Rigaku

SmartLab SE

Getting Started Guide

This manual describes the correct use of the product as well the usage precautions to be observed. To obtain full-expected performance from the product, please read this manual thoroughly.

Also, store this manual at an easily accessible place so that you can promptly refer to it whenever it is necessary.

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   (3) Symantec's "Norton Internet Security version 22.8" or its subsequent version
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(2) Non-compliance of the usage instruction described on the Document,

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2) If Customer breaches any provision of this Agreement or the Additional License Terms, and such breach is not remedied within a reasonable time stipulated on the Rigaku's notice of remedy, Rigaku may terminate this Agreement.

16. Dispute Resolution

This Agreement and the Additional License Terms shall be construed and governed by and under the laws of Japan. All disputes which may arise between Customer and Rigaku, out of or in relation to or in connection with this Agreement and the Additional License Terms shall be finally settled by arbitration in Tokyo, in accordance with the Commercial Arbitration Rules of the Japan Commercial Arbitration Association.

Contents

Item No. A00010172/ A00010173
Manual No. ME13579C01
2019. 01 (First Edition)

Introduction

Overall of SmartLab SE／SmartLab Studio II

The SmartLab SE automated multipurpose X-ray diffractometer is a general-purpose X-ray diffraction system equipped with a theta-theta goniometer featuring a horizontal sample mount. By changing devices and optical units, the operator can measure and evaluate a wide variety of materials from powder samples to thin film samples.
SmartLab Studio II is a software program designed to control X-ray diffraction measurement performed by SmartLab SE and analyze the measured data. It has a function named "Package Activities" which will navigate you through X-ray measurement procedure according to the purpose of the measurement. In a **Package Activities**, a series of procedures, such as optics alignments, sample position adjustments, and measurement condition configurations, are packaged. The user just has to select a package that meets the purpose of the sample evaluation and enter simple sample information; from then on, just by following the guidance, the user can complete the measurement. Most of the optical components and devices used in SmartLab SE are recognized by SmartLab Studio II. If an incorrect slit or analyzer is mounted, SmartLab Studio II will notify the user by a message to replace the incorrect optics, thus the measurement can always be performed with the best system configuration.

Although each Package Activity is designed by expertise who are well-experienced in that field, users can customize the conditions of alignments or measurements as necessary to let the Package Activities be applicable for special cases as well. Pro Control (manual measurement) is also available, thus a wide range of users can use the system.

Glossary

Package Activity

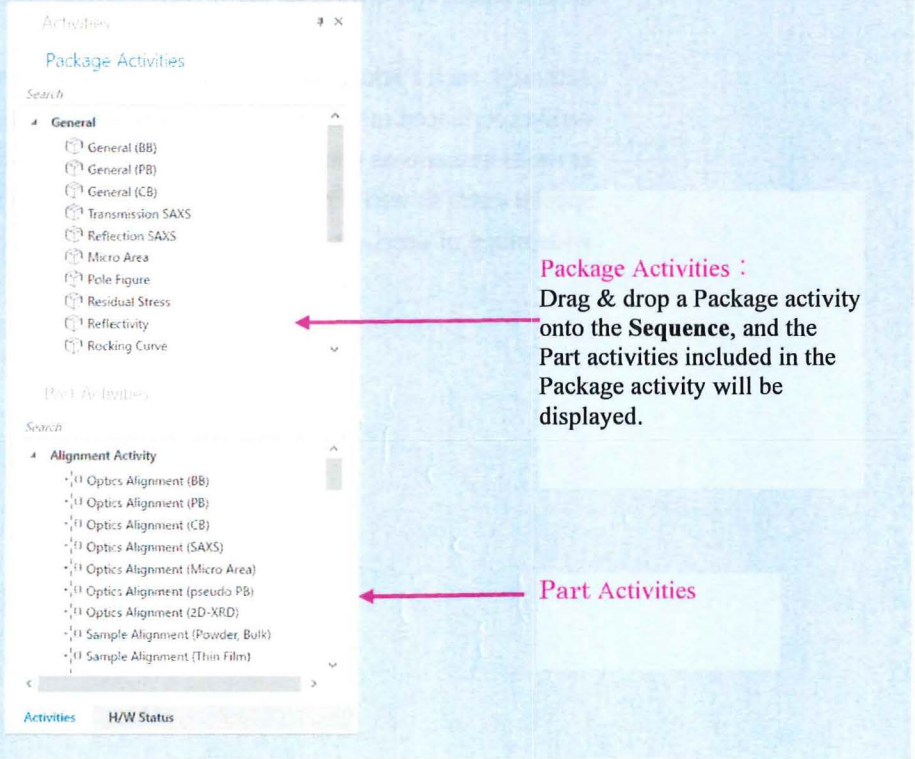
A Package activity refers to a packaged series of steps (optics alignment → sample alignment → measurement operations) in an X-ray measurement procedure. Package activities for specific analytical purposes, such as Reflectivity Package activity and Texture Package activity, are made ready in SmartLab Studio II.
A Package activity consists of multiple **Part activities**, which are steps in an X-ray measurement procedure, such as alignment or measurement.

