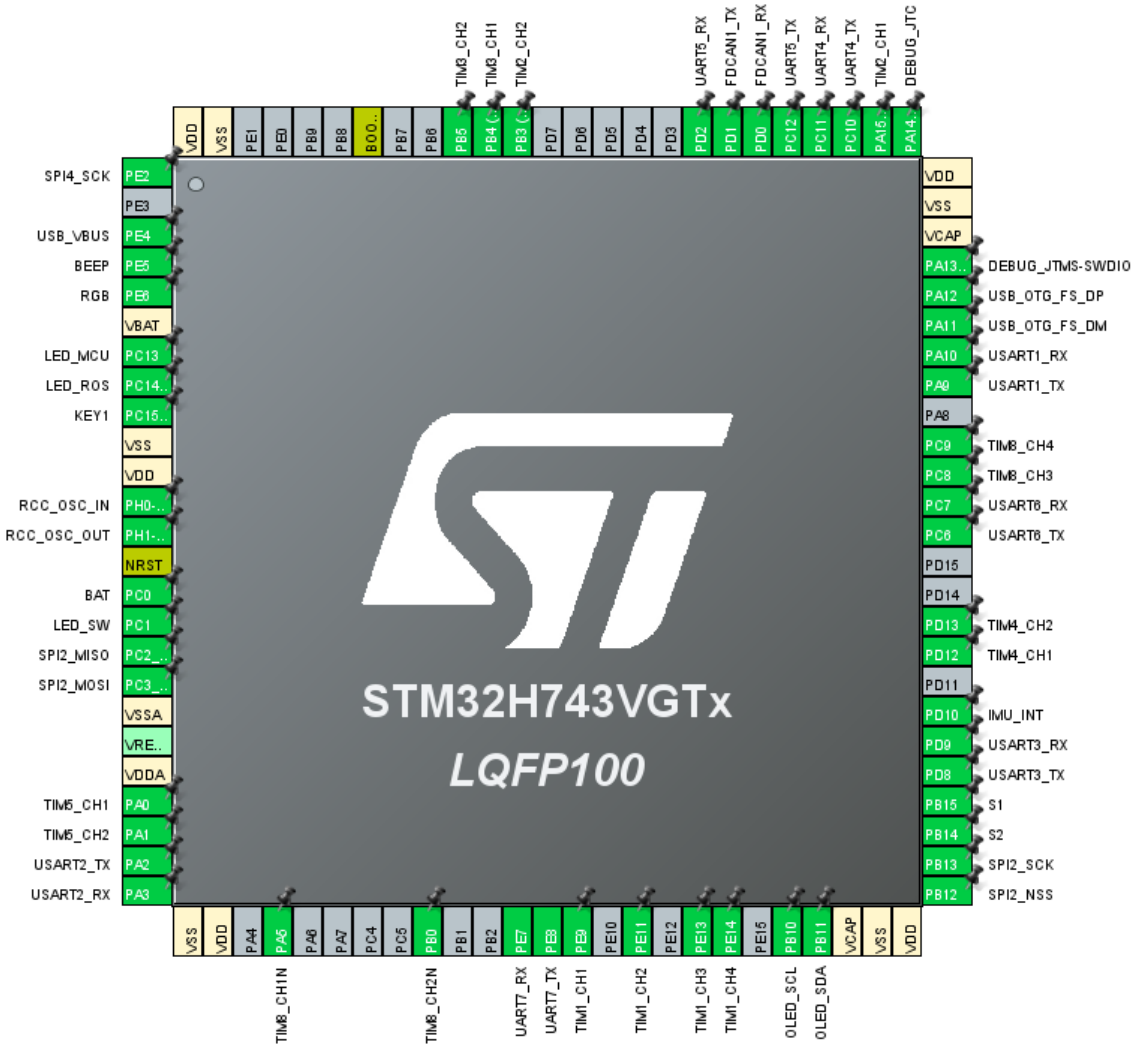
17. 12V serial servo interface: connect to 12V serial servo
18. Communication and firmware burning interface: TYPE-C serial port for burning MCU firmware and data communication
19. Handle interface: connect USB handle
20. M3 motor: connected to the right front motor of the car
21. M4 motor: connected to the right rear motor of the car
22. M1 motor: connected to the left front motor of the car
23. M2 motor: connected to the left rear motor of the car
24. Type-C 5V output interface: 5.1V\5A output, with Raspberry Pi exclusive protocol
25. DC 5V output interface: provides 5V voltage output
26. T-type DC 12V power input interface: connect to 12V power supply to power the motherboard
27. LED indicator: LED indicator to show voltage and function
28. DC12V power output: provides 12V voltage output
29. DC12V power output: provides 12V voltage output
30. Power switch: controls the entire board. Turn the switch to OFF to shut down the board, and turn it to ON to power on the board.
31. Charging port: 12.6V charging port
32. Nine-axis attitude sensor: including 3-axis accelerometer, 3-axis gyroscope, and 3-axis magnetometer
33. SWD debug interface: users can use ST-LINK for debugging

