



## **Installation and Getting Started Guide**

**Metrics Win4156**

**Version 4.5**

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# Installation and Configuration

## Installing the Win4156 Software

The installation program for the Metrics Win4156 software installs all components necessary to run Metrics Win4156. You can download the auto-extracting archive MTW4156-45.EXE from the Metrics Technology website under Downloads link. Be sure to save the install file to your local hard disk before running the installation. Running the installation from the website will cause an installation error. You will need a valid customer login to enter the Software Downloads area.

**NOTE:** You should also download the latest available HotFix release which can be found in the same software list and designated MTW4156-45-HFXX.EXE where the XX is the version of the HotFix. HotFixes contain resolutions to any reported issues and some enhancements that have been added since the initial release of Metrics Win4156 4.5. It is only necessary to apply the latest HotFix to your system since all updates are contained in the latest build. Save the HotFix file to your local computer and you can install it after the base Metrics Win4156 installation is complete. It is recommended that you keep an archive copy on CD of all HotFixes applied. These are removed from the website once the version is obsolete.

### *Obtain a Codeword*

This codeword is obtained by registering your software with Metrics Technology. Please visit our website at [www.metricstech.com](http://www.metricstech.com) to register your software and obtain the codeword.

### *Important Note for Customers upgrading*

The Metrics Win4156 setup program requires that you backup and uninstall the previous version. To do this, please perform the following steps:

**DO NOT LEAVE YOUR BACKUP ARCHIVE IN THE METRICS DIRECTORY!  
COPY THE BACKUP.ZIP FILE TO A DIFFERENT LOCATION LIKE A USB DRIVE.**

1. Go to the File Menu and select Backup

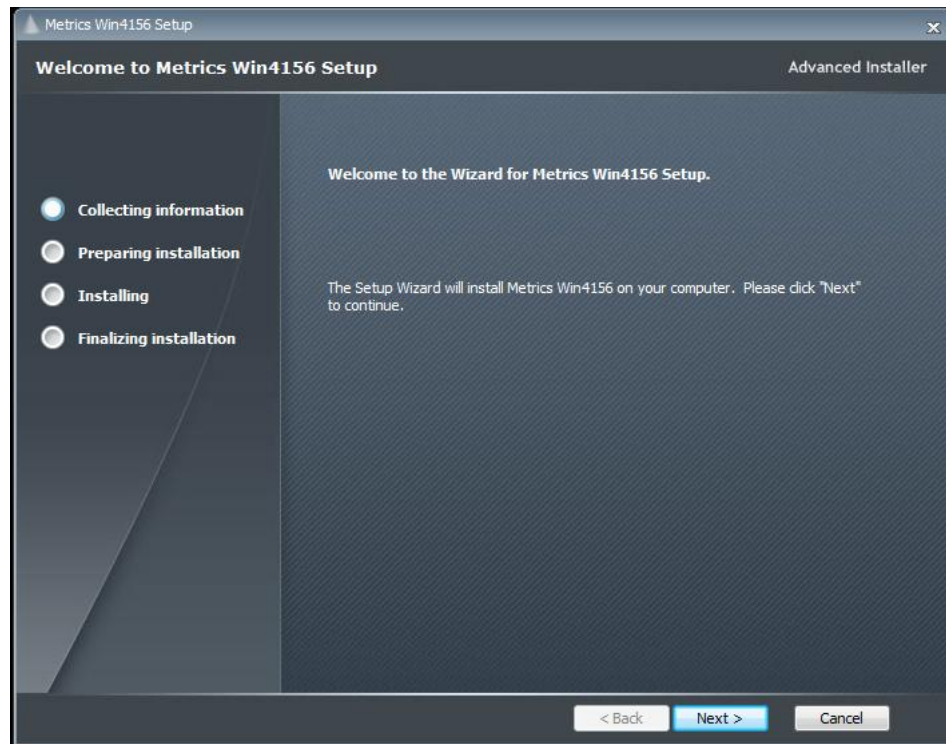
2. Enter the name of the backup ZIP archive in the W4156 directory (i.e. C:\METRICS\W4156\backup.zip)
3. Allow the backup utility to complete then copy the .ZIP file to another drive location.

After upgrading, some of the functions of the software will require that older projects or features be modified.

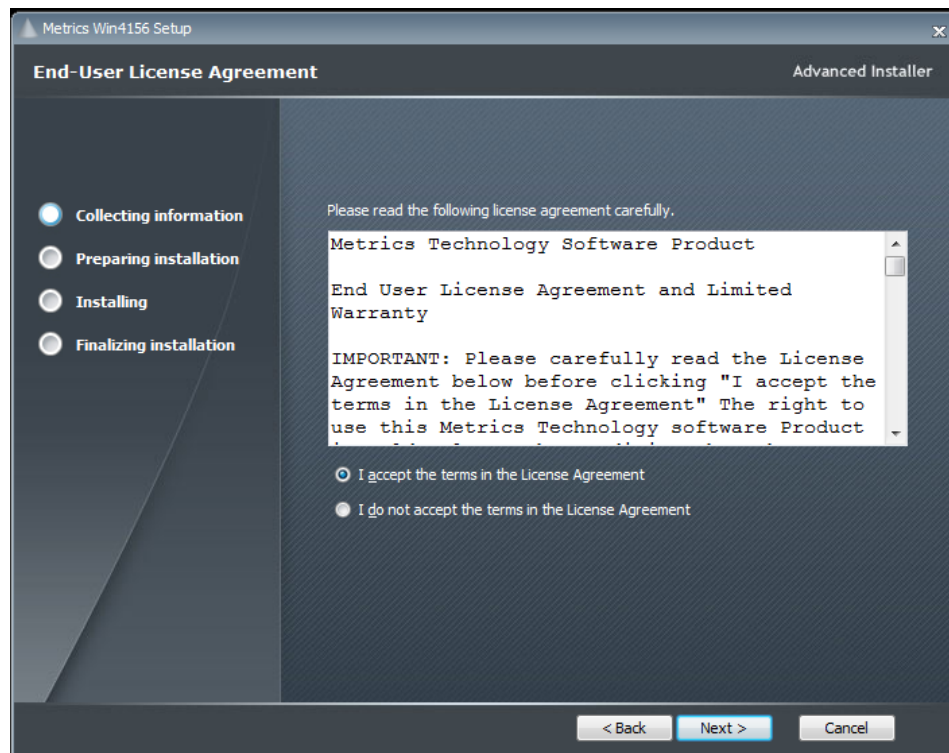
Metrics Win4156 files are now be stored in the windows file system. Existing tests should be opened and then saved in the Metrics\ics\projects directory.

## ***Procedure to Upgrade Win4156 from 4.x to 4.5***

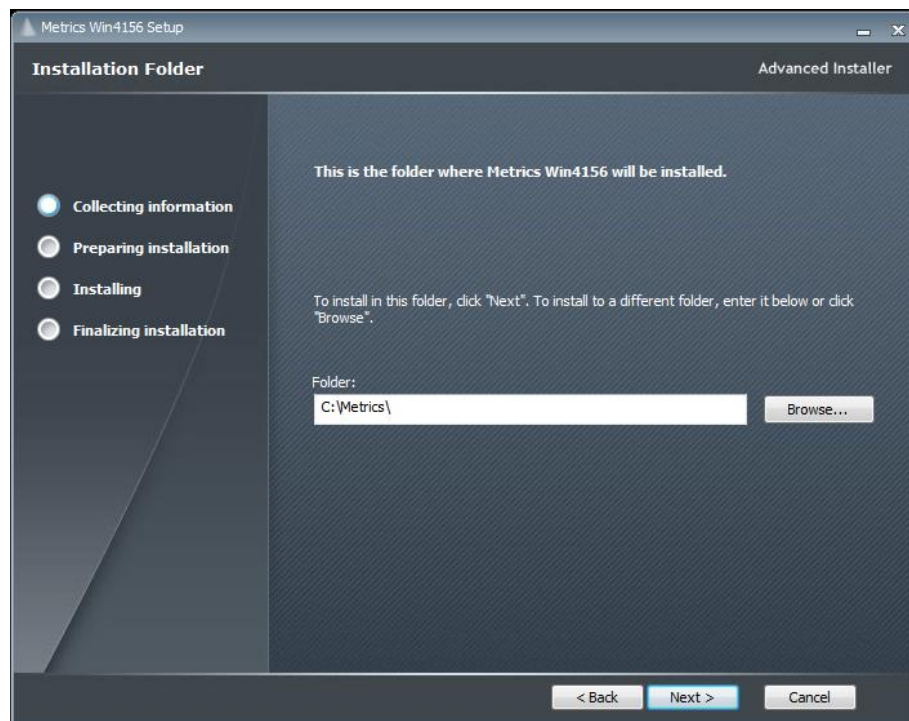
1. Start the MTW4156-45.EXE installation program.



2. Click **Next** button on the "Welcome" panel.

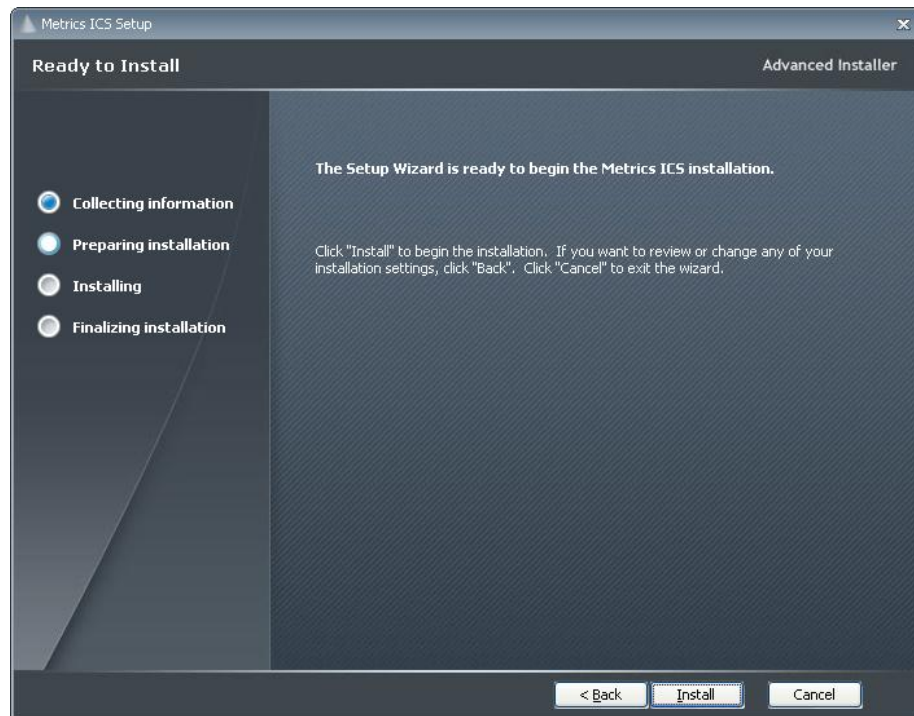


3. Read the "Software License Agreement" and click the **I agree to the terms in the License Agreement** button to agree to the terms. Then click **Next**.

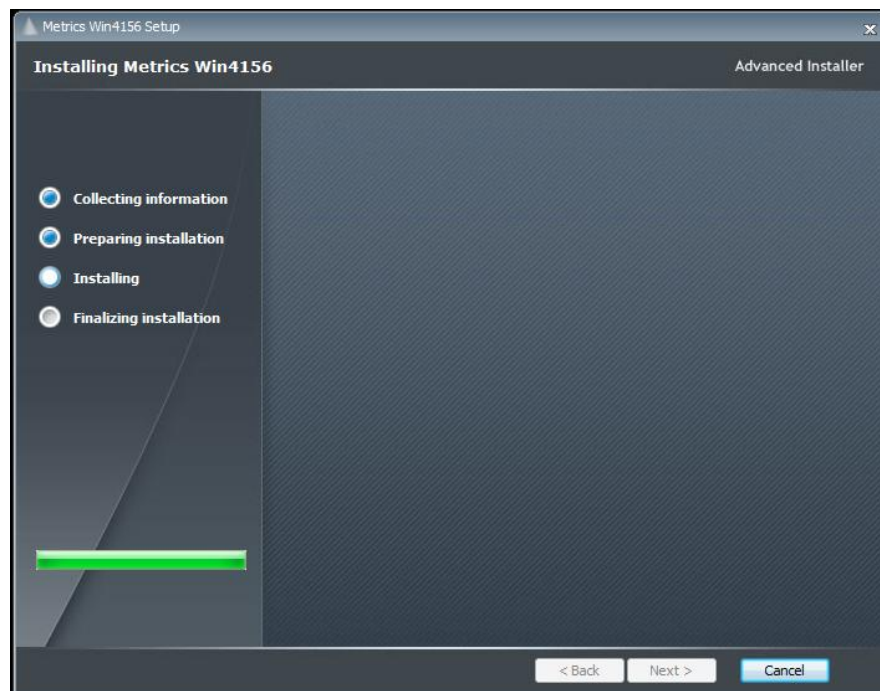


4. Choose "destination location" for installation and click the **Next** button.

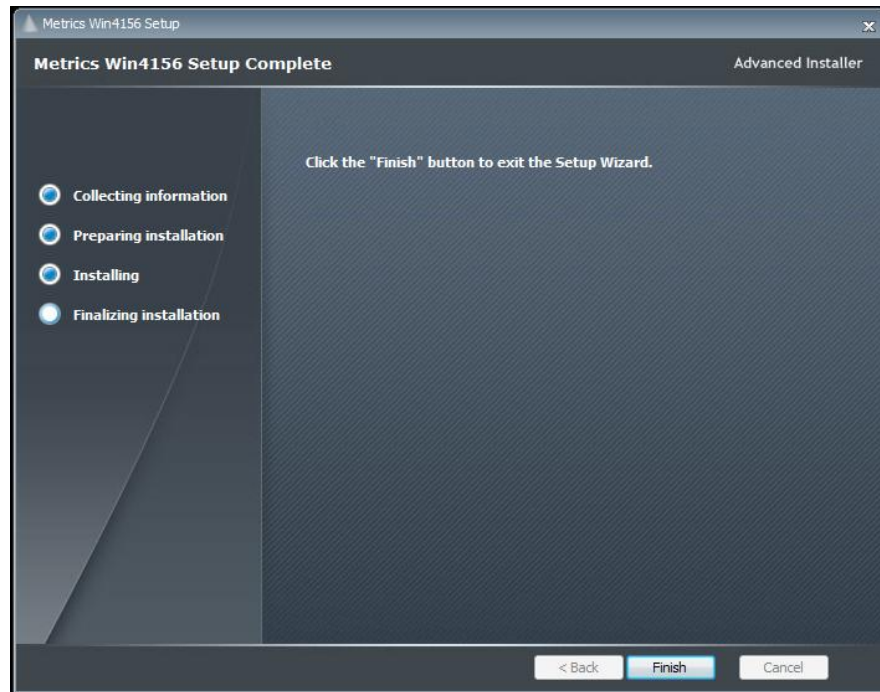
**NOTE:** It is recommended to select the default C:\Metrics\ as the location to maintain compatibility with previous versions of the software backups.



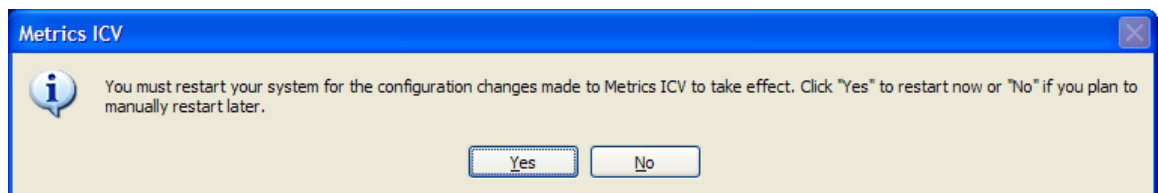
5. Click the **Install** button to begin the Metrics Win4156 installation.



6. Allow the Metrics Win4156 installation to complete.



7. Then click **Finish** to complete the installation.
8. After the installation is finished, re-start the computer.

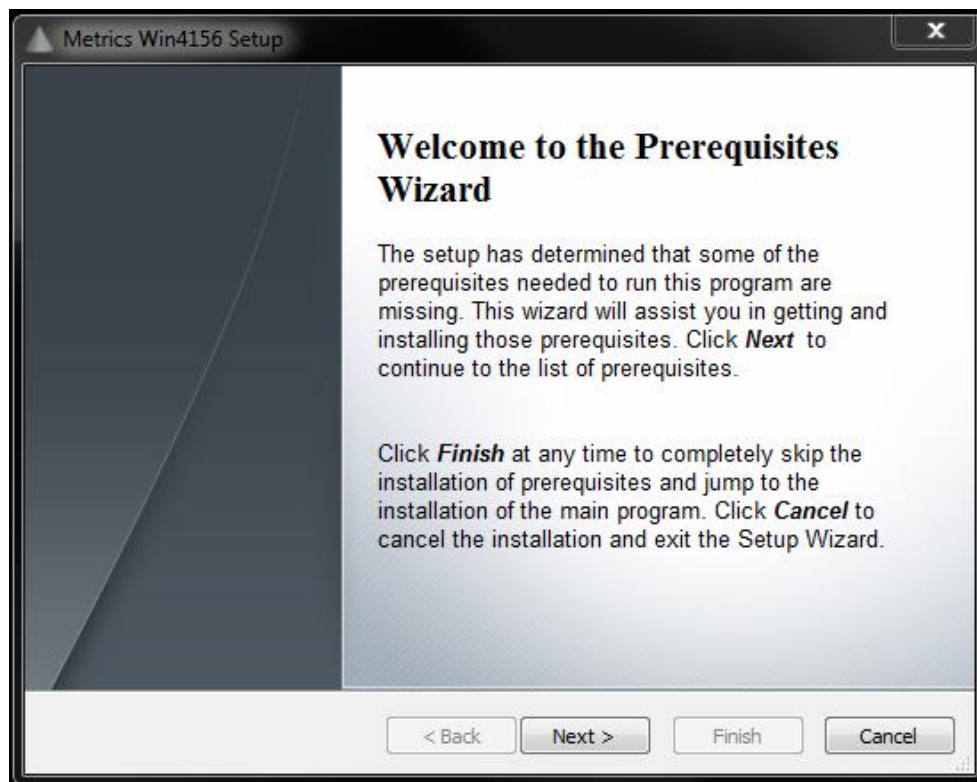




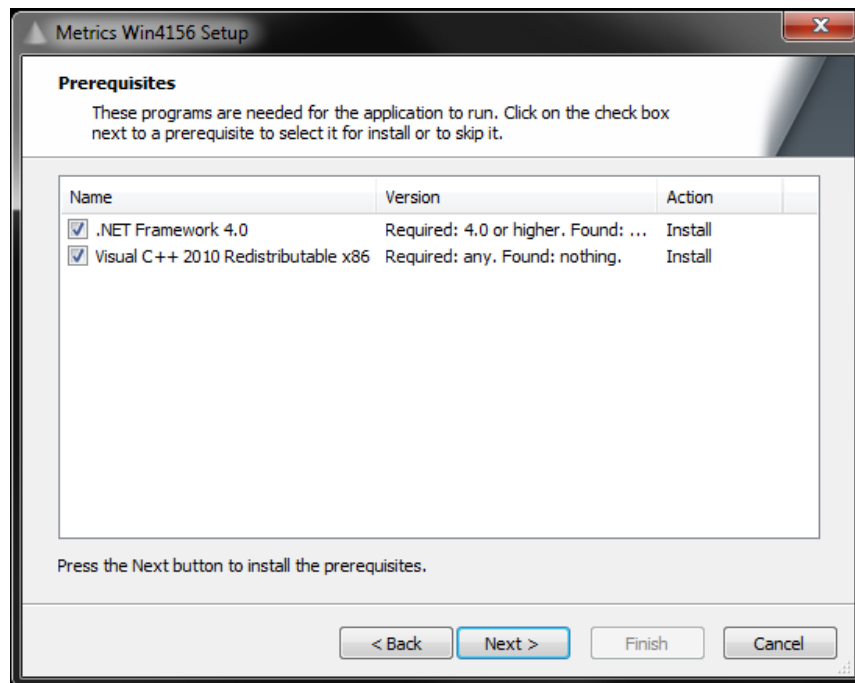
## ***Procedure to Install Win4156 (new installation)***

1. Download the Metrics Win4145 installer MTW4156-45.exe to the local drive of your computer.
2. Select the **MTW4156-45.exe** application icon to start the installation program.

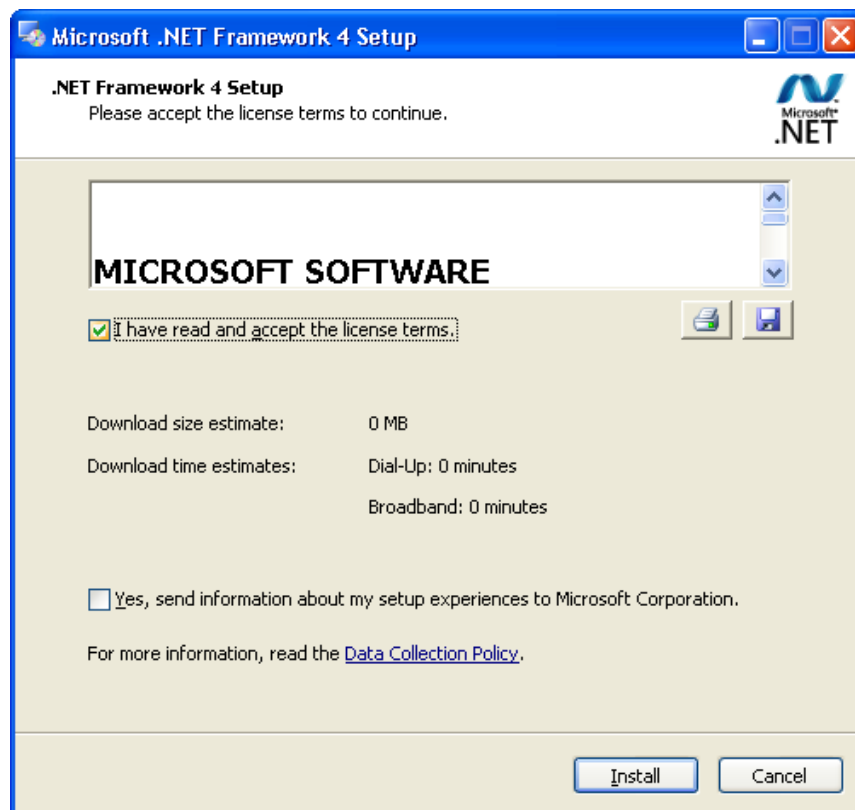
The installation will check for any prerequisites and start the Prerequisites Wizard to install the necessary software. Please note installation of some of these software components requires acceptance of the 3<sup>rd</sup> Party license agreements displayed during installation. Installation of some components can take some time so you should allow more time for installation if these components are not already installed on your workstation PC.



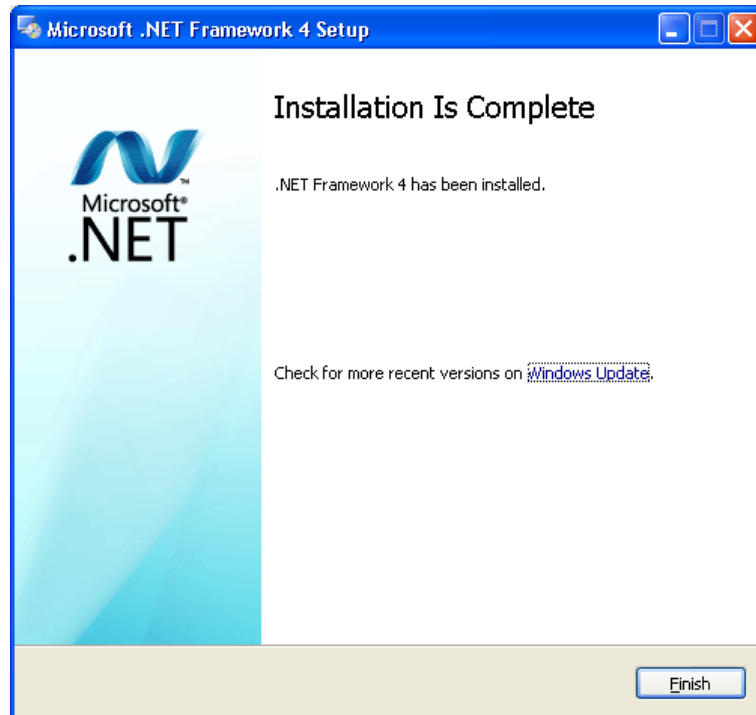
3. Click **Next** button on the "Welcome" panel.



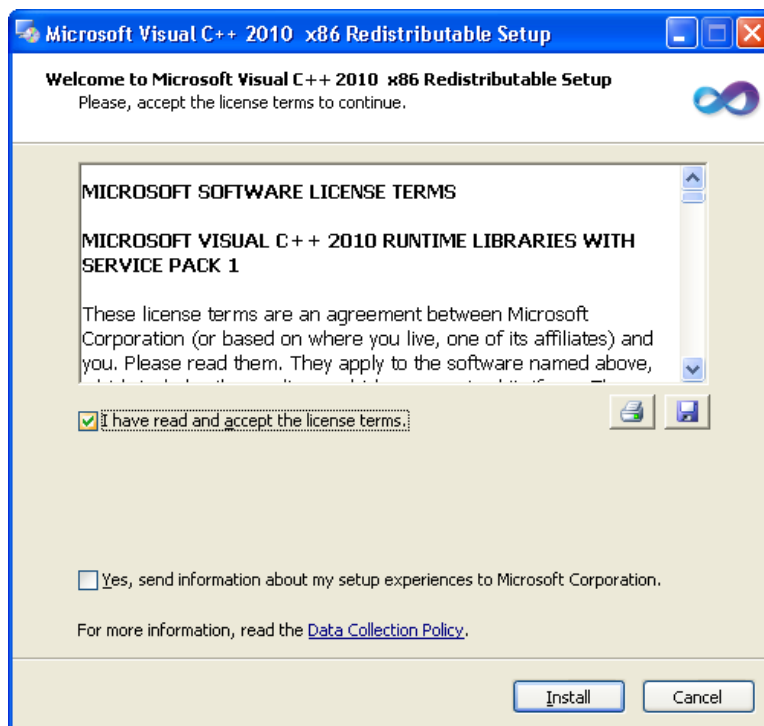
- Click **Next** button on the "Prerequisites" panel.



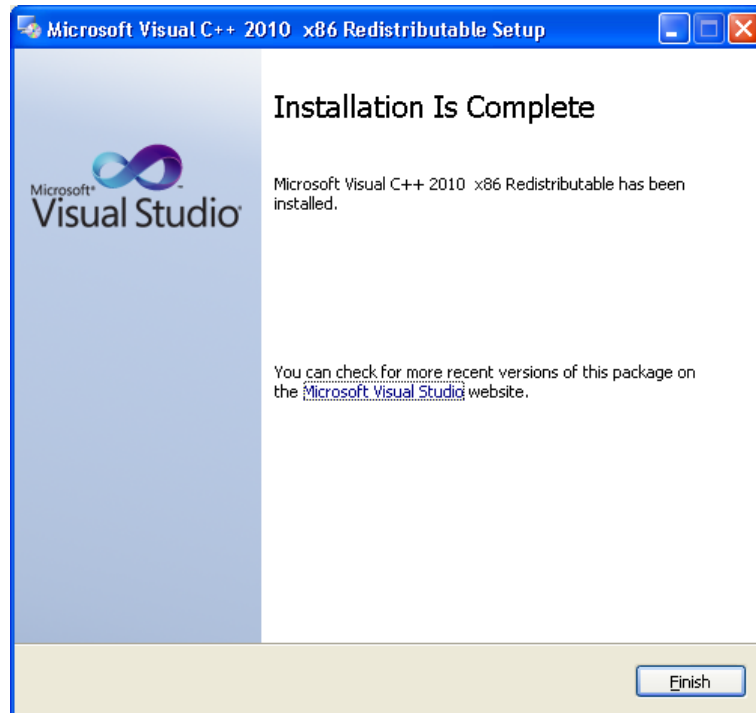
- Click **I have read and accept the license terms** then click the **Install** button on the "Microsoft .NET Framework" panel.



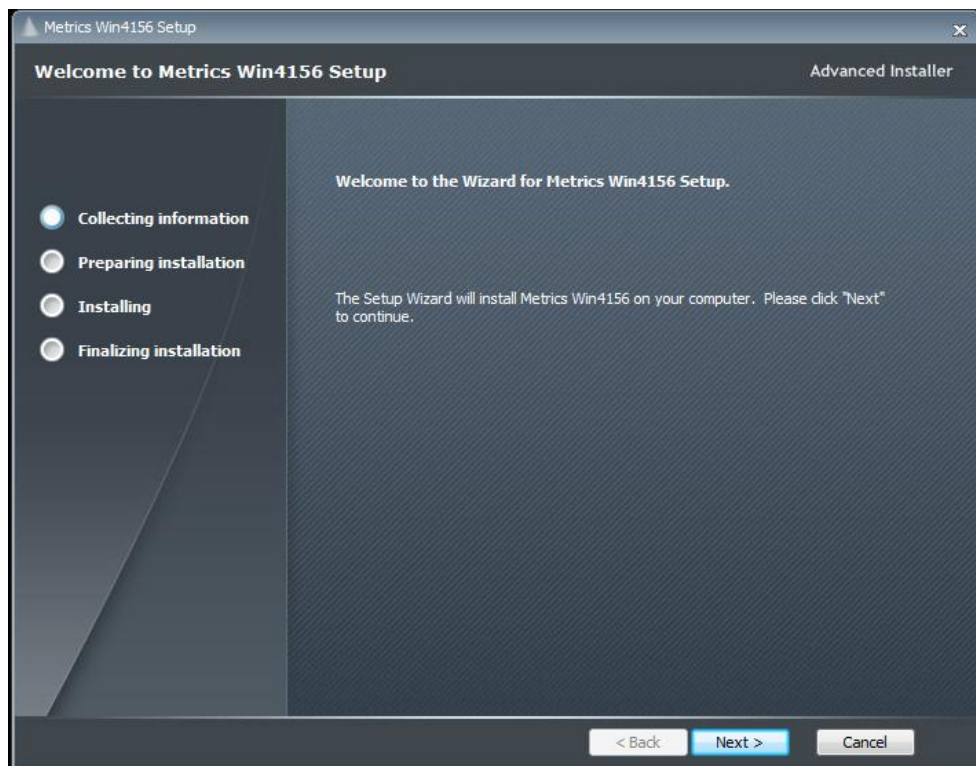
6. Click **Finish** to continue.



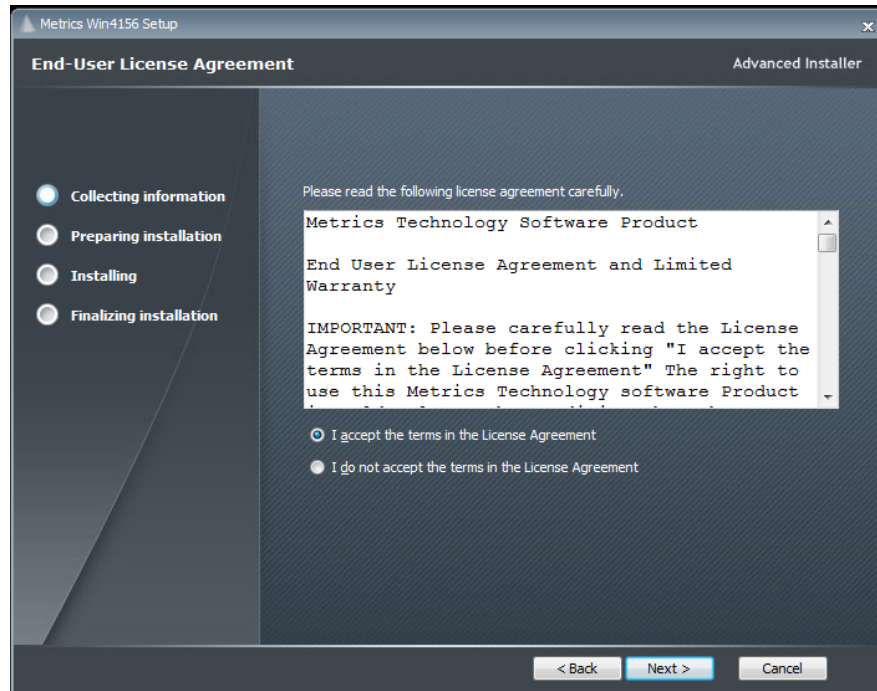
7. Click **I have read and accept the license terms** then click the **Install** button on the " Microsoft Visual C++ 2015-2022 Redistributable " panel.



