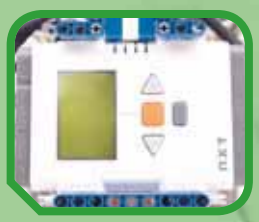

THE LEGO® MINDSTORMS® NXT ZOO!

an unofficial, kid-friendly guide to building robotic animals with **LEGO MINDSTORMS NXT**

fay **rhodes**

NO STARCH PRESS

5

spiderbot: an NXT spider

Spiderbot is a walking eight-legged spider that avoids objects, turns, and runs in forward or reverse.

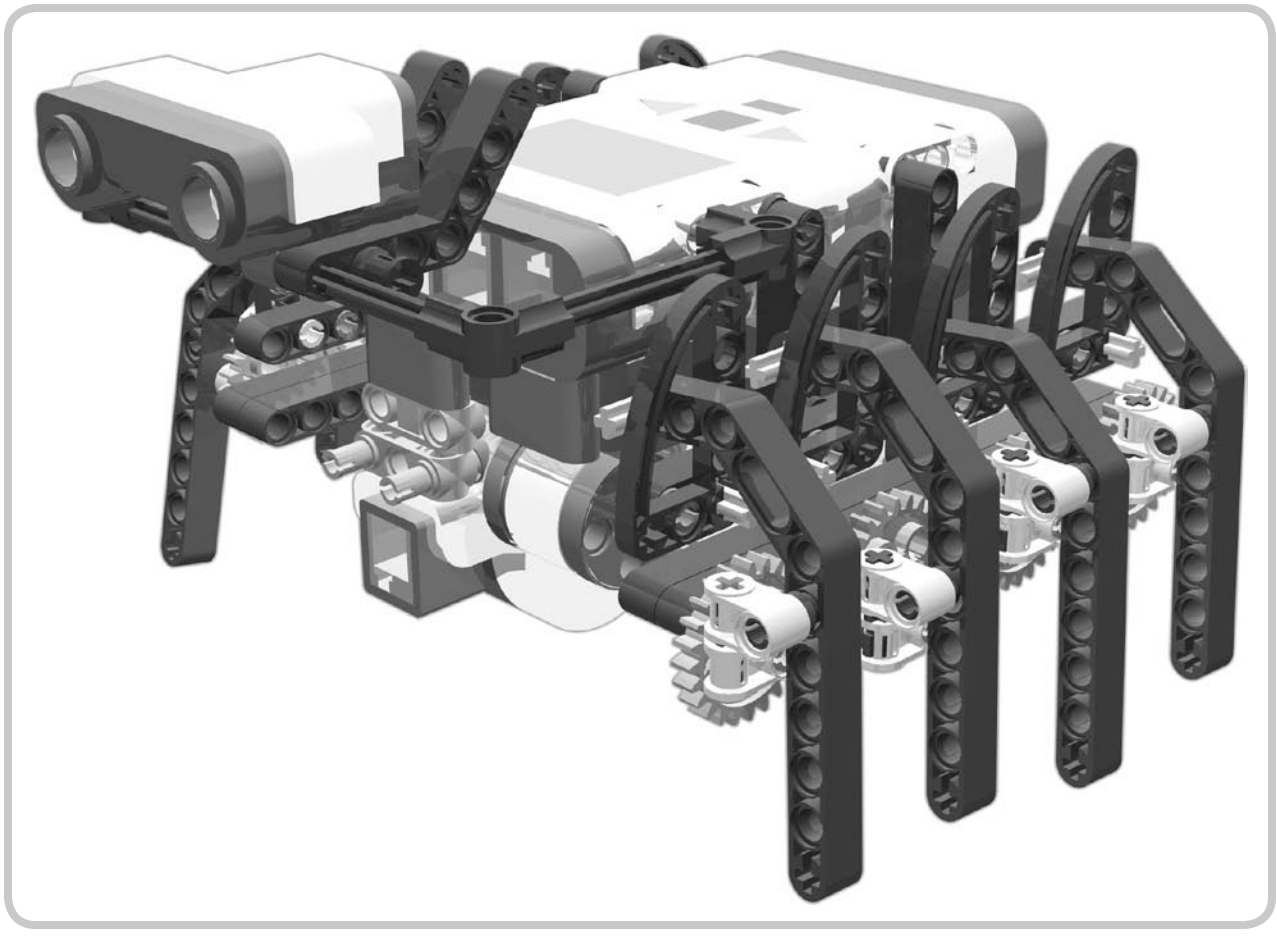

Figure 5-1: Spiderbot!

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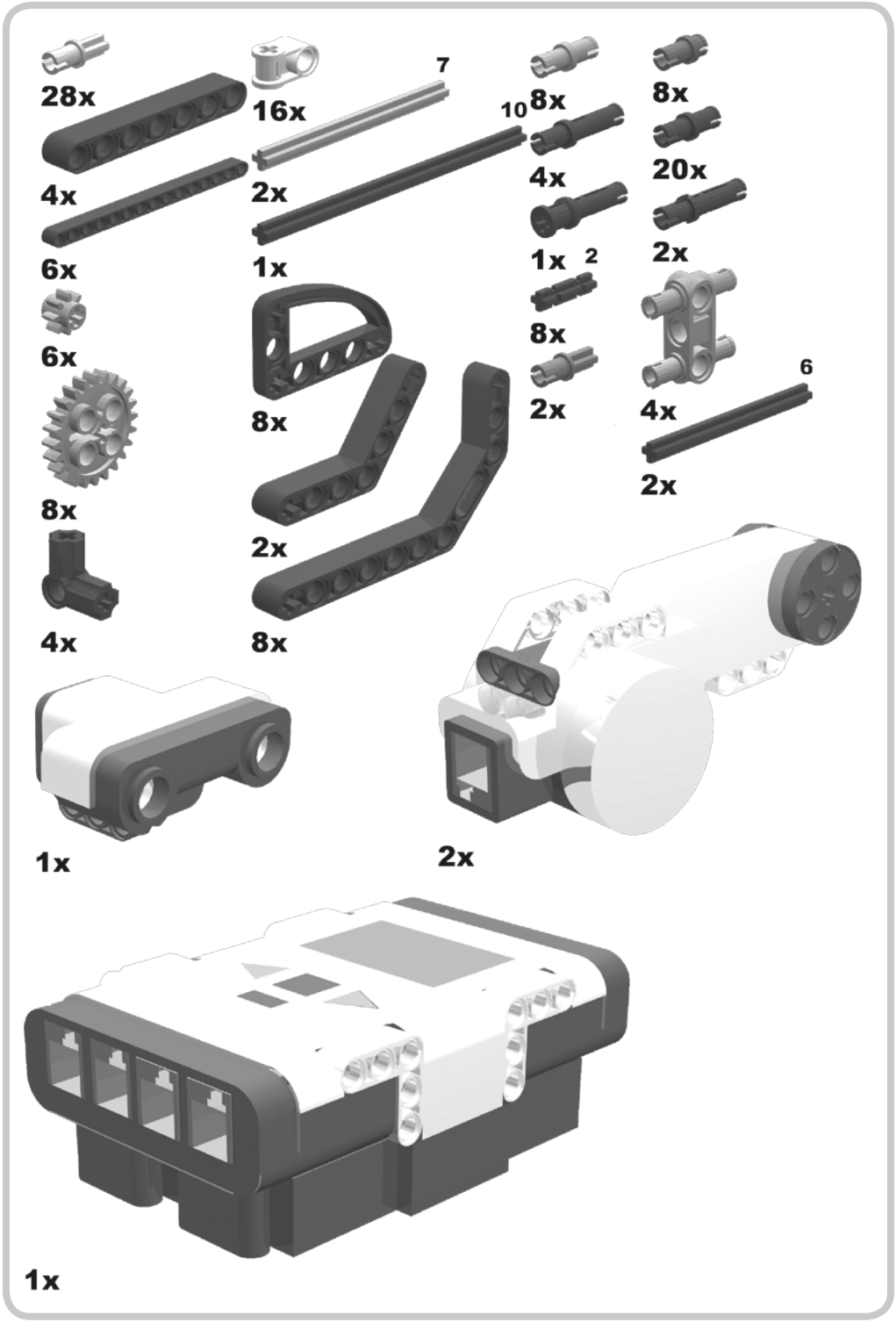
building spiderbot



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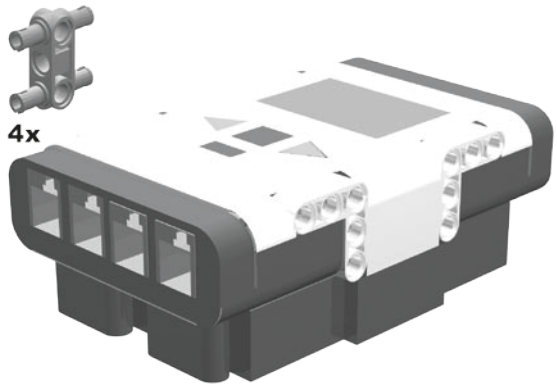

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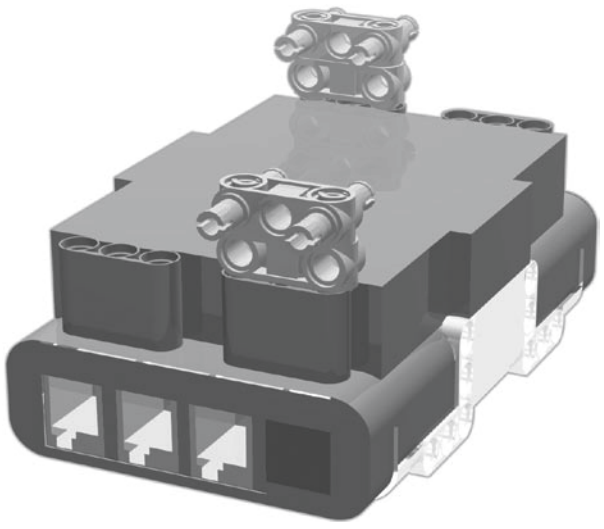

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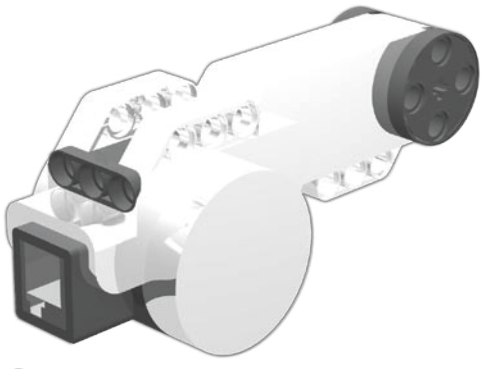

