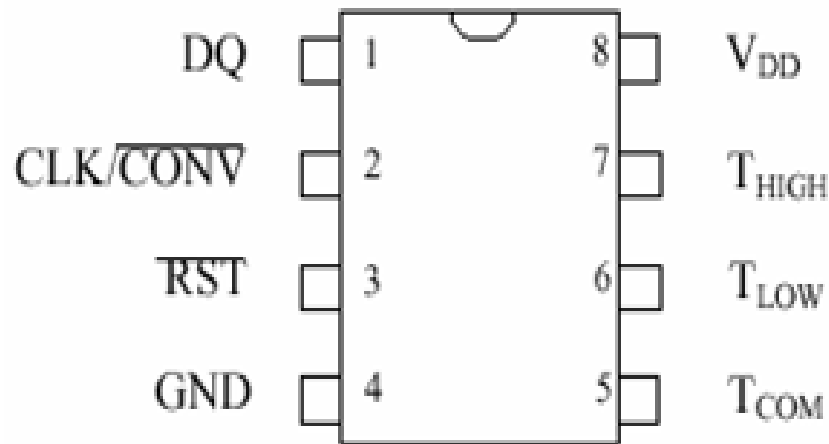# Lecture 10

Thermal Sensors

DS1620
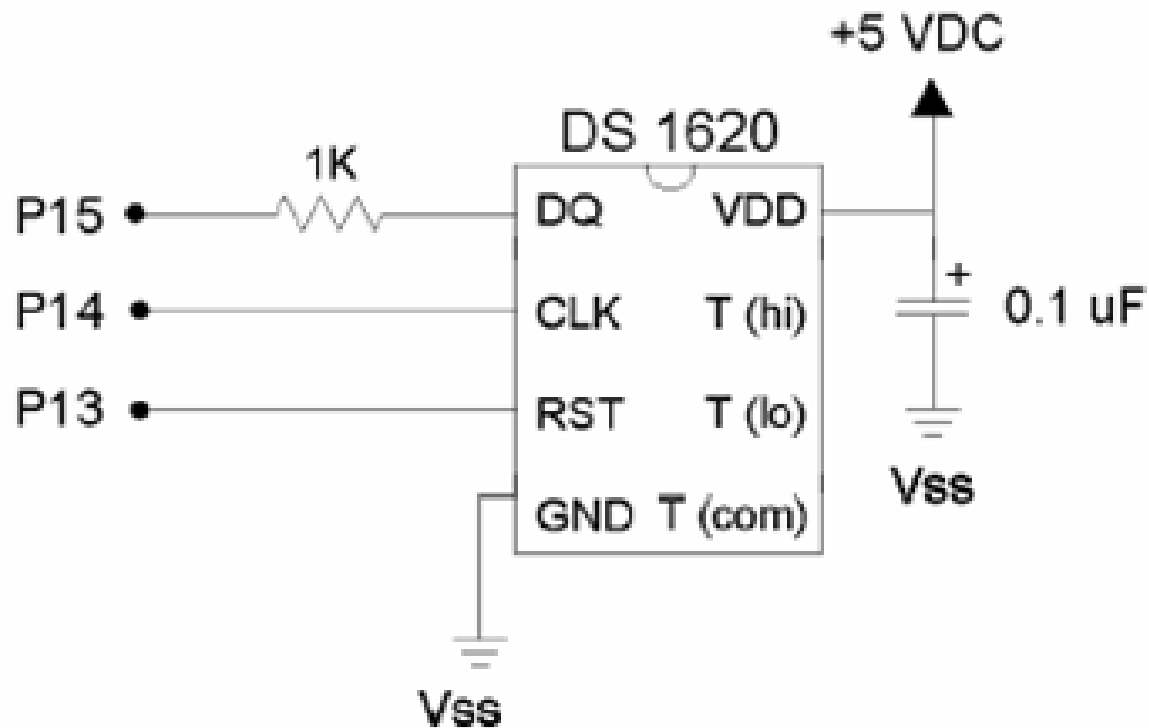

- Digital thermometer
  - Provides 9-bit temperature readings
  - Temperature range from -55ºC to 125ºC
  - Acts as a thermostat

