

Welcome to Apollo

For more information, please visit the website and select Apollo

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Arduino Pins

Digital Pins

digitalWrite
digitalRead
pinMode

Analog Pins

analogRead
digitalRead

Default Code

Sensor
Pins

Motor
Pins

D49

LED

A15

Motor Battery
Level

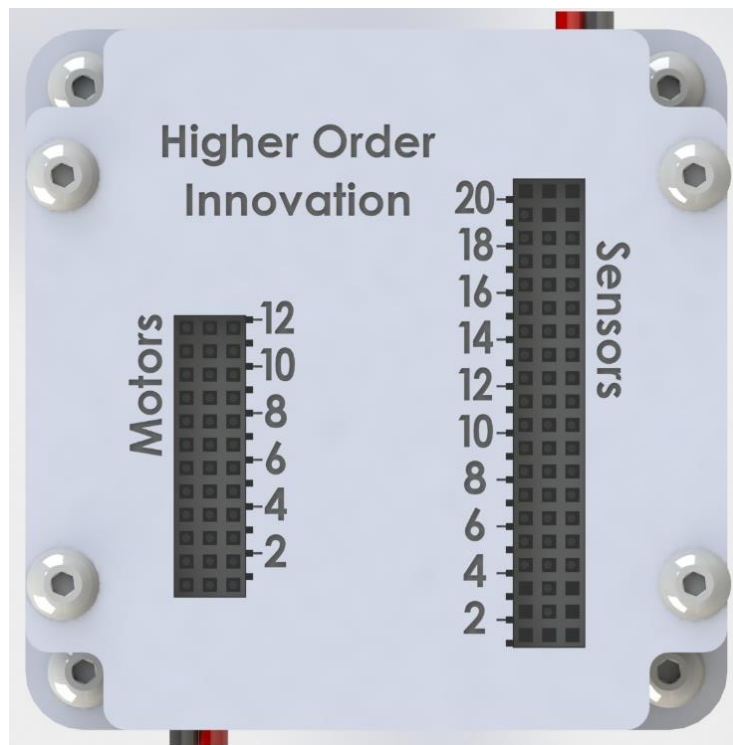
A16

Micro Battery
Level

Microcontroller
Power ↓

D22
D23
D24
D25
D26
D27
D28
D29
D30
D31
D32
D33

M12
M11
M10
M9
M8
M7
M6
M5
M4
M3
M2
M1



S20
S19
S18
S17
S16
S15
S14
S13
S12
S11

A4
A5
A6
A7
A8
A9
A10
A11
A12
A13

S10
S9
S8
S7
S6
S5
S4
S3
S2
S1

D43
D42
D39
D34
D35
D36
D37
D40
D41
D38

↑ Motor
Power

Apollo

Out of the Box

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The kit contains a PS3 controller, USB Bluetooth dongle, USB-Mini cable, and Apollo control system.

The controller must be paired with Apollo. This does not have to be done every time.

1. Power the microcontroller.
2. Install the Bluetooth dongle and wait at least 5 seconds.
3. Remove the Bluetooth dongle and replace it with a USB cable between the controller and Apollo. Wait 10 seconds.
4. Replace the Bluetooth dongle.

Each time that you wish to remote control your robot, you must link the controller to Apollo.

1. Power the microcontroller.
2. Press the PS button to begin linking. All four lights on the controller will blink together. When the link is completed, the remote controller will vibrate, the USB dongle will glow solid blue, and Apollo will glow green.



Motor	Inversion Port	Speed Port	Direction 1	Direction 2
M1/M9	S1	S11	Right Joystick Up*	Right Joystick Down*
M2/M10	S2	S12	Left Joystick Up*	Left Joystick Down*
M3/M11	S3	S13	Triangle	Cross
M4/M12	S4	S14	Up (D-pad)	Down (D-pad)
M5	S5	S15	L1	L2*
M6	S6	S16	R1	R2*
M7	S7	S17	Circle	Square
M8	S8	S18	Left	Right

* - Indicates an Analog Command

The default code maps twelve motor ports to sixteen actions on the PS3 controller. In addition to controlling motors, the default code will display remote control battery level across the top of the controller. Jumper clips in Inversion Ports will cause a motor to spin the opposite direction. A jumper clip in a Speed Port will cause a motor to move 30% slower.



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Firmware 2.0

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The version of firmware can be determined upon powering the controller. The green light will flash four times if this is the installed default code. This light pattern will happen every time the controller is reset.

Changes:

- Motors M1-M4 are cloned to M9-M12. Ex. Pushing the right joystick up will cause M1 and M9 to act the same.
- Introduced Speed Ports. Ex. A Jumper Clip installed in S13 will cause motor M3 to move at 70% of it maximum speed. This is helpful when moving an arm for instance is too fast normally.
- If the Apollo senses an abnormally long time between PS3 messages (a dropped signal), the controller will reset itself. The green light will flash four times and the Bluetooth Dongle will reset itself as well.



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Programming Guide

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The Integrated Development Environment (IDE)

The Apollo control system can be reprogrammed via the USB-mini port. The program can be loaded through several different integrated development environments. The Arduino IDE (<http://arduino.cc/en/main/software>) is a basic environment and a good place to get started. When your code grows too large and becomes difficult to manage. Atmel Studio with the VisualMicro plugin is a great option. It provides many more features that are found in advanced IDEs.

The Library

There are several layers of functionality built into the PS3-arduino software base. These functions provide access to all of the features of the controller. These features include the battery level, vibration, LED readout, button reading, joystick reading, and orientation angle. NOTE: In order to access these functions, libraries need to be added to the Arduino software. The up to date libraries can be downloaded from https://github.com/felis/USB_Host_Shield_2.0. Download the zip file containing the library, the download button will be on the right side of the page. From inside the Arduino IDE, go to Sketch->Include Library->Add zip Library and find the newly downloaded USB_Host_Shield_2.0 zip file. Select it and the library will be added to your installation.

Adding Apollo to Arduino

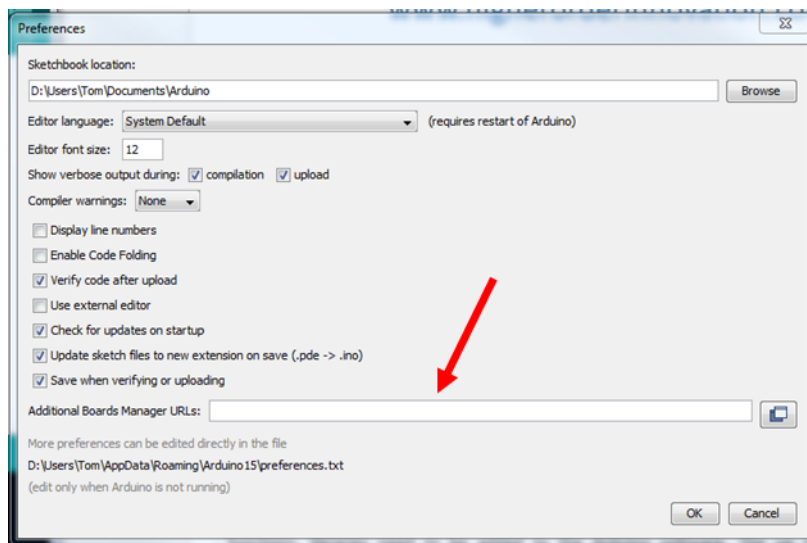
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The Board

The Apollo is based on the same microcontroller as the 'Sparkfun Mega Pro' board with the 'ATMEGA 2560 (3.3V/8MHz)' processor. If this board is not included in your Arduino development environment, follow the instructions below to add it.

1. Download Arduino 1.6.5+ from Arduino.cc if you are not up to date.
2. Open the IDE and go to File->Preferences.
3. Near the bottom is a textbox for Additional Boards Manager URLs. Enter Sparkfun's URL, 'https://raw.githubusercontent.com/sparkfun/Arduino_Boards/master/IDE_Board_Manager/package_sparkfun_index.json'. Exit the preferences window.



4. Go to Tools->Boards->Boards Manager. Scroll down to the Sparkfun AVR Boards by Sparkfun Electronics and install this package.
5. Restart the IDE and the 'Sparkfun Mega Pro' board with the 'ATMEGA 2560 (3.3V/8MHz)' processor will be available for targeting.
6. To test that you can successfully reprogram Apollo, open File->Examples->Basics>Blink. Change the '13' in lines 20, 35, and 37 to '49'. Pin 49 is the pin that a green LED is mounted to on the board. Upload the code by pressing the green arrow in the top left corner. A green light should blink out from Apollo's case.

Apollo

Competition Kit

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Apollo is the result of feedback and observations over the course of several years. This is an Arduino based control system that is more complete and more functional than any other system.

Great for:

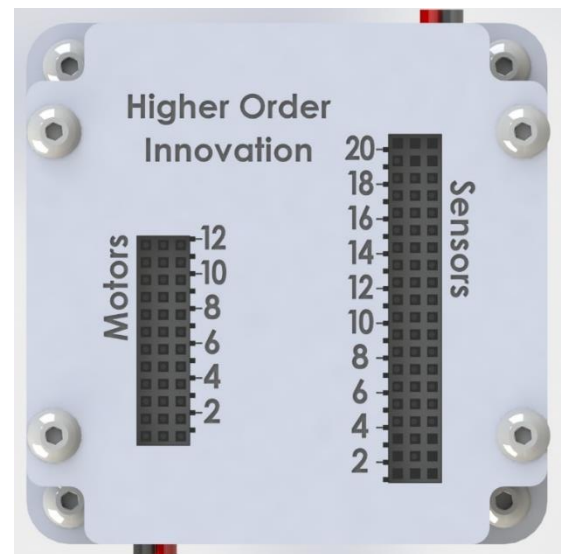
- Classroom based instruction on topics from basic programming concepts to full robotic control
- Projects that need a remote control. Who doesn't like to be in control?
- Controlling your competition robot

Features:

- Ease - Ready to use out of the box (Default code comes preloaded)
- Built in three pin interface for 12 motors and 20 sensors
- PS3 controller support
- Fully reprogrammable
- Advanced access - shield compatible pins for direct module addition

Contents:

- Apollo
 - 256Kb of program memory
 - Reprogrammable
 - 3-pin Keyed Connector Interface
 - Protective Case
- Sony PS3 Remote Controller
- USB Bluetooth Dongle
- USB-mini cable



Higher-order Innovation has done all the work to put together this high quality, functionally rich control system. We strive to constantly improve the experience of those working with our kits. This board represents the culmination of several years of development and is the smallest and most functional control system to date.