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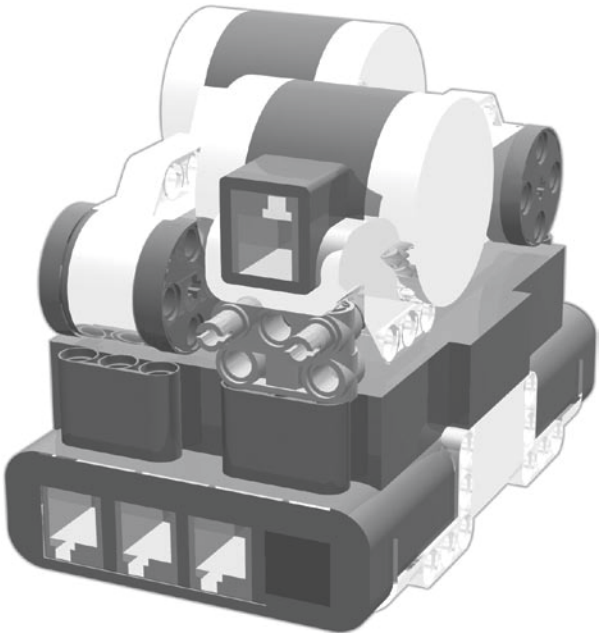

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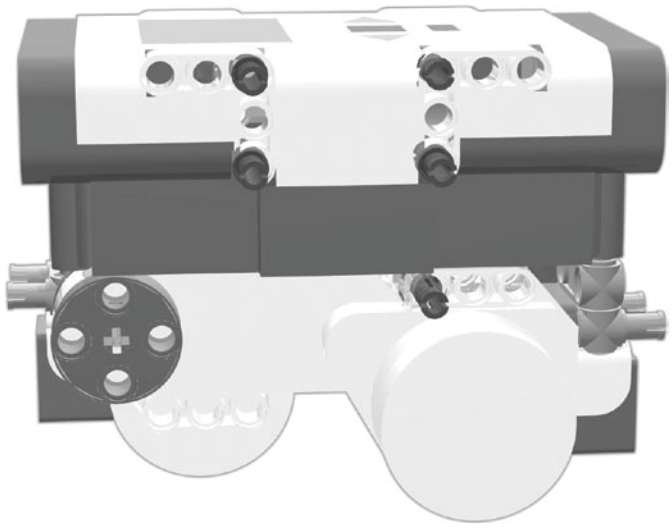

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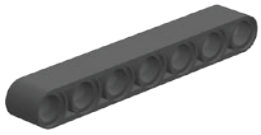

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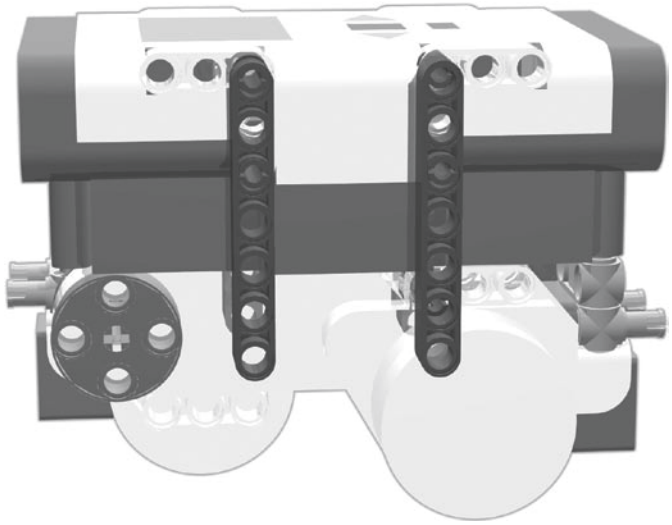

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5

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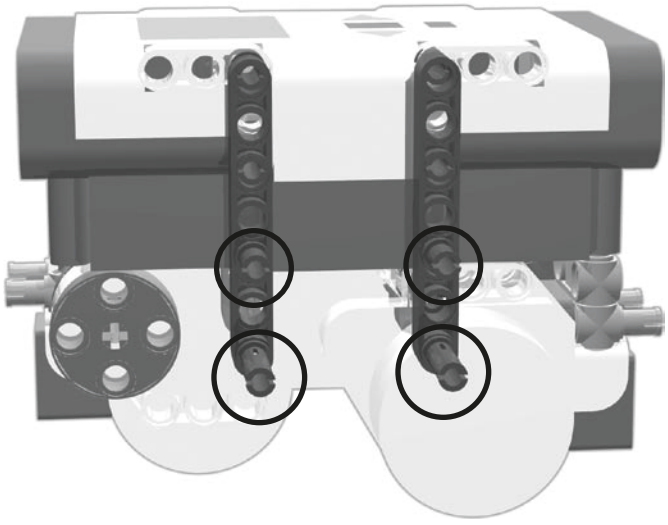
2x



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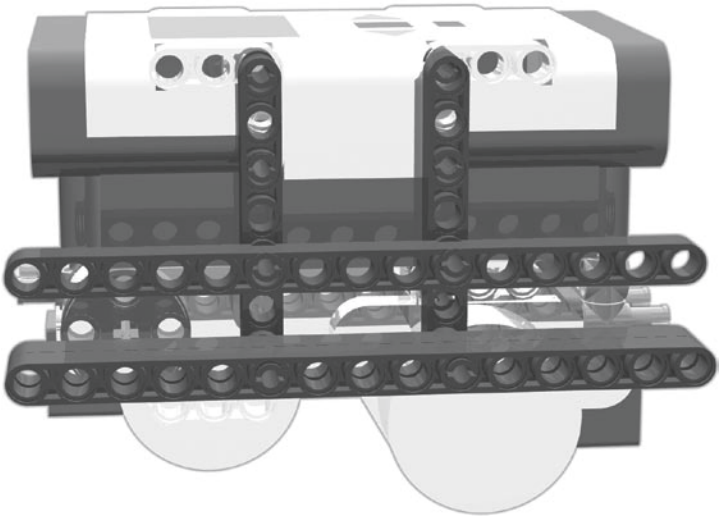

Place two beams on the long pins at the bottom.

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7

4x

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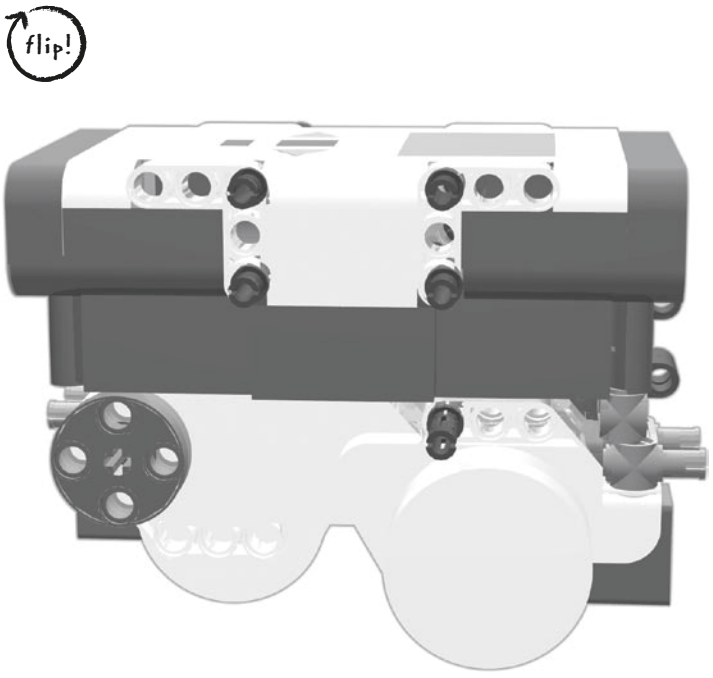

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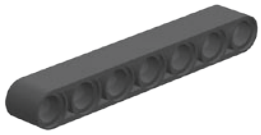

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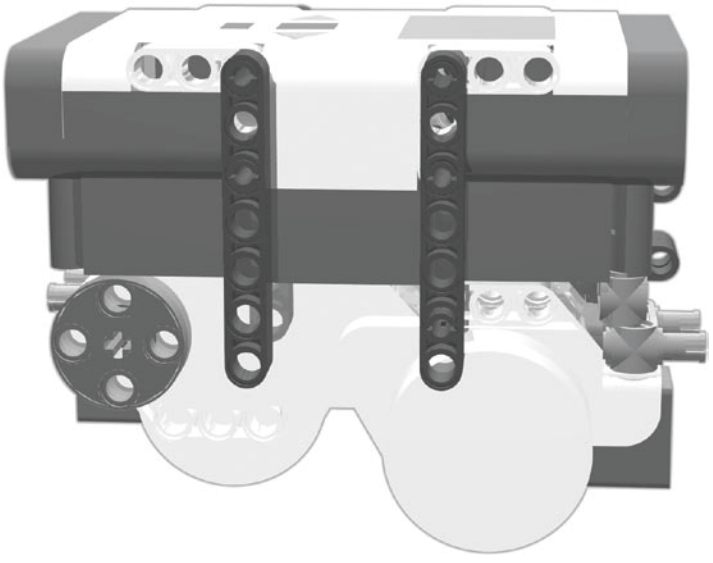

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9

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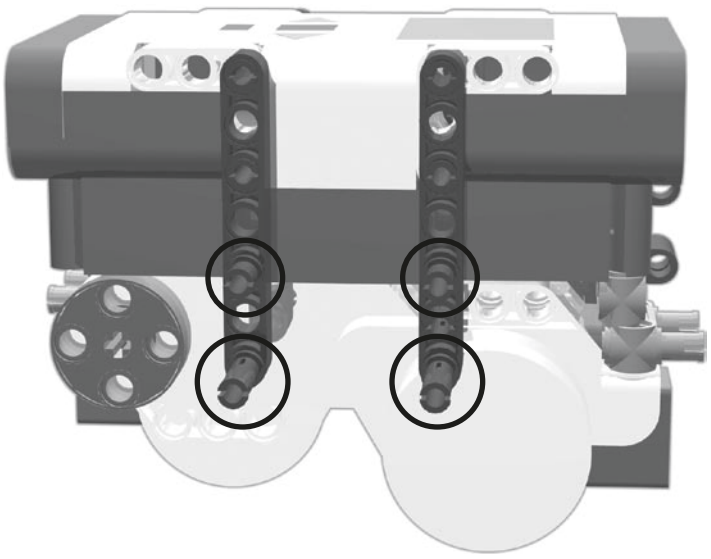

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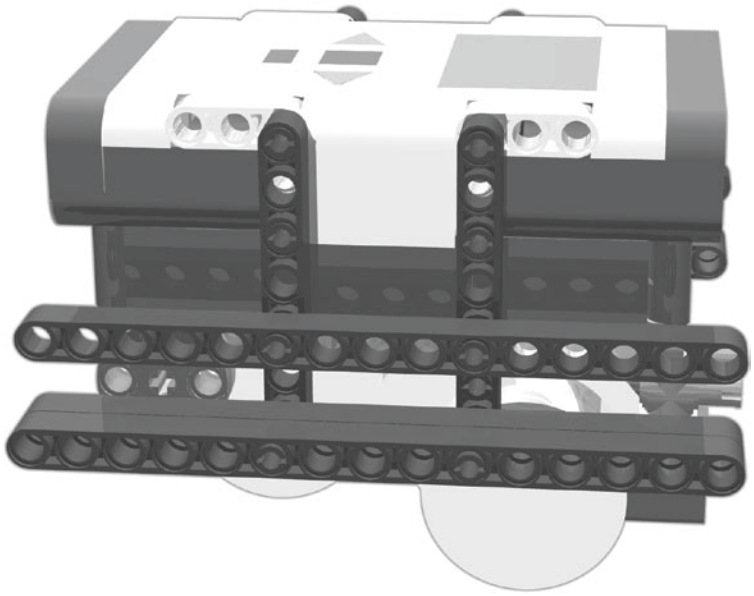

Place two beams on the long pins at the bottom.