Detail Description

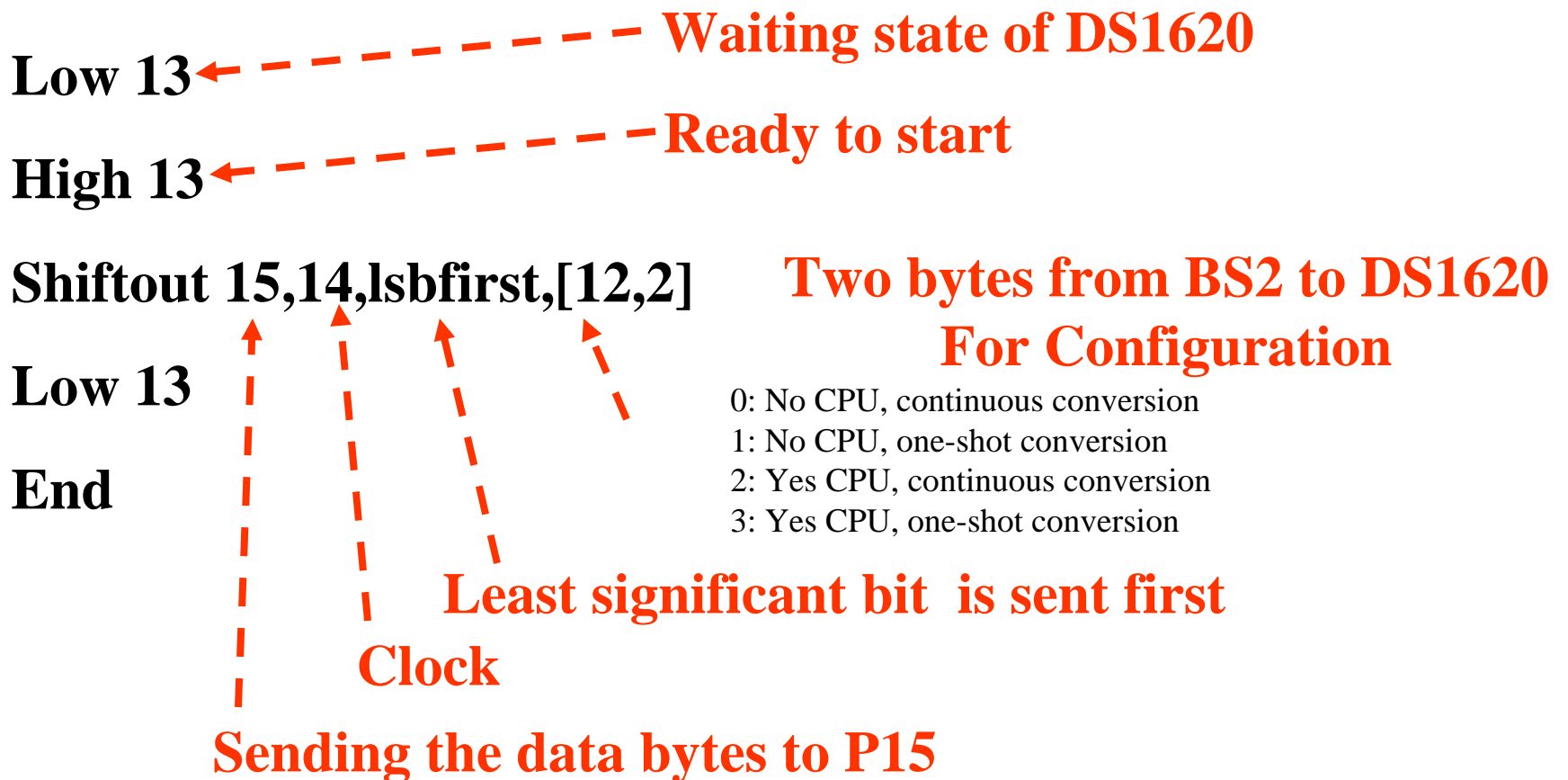| PIN	SYMBOL	DESCRIPTION
1	DQ	**Data Input/Output pin** for 3-wire communication port.
2	CLK/$\overline{\text{CONV}}$	**Clock input pin** for 3-wire communication port. When the DS1620 is used in a stand-alone application with no 3–wire port, this pin can be used as a convert pin. Temperature conversion will begin on the falling edge of $\overline{\text{CONV}}$.
3	$\overline{\text{RST}}$	**Reset input pin** for 3-wire communication port.
4	GND	**Ground pin.**
5	T_{COM}	**High/Low Combination Trigger**. Goes high when temperature exceeds TH; will reset to low when temperature falls below TL.
6	T_{LOW}	**Low Temperature Trigger.** Goes high when temperature falls below TL.
7	T_{HIGH}	**High Temperature Trigger.** Goes high when temperature exceeds TH.
8	V_{DD}	**Supply Voltage.** 2.7V – 5.5V input power pin.

DS1620 with BS2

Programming for DS1620 1

Low 13 ← – – – – – – – – – **Waiting state of DS1620**

← – – – – – – **Ready to start**
High 13

Shiftout 15,14,lsbfirst,[12,2]   **Two bytes from BS2 to DS1620**
                                  For Configuration

Low 13

0: No CPU, continuous conversion
1: No CPU, one-shot conversion
End
2: Yes CPU, continuous conversion
3: Yes CPU, one-shot conversion

Least significant bit is sent first

Clock

Sending the data bytes to P15

Programming for DS1620 2

high 13 ← – – – – – – – – – **Ready to start**

Shiftout 15,14,lsbfirst,[238] ← – – – **Start conversion**

low 13

Temploop:

high 13

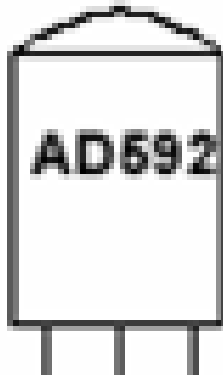shiftout 15,14,lsbfirst,[170] ← – – – **Send "get data" command**

shiftin 15,14,lsbpre,[x] ← – – – – **Get the data**

low 13

degC=x/2

Goto Temploop

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AD592

AD592

PIN 3   PIN 2   PIN 1
 □   □   □
(−)   (NC)   (+)
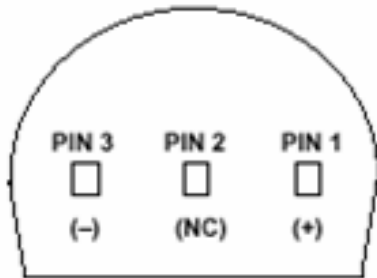
✱ PIN 2 CAN BE EITHER ATTACHED OR UNCONNECTED
BOTTOM VIEW

- Analog temperature sensor
  - Provides an output current proportional to absolute temperature
  - Temperature range from -25°C to 105°C
  - Acts as a thermostat
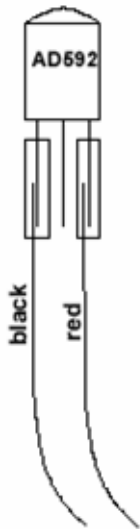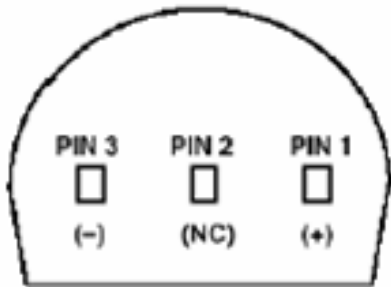 - Extended out away from the recording instruments

Temperature Probe with AD592
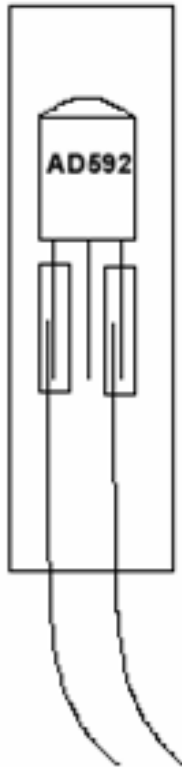
- The part needs to be protected before being inserted into liquid

