# ROTEM'S New Protocol Structure

- A new GUI software will be writing for the new protocol
- The mode of operation would be as follows: only the master initiates transmission, and after each write command, there will be a read command to verify the changes
- All information will be in **ASCII**.
- If the string received, doesn't starts with 0A or doesn't ends with 0D, this command must be ignored
- First device to support the protocol would be Telepole i2 followed by RI-02
- When there is multiple data to be send, it would be separated by comma '**,**'
- Empty field must be equal to 0 (30H) not empty (null)
- 0xA = CTRL+J = "\n" | 0xD = CTRL+M = "\r"

**Command Structure**

| **Op Code** | **Index** | **Action** |
|---|---|---|
| Byte | Byte | Byte |
| A-Z,a-z | a-z,A-Z | 1-9 |

Start Trans. New Struc. End Trans.

| **0xA** | **#** | **Header** | **Command** | **Data** | **0xD** |
|---|---|---|---|---|---|
| Byte | Byte | | | | Byte |

| **Bit Flags** | **Device Info & Address** |
|---|---|
| Byte | **,**XX,XX,XX |

Actions

| | |
|---|---|
| 1 | Read |
| 2 | Write |
| 3 | Start |
| 4 | Stop |
| | |
| 9 | Response |

Bit Flags

| **Bit** | **Name** |
|---|---|
| **1** | **Device Info** |
| 2 | TCP Address |
| 3 | GPS Address |
| 4 | User Address |
| 5-8 | Open |

Device Info

| **Data** | **Name** |
|---|---|
| 0 | Meter |
| 1 | DRM-3000 Ext. DET #1 |
| 2 | DRM-3000 Ext. DET #2 |
| 3 | DRM-3000 Ext. DET #3 |
| 4 | DRM-3000 AUX (4-20) |

When **Index** is equals to **0** then all Category Data is sent within the Data String

| Category | Op Code | Index | Filed Name | Example |
|---|---|---|---|---|
| Device ID | A | a | Meter Name & Type | 101 [Telepole i2 WR Det] |
| | | b | Firmware Version | 1.01 (x4 Chars) |
| | | c | Serial Number [10] | 428015-001 (x10 Chars) |
| | | d | Com. Serial Number [6] | 994156 (x6 Chars) |
| | | e | Measuring Units | Refer to Table 2 |
| | | | | |
| Current Reading | B | a | Rate (-background) | 55.4 |
| | | b | Background | 0 |
| | | c | Counts (cps) | 23 |
| | | d | Dose | 55.4 |
| | | e | Status | Table 2 |
| | | f | Store Count/Data | 126 |
| | | g | Store Delete | [No Data] |
| | | h | Dose Delete | [No Data] |
| | | i | Windows [1-5] | 24,62,27,278,2 |
| | | | | |
| Factors | C | a | Current Factor | 2 |
| | | b | Factor #1 | 1.01 |
| | | c | Factor #2 | 1.4 |
| | | d | Factor #3 | 0.99 |
| | | e | Factor #4 | 1.2 |
| | | f | Factor #5 | 0.84 |
| | | **0** | (Can be read only with 0) | |
| Binary Options | D | a | Dose | 0/1 (LSB) |
| | | b | Latch | 0/1 |
| | | c | Upper LED | 0/1 |
| | | d | Upper Buzzer | 0/1 |
| | | e | Interlock (Relay) | 0/1 |
| | | f | Sleep Mode | 0/1 |
| | | g | Light | 0/1 |
| | | h | Speaker | 0/1 (MSB) |
| | | | | |
| Time Value Interval | E | a | Rate Interval (x1 Sec) | (Range 1-999) |
| | | b | Over threshold Interval (x1 Sec) | (Range 1-999) |
| | | c | Counts Interval (x100ms) | 2 for 200 mSec |
| | | d | Reset Dose Interval | 24 (Hours) – (0 = None) |
| | | | | |
| Thresholds | F | a | Thresholds #1 (Green to Yellow) | 0.5 |
| | | b | Thresholds #2 (Yellow to Red) | 55 |
| | | c | User Threshold | 105 |
| | | d | Dose Threshold | 1300 |
| | | e | High background threshold | 50 |

| | | |
|---|---|---|
| | New Protocol | Date: 07/10/2019 |
| | | Edition: 019 |
| | RD-4-03-001 | Page 3 Out 7 |

| | | | | |
|---|---|---|---|---|
| Cal Data | G | a | Calibrator Name | Dima Shmid (x16 Chars) |
| | | b | Calibration Date | 06.09.15 (Sep 06) |
| | | c | Calibrate Due Date | 06.09.16 (Sep 06) |
| | | | | |
| Time | H | a | Current Time + Date | 06.09.15,12:20:01 |
| | | b | Next Time Reset Dose | 02.01.18,08:05:01 |
| | | 0 | (Can be read only with 0) | |
| Tables | I | a | Temperature Compensation (x6) | -20,-10,5,23,33,51 |
| | | b | Bias Voltage Compensation (x6) | -139,-111,-48,0,41,116 |
| | | c | Current Thresholds (x6) | 180,187,200,210,225,240 |
| | | d | Dead Time Correction (x8) | 1,1,1.02,1.03,1.175,1.5,3.3 |
| | | | | |
| Saved Reading | J | a | Index | 10 |
| | | b | Date | 06.09.15,12:20:01 |
| | | c | Rate | 55 |
| | | d | Dose | 33 |
| | | e | Status | Table 2 |
| | | | | |
| Environmental | K | a | Temp | 25 |
| | | b | Humidity | 12 |
| | | c | Pressure | 1 |
| | | | | |
| Sample | L | a | Battery Voltage | 3000 (mV) |
| | | b | 3.3 Voltage | 3320 (mV) |
| | | c | 5 Voltage | 5025 (mV) |
| | | d | High Voltage | 1240 (mV) |
| | | | | (Separate with ,) |
| Push Button Menu | M | 1 | Freeze | 1 |
| | | 2 | Speaker | 2 |
| | | 3 | Led**1** | 3 |
| | | 4 | Graph | 4 |
| | | 5 | Threshold | 5 |
| | | 6 | Range | 6 |
| | | 7 | Dose | 7 |
| | | 8 | Internal Detector | 8 |
| | | 9 | Zigbee/Bluetooth | 9 |
| | | 10 | Backlight | 10 |
| | | 11 | Sleep | 11 |
| | | 12 | (Empty Space) | 12 |
| | | 13 | Store | 13 |
| | | 14 | Analog Graph | 14 |
| | | 15 | Calibration (Through Meter) | 15 |
| | | 0 | (Can be read only with 0) | |
| | | a | Download | 0/1 (LSB) |

| | | | | |
|---|---|---|---|---|
| Loader | N | b | Upload | 0/1 |
| | | c | Execute software | 0/1 |
| | | 0 | (Can be read only with 0) | |
| Current Range | O | a | **W**ide **R**ange | 0/1 (LSB) |
| | | b | **L**ow **R**ange | 0/1 |
| | | C | **H**igh **R**ange | 0/1 |
| | | 0 | | |
| WRM | P | a | WRM Detector Transmission | Table 3 |
| | | | | |
| Boot Setup | Q | a | Backlight level | Range [0-3] |
| | | b | Sound Level | Range [0-4] |
| | | | | |
| Built In Test (DRM-3000) | R | a | Detector Identification (Interconnection + A,B,C) | Table 4 |
| | | b | Binary Outputs(read+write) | Table 5 |
| | | c | H.V Sample | 1.25 (V) |
| | | d | Detector Rate | 10126 |
| | | e | Ext. det. communication | 2 Chars |
| | | | | |
| Stack Monitoring Settings | S | a | Discriminator #1 | 0-1023 |
| | | b | Discriminator #2 | 0-1023 |
| | | c | Discriminator #3 | 0-1023 |
| | | d | Discriminator #4 | 0-1023 |
| | | e | Discriminator #5 | 0-1023 |
| | | f | Bias Voltage @ 25C (DAC) | 0-1023 |
| | | g | Amplifier EPOT | 0-127 |
| | | | | |
| Stack Monitoring Readings | T | a | Window #1 | 0-65535 |
| | | b | Window #2 | 0-65535 |
| | | c | Window #3 | 0-65535 |
| | | d | Window #4 | 0-65535 |
| | | e | Window #5 | 0-65535 |
| | | f | PM-11 Reading | 0-65535 |
| | | g | Flow Meter Reading | 0-65535 |
| | | h | Current Bias Voltage | 0-1023 |
| | | i | Current Temp (C) (A/D) | (-20C)-50C |
| | | | | |
| Background Parameters | U | a | Averaging factor | 1000 |
| | | b | Initial background duration (sec) | 100 |
| | | | (Can be read only with 0) | |
| DRM Configuration | V | a | Remote detectors IP | 127.0.0.1:2, 10.0.0.14:4… |
| | | b | IP camera URL | https://10.0.0.95:/... |
| | | c | Selectable detector names | AMP, Ext.GM, DRM… |
| | | d | Password | 2213 (Table 6) |

- Meter Type / Detector Type

| | Meter Code | Meter Type | | External Detector Type | |
|---|---|---|---|---|---|
| 1 | Telepole II | 0 | No Meter | 0 | No Ext. Detector |
| | | 1 | Meter W/O Internal Det. | 1 | W.R Detector |
| | | 2 | Meter With In. L.R Det. | 2 | VHR Detector |
| | | 3 | Meter With In. H.R Det. | 3 | Betta Detector |
| | | 4 | Meter With Ex. PM-33 | 4 | XDS Detector |
| | | 5 | Meter With Berthold | | |
| | | | | | |
| 2 | DRM-3000 | 0 | No Meter (Only Det. Info) | 0 | No Ext. Detector |
| | | 1 | Meter W/O Internal Det. | 1 | Flow Meter |
| | | 2 | Meter With In.W.R Det. | 2 | DRM-2E |
| | | 3 | Meter With In. L.R Det. | 3 | AMP-50 |
| | | 4 | Meter With In. H.R Det. | 4 | AMP-100 |
| | | | | 5 | AMP-200 |
| | | | | 6 | AMP-300 |
| | | | | 7 | GM-40 |
| | | | | 8 | GM-41 |
| | | | | 9 | GM-42 |
| | | | | a | DRM-2E Smart Detector |
| | | | | b | PM-11M |
| | | | | c | GM-10 |
| | | | | d | 4-20 devices |
| | | | | | |
| 3 | DPU-3 | 0 | No Meter (Only Det. Info) | 0 | No Ext. Detector |
| | | 1 | Meter W/O Internal Det. | 1 | Flow Meter |
| | | 2 | Meter With In. W.R Det. | 2 | DRM-2E |
| | | | | 3 | AMP-50 |
| | | | | 4 | AMP-100 |
| | | | | 5 | AMP-200 |
| | | | | 6 | AMP-300 |
| | | | | 7 | GM-40 |
| | | | | 8 | GM-41 |
| | | | | 9 | GM-42 |
| | | | | a | Telepole WR |
| | | | | b | PM-11M |
| | | | | c | GM-10 |
| | | | | d | 4-20 devices |
| | | | | | |
| 4 | Stack Monitoring | 0 | No Meter | 0 | PM11 with windows |
| | | | | 1 | Flow Meter |
| | | | | 2 | GM detector |
| | | | | 3 | |

Examples:
101 – External W.R Detector
112 – Meter W/O internal Det. With External VHR Detector
121 – Meter with Internal LR Detector with External W.R Detector

## Table 1

- Measuring unit (x1 Byte)
  - 31H (‘1’) – mR/h
  - 32H (‘2’) – uSv/h
  - 33H (‘3’) – uR/h
  - 34H (‘4’) - CPS
  - 35H (‘5’) - CPM
  - 36H (‘6’) - Bq
  - 37H (‘7’) – mCi
  - 38H (‘8’) - dpm
  - 39H (‘9’) - dps
  - 40H (‘a’) – m/s
  - 41H (‘b’) - mA

## Table 2

- Status Byte explanation

| | | | |
|---|---|---|---|
| Status | a | Rate Overflow | 0/1 (LSB) |
| | b | Over Threshold | 0/1 |
| | c | High Background | 0/1 |
| | d | Low H.V | 0/1 |
| | e | Low Background | 0/1 |
| | f | Low Detector Fault | 0/1 |
| | g | High Detector Fault | 0/1 |
| | h | No External Detector detected | 0/1 |
| | i | WRM not mounted | 0/1 |
| | j | Voltage (Battery) Low | 0/1 |

| **Byte #2** | | | | | | | | **Byte #1** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | k | j | i | h | g | f | e | d | c | b | a |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 |

Status with High Background (c=1), Low H.V (d=1), High Detector Fault (g=1) would be presents as:

| Byte #1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| h | g | f | e | d | c | b | a |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 4 | | | | C | | | |

Status is always 4 bytes length

0A # 30 I 0 39, 30 30 34 43,0D

## Table 3

| Op Code | Index | Value | Meaning |
|---|---|---|---|
| P | a | 31H | WRM Dual Packet (New Protocol) |
| P | a | 32H | WRM Single Packet – Only External Detector (Old Protocol) |

## Table 4

| Byte | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | C | B | A | Inter_CON#4 | Inter_CON#3 | Inter_CON#2 | Inter_CON#1 |
| 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 |

## Table 5

| Byte#1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | H.V Enable | Range Selection | Signal/Factor Selection |
| 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 |

## Table 6

| **Password number** | 1 | 2 | 3 |
|---|---|---|---|
| **Correspond button** | Select Button | Up Button | Down Button |

**Store Function:**

- Only Devices that support Store function will have indexes f & g in Op code B
- Every read of Op code B, the index f will contain the number of store indexes inside the device, index g will not appear.
- To extract store data, need to be executed read operation of Op Code B, index f [#10Bf1]
- Store indexes are extracted from the first one to the last one, with the following structure:
  Index, Date, Time, Meter Rate, External Detector Rate, Meter Status, External Detector Status
  #10Bf9,001,22.10.15,02:29:36,0.00,345.06,0002,0000
  #10Bf9,002,22.10.15,02:29:43,0.00,82.74,0002,0000
- Store data is not deleted after reading operation
- When need to delete stored data, a write operation must be executed on Op Code B, index g, without any data [#10Bg2]