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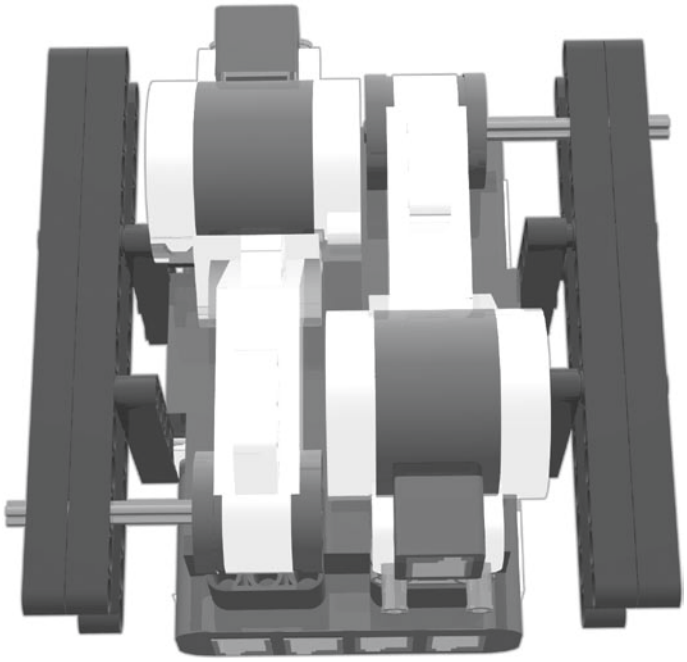
11

2x

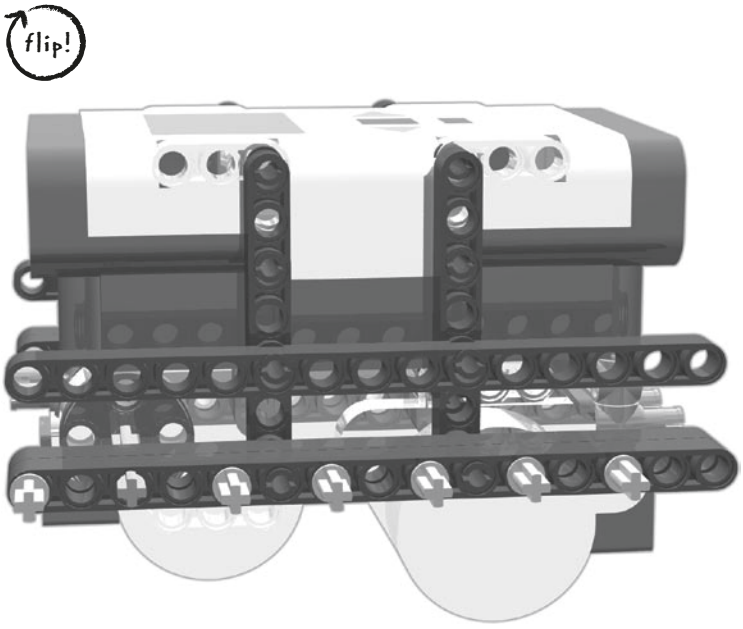


bottom view

Attach #7 axles to the motors.

12

6x



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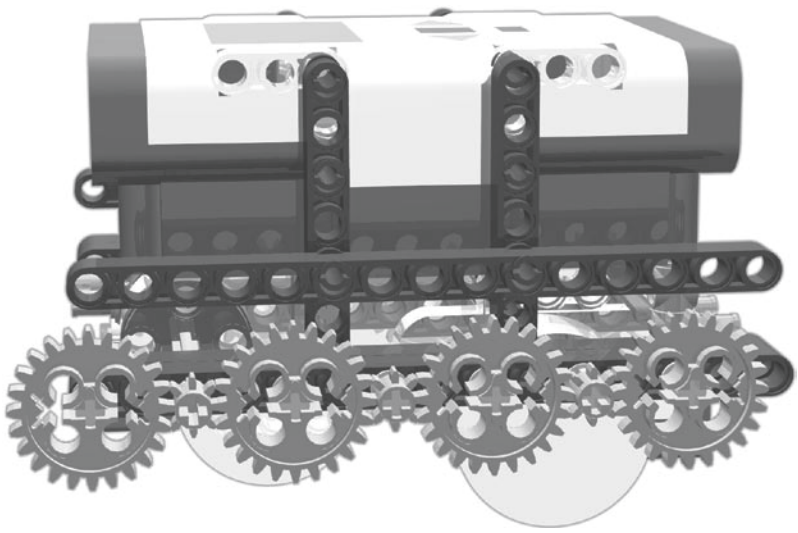
13

3x

4x



14

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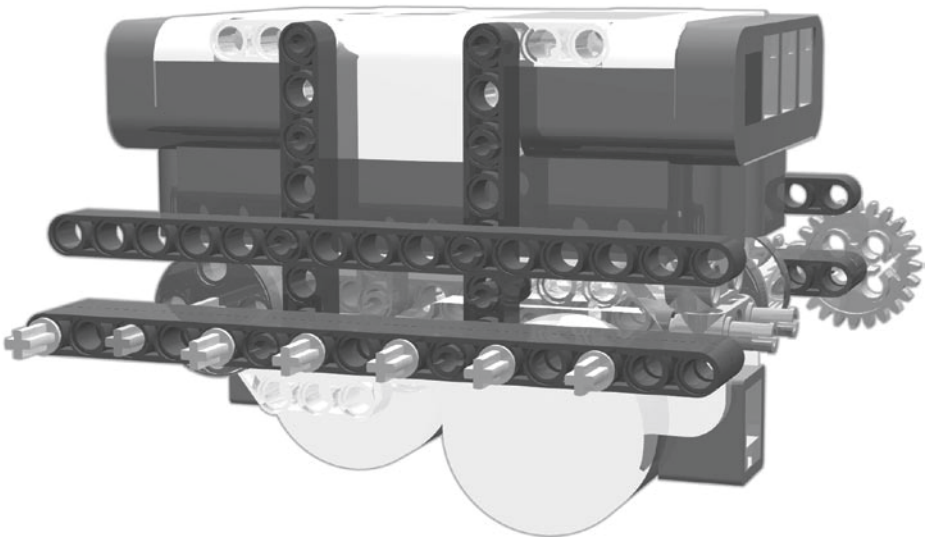

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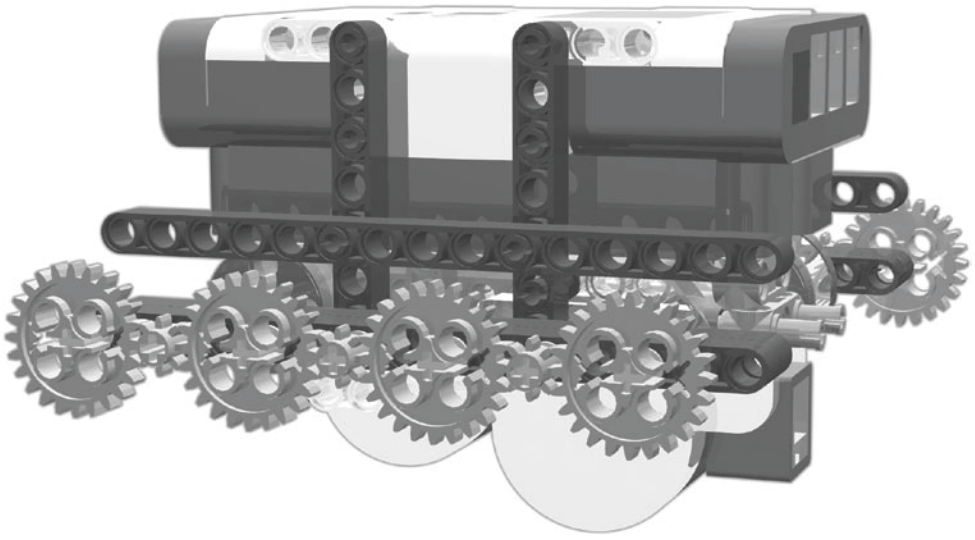
15

