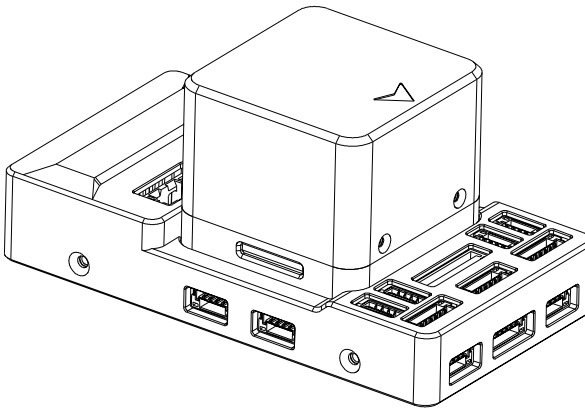
V7 Pro Autopilot

User Manual



For more details please visit our website: www.v-uav.com

Disclaimer and Warning

Please read this article carefully to ensure the correct use of the product. Failure to comply with and operate in accordance with the instructions in this manual may damage the product. Users must not disassemble or assemble the autopilot by themselves, otherwise the it may not work properly.

Since our company cannot control the specific use, installation, modification and improper use of the user, our company will not bear the corresponding losses and compensation liability for direct or indirect losses or damages caused by the above situations. Our company is not responsible for any indirect or direct losses and damages caused by the use of this product.

Advantages

1. Adopt industrial-grade ADIS14670, ICM42688-P sensors and RM3100 magnetic compass.

2. Built-in VUAV professional-grade shock absorption system, better shock absorption effect.

3. Support temperature compensation, improved IMU working effect.

4. Support power reverse connection protection and short circuit protection.

5. Interface adopts anti-static protection.

6. Support 3-way power supply redundancy.

7. Modular design, supports customized carrier boards.

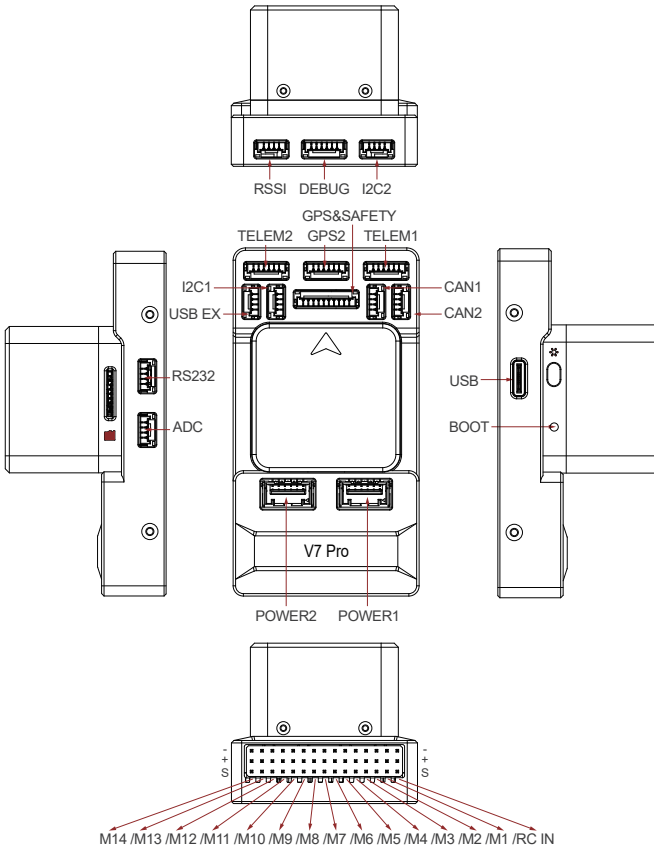
8. Support Follow-me function

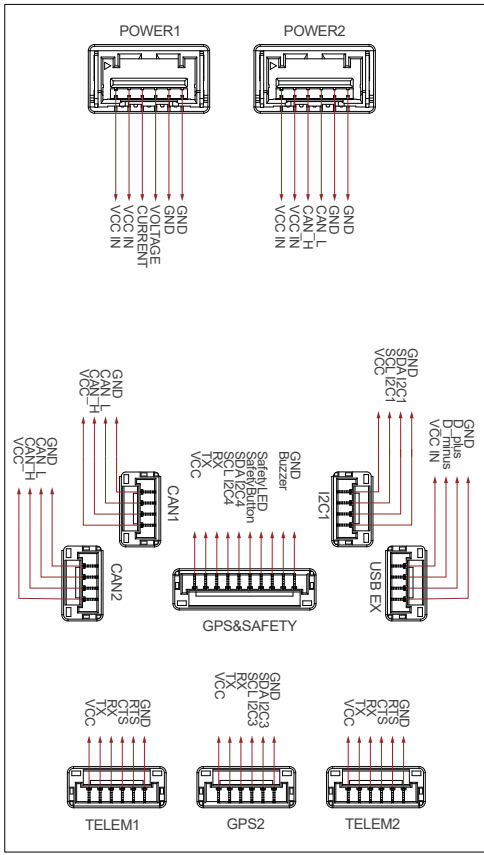
1. Hardware Specifications

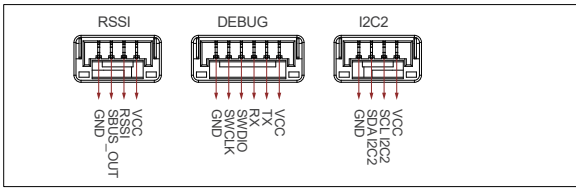
Processor	
Processor	STM32H743
Sensor	
Accelerometer	ADIS16470/ICM-42688-P/ICM-42688-P
Gyroscope	ADIS16470/ICM-42688-P/ICM-42688-P
Electronic Compass	RM3100
Barometer	MS5611 x2
Interfaces	
UART Serial Port	6
I2C	4
PWM Output	14
RCIN	1 (support PPM/SBUS/DSM)
RSSI	1
SBUS Output	1
CAN	2
Power Input	2 (POWER 1 is common ADC power detection interface, POWER 2 is CAN power interface)
GPS Interface	2
ADC	2

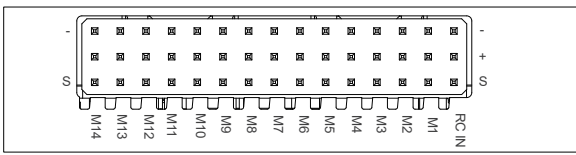
RS232	1
DEBUG	1
JATG	1
USB Interface	1
USB Expansion Interface	1
SD Card Slot	1
Working Environment & Physical Parameters	
Main Power Port Working Voltage	4.5v~5.4v
USB Power Port Working Voltage	4.5v~5.4v
Servo Input	0~9.9v
Working Temperature	-20~85℃
Operating Humidity	5%~95% (non-condensing)
Weight	100g
Product meas.	85*45.4*39.6mm
Supported Platforms	
Supported Platforms	Generic (Any Rotary-wing Drone / fixed-wing UAV, VTOL fixed-wing UAV, unmanned ground vehicle or boat)

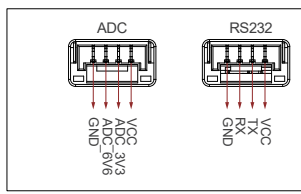
2. Interface Definition




POWER1
VCC IN
VCC IN
CURRENT
VOLTAGE
GND
GND
POWER2
VCC IN
VCC IN
CAN_H
CAN_L
GND
GND
I2C1
VCC
SCL
SDA
GND
D_minus
D_plus
VCC IN
USB EX
CAN1
VCC
TX
RX
SDA I2C4
SCL I2C4
SafetyButton
SafetyLED
Buzzer
GND
GPS&SAFETY
CAN2
VCC
CAN_H
CAN_L
GND
TELEM1
VCC
TX
RX
CTS
RTS
GND
GPS2
VCC
TX
RX
SCL I2C3
SDA I2C3
GND
TELEM2
VCC
TX
RX
CTS
GND


RSSI
VCC
RSSI
SBUS_OUT
GND
DEBUG
VCC
TX
RX
SWDIO
SWCLK
GND
I2C2
VCC
SCL I2C2
SDA I2C2
GND


-
S
-
+
S
M14
M13
M12
M11
M10
M9
M8
M7
M6
M5
M4
M3
M2
M1
RC IN


ADC
VCC
ADC_3V3
ADC_6V6
GND
RS232
VCC
TX
RX
GND

2.2 UART Interface Mapping

- SERIAL0-> USB
- SERIAL1-> UART2 (Telem1) (DMA Enabled)
- SERIAL2-> UART6 (Telem2) (DMA Enabled)
- SERIAL3-> UART1 (GPS&SAFETY)GPS1
- SERIAL4 -> UART3 (GPS2)
- SERIAL5->UART8 (USER) TX only
- SERIAL6-> UART4 (RS232)
- SERIAL7 -> USB2 (Virtual ports on the same connector)
- SERIAL8-> UART7 (DEBUG)

Telem1, Telem2 port have RTS/CTS pins, the other UARTs do not have RTS/CTS

2.3 Port Definition

Port TELEM1, TELEM2		
Pin	Signal	Volt
1	VCC	+5V
2	TX(OUT)	+3.3V
3	RX(IN)	+3.3V
4	CTS	+3.3V
5	RTS	+3.3V
6	GND	GND

Port GPS1（GPS1&SAFETY) / I2C4		
Pin	Signal	Volt
1	VCC	+5V
2	TX(OUT)	+3.3V
3	RX(IN)	+3.3V
4	SCL I2C4	+3.3V(pullups)
5	SDA I2C4	+3.3V(pullups)
6	SafetyButton	+3.3V
7	SafetyLED	+3.3V
8	-	-
9	Buzzer	+3.3V
10	GND	GND

Port GPS2, I2C3		
Pin	Signal	Volt
1	VCC	+5V
2	TX(OUT)	+3.3V
3	RX(IN)	+3.3V
4	SCL I2C3	+3.3V
5	SDA I2C3	+3.3V
6	GND	GND

Port CAN1, CAN2		
Pin	Signal	Volt
1	VCC	+5V
2	CAN_H	+24v
3	CAN_L	+24v
4	GND	GND

Port I2C1, I2C2		
Pin	Signal	Volt
1	VCC	+5V
2	SCL	+3.3V(pullups)
3	SDA	+3.3V(pullups)
4	GND	GND

Port USB, EX		
Pin	Signal	Volt
1	VCC IN	+5V
2	D_minus	+3.3V
3	D_plus	+3.3V
4	GND	GND

Port RSSI		
Pin	Signal	Volt
1	VCC	+5V
2	RSSI	up to +3.3v
3	UART8_TX(OUT)	+3.3v
4	GND	GND

Port RS232		
Pin	Signal	Volt
1	VCC	+5V
2	TX(OUT)	+3.3V
3	RX(IN)	+3.3V
4	GND	GND

Port DEBUG		
Pin	Signal	Volt
1	VCC	+5V
2	TX(OUT)	+3.3V
3	RX(IN)	+3.3V
4	SWDIO	+3.3V
5	SWCLK	+3.3V
6	GND	GND

Port ADC		
Pin	Signal	Volt
1	VCC	+5V
2	ADC_3V3	up to +3.3v
3	ADC_6V6	up to +6.6v
4	GND	GND

Port POWER1		
Pin	Signal	Volt
1	VCC IN	+5V
2	VCC IN	+5V
3	CURRENT	up to +3.3v
4	VOLTAGE	up to +3.3v
5	GND	GND
6	GND	GND

Port POWER2 (CAN1)		
Pin	Signal	Volt
1	VCC IN	+5V
2	VCC IN	+5V
3	CAN1_H	+24V
4	CAN1_L	+24V
5	GND	GND
6	GND	GND

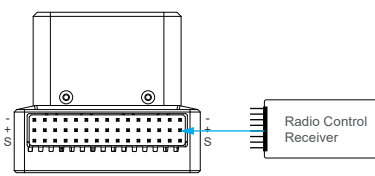
2.4 GPIO Function

There are 14 PWM channels can be used for GPI0 functions(relays, buttons, RPM, etc.)
The pin numbers for these channels are as follows:

