BLE 3000 Module

User's Guide

MIRION TECHNOLOGIES Health Physics Division

Radiation Safety. Perfected.

DOC015145EN-A

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Revision	Date	Verified by	Approved by	Origin and description of the revision	Edited pages
A	2020-07	T. VIALLAT	V. DUQUESNE	Document creation	/

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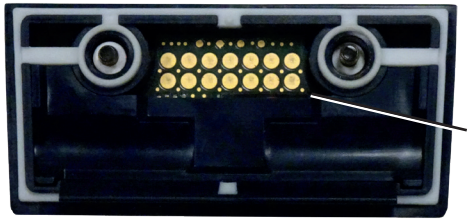


Connection pad

Attachment screws

Wearing and Battery Guidelines

Technical information

The BLE 3000 Module is mounted on a DMC 3000 to expand the DMC 3000's measurement capabilities to Bluetooth features.
This user's guide is to be used along with the DMC 3000 User's Guide (n°151153EN).

2.1 Use and Functionality

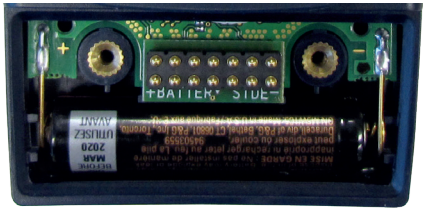
The BLE 3000 module is part of the accessory range of Mirion Technologies DMC 3000 electronic dosimeter.

When attached to the DMC 3000, the BLE 3000 module adds the following features:

- Bluetooth functions,
- Amplification of visual alarms,
- Alarm report to an external accessory (wristband, smartwatch...).

The BLE 3000 module physically integrates into the dosimeter's case.

2.1.1 DMC 3000

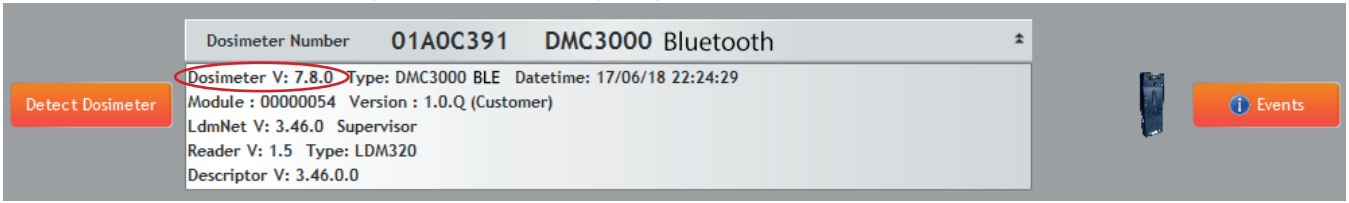


The DMC 3000 must be equipped with the 26-pin connector (*PN: 00153458*) prior to the attachment of the BLE 3000 module.

For the BLE 3000 module to work correctly, it must be paired with a DMC 3000 using firmware V.7.8 or greater.

If the dosimeter displays a star at the bottom of its screen, firmware version is earlier than V.7.8 and is not suitable.
Otherwise, check firmware version by pressing the "+" button to display firmware version.
If firmware version is not visible, use DMC*User* revision 1.11 or greater.

Please contact Mirion Technologies for compatibility diagnosis and information.



The DMC 3000 must be set to accept the BLE 3000 module (configurable in the Parameters tab of DMC*User*, see §2.7).

2.2 Settings

The BLE 3000 module contains all the proper functional settings parameters.
These parameters are saved in the module on non-volatile memory.

2.3 Bluetooth Functions

2.3.1 Transmission

When the dosimeter switches to measurement mode, the BLE 3000 module automatically switches to transmission mode. The BLE 3000 module then periodically transmits the dosimetric data, the normal transmission rate can be set between 2 and 255 seconds.

If the dosimeter is in default or in alarm, the transmission frequency is increased.
It helps to get a more frequent update of info in case of danger (the minimum transmission interval is of two seconds).

2.3.2 Bluetooth function setup

The Bluetooth function of the BLE 3000 module can be set using DMC*User*.
The following items can be set:

- the transmission intervals (normal)
- the setup of the data to be transmitted.

For more details about module setup in DMC*User*, please refer to the DMC*User* Instruction Manual.

Additional module	
KnTask Hp(10) (Efficiency coef. multiplier)	1.00
KnMul Hp(10) (Efficiency coef. multiplier)	1.00
Module last calibration (Date)	24 Jan 2018
Module next calibration (Date)	24 Jan 2020
Module check interval (in months)	24
Chirp mode	Beep inc. dose 1 µSv (0.1 mrem)
Blue led source	Module measure
Blue led configuration	Inc. dose 1 µSv
Enable telemetry feature	Yes
Enable visual signaling	Yes
Battery type	Alkaline
WRM transmission	
Telemetry protocol	WRM3
Nominal transmission period (s)	4
Enable USB transmission	Yes
WRM3 additional transmitted data	
Module voltage	Yes
Primary measurement thresholds	Yes
Secondary measurement thresholds	Yes
RWP	Yes
Task code	No
User data area	No
TLD / Badge	No
Wearer name	Yes
Wearer ID	Yes
Total dose	Yes
Measurement duration	Yes

Module setup in DMCUser

2.4 Historical Data Function

Measurements and events of the BLE 3000 module are automatically stored in the DMC 3000 histogram.

2.5 Handling Recommendations

Do no use the dosimeter belt clip when the BLE 3000 module is attached as the opening gap of the clip is significantly reduced.

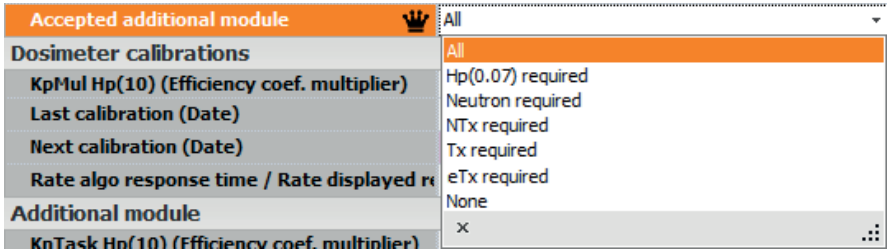
The user must always wear the dosimeter against the body (see the label on the back of the module).

Avoid having any foreign content, such as dust, dirt, or labeling between the 26-pin connector board and the BLE 3000 module (no sticker, no dust, no stain, etc.).

Make sure the gasket is clean and in good condition.
For proper sealing, equal and proper torque should be applied on the two screws (see §4.2).

2.6 Module Management

The Module Management Mode is configurable using DMC*User* software.



- **None**: any module connection is ignored by the dosimeter.
- **All**: DMC 3000 accepts any type of modules. When a module is connected, the dosimeter automatically changes its display configuration and displays the *H*p(10) neutron or *H*p(0,07) shallow dose depending on the type of module.
- **Hp(0,07) required / Telemetry required / Neutron required / NTx required / eTx required / Bluetooth required**: DMC 3000 needs the required module otherwise a default message "WRG MOd" is displayed or "Mod def" if no module is connected.

When a dosimeter is configured in "All" mode and has been equipped with a module, the "Detach Module" command resets the fault message "Mod def" and return to operate without any module.

Note that the behavior is the same for battery removal.

Note: This command resets the secondary dose of the dosimeter.
Note: if the dosimeter is configured in "Neutron required" or "Hp(0,07) required" mode, this command resets the secondary dose but it does not modify dosimeter operation.

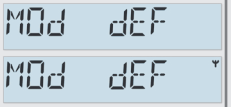
3.1 Bluetooth Function Fault and the DMC 3000

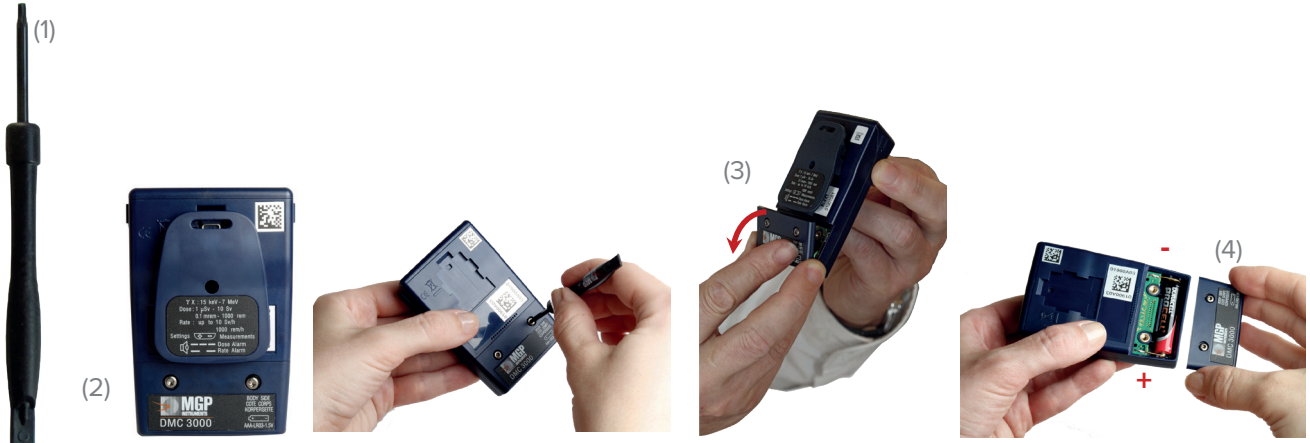
During a fault with the telemetry function of the BLE 3000 module, the DMC 3000 will exhibit the following characteristics:

- Dosimeter detection will not be affected by the telemetry function failure.
- Dosimeter will retain all Dose, Max Rate, set points and status bits regardless of module status, failure or connections.
- Dosimeter Dose and Dose Rate Alarms will take precedence over any telemetry fault messages.

3.2 Fault Diagnosis and Resolution

Major Fault: a major fault prevents the dosimeter from going into Run mode

Display	Causes	Solutions
	- Module management is incorrect. - The 26-pin connector is missing or unproperly installed.	Check the module management (refer to §2.9). Remove the BLE 3000 module and check that the 26-pin connector is properly installed.
	- The module was disconnected from the DMC 3000 without first affecting the disconnection via DMC*User*. - It is possible that the dosimeter's firmware version does not support the module.	Put the DMC 3000 in Pause mode. Check the module connection and the integrity of the connector. Make sure the firmware version of the dosimeter is V.7.8 or greater. Reconnect the module while the DMC 3000 is in Pause mode. If problem persists, contact your Mirion representative.
	Problem of communication between the dosimeter and the NTx module.	Check the module connection and the integrity of the connector. Verify that the firmware version of the dosimeter is V.7.8 or greater. Reconnect the module. If problem persists, contact your Mirion representative.
	The dosimeter does not recognize the module.	Use DMC*User* to change the DMC 3000 configuration, make sure it accepts the BLE 3000 module. See §2.7.



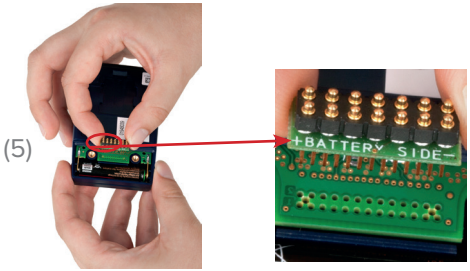
4.1 Removing the dosimeter battery cache

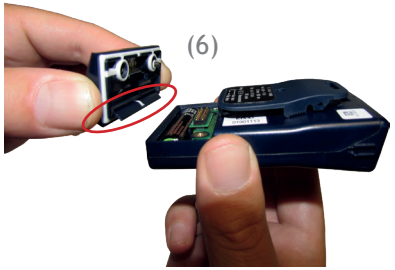
- Make sure the dosimeter is in PAUSE mode.
- Unscrew the two screws (2) with the screwdriver provided with your DMC 3000 (1).
- Rotate the battery cover (3).
- Remove the battery cover (4).

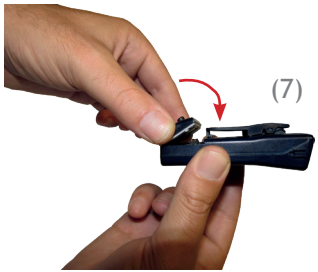
Note :
Due to the presence of voltage on the pins of the 26-pin connector, remove or add new modules when the dosimeter is in Pause mode to avoid shorting the pins.

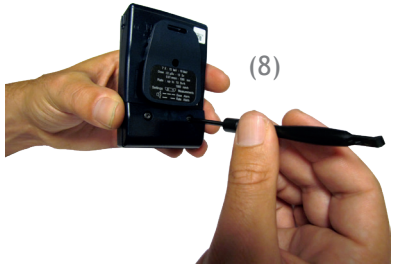
4.2 Attaching the BLE 3000 module

- Carefully insert 26-pin connector, ensuring side labeled “BATTERY SIDE” is inserted closest to the battery (5).
- Check the cleanliness of the module gasket.
- Engage the module bottom side first, with the gasket placed inside the bottom of the DMC 3000.
- Rotate the module (7).
- Hand tighten the two module screws with the provided screwdriver (1) at 0.25 to 0.35 Nm (8).
- Ensure the icon is displayed. If it does not, verify the dosimeter is configured to accept the module (see §2.2.3 and §2.7).

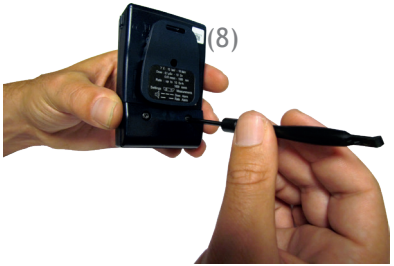








Note:
Due to the presence of voltage on the pins of the 26-pin connector, remove or add new modules when the dosimeter is in Pause mode. Avoid shorting the pins.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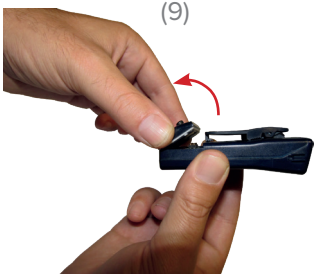
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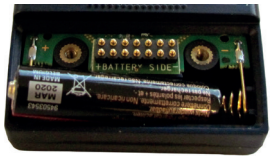
(10)



(11)

4.3 Detaching the BLE 3000 module

- Make sure the DMC 3000 is in Pause mode.
- Unscrew the two screws (8) with the screwdriver provided with your DMC 3000 (1).
- Pivot the module and detach it from the dosimeter (9).
- Conduct a software disconnect using the "Detach Module" command of DMCUser software (10), or temporarily remove the dosimeter's battery (11).
- Replace the battery if necessary.

Note:
Due to the presence of voltage on the pins of the 26-pin connector, remove or add new modules when the dosimeter is in Pause mode. Avoid shorting the pins.

5.1 Maintenance

Mirion Technologies recommends full inspections of dosimeters and modules at a minimum of once a year.

- Functions: check that the DMC 3000 displays  .
- Check the auto-test when the DMC 3000 exits standby mode:
  - the speaker will chirp once
  - the front flash LED and top LEDs (Red, Green, Blue) will briefly illuminate
  - all display segments will activate
  - the backlight will turn on
- Check the speaker by activating the dosimeter using a rate pre-alarm set point of 0 mSv/h (0.0 mrem/h).

6.1 EU declaration of conformity

- EU declaration of conformity for BLE 3000 module: DOC013812

The EU declaration of conformity certificate can be delivered on request by Mirion Technologies SAS.

6.2 Electrical Characteristics

- DMC 3000 battery life (with the BLE 3000 module) is 4.5 calendar months (typical use of eight (8) hours a day, five days per week in Run mode, without excessive alarms (*).
- DMC 3000 battery life (with the BLE 3000 module) of 1000 hours in continuous operation without excessive alarms (*)

  (*) 0.1% of functional time in alarm.

Typical use at 20°C, transmission interval of 4 seconds, with Duracell Industrial battery.

- Recommended batteries:
  - Duracell AAA Ultra Power MX2400
  - Duracell AAA Industrial ID2400
  - Energizer AAA E92
- Free field range:
  - Module BLE 3000: 15m (49 feet)

Note:
- Only recommended batteries or high quality Alkaline batteries should be used with your BLE 3000 module.
- The environment between the dosimeters and the reception station has a great influence on the communication range. Metallic objects, concrete walls, etc. can significantly reduce the communication range.

6.3 Mechanical Characteristics

- Rugged, high impact polycarbonate-ABS case.
- Dimensions (DMC 3000 + BLE 3000 module):
  - 60 x 88 x 29 mm (2.4 x 3.5 x 1.1 in) with standard clip
  - 86 x 56 x 21 mm (3.4 x 2.2 x 0.8 in) without clip.
- Weight (BLE 3000 module + DMC 3000 with alkaline batteries and a standard clip): < 105 g (3.7 oz).
- Weight (BLE 3000 module only): 20 g (0.7 oz)

6.4 Environmental Characteristics

The following characteristics are applicable to DMC 3000 equipped with a BLE 3000 module.

- Temperature Range: -10°C to 50°C (14°F to 122°F) / 0°C to 50°C (32°F to 122°F) for the telemetry function
- Relative humidity: <90% at 42°C (108°F)
- Storage: -20°C to 71°C (-4°F to 160°F) without battery
- Shock, vibration and drop resistant
- Waterproof IP67 1m (39 in) for 1 hour
- EMC: complies with and exceeds standards by a large margin
  (CE compliant, refer to chapter §6.1 EU declaration of conformity)
  - MIL STD 461 RS 103 (pulsed electric field): exceeds 200 V/m from 80 MHz to 5 GHz
  - MIL STD 461 RS 101 (magnetic field 30 Hz to 100 kHz): norm of the regulation +6dB
  - ETSI 301-489 -1 and 17 electromagnetic compatibility (EMC) for radio equipment
  - ETSI 301-328 (harmonized european standard for access to radioelectric spectrum)

6.5 Functional Characteristics

Confidence test:

- Test of module/dosimeter link every second.
- Test of BLE 3000 module data integrity by CRC 16 check.

6.6 Environmental regulations

In accordance with European regulation (Directive DEEE 2002-96-CE), BLE 3000 modules should not be thrown out with non-sorted waste, but must be selectively collected.

Follow local regulations.

6.7 FCC regulations

FCC ID: 2AWTM-BLE3000

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

§15.21: Caution: the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

§15.105: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

§RF Exposure: This device complies with FCC radiation exposure limits set forth for general population. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

6.8 IC regulation

IC number: 26297- BLE3000

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

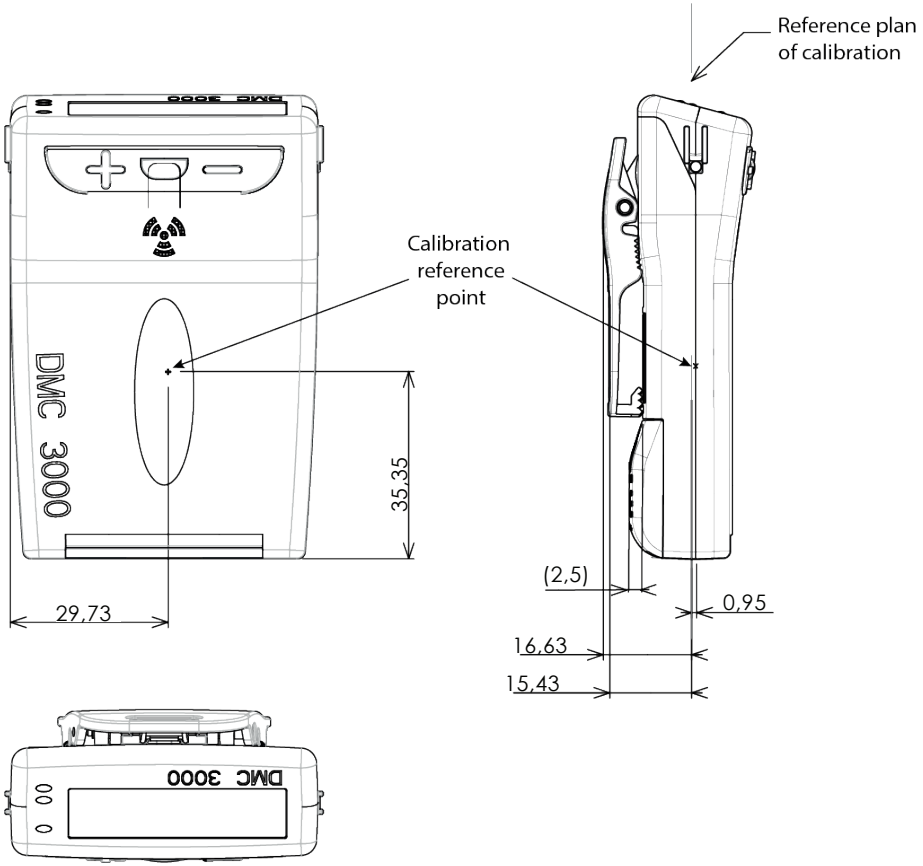
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible de compromettre le fonctionnement.

Portable device

This device complies with ISED radiation exposure limits set forth for general population. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par ISDE. L'appareil ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

6.9 Calibration Reference Point



Note : Dimensions in millimeters

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If necessary, please send an email to:
environnement-iso14001@mirion.com

Notes:


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TECHNOLOGIES
Detection & Measurement Division