

This is a Quick Start Guide for using the VEX CORTEX and VEX Joystick. Refer to the VEX Wiki for updates to this document.

1. Basic connections; batteries, microcontroller, joysticks and VEXnet keys.
  - a. Attach 7.2v battery power and a VEXnet 802.11g key to the VEX CORTEX as shown.



- b. Add AAA batteries to the Joystick by loosening the screw as shown. Remove the battery cover.



- c. Install six identical batteries as shown. Use Alkaline, Ni-Cad or Ni-MH chemistries, but DO NOT mix different chemistry batteries. Charge rechargeable batteries only with a quality charger designed for your battery chemistry.



- d. Reinstall the battery cover and add the VEXnet 802.11g key as shown. Insert the two tabs of the battery cover first along the back edge of the battery cover to aid in installation.



- e. For longest battery life, turn on the units only when needed. Fresh batteries in the Joystick will provide about two hours of run time.  
f. Turn on the CORTEX Microcontroller and the Joystick by setting the power switches to ON as shown in the two pictures below.



- g. A valid link is as shown. The VEXnet light will be blinking a fast green on both units. The Robot light will wink green (be mostly on) on both units and when using fully charged batteries. It will take about 10 to 15 seconds for a link to be established. The Joystick light will be solid green when using fully charged batteries.



- h. If the units fail to link up, tethering may be required, otherwise skip this step. Start with the CORTEX and Joystick turned off. Remove the VEXnet keys. Connect the CORTEX to the Joystick with a USB A-male to A-male Cable. Power up only CORTEX. A successful tether is indicated by a solid green VEXnet light as shown below. Disregard the other lights as you are only interested in the VEXnet light. Tethering may take up to one minute. When finished, turn off the units, attach the VEXnet keys and power both units on.



- i. Add motors and test. The following picture shows 276-2163 motors plugged into motor port 2 and motor port 5. Pushing Joystick Channel 3 up will cause Motor 2 to turn clockwise. Pushing Joystick Channel 2 up will cause Motor 5 to turn counterclockwise.





- j. **Motor Reversing:** The default code allows jumpers or switches to be installed in the Digital ports to invert the motor direction. This is useful to correct the direction of motors without changing code, or when using a switch to reverse a motor if the robot hits an object. The following picture shows motor reversing jumpers installed in Digital ports 2 and 5 to reverse Motor Ports 2 and 5.



- k. **Two Joystick Operation:** The default code allows two Joysticks to control motors when a jumper is installed in CORTEX location Digital 11. Connect the two Joysticks together using the PARTNER ports with a coiled handset cord as shown. Only one Joystick should have a VEXnet key installed. The Joystick to Joystick connection is shown below.



- l. **Switch Limit Inputs:** The default code allows jumpers or switches to be installed in the Analog ports to limit certain motor directions. These are useful to keep an arm from bottoming out. A limit switch plugged in to Analog 1 will stop Motor 6 from turning counterclockwise when activated. A limit switch plugged in to Analog 2 will stop Motor 6 from turning clockwise when activated.



- m. Refer to the attached figures for details and options of Joystick input to Motor response. These motor directions will make a Protobot robot go forward when the sticks are pushed “up”. Robots that do not have an idler gear will go in the opposite direction until a reversing jumper is installed or custom code is created.

**NO Jumpers Installed - Single Driver Mode, Tank Drive**

Motor 1	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 2	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 3	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 4	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW
Motor 5	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW
Motor 6	MECH 1	Primary Driver	Channel 5 (left shoulder buttons)	U Button = Motor CW
Motor 7	MECH 2	Primary Driver	Channel 6 (right shoulder buttons)	U Button = Motor CW
Motor 8	MECH 3	Primary Driver	Channel 7 (left d-pad buttons, U/D)	U Button = Motor CW
Motor 9	MECH 4	Primary Driver	Channel 8 right d-pad buttons, U/D)	U Button = Motor CW
Motor 10	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW

**Jumper installed in Digital 11 - Dual Driver Mode, Tank Drive**

Motor 1	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 2	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 3	LEFT DRIVE	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 4	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW
Motor 5	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW
Motor 6	MECH 1	Secondary Driver	Channel 5 (left shoulder buttons)	U Button = Motor CW
Motor 7	MECH 2	Secondary Driver	Channel 6 (right shoulder buttons)	U Button = Motor CW
Motor 8	MECH 3	Secondary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 9	MECH 4	Secondary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CW
Motor 10	RIGHT DRIVE	Primary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CCW

**Jumper installed in Digital 12 - Single Driver Mode, Arcade Drive**

Motor 1	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 2	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 3	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 4	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 5	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 6	MECH 1	Primary Driver	Channel 5 (left shoulder buttons)	U Button = Motor CW
Motor 7	MECH 2	Primary Driver	Channel 6 (right shoulder buttons)	U Button = Motor CW
Motor 8	MECH 3	Primary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 9	MECH 4	Primary Driver	Channel 4 left stick, X-axis)	Joystick Right = Motor CCW
Motor 10	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	

**Jumper installed in Digital 11 & Digital 12 - Dual Driver Mode, Arcade Drive**

Motor 1	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 2	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 3	LEFT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 4	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 5	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	
Motor 6	MECH 1	Secondary Driver	Channel 5 (left shoulder buttons)	U Button = Motor CW
Motor 7	MECH 2	Secondary Driver	Channel 6 (right shoulder buttons)	U Button = Motor CW
Motor 8	MECH 3	Secondary Driver	Channel 3 (left stick, Y-axis)	Joystick Up = Motor CW
Motor 9	MECH 4	Secondary Driver	Channel 2 (right stick, Y-axis)	Joystick Up = Motor CW
Motor 10	RIGHT DRIVE	Primary Driver	Arcade Drive (see separate chart)	

**Arcade Mode - Channel 1 (right stick, X-axis) + Channel 2 (right stick, Y-axis)**

Channel 1 (right stick, X-axis) <b>Robot Turn Rate</b>	Motor 1	LEFT DRIVE	Joystick Right = Motor CW
	Motor 2	LEFT DRIVE	Joystick Right = Motor CW
	Motor 3	LEFT DRIVE	Joystick Right = Motor CW
	Motor 4	RIGHT DRIVE	Joystick Right = Motor CW
	Motor 5	RIGHT DRIVE	Joystick Right = Motor CW
	Motor 10	RIGHT DRIVE	Joystick Right = Motor CW

Channel 2 (right stick, Y-axis) <b>Robot Forward Speed</b>	Motor 1	LEFT DRIVE	Joystick Up = Motor CW
	Motor 2	LEFT DRIVE	Joystick Up = Motor CW
	Motor 3	LEFT DRIVE	Joystick Up = Motor CW
	Motor 4	RIGHT DRIVE	Joystick Up = Motor CCW
	Motor 5	RIGHT DRIVE	Joystick Up = Motor CCW
	Motor 10	RIGHT DRIVE	Joystick Up = Motor CCW

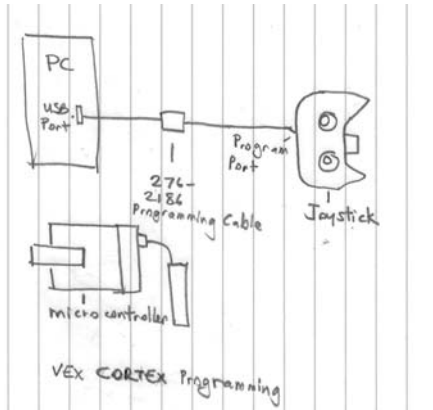
**Reverse Motor Direction**

Reverse Motor 1	Jumper in Digital 1
Reverse Motor 2	Jumper in Digital 2
Reverse Motor 3	Jumper in Digital 3
Reverse Motor 4	Jumper in Digital 4
Reverse Motor 5	Jumper in Digital 5
Reverse Motor 6	Jumper in Digital 6
Reverse Motor 7	Jumper in Digital 7
Reverse Motor 8	Jumper in Digital 8
Reverse Motor 9	Jumper in Digital 9
Reverse Motor 10	Jumper in Digital 10

**Limit Switch Inputs**

Motor 6 ignores CCW	Jumper in Analog 1
Motor 6 ignores CW	Jumper in Analog 2
Motor 7 ignores CCW	Jumper in Analog 3
Motor 7 ignores CW	Jumper in Analog 4
Motor 8 ignores CCW	Jumper in Analog 5
Motor 8 ignores CW	Jumper in Analog 6
Motor 9 ignores CCW	Jumper in Analog 7
Motor 9 ignores CW	Jumper in Analog 8

- n. The CORTEX may be reprogrammed. Shown is the interconnect sketch for wireless reprogramming. For non-wireless reprogramming, the VEXnet keys may be substituted with a USB A-male to A-male cable.





- o. Diagnostics Information: refer to the following chart for Joystick and CORTEX light patterns and meanings.

Robot	VEXnet	Game	
	Blip (yellow)		Startup - looking for USB device
	Fast (yellow)		Linking - Searching for VEXnet mate
	Fast (green)		Linked
	Slow (yellow)		Linked - Data quality reduced
	Solid (green)		Tethered
	Slow (red)		Fault: Lost Link - Searching for VEXnet mate

Robot [1]	VEXnet	Game	
(red)			Main Battery = <b>Dead</b> (<5.5v) or CORTEX Off [2]
(yellow)			Main Battery = <b>Low</b> (<6.5v) [2]
(green)			Main Battery = <b>Good</b>
Solid			<b>All Good:</b> Both Joysticks connected
Solid + 1 Blink			<b>All Good:</b> Tx1 Joystick connected
Fast (red) [3]			Fault: Low Backup Battery (0v-8v)

Note 1: Robot LED only works on Joystick when Linked

Note 2: Lowest CORTEX battery color latched at Joystick and CORTEX

Note 3: No Backup Battery only indicated if competition cable is connected.

Robot	VEXnet	Game [4]	
		Off	No Competition connection
		Solid (green)	Driver
		Fast (green)	Autonomous
		Fast (yellow)	Disabled

Note 4: Game LED only used when the competition cable is connected.

Game LED only works on the Robot when Linked.

**Joystick [5]**

(red)	Joystick Battery = <b>Dead</b> (<5.5v)
(yellow)	Joystick Battery = <b>Low</b> (<6.5v)
(green)	Joystick Battery = <b>Good</b>
Fast	Two Joysticks in use
Solid	One Joystick in use

Note 5: Joystick LED only on Joystick.

Robot, VEXnet, and Game LED's show the same data [2]

