

**Semiconductor Parameter  
Measurement Application**

**CS-810  
Instruction Manual**

---

**IWATSU**



# Preface

- ◇ Thank you so much for purchasing the Semiconductor Parameter Measurement Application CS-810. We hope it will bring you continued enjoyment and satisfaction.
- ◇ This instruction manual describes the CS-810 that controls the curve tracer CS-3000, CS-5000 and CS-10000 series and PC using the LAN interface, and measures the characteristics of a device automatically.  
For the function and the operation method of the curve tracer, refer to the instruction manual of each instrument.
- ◇ Before using the CS-810, read this manual and understand the content sufficiently. After you read it, keep this manual, instruction manual, and CD in a safe place.

# Notices

- ◇ A part of this manual may be changed without notice for improving the performance and the function.
- ◇ Reprint or copy of the content of this manual without notice is prohibited.
- ◇ All instrument names and brand names included with this manual are described for the identification. Each instrument name and brand is the registered trade mark held by relevant individual or body corporate.
- ◇ Microsoft, Microsoft Windows, and Microsoft Excel are registered trademarks of Microsoft Corporation . NI and National Instruments are registered trademarks of National Instruments Corporation.
- ◇ If you have any inquiry on this instrument, please contact Iwatsu at the address listed at the end of this manual or our sales distributors or contact Iwatsu office or our sales distributors for repair.

## Manual Part Number

KML078391


## History

- ◇ March 2011: 1st edition issued
- ◇ November 2011: 2nd edition issued
- ◇ November 2012: 3rd edition issued
- ◇ May 2014: 4th edition issued
- ◇ November 2014: 5th edition issued
- ◇ February 2015: 6th edition issued
- ◇ April 2016: 7th edition issued
- ◇ September 2016: 8th edition issued
- ◇ April 2017: 9th edition issue

# Important Safety Precautions

To ensure safe operation of this instrument and to prevent damage to property, read and carefully observe "⚠ CAUTION" in the following section. Be sure to read them.

### Description of "⚠ CAUTION" in this manual

 <b>CAUTION</b>	If you handle the instrument wrongly ignoring the item described here, this software may be damaged.
--	--



## Be sure to read the following for safety.



### • Caution for using this software

- When you install this software into the PC and use it, read and observe the content of "1.2 Prohibited matter" in this instruction manual. Otherwise, we may not repair the instrument.

## Verify the package contents

If the CS-810 reaches you, please Verify the package contents. If some item is missing or the CD is damaged during the transportation, please contact Iwatsu at the address listed at the end of this manual or our sales distributors or contact Iwatsu office or our sales distributors for repair.

## Packaged items

### ○ CD

The data stored in the CD of Semiconductor Parameter Measurement Application CS-810 is shown below.

 Install CD	
 readme_j.txt	
 readme_e.txt	
 EULA_j.pdf	<b>Software License Agreement (Japanese)</b>
 EULA_e.pdf	<b>Software License Agreement (English)</b>
 NILicenseAgreement_j.pdf	<b>NI-VISA license agreement (Japanese)</b>
 NILicenseAgreement_e.pdf	<b>NI-VISA license agreement (English)</b>
 CS-810InstallManual_j.pdf	<b>Install Manual (Japanese)</b>
 CS-810InstallManual_en.pdf	<b>Install Manual (English)</b>
 Setup.exe	<b>CS-810 installer</b>
 Install	<b>Data folder for installer</b>
 visa462runtime.exe	<b>NI-VISA runtime installer</b>
 Manual	<b>Folder of instruction manual</b>
 CS-810Manual_j.pdf	<b>CS-810 Instruction Manual (Japanese)</b>
 CS-810Manual_en.pdf	<b>CS-810 Instruction Manual (English)</b>
 CS_WaveViewerHelp_j.pdf	<b>WaveViewer Instruction Manual (Japanese)</b>
 CS_WaveViewerHelp_en.pdf	<b>WaveViewer Instruction Manual (English)</b>
 CS_CurveMakerHelp_j.pdf	<b>CurveMakerTool Instruction Manual (Japanese)</b>
 CS_CurveMakerHelp_en.pdf	<b>CurveMakerTool Instruction Manual (English)</b>
 CS_RemoteCtrlHelp_j.pdf	<b>RemoteCtrlTool Instruction Manual (Japanese)</b>
 CS_RemoteCtrlHelp_en.pdf	<b>RemoteCtrlTool Instruction Manual (English)</b>
 CS_AddonCtrlHelp_j.pdf	<b>AddonCtrlTool Instruction Manual (Japanese)</b>
 CS_AddonCtrlHelp_en.pdf	<b>AddonCtrlTool Instruction Manual (English)</b>
 CS_CurveMakerHelp_j.pdf	<b>CurveMakerTool Instruction Manual (Japanese)</b>
 CS_CurveMakerHelp_en.pdf	<b>CurveMakerTool Instruction Manual (English)</b>

- Instruction Manual (printed document)
  - Instruction Manual (this document)
  - Install Manual
- Software License Agreement (printed document)

## Handling of the instrument

If a defect is generated at the install carried out by this instrument or a malfunction is generated after the install, please contact our company's service office (refer to the end of this manual and contact address").

# Contents

1	Overview .....	3
1.1	Main functions.....	3
1.2	Prohibited matter .....	4
2	Operating environments.....	5
3	Connection .....	6
3.1	Network setting .....	6
3.2	Cable connection .....	6
3.3	Check of connection .....	7
4	Using the instrument with CS-810 .....	8
4.1	Activation and initial setting of application .....	8
4.2	Setting of automatic measurement.....	9
4.3	Measurement.....	12
5	Flow of measurement.....	14
6	Descriptions of screens.....	15
6.1	Terminology .....	15
6.2	Main screen .....	15
6.3	TestSuiteFile Edit screen.....	19
7	Configuration of file .....	21
7.1	Details on configuration .....	21
8	TestSuiteFile .....	23
8.1	Creation / selection of TestSuiteFile.....	23
8.2	Edit of TestSuiteFile.....	23
8.2.1	Configuration setting.....	24
8.2.2	Item Setup .....	25
8.2.3	Suite Setup .....	30
8.2.4	Common Setup.....	31
8.2.5	Termination of edit.....	32
8.3	Notes on SETUP file.....	32
8.3.1	About making the SETUP file .....	32
8.3.2	Specification and preservation of the SETUP file.....	32
9	LogFile.....	34
9.1	Setting at measurement.....	34
9.2	Browse and re-measurement of LogFile .....	35
9.3	Export.....	38

10	Measurement .....	40
10.1	Specification of Device Name.....	40
10.2	Display during measurement.....	41
10.3	Pause of measurement.....	41
10.4	Level evaluation.....	41
10.5	Termination of measurement.....	41
11	Example of measurement.....	42
11.1	Example of measurement for MOSFET .....	42
11.2	Example of measurement of transistor.....	50
11.3	Example of measurement of stress application.....	53
12	Addon function .....	56
12.1	AddonConfiguration .....	56
12.2	AddonControl.....	57
12.2.1	AddonSettingFile (the setting data file) .....	58
12.2.2	ScannerSystemCtrl: Settings for the scanner system.....	58
12.2.3	TempRegulator: Settings for the fixture with a temperature regulator .....	59
12.2.4	Add or delete Device .....	60
12.2.5	Automatic measurement.....	60
12.2.6	Examples of Addon function settings .....	62

# 1 Overview

Semiconductor Parameter Measurement Application CS-810 is the application software that connects the Curve Tracers CS-3000 Series, CS-5000 Series, and CS-10000 Series to a PC with LAN interface and automatically measures characteristics of a device by remote control.

For evaluating the performance of a semiconductor device, it is necessary to measure some parameters (e.g.  $I_{ces}$ ,  $V_{ces}$ ,  $V_{th}$ , etc...) generally. However, measuring all parameters for more than one device is a hard work.

This software is convenient for reducing the labor hour of manual operation for such a work. If you use this software, for example, the measurement of each parameter is automatically performed following the prior setting. For this reason, the manual work is only the replacement of target devices and the change of wiring basically. The result of parameter measurement can be evaluated with the threshold value that has been set by automatically classifying the levels. Moreover, all parameter measurement results of all devices can be collectively saved, so you can browse them later.

In this manner, you can use this software as a convenient tool when you measure same types of devices repeatedly.

## 1.1 Main functions

- Automatic measurement  
A series of operations such as setting of Curve Tracer, acquisition of characteristic curve, reading of characteristic value from characteristic curve, and level evaluation are automatically executed. If more than one measurement item is set in advance, this series of operations is automatically executed for all measurement items.
- Setting and storage of automatic measurement items  
The settings of measurement items (item name, setting of Curve Tracer, method for acquiring a characteristic curve (Sweep,  $V_{th}$ , Single) and application of constant current/voltage (stress), method for reading a characteristic value, setting of Level evaluation etc.) that are carried out by the automatic measurement can be saved in a file. A file can include more than one measurement item. You can restart the same measurement by reading a saved file.
- Acquisition and setting of Curve Tracer SETUP  
During the automatic measurement, the setting of Curve Tracer is carried out by recalling a SETUP file, so it is necessary to create a SETUP for each measurement item. In order to enabling this operation, you can acquire and store the setting of Curve Tracer as a SETUP file in a PC or set a SETUP file that is stored in a PC for Curve Tracer by contraries.
- Evaluation of level of measurement value  
The measurement value acquired by automatic measurement can be evaluated with an arbitrary level. The evaluation can be used for classifying conforming product and defective product. Action setting (stop of measurement, skip of measurement, warning display, and acquisition of Hardcopy) can be made for each level.
- Saving and reading of measurement result data  
The measurement result of automatic measurement is automatically saved in LogFile in XML format. The saved LogFile can be browsed and additional measurement can be carried out.
- Output of Excel or CSV file of measurement result data  
The measurement result of automatic measurement can be output by converting it to Excel file or CSV file.
- Control of the scanner system CS-700 and the fixture with a temperature regulator (CTJ1050)  
Measurements can be made by incorporating into automatic measurement the controls such as the channel setting of the scanner system and the temperature setting of the fixture with a temperature regulator.



- Application of constant voltage/current for a specified duration  
Constant voltage or constant current can be applied for a specified duration as an automatic measurement item. Application conditions are set by ConstantVoltage/Current of Curve Tracer.

## **1.2 Prohibited matter**

When you use this software, observe the requirements shown below. Otherwise, the behavior cannot be ensured.

- This software can be installed into only one PC. The install into two or more PCs acts against the license agreement.
- Do not use a PC in power-saving mode.
- If the control from more than one connection is carried out at the same time during the measurement with this software by controlling Curve Tracer from other software, for example, the measurement may not be carried out properly.
- Do not use the measurement setting file (TestSuiteFile) and measurement result file (LogFile) for this application by editing them in the method other than the method of this software.
- Do not edit SETUP file of Curve Tracer to recall it to Curve Tracer or do not use it for this software.

## 2 System Requirements

The Requirements for using this software are shown below.

Classifications	Items	Necessary requirements and specifications
Curve Tracer	Model	CS-3000 Series, CS-5000 Series, CS-10000 Series
	Software version	1.25 or later (CS-3000 Series only) For stress application CS-3000 Series, CS-5000 Series 1.35 or later CS-10000 Series 1.12 or later
	Software option	CS-800 PRM_SRCH
Control PC	–	PC-AT compatible machine (DOS/V machine) Desktop and laptop (notebook)
	OS	Windows Vista (English version, Japanese version) 32bit Windows 7 / 8 / 8.1 / 10 (English version, Japanese version) 32bit or 64bit
	.Net Framework	4.0 or later
	VISA library	15.0.0
	Microsoft Excel	2007 or later 32bit (only when conversion to Excel is executed)

For stable operation of automatic measurement, please configure the system of the PC as follows prior to launching the application.

- Setting of power plans  
Since operation time will not be as specified if PC enters the system stand-by (sleep) or hibernation mode during stress application or waiting time of TempRegulator, set time to enter into sleep and hibernation to appropriate values using Power Options of Windows.
- Setting of Windows Update  
Since the application may be prevented from continuing its operation due to automatic rebooting, etc., if any updates are automatically installed by Windows Update during stress application or waiting time of TempRegulator, configure Windows Update so that any updates will not be automatically installed during the automatic measurement of the application.

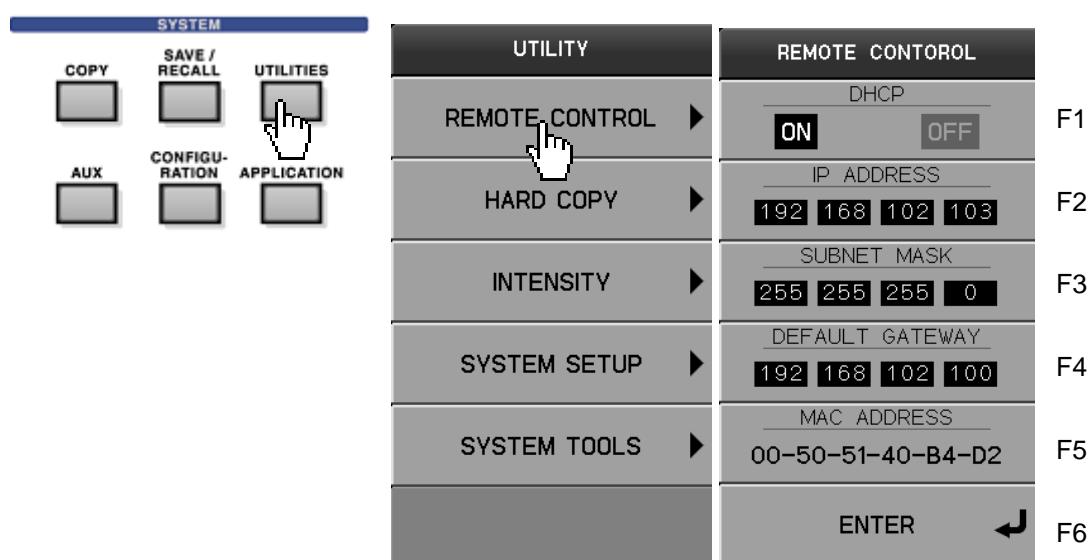
### 3 Connection

#### 3.1 Network setting

This application uses TCP/IP protocol for the communications with Curve Tracer, so it is necessary to make network setting such as IP address. For REMOTE CONTROL setting of Curve Tracer, DHCP function is set to ON when the product is shipped from factory and the network setting is automatically carried out. For the environment without DHCP server, set DHCP function to OFF and make settings shown below manually.

- IP address
- Subnet mask
- Default gateway

The setting is made with [REMOTE CONTROL sub menu]. If you want to display [REMOTE CONTROL sub menu], press buttons in order of UTILITY key and F1 (REMOTE CONTROL) key.



For details on the setting, refer to [REMOTE CONTROL sub menu] in the instruction manual of Curve Tracer CS-3000.

Make the network setting between PC in which this application is installed and Curve Tracer properly for enabling communications.

#### 3.2 Cable connection

If a proper network setting is made, turn OFF the power supply of Curve Tracer and connect PC in which this application is installed and Curve Tracer with a network cable.

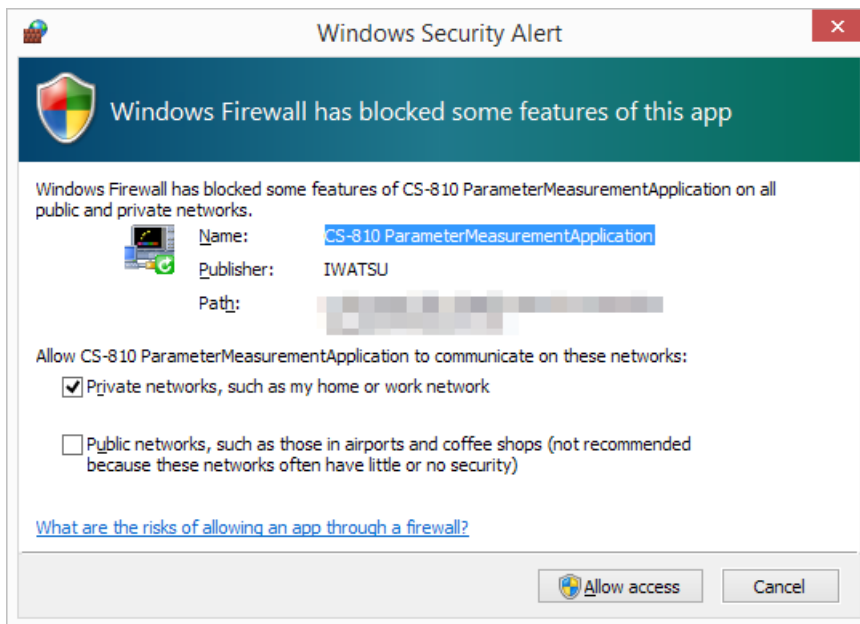
For the connection via network, make a connection to the network terminal such as hub using a straight cable. When you connect Curve Tracer and PC directly, make a connection using a cross cable (for some PCs, the method of connection is distinguished by PC side by automatic detection, so both cables can be connected).

### 3.3 Check of connection

Turn ON the power supply of Curve Tracer. You can check the IP address that is set manually or automatically by clicking [UTILITY]-[REMOTE CONTROL].

Activate CS-810ParameterMeasurementApplication and input the IP address of Curve Tracer in [IPaddress] on the main screen. Click [Measure]-[ConnectCheck] on the main menu. If the connection is made properly, the message that the connection is made successfully is displayed at the lower left of the main screen. If the connection is failed, a warning screen is displayed. Check the network setting and connection.

When connecting for the first time, the Windows Firewall function displays a security warning screen. A connection error occurs: after performing the following permission operations, connect again.



Access needs to be allowed for the communication between the application and the Curve Tracer. Mark the network for which communication is to be allowed in accordance with the communication environment of use, and click [Allow access].

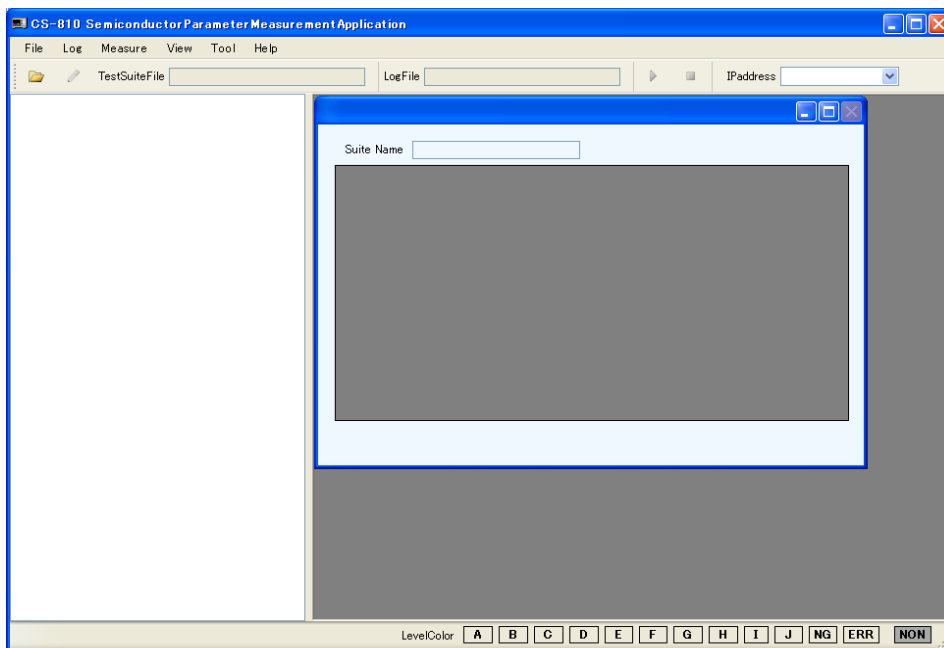
## 4 Using the instrument with CS-810

This chapter describes the flow from activation of application, setting of automatic measurement to measurement in series.

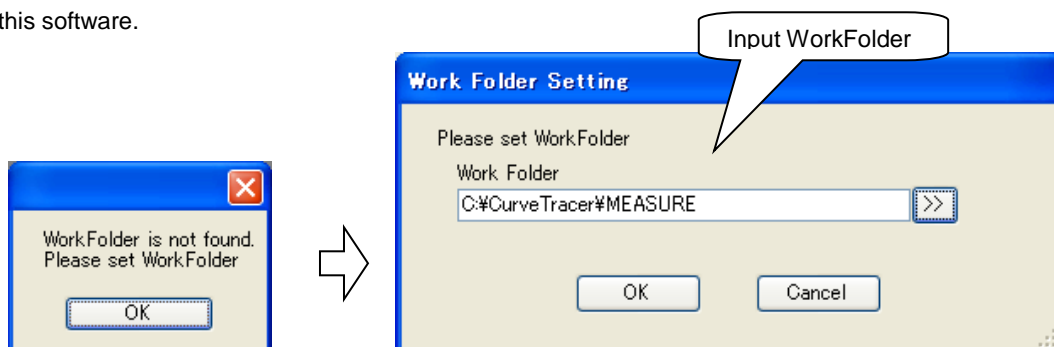
Here shows an example of measurement of 1Ω resistance.

