DOSIMETRY

IRD 2000

DosiCal M Version



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1 General

1.1 Purpose of this document

This document provides the information required to operate the irradiator.

1.2 Conventions

Use of typographical symbols:

Symbols " \blacksquare " and " \square ":

These symbols are used for descriptions and lists.

The symbol " ■ " corresponds to the **first** level of a list.

The symbol " \square " corresponds to the **second** level of a list.

For legibility reasons, these symbols are aligned vertically.

1.3 Reference documents

For complementary information to the current User's Manual, refer to the User's Manuals listed below (MGP Instruments reference)

	User Manual	MGP Designation	
	Dosimeter Reader	LDM 2000	
		DMC 2000 family:	
Civil version		 DMC 2000S 	
	Compact dosimeters	 DMC 2000X 	
		 DMC 2000XB 	
		 DMC 3000 	
	User guide	MGP Designation	
Military Version	Dosimeter Reader	LDM 2000	
	Compact dosimeters	SOR family	

1.4 General Presentation of the IRD

The **D**osimeter **IRradiator** is an irradiator designed to check the physical nuclear and electronic response of the DMC 2000, SOR and SOR/T and DMC 3000 family of individual dosimeters.



<u>Note:</u> For the list of types of dosimeters checked, see para. "11.4 Equipment Items", p.92.

It can be considered as an appropriate checking device, with adjustment if necessary, of the response of the dosimeters.

This concept has taken into consideration the following objectives:

- Simplicity of use: The manual operations are limited to insertion and removal of the dosimeters.
- Reliable reproducibility:

The exposure conditions are reproducible and the data acquisition and calculations are done automatically.

Capability to quickly calibrate a large number of dosimeters:

Use of three exposure places simultaneously per irradiation module and the possibility to control two irradiation modules in parallel from the same computer, that is a check of 6 dosimeters.

Traceability:

The results are traceable from transfer standard dosimeters to the results related to the checked dosimeters.

No paper:

The result Data Base is integrated into the application.

Safety:

Very low dose rate levels on the surface of the device

1.5 Main Cases of Use

 The IRD is designed to equip technical sections of nuclear installations in charge of the preventive maintenance, at the industrial use, of the DMC 2000, SOR and SOR/T and DMC 3000 family dosimeters.



Recommendations:

The user must apply the texts in force relating to worker protection against radiation hazards.

The user must have obtained authorization for use from the Authority. The user must have a radiation monitoring skilled person internal to his plant. This person shall check that worker protection is ensured

2 Description of the IRD

2.1 Chapter content

This chapter has successively:

- detailed description of the irradiator and its components,
- functional description of the irradiator (synoptic),
- the various versions and options available

2.2 IRD

The IRD is composed of the following main sub-assemblies:

- one or two irradiation modules,
- one reader and its interface box,
- the DOSICAL software for control,
- connecting cables.

To use it, the following items are also required:

- a PC,
- a printer. (optional)
- As an option: reference dosimeters

2.3 Description of Each IRD Component

2.3.1 Irradiation Module

The module is the mechanical section which is intended to position the dosimeter opposite the irradiation source.

It mainly comprising:

- a radiological protection made of 5 cm of lead in all directions with a recess forming an irradiation beam.
- a source carrier, designated as « main source location », for the main source,
- The main source, The available versions are:
- standard version:
 - permanent source 370 MBq (10 mCi) of Cs137.
- military version:
 - removable source provided by the French Army.



<u>Note :</u> Other radio-isotopes or other source activities available upon request.

- A movable carrier where the 3 dosimeters are installed, which allows:
- □ In the open position, to insert and remove the dosimeters, (see Figure 2 or Figure 3)
- In the closed position, the precise positioning of the dosimeters regarding the source and the direct exposure of the detector area to the beam generated by the source. (See Figure 1).
- A removable plastic screen, only used for the XB dosimeters. During the measurements with the main source, this plastic screen is positioned within the dosimeter irradiation field whereas it must be removed from the dosimeter irradiation field for the measurements with the secondary source.



<u>Note :</u>

An electrical contact allows the detection of the closed position.

- This device includes a lead shield to shut the beam when the carrier is in the open position.
- □ Air-charged springs ensure the lift of the carrier without any effort for the operator.
- A lockable shutter through the positioning of a locating wedge, with three positions available, that allows:
- In the closed position (indexed handle in up position, shutter down): to mask the main source beam;
- In the open position (indexed handle in down position, shutter up): to open the main source beam,
- In intermediate position (indexed handle in intermediate position): to mask the main source beam and to expose the dosimeter placed in the middle position to the beam of a secondary source installed in the shutter.



Figure 1 - View from the irradiator side and detail of the shutter in the open position

- a location, designated as secondary source carrier, for the secondary source, housed in the shutter,
- an optional secondary source:



The necessary proximity of the secondary source to the dosimeter, allows the calibration of only ONE dosimeter in the middle position (number 2)

- Gamma source of low energy for all the dosimeter types.
- Beta source to check the beta response of the DMC2000XB-type dosimeters.
- 3 antennas placed in the immediate proximity of the dosimeter antennas.
- A connector



Figure 2 - Irradiator front view, dosimeter carrier lifted



Figure 3 - Irradiator rear view, dosimeter carrier lifted



Figure 4 - Irradiator top view

- a cable to connect the 3 antennas and contacts to detect the dosimeter placement.
- markings for the 3 positions, the location of the shutter, the connector, the required source identification and the manufacturer information.
- hoisting rings to facilitate handling.

2.3.2 **Reader and Irradiator Interface**

The reader allows for information exchange between the PC and the dosimeters through a wireless link.

The reader is an LDM2000-type with the internal antenna removed or disconnected. The external antenna connector allows the connection to a multiplexing card of up to 8 external antennas. This card is located in an extension box attached below the reader.

	Kali	Enter Calification (CSER)	Two Examp Two Anterney And Access Anterney And Access	
ension box		-		7

Ext









Figure 7 - Connectors on the extension box, left view



Figure 8 - Power connector (right side of extension box)

The extension box is fitted with a power cord , one or two connectors per irradiation module and a connector to the control unit. One cord for the PC is included.

The reader has a display (not used in this application) and two signaling lights to indicate the transmission and reception of the « hand-free » messages.

2.3.3 Control Unit

The control unit is a personal computer equipped with Dosical Software fixed or portable with an available serial port to connect to the reader.

A printer to generate a hardcopy of the results as well as a large capacity hard disk are recommended

2.3.4 Reference Dosimeters

A set of 3 reference dosimeters whose response is well known and traceable to a national standard or client owned traceable source is required for the calibration. A spare reference dosimeter is desirable.

2.4 IRD configuration summary

	Main Source (S1)	Irradiation Module
Civil version	 10 mCi Cs 137 	 one only
Military version	 army gamma source 	 one only

2.4.1 Standard Configurations

- Carrier
- Dosimeters: type DMC 2000S, X, XB and SOR501,
- Dosimeters: type SOR313, SOR 480, SOR/T.
- Dosimeters type DMC 3000
- Main Source
- □ internal, Cs137 370 MBq (10 mCi)
- □ without the source, with a pig to hold instruction source IF177 (French Army)
- Number of modules
- □ 1 irradiation module
- 2 irradiation modules
- Special Versions
- Secondary Source Sr 90 or other
- Pig without the source
- Other main sources

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- Accessories
- □ Reference Dosimeters with certified calibration certificate, (COFRAC)
- D PC compatible computer,
- D Printer,
- □ Extension box/module connecting cable,
- Extension box/PC connecting cable:
 - standard serial link with SUB-D 9-contact connector

2.5 General Functional Description

- The dosimeters to be controlled are placed in an irradiation module containing, in its basic version, a permanent source placed on the main location.
- The dosimeters communicate with an LDM2000 dosimeter reader by means of "Handfree" communication antennas through a reader extension box integrating a multiplexing card.

119206EN-H

- The dosimeter reader transmits its information to the PC, control unit using a communication protocol managed by the LDMNet.
 The analysis and configuration of the checks are ensured by means of the DOSICAL software.
- The reader transmits the requests to the dosimeter after selecting the antenna of the location aimed at and then converts the message from the dosimeter to the PC.
- DOSICAL can thus activate the dosimeters, then, after a delay of exposure, read the dosimeter again.
- DOSICAL, via the reader, polls the status of the switch activated in order to check that the carrier is lowered and has not been raised again.
- The retained exposure time of each dosimeter is the shortest one. Each dosimeter has a waiting time delay, which enables the first one to be read again whereas the last one has not arrived to its exposure duration.
- The calibrations take place successively without any command from the operator: (the carrier lifting/lowering gives the beginning or end of the control)
- The dosimeter and switch polling can be extended to a second module. This way, the operation can be completely asynchronous, (each on its own timing), this allows loading and unloading one dosimeter while the other is being exposed.



Figure 9 Operating diagram

3 Installation and start-up

3.1 Chapter content

This chapter contains in chronological order all the necessary operations needed to set up and use the IRD for the first time.

3.2 Component Verification

Before starting any connections, verify that all the following components are available:

- the irradiation module(s),
- the LDM2000 Reader and its extension box,
- a PC with the software package (DOSICAL and other required software modules) installed (see the corresponding appendix),
- a printer,
- all the interconnection and power cables.

3.3 IRD Installation

It is recommended to create a work location reserved for the IRD 2000, in this mode the furniture can be set-up with the best ergonomic and lowest radiological risks possible.

It must be considered:

- the presence of an almost-permanent operator,
- the ergonomic use of the PC,
- the handling of the dosimeters (load and unload),
- the handling of the irradiation module (lowering the carrier),
- the orientation of the irradiation module to minimize the leak rate in the work area (see chapter " Physical Characteristics – standard version", p. 65).



The user must provide a 230V line for each subset (Extension box/LDM 2000, computer, printer).

3.4 First use

3.4.1 Software Package Installation

In order to reduce the volume of the document Appendix 1: Installation of the Software Package, page **67**, describes all the installation and configuration procedures of the software modules required, according to the PC context (network card installed or not).

3.4.2 Hardware Installation

The hardware installation consists in connecting the PC to the dosimeter reader, setting up and establishing the communication between them.

3.4.2.1 Connection of PC to LDM2000 reader



The connection between the PC and the reader consists in connecting the serial port COM of the PC to the *RS232/485* port in the reader (see figure above) with a standard serial communication cable type DTE / DCE.

Verify there is power in the LDM2000 (the green LED flashes)

For more information about this cable, contact MGP Instruments.

3.4.2.2 Address selection in the LDM2000

Each LDM2000 Reader is identified by an address from **00** to **99**. This address is used in a networked centralized dosimetry system.

In the case of the use with the DOSICAL software, this address must be set to « 01 ».

To program this address (see figure below):

- Remove the protective plate on the side of the reader by removing the two attaching screws,
- Using a small screwdriver, set:
- □ the **unit number** with the lower wheel to « **1** »,
- □ the tens number with the upper wheel to « 0 »,



3.4.2.3 Powering the LDM2000 Reader

- Power on the reader
- In the case of a LDM2000 use, verify the following message:

*		
	HELLO	
ACZ	Pst time.: 3s	AUS

The normal operating status is defined in the following paragraph.



Meaning of this display: <u>A C Z</u>: the LDM2000 reader is in "Access Control" mode <u>A U S</u>: the LDM2000 reader is in "Secure Stand-Alone" mode: performs access control activities based in local parameters and stores locally information on entries/exits.

Refer to LDM2000 user's manual #115373, for complementary information,

3.4.3 DOSICAL Start-up

- Turn the PC power ON:
- □ The start-up screen of DOSICAL (see below) will appear

1	🐞 DOSICAL : Irradiator # 200328								
Eile	<u>A</u> dministration	<u>P</u> arameters	<u>C</u> hecking	M <u>o</u> dule	<u>V</u> iew	Main <u>t</u> enance	<u>H</u> elp		
							User:	1/24/2012 4:55 PM	AJ INSER NUM a

After launching the DOSICAL software, the LDM2000 display will show the following:

*		
	HELLO	
SLV	Pst time.: 3s	SAT



Γ.

Meaning of this display:

<u>SLV</u>: the LDM2000 reader is in "Configuration" mode

<u>S A T</u>: the LDM2000 reader is in "SATellite" mode: this indicates that the connection between the reader and the PC is stable.

See , for complementary 'information, the LDM2000 technical manual Number 115373

If « **SAT** » is not displayed on the bottom right of the display, the connection between the reader and the PC is not correct.

In this case, ensure the installation of all cables is correct and check the following:

- COM port of the PC used to connect to the LDM2000 is well set in DOSICAL
- The reader physical address is set to 01
- The cable is a serial cable of the DTE/DCE communication type

The user then accesses a selection of functions, differing according to the user profile which has been assigned to him by the DOSICAL administrator.

Appendix 2, page89, details the user profiles and the administration of the access levels by DOSICAL.

The next chapter describes the parameter setting to be performed upon a first operation of DOSICAL and the DOSICAL operating functions in its current use.

4 Typical use of an irradiator

4.1 First Use

Upon completion of the hardware and software installation, perform the following upon a first use:

Enter the general parameters and nomenclatures.



For complementary information see in this chapter:" **General Parameters**", p 19

- section "Nomenclature", p 22
- section "Nomenclature of the Reference Dosimeters p 23
- section "Nomenclature of the Sources p 25
- section "Nomenclature of the Modules, p.26
- section "Nomenclature of the irradiator", p. 27
- Check whether a valid calibration exists and, if applicable, perform it.



<u>Note:</u> For additional information on calibration, see chapter "Maintenance", section "Calibration", page. 51

Then proceed to the operator level standard operations (in this chapter, see "*Opening of Check Session*", page 28).

Upon the next uses, the operator directly accesses the standard operations.

4.1.1 Main screen

Upon completion of the software initialization phase, the **main window** appears, and comprises:

- a menu bar comprised of 8 menus:
- □ the « File » menu,
- □ the « Administration » menu,
- □ the « Parameters» menu
- □ the « Checking» menu,
- □ the « Module » menu,
- □ the « View» menu,
- □ the « Maintenance» menu,
- □ the « **Help** » menu,

ا 🕷	OOSICAL : Irradiato	r # 200328						
File	Administration	Parameters	Checking	М	odul	e View	Maintenance	Help
	Communication	parameters						
	Language			۰.				
	Units			•		cGy		
	Print Screen				\checkmark	mrem		
						mSv		
	Exit		Ctrl+Q	2				

4.1.2 File menu settings

4.1.2.1 Communication parameters

The general parameters must be entered to access the software functions.

Default values are loaded upon installation and the user can customize them.

The "File" menu "Communication parameters" sub-menu, accessible at all levels, is used to access the DOSICAL/irradiator communication parameters:

- Communication port used,
- Communication speed (38 400 bauds by default),
- Data bits (8 by default),
- Parity (« None» by default),
- □ Stop bits (1 by default).

Communication p	arameters
Comm	n port COM1 -
Speed (bauds)	38400 🔻
Data bits	8
Parity	None
Stop bits	1 -
	OK Cancel

Figure 10 - DOSICAL "Communication parameters" screen

This information is recorded in the *ini* file through the "OK" button.

4.1.2.2 Language

The « File » menu « Language » submenu, accessible at all levels, is used to change the DOSICAL language.

4.1.2.3 Units

The « File » menu « Units » submenu, accessible at all levels, is used to select the working unit which will be used in all the DOSICAL screens.

4.1.2.4 Print screen

We may at any time, print the current screen of DOSICAL by clicking "Print Screen" menu "File".

4.1.3 Parameters

The « Parameters » menu is used to access the « general parameters » and « targets » configuration. It is also used to access the four nomenclature management screens (see p. 22).

4.1.3.1 General Parameters

The general parameters must be entered to access the software functions.

Default values are loaded upon installation and the user can customize them.

4.1.3.2 Entering General Parameters

Access to the general parameters file is obtained from the "General Parameters" sub-menu of the "File" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level. Enables to access to general parameters:

- Of the irradiator:
- D Maximum number of authorized modules.
- □ Range of efficiency's coefficient for DMC 2000 & 3000
- Efficiency coefficient limits (points out a dosimeter as invalid if during a calibration the new coefficient has a different percentage compared to the former than the input value.
- □ Exposure delay of a basic measurement.
- Number of exposures performed upon a check.
- □ Checking the triggering of the dose alarm.
- Of the dosimeters:
- Customization of the displayed message on dosimeter check in progress, correct check or incorrect check (in the case of a correct check, the desired display may be a text or the desired date for the next check).
- Configuration files applied to the dosimeters upon completion of correct or incorrect check. For each type of dosimeter, a file can be selected in case of correct check and a file in case of incorrect check. This function is activated by checking the box corresponding to the dosimeter type and check result.
- respectively for the main source location (permanent source) and the secondary source location:
- □ Target exposure dose, for main source and secondary source.

- Acceptance Interval of a check (admitted tolerance)
- Command lines launched
- Command lines launched at the end of each check session or at the end of each dosimeter check, is the option is validate
- Command lines launched at the end of each calibration session or at the end of each dosimeter calibration is the option is validate.
- Miscellaneous
- Check written time in the dosimeter after control: GMT or local time of the machine
- Reset dosimeter historical (historical contains just two changes of state of the dosimeter: Pause to run and run at pause)
- Reset dosimeter, dose, dose rate and date. Historical contains just two changes of dosimeter's state: setting "run", setting "pause" and the low dose measured during this transition.

🐞 [MGPI] : DOSICAL : Irradiator # 200328				
<u>File Administration Parameters Checking</u>	M <u>o</u> dule <u>V</u> iew	Main <u>t</u> enance <u>H</u> elp		
General Parameters :				
Maximum Number of Authorized Modules	2 🔻	Secondary Source Author	orized	
Efficiency Coefficient Bange DMC 2000 Min	200 May	400	Checking the triggering of the dose	alarm
			Checking the triggening of the dose	aiaiiii
Efficiency Coefficient Range DMC 3000 Min	150 Max	250	🔲 Reset histo, dose, rate, date	
Recalculated Efficiency Coefficient Limits	30 %	Exposure Delay	y (basic measurement) 1 mn	
Exposure count	1	Dose for the triggering	1 mSv Restored Dose	1 mSv
Dosimeter Display :				=====
Dosimeter Status Display 🔲 On Corre	ct Check (Passed)	Text	PASSEI 🔘 Next Cal. Date in	6 Month(s)
Dosimeter Status Display 📃 On Incom	rect Check (out of lim	its or invalid)	FAIL	
Dosimeter Status Display 📃 During C	heck in Progress		TEST	
Dosimeter configuration files :				
On Correc	ct Check (Passed)		On Incorrect Check (out of limits or in	nvalid)
SOR		Browse		Browse
DMC 2000 GN		Browse		Browse
DMC 2000 S		Browse		Browse
DMC 2000 X		Browse		Browse
DMC 2000 XB		Browse		Browse
DMC 3000		Browse		Browse
Main Source Location :				
	_			-
Sa	/e	Close	e	
		User: mgpi	2/29/2012 10:50 AM	MAJ INSER NUM.

🐞 [MGPI] : DOSICAL : Irra	diator # 200328						
<u>File</u> <u>Administration</u> Pa	arameters <u>C</u> hecki	ng M <u>o</u> dule	View	Main <u>t</u> enance	<u>H</u> elp		
Dosimeter Status Display	Don I	ncorrect Check	(out of lir	mits or invalid)	L	FAIL	o monai(s)
Dosimeter Status Display	🔲 Duri	ng Check in Pro	igress			TEST	
 Dosimeter configuration file 	s: On C	orrect Check (F	'assed)			On Incorrect Check (out of limit	ts or invalid)
SOR 🛛]			Browse			Browse
DMC 2000 GN]			Browse			Browse
DMC 2000 S]			Browse			Browse
DMC 2000 X]			Browse			Browse
DMC 2000 ×B]			Browse			Browse
DMC 3000				Browse			Browse
Main Source Location : Target Exposure	5	mrem		Acceptance In	erval	15 %	E
Command lines :							
Batch Lheck					JMC Lhec	ж 	
Batch Calibration	ndb'' ?DAILY BAT	CH_CALIBRAT	ION ?yes	5	Ome Calibr	ration ata\Dosical.mdb" ?SIN	NGLE_CALIBRATION
Misc :							
Dosimeter Date/Time	🔘 GMT	Local					
		Save			Clo	se	Ŧ
					User : mgp	pi 1/24/2012 5:04	4 PM MAJ INSER NUM]

Figure 11 - Dosical "General parameters " screen, typical values

This information is stored in the data base by pressing the "Save" button, in the lower right corner of the general parameters screen.

To exit the general parameters, press the "Close" button, in the lower right corner of the general parameters screen.

4.1.3.3 Targets

The targets must be defined to allow for software running.

Default values are loaded upon installation and the user can customize them.

4.1.3.4 Target Information

The DOSICAL « Parameters » menu « Targets » submenu, only accessible at the « SUPERVISOR » and « MANUFACTURER » levels, is used to access the target configuration.

The desired target must be selected for each dosimeter type.



<u>Note :</u>

In the case of an XB type dosimeter, there are 4 targets to be completed. They are defined according to the magnitude (Hp or Hs) and location used (main or secondary).

🕷 (I	MGPI] : DOSICAL	: Irradiator # 2	00328						- 🗉 🗙
<u>F</u> ile	<u>A</u> dministration	<u>P</u> arameters	<u>C</u> hecking	M <u>o</u> dule	<u>V</u> iew	Main <u>t</u> enance	<u>H</u> elp		
-Ta	rgets : SOR :								
	Target	1.09							
	DMC 2000 S :								
	Target	1							
	DMC 2000 X :								
	Target	1							
	DMC 2000 GN : -								
	Target	1							
	DMC 2000 XB :								
	Target Hp Main		1	Targe	t Hs Mai	in	1		
	Target Hp Secor	ndary	0.1	Targe	t Hs Sec	condary	1		
	DMC 3000 :								
	DMC 3000	1							
				(
					<u>S</u> ave		<u>C</u> lose		
							User:mgpi	1/24/2012 5:06 PM MA	J INSER NUM

Figure 12 : DOSICAL "Targets" screen, typical values

This information is stored in the database through the "Save" button at the bottom of the target screen.

To exit the general parameters, press the "Close" button, at the bottom of the general parameters screen.

4.1.4 Nomenclature

The nomenclature data must be entered to access the software functions.

The nomenclatures enable the permanent information related to the following to be stored:

- the reference dosimeters.
- the source(s),
- the irradiation module(s),

the irradiator,

The items of information identified "valid" are those used by default.

Different configurations, not used momentarily or old and identified "invalid", can however be stored.

CAUTION: The nomenclature entering order SHALL MANDATORILY BE SOURCE MODULE IRRADIATOR
IRRADIATOR
The irradiator integrates the module, which integrates the source



One or more items can be deleted in each one of the four screens (reference dosimeters, sources, modules, irradiator) by selecting the complete line involved (by clicking the box to the left of the line) and by pressing the « Del. » key. This deletion is however possible only when the item is not used elsewhere.

4.1.5 Nomenclature of the Reference Dosimeters

The nomenclature stores all the successive reference exposures of all the reference dosimeters

4.1.5.1 Access to Reference Dosimeter Nomenclature Management Function

Access to the reference dosimeter nomenclature function is gained from the "Reference Dosimeter" sub-menu of the "File" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level.

It is in the form of a table whose lines (record in a data base) identify a given reference dosimeter in a single way through the following information:

- Dosimeter Serial Number,
- Reference Exposure Date,
- Reference Exposure Identification, (Cs137 Hp or Sr90 HS for example)
- Measurement type (Hp or Hs dose equivalent),
- Dosimeter Response to the test,
- Check Declared Uncertainty,
- Dosimeter Validity or Invalidity.
- Dosimeter Response = read_dose / reference_dose.

After each reference exposure of a dosimeter, record a new line by validating it and invalidating the previous records.

)osimeter #	Reference Exposure Date	Reference Exposure Identification	Туре	Response	(%)Declared Uncertainty	Dosimeter Validated
213105	9/29/2009	60Co	Hp	0.830	5.370	X
213105	7/15/2008	60Co	Hp	0.830	5.340	
213105	4/10/2002	60Co	Hp	0.840	4.840	
228014	4/10/2002	60Co	Hp	0.840	4.300	
228017	9/29/2009	60Co	Hp	0.800	4.970	X
228017	7/15/2008	60Co	Hp	0.820	4.960	
228017	4/9/2002	60Co	Hp	0.810	4.950	
228019	9/29/2009	60Co	Hp	0.820	5.020	X
228019	7/15/2008	60Co	Hp	0.830	5.260	
228019	4/10/2002	60Co	Hp	0.820	4.820	
309710	9/30/2009	60Co	Hp	0.910	5.040	X
309710	9/10/2008	60Co	Hp	0.920	5.110	X
309710	8/22/2006	60Co	Hp	0.910	4.980	
310247	9/30/2009	60Co	Hp	0.890	5.740	X
310247	9/10/2008	60Co	Hp	0.900	5.020	
310247	4/19/2002	60Co	Hp	0.900	4.880	
311743	9/30/2009	60Co	Hp	0.900	5.320	X
311743	9/10/2008	60Co	Hp	0.910	5.240	
311743	4/18/2002	60Co	Hp	0.900	5.450	
311953	9/10/2008	60Co	Hp	0.900	5.470	
311953	4/19/2002	60Co	Hp	0.900	4.900	
393043	1/16/2012	Cs 137	Hp	0.137	5.137	X
393043	1/16/2012	Cs 137	Hs	0.138	5.138	X

Figure 13 DOSICAL « Reference Dosimeter » Nomenclature Screen

The isotope type to which the response refers, e.g.: Cs 137 or Sr 90, must be specified in the magnitude part.

For a same reference dosimeter, only two valid responses can be obtained at a time. An Hp response and an Hs response.

When calibration is achieved on the Sr 90 secondary source in Hs, it is necessary to invalidate the Hs response to Cs 137 and create an Hs response to Sr 90, and vice versa, when Hs/Cs 137 calibration is necessary, invalidate the Hs response to Sr 90 and create an Hs response to Cs 137.

- For an XB dosimeter, there will be 3 declarations:
- □ an Hp response to Cs 137
- □ an Hs response to Cs 137
- □ an Hs response to Sr 90.

As there could be only one response for a same dosimeter and a same magnitude (Hp or Hs), the date recorded for the Hs response to Cs 137 must be different of that entered for the Hs response to Sr 90.

Before any computerized calibration and for XB dosimeters, check that the displayed response of the reference dosimeters corresponds to the isotope to be measured Cs 137 or Sr 90.

4.1.6 Nomenclature of the Sources



CAUTION: The module calibration function and the dosimeter check function ARE NOT ACCESSIBLE if the nomenclature of the sources has not been entered.

4.1.6.1 Access to Source Nomenclature Management Function

Access to the reference dosimeter nomenclature file function is done from the "Sources" sub-menu of the "**Parameters**" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level.

It is in the form of a table whose lines (record in a data base) identify a given source in a single way through the following information:

- Source Serial Number,
- Radionuclide constituting the Source,
- Radionuclide Name,
- Activity Decay Period expressed in years,
- Activity on the recording date in MegaBecquerels (MBq),
- Source Location:
- □ Main,
- Secondary
- Creation Date of the record attached to the described source.

	Serial #	Symbol	Description	Decay Period	Activity(MBq)	Location Type	Fabrication Date
	GG	CS 137	Cesium	30.170	10	Main	1/30/2008
	KK159	60Co	COBALT 60	5.271	37	Main	5/21/2002
_							
_							
-							
-							
-							
_							
-							

Figure 14 DOSICAL "Sources" Nomenclature screen

4.1.7 Nomenclature of the Modules

The nomenclature maintains a list of the modules managed by the software.

The software checks that the number of valid modules coincides with the number entered in the general parameters.

The invalid modules are the modules that have been once managed by the software and that have been replaced by the manufacturer.

4.1.7.1 Access to Module Nomenclature Management Function

Access to the module nomenclature function is gained from the "Modules" sub-menu of the "**Parameters**" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level. Enables to access to irradiator modules nomenclature.

It is in the form of a table whose lines (record in a data base) identify a given module in a single way through the following information:

- Module Serial Number,
- Caption Number,
- Permanent Source Serial Number,
- Existence of a secondary source location,
- □ In that case, Secondary Source location Serial Number,
- Creation Date of the record attached to the described module.
- Module validity
- Comment

Serial #	Part #	Permanent Source on the Main Location	With 2nd location	Permanent Source on the Secondary Location	Fabrication Date	Vali
020500/A	121401/A	GG	Х	KK159	5/21/2002	Х
025001/B	121401/B	KK159	Х		1/19/2012	
						-


4.1.8 Nomenclature of the irradiator

The nomenclature keeps a trace of the irradiators managed by the software.

The software checks the validity of one irradiator at one time.

The invalid irradiators are irradiators that have been once managed by the software or that have been replaced by the manufacturer.

4.1.8.1 Access to Irradiator Nomenclature Management Function

Access to the irradiators nomenclature function is gained from the sub-menu "Irradiators" of the "File" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level.

It is in the form of a table whose lines (record in a data base) identify a given irradiator in a single way through the following information:

- Irradiator Serial Number,
- Module A Serial Number,
- 2nd module (B) Serial Number, if 2 modules option selected,
- Creation Date of the record attached to the described irradiator,
- Validity of the irradiator.
- Comments

Serial #	Module A Serial #	Module B Serial #	Fabrication Date	Valid	
200328	020500/A	025001/B	5/21/2002	X	
	III				

Figure 16 - « Irradiators » Nomenclature screen

- Choose 1 or 2 modules:
- □ The irradiator can be configured with 2 modules, only if the number of authorized modules listed in the general parameters is set to 2.

When the user wants to configure the irradiator with only one module, he can select module A or module B.

NOTE:



The user has the possibility to configure an irradiator with 2 modules where one does not have a secondary source location:

For module calibration or dosimeter check, if the user selects the secondary source location, only the module equipped with a secondary source location will be proposed (primary source hidden).

4.2 Operations Allowed at Operator Level

Assuming that on start-up the irradiator has been configured (see chapter "Installation and start-up", p. **11** and that a valid calibration has been completed (see chapter "Maintenance", section "**Maintenance Help Functions**", p. **45**).

The operations that a skilled operator must perform are:

- Check without calibration,
- Check with calibration,
- Consultation of the data base,
- Computerized calibration (validation not included).

4.2.1 Session Notion

The checks with or without calibrations are grouped in sessions.

One session is a series of checks done under identical conditions with the same label, i.e., with no change to the following parameters: label, check without/with calibration, dosimeter lot identification, operator identification, source location type, magnitude type, dosimeter check type, module type, source type.

The selection, in the **"Checking"** menu, of the "Check with or without calibration" submenus, implies the following:

- Opening of a session,
- Or to continue a session in progress, if DOSICAL has not detected any changes.

4.2.1.1 Opening of Check Session

All dosimeter Checks (with or without calibration) are automatically associated with the session in progress.

The opening of a session is done by providing the following information:

Source / signification					
Free Text					
Choice: main or secondary					
"Hp" or "Hs" or both (for an XB					
dosimeter)					
Selection of the dosimeter type in the					

Next you select one or two irradiation modules.

DOSICAL associates automatically an opening date and records the main common characteristics:

- Target Exposure Dose,
- Acceptance Interval,
- with or without calibration.

The information relative to the session in progress are displayed.

If the operator modifies one or more fields, a new session is opened.

The absence of information in the obligatory fields, or the absence of validation, cancels the session opening.

Once a new session is opened, it becomes the current session and the previous session is closed.

4.2.2 Dosimeter Check Functions

Access to these functions is obtained from the menu "Checking" of DOSICAL:

- « Checking Without Calibration... »,
- « Checking With Calibration...»,

(MGPI] : DOSICAL : Irradiator # 200328											
File Administration Parameters	Checking Module View Maintenance Help										
	Checking Without Calibration										
	Checking With Calibration										

4.2.2.1 Dosimeter Check Function without Calibration

This function allows the verification of a dosimeter lot without adjusting their response.

Access to this function is gained from the "Checking without calibration" sub-menu of the "File" menu in DOSICAL. This check is thoroughly controlled by DOSICAL.

Elle Administration Parameters Checking Mgdule Yiew Maintenance Help Dosimeter DMC2000S Operator mgpi Exposure count : 1 Start Target Exposure 5 mem Acceptance Interval 15 % Target Hp 1 Hs Module A. Serial #: 020500/A Operator mgpi Exposure count : 1 Target Hp 1 Hs Module A. Serial #: 020500/A Source Loc Main Acceptance Interval 15 % Target Hp 1 Hs Module A. Serial #: 020500/A Source 2:04 Hp rate/pos:1 287 2 282 mmem/h Status Cancel Reference cal Hp rate/pos:1 287 2 282 mmem/h Status Reference rate Exposure time Reference dose Dose experiments Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference dose Dose experiments Image: Module A. Serial #: Image: Module A. Serial #:	🐞 [MGPI] : DOSICAL : Irradiator	r # 200328 - [Dosime	ter Check]					
Dosimeter Check, Without Calibration Batch Number DF 65221 Source Loc Main Type Hp Check XB Start Type of dosimeter DMC2000S Operator mgpi Exposure count : 1 Target Exposure count : 1 Hs Module A, Serial II: 020500/A Source III: 020500/A Acceptance Interval 15 % Target Hp 1 Hs Module A, Serial II: 020500/A GG CS 137 Main Action Cancel Reference call Hp rate/pos:1 287 2 244 3 282 mrem/h Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference dose Dose expe (mrem) Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference dose Dose expe (mrem) Dosimeter Type Eff coeff as New Eff Reference rate (mrem) (mrem)	File Administration Paramet	ters <u>C</u> hecking M	dule <u>V</u> iew M	Main <u>t</u> enance <u>H</u> el	р			
Batch Number UP B321 Source Loc Main Type Hp Check X8 Statt Type of dosimeter DMC2000S Operator mgpi Exposure count : 1 Target Hp 1 Hs Module A, Serial #: 020500/A Source # GG CS 137 Main Action Cancel Reference call Hp rate/pos.1 287 2 284 3 282 mrem/h Status Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure (mrem) Dose experiments Image: A status Type Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference dose Dose experiments Image: A status Type Eff coeff as New Eff Reference rate Exposure time Reference dose Type Image: A status Type Eff coeff as New Eff Reference rate Type Type<	- Dosimeter Check Without Calibrati	ion		.	(
Type of dosimeter DMC2000S Uperator mppi Exposure count: 1 Target Exposure 5 mem Acceptance Interval 15 % Target Hp 1 Hs Module A, Serial #: 020500/A GG CS 137 Main Action Cancel Reference cal Hp rate/pos.1 287 2 284 3 282 mem/h Status Reference cal Hs rate mrem/h Type Eff coeff as found New Eff (mrem/h) Exposure time (mrem) Reference dose (mrem) Dose expe Date and Hour Pos Mode Dosimeter Type Eff coeff as found New Eff (mrem/h) Exposure time (mrem) Reference dose (mrem) Dose expe Image: tal and Hour Pos Mode Desimeter Type Eff coeff as found New Eff (mrem/h) Exposure time (mrem) (mrem) Image: tal and Hour Pos Mode Dosimeter Type Eff coeff as found New Eff (mrem/h) Exposure time (mrem) Image: tal and the tal and tal and the tal and the tal and the tal and the tal and tal and t	Batch Number UF 66321	Source Loc	Main	i ype	Нр ▼	Check XB		<u>S</u> tart
Target Exposure 5 mem Acceptance Interval 15 % Target Hp 1 Hs Module A, Serial II: 020500/A Source III GG CS 137 Main Action Cancel Reference cal Hp rate/pos.1 287 2 284 3 282 mrem/h Status Reference cal Hs rate mrem/h Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference does Dose experiments Image: Target Hp and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference does (sec.) Dose experiments Image: Target Hp and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time (mrem) (mr	Type of dosimeter DMC200	pe of dosimeter DMC2000S Operator mgpi Exposure count : 1						
Module A, Senal II: U2000/A CG CS 137 Main Action Cancel Reference cal Hp rate/pos:1 287 2 284 3 282 mrem/h Status Reference cal Hs rate mem/h mem/h Eff coeff as New Eff Coeff (mrem/h) Reference cales coeff (mrem) Dose experiments Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Coeff (mrem/h) Reference cales (sec.) Reference dose (mrem) Coeff (mrem) 4	Target Exposure 5	mrem Accepta	nce Interval	15 %	Target I	Hp 1 Hs	:	
Source # Gd CS 137 Main Count Reference cal Hp rate/pos.1 287 2 284 3 282 mrem/h Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time Reference dose Dose expe (mrem) Image: Status . <td>Module A, Serial #: U2U:</td> <td>500/A</td> <td>27 MS.</td> <td>Action</td> <td></td> <td></td> <td>Г</td> <td>Cancel</td>	Module A, Serial #: U2U:	500/A	27 MS.	Action			Г	Cancel
Reference call Hs rate mrem/h Date and Hour Pos Mode Dosimeter Type Eff coeff as New Eff Reference rate Exposure time (mrem) # . found Coeff Reference rate (sec.)	Beference cal Hp rate/por	uu ∟əı ∝1 २०7 २ २०४	37 Main 2 202 mrom	л. Status				Dancor
Date and Hour Pos Mode Type Eff coeff as found New Eff Reference rate (mrem/h) Exposure time (sec.) Reference dose (mrem) ▲ ▲	Reference cal Hs rate	3.1 207 2 204	J ZOZ IIIICIII	/h				
	Date and Hour Pos	Mode Dosimete	r Type Eff.co	effas New Eff nd Coeff	Reference rate (mrem/h)	Exposure time (sec.)	Reference dose (mrem)	Dose expec (mrem)
Close							Close	•

Figure 17 - Start up screen of a normal dosimeter check without calibration

This screen is divided in several fields:

- Standard session characteristics,
- System Check Dialog with the operator, top right:
- □ "Action" zone: instruction, in red color, for the attention of the operator,
- □ "Status" zone: report of the actions of the system in progress.
- Results of the previous cycle (to allow the storage during hidden time)
- commands:
- □ "Start": launch the check
- □ "Abort": calibration in progress, quit the function,
- □ "End of session": close the check session.



• To start up the check, click on the button « Start », on the top right of the screen.



Figure 18 - System Message for the first check

Verify that the IRD shutter is in the 'open' position: handle in the low position, shutter lifted to allow the beam from the main source to pass

- As regards XB dosimeters and Cs 137 main source,
- check that the plastic screen is **positioned** within the dosimeter irradiation field.
- As regards XB dosimeters and Sr 90 secondary source,
- check that the plastic screen is **removed** from the dosimeter irradiation field.
- Insert the dosimeters in the carrier with their front facing the source, against the stop above each housing.



Figure 19 - Operator Dialog: Insertion of the dosimeters

The dosimeter carrier is fitted with a spring to ensure the dosimeter stays in place during the check.

The concept of the dosimeter carrier is a compromise between the reproducibility requirements and the ease to install and remove the dosimeters.



Note

The dosimeter can be in "active" or in "pause" mode. If in « active » mode, its dose value and its status will be erased.

The dose alarm threshold can be modified by DOSICAL. If the case occurs, the alarms are audible during the check.



Caution:

For the DMC 2000 XB dosimeter with a secondary source, only the 2nd position will be available

Warning: It is imperative to use a carrier appropriate at the type of dosimeter used.

Otherwise, the dosimeters will be wrongly positioned in the IRD, which has the effect of producing measures, and therefore an improper calibration.



For dosimeters type :

DMC 2000 S, X, XB : DMC 2000 carrier.

DMC 2000 GN : DMC 2000 GN carrier.

SOR : SOR carrier.

DMC 3000 : DMC 3000 carrier.

Move the carrier down until locking

Working, do not touch the carrier	<u>C</u> ancel
1:Identification completed 2:Identification completed 3:Identification completed	

Figure 20 : Operator Dialog: Dosimeter identification

DOSICAL checks that the present dosimeters are of the same type as that of the session (selected in the « Dosimeter type » scrolling list). If at least one of the dosimeters is not of the selected type, the check then stops with an error message.



Figure 21 Typical error message if the type of a dosimeter is different of that selected

DOSICAL then starts the exposure and displays the time delay countdown.

Working, do not touch the carrier	<u>C</u> ancel
1:Counting time in progress (52 s) 2:Counting time in progress (55 s) 3:Counting time in progress (79 s)	

Figure 22 - Operator Dialog: Delay counting for each dosimeter

Any opening of the carrier causes the calibration in progress to be aborted and a message is given to the operator.

Working, do not touch the carrier	<u>C</u> ancel
1:Acquisition completed 2:Acquisition completed 3:Acquisition in progress	

Figure 23 - Operator Dialog: Acquisition of dosimeter exposure measurements

During data acquisition, if DOSICAL detects that the efficiency coefficient of a dosimeter differs from the last coefficient known in the database for this dosimeter and this magnitude, it then displays an information message.



Figure 24 : Information Message: Efficiency coefficient modified out of DOSICAL

Lift the carrier	<u>C</u> ancel
1:Acquisition completed 2:Acquisition completed 3:Acquisition completed	

Figure 25 - Operator Dialog: End of dosimeter exposure data acquisition.

- After the message "Lift the carrier", pull the latch that unlocks the carrier: then it automatically lifts up with the push of the air-charged springs.
- Remove the dosimeters and store them according to the displayed results.

The results are automatically recorded into the data base



Lift the carrier	<u>C</u> ancel

Figure 26 - Operator Dialog: End of Check

Next reload three other dosimeters and restart the same sequence.



CAUTION:

The dosimeters can be inserted into or removed from the irradiator only when the carrier is fully open.

4.2.2.2 Error Message

If some dosimeter's parameters are out of range, Dosical displays the following message: "Received message corrupted".



<u>Note:</u>

This is not due to an Hand-free exchange problem. In this case, contact MGPI specifying the message content.

4.2.2.3 Results Screen for a Check without Calibration

(MGPI] : DOSICAL : Irradiator # 200328 - [Dosimeter Check]										• X
<u>File A</u> dministration <u>P</u> arameters <u>C</u> hecking M <u>o</u> dule <u>V</u> iew Main <u>t</u> enance <u>H</u> elp										
Dosimeter Check Without Calibration Batch Number OF 66321 Stort Type Hp Check XB										
Type of dosimeter	Type of dosimeter DMC2000S - Operator mgpi Exposure count : 1									Jtart
Target Exposure	5	mrem	Acceptanc	e Interva	al 15	%	Target	Hp 1 Hs		
Module A, Seria	I #: 02	20500/A							_	
Source #		GG	CS 137	7 M	lain ^{Act}	ion Lift the	e carrier			<u>C</u> ancel
Reference cal H	p rate/	pos.1 287	2 284	3 282	mrem/h ^{Sta}	tus 1:Acqu 2:Acqu	uisition complet	ted ed		
Reference cal H	s rate				mrem/h	3:Acqu	uisition complet	ted		
Date and Hour	Pos	Mode	Dosimeter #	Type	Eff coeff as found	New Eff Coeff	Reference rate (mrem/h)	Exposure time (sec.)	Reference dose (mrem)	Dose exper (mrem)
8/31/2010 1:19:07	1	Check	845400	Hp	368	368	286.9	73	5.8	5
8/31/2010 1:19:26	2	Check	845402	Hp	396	396	284.4	78	6.2	E
8/31/2010 1:19:45	3	Check	845401	Hp	352	352	282.1	80	6.3	E
•										Þ

🐞 [MGPI] : DO	SICAL : Irradia	tor # 200328 -	[Dosimeter Che	eck]							X
<u>File A</u> dminist	tration <u>P</u> ara	meters <u>C</u> hecl	king M <u>o</u> dule	View	Main <u>t</u> en	ance <u>H</u> elp)				
Dosimeter Check Without Calibration Batch Number 0F 66321 Source Loc Main Type Hp ▼ Check XB											art
Type of dosime	eter DMC	2000S -	Opera	tor		mgpi	Expos	ure cou	nt : 1	<u></u> tc	
Target Exposur	re 5	mrem	Acceptance Inte	erval	15	%	Targ	jet Hp	1 Hs		
Module A	A, Serial #: 0 :#	20500/A GG	CS 137	Main	Actio	n <mark>Lift the</mark>	carrier			<u> </u>	ancel
	nce cal Hp rate. nce cal Hs rate	/pos.1 287	2 284 3 2	82 mrem	n∕h Statu n∕h	s 1:Acqui 2:Acqui 3:Acqui	isition com isition com	pleted pleted pleted			
New Eff F Coeff	Reference rate (mrem/h)	Exposure time (sec.)	Reference dos (mrem)	e Dose ((m	expected irem)	Dose read (mrem)	Response	Tol (%)	Decision	Check of dose alarm triggering	
368	286.9	73	5.8	;	5.8	5.8	1	15	Pass		
396	284.4	78	6.2	2	6.2	6.4	1.04	15	Pass		
352	282.1	80	6.3	;	6.3	6.1	0.97	15	Pass		
•											•

Screen example with "check alarm" parameter authorized.

[MGPI] : DOSICAL : Irradiator # 200328 - [Dosimeter Check]										
<u>File A</u> dministration <u>P</u> arameters <u>C</u> hecking M <u>o</u> dule <u>V</u> iew Main <u>t</u> enance <u>H</u> elp										
- Dosimeter Check Witho	ut Calibration									
Batch Number OF 66	321	Source	e Loc	Main		Туре	Hp 👻		Check XB	Charl
Type of dosimeter	DMC2000S	-	Оре	erator		mgpi	Expos	ure cour	nt : 1	<u>s</u> tart
Target Exposure	5 mrem	A A	cceptance l	nterval	15	%	Targ	et Hp	1 Hs	
Module A, Seria	l #: 020500/	A								
Source #	GG		CS 137	Main	Action	n <mark>Workin</mark>	g, do not t	ouch ti	ne carrier	<u>C</u> ancel
Reference cal H	lp rate/pos.1	287 2	284 3	282 mrem	/h Statu:	1:Acqui	isition com	pleted		
Reference cal H	ls rate			mrem	/h	3:Acqui	isition in pr	ogress		
New Eff Referenc Coeff (mrem	e rate Exposu /h) (se	ıre time ∣ F ∞.)	Reference d (mrem)	ose Dose e (mi	xpected rem)	Dose read (mrem)	Response	Tol (%)	Decision	Check of dose Alarm triggering
368 2	86.9	73	Ę	5.8	5.8	5.8	1	15	Invalid	Pass
396 2	84.4	78	6	5.2	6.2	6.4	1.04	15	Pass	Inconclusive
										▼



<u>Note:</u> Only the display area of this screen can be stretched, for the other, the use of the horizontal scroll bar is needed.

For an XB dosimeter, there will be two magnitudes measured, Hp and Hs.

To abort the check:

 Click on the button « Abort », on the right of the « Action » - « Status » zones To exit the session:

Click on the button « End of Session », on the bottom right of the screen

The results of a check can be:

- pass: response falls within the acceptance interval.
- fail: response is outside the acceptance interval but is within the interval authorizing a calibration.
- invalid: response is outside the interval authorizing a calibration.

4.2.2.4 Dosimeter Check Function with Calibration

This function allows the verification of a dosimeter lot and adjust the response of those which are outside the acceptable limit.

The response after the adjustment is verified again. The adjustment is done by modifying the "efficiency coefficient". The values after and before the adjustment are provided.

Access to this function is obtained from the "Checking with calibration" sub-menu from the **"Checking"** menu of DOSICAL. The two successive checks are entirely controlled by DOSICAL.

The same screen as in normal check is used, with the result table presenting the results of the 2 checks instead of one per equipment.

The procedure is identical to the "check without calibration" case.

DOSICAL automatically stores the two checks and the efficiency coefficient change.

- 1: If at least one dosimeter is out of tolerances upon completion of the first check, all remain in place, the dosimeter(s) involved only being recalibrated and rechecked. If no dosimeter is out of tolerances upon completion of the first check, the sequence then ends.
- 2: If the procedure is cancelled while rechecking a dosimeter, an information message box will be displayed at the next calibration of this dosimeter.
- 3: After a calibration, if the response is accepted (result: PASS), the calibration date is set into the dosimeter.
- 4: The calculations are detailed in Appendix 3: Calculations Performed Upon a Calibration", p 93



<u>Warning:</u> Caution : For the DMC 2000 XB

Only the 2nd position is available for calibration with the primary source.

Calibration with the secondary source is not available (control without calibration only)



<u>Warning:</u>

Warning: It is imperative to use a carrier appropriate at the type of dosimeter used.

Otherwise, the dosimeters will be wrongly positioned in the IRD, which has the effect of producing measures, and therefore an improper calibration.

For dosimeters type :

DMC 2000 S, X, XB : DMC 2000 carrier.

DMC 2000 GN : DMC 2000 GN carrier.

SOR : SOR carrier.

DMC 3000 : DMC 3000 carrier.

4.2.2.5 Results Screen of a Check with Calibration

Sector (MGPI) : DOSICAL : Irradiator # 200328 - [Dosimeter Check]													
<u>File</u> <u>A</u> dministration	Paran	neters <u>C</u> hec	king M <u>o</u> d	ule <u>V</u> ie	ew Main <u>t</u> e	nance <u>H</u> el	р						
Dosimeter Check With C Batch Number OF 663	Dosimeter Check With Calibration Batch Number OF 66321 Source Loc Main Type Hp Check XB												
Type of dosimeter	DMC:	2000S 🔹	-) 0	Iperator		mgpi	Exposure	count : 1		start			
Target Exposure	5	mrem	Acceptanc	e Interval	15	%	Target	Hp 1 Hs	\$				
Module A, Serial	I #: 02	20500/A							_				
Source # GG CS 137 Main Action Lift the carrier													
Reference cal Hp rate/pos.1 287 2 284 3 282 mrem/h Status 1:Acquisition completed													
Reference cal H	s rate				mrem/h	3:Acqu	uisition complet	ted					
Date and Hour	Pos	Mode	Dosimeter #	Type	Eff coeff as found	New Eff Coeff	Reference rate (mrem/h)	Exposure time (sec.)	Reference dose (mrem)	Dose exper (mrem)			
8/31/2010 1:25:03	1	1st Check	845400	Hp	368	368	286.9	74	5.9	5			
8/31/2010 1:25:22	2	1st Check	845402	Hp	396	396	284.4	77	6.1	E			
8/31/2010 1:25:42	3	1st Check	845401	Hp	352	352	282.1	82	6.4	E			
•										Þ			

🐞 [MGPI] : DOSICA	L : Irradia	ator # 200328 -	[Dosimeter Ch	eck]							X	
<u>File</u> <u>A</u> dministration	on <u>P</u> ara	meters <u>C</u> heck	ting M <u>o</u> dule	<u>V</u> iew	Main <u>t</u> en	ance <u>H</u> elp)					
Dosimeter Check W Batch Number	it <mark>h Calib</mark> rat 566321	ion Sou	urce Loc	Main		Туре	Hp 🔻		Check XB	C to	art	
Type of dosimeter DMC2000S - Operator mgpi Exposure count : 1											art	
Target Exposure	5	mrem	Acceptance Int	erval	15	%	Targ	jet Hp	1 Hs			
Module A, Serial #: 020500/A Source # GG CS 137 Main Action Lift the carrier Cancel												
Reference of Refer	Source # GG CS 137 Main Action Cit the came Reference cal Hp rate/pos.1 287 2 284 3 282 mrem/h Status Reference cal Hs rate mrem/h 3:Acquisition completed 3:Acquisition completed											
New Eff Refer Coeff (m	ence rate rem/h)	Exposure time (sec.)	Reference dos (mrem)	e Dose (m	expected arem)	Dose read (mrem)	Response	Tol (%)	Decision	Check of dose alarm triggering		
368	286.9	74	5.5	Э	5.9	5.7	0.97	15	Pass		1	
396	284.4	77	6.1	1	6.1	6.2	1.02	15	Pass			
352	282.1	82	6.4	4	6.4	6.4	1	15	Pass			
1											Þ	

4.2.2.6 Using the command lines

This function allows to execute external software after each dosimeter check or at the end of the check session. For example, report edit.

In the case of the batch check with or without calibration, the name of the session is added as parameter to the command line.

4.2.2.7 Dosiparc link

This function allows to update the Dosiparc calibration data.

To use this function an ODBC link with the Dosiparc database is necessary (DSN: Dosiparc)

It is also necessary to change to 1, the label « Dosiparc » in the dosical.ini file. (Dosiparc=1)

4.2.3 Consulting Function

Access to this function is obtained from the "View" menu of DOSICAL.

This menu allows the access to the three following sub-menus:

- « Session... »,
- « Dosimeter Calibration...»,
- « Module Calibration...»,

MGPIJ : DOSICAL : Irradiator # 200328	
File Administration Parameters Checking Module View Mainten	ince Help
Session	
Dosimeter	Calibration
Module Ca	libration

4.2.3.1 Sessions

Access to this function is obtained from the "Session" sub-menu of the « View » menu of DOSICAL.

- Information zone "Session List": see screen next page
- For the selected session (click on the session table line), "Session Detail " zone:
- Calibration information used in the selected session and by module
- Access to the list of dosimeter checks in the selected session by clicking on the "Check List" button, on the lower left corner of the screen.
- Available actions for the selected session:
- □ At the "SUPERVISOR" level:
 - delete a session: click on the "Delete" button.
- All levels:
 - print the session list: click on the "Print" button.
 - exit the session inquiry: click on the "Close" button

4.2.3.1.1 Selection and Sort-by

• The session list is sorted by date in decreasing order.

Opening Date	Operato	ı	Calibratio	on Check	XB Dosim	eter Batch Number	Source Location	Туре	Target exposure(mrem)	Inte Accej
1/10/2005 9:41:41 AM	MGPI		×		SOR 501	160702	Main	Нр	5	
7/21/2004 9:41:43 AM	MGPI				SOR 501	160702	Main	Hp	5	
8/19/2003 2:21:52 PM	MGPI		Х		SOR 501	160702	Main	Hp	5	
8/18/2003 10:58:42	MGPI		Х		SOR 501	160702	Main	Hp	5	
8/18/2003 10:31:41	MGPI				SOR 501	160702	Main	Hp	5	
1/15/2003 4:16:19 PM	MGPI		×		SOR 501	160702	Main	Hp	5	
1/14/2003 2:10:45 PM	MGPI		×		SOR 501	160702	Main	Hp	5	
11/13/2002 3:31:18	MGPI		×		SOR 501	160702	Main	Hp	5	
11/13/2002 2:23:44	MGPI		×		SOR 501	160702	Main	Hp	5	
11/12/2002 2:59:44	MGPI				SOR 501	160702	Main	Hp	5	
10/23/2002 4:28:00	MGPI		×		SOR 501	160702	Main	Hp	5	
7/16/2002 4:37:30 PM	MGPI				SOR 501	160702	Main	Hp	5	
7/16/2002 3:45:20 PM	MGPI				SOR 501	160702	Main	Hp	6	
7/16/2002 2:21:09 PM	MGPI				SOR 501	160702	Main	Hp	5	
7/11/2002 2:37:57 PM	MGPI				SOR501	110702	Main	Hp	5	
7/10/2002 11:11:08	MGPI				DMC 200	DO MGPI	Main	Hp	5	
Session Detail :										•
Module A, Serial #		020	500/A			Module B, Seri	al #			
Source #	KK159		60C	o Mair	n	Source #				
Reference cal Hp rate/	pos.1	127 :	2 128	3 125	mrem/h	Reference cal Hp) rate/pos.1	2	3	mrem/h
Reference cal Hs rate					mrem/h	Reference cal Hs	rate			mrem/h
<u>C</u> heck List								<u>D</u> e	elete	<u>Print</u>

Figure 27 - Screen "Session list"

4.2.3.2 Dosimeter Checks

Access to this function is obtained from the "Dosimeter Calibration" sub-menu from the "View" menu of DOSICAL.

 This information is given in the "Check List" zone: see the screen next page for an exhaustive list of all the information.

4.2.3.2.1 Search criteria and Sort-by

- The search criteria are in order:
- Selection interval of dosimeter number, if this interval is not provided, the checks performed on all the dosimeters are displayed.
- Choice of the main or secondary source location,
- Choice of all the checks or the last result per dosimeter by each session
- the default display of the checks is provided by decreasing dosimeter number and decreasing date; the table can be sorted by column in increasing or decreasing order by clicking the column titles.

osimeter Ca	alibration :										
)osimeter #	Date and Hour	Module Serial #	Pos	Mode	Type	Eff coeff as found	New Eff Coeff	Reference rate (mrem/h)	Exposure time (sec.)	Reference dose (mrem)	Di_▲ exp∈ (mi
232766	12/09/2006 13:58:39	MODULE_001	1	Check	Hp	264	248	363,4	31	3,1	
232766	12/09/2006 13:57:50	MODULE_001	1	Check	Hp	264	264	363,4	30	3	_
232766	12/09/2006 13:53:52	MODULE_001	1	Check	Hp	292	264	363,4	52	5,2	
232766	12/09/2006 13:52:38	MODULE_001	1	Check	Hp	292	292	363,4	51	5,1	
232766	12/09/2006 12:44:56	MODULE_001	1	1st Check	Hp	292	292	363,4	49	4,9	
232766	11/09/2006 16:37:42	MODULE_001	1	1st Check	Hp	284	292	350	53	5,2	
232766	11/09/2006 16:36:17	MODULE_001	1	1st Check	Hp	284	284	350	60	5,8	
232766	11/09/2006 16:33:32	MODULE_001	1	1st Check	Hp	284	284	350	61	5,9	
232766	11/09/2006 15:52:19	MODULE_001	3	Check	Hp	284	284	310	74	6,4	
232766	11/09/2006 15:48:21	MODULE_001	3	Check	Hp	284	284	310	60	5,2	
233652	12/09/2006 13:58:08	MODULE_001	2	Check	Hp	260	260	358	38	3,8	
233652	12/09/2006 13:53:00	MODULE_001	2	Check	Hp	260	260	358	57	5,7	
233652	12/09/2006 12:45:16	MODULE_001	2	Check	Hp	260	260	358	48	4,8	
233652	11/09/2006 16:43:15	MODULE_001	3	Check	Hp	276	260	350	49	4,8	
233652	11/09/2006 16:42:07	MODULE_001	3	Check	Hp	276	276	350	48	4,7	
233652	11/09/2006 16:39:29	MODULE_001	3	Check	Hp	312	276	350	48	4,7	
											•

Figure 28 - "Check List" screen

- To see the checks according to the selected criteria in the "display criteria": click the "Display" button, on the top right hand corner of the screen.
- To delete the current selected check (line highlighted in green): click the "Delete" button, on the lower right corner of the screen.

- To print out the check results: click on the "Print" button , on the lower right corner of the screen.
- To exit the consultation: click on the "Close" button.

4.2.3.3 Module calibration

The sub-menu "Module Calibration" of the menu "View", allows to consult the calibration list of a given irradiator module, for a given source, either placed in the main source location or secondary source location, for a given dose equivalent measurement type.

For a selected calibration (see screen next page, line highlighted in green), you can consult by clicking

- the button "Check List", the dosimeters checks, with or without calibration,
- the button « Calibration Detail », the results of the tests related to a computerized calibration, if there is one, for the selected calibration.
- To print one or more calibration, you have to click on "Print" button. The software asks if you wish to print only the displayed list or the whole calibration.

At the « SUPERVISOR » or « MANUFACTURER »levels, you can:

- approve a selected calibration, (click on the "Approve" button)
- delete a selected calibration (click on the "Delete" button).

At all levels:

- print the calibration list: click on the "Print" button.
- Sort-by , the calibration display is sorted by decreasing date.

Date	Irradiator Serial #	Module Serial #	Source Serial #, Symbol, Type	Source Location	Type ·	Conclusion	
9/25/2008	200328	020500/A	KK159, 60Co, Main	Main	Нр	Passed	-
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T.
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T.
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T
9/24/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T.
9/23/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T
9/19/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T
9/16/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	T.
9/16/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	Г
9/16/2008	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	Г
9/10/2007	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	Г
9/10/2007	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
9/4/2007	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
9/21/2006	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
9/19/2006	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	Γ
3/1/2005	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
1/10/2005	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	Г
1/10/2005	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
8/19/2003	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
8/18/2003	200328	020500/A	KK159, 60Co, Main	Main	Hp	Passed	
							•
<u>C</u> alibra	ation Detail	<u>C</u> heck List	Sessio <u>n</u> List	Approve	<u>D</u> elete	<u>P</u> ri	nt

Figure 29 - « Calibration List » screen- Partial view of the fields of a table

osition : 1 🧿	2 🔘 3 🔘	Current	Rate 65 m	nrem/h		
Dosimeter #	Response / Abs Ref	Measure #	Response / Current Standard	Response Corrected	Source Rate Recalculated	r
309710	0.910	1	0.945	1.038	68	·
309710	0.910	2	0.948	1.042	68	
309710	0.910	3	0.948	1.042	68	
310247	0.900	1	0.932	1.035	67	
310247	0.900	2	0.928	1.031	67	
310247	0.900	3	0.928	1.031	67	
311953	0.900	1	0.968	1.075	70	
311953	0.900	2	0.928	1.031	67	
311953	0.900	3	0.951	1.057	69	
Min	67	mrem/h		Mean Cid Davi	68	mrem/h ∾
Max	70	mrem/h		StalDev	1.33	10
				Validity	Valid	
					Pri	int

Figure 30 - « Calibration Details » Secondary screen,

-> accessible by clicking the button "Calibration Detail" of the screen related to the calibration list.

9 exposure measurements (3 for each dosimeter) performed during the selected calibration are displayed (line overscored in green on screen).

Blank page

5 Maintenance

This section describes the preventive and corrective maintenance operations of the irradiator.

5.1 Maintenance Help Functions

5.2 "Maintenance" Menu

This menu allows the access to the 2 following sub-menus:

- « Exchange Test... »,
- « Basic Exposure...»,
- « Database management...»,

🐞 (N	MGPI] : DOSICAL :	Irradiator # 20	00328			
File	Administration	Parameters	Checking	Module	View	Maintenance Help
						Exchange Test
						Basic Exposure
						Continuous test
						Dosical log file viewer
						Database management

5.2.1 Exchange Test

This sub-menu of the menu "Maintenance" of DOSICAL allows to test an elementary data exchange between a dosimeter, a LDM2000 reader and a PC.

Each test is performed for a dosimeter position chosen within the 3 available positions. It is entirely controlled by DOSICAL.

The operator must insert the dosimeter before starting the test.

- to start the test: click on the 'Start" button
- to exit the test: click on the "Close" button.

Exchange Test :		<u>S</u> tart
Module A, Serial #:020500/A		
B. W	Action	
Position : 1 💿 2 🔘 3 🔘	Chalter	Identification completed
	Status	Identification completed
	Dosimeter # read	190204

Figure 31 - "Exchange Test" screen - End of Test

5.2.2 Basic Exposure

This sub-menu of the "Maintenance" menu of DOSICAL allows to perform a basic exposure test of a dosimeter (identification, activation, exposure and measurement data acquisition).

Each test is performed for a dosimeter position chosen within the 3 available positions. It is entirely controlled by DOSICAL.

- to start the exposure test: click on the "Start" button.
- test abortion to the operator's initiative: click on the "Abort" button
- to exit the test: click on the "Close" button.

Basic Exposure : Duration 1 r	nn				<u>S</u> tart
Module A, Se	erial #:020500/A n: 1		Action	Lift the carrier	<u>C</u> ancel
			Status	Acquisition completed	
Dosimeter # read 190204	Dose Hp read 5.2	mrem	Duration	71 sec Hp rate 349,41	mrem/h

Figure 32 « Basic Exposure » screen - End of Test

The displayed results are:

- Dosimeter Serial Number,
- Hp dose equivalent read,
- The measurement duration read from the dosimeter.
- Hp dose rate read.



Note:

In the case of an XB type dosimeter, the Hs dose read and Hs rate read fields are also present.

5.2.3 Continuous test

5.2.3.1 Introduction

This sub-menu of the "Maintenance" menu of DOSICAL allows to use the software in « continuous test mode ».

This mode allows you to check the proper communication between the irradiator and dosimeters, and return any communication errors in a trace file, through an fatigue tests when Check Function with or without calibration is used (See 4.2.2.1 Dosimeter Check Function with Calibration & 4.2.2.4 Dosimeter Check Function with Calibration chapters).

5.2.3.2 Enable/disable the "continuous test mode"

To enable/disable the "continuous test mode", simply select/deselect this mode in the Maintenance Menu, Continuous test. A checkbox indicate if this mode is in used or not.

🕷 (N	MGPI] : DOSICAL :	Irradiator # 20	00328						
File	Administration	Parameters	Checking	Module	View	Mai	ntenance	Help	
							Exchange Basic Exp	e Test oosure	
						\checkmark	Continuo	ous test	
							Dosical lo	og file viewer	
							Database	management	

Figure 33 - The checkbox to indicate if the « continuous test mode » is in used or not.

5.2.3.3 Launch a dosimeter check function in "continuous test mode"

After activating the "continuous test mode", simply launch the dosimeter test check with or without calibration.

To do that, see 4.2.2.1 Dosimeter Check Function without Calibration & 4.2.2.4 Dosimeter Check Function with Calibration chapters.

5.2.3.4 Difference between the dosimeter check function in "continuous test mode" and "standard mode"

During the dosimeter check function with or without calibration in "continuous test mode", DosiCal performs all steps of the check function.

The only difference is in the step "End of Control": DosiCal relaunch automatically, another control, until the user decides to stop the fatigue tests.

A reminder text is displayed in the title bar of the Dosimeter Check Function without Calibration form.

🐞 [MGPI] : DOSICAL : I	Irradia	tor # 20	0328 - ((Dosimete	r Check	(Continue	ous test)]						
<u>File</u> <u>Administration</u>	Parar	neters	<u>C</u> hecki	ing M <u>o</u> d	lule <u>V</u>	iew Mai	n <u>t</u> enance	<u>H</u> el	р				
- Dosimeter Check Withou	ut Calib	ration											
Batch Number	OF 66	5321		So	urce Loo	ation	Main		Type 🖡	lp 🔻 🗖	Check XB		
Type of dosimeter	DMC:	2000S	•		Op	erator	mg	oi	Exposur	e count : 1			<u>S</u> tart
Target Exposure	5	mrem		Ассер	tance In	terval 1	15 %		Target	Hp 1	Hs		
Module A, Seria	l #: 0	20500//	Α										
Source #		GG		CS 13	7 N	tain (Action						<u>Cancel</u>
Reference cal H	lp rate/	/pos.1	300	2 350	3 360	mrem/h ^S	Status						
Reference cal H	ls rate					mrem/h							
Date and Hour	Pos	Mod	le I	Dosimeter #	Туре	Eff coeff a	as Nev	v Eff	Reference rate	Exposure tim	e Referenc	ce dose	Dose exper
				π		Iodila		Jon	(moni/h)	(366.)	(inte	ang	(mem)

Figure 34 - The reminder text in the main Dosimeter Check Function without Calibration, to indicate if the « continuous test mode » is in used or not.

In addition, during the entire Dosimeter Check Function in "continuous test mode", a real time monitoring window is displayed, to show and log the potential communication errors. Those communications errors are saved in a log file, described in the in the following chapter.

Dosic	cal Log Viewer ((1.0.0.0)				
Sele	ect Log File	C:\ProgramData\Mirion\Do	siCal\CommunicationLog.log			
	Err / Total	Date and Time	Message	Module	Position	Phase
•		01/25/2012 19:21:38 PM	Checking Started (DMC3000)			
		01/25/2012 19:21:49 PM	Dosimeter # : 900746	Module: B	Position: 1	
		01/25/2012 19:22:17 PM	Dosimeter # : 900614	Module: B	Position: 2	
		01/25/2012 19:22:45 PM	Dosimeter # : 900741	Module: B	Position: 3	
	1/162	01/25/2012 23:33:07 PM	Could not synchronize with DMC (Expecting: 900741)	Module: B	Position: 3	Phase: 0
*						
					1	

Figure 35 - The real time error monitoring window, during the Dosimeter Check Function in "continuous test mode"

5.2.3.5 The log file generated during the Dosimeter Check Function in "continuous test mode"

During the Dosimeter Check Function in "continuous test mode", a log file, that contains the different error event's information, that was intercepted, is automatically created.

It will contain in chronological order:

1. At the beginning of the test:

- The date and time of test beginning.
- The type of dosimeter used.
- The message that indicates the beginning of the test.

2. During the first check, up on the detection of each dosimeter::

- The detection date and time.
- The dosimeter serial number.
- The module number that contain the dosimeter.
- The position of this dosimeter in this module.

3. At each communication error:

- The report "error number" on the checksum.
- The date and time of this error.
- The error message.
- The dosimeter serial number expected.
- The module number that contain the dosimeter.
- The position of this dosimeter in this module.
- The phase number.

4. At the test completion:

- The date and time of test completion.
- The checks total number.

The name of this log file is **CommunicationLog.log**.

It's located in the DosiCal data storage directory:

- **For Windows 9x :** The DosiCal installation directory.
- For Windows 2000, Windows XP, Windows Server 2003 :
 C:\Documents and Settings\All Users\Application Data\Mirion\DosiCal\
- For Windows Vista, Windows Server 2008, Windows 7 and higher: C:\ProgramData\Mirion\DosiCal\

5.2.3.6 The communication error list that are intercepted in "continuous test mode"

The Intercepted communication errors in this mode are:

- -30608 : Could not synchronize with DMC.
- -30204 : Multiple dosimeters.
- -30205 : No Dosimeter.

5.2.3.7 How to stop a Dosimeter Check Function in "continuous test mode"?

To stop a Dosimeter Check Function in "continuous test mode", the user have just to click on the "abort" button, at any check step. Then close the main Dosimeter Check Function form, by clicking on the close button.

5.2.4 The DosiCal Log Viewer

This sub-menu of the "Maintenance" menu of DOSICAL allows to load the DosiCal Log Viewer, to posteriorly show the content of the "continuous test mode" log file.

To load a log file, just load the "DosiCal Log Viewer", by the "Maintenance" Menu, "DosiCal Log File Viewer".

Then, in the "DosiCal Log Viewer" main form, just click on the "Select log file" button. The standard "Windows File Open/Save dialog box", is loaded.

In this dialog box, select a "continuous test mode" log file, and click on the "open" button.

The reader formats and displays the information contained in the log file.

00	Sect Log The	C. 4 Togrambata (Million 450	sical communication by log			
	Err / Total	Date and Time	Message	Module	Position	Phase
•		01/25/2012 19:21:38 PM	Checking Started (DMC3000)			
		01/25/2012 19:21:49 PM	Dosimeter # : 900746	Module: B	Position: 1	
		01/25/2012 19:22:17 PM	Dosimeter # : 900614	Module: B	Position: 2	
		01/25/2012 19:22:45 PM	Dosimeter # : 900741	Module: B	Position: 3	
	1/162	01/25/2012 23:33:07 PM	Could not synchronize with DMC (Expecting: 900741)	Module: B	Position: 3	Phase: 0
		01/26/2012 08:58:05 AM	Checking Stopped (Total : 519)			
ŧ						

Figure 36 - The DosiCal Log File Viewer, with a "continuous test mode" log file loaded

5.2.5 Database management

The database purge function is intended to delete dosimeter check records in order to avoid saturation of the database used.

The "File" menu "Database management" sub-menu is only accessible at the "SUPERVISOR" and "MANUFACTURER" levels.

Database management :
Number of calibrations in DDB 2757 Date of the first calibration 5/22/2002
Delete calibrations older than 12 • Month(s keeping a minimum of 6 • calibrations for each dosimeter Delete
Delete calibrations older than 8 - Years keeping a minimum of E calibrations for each dosimeter Delete
For each dosimeter, keep 9 v last calibrations Delete

Figure 37 - DOSICAL "Database management" screen

- Database (DDB) information:
- □ Number of calibrations in DDB,
- Date of the first calibration.
- 3 possible types of purge:
- Delete calibrations by selecting the age in months, as well as the minimum number of calibrations to be kept for each dosimeter.
- Delete calibrations by selecting the age in years, as well as the minimum number of calibrations to be kept for each dosimeter.
- Delete calibrations by only selecting the number of calibrations to be kept for each dosimeter.

5.3 Calibration

The calibration function allows the generation of reference dose rates used by dosimeter checks.

- A calibration is uniquely identified by:
- D One irradiation module,
- D One source location, main or secondary,
- One source, identified by its serial number,
 - it allows the possibility to switch the source carriers.
 - if this number is not entered, a common number by default is taken

- One measurement type: Hp or Hs
- One type of dosimeter

Moreover, a calibration is characterized by its creation date.

A calibration then comprises:

- the set of the 3 available positions for a main source,
- a unique position for the secondary source.

Upon a session opening, the last created calibration is considered as the current calibration:

- for each serial number of the declared module,
- for the source selected (main/secondary),
- for the source serial number.

Access to the calibration functions is obtained from the "Module" menu of DOSICAL.

5.3.1 "Module" Menu

This menu allows the access to the 2 following sub-menus:

- « Computerized Calibration... »,
- « Manual Calibration...»,

🐞 [N	/GPI] : DOSICAL :	Irradiator # 20	00328	
File	Administration	Parameters	Checking	Module View Maintenance Help
				Computerized Calibration
				Manual Calibration

5.3.2 Manual Calibration

This function enables the reference rate of each respective position to be forced to a given value.

This can follow a calibration process specific to the customer.

5.3.3 Access to the manual calibration function

It is obtained from the "Manual Calibration" sub-menu of the "Module" menu in DOSICAL. This access is only for users with the « MANUFACTURER » level and the « SUPERVISOR » level.

al Calibration					
Calibration Data :					
Operator	mgpi				
Module #	020500/A	Source Location	Main	Туре	Hp 🔻
Source #	Nr CS 7 P03 0034/98	CS 137 Main	Decay Period		30.17 Years
Type of dosimete	er DMC2000S 🗸				
- Calibration Value:	s :		Decision 1 Decis	: C)W 2
Calibration On	1/26/2012 Calcula	ted Reference Rate 3	10 320	ion 2 - F 30	10 mrem/h
	Calibrati	on Result	alid 🔻 Valid	▼ V.	alid 🔻
- Results Approval	:				
Approver	mgpi	Approval P	assed 🔻		
Comments	My comment				
					<u>S</u> ave
					Close

Figure 38 - « Manual Calibration » screen -

->The Reference Dose Rates calculated for each position of the dosimeters are forced

-> Module 1 - Source Nr CS 7 P03 0034/98 , Cs137 placed on the main source location - Hp-type measurement

The reference rates for the main source can be established by achieving basic exposure at each position.

For the secondary source, the Hs reference rate is established in position 2 only and according to this principle:

- Remove the plastic screen from the dosimeter irradiation field.
- □ Place the source shutter in intermediate position.
- Insert a dosimeter into the rack at location 2,
- achieve basic exposure for a standard dosimeter.

The minimum exposure time is two minutes. Record the Hs rate only, given in mrem/h.

 Calculate the corrected Hp/Sr rate = read rate / Hp/Sr 90 standard dosimeter response (Sr 90 standard dosimeter response = read dose / expected dose). The Hp rate is considered equal to the Hs rate.

zone "Calibration Data":

a selection by means of a scrolling list can be done for the following data:

- □ the source location: main or secondary
- D The dose equivalent measurement: Hp or Hs
- The source: serial number to select
- Type of dosimeter
- zone "Calibration Values": for each calibration position:
- □ Calculated Reference Rate,
- Calibration Result:
 -scrolling list with two choices: valid or invalid
- zone "Results Approval"
- Approval:
 - scrolling-list choices: passed or failed.
- D Comments: free text , complementary information on the performed manual calibration.
- Commands:
- □ "Save": records the manual calibration into the Data Base.
- □ "Close": exits the manual calibration function.



<u>Note:</u>

The dosimeter type is set by default to the last type used in manual or computerized calibration.

5.3.4 Computerized Calibration using Reference Dosimeters



CAUTION:

An existing calibration is required before using this function. If it is not the case, enter an approximate manual calibration. Blank the source prior to performing any operation

This function allows the creation of a calibration record, considering a lot of 3 Reference Dosimeters, previously characterized by means of an "absolute" reference (in general, using a secondary standard owned by an accredited laboratory).

The operation sequence consists in 9 exposures, identical to Dosimeter Checks (3 series of 3 successive exposures per dosimeter, each series corresponding to a permutation of the positions of the 3 dosimeters).

Access to this function is gained from the "Computerized Calibration" sub-menu of the "Module" menu of DOSICAL.

All the items of information related to the creation of calibration are stored in the data base.

The absence of information in the obligatory fields or the absence of validation cancels the creation of the calibration record.

The operating process is the following:

Select the appropriate value for the « Source location », « Magnitude » and « Dosimeter type » fields.

Note:

If the secondary location has not been enabled in the « General parameters » menu, the « Source location » field cannot be modified and its value is « Main ». The dosimeter type is set by default to the last type used in manual or computerized calibration.

Select the 3 reference dosimeters,



Note

The reference dosimeter nomenclature must have been completed beforehand and comprise at least 3 valid reference dosimeters.

It is possible to use reference dosimeters DMC 2000 XB to establish the reference flow rate of DMC 2000 X.

In this case, after the computerized calibration , it will be necessary to perform a manual calibration to validate the calibration for the DMC 2000 X dosimeters

- Place the reference dosimeters in the 3 positions (in any order),
- Before any computerized calibration and for XB dosimeters, check that the response displayed for each reference dosimeter corresponds to the magnitude and isotope to be measured.
- Start the calibration (button "Start" of the "Calibration with Reference Dosimeters" screen) and follow the instructions ("Action" zone):

Action Working, do not touch the carrier	<u>Cancel</u>
Status 1:Identification completed 2:Identification completed 3:Identification completed	

Figure 39 - "Computerized Calibration"

-> Screen Information Zone: End of Dosimeters Identification

DOSICAL then checks that the 3 present dosimeters correspond to those selected in the interface by comparing the serial numbers and also the dosimeter type. An error message appears if the dosimeters do not correspond.



Figure 40 : Typical Error Message: The type of a dosimeter is incorrect.

The system performs 3 successive measurements and then waits for the carrier lift by the operator:

Action Lift the carrier	<u>Cancel</u>
Status 1:Acquisition completed 2:Acquisition completed 3:Acquisition completed	

Figure 41 - "Computerized Calibration"

- -> Screen Information Zone: End of Dosimeters Measurement Data Acquisition
- Lift the carrier, then execute a circular permutation of the positions of the dosimeters and move the carrier down:
 - The system performs 3 successive measurements and then waits for the carrier lift
- Lift the carrier, then execute the last circular permutation and move the carrier down: The system performs 3 successive measurements and then displays the calculated results

Action		<u>C</u> ancel
Status Calib	oration completed	

Figure 42 - "Computerized Calibration" Screen Information Zone: End of Calibration



Note:

To avoid a permutation error, consult the "Reference Dosimeters" table of the "Computerized Calibration" screen, columns "Position1", "Position2", Position3": each column lists, for each reference dosimeter, the number of performed measurements according to the occupied position (see picture next page).

Computerized calibration for the secondary source is only possible in Hs. If the secondary source is Sr 90, it is necessary to enter the response of each reference dosimeter for this radioelement. Refer to paragraph "4.1.5 Nomenclature of the Reference Dosimeters" to enter this value.

For the XB dosimeters and for the secondary source only, the Sr 90 Hp rate is considered equal to the Sr 90 Hs rate. Therefore, after computerized calibration with Hs secondary source, manual calibration is necessary to set the Sr 90 secondary equal to source Hp rate value.

- The detail of elementary results can be consulted: Click on the "Detail" button, on the right corner of the "Reference Dosimeters" zone
- To be valid, each calibration MUST BE APPROVED at the "SUPERVISOR" level: Click on the "Approve" button, on the right corner of the "Reference Dosimeters" zone, if your access level is sufficient.

Calibration With R Operator	eference Dosimeters : mgpi	Source L	.oc	Main	Ty	pe Hp	-		Start
Type of dosimeter	DMC2000S -	Target E	xposure	0.005	cGy Ac	ceptance Inter	val 15	%	Dur
Module A	A, Serial #:020500/A								
Source #	CS 7 P03 0034/98	CS 137	Main	Action	Lift the carr	ier			<u>C</u> ancel
Reference Dosim	Decay Period	30.170	Years	Status	1:Acquisitio 2:Acquisitio 3:Acquisitio	n completed n completed n completed			
Dosimeter #	Reference Exposure Documer	nt Ne	ext Cal.	Response	Туре	Position1	Position2	Position3	Detail
157794 CI	ENG SPRSE Certificat D 99-053	16/0)6/1999	1.04	Нр		3	3	
158714 Ci	ENG SPRSE Certificat D 99-051	15/0	6/1999	1.09	Hp	3		3	Approve
159113 CI	ENG SPRSE Certificat D 99-054	16/0)6/1999	1.06	Hp	3	3		
Calibration On	24/05/2000		Calo	ulated Refere	ence Rate				cGy/h ≫
Declared Uncerta	ainty 2.20 %		Calib	pration Result					10

Figure 43 - "Computerized Calibration" screen:

-> End of the 3 Dosimeters exposures for the second permutation

The screen appears divided in the following fields:

- "Calibration with Reference Dosimeters" zone:
- Remainder of the calibration characteristics:

- not modifiable: Operator's Identification, Source Location Type, and Measurement Type.

- modifiable: Target Exposure and Calibration Acceptance Interval.
- "Module x , Serial Number #:<Module Identification>" zone:
- Remainder of the characteristics of the irradiation module source
- □ System Dialog with the operator, on top right:
 - "Action" zone: instruction , in red color, for the operator's attention,
 - "Status" zone: report of the system actions in progress.
- Results of the dosimeters previous calibration and display in real time of the number of exposures performed during the current permutation of the 3 dosimeters. Each cycle is completed when 3 exposures for each dosimeter have been performed for the positions relative to the current permutation.
- Commands:
- □ "Start": Starts the calibration process
- □ "Abort": Aborts the calibration process,
- "Detail": Gives access to the "Calibration Detail" screen, providing the results of the 9 measurements performed during the calibration process, which is 3 measurements for each dosimeter.
- "Approve": Calibration Results.
- □ "Close": Exits the computerized calibration function.

Calibration With Operator	Reference Dosimeters : mgpi	Source L	oc	Main	Тур	pe (Hp	-		Ctort
Type of dosime	er DMC2000S 👻	Target Ex	posure	0.005	cGy Ac	ceptance Interv	al 15	%	<u>s</u> tan
Module	A, Serial #:020500/A								
Source	# CS 7 P03 0034/98	CS 137	Main	Action	Lift the carri	ier			<u>C</u> ancel
¥	Decay Period	30.170	Years	Status	1:Acquisition 2:Acquisition 3:Acquisition	n completed n completed			
Reference Dos	simeters:				o.nequisitio	in completed			,
Dosimeter #	Reference Exposure Docume	nt Nex	kt Cal.	Response	Туре	Position1	Position2	Position3	Detail
157794	CENG SPRSE Certificat D 99-053	3 16/0	6/1999	1.04	Hp		3	3	
158714	CENG SPRSE Certificat D 99-051	15/0	6/1999	1.09	Hp	3		3	Approve
159113	CENG SPRSE Certificat D 99-054	4 16/0	6/1999	1.06	Hp	3	3		
Colibration On	24/05/2000		Calc	ulated Refer	ence Rate	0.291	0.282	0.284	¢ cGy/h
Calibration On	24/03/2000		Asso	ciated Unce	rtainty	1.59	1.44	1.48	ì %
Declared Unce	ertainty 2.20 %		Calib	ration Result	t	Valid	Valid	Valid	

Figure 44 - End of a computerized calibration sequence:

-> End of a test series for each of the three dosimeter permutations.

"Detail" and "Approve" buttons are accessible. Exit the calibration sequence by clicking the "Close" button,

in the lower right corner of the screen

The validity criterion is achieved as follows:

If the equipment is equipped with a source, the relative standard deviation (or associated uncertainty) should be less than the declared calibration uncertainty of the reference dosimeters increased by 3% to allow for the minimum reproducibility error.

No basic measurement should be greater than more than 3 times the average standard deviation.

Otherwise, calibration is invalid.

Calibration Details	2020	Current	Bate 0.284 d	Gu/h		
Dosimeter #	Response / Abs Ref	Measure #	Response / Current Standard	Response Corrected	Source Rate Recalculated	
157794	1.04	1	1.06	1.02	0.291	
157794	1.04	2	1.03	0.99	0.282	
157794	1.04	3	1.03	0.99	0.282	
158714	1.09	1	1.10	1.01	0.286	
158714	1.09	2	1.08	0.99	0.282	
158714	1.09	3	1.08	0.99	0.282	
159113	1.06	1	1.10	1.04	0.294	
159113	1.06	2	1.05	0.99	0.281	
159113	1.06	3	1.06	1	0.285	
Min	0.28	1 cGy/h		Mean Std Dev	0.285 1.59	cGy/h %
Max	0.29	4 cliy/h		Validity	Valid	
					Pri	int

Figure 45 - Detail of a computerized calibration sequence of 3 dosimeters:

-> 3 measurements are displayed for each dosimeter for each position occupied during each permutation.

Calibration Data : —								
Operator	SUPE	RVISOR						
Module #	MOD	00-010	Source L	ocation	Main	Туре	Hp	
Source #	CS 7 PO	3 0034/98	Cs 137	Main	Decay	Period	30.170	Years
Type of dosimeter	[MC2000S						
Calibration Values :								
					Position 1	Position 2	Position 3	
Calibration On 2	24/05/2000 Calculated		ted Referenci	d Reference Rate		0.282	0.284	cGy/h
Declared Uncertain	ty 1.55	% Associa	ted Uncertainty		1.59 1	1.44	1.46	%
		Calibrati	on Result		Valid	Valid	Valid	
Results Approval : -								
Approver	mgpi		Approval Pas		Passed 🔻]		
Comments M	y comment]

Figure 46 - Calibration Approval ("SUPERVISOR" level only)

5.4 Adjustment of Stops

A dosimeter must be always positioned in the carrier sleeve in the same way.

The positioning reference point is the bearing point of the dosimeter against the upper stop.

Proceed as follows to adjust:



CAUTION: Blank the source prior to performing any operation.

- Lift the carrier,
- Loosen the stop screws located above the sleeve at position 1,
- Insert a 1 mm thick shim in the sleeve between the dosimeter front panel (pushbutton side) and the sleeve wall,
- Position a dosimeter in the sleeve and position the adjustment stop against the dosimeter and bearing on its support (see illustration below),
- Secure the stop with its tightening screw and check that it does not pivot by pressing on the dosimeter bearing point,
- Readjust if required.

Perform this adjustment for positions 2 and 3.



5.5 Replacement of Air-Charged Springs



The spare springs shall previously be adjusted for a pressure of 55 N applied at mid-travel (if required, consult MGP Instruments for this adjustment).

The operation consists in replacing the air-charged springs one after each other.

Proceed as follows to adjust:

Note:



CAUTION

Blank the source prior to performing any operation.

- Lift the carrier,
- Unscrew the upper and lower retaining screws of one of the springs,
- Position the attaching screws on the new spring,
- Apply a drop of low-strength thread locking compound to these screws to secure them after tightening,
- Reassemble the spring by proceeding in the reverse manner.
- Replace the other air-charged spring.

5.6 Spare parts and accessories

Description	MGP Instruments reference
IRD communication assembly (printed-circuit card, antenna and mechanical support)	129228
Monitor without antenna and extension box	114024GJ001J
2 air-charged springs	129251
6-channel IRD extension box complete with associated multiplexing card	118819-SAV
3-channel IRD extension box complete with associated multiplexing card	118827-SAV
6-channel IRD multiplexing card	129226
3-channel IRD multiplexing card	129227
Source carrier without source	120015

Dosical software	129232
IRD cable between extension box and irradiation module	119223
PC cable for RS232 link	70032131BA
Power supply cable for Europe	71000310
Power supply cable for US	Not referenced
Power supply cable for UK	Not referenced
Portable sor assembly without actuator	129234
Portable dmc assembly without actuator	129235
3 Stops for SOR dosimeter	120093
3 Stops for DMC dosimeter	120094
Cs137 reference DMC 2000S dosimeter	127744
Cs137 reference SOR dosimeter	129224
DMC 2000 GN IRD rack	137911
Secondary source support with Sr/Y source	120117
Mobile carrier kit for IRD DMC 3000 (Extension box steel square + butterfly thumbscrews)	154016 LF
IRD communication kit (Retrofit Kit : 3 IRD communication cards)	153773
DMC3000 Mobile carrier	151023

5.7 Standard Product References

Description	MGPI Reference
IRD 3 DMC Cs FR	129117
IRD 3 DMC Cs EN	129118
IRD 3 SOR Cs FR	129119
IRD 3 SOR Cs EN	129120
IRD 6 DMC Cs FR	129121
-------------------------	-------------------
IRD 6 DMC Cs EN	129122
IRD 3DMC without source	129123
IRD DMC 2000XB	Please consult us

Blank page

6 Technical characteristics

6.1 **Physical Characteristics – standard version**

Characteristics	Value or type
Radioactive source	Cs 137
Activity	≅ 370 MBq
Dose rate generated (at DMC 2000)	≅ 3 mSv.h-1
Dose per check	≅ 50 μSv
Uncertainty	≤ 5%
Duration of a check (for \leq 3 DMC 2000)	< 2 min
Checking rate without set alarm	69 dosimeters/h for 1 module
and test dose alarm	greater than 115 dosimeters/h for 2 modules
Dose rate generated	< 2.5 µSv/h at 1m
	< 7.5 µSv/h at 30 cm

6.2 Mechanical Characteristics

	dimensions:	
	width:	350 mm
	height:	443 mm
	depth:	529 mm
•	weight:	<= 80 kg

6.3 **Electrical Characteristics**

	power supply:	230 V - 50 Hz
--	---------------	---------------

- consumption: <2 A
- complies with the European standards related to the radio interference limitations (directives 89/336 and 92/31)

6.4 Environmental Conditions

- temperature
- operating:

10°C to 45°C

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- ambient humidity (without condensation)
- □ operating: $\leq 80\%$
- absolute ambient pressure
- □ operating: 860 to 1060 hPa
- The external dose rate has to be lower than 10µSv/h to not influence measurements.

6.5 Special Characteristics

- Cs137 sealed source:
- complying with ISO 2919
- □ ISO classification: C 65445
- Property transfer covered by EURATOM regulation No. 1493/93 which induces the obligation of a prior transfer declaration to the appropriate authorities of the recipient country.
- Compatibility with the arrangements stipulated by decree 86-1103 and 75-087, changed 88-662 of the French regulation, which induce the obligation of installing the IRD in radiologically "monitored" area:
 ambient dose equivalent rate: 2.5 μSv/h <= Hp(10) <= 7.5 μSv/h.

6.6 **Processing Unit: basic configuration**

Processor:	32 bits (x86) or 64 bits (x64) \ge 1 GHz
 Minimum disk space: 	≥ 1Go
RAM :	≥ 1Go

- Graphics device: Minimum resolution of 1024x768
- Operating Systems: ≥ Windows 98
- MGPI software package: DOSICAL license

7 Appendix 1: Installation of the Software Package

This chapter describes the installation and configuration procedures for the software package required to use the IRD according to the type of environment of your PC:

- Windows 98
- Windows 2000 or XP
- Windows Vista
- Windows Seven[™] or higher

The operating systems (listed above) are assumed to be already installed in the IRD operating PC.

The installation is made from a CD-ROM

The following tables list the installation and set-up procedures of the software modules, with a reference to the page describing the procedure in this appendix according to the operating system of the PC involved.

7.1 List of Installation and Set-up Procedures

	Procedures	Page
	Installation of DOSICAL	67
	Selection of the ODBC data source and designation of the user data base	75
OPTIONAL	Customization of « DOSICAL »	81
	also see typical "DOSICAL" main configuration file "main.ini"	82

Hereafter in this appendix, the CD-ROM drive of your personal computer is identified by character string « <D>: $\$ ».

7.2 Installation of "DOSICAL " (#784)

Insert the DosiCal CD ROM in the drive. If the CD ROM autoplay function was enabled, the DosiCal installation program is automatically launched

In the otherwise case, launch directly the installation program by executing the « $\tt Setup.exe$ » file, that is in the CD ROM root.

The installation of the « DosiCal » software (#784) starts.

The following dialog box is displayed



Once the installation procedure language is selected, click on the « OK » button to start installing. The following screens are displayed.





Click on « Next » to continue.

Accept the following license agreement or abort installation if you do not agree the agreement terms.

DosiCal Setup	X
License Agreement Please read the following license agreement carefully.	
Press the PAGE DOWN key to see the rest of the agreement.	
Warning: This software is protected under copyright law and by international convention. Reproduction or distribution of this software, in whole or in part, by any means or in any form, is strictly prohibited; and any person who does so shall be considered guilty of copyright infringement and shall be liable to criminal prosecution as provided for by the law.	*
Do you accept all the terms of the preceding License Agreement? If you choose N setup will close. To install DosiCal, you must accept this agreement.	No, the
InstallShield <u>< B</u> ack <u>Y</u> es	<u>N</u> o

The customer information screen is then proposed:

DosiCal Setup
Customer Information Image: Customer Information Please enter your information. Image: Customer Information
Please enter your name, the name of the company for whom you work and the product serial number.
User Name:
User
Company Name:
Company
Serial Number:
12345
nstallShield
< <u>B</u> ack <u>N</u> ext > Cancel

Once the "User name" and the "Company name" are entered, click on the « Next » button The following dialog box above appears

DosiCal Setup
Choose Destination Location Select folder where Setup will install files.
Setup will install DosiCal in the following folder.
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.
Destination Folder
C:\Program Files\Mirion\DosiCal Browse
InstallShield
< <u>B</u> ack <u>Next</u> > Cancel

It is then possible to change the « Dosical (# 784) » installation directory by selecting the desired directory by means of the « Browse » button.

To proceed with the installation, after possibly changing the « Dosical (# 784) » installation directory, just click on the « Next » button.

In case of an upgrade or a reinstallation of DosiCal :

If a DosiCal database is already present on the computer, the program offers its importation and use.



Click "Yes" to import and use the existing DosiCal database.

Click "No" to replace the existing DosiCal database, by an empty database.

The type of desired installation is then requested; it should however be noted that, regardless of the mode selected, the result is the same since there are no optional components in this setup.

DosiCal Setup	
Setup Type Select the Setu	ир Type to install.
Click the type o	of Setup you prefer, then click Next.
• Typical	Program will be installed with the most common options. Recommended for most users.
C <u>C</u> ompact	Program will be installed with minimum required options.
C C <u>u</u> stom	You may choose the options you want to install. Recommended for advanced users.
InstallShield	
	< <u>B</u> ack <u>N</u> ext> Cancel

The program folder, which must contain the Dosical application shortcuts, is then requested, as shown by the following screen:

Dos	siCal Setup		
(Select Program Folder Please select a program folder.		
Setup will add program icons to the Program Folder listed below. You may type a ne name, or select one from the existing folders list. Click Next to continue.			
	Program Folders:		
	DosiCal		
	Existing Folders:		
	Accessories Administrative Tools Games Maintenance Startup Tablet PC USB over Ethernet Client		
Inst	InstallShield		
	< <u>B</u> ack <u>N</u> ext > Cancel		

Then, the program asks what format will be used by DosiCal when he generates a report: A4 or North America (US Letter).



Click "Yes" to use the A4 paper size.

Click "No" to use the North America paper size (US Letter).

The installation subsequently takes place:



In case of Windows 98, Windows 2000, Windows XP, Windows Server 2003:

The installation program install or update some required components (depending the computer configuration) :

- Windows Installer v3.1 redistributable package (v2)
- Windows Imaging Component
- Microsoft .NET Framework v2.0 (x86) redistributable package

Therefore, one or more dialog boxes may be displayed as the following:

Software Update Installation Wizard	
Updating Your System	
Please wait while setup inspects your current configuration, archives your current files and updates your files. Installing files Details Installing file PHOTOMETADATAHANDLER.	
< <u>B</u> ack Finish	Cancel

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When the installation is successful the following window appears

DosiCal Setup	
	InstallShield Wizard Complete The InstallShield Wizard has successfully installed DosiCal. Before you can use the program, you must restart your computer. Yes, I want to restart my computer now. No, I will restart my computer later. Remove any disks from their drives, and then click Finish to complete setup.
	< <u>B</u> ack Finish Cancel

Before you can begin to use DosiCal it is strongly recommended to restart your computer to finish the installation of any shared components that could not be recorded / updated during that Windows® session.

Select « Yes, I want to restart my computer now» if you saved all your data, and closed all your applications.

Otherwise select « No, I will restart my computer later».

In the event of installation fault, a message detailing the failure cause is displayed. In such a case, please send us this message to help us in diagnosing the failure of your installation.



Note:

when the DOSICAL software is run for the first time, if an earlier version of the database "dosical.mdb" is available, it will be updated with the new parameters to the default values.

7.2.1 Manual Selection of ODBC Data Source and Designation of User Data Base (advanced user)

During the DosiCal installation, the data source is automatically created.

However in advanced use of DosiCal, it can be necessary to create or modify the data source manually.



Warning: This manipulation is reserved to advanced user.

It is required to configure the **DOSICAL** ODBC source through the designation of the ODBC driver to be implemented (MS Access in this case) and the indication of the data base location:

« **dosical.mdb** » file, installed by default in the DosiCal data storage directory (See. 7.5.3 DosiCal M specific upgrade).

7.2.1.1 Under Windows 98 / 98SE

In the « Control Panel » on your « Workstation », double-click on the « 32bit ODBC » or « ODBC » icon.



The following dialog box appears:

()	DDBC Da	ita Source Administrator	×
U	ser DSN	System DSN File DSN Drivers Tracing Connection Pooling About	
	System D	ata Sources:	
	Name	Driver Add	
		Remove	
		Configure	
	3	An ODBC System data source stores information about how to connect to the indicated data provider. A System data source is visible to all users	
		OK Cancel Apply Help	

Then click on the « System DSN » tab and the « Add... » button to create the ODBC source.

Then, the following dialog box appears:

Create New Data Source			
	Select a driver for which you want to a	set up a data sou	rce.
	Name	Version	Company 🔺
	CR SQLBase	3.10.0000	INTERSOLV,
	CR Sybase System 10	3.10.0000	INTERSOLV,
	Microsoft Access Driver (*.mdb)	3.51.171300	Microsoft Cor
	Microsoft dBase Driver (*.dbf)	3.51.171300	Microsoft Corj
	Microsoft Excel Driver (*.xls)	3.51.171300	Microsoft Corp
	Microsoft FoxPro Driver (*.dbf)	3.51.171300	Microsoft Corj
	Microsoft ODBC pour Oracle	2.573.292700	Microsoft Corp
	Microsoft Paradox Driver (*.db)	3.51.171300	Microsoft Corj
	Microsoft Text Driver (*.txt; *.csv)	3.51.171300	Microsoft Corp
	Microsoft Visual FoxPro Driver	6 OD 816700	Microsoft Cor
	< <u>B</u> ack	Finish	Cancel

Select « Microsoft Access Driver (*.mdb) » in the above data field and click on the « Finish » button.

The following dialog box appears:

ODBC Installation	for Microsoft Access 97	×
Data Source Name:	DOSICAL	ОК
Description :		Cancel
🖵 DataBase 🛛 –		Cancer
DataBase : C	:\Program Files\DOSICAL\dosical.mdb	Help
<u> Želect</u>	<u>Create</u> <u>Repare</u> Compact	Advanced settings
System DataBas	Se	
None		
€ Data <u>B</u> ase		
	Base de données système	<u>O</u> ptions>>

 In the « Data Source Name: » data field, enter « DOSICAL » as data source name and then click on the « Select... » button.

The following dialog box appears:

Select DataBase		×
DataBase dosical.mdb	Directories: c:\program files\dosical	OK Cancel Help Read Only Exclusive
File Types: Access 97 DataBase	Drivers:	Network

- Then select the « dosical.mdb » file
- Then click on the « OK » button.
- Click « OK » for each of the dialog boxes which are displayed in turn and until the return to the « Control Panel ».

The ODBC source intended to access the data base used by « Dosical» is now created.

7.2.1.2 Under Windows 2000 / XP / Vista / Seven

In the "Control panel", double-click on the on the "Administrative Tools" icon.



Then open the Data source file (OBDC).

🗃 Administrative Tools				_	
File Edit View Favorites 1	ools Help				
📙 🕁 Back 🔹 🔿 👻 🔂 🔯 Sear	:h 🔓 Folders	③History 대	2 °2 × 2 °) <u>III</u> •	
Address 🔞 Administrative Tools				•	∂Go
	j.		F		
Administrative	Services	Management	(ODBC)	Event viewer	
Tools		<u> </u>	<i>2</i> 03.		
Data Sources (ODBC) Shortcut	Local Security Policy	Performance	Services	Telnet Server Administration	
Adds, removes, and configures Open Database Connectivity (ODBC) data sources and drivers.					
Modified: 1/26/2004 5:55 AM					
Size: 1.42 KB					
Attributes: (normal)					
Adds, removes, and configures Open [atabase Connecti	vity (OI 1.42 KB	📃 My	Computer	

The following dialog box appears:

📢 ODBC Data	a Source Administrator	<u>'</u> ×
User DSN	System DSN File DSN Drivers Tracing Connection Pooling About	1_
System Dat	ta Sources:	
Name C dosical C	Driver Driver do Microsoft Access (*.mdb) Remove Configure	
3	An ODBC System data source stores information about how to connect to the indicated data provider. A System data source is visible to all users on this machine, including NT services.	

Then click on the « System DSN » tab and the « Add... » button to create the ODBC source.

Select « Microsoft Access Driver (*.mdb) » in the above data field and click on the « Finish » button.

Create New Data Source	×
Select a driver for which you want to set up a data source. Name V Driver da Microsoft para arquivos texto (*.txt; *.csv) 4. Driver do Microsoft Access (*.dbf) 4. Driver do Microsoft Base (*.dbf) 4. Driver do Microsoft Paradox (*.db) 4. Driver do Microsoft Access Driver (*.mdb) 4. Microsoft Access Driver (*.mdb) 4. Microsoft dBase Driver (*.dbf) 4. Microsoft dBase MEP Driver (*.dbf) 4.	
< Back Finish Cancel	

Then, the following dialog box appears:

ODBC Installation for Microsoft Access 97	×
Data Source DOSICAL	ОК
Description :	Cancel
- DataBase	Cancer
DataBase : C:\Program Files\DOSICAL\dosical.mdb	Help
Select Create Repare Compact	Advanced settings
- System DataBase	
None	
🔿 Data <u>B</u> ase	
Base de données système	Options>>
Base de données s <u>u</u> stème	<u>Options>></u>

 In the « Data Source Name: » data field, enter « DOSICAL » as data source name and then click on the « OK » button.

The following dialog box appears:

Select Database		X
Database Name Dosical.mdb Dosical (original).mdb Dosical.mdb	Directories: c:\program files\dosical\data C:\ Program Files DosiCal Data	OK Cancel Help Read Only Exclusive
List Files of Type: Access Databases (*.m.	Drives:	Network

- Then select the « dosical.mdb »
- Then click on the « OK » button.
- Click « OK » for each of the dialog boxes which are displayed in turn and until the return to the « Control Panel ».

🕙 ODBC Data Source Administrator	? ×
User DSN System DSN File DSN Drivers Tracing Connection	Pooling About
System Data Sources:	
Name Driver	Add
dosical Driver do Microsoft Access (*.mdb)	Remove
	Configure
An ODBC System data source stores information about h the indicated data provider. A System data source is vis on this machine, including NT services.	ow to connect to ible to all users
OK Cancel Apply	Help

The ODBC source intended to access the data base used by « Dosical» is now created.

7.3 Customization of « DOSICAL »

« Dosical » is customized by editing the « main.ini » file (see paragraph Typical

- « Dosical » Software « main.ini » Main Configuration File, page 82), resident in the
- « Dosical » installation directory, with a Windows standard text editor, and by replacing:

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- the value associated with the « Name » (=« nom/name ») entry of the [User] section with a specific name limited to 19 characters,
- the value associated with the « Company » (=« entreprise/company ») entry of the [User] section with a specific name limited to 30 characters.



DO NOT MODIFY the value associated with the « NumeroSerie » (=« 0123456789 ») entry of the [User] section ..

7.4 Configuration Files

7.4.1 Typical « Dosical » Software « main.ini » Main Configuration File

; Host software package main section

[Principale]

NomHote=""

NomServeur=""

SeparateurExcel="\t"

Sizeable=1

Moveable=1

Maximize=1

Minimize=1

Visibilite=1

Reduction=0

GestionWelcome=1

GestionJournal=1

GestionHorloge=1

GestionAdministration=1

GestionOutils=0

GestionAudio=1

GestionToolbar=0

NiveauDebog=0

MultiInstances=0

ControleSortie=0

; Software package version definition section (medium No. 614)

[Progiciel]

Mnemonique=DOSICAL

Icone=dosical.ico

Version=784x DateVersion=jj mmm aaaa

; Definition section of different software package access levels [Niveaux] NiveauInitialisation=0 NiveauSortie=0

; Extension definition section [Outils] Argument=" /f%s"

; Language file definition section [Langues] fra=fra.ini eng=enx.ini enu=enx.ini

; User definition section [Utilisateur] Nom=nom/name Entreprise=entreprise/company NumeroSerie=0123456789

7.5 Software Updating

After updating of the DOSICAL software to version H, the following window appears upon the next running:

7.5.1 Update DosiCal to an higher version

Before you can update DosiCal to an higher version, it is imperative to uninstall the old version.

DosiCal uninstalling, doesn't delete any configuration files modified or created when using the software, for example, the database.

To start the DosiCal uninstallation, launch the "Add / Remove Programs" utility:

For Windows 9x, Windows 2000, Windows XP, Windows Server 2003 :

- a. Start Menu, Control panel, Add/Remove Programs.
- b. Select DosiCal in the list, and then click on the "Delete" from the list.

For Windows Vista, Windows Server 2008, Windows 7 et supérieur :

- a. Start Menu, Control panel, Programs and Feathures
- b. Select DosiCal in the list, and then click on the « Uninstall/change» button from the "Menu bar".

• Whatever the operating system :

c. The maintenance program starts

InstallShield Wiz	ard
Welcome Modify, repair	r, or remove the program.
Welcome to t installation. C	the DosiCal Setup Maintenance program. This program lets you modify the current lick one of the options below.
⊙ <u>M</u> odify	Select new program components to add or select currently installed components to remove.
C R <u>e</u> pair	Reinstall all program components installed by the previous setup.
	Remove all installed components.
	< <u>B</u> ack <u>N</u> ext > Cancel
d. Sele	ct « Remove », and click on the « Next » button.

e. Validate the uninstallation confirmation message.

7.5.2 DosiCal H specific upgrade

After updating of the DOSICAL software to version H, the following window appears upon the next running:

The second secon		
Your database is not up-to-date.		
To update your database, choose the type of dosimeter you use, or click on the Exit button to leave DosiCal without modifying the database.		
Type of dosimeter		
Save Exit		

You must enter the type of dosimeter you use. This operation allows for assignment of this dosimeter type to all the records present in the database. It also allows for assignment of the previously used target value to the target corresponding to this dosimeter type (in the case of an XB dosimeter, the target retained will be XB Hp Main).

In order to save your selection and access the DOSICAL software, click the « Save » button.

In order to cancel DOSICAL running, without saving your selection, click the « Exit » button.

7.5.3 DosiCal M specific upgrade

Since the M version, DosiCal are Windows 7 ready.

This compatibility leads to move the DosiCal data directories (database and configuration files DosiCal, dosimeters configuration files ...), which were in the DosiCal installation directory.

Depending the operating system, the New DosiCal data storage directory becomes:
 For Windows 9x : The DosiCal installation directory.

- For Windows 2000, Windows XP, Windows Server 2003 : C:\Documents and Settings\All Users\Application Data\Mirion\DosiCal\
- For Windows Vista, Windows Server 2008, Windows 7 and higher: C:\ProgramData\Mirion\DosiCal\

7.6 Use of DosiCal with the Russian language on an English Windows XP system

In order to use correctly DosiCal software with the Russian language you have to configure the regional settings of Windows XP as follows:

From the Control Panel, select and open the "regional and language options" .



Select the "Advanced" tab and in the drop-down list corresponding to the language used for non-Unicode applications, select Russian.

Regional and Language Options
Regional Options Languages Advanced
Language for non-Unicode programs
This system setting enables non-Unicode programs to display menus and dialogs in their native language. It does not affect Unicode programs, but it does apply to all users of this computer.
Select a language to match the language version of the non-Unicode programs you want to use:
Russian 💌
Code page conversion tables 10000 (MAC - Roman) 10001 (MAC - Japanese) 10002 (MAC - Traditional Chinese Big5) 10003 (MAC - Korean) 10004 (MAC - Arabic) 10005 (MAC - Hebrew)
Default user account settings Apply all settings to the current user account and to the <u>d</u> efault user profile
OK Cancel Apply

The system may ask the cdrom to install Windows XP if it detects the absence of certain files. In this case insert the cdrom and validate the option to copy files from the cdrom.

The system may also ask if you want to replace some files needed to use the Russian language already on the computer by those present on the installation CD of Windows XP. It is not necessary.

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8 Appendix 2: User Profiles

When the user runs the DOSICAL software, only the following functions are available to him:

- consultation,
- identification, enabling him, after authentication with a password, to access the software reserved functions (according to the profile assigned by the administrator).

Four user profiles are provided with, for each one, the following accesses to the reserved functions of the DOSICAL software:

- Administrator »:
- access to the account management only, to declare the DOSICAL users and assign them with a profile.
- User/password by default: mgpa/mgpa
- « Operator »:
- D dosimeter check: with or without calibration,
- creation of module calibration with reference dosimeters: the calibration is not valid as long as it is not approved by a supervisor-type user,
- number of a maintenance functions: exchange test, basic exposure.
- consultation and editing of the results.
- User/password by fault: mgpo/mgpo
- Supervisor »:
- □ functions accessible to the operator profile,
- n management of some software general parameters,
- n management of nomenclatures: irradiator, module, reference dosimeters,
- approval of module calibration with reference dosimeters,
- □ creation of manual calibration,
- deletion of session, dosimeter check and module calibration.
- □ User/password by fault: mgps/mgps
- Manufacturer »:
- access to all the software functions, except for the account management.



<u>Note :</u>

A user can only have one profile assigned by the administrator (no cumulated profiles).

The DOSICAL access level management, which is to be performed by the "administrator" user, is performed through the DOSICAL "Administration" menu, as described below.

8.1 "Administration" Menu

This menu allows access to the following three sub-menus:

- "Log in",
- "Log out",
- "Account Management".



8.1.1 Identification

This function enables the user to identify himself with his password in order to continue the session with another user profile.

Administration / Identification:

 Identification 	x	
User	mgpa	
Password	××××	
OK Cancel		

After validation, the user can continue the session with his user profile.



Advice:

Reminder: the user name and profile appear in the status bar of the DosiXom main screen.

8.1.2 End of Session

This function is used to continue the session with an Operator account.

Administration / Log Out

8.1.3 Account Management

This function is used to manage the user accounts (addition, deletion, modification of the password). It is accessible only for a user having the Administrator profile.

Administration / Account management:

= Account		×
Access level	User	
New mgpa mgpi	Access level	
mgpm mgpo maps	User	
	Password	
	Password confirmation	
	Insert	Delete Exit

- List of users area: this area comprises the list of users recorded in the system.
- User's data area:
- Access level: this field is used to define the user profile concerned among the Administrator, Supervisor and Operator profiles
- **User**: this field is used to enter the user name
- Password: this field is used to define the password allocated to the user. When typing, the characters are replaced with a series of x.
- Password confirmation: this check field is used to enter the password again to make sure that it corresponds to that entered in the Password field. In case of error, the password must be entered again.

8.1.3.1 Addition of a New User

From the Users management box:

- In the List of users area, select the Add New User label and fill in the different fields of the User's data area (Access level, User, Password, Confirm).
- Validate this new user by clicking **Add**.

8.1.3.2 Modification of a User

From the Users management box:

- Select the user involved in the List of users area and modify the fields of the User's data area.
- Validate the modifications applied by clicking **Modify**.

8.1.3.3 Deletion of a New User

From the Users management box:

- Select the user involved in the List of users area.
- Delete this user by clicking **Delete**.

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9 Appendix 3: Calculations Performed Upon a Calibration

9.1 Current Reference Dose Rate Calculation:

The dose rate of the reference sources must be corrected for the radioactive decrease between the date of calibration and the current date:

For the selected module, the selected source, for the current position (1,2,3), for the quantity concerned (Hp/Hs),

Current_Ref_Rate = Calibration_Ref_Rate * exp (- 0.693 * duration / decay)

where:

- duration =
- Current_date Calibration_date in the same unit as the period decay:
 - activity decay period defined upon source calibration

9.2 **Exposure Duration Calculation**

Obtained by the division of the dose target by the current reference rate:

Theoretical_Exposure_duration = Target_Exposure_Dose * 3600 / Current_Ref_Rate

where:

- Target_Exposure_Dose is defined among the general parameters (only depends on the main or secondary source selection).
- duration in seconds: rounded off to the next higher value.

9.3 Reference dose calculation and expected dose calculation

Obtained by multiplying the actual exposure duration (read in the dosimeter) by the current reference rate:

reference_dose = actual_exposure_duration * current_ref_rate / 3600

expected_dose = actual_exposure_duration * (current_ref_rate * target) / 3600

where:

- Duration in seconds
- dose and rate in homogeneous unit
- □ target

9.4 **Response Calculation and Decision**

The response is the quotient of the read rate over the expected dose.

Response = Read_Dose / Expected_Dose (displayed value)

- complying if target tolerance/100 =< response_reference =< target + tolerance/100</p>
- □ tolerance expressed in %

Note:



The tolerance is termed "acceptance interval".

9.5 New Efficiency Coefficient Calculation

The calibration is achieved only if the response remains within an acceptance interval fixed upon the definition of the control characteristics; otherwise, an error is indicated (case of a dosimeter fault or false handling).

Expected_response = read_dose / expected_dose

theoretical_modified_efficiency = current_efficiency * Expected_response

The displayed efficiency is the actual value read in the dosimeter. It may be slightly different of the theoretical_modified_efficiency.

9.6 DMC2000 XB Case

The type of dosimeter is determined by its serial number. A section is reserved to this model.

The DMC2000XB provides 2 Hp and Hs doses.

The result of a check is expressed in two result lines, each analyzing the reference dose rate and the read dose specific to Hp or Hs (the duration read is common).

The calibration of a source according to one of the quantities may be non-existent. In such a case, any corresponding processing can be ignored and only the other quantity considered.

If the operator selected the main source, a check with calibration can be performed, provided that the calibration according to the two quantities exists, and a new efficiency coefficient for each Hp and Hs quantity can be calculated.

10 Appendix 4: Calculations Made Upon Calibration

Relative standard deviation or associated uncertainty

= 1/ average (x) * $\sqrt{[(n * \Sigma(x)^2 - (\Sigma x)^2) / (n^*(n-1))]}$

with x recorded measurements, and n number of measurements.

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11 Glossary

11.1 Actions and Sequences of Actions

Calibration [of Irradiator]: operation consisting in establishing the irradiator reference response. Can be performed with reference dosimeters or other measurement means.

Check, or Physical Check, or Source Test [of Dosimeter]: operation consisting in evaluating the response of a dosimeter exposed to a source under reproducible conditions. Check that the dosimeter response is within a given interval around the expected reference response.

Calibration [of Dosimeter]: sequence including a check possibly followed by a calibration with final check.

Calibration [of Dosimeter]: operation consisting in modifying the efficiency coefficient of a dosimeter so that its response is within a given acceptance interval.

Calibration Session: series of calibrations performed under similar conditions.

11.2 Dose Equivalent Definition

- Hp: deep dose equivalent Hp(10)
- Hs: superficial dose equivalent Hp(0.07)

11.3 Units

Unit	Measurement Type	Qualification	Conversion
rem	dose equivalent	former unit 'rad equivalent man'	1 rem = 10 mSv
mrem	dose equivalent	former unit	1 mrem = 10 ⁻² mSv
rem/h	dose equivalent rate	former unit	1 rem/h = 10 mSv/h
mrem/h	dose equivalent rate	former unit millirem per hour	1 mrem/h = 10 ⁻² mSv/h
mSv	dose equivalent	international unit 'milliSievert'	1 mSv = 10 ⁻¹ rem 1 mSv = 10 ⁺² mrem
mSv/h	dose equivalent rate	international unit	1 mSv/h = 10 ⁻¹ rem/h 1 mSv/h = 10 ⁺² mrem/h

сGy	absorbed dose	absorbed dose unit 'centiGray'	1 rem or 10 mSv
cGy/h	absorbed dose equivalent rate		

11.4 Equipment Items

 Definition of reference dosimeters: Dosimeters whose response is evaluated with respect to a reference traceable with the national or customer's standards.

Type of Equipment	Name	Version	Quantity (ies) Evaluated
Irradiator	IRD 2000	Standard	
Irradiator	IRD 2000 + DMC 3000 Kit	Standard	
	-		
Dosimeters	DMC 2000 S New-generation	Standard	Нр(10)
	SOR	DMC2000S military version	
	DMC 2000 X	DMC2000, version X	Hp(10) by including X-rays
	DMC 2000 XB	DMC2000, version XB	Hp(10) Hp(0.07)
	DMC 3000	Standard	Hp(10)

• Table of equipment items likely to be used according to the operating context
11.5 Software

DOSICAL IRD control unit software

11.6 Calculated Parameters

Efficiency coefficient or efficiency:

parameter establishing a proportionality relation between the dosimeter counting and the response displayed: by convention, expressed in counts per second for 10 mSv/h. This parameter is modified by the calibration.

11.6.1 Target

Value of the expected response, during calibration of the dosimeter to the reference body. It must be determined by the radiation monitoring skilled person. It depends on the source mounted in the IRD. This parameter is set to 1 by default.



MGPI supplies dosimeters with different targets.

In the case of calibration with an irradiator fitted with a Cs 137 source, for standardization to:*

- Co 60 and for a DMC2000S, the target will be equal to 1.17.
- centered between the Cs 137 and the Co 60, and for a SOR, the target will be equal to 1.09.
- For a DMC2000XB, in HP and Hs measurement, with Cs 137, and in HS measurement with SR 90 the target will be equal to 1
- For a DMC2000XB, in HP measurement, with Sr 90, the target will be equal to 0.1

Usually, the main source corresponds to Cs137 and the secondary source to SR 90. The target value is prone to modification according to the evolution of the dosimeters





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