Engineering Lab

Synchronized Motors Turning Lab

In this lab you will experiment with the Synchronizing Motors command. You will complete the table on the second page. As you analyze the robot's turning ability you will discover that the synchronizing motors command is a very powerful tool that allows you to make very accurate turns with your robot.

In this lab there are four variables that you can modify to achieve the results you want: which motors to sync (synchBC or synchCB), the turn ratio, the motor power level, and how long the motors will be turned on (via the wait1Msec command.)

There are also a couple of rules to keep in mind when synchronizing motors.

1. The slave motor can be set to any power less than or equal to the master.

2. Because the limit of the Turn Ratio is 100% of the Master Motor's power, the motor which requires the **higher power setting** must always be the Master Motor.

3. Remember to unsynch your motors once you've completed the synchronizing task. To unsynch your motors using the "nSyncedMotors = synchNone;" command when you are finished.

```
1  task main()
2  {
3      nSyncedMotors = synchBC;
4      nSyncedTurnRatio = 60;
5      motor[motorB] = 50;
6      wait1Msec(5000);
7  }
```

Four variables that you control:
1. Which motors to synch (synchBC or synchCB)
2. The turn ratio
3. The motor power level
4. The wait statement

In the program above, the line "nSyncedTurnRatio = 60;", means that the slave motor's speed is 60% of the master motor speed. In the chart below you can see how the "Slave Motor Speed" changes as the motor power level changes. When you synchronize your motors remember that the slave motor power level is proportional to the master motor power level.

Master Motor Speed	100					60				
Turn Ratio	100%	50%	0%	-25%	-100%	100%	50%	0%	-25%	-100%
Slave Motor Speed	100	50	0	-25	-100	60	30	0	-15	-60

Synchronizing Motor Command Review

To use Motor Synchronization in ROBOTC, type in this command to enable synching:

nSyncedMotors = synchBC;

This command assigns motorB as the master motor, and motorC as the slave. You can also use "synchAB", "synchAC", "synchCB", "synchCA", and "synchBA".

To set the turn ratio, add use the following command to your program:

nSyncedTurnRatio = -100;

To unsynch the motors, add use the following command to your program:

nSyncedMotors = synchNone;

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See the picture of the robot and the concentric circles below. Write a program that will allow your robot to travel around the 1", 2", 3", and 4" circles in the shortest distance. Use the "Synchronized Motors" commands to accomplish this. Use the table below to collect your data. Save your results in your "Engineering Design" notebook. Be prepared to present your results.

Rules:
1. Your robot must travel all the way around the circle.
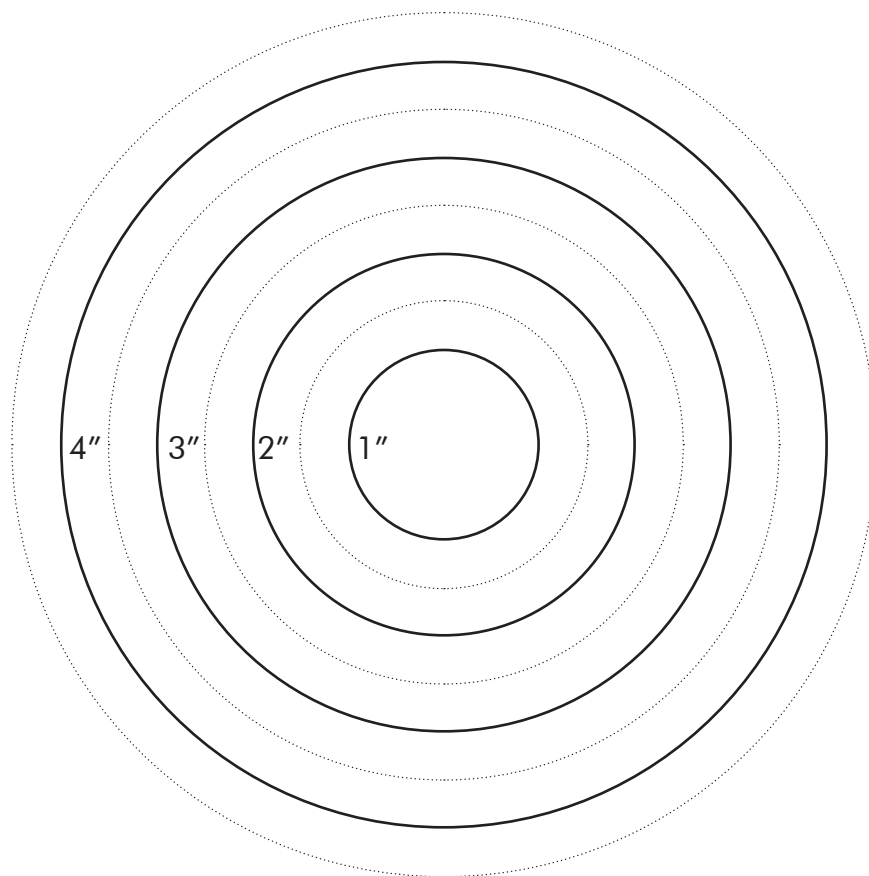2. Your robot must not touch the circle that it is travelling around.