3x

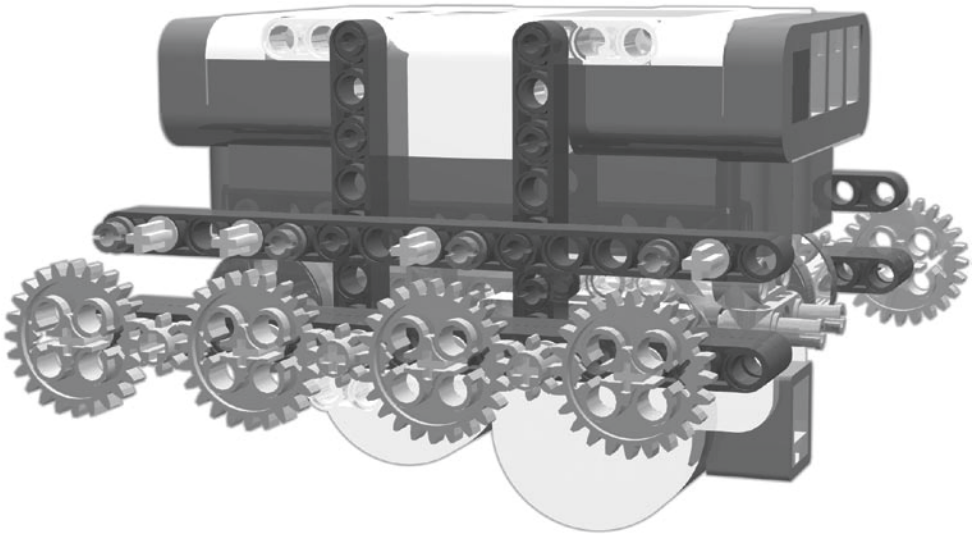
4x



16

4x

4x



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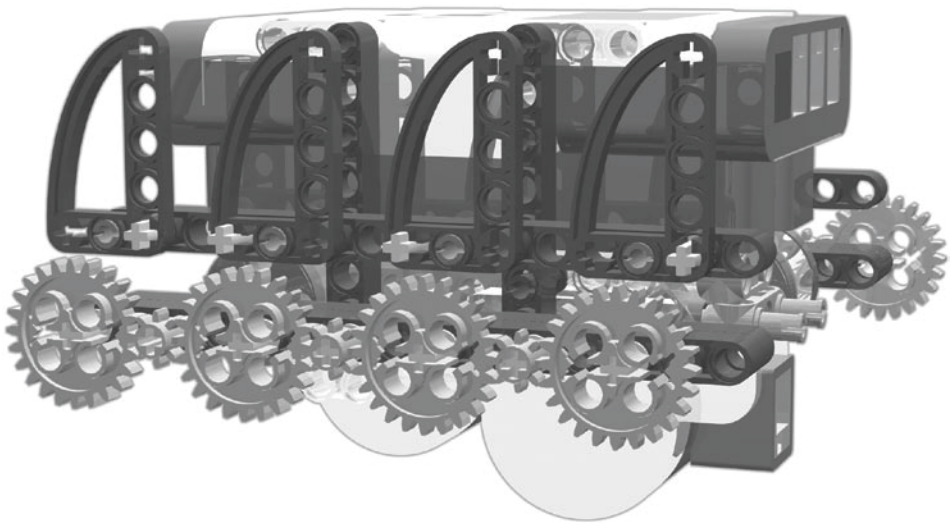
17

4x



18

4x

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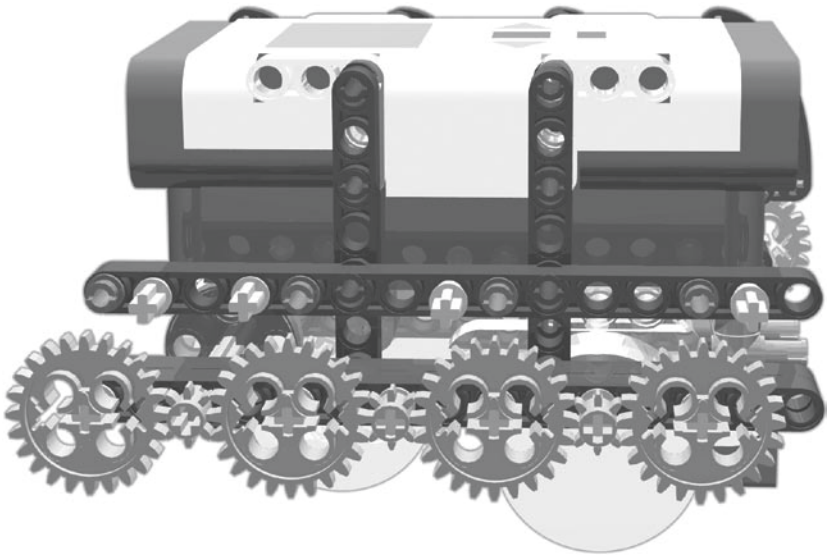

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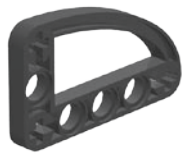

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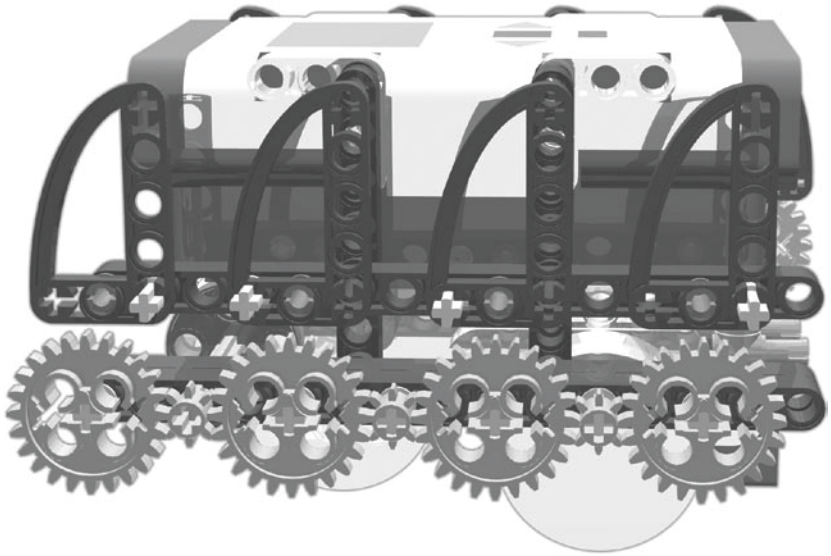

20

4x

2

4x

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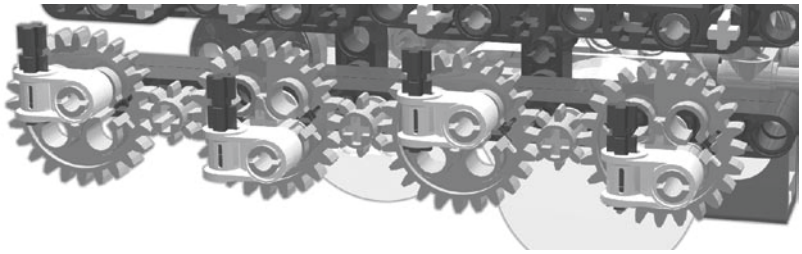

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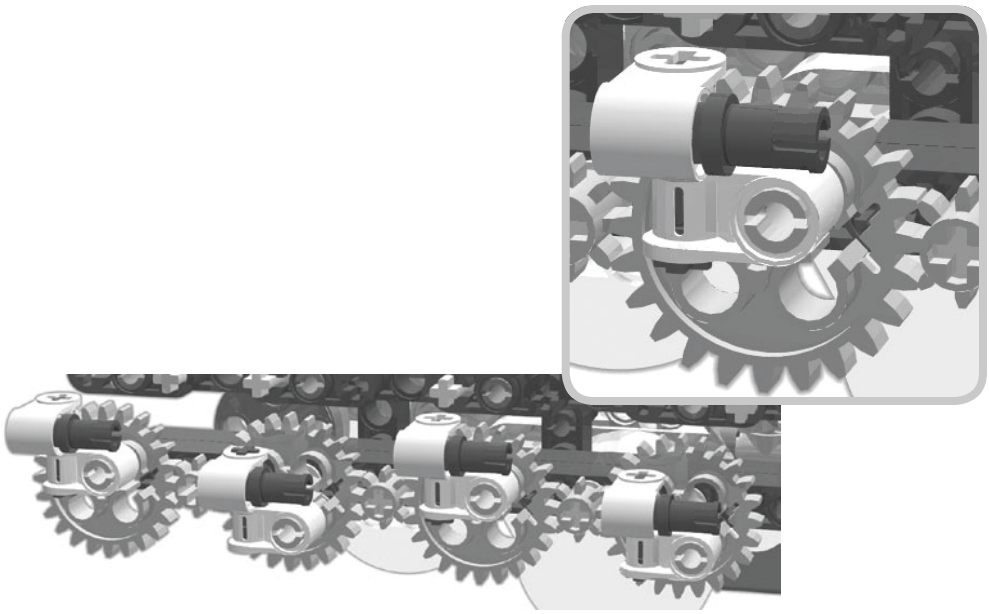
21

4x

4x

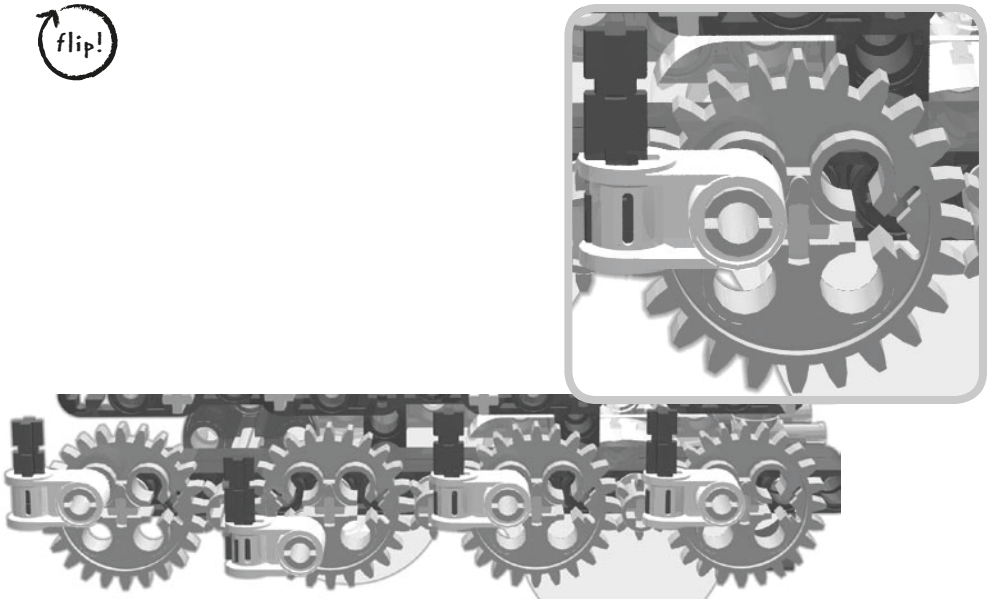


22

4x 2

4x

4x



Note that the pins are placed differently on this side than the other side.

NOTE These pictures are only a guide. You might need to rearrange the placement of these pieces on your robot to get smooth motion.

