

## Chapter 2: The TekExcel Toolbar

### *Using the TekExcel Toolbar with Microsoft™ Excel*

#### Introduction

This chapter introduces you to the TekExcel Toolbar—a multi-purpose toolbar that allows you to place data from your Windows-based oscilloscope directly into an Excel document simply by clicking a few buttons. Easy acquisition is the heart of the toolbar. You can make single or repeated captures of data on a triggered, periodic, or timed basis, with the option of also graphing the data. Figure 6 shows the TekExcel Toolbar, which includes six button icons.



**Figure 6: The TekExcel Toolbar in Excel**

No programming is required in order to use the TekExcel Toolbar; however, the Visual Basic source code for the toolbar is available on the companion CD for experienced VB programmers who wish to modify toolbar features for their own use. In later chapters of this book, you will learn how to build less complicated VBA programs that implement some of the functions built into this toolbar.

#### **Toolbar Prerequisites**

You can use the TekExcel Toolbar with Microsoft Excel<sup>1</sup> running either on your Tektronix Windows-based oscilloscope or on a separate PC connected by a network to your oscilloscope. The oscilloscope and connected PC (if any) must each have TekVISA installed on it in order to establish a connection between Excel and your oscilloscope. See Appendix B for information about configuring access to networked oscilloscopes.

<sup>1</sup> The toolbar runs as an Add-In to Microsoft Excel 2000 and XP.

### Toolbar Features

The TekExcel Toolbar enables rapid capture of oscilloscope data from within Microsoft Excel worksheets. Table 3 describes the six buttons on the toolbar that work with the TDS5000, 6000, and 7000. Some other instruments do not offer all six buttons.

**Table 3: Summary of TekExcel Toolbar buttons**

Icon	Button Name	Meaning
	<b>Connect</b>	Chooses the TekVISA-enabled oscilloscope with which to connect.
	<b>Settings</b>	Saves oscilloscope settings to a file or Excel workbook, and restores oscilloscope settings from a file or Excel workbook. Settings saved into a workbook are automatically loaded into the oscilloscope when the workbook is opened.
	<b>Waveform</b>	Captures waveform data into a worksheet and graphs it.
	<b>Measurement</b>	Captures and graphs single or periodic waveform measurements.
	<b>Trigger Capture</b>	Captures waveform data from an oscilloscope-defined trigger, places it into a worksheet, and graphs it.  <b>Note:</b> The TDS5000, 6000, and 7000 support this toolbar button. Other instruments do not.
	<b>Help</b>	Launches the online help file for the TekExcel Toolbar.

The toolbar is easy to use. Click a button and a dialog box appears. Within dialog boxes, you can select the type of data you want to capture and automatically paste into Excel, along with an optional line chart.

If you let your mouse linger over a button, a tool tip will appear indicating the button's function. Clicking the **Help** button launches an online help file for the TekExcel Toolbar (see page 34).

### Adding the TekExcel Toolbar to Excel

The TekExcel Toolbar is an Excel Add-In. During toolbar installation, the toolbar file (**TekExcelToolbar.xla**) is normally placed in a subdirectory of the main TekVISA files.<sup>2</sup>

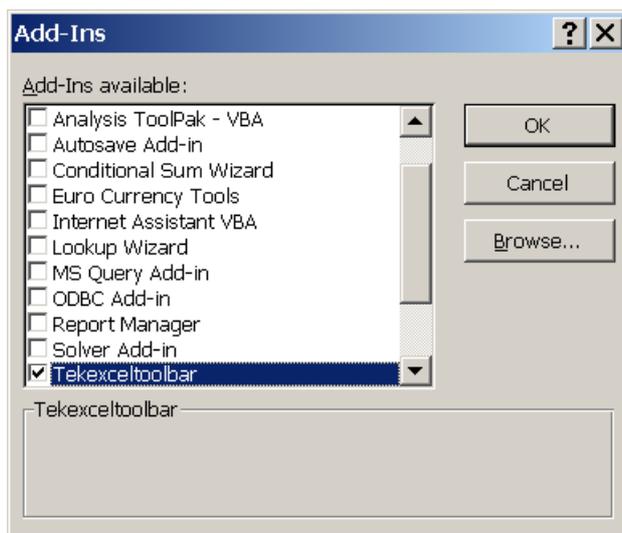
<sup>2</sup> Assuming you are installing on the C: drive on a Windows 98 system, the toolbar is placed in C:\VXI\pnp\Win95\TEKvisa\ExcelToolbar\TekExcelToolbar.xla. On a Windows NT system, the toolbar is placed in C:\VXI\pnp\WinNT\TEKvisa\ExcelToolbar\TekExcelToolbar.xla.

When you first install the TekExcel Toolbar, follow these steps to add it to Excel:

Start up Excel and select **Tools > Add-Ins...** from the Excel menu bar.

The Add-Ins dialog box appears.

Select the check box next to **TekExcel Toolbar** in the list of choices. If the TekExcel Toolbar does not appear in the list, click the **Browse...** button, navigate to the appropriate directory, and select the **TekExcelToolbar.xla** file.



Click **OK**.

The TekExcel Toolbar appears undocked in the Excel program.



Leave the toolbar undocked, or drag it up to the Excel Formatting Toolbar if you want it to remain docked in a fixed position.

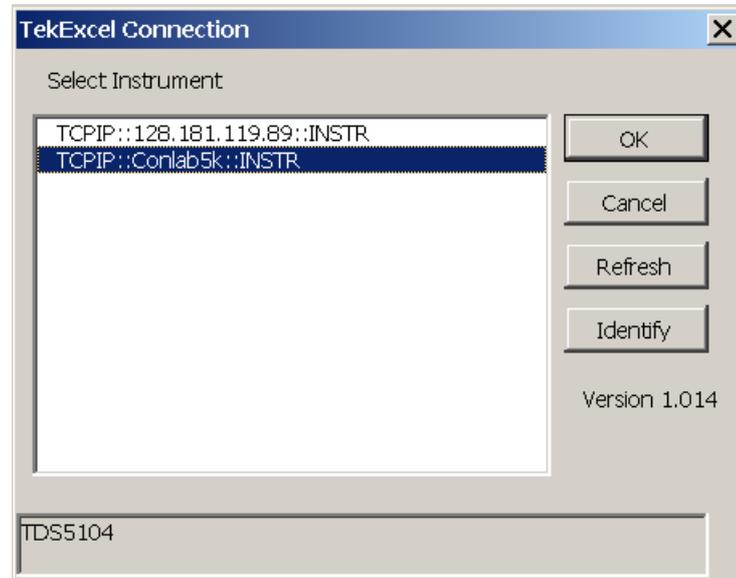
## Connecting to Oscilloscopes

The **Connect** button on the TekExcel Toolbar allows you to select a TekVISA-enabled oscilloscope with which to establish a connection.

