How To Build A Mini-Robot

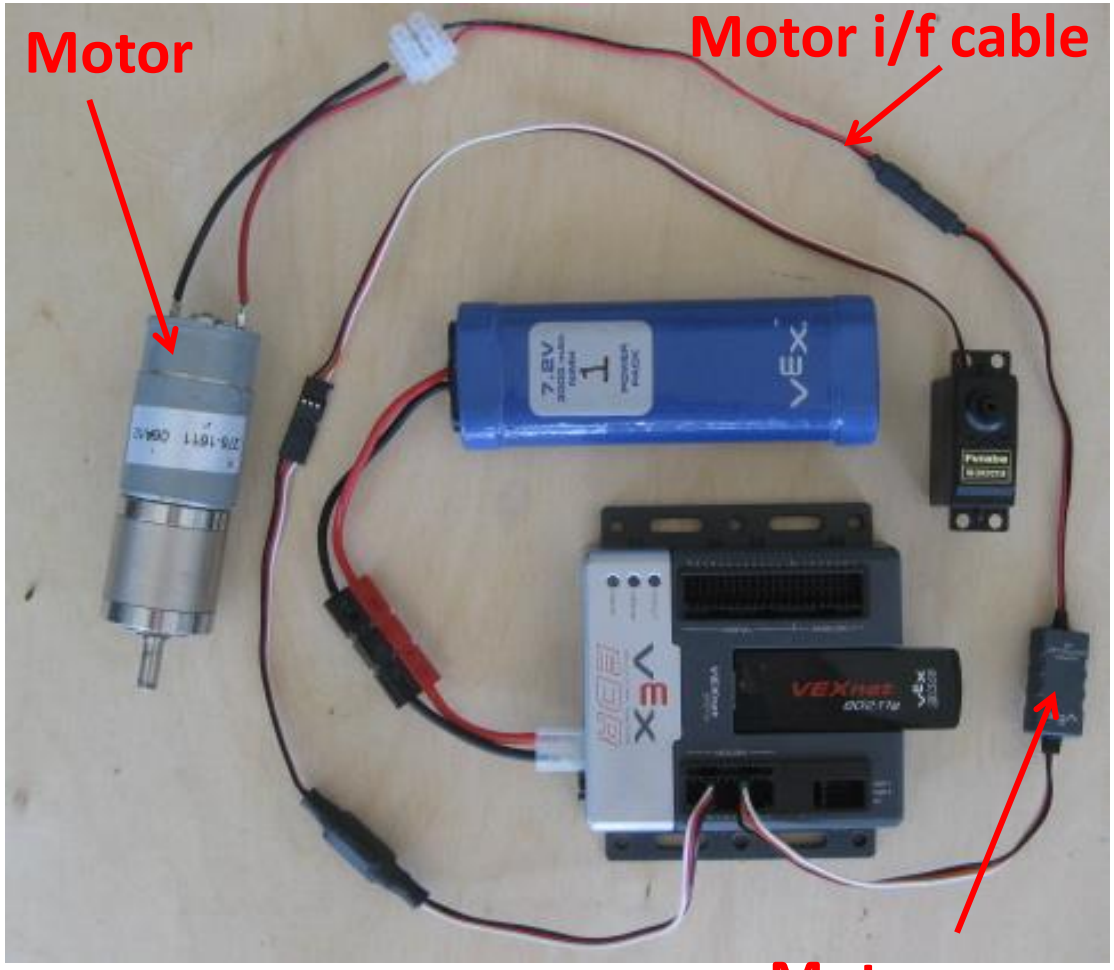
TMI Activity

Chassis & Wheels & Motors

Purpose – To move around the game field

- Attach the aluminum wheel hubs to the plywood wheels
- Attach a **large** motor to each wheel hub – using the set screws on the hub carefully
- Attach the motors to the bottom of the chassis (plywood board) using VEX motor mounts (or pipe hanger tape) to stabilize. (Hanger tape can act as motor mounts here. See photo on p. 14)
- Attach the (free) ends of the motor's red / black wires to the white block of the screw terminal motor interface cable (from Returnable Kit) (See photo on p. 3. Use a very small screw driver.)
- Attach the Screw Terminal Motor interface cable to a motor controller (from Returnable Kit) **(See Connecting a Motor p.3)**

Connecting a Motor



Attach the red / black wires from the motor to the block of the screw terminal motor interface cable

Connect the Motor interface cable to a Motor Controller

Insert the Motor Controller into a motor port (2 through 9)

Hand / Claw

Purpose - To grab & release game field pieces

- Using cup, spoons, tin, sewer pipe, plastic, wire hanger, etc. design a hand / claw. Decide whether to use a small motor or servo to open / close the hand / claw
- If using a servo, attach Servo Power Adaptor cable & maybe a Servo Extension Cable (from Returnable Kit) to attach to cables that are part of the servos **(See Connecting a Servo p.5.)**
- If using a servo, decide which type of servo horn might work best
- If using a small motor (**See Connecting a Motor p.3.)**

Connecting a Servo

Connect a servo (or servo extension cable) to a Servo Power Adaptor cable

Insert a Servo Power Adaptor cable into a motor port (2 through 9)

Arm & Arm Frame

Purpose - To move arm up & down (floor to scoring bucket)

- Start with the 24” PVC tube as arm
- Build a fulcrum for the arm with wood and attach it to the chassis (See photo on p. 14)
- Decide how to attach the hand / claw to the end of the arm (wood, screws, etc.)
- Decide how to attach the seine twine onto the arm to raise & lower it (See next slide)

Spool & Motor

Purpose – to control the arm up/down movement

- Decide whether you'll need the spool & twine to raise & lower the arm
- Decide how to attach the seine twine onto the spool
- Decide how to attach the spool to a small motor
- Attach a small motor **See Connecting a Motor**
- Decide how to attach the motor to the chassis
- Decide how to use the twine to raise & lower the arm

Organizing Parts on Chassis

Purpose – to balance robot

- Decide where to put the cortex & 7.2v battery (from Returnable Kit)
- Decide how to attach them on the chassis
- Decide how the arm is attached on the chassis
- Decide how the spool / motor is attached on the chassis
- Decide if your robot is balanced and reorganize parts if not

Attaching Cables to Cortex

Purpose - To make the robot joystick work

- Plug cables into the cortex – to proper pins using the BEST Default Program description **(See VEXnet Cortex Controller & BEST Default Program)**
  - Remember BLACK wire is on the outside of the cortex
  - Motor interface cable attaches from motors
  - Servo extension cable attaches from servos
- Stabilize wires / cables so they don't pull out
  - Painter's tape, zip ties, etc.
  - Expect to relocate them later

VEXnet Cortex Controller

8 Analog inputs

12 Digital inputs or outputs

Speaker Output

System Status Indicators

WiFi 802.11 Proprietary Comm.

Standard Serial Interfaces (UART, I2C)

10 Motor/Servo Ports (Built-In ESC on 2 ports)

BEST Default Program

Motor/Servo Port	Joystick Channel	Motor Limits	
		Positive Direction	Negative Direction
Motor 2 (pair opposite of Motor 9)	Stick 3	None	None
Motor 3	Stick 4	None	None
Motor 4 (pair opposite of Motor 7)	Button 7 and 8 Up/Down/Left/Right	None	None
Motor 5	Stick 1	Digital Input 1	Digital Input 2
Motor 6	Stick 2	Analog Input 1	Analog Input 1
Motor 7 (pair opposite of Motor 4)	Button 7 and 8 Up/Down/Left/Right	None	None
Motor 8	Button 6 Up	None	None
Motor 9 (pair opposite of Motor 2)	Stick 3	None	None

Synchronize & Test

Purpose – To turn it on and get it tested

- Put the communication keys into the joystick & cortex
- Turn on joystick & cortex and synchronize them
- Does everything look okay? **(See LED status lights)**
- Test each robot function using the joystick channel on the Default program
- Does the robot move?
- Does the hand / claw open / close?
- Does the arm move up / down?

- If not…. Find out what's wrong & fix it

LED Status Lights

joystick battery status

robot battery status

comm. link status

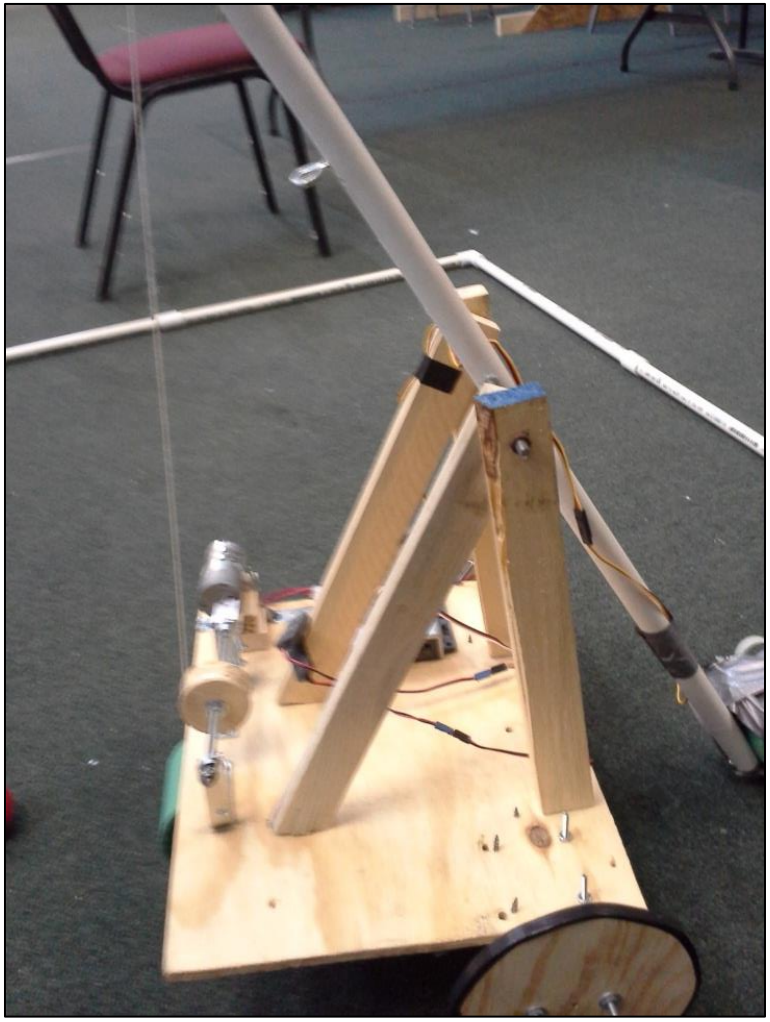
Game status (not used by BEST)

- Green battery – good charge
- Yellow battery - dying
- Red battery – dead

- Green VEXnet – comm. established
- Yellow VEXnet – searching
- Lights on the controller and the joystick are the same

ROCKY MOUNTAIN BEST

One Idea for Arm



Wheels & Hubs & Large Motor