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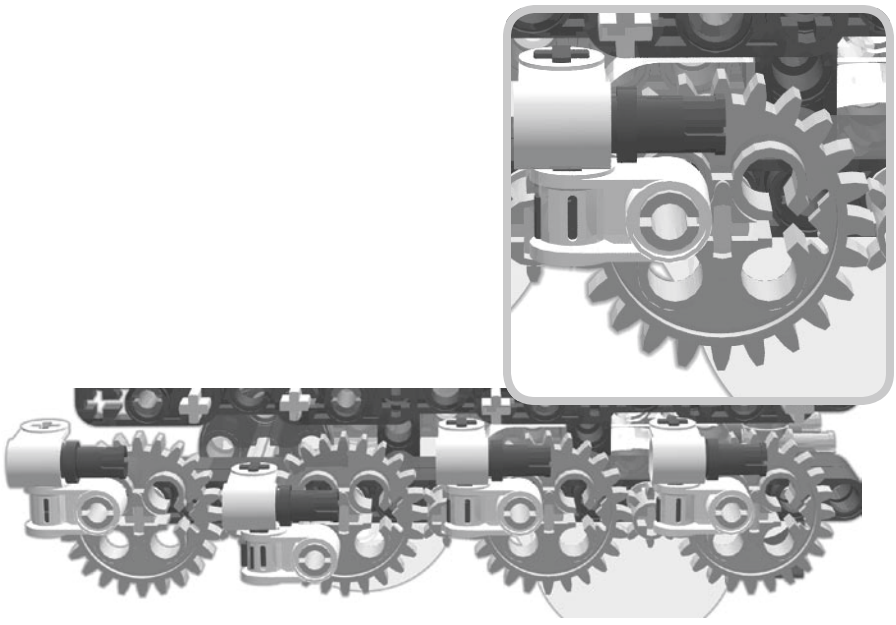
23

4x

4x



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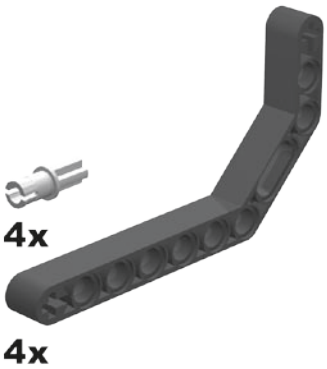
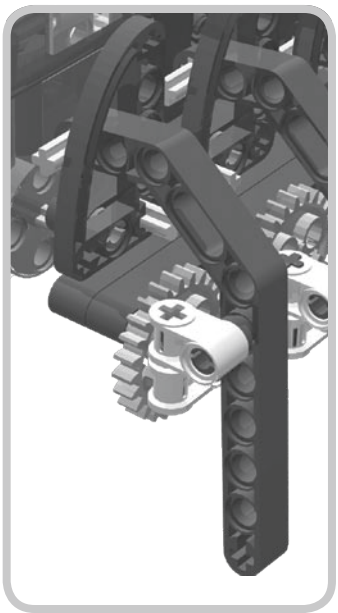
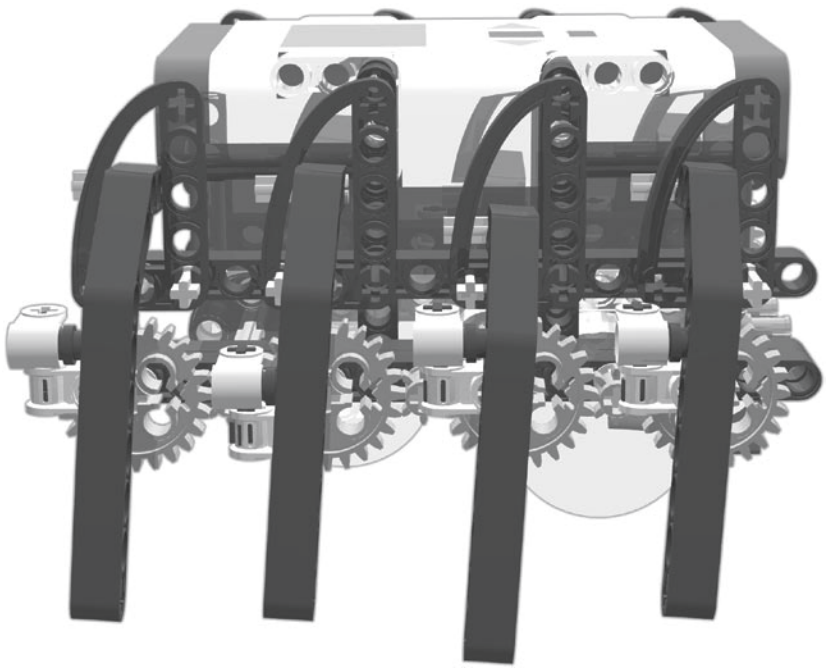
24



4x

4x





In step 24, insert an axle pin (any color) at the end of the beam. Turn it at a right angle to slide it through the supporting "shoulder" beam. The pin will keep the beam from coming out of the shoulder piece.

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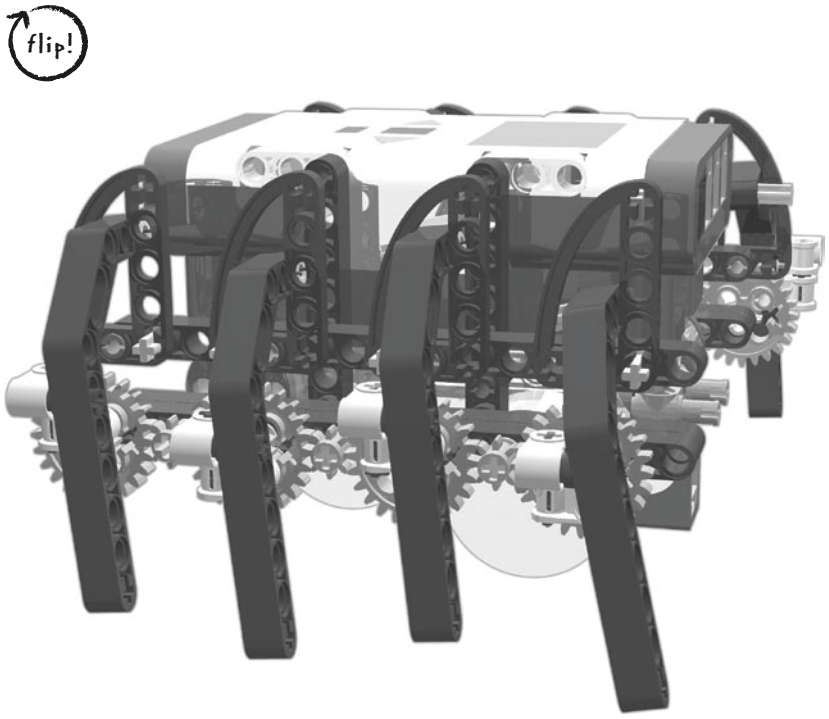
25

4x

4x



Insert an axle pin (any color) at the end of the beam. Turn it at a right angle to slide it through the supporting "shoulder" beam. The pin will keep the beam from coming out of the shoulder piece.

pause now to test your robot's legs

Now is the best time to test Spiderbot's legs. Turn the spider on its back and remove the driving gears (the small gears on the motor axles). Now you can spin all the gears both ways to discover problem areas and make adjustments. When all the legs and gears move freely, reinsert the driving gears and move on to the next step.

NOTE Keep in mind that you might need to change the placement of the legs to find the best arrangement for your robot.

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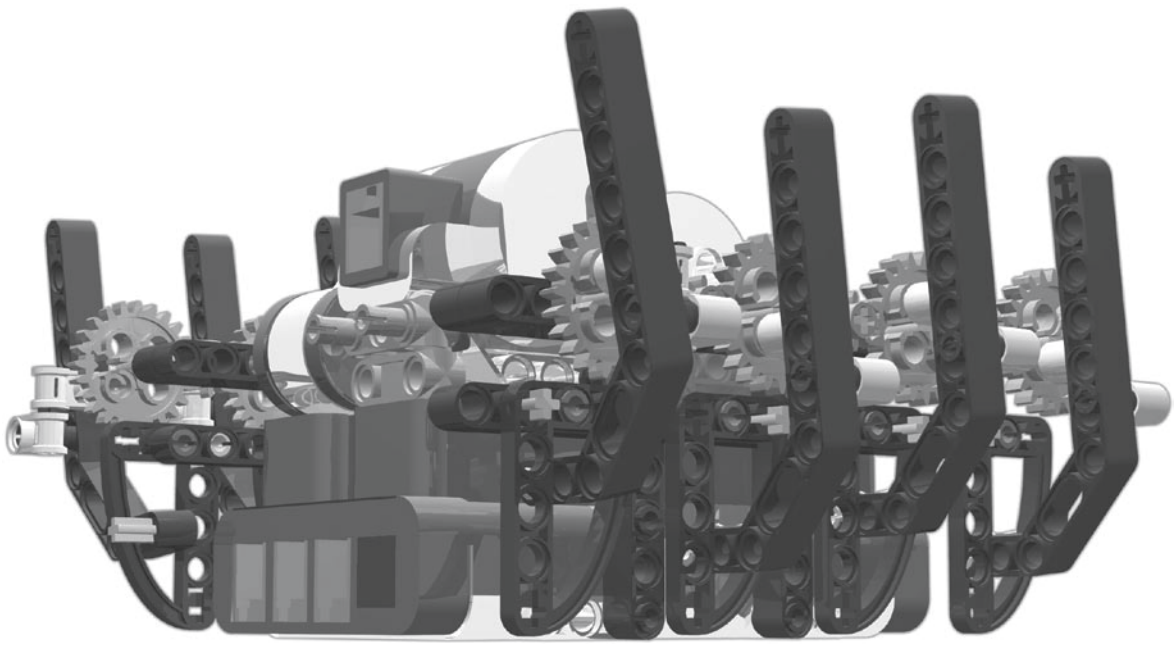
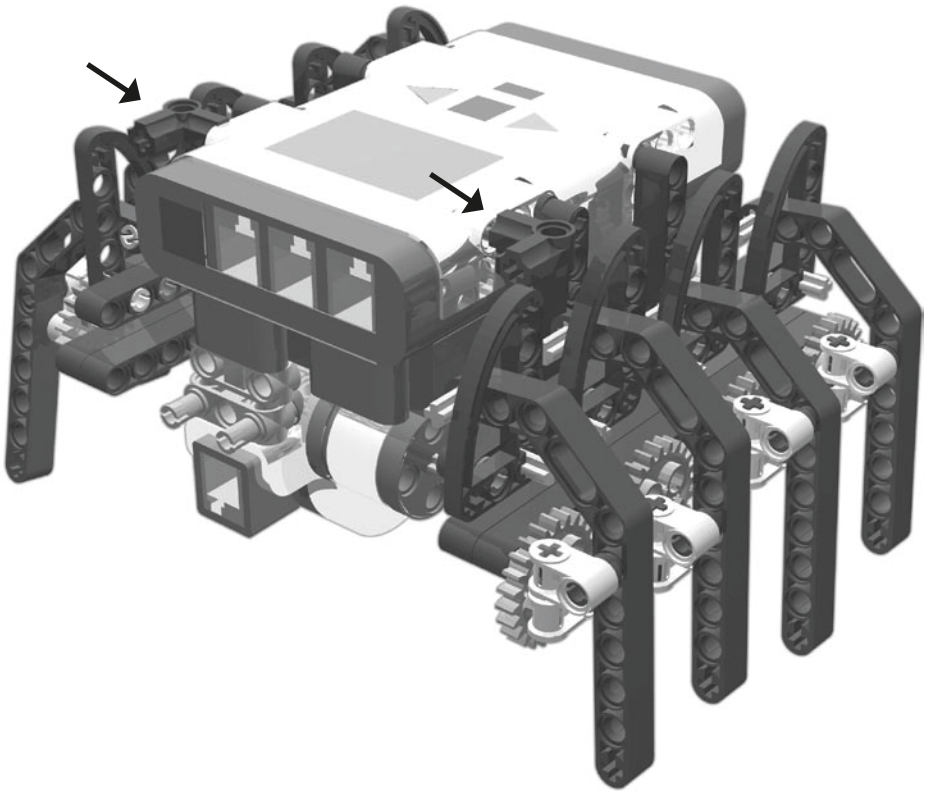


