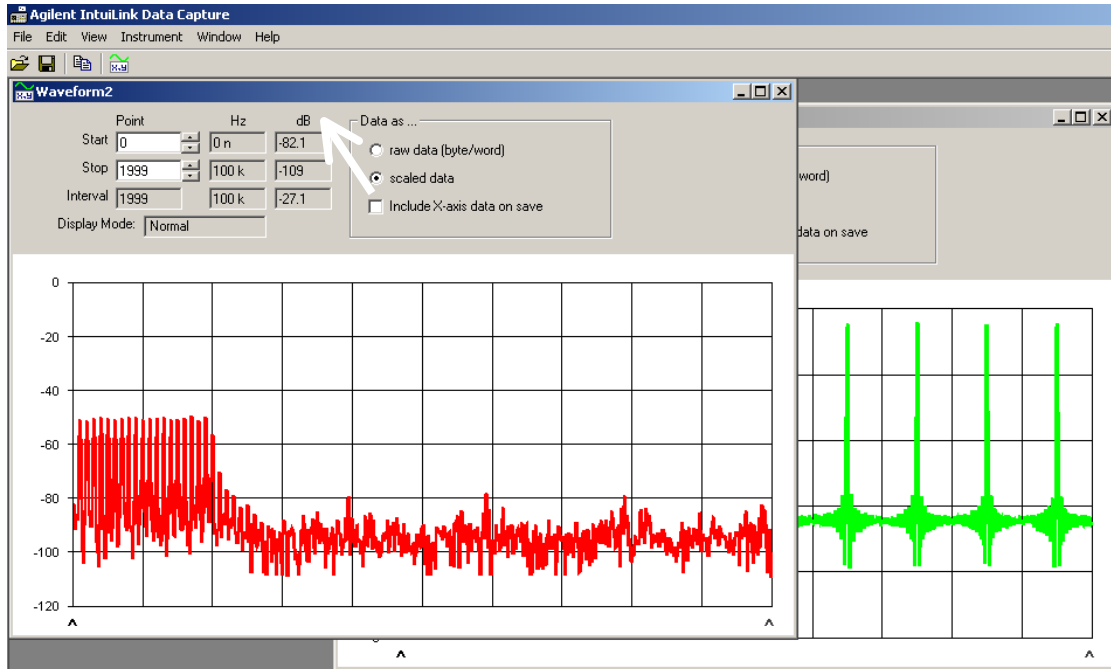# IntuiLink Data Capture

Waveforms are actual time and voltage data from the *oscilloscope*. IntuiLink **Data Capture** displays them graphically, but they are stored as a table of time - voltage pairs. (*Note*: in case of Math | FFT data: amplitude [dB] - frequency pairs.) This data can be stored in several other formats or copied to other programs for further analysis.
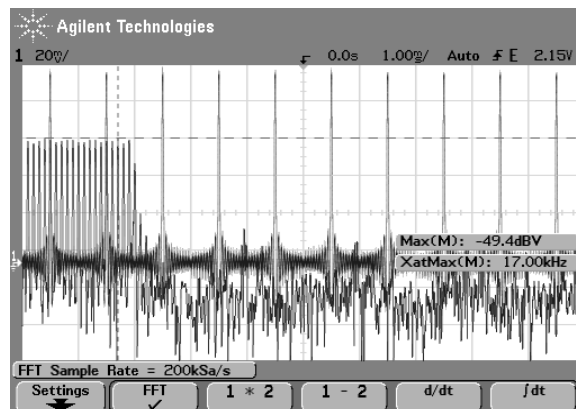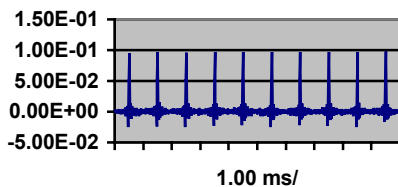

Remarks:

(**1**) Oscilloscope **screen image** with IntuiLink Toolbar (for Word):

(**2**) Oscilloscope **waveform data** with Intuilink Toolbar (for Word; **max** 500 points)

