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# Agilent IntuiLink Multimeter

*Software for the Agilent Technologies 34401A Multimeter  
and 34420A Nano Volt / Micro Ohm Meter*

## **Getting Started With Agilent IntuiLink**

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# Agilent IntuiLink Multimeter

Software for the Agilent 34401A Multimeter and  
34420A Nano Volt / Micro Ohm Meter

## Software Overview

Agilent IntuiLink offers a set of connectivity tools that enable you to quickly and easily move data from your Agilent 34401A Multimeter and 34420A Nano Volt / Micro Ohm Meter to your PC. Whether you are an experienced programmer or would prefer not to program at all, Agilent IntuiLink is designed to give you a high-level of instrument control using software applications that you are probably already using on your PC.

### For the Non-Programmer — A Simple Toolbar Add-In for Excel and Word

Agilent IntuiLink provides an easy-to-use toolbar that enables you to save instrument settings to a file and retrieve them for later use, insert instrument readings into Microsoft® Excel® or Microsoft® Word®, and log instrument readings in Excel.

Once installed, the toolbar is automatically loaded and operates just like any other toolbar in these applications. Use the **Tools | Add-Ins** menu to add or remove the toolbar from the application. The toolbar is shown below with a brief description of each toolbar button.

**NOTE:** To get started with the toolbar, you will need to open Excel or Word. The toolbar will automatically load when you open Excel. You can load the toolbar from the **Start | Programs | Agilent IntuiLink | 34401A** menu for both Excel and Word.



The toolbar buttons are described on the following page.



**About Agilent Multimeter Toolbar** Returns the software version number and allows you to select the local language for the dialog boxes and help system.



**Connect to Multimeter** Configures the remote interface connection to the multimeter.



**Save / Load Settings** Stores the instrument settings to a file or downloads a previously-stored settings file to the instrument.



**Set Multimeter Functions** Allows setting multimeter functions from the toolbar, or you can choose to set the functions at the instrument's front panel. The Agilent Multimeter toolbar also has Temperature measurement functions for use with a thermistor (5kohm) or RTD for the Agilent 34401A.



**Get Single Measurement** Acquires a single measurement (ac volts, dc volts, resistance, etc.) from the multimeter and places it in the active worksheet or document.



**Logging Data in Excel** Sets up a worksheet template, retrieves measurements at periodic intervals and inserts them in the worksheet. (Excel only)



**Toolbar Help** Provides step-by-step explanations to help you learn to use the toolbar.

### **Excel Macro Support**

You can create a macro for any of the toolbar operations using the Excel macro recording feature. You can then run the macro to automatically "play back" the recorded actions.

## For the Programmer — The Agilent 3494A General Purpose I/O ActiveX Custom Control

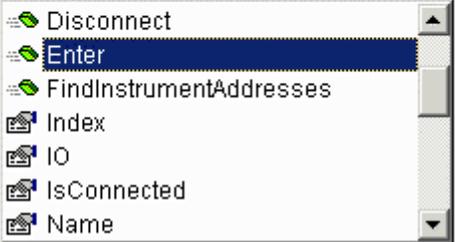
For more sophisticated programming, a General Purpose I/O ActiveX™ Custom Control is provided with Agilent IntuiLink to make it easy to program your multimeter using common programming environments such as Visual Basic®, Visual Basic for Applications® (Excel and Word), and Visual C++®.

The Agilent 3494A Control makes programming in Visual Basic as easy as any other control provided in Visual Basic. Use it to connect to GPIB, or RS232 and send the instrument's SCPI commands. Use the control to send instrument commands and read strings and data from the instrument. The Output and Enter commands are modeled after 'Rocky Mountain Basic'. The powerful number generator provided converts the readings returned by the instrument into a number or array of numbers.

As shown in the sample below, it only takes a few lines of Visual Basic code to take a reading with the instrument. The connection is set and tested using Property Pages during design time.

```
Dim Reading As Double

With dmm
    .Output "Measure:Voltage:AC?"
    .Enter Reading
    .Output "Measure:Voltage:DC?"
    .en
```



To help you become familiar with the structure and operation of the Agilent 3494A Control, we have included several programming examples with Agilent IntuiLink. These files will be loaded on your PC as part of the installation procedure. For more information, navigate to:

**Start | Programs | Agilent IntuiLink | Multimeter | Examples**

Or, look in the folder:

**C:\Program Files\Agilent\IntuiLink\Multimeter\Examples**

We have also included several getting started documents to help you become familiar with the Agilent 3494A Control in Excel, Visual Basic, and C++. For more information, find the file named **agt3494A.hlp** located either in **...\Program Files\Agilent\IOLibraries** or **...\Program Files\Common Files**.

## Toolbar Overview



### About Agilent Multimeter Toolbar

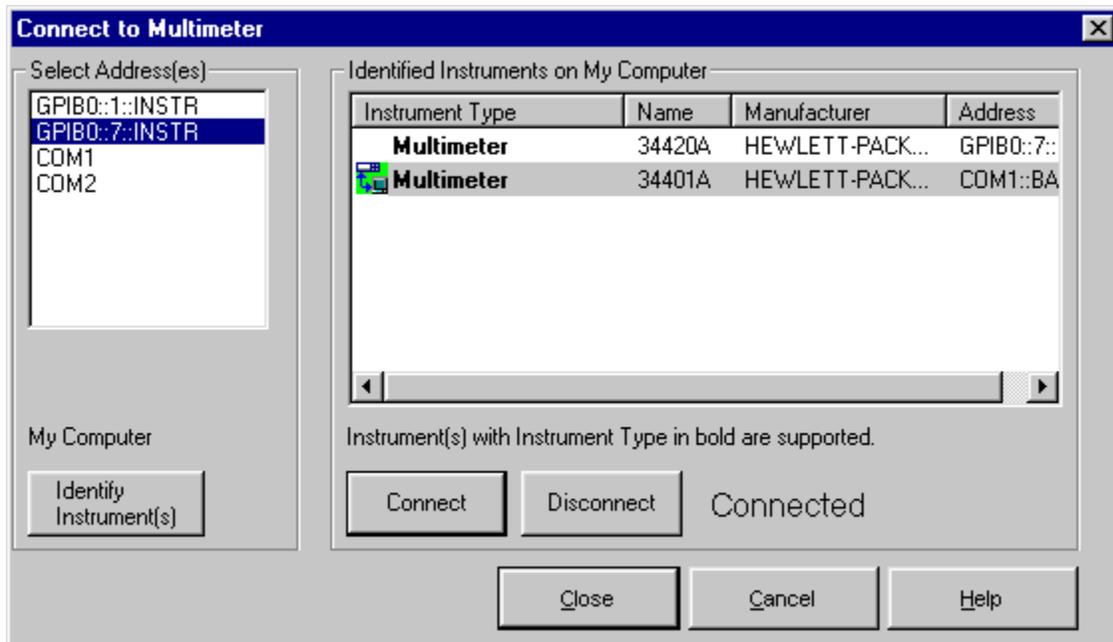
Agilent IntuiLink Multimeter supports English, German, French. In Asian operating systems it also supports Japanese, Korean, Traditional Chinese and Simplified Chinese. Select the language desired.

Click the **About** tab to view the Agilent IntuiLink version information.



### Connect to Multimeter

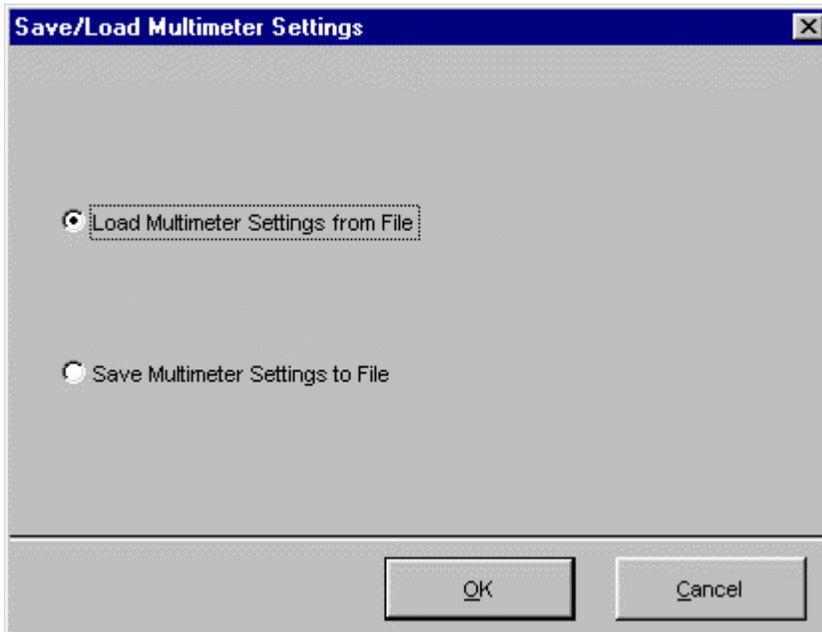
Agilent IntuiLink makes it easy to establish an interface connection between your multimeter and your PC. Whether you are connecting to the multimeter using a GP-IB port or an RS-232 (COM) port, Agilent IntuiLink does the work for you.





## Save / Load Multimeter Settings

Agilent IntuiLink gives you the ability to store the current multimeter settings to a file on your PC or download previously-stored settings to your multimeter. The multimeter settings are stored in a text format (.dmm file extension).





## Set Multimeter Functions

Agilent IntuiLink provides the ability to set the multimeter functions from a dialog box. You can select the function, range, and resolution. You may also choose to use the current instrument settings or get the settings currently in use.

### Agilent 34401A dialog

The screenshot shows the 'Set up Multimeter' dialog box for the Agilent 34401A. It features three main sections: 'Function:', 'Range:', and 'Resolution:'. The 'Function:' list includes Resistance (4W), DC Current, AC Current, DC Ratio, Frequency, Period, Thermistor (5k) (which is selected), and RTD (Type 85). The 'Range:' dropdown is set to 'AUTO'. The 'Resolution:' dropdown is set to '4 digits'. There is a checkbox for 'Use Instrument Settings' which is unchecked. A 'Get Multimeter Settings' button is located below the function list. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

### Agilent 34420A dialog

The screenshot shows the 'Set up Multimeter' dialog box for the Agilent 34420A. It features four main sections: 'Function:', 'Range:', 'Resolution:', and 'Chan'. The 'Function:' list includes DC Voltage, Resistance (2W), Resistance (4W), DC Ratio, DC Difference, Thermistor, RTD, and Thermocouple (which is selected). The 'Range:' dropdown is empty. The 'Resolution:' dropdown is set to '5 digits'. The 'Chan' section has two radio buttons, '1' and '2', with '2' selected. Below these are three more sections: 'TCouple Type' set to 'K', 'TC Ref Junc Source' set to 'Fixed', and 'TC Ref Junc Temp' set to '0'. There is a checkbox for 'Use Instrument Settings' which is unchecked. A 'Get Multimeter Settings' button is located below the function list. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

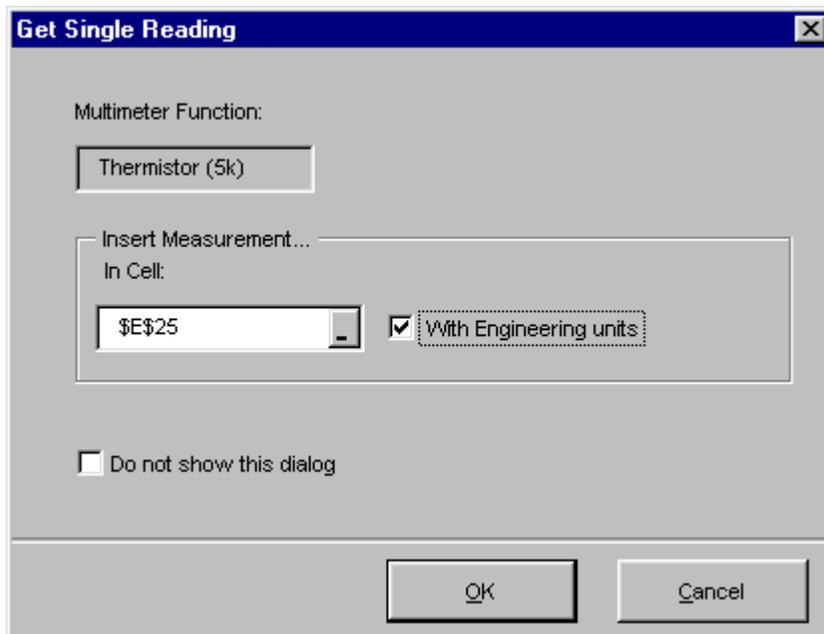


## Get Single Reading

For some applications, you may want to capture a single measurement (voltage, temperature, etc.) and place it in the active worksheet or document.

If you choose not to show this dialog box, a single click of the toolbar button will take a measurement and put the results directly in the open worksheet or document.

### Excel Dialog Box:





## Set Up / Run Logging Worksheet

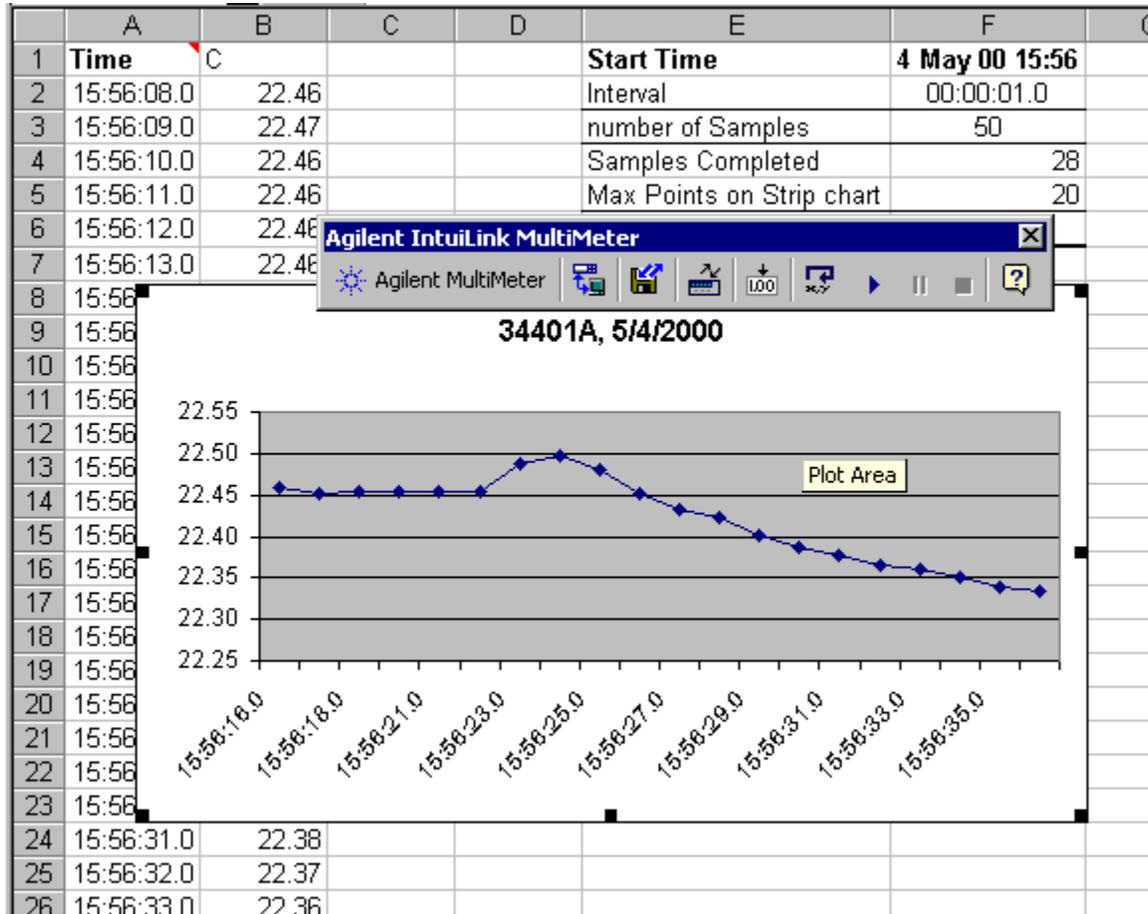
In Excel you can log readings to the worksheet and display the data as a graph or as a strip chart. The logging can be initiated immediately on closing the dialog, at a later time or by an external trigger at the instrument. The chart created is an Excel chart. You can modify it to suit your own requirements.

