

# Data Logging with PIC Microcontrollers

A dark world map is centered in the background. Overlaid on the map are several circular icons: a large one on the left with a diagonal arrow pointing up and right, and three smaller ones on the right with vertical arrows pointing up. The bottom of the slide features a glowing orange and yellow gradient that curves across the width of the page.

Robert Joseph Korn

RJK@OVCCORP.COM

Director of Operations and Infrastructure  
Pratt Institute

Sole Proprietor  
Open Valley Consulting Corp

# Data Logging with PIC Microcontrollers

## Topics:

- PIC Microcontroller A/D
- Dallas One Wire Digital Temperature Sensors
- LAMP Server – Linux Apache Mysql PHP
- LCD Smartie PC Based LCD Display Driver
- Pachube Data Logger Service
- Flash Animations for Display of Data
- Iphone / Ipad Serial Tricks

# Data Logging with PIC Microcontrollers

## PIC Microcontrollers:

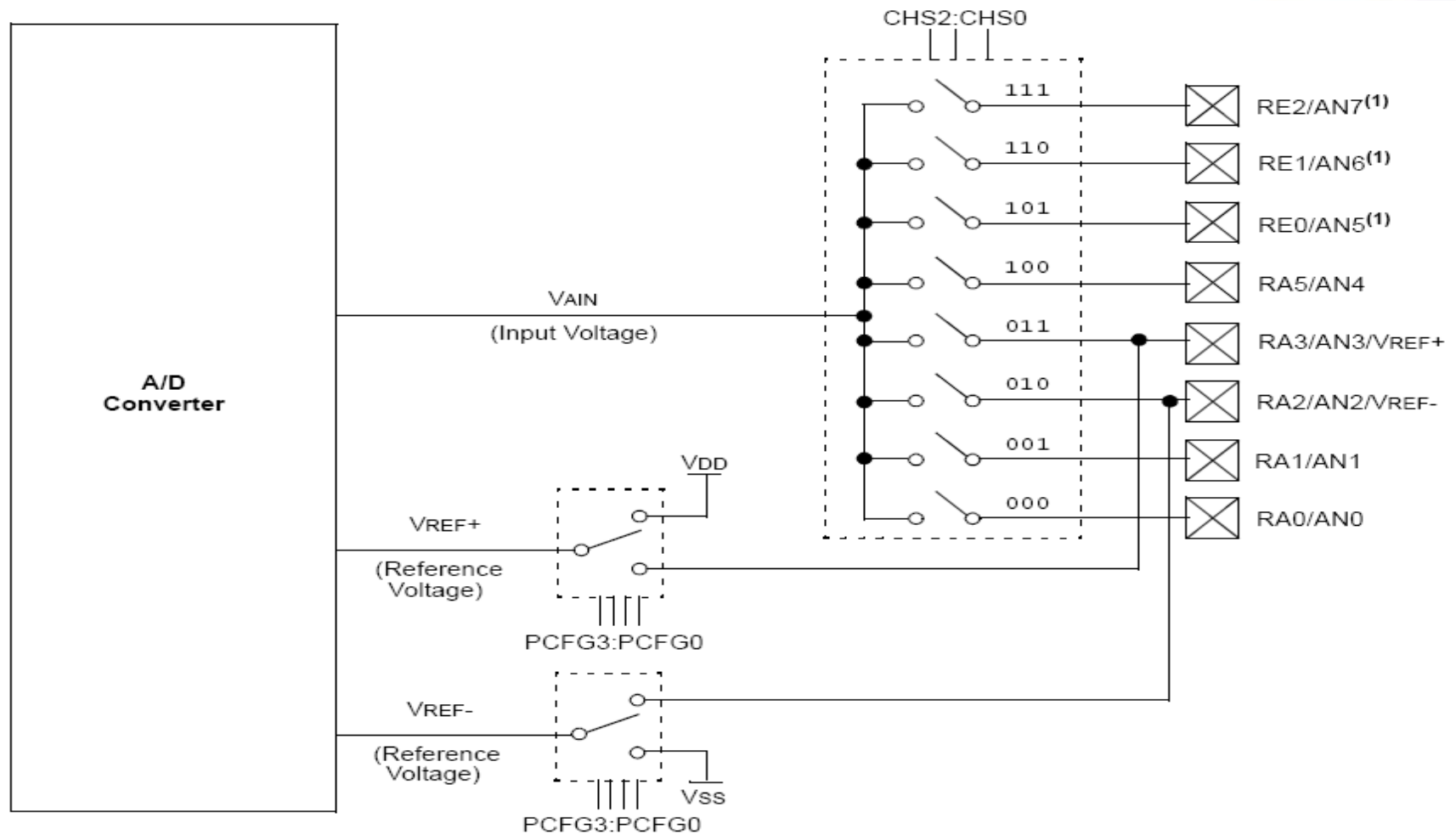
- 16F73 – 8bit ADC – Hardware USART
- 16F876 – 10bit ADC – Hardware USART
- 18F2553 – 12bit ADC – Hardware USART & USB

## Tools:

- Melabs PicBasic Pro
- Microchip PicKit 2 Programmer
- Commonly Available USB Interfaces

# Data Logging with PIC Microcontrollers

## 16F87X ADC



# Data Logging with PIC Microcontrollers

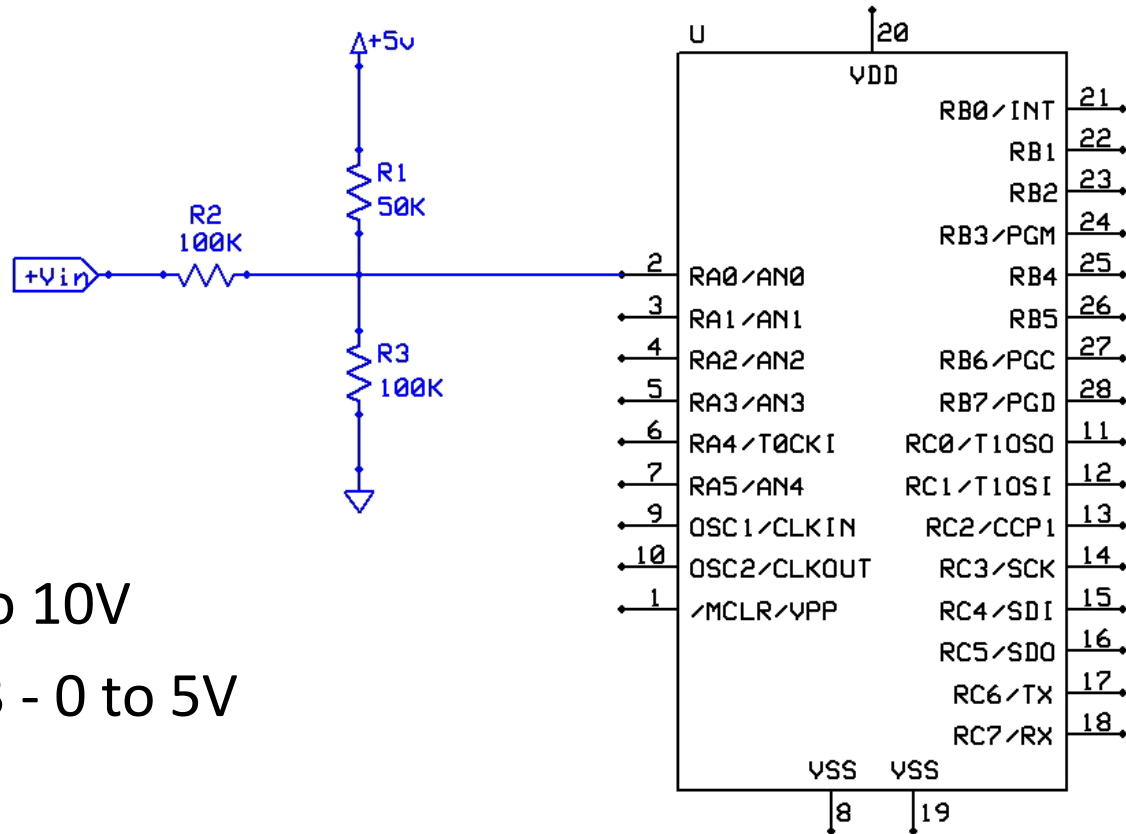
## A/D Converter: Range

Minimum and maximum voltage levels that the A/D converter can quantize

0-5V input can be scaled to -10V to +10V using a couple of resistors and a single +5Vref

# Data Logging with PIC Microcontrollers

## A/D Converter: Range



Input Range:

-10V to +10V

Delete R1 - 0 to 10V

Delete R1 & R3 - 0 to 5V

# Data Logging with PIC Microcontrollers

## A/D Converter: Sample Rate

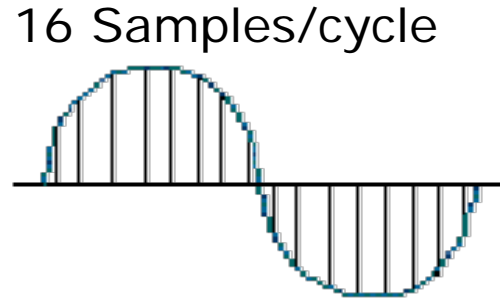
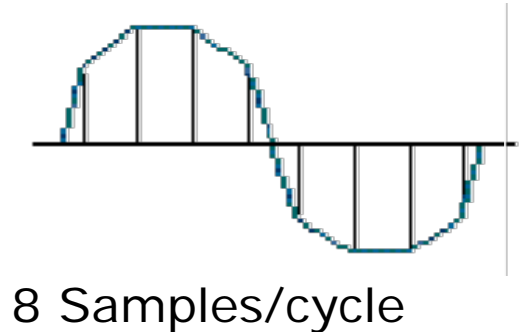
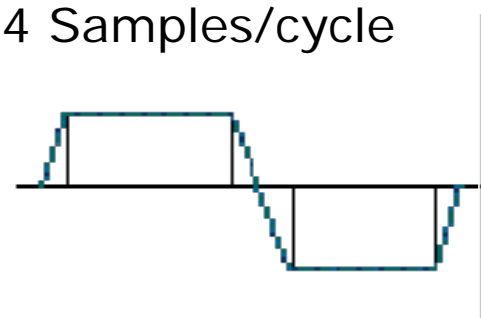
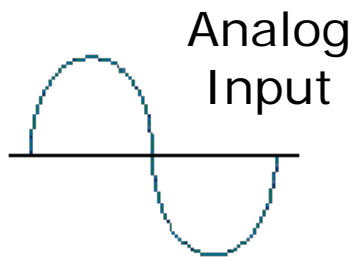
- Generally using a higher sample rate will yield better results. The reason one would use a lower sampling rate is because the amount of total samples that can be taken is limited, the processing power required to handle the data is limited, or the extra precision obtained by the high sampling rate is unnecessary.

# Data Logging with PIC Microcontrollers



One of the factors to consider in converting analog signals to digital is the sampling rate. The sampling rate determines how often conversions take place

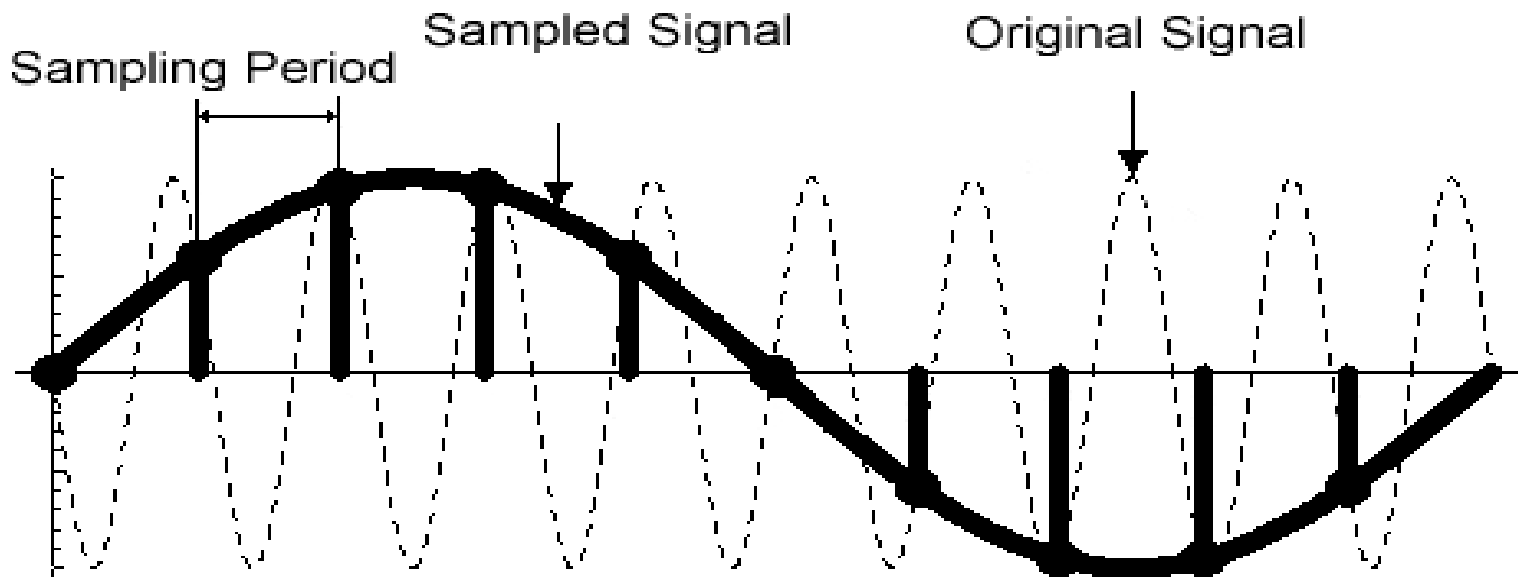
This example shows three different sampling rates for an analog input signal. The 16 samples per cycle digitized signal looks closer to the original analog input than the 4 samples per cycle signal.





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- A problem with using too low of a sampling rate is that aliasing might occur. Aliasing is when the acquired signal gets distorted by a sampling rate that is too small. In this example, the original signal is sampled so slowly that the sampled signal looks like a completely different frequency than the original signal.



# Data Logging with PIC Microcontrollers

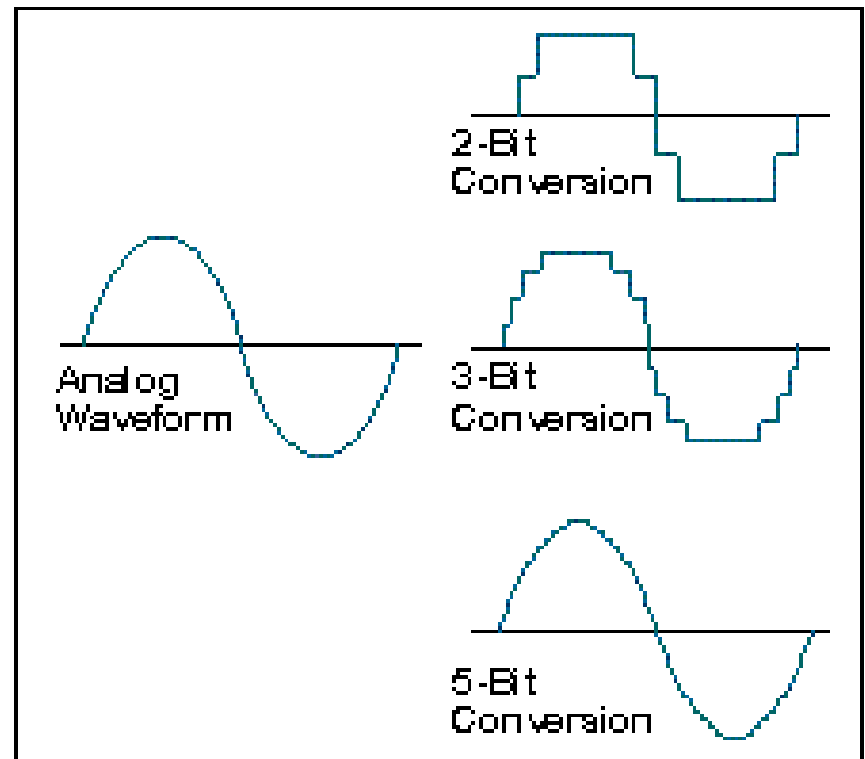


## A/D Converter: Resolution

The resolution of a converted signal is the number of bits that are used to store each sample of data.

For example, a 8 bit resolution will allow 8 to the 2nd power number of values for the data, meaning that the data can take 256 possible values.

The higher the resolution, the closer the digitized signal will resemble the original analog waveform.



