KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Analog Sensors - Rangefinders

Professional Development Workshop

Analog Sensors - Rangefinders

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Learning About Analog Sensors

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

- Returns the analog value of the port (a value in the range 0 to 4095). Analog ports are numbered 0 through 5.
- Light, slide, range and reflectance sensors are examples of sensors you would use in analog ports.

Light Sensor

Slide Sensor

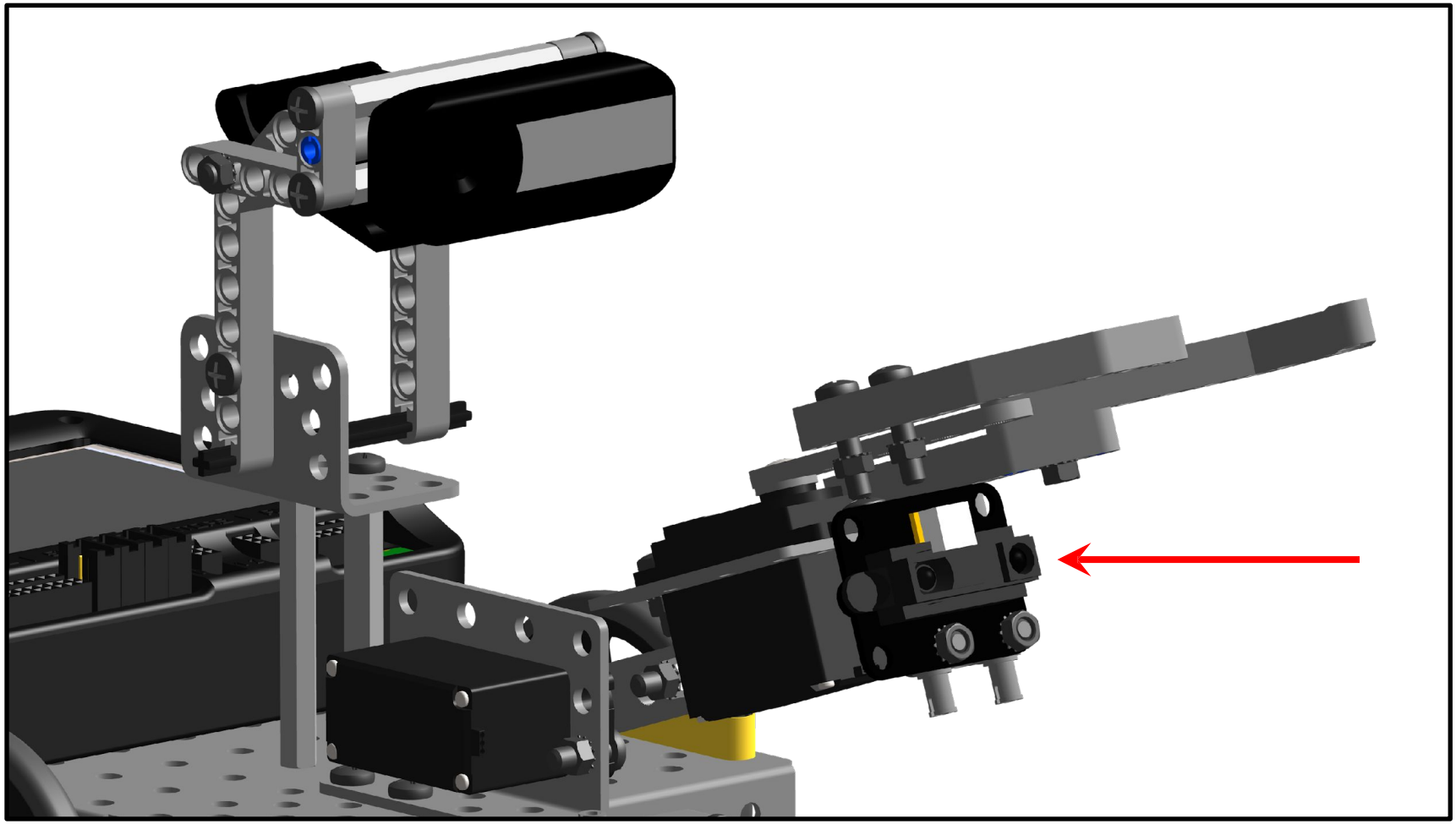
“ET” Range Sensor

Small Reflectance Sensor

Range Sensor Mounted on Robot

KISS INSTITUTE FOR PRACTICAL ROBOTICS

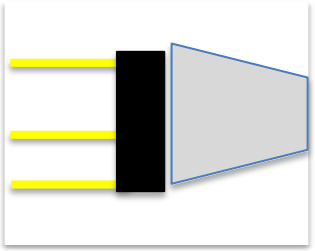
Botball®

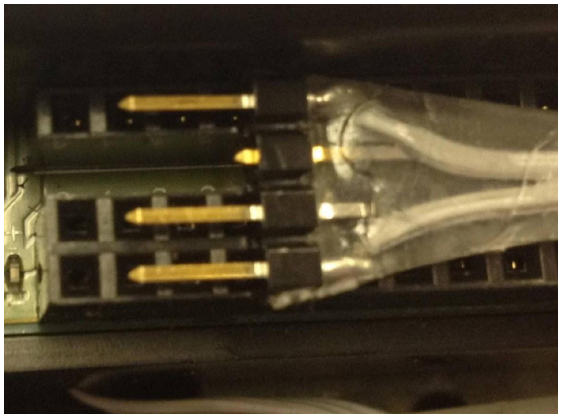


Plug in your Range Sensor

Plug your analog sensor into analog port 0

Sensor Plug Orientation

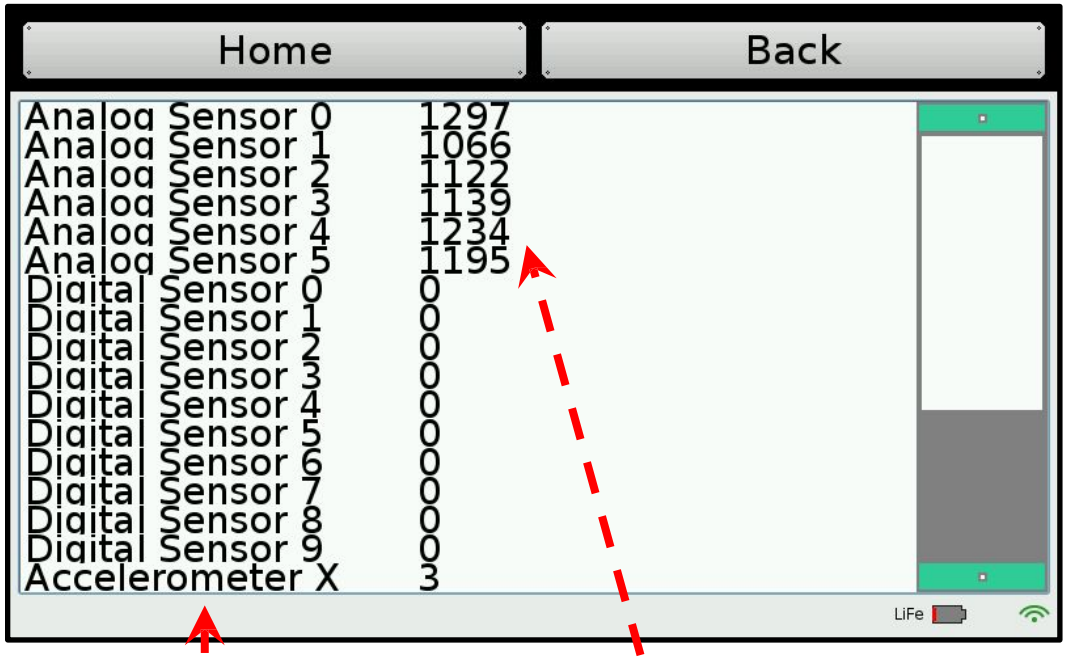




Close-up of sensor plug orientation

Range Sensor

Check ET Sensor on Wombat Screen

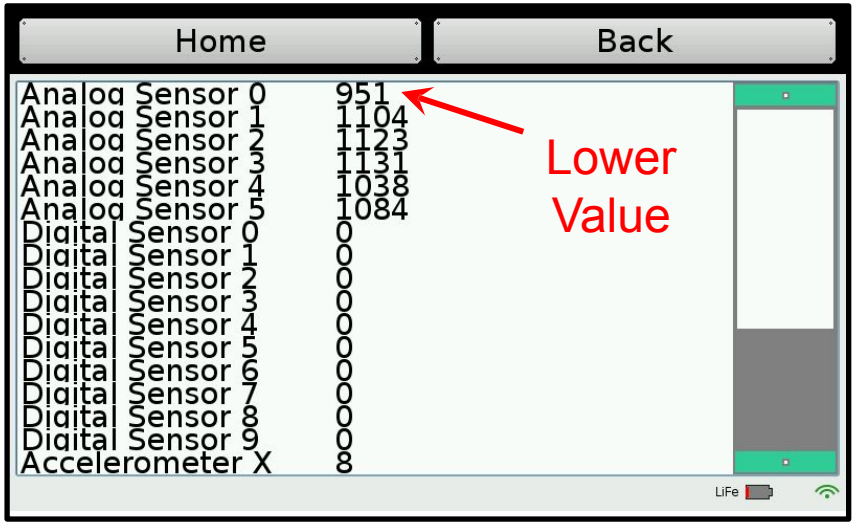


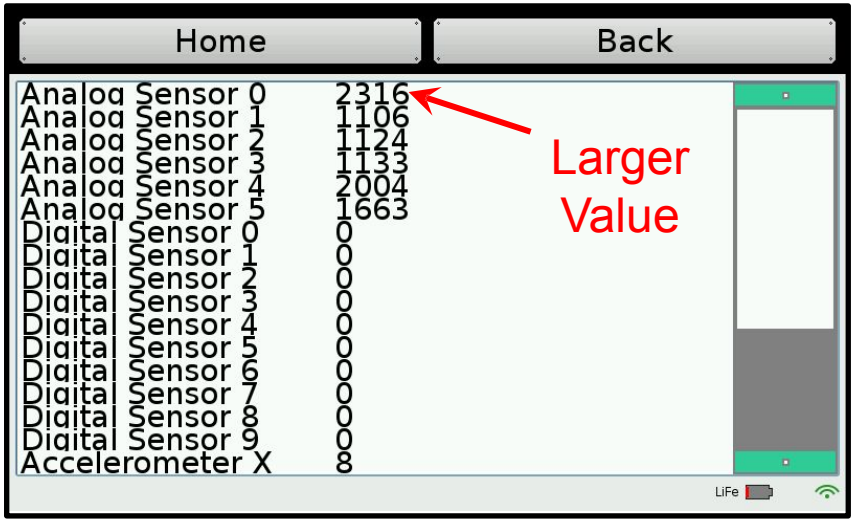
"ET" Range Sensor (or Wall·E?)

Read the values when your ET sensor is pointed at an object and slowly move it toward/away from the object
(this is a distance sensor)

ET (Wall·E) Sensor Information

- **Low values:** indicate greater distance (farther from robot)
- **High values:** indicate shorter distance (closer to robot)
- Optimal range is ~4” and further away
- 0” to 3.5” values are not optimal
- Objects closer than the focal point (~4”) will have the same readings as those further away.



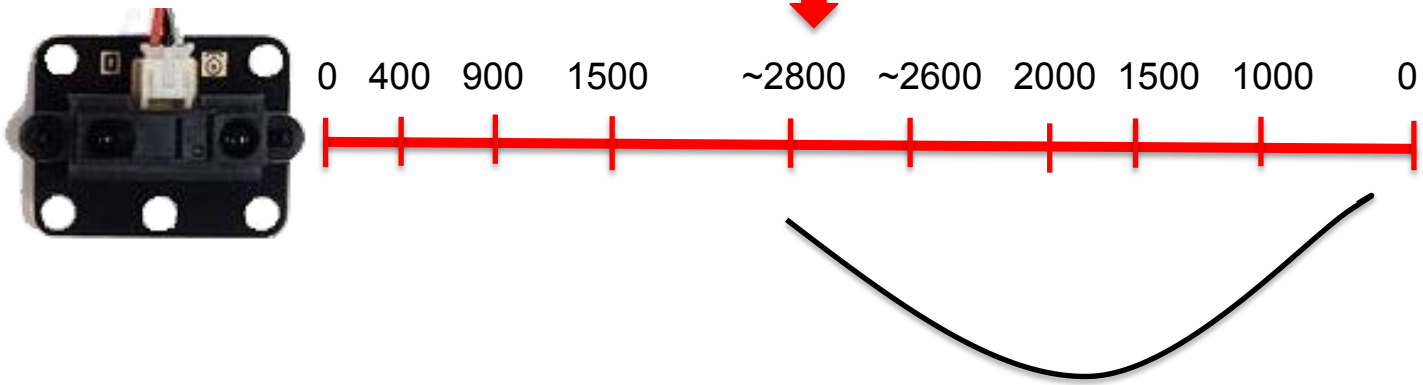


ET Sensor Values

Objects that are inside the focal point return a smaller #, too close to object

Focal Point

Objects that are farther away return a smaller number



You may need to adjust the value chosen, up or down a little, for your desired distance from an object. Optimal distance is about 4” away from the sensor.

