Parallel Port (Printer Port)

http://en.wikipedia.org/wiki/Parallel_port

$$

2 MB/s (max)

Serial Port

http://en.wikipedia.org/wiki/Serial_port

$

115200 bits/s
~ 14 kB/s

GPIB
(General Purpose Interface Bus, or IEEE-488)

http://en.wikipedia.org/wiki/File:Digitaloszilloskop_Schnittstellen_IMGP1974_WP.jpg

http://en.wikipedia.org/wiki/IEEE-488

$$$$

8 MB/s

USB (Universal Serial Bus)

$
Cheap
Fast
Ubiquitous

USB 2.0: 480 Mbit/s
60 MByte/s

Converters available to older interfaces

Active converter

(contains microchip and is power by the bus)

Communication over the serial port often uses SCPI

SCPI: Standard Commands for Programmable Instruments (SCPI)

Example Commands for the Thor Labs PM100

Command	Description
*IDN?	Identification query. (IEEE488.2-1992-§10.14)
*TST?	Self test query. (IEEE488.2-1992-§10.38)
*OPC	Operation complete command. (IEEE488.2-1992-§10.18)
*OPC?	Operation complete query. (IEEE488.2-1992-§10.19)
*WAI	Wait command. (IEEE488.2-1992-§10.39)
*RST	Reset command. (IEEE488.2-1992-§10.32)
*SRE	Service Request Enable command. (IEEE488.2-1992-§10.34)
*SRE?	Service Request Enable query. (IEEE488.2-1992-§10.35)
*STB?	Read Status Byte query. (IEEE488.2-1992-§10.36)
*ESE	Standard Event Status Enable command. (IEEE488.2-1992-§10.10)
*ESE?	Standard Event Status Enable query. (IEEE488.2-1992-§10.11)
*ESR?	Standard Event Status Register query. (IEEE488.2-1992-§10.12)
*CLS	Clear Status command. (IEEE488.2-1992-§10.3)

Communication over the serial port is easy to do in MATLAB

```
s1 = serial('COM3','BaudRate',115200,'Parity','none','DataBits',8,'StopBits',1,'Terminator',{'CR/LF','LF'},'FlowControl','Hardware')
fopen(s1)

% To query the device.
fprintf(s1, '*IDN?')
[out]=fscanf(s1)

fclose(s1)
```
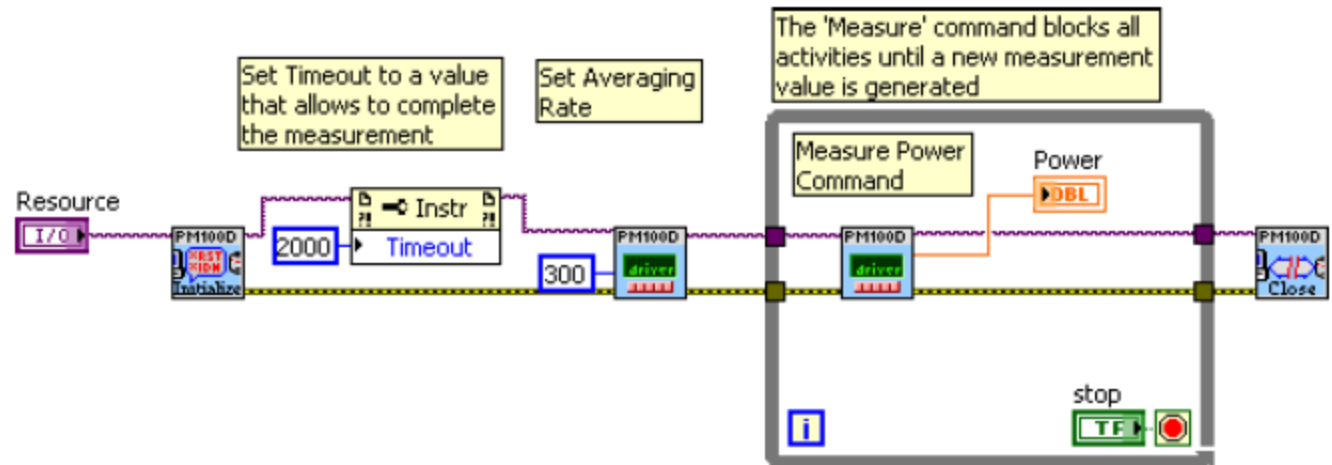
See PowerMeterExample.m

How do we talk to the new USB power meter?

Easiest: LabView

The new power meter uses VISA, and this is very common for USB instumentation.

VISA: Virtual Instrument Software Architecture

VISA is a communication protocol that supports GPIB,
RS-232, USB, Ethernet, PXI, and PCI.

MATLAB supports VISA through the instrument control toolbox.

You can use VISA functions in C-language codes

```
.
.
#include "visa.h"
.
.
status=viOpenDefaultRM (&defaultRM);
status = viOpen (defaultRM, "ASRL1::INSTR", VI_NULL, VI_NULL, &instr);
.
.
strcpy (stringinput,"*IDN?\n");
status = viWrite (instr, (ViBuf)stringinput, (ViUInt32)strlen(stringinput), &writeCount);
status = viRead (instr, buffer, 100, &retCount);
.
.
```

What if you have done all that programming work and now you want to use a different XXX (oscilloscope, etc) ?

IVI to the rescue:

Interchangeable Virtual Instrument Foundation

> *"The IVI Foundation is an open consortium founded to promote specifications for programming test instruments that simplify interchangeability, provide better performance, and reduce the cost of program development and maintenance."*

Class	IVI Driver
Digital multimeter (DMM)	IviDmm
Oscilloscope	IviScope
Arbitrary waveform/function generator	IviFgen
DC power supply	IviDCPwr
AC power supply	IviACPwr
Switch	IviSwtch
Power meter	IviPwrMeter
Spectrum analyzer	IviSpecAn
RF signal generator	IviRFSigGen
Upconverter	IviUpconverter
Downconverter	IviDownconverter
Digitizer	IviDigitizer
Counter/timer	IviCounter

IVI is a layer above VISA and standardizes communication for specific types of instrumentation

http://www.ivifoundation.org/