



FLIGHT CONTROLLER MOMOFC-1

STM32F405RGT6, BMI088, HMC5883L, DPS310, OSD, 5x UARTs, 1x I2C, 10x PWM, Dual BEC support, 2~5S LiPo

Features

- STM32F405RGT6, 1MB flash
- 6-axis inertial sensor (IMU)
- Barometer and magnetometer
- 5V BEC input
- Dual BEC capable (selectable): BEC1: S1-S5 or S1-S8, BEC2: S6-S8
- Analog VTX overlay.
- max. 6 motors + 3servos in INAV/BF multirotor mixer.
- DJI HD System support (Caddx Vista & Air Unit)
- SBUS support (selectable, RX2)
- USB-C
- Protection/extender PCBs
- No BlackBox (Flash/SD)

Specifications

- MCU: STM32F405RGT6
- IMU: BOSCH BM088
- Magnetometer: HMC5883L
- OSD: AT7456E, DJI OSD
- Baro: Infineon DPS310 (I2C)
- 5x UARTs (eg. RX, SBUS, DJI, ESC telemetry), 1x Softserial_Tx option
- 10x PWM outputs (6x Dshot)
- 1x I2C
- 4x ADC (VBAT, Current, RSSI, Airspeed)
- 2x PINIO
- 3x LEDs for FC STATUS (Blue, Green) and 3.3V indicator (Red)
- RGB led support (WS2812)

Power

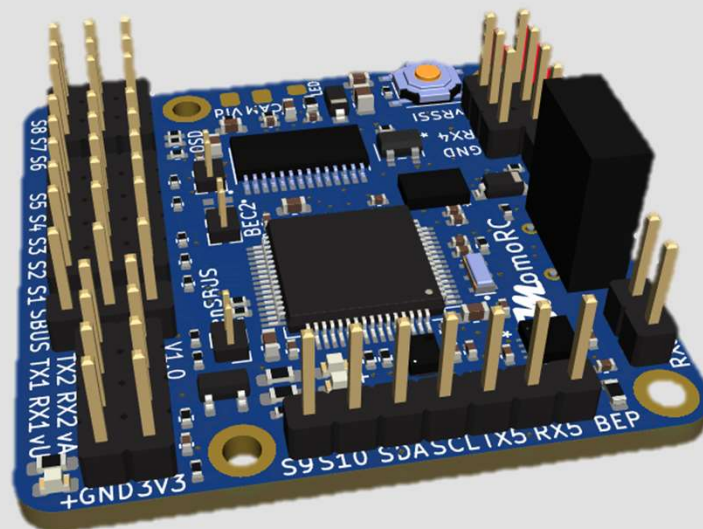
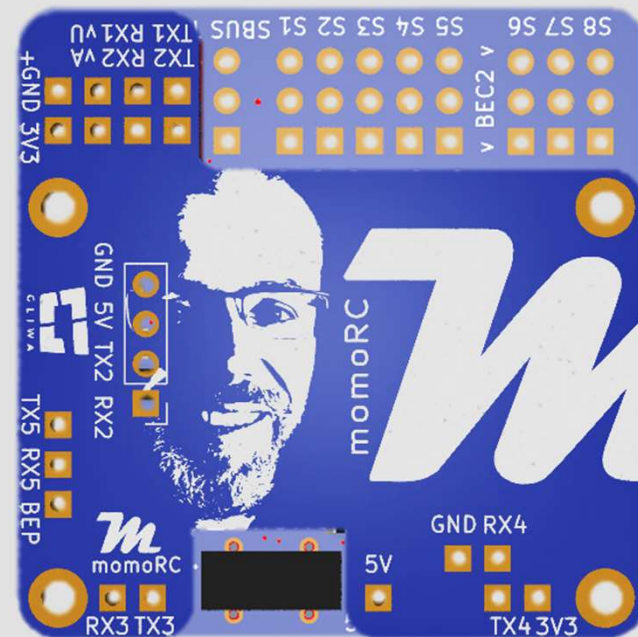
- Input: 5V (from BEC or MomoRC adapter board)
- LDO: 3.3V 600mA
- Battery Voltage sensing: 2K:12K (INAV scale 700)
- Supports external current sensor

Firmware

- INAV: MOMOFC
- BetaFlight: COMPILEYOURSELF

Physical

- Mounting: 25/35 x 35mm, Φ 2.5mm
- Dimensions: 40 x 40 x 5 mm
- Weight: 7g

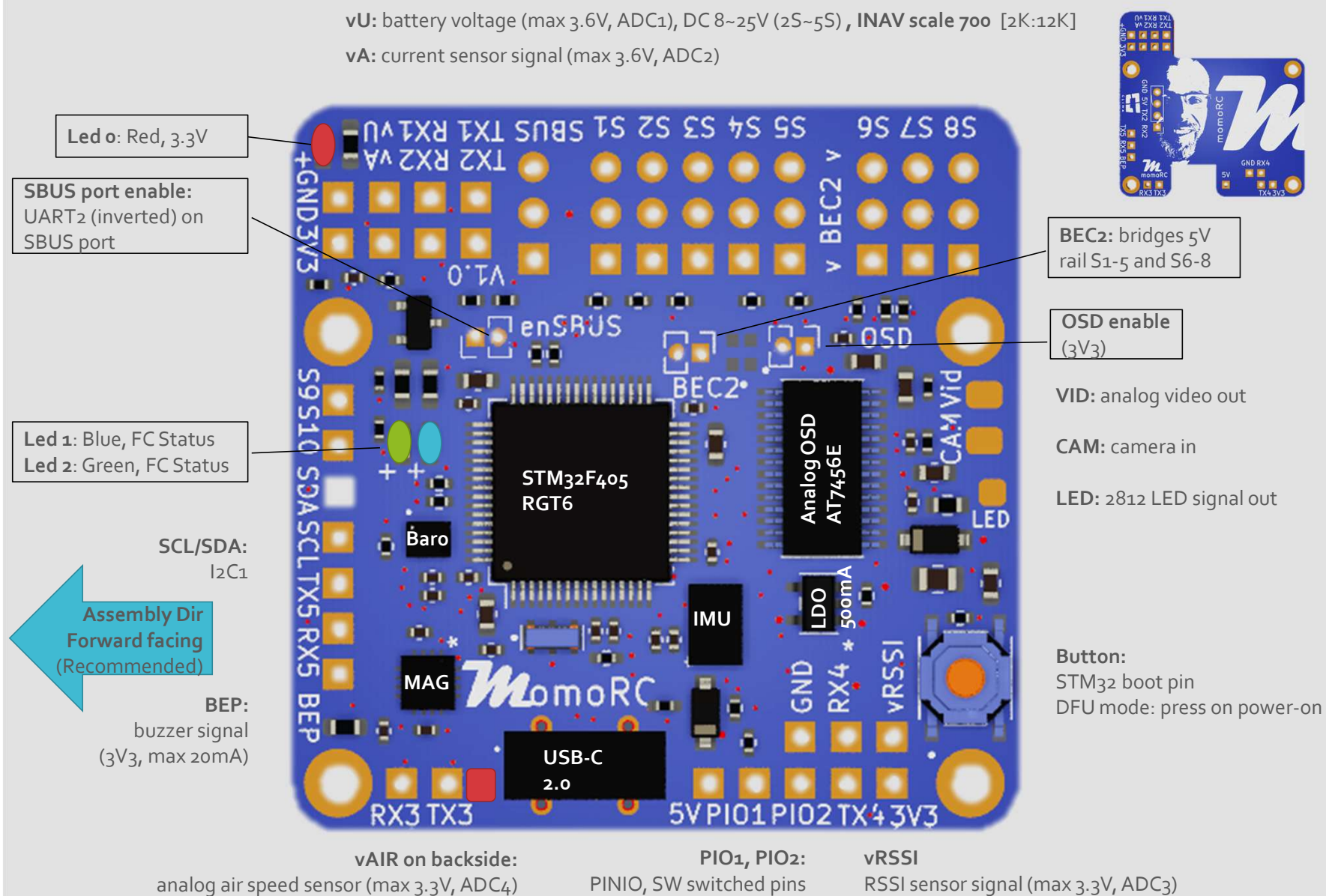




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Layout Base module





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INAV Config

UARTS/Receiver:

UART1: USER defined

UART2: Receiver

a) **CRSF:** RX2/TX2

b) **FRSKY SBUS:** SBUS RX:
SPORT telemetry:

RX: "SBUS"-PAD(= invert.RX2), connect to receiver SBUS (!enable SBUS jumper)

TX2: remap TX2 to 'Softserial_TX1' for telemetry, INAV "enable Softserial_Tx1"

c) **FRSKY FPORT:**

TX2: to FPORT, uninverted S.Port/F.Port signal (hacked)

UART3: USER defined, RX3 for BLHeli32 ESC telemetry

UART4: DJI OSD

UART5: GPS

Battery Voltage:

INAV scale 700 [2K:12K]

vU: battery voltage (max 3.6V, ADC1), DC 8~25V (2S~5S)

DSHOT:

With INAV firmware, DSHOT can not work on S3, S5, S7
because of DMA clash, pls use ONESHOT or MULTISHOT
and calibrate ESC PWM range.

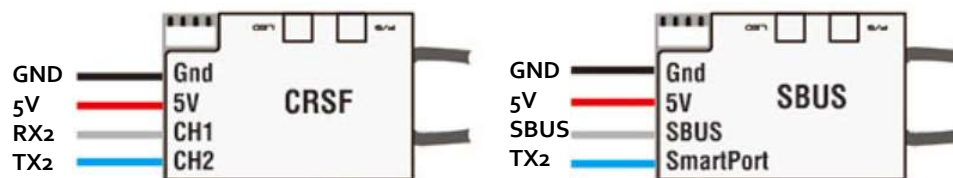
Magnetometer:

HMC5883L (autodetected)

Barometer/Vario:

Infineon DPS310 (autodetected)

Receiver Wiring



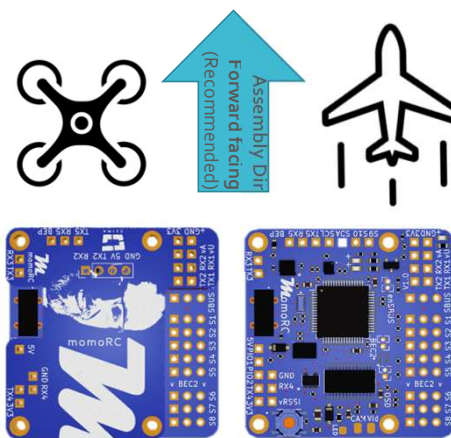
!!! Only works with uninverted F.PORT/S.PORT



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Assembly Notes IMU config (INAV)



Check magnetometer alignment (CLI):

```
align_mag      = CW0  
align_mag_roll = 0  
align_mag_pitch = 0  
align_mag_yaw  = 0
```

Check board alignment (CLI):

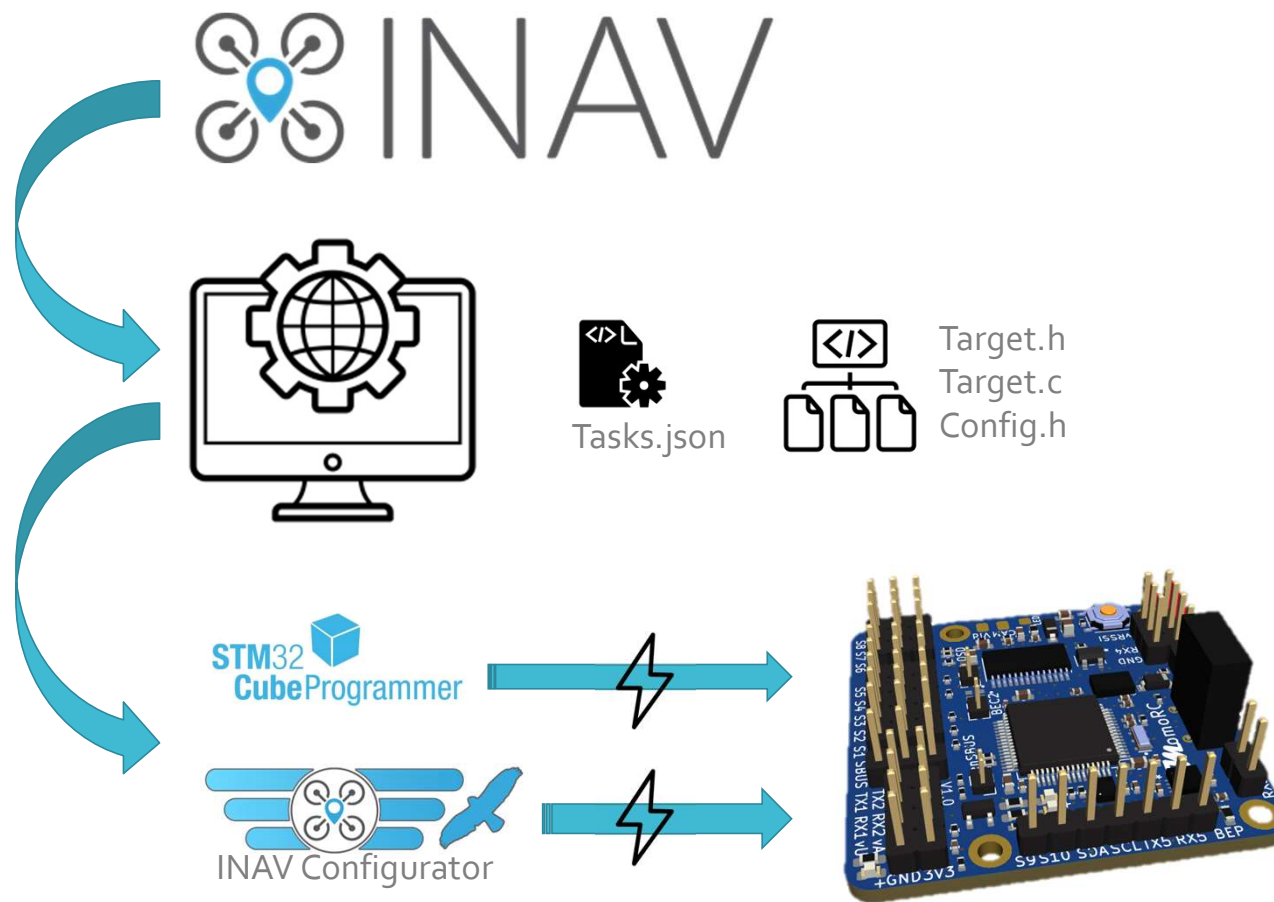
```
align_board_roll = 0  
align_board_pitch = 0  
align_board_yaw  = 0
```



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Software Documentation





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How to build for
INAV

INAV releases

Build Environment

Prepare Build

Customize own target

Build/make

Initial Flashing

INAV project:

<https://github.com/iNavFlight/inav>

INAV Releases:

INAV: <https://github.com/iNavFlight/inav/releases>

INAV Configurator: <https://github.com/iNavFlight/inav-configurator/releases>

Build environment setup

see actual INAV versions specifics in ...

→ <https://github.com/iNavFlight/inav/tree/master/docs/development>

→ „Building in Windows 10 or 11 with Linux Subsystem.md“

→ „IDE - Visual Studio Code with Windows 10.md“

Prepare your build : : Git clone or download INAV (any release)

Customize/define your own version of MomoFC in INAV:

a) Copy existing/closest matching target (MATEK F405HD) folder to new <myFCName> folder in /src/main/targets

b) Adapt the following files: (working example see next slides)

- target.c
- target.h
- config.h

Prepare for building:

a) Create own build task (see example)

b) update cmake environment: start „cmake ..“ in /build

c) „make <targetName>“

Initial Flashing a new Flight Controller:

Flash own target build on untouched FC with STM Cube Programmer



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INAVtarget

config.h

Config.h:

```
#pragma once
#define USE_TARGET_CONFIG

# define TARGET_BOARD_IDENTIFIER "MOFC,, // 4 Bytes !!!"
# define USBD_PRODUCT_STRING "MomoFC405"

#define LED0 PA14 //Blue
#define LED1 PA13 //Green

#define BEEPER PB9
#define BEEPER_INVERTED
#define BEEPER_PWM_FREQUENCY 2500

// ***** SPI IMU & OSD *****
#define USE_SPI
#define USE_SPI_DEVICE_1

#define SPI1_SCK_PIN PA5
#define SPI1_MISO_PIN PA6
#define SPI1_MOSI_PIN PA7

#define USE_IMU_BMI088
#define IMU_BMI088_ALIGN CW0_DEG
#define BMI088_SPI_BUS BUS_SPI1
#define BMI088_GYRO_CS_PIN PC7
#define BMI088_ACC_CS_PIN PC14
#define GYRO_INT_EXTI PC15
#define BMI088_EXTI_PIN GYRO_INT_EXTI
#define USE_EXTI
#define USE_MPU_DATA_READY_SIGNAL

#define USE_MAX7456
#define MAX7456_SPI_BUS BUS_SPI1
#define MAX7456_CS_PIN PB12

// ***** SPI2 Flash/SD Card *****
// deleted

// ***** I2C /Baro/Mag *****
#define USE_I2C
#define USE_I2C_DEVICE_1
#define I2C1_SCL PB8
#define I2C1_SDA PB7

#define USE_BARO
#define BARO_I2C_BUS BUS_I2C1
#define USE_BARO_BMP280
#define USE_BARO_MS5611
#define USE_BARO_DPS310
#define USE_BARO_SPL06

#define USE_MAG
#define MAG_I2C_BUS BUS_I2C1
#define USE_MAG_HMC5883
#define USE_MAG_QMC5883
#define USE_MAG_IST8310
#define USE_MAG_IST8308
#define USE_MAG_MAG3110
#define USE_MAG_LIS3MDL

#define USE_RANGEFINDER
#define RANGEFINDER_I2C_BUS BUS_I2C1
#define PITOT_I2C_BUS BUS_I2C1
#define TEMPERATURE_I2C_BUS BUS_I2C1
#define BNO055_I2C_BUS BUS_I2C1

// ***** UART *****
#define USE_VCP

#define USE_UART1
#define UART1_TX_PIN PA9
#define UART1_RX_PIN PA10

#define USE_UART2
#define UART2_TX_PIN PA2
#define UART2_RX_PIN PA3

#define USE_UART3
#define UART3_TX_PIN PC10
#define UART3_RX_PIN PC11

#define USE_UART4
#define UART4_TX_PIN PA0
#define UART4_RX_PIN PA1

#define USE_UART5
#define UART5_TX_PIN PC12
#define UART5_RX_PIN PD2

#define USE_SOFTSERIAL1
#define SOFTSERIAL_1_TX_PIN PA2
#define SOFTSERIAL_1_RX_PIN PA2

#define SERIAL_PORT_COUNT 7 // VCP, UART1,2,3,4,5, Softserial

#define DEFAULT_RX_TYPE RX_TYPE_SERIAL
#define SERIALRX_PROVIDER SERIALRX_CRSF
#define SERIALRX_UART SERIAL_PORT_USART2

// ***** ADC *****
#define USE_ADC
#define ADC_INSTANCE ADC1
#define ADC1_DMA_STREAM DMA2_Stream4
#define ADC_CHANNEL_1_PIN PC4
#define ADC_CHANNEL_2_PIN PC5
#define ADC_CHANNEL_3_PIN PB0
#define ADC_CHANNEL_4_PIN PC0

#define VBAT_ADC_CHANNEL ADC_CHN_1
#define CURRENT_METER_ADC_CHANNEL ADC_CHN_2
#define RSSI_ADC_CHANNEL ADC_CHN_3
#define AIRSPEED_ADC_CHANNEL ADC_CHN_4

// ***** PINIO *****
#define USE_PINIO
#define USE_PINIOBOX
#define PINIO1_PIN PC1
#define PINIO2_PIN PC2

// ***** LEDSTRIP *****
#define USE_LED_STRIP
#define WS2811_PIN PB1

// ***** others *****
#define DEFAULT_FEATURES (FEATURE_OSD |
FEATURE_TELEMETRY | FEATURE_CURRENT_METER |
FEATURE_VBAT | FEATURE_TX_PROF_SEL)

#define VBAT_SCALE_DEFAULT 700
#define CURRENT_METER_SCALE 150

#define TARGET_IO_PORTA 0xffff
#define TARGET_IO_PORTB 0xffff
#define TARGET_IO_PORTC 0xffff
#define TARGET_IO_PORTD (BIT(2))

#define MAX_PWM_OUTPUT_PORTS 10

#define USE_SERIAL_4WAY_BLHELI_INTERFACE
#define USE_DSHOT
#define USE_ESC_SENSOR
```



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INAVtarget

config.c

target.c

config.c:

```
void targetConfiguration(void)
{
    pinioBoxConfigMutable()->permanentId[0] = BOX_PERMANENT_ID_USER1;
    pinioBoxConfigMutable()->permanentId[1] = BOX_PERMANENT_ID_USER2;
    beeperConfigMutable()->pwmMode = true;
}
```

Target.c:

```
timerHardware_t timerHardware[] = {
    DEF_TIM(TIM8, CH4, PC9, TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR, 0, 0), // S1 D(2,7,7) UP217
    DEF_TIM(TIM8, CH3, PC8, TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR, 0, 0), // S2 D(2,2,0) UP217
    DEF_TIM(TIM1, CH3N, PB15, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 0), // S3 D(2,6,0) UP256
    DEF_TIM(TIM1, CH1, PA8, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 1), // S4 D(2,1,6) UP256

    DEF_TIM(TIM2, CH4, PB11, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 0), // S5 D(1,7,3) UP173
    DEF_TIM(TIM2, CH3, PB10, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 0), // S6 D(1,1,3) UP173
    DEF_TIM(TIM2, CH2, PB3, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 0), // S7 D(1,6,3) UP173
    DEF_TIM(TIM2, CH1, PA15, TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO, 0, 0), // S8 D(1,5,3) UP173

    DEF_TIM(TIM12, CH1, PB14, TIM_USE_MC_SERVO | TIM_USE_FW_SERVO, 0, 0), // S9 DMA NONE
    // DEF_TIM(TIM13, CH1, PA6, TIM_USE_MC_SERVO | TIM_USE_FW_SERVO, 0, 0), // S10 DMA NONE
    DEF_TIM(TIM4, CH1, PB6, TIM_USE_MC_SERVO | TIM_USE_FW_SERVO, 0, 0), // S10 D(1,0,2)

    DEF_TIM(TIM3, CH4, PB1, TIM_USE_LED, 0, 0), // 2812LED D(1,2,5)
    DEF_TIM(TIM11, CH1, PB9, TIM_USE_BEEPER, 0, 0), // BEEPER PWM

    DEF_TIM(TIM9, CH2, PA3, TIM_USE_PPM, 0, 0), //RX2
    DEF_TIM(TIM5, CH3, PA2, TIM_USE_ANY, 0, 0), //TX2 softserial1_Tx
};

const int timerHardwareCount = sizeof(timerHardware) / sizeof(timerHardware[0]);
```




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INAVtarget

buildtask

TASKS.JSON in build environment:

```
.....  
  
// Momo FC  
{  
  "label": "Build MomoFC405",  
  "type": "shell",  
  "command": "make MOMOFC405", // naming must match newly created target/folder !!!!  
  "group": "build",  
  "problemMatcher": [],  
  "options": {  
    "cwd": "${workspaceFolder}/build"  
  }  
}
```

.....



Assembly Dir
Forward facing
(Recommended)

