DMC 3000 Telemetry Module

User's Guide

MIRION TECHNOLOGIES Health Physics Division

Radiation Safety. Perfected.

15-00100 Rev A

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for Transmission

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2.1 Use and Functionality

The DMC 3000 Telemetry Module is the latest accessory for use with Mirion's DMC 3000 electronic dosimeter.

It enhances the DMC 3000 family of products by offering remote monitoring functions as well as augmenting alarms through a series of bright LED indicators.

Additionally, the DMC 3000 Telemetry Module physically integrates into the dosimeter's case, allowing for continued ease of dosimeter operation and monitoring.

The DMC 3000 Telemetry Module uses WRM2 communication protocol. Hence, there is no need for infrastructure upgrades. It integrates seamlessly with existing telemetry software.

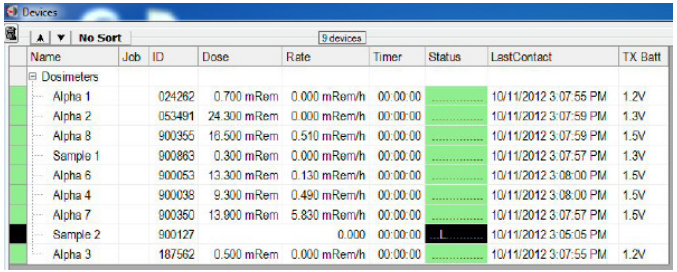
2.2 Compatibility with Mirion Technologies Products

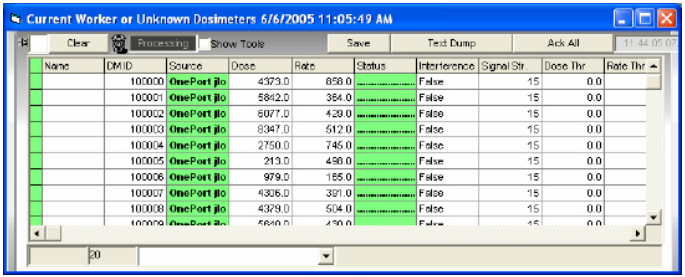
2.2.1 900 MHz and 2.4 GHz DM

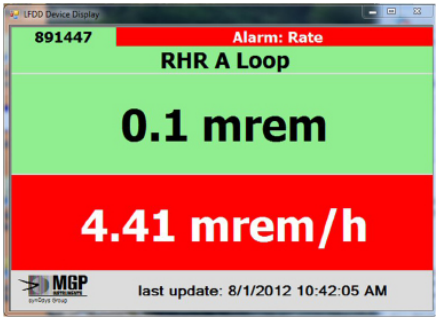
The DMC 3000 Telemetry Module comes in both 900 (902–928) MHz and 2.4 GHz[DM] models, making it compatible with existing base transceivers, repeaters, and other Mirion products.

2.2.2 WRM Protocol Compatible

The DMC 3000 Telemetry Module uses WRM2 communications protocol, and can be used with existing telemetry software such as WinWRM2, Large Format Display, TeleView 2000 and TeleView 3000.







3.1 Attachment to and Removal of Transmitter from DMC 3000

3.1.1 Dosimeter Preparation

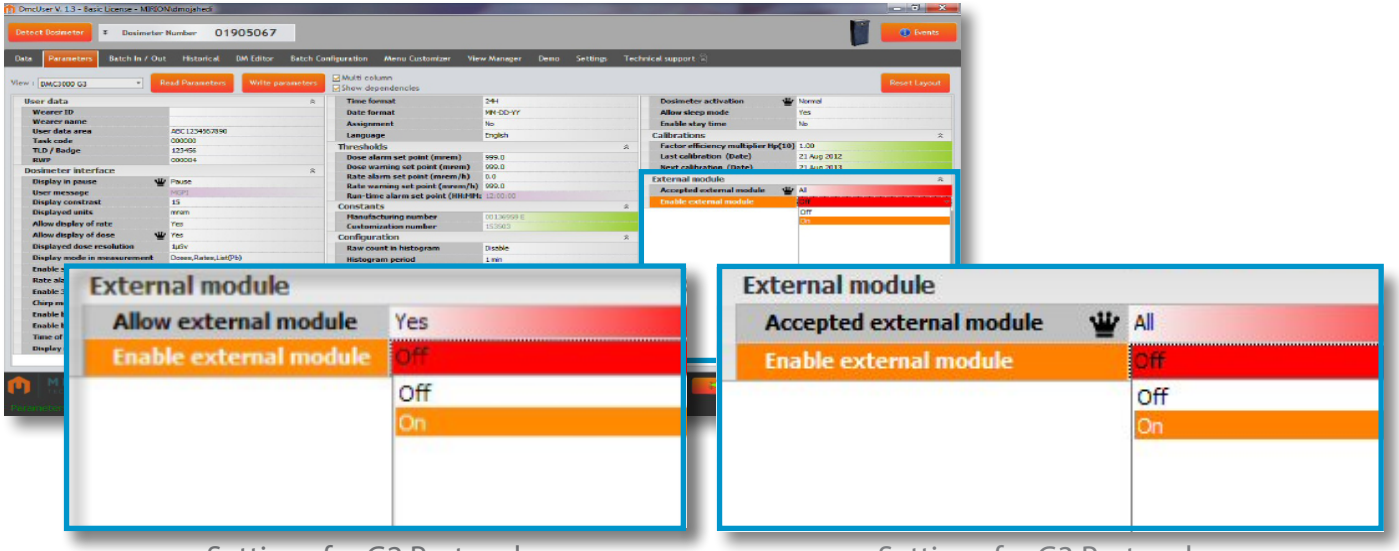
- Dosimeter should be in Pause mode.
- DMCUser's Parameter settings shall be configured as follows:

G2 Protocol

- For "Allow external module" select "Yes".
- For "Enable external module" select "On".

G3 Protocol

- For "Accepted external module"select "All" or "Telemetry required".
- For "Enable external module" select "On".



Settings for G2 Protocol

Settings for G3 Protocol

3.1.2 Attachment

(1)

(2)

(3)

(4)

(5)

Screw Type:
Torx N° 8, ISO 14583

- Ensure dosimeter is in Pause mode (i.e., not in Run or Sleep mode).
- Unscrew the two screws (1) with the screwdriver provided with your DMC 3000.
- Rotate and remove the battery cover (2).
- If not preinstalled, carefully insert 26-pin connector (3), ensuring side labeled "BATTERY SIDE" is inserted closest to the battery.
- Engage the telemetry module front (i.e., LED) side first (4) and rotate to close.
- Hand tighten with the tool provided at 0.25 to 0.35 Nm (2.2 to 3.1 in.Lb). *Do not over torque.*
- Insert battery into transmitter positive (+) side first (see label on back of telemetry module).
- Ensure transmitter self tests (see Section 3.1.5) and dosimeter display's transmitter icon activates (see icon below). If errors arise, see Troubleshooting Guide in section 6.2.

Note: The transmitter will not work if the 26-pin connector is not installed.

The telemetry module must be connected for the first time with the dosimeter in Pause mode to enable the proper configuration recognition without risk of disruption of measurement operations. Once recognized a module may be exchanged in Run mode, assuming there was some kind of module fault immediately prior to disconnection.

Transmitter Icon

3.1.3 Detachment

- Ensure the dosimeter is in Pause mode.
- Detach the transmitter from the dosimeter.
- Recommended method for clearing "MOD DEF" alert indication from dosimeter display is to perform the following:
  - Select "Detach Module" in the bottom of DMCUser's window.
  - Alternatively, remove the dosimeter's battery and then put it immediately back into place.
- Replace the dosimeter's battery cover.
- Ensure the dosimeter display's transmitter icon deactivates.

3.1.4 Handshaking

The handshaking process is the sequence of data exchanges executed in order to check the information of the connected module (type of module, status and configuration). The sequence is performed during the initial connection process of the module or upon battery replacement.

This sequence is started by the dosimeter when it receives an acknowledgement from the module (on the same signal used for the physical detection) that is ready for use.

For data integrity reasons this initial handshaking is prevented with dosimeter in Run mode in order to preserve the main feature of the dosimeter: dose counting, alarming, and histogram/status messages.

3.1.5 Self Tests

In order to ensure the module preserves the longest transmit life, a battery self test and diagnostic LED sequence is performed following battery installation:

- Upon insertion of new or unused battery, transmitter will perform a self-test with a green test pattern on the right LED.

- If a used battery is inserted, the test pattern will illuminate a yellow pattern on the right LED.

- Following the battery check the transmitter will also test alarm LEDs by illuminating both red LEDs.

Note: See also troubleshooting.

4.1 Visual Indicators

4.1.1 Transmission

Data exchanges are the functional information transferred between the dosimeter and the telemetry module in order to package and transmit dosimeter data. The DMC 3000 Telemetry Module has two green LEDs. Under normal conditions, they shall both flash whenever the device transmits (i.e., every 2, 4, 8, 16, 32, or 64 seconds).

The left green LED denotes proper reading of dosimeter data by the telemetry module.

The right green LED denotes transmission of dosimeter data by the telemetry module.

The dosimeter display's transmitter icon will also blink during data transmission.

DMC 3000 in Alarm

4.1.2 Alarms

The telemetry module has two red LEDs that flash under alarm conditions.

Transmitter	DMC 3000
FLASH LED	FLASH LED VIBRATOR BUZZER

4.1.3 Low/Dead Battery

The telemetry module has battery indicator LEDs that flash to indicate a weakened or dead battery.

- When the battery is weakened, the left yellow LED will flash in place of the green LED.

- When the battery is dead (i.e., too weak to properly transmit), both yellow LEDs will flash in place of the green LEDs.

Although DMC/Telemetry Module has an ongoing communication, there is no data transmission made when both LEDs flash yellow. However, alarm indication is still available.

Note: When the transmitter reaches its low battery state (yellow LED) the transmission frequency will default to 8 seconds.

4.1.4 USB Connectivity

The blue LED will flash when the telemetry module is connected to a computer via the USB cable and in communication with WRM Configuration Studio software.

Note: All functionality described in this manual is considered standard and default. However, firmware upgrades and user configurations might affect settings. Contact your local Mirion representative with any questions.

4.2 Battery Replacement

A yellow and green flashing LED indicates the transmitter is still transmitting at a less than optimum voltage level and a battery change should be performed within the next few hours (see Section 4.1.3).

The dosimeter will provide a warning upon detection of a transmitter dead battery threshold via a display indication.

- Unscrew the telemetry module's battery cover.
- Remove used battery.
- Insert new battery positive (+) side first (see label on back of telemetry module).
- Reattach battery cover.
- Verify that a self-test is performed (see Section 3.1.5).

Battery Type:
Energizer or Duracell
Alkaline 1.5 V AAA LR03

Note: If the transmitter's battery is changed while the dosimeter is in Run mode, it can take up to ten minutes for the new battery's voltage to update in any telemetry readings. Alternatively, if after the battery change, the dosimeter is put into Pause mode and again put back into Run mode, the transmitter should provide the new voltage upon the next transmission.

Do not re-use previously used batteries. Mirion recommends new 1.5 VDC AAA Energizer alkaline or Duracell alkaline batteries.

5.1 Set Up & Configuration

The DMC 3000 Telemetry Module comes factory configured before use, with telemetry enabled. The telemetry module is set to transmit every four (4) seconds.

5.2 Configuration

Selectable Operating Features using the WRM Configuration Studio software:

- Firmware Upgrades
- Telemetry interval level - 2, 4, 8, 16, 32, or 64 seconds
- Enabling and disabling LED indicators
- Self-test mode settings
- Diagnostics

Note:
The configuration software for the DMC 3000 Telemetry Module is intended for an appropriate experienced user to modify selectable parameters outside factory default values.

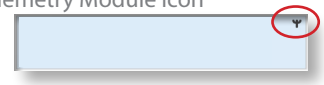
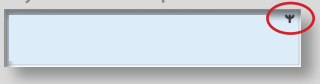
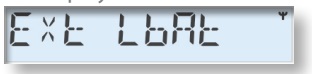
If a telemetry module's configurations have been changed while attached to a dosimeter in Run mode, the dosimeter must be first put into Pause mode for the changes to take effect.

6.1 Telemetry Module Faults and the DMC 3000

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

- Dosimeter detection will not be affected by the module 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 module fault messages.

6.2 Troubleshooting Guide

Issue	Solution
No Telemetry Module Icon 	▪ Ensure telemetry module enabled in DMCUser. ▪ Remove module and confirm connector installed (see Figure 3.1.2). ▪ Remove and replace telemetry module battery.
Telemetry Module Icon doesn't blink when Telemetry Module in operation 	▪ Ensure dosimeter is in Run mode. ▪ Remove and replace telemetry module battery. ▪ Ensure telemetry module enabled in DMCUser (see Section 3.1.1).
Dosimeter display EXT L. BAT 	▪ Replace transmitter battery with a fresh/new AAA battery of a type approved by Mirion (see Section 3.3).
Dosimeter Display DEF MOD 	▪ Replace transmitter battery with a fresh/new AAA battery of a type approved by Mirion (see Section 3.3). ▪ Ensure telemetry module enabled in DMCUser (see Section 3.1.1). ▪ Remove module and confirm connector installed (see Figure 3.1.2). ▪ Remove and replace telemetry module battery.
Dosimeter Display Fault Messages	▪ Refer to DMC 3000 User's Guide (Document 151153EN-B).

7.1 LED Summary

LED Pattern	Meaning
	▪ Proper reading and transmission of dosimeter data.
	▪ Indicator of new or unused battery insertion.
	▪ Indicator of used battery insertion.
	▪ Indication of a low battery during transmission of data.
	▪ Dead Battery (no transmission).
	▪ Alarms (Dose, Rate, Warnings, Chirp, Clock).
	▪ USB data exchange.

8.1 Physical Characteristics

- **Height** 4.8 in. (121 mm)
- **Width** 2.3 in. (58 mm)
- **Thickness** 0.98 in. (25 mm)
- **Weight** 54 g without DMC 3000 and 165 g with the DMC 3000 and AAA Battery
- **Case** Blue PC/ABS plastic
- **LED** RGB LED's
- **Antenna Connectors** Wired
- **PC Communications** Micro-USB
- **Ruggedness** 3 drops on each face from 1.5 m.

8.2 Electrical Characteristics

- **Transmit Power Output** 100 mW (900 MHz)
  10 mW - 63 mW (2.4 GHz^{DM}) configurable
- **Transmission Range** 1.6 miles, line of sight (900 MHz), 1 mile, line of sight (2.4 GHz)
- **Radiated Power** Less than 0.1 V/m in accordance with EPRI-TR-102323
- **Receiver Sensitivity** -106 dBm (900 MHz) - 100 dBm (2.4 GHz)
- **Frequencies** 900 (902-928) MHz or 2.4 ISM Frequency range
- **Over the air data stream:** 19.2 k bps for WRM^{2} 900 MHz or 250 K bps for WRM^{DM}
- **Transmission interval** 2, 4, 8, 16, 32, or 64 seconds
- **Agency Approvals:** FCC (900 MHz) (USA), IC (Canada), and CE (Europe) (2.4 GHz)
- **Internal Power** AAA Alkaline Battery (Energizer or Duracell recommended)
- **Battery Life** > 24 hours of runtime

8.3 Environment

- **Operating Temp** 32°F to 122°F (0°C to 50°C)
- **Relative Humidity** 10-95% Relative Humidity (noncondensing)
- **EMI Tolerance** MIL-STD. 461 RS-103, 200 Vm 30 MHz to 5 GHz

MIRION TECHNOLOGIES Health Physics Division

Americas

Mirion Technologies (MGPI), Inc.
5000 Highlands Parkway Suite 150
Smyrna, GA 30082
USA
Tel. +1 770-432-2744

Europe

Mirion Technologies (MGPI) S.A.
Lieu-dit Calès, route d'Eyguières,
13113 Lamanon
France
Tel. +33 (0)4 90 59 59 59

Asia

Mirion Commercial (Beijing) Co., Ltd.
Room 801 - 78 Jiangchang San Lu
Zhabei District
Shanghai 200436
China
Tel. +86-21-6180 6920