The screenshot shows the 'Set up/Run Logging Worksheet' dialog box with the 'Logging' tab selected. The 'Begin Logging Data' section has three radio buttons: 'Immediately' (selected), 'At Time' (with input fields for 5/4/00, 15 hh, 48 mm, 12 ss), and 'On receiving external trigger'. The 'With Interval of:' section has input fields for 0 hh, 0 mm, and 1.0 ss.s. The 'Terminating Upon:' section has two radio buttons: 'Number of Readings' (selected, with a text box containing 50) and 'Duration' (with input fields for 0 hh, 0 mm, 50 ss). At the bottom are 'OK' and 'Cancel' buttons.

The screenshot shows the 'Set up/Run Logging Worksheet' dialog box with the 'Chart' tab selected. The 'Chart Type' section has three radio buttons: 'No Chart' (selected), 'Graph', and 'Strip Chart' (with a 'Number of Points' text box containing 20). The 'Place Graph in ...' section has two radio buttons: 'Separate Sheet' (selected) and 'Sheet'. At the bottom are 'OK' and 'Cancel' buttons.

## Logging Data in Excel

In Excel, the time and data are placed in a spreadsheet and, if requested, a chart is created showing the logging data. Details about the logging session are also included on the spreadsheet.



### Toolbar Help

Like most PC applications, a help system is included with Agilent IntuiLink to assist you with the operation of the toolbar. The help system and all dialog boxes are available in multiple languages.

## Software Installation

### Installing Agilent IntuiLink

You can install Agilent IntuiLink from the CD-ROM included with your instrument or you can download the software from the Agilent Technologies web site ([www.agilent.com/find/bi](http://www.agilent.com/find/bi)). Select 'Services and Support' and then select 'Test and Measurement / Technical Support'. Software updates and future releases will also be available from this web site.

After installing the software on your PC, go to the **Tools | Add-Ins** menu in Excel or Word to enable Agilent IntuiLink operations in the selected application. For more information on using the Agilent 3494A Control with Visual Basic, refer to the help file included with the ActiveX Control. Note that all of the necessary I/O functionality is also loaded when you install the software, including the ability to control your multimeter using both Agilent Technologies and National Instruments interface cards and standard RS-232 (COM) ports on your PC.

### Minimum System Requirements

#### PC Operating System Requirements:

Windows® 95 or Windows® 98

Windows NT® 4.0 SP 4 or higher, Windows 2000

Pentium-90

32 MB RAM

20 MB free disk space

#### Environments Supported:

##### Applications

Microsoft Excel 97, Excel 2000

Microsoft Word 97, Word 2000

##### Software Development

Visual Basic 5.0/6.0

VBA 5.0/6.0

Agilent VEE 5.0 or greater

Visual C/C++ 5.0/6.0

#### Instruments Supported with Toolbar:

Agilent 34401A

Agilent 34420A

## **Supported Instruments**

**Agilent 34401A Multimeter**

**Agilent 34420A Nano Volt / Micro Ohm Meter**

## **Supported PC-to-Instrument Interfaces**

### **GPIB Interface**

#### **Supported using Agilent SICL (Standard Instrument Control Library):**

Agilent 82335B

Agilent 82340A/B/C

Agilent 82341A/B/C/D

Agilent 82350A

#### **Supported using National Instruments NI-488.2 Library:**

National Instruments AT-GPIB/TNT

National Instruments PCI-GPIB

National Instruments PCMCIA-GPIB

### **RS-232 Interface:**

COM1

COM2

COM3

COM4

## Task Reference: **Toolbar for Excel**

Agilent IntuiLink provides an easy-to-use toolbar that enables you to save instrument settings to a file and retrieve them for later use, insert instrument readings into Microsoft® Excel®, and log instrument readings in Excel.

Once installed, the toolbar is automatically loaded and operates just like any other toolbar. Use the **Tools | Add-Ins** menu to add or remove the toolbar from the application.



### **Connect to the DMM**

1. Make sure that your Multimeter is physically connected to your computer and turned on and that the correct cable is used. (RS232 cable; Agilent Part Number 5182-4794)
2. Click 'Connect to Multimeter' on the toolbar.
3. Highlight the address from the Select Instrument Address list for the instrument you wish to connect..
4. Click Identify Instrument(s). The instrument type, name, and address appear in the Identified Instruments list on the right. Instruments supported by the Multimeter toolbar are in bold type.

**Tip:** You can double-click on the instrument address to perform the 'Identify Instruments' task.

5. In the Identified Instruments list, highlight the instrument that you wish to connect.
6. Click Connect.  
A green icon appears to the left of the instrument that is connected.

**Tip:** You can double-click on the instrument to connect to it.

7. Once you have established a connection, click Close to close the dialog. The toolbar will remember the connection for any future sessions. If the instrument I/O address is changed, be sure to reset the connection.



### **Change or retrieve the multimeter settings**

1. Click Instrument Settings on the Agilent Multimeter toolbar
2. To manually set the instrument instead of using the toolbar, check the Always use the Instrument Settings check box.
3. If you wish to change the functions from the toolbar leave that check box unchecked.
4. Select the function and other relevant parameters or click Get DMM settings to set the dialog box to the present DMM settings.
5. Click OK

#### **Remarks:**

The settings in the DMM Settings dialog will be used for single readings, and logged readings as long as the **Always use the Instrument Settings** is not checked.



## Capture a single measurement from the DMM

1. Click Get Display Reading on the Agilent toolbar.
2. The currently selected DMM function is shown.
3. The active cell in the current worksheet is selected.
4. Choose 'Use Eng Units' to have the measurement displayed as a number annotated by units. The number will be put in the worksheet cell selected and the units will be put in the next cell to the right. Clear the check box to obtain only the measurement data.
5. Click OK.



## Save the current Multimeter settings to a file

1. Click Save / Load instrument Settings on the Agilent Multimeter toolbar.
2. Select 'Save Instrument Settings to File' and then click OK.
3. Navigate to the desired directory on your PC and enter a file name (.dmm file extension).
4. Click Save to store the file.



## Download previously stored settings to the Multimeter

1. Click Save / Load Instrument Settings on the Agilent Multimeter toolbar.
2. Select 'Load Instrument Settings From File' and then click OK.
3. Navigate to the desired directory on your PC and open the previously stored file (.dmm file extension)
4. Click Open to open the file and download the stored settings to the Multimeter.



## Open a logging worksheet and log data

1. Click Make Logging Worksheet on the Agilent toolbar.
2. Click the Logging tab. Select when the logging should begin. You may select either 'Immediately' or at a time you enter.
3. Select the logging interval by entering the hour (hh) minute (mm) or second (ss.s) values. You may enter either the number of samples to take, or select the logging duration as hh,mm,ss. Ensure that the logging interval is greater than the reading time for a consistent time stamp. Refer to the multimeter reading times listed below.
4. Alternately you can select 'External Trigger'. When External Trigger is selected, the logging will begin when an external trigger is received. Any subsequent triggers are ignored.
5. Click the Chart tab. You may select the type of chart to make and whether the chart is to be included in the current worksheet or in a separate worksheet.
6. Click OK.
7. Logging will begin according to the settings you made. While the logging is in progress, you can:



Start logging or continue paused logging.



Pause the logging.



Stop the logging.

### 34401A Reading times

The following approximate reading times are in seconds for GPIB. For RS232 at a Baud rate of 9600 add 70 msec. When setting the interval for logging, insure that the interval is larger than the reading times of the instrument. Higher resolution will take longer but will result in less noise and better accuracy. The time it takes to insert the data on to the worksheet is dependent on your PC.

#### DC Volts, DC Current, Resistance and Temperature

Resolution	Time per reading	Integration Time: 60 Hz (50Hz) line frequency
4 digit	0.04 sec	3.3 msec (4 msec)
5 digit	0.07 sec	16.7 msec (20 msec)
6 digit	0.4 sec	167 msec (200 msec)

#### AC Volts and AC Current:

Resolution	Time per reading
slow	7 sec
medium	1.1 sec
fast	0.6 sec

#### Frequency and Period:

Aperture	Time per reading
0.01 sec	1.1 sec
0.1 sec	1.2 sec
1 sec	2.1 sec

### 34420A Reading Times

The following reading times are approximations in seconds for GPIB. For RS232 at a Baud rate of 9600 add an additional 70 msec. When setting the interval for logging, insure that the interval is larger than the reading times of the instrument. Higher resolution will take longer but will result in less noise and better accuracy. The time it takes to insert the data on the worksheet is dependent on your PC and must also be considered.

Resolution	Time per reading	Integration Time: 60 Hz (50Hz) line frequency
5 digit	0.08 sec	16.7 msec (20 msec)
6 digit	0.40 sec	333 msec (400 msec)
7 digit	0.70 (.80) sec	667 msec (800 msec)

## Delete the Agilent Toolbar from Excel

1. From the Tools menu in Excel, select Add-Ins.
2. Clear the check box next to 'Agilent Multimeter Toolbar'. Make sure that the box is not checked.
3. Click OK.

## Automate tasks using an Excel macro

You can automate the operations on the Agilent Toolbar using an Excel macro. You can then run the macro to automatically "play back" the recorded actions. Refer to the Excel help system for more information on using macros.



### Select the local language

- 1 Click **About Agilent Multimeter** on the toolbar.
- 2 Click the **Select Language** tab.
- 3 Select the desired language. The dialog boxes and help system will appear in the selected language.
- 4 Click **OK**.

## Task Reference: **Toolbar for Word**

Agilent IntuiLink provides an easy-to-use toolbar that enables you to save instrument settings to a file and retrieve them for later use, and insert instrument readings into Microsoft® Word®.

Once installed, the toolbar is automatically loaded and operates just like any other toolbar. Use the **Tools | Add-Ins** menu to add or remove the toolbar from the application.



### **Connect to the DMM**

1. Make sure that your Multimeter is physically connected to your computer and turned on and that the correct cable is used. (RS232 cable; Agilent Part Number 5182-4794)
2. Click Connect to Multimeter on the toolbar.
3. Highlight the address in the Select Address list of Find Address dialog.
4. Click Identify Instrument(s). The instrument type, name, and address appear in the Identified Instruments list on the right. Instruments supported by the Multimeter toolbar are in bold type.

**Tip: You can double-click on the instrument address and the instruments at that address will appear in the Identified Instruments list.**

8. In the Identified Instruments list, highlight the instrument that you want to connect.
9. Click Select Instrument and Close to connect the selected instrument and return to the application.  
A green icon appears to the left of the instrument that is connected.

*If you do not know the address, you have two options:*

**a.** You can select the address that you think may be correct and click the **Identify Instrument(s)** button to determine the type of instrument at that address.

**OR**

**b.** You can select more than one address (hold down the **Shift** key while clicking with the mouse or hold down the **CTRL** key while dragging the mouse) and click **Identify Instrument(s)**. All the instruments at the selected addresses are listed, with the instruments supported by the toolbar in bold.



### **Change or retrieve the multimeter settings**

1. Click Instrument settings on the Agilent Multimeter toolbar
2. If you wish to set the instrument manually and not have the toolbar effect the settings, then check the 'Always use the Instrument Settings' check box.
3. If you wish to change the functions from the toolbar leave that check box unchecked.
4. Select the function and other relevant parameters or click Get DMM settings to set the dialog box to the present DMM settings.
5. Click OK

#### **Remarks:**

The settings in the DMM Settings dialog will be used for single readings, and logged readings as long as the **Always use the Instrument Settings** is not checked



## Capture a single measurement from the DMM

1. Click Get Display Reading on the Agilent toolbar.
2. The current selected DMM function is shown.
3. The active document is selected.
4. Choose 'Use Eng Units' to have the measurement displayed as a number annotated by units. The number and units will be put in the document selected. Clear the check box to obtain only the measurement data.
5. Click OK.



## Save the current Multimeter settings to a file

1. Click Save / Load instrument Settings on the Agilent Multimeter toolbar.
2. Select 'Save Instrument Settings to File' and then click OK.
3. Navigate to the desired directory on your PC and enter a file name (.dmm file extension).
4. Click Save to store the file.



## Download previously stored settings to the Multimeter

1. Click Save / Load Instrument Settings on the Agilent Multimeter toolbar.
2. Select 'Load Instrument Settings From File' and then click OK.
3. Navigate to the desired directory on your PC and locate the previously stored file (.dmm file extension)
4. Click Open to open the file and download the stored settings to the Multimeter.



## Select the local language

1. Click About Agilent Multimeter on the toolbar.
2. Click the Select Language tab.
3. Select the desired language. The dialog boxes and help system will appear in the selected language.
4. Click OK.

## Technical Support

### Complimentary Start-Up Assistance

#### Terms and Conditions

Agilent Technologies (Agilent) will provide Start-Up Assistance at no charge to resolve questions relating to the installation, operation, and use of this software product. Start-Up Assistance is available to help you install the software on your PC, establish communication with a compatible instrument, and answer questions relating to the functionality of the software components provided by Agilent. Start-Up Assistance does not support requests to modify or enhance the functionality of the software. For services not covered by Start-Up Assistance, you may be referred to fee-based services for advanced assistance.

Agilent will make reasonable efforts to respond to each customer request for Start-Up Assistance within two working days, but is under no obligation to respond within a prescribed time frame. Requests for Start-Up Assistance are handled in the order in which they were received. Agilent will make reasonable efforts to solve customer problems, but cannot guarantee success.

*Agilent Technologies reserves the right to terminate Start-Up Assistance at any time without notice.*

## Contacting Agilent for Technical Support

Country	Telephone	Fax	E-Mail
Australia	1 800 629 485	03 9272 0749	info_tmo@agilent.com
Austria	(01) 25000-7006	(01) 25000-6558	messtechnik_vertrieb@hp.com
Bangladesh	880-2-9130480	880-2-871034	jiu@bangla.net
Belgium	32-2-778.34.13	32-2-778.34.14	---
Brazil	(+55 11) 7297-8600	(+55 11) 7297-8171	tmobrasil@hp.com
Canada	877 894-4414	(905) 206-4120	---
China	86 10 65645261	86 10 65668250	HPAcademy_China@hp.com
Czech Republic	+420 2 333 21707	+420 2 333 20672	haasz@hstest.cz
Denmark	45 99-15-15	---	---
Europe	---	31 20 547 7700	ots_europe@hp.com
Finland	358-10-885 2100	---	---
France	01 69 29 4114	01 69 82 6535	---
Germany	---	(0180) 524-6335	messtechnik_vertrieb@hp.com
Hong Kong	(852) 2599 7889	(852) 2506 9256	---
Hungary	(36) 1 382 6006	(36) 1 382 6001	---
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Ireland	01 205 4538	---	---
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Japan	81-426-56-7832	81-426-56-7840	mac_support@om.jpn.hp.com
Korea	82/2-769-0800	82/2-784-5839	asia_ots-korea@agilent.com
Luxembourg	32-2-778.59.50	32-2-778.59.51	---
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Spain	34 91 631.13.23	34 91 631.14.69	---
Sri Lanka	94-74-717 701	941-504 340	dayankaru@sscomp.co.ae
Sweden	(08) 444-2277	46 8 444-2525	---
Switzerland	---	(0180) 524-6335	messtechnik_vertrieb@hp.com
Taiwan	0800-47866	---	---
Thailand	(02) 661-5900	(02) 661-6420	---
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United Kingdom	01344-366666	---	---
United States	800 452 4844	888-900-8921	---
Viet Nam	844-8-229808	844-8-229553	sysco.vn@hn.vnn

