Fruit Removal Force (FRF, Pull Force): Why and How to Measure It

Researchers:

- Effects of PGRs (plant growth regulators) or nutrition on fruit quality
- Effects of chemical loosening agents for mechanical harvest
- Compare application methods for abscission agents and efficacy of fruit/nut/vegetable removal
- Selection of cultivars for breeding by tendency to loosen readily
- Abscission responses, including effects of PGRs, stresses, other factors on preharvest drop

Growers, PCAs, processors:

- Same as above!
- Plan your harvest by Brix, firmness, and FRF
- Track changes in your fruit's tendency to drop by your own management practices
- The same instrument that tests FRF can also be used to test firmness of many fruits
- **Why spend $$$ per acre on chemical applications without understanding the impact on your fruit? Spending a little on simple technology may save you $$$ in the long run**

Kitren Glozer
Associate Project Scientist
Dept. of Plant Sciences
University of California, Davis
July 2008

UC DAVIS
UNIVERSITY OF CALIFORNIA

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PLANT SCIENCES

Contents

Look for $ symbol – attention to additional value for hardware and software presented in this guide to use in other ways

ACKNOWLEDGEMENTS

Preparation of this guide was made possible with the aid of the following…

Technical support by:

Imada.com

Itinscales.com

TalTech.com

How to Measure FRF, a Guide using:

- **an Imada Digital Gauge (DS2- model number depends on force range to be measured)**
- **data acquisition software**
- **a Data Acquisition System (data button & RS232 serial cables)**

This guide is not designed to suggest an Imada gauge is the only option. Other digital force gauges can be found online, for example, at http://www.force-gauge.net/digital_force_gauges.htm

What You Need to Get Started

Essentials:

- **Imada DS2 digital gauge**
  (model DS2-11 measures up to 11 lb, DS2-44 up to 44 lb, range of weights available)

  Mechanical gauges are also available, cheaper, but don't automate data entry

- An attachment to hold the fruit or the stem – type depends on fruit size, stem length, and ease of use

---

Optionals: to automate the job, and make it more accurate; purchase from Imada, Inc. or their licensed distributers

- PC with serial port (or USB with additional serial port adapter)

- SW-1 software configured for the gauge, running with WinWedge software

RS-232C Cable CB-203
10' length connects force gauge to computer (9pin)

- DB-1 data entry button

- DB9 serial cable to run from button to PC, comes with button

Online Vendors for Equipment & Prices (current as of July, 2008)

- Imada
- Checkline
- Itinscales
- Scalesgalore
- Valuescale
- Prices typically identical among sites

NOTE THAT THE SW1-XV SOFTWARE IS NOW THE DEFAULT, REGARDLESS OF WHAT ELSE YOU MAY SEE! It includes WinWedge and runs on all versions of Windows, including Vista.

Quantity: 1 DS2-11 - $595 Add to Cart

Optional OH-1 Handle, Add $85

Optional SW-1 Data Acquisition Software, Add $199

Optional SW1-XV Data Acquisition Software for Windows Vista / XP , Add $249

Optional DB-1 Data Button, Add $145

Click on the DB-1 Data button link to order the CB-203 cable

Quantity: 1 DB-1 - $145 Add to Cart

SW-1 Data Acquisition Software, Add $199

Imada CB-203 (RS-232) Cable, Add $75

The Gauge

- Select model based on range of fruit removal force: (11 lb works for stone fruit; higher force may be required for pome fruits)
- Can be used for compression (firmness) measurements also. A test stand with distance meter makes this more accurate (see vendors for more info)
- Measures in lb, kg, or Newtons

Easy-to-use digital gauge with large easy-to-read display

- Simple operation, easy-to-use, accurate
- Large easy-to-read LCD display
- Ergonomic, durable, heavy-duty metal construction
- Push-button selectable lbf, kgf, and Newton units
- RS-232C, Digimatic and analog outputs
- Programmable High/Low setpoints with LCD indicators
- Overload capacity 200% F.S.
- Overload alarm, display flashes at overload limit
- Low battery icon
- Runs on internal NI-MH batteries or AC adapter
- Selectable real time or peak mode operation
- Push-button tare function n Reversible display
- Set of six attachments, AC charger/adapter and carrying case

PRICING DELIVERY SUPPORT

Easy-to-Use

Dimensions | Data Acquisition

DS2 Specifications	
Accuracy	± 0.2% F.S., ± 1 LSD
Selectable Units	lbf(ozf), kgf(gf) or Newtons
Overload Capacity	200% of F.S. (Overload indicator flashes beyond 110% of F.S.)
Data processing speed	1,000 data/second (30 data/second rate selectable)
Display Update	10 times/second
Power	Rechargeable Ni-MH battery pack or AC adapter
Battery Indicator	Display flashes battery icon when battery is low
CPU	8-bit CMOS
Setpoints	Programmable high/low setpoints with LCD indicators
Outputs	RS-232C, Digimatic and ±1 VDC analog output
Operating Temp.	32° to 100°F (0° to 40°C)

- **Force Ranges**

Model	Capacity	Resolution
DS2-0.4	7.00 oz 200 g 2.000 N	0.01 oz 0.1 g 0.001 N
DS2-1	18.00 oz 500 g 5.000 N	0.01 oz 0.1 g 0.001 N
DS2-4	4.400 lb 2.000 KG 20.00 N	0.001 lb 0.001 Kg 0.01 N
DS2-11	11.00 lb 5.000 Kg 50.00 N	0.01 lb 0.001 kg 0.01 N
DS2-44	44.00 lb 20.00 Kg 200.0 N	0.01 lb 0.01 kg 0.1 N
DS2-110	110.0 lb 50.00 Kg 500.0 N	0.1 lb 0.01 kg 0.1 N
DS2-220	220.0 lb 100.0 Kg 1000 N	0.1 lb 0.1 kg 1 N

Support for the Imada hardware

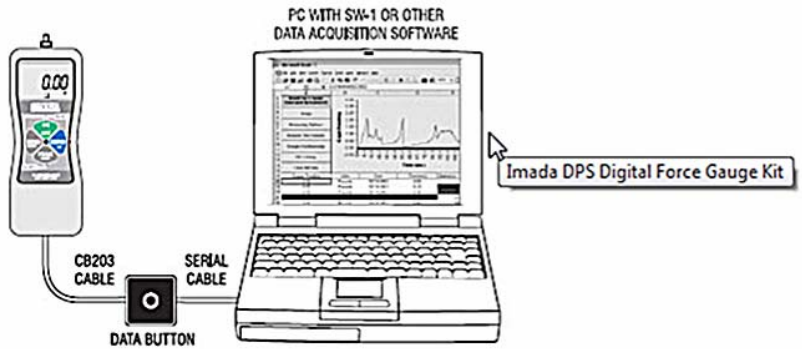
User manual for the DS2 Gauge comes with gauge and is also available by download from

www.itinscales.com/**imada_ds2**_force_gauge.htm

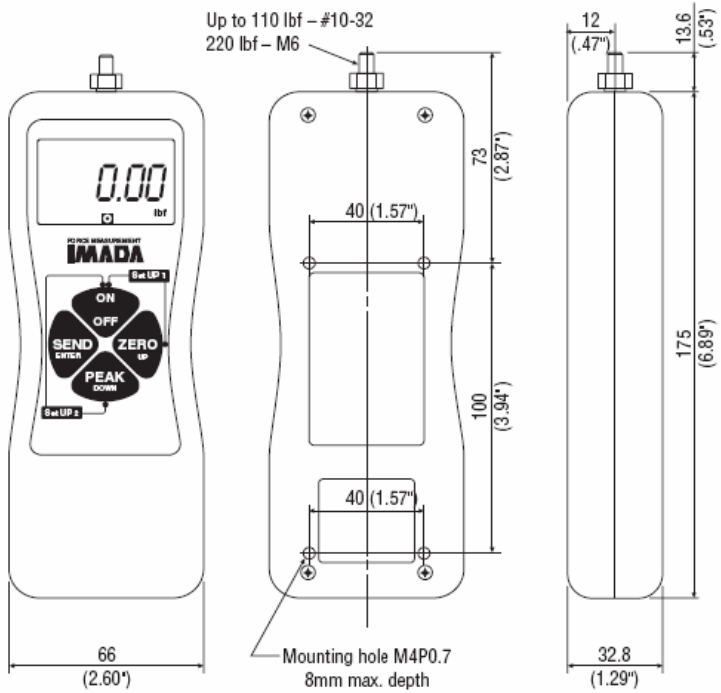
www.checkline.com/products/126098/ds2-manual-1.pdf

Gauge specs in pdf file from http://www.forcegauge.net/catalog/products/specification/ds2-e.pdf

Includes physical dimensions and mounting holes for attaching to a mount, whether Imada mount or other



Click here for Imada DS2 User's Manual
(requires Adobe PDF)



Data Acquisition Hardware:

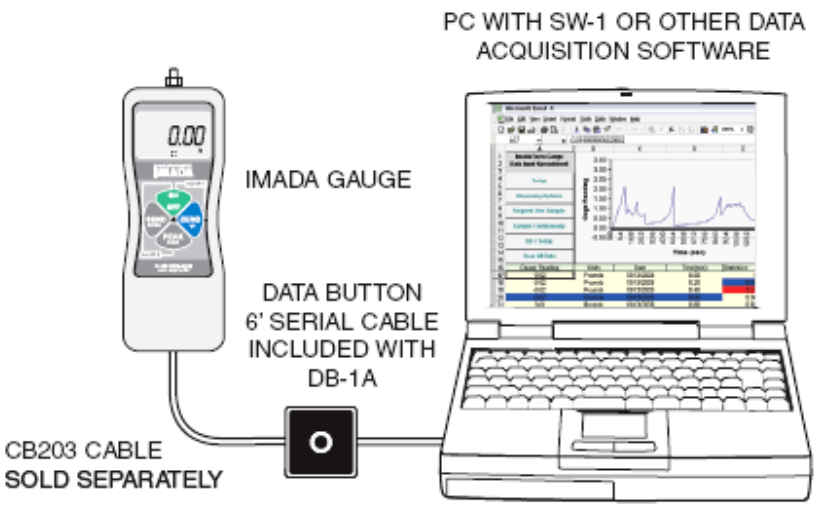
DB-1 DATA BUTTON –collects either force or tension data (if you want to use a motorized test stand with distance measurement, you will need the DB-2X to collect 2 measurements simultaneously). ***The DB-1 data button manual is here***

Author's note: You can also send the data directly to a PC using just the CB203 cable without the button and the 'Send' button on the face of the gauge, but then you have to manually zero each reading after 'Send'.

* For faster than 1 data/sec. automatic data acquisition, use DB-1A data input button sold separately.

CB-203 cable (9 pin) or CB-204 cable (25 pin) (sold separately)

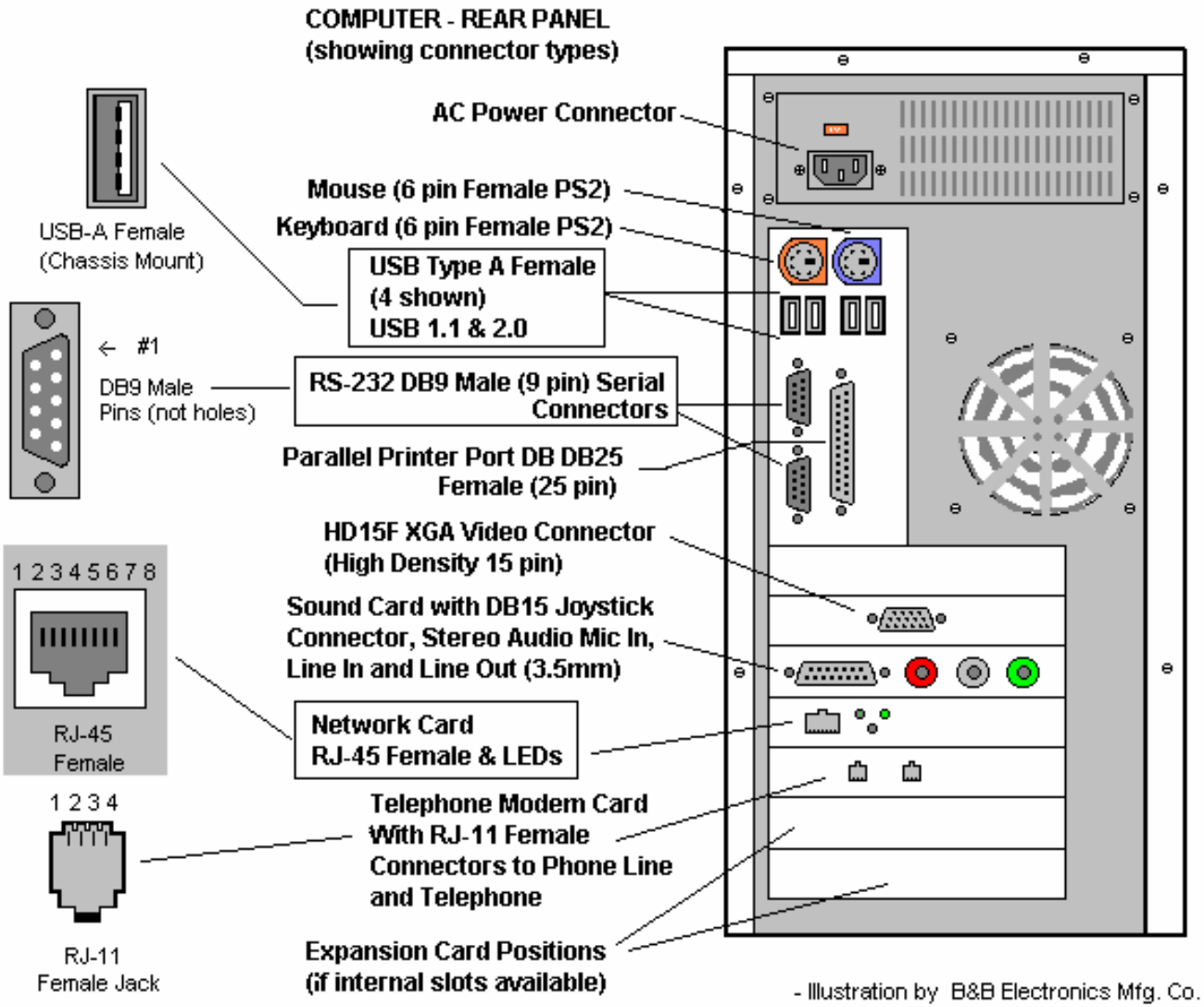
6' serial cable included with DB-1A



- Standard **RS232C cable** for sending data to a serial port (comes with the button)

Types of ports on a PC (this shows a desktop; some of these ports may not be found on a particular laptop)

Connector Types (Rear Panel) Desktop - Illustration



Your laptop doesn’t have a serial (COM) port?

- If your computer doesn’t have a serial port, you will need a USB to male DB9 Serial RS232 adapter cable
- Manufacturers include Belkin, Sabrant and Startech, and prices are typically $15 to $35 for the cable and driver. Purchase online (CompUSA, B&B Electronics, for instance) or at retail electronics stores such as Fry’s.
- If you plug the cable into a USB port, you may have to test whether the USB port is Com 1, 2, 3, or 4 when you start the gauge and the software (instructions in the manual and in ‘Troubleshooting’ section at the end of this guide).

Attachments

- **Standard attachments**

Low Capacity Attachments	
Small Hook A-1, S-1, SH-1	
Flat Tip A-2, S-2, SH-2	
Conical Tip A-3, S-3, SH-3	
Chisel Tip A-4, S-4 , SH-4	
Notched Tip A-5, S-5, SH-5	

Extension Shaft A-6, S-6, SH-6	
Large Hook A-7, S-7, SH-7 (PS & Z2 ONLY)	
Y-Hook A-8, S-8, SH-8 (PS & Z2 ONLY)	

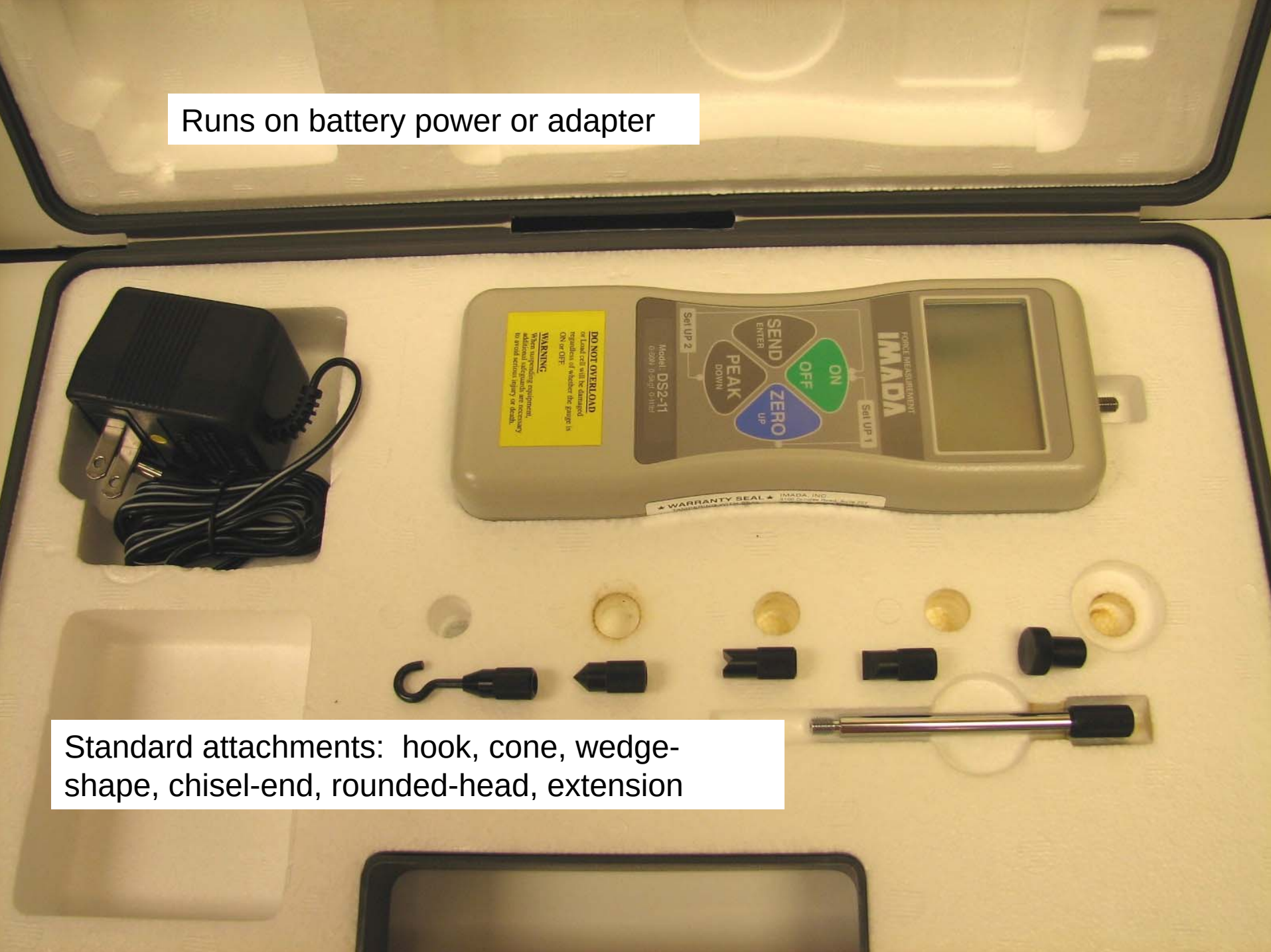
Y-Hook can work well with a homemade modification, for fruits like olives, cherries or grapes

- **Special attachments**

The **Wedge Grip** holds thin long stems, however, you may find other attachments or self-made modifications to work for you.

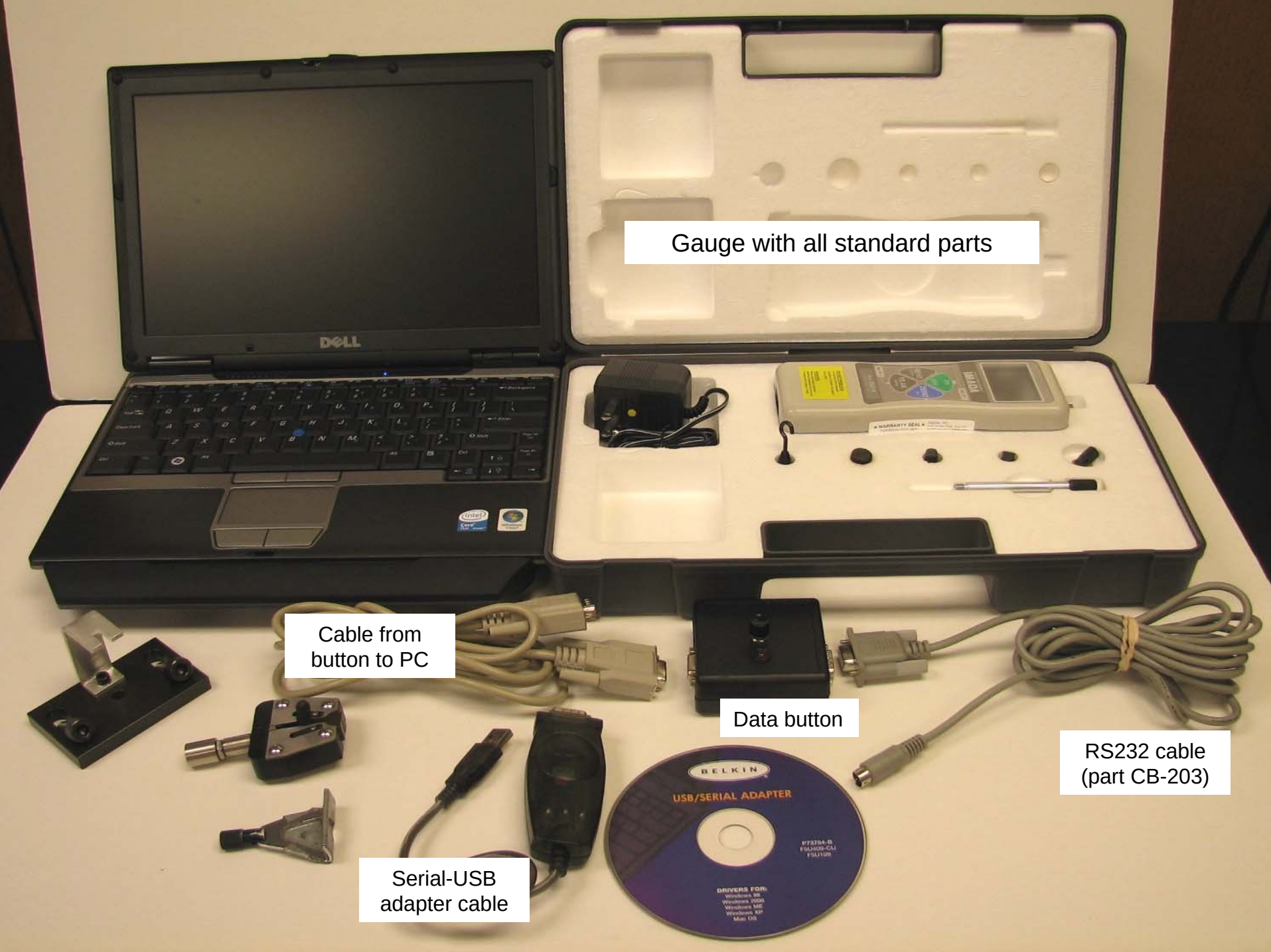
Wedge Grip		
 Imada KC-20 Wedge Grip $395 BUY	This spring-loaded grip is ideal for tensile measurements of thick materials up to 10mm. 15mm serrated jaw.	KC-20: 110 lb max ($395) KC-100: 220 lb max ($450) KC-1100: 1100 lb max ($550)

Older style
grip shown in some photos

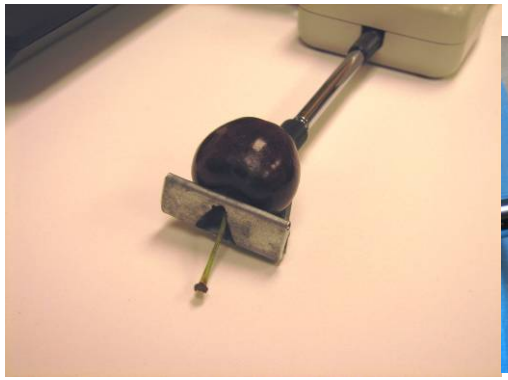

Runs on battery power or adapter
DO NOT OVERLOAD
or Load cell will be damaged
regardless of whether the gauge is
ON or OFF.
WARNING
When surrounding equipment,
additional safeguards are necessary
to avoid serious injury or death.
Model DS2-11
SEND
ENTER
PEAK
DOWN
ON
OFF
ZERO
UP
Set UP 2
Set UP 1
FORCE MEASUREMENT
IMADA
WARRANTY SEAL
IMADA, INC
Standard attachments: hook, cone, wedge-shape, chisel-end, rounded-head, extension

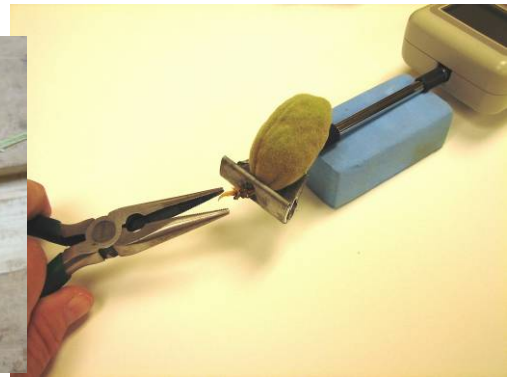
Old Wedge Grip, modified Y hook and custom made holder for fruit. Y-Hook can work well with a homemade modification, for fruits like olives, cherries or grapes. For big fruit, you may have to come up with your own modifications.

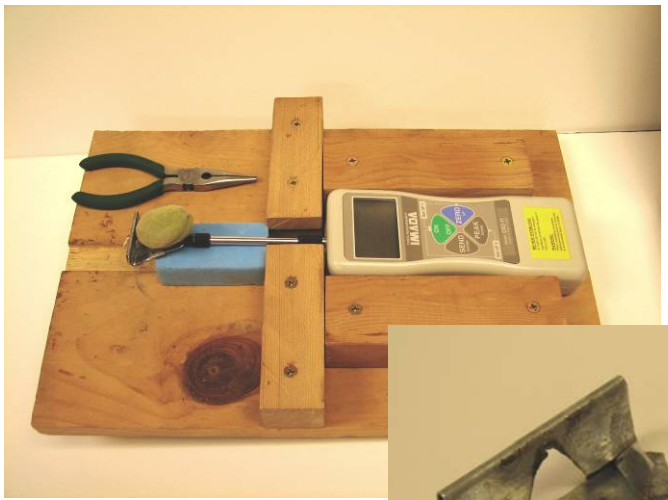
Y hook modified with sheet metal to hold small fruit

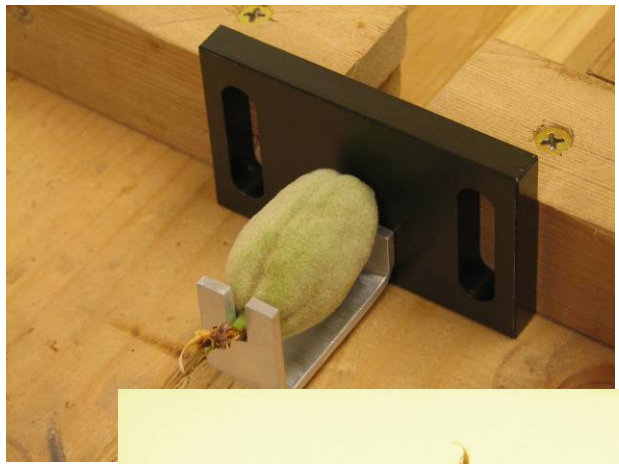

Gauge with all standard parts
Cable from button to PC
Data button
RS232 cable (part CB-203)
Serial-USB adapter cable
BELKIN
USB/SERIAL ADAPTER
DRIVERS FOR:

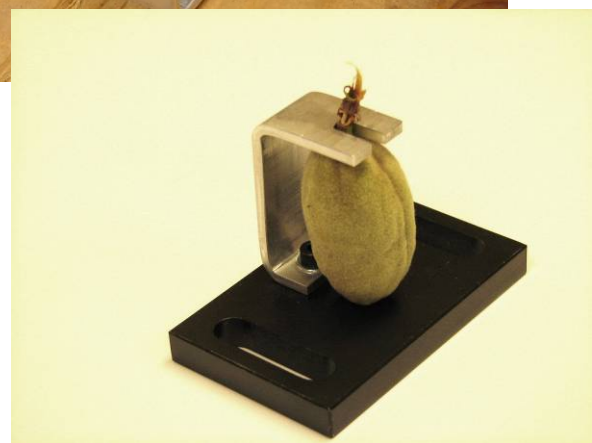
Examples of use, setup, attachments











Mechanical Gauge Option: Cost-saving alternative; data must be hand-entered into computer

Home

Push / Pull Mechanical Force Gauge – Series FB

- Simple, rugged, virtually maintenance free
- Retains a high degree of accuracy for extended periods
- Ergonomic, heavy-duty metal construction
- No batteries needed
- Intrinsically safe in hazardous environments
- Capacity up to 150 lbf (push and pull)
- Overload capacity 165 lbf on all ranges
- Tare ring
- Real time and peak mode
- Full set of accessories and carrying case included

PRICING DELIVERY SUPPORT

Dimensions | Special Attachments

FB Kit

The rugged construction of the FB/PS force gauges will withstand industrial environments and yet retain calibration for extended periods.

Ergonomic design makes it ideal for hand held use, or it can be mounted to a test stand. The Zero-Tare ring allows you to zero the gauge to compensate for measuring attachments and changes in measuring position. The real time/peak hold selector switch allows you to observe transients or capture peaks. Many ranges are available to cover all of your measurement needs (also available in Newtons).

The FB series is sold in kits complete with force gauge, hard carrying case, five measuring attachments (flat head, conical, chisel, notched, and small hook) as well as a 3 inch extension shaft. PS resolution is 2 times greater than FB and the kit includes everything in the FB kit plus a large hook and Y-hook. An optional handle to facilitate the measurement of heavy loads is also available.

Quantity: 1 | Imada FB-32oz - $430

Typical price, currently

Mechanical Gauge Specs

- Simple, rugged and virtually maintenance free
- Retains a high degree of accuracy for extended periods
- Ergonomic, heavy-duty metal construction
- No batteries needed
- Intrinsically safe in hazardous environments
- Capacity up to 100 pounds (push/pull)
- Overload capacity 165 pounds on all ranges
- Tare ring
- Real time and peak mode
- Full set of accessories and carrying case included
- Optional attachments

Specs

Pounds		Kilograms		Newtons	
Model	Capacity x Resolution	Model	Capacity x Resolution	Model	Capacity x Resolution
FB-32oz	32 x 0.25 oz	FB-1kg	1 kg x 10 g	FB-10N	10N x 0.05 N
FB-2	2 x 0.02 lb	FB-2kg	2 kg x 20 g	FB-20N	20N x 0.1 N
FB-5	5 x 0.05 lb	FB-3kg	3 kg x 25 g	FB-30N	30 N x 0.2 N
FB-10	10 x 0.1 lb	FB-5kg	5 kg x 50 g	PS-50N	50N x 0.25 N
FB-20	20 x 0.2 lb	FB-10kg	10 kg x 100 g	FB-100N	100 N x 0.5 N
FB-30	30 x 0.25 lb	FB-20kg	20 kg x 200 g	FB-200N	200 N x 1 N
FB-50	50 x 0.5 lb	FB-30kg	30 kg x 250 g	FB-300N	300 N x 2 N

Data Acquisition, the Software: What it is, How it works

- **SW-1** (Imada software) is the custom configuration file made to go with the Imada digital gauge to put force data measurements into a spreadsheet with summary statistics included.
- It works with a 'wedge' type of software that 'wedges' data in the form of ASCII files, usually, into spreadsheets, databases and text documents).
- There are other 'wedge' software packages available from other dealers, but Imada has customized this software for its gauge. When you purchase SW-1 you get it packaged with WinWedge (below).

$ • **WinWedge (Standard) RS232 Data Acquisition Software**

By TalTech

This package inputs serial data directly into any PC application. **Collect data from any RS232 instrument** (that is, a serial device producing RS232 type data). This package inputs real-time data directly into EXCEL.

Similar software for collecting data from RS232 devices can be used if you already have it, but this guide doesn't cover that option. Others include 'Collect' http://www.labtronics.com/DI/RS232_Software.htm

and 'Windmill' by http://www.windmill.co.uk/rs232.html

$ **RS232 Data Acquisition software can be used with many instruments (balances, pH meter, colorimeter, calipers, barcode scanners, etc)**

imada.com
FORCE & TORQUE MEASUREMENT
ISO 9001 & ISO/IEC 17025 ACCREDITED

IMADA, Inc.®
3100 Dundee Rd., Suite 707, Northbrook, IL 60062
Tel: 847-562-0834 Fax: 847-562-0839
www.imada.com E-mail: imada@imada.com

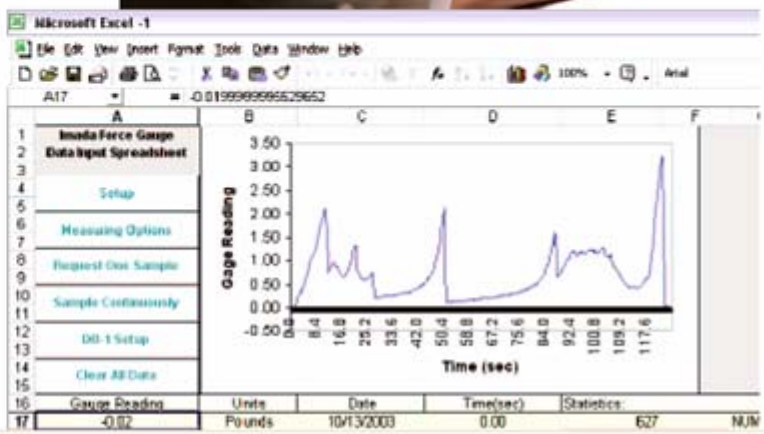
SW-1XV Data Acquisition Software

- Full SPC and graphing capabilities
- Designed for Imada gauges
- Automates your data collection

SW-1XV is a highly customized Excel spreadsheet specifically designed for capturing and analyzing real-time data from Imada gauges with a RS-232 port.

SW-1XV allows real time data* from RS-232 instruments to be input directly into any Windows program – including Microsoft Excel. SW-1 inputs gauge readings in real time and provides a running log of all force measurements along with a chart of the data as well as statistical information including Min, Max, Mean, Median, Standard Deviation, Average Deviation and Variance.

Complete control of the gauge is provided through a set of "buttons" on the spreadsheet that enable easy editing of the sampling rate, force measurement units, peak/real time, tare and power off.



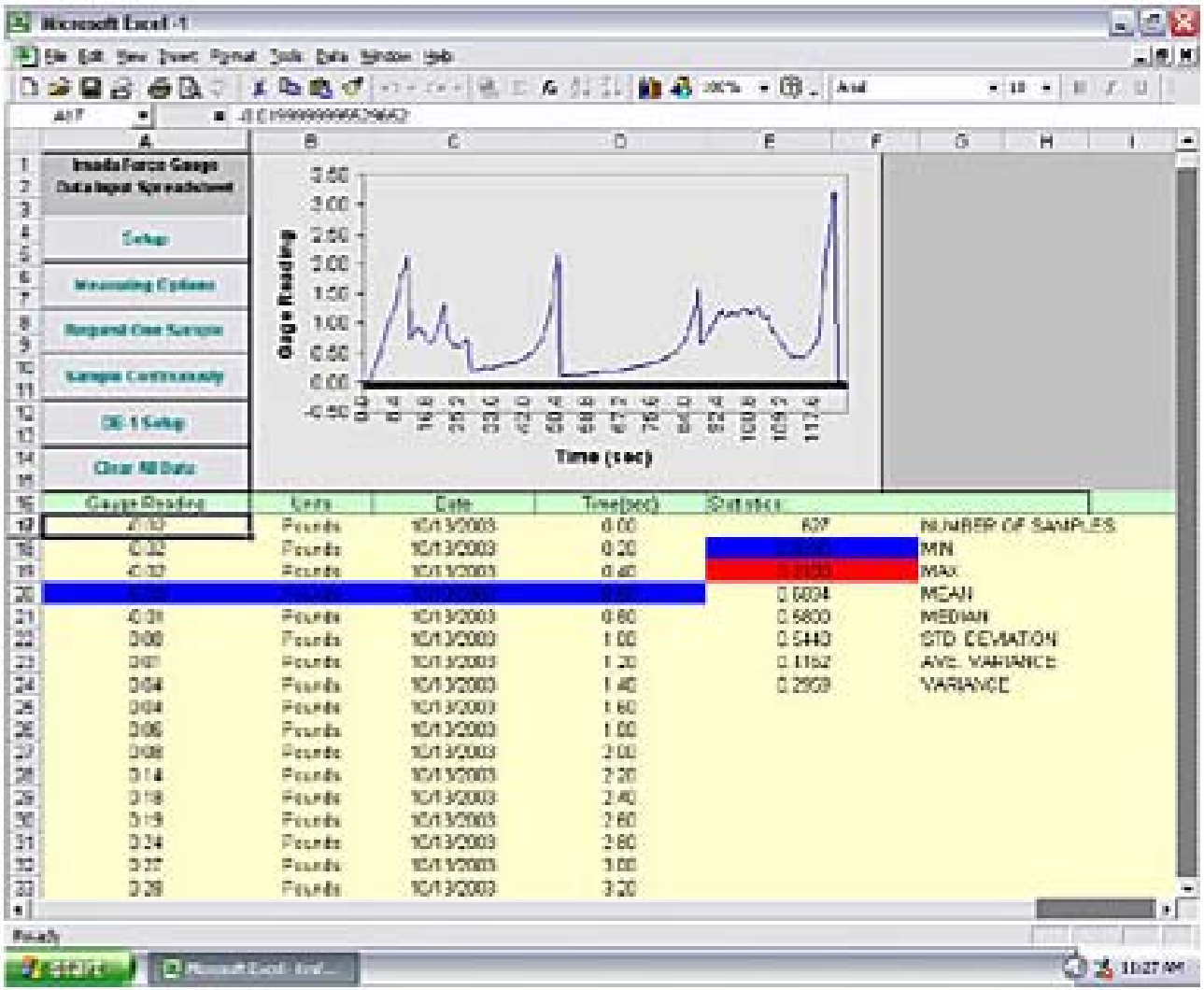
Other features include a memory download option for Z2, Z2S-DPU and Z2H gauges only. If desired, the entire stack can be saved to disk, analyzed or cleared. Because all data is entered directly into a standard Excel spreadsheet, you are virtually unlimited in your ability to analyze your force gauge data using all of the powerful tools available in Excel.

Hardware Requirements: Imada Gauge with RS-232 serial port, CB-203 cable, a Pentium or equivalent with 32MB RAM or better, a mouse and approximately 1 MB hard disk space.

Your data goes into the customized spreadsheet with summary statistics. The software comes with complete 'how-to' manual.

Use Data Button to send data to PC and zero the gauge!

MODEL	CABLE (10')
DPS	CB203
DPSH	
Z2	CB204
Z2H	
Z2S-DPU	
DTX2	
HTG2	



Home Insert Page Layout Formulas Data Review View Add-Ins

Imada Force Gauge Data Input Spreadsheet

Setup

kg	N	lb	oz

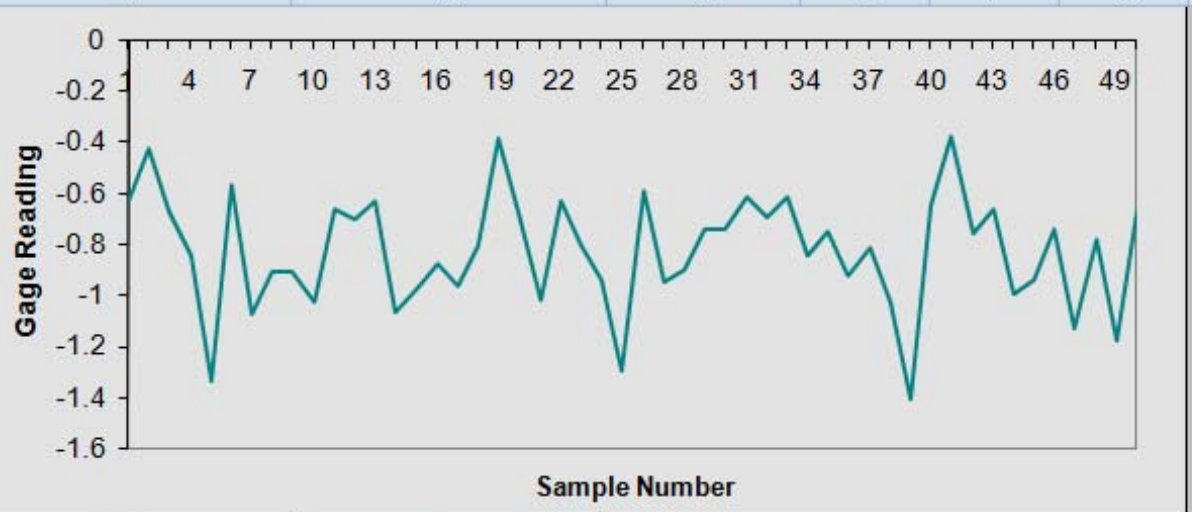
Peak	Real Time	Tare	Pwr Off

Request One Sample

Sample Continuously

Set Sampling Rate

Clear All Data



Gauge Reading	Date	Time
-0.636	6/1/2008	1:47:06
-0.428	6/1/2008	1:47:15
-0.672	6/1/2008	1:47:28
-0.852	6/1/2008	1:47:42
-1.34	6/1/2008	1:47:51
-0.571	6/1/2008	1:47:57
-1.074	6/1/2008	1:48:06
-0.913	6/1/2008	1:48:14
-0.913	6/1/2008	1:48:21
-1.029	6/1/2008	1:48:31
-0.669	6/1/2008	1:48:38
-0.704	6/1/2008	1:48:45
-0.635	6/1/2008	1:48:53
-1.07	6/1/2008	1:49:03
-0.976	6/1/2008	1:49:12
-0.88	6/1/2008	1:49:20
-0.968	6/1/2008	1:49:27
-0.812	6/1/2008	1:49:35
-0.39	6/1/2008	1:49:41
-0.681	6/1/2008	1:49:49
-1.023	6/1/2008	1:49:59

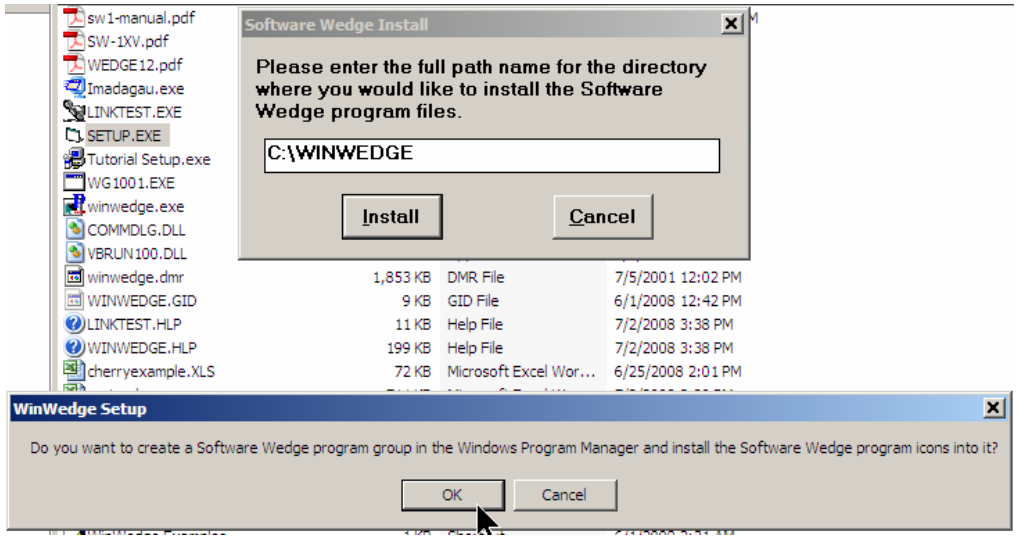
Statistics:	
Min:	-1.409
Max:	-0.384
Mean:	-0.83026
Median:	-0.8105
Std. Deviation:	0.2236
Ave. Deviation:	0.180161
Variance:	0.049997

Example of the spreadsheet

INSTRUCTIONS FOR INSTALLING WINWEDGE AND IMADA SW-1 SOFTWARE

Step 1: Install WinWedge on your PC

- Place WinWedge Installation disk into your CD drive, run SETUP.EXE and follow the instructions presented on screen to completely install WinWedge.



Step 2: Copy SWIX.XLS and configuration files to your WinWedge directory (usually it will be C:\WINWEDGE)

- Place the IMADA spreadsheet disk into CD drive. Using Windows Explorer, move all files from the IMADA spreadsheet disk to the directory where you installed WinWedge.

IMPORTANT: SW1X.XLS will not work correctly if the configuration files (Imada1a.sw3, Imada2a.sw3, Imada3a.sw3, Imada4a.sw3) are not copied to the same directory where you installed WinWedge. These are needed for the gauge to communicate with the correct COM port.

INSTRUCTIONS FOR INSTALLING WINWEDGE AND IMADA SW-1 SOFTWARE

You can copy the ‘start up file’ to your desktop as an icon for quick-starting the program.

Step 3: Connect you Force Gauge to your PC

- Connect your force gauge to an available COM port on the back of your PC and note which port the instrument is connected to (ie.COM1, COM2, etc.). If you have connected the gauge to a serial port, this will usually be COM1. If you are using a USB port, it may be COM 1, 2, 3, or 4. If you are using the DB-1 Data Button, you will have the gauge, RS232 cable (part CB-203), DB-1 Data Button and the serial cable from button to computer for this connection. Otherwise, connect the RS232 cable (part CB-203) cable to the gauge and then to the computer.

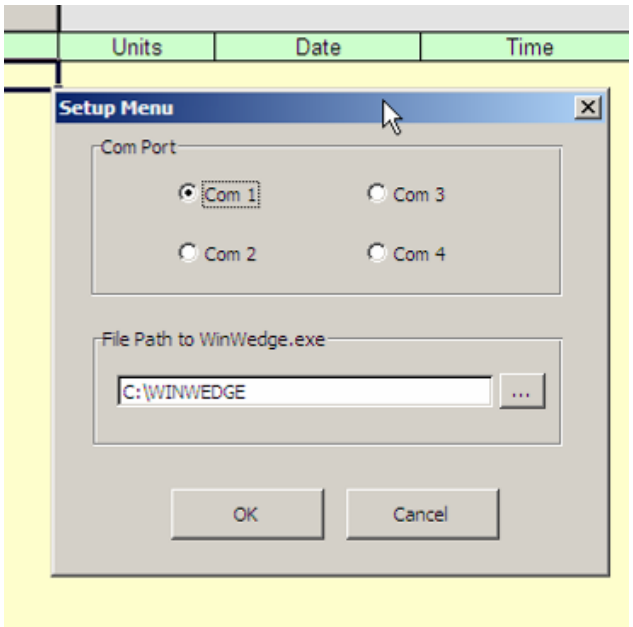
Step 4:

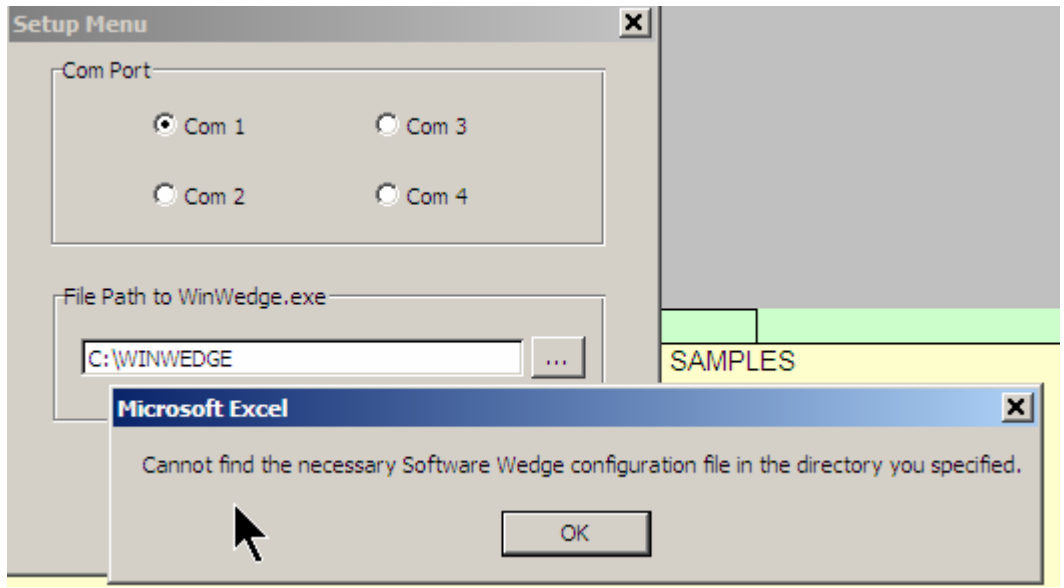
Launch Excel, and open the sw1x.xls spreadsheet located in the WinWedge directory.

- You may get a security warning, saying ‘Macros may contain viruses….’ In that case, you should select the button that says ‘Enable Macros’.
- This may occur if the security level in Excel is set to high. Select the Tools menu in Excel and then select Macro/Security. In the dialog window, set the security level to Medium.

INSTRUCTIONS FOR INSTALLING WINWEDGE AND IMADA SW-1 SOFTWARE

- Select the COM port that your measuring instrument is connected to and the directory where WinWedge is installed in your PC. **<u>Click on the 'OK' button only once.</u>**





If you get this message, see the Troubleshooting section at the end of this guide.

DB-1 DATA BUTTON OPERATING MANUAL

Because the Data Button must be configured with the software to 'send' the data to the PC, it will be explained next.

DB-1 is a simple, compact, one channel interface that enables the user to send measurement data to a PC running SW-1 IMADA data acquisition software. The LED lamp will light up for both single data and automatic acquisition modes when data is being sent to the computer. If needed, a foot switch or other type of remote switch with a 3.5mm plug can be connected to the external toggle input. No external power supply is needed as power is supplied through the PC.

Connect DB-1 data button to IMADA gauge with CB-203 (for DPS) cable and also to the PC with a provided serial cable.

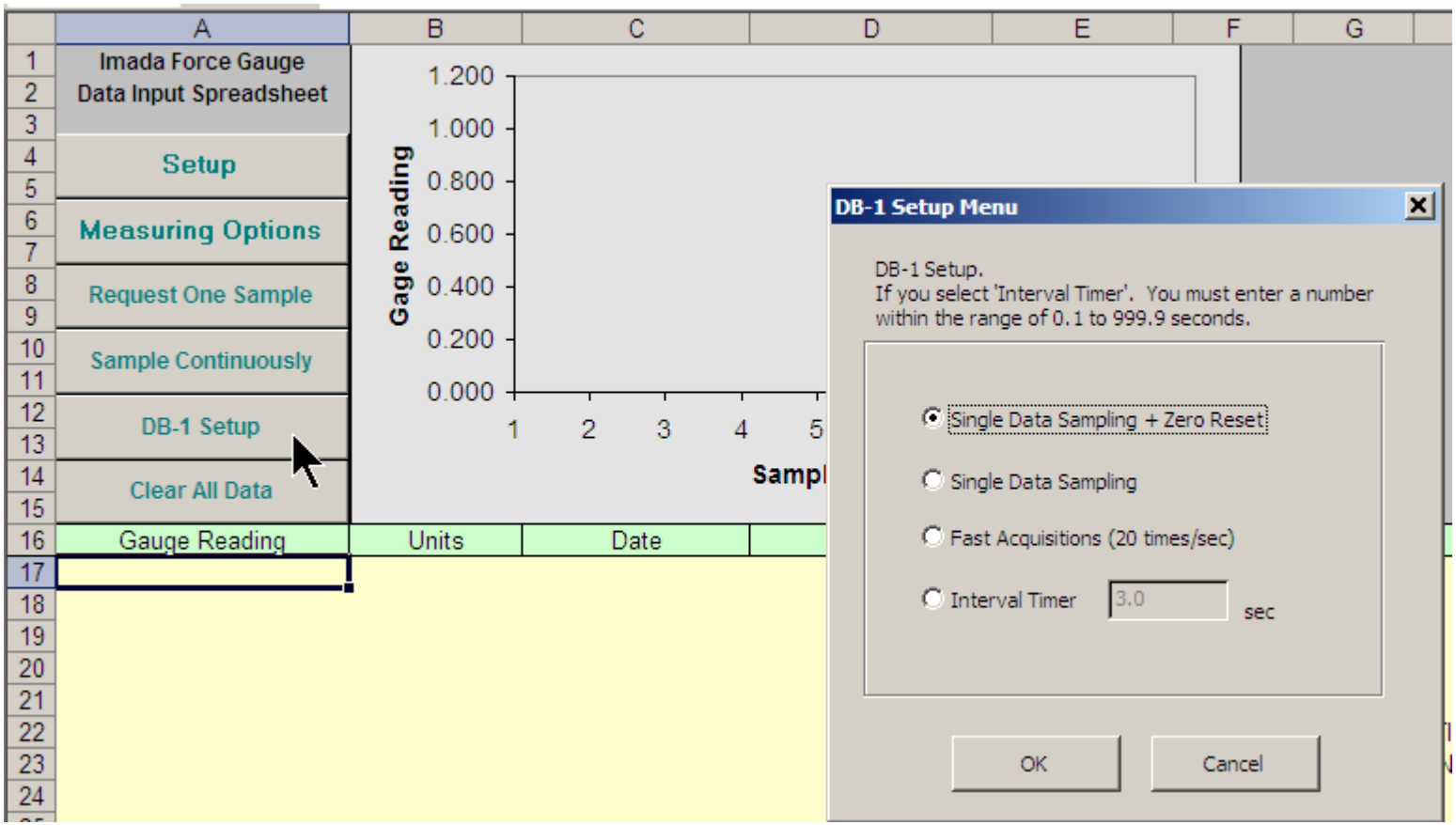
Single data mode (w/ automatic zero)

Open the IMADA SW-1 spreadsheet, click the DB-1 setup button and select the single data sampling or the single data sampling + zero reset. Simplifies peak measuring tests when automatic zero reset is selected, as it "zeros" the gauge after sending the data to the computer, thus eliminating the need to reset manually for each test. Each time you press the DB-1 button it will collect a single data sample from the gauge.

Automatic acquisition mode

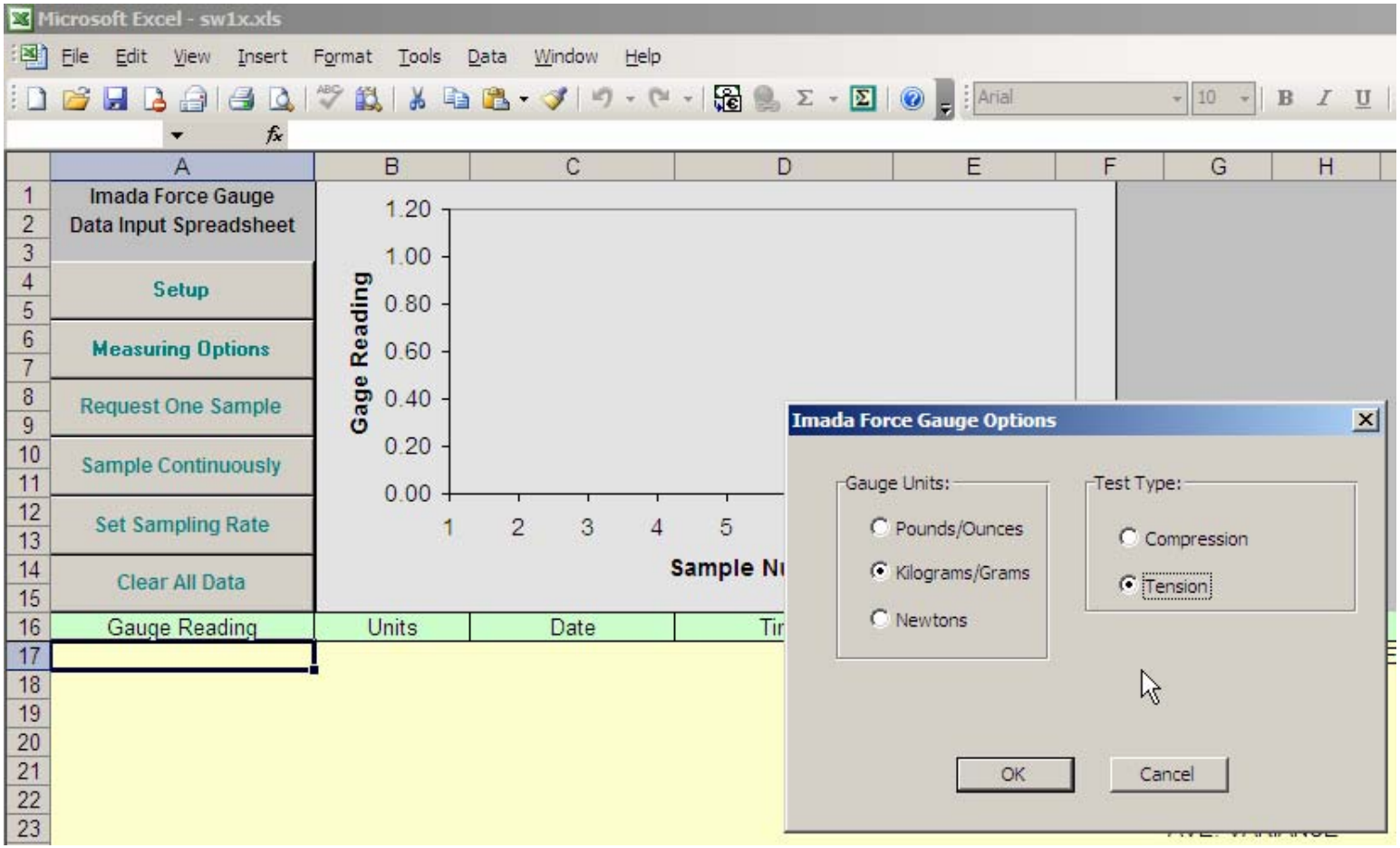
Go to the IMADA SW-1 spreadsheet, click the DB-1 setup button and select the interval timer. Enter an acquisition rate in the range of 0.1 to 999.9 seconds or select "fast acquisitions" for a fixed 20-data/second-acquisition rate. Press the DB-1 button to start the acquisition timer and press it again to stop the acquisition timer.

Setup your data collection: Data button setup, typical choices for FRF



Select the test type and unit of measure (Measuring Options)

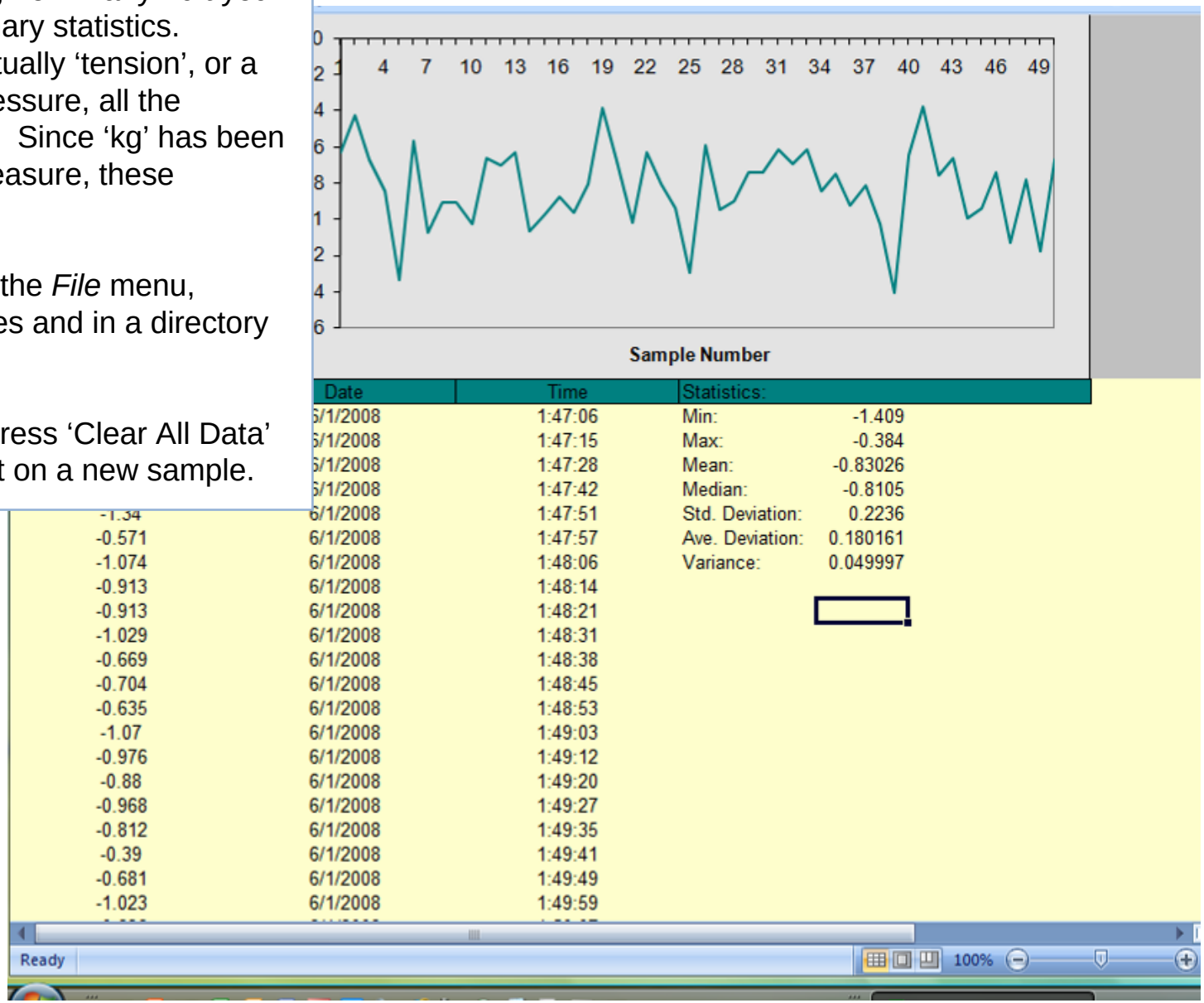
- After the spreadsheet opens units of measure (kg, N, lb), type of force measured (compression or tension) and other test parameters can be selected in the spreadsheet or on the gauge, using the buttons.



When you have taken a number of pull force readings from your gauge, your spreadsheet will look like this, showing how many fruit you have sampled with summary statistics. Because ‘pull force’ is actually ‘tension’, or a **negative** force, unlike pressure, all the readings will be negative. Since ‘kg’ has been selected as the unit of measure, these readings are in kg/cm^2.

Save your data file using the *File* menu, naming it after the samples and in a directory you can find easily later.

To start a new data file, press ‘Clear All Data’ and you are ready to start on a new sample.



Preparing for Testing: Organizing your samples

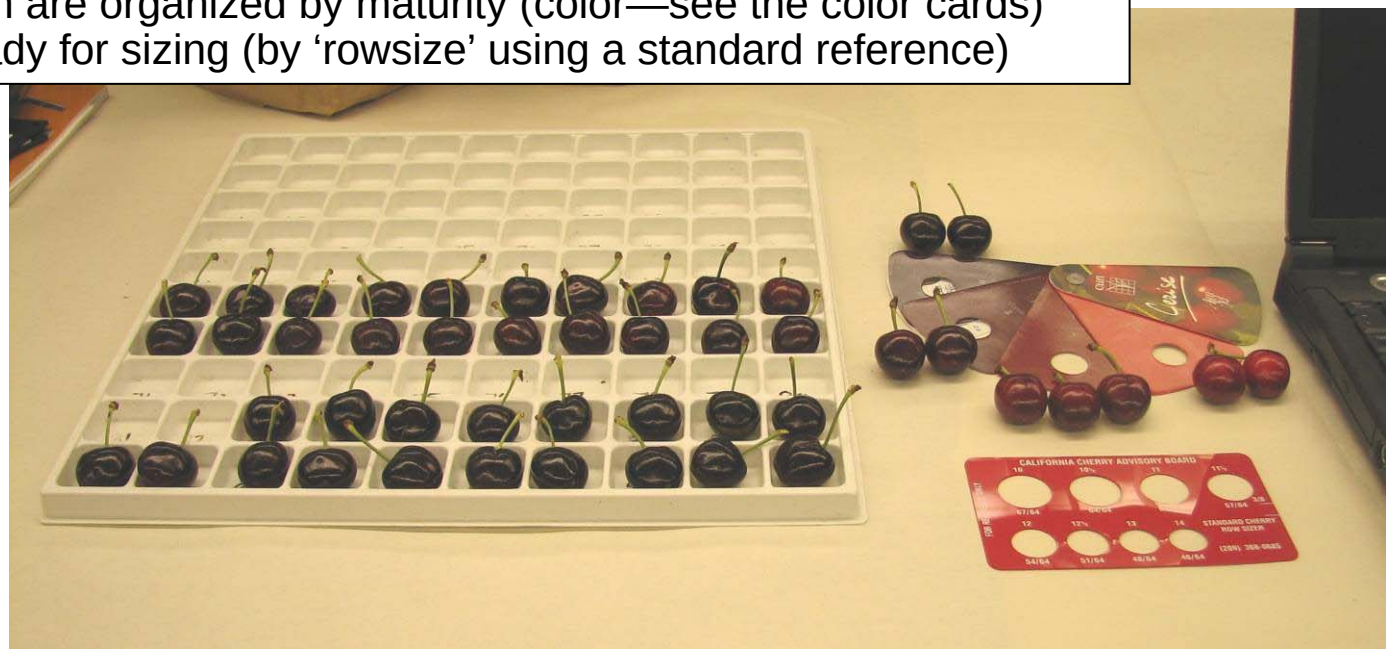
--Select the fruit that may give you the information you need (such as the ripest fruit), realizing that fruit of uniform maturity and size will minimize meaningless data

--Organize your fruit by treatment, variety, or other factor that may affect the results

--Sample trays (called 'liners') to hold small fruits cherries to be tested, can be purchased from:

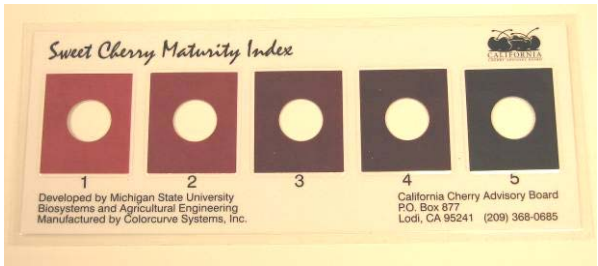
The California Dried Fruit Association (209-544-1414)

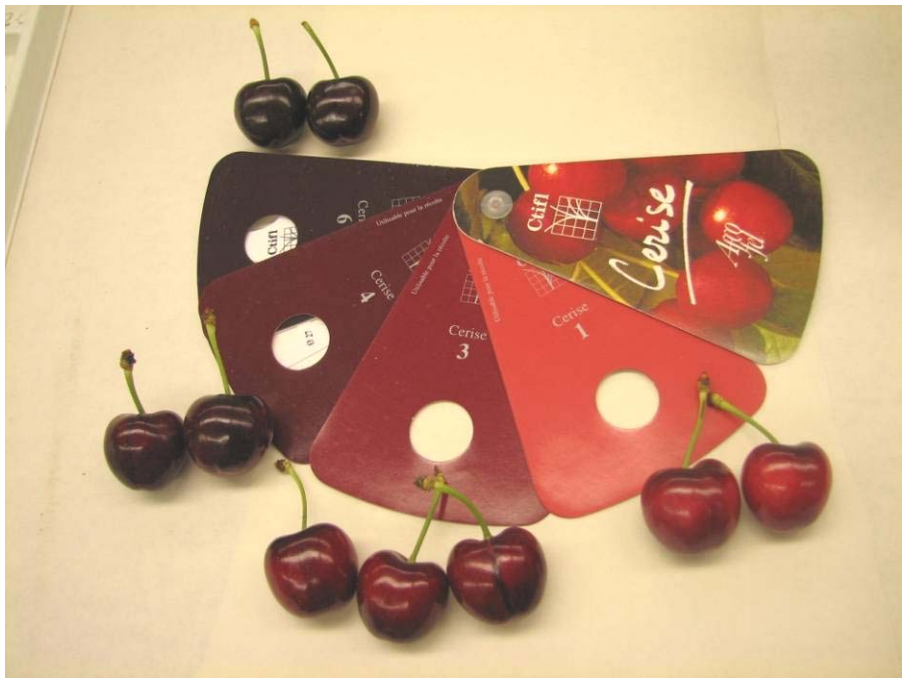
--The fruit shown are organized by maturity (color—see the color cards) and are also ready for sizing (by 'rowsize' using a standard reference)



Fruit must be collected using marketable colors, depending on the variety and the commercial standards

Shown here are an example of **color standards** (CTIFL color cards from France), **California Cherry Advisory Board color standard card and standard row sizer** that shows minimum red color for ‘Bing’.





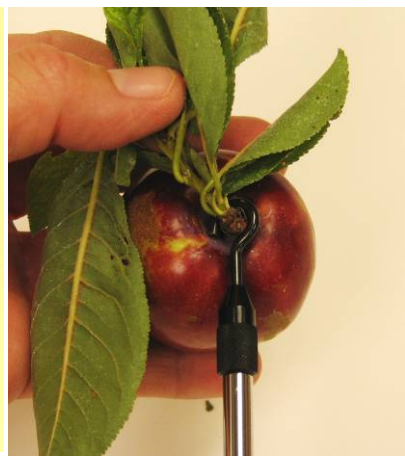
Fruit must be separated by marketable colors for comparisons: minimum red must be compared only to minimum red and dark red to dark red. Maturity affects fruit removal force!

Samples must be separated by ‘treatment’ or other identifiers of interest.

Fruit sizing for quality can be done manually or automated with other equipment

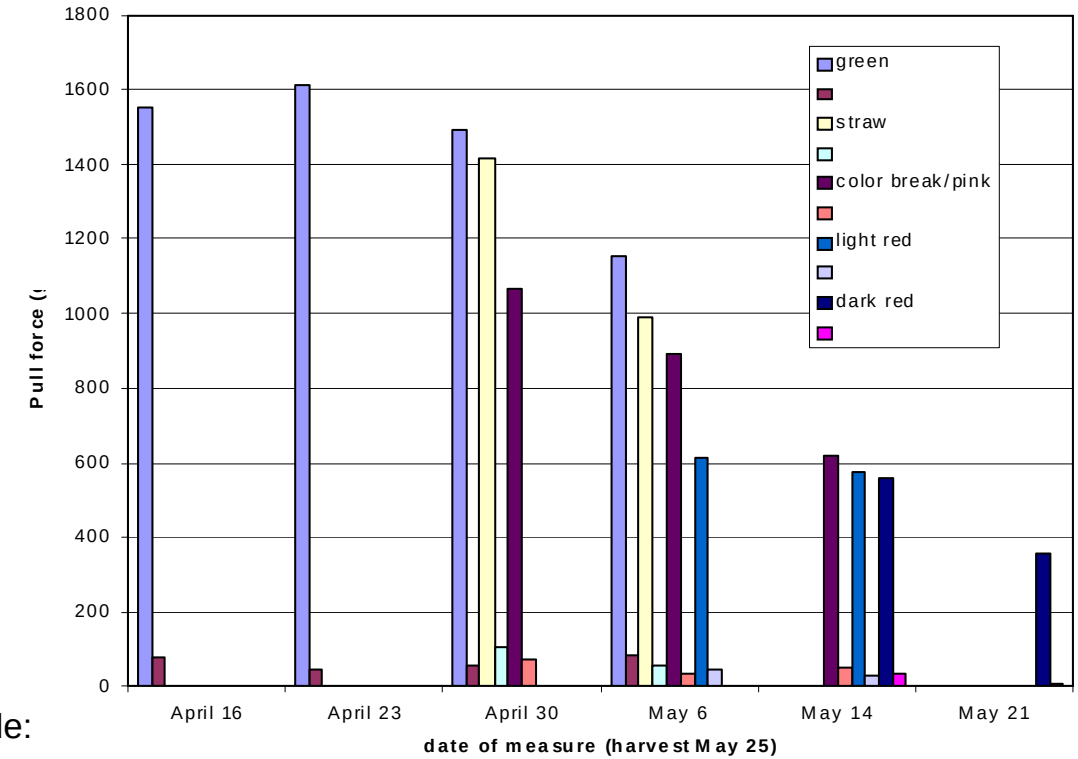
Caution about how to handle the fruit with the gauge

- Set the gauge to ‘Peak’ measurement and the reading will stop at the maximum tension. Otherwise, it resets as soon as the stem is released, and you lose the data.
- Do not yank the fruit or the stem. A quick jerk will produce poor, inconsistent data. Pull steadily.
- If you wish to use the ‘hook’ standard attachment to put over the fruit while it is still attached to the tree, instead of one of the special attachments, you can, but you probably are also measuring some shear force that changes the FRF to shear + pull. This may be ok for comparisons, but not for the clearest data.
- Take enough readings from any given group of fruit to be certain of the results. More is better than too few, to trust the data.



Working with Your FRF Data

Simple use: You may use this data and the statistics as shown by the Imada program 'as is'. If you view the previous example, you will see that for the 50 fruit sampled, simple summary statistics were performed, including minimum and maximum values, mean (average), etc.
You can chart your results in Excel.



Typical applications of a simple sort include:

- Variety A tends to have higher FRF than Variety B at same maturity
- Fruit this year have higher FRF than last year
- Why are my fruit dropping/losing stems? *Low FRF*
- Do applications of ethephon loosen my fruit?
- What is the change over time due to fruit maturity?
- Does Product A that I am paying a lot of money for, appear to give me better/worse/same FRF?

Working with Your FRF Data

Comparing more than one treatment, maturity, variety, etc:
If you wish to compare values from different groups, you must use statistical programs (like those found in Excel). For that, you will need to use the data as Excel files, or some other form that can be used by a statisctical program. Here is one way to do that, starting with the file created in Excel by the program. We are assuming you have at least some knowledge of working with a spreadsheet program like Excel.

Because 'pull force' is actually 'tension', or a **negative** force, unlike pressure, all the readings will be negative. Since 'kg' has been selected as the unit of measure, these readings are in kg/cm^2. Usually FRF (pull force, or FRM = fruit removal force) is expressed in g/cm2 and without a negative value, as a matter of convention.

Open your data file. You can use Excel to convert the negative kg values by placing the formula

=A1*-1 in cell B1 and then 'Enter'

Now highlight B1 and all the cells below down to where your data stops, and use 'Ctrl' + "D" keys pressed together to copy the formula down, converting your data for convenience. If you paste this data, you must always use 'Paste Special', followed by 'Values' to get these values to use for statistical analysis.

Statistical analysis of data is beyond the scope of this 'how to guide'.

$

Other uses for this ‘expensive’ tool?

Measure firmness more accurately than a hand-held penetrometer

Best if you want to test the force to break the skin. If you want to test flesh firmness, this is not as simple.

Greatest accuracy for flesh firmness will require a way to press the fruit for the same distance each time—Imada has expensive mounts that control ‘travel’ (movement over distance) of the gauge. You can also make a mark on the shaft of one of the standard attachments that can be used to press into the flesh just to that distance. There are other ways to do this also, be inventive!

Information is power—

be the gatekeeper of your own fruit quality!

Small piece of tape used to mark a set distance

Additional information for those who want to use the Imada gauge for Compression and Tension measurements – 2 types of data buttons

- **DB-1:** one channel mode -- collects force or torque data
- **DB-2:** two channel model -- collects both force and displacement data (use with test stands equipped with digital distance meters)
- **SW-1:** Data Acquisition Software
- Send data to the PC spread sheet with the touch of a button
- Zero the gauge
- Select different acquisition rates

DB buttons work with Imada SW software to automate data collection from Imada force or torque gauges. Enter peak measurements into the spreadsheet and "zero" the gauge with a touch of the button. Minimize computer time and mouse useage.

DB-1 Data Button -- Single Channel

DB-1 is a simple, compact, one channel interface that enables the user to send measurement data to a PC running SW-1, Imada data acquisition software, or other software.

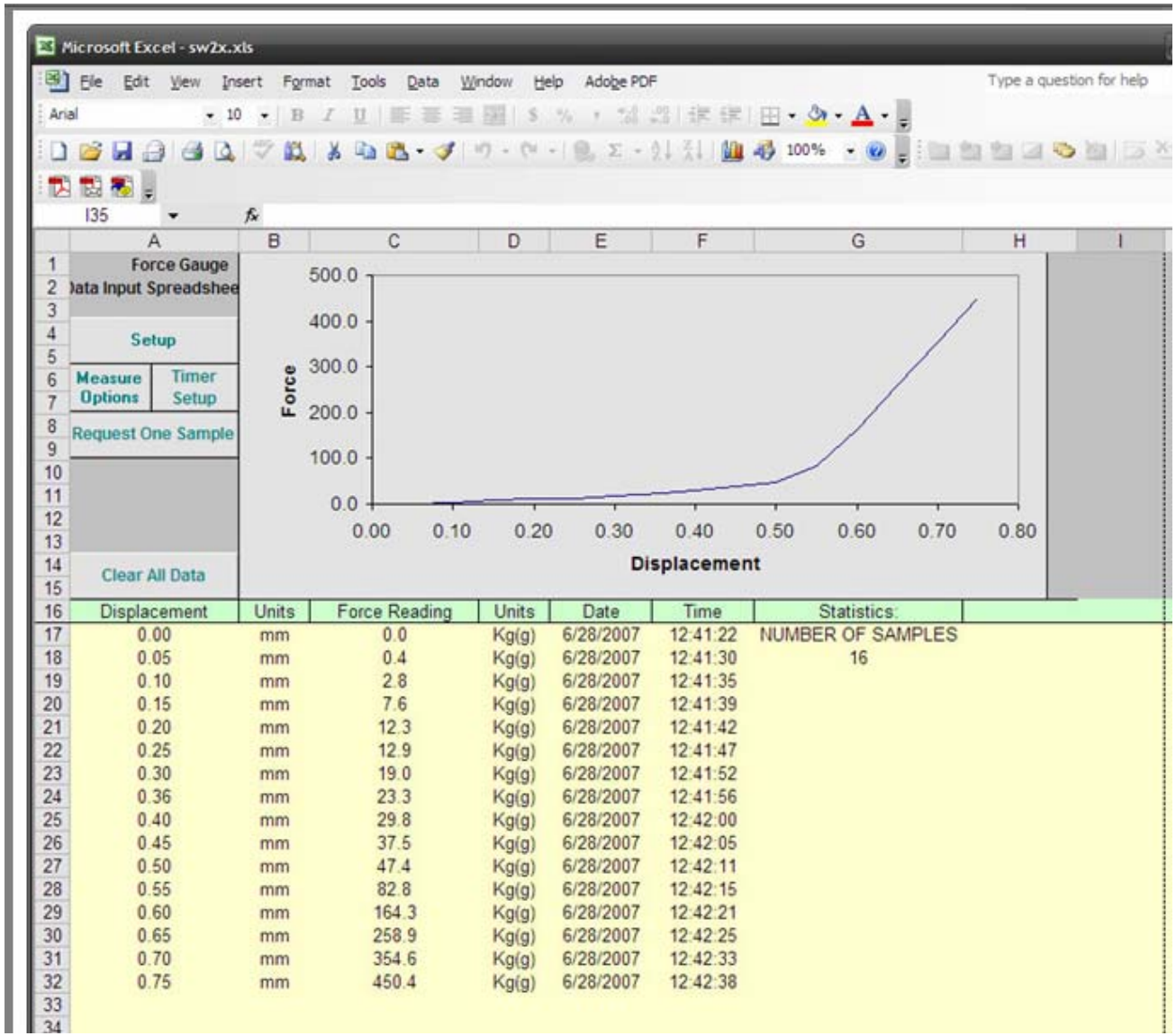
Single data mode simplifies peak measuring tests because it also 'zeros' the gauge after sending the data to the computer, thus eliminating the need to reset manually for each test.

Automatic acquisition mode allows users to select different acquisition rates from 20 data/second to 1 data/999.9 seconds. Start data acquisition by clicking the button, then click again to stop, which simplifies start/stop functions by eliminating the need to use computer mouse and screen to control testing. This allows users to focus on the testing rather than the PC and the data acquisition spreadsheet.

As a visual confirmation, the LED lamp will light up for both single data and automatic acquisition modes when data is being sent to the computer.

