



RST INSTRUMENTS LTD.

MTCM
Graphing Logger
Instruction Manual

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MTCM Graphing Logger

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Table of Contents

1	OVERVIEW	1
2	QUICK-START INSTRUCTIONS	2
3	POWERING ON/OFF	3
4	MTCM FRONT PANEL CONTROLS	5
4.1	Graph Screen.....	5
4.1.1	Graph Menu	7
4.2	Alarms	8
4.2.1	Fixed Alarm	8
4.2.2	Rate Alarm	11
4.3	Monitor	13
4.4	Memory.....	14
4.5	Battery.....	15
4.6	Logging	16
4.7	Logger Date & Time	16
4.8	Logger Temperature	17
5	MTCM GRAPHING LOGGER INTERNAL BATTERY	18
6	SOFTWARE & FIRMWARE UPDATES	19
7	WARRANTY	19
8	CONTACT US	20
9	APPENDIX A – MTCM GRAPHING LOGGER MENU FLOW CHART	21
10	APPENDIX B – SPECIFICATIONS	22

Table of Figures

Figure 1 – MTCM Graphing Logger	1
Figure 2 – Manual Power Off	3
Figure 3 – Auto Off Screen	3
Figure 4 – Auto Power Off Time	4
Figure 5 – Auto Backlight Off	4
Figure 6 – MTCM Graphing Logger Details	5
Figure 7 – Default Graph Screen	5
Figure 8 – Alarm Active Graph Screen	6
Figure 9 – Alarm Latched Graph Screen	6
Figure 10 – Graph Menu	7
Figure 11 – Alarm Settings Menu	8
Figure 12 – Fixed Alarm Illustration	9
Figure 13 – Fixed Alarm Settings Menu	9
Figure 14 – Alarm Limits beyond visible graph area	10
Figure 15 – Auto Change Baseline	10
Figure 16 – Rate Alarm Settings Menu	11
Figure 17 – Rate Alarm Illustration	12
Figure 18 – Reset Rate Alarm	12
Figure 19 – Rate Alarm Graph	13
Figure 20 – Monitor Mode	13
Figure 21 – View Memory	14
Figure 22 – Logger Battery	15
Figure 23 – Logging	16
Figure 24 – Date & Time	16
Figure 25 – Instrument Temperature	17
Figure 26 – Battery Door	18
Figure 27 – Battery Voltage	18
Figure 28 – MTCM Graphing Logger Menu Flow-Chart	21

1 OVERVIEW

The RST MTCM Graphing Logger Instrument is a dedicated intelligent measuring system specially designed for reading, displaying, logging and graphing mine tunnel convergence from instruments based on linear potentiometers such as convergence monitors and ground movement monitors. It's lightweight, yet extremely rugged design is perfectly suited for harsh environmental conditions often encountered in the field. Furthermore the MTCM is extremely easy to use with a USB interface for downloading data. A field programmable tracking window alarm, with flashing LED warning and acknowledge reset, serves as a visual safety element from a distance.

Complementing its high level of accuracy, the MTCM is designed for maximum efficiency with the user in mind. In addition to the simple power requirements of only one lithium battery, the MTCM comes well-equipped with a large graphics display with backlight. 3.6V LS33600 lithium battery is field replaceable, negating the need for charging or return the readout to the factory for battery replacement.

The MTCM is a precision instrument and should be treated as such. It should be protected against shock and heavy vibration. Its case is water resistant; however care should be taken to avoid getting the open unit wet, as damage to internal components could occur.

For any repair, the unit should be returned to the manufacturer as there are no user serviceable parts. In the event that the unit is disassembled by the user the warranty will be void.

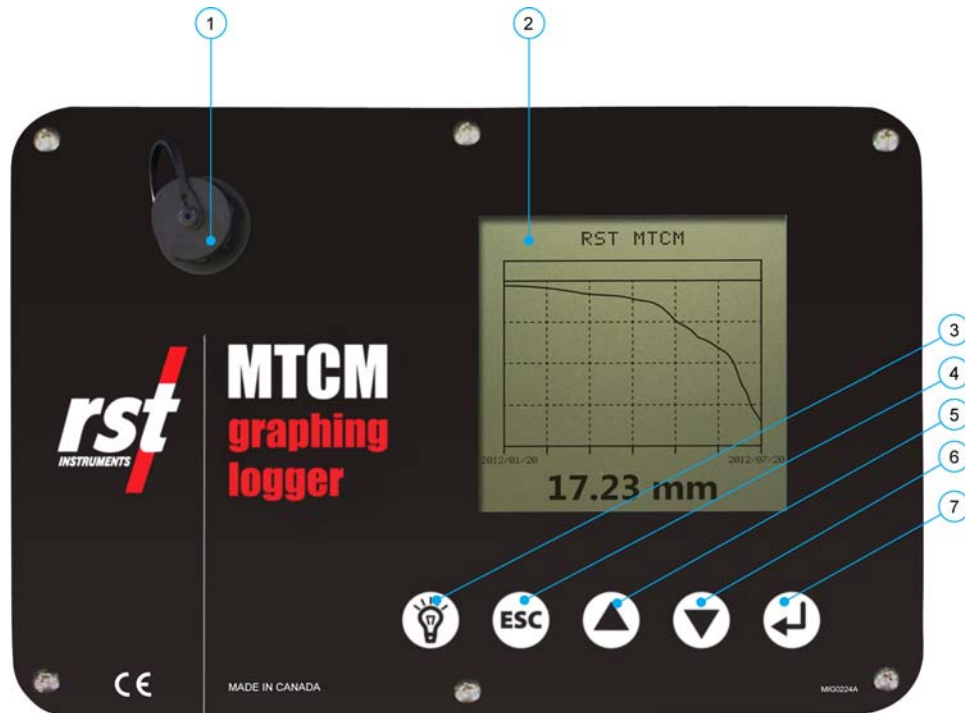


Figure 1 – MTCM Graphing Logger

- | | |
|--------------------------------|--------------------------------------|
| 1. Large Character LCD display | 5. Scroll Up |
| 2. Alarm Indication LED | 6. ESC (navigates back a menu) |
| 3. Enter | 7. Backlight (Peak reading ON / OFF) |
| 4. Scroll Down | |

2 QUICK-START INSTRUCTIONS

The following is a brief outline with references to other parts of this manual to get you up and running quickly with the MTCM Graphing Logger:

1. Power on the device (Section 3)
2. Connect USB cable to host computer and configure sensor parameters.
Two calibration methods are available to choose:
 - Linear Calibration when *multiplier* and *zero reading* are provided.
 - Range Input when readings for *lower* and *upper voltage* are known.Sensor maximum and minimum readings can be edited or default values left.
Refer to Single and Multi Channel Datalogger Instruction Manual for detailed instructions.
3. Set the desired logging interval.
Refer to Single and Multi Channel Datalogger Instruction Manual for detailed instructions.
4. Adjust *Alarm Settings* and *Custom Graph Settings*.
Set Alarm type and adjust alarm settings so alarm will be triggered at desired levels. Refer to Section 4.1.1 and Single and Multi Channel Datalogger Instruction Manual for details on Alarm settings
Adjust *Graph Settings* for proper *time span*. Keep in mind that long time span with short logging interval will result in large number of data points. Set *custom maximum* and *minimum* values to enable *zoom in* feature. Refer to Section 4.2 and Single and Multi Channel Datalogger Instruction Manual for detailed instructions.
Alarm Settings and Custom Graph Settings can be altered without affecting logged data storage.
Use *Monitor* screen to see sensor reading in real time. Press *Up* or *Down* keys to scroll to Monitor and press enter. Refer to Section 4.3 for more information.

3 POWERING ON/OFF

The MTCM Graphing Logger can be powered on anytime by pressing any key. The unit can be powered off manually or automatically. To power off manually, use the up/down arrows to scroll to the following screen:

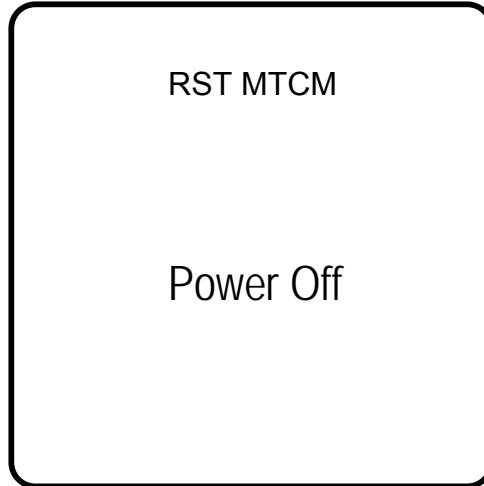


Figure 2 – Manual Power Off

- Press *Enter* and the unit will turn off.
- To adjust the automatic power off settings, navigate to the *Auto Off* screen as shown below:

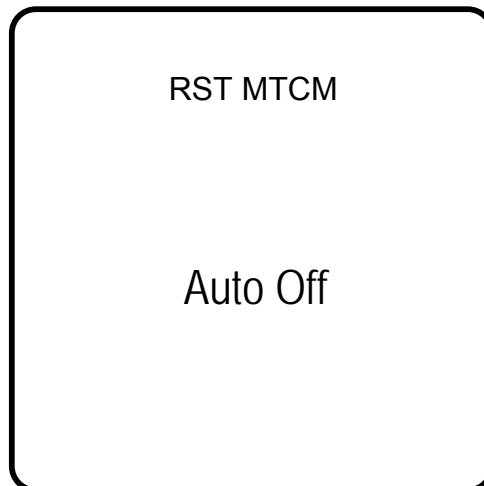


Figure 3 – Auto Off Screen

- Press *Enter* and the following screen will appear:

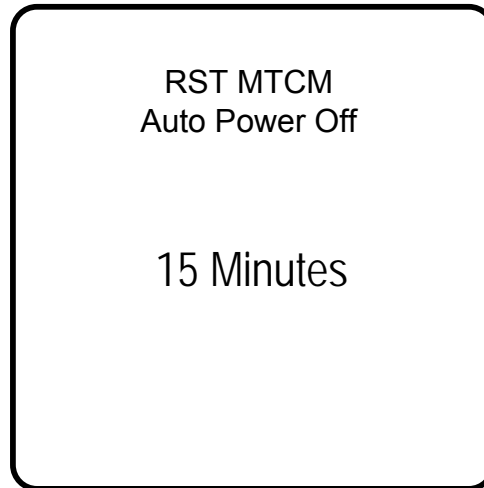


Figure 4 – Auto Power Off Time

Use the arrow keys to scroll to the desired auto power off time. Please note that the auto power off feature is always active and cannot be disabled. This is to conserve battery life. The default is 15 minutes. The next screen prompts to set the Auto Backlight Off:

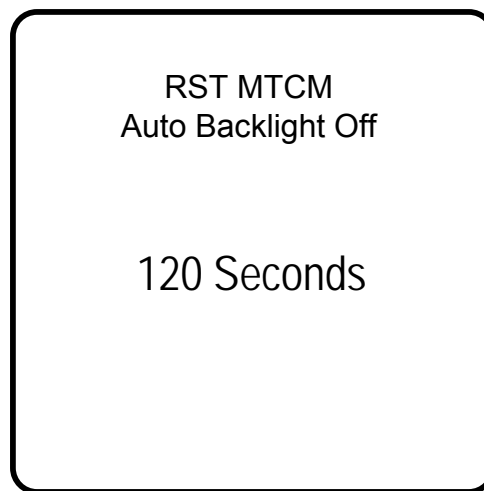


Figure 5 – Auto Backlight Off

Use the up/down scroll buttons to adjust.

4 MTCM FRONT PANEL CONTROLS

4.1 Graph Screen

Upon powering on the unit (by pressing any key), an opening screen will appear showing the RST Instruments logo. If the user wishes to view the details of the readout *press any key* immediately and the following will appear:

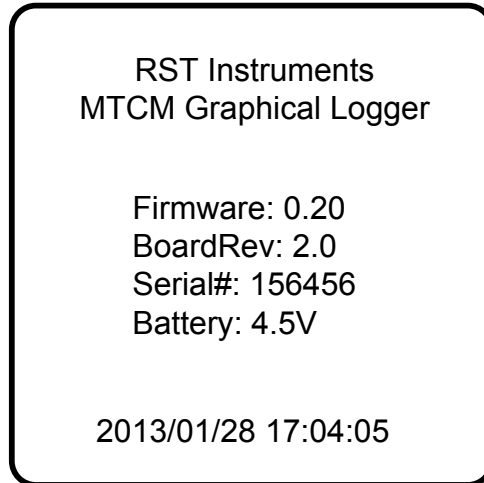


Figure 6 – MTCM Graphing Logger Details

This displays the model, version number, serial number and the current date/time settings. It is always a good idea to ensure that the date and time are correct, as this may affect any readings being stored in memory on the unit. Refer to section 4.7 for setting the date and time.

If no keys are pressed after power on, the unit will default to graph screen as shown below.

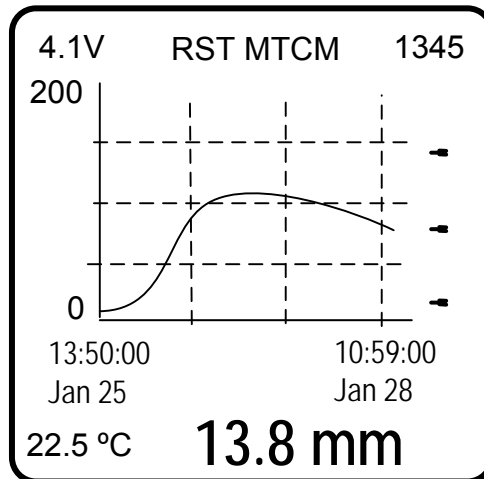


Figure 7 – Default Graph Screen

Graph screen displays number of recorded data points in upper right corner, logger temperature and most recently logged value at the screen bottom.

Note

The MTCM logger can display up to 4000 data points. Memory capacity allows logging up to 400,000 recorded values.

If the sensor reading falls outside of allowed range, the alarm indicator *Alarm Active* appears in lower left corner.

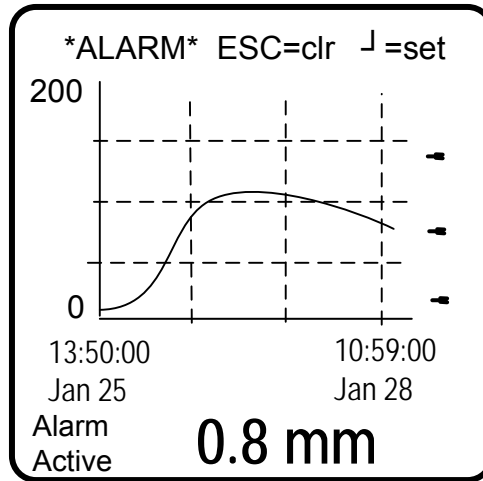


Figure 8 – Alarm Active Graph Screen

The logger stays in alarm condition. To exit alarm condition, press either:

- ESC button – clears alarm
- Enter button – clears alarm and sets alarm baseline to currently read value.

In the case when logger is in alarm condition and read value goes back to allowed range, *Alarm Latched* indicator appears. This condition can be cleared using ESC or Enter buttons as described above.

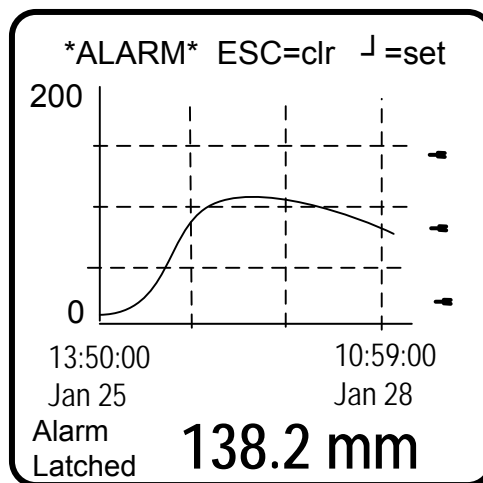


Figure 9 – Alarm Latched Graph Screen

4.1.1 Graph Menu

When the logger is displaying graph, press the Enter key to display graph menu.

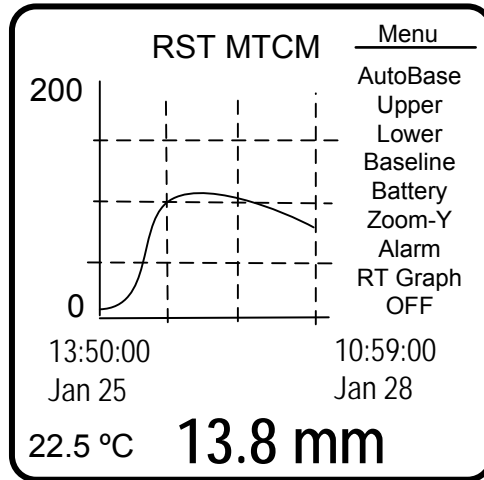


Figure 10 – Graph Menu

Select menu option using arrow keys, then press Enter to adjust selected settings.

- Upper – adjust upper alarm limit (fixed alarm only).
- Lower – adjust lower alarm limit (fixed alarm only).
- Base – adjust alarm base level (fixed alarm only).
- RTGrph – display actual readings plotted in real time.
- Alarms – adjust alarm settings. Press Enter to go Alarms screen. (Section 4.2)
- Monitor – activate monitor display of real time numeric readings. Press Enter to go Monitor screen. (Section 4.3)
- Zoom – change viewable graph area. Following zoom options are available:
None – view entire graph set by scale limits.
Limits – view range set by upper and lower alarm limits.
Custom – graph scale limits set using Host Software.
- Bat – see battery level. Press Enter to go Battery screen. (Section 4.5)
- OFF – power off the logger. (Section 2)

4.2 Alarms

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Alarms* screen.

One of two alarm types can be selected.

Alarms can be disabled using provided checkbox.

In Fixed Alarm, baseline, upper and lower limits are initially adjusted to pre-set values.

In Rate Alarm, baseline is calculated and averaged on each Long Term Sample Number. Upper and lower limits are calculated from Rate of Limit Increase and number of days into current period.

The Initial Limit sets the starting limit for alarm trigger.

Select desired menu option using up and down arrows. Then press Enter and adjust selected setting.

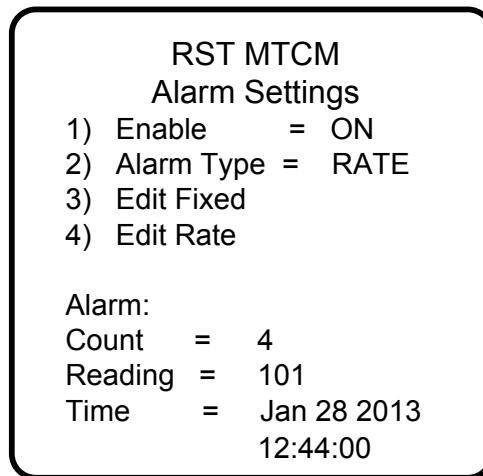


Figure 11 – Alarm Settings Menu

4.2.1 Fixed Alarm

Alarm limits are used to set alarm triggering range. Alarm will occur if read value is above *Upper Limit* or below *Lower Limit*. Enter *Baseline* setting for convenient range adjustment.

Press Enter again to save setting or ESC to leave option. Alternatively, Baseline level can be adjusted to move entire range up or down.

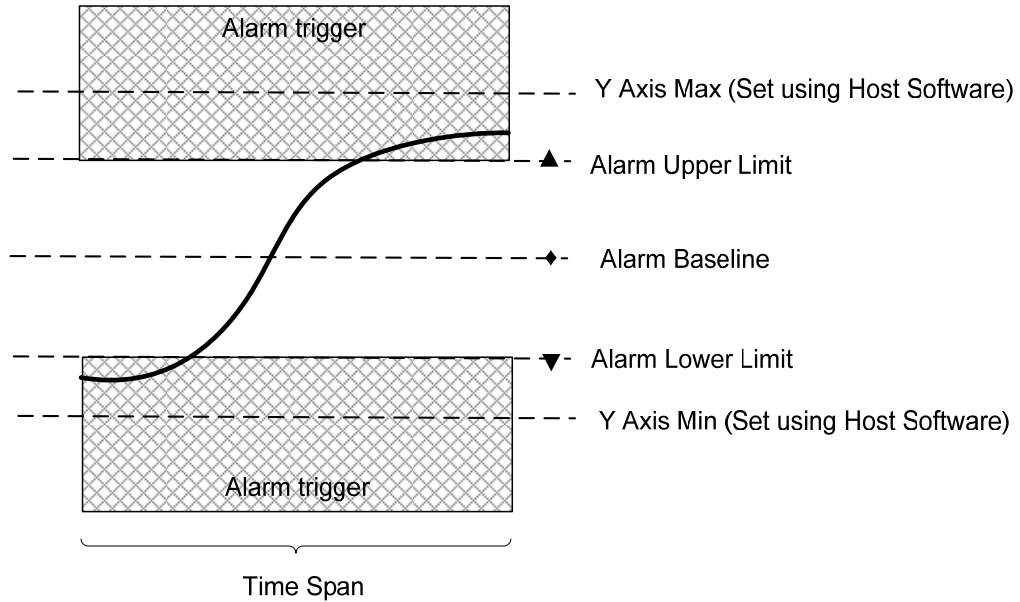


Figure 12 – Fixed Alarm Illustration

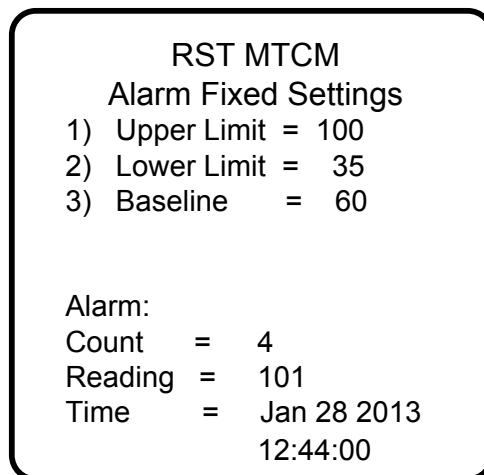


Figure 13 – Fixed Alarm Settings Menu

Note

If Alarm Limits are beyond visible graph area, triangular markers appear, as shown below.

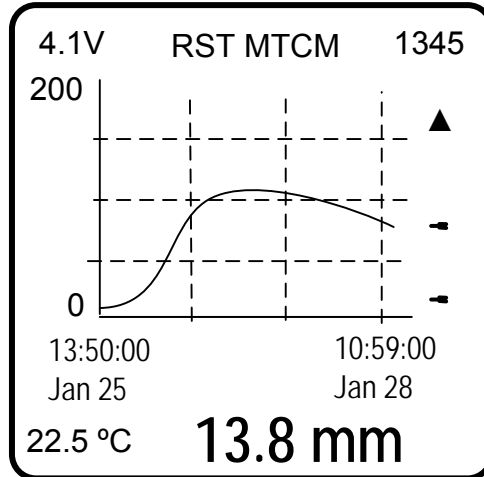


Figure 14 – Alarm Limits beyond visible graph area

In Alarm Trigger State, select AutoBase to choose desired action. Either set the new baseline to match current reading, or leave settings unchanged.

RST MTCM		
Auto Change Baseline		
Change baseline to the current reading.		
	Cur	New
Upper Limit	43	129
Lower Limit	5	78
Baseline	36	39
Press Enter to accept		
Press Esc to decline		

Figure 15 – Auto Change Baseline

4.2.2 Rate Alarm

In Rate Alarm, the alarm will occur if recorded value exceeds Averaged Baseline by more than calculated limit. The Averaged Baseline is obtained from averaging reading samples starting Tracking Number back.

The following values are user adjustable:

- Tracking Number (Number of readings to read back). Set to 7 in following example.
- Rate in mm per Tracking Period. Set to 28mm in following example.
- Base Avg Number (Number of Samples to Average). Set to 3 in following example.

Reset Track is used to clear averaging count to zero.

RST MTCM	
Alarm Rate Settings	
1) Tracking #	= 7
2) Rate – mm/4wk	= 28
3) Base Avg #	= 3
4) Reset Track	= 7
Upper :	22
Lower :	18
Baseline :	20

Figure 16 – Rate Alarm Settings Menu

The change Rate is expressed over 28 day period (4 weeks).

Given the logging interval, the Tracking Period is then calculated as Tracking Number x interval.

In the following example, the interval has been set to 1 day; therefore the Tracking Period is 7 days. The Alarm Trigger Limit will stay at 7 mm (Tracking Period (7) x Rate per day(1)).

Note

If logging interval is changed, both Tracking Period and Alarm Trigger Limit will be adjusted accordingly.

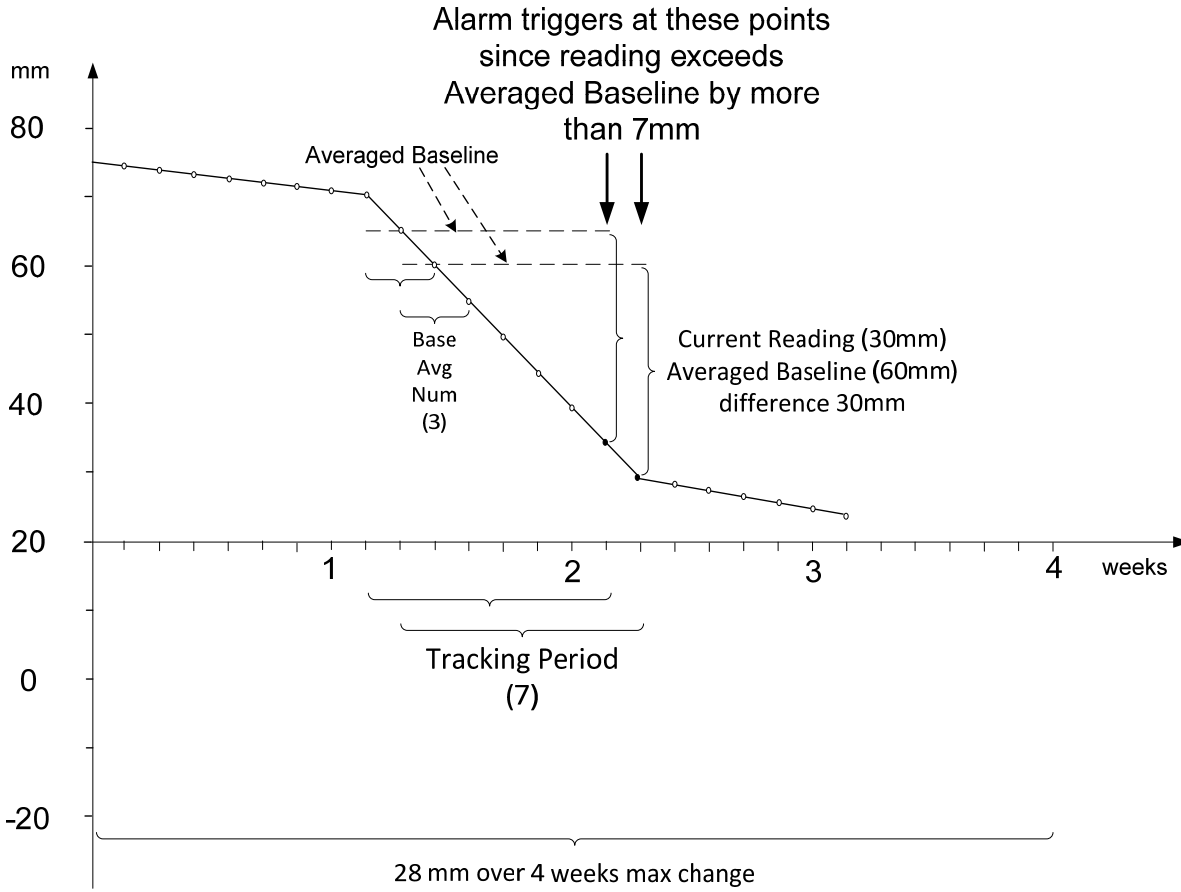


Figure 17 – Rate Alarm Illustration

After alarm trigger, current state can be reset to restart sample averaging.
Alternatively, pressing Esc key will just clear the alarm, leaving sample averaging unchanged.

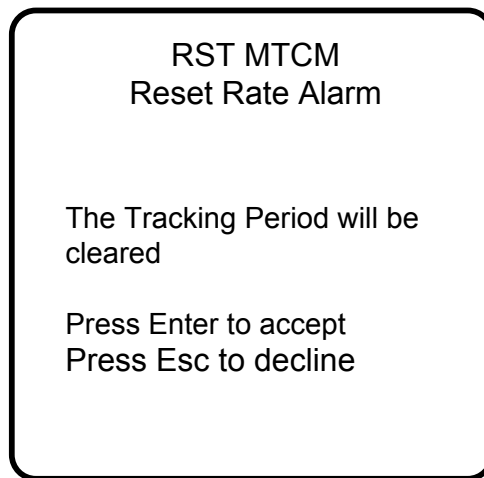


Figure 18 – Reset Rate Alarm

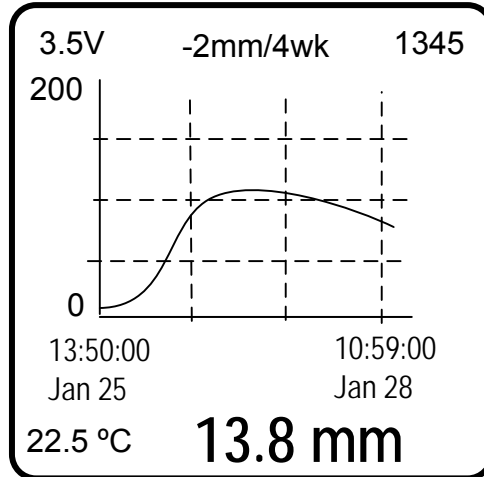


Figure 19 – Rate Alarm Graph

4.3 Monitor

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Monitor* screen.

View the real time instrument readings as shown below:

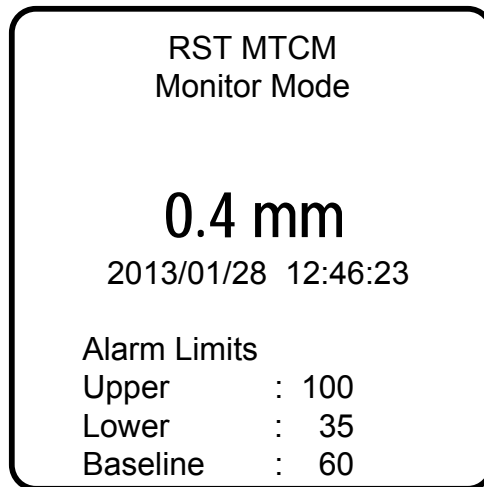
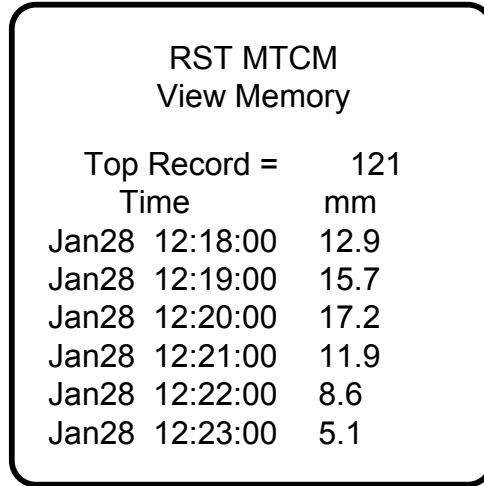


Figure 20 – Monitor Mode

4.4 Memory

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Memory* screen.



RST MTCM
View Memory

	Top Record =	121
	Time	mm
Jan28	12:18:00	12.9
Jan28	12:19:00	15.7
Jan28	12:20:00	17.2
Jan28	12:21:00	11.9
Jan28	12:22:00	8.6
Jan28	12:23:00	5.1

Figure 21 – View Memory

4.5 Battery

Check the battery status. It is highly recommended to check battery status periodically to ensure uninterrupted instrument operation.

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Battery* screen.

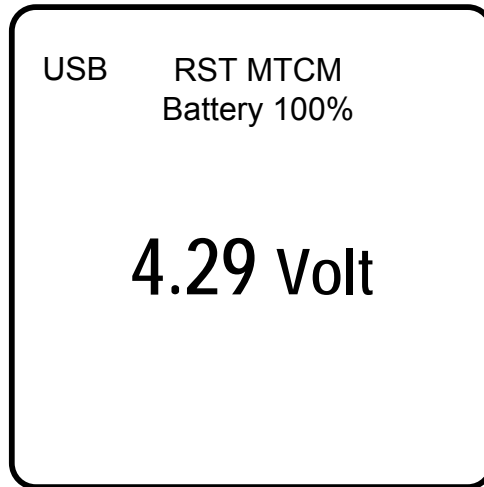


Figure 22 – Logger Battery

USB indicator implies USB cable plugged in. The unit is being powered by USB if USB power is present.

Note

If the battery voltage drops below 3.5 volts a low battery warning will be displayed in the form of "BAT" in the upper area of each screen. Change the batteries at this time.

4.6 Logging

The Logging screen displays logger memory usage and logging rate.

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Logging* screen.

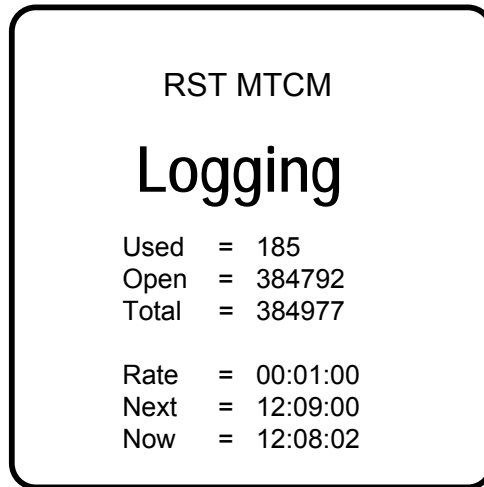


Figure 23 – Logging

4.7 Logger Date & Time

Keeping the date and time current ensures that you have accurate historical records of your data. Whenever a reading is taken and stored in the units' memory, an associated date/time stamp is always included.

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to the *Date Time* screen:



Figure 24 – Date & Time

- If the date or time is incorrect, use MultiChannel Host Software to edit date and time settings.

4.8 Logger Temperature

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll through options to *Logger Temperature*.

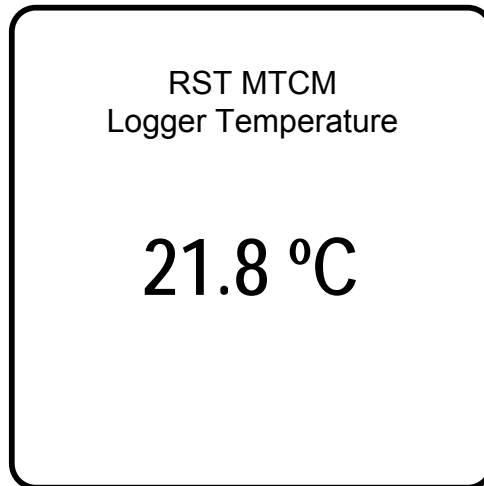


Figure 25 – Instrument Temperature

5 MTCM GRAPHING LOGGER INTERNAL BATTERY

The RST MTCM Graphing Logger operates on special 3.6V LS33600 lithium battery. Access to the battery is done through a port on the side of the unit (see Figure 26).

Contact RST for a replacement battery



Figure 26 – Battery Door

The status of the battery can be checked by:

- Turning on the readout by pressing any key.
- Using the arrow keys, scroll through options to the battery voltage screen.
- The readout will display the *battery voltage* as shown below:

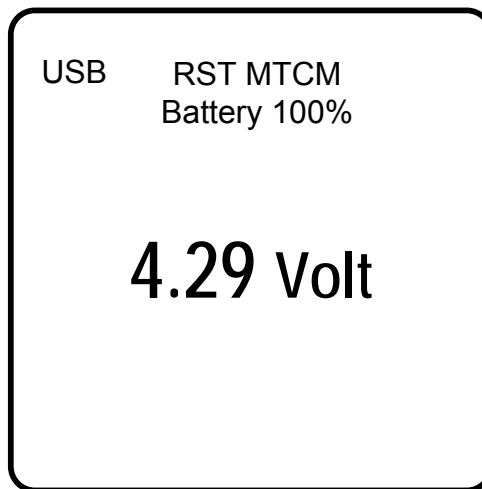


Figure 27 – Battery Voltage

Note

If the battery voltage drops below 3.5 volts a low battery warning will be displayed in the form of "BAT" in the upper area of each screen. Change the battery at this time.

6 SOFTWARE & FIRMWARE UPDATES

The MTCM Graphing Logger is designed such that the unit's software and firmware can be easily updated by the customer through the USB port. Please regularly visit:

<http://www.rstinstruments.com> for product updates.

7 WARRANTY

RST Instruments Ltd. reserves the right to change the price or modify the specifications of its equipment without notice.

RST Instruments Ltd. agrees, for a period of 12 (twelve) months from the date of purchase, as evidenced by the date of the invoice, to replace any equipment which fails or malfunctions as a result of defects in materials or workmanship when that equipment has been serviced or installed by the servants or agents of RST Instruments Ltd. The agreement to replace herein contained does not apply to the compensation or any portion of installation or site preparation

There is no warranty, representation, or condition of any kind, expressed or implied with respect to the equipment or the accuracy or longevity thereof, except that of replacement as stated above. RST Instruments and its servants or agents will not be liable for any special, indirect or consequential damages arising from the servicing or installation of the equipment, nor shall recovery of any kind against the said company be greater in amount than the purchase price of the specific equipment purchased which allegedly caused the damage. The purchasers assumes all risks and liabilities for any loss, damage or injury to persons or property of the purchasers or others, however caused, arising out of the use or possession of any equipment supplied by RST Instruments Ltd. save and except the agreement to replace contained herein.

8 CONTACT US

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9 APPENDIX A – MTCM GRAPHING LOGGER MENU FLOW CHART

The following flow chart outlines all functions of the MTCM Graphing Logger front panel controls:

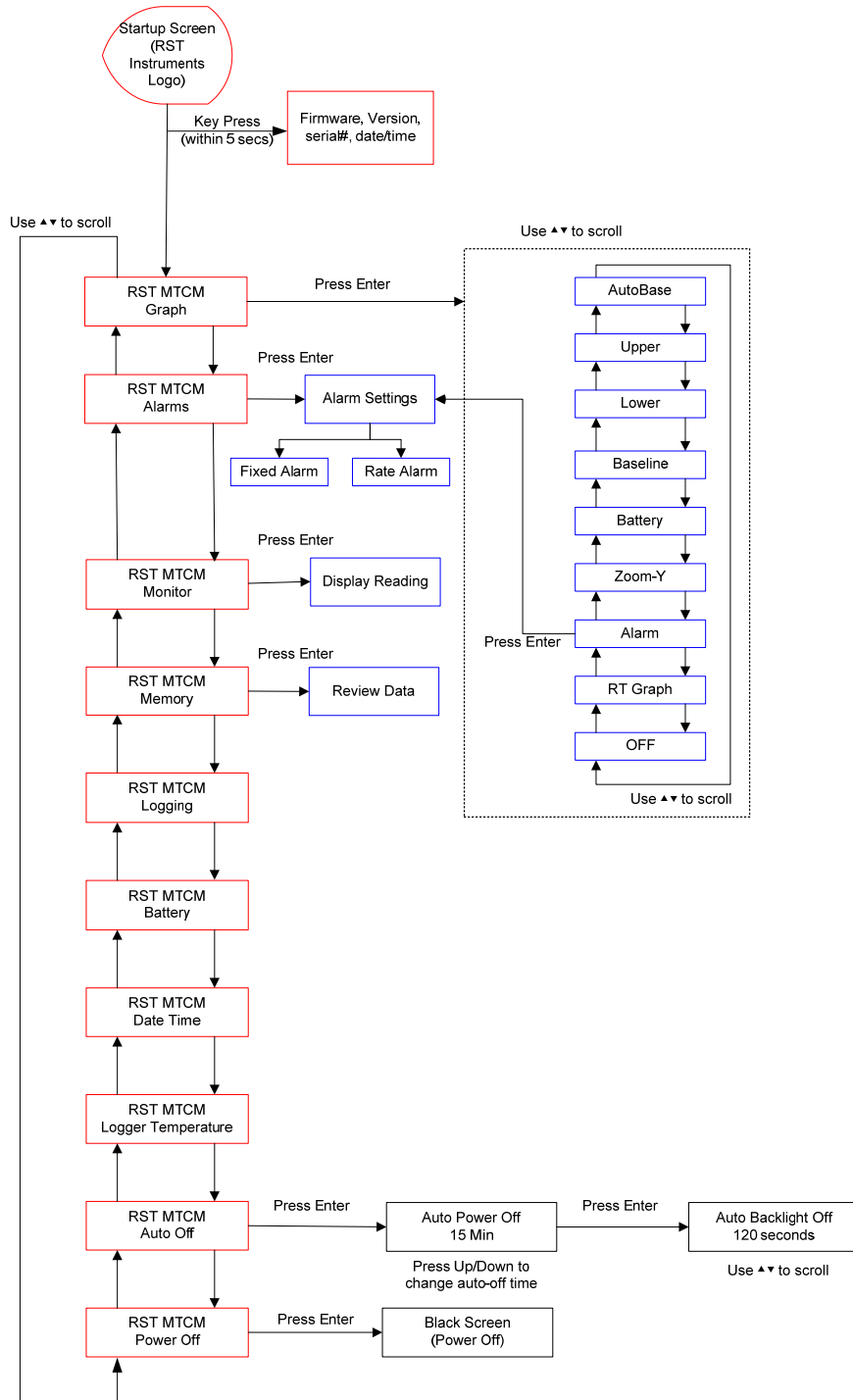


Figure 28 – MTCM Graphing Logger Menu Flow-Chart

10 APPENDIX B – SPECIFICATIONS

<i>Description</i>	<i>Specification</i>
Display	Graphic 128 x 128 pixels large character display
Display Backlight	High efficiency LCD with auto off
Range	150 mm
Excitation Range	3.3 Volts
Resolution	0.01 %
Memory Capacity	385,000 custom labeled points
Location Identification String	Up to 20 characters
Download Speed	15 seconds (full memory)
Battery	3 "AA" alkaline
Battery Indicator	On-screen low battery indicator
Tunnel Size	1.8 – 4m (70 – 157 inch)
Operating Temperature	-20 °C to 60 °C
Dimensions	W 22cm x D 19cm x H9.5cm (8.75 x 7.5 x 3.75in.)
Weight	1.1 kg (2.4 lbs)