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## USB Interfaces

DKU-5

Made for Nokia Phones

3.3V ARK USB based Chipset Preferred

Available for \$3 - \$7 on Ebay



USB MIDI

Apple Supported Iphone / Ipad interface

Available for \$5 - \$9 on Ebay



# Data Logging with PIC Microcontrollers

## Dallas One Wire Sensors

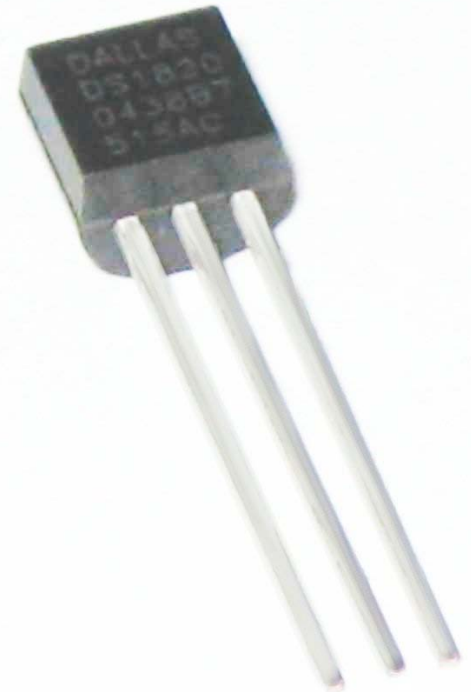
DS1820B

TO-92 Package

Digital Output

Great noise Immunity

Long Cable Runs



# Data Logging with PIC Microcontrollers

## PicBasic Pro Source

```
temperature    VAR    WORD    ' Temperature storage
count_remain   VAR    BYTE    ' Count remaining
count_per_c    VAR    BYTE    ' Count per degree C
DQ             VAR    PORTC.0  ' One-wire data pin
mainloop:
    OWOUT DQ, 1, [$CC, $44]    ' Start temperature conversion
    pause 2000

    OWOUT DQ, 1, [$CC, $BE]    ' Read the temperature
    OWIN DQ, 0, [temperature.LOWBYTE, temperature.HIGHBYTE]

    ' Calculate temperature in degrees C to 2 decimal places
    ' (not valid for negative temperature)
    temperature = temperature */ 1600
    SEROUT DEC (temperature / 100), ".", DEC2 temperature, " C "
GoTo mainloop    ' Do it forever
```

# Data Logging with PIC Microcontrollers

## LAMP Server

**LAMP** is an acronym coined from the first letters of [Linux](#) , [Apache HTTP Server](#), [MySQL](#) and [Perl/PHP/Python](#). These are the principal components used to build a viable general purpose web server

Though the original authors of these programs did not design them all to work specifically with each other, the development philosophy and tool sets are shared and were developed in close conjunction. The software combination has become popular because it is free of cost, open-source, and therefore easily adaptable.

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## LCD Smartie

LCD Smartie is software for Windows that you can use to show lots of different types of information on an LCD/VFD.

It can display: Everest stats, Speedfan stats, MBM stats (your CPU temp, fan/cooler speed, etc), BBC World News (or any other RSS feed!), WinAmp stats (currently playing tracks title, length, position, etc), Network stats (speed, total bytes, etc), CPU Speed, Disk available/free, memory usage, Email details, game stats, and many more...

With a little help from a Serial to Network Proxy it can be used to drive remote display over the internet too.

# Data Logging with PIC Microcontrollers

## Pachube

Pronounced "Patch Bay"

[Pachube](#) is a realtime data infrastructure platform for the [Internet of Things](#), managing millions of datapoints per day from thousands of individuals, organisations & companies around the world.

Apart from enabling direct connections between any two devices, objects or environments, it can also be used cross-domain and cross-industry, to facilitate many-to-many connections: just like a physical "patch bay" (or telephone switchboard) Pachube enables things to "plug-in" to other things in real time so that, for example, buildings, weather stations, interactive environments, air quality monitors, networked energy monitors, virtual worlds and mobile sensor devices can all "talk" and "respond" to each other in realtime



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## Flash

### Dark Artistry – Open Flash Gauges

<http://www.darkartistry.com/content/view/129/48/>

- Open Source Flash meters, gauges, and gadgets for live dashboard web applications! Use your favorite Javascript toolkit or roll your own. Update live using Ajax or by form, whatever. Current examples use Mootools 3 Ajax and Json to update and are included in the download - simply unzip to the root of your test server and load index.html. Objects included, temperature gauge, resource meter, pos/neg meter, dual needle gauge, in/out gauges (shown above), and more. View the live examples page for a complete list.
- Tested platforms Linux, Windows XP/2003, OS X 10.4
- Tested Browsers Firefox, Flock, IE7, Safari (OS X), Opera
- Requirements : Only one, you need a web server like IIS or Apache for these to work.

# Data Logging with PIC Microcontrollers

## Iphone / Ipad Serial

- Midi USB adapter
- Camera connection adapter kit
- 31250 Baud Serial
- Optically Isolated Interface
- Easy to interface to a PIC
- Fully Supported by Apple

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## Questions?



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# Thank You!



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