No external power supply is needed as power is supplied through the PC. Connect Imada gauges to the data input button with cable CB203 and the computer to the data button with a 6' DB9 serial cable (included with DB-1).

2-Channel data, showing compression over distance (=displacement); since 2 kinds of data are taken for each time interval, this requires a 2-channel data button and a test stand with a distance meter); not covered in this guide



Displacement	Units	Force Reading	Units	Date	Time	Statistics:
0.00	mm	0.0	Kg(g)	6/28/2007	12:41:22	NUMBER OF SAMPLES
0.05	mm	0.4	Kg(g)	6/28/2007	12:41:30	16
0.10	mm	2.8	Kg(g)	6/28/2007	12:41:35	
0.15	mm	7.6	Kg(g)	6/28/2007	12:41:39	
0.20	mm	12.3	Kg(g)	6/28/2007	12:41:42	
0.25	mm	12.9	Kg(g)	6/28/2007	12:41:47	
0.30	mm	19.0	Kg(g)	6/28/2007	12:41:52	
0.36	mm	23.3	Kg(g)	6/28/2007	12:41:56	
0.40	mm	29.8	Kg(g)	6/28/2007	12:42:00	
0.45	mm	37.5	Kg(g)	6/28/2007	12:42:05	
0.50	mm	47.4	Kg(g)	6/28/2007	12:42:11	
0.55	mm	82.8	Kg(g)	6/28/2007	12:42:15	
0.60	mm	164.3	Kg(g)	6/28/2007	12:42:21	
0.65	mm	258.9	Kg(g)	6/28/2007	12:42:25	
0.70	mm	354.6	Kg(g)	6/28/2007	12:42:33	
0.75	mm	450.4	Kg(g)	6/28/2007	12:42:38	

Troubleshooting and Support

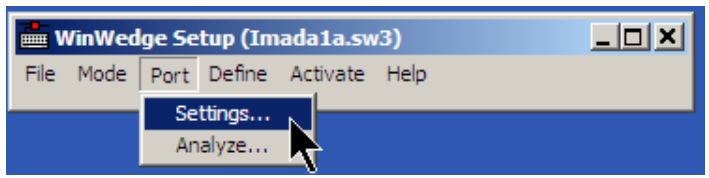
COM port won't configure so I can't use the Imada software SW-1

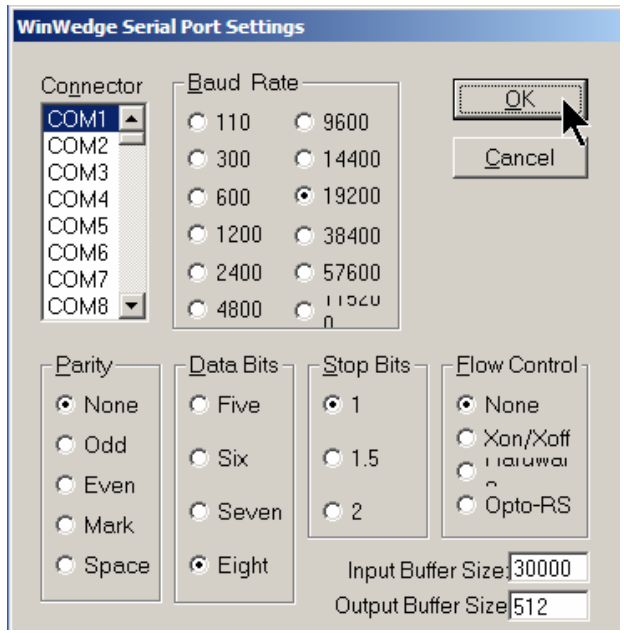
- ***Some of the CDs may ship with one or more configuration files that you need for the COM port communication missing. Contact Imada at 800-373-9989 for help if you cannot configure your COM port.***
- ***Alternatively, you can create the missing file. Look in your C:\WinWedge folder and see if you have all 4 of the ImadaXa.sw3 files. If one is missing (some CDs shipped without Imada1a.sw3) do the following:***

a. Close Excel. Start the WinWedge program Wedge.exe

b. Go to 'File' dropdown menu and choose 'Open' and 'Imada2a.sw3'

c. Go to the 'Port' dropdown menu and choose 'Settings'





Change any options to look like this picture

e. Choose 'Ok" then go to 'File' dropdown menu and choose 'Save as' and name the file 'Imada1a.sw3'

g. You have now created the missing configuration file.

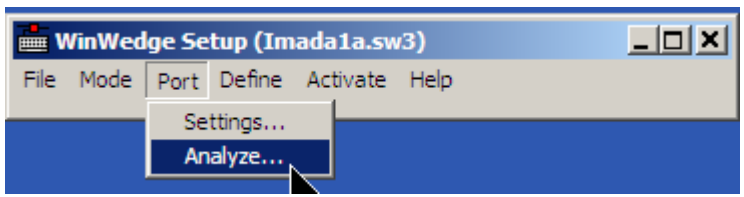
h. Reopen Excel, sw1.xls and choose your COM port.

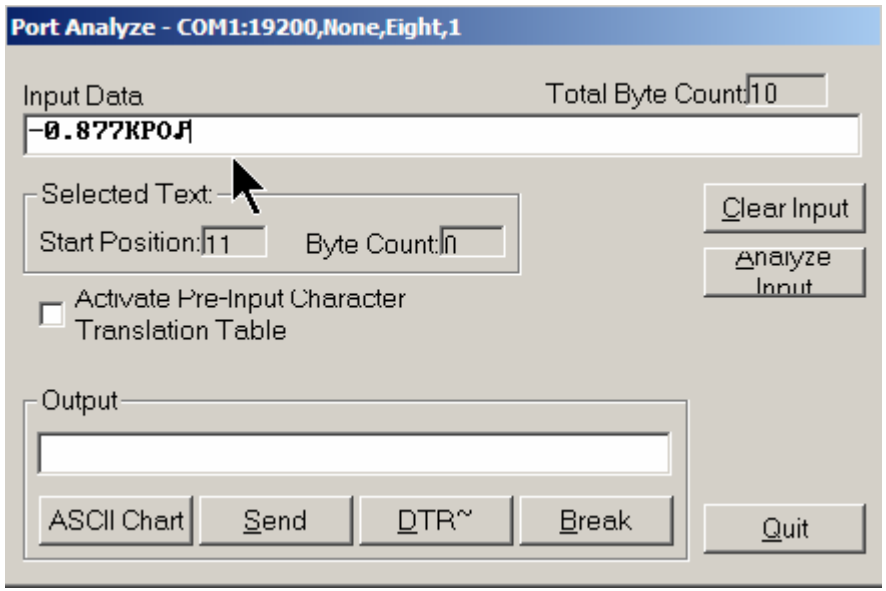
See next page

Troubleshooting and Support

You may wish to test your COM port configuration to be sure it is working right.

- From the WinWedge program,
- Go to the ‘Port’ dropdown menu and choose ‘Analyze’
- Send some data to your computer by pushing or pulling on the gauge
- If the reading on the gauge’s window looks like the reading in the ‘Input Data’ window on the computer screen (even with some extra symbols), the COM port is correctly chosen and configured and you are ready to collect data





TalTech:

My New Computer Does Not Have Any COM Ports - What Do I Do Now?

Dec 2004

Help! - My New Computer Does Not Have Any COM Ports - What Do I Do Now?
Many new laptop (and some desktop) PCs are not shipped with any RS232 COM ports and instead they are equipped with USB ports. Because of this there is a great deal of confusion about how to handle the problem of connecting RS232 devices to the computer.

Why Can't I Plug An RS232 Device Into The USB Port?
The USB port on your PC is not at all similar to a RS232 COM port and it is not possible to have a Windows application program that is able to "open" a USB port and input data from it directly. All devices that connect to a USB port on a PC must either come with special "Device Driver" software that acts as the interface to the device or they must use one of the device drivers that are built into Windows. For example, many bar code scanners are now shipped with USB connectors so that you can connect the bar code scanner to the USB port on your PC. The way that most of them work is that when you plug the bar code scanner into the USB port on your PC, the scanner identifies itself to Windows as a "keyboard device" and instructs Windows to load the built in USB keyboard device driver that is normally shipped with Windows so that the bar code scanner will function as if it were a second keyboard connected to your PC. As far as Windows knows the bar code scanner is just another keyboard and when you scan a bar code, the data encoded in the bar code goes into the PC as if someone were typing it in on a keyboard.

Other devices that connect to a USB port may come with a Device Driver that you need to install. The problem with this is that any software that needs to communicate with the device will need to perform all data communications with the device through the device driver. In other words, you would not be able to use a standard "communications" program like the Hyperterminal program that comes with Windows or WinWedge from TALtech to read in data from the device. The only way to communicate with these types of USB devices would be to either develop custom software or be restricted to using whatever software the manufacturer of the device provides.

Because of this problem, many instrument manufacturers are staying with the RS232 serial interface as it is much more flexible than the USB interface and there is also a wide variety of off the shelf serial communications software products available that can be used to communicate with standard RS232 instruments.

TalTech:

The Solution To The Problem

If you have devices that connect to a PC using a standard RS232 serial port connection and your PC (laptop or desktop) does not have a RS232 serial port available, then the only real option is to purchase an add-on serial adapter that either gets plugged into a slot inside your PC or connects to a USB port (a USB add-on RS232 serial adapter). Both types of add-on serial adapter are readily available at any computer or office supply store.

The USB add-on serial adapters are the simplest to use. Basically they consist of a small cable with a USB connector on one side and a RS232 serial port connector on the other. The way that they work is that you first install a driver for the add-on USB serial adapter and then when you connect the adapter to the USB port on your PC, the driver creates a "virtual RS232 COM port" in Windows that is really a connection to the serial port on the add-on USB serial adapter. In other words, the add-on USB serial adapter appears to Windows as if it were a built in RS232 COM port and you can use any standard serial communications software to send and receive data through the add-on serial adapter just as if it were built into the motherboard of the PC. Single port add-on USB serial adapters generally sell for about $30.00. Multi-port USB add-on serial adapters are also available so that you can add as many RS232 serial ports as you like to a PC - all through a simple connection to the USB port.

One big advantage of the USB based add-on RS232 serial adapters is that you do not need to open the PC and insert a card into a card slot and you also do not need to worry about having any free resources like IRQs or port addresses because everything goes through the USB bus.

Summary

If your new computer does not have a built in COM port, get an USB add-on serial adapter from your local computer or office supply store, install the driver that comes with the adapter and plug it into the USB port. You will be able to use any standard RS232 serial communications software just like you did before when your PC had a built in COM port.

More help for understanding your computer's ports

TAL tech
instrumental software solutions

VIEW CART | Quick Links | SEARCH | GO

COMShow Utilitiy

The COMShow Utility should begin to download automatically, if it does not click the link below...

Download Now (1.3 MB setup file for Windows)

Find out what COM ports are installed on your computer without using a screwdriver! Full Visual Basic 6 Source code is included!

ShowPorts for DOS Utility - (20 KB executable file)
Besides listing the available com ports, ShowPorts for DOS also displays the IRQ, port base addresses and what type of UART each port uses. This is a DOS program that should not be run inside the Windows environment. Refer to the read me file that is supplied with this program before running it.

…and serial communications (next page)

Introduction to Serial Communications

All IBM PC and compatible computers are typically equipped with two serial ports and one parallel port. Although these two types of ports are used for communicating with external devices, they work in different ways.

A parallel port sends and receives data eight bits at a time over 8 separate wires. This allows data to be transferred very quickly; however, the cable required is more bulky because of the number of individual wires it must contain. Parallel ports are typically used to connect a PC to a printer and are rarely used for much else. A serial port sends and receives data one bit at a time over one wire. While it takes eight times as long to transfer each byte of data this way, only a few wires are required. In fact, two-way (full duplex) communications is possible with only three separate wires - one to send, one to receive, and a common signal ground wire.

See Also: