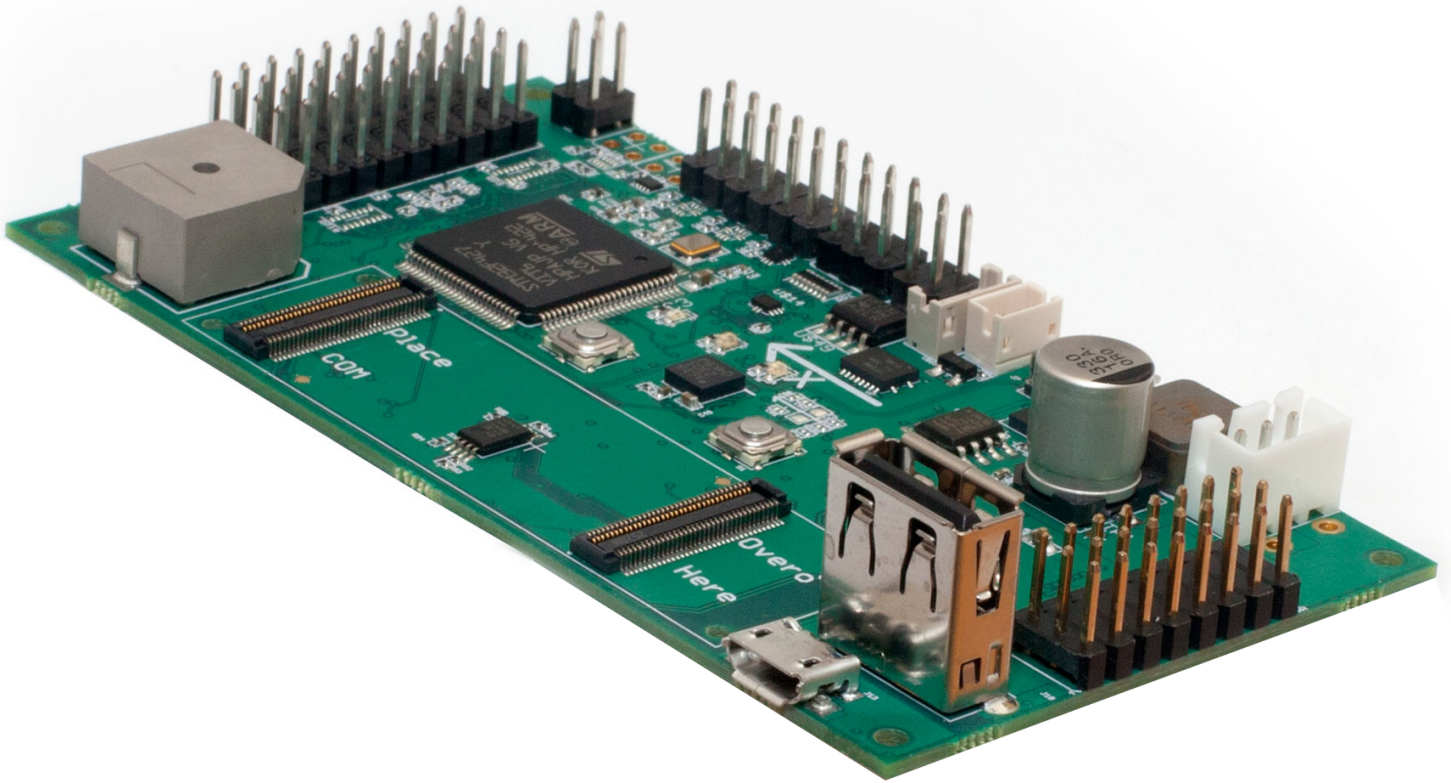


# AeroCore 2 MAV Control Board

## Reference Manual



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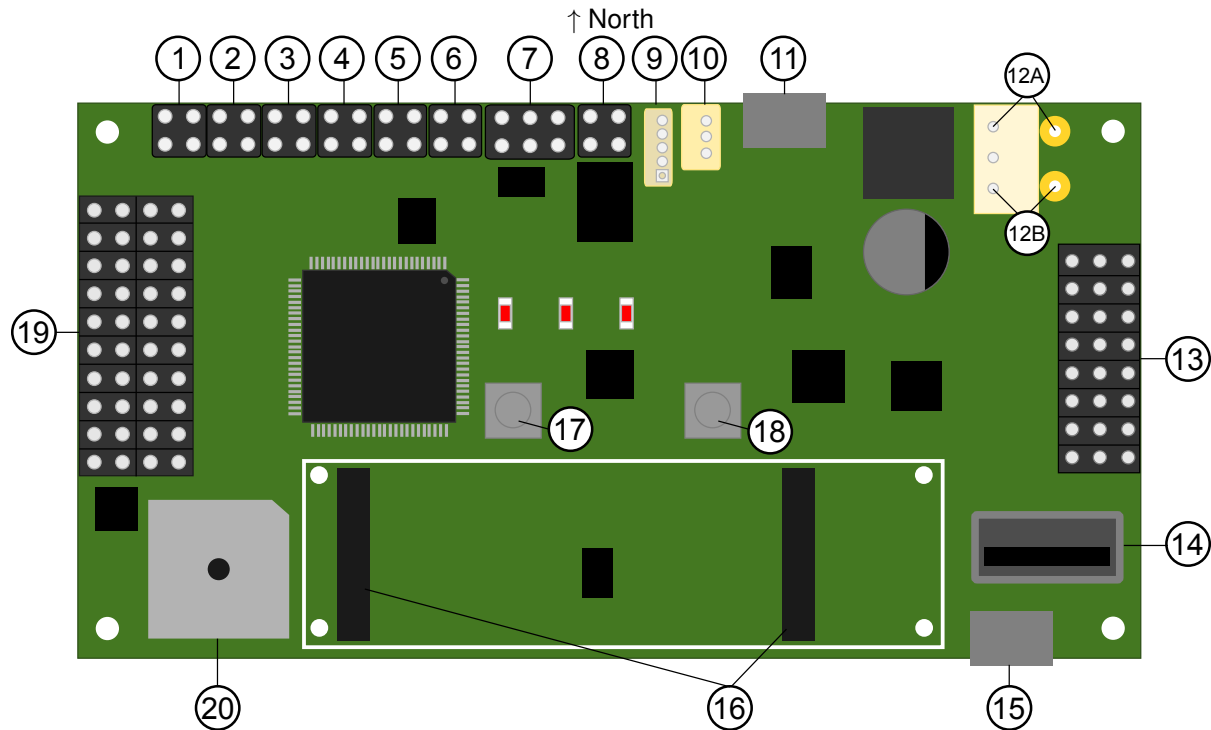
# Contents

<b>1 Header Overview</b>	<b>1</b>
<b>2 North Edge Headers</b>	<b>2</b>
2.1 Cortex-M4 Analog . . . . .	2
2.2 Cortex-M4 I2C2 . . . . .	2
2.3 Overo I2C . . . . .	2
2.4 Cortex-M4 UART 7 . . . . .	2
2.5 Cortex-M4 UART 2 . . . . .	2
2.6 Overo UART . . . . .	3
2.7 Cortex-M4 SPI1 . . . . .	3
2.8 Cortex-M4 CAN1 . . . . .	3
2.9 GPS . . . . .	3
2.10 Spektrum . . . . .	3
<b>3 East Edge Headers</b>	<b>4</b>
3.1 PWM Header . . . . .	4
<b>4 West Edge Headers</b>	<b>5</b>
4.1 Power & GPIO Header . . . . .	5
<b>5 COM - MCU Bridge</b>	<b>6</b>
5.1 UART . . . . .	6
5.2 SPI . . . . .	6
<b>6 AeroCore Onboard Software</b>	<b>7</b>
6.1 Installing the Bootloader . . . . .	7
6.2 Installing the Firmware . . . . .	8
6.2.1 QGroundControl . . . . .	8
6.2.2 Command Line - Source Code . . . . .	8



## 1 Header Overview

This document details the default pinout mappings for the Cortex-M4 microcontroller and Overo-series COM. These mappings are only defaults and can be changed in software to suit your application. All header diagrams are presented with orientations relative to this diagram:



<b>1</b>	Cortex-M4 Analog
<b>2</b>	Cortex-M4 I2C
<b>3</b>	Overo I2C2
<b>4</b>	Cortex-M4 UART7
<b>5</b>	Cortex-M4 UART2
<b>6</b>	Overo UART
<b>7</b>	Cortex-M4 SPI1
<b>8</b>	Cortex-M4 CAN1
<b>9</b>	GPS
<b>10</b>	Spektrum
<b>11</b>	Cortex-M4 USB
<b>12A</b>	GND

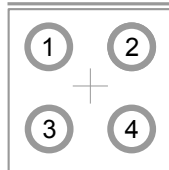
<b>12B</b>	VCC_BATT
<b>13</b>	PWM Header
<b>14</b>	Overo USB Host
<b>15</b>	Overo USB Console Port
<b>16</b>	Overo Connectors
<b>17</b>	Cortex M4 Reset
<b>18</b>	Overo Reset
<b>19</b>	5V & GND (left) M4 & Overo GPIO (right)



Double lines indicate the edge of the printed circuit board.

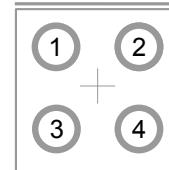
## 2 North Edge Headers

### 2.1 Cortex-M4 Analog



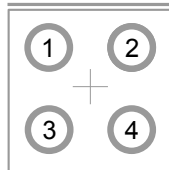
Pin	Processor	Port	Signal
1		AGND	
2	Cortex-M4	PC3	ADC1.13
3	Cortex-M4	PC2	ADC1.12
4	Cortex-M4	PC1	ADC1.11

### 2.2 Cortex-M4 I2C2



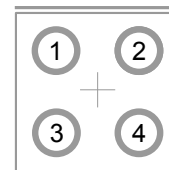
Pin	Processor	Port	Signal
1	Cortex-M4	PB11	SDA
2			GND
3	Cortex-M4	PB10	SCL
4			VCC_3.0

### 2.3 Overo I2C



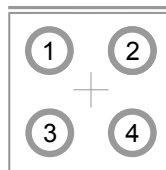
Pin	Processor	Signal
1	Overo COM	SDA
2		GND
3	Overo COM	SCL
4		VCC_3.0

### 2.4 Cortex-M4 UART 7



Pin	Processor	Port	Signal
1	Cortex-M4	PE8	TX
2			GND
3	Cortex-M4	PE7	RX
4			VCC_3.0

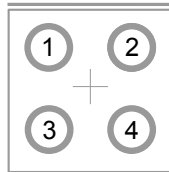
### 2.5 Cortex-M4 UART 2



Pin	Processor	Port	Signal
1	Cortex-M4	PD5	TX
2			GND
3	Cortex-M4	PD6	RX
4			VCC.3.0

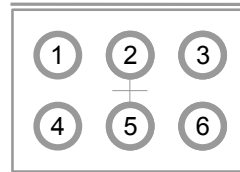


## 2.6 Overo UART<sup>1</sup>



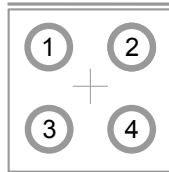
Pin	Processor	Signal
1	Overo COM	TX
2		GND
3	Overo COM	RX
4		VCC_3.0

## 2.7 Cortex-M4 SPI1



Pin	Processor	Port	Signal
1	Cortex-M4	PC5	NIRQ
2			GND
3	Cortex-M4	PA5	CLK
4	Cortex-M4	PA6	MISO
5	Cortex-M4	PA4	CS0
6	Cortex-M4	PA7	MOSI

## 2.8 Cortex-M4 CAN1



Pin	Processor	Port	Signal
1	Cortex-M4	PD1	TX
2	SN65HVD232 Transceiver		CANH
3	Cortex-M4	PD0	RX
4	SN65HVD232 Transceiver		CANL

## 2.9 GPS



Pin	Processor	Port	Signal
1			V_OUT (5.0V <sup>2</sup> )
2	Cortex-M4	PB6	UART1_TX
3	Cortex-M4	PB7	UART1_RX
4			VCC.3.3
5			GND

## 2.10 Spektrum



Pin	Processor	Port	Signal
1			VCC_3.3
2			GND
3	Cortex-M4	PE0	UART8_RX

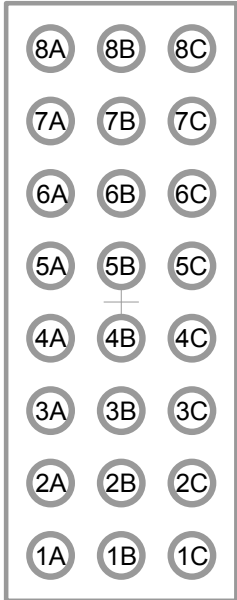
<sup>1</sup>The Overo UART header cannot be used at the same time as the USB console as both interfaces are multiplexed on the Overo COM's UART3. Selection defaults to USB unless Overo GPIO78 is pulled high.

<sup>2</sup>5.0V from power multiplexor sourced from battery / USB (battery default)



## 3 East Edge Headers

### 3.1 PWM Header

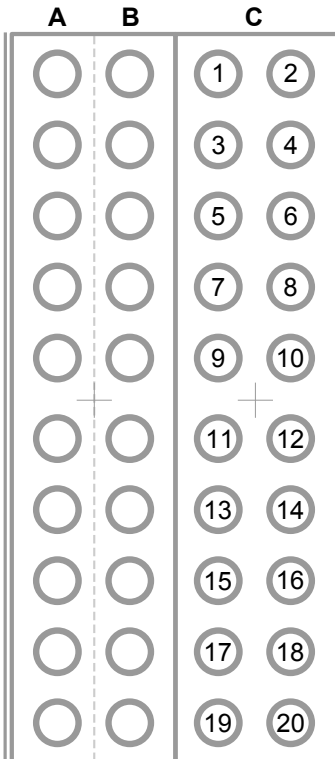


Pin		Processor	Port	Signal
1	A	Cortex-M4	PD12	PWM1
	B			VCC_5.0
	C			GND
2	A	Cortex-M4	PD13	PWM2
	B			VCC_5.0
	C			GND
3	A	Cortex-M4	PD14	PWM3
	B			VCC_5.0
	C			GND
4	A	Cortex-M4	PD15	PWM4
	B			VCC_5.0
	C			GND
5	A	Cortex-M4	PA0	PWM5
	B			VCC_5.0
	C			GND
6	A	Cortex-M4	PA1	PWM6
	B			VCC_5.0
	C			GND
7	A	Cortex-M4	PA2	PWM7
	B			VCC_5.0
	C			GND
8	A	Cortex-M4	PA3	PWM8
	B			VCC_5.0
	C			GND



## 4 West Edge Headers

### 4.1 Power & GPIO Header



**Column A:** Ground Rail

**Column B:** 5.0 Volt Rail

**Column C:**

Pin	Processor	Port	Signal
1	Cortex-M4	PB9	
2	Cortex-M4	PB8	Buzzer <sup>3</sup>
3	Cortex-M4	PC9	
4	Cortex-M4	PB0	
5	Cortex-M4	PE5	GPIO08
6	Overo COM		GPIO72
7	Cortex-M4	PE6	GPIO07
8	Overo COM		GPIO68
9	Cortex-M4	PC6	GPIO06
10	Overo COM		GPIO66
11	Cortex-M4	PC7	GPIO05
12	Overo COM		GPIO76
13	Cortex-M4	PC8	GPIO04
14			VOUT
15	Cortex-M4	PA8	GPIO03
16			GND
17	Cortex-M4	PA9	GPIO02
18			VCC_3.3
19	Cortex-M4	PA10	GPIO01
20			GND

<sup>3</sup>The buzzer is enabled by default, but can be temporarily silenced for 10 seconds by pressing the button on the bottom of the buzzer. For long-term silencing, jumpering the two test points on the bottom of the buzzer (e.g., with a wire or solder bridge) will disable the buzzer.





## 5 COM - MCU Bridge

The COM - MCU bridge connects the Overo COM to the Cortex-M4 microcontroller using two interfaces.

### 5.1 UART

A UART bridge connects the Overo COM's UART1 bus to the Cortex-M4's UART3 bus.

### 5.2 SPI

The Overo COM's SPI1 bus is connected to the Cortex-M4's SPI2 bus.



## 6 AeroCore Onboard Software

The AeroCore uses firmware based on the PX4 autopilot project, with NuttX real-time OS at its core. NuttX Real-Time Operating System (<http://www.nuttx.org>) is a POSIX and ANSI compliant OS with a small footprint. A comprehensive user guide is available [online](#).

Your AeroCore MAV Control Board comes pre-flashed with a bootloader and firmware. You can update or re-flash the bootloader and firmware using the instructions in the following sections. Note, the AeroCore comes pre-flashed with the bootloader and normally does not need to be re-flashed.

### 6.1 Installing the Bootloader

To install the bootloader, you will need dfu-util (<http://dfu-util.sourceforge.net/>) and the bootloader binaries from [Gumstix](#).

You can optionally download and compile the bootloader from <https://github.com/aerocore/Bootloader/tree/aerocore2>.

On a Ubuntu development machine (Windows and Mac OS users check dfu-util documentation)

1. Install dfu-util

```
$ sudo apt-get install dfu-util
```

2. Download the latest bootloader binary at [http://gumstix-aerocore.s3.amazonaws.com/Bootloader/px4aerocore\\_bl.bin](http://gumstix-aerocore.s3.amazonaws.com/Bootloader/px4aerocore_bl.bin) to your present working directory.

3. Locate the BOOT0 button, circled in yellow below



4. While pressing the BOOT0 button, plug in the micro-USB connector into the Cortex-M4 USB (11). Once the micro-USB has been plugged in you can release the BOOT0 button.

5. Flash the downloaded bootloader binary to the AeroCore

```
$ sudo dfu-util -a 0 -D px4aerocore_bl.bin -s 0x08000000
```

6. Press the Cortex M4 Reset button (17), you should see a solid blue LED and flashing yellow LED



## 6.2 Installing the Firmware

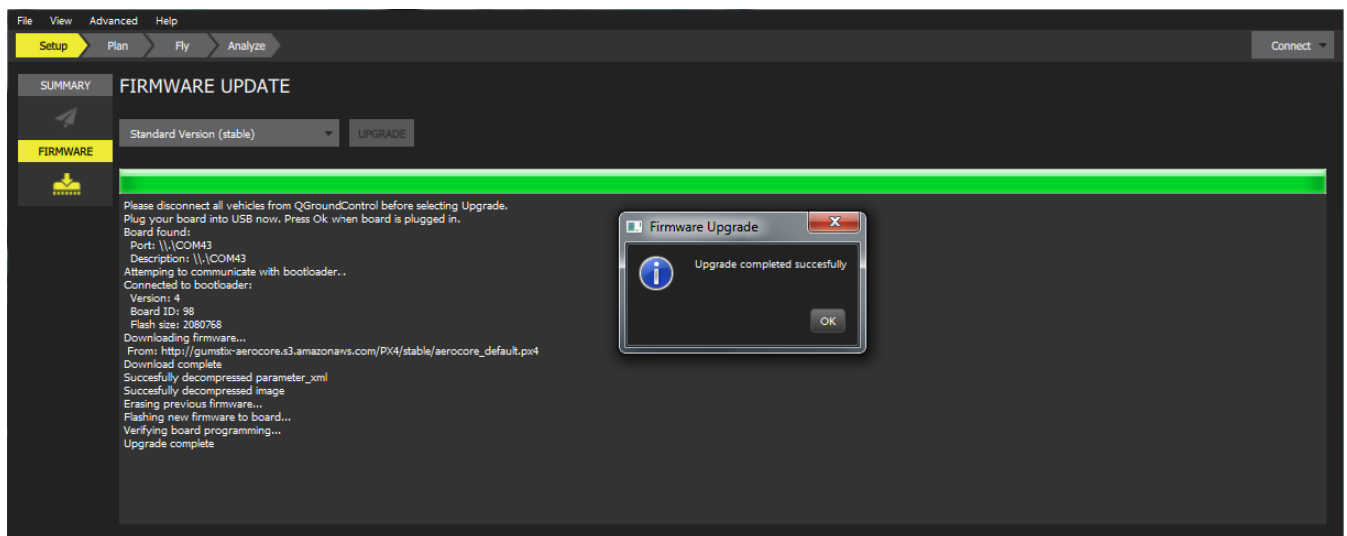
The AeroCore bootloader allows for quick and easy firmware upgrades. There are two methods of flashing the firmware

### 6.2.1 QGroundControl

The open-source ground station software can be used to download and install firmware easily without the need to compile the firmware. AeroCore support has been included in QGroundControl since v2.5.2. You can either download the [binaries](#) or the [source code](#) and compile it yourself.

**Windows users**, you will need to update the AeroCore driver. QGroundControl will install a PX4 FMU driver but that will not give you full functionality. You will need to download and install the [AeroCore driver](#). Details on how to install the driver can be found on the [QGroundControl website](#).

Once installed, follow the firmware upgrade screen directions. It will automatically download and flash stable (default), beta or master branch firmware or you can use your own custom firmware.



### 6.2.2 Command Line - Source Code

This allows you to fully customize your AeroCore by developing your own software. The AeroCore firmware is a fork off of the [PX4 firmware](#), there are some minor changes necessary to support the AeroCore hardware.

1. Navigate to <https://github.com/aerocore/manifest>
2. Select the branch you would like to use
  - **aerocore2-master** - master branch, current development
  - **aerocore2-beta** - beta branch, test-flown, generally safe but can have issues
  - **aerocore2-stable** - latest release with fixes



3. Follow the steps given to flash your board, using your chosen branch (stable is shown below)  
\$ `repo init -u git://github.com/aerocore/manifest.git -b aerocore2-stable`  
\$ `repo sync`
4. Flashing the bootloader is usually not necessary
5. Flash the AeroCore using  
\$ `make aerocore_default upload`



## Resources

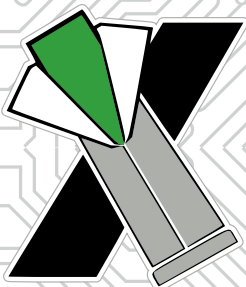
For more information on developing solutions with Gumstix hardware and software, visit the [Gumstix Developer Center](http://www.gumstix.org) at [www.gumstix.org](http://www.gumstix.org).

For more information on the QGroundControl flight control software and MAVLink, visit [www.qgroundcontrol.org](http://www.qgroundcontrol.org).

## Support

Open source community support for developing hardware and software solutions is available from the [Gumstix mailing list](#) and [archives](#).

Customers with sales inquiries or hardware support issues should contact Gumstix Customer Service at [sales@gumstix.com](mailto:sales@gumstix.com).



### AeroCore 2 MAV Control Board

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