PX4MINIAIO / RTF MINIHAWK v1.3 Flight Controller

The MiniPX4 is one of the smallest Multicopter Flight Controllers which is compatible with the Arducopter PX4 version 1 firmware. It was designed with a small footprint in mind to fit into small to large frame size that have a 30x30mm mounting holes. The full size board measured 35x35mm with most important sensors and I/O interfaces implemented to allowed for Radio telemetry, Battery Telemetry, OSD telemetry, and GPS installation.

PX4miniAIO v1.3 Flight Controller Pin Map:

Figure - 1 PX4miniAIO v1.3 Top View
Figure - 2 PX4miniAIO v1.3 Bottom View

NOTE:
1. For Radio and OSD Telemetry: Use UART2
2. For Debug and Logging Info: Use UART1
It’s important that you perform a bootloader fw update to ensure your PX4miniAIO is up to date with the latest bug fixes, and for optimal performance.

1. **Flashing the PX4miniAIO Bootloader:**
   a. Do not plug in the Battery to power the PX4miniAIO
   b. Download the updated PX4mini Bootloader here:  
      http://api.viglink.com/api/click?for...Fpx4fmu_bl.bin
   c. Ensure only the USB/LED/MAG module is plugged in the USB + IIC3 port
   d. Launch Mission Planner (MP) v1.3.34 or latest
   e. Connect the USB cable to the PX4miniAIO from your PC/Laptop
   f. In MP: Click **CONNECT**
   g. Click on **TERMINAL**
   h. Select **NSH** on the drop down combo box and click **CONNECT**
   i. **NSH** should be connected and data scrolling through the terminal
   j. Enter or copy and paste the following command to the NSH terminal command line interface:
      \`bl_update /fs/microsd/px4fmu_bl.bin\`
      and press **Enter/Return**
   k. You should get the following messages:
      - bl_update: image validated, erasing bootloader...
      - bl_update: flashing...
      - bl_update: verifying...
      - bl_update: bootloader update complete
   l. The PX4miniAIO is now updated with the latest bootloader firmware
   m. Reboot the PX4miniAIO plug and unplug the USB cable.

In the event that you cannot update the bootloader using the aforementioned steps:
   a. Load the PX4miniAIO with the **Antenna Tracker** firmware
   b. Repeat steps 1.a through 1.m

2. **Solid RED LED error Firmware Update:**
   a. To get rid of the annoying solid RED LED error, you need to manually load the unofficial ET (A.K.A Etheli) firmware here:  
      http://www.etheli.com/APM/ PX4MiniAIO... px4v1_px4.zip
      and unzip it
   b. Connect to Mission Planner (MP)
   c. Click **INITIAL SETUP**
   d. Click on **Install Firmware**
   e. Click on **Load custom firmware**
   f. Select the fw that was downloaded in step 2.a
   g. Follow the on screen instructions
   h. Follow the normal MP Copter configuration and tuning process
3. **Compass Configuration:**

A maximum of 2 compasses can be installed to the PX4miniAIO via the IIC2 and IIC3 ports. The IIC3 port is used by default based on the current delivery Hardware setup.

The USB/LED module packaged with the PX4MINIAIO has a built in Compass chip, HMC5983. Enable to power/configure and update sw on the PX4MINIAIO, the USB/LED module has to be plugged into USB + IIC3 port. When power is applied to the USB/LED module, and once ArduCopter software is loaded, ArduCopter will automatically detect and configure the USB/LED Compass appropriately. Compass calibration will be required when the PX4MINIAIO first boot up and connected to MP or after a second external compass is installed or the Full Parameter List is Reset to Default.


There are many GPS + Compass modules of choice, but the one that we have been testing, that seems to satisfy our tests, is the RTFQ mini M8N + Compass GPS. However, many user have recommended the U-BLOX LEA-6H over the M8N. It’s up to you to test and pick the one that will provide the most reliable Satellites count and Compass reading with low HDOP values.

a. **Setting up the existing Compass on the USB/LED/Compass module on USB + IIC3 port:**

It is importance that the Compass heading is set properly. See below for Compass heading orientation of the USB/LED/Compass module:

![USB/LED/Compass module Orientation](image-url)
b. **Setting up the 2nd Compass on the USB/LED/Compass module on the GPS + IIC2 port:**

The following Compass orientation configuration is based on the MINI-UBLOX M8N GPS v2 + Compass from RTFQ:

![Figure - 4 MINI M8N GPS/Compass Module Orientation](image)

**NOTE:** It's recommended that only one compass is used.

If you are planning to use the compass on USB/LED + IIC3 port, then disable the compass on GPS + IIC2 port by disconnecting the SCL and SDA wires from the Compass module.

If you are planning to use the compass on GPS + IIC2 port, then disable the compass on USB + IIC3 port by performing the Compass trace cut mod below.

![Figure - 5 USB/LED/Compas Module Mod](image)

In addition, to ensure proper compass settings, it's recommended to do a full parameter reset and redo the Calibration process after the above compass mod.

a. Connect to MP  
b. Go to Configure/Tuning  
c. Select Full Parameter List  
d. Click **Reset to Default** (the button is on the right side of MP window)  
e. Recycle power on the PX4miniAIO  
f. Click CONNECT  
g. Goto INITIAL SETUP  
h. Go through the Calibration steps
4. **Radio/OSD/RSSI Telemetry and RX Connections Diagram:**

   a. Radio and OSD telemetry is connected via the UART2 interface. Below is the wiring diagram showing the connections for the radio telemetry (Figure 6). However, the OSD wiring connection would be the same (Figure 7).

   **Note:** The RX and TX wires are crossed

   ![Radio Telemetry and RX connections](image)

   **Figure - 6 Radio Telemetry and RX Connections Diagram**

   ![OSD Connection Diagram](image)

   **Figure - 7 OSD Connection Diagram**
b. To get RSSI information go to the Full Parameter Tree and set the following parameters:
   - RSSI_CHANNEL to 8 (Channel 8)
   - RSSI_TYPE to 2

![Figure - 8 RSSI Parameter Configuration](image)

**RSSI_TYPE meanings:**
0 = Disabled
1 = Analog Pin
2 = RC Channel PWM Value (Copter is reading RSSI data from the PPM Stream)

If using the X8R receiver, the RSSI from the X8R connects to the “SBUS Out” of the PX4miniAIO with no mod required.
5. **PIXHAWK USB/LED Module Mod:**

If your PX4miniAIO USB/LED/Compass decided to quit on you and you cannot order the part, then use the PIXHAWK USB/LED + I2C HUB as a replacement.

**NOTE:** This mod will provide LED status and SW/Configuration Update only via the USB & GPS + IIC3 interface port. For Compass information, you will need to provide an external compass module connecting to either the GPS + IIC2 port or an external compass module connecting to the PIXHAWK I2C hub.

![Figure - 9 PIXHAWK USB/LED Module Mod Diagram](image-url)
6. **PX4miniAIO Serial & IIC3 Cable Mod:**
   a. If you only have a GPS with no compass, and wanted to use a separate Compass module, then modify the PX4miniAIO USB/LED 6p CABLE to use the PIXHAWK I2C HUB to plug in an external Compass module. The following diagram, Figure 10, will outline the mod.

   ![Diagram of PX4miniAIO Serial & IIC3 Cable Mod](image)

   **Figure - 10 PX4miniAIO Serial & IIC3 Cable Mod Diagram**

   b. As always, redo your compass calibration after a compass installation. If compass calibration is not successful, perform a full parameter list reset and redo the calibration process. See **Compass Configuration** for more info.