Part Activity

A Part Activity refers to a single step, such as alignment or measurement, which are enabled by scans and axis movement. Conditions are specified in a Part Activity beforehand; therefore, using Part Activities allows easy alignment and measurement operations without the need to enter detailed scan conditions or axis drive conditions. SmartLab Studio II offers Optics Alignment Part, Sample Alignment Part, and various data measurement Parts, as well as Basic Part which provides fundamental functions such as axis drive and scan.

Activities panel

Package Activities, and **Part Activities** are shown on the **Activities** panel in SmartLab Studio II



Manuals and Helps

SmartLab Studio II provides several types of manuals and help topics. Refer to the necessary manuals and help topics according to your purpose.

Manuals

Guidelines for safe use of the X-ray diffractometer
This guideline summarizes the cautions to prevent accidents, such as X-ray exposure, electric shock due to contact with high-voltage parts of SmartLab SE, and other fatal accidents or injuries.
Read this manual thoroughly before starting to use SmartLab SE for the first time.

Getting Started Guide (this manual)
This "Getting Started Guide" describes the overall information of SmartLab SE and SmartLab Studio II together with the flow of a Package Activity which is a typical measurement procedure. When using SmartLab SE for the first time, read this manual. This Getting Started Guide does not include safety precautions upon handling SmartLab SE. Be sure to read the "Guideline for Safe use of the X-ray Diffractometer" as well.

SmartLab SE Instruction Manual
This manual describes the names of SmartLab SE parts and units and how to mount them. When using SmartLab SE for the first time, make sure to read this manual beforehand. Read this manual as necessary, such as when replacing (mounting or removing) optical units or sample attachments.

Others
Instruction manuals other than those described above may be included according to the optional components. Before using the optional components for the first time, read all the instruction manuals included with the optional components.

User Manual and Helps

SmartLab Studio II User Manual can be referred to by clicking **Manual** in the **File** menu of SmartLab Studio II. The help topics of Part Activities can also be displayed by clicking the ⓘ button on the title bar of a panel.

SmartLab Studio II User Manual
SmartLab Studio II User Manual describes the functions of SmartLab Studio II in detail. Each function is described together with a simple usage example. Read this reference help for details on the procedure of each function. Read this reference for details on how to create a macro measurement as well.

Help topic of Part Activities
This help topic describes the configuration and the alignment and measurement flow of each Part Activity.

How to make a measurement?

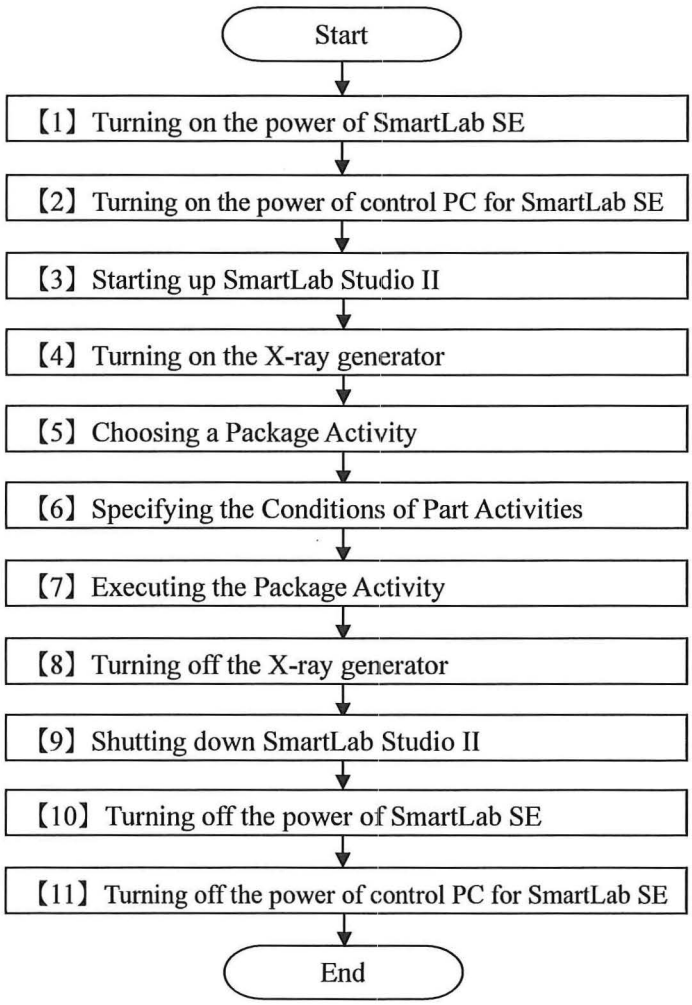
This chapter describes how to use **Package Activities**, which are typical measurement methods of SmartLab SE.

Note

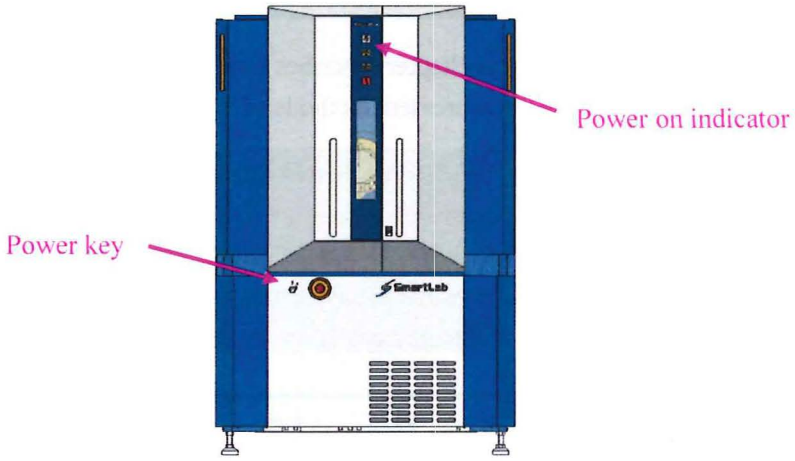
This Getting Started Guide describes only the overall information of Package Activities. It does not describe the configurations and precautions of each Package Activities in detail. For details, refer to the help topic of each Package Activity. Note that in this Getting Started Guide, the images of **General – General (BB)** Package Activity are used as examples.

The flow of Package Activity

The following flow shows the overall flow of Package Activities, from starting up SmartLab SE, specifying conditions and executing Package Activities, and up to shutting down SmartLab SE.



【1】 Turning on the power of SmartLab SE

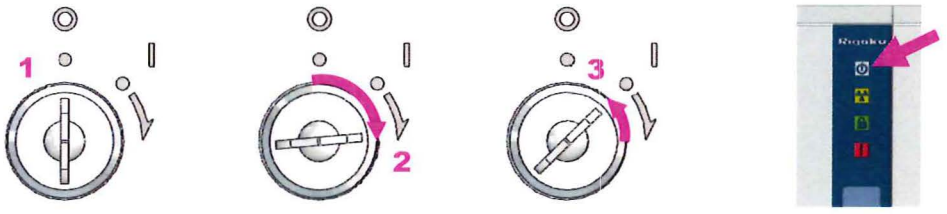


1 **Make sure that the power key is inserted into the front panel of the instrument.**
If the power key is not inserted, insert the power key.

2 **Turn the power key clockwise to the position (further to the right than the position).**

Note When the power key is turned, the instrument initialization will start. It will take about 5 minutes for the initialization to be completed. The instrument control in SmartLab Studio II is unavailable while the initialization is in process.

3 **The key automatically moves to the position and the Power-On indicator turns on.**



Power key **Power-on indicator**

Tip The power-on indicator is lighted when SmartLab SE is turned on. The alarm indicator will be blinking in red in an error occurs. For details, refer to "SmartLab SE *Instruction Manual*".

Tip If you use HyPix-400, refer to the Instruction Manual "*SmartLab SE + HyPix-400 System*" before going to the next step.

【2】 Turning on the power of control PC for SmartLab SE

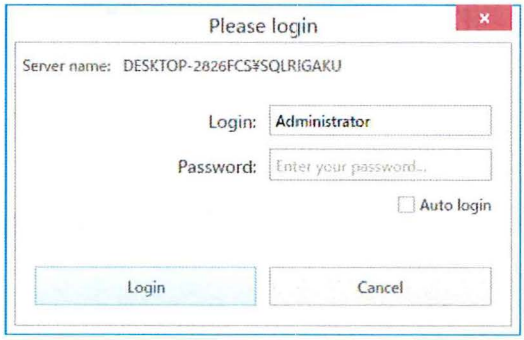
Make sure that SmartLab SE is connected to the control PC, and then turn on the PC.

【3】 Starting up SmartLab Studio II

1 **Double-click the SmartLab Studio II shortcut icon on the desktop.**

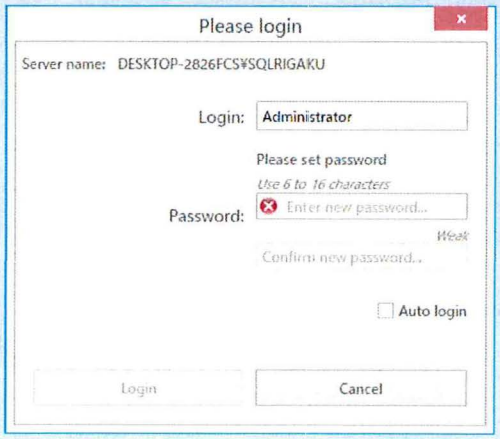
The login window appears.

2 **Enter the login name and password in the Login and Password boxes, respectively, and click the Login button.**



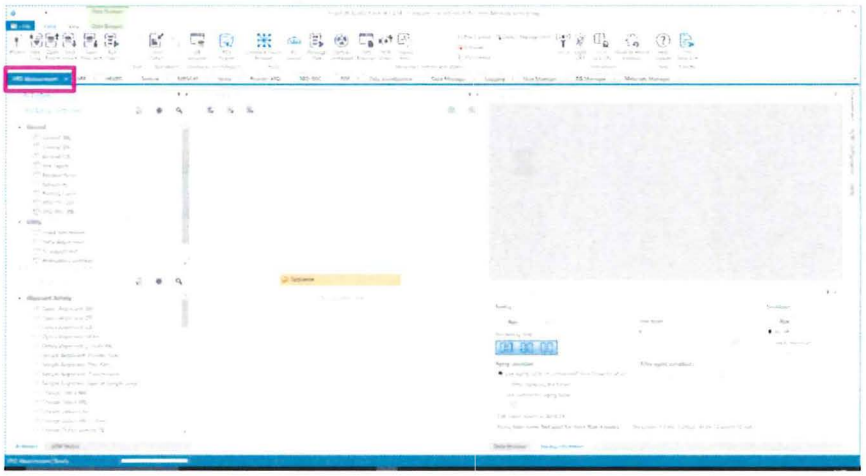
Note

Set your password when you log in for the first time.



Plugin names which are being loaded will be displayed on the splash screen of SmartLab Studio II. Please wait 30 – 60 seconds. The splash screen will be closed and the main window of SmartLab Studio II will be displayed.

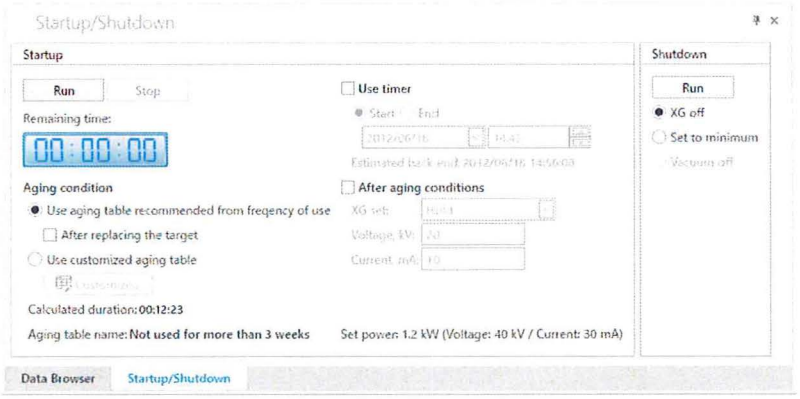
3 **Click the XRD Measurement tab to display the XRD Measurement plugin panel.**



【4】 Turning on the X-ray generator

Turn on the power of the X-ray generator and execute aging according to the procedure below. The purpose of aging is to warm up the X-ray generator. It will take about 7 to 12 minutes for the high voltage applied to become stable.

1 **Click Home – Startup/Shutdown to display the Startup/Shutdown panel.**



2 **Set the frequency of X-ray generator usage, voltage, and current.**

Select **Use aging table recommended from frequency of use** under **Aging condition**.

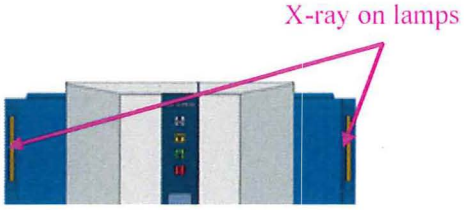
3 **Click the Excute button to start aging.**

Aging will be performed until the voltage and current applied to the X-ray tube reach the preset values.

After the aging process is completed, the tube voltage and current values will be displayed on the **H/W status** panel.

The instrument initialization which starts immediately after the power of SmartLab SE is turned on will take about 5 minutes. While the initialization is in process, the **Execute** button cannot be clicked.

Tip When the X-ray generator is turned on, the X-ray on lamps will turn on.

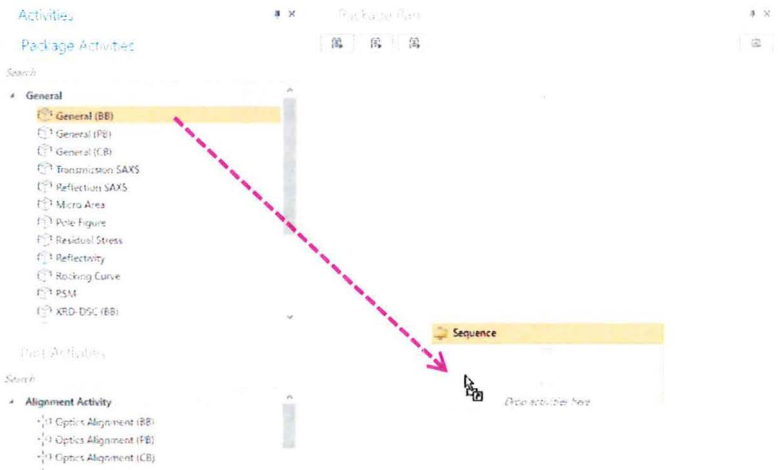


4 **Click the ✕ button to close the Startup/Shutdown panel.**

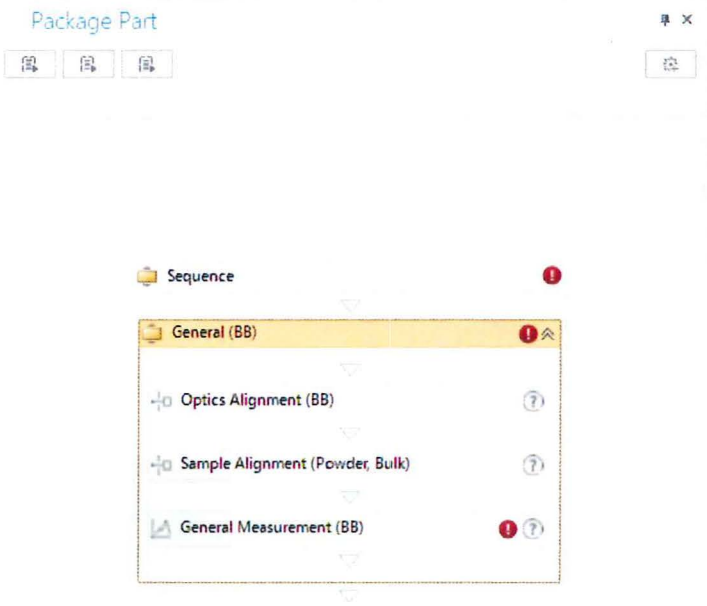
【5】 Choosing a Package Activity

In this section, choose a Package Activity according to the purpose of the measurement.

1 **Select a Package activity from the Package Activities panel, and drag & drop the Package activity on the Sequence in the PackagePart panel.**
Here, select **General (BB)** from the **General** section, and drag & drop it on the **Sequence** panel.



2 **The conditions settings panels of the three Part activities will be displayed on the Sequence.**



【6】 Specifying Conditions of Part Activities

Specify the conditions of Part Activities displayed on the **Sequence** according to the procedure below.
In this section, the **General – General (BB)** Package Activities is used as an example.

Specifying Optics Alignment Part conditions

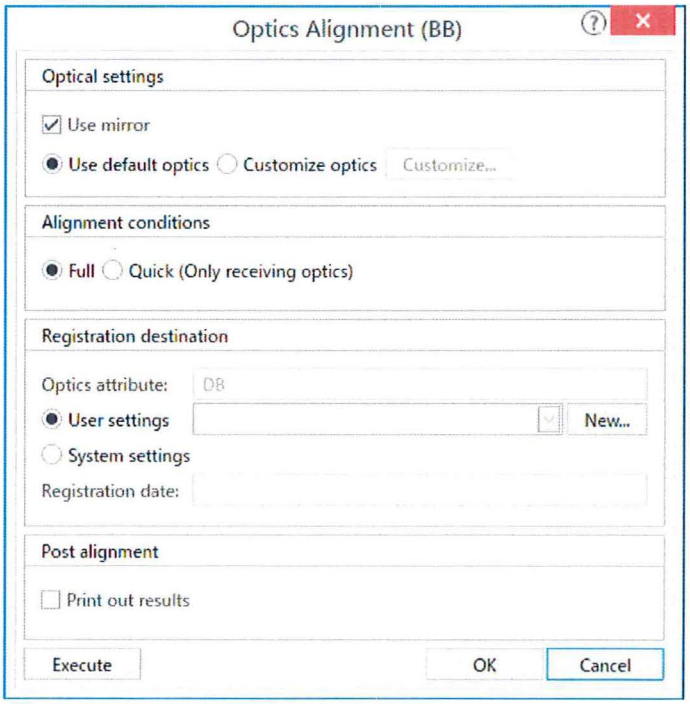
To display a Part Activity dialog box, click the Part Activity button on the **Sequence**.

1 **Click the Optics Alignment (BB) button on the Sequence, and then set conditions in the Optics Alignment (BB) dialog box that appears.**

(1) To change the optical components and devices to be used in the alignment, select **Customize optics**, and then click the **Customize** button.

(2) Select **Full** if you perform the alignment from the beginning. Select **Quick (only receiving optics)** if you perform the quick alignment based on the past alignment results.

(3) Select the name to register the alignment results from the **User settings** box, or click the **New** button and enter a new registration name.



Tip

For details on how to specify the conditions, click the ? button and refer to the help topic that appears.

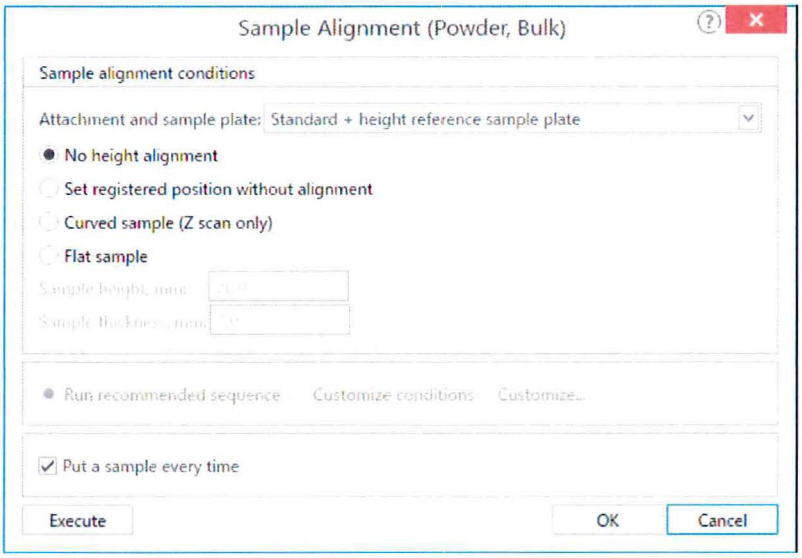
Specifying Sample Alignment Part conditions

1 **Click the Sample Alignment (Powder, Bulk) button on the Sequence and set conditions in the Sample Alignment (Powder, Bulk) dialog box that appears.**

(1) Select the attachment and sample plate to be used in the alignment.

(2) Select one of the four sample alignment conditions.

(3) To customize the scan conditions, select **Customize conditions** and then click the **Customize** button.



Tip

For details on how to specify the conditions, click the ? button and refer to the help topic that appears.

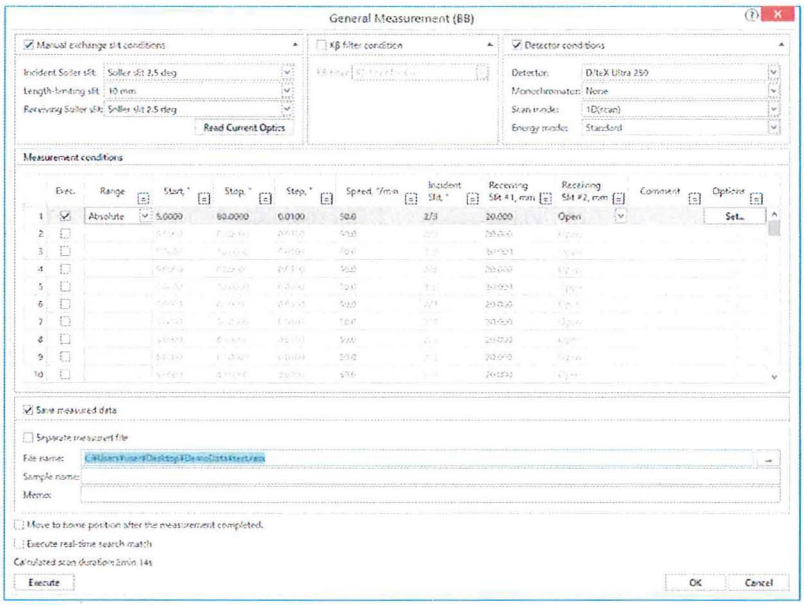
Specifying Data Acquisition Part conditions

Specify the file name to save the measurement result as. Specify the measurement conditions of the data as well.

1 Click the General Measurement (BB) button on the Sequence and set conditions in the General Measurement (BB) dialog box that appears.

(1) If you use different manual exchange slit(s) used in the alignment, check the **Manual exchange slit conditions** box and select the slit(s) which you are going to use.

(2) To save measurement data, check the **Save measured data** box. Click the ... button to open the **Save As** dialog box, and then set the destination folder and the filename.



Tip If you use database, all the measured data will be saved in the database. If you save data in the Windows file system, run SmartLab Studio II without using database, or export data stored in database as a file.

For details on how to specify the conditions, click the ? button and refer to the help topic that appears.

Scan mode

The XRD Measurement plugin contains the following five scan modes. The choices will change based on the installed detector.

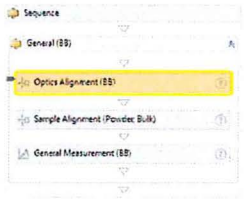
Scan mode	Description	Output data	HyPix-400	D/teX Ultra 250 series
2D (scan)	TDI scan	Image data Profile data	✔	
2D (Single exposure)	Detector is fixed during measurement.	Image data Profile data	✔	
2D (Multiple exposure)	Exposure and detector's movement are alternately repeated in the scan range.	Image data Profile data	✔	
1D (scan)	TDI scan	Profile data	✔	✔
1D (Single exposure)	Detector is fixed during measurement.	Profile data	✔	✔
1D (exposure)	Exposure without moving the detector	Profile data	✔	✔
0D (continuous)	Continuous scan by 0D mode	Profile data	✔	✔
0D (step)	Step scan by 0D mode	Profile data	✔	✔

【7】 Executing Package Activity

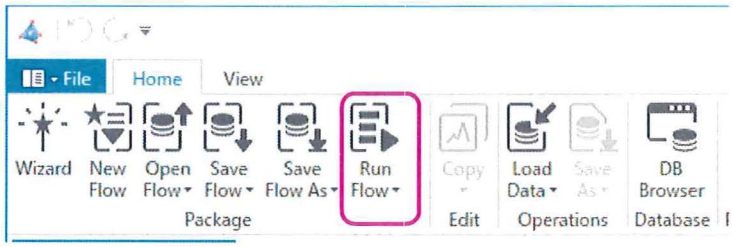
After all of the Part conditions are configured, prepare the sample and execute the Package Activity according to the procedure below. When a message prompting you to exchange the sample appears while the Package Activity is in process, exchange the sample on SmartLab SE.

Each part can be executed individually.
For more details, refer to the help topic of each Part Activity.

The running Part will be highlighted.



1 **Click the Run Flow button on the Home tab to execute the Package Activity.**

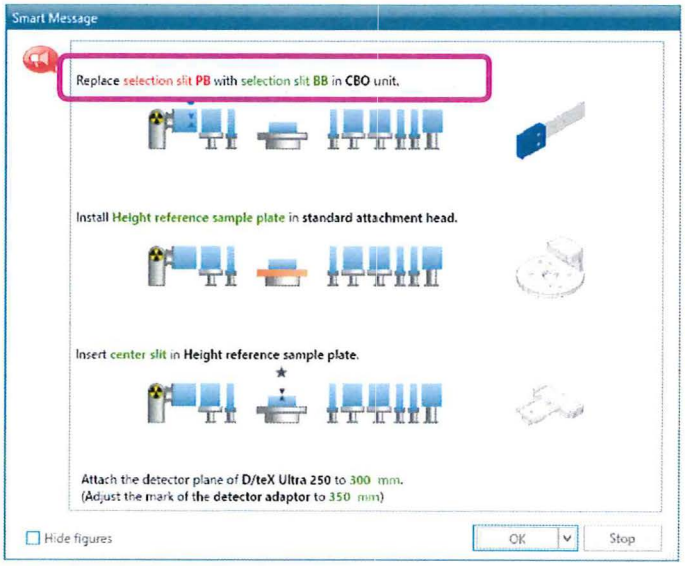


The optics alignment Part, sample alignment Part, and data measurement Part are performed in sequence.

2 **Follow the instruction of the displayed message to execute the Package Activity.**

If a message similar to the following message (SmartMessage) appears while the measurement is in process, replace the optics, such as selection slits, according to the procedure below.

Example: Replacing optics



(1) Open the door of the radiation enclosure.

(2) Follow the instructions in the **SmartMessage** dialog box to replace the optics.

(3) Close the door.

(4) Click the **OK** button in the **SmartMessage** dialog box.
The alignment and measurement will start.

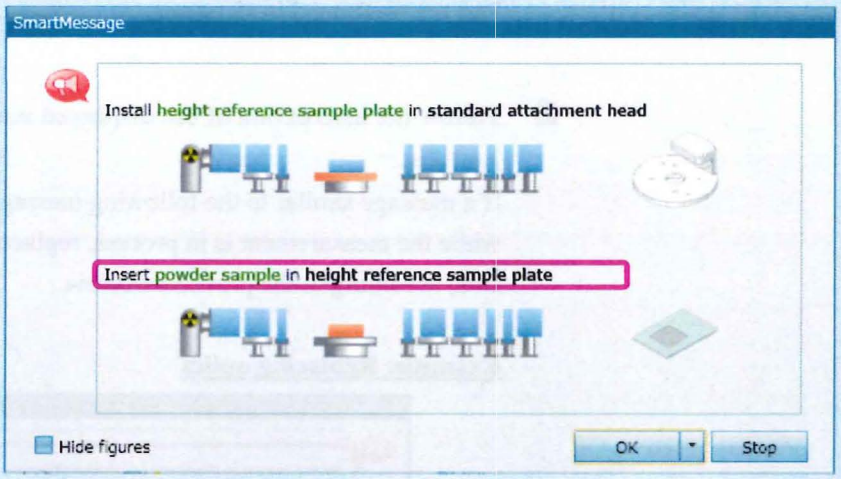
Note

In some cases, the message "Close the door of the radiation enclosure." is displayed after clicking the **OK** button of **SmartMessage**. If this message appears, confirm that the door is surely closed, and then click the **OK** button.

Note

When mounting the sample,
When the sample alignment starts, the following **SmartMessage** dialog box will appear. Mount the sample in the same procedure as the optics replacement described in step **2**.

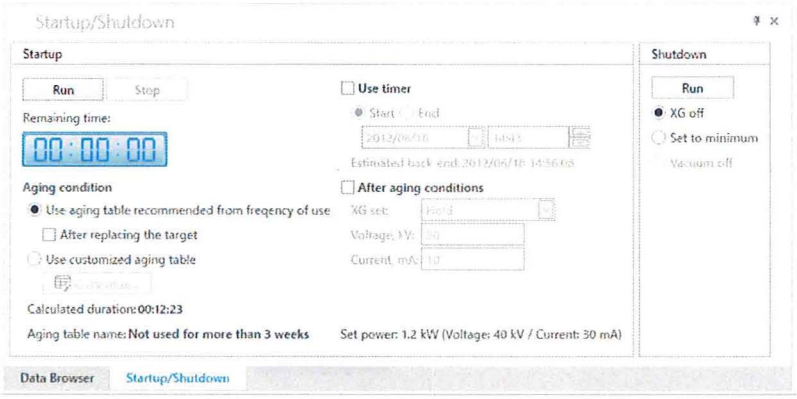
Example: Mounting a sample in **General – General (BB)** Package Activity



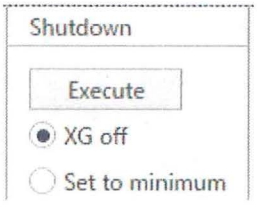
【8】 Turning off the X-ray generator

After all measurements are completed, turn off the power of the X-ray generator according to the procedure below.

1 **Click Home – Startup/shutdown to display the Startup/Shutdown panel.**

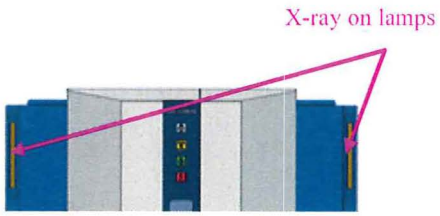


2 **Select XG Off in the Shutdown pane. Click the Execute button.**



The X-ray generator will turn off within a few minutes.

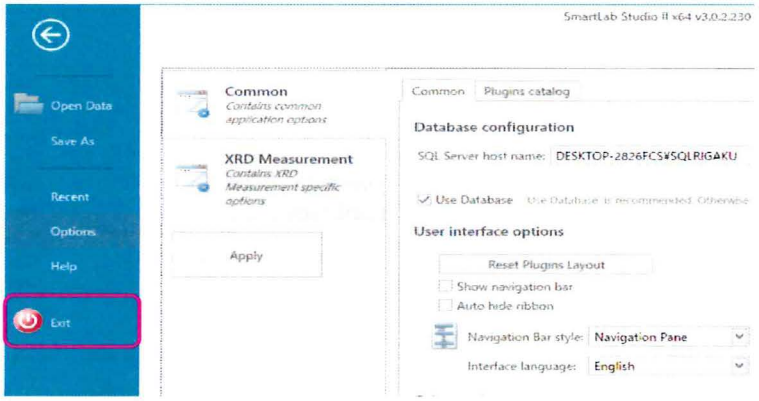
Tip X-ray on lamps will turn off when the X-ray generator turns off.



【9】 Shutting down SmartLab Studio II

After turning off the X-ray generator, shut down SmartLab Studio II according to the procedure below.

1 **To shut down the SmartLab Studio II program, select Exit under the File menu.**



【10】 Turning off the power of SmartLab SE

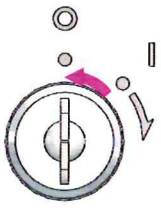
When not using SmartLab SE for an extended period of time (such as during New Year holidays), turn off the power of SmartLab SE according to the procedure below.

1 **Confirm the status of SmartLab SE.**

Confirm that measurement is completed, the X-ray generation is OFF, all the controlling processes are completed, and the power key is inserted in the front panel of SmartLab SE.

2 **Turn the power key counterclockwise to the ◎ position.**

3 **Confirm that the power-on indicator is turned off.**



Power key

Power-on indicator

【11】 Turning off the power of control PC for SmartLab SE

Turn off the power of control PC for SmartLab SE.

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