

# Stretch Sensor



The Stretch Sensor is a unique sensor that changes resistance when stretched.

Some applications for the Stretch Sensor are:

- \* Robotics
- \* Biometric displacement reading
- \* VR Gloves and VR suits
- \* Physics applications & experiments
- \* Feedback sensor for air muscles



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The Stretch Sensor is a unique polymer component that changes resistance when stretched. An un stretched sensor has a nominal resistance of 1000 ohms per linear inch. As the stretch sensor is stretched the resistance gradually increases. When the sensor is stretched 50 % its resistance will approximately double to 2.0 K-ohms per inch.

The stretch sensor is a new way to measure stretch, displacement and force. The sensor is a flexible cylindrical cord .060-.070 in diameter, with spade or ring electrical terminals at each end. Recommended operating range is 40-50% elongation for repeatable operation.

### **Making Resistive Measurements**

Taking measurements of the stretch sensor uses the same methodology as taking resistive measurements of a variable resistor. The terminal ends of the sensor are connected to a VOM meter set to measure ohms.

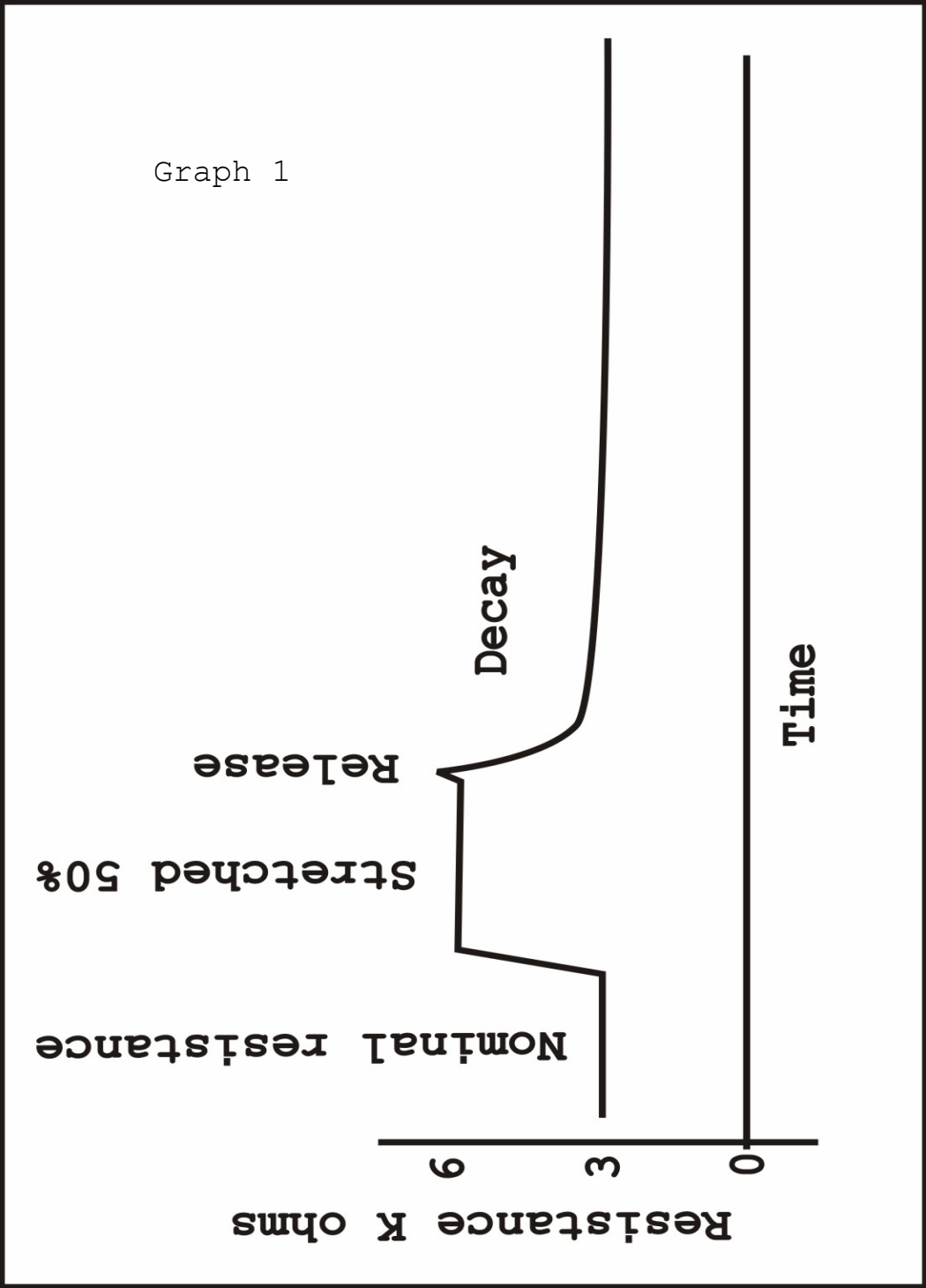
Being a variable resistor one can also employ other methods of measurements such as placing the stretch sensor in a Wheatstone Bridge. The output of the bridge is typically the input of an operational amplifier.

