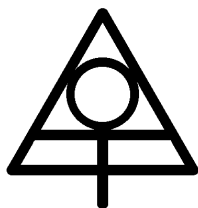# Datalogger RailBox V16

User's Manual

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1 DATALOGGER GENERAL DESCRIPTION

RailBox V16 is a battery operated sixteen voltage channel datalogger for automatic data recording. The logger is made for easy installation in any enclosure with DIN-rail holders. It is powered by any external d.c. voltage in the range 6.5 to 15 Volts. It is intended for larger custom application like EMS sap flow systems, soil water status, stem increment sets etc.

An additional temperature channel for connection of RTD sensors in primarily aimed for the measurement with thermocouples with a special terminal module.

The logger is equipped with two 5 V excitation outputs active during measurement and/or data averaging.

Main features

- DIN-rail mounting

- 16 eight voltage inputs

- high storage capacity 220,000 values

- low current consumption

- built-in input channel for RTD temperature sensors in twor-wire connection

- advanced Windows$^®$ software for datalogger setting, data retrieval and processing

- ready for remote access via GSM modem

1.1   SPECIFICATIONS

Channel types	Sixteen differential voltages, RTD sensor input
Voltage inputs	± 20 mV up to ± 2.5 V in eight ranges
Voltage limit	maximum +5 Volts from GND on any input terminal
Accuracy	0.03 % of full scale
Resolution	16 bits
Measuring interval	3 sec to 4 hrs
Averaging interval	3 sec to 4 hrs
Warm-up time	independently set for measurement and averaging, 1 to 5 sec
Exciting voltage	independent outputs for time of measurement and averaging, 5 Volts, ± 2 mV
max. load	30 mA
voltage drop	Approx. 6 mV/mA of loading current
Overvoltage protection	diode suppressors connected to each input terminal
Power supplying:	
External d.c.	6.5 to 15 Volts
Power consumption	
- idle	150 µA
- measuring	15 mA (without excited load)
System back-up	Lithium coin type battery CR2032, 3 V
Back-up battery lifetime	5 years at least
Memory capacity	220,000 records
Size	120 x 105 x 24 mm
Weight	0.14 kg
Operating range	-20 to 60 deg.C

1.2   ASSEMBLY

The datalogger is build into a standard DIN-rail box. The terminals are located on both side-walls, all indicators, buttons and connectors are set on the front panel.

The upper panel is covered by a transparent lid with the hole for RS232 connector (Jack 2.5 mm).

Below the lid are placed two LED indicators, power switch and a checking button for brief system testing.

1.3   POWER MANAGEMENT

The datalogger is powered from external voltage 6.5 to 15 Volts. When the power is disconnected or the system is off, the internal real time clock and system variables are supplied from the build-in back-up battery. The back-up battery should be replaced each five years although the specified lifetime is more than eight years.

The battery and system status are indicated by two LEDs on the upper panel. The green led indicates the normal operation that means it burns during the regular measurement as well as by communication with PC or other external system (modem).

The system status can be briefly tested after pushing the small button bellow LEDs:

- 3 x green   batteries O.K.
- 3 x green + yellow   batteries should be replaced
- 12 x yellow (fast)   incorrect system status

When the fast yellow flashings appear, the system has to be refreshed with connected PC running Mini32 software.

2   DATALOGGER OPERATION

2.1   MEMORY

The datalogger principally measures in regular intervals electrical signals connected to input channels and stores the measured values in the memory.

The datalogger operates in two modes according what to do if its memory is full

- the logger continues operating and replaces oldest data in memory with actual values
- the logger stops operation when the memory is full

The operating mode is set by the process of datalogger reset (Initialization).

2.2   DATA AVERAGING

The measured values are saved directly or (more often) as an average within certain time interval. For instance, the logger measures each minute and each hour calculates the average and saves this average in the memory.

2.3   CHANNEL TYPES

RailBox V16 has two channel types; sixteen voltage inputs and one channel for temperature measurement with a RTD sensor. The temperature channel is intended for the measurement of "cold junction" of thermocouples when a special terminal block is used.

The range of voltage channel has to be set manually in the datalogger configuration. For those gauges they are included in library, the proper sensor range is recommended in channel setting window (refer to Mini32 software manual). The range of user-defined sensors should be set according to the knowledge of their output characteristic. If the input signal exceeds the range, the voltage value is replaced with missing value symbol (refer to Mini32 software manual for details). Please note that the maximum voltage range from zero up to +5 Volts regarding to GND (or negative pole of external power supply) on each terminal is allowed otherwise interference between channels will occur!

2.4   EXCITATION VOLTAGE

Some sensors need energy for their power supplying during or a reference voltage the measuring process. For this purpose, the datalogger is equipped with two independent 5 V excitation sources. One voltage output is active always when the measurement is performed (including the warm-up time), the second one is active just in those times when the data are also averaged and stored to the memory.

5 V source is intended mostly for sensor powering. The voltage is accurate just in case of zero loads. Otherwise the voltage decreases a bit with load current for ca 6 mV per 1 mA of output current. (0.12 %/mA). The maximum load current is limited approximately by 30 mA.

2.5   GAUGE TYPES

A library of common gauges is predefined in attached software Mini32 relevant to RailBox V16 model.

2.6   TIMING OF THE MEASUREMENT

There are two different time periods that should be mentioned - measuring period and the period of averaging (storing into the memory).

Another time period called "warm-up" time (1 to 5 seconds) can be set if some sensors need settling time higher than one hundred milliseconds for stabilizing (reset). Since there are two excitation outputs independently activated in time of the

measurement and in time of averaging, also two independent "warm-up" times has to be set. Clearly, the "warm-up" time in averaging period cannot be shorter than the measuring one.

Note that all these time intervals periods influence the memory capacity and the battery lifetime.

2.7 STORAGE CAPACITY

The memory is organized in cycle so the oldest data are continuously overwritten with the newest ones. The total memory capacity is slightly above 220,000 values independently on the channel type.

2.8 REAL TIME CLOCK

The datalogger time is set by the initializing process. Before the start of the initialization, the computer time is offered for possible editing. Clock time can be also corrected directly without necessary initialization since. This option is supported by all EMS dataloggers manufactured in summer 2011 and later.

2.9 DATALOGGER COMMUNICATION

The RailBox datalogger does not have any display or keyboard; the datalogger setting, data downloading and viewing suppose the use of PC computer. Computer can be connected to the datalogger directly via a special cable with 9-pin D-sub and 2.5 mm stereo Jack connectors.

3 SOFTWARE

The program Mini.exe (32-bit version working under all Windows$^{®}$ operating system) or Mini32.exe (Windows$^{®}$ 95, 98, NT, XP, Vista, 7) supports all necessary operations for datalogger setting, data handling and file processing via RS232 serial line connection (special PC cable is required). The software components are placed in the directory c:\Program Files\EMSoft\Mini32\ if not specified otherwise during the installation process. On-line help facility will guide you through particular software topics.

Note: Since currently produced notebooks are already not equipped with serial (COM) port, an additional USB/RS232 convertor has to be used.

The installation of Mini32 software includes also firmware files containing internal datalogger code (firmware) of all supported hardware systems.

Since the software includes a lot of sophisticated options like statistics, advanced graphics, user defined calculation etc., some options might be accessible in future after the registration only.

Refer to Mini32 user's manual for software details and other related information.

4   WARRANTY

The product is warranted by exporter against defects in material and workmanship for a period of **two years** from the date of shipment from the company.

The product found to be defective during the warranty period will be repaired or replaced and returned freight prepaid.

The producer is not responsible for the faults originated by careless manipulation, incorrect operations, wrong applications or the destruction of seals.