How to Make Temperature Probe 1

PIN 3   PIN 2   PIN 1
☐   ☐   ☐
(−)   (NC)   (+)

AD592

black   red

1. Identify the AD 592's (-), NC, and (+) pins from this picture as viewed from the bottom

2. Slip the solder sleeve over the black wire and pin 3 (-)

3. Slip another solder sleeve over the red wire and pin 1 (+)

4. Heat up the connections until the wires are joined

How to Make Temperature Probe 2

Clamp here
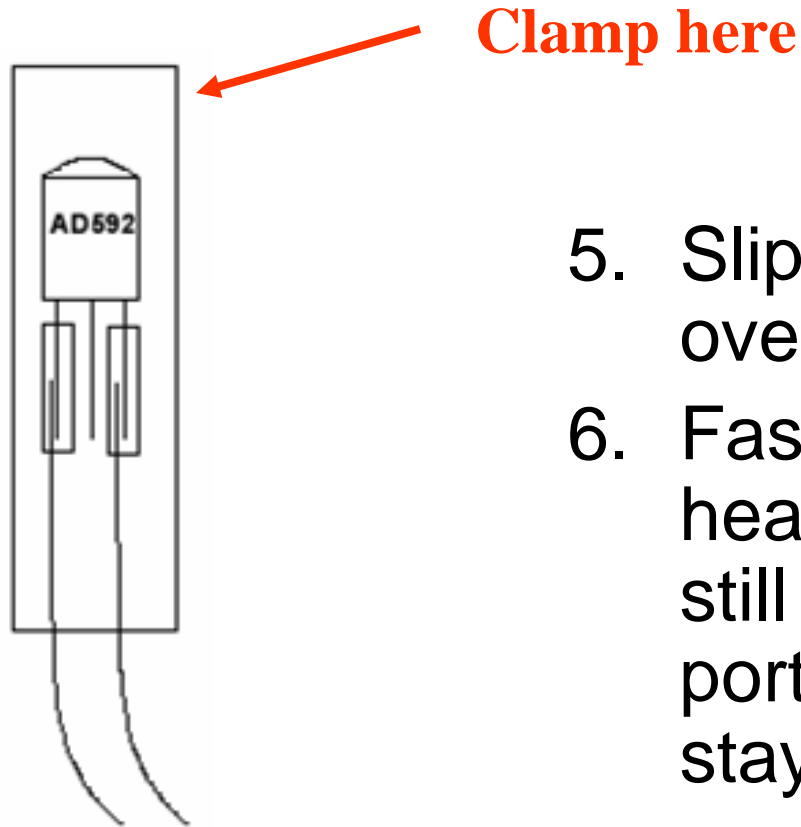
AD592

5. Slip the heat shrink tubing over the entire package

6. Fasten the package with a heat gun, and while it's still hot clamp the top portion to ensure that it stays shut

AD592 with BS2
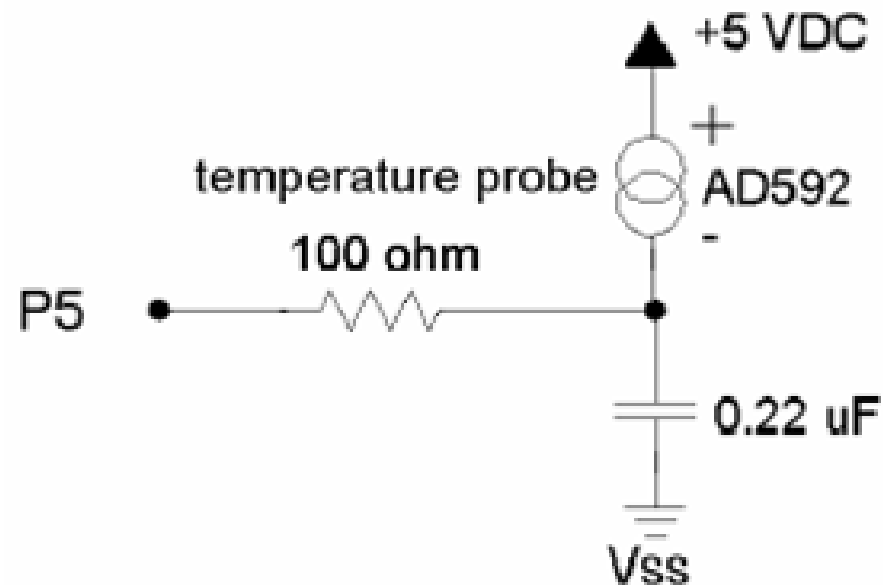
Caution!!
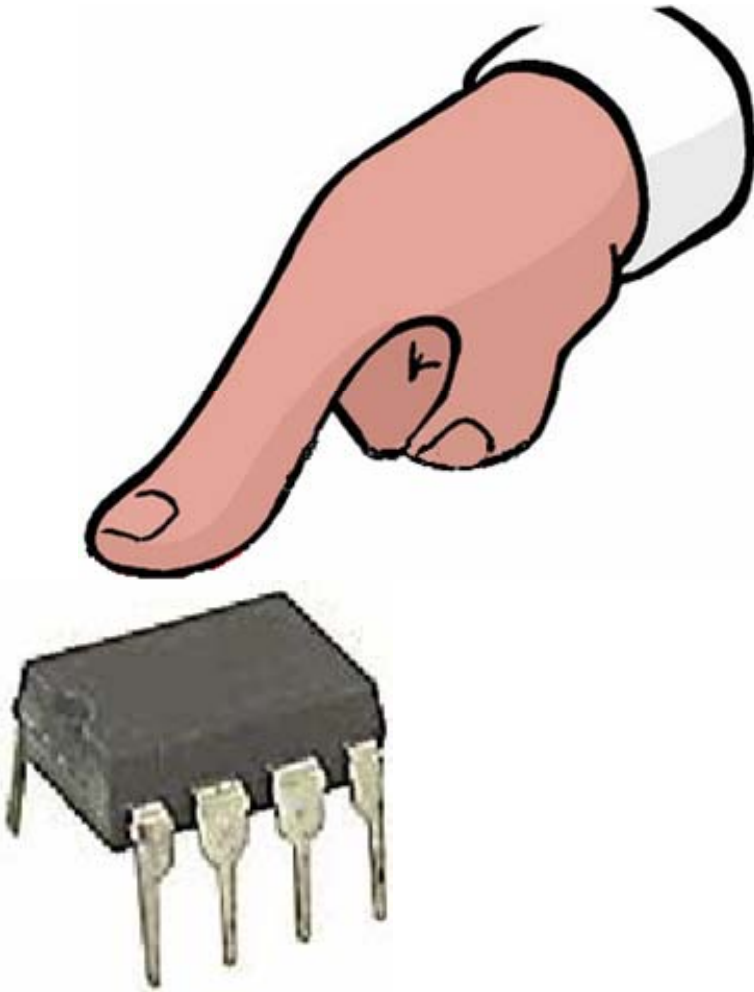
- Be careful when you put your finger on it
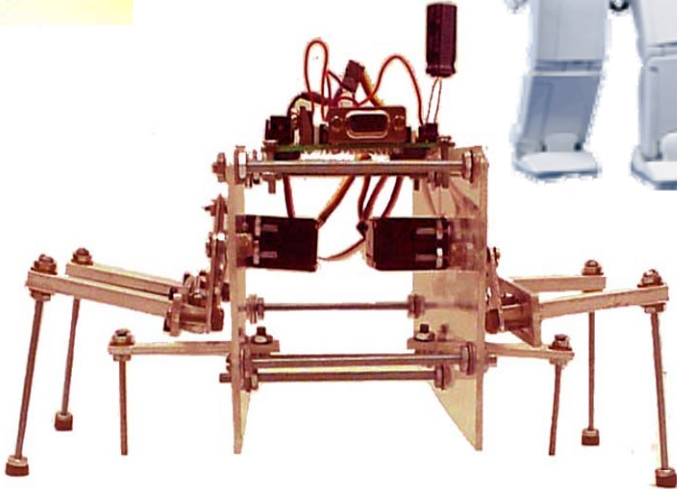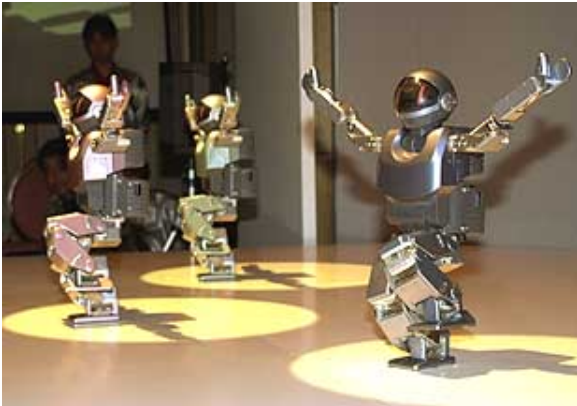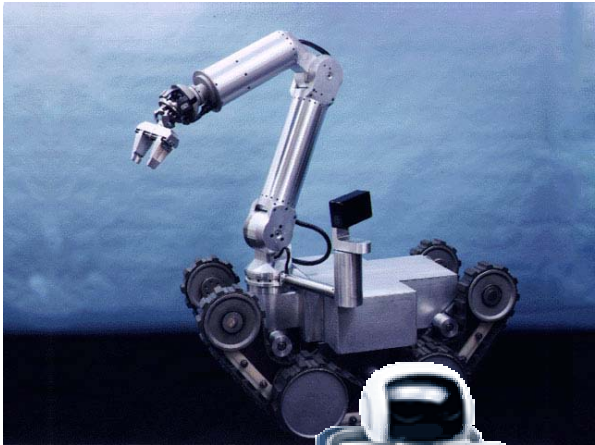- Specially for a big finger