To connect to a Tektronix Windows-based oscilloscope from within Excel:

1. Click the **Connect** button on the TekExcel Toolbar.

A dialog box similar to the following appears:



2. By default, the first GPIB device encountered in the instrument list is selected.
3. Leave the selection as is, or select another instrument with which to connect and click **OK**.

The connection with the selected instrument is made. You may only connect to one instrument at a time using the TekExcel Toolbar.

**Note:** Click the **Refresh** button to display any changes to the list of connected devices since the last time you clicked the **Connect** button.

Click the **Identify** button to display the instrument model number at the bottom of the dialog box.

## Saving and Restoring Scope Settings

The **Settings** button on the TekExcel Toolbar allows you to save oscilloscope settings to a file or to an active Excel workbook, and restore them later to the oscilloscope.

If you save settings to an active worksheet and then save and reopen the associated Excel **.xls** file, the settings are automatically assigned to the oscilloscope.

If you save settings to a file, you have the option of placing a descriptor in the settings file. The file can take one of two forms:

- **Files with a .set extension** are identical to settings saved from within the oscilloscope.
- **Files with an .stg extension** contain both the oscilloscope settings and a **descriptor** that you specify when saving the settings. Descriptors may be up to 256 characters in length and can serve as useful reminders when you are storing many different oscilloscope settings on disk. Descriptors also provide an alternative to long file names as a way of differentiating files.

### Save Settings from the Scope

Display Current Settings from the Scope

To capture and display oscilloscope settings:

1. Click the **Settings** button on the TekExcel Toolbar.  
  
A dialog box labeled TekExcel Settings appears.
2. Click the **Scope** button in the upper-left pane labeled **Get Settings from**.

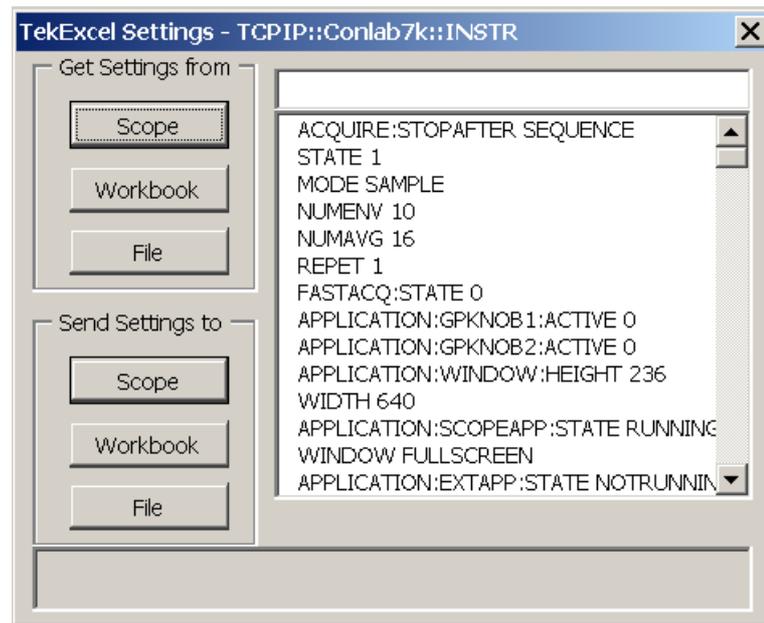
Settings from the oscilloscope appear in a scrollable list box on the lower-right pane.

Save Scope Settings to a Workbook

To save current oscilloscope settings to the Excel workbook:

1. Click the **Workbook** button in the lower-left pane labeled **Send Settings to**.

Oscilloscope settings are saved into an invisible worksheet in the workbook named **ExcelVISASettings**. When you save your work under Excel, this worksheet is stored inside your .xls file.



**Note:** To make the **TekExcelSettings** sheet visible:

- Press **Alt+F11** to open the Visual Basic for Applications editor.
- Press **Ctrl+G** to open the Immediate Window.
- Type the following line exactly as shown (the name is case-sensitive):

```
Activeworkbook.Worksheets("TekExcelSettings").Visible = True
```

- Press **Enter**

A tab for the worksheet now appears, with the oscilloscope settings stored in a single cell of the sheet. The worksheet remains visible until you type the following line in the Immediate Window and press **Enter**:

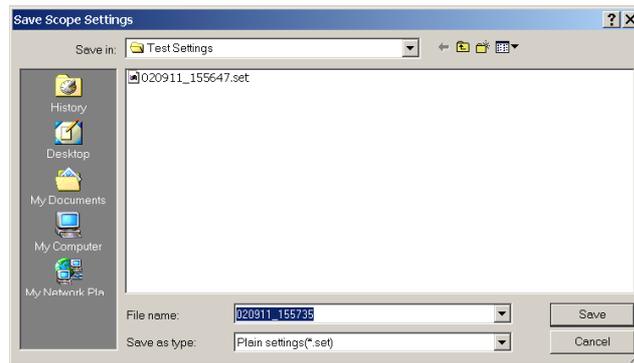
```
Activeworkbook.Worksheets("TekExcelSettings").Visible = False
```

#### Save Scope Settings to a File

To save the current oscilloscope settings to a file:

1. If desired, type in a descriptor for the current oscilloscope settings in the edit box on the upper-right pane of the TekExcel Settings window
2. Click the **File** button in the lower-left pane labeled **Send Settings to**.

A Save Scope Settings box appears, as shown below.



The default name of the file is a date/time representation in the format *yymmdd\_hhmmss* (using two-digit representations of year/month/day\_hour/minute/second). For instance, the file name 010412\_183303 represents April 12, 2001 at 6:33:03 PM.

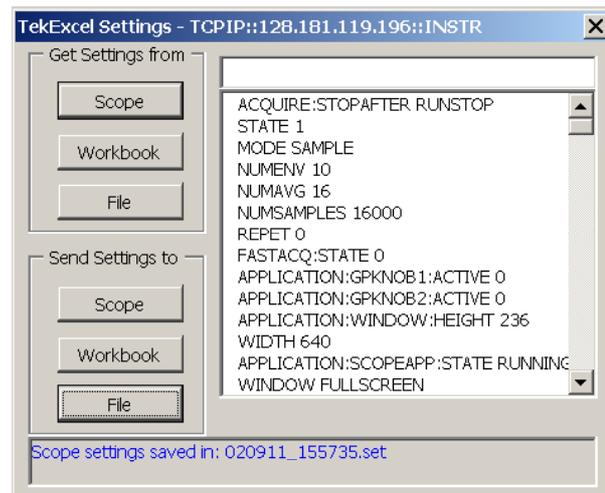
If the descriptor edit box:

- is empty, the default file type in the Save Scope Settings box is **.set**.
- contains text, the default file type in the Save Scope Settings box is **.stg**.

Regardless of the file type presented, you can still select a different scope settings file type from the Save as type field in the Save Scope Settings box.

3. Leave the file name and type as is, or change the name and/or type to your preferences.
4. Click **Save** to save the file under the selected name and type.

A message appears at the bottom of the TekExcel Settings dialog box confirming the location of the saved file.



### Assign Stored Settings to the Scope

#### Assign Settings from a Workbook

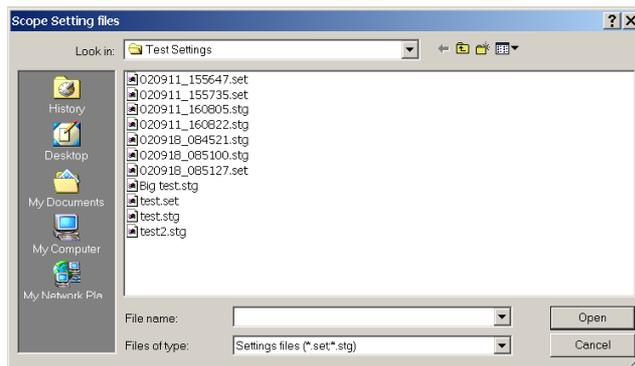
When you save your work under Excel, the **TekExcelSettings** worksheet is stored inside your .xls file. When you open the Excel file later, the settings saved in the workbook are automatically loaded into the oscilloscope by a stored Excel macro. If for some reason this macro fails to execute, you can assign settings stored in the workbook by taking the following steps:

1. Click the **Settings** button on the TekExcel Toolbar.  
A TekExcel Settings box appears.
2. Click on the **Get Settings from Workbook** button.
3. Click on the **Send Settings to Scope** button.

#### Assign Settings from a File

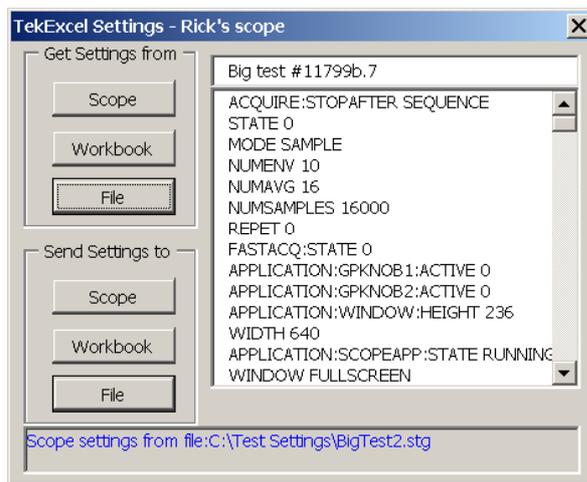
To assign settings to the oscilloscope from those stored in a file:

1. Click the **Settings** button on the TekExcel Toolbar.  
A TekExcel Settings box appears.
2. Click on **Get Settings from File** button.  
An Scope Settings files box appears showing (.set) and (.stg) files.



3. Select the desired file and click **Open**.

Settings appear in the TekExcel Settings box. The settings are assigned to the oscilloscope. For settings stored in (.stg) files, the descriptor also appears above the list box as shown:



## Capturing and Graphing Waveforms

The **Waveform** button on the TekExcel Toolbar allows you to capture the time and values of a single waveform sequence into the current worksheet, beginning at a chosen cell location. You select the type of waveform (such as Sample or Average—see page 42) on the oscilloscope before the capture.

Waveform data from all selected channels is captured and placed into the active sheet. The waveform capture is limited to 65000 rows of data, the approximate number of rows in Excel spreadsheets.

You also have the option of charting the waveform data. You can have the chart inserted into the active sheet or a separate sheet.

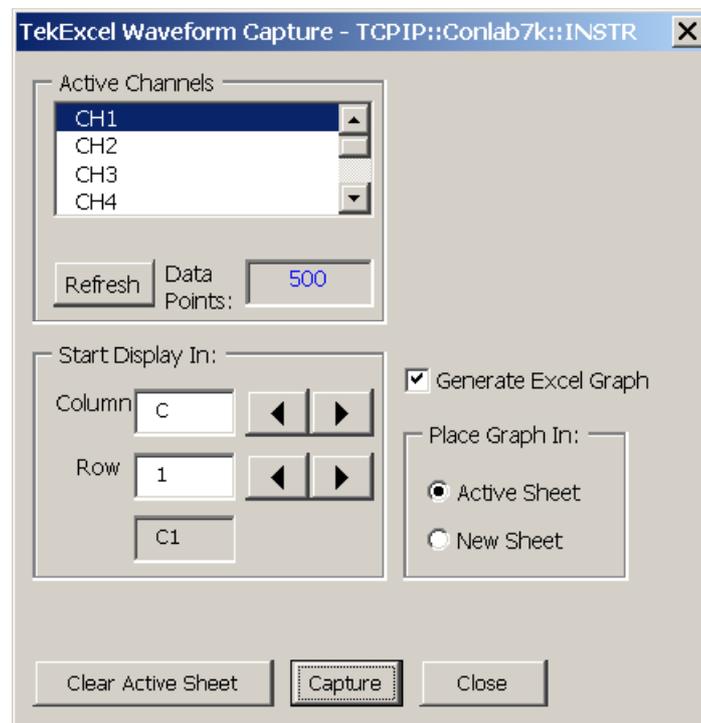
**Note:** If you want to capture triggered waveform data instead of a single untriggered sequence, see the **Trigger Capture** button on page 31.

For information about clearing the active sheet, see page 24.

To capture waveforms into an Excel spreadsheet and, optionally, graph it:

1. Select the **Waveforms** button on the TekExcel Toolbar.

A dialog box similar to the following appears:



All active channels are displayed, along with the number of data points in the waveform sample, derived from oscilloscope settings.

**Note:** You can click the **Refresh** button to display any oscilloscope changes to the number of active channels, the measurement source channel, or the number of data samples.

2. Select the channel(s) from which you want to capture data. (Hold down the **Ctrl** key while clicking if you want to make multiple selections.)
3. Select the starting cell in which to begin inserting the waveform, or leave the default as is (**A1**).

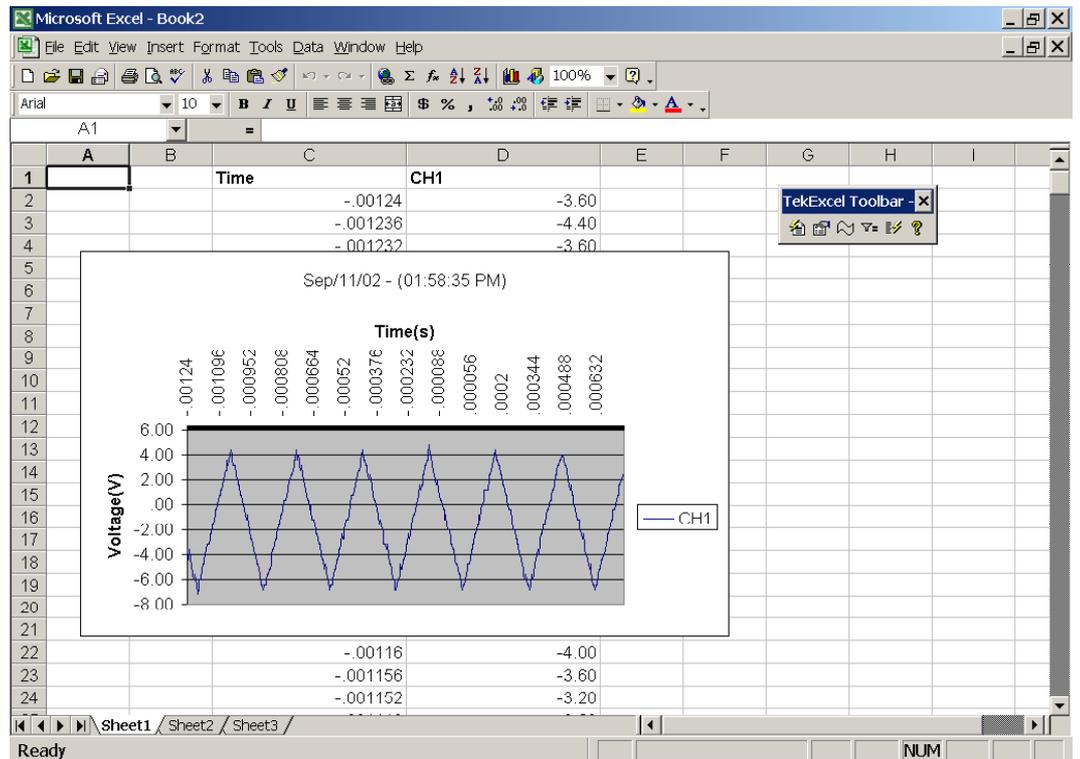
You can specify the starting cell either by scrolling through the column and row values, or by directly entering the row and column

values in the edit boxes under the Start Data Display heading. Possible Excel starting cells range from A1 to AZ99. Starting cell designations must take the A1-style format rather than the R1C1-style format (explained on page 68).

4. If you want to generate an Excel graph on completion of the waveform capture, select the **Generate Excel graph** check box to enable the graph placement option buttons, and click **Active Sheet** or **New Sheet**, depending on where you want the chart inserted.
5. Click **OK** to start the acquisition and display the data in the active sheet starting at the designated cell.

A single time column is displayed and the data values from all selected channels appear in successive columns (with a maximum of 65000 rows).

If you checked the box to graph the data, a stacked line graph appears after the capture, either in the active sheet (as shown here) or in a separate chart sheet. If necessary, you can modify this chart using Excel.



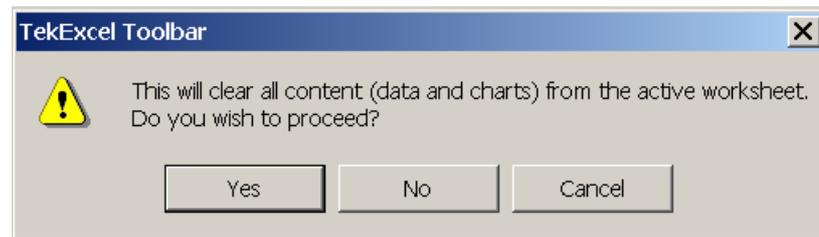
## Clearing the Active Sheet

The **Clear Active Sheet** button is available on the dialog box displayed when you click the **Waveform**, **Measurement**, or **Trigger Capture** buttons on the toolbar. Behavior is the same in all three cases.

To clear the active sheet (data and charts):

1. Click the **Clear Active Sheet** button.

The following prompt message appears:

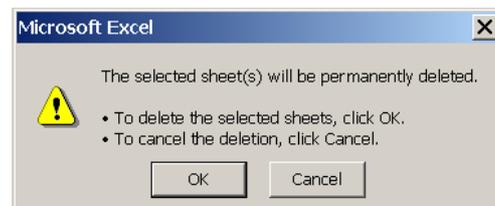


2. Click **Yes** to clear all contents—data and charts.

This clears all data, all cell formulas, and all cell formatting from the active worksheet cells. It also removes any embedded charts inside the active worksheet.

3. If the active sheet is a separate chart sheet, select the sheet labeled **TekChart1**, and click the **Clear Active Sheet** button.

The following prompt message appears:



4. Click **OK** to clear the chart.

The **TekChart1** chart sheet is removed.

## Capturing and Graphing Measurements

The **Measurement** button on the TekExcel Toolbar allows you to capture single or repeated timed measurement(s) and optionally graph them as well.

### Capture Single Measurement(s)

To capture one or more single measurements:

1. Select the **Measurement** button on the TekExcel Toolbar.

A three-tabbed dialog box appears.

2. Choose the **Selection** tab.

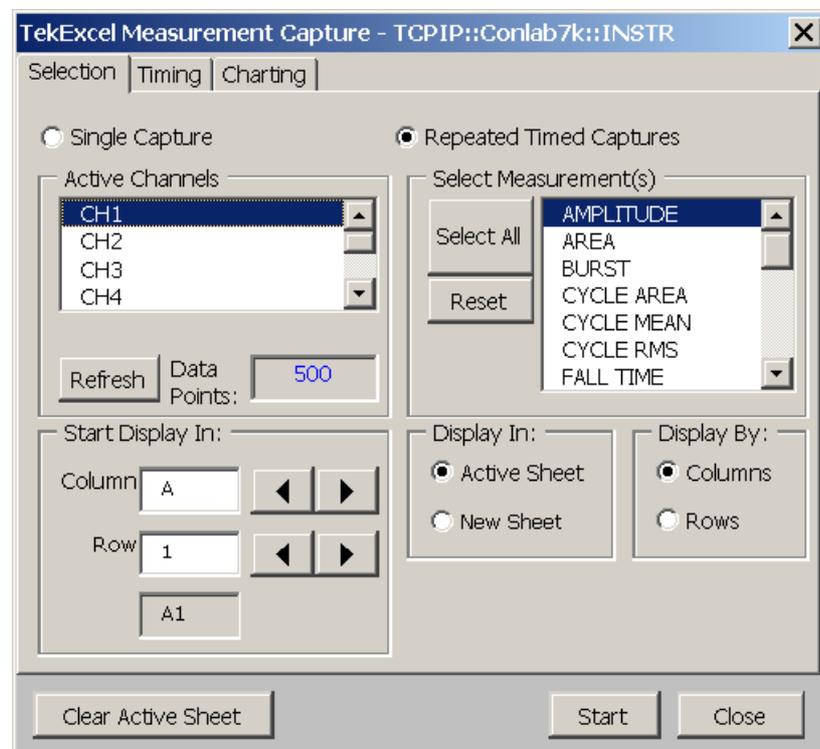
All active channels are displayed. The current measurement source channel is indicated by the appearance of the word **Measure** to the right of the measurement channel (screen appearance is slightly different for TDS/CSA8000 Series Oscilloscopes).

**Note:** You can click the **Refresh** button to display any oscilloscope changes to the number of active channels or the measurement source channel.

3. Select the **Single Capture** option button.

The Timing and Charting tab forms disappear and a Select All check box appears on the Selection tab.

4. Click a measurement from the list box under the Select Measurement(s) heading to select it. To select multiple measurements, hold down the **Ctrl** key while highlighting the measurements you want to select, or select the **Select all** check box as shown to select all measurements available in the list.



5. Select the starting cell in which to begin inserting the measurement(s), or leave the default as is (**A1**).

You can specify the starting cell either by scrolling through the column and row values, or by directly entering the row and column values in the edit boxes under the Start Data Display heading. Possible Excel starting cells range from A1 to AZ99. Starting cell designations must take the A1-style format rather than the R1C1-style format (explained on page 68).

Click **Columns** or **Rows**, depending on how you want the data arranged.

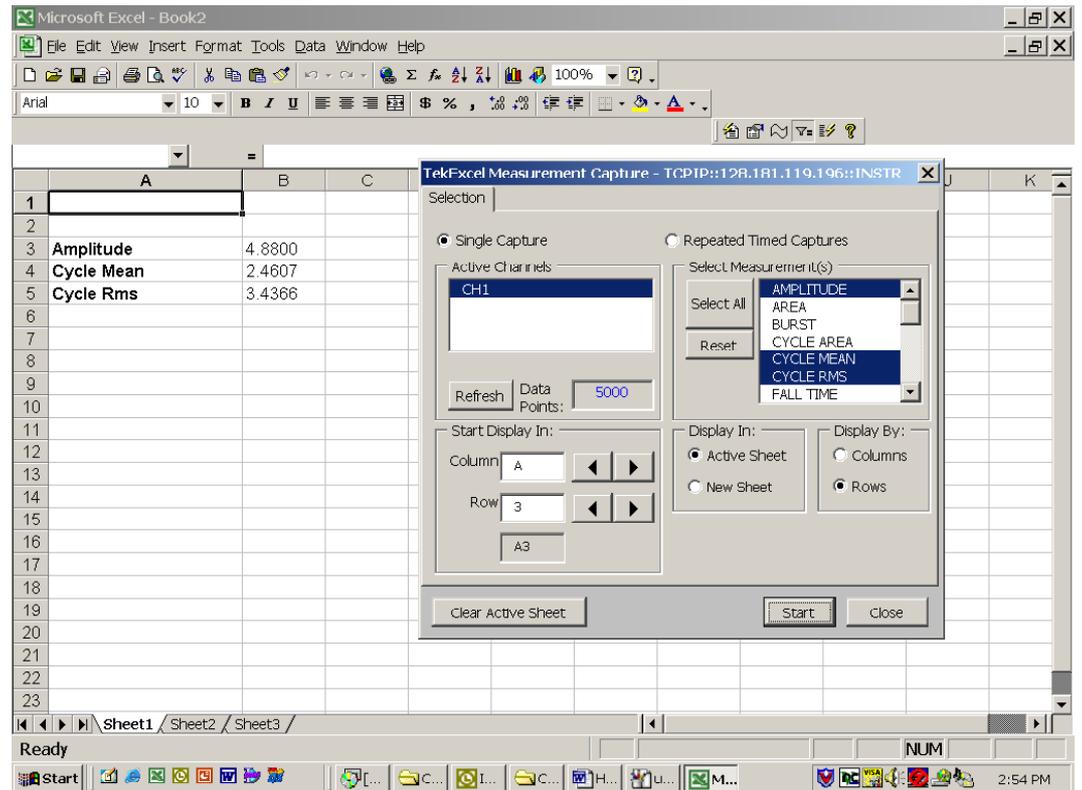
Usually captured measurements are placed in columns, because there are over 65000 rows in an Excel worksheet, whereas data placed in rows is subject to a 256-column limit in Excel worksheets. If you choose the **Select All** check box, however, the **Rows** option button is selected by default because these measurement snapshots are best displayed vertically, with engineering units in a column to the right.

Click **Active Sheet** or **New Sheet**, depending on where you want the data inserted.

**Note:** For information about clearing the active sheet, see page 24.

Click **Start**.

Measurement heading(s) and current values, along with their units of measure, are placed in the selected sheet starting at the designated cell.



### Capture and Graph Repeated Measurement(s)

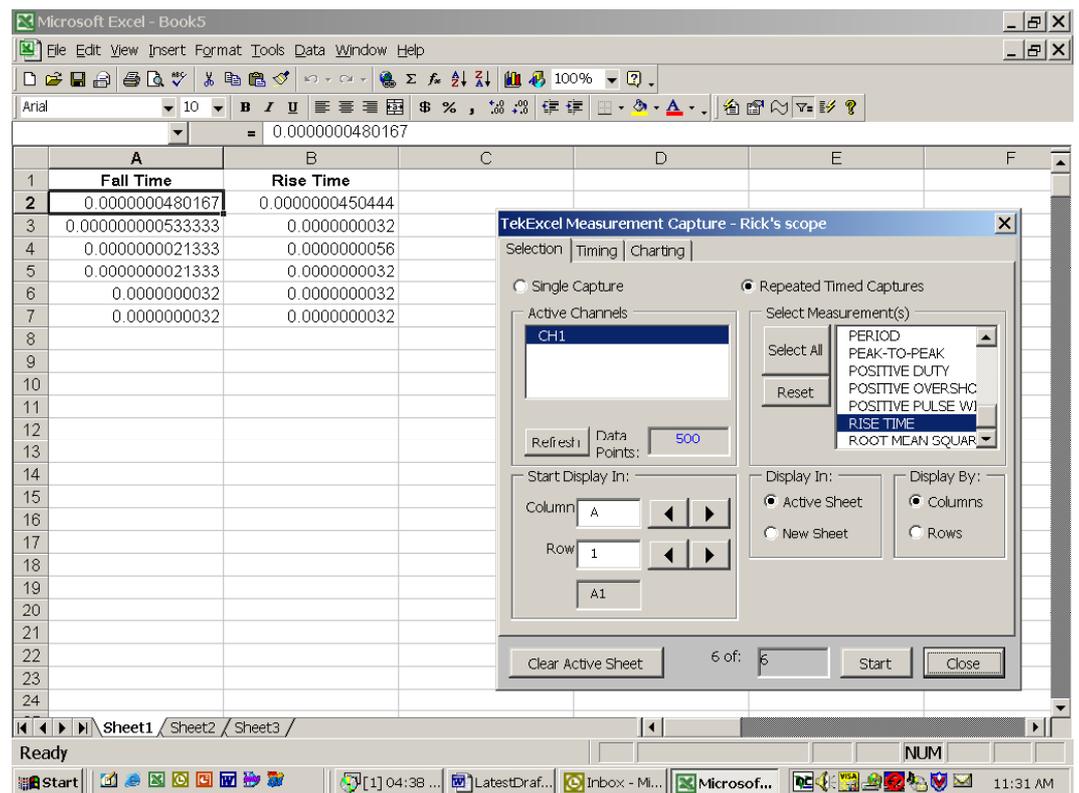
To capture multiple timed measurement(s):

1. Select the **Measurement** button on the TekExcel Toolbar.

A three-tabbed dialog box appears.

2. Choose options from the **Selection** tab (see Select Measurement(s) on page 28), the **Timing** tab (see page 29), and the **Charting** tab (see page 30).
3. When you have made all your selections, click **Start** from any of the tabs.

Measurement heading(s) and current values, along with their units of measure, are placed in the selected sheet starting at the designated cell. An optional chart may also appear in the active sheet as shown here, or in a separate chart sheet:



### Select Measurement(s)

To select the measurement(s) to capture:

1. Choose the **Selection** tab.

All active channels are displayed.

**Note:** You can click the **Refresh** button to display any oscilloscope changes to the number of active channels or the measurement source channel.

2. Select the **Repeated timed captures** option button.

3. Click a measurement from the list box under the Select Measurement(s) heading to select it. To select multiple measurements, hold down the **Ctrl** key while highlighting the measurements you want to select.
4. Select the starting cell in which to begin inserting the waveform, or leave the default as is (**C1**).

You can specify the starting cell either by scrolling through the column and row values, or by directly entering the row and column values in the edit boxes under the Start Data Display heading. Possible Excel starting cells range from A1 to AZ99. Starting cell designations must take the A1-style format rather than the R1C1-style format (explained on page 68).

5. Click **Columns** or **Rows**, depending on how you want the data arranged.

Usually captured measurements are placed in columns, because there are over 65000 rows in an Excel worksheet, whereas data placed in rows is subject to a 256-column limit in Excel worksheets.

6. Click **Active Sheet** or **New Sheet**, depending on where you want the data inserted.

**Note:** For information about clearing the active sheet, see page 24.

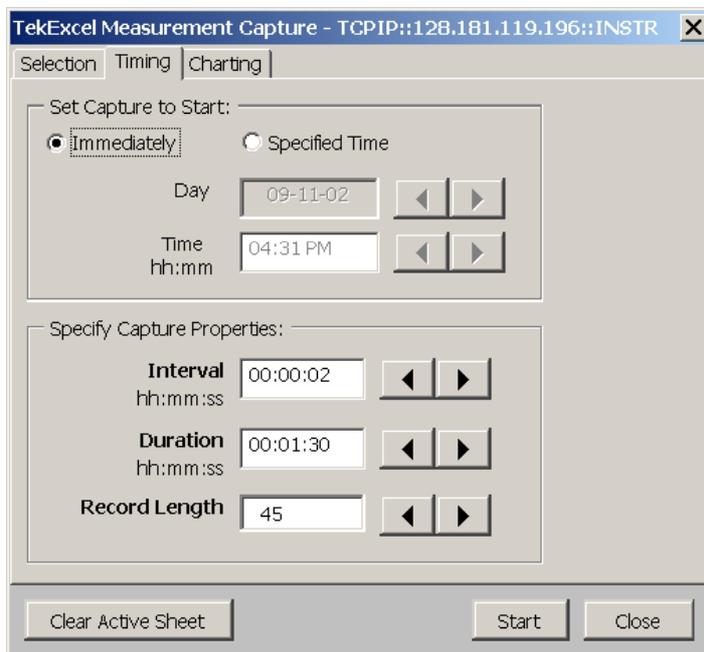
### Specify Timing

To specify timing of the capture:

1. Select the **Timing** tab.
2. If you want the measurement capture to begin as soon as you click the **Start** button, choose the **Immediately** option button.
3. If you want to delay measurement capture until a specified time:
  - a. Choose the **Specified Time** option button.
  - b. In the **Day** box, type or select the date to begin the measurement capture.
  - c. In the **Time** box, type or select the hour and minute to begin the capture.
4. In the **Interval** box, type or select a time value to specify the interval between captures. Notice that this value adjusts the **Record Length** value.

5. In the **Duration** box, type or select a time value to specify the duration of each capture. Notice that this value adjusts the **Record Length** value.
6. If necessary, change the value in the **Record Length** text box to change the record length of each capture. Notice that this value adjusts the **Duration** value.

For example, suppose that a capture with a 2-second interval and a 1-minute duration displays a record length of 30. If you change the capture to a 3-second interval, the record length changes to 20. If instead, you keep the 2-second interval and change the record length to 60, the duration changes from 1-minute to 2-minute.



#### Choose Charting Options

To specify charting options for the capture:

1. Select the **Charting** tab.  
The **No Chart** option appears preselected as the default option.
2. If you want charting to take place at periodic intervals, click the **Periodically** option button and choose **10**, **20**, **25**, or **50** as the percentage of completion interval for periodic chart updates.
3. If you want charting to take place after all measurement capturing completes, click the **Upon Completion** option button.

4. Click **Active Sheet** or **New Sheet**, depending on where you want the chart inserted.

**Note:** For information about clearing the active sheet, see page 24.

## Capturing Triggered Waveforms

The **Trigger Capture** button on the TekExcel Toolbar allows you to capture the time and values of a triggered waveform and/or measurement(s) into the current worksheet, beginning at a chosen cell location. You select the type of trigger event (such as Edge or Glitch), the type of waveform (such as Sample or Average—see page 42), the active channels, and the measurement channel on the oscilloscope before the capture. The toolbar dialog box allows you to select one or more active channels from which to capture a waveform, and one or more types of measurements to capture over the measurement channel.

If you select the Waveform check box, waveform data from all selected active channels is captured and placed into the active sheet when the trigger event occurs. The waveform capture is limited to 65000 rows of data, the approximate number of rows in Excel spreadsheets.

If you select the Measurement check box, measurement data from the measurement channel is captured and placed into the active sheet (in a column before any captured waveform data) when the triggered event occurs.

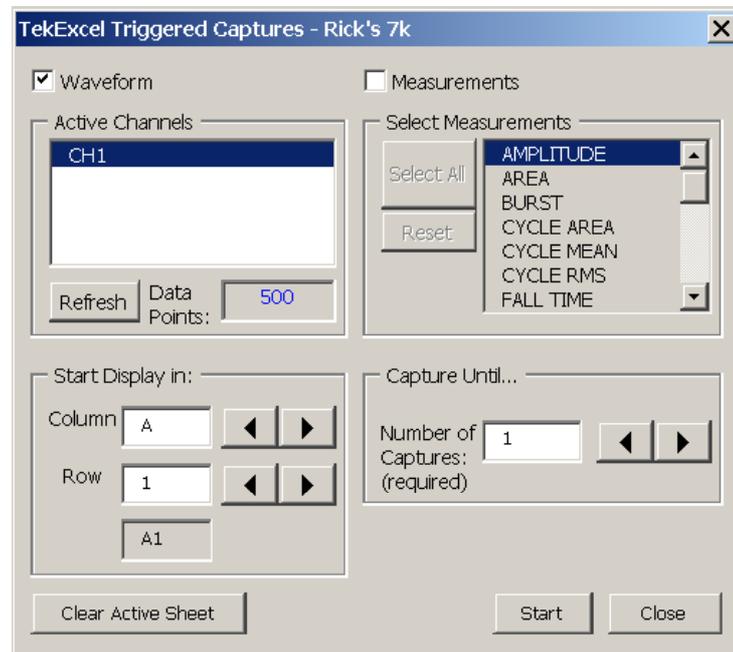
You have the option of performing a specified number of captures.

**Note:** If you want to capture a single untriggered waveform sequence instead of triggered waveform data, see the **Waveform** button on page 21. If you want to capture untriggered measurement data, see the **Measurement** button on page 24. For information about clearing the active sheet, see page 24.

To capture triggered data into an Excel spreadsheet:

1. Select the **Trigger Capture** button on the TekExcel Toolbar.

A dialog box similar to the following appears:



All active channels are displayed, along with the number of data points in the waveform sample, derived from oscilloscope settings. The current measurement source channel is indicated by the appearance of the word **Measure** to the right of the measurement channel.

**Note:** You can click the **Refresh** button to display any oscilloscope changes to the number of active channels, the measurement source channel, or the number of data samples.

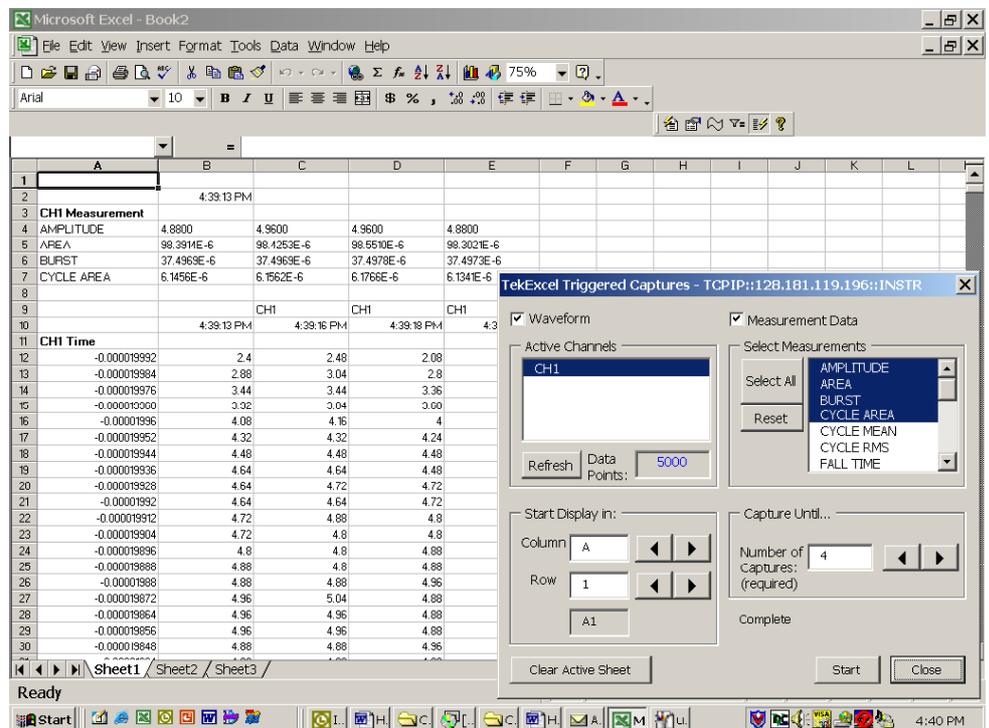
2. If you want to capture triggered waveform data from the measurement source channel:
  - a. Select the **Waveform** check box.
  - b. Click to select one or more active channels in the list box from which to capture the data.
3. If you want to capture triggered measurement data:
  - a. Select the **Measurement** check box.
  - b. Click to select one or more measurements in the list box to capture over the Measurement channel.
4. Select the starting cell in which to begin inserting the data, or leave the default as is (**A1**).

You can specify the starting cell either by scrolling through the column and row values, or by directly entering the row and column values in the edit boxes under the Start Data Display heading. Possible Excel starting cells range from A1 to AZ99. Starting cell designations must take the A1-style format rather than the R1C1-style format (explained on page 68).

5. Specify the number of captures to perform or leave the default value of **1**.
6. Click **OK** to start the acquisition and display the data in the active sheet starting at the designated cell.

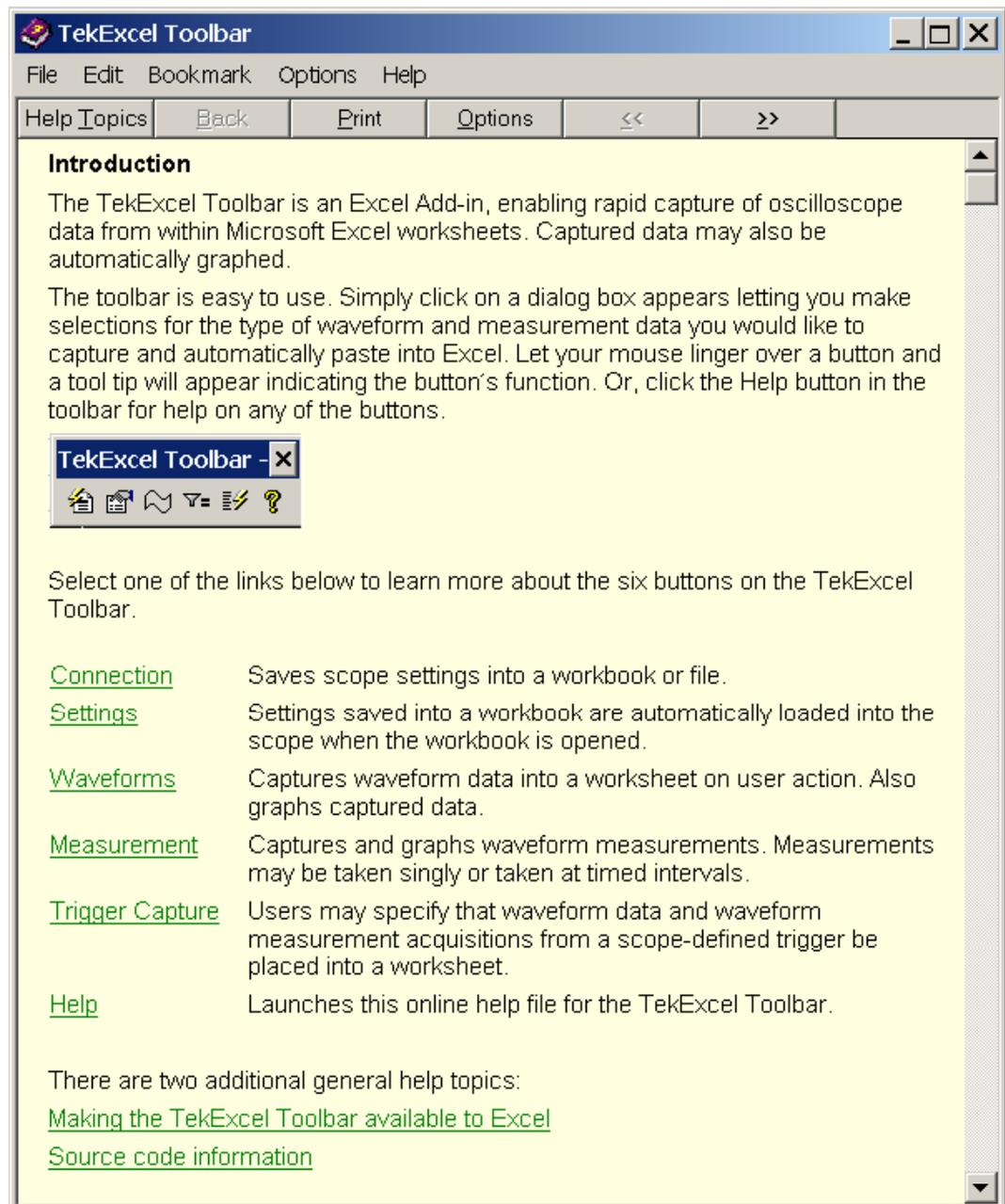
For measurement data, a time stamp for the triggered event appears in the first row of a column, followed by the requested measurement(s), with engineering unit(s) added if that box was checked.

For waveform data, times for each data point appear in the first column. The first row of subsequent columns contains a time stamp for each capture of a triggered event. Below the time stamp, waveform data values appear in successive rows (with a maximum of 65000 rows). The number of columns of data varies depending on the number of captures.



## Getting Help with the TekExcel Toolbar

The **Help** button on the TekExcel Toolbar displays online help for the toolbar. When you click this button, the following Help screen appears:



You can navigate through the pages of this online help system using the usual buttons and links available in Windows-based Help files.

## TekExcel Toolbar Source Code

Tektronix used the TekVISA ActiveX control to build the TekExcel Toolbar described in this chapter. The source code for this Add-In along with explanatory text is available on the companion CD that accompanies this book. You can also view the source code by loading the TekExcel Toolbar and going to the Excel Visual Basic Editor (select **Tools > Macro > Visual Basic Editor** or press **Alt+F11**).

The source code is a good place to look if you wish to build your own specialized Excel Add-In or customize the TekExcel Toolbar. Before dealing with the extra complexity of building an Add-In, however, look over the rest of the chapters in the Excel part of this book. These chapters introduce you to the TekVISA ActiveX control, and take you step-by-step through procedures for using Excel VBA to build some simple dialog boxes for capturing oscilloscope data and communicating with your oscilloscope.

## Chapter 2 Review

To review what you learned in this chapter:

- You learned that you **do not have to do any programming** to use the TekExcel Toolbar.
- You learned how to use the TekExcel Toolbar to **establish a connection** between Excel and your oscilloscope and **get or set scope settings**.
- You learned how to use the TekExcel Toolbar to **acquire measurement and waveform data** from your oscilloscope and optionally chart it.
- You learned that the TekExcel Toolbar **source code is available** to you if you want to customize the functionality of the toolbar or learn how to build your own.