PWM Channels	Pin	PWM Channels	Pin
PWM1	50	PWM8	57
PWM2	51	PWM9	58
PWM3	52	PWM10	59
PWM4	53	PWM11	60
PWM5	54	PWM12	61
PWM6	55	PWM13	62
PWM7	56	PWM14	63

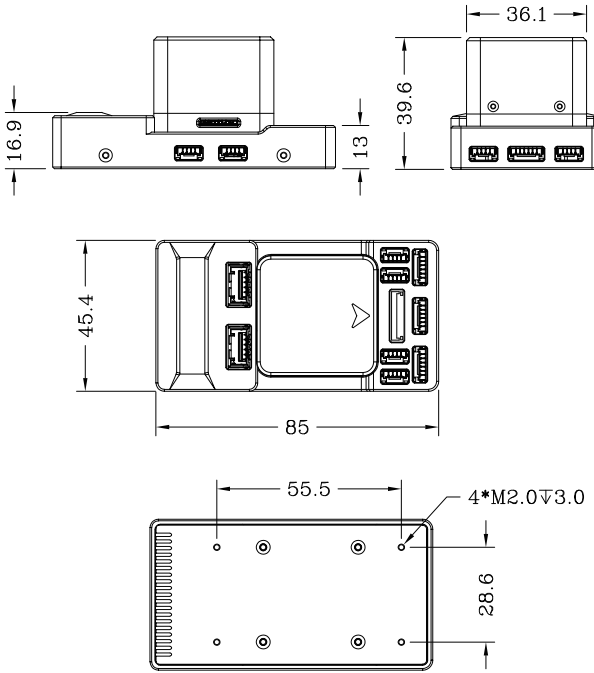
2.5 RCIN

The RC input is configured on the RCIN pin at the end of the servo, which supports all unidirectional RC protocols.



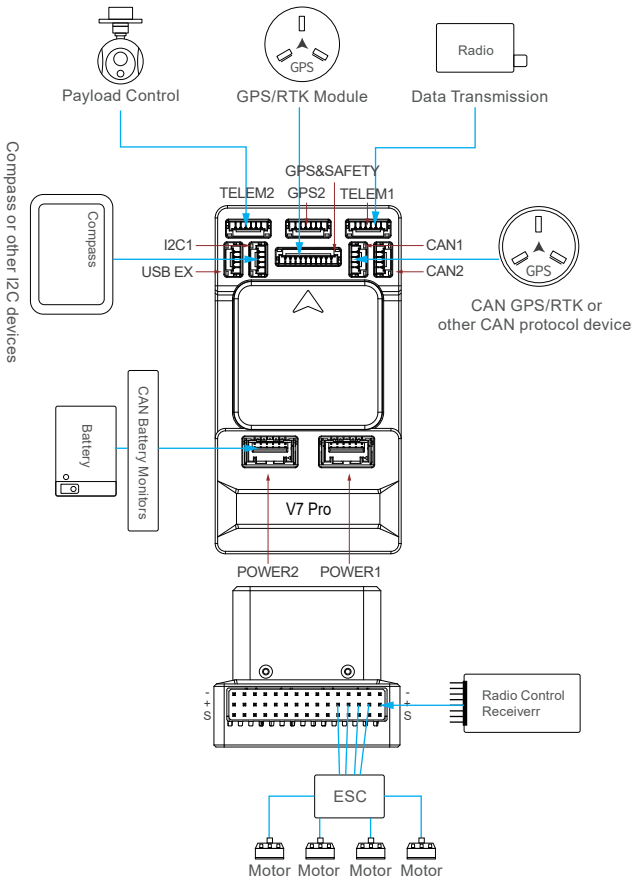
3. Quick Start

- This quick start guides how to power the V7Pro autopilot and connect other important external devices.



