

Introduction (Test Condition Editor)

This operation guide explains how to use the Test Condition Editor to create test conditions for tests that are executed with the Kikusui PFX2512 Charge/Discharge System Controller.

■Product Version Covered

This guide covers Test Condition Editor version 1.x. You can check the version by clicking About on the Help menu.

■Notations used in this manual

- In the interest of brevity, the PFX2512 Charge/Discharge System Controller shall be hereafter referred to as the “PFX2512 Series”.
- The term “PC” is used to refer generally to both personal computers and workstations.

Creating Test Conditions

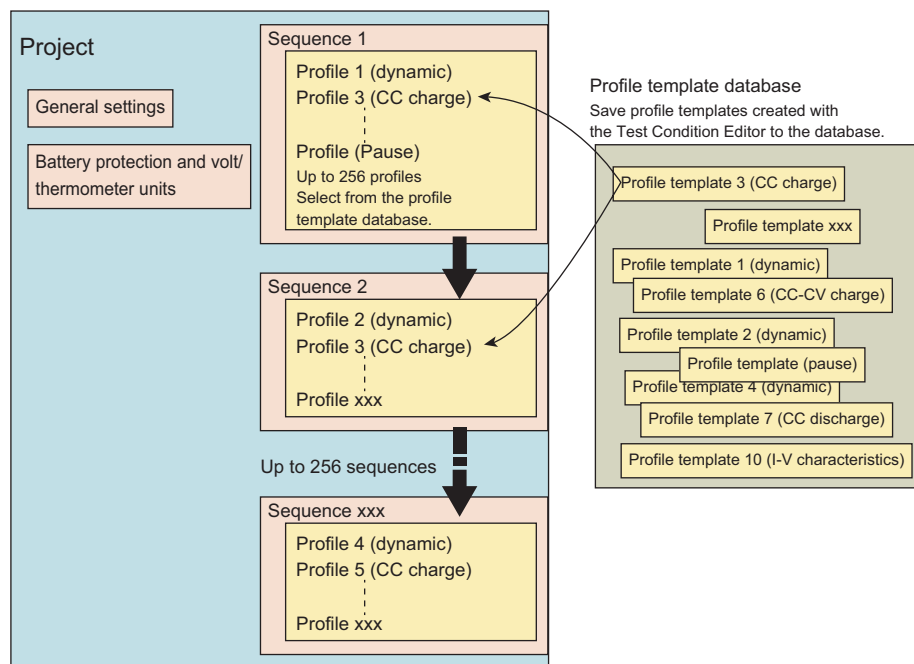
This section describes the Test Condition Editor and explains how to create test conditions.

Test Condition Editor is used to create and edit all test conditions related to charging and discharging.

Project (test condition) structure

In a charge/discharge test using SD007, the sequences in a project are executed in order.

Use the Test Condition Editor to set up profiles and projects.



Project

Set the model information, general settings, and sequences in projects. SD007 executes charge/discharge test at the project level.

Profile template

Set detailed charge/discharge conditions in profile templates.

When you finish configuring a profile template, assign a name to the template and save it in the profile template database. Profile templates that are saved can be used in other projects.

General settings

Set the model ID, battery information, life judgment, temperature synchronization, etc.

Battery protection and volt / thermometer units

Set protection functions, cell voltages, etc.

Sequence

Select profile templates from the profile template database. A sequence is a collection of profiles. You can set repetition counts and stop conditions.

Link and jump

Set links (use test results as conditions for the following test) and jumps (use factors that cause the profile to stop to branch the sequence).

Project (test condition) workflow

- 1 Start the Test Condition Editor.**
Projects and profiles are created using the Test Condition Editor.
- 2 Set the model ID.**
Specify whether the OP02-PFX option will be used.
- 3 Set nominal values, life judgment, etc.**
- 4 Set protection functions, cell voltages, etc.**
- 5 Create a profile template.**
If you are going to use an existing profile template, you do not have to create a new one.
- 6 Configure a sequence.**
Configure a sequence by selecting profile templates from the database. Set the number of sequence repetitions and the chain feature.
- 7 Assign a name to the project and save.**
Project creation is complete. You can now start a charge/discharge test using Test Exec.

Starting the Test Condition Editor

To start the Test Condition Editor, on the taskbar, click Start, All Programs, Kikusui BPChecker3000, and Test Condition Editor.

The screenshot shows the 'Test Condition Editor' window. It has a menu bar with 'File', 'Tool', and 'Help'. Below the menu bar is a toolbar with 'New Project', 'Open', and 'Save' buttons. The main window is divided into several sections:

- General** (selected tab):
 - Model Information**: A text box for 'Model ID' with a red instruction: 'Input Model ID.' and 'Click: New Project or Open Project to set up Model ID.'
 - Nominal Values**: A group of dropdown menus for 'Current Capacity [Ah]' (0.1000), 'Power Capacity [Wh]' (0.1), 'Voltage [V]' (1.000), 'Volume [l]' (0.100), and 'Mass [g]' (0.1).
 - Life Judgement**: A checkbox labeled 'Life Judgement' is unchecked. Below it are dropdown menus for 'Capacity Ratio [%]' (0.0) and 'Judgement Count' (3).
- Comment**: A section with dropdown menus for 'Project Name' (Project 001), 'Date' (2012/04/23), 'Operator', and 'Battery Type', followed by a text area for 'Note'.

Before Creating Test Conditions



Description of the display

Test Condition Editor has five tabs.

You can open the Profile Editor by clicking New on the “New or Edit Profile Template” tab.

	Description
General tab	The page that appears first when BPChecker3000 is started. Set nominal values, life judgment, SOC/DOD, comments, etc.
Bt Protection and Options tab	Configure battery protection, module, and cell voltage and temperature settings.
New or Edit Profile Template tab	Create new profile templates and edit profile templates that are stored in the profile template database.
Sequence tab	Configure sequences.
Link Jump tab	Displays sequence settings graphically. Set links and jumps.

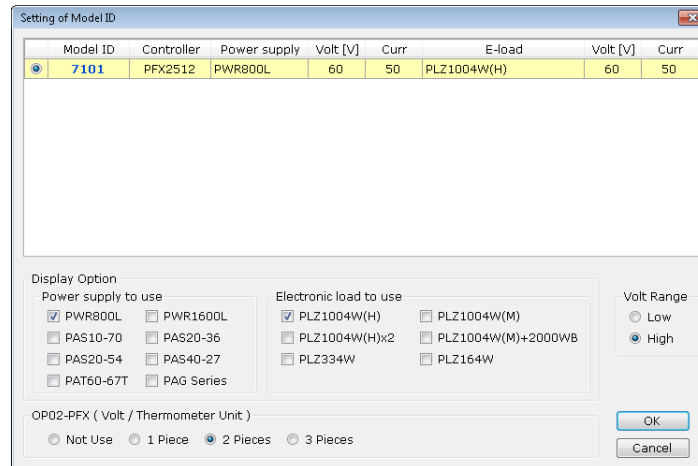
Input range

If you enter a value outside the input range, a  mark will be displayed to the right of the text box and the input range will be displayed. Enter a correct value. If a  is displayed, you will not be able to save the test conditions.

Creating a Project (Test Condition) File

Creating a new project

To create a new test condition file, click  . Or on the File menu, click New Project.



The 'Setting of Model ID' dialog box contains a table with the following data:

Model ID	Controller	Power supply	Volt [V]	Curr	E-load	Volt [V]	Curr
7101	PFX2512	PWR800L	60	50	PLZ1004W(H)	60	50

Below the table, there are sections for 'Display Option' and 'Electronic load to use'. The 'Display Option' section includes checkboxes for 'PWR800L', 'PWR1600L', 'PAS10-70', 'PAS20-36', 'PAS20-54', 'PAS40-27', 'PAT60-67T', and 'PAG Series'. The 'Electronic load to use' section includes checkboxes for 'PLZ1004W(H)', 'PLZ1004W(M)', 'PLZ1004W(M)+2000WB', 'PLZ334W', and 'PLZ164W'. There is also a 'Volt Range' section with radio buttons for 'Low' and 'High'. At the bottom, there is a section for 'OP02-PFX (Volt / Thermometer Unit)' with radio buttons for 'Not Use', '1 Piece', '2 Pieces', and '3 Pieces'. 'OK' and 'Cancel' buttons are at the bottom right.

Select the check boxes for the power supplies and electronic loads that you have. The selectable model IDs will appear.

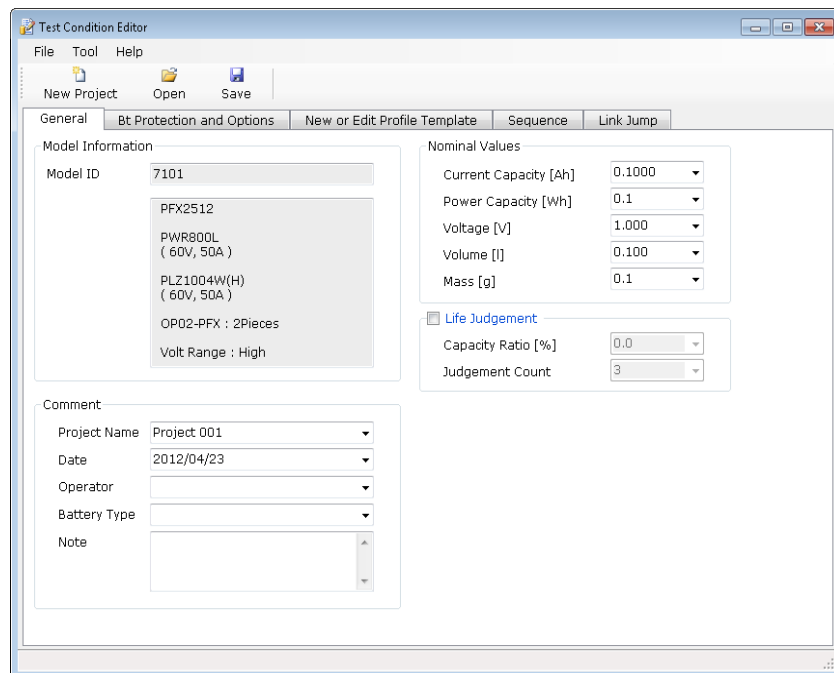
Select the voltage range to use.

When Volt/Thermometer unit OP02-PFX option boards are installed in the PFX2512, select the number of boards that are installed.

If you select 1piece or greater, the cell voltage test is enabled.

Click the model ID, which is the combination of the power supply and the electronic load, to use in the test, and click OK. A new project will open.

The model ID that you selected appears in the Model Information area on the General tab.



The 'Test Condition Editor' dialog box has a 'General' tab. The 'Model Information' section shows the selected model ID '7101' and its components: 'PFX2512', 'PWR800L (60V, 50A)', 'PLZ1004W(H) (60V, 50A)', 'OP02-PFX : 2Pieces', and 'Volt Range : High'. The 'Nominal Values' section includes dropdown menus for 'Current Capacity [Ah]' (0.1000), 'Power Capacity [Wh]' (0.1), 'Voltage [V]' (1.000), 'Volume [l]' (0.100), and 'Mass [g]' (0.1). The 'Life Judgement' section includes a checkbox for 'Life Judgement', a dropdown for 'Capacity Ratio [%]' (0.0), and a dropdown for 'Judgement Count' (3). The 'Comment' section includes fields for 'Project Name' (Project 001), 'Date' (2012/04/23), 'Operator', 'Battery Type', and 'Note'.

Editing an existing test condition file

To edit an existing test condition file, click  . Or on the File menu, click Open Project.

If you save this file by clicking Save Project As on the File menu and specifying a different file name, you will be able to create a new file based on an existing file.

Configuring a Project's General Settings

Under Model Information, the information of the model that you selected when you created the new project is displayed. You cannot change the model information. To do so, create a new project.

