TelePole Wide Range

Operating & Maintenance Manual

Document # 15-00008

For Firmware version 130808
(September 2013) and later

Revision 7
September 2013

MIRION TECHNOLOGIES Health Physics Division

REVISION LOG: Telepole Wide Range Operating & Maintenance Manual

Revision #	Date	Revised Pages	Comments
0	6/01/1998	N/A	Original Document number PRIR28T8.DOC
1.0	6/03/99	1 - 4	Updated version, revision log, table of contents. Calibration instructions modified.
		Chapter 5	Electronic Block diagrams description chapter added.
		Chapter 7	Troubleshooting chapter added.
		Chapter 8	Appendix 2 – Calibration.
		16,46,47	Appendix 3 – Rotem Meter View Software
		48,49,50	Updated title page to reflect all MGPI manuals.
2.0	2/1/02	9	Section3 – clarification of beep pattern for self test acknowledgement. Clarification of note pertaining to low range detector connection at start-up.
3.0	5/1/2007	Pg 17	Corrected F4 calibration Factor to 200 R/hr Added wording about optional WRM2 radio kit
		Pg 10	Added comments on optional firmware for new switching for detectors.
4.0	12/31/2009	Pg. 8, 9, 10. Pg 16 Pg 46 Pg 54 Pg 56	Added comments on new firmware for switching of detectors and error messages associated with detector failures. Removed the graph for the 600-800 mR/Hr switching Corrected Part number for WR2 Kit. Added part numbers for screws Corrected grammar Changed SynOdys WEB address to Mirion
5.0	1/31/2011	All Cover Page 4 9 9	Added Mirion Logo header to document Added reference to Firmware Version number 101125 Re-numbered pages in Table of Contents Added reference to latest firmware (101125) Added paragraph on memory board viability alarm (EcF)
		13	Added paragraph ‘e.’ on memory board viability alarm (EcF)
		13 15	Corrected method of clearing saved data Added part number RTM-6001 reference to Section4.1.3 and added “and hold” to Section4.1.3 paragraph
		37 38 59	Added Section8.8 Meter Parameters Added Section8.9 on Memory Board Viability Check Added meter types ‘DRM’ and ‘AMPs’ to Preface. Added Cable part number (RTM-6001) to Required equipment
		63	Corrected Reference drawing numbers and revisions
6.0	1/26/2012	All Cover Page 7, 9, 10, 13, 18, 30, 31 10	Changed MGP to Mirion. Updated firmware number to 110623. Updated Measuring Ranges. Added memory board’s role in startup self test.

6.0 (continued)		11-12	Further details on Freeze Mode added. Explanations on activating the reset function and on how to turn the click rate on and off.
		12	Added instructions on manually switching to High Range.
		13	Expanded on causes for an E.Hd Fault.
		14	Updated Push-buttons Function.
		18	Clarified reasoning behind high range calibration points.
		19	Adjusted calibration points. Updated instructions on dealing with an E.Hd error.
		18-19	Updated information on calibration factors.
		20	Added details about performing a calibration check.
		22	Deleted Section 6.
		58-59	Updated calibration instructions. Added new Section 4.8.
7.0	9/9/2013	10	Noted addition of calibration factor display when using firmware 130808 or newer.
		19-20	Noted changes in Appendix for Generic Calibration Procedure. Changed lower range of field to 500 mR when user presses F2. Added requirement to record the calibration factor when conducting calibration.
		20, 60	Added warning about turning Telepole off prior to changing internal switch position for storing calibration factors. Added step for verifying display of calibration factor.
		23	Added descriptions of the Telepole's three ID numbers.
		39	Changed PCB number to 1944.
		59	Added instructions to note final calibration factor for each section. Changed lower range for F2 factor to 500 mR.
		61	Added Windows 7 to list of usable operating systems.

Mirion Technologies reserves the right to change specifications without advance notice.

Table of Contents

1. The TelePole WR Meter

1.1. General Description

The **TelePole WR** (Wide Range) is a gamma meter, mounted on a telescopic pole, designed to obtain readings in wide radiation fields. The detector, with its two GM tubes, features a wide measurement range of 50 μR/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** can be used as a stand-alone instrument or it can be integrated into systems, using existing equipment and software.

The **TelePole'**s auto-ranging meter utilizes a combination display consisting of a smoothed digital readout for minimum fluctuation and a two-decade analog bar graph for fast response. The four-segment, sturdy, low cost 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, and data downloading capability for use with the survey mapping software.

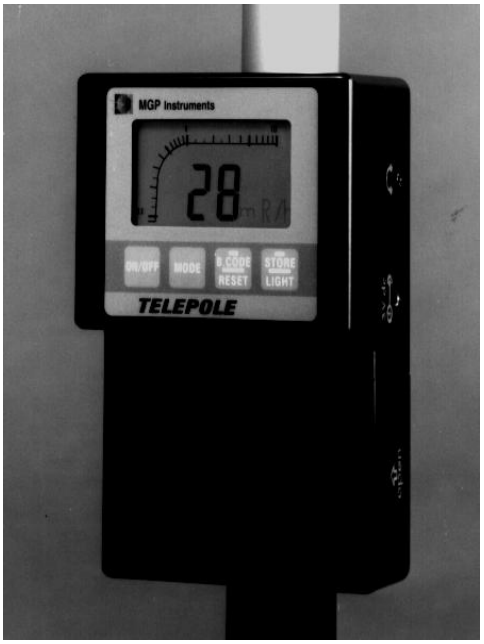


Figure 1-1. TelePole Meter

1.2. Features

- Wide measuring range.
- Rugged, sturdy construction combined with low cost replacement parts.
- Built-in RJ-11 connection for use with a WRM Plus transmitter.
- Optional WRM2 Radio Kit Part Number WR2-A005
- Built-in RS-232 communication.
- Internal alarm thresholds for exposure rate.
- Dual-output "DigiLog" display combines a stable and accurate digital readout with a fast responding analog bargraph.
- Display backlight offers bright illumination for use in low light areas.
- External DC power supply connection.
- External headphone connection.

1.3. Applications

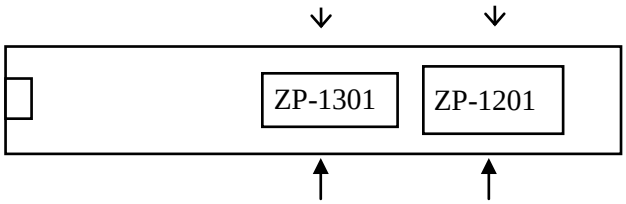
- Supports ALARA principles by allowing operators to obtain readings at a distance of up to eleven feet away from the radiation fields.
- Survey instrument, either with simple data storage, data memory and data downloading to survey mapping software.
- Real-time exposure rate monitoring connected to a WRM transmitter. Transmitted data conforms to existing MGPI monitoring software (e.g. WinWRM2, TeleView 2000).

  Note: *The dose function of the software displays "888888.88" when transmitting data, since no accumulated dose function exists on the telepole instrument.*
- Areas that are hard-to-reach. (e.g. vehicle surveys, elevated piping, etc.)

2. Specifications

Detector		GM tube ZP-1301 (or equivalent) - high range 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 70 keV to 1.1 MeV
Sensitivity (Cs-137)		17 cps/mR/h (low range) 0.3 cps/mR/h (high range)
Data logging		346 data records (1550 with extended memory)
Display		DigiLog (3 digits and 2 decades of analog bar graph)
Power source		Two 1.5 Volt C-type alkaline cells, 70 hours of continuous operation (30% less if back light is kept on continuously)
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		Aluminum, black anodizing
Dimensions	**Meter**	Width: 93 mm (3.7”) Length: 148 mm (5.8”) Height: 56 mm (2.2”)
	Probe head	Length: 226 mm (8.9”) Diameter: 33 mm (1.3”)
	Pole length	Extended: Up to 337 cm (11 ft)
	Pole length	Collapsed: Down to 107 cm (3.5 ft)
Weight	**Meter**	680 gr. (1.5 lbs.)
	Probe	175 gr. (0.39 lbs.)
	Pole	1200 gr. (2.7 lbs.)
	Total	2055 gr. (7.29 lbs.)
Meter probe connection		Standard phone cable

Calibrate/Measuring direction



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 - 400	2
400 - 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 faster and equal in both instances. Large changes in the radiation field will enable the instrument to react almost immediately.
The increased change in the 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.

3. Operating Instructions

3.1. Preparation for Use

Remove the instrument from the shipping container and check for any physical damage. In the case of damage, report it immediately to MGP Instruments.
Do not attempt to install or operate damaged equipment since safety and performance may be affected

3.2. Starting-up

Ensure that the detector cable is connected to the back of the meter. Press the ON/OFF push-button.

Present models (firmware version 101125, effective January, 2011 and later) display the firmware version number (two sets of three digits each which when combined identifies the six digit firmware version number). The latest firmware version (130808) also displays the calibration factors (F1 – F5) so they can be verified after calibration. The meter then emits three short beeps and begins a self test. Should the self test procedure identify a failure of the low range detector, the display will indicate 'E.Ld' (Error Low Range detector) approximately 1 minute following start-up. If a low range detector failure message is displayed, remove the meter from service.

Additionally, if there is a failure of the high range detector, and the meter is exposed to, or powered up in a radiation field greater than 1,500 mR/h, it will display an error message, indicating 'E.Hd' (Error High Range detector). The meter should be removed from service if a high range detector failure message is displayed. The exception to this is if the poles is switched to Manual High Range, and then left in a very low background area for an extended period of time you may also see an E.Hd error. In this scenario, however, the pole is performing as expected and you may clear the error by turning the pole off and on again.

Also on start up the TelePole performs a diagnostic of the memory to confirm memory functions. On start up, if the memory confirmation fails, the meter will display "EcF" (component failure error) for approximately 10 seconds. This indicates memory board failure. Beginning with firmware version 101125 the cal factors have been moved from the memory board to the CPU board EPROM. This leaves two functions for the memory board. It is utilized to store the TelePole ID for telemetry and to store data points for survey mapping. If these two functions are **not** utilized by the user, then the user may continue to utilize the TelePole which will return to normal operation after about 10 seconds. If these functions are utilized, then the user shall remove from service and replace the memory board.

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

3.3. General Functions

3.3.1. Exposure Rate Display

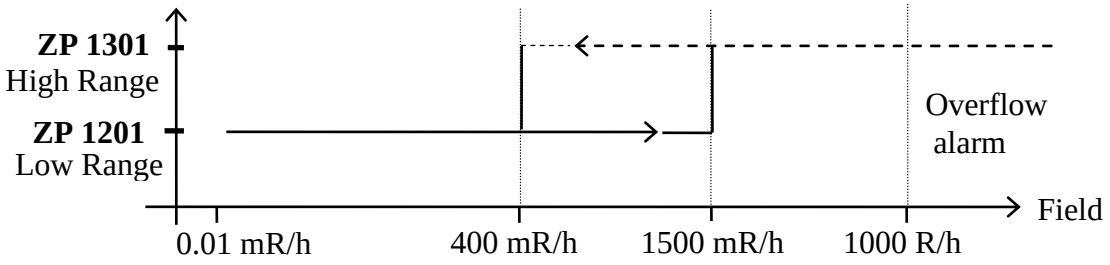
The TelePole measures Exposure rates in the range of 0.01mR/h to 999 R/h.
Readings are displayed in digital and analog mode. The ranges in the bar graph are changed automatically and the units displayed correspond to both, the digital and analog display. The bar graph measuring response is quicker than the digital display response since the latter averages the readings.

3.3.2. 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 1,500 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 400 mR/h when the radiation field decreases (low range Geiger is connected).

Geiger Type Standard 110623 Firmware, effective September, 2011 and later.



3.3.3. Reading reset / Freeze Mode:

Exposure rate - While in Exposure rate mode, a short press on the B. Code / RESET push-button changes the meter mode to FREEZE. Freeze is for peak measuring and is designated on the meter by the flashing rate units. An additional short press returns back to the normal Exposure Rate mode.

The reset function, which is activated by a long press on the B. Code / Reset button, provides a rapid means of resetting the display to zero to enable accurate measurement of low level exposure rates.

3.3.4. Audible announcements:

- When the meter is turned on, the radiation field intensity is observed by the click rate. A short press on the MODE push-button toggles the click on and off.
- Each push-button press is accompanied by an audible beep.

- In case of threshold alarm or failure alarm the audible alarm is activated. To mute the audible alarms press the RESET push-button.

3.3.5. Manual High Range

When a situation occurs such as high dose rate in a columnated beam of radiation, the telepole may have a difficult time automatically switching to the high range detector if it is completely outside of the beam. In this situation, the telepole can be manually switched to the high range detector by a long press on the MODE button. When the pole is in manual high range, you will note a flashing "M" on the display. The display will stay in R/hr. A second long press will take the pole back out of manual high range mode. Changing to Manual High Range will take the meter out of Freeze Mode, but it can be reinitiated if needed.

3.4. Threshold Selection

A threshold value can be selected from a series of 11 threshold values. The value is kept in memory even if the meter is turned off or if power is lost.

Threshold values:
Exposure rate: 2.00, 5.00, 50.0, 100, 500 [mR/h], 1.00, 10.0, 200, 400, 800, 999 [R/h]
To choose the required threshold value, proceed with the following steps:

3.4.1. Enter threshold mode by pressing the MODE & RESET push buttons simultaneously. The threshold readings, the SET and RATE segments and the SPK icon will be displayed.

3.4.2. Each short press on the RESET push-button advances the display to the next threshold value, according to the order described in Section3.4.

3.4.3. To exit the set threshold mode, save and set the new threshold value, press the MODE & RESET push buttons simultaneously. An audible beep will verify that the new threshold value was saved.

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3.5. Alarms

***a. Detector Failure Alarm*:**

The current firmware version offers two alarm types for detector failure E.Ld & E.Hd

The **Err.** LCDs and **SPK icon** will blink on the display and provide and audible alarm:

E.Ld Fault:

1. The detector is disconnected.
2. The detector high voltage power supply is defective.
3. The detector is located in a background radiation field < 1,500 mR/h and the low range Geiger is defective. This alarm appears within 1 minute.

E.Hd Fault

1. The detector is located in a radiation field higher than 1,500 mR/h, and the high range Geiger is defective. This alarm appears instantly. This may also occur if the pole is placed in manual high range and left in a very low background area.

Note: It is recommended to check the meter and the detector with a calibration source, to ensure correct operation. Check:
Background field during two minutes,
50 mR/h for the low range Geiger,
5.00 R/h for the high range Geiger.

To mute the audible alarm, press the RESET push-button.

***b. Battery alarm*:** If battery voltage decreases below 2.2V, the **battery** and **SPK** icons blink on the display, and an interrupted audible alarm is activated.
To mute the audible alarm, press the RESET push-button.

***c. Overflow alarm*:** If the displayed Exposure rate is over 999 R/h, the **O.F.** LCDs and **SPK** icon will blink on the display and an interrupted audible alarm will be activated. To mute the audible alarm, press the RESET push-button.

***d. Threshold alarm for Exposure rate*:** If the Exposure rate reading exceeds threshold value, the **RATE** LCDs and **SPK** icon will be displayed, accompanied by an audible beep.
Pressing the RESET push-button mutes the audible alarm, but the **RATE** LCDs, the **SPK** icon and the reading continue to be displayed, until the reading decreases to 75% of threshold value. In case the reading exceeds threshold value and then decreases to below 75% of the threshold value, the **RATE** LCDs, the **SPK** icon and the beep sound will automatically cancel, even though the RESET push-button has not been pressed.

e. Memory Board Viability: (effective with firmware version 101125 and later) If the Telepole memory board has faulted, causing a change in any of the F1 – F5 calibration factors from the previous calibration, the Telepole will alert the User. On start up, if the validation fails, the meter will display "EcF" for approximately 10 seconds. Additionally, the storage of the calibration factors has been relocated to the EPROM on the CPU Board.

3.6. Push-buttons Function

Function	Pressing mode	Push-buttons
Meter on/off	Short	ON/OFF
Speaker / Chirp on/off	Short	MODE
Initiates manual activation of High Range detector. Second long push returns to normal operation	Long	MODE
In case of an alarm condition (threshold or malfunction) the beeper is activated. Pressing the RESET push-button turns the beeper off.	Short	B.CODE / RESET
In Exposure rate mode, the first press enters the FREEZE mode, the second press returns to Exposure Rate Mode.	Short	B.CODE / RESET
Turns the back light on, and a second long push turns the back light back off.	Long	STORE / LIGHT
Stores the reading value, then displays the available memory space left.	Short	STORE / LIGHT
Resets the meter	Long	B.CODE / RESET
Initiates Threshold Set Mode Selects one of eleven threshold values. Returns to Exposure Rate Mode	Simultaneously Short Simultaneously	MODE + RESET RESET MODE + RESET
Clear data from the meter's internal memory. Press and hold B.CODE/RESET for 10 seconds. To erase the memory data, press and hold again while the current memory location is flashing.	Two sequential Long pressings (10 sec)	

3.7. Battery Replacement

Note: *The battery compartment is located on the lower right side of the TelePole's meter.*

3.7.1. ***Slide out the battery compartment cover in the direction of the arrow (open). See Fig. 3-1***.

3.7.2. ***Insert two C-type alkaline batteries with the correct polarity***.

3.7.3. ***To close of the battery compartment, press the batteries down, place the compartment cover on the battery edge, press the batteries down with the compartment cover and slide the cover into place along the side slots***.

Using an External Power Supply

Power can be supplied to the meter in one of two ways:

1. Ordinary batteries - default use. When an external 3V DC power supplies is connected, the internal batteries will be disconnected.
2. Rechargeable batteries - on request. A 2.9V to 3.2V external power supply charges the batteries. A jumper on the PSU board (1945) E2 (1-2) on the printed circuit performs the interchange.

Warning: *Be sure to connect the external power supply with the correct polarity, as indicated on the instrument battery compartment.*

Figure 3-1. TelePole Battery Compartment

4. Communication

4.1. Communication to RMV (Rotem Meter View) software

The TelePole is compatible with the survey mapping software. Using the following operating procedure***:***

4.1.1. ***To save the instrument data (ID, time, date, value, unit, comments) perform a short press on the STORE push-button***.

4.1.2. ***After the saving operation, the amount of available memory space remaining is displayed***.

4.1.3. ***To load data from the TelePole to the RMV software, connect the RS232 of the PC to COM-1 on the TelePole rear panel by a special communication cable (Part number RTM-6001 supplied with the software system). Downloading data from the TelePole to the PC clears the instrument's memory. TelePole can store up-to 346 readings (or 1550 optional with extended memory)***.

Note: *To purposely clear data from the TelePole's memory press the B.CODE push-button for 10 seconds, the current available memory space is displayed for an additional ten seconds. An additional press and hold of the B.CODE push-button while the current memory location is flashing. The instrument indicates it by four audible beeps and* ***346 m****, the new available memory space is displayed.*

4.2. WRM Communication

The WRM transmitter is connected to the serial port COM-2 located in the instrument's rear side via a standard telephone cable. The additional operations like transfer of data, are performed automatically. The WRM communication protocol includes accumulated dose data. ***Note:*** *The TelePole does not measure accumulated dose, therefore instead of transmitting the accumulated dose value, it transmits the digits 888888.8.*

4.3. WRM2 Communication

The WRM2 optional kit (WR2-A005) is connected via two screws on the meter box and is powered by the same power supply that powers the TelePole. The transmission interval level is defaulted 4 seconds and can be changed using the Meter View software with the communication cable designed for the TelePole and the Ram Ion and the baud rate to the Telepole when using the WRM2 radio is set to 19,200 BPS. The WRM2 kit is available to older instruments built 2006 or later and require new firmware and two wired jumpers installed. Instruments built in 2007 or greater are pre-configured for the WRM2 Telepole kit. ***Note:*** *The TelePole does not measure accumulated dose, therefore instead of transmitting the accumulated dose value, it transmits the digits 888888.8.*

4.4. RS-232 and WRM Plus Connection

Communication parameters	**COM-1**	**COM-2**
Baud rate:	9600	300
Parity:	None	None
Hardware handshaking:	None	None
Software handshaking:	None	None
Stop bit:	One	One
Prefix:	01	LF
Suffix:	04	CR
Data format:	8 data bits	8 data bits

4.5. With Optional WRM2 Kit Data Connection

Communication parameters	**COM-1**	**COM-2**
Baud rate:	19,200	19,200
Parity:	None	None
Hardware handshaking:	None	None
Software handshaking:	None	None
Stop bit:	One	One
Prefix:	01	LF
Suffix:	04	CR
Data format:	8 data bits	8 data bits

5. Calibration Instructions

5.1. Preface

5.1.1. Calibration Factors

To improve the linearity, the **TelePole** uses five calibration factors: The two lower factors are for the low range Geiger, from 0.01 mR/h to 5,500 mR/h and the other three are for the high range Geiger, from 1500 mR/h to 1000 R/hr.

The calibration factors will be displayed on the meter, as follows:

F1 - first calibration factor for low range.

F2 - second calibration factor for low range.

F3 - first calibration factor for high range.

F4 - second calibration factor for high range.

F5 - third calibration factor for high range.

F1 and **F3** are used to compensate the Geiger sensitivity tolerances.

F1 for the low range Geiger (ZP1201) and **F3** for the high range Geiger (ZP1301).

F2, F4 and **F5** are used to compensate the Geiger dead time tolerances.

F2 for the low range Geiger (ZP1201) and **F4**, **F5** for the high range Geiger (ZP1301).

5.1.2. Calibration Ranges

F1 should to be set at 10 – 100 mR/h.

F2 should be set at 400 – 1500 mR/h.

F3 should be set at 1500 – 3000 mR/h.*

F4 should be set at 100 – 300 R/h.

F5 should be set at 400 – 1000 R/h.

*The tight range for the F3 value is set 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.

Measured (displayed) readings are calculated by one of the following two formulas, depending on the intensity of the radiation field:

Low range: N(mR/h) = [**n***F1 + dead time correction {n*F2}]/17

High range, up to 300 R/h: N(R/h) = [**n***F3 + dead time correction {**n***F4}]/300

High range, over 400 R/h: N(R/h) = [**n***F3 + dead time correction {**n***F5}]/300

Where

n is the detector frequency obtained in the radiation field.

N is the updated measurement reading.

Between 300 R/h to 400 R/h, a weighted average of F4 and F5 is used as the dead time correction factor. The calculation of the "averaged factor" and the corresponding measurement formula follow:

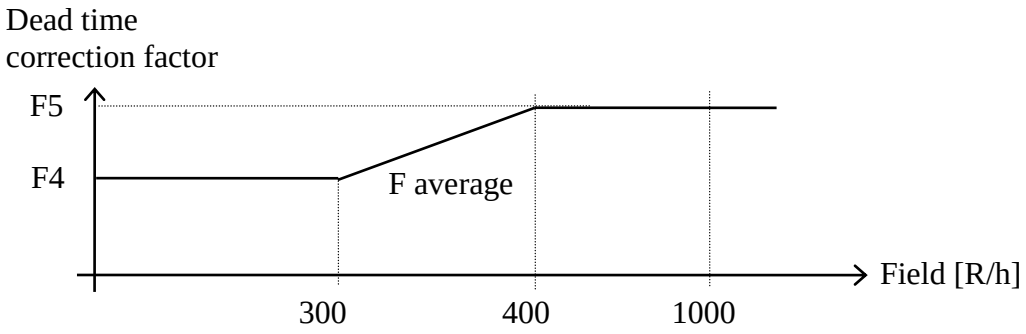
x = (last N(R/h) - 300)/100

Last N = previous measurement reading

F average = (1-x)* F4 + x* F5

N(R/h) = [n*F1 + dead time correction {n*F average}/300

The following graph illustrates the ranges over which F4, F5 and F average are used as the TelePole's dead time correction factor:



5.2. Calibration Procedure (See Appendix 1 for Generic Calibration Procedure)

5.2.1. ***To set the TelePole to the calibration mode unscrew the calibration screw located on the back of the meter. Turn the internal switch to the calibration position***.
In a field higher than 10 mRh, the meter automatically enables only the display and setting of the appropriate factor, depending on the field intensity.

F1 if the probe head is in a field higher than 10 mR/h and lower than 100mR/h.

F2 if the probe head is in a field higher than 500 mR/h and lower than 1500 mR/h

F3 if the probe head is in a field higher than 1500mR/h and lower than 50 R/h.

F4 if the probe head is in a field higher than 100 R/h and lower than 350 R/h.

F5 if the probe head is in a field higher than 350 R/h

5.2.2. ***Expose the detector to a radiation field appropriate for F1***.
The display will show:

→ F1 → F (factor) → mR/h (reading) →
↑_____↓

Change the factor by pressing the RESET or LIGHT push-button to obtain the desired reading and record the factor.

5.2.3. ***Expose the detector to a radiation field appropriate for F2.***
The display will show:

→ F2 → F (factor) → mR/h (reading) →
↑_____↓

Change the factor by pressing the RESET or LIGHT push-button to obtain the desired reading and record the factor.

5.2.4. ***Expose the detector to a radiation field appropriate for F3***.
The display will show:

→ F3 → F (factor) → R/h (reading) →
↑_____↓

Change the factor by pressing the RESET or LIGHT push-button to obtain the desired reading and record the factor.

5.2.5. ***Expose the detector to a radiation field appropriate for F4***.
The display will show:

→ F4 → F (factor) → R/h (reading) →
↑_____↓

Change the factor by pressing the RESET or LIGHT push-button to obtain the desired reading and record the factor.

5.2.6. ***Expose the detector to a radiation field appropriate for F5***.
The display will show:

→ F5 → F (factor) → R/h (reading) →
↑_____↓

Change the factor by pressing the RESET or LIGHT push-button to obtain the desired reading and record the factor.

NOTE: Changing the internal switch to operating position stores the calibration factors. If the meter is turned off ***prior*** to changing the internal switch position, THE CALIBRATION FACTORS WILL NOT BE SAVED!

5.2.7. ***Set the TelePole to the operating mode, turn the internal switch to the operating position***

5.2.8. ***Power the telepole off and back on and verify the F factor that are displayed upon startup match the as left F factors set during calibration.***

5.2.9. ***Perform Linearity check on instrument after calibration. Typically 1 point per decade is sufficient.***

5.3. CPU Unit Pulser Check (Option Only)

Note: *Although it is possible to "calibrate" the TelePole using a series of input pulses (from a pulser), the manufacturer strongly recommends against this. Checking instrument response to input pulses ensures that the meter's CPU is operating properly,* ***but indicates nothing about the detector.*** *The manufacturer recommends that the instrument is calibrated*

according to the previous Section(5.2 Calibration procedure), by exposing the probe head to known radiation fields and adjusting factors appropriately, which ensures that both the detectors and the CPU are operating properly.

The CPU unit counts the input pulses, calculates dead time, averages the results, and displays the reading.

To check the CPU unit "calibration" perform the following procedure:

5.3.1. ***Disconnect the detector telephone connector from the meter***.

5.3.2. ***Adjust the pulser output to obtain a 5 Volts amplitude and 10 μsec width pulse***.

5.3.3. ***Connect the pulser output as follows: (+) to pin 1 and (-) to pin 2***.
Option: A more convenient and easier way to perform this step is by using the TelePole Pulser Adapter. Proceed as follows:
- Connect the adapter telephone cable to the detector connector (**Det.**) on the TelePole.
- Connect the pulser signal output to pin 4 on the adapter board.
- Connect the pulser ground output to pin 3 on the adapter board.

5.3.4. ***First, turn the meter on, and then turn the pulser on. Ensure to obtain the base unit reading (±10%) according to the following table***:

Tab1e 1 - Low Range Geiger

Input Frequency <Hz>	Display <mR/h>
17	1.00
170	10.0
2000	141
4000	365
5000	534
6000	730
6300	804

Table 2 - High Range Geiger

Input Frequency <Hz>	Display <R/h>
3200	10.7
10.000	39.2
30.000	183
40.000	323
50.000	525
60.000	839
75.000	O.F. (overflow)

These results are valid only when all factors equal to 1.

6. Telepole ID Numbers

6.1 The Telepole has three different ID Numbers

6.1.1 One can be set by RMC software, this number (e.g 6611-123) based on 66-code for telepole, 11-production year (2011), 123 serial number. This SN is the same as the meter sticker and calibration certificate.

6.1.2 Serial number seen when using RMV software is basically the same format as above but has 4 leading zeros (e.g. 00006611-123). This number cannot be set, and it is set by the firmware.

6.1.3 The last serial number is for using a WRM2 transmitter. This serial number based on the 6611-123 format but modified by firmware to be 901123 (9- ROTEM meter, 0- Telepole meter type, 1 production year(2011), 123 serial number). This number cannot be set, it is set by the firmware.

7. Electronic Block Diagrams Description

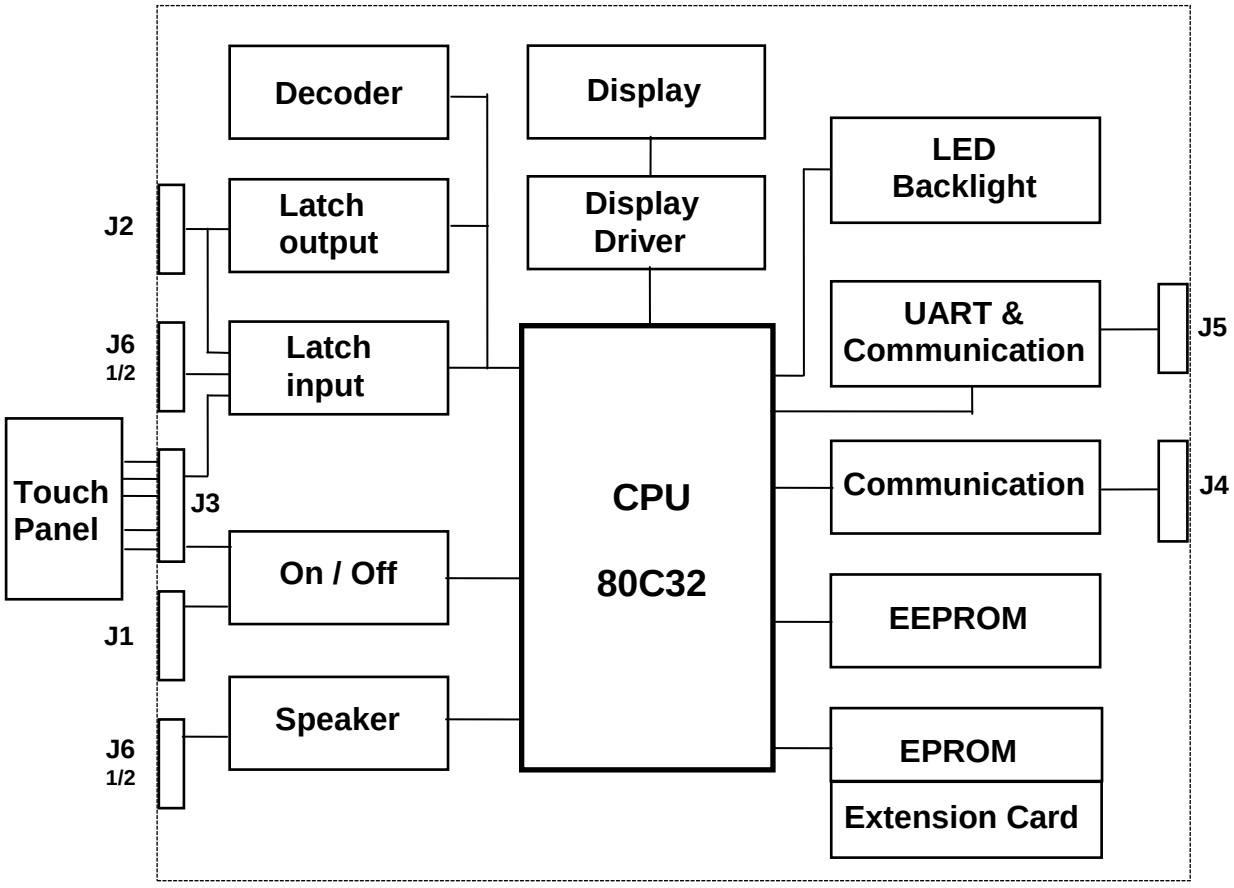
See block & wiring diagram DRW# 12850-50-00.

7.1. Meter

The meter unit includes the CPU and the Power Supply boards.

7.1.1. CPU Board Description

DRW #12850-45-00, PC #2203.



On /Off Circuit (Q3, Q4, Q5)

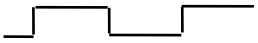
A momentary short between pin J3/1 and J3/2 switches Q3 and Q4 on.
The battery voltage powers the power supply circuit.
U5/5 is set to “1” (in software), Q3 is switched on, and as a result the meter is turned on.
An additional momentary short between J3/1 and J3/2 sets U5/6 to “0” through Q5. U5/5 is set to “0” and the meter is turned off.

Speaker Circuit (U13)

The speaker circuit is activated in the following cases:
a. Threshold level exceeding.
b. Malfunction.
c. Push-button pressing approval.
d. The speaker clicks frequency is proportional to the radiation field intensity.

A 3 KHz signal on pin U13/3 activates the speaker. Two ports control the speaker:
Port 1 - alarm, pin U3/9
Port 2 - speaker on, pin U3/19

For threshold level exceeding and malfunction:
U3/9 - "0"
U3/19 -



1sec 1sec

For push-button pressing approval:

U3/9 - "0"
U3/19 -

100msec

For clicks activation in relation to the radiation field intensity:
U3/9 - "1"
U3/19 - "1"

To mute the speaker:
U3/9 - "0"
U3/19 - "1"

Input & Output Latch

Two **74HC373** IC's are used for the input/output signals. The IC's are connected to the CPU BUS.
Input signals - **U9, address** - 8200H
Output signals - **U3, address** - 8100H

Output Signals

0	-	U3/2	external/internal detector (optional)
1	-	U3/5	low range / high range Geiger
2	-	U3/6	Electro-luminescence
3	-	U3/9	speaker alarm
4	-	U3/12	not in use
5	-	U3/15	not in use
6	-	U3/16	enables VCC for barcode laser reader
7	-	U3/19	speaker on

Input Signals

0	-	U9/3	MODE push-button
1	-	U9/4	RESET push-button
2	-	U9/7	LIGHT push-button
3	-	U9/8	low battery
4	-	U9/13	not in use
5	-	U9/14	calibration mode
6	-	U9/17	internal Geiger (optional)
7	-	U9/18	PC communication

Touch Panel

The touch panel push buttons are connected to the micro-controller chip in the CPU board via input latch, except the on/off push-button that is connected to the on-off circuit.

Display (U17, U18)

DRW # 12850-40-00 sheet 2.
The display shows the meter readings and messages.
The display driver (U17) receives clock and serial data from the CPU and transmits it in parallel to the display in three back planes.
U18 - Rotem's custom display especially designed for the RAM ION and Telepole meters. The display includes 3-character 7-segment, 2 decimal points, bar graph and data segments.

LED Backlight Luminescence (Q6, D-10, D-11)

Pressing the LIGHT push-button turns on the display illumination.

EPROM Circuit (U2, U5) & Extension Card

U2 - 74HC 373, Address A_0 - A_7, latch from AD_0 - AD_7 .
U5 - 27C 256, EPROM contains software code.
The extension card, DRW # 12850-41-00, is installed on the EPROM socket.
The extension card includes EPROM, NOVRAM, Reset and Watchdog circuit.
U2 - NOVRAM: DS1243 8K byte, or DS1244, 32K byte.
The NOVRAM contains: SRAM, clock, calendar and battery back up, used for storing the SMARTS data.
U3 - MAX1232, watchdog and reset circuit. The micro-controller receives a reset signal in two cases:
a. When the meter is turned on.
b. In case of software failure.
Pulses are sent from U6/2 to U3/7 as long as operation runs ok. In case of a fault detection in software, the pulses stop and a reset signal is obtained on U3/6.

CPU Circuit (U6)
The micro-controller circuit manages all the meter activities.

EEPROM Back up Memory (U1)

The X2C04 is a 512-byte serial EEPROM (Electrically Erasable Prom).
The EEPROM stores threshold values, ID number and calibration factors values.

Communication Circuit

The CPU board contains two separate communication ports. One is the micro-controller communication port used for the SMARTS communication:

J4/1 TxD - This is the serial data line transmitted from the meter. The logic level swings are 0 to 5 Volts, and can be described as RS-232 TTL level. This circuit is able to drive TTL, LSTTL, and CMOS inputs.

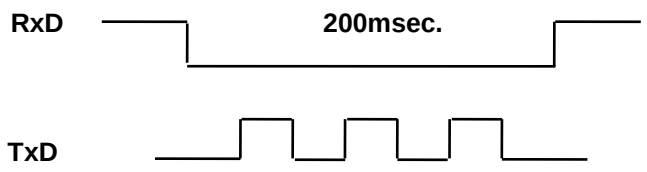
J4/2 RxD - This is the serial data line received in the meter. The meter accepts serial data either in RS-232 signal levels (low: -3 to -15 Volts, high: +3 to 15 Volts) or TTL levels (low: 0.8 Volts, high: 2.0 Volts).
J4/3, 6 - ground
J4/4 - + 5V

UART & Communication
The other communication port is used for the WRM system or COMBO system.
U12 - 82510 is connected to the CPU BUS, address 8700H.

J5/1 TxD - This is the serial data line transmitted from the meter. The logic level swings are 0 to 5 Volts, and can be described as RS-232 TTL level. This circuit is able to drive TTL, LSTTL, and CMOS inputs.

J5/2 RxD - This is the serial data line received in the meter. The meter accepts serial data either in RS-232 signal levels (low: -3 to -15 Volts, high: +3 to 15 Volts) or TTL levels (low: 0.8 Volts, high: 2.0 Volts).
J5/3 - ground
J5/6 - + 5V
J5/7 - trigger from the WRM transmitter

The communication port receives a trigger from the WRM transmitter and transmits the data to the WRM system.

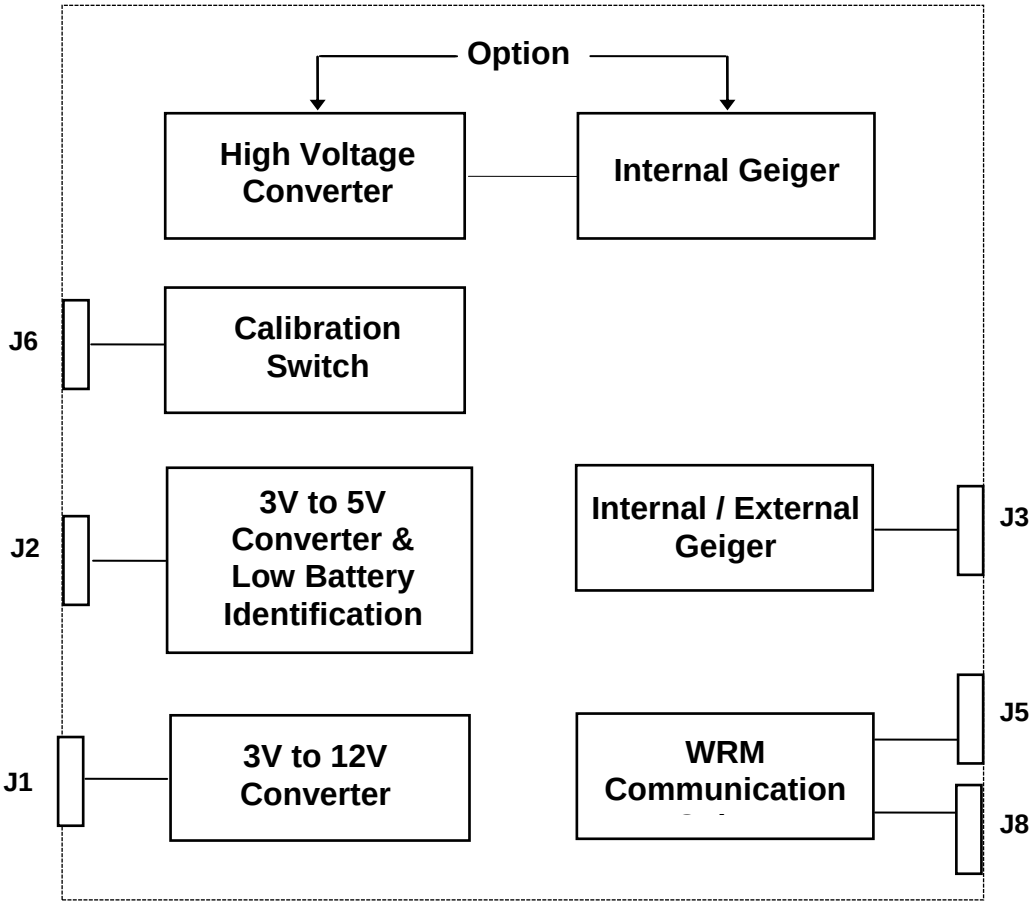


Decoder

U11 - 74HC138, sets addresses for the input/output IC's and UART IC.
Address ranges from 8000H to 8700H.
Three addresses are used:
8100 - input latch U3
8200 - output latch U9
8700 - UART 82510 U12

7.1.2. Power Supply

DRW #12850-42-00. TelePole, Power Supply, PC #1945



H.V. Board Block Diagram

High Voltage Converter & Internal Geiger (optional)

The high voltage converter and internal Geiger components are installed on the board only when the internal Geiger is used. As well, a short is performed on jumper E3. When the microcontroller identifies the short on E3 via J5/5, the internal Geiger is activated.

High Voltage Circuit for the Internal Geiger

The H.V. circuit includes an ORAM 5525 transformer, a voltage multiplier (D4, D5, D6, C7, C3), and an RV4192 switching regulator.

R10 and R9 are voltage feedback for the switching regulator.

The high voltage, 500V ±5% generated in the H.V. circuit is transmitted to the Geiger. When the Geiger is positioned in a radiation field, positive pulses ⎍ are obtained on pin K1 of the Geiger. These pulses are shaped and amplified by Q1, Q4, and RC components.

Internal / External Geiger Selection
U2 - 74HC132 and port J2/4 are used to select between the internal and external Geiger.
J2/4 enables to select between operation and display of internal Geiger or external Geiger.
J2/4 = "0" - internal Geiger
J2/4 = "1" - external detector.

3V to 5V Converter & Low Battery Identification
MRX756 (U1) and RCL components convert the battery voltage to 5V, (which is) the meter's main power supply.
Input voltage range: 1.7V to 3V DC.
Output voltage range: 5V ±0.1V.

Low battery identification is performed by U1. When the battery voltage reduces below 2.0V on pin LB1, LB0 (pin 4) on U1 resets to "0".

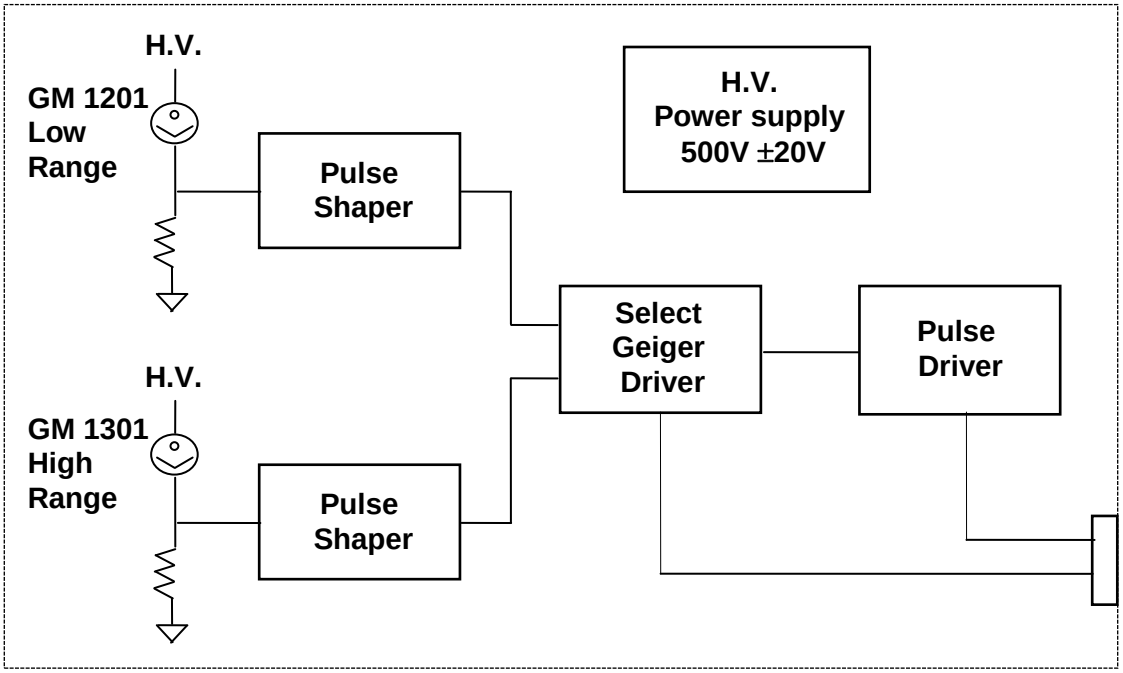
3V to 12V Converter
MAX771 (U4) and RCL components convert the battery voltage to 12V that is aimed for the speaker circuit.

7.2. WRM Communication

Q2, Q3 and resistors adapt between the WRM transmitter and meter voltage levels.
E1 (1-3) should be shorted.

7.3. Wide Range Detector

DRW # 12852-40-00, PCB # 2003



Detector Block Diagram

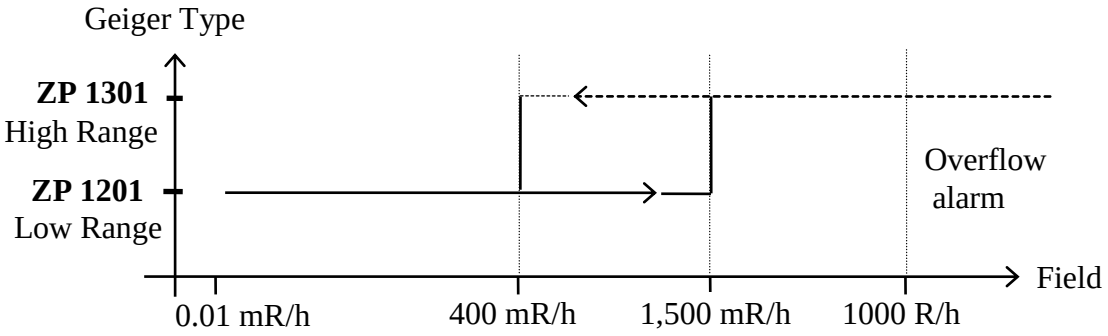
High Voltage Power Supply
The H.V. board includes an ORAM 5525 transformer, a voltage multiplier (D1, D2, D3, C8, C11), an RV4192 switching regulator.
R3 and R4 are voltage feedback for the switching regulator.
H.V. range: 500V to 550V DC. The high voltage is aimed for both Geigers.

Pulse Shaper
Each Geiger includes a pulse shaper circuit.
Q3 and RC for the low range Geiger 1201.
Q5 and RC for the high range Geiger 1301.

7.3.1. Select Geigers

The detector includes two Geigers: 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 only the low range Geiger is connected and the field is measured by the low range Geiger. In case the radiation field is higher than 1,500 mR/h the low range Geiger is disconnected, and the radiation field is measured by the high range Geiger.

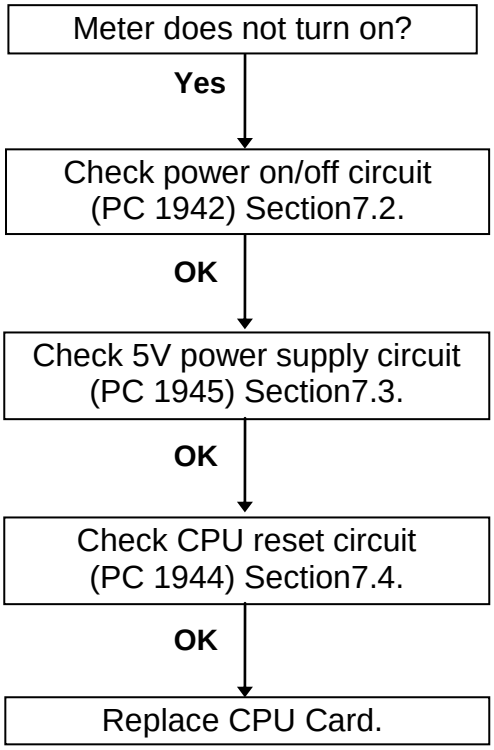
The switching between the low and high range Geigers is done at 1,500 mR/h when the radiation field increases (low range Geiger is disconnected), and at 400 mR/h when the radiation field decreases (low range Geiger is connected).
Geigers selection is performed via J1/2 control line.



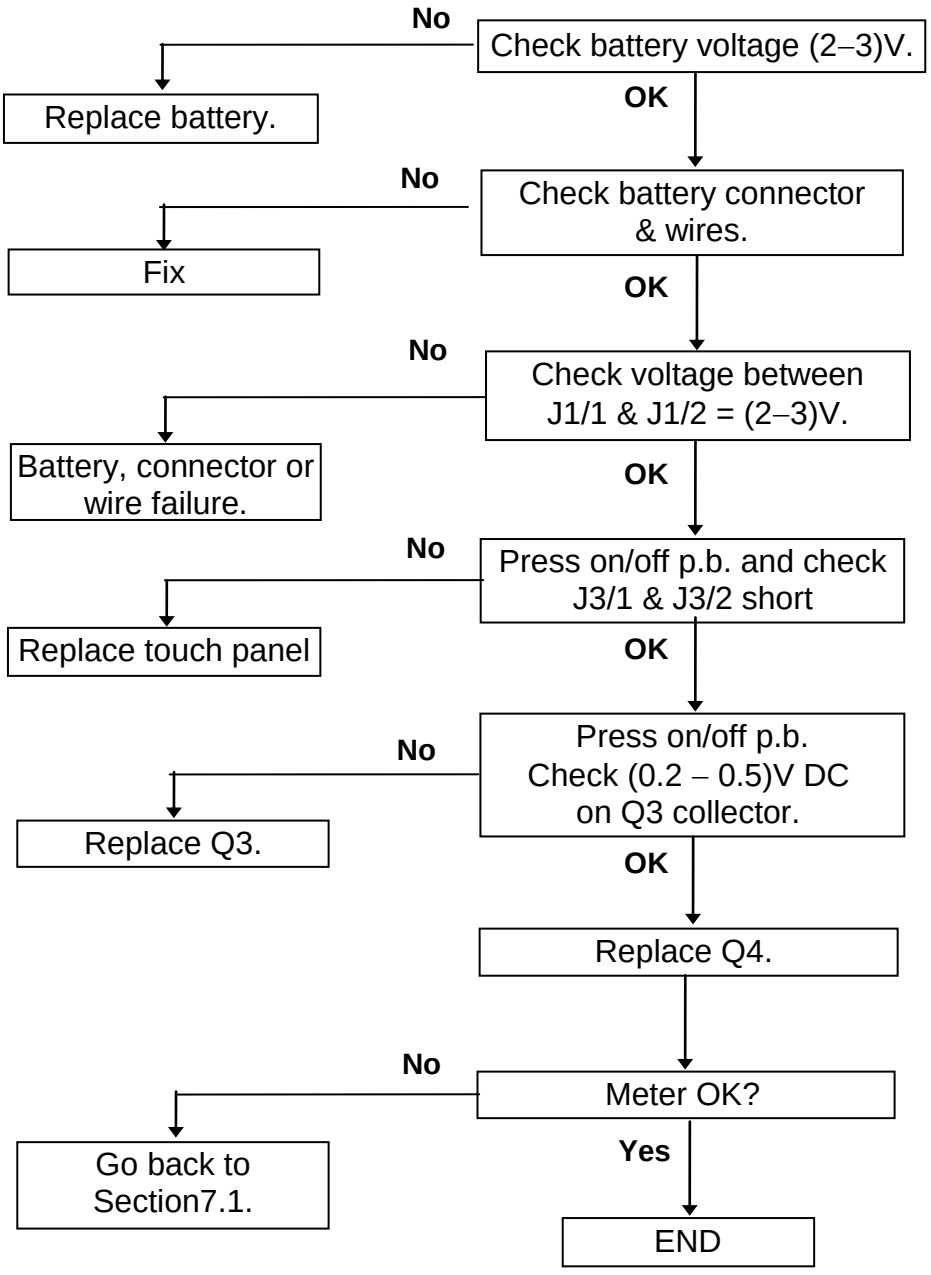
Pulse Drive
Q2, Q4 and R23 drive the detector pulses to the meter.

8. Troubleshooting

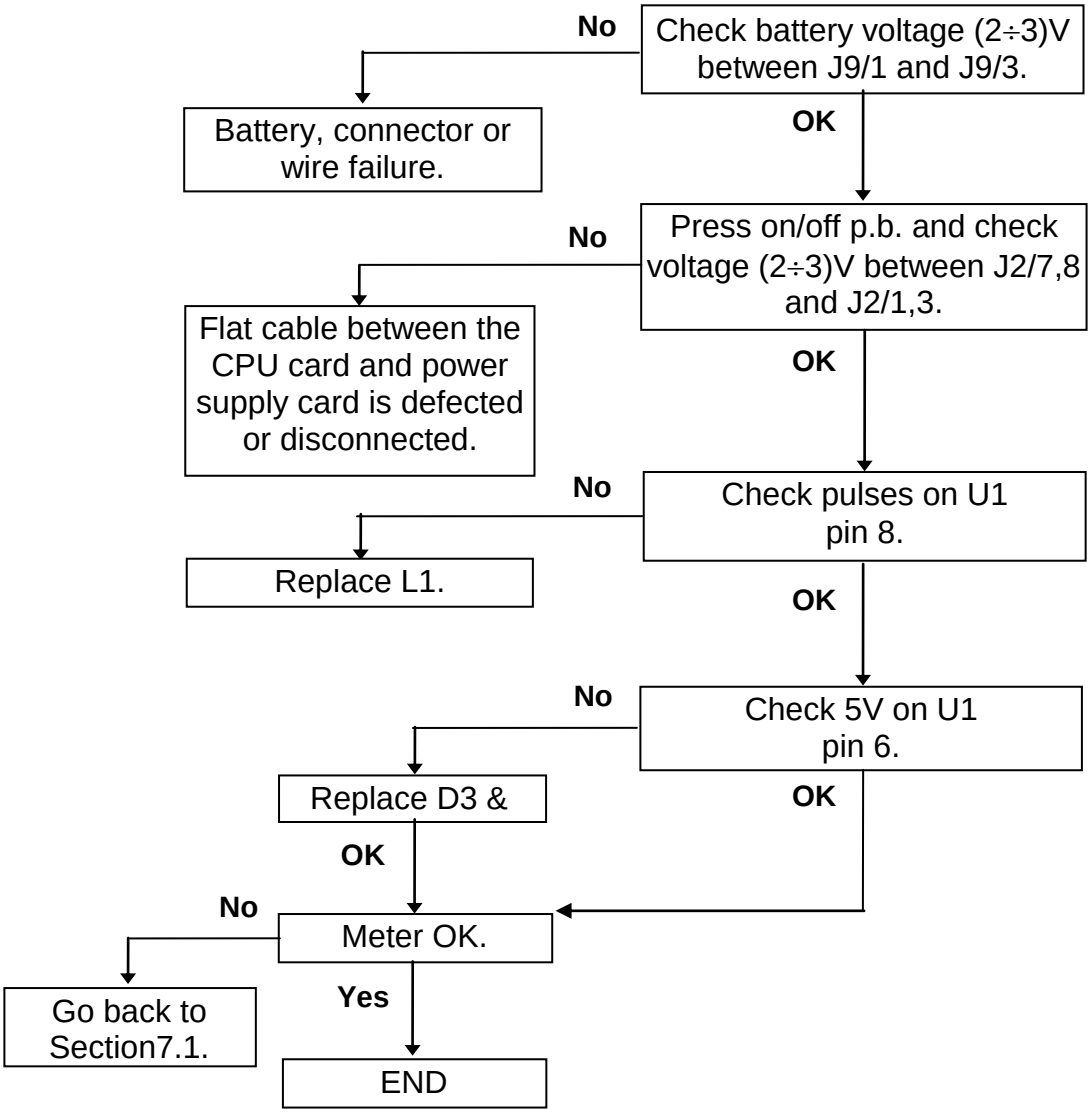
8.1. Meter does not power turn ON



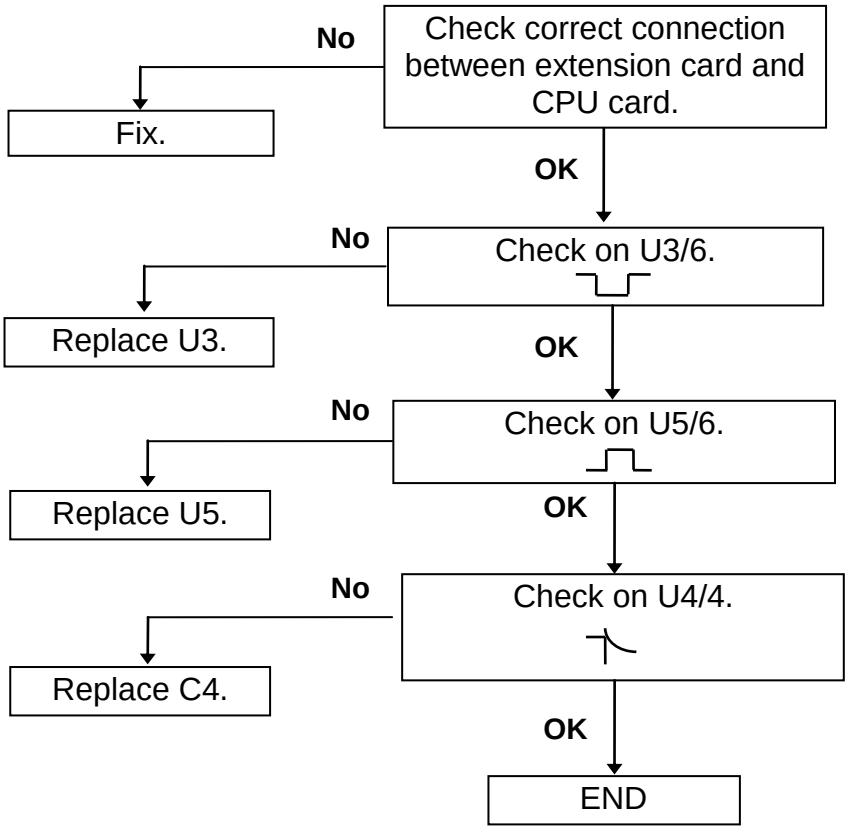
8.2. Power on/off circuit (PC 1942)



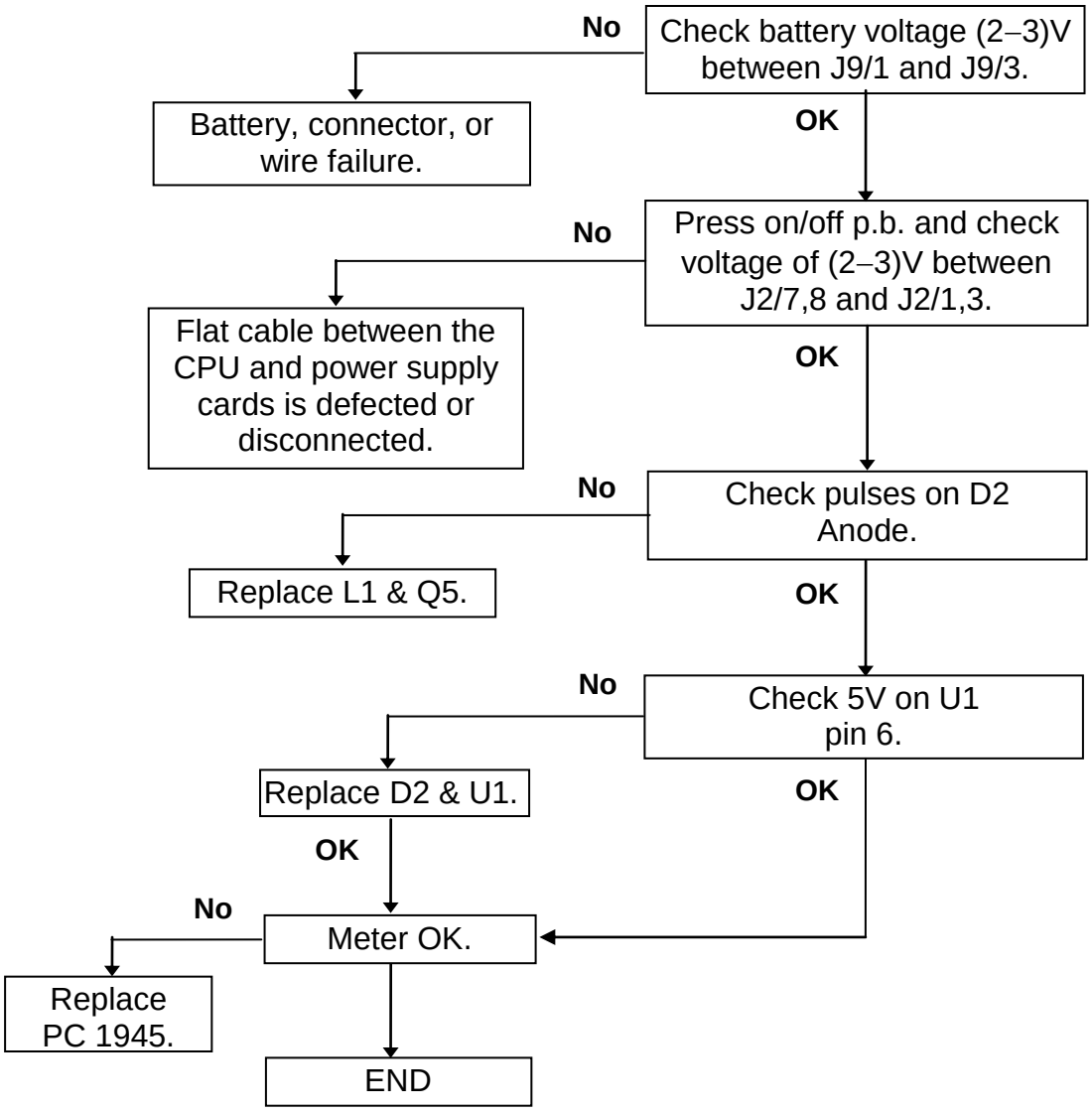
8.3. 5V power supply circuit (PC 1945)



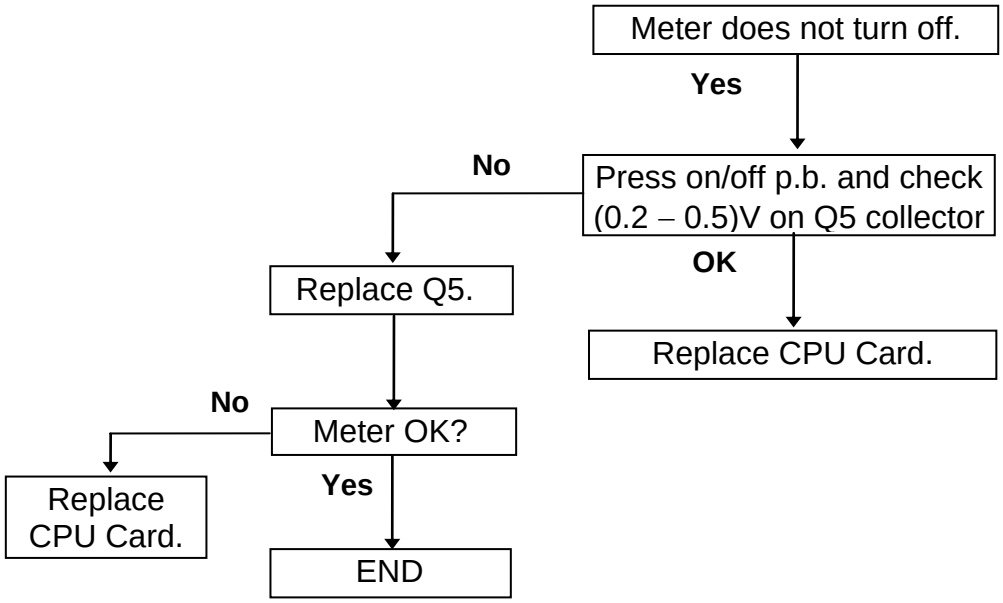
8.4. CPU reset circuit (PC 1944)



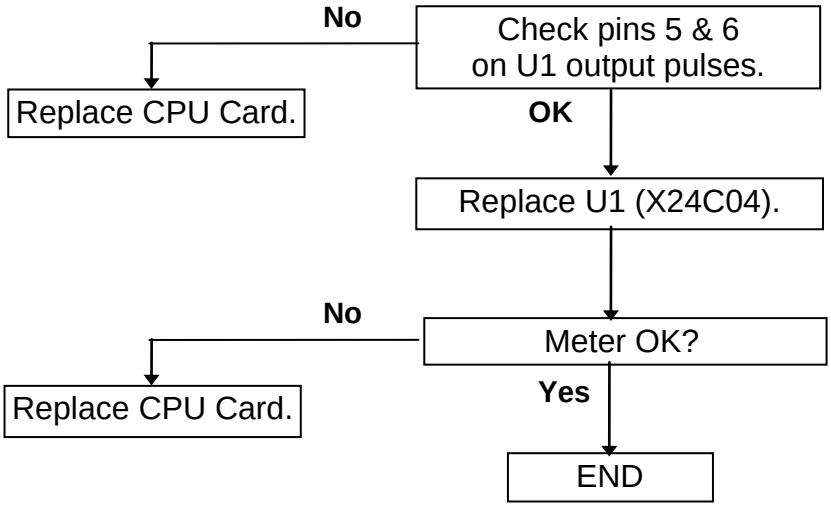
8.5. 12V power supply circuit (PC 1945)



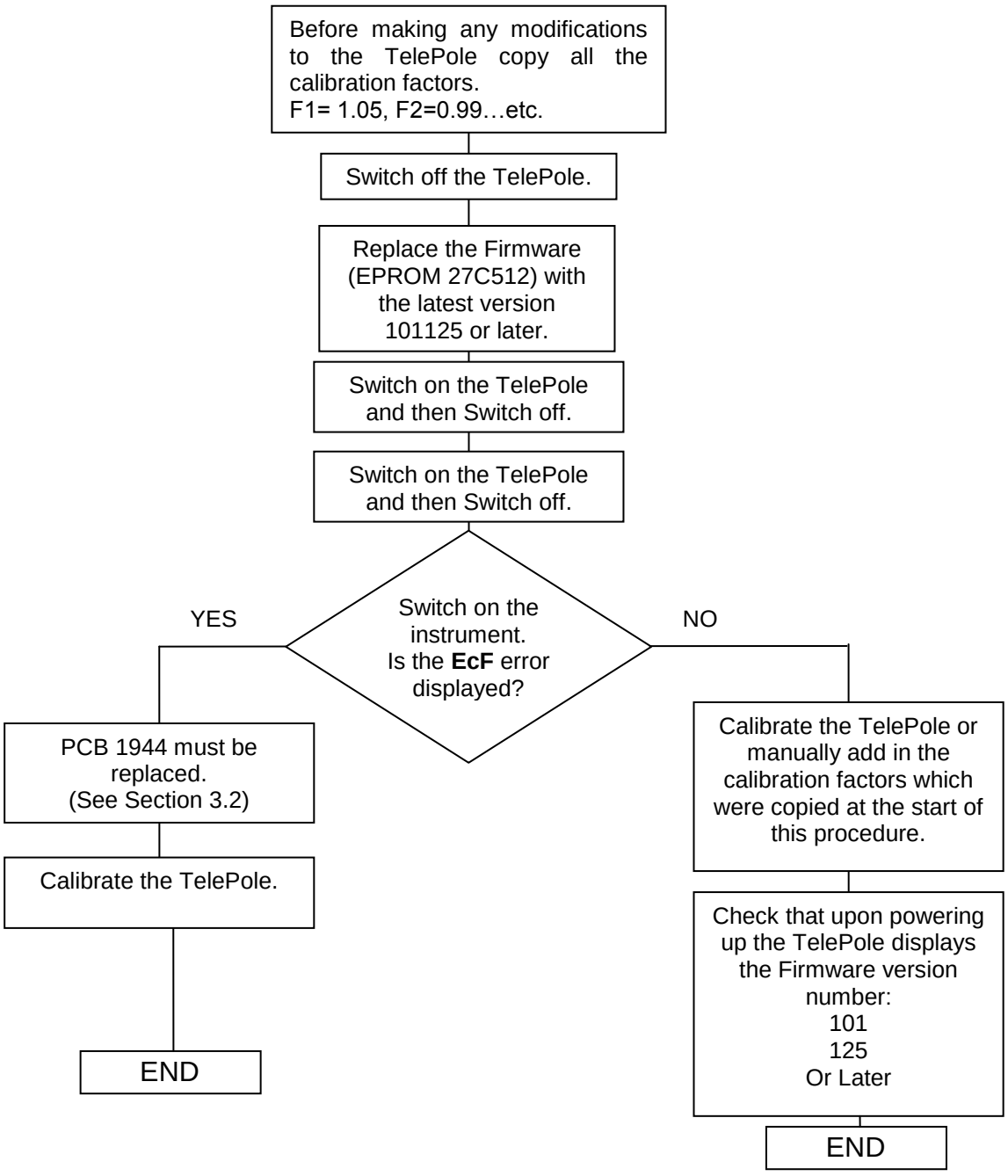
8.6. Meter does not turn off



8.7. Meter parameters are not saved in the internal memory (Hardware Check)



8.8. Meter parameters are not saved in the internal memory (Firmware Check/Replacement)



8.9. Memory Board Viability Check: The viability of the Telepole memory board, specifically the ability to store saved readings and instrument parameters, can be checked at any time using the following procedure.

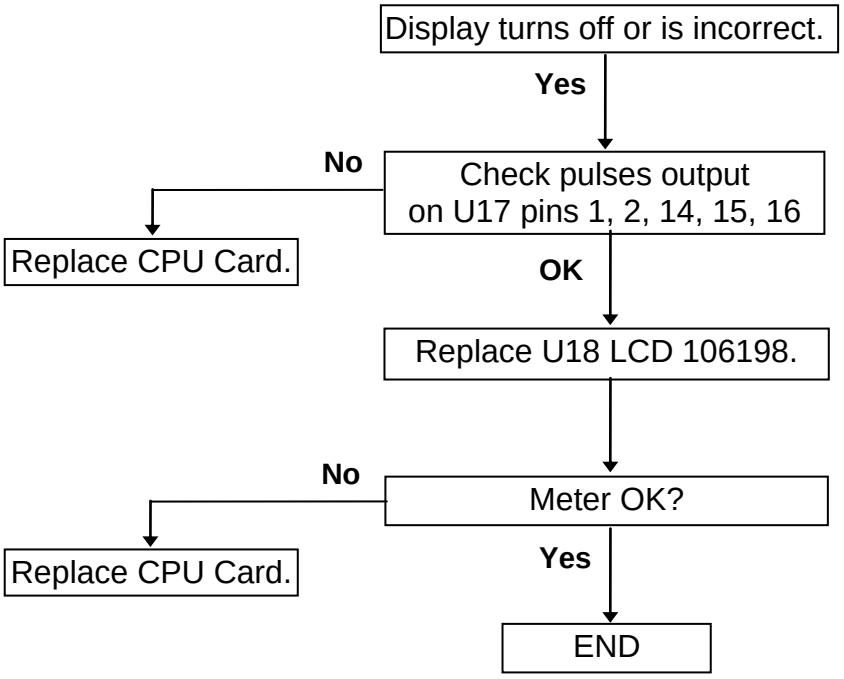
8.9.1. Clear the Telepole stored memory by a press and hold of the B.CODE/RESET button for approximately 10 seconds until the instrument beeps and XXXm is displayed with memory location (XXXm) flashing. While the memory location is flashing, release and press again the B.CODE/RESET, holding the button until the instrument beeps 3 times and memory location of 347m is displayed. Power off the Telepole and wait approximately 15 minutes.

8.9.2. Following the above step, power on the Telepole and let it complete the start-up checks. Press the STORE/LIGHT button and observe the displayed memory location. A memory location of something other than 347m is an indication that the memory board has failed.

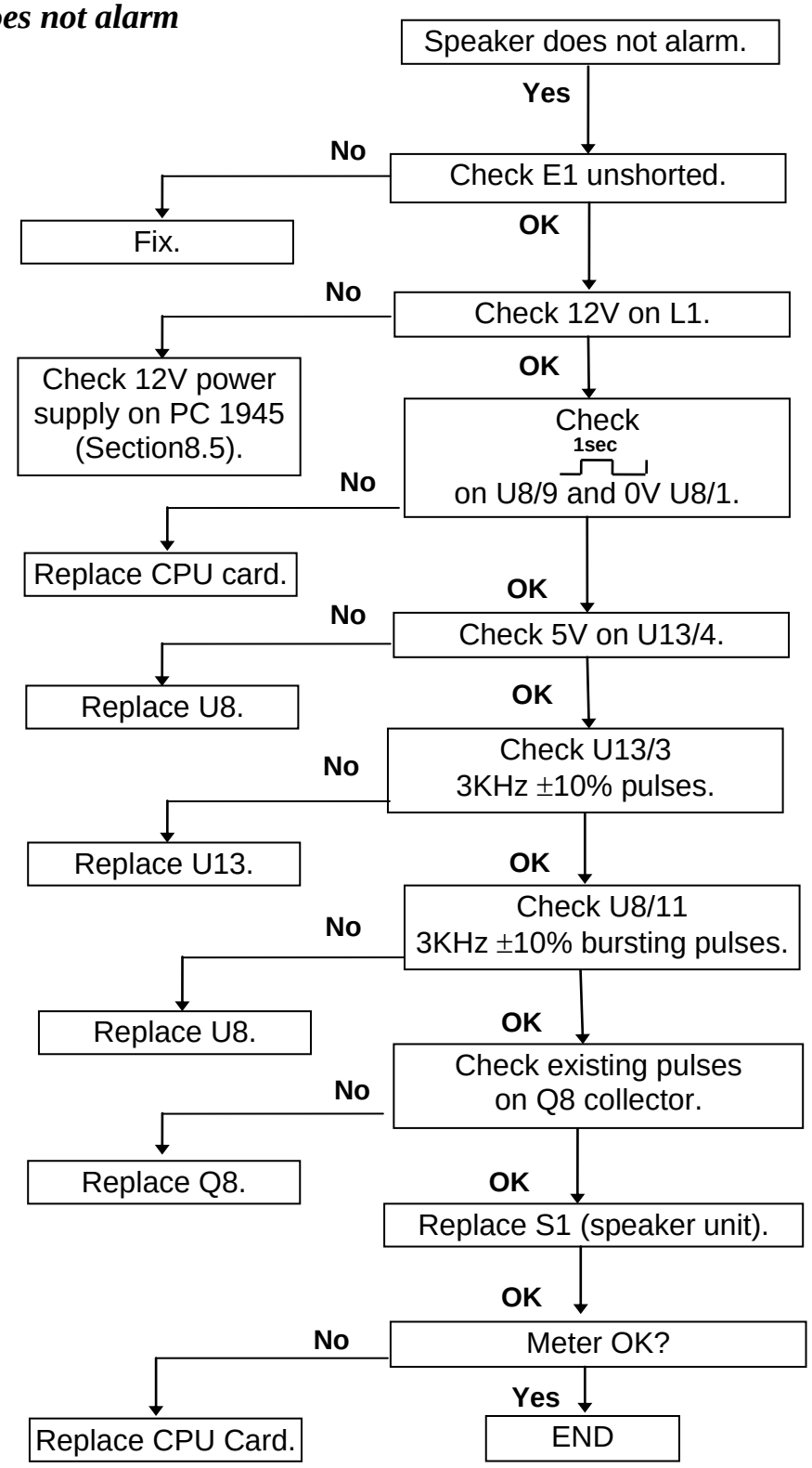
8.9.3. Store additional readings to memory by pressing the STORE/LIGHT button. Each subsequent press of the STORE/LIGHT button should count down the memory locations from 347m…346m…345m and so forth, indicating the memory board is working properly

8.9.4. If the memory board has failed the viability check, remove the instrument from service and replace the memory board, part number RTM-3021.

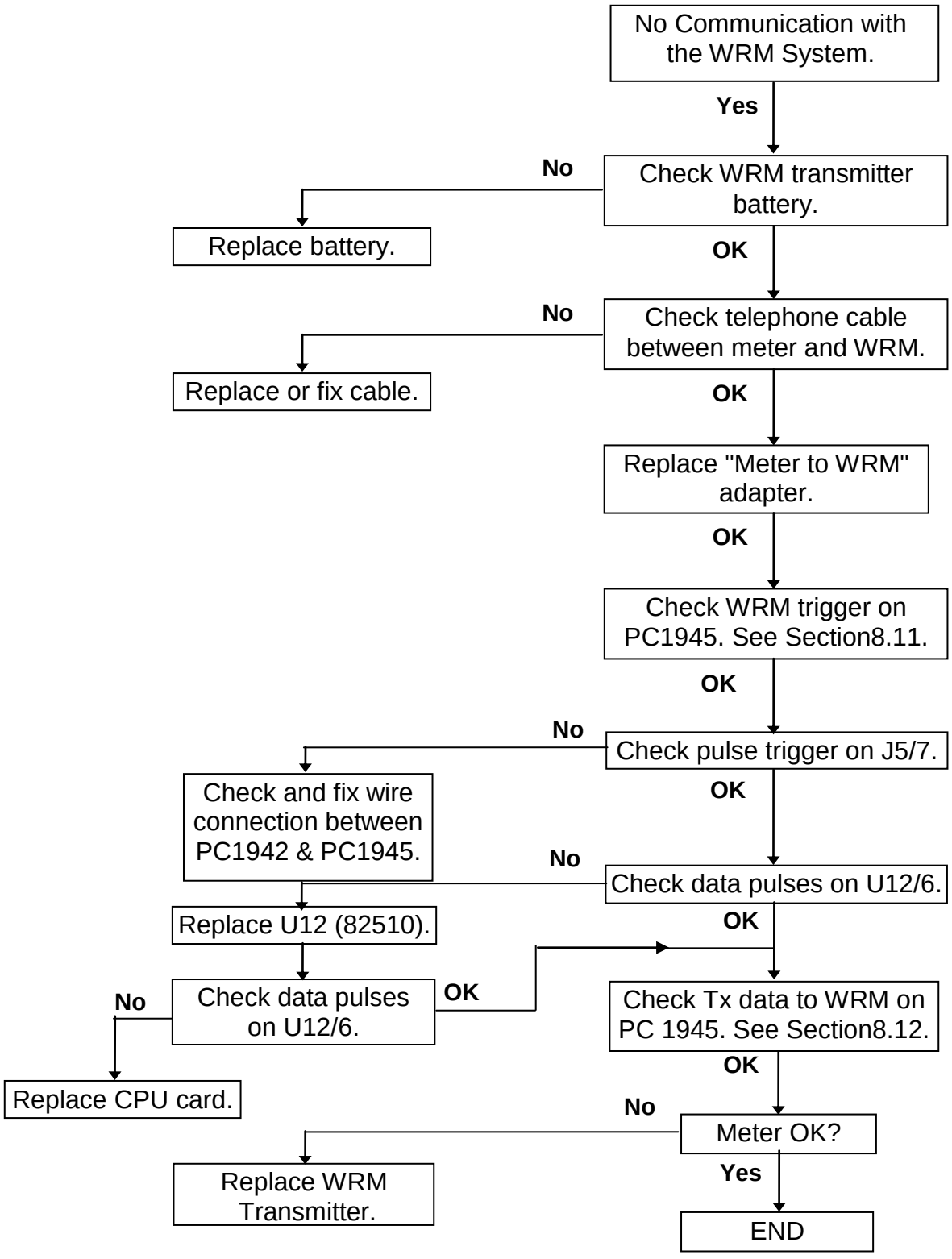
8.10. Display turns off or is incorrect



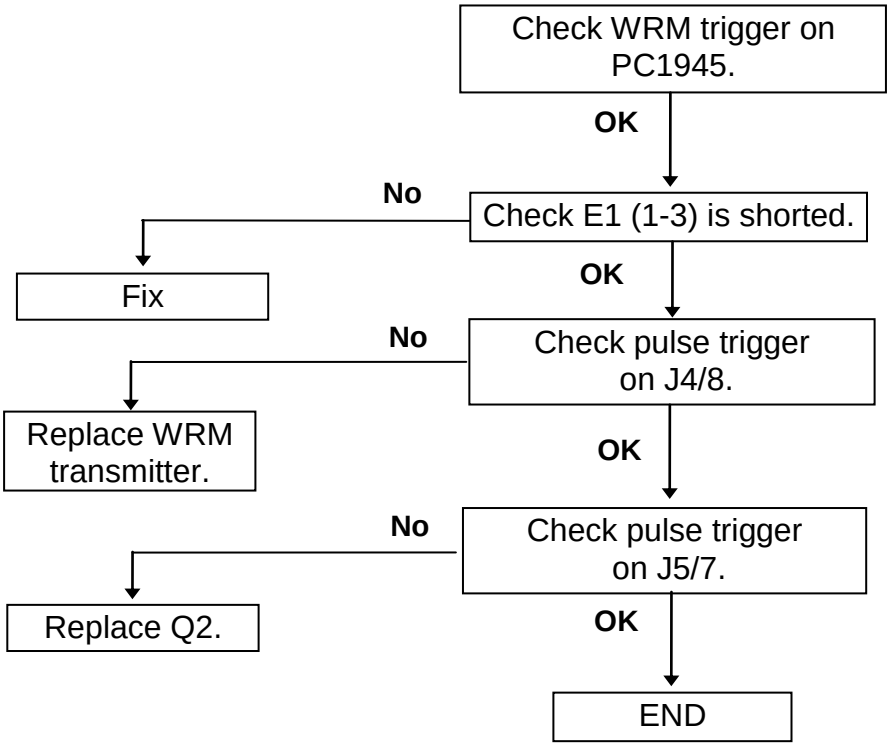
8.11. Speaker does not alarm



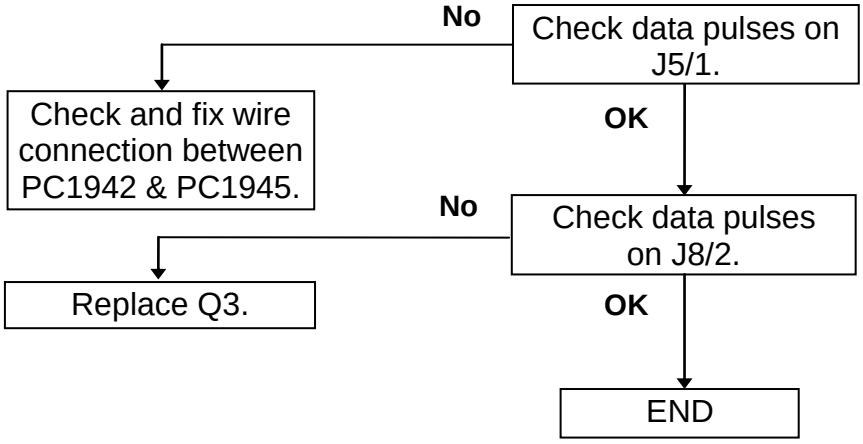
8.12. No communication with the WRM system



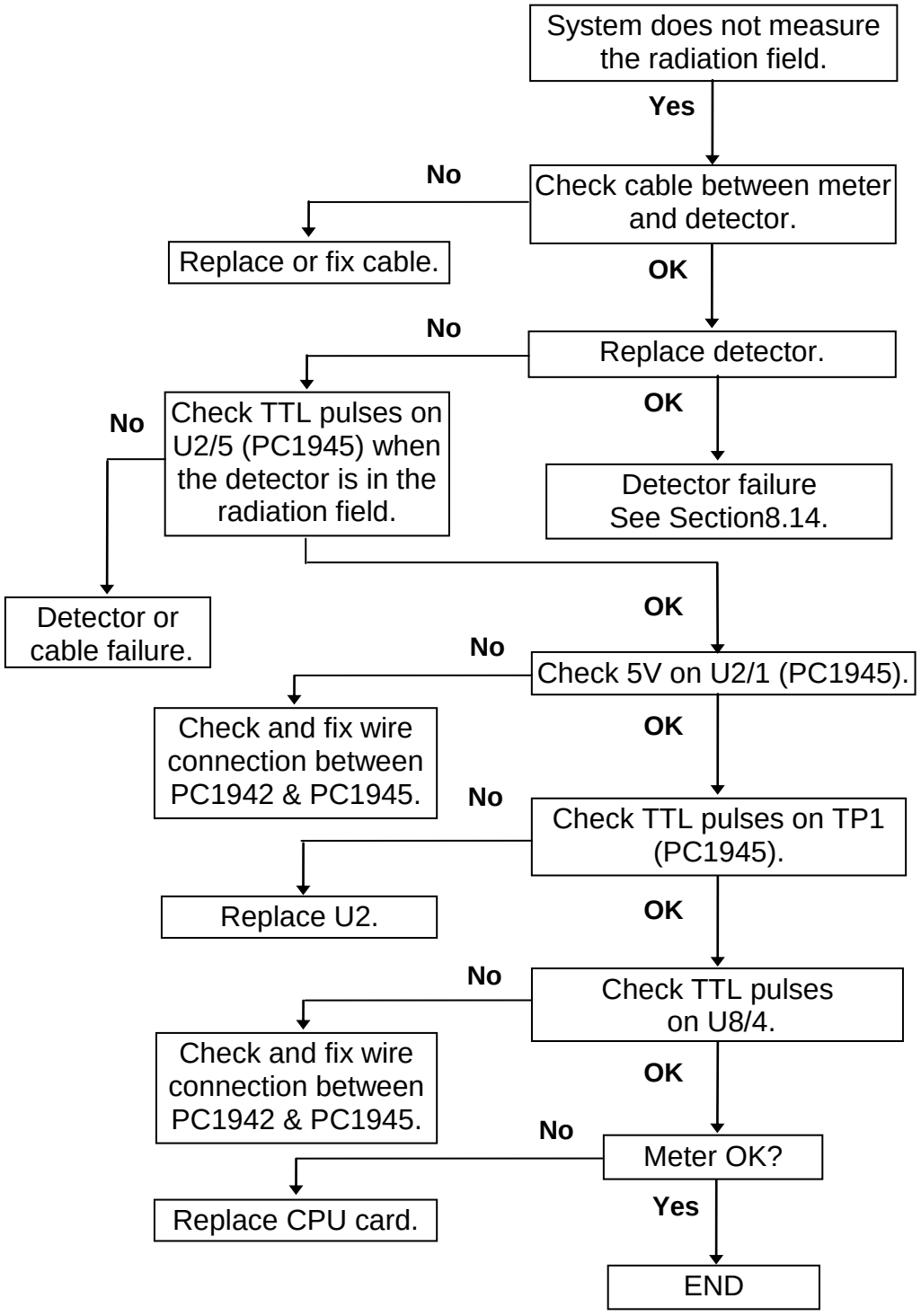
8.13. WRM trigger checking



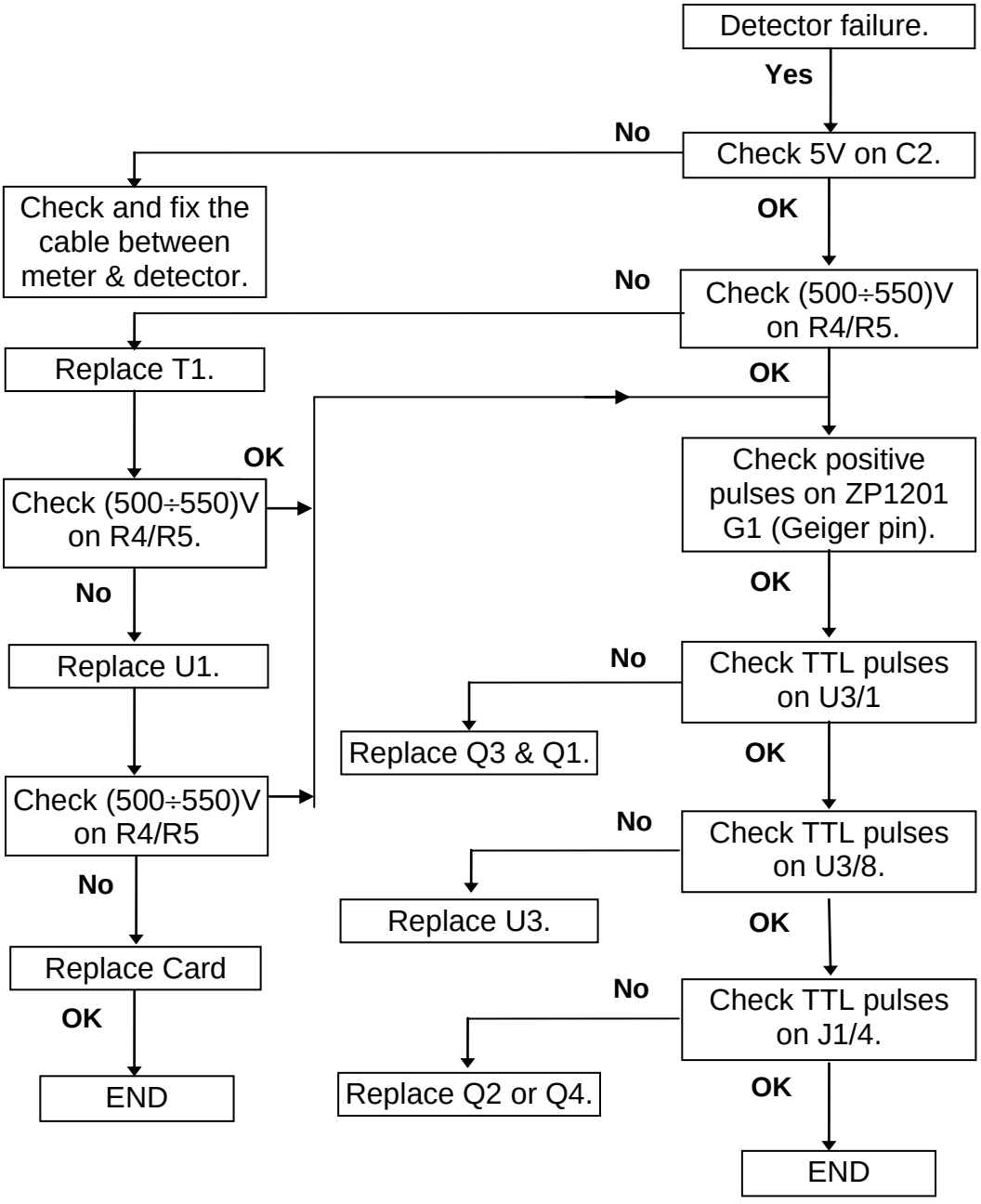
8.14. Check Tx Data to WRM on PC 1945



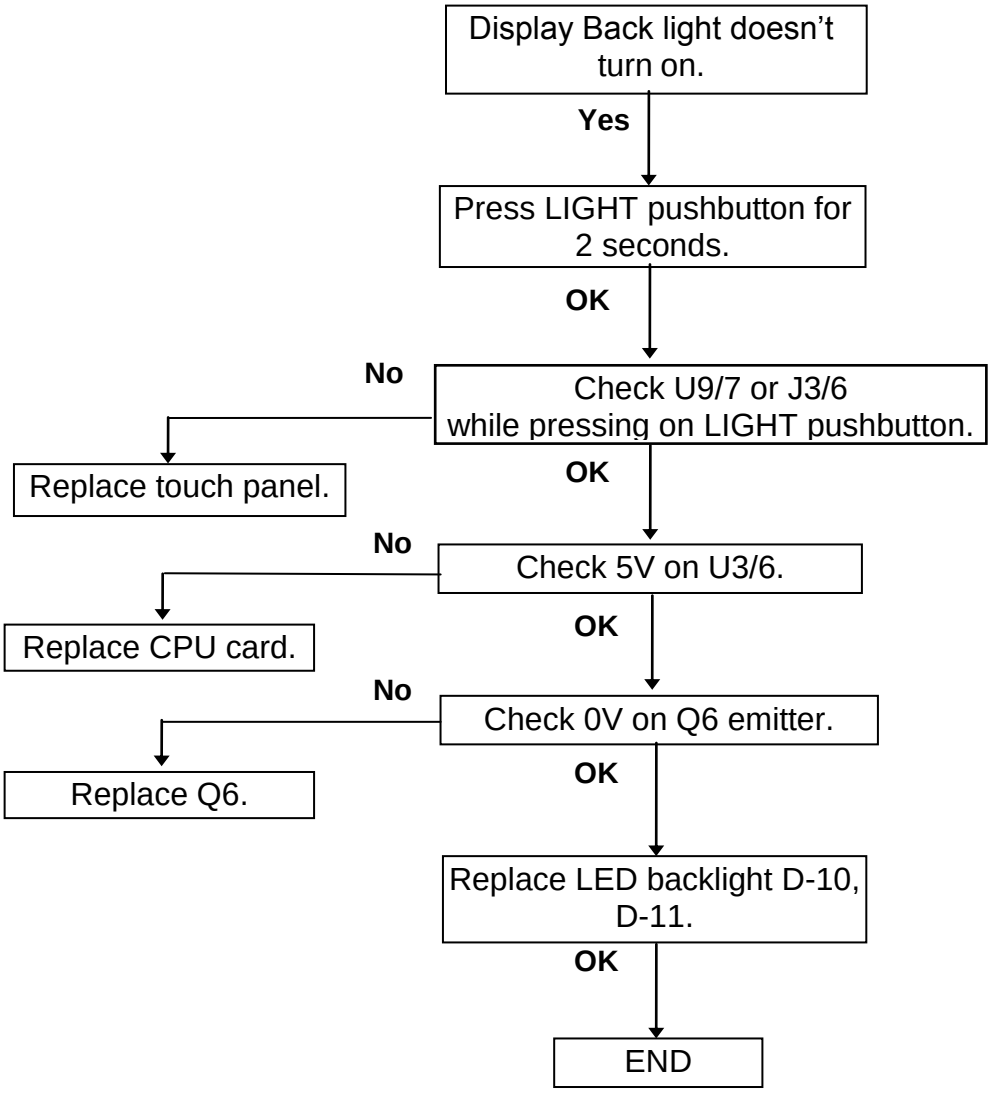
8.15. Instrument does not measure the radiation



8.16. Detector failure (PC 2003)

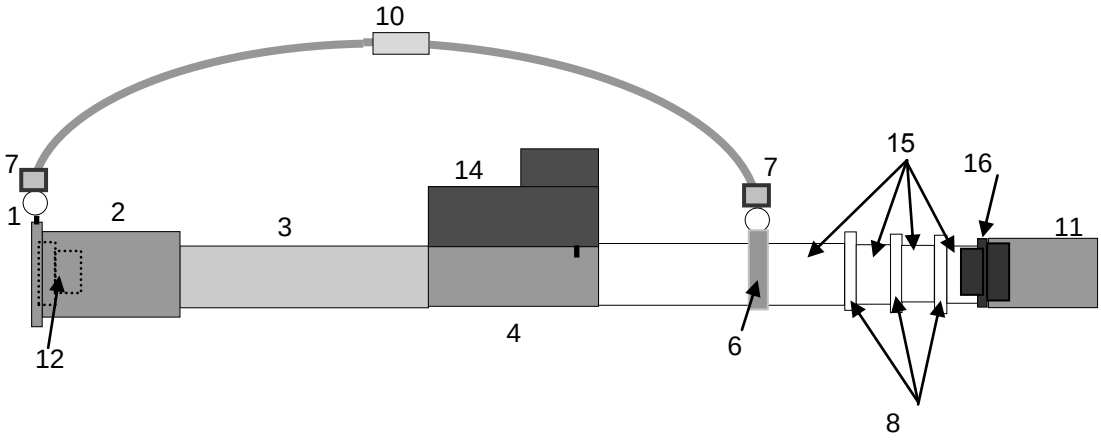


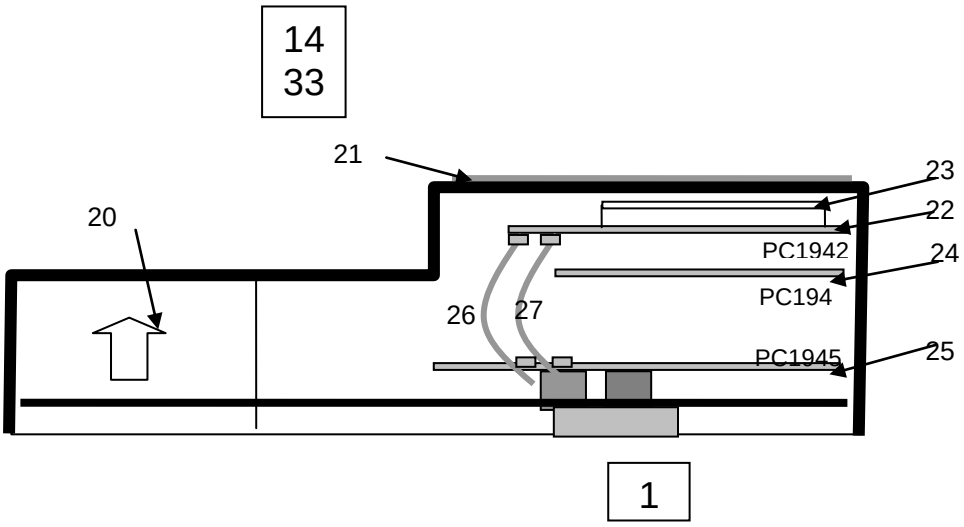
8.17. Display Back Light doesn't turn ON

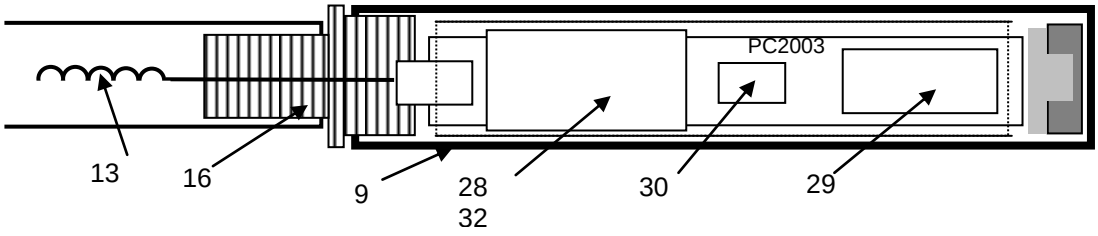


9. Mechanical Instructions

9.1. TelePole WR meter exploded drawing and parts list







TelePole WR Part Numbers

P/N	Part Name	Part #
RTM-9113	Complete TelePole WR	
RTM-3010	Meter bracket & 4 screw	4
RTM-3017	Carrying strap	10
RTM-3013	2 strap clip	7
	Pole assembly	
RTM-3020	Complete pole assembly	
RTM-3014	4 Segment pole with fastening nuts	15
RTM-4037	Collar, aluminum (external) set of 3	8a,8b,8c
RTM-4036	Clutch, plastic (internal), set of 3	8a,8b,8c
RTM-3018	Rear lid (underneath grip)	12
RTM-3008	Grip	2
RTM-3007	Rear strap holder	1
RTM-3009	Heat shrinkable tube	3
RTM-3012	Front strap holder	6
RTM-3050	Pole to Detector adapter & 2 screw	16
RTM-3019	Telephone coiled cable 120 cm(internal)	13
	Meter assembly	
RTM-3046	Complete meter assembly	33
	Mechanical parts	
RTM-3011	Meter case complete without electronics boards	14
RTM-1023	Battery cover	20
	Electronic parts	
RTM-3045	Touch panel	21
RTM-3022	CPU board with LCD	22
RTM-3044	LCD display	23
RTM-3021	Memory board with EPROM	24
RTM-3023	Power supply board	25
RTM-3024	Flat cable 10p	26
RTM-3025	Flat cable 4p	27

	Detector assembly	
RTM-3049	Complete detector assembly	11
RTM-3048	Detector board 2003 with 2 Geiger, rear flange (and 2 screws), damping sponge and mica cover	28
RTM-7000	Detector board 2003 without Geiger	32
RTM-4022	Geiger1201	29
RTM-4035	Geiger1301	30
RTM-3051	Detector sleeve/cover & 3 screws	9
	Telepole Screws	
RTM-3157	Telepole screw, detector board – Used to fasten detector board to end cap. Two (2) screws used per Telepole. Sold as qty. 10.	Not Shown
RTM-3158	Telepole screw, back plate of meter case – Used to fasten back plate of meter case to front of meter case. Four (4) screws used per Telepole. Sold as qty. 10.	Not Shown

RTM-3159	Telepole screw, RS-232 connector – Used to fasten RS-232 port to back plate of meter case. Two (2) screws used per Telepole. Sold as qty. 10.	Not Shown
RTM-3160	Telepole screw, power supply and CPU boards – Used to fasten power supply board to back plate of meter case and CPU board to front of meter case. Eight (8) screws used per Telepole - four for power supply board, four for CPU board. Note: three (3) of these screws are used with RTM-3161 spacers to fasten CPU board to front of meter case. Sold as qty. 10.	Not Shown
RTM-3161	Telepole spacer, CPU board – Used to stand off CPU board from front of meter case. Note: RTM-3160 (qty. 3) are used to fasten CPU board to these spacers. Three (3) spacers used per Telepole. Sold as qty. 10.	Not Shown
RTM-3162	Telepole screw, meter case to pole – Used to fasten meter case to pole. Four (4) screws used per Telepole. Sold as qty. 10.	Not Shown
RTM-3163	Telepole screw, assemblies to pole – Used to fasten detector sleeve to detector base, detector / collar assembly to pole, and instrument base assembly to pole. Six (6) screws used per Telepole - two for detector sleeve to detector base (in conjunction with one RTM-3164), two for detector / collar assembly to pole, two for instrument base assembly to pole. Sold as qty. 10.	Not Shown
RTM-3164	Telepole screw, detector / collar assembly – Used to fasten detector sleeve and detector collar to detector base. One (1) screw used per Telepole. Note: Used in conjunction with RTM-3163 (qty. 2) to complete detector / collar	Not Shown

	assembly. Sold as qty. 10.	
RTM-3165	Telepole screw, collars (tangential) – Used to tighten detector collar and upper strap ring collar on pole. Two (2) screws used per Telepole - one for detector collar, one for upper strap ring collar. Sold as qty. 10.	Not Shown
RTM-3166	Telepole screw, Calibration port – Used to seal calibration port. One (1) screw used per Telepole. Sold as qty. 10	Not Shown

9.2. Preparation for Use

***Note:** See the telescopic pole construction scheme for reference.*

NOTE: The manufacturer recommends that the end user/owner to perform periodic inspections of the telescopic pole, collars, and clutches to ensure proper operational use and safety.

9.2.1. Check the condition of the segments, collars, and clutches (under collars) as follows: Hold the telescopic pole with both hands horizontally. Wear the carrying strap (15) over the head and on the shoulder, one hand holding the pole and the other hand free to adjust the strap to the optimal length. See Figure 8-1.

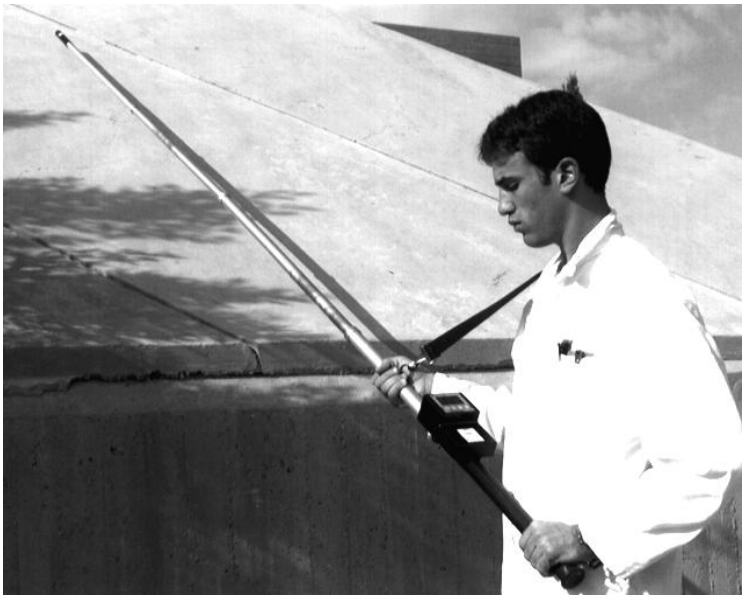


Figure 8-1. Telescopic pole holding

9.2.2. Check the segments' fastening/collar nuts (8: a, b, c) by turning them slightly, to make sure there are no disturbances or wore clutches.

9.2.3. Check the pole segments (9, 10, 11, 12) by extending them all the way out, following the proceeding steps:

9.2.4. Ensure the three fastening nuts (8: a, b, c) are locked.

9.2.5. Loosen nut (8c) by turning it counter-clockwise (looking from the meter side).

9.2.6. Pull segment (12) all the way out.

9.2.7. Tighten nut (8c).

9.2.8. Loosen nut (8b).

9.2.9. Pull segment (11) all the way out.

9.2.10. Tighten the middle nut (8b).

9.2.11. Loosen nut (8a).

9.2.12. Pull segment (10) all the way out.

9.2.13. Tighten nut (8a).

9.2.14. **Ensure that proper tension is on each collar in order for the segments to stay in one position when moving the instrument up and down and side to side with the segments completed extended.**

9.2.15. Now collapse each segment back inwards in the reverse order.

9.3. Detector disassembly (14)

9.3.1. Loosen the three NC 4-40x3/8 Philips flat screws located at the bottom of the detector (14).

9.3.2. Gently pull the detector (14) about two cm out with one hand. Hold the detector cable with the other hand and continue drawing the detector tube out until the connector is visible. Press the connector's plastic clip to disconnect the cable from the detector. Hold the cable end with a clip to prevent it from entering back into the pole.

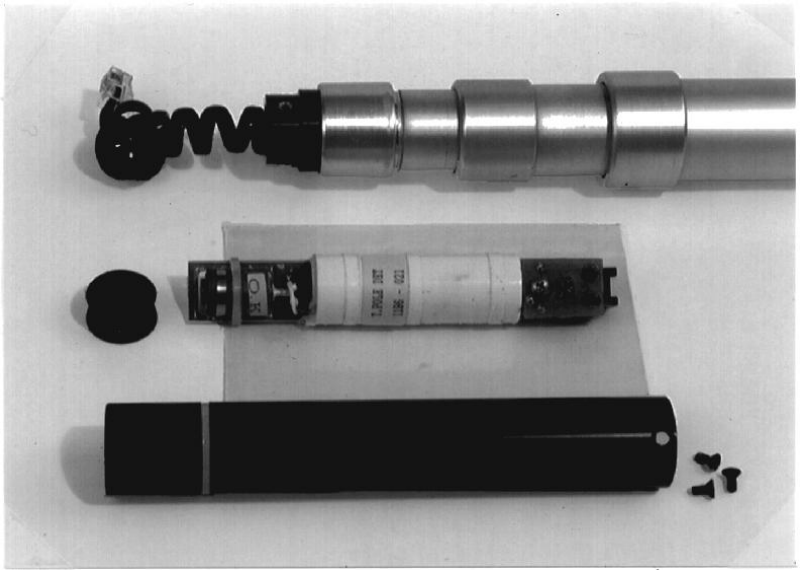


Figure 8-2. Detector disassembly

9.4. Meter disassembly (4, 5)

9.4.1. Disconnect the detector phone cable connector from the meter rear panel by pressing the plastic clip.

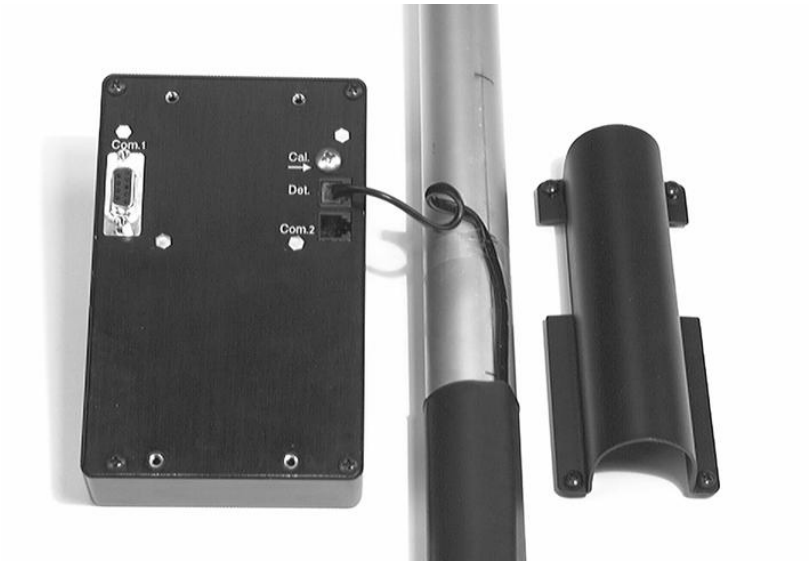


Figure 8-3. Meter disassembly

9.4.2. Loosen the four NC 6-60 Philips screws fastening the meter holder (4) to the meter.

9.4.3. The meter and holder are now detached from the telescopic pole. See Figure 8-3.

9.5. Meter Holder Assembly (4)

9.5.1. Position the meter (5) on a flat and clean surface with the display facing down.

9.5.2. Position the telescopic pole on the meter rear cover.

9.5.3. Position the meter holder (4) on the meter (5) while the cable groove is facing the telephone socket side.

9.5.4. Ensure the cable goes through the inside space created between the meter holder and the meter rear cover.

9.5.5. Attach the meter holder (4) to the heat shrinkable tube (3) and tighten the four screws.

9.6. Detector Assembly (14)

9.6.1. Connect the cable to the detector. Insert the detector (14) back into the pole's end.

9.6.2. Tighten the three NC 4-40 x 3/8 Philips flat screws located on the detector bottom part (14), use lock tight material to secure the screws.

9.7. Pole Segments Assembly

9.7.1. Insert the segments (9, 10, 11, 12) one into the other according to their diameter size, from the largest to the smallest one, while the threads are facing forward in the detector direction.

9.7.2. Insert plastic rings into the two biggest fastening nuts (8a, 8b).

9.7.3. Screw the two fastening nuts (8a, 8b) on the segments (9, 10), in order of their size (first the bigger nut 8a), and then fasten them.

9.7.4. Insert the smallest plastic ring on the last segment (12), push the ring backwards, next to the thread of segment (11).

9.7.5. Insert the third nut (8c) and screw it on segment (11).

9.8. Pole Segments Disassembly

9.8.1. Perform the steps in Section8.7 in the reverse order. Telescopic Pole Troubleshooting Table

Symptom	Probable Cause	Required Action
Segments are stuck and the pole doesn't extend.	Superficial damage, crushed, (squeeze) segments and / or adjusting nuts.	Visually inspect segments and/or nuts for external damages. Replace damaged parts.
	Cable is caught inside the segments.	Shake the pole up and down to release the cable. Remove any foreign debris from the sections.
	Sand or chips of dirt caught inside, between the segments.	
After extending out the segments, they cannot be retrieved back.	Squeezing or bending of the segments and/or adjusting nuts.	Replace telescopic pole.
	Fastening nuts are stuck.	Loosen the nut and remove it to inspect visually. If the plastic ring underneath is damaged, replace it.
	Cable is caught inside the pole.	Disassemble the detector. Disconnect the cable and pull it in and out several times to release it, at the same time, extend and collapse the segments several times.
Cable damage.	Instrument stored with the telescopic pole extended for a long period. Cable loses flexibility.	Store the instrument with the telescopic pole collapsed.

Appendix 1

Generic TelePole Calibration

1. It is possible to set/change **all** the factors **outside** the radiation chamber.
2. When the radiation field is **lower than 10 mR/h**, it is possible to change **all** the factors.
3. When in the calibration mode and the external radiation field is lower than 10 mR/h, pressing the MODE push-button can switch between the different factors.
4. Suggested procedure:

   4.1 Carefully turn the internal switch to the calibration position located on the back of the meter housing.

   4.2 Press the MODE push-button twice to enter the calibration mode.

   4.3 Expose the TelePole to a radiation field of 10 - 100mR/h. The meter will be automatically set to factor F1. Now the factor can be changed either by pressing the RESET or LIGHT push-button or taking the meter outside the radiation chamber and adjust the factor F1. Note the final F1 factor.

   4.4 Expose the TelePole to a radiation field of 500 – 1500 mR/h. The meter will be automatically set to factor F2. Now the factor can be changed either by pressing the RESET or LIGHT push-button or taking the meter outside the radiation chamber, the radiation field should be lower than 10 mR/h. Notice if the current displayed radiation factor is F2. If the factor is not F2 press the MODE push-button to switch to F2. Adjust F2 by pressing the RESET or LIGHT push-button. Note the final F2 factor.

   4.5 Expose the TelePole to a radiation field of 1500 – 3000 mR/h. The meter will be automatically set to factor F3. Now the factor can be changed either by pressing the RESET or LIGHT push-button or taking the meter outside the radiation chamber, the radiation field should be lower than 10 mR/h. Notice if the current displayed radiation factor is F3. If the factor is not F3 press the MODE push-button to switch to F3. Adjust F3 by pressing the RESET or LIGHT push-button. Note the final F3 factor.

   4.6 Expose the TelePole to a radiation field of –100 - 300 R/h. The meter will be automatically set to factor F4. Now the factor can be changed either by pressing the RESET or LIGHT push-button or taking the meter outside the radiation chamber, the radiation field shold be lower than 10 mR/h. Notice if the current displayed radiation factor is F4. If the factor is not F4 press the MODE push-button to switch to F4. Adjust F4 by pressing the RESET or LIGHT push-button. Note the final F4 factor.

   4.7 Expose the TelePole to a radiation field of 400 - 1000 R/h. The meter will be automatically set to factor F5. Now the factor can be changed either by pressing the RESET or LIGHT push-button, or taking the meter outside the radiation chamber, the radiation field should be lower than 10 mR/h. Notice if the current displayed radiation

factor is F5. If the factor is not F5 press the MODE push-button to switch to F5. Adjust F5 by pressing the RESET or LIGHT push-button. Note the final F5 factor.

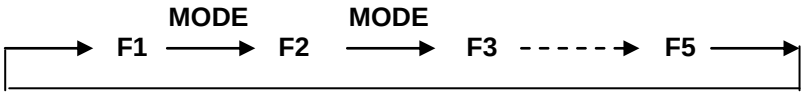
NOTE: Changing the internal switch to operating position stores the calibration factors. If the meter is turned off prior to changing the internal switch position, THE CALIBRATION FACTORS WILL NOT BE SAVED!

4.8 Place unit back to normal operating mode utilizing dip switch.

4.9 Power the telepole off and back on and verify the F factor that are displayed upon startup match the as left F factors set during calibration

4.10 Perform Linearity check on instrument after calibration. Typically 1 point per decade is sufficient.

5. When adjusting F2, F3, F4, F5, and the TelePole is taken out of the radiation chamber, it can either remain at the current factor or switch back to F1, depending upon the radiation field falling speed. If the meter switches to F1, press the MODE push-button to switch to the current factor, each press will precede the factor to the next factor.



Appendix 2

Rotem Meter View Software (RMV)

Preface

Rotem **M**eter **V**iew Software (RMV) is a WINDOWS based program, used to download ROTEM's meters measurements to a PC. Meters included are: RAM ION, TelePole, DRMs, AMPS and RAM DA-2000.
Communication between the meter and the PC can be performed in two modes:
On-Line - The meter downloads the measured data into the PC at intervals time set by the user.
Off-Line - Data is stored in the meter (up to 347 strings) and then downloaded into the PC.

Required Equipment

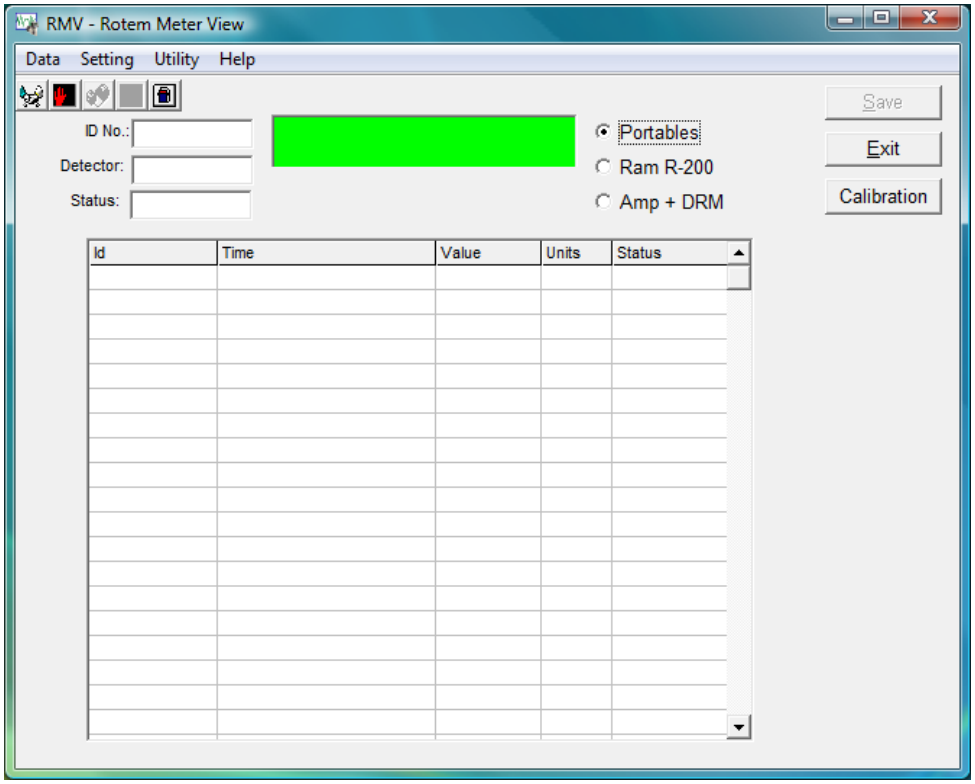
PC based WINDOWS 2000/XP/Vista/W7 and RS-232 communication port.
Mirion's customized communication cable (Part number RTM-6001).
Download Meter View from the Mirion Technologies web site www.mirion-hp.com.

Software Installation

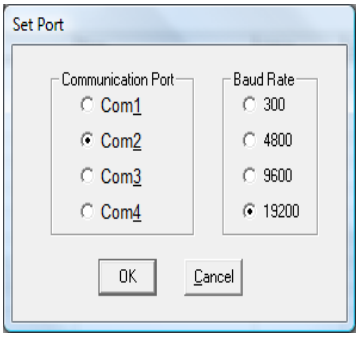
Insert the CD into the CD drive. Select Start, then run and select the setup.exe file.

Operating Instructions

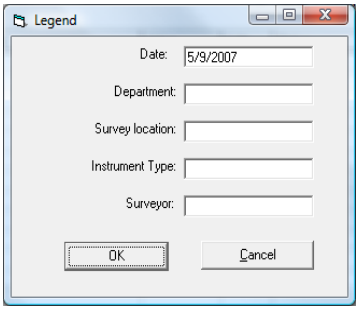
1. Connect one of ROTEM's meters to the PC via RS-232 communication port, by the customized communication cable.
2. Start the Meter View software.



3. Select ‘Setting’ to set the Communication Port.



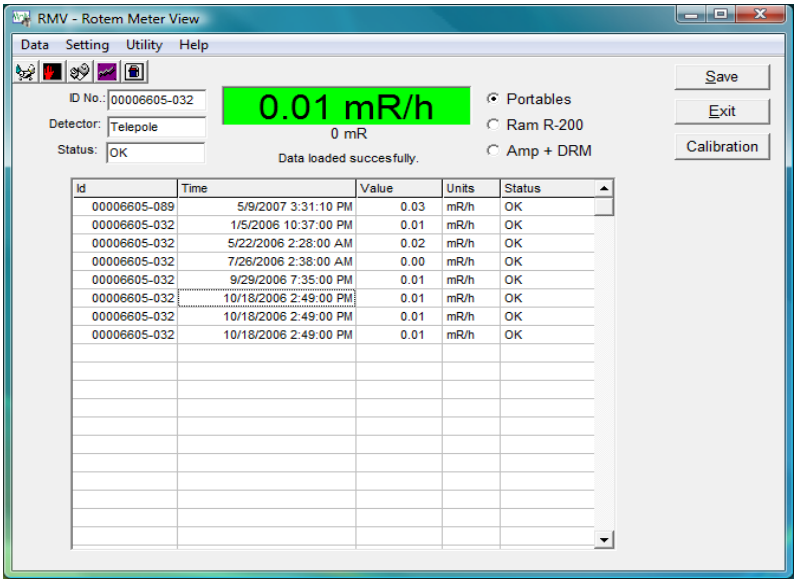
4. Select Get legend to fill the legend parameters.



Data Download to PC

Off Line

1. Store the ID location in the meter by a short press on the SPEAKER push-button.
2. Store the measurements and date in the meter by a short press on the LIGHT push-button.
3. Select 'Data' "Get offline data' to download the meter's data.



In the displayed table notice that:
When an asterisk (*) appears on the **Over Thr.** column, it indicates a reading higher than threshold setting.
The **Status** column indicates threshold or failure alarms.

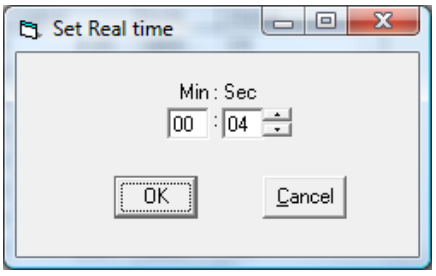
Bytes status description:

		32	16	8	4	2	1
		OFLO dose	OFLO rate	Over thr. rate	Over thr. dose	Detector fail	Low battery

For example:
Status = 1 - low battery
Status = 8 - over threshold rate
Status = 9 - low battery and over threshold rate

On-Line

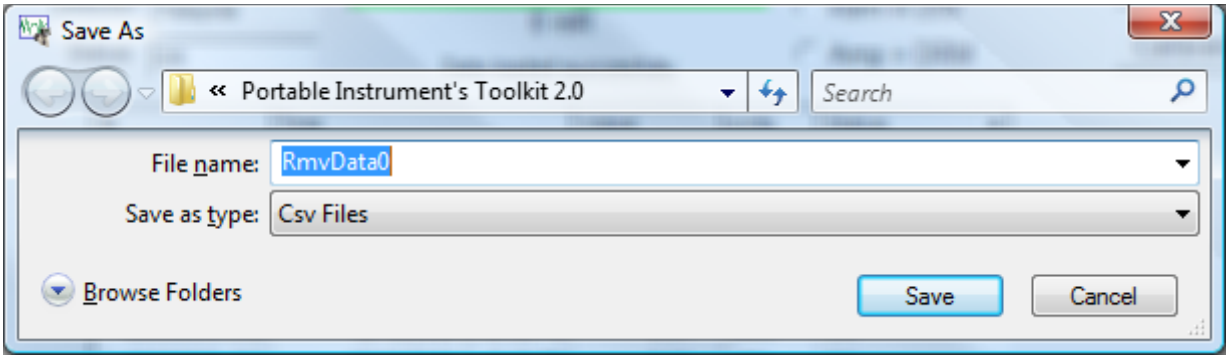
1. Select '**Set Interval'** for WRM2 Radio.



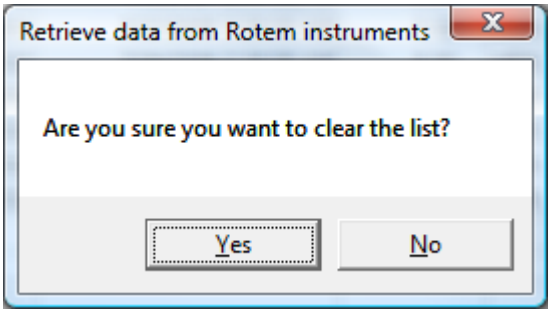
2. Select **Start**, the meter downloads the data into the PC at intervals time set by the user. The **Start** icon is replaced by the **Stop** icon.
   Note: When software is in the on-line mode, the **Get Data** icon is blocked since it belongs to the **off-line** mode.
3. To exit of the **on-line** mode select the **Stop** icon (green color). The **Start** icon (orange color) is displayed on the Meter View window.

General Functions

1. To save the data file select the **Save** icon and type the **File Name**. The saved data file can be opened using MS NotePad or Spreadsheet software.



2. Select the **Clear** icon to clear the screen after saving the file.



3. To set the correct time and date to the TelePole select 'Utility' and then Send Time.

Appendix 3

TelePole WR - List of Electronic Drawings

Available Upon Request

DRW #12850-45-00 - Ver. 2.1 - CPU - DigiLog, PC #2203
DRW #12850-41-00 - Ver. 2.3 - CPU - DigiLog Extension Card, PC #1944
DRW #12850-42-00 - Ver. 4.0 – TelePole, Power Supply, PC #1945
DRW #12852-42-00 - Ver. 1.0 – TelePole WR, GM Detector, PC #2196
DRW #12852-50-00 - Ver. 1.0 – TelePole WR, Wiring Diagram

TelePole Wide Range Operating and Maintenance Manual

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