### 4.1 Activation and initial setting of application

- ① Turn ON the power supply of Curve Tracer.
- ② Double-click the icon for CS-810ToolSet on the desktop of the PC and click the CS-810ParameterMeasurementApplication button on the screen that opens to activate the application.



The initial setting is not made when you use the application for the first time, so the setting of Work Folder is requested. Work Folder is the operation folder that is the storage destination of files created by this software.




- ③ Connection setting  
Input the IP address of Curve Tracer in [IPAddress] on the toolbar.  
You can check the IP address of Curve Tracer with [REMOTE CONTROL sub menu] of Curve Tracer.

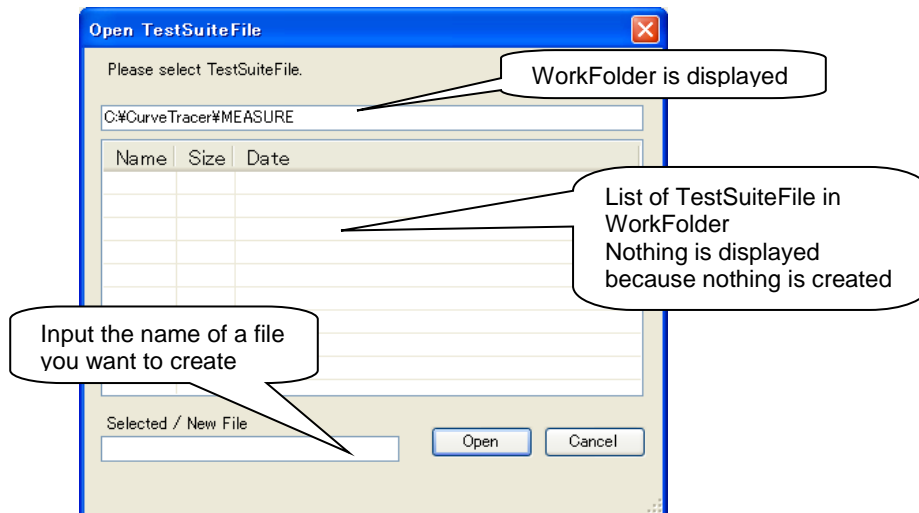
## 4.2 Setting of automatic measurement

All measurement settings required for the automatic measurement are created and saved in a file called TestSuiteFile. The measurement is executed following the content of this file. For details on TestSuiteFile, refer to "8 TestSuiteFile."

### ① Create TestSuiteFile.

Click [Open button]  on the toolbar of the main screen.

Open TestSuiteFile screen is displayed.



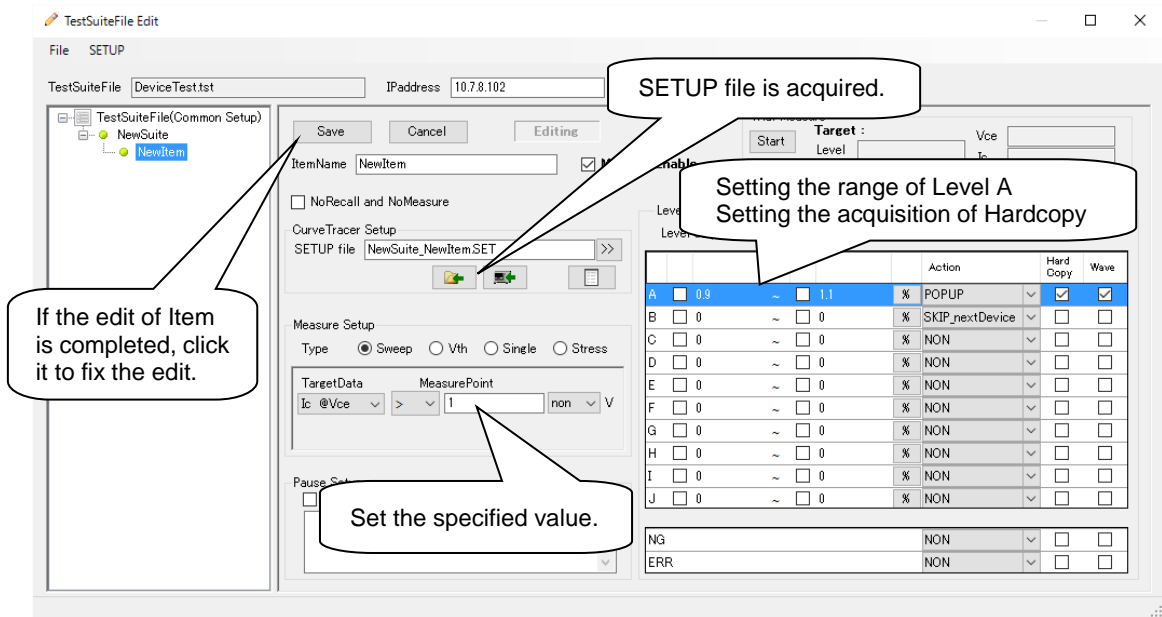
Enter the file name of TestSuiteFile to be created into [Selected/New File]. The extension will be .tst. Here, type "DeviceTest.tst" as an example and click the [Open] button.

### ② Edit TestSuiteFile

When a file is created newly, TestSuiteFile Edit screen is automatically displayed after the selection of TestSuiteFile is completed. When a file is created newly, a Suite and an Item are automatically created. <Setting of Item>

Item indicates a measurement item and one measurement result can be acquired for one Item. It is necessary to set following items for each Item. Refer to 8.2.2 Item Setup.

- Method for acquiring a characteristic curve
- Setting of Curve Tracer (SETUP file)
- Method for reading a characteristic value from a characteristic curve
- Method for evaluating the level



**Item settings screen**

As a concrete example, set "Item for measuring the current value when 1V is applied to 1Ω resistance."

- Method for acquiring a characteristic curve  
In this example, acquire a characteristic curve with SWEEP measurement.  
Set [Type] of [MeasureSetup] to Sweep.

- Setting of Curve Tracer

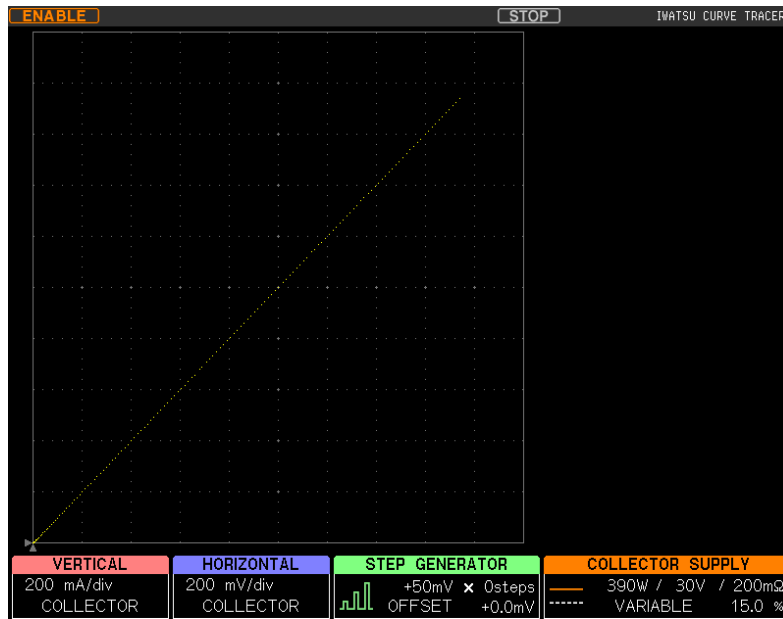
Connect a 1Ω resistance between the COLLECTOR and the EMITTER terminals.

Operate Curve Tracer and make a setting so that a characteristic curve that steps over 1V can be acquired when SWEEP is executed. An example of setting is shown in the table below.


Example of settings for Curve Tracer

Configuration	COLLECTOR terminal : collector supply output BASE (GATE) terminal : SHORT to EMITTER EMITTER terminal : COMMON
Collector supply HV / HC	HIGH VOLTAGE
Collector supply maximum peak power / voltage (MAX PEAK POWER WATTS / VOLTAGE)	390W / 30V
Collector supply mode	+DC
Collector supply VARIABLE	20%
Collector supply SWEEP TYPE	UP
VERTICAL axis	200mA/div
HORIZONTAL axis	COLLECTOR, 200mV/div

After the setting of Curve Tracer is terminated, execute SWEEP with the main unit and check the characteristic curve that steps over 1V can be acquire as shown below.



**Screen when SWEEP measurement is manually executed**

After the characteristic curve is confirmed, press [SETUP file acquisition button]  to acquire the current setting of Curve Tracer in a PC file.

- Method for reading a characteristic value from a characteristic curve  
In this example, read the current value  $I_c$  when 1V is applied to  $V_{ce}$  from a characteristic curve.  
[TargetData] is  $I_c@V_{ce}$ .  
Set the specified value 1V at [Measure Point].
- Method for evaluating the level  
In this example, the measurement result is evaluated as good (Level A) at 0.9 to 1.1A and the screen hardcopy at that time is recorded.  
Check both of upper limit and lower limit of Level A of [Level Setup] and set the range 0.9 to 1.1, and then check the [Hardcopy].

After the edit is completed, fix the edit by clicking [Save button]. Then, the edit of Item is terminated.

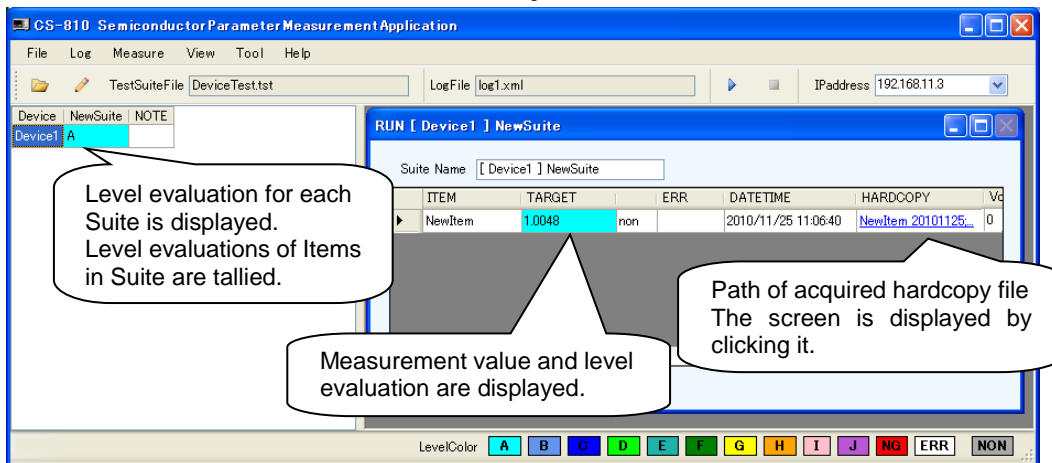
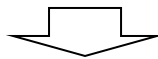
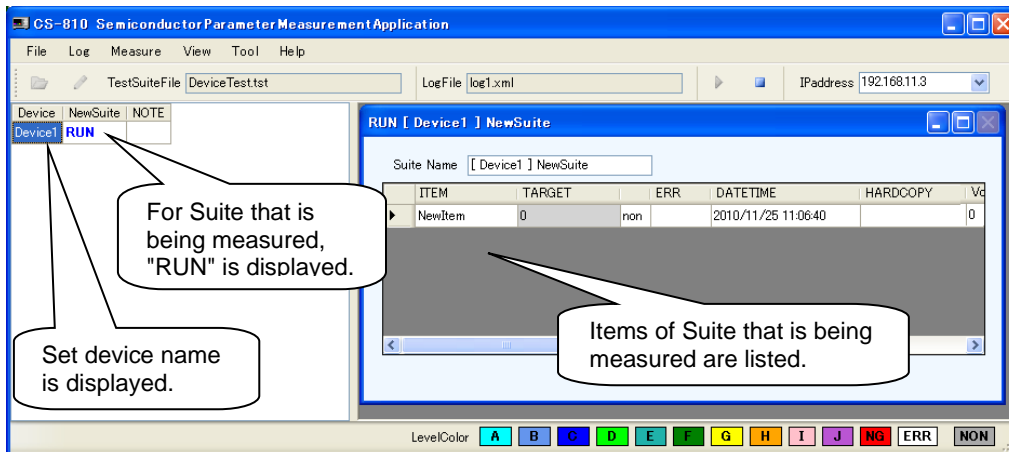
③ Terminating the edit of TestSuiteFile

Terminate the edit of TestSuiteFile by the menu on TestSuiteFile Edit screen, [File]-[Save+Exit].

If [Save+Exit] are not selected, the content of edit is not reflected to TestSuiteFile.







If the measurement of Item is completed, the measurement result and the level evaluation are displayed. When the measurement of all Items in Suite is completed, the level judgment of each Suite is displayed in a left Suite result display.

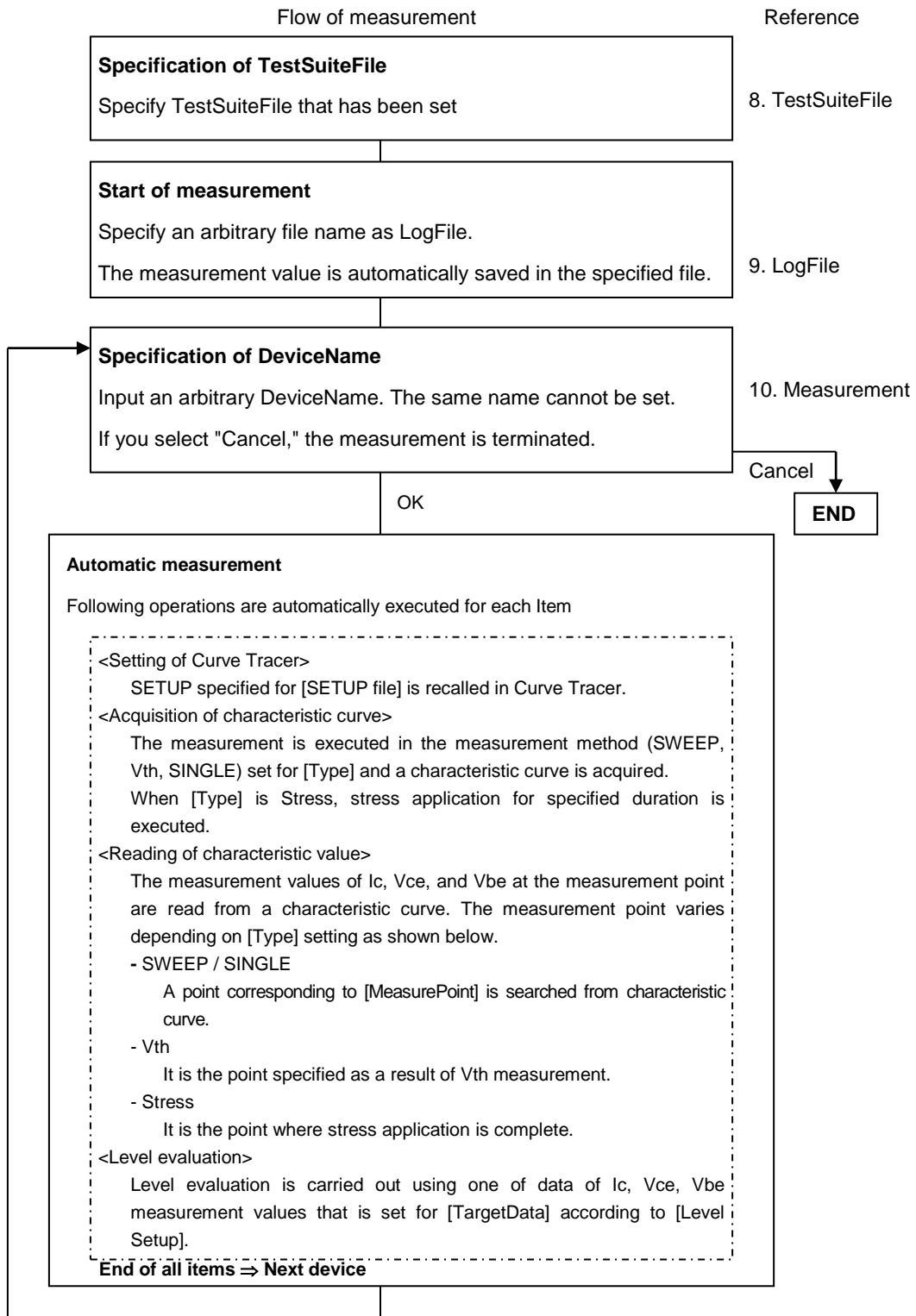
If the measurement of all Items is completed, the operation returns to "② Setting of device name" for measuring the next device. Click [Cancel button] on the device name setting screen to terminate the measurement.

The measurement result is automatically saved in LogFile "log1.xml" you set. You can browse LogFile later.

## 5 Flow of measurement

For the measurement, the measurement items (Item) set for the setting file (TestSuiteFile) are automatically executed.

Item in [ ] indicates the item that is set as Item for TestSuiteFile.



## 6 Descriptions of screens

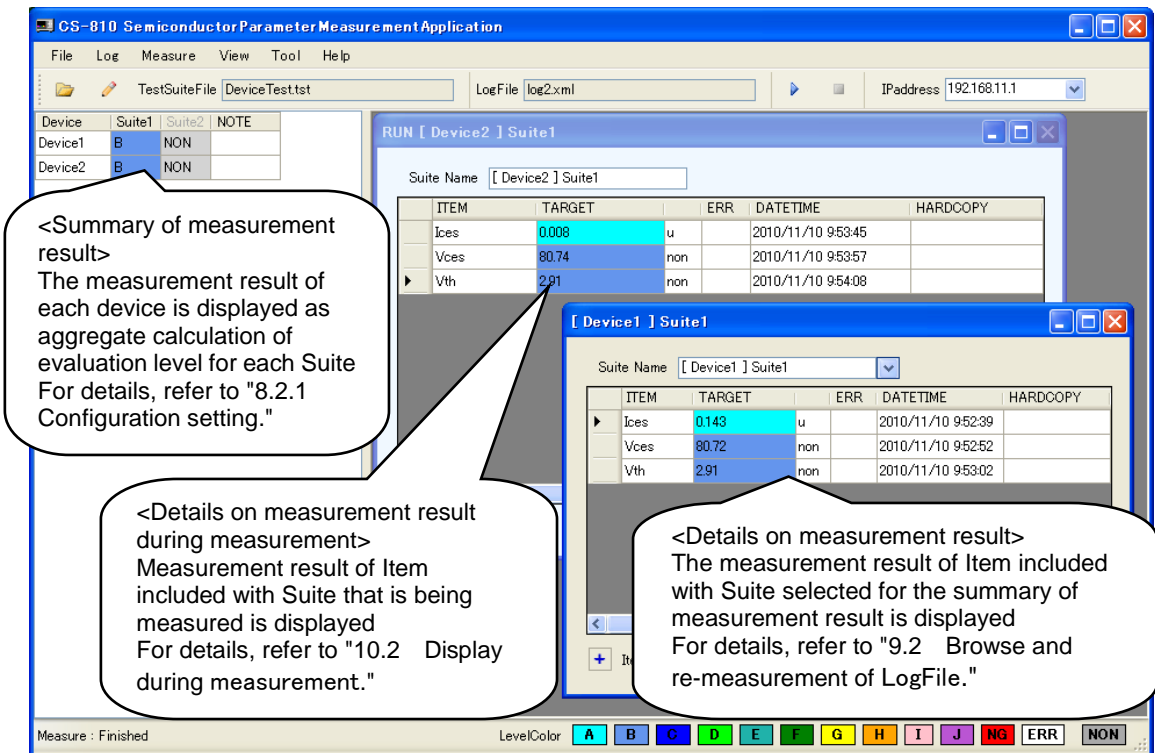
This chapter describes each screen and main terms.

### 6.1 Terminology

Terms	Descriptions	Referential chapters
Item	It is an item of characteristic measurement. One measurement result is acquired for one Item. When the measurement is executed, a series of behavior; setting of Curve Tracer – acquisition of characteristic curve – reading of characteristic value (from characteristic curve) – level evaluation is carried out for each Item when the measurement is executed.	8.2.2 Item Setup
Suite	It is a collection of more than one Item (measurement item). It is a category set by a user arbitrarily. The execution of measurement and the browse of measurement result can be collectively carried out by unit of Suite. It is used for classifying each device for the module in which more than one device is packaged.	8.2.3 Suite Setup
TestSuiteFile	It is a file for saving all measurement settings. The measurement is executed following this file.	8 TestSuiteFile
LogFile	It is a file for saving the measurement result. It is specified when the measurement is started and the measurement result is saved as automatically. It can be browsed.	9 LogFile
SETUP File	It is a setting file of Curve Tracer. A SETUP File is specified and Curve Tracer is set for each Item (measurement item).	8.3 Notes on SETUP file
Work Folder	It is an operation folder in which files created by this software such as TestSuiteFile, LogFile, and SETUP File are stored.	7 Configuration of file

### 6.2 Main screen

It is the screen that is displayed immediately after this software is activated. The execution of measurement and the browse of log file are carried out on this screen. All operations such as various setup screens and call of a tool are started from this screen.



**Figure 6-1** Main screen (example while the measurement is executed)

**<Description of displayed item>**

Item names	Descriptions
TestSuiteFile	Displays the opened TestSuiteFile name. Nothing can be input.
LogFile	Displays the opened LogFile name. Nothing can be input.
IPaddress	Input the IP address of Curve Tracer.
LevelColor	Displays the color of the evaluation level set by CommonSetup of TestSuiteFile. NON is the setting fixed to gray.

<Description of menu>

- File

Menus	Descriptions
Open	Carries out new creation / open of TestSuiteFile The screen for specifying a file is opened
Recent TestSuiteFile	Displays recently used TestSuiteFile. Up to six files are displayed. If you click it, the selected TestSuiteFile is opened.
Edit	Edits the opened TestSuiteFile TestSuiteFile Edit screen is opened
Work Folder Setting	Makes a setting of Work Folder Work Folder Setup screen is opened
Exit	Application is quit

- Log

Menus	Descriptions	
Open/Delete	Carries out open / delete of LogFile The screen for specifying a file is opened	
Recent LogFile	Displays recently used LogFile. Up to six files are displayed. If you click it, the selected LogFile is opened.	
Save	Overwrites and saves the opened LogFile * While the measurement is executed, the measurement result is always saved automatically, so it is not necessary to save it daringly. The manual saving is necessary only when a comment is written in NOTE field.	
Export	to CSV	Converts the opened LogFile to CSV format and saves in a CSV file. The screen for specifying a file is opened
	to Excel	Converts the opened LogFile in Excel format with an arbitrary allocation and saves it in an Excel file. The screen for specifying the allocation is opened.

- Measure

Menus	Descriptions
Start	Starts the measurement. The behavior is same as that of [Start button] on the toolbar. Open LogFile screen of the storage destination of the measurement data is opened.
Abort	Aborts the measurement. The behavior is same as that of [Abort button] on the toolbar.
ConnectCheck	Checks the connection with Curve Tracer. Checks the connection with the address that is specified as an [IPaddress]. The check result is displayed at the status display part at lower part of the screen.

- View

Menus	Descriptions
All Close	Closes all displayed Item measurement result screen Item result screen during the measurement is not closed
List of displayed screens	Lists the displayed Item measurement result screen and the Item result screen during the measurement. If you click a screen, the selected screen becomes active.

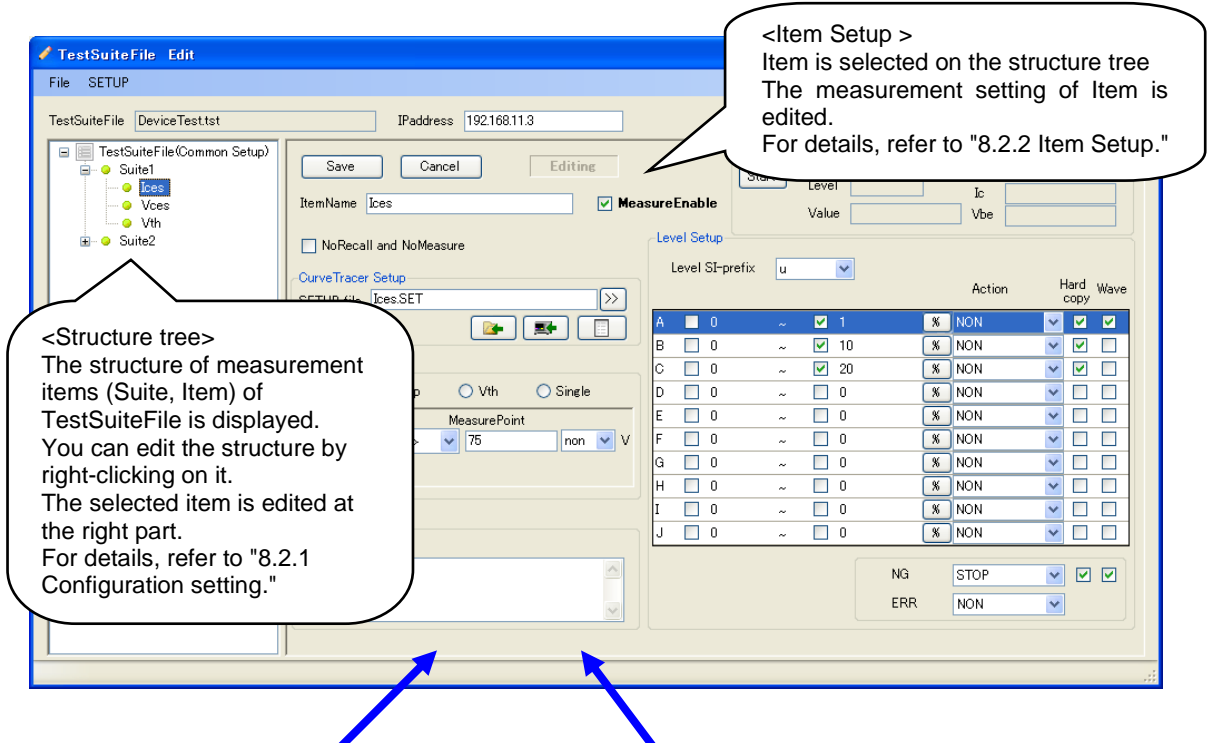
- Tool

Menus	Descriptions
Beep	Sets the ON/OFF of the beep.
AddonConfiguration	Sets the configuration of the Addon function. Displays the Addon List.
AddonControl	Sets the Addon function and carries out the measurement using the Addon function. Opens the control screen.

- Help

Menus	Descriptions
About	Displays the information of this application
Help	Displays the help information of this application

### 6.3 TestSuiteFile Edit screen



<Suite Setup >

Suite is selected on structure tree.

Refer to "8.2.3 Suite Setup."

<Common Setup >

Common Setup is selected on structure tree.

Refer to "8.2.4 Common Setup."

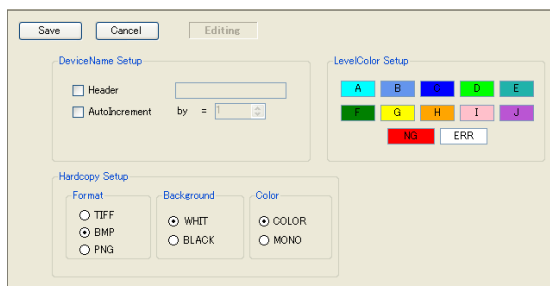
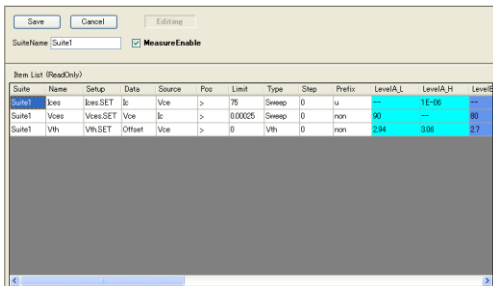


Figure 6-2 TestSuite Edit screen

<Description of displayed item>

Item names	Descriptions
TestSuiteFile	Displays the name of TestSuiteFile to be edited. Nothing can be input.
IPAddress	Input the IP address of Curve Tracer. This function is used for acquiring and setting a SETUP file. The address is the same for the setting of main screen.



<Description of menus>

- File

Menus	Descriptions
Copy to NewFile	Copies a TestSuiteFile that is being edited and saved in other file. Also, the SETUP file specified in the Item is copied. The screen for specifying a file is opened.
Discard + Exit	Closes the edit screen without saving the content of edit by resetting the TestSuiteFile to the original status before the edit screen is opened.
Save + Exit	Closes the edit screen by saving the content of edit in the TestSuiteFile.

- SETUP

Menus	Descriptions
Import	Copies the specified SETUP file in the SETUP folder corresponding to the TestSuiteFile that is being edited (at Work Folder or lower). This function is executed when you use a SETUP used for other TestSuiteFile or SETUP file saving in a USB memory by Curve Tracer CS-3000. "Export SETUP files" screen is opened.
Export	Copies a file stored in the SETUP folder to the arbitrary folder corresponding to the TestSuiteFile that is being edited (at Work Folder or lower). "Export SETUP files" screen (Export folder specification) is opened.

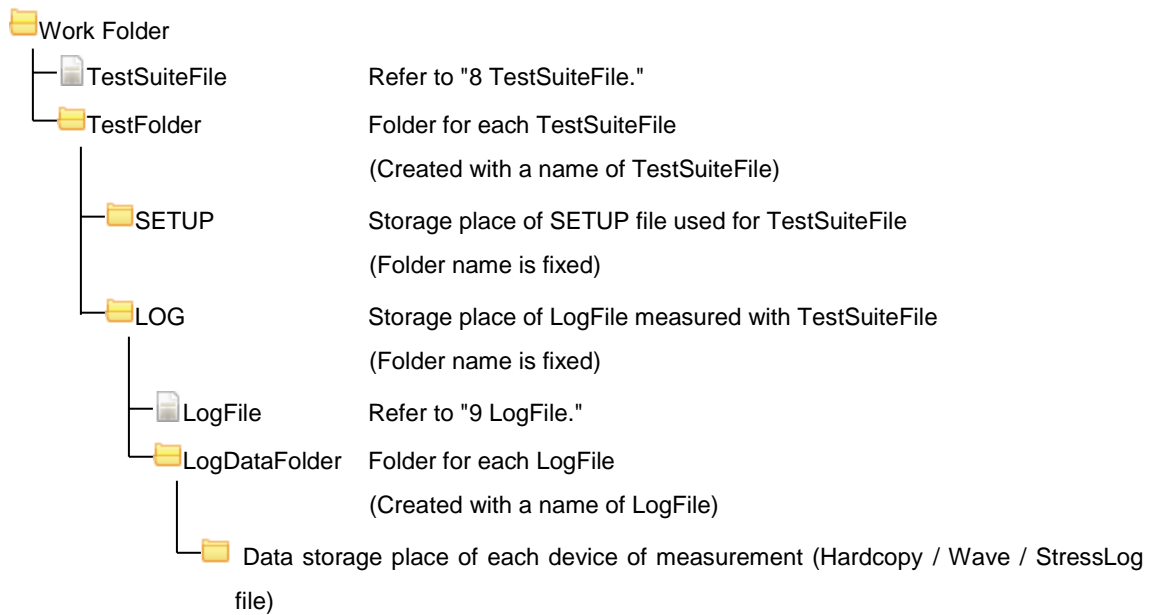
## 7 Configuration of file

With this application, a Work Folder is set and all of measurement setting files (TestSuiteFile) and measurement result files (LogFile) are created in the Work Folder.

Make a setting of Work Folder with the menu on the main screen, [File]-[WorkFolder Setting].

If Work Folder is not properly set at the startup, the resetting is requested.

### 7.1 Details on configuration

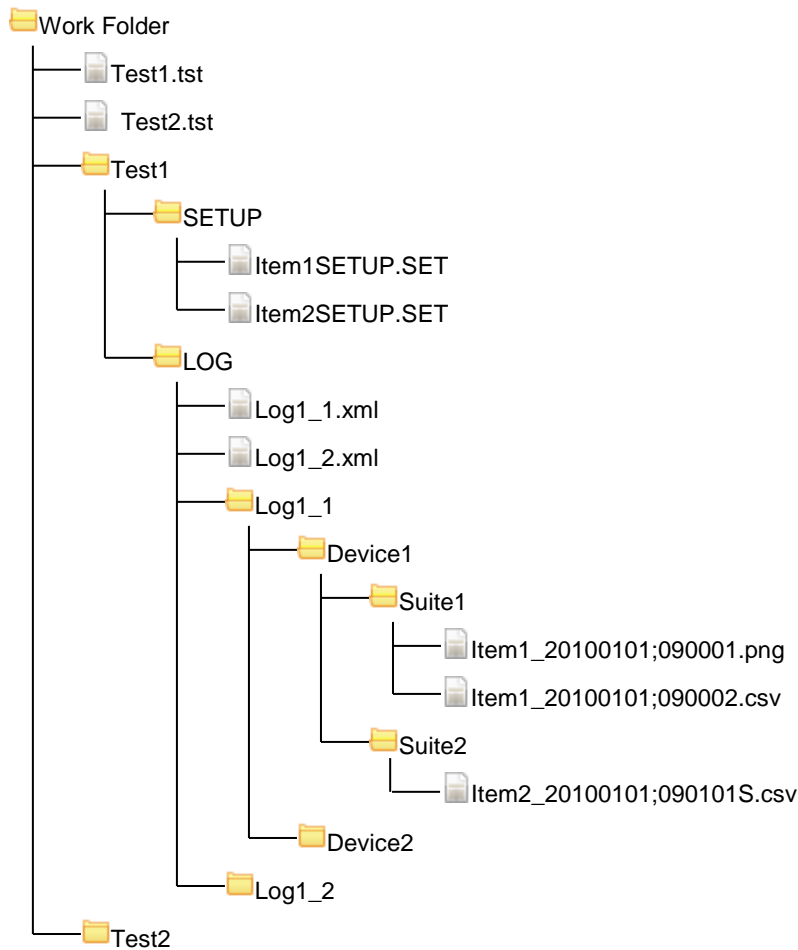


<Example of configuration>

Here describes the configuration of folders when settings and measurements shown below are carried out as an example.

TestSuiteFile : Test1.tst, Test2.tst  
(Suite1-Item1 and Suite2-Item2 are created in Test1.tst and the acquisition of Hardcopy is set by Item1. It is acquired at 09:00:01 on 2010/01/01. And, the acquisition of Wave is set by Item1. It is acquired at 09:00:02 on 2010/01/01. Acquisition of StressLog is set by Item2. It is acquired at 09:01:01 on 2010/01/01.)


LogFile : Log1\_1.xml and Log1\_2.xml measured by Test1.tst  
(Log1\_1.xml measured Device1 and Device2)

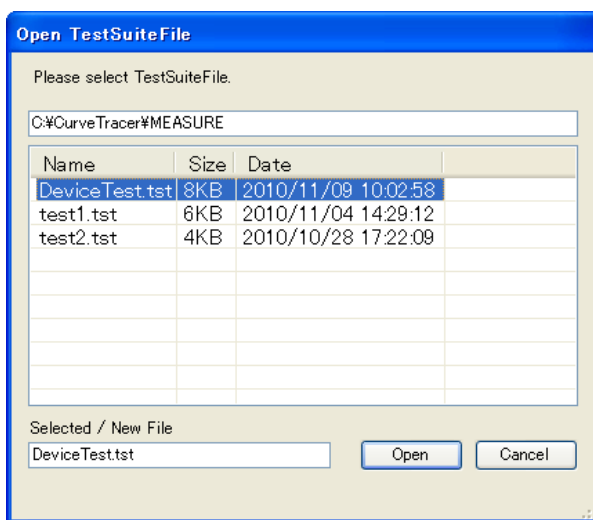


## 8 TestSuiteFile

The TestSuiteFile is a file stored as .tst file in XML format in which the configuration and the setting of automatic measurement are described. This application performs the automatic measurement according to the content described in TestSuiteFile. Consequently, it is always necessary to create a TestSuiteFile before the measurement. If it is created once, the same measurement can be performed by opening the created TestSuiteFile from the next measurement.


### 8.1 Creation / selection of TestSuiteFile

If you click the menu on the main screen, [File]-[Open] or clicking [Open button]  on the toolbar, the screen for opening a TestSuiteFile is displayed.



When you create a TestSuiteFile newly, specify the file name created here. If you open an existing file, select it from the list.

### 8.2 Edit of TestSuiteFile

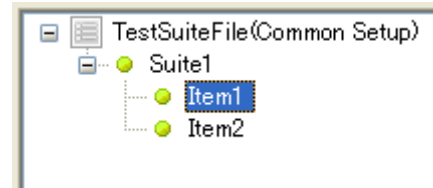
For a new creation, TestSuiteFile Edit screen automatically appears if TestSuiteFile is opened. When you edit an existing file, click the menu on the main screen, [File]-[Edit] or click [Edit button]  on the toolbar while TestSuiteFile is opened. Then, TestSuiteFile Edit screen appears.

For TestSuiteFile, set a characteristic you want to measure as a measurement item (Item). For each measurement item (Item), the configuration is set in the category defined by a user called test suite (Suite). The following page describes the edit of TestSuiteFile in categories of configuration setting, Common Setup, Suite Setup, and Item Setup.

## 8.2.1 Configuration setting

Set the configurations of Suite and Item on the Tree at the left part of TestSuiteFile Edit screen.

The menu is displayed by right-clicking each item.



- TestSuiteFile (Common Setup) menu

Menu item	Behavior
Add Suite	Adds a new Suite to the bottom. The temporary name is set as NewSuite. The name can be changed on Suite Setup screen. *1

- Suite menu

Menu items	Behaviors
Copy+Paste	Copies the selected Suite and adds it to the bottom. The temporary name is set as [SuiteName] _copy. The name can be changed on Suite Setup screen. *1
Up	Moves the selected Suite upward by one stage.
Down	Moves the selected Suite downward by one stage.
Delete	Deletes the selected Suite.
Add Item	Adds a new Item to the bottom of the selected Suite. The temporary name is set as NewItem. The name can be changed on TestSuiteFile Edit screen. *2

- Item menu

Menu items	Behaviors
Copy+Paste	Copies the selected Item and adds it to the bottom. The temporary name is set as [ItemName] _copy. The name can be changed on TestSuiteFile Edit screen. *2
Up	Moves the selected Item upward by one stage.
Down	Moves the selected Item downward by one stage.
Delete	Deletes the selected Item.

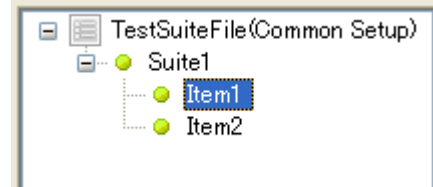
\*1: Up to 40 Suites can be created.

\*2: Up to 40 Items can be created in one Suite.

## 8.2.2 Item Setup

It is set to measure one characteristic. Specify the Curve Tracer setting (a SETUP file) and set the point for measurement and the Level range for evaluation so on.

If you select the hierarchy of Item from the Tree at the left of TestSuiteFile Edit screen (right figure), the right part of TestSuiteFile Edit screen changes to the Item Setup screen shown in below.



Save
Cancel
Editing

ItemName   **MeasureEnable**

NoRecall and NoMeasure

CurveTracer Setup  
 SETUP file  >>

Measure Setup  
 Type  Sweep  Vth  Single  Stress

TargetData  MeasurePoint   V

Pause Setup  
 Pause

Trial Measure  
 Start  Target :  Vce   
 Level  Ic   
 Value  Vbe

Level Setup  
 Level SI-prefix

					Action	Hard Copy	Wave
A	<input type="checkbox"/> 0	~	<input checked="" type="checkbox"/> 1	%	NON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B	<input type="checkbox"/> 0	~	<input checked="" type="checkbox"/> 10	%	NON	<input checked="" type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/> 0	~	<input checked="" type="checkbox"/> 20	%	NON	<input checked="" type="checkbox"/>	<input type="checkbox"/>
D	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
E	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
F	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
G	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
H	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
I	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
J	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
NG					STOP	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ERR					NON	<input checked="" type="checkbox"/>	<input type="checkbox"/>

- **ItemName**  
 Sets the name of measurement item (Item)  
 Same ItemName cannot be set in Suite  
 Both of two-bytes and one-byte characters can be set. However, characters shown below cannot be used.  
 (One-byte \: / ? [ ] \* < > ' " two-byte ¥ : / ? [ ] \* ' )  
 Up to 30 characters can be set regardless of two-byte and one-byte characters.
- **MeasureEnable**  
 Sets validity / invalidity of measurement. If it is deselected, the measurement becomes invalid and not executed.
- **NoRecall and NoMeasure**  
 Neither the setting change of Curve Tracer (Recall of the SETUP file) nor the measurement are executed when checking it, the value of the point specified with [MeasureSetup] is searched and acquired from the measured waveform data (the data measured with previous one Item), and it is assumed the measurement result of Item.

- CurveTracerSetup

Specifies the setting of Curve Tracer with a SETUP file.

It is specified from a SETUP file stored in the SETUP folder corresponding to TestSuiteFile (refer to 7 Configuration of file). For the addition of a file to the SETUP folder, refer to 8.3 Notes on setup file.



Acquires the current setting of Curve Tracer in a file specified for [SETUP file] by remote control.



Recall of a SETUP file specified in [SETUP file] for Curve Tracer by remote control



Displays the list of setting items of SETUP file that is specified as [SETUP file].

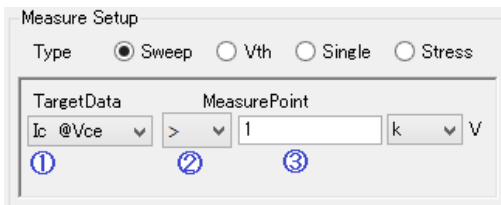
A set item cannot be edited. A SETUP file can be saved with other name from the list display screen.

- MeasureSetup

- Selection of measuring method [Type]

Select the measurement method from Sweep, Vth, Single, and Stress. The content of setting for [Measure Setup] changes by [Type].

#### Sweep



Select the combination of waveform type of the target data and waveform type for deciding the measurement point (①).

Set the value of the measurement point (③).

Select the method for deciding the measurement point (②)

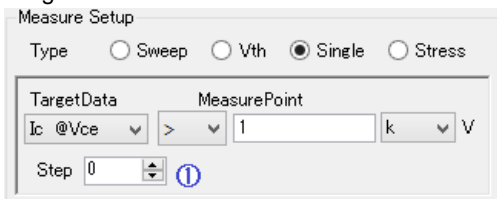
#### Vth



Select the target data from Offset, Vbe,  $\beta$  or gm.

The measurement point is the one where Vth measurement is completed.

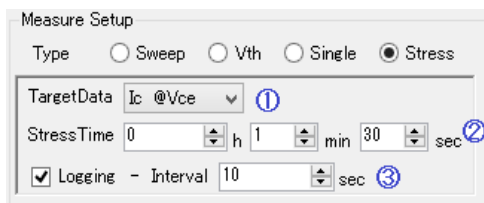
#### Single



Select the Step to be measured (①).

Make a setting in a same way as Sweep.

## Stress



Select the combination of waveform type of the target data and waveform type of the application target of constant stress (①).  
 Set the application time (②).  
 ( Allowable range : 10 sec - 1000h59min50sec )  
 Set saving of measurements to a file and its interval during application (③).

### ■ Selection of the target waveform [Target Data]

When [Type] is Vth, select as follows.

- Offset            Offset setting value of STEP GENERATOR
- Vbe              Measurements between BASE-EMITTER
- $\beta$  or gm         $\beta$  or gm calculated from the measurement Vbe between BASE-EMITTER

When [Type] is Sweep or Single, select (Target type) @ (Source waveform).

After measurements, search for the point that becomes MeasurePoint from the Source waveform data, and acquire the value of the point according to the setting of the Target type. When the target type is "R", it becomes the value of resistance (Vce/Ic).

When [Type] is Stress, select (Target type) @ (Source waveform).

Measurements of waveform set as Target type is the target of level evaluation.

Target of constant stress application (Vce or Ic) is set by SETUP specified by [Setup file] of [CurveTracer Setup].

### ■ Setting of [Measure point]

Set the value that becomes the measuring target of the Source waveform selected with [TargetData]. SI-Prefix can be set within the range of p ( $10^{-12}$ ) ~ G ( $10^9$ ). The value can be set by the resolution of  $1E-10$  within the range of  $-1E+10$ - $1E+10$ . The value is rounded by eight effective digit numbers.

The measurement point hardly becomes same as the setting value, so the measurement values of two points that step over the setting value are the candidates. Set the method for deciding the measurement point according to the characteristic measurement of the target.

Symbols	Methods for deciding the measurement point
>	Measurement point larger than setting value
<	Measurement point smaller than setting value
$\cong$	Measurement point more close to setting value
=	Calculation value when it interpolates between two points, and it becomes set value

### • Pause Setup

The pause can be set before Item measurement is started.

If you select [Pause], the dialog box displaying the content set for [Comment] before the measurement of Item is started is displayed and the measurement of Item is paused temporarily. Up to 256 characters can be set for [Comment].

This function is used when it is necessary to switch the wiring.

### • Level Setup

Set SI-Prefix from p ( $10^{-12}$ ) to G ( $10^9$ ). When the measurement result is displayed, the Target value is displayed using this setting. The range of Level setting shown below is also set with the value using this SI-Prefix.



Set the Level at 10 levels from A to J.

The evaluation is carried out from A in series and the measurement result that is not evaluated as effective Level is set to NG.

However, when all the levels are invalid settings, it is determined level A, and the action after the determination also follows the setting of level A.

ERR is the status that the effective measurement data cannot be acquired (The measurement did not settle with Vth etc.).

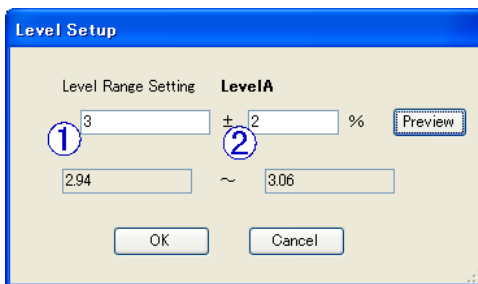
					Action	Hard copy	Wave			
A	<input type="checkbox"/>	0	~	<input checked="" type="checkbox"/>	1	%	NON	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B	<input type="checkbox"/>	0	~	<input checked="" type="checkbox"/>	10	%	NON	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/>	0	~	<input checked="" type="checkbox"/>	20	%	NON	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Set the range of Level from lower limit value to upper limit value. The value can be set by the resolution of 1E-10 within the range of -1E+10-1E+10. The value is rounded by eight effective digit numbers.

Only the selected item is valid.

The lower limit value and the upper limit value can be edited by clicking the point you want to set.

Use it when you want to set the level with an error [%] from the target value.  
If you click it, the dialog box for setting the range of Level is displayed.



Specify the target value in ① and specify the error [%] in ②.

The lower limit value and the upper limit value are displayed in the [Preview].

As for the lower limit value and the upper limit value, the range of the Level setting of the above-mentioned becomes effective.

If you click [OK], the Level is set.

Select the behavior when the set Level is evaluated for [Action].

Types of action	Descriptions of behavior
NON	Nothing is carried out.
Skip_nextSuite	Shifts to the measurement of the next Suite without measuring the remaining Items in Suite that is currently measured.
Skip_nextDevice	Shifts to the measurement of the next device without measuring the remaining Items in Device that is currently measured.
Skip_selectItem	Opens the Item Select screen. [Skip to] Shifts to the measurement of the selected Item. [without Skip] Continues the measurement. Shifts to the next Item. [Abort] Aborts the measurement.
POPUP	Displays the dialog box and pauses the measurement. Continue measurement / stop measurement can be selected.
STOP	Stops the measurement.

If you select [Hardcopy], the Hardcopy of the screen when the measurement is terminated is saved as a file when the measurement result is evaluated as the set Level. The setting of Format etc. of Hardcopy is made for the common setup (refer to "8.2.4 Common Setup").

If you select [Wave], the measurement waveform data is saved as a file by the CSV format when the measurement result is evaluated as the set Level.

- Save/Cancel

The edit is fixed by clicking [Save button]. If you click [Cancel button], the edit is discarded and the setting returns to the original setting before Item Setup is opened. If you do not release the edit status by clicking [Save] or [Cancel button], the setting cannot shift to the other setting (Item Setup, Suite Setup, Common Setup).

- Trial Measure

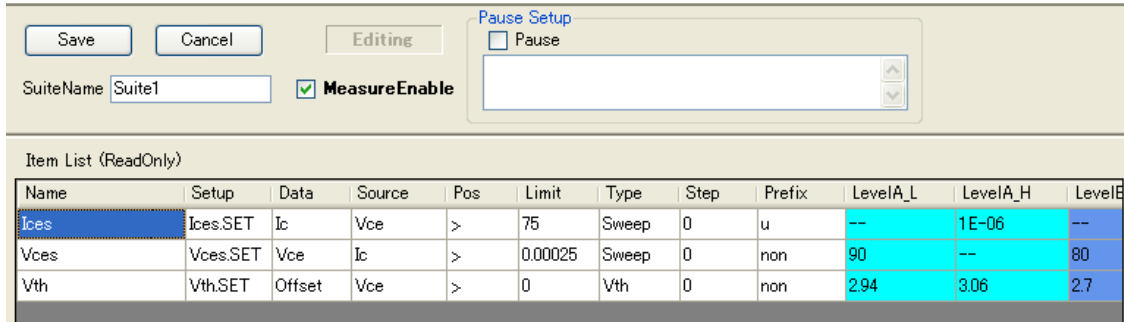
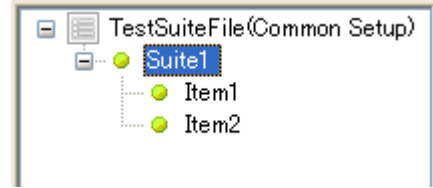
Confirm the setting contents and measure.

The measurement is executed with the [Start button], and the measurement result is displayed.

### 8.2.3 Suite Setup

Set the name of Suite that is the collection of measurement items (Item) and validity / invalidity of the measurement.

If you select a hierarchy of Suite from the Tree at the left part of TestSuiteFile Edit screen (right figure), the right part of TestSuiteFile Edit screen changes to the Suite Setup screen shown below (figure below).

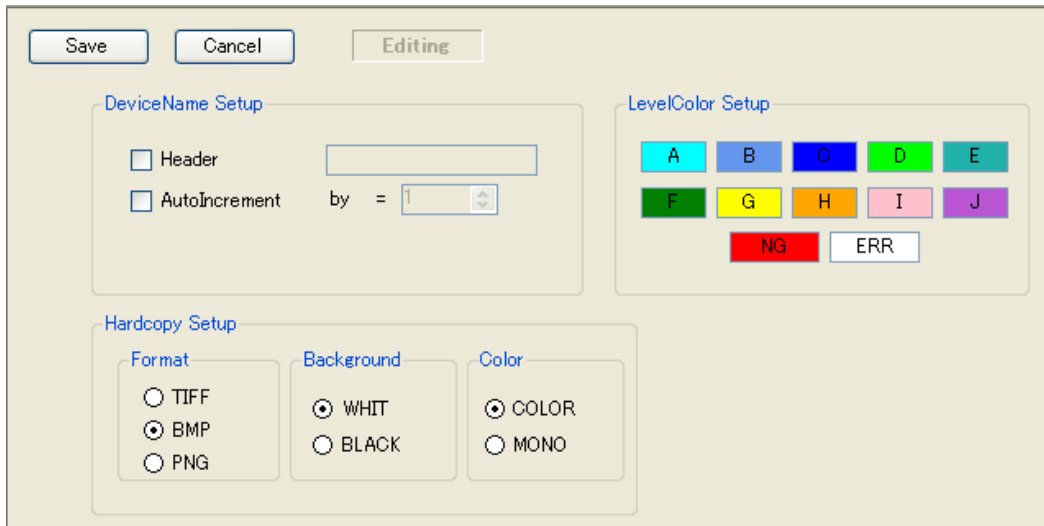
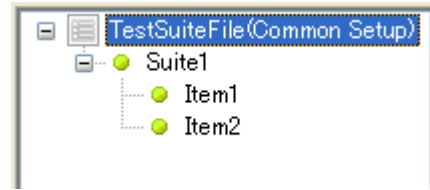


- SuiteName**  
 Sets the name of Suite. The same name of Suite cannot be set in TestSuiteFile.  
 Both of two-bytes and one-byte characters can be set. However, characters shown below cannot be used.  
 (One-byte \ : / ? [ ] \* < > ' " two-byte ¥ : / ? [ ] \* )  
 Up to 30 characters can be set regardless of two-byte and one-byte characters. If you want to convert the measurement result to Excel to save it, the setting of sheet division has restrictions including DeviceName for both of Device/Suite. For details, refer to "9.3 Conversion and storage."
- MeasureEnable**  
 Sets validity / invalidity of the measurement. If it is selected, the measurement becomes invalid.  
 The setting affects all Items included with the Suite.
- Pause Setup**  
 A pause can be set before the start of the Suite measurement.  
 Marking [Pause] opens the dialog box when the measurement is carried out which displays the contents that were set to [Comment] before the start of the Suite measurement, and then a pause is made. Up to 256 characters can be set to [Comment].  
 Use it when switching of wiring is required, etc.
- Save / Cancel**  
 The edit is fixed by clicking [Save button]. If you change the setting of Suite, the settings of all Items included with the Suite are also changed. If you click [Cancel button], the edit is discarded and the setting returns to the original setting before Suite is opened. If you do not release the edit status by clicking "Save" or [Cancel button], the setting cannot shift to the other setting (Item Setup, Suite Setup, Common Setup).
- ItemList**  
 Displays the list of Items included with Suite. The setting cannot be changed.  
 Right-click to open [Delete menu]. Selected Item (plural and acceptable) can be deleted. The deletion of Item cannot be executed while editing Suite.

## 8.2.4 Common Setup

Make a setting common to all Suites and Items.

If you select a hierarchy of TestSuiteFile from the Tree at the left part of TestSuiteFile Edit screen (right figure), the right part of TestSuiteFile Edit screen changes to the Common Setup screen shown below (figure below).



- DeviceName Setup**  
 Makes a setting for the automatic setting of Device Name that is set at the measurement.  
 If you select [Header], the prefix character string can be set. "Header", the prefix character string can set both em-size and normal-width. However, the following characters are enabled to be used. (Em-size \ : / ? [ ] \* < > and normal-width ¥ : / ? [ ] \* ') It is possible to set it to em-size and normal-width up to barrier and 20 characters or less.  
 If you select [AutoIncrement], Device Name to which the value set by [by] is automatically added is set at the measurement.
- Hardcopy Setup**  
 Sets the format etc. of a Hardcopy file that is acquired when [Hardcopy] is selected for Level evaluation of Item Setup.  
 Format        Selects the file format from TIFF/BMP/PNG  
 Background   Selects the background color from Black/White  
 Color        Selects the display color from Color / Monochro
- LevelColor Setup**  
 Sets the color for each Level used for displaying the measurement result of the main form.  
 If you click the character string of each Level, the screen for specifying the color is opened.
- Save / Cancel**  
 The edit is fixed by clicking [Save button]. The edit is discarded by clicking [Cancel button] and the setting returns to the original setting before Common Setup is opened. If the edit status is not released by clicking [Save] or [Cancel button], the setting cannot shift to the other setting (Item Setup, Suite Setup).

### 8.2.5 Termination of edit

When the edit is terminated, select [Save+Exit] or [Discard+Exit] of the menu [File].

For [Save+Exit], the edit is terminated by saving the content of edit in TestSuiteFile. An imported or acquired SETUP file is also stored in the SETUP folder corresponding to TestSuiteFile.

For [Discard+Exit], the edit screen is reset to the original status before the edit screen is opened without saving the content of edit in TestSuiteFile. An imported or acquired SETUP file is also discarded and the status is reset to the original status before the edit screen is opened.

## 8.3 Notes on SETUP file

The setting of Curve Tracer for each Item is specified by a SETUP file.

### 8.3.1 About making the SETUP file

< About measurement mode >

The setting of the main unit of the Curve Tracer on the measurement of each Item is specified with the SETUP file. As for the measurement mode (SWEEP and SINGLE, etc.), the mode set with Item setting [Measure Setup]-[Type] of TestSuiteFile is used. For example, if [Measure Setup]-[Type] is set to SWEEP by the Item setting even when the SETUP file from which the main unit of the Curve Tracer is acquired in the REPEAT mode is specified, the SWEEP measurement is executed.

< About the range of SWEEP >

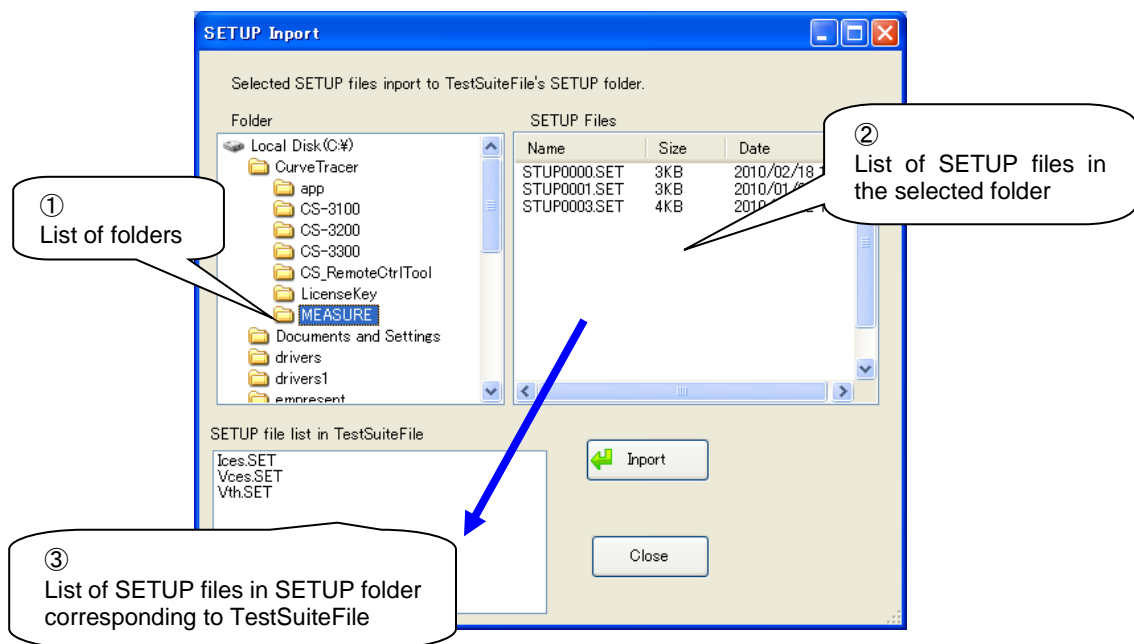
The range of SWEEP of the setting of [Measure Setup]-[Type] of the Item setting to SWEEP becomes the range of SWEEP from the Variable value when the SETUP file is made. However, when the SETUP file is made, it becomes the range of SWEEP of the measurement immediately before when the measurement immediately before is SWEEP mode.

< About stress application >


Stress application is set by the CONSTANT VOLTAGE/CURRENT menu of Curve Tracer.

### 8.3.2 Specification and preservation of the SETUP file

When you specify a SETUP file for the Item Setup, only SETUP files stored in the SETUP folder corresponding to TestSuiteFile ([Work Folder]\[TestSuiteFile name folder]\SETUP) can be specified. A SETUP file can be added to the SETUP folder by clicking the menu on TestSuiteFile Edit screen, [SETUP]-[Import].

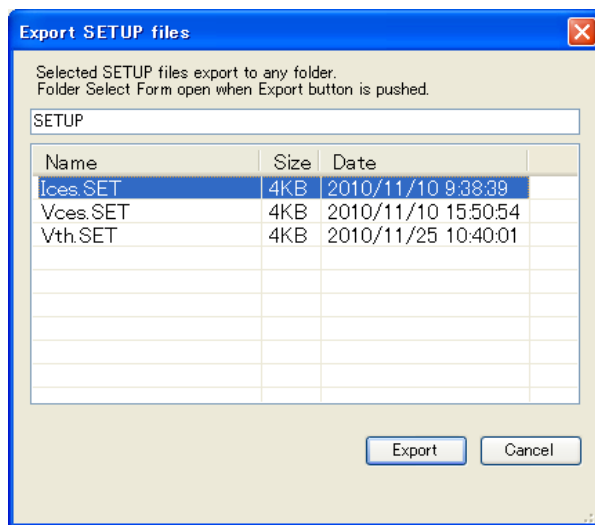


Select the folder in which a SETUP file you want to specify is stored in ① and select a SETUP file in ② (more than one file can be selected). If you click [Import button], the file is copied in the SETUP folder. More than one file can be specified. SETUP files in the SETUP folder that currently correspond to TestSuiteFile are displayed in ③.

A SETUP file can be also moved in a same way by pressing [Import button] on [Export SETUP files] screen that is opened by clicking  [reference button] on [Curve Tracer Setup] of the Item setup screen. (Refer to 8.2.2 Item Setup.)

CAUTION: If the edit is discarded by selecting [Discard+Exit], for example, when the edit of TestSuiteFile is terminated, a SETUP file that is imported or acquired during the edit.

In order to move a SETUP file stored in a SETUP folder corresponding to TestSuiteFile to other location, use the menu [SETUP]-[Export] on TestSuiteFile Edit screen.



The list of SETUP files in SETUP folder is displayed. Select a SETUP file you want to move (more than one file can be selected) and press [Export button]. Specifying folder screen is opened. The selected SETUP file is copied in the specified folder.

## 9 LogFile


LogFile is .xml file in XML format in which the content of TestSuiteFile and the measurement result when the measurement is carried out are described.

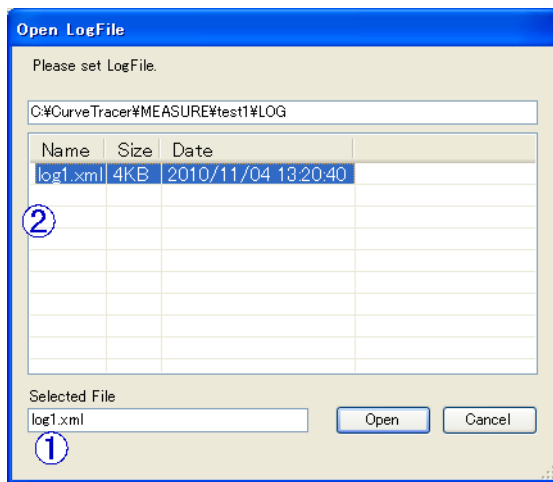
LogFile depends on TestSuiteFile and is stored in a LOG folder corresponding to TestSuiteFile.

When the content of TestSuiteFile in the dependence origin is not corresponding to the content of TestSuiteFile that has been described to LogFile (When TestSuiteFile is edited so on after measurement), the additional measurement and the re-measurement cannot be executed. Up to 10,000 devices can be stored in one LogFile.

### 9.1 Setting at measurement

If the measurement is started by clicking the menu on the main screen, [Measure]-[Start] or [Start" button]

 on the toolbar, "Open LogFile" screen is opened.

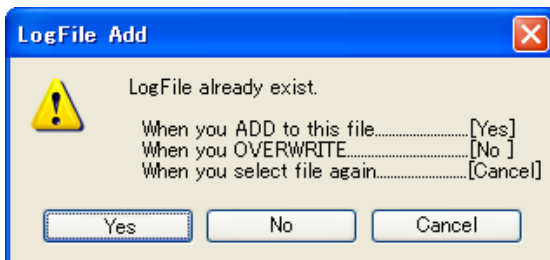


Specify the storage destination LogFile of the measurement result.

For a new measurement, input an arbitrary file name in [Selected File] (①).

For the additional measurement, select an existing LogFile from the list (②).

When existing LogFile is selected, the selection of the additional measurement, the superscription measurement, and the re-selection is demanded.



For the additional measurement, the selected LogFile is opened and the measurement is added to the displayed measurement result as a next device.

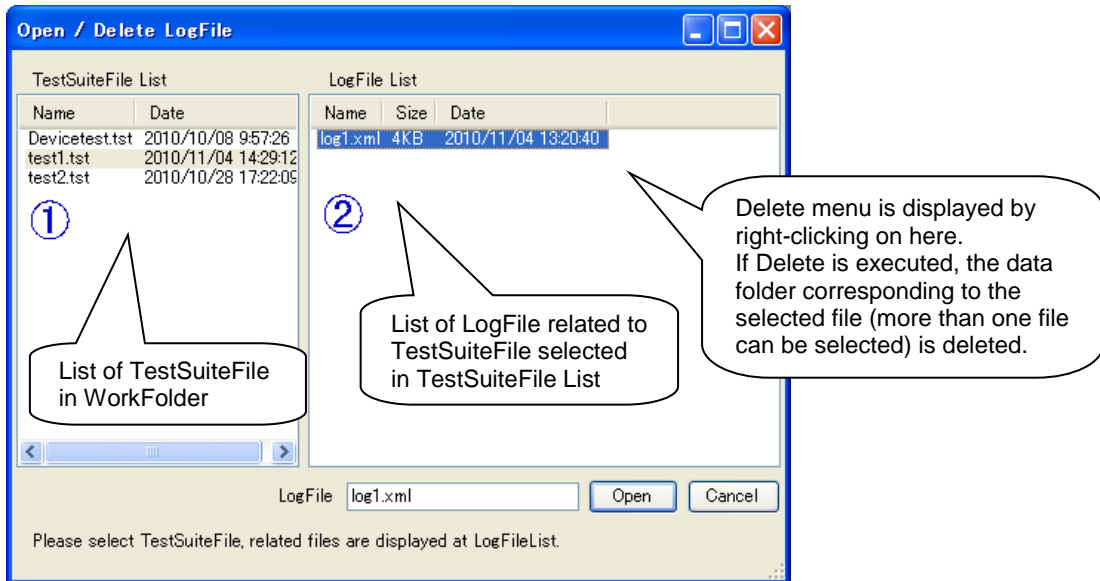
In the superscription measurement, selected LogFile and related data (Hardcopy etc.) are deleted, and the measurement result is preserved in selected LogFile.

#### CAUTION:

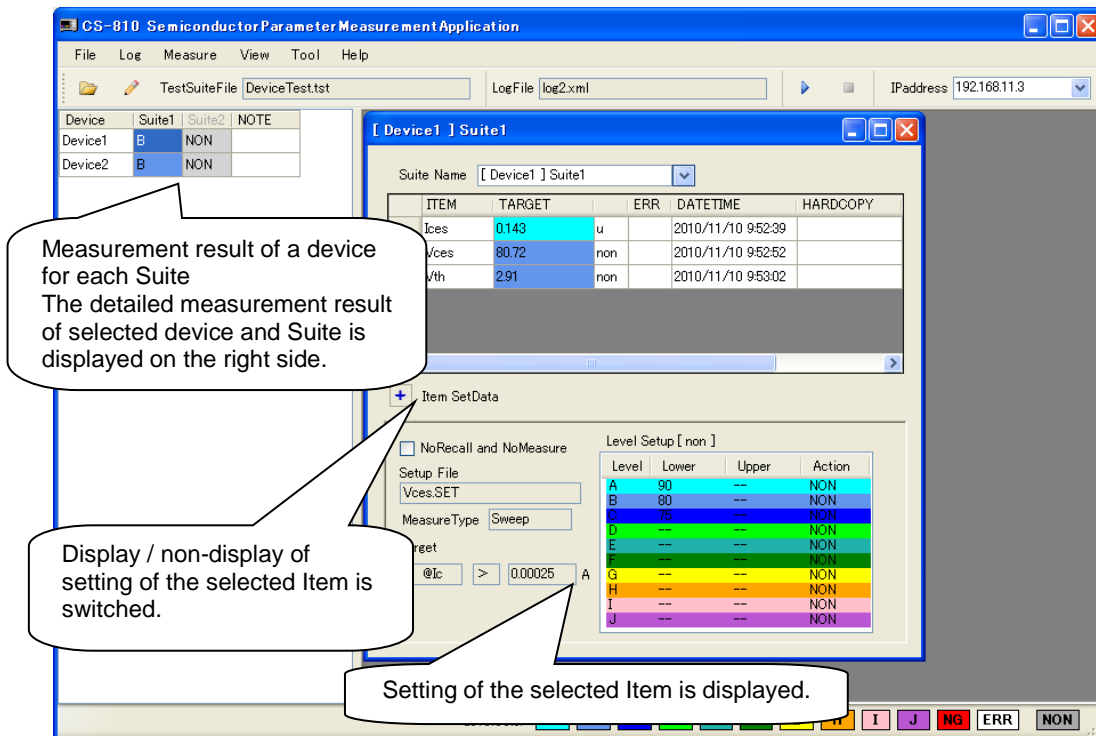
If the Item configuration of TestSuiteFile when the selected LogFile is measured does not correspond to that of current TestSuiteFile, the additional measurement cannot be executed. If the level setting is not correspondent, the resetting of the measurement result of LogFile at the level of current TestSuiteFile is requested. If the setting is made again, the additional measurement is enabled.

## 9.2 Browse and re-measurement of LogFile

The stored LogFile in XML format can be opened by clicking the menu on the main screen, [Log]-[Open].



- ① LogFile depends on TestSuiteFile. Select TestSuiteFile on which LogFile you want to open depends from [TestSuiteFileList].
- ② The list of relevant LogFile is displayed. Select LogFile you want to open. LogFile is opened by clicking [Open button] and the measurement result is displayed on the main screen.





<Display of Suite measurement result>

The measurement result of a device for each Suite is displayed. The Item level in Suite at the worst is displayed.

Device	Suite1	Suite2	NOTE
Device1	B	NON	
Device2	B	NON	

Callout: SuiteTitle display (points to Suite1 column)

Callout: The measurement result of Item (Ices, Vces, and Vth) in Suite1 is levels A and B, so the worst level B is the result of Suite1. (points to Suite1 column)

If you right-click on each cell, the menu of re-measurement is displayed.

Menus	Clicked positions	Operations to be executed
Retry Suite	Row header (SuiteTitle display part)	Only the selected Suite is re-measured up to the measured final device. The measurement result is updated for the re-measurement item only.
Retry Device	Device row (Device Name display part)	All Suites are re-measured for the selected device only. The measurement result is updated for the re-measurement item only.
Retry	Cell (Suite measurement result display part)	Only the selected Suite of the selected device is measured. The measurement result is updated for the re-measurement item only.

<Display of Item measurement result>

Selected Item	ITEM	TARGET	unit	ERR	DATETIME	HARDCOPY	WAVE
	Ices	0.143	u	A	2010/11/10 9:52:39		
	Vces	80.72	non	V	2010/11/10 9:52:52		
	Vth	2.91	non	(V)	2010/11/10 9:53:02		

Callout: Measurement value and evaluation level (displayed with color) (points to 0.143)

Callout: ERR Type (points to A)

Callout: Measurement date and time Application time for stress (points to 2010/11/10 9:52:39)

Callout: Hardcopy Wave StressLog file path If a path is displayed, an image data list is opened by clicking it. (points to HARDCOPY column)

ERR Type	Factor
NON	Normal termination
OVL	Overload generation
DATA	Waveform data none, object point none, the Vth measurement did not settle, stress application value was not reached, and so on.
SETUP	Failing in Recall of the SETUP file
ABORT	Measurement discontinuance (Abort key pressing, stress application was stopped by Curve Tracer, etc.)
LEV	Failing in the Level judgment
SYS	System error (It was not possible to communicate, and so on.)

ACT	Failing in the Action processing after the Level judgment
OBS	Measurement value exceeded observation limit during stress application.
OUTPUT	Output was stopped during stress application (Abort / Interlock of Curve Tracer, etc.)

If you right-click on each line, the menu of re-measurement is displayed.

Menu	Operation to be executed
Retry Item	Only the selected Item of the selected device is re-measured. The measurement result is updated for the re-measurement item only.

**CAUTION:**

If the Item configuration of TestSuiteFile when the selected LogFile is measured does not correspond to that of current TestSuiteFile, the display of the TestSuiteFile name on the main screen becomes a gray display, and cannot be measured again. Moreover, Item and Suite that can be measured again depend on the setting of [MeasureEnable] of present TestSuiteFile even when the composition of Item is corresponding. If Level setting is not correspondent, the resetting of the Level of measurement result of LogFile at the level of current TestSuiteFile is requested. If the setting is made again, the additional measurement is enabled.

The item for which MeasureEnable is set in TestSuiteFile when the re-measurement is executed is the target of measurement.

NOTE row in the list of Suite measurement result on Main screen can be written arbitrarily. Use it to describe the special note etc. of each device. The content of writing is not automatically saved, so save LogFile by clicking the menu Log-Save.

### 9.3 Export

The displayed measurement result can be stored by converting it to an Excel file or CSV file.

- CSV file conversion

If you click the menu on the main menu, [Log]-[Export]-[toCSV], the screen for specifying a file is opened and the data converted to CSV format is saved in an arbitrary file in the format shown below. Moreover, HardcopyFilePath becomes a relative path from WorkFolder.

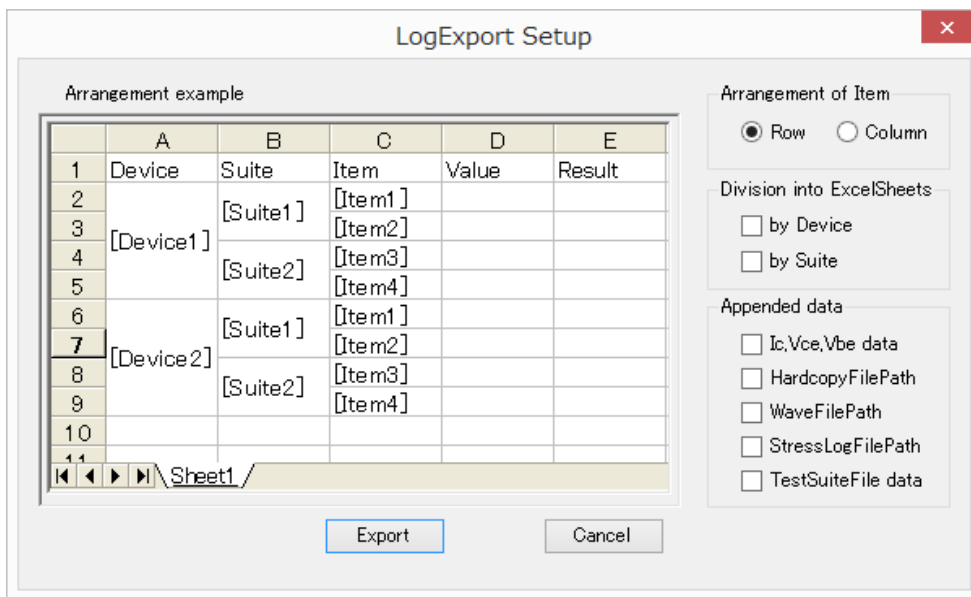
It is assumed, "9.91E+37" when the value is not Target expressible (It is infinite in division etc. by 0) as the numerical value.

<Format of measurement result>

"Device Name", "Suite name", "Item name", Target value, "Level", Ic, Vce, Vbe, "Hardcopy file path", "Wave file path", and "StressLog file path"

- Excel file conversion

If you click the menu on the main screen, [Log]-[Export]-[toExcel], "LogExport Setup" screen is opened.



Setting items		Details
Arrangement of Item		Specifies the allocation direction of Item from row direction (Row) / column direction (Column).
Division into ExcelSheets		Specifies the method for dividing data into ExcelSheet.
Appended data	Ic,Vce,Vbe data	Stores not only Target value displayed in the measurement result, but also the measurement results of Ic, Vce, and Vbe.
	HardcopyFilePath	Stores the path of a Hardcopy file that is acquired during the measurement. HardcopyFilePath becomes a relative path from WorkFolder when conversion is preserved.
	WaveFilePath	Stores the path of a waveform data file that is acquired during the measurement. WaveFilePath becomes a relative path from WorkFolder when conversion is preserved.
	StressLogFilePath	Stores the path of a stress application log file that is acquired during the stress application. StressLogFilePath becomes a relative path from WorkFolder when conversion is preserved.
	TestSuiteFile data	Stores the content of TestSuiteFile set. It is stored in the first seat.

An example of allocation with the specified setting is displayed at the left part.

The screen for specifying the file of storage destination is opened and the data can be saved in an arbitrary file by clicking [Export button].

The conversion storage processing is cancelled by clicking [Cancel button].

The conversion preservation processing can be discontinued by clicking the [Abort button] on the dialog screen displayed while converting. When the specified Excel file has already opened, the conversion preservation processing cannot be done. Please click the [Export button] again after shutting the Excel file.


It is assumed, "9.91E+37" when the value is not Target expressible (It is infinite in division etc. by 0) as the numerical value.


CAUTION: Restriction at the conversion to Excel

- The number of rows after the conversion is up to 256 rows.
- The number of columns after the conversion is up to 65535 columns.
- The number of sheets after the conversion is up to 100 sheets.
- If both of Device division and Suite division are specified for [Division into ExcelSheet], the maximum character string length of "Device name\_Suite name" is 30 characters.

For the data exceeding the restrictions above, a warning is displayed when the conversion is executed and the data cannot be converted.

## 10 Measurement

Open TestSuiteFile you want to measure by clicking [File]-[Open] on the main menu or [Open button]  on the toolbar.

Start the measurement by clicking the menu on the main screen, [Measure]-[Start] or [Start button]  on the toolbar.

Specify the storage destination LogFile. If a new file is specified, a new measurement is executed. If an existing file is specified, the additional measurement is executed.

### 10.1 Specification of Device Name

If the measurement is started, Device Name Setting screen is opened.



Input an arbitrary Device Name.

Both of two-byte and one-byte characters can be input for the Device Name. However, characters shown below cannot be used.

(One-byte \ : / ? [ ] \* < > ' " two-byte ¥ : / ? [ ] \* ')

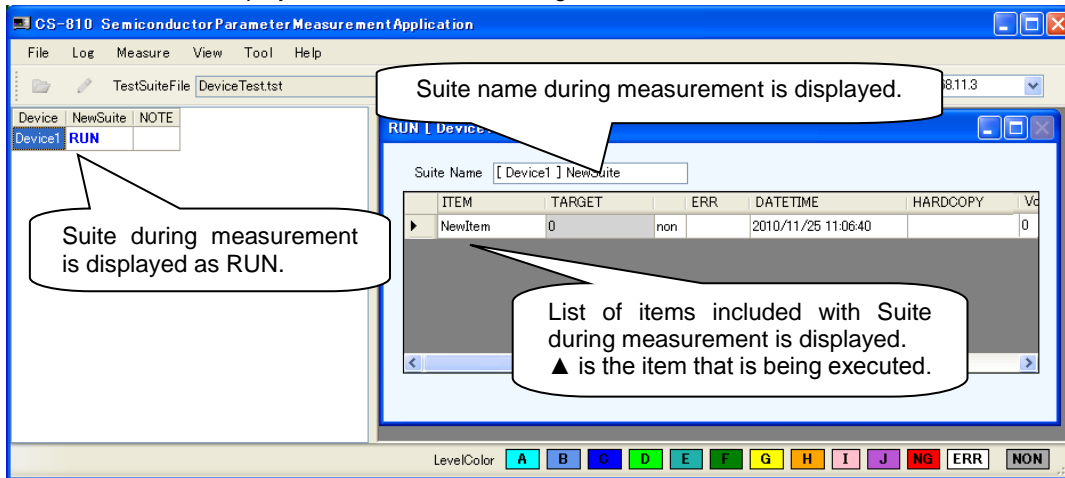
Up to 30 characters can be set regardless of two-byte and one-byte characters. The same Device Name cannot be set in the LogFile. Up to 10,000 devices can be measured in one LogFile.

The initial value is displayed according to the [DeviceNameSetup] set for the [Common Setting] of TestSuiteFile.

- If [Header] is set  
The character string set for Header character string is displayed at the beginning.  
If a character string is input again on the Device Name Setting screen, the character string that was input anew is displayed on the Device Name Setting screen of the next device. If the measurement is terminated, Header character string that is set for the DeviceNameSetup of TestSuiteFile is displayed for the next measurement.
- If [AutoIncrement] is set  
The initial value is 0 and the value that is automatically increased by the value set by "by" is displayed. If the value is input anew on the Device Name Setting screen, the value becomes the initial value and the value adding the value set by "by" to the value that was input anew is displayed on the Device Name Setting screen of the next device. If the measurement is terminated, the next measurement is started from the initial value 0.
- If both of [Header] and [AutoIncrement] are set  
Header character string part and Increment value part are separately displayed on the Device Name Setting screen. Each item is set by the operation described before. For Increment value part, only value can be input.

## 10.2 Display during measurement

The main screen is displayed as shown below during the measurement.



## 10.3 Pause of measurement

If [Pause] is set for the Item Setup of TestSuiteFile, the screen displaying the comment set for [Comment] of [PauseSetting] is opened before the item is measured and the measurement is paused. If you click [OK button], the measurement is restarted. If you click [Cancel button], the measurement is cancelled.

## 10.4 Level evaluation

The value of measured target is evaluated within the level range set for Item Setup of TestSuiteFile. The evaluation is carried out within the level range of effective setting from A to J in series. If the measurement result does not reach the effective level, it is evaluated as level NG. However, when all the levels are invalid settings, it is determined level A, and the action after the determination also follows the setting of level A. If a measurement value cannot be acquired properly for some reasons; there is no specified measurement point in [Measure Point], the measurement is settled by Vth measurement, for example, the measurement result is evaluated as level ERR.

The [Action] of the level set for Item Setup of TestSuiteFile is executed at the evaluated level.


For details on the action, refer to "8.2.2 Item Setup".

If [Hardcopy] of the evaluated level is selected, the screen hardcopy of Curve Tracer is acquired as a file after Item measurement is terminated. The format of the hardcopy is specified by Common Setup of TestSuiteFile. The hardcopy file is automatically created and stored in LogDataFolder corresponding to LogFile that is being measured in Work Folder with a configuration shown below (refer to "7 Configuration of file").

LogDataFolder\[Device name]\[Suite name]\[Item name]\_yyyyMMdd;HHmmss.[format extension]  
(yyyyMMdd;HHmmss is the time stamp)

## 10.5 Termination of measurement

The measurement is terminated by clicking [Cancel button] on the Device Name Setting screen. The normal termination of the measurement is displayed.

The measurement can be also terminated by clicking [Cancel button] on the Pause screen. In this case, the interrupted termination of the measurement is displayed. The measurement can be also terminated by clicking [Measure]-[Abort] on the main screen or [Abort button]  on the toolbar. In this case, the interrupted termination of the measurement is also displayed.

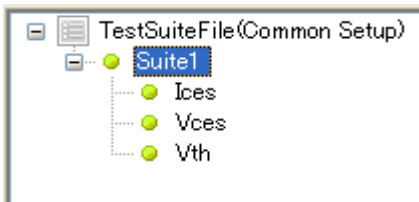
# 11 Example of measurement

Here describes the setting of Curve Tracer and this application for the measurement of main characteristics using a concrete example.

## 11.1 Example of measurement for MOSFET

Here describes the setting of Sweep and Vth measurement using the measurement of MOSFET as an example.

Create an item of a characteristic you want to measure in Suite additionally and make a setting of item. In the figure below, items of Ices, Vces, and Vth are created in Suite1 (item name can be set arbitrarily).



Item Setup and notes on the setting of Curve Tracer for Ices, Vces, and Vth are separately described as shown below.

### ■ Measurement of Ices

Measure the leak current between collector and emitter.

<Value of standard>

Ices: Max 20uA (Vce=75V, Vbe=0V)

Measure the value of Ic when the value of Vce becomes 75.0V for the Sweep measurement.

<Setting of items of application>

<Setting of Curve Tracer>  
(to be described)

<Setting of evaluation level>  
LevelA: 1uA or less  
LevelB: 10uA or less  
LevelC: 20uA or less  
The nonstandard value is NG.

<Setting of measurement point>  
Acquires the value of Ic of the first measurement point for which the value of Vce becomes larger than 75V.

	0	~	1	%	NON	Action	Hardcopy
A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	NON	<input type="checkbox"/>	<input type="checkbox"/>
B	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	NON	<input type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	20	NON	<input type="checkbox"/>	<input type="checkbox"/>
D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>
E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>
F	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>
G	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>
H	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>
I	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	NON	<input type="checkbox"/>	<input type="checkbox"/>

NG STOP

ERR NON

<Setting of Curve Tracer>

Classifications	Setting items	Setting values	Remarks
CONFIGURATION		Collector/Short/Common	
COLLECTOR SUPPLY	UNIT	HIGH VOLTAGE	
	MODE	+LEAKAGE	
	MAX PEAK POWER	120mW	Minimum setting *1
	MAX PEAK VOLT	300V	For outputting up to 75V
	SWEEP TYPE	CUSTOM	
	SWEEP range (Variable to SweepEndVariable)	20.0 to 30.0%	Approximately 75.0V
HORIZONTAL		COLLECTOR 10.0V/div	So that 75.0V falls in the range
VERTICAL		EMITTER 2uA/div	So that 20uA falls in the range
LIMIT SWEEP	HORIZONTAL	> 76.0 V	75.0V or slightly larger value
	VIRTICAL	OFF	

\*1: For suppressing the effect of the ripple component (included with DC output from collector supply), which is a problem for LEAKAGE measurement, select the wattage as small as possible.

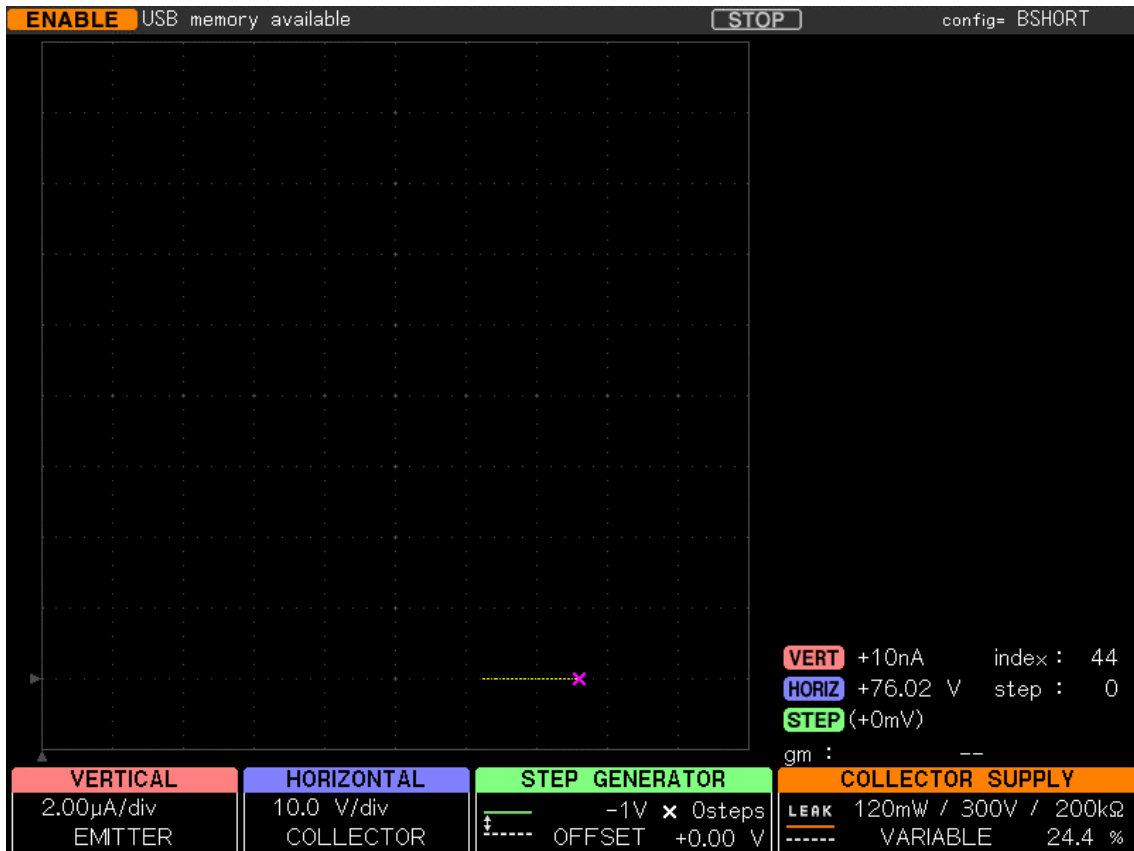
<Notes on the setting of Curve Tracer>

For the measurement of  $I_{ces}$ , make a setting of Curve Tracer so that  $V_{ce}$  acquires  $I_{ce}$ - $V_{ce}$  curves that steps over the specified value.

In this example, the SWEEP range for which the specified value 75.0V falls in the range is set using CUSTOM SWEEP. Decide the Sweep range considering the variability of characteristics of a target device. If LIMIT SWEEP function is used at the same time, the measurement can be terminated when the value reaches the specified value. It is convenient for shortening the measurement time and preventing the applying of overvoltage.



The result of executed Sweep measurement with this setting is shown in the figure below.



In the example shown in the figure above, the standard value of  $V_{ce}$ , 75V is specified for the upper limit of SWEEP for LIMIT SWEEP setting and the Sweep measurement is performed from Variable=20.0% to SweepEndVariable=30.0%. At this time, the variable is 24.4% and 75.0V is exceeded, the Sweep measurement is stopped.

<Measurement result>

The result of measurement using CS-810 is shown in the figure below.  $I_{ces}$  is 0.01  $\mu\text{A}$  and it is 1  $\mu\text{A}$  or less, so the measurement result is evaluated as LevelA.

The screenshot shows a software window titled "[ Device1 ] Suite1" with a table of measurement results. A blue arrow points to the "TARGET" column for the "Ices" row.

ITEM	TARGET	ERR	DATETIME	HARDCOPY
Ices	0.01	u	2010/11/10 9:52:39	
Vces	80.75	non	2010/11/10 9:52:52	
Vth	2.90	non	2010/11/10 9:53:02	

■ Measurement of Vces

Measure the maximum voltage between collector and emitter.

<Value of standard>

Vces: Min 75V (Ic=250uA, Vbe=0V)

For the Sweep measurement, measure the value of Vce when the value of Ic becomes 250μA.

<Setting of items of application>

The screenshot shows a software interface with several sections:

- CurveTracer Setup:** Includes 'Save', 'Cancel', 'ItemName' (Vces), 'NoRecall and NoMeasure' checkbox, and 'SETUP file' (Vces.SET).
- Measure Setup:** Includes 'Type' (Sweep selected), 'TargetData' (Vce @Ic), and 'MeasurePoint' (> 250 u A).
- Level Setup:** Includes 'Level SI-prefix' (non) and a table of evaluation levels.
- Evaluation Levels Table:**

Level	Value	Unit	Target	Operator	Level	Action	Hardcopy
A	90	%	0	~	NON	✓	
B	80	%	0	~	NON	✓	
C	75	%	0	~	NON	✓	
D	0	%	0	~	NON		
E	0	%	0	~	NON		
F	0	%	0	~	NON		
G	0	%	0	~	NON		
H	0	%	0	~	NON		
I	0	%	0	~	NON		
J	0	%	0	~	NON		
K	0	%	0	~	NON		
L	0	%	0	~	NON		
M	0	%	0	~	NON		
N	0	%	0	~	NON		
O	0	%	0	~	NON		
P	0	%	0	~	NON		
Q	0	%	0	~	NON		
R	0	%	0	~	NON		
S	0	%	0	~	NON		
T	0	%	0	~	NON		
U	0	%	0	~	NON		
V	0	%	0	~	NON		
W	0	%	0	~	NON		
X	0	%	0	~	NON		
Y	0	%	0	~	NON		
Z	0	%	0	~	NON		
- NG/ERR:** Includes 'NG' (STOP) and 'ERR' (NON) dropdowns.

Callouts in the image:

- <Setting of Curve Tracer> (to be described)** points to the 'CurveTracer Setup' section.
- <Setting of measurement point>** Acquires the value of Vce of the first measurement point for which the value of Ic becomes larger than 250uA. It points to the 'MeasurePoint' field.
- <Setting of evaluation level>** LevelA: 90V or less, LevelB: 80V or less, LevelC: 75V or less. The nonstandard value is NG. It points to the evaluation levels table.

< Settings of Curve Tracer >

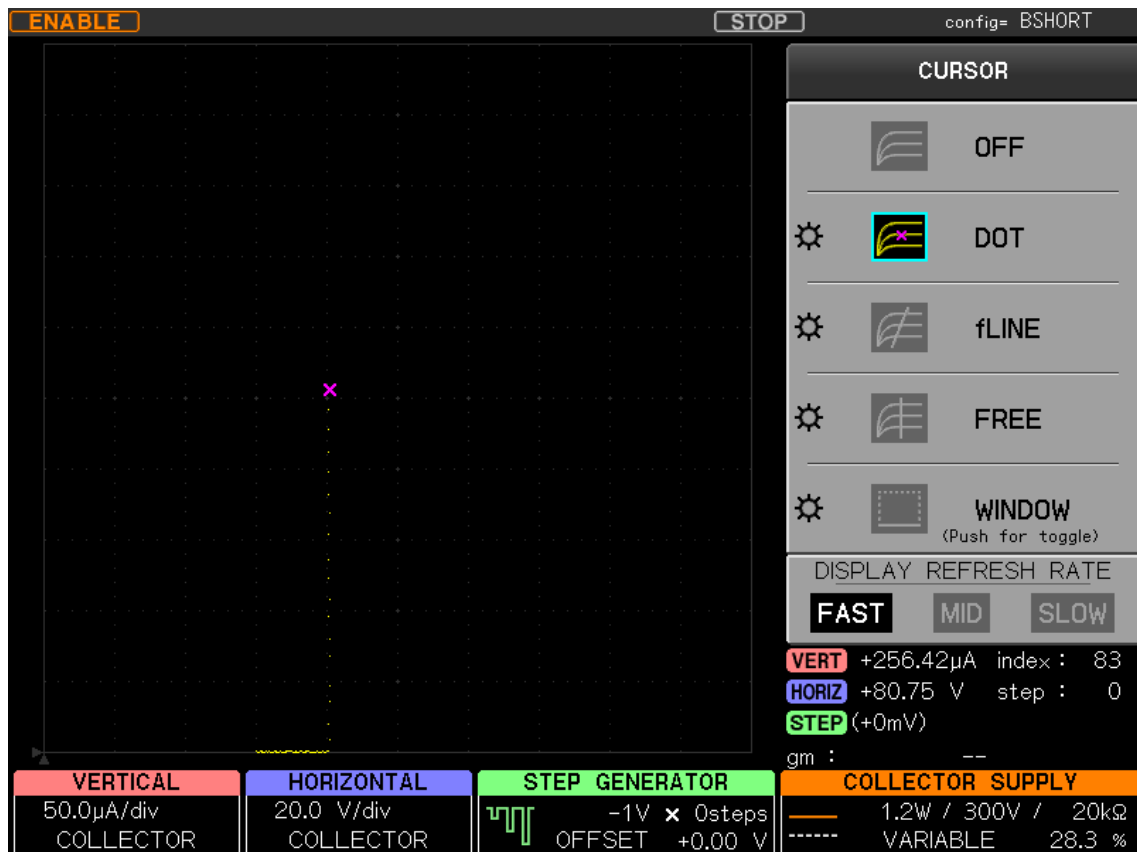
Classifications	Setting items	Setting values	Remarks
CONFIGURATION		Collector/Short/Common	
COLLECTOR SUPPLY	UNIT	HIGH VOLTAGE	
	MODE	+DC	
	MAX PEAK POWER	1.2W	
	MAX PEAK VOLT	300V	For outputting up to 75V
	SWEEP TYPE	CUSTOM	
	SWEEP range (Variable to SweepEndVariable)	20.0 to 30.0%	Approximately 75.0V
HORIZONTAL		COLLECTOR 20.0V/div	75.0V or more is supported.
VERTICAL		COLLECTOR 50.0uA/div	So that 250uA falls in the range
LIMIT SWEEP	HORIZONTAL	OFF	
	VIRTICAL	250uA	Standard value or more

<Notes on the setting of Curve Tracer>

For the measurement of  $V_{ces}$ , set the Curve Tracer so that  $I_c$  acquires  $I_c$ - $V_{ce}$  curve that steps over the specified value.

In this example, the SWEEP range that the specified value 250 $\mu$ A falls in the range is set using CUSTOM SWEEP. Decide the SWEEP range considering the variability of characteristics of a target device. If LIMIT SWEEP function is used at the same time, the measurement can be terminated when the value reaches the specified value. It is convenient for shortening the measurement time and preventing the overvoltage.

The result of Sweep measurement with this setting is shown in the figure below.



In the example shown in the figure above, the specified value of  $I_c$ , 250 $\mu$ A is specified as the upper limit of SWEEP for LIMIT SWEEP setting and the Sweep measurement is performed from Variable=20.0% to SweepEndVariable=30.0%. At this time, the variable is 28.3% and 250 $\mu$ A is exceeded, the Sweep measurement is stopped.

<Measurement result>

The result of measurement using CS-810 is shown in the figure below. Vces is 80.75V exceeding 80V, so the measurement result is evaluated as LevelB.

ITEM	TARGET	ERR	DATETIME	HARDCOPY
Ices	0.01	u	2010/11/10 9:52:39	
Vces	80.75	non	2010/11/10 9:52:52	
Vth	2.90	non	2010/11/10 9:53:02	

■ Measurement of Vth

Carry out the measurement of threshold voltage between gate and emitter.

<Value of standard>

Vth: Min 2.0V Max 4.0V (Ic=250uA, Vce=10V)

For Vth measurement, measure the gate voltage for which the value of Ic is 250uA and the value of Vce is 10V.

<Setting of items of application>

<Setting of Curve Tracer>  
(to be described)

<Setting of evaluation level>  
LevelA: range of 2% of 3V  
LevelB: range of 10% of 3V  
LevelC: range of standard (2V to 4V)  
The nonstandard value is NG.

<Setting of measurement point>  
Acquires the value of step generator when Vth measurement is completed.

Level	Level SI-prefix	Level Value	Target Value	Action	Hardcopy
A	non	2.94	3.06	% NON	<input type="checkbox"/>
B	non	2.7	3.3	% NON	<input type="checkbox"/>
C	non	2	4	% NON	<input type="checkbox"/>
D	non	0	0	% NON	<input type="checkbox"/>
E	non	0	0	% NON	<input type="checkbox"/>
F	non	0	0	% NON	<input type="checkbox"/>
G	non	0	0	% NON	<input type="checkbox"/>
H	non	0	0	% NON	<input type="checkbox"/>
I	non	0	0	% NON	<input type="checkbox"/>
J	non	0	0	% NON	<input type="checkbox"/>

NG: STOP   
ERR: NON

<Settings of Curve Tracer>

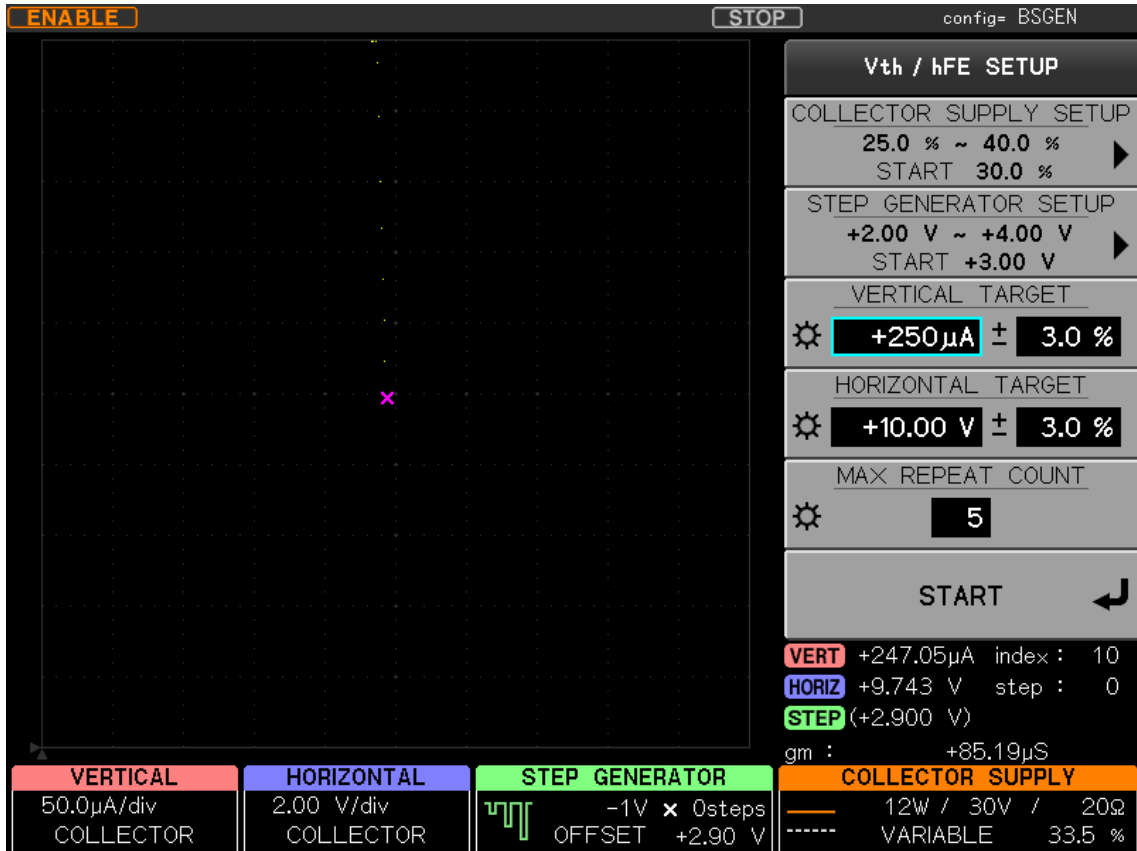
Classifications	Setting items	Setting values	Remarks
CONFIGURATION		Collector/StepGen/Common	
COLLECTOR SUPPLY	UNIT	HIGH VOLTAGE	
	MODE	+DC	
	MAX PEAK POWER	1.2W	
	MAX PEAK VOLT	30V	For outputting up to 10V
HORIZONTAL		COLLECTOR 2.00V/div	So that 10.0V falls in the range
VERTICAL		COLLECTOR 50.0uA/div	So that 250uA falls in the range
Vth/hFE SETUP	COLLECTOR SUPPLY	25.0 to 40.0% start=30.0%	
	STEP GENERATOR	2.0V to 4.0V start=3.0V	Standard range
	VERTICAL TARGET	250uA	Value of standard
	HORIZONTAL TARGET	10.0V	Value of standard

<Notes on the setting of Curve Tracer>

For the measurement of Vth, use Vth/hFE measurement function of Curve Tracer.

In Vth/hFE SETUP menu, set the standard value to TARGET and set the range of VARIABLE to be searched for COLLECTOR SUPPLY SETUP and set the range of gate voltage to be searched for STEP GENERATOR SETUP, and then search the measurement point that falls in the range of TARGET while changing the both outputs within the set range. Make a setting so that the standard value falls in the search range.

The result of Vth measurement with this setting is shown in the figure below.



In the example shown in the figure above, COLLECTOR SUPPLY is searched within the range of 25.0% to 40.0% and STEP GENERATOR is searched within the range of 2.0V to 4.0V, and the point of the standard value ( $I_c=250\mu A$ ,  $V_{ce}=10V$ ) that falls within the range of 3% is searched and measured. Variable is 33.5% and StepGeneratorOffset is 2.90V, and then the point falls within the range of 3% of the specified value, so the measurement is completed.

<Measurement result>

The result of measurement using CS-810 is shown in the figure below. Vth is 2.90V and falls within the range; 10% of 3V, so the measurement result is evaluated as LevelB.

The screenshot shows a software window titled "[ Device1 ] Suite1" with a table of measurement results. A blue arrow points to the Vth row in the table.

ITEM	TARGET	ERR	DATETIME	HARDCOPY
Ices	0.01	u	2010/11/10 9:52:39	
Vces	80.75	non	2010/11/10 9:52:52	
Vth	2.90	non	2010/11/10 9:53:02	

## 11.2 Example of measurement of transistor

Here describes the setting of Single measurement using the measurement of transistor as an example.

Acquire the value of  $I_c$  when an arbitrary current and collector voltage are applied from the output characteristic ( $V_{ce}$ - $I_c$  static characteristic) of transistor.

<Value of standard>

$I_c$ : Min  $-16.0\text{mA}$  Max  $-2.8\text{mA}$  ( $V_{ce}=-6\text{V}$ ,  $I_b=-40\mu\text{A}$ )

For the Single measurement, measure  $I_c$  for which the value of  $V_{ce}$  when  $-40\mu\text{A}$  is applied to the base becomes  $-6\text{V}$ .

<Setting of items of application>

The screenshot shows a software interface for setting up a measurement. It includes sections for Curve Tracer Setup, Measure Setup, and Level Setup. A table in the Level Setup section defines evaluation levels A through J. Callouts provide detailed explanations for specific settings.

**<Setting of Curve Tracer> (to be described)**

**<Setting of evaluation level>**  
 LevelA: range of  $-10.0\text{mA}$  to  $-8.8\text{mA}$   
 LevelB: range of  $-16.0\text{mA}$  to  $-2.8\text{mA}$   
 The nonstandard value is NG.

**<Setting of measurement point>**  
 Acquires the value of  $I_c$  of the first measurement point for which  $V_{ce}$  becomes smaller than  $-6\text{V}$  when Step=2 (base current  $=-40\mu\text{A}$ ).

	Level	Min	Max	Unit	Action	Hardcopy
A	<input checked="" type="checkbox"/>	-10	-8.8	%	NON	<input type="checkbox"/>
B	<input checked="" type="checkbox"/>	-16	-2.8	%	NON	<input type="checkbox"/>
C	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
D	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
E	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
F	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
G	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
H	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
I	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>
J	<input type="checkbox"/>	0	0	%	NON	<input type="checkbox"/>

NG: STOP   
 ERR: NON

<Settings of Curve Tracer>

Classifications	Setting items	Setting values	Remarks
CONFIGURATION		Collector/StepGen/Common	
COLLECTOR SUPPLY	UNIT	HIGH VOLTAGE	
	MODE	-SIN	
	MAX PEAK POWER	120W	
	MAX PEAK VOLT	30V	For outputting up to -6V
	Variable	24.1%	
STEP GENERATOR	MODE	-STEP	
	AMPULITUDE	20uA/div	
	NUMBER OF STEPS	5	Larger than Step=2
	OFFSET	0.0uA	
HORIZONTAL		COLLECTOR 1.00V/div	So that -6.0V falls in the range
VERTICAL		COLLECTOR 2.00mA/div	So that -16mA falls in the range

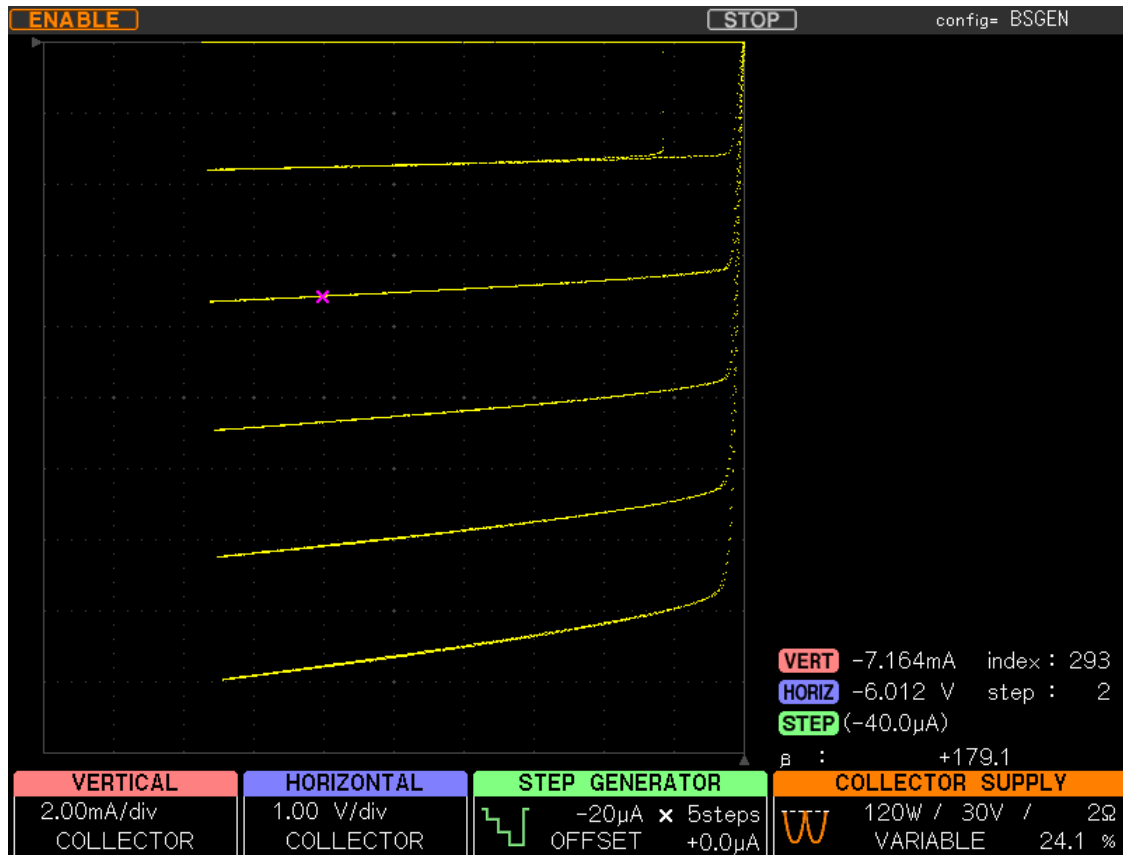
<Notes on the setting of the Curve Tracer>

For the measurement of Vce-Ic static characteristic, the Curve Tracer is set by applying the base current of the standard value and Vce can acquire Ice-Vce curves that steps over the specified value at that time.

In this example, STEP GENERATOR is set to 5 steps in -20uA-interval so that -40uA is applied and VARIABLE is set so that the standard value (Vce=-6V) is included. Decide the setting of VARIABLE considering the variability of characteristics of a target device.



The result of Single measurement with this setting is shown in the figure below.



In the example above, STEP GENERATOR is  $-40\mu\text{A}$  at Step=2 and SINGLE measurement is carried out for COLLECTOR SUPPLY at 24.1%.  $V_{ce}=-6.0\text{V}$  is included with the measurement waveform.

<Measurement result>

The result measured using CS-810 is shown in the figure below. The measurement result is  $I_c=-7.164\text{mA}$ , which falls in the range of  $-16.0\text{mA}$  to  $-2.8\text{mA}$ , so it is evaluated as LevelB.

[ Device1 ] Suite2

Suite Name [ Device1 ] Suite2

ITEM	TARGET	ERR	DATETIME	HARDCOPY
Ic_Vce	-7.164	m	2010/11/10 15:51:...	

### 11.3 Example of measurement of stress application

Here describes the setting of stress application measurement.

As an example, constant voltage of 5.00V is applied for 3 minutes 30 seconds.

<Value of standard>

Application setting Vce : apply 5.00V with precision of  $\pm 3.0\%$

Observation setting Vce : 4.00V to 6.00V is the tolerance

Ic : 9.00mA to 11.00mA is the tolerance

Set [Type] of MeasureSetup to Stress and set [Stress Time] to 0h 3min 30sec.

<Setting of items of application>

The screenshot shows a software window with several sections: 'CurveTracer Setup', 'Measure Setup', and 'Level Setup'. Callouts provide detailed explanations for various settings:

- <Setting of Curve Tracer>** (to be described)
- <Setting of measurement point>** Selects the target of Level evaluation when the stress application is complete. (Points to 'Ic @Vce' in TargetData)
- <Setting of stress time>** Sets duration of constant voltage application. (Points to 'StressTime' set to 0h 3min 30sec)
- <Setting of evaluation level>** LevelA: range between 9.5mA and 10.5mA. Outside this range will be judged as NG. Usually set the values within the tolerance of observation set up. (Points to Level A in the table)
- <Setting of the operation on error>** When measurement value exceeds the observation limit or output is stopped, status becomes ERR. In this example, this item is set to stop whole measurement on ERR. (Points to 'STOP' in the Action column)

	Level	SI-prefix	Unit	Min	Max	Unit	Action	Hard copy	Wave
A	<input checked="" type="checkbox"/> 9.5	~	<input checked="" type="checkbox"/> 10.5	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
B	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
D	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
E	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
F	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
G	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
H	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
I	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/> 0	~	<input type="checkbox"/> 0	%	NON	%	NON	<input type="checkbox"/>	<input type="checkbox"/>

NG: NON  
ERR: STOP

<Setting of Curve Tracer>

Classifications	Setting items	Setting values	Remarks
CONFIGURATION		Collector/StepGen/Common	
COLLECTOR SUPPLY	UNIT	HIGH VOLTAGE	
	MODE	DC	
	MAX PEAK POWER	120 W	
	MAX PEAK VOLT	30V	For outputting up to 5.0V.
	Variable	24.1 %	
HORIZONTAL		COLLECTOR 1.00V/div	So that 5.0V falls in the range.
VERTICAL		COLLECTOR 2.00mA/div	So that 10.0mA falls in the range.
CONSTANT VOLTAGE/CURRENT	CONSTANT SOURCE	VOLTAGE	
	TARGET	5.0V $\pm$ 3%	
	OBSERVATION SETUP	VceUpper=6.0V VceLower=4.0V IcUpper=11.0mA IcLower=9.0mA	

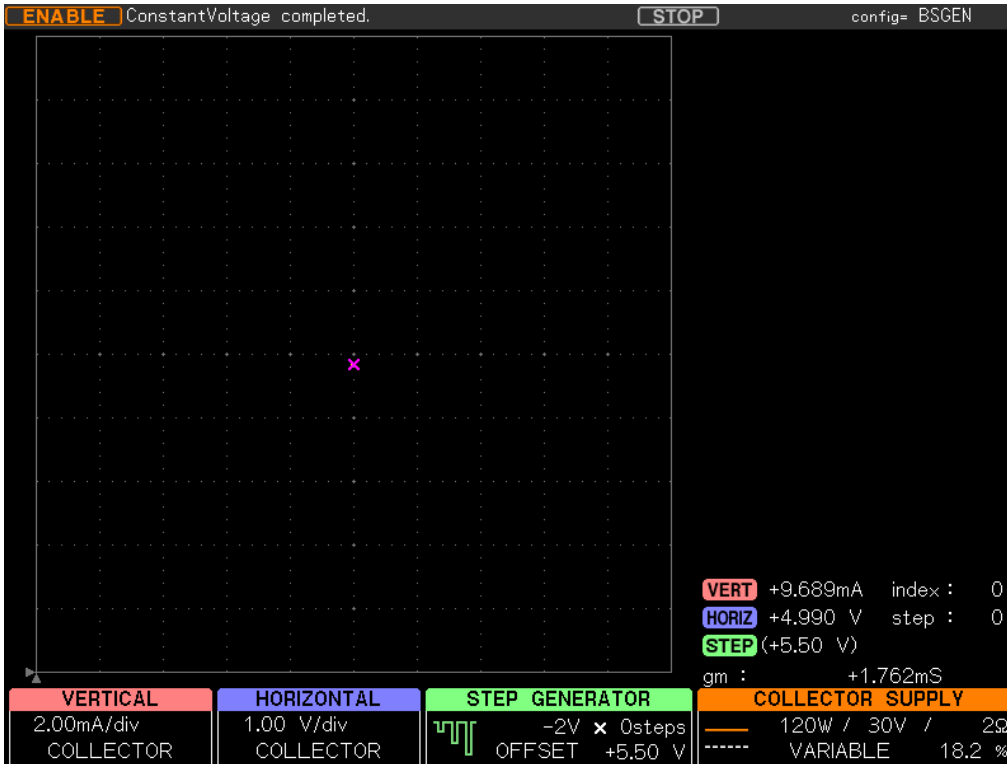
<Notes on the setting of the Curve Tracer>

The voltage to be applied and observation range for safety are set by CONSTANT VOLTAGE/CURRENT menu of Curve Tracer.

Specify the voltage to be applied to TARGET. When voltage exceeds the set limit, Curve Tracer automatically adjusts output of collector supply so that voltage returns to a value within the range.

For OBSERVATION SETUP, specify the safe range for application. When output exceeds the set limit, collector supply output is stopped and constant voltage application will be aborted.

The result of stress application with this setting is shown in the figure below.



When the application time is complete, COLLECTOR SUPPLY is 18.2%, Vce=4.990V, and Ic=9.689mA. Stress application is completed within the range set to TARGET.

<Measurement result>

The result measured using CS-810 is shown in the figure below. The measurement result is Ic=9.689mA, which falls in the range of 9.5mA to 10.5mA; so it is evaluated as LevelA.

The screenshot shows a software window titled "[ Device1 ] Suite3" with a table of measurement results. A blue arrow points to the 'TARGET' column.

ITEM	TARGET	unit	ERR	DATETIME	HARDWARE	WAVE	STRESS_LOG
StressVcelItem	9.689	m A		0:03:30	Stress...		StressVcelItem

When constant voltage or current application is stopped by Curve Tracer (measurements outside the observation range, change of status such as Breaker/Interlock, operation of Abort button of ConstantVoltage/Current menu, etc.), the stress application of CS-810 aborts with ERR, and operation specified by Action of ERR in the Item setting is carried out.

In this example, since Action of ERR is set to STOP, whole measurement will be aborted.

## 12 Addon function

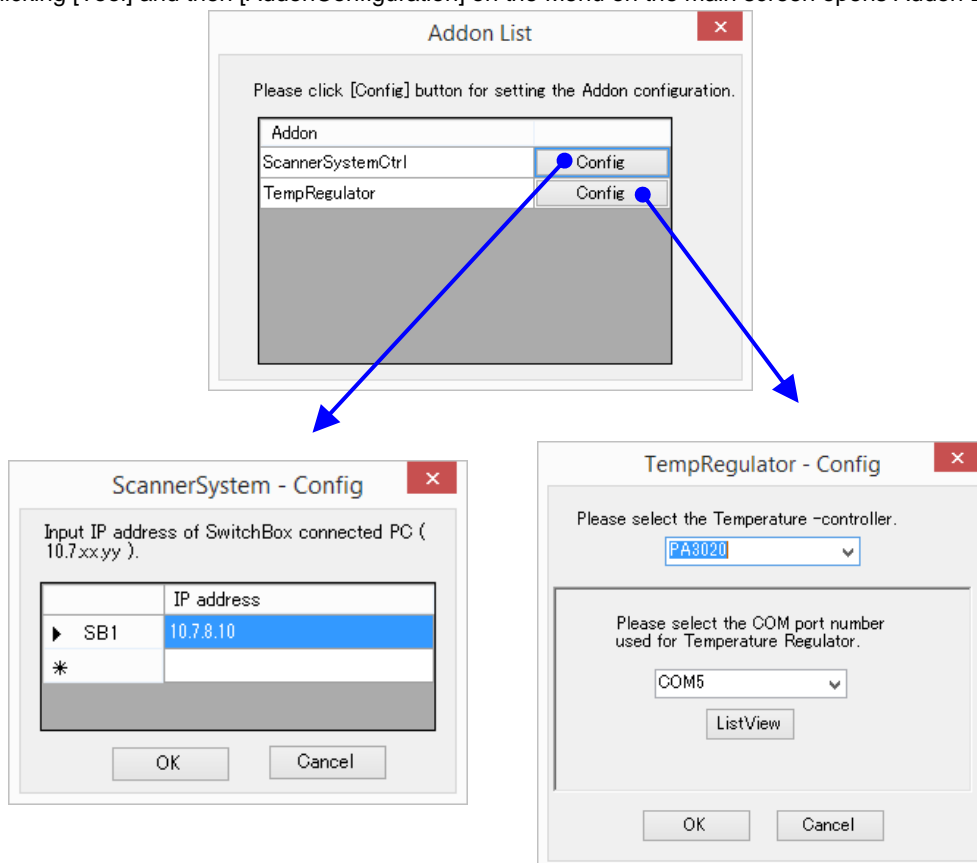
The control of devices other than the Curve Tracer can be incorporated into the automatic measurement as the Addon function.

The scanner system (CS-700) and the fixture with a temperature regulator (CTJ1050) are controlled.

### 12.1 AddonConfiguration

Make the configuration settings of the Addon function.

Clicking [Tool] and then [AddonConfiguration] on the Menu on the main screen opens Addon List as below.



Specify the IP address that is set to SwitchBox of the scanner system. The upper 2 bytes are fixed as 10.7.xx.yy. (\*1)  
The SwitchBox name is sequentially numbered automatically.

Select the temperature regulator to be used from the list shown in the upper part. Specify the COM port number connected to the selected temperature regulator.  
Clicking the [ListView] button displays a list of COM ports used on the PC.

\*1: DefaultGateway of the scanner system's SwitchBox is fixed at 255.255.255.0. Set IP addresses of the Curve Tracer and the PC on which the CS-810 is installed in line with 10.7.xx that is set to SwitchBox.

## 12.2 AddonControl

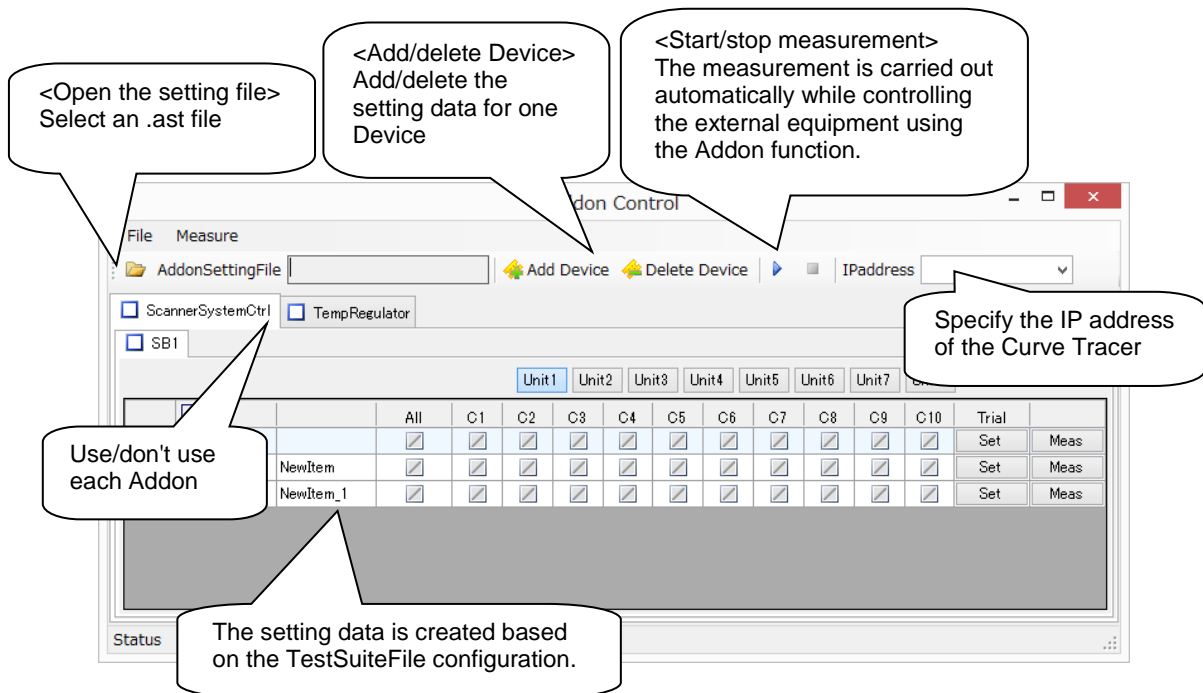
Clicking [Tool] and then [AddonControl] on the Menu on the main screen opens the Addon function control screen.

The start/stop of the automatic measurement using the Addon function and the creation of each Addon setting data, etc. are carried out.

Automatic measurements are carried out based on the TestSuiteFile configuration that is open on the main screen. Before the measurement of each Device or Item, Addon is executed in accordance with the Addon setting data.

When opening the control screen, Addon setting data for one device is created as the default data based on the TestSuiteFile configuration, and data is then added/deleted for each device.

For this reason, AddonControl cannot be executed unless TestSuiteFile is open on the main screen.



### <Description of menus>

- File

Menus	Descriptions
Open	New/Open of AddonSettingFile (.ast setting data files). The screen to specify the file opens.
Save	Overwrites and saves the opened Addon settings files with the displayed settings.
SaveAs	Saves the displayed settings by specifying the file name. The screen to specify the file opens.
Exit	Closes the AddonControl screen.

- Measure

Menus	Descriptions
Start	The measurement is carried out automatically while controlling the external equipment using the Addon function.
Abort	Aborts the automatic measurement that uses the Addon function.

### 12.2.1 AddonSettingFile (the setting data file)

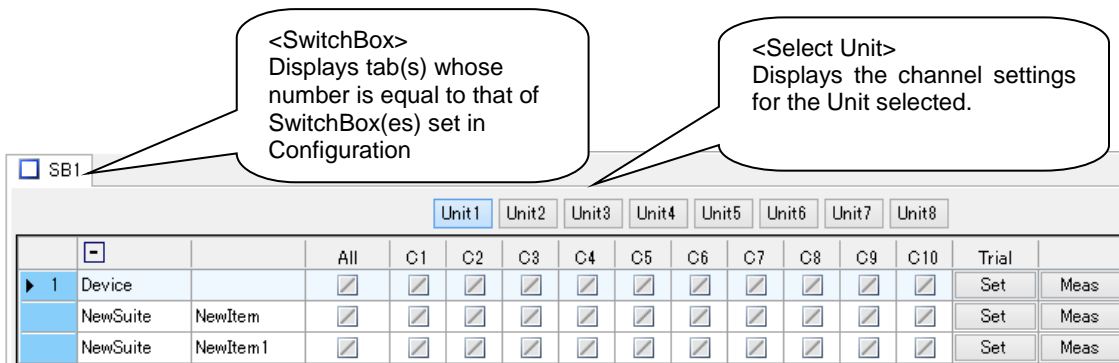
AddonSettingFile is the Addon setting data file that retains the Addon settings for multiple devices with the Suite and Item TestSuiteFile configuration displayed on the main screen as one device. Files with the .ast extension can be saved and read.

When opening the existing AddonSettingFile, the current Item configuration takes precedence over the Item configuration saved in AddonSettingFile if they are different. The Addon settings of the Item that does not exist in AddonSettingFile become the default values, and the Item that exists only in AddonSettingFile is ignored. The number of devices is to be set in AddonSettingFile.

This conversion does not affect AddonSettingFile itself. To apply the conversion to the file, overwrite and save AddonSettingFile.

### 12.2.2 ScannerSystemCtrl: Settings for the scanner system

Make the channel settings for the scanner system.



- ON: Sets the channel to ON.
- OFF: Sets the channel to OFF.
- Don'tCare: Does not change the channel setting. (Default value)

At the start of the automatic measurement, all channels are reset to OFF.

- Trial Set  
Clicking the [Set] button executes the Addon for the clicked Item or Device.  
Make the settings for all Units in all SwitchBoxes of ScanUnitSystem. All the settings from the top line down to the clicked line will have been configured in order.
- Trial Measure  
Clicking the [Meas] button carries out the measurement of the clicked Item and displays the measurement results in a pop-up window.  
Addon is not executed and only the measurement is carried out. Device is excluded from the measurement.

### 12.2.3 TempRegulator: Settings for the fixture with a temperature regulator

Make the temperature settings, etc. for the fixture with a temperature regulator.

Set the parameter in a left chart. This setting is different depending on the type of temperature regulator selected with [AddonConfiguration].

Here, it explains PA3020.

Select an external sensor, an internal sensor in [SensorMode].

Select the sensor type used with temperature regulator in [SensorType] when you select an external sensor.

Set [Scaling] when you set the sensor type to VOLT.

Set the following temperatures. The automatic measurement sets the temperatures in the order of No. and measures at the same temperature the number of devices that were created as the Addon setting data.

No.	Temperature	Timeout [min]	Wait [min]	Trial
1	40	0	10	Set
2	50	10	20	Set
*				

Operations such as the start of the measurement cannot be carried out while each cell is being edited. Carry out the operation after quitting the editing state by moving to another cell, etc.

Clicking the head of the line to select the line and right-clicking it displays the Menu of the line. Lines can be deleted or inserted.

- Temperature  
Setting range: 0-500°C  
Makes the temperature settings. When the set temperature is reached, measurement starts after the time set in Wait has passed.
- Timeout  
Setting range: 0-1000 minutes  
Sets the maximum allowable time in minutes before reaching the temperature set to Temperature. If it is set to 0 second, waits for the temperature to reach the set temperature unlimitedly without checking for time-out. If the temperature does not reach the set temperature within the time set to Timeout, the measurement stops.
- Wait  
Setting range: 0-1000 minutes  
Sets the time in minutes from the attainment of the temperature set to Temperature to the start of the measurement.



- Trial Set

Clicking the [Set] button controls the temperature regulator in accordance with the settings of the clicked line.

The check for Timeout and the control of Wait after the attainment of the set temperature are also carried out.

#### **12.2.4 Add or delete Device**

Clicking the [AddDevice] button adds the Addon setting data for one device as the default value.

Clicking the [DeleteDevice] button displays the delete confirmation of the selected device.

Clicking the [Yes] button deletes the Addon setting data of the target device.

However, deletion cannot be carried out if there is only one device.

These operations affect all of the Addon settings.

Device cannot be added or deleted with [TempRegulator].

#### **12.2.5 Automatic measurement**

Clicking the [Start] button or [Measure] and then [Start] on the Menu starts the automatic measurement.

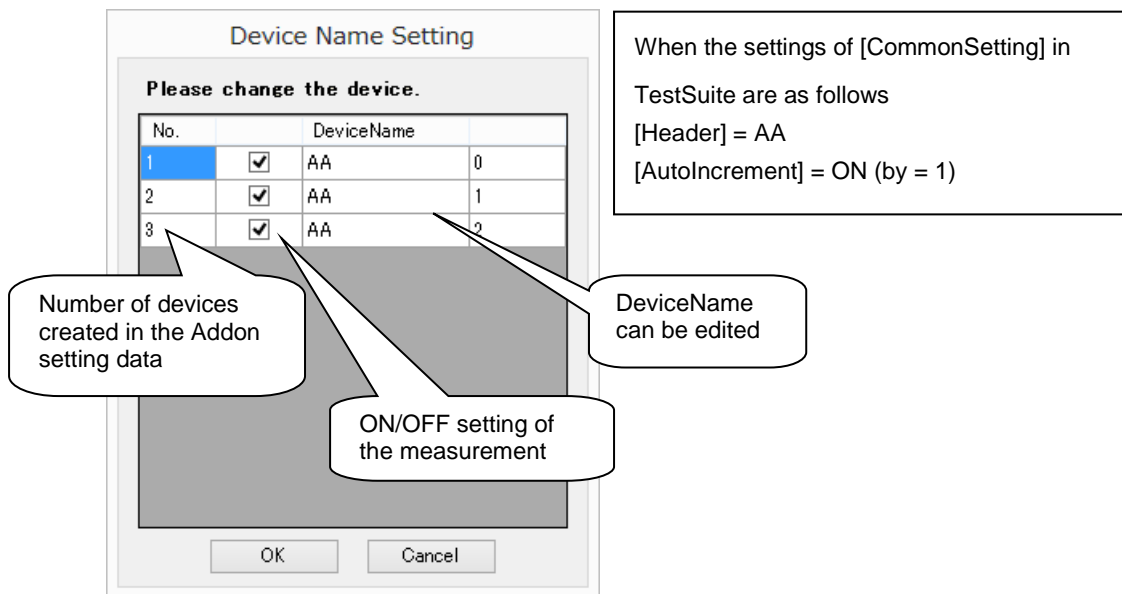
The measurement proceeds in accordance with TestSuiteFile that is open on the main screen. Before the measurement of each Item and Device is carried out, the Addon is executed in accordance with the Addon setting data.

In the case of using the fixture with a temperature regulator, the temperature regulator is controlled by the temperature set to the Addon setting data, and the automatic measurement is carried out at the same temperature for the number of devices created in the Addon setting data.

The flow after the start of the automatic measurement is mostly the same as the normal automatic measurement starting from the main screen (refer to “4.3 Measurement”).

The automatic measurement is carried out for the number of devices set in the Addon setting data, so make the DeviceName settings for the number of the set devices on the DeviceName setting screen. Start the measurement with the [OK] button.

The check boxes set the ON/OFF of the measurements. If the box is set to OFF, the Addon settings and the measurement for the set device number are not carried out. The ON settings can only be made for a sequential device number from 1.



When the measurement of the specified number of devices is complete, the DeviceName setting screen opens again. Replace the device, set DeviceName, and restart the measurement with the [OK] button. The [Cancel] button quits the measurement.

In the case of using the fixture with a temperature regulator, the set temperature is added at the end of DeviceName as the temperature information in such a way as "DeviceName; temperature". When the automatic measurement has been carried out for all the temperatures set in the Addon setting data and the measurement is complete, the DeviceName setting screen opens.

To abort the measurement while the measurement is being carried out, click the [Abort] button or [Measure] and then [Abort] on the Menu.

Neither editing of each Addon setting nor change of the number of devices can be made during the measurement.

**CAUTION:** In the case of using the fixture with a temperature regulator, be sure that the PC on which the application is running does not go to sleep until the set temperature is reached as well as during the Wait time after the set temperature has been reached.

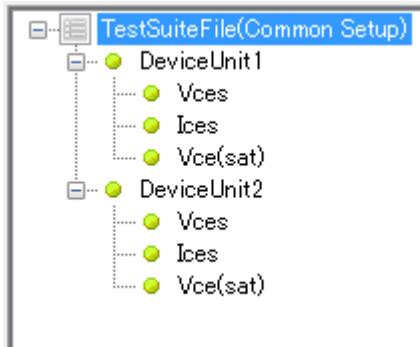
### 12.2.6 Examples of Addon function settings

- Try measuring a 2-in-1 device using the scanner system

The settings for automatically measuring a 2-in-1 device in which two units are mounted on a single device by the scanner system's wiring switching are described below.

<Measurement contents>

Common to each unit on the device: Vces, Ices, and Vce(sat)



TestSuiteFile configuration

<Addon settings>

Only Unit 1 of the scanner system is to be used.

Addon setting data for wiring Channel 1 to the first unit on the device and Channel 2 to the second unit

		All	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Trial	Meas
▶ 1	Device	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit1 Vces	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit1 Ices	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit1 Vce(sat)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit2 Vces	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit2 Ices	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	DeviceUnit2 Vce(sat)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas

Make the channel settings to the head Item of Suite.

Set to Don'tCare where there is no change to the settings.

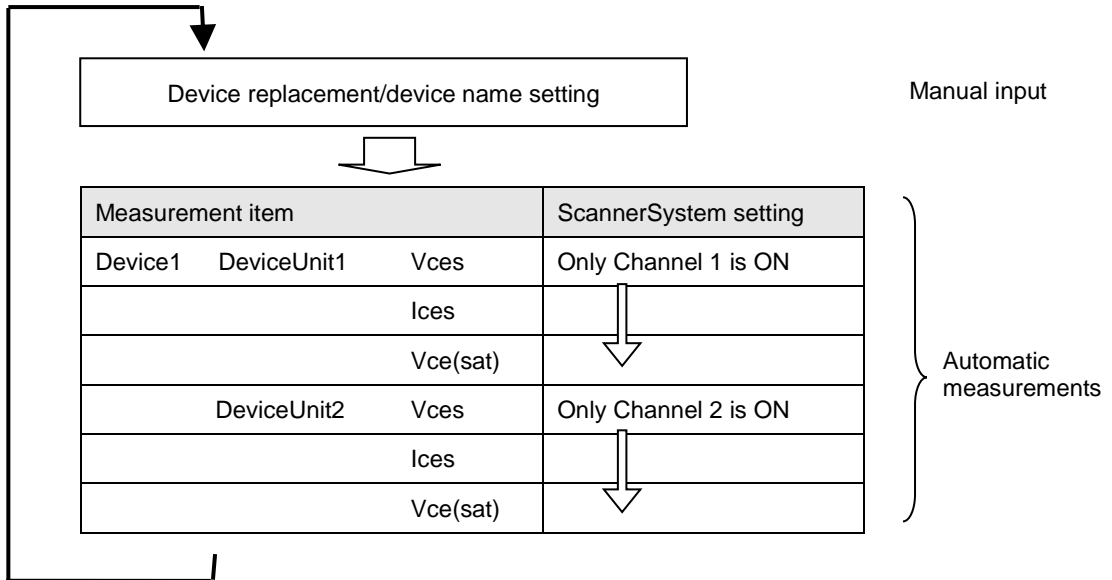
At the start of the measurement, the settings are reset (all Channels to OFF).

<Measurement>

The automatic measurement is carried out in the following manner.

Device	DeviceUnit1	DeviceUnit2	NOTE
Device1	B	B	

Measurement results LOG display

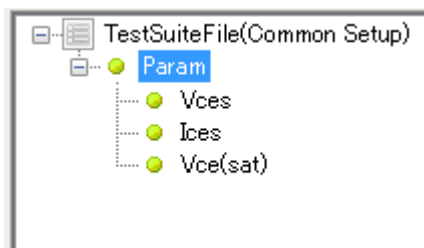


- Try measuring two devices using ScanUnitSystem

The settings for automatically measuring two devices by the scanner system's wiring switching are described below.

<Measurement contents>

Vces, Ices, and Vce(sat)

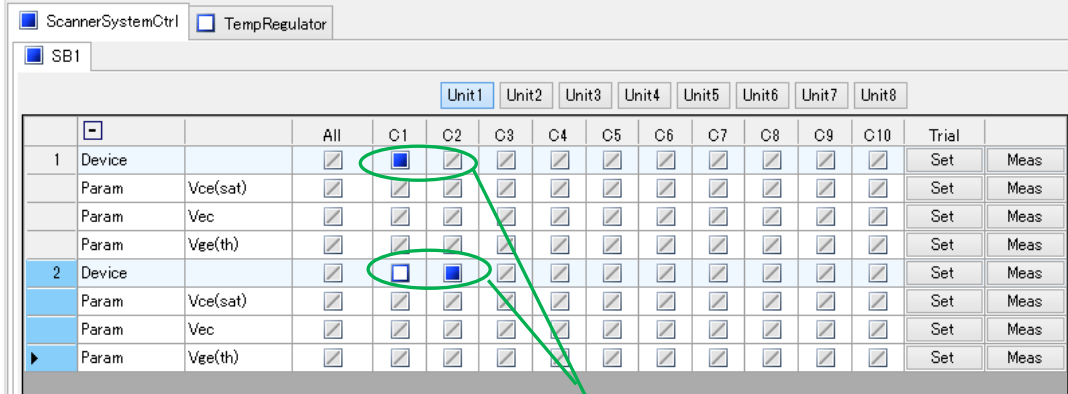


TestSuiteFile configuration

<Addon settings>

Only Unit 1 of the scanner system is to be used.

Addon setting data for wiring Channel 1 to the first device and Channel 2 to the second device



Add a device with [AddDevice].

Make the channel settings for each device.

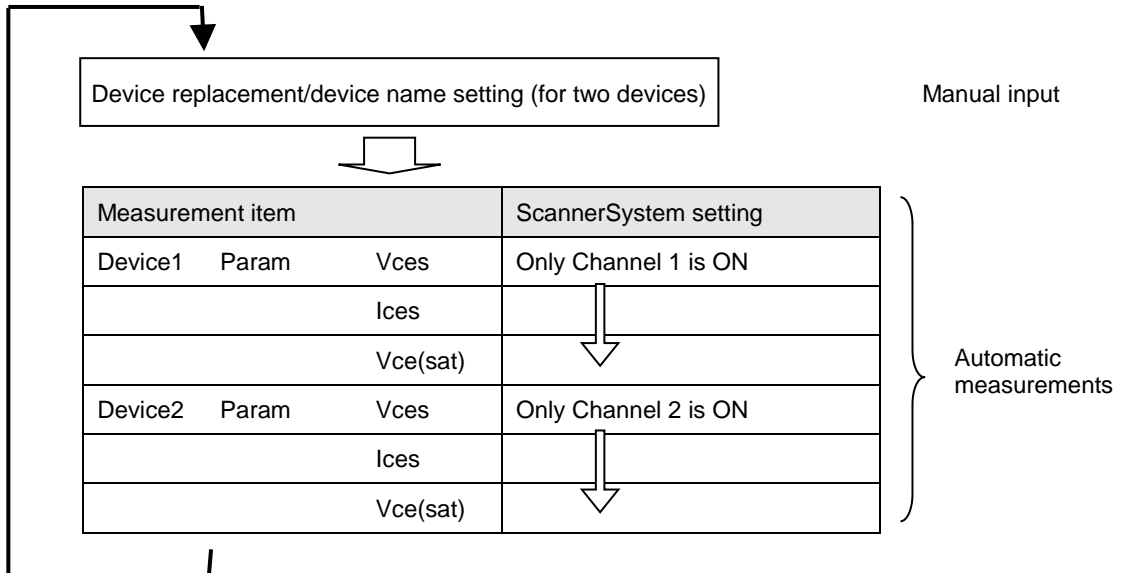
At the start of the measurement, the settings are reset (all Channels to OFF). Set to Don'tCare where there is no change to the settings.

<Measurement>

The automatic measurement is carried out in the following manner.

Device	Param	NOTE
Device 1	B	
Device 2	B	

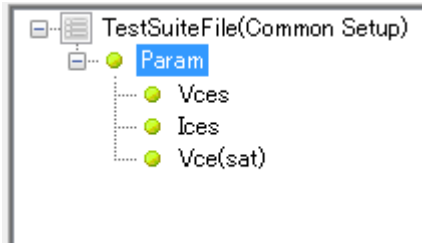
Measurement results LOG display



- Try measuring two devices using ScanUnitSystem and TempRegulator
- The settings for automatically measuring two devices by automatically setting the temperature using the scanner system's wiring switching are described below.

<Measurement contents>

Vces, Ices, and Vce(sat)



TestSuiteFile configuration

<Addon settings>

Only Unit 1 of the scanner system is to be used.

Addon setting data for wiring Channel 3 to the first device and Channel 4 to the second device

		All	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Trial	Meas
1	Device	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vce(sat)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vec	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vge(th)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
2	Device	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vce(sat)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vec	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas
	Param	Vge(th)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Set	Meas

Add a device with [AddDevice].

Make the channel settings to each device.

At the start of the measurement, the settings are reset (all Channels to OFF). Set to Don'tCare where there is no change to the settings.

The settings for making measurements at temperatures of 50°C (Wait = 5 minutes) and 100°C (Wait = 10 minutes)

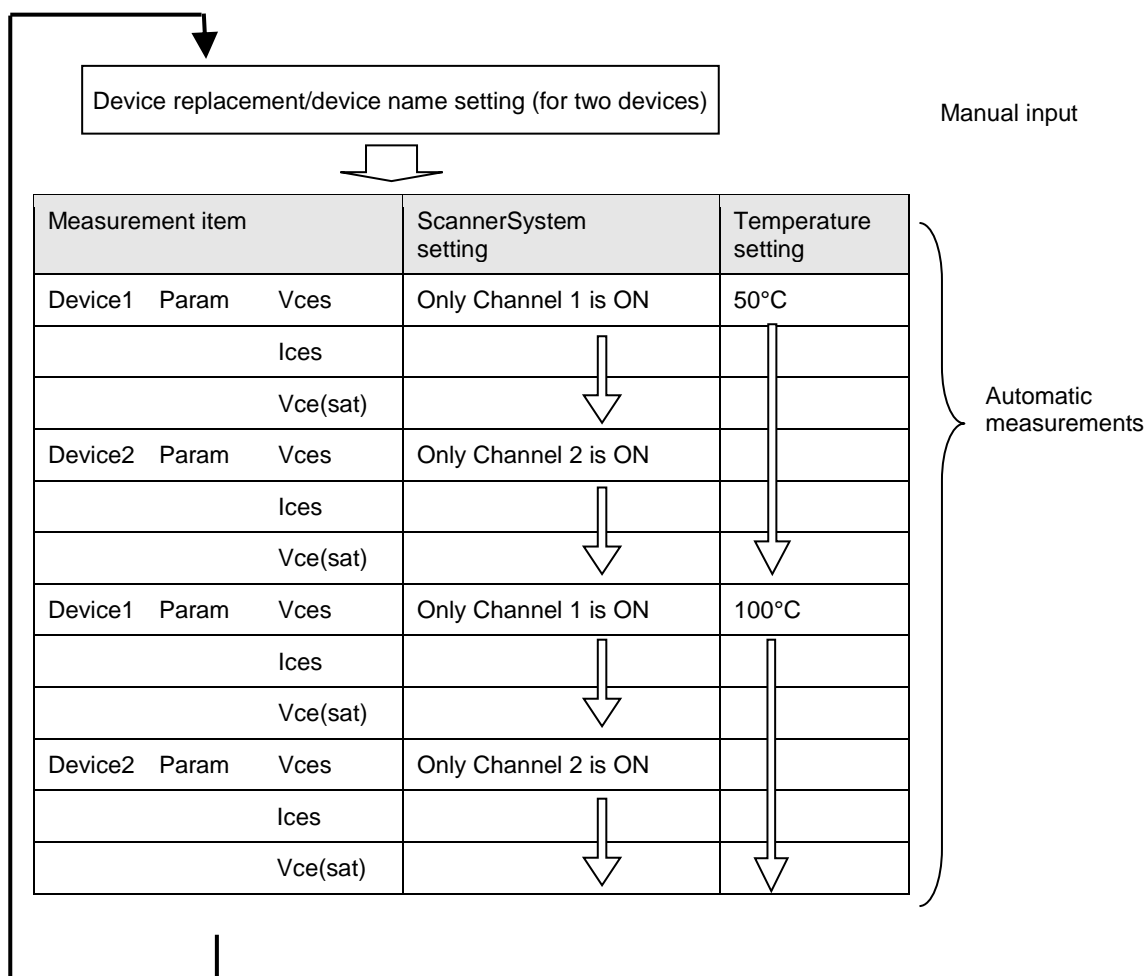
No.	Temperature	Timeout [min]	Wait [min]	Trial
1	50	0	5	Set
2	100	0	10	Set
*				

<Measurement>

The automatic measurement is carried out in the following manner.

Device	Param	NOTE
Device 1;50	B	
Device 2;50	B	
Device 1;100	B	
Device 2;100	B	

Measurement results LOG display



Memo



## **IWATSU ELECTRIC CO., LTD.**

**Address** : 7-41 Kugayama 1-chome Suginami-ku Tokyo, 168-8501 Japan

**Phone** : +81 3 5370 5483

**Facsimile** : +81 3 5370 5492

**Homepage** : <http://www.iti.iwatsu.co.jp>