The screenshot shows the 'Test Condition Editor' window with the 'General' tab selected. The 'Model Information' section lists the following details for Model ID 7101: PFX2512, PWR800L (60V, 50A), PLZ1004W(H) (60V, 50A), OP02-PFX : 2Pieces, and Volt Range : High. The 'Nominal Values' section contains dropdown menus for Current Capacity [Ah] (0.1000), Power Capacity [Wh] (0.1), Voltage [V] (1.000), Volume [l] (0.100), and Mass [g] (0.1). The 'Life Judgement' section has a checked checkbox, Capacity Ratio [%] (0.0), and Judgement Count (3). The 'Comment' section includes fields for Project Name (Project 001), Date (2012/04/23), Operator, Battery Type, and a Note text area.

Entering comments

Enter the project name, date, operator name, battery type, and notes.

Item	Description
Project Name	Enter the name of the file to save.
Date	Select the type of date to display.
Operator	Enter the name of the operator. You can enter up to 63 characters.
Battery Type	Enter the battery type.
Note	Enter an arbitrary note or comment.

Setting the battery information

Set DUT information.

Item	Description
Current Capacity	Enter the nominal current capacity of the DUT. The nominal current capacity is used as a reference when setting OAH (overcharge capacity protection). It is used to convert the profile type patterns and I-V characteristic CC capacity ratio into current values. Enter an appropriate value.
Power Capacity	Enter the nominal power capacity of the DUT. This is used to convert the profile type patterns and I-V characteristic CP capacity ratio into power values. Enter an appropriate value.
Voltage	Enter the nominal voltage of the DUT.
Volume	Enter the volume of the DUT.
Mass	Enter the weight of the DUT.

Setting the battery life

Battery capacity degrades or its impedance increases as batteries are repeatedly charged and discharged.

If Life judgement check box is selected, the function determines that the battery has reached the end of its life when the measured capacity falls below the specified percentage of the nominal capacity.

Set the battery life judgment conditions. This function terminates the test in the same manner as when the test is normally completed if it determines that the battery has reached the end of its life.

Battery life judgment is valid for profiles whose Judge Life Enable check box is selected in the charge/discharge profile.

Item	Description
Capacity Ratio	The minimum capacity rate can only be specified for discharge. The reference capacity value is the current capacity that was entered in "Nominal Value" which is taken to be 100%.
Judgement Count	Specify the number of failures for terminating the test. For example, if you specify a value of 9, the test is terminated when the function determines that the battery has reached the end of its life nine times.

Configuring battery protection and volt / thermometer units

After you enter the project's general settings, configure the battery protection and volt / thermometer units (software protection).

The screenshot shows the 'Test Condition Editor' window with the 'Bt Protection and Options' tab selected. The 'DUT Protection' section contains a table with the following data:

En	Item	Value	Delay[ms]
<input checked="" type="checkbox"/>	SOVP[V]	60.000	10
<input checked="" type="checkbox"/>	SUVP[V]	0.000	10
<input checked="" type="checkbox"/>	OAH[%]	100	----
<input checked="" type="checkbox"/>	OTP[°C]	100.0	----
<input checked="" type="checkbox"/>	SOC[P[A]	Auto	10

Below this table, the 'Module Settings' section has a checked option 'DUT Confirm Combine'. To the right, there are two informational notes: 'As for OAH protection, the value is percentage against NOMINAL CAPACITY specified at the BATTERY INFO section.' and 'As for OTP protection, enable it only if a thurmo sensor is equipped.'

The 'Cell Voltage / Temp / Unbalance Protection Function' section is also visible. It includes a 'Measure' table, a 'Protection' table, and an 'Unbalance Margin [V]' set to 1.000. The 'Measure' table has columns for S-T, Volt, and Temp. The 'Protection' table has columns for S-T, En, SOVP[V], SUVP[V], Delay [ms], and UB. The 'Unbalance Margin' table has columns for S-T, En, and OTP [°C]. All tables show data for four channels (1-1 to 1-4).

At the bottom, there are 'Copy' and 'Paste' buttons, and a note: '* "UB" is an Unbalance Protection Function.'

Configuring battery protection

CAUTION

- This function is used to prevent serious accidents such as damages to or explosion of the DUT (battery). Unless there is a special reason not to do so, use this protection function when performing tests.
- In case of the incorrect setting, it may generate the trouble such as a damage to the DUT caused by not activating the protection function under the abnormal operation (when it requires to activate the protection function), or aborting the test even detected no abnormality.

NOTE

You must set software protection to protect the DUT (battery). If you do not set appropriate values, alarms and warnings will occur frequently, and you will not be able to execute the tests.

Each item is enabled only when the check box is selected.

You can set the cells' protection functions in the "Cell Voltage/ Temp/ Unbalance Protection Function" area.

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Item	Description
SOVP	<p>Set the OVP (overvoltage protection). If battery voltage exceeds the OVP value during testing, an alarm occurs and the test is aborted. The accurate overvoltage detection is possible because of the detection accuracy is the same as the voltage measurement accuracy. The detecting speed is 150 ms (max).</p> <p>In normal cases, set a voltage relatively close to the cutoff voltage or CV voltage for charging.</p> <ul style="list-style-type: none"> • Delay <p>Set the activation delay time for the protection function. (the period of time to start activation of the protection function)</p>
SUVP	<p>Set the UVP (undervoltage protection). If battery voltage falls below the UVP value during testing, an alarm occurs and the test is aborted. The accurate undervoltage detection is possible because of the detection accuracy is the same as the voltage measurement accuracy. The detecting speed is 150 ms (max).</p> <p>In normal cases, set a voltage relatively close to the cutoff voltage for discharging.</p> <ul style="list-style-type: none"> • Delay <p>Set the activation delay time for the protection function. (the period of time to start activation of the protection function)</p>
OAH	<p>Set the OAH (overcharge capacity protection). If battery capacity exceeds the OAH value during charge testing, an alarm occurs and the test is aborted. The value is a percentage with respect to the current capacity that was entered in General.</p> <p>Set an appropriate value when performing overcharge or overdischarge tests.</p>
OTP	<p>Set the OTP (overtemperature protection). If battery temperature exceeds the OTP value during testing, an alarm occurs and the test is aborted.</p> <p>Specify an appropriate value by taking the temperature measurement error and ambient temperature fluctuation into consideration.</p> <p>If the temperature measurement is not required (including the case for not connecting the thermistor), invalid the OTP protection function.</p>
SOCP	<p>Set either valid or invalid of the OCP (Over Current Protection) function.</p> <p>When the charge current exceeds the OCP value during the test (detected by the AC converter), the alarm will be activated and abort the test. You cannot set the OCP value.</p> <ul style="list-style-type: none"> • Delay <p>It sets the activation delay time for the protection function. (the time to start activation of the protection function)</p>

Configuring the connection check function

Configure the DUT connection check function. The connection check function is to measure the voltage value on each of the output cable and the voltage sensing wire, and if there is any difference in measured voltage value, this function determine the status as abnormal connection and an alarm occurs. The connection check function activates immediately before the charge or discharge operation is begun.

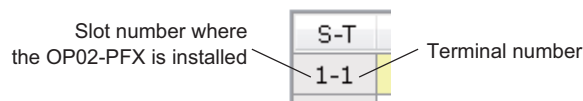
Item	Description
DUT Confirm Combine	The connection check function of the DUT (device under test) is enabled if the check box is selected. During this period, if the voltage of the DUT varies (the rest time is set to short time, etc.), it may cause generation of the alarm even when the connection is wired properly. In such case, please disable the connection check function.

Configuring the cell voltage, temperature, and unbalance protection functions

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Configure the cell voltage, temperature, and unbalance protection functions.

The configuration is valid when multiple OP02-PFXs are selected when a project is created.



You can use the Copy and Paste buttons to copy and paste the cell contents.

The configuration is enabled when the cell terminal number check box is selected.

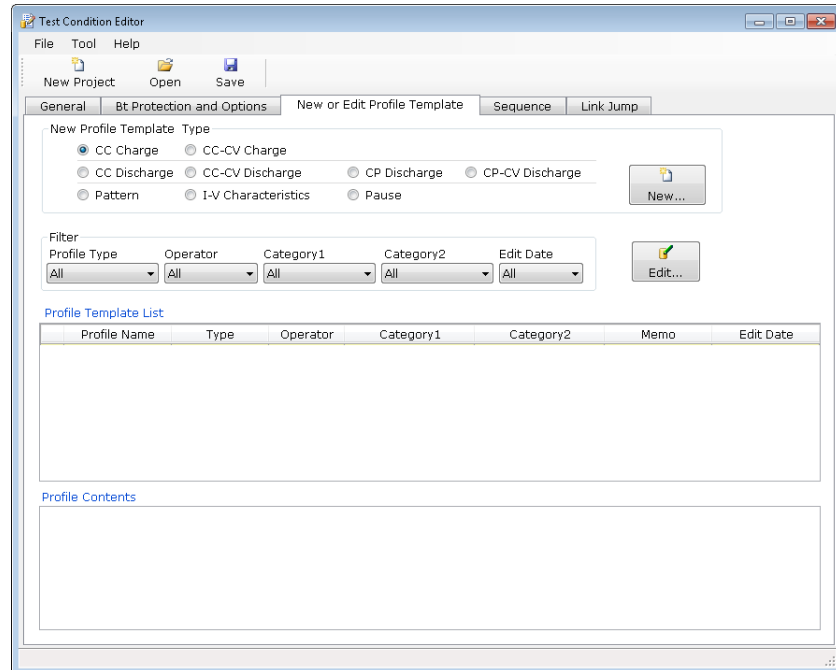
Item	Description
Unbalance Margin	An alarm occurs when the unbalance voltage exceeds the unbalance margin. The multiple cells that you have specified for voltage measurement (the OVP and UVP terminals that you have selected) are compared, and the difference between the maximum and minimum cell voltages is the unbalance voltage. The unbalance voltage is detected approximately 0.1 second after the cell voltage measurement completes. If the charge / discharge voltage fluctuates greatly (the internal voltage of the DUT is high), this function may not operate correctly. If the measured voltages are different or sensing cables are not connected to both ends of the cells, this function will not operate correctly.
Measure	<ul style="list-style-type: none"> Volt check box Measures the voltage of the selected terminal. Temp check box Measures the temperature of the selected terminal.
Protection (SOVP, SUVP)	An alarm occurs and the test is aborted when the voltage at the terminal whose En check box is selected exceeds the OVP value or falls below the UVP value. Set the OVP and UVP value. <ul style="list-style-type: none"> Delay Set the amount of time (the delay) before the OVP/UVP begins operating. UB check box The unbalance protection function of the selected terminal is enabled.
Protection (OTP)	An alarm occurs and the test is aborted when the temperature at the terminal whose En check box is selected exceeds the OTP value. Set the OTP value.

Creating Profile Templates

Before configuring sequences, create profile templates.

If you are going to use an existing profile template to configure sequences, you don't have to create a new one.

When you set test conditions in a profile template, assign a name to the template and save it in the BPChecker3000 profile template database.

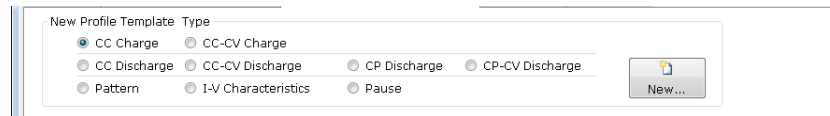


Profile template creation workflow

- 1 Select a profile type, and click New.**
The Profile Editor opens.
- 2 Enter the detailed test conditions (charge/discharge settings, rest conditions, and end conditions).**
- 3 To control temperature chambers, enter control settings.**
- 4 Assign a name to the profile template and save it.**
The profile template is saved in the profile template database. The Profile Editor closes.
- 5 Repeat step 1 to step 4 to create all necessary profile templates.**

Selecting the profile type

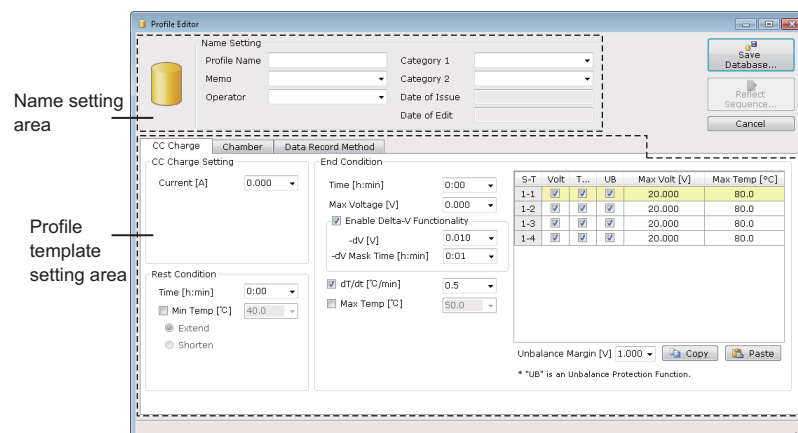
First, select the profile type.



Item	Description
CC Charge	CC Charge -> Rest
CC-CV Charge	CC-CV Charge -> Rest
CC Discharge	CC Discharge -> Rest
CC-CV Discharge	CC-CV Discharge -> Rest
CP Discharge	CP Discharge -> Rest
CP-CV Discharge	CP-CV Discharge -> Rest
Pattern	Up to 1000 steps of Charge/discharge patterns (CC Charge, CC Discharge, CP Discharge, and Pause) can be configured. you can specify the ratio of current/power capacity. Up to 65000 steps in a single project.
I-V Characteristics	Up to 1000 steps of charge/discharge patterns (CC Charge, CC Discharge, and Pause) can be configured. Up to 65000 steps in a single project.
Pause	Pauses the test.

After selecting the profile type, click New to open the Profile Editor.

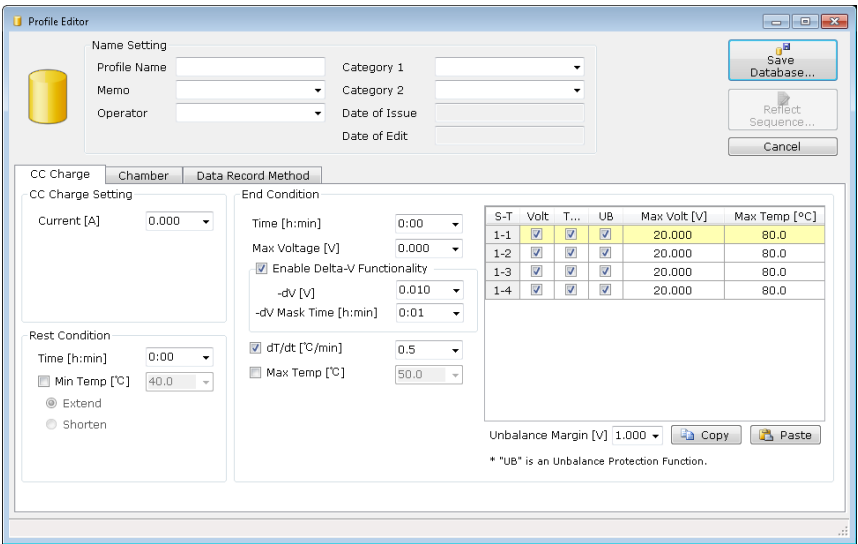
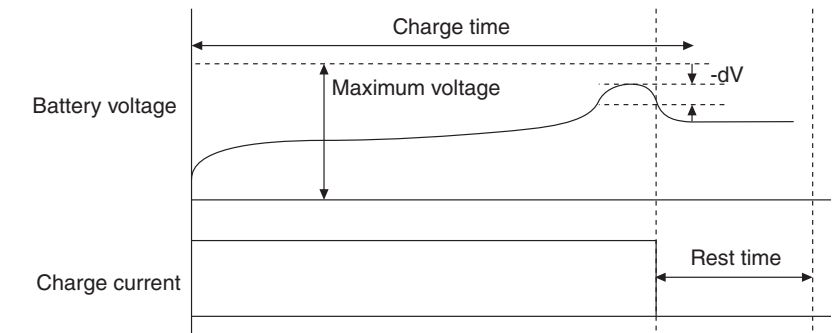
The Profile Editor consists of two areas: Name Setting and Profile Template Setting.



Configuring the CC charge type settings

The CC Charge, Chamber, Data Record Method tabs are displayed. Check box items are enabled when you select the check boxes.

The following figure is shown as an example of the Constant Current (CC) charge operation. The figure illustrates the transition of constant current charge -> -dV detection -> charge termination -> charge rest.



CC Charge Setting

Item	Description
Current	Set the charge current.

Rest Condition

For details on rest conditions, see page 34.


End Condition

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Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

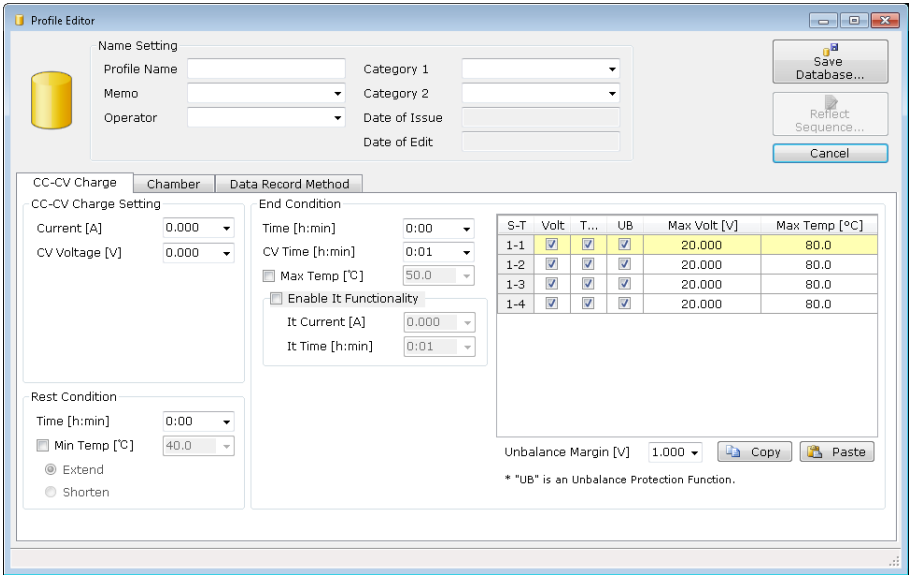
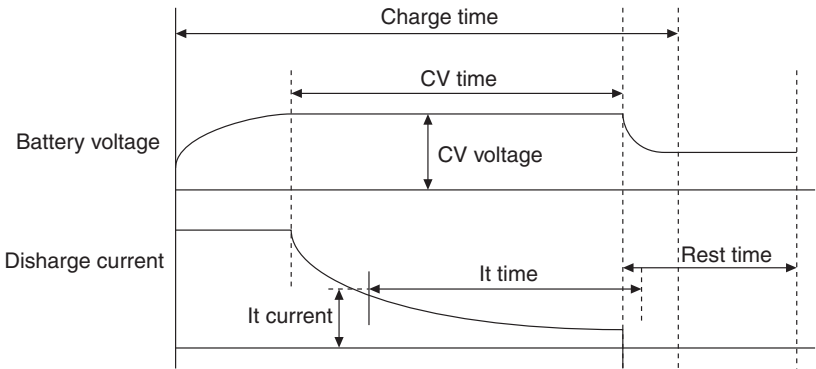
Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
Max Voltage	When the battery voltage reaches the maximum voltage, the profile is ended.
Enable Delta-V Functionality	<ul style="list-style-type: none"> -dV Charging ends when the battery voltage drops by a value specified by -dV during charging. This detection can be disabled during the -dV mask time. -dV Mask Time The -dV detection is disabled during the -dV mask time.
-dT/dt	When the temperature of the battery being charged increases at dT/dt (change per unit time of minutes), the profile is ended.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.

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After you configure the CC charge settings, configure the temperature chamber and date record method.

Configuring the CC-CV charge type settings

The CC-CV Charge, Chamber, Data Record Method tabs are displayed.
Check box items are enabled when you select the check boxes.
The following figure is shown as an example of the Constant Current and the Constant Voltage (CC-CV) charge operation. The figure illustrates the transition of constant current charge -> constant voltage charge -> CV time -> charge rest. (In this example, charge is complete when CV time is reached.)



CC-CV Charge Setting

Item	Description
Current	Set the charge current.
CV Voltage	Set the voltage value at which the battery voltage moves to constant voltage (CV) operation.

Rest Condition

For details on rest conditions, see page 34.


End Condition

 p. 35

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

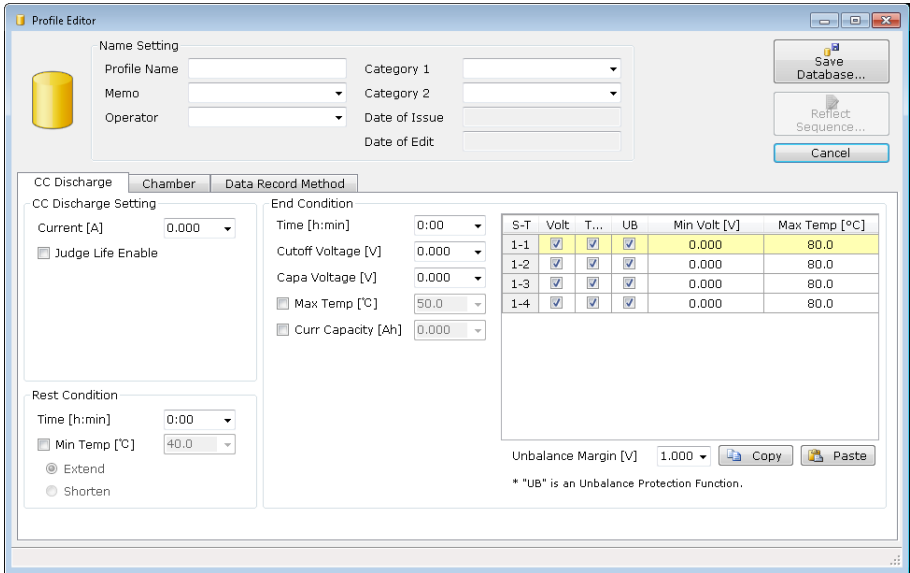
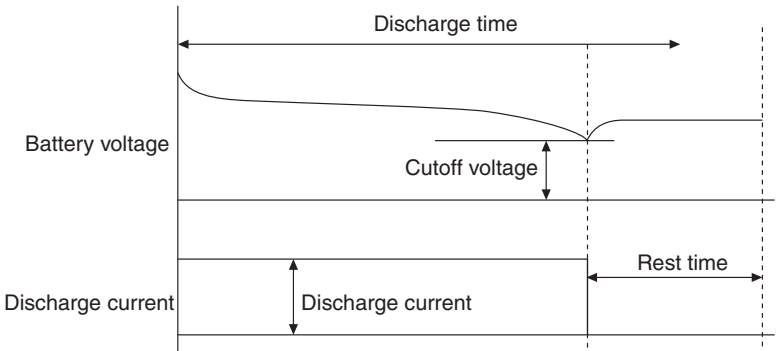
Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
CV Time	Set the time from when the test enters constant voltage (CV) mode to when the profile is ended.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.
Enable It Functionality	<ul style="list-style-type: none"> It Current The It current is a current value that you can set as you like for detecting charge current during constant voltage charging. When It current is detected, after the It time elapses, the profile is ended. It Time Set the time that needs to elapse after It current is detected to end the profile.

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After you configure the CC-CV charge settings, configure the temperature chamber and date record method.

Configuring the CC Discharge type settings

The CC Discharge, Chamber, Data Record Method tabs are displayed.
Check box items are enabled when you select the check boxes.
The following figure is shown as an example of the Constant Current (CC) discharge operation. The figure illustrates the transition of constant current discharge -> voltage drop to the cutoff voltage -> discharge termination -> discharge rest.



CC Discharge Setting

Item	Description
Current	Set the discharge current.
Judge Life Enable	Enables life judgment on the discharge. See p. 10 .

Rest Condition

For details on rest conditions, see page 34.


End Condition

 p. 35

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
Cutoff Voltage	When the cutoff voltage is reached during discharge, the profile is ended, even when the discharge time has not elapsed.
Capa Voltage	When the battery voltage that decreases with discharging goes below the voltage capacity, discharge capacity integration is stopped.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.
Curr Capacity	When the integrated current reaches the current capacity, the profile is ended.

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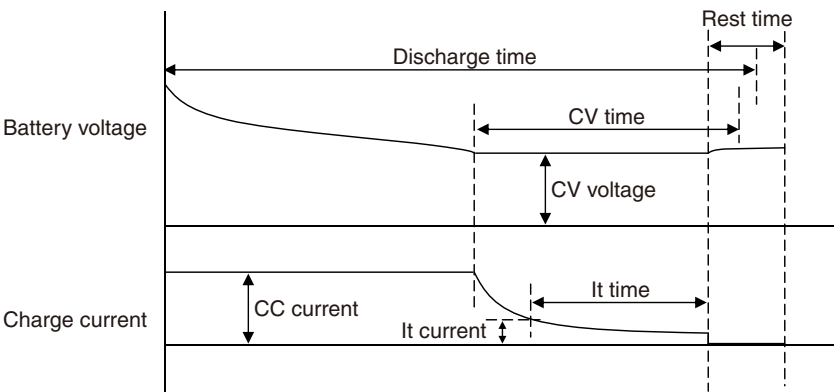
After you configure the CC discharge settings, configure the temperature chamber and date record method.

Configuring the CC-CV Discharge type settings

The CC-CV Discharge, Chamber, Data Record Method tabs are displayed.

Check box items are enabled when you select the check boxes.

The following figure is shown as an example of the Constant Current and the Constant Voltage (CC-CV) discharge operation. The figure illustrates the transition of constant current discharge -> constant voltage discharge -> It time -> discharge rest. (In this example, discharge is complete when It time is reached.)



CC-CV Discharge Setting

Item	Description
Current	Set the discharge current.
CV Voltage	Set the voltage value at which the battery voltage moves to constant voltage (CV) operation.
judge Life Enable	Enables life judgment on the discharge. See p. 10.

Rest Condition

For details on rest conditions, see page 34.


End Condition

 p. 35

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

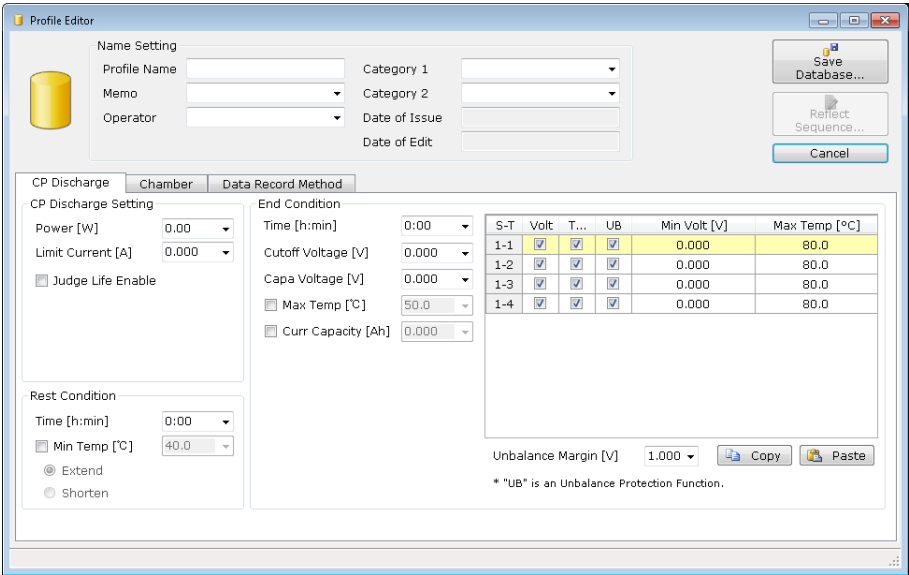
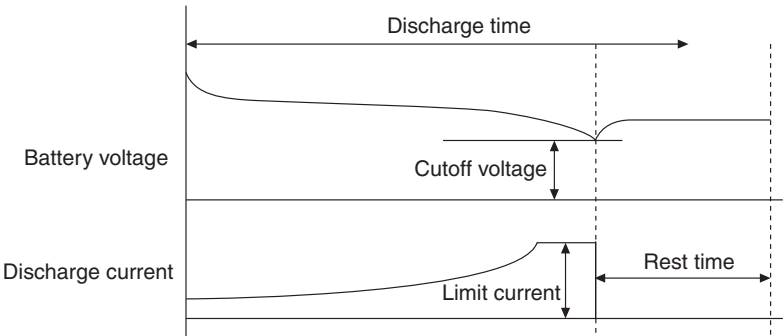
Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
CV Time	Set the time from when the test enters constant voltage (CV) mode to when the profile is ended.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.
Curr Capacity	When the integrated current reaches the current capacity, the profile is ended.
Enable It Functionality	<ul style="list-style-type: none"> • It Current The It current is a current value that you can set as you like for detecting discharge current during constant voltage discharging. When It current is detected, after the It time elapses, the profile is ended. • It Time Set the time that needs to elapse after It current is detected to end the profile.

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After you configure the CC-CV discharge settings, configure the temperature chamber and date record method.

Configuring the CP Discharge type settings

The CP Discharge, Chamber, Data Record Method tabs are displayed.
Check box items are enabled when you select the check boxes.
The following figure is shown as an example of the Constant Power (CP) discharge operation. The figure illustrates the transition of constant power discharge -> voltage drop to the cutoff voltage -> discharge termination -> discharge rest.



CP Discharge Setting

Item	Description
Power	Set the discharge power.
Limit Current	Set the upper limit value for the discharge current. The discharge current increases as the battery voltage drops.
Judge Life Enable	Enables life judgment on the discharge. See p. 10.

Rest Condition

For details on rest conditions, see page 34.

End Condition

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Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
Cutoff Voltage	When the cutoff voltage is reached during discharge, the profile is ended, even when the discharge time has not elapsed.
Capa Voltage	When the battery voltage that decreases with discharging goes below the voltage capacity, discharge capacity integration is stopped.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.
Curr Capacity	When the discharge capacity reaches the specified value, the profile is ended.

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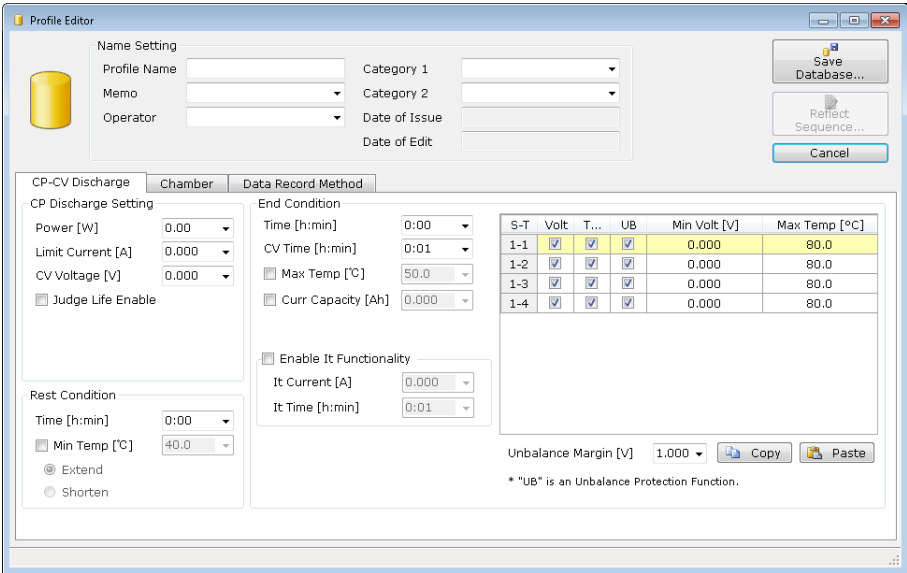
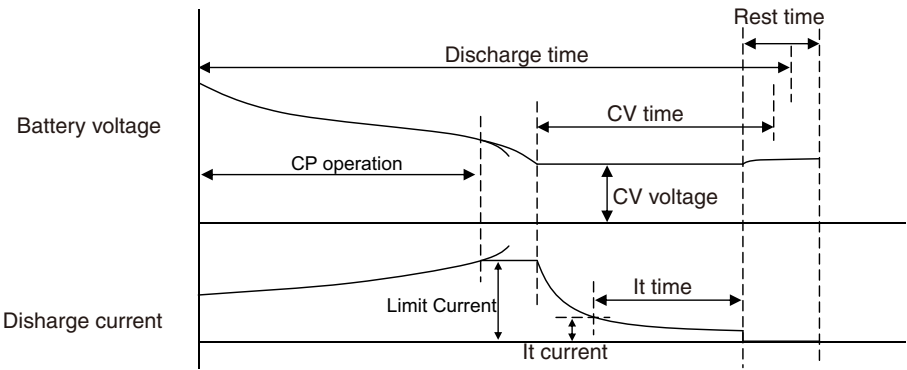
After you configure the CP discharge settings, configure the temperature chamber and date record method.

Configuring the CP-CV Discharge type settings

The CP-CV Discharge, Chamber, Data Record Method tabs are displayed.

Check box items are enabled when you select the check boxes.

The following figure is shown as an example of the Constant Power and the Constant Voltage (CP-CV) discharge operation. The figure illustrates the transition of constant power discharge -> constant voltage discharge -> It time -> discharge rest. (In this example, discharge is complete when It time is reached.)



CP-CV Discharge Setting

Item	Description
Power	Set the discharge current.
Limit Current	Set the upper limit value for the discharge current. The discharge current increases as the battery voltage drops.
CV Voltage	Set the voltage value at which the battery voltage moves to constant voltage (CV) operation.
Judge Life Enable	Enables life judgment on the discharge. See p. 10.

Rest Condition

For details on rest conditions, see page 34.


End Condition

 p. 35

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the time.

Item	Description
Time	Set the profile's maximum time. When the total time elapses, the profile is ended.
CV Time	Set the time from when the test enters constant voltage (CV) mode to when the profile is ended.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.
Curr Capacity	When the discharge capacity reaches the specified value, the profile is ended.
Enable It Functionality	<ul style="list-style-type: none"> • It Current The It current is a current value that you can set as you like for detecting discharge current during constant voltage discharging. When It current is detected, after the It time elapses, the profile is ended. • It Time Set the time that needs to elapse after It current is detected to end the profile.

 p. 36, p. 38

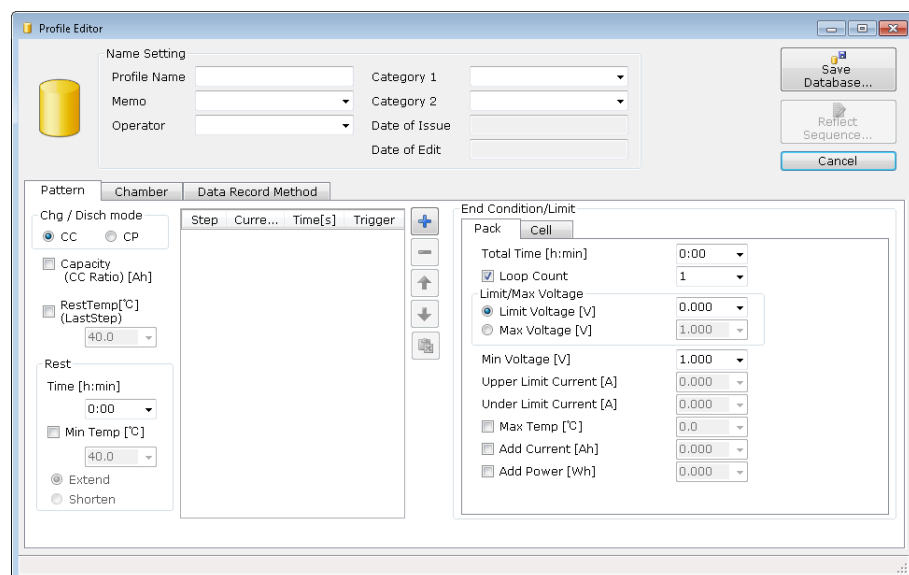
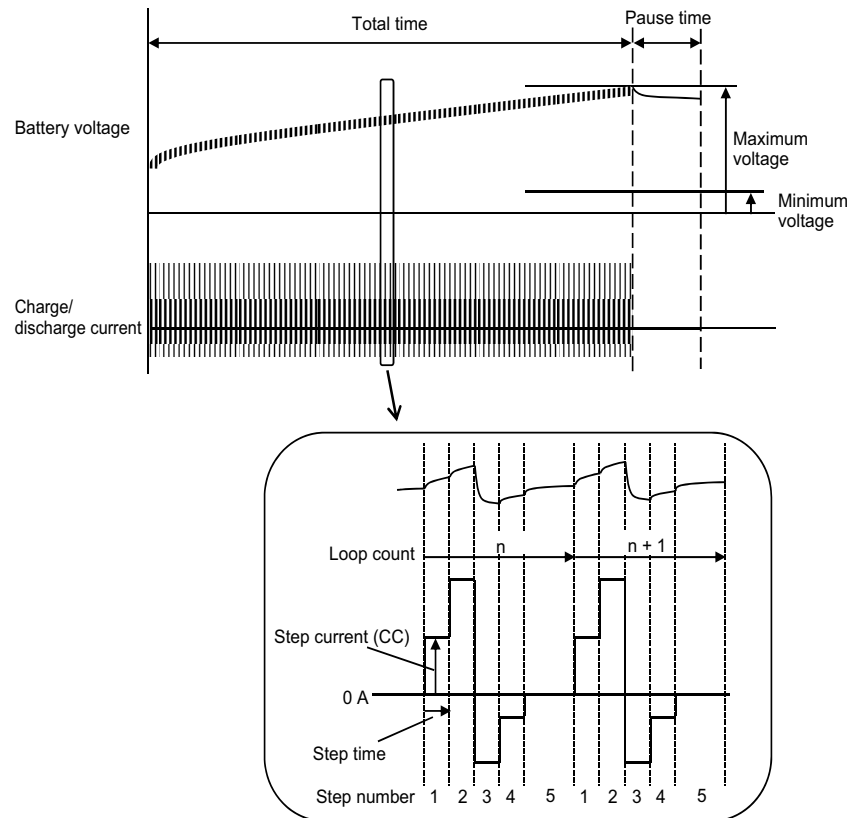
After you configure the CP-CV discharge settings, configure the temperature chamber and date record method.

Configure the pattern details

A pattern is a collection of steps. You can configure up to 1000 steps (up to 65000 steps in a single sequence) in a charge/discharge pattern.

The Pattern, Chamber, Data Record Method tabs are displayed.

Check box items are enabled when you select the check boxes.



Chg/Disch mode, Capacity, RestTemp

Item	Description
Chg/ Disch mode	Select the charge/discharge pattern (CC or CP). You will not be able to change this setting after you configure the step. Select this first.
Capacity (CC/CP Ratio)	If you select this check box, the capacity is automatically converted into a current/power value when profiles are configured in sequences.
RestTemp (LastStep)	The temperature of the last step will be judged. This is valid when the current setting of the last step is 0 A.


Rest


For details on rest conditions, see page 34.

Editing steps


The tests are executed in order starting from step 1.


Click  to add a step.

To insert a step between two steps, select the step before where you want to insert the step, and click .

To delete a step, select the step that you want to delete, and click .

You can enter steps' current and power values and times into an Excel sheet, and paste the data to the Profile Editor.

Click  to paste the data that you copied from Excel. If you copy more than two columns, the first two columns will be pasted. If you copy more than 1000 rows, the first 1000 rows will be pasted.

To move a step up, select the step, and click . To move a step down, select the step, and click .

Item	Description
Current/ Power	If you have set the Chg/Disch mode to CC, set the charge/discharge current. If you have set the Chg/Disch mode to CP, set the discharge power. If you have selected the capacity check box, set the ratio of current/power capacity.
Time	Set the step's charge/discharge time.
Trigger	If you select this check box, high-speed sampling will start when the step is executed. You can select this check box in only one step.

See p. 35

End Condition/Limit

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

You must enter the total time. Check box items are enabled when you select the check boxes.

Item	Description
Total Time	Set the profile's maximum execution time. When the total time elapses, the profile is ended.
Loop Count	Set the number of times to repeat the profile. One iteration of a profile is from step 1 to the last step. When the specified number of repetitions is complete, the profile is ended.
Limit/Max Voltage	Select limit voltage or maximum voltage. If you select limit voltage, the test switches to CV mode when the battery voltage reaches the limit voltage. The profile is not ended in this case. If you select maximum voltage, when the battery voltage reaches the maximum voltage, the profile is ended.
Min Voltage	Set the minimum battery voltage. When the battery voltage falls below the minimum voltage, the profile is ended.
Upper Limit Current	This is the upper current limit for when you set the charge/discharge pattern to CP. When the current reaches the specified value, the test switches to CC mode. The profile is not ended in this case.
Under Limit Current	This is the lower current limit for when you set the charge/discharge pattern to CP. When the current falls below the specified value, the test switches to CC mode. The profile is not ended in this case.
Max Temp	Set the maximum battery temperature. When the battery temperature reaches the specified value, the profile is ended.
Add Current	When the integrated current reaches the specified value, the profile is ended.
Add Power	When the integrated power reaches the specified value, the profile is ended.

See p. 36, p. 38

After you configure the pattern, configure the temperature chamber and date record method.

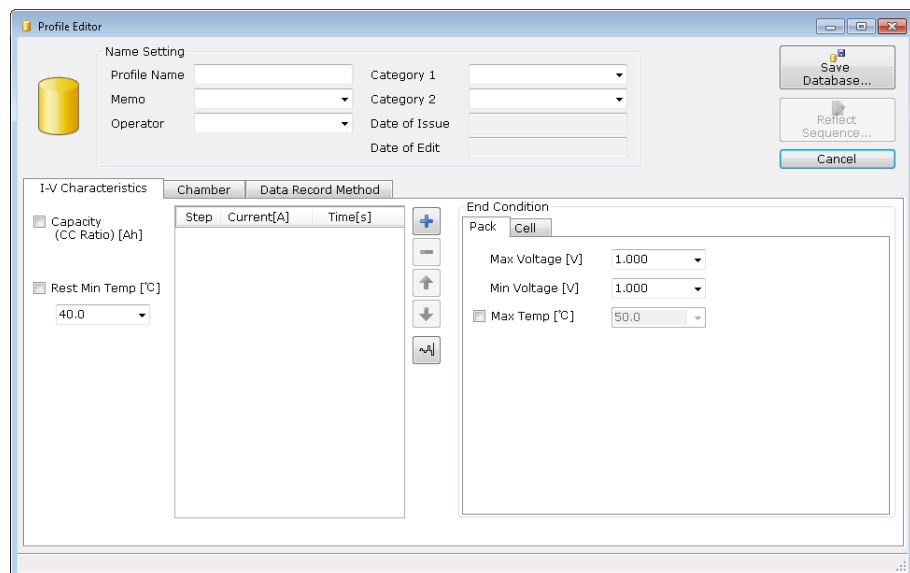
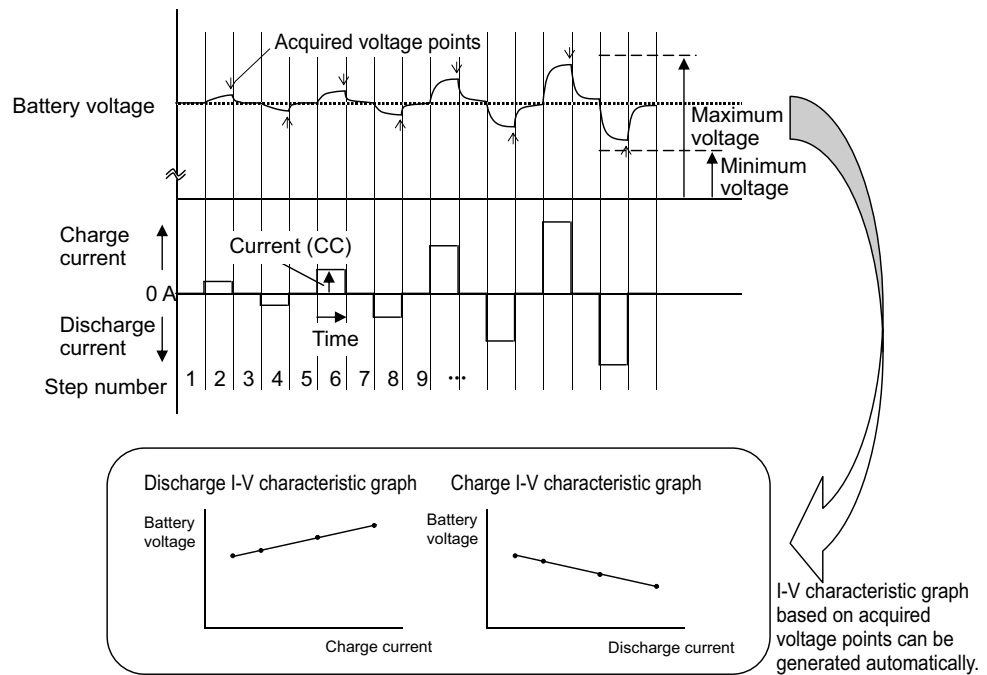
Configuring the I-V Characteristic type settings

A I-V characteristic pattern is a collection of steps. You can configure up to 1000 steps (up to 65000 steps in a single sequence) in a charge/discharge pattern.

Configure the step and profile end conditions.

Check box items are enabled when you select the check boxes.


The I-V Characteristics, Chamber, Data Record Method tabs are displayed.





Capacity, Rest Min Temp


Item	Description
Capacity (CC Ratio)	If you select this check box, the capacity is automatically converted into a current value when profiles are configured in sequences.
Rest Min Temp	If you set the minimum temperature, the test is paused until the battery temperature of the step whose current is set to 0 A falls below the minimum temperature.


Editing steps

Click  to add a step.

To insert a step between two steps, select the step before where you want to insert the step, and click .

To delete a step, select the step that you want to delete, and click .

To move a step up, select the step, and click . To move a step down, select the step, and click .

Click  to automatically configure steps. You can use this button to create steps that automatically alternate charging and discharging with current that increases in step increments.

Item	Description
Step	The step number. The tests are executed in order starting from step 1.
Current	Set the charge current. If you have selected the capacity check box, set the ratio of current capacity.
Time	Set the maximum charge duration.


End Condition

 p. 35

Set the profile end conditions. If OP02-PFXs are installed, you can also set cell voltage and temperature end conditions.

■Pack

Item	Description
Max Voltage	When the battery voltage reaches the maximum voltage, the profile is ended.
Min Voltage	When the battery voltage reaches the minimum voltage, the profile is ended.
Max Temp	When the battery temperature reaches the maximum temperature, the profile is ended.

 p. 36, p. 38

After you configure the I-V characteristic pattern settings, configure the temperature chamber and date record method.

Configure the pause settings

This is a profile for pausing tests. You can include this profile to systematically pause tests. When you resume the test, you can select whether to execute the next profile or a specific profile.

The screenshot shows the 'Profile Editor' dialog box with the 'Pause' tab selected. The dialog has a title bar with standard window controls. On the left is a yellow cylinder icon. The main area is divided into two sections. The top section, 'Name Setting', contains fields for 'Profile Name', 'Memo', and 'Operator', each with a dropdown arrow. To the right of these are 'Category 1' and 'Category 2' dropdowns, and 'Date of Issue' and 'Date of Edit' text boxes. On the far right are three buttons: 'Save Database...', 'Reflect Sequence...', and 'Cancel'. The bottom section, 'Pause', contains a 'comment' label and a large text area with a dropdown arrow at the bottom.

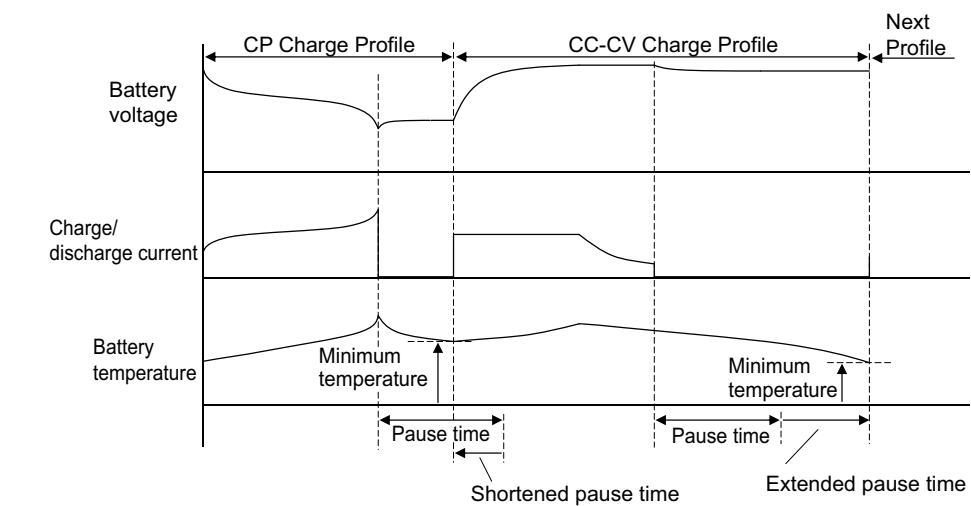
Name Setting	
Profile Name	
Memo	
Operator	
Category 1	
Category 2	
Date of Issue	
Date of Edit	

Buttons: Save Database..., Reflect Sequence..., Cancel

Pause tab: comment

Setting rest conditions

Set the profile rest conditions.
The figure illustrates an operation of a rest condition (CP discharge).



Item	Description
Time	Set the rest time.
Min Temp	Set the minimum temperature. Select Extend or Shorten. If you select Extend, when the battery voltage does not fall below the minimum temperature after the rest time elapses, the rest time is extended until it does. If you select Shorten, when the battery voltage falls below the minimum temperature before the rest time elapses, the rest time is shortened.

Setting the end conditions of battery cells

If OP02-PFXs are installed, you can set cell voltages or temperatures as profiles' end conditions.

The multiple cells that you have specified for voltage measurement (the terminals that you have set maximum voltages for) are compared, and the difference between the maximum and minimum cell voltages is the unbalance margin. The unbalance margin is detected approximately 1 second after the cell voltage measurement completes. If the charge / discharge voltage fluctuates greatly (the internal voltage of the DUT is high), this function may not operate correctly.

You can use the Copy and Paste buttons to copy and paste the cell contents.

Check box items are enabled when you select the check boxes.

S-T	Volt	T...	UB	Min Volt [V]	Max Temp [°C]
1-1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.000	80.0
1-2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.000	80.0
1-3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.000	80.0
1-4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.000	80.0

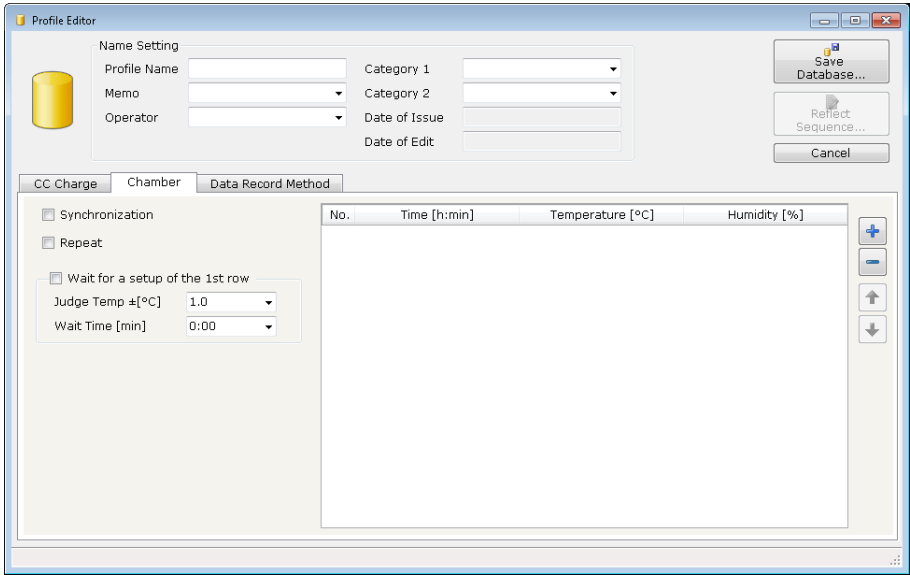
Unbalance Margin [V]

* "UB" is an Unbalance Protection Function.

Item	Description
Check box items	When you select a check box, the profile is ended when the specified value is exceeded.
Volt	When the cell voltage exceeds the specified voltage, the profile is ended.
Temp	When the cell temperature exceeds the specified temperature, the profile is ended.
UB	When the unbalance voltage exceeds the unbalance margin, the profile is ended.
Min Volt	Set the minimum cell voltage for ending the profile. This value is valid for discharge, pattern, and I-V characteristic profiles.
Max Volt	Set the maximum cell voltage for ending the profile. This value is valid for charge, pattern, and I-V characteristic profiles.
Max Temp	Set the maximum cell temperature for ending the profile.
Unbalance Margin	Set the unbalance margin for ending the profile.


Configuring temperature chambers


If you are using temperature chambers, you can control them.
Check box items are enabled when you select the check boxes.





Item	Description
Synchronization	Synchronizes the profile start timings of the PFX2521s that have been placed in the same temperature chamber.
Repeat	Select this check box to repeat the step. If it is not selected, the temperature of the last step is maintained.
Wait for a setup of the 1st row	Waits until the temperature of step 1 is stable. <ul style="list-style-type: none">Judge TempSet the allowable range of target temperature.Wait time Even if the temperature chamber reaches the target temperature and humidity, you must allow some time for the battery in the chamber to reach the temperature. This setting specifies the wait time. If testing is performed in synchronization with the temperature chambers, the actual charge/discharge starts after the wait time elapses.

Editing steps

Click  to add a step.

To insert a step between two steps, select the step before where you want to insert the step, and click  .

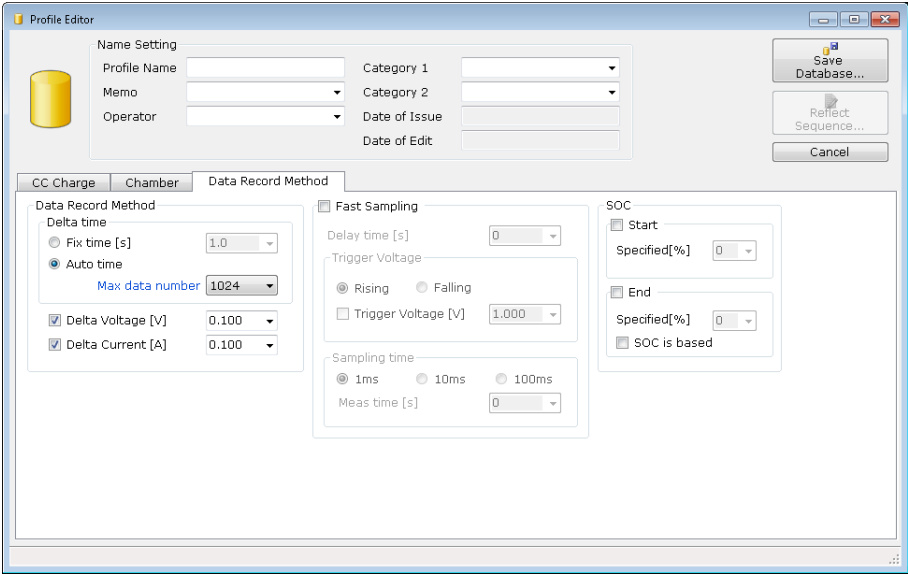
To delete a step, select the step that you want to delete, and click  .

To move a step up, select the step, and click  . To move a step down, select the step, and click  .

Item	Description
No.	The step number. The tests are executed in order starting from step 1.
Time	Set the step execution time.
Temperature	Specify the temperature setting of the chamber.
Humidity	Specify the humidity setting of the chamber. Check the control range of the temperature and humidity of the temperature chamber being used. Depending on the performance of the temperature chamber, some humidity ranges may not be possible against the specified temperature. In such case, specify -1 and the humidity control will be disabled.

Data record method

This screen is used to set the recording method of the charge/discharge data file that the Test Executive creates. You can select one or more items. Check box items are enabled when you select the check boxes.



Data Record Method

Set the method for recording test results.

Item	Description
Delta Time	<p>Set the delta time to time or data values.</p> <p>If you set the delta time to time, setting a shorter time will cause the amount of data that will be recorded to increase. When the period of testing time is long, it is convenient to use the “Auto time” which limits the total volume of the data.</p> <ul style="list-style-type: none">• Fix time <p>Set the time interval for recording the data. If a short time is specified, the amount of data that is recorded increases. If the test period is long (several hours or more), the number of data points becomes greater than 1 000 points. Use caution when setting the time.</p> <ul style="list-style-type: none">• Auto time <p>Set the Max data number of data for recording.</p> <p>Calculated by dividing the maximum test period of each phase (the time when the test is performed as scheduled without early termination including the pause section) by the “Max data number.”</p>
Delta Voltage	<p>Data is recorded when the voltage changes by an amount greater than the specified value.</p>
Delt Current	<p>Data is recorded when the current changes by an amount greater than the specified value.</p>

Fast Sampling

Select this check box to enable high-speed sampling. High-speed sampling will make graph drawing take a long time and will consume more hard disk space. If you do not need high-speed sampling, do not select this check box.

Item	Description
Delay time	Set the delay for starting high-speed sampling. If a trigger voltage is specified, the delay is from when the trigger voltage is exceeded until high-speed sampling starts. If the profile type is pattern and a step trigger is specified, the delay is from when the specified step is reached until high-speed sampling starts. For other cases, the delay is from when the profile starts until high-speed sampling starts. The selectable range is 0 s to 999 s. If the profile type is pattern, the selectable range is from -1 s.
Trigger Voltage	Select the voltage detection method (Rising or Falling). When the specified voltage is reached, high-speed sampling starts.
Sampling time	Set the sampling time interval. Select 1 ms, 10 ms, or 100 ms. • Meas time Set the duration to measure in high-speed sampling mode.

SOC

Set the SOC reference. If you do not set it, the previous SOC value is used.

The SOC indication is determined by the following equation.

$$\text{SOC indication [\%]} = \text{SOC at charge/discharge start time [\%]} + \frac{\text{Charge/discharge current capacity}}{\text{Reference current capacity}} \times 100 [\%]$$

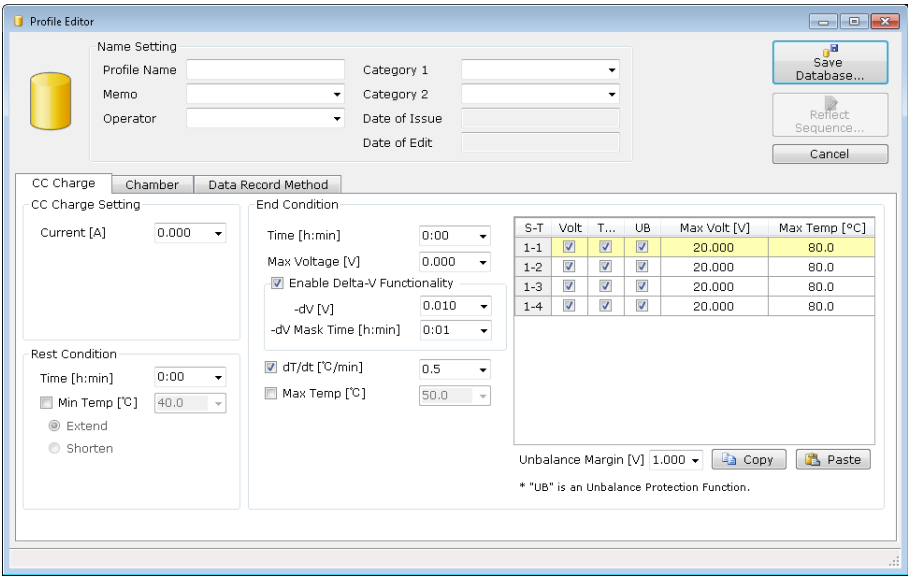
SOC at charge/discharge start time can be set to the previous result or a specific value.

The reference current capacity can be set to the nominal value or a measured value.

Item	Description
Start	Set a specific value.
End	Set a specific value. The default reference current capacity is the nominal current capacity. If you select the "SOC is based" check box, the SOC for subsequent tests will be calculated using this test profile's test result.

Saving a profile template

When you finish the profile template settings, enter the settings under Name Setting, and save the file.



Item	Description
Profile Name	Enter the name of the file. Be sure to enter the name.
Memo	Enter memos and comments as you like.
Operator	Enter the operator name. You can enter up to 48 characters.
Category 1	Enter a category (keyword) as you like. You can use this as a filter for searching for graphs to draw in the Graph Viewer. You can enter up to 48 characters.
Category 2	Enter a category (keyword) as you like. You can use this as a filter for searching for graphs to draw in the Graph Viewer. You can enter up to 48 characters.
Date of Issue	Displays the date when the profile template was created. You cannot enter this information.
Date of Edit	Displays the date when the profile template was last updated. You cannot enter this information.

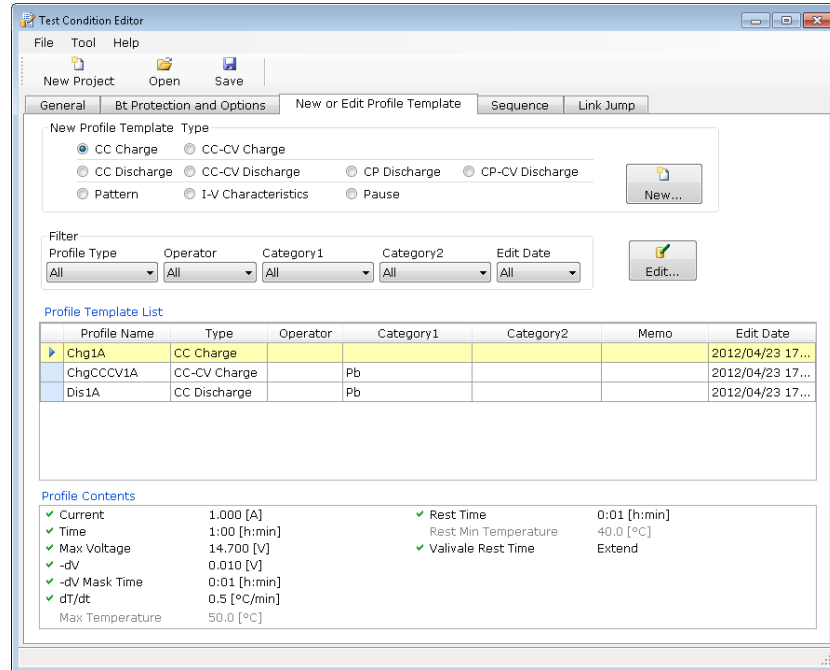
When you have entered the necessary information, click Save Database to save the profile template in the BPChecker3000 profile template database.

The profile template database may be corrupted if the Test Condition Editor terminates abnormally. We recommend that you regularly back up the database.

Changing and deleting a profile template

You can change a saved profile template or use it to create a new template.

The saved profile templates are displayed in the Profile Template List on the New or Edit Profile Template tab.



Changing a profile template

- 1 From the list, select the profile template that you want to change.**
You can use filters to narrow down the profile templates that are shown in the list. The contents of the selected profile template are displayed under Profile Contents.
- 2 Click Edit.**
The Profile Editor opens.
- 3 Change the settings.**
- 4 Click Save Database to save the template.**
The Profile Editor closes, and the profile template is overwritten.

Creating a new profile template using an existing profile template

- 1 From the Profile Template List, select the profile template that you want to change.**

You can use filters to narrow down the profile templates that are shown in the list. The contents of the selected profile template are displayed under Profile Contents.
- 2 Click Edit.**

The Profile Editor opens.
- 3 Change the settings.**
- 4 Change the Profile Name.**

The Profile Name setting is used as name for saving the profile template in the database. If you do not change the Profile Name or use an existing Profile Name, the profile will be overwritten.
- 5 Click Save Database to save the template.**

The Profile Editor closes, and the new profile template is saved.

Deleting a profile template

- 1 From the Profile Template List, select the profile template that you want to delete.**

You can use filters to narrow down the profile templates that are shown in the list. The contents of the selected profile template are displayed under Profile Contents.
- 2 Right-click, and select Delete.**
- 3 Click OK.**

The selected profile template is deleted from the database.

Backing up the profile template database

Profile templates that you create are saved in the BPChecker3000 database.

The profile template database may be corrupted if the Test Condition Editor terminates abnormally. BPChecker3000 allows you to create back up of the database. For protecting your data, regularly back up the database.

On the Tool menu, click Utility and then Validate to check whether the profile template database is not corrupt.

Backing up the profile template database

- 1 On the Tool menu, click Utility and then Backup.**
- 2 Enter a file name, and save a back up of the profile template database.**

Recalling a backup file

- 1 On the Tool menu, click Utility and then Restore.**
- 2 Select a backup file that you have saved before.**
The database is restored to the saved information.

Configuring Sequences

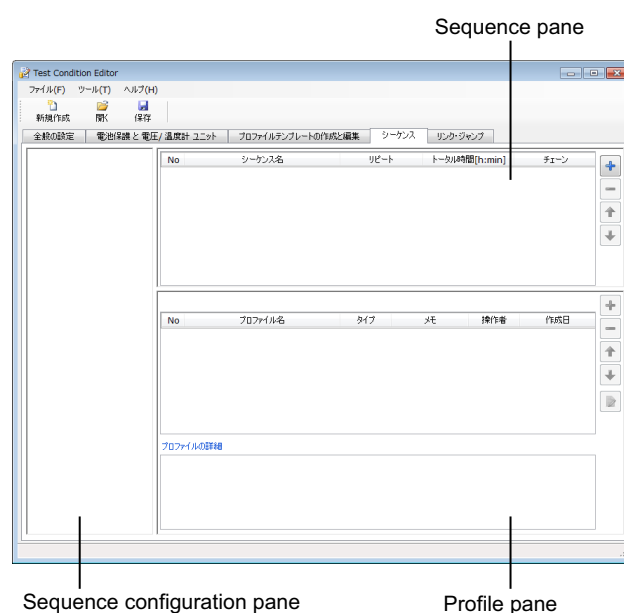
After you have completed configuring general settings and creating profile templates, configure sequences.

You can configure 256 profiles in a single sequence.

You can configure 256 sequences in a project.

Entering settings on the Sequence tab

Sequences are a collection of existing profiles. The Sequence tab consists of three panes.




Item	Description
Sequence configuration pane	Displays a project's sequence configuration.
Sequence pane	Displays sequence information. Charge/discharge test sequences displayed in the sequence pane are executed in order from the top sequence. If you select a sequence in this pane, the profiles in the sequence are displayed in the profile pane. You can use this pane to add and delete sequences from the project. Set the end conditions of sequences and other settings.
Profile pane	Displays the profiles in the sequence that is selected in the sequence pane. You can use this pane to add and delete profiles from the sequence.


Sequence configuration workflow

The Test Executive executes charge/discharge test sequences displayed in the sequence pane in order from the top sequence.



- 1 In the sequence pane, add a sequence.**
- 2 In the profile pane, add profiles to the sequence.**
- 3 In the sequence pane, set the number of repetitions, end conditions, etc.**
- 4 Repeat step 1 to step 3 to configure all necessary sequences.**
When you finish configuring sequences, execute charge/discharge tests using the Test Executive.

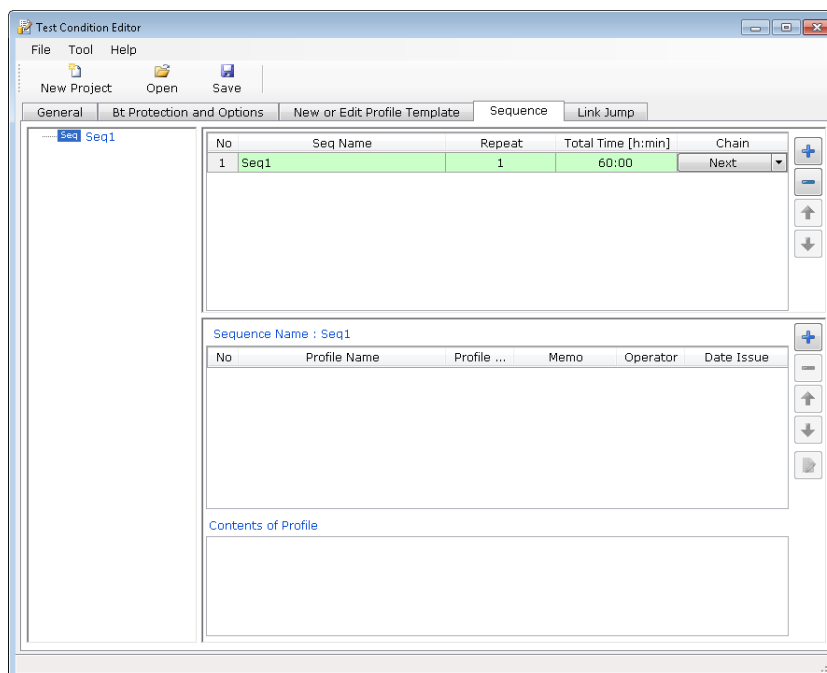
Configuring sequences

In the sequence pane, click  to add a new sequence to the project.

To insert a sequence between two sequences, select the sequence before where you want to insert the sequence, and click .

To delete a sequence, select the sequence that you want to delete, and click .

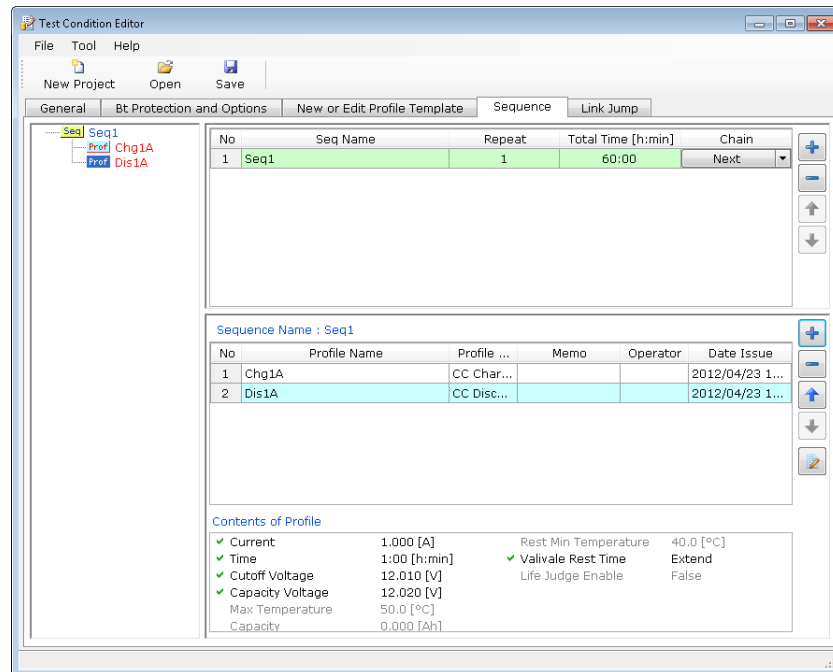
To move a sequence up, select the sequence, and click . To move a sequence down, select the sequence, and click .




Next, add profiles to the sequences that you have created.

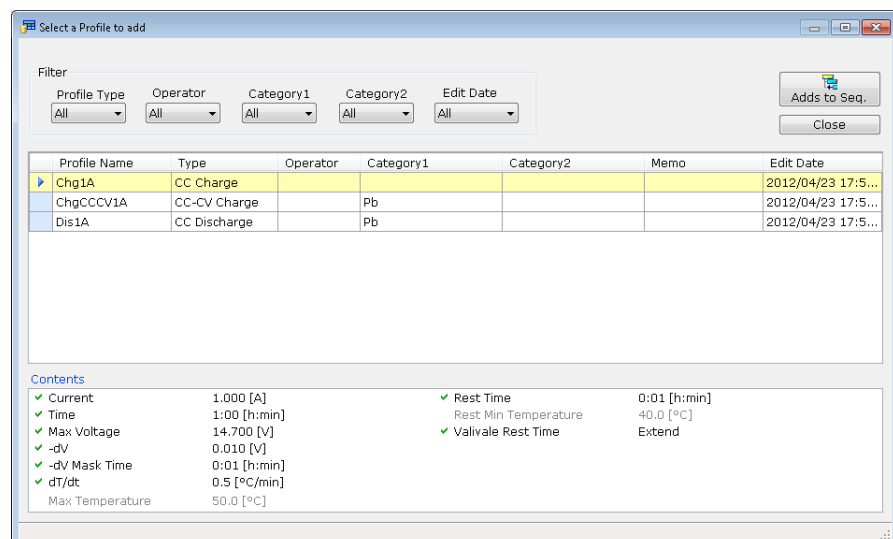
Adding profiles to sequences

Adding a profile



- 1 In the sequence pane, select the sequence that you want to add profiles to.
- 2 In the profile pane, click  to open the profile template list (the list of profile templates in the database).

You can use filters to narrow down the profile templates that are shown in the list.



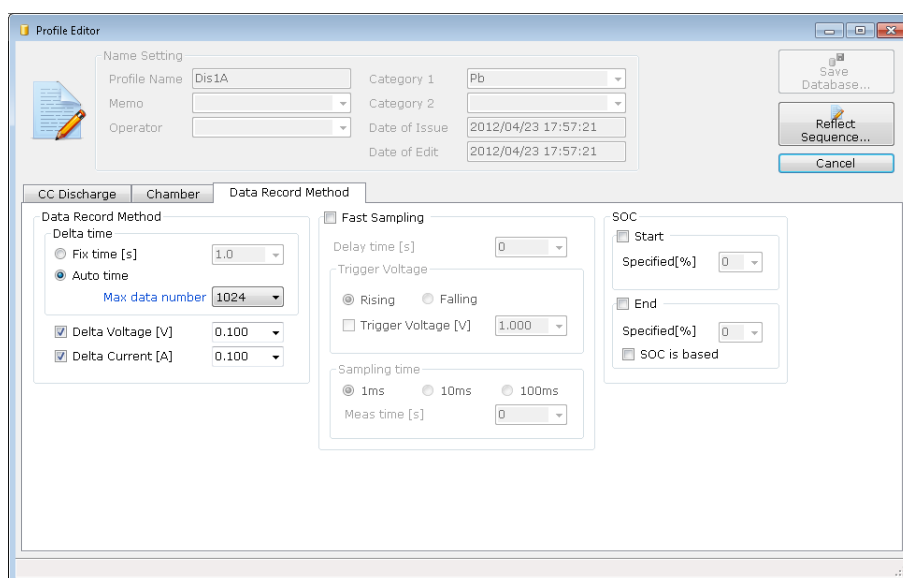
- 3 From the list, select a profile template that you want to add to the sequence. The details of the selected profile template are displayed under Contents.
- 4 Click Add to Seq. to add the profile to the sequence. The selected profile is added to the profile pane.


- 5 To add more profiles to the sequence, repeat step 3 and step 4.**
The selected profile is added to the profile pane.
- 6 When you finish adding all the necessary profiles to the sequence, click Close.**
The profile template list closes.

Changing the settings of a profile that has been added to a sequence


You can change the settings of a profile that has been added to a sequence. Changing the profile that has been added to a sequence will not change the settings of the profile template in the profile template database. If you add the same profile after changing the settings, the profile with the original settings will be added.


If you change a profile that has been added to a sequence, an asterisk is appended to the Profile Name in the profile pane. This asterisk indicates that the profile settings are different from those of the profile template in the database.



- 1 In the profile pane, select the profile that you want to change.**
- 2 Click .**
The Profile Editor opens. The Name Setting area will be unavailable.
- 3 Change the settings.**
- 4 Click Reflect Sequence.**
The profile in the sequence will be changed. An asterisk is appended to the Profile Name.

Changing the profile configuration and deleting profiles

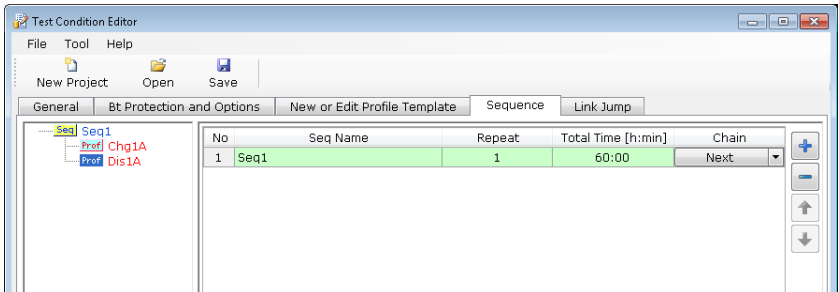
To insert a profile between two profiles, select the profile before where you want to insert the profile, and click  .

To delete a profile, select the profile that you want to delete, and click  .

To move a profile up, select the profile, and click  . To move a profile down, select the profile, and click  .

Setting sequence settings

After adding profiles, set sequence end conditions and other settings.
In the sequence pane, select the sequence that you want to configure.



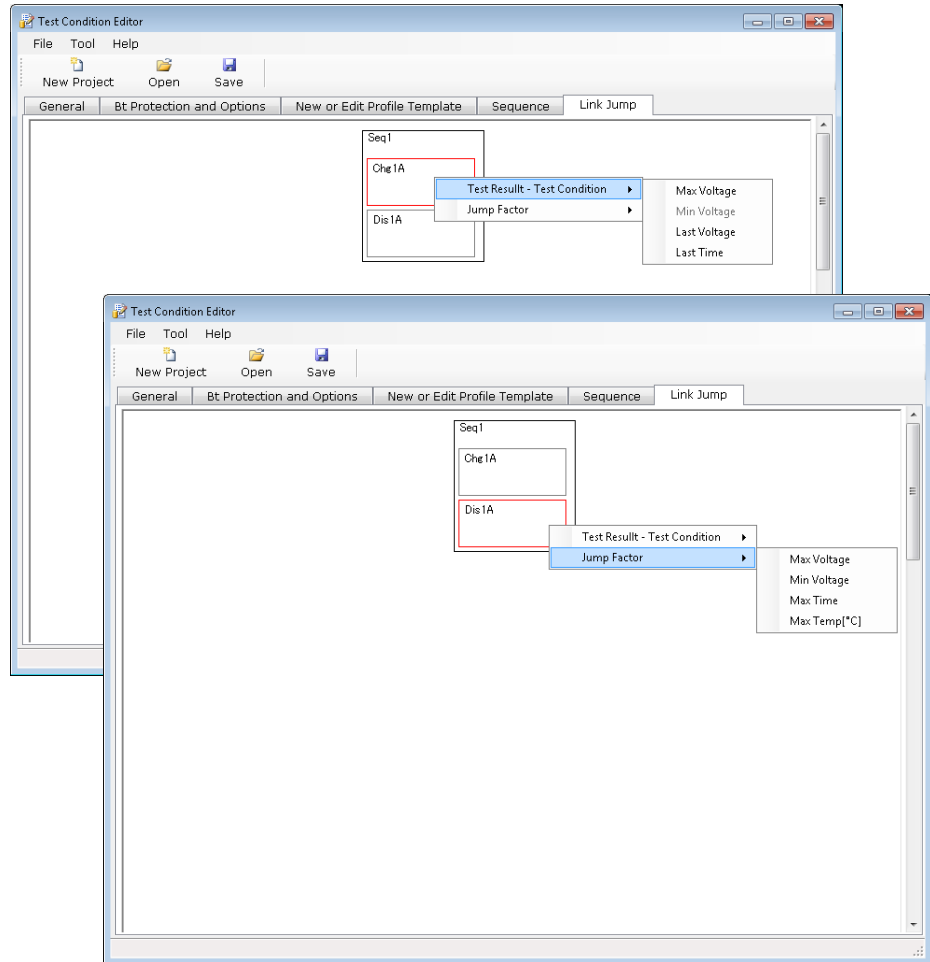
Item	Description
Seq Name	Enter the sequence name.
Repeat	A sequence execution includes the execution of all the charge/discharge tests defined in the profiles starting with the top profile. When the test of the last profile is complete, one iteration of the sequence is complete. Set how many times to repeat the sequence.
Total Time	Set the total time for executing the sequence. If more than the total time has elapsed when the last profile is complete, the sequence is ended, and the next sequence is executed.
Chain	Select whether to start the next sequence or end the test. Select Next to execute the next sequence. Select End to end the test, without executing the next sequence.

When you finish configuring all sequence settings, save the project.

Setting Links and Jumps

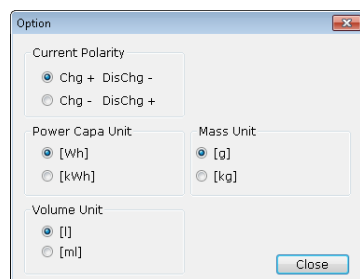
You can use test results as conditions for the following test (links) and use factors that cause the profile to stop to branch the sequence (jumps).

The Link Jump tab displays sequence settings graphically. You can use this graphical interface to set links and jumps. Use right-clicking to set links and jumps.



Other Settings

You can set current polarity, power capa unit, volume unit, and mass unit.
On the Tool menu, click Option.



Saving Projects

When you finish configuring all sequence settings, save the project.

To save a new project or overwrite a recalled project, on the File menu, click Save Project, or click Save. Enter the file name and save.

To save a recalled project with a different name, on the File menu, click Save Project As. Enter the file name and save.

After you save the project, you can start charge/discharge tests using the Test Executive.

Menu Reference

Menu			Description
File	New Project		Create a new project.
	Open Project		Open a saved project.
	Save Project		Overwrite a project.
			Save a project with a specific file name.
	Resent Project File		Open a recent project file.
	Exit		Closes the Test Condition Editor.
Tool	Utility	Backup	Back up the profile template database.
		Restore	Restore the profile template database.
		Validate	Checks whether the profile template database is corrupt.
	Option		Set the current polarity, power capa unit, volume unit, and mass unit.
Help	About		Displays Test Condition Editor information.
	Help		Displays a help file.