



Fidelis

Secondary Standard Dose Calibrator Software User Manual Issue 3

*This precision instrument is designed for use as a Secondary Standard Reference Dose Calibrator, for calibration and QA of Tertiary Standard Calibrators. It is **NOT** specified to be used as a medical device for the direct treatment of patients.*

Only qualified personnel should operate or service this product, no user serviceable parts are inside. Any attempt to service the product by unauthorised personnel will invalidate the warranty.



Warnings - please read before use!

- Always allow the chamber to reach room temperature after unpacking before use. Allow a warm up time when powered up of least 1 hour before taking any measurements.
- High voltage (-1450V) is present inside the Fidelis chamber, discontinue use if the well liner becomes damaged, refer instrument to manufacturer for repair.
- This equipment must be earthed via the mains supply; the system relies on an earth to be present, for both stability of reading and electrical safety.
- Only qualified personnel should operate or service this product, no user serviceable parts are inside. Any attempt to service the product by unauthorised personnel will invalidate the warranty.
- It is desirable to leave the system powered at all times to maintain the stability of the instrument, especially if the instrument is subjected to low temperatures or high humidity. Care must be exercised in moving the instrument or when any maintenance is performed, the system is a precision electronic instrument.
- Periodic checking of any radiological measurement instrument is highly recommended, suitable working practices should be maintained to ensure that instruments are checked on a periodic basis and that suitable daily tests and checks are made to ensure the instruments accuracy/performance.
- Care should be taken to ensure that adequate radiological shielding is used to protect user of the instrument from excessive radiation doses during normal use.
- Please observe all local rules for disposal of this equipment.



It is essential that the daily test is run every day to ensure system stability.

Explanation of Icons



Risk of Electrocution



Risk of Exposure to Radiation



Caution



Note



Inspection



Warning, Prohibition



Maintenance Action



Assistance

Revision History

Issue	Date	Changed By
1	December 2006	First Edition
2	January 2007	RDH
3	April 2007	RDH

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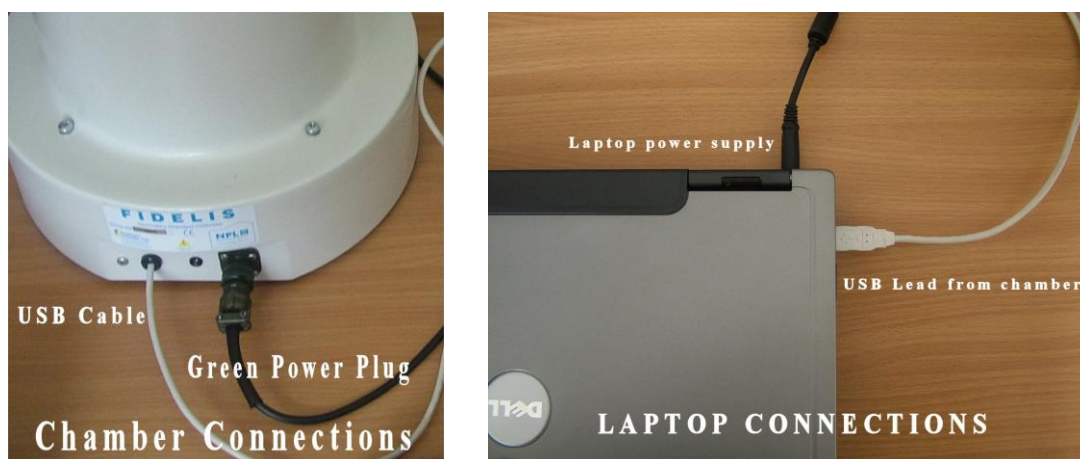
Introduction

This manual describes the Southern Scientific Fidelis Secondary Standard Dose Calibrator PC software and chamber. Please email any comments or suggestions to fidelis@ssl.gb.com.

System Connections

The Fidelis system is supplied preconfigured and ready for use.

Connect the flying USB connector from the chamber into a USB port on the computer and power up the computer. Connect the Filtered AC Power Supply three pin circular connector to the corresponding connector on the chamber and screw the locking ring until it fully locks the connectors together. The system should always be powered up or down in the correct sequence.



Power Up

Make sure the chamber is powered up before running the Fidelis software. This ensures that the computer can detect the chamber correctly.



Due to this being a high precision instrument, the chamber should be powered up and allowed to reach room temperature for approximately one hour before use and it is recommended that the chamber be kept powered to maintain stability.

Power Down

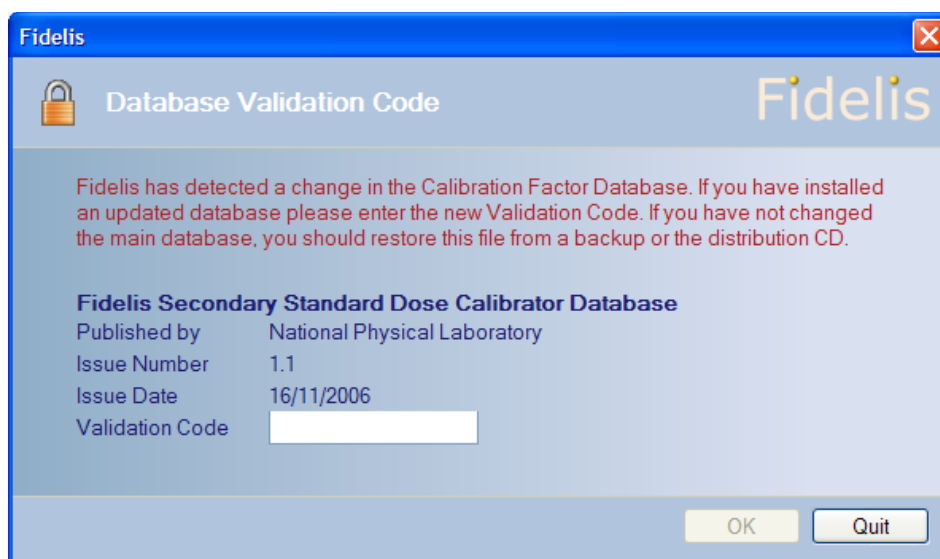
If the USB cable is removed from the chamber whilst the software is running it might be necessary to reboot the computer. It is therefore recommended that the Fidelis software is closed BEFORE the USB cable is unplugged.

Starting the Fidelis Software

Double click the Fidelis icon on the Windows XP desktop to start the system. The Fidelis splash screen will then show and the system will attempt to connect to the attached chamber.



During this initialisation process, the calibration factor database is loaded and validated. It is vital that the database is not modified by any unauthorised person since this could invalidate the integrity of system calculations. To ensure this integrity, Fidelis uses a validation code system. The system is supplied with the correct code already entered, but if the database is modified or corrupted, you will see the following dialog box. In most cases, you will need to reinstall the original calibration factor database to correct this problem.



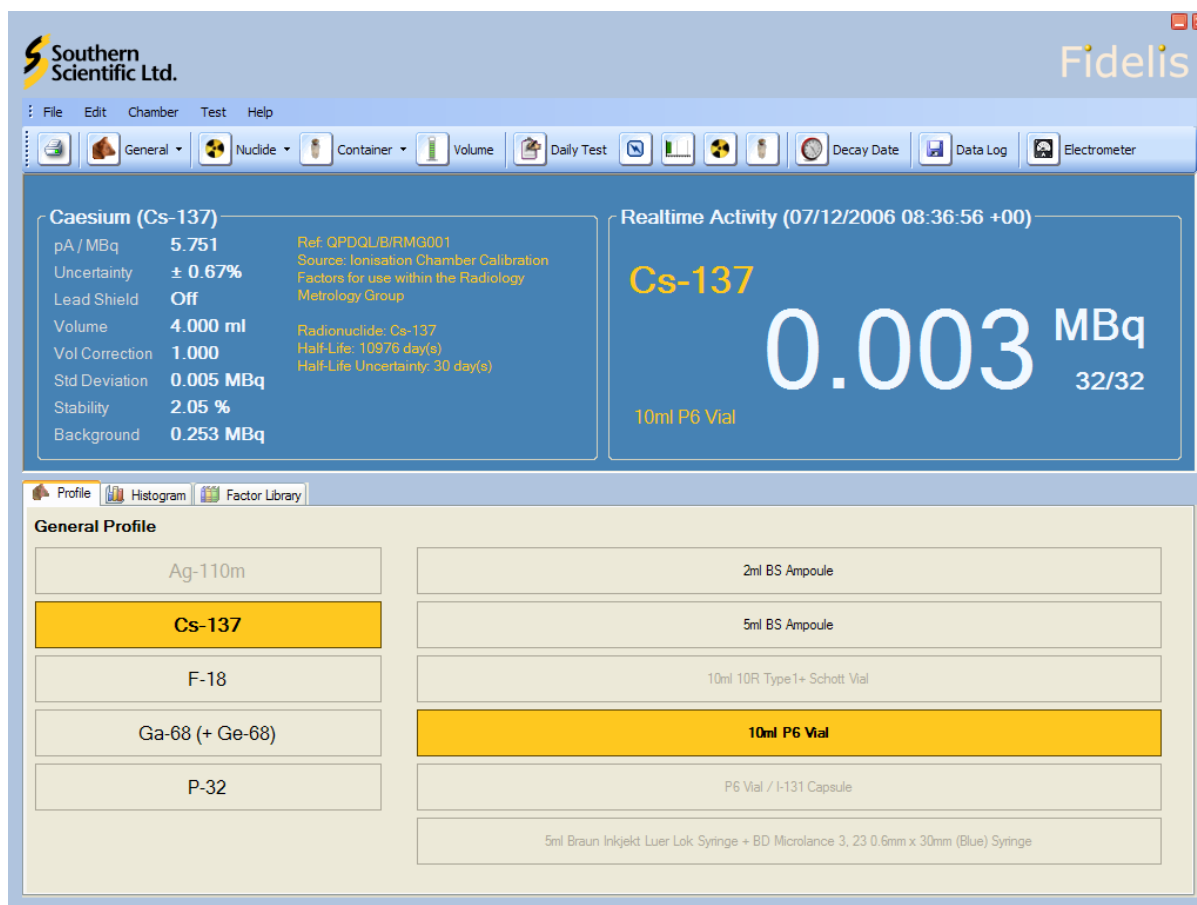
If the chamber is not powered or is not connected, you will see the following message.



Make sure the chamber is powered and connected then click retry.

Main Interface

This is the Fidelis main interface screen.



The screen is divided into four main areas. The pull down menu and toolbar area (top), the calibration factor information panel (top-left), the current activity and electrometer status panel (top-right), and a lower panel containing tabbed profile, histogram and library pages.

Each of these areas is described in more detail in the following sections.

Menus and Toolbars

This table describes all the menu options and toolbar buttons.

File Menu	Toolbar	Description
Create/Stop Data Log...		This option starts or stops saving to a data log file. See Data Log section for more information.
Open Data Log...		Open a previously created data log file. Data log files are CSV files containing tabulated records of data samples captured every n seconds. They are mainly used for linearity checks. See Data Log section for more information.
Open Daily Test Report...		Open a previously created daily test report. A daily test report is text file generated at the end of every daily test run which summarises the results of each individual test. They could be printed and filed as part of a departmental QA system. The individual daily tests are described in more detail later in this document.
Open Test Log...		Open a test log file. A test log file is a CSV file containing tabulated results of all previously run system tests. The HV test log for instance will contain all the HV readings that Fidelis has ever read. This data could be graphed to check for any HV gain/loss trend.
Reload Databases		This will reload database files.
Print Current Reading		This option prints the currently displayed reading. See appendix 1 for example reading print outputs.
Report -> Nuclide		Generates a nudide report sorted by nuclide name or atomic mass.
Report -> Container		Generate a container report
Report -> Calibration Factor		Generate a calibration factor report
Report -> System Settings		Generate a system settings report
Report -> Profiles		Generate a profile report
Report -> Check Sources		Generate a check source report
Exit Fidelis...		Exit Fidelis software.

Edit Menu

Electrometer Mode		Put the system in Electrometer mode. See Electrometer Mode section.
Change Profile		Cycle through the available profiles. Profiles group selected nuclides and containers together which are commonly used in the same context. See Profile Tab Page section for more information about profiles.
Change Nuclide		Cycle through the available nuclides in the currently selected profile.
Change Container		Cycle through the available containers in the currently selected profile.
Toggle Shield Mode		Turn shield mode on or off. The shield mode defines whether you have the lead shield fitted to the chamber. Note that the lead shield is an optional extra for the Fidelis system and is not supplied by default.
Set Volume		Selection this option to change the container volume. This option is only available if the currently selected calibration factor has volume correction data. See Set Container Volume section for more information.
Set Decay Date		Fidelis can forward or back calculate activity to a given date. Use this option to specify this date. See Set Decay Date section for more information.
Preferences...		Opens the system preferences dialog box. See System Preferences section for more information.

Chamber Menu

Chamber x (COMx)

Lists the chambers that have been detected during system initialisation.

Test Menu

Run Daily Test...



Starts the daily test. See Daily Test section for more information about this.

Daily Test Summary...

Open the daily test summary window. See Daily Test Summary section.

Set System Date...

Set the current system date.

Electrometer Checks...

Run the Electrometer Checks Test. See later section.

High Voltage Test...



Run the HV Test. See later section.

Amplifier Offset Test...



Run the Amplifier Offset Test. See later section.

Background Radiation...



Run the Background Radiation Test. See later section.

Check Source Test...



Run the Check Source Test. See later section.

Reset Background to Zero

Resets the background radiation value to zero. This will invalidate the background radiation test result and can only be performed by an administrator.

Help Menu

About

Show the Fidelis about dialog window.

Release Notes

Show release notes for installed software

Calibration Factor Information Panel

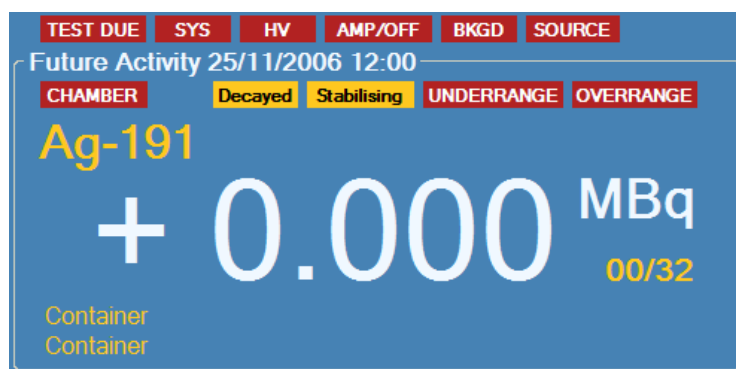
This panel contains information about the currently selected calibration factor and statistics relating to the displayed reading.

Caesium (Cs-137)		
pA / MBq	5.751	Ref: QPDQL/B/RMG001 Source: Ionisation Chamber Calibration Factors for use within the Radiology Metrology Group
Uncertainty	± 0.67%	
Lead Shield	Off	
Volume	4.000 ml	Radionuclide: Cs-137 Half-Life: 10976 day(s) Half-Life Uncertainty: 30 day(s)
Vol Correction	1.000	
Std Deviation	0.005 MBq	
Stability	2.05 %	
Background	0.253 MBq	

Field	Description
pA / MBq	Shows how many pA represent one (1) MBq of the currently selected nuclide when presented in the currently selected container. This value will be highlighted if the calibration factor is not NMI certified or if the shield mode is selected and the calibration factor does not have a factor for that configuration.
Uncertainty	Gives a measure of uncertainty for the above calibration factor.
Lead Shield	On/Off depending on current shield mode.
Volume	The volume of the nuclide in the container
Vol. Correction	The volume correction factor based on the volume above and the correction coefficients defined for the currently selected calibration factor.
Std. Deviation	The standard deviation (n-1) of the samples collected to derive the Mean Reading.
Stability	Stability is Standard Deviation divided by Mean Reading and gives a good indication of data stability.
Background	The current background radiation.
Notes	To the right of these fields is an area showing any notes associated with the currently selected calibration factor, the nuclide, or the container.

Activity Status Panel

The activity panel shows the Mean Reading in large white text. Immediately to the right of this value are the units of display and below this, nn/mm represents the number of consecutive samples that have been averaged to derive the reading (nn) and the maximum number of samples that will be collected (mm).



Ag-191	The currently selected nuclide
+ 0.000	The latest mean reading
MBq	The units of the latest mean reading. If enabled, click this unit to cycle through all available units
nn/mm	Represents the number of consecutive samples that have been averaged to derive the reading (nn) and the rolling maximum number of samples that will be collected (mm). Click this field to manually clear the average. You can also use the Backspace key to clear the average buffer.
Container	The currently selected container
Future Activity...	Shows the date that the display reading is valid for. If the reading is back or forward calculated, this heading will change appropriately
TEST DUE	Shown when the daily test last run date is older than 24 hours
SYS	Shown when the Electrometer Checks Test has failed
HV	Shown when the HV Test has failed
AMP/OFF	Shown when the Amplifier Offset Test has failed
BKGD	Shown when the Background radiation Test has failed
SOURCE	Shown when the Check Source Test has failed
CHAMBER	Shown when the chamber is not responding
Decayed	Shown when the reading is back or forward decayed
Stabilising	Shown when the electrometer is still stabilising. This timer is reset every time the chamber is powered up. Click the label to deactivate it.
UNDERRANGE	Shown when the electrometer is reading zero. See troubleshooting.
OVERRANGE	Shown when the electrometer is reading maximum. See troubleshooting.

Profile Tab Page

This tab page details the currently selected profile. Profiles group selected nuclides and containers together which are commonly used in the same radio-pharmacy context.

The screenshot shows a software interface with three tabs at the top: 'Profile' (selected), 'Histogram', and 'Factor Library'. Below the tabs is a section titled 'General Profile'. It contains two columns of buttons. The left column lists nuclides: 'Ag-110m', 'Cs-137' (highlighted in yellow), 'F-18', 'Ga-68 (+ Ge-68)', and 'P-32'. The right column lists containers: '2ml BS Ampoule', '5ml BS Ampoule', '10ml 10R Type1+ Schott Vial', '10ml P6 Vial' (highlighted in yellow), 'P6 Vial / I-131 Capsule', and '5ml Braun Injekt Luer Lok Syringe + BD Microlance 3, 23 0.6mm x 30mm (Blue) Syringe'.

General Profile	
Ag-110m	2ml BS Ampoule
Cs-137	5ml BS Ampoule
F-18	10ml 10R Type1+ Schott Vial
Ga-68 (+ Ge-68)	10ml P6 Vial
P-32	P6 Vial / I-131 Capsule
	5ml Braun Injekt Luer Lok Syringe + BD Microlance 3, 23 0.6mm x 30mm (Blue) Syringe

Below the profile title nuclides are listed on the left and containers on the right. Click a nuclide or container to select the item. Nuclides will be greyed when a calibration factor does not exist for the current container. Similarly containers will be greyed when a calibration factor does not exist for the current nuclide. You can still select these items, but the change will cause the nuclide / container to change also.

Click the profile title to cycle through available profiles.

Factor Library Tab Page

The tab page allows you to view all the calibration factors available in the Fidelis databases.

Nuclide	Container	pA/MBq [Unshielded]	pA/MBq [Shielded]	VCF [A1]	VCF [A2]	Trace	Edit	Notes
Ag-110m	CAP-1131-SCHOTT	26.1 / 15%	0	0	0	No	Yes	The calibration factor for this radionuclide is
Ag-110m	SCHOTT-T1-10R	26.1 / 15%	0	0	0	No	No	The calibration factor for this radionuclide is
Am-241	AMP-BS-02ML	0.2495 / 0.34%	0	-0.00057	-0.00463	Yes	No	
Am-241	AMP-BS-05ML	0.2418 / 0.34%	0	0.00233	-0.00046	Yes	No	
Am-241	VIAL-P6-10ML	0.228 / 0.34%	0	0.0024	-0.00016	Yes	No	
Au-198	AMP-BS-02ML	4.318 / 0.34%	0	0.00745	-0.00583	Yes	No	
Au-198	AMP-BS-05ML	4.283 / 0.34%	0	0.00529	-0.00064	Yes	No	
Au-198	VIAL-P6-10ML	4.25 / 0.34%	0	0.00284	-0.00019	Yes	No	
Au-199	AMP-BS-02ML	0.9731 / 0.84%	0	0	0	No	No	The calibration factor for this radionuclide is
Au-199	AMP-BS-05ML	0.9647 / 0.84%	0	0	0	No	No	The calibration factor for this radionuclide is
Au-199	VIAL-P6-10ML	0.9501 / 0.84%	0	0	0	No	No	The calibration factor for this radionuclide is
Ba-133	AMP-BS-02ML	4.362 / 0.67%	0	0.00606	-0.00511	Yes	No	
Ba-133	AMP-BS-05ML	4.298 / 0.67%	0	0.0029	-0.00058	Yes	No	
Ba-133	VIAL-P6-10ML	4.188 / 0.67%	0	0.00295	-0.00019	Yes	No	

- Find** Use the Find field to filter the calibration factor list. Typing “caesium” for instance will filter the list to show only the calibration factors that are defined for caesium. Type “Schott” to list the factors defined for Schott Vials.
- Clear** Click this to reset all filter options and show all calibration factors.
- Traceable Only** Only show NMI traceable calibration factors.
- Editable Only** Only show user defined calibration factors.
- Shielded Only** Only show calibration factors characterised with the lead shield fitted.
- Report** Generate database reports including a calibration factor reports based on the current filter options.
- Nuclides** Open the Nuclide Editor. See separate section.
- Containers** Open the Container Editor. See separate section.
- New Factor** Open the Calibration Factor Editor. See separate section.

Common Procedures

Adding and removing nuclides or containers to and from a profile

- 1) Select the Factor Library Tab
- 2) Find a calibration factor that uses the nuclide or container you wish to add
- 3) Right click the calibration factor in the library list
- 4) Select either the nuclide or the container from the context menu
- 5) Click either "add to..." or "remove from..." the profile you wish to change

Creating a new Check Source

- 1) Open System Options from the Edit menu.
- 2) If necessary, logon as the administrator.
- 3) Select the test options tab.
- 4) Select the Check Source sub-tab
- 5) Click Define Sources. See Check Source Editor section for more details about editing/creating Fidelis Check Sources.

Creating a new nuclide record

- 1) Select the Factor Library Tab
- 2) Click Nuclides. See Nuclide Editor Section for more information about the nuclide editor.
- 3) Click New
- 4) Select the element for the new nuclide
- 5) Enter the atomic mass
- 6) Click build to construct to nuclide name. This must be unique within the system.
- 7) Modify the nuclide name as required
- 8) Enter the half-life of the new nuclide
- 9) Enter the half-life uncertainty (if known)
- 10) Click Save and confirm.

Creating a new container record

- 1) Select the Factor Library Tab
- 2) Click Containers. See Container Editor Section for more information about the container editor.
- 3) Click New
- 4) Enter a code number to describe the new container. This must be unique within the system.
- 5) Enter the container description
- 6) Define the container type.
- 7) Define whether the new container has a volume associated with it. Capsules, for instance, do not since they are closed and of fixed volume.
- 8) If necessary, define the container volume, the nominal volume and the min/max volumes for use in any volume correction calculations.
- 9) Click Save and confirm.

Creating a new calibration factor record

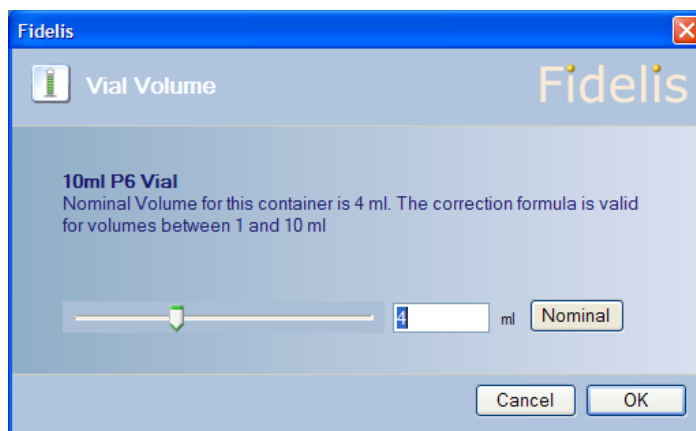
- 1) Select the Factor Library Tab
- 2) Click New Factor
- 3) Define the nuclide and container for the new factor. Note that these must be a unique combination.
- 4) Enter at least one pA/MBq factor for either the shielded or unshielded configuration.
- 5) If known, enter the volume correction parameters. See *Calibration Factor Editor* section for more information about these values.

Switch off administrator mode without exiting the software

- 1) Open System Options from the Edit menu.
- 2) If necessary, logon as the administrator.
- 3) Uncheck the Administrator Mode check box in the bottom left hand corner of the dialog box

Set Container Volume

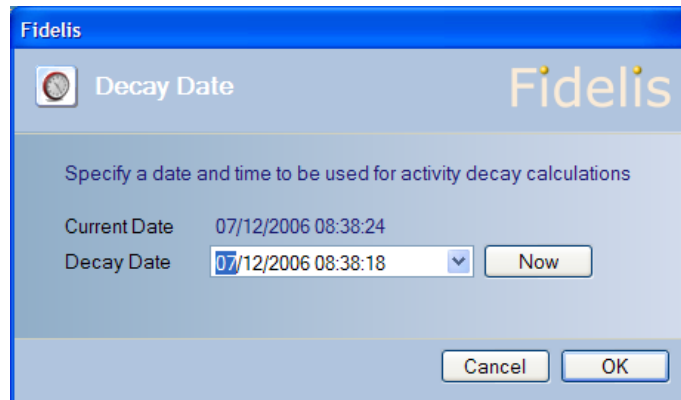
This allows you to specify the volume of radionuclide in the container for the currently selected calibration factor.



Use the slider bar or type a value into the text box. Click Nominal to automatically set the value to the nominal volume for the currently selected container type.

Set Decay Date

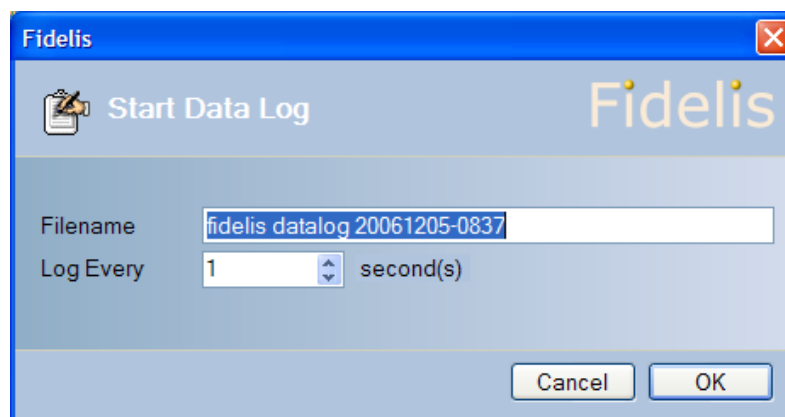
Fidelis can forward or back calculate activity to a given date.



Use the calendar control to specify the date you want Fidelis to forward or back calculate activity for. If required, you can enter the time using the keyboard although the up/down arrow keys can be used to change individual time components. Click Now to cancel forward/back calculation and show real-time activity. Clicking this button will also close the window.

Data Logging

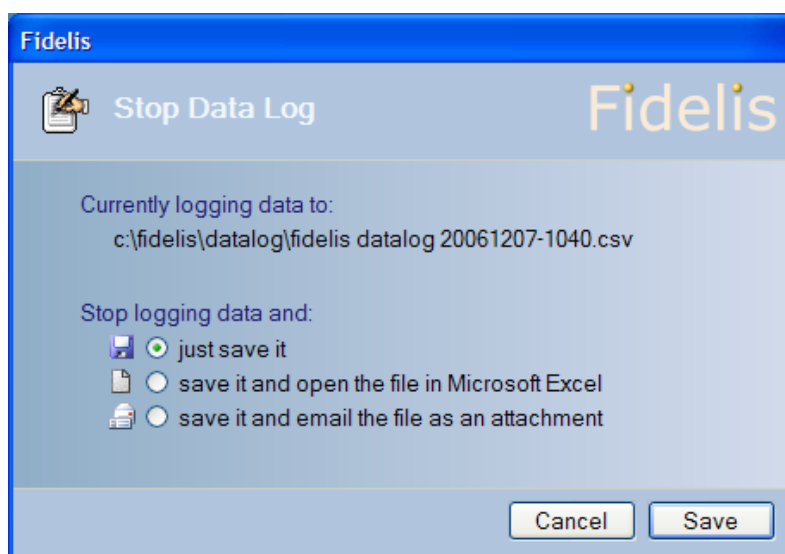
The Start Data Log option will open the following window.



Fidelis will automatically assign a filename for the data log file based on the current system date and time. You can select the sample frequency in seconds. Click OK to start data logging.

During data logging the following icon will appear in the upper left of the interface and will increment each time a reading is saved.  **Logging: 00000**

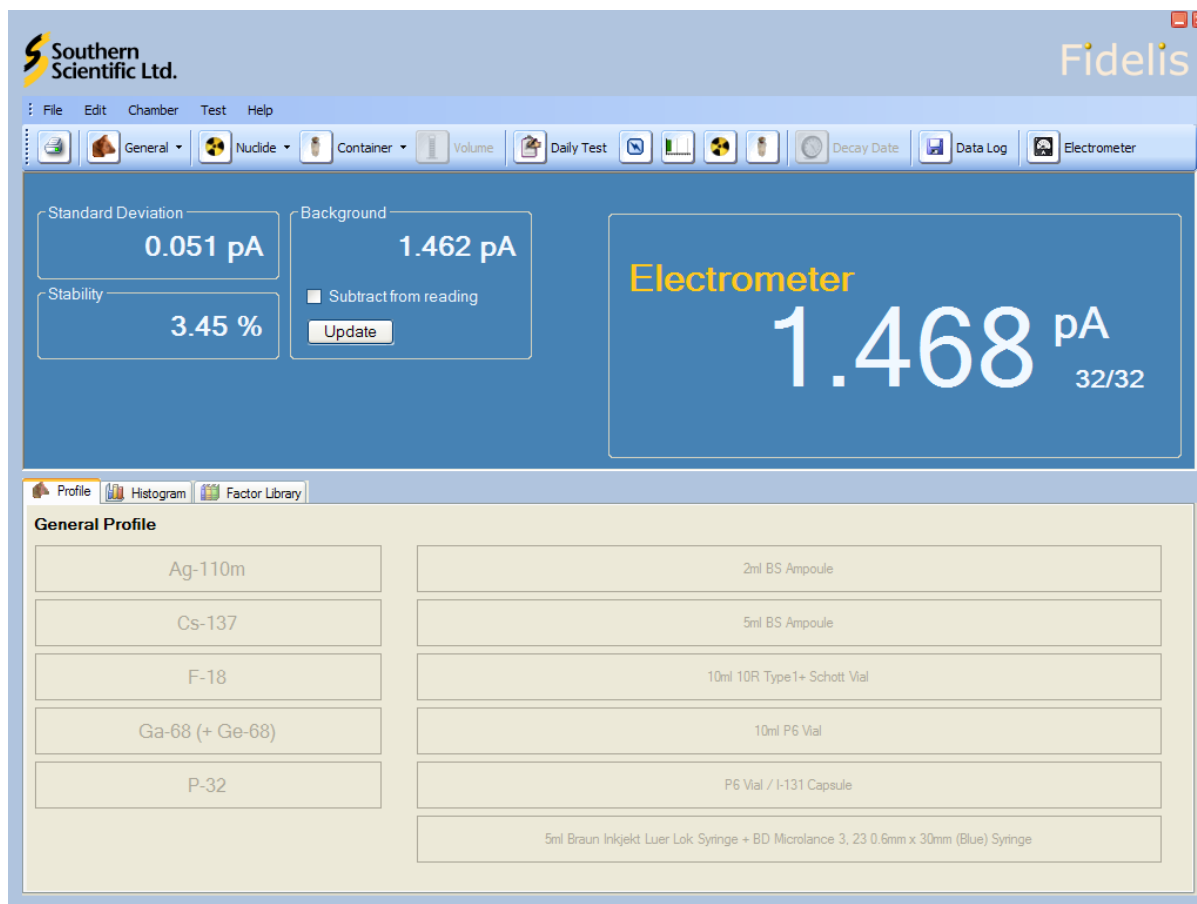
The Stop Data Log option will open the following window.



Choose what you want to do with the data log file then click save.

Electrometer Mode

Select the Electrometer option to place the system in current measurement mode. You will notice that the upper portion of the interface changes to show only the relevant information for this mode.



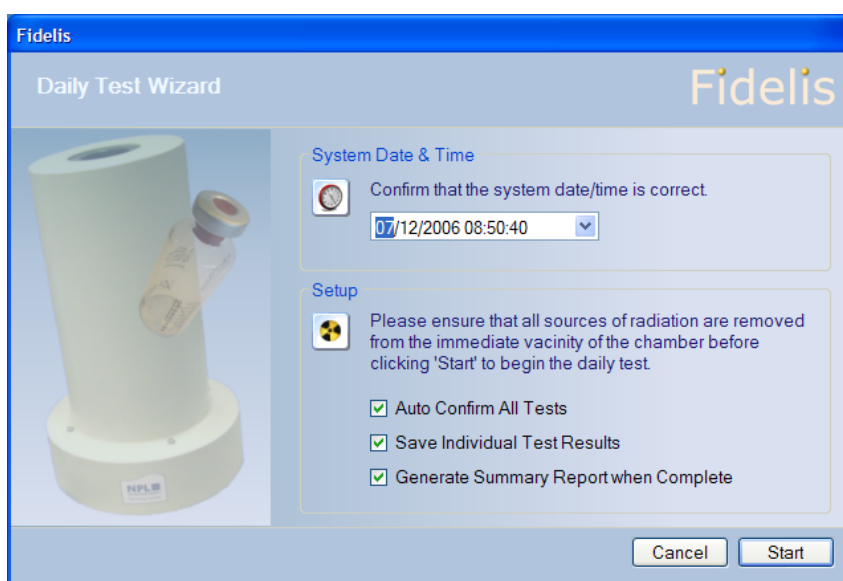
Similar to the calibration factor display mode, the right-hand upper panel shows the electrometer current in pA. The 32/32 below this reading represents the number of consecutive samples that have been averaged to derive the reading and the maximum number of samples that will be collected. The upper left portion of the screen shows the standard deviation (n-1) of the samples collected to derive the average. Stability is Standard Deviation divided by Mean Reading and gives a good indication of data stability. Also in this panel is the currently measured background reading expressed in pA. Use the Subtract check box to optionally remove this from the displayed reading. Click update to start the background acquisition test.

Daily Test

The daily test sequence runs through the following tests in sequence:

1. Confirm System Date
2. Electrometer Checks
3. High Voltage Test
4. Amplifier Offset Test
5. Background Radiation Test
6. Check Source Test

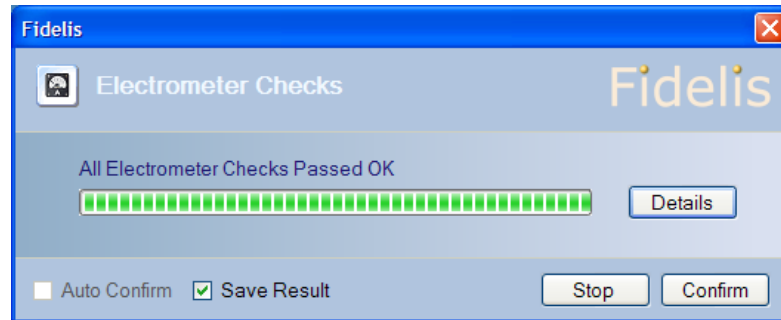
When all tests are complete, a test report will be (optionally) generated and a summary screen will be displayed. See the following sections for full descriptions of these tests.



Follow the on-screen instructions then click Start to begin the first test.

Electrometer Checks

The *electrometer checks* test makes sure that the electrometer module inside the chamber housing is responding correctly and goes on to perform an internal calibration of the ADC electronics. This test should be performed every day.



Click Details to show each electrometer test as it is performed. If all tests pass, you will see the message shown above.

If Auto Complete is selected, the window will close when all the electrometer checks are completed.

If Save Result is selected, the test results will be appended to the test log file.

High Voltage Test

This test measures the high voltage supply to the chamber. This is compared to an expected voltage and tolerance to determine if the value is acceptable.

Fidelis

High Voltage Test

Expecting HV reading +/- 50V from baseline of 1450.000V
Stability must be < 10.00%
Click Pass/Fail to acknowledge the test result

Acquired 10 reading(s)
HV Readback 1465 V
Stability < 0.01 % **Pass**

Previous Test Results:

16/04/2007 13:40:31

1515
1500
1400
1385

HV (Volts)

1465

☐ Auto Confirm ☒ Save Result **Cancel** **Pass**

Before data is collected, the system will wait for a fixed number of seconds to allow the reading to stabilise.

A predefined number of consecutive samples must be acquired before the reading is considered to be valid. If the reading becomes unstable, this period will reset and start counting down again. If the acquisition value is not reaching zero, this indicates that the reading is unstable and it is likely that the chamber is not working. See troubleshooting.

The graph shows the last ten test results and gives an instant indication of test result trends.

If Auto Confirm is selected, the window will close when settle reaches zero.

If Save Result is selected, the test results will be appended to the test log file.

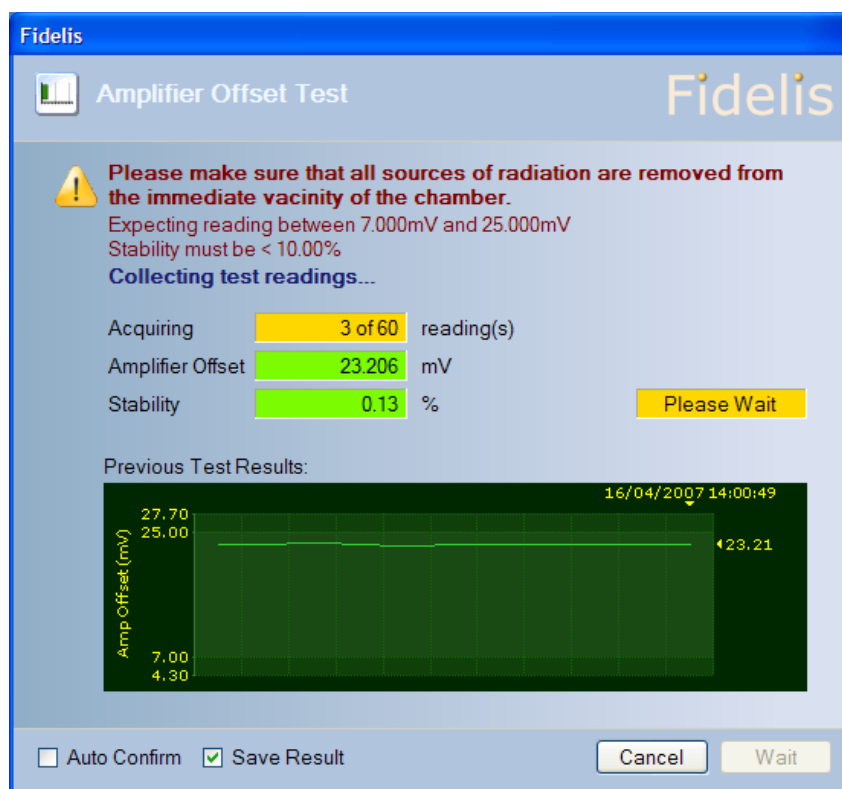
Amplifier Offset Test

The amplifier offset test measures the reading from the electrometer when there is no input current on the amplifier. This differs from background radiation because the measurement is taken with no amplifier gain. Within the electrometer, this offset is then subtracted from all subsequent measurements.



It is still important that sources of radiation are removed from the vicinity of the chamber during this test.

This reading is tested within a band of acceptability to determine if the test is successful.



Before data is collected, the system will wait for a fixed number of seconds to allow the reading to stabilise.

A predefined number of consecutive samples must be acquired before the reading is considered to be valid. If the reading becomes unstable, this period will reset and start counting down again. If the acquisition value is not reaching zero, this indicates that the reading is unstable and it is likely that the chamber is not working. See troubleshooting.

The graph shows the last ten test results and gives an instant indication of test result trends.

If Auto Confirm is selected, the window will close when settle reaches zero.

If Save Result is selected, the test results will be appended to the test log file.

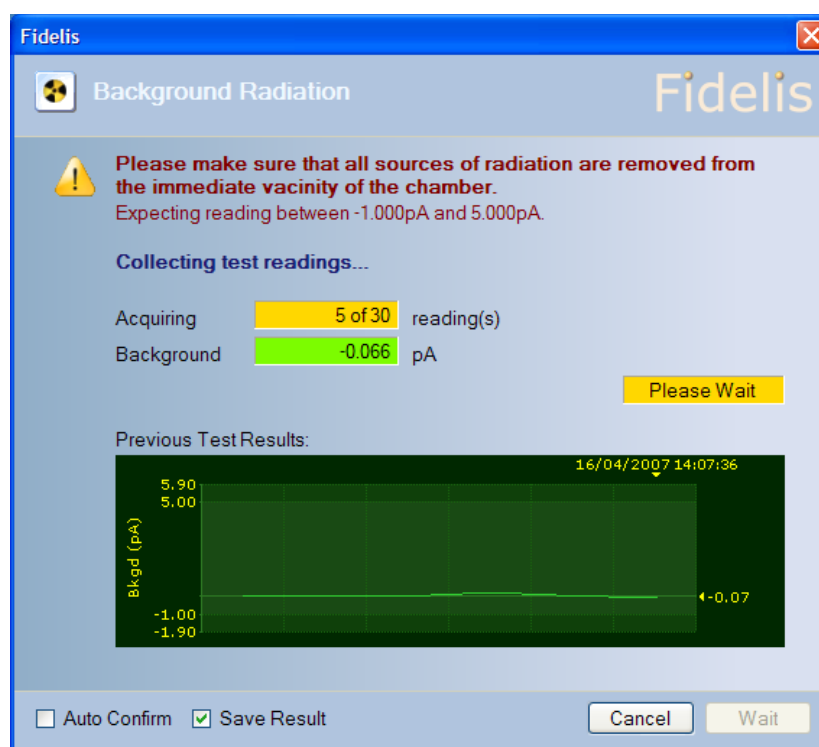
Background Radiation Test

This test takes a background radiation reading to be subtracted from all future readings.



Please note that it is vital that sources of radiation are removed from the vicinity of the chamber during this test.

This reading is tested within a band of acceptability to determine if the test is successful.



Before data is collected, the system will wait for a fixed number of seconds to allow the reading to stabilise.

A predefined number of consecutive samples must be acquired before the reading is considered to be valid. If the reading becomes unstable, this period will reset and start counting down again. If the acquisition value is not reaching zero, this indicates that the reading is unstable and it is likely that the chamber is not working. See troubleshooting.

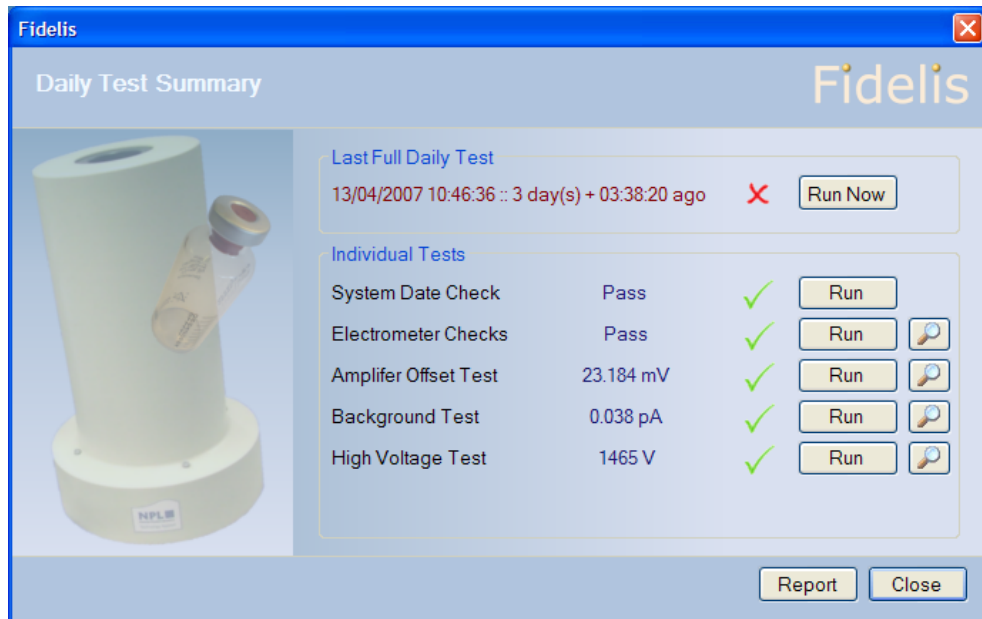
The graph shows the last ten test results and gives an instant indication of test result trends.

If Auto Confirm is selected, the window will close when settle reaches zero.

If Save Result is selected, the test results will be appended to the test log file.

Daily Test Summary

This gives a summary of results for the daily test.

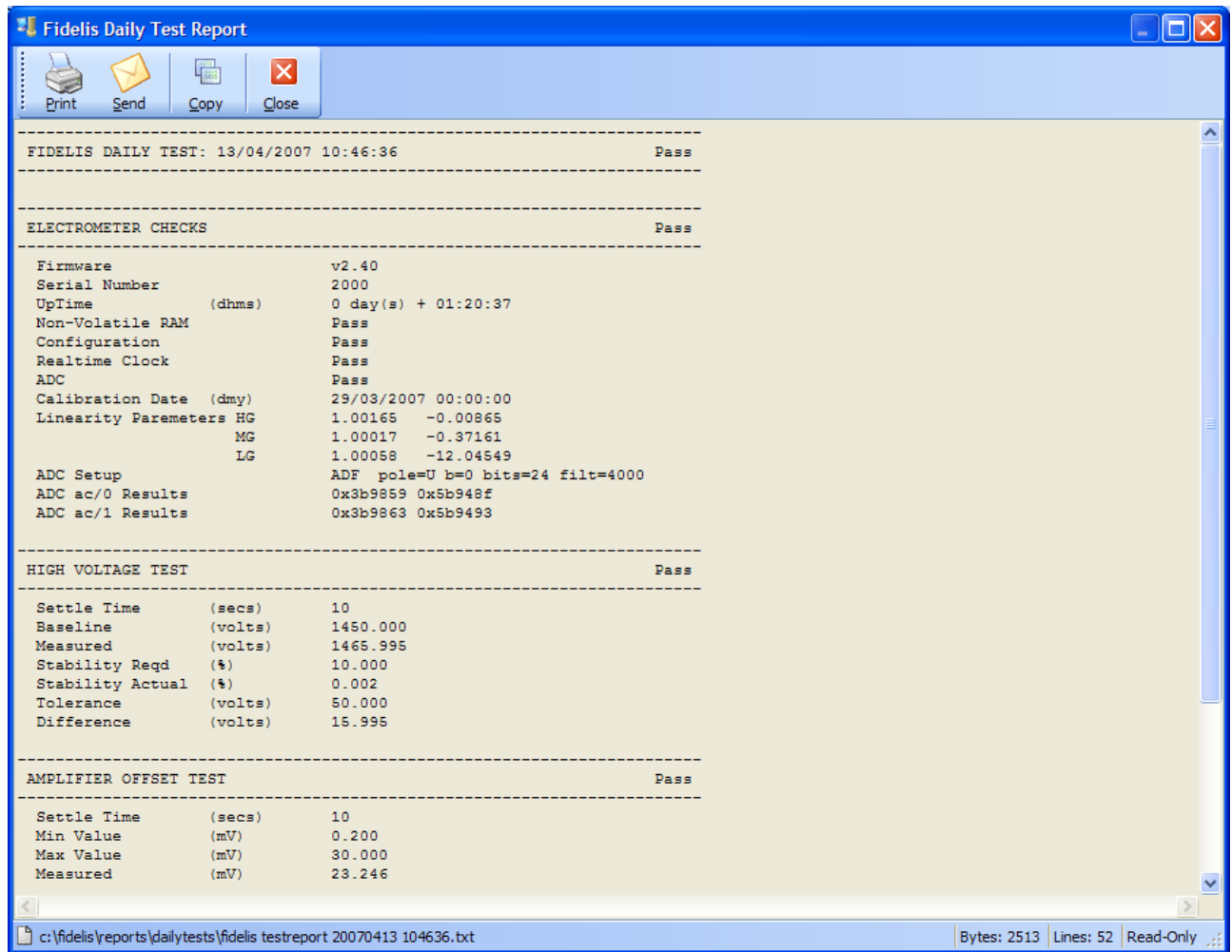


Clicking Run Now will start a new daily test sequence. Clicking Run next to each of the individual test allows them to be rerun and the last daily test report updated. Click the magnifier icon next to each test to open the test log for that test.

Click Report to view the latest daily test report.

Daily Test Report

When you complete a daily test sequence, Fidelis creates a daily test report.



From this screen you can print, email, or copy the report to the clipboard.

System Preferences

Changing system preferences in Fidelis requires administrator access. See Administrator Logon section for more information about this. System Options are grouped using tab pages. Click a tab page to show grouped options.



Click 'Close and Lock Admin Mode' to close the preferences dialog and require operator to enter administration password to open preferences dialog again.

General Options

This tab groups general system options for Fidelis.

Option

Administrator Password
Start in Admin Mode
Start in Simulator Mode
Edit Profiles
Load Profiles
Activity Units
Allow Unit Change
Highlight Uncertainty

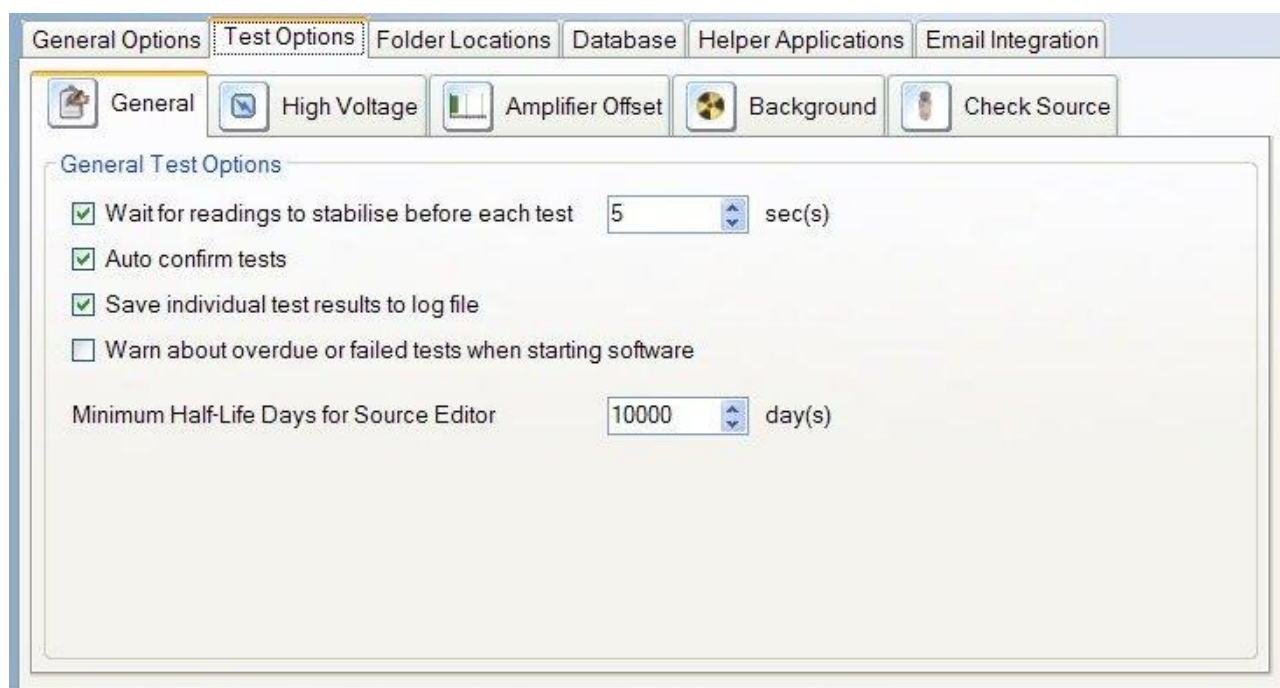
Highlight Stability
Test Report Font
System Log Font
Close and Lock

Description

Click Change to change the administrator password.
When selected Fidelis will start in administrator mode
When selected Fidelis will start in simulation mode
Click to open profiles definition file
Click to reload profiles from (edited) profiles definition file
Select the preferred activity units for the main activity screen.
When selected user can click units on main screen to toggle selection.
If selected, calibration factor uncertainties above the specified percentage will be highlighted.
If selected, stabilities above the specified percentage will be highlighted.
Font used when printing daily test reports
Font used when printing system logs
Close the preferences dialog and require operator to enter administration password to open preferences dialog again

Test Options - General

These are general options applicable to all Fidelis tests.



Wait for... stabilise...	Define the number of seconds to wait for a given reading to stabilise before acquiring test data.
Auto Confirm Tests	Selecting this option causes individual tests to be accepted if they meet the defined pass conditions for that test.
Auto Confirm Failed Tests	Selecting this option will auto confirm tests even if they do not meet the defined pass conditions for that test so long as the minimum number of consecutive samples have been acquired.
Warn about overdue...	Select this option to cause the system to prompt the user on system start-up if any of the individual daily tests are overdue or expired.
Save Individual Results	Select this option to save individual test results to their own log file for future analysis.
Minimum Half-Life	Defines the minimum half-life of a nuclide in days. This option filters the list of available nudides in the check source editor.

Test Options – High Voltage

These are options applicable to the high voltage test.

The screenshot shows the 'Test Options' dialog box with the 'High Voltage' tab selected. The 'Test Conditions' section contains the following settings:

Parameter	Value	Unit/Description
Acquire	10	consecutive readings(s)
Baseline	1450	V
Accept values +/-	50	V
Minimum Stability	☒ 10	%

Acquire	Defines the number of consecutive samples that must be taken before the reading is considered to be valid.
Baseline	The HV reading that was set when the instrument was calibrated.
Accept Values +/-	An acceptable deviation from the baseline HV expressed in V.
Minimum Stability	If selected, defines the minimum stability above which values will be rejected.

Test Options – Amplifier Offset

These are options applicable to the amplifier offset test.

The screenshot shows a software interface with a main menu bar at the top containing 'General Options', 'Test Options', 'Folder Locations', 'Database', 'Helper Applications', and 'Email Integration'. Below this is a sub-menu bar with icons and labels for 'General', 'High Voltage', 'Amplifier Offset', 'Background', and 'Check Source'. The 'Amplifier Offset' sub-tab is selected, displaying a 'Test Conditions' panel. This panel includes the following settings:

- Acquire:** A numeric input field with the value '60' and a unit label 'consecutive readings(s)'.
- Minimum Value:** A numeric input field with the value '7' and a unit label 'mV'.
- Maximum Value:** A numeric input field with the value '25' and a unit label 'mV'.
- Minimum Stability:** A checkbox that is checked, followed by a numeric input field with the value '10' and a unit label '%'. The checkbox is accompanied by a small green checkmark icon.

Acquire	Defines the number of consecutive samples that must be taken before the reading is considered to be valid.
Minimum Value	Defines the lower limit of acceptability for the reading in mV.
Maximum Value	Defines the upper limit of acceptability for the reading in mV.
Minimum Stability	If selected, defines the minimum stability above which values will be rejected.

Test Options – Background Radiation

These are options applicable to the background radiation test.

The screenshot shows the 'Test Options' dialog box with the 'Background' sub-tab selected. The 'Test Conditions' section includes the following settings:

Parameter	Value	Unit
Acquire	30	consecutive readings(s)
Minimum Value	-1	pA
Maximum Value	5	pA
Minimum Stability	☐ 10	%

Acquire	Defines the number of consecutive samples that must be taken before the reading is considered to be valid.
Minimum Value	Defines the lower limit of acceptability for the reading in pA.
Maximum Value	Defines the upper limit of acceptability for the reading in pA.
Minimum Stability	If selected, defines the minimum stability above which values will be rejected.

Test Options – Check Source

These are options applicable to the check source test.

The screenshot shows a software interface with several tabs: General Options, Test Options, Folder Locations, Database, Helper Applications, and Email Integration. The 'Test Options' tab is selected, and within it, the 'Check Source' sub-tab is active. The 'Test Conditions' section contains the following settings:

- Acquire:** 30 consecutive readings(s)
- Default Check Source:** Caesium-137 :: 2001 :: 10.00 pA @ 01/01/2007 00:00:00 (with a 'Define Sources' button)
- Measured to be within:** 2 % of Calculated Activity
- Source less than:** 5 half-lives old
- Minimum Stability:** ☒ 10 %
- Part of Daily Test Sequence:** ☐

Acquire	Defines the number of consecutive samples that must be taken before the reading is considered to be valid.
Default Check Source	Select the default check source to be used for the check source test. Click Define Sources to edit check sources. See Check Source Editor section for more information about this option.
Measured to be within	Defines the percentage difference that the measured reading can deviate from a calculated reading based on the age of the source and the initial activity.
Source Less Than	Defines the maximum age of a check source in terms of half-lives.
Minimum Half-Life	Defines the minimum half-life of a nuclide in days. This option filters the list of available nudides in the check source editor.
Minimum Stability	If selected, defines the minimum stability above which values will be rejected.
Part of Daily Test	If selected, makes the check source test part of the daily test sequence.

Folder Locations

Use these options to change the locations where Fidelis will store data files and logs.

Option	Description
Data Folder (root)	This defines the root folder for all Fidelis folders. Click Select to change the root folder.
Databases	The subfolder for database files
Individual Test Logs	The subfolder for test logs
Data Logs	The subfolder for data logs
Reports	The subfolder for reports
Daily Test Reports	The subfolder for daily test reports
Backup Data	The subfolder for backup data
Default Folders	Click this to restore default folder locations
System Log Folder	The subfolder for system log files. A new system log file will be created based on the period set by the New File Every control.
Verbose Logging	Click this to enable verbose system logging.
Suppress Warnings	If selected, suppresses warning messages in the system log file relating to database entries.

Database

This page summarises the databases in use by Fidelis.

General Options
Test Options
Folder Locations
Database
Helper Applications
Email Integration

Database Options

Validation Code for Main Database

Database	Publisher	Issue	Date	N	C	F	Code
 Fidelis Secondary Standard Dose Calibr...	National Physical Lab...	1.1	16/11/2006	177	86	619	----
 Fidelis User Database	Fidelis	1	04/04/2007	0	1	1	----

Option

Validation Code

Description

Uses this box to specify the validation code for the main database file. This should not require changing.

Helper Applications

Use these options to configure helper applications used by fidelis.

The screenshot shows the 'Helper Applications' configuration window. It features a tabbed interface with the following tabs: General Options, Test Options, Folder Locations, Database, Helper Applications (active), and Email Integration. The 'Text Editor' section contains a 'Title' field with 'Microsoft Notepad' and an 'Application Path' field with 'notepad.exe', accompanied by 'Select...' and 'Test...' buttons. Below this is a checked checkbox for 'Enable Spreadsheet Integration'. The 'Spreadsheet' section contains a 'Title' field with 'Microsoft Excel' and an 'Application Path' field with 'excel.exe', also with 'Select...' and 'Test...' buttons. A 'Defaults' button is located at the bottom right of the window.

Option	Description
Text Editor Title	The name of the text editor being used
Text Editor Path	Path to the text editor. Click Select to change this entry and Test to try and launch the specified application.
Enable Spreadsheet Integration	Check this box to enable spreadsheet integration. We recommend Microsoft Excel.
Spreadsheet Title	The name of the spreadsheet being used
Spreadsheet Path	Path to the spreadsheet. Click Select to change this entry and Test to try to launch the specified application.

Email Integration

Fidelis can email various reports directly from the application. Use these options to configure email integration. This is only useful if your calibrator has a network or internet connection. It is disabled by default and we would generally not recommend connecting your Secondary Standard Dose Calibrator to the internet.

Option	Description
Enable Email Integration	Select to enable email integration
Method	Select either Command Line or SMTP.
Test	Click to test the current email settings.
Defaults	Restore default settings for the currently selected mode.
Command Line Title	Email client application title.
Command Line Path	Email client application path.
Command Line Basic Parameters	Email client application basic parameters.
Command Line Attachment Parameter	Email client application attachment parameter.



Command line email integration has been tested to work with Microsoft Office 2003. Microsoft Office 2007 is not currently supported.

Check Source Editor

The check source editor is used to define check sources for use in the Fidelis check source test.

Use the list box on the left to select the source and then edit fields as required.

Click New to create a new check source.

A check source is defined by the nuclide and container, an issue date, and the activity of the source at the issue date. From this information Fidelis calculates the activity now using the following formula.

$$\text{activity}_{\text{decayed}} = \text{activity}_{\text{now}} \times \exp\left(\frac{\log(0.5)}{\log(\exp(1))} \times \frac{\text{time}_{\text{secs}}}{\text{halflife}_{\text{secs}}}\right)$$

Where:

$$\text{time}_{\text{secs}} = \text{dateto}_{\text{secs}} - \text{datefrom}_{\text{secs}}$$

Nuclide Editor

The nuclide editor is used to define nuclides for use in the Fidelis system.

Use the list box on the left to select a nuclide and then edit as required. Click New to create a new nuclide record.



Note that nuclides defined in the main database cannot be edited as this would compromise system data integrity.

Container Editor

The container editor is used to define containers for use in the Fidelis system.

Fidelis

Container Editor

Containers

☒ All ☐ System ☐ User

- 2ml BS Ampoule
- 5ml BS Ampoule
- 10ml 10R Type1+ Schott Vial
- 10ml P6 Vial**
- 10R Type1+ Schott Vial / I-131 Ca
- P6 Vial / I-131 Capsule
- 1ml BD Luer Lok Syringe + BD Mi
- 3ml BD Luer Lok Syringe + BD Mi
- 5ml BD Luer Lok Syringe + BD Mi
- 10ml BD Luer Lok Syringe + BD M
- 1ml BD Luer Lok Syringe + BD Mi
- 3ml BD Luer Lok Syringe + BD Mi
- 5ml BD Luer Lok Syringe + BD Mi
- 10ml BD Luer Lok Syringe + BD M
- 1ml BD Luer Slip Syringe + BD Mi
- 3ml BD Luer Slip Syringe + BD Mi
- 5ml BD Luer Slip Syringe + BD Mi
- 10ml BD Luer Slip Syringe + BD M
- 1ml BD Luer Slip Syringe + BD Mi

10ml P6 Vial

Container Code: VIAL-P6-10ML

Description: P6

Type: Vial ☒ Uses Volume

Container Volume: 10 ml

Nominal Volume: 4 ml

Min / Max Volume: 1 ml 10 ml ☒ ReadOnly

Notes:

Use the list box on the left to select a container and then edit as required. Click New to create a new container record.



Note that containers defined in the main database cannot be edited as this would compromise system data integrity.

Calibration Factor Editor

The calibration factor editor is used to define new calibration factors for use in the Fidelis system.

Fidelis Calibration Factor Editor

Data Source: Fidelis User Datasource ReadOnly ☐

Chamber Type: NPL Secondary Standard Radionuclide Calibrator NMI Traceable ☐

Nuclide: Ra-226 Nuclides

Container: 10ml P6 Vial Containers

	Unshielded	Shielded
Factor	☒ 5.751 pA/MBq	☒ 5.834 pA/MBq
Uncertainty	☒ 0.67 %	☒ 0.7 %
Vol. Correction	☒ 0.00262 A1	☐ -0.00017 A2

Notes:

Undo Cancel Done



Note that calibration factors defined in the main database cannot be edited as this would compromise system data integrity.

You must select a nuclide / container combination that has not previously been defined. The editor will warn you if this happens. You can then optionally specify pA/MBq ratios for both shielded and unshielded configurations plus associated uncertainty factors if known.

Volume correction terms describe the following equation:

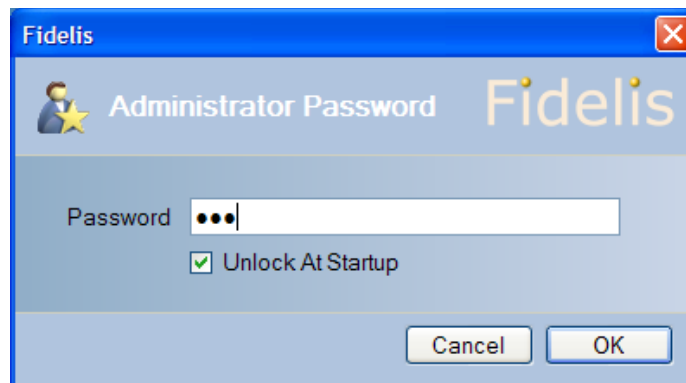
$$VCF = A2 \times Mass_{diff}^2 + A1 \times Mass_{diff} + 1$$

Where:

$$Mass_{diff} = Mass_{actual} - Mass_{nominal}$$

Administrator Login

Certain options within the Fidelis software require administrator login. If this is required you will see this window.



Enter the current administrator password and click OK. When a correct password is entered the "Unlock At Startup" check box will show which, if selected, will make administrator mode persistent between Fidelis sessions.



The default administrator password is "ssl"

Troubleshooting

Symptom	Possible Solutions
Settle period not reaching zero The reading has become very unstable or is either underrange or overrange. UNDERRANGE OVERRANGE	Check for damage to chamber or contamination. Make sure all daily tests have been successfully passed. Remove power and reapply.
Laptop fails to run Fidelis software	Reinstall software from backup disc. Consult manufacturer.
Software fails to connect to chamber CHAMBER	Ensure USB is plugged in and not damaged. Ensure USB cable is plugged in and the chamber is powered BEFORE running the software. Ensure power is supplied to chamber. If power ok and USB ok, remove power from chamber for 1 minute then re-apply.
Filtered power supply fails to supply voltage (i.e. Blue neon is off)	Check switch is on Check connection to mains supply Check fuse
System reads high background BKGD	Check for contamination Check for sources in the room Check for water having entered bottom of chamber
Laptop fails to power on	Check supply to laptop. Check laptop instruction guide for possible problems.
Unit fails check source test SOURCE	Ensure tests have been run in the correct order as defined by the daily test sequence and that they have all passed. Check location of source in chamber Check correct source is in use and that the vial type and parameters for the check source are correct. Carry out same checks as for high background
Unit shows incorrect or unexpected value	Check that decay calculations are not enabled Carry out same checks as for high background
Reading appears unstable	Allow to settle for one hour in a powered state at room

Symptom	Possible Solutions
	temperature before use. Ensure chamber is not wet
Unit reads Zero current at all times UNDERRANGE	Run daily test, if problem continues consult manufacturer
Well liner damaged	 DO NOT USE contact manufacturer.
Electrometer failure CHAMBER	Remove power from the system and restart as described in this manual. If problem persists consult the manufacturer
HV fail	Consult manufacturer.

Appendix 1 - Example Reading Reports



Report Date	07/12/2006 10:49:20
Radionuclide	Cs-137
Container	VIAL-P6-10ML
Volume	4.000 ml
VCF	1.000
Background	0.254 MBq
Reading Date	07/12/2006 10:49:20 +00
Reading Std Dev (s)	0.004 MBq
Reading Stability	1.41%
Reading	0.003 MBq

Details

Average Terms (n/max)	32/32
Gain Stage	High (Auto)
Cs-137 Half-Life	1.0976E+04 day(s)
Half-Life Uncertainty	3E+01 day(s)
CF ShieldMode	Shield Off
CF pA/MBq	5.751
CF Uncertainty	± 0.67%
Container Nominal Mass	4 ml
Container Min Mass	1 ml
Container Max Mass	10 ml

Notes

Data Source Ref: QPDQL/B/RMG001

Ionisation Chamber Calibration Factors for use within the Radiology Metrology Group

Full Container Description: 10ml P6 Vial



Report Date	07/12/2006 10:51:35
Mode	Electrometer
Reading Std Dev (s)	0.027 pA
Reading Stability	1.82%
Reading	1.478 pA

Details

Average Terms (n/max)	32/32
Gain Stage	High (Auto)