FreeFlight IMU manual for V1.22L

The FreeFlight IMU is a Inertial Measurement Unit   - IMU - designed for use in multirotor helis and planes.

It has 9 degrees of measurements coming from a 3-axis gyro, a 3-axis accelerometer and a 3-axis compass. In addition there is also a absolute pressure sensor, that is used as an altimeter for height hold function.

Specifications:

Invensense ITG-3200 3-axis gyro
Bosch BMA180 3-axis accelerometer
Honeywell HMC5883L 3-axis magnetometer (compass)
Bosch BMP085 absolute pressure sensor (Altimeter)

Operation is pure I2C with interrupt pins from accel and gyro brought out to headers.

The onboard 3.3V LDO regulator can be fed with DC 2.5 - 6.5 volts.

Logic levels are max 3.3 volts, which means that you have to use a logic level converter or disable internal pullups for 5V Arduinos and AVR´s. Disabling the Internal pullups in Arduino/AVR makes the Arduino recognize anything over 3V as logic high. See appendix for different types of Logic Level Conversion circuits.

Overview:
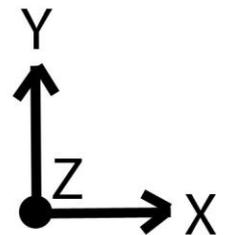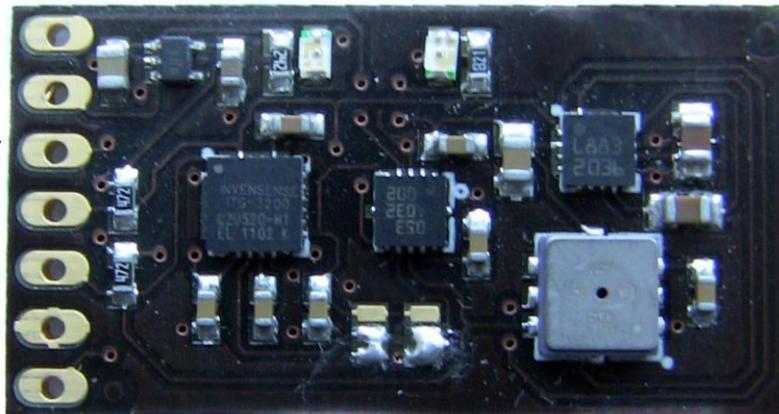
Mounting hints

Mount the PCB using doublesided foam tape. Put a piece of open cell foam over the barometer (DO NOT GLUE). This will protect it from pressure surges coming from props or wind. Also make sure the Barometer is not succepted to direct sunlight as this will have a negative impact on barometer reading.

Precautions

Remember to disable the internal pullups for 5V Arduinos´s or AVR´s. Alternatively you can use a logic level converter. Mount the sensor board in a protected place on your plane or multicopte. Mount the board away from sources of magnetism; eg buzzers and motors.

Multiwii setup

The following example is taken from Multiwii_dev, but its the same parameters for 1.7

```
/*****************************/

/****CONFIGURABLE PARAMETERS****/

/*****************************/


/* Set the minimum throttle command sent to the ESC (Electronic Speed Controller)

   This is the minimum value that allow motors to run at a idle speed  */

//#define MINTHROTTLE 1300 // for Turnigy Plush ESCs 10A

#define MINTHROTTLE 1120 // for Super Simple ESCs 10A


//#define I2C_SPEED 100000L     //100kHz normal mode, this value must be used for a genuine WMP

#define I2C_SPEED 400000L   //400kHz fast mode, it works only with some WMP clones


#define PROMINI  //Arduino type

//#define MEGA


//enable internal I2C pull ups
```

```
//#define INTERNAL_I2C_PULLUPS


//****** advanced users settings   *************


/* I2C gyroscope */

#define ITG3200

//#define L3G4200D


/* I2C accelerometer */

//#define ADXL345

//#define BMA020

#define BMA180

//#define NUNCHACK  // if you want to use the nunckuk as a standalone I2C ACC without WMP


/* I2C barometer */

#define BMP085


/* I2C magnetometer */

//#define HMC5843

#define HMC5883
```

Accel calibration

Place the craft on a level surface and press the "calib_acc" button in the GUI. X and Y should be 0 and Z should be 270

Compass calibration

Press the calib_mag button in the GUI. You now have 30 seconds to rotate the craft on each axis. One full turn on each axis should be sufficient.
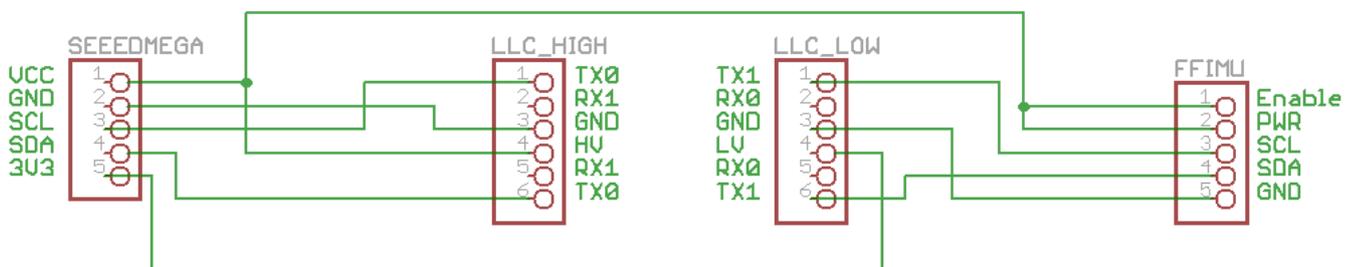
Barometer

Barometer should be covered by some open-cell foam. Typically the kind of stuff used for noise dampening should be fine. Verify that air can pass through the foam before mounting it!

Logic Level Conversion setups:

Sparkfun LLC:

Test schematic for FreeFlight IMU with SFE Logic Level Converter

Based on MWC schematic for ADXL345 and BMP085 by Berkely

```
        SEEEDMEGA               LLC_HIGH              LLC_LOW              FFIMU
VCC    1                       1  TX0          TX1   1                    1   Enable
GND    2                       2  RX1          RX0   2                    2   PWR
SCL    3                       3  GND          GND   3                    3   SCL
SDA    4                       4  HV           LV    4                    4   SDA
3V3    5                       5  RX1          RX0   5                    5   GND
                               6  TX0          TX1   6
```

Have fun with it, and remember to fly safe. Never fly over populated areas or over people. Multicopters can do serious damage to people and animals.