

PhantomX Hexapod Manual



INTRODUCTION

This PhantomX Hexapod Comprehensive Kit comes with everything you need for a fully-featured robotic platform. All 18 Dynamixels (preset with IDs), frame components, anodized black socket-head hardware, an ArbotiX Robocontroller, FTDI interface for programming, the handheld Arbotix Commander, a set of Xbees, a PC-side Xbee USB interface, 3S 2100mAh Thunder Power LiPo Battery, Multi-Function LiPo Balance Charger, and even a bottle of Thread-Locker! We also have highly detailed step-by-step assembly manuals to ensure your kit goes together smoothly.

Product Features:

- Advanced Dynamixel AX Series Robot Servos
- 3 Degree-Of-Freedom Legs
- Arduino-Compatible Arbotix Robocontroller
- Open Source Software
- Advanced Inverse Kinematics Driven Gait Engine
- 6 Different Walking Gaits Available
- High Quality LiPo Battery
- Rugged ABS Construction
- Totally Hackable!
- Add Arms, Grippers, Cameras, Pan/Tilts, even Computers!
- Wireless Xbee Control via PC or Handheld
- Tons of I/O available and fully programmable for autonomy
- Great platform for hobby, education, research, and Mech Warfare!

GETTING STARTED

Congratulations on your purchase of the PhantomX Hexapod Kit! The first thing we recommend when unpacking your kit is to refer to the Assembly Guide and take a quick inventory of all of your parts using the parts list (found at the end of this packet). (www.trossenrobotics.com/productdocs/assemblyguides/phantomx-hexapod.html)

Be sure to read through the Assembly Guide prior to starting your build so that you have a good overview of the build process. When you are done building your hexapod, you will need to pair your Xbees and program the Arbotix with the latest PhantomX Hexapod NUKE Sketch:

(http://www.trossenrobotics.com/productdocs/AX_12_PhantomX_Hexapod.zip)

The Xbees that come with this kit ship with factory defaults. You will need to change the baud rate to 38400 and pair them for proper use. Please refer to the tutorial found here:

(<http://forums.trossenrobotics.com/tutorials/how-to-diy-128/xbee-basics-3259/>)

Please note that your kit comes with a UartSBee instead of an XBee Explorer. The UartSBee is still compatible with these instructions, just make sure the voltage switch is set to '3v3'

The Arbotix Robocontroller uses the Arduino IDE to create and upload firmware. If you are not already familiar with the Arduino IDE, we recommend reading through some of the documentation available on the Arduino website (<http://arduino.cc>). The Arduino IDE needs to be configured in order to recognize and program the Arbotix; information on how to do this can be found under the Documentation & Downloads section on the product page (<http://code.google.com/p/arbotix/wiki/GettingSetup>). Once your Arduino IDE is properly configured, the PhantomX hexapod sketch can be uploaded. You will use the UartSBee as an FTDI programmer to load the program onto your Arbotix Robocontroller. For instructions on how to setup your UartSBee for FTDI programming, refer to the tutorial found here:

<http://www.trossenrobotics.com/productdocs/assemblyguides/uartsbee-ftdi.html>

Note: You can power the Arbotix from the FTDI cable by changing the appropriate jumper, this is useful for setting it up and testing prior to having your power wires and battery installed (just remember to set it back when you're done!)

Each servo has the network ID preset, pay close attention to which servos you are using to assemble each leg, there is a diagram in the Assembly Guide that explains which servos go where.

We recommend setting up your LiPo Balance Charger and getting your pack fully charged prior to assembly, so that you won't have to wait for it when you're done building! Once you have completed the assembly of your robot, it is ready to run using the handheld Arbotix Commander!

OVERVIEW

The PhantomX Hexapod is a fairly complex robot, but anyone with a sense of adventure and some programming experience can tweak the software to their liking. All of the software used was developed by Vanadium Labs and is open source by nature, with the intention of encouraging people to modify, hack, and change it any way they see fit. The core of the PhantomX is the Arbotix Robocontroller; this microcontroller runs an inverse kinematics & gait engine that tell the AX-12 Dynamixel network where, when, and how to position the legs. The Arbotix accepts navigation commands using the 'Commander Protocol', which is a simple serial protocol that allows for proportional control of the robot's walking. The Arbotix Commander is a ready-to-run handheld controller that outputs this protocol, and using a pair of Xbee wireless modules, the Robocontroller and the Commander can communicate. This same protocol can also be used to control the hexapod from a computer using the supplied USB Xbee interface. Any programming language that can talk to a serial port is capable of controlling the PhantomX Hexapod using the Commander Protocol (which is detailed in the Arbotix Commander Manual).

DETAILS OF COMMUNICATION PROTOCOL

The "Commander Protocol" is quite simple to generate – even on devices other than the hand held Arbotix Commander. For instance, there is a python version included with PyPose. The core of the protocol is an 8-byte packet:

Byte	Name	Value
1	Header	255
2	Right Joystick, Vertical	Centered around 128, values can range from -125 to 125.
3	Right Joystick, Horizontal	Centered around 128, values can range from -125 to 125.
4	Left Joystick, Vertical	Centered around 128, values can range from -125 to 125.
5	Left Joystick, Horizontal	Centered around 128, values can range from -125 to 125.
6	Button Values	See Mask below
7	Extended Instruction	See the Commander Manual for details.
8	Checksum	$(255 - (\text{byte2} + \text{byte3} + \dots + \text{byte7}) \text{ Mod } 256)$
Bit	Value	
Low	Button R1	
2	Button R2	
3	Button R3	
4	Button L4	
5	Button L5	
6	Button L6	
7	Right Top Button	
High	Left Top Button	

PhantomX Hexapod Comprehensive - Parts Checklist

HARDWARE KIT

- 1x Hexapod Body Kit
- 3x Hexapod Leg Kits
- 1x Nut & Bolt Hardware Kit

COLORED FRAMES KIT – BLUE/BLACK/RED

- 12x F2 Bioloid Frames
- 12x F3 Bioloid Frames

SERVOS & CABLES

- 18x AX Dynamixel Servos (verify ID programmed)
- 18x 200mm 3P Cables

ELECTRONICS PACK

- Arbotix
- Arbotix Commander
- LiPo Balance Starter Kit
- FTDI Adapter/ USB Xbee Interface(UartSBee)
- 11.1v 3S LiPo Battery
- LiPo Battery Voltage Tester / Monitor
- 2x Xbee 1mw Modules
- USB A to Mini-B Cable

PhantomX Hexapod Comprehensive (NO SERVO)

- Parts Checklist

HARDWARE KIT

- 1x Hexapod Body Kit
- 3x Hexapod Leg Kits
- 1x Nut & Bolt Hardware Kit

COLORED FRAMES KIT – BLUE/BLACK/RED

- 12x F2 Bioloid Frames
- 12x F3 Bioloid Frames

ELECTRONICS PACK

- Arbotix
- Arbotix Commander
- LiPo Balance Starter Kit
- FTDI Adapter/ USB Xbee Interface(UartSBee)
- 11.1v 3S LiPo Battery
- LiPo Battery Voltage Tester / Monitor
- 2x Xbee 1mw Modules
- USB A to Mini-B Cable

PhantomX Hexapod Barebones - Parts Checklist

HARDWARE KIT

- 1x Hexapod Body Kit
- 3x Hexapod Leg Kits
- 1x Nut & Bolt Hardware Kit

COLORED FRAMES KIT – BLUE/BLACK/RED

- 12x F2 Bioloid Frames
- 12x F3 Bioloid Frames