ET Sensor Focal Point Problem

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Using the sensor values you should see that the farther away an object is the lower the value returned. The closer an object is the higher the value until you get within ~4” of the sensor.

1. Extend your arm in front of you with your thumb pointed up.
2. Focus on your thumb and then slowly bring your thumb toward your face.
3. What happens when your thumb gets close to your face?
4. Did it get blurry? Yes! It got within the focal point of your eyes (where you could focus on it and make it clear)
5. The ET sensor also has a focal point and if the object is too close the sensor cannot tell if it is close or far away.
6. When attaching your ET sensor to your robot, consider the ~4” distance from your sensor to its focal point.

Learning to Use an ET Analog Sensor

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Type of sensor: analog, digital

Port number: analog 0-5 digital 0-9

Notice **no** terminating semicolon

Source Code

```
1
2
3     while (analog(port#) <= ?)
4     {
5         motor(0, 40);
6         motor(3, 40);
7     }
8
```

What you want it to repeat while checking to see if the **while** statement is true

Boolean Logic

>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
==	Equal to
!=	Not equal to

Find the Wall

KISS INSTITUTE FOR PRACTICAL ROBOTICS

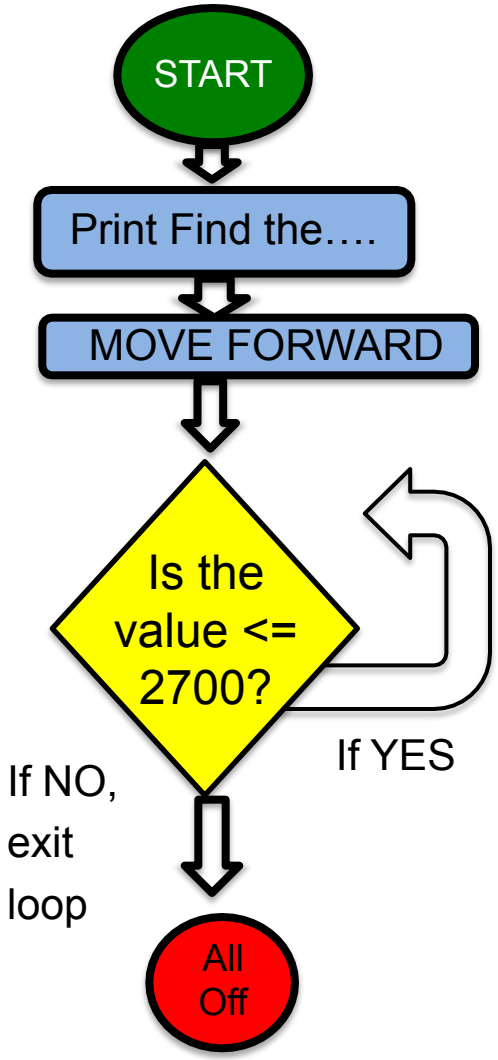
Botball®

1. Open a new project, name it “Find the Wall”.

2. Write and compile a program that will find the wall and stop.

Pseudocode (Task Analysis)

1. Print Find the Wall and Stop
2. Check the sensor value in analog port 1. Is the value <= 2700?
3. Drive forward as long as the value is <= 2700 (or your determined value)
4. Exit loop when value is 2700(or your determined value) or greater
5. Shut everything off



While
“find the wall” Solution

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Source Code

```
1  #include <kipr/wombat.h>
2
3  int main()
4  {
5      printf(“Find the wall\n”);
6      while (analog(0) <= 2700)
7      {
8          motor(0, 40);
9          motor(3, 40);
10     }
11     ao();
12
13     return 0;
14 }
15
```

ET - Find the Wall and Back Up

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Pseudocode (Task Analysis)

1. Print Find the Wall and Back Up
2. Check the sensor value in analog 1. Is the port value <= 2700?
3. Drive forward as long as the value is <= 2700 (or your determined value)
4. Exit loop when value is 2700(or your determined value) or greater
5. Back up for 3 seconds
6. Shut everything off

This is an example of taking a shorter program and building/expanding upon it to accomplish more.