26

2x

2x



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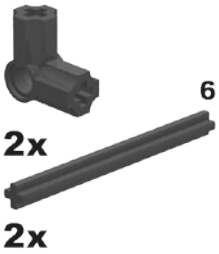
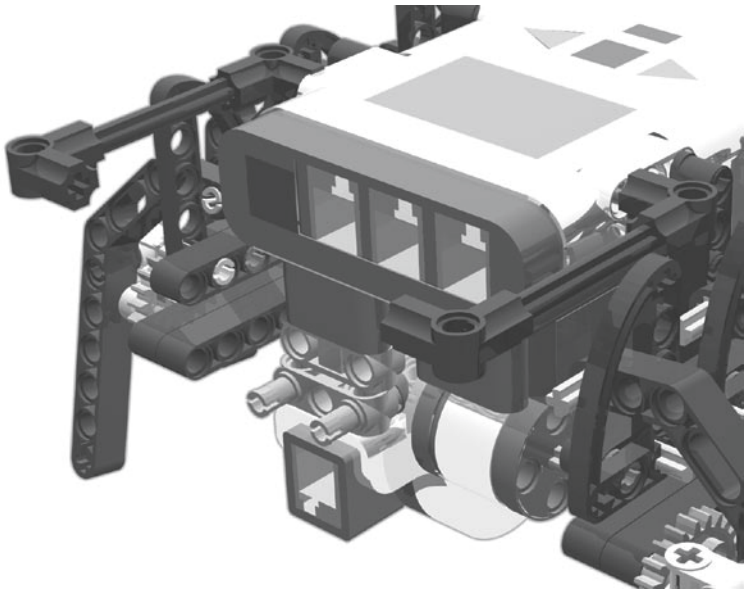
27





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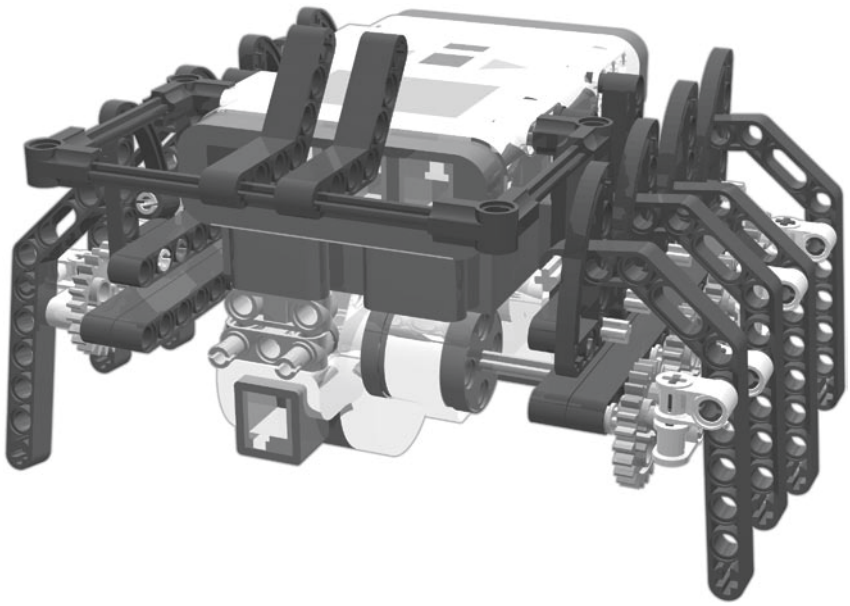

Step 28 shows you where these parts will go. Wait to assemble them with the Ultrasonic Sensor in the next step.

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Place the sensor between the two bent beams. Thread the axle through the first hole in the sensor; insert a long pin into the second or third hole.

wiring connections

Connect the motors that drive the legs to output ports B and C. Connect the Ultrasonic Sensor to input port 4.

programming spiderbot

Let's write a program to make the spider move around the room while avoiding objects in front of it.

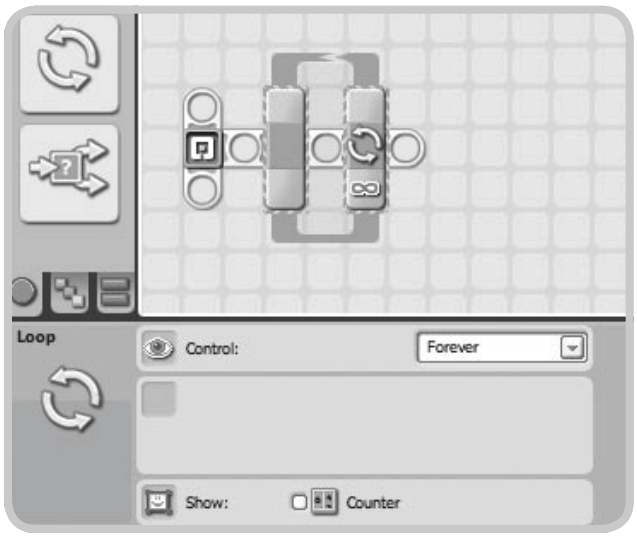

Figure 5-2: First, we'll place a Loop block on the beam and configure it as a Forever loop. This loop will contain all the action steps for the spider.

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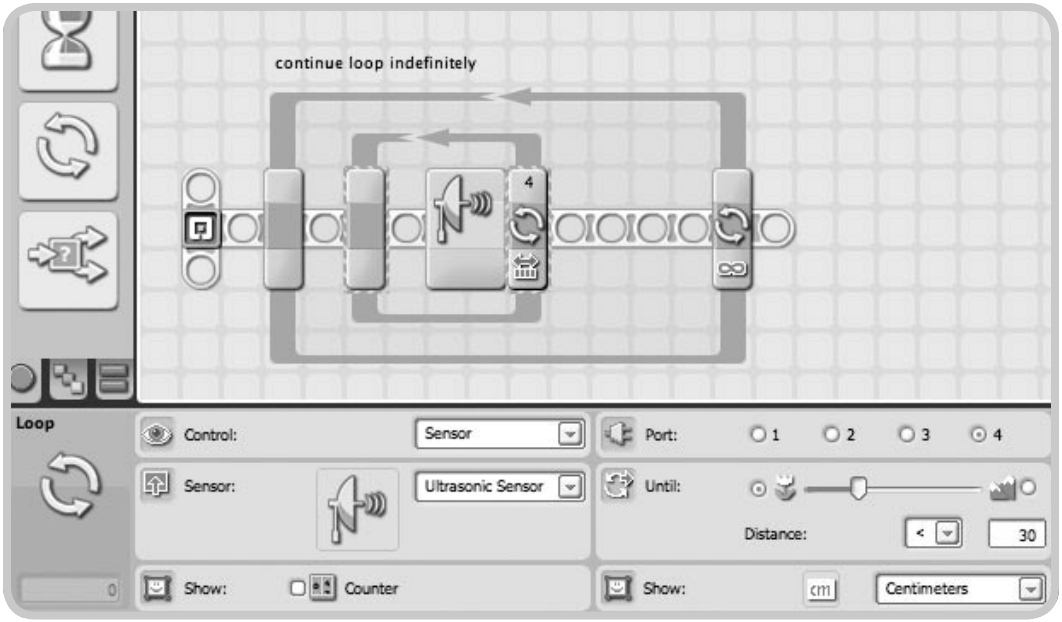

Figure 5-3: Place another Loop block inside that loop, but this time, configure it as shown here: an Ultrasonic Sensor looking for a distance of less than (<) 30 centimeters. Input port 4 is the usual choice for the Ultrasonic Sensor.

Because the robot has motors placed in opposite directions, we need to choose different directions for each of the motors in the program.

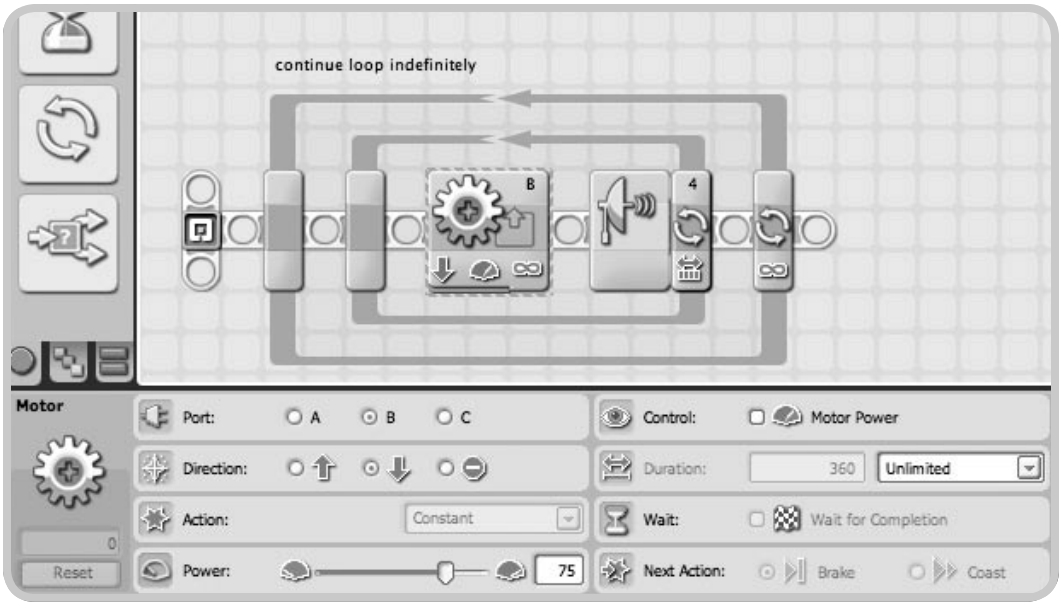

Figure 5-4: Place a Motor block in the Ultrasonic Sensor loop and connect it to output port B. Copy the settings displayed in the configuration panel shown here.