54622A, CHAN1, 08:53, 2/3/2003

The Agilent **Data Capture** is a <u>stand alone</u> <u>program</u> for the purpose of downloading **waveform** data from Agilent Oscilloscopes.
It provides the following functionality:

1.   <u>Download</u> waveform data and display the data as a simple chart
2.   <u>Save</u> the data as binary or text files
3.   <u>Copy</u> the chart and a selected portion of the data to the clipboard
4.   <u>Load</u> saved data back into the application

Connecting to the Instrument

- From the **Instrument** *menu* select your instrument or family of instruments.
- Make sure that your Instrument is physically connected to your computer and turned ON.
- If the instrument address is not the default GPIB address, the **Set I/O** *tab/dialog* will be visible.
    - Click on **Find Instrument …** to initiate a search.
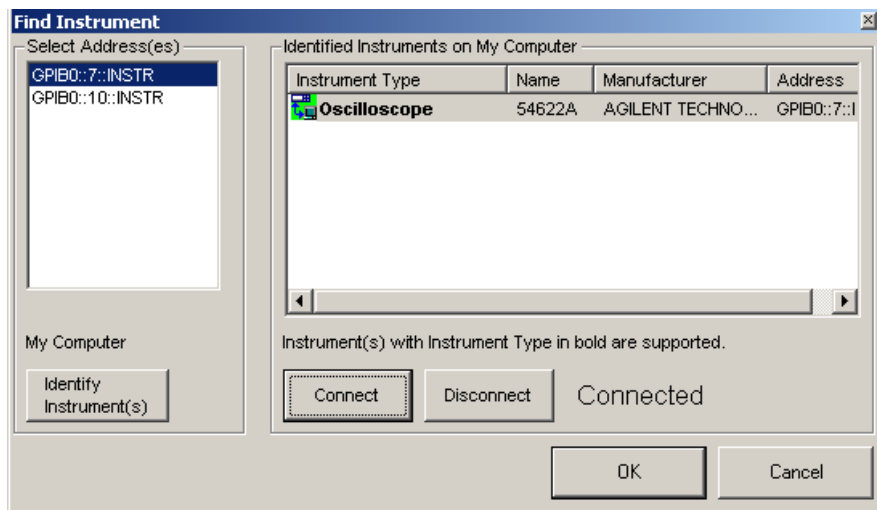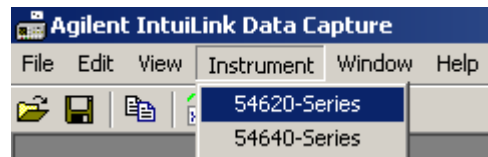

    - <u>Highlight</u> the address from the **Select** Instrument **Address** list for the instrument you wish to connect. (Or double-click to perform Identify task.)
    - Click **Identify Instrument.** The instrument type, name, and address appear in the Identified Instruments list on the right. Instruments supported by your menu selection are in bold type.
    - In the Identified Instruments list, <u>highlight</u> the instrument that you wish to connect. (Or double-click to Connect to it.)
    - Click **Connect**.
    - A green icon appears to the left of the instrument that is connected.
- Once you have established a connection, click OK. Data Capture will **remember** the connection for any future sessions. If the instrument I/O address is changed, be sure to reset the connection.
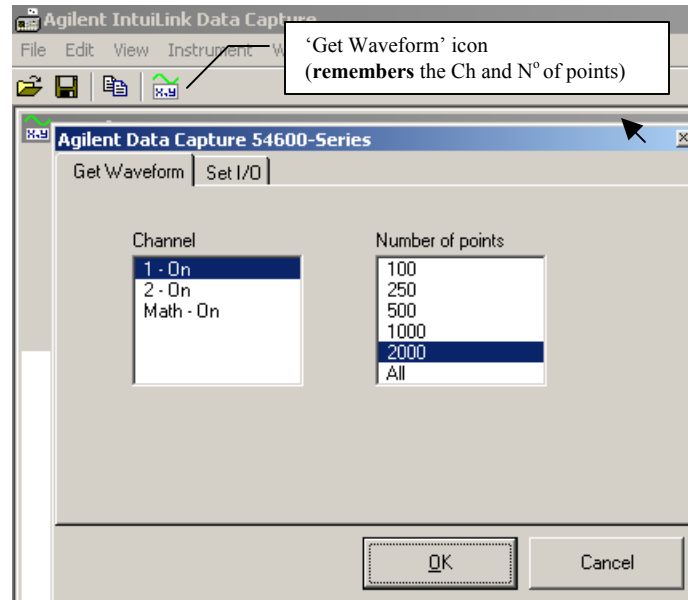
You are now ready to get data from the instrument.

