Pixhawk Overview

!Note

Older versions of Pixhawk use an early version of the STM32F427 chip (RevA, RevY and Rev1).

A hardware bug is present in these chips that limit the flash memory to 1 MB. Any boards containing this chip cannot include all ArduPilot features due to this limitation.

Specifications

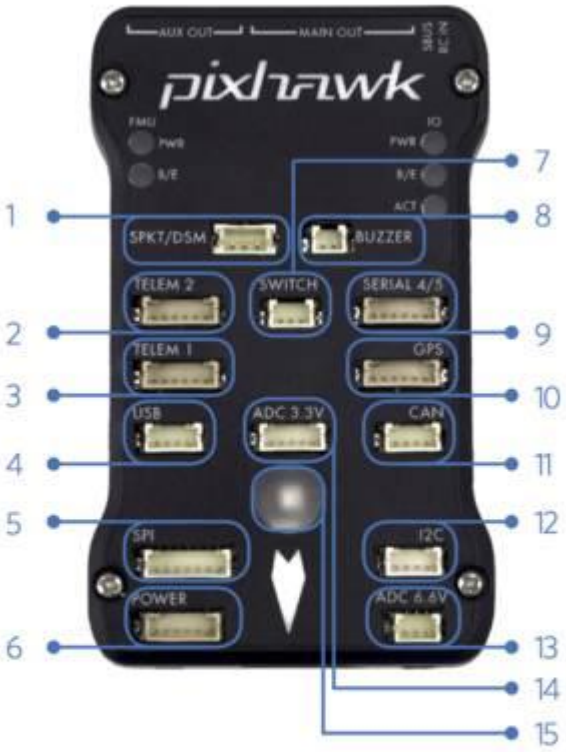
- **Processor**
  - 32-bit ARM Cortex M4 core with FPU
  - 168 Mhz/256 KB RAM/2 MB Flash
  - 32-bit failsafe co-processor
- **Sensors**
  - MPU6000 as main accel and gyro
  - ST Micro 16-bit gyroscope
  - ST Micro 14-bit accelerometer/compass (magnetometer)
  - MEAS barometer
- **Power**
  - Ideal diode controller with automatic failover
  - Servo rail high-power (7 V) and high-current ready
  - All peripheral outputs over-current protected, all inputs ESD protected
- **Interfaces**
  - 5x UART serial ports, 1 high-power capable, 2 with HW flow control
  - Spektrum DSM/DSM2/DSM-X Satellite input
  - Futaba S.BUS input (output not yet implemented)
  - PPM sum signal
  - RSSI (PWM or voltage) input
  - I2C, SPI, 2x CAN, USB
  - 3.3V and 6.6V ADC inputs
- **Dimensions**
  - Weight 38 g (1.3 oz)

- Width 50 mm (2.0”)
- Height 15.5 mm (.6”)
- Length 81.5 mm (3.2”)

Pixhawk connector assignments

Warning

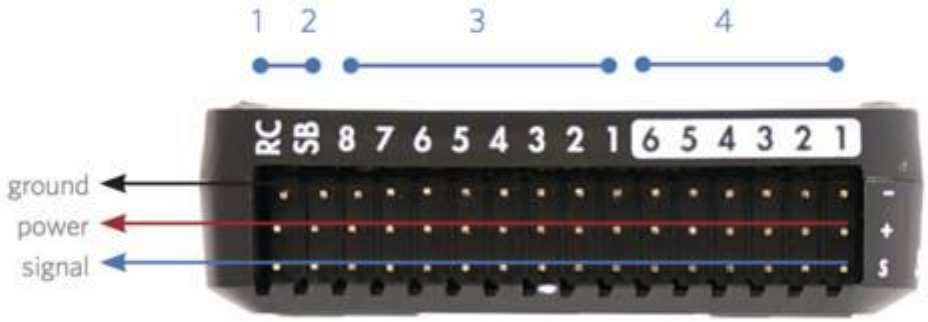
Many Pixhawk clones use Molex picoblade connectors instead of DF13 connectors. They have rectangular pins, rather than square ones, and cannot be assumed compatible.



1 Spektrum DSM receiver
2 Telemetry (on-screen display)
3 Telemetry (radio telemetry)
4 USB
5 SPI (serial peripheral interface) bus
6 Power module
7 Safety switch button
8 Buzzer
9 Serial
10 GPS module
11 CAN (controller area network) bus
12 I²C splitter or compass module
13 Analog to digital converter 6.6 V
14 Analog to digital converter 3.3 V
15 LED indicator



1 Input/output reset button
2 SD card
3 Flight management reset button
4 Micro-USB port



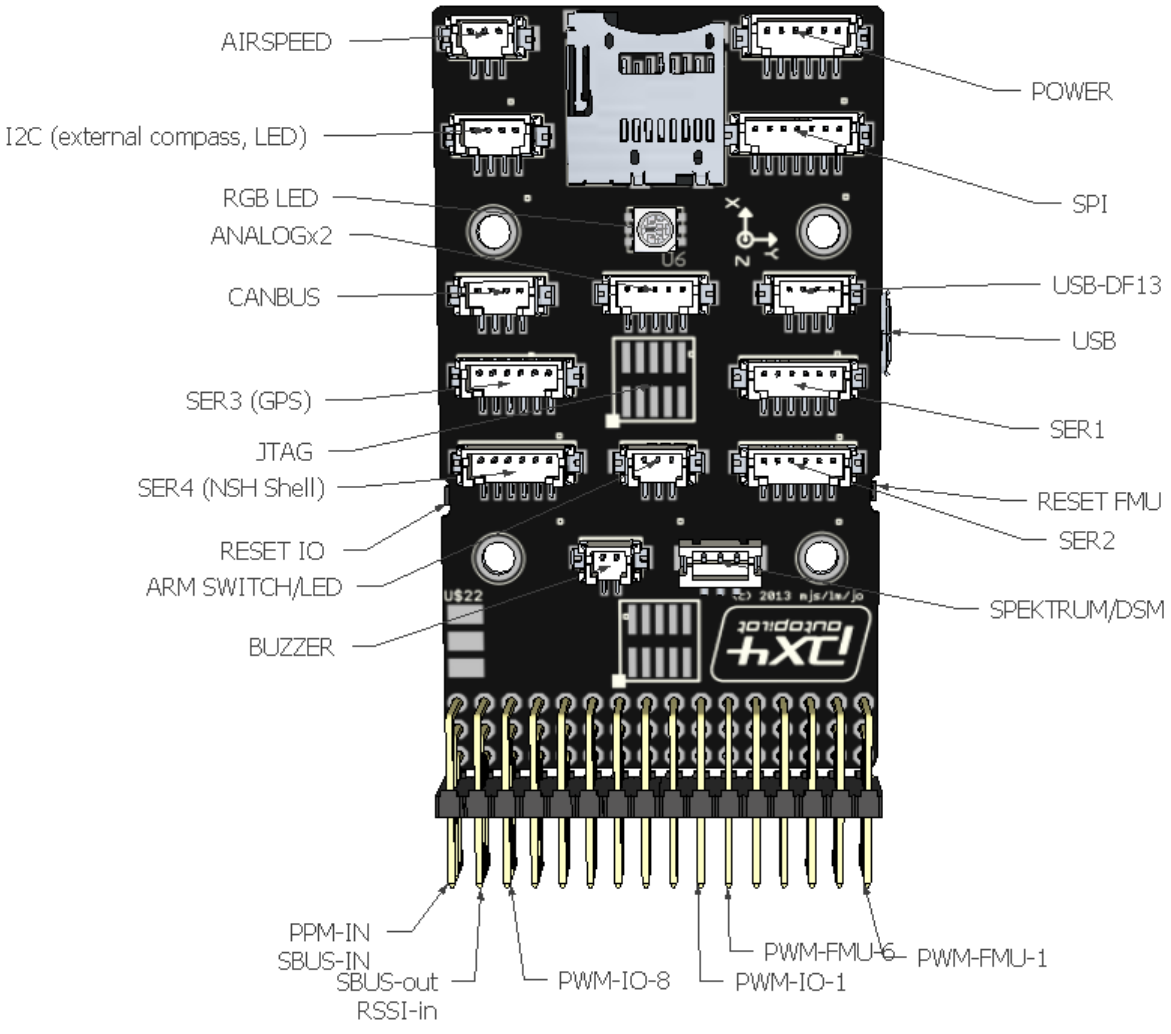
1 Radio control receiver input
2 S.Bus output
3 Main outputs
4 Auxiliary outputs



Pixhawk PWM connectors for servos and ESCs and PPM-SUM in and SBUS out



Pixhawk connector diagram



For all connectors pin 1 is on the right in the above image

Serial 1 (Telem 1) and Serial 2 (Telem 2) Pins: 6 = GND, 5 = RTS, 4 = CTS, 3 = RX, 2 = TX, 1 = 5V.

Pixhawk connector pin assignments

TELEM1, TELEM2 ports

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	TX (OUT)	+3.3V
3 (blk)	RX (IN)	+3.3V
4 (blk)	CTS	+3.3V
5 (blk)	RTS	+3.3V
6 (blk)	GND	GND

GPS port

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	TX (OUT)	+3.3V
3 (blk)	RX (IN)	+3.3V
4 (blk)	CAN2 TX	+3.3V
5 (blk)	CAN2 RX	+3.3V
6 (blk)	GND	GND

SERIAL 4/5 port - due to space constraints two ports are on one connector.

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	TX (#4)	+3.3V
3 (blk)	RX (#4)	+3.3V
4 (blk)	TX (#5)	+3.3V
5 (blk)	RX (#5)	+3.3V
6 (blk)	GND	GND

ADC 6.6V

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	ADC IN	up to +6.6V
3 (blk)	GND	GND

ADC 3.3V

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	ADC IN	up to +3.3V
3 (blk)	GND	GND
4 (blk)	ADC IN	up to +3.3V
5 (blk)	GND	GND

I2C

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	SCL	+3.3 (pullups)
3 (blk)	SDA	+3.3 (pullups)
4 (blk)	GND	GND

CAN

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	CAN_H	+12V
3 (blk)	CAN_L	+12V
4 (blk)	GND	GND

SPI

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	SPI_SCK	3.3V
3 (blk)	SPI_MISO	+3.3V
4 (blk)	SPI_MOSI	+3.3V
5 (blk)	!SPI_NSS	+3.3V
6 (blk)	!GPIO	+3.3V
7 (blk)	GND	GND

POWER

Pin	Signal	Volt
1 (red)	VCC	+5V
2 (blk)	VCC	+5V
3 (blk)	CURRENT	up to +3.3V
4 (blk)	VOLTAGE	up to +3.3V
5 (blk)	GND	GND
6 (blk)	GND	GND

SWITCH

Pin	Signal	Volt
1 (red)	VCC	+3.3V
2 (blk)	!IO_LED_SAFETY	GND
3 (blk)	SAFETY	GND

Console Port

The system's serial console runs on the port labeled SERIAL4/5. The pinout is standard serial pinout, to connect to a standard FTDI cable (3.3V, but it's 5V tolerant).

Pixhawk		FTDI	
1	+5V (red)		N/C
2	Tx		N/C
3	Rx		N/C
4	Tx	5	Rx (yellow)
5	Rx	4	Tx (orange)
6	GND	1	GND (black)

Spektrum/DSM Port

The Spektrum/DSM port is for connecting Spektrum DSM-2/DSMX receiver modules.

Pin	Signal	Volt
1 (white)	Signal	+3.3V
2 (black)	GND	GND
3 (red)	VCC	+3.3V

Pixhawk analog input pins

This section lists the analog pins available on the Pixhawk. These are virtual pins, defined in the firmware.

Virtual Pin 2 and Power connector Pin 4: power management connector voltage pin, accepts up to 3.3V, usually attached to a power module with 10.1:1 scaling

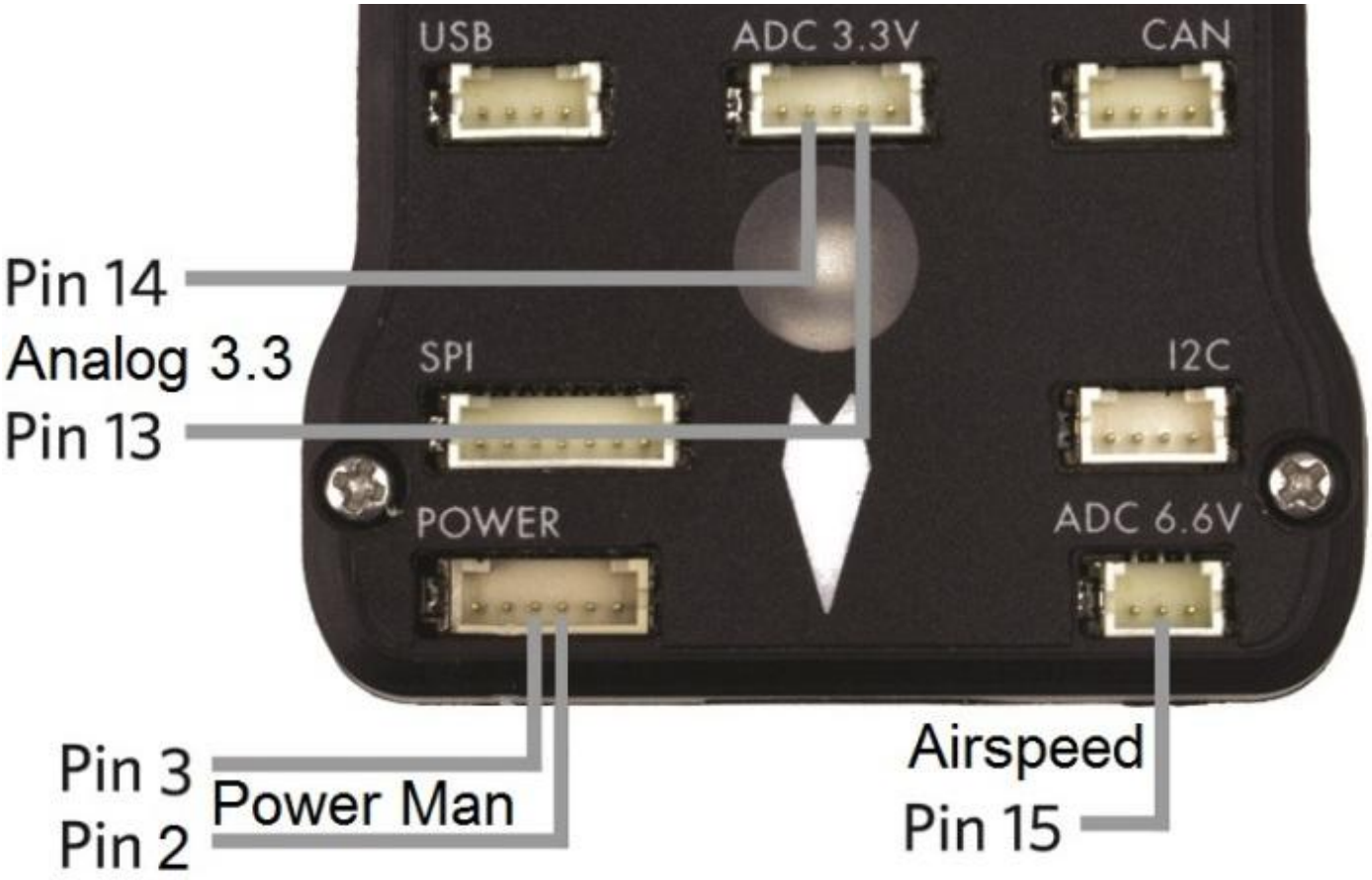
Virtual Pin 3 and Power connector Pin 3: power management connector current pin, accepts up to 3.3V, usually attached to a power module with 17:1 scaling

Virtual Pin 4 and (No connector Pin): VCC 5V rail sensing. This virtual pin reads the voltage on the 5V supply rail. It is used to provide the HWSTATUS.Vcc reading that ground stations use to display 5V status

Virtual Pin 13 and ADC 3.3V connector Pin 4: This takes a max of 3.3V. May be used for sonar or other analog sensors.

Virtual Pin 14 and ADC 3.3V connector Pin 2: This takes a max of 3.3V. May be used for second sonar or other analog sensor.

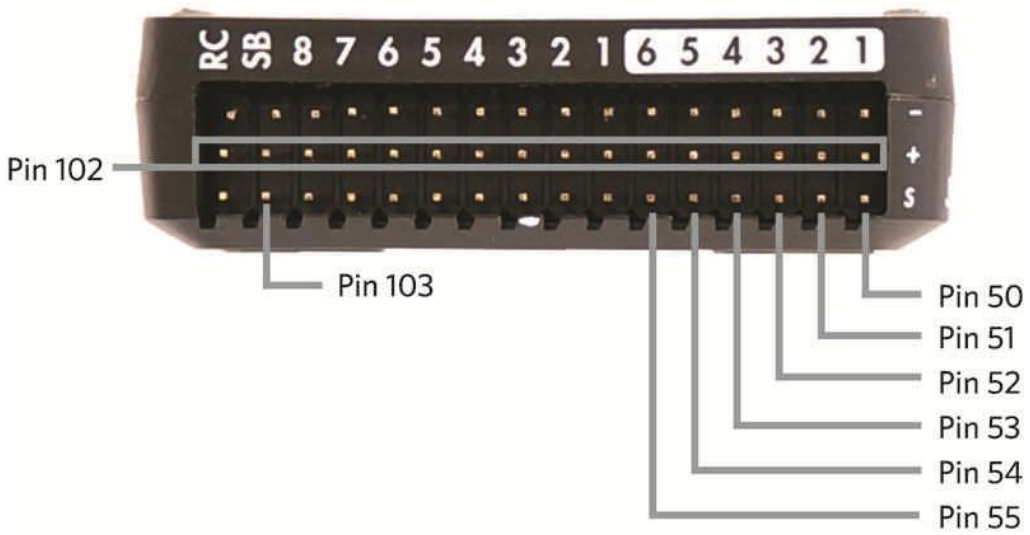
Virtual Pin 15 and ADC 6.6V connector Pin 2: analog airspeed sensor port. This has 2:1 scaling builtin, so can take up to 6.6v analog inputs. Usually used for analog airspeed, but may be used for analog sonar or other analog sensors.



Virtual Pin 102: Servo power rail voltage. This is an internal measurement of the servo rail voltage made by the IO board within the Pixhawk. It has 3:1 scaling, allowing it to measure up to 9.9V.

Virtual Pin 103: RSSI (Received Signal Strength Input) input pin voltage (SBus connector output pin). This is the voltage measured by the RSSI input pin on the SBUS-out connector (the bottom pin of the 2nd last servo connector on the 14 connector servo rail).

This can alternatively serve as SBus out by setting the BRD_SBUS_OUT parameter (Copter, Plane, Rover).



Pixhawk digital outputs and inputs (Virtual Pins 50-55)¶

The Pixhawk has no dedicated digital output or input pins on its DF13 connectors, but you can assign up to 6 of the "AUX SERVO" connectors to be digital GPIO outputs/inputs. These are the first 6 of the 14 three-pin servo connectors on the end of the board. They are marked as AUX servo pins 1 - 6 on the silkscreen as seen above.

To set the number of these pins that are available as digital inputs/outputs, set the BRD_PWM_COUNT parameter. On Pixhawk this defaults to 4, which means the first 4 AUX connectors are for servos (PWM) and the last 2 are for digital inputs/outputs. If you set BRD_PWM_COUNT to 0 then you would have 6 virtual digital pins and still have 8 PWM outputs on the rest of the connector.

!Note

in firmware versions 4.2 and later, the method for setting a PWM/SERVO/MOTOR output to be a GPIO function is changed. Instead of BRD_PWM_COUNT being used, the individual SERVOx_FUNCTION parameter is merely set to "-1". If set to "0", it remains a PWM output, unassigned to a function, and outputs that output's trim value when board safety is not active. If the servo function is being "mirrored" to a remote device, as in the case of a DroneCAN or KDECAN ESC, then in order to change the autopilot board's corresponding output pin to be a GPIO, but allow the SERVOx_FUNCTION to still be assigned to the remote device, the SERVO_GPIO_MASK parameter can be used to assign the board pin to be a GPIO without affecting the SERVOx_FUNCTION assignment for the remote device.

The 6 possible pins are available for PIN variables as pin numbers 50 to 55 inclusive.

In summary:

If BRD_PWM_CNT = 2 then

50 = RC9

51 = RC10

52 = Aux 3

53 = Aux 4

54 = Aux 5

55 = Aux 6

If BRD_PWM_CNT = 4 then

50 = RC9

51 = RC10

52 = RC11

53 = RC12

54 = Aux 5

55 = Aux 6

If BRD_PWM_CNT = 6 then

50 = RC9

51 = RC10

52 = RC11

53 = RC12

54 = RC13

55 = RC14

By default, the pins are digital outputs as outlined above. A digital pin will instead be a digital input if it is assigned to a parameter that represents a digital input. For example, setting CAM1_FEEDBAK_PIN to 50 will make pin 50 the digital input that receives a signal from the camera when a picture has been taken.