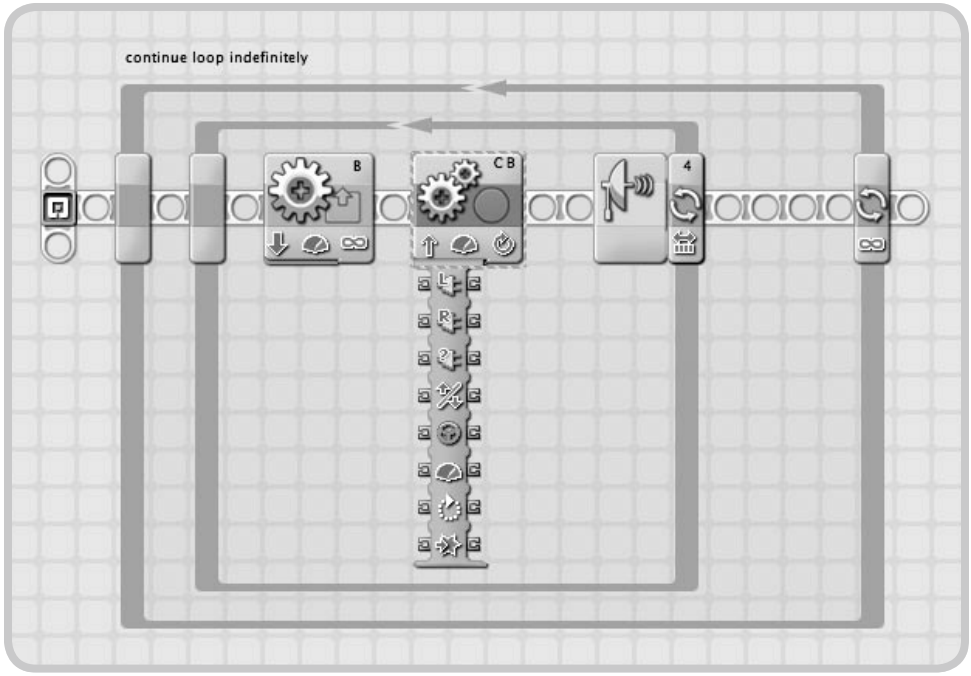

Figure 5-5: Here is another place where we need to use the expansion trick from Chapter 4 (pages 80–81). Add a Move block to the loop and click the lower left edge of the block to open the data hub. (The data hub is the bar hanging down from the Move block.)

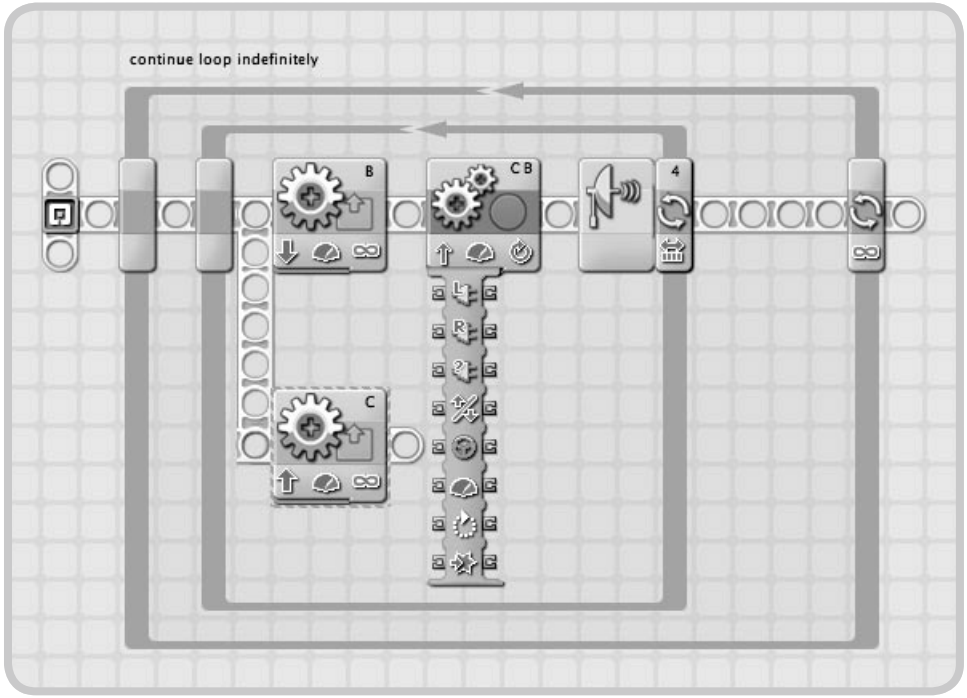

Figure 5-6: Insert a Move block below the B Motor block. Press SHIFT and use your mouse to drag a beam from in front of the B Motor block down to the C Motor block.

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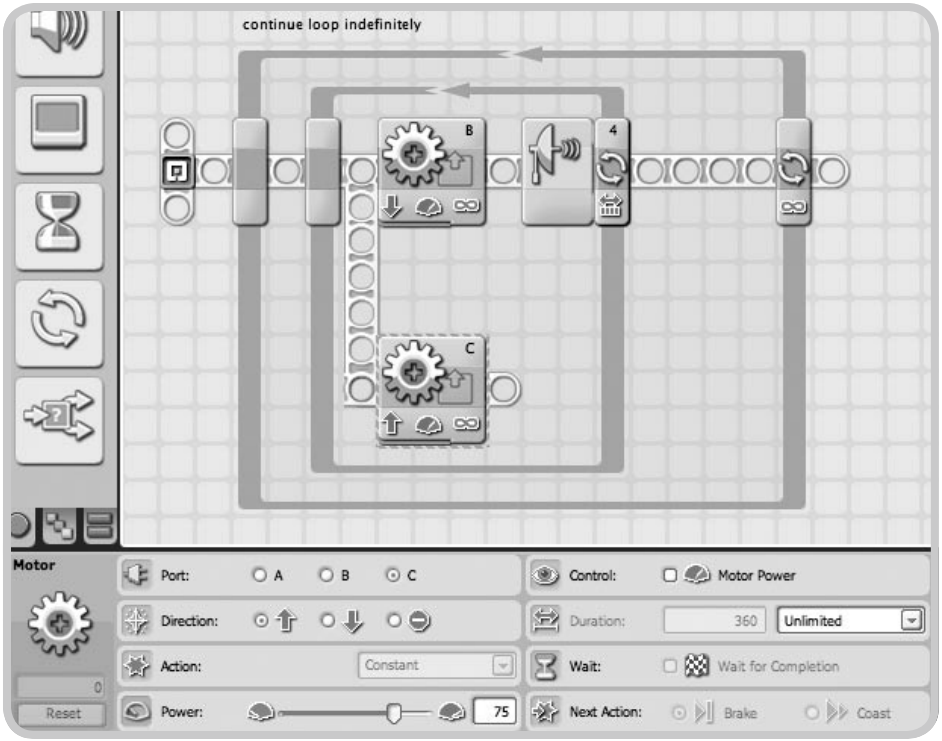

Figure 5-7: Delete the Move block. Settings for the C Motor block are shown here.

To make the robot back up, we'll add two Motor blocks.

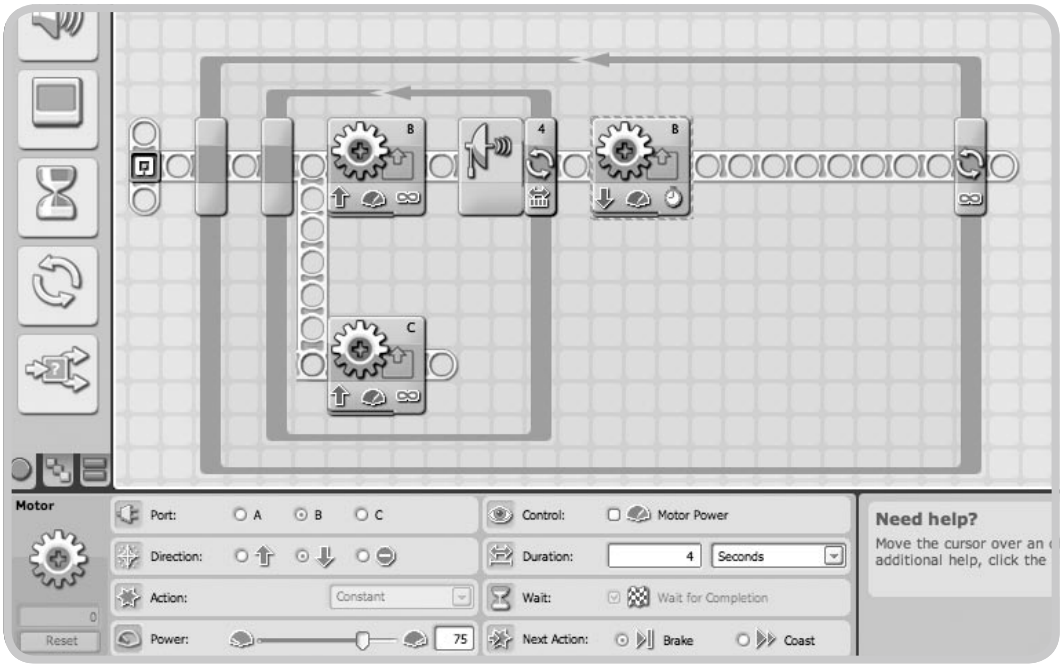

Figure 5-8: First add a Motor block after the inner loop. Select the settings shown here.

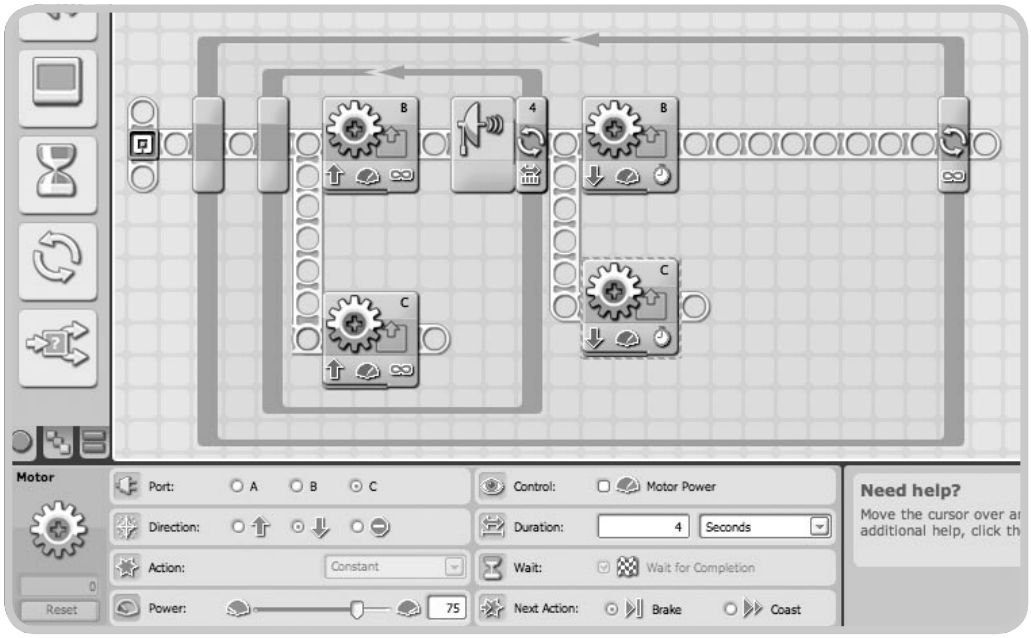

Figure 5-9: Add a Motor block under the B Motor block. Use the settings shown here.