3.2 Hareware Connection Overview

- The following picture shows the most important peripheral connections of V7 Pro

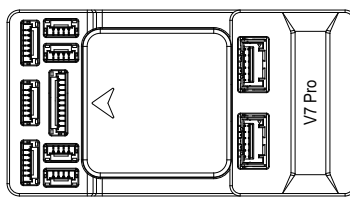


Main Interfaces	Function
POWER1	Connect to analog power modules for power input & detection of AD Voltage and current.
POWER2	Connect to CAN power module.
GPS&SAFETY/I2C4	Connect to GPS, it contains GPS, safety switch, buzzer interface functions.
GPS2/I2C3	Can be used to connect to GPS, also can be used as a second GPS (can also support MAVLINK data exchange).
TELEM1/TELEM2	Connection to digital transmission, etc., for MAVLINK data exchange.
TF	Can be used to insert TF card for log storage.
M1-M14	PWM signal output port, can be used to control motor or servo; and M1~M12 support dshot protocol, M1~M8 support bi-directional dshot protocol.
RSSI	Support RSSI Input、SBUS Output.
DEBUG	For MCU chip debugging (can also be used as a MAVLINK to exchange data).
USB	Connect to computer for communication between flight control and computer (such as burn firmware).
USBEX	Expand USB Interface and connect to computer for communication between flight control and computer (such as burn firmware).
I2C1/I2C2	Connect to external compass, airspeed meter and other I2C devices for communication between flight control and I2C devices.

CAN1/CAN2	Connect DroneCAN(UAVCAN) devices such as CAN, GPS for communication between flight control and DroneCAN(UAVCAN) devices.
RCIN	Support PPM/ SBUS/ DSM Input.
RS232	Support RS232 data interaction.
ADC	Analog inputs (analog ranging, monitoring analog voltage and current, etc.)

3.3 Head Direction

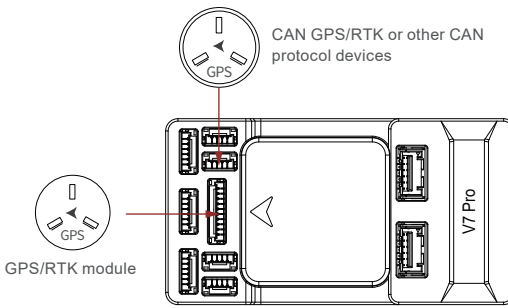
The default orientation of the autopilot is as indicated by the arrow, please ensure the arrow is pointing to the right front of your carrier. If the controller cannot be mounted in the default orientation, you will need to configure the autopilot software with the orientation actually used.



Head Direction

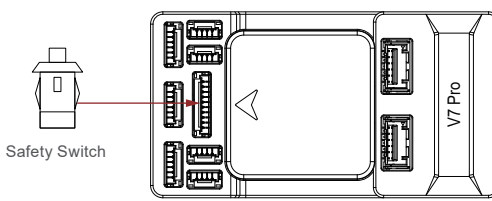
3.4 GPS

We recommend to use CAN GPS/RTK, only need to connect it to the CAN1/2 interface. You can also use a normal GPS/RTK module, just connect it to the GPS interface. The commonly used GPS modules generally integrate GPS, compass, safety switch, buzzer and LED status light. The GPS module should be installed on a bracket and away from other electronic devices. The installation direction should be the same as the direction of the autopilot.



3.5 Safety Switch

The safety switch is an additional mechanism to prevent accidental unlocking. If used, please connect it to the GPS & SAFETY port.



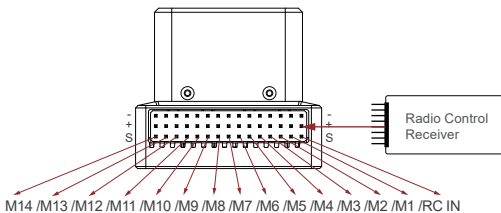
3.6 Buzzer

You can choose a GPS with a buzzer or an external buzzer.

3.7 Radio Control

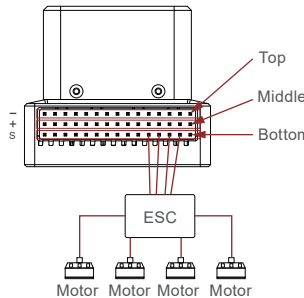
For safety reasons, it is recommended that you connect the handheld remote controller (For emergency use) regardless of whether you are controlling manually or automatically.