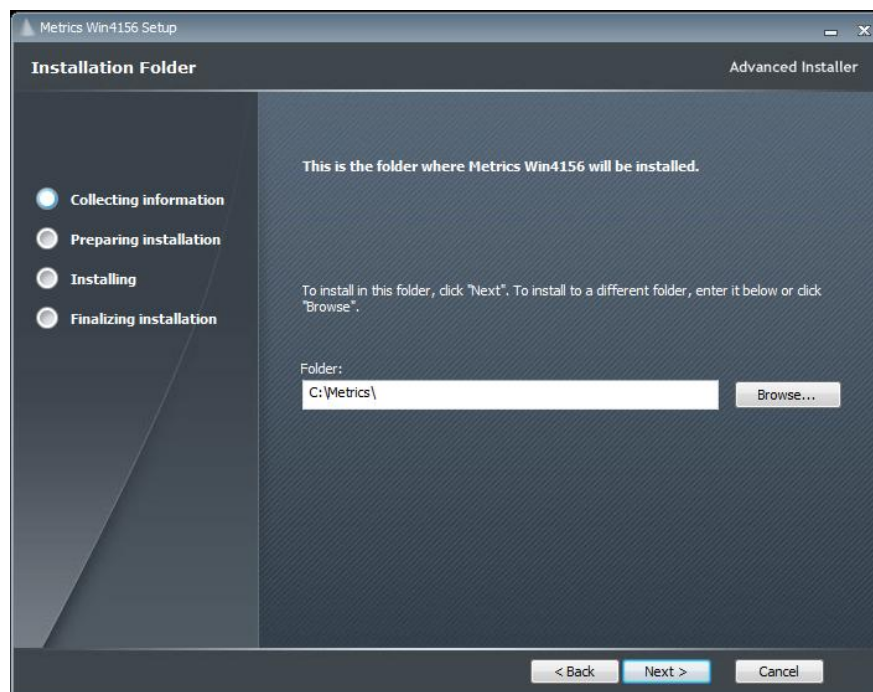
8. Click **Finish** to continue.



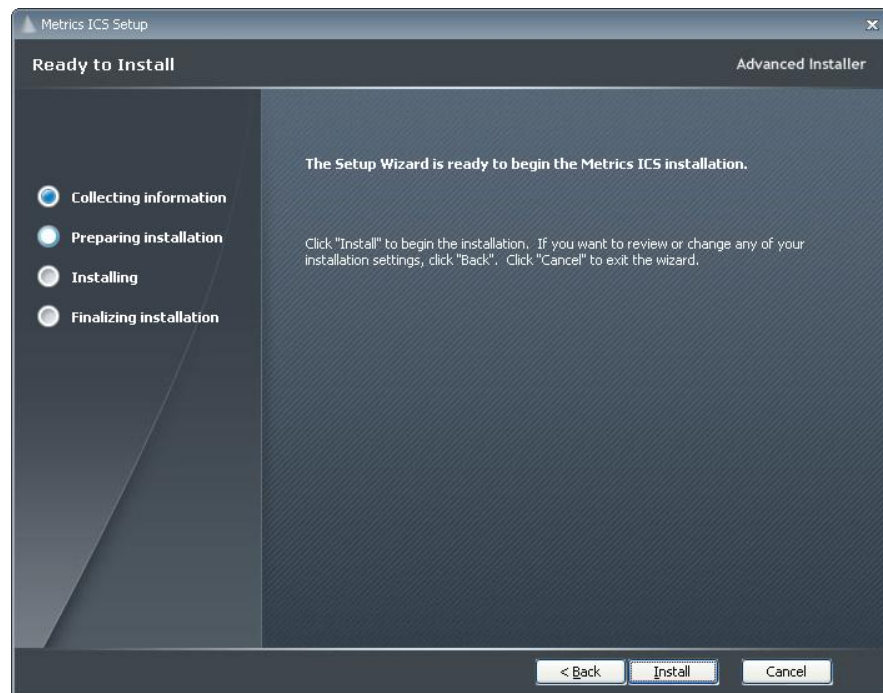
9. Click **Next** button on the "Welcome" panel.



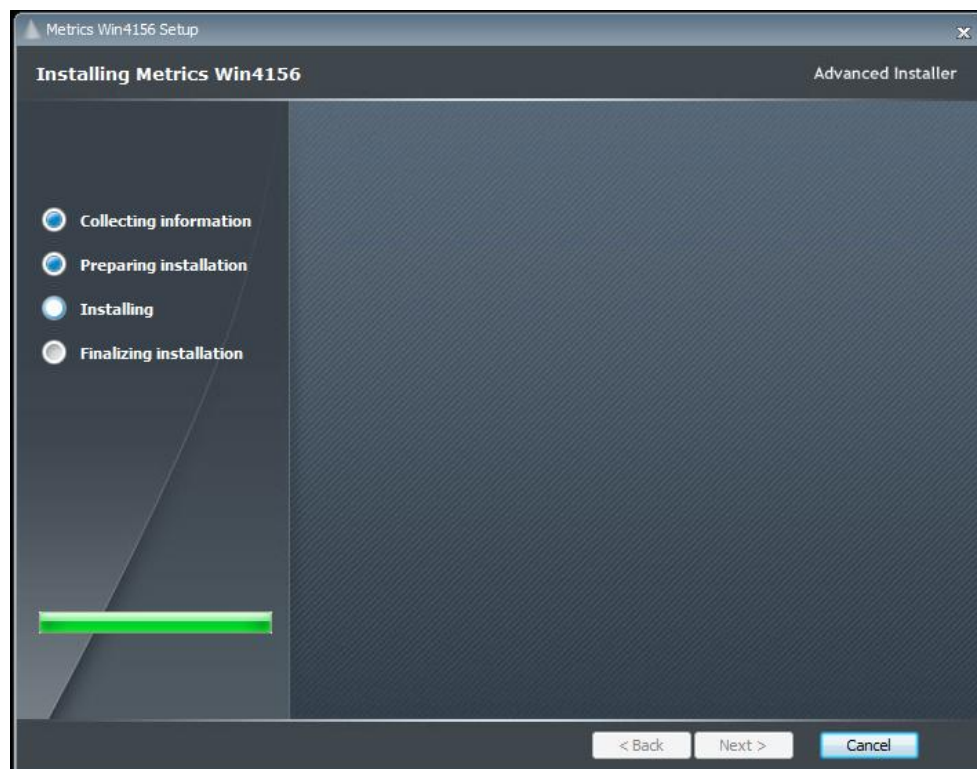
10. Read the "Software License Agreement" and click the **I agree to the terms in the License Agreement** button to agree to the terms. Then click **Next**.



11. Choose "destination location" for installation and click the **Next** button.  
*Note:* It is recommended to select the default C:\Metrics\ as the location to maintain compatibility with previous versions of the software backups.

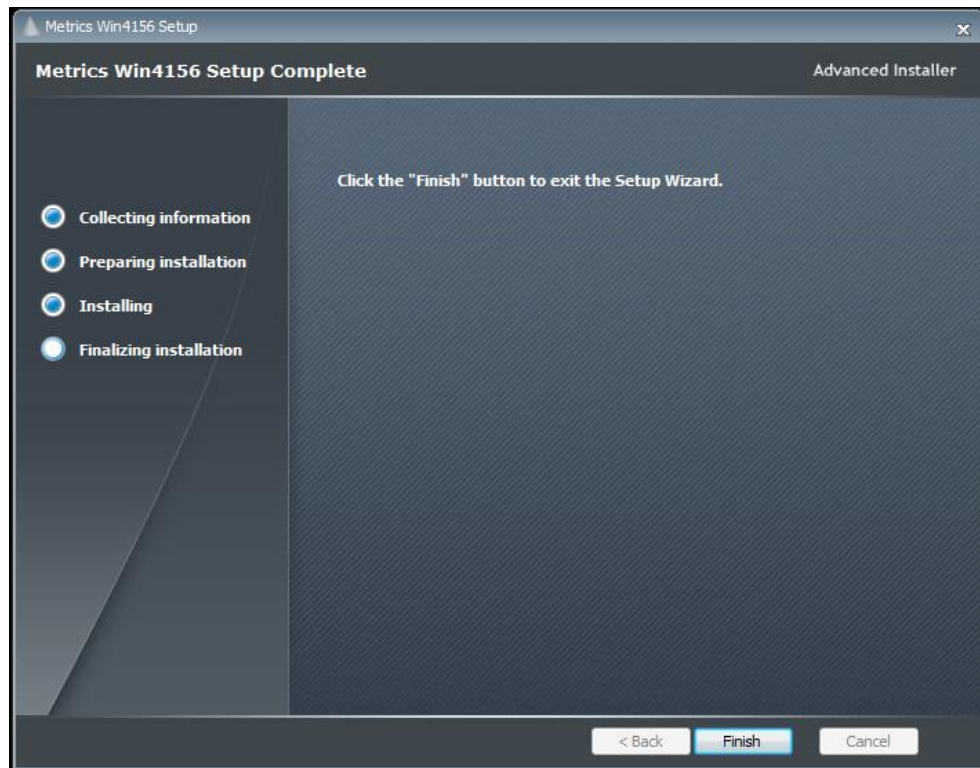


12. Click the **Install** button to begin the Metrics Win4156 installation.



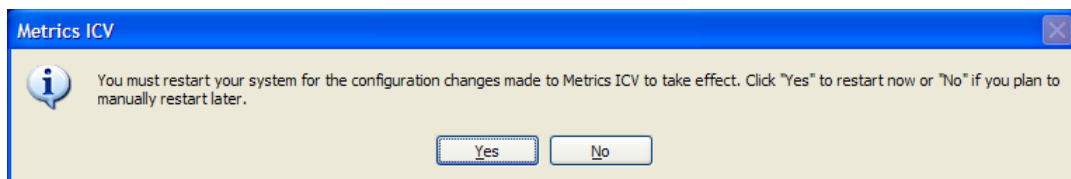
13. Allow the Metrics Win4156 installation to complete.





14. Then click **Finish** to complete the installation.

15. After the installation is finished, re-start the computer.



# Metrics Codewords

Metrics Technology software products use a combination Node Locked license model which includes the generation of a hardware fingerprint for the workstation PC and a Codeword. The unique combination of a Codeword and license.v2c file allows the software product to be run on a single workstation PC for which the license has been activated.

## *Software Codeword Information*

There will be a codeword for each software component ordered. This information is made up of two (2) parts, the Registration Information and Codeword Information. We encourage all customers to register their software with Metrics Technology. Only registered users will receive technical support for their products.

### *Customer ID*

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The Customer ID is a number that has the form IAXXXXXA. Where the X is a number. Variations include IHXXXXA, MHXXXXA, and MKXXXXA. This number must match the number on the Security Key.

### *Product Desc*

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This is the Product Description. This will be the name of the product, such as Metrics Win4156 or Metrics Win4156.

### *Product ID*

---

The product ID is MTW4145 should be entered in the ID field

### *Version*

---

This is the version of the software i.e. 4.5.0

**Note:** The version number and the codeword are matched. Thus, customers who have not purchased an upgrade will not be able to run it without purchasing the correct codeword.

### *Codeword Serial*

---

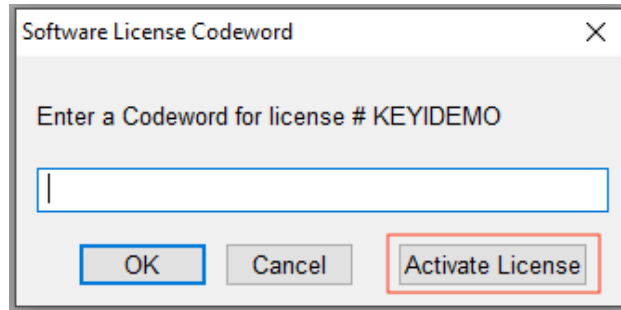
Example Codeword

AWRZI-XXC6Z-HK3EM-1RHU0-GUJ8A-UPX0R

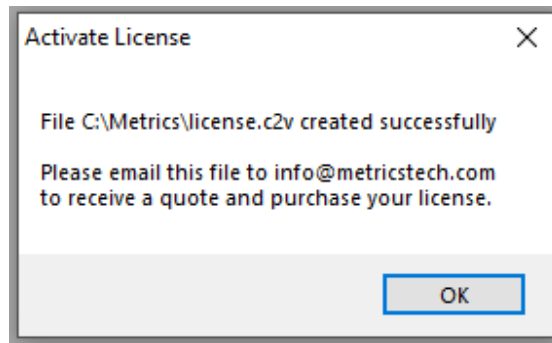


## *Activate the Win4156 License*

1. Go to Help->Codeword... and then click the "Activate License" button.



2. A file named license.c2v (Customer to Vendor) will be created in the C:\Metrics directory.



3. Email this file to "[info@metricstech.com](mailto:info@metricstech.com)" as an attachment
4. Customer Service will create another file named "<YourLicenseNumber>\_license.v2c". This is the (Vendor to Customer) file and will be emailed back to you. ( For example: IA54999A\_license.v2c )
5. Copy this file to the C:\Metrics directory and rename it to the abbreviated name **license.v2c**
6. Close ICS and restart

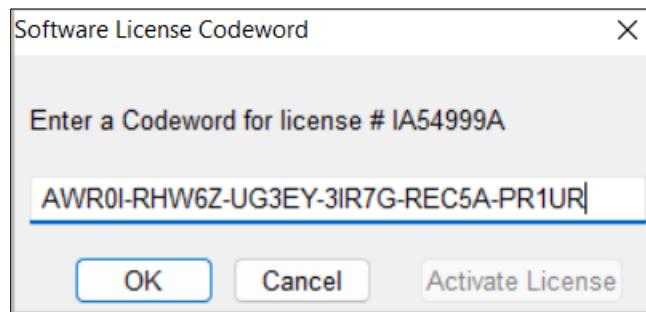
## ***Enter the Codeword***

The software Codeword Serial number can be manually entered in Win4156.

### ***To Enter the Win4156 Codeword Serial number:***

---

2. Open the Win4156 program. In Win4156 select the menu item Help » Codeword to open the *Software License Codeword* window.



3. Enter the Win4156 Codeword Serial number supplied on the product registration certificate.

**Note:** It is recommended that you cut and paste the codeword from the registration e-mail sent from Metrics Technology Customer Service. If typing the codeword from the keyboard be careful not to transpose letters or numbers. The letter I can be confused for the number 1 and the letter O can be mistaken for the number 0.

4. Click the **OK** button.



## **Win4156 Installation & Getting Started Guide**

**Metrics Win4156**

**Version 4.5**

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# Introductory Information

## *Goal of This Manual*

The goal of this manual is to provide a process for the user to be able to create a test and analyze the data with Metrics Win4156. A test setup will be created that measures the Threshold Voltage of a MOSFET device. The measured data will then be plotted and the  $V_{th}$  value will be extracted.

# Chapter 1- Win4156 Getting Started Guide

## *Introduction*

The first Chapter of the Self-Paced Guide introduces the Metrics Win4156 software. This Chapter also provides important information on software versions and support.

Please note that each Chapter builds upon the information presented in the previous Chapters. It is recommended that the Guide is followed in the order presented.

## *Topics Covered*

- What is Metrics Win4156 Software?
- Overview of Metrics Win4156 Software
- Updating Versions
- Support

## ***What is Metrics Win4156 Software?***

The Metrics Win4156 Software is an application designed for semiconductor characterization applications. Measurements for different technologies can be created in a matter of minutes without programming. It is based on the industry standard Metrics Win4156 software and provides driver for the HP4156A/B.

### ***Metrics Win4156 Controls:***

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- Semiconductor Parameter Analyzers
  - HP 4155A
  - HP 4155B
  - HP 4155C
  - HP 4156A
  - HP 4156B
  - HP 4156C

## ***Overview of Metrics Win4156 Software***

Metrics Win4156 Software allows provides an environment for the collection of data in three steps: Setup, Execute, and Analyze. The Setup of a Measurement typically takes no more than 1-2 minutes.

Win4156 supports several measurement modes to accommodate most testing methods.

The Analysis tools in Win4156 include plotting and data extraction. Once the functions are created, they can be saved with the data.

The advantage of Win4156 is that once a test is created and saved it can be re-opened and used again, including the analysis.

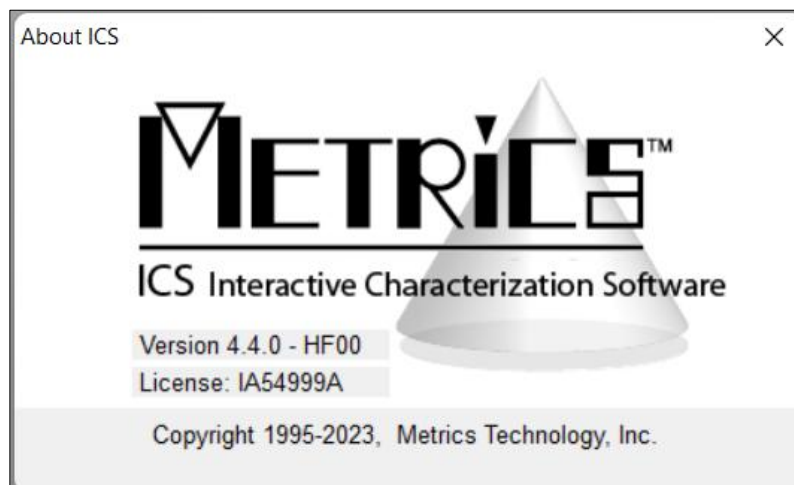
## ***Determining Software Version***

The software version and build date are very important when requesting support. Without this information it is impossible to provide efficient service. Please be prepared to provide this information when seeking support.

### ***To determine the software version:***

---

1. Open the Metrics Win4156 Software.
2. Click the Help menu item.
3. Click the About item.



## ***Updating the Metrics Win4156 Software***

Please keep your software up to date by downloading and installing the Metrics Technology HotFixes. Your software will occasionally remind you to check for updated HotFixes. HotFixes are critical updates for any discovered defects. Often the issues addressed in the updates are ones that you may just now be encountering.

Metrics Technology also provides a Service Pack when necessary. A Service Pack will contain all HotFixes and new program features. Once a Service Pack has been created and verified by Metrics Technology, it is placed on our website; [www.metricstech.com](http://www.metricstech.com). Please note the Service Packs are very large and will take time to download depending upon your connection speed. Once downloaded the file is an .EXE application.

## ***Support***

Metrics Technology provides technical support to customers for one year after the purchase of the Metrics Win4145 software. This support period includes a ninety-day period when telephone support is available. The remainder of the year's support is provided by email. Information on how to set-up instruments can be found under the HELP tab of the software.

Once you have registered at our website, [www.metricstech.com](http://www.metricstech.com) as a user you can access our Knowledge Base through your Customer Portal. If your issue is not addressed in the Knowledge Base it is most efficient to assist you if you submit a support ticket through your Customer Portal. Please provide the following information:

1. Your software License Number (also known as Customer ID (CID) / Registration number). The sequence will be IA#####A, IH#####A or MK#####A, etc. (# represents a number).
2. Version of software and last HotFix applied. If you are using a currently supported version be sure you have applied the latest HotFix (HF##) available at our website accessed through your customer portal. The issue you may be experiencing may have been addressed in the latest Hotfix. The latest Hotfix contains all previous Hotfix resolutions.
3. List of equipment you are using to test your devices.
4. The ICS project file or VBScript algorithms being executed.
5. Screen shots of the error code (Alt->Prt Scr) to capture the error window.  
***Images sent from a camera are often illegible.***



# Chapter 2- Selecting Instruments

## *Introduction*

The Module introduces the Metrics Win4156 (Control Software for HP4156A/B/C) measurement engine and demonstrates how to create measurements with it.

## *Topics Covered:*

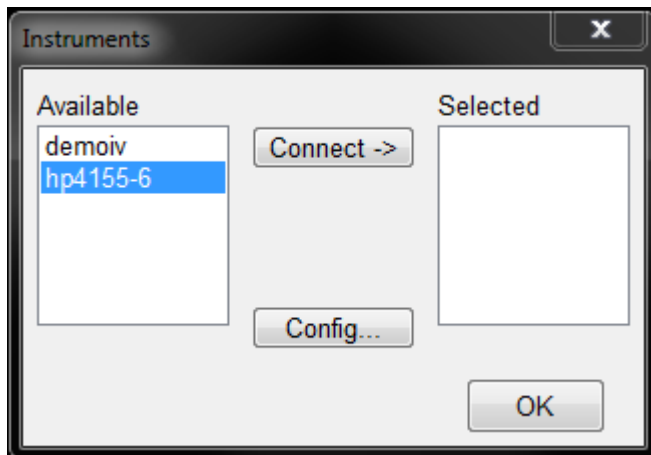
- Selecting an Instrument
- Configuring the Instrument
- Polling an Instrument

## *Selecting an Instrument Driver*

Before creating a measurement, Win4156 must know what instrument is being used. This is accomplished by configuring Win4156. Once an instrument has been configured, Win4156 will remember this configuration. The only time Win4156 must be reconfigured is when the instrument is changed or the ICS40.INI file is erased.



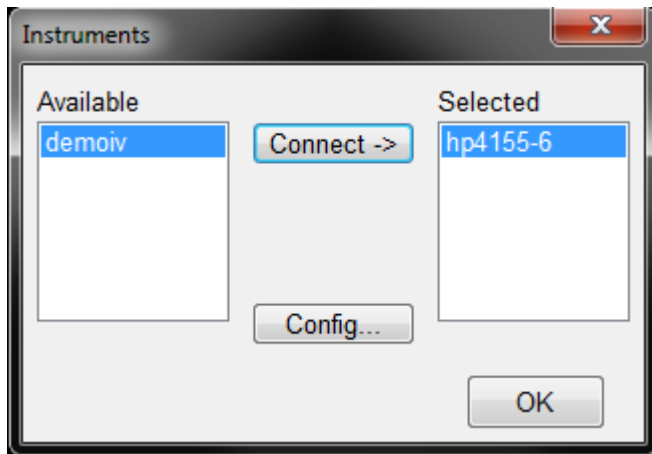
1. Click the **Select Instrument** button.
2. Highlight the instrument to be added and click the **Connect** button.



## *Configuring the Instrument*

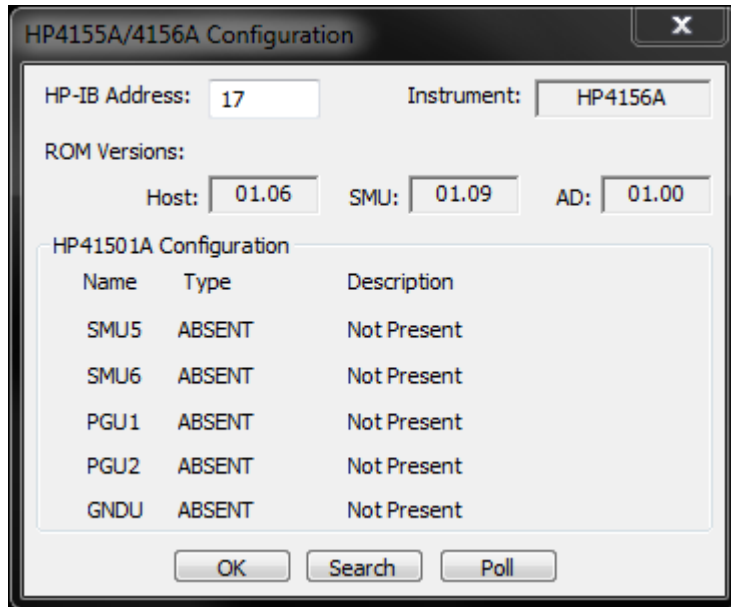
After the Instrument driver is selected, it must be configured.

1. Highlight the instrument to be configured and click the **Config** button.
2. Enter the GPIB address.



## *Polling an Instrument*

To confirm that the instrument and Win4156 are communicating properly, poll the instrument.



1. Click the **Poll** button.
2. Click the **OK** button to close the Configuration window.
3. Click the **OK** button to close the Instruments window.

# Chapter 3- Creating Measurements

## *Introduction*

The Module introduces the Metrics Win4156 (Interactive Characterization Software) measurement engine and demonstrates how to create measurements with it. Special demonstration drivers have been created to allow the development to be independent of the instrument. For details about the instrument drivers provided with Metrics Win4156, please refer to the Metrics Win4156 documentation. The steps to creating a test method will be covered.

## *Topics Covered*

- Creating a Sweep Measurement
- Creating a Spot Measurement
- Creating a Time-Based Measurement

## Create a Sweep Measurement

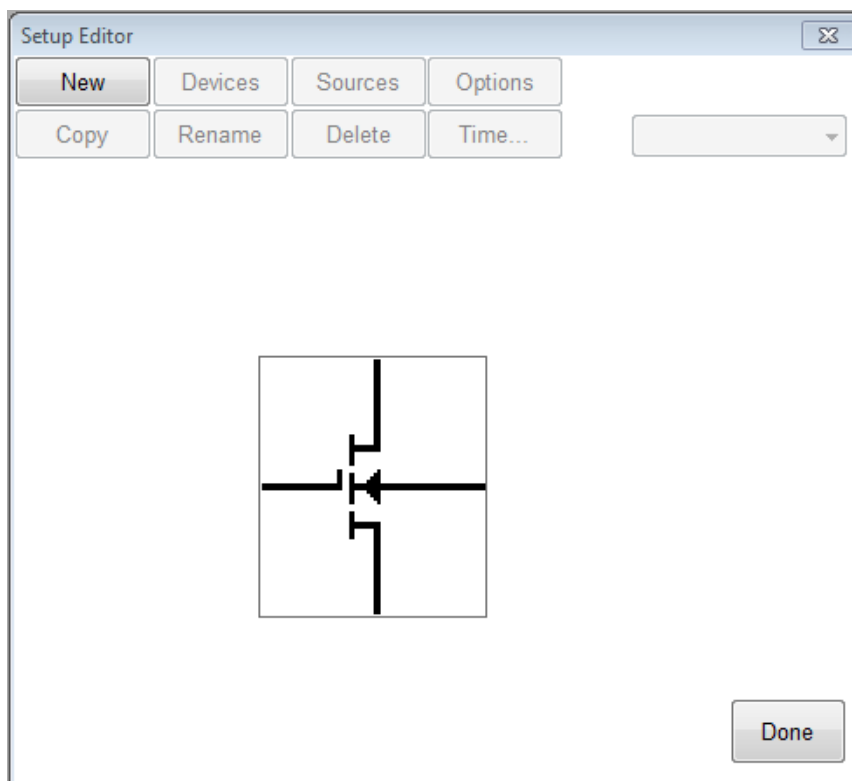
The following example demonstrates how to create a sweep measurement using Win4156. This example uses the demonstration driver within Win4156.

### *To Create a Sweep:*

---

#### 1. Open the setup editor.

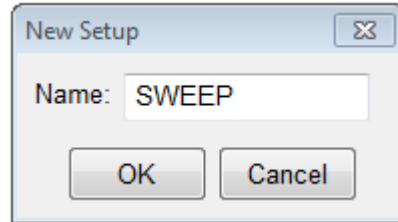
The Setup Editor is the place in Win4156 where the measurement is configured. It can be opened by clicking the Setup Editor button.



#### 2. Click **New** to create a new setup

### 3. Name the Measurement Setup

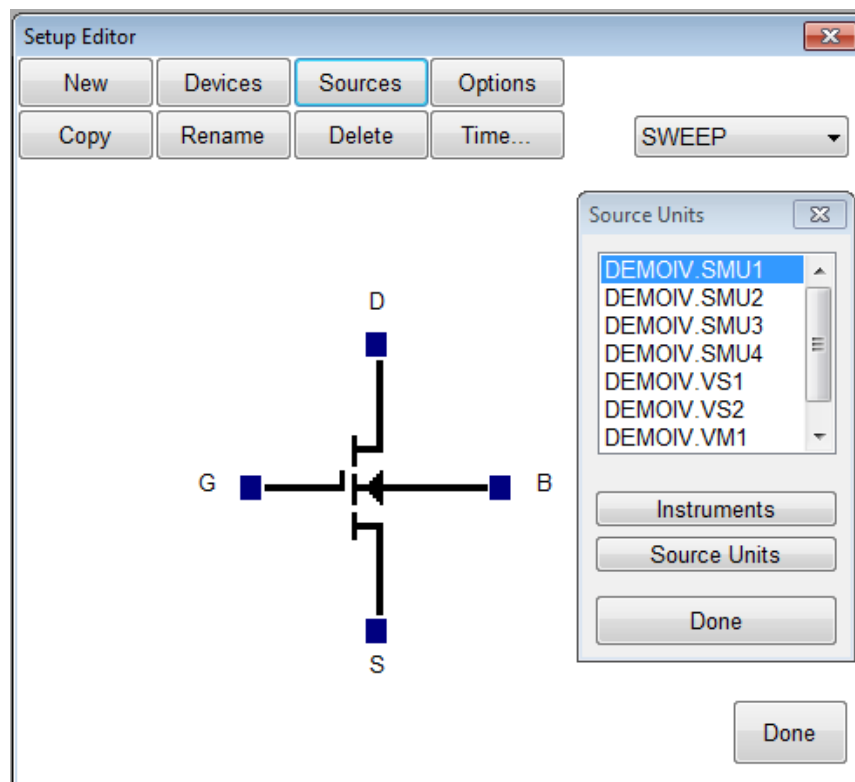
Each measurement must have a unique name. Before the measurement can be created, it must be given a name. To name the measurement:



- a. Entering a name then click the **OK** button.

### 4. Select Source Units

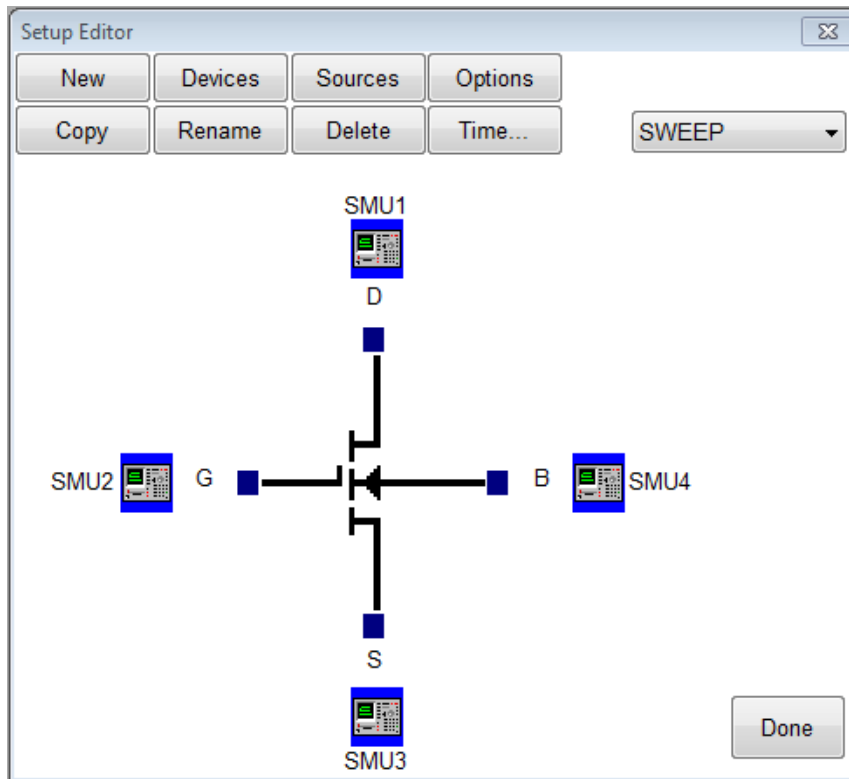
The source units correspond to the outputs of the instrument you are using. Metrics Win4156 provides a graphical way to document the connections for later reference. To add a source unit:



- a. Click on the **Sources** button to open the Source Units window.
- b. Highlight the specific unit.
- c. Click the blue box beside the device lead in the Setup Editor.

**To remove a source unit:**

- a. Highlight the attached unit.
- b. Click the blue box beside the device lead in the Setup Editor.
- c. Click the **Yes** button when asked if "Do you really want to remove the source".

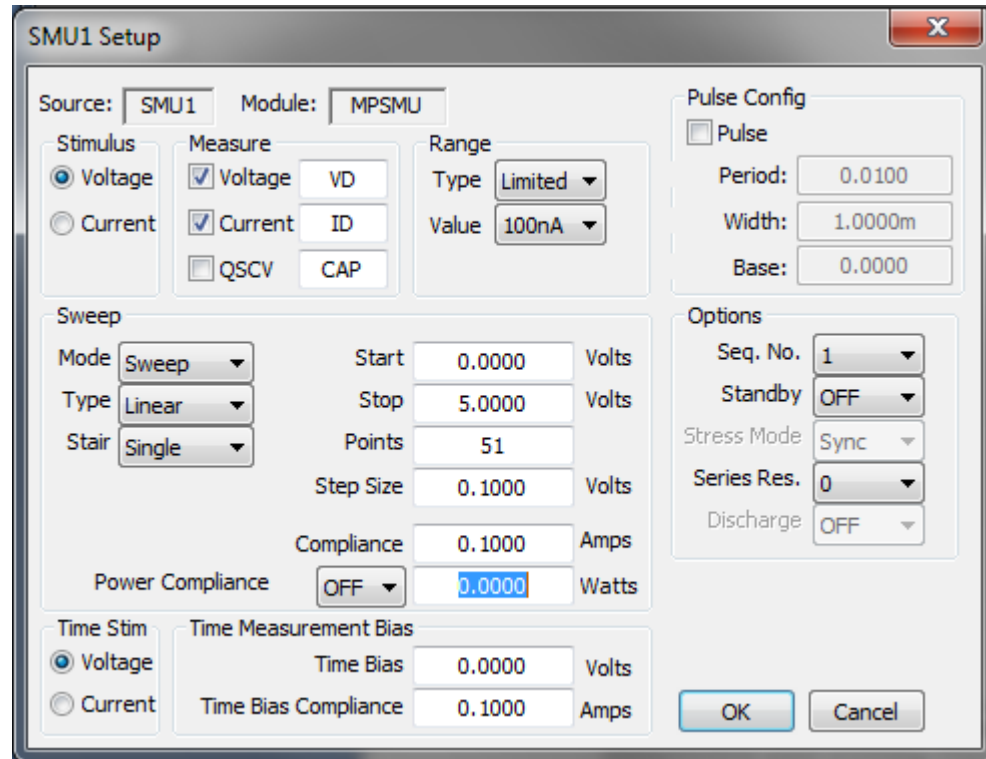


**Note:** The graphic is merely a representation of the device. The software does not expect behaviors from the data. Thus, the pin-out does not have to exactly match, rather it is only for reference.



## 5. Configure Source Units.

In this example we are creating a sweep source, so we must configure the source unit properly. To setup a sweep source:



1. Select the stimulus type.
2. Select the values to be measured (see note below).
3. Click the blue box beside the device lead in the Setup Editor.
4. Select the sweep timing (see note below).
5. Select the Source Mode. In this case we want it to be **Sweep**.
6. Setup the sweep parameters.

**Note:** Most SMU's can only measure the signal that is not being sourced. Therefore, in this case we have selected the Stimulus to be Voltage resulting in the Current being measured. The values returned for Voltage in this case would be the calculated voltage steps. The opposite is true when the Stimulus mode is set to Current. The Sweep Time parameters are to control the rate of the sweep. Please note that these inputs vary for different instruments.

## Create a Spot Measurement

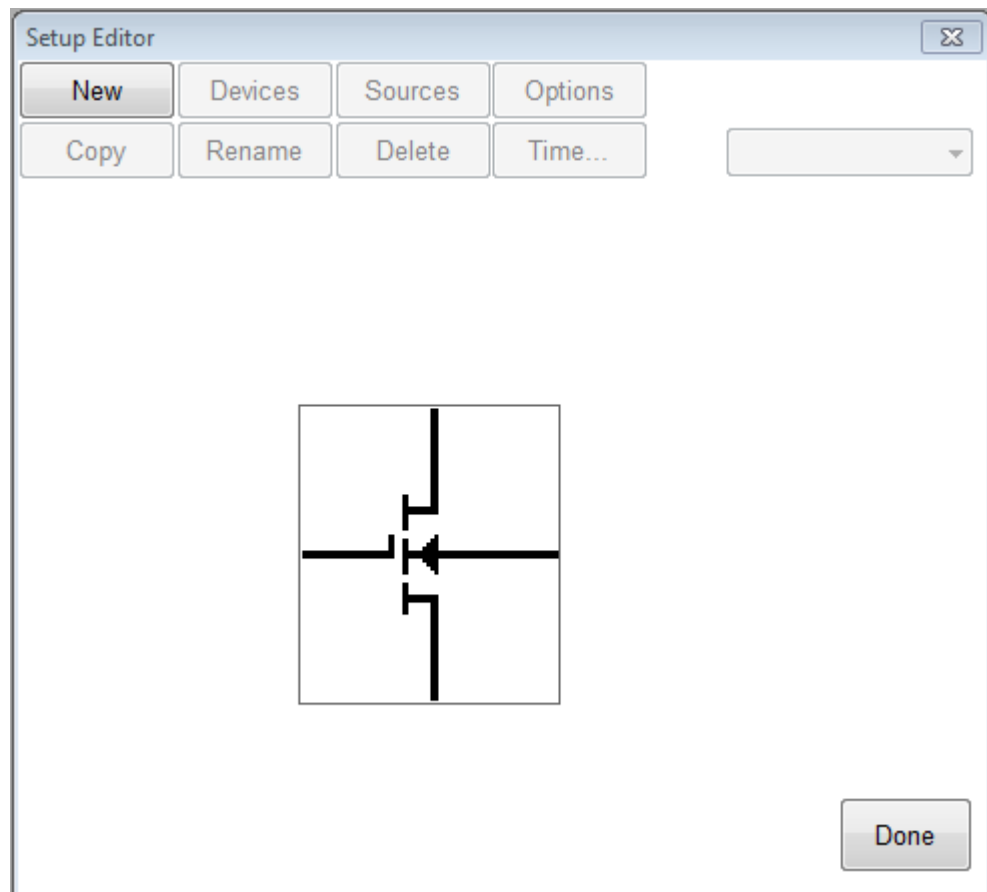
In this example we will create a spot (or single point) measurement. Most of the steps are the same or similar to creating a sweep measurement. The first step is to open the setup editor. The setup editor can be opened by clicking the Setup Editor button.

### *To Create a Spot Measurement:*

---

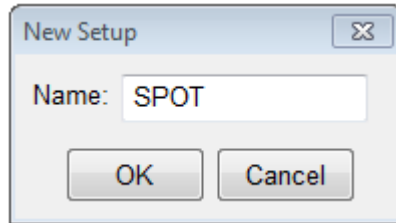
#### 1. Open the setup editor.

The Setup Editor is the place in Win4156 where the measurement is configured. It can be opened by clicking the Setup Editor button.



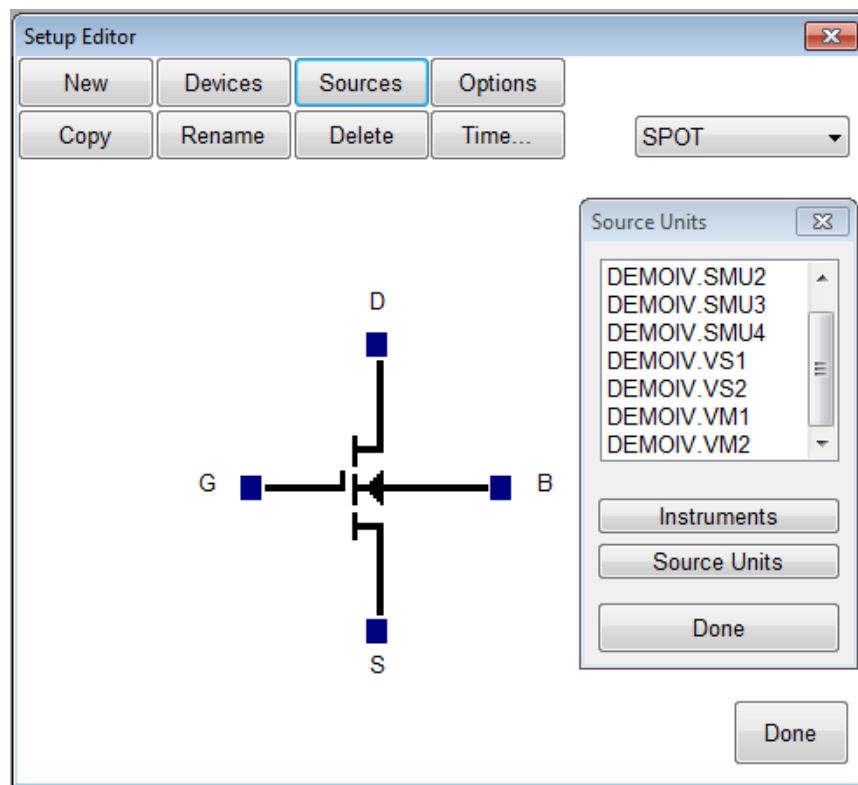
## 2. Name the Measurement Setup.

Each measurement must have a unique name. Before the measurement can be created, it must be given a name. To name the measurement:

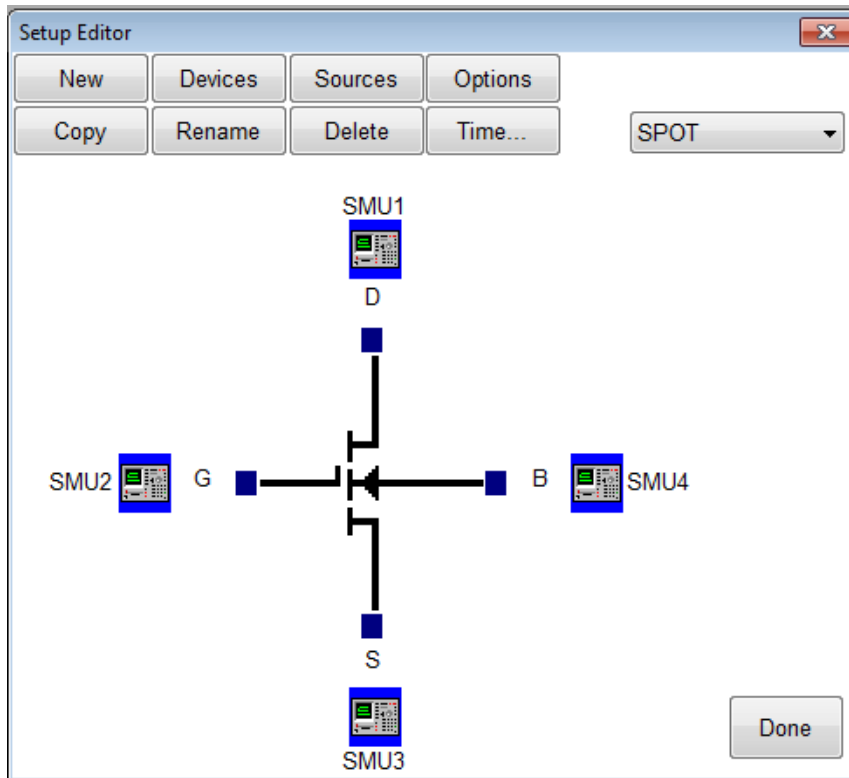


- Click the **New** button and type in a name.
- Click the **OK** button after entering the name.
- Select Source Units.

The source units correspond to the outputs of the instrument you are using. Metrics Win4156 provides a graphical way to document the connections for later reference. To add a source unit:



- Click on the Source Units button to open the Source Units window.
- Highlight the specific unit.
- Click the blue box beside the device lead in the Setup Editor.



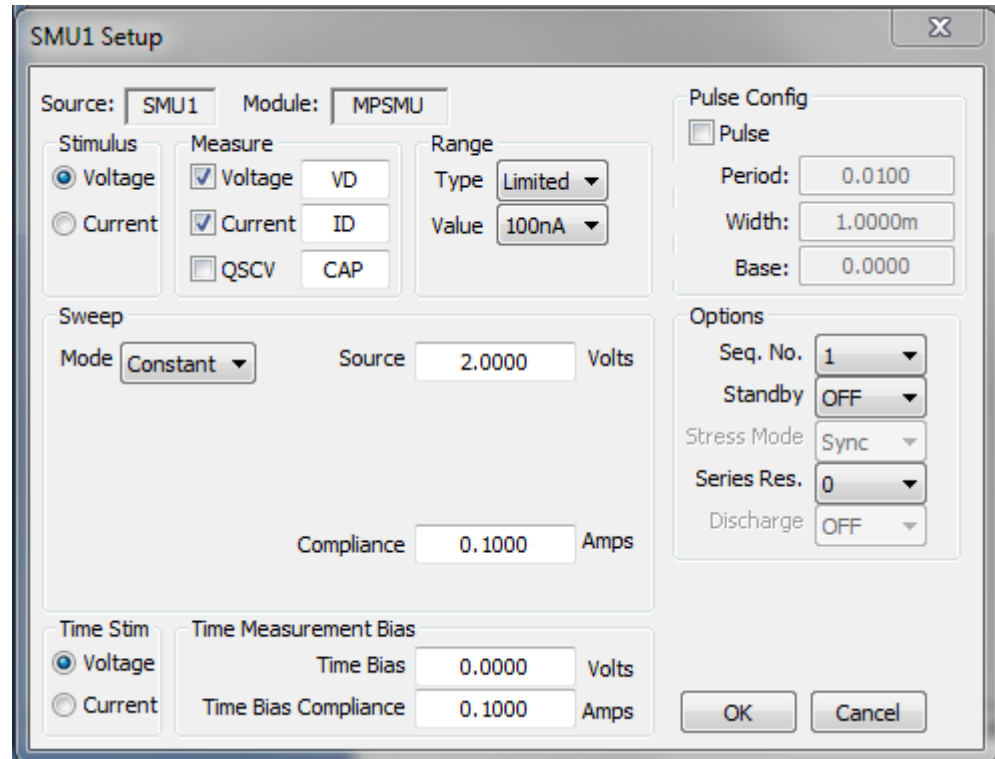
**To remove a source unit:**

- Highlight the specific unit.
- Click the blue box beside the device lead in the Setup Editor.
- Click the **Yes** button.

**Note:** The graphic is merely a representation of the device. The software does not expect behaviors from the data. Thus, the pin-out does not have to exactly match, rather it is only for reference.

### 3. Configure Source Units.

In this example we are creating a spot source, so we must configure the source unit properly. To setup a spot source:



1. Select the stimulus type.
2. Select the values to be measured (see note below).
3. Select the Source Mode. In this case we want it to be **Const.**
4. Setup the source bias.

**Note:** Most SMU's can only measure the signal that is not being sourced. Therefore, in this case we have selected the Stimulus to be Voltage resulting in the Current being measured. The values returned for Voltage in this case would be the calculated voltage steps. The opposite is true when the Stimulus mode is set to Current. Please note that these inputs vary for different instruments.

## *Creating a Time-Based Measurement*

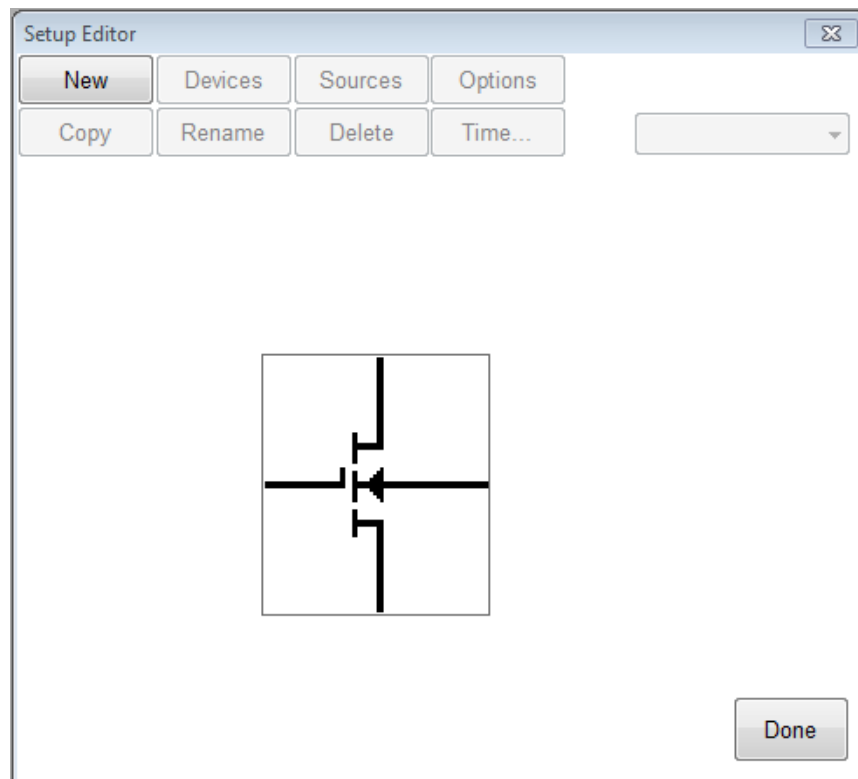
In this example we will create a time-based measurement. Most of the steps are the same or similar to creating a spot measurement. The first step is to open the setup editor.

### *To Create a Time-Based Measurement:*

---

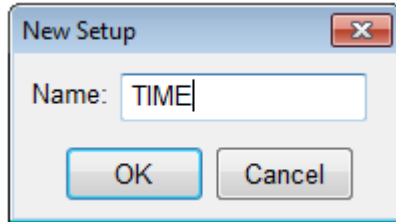
#### **1. Open the setup editor.**

The Setup Editor is the place in Win4156 where the measurement is configured. It can be opened by clicking the Setup Editor button.

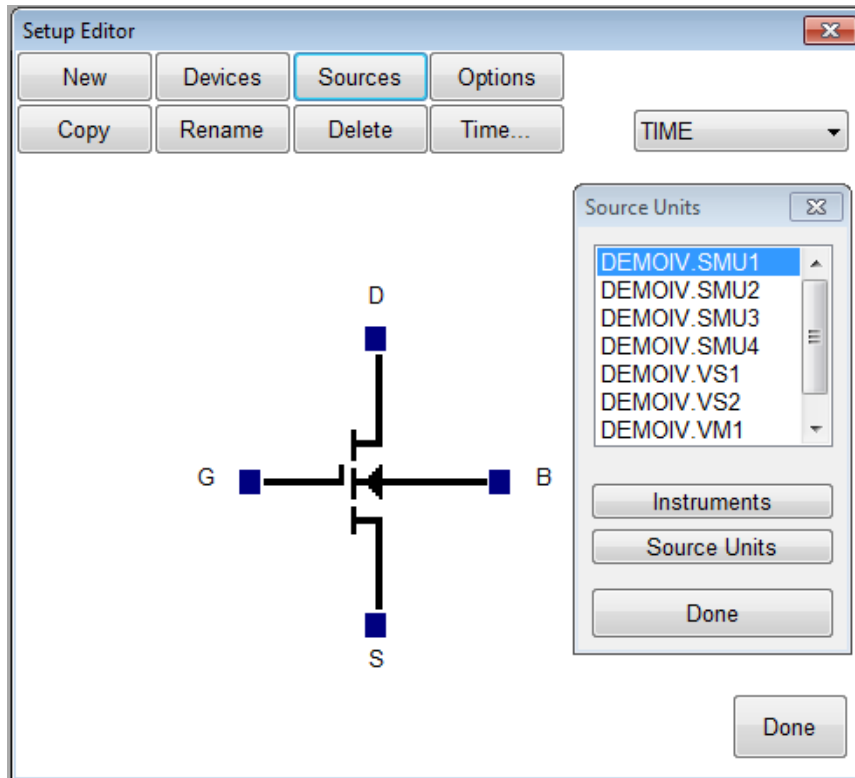


## 2. Name the Measurement Setup.

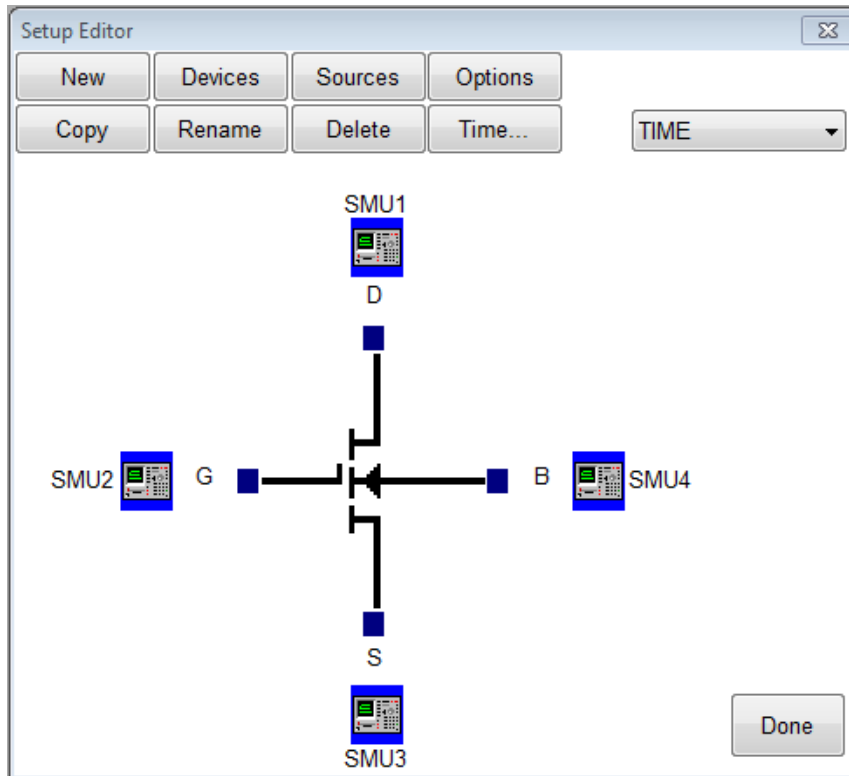
Each measurement must have a unique name. Before the measurement can be created, it must be given a name. To name the measurement:



- Click the **New** button and type in a name.
- Click the **OK** button after entering the name.
- Select Source Units.



The source units correspond to the outputs of the instrument you are using. Metrics Win4156 provides a graphical way to document the connects for later reference. To add a source unit:



- Click on the Source Units button to open the Source Units window.
- Highlight the specific unit.
- Click the blue box beside the device lead in the Setup Editor.

**To remove a source unit:**

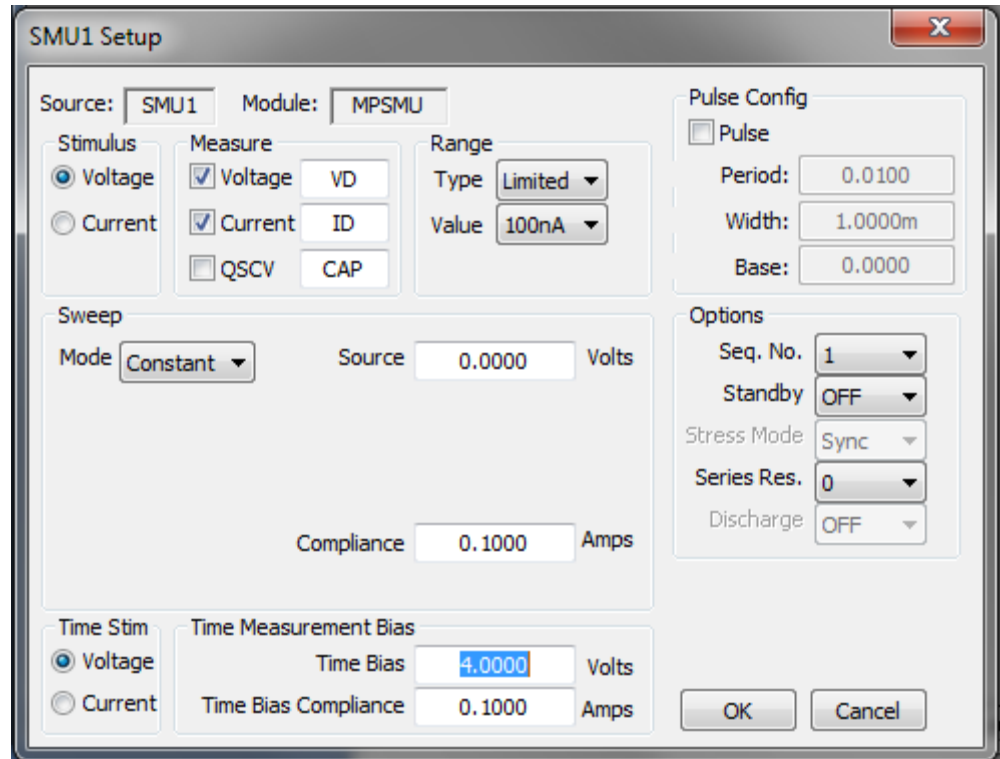
- Highlight the specific unit.
- Click the blue box beside the device lead in the Setup Editor.
- Click the **Yes** button.

**Note:** The graphic is merely a representation of the device. The software does not expect behaviors from the data. Thus, the pinout does not have to exactly match, rather it is only for reference.



### 3. Configure Source Units.

In this example we are creating a time stimulus source, so we must configure the source unit properly. To setup a time stimulus source:

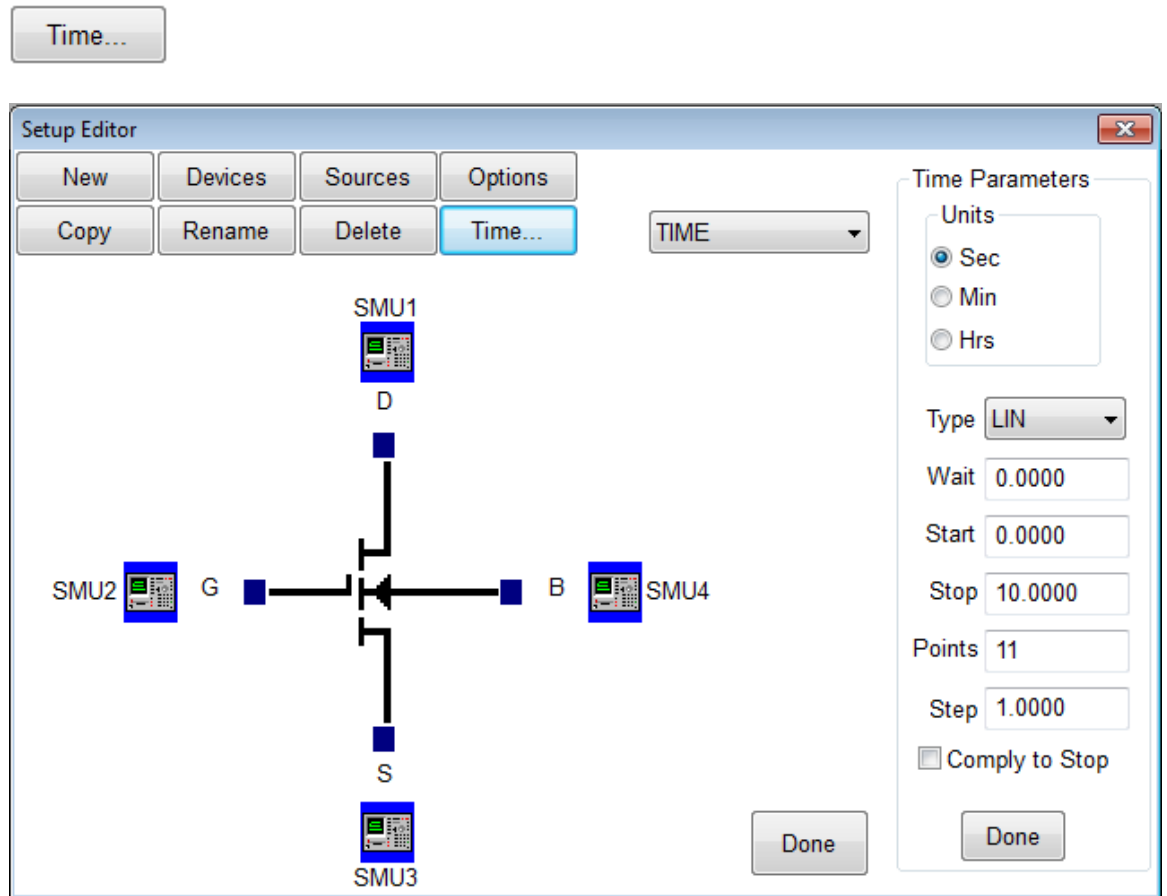


- Select the stimulus type.
- Select the values to be measured (see note below).
- Select the Time Bias and Compliance.

**Note:** Most SMU's can only measure the signal that is not being sourced. Therefore, in this case we have selected the Stimulus to be Voltage resulting in the Current being measured. The values returned for Voltage in this case would be the calculated voltage steps. The opposite is true when the Stimulus mode is set to Current. Please note that these inputs vary for different instruments.

#### 4. Set Time Parameters.

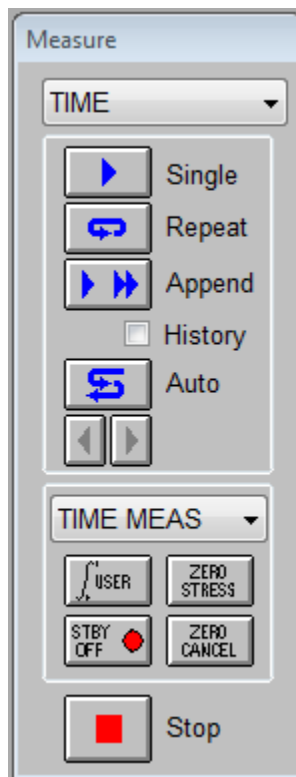
We must specify the time interval that the measurements will be made. To setup the time parameters:



- Select the Time Units.
- Select the sampling type.
- Enter the Wait time.
- Enter the Start, Stop, and Step values. Select the Comply to Stop, option if desired.

## 5. Set Measurement Mode.

We must specify the measurement mode as **Time Meas.** To setup the measurement mode:



- a. Select the Setup.
- b. Select the **TIME MEAS** mode.

# Chapter 4- Executing Measurements

## *Introduction*

This Module details the execution of the measurement using Win4156.

**Note:** When creating new tests, it is necessary that the data be measured before the analysis is created.

## *Topics Covered*

- Measurement Remote Control
- The Date Window

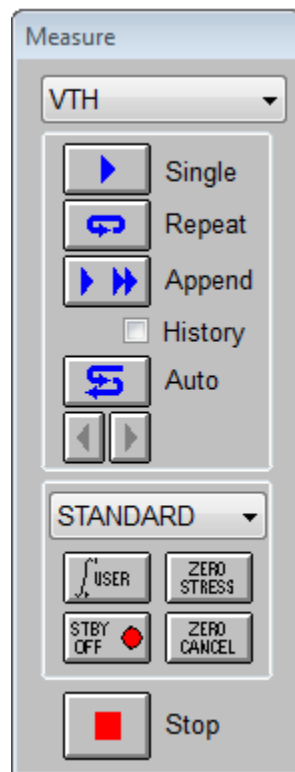
## *Measurement Remote Control*

Metrics Win4156 contains a tool named the Measurement Remote Control. This control is activated by clicking the Measure button on the Win4156 toolbar.



This toolbar contains buttons to begin the measurement as well as menus to select the measurement and mode.

**Note:** The remote control window can be moved anywhere on the desktop.



The Measurement Remote Control has four sections.

### *Section 1: Measurement Menu*

---

This pull-down menu allows the selection of a specific test to be executed.

### *Section 2: Execute Buttons*

---

This section contains the buttons that will start the measurement. Several modes of measurement are available and the buttons correspond to the selected mode.

### *Section 3: Measurement Mode Menu*

---

This pull-down menu allows the selection of the measurement mode. Most measurements are made in standard mode, however Win4156 does support several specialized measurement modes which require this measurement mode setting to be modified. (i.e. ICS time measure modes) Please refer to the Win4156 Reference Guide for details on the additional modes.

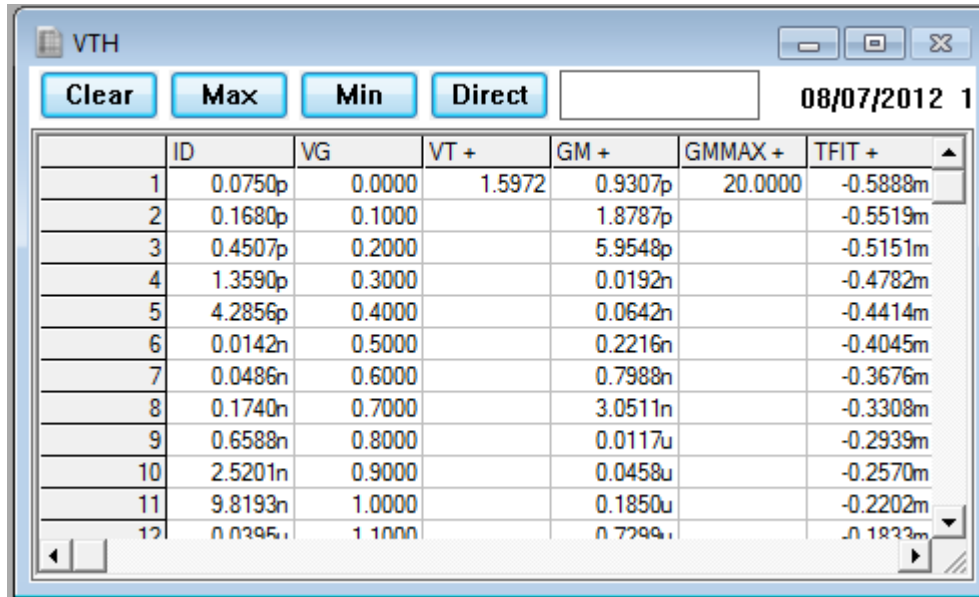
### *Section 4: Stop Button*

---

This button allows the user to stop the measurement.

## The Data Window

When a new setup is created the spreadsheet is automatically created when a test setup is created. It will begin as a minimized window in the lower left corner of the Win4156 window. To view the data simply double-click the window that has the same name as the test setup.

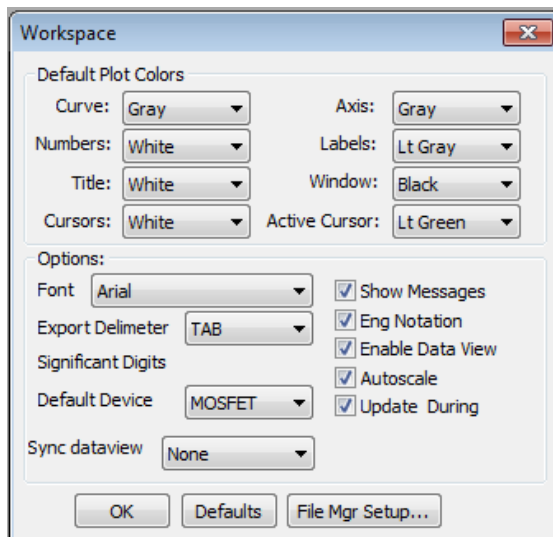


The screenshot shows a window titled "VTH" with a toolbar containing "Clear", "Max", "Min", and "Direct" buttons. A date field displays "08/07/2012 1". Below the toolbar is a table with 7 columns: ID, VG, VT +, GM +, GMMAX +, and TFIT +. The table contains 12 rows of data. The first row has values: 1, 0.0750p, 0.0000, 1.5972, 0.9307p, 20.0000, -0.5888m. The last row has values: 12, 0.0395p, 1.1000, 0.7299p, 20.0000, -0.1833m.

|    | ID      | VG     | VT +   | GM +    | GMMAX + | TFIT +   |
|----|---------|--------|--------|---------|---------|----------|
| 1  | 0.0750p | 0.0000 | 1.5972 | 0.9307p | 20.0000 | -0.5888m |
| 2  | 0.1680p | 0.1000 |        | 1.8787p |         | -0.5519m |
| 3  | 0.4507p | 0.2000 |        | 5.9548p |         | -0.5151m |
| 4  | 1.3590p | 0.3000 |        | 0.0192n |         | -0.4782m |
| 5  | 4.2856p | 0.4000 |        | 0.0642n |         | -0.4414m |
| 6  | 0.0142n | 0.5000 |        | 0.2216n |         | -0.4045m |
| 7  | 0.0486n | 0.6000 |        | 0.7988n |         | -0.3676m |
| 8  | 0.1740n | 0.7000 |        | 3.0511n |         | -0.3308m |
| 9  | 0.6588n | 0.8000 |        | 0.0117u |         | -0.2939m |
| 10 | 2.5201n | 0.9000 |        | 0.0458u |         | -0.2570m |
| 11 | 9.8193n | 1.0000 |        | 0.1850u |         | -0.2202m |
| 12 | 0.0395p | 1.1000 |        | 0.7299p |         | -0.1833m |

The Data window automatically returns the measured data and displays it. When parameters are extracted the values are also displayed.

**Note:** Win4156 has a feature named "Enable Data View". To enable or disable this feature select Workspace from the Options menu.

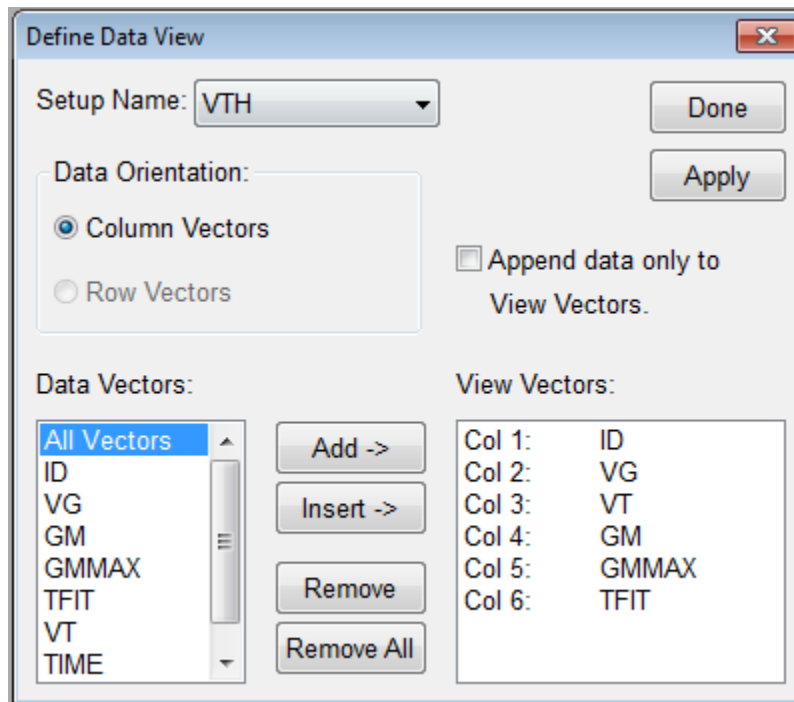


The screenshot shows the "Workspace" dialog box with the following settings:

- Default Plot Colors:
  - Curve: Gray
  - Axis: Gray
  - Numbers: White
  - Labels: Lt Gray
  - Title: White
  - Window: Black
  - Cursors: White
  - Active Cursor: Lt Green
- Options:
  - Font: Arial
  - Export Delimiter: TAB
  - Significant Digits: (empty)
  - Default Device: MOSFET
  - Sync dataview: None
  - ☒ Show Messages
  - ☒ Eng Notation
  - ☒ Enable Data View
  - ☒ Autoscale
  - ☒ Update During

Buttons at the bottom: OK, Defaults, File Mgr Setup...

## *Edit the Data View*



The 'Define Data View' dialog box is shown. It has a title bar with a close button. The 'Setup Name' is set to 'VTH'. There are 'Done' and 'Apply' buttons. Under 'Data Orientation', 'Column Vectors' is selected. There is an unchecked checkbox for 'Append data only to View Vectors.'. Under 'Data Vectors', a list contains 'All Vectors', 'ID', 'VG', 'GM', 'GMMAX', 'TFIT', 'VT', and 'TIME'. To the right of this list are buttons: 'Add ->', 'Insert ->', 'Remove', and 'Remove All'. Under 'View Vectors', a list shows: 'Col 1: ID', 'Col 2: VG', 'Col 3: VT', 'Col 4: GM', 'Col 5: GMMAX', and 'Col 6: TFIT'.

| Col    | Vector |
|--------|--------|
| Col 1: | ID     |
| Col 2: | VG     |
| Col 3: | VT     |
| Col 4: | GM     |
| Col 5: | GMMAX  |
| Col 6: | TFIT   |

This feature allows the user to select only data vectors that are chosen to be displayed. It also allows the reordering of the data vectors as they appear in the data window. The default behavior is for the Data View to be disabled which displays all vectors for a chosen setup.

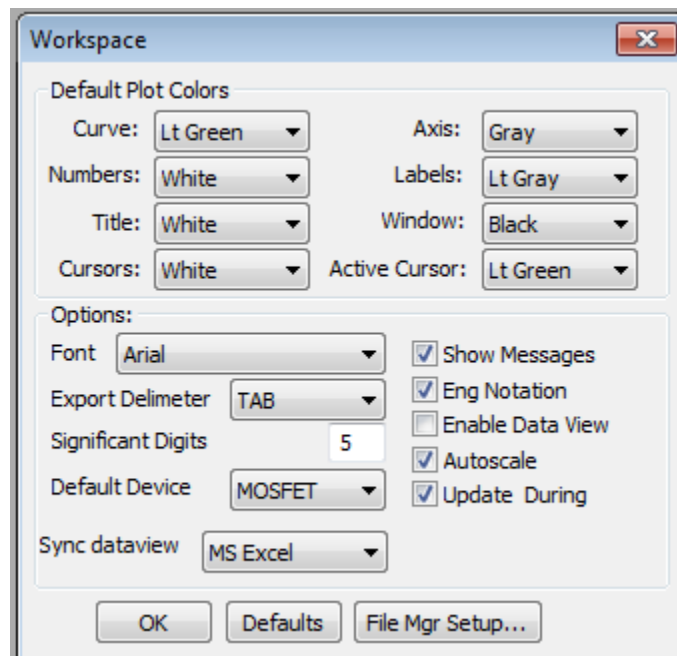


## *Sync the DataView with Microsoft Excel*

This feature allows the user to automatically synchronize all Data Views with a Microsoft Excel workbook. The default behavior is for the Data View to be disabled which displays all vectors for each setup in separate tabs of the workbook.

**Note:** Win4156 has a feature named "Enable Data View". To enable or disable this feature select Workspace from the Options menu.

**Note:** Win4156 has a feature named "Sync Data View". To enable or disable this feature select Workspace from the Options menu.



VTH

Clear Max Min Direct 08/07/2012 15

|    | ID      | VG     | GM +    | GMMAX + | TFIT +   | VTH +  |
|----|---------|--------|---------|---------|----------|--------|
| 1  | 0.1087p | 0.0000 | 1.3488p | 20.0000 | -0.8533m | 1.5972 |
| 2  | 0.2435p | 0.1000 | 2.7227p |         | -0.7999m |        |
| 3  | 0.6532p | 0.2000 | 8.6301p |         | -0.7465m |        |
| 4  | 1.9696p | 0.3000 | 0.0278n |         | -0.6931m |        |
| 5  | 6.2109p | 0.4000 | 0.0930n |         | -0.6396m |        |
| 6  | 0.0206n | 0.5000 | 0.3212n |         | -0.5862m |        |
| 7  | 0.0704n | 0.6000 | 1.1577n |         | -0.5328m |        |
| 8  | 0.2521n | 0.7000 | 4.4218n |         | -0.4794m |        |
| 9  | 0.9548n | 0.8000 | 0.0170u |         | -0.4259m |        |
| 10 | 3.6524n | 0.9000 | 0.0664u |         | -0.3725m |        |
| 11 | 0.0142u | 1.0000 | 0.2680u |         | -0.3191m |        |
| 12 | 0.0573u | 1.1000 | 1.0578u |         | -0.2657m |        |

While the "Sync dataview" is selected all data will be automatically synced to the MS Excel spreadsheet.

Book1 - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Team

PivotTable Table Picture Charts Hyperlink Text Box Header & Footer WordArt

Tables Illustrations Links Text

A1 fx ID

|    | A        | B   | C        | D       | E        | F        | G |
|----|----------|-----|----------|---------|----------|----------|---|
| 1  | ID       | VG  | GM +     | GMMAX + | TFIT +   | VTH +    |   |
| 2  | 1.09E-13 | 0   | 1.35E-12 | 20      | -0.00085 | 1.597227 |   |
| 3  | 2.44E-13 | 0.1 | 2.72E-12 |         | -0.0008  |          |   |
| 4  | 6.53E-13 | 0.2 | 8.63E-12 |         | -0.00075 |          |   |
| 5  | 1.97E-12 | 0.3 | 2.78E-11 |         | -0.00069 |          |   |
| 6  | 6.21E-12 | 0.4 | 9.3E-11  |         | -0.00064 |          |   |
| 7  | 2.06E-11 | 0.5 | 3.21E-10 |         | -0.00059 |          |   |
| 8  | 7.04E-11 | 0.6 | 1.16E-09 |         | -0.00053 |          |   |
| 9  | 2.52E-10 | 0.7 | 4.42E-09 |         | -0.00048 |          |   |
| 10 | 9.55E-10 | 0.8 | 1.7E-08  |         | -0.00043 |          |   |
| 11 | 3.65E-09 | 0.9 | 6.64E-08 |         | -0.00037 |          |   |
| 12 | 1.42E-08 | 1   | 2.68E-07 |         | -0.00032 |          |   |
| 13 | 5.73E-08 | 1.1 | 1.06E-06 |         | -0.00027 |          |   |
| 14 | 2.26E-07 | 1.2 | 4.01E-06 |         | -0.00021 |          |   |

VTH Sheet1 Sheet2 Sheet3

Ready 100%

You can create user defined macros to perform further analysis to create custom reports and save out to the file system in .XLS format.

Notice that not only the measured data vectors are synced but also any transforms that have been setup for the raw data.

# Chapter 5- Plotting Data

## *Introduction*

This Module introduces the plotting tool of the Win4156 software. The plotting tool allows for the graphical analysis of data measured with Win4156.

## *Topics Covered*

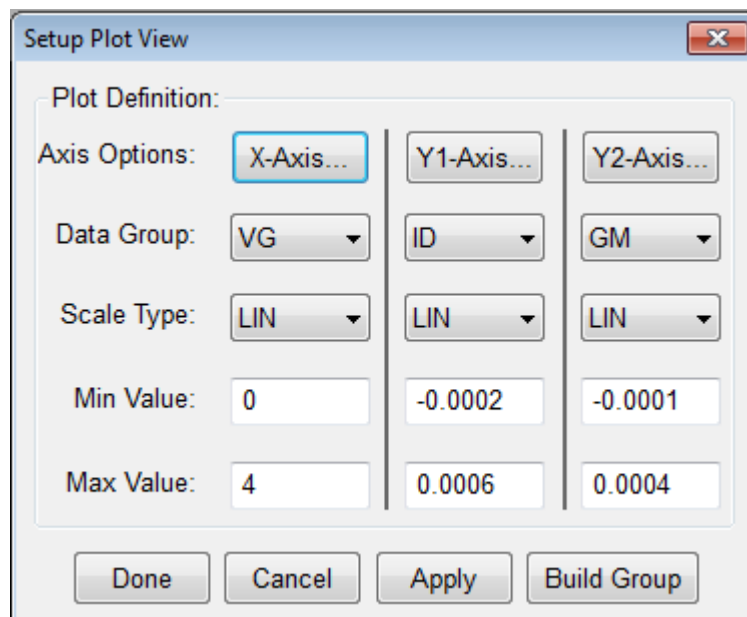
- Creating a Plot
- Editing a Plot

## Creating a Plot

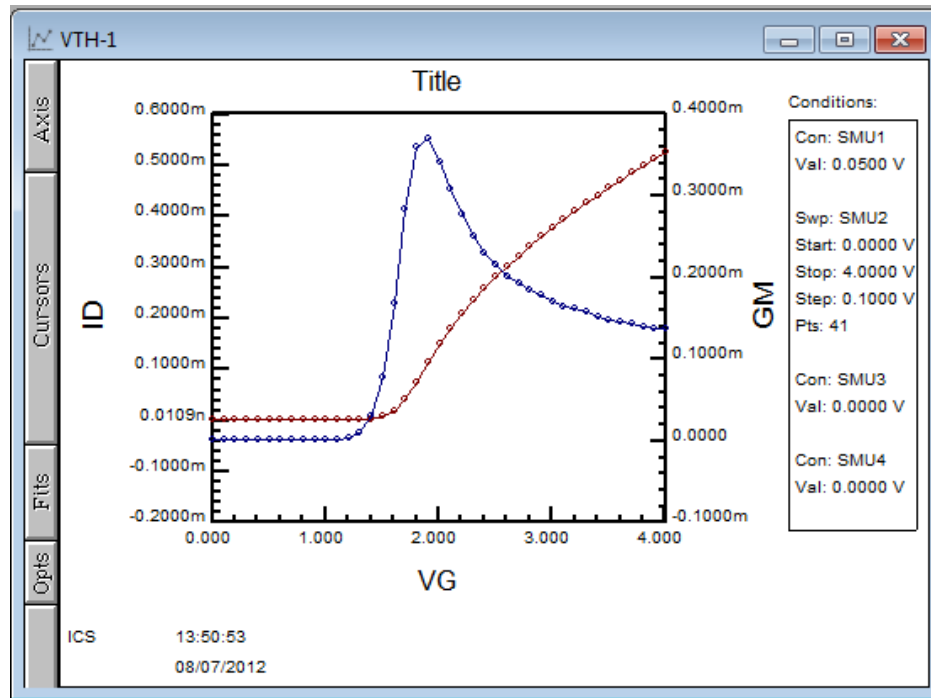
The Metrics Win4156 software uses a custom plot tool to display plots and provide analysis features like read-out cursors and line fits.

*To create a new plot:*

---

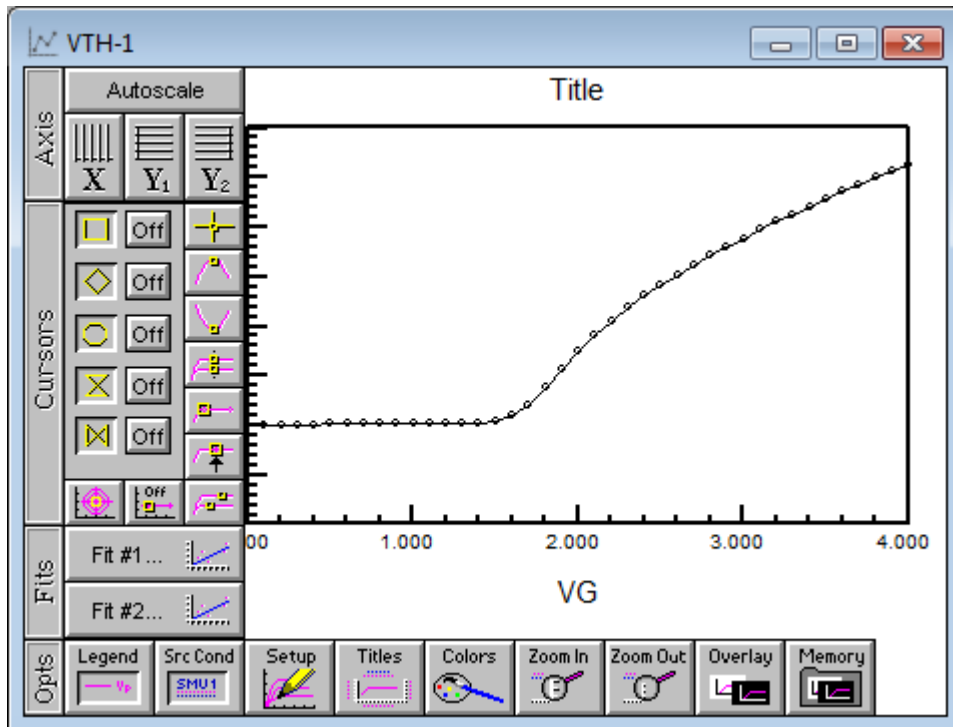


1. Click the **Plot** button on the toolbar.
2. Configure the plot.
3. Click the **Done** button and the plot will be created.



**Note:** The plot is made from whatever data window is currently active. The name of the plot in the Window title is the setup name followed by a dash and a number. Multiple plots can be created from the same data set, the number will just increase.

## *Editing a Plot*



The plot window contains the editing tools for the plot.

1. The Axis button reveals the tools to change the axis from linear to logarithmic and to auto scale the plot.
2. The Cursors button allows the addition and control of cursors on the plot.
3. The Fits button allows the application of curve fits related to the cursors.
4. The Opts button presents several options for adding notes to the plot, overlaying plots, zooming features, and setup changes.

These functions are discussed in great detail within the Win4156 Reference Manual.

# Chapter 6- Extracting Data

## *Introduction*

After executing a measurement, Win4156 can extract parameters. Once the procedures are defined, each time the measurement is run the calculations are performed automatically.

This Module demonstrates how to extract parameters from the raw data using the Transform Editor within Win4156.

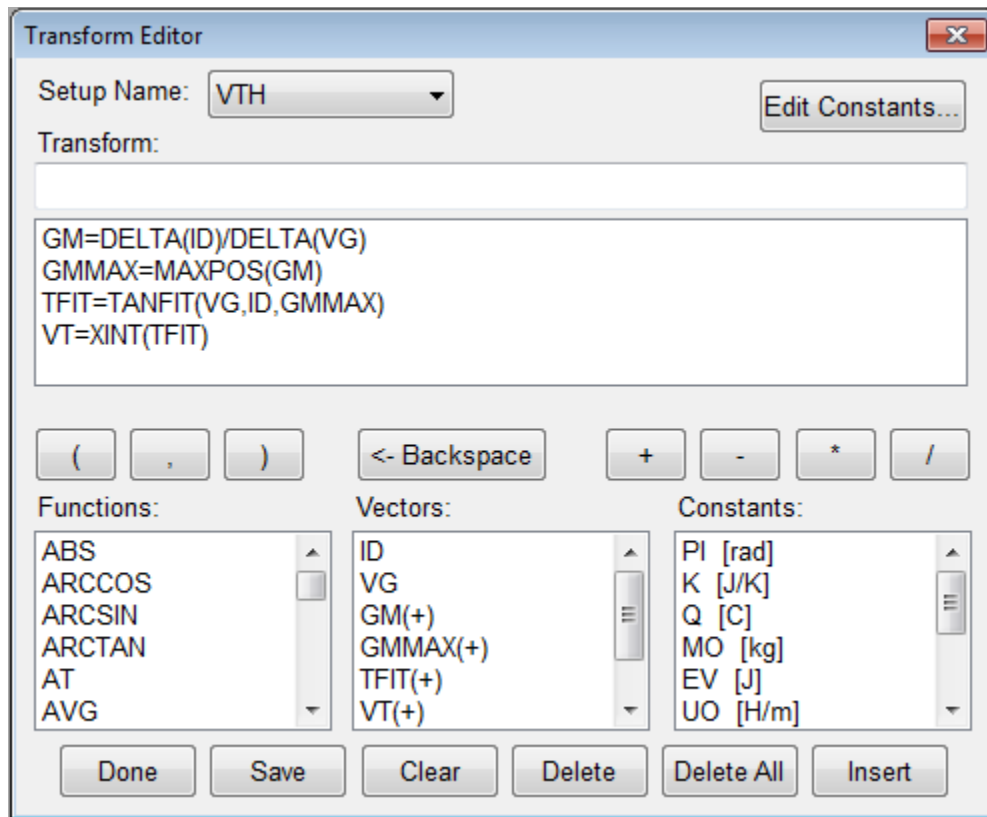
## *Topics Covered*

- The Transform Editor
- Defining a Transform
- Sharing Data Between Transforms



## The Transform Editor

Calculations are created within the Transform Editor. To open the editor, click the "Transform Editor" button on the Win4156 toolbar.



The Transform Editor contains several areas:

### 1. Transform Entry Box

The location to enter the transform.

### 2. Defined Transform List

A list of all transforms defined for this setup.

### *3. Function List*

---

Predefined functions available for the calculation of parameters.

### *4. Vector List*

---

A list of the measured and calculated data vectors.

### *5. Constant List*

---

A list of constants that can be used in calculations.

### *6. Edit Constant Button*

---

Allows constants to be defined and edited.

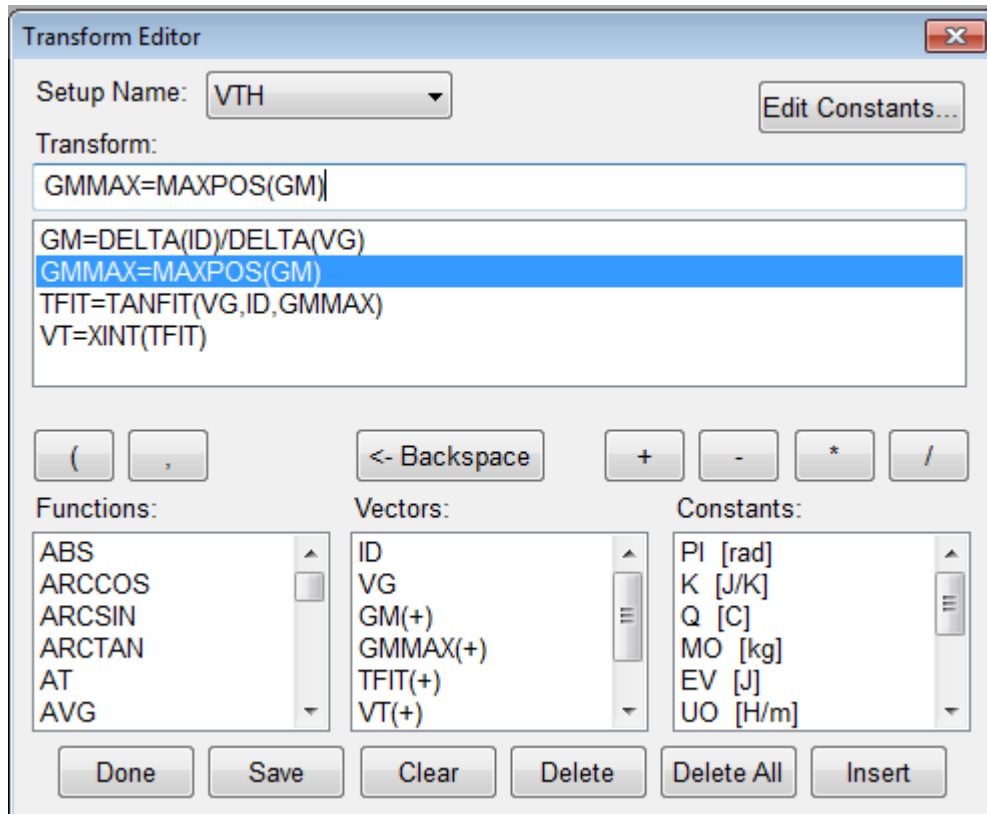
### *7. Action Buttons*

---

Controls for the saving of transforms, deleting of transforms, and exiting the Transform Editor.

## Defining a Transform

Calculations are created within the Transform Editor. To open the "Transform Editor" click the **f(x)** button on the Win4156 toolbar.



### *To create a calculation:*

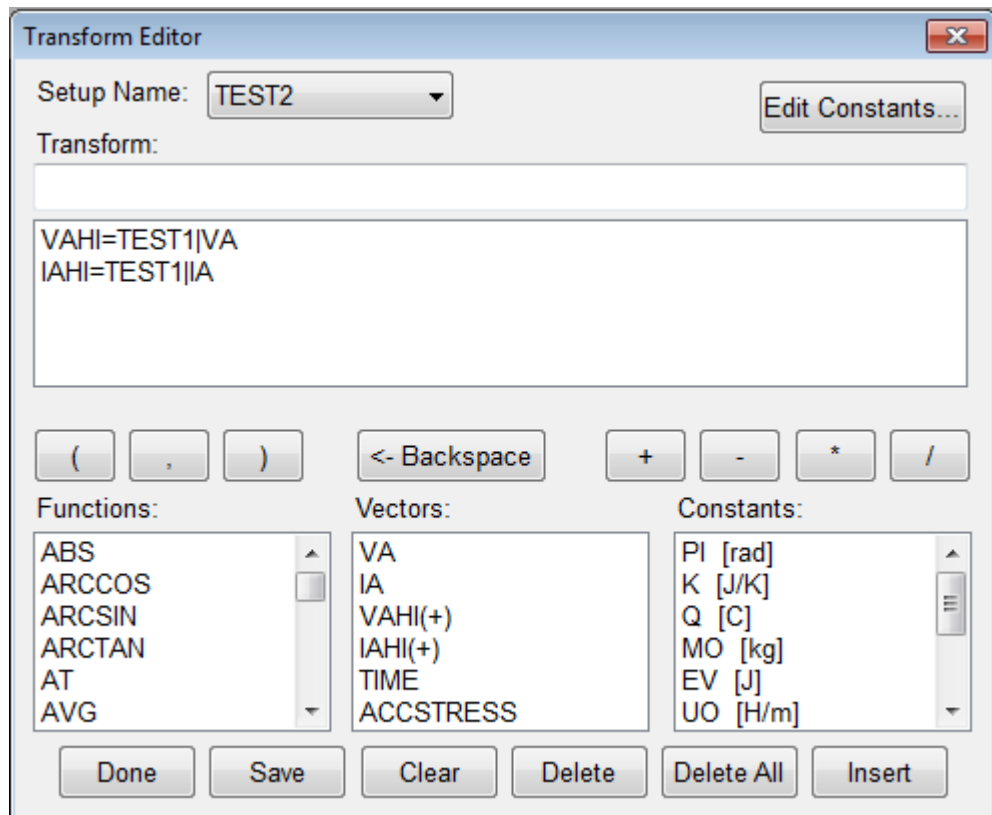
1. Enter the calculation in the "Transform" box. The calculation must be in the form **variable = function(vector)**
2. Hit the **Enter** key or click the **Save** button to save the new calculation.
3. Once all calculations have been saved, click the **Done** button.

## Sharing Data Between Transforms

Data vectors from one setup can be shared with another setup in the same project file. For instance, if one setup **TEST2** measures the resistance from **0 – 1.0 Volts** and the second **TEST1** from **1.1 – 2.0 Volts** the data can be merged to form a full sweep from **0 – 2.0 V**. You can simply create a transform setup **TEST2** of the form **Variable = Setup | Vector** to allow sharing the data from setup **TEST1**.

### *To Share Data:*

We must first create two different setups with **TEST2** being the sweep from **0-1 V** and **TEST1** being the sweep from **1.1 to 2 V**.



1. Open the **Transform Editor** and make sure the setup name is **TEST2**.
2. Create a new Transform **VAHI** as shown above specifying the vector setup name **TEST1** and the vector name **VA** separated by the pipe character `|`.
3. The resulting transform will contain the **VA** data from **TEST1**.
4. Click the **Save** button to save **VAHI**.

You can use the same step to create the transform **IAHI** to share the **IA** data from **TEST1**.

|    | VA     | IA      |
|----|--------|---------|
| 1  | 0.0000 | 0.1049p |
| 2  | 0.1000 | 4.4441p |
| 3  | 0.2000 | 0.4726n |
| 4  | 0.3000 | 0.0778u |
| 5  | 0.4000 | 8.8933u |
| 6  | 0.5000 | 0.1426m |
| 7  | 0.6000 | 0.3110m |
| 8  | 0.7000 | 0.4291m |
| 9  | 0.8000 | 0.5255m |
| 10 | 0.9000 | 0.6095m |
| 11 | 1.0000 | 0.6861m |
| 12 |        |         |
| 13 |        |         |
| 14 |        |         |

After applying the transforms **VAHI** and **IAHI** the data from **TEST1** is appended to the data from **TEST2** and displayed in the data window for **TEST2**.

|    | VA     | IA      | VAHI + | IAHI +  |
|----|--------|---------|--------|---------|
| 1  | 1.1000 | 0.1051p | 0.0000 | 0.1049p |
| 2  | 1.1900 | 4.4496p | 0.1000 | 4.4441p |
| 3  | 1.2800 | 0.4732n | 0.2000 | 0.4726n |
| 4  | 1.3700 | 0.0779u | 0.3000 | 0.0778u |
| 5  | 1.4600 | 8.9044u | 0.4000 | 8.8933u |
| 6  | 1.5500 | 0.1428m | 0.5000 | 0.1426m |
| 7  | 1.6400 | 0.3114m | 0.6000 | 0.3110m |
| 8  | 1.7300 | 0.4297m | 0.7000 | 0.4291m |
| 9  | 1.8200 | 0.5261m | 0.8000 | 0.5255m |
| 10 | 1.9100 | 0.6103m | 0.9000 | 0.6095m |
| 11 | 2.0000 | 0.6869m | 1.0000 | 0.6861m |
| 12 |        |         |        |         |
| 13 |        |         |        |         |
| 14 |        |         |        |         |

# Chapter 7- Saving Data

## *Introduction*

Metrics Win4156 saves the data within the standard Windows File System. This Module covers the data. Where it is stored, how it is stored, and how to retrieve it are covered.

## *Topics Covered*

- Where is the Data?
- Saving a Project

## *Where is the Data?*

Metrics Win4156 allows the data to be stored anywhere within the windows file system.

**Note:** If you want the Win4156 Backup utility to save the data, make sure it is saved within the Metrics\ics\projects directory.

## *Saving a Project*

The project is a collection of the test method(s) and the data. To save the data simply select **File >> Save As** and select the directory and filename or to save the currently open project simply select the **Save** toolbar icon.