Now we'll place the final Motor blocks. This time we want the spider to turn, so we'll direct both motors to turn in the same direction.

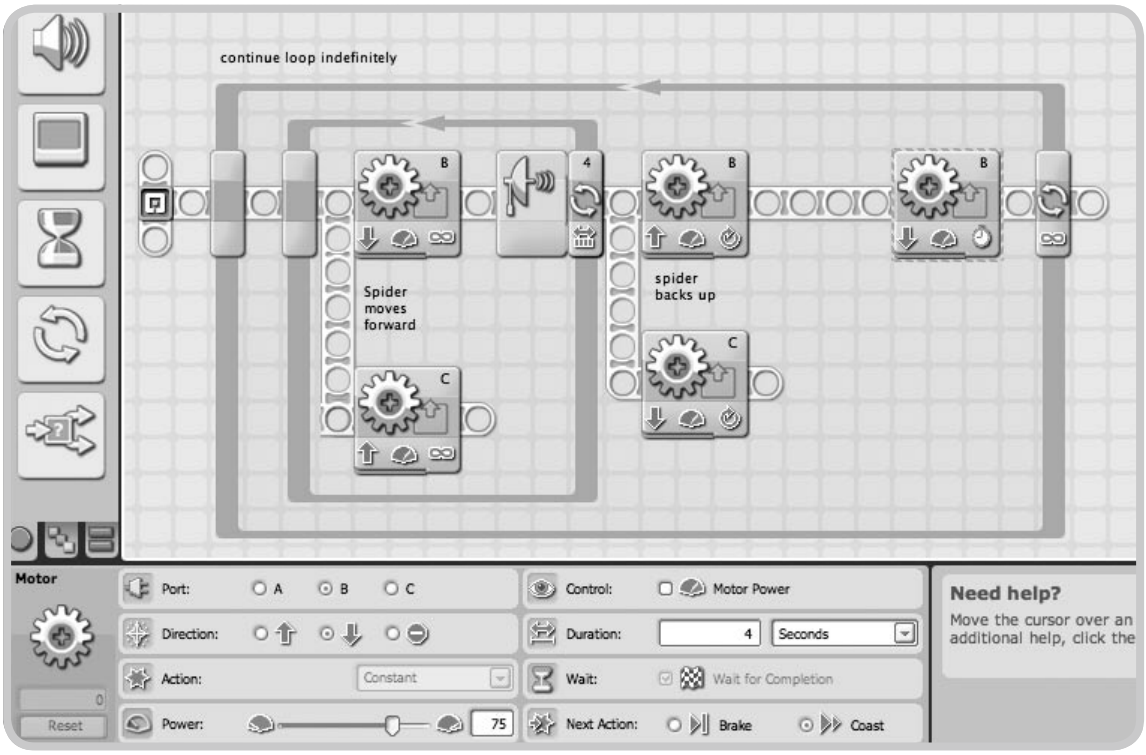

Figure 5-10: Configure the B Motor to move for 4 seconds, as shown here.

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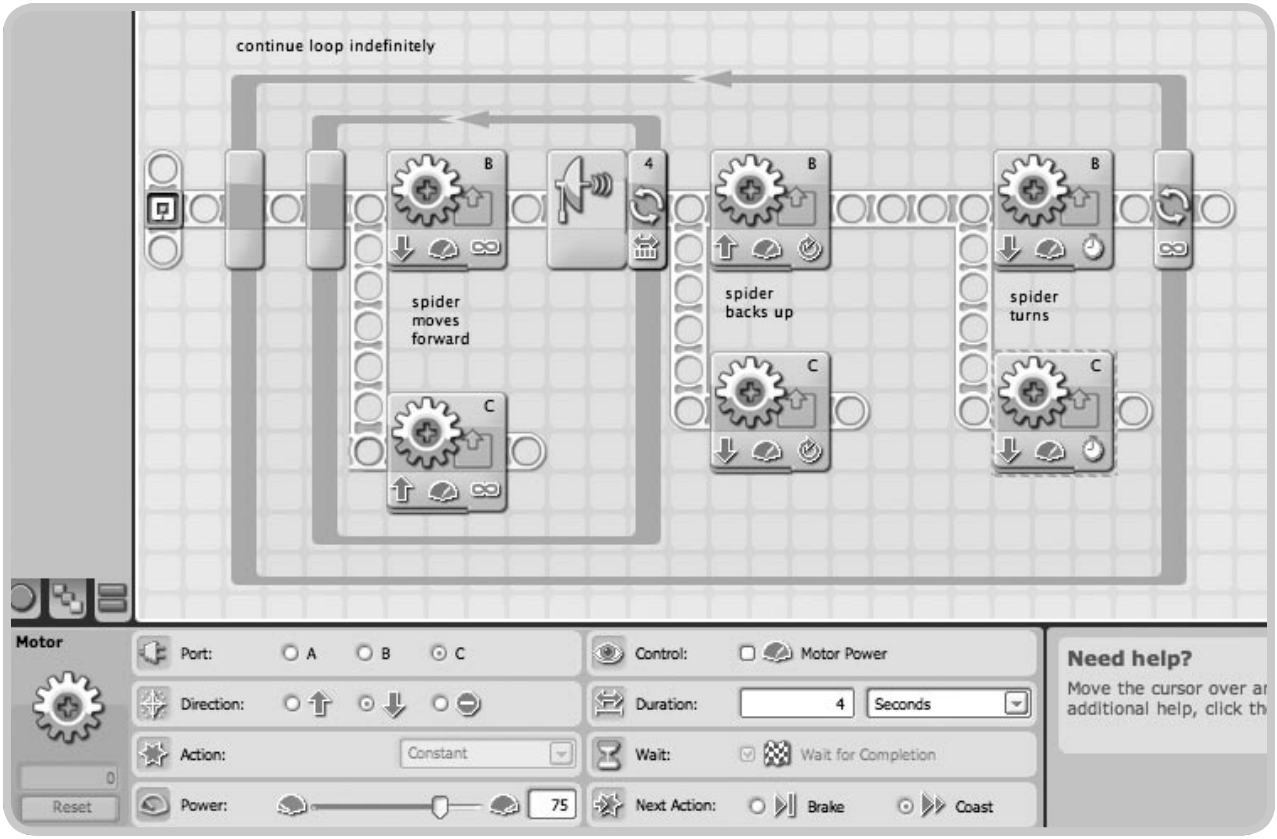

Figure 5-11: Place the second Motor block below the B Motor block and configure it as shown here.

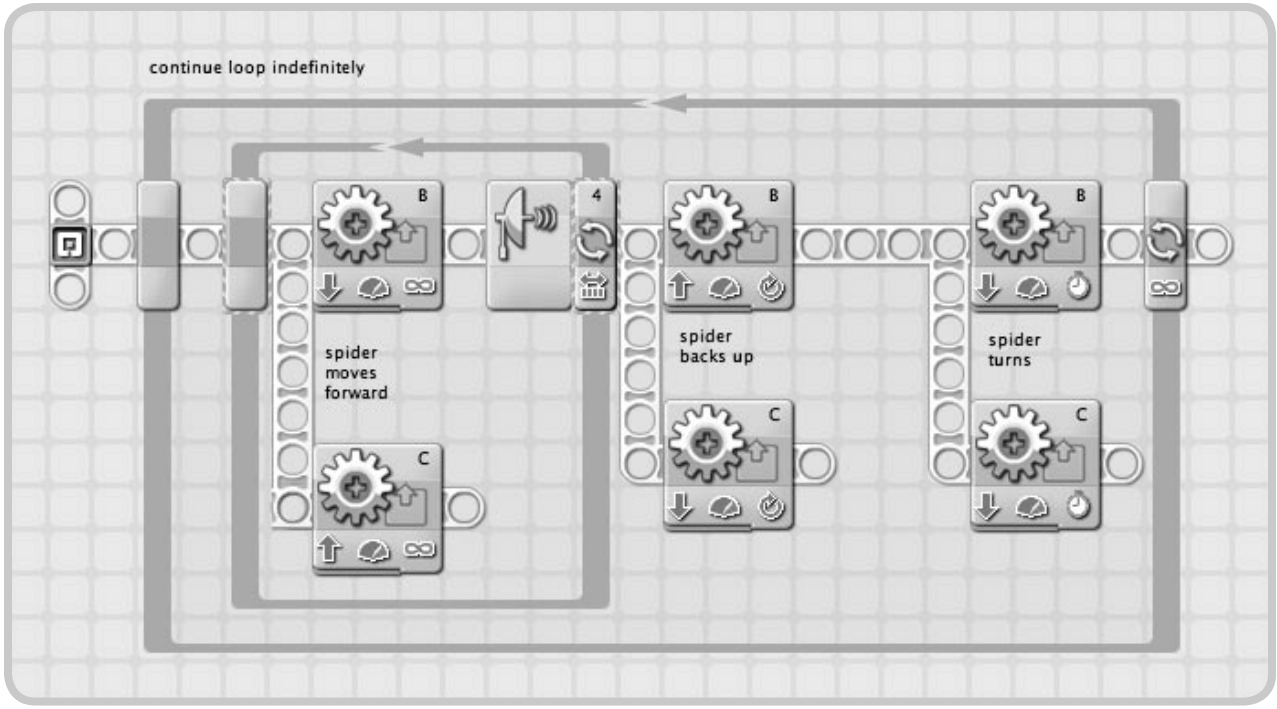

Figure 5-12: The completed program

If you stopped to test and readjust the spider after step 25, you should be ready to download the programs and get your spider crawling.

NOTE If your spider moves in the wrong direction when you start it, either switch the direction of each motor in the program or switch the wire connections to the opposite motors.

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