(1a) Getting data from Instrument:

To download data from the instrument, select from the **Instrument** *menu* and select your instrument (or select the 'Get Waveform' icon after Connecting to the Instrument).
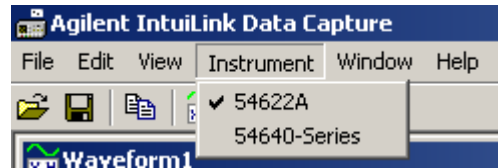
Select the **Channel** and **Number of points** to download:

The OK button of the Instrument *tab* is only enabled when the channel selected is ON. If the channel you wish to download is off, click on Cancel, turn the channel ON at the instrument and return to the Instrument dialog.

Remarks

> When selecting **'All'** points the maximum number of points available will be sent.
>
> > For **Math** the Maximum number of points is 2000.
> > For channel 1-2 the Maximum number of points is **dependent on** the **time base** settings. To achieve a point count *greater than* 2000, the time base must be set to Main (not delayed), the **Acquisition** must be set to Normal, or if set to Average the points must be 1, and Math must be OFF.
> > At **fast** horizontal sweep times (<1usec) the maximum number of points may be 2000.
>
> For large number of points, that may take an extended period of time to download, a dialog will appear to indicate the number of points available and an <u>estimate of time</u> for <u>the download</u>. Click on Cancel if the time and number of points is unacceptable.
>
> See: (1b) and Appendix **C**.

(1b) Display of Waveform Data:

The waveform data is loaded from the oscilloscope as either an array of **bytes** or **integers**. This is done to increase the speed of the download.
To reconstruct the data into the units of volts and seconds scaling factors are downloaded in an array of doubles called the **preamble**.

The data from the oscilloscope is displayed as **'raw data'** in *green* on the graph.

Using the preamble the 'raw data' is reconstructed into volts and seconds (or in case of Math | FFT: dB and Hz) and is displayed in *red* when **'scaled data'** is selected.

> The resolution of the displayed graph is 500 points and therefore not all points are displayed when the data contains more than 500 points.
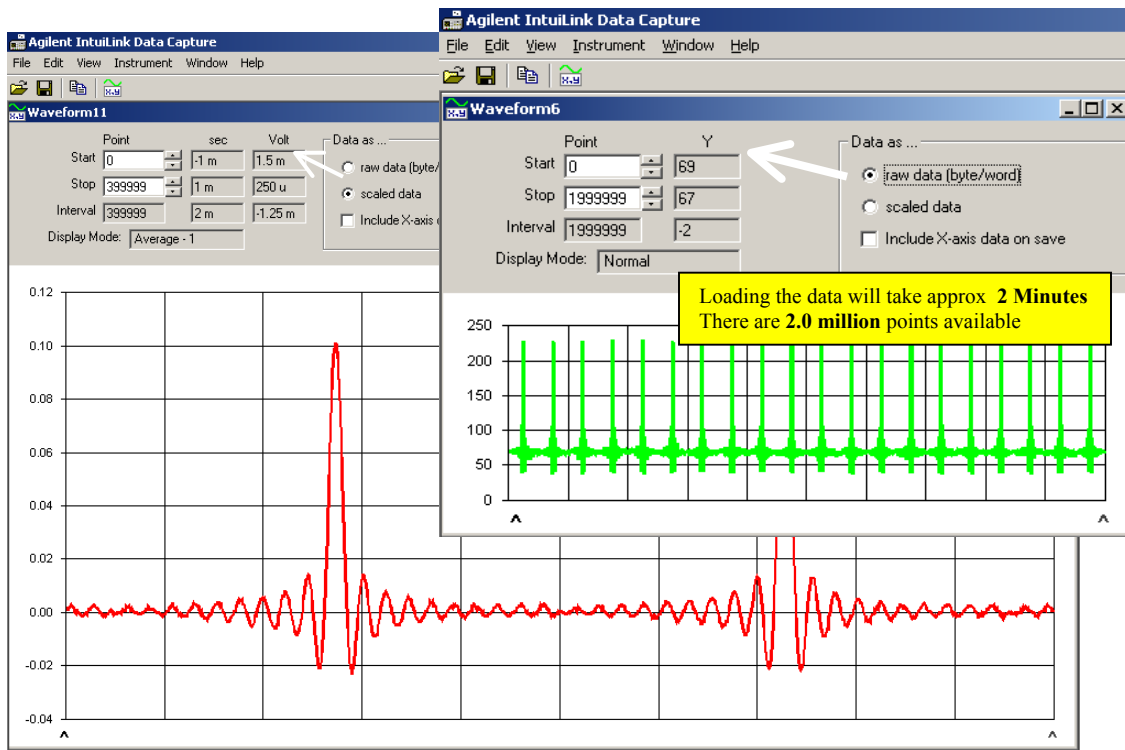
When saving the data to a file or to the clipboard, the data is saved in the *format* indicated in the window. Raw data will take less space.

To reload the data from a text file you **must** save the file as raw data.

(2) Save to File:

You can save data to a file as **text** that can be read by **Excel** or Notepad, or you can save the file as a **binary** file that can be read from a program (see: Appendix **A**).

(a) Text File
The file can be saved in several different formats.

(a1) For minimum size you can save the <u>raw data</u> with or without x-axis data. When saved this way the first two lines represent the **preamble** that provides information about the data. (See: Appendix **B**.)
The x-axis data (saved only when selected on the chart form) will be a simple count from 0 to the maximum points in increments of one.
The y-axis data is saved as a simple **Integer** that is representative of the y-axis. Both the x-axis and the y-axis will have to be reconstructed using the preamble with the provided data.
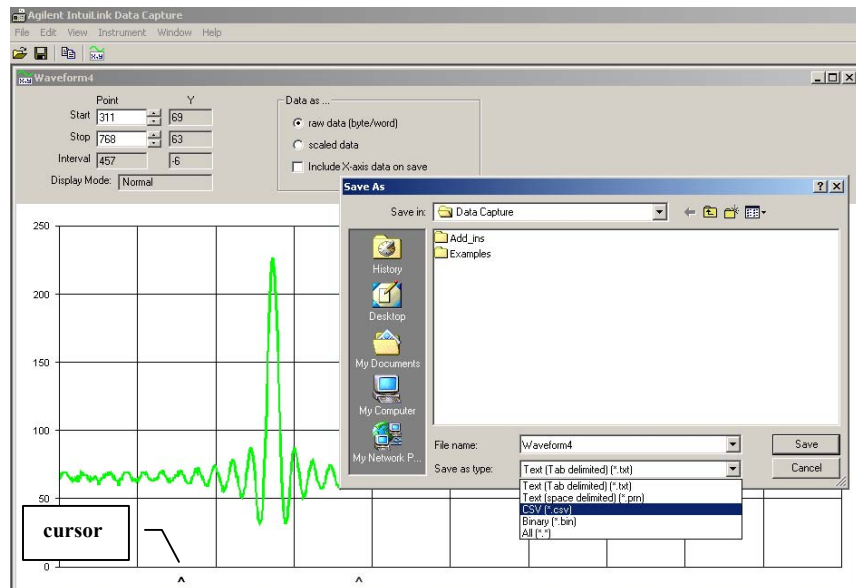
(a2) When the file is saved as <u>scaled (Volts) data</u>, the data is saved in **scientific notation** taking into account the precision of the data. When the x-axis is saved along with the y-axis, a complete x, y pair is saved, but at the expense of a *much larger* file. This can become very important when saving a large number of points.

If you expect to retrieve the data back into the Data Capture application, you **must** save the file as a text file of <u>raw</u> data, **or** as a **binary** file.

Use the **.CSV** file format for easy importing into **Excel**.
Alternately you can 'Copy' the data to the clipboard and then 'Paste' into Excel.

(b) Binary File
Binary data is always saved as <u>raw</u> data <u>with the preamble</u> and <u>no x-axis</u> data.
This is the smallest file size for saving large amounts of data.
Excel can **not** read this file.

(3) Copy to Clipboard:

You can copy the data <u>between</u> <u>the cursors</u> (at the bottom of the chart, see above) to the clipboard along with a picture of the chart with the menu 'Edit, Copy'.
Use 'Copy' to quickly move small amounts of data to **Excel** or **Word**, or to document the chart and the rest of the window.
The <u>maximum</u> data saved to the clipboard is 50 thousand points.

Remarks

Only the **visible portion** of the chart will be copied to the clipboard. If the upper left corner is hidden, it will be moved to make it visible. If either the right or bottom portion of the chart is hidden it will be truncated.

When using the clipboard to paste the chart picture in Word or Excel, use the menu 'Edit, Paste Special' to retrieve the chart picture.

(4) Opening a file:

To open a previously saved file, click on 'File, Open' and select the type of file you wish to open.
Open requires that the file be saved as a text file of <u>raw</u> data, or as a <u>binary</u> file. **Only files saved with this application can be opened.**

Appendix:

(A) File Format

Text files are saved with delimiters to separate the data. Each file type uses a different delimiter. The binary files use no delimiters. The following summarizes the data in these files:

File types	File Extension	Delimiter	Data as
Text	.csv	comma/semicolon	columns
Text	.txt	tab	columns
Text	.prn	space	rows
Binary	.bin	none	N/A

(A1) The **text file** is saved either as a raw scope data, or as scaled data. Additionally it may be saved with the x-axis data.

When saved as <u>raw</u> scope data the **preamble** description is on the first line, the preamble data on the second. The third line is the header for the data to follow.

When saved as <u>real (scaled data)</u> no preamble is saved, only the data header and the data.

(A2) **Binary** data is always saved as raw scope data regardless of the settings in the window. First there are 11 numbers (double precision) for the preamble followed by the y-axis data as either a byte data type or Word data type. Use the preamble and y-axis data to recreate the original data.

Remarks

All the text files save the data in the <u>local</u> format. If the PC country setting uses the decimal for the radix, the numbers in the file will have the decimal as the radix. If the PC country setting use the comma as a radix, the numbers in the file will have the comma as the radix.

For the **.CSV** file, the delimiter is dependent on the country setting.

(B) Reading the binary file

It is always saved as <u>raw</u> scope data regardless of the settings in the window.
First there are 11 numbers (double precision) for the **preamble** followed by the y-axis
data as either a byte data type or Word data type.
Use the preamble and y-axis data to recreate the original data.

1. The preamble consists of 11 doubles (double-precision floating point, 8 bytes). Read these into
an array or as separate values. The first value will be required to know the data type of the
remaining values.
2. Check to see if the 0 bit is set in the first value of the preamble. If the first value has the 0 bit set
then the remaining values will be a word data type, if it is not set the remaining values will be byte
data type
3. Read the remaining data as bytes or words depending on the setting of 2 above.

Preamble

When saving the data to a file as <u>raw</u> scope data, the first part of the file will have the
preamble for the data. The preamble contains the information to reconstruct the data to its
actual values. In a text file **(.txt, .csv,** and **.prn)** the first line in the data is a description of the
preamble, the second line is the preamble data. The data is separated by the delimiter. There
are 11 data points.

<u>Index</u> <u>Description</u>

0	* Data Type; 1-**raw** scope data (word), 2-**Scaled** Data (double),
	4-includes **x-axis** data, 8- **binary** file data
1	Display Mode; 0-Normal, 1-Peak detect; 2-Average
2	The number of points in the file
3	Count for Average mode else 1
4	x increment
5	* x origin
6	x reference
7	y increment
8	y origin
9	y reference
10	* Not from scope; 1-2 analog channels; 5-math;

* These values may not be the same as originally from scope

(C) N^o of points <u>depends on</u> the time base settings

Acquire mode*: Normal (or Avg = 1), CH2 off, Math off

* note: