pixhawk®

DS-018 Pixhawk Autopilot v6C Standard

Revision: 0.1.0
Revision date: December 13, 2022

Abstract

This document is the formal version of the Pixhawk industry standard that includes all aspects of the hardware standard required to build compatible autopilots.

Table of Contents

Document Revisions

Revision	Date	Editor	Reviewer	Comments
0.1.0	12/13/22	Vince Poon	Ramón Roche	Initial specification

Contact and Public Developer Call

This standard is being developed on a public developer call.
For further questions, please contact the maintainer of the standard, lorenz@px4.io.

Trademark Guideline

Pixhawk is a registered trademark and is used to mark and protect the consistent use of this standard. The requirements for this are covered in this document: Trademark Guideline

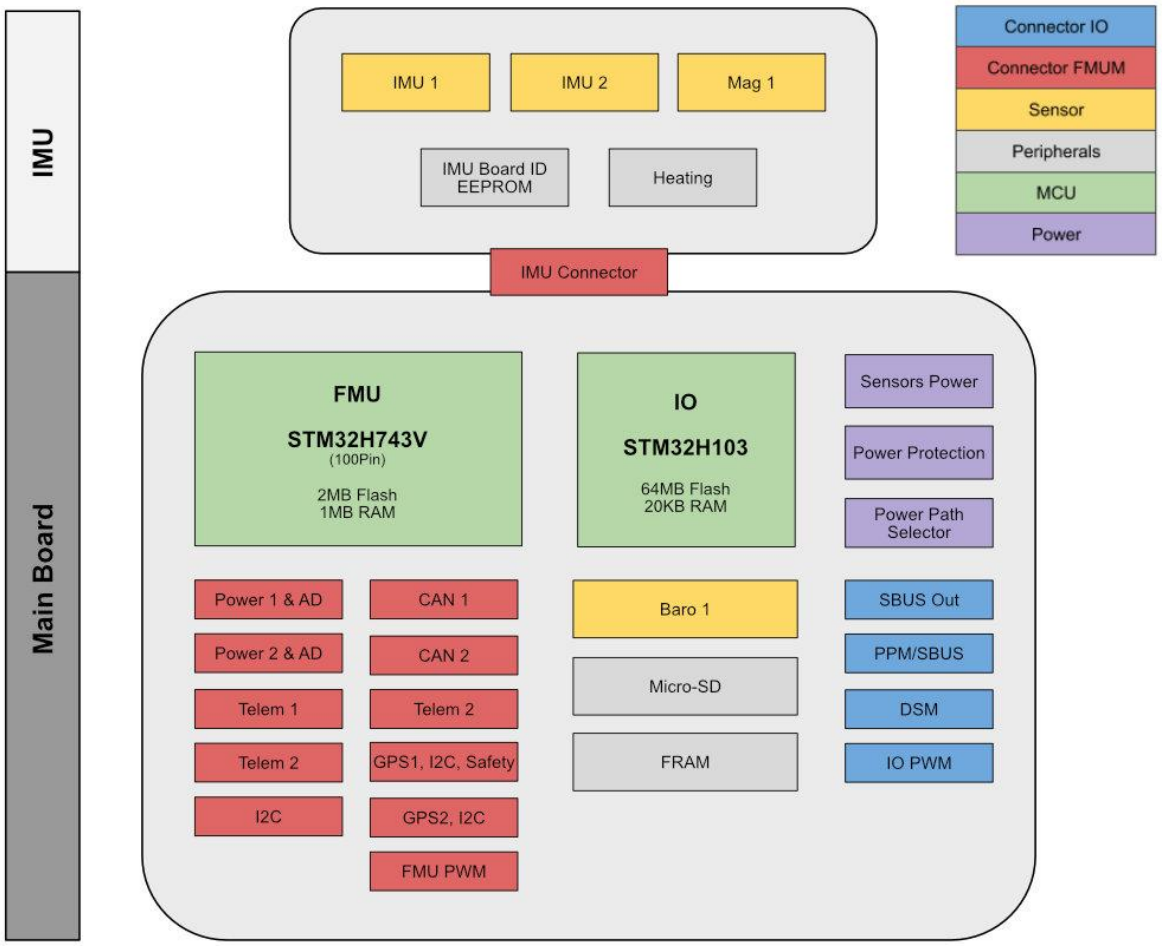
License and Disclaimer

Related Standards

- DS-009 Pixhawk Connector Standard

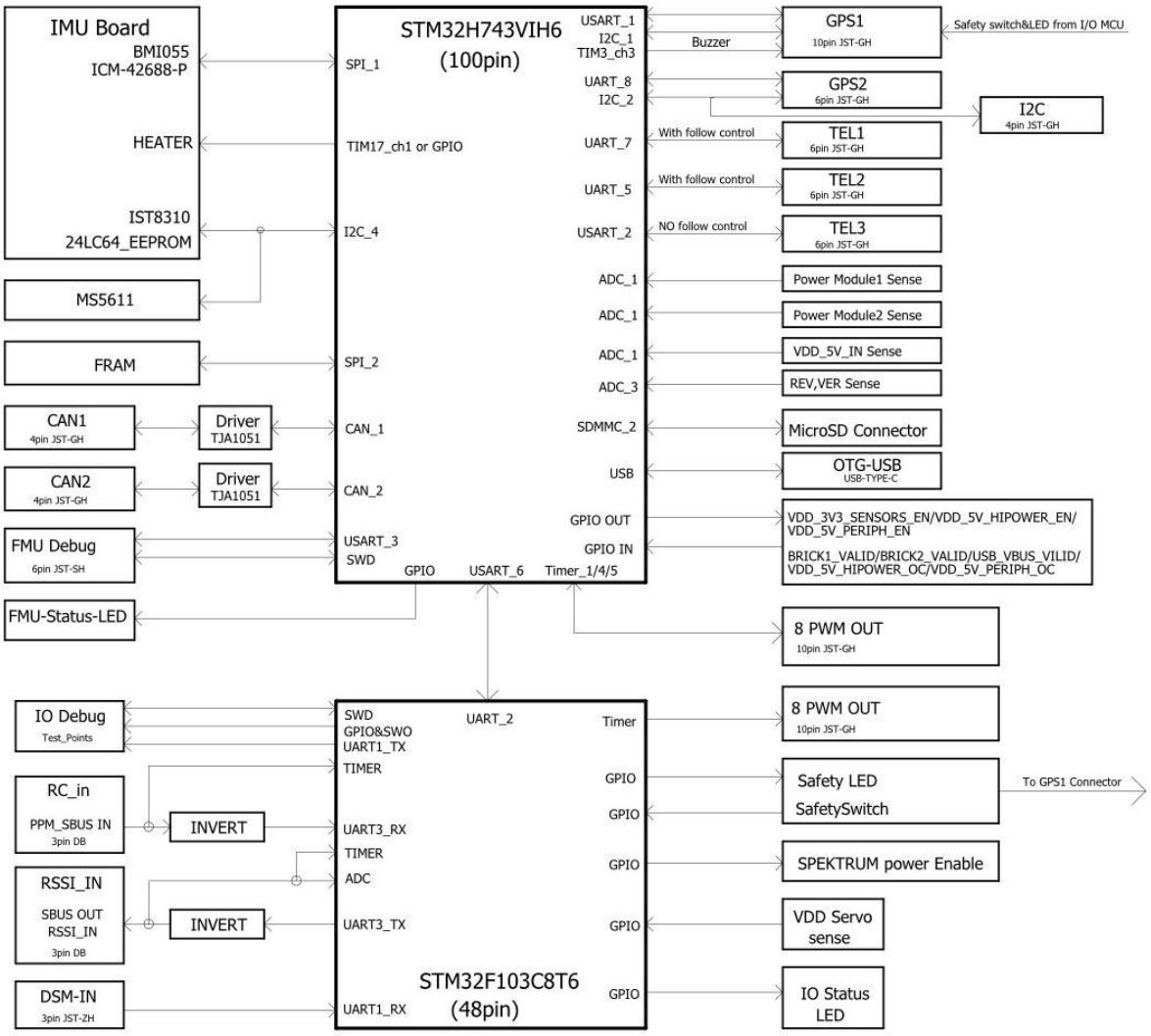
FMUv6C Summary

Overview



NOTE: Connectors as shown are optional

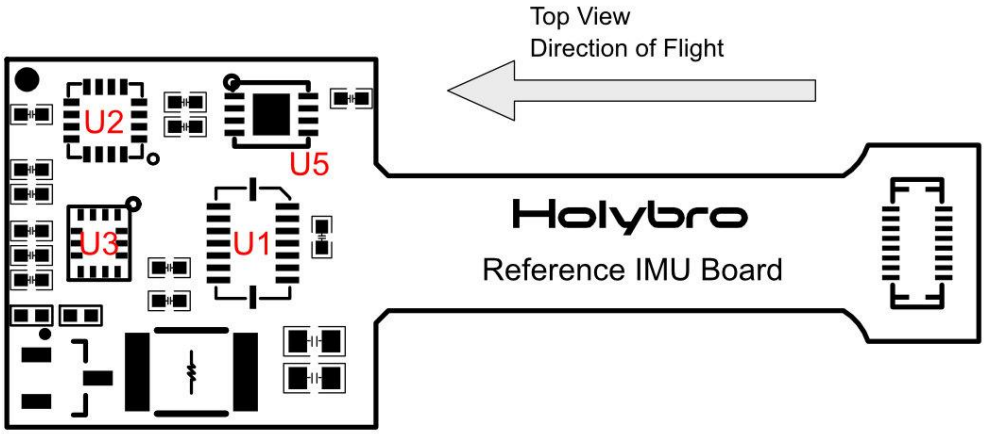
Detailed Block Diagram Reference



- Redundant IMU sensors
  - TDK Invensense ICM-42688-P (Vibration Isolated)
  - Bosch BMI055 (Vibration Isolated)
  - iSentek IST8310 compass (Vibration Isolated)
  - TE Connectivity MS5611 or Bosch BMP388 (Vibration Isolated)
  - On-IMU calibration EEPROM memory for high-accuracy sensors
- Automated sensor calibration eliminating varying signals and temperature
- Operating temperature -40 to +85°C
- FRAM memory for configuration data (SPI2)
- Extensive power monitoring
  - Two smart batteries on SMBus or more on DroneCAN
  - 5V rail monitoring
  - 3.3V rail monitoring for CPU
  - 3.3V rail monitoring for each sensor domain

- Redundant power supply: The autopilot can be powered from up to three power sources and every sensor set is powered by an independent LDO with independent power control
- Battery-backed real time clock for running security applications without GPS coverage

FMUv6C Sensors Locations



Sensor Sets

Sensor sets comprised an Main Board set of sensors and an IMU set of sensors. These are revisioned in pairs. (Rev 1, Rev 2, Rev 3, etc)

Sensor Set

Sensor Set (Rev 0 & 1)

Main Board

Name	Sensor Type	Bus	Chip Select/ 7 Bit Addr	DRDY	Power Domain
U1 (FRAM)	FM25V02A-G	SPI2	CS1	-NONE	FMU VDD3V3
U7 (BARO)	Ms5611	I2C4	0x77	-NONE	1

IMU Board

Name	Sensor Type	Bus	Chip Select/ 7 Bit Addr	DRDY	Power Domain
U1 (IMU1)	BMI055 ACCEL	SPI1	CS1	DRDY1	1
U1 (IMU1)	BMI055 GYRO	SPI1	CS2	DRDY2	1
U3 (IMU2)	ICM-42688-P	SPI1	CS3	DRDY3	1
U2 (MAG)	IST8310	I2C4	0x0C	-NONE	1
U5	EEPROM	I2C4	0x51	-NONE	1

Full FMUv6C Pinout

The official Pinout for FMUv6C is covered in this pinout sheet.

		STM32H743 Signal	Usage
PA	0	TIM5_CH1	FMU_CH7
PA	1	TIM5_CH2	FMU_CH8
PA	2	ADC1_INP14	FMU_BAT2_I
PA	3	USART2_RX	FMU_USART2_RX_TEL3
PA	4	ADC1_INP18	FMU_SCALED_V5
PA	5	SPI1_SCK	FMU_SPI1_SCK_SENSOR
PA	6	SPI1_MISO	FMU_SPI1_MISO_SENSOR
PA	7	SPI1_MOSI	FMU_SPI1_MOSI_SENSOR
PA	8	TIM1_CH1	FMU_CH1
PA	9	USB_OTG_FS_VBUS	FMU_VBUS_SENSE
PA	10	USART1_RX	FMU_UART1_RX_GPS1
PA	11	USB_OTG_FS_DM	FMU_USB_DM
PA	12	USB_OTG_FS_DP	FMU_USB_DP
PA	13	SWDIO	FMU_SWDIO
PA	14	SWCLK	FMU_SWCLK
PA	15	PA15	N_BRICK1_VALID
PB	0	TIM3_CH3	FMU_BUZZER
PB	1	ADC1_INP5	FMU_BAT2_V
PB	2	PB2	VDD_3V3_SENSORS_EN
PB	3	SDMMC2_D2	FMU_SDMMC2_D2
PB	4	SDMMC2_D3	FMU_SDMMC2_D3
PB	5	CAN2_RX	FMU_CAN2_RX
PB	6	USART1_TX	FMU_USART1_TX_GPS1
PB	7	I2C1_SDA	FMU_I2C1_SDA_GPS1_MAG_LED
PB	8	I2C1_SCL	FMU_I2C1_SCL_GPS1_MAG_LED
PB	9	TIM17_CH1	FMU_HEATER
PB	10	I2C2_SCL	FMU_I2C2_SCL_GPS2_MAG_LED
PB	11	I2C2_SDA	FMU_I2C2_SDA_GPS2_MAG_LED
PB	12	PB12	N_BRICK2_VALID

PB	13	CAN2_TX	FMU_CAN2_TX
PB	14	SDMMC2_D0	FMU_SDMMC2_D0
PB	15	SDMMC2_D1	FMU_SDMMC2_D1
PC	0	ADC3_INP10	HW_REV_SENSE
PC	1	ADC3_INP11	HW_VER_SENSE
PC	2	SPI2_MISO	FMU_SPI2_MISO_FRAM
PC	3	SPI2_MOSI	FMU_SPI2_MOSI_FRAM
PC	4	ADC1_INP4	FMU_BAT1_I
PC	5	ADC1_INP8	FMU_BAT1_V
PC	6	USART6_TX	FMU_USART6_TX_TO_IO
PC	7	USART6_RX	FMU_USART6_RX_FROM_IO
PC	8	UART5_RTS	FMU_UART5_RTS_TEL2
PC	9	UART5_CTS	FMU_UART5_CTS_TEL2
PC	10	PC10	N_VDD_5V_HIPOWER_EN
PC	11	PC11	N_VDD_5V_HIPOWER_OC
PC	12	UART5_TX	FMU_UART5_TX_TEL2
PC	13	PC13	FMU_SPI1_CS3_ICM42688
PC	14	PC14	FMU_SPI1_CS2_BMI055_GYRO
PC	15	PC15	FMU_SPI1_CS1_BMI055_ACC
PD	0	CAN1_RX	FMU_CAN1_RX
PD	1	CAN1_TX	FMU_CAN1_TX
PD	2	UART5_RX	FMU_UART5_RX_TEL2
PD	3	SPI2_SCK	FMU_SPI2_SCK_FRAM
PD	4	PD4	FMU_SPI2_CS_FRAM
PD	5	USART2_TX	FMU_USART2_TX_TEL3
PD	6	SDMMC2_CK	FMU_SDMMC2_CK
PD	7	SDMMC2_CMD	FMU_SDMMC2_CMD
PD	8	USART3_TX	FMU_USART3_TX_DEBUG
PD	9	USART3_RX	FMU_USART3_RX_TEBUG
PD	10	PD10	N_FMU_LED_RED
PD	11	PD11	N_FMU_LED_BLUE
PD	12	I2C4_SCL	FMU_I2C4_SCL
PD	13	I2C4_SDA	FMU_I2C4_SDA
PD	14	TIM4_CH3	FMU_CH5

PD	15	TIM4_CH4	FMU_CH6
PE	0	UART8_RX	FMU_UART8_RX_GPS2
PE	1	UART8_TX	FMU_UART8_TX_GPS2
PE	2	PE2	N_VDD_5V_PERIPH_EN
PE	3	PE3	N_VDD_5V_PERIPH_OC
PE	4	PE4	FMU_SPI1_DRDY1_BMI055_ACC
PE	5	PE5	FMU_SPI1_DRDY2_BMI055_GYRO
PE	6	PE6	FMU_SPI1_DRDY3_ICM42688
PE	7	UART7_RX	FMU_UART7_RX_TEL1
PE	8	UART7_TX	FMU_UART7_TX_TEL1
PE	9	UART7_RTS	FMU_UART7_RTS_TEL1
PE	10	UART7_CTS	FMU_UART7_CTS_TEL1
PE	11	TIM1_CH2	FMU_CH2
PE	12	PE12	HW_VER_REV_DRIVE
PE	13	TIM2_CH3	FMU_CH3
PE	14	TIM2_CH4	FMU_CH4
PE	15	PE15	N_USB_VBUS_VALID