Temperaure Sensors Experiments

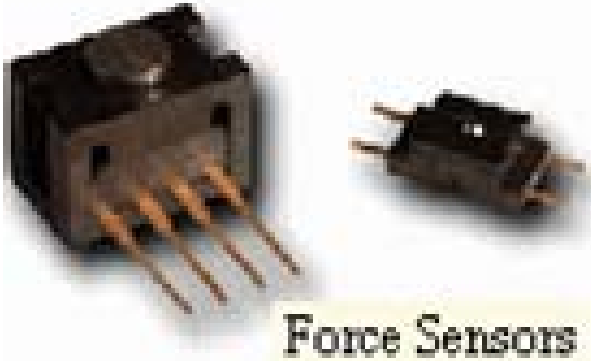| Experiments	Chapters
What's micro controller	
Basic A and D	
Process Control	
Boe Bot Robotics	
Smart Sensors	
Others	

Lecture 11

Robotics

Robots

Definition of Robot

- First introduced
  by Karel Capek in a 1920

- Definition of robot
  - Reprogrammable
  - Multifunctional manipulator
  - Designed to move material, parts, tools or specialized devices
  - Through variable programmed motions for the performance of a variety of tasks
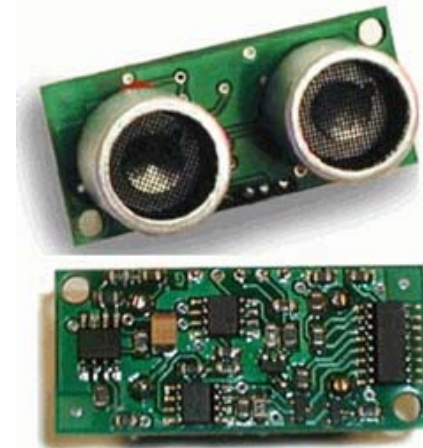 - Robot Institute of America, 1979

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Sensors

Force Sensors

In-Sight vision sensors

Tilt Sensor

Devantech SRF04

UltraSonic Ranger

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Actuators

- Actuators used in robotics is almost always combinations of different electro-mechanical devices

  – Stepper motor

  – AC servo motor

  – Brushless DC servo motor

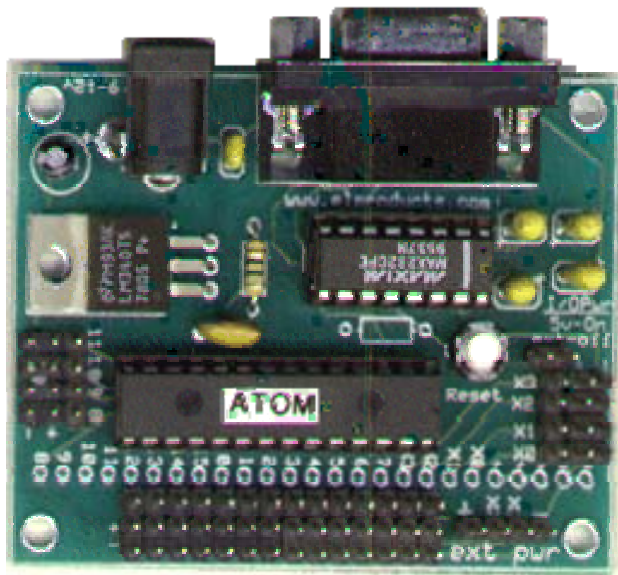 – Brushed DC servo motor
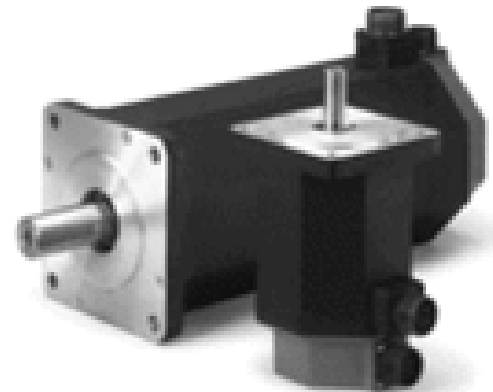
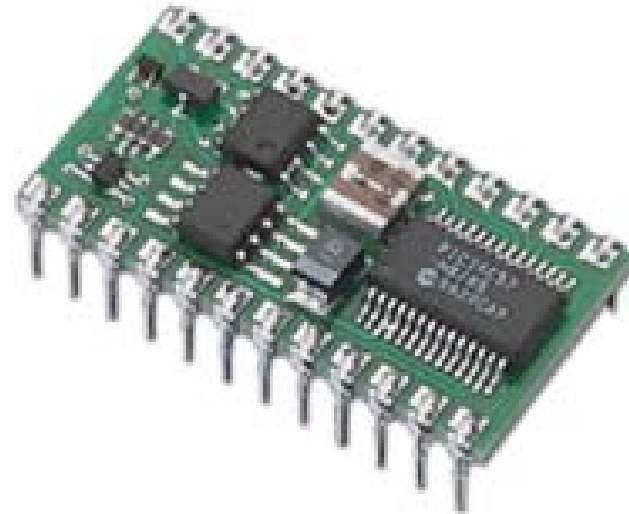Hydraulic Motor

Stepper Motor

Pneumatic Motor

Servo Motor

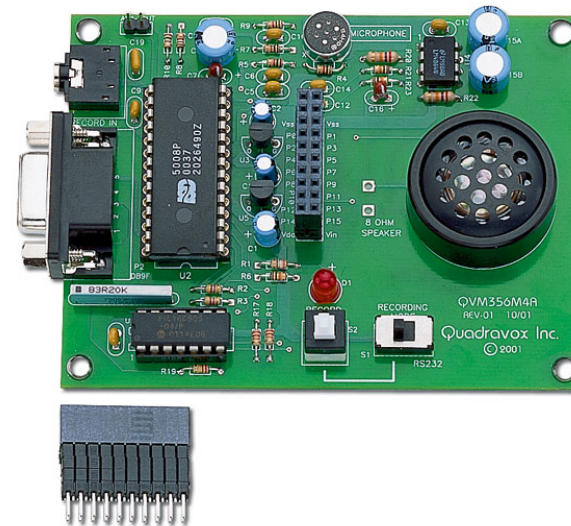# Controller

RoboBoard Robotics Controller

BASIC Stamp 2 Module

The Interface Units

Interfacing with the external world (sensors and actuators)

Analog to Digital Converter

Operational Amplifier

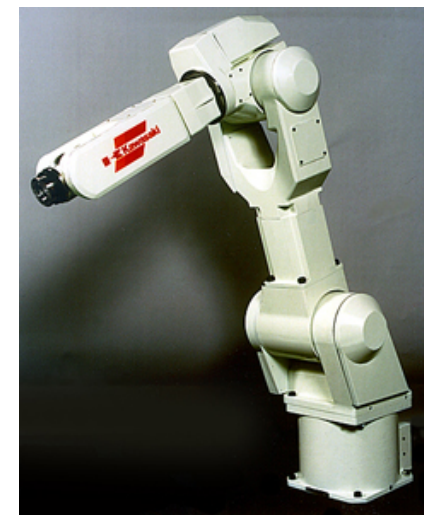# What Can a Robot Do?

- Industrial Robots

  1. Material Handling
  2. Material Transfer
  3. Machine Loading and/or Unloading
  4. Spot Welding
  5. Continuous Arc Welding
  6. Spray Coating
  7. Assembly
  8. Inspection

Material Handling Manipulator

Assembly Manipulator

Spot Welding Manipulator

How to Modify Servo Motor
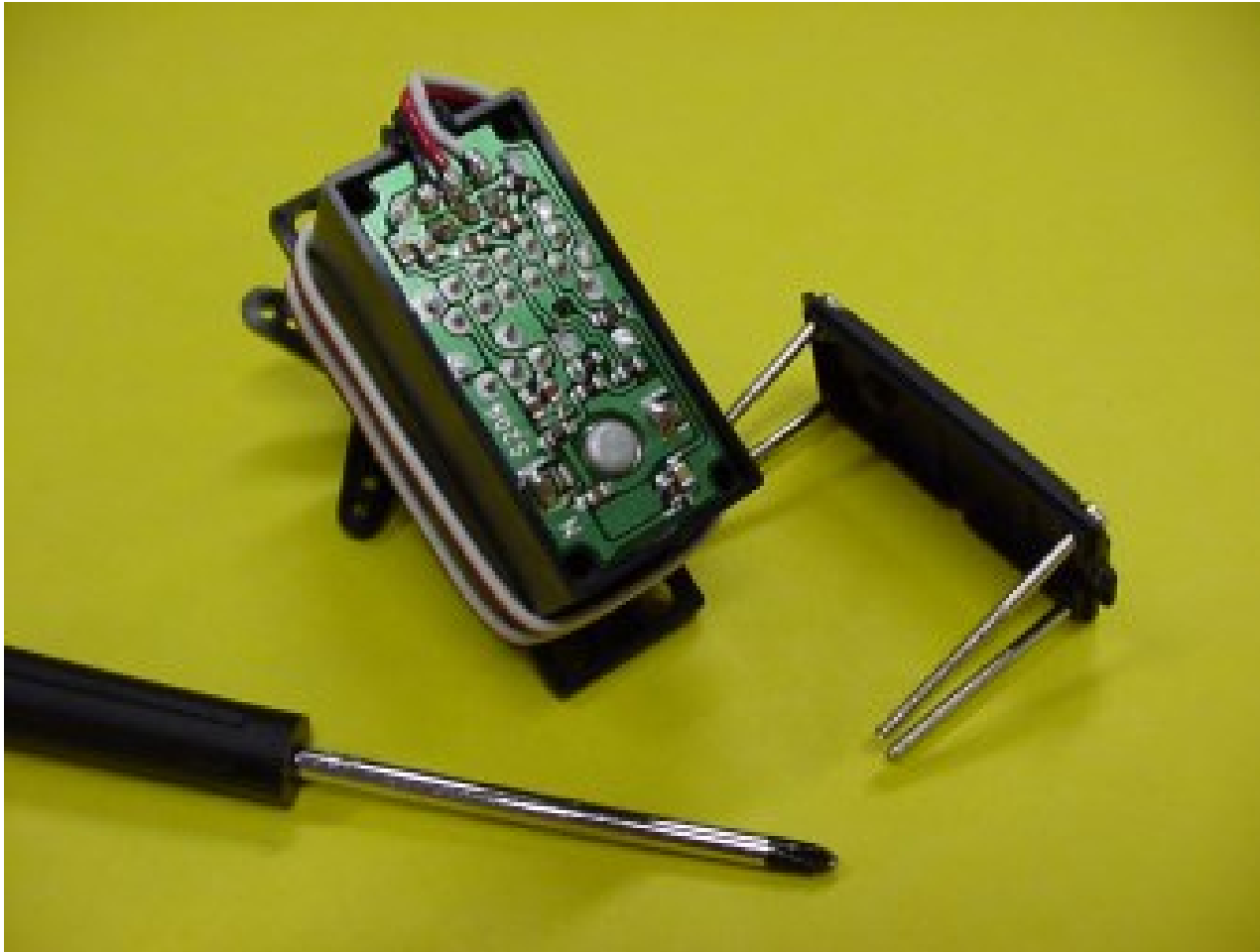
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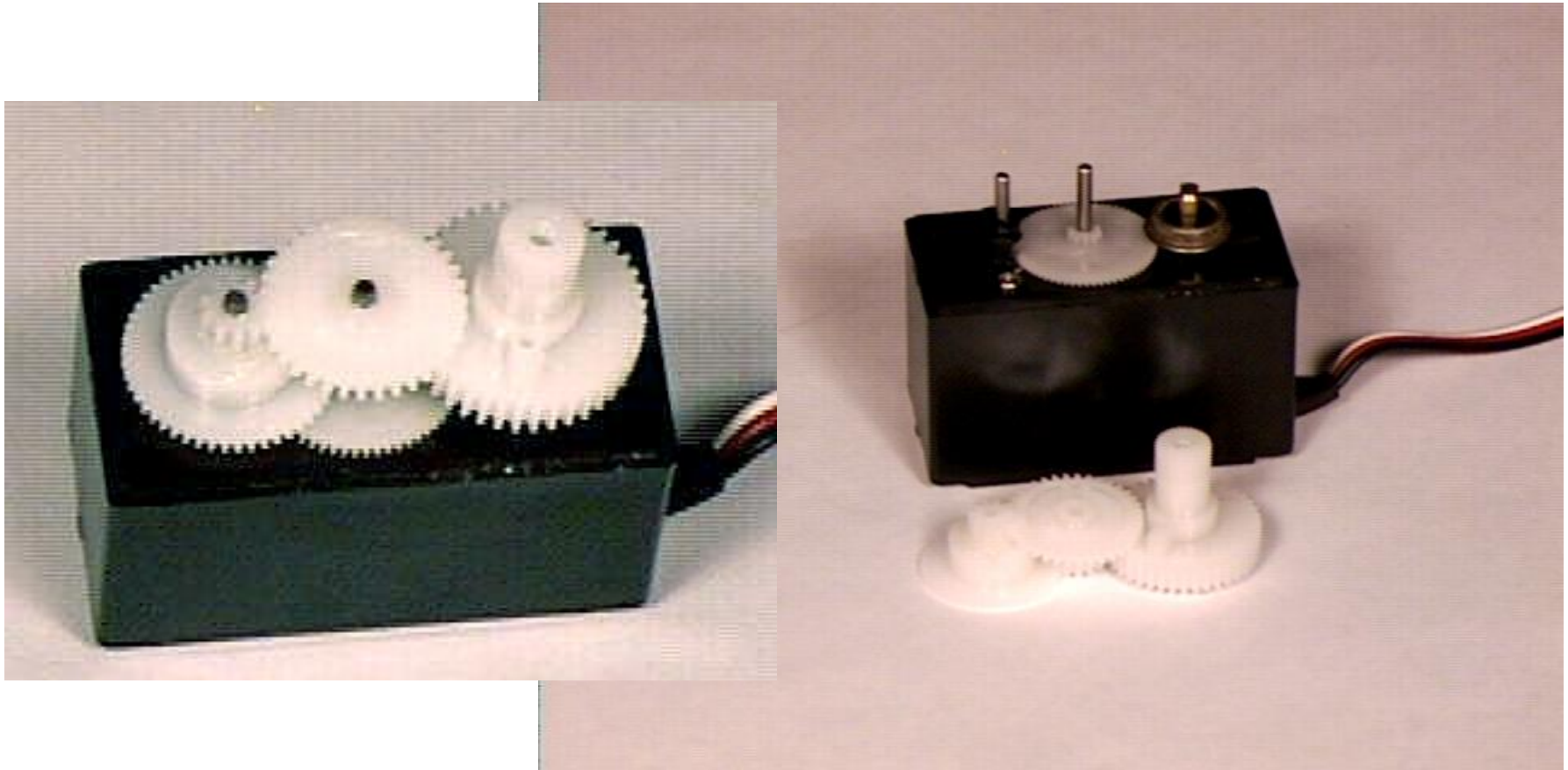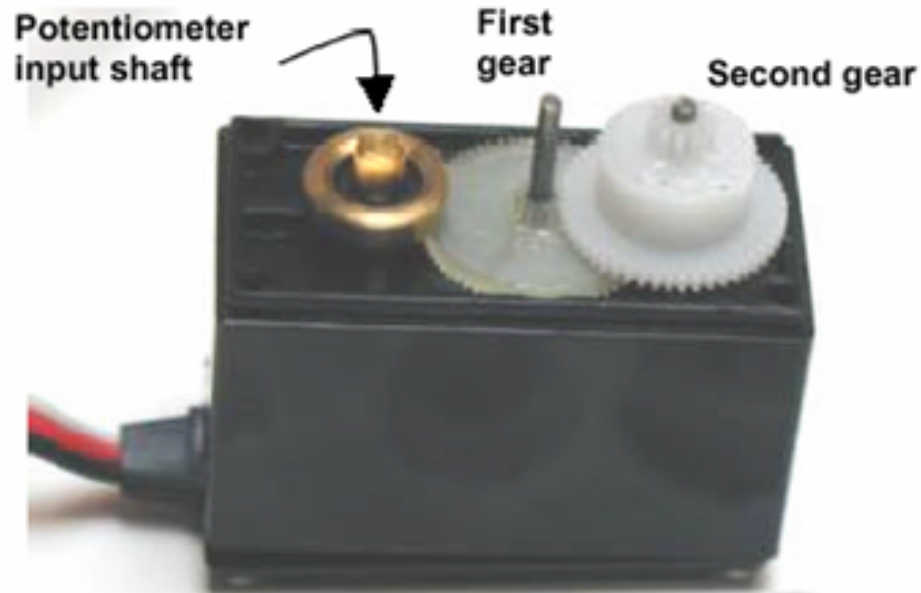NEW YORK UNIVERSITY

Prepare All the Tools

Open Cover

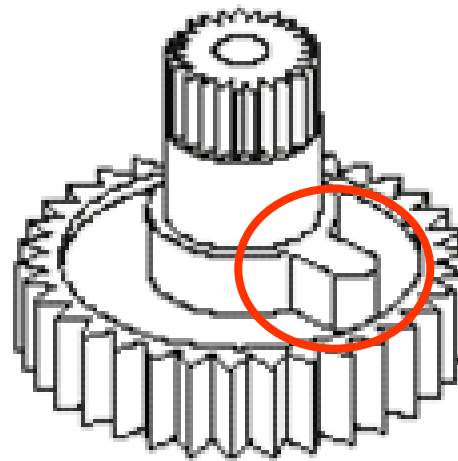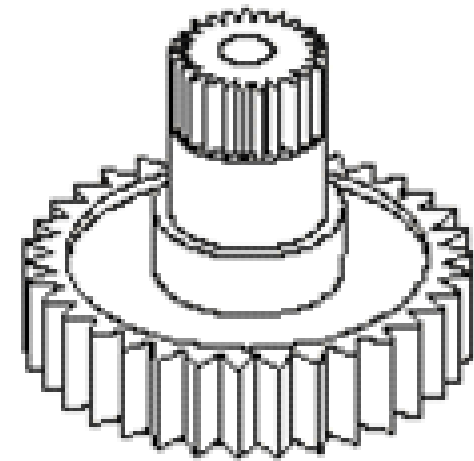# Take All Gears Out

Take Pot Drive Plate Out

Don't forget to remove it

Cut Tab off the Surface of the Gear
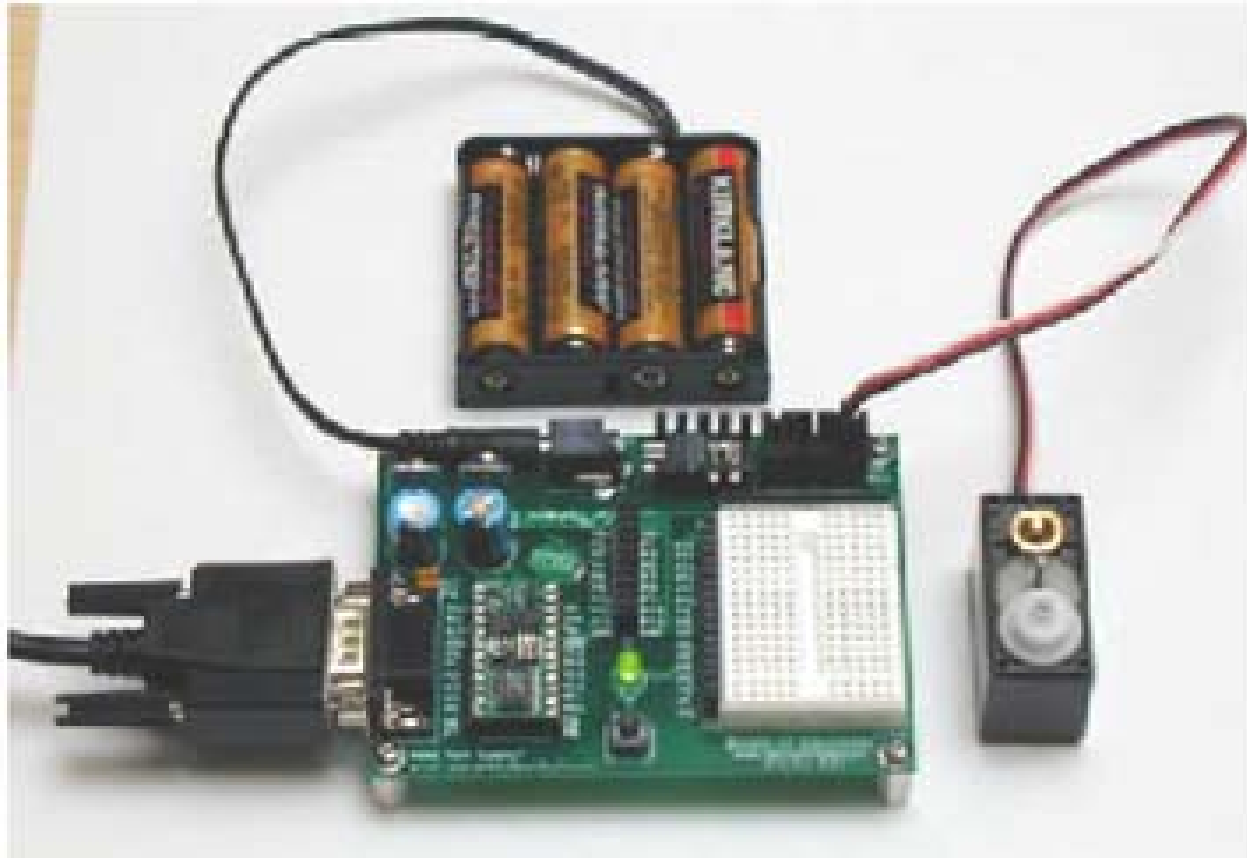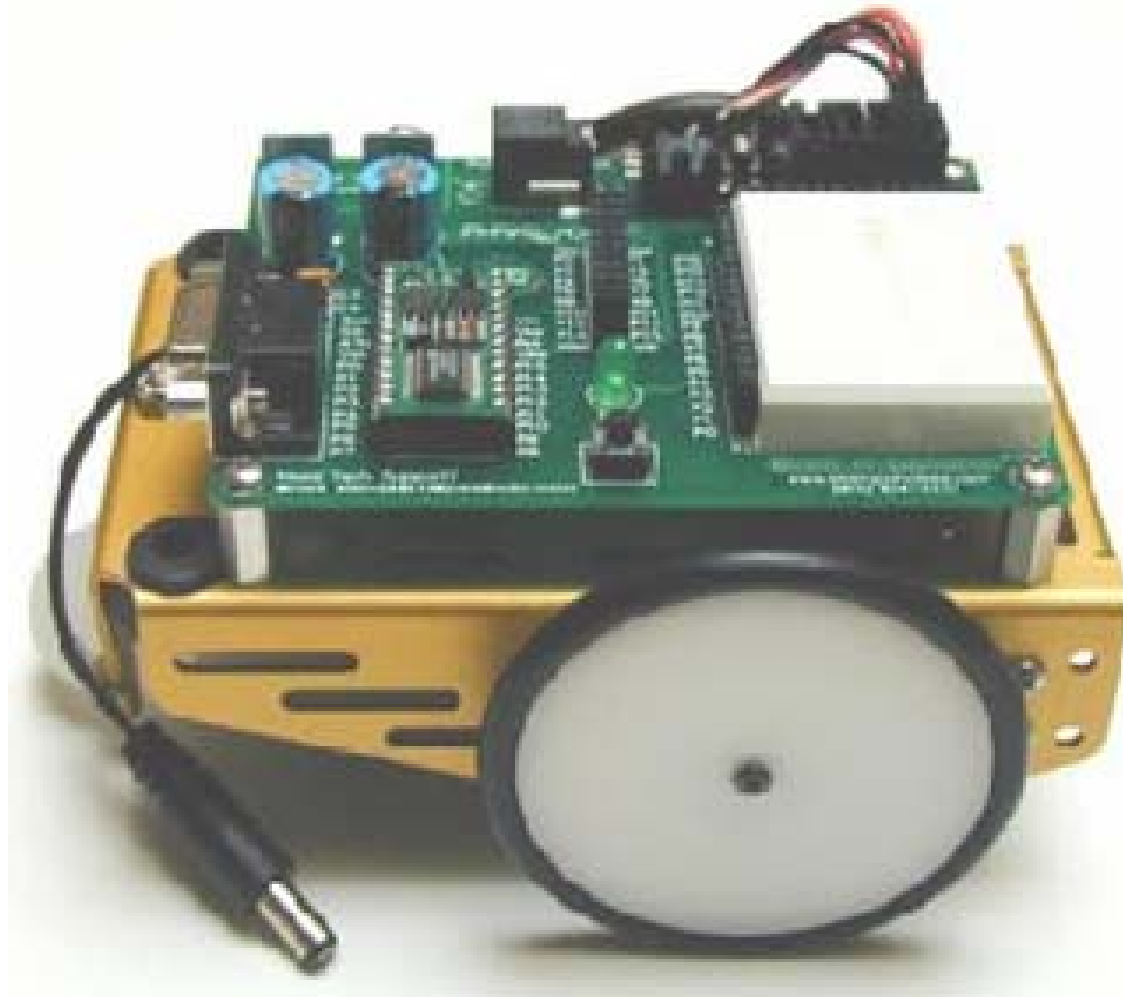

Before

After

Servo Calibration

low 12

loop:
   pulsout 12, 750
   pause 20
goto loop

Fully Assembled Boe-Bot

Robot Experiments

Experiments	Chapters
What's micro controller	
Basic A and D	
Process Control	
Boe Bot Robotics	1, 2, 3, and 4
Smart Sensors	
Others	