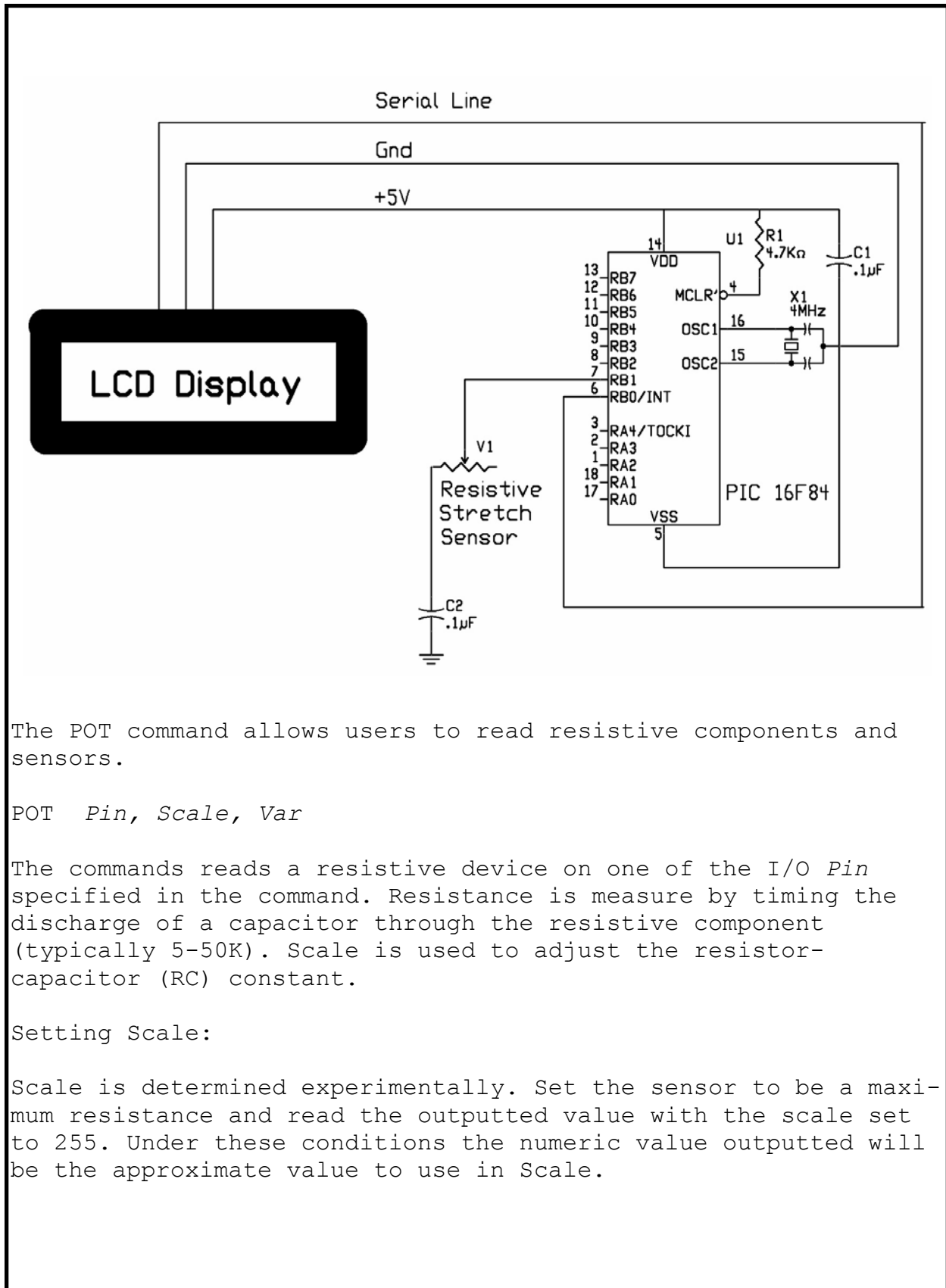
One may use a variety of microcontrollers to read the stretch sensor. The PIC series of microcontrollers from MicroChip will be illustrated.

The stretch sensor has a few resistive artifacts.

When stretched into position and released, the resistance may increase slightly upon release, before decaying to its resting resistive value.

The decay of the resistive value to its resting value take place over time. The initial release will typically bring the resistance value down to approximately +10% of its initial resting valve. Resistive value continues to decay to its nominal resting value, see graph 1.





