# 1908-PC Link Software

Introduction

The 1908-PC Link App is a small Windows program for automating the basic functions of the Aim-TTi 1908 DMM while providing some enhancements to its functionality such as a bargraph with minimum and maximum markers and a simple logger with tabular and graphical views.

Requirements

The application is a single executable (1908-PC Link.exe) for use on Windows 32 or 64-bit environments. DirectX 11 or later is required which was provided from Vista SP2 and 7 SP1 or later. No installation is required. Connection to the 1908 hardware can be RS232, USB or Ethernet. Multiple software instances can be run to control more than one hardware instance.

Getting Started

Running the software consists of copying the executable file to a suitable location on your computer and double-clicking it. When you first start the application, you will be presented with a graphic emulation of the front panel of the 1908 hardware. Note that the button layout and display are not exactly the same and that some functions behave in a subtly different manner. All the controls have tooltips which describe their function in the status bar at the bottom when you hover over them.
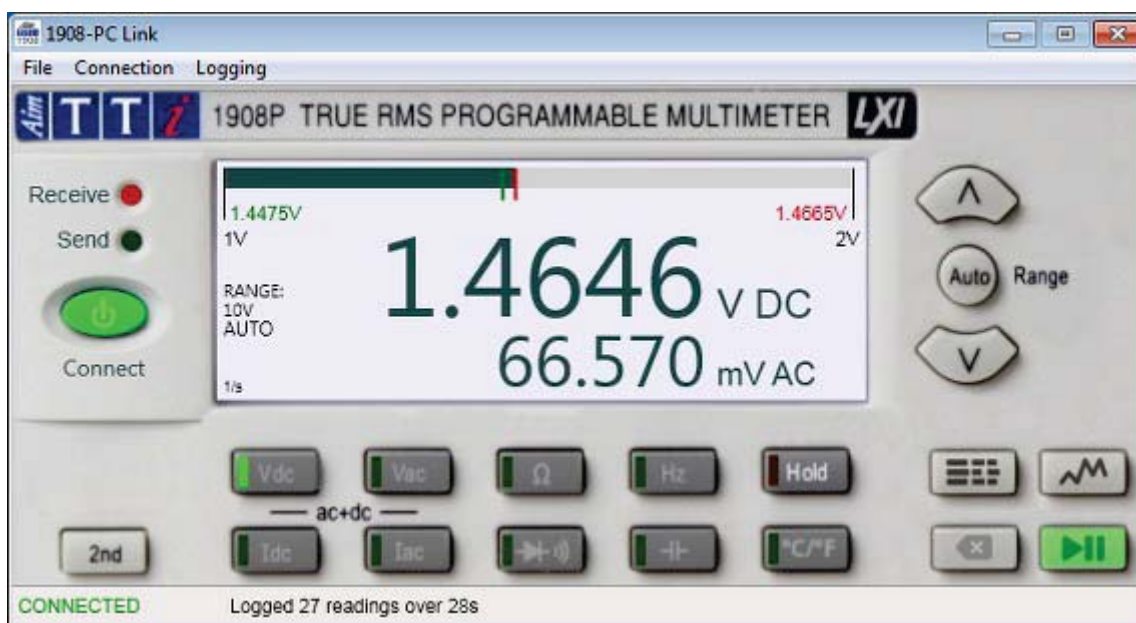
Selecting a connection

From the Connection menu, select "Settings" and the following dialogue will appear:
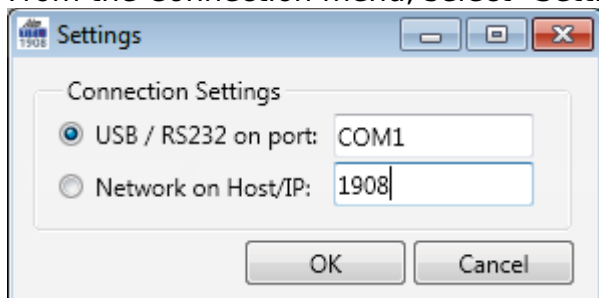
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Since the USB implementation is done using a virtual COM port, the same setting (USB / RS232) works for either RS232 or USB. Simply enter the name of the COM port. The COM port used by USB can be found in Windows Device Manager in the Ports section.

If connecting using an Ethernet connection, select "Network" and enter either the IP address of the device, or, if supported by your network infrastructure, the Hostname. There are third party LXI discovery tools which can locate the device on a network and return the IP address.

The 1908 supports USB connections while on battery power, but for the other two connections, the unit must be on mains power.

Connecting

Connecting to the hardware is achieved by either clicking the green "Connect" button on the software front-panel emulation, or selecting the "Connect" option in the "Connection" menu. The software will attempt to connect to the hardware using the connection settings supplied. This consists of attempting to create a connection to the hardware and then requesting the ID of the connected instrument to check that it is supported. All being well, the software will then begin to update its display to correspond to the display from the hardware. The software does not reset the hardware when it connects.

When the software connects to the hardware, the 1908 hardware is put in "remote" mode and "REM" will appear in its display. This state locks out the majority of the 1908DMM front panel controls. To regain control of the hardware, disconnect the software by clicking the "Connect" button again or selecting "Disconnect" from the "Connection" menu, then press the "Escape" (Local) button on the hardware to put it back in local control mode. You can then make changes to the settings on the hardware and then re-connect the software and the settings will persist. This allows you to use settings on the hardware that you cannot access from the software interface.

Function Selection

While the software is connected to the instrument it is possible to change the measurement function of the main and secondary displays and to change the input range of the primary display. More advanced functions are only available from the instrument front panel. To select the function of the secondary display, first click the "2nd" button and then the required function. Not all functions are applicable to the secondary display. Press the "2nd" button again to return to the settings for the main display. While the "2nd" button is illuminated, the indicators in the function buttons show the function selected for the secondary display.

To select the "ac + dc" functions which are normally selected by clicking on two buttons on the front panel of the hardware, click between the buttons.

Hold Function

The hold function simply stops the software screen readings being updated. It doesn't put the hardware into Hold mode and doesn't stop results being read and logged in the background, or the bargraph/Min/Max functioning.

Range Selection

The measurement range used by the main display of the instrument can be set to automatic or to a manually selected range using the "Range" buttons on the right of the software interface. Clicking the "Up" or "Down" arrows when the hardware is in autoranging mode will take the instrument out of autoranging and select the next range up or down from the automatically selected range. Repeatedly clicking the range up or down buttons will increase or decrease the range. Clicking the "Auto" button puts it back in auto-ranging mode.

Bargraph Display and Min and Max values
The software interface includes a bargraph display that is intended to make it easier to trim or null a circuit by providing an analogue representation of the main display value, along with the minimum, maximum and zero markers. The Bargraph range is completely automatic based on the minimum and maximum values so far encountered. Resetting the min and max values (see below) will effectively zoom the display to the current value. Initially the bargraph scale end values are based on the minimum and maximum values scaled to one significant figure. This can be increased to two or three significant figures (effectively zooming the scale to more closely matching the min and max figures) by clicking on the bargraph. This only updates while the hardware is connected and updating.

The minimum and maximum values are the minimum and maximum values encountered by the software, and may not correspond to the minimum and maximum values seen by the hardware depending on when they were reset etc. The minimum is shown on the bargraph as a green marker with its value shown in green to the left. The maximum is shown in red and to the right.

Resetting Min and Max Values
The minimum is shown on the bargraph as a green marker with its value shown in green to the left. The maximum is shown in red and to the right. These can be reset independently by double-clicking on their respective numeric readings while the unit is connected.

Logging
The software provides a simple log function that records both the main and secondary display values at fixed intervals and displays them in both tabular and graphical form. This is independent from the logging function provided in the 1908 hardware.

Set the read rate for the logger by going to the "Logger Settings" dialogue via the "logging" menu. This is set in seconds. While setting a value less than 1s is possible, the rate at which the readings are taken and relayed to the computer will have an impact on whether the set read rate can be achieved. Set the rate to "0" seconds to run as fast as possible. The read rate is indicated in the bottom left of the screen.

Start and pause the logging by pressing the button

Clear the log by pressing the button

Show and hide the log tabular view by pressing the button

Show and hide the graphical view by clicking the button

There is no defined limit to the number of points that you can log, but it will be practically limited by available memory and processor speed. If measuring a large number of points on a slow computer, it will help to close the graph window as the update rate is likely to slow significantly.

The Graph Window
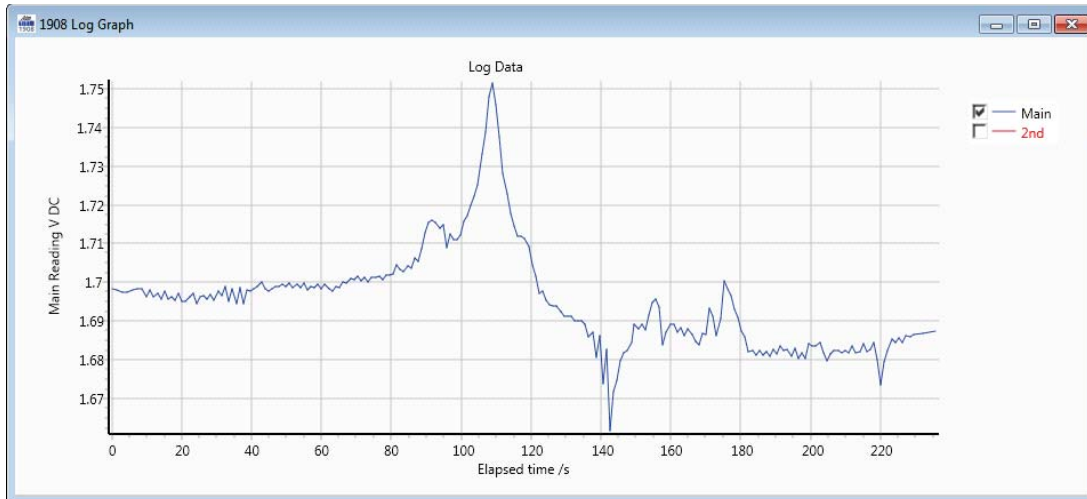
Open or close the graph window by clicking on the ⌃M button. By default the graph window auto-ranges to show all the data points. Managing the displayed data points is done with the mouse:

- Left click and drag the graph to move the view area
- Zoom horizontally using the scroll wheel
- Zoom vertically using the shift key and the scroll wheel
- Zoom both axes using the Ctrl key and scroll wheel
- Zoom in to an area by right clicking and dragging top left to bottom right over the desired area.
  - The zoom area is constrained to the last used zoom action: zoom horizontally to constrain the zoom area to zooming only horizontally (scroll wheel), zoom vertically (shift + scroll) to constrain the zoom area to zooming only vertically. Zoom both (ctrl + scroll) to remove the zoom area constraints.
- Reset the zoom out to the graph extents by right clicking and dragging upwards from right to left.
- To see data point labels, zoom in so that 20 data points or less are visible horizontally.

Export / Import log data

The log data can be exported as a csv file using the "Export log to csv" option in the File menu. Previously exported log data can also be imported using the corresponding import function. This replaces any data in the log at the time. Only data that was exported from the 1908 should be re-imported. Any other CSV data will have unpredictable results.

Downloading the Hardware Log Data

Log data from the hardware can also be downloaded into the software, from where it can be subsequently exported as CSV. This is done using the "Download log from hardware" option in the "File" menu while the hardware is connected. Only the primary display reading is logged in the hardware and there is no time-stamping. Note that if the log contains a large number of readings, this can take a significant time to download. With the Ethernet connection this is downloaded as a single transaction and there is no progress indication. With the RS232 and USB connections, there is an activity indication in the status bar while the download is processed.

Note that the hardware log data is a collection of discrete readings, each with their own measurement unit and no time stamping. For this reason the downloaded log data cannot be displayed on the graph window and the graph window is expected to remain empty.

To plot the downloaded log data, export it to CSV and import into a spreadsheet or graphing utility.

Persisting the Settings

When the software exits, it writes an XML file called "1908_settings.xml" to the folder it was run from storing the connection and window information that was last used. These settings are restored automatically when the software is next started. To reset to defaults, simply delete this file. If running multiple instances of the software to control multiple devices, it may help to run the software from multiple folders.

Logger Read Rate Notes

The speed and timing precision of the logging function is limited by the software architecture. The software takes readings from the hardware as fast as possible and designates which of these values should be used for the log file based on the logging interval. This means that the precision with which the measurement corresponds to a particular moment in time depends quite heavily on the both the hardware measurement rate and the software update rate. The logger uses a millisecond precision timer to request the readings so the drift over time should be minimal, but the precision with which the readings correspond to these moments in time is dependent on the connection interface and the hardware reading rate. How fast the software can read from the hardware will depend on the connection(Ethernet being typically faster than USB and USB being typically faster than RS232), although the reading rate will also depend on the measurement units and the read rate configured in the hardware. The read rate available from the software interface is not as fast as the hardware read rate as the software has additional control overheads. If the secondary display function is not set, it will not be read when the logging function is enabled which speeds up the read rate. In addition, some of the control functionality is shut down while logging so that the read rate can be as high as possible. In summary, to increase the logging rate:

- Use the USB or Ethernet connection in preference to RS232 (GPIB is not supported)
- Don't select a function for the secondary display if it's not needed
- Set the logging interval to zero seconds
- Configure the 1908 hardware speed to "Fast" (from the hardware "utilities" menu - note that this reduces the reading precision)
- Keep the graph window closed while acquiring data (redrawing it slows down the PC)

The theoretical maximum read rate is close to 20/s but is computer and connection dependent.

Troubleshooting

If you see the error message: "Cannot create texture for 'TCanvasD2D'" - You might need to update your DirectX version. Windows Vista before SP2 and the Platform Update or Windows 7 before SP1 may see this. Windows Update should fix it.