



RST INSTRUMENTS LTD.

Carlson/RST MA-7
Readout
Instruction Manual

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Carlson/RST MA-7 Readout Instruction Manual

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Product: Carlson/RST MA-7 Readout Instruction Manual

Document number: CAM0003E Carlson_RST MA-7 Readout Instruction Manual.doc

Revision: E

Date: January 12, 2015

Table of Contents

1	OVERVIEW	4
1.1	Connections of Carlson Meters	5
1.2	Arithmetic	6
2	POWERING ON/OFF	7
3	MA7 FRONT PANEL CONTROLS	9
3.1	Startup.....	9
3.2	Setting the Date & Time	10
4	MONITOR SETTINGS.....	11
5	MANUAL READINGS	12
6	STORING READINGS IN MEMORY.....	12
6.1	Creating Memory Locations in the Field	12
6.2	Reviewing Data.....	15
6.3	Datalogging.....	15
6.4	Deleting	16
7	MA7 INTERNAL BATTERY	17
8	SOFTWARE & FIRMWARE UPDATES	18
9	WARRANTY.....	18
10	CONTACT US.....	19
11	APPENDIX A – MA7 MENU FLOW CHART	20
12	APPENDIX C – SPECIFICATIONS	21

Table of Figures

Figure 1 – MA7 Readout.....	4
Figure 2 – Wiring Connections.....	5
Figure 3 – Carlson Meter Electrical Diagram.....	6
Figure 4 – Manual Power Off.....	7
Figure 5 – Auto Off Screen.....	7
Figure 6 – Auto Power Off Time.....	7
Figure 7 – Auto Backlight Off.....	8
Figure 8 – MA7 Readout Details.....	9
Figure 9 – Readings Screen.....	9
Figure 10 – Set Time.....	10
Figure 11 – Date/Time Set.....	10
Figure 12 – Monitor Settings.....	11
Figure 13 – Monitor Settings Options.....	11
Figure 14 – Memory Screen.....	12
Figure 15 – Create Location.....	13
Figure 16 – New Location.....	13
Figure 17 – Select Location.....	13
Figure 18 – Storing a Reading.....	14
Figure 19 – Select a Location.....	15
Figure 20 – Reviewing Data.....	15
Figure 21 – Delete.....	16
Figure 22 – Delete Options.....	16
Figure 23 – Battery Door.....	17
Figure 24 – Battery Voltage.....	17
Figure 25 – MA7 Menu Flow-Chart.....	20

1 OVERVIEW

The Carlson MA-7 Readout Instrument is a dedicated intelligent measuring system specially designed for reading the output of all Carlson meters. Its special features are:

1. All readings are made on the meter itself, eliminating the effects of cable.
2. All Carlson meters require only 3 conductor cable when used with the MA-7 Readout Instrument. (If the meters already installed have 4-conductor cable, connect the red wire.)
3. If cable connections to the Readout Instrument are broken or connected in the wrong order, the display indicates an error.
4. The MA-7 Readout Instrument automatically distinguishes between thermometers and all other Carlson meters. If the Readout Instrument senses a thermometer it displays the temperature in degrees F and C. For all other meters, the display indicates ratio and resistance in percent and ohms respectively.
5. The portable MA-7 Readout Instrument runs off 3 AA alkaline batteries.

The MA-7 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 – MA7 Readout

1. USB Connector
2. Large Character LCD display
3. Backlight
4. ESC (navigates back a menu)
5. Scroll Up
6. Scroll Down
7. Enter
8. Terminal Posts (for sensor connection)

1.1 Connections of Carlson Meters

All connections are made by simply connecting all wires to the matching color binding post. This is different from previous Carlson readouts, which had different connections depending on the type of instrument. The readout automatically detects the instrument and wiring, and displays according to instrument.

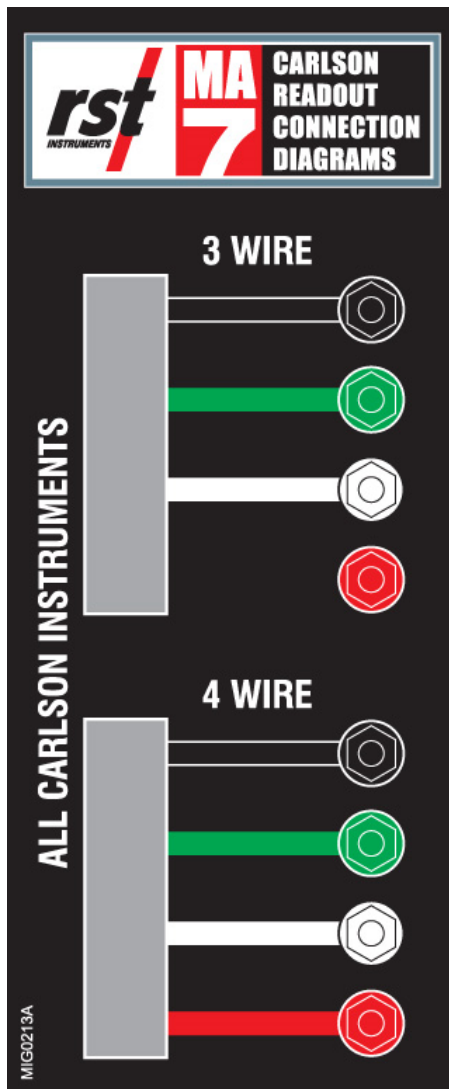


Figure 2 – Wiring Connections

1.2 Arithmetic

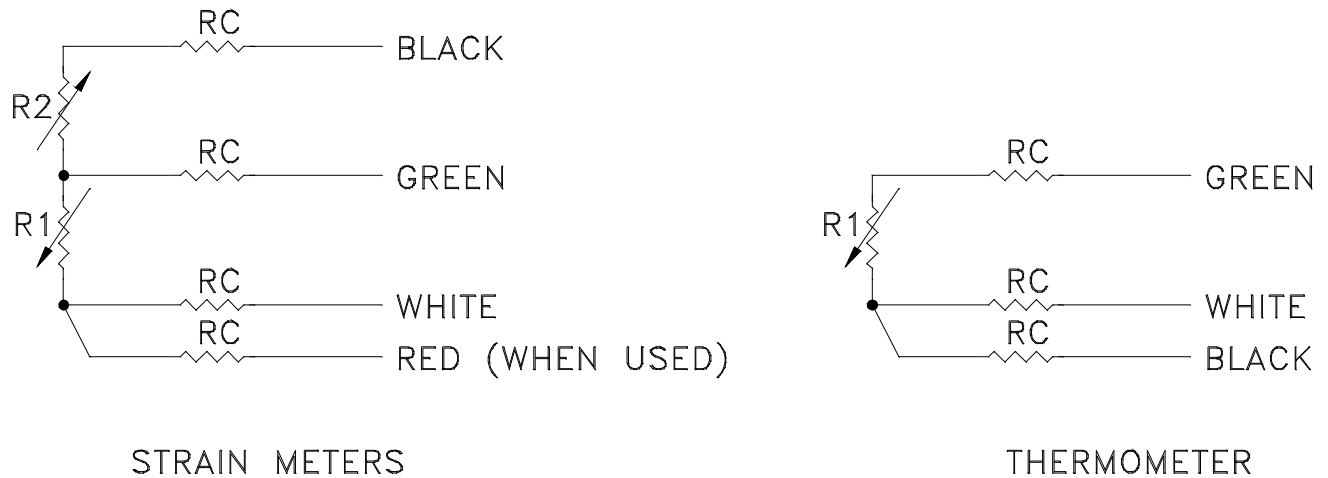


Figure 3 – Carlson Meter Electrical Diagram

Refer to Figure 1 for a schematic of the Carlson (RTD) thermometer and all other Carlson meters:

For each reading, measurements of the Carlson meter are made:

- The first reading $R_1+R_2+2R_C$
- The second reading R_1+R_C
- The third reading R_1+2R_C
- The loss through the red wire R_C as measured between white and red (when used)

By adding and subtracting in various combinations, values for $R_1+R_2=$ RESISTANCE (R), and RATIO (R_1/R_2) may be found.

If the value for ratio was found to be less than 50%, the Carlson meter is determined to be a thermometer (RTD) and the resistance is converted to temperature by the following equation:

- Temp (F) = $10(R-39.00 \text{ ohms})$

The result is processed and displayed in either F or °C units.

If any one of the three connections to the Readout Instrument is broken or the ratio is greater than 199% the reading is out of range and the display will show error "Check Connections". This will occur for any case where the total resistance exceeds 120 ohms, e.g. $R_1+R_2+2R_C \geq 120$ ohms.

If the value for ratio was found to be greater than 50%, the Carlson meter is determined to be one having the elastic wire strain meter-sensing element. Display will be a ratio expressed as a percentage and resistance expressed in ohms.

2 POWERING ON/OFF

The MA7 readout 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:

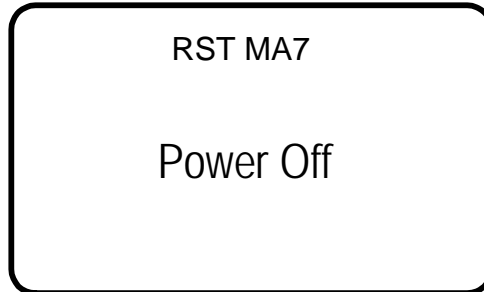


Figure 4 – Manual Power Off

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

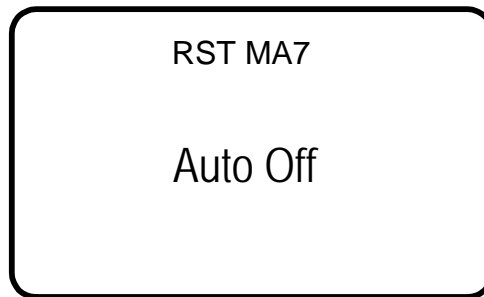


Figure 5 – Auto Off Screen

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

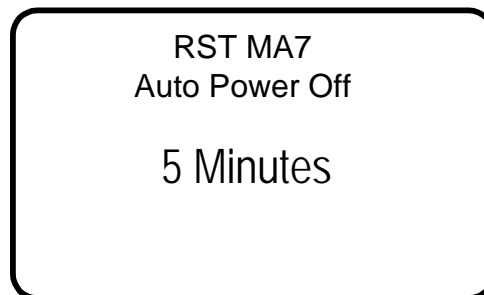


Figure 6 – Auto Power Off Time

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 5 minutes. The next screen prompts to set the Auto Backlight Off:

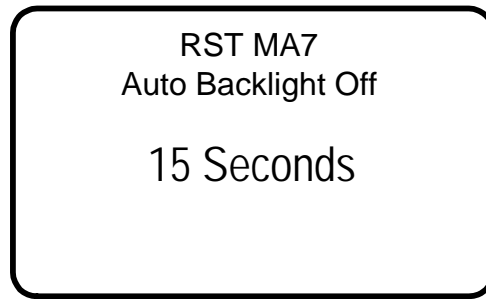


Figure 7 – Auto Backlight Off

Use the up/down scroll buttons to adjust.

3 MA7 FRONT PANEL CONTROLS

3.1 Startup

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:

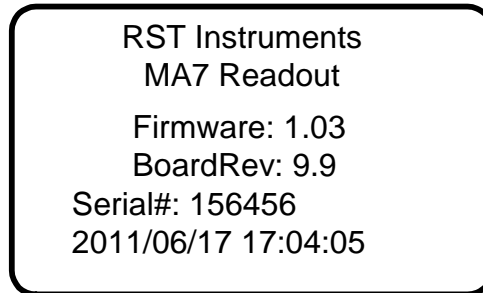


Figure 8 – MA7 Readout Details

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 3.2 for setting the date and time.

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

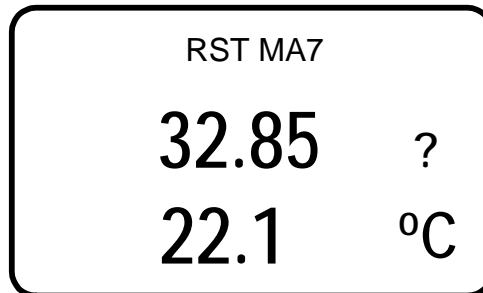


Figure 9 – Readings Screen

The readings screen displays the current resistance and temperature or resistance ratio reading (assuming an instrument is connected). Temperature units can be changed if desired (section 4).

3.2 Setting the 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 down to the *Set Time* screen and press *Enter*:

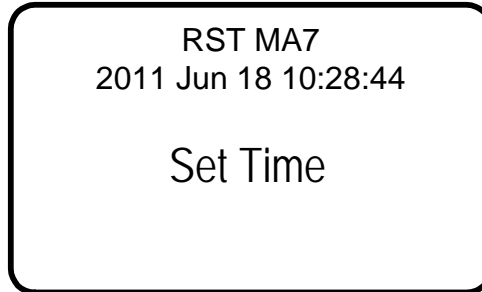


Figure 10 – Set Time

- The current editable data field will have an underline, use the arrow keys to modify the field and press enter when complete (pressing enter cycles through each field).

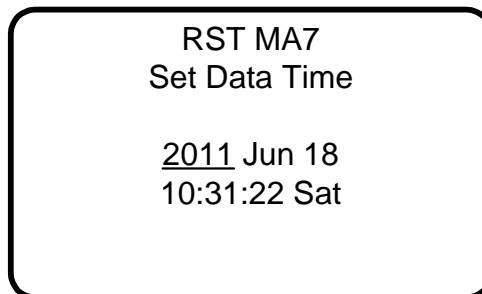


Figure 11 – Date/Time Set

- When complete the program will exit to the main menu screen.

4 MONITOR SETTINGS

Various parameters of the MA7 readout can be adjusted by selecting the *Monitor Settings* menu as shown below:

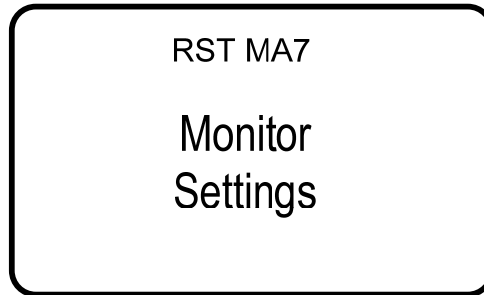


Figure 12 – Monitor Settings

- Press *Enter* to choose whether a custom or predefined setting is required.

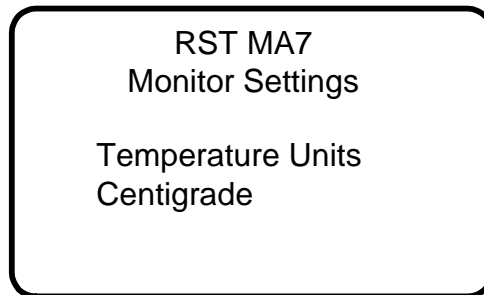


Figure 13 – Monitor Settings Options

5 MANUAL READINGS

The following instructions outline the basic steps needed to take a manual reading with the MA7 readout:

- Connect the instrument leads to the quick-connect terminals. Match the wires color for color.
- Turn on the readout by pressing any key.
- The readout will go through its startup procedure, and automatically default to the reading screen.
- The resistance reading will appear along with the temperature ($^{\circ}\text{C}/^{\circ}\text{F}$) or resistance ratio.
- Record the reading and move onto the next instrument.

For memory functions, please refer to section 6.

6 STORING READINGS IN MEMORY

The MA7 has 128k of internal memory allowing it to store over 11 000 time-stamped, resistance and Thermistor readings. The current memory usage is displayed on *Memory* screen, as shown in Figure 14. Data can be reviewed either on-board or downloaded to a host computer via the USB connector. Individual locations can be preconfigured in the office via the Multireadout Host Software or by creating locations on the unit itself (section 6.1).

6.1 Creating Memory Locations in the Field

The MA7 Readout has the ability to be either pre-configured in the office (through Host Software), or taken directly to the field. If taken directly to the field, each location will be assigned a generic name which is editable once back in the office and connected to a host computer. In most cases it is recommended that the MA7 be pre-configured in the office prior to taking readings in the field. In this manner, site location names can be setup ahead of time allowing the field personnel to be able to arrive at instrument locations, and store readings without needing to create a location in the units' memory.

If the MA7 has not been pre-configured in the office, the following instructions explain how to create new locations. Please refer to Figure 25 (flow chart) for a graphical representation of the steps outlined below:

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll to *Memory* and press *Enter*.

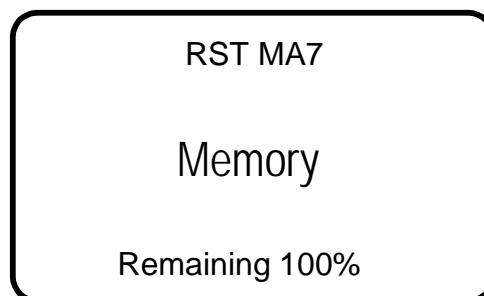


Figure 14 – Memory Screen

- Press *Enter* to advance to the next screen.

- Using the arrow keys, scroll to *Create Location* and press *Enter*.

Note
The maximum number of predefined locations is 254.

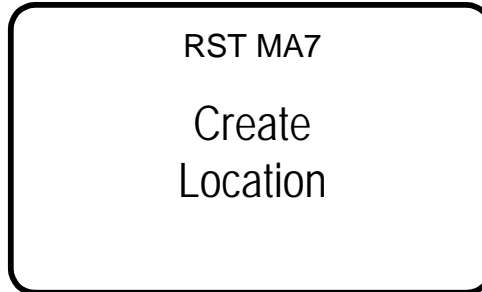


Figure 15 – Create Location

- The readout unit will automatically create a site called *Location X* where 'X' is the next storage location available in the units' memory. Please note that when creating new sites in the field, you can only name them *Location X*. Make note of the real location name in your field notebook and its relation to the *Location* number. When connecting to the Host Software back in the office, a custom name can be entered at that time. This replaces the site name assigned by the readout.

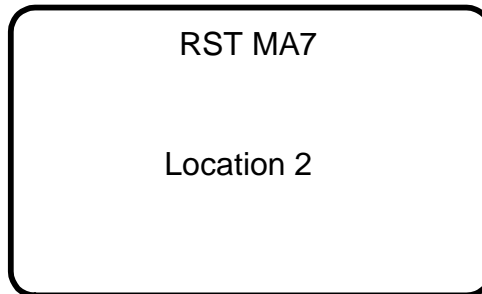


Figure 16 – New Location

- The MA7 automatically increments the new location to the next number available.
- Press *Enter* and the unit will return to the previous menu. Use the arrow keys to scroll to *Store Data* and press *Enter*. The following screen will appear:

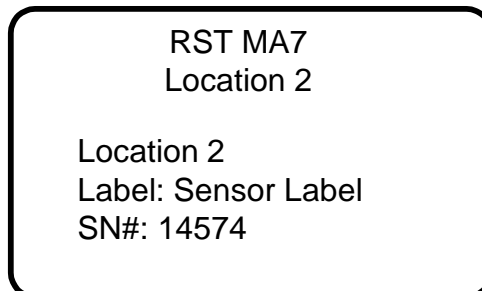


Figure 17 – Select Location

- Use the arrow keys to select the location you just created. When the desired location is found, press *Enter* to select it. The following will appear:

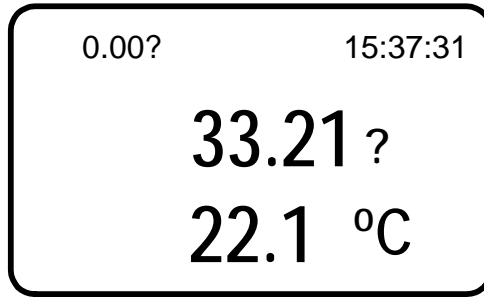


Figure 18 – Storing a Reading

- The MA7 will prompt you with the question: *Accept?*, press *Enter* to store the reading.
- After storing the reading, the MA7 will return the user to the previous screen.

6.2 Reviewing Data

To review any reading on the MA7 unit itself, please follow these instructions:

- Power on the readout by pressing any key.
- Using the arrow keys, scroll down to *Memory*, press *Enter*.
- Scroll to *Review Data* and press *Enter*.
- Scroll to the desired location (using arrow keys) and press *Enter*.

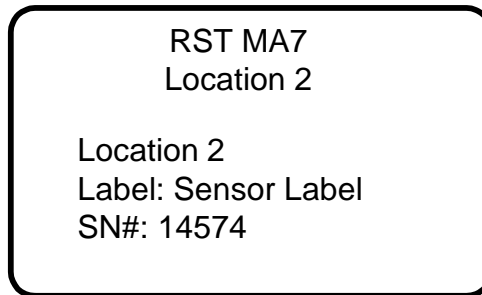


Figure 19 – Select a Location

- If the location contains more than one reading, these readings can be scrolled through using the arrow keys. The date and time of each reading will appear to differentiate each reading.

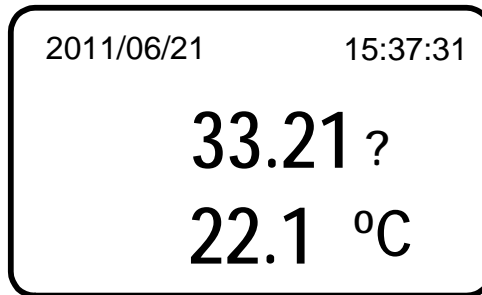


Figure 20 – Reviewing Data

6.3 Datalogging

The MA7 will have basic datalogging function in next readout revision. The user will be able to set the datalogging interval and the number of iterations.

6.4 Deleting

All location information can be deleted from the MA7 readout or via the Host Software. This is done by the following:

- Power on the display by pressing any key.
- Using the arrow keys, scroll down to *Memory*, press *Enter*.
- Using the arrow keys, scroll to *Delete* and press *Enter*.

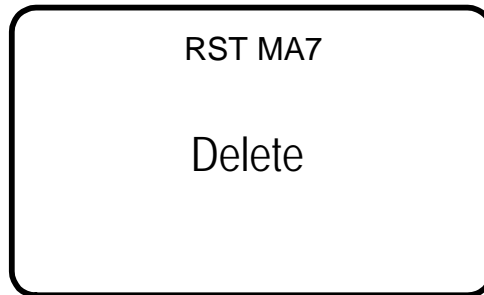


Figure 21 – Delete

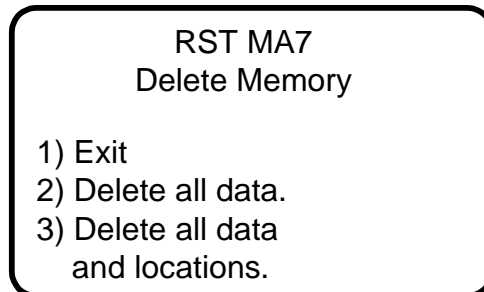


Figure 22 – Delete Options

Using the *arrow keys*, scroll to the desired delete option and press the *Enter* key to select. Press *Enter* to confirm, press *ESC* to exit back to the main menu.

7 MA7 INTERNAL BATTERY

The RST MA7 operates on 3 alkaline AA batteries. Access to the batteries is done through a port on the side of the unit. Use a flathead screwdriver or a coin to access the batteries (see Figure 23). The unit ships standard with regular AA batteries. If the unit is being used consistently in cold environments, the user may replace the alkaline batteries with lithium batteries which are also readily available.



Figure 23 – Battery Door

The status of the battery can be checked by:

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

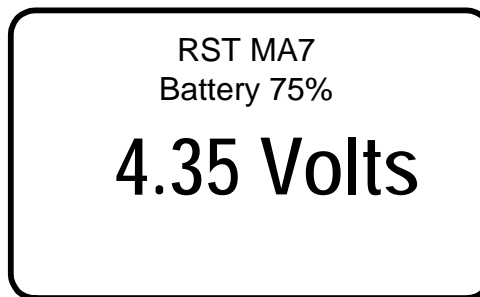


Figure 24 – Battery Voltage

Note

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

8 SOFTWARE & FIRMWARE UPDATES

The MA7 readout 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.

9 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.

10 CONTACT US

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11 APPENDIX A – MA7 MENU FLOW CHART

The following flow chart outlines all functions of the MA7 front panel controls:

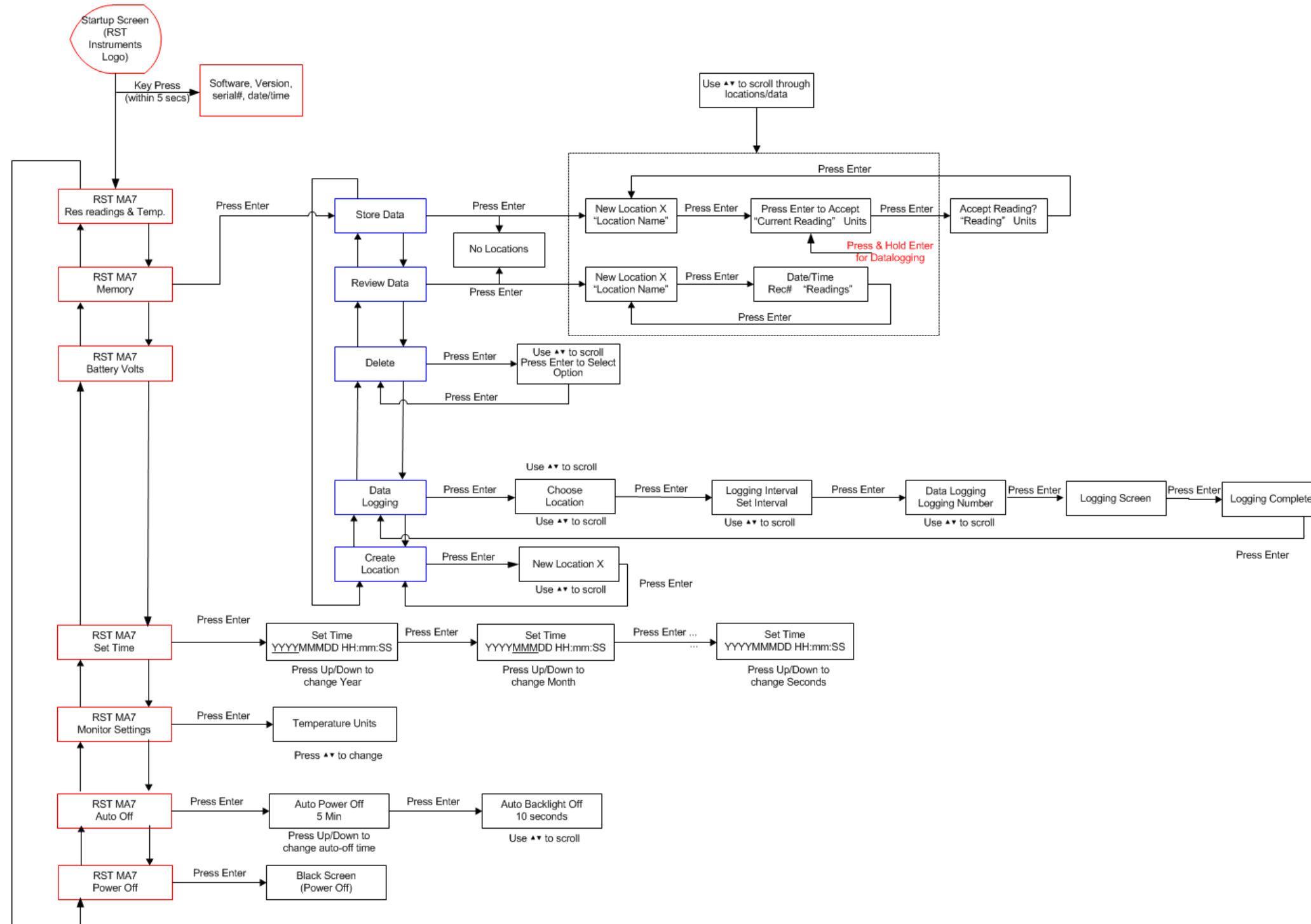


Figure 25 – MA7 Menu Flow-Chart

12 APPENDIX C – SPECIFICATIONS

<i>Description</i>	<i>Specification</i>
Resistance Readout Accuracy	$\pm 0.01\Omega$
Supported Carlson Sensors	3 wire, 4 wire, Temperature
Temperature Readout Accuracy	$\pm 0.1^{\circ}\text{C}$
Temperature Readout Range	-50°C to 80°C
Display	Graphic 128 x 64 pixels large character display
Display Backlight	High efficiency LCD with auto off
Memory	128 kB
Max Instrument Locations	254
Memory Capacity	5700 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
Operating Temperature	-20°C to 60°C
Dimensions	W 22cm x D 19cm x H 9.5cm (8.75 x 7.5 x 3.75in.)
Weight	1.1 kg (2.4 lbs)