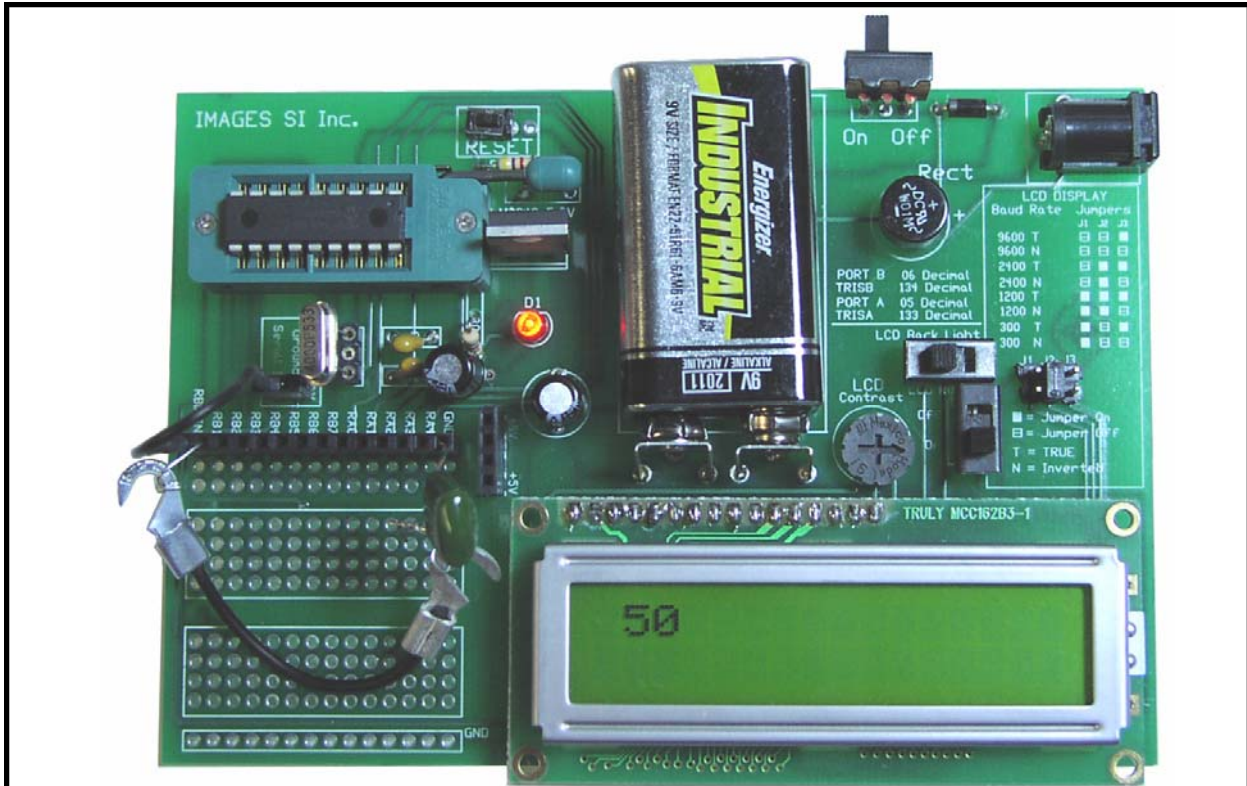
The POT command allows users to read resistive components and sensors.

POT *Pin, Scale, Var*

The commands reads a resistive device on one of the I/O *Pin* specified in the command. Resistance is measure by timing the discharge of a capacitor through the resistive component (typically 5-50K). Scale is used to adjust the resistor-capacitor (RC) constant.

Setting Scale:

Scale is determined experimentally. Set the sensor to be a maximum resistance and read the outputted value with the scale set to 255. Under these conditions the numeric value outputted will be the approximate value to use in Scale.



```
'Stretch Sensor Test for Scale
b VAR BYTE
start:
Pot 1, 255, b           'Read RB1 (read scale)
SerOut 0,4, [254,1]    'Clear LCD screen
Pause 2
SerOut 0,4, [" ",#b]   'Send POT value on Pin RB0
Pause 100              'wait .1 second
GoTo start             'do it again
```

The program above provided a number output of 160, which is used in the next program to provide the best range of values.

```
' Stretch Sensor
B VAR BYTE
start:
Pot 1, 160, b           'Read sensor on pin RB1
SerOut 0,4, [254,1]    'Clear LCD screen
Pause 2
SerOut 0,4, [" ",#b]   'Send POT value on Pin RB0
Pause 100              'wait .1 second
GoTo start             'do it again
```

Program Notes:

The program outputs the data at 2400 Baud - inverted, 8 bits, no parity, one stop bit to the LCD display. The LCD displays a numeric value between 0 and 255 that represents the resistance of the stretch sensor in real time.

Equipment:

PICX Board with LCD Display

16F84 4 MHz

1 stretch sensor

Notes: