Telepole II Operating Manual
Telescopic Meter

Preliminary Version

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RCTEM
Rotem Industries Ltd רותם תעשיות בע"מ

REVISION LOG: Telepole II Telescopic Meter

Revision #	Date	Revised Pages	Comments
2	4/27/2015		
3	17/11/2015		Various detectors have been described, Screens showing the various functions have been added,
4	29/12/2015		The BT connection has been explained
5	10/3/2016		Added Calibration using Meter

Rotem Industries reserves the right to change specifications without advance notice

Table of Contents

1. The TelePole II Meter

1.1. General Description

The **TelePole II**is a telescopic gamma meter designed to obtain readings in wide radiation fields. The TelePole II contains both an internal and external detector. The internal detector, mounted in the Control Box provides radiation measurements from 50 μR/h to 4 R/h (0.5 μSv/h –40mSv/h) in proximity to the user, while the external detector, mounted on the end of the telescopic pole, with its two GM tubes, provides a wide measurement range of 50μR/h to 1000 R/h (0.5 μSv/h to 10 Sv/h).The display range starts from 0.00mR/h (0.0uSv/h).

The rugged, low maintenance **TelePole II** can be used as a stand-alone instrument or it can be integrated as an Area Monitor into systems, using existing equipment and software.

The **TelePole II'**s auto-ranging meter utilizes a combination display of both internal and external detectors to provide a smoothed digital readout for minimum fluctuation and fast response. The improved quarter locking four-segment, pole extends to eleven feet long and collapses to three and a half feet for easy transport. The **TelePole** includes a built-in microprocessor, data memory, Bluetooth and WRM2 to provide maximum reach back capabilities.

Figure 1-1. TelePole II Meter

1.2. Features

- Wide measuring range.
- Rugged, sturdy construction combined with low cost replacement parts.
- Built-in WRM2 socket for use with a WRM transmitters.
- Internal alarm thresholds for exposure rate.
- Color coded display according to field range
- Dual-output display combines a stable and accurate digital readout of both the internal and external detectors
- Display backlight offers extra bright illumination
- Special sleep mode which allows the instrument to remotely read and transmit data when the display is not required
- LED in the tip of the external detector provides extra lighting for accurate placement of the external detector
- Built-in USB communication.
- External USB power supply connection.
- External BT headphone connection.
- External BT and Alarm Bracelet connection
- Capability to provide Accumulated Dose
- Capability to provide rate graph
- Capability to provide store record reading and download to PC
- Easy to use, ergonometric menu which can be setup using external software.
- Several types of external detector can be attached to meter(WR, BETA+GAMMA, XDS etc.)
- Built in LED on the detector to illuminate vicinity of measuring point

1.3. Applications

- Supports ALARA principles by allowing operators to obtain readings at a distance of up to eleven feet away from the radiation fields.
- Survey instrument, either with simple data storage, data memory and data downloading to external software.
- Real-time exposure rate monitoring connected to a WRM transmitter. Transmitted data conforms to existing MGPI monitoring software (i.e. WinWRM2, TeleView 2000).
- Areas that are hard-to-reach. (i.e. vehicle surveys, elevated piping, etc.)

2. Choosing the Right Model

The TelePole II is capable of supporting a number of external detectors as described below. Each detector contains an internal calibration factor which makes it very easy to interchange between detectors. The table below explains the many different configurations available today:

	Extended Pole Length	Internal Detector in Meter	External Detector on Pole	Units of Measurement	IP Rating	Bluetooth
TEL-	1 1.5 m 5 ft	1 Without	1 Wide Range	1 R/h	1 IP-65	1 Without
	2 3.3 m 11 ft	2 Included	2 Gamma + Beta	2 Sv/h	2 IP-67	2 Included
	3 4 m 13 ft		3 VHR			
			4 XDS			

The Catalog Number starts with TEL-
Which Extended Pole Length do you require, 1, 2 or 3?
Do you want an internal detector in the Meter?
Which type of external detector do you want on the end of the Pole, 1, 2, 3 or 4?
Which Units of measurement do you want to use, 1 or 2?
How waterproof do you need the TelePole to be, 1 or 2?
And finally do you want the BT connection to an earphone and bracelet or not?

If you want a standard Length of 11ft (2) and with an internal detector (2) and the external detector should be a wide range (1) in units of mR/h (1) with an IP-65 rating (1) without Bluetooth (1)…
you should use Catalog Number: TEL-221111

Pole Lengths:

Model	Extended	Closed	Weight
1	1.76 meter (5.77 ft.)	0.80 meter (2.62 ft.)	1.56 Kg (3.44 lbs.)
2	3.30 meter (11 ft.)	1.20 meter (3.9 ft.)	1.80 Kg (3.97 lbs.)
3	4.00 meter (13 ft.)	1.40 meter (4.6 ft.)	2.00 Kg (4.40 lbs.)

3. TelePole General Specifications

External Detector		See Table below
Internal Detector		GM tube ZP-1201 (or equivalent) - low range
Measuring range		0.05 mR/h to 1000 R/h (0.5 μSv/h to 10 Sv/h) Automatic switching between the two GM tubes at 1,500 mR/h (ascending dose rate) and 400 mR/h (descending dose rate)
Accuracy		±10 % of reading, within the measuring range
Energy response (Cs-137)		±20 % at 65KeV to 1.1 MeV
Sensitivity (Cs-137)		17 cps/mR/h(internal detector)
Data logging		200 data records
Display		Digitalfor external detector rate and dose Digital for internal detector rate Trend graph for external detector rate (3 digits with auto ranging units of measurement)
Power source		4 x 1.5 Volt AA-type alkaline cells, 100 hours of continuous operation
Temperature range	Operation:	-10°C to +50°C (15°F to 122°F)
	Storage:	-20°C to + 60°C (-5°F to 140°F)
Humidity range		10% to 95% RH (non condensing)
Casing Material		ABSHard Plastic Mold
Detector Casing		Anodized Aluminum
Telescopic Pole		Anodized Aluminum
Dimensions	**Control Box**	Width: 35mm (1.4”) Length: 170mm (6.7”) Breadth: 115mm (4.5”)
	Pole length	Dependent on your requirement above
Weight	**Meter**	680 gr. (1.5 lbs.)
	Probe	175 gr. (0.39 lbs.)
	Pole	Dependent on your requirement above
	Total	Approximately 2055 gr. (7.29 lbs.)

4. TelePole DetectorSpecifications

The TelePole II enables the user to connect a number of External Detectors. Each external detector can also be used independently to the meter by simply connecting it to a Computer using a standard USB cable (USB 2.0 A to Mini B) of the TelePole II includes the following state of the art features:

1. Waterproof (IP-67) detector including waterproof USB connection
2. Built in processor to facilitate independent communications with either the Control Box or directly to the RMVC software.
3. Built in calibration factor which facilities easy and instant switching of detectors
4. Quick Connect to Telescopic Pole

4.1. Wide Range Detector

Each detector contains two GM tubes and measures Gamma and X-Ray radiation only.

GM Tubes:	ZP-1301 and ZP1201 (or equivalent)
Measuring Range:	0.1µSv/hr to 10Sv/hr (10µR/hr - 1000R/hr)
Accuracy:	± 10% of reading within the measuring range
Energy response (Cs-137):	± 25% from 70 keV to 2 MeV
Sensitivity (Cs-137):	0.3 cps/mR/h and 17 cps/mR/h
Power Source:	Standard USB cable from Meter or Computer
Temperature range:	-10^{o}C to +50^{o}C (15^{o}F ^{to} 122^{o}F) Operation
Humidity Range:	Detector is IP-67 rated
Casing Material:	Black anodized aluminum
Dimensions:	Diameter: 33m (1.3”) x 21cm (8.27”) Length
Weight:	220 grams (0.5 lbs)

4.2. Gamma Beta Detector

Each detector contains two GM tubes and measures Gamma, X-Ray and Beta radiation. The Top GM tube is an open window Beta detector so measurements for beta contamination should be measured from the top of the detector.

GM Tubes:	ZP-1301 and ZP1400 (or equivalent)
Measuring Range:	0.1µSv/hr to 10Sv/hr (10µR/hr - 1000R/hr)
Accuracy:	± 10% of reading within the measuring range
Energy response (Cs-137):	± 25% from 80 keV to 2 MeV
Sensitivity (Cs-137):	0.3 cps/mR/h and 17 cps/mR/h
Power Source:	Standard USB cable from Meter or Computer
Temperature range:	-10°C to +50°C (15°F to 122°F) Operation
Humidity Range:	Nominal range 0 to 85%
Casing Material:	Black anodized aluminum
Dimensions:	Diameter: 33m (1.3”) x 21cm (8.27”) Length
Weight:	220 grams (0.5 lbs)

4.3. VHR (Very High Range) Gamma Detector

This detector contains two GM tubes and measures Gamma and X-Ray radiation only. This detector provides a measuring range from 0.01 uSv/h to 100 Sv/h (0.01 mR/h to 10,000 R/h)

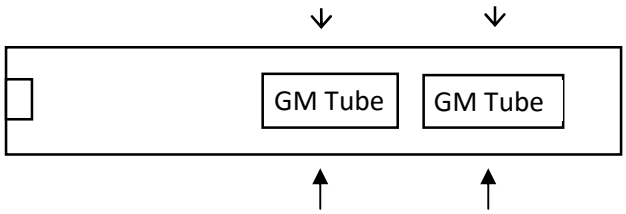
GM Tubes:	ZP-1201 and 4G60M (or equivalent)
Measuring Range:	0.01 uSv/h to 100 Sv/h (0.01 mR/h to 10,000 R/h)
Accuracy:	± 10% of reading within the measuring range
Energy response (Cs-137):	± 25% from 80 keV to 2 MeV
Sensitivity (Cs-137):	17 cps/mR/h and60 cps/R/h
Power Source:	Standard USB cable from Meter or Computer
Temperature range:	-10°C to +50°C (15°F to 122°F) Operation
Humidity Range:	Detector is IP-67 rated
Casing Material:	Black anodized aluminum
Dimensions:	Diameter: 33m (1.3”) x 21cm (8.27”) Length
Weight:	220 grams (0.5 lbs)

4.4. xDS Sensitive Detector

This detector contains a single CsI(Tl) crystal with Silicon Photomultiplier, making it an extremely sensitive and quick responding detector

Detector:	CsI(Tl) crystal with Silicon Photomultiplier
Measuring Range:	0.001uSv/h to 500 uSv/h (0.01 mR/h to 10,000 R/h)
Accuracy:	± 10% of reading within the measuring range
Energy response (Cs-137):	± 25% from 80 keV to 2 MeV
Sensitivity (Cs-137):	≤1,100 cps/mR/h
Power Source:	Standard USB cable from Meter or Computer
Temperature range:	-20°C to +50°C (15°F to 122°F) Operation
Humidity Range:	Detector is IP-67 rated
Casing Material:	Black anodized aluminum
Dimensions:	Diameter: 33m (1.3”) x 21cm (8.27”) Length
Weight:	220 grams (0.5 lbs)

Calibrate/Measuring direction



For Wide Range Models:
Response time depends on dose rate changes:

Radiation field [mR/h]	Response time [sec.]
< 0.6	45
0.6 - 2.5	20 - 30
2.5 - 20	5 - 10
20 - 60	2 - 4
> 60	≤2
< 2 R/h	2 - 6
2 R/h - 10 R/h	2 - 3
> 10 R/h	≤ 2

The response time for the increasing and decreasing changes in radiation field is fasterand equal in both instances. Large changes in the radiation field will enable the instrument to react almost immediately.
The increased change inthe response time depends on the current reading and the extent of the change in the radiation field. Generally it will be less than 2 sec.

5. Operating Instructions

5.1. Preparation for Use

Remove the instrument from the shipping container and inspect for any physical damage. In the case of damage, report it immediately to Mirion Technologies.

Do not attempt to install or operate damaged equipment since safety and performance may be affected

NOTE: The manufacturer recommends that the end user / owner to perform periodic inspections (during daily performance checks) of the telescopic pole, collars, and meter to ensure proper operational use and safety.

4.1.1 General Inspections to be performed:

4.1.1.1 Check the condition of the pole segments freely extend and properly lock.

4.1.1.2 Inspect the detector Head for locking ring tightness and pole screw tightness.

Figure 4-1. Detector Head Inspection

4.1.1.3 Inspect strap holders for tightness (if these components have been removed – manufacturer recommends using Loctite 221 (or similar) compound for when the components are reattached.

Figure 4-2. Strap Holder Screw Inspection

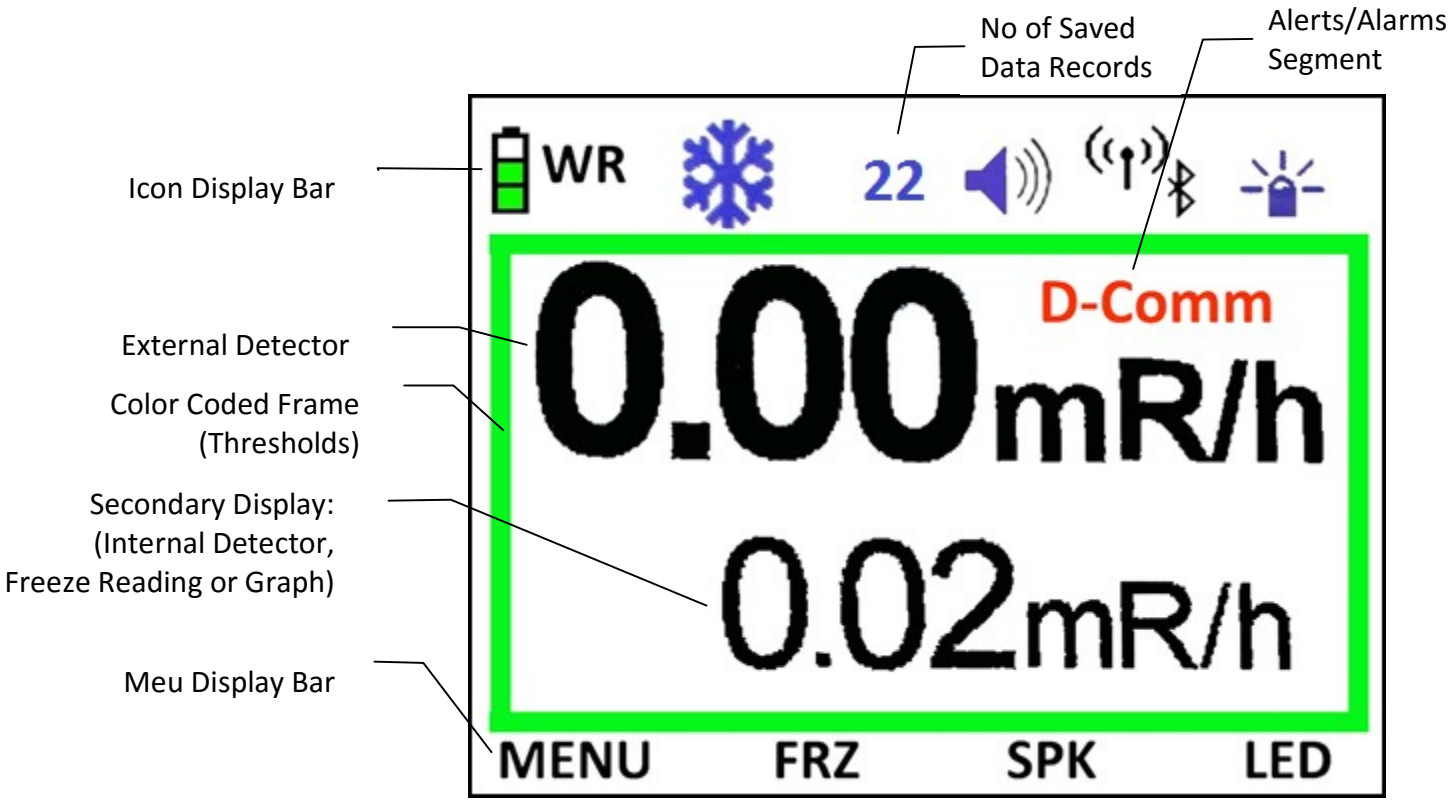
4.1.1.4 Meter connection to pole

Figure 4-3. Meter Connection to Pole

5.2. Starting-up

- Remove the meter from the telescopic pole by unscrewing the two knurled headed screws on the bottom of the meter mount.
- Remove the battery compartment cover located on the bottom of the meter, see section 4.9
- Insert 4 x 1.5 v AA battery cells into the battery compartment
- Connect the external detector to pole topand hand tighten the threaded collar.
- Press the **ON/OFF** push-button to turn the meter on by holding the ON/OFF button for five (5) seconds
- If the initial screen shows the serial number of the Meter and Detector, the connection is established.

Following a successful self-test startup, the meter is ready for use.



5.3. The Display

5.3.1. Icon Display Bar

ICON	Explanation	Indication
	Battery Condition	**>5.2v 3/3 green** **>5v 2/3 yellow** **>4.6v1/3 red** **>4.1vempty frame**
WR	**Indication of active GM Tube** **WR**- Wide Range (Auto ranging) **HR** – High Range only **LR** – Low Range only	The Menu enables the user to manually select one of the three options, and the active option will be displayed here.
	**Freeze Mode Activated** The highest dose rate of the external detector will be frozen on the display	The Menu enables the user to activate or deactivate the Freeze Mode
	**Speaker** Activated	
	**External Communication Activated** WRM2 or Bluetooth	
	**External LED on tip of Detector** Activated	
123	**Stored records**	Capable of storing 200 data records

5.3.1. Alarms Segment and priority

ICON	Explanation
D-COM	No Communication between External Detector and Meter
D-LR	The External Low Range Geiger (1201) is malfunctioning
D-HR	The External High Range Geiger(1301) is malfunctioning
D-HV	High Voltage to the External Detector is malfunctioning
D-O.F	Overflow Condition on External Detector (>1000R/h)
M-O.F	Overflow Condition on Meter(>4R/h)
ALARM	Over threshold Condition (External Detector)
L.BAT	Meter battery voltage too low, must be re place.
M- LR	The Internal Detector (1201) is malfunctioning
M-HV	High Voltage to the Internal Detector is malfunctioning
D-CAL	The Calibration to the External Detector is overdue
M-CAL	The Calibration to the Internal Detector is overdue

5.3.2. Menu Display Bar

5.3.2.1. Freeze [FRZ] Mode

This mode freezes the highest reading until the user clicks on FRZ again to release. A Freeze icon  will be displayed to show the instrument is currently in the Freeze mode.

5.3.2.2. Speaker [SPK] Mode

This mode activates the Speaker to provide clicks and error alerts. The SPK Icon  will be displayed to show the instrument is currently providing audio feedback to the user.

5.3.2.3. LED (LED Flashlight) Mode

This command activates the LED on the tip of the detector.

Push MENU to see the next Line…

5.3.2.4. GRAPH Mode

This command activates a graph in the lower part of the display. The highest value of the graph is displayed to the left of the graph. The graph displays data for a period of 30 minutes, updates every second from right to left.

5.3.2.5. THR (Threshold) Mode

This command displays the three threshold levels and associated colors. The threshold levels are set using our RMV software which is freely available off our website.

5.3.2.6. RANGE Mode

This command allow the user to manually select either the HR (High Range), LR (Low Range) or WR (Wide Range) of the external Detector. An Icon (HR. LR or WR) will be displayed according to the selected range. (Partially operational)

Push MENU to see the next Line…

5.3.2.7. The Dose Command

This command will display the accumulated Dose of the external detector since the instrument was powered up. The Dose will be cleared when the instrument is switched off.

5.3.2.8. The Internal Detector (INT DET) Command

This command is used to Hide/Restore the display of the internal detector. The Display of the internal detector is hidden behind the Graph and Dose when selected for display by the user.

5.3.2.9. The Xbee or Bluetooth (Z/BT) Command

This command is used to activate the WRM2 and BT transmitters in the instrument. First click will activate the WRM2 and second click will activate the BT. An appropriate icon  or  is displayed to show which option is currently active. The BT option is used to connect a BT earphone or BT bracelet to the TelePole II. For more information see paragraph 6.2.3Bluetooth Communication.

Push MENU to see the next Line…

5.3.2.10. The Bright Command

This command dims and brightens the screen. It will default to the second brightest selection upon power up. Using brighter screens will increase power consumption and reduce battery life.

5.3.2.11. The Store Command

This command will store up to 200 points of dose rate data. The number will decrease each time the button is pressed  - the displayed number represents the available points remaining. This data may be obtained by RMC in the RMVC software. Once the data is viewed through the software and the window closed – it will delete all data. The data may be saved to the user's computer.

5.4. General Functions

5.4.1. DoseRate Display

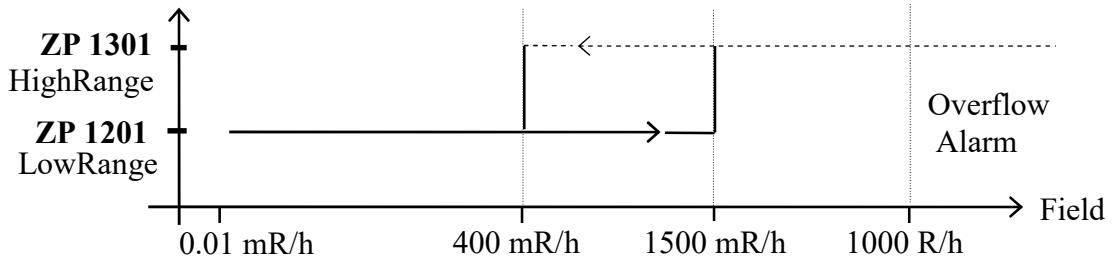
The TelePole II measures dose rates for both the external and internal detectors:
External Detector Range: 0.01mR/h to 999 R/h.
Internal Detector Range: 0.01 mR/h to 1.5 R/h.

Readings are displayed digitally and updated every second

5.4.2. Automatic Range Switching:

The detector probe assembly includes two GM detectors: 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 the field is measured by the low range Geiger. In case the radiation field increases above 1500 mR/h, the low range Geiger is disconnected, and the radiation field is measured by the high range Geiger. The switching between the low and high range Geigers is done at 1,500 mR/h when the radiation field increases (low range Geiger is disconnected), and at 400mR/hwhen the radiation field decreases (low range Geiger is connected).

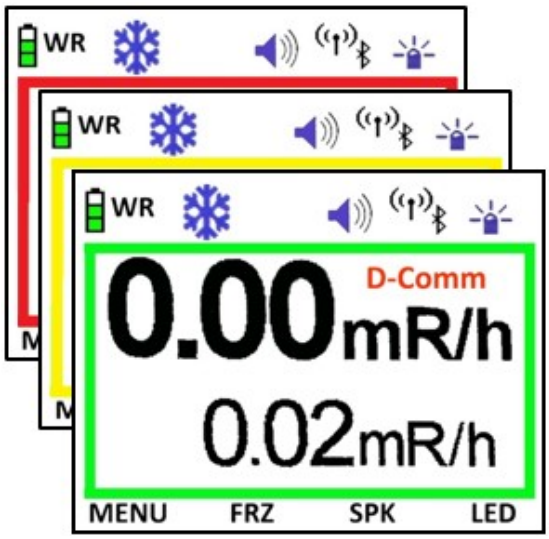


The same switching ranges are applicable for the TelePole VHS and TelePole Gamma Bata models

5.5. Threshold Selection

The TelePole II is capable of storing two dose rate threshold levelswhich are reflected in three colored frames (green, yellow and red) in the Display, and provide a visual indication to the user of the radiation levels detected by the external detector.

Above Threshold 2	
From Threshold 1 to Threshold 2	
From 0.00 mR/h to Threshold 1	



To see the current Threshold settings, click on the THR (Threshold) command in the Menu Display Bar.

The following will be displayed:**THR < 10** **THR < 20** **THR < 30**

Additionally an Alarm threshold can be set which provides an audio and visual alarm in the case where the external detector detects a radiation field above the set threshold.

Both these thresholds are set using the external RMV software which is freely available off our website.

5.6. Meter & Detector Alerts and Alarms

In case of malfunction in meter or detector function an audible and visual alarm will be displayed, press on each of push button will mute audible alarm

D-COM	No Communication between External Detector and Meter
D-LR	The External Low Range Geiger (1201) is malfunctioning
D-HR	The External High Range Geiger(1301) is malfunctioning
D-HV	High Voltage to the External Detector is malfunctioning
D-O.F	Overflow Condition on External Detector (>1000R/h)
M-O.F	Overflow Condition on Meter(>4R/h)
ALARM	Over threshold Condition (External Detector), un latch alarm.
L.BAT	Meter battery voltage too low, must be re place.
M- LR	The Internal Detector (1201) is malfunctioning
M-HV	High Voltage to the Internal Detector is malfunctioning
D-CAL	The Calibration to the External Detector is overdue
M-CAL	The Calibration to the Internal Detector is overdue

5.7. Push-buttons Function

5.7.1. Push button function Control

To power up the instrument, click on the On/Off Button
To switch off the instrument, click, with a long press on the On/Off Button
To switch between menu pages, a short press on the MENU (Power) Button

The TelePole II Menu provides a number of lines containing operational functions. Upon power up the First Line is displayed. Eachadditional line is accessed by clicking with a short press on the MENU Command (POWER Button).

The order of the commands and the used commands in this menu can be configured using our RMV software which is freely available off our website.

MENU	FRZ	SPK	LED
MENU	GRAPH	THR	RANGE
MENU	DOSE	INT DET	WRM/BT
MENU	BRIGHT	CAL	STORE

5.8. Meter display

The first big characters are used to display the external detector measuring reading.
The second smaller character are used to display different options according to operator's request.

Threshold value Internal detector Graph AccumulatedDose

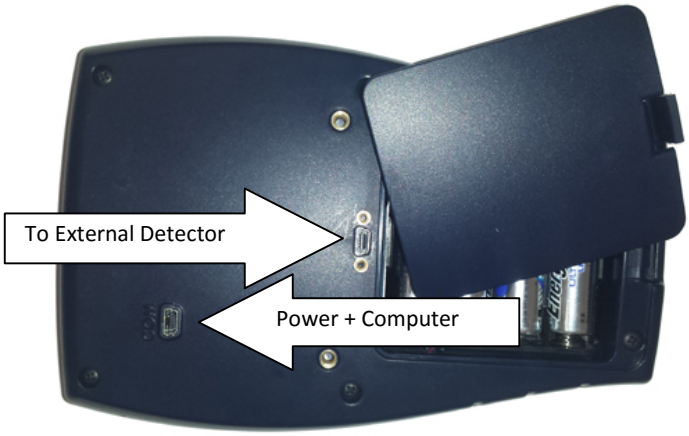
5.9. Battery Replacement

Note: The battery compartment is located on the underside of the TelePole II's Control Box.

The instrument can be powered using the external USB connection to PC

Release the Control Box from the Control Box Bracket by opening the two thumb-screws at the back of the Control Box Bracket

Open the Battery Compartment Lid and replace the batteries



6. Communication

The TelePole II offers a number of communication options:

6.1. Control Box to External Detector

The Communications takes place through the USB port closest to the battery compartment. The Control Box can also be used as a portable meter connected via a standard USB cable to an external detector without using the Telescopic Pole.

6.2. Control Box to Computer

6.2.1. USB Port

The communication takes place through the USB port furthest from the battery compartment. This USB port is also used to provide power to the TelePole II Control Box if required.

6.2.2. Xbee Communication

The TelePole II is capable of supporting a Xbee transmitter which is installed into the Control Box and activated via the Menu.

6.2.3. Bluetooth Communication

The TelePole II is capable of connecting to one device at a time.
The TelePole does no support a device that requires connection verification using a password or pin number.
The device (BT earphone or BT Bracelet) will provide an alert upon over threshold alarm, neither of these devices provide feedback on clicking frequencies.
The alert in the earphone is an audio signal and depends on the model of earphone and the alert in the bracelet is a vibration.

The first step is to pair the earphone or bracelet to the TelePole II. This is achieved by activating the pairing procedure on the earphone/bracelet and then activating the Z/BT function using the Menu of the TelePole II. First activate the pairing mode in the earphone/bracelet, by clicking on the button twice and then click on the Z/BT function in the menu until the BT symbol appears.
The pairing operation should be done in a clean environment without any chance of picking up a stray instrument which is also activating a BT mode.
The pairing procedure could take up to 10 seconds. The earphone will announce a successful connection and the bracelet will vibrate.

The bracelet will vibrate once the pairing is achieved and the earphone will announce the connection.

The BT connection in the Control Box should be activate and you should see the BT icon until the connection to the device is no longer required.

7. Calibration

7.1. Purpose

Provide guidance for calibration of the TelePole II.

7.2. References

ANSI-323, American National Standard for Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments

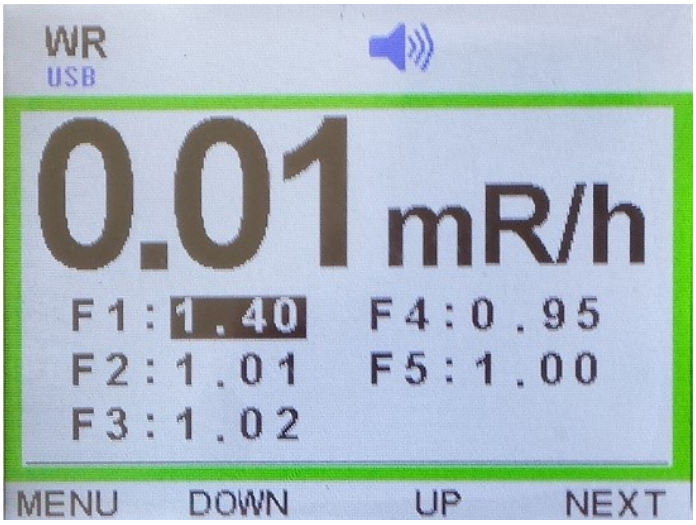
7.3. Calibration via the Touch Panel on the instrument

The TelePole II can be calibrated in the field without using any external programs. The calibration is achieved by clicking on the Menu pushbutton till the Cal. Command appears.

The Cal function is currently used to calibrate the external detector only. The Internal detector can be calibrated using the RMVC software.

Click Cal, the following display appears:

Note that the Calibration Date will update immediately to a year from the time you clicked on the Cal command. Even if no modifications were made to the Factors.



The DOWN and UP commands are used to change the F1 Factor. The reading above will automatically update according to the modifications and each time you click on DOWN or UP a new calibration factor is saved. You can exit this Display at any time by clicking the MENU command.

The NEXT command is used to change the next factor. Each time you click on DOWN or UP a new calibration factor is saved. You can change the next factor by clicking NEXT or exit this Display at any time by clicking the MENU command.

7.4. Calibration via RMVC Software

7.5. Prerequisites

7.5.1. Examine the instrument for damage that could affect operation

7.5.2. Meter Box should be disconnected to Detector Head and connected to the Computer via a separate USB Cable connection.

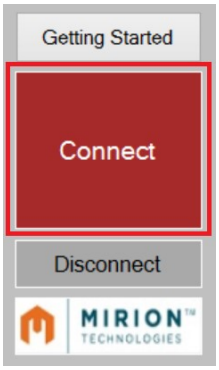
7.6. Setup

7.6.1. Obtain a mini USB cable for the TelePole II and the RMVC software.

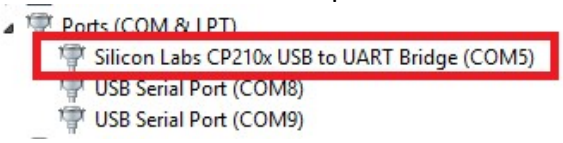
7.6.2. Start up the RMVC software

7.6.3. Connect the USB Mini cable to the Computer and Com Port on the TelePole II Meter or Detector.

7.6.4. Click Connect in the main menu:

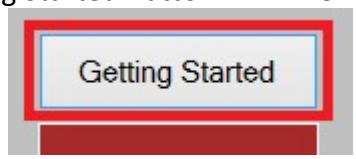


7.6.5. NOTE – if this is the first time connecting the TelePole II to the user computer, you will need to establish which com port is to be used. To do this go to Device Manager and check the com ports. The user should see a port similar to the one shown below:



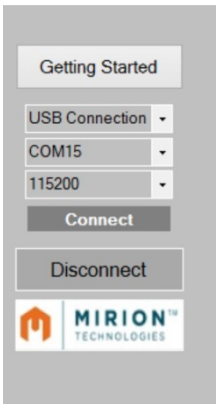
If the correct port is not shown, follow the below instructions:

6.4.5.1 Click on the Getting Started Button in RMVC



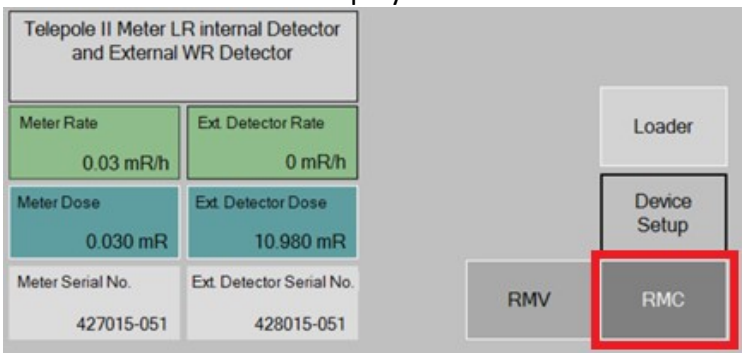
6.4.5.2 Follow the onscreen instructions and download the VCP driver from the provided link.

7.6.6. The following will be displayed:



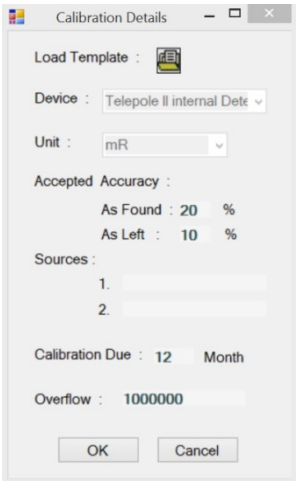
7.6.7. Select or verify the correct Com Port and the correct baud rate (should be 115200). Click Connect.

7.6.8. Prior to clicking on RMC, ensure that the TelePole II 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.



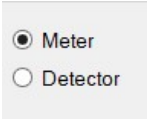
7.6.9. Enter in login information, User Name (this is user defined – for example user Windows Process ID) and password – ram.

7.6.10. 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.



7.7. Calibration

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



7.7.2. 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.

Sample entry below

1	50.7 mR/h	58*F1	0

7.7.3. 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

7.7.4. Recommended Linearity and Calibration Points

Recommended Linearity / Calibration Points (Meter Only)	
DOSE RATES	CALIBRATION FACTORS
1 – 10 mR/h	
10 – 100 mR/h	F1
100 – 500 mR/h	*
400 – 1500 mR/h	F2
> 1500 mR/h	OFLO test
Recommended Linearity / Calibration Points (Detector – Low Range / High Range)	
DOSE RATES	CALIBRATION FACTORS
1 – 10 mR/h	
10 – 100 mR/h	F1
100 – 500 mR/h	*
400 – 1500 mR/h	F2
1000 – 1500 mR/h	*
1500 – 3000 mR/h	** F3
10 – 100 R/h	
100 – 300 R/h	F4
400 – 1000 R/h	F5
> 1500 R/h	OFLO test

* Only one of these points needs to be shot depending on the point chosen for the F2 value (e.g. if a point between 400 mR/h and 1000 mR/h is chosen, then skip the 100 – 500 mR/h point)

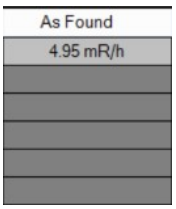
** The tight range for the F3 value is to provide good linearity for the High Range tube in the switch – over range 1500 – 400 mR/h. Higher calibration points may be used if the customer verifies acceptability of high range response in switchover range.
The above entered information may be saved as a template to be used for future calibrations. Click the save icon and name for later use. 

7.7.5. 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.

7.7.6. Select the Load Template Icon, then navigate to the storage location and select Open.


7.7.7. Expose the detector to a radiation field appropriate for the desired point.

7.7.8. In the associated point – click in the As Found Block. This will insert the dose rate information.



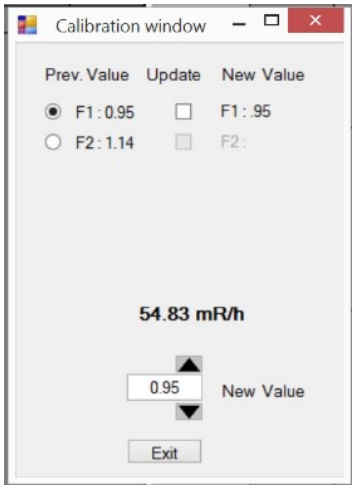
7.7.9. If a value was incorrectly entered into the wrong block; the user may select a different block and then click on the correct block again to update or the following icon may be clicked Remove Measure Points (Caution – this removes all the data). 

7.7.10. Complete steps 6.5.7 – 6.5.9 until all associated points are populated.

7.7.11. 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.

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

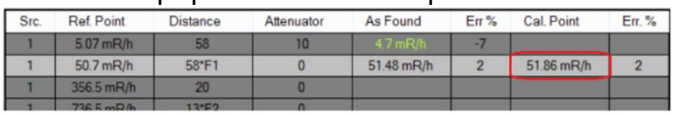
7.7.13. The following will be displayed for meter calibration (the detector head will have values of F1 – F5):



7.7.14. 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.

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

7.7.16. 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				

7.7.17. 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

7.7.18. Once completed; click on the icon for Create Calibration Certificate. 

7.7.19. 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.