DRM-3000 Multi-Probe Area Meter

Operating Manual

Version: 1.17 November 2024

CPS Hardware Version: 7
CPU Hardware Version: 5

CPS Firmware Version: 2.05
CPU Firmware Version: 1.24

ROTEM
Rotem Industries Ltd

Return remarks @

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Your "Return Remarks" will help us to provide you a better service. Thank you. References to be recalled with the "Return Remarks":

- ⇨ *Title, reference and index of manual*
- ⇨ *Chapter, paragraph and page concerned*

The publication, translation or reproduction, either partly or wholly, of this document are not allowed without our written consent.
Under no circumstances can the detectors be connected or disconnected when the Unit is under power.
Considering local regulation in force: person and equipment protection against electric shocks, Rotem Industries Ltd. recalls that ANY WORK ON A POWERED EQUIPMENT SHALL MANDATORILY BE PERFORMED BY QUALIFIED AND AUTHORIZED PERSONNEL.

Ionizing radiation of the sources used is dangerous for the worker whenever the protective measures are not strictly applied.
Although our equipment items are built in compliance with the most severe safety standards, the ionizing radiation source represents a danger when the worker is not qualified or not warned.

ANY HANDLING OF RADIOACTIVE SOURCES SHALL MANDATORILY BE PERFORMED BY QUALIFIED ANO AUTHORIZED PERSONNEL.
Consequently, all precautions shall be taken to prevent any non-authorized or non-qualified person from using this equipment, endangering others and themselves.

Prior to any handling, those qualified and authorized to use this equipment shall get information on the protective measures set forth by the national standards in force.

Abandonment or destruction of equipment containing a radioactive source is FORBIDDEN. If no longer required, the user must inform Rotem Industries Ltd. who will arrange to take the source back (according to the contract) and establish a certificate stating that the source has been taken back. In the event that the source is lost or stolen, the user must inform the appropriate authorities soon as possible

Directive 2002196/EC of the European parliament and of the council of January 2003 on waste electrical and electronic equipment (WEEE). At the end of the product's useful life, please dispose of it at appropriate collection points provided in your country.

Revisions Log

Revision	Date	Origin and designation of modification	Modified pages
1.01	05/05/2019	Added: 1. Replacing SD card 2. Updating the Firmware	25 and 28
1.02	17/06/2019	Added: 1. Cal Due: Display command 2. Display Graph option 3. Display Average option 4. Calibration option	
1.03	18/07/2019	Added: 1. 8.4 Setting up the Meter 2. IP Cam instructions	
1.04	15/08/2019	6.3.1 Changed Power Input Specs	
1.05	03/09/2019	Added calibration position of DRM-3000 for internal detector. Updated screens	
1.06	10/10/2019	Updated Section 7 Updating the DRM-3000	28 to 33
1.07	04/11/2019	Added Icon and explanation of the average function	20, 23 and 26
1.08	05/03/2020	Updated screenshots Simplified Connection Instructions	
1.09	19/04/2020	Added background color explanation. Added Alarm Confirmation Procedure Added Latching explanation.	19 and 29
1.10	07/05/2020	Added Operating System Details	8
1.11	06/07/2021	Solenoid activation upon power up	15
1.12	29/11/2021	Replaced Pictures showing new ext. detector numbering	10, 11, 49
1.13	22/07/2023	Added Peripherals (using and installation) Interfacing with AMP type Detectors.	Paragraph 31 15
1.14	22/09/2023	Added Remote Display Unit setup instructions. Added Download data records from internal memory Instructions.	4631 6859
1.15	07/09/2024	Added Interfacing with Modem Router Modified Firmware Updating Procedure	30 35330
1.16	18/09/2024	Added Fixing CPS update after crash paragraph	שגיאה! הסימניה אינה מוגדרת.40

1.17	26/09/2024	Updated *Updating the firmware of the DRM-3000* Section Created Troubleshooting Section	99 70

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1 Introduction

1.1 General

The Data Radiation Meter, DRM-3000, is a multiple detector-based dose rate meter, capable of supporting one internal gamma detector and three external detectors by using state-of-the-art microprocessor-based technology and combined telemetry of the WRM2 900 MHz or 2.4 GHZ FHSS radio. The DRM-3000 is designed for highly stable and accurate dose rate measurements from different types of detectors.

The DRM-3000 is a lightweight and compact instrument with sophisticated software offering special features and optimal performance for telemetry data.

The RMVC Software is used to configure (RMV) and calibrate (RMC) the DRM family of detectors.

An automatic self-diagnostic procedure continuously checks both electronics and detectors and reports any case of detector failure.

The DRM may be used in the following ways:
by connecting the meter to a PC
by connecting the meter to a DDC-16/AM-16 Area Meter (wired) or RS-485 cable
by using the internal WRM2 FHSS radio to transmit data
by using an internal or externally connected network adapter

The meter includes four electronic boards:
PCL R1010V5.0 CPU Board- responsible for managing the GUI
PCL R1011V7.0 CPS-MAIN Board – responsible for managing the external detectors
PCL R1020V2.0 CPS-STACK Board – responsible for providing the H.V. to AMP detectors if required.
PCL R1021V2.0 DC2DC Board – responsible for providing 24VDC if required
PCL R1022 V3.0 Internal W.R Detector – If required

A built-in TCP/IP is the connection used for calibration and configuration. The WRM2 FHSS radio is already included in the DRM-3000 package and a base station (ROTEMI P/N: WR2-9001) is needed for reception of telemetry data.

1.2 Field of use

The DRM-3000 has been designed to be mounted in a strategic position providing up to four radiation levels simultaneously thus providing the users, a comprehensive overview of the radiological conditions in the workplace. Each of the four sections can be programmed to display the Dose Rate, Accumulated Dose and Detector Name. The background color of each section reflects the relationship between the dose rate and threshold levels thus providing an extra input for the user.

The radiation data is stored internally in each meter for a month and can also be exported to an external Control Station in TCP/IP, POE, 485 or wireless modes.

1.3 DRM-3000 main advantages

- Single Meter Supporting 4 detectors – More cost effective
- Large Color Display with color coded background– Radiological conditions are clearly shown
- TCP/POE Data transmission and power supply – No need for external power sources
- Saves Data for a period of one month – Can be downloaded online or at a later stage
- Supports a wide range of external detectors

2 Technical Specifications

Casing:	High Impact Plastic (ABS-PC) with Aluminum back cover	
Display:	7" HD Display background color according to dose rate	
Power Source:	External DC Power, POE and Internal Battery (24 hours). Charging Time - 5 hrs.	
I/O:	3 x External Detectors	Serial (RS-485) or Digital pulse or Analog pulse
	AUX connector D-Type 26 pin	RS-485 and 4-20 mA and External Power 24V and optional light tower and Dry contact
	RJ-45	Ethernet Cable
	10/100 BASE –TX PoE/IEEE 802.3 af/at compliant	
Temperature Range:	Operation: -25°C to +55°C	(-13°F to 131°F)
Humidity Range:	40% to 95% RH (non-condensing)	
Alert indicators:	Buzzer	85 dB at 30 cm
Optional:	High Volume Buzzer	100 dB at 30 cm
	Multicolored LED	Colors: White, Green, Yellow, Red, Purple, Blue and Light Blue
	Advanced Detector Bracket with 3 colored LED's and buzzer	
	Remote Light Tower (5 colors) showing Worst Case Scenario	
Dimensions:	Meter: 25 cm W x 23 cm H x 7 cm D (10" x 9" x 2.75")	
Weight:	1.75 Kg (3.9 lbs.)	
Internal Detector:	Optional	
Detectors:	GM Tubes, ZP-1301 and ZP-1201 (or equivalent)	
Measuring Range:	0.5 µSv/h to 10 Sv/h (50 µR/h - 1,000 R/h)	
Sensitivity:	0.3 - 18 cps/mR/h (^{137}Cs)	
Accuracy:	±10% of reading	
Units:	mR and mR/h or µSv and µSv/h	
Max Cable Length:	100 meters/yards from Instrument to Detector	

2.1 Operating System Details

Operating system	LINUX kernel release ver. 3.14.52-1.1.1 ga
Main Processor	ARM CORTEX A7 32 bit
Storage	SD 64 Gb
OS supported drivers for external devices	RTC: ds1307 Battery: BQ40Z50

3 Hardware and Firmware Upgrades

3.1 Current Hardware Configuration:

BEN-0076	PCL R1011V7.0 CPS-MAIN Board For DRM-3000/DRM-3000
BEN-0655	PCL R1010V5.0 CPU Board with TFT Display For DRM-3000
BEN-0037	PCL R1020V2.0 CPS-STACK Board For DRM-3000/DRM-3000
BEN-0038	PCL R1021V2.0 DC2DC Board For DRM-3000/DRM-3000

3.2 Current Firmware Configuration:

CPU – Version 1.24
CPS – Version 2.05

3.3 List of Upgrades

1. The DRM-3000 now enables the user to set a Static IP address using our RMVC Software version 1.0.9.7 which is feely available off our website at https://www.rotem-radiation.co.il/service2/rotem-meter-view-3000/

2. The DRM-3000 now saves radiation data from all four detectors for a period of one year in a cyclic FIFO fashion.

3. The DRM-3000 provides a 4-20 mA output via the Auxiliary Connector for each of the four detectors.

4. The DRM-3000 supports our Remote Detector Bracket providing another option to remotely display radiation levels.

5. The DRM-3000 can activate up to 8 relays which are mounted on an External Signal Interface which is connected to the network via TCP/IP. The relays are activated upon breach of the User Threshold of each Detector.

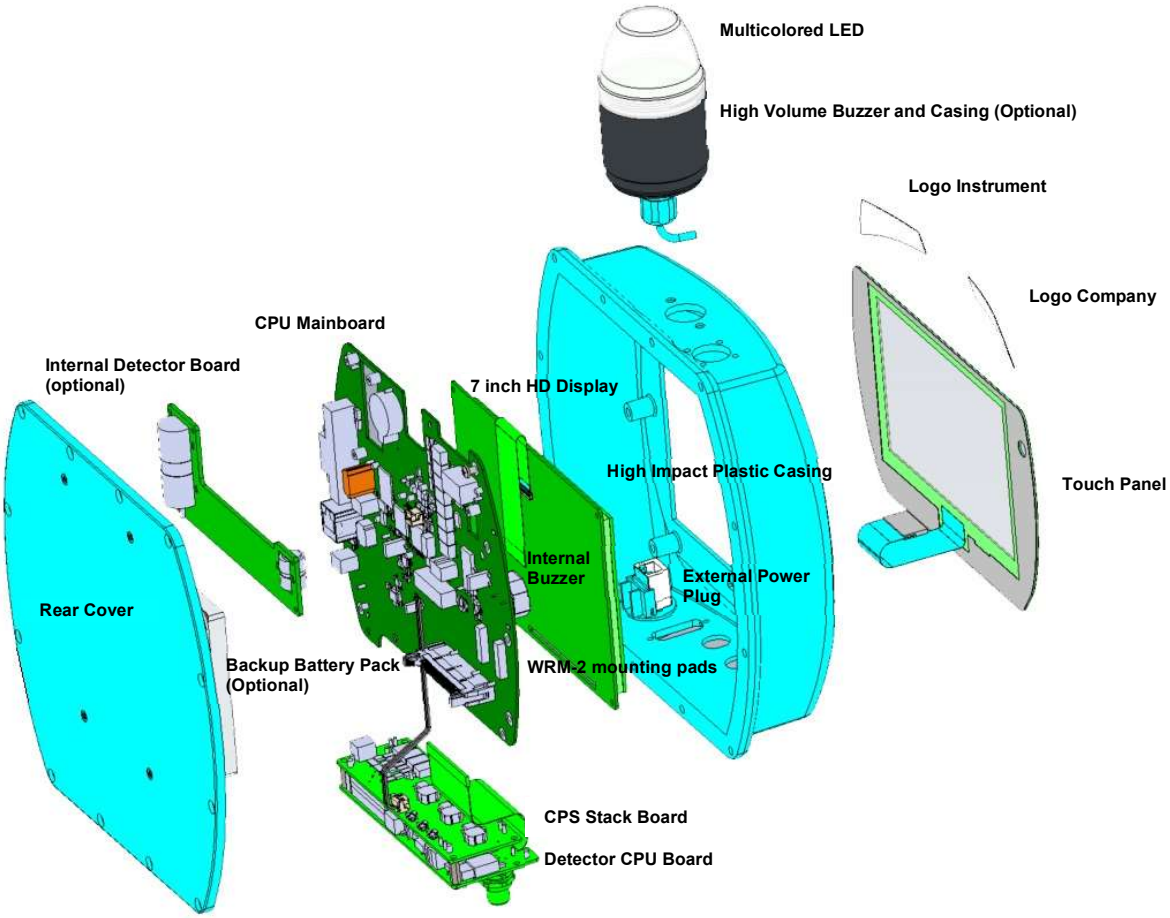
4 Supported Detectors

The following detectors are supported by the DRM-3000. The maximum cable length between the Meter and Detector is 100 yards.

	Description	Measuring Range
	GM-42 Low Range Gamma	0.5 µSv/h to 10 mSv/h (50 µR/h to 1R/h)
	GM-41 High Range Gamma	1 µSv/h to 1 Sv/h (0.1 mR/h to 100 R/h)
	Wide Range Gamma	0.5 µSv/h to 10 Sv/h (50 µR/h to 1,000 R/h)
	AMP-300 Gamma	1 mSv/h to 300 Sv/h (100 mR/h to 30,000 R/h)
	AMP-200 Gamma	10 mSv/h to 150 Sv/h (1 R/h to 15,000 R/h)
	AMP-100 Gamma	50 µSv/h to 10 Sv/h (5 mR/h up to 1,000 R/h)
	AMP-50 Gamma	0.1 µSv/h to 40 mSv/h 0.2 (10 µR/h to 4 R/h)
	Ludlum 42-30 Neutron	0 to 100 mSv/h (0 to 10,000 mrem/h) Thermal to approx. 12 MeV
	Berthold LB6411 Neutron	30 nSv/h to 100 mSv/h (3 uR/h to 10,000 mrem/h) Thermal to 20 MeV
	Ludlum Prescila Neutron	Thermal to 100 MeV
	IC-10 Ion Chamber	1 µSv/hr to 250 mSv/hr (0.1 mR/h to 25 R/h)
	GM-10 Low Energy Gamma	0 to 42,000 CPS
	SFP-100 Alpha Beta Frisker	

5 Description

5.1 Physical presentation



6 Mounting the DRM-3000

The DRM-3000 can be either wall mounted or connected to a tabletop bracket.

6.1 Wall Mounting

The DRM-3000 is supplied with a wall bracket and 4 Wall mounting screws. Attach the 4 screws to the back cover of the Meter and attach the Wall bracket to the wall taking care that the key slots are facing upwards. The DRM-3000 is attached to the bracket by placing the four screws over the key slots and pushing down to secure.

Key slot direction

6.2 Table Top Mounting

The four screws shown above can be used to secure the DRM-3000 to the Table top Bracket shown here

7 Operation

7.1 Detectors

Each DRM-3000 is capable of supporting one external instrument with a 4-20 mA Output. The User can set the required Units of Measurement, High (20mA) Range and Low (4mA) Range in the DRM-3000 using the RMVC software.

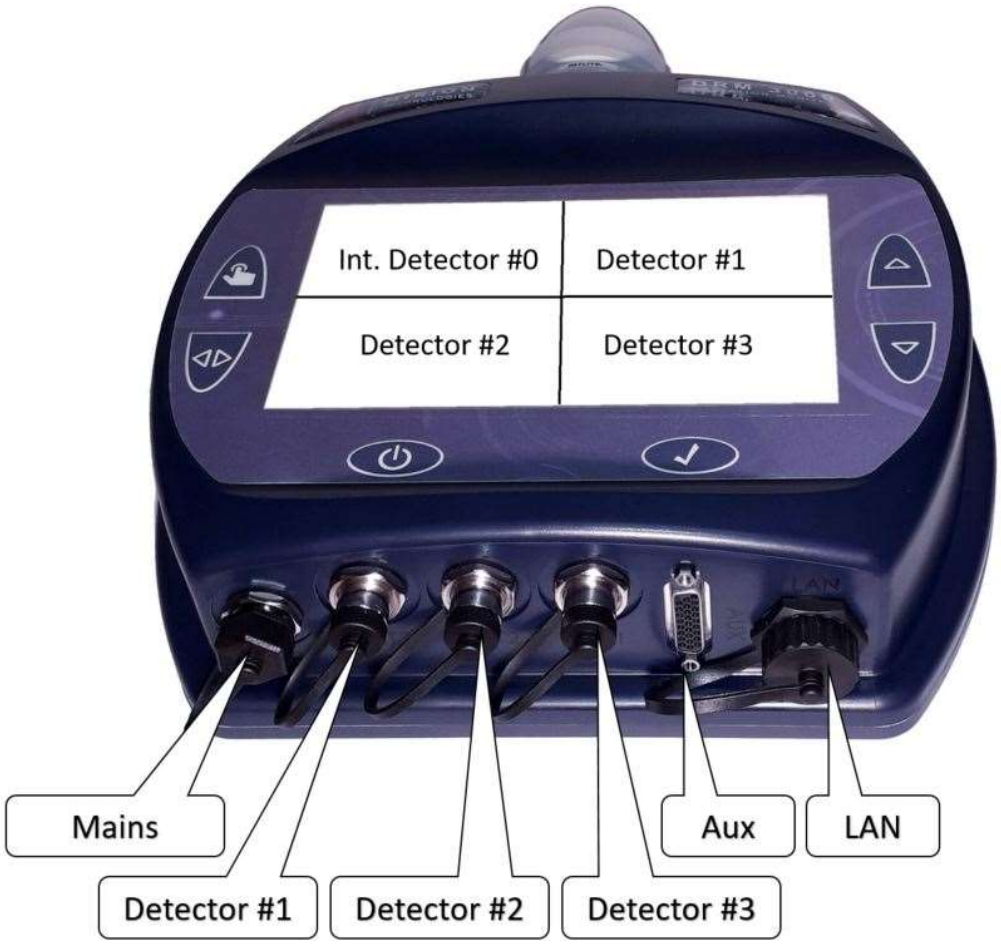
The DRM-3000 is also capable of supporting the full range of Rotem Detectors as well as others like the Ludlum 42-30 Rem Ball Neutron detector, the Ludlum Prescila Neutron Detector and the SFP-100 Alpha Beta detector from V.F.

Some detectors like the AMP series, which have a minimum amount of electronics in the detector to preserve their “radiation hardness” need the H.V. to be supplied by the DRM-3000 and other detectors, like the Wide Range Gamma detector, which is a smart detector, are capable of sending the radiation data to the DRM-3000 via serial data.

The DRM-3000 is designed to interface with all these different types of detectors but care should to be taken when first connecting the detectors to the DRM-3000

7.1.1 Connecting the Detectors

The placement of detectors in their slots defines the position their data is displayed on the Screen.



If more than one detector is connected to the DRM-3000 Meter, the Display will be divided into all four segments and each segment will display according to the connector. For example if an internal detector is installed and a detector is connected to the Detector 1 connector, then the two top segments will show data and the bottom two segments will stay blank.

7.1.2 Response Times for the GM Tubes

Table 1
Response Time for Small Changes

Radiation Field Range [mR/h]	Response Time [sec.]
< 0.5	45
0.5 - 1.5	30
1.5 - 2.5	20
2.5 - 6	10
6 - 12	6
12 - 24	4
20 - 60	3
60 - 800	2
0.6 - 1.2 R/h	5
1.2 - 2 R/h	4
2 - 3 R/h	3
3 - 10 R/h	2 – 3
> 10 R/h	≤ 2

Table 2
Fast Response Time

Radiation field [mR/h] from	to/above	Response Time [sec.]
0.05	1.0	≤ 2
0.5	3.0	≤ 2
1.5	5.0	≤ 2
2.5	12	≤ 2
6	20	≤ 2
12	40	≤ 2
20	60	≤ 2
1 R/h	2 R/h	≤ 2
2 R/h	2.6 R/h	≤ 2

If the radiation field measured by the meter increases significantly, the response time will be ≤ 2 sec. as seen in Table 2. In other cases the response time is according to Table 1.

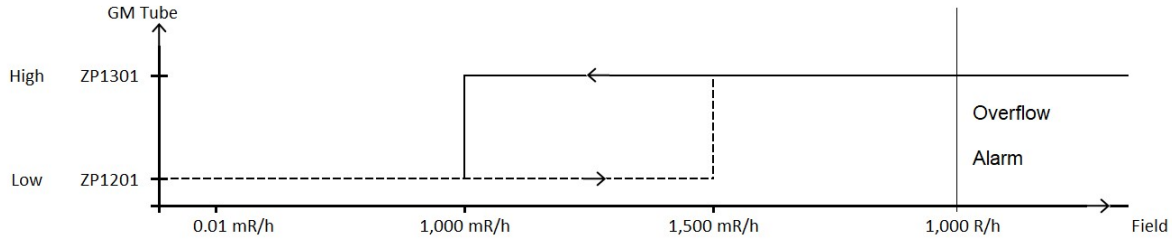
For example:
For a radiation field increase from 2.5 mR/h to 12 mR/h, the response time will be ≤ 2 sec.
For radiation field fluctuations between 2.5 mR/h and 6 mR/h, the response time will be 10 sec.

4.1.1 Automatic Range Switching for the DRM-3000

Both the Internal and external detectors include two GM Tubes:

Low range - ZP-1201 (or equivalent), and high range - ZP-1301 (or equivalent).
In a field of 0.01 mR/h to 1,500 mR/h both GM tubes are connected and the field is measured by the low range GM tube. If the radiation field is higher than 1,500 mR/h, the low range detector is disconnected, and the radiation field is measured by the high range GM tube.

The switching between the low and high range GM-Tube is performed at 1,500 mR/h when the radiation field increases (low range detector is disconnected), and at 1,000 mR/h when the radiation field decreases (low range detector is connected).



7.2 Using AMP Detectors

The DRM-3000 is capable of supporting Our line of AMP-50, AMP-100, AMP-200 and AMP-300 detectors:

Measuring Ranges:

AMP-50	0.1 uSv/h to 40 mSv/h	0.01 mR/h to 4 R/h
AMP-100	50 µSv/hr to 10 Sv/hr	5 mR/h up to 1,000 R/h
AMP-200	10 mSv/h to 100 Sv/h	1 R/h to 10,000 R/h
AMP-300	1 mSv/h to 300 Sv/h	0.1 R/h to 30,000 R/h

The AMP detectors are dumb detectors with minimal electronics inside the detector, the Meter provides the H.V. Power supply and the calibration factor. Having minimal electronics improves the detectors' resistance to radiation damage thus providing a longer life for each detector.

Each AMP Detector is supplied after being calibrated to a specific Connector (Detector #1, Detector #2 and/or Detector #3) and specific DRM-3000. The DRM-3000 is capable of identifying the AMP detector cable and upon Powering Up the DRM-3000 will ask the User to identify the AMP detector being inserted by displaying list of detectors and serial numbers. The user moves the selection to the required line by clicking on the  up or down arrows and then on the  Confirm button to enter his selection.

In case of a power failure, and lack of User response, the DRM-3000 will, after a user set time interval (using our RMVC Software), assume that the AMP detector has not been moved and apply the same calibration factors as before.

7.3 Power

The DRM-3000 Meter requires between 9VDC to 15VDC 1.5A to operate and is powered by one of three options mentioned below:

1. **AC Power** through a power transformer connected to a cable (6.5ft) which connects externally to the Power Connector shown below

The AC Power Adapter Features

Output; 12 VDC / 2 Amps
Universal Input Range 100~240Vac 50~60 Hz
Safety: UL/CUL/PSE/BSMI/RCM/GS
EMI: CE/FCC Class B: Conduction & Radiation Met.
Protection: OVP (Over Voltage Protection), SCP (Short Circuit Protection), OCP (Over Current Protection)

2. **POE** (Power over Ethernet) which uses a standard configuration of 10/100BASE-TX PoE which is IEEE802.3 af/at compliant.

3. **Internal Battery** which provides 24 hours operation at background radiation levels.

   The DRM-3000 will draw power in the following priority: 1. AC Power, 2. POE and 3. Internal Battery. This means that if all three are connected the Meter will use the AC Power only and will not use the POE or internal battery.

The DRM-3000 will charge the internal battery only if connected directly to the AC Power.

The DRM-3000 will be capable of supplying 24VDC through the Auxiliary connector only if connected directly to the AC Power and if the optional DC power board exists in the Instrument.

7.3.1 Power Consumption

The Following table describes the consumption of the DRM-3000 when connected to an external DC source of 12VDC with different connections

Condition	Current Consumption	Power
DRM-3000 without any detector	450 mA	5.4 W
As above with Internal Detector	600 mA	5.5 W
As above with 3 external detectors	950 mA	6.1 W

As above under alarm condition	970 mA	8 W

7.4 Internal Memory

The DRM-3000 is capable of storing the radiation data on the internal SD card, from all four detectors for a period of one year in a cyclic FIFO fashion. The DRM-3000 uses around 350 Mbytes for a full load of 4 detectors per month and 4.2 Gbytes/Annum.

7.5 The LAN connector

The external LAN Connector can be used to connect the DRM-3000 to the Ethernet to interface with a web-based software or the LAN connector can be used to connect the DRM-3000 directly to a computer for the purpose of setting up the instrument, downloading data or uploading new firmware.

To create a clean Ethernet or POE installation, we offer a back cover of the DRM-3000 with a hole for the Ethernet cable. This way the DRM-300 can be mounted flush to the wall.

7.5.1 The IP address

From this version onwards, it is possible to select either a static or dynamic IP address for each DRM-3000. The DRM-3000 is shipped with a static setting as the default, you can modify the setting by connecting the DRM-3000 to the RMVC software and accessing the Setup Options. See 12.4page 5842, “Setting up the Meter” paragraph for more information.

Each DRM-3000 is provided with a unique MAC address which can be used along with DHCP to set a static IP. There are two connection options: network connection via DHCP or direct connection to a PC. In a network connection the Switch is responsible for providing a dynamic IP address and can be configured to provide a fixed IP address according to the MAC address of each DRM-3000. In a direct connection the network adapter provides an Automatic Private IP Addressing (APIPA) to the DRM-3000 each time they are connected and after a period of up to 30 seconds. The range of IP addresses is 169.254.X.X

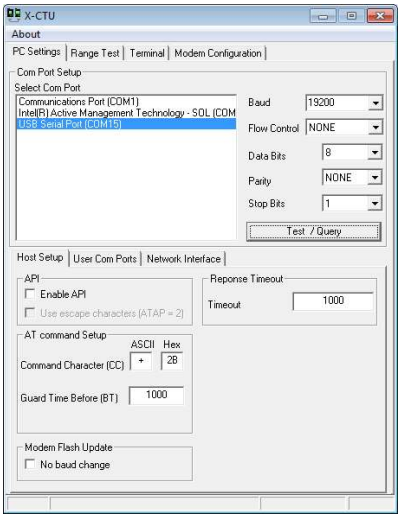
7.6 Installing the WRM2 Transmitter

7.6.1 WRM2 Radio Transmitter Characteristics

1. 10.25” L x 4.28” D x 4.88 W
2. Transmit power output 100 mW (900 MHz), 50 mW (2.4 GHz), 3.5 mW (868 MHz)
3. Receiver sensitivity -110 dBm (900 MHz) and –105 dBm (2.4 GHz)
4. 868 MHz, 900 MHz or 2.4 GHz spread spectrum hopper (FHSS)
5. Range for the 900 MHz unit 1500’ indoors-industrial environment, 2 miles outdoors RF line-of-sight with standard dipole antenna, up to 20 miles with high gain directional antenna
6. Range for the 2.4 GHz unit 600’ (200 m) indoors, 1.5 miles outdoors with RF line-of-sight w/ dipole antenna, up to 10 miles (16 km) with high gain antenna
7. Over the air data stream at 19,200 BAUD
8. Addressable from 0 to 65,000
9. FCC approved, IC Certified, 2.4 GHz and 868 MHz are CE marked
10. Programmable transmission intervals from 1 sec to 16 sec.

7.6.2 Configuring the WRM2 Module

The WRM2 Transmitter should be configured to the following parameters in order to enable it to be compatible to the DRM-3000



7.6.3 Inserting the WRM2 Module

1. Under no circumstances can the WRM-2 transmitter be connected or disconnected to its mounting pads while the Unit is under power.
2. Open the rear cover of the Meter and insert the WRM-2 transmitter onto its mounting pads.
3. Close the rear cover
4. Activate the WRM2 from the Q-SETUP screen or from the RMVC Software program.

7.7 Pushbuttons, Icons and Menus

7.7.1 Background Colors

The DRM-3000 provides a number of background colors on the display to help users identify the radiological conditions and reasons for the audible alarms.

Each of the four display segments shows its own individual color, while the external LED shows the color reflecting the worst case scenario as follows:

Green from background to first threshold
Yellow from first threshold to second threshold
Red from second threshold upwards or User Threshold (Alarm).
Blue Shows a Lost Contact condition between detector and Meter

7.7.2 Confirming an Alarm

Clicking on any of the buttons on the Control Panel resets the Alert condition, silences the buzzer and deactivates the solenoid. The background color remains either yellow or red as long as the dose rate exceeds any of the thresholds.

The DRM-3000 provides both an audible and visible alarm when the following occurs:

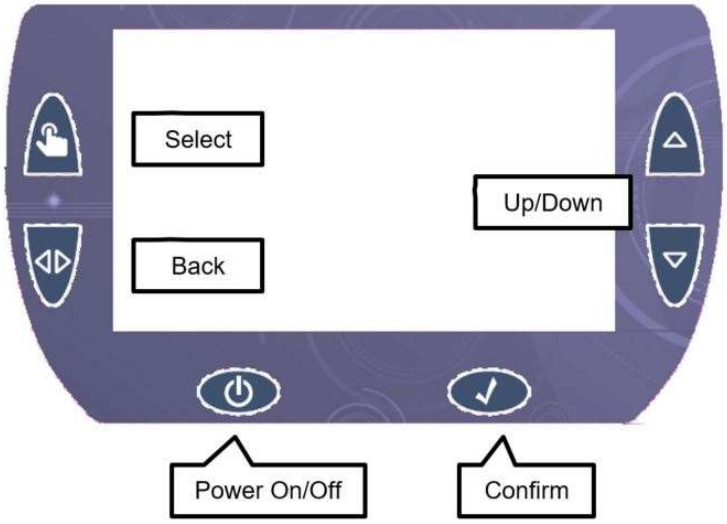
Over threshold condition: There are two internal thresholds for dose rate and one internal threshold for alarm. The background color will change from green to yellow if the first dose rate threshold is breached and from yellow to red if the seconds dose rate threshold is breached.

Over User Threshold condition: This internal threshold is set via the RMVC software or WebiSmarts Software and activates an audible alarm, changes the background color to red and activates the internal solenoid: Clicking on any of the buttons

Lost Contact condition between detector and Meter

Detector Fail condition

7.7.3 Pushbuttons



7.7.3.1 Powering Up the Meter

Before powering up the Meter, make sure all the external detectors are connected, during the powering up routine, the Meter will automatically identify all connected detectors.

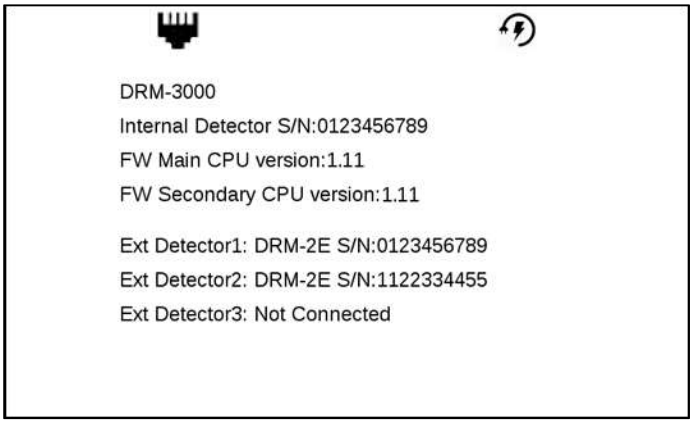
Press, with a short press on the On/Off Button, the Display will flash and the Meter will begin the Power Up Routine.

7.7.3.1.1 Power Up Routine

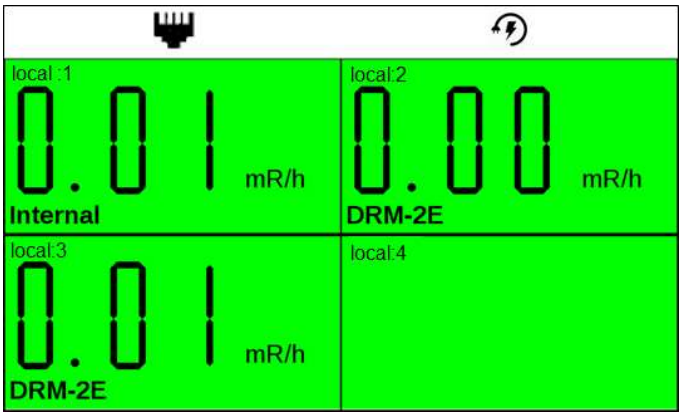
Screen Flashes once
Penguin shown top left hand corner
Open embedded loading
Desktop followed by
Startup Screen
Upper Led flashes green and buzzer sounds and after a few seconds the Display

shows the Radiation Data.

The Startup Screen



The Initial Display

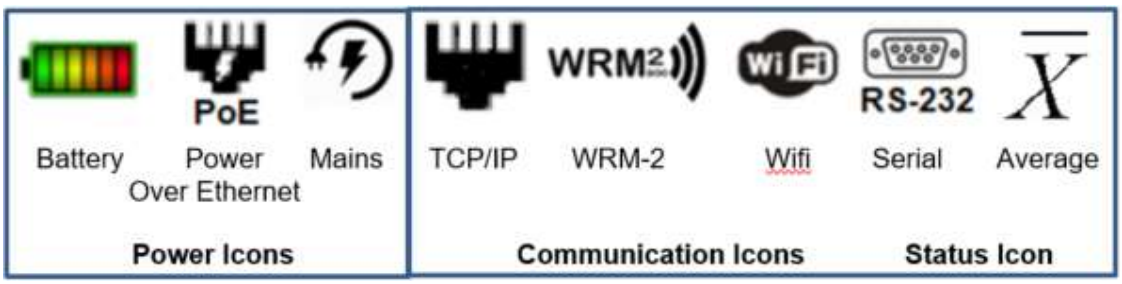


7.7.3.2 Powering Down The Meter

Press Continuously on the On/Off Button until the Meter turns off

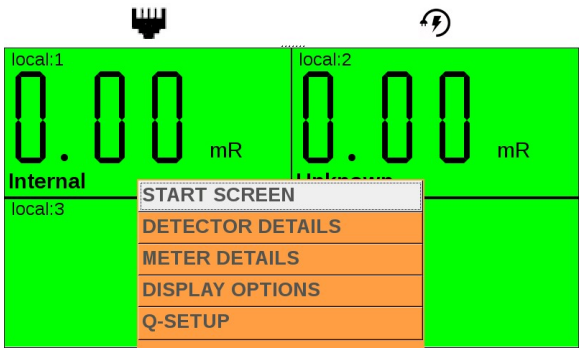
7.7.4 Icons

The DRM-3000 displays both the power and communication statuses at all times.



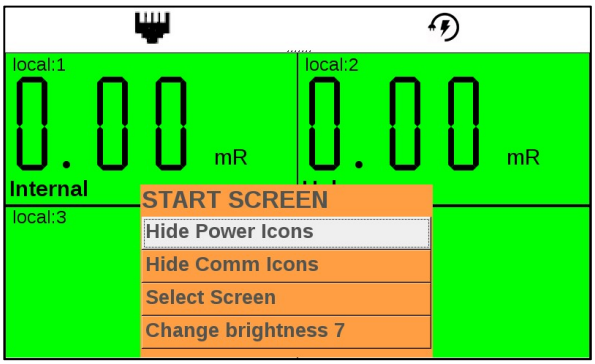
7.7.5 User Interface Menus

Click on the Confirm Button to display the Main Menu

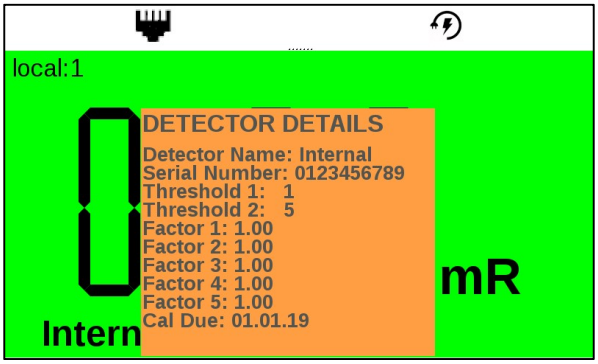


Click on the Up or Down Button to navigate to the required command [METER DETAILS]

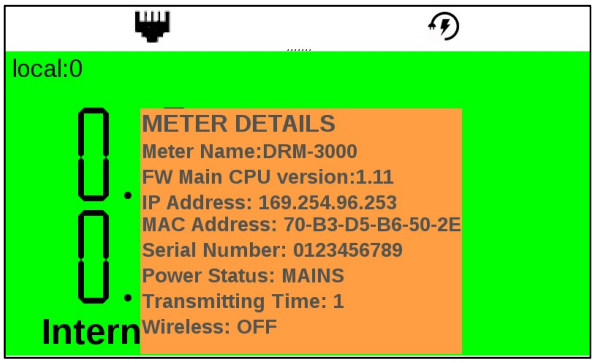
1. START SCREEN – Control which ICONS and which screen segments to Display



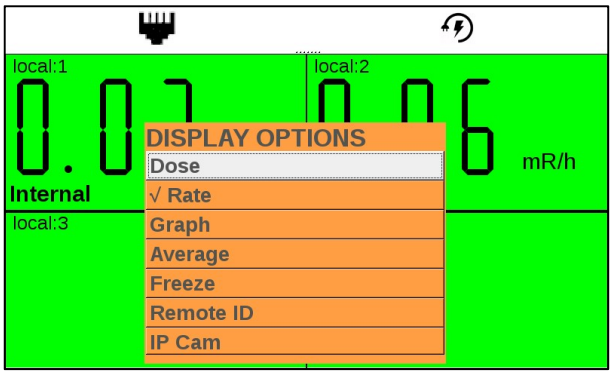
2. DETECTOR DETAILS – Show the parameters of each point. The user first needs to identify the detector he wants to query (Top left, Top Right…) and then display the parameters. Please note that if the detector does not exist and the display is blank, the software will not display the blank screen, and the Quick Selection method (button next to the quarter screen display) will not focus on the blank screen.



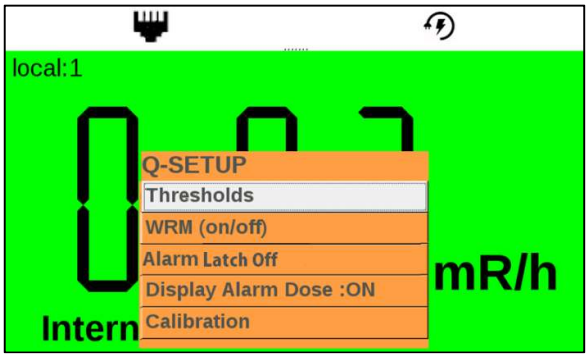
3. METER DETAILS – Show the parameters of the Meter



4. DISPLAY OPTIONS – Provides the user with tools to set the display options.



5. Q-SETUP
   Password required to access the Q-SETUP menu



1. START SCREEN

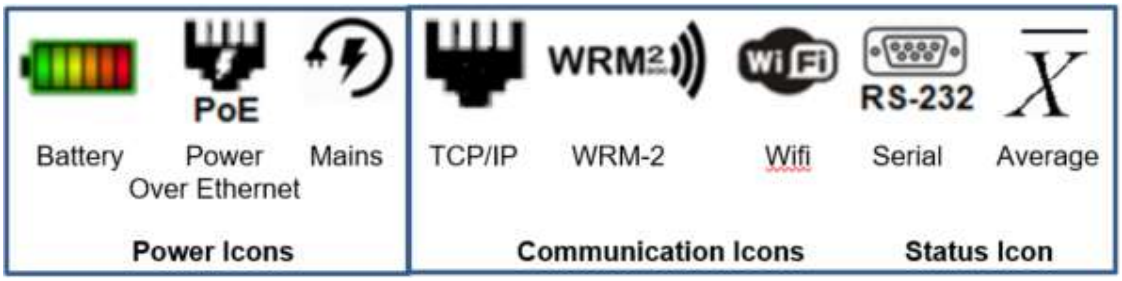
Click on the Confirm Button to display the Main Menu

START SCREEN
DETECTOR DETAILS
METER DETAILS
DISPLAY OPTIONS
Q-SETUP

Click on the Up or Down Button to navigate to the required command [START SCREEN]

Click on the Confirm Button and the Sub-Menu will appear

Show/Hide Power Options Show/Hide Comm. Icons	In both cases click on the Confirm Button to toggle between the two options, the Icons will reflect the status.
Select Screen	Used to Select (Focus) on a specific screen if more than one detector is displayed.
Change Brightness 6	Used to change the brightness of the display. Each click on the Confirm Button changes the level of brightness



In the case of more than one external detector connected to the DRM-3000, the user can select which of the four can be in focus and displayed in a full screen mode. The Focus on the specific detector is used to enable the user to query and/or modify a parameter. There are two methods to Focus on a single Display, the first is Q-Focus described below and the second is menu driven by asking you to select which detector you want to focus on. if you need to see the details of a specific detector, we suggest you first focus into that detector and then open the Detector Details Menu. This will save you the extra step of having to define the position of the detector on the screen after opening the Menu

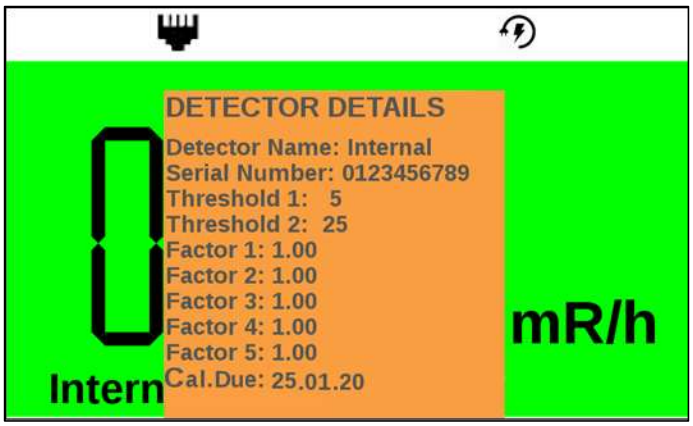
Q-Focus: Click on the button next to screen. To Focus on the Internal Detector, click on the **Select** Button and the Internal Detector will open to full screen. To revert back to the four screens, click on the **Select** Button again. In the example below, if you click on the **Down** Button you will see a blank screen.

Once you have focused on one of the four detectors, you can focus on the next detector by clicking on the associated button next to it and if you click once again on the button the display will show all four screens.

2. DETECTOR DETAILS

Click on the  Up or Down Button to navigate to the required command [DETECTOR DETAILS]

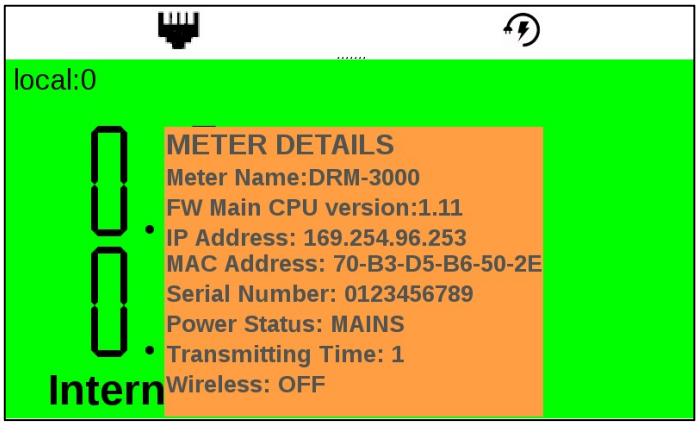
Click on the  Confirm Button and the Sub-Menu will appear



3. METER DETAILS

Click on the  Up or Down Button to navigate to the required command [METER DETAILS]

Click on the  Confirm Button and the Sub-Menu will appear



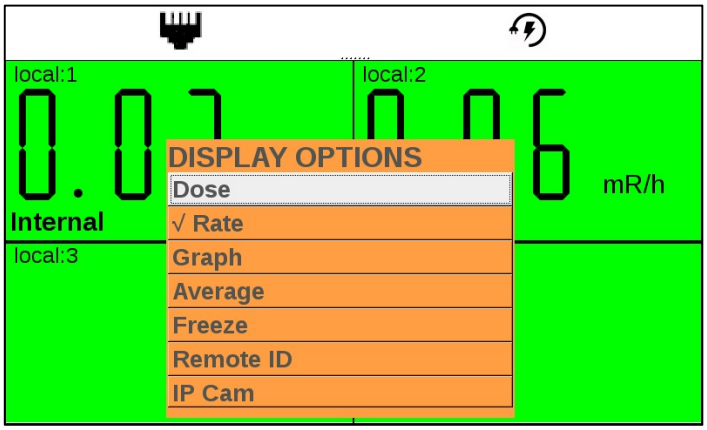
Click on the  Back Button to go back to a previous menu

4. DISPLAY OPTIONS

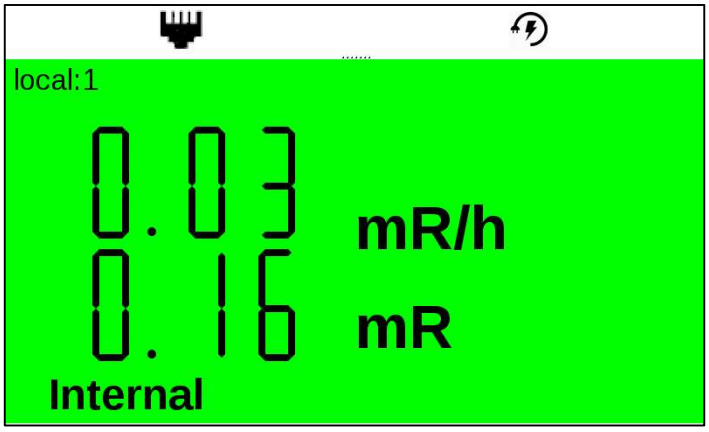
Click on the  Up or Down Button to navigate to the required command [DISPLAY OPTIONS]

Click on the Confirm Button and the following screen will appear

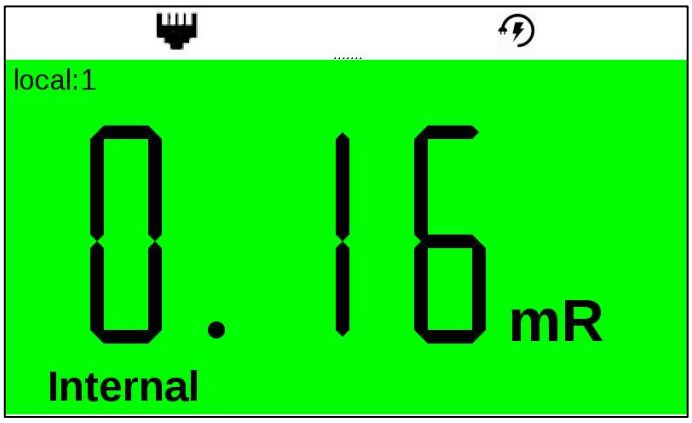
4.1. Display Dose



First click on the Confirm Button adds the display of the Accumulated Dose to the display of the dose rate.



Second click on the Confirm Button displays only the Accumulated Dose.



4.2. Display Rate

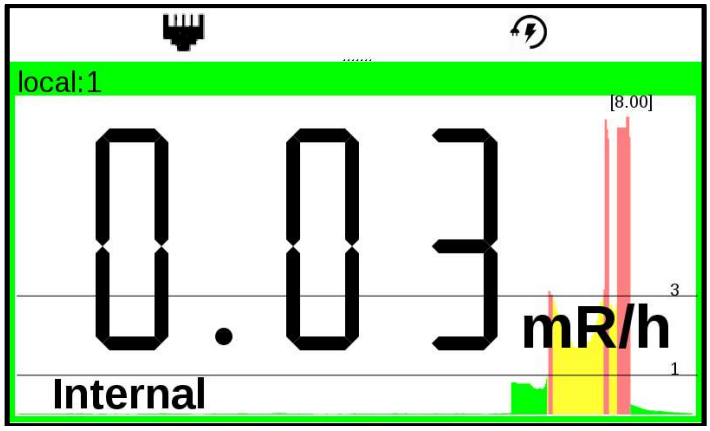
To return to displaying the Dose Rate, click on the Back Button to go back to a previous menu and select **Rate**

First click on the Confirm Button adds the display of the Dose Rate to the display of the accumulated dose displayed.

Second click on the Confirm Button displays only the Dose Rate.

4.3. Display a Graph

Go back to the DISPLAY OPTIONS Menu and select GRAPH



A live color coded graph of the Dose Rate will begin to develop in the background showing the threshold levels.

4.4. Display Average

Selecting this Display mode displays the average dose rate from the time you select this option. The DRM-3000 will save the actual data but display the average of the sum of all the data lines in a table of up to 600 values (10 minutes) and then the table will continue to update in a cyclic fashion. Data transmitted to a Computer will be the actual data and not the average displayed value.

4.5. Freeze Mode

Selecting this Display mode displays the highest dose rate received from the time you select this option.

4.6. Remote ID

Used to insert/replace existing detector readings on the display. The RMVC Software is used to create a library of up to 4 remote detectors, identified by their IP addresses into the DRM-3000. Each of these 4 remote detectors is associated with a specific quarter in the Display. If the user wants to replace the current displayed local detector with the designated remote detector, he simply selects Remote ID and then identifies the position (Top left, Top right…)

and clicks on the Confirm Button. The Remote detector associated to that quarter of the display will appear instead of the current one.

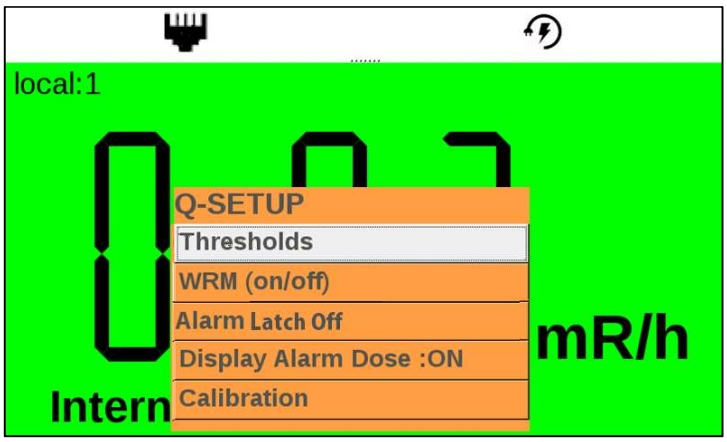
4.7. IP Cam

If the IP Cam has been defined by in the RMVC Software, then the user simply clicks on the IP Cam option and then selects which quarter of the display to use to display the ICAM picture and once this is set, the live picture will appear. As per each of the quarters, clicking on the button closest to that corner will cause the picture to be displayed on the full screen and another click will revert to the original screen.

5. Q-SETUP

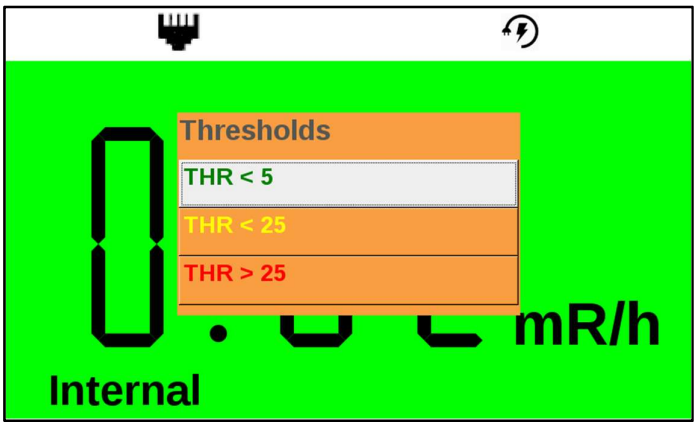
Click on the Up or Down Button to navigate to the required command [Q-SETUP]

Click on the Confirm Button and you will need to enter a password to access the Q-Setup Menu. The password is Up, Select, Up, Down and Confirm or
The following screen will appear:



7.7.5.1 Setting the Thresholds

Click on the Up or Down Button to navigate to the required command [Thresholds]
The following screen appears:



Each click on the Confirm Button will activate the next line

Use the  Up or Down Buttons to adjust the green threshold. In any case you cannot adjust the lower green threshold to be higher than the yellow threshold so it may be necessary to adjust the higher threshold before adjusting the lower threshold. You may also notice that the two higher thresholds are adjusted together where the yellow color will be displayed until the dose rate reaches 25 mR/h and above 25 mR/h the background color will change to red.

To save the Threshold setting you need to click on the  Confirm button.

7.7.5.2 Activating/Deactivating the WRM2 transmitter.

Click on the  Up or Down Button to navigate to the required command WRM (on/off)

Each click on the  Confirm Button will provide/cut power to the WRM2 module. The WRM2 icon will be displayed whenever power is applied to the module.

Once the WRM2 option is activated then the radiation data is sent via wireless and TCP/IP. If the meter contains a WRM2 transmitter. If there is no WRM2 transmitter then the meter sends the data via the TCP/IP connection.

7.7.5.3 Latching/Unlatching the Alerts and Alarms

When the latch is on, the Alarm or Alert will not drop and will continue to provide audio and visual signals even when the dose rate returns to below the threshold.

When the latch is off the Alarm or Alert will cease when the dose rate returns to below the threshold

To toggle the latch setting click on the  Confirm Button

The Latch can also be set using the RMVC software

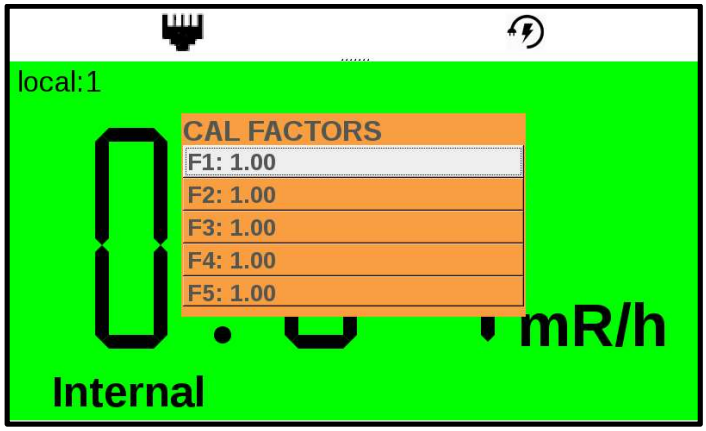
7.7.5.4 Activating/Deactivating the Dose Alarm

The Dose Alarm is set through the RMVC Software and is useful in providing an alarm if the accumulated dose in a room is above the expected level.

Calibrating the external detectors using the DRM-3000 Touch panel

Click on the  Back Button to go back to a previous menu

Click on the  Up or Down Button to navigate to the required command Calibration



Each click on the Confirm Button will activate the next line

Click on the Up or Down Button to modify the factor's value

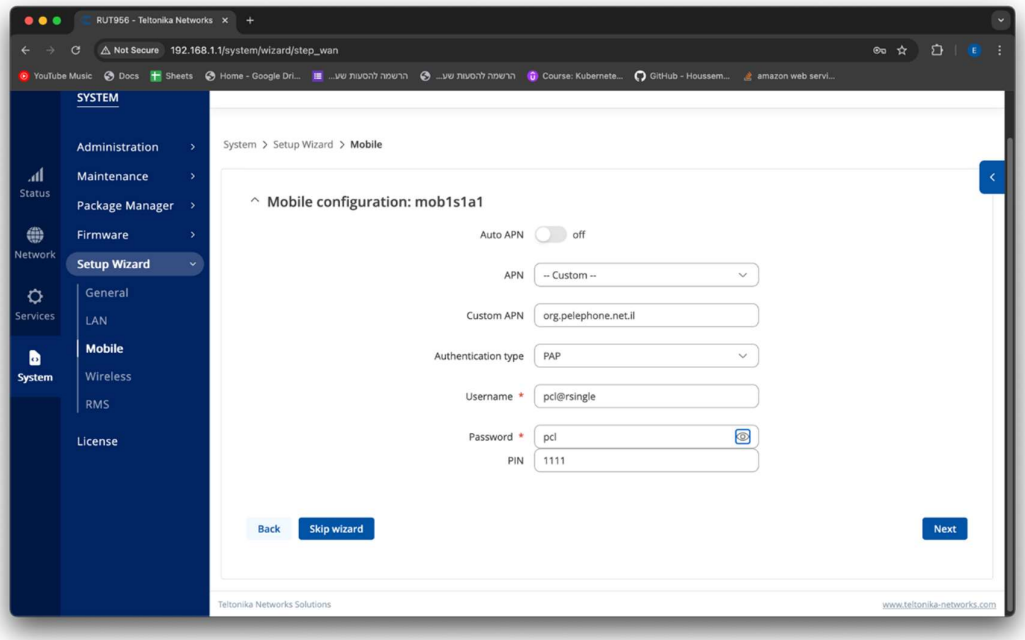
Click on the Confirm Button to save the new value and highlight the next line

If you don't want to save the new value, click on the Back Button to return to the Q-SETUP Screen.

8 Interfacing with a Modem Router

8.1 Configuring the WAN internet connection in the Modem Router

1. Open the Modem Routers' Setup screen and Go to the System/Setup Wizard/Mobile screen, the following screen will appear:

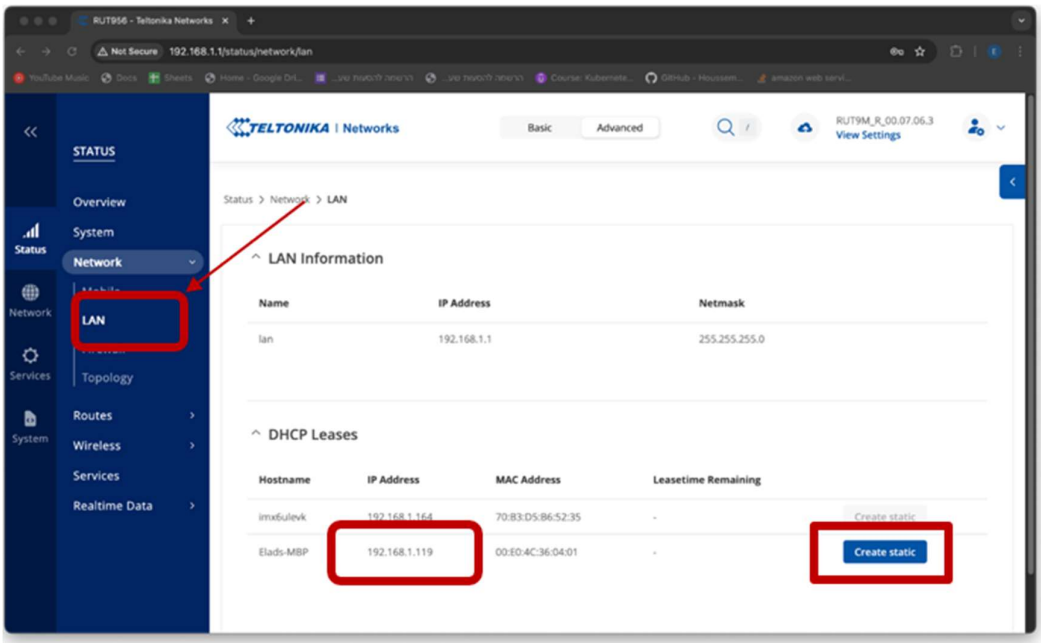


APN: org.pelephone.net.il
Username: pcl@rsingle
Password: pcl
Authentication type: PAP

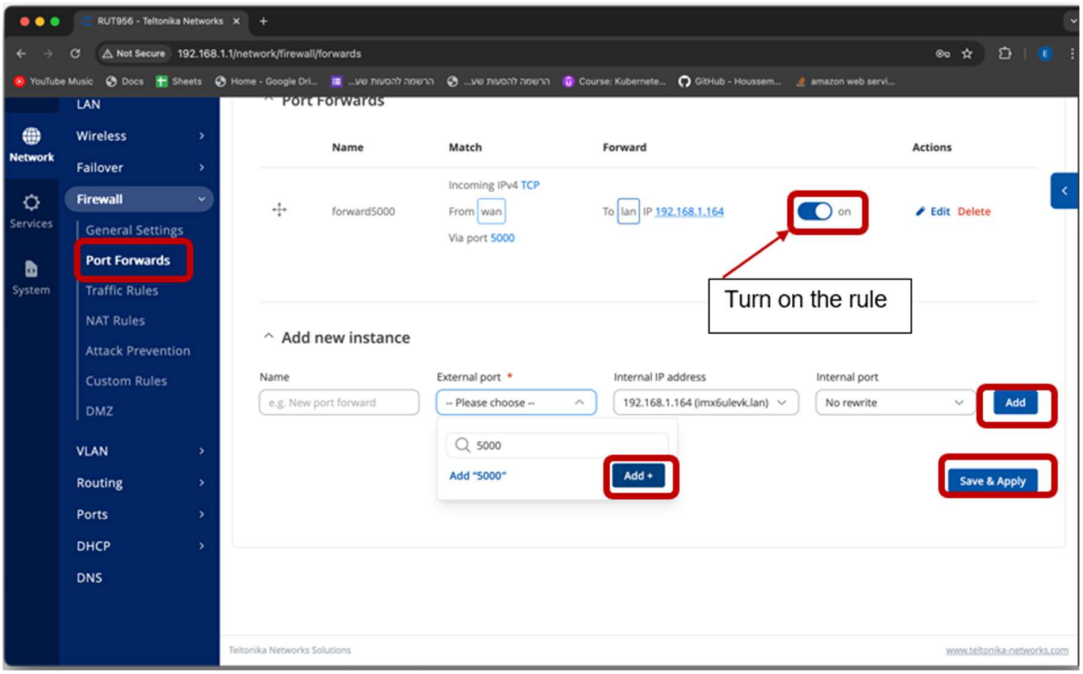
2. Click next and go through the wizard to finish the setup.

8.2 Configuring the Modem Router for the DRM-3000

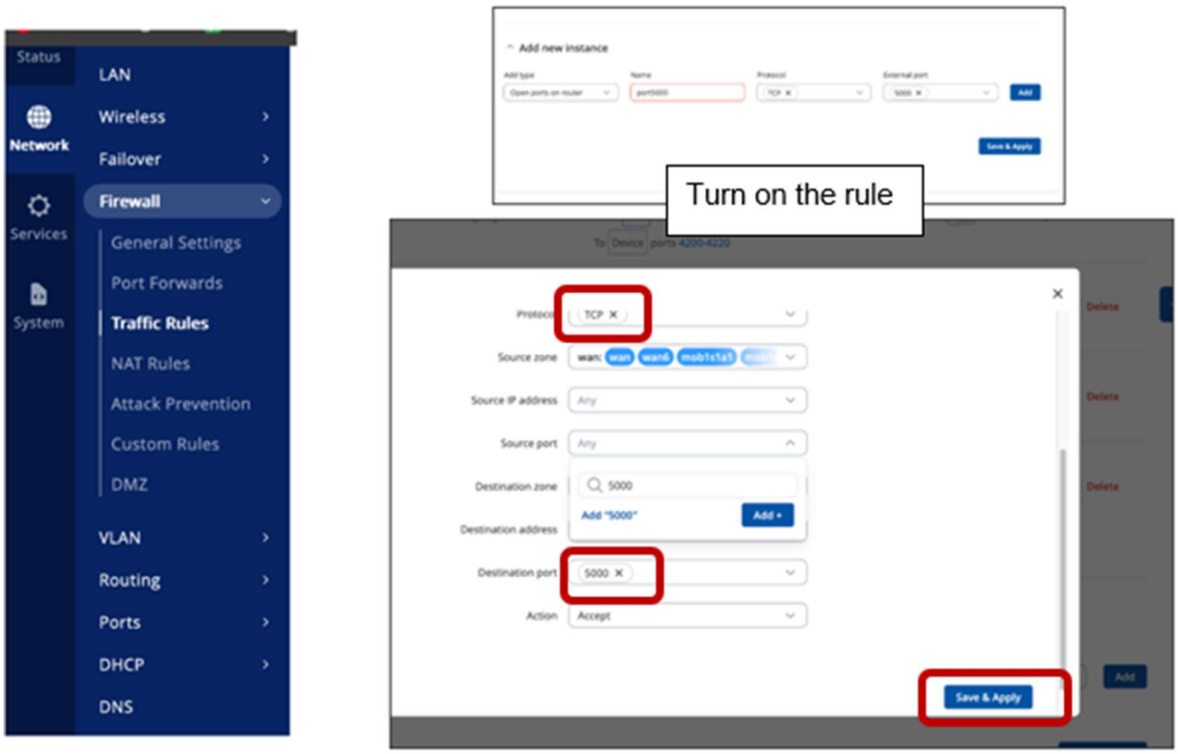
1. To Register the DRM-3000's static IP address go to the Status/Network/LAN screen and click the Create static button next to the DRM-3000's IP, the buttons' color will change from blue grey



2. Set the Port Forwarding for port 5000 by going to the Network/Firewall/Port Forwards screen and adding in a new instance. Give a name to the rule, choose external port 5000 and the internal IP of the DRM-3000. Click “Add” and a form will be opened. Go to the bottom of the form and click “Save & Apply”. After the rule is added turn it on to make sure it works and click “Save & Apply” again.

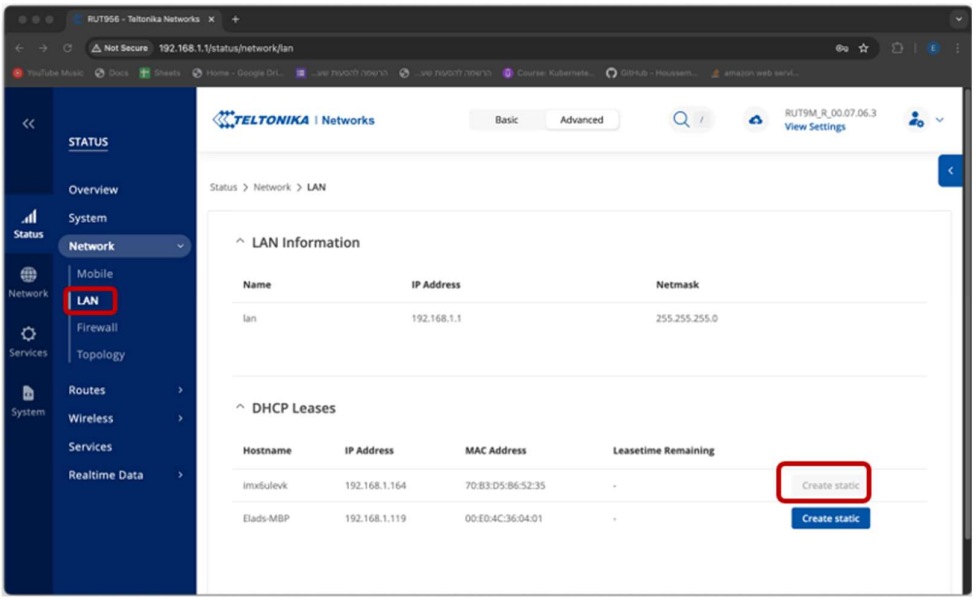


3. Add a traffic rule for port 5000 by opening the Network/Firewall/Traffic Rules screen and adding in a new instance. Give a name to the rule and choose TCP as Protocol. Then choose port 5000. Click “Add” and a form will open. Add 5000 to the source port and choose the DRM-3000 as the Destination address. Make sure the Destination port is 5000 and click “Save & Apply”. Turn on the rule and click again on “Save & Apply”.

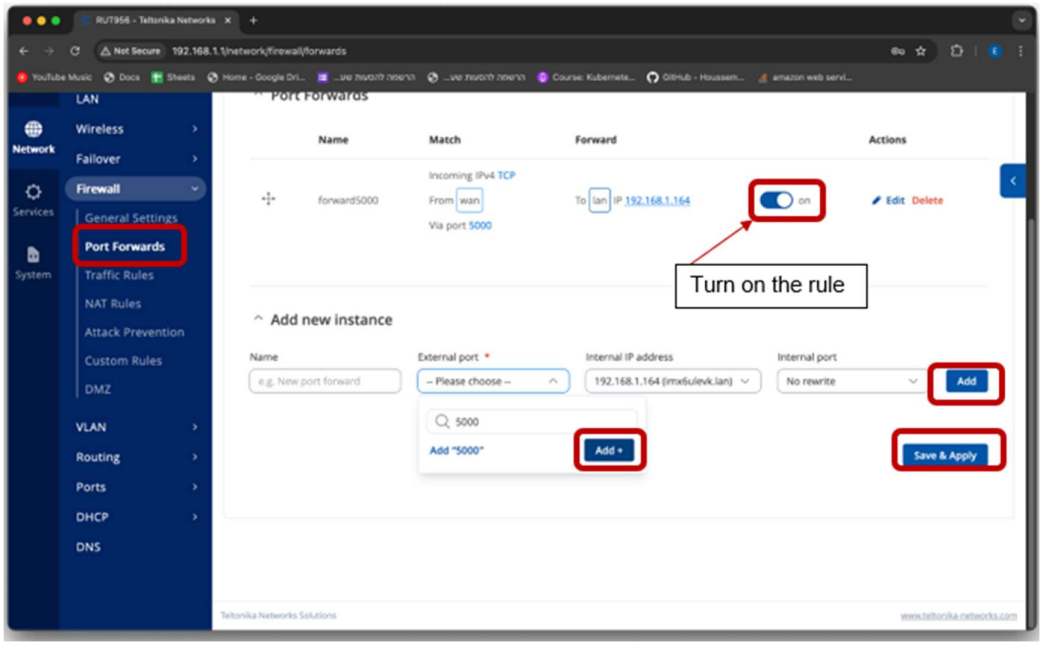


8.3 Configuring the Modem Router for WebiSmarts Server

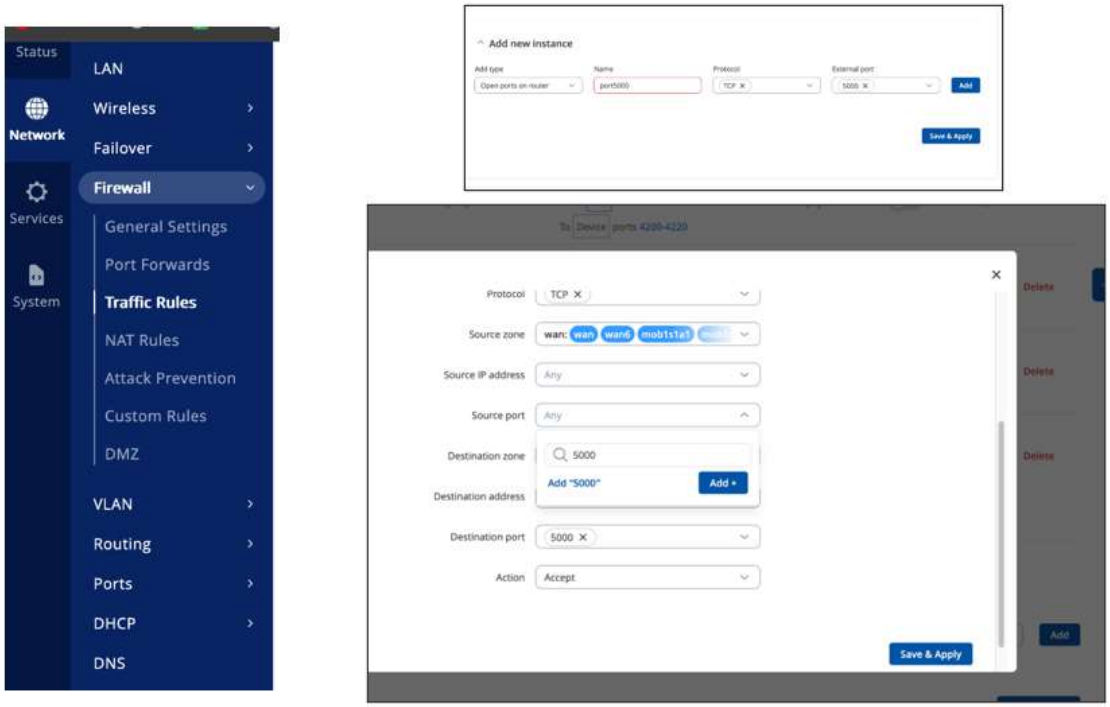
1. To register the WebiSmarts static IP address, go to Status/Network/LAN and click the Create static button next to the Server IP (blue before clicking and grey afterwards).



2. Set the Port Forwarding for port 5000 by going go to Network/Firewall/Port Forwards and adding a new instance. Give a name to the rule, choose external port 5000 and internal IP of the DRM-3000. Click “Add” and a form will be opened. Go to the bottom of the form and click “Save & Apply”. After the rule is added turn it on to make sure it works and click “Save & Apply” again.



3. repeat same process for port 15386.
4. Add a traffic rule for port 5000: go to Network/Firewall/Traffic Rules and add a new instance.
5. Give a name to the rule and choose TCP as Protocol. Then choose port 5000. Click “Add” and a form will open.
6. Add 5000 to the source port and choose the DRM-3000 as Destination address. Make sure the Destination port is 5000 and click “Save & Apply”.
7. Turn on the rule and click again on “Save & Apply”.
8. Repeat the same process for ports: 15386, 8080.



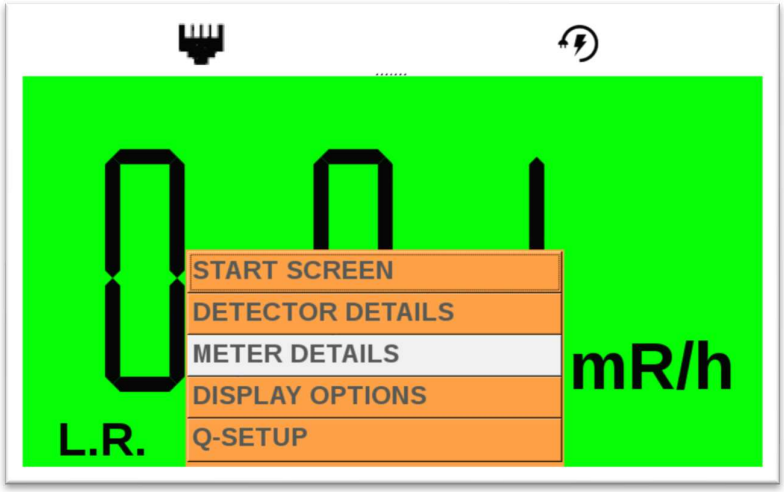
9 Updating the firmware of the DRM-3000

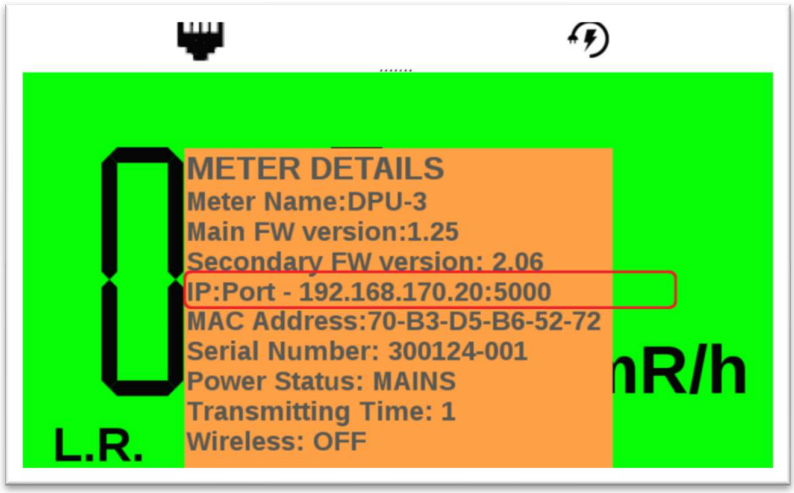
The DRM-3000 contains two separate CPU's (Mainboard (CPU) and Detector Board (CPS) – Main and Secondary). The CPU firmware is responsible for interfacing with the User and the CPS firmware is responsible for handling the detectors, both internal and external, and is updated through the Loader function in the RMVC Software.

You should update the CPU firmware before updating the CPS firmware.

You can connect the DRM-3000 directly to your computer using an Ethernet cable or through your network with the DRM-3000 connected to the network.

To find the IP of the device select the Meter details from the DPU3/DRM3000 push buttons menu:





9.1 Updating the CPU Firmware

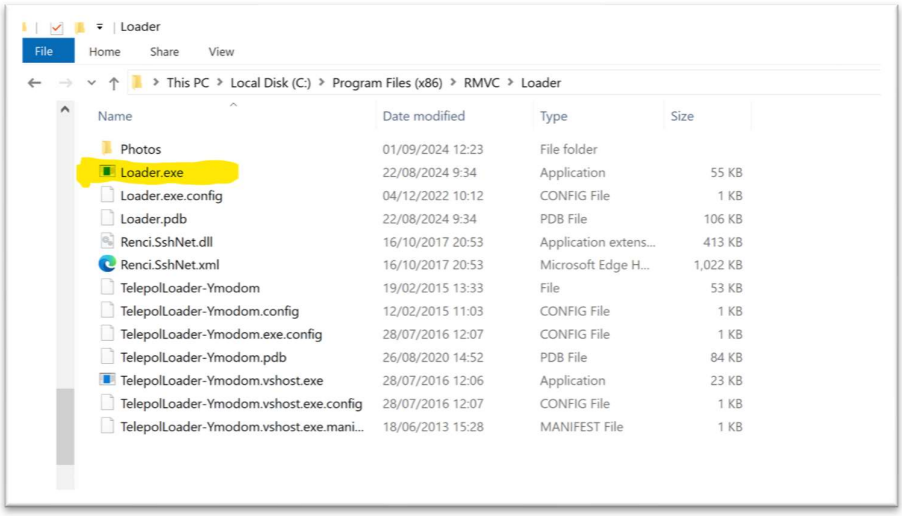
There are two methods of CPU updating:
- Using the Loader method (recommended).
- Using the Script method.

9.1.1 Using the Loader method (recommended)

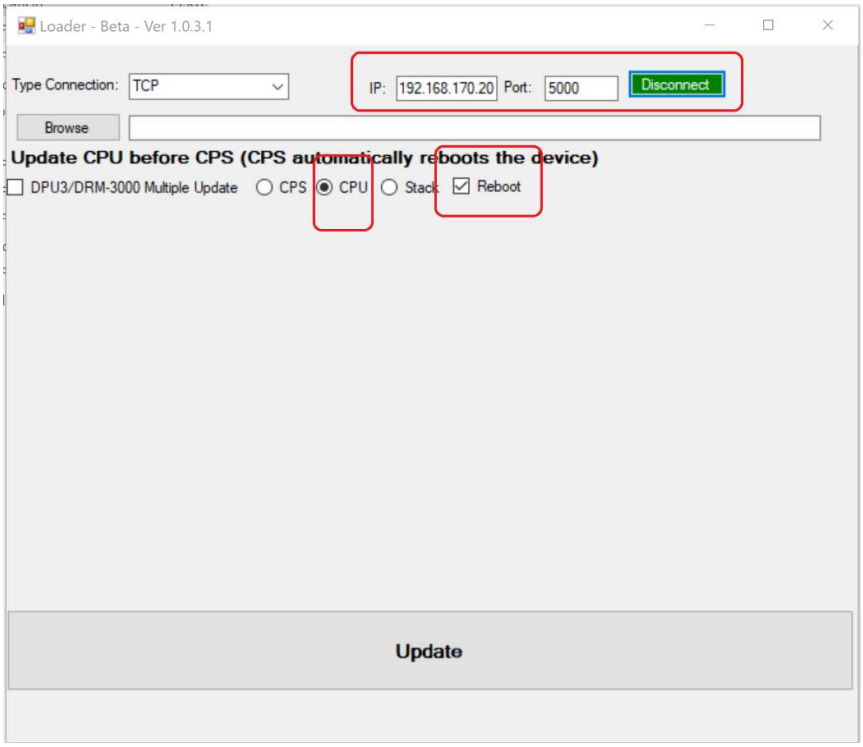
1. The DRM-3000 CPU update package contains several files and should be placed in a separate folder on your desktop.

2. Go to the Loader App inside the RMVC folder: **“C:\Program Files (x86)\RMVC\Loader”**.

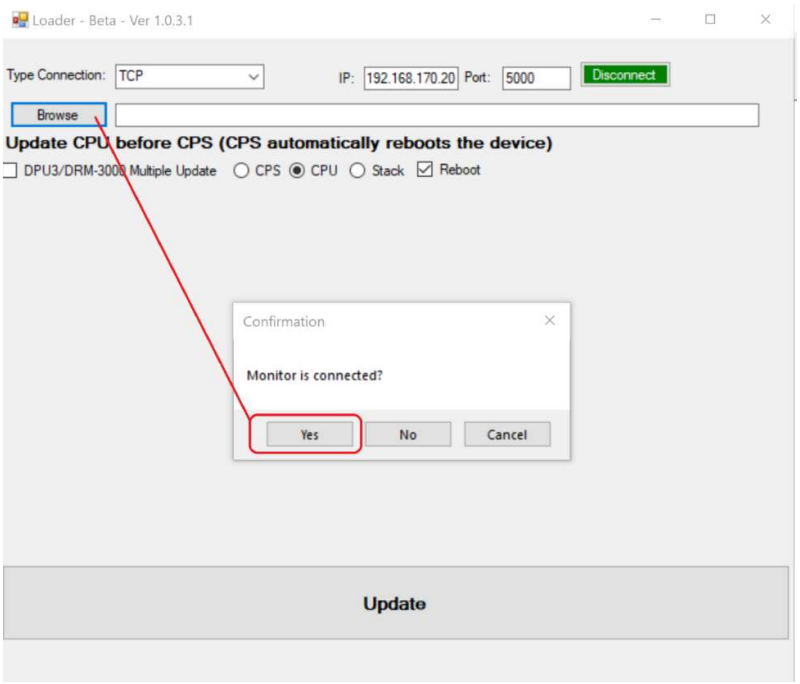
3. Open the Loader.exe file.



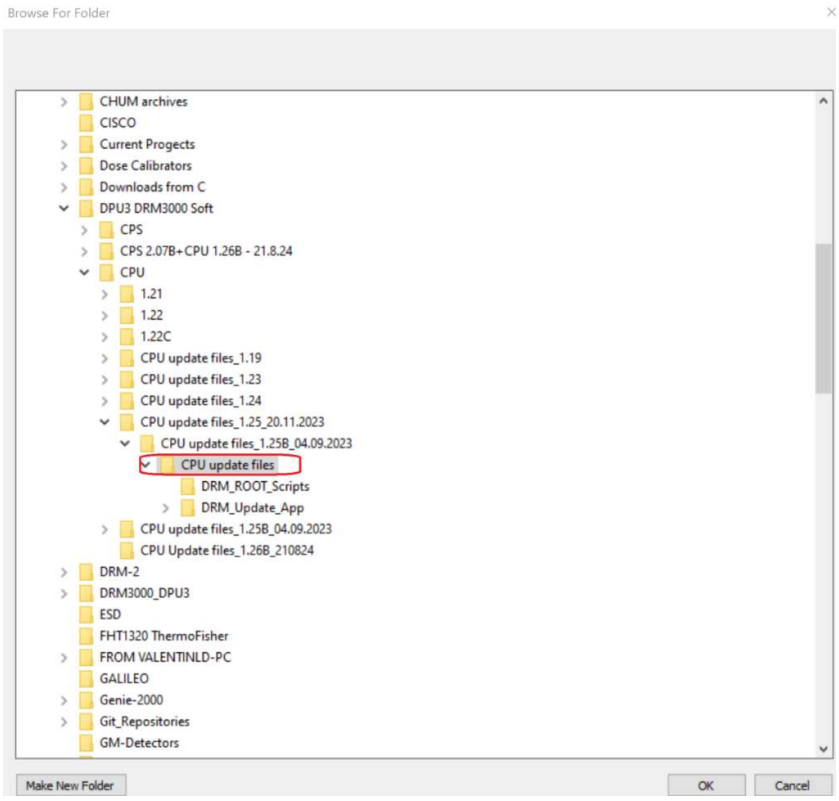
4. Insert the DRM-3000’s IP address and port 5000.
Select the “CPU” radio button to update the CPU and **<u>check the reboot option for the device to be rebooted after the update.</u>**



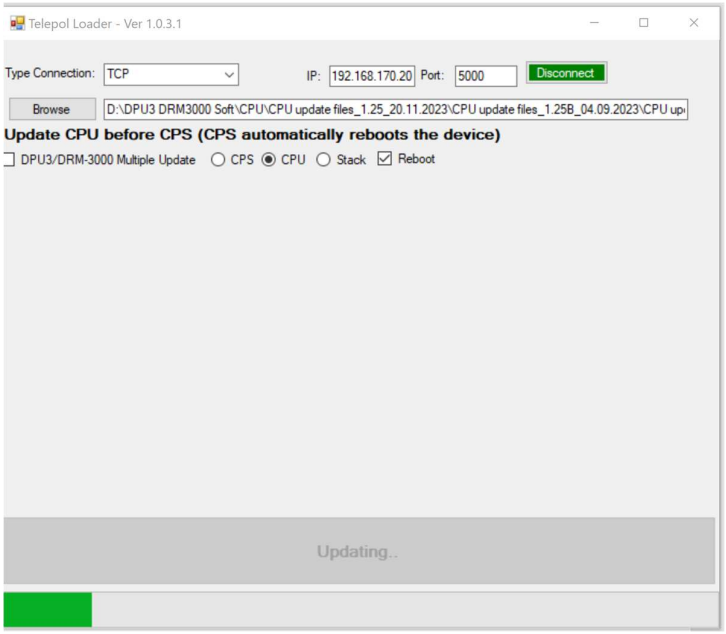
5. Click “browse” and confirm if device connected**.**



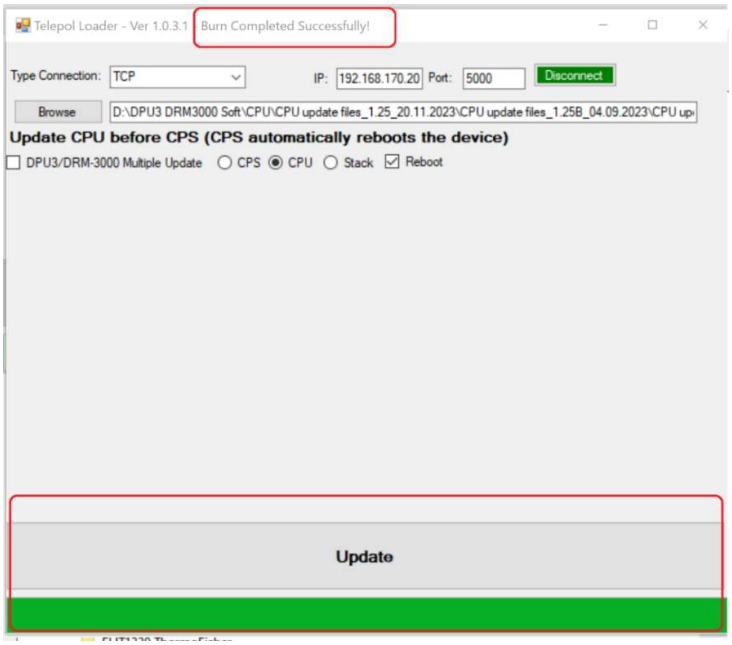
Choose the folder named "CPU update files" and click OK.



Then click “Update” and wait for the progress bar to finish.

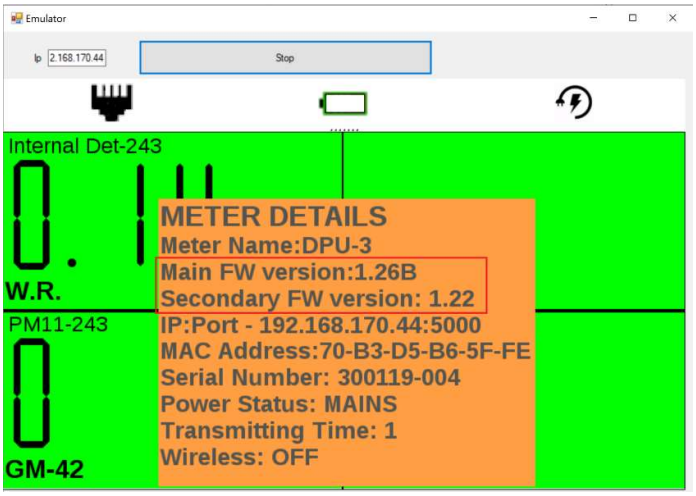


Ensure that the progress bar shows progress.



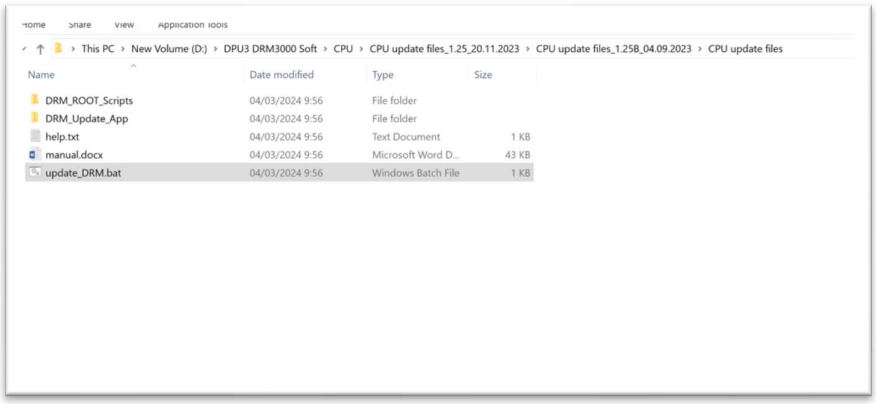
Once the updating procedure is complete, the Meter will Reboot.

Verify the new firmware in the Meter Details screen.

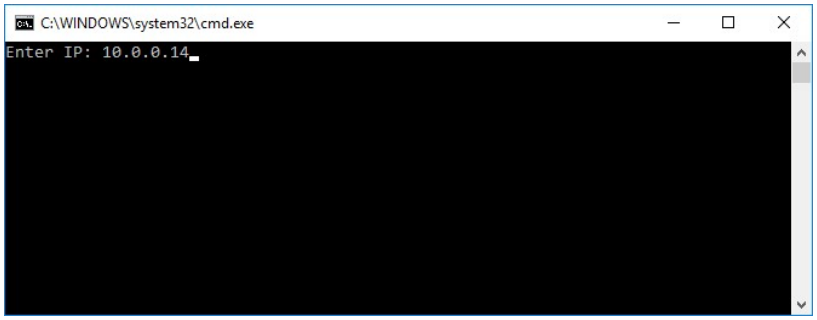


9.1.2 Using the Script method

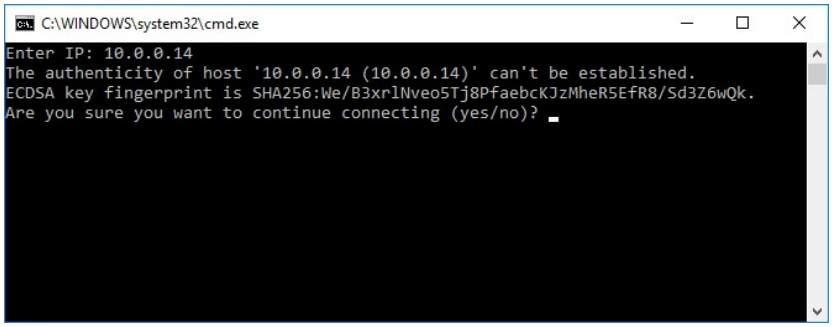
1. The DRM-3000 CPU update package contains a number of files and should be placed in a separate folder on your desktop.
2. Open the folder with new FW updates.



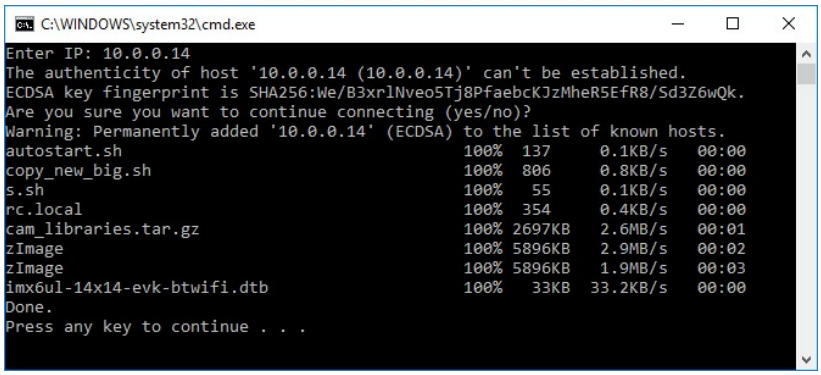
3. Run the "**update_DRM.bat**" batch file from the folder "CPU update files"
4. Insert the DRM-3000's IP address (see page שגיאה! מקור ההפניה לא נמצא.35 for instructions)



5. Click ENTER, the following screen will appear:



6. Type Yes, the following screen will appear upon successful uploading of updated firmware



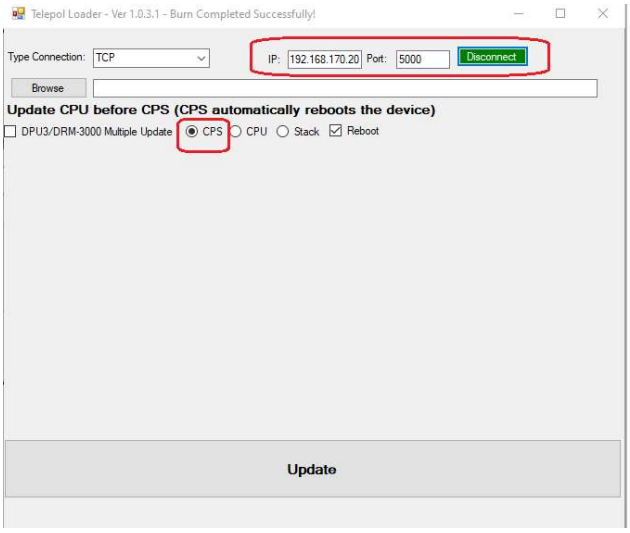
7. Press any key to continue.

8. Switch off the meter and switch on again to check that the firmware update was successfully achieved.

9.2 Updating the CPS Firmware

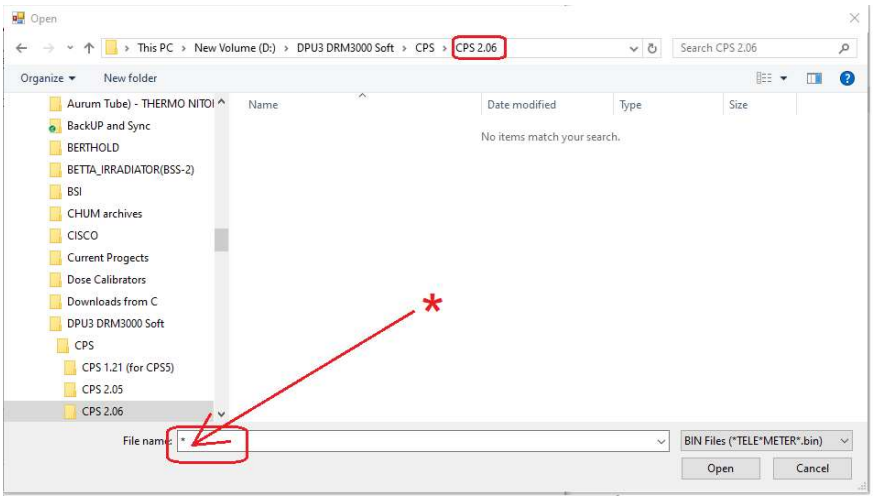
The CPS firmware is responsible for the interface between the Meter and detectors (internal and external) and is uploaded according to the following procedure:

1. Open the loader app, and type fill in your device's IP address and the 5000 port.

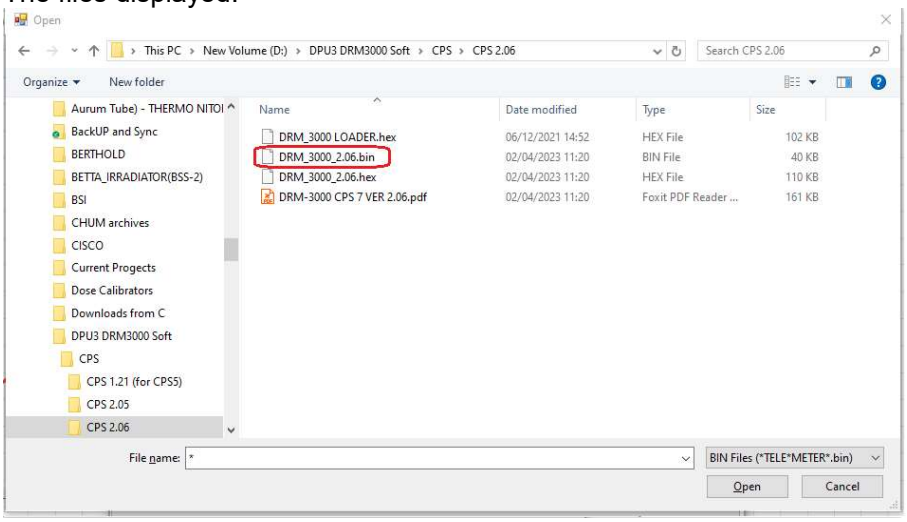


2. Press "Connect". The button should turn green if all was correct.

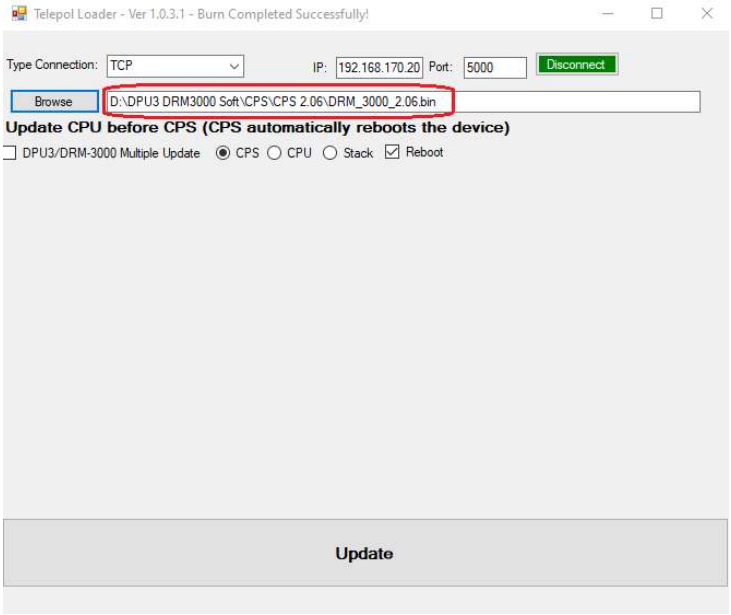
3. Press “Browse” button and find the new FW file and open it.
   Usually the files are invisible on the CPS-update folder.
   Write the “ * ” symbol to the File name field and press enter.



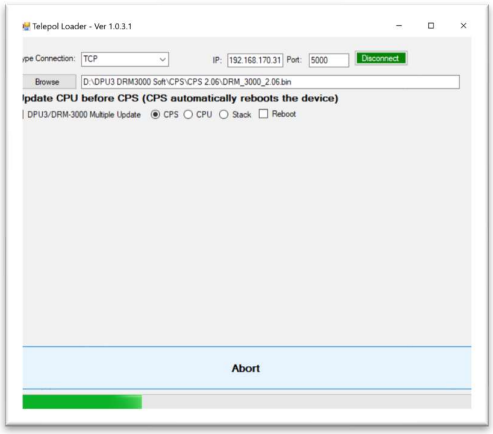
The files displayed:

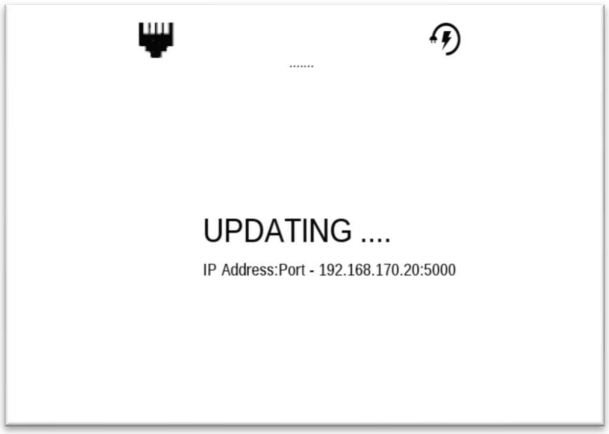


4. Open the *.bin file.



5. Press UPDATE
   Make sure the progress bar is showing progress and the screen of the Device displays "UPDATING…".





6. The device should start automatically.

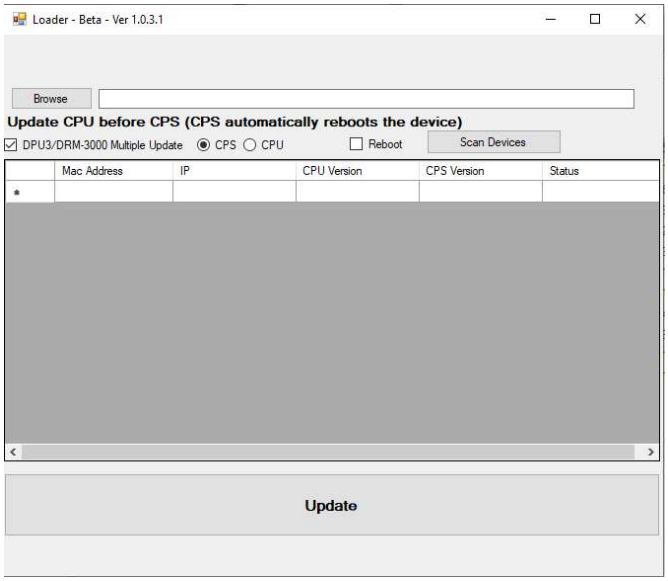
   Wait for a few seconds before turning the device off and on.

   Verify that the startup menu reflects the modifications and shows the latest version of the firmware. Click Confirm (✓) button in the DPU3 and enter Meter Details to validate the CPU and CPS new firmware versions.

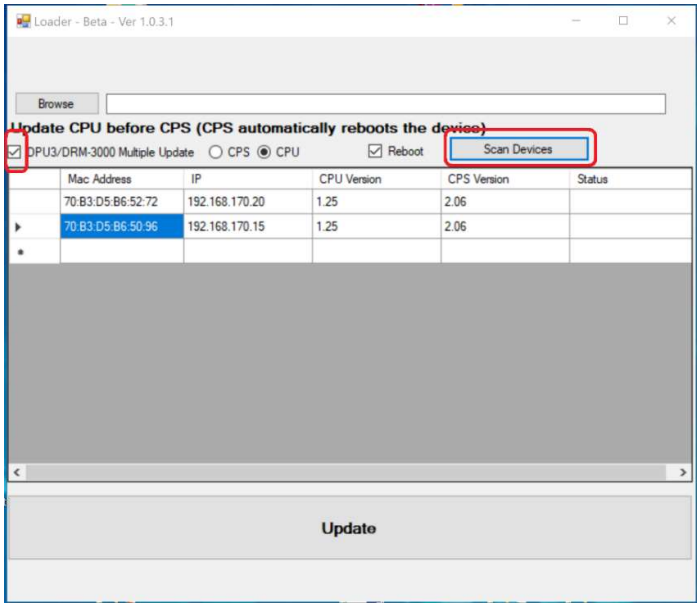
3. Updating using the Multiple Option.

This method is used to update the CPS files into a number of meters.

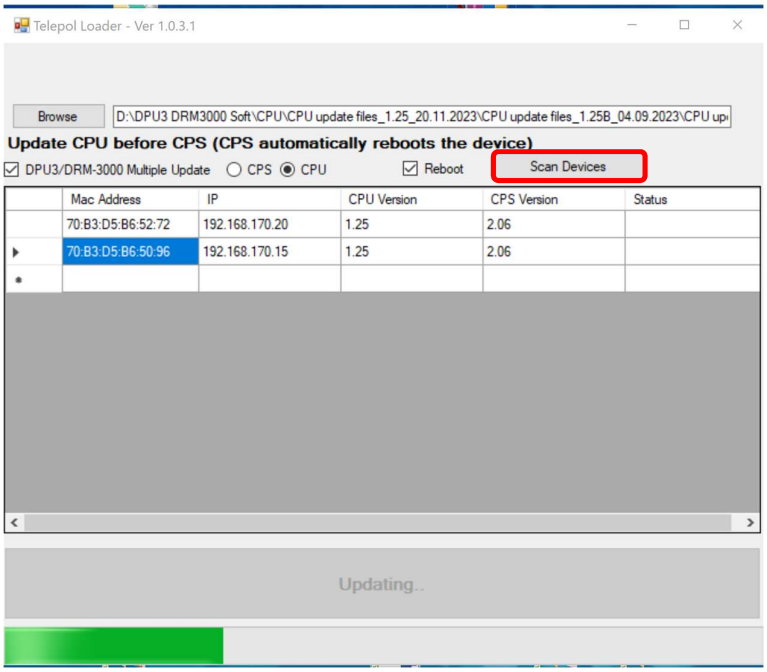
1) Click on the "DPU3/DRM-3000 Multiple Update" button after opening the Loader app, the following screen appears:

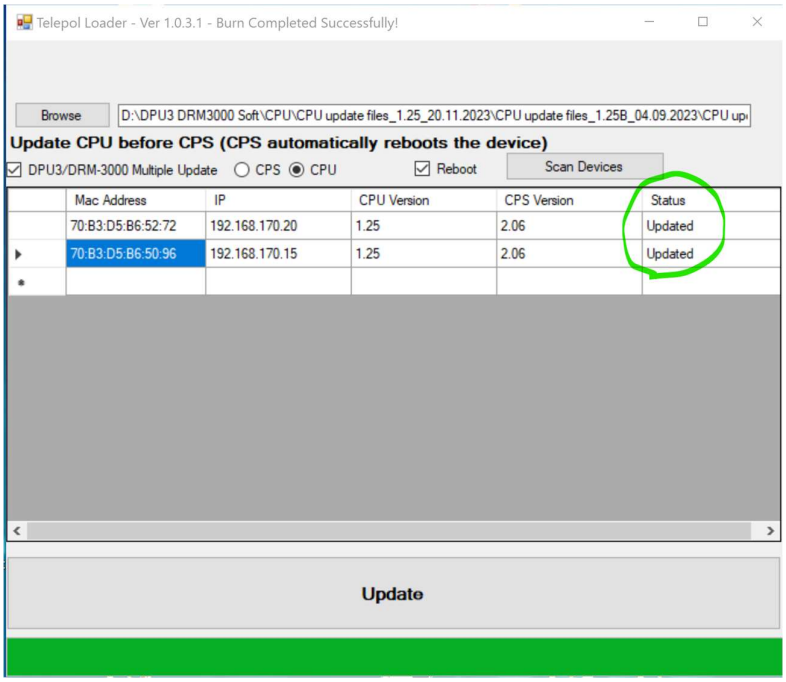


2) Press the “Scan Devices” button to find connected devices.
3) Choose the CPU or CPS radio button (shown example of CPS-update)
4) Press Browse to choose the updating folder for CPU-update or *.bin file for CPS-update as explained in paragraphs 1 and 2.



5) Click Update.





Status “Updated” displayed.

10 Peripherals

10.1 The Aux Connector

The Aux Connector provides the following inputs and outputs as per the diagram below:

1. Flow Meter

   Pin #10 – +24VDC OUT
   Pin #11 – Flow Meter Input (4-20mA)
   Pin #12 – 24V GND (Power to Flow Meter)

2. RS-485 or RS-232 (two pins)

   We have integrated a multiprotocol transceiver IC so that the user can select his preferable sort of communication
   RX – Pin #8
   TX- Pin #9

3. Output for external light tower

   Pins 14,15,17,21 are dedicated to powering and controlling our signal light unit. The Light Tower receives power from Pin #21 (OUT).

4. 4-20mA Output

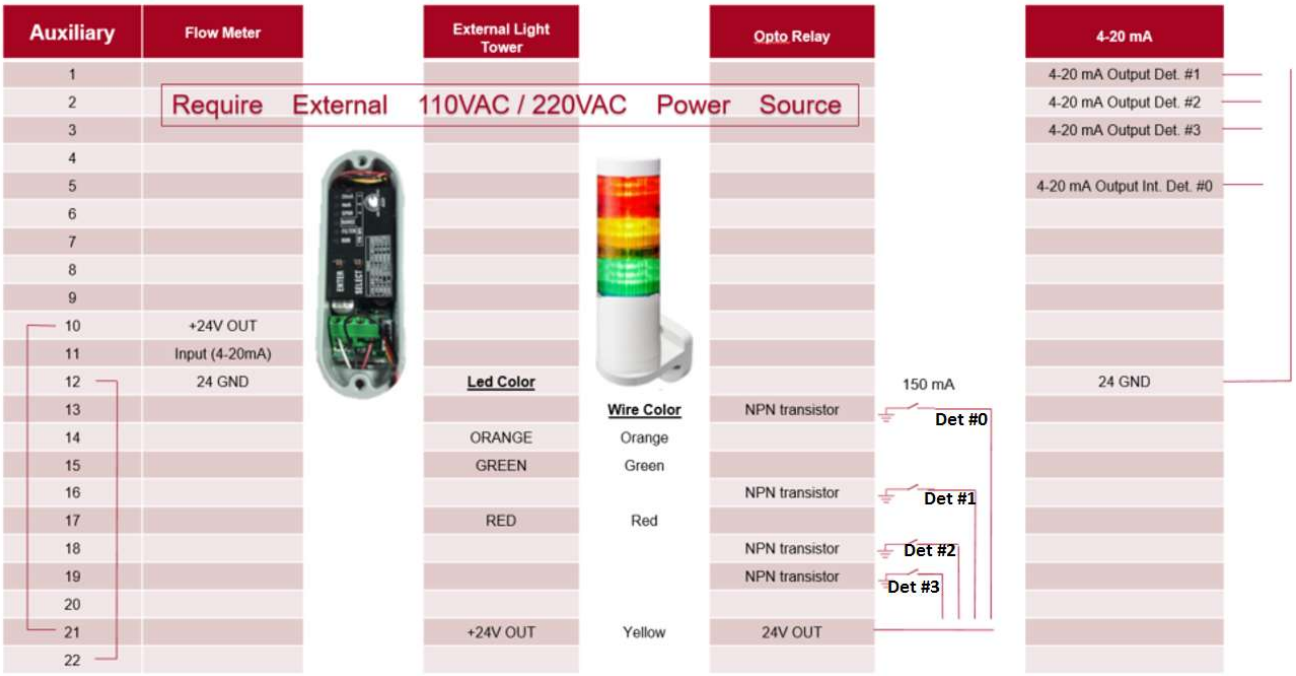
   Pins 1,2,3 and 5 provide 4-20 mA for detector # 0,1,2,3 respectively. Earthing for these four detectors comes from Pin # 12

5. Opto Relays

   Pins 13,16,18 and 19 provide 24VDC (150 mA Max) for detector # 0,1,2,3 respectively. Earthing for these four detectors comes from Pin # 21

10.2 Aux Connector Schematics

Some of the peripherals are activated through the Axillary Connector, here is a diagram of the pins used.



10.3 Remote Display Unit

The Remote Display Unit is used to mirror up to four different online measurements from any of DRM-3000's on the network. The screens will be displayed exactly as the original including background color.

The Remote Display Unit is meant to be connected to the POE Switch thus receiving power and data through the Ethernet cable.

The Remote Display Unit does not have the capability to connect to detectors (internal or external) or connect to an external power source.

10.3.1 Setting up the Remote Display

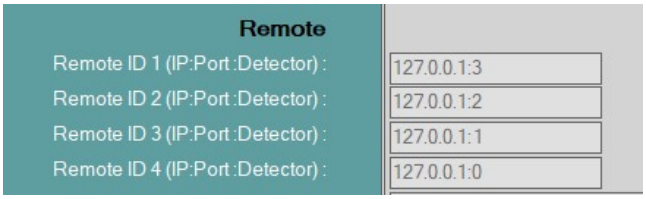
The procedure for setting up which detectors should be mirrored is as follows:

Let's assume you want to display detectors from a Slave DRM-3000 to a Remote Display Unit or a Master DRM-3000.

Remote ID – The table below associates the IP address of the slave detector to the position you want it displayed in the Remote Display Unit.

1. On the Master Unit, input the IP address of the slave DRM-3000, followed by a colon, followed by the number of detector.

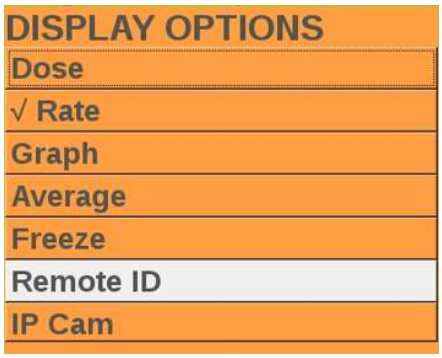
Remote ID 1 – The Top Left-hand side.
Remote ID 2 – Top right-hand side.
Remote ID 3 – Bottom left-hand side
Remote ID 4– bottom right-hand side



This table means that the internal detector of the Slave (Detector #0) will always be displayed in the bottom right-hand side of the Remote Display Unit and Detector #3 will always be displayed in the top Left-hand side of the Remote Display Unit.

2. On the Master Unit, access the Display Options menu:

The following screen appears:



3. Select Remote ID, the following screen appears:

4. After selecting Top Left, the dose rate of the detector # 3 from the DRM-3000 with IP address 127.0.0.1 will be displayed. If you want to display the internal detector from the DRM-3000 then select bottom-right.

10.4 Using the External Light Tower

In cases where the DRM-3000 is mounted inside a room and you want to have an indication of the radiation levels before entering the room, we provide an external light tower to provide a quick preview of the radiological conditions by lighting up a green, yellow or red LED according to the worst-case scenario after comparing the threshold levels for each of the four detectors mounted on the DRM-3000.

10.4.1 Installing the Light Tower

In cases where the DRM-3000 is mounted inside a room and you want to have an indication of the radiation levels before entering the room, we provide an external light tower to provide a quick preview of the radiological conditions by lighting up a green, yellow or red LED according to the **worst-case scenario** after comparing the threshold levels for each of the four detectors mounted on the DRM-3000.

The Light Tower cable configuration is as follows:

DRM-3000 Auxiliary Connector	Light Tower End of Cable
13 ---White----	------White------
14---Orange---	------Orange----
15---Green-----	------Green------
16---Blue-------	-------Blue-------
17---Red--------	-------Red-------
18---Purple----	-------Purple----
21---Yellow----	-------Yellow----

We supply the Light Tower along with its cable to allow the installer to run the Auxiliary Connector cable from the position of the DRM-3000 to the position of the Light Tower and then connect the same colors together after running the cable through the wall bracket.

The nuts that are used to connect the Light Tower to the Bracket are found in the Box of the Light Tower.

Mount the wall bracket in the desired position and then push the spare cable back into the wall before connecting light tower to the bracket.

Once Connected the LED's light up in the following test sequence when the DRM-3000 is powered up; Green Red and then Orange and finally the buzzer is sounded.

10.5 Using the External Signal Interface

The External Signal Interface is an Ethernet based bank of relays which is mounted anywhere in the plant, connected to the same network as the DRM-3000 and activated directly by the

DRM-3000's. The DRM-3000 is programmed using our RMVC software to activate specific relays upon User Alarm condition.

The External Signal Interface (Relay Card, Potential Free Contacts) Board provides eight-volt free contact relay outputs with a current rating of up to 16A.

10.6 Installing the External Signal Interface.

The External Signal Interface is supplied along with a 12VDC Power Supply so the unit should be mounted close to an external power source and an Ethernet Socket.

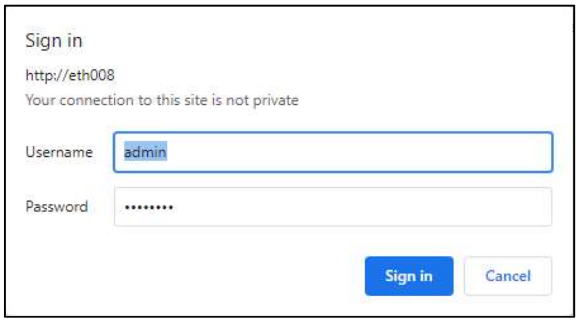
The IT department of the site should set the IP address of the External Signal Interface to be fixed.

Wires should be run from this position to the peripherals using this Interface.

10.6.1 Identifying the IP address of the External Signal Interface

Showing the status of the External Signal Interface

Open your browser and type http://ETH008, you will be prompted for a password as shown below:

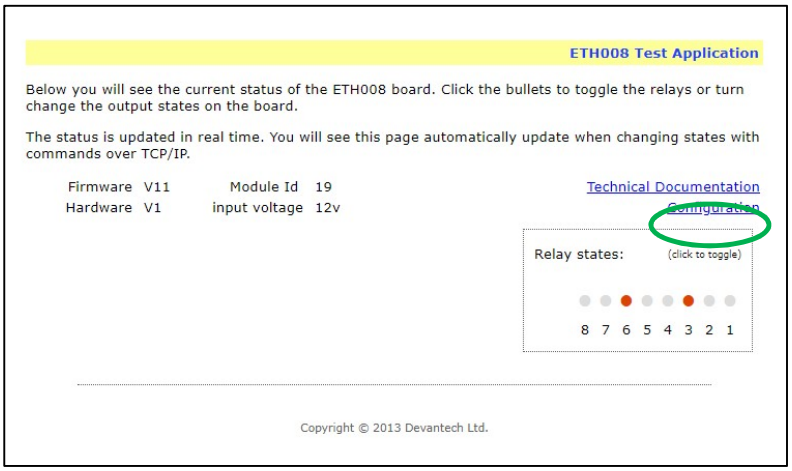


The default login is:

Username: admin

Password: password

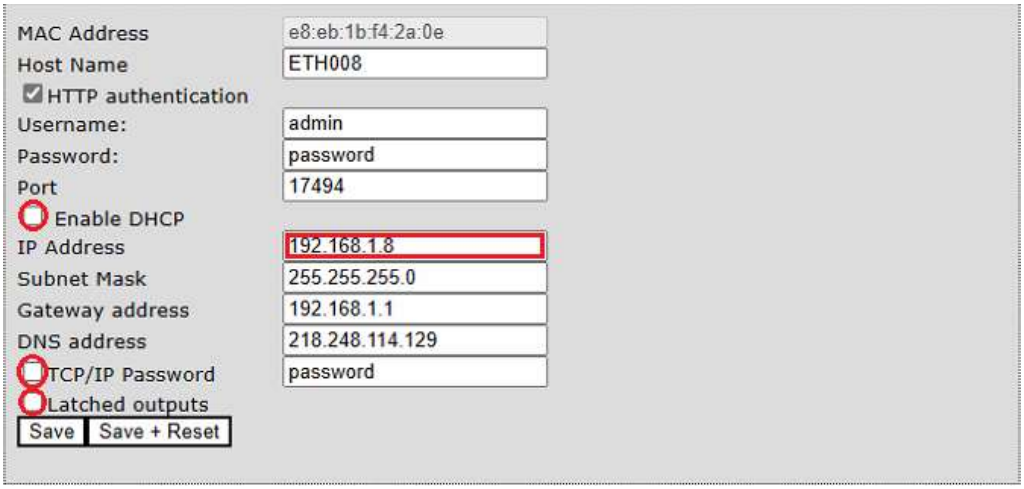
The flowing status screen appears as you can see the two relays 3 and 6 are shown to be activated.



Use the Configuration link to set up a permanent IP address

10.6.2 Setting a permanent IP Address

Click on the Configuration link, circled in green above, the following screen will appear:



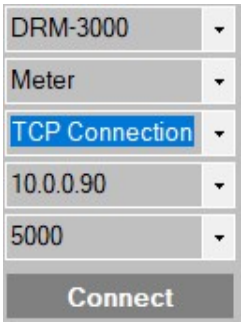
To connect to the TCP relay, it has to use static IP. Make sure the circled check boxes are unchecked. Enter the desired IP address in the circled checkbox and click **Save + Reset** to assign the new IP address to the board

10.6.3 Setting up the External Signal Interface

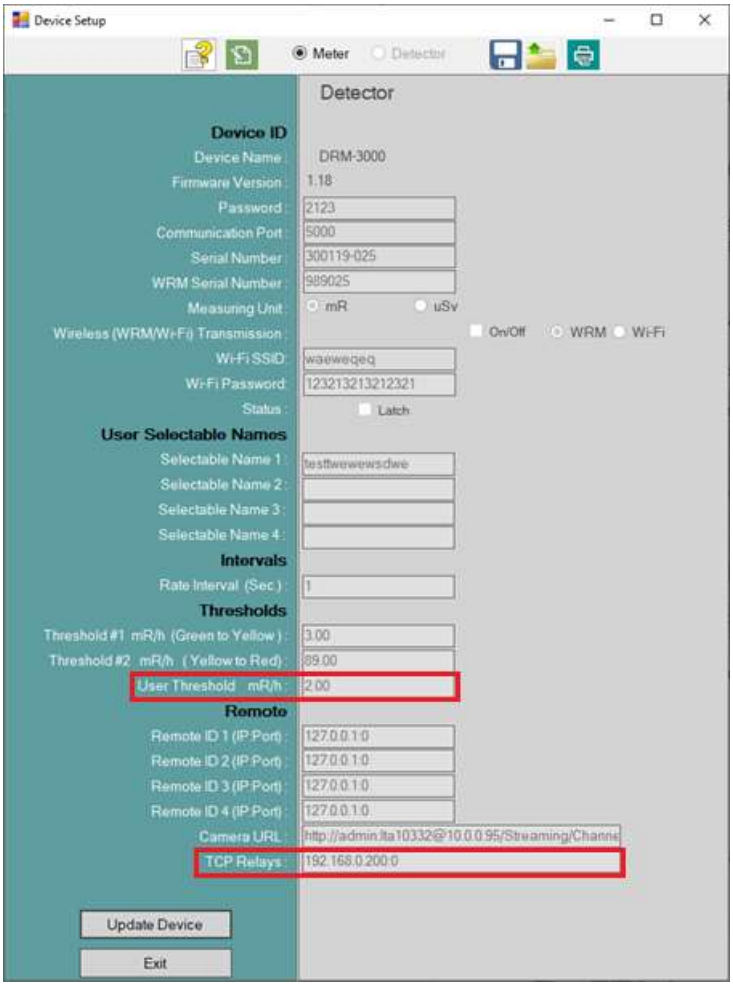
The RMVC Software (version 1.0.9.5 onwards) can be downloaded from our website at https://www.rotem-radiation.co.il/service2/rotem-meter-view-3000/

Please follow the installation instructions until the software is installed.

Select the DRM-3000 Connect Details, and click Connect.



Click Device Setup, the following screen appears:



Let's assume you have identified the IP address of the External Signal Interface as 10.0.0.109 and you want to activate relay #1, then the TCP Relays content line should be updated as follows: 10.0.0.109-1

Click Update Device

From now on each time the radiation level goes above the User Threshold, relay #1 will be activated.

You can activate up to 10 separate relays by separating each command with a semi-colon ;

10.0.0.109-1;10.0.0.109-2;10.0.0.109-3 or even activate relays on other External Signal Interfaces 10.0.0.110-1;10.0.0.109-1;10.0.0.109-3

Once you have set up the DRM-3000, reboot it (Power off, Power On) for the settings to take effect.

10.7 Utilizing the 4-20mA Output

THE DRM-3000 can provide a 4-20mA output from each of the four detectors. The DRM-3000 converts the current displayed dose rate to 4-20 mA outputs on the AUX connector. Those outputs are a logarithmic function of the current displayed dose rate. The outputs are scaled by the full-scale value and low scale value.

Auxiliary(PIN Number)	4-20mA
1	4-20mA Output Det.#1
2	4-20mA Output Det.#2
3	4-20mA Output Det.#3
4	-
5	4-20mA Output Det.#Internal Det.
12	GND(-)

Output current is calculated using the following equations:

Maximum output current available - $\mathrm{I_{out\_max}} = 20\mathrm{mA}$

Minimum output current available - $\mathrm{I_{out\_min}} = 4\mathrm{mA}$

Full scale dose rate value - $F_{FSV} = 10{,}000\mathrm{R/h}$

Low scale dose rate value - $F_{LSV} = 0.1\mathrm{mR/h}$

Current displayed dose rate - F_{det}(R/h)

Current displayed dose rate, expressed in a decimal number - $\boldsymbol{F_{det\_dB}}$

$$\mathrm{F_{det\_dB}} = \log_{10}\frac{\mathrm{F_{det}}}{\mathrm{F_{LSV}}}$$

$$\mathrm{I_{out}} = \frac{\mathrm{F_{det\_dB}}}{8}\left(\mathrm{I_{out\_max}} - \mathrm{I_{out\_min}}\right) + \mathrm{I_{out\_min}}$$

For example, Assume:

$$\mathrm{F_{det}} = 100\mathrm{R/h}$$

$$\mathrm{F_{det\_dB}} = \log_{10}\frac{100\mathrm{R/h}}{0.1\mathrm{mR/h}} = \log_{10} 1{,}000{,}000 = 6$$

$$\mathrm{I_{out}} = \frac{\mathrm{F_{det\_dB}}}{8}\left(\mathrm{I_{out_{max}}} - \mathrm{I_{out_{min}}}\right) + \mathrm{I_{out_{min}}} = \frac{6}{8}(20\mathrm{mA} - 4\mathrm{mA}) + 4\mathrm{mA} = 16\mathrm{mA}$$

If the current displayed dose rate is above the full-scale value (10,000R/h), the 4-20mA output will be forced to maximum output current (20mA). If the current displayed dose rate is below the low scale value (0.1mR/h), the 4-20mA output will be forced to minimum output current (4mA).

10.8 Using the Advanced Detector Bracket

The Advanced Detector Bracket provides a local interface (Audio and visual) when the DRM-3000 is mounted in another location and not visible from the detectors' location.

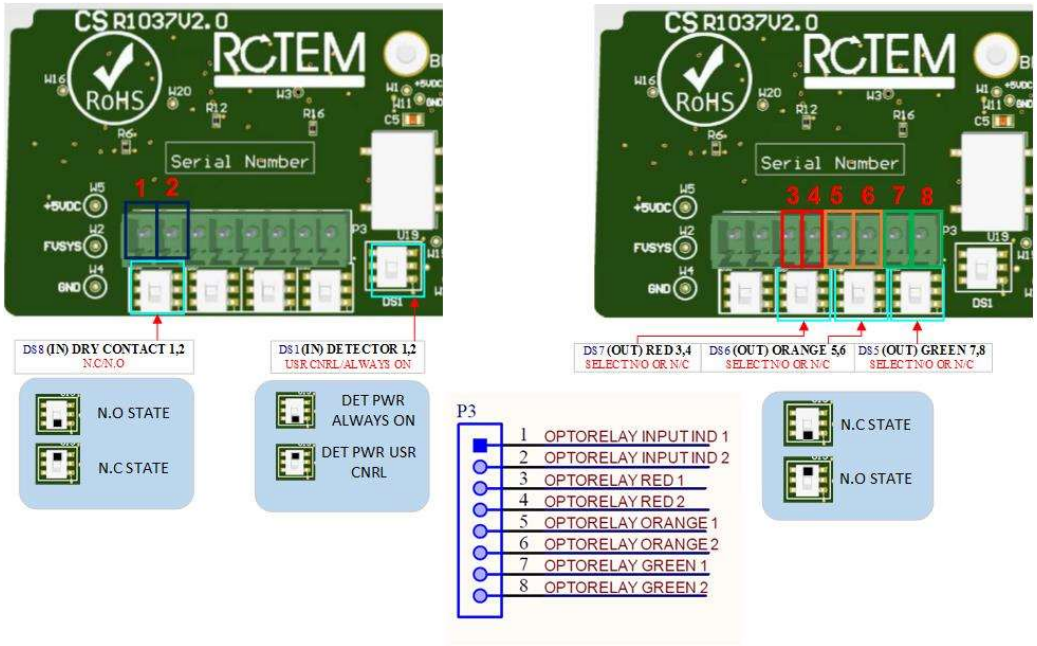
The following detectors can be mounted inside the Bracket: Wide Range, GM-40, GM-41, GM-42, GM-10 and IC-10 and AMP-50, AMP-100, AMP-200 and AMP-300. Other bulkier detectors can be mounted next to the Bracket with a longer interconnection cable.

The Bracket is controlled directly by the DRM-3000 and provides Visual feedback of the dose rate levels by lighting one of the three LED's, green, yellow or red using the same threshold levels as set in the DRM-3000.

Audio feedback is provided by a volume adjustable buzzer on the bottom of the bracket. Each time a threshold level is breached the buzzer will sound to alert users nearby. Users can mute the buzzer by pressing on the LED cover until the next threshold is breached.

If the buzzer is not required, then the red button situated on the underside can be pushed to permanently mute the buzzer and in this case the button will light up red to indicate to users that no audible alarm will be issued.

The Bracket also contains a bank of optocoupler relays for each threshold level (3,4 5,6 7,8) that can be used to interface with external controllers. It also contains a single input channel (1,2) that can be connected to an accelerator controller and in the case of BEAM ON, power is cut to the detector (User Controlled) and restored when the Beam is turned off. This is useful for prolonging GM Tube Lifetime



11 Communication

The communication between the DRM and PC can be performed in 3 ways:

1) Wireless Radio WRM2 located inside the meter.

2) Direct TCP/IP via the meter communication port (RJ-45 connector) using a TCP/IP to USB Adapter. We have tested the TL-UE300 USB 3.0 TO GIGABIT ETHERNET Adapter successfully.

3) Network TCP/IP via the meter communication port (RJ-45 connector).

   Open the Network Connections screen on your P.C.
   Connect the Meter to your Network connector using a standard network cable.
   After a few seconds, if you open the METER DETAILS screen on the Meter, you will see the IP Address on the Meter update. This IP address is used to connect to the Meter.

11.1 Protocol

Communication parameters:

- Baud rate: **19200 is the default.**
- Parity: None
- Hardware handshaking: None
- Software handshaking: None
- Stop bit: 1
- Prefix: LF
- Suffix: CR
- Data format: 8 data bits

11.2 Communication Protocol

Description: DRM data to PC via radio or TCP/IP

Byte 1 LF
Byte 2 to **byte 7** Id meter number for communication set via Meter View software
Byte 8 status = 0x30=okay, 0x31=over load, 0x32=over threshold, 0x33=no external power, 0x34=low backup battery, 0x38=detector fault.
Byte 9 Status = multiple status messages – See information below.
Byte 10 to **byte 16** Dose Reading (xxxxx.x) or 88888.8 in case the Dose is disabled
Byte 17 = 0x30
Byte 18 to **byte 22** rate reading X.YZW * 10 ^{T}
Byte 23 = 0x30
Byte 24 to **byte 25** check sum
Byte 26 CR

Byte	Description
1	LF
2	N5
3	N4
4	N3
5	N2
6	N1

7	N0
8	Status
9	Status
10	D5
11	D4
12	D3
13	D2
14	D1
15	D0
16	D-1
17	30H
18	X
19	Y
20	Z
21	T
22	W
23	Status 3 lsb
24	CS msb
25	CS lsb
26	CR

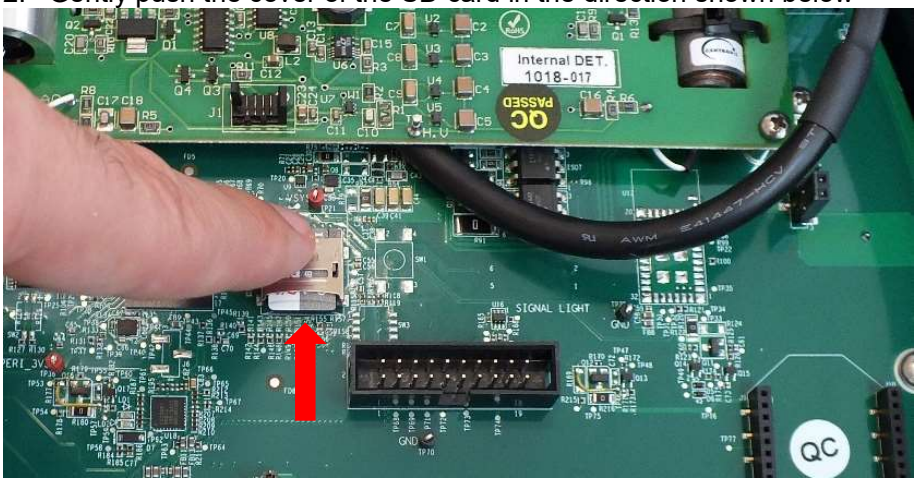
Status Message - Byte 9

Overflow	Threshold Alarm	Loss of external power	Low Battery	Error with Detector	Status Code
					30H
1					31H
	1				32H
		1			33H
			1		34H
				1	35H
1		1			36H
1			1		37H
1		1	1		38H
	1	1			39H
	1		1		41H
	1	1	1		42H
		1	1		43H
		1		1	44H
		1	1		45H
			1		46H

11.3 Replacing the Firmware SD card

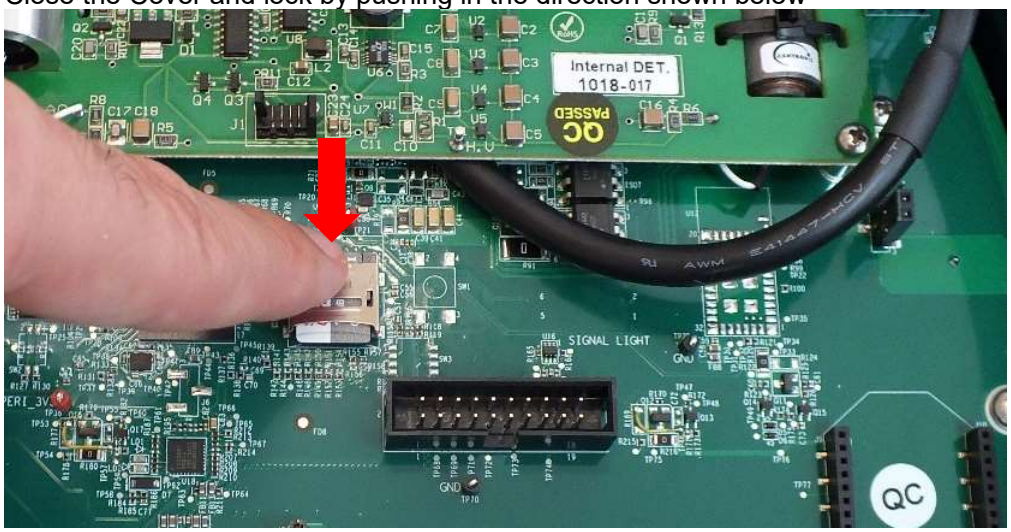
In some cases it may be necessary to replace the SD card holding the CPU firmware version:

1. Open the back lid of the instrument
2. Gently push the cover of the SD card in the direction shown below



3. Take out current SD card and put the new one instead, make sure it fits the slot.

4. Close the Cover and lock by pushing in the direction shown below



12 RMVC accessible functions

12.1 Defining the IP connection

From this version onwards, it is possible to select either a static or dynamic IP address for each DRM-3000. The DRM-3000 is shipped with a static setting as the default, you can modify the setting by connecting the DRM-3000 to the RMVC software and accessing the Setup Options. See 12.4page 5842, “Setting up the Meter” paragraph for more information.

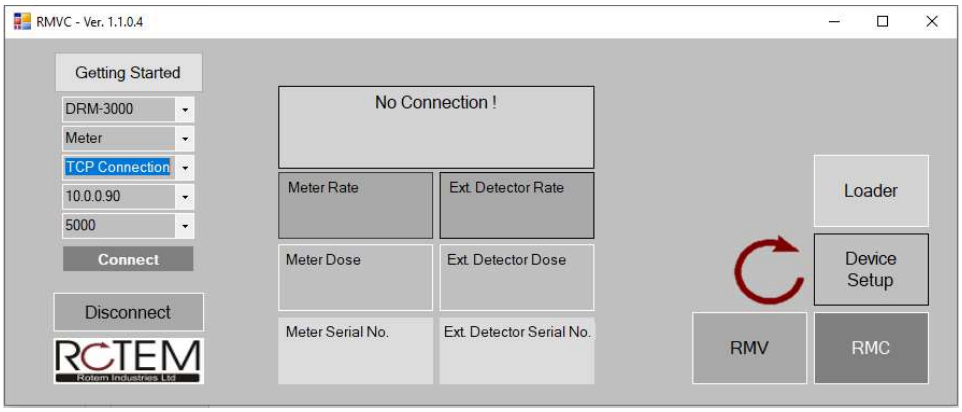
Each DRM-3000 is provided with a unique MAC address which can be used along with DHCP to set a static IP. There are two connection options: network connection via DHCP or direct connection to a PC. In a network connection the Switch is responsible for providing a dynamic IP address and can be configured to provide a fixed IP address according to the MAC address of each DRM-3000. In a direct connection the network adapter provides an Automatic Private IP Addressing (APIPA) to the DRM-3000 each time they are connected and after a period of up to 30 seconds. The range of IP addresses is 169.254.X.X

12.2 Real time Monitoring

12.2.1 Connecting to the DRM-3000

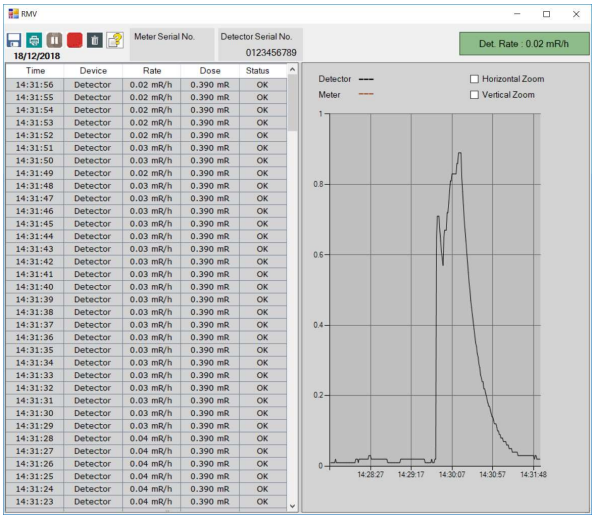
To connect to the DRM-3000, you should select the following options:

DRM-3000
Meter or Int. Detector or Detector #2 or Detector#2 …
TCP Connection
IP address according to IP address shown on the METER DETAILS screen.
5000



12.3 Downloading the data

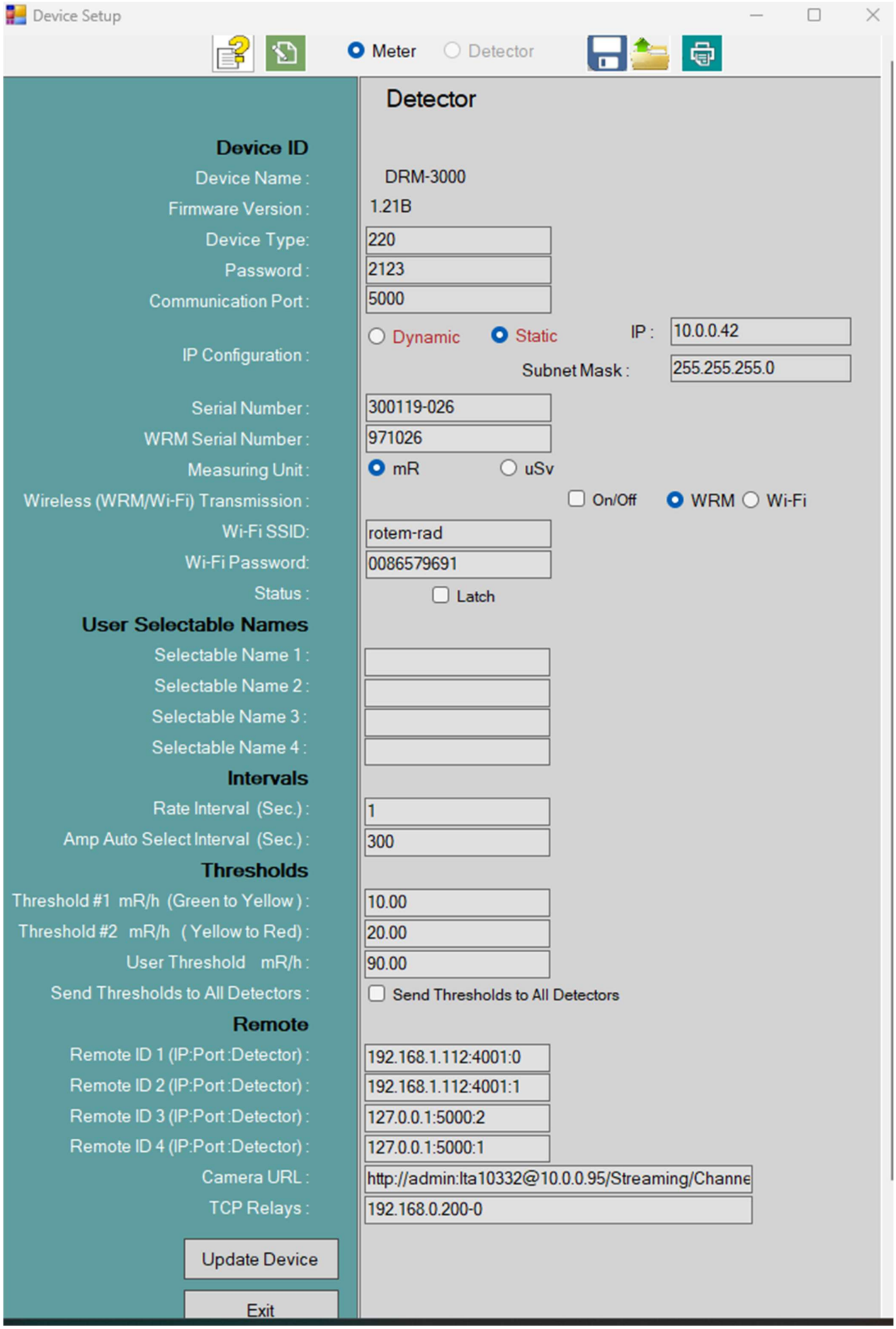
For Data collection, click RMV

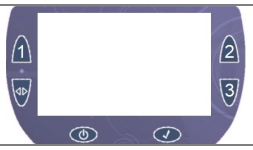


The current version of RMVC supports the retrieval and display of each external detector according to the selection Meter, Det #1, Det #2 or Det #3, connected to the Meter.

12.4 Setting up the Meter

Click Device Setup, the following screen appears:


Device Setup
Meter
Detector
Detector
Device ID
Device Name :
DRM-3000
Firmware Version :
1.21B
Device Type:
220
Password :
2123
Communication Port :
5000
IP Configuration :
Dynamic
Static
IP :
10.0.0.42
Subnet Mask :
255.255.255.0
Serial Number :
300119-026
WRM Serial Number :
971026
Measuring Unit :
mR
uSv
Wireless (WRM/Wi-Fi) Transmission :
On/Off
WRM
Wi-Fi
Wi-Fi SSID:
rotem-rad
Wi-Fi Password:
0086579691
Status :
Latch
User Selectable Names
Selectable Name 1 :
Selectable Name 2 :
Selectable Name 3 :
Selectable Name 4 :
Intervals
Rate Interval (Sec.) :
1
Amp Auto Select Interval (Sec.) :
300
Thresholds
Threshold #1 mR/h (Green to Yellow) :
10.00
Threshold #2 mR/h (Yellow to Red) :
20.00
User Threshold mR/h :
90.00
Send Thresholds to All Detectors :
Send Thresholds to All Detectors
Remote
Remote ID 1 (IP:Port :Detector) :
192.168.1.112:4001:0
Remote ID 2 (IP:Port :Detector) :
192.168.1.112:4001:1
Remote ID 3 (IP:Port :Detector) :
127.0.0.1:5000:2
Remote ID 4 (IP:Port :Detector) :
127.0.0.1:5000:1
Camera URL :
http://admin:lta10332@10.0.0.95/Streaming/Channe
TCP Relays :
192.168.0.200-0
Update Device
Exit

Device ID	
Device Name:	Internal Name of Detector
Firmware Version:	Firmware version of Detector
Device Type:	See Device Type Table Below
Password**:**	Must be 4 digits, consisting of 1-3 in any order. Each button represents a number 
Communication Port:	5000 is our default value and is set in the DRM-3000, RMVC software and WebiSmarts Software to be the same number so that all can communicate.
Dynamic or Static:	Select between Dynamic IP or Static IP and id selected, enter the Static IP and Subnet Mask parameters
Serial Number:	Serial number of the Meter
WRM Serial Number:	Serial number of the Wrm Transmitter
Measuring Unit:	Select between mR or uSv
Wireless (WRM/WiFi) Transmission:	You can select between On/Off, WRM or Wi-Fi, depending on the hardware installed in the DRM-3000
Wi-Fi SSID:	Parameter required for Wi-Fi Communication
Wi-Fi Password:	Parameter required for Wi-Fi Communication
Status:	Latch (Alarm remains after radiation subsides), Unlatch (Alarm disappears after radiation subsides)
User Selectable Names	
Selectable Name 1:	User can associate names to each of the detectors to help identify their location in the field. The names, once you click Update Device, the names will appear on the DRM-3000
Selectable Name 2:	
Selectable Name 3:	
Selectable Name 4:	
Intervals	
Rate Interval (Sec):	Sets the polling rate from the RMVC software to the DRM-3000
Amp auto select Interval (Sec):	Defines after how many seconds the device will choose last known AMP type and Det # automatically (default is 300 seconds)
Thresholds	Clicking on any of the buttons on the Control Panel resets the Alert condition, silences the buzzer and deactivates the solenoid
Threshold #1 (Green to Yellow)	Sets lower threshold level and influences the background color of the display
Threshold #2 (Yellow to Red)	Sets the higher threshold level and influences the background color of the display
User Threshold:	Sets an alarm threshold which when activated changes the background color to red, activates the buzzer and the internal solenoid. The alarm will not be activated for detectors where the User threshold is set to zero so the meter can be setup so that only a specific detector will activate the solenoid.
Send Thresholds to all detectors:	Option to update all detectors connected to the DRM-3000 with the Thresholds above instead of setting each detector separately.
Remote	
Remote ID 1 (IP Port Detector): Remote ID 2 (IP Port Detector): Remote ID 3 (IP Port Detector): Remote ID 4 (IP Port Detector):	You can create a library of four remote detectors (according to their IP addresses and ports) for use in the display of DRM-3000. You can select to display any of these four remote detectors in any of the four display slots
Camera URL:	If a remote camera is required, the URL of the camera is

inserted here and the picture will occupy one of the four display slots. The URL address is normally supplied by the manufacturer of the camera

i.e., http://admin:admin@xxx.xxx.xxx.xxx/h264

TCP Relays:

This utilizes relays on an External Signal Interface, which is a bank of relays mounted on a PC Board and accessed via the intranet by the DRM-3000 after it has been programmed to activate a number of relays following a breach of the User Threshold.
For example:
10.0.0.19-3; 10.0.0.19-4 (Last Line page 41) means ..
Activate relays number 3 and 4 on the External Signal Interface which has an IP address of 10.0.0.19 when the User threshold is breached

Device Type Table

The Device Type parameter is setup in-house and determines the operational mode of the instrument. We strongly recommend not to modify this setting and avoid unnecessary problems. This table is to provide general knowledge of the workings of the DRM-3000.

If, for purpose of setting up use of an LND GM tube, you need to change the meter type. You can open the Meter Type by clicking on the Device ID Heading many times.

The Device Type Parameter consists of three digits: [2 or 3] [0-6] [0-h]

Meter Code: 2 = DRM-3000, 3 = DRM-3000
Meter Type: 0-6 as displayed below
External Detector Type: The DRM-3000 will automatically recognize most of the detectors and this parameter is used to identify the special cases (d to h)

- Meter Type / Detector Type

	Meter Code	Meter Type		External Detector Type	
2/ 3	DRM-3000/ DPU3	0	No Meter (Only Det. Info)	0	No Ext. Detector
		1	Meter W/O Internal Det.	1	Flow Meter
		2	Meter with In. W.R CNT Det.	2	DRM-2E
		3	Meter with In. L.R CNT Det.	3	AMP-50
		4	Meter with In. H.R CNT Det.	4	AMP-100
		5	Meter with In. W.R LND Det.	5	AMP-200
		6	Meter with In. L.R LND Det.	6	AMP-300
				7	GM-40
				8	GM-41
				9	GM-42
				a	DRM-2E Smart Detector
				b	PM-11M
				c	GM-10
				d	4-20 devices
				e	IC-10
				f	LAP-10 (Ludlum)
				g	SFP-100D
				h	Berthold
				i	Wendi
				j	SND-01

13 Real time Calibrating

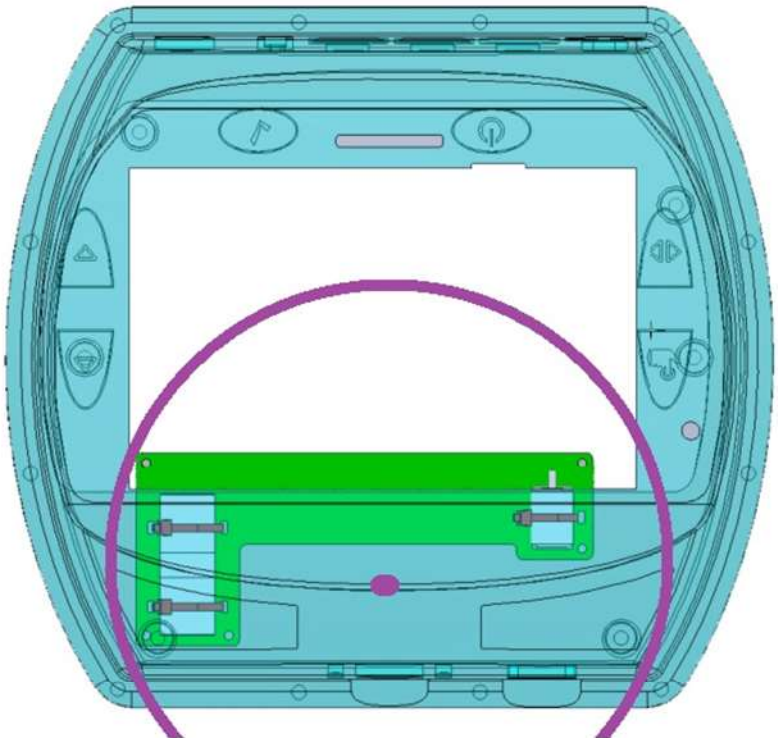
The DRM-3000 meter and detectors are supplied with calibration certificates as per the examples below:

Calibration of the Internal Detector can be carried out by connecting the DRM-3000 to a PC directly using the Ethernet to USB cable or remotely through the Ethernet using a dynamic IP address.

The DRM is positioned in the calibration chamber as shown below and care should be taken to ensure that both GM tubes are situated within the same homogeneous dose rate field.

The DRM-3000 is placed in a jig upside down to allow easy accessibility to the power and communication cables.

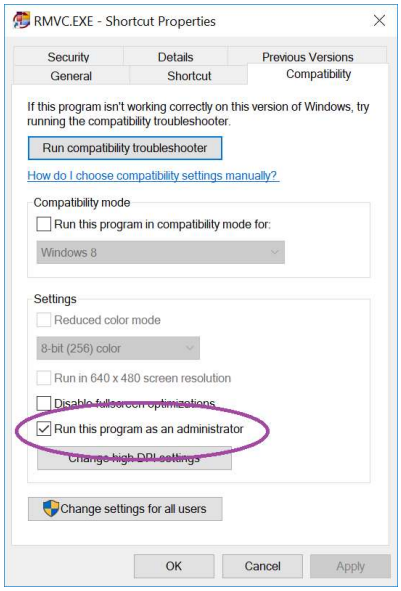
The center of the beam should be focused on the corner between the face and top of the meter.



Calibration of the external detectors is achieved using a designated USB to Detector cable. The calibration factor is saved in the detector and therefore the calibration of the external detectors can be achieved independently of the DRM-3000 Meter.

The calibration procedure for the internal and external wide range detectors is identical to the calibration procedure of the TelePole.

The RMVC Software automatically creates a network connection and therefore needs to run in the Administrator mode. After the installation procedure, Set the Compatibility to Administrator as shown below:



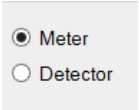
13.1 Setup

1. Obtain a USB to Ethernet cable for the DRM-3000 and the RMVC software.
2. Start up the RMVC software
3. Connect the cable to the Computer and Ethernet connector on the Meter.
4. Click Connect in the main menu:
5. Prior to clicking on RMC, ensure that the DRM-3000 is communicating to the software (radiological information is displayed in Meter Rate / Meter Dose and Meter Serial No. is displayed). Once this information is displayed click on RMC.

6. Enter in login information, User Name; This name will appear on the calibration sheet

7. The following screen will appear after logging into RMVC. The Accuracy Information may be updated per site procedures or protocols. Source information is per site procedure or protocols. Once updated; select OK. Note: The Calibration Due will track when the Calibration is Due and show a Calibrate Alarm (D-CAL) when overdue.

1. Click desired detector selection for calibration (Meter – Internal; Detector – External):



2. NOTE: In the table below it is recommended to include a notation in the distance value to identify the points for calibration factors (F1, F2, etc.) – e.g. 58*F1.

3. If this is not the initial calibration skip this step. Enter Source information into the provided chart in the software (Src. – Source Number; Ref. Point – Defined Dose Rate; Distance – Defined Distance from Source; Attenuator – user applied shielding factor for source – if none is utilized enter 0). Below is an example of a Meter Calibration.

Src	Ref. Point	Distance	Attenuator
1	5.07 mR/h	58 in	10
1	50.7 mR/h	58 in * F1	1
1	240.5 mR/h	25 in	1
1	962.1 mR/h	11 in * F2	1
1	1309.5 mR/h	9	1

13.1.1 Recommended Calibration Points

Meter		GM Tube
DOSE RATES	**CALIBRATION FACTORS**	ZP1201
0.1 to 1 mSv/h (10 to 100 mR/h)	F1	
4 to 15 mSv/h (400 to 1500 mR/h)	F2	
> 15 mSv/h (1500 mR/h)	OFLO test	
Detector – Low Range / High Range		
DOSE RATES	**CALIBRATION FACTORS**	
0.1 to 1 mSv/h (10 to 100 mR/h)	F1	ZP1201
1 to 15 mSv/h (100 to 1500 mR/h)	F2	
15 to 1,000 mSv/h (1.5 to 100 R/h)	F3	ZP1301
2 to 3 Sv/h (100 to 300 R/h)	F4	
3 to 10 Sv/h (300 to 1000 R/h)	F5	
> 15 Sv/h (1500 R/h)	OFLO test	

4. Each calibration factor can be set within the range mentioned above (e.g. 0.1 mSv/h to 1 mSv/h) but we recommend that if possible each calibration factor be set in the middle of each range. So for the range of 0.1 mSv/h to 1 mSv/h, we recommend that the detector is placed in a dose rate field of 0.5 mSv/h.

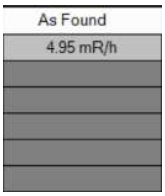
Meter	
Recommended Cal Point	CALIBRATION FACTORS
0.5 mSv/h (50 mR/h)	F1
7 mSv/h (700 mR/h)	F2
Detector – Low Range / High Range	
Recommended Cal Point	CALIBRATION FACTORS
0.5 mSv/h (50 mR/h)	F1
7 mSv/h (700 mR/h)	F2
0.5 Sv/h (50 R/h)	F3
2 Sv/h (200 R/h)	F4
6.5 Sv/h (650 R/h)	F5
> 15 Sv/h (1500 R/h)	OFLO test

5. The tight range for the F3 value is to provide good linearity for the High Range tube in the switch – over range 1500 – 400 mR/h. Higher calibration points may be used if the customer verifies acceptability of high range response in switch over range.

6. The above entered information may be saved as a template to be used for future calibrations. Click the save icon and name for later use.

7. If not already performed, repeat from step 6.5.3 and create the second table for dose rate calibration points for the meter or detector head which ever was not performed first.

8. Select the Load Template Icon, then navigate to the storage location and select Open.
9. Expose the detector to a radiation field appropriate for the desired point.
10. In the associated point – click in the As Found Block. This will insert the dose rate information.

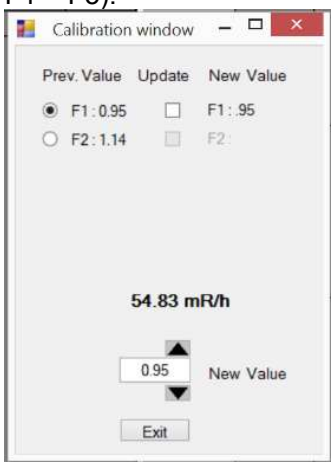


11. If a value was incorrectly entered into the wrong block; the user may select a different block and then click on the correct block again to update or the following icon may be clicked Remove Measure Points (Caution – this removes all the data).
12. Complete steps 6.5.7 – 6.5.9 until all associated points are populated.

13. If the As Found data is within the sites requirement then the calibration is complete. If Complete return to Step 6.5.6 and repeat the process for the meter or detector head if not performed yet. If As Found is not within tolerance, then proceed to the next step.

14. To adjust the F1 Factors – click the calibrate button.

15. The following will be displayed for meter calibration (the detector head will have values of F1 – F5):



16. The dose rate value will be displayed above the adjustment bar(s). To adjust the meter to the reference dose rate click on either the up or down arrows.

17. Once the desired meter dose rate is obtained; click on the associated Calibration Point (e.g., F1) update and then exit.

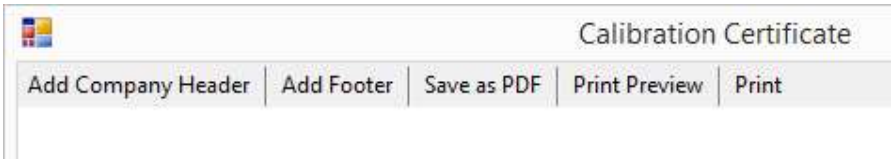
18. The Cal. Point Value will populate when the update box is checked:

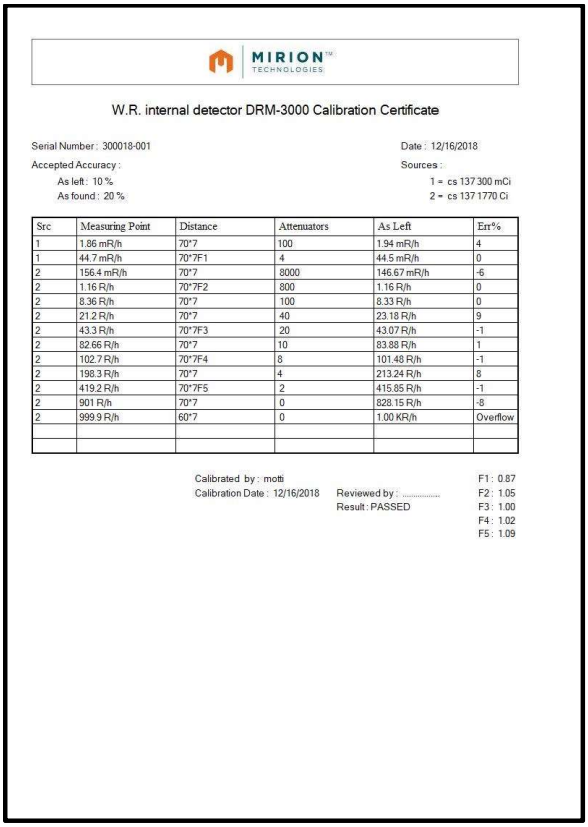
Src.	Ref. Point	Distance	Attenuator	As Found	Err %	Cal. Point	Err. %
1	5.07 mR/h	58	10	4.7 mR/h	-7		
1	50.7 mR/h	58*F1	0	51.48 mR/h	2	51.86 mR/h	2
1	356.5 mR/h	20	0				
1	736.5 mR/h	13*F2	0				

19. Repeat steps 6.5.14 thru 6.5.17 for all other F Value Calibration Points. Once all Calibration Factors (F Values) are completed, complete the calibration by updating the remaining Values in the Cal. Point Column. (Expose the meter / detector to the appropriate value and click in the Ca. Pint Block of that point to update.)

Src.	Ref. Point	Distance	Attenuator	As Found	Err %	Cal. Point	Err. %
1	5.07 mR/h	58	10	4.72 mR/h	-7	5.29 mR/h	4
1	50.7 mR/h	58*F1	0	53.66 mR/h	6	50.42 mR/h	-1
1	356.5 mR/h	20	0	346.47 mR/h	-3	360.01 mR/h	1
1	736.5 mR/h	13*F2	0	694.59 mR/h	-6	733.06 mR/h	0
1	1115.8 mR/h	10	0	1093.09 R/h	-2	1182.1 R/h	6

20. Once completed; click on the icon for Create Calibration Certificate. 
21. Once the Calibration Certificate is started, the user may add a custom Header or Footer to the document prior to printing. Select either Add Company Header or Add Footer, and select the file to be utilized.





MIRION TECHNOLOGIES

W.R. internal detector DRM-3000 Calibration Certificate

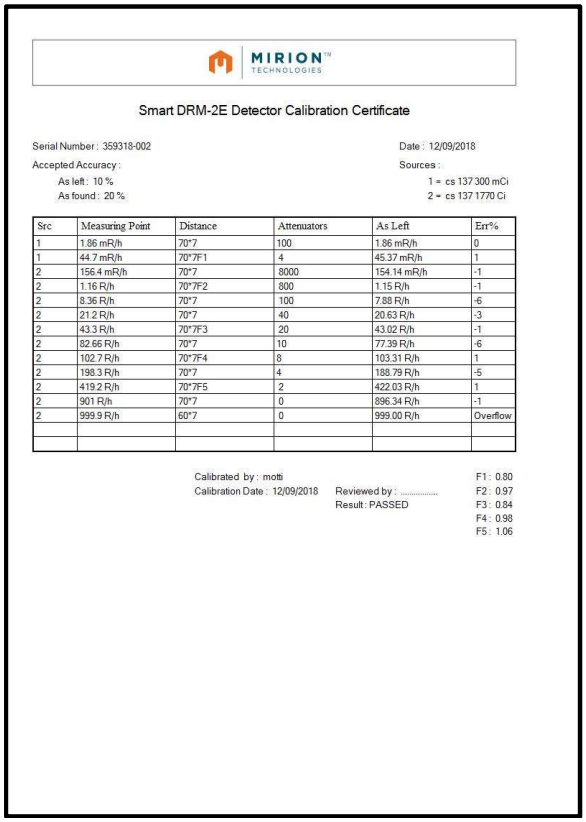
Serial Number : 300018-001
Accepted Accuracy :
As left : 10 %
As found : 20 %

Date : 12/16/2018
Sources :
1 = cs 137 300 mCi
2 = cs 137 1770 Ci

Src	Measuring Point	Distance	Attenuators	As Left	Err%
1	1.86 mR/h	70*7	100	1.94 mR/h	4
1	44.7 mR/h	70*7F1	4	44.5 mR/h	0
2	156.4 mR/h	70*7	8000	146.67 mR/h	-6
2	1.16 R/h	70*7F2	800	1.16 R/h	0
2	8.36 R/h	70*7	100	8.33 R/h	0
2	21.2 R/h	70*7	40	23.18 R/h	9
2	43.3 R/h	70*7F3	20	43.07 R/h	-1
2	82.66 R/h	70*7	10	83.88 R/h	1
2	102.7 R/h	70*7F4	8	101.48 R/h	-1
2	198.3 R/h	70*7	4	213.24 R/h	8
2	419.2 R/h	70*7F5	2	415.85 R/h	-1
2	901 R/h	70*7	0	828.15 R/h	-8
2	999.9 R/h	60*7	0	1.00 KR/h	Overflow

Calibrated by : motti
Calibration Date : 12/16/2018
Reviewed by : .....
Result : PASSED

F1 : 0.87
F2 : 1.05
F3 : 1.00
F4 : 1.02
F5 : 1.09



MIRION TECHNOLOGIES

Smart DRM-2E Detector Calibration Certificate

Serial Number : 359318-002
Date : 12/09/2018
Accepted Accuracy :
As left : 10 %
As found : 20 %
Sources :
1 = cs 137 300 mCi
2 = cs 137 1770 Ci

Src	Measuring Point	Distance	Attenuators	As Left	Err%
1	1.86 mR/h	70"7	100	1.86 mR/h	0
1	44.7 mR/h	70"7F1	4	45.37 mR/h	1
2	156.4 mR/h	70"7	8000	154.14 mR/h	-1
2	1.16 R/h	70"7F2	800	1.15 R/h	-1
2	8.36 R/h	70"7	100	7.88 R/h	-6
2	21.2 R/h	70"7	40	20.63 R/h	-3
2	43.3 R/h	70"7F3	20	43.02 R/h	-1
2	82.66 R/h	70"7	10	77.39 R/h	-6
2	102.7 R/h	70"7F4	8	103.31 R/h	1
2	198.3 R/h	70"7	4	188.79 R/h	-5
2	419.2 R/h	70"7F5	2	422.03 R/h	1
2	901 R/h	70"7	0	896.34 R/h	-1
2	999.9 R/h	60"7	0	999.00 R/h	Overflow

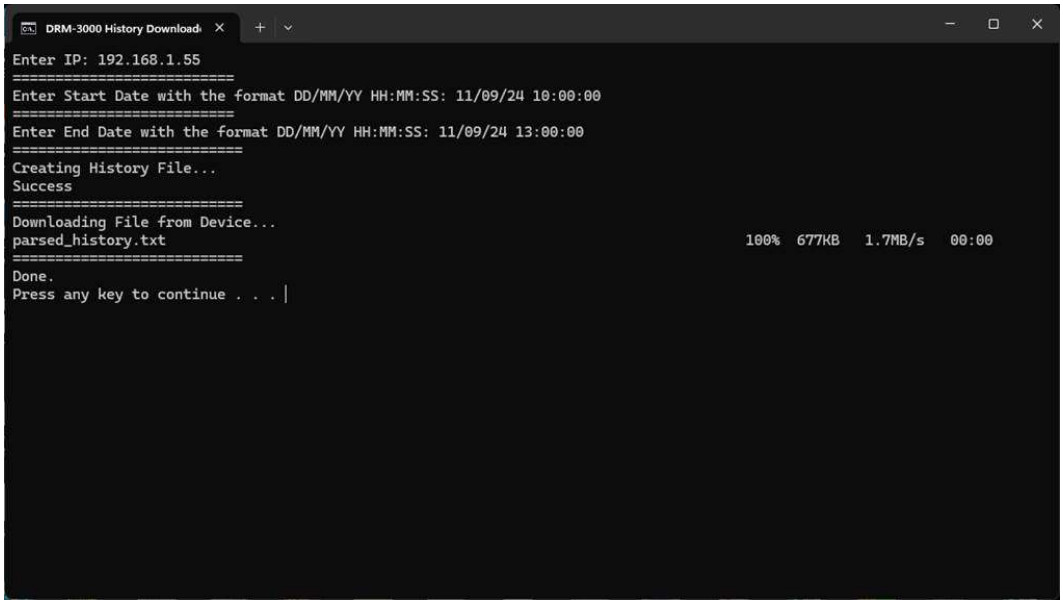
Calibrated by : motti
Calibration Date : 12/09/2018
Reviewed by : .....
Result : PASSED

F1 : 0.80
F2 : 0.97
F3 : 0.84
F4 : 0.98
F5 : 1.06

14 Saving historical data

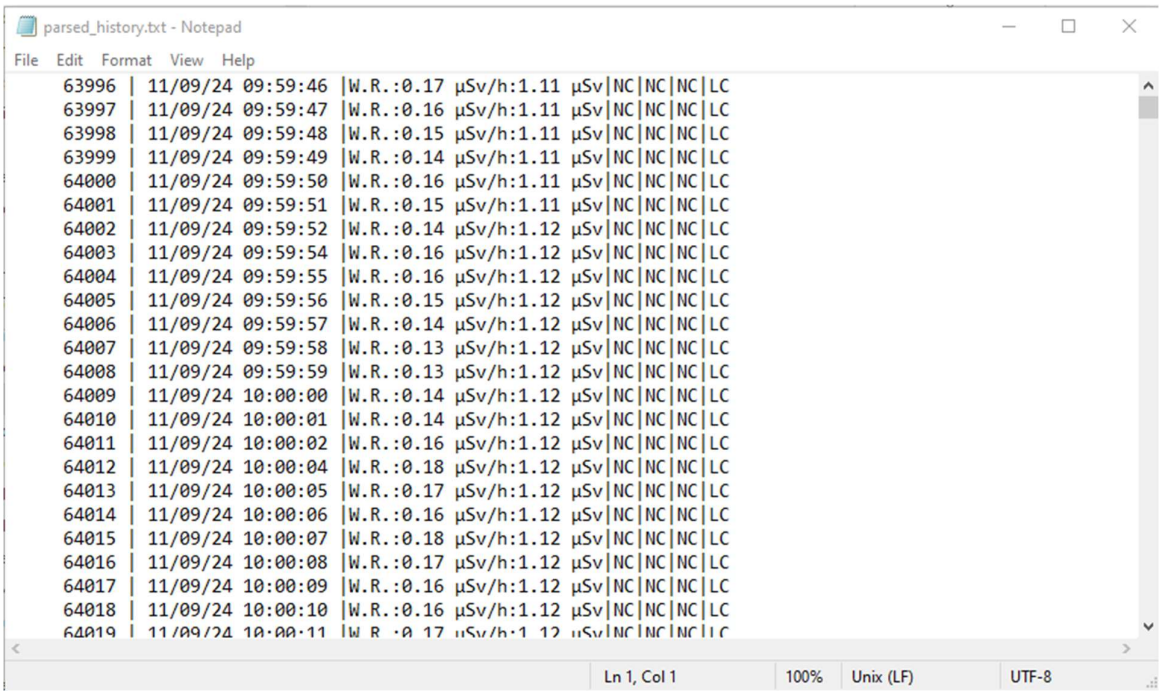
The DRM-3000 saves up to one years' worth of data for all connected detectors internally in a FIFO fashion. If you are interested in downloading data to your P.C. This chapter explains the procedure.

1. From our website, download the *History Batch File* from the same location that you access the WebiSmarts Software. Please contact us if you require the address.
2. Note the IP address of the DRM-3000 that you wish to access to download the data.
3. You can use any Computer on the network that can successfully ping the DRM-3000.
4. Create a Folder anywhere on your computer. The software will remember the address of this folder and download the file to that address.
5. Run the program as follows:



6. Insert IP address of the DRM-3000
7. Enter Start date in exactly the format required DD/MM/YY HH:MM:SS
8. Enter END date in exactly the format required DD/MM/YY HH:MM:SS
9. Click ENTER

You will see a file called *parsed_history* in the directory you created. Open this file to see the data records:



This meter has only one internal detector and its' type is W.R. Each data record shows:

Record Number | Time Stamp | Detector Type | Dose Rate | Dose |

For the other three positions there was no detector connected. We record one internal + three external detectors + Aux. A total of data from 5 detectors.

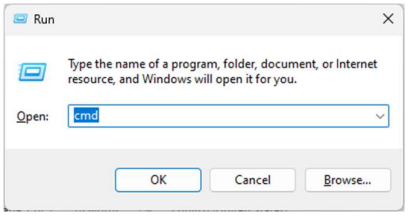
The next time you run this procedure, the program will overwrite the file called parsed_history, so we suggest you either rename the file or save it somewhere else.

15 Troubleshooting

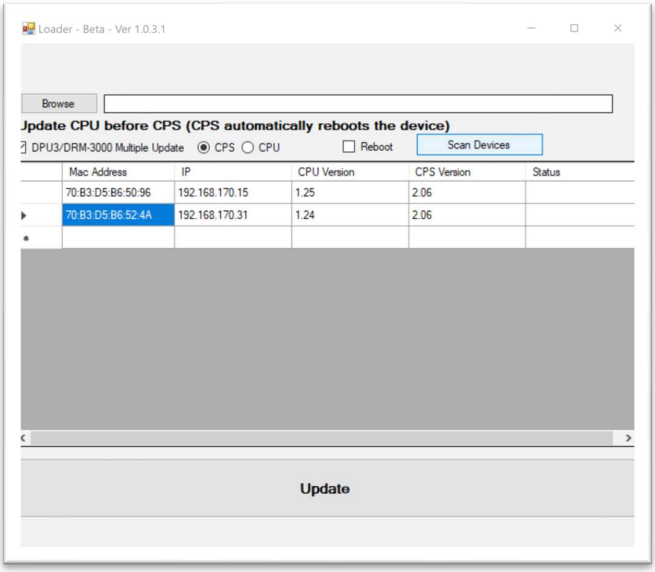
15.1 Fixing a CPS update after a Meter crash

If the meter crashes (See the Picture) during the firmware update sequence or the device failed to start there is a method to bypass the application and finish the update.

1. Click  and enter cmd.

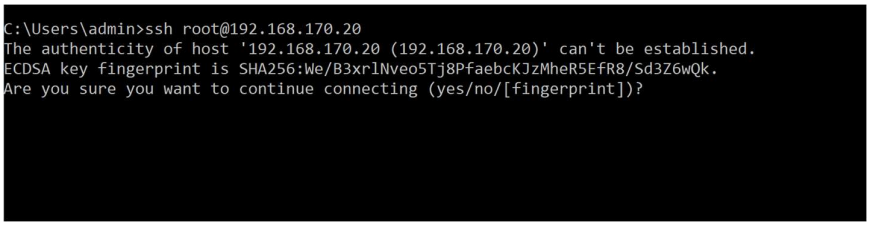


2. Find the IP Address of the device
   Run the Loader and Scan Devices:

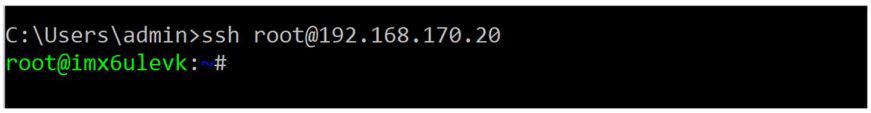


In case you can't find the meters' IP address See paragraph 15.1.2~~15.1.2~~. Fix Procedure for Device not recognized.

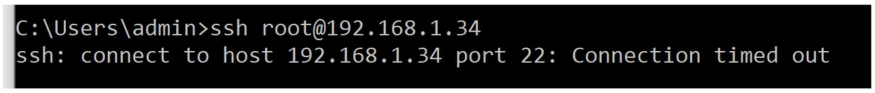
3. Connect to the device via SSH, the following will be shown:



Type Yes to continue



In case of timeout error see 15.1.1~~15.1.1~~ Fix Procedure for Ssh connection

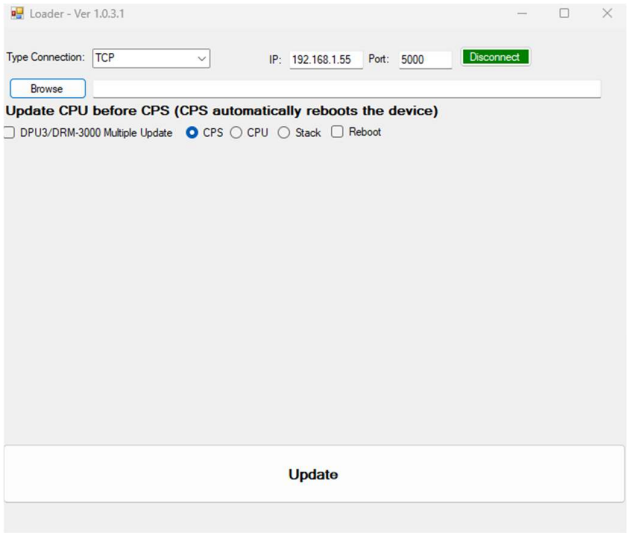


Enter the command "./s.sh" to stop the application from trying to run.

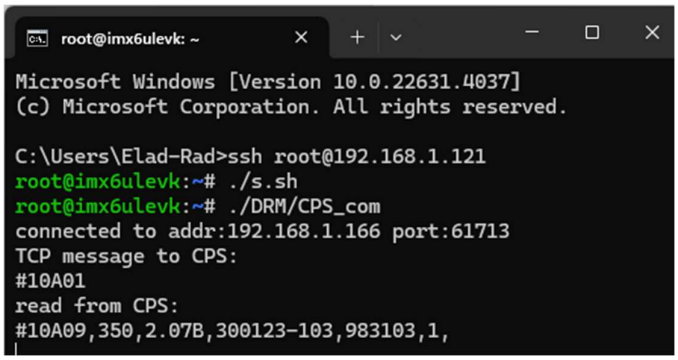
Run the CPS com app using the command "./DRM/CPS_Com".

If there is no prompt on the screen and a "fail" message is not displayed, then the application is running.

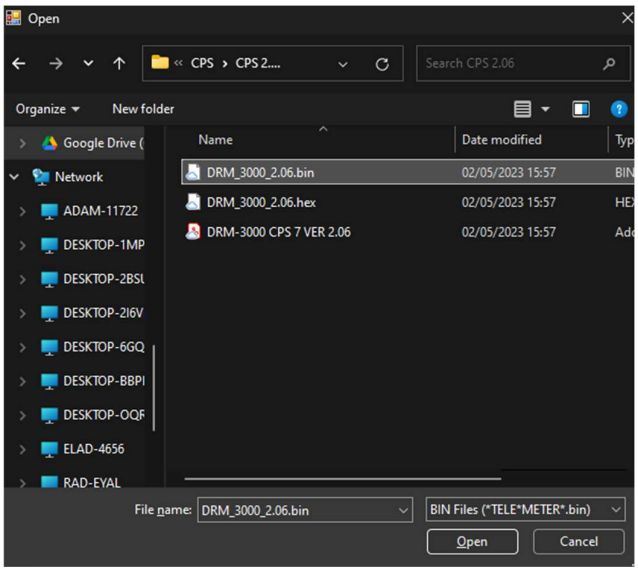
Connect to the device using the loader app.



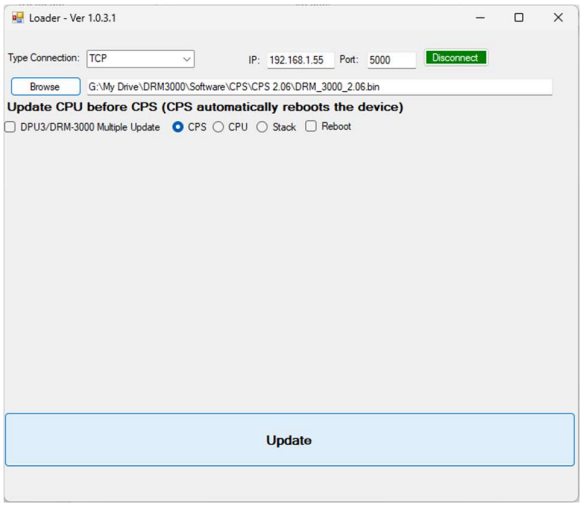
The cmd screen will look like this:



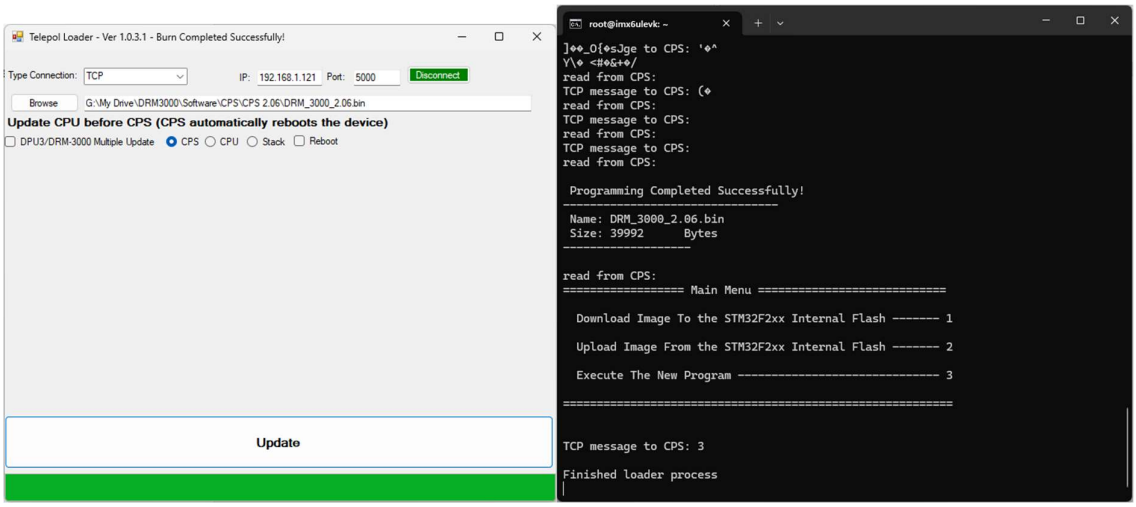
Choose the CPS option and click Browse button to select **BIN** file with the firmware, Click open.



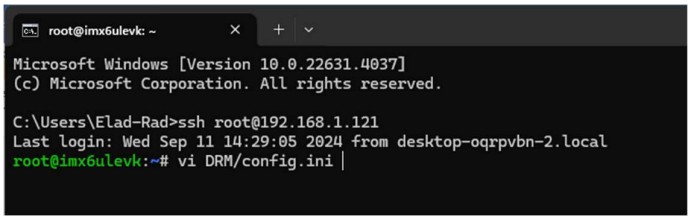
Click “Update” and ensure that the progress bar is showing progress.



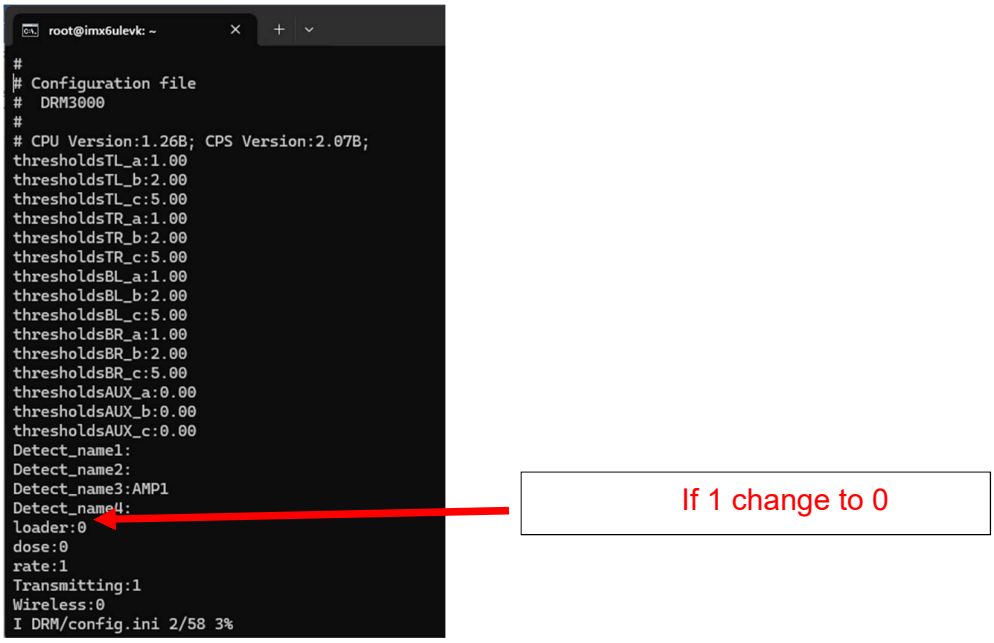
The cmd screen will show some letters running in the screen and a message that the programming completed successfully.



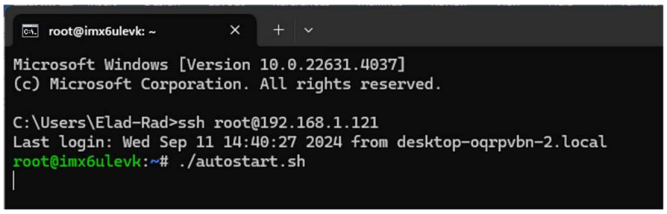
Click CTRL + Z and enter the command “vi DRM/config.ini” to exit from loader mode.



4. Click i to edit the file and make sure the number next to loader is 0.



Click ESC button and then hold the CNTL and double click Z. this will save the change we made to the loader mode.
Enter the command “./autostart.sh” and click enter to run the application.



Close the CMD program.

15.1.1 Fix Procedure for Ssh connection

If the subnet of the device and the PC are different, the connection to the device will fail.

You need to Change the IP address of the pc to be in the same subnet mask as the Device.

Example:

Device IP address 192.168.1.2 with subnet mask 255.255.255.0

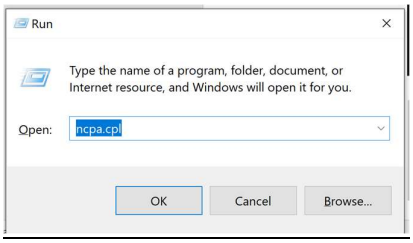
Then **PC IP** address 192.168.1.3 with subnet mask 255.255.255.0

Note: the pc and the device IP address must be different.

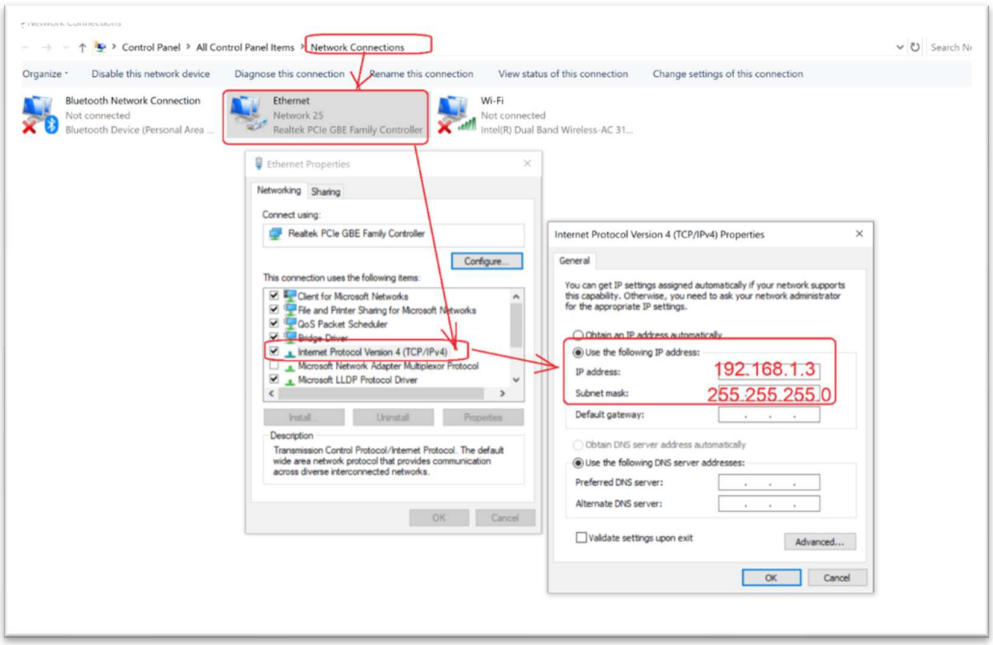
How to change the IP of the PC:

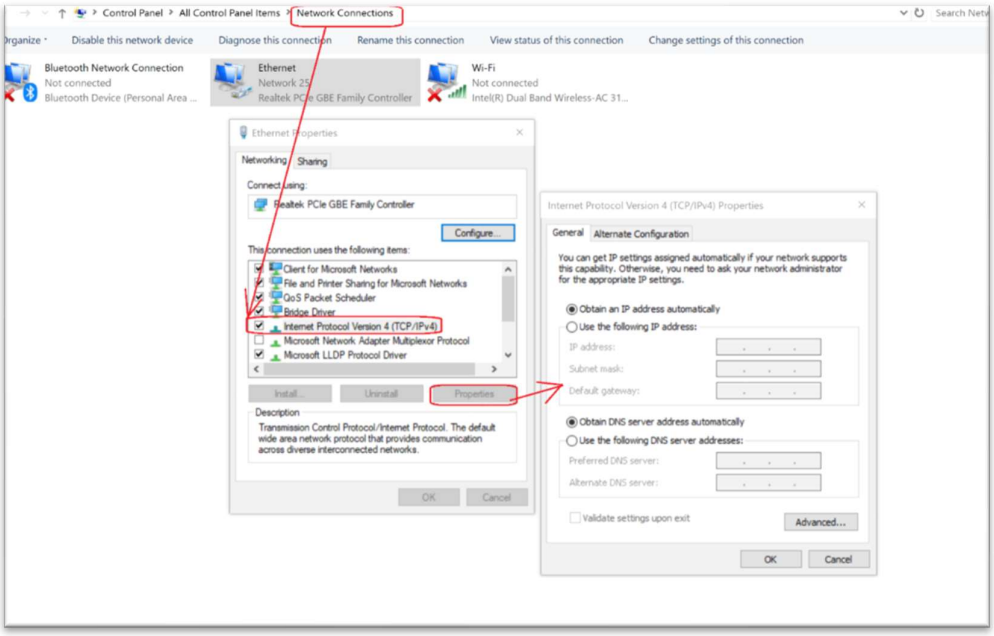
Click  and enter cmd.

Run command “ncpa.cpl” :



Change the IP and Subnet:





15.1.2 Fix Procedure for Device not recognized

If more than one device is recognized and the IP of the device is not known
Then:
1) Connect the Device to the PC directly.
2) Wait about 1 minute while the Device is assigned the IP.
3) Run the Loader scanning again.

IP of the Device starts with IP 169.254.x.x.
Change the IP address of the PC (as shown in ANNEX2) to 169.254.X.X with subnet mask 255.255.0.0

Note: the computer and the device IP address must be different.