Circle	Motors Sync Command	Turn Ratio	Power Level	Wait State
1	synchBC			
2	synchBC			
3	synchBC			
4	synchBC			
1	synchCB			
2	synchCB			
3	synchCB			
4	synchCB			
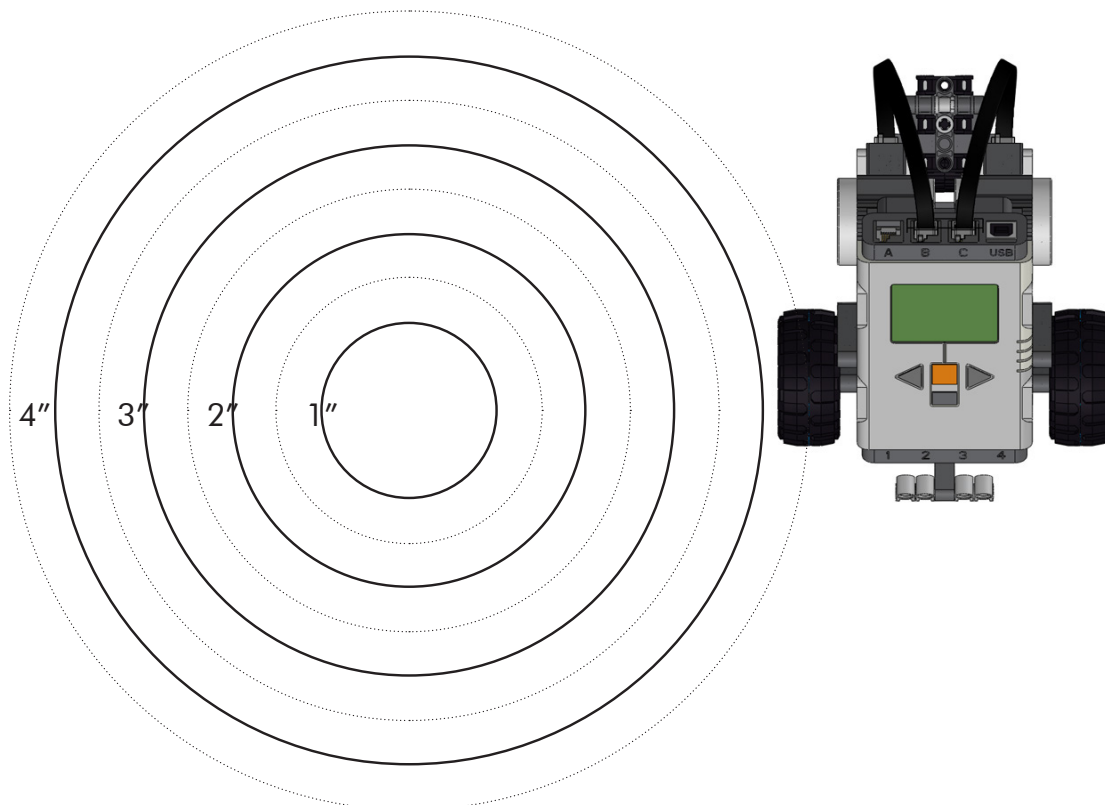
Engineering Lab

Synchronizing Motors Turning Lab Test Bed
For best results tape down the edges of the paper.

4"   3"   2"   1"

When reproducing this testbed, check the measurements;
some copiers or printers may shrink the page.