FB12 Single Tube Luminometer

User's Manual

FB12-e-07/06

Berthold
DETECTION SYSTEMS

Contents

Typographical Conventions

FB12 Luminometer

Messages on the LC display are printed in boldface type,
e.g. menu **MEASURE**, **SCROLL** or **MAIN**.
The <**ENTER**> function key is printed in boldface inside pointed brackets.

PC software

Menu and option titles of the PC software *are* printed in boldface inside square brackets ([ ]),
e.g., [**File**], [**Options**].

PC software buttons *are printed* in boldface *inside* pointed brackets (<>),
e.g., <**OK**>, <**Start Quick Measurement**>, <**F1**>, <**enter**>, <**Alt**>.

Safety Instructions

The **FB12** luminometer was manufactured in accordance with safety requirements for electronic and medical luminometers. It is the operator's responsibility to adhere to regulations on the installation and/or operation of sample measuring systems that are required by law. The user must assure that assays for in-vitro-diagnostic use are validated with the system.

The manufacturer guarantees safe operation of the equipment, both electrically and mechanically, if user follows the instructions set forth in this manual. The user must ensure that the instruments are set up and installed in such a way that their function is not impaired.

The instruments have been tested by the manufacturer and are supplied in a condition that allows safe and reliable operation.

This User's Manual includes information and warnings that have to be observed by the user to ensure safe operation of the instruments.

Please adhere to the following safety instructions before taking the instrument into service and during operation of the system:

1. Only trained personnel may operate the instrument. It is strongly recommended that all users read this manual prior to use.
2. The instrument may only be used for the designated application. A single sample luminometer is employed for detection of chemi- and bioluminescence in different sample tube formats.
3. **Berthold Detection Systems** assumes no liability for any damages, including those to third parties, caused by improper use or handling of the device.
4. The system is designed according to the IEC 1010-1 or EN 610 10-1 regulations for electrical measuring systems.
5. Only qualified personnel may carry out Service and repair work . Reassemble it completely before use.

6. The user may only perform the maintenance work described in this manual.
7. Use only parts described in this manual for servicing.
8. The instruments are live and improper handling may cause damage.
9. If you realize that the instrument has become unsafe to use, switch it off and disconnect it from the power supply.
10. All instruments supplied and all additional devices must be grounded. Use three-prong, grounded plugs.

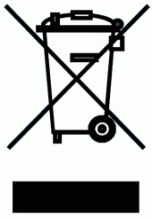
11. **Before** opening the locking screw or the instrument head on the top side of the instrument, disconnect power and then open the sample drawer to protect the photomultiplier against direct incident light. **Otherwise, the photomultiplier may get damaged!**
    Do not keep the sample drawer open for a long period of time.
12. If liquid gets inside the instrument, pull the power cord. Clean the unit or have it cleaned by an authorized service center .

The tests and maintenance work recommended by the manufacturer should be performed to make sure that the operator remains safe and that the instrument continues to function correctly. Authorized service engineers must perform any service and maintenance work not described in the operating manual.

Return shipment

If the instrument has to be returned to Berthold Detection Systems for servicing or inspection, we recommend that you use the original cardboard box.

Please remove the reflector (sample holder) in order to avoid damage to the sample chamber (see chapter 14).



Disposal

This luminometer contains electronic parts. To prevent environmental pollution please dispose the instrument and the corresponding accessories according to the directive 2002/96/EC or contact your local representative.

1. Getting Started

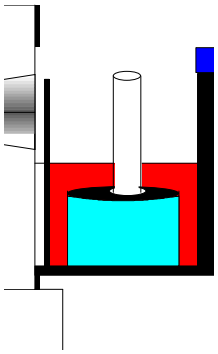
Description

The FB12 luminometer is a highly sensitive and compact single sample luminometer, designed specifically for the detection of chemiluminescence and bioluminescence in different kinds of applications. It can be employed for all glow type measurements. The sample chamber accommodates various sample formats. FB12 may be operated as a standalone instrument using special Windows software..

Optionally, an external printer can be connected to the **FB12**. In this case, additional cut-off measurements can be run on the standalone instrument and the results can be output to printer (see chapter 11).

Luminometer installation

- ❑ The instrument should be set up in a dry, dust-free environment and protected from direct sunlight and significant temperature fluctuations!
- ❑ Carefully unpack the **FB12 Luminometer** and put it on your desktop.
- ❑ Plug the connector module that fits into your wall outlet onto the power supply unit.



- ❑ Plug the power supply unit into a wall outlet and the pin connector of the power supply unit into the socket on the instrument rear panel.
- ❑ Turn the instrument on at the mains switch. The display will show: „Please wait“ while the instrument is performing a self-test. Then the main menu appears.
- ❑ Open the sample drawer and insert the sample holder (reflector).

- ❑ Different sample formats may be used:
  Culture dishes with up to 35 mm diameter
  Scintillation bottles containing up to 20 ml
  Reaction bottles with up to 12 mm diameter and up to 75 mm length (see chapter 13).

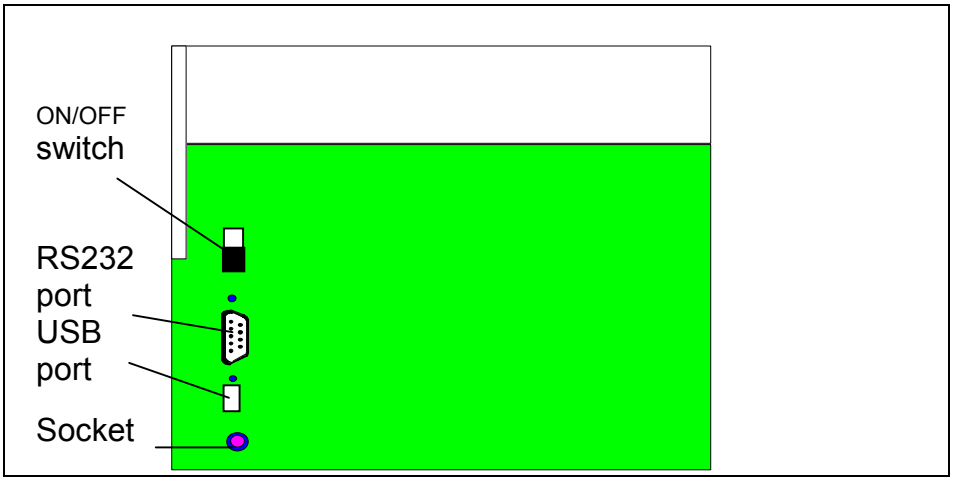
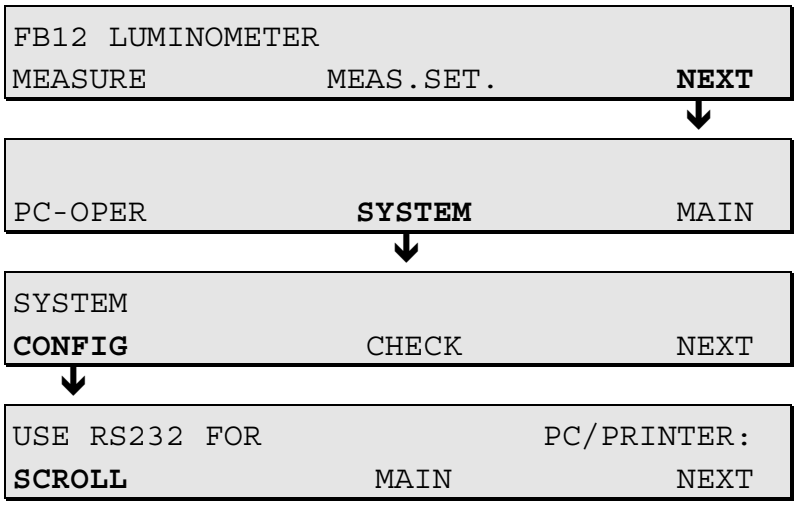


Figure 1: *FB12 Luminometer (rear view)*

Configuration

Set up the instrument parameters according to your needs as follows (confirm entries with <**Enter**>, push <**Next**> to continue with next display):



- ❑ Select **PC** if the **FB12** is used as standalone instrument for raw data measurements or if the luminometer is connected to a PC.
- ❑ If you are using the **FB12** as standalone instrument to run cut-off measurements or you want to print out raw data, then connect an external printer and select **PRINTER** (see chapter 11).
- ❑ Then select the desired language and enter **Date** and **Time**, **Baudrate** (9600) and the RLU factor = 1.

2. Structure of Microprocessor Software

Operating elements on the front panel

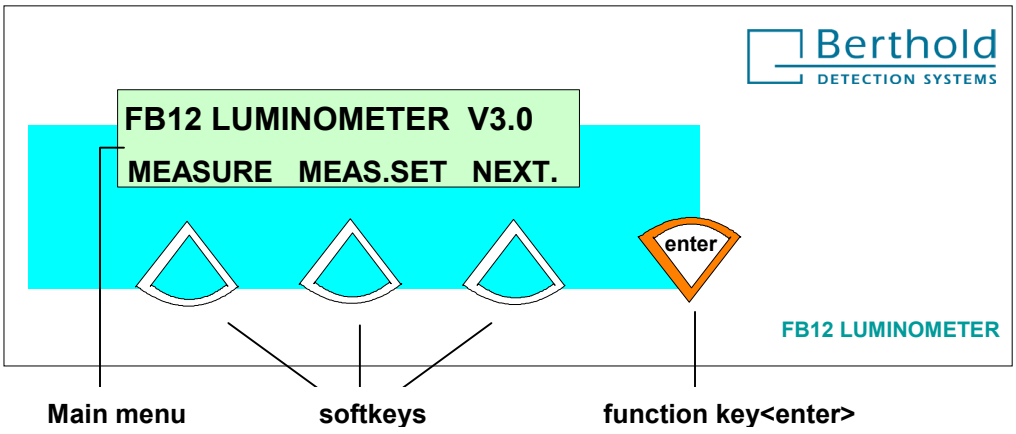


Figure 2: Operating elements on front panel

Meaning and operation of individual functions

MEASURE Measurement in stand-alone mode after input of measurement parameters and configuration.

MEAS.SET. Define the measurement parameters for stand-alone operation.

If the interface is set to **PRINTER**, you may choose parameter entry either for a raw data or for a cut-off measurement (see chapter 11).

PC-OPER Switchover to **PC-OPERATION**. This function is not available if the interface has been set to **PRINTER**.

SYSTEM

CONFIG: Define the system parameters.

CHECK: Here a continuous measurement is performed (see chapter 3.3).

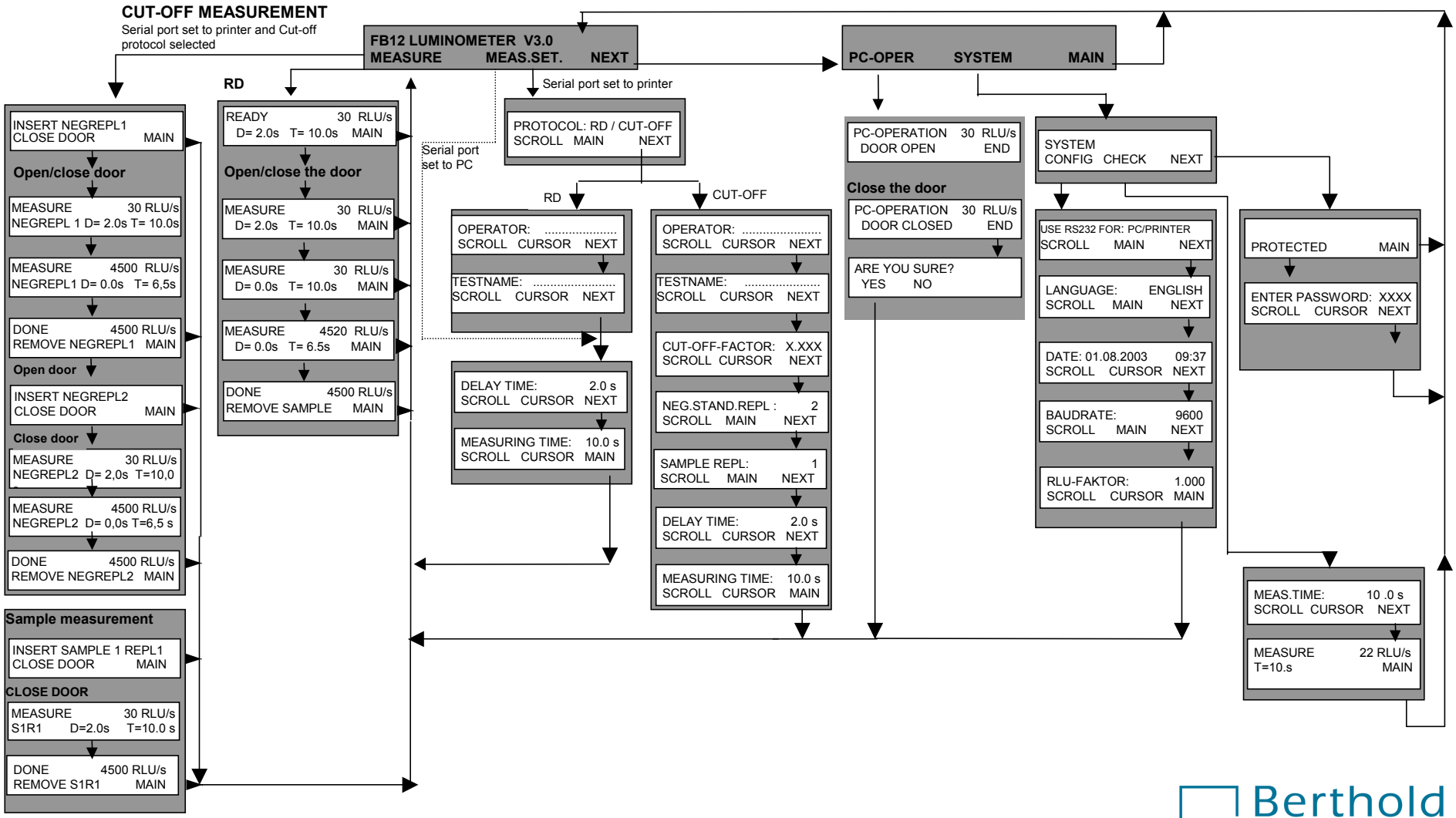
Accept Confirm each entry or new setting with **<ENTER>**. If you want to keep a setting, you may proceed directly with **NEXT** or **MAIN**.

Input

CURSOR Move the cursor left.

SCROLL The highlighted digit or letter is incremented by 1 (cyclical order: 0, 1... 9, 0, 1... and A, B ...Z, A ...).

Menu Structure of the Instrument Software



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3. Measurement in Stand-alone Mode

3.1 Overview

The luminometer should be switched on at least 30 minutes before starting a measurement.

Units

Luminescence is measured in „Relative Light Units“ (RLU). The RLU/s displayed by the FB12 luminometer are equal to the counts/s picked up by the detector, with the default RLU factor set to 1.

RLU/s = cps • RLU factor

The factory-set factor (=1) should be changed only when comparing results measured with different luminometers. The entered factor multiplies all measured results; it is changed on the main menu under **SYSTEM**.

Overload

If one or several measured values in the measurement interval exceed the measuring range of the luminometer, OVERLOAD appears on the display. To obtain a meaningful result, the sample has to be diluted and measured again.

```
DONE                    OVERLOAD RLU/s
REMOVE SAMPLE                    MAIN
```

Definition of measurement and delay time

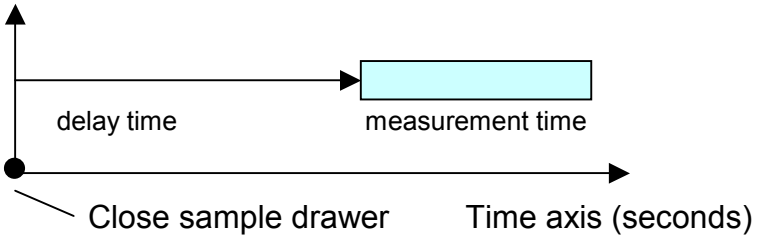


Figure 3: Illustration of delay and measurement times

All delay times start with the closing of the sample drawer. The minimum delay time is 1 s.

Discarding and repeating a measurement

Opening the sample drawer will terminate a measurement.

In the raw data mode the display shows:

```
MEAS. ABORTED!
PRESS ENTER!
```

Close the sample drawer and push <**ENTER**> to start the next measurement.

In case of a cut-off measurement (only possible if the interface has been set to **PRINTER**), the following display appears:

```
MEAS. ABORTED!
REPEAT                          DISCARD
```

REPEAT Repeat measurement of replicate sample.

DISCARD Measure next sample.

The measured values are calculated depending on this selection.

Data output on display

Only raw data in RLU/s are displayed.

3.2 Raw Data Measurement

In the raw data mode, samples are measured and numbered consecutively.

Creating a protocol[1)]

```
FB12 LUMINOMETER
MEASURE          MEAS.SET          NEXT
```

```
DELAY TIME:                        2.0 s
SCROLL            CURSOR            NEXT
```

```
MEASURING TIME:                   10.0 s
SCROLL            CURSOR            MAIN
```

- ❑ Define delay time and measurement time.
- ❑ Press **MAIN** to return to the main menu.

Raw Data Measurement

- ❑ The display shows the main menu:

```
FB12 LUMINOMETER
MEASURE          MEAS.SET          NEXT
```

```
READY                          30 RLU/s
   D= 2.0s        T= 10.0s          MAIN
```

- ❑ Insert sample tube and close sample drawer. The measurement starts.

```
MEASURE                      4500  RLU/s
   D= 2.0s        T= 10.0s          MAIN
```

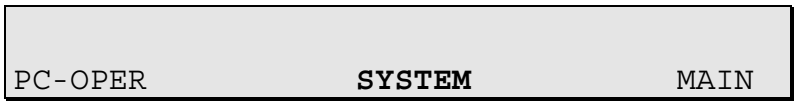
- ❑ At the end of the measurement time the following display appears:

```
DONE                           4500 RLU/s
REMOVE SAMPLE                       MAIN
```

[1)] If the interface has been set to **PRINTER**, you can here choose between raw data and cut-off (see chapter 11).

3.3 Check Mode

The check function enables the user to check the photomultiplier if no measurement is running. The measured RLU values are displayed continuously regardless of whether the sample drawer is open or closed. Push **MAIN** to terminate the measurement.



- Push the **SYSTEM** button to open the PARAMETER menu.

- Push the **CHECK** button. The selected measurement time is used as integration time.

- Change the measurement time with **SCROLL** and confirm with **<ENTER>.** Push **NEXT** to start the measurement.

- Push **MAIN** to return to the main menu.

4. Working with the FB12 PC Software

4.1 PC Software Installation

- ❑ Close all *Windows* applications.
- ❑ Insert software CD in the CD drive. The CD navigator will automatically start the internet browser.
- ❑ Select "**Software**" in the navigator bar, then "**FB12/Sirius Software Installation**".
- ❑ Double-click the **Setup.exe** file to initiate the setup.
- ❑ If the CD navigator does not automatically start, open Windows Explorer and select CD drive. Double-click **start.htm** to start the CD and continue, as described above, to install the software.
- ❑ Follow the instructions of the setup program. When the program is started, the [**Welcome**] screen is displayed. Click **<Next>**. The [**Choose Destination Location**] dialog box appears. Click **<Next>** to keep the defaulted directory **C:\…\FB12 software**. Click **<Browse>** to choose another directory. Select the base software and the different protocol types in the [**Select Components**] dialog box.
- ❑ Click <**Next**>: [**Select Program Manager Group**].
- ❑ Click <**Next**> (display of [**Start Installation**]).
- ❑ Click **<Next>** to start the installation.
- ❑ Upon completion of the installation process, click <**Finish**>.
- ❑ The software includes a 30 days trial option for non-purchased software components.

Important information for Windows NT/2000 users

Please ensure the software is installed in administrator mode. For work with the software administrator rights are not necessary.

Installation of additional protocol types

Proceed as described above. Select the protocol types needed in the [**Software Components**] dialog box. Then complete the installation.

Instructions for use of USB connection

After installation of the FB12/ Sirius software, connect the luminometer to PC using the USB.

- ❑ The PC will recognize that there is a new device and ask for a driver. Follow the installation wizard and install the respective driver from your CD.
- ❑ Note the communication settings in Windows System [**Hardware**],[**Device Manager**]. The USB Serial port is usually assigned as COM3 or higher. Notice the assigned COM port for selection in the [**Serial port**] box of the FB12/ Sirius software (see 4.2).

4.2 Initial Software Start Up

- ❑ Double-click on the **FB12** software ICON.
- ❑ Click on the <**Options**> button.
- ❑ Select the serial port used (**COM1** or **COM16**) in the [**Serial Port**] box. For use of the USB connection select the COM port assigned to the USB Serial port (see 4.1). COM1 or COM2 are generally used for RS232 connection. Set the baud rate to [**9600**].
- ❑ In the [**Default Data storage directory**] box, enter the directory where the measurement data are to be saved.
- ❑ To hear a signal at the end of a measurement, select the item [**Beep when measurement is completed**].
- ❑ Click <**OK**> to save the entries. The program changes to the Protocol Manager.

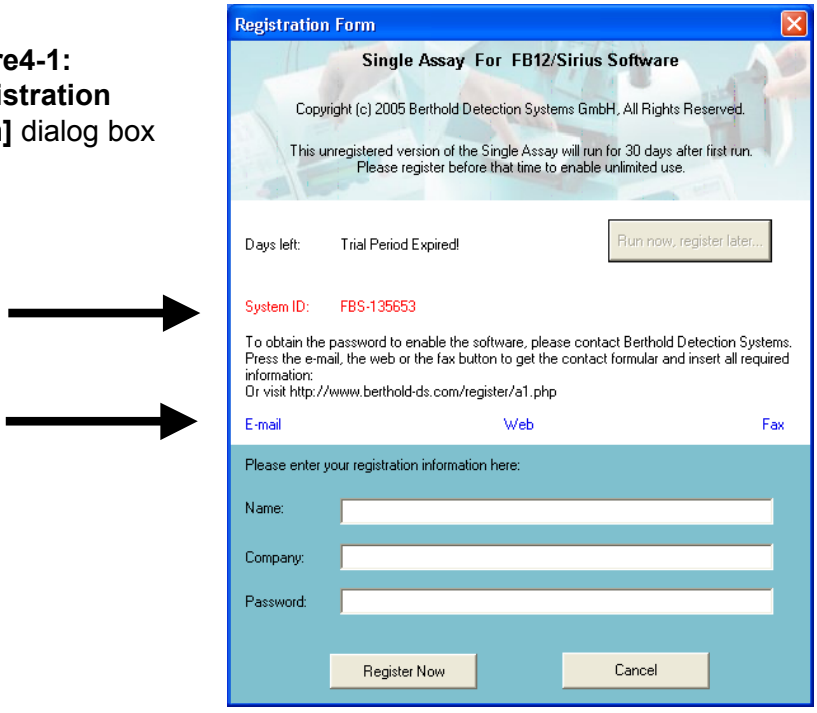
Software Registration

FB12/ Sirius software may be used for 30 days without registration. A prompt to enter a registration password will appear each time a protocol is selected or the measurement menu is opened until registration passwords are entered. User may close the **Registration Form** dialog box by clicking **<Run Now, Register Later>** and continue working with the software.

The passwords must be entered within 30 days in order to continue working with the software. The [**Registration Form**] dialog box appears again; either enter registration password or click **<Cancel>** to close this dialog box.

Passwords may be requested via **E-Mail, Fax or Web**. Follow the instructions on the registration form. Press the respective E-mail, Web or Fax button, insert required information in the predefined mail, fax form or web registration form and forward to **Berthold Detection Systems.**

Figure4-1: [Registration Form] dialog box



Passwords may also be requested via the BDS homepage. Please provide the **System ID** of the PC. The number is printed in red in the registration dialog of the software.

Registration

Owner will receive registration passwords from **Berthold Detection Systems** (one password for each purchased protocol).

When [**Registration Form**] dialog box appears, enter the user`s name, the company name and the **password for that protocol**. Click <**Register Now**>. Upon entry of correct passwords, the software may continue to be used. The [**Registration Form**] dialog box will not appear again.

4.3 Basic Software Structure

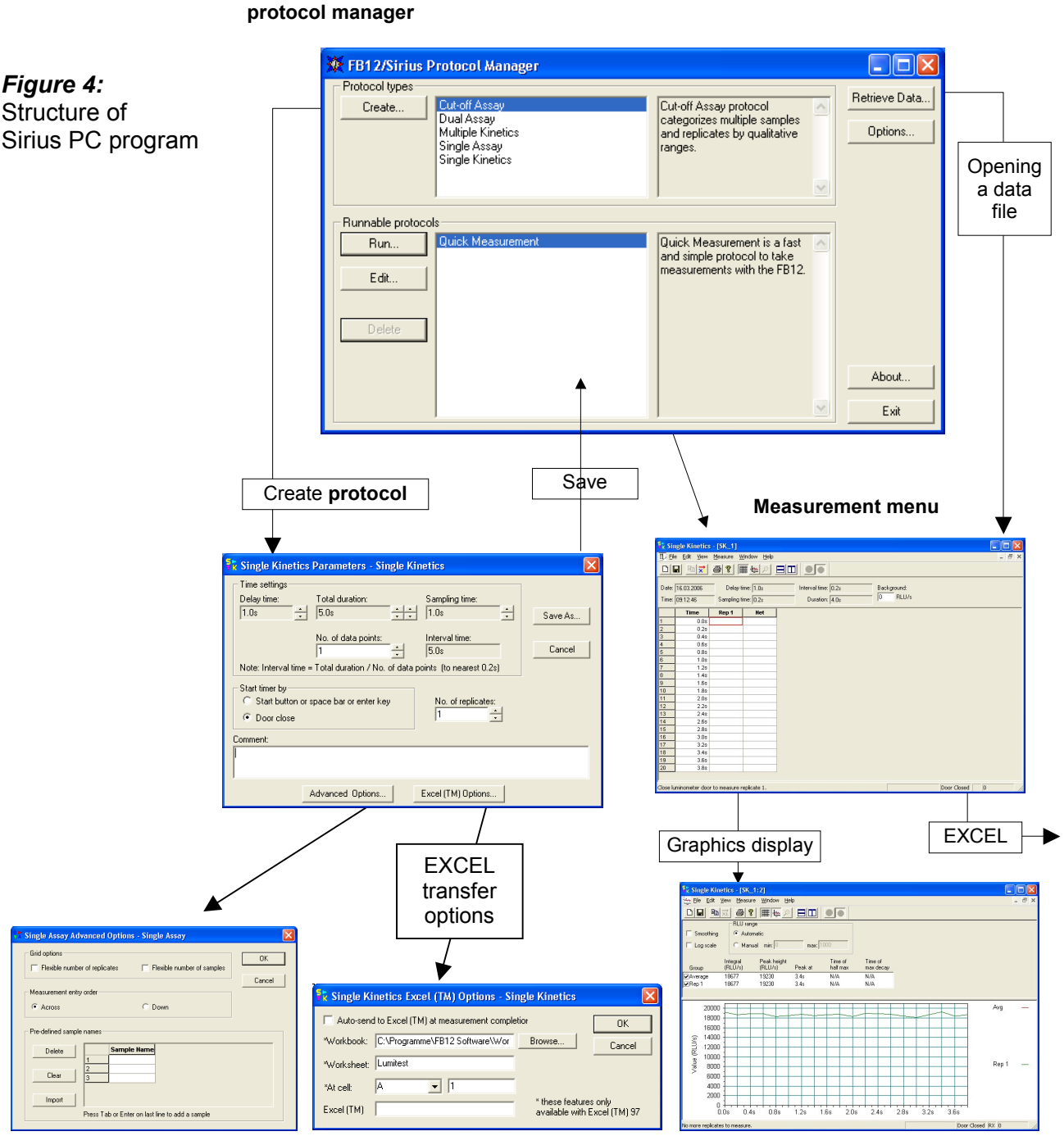


Figure 4: Structure of Sirius PC program

4.3.1 Protocol Manager

[**Protocol types**]
Shows the protocol types which can be used as templates for creating protocols.

[**Runable protocols**]
Shows a list of created protocols. Protocols are edited using the buttons in this box:

<Run>
Shows the measurement menu and you can start a measurement with the selected protocol.

<Edit>
Edit the parameters in the selected protocol.

<Delete>
Delete the selected protocol.

Quick Measurement
is not a protocol type, but a measurement protocol; parameters may be changed, but may not be stored in separate protocols.

<Retrieve>
Shows the stored measurement data; double-click to open the desired data file (*.MDS).

<Options>
Gives information about the used COM port, the Baud rate and the default data storage directory.

4.3.2 Measurement Menu

Select the desired protocol and click <**Run**>. The measurement menu is displayed.

Before starting a run
On the luminometer: Select **NEXT** and then **PC-OPER** (see chapter 4.4).

Measurement start
By opening / closing the sample drawer or pressing the green button or the spacebar.

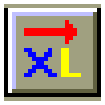
Meas. completed
As soon as the measurement time is over.

Measurement stop
By opening the sample drawer or pressing the red button.

Single values
Measured results are transferred from the luminometer to the PC every 0.2 seconds. To view single values, place the cursor over a measured result.

Result fields
To change the size of a result field, move cursor to the right-hand margin of the header. As soon as the cursor shape changes to a double-arrow, click the left mouse button and drag the cursor, with the mouse button held down, left or right.

EXCEL Transfer



Click the button depicted to the left to manually import data into a new or predefined Excel worksheet. The transfer may also be automated in the protocol.

4.3.3 Working with the Software

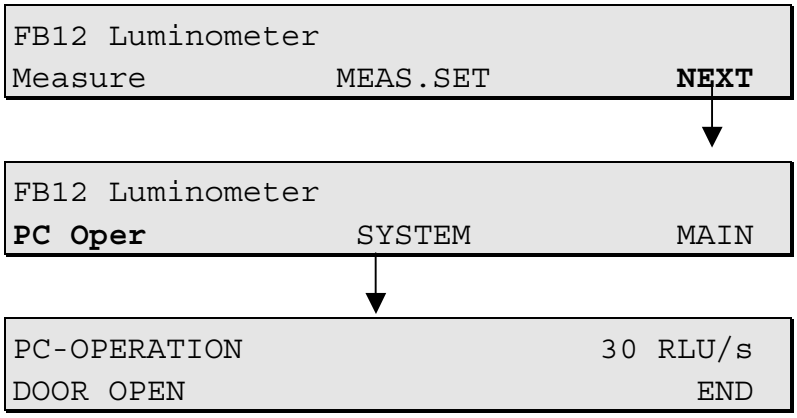
Tool buttons on the measurement menu simplify program handling. Apart from a few exceptions you need not select any pull-down menus.

Tool buttons and their meaning:

Button	*Meaning*	*Pull-down menu -> Option*
	Save measurement data	[**File**] -> [**Save (as**)]
	Import measurement data into Excel	[**Edit**] ->[**Send to Excel**]
	Print	[**File**] -> [**Print**]
	Start measurement	[**Measure**] -> [**Start Measurement**]
	Stop measurement	[**Measure**] -> [**Stop Measurement**]
	Delete last measurement	[**Measure**] -> [**Delete Last Measurement**]
	Display results in spreadsheet	[**Measure**] -> [**Kinetics**]
	Display results in a graph	[**Measure**] -> [**Kinetics**]
	Tile window horizontally	[**Window**] -> [**Tile Horizontal**]
	Tile window vertically	[**Window**] -> [**Tile Vertical**]
	Create new data file in measurement menu	
	Copy selected data to clipboard	

4.4 FB12 Luminometer Setup

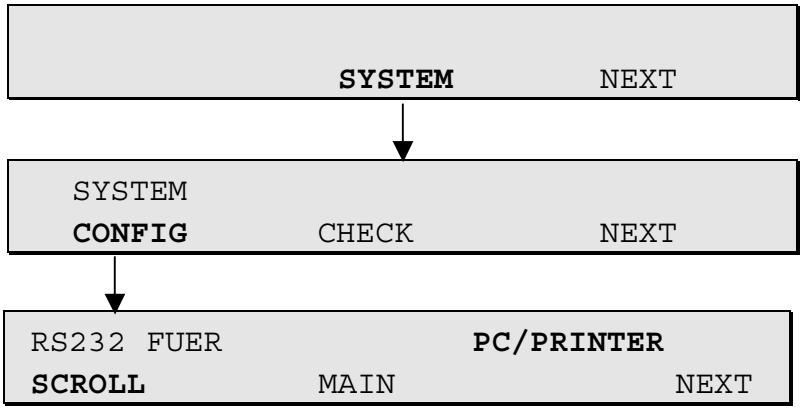
- Connect the FB12 luminometer with the respective cable (supplied) to a serial COM port or USB port on your PC.
- Select **NEXT** and **PC-OPER** on the main menu to **set the FB12 luminometer to PC operation**.



- The measuring instrument is now in the PC operation mode. The measured values are displayed continuously in the top row. The bottom row shows the status of the sample drawer. Push **END** to return to the standalone mode.

Note!

The function PC operation is not available if the serial interface has been set to **PRINTER**. To configure the interface for PC operation, set the RS232 interface configuration on the SYSTEM menu to PC communication.



- ❑ Push **SCROLL** and change the instrument from **PRINTER** configuration to **PC** configuration.
- ❑ Push **<ENTER>** to confirm your entry. Push **MAIN** to return to the main menu.
- ❑ On the main menu, select **NEXT** and then **PC-OPER** which is now available.

4.5 Comparison of Software Protocols

To help you get a quick overview of the different protocol types, we have summarized their functions in the table below:

	Quick Measur.	Single Assay	Single Kinetics	Multiple Kinetics	Dual Assay	Cut-Off-Assay
Function		Measurement of several samples with replicates	Continuous measurement of one sample	Several samples, discontinuous measurement	Measurement of sample series A and B	Classification of samples
1st sample = BG	no	yes	no BG may be defined	no BG may be defined	yes	Yes
Replicates	no	flexible	yes	yes	same number for A and B	yes: for samples, neg. and pos. controls
Number of samples	any	flexible	1 sample measured with any data points	any, with any data points	same number for A and B	yes: for samples, neg. and pos. controls
Calculations	none	>1 replicate: average value %stdv/av	>1 replicate: average value %stdv/av repl. 1, repl. 2 log/normal scaling, smoothing, peak half-life time during increase and decay	>1 replicate: average value %stdv/av repl. 1, repl. 2 log/normal scaling, smoothing, peak half-life time during increase and decay	>1 replicate: average value %stdv/av	>1 replicate: average value %stdv/av
Kinetics graph	none	always for last sample	complete graph of all replicates	complete graph of all replicates	always for last sample	always for last sample
Miscellaneous	Meas. sequence	predefined sample names		measurement start only at closing of sample drawer	predefined sample names different calculation formulas for A and B	predefined sample names different cut-off calculations and classifications

BG = Background

5. Quick Measurement

This protocol type measures the raw data of consecutively numbered samples.

5.1 Protocol

- In the **Protocol Manager**, select the [**Quick Measurement**] protocol and click <**Edit**>. The [**Quick Measurement Parameters**] dialog box appears.
- Set **Delay time** for the measurement and **Measurement time** by clicking on the respective arrow buttons.
- Click <**Save**> to save the measurement parameters. The program returns to the Protocol Manager.

5.2 Measurements

- In the **Protocol Manager**, select the [**Quick Measurement**] protocol and click <**Run**>. The measurement menu appears showing the parameters *Measurement time* and *Delay time* defined for the measurement.
- Open sample drawer and insert sample tube.
- Close sample drawer. The measurement process starts as soon as the preset delay time is over.
- The result is displayed at the end of the measurement.
- Proceed in the same manner to measure the next sample.

6. Single Assay

This protocol type allows you to run background measurements and to measure replicates of samples.

6.1 Protocol

Select **Single Assay** and push **<Create>**.

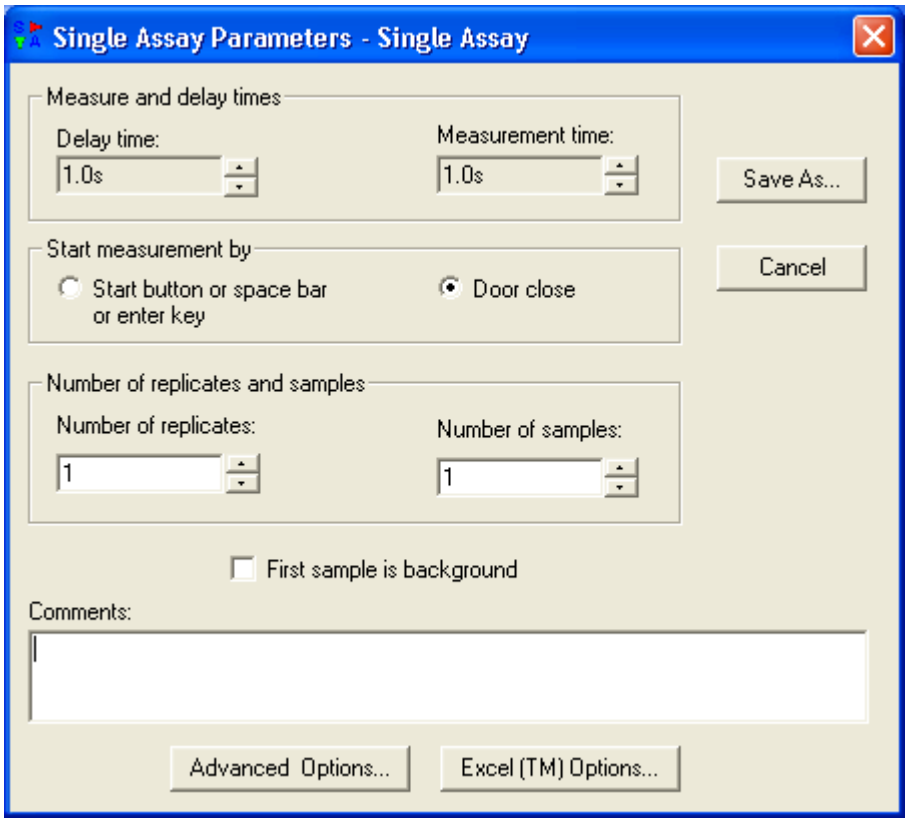


Figure 6-1: *Dialog box* ***[Single Assay Parameters]*** *Page 1*

[Delay time]
Delay before measurement; can be set only if a measurement is started by closing the sample drawer.

[Measurement time]
Measurement time for each sample measurement.

[Start Meas. by]
Select how to start the measurement on the measurement menu:

[Start button]

By clicking the Start button or pressing the spacebar. No delay time can be defined here!

[**Door close**]
By closing the sample drawer of the luminometer.

[**Number of replicates**]

[**Number of samples**]

[**First sample is background**] Measurements of the first sample replicate are considered background measurements.

<Advanced Options>
Opens page 2 of the **Single Assay Parameters** dialog box.

Figure 6-2: *Dialog box [**Single Assay Parameters**] Page 2*

[**Grid Options**]
You may select a flexible table set-up, so that the number of replicates and/or samples may be changed during measurement at the push of a button.

[**Measurement orders**]
Order of measurement

[**Across**]

Sample	Rep1	Rep2
1	→	
2		
3		

Measurements are carried out by rows: first, all replicates of the first sample, then all those of the second sample, etc.

[**Down**]

Sample	Rep1	Rep2
1		
2	↓	
3		

Measurements are done by columns, e.g. first the first replicate of all samples, then the second replicate of all samples, etc.

6.2 Measurements

Preparation At luminometer: Select **NEXT** and then **PC-OPER.** In the *PC* software : Select a protocol (type **Single Assay**), click <**Run**> and the program will go to the measurement menu.

Parameter Display of the run parameters. If you have defined the number of replicates as variable, you may change this by clicking on the respective button. A background value can also be set manually if no background measurement is carried out. The value entered here is subtracted from the raw data of each sample.

Measurement start By opening / closing the sample drawer or by clicking on the Start button.

Results The measurement values will be displayed in a table depending on the definition in the protocol with the following columns (one row for each sample):

[**Sample**] Sample name.

[**Rep...**] One column has been reserved for each replicate. If the number of replicates was defined as variable in the protocol, you may increase the number of columns by clicking the appropriate button (+).

[**Average**] This column contains the average values, calculated from the replicate results of that row.

[**%SD/Avg**] Standard deviation in percent, divided by average value.

[**Net**] Average value minus background value.

[**%SD/Net**] Standard deviation in percent, divided by net average value.

Graph

The measurement data trend of each single measurement with data points can be displayed in a graph, either online or at the end of the measurement, by clicking the graph button.

7. Dual Assay

In the measurement mode **Dual Assay** two sample sequences A and B are measured. Subsequently, a mathematical correlation is established between both measurement sequences.

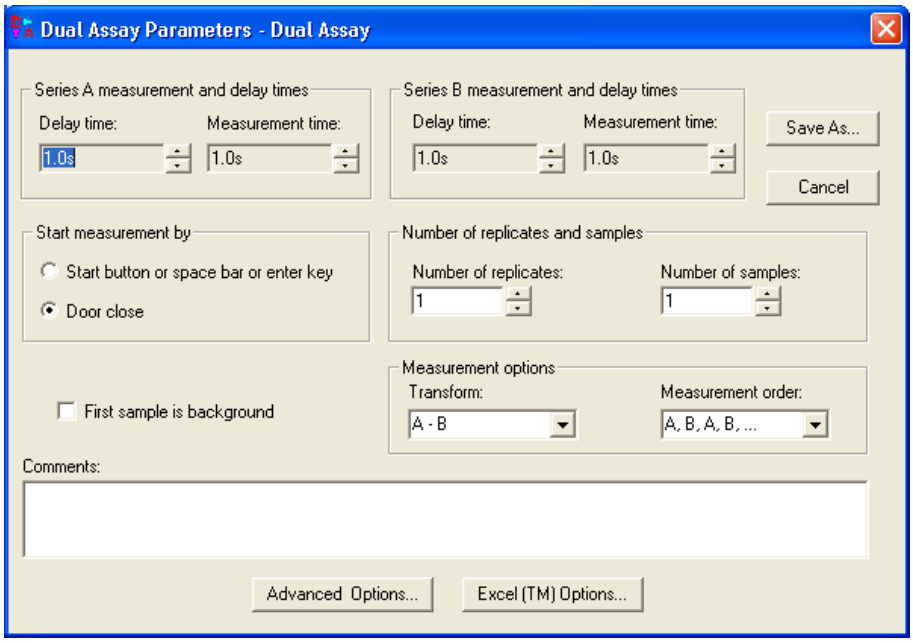
Typical application: Dual reporter gene assays.

7.1 Protocol

Select **Dual Assay** and *press* **<Create>**.

Figure 7-1: *Dialog box* ***[Dual Assay Parameters]***

Page 1



[**Series A measurement and delay time**]

[**Delay time**]
Delay for sequence A prior to each measurement; can be set only if a measurement is started by closing the sample drawer.

[**Measurement time**] for each sample measurement of series A.

[**Series B measurement and delay time**]

Enter parameters for series B in the same manner as for series A.

[**Start Meas. by**]

Select how to start the measurement:

[**Start button]**
By clicking on the Start button or by *pressing* the spacebar. No delay time can be defined here!

[Door close]
By closing the sample drawer.

[Number of replicates and samples]

[**Number of replicates**]

[**Number of samples**]

[**First sample is background**]
Measurements of the first sample replicate are considered background measurements.

[**Measurement options**]

[**Transform**]
Select the calculation formula.

[**Measurement order**]
Selection of order: Either one sample of sequence B after each one of sequence A, or all samples of sequence A in a row and then all those of sequence B.

7.2 Measurements

Preparation

At luminometer: Select **NEXT** and then **PC-OPER.** In the PC software: Select a protocol (type **Dual Assay**), click <**Run**> and the program will go to the measurement menu.

Parameter

Display of measurement parameters series A and series B. The measured background values are displayed in the [**Background A**] and [**Background B**] text boxes, if the first sample of each sequence was defined as background in the protocol. A background value can be entered manually. The value displayed here will be subtracted from the raw data of each sample.

Measurement start

By opening / closing the sample drawer or by clicking the Start button.

Results

Display of measured values:

[**Sample**]	Sample name.
[**Net A**]	Net rate of series A = average value of the replicates of the first sample of sequence A, minus background.
[**Net B**]	Net rate of series B
[**A ...B**]	Calculation of the two net rates according to the formula defined in the protocol
[**%SD/Avg**]	Standard deviation in percent/average value.
[**Rep ...A**]	Measurement value for replicates of series A.
[**Average A**]	Average value from replicate results of series A of the respective row.
[**%SD/Avg**]	Standard deviation in percent/average value.
[**Net**]	Average value minus background (series A).
[**%SD/Net**]	Standard deviation in percent/average value.

The following columns contain the measured values for series B.

8. Single Kinetics

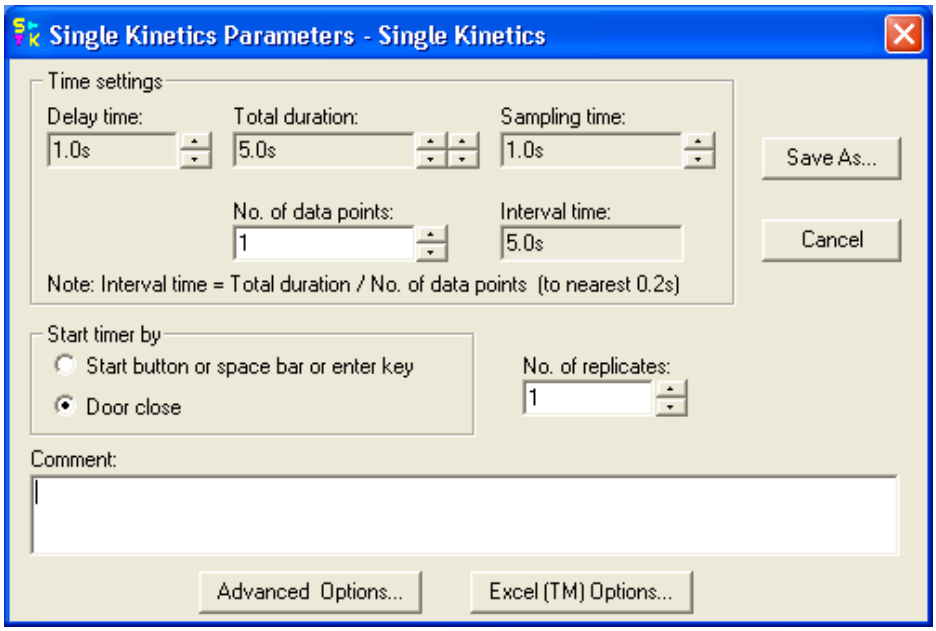
The measurement type **Single Kinetics** is used to measure the trend of the light emission over a specific period of time.

8.1 Protocol

Select **Single Kinetics** and push **<Create>**.

Figure 8-1: *Dialog box* ***[Single Kinetics Parameters]***

Page 1



[**Time settings**]
The following 5 parameters of this group box are mutually conditional (with the exception of delay time):

[**Delay time**]
Delay before each measurement; can be set only if a measurement is started by closing the sample drawer.

[**Total duration**]
Total sample measurement time, including the following times:

[**Sampling time**]
Measurement time per data point.

[**No. of Data points**]
Number of data points multiplied by the interval time shows the total duration of the measurement.

[**Interval time**]
The interval time may be longer than the individual measurement time of the data point.

[**Start Meas. by**]
Select how measurement is to be started on the measurement menu.

[**Start button**]
By clicking the Start button or pressing the spacebar. No delay time can be defined here!

[Door close]
By closing the sample drawer. Measurements with injectors can only be started in this manner.

[**Number of replicates**]

<Advanced Options>
Click this button to open page 2 of the **Single Kinetics Parameters** dialog box.

[**Use luminometer as time basis**]
Select the luminometer as time basis.

8.2 Measurements

Preparation

At luminometer: Select **NEXT** and then **PC-OPER**. In the PC software: Select a protocol (type **Single Kinetics**), click <**Run**> and the program will go to the measurement menu.

Parameter

Display of measurement parameters. You may type a background value into the [**Background RLU/s**] box. The value entered here is subtracted from the raw data of each sample.

Measurement start

By opening/closing the sample drawer or by clicking the Start button.

Results

The measurement values will be displayed in a table depending on the definition in the protocol with the following columns (one row for each sample):

[**Time**] Length of time the light emission is measured.

[**Rep...**] Measurement values for individual replicates.

[**Average**] Average value of replicates.

[**%stdv/Av**] Standard deviation in percent, divided by average value.

[**Net**] Net value (average value minus BG value)

[**%SD/Net**] Standard deviation in percent, divided by net average value.

Graph

The measurement data trend of each single measurement can be displayed in a graph, either online or at the end of the measurement, by clicking the graph button. Further options for processing the graph become visible when you enlarge the graph window.

[**Group**] Select which replicate curve(s) is to be displayed.

[**Smoothing**] Smoothes all displayed curves.

[**Log scale**] Logarithmic scaling.

[**RLU-range**] Select if scaling is to be applied automatically or manually.

9. Multiple Kinetics

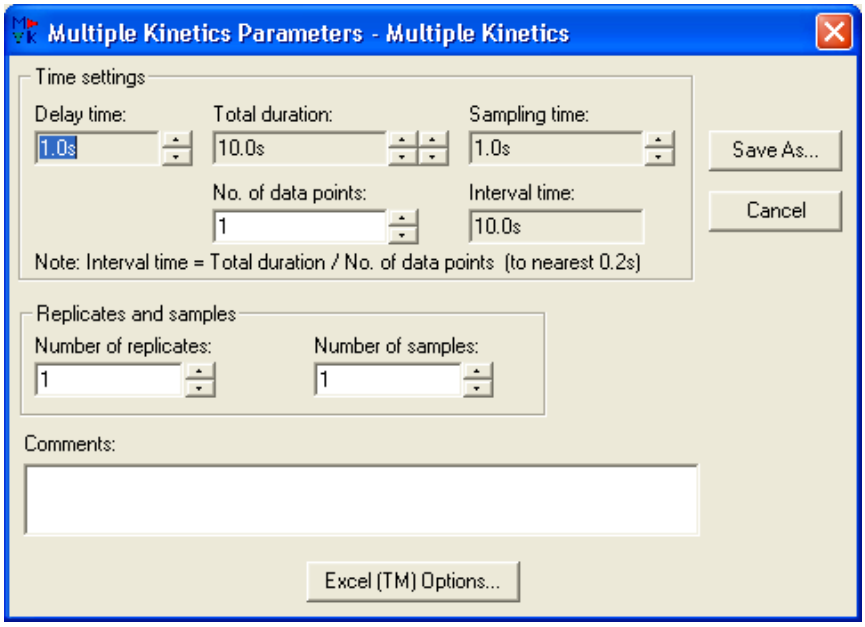
In the **Multiple Kinetics** mode, the trend of several samples is measured in parallel over a longer period of time.

9.1 Protocol

Select **Multiple Kinetics** and push **<Create>**.

Figure 9-1: *Dialog box* ***[Multiple Kinetics Parameters]***

Page 1



[Time settings]
The following 5 parameters of this group box are mutually conditional (with the exception of delay time):

[Delay time]
Delay before every measurement.

[Total duration]
Total sample measurement time, including the following times:

[Sampling time]
Measurement time per data point.

[**No. of Data points**]
Number of data points multiplied by the interval time shows the total duration of the measurement.

[**Interval time**]
The interval time may be longer than the respective measurement time of the data point.

[**Number of replicates / samples**]
The number of replicates or samples.

Please note: **A measurement can only be started by closing the sample drawer**.

9.2 Measurements

Preparation At luminometer: Select **NEXT** and then **PC-OPER.** In the PC software: Select a protocol (type **Multiple *Kinetics)***, click <***Run***> and the program will go to the measurement menu.

Parameter Display of measurement parameters. You may type a background value into the [**Background RLU/s**] box. The value entered here is subtracted from the raw data of each sample.

Measurement start By opening/closing the sample drawer or by clicking the Start button.

Results Measured values are displayed in a table:

[**Time**] Length of time, over which the light emission is measured. The number of data points in [time] is calculated by dividing the total measurement duration by the interval time.

[**S1 Rep1**] Measurement value of the first replicate of the first sample.

[**S1 Rep2**] Measurement value of the second replicate of the first sample.

[**Average**] Average value of replicates of the first sample.

[**%SD/Avg**] Standard deviation in percent, divided by average value.

[**Net**] Net value (average value minus BG value).

[**%SD/Net**] Standard deviation in percent, divided by net average value.

[**S2 Rep1**] Measurement value of the first replicate of the second sample.

[**S2 Rep2**] Measurement value of the second replicate of the second sample.

[**Average**] Average value of replicates of the second sample.

[**%SD/avg**] Standard deviation in percent, divided by average value.

[**Net**] Net value (average value minus BG value).

[**%SD/Net**] Standard deviation in percent, divided by net average value.

[**S...Rep...**] Further samples with replicates.

Graph

The measurement data trend of each single measurement can be displayed in a graph, either online or at the end of the measurement, by clicking the graph button. Further options for processing the graph become visible when you enlarge the graph window.

10. Cut-off Assay

A **Cut-off** protocol classifies samples into three categories. So-called cut-off thresholds (high and low) are measured by defining fixed parameters and measuring negative and positive controls.

10.1 Protocol

Select **Cut-off ASSAY** and press **<Create>**.

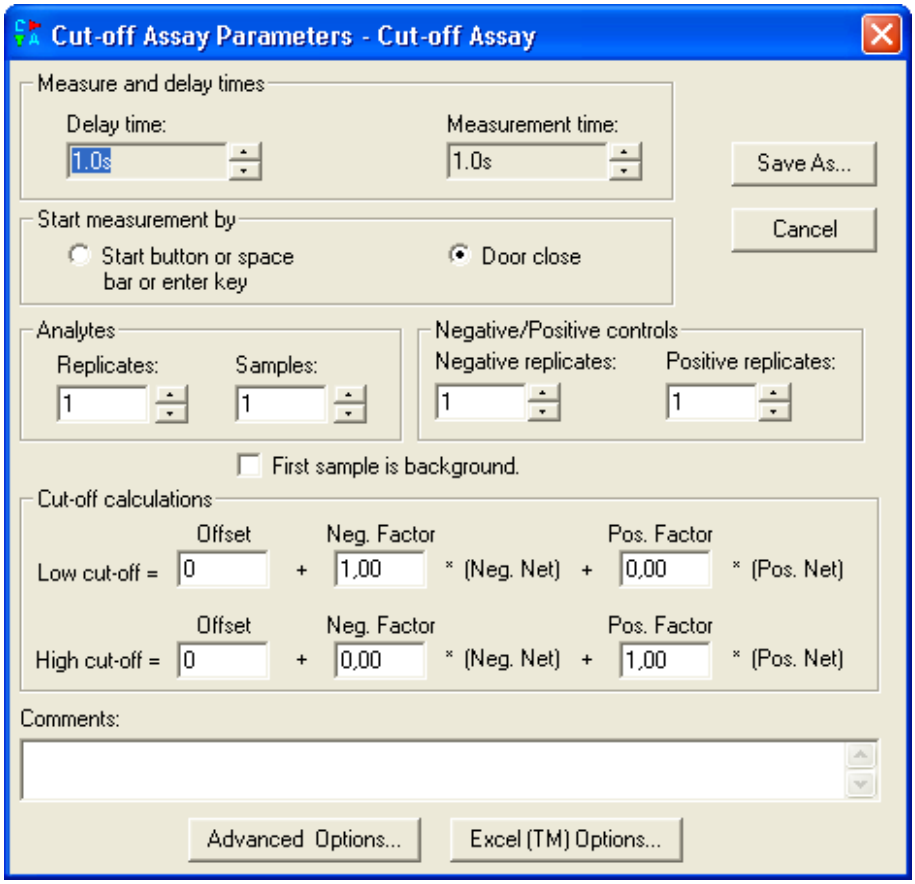


Figure 10-1: *Dialog box* ***[Cut-off Parameters]***

Page 1

[**Delay time**]
Delay time before measurement; can be set only if measurement is started by closing the sample drawer.

[**Measur. time**]
Measurement time for each sample measurement.

[**Start Meas. by**]
Select how to start the measurement on the measurement menu:

[**Start button**]
By clicking the Start button or pressing the spacebar. No delay time can be defined here!

[**Door close**]
By closing the sample drawer of the luminometer.

[**Analytes**] Define the number of replicates and samples.

[**Negative/Positive controls**]
Define the number of replicates of negative and positive controls.

[**First sample is background**]
Measurements of the first sample replicates are treated as background measurements.

[**Cut-off calculations**]
Definition of low and high threshold by the following parameters:

[**Offset**]		Offset (RLU) value
+	[**Neg. Factor**]	any constant
x	[**Neg. Net**]	net rate of negative control
+	[**Pos. Factor**]	any constant
x	[**Pos. Net**]	net rate of positive control

<Advanced Options>
Click this button to open page 2 of the **Cut-off Parameters** dialog box.

[**Result text**]
Designation for Cut-off results. The following designations are defaulted:

[**Negative result text**]	NEG
[**Positive result text**]	POS
[**Equivocal result text**]	+/-

10.2 Measurements

Preparation At luminometer: Select **NEXT** and then **PC-OPER.** In the PC software: Select a protocol (type **Cut-off**), click <**Run**> and the program will go to the measurement menu.

Parameter Display of measurement parameters. You may type a background value into the [**Background RLU/s**] box. The value entered here is subtracted from the raw data of each sample.

Measurement start By opening/closing the sample drawer or by clicking the Start button.

Results Measured values are displayed in a table:

[**Sample**]	Sample name.
[**Rep...**]	A column is reserved for each replicate.
[**Result**]	Result column. POS, NEG or +/- as result.
[**Average**]	Average value from the replicates of one sample.
[**%SD/Avg**]	Standard deviation in percent/average value
[**Net**]	Average value minus background value.
[**%SD/Net**]	Standard deviation in percent/net average value.

11. External Printer with Additional Options

The **FB12** luminometer can be upgraded by an external serial printer to output the measured results directly to printer. To this end, the interface has to be set to **PRINTER** in the instrument software. In this mode, cut-off measurements can be carried out in addition to extended raw data measurements and their results can be output to printer.

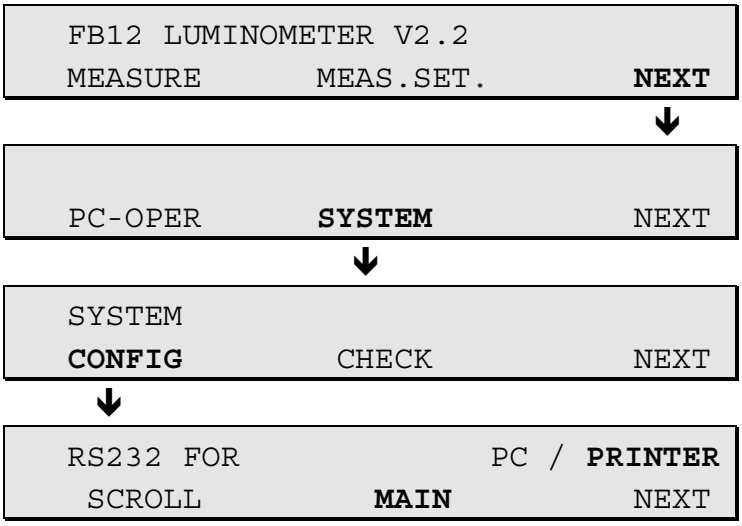
The serial port is designed for the serial printer Seiko Instruments TM DPU-414, which you can order directly from Berthold Detections Systems.

11.1 Physical Installation of the Printer

- The Seiko TM DPU-414 Thermal Printer is supplied with a power supply (7.5V) and an interface cable (9 pin data cable, male-female)
- Plug the appropriate plug module into the power supply. The power pack adjusts to the supply voltage of 220V or 110V.
- The power supply should be properly plugged into the wall outlet, while the pin plug is plugged into the connection at the back side of the printer.
- The power supply of the printer and the luminometer can be discriminated by the standard device plug (5,5mm) and the CINCH plug (3.5mmm), respectively.
- Connect the enclosed interface cable to the serial ports. The female end should be plugged in to the back of the FB12, while the male end should be plugged in to the pack of the printer.

11.2 Printer Setup

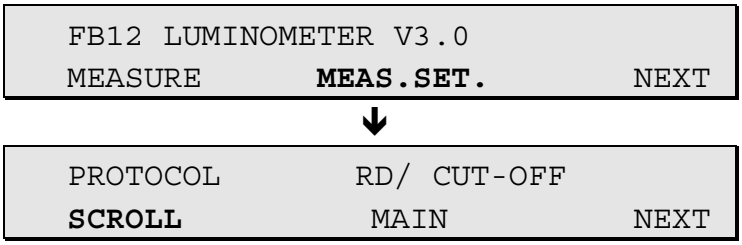
From the main menu on the FB12, press the **NEXT** button and go into **SYSTEM.**



- ❏ Press **SCROLL** to adjust the instrument from PC configuration to the printer configuration. Confirm your entry with **<ENTER>**.
- ❏ Push **MAIN** to return to the main menu.

11.3 Cut-Off Protocol

Provided the interface is set to **PRINTER**, you can choose either cut-off protocol or extended raw data protocol by pushing **MEAS.SET.** on the main menu (see chapter 11.5) and define the respective protocols:



❑ Push **SCROLL** to select the cut-off protocol.

```
OPERATOR   ....................
SCROLL              CURSOR          NEXT
                                     ↓
TESTNAME   ....................
SCROLL              CURSOR          NEXT
```

Enter a user name and a test name and then define the cut-off factor, the number of negative standard replicates, the sample replicates, the delay time and the measuring time:

```
CUT-OFF-FAKTOR:                   X.XXX
SCROLL              CURSOR          NEXT
                                     ↓
NEG. STAND. REPL.:                    2
SCROLL             CURSOR           NEXT
                                     ↓
SAMPLE REPL.:                         1
SCROLL              CURSOR          NEXT
                                     ↓
DELAY TIME:                       2.0 s
SCROLL              CURSOR          NEXT
                                     ↓
MEASURING TIME:                  10.0 s
SCROLL              CURSOR          NEXT
```

11.4 Cut-off Measurement

The **CUT-OFF** protocol will allow replicates to be measured and classified as positive or negative samples. This is done by calculating a Cut-off threshold. Based on the average of the negative standard replicates and the Cut-off factor this threshold is calculated as follows:

Ned-STD.-Replicates –Average x Cutoff-Factor = Cutoff-threshold

The RLU value of the negative standard replicates are measured at the beginning of the measurement sequence. From there the Cutoff-threshold is calculated.

If the interface has been set to **PRINTER** and you have selected the cut-off protocol (after you have pushed **MEAS.SET.)**, you can run a cut-off measurement by selecting **MEASURE** on the main menu:

- Select menu **MEASURE**.
- The Cut-off measurement menu starts.
- Place tubes for negative standard replicate 1 and close sample drawer to start the measurement sequence.
- Open sample drawer at the end of the measurement and remove sample tube.
- Proceed as instructed on the display: *insert* sample tube for 2nd negative standard replicate and close sample drawer.
- Average value and standard deviation are calculated and printed out after completion of all standard measurements. You are then prompted to insert the first sample replicate.
- Close sample drawer. The measured values as well as the result of the sample classification are printed out at the end of the measurement.
- Open sample drawer and replace sample tube.
- Following this protocol you can measure as many samples as you choose.

Printout to external printer

Example: Date: XX.XX.XXXX XX:XX
Name:
CUT OFF Assay:
Neg. STD Repl = 3 Sample replicate = 1
Delay-Time = 2.0s Meas.Time = 5.0s
Cut-off factor = 2.000

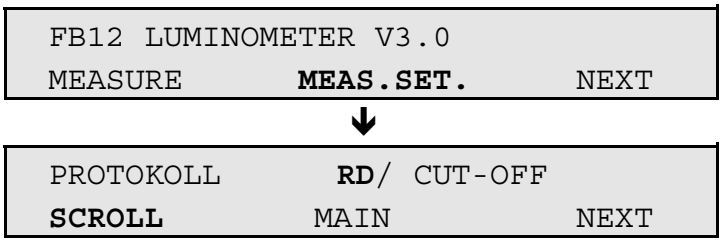
Neg. STD Repl.	Result
1	415 RLU/s
2	435 RLU/s
3	410 RLU/s

Neg. Standard Avg = 420 RLU/s
%VC = 2.6%
Cut-Off-Value = 840 RLU/s

Then the samples to be classified may be measured. Based on the calculated Cut-Off value of e.g. 840 RLU/s, any measurement results below 840 RLU/s will be denoted as NEGATIVE, while any value above 840 RLU/s will be denoted POSITIVE.

11.5 Extended Raw Data Protocol

With the interface set to **PRINTER**, select the raw data protocol on the main menu as follows:



Push **SCROLL** to select the raw data protocol. In this case, the raw data protocol is extended: you may enter a **user name** and a t**est name** in addition.

11.6 Raw Data Measurement

A raw data measurement is started just like a cut-off measurement by selecting the **MEASURE** menu.

The current measured value is printed out without any further modification or calculation. In addition, the measurement parameters you have defined, the date as well as the entered user and test name will be documented.

12. Maintenance

The **FB12** luminometer is practically maintenance-free. It only has to be protected from dirt and may have to be cleaned.

The surface of the instrument is protected by a robust and washable finish. Should it become dirty or dusty, we recommend wiping it with a damp cloth. If necessary a mild detergent (**not** an abrasive!) can be used.

The sample drawer and especially the measurement window also have to be kept clean and should be wiped off with a damp cloth if dirty.

Please keep in mind that the screw on top of the instrument must always be firmly closed. The PMT may get damaged by incidence of light.

No fluid should ever enter the instrument! If this should happen, disconnect the instrument immediately and notify a service representative!

13. Technical Data

Sample format	• Sample tubes up to 12 mm diameter (12 mm = standard) and up to 75 mm length, with or without cap • 35 mm diameter culture dishes • Scintillation vials up to 20 ml • Microfuge tubes
Detector	Photomultiplier tube with bialkali cathode, effective spectral range 300-600 nm (extended range on request), operated in photon counting mode
Sensitivity	Less than 1,000 molecules firefly luciferase 1 amol ATP in a HS assay
Dynamic range	6 decades
Hardware	Micro-controller controlling all instrument functions
Microprocessor software	Operation via 3 softkeys and 1 <**ENTER**> button • Delay and measurement time settings in increments of 0.1 s • Data output in RLU/sec Additional data evaluation modes (external printer required) • Extended raw data protocol, • Cut-Off protocol
Measurement time	0,2 - 99.9 s
Interfaces	RS 232 or USB interface for PC connection
Printer	External printer (option)
Dimensions	W 220 mm, D 170 mm, H 220 mm
Weight	approx. 2.5 kg
Power supply	DC 12 V, 0.6 A, supplied through mains adapter (included)
Temperature range	Storage 0° - 40° C Operation 10° – 35°C
Humidity	10% - 80%

PC software	MS Windows application for measurement and evaluation
Platform/ Required Hardware	Windows® compatible PC, Pentium like processor, RS232 or USB port.
Operating System	Windows® 2000, XP
Additional Software	Microsoft® EXCEL 2000, XP (optional)

Accessories

Order number	Description
18100010	Reflector type RFB201.3
18120010	Power supply unit (12V, min. 0.8 A, input voltage 100-240V)
18200250	Serial data cable
18200260	USB cable
13200500	5 ml tubes, 12x75 mm, 500 each
15300100	External thermo printer Seiko DPU 414 with data cable, power supply (12V, min. 0,8 A, input voltage 100-240V)

14. Preparing FB12 for Transport

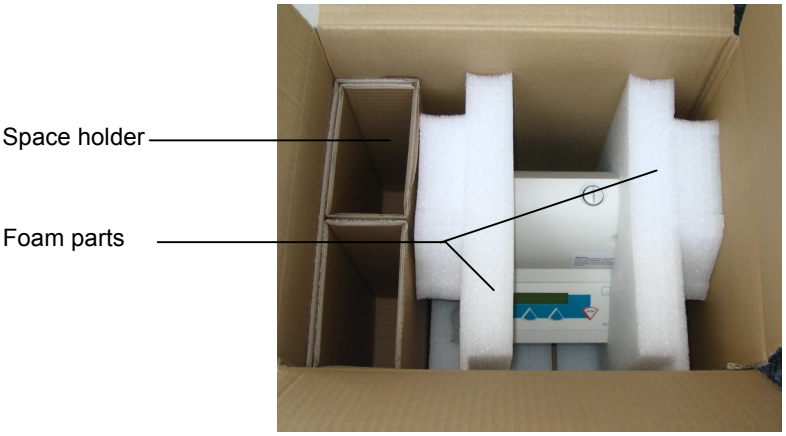
If it should become necessary that FB12 has to be serviced please observe the following instructions for shipping it to your local distributor or Berthold Detection Systems.

1. Turn luminometer off and disconnect power supply.

2. Remove the reflector.

3. For safe shipment put the **luminometer and the accessory box** into the original cardboard box and seal it. If the original box is not available please contact service@berthold-ds.com. We will send a box back to you.

Original packaging of FB12 :
Add the accessory-box finally



4. Before return please contact your local distributor or Berthold Detection systems for shipping instructions.

15. Index

16. Decontamination Form

Any laboratory instrument used for clinical or research analysis maybe considered a biohazard and requires decontamination prior to handling. Universal precautions are suggested wherever applicable.

Before shipping any instrument back to Berthold Detection Systems the luminometers have to be cleaned in the following way:

1. Wash the housing with a moist cloth, if necessary use a mild detergent or disinfectant. Do not use any scouring agents!
2. Open the access door, remove and clean the reflector, then clean the measurement chamber with the measurement window carefully. Use e.g. cotton buds for hard to access locations.

Berthold Detection Systems only accepts instruments for repair together with a filled out decontamination form. Please copy this page and fax it to us before you send off the package. Thank you.

Instrument Type:

Serial Number:

☐ I confirm that the specified instrument was decontaminated according to the above described decontamination procedure

☐ I confirm that the above specified instrument had no contact to any hazardous material.

Company	
Contact Person	
Position	
Telephone	

Date:_____ Signature: _____

Please copy and fax to:
Berthold Detection Systems, Bleichstr. 56-68, 75173 Pforzheim,
Tel.:+49-(0)7231-9206-0, Fax -50