The figure below shows how you can connect to your remote control receiver:



3.8 PWM Output

V7 Pro support up to 14 PWM outputs and all PWM protocols, Outputs 1-12 support Dshot and outputs 1-8 support bidirectional Dshot. Among all the 14 PWM outputs, the top ones are GND, the middle ones are 5V(there is no 5V power by default. A power module is needed to power one of the channels to have 5V), and the bottom ones are signal.



The 14 PWM outputs are divided into 4 groups:
Group 1: m1 m2 m3 m4
Group 2: m5 m6 m7 m8
Group 3: m9 m10 m11 m12
Group 4: m13 m14

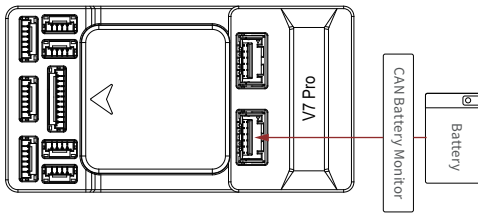
Channels in the same group need to use the same output rate. If any channel in a group uses Dshot, all channels in the group need to use Dshot.

3.9 Analog Input

V7 Pro Autopilot has 5 analog inputs
ADC PIN2—Battery Current
ADC PIN16—Battery Voltage
ADC PIN19—ADC 3v3 Sense
ADC PIN3—ADC 6V6 Sense
ADC PIN9—RSSI Voltage Detection

3.10 Power

V7 Pro has POWER1, POWER2, USB, USBEX and other power supply interfaces. Please connect the power module to the recommended interface (such as POWER 1, POWER 2).



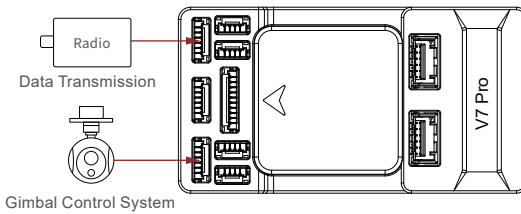
3.11 Battery Monitor Configuration

If you have connected the POWER1 ADC and POWER2 CAN power modules,
The correct battery setup parameters are:
Enable Battery1 monitor:
BATT_MONITOR 4
BATT_VOLT_PIN 16
BATT_CUR_PIN 2
BATT_VOLT_MULT 15.7 (may need to be adjusted if not using the provided monitor)
BATT_AMP_PERVLT 60.61 (may need to be adjusted if not using the provided monitor)

Enable Battery2 monitor: BATT2_MONITOR 8

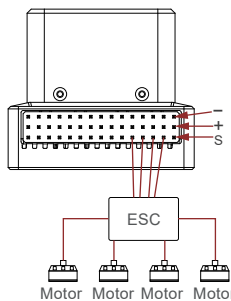
3.12 Data Transmission and Gimbal Control System

By using the data transmission and gimbal control system, you can communicate with the platform through the ground station software, monitor and control the platform and gimbal during missions. The airborne end of data transmission system should be connected to TELEM1 interface, and the gimbal control system should be connected to the TELEM2 interface.



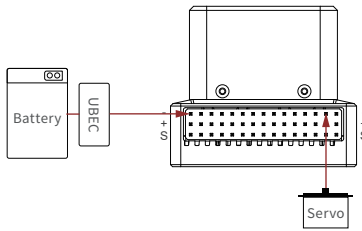
3.13 Motor

The motor & servo system are connected to the M1~M14 ports in the order specified for your carrier.



3.14 Servo Power Supply

The servo interface of V7 Pro is isolated from its internal power supply. Other PWM interfaces will not power the servo except RCIN with 5V. If you need to power the servo, please connect the BEC to any column of the positive and negative poles in M1-M14 (The negative poles of M1-M14 are all connected, likewise to the positive poles), then connect the servo. V7 Pro supports servo voltage monitoring which supports max 9.9V input.



4. Loading Firmware

V7 Pro Autopilot comes with a pre-installed ArduPilot compatible bootloader, allowing loading *.apj firmware files with any ArduPilot compatible ground station software (Mission Planner or QGroundControl).

This user manual is subject to update without notice.

For details, please visit http://www.v-uav.com/index.php to get the latest product information.

Technical support : support@V-UAV.com