2. Component distribution diagram on the back of the control board



1. STM32 microcontroller: main chip, controls the function operation of the entire board
2. Charging port: 12.6V charging port
3. Self-locking switch interface: can be used to connect an external self-locking switch to control the switch of the entire board

3. Control board pin assignment diagram



Peripheral functions	Pins	Remark
Active buzzer	PE5	Common GPIO
RGB light strips	PE6	SPI4_MOSI (SPI4_SCK is the SPI4 clock, which is not needed and has been left floating)
LED_MCU indicator	PC13	Ordinary GPIO, status indicator
LED_ROS indicator	PC14	Ordinary GPIO, ROS status indicator
KEY1 button	PC15	Ordinary GPIO, input pull-up
25M crystal oscillator	PH0/PH1	
BAT power supply voltage detection	PC0	ADC detection
LED_SW indicator	PC1	Ordinary GPIO, switch indicator light
IMU attitude sensor	PC2/PC3/PB13/PB12/PD10	SPI2 - MISO/MOSI/SCK/NSS/INT
M3 motor encoder	PA0/PA1	Encoder mode, Timer 5 channel 1 and channel 2
SBUS interface	PA3	Serial port 2 receiving pin (PA2 is the serial port 2 sending pin, which is not needed and has been left floating)
M3 motor drive	PA5/PB0	PWM output mode, timer 8 channel 1N and channel 2N
Debug interface	PE7/PE8	Serial port 7, print log information
M2 motor drive	PE9/PE11	PWM output mode, Timer 1 channel 1 and channel 2
M1 motor drive	PE13/PE14	PWM output mode, timer 1 channel 3 and channel 4
OLED display	PB10/PB11	I2C interface
PWM servo S1	PB15	Timer 12 channel 2
PWM servo S2	PB14	Timer 12 channel 1
Bus Servo	PD8/PD9	Serial port 3
M4 motor encoder	PD12/PD13	Encoder mode, Timer 4 channel 1 and channel 2
Control interface	PC6/PC7	Serial port 6

Peripheral functions	Pins	Remark
M4 motor drive	PC8/PC9	PWM output mode, timer 8 channel 3 and channel 4
Burning and communication interface	PA9/PA10	Serial port 1
USB controller interface	PA11/PA12	USB Host
SWD interface	PA13/PA14	SWDIO/SWCLK
M2 motor encoder	PA15/PB3	Encoder mode, Timer 2 channel 1 and channel 2
Left radar interface	PC10/PC11	Serial port 4
Right radar interface	PC12/PD2	Serial port 5
CAN interface	PD0/PD1	
M1 motor encoder	PB4/PB5	Encoder mode, Timer 3 channel 1 and channel 2

4. Analysis of Common Problems

1. How does a main control board (such as Jetson Nano) drive a control board? How do I communicate with the control board?

A: The factory firmware of the control board integrates the Microros framework program. Jetson Nano is connected to the control board through the USB Connect interface, opens the Microros agent and sends the corresponding topic instructions. The microcontroller integrated in the control board receives and parses the data, and then processes the specific commands to be executed.

2. How is the robot powered? Does the main control board need a separate power supply?

A: The car comes with a battery pack. Plug the battery pack into the DC 12V T-type power connector on the control board and turn on the main power switch. The control board has an integrated voltage conversion chip. For the Jetson Nano motherboard, power is supplied via the DC 5V power cable. For the Raspberry Pi 5, power is supplied via the Type-C 5V output power cable with protocol. For the Jetson Orin series, power is supplied via the DC 12V output power cable.

3. How to update the MCU firmware? Why do we need to update the MCU firmware?

A: The MCU integrated into the control board is pre-loaded with factory firmware. You do not need to update the firmware unless necessary. If you need to update the firmware, please refer to the firmware update tutorial to update the MCU firmware. If the control board has been pre-loaded with a separate hex file, please re-load the firmware to the factory firmware before

running the ROS example.