Installation and Getting Started Guide

Metrics ICS

Version 4.3

© Copyright 1995-2021, Metrics Technology, Inc. All rights reserved.

Table of Contents

Installing the ICS Software 4
Obtain a Codeword 4
Important Note for Customers upgrading from Version 3.7 or earlier 4
Procedure to Upgrade ICS from 4.0, 4.1, 4.2 to 4.3 5
Procedure to Install ICS 4.3 (new installation) 12
Metrics Codewords 22
Software Codeword Information 22
Entry of the Codeword Serial Number 23
Introductory Information 25
Goal of This Manual 25
Chapter 1- ICS Getting Started Guide 26
Introduction 26
Topics Covered 26
What is Metrics ICS Software? 27
Overview of Metrics ICS Software 27
Determining Software Version 28
Updating the Metrics ICS Software 28
Support 29
Chapter 2- Selecting Instruments 30
Introduction 30
Topics Covered: 30
Selecting an Instrument Driver 31
Configuring the Instrument 32
Polling an Instrument 32
Chapter 3- Creating Measurements 33
Introduction 33
Topics Covered 33
Create a Sweep Measurement 34
Create a Spot Measurement 38
Creating a Time-Based Measurement 42
Chapter 4- Executing Measurements 48
Introduction 48
Topics Covered 48
Measurement Remote Control 49
The Data Window 51
The Data Window 51
Edit the DataView 52
Sync the DataView with Microsoft Excel 53

© Copyright 1995-2021, Metrics Technology, Inc. All rights reserved.

Chapter 5- Plotting Data 55
Introduction 55
Topics Covered 55
Creating a Plot 56
Editing a Plot 58
Chapter 6- Extracting Data 59
Introduction 59
Topics Covered 59
The Transform Editor 60
Defining a Transform 62
Sharing Data Between Transforms 63
Chapter 7- Saving Data 65
Introduction 65
Topics Covered 65
Where is the Data? 66
Saving a Project 66

© Copyright 1995-2021, Metrics Technology, Inc. All rights reserved.

Installation and Configuration

Installing the ICS Software

NOTE: Do not install the USB Security Key until after the Metrics ICS Software is installed and the PC is restarted. The security key requires special drivers that are installed with ICS. Windows Hardware Manager should detect the USB Security Key as Safenet USB SuperPro/UltraPro and install the driver automatically.

The installation program for the Metrics ICS software installs all components necessary to run Metrics ICS. You can download the auto-extracting archive MTICS-43.exe from the Metrics Technology website under Downloads link of your Customer Portal page. 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 to register at our website to receive your log-in credentials to enter the Support/Customer Portal/Downloads area.

NOTE: You should also download the latest available HotFix release which can be found in the same software list and designated MTICS-43-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 ICS 4.3 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 install it after the base Metrics ICS installation is complete. It is recommended that you make a backup archive of the latest HotFix you apply. 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 to register your software and obtain the codeword. A permanent or temporary codeword will be sent within 24 hours.

Important Note for Customers upgrading from Version 3.7 or later

The Metrics ICS 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.

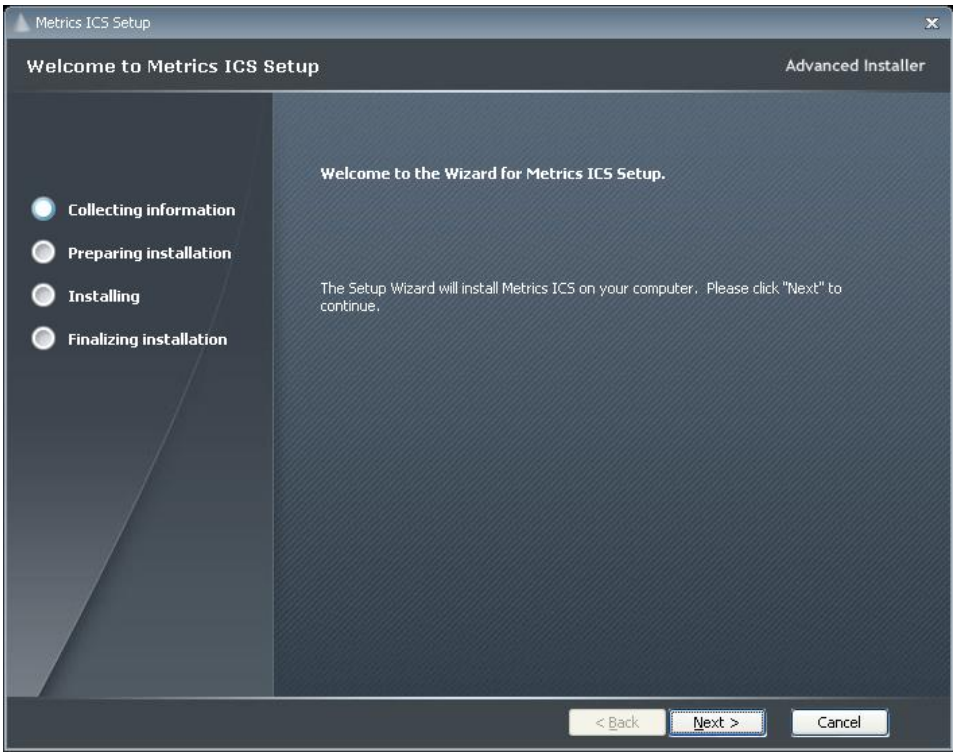
1. Go to the File Menu and select Backup
2. Enter the name of the backup ZIP archive in the ICS directory (i.e. C:\METRICS\ICS\backup.zip)
3. Allow the backup utility to complete then copy the .ZIP file to another drive location.

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

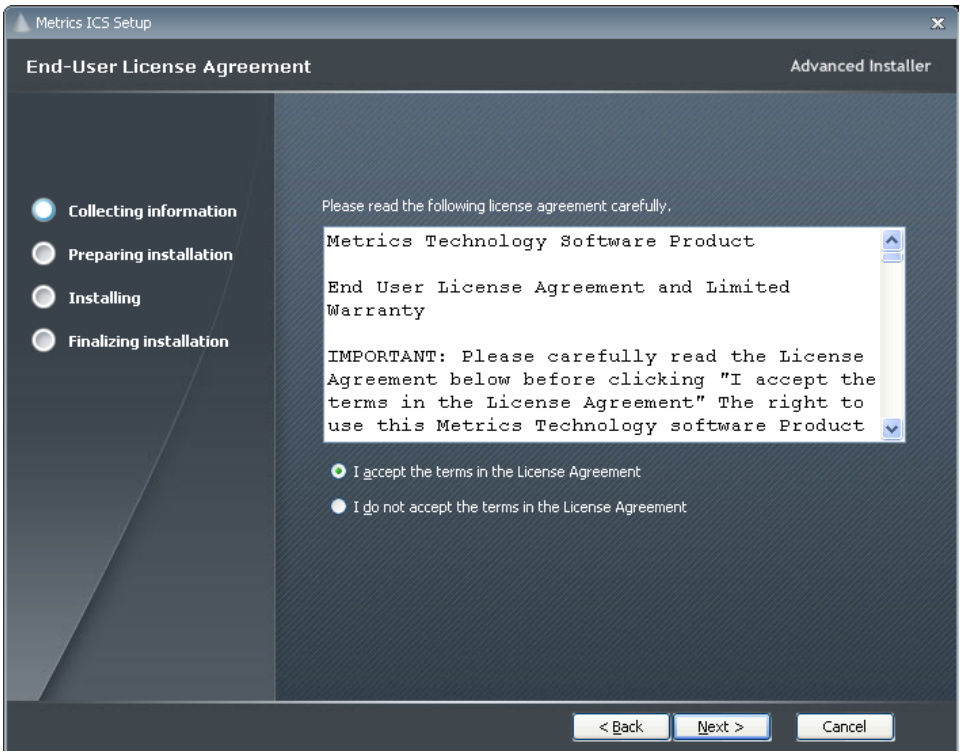
Procedure to Upgrade ICS from 4.0, 4.1, 4.2 to 4.3

1. Insert the Metrics ICS install CD into the CD-ROM drive of your computer.

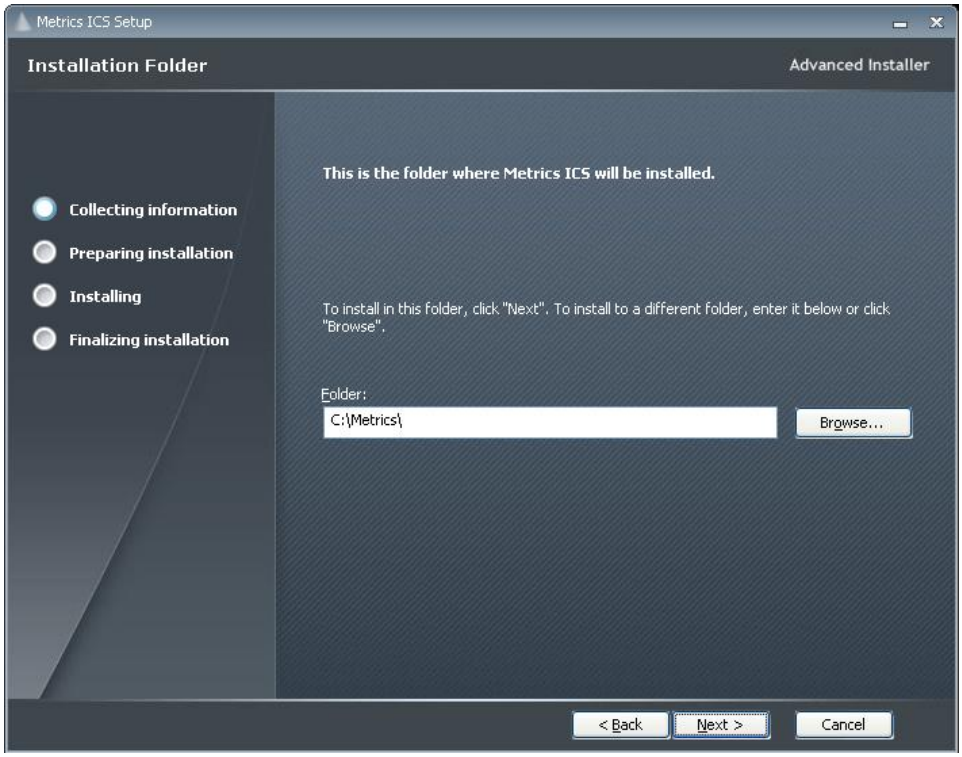
2. The CD-ROM should automatically start the MTICS-43.exe installation program. If the installation does not start automatically then select right click on the CD drive icon in Windows Explorer and then select "explore". Select the MTICS-43**.exe** application icon to start the installation program manually.



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

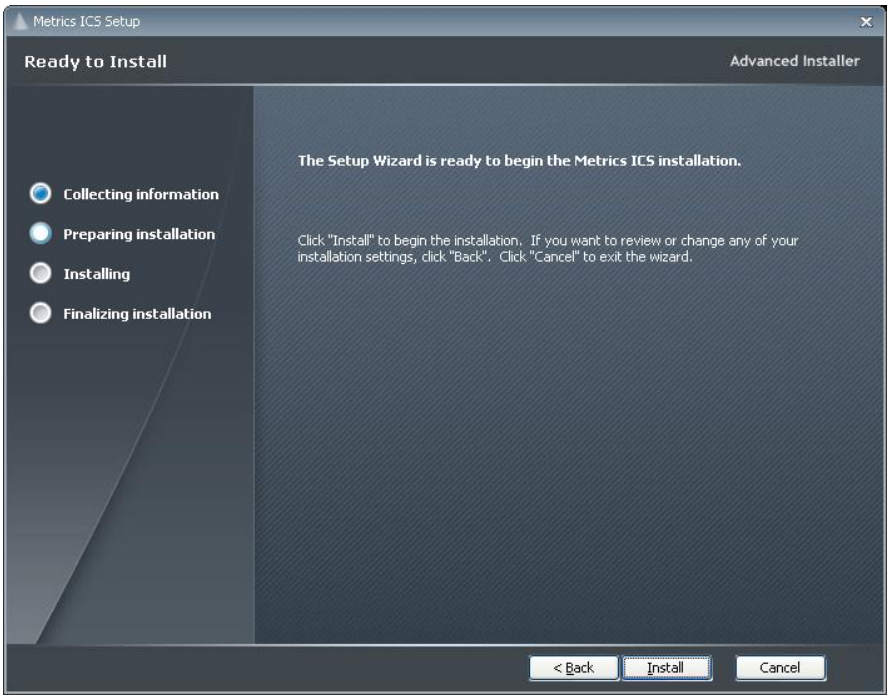


4. Read the "Software License Agreement" and click the **I agree to the terms in the License Agreement** button to agree to the terms. Then click **Next**.



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

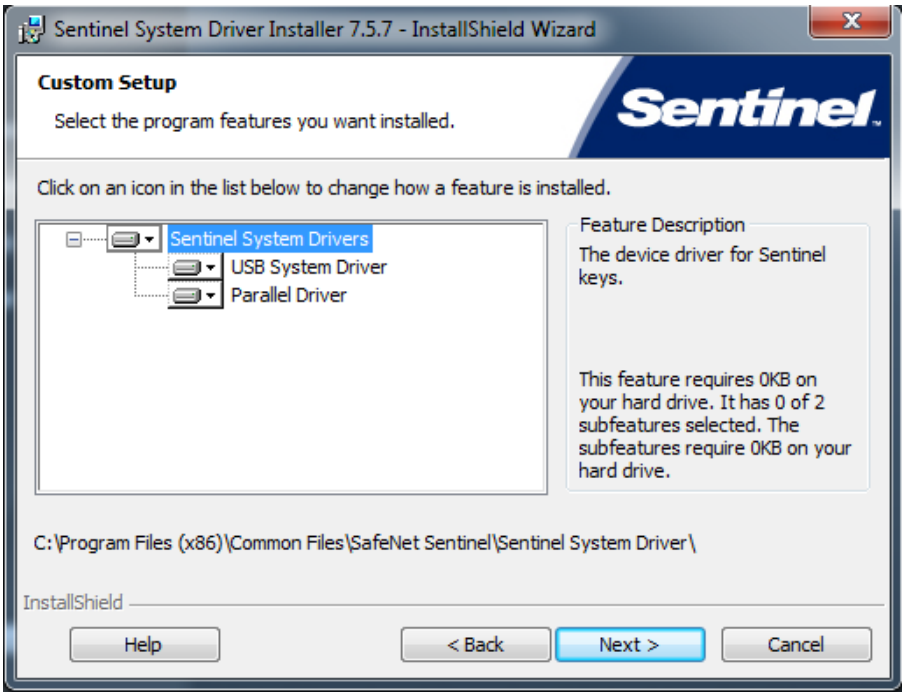
Note: It is recommended to select the default C:\Metrics\ as the location to maintain compatibility with previous versions of the software backups.



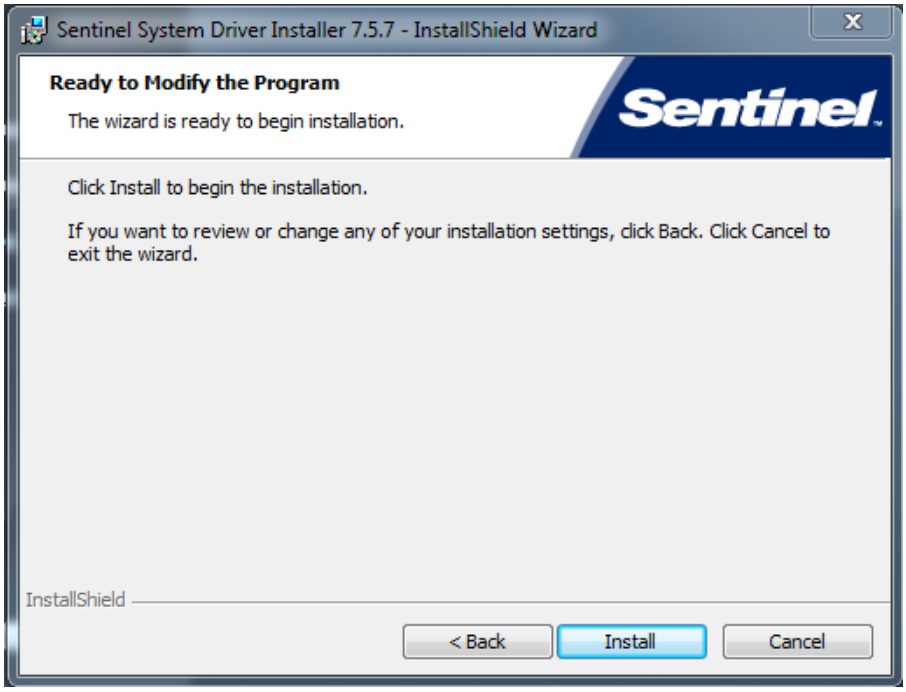
6. Click the **Install** button to begin the Metrics ICS installation.

7. The Safenet Sentinel Pro driver installation will now be started to install the security license components.

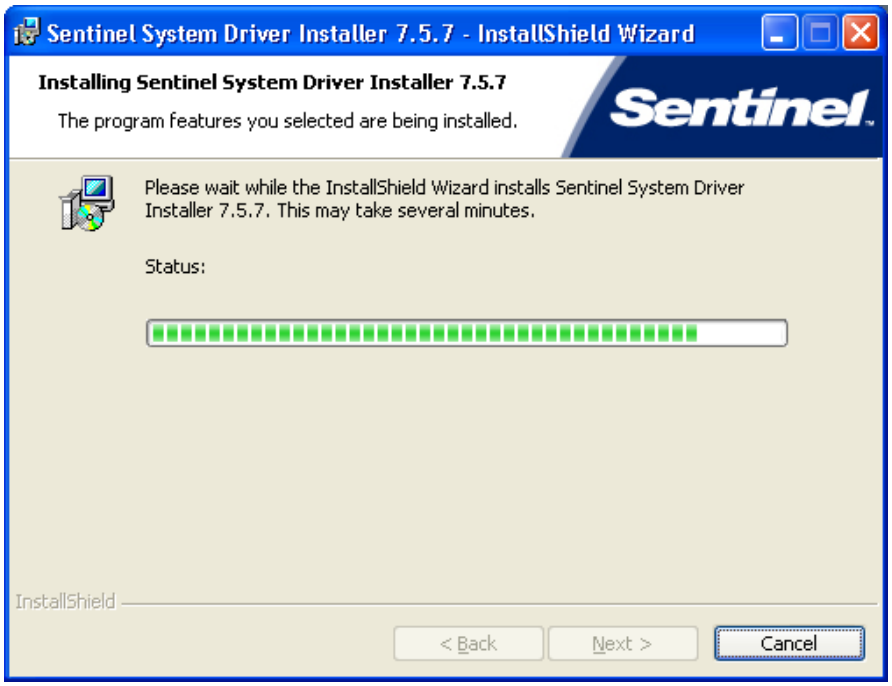
8. Select **Modify** setup type and click the **Next** button.



9. Click **Next** to start select the custom installation.

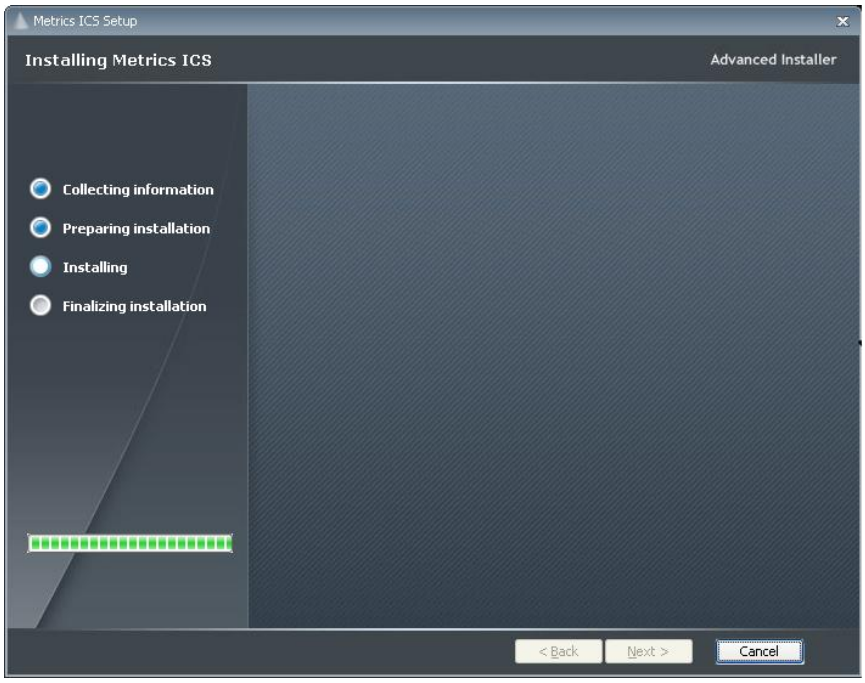


10. Click **Install** to start the Sentinel Driver installation.

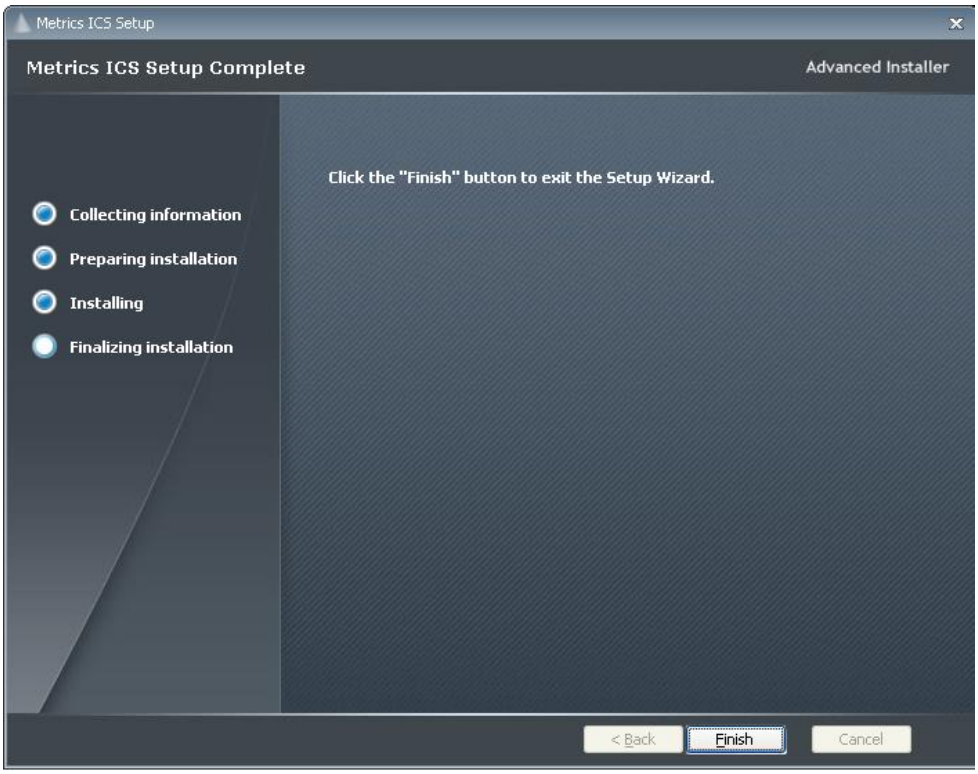


11. Allow the installation to complete.

12. Then click **Finish** to continue with the Metrics ICS installation.

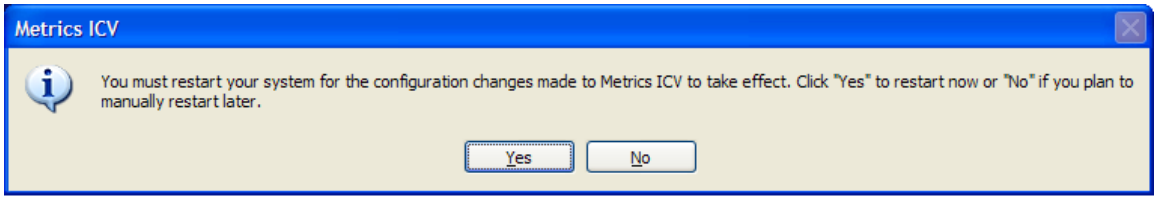


13. Allow the Metrics ICS installation to complete.



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

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



16. Connect the USB Security Key to the USB port of your computer. The Windows Hardware Manager should detect the USB device as Safenet USB SuperPro/UltraPro and should automatically install the driver for the device.

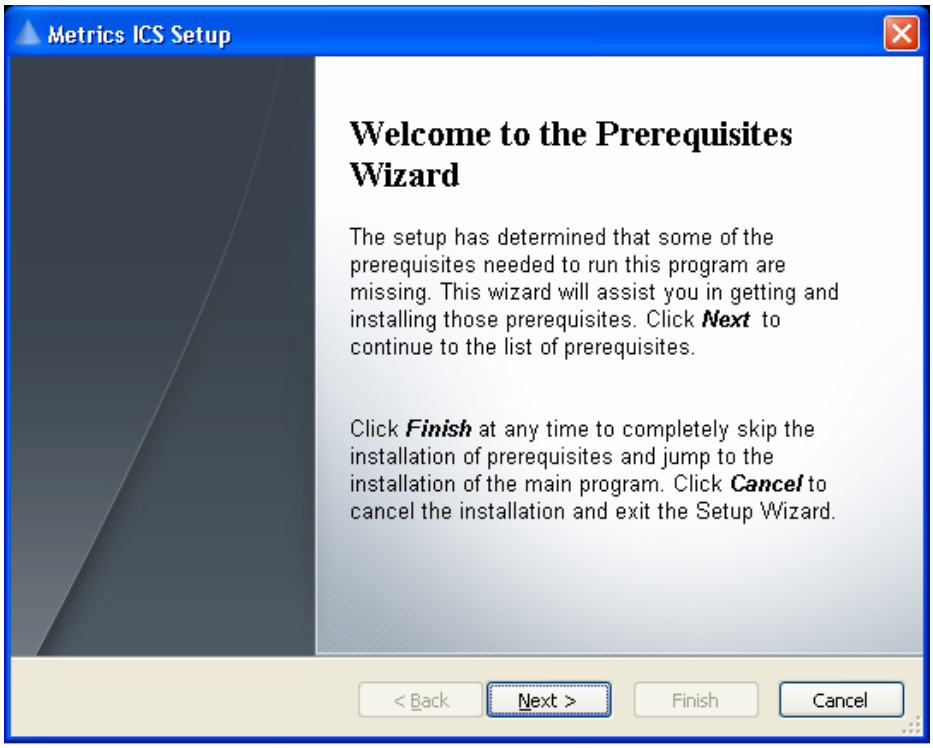
    Note: It is recommended the security plug be connected directly to the computer instead of through a USB hub or keyboard port if possible.

Procedure to Install ICS 4.3 (new installation)

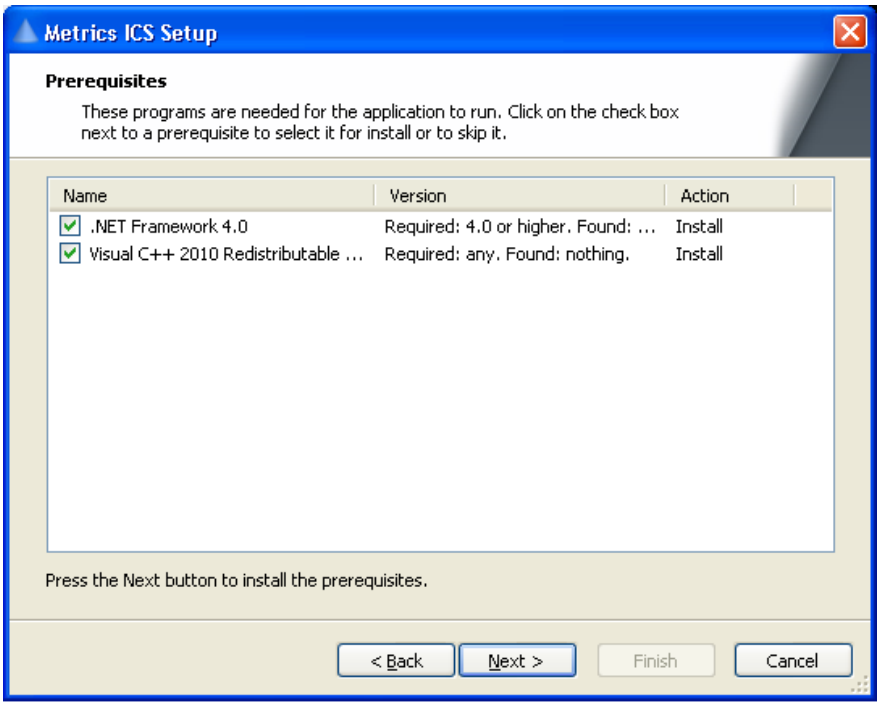
1. Insert the Metrics ICS install CD into the CD-ROM drive of your computer.

2. The CD-ROM should automatically start the MTICS-43.exe installation program. If the installation does not start automatically then select right click on the CD drive icon in Windows Explorer and then select "explore". Select the MTICS-43.exe application icon to start the installation program manually.

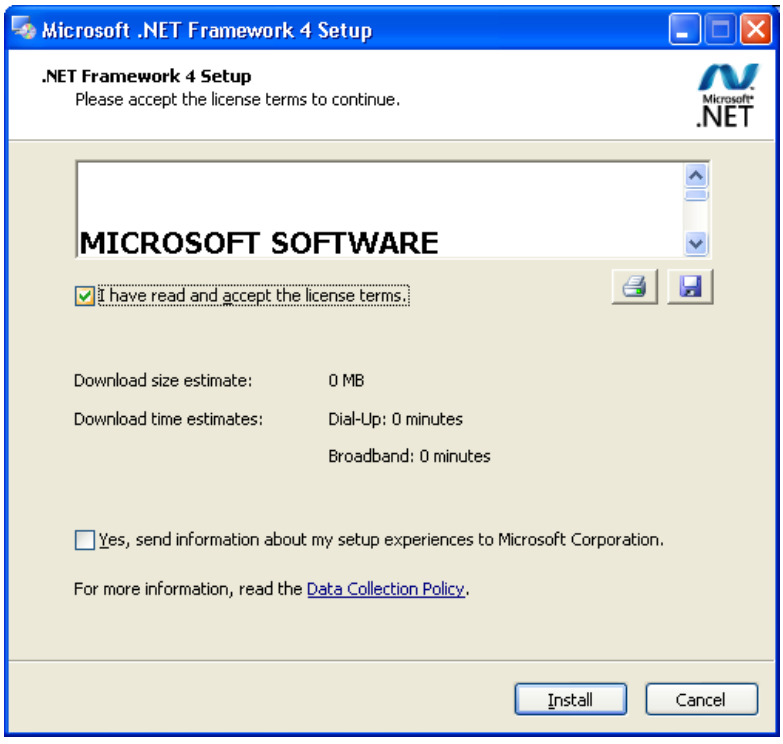
   The installation will check for any prerequisites and start the Prerequisites Wizard to install the necessary software. Please note installation of some of these software components requires acceptance of the 3rd Party license agreements displayed during installation. Installation of some components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



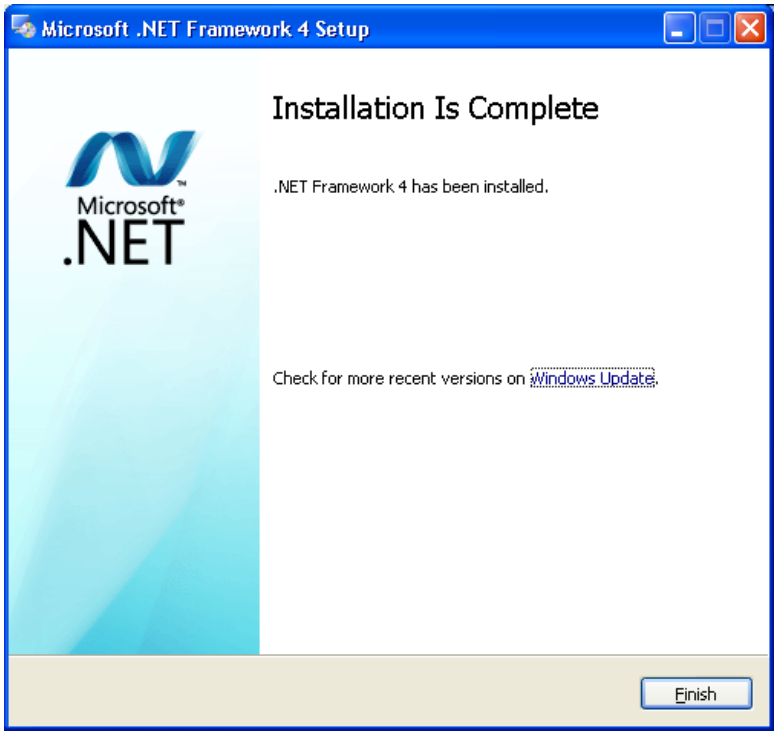
3. Click **Next** button on the "Welcome" panel.



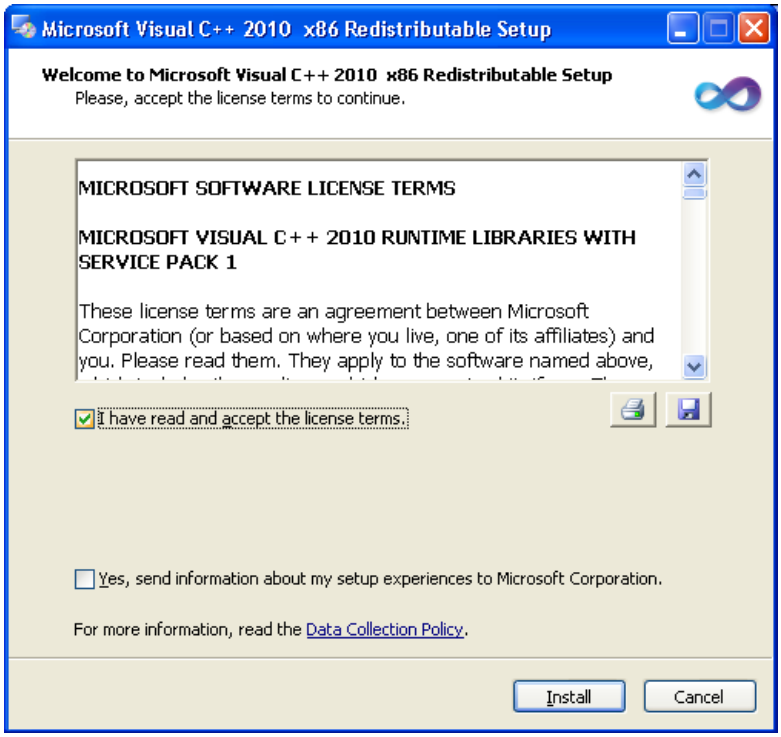
4. Click **Next** button on the "Prerequisites" panel.



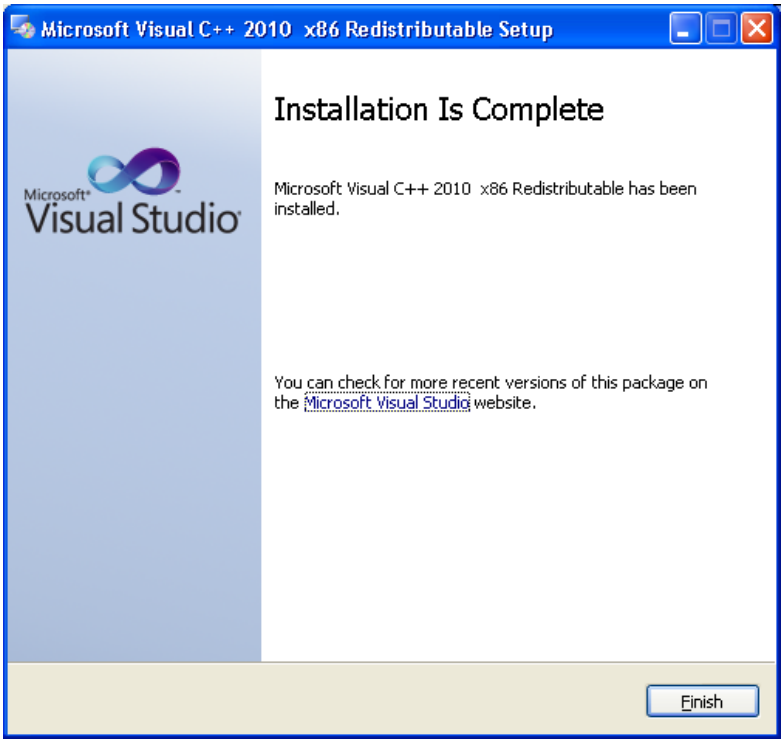
5. Click **I have read and accept the license terms** then click the **Install** button on the "Microsoft .NET Framework" panel.



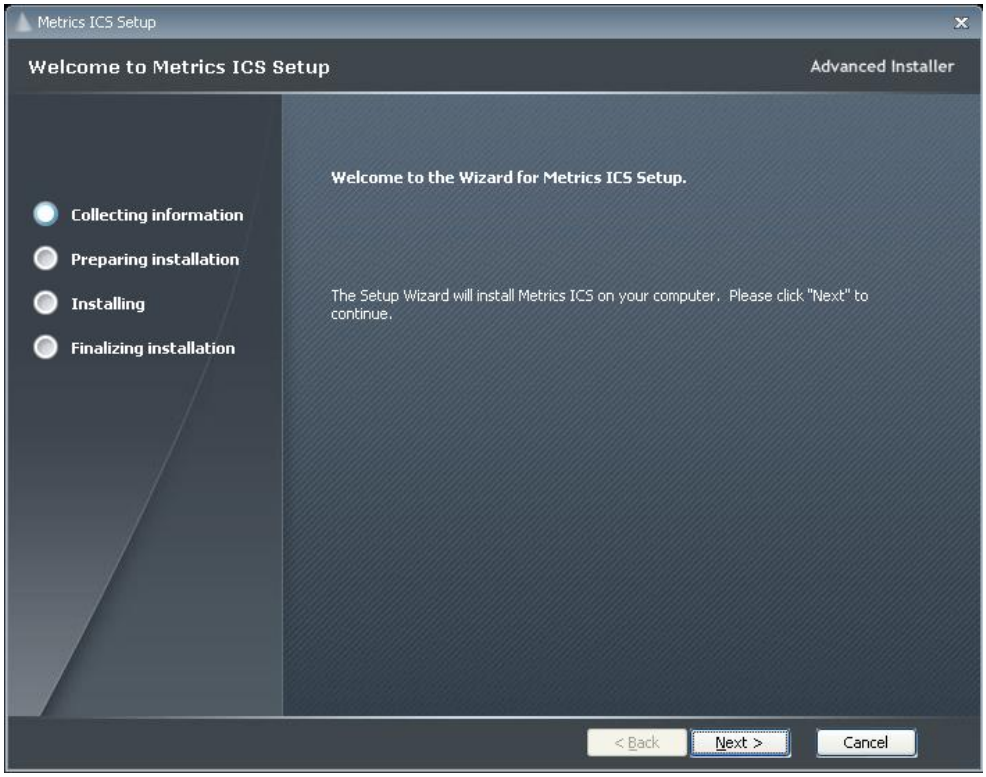
6. Click **Finish** to continue.



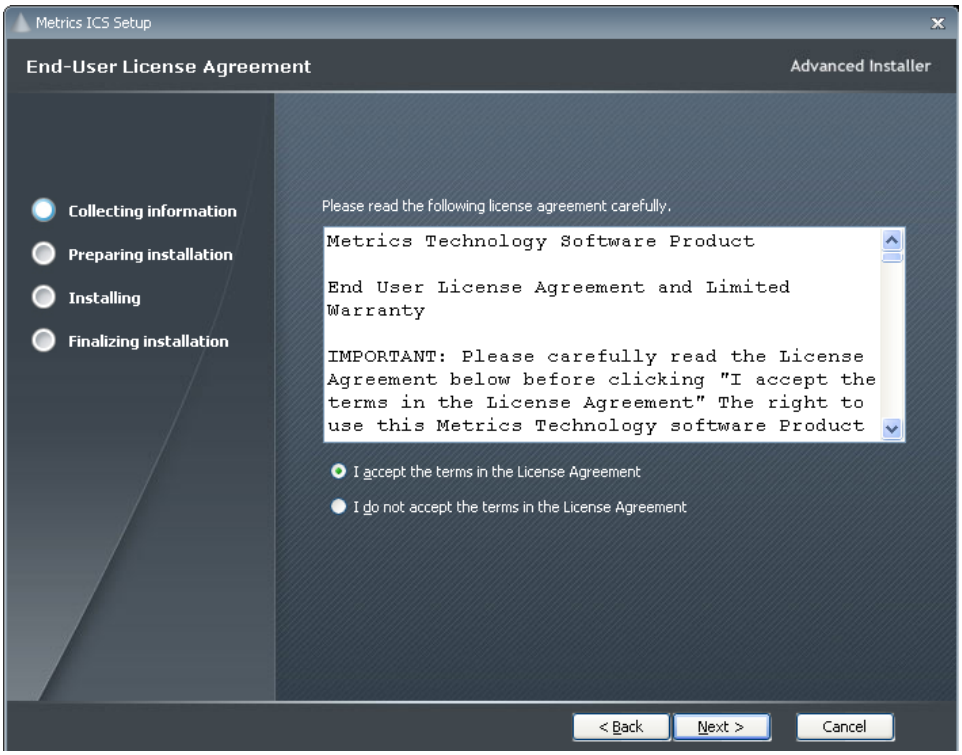
7. Click **I have read and accept the license terms** then click the **Install** button on the " Microsoft Visual C++ 2010 Redistributable " panel.



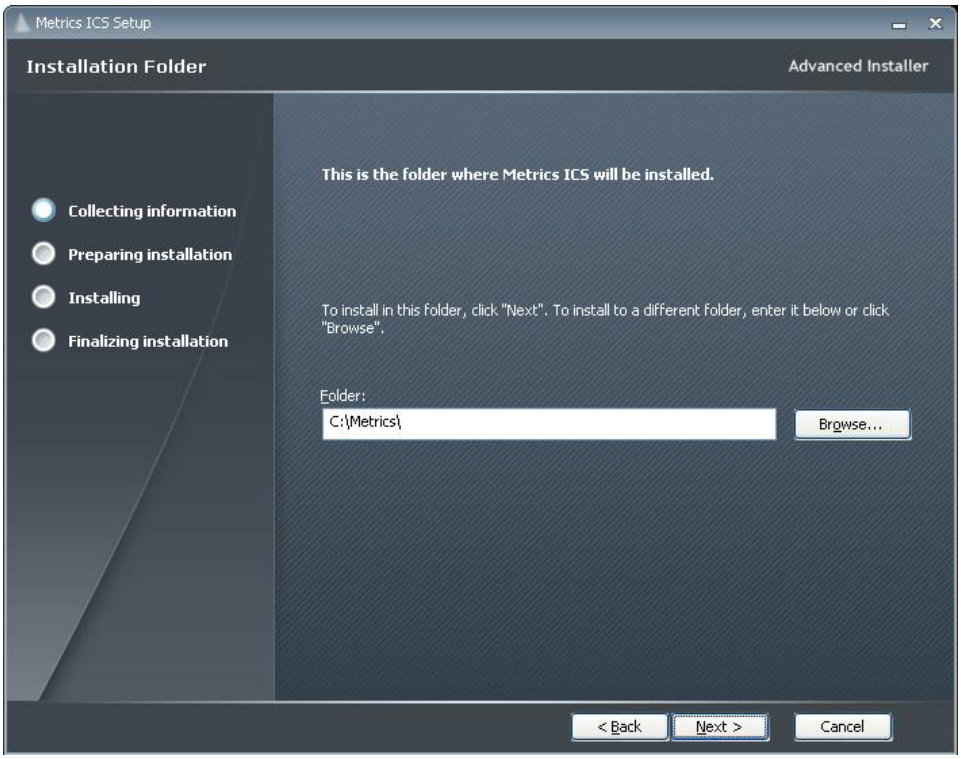
8. Click **Finish** to continue.



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

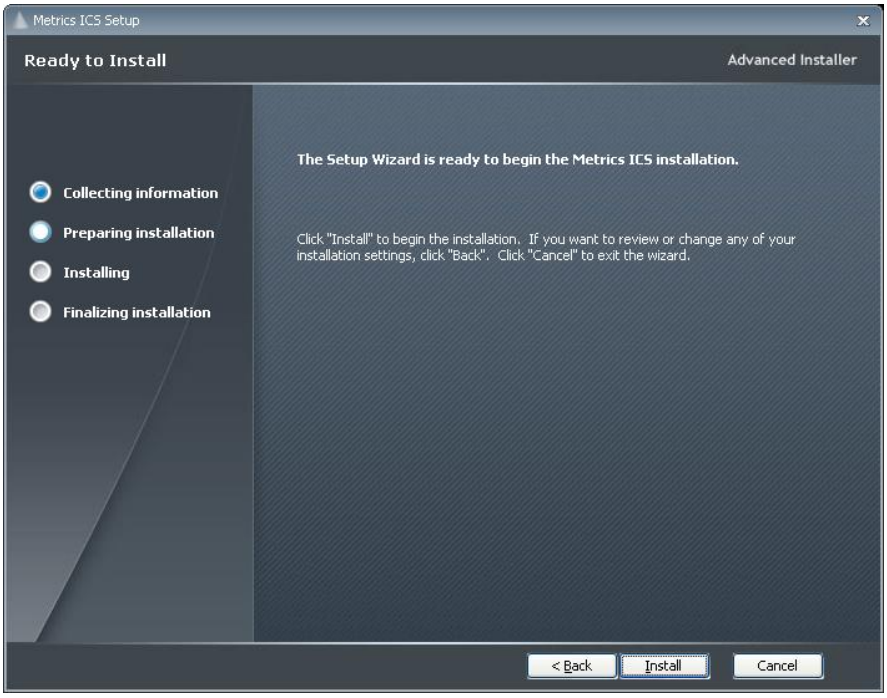


10. Read the "Software License Agreement" and click the **I agree to the terms in the License Agreement** button to agree to the terms. Then click **Next**.



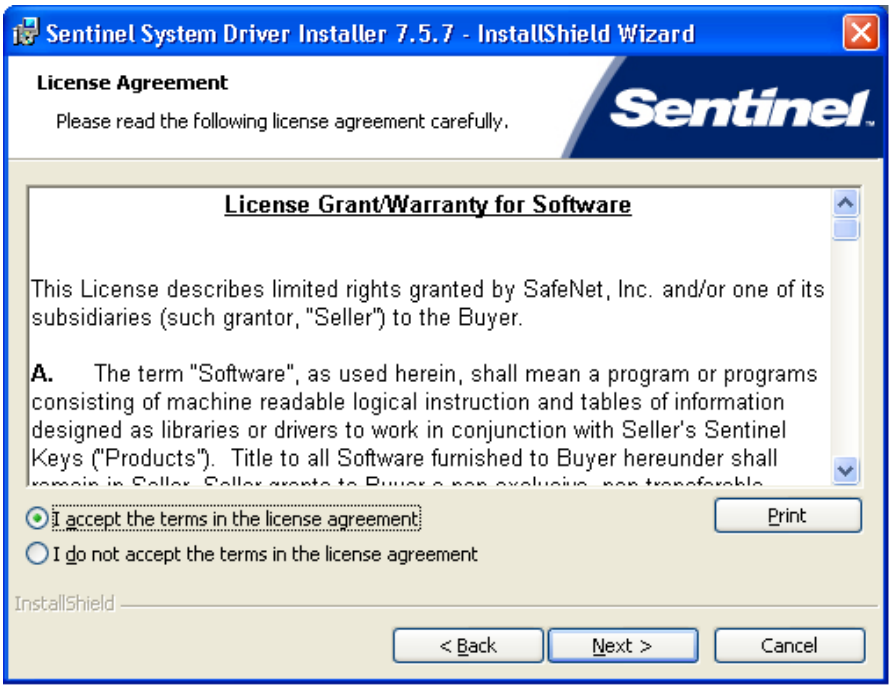
11. Choose "destination location" for installation and click the Next button.

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

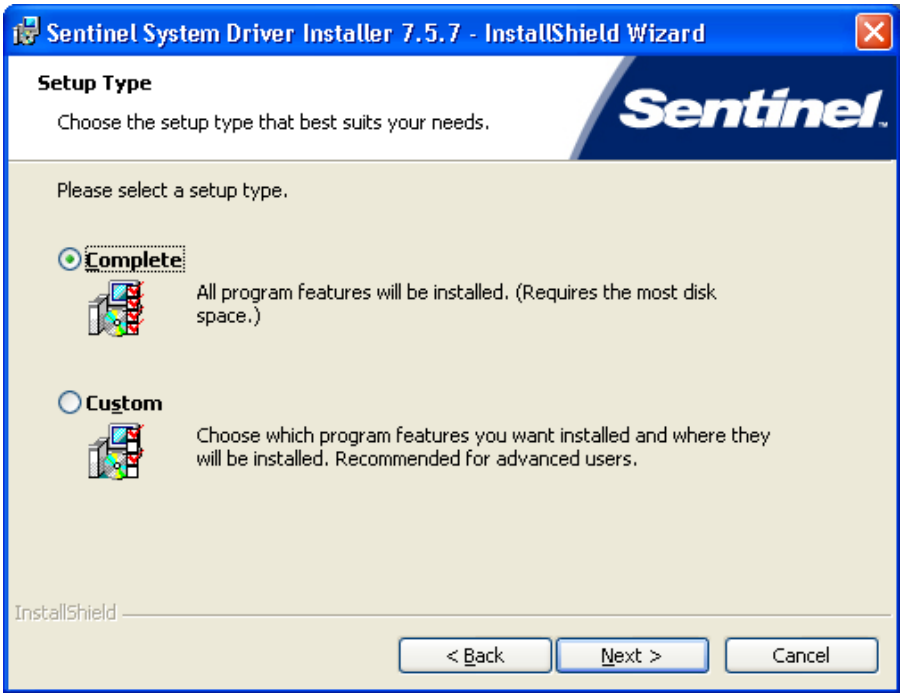


12. Click the **Install** button to begin the Metrics ICS installation.

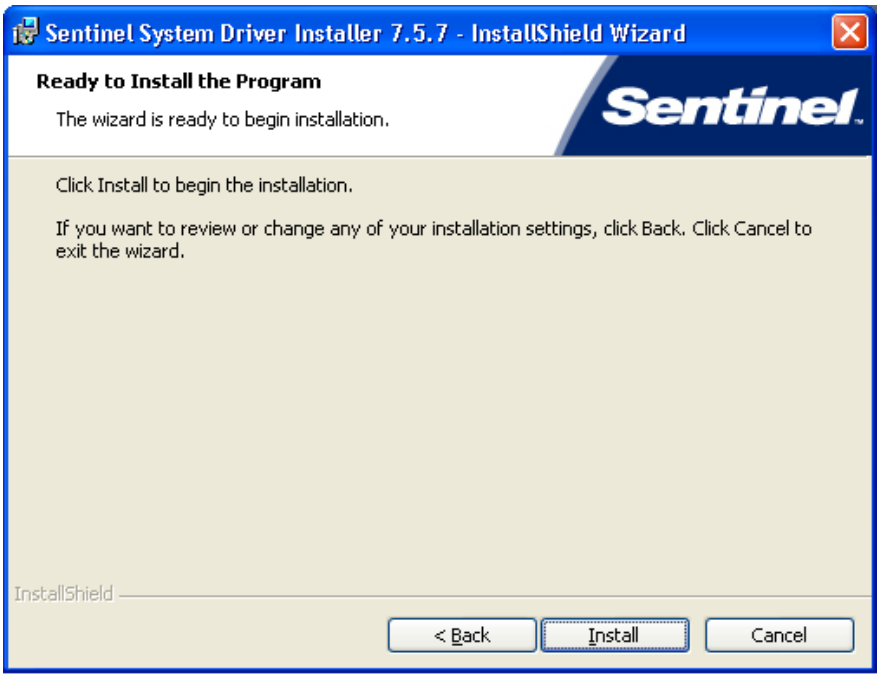
13. The Safenet Sentinel Pro driver installation will now be started to install the security license components.



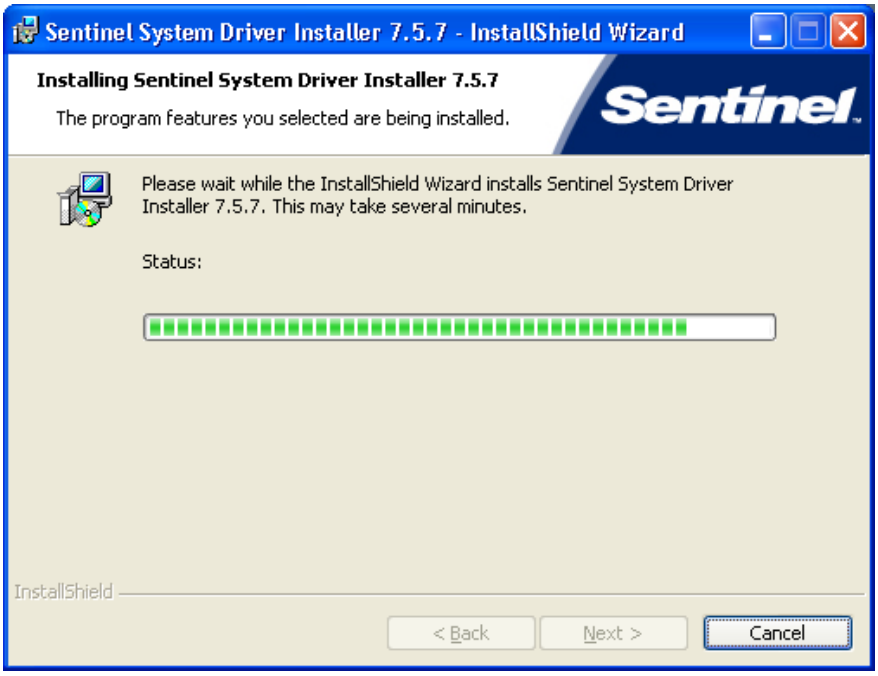
14. Read the "Software License Agreement" and click the **I agree to the terms in the License Agreement** button to agree to the terms. Then click **Next**.



15. Select "Complete" setup type and click the **Next** button.

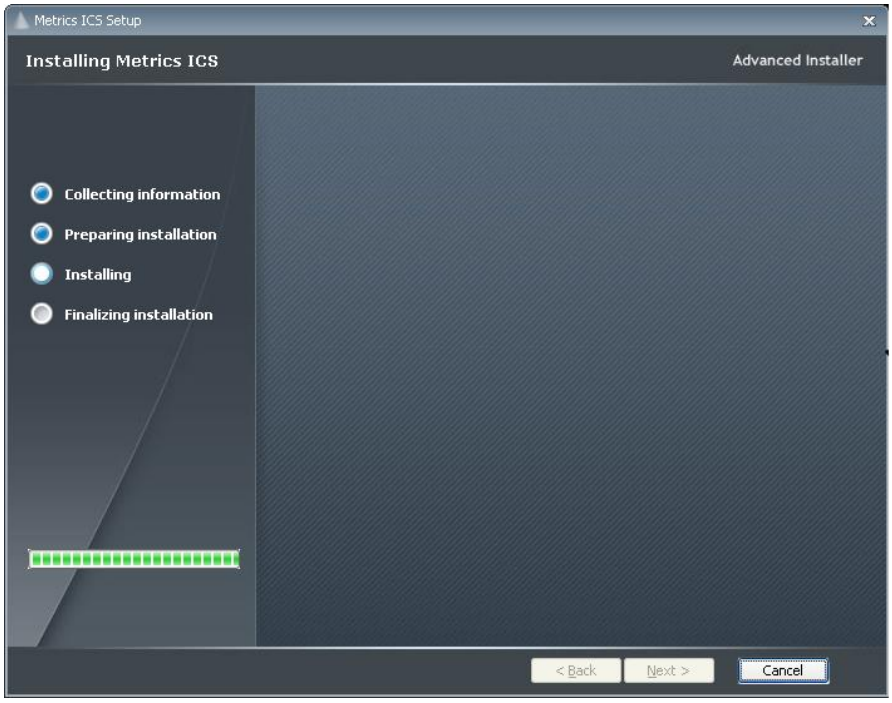


16. Click **Install** to start the Sentinel Driver installation.

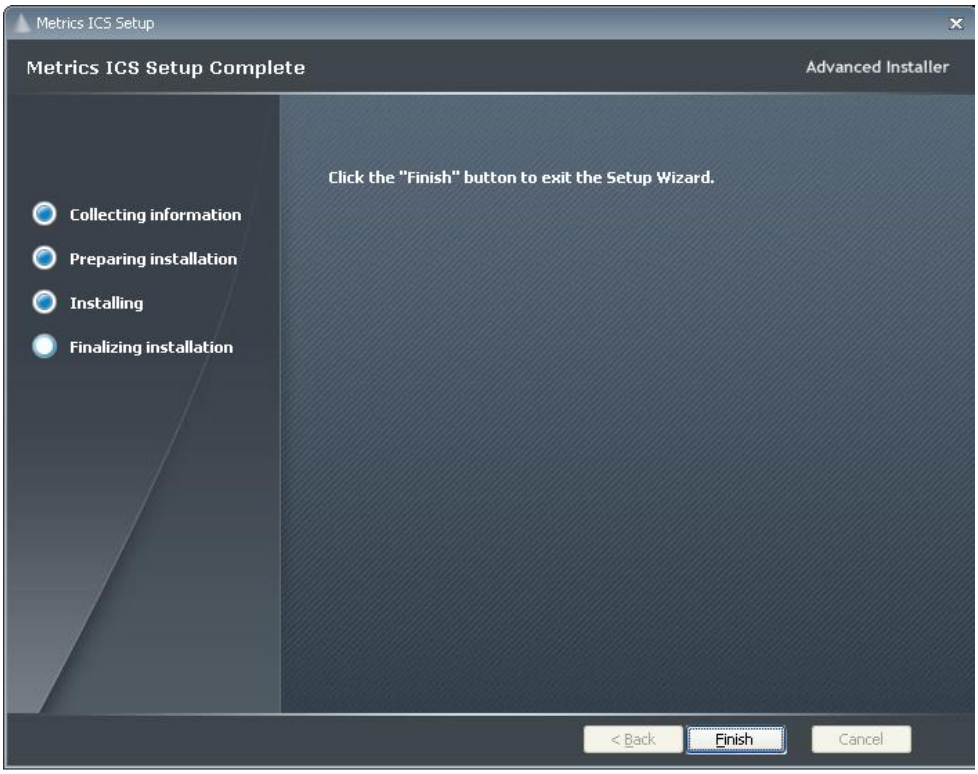


17. Allow the installation to complete.

18. Then click **Finish** to continue with the Metrics ICS installation.

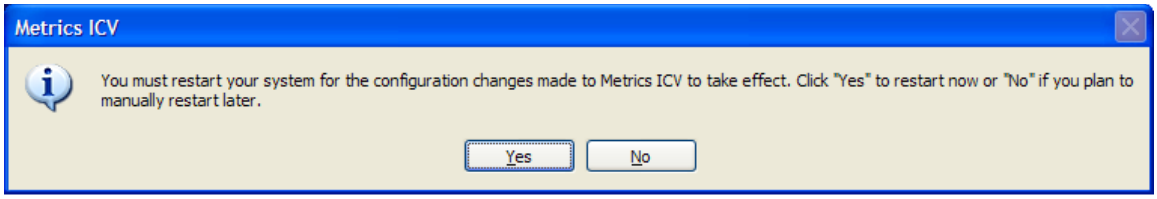


19. Allow the Metrics ICS installation to complete.



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

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



22. Connect the USB Security Key to the USB port of your computer. The Windows Hardware Manager should detect the USB device as Safenet USB SuperPro/UltraPro and should automatically install the driver for the device.

    Note: It is recommended the security plug be connected directly to the computer instead of through a USB hub or keyboard port if possible.

Metrics Codewords

Metrics Technology software products use a combination of a hardware Security Key and Codeword. The unique combination of a Codeword and Security Key allows full functionality the software product to be run on any workstation PC or laptop.

Software Codeword Information

There will be a codeword for each software component ordered. This information is made up of two (2) parts, the License 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

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

Product Desc

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

Product ID

The product ID is MTICS and should be entered in the ID field

Version

This is the version of the software i.e. 4.3.0

Note: The version number and the codeword are matched. Thus, customers who have not purchased an upgrade will not be able to run software without purchasing an upgrade with a correlating codeword.

Codeword Serial

Example Codeword:**AWRZI-XXC6Z-HK3EM-1RHU0-GUJ8A-UPX0R**

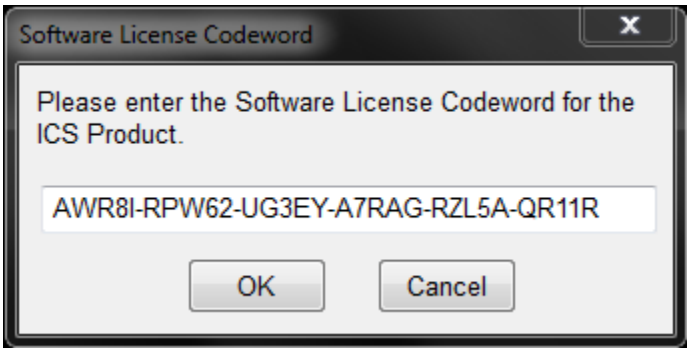
Entry of the Codeword Serial Number

Note: It is recommended that you cut and paste the codeword from the registration e-mail sent from Metrics Technology Customer Service. Be careful not to copy any spaces before or after the alpha-numeric codeword string.

The software Codeword Serial number can be manually entered in ICS. 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. Be careful not to include any space before or after the code word string.

To Enter the ICS Codeword Serial number:

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



2. Enter the ICS Codeword Serial number supplied on the product registration certificate or e-mail.

3. Click the **OK** button.

Getting Started Guide

Metrics ICS

Version 4.3

© Copyright 1995-2021, Metrics Technology, Inc. All rights reserved.

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 ICS. A test setup will be created that measures the Threshold Voltage of a MOSFET device. The measured data will then be plotted and the Vth value will be extracted.

Chapter 1 - ICS Getting Started Guide

Introduction

The first Chapter of the Self-Paced Guide introduces the Metrics ICS 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 ICS Software?
- Overview of Metrics ICS Software
- Updating Versions
- Support

What is Metrics ICS Software?

The Metrics ICS Software is an application designed for semiconductor characterization applications. Measurements for different technologies can be created in a matter of minutes without programming.

Metrics ICS Controls:

- Semiconductor Parameter Analyzers
- C-V Meters
- Other Source Meters

Overview of Metrics ICS Software

Metrics ICS Software 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.

ICS supports several measurement modes to accommodate most testing methods.

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

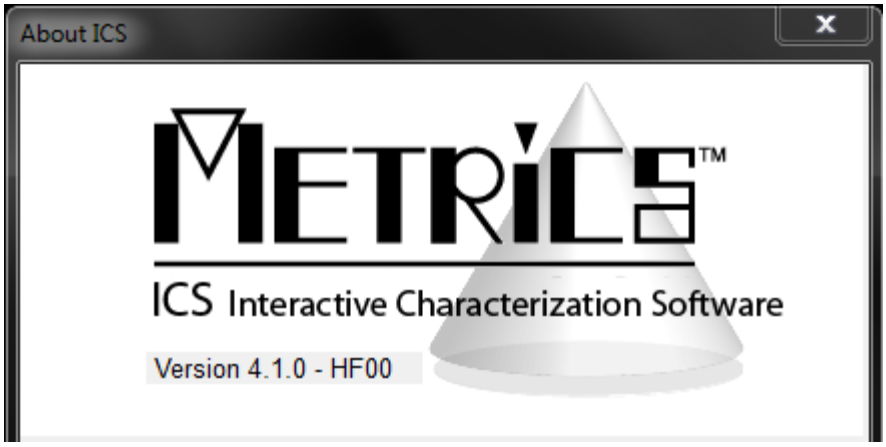
The advantage of ICS is that once a test is created and saved it can be re-opened and used again, including the analysis.

Determining Software Version

The software version and build date are very important when requesting support. Please be prepared to provide this information when seeking support.

To determine the software version:

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



Updating the Metrics ICS 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 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. 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.

It is recommended that you make an archive disc copy of any HotFix or Service Pack you apply to your system.

Support

Metrics Technology provides technical support to customers for one year after the purchase of the Metrics 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. Please visit our website at www.metricstech.com to register your software and obtain your log-in information.

If you are a customer that has registered and been provided log-in credentials 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 IAXXXXXA, IHXXXXXA or MKXXXXXA, etc. (X 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. A 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, or for MAC keyboard press Shift-Command-4) to capture the error window.
   Images sent from a phone camera are often illegible.

Chapter 2- Selecting Instruments

Introduction

This Module introduces the Metrics ICS (Interactive Characterization Software) measurement engine and demonstrates how to create test setups with it.

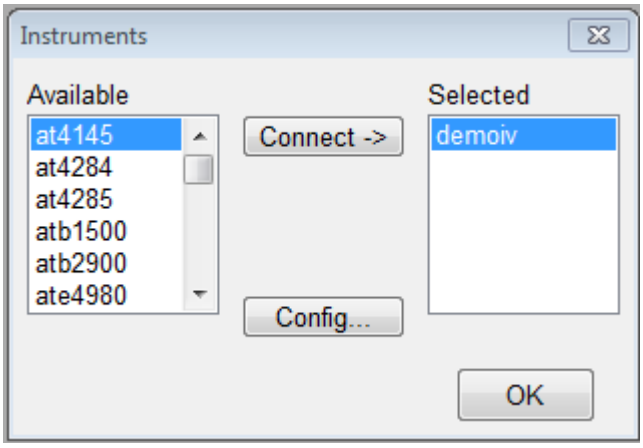
Topics Covered:

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

Selecting an Instrument Driver

Before creating a measurement, ICS must know what instrument is being used. This is accomplished by configuring the instrument in the "Select Instrument " dialog in ICS. Once an instrument has been configured, ICS will remember this configuration. The only time ICS must be reconfigured is when the instrument is changed or the ICS40.INI file is deleted if requested by Metrics technical support.

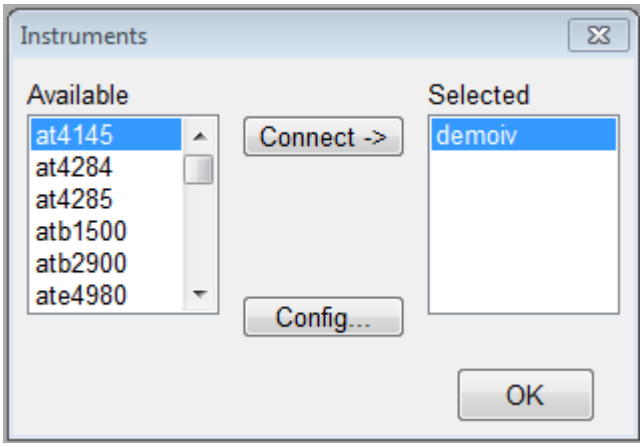
1. Click the **Select Instrument** button.
2. Highlight the instrument to be added and click the **Connect** button.



Configuring the Instrument

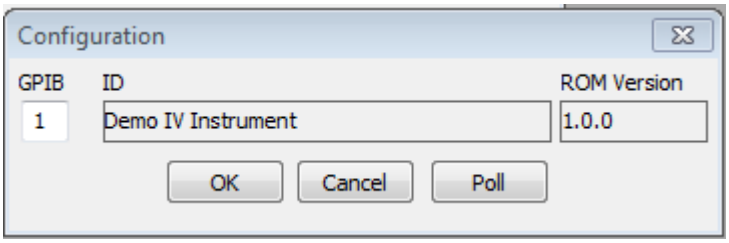
After the Instrument driver is selected, it must be configured.

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 ICS 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 ICS (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 ICS, please refer to the Metrics ICS 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

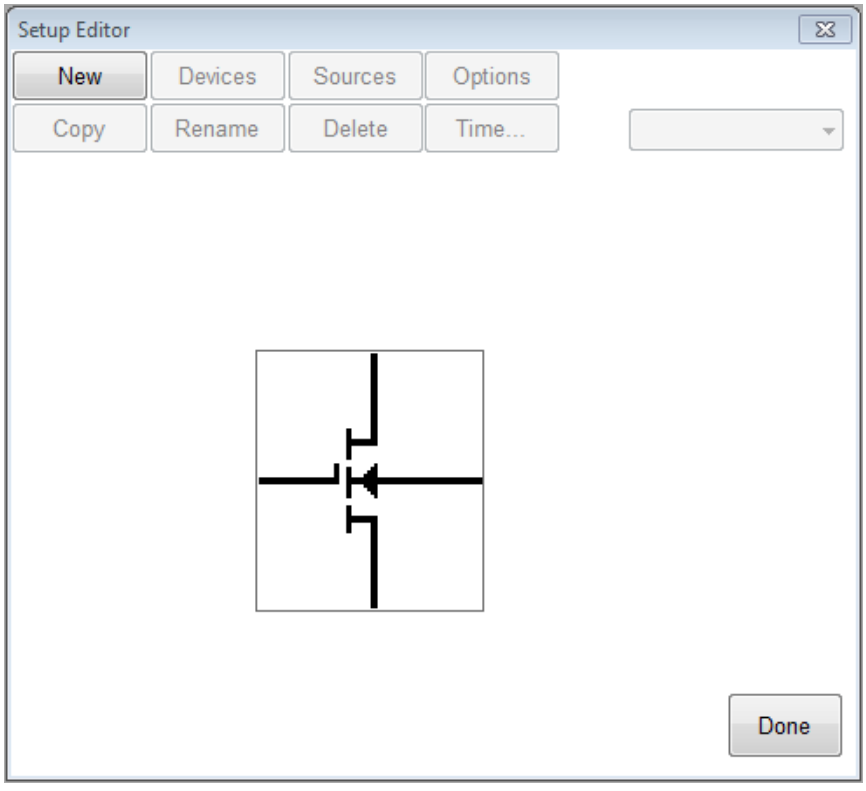
Create a Sweep Measurement

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

To Create a Sweep:

1. Open the setup editor.

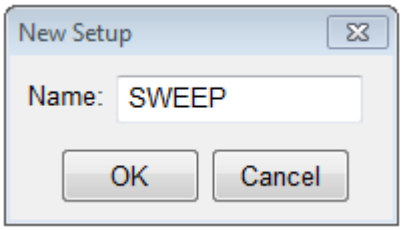
The Setup Editor is the place in ICS where the measurement is configured. It can be opened by clicking the Setup Editor button.



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

3. Name the Measurement Setup

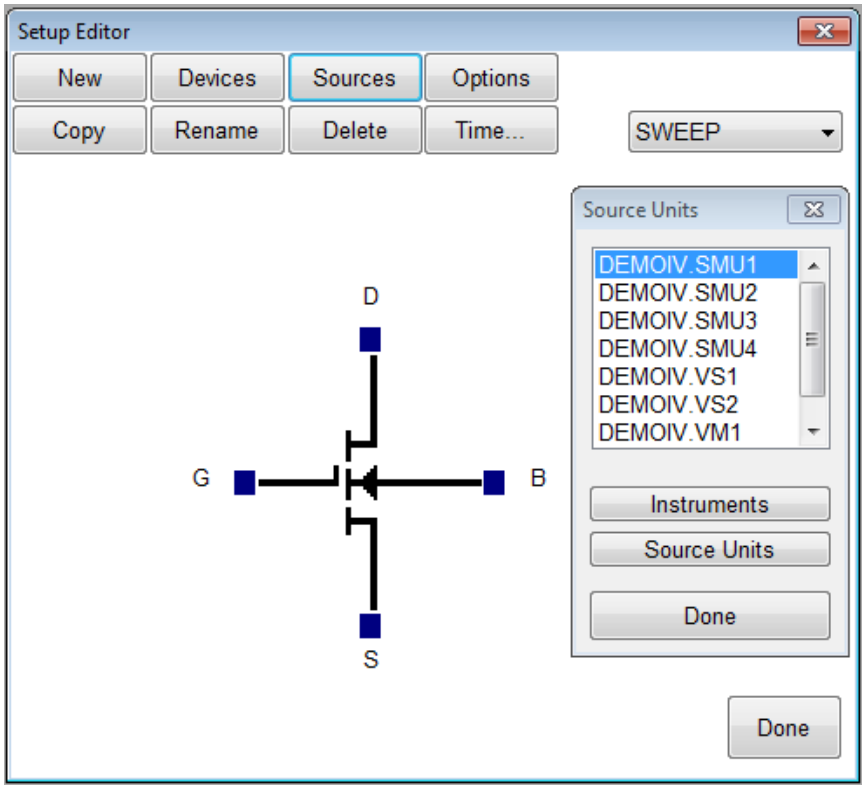
Each measurement must have a unique name. Before the measurement can be created, it must be given a name. To name the measurement:



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

4. Select Source Units

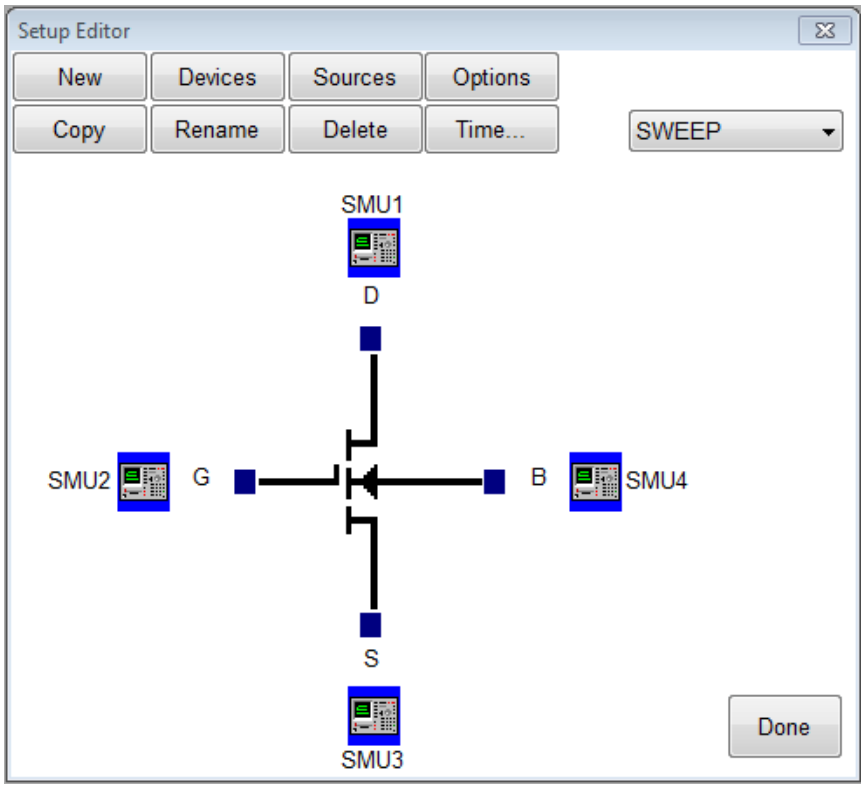
The source units correspond to the outputs of the instrument you are using. Metrics ICS provides a graphical way to document the connections for later reference. To add a source unit:



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.

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".

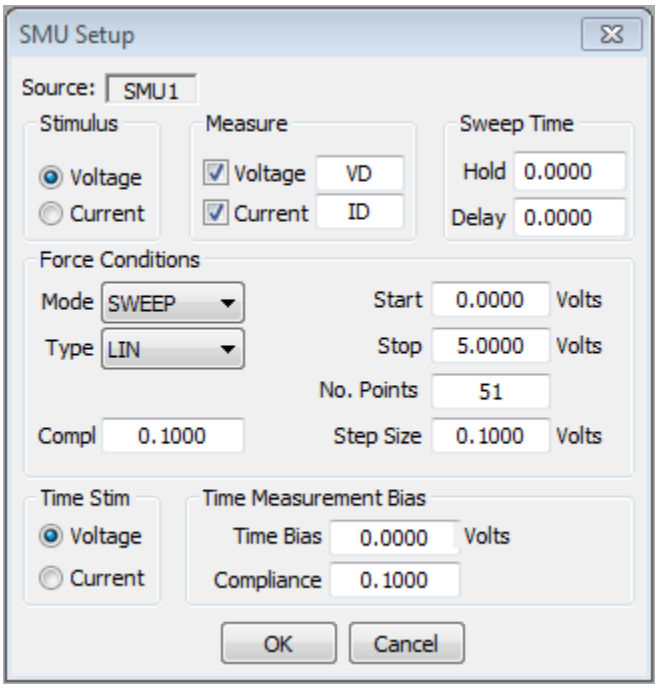


Note: The graphic is merely a representation of the device under test. The software does not strictly enforce any information from the graphic layout. Thus, the pin-out does not have to exactly match. It is only documentation of the connection and for reference only.

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:

Click the blue box beside the device lead in the Setup Editor.



1. Select the stimulus type Voltage or Current.
2. Select the values to be measured (see note below).
3. Select the Source Mode. In this case we want it to be **Sweep**.
4. Select the Source Type. Lin, Log
5. Enter current of voltage compliance value
6. Setup the sweep parameters.
7. Select the sweep timing (see note below).

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.

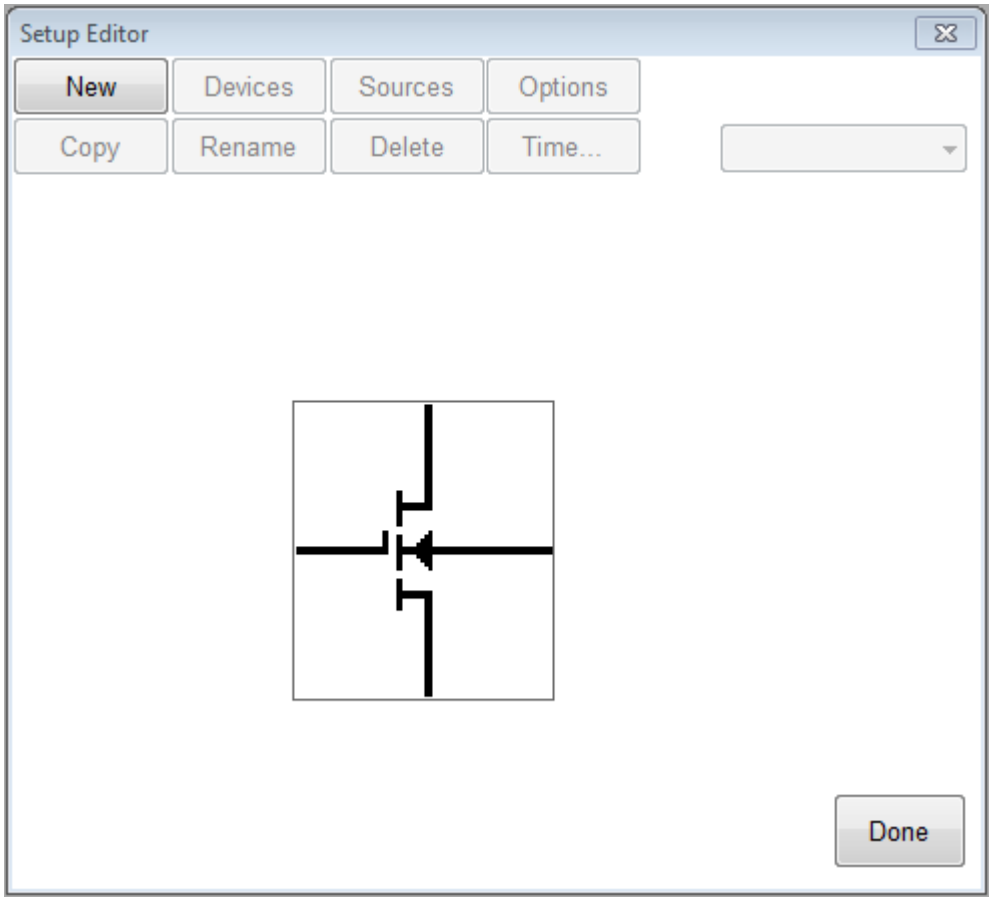
Create a Spot Measurement

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:

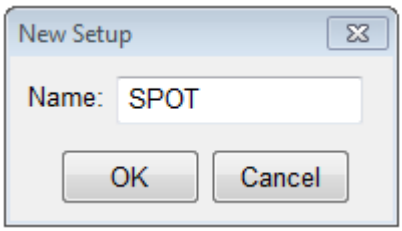
1. Open the setup editor.

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



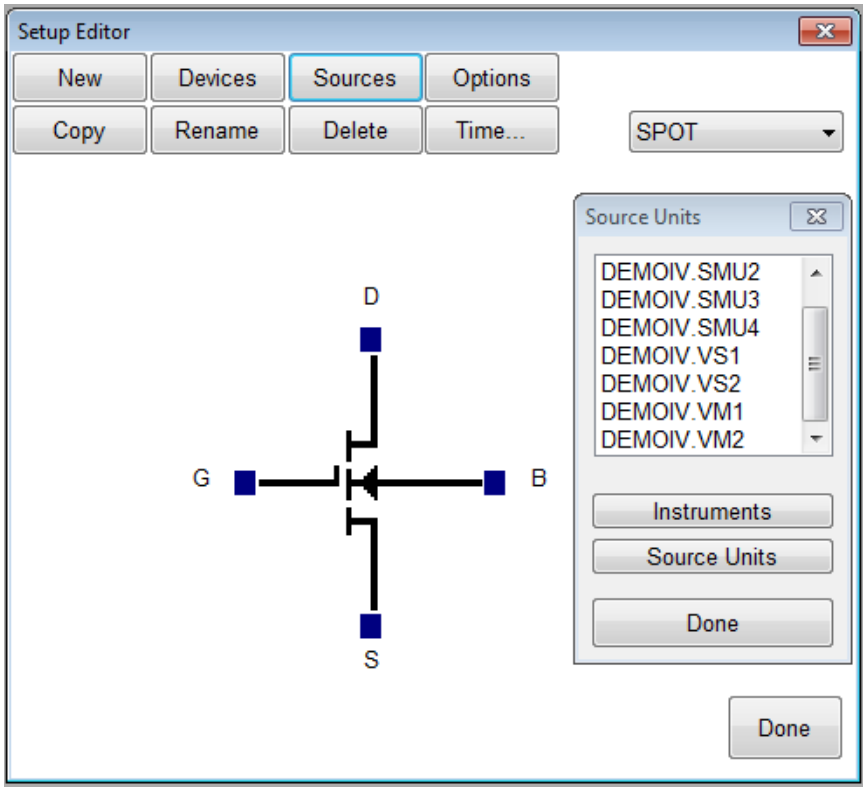
2. Name the Measurement Setup.

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

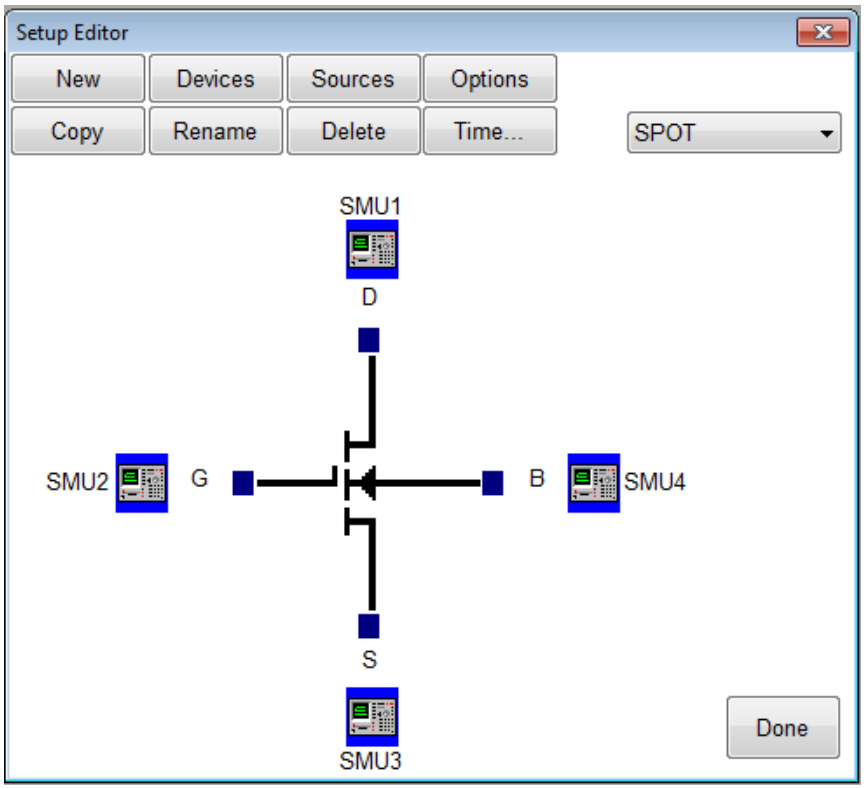


a. Click the **New** button and type in a name.
b. Click the **OK** button after entering the name.
c. Click the Sources button.

The source units correspond to the outputs of the instrument you are using. Metrics ICS 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 dialog.
b. Select the desired unit.
c. Click the blue box beside the device lead.



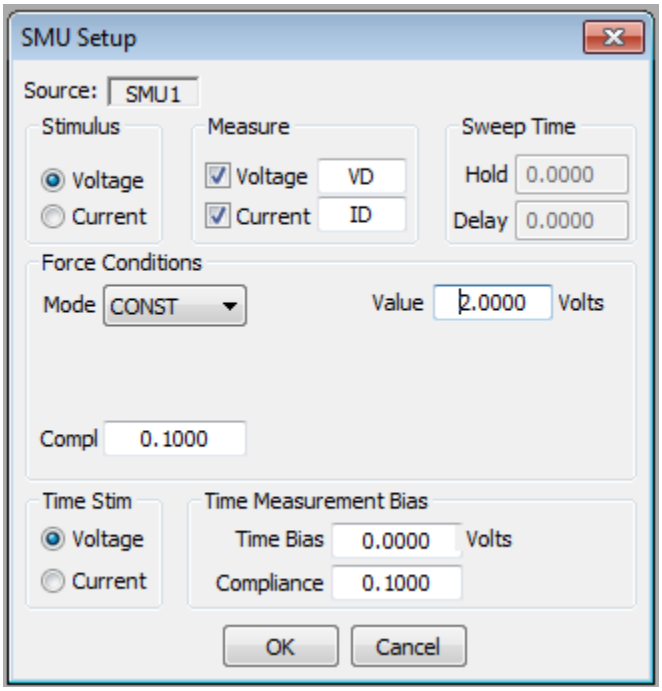
To remove a source unit:

a. Select the desired unit to delete from the Source Units list.
b. Click the blue box beside the device lead.
c. Click the **Yes** button when asked if you really want to delete the source unit.

Note: The graphic is merely a representation of the device. The pin-out does not have to match exactly, 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. 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.

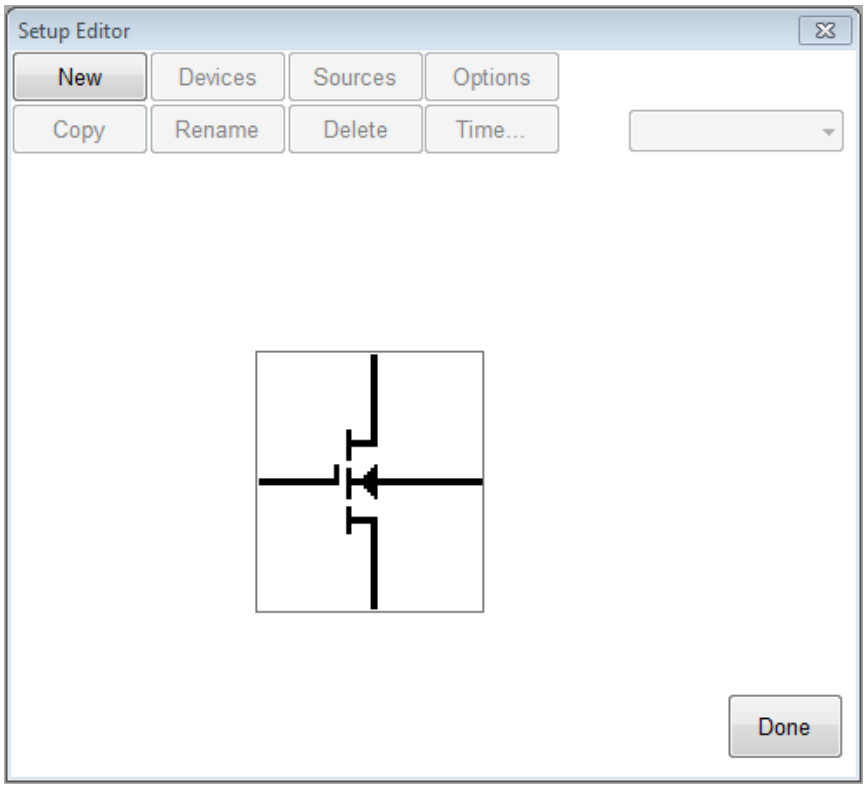
Creating a Time-Based Measurement

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:

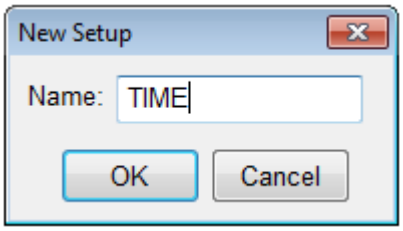
1. Open the setup editor.

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

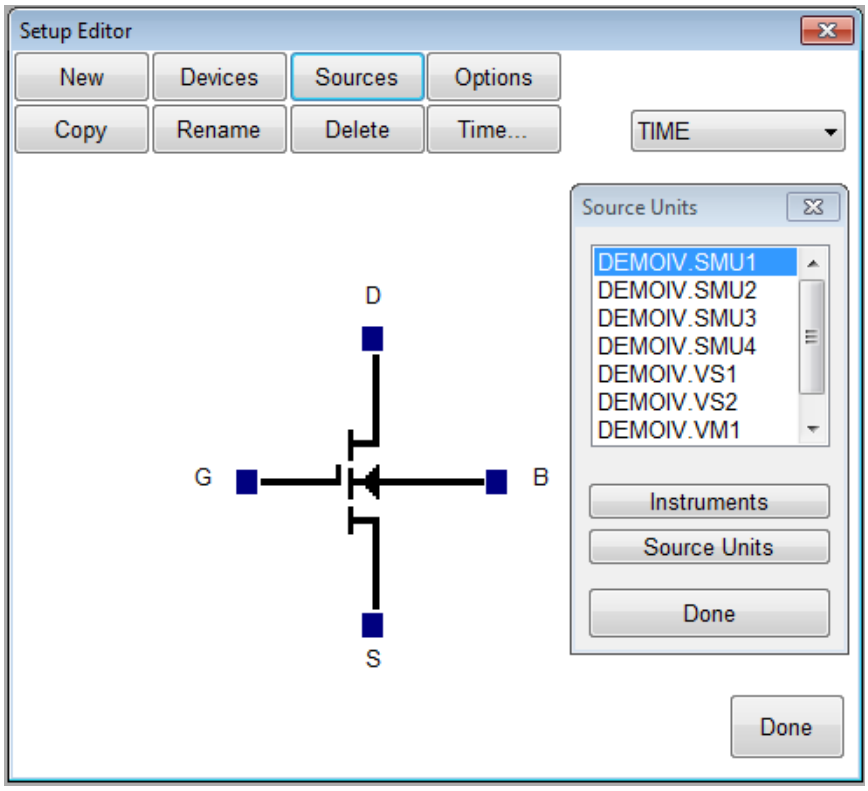


2. Name the Measurement Setup.

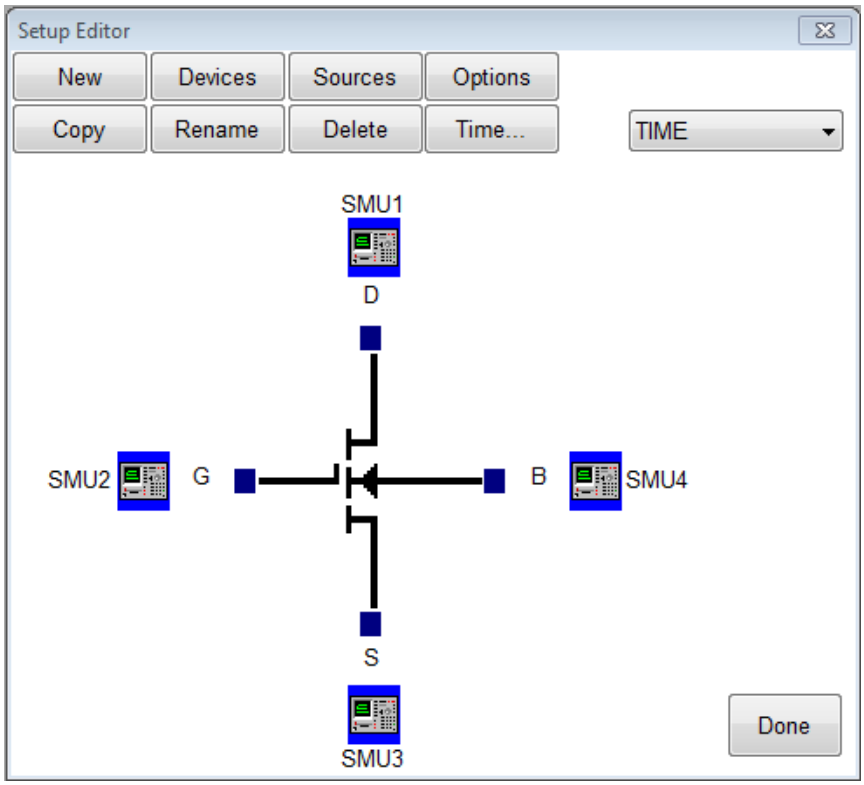
Each measurement must have a unique name. Before the measurement can be created, it must be given a name. To name the measurement:



a. Click the **New** button and type in a name.
b. Click the **OK** button after entering the name.
c. Click the Sources button.



The source units correspond to the outputs of the instrument you are using. Metrics ICS 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 dialog.
b. Highlight the desired unit.
c. Click the blue box beside the device lead in the Setup Editor.

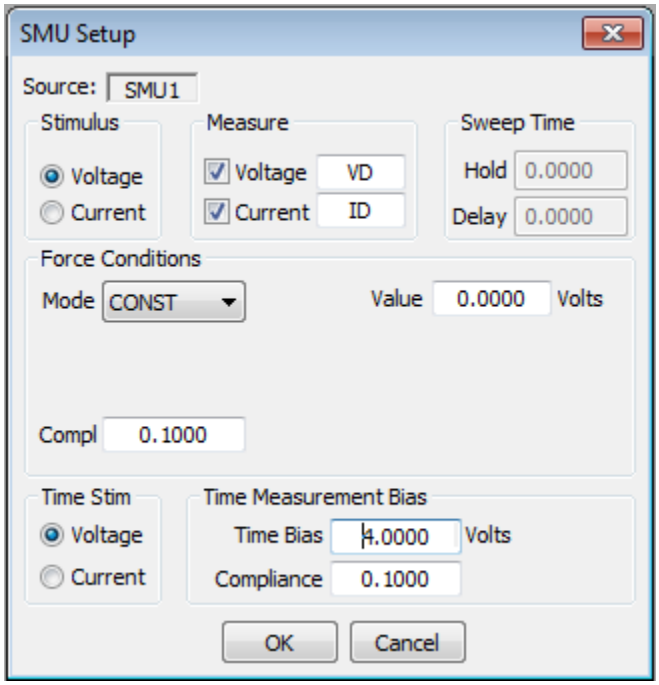
To remove a source unit:

a. Highlight the specific unit.
b. Click the blue box beside the device lead in the Setup Editor.
c. 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 time stimulus source, so we must configure the source unit properly. To setup a time stimulus source:

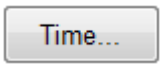


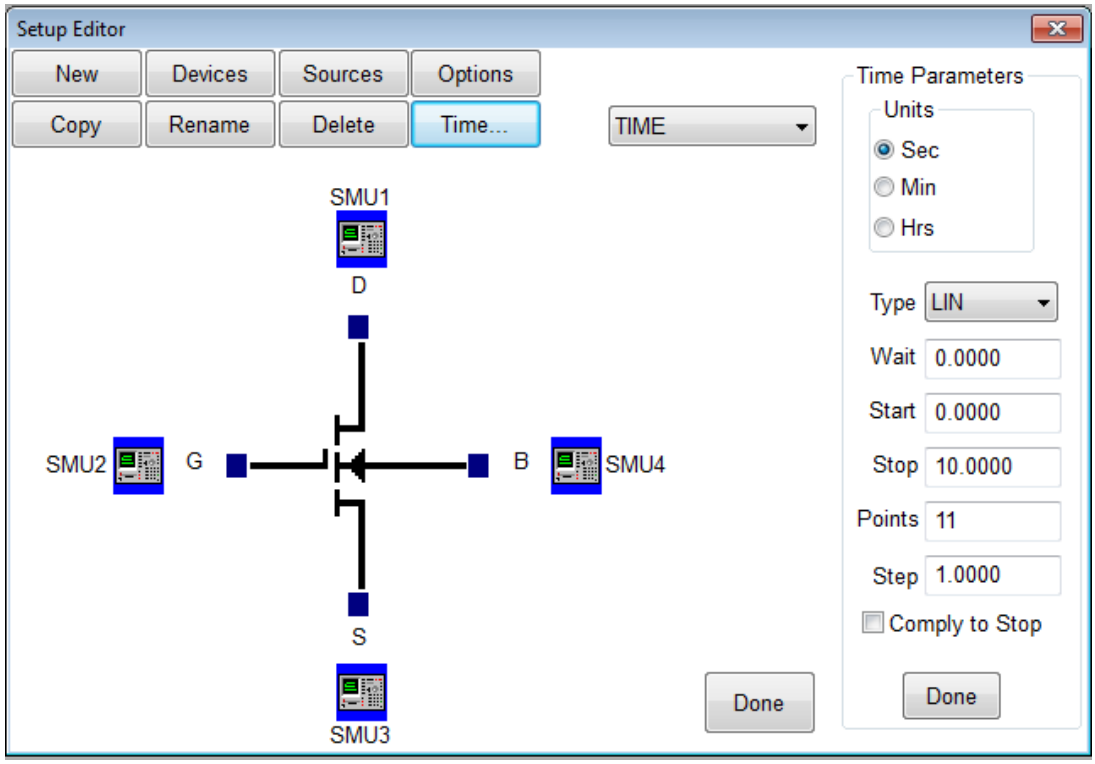
a. Select the stimulus type.
b. Select the values to be measured (see note below).
c. Select the Time Bias and Compliance.

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:

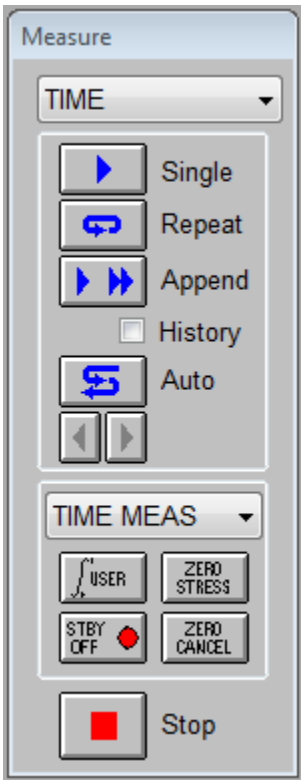




a. Select the Time Units.
b. Select the sampling type.
c. Enter the Wait time.
d. Enter the Start, Stop, and Step values. Select the Comply to Stop, option if desired.

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 ICS.

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

Topics Covered

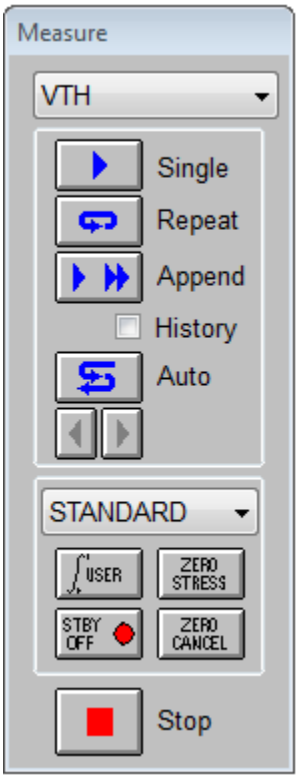
- Measurement Remote Control
- The Data Window

Measurement Remote Control

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

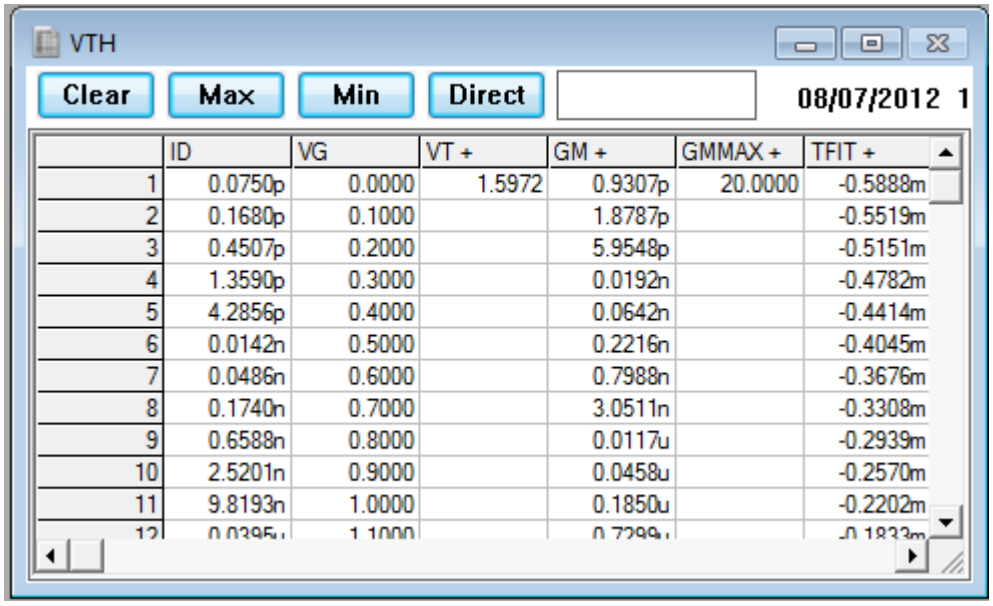
This pull-down menu allows the selection of the measurement mode. Most measurements are made in standard mode; however, ICS does support several specialized measurement modes which require this to be modified.

Section 4: Stop Button

This button allows the user to stop the measurement.

The Data Window

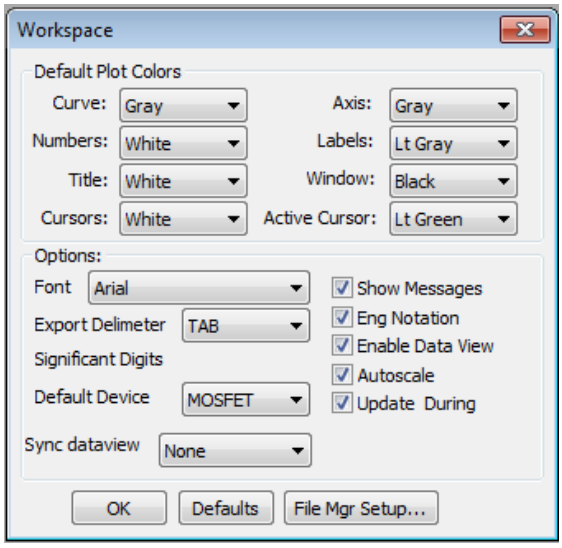
When a new setup is created the spreadsheet is automatically created when a test setup is created. It will begin as a minimized window in the lower left corner of the ICS window. To view the data simply double-click the window that has the same name as the test setup.



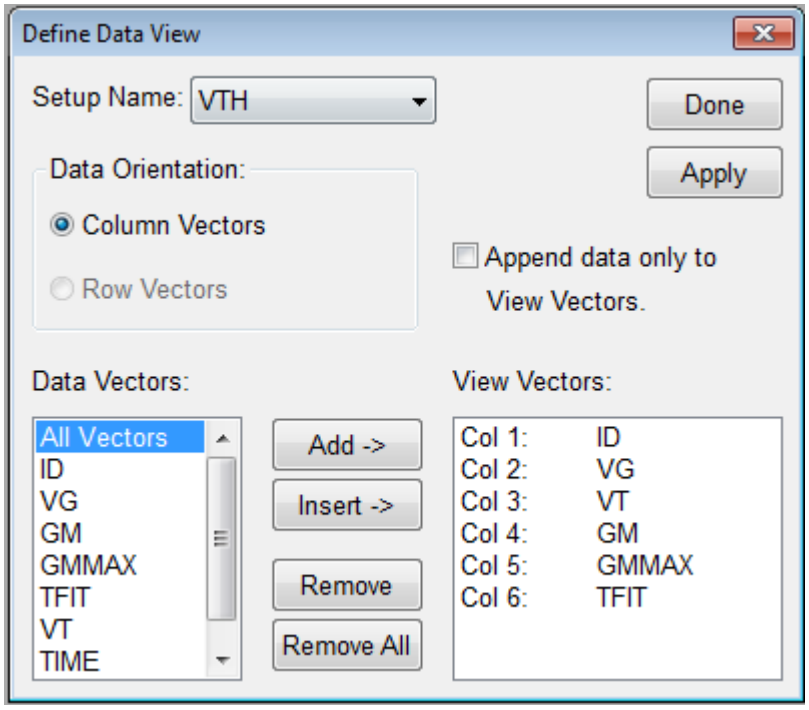
	ID	VG	VT +	GM +	GMMAX +	TFIT +
1	0.0750p	0.0000	1.5972	0.9307p	20.0000	-0.5888m
2	0.1680p	0.1000		1.8787p		-0.5519m
3	0.4507p	0.2000		5.9548p		-0.5151m
4	1.3590p	0.3000		0.0192n		-0.4782m
5	4.2856p	0.4000		0.0642n		-0.4414m
6	0.0142n	0.5000		0.2216n		-0.4045m
7	0.0486n	0.6000		0.7988n		-0.3676m
8	0.1740n	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	0.0395u	1.1000		0.7299u		-0.1833m

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

Note: ICS has a feature named "Enable DataView". To enable or disable this feature select Workspace from the Options menu.



Edit the DataView

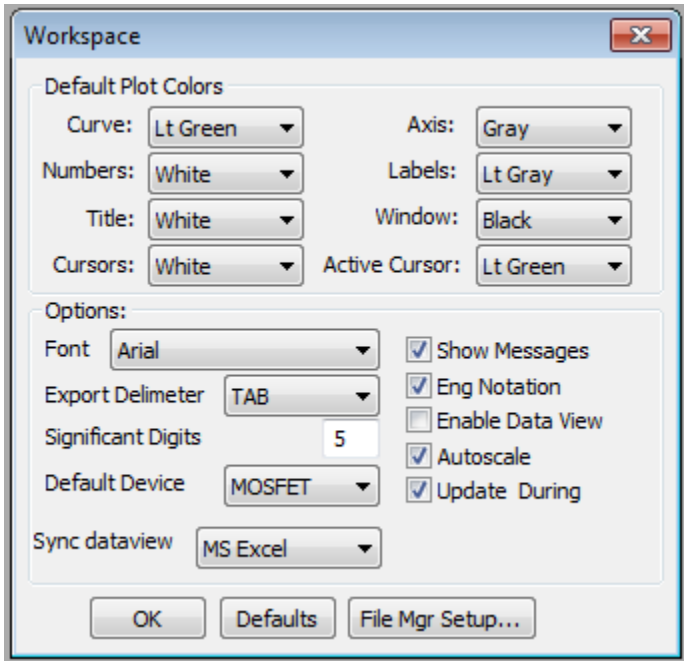


This feature allows the user to select that only data vectors that are chosen be displayed. It also allows the reordering of the data vectors as they appear in the data window. The default behavior is for the DataView to be disabled which displays all vectors for a chosen setup.

Sync the DataView with Microsoft Excel

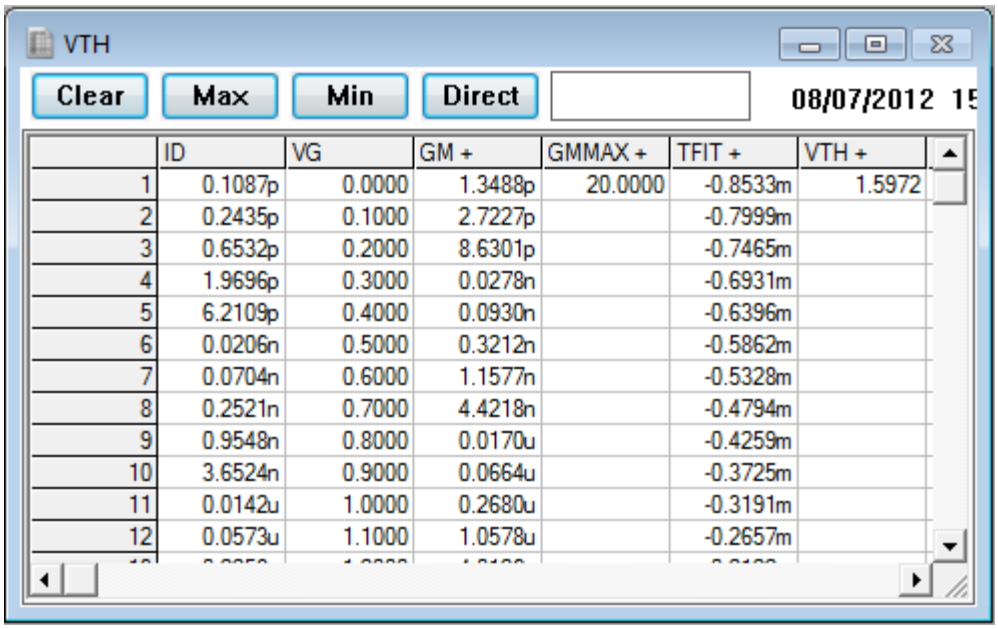
This feature allows the user to automatically synchronize all DataViews with a Microsoft Excel workbook. The default behavior is for the DataView to be disabled which displays all vectors for each setup in separate tabs of the workbook.
Note: ICS has a feature named "Enable DataView". To enable or disable this feature select Workspace from the Options menu.

Note: ICS has a feature named "Sync dataview". To enable or disable this feature select Workspace from the Options menu.

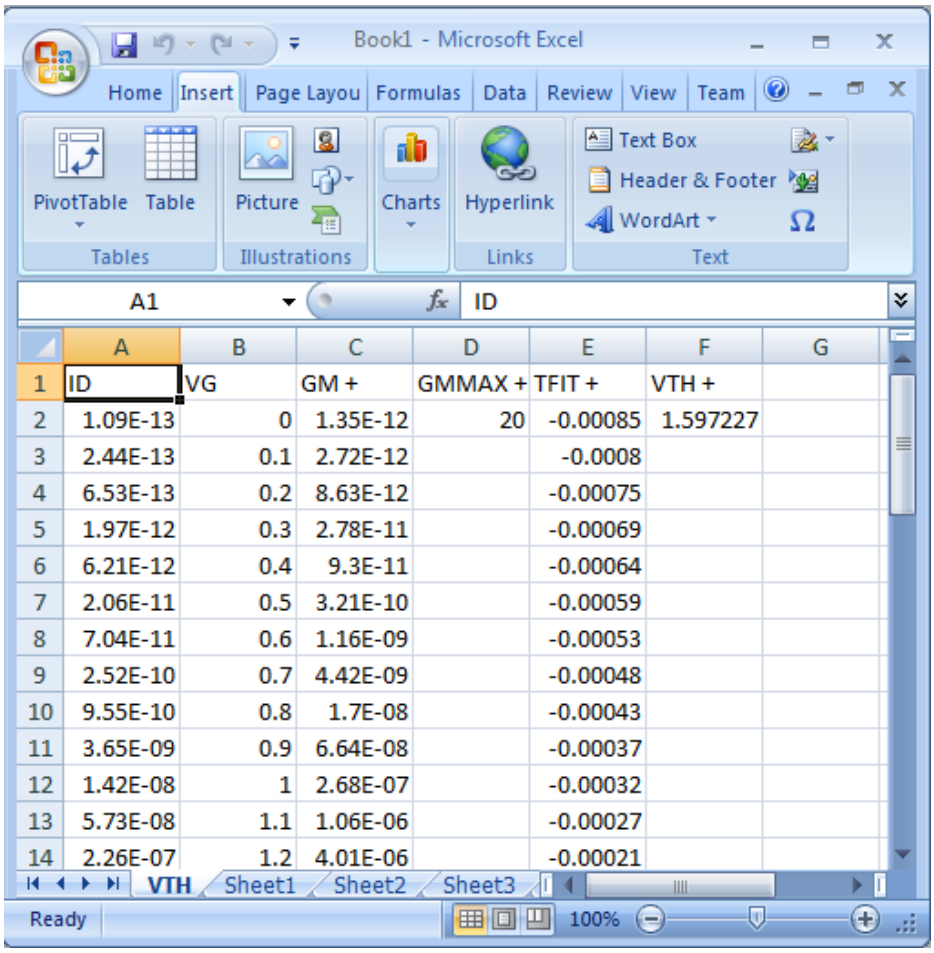


While the "Sync DataView" is selected all data will be automatically synced to the Excel spreadsheet. You can create user defined macros to perform further analysis to create custom reports and save out to the file system in .XLS format.

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



	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	



	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		

Chapter 5- Plotting Data

Introduction

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

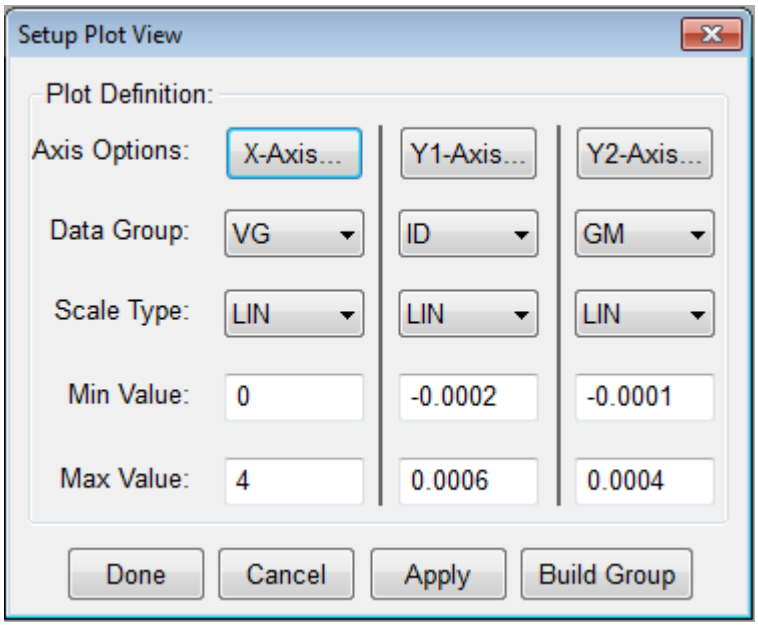
Topics Covered

- Creating a Plot
- Editing a Plot

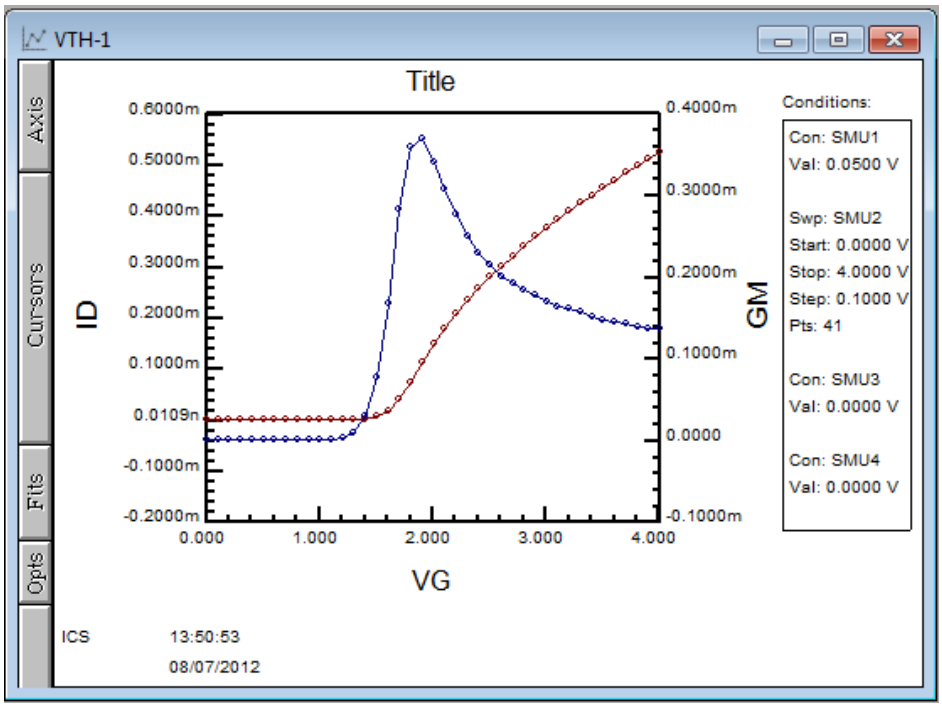
Creating a Plot

The Metrics ICS 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:

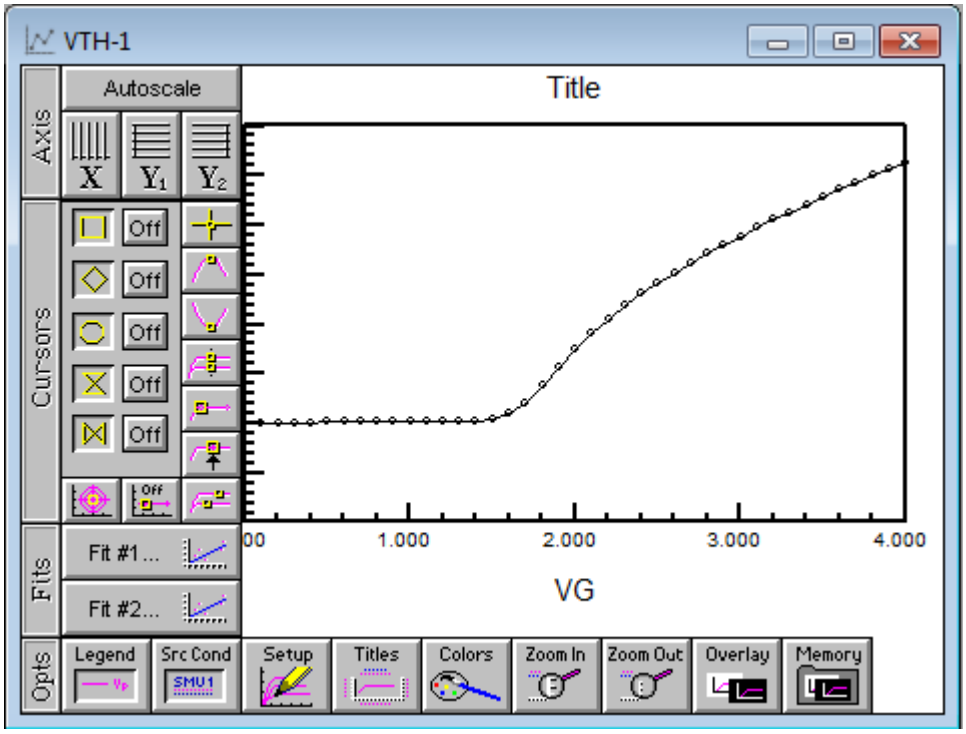


1. Click the **Plot** button on the toolbar.
2. Configure the plot.
3. Click the **Done** button and the plot will be created.



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 ICS Reference Manual.

Chapter 6- Extracting Data

Introduction

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

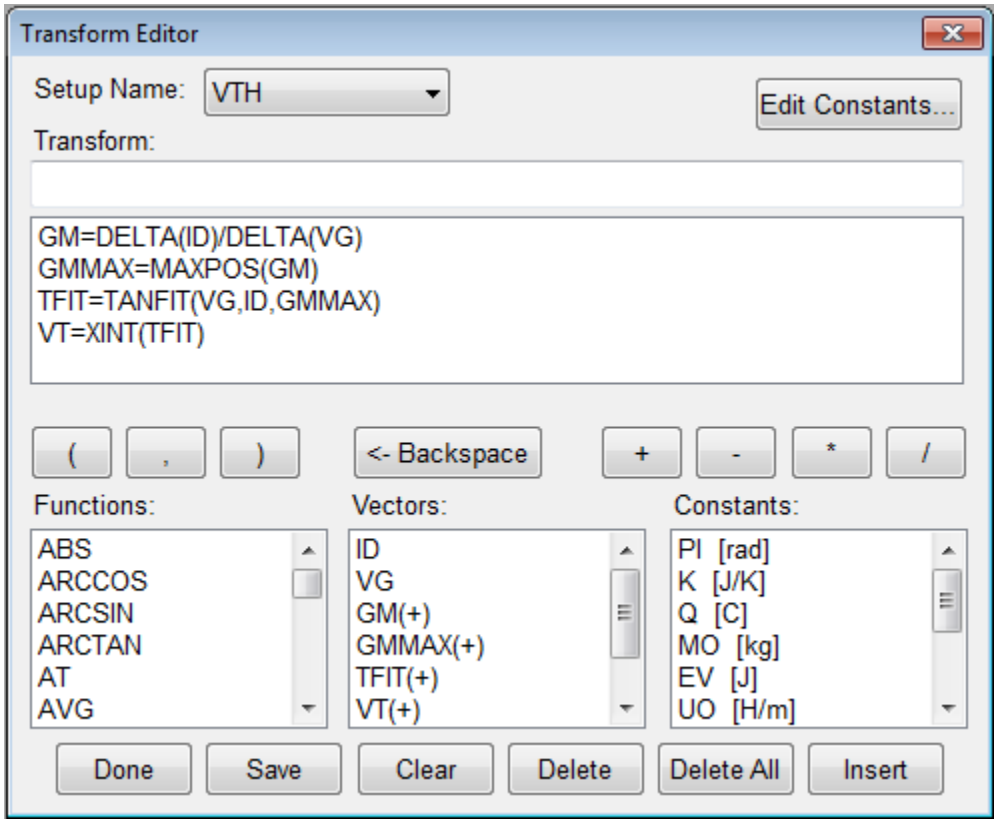
This Module demonstrates how to extract parameters from the raw data using the Transform Editor within ICS.

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 ICS 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

A predefined function(s) 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

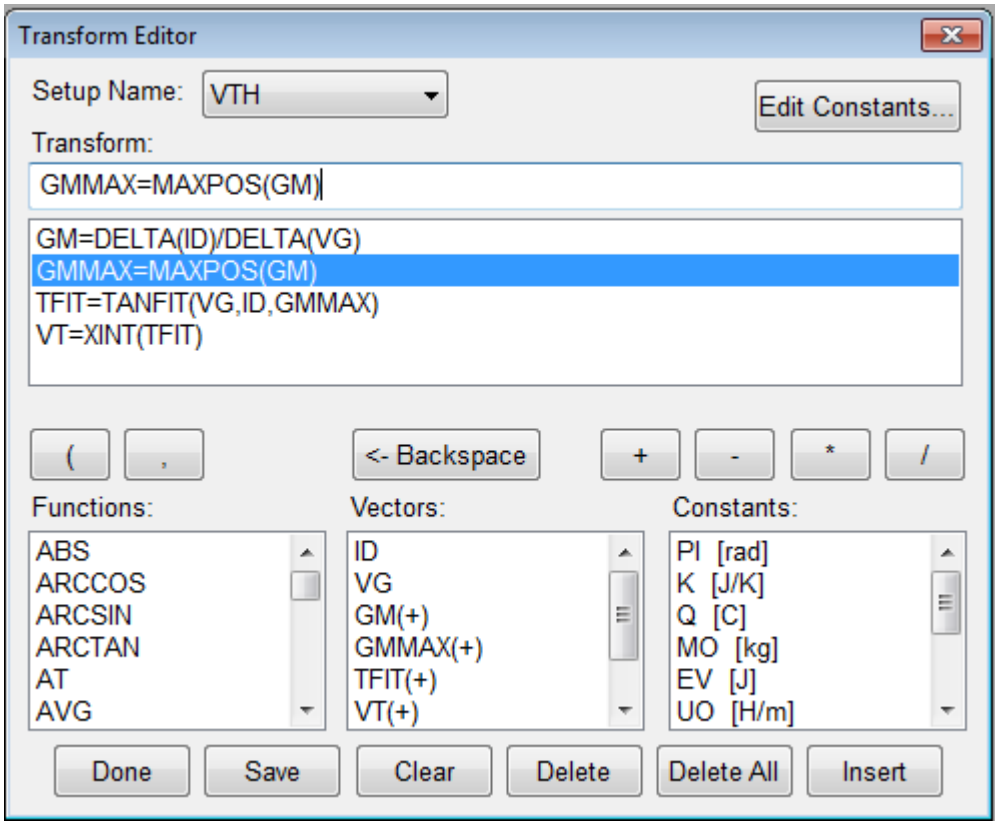
Allows constants to be defined and edited.

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 editor, click the "Transform Editor" button on the ICS toolbar.



To create a calculation:

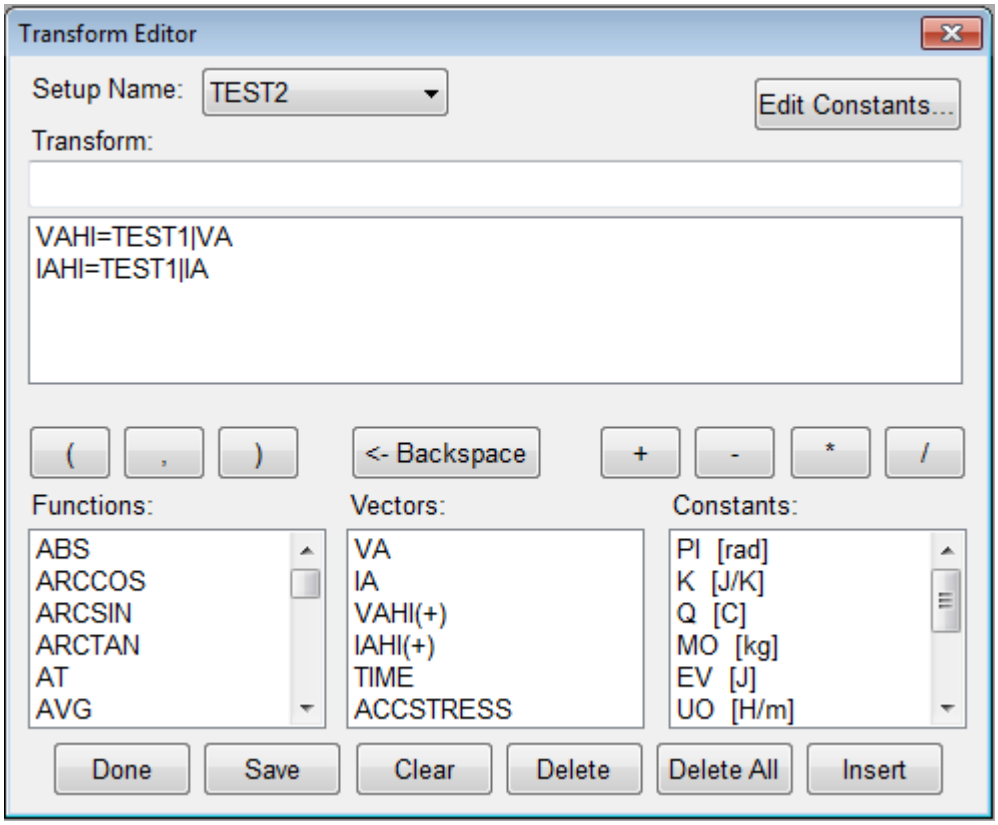
1. Enter the calculation in the "Transform" box. The calculation must be in the form result=function(vector)
2. Click the **Save** button to save the new calculation.
3. Once all calculations have been saved, click the **Done** button.

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 Volts and the second (TEST1) from 1.1-2 Volts the data can be merged to form a full sweep from 0-2 Volts.

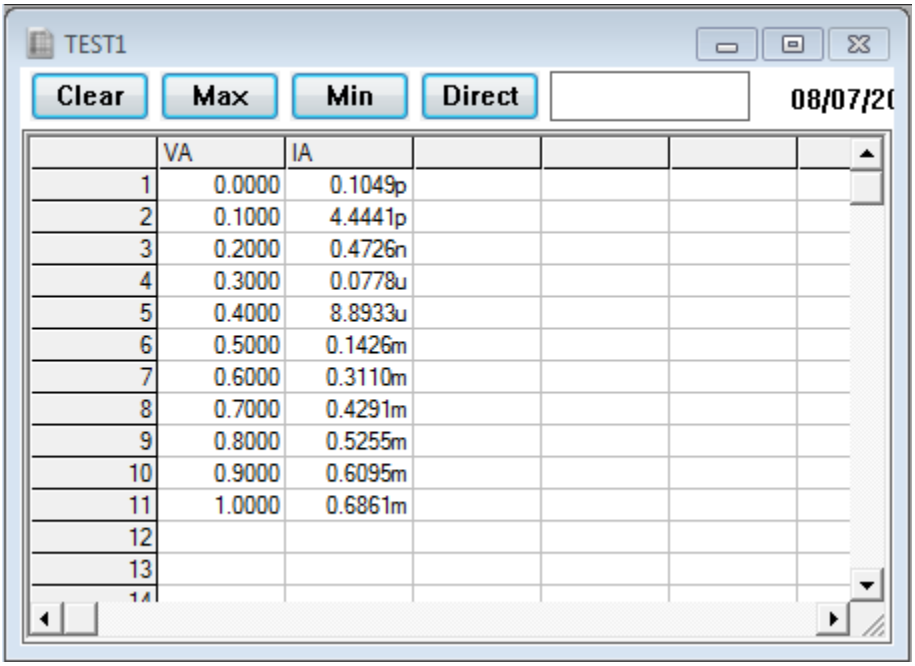
To Share Data:

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



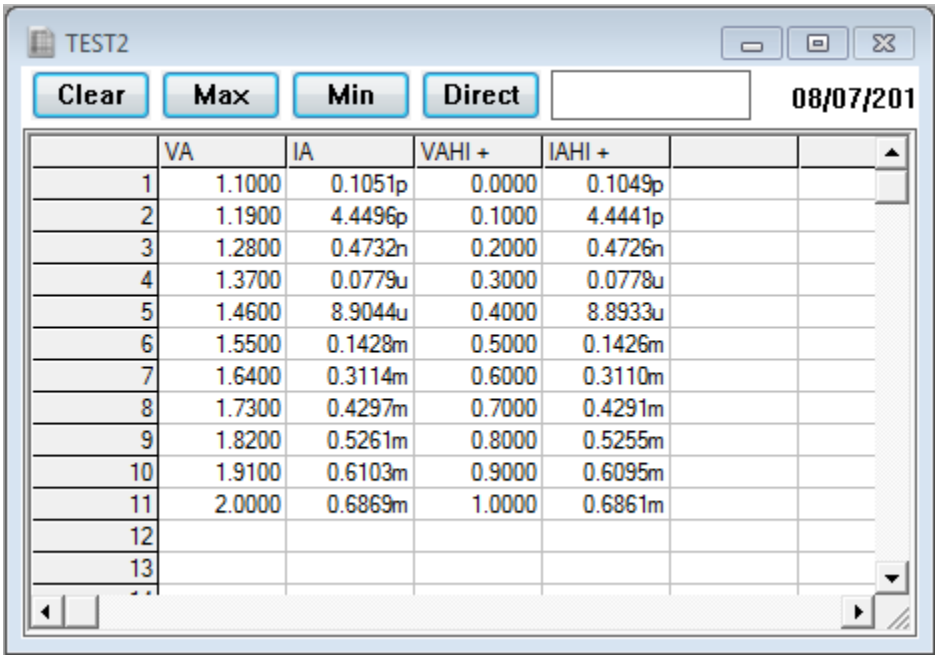
1. Open the Transform Editor and make sure the setup name is TEST2.
2. Create a new Transform as shown above.
3. Click the **Save** button.

The use of the transform result=setup name|vector name allows the data to be moved from one setup to another.



	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		

After applying the transform result=setup name|vector name the data to be from TEST1 is 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				

Chapter 7 - Saving Data

Introduction

Metrics ICS 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.

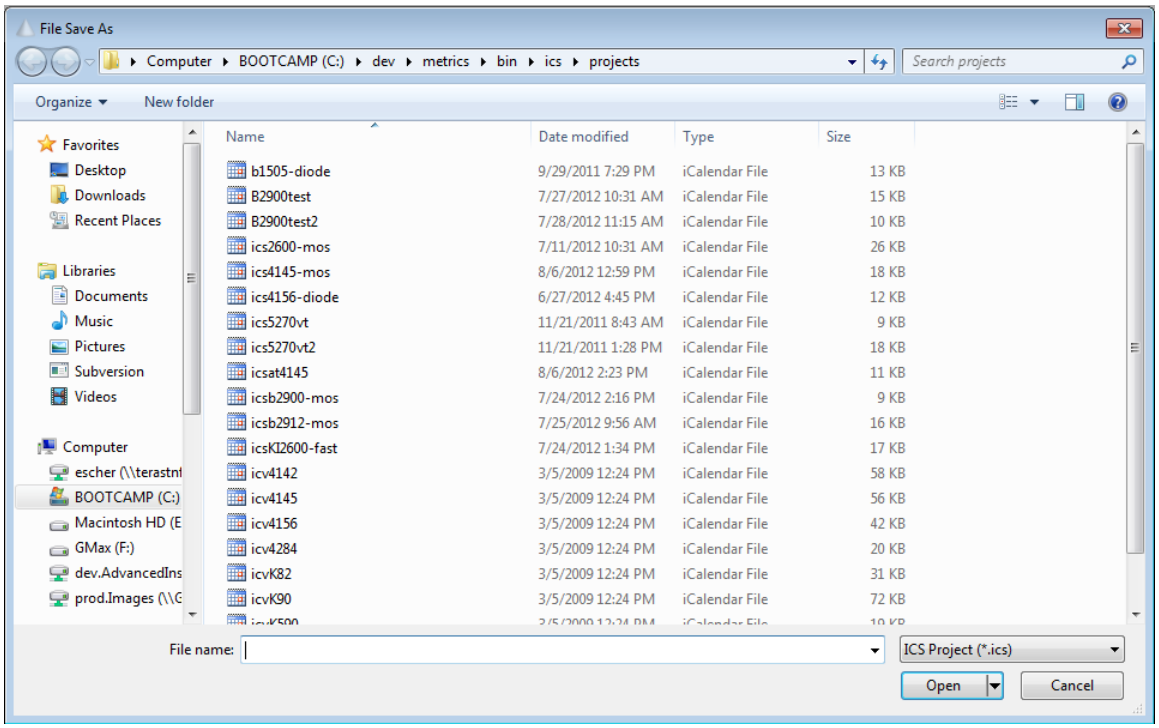
Topics Covered

- Where is the Data?
- Saving a Project

Where is the Data?

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

Note: If you want the ICS 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.