

DATA LOGGER MICROPROCESSOR-BASED

RPM – 416



OPERATIONAL MANUAL TECHNICAL SPECIFICATION

*Production Quality Control System meets the requirements of
DSTU ISO 9001:2009 (ISO 9001:2008), № UA 2.032.7110-12*

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WARNING MESSAGES

Prior to exploitation of the device, please, study the Operational Manual.

Prior the connection of the device to the power supply line, keep it under the operating conditions for two hours.

Don't use abrasive materials or organic compositions (spirit, petroleum, solvents etc.) for cleaning of the device.



IT IS FORBIDDEN TO OPEN AND REPAIR THE DEVICE WITHOUT AUTHORITY. The device components can be under live electricity.



IT IS FORBIDDEN TO USE THE DEVICE WITH MECHANICAL DAMAGES OF THE CASE.



IT IS FORBIDDEN TO LET THE MOISTURE GET INSIDE THE DEVICE AND TO USE IT IN CONDITIONS OF HIGH HUMIDITY.

The device is safe for operation under observing the rules of exploitation.

INTRODUCTION

This operation manual is intended for description, principle of work, construction, mode of work and maintenance of the microprocessor-based data logger RPM-416 (further in text as «data logger», «RPM-416» or «data logger RPM-416»).

Terms and abbreviations:

- ❖ **Twisted pair** – a pair of isolated signal line wires in cable twisted between themselves for reduction of transmitted signals distortions;
- ❖ **Display** – a symbolic LCD display 4 lines of 20 symbols;
- ❖ **Cursor** – a screen symbol ◀ ▶, showing the current position to which the action will be used;
- ❖ **Memory card** – a portable flash-memory card SD / MMC, which is used for multiple recording and storage of information in the portable electronic devices;
- ❖ **EM** – Expansion Module (a device connected to the data logger for expansion of incoming signals range);
- ❖ **MM** – Measuring Module (is a part of data logger scheme).
- ❖ **PC** – Personal Computer;
- ❖ **On default** – preset parameters values which are used by the data logger until the user explicitly changes them;
- ❖ **Dry contact** – a terminal which has no galvanic connection with power supply lines and "ground" (for example: mechanical button, hermetic contact, relay contacts, standard and limit switches);
- ❖ **CT** – Current Transformer intended for transmitting the signal of measuring information (for example T-0.66, TOP-066, TSHP-0.66 etc. with accuracy class index 0.5 or 0.5 S);
- ❖ **Formatting** — the process of recording in the memory card file system structure (FAT12, FAT16 or FAT32), which makes it possible to use the memory card in operational system for data storage;
- ❖ **Screen** – full-scale (4 lines with 20 symbols) image output on the display;
- ❖ **10Base-T** – a standard Ethernet for linking up via twisted pairs with speed 10 Mbit/sec;
- ❖ **100Base-T** – a standard Ethernet for linking up via twisted pairs with speed 100 Mbit/sec;
- ❖ **DHCP** – network protocol which enables the devices to receive automatically IP-addresses and other parameters necessary for work in TCP / IP networks;
- ❖ **Ethernet** – package technology of data transmitting mainly used in computer local networks;
- ❖ **FTP** – standard protocol of files transmitting in TCP / IP networks;
- ❖ **Modbus TCP** – open communicational protocol based on "client-server" architecture. It is used for data transmitting in TCP / IP networks;
- ❖ **MAC** – address used in transmitting via Ethernet for device identification. As a rule it has a global unique denotation;
- ❖ **RMS** –root mean square value;
- ❖ **RJ-45** – unified connector used for connection in networks via standard 10Base-T/100Base-T;
- ❖ **RJ-11** – unified connector used for connection of telephone or communicational equipment;
- ❖ **Web-interface** – system of user interaction with device via computer browser;

1 SCOPE OF RPM-416

Data logger RPM-416 is a microprocessor-based device intended for electrical parameters measuring and monitoring on the data logger display as well as data archiving.

The data archiving is made on the removable memory card (SD / MMC), which can be later analyzed by software program RPM-416 Data Analysis (the program can be found on website www.novatek-electro.com), installed on the standard or portable PC. Data files have extension "RDF".

Data logger RPM-416 has an inbuilt real time clock with power from a lithium-type battery.

RPM-416 can be connected to Ethernet network via standard 10Base-T or 100Base-T. In this case simultaneously with data recording to memory card, the RPM-416 configuration and data transmitting to the PC is possible.

The main possibilities of the data logger:

- ❖ **Multi-channeling** – one data logger is sufficient for all working data receiving from the controlled device;
- ❖ **Versatility** – the additional modules can be connected to the data logger which makes it possible to expand the range of incoming signals (voltage, current, temperature, discrete inputs, etc.);
- ❖ **Galvanic separation** – incoming signals of high voltage and current are galvanic separated from other inputs which ensures easiness of data logger connection;
- ❖ **High fidelity** – self-control system and data saving algorithm protect against data loss in case of emergency situations (power supply failure);
- ❖ **Servicing convenience** – four-lined symbolic display with illuminating enables to adjust the data logger and monitor its work (the values of recorded incoming signals are shown on the display), the key-board is used for setting and control of the data logger;
- ❖ **Remote monitoring and configuration** – if the data logger is installed in a hard accessible place with Ethernet connection it can simultaneously with the data recording on the memory card make data transmitting to PC. It enables to make a remote monitoring of the object. The more detailed analysis can be made on the basis of the data stored on the memory card. Web-interface enables via PC browser to make a remote configuration of the data logger without installing any other additional programs.

2 TECHNICAL SPECIFICATION AND WORKING CONDITIONS OF RPM-416

2.1 Basic technical features

The basic technical features of RPM-416 are resulted in Table 2.1.

Table 2.1 – Basic technical features

Item	Value
Nominal operating supply voltage (\sim), V	220 / 240
Performance capacity voltage (\sim / \dots), V	24 – 265
Power-line frequency, Hz	45 – 65
Power consumption (from line \sim 220 V), VA, not more	6.0
Power consumption (from power source +24 V), VA, not more	2.2
Period of data recording to the memory card, sec.	0,001 – 3600
External memory storage (memory card, optional)	SD / MMC
Maximal capacity of external memory card, GB	32
Supported file systems of external memory card, FAT	12, 16, 32
Minimal size of data file, KB	32
Maximal size of data file, MB	512
Size of one block of recorded data (15 channels), byte	68
Error of clock run, at temperature 25 °C, not more, sec / day	1
Connection to Ethernet or PC	10Base-T / 100Base-T
Modbus TCP	yes
Web-interface	yes
FTP	yes
Weight, kg, not more	0.5
Overall dimensions, mm	157 x 91 x 57
The intent of the device	Digital indication devices
Nominal working mode	continuous
Protection class rating (case / terminal block)	IP40 / IP20
Protection class from electric shock	II

Table 2.1 (continued)

Item	Value
Climatic version	UHL3.1 (average and cold zone, indoor)
Pollution level	II
Overvoltage category	II
Isolation nominal voltage, V	450
Nominal impulse withstand voltage, kV	2.5
Cross-section area of connection terminals, mm ²	0.2 – 2.5
Maximum torque of terminal fixing, N*m	0.4
Assembling is designed on standard DIN-rack 35 mm	
Orientation, user-defined	

Harmful substances, in more than allowed concentration, are not available.

2.2 Input characteristics

Input characteristics of RPM-416 are resulted in Table 2.2.

Measurement error is resulted in \pm % of scale value.

Table 2.2 – Inputs characteristics

Item	Value
Voltage input	3 channels
Voltage measuring range, V	3.0 – 300.0
Voltage measuring error	\pm 1 %
Voltage measuring type	RMS / Instant
Voltage frequency measuring range, Hz	25.00 – 70.00
Voltage frequency measuring error (for sine signal)	\pm 0.05 %
Current input	4 channels
Current measuring range, A	0.05 – 10.00
Current measuring error	\pm 0.5 %
Current measuring type	RMS / Instant
Current sensor type	TT with output 5 A
Supported rating values TT, A	5, 10, 15, 20, 30, 40, 50, 75, 100, 150, 200, 300, 400, 600, 800, 1000, 1500, 2000
Current frequency measuring range, Hz	25.00 – 70.00
Current frequency measuring error (for sine signal)	\pm 0.05 %
Overload capability 50 A (not often than once a minute), not more, sec	0.3
*Working power input	3 channels
Active power measuring range, W	0.3 – 600 000
Reactive power measuring rate, VAR	0.3 – 600 000
Gross power measuring range, VA	0.3 – 600 000
Power factor measuring range, $\cos \varphi$	0.001 – 1.000
Temperature input	2 channels
Temperature sensor type	PTC1000 / PT1000
Temperature measuring range for PTC1000, °C	from -50.0 to 120.0
Temperature measuring range for PT1000, °C	from -50.0 to 250.0
Temperature measuring error	\pm 0.5 %
Voltage input 0 – 10 V (-----)	1 channel
Voltage measuring range, V	0.01 – 10.00
Voltage measuring error	\pm 0.5 %
Voltage sensor type	0 – 10 V / 2 – 10 V
Current input 0 – 20 mA (-----)	1 channel
Current measuring range, mA	0 – 20
Current measuring error	\pm 0.5 %
Current sensor type	0 – 20 mA / 4 – 20 mA

Table 2.2 (continued)

Item	Value
Digital input	4 channels
Measuring range	closed – opened
Digital signal sensor type	Dry contact

* - power input has no physical connection terminals, the power parameters are calculated on basis of measured values of voltage and current.	

2.3 Working conditions

The data logger RPM-416 is intended for working in the following conditions:

- Ambient temperature, from - 20 to +45 °C;
- Atmospheric pressure from 84 to 106.7 kPa;
- Relative air humidity (at temperature +25 °C) 30 ... 80%.

3. DESIGN AND OPERATION PRINCIPLE OF RPM-416

3.1 Design

3.1.1 Construction

The data logger is constructively made in plastic case intended for fixing on DIN-rack 35 mm, case dimensions (157 mm x 91 mm x 57 mm) 9 modules of S type. The case is made of crashworthy, self-extinguishing material ABS. The design with overall and fixing dimensions is shown in picture 3.1.

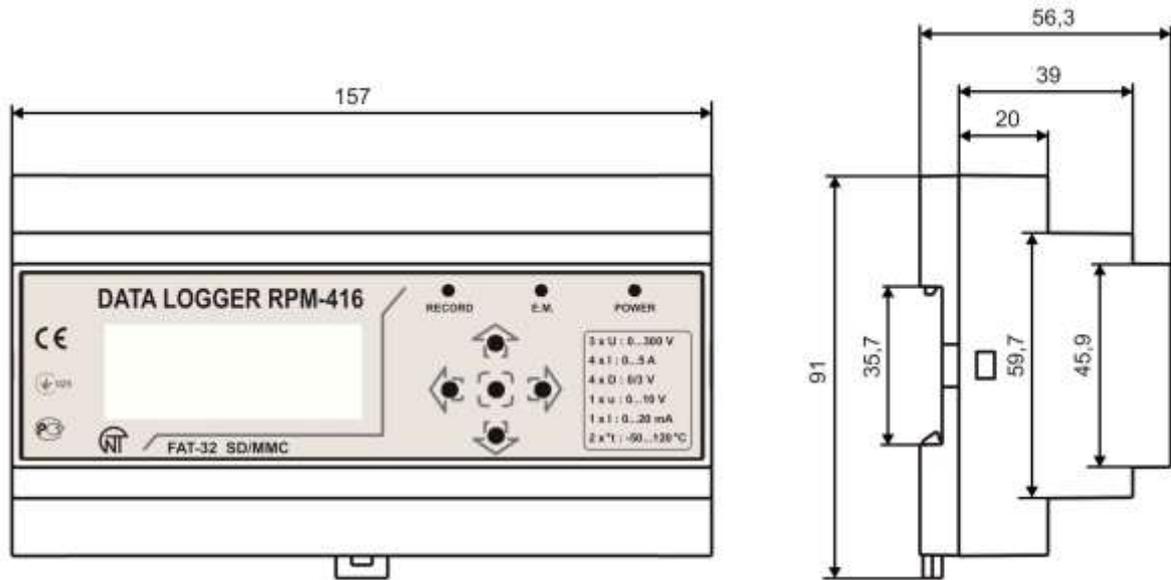
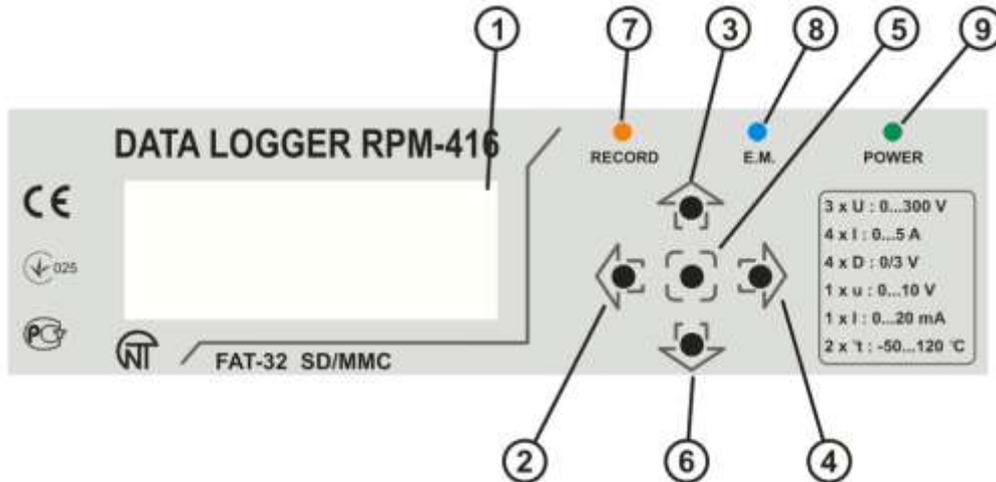


Fig. 3.1 – data logger design with overall and fixing dimensions

3.1.2 Display and control

The data logger front panel is shown in the picture 3.2.



- 1 – Display (yellow-green indication);
- 2 – Button ◀ (left) is used for moving the indicator to the left;
- 3 – Button ▲ (up) is used for moving the indicator upwards or for increasing parameter value;
- 4 – Button ▶ (right) is used for moving the indicator to the right;
- 5 – Button ◻ (enter) is used for value entry approval or menu item choice;
- 6 – Button ▼ (down) is used for moving the indicator downwards or for decreasing the parameter value;
- 7 – LED indicator **RECORDING** (light on – when the data recording on the memory card is initiated, light off – when the data recording on the memory card is finished, flare up – when the data recording on the memory card is paused, flickering – when there is at least one error in the data logger operation);
- 8 – LED indicator **E.M.** (E.M. light on – when at least one extension module is connected, flickering – when there is data transmitting between extension modules, light off – when the extension modules are not connected);
- 9 – LED indicator **POWER** (light on – when the power is on, light off – when the power is off).

Fig. 3.2 – The data logger front panel

On the data logger front panel there are located the elements of control (five-button keyboard) and indication (LED symbolic display), Fig. 3.2. With the help of the key-board are made all the settings of the data logger operation parameters and initiation of incoming signals values recording to the memory card. The current values of the data logger operation, the values of incoming signals and data logger state information are shown on the display.

3.1.3 Real time clock

The data logger is equipped with the inbuilt real time clock which is powered (in case of main power failure) from inbuilt backup power cell – lithium type battery. The power from the backup supply is sufficient continuous operation of real time clock during 10 years (at temperature 25 °C). In case of data logger operation at temperatures on the limits of working range the working period of clock decreases.

3.2 Operation principle

The data logger operation principle is based on the measuring values from all sensors connected to the data logger inputs, accumulating the data in the data logger internal memory and data recording to the external memory storage – memory card (SD / MMC).

4 TECHNICAL MAINTENANCE AND SAFETY MEASURES

4.1 Safety measures

4.1.1 THE VALUES OF MEASURED SIGNALS CONNECTED TO THE REGISTER INPUT TERMINALS SHOULD NOT EXCEED THOSE SPECIFIED IN THIS MANUAL BECAUSE IT MAY RESULT IN DAMAGE OF INCOMING LINES, DISRUPTION OF CONTACT GROUP AND REGISTER INFLAMMATION.

- 4.1.2 **RPM-416 USES THE VOLTAGE THAT IS DANGEROUS FOR LIFE. While repair work, maintenance work, installation work it is necessary to disconnect the data logger and incoming measuring lines from the power supply.**
- 4.1.3 The data logger is not designed for operation in vibration and impacts conditions.
- 4.1.4 The moisture is not allowed on the input contacts of terminal blocks and on data logger internal electric elements.
- 4.1.5 It is forbidden to use the data logger in aggressive environment with acid, caustic, oil content in the air.
- 4.1.6 The data logger connection, setting and maintenance should be made only by authorized personnel who have studied this operational manual.
- 4.1.7 During operation and technical maintenance, it is necessary to observe the requirements of normative documents GOST 12.3.019-80, "The rules of technical operation of consumers' electrical devices" and "The safety rules during operation of consumers' electrical devices".

4.2 Procedure of technical maintenance of RPM-416

The recommended period of technical maintenance is once every six months.

The technical maintenance consists of visual inspection of the data logger during which is checked the wires connection reliability, the absence of cracks and damages on its case.

During the technical maintenance of the data logger it is necessary to observe all safety rules specified in item 4.1.

5 CONNECTION OF RPM-416

5.1 General instructions

Prepare the cables for the data logger connection to sensors and external devices as well as to the power supply source. It is recommended for reliability of electric connection to use the copper cables the ends of which should be cleaned before connecting. The cleaning of cable wires should be made in such manner that the cleaned wire ends don't exceed the limits of terminal block after connection to the data logger. The recommended cable cross section area for voltage measuring should be 1.5 – 2.5 mm², for other connections 0.75 – 2.5 mm².

For reduction of electric field influence the installation of "data logger-sensor" lines should be made as a separate route (or several routes). The routes should be located separately from the power cables as well as away from the cables which make high frequency and impulse noise. The routes should be planned in such a way that the length of signal lines is minimal.

The connection of extension modules is made with the help of cable CEM-11-1 (see Item 5.2, the cable is supplied along with every extension module).

The connection of the data logger to Ethernet network is carried out by the cable made according to the standard ANSI EIA TIA 568B (see Item 5.3, the cable is supply along with the data logger).

During use of backup power supply the connection is made to the same terminals as the main power source. It is necessary to have a scheme ABI (Automatic Backup Input) for switching from the main power source to the backup power supply.

For ensuring the continuous data recording ABI should switch power supply to backup source within period not more than 0.5 sec.

5.2 Connection

The connection of RPM-416 is made according to the scheme resulted in picture 5.1.

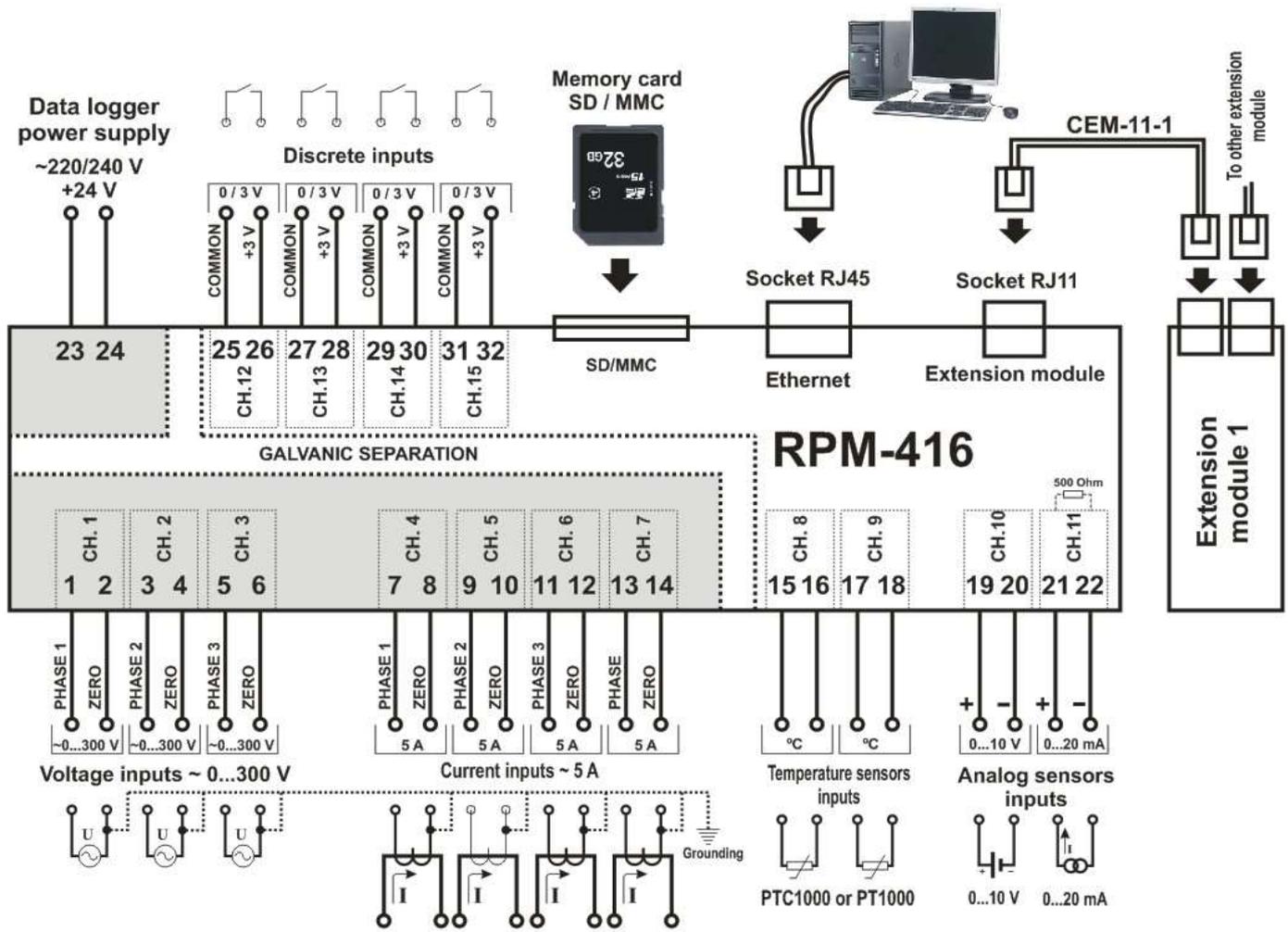


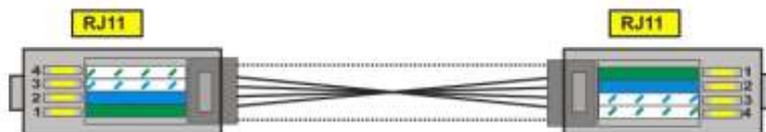
Fig. 5.1 – Connection scheme of RPM-416



NOTE: TERMINALS (23,24) FOR CONNECTION OF POWER SUPPLY LINES AND TERMINALS (1,2,3,4,5,6) FOR VOLTAGE MEASURING, ARE DESIGNED FOR MAXIMAL VOLTAGE 300 V. IN ORDER TO AVOID THE ELECTRIC BREAKDOWN OF ISOLATION THE CONNECTION OF POWER SOURCES WITH VOLTAGE HIGHER THAN SPECIFIED IS FORBIDDEN.

5.3 Connection of extension modules to RPM-416

Up to 4 extension modules can be connected to the data logger at the same time. At attempt to add more than specified quantity of modules the data logger stop to perceive all modules and switches them off. The extension modules installation should be carried out with the data logger power being switched off. The module connection should be made with cable CEM-11-1 (is not supplied with the data logger). The number indication of cable CEM-11-1 terminals is resulted in the picture 5.2.



#	Color	Function
1	green	power
2	blue	synchronization
3	white-blue	data
4	white-green	ground

#	Color	Function
1	green	power
2	blue	synchronization
3	white-blue	data
4	white-green	ground

Fig. 5.2 – Number and color indication of cable CEM-11-1

One end of the cable is connected to the socket RJ11 located in the data logger as shown in picture 5.1, the other end of the cable is connected to the socket RJ11 located in the extension module.

The connection linkage is made automatically after power input to the data logger.

The cable CEM-11-1 is supplied with every extension module.



NOTE: THE CONNECTION OF EXTENSION MODULES SHOULD BE MADE ON THE RIGHT SIDE OF REGISTER CASE AND ONLY VIA CABLE CEM-11-1 (See. FIG. 5.1).

5.4 Connection of RPM-416 to Ethernet network

Connection of the data logger to Ethernet network is carried out via the cable made according to the standard ANSI EIA TIA 568B category Cat.3 and higher (supplied with the device).

The numeral indication of such cable is shown in the picture 5.3.

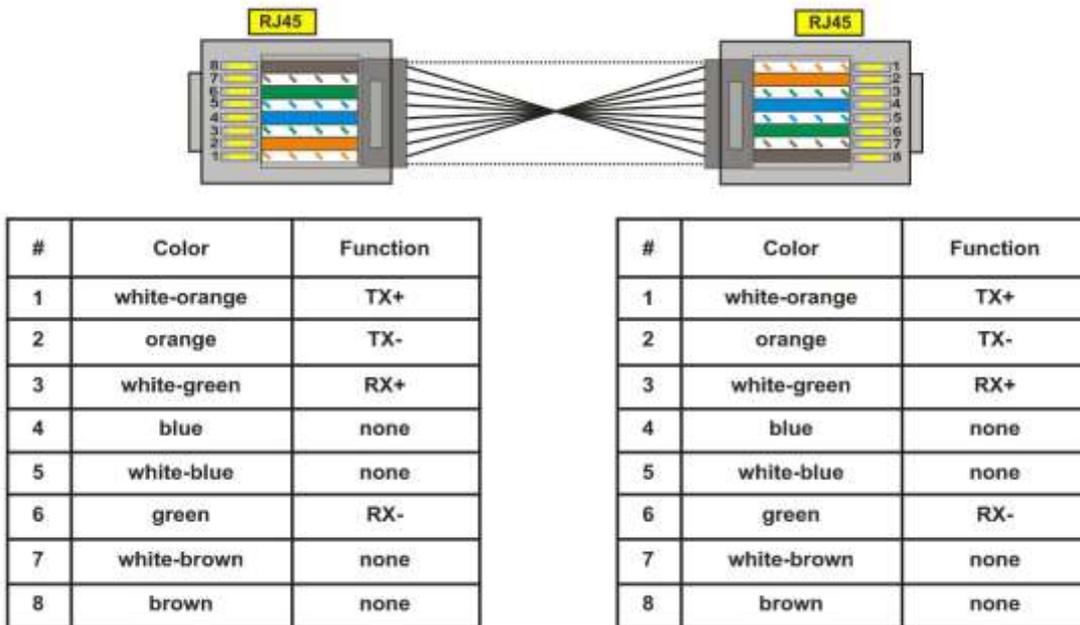


Fig. 5.3 – Numeral and color indication of cable for connection to Ethernet

One end of the cable is connected to the socket RJ45 located in the data logger as shown in the picture 5.1, the other end of the cable is connected to the socket of network adapter located in the PC or other network device.

LED indicators, located near the socket RJ45. indicate:

- **green** – data interchange;
- **yellow** – communication.

For communication connection via Ethernet interface the data logger and PC should be in the same IP-sub net.

Programming of the data logger while connection to Ethernet network is described in Appendix A.

Programming of the data logger while connection to Internet network is described in Appendix B.

6 SCOPE OF INTENDED USE

6.1 The use of data logger RPM-416

6.1.1 Initialization

After supply of the power to the data logger the process of initialization takes place, the LED indicator **POWER** (Fig. 3.2 item 9) and on the display (Fig. 3.2 item 1) there is a printed message shown in the picture 6.1.

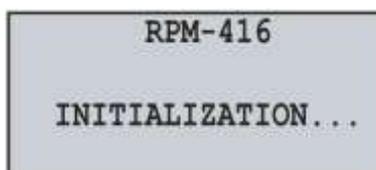


Fig. 6.1 –Initialization of Data logger

6.1.2 Main screen

After completion of initialization, the main screen will be shown on the display which view depends on if a memory card is installed or is not installed. In the figure 6.2 both variants of main screen views are shown.



Fig. 6.2 – Main screen view (with and without memory card)

In the first line there is shown the current date and time in form of DDD dd mm yyyy HH:MM, where:

- DDD - day of week:
 - Mon - Monday;
 - Tue - Tuesday;
 - Wed - Wednesday;
 - Thu - Thursday;
 - Fri - Friday;
 - Sat - Saturday;
 - Sun - Sunday.
- dd - date;
- mm - month;
- yyyy - year;
- HH - hours;
- MM - minutes.

In the second and third lines there is information of occupied and free space on the memory card (“**Used**” – Used space and “**Free**” – free space).

In case there is no memory card installed the display shows the following message “Memory card is not installed”.

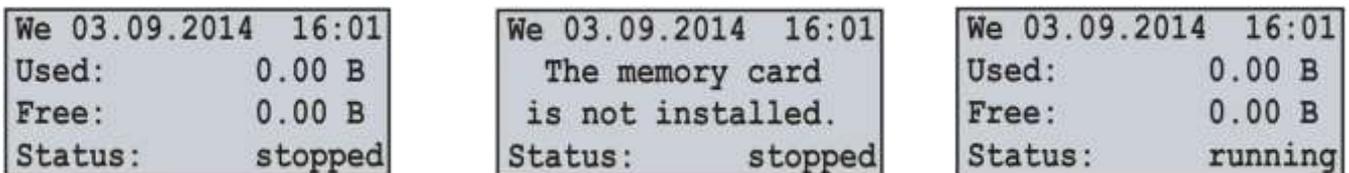
In the fourth line there are shown the main menu items of the data logger control. The choice of the menu items is made by buttons ◀ (left) or ▶ (right) (the selected item of the menu is illuminated by indicator “◀ ▶”), the conformation of the item is made by pressing the button ◻ (enter).

The main menu items of the Data logger:

- “**Menu**” – opens the menu of the data logger control;
- “**Start**” – starts the process of data recording to the memory card;
- “**Stop**” – stops the process of data recording to the memory card;
- “**Pause**” – pauses the process of data recording to the memory card;
- “**Cont.**” – resumes the process of data recording to the memory card;
- “**Meas.**” – opens the menu for measured values review.

6.1.3 Main screen menu items dissimulation

If during 10 seconds no button on the front panel was pressed the menu items of data logger control will be dissimulated and instead of them there will be shown the current state of the data logger (Fig. 6.3).



With memory card and recording process stopped Without memory card and recording process stopped With memory card and recording process started

Fig. 6.3 – Variants of main screen of data logger state.

In order to restore the indication of menu items of data logger control it is enough to press any button on the front panel of the data logger. The indication of the data logger state will be dissimulated and the control menu items will be shown instead (Fig. 6.2).

6.1.4 Starting up and finishing of data recording process

To start the process of data recording to the memory card it is necessary to select with the buttons ◀ (left) or ▶ (right) the menu item **“Start”**, then by pressing the button ◻ (enter) to confirm the choice, on the data logger display there will be a message confirming the beginning of the recording process (Fig. 6.4) and LED indicator **RECORDING** will be on (Fig. 3.2 item 7). After 3 seconds the main screen (Fig. 6.4) will be shown on the data logger display.

On the main screen there will be alternatively shown information of the free and occupied space on the memory card (Fig. 6.4 – Main screen (variant 1)), as well as the name and size of the last recorded file (Fig. 6.4 – Main screen (variant 2)).

The information interchange on the main screen still continues after stopping of the data recording process.

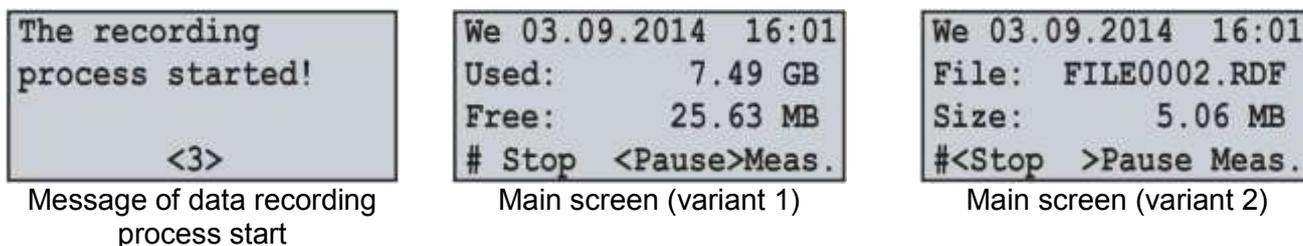


Fig. 6.4 – Main menu view after start of data recording process

If there is no mistakes in configuration, the data logger creates a new file in the following path **“RPM-416\2014\JUL\03\FILE0001.RDF”**, where:

- “RPM-416” – data logger core catalogue;
- “2014” – sub catalogue with indication of the current year (1980 - 2107);
- “JUL” – sub catalogue with indication of the current month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec);
- “03” – sub catalogue with indication of the current date (01 – 31);
- “FILE0001.RDF” – the file name with extension **“RDF”** (FILE0001 – FILE9999).

When the file size reaches the user defined limit (32 KB – 512 MB), the data logger automatically creates a new file with the following name **“FILE0002.RDF”**. When the file name reaches the maximum (**“FILE9999.RDF”**), the recording process will be terminated and on the data logger display there will be a message about an error shown in the figure 6.5. The LED indicator **RECORDING** (Fig. 3.2, item 7) will start flickering indicating that there is a mistake in the data logger operation.

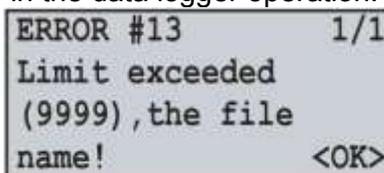


Fig. 6.5 – The message about an error when the file name reaches the limit

For confirming the error it is necessary to press the button ◻ (enter) (Fig. 3.2, item 5). The LED indicator **RECORDING** (Fig. 3.2, item 7) will start flickering indicating that the recording process is paused.

Depending on selected by user the recorded readings (the maximal number of recorded at the same time readings is equal to 15), one data block size being recorded to the memory card for 15 readings is 68 bytes.

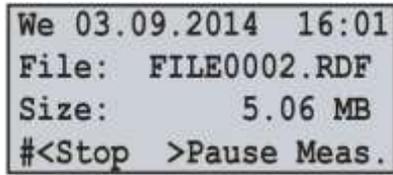
The stream of recorded data at discretion 1 ms for 15 readings is:

68 KB / sec, 4.08 MB / min or 244.8 MB / hour.

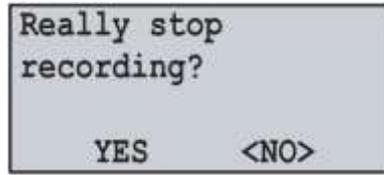
stream of recorded data at discretion 1 s for 15 readings is:

68 byte / sec, 4.08 KB / min or 244.8 KB / hour.

In order to stop the recording process it is necessary on the main screen of the data logger (Fig. 6.6) by buttons ◀ (left) or ▶ (right) to select a menu item **STOP**, and by button ◻ (enter) to confirm the selection. On the display of the data logger there will be a message (Fig. 6.6), in which it is necessary to confirm the stop of the recording process.



Main screen



Screen of confirming the recording process stop "Yes" "No"

Fig. 6.6 – View of main screen and screen of confirming the recording process stop

For confirming the recording process stop it is necessary to select by buttons ◀ (left) or ▶ (right) indicator position "YES", and by button ■ (enter) confirm the selection, the data logger will stop the recording process of data to the memory card the LED indicator **RECORDING** (Fig. 3.2, item 7) will light off and the display will look as shown in the figure 6.2 (with memory card).

After locating the indicator in position "NO", the data logger will continue recording and there will be on the display the main screen resulted in the figure 6.6.

If during the recording the memory card is full and has no free space, then depending on the selected type of recording ("**Until memory**" or "**The ring**"):

"**Until memory**" – there will be a message about an error on the display (resulted in the figure 6.7.), and the recording automatically stops.

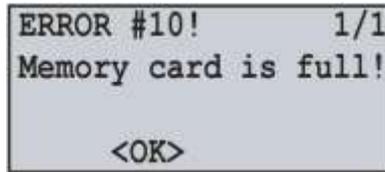


Fig. 6.7 – A message about an error when there is no free space on the memory card

"**The ring**" – there will be a message on the display about the deleting of old files (resulted in the figure 6.8). The data logger makes searching and deleting the old files in order to free some space on the memory card for creating a new file.

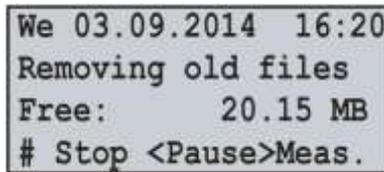


Fig. 6.8 – A screen of old files deleting



During old files deleting the data recording to the memory card pause and after freeing the available space for a new file, the recording starts automatically.

6.1.5 Data recording at event

RPM-416 can make data recording at event (this mode is described in the chapter 7, item 7.5).

If the data recording at event is switched on, the values measured by the data logger continuously are being recorded in temporary buffer storage with a user defined periodic sequence (parameter "**Discreteness**" at default is **1 ms**). Maximal length of temporary buffer storage is 1920 recordings.

The buffer storage is a sequential date, where the reading is performed from "beginning", and recording is made to "end". When the buffer is full the data deleting is performed from "beginning", and the new data is being located in "end".

In RPM-416 there are available five sources of events, every of which can be set individually to any of the data logger inputs.

Until the event happens, the data logger continuously checks the measured values with the up and down limits specified by the user during the event setting. If the measured value is higher (up limit) or lower (down limit) the event is generated.

After the event happens, the data recording is performed in three stages, as resulted in figure 6.9.

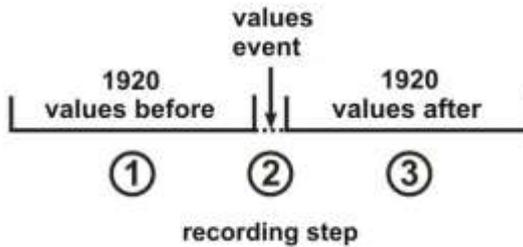


Fig. 6.9 – Data recording at event (stages)

At the first stage, the values accumulated in the temporal buffer storage are recorded.

At the second stage the value generated the event is recorded.

At the third stage after event changed values are recorded.

After completion of all stages of recording the data logger goes to stand-by mode waiting for a new event.

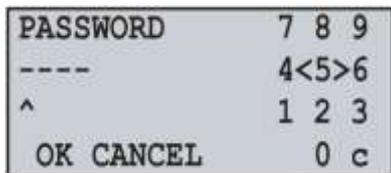
The number of values recorded before and after the event is set by parameters “**Points before**” and “**Points after**” in the menu of events setting (Chapter 7, item 7.5).

If the limit of the event is set for a single recording (“**ONCE**” Chapter 7, item 7.5.4.2), then there will be no generating of the next event if the measured value is lower (up level) or higher (down level) of specified limits.

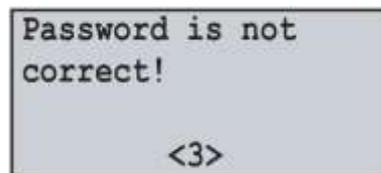
If the event limit is set on continuous recording (“**LONG**” Chapter 7, item 7.5.4.2), then after the event happens the data recording will continue, until the measured value is higher (up level) or lower (down level) of specified limits.

6.1.6 The main menu of the data logger

For entering in the data logger main menu it is necessary: on the main screen by buttons ◀ (left) or ▶ (right) to select item “**MENU/МЕНЮ**”, and by button ◻ (enter) to confirm the selection. If the password was set before the data logger asks to enter the password (Fig. 6.10 Screen of password entering).



Screen of password entering



Message about an error of password entering

Fig. 6.10 – Screen of password entering and screen of an error of password entering

The password entering is carried out in the following manner: by buttons ◀ (left), ▶ (right), ▲ (up) and ▼ (down) make the selection of one digit of password (the selected digit is illuminated by cursor), and by button ◻ (enter) confirm the selection.

Sign “^” indicates the digit which is selected at the moment.

To delete one digit of the password it is necessary to set a cursor in position “c” (for example in case of error selection).

After completion of password selection it is necessary to set a cursor in position “OK” and press the button ◻ (enter), if the password is not correct there will be a message about the mistake on the display resulted in the figure 6.10.

If the password is correct or if the password was deactivated by the user, there will be a list of main menu available items on the display of the data logger.

The screen of the data logger main menu is resulted in the figure 6.11.

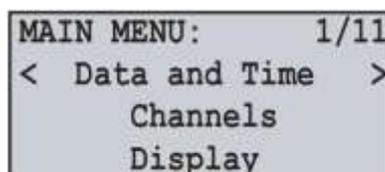


Fig. 6.11 – Screen of the data logger main menu

The selection of the menu items is made by buttons ▲ (up) or ▼ (down), the confirmation of the selection is made by button ■ (enter).

To escape from the main menu it is necessary to press the button ◀ (left). If there were made changes in settings, the data logger asks to save them by the message on the display resulted in figure 6.12. Otherwise on the data logger display there will be the main screen (Fig. 6.2).

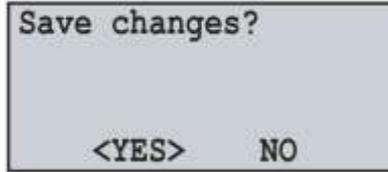


Fig. 6.12 – Screen of saving the changes

To confirm the saving it is necessary by button ◀ (left) locate the cursor in position “YES” and press the button ■ (enter). The data logger makes saving of the settings in nonvolatile memory and the display will show the main menu (Fig. 6.2).

To cancel the saving of the settings it is necessary by button ▶ (right) to put the cursor in position “NO” and press the button ■ (enter). The data logger will load the settings from the nonvolatile memory and the display will show the main menu (Fig. 6.2).

The full list of items of the main menu is described Chapter 7 “The setting of the data logger RPM-416”.



The item “MENU” of the main screen (Fig. 6.2) is available when the data recording to the memory card is stopped. To stop the recording process it is necessary to follow the procedure described in item 6.1.4.

6.1.7 The review of measured values

To review the measured values it is necessary: on the main screen by buttons ◀ (left) or ▶ (right) to select item “Measuring”, and by the button ■ (enter) confirm the selection. The display will show the first open channel (opening or closing of the channels is carried out by menu item “Channels” in the main menu of the data logger), and its changed values.

The screen of measured values for channel 1 is resulted in figure 6.13.

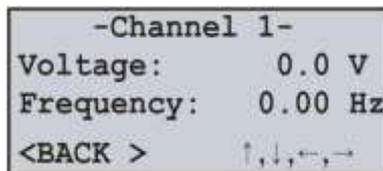


Fig. 6.13 – Screen of measured values for channel 1

In the first line the channel number is shown (“-Channel 1-”).

In the second and third lines, there are available measured values for this channel.

In the fourth line, there is a menu item “BACK”, and arrow symbols of navigation.

Shifting to the next open channel is made by pressing the button ◀ (left) or ▶ (right), and by buttons ▲ (up) or ▼ (down) you can scroll through the list of available measuring.

To escape from the screen of measured values it is necessary to press the button ■ (enter), the display will go to initial view (Fig. 6.4 – Main screen).

In the table 6.1 there is a list of channels with corresponding names of measured values.

Table 6.1 – The list of channels with corresponding names of measured values

Channel	Number of value				
	1	2	3	4	5
1	RMS voltage, V	Frequency, Hz	Instantaneous voltage, V	----	----
2	RMS voltage, V	Frequency, Hz	Instantaneous voltage, V	----	----
3	RMS voltage, V	Frequency, Hz	Instantaneous voltage, V	----	----

Table 6.1 (continued)

Channel	Number of value				
	1	2	3	4	5
4	RMS current, V	Frequency, Hz	Instantaneous current, V	----	----
5	RMS current, V	Frequency, Hz	Instantaneous current, V	----	----
6	RMS current, V	Frequency, Hz	Instantaneous current, V	----	----
7	RMS current, V	Frequency, Hz	Instantaneous current, V	----	----
8	Temperature, °C	----	----	----	----
9	Temperature, °C	----	----	----	----
10	Analog voltage, V	----	----	----	----
11	Analog current, mA	----	----	----	----
12	Digital input	----	----	----	----
13	Digital input	----	----	----	----
14	Digital input	----	----	----	----
15	Digital input	----	----	----	----
16	Active power, W	Reactive power, VAR	Full power, VA	Power factor, cos φ	----
17	Active power, W	Reactive power, VAR	Full power, VA	Power factor, cos φ	----
18	Active power, W	Reactive power, VAR	Full power, VA	Power factor, cos φ	----

 Channels 16, 17 and 18 do not have physical terminals, their values are calculated based on the corresponding measured values of voltage and current:
 - Channel 16 = Channel 1 и Channel 4;
 - Channel 17 = Channel 2 и Channel 5;
 - Channel 18 = Channel 3 и Channel 6.

6.1.8 Error message confirmation

In the process of the data logger work there can happen different errors (real time clock error, data exchange failure, settings failure etc.).

The total list of possible errors is presented in Table 6.2.

If an error takes place it is shown on the display of the data logger. The LED indicator **RECORD** begins to blink.

The error message will be on the display until all errors are confirmed.

Screen with an error message is resulted in the figure 6.14.

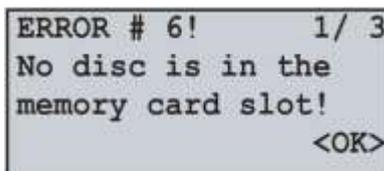


Fig. 6.14 – Screen with an error message

In the first line there is a description of error and its code “**ERROR # 6!**”. As well in the first line there is a current number of error and total quantity of errors “**1/ 3**”.

In the second, third and fourth lines there is an error text.

By buttons ▲ (up) and ▼ (down) you can scroll the list of errors and by button ■ (enter) you can confirm the current error.

If all the error are confirmed by user but the data logger continues to state the active errors, the LED indicator **RECORDING** continues to flicker. After 20 seconds the data logger will again show the active errors on the display.

If there are no active errors and the user confirmed all the errors, LED indicator **RECORDING** lights off – in case the recording is stopped, lights on – in case the recording continues or lights flicker – in case the recording is paused.

Table 6.2 – Total list of possible errors of the data logger

Error code	Error message	Troubleshooting method
# 1	Failure is detected real-time clock.	Set the date and time.
# 2	No connection with ADC!	Switch off and switch on again the data logger.
# 3	No connection to MM!	
# 4	No connection with EM!	
# 5	No connection with ROM!	
# 6	No disc is in the memory card slot!	Insert the memory card in slot of the data logger.
# 7	Disk is write protected!	Deactivate the recording protection on the memory card.
# 8	Unable to initialize the disk!	Switch off and switch on again the data logger. Take out and insert the memory card in the data logger. Replace the memory card.
# 9	Unable to connect to the disk!	
#10	Memory card is full!	Delete the files which are not used on the memory card. Use recording mode “Circling”. Replace the memory card.
#11	Unable to read data from the disk!	Switch off and switch on again the data logger. Take out and insert the memory card in the data logger. Format the memory card. Replace the memory card.
#12	Unable to create or open a directory RDF!	
#13	Limit exceeded (9999), the file name!	Delete the file from current directory. Replace the memory card.
#14	Unable to get the list of files!	Switch off and switch on again the data logger. Take out and insert the memory card in the data logger. Format the memory card. Replace the memory card.
#15	Can not create file!	
#16	Unable to write to file!	
#17	Damaged settings in the flash memory!	Reset the settings of the data logger to factory settings. Reset the data logger.
#18	Unable to save settings to flash memory!	Switch off and switch on again the data logger. Reset the data logger.
#19	Damage the calibration in flash memory!	The data logger should be calibrated. This procedure can be performed only at the manufacturer plant.
#20 - #32	Unknown error!	The reserved errors codes. Switch off and switch on again the data logger.
---	NMI_HANDLER	Critical error. Switch off and switch on again the data logger.
---	HARDFULT_HANDLER	
---	MEMMANAGE_HANDLER	
---	BUSFAULT_HANDLER	
---	USAGEFAULT_HANDLER	
---	STACK_OVERFLOW	
---	HEAP_OVERFLOW	
---	ERROR_SETTINGS	
---	ERROR_BUTTON	
---	ERROR_DIG_INP	
---	ERROR_SD_CARD	
---	ERROR_SPI_SRAM	
---	ERROR_RTC	

Table 6.2 (continued)

Error code	Error text	Troubleshooting method
---	ERROR_ADC1_CH	Critical error. Switch off and switch on again the data logger.
---	ERROR_USART2_MCU2	
---	ERROR_IP	
---	ERROR_HTTP	
---	ERROR_MODBUS	
---	ERROR_FTP	
---	ERROR_TGUI	
---	ERROR_TCOLL	
---	ERROR_TWRITE	

6.2 Use of Web-interface

For access to Web-interface of the data logger, the PC is required with installed Web-browser.

In the Web-browser put in IP-address of the data logger (factory setting 192.168.0.2) and press the button of access to this address.

On the PC screen there will be a welcome page of the data logger RPM-416 with offer to enter the password (factory setting “admin”).

After the password entering and pressing of the button “Enter”, if the password is correct, there will be the main screen of the data logger. If the password is not correct, there will be a password error message on the PC display.

On the main screen you can monitor the current state of the data logger, make setting, control and restart.

After resetting RPM-416 it is necessary to press the button “Save”. The entered settings will be checked. In case there are no errors in the setting parameters, they will be saved in nonvolatile memory of the data logger. In case there are some errors in the setting parameters they will not be saved.

After the completion of the work with Web-interface it is necessary to press the button “Escape”, the main page will be closed and the welcome and password page will be opened.

If there is no activity of the user during 5 minutes (this period is specified by the user, see item 7.8.2.3), the data logger automatically closes the communication. In this case it is necessary to enter IP-address of the data logger and password again.

Note – if the address parameters in Ethernet network (MAC-address, IP-address or DHCP setting) were changed then in response to pressing the button “Restart”, Web-browser may not load the page. It happens because Web-browser requests to the old address of the data logger. In this case it is necessary to restart the connection.



The data logger has restriction of number of simultaneously connected clients to Web-interface (not more than two). All connections exceeding the limit will be automatically closed.

6.3 Use of Modbus TCP protocol

Connection protocol Modbus TCP enables to connect the data logger to the network organized by standard Ethernet. The use of the data logger in network enables to perform the following operations:

- data receiving in systems SCADA;
- programming the data logger via PC (by program RPM-416 Data Analysis);
- remote control of the data logger.

While connection to the data logger, the access to the command registry and recording function is blocked (reading function is not blocked). To unblock the access to the command data logger and recording function it is necessary to write in registries 51-65 modbus password in symbols ASCII (factory variant “admin”). In not used registries there should be written zero values (0x0000).

In case if the modbus password is correct, the data logger will unlock the access to the command registry and recording function.

The data logger control is carried out via the command registry (Table 6.4).

After completing of data logger resetting, it is necessary to carry out the command of recording in the nonvolatile memory (0x472C). For the changes to take place the data logger should be restarted (0xF2C5).

If the functions of recording and control of the data logger is not used for a long period of time it is necessary to block the access to them by writing in registries 51-65 the values differing from password modbus (for example, 0).

If there is no data exchange for 60 seconds (time is set by the user, item 7.8.1.3), the data logger automatically breaks the connection with the client.

In the data logger all values with a dot are resulted to the whole numbers. That's why while processing the data it is necessary to use the additional mathematic operations.

To the request of reading the value with a dot (for example, **1.000**) the data logger will return the whole number value **1000**, for adjusting to the correct format it is necessary to divide the number by 1000.

Before recording the value with a dot (for example, **1.000**) it is necessary to bring the value to the whole number by multiplying by 1000, then make recording of the value in the data logger.

The coefficient of changing to whole number is defined by number of digits after the dot (1.0 – 10; 1.00 – 100; 1.000 - 1000).

The list of supported functions (Modbus) is resulted in the Table 6.3.

The address of command registry is resulted in Table 6.4.

Addresses of additional registries are resulted in Table 6.5.

Addresses of registries of measured values are resulted in Table 6.6.

Addresses of registries of programmable parameters are resulted in Table 6.7.



The data logger has restriction of number of simultaneously connected clients to Modbus TCP (not more than five). All connections exceeding the limit will be automatically closed.

Table 6.3 – List of supported functions

Function (hex)	Purpose	Remark
0x03	Reading of one or several registries	Maximum 125
0x06	Recording of one values in the registrar	----
0x10	Recording of one or several values in the registries	Maximum 123

Table 6.4 – Command registry RPM-416

Name	Description	WR/RD	Address (DEC)
Command registry	Command codes: 0xF2C5 – the data logger restart. 0x77A6 – to start the recording. 0x5606 – to stop the recording. 0x5596 – All errors reset. 0x472C – to record the settings in nonvolatile memory. 0xD357 – to load the settings from nonvolatile memory.	WR	50
Modbus password (16 chars ASCII)	Enter the correct password for access to recording (on default – “admin”). Enter any not correct value for non-admission to recording. Supported symbols: A-Z; a-z; 0-9.	WR	51-66

Rec/Read – access type to registry Recording / Reading.

Address view “50” means value 16 bit (UINT).

Address view “51-65” means a range of 16 bit values.

Table 6.5 – Additional registries RPM-416

Name	Description		WR/RD	Address (DEC)
Identifier	Identifier of device RPM-416 (value 14)		RD	0
Micro program version	Bit 15 – Bit 8	1	RD	1
	Bit 7 – Bit 0	0		
Registry of state	Bit 0	0 : no errors in the data logger 1 : some errors (see errors flags)	RD	2:3
	Bit 1	0 : data recording stopped 1 : data recording started		

Table 6.5 (continued)

Name	Description	WR/RD	Address (DEC)	
	Bit 3	0 : no disc in the card slot 1 : a disc in the card slot	RD	2:3
	Bit 4	0 : memory card is not initialized 1 : memory card is initialized		
	Bit 5	0 : FAT is not ready 1 : FAT is ready		
	Bit 6	0 : file is closed 1 : file is open		
	Bit 7	0 : recording in file is finished 1 : recording in file is in process		
	Bit 8	1 : file deleting is in process		
	Bit 9	1 : file synchronization is needed		
Bits from 10 to 31 are reserved				
Registry of errors	Bit 0	Real time clock failure	RD	4:5
	Bit 1	No access to AD coder		
	Bit 2	No access to MI.		
	Bit 3	No access to MR.		
	Bit 4	No access to RAM.		
	Bit 5	No disc in card slot.		
	Bit 6	Disc is protected from recording.		
	Bit 7	Disc initialization is impossible.		
	Bit 8	Disc connection is impossible.		
	Bit 9	No free space on disc.		
	Bit 10	Data reading from disc is impossible.		
	Bit 11	Catalogue cannot be created or opened.		
	Bit 12	File name limit (9999) is exceeded.		
	Bit 13	Files list is not available.		
	Bit 14	File cannot be created.		
	Bit 15	Recording in file is impossible.		
	Bit 16	Settings failure in flash memory.		
Bit 17	Settings cannot be saved in flash memory.			
Bit 18	Calibration failure in flash memory.			
Bits from 19 to 32 are reserved.				
Memory card capacity	Multiply by 512 for value in bytes	RD	6:7	
Free space on the memory card	Multiply by 512 for value in bytes	RD	8:9	
File identifier	File identifier 0 – 9999 (FILE0001.RDF)	RD	10	
File size, byte	Data file size	RD	11:12	
Operation time, sec	Time since the last switching on	RD	13:14	
System time, sec	Time is counted since 01.01.1980 / 00:00:00	WR/RD	15:16	
<p>-----</p> <p>Rec/Read – access type to registry Recording / Reading. Address view “1” means value 16 bit (UINT). Address view “2:3” means value 32 bit (ULONG).</p>				

Table 6.6 – Registries of measured values RPM-416

Channel	Name	Value	Type	WR/RD	Address (DEC)
1	RMS Voltage of Phase 1, V	0.1	ULONG	RD	100:101
	Voltage Frequency of Phase 1, Hz	0.01	ULONG	RD	102:103
	Momentary Voltage of Phase 1, V	0.1	LONG	RD	104:105
	Reserved	---	---	RD	106-109
2	RMS Voltage of Phase 2, V	0.1	ULONG	RD	110:111
	Voltage Frequency of Phase 2, Hz	0.01	ULONG	RD	112:113
	Momentary Voltage of Phase 2, V	0.1	LONG	RD	114:115
	Reserved	---	---	RD	116-119

Table 6.6 (continued)

Channel	Name	Value	Type	WR/RD	Address (DEC)
3	RMS Voltage of Phase 3, V	0.1	ULONG	RD	120:121
	Voltage Frequency of Phase 3, Hz	0.01	ULONG	RD	122:123
	Momentary Voltage of Phase 3, V	0.1	LONG	RD	124:125
	<i>Reserved</i>	---	---	RD	126-129
4	RMS current of phase 1, A	0.1	ULONG	RD	130:131
	Current frequency of phase 1, Hz	0.01	ULONG	RD	132:133
	Momentary current of phase 1, A	0.1	LONG	RD	134:135
	<i>Reserved</i>	---	---	RD	136-139
5	RMS current of phase 2, A	0.1	ULONG	RD	140:141
	Current frequency of phase 2, Hz	0.01	ULONG	RD	142:143
	Momentary current of phase 2, A	0.1	LONG	RD	144:145
	<i>Reserved</i>	---	---	RD	146-149
6	RMS current of phase 3, A	0.1	ULONG	RD	150:151
	Current frequency of phase 3, Hz	0.01	ULONG	RD	152:153
	Momentary current of phase 3, A	0.1	LONG	RD	154:155
	<i>Reserved</i>	---	---	RD	156-159
7	RMS current, A	0.1	ULONG	RD	160:161
	Current frequency, Hz	0.01	ULONG	RD	162:163
	Momentary current, A	0.1	LONG	RD	164:165
	<i>Reserved</i>	---	---	RD	166-169
8	Temperature 1, °C	0.1	LONG	RD	170:171
	<i>Reserved</i>	---	---	RD	172-179
9	Temperature 2, °C	0.1	LONG	RD	180:181
	<i>Reserved</i>	---	---	RD	182-189
10	Analog voltage 0-10 V, V	0.01	ULONG	RD	190:191
	<i>Reserved</i>	---	---	RD	192-199
11	Analog current 0-20 mA, mA	0.01	ULONG	RD	200:201
	<i>Reserved</i>	---	---	RD	202-209
12	Digital input 1	1.0	ULONG	RD	210:211
	<i>Reserved</i>	---	---	RD	212-219
13	Digital input 2	1.0	ULONG	RD	220:221
	<i>Reserved</i>	---	---	RD	222-229
14	Digital input 3	1.0	ULONG	RD	230:231
	<i>Reserved</i>	---	---	RD	232-239
15	Digital input 4	1.0	ULONG	RD	240:241
	<i>Reserved</i>	---	---	RD	242-249
16	Full power of phase 1, VA	0.1	ULONG	RD	250:251
	Active power of phase 1, W	0.1	ULONG	RD	252:253
	Reactive power of phase 1, VAR	0.1	ULONG	RD	254:255
	Power factor of phase 1, cos φ	0.001	ULONG	RD	256:257
	<i>Reserved</i>	---	---	RD	258-259
17	Full power of phase 2, VA	0.1	ULONG	RD	260:261
	Active power of phase 2, W	0.1	ULONG	RD	262:263
	Reactive power of phase 2, VAR	0.1	ULONG	RD	264:265
	Power factor of phase 2, cos φ	0.001	ULONG	RD	266:267
	<i>Reserved</i>	---	---	RD	268-269
18	Full power of phase 3, VA	0.1	ULONG	RD	270:271
	Active power of phase 3, W	0.1	ULONG	RD	272:273
	Reactive power of phase 3, VAR	0.1	ULONG	RD	274:275
	Power factor of phase 3, cos φ	0.001	ULONG	RD	276:277
	<i>Reserved</i>	---	---	RD	278-279

Rec/Read – access type to registry Recording / Reading.
Address view “**100**” means value 16 bit.
Address view “**106-109**” means a range of 16 bit values.
Address view “**110:111**” means value 32 bit.

Table 6.7 – Parameters registries RPM-416

Name	Min. / Max.	Factory value	Type	WR/RD	Address (DEC)
Time correction, sec / day	-5.2 / +5.2	0.0	INT	WR/RD	500
Channel 1 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	501
Channel 2 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	502
Channel 3 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	503
Channel 4 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	504
Channel 5 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	505
Channel 6 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	506
Channel 7 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	507
Channel 8 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	508
Channel 9 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	509
Channel 10 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	510
Channel 11 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	511
Channel 12 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	512
Channel 13 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	513
Channel 14 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	514
Channel 15 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	515
Channel 16 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	516
Channel 17 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	517
Channel 18 [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	518
Voltage sensor coefficient Ph1 (Channel 1)	1.0 / 99.9	1.0	UINT	WR/RD	519
Voltage sensor coefficient Ph2 (Channel 2)	1.0 / 99.9	1.0	UINT	WR/RD	520
Voltage sensor coefficient Ph3 (Channel 3)	1.0 / 99.9	1.0	UINT	WR/RD	521
Nominal TT Phase 1 (Channel 4), A	5 / 2000	5	UINT	WR/RD	522
Nominal TT Phase 2 (Channel 5), A	5 / 2000	5	UINT	WR/RD	523
Nominal TT Phase 3 (Channel 6), A	5 / 2000	5	UINT	WR/RD	524
Nominal TT (Channel 7), A	5 / 2000	5	UINT	WR/RD	525
Temperature correction (Channel 8), °C	-9.9 / +9.9	0.0	INT	WR/RD	526
Temperature correction (Channel 9), °C	-9.9 / +9.9	0.0	INT	WR/RD	527
Temperature sensor type (Channel 8) [0 – PTC1000; 1 – PT1000]	0 / 1	1	UINT	WR/RD	528
Temperature sensor type (Channel 9) [0 – PTC1000; 1 – PT1000]	0 / 1	1	UINT	WR/RD	529
Analog voltage sensor type 0-10 V (Channel 10) [0 – 0-10V; 1 – 2-10V]	0 / 1	0	UINT	WR/RD	530
Analog current sensor type 0-20 mA (Channel 11) [0 – 0-20mA; 1 – 4-20mA]	0 / 1	0	UINT	WR/RD	531
Discrete input type (Channel 12) [0 – not invert.; 1 – invert.]	0 / 1	0	UINT	WR/RD	532
Discrete input type (Channel 13) [0 – not invert; 1 – invert.]	0 / 1	0	UINT	WR/RD	533
Discrete input type (Channel 14) [0 – not invert; 1 – invert.]	0 / 1	0	UINT	WR/RD	534
Discrete input type (Channel 15) [0 – not invert; 1 – invert.]	0 / 1	0	UINT	WR/RD	535
Event 1, up limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	536
Event 2, up limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	537
Event 3, up limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	538
Event 4, up limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	539
Event 5, up limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	540

Table 6.7 (continued)

Name	Min. / Max.	Factory value	Type	WR/RD	Address (DEC)
Event 1, down limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	541
Event 2, down limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	542
Event 3, down limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	543
Event 4, down limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	544
Event 5, down limit [0 – off; 1 – momentary; 2 – continued]	0 / 2	0	UINT	WR/RD	545
Event 1, up limit value	--- / ---	0	ULONG	WR/RD	546:547
Event 2, up limit value	--- / ---	0	ULONG	WR/RD	548:549
Event 3, up limit value	--- / ---	0	ULONG	WR/RD	550:551
Event 4, up limit value	--- / ---	0	ULONG	WR/RD	552:553
Event 5, up limit value	--- / ---	0	ULONG	WR/RD	554:555
Event 1, down limit value	--- / ---	0	ULONG	WR/RD	556:557
Event 2, down limit value	--- / ---	0	ULONG	WR/RD	558:559
Event 3, down limit value	--- / ---	0	ULONG	WR/RD	560:561
Event 4, down limit value	--- / ---	0	ULONG	WR/RD	562:563
Event 5, down limit value	--- / ---	0	ULONG	WR/RD	564:565
Event 1, up limit time, ms	1 ms / 60 s	10	UINT	WR/RD	566
Event 2, up limit time, ms	1 ms / 60 s	10	UINT	WR/RD	567
Event 3, up limit time, ms	1 ms / 60 s	10	UINT	WR/RD	568
Event 4, up limit time, ms	1 ms / 60 s	10	UINT	WR/RD	569
Event 5, up limit time, ms	1 ms / 60 s	10	UINT	WR/RD	570
Event 1, down limit time, ms	1 ms / 60 s	10	UINT	WR/RD	571
Event 2, down limit time, ms	1 ms / 60 s	10	UINT	WR/RD	572
Event 3, down limit time, ms	1 ms / 60 s	10	UINT	WR/RD	573
Event 4, down limit time, ms	1 ms / 60 s	10	UINT	WR/RD	574
Event 5, down limit time, ms	1 ms / 60 s	10	UINT	WR/RD	575
Event 1, value source [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	576
Event 2, value source [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	577
Event 3, value source [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	578
Event 4, value source [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	579
Event 5, value source [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	580
Display illuminating mode [0 – off; 1 – on; 2 – will be off in 30 sec]	0 / 2	2	UINT	WR/RD	581
Recorded Data Source 1 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	582
Recorded Data Source 2 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	583

Table 6.7 (continued)

Name	Min. / Max.	Factory value	Type	WR/RD	Address (DEC)
Recorded Data Source 3 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	584
Recorded Data Source 4 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	585
Recorded Data Source 5 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	586
Recorded Data Source 6 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	587
Recorded Data Source 7 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	588
Recorded Data Source 8 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	589
Recorded Data Source 9 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	590
Recorded Data Source 10 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	591
Recorded Data Source 11 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	592
Recorded Data Source 12 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	593
Recorded Data Source 13 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	594
Recorded Data Source 14 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	595
Recorded Data Source 15 [bit15 – bit8 : channel number; bit7 – bit0 : value number]	Chan. 0 / 17 Value 0 / 4	65535	UINT	WR/RD	596
Data recording period, ms	1 ms / 60 min	1000	ULONG	WR/RD	597:598
File size limit, bytes	32 KB / 512 MB	32768	ULONG	WR/RD	599:600
Data recording type [0 – till full; 1 – circling]	0 / 1	0	UINT	WR/RD	601
Events recording [0 – off; 1 – on]	0 / 1	0	UINT	WR/RD	602
Number of dots before event	0 / 1920	100	UINT	WR/RD	603
Number of dots after event	0 / 1920	100	UINT	WR/RD	604
Discreteness of events recording, ms	1 ms / 1000 ms	1	UINT	WR/RD	605
Access password [0 – off; 1 – on]	0 / 1	0	UINT	WR/RD	606
Access password definitions bit31 – bit24 : 4-th figure of password; bit23 – bit16 : 3-rd figure of password; bit15 – bit8 : 2-nd figure of password; bit7 – bit0 : 1-st figure of password	0000 / 9999	1234	UINT	WR/RD	607:608

Table 6.7 (continued)

DHCP auto setting [0 – off; 1 – on]	0 / 1	0	UINT	WR/RD	609
IP-address of the data logger	--- / ---	192.168.0.2	ULONG	WR/RD	610:611
Sub net mask	--- / ---	255.255.255.0	ULONG	WR/RD	612:613
Main gateway	--- / ---	192.168.0.1	ULONG	WR/RD	614:615
Modbus TCP server [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	616
Modbus TCP port	1 / 65535	502	UINT	WR/RD	617
Modbus TCP timeout, s	60 / 3600	60	UINT	WR/RD	618
MODBUS password (16 symbols ASCII)	A-Z, a-z, 0-9	“admin”	STR	WR/RD	619-634
HTTP server [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	635
HTTP port	1 / 65535	80	UINT	WR/RD	636
HTTP timeout, s	60 / 3600	300	UINT	WR/RD	637
HTTP password (16 symbols ASCII)	A-Z, a-z, 0-9	“admin”	STR	WR/RD	638-653
FTP server [0 – off; 1 – on]	0 / 1	1	UINT	WR/RD	654
FTP port	1 / 65535	80	UINT	WR/RD	655
FTP timeout, s	60 / 3600	300	UINT	WR/RD	656
FTP password (16 symbols ASCII)	A-Z, a-z, 0-9	“admin”	STR	WR/RD	657-672
<p>----- Rec/Read – access type to registry Recording / Reading. Address view “500” means value 16 bits. Address view “619-634” means a range of 16 bit values. Address view “546:547” means value 32 bits.</p>					

6.4 Use of FTP protocol

File transfer protocol FTP uses the double connection. Herein one channel is as a pilot through which the commands from the data logger come in and respond goes out (on default TCP-port 21), and via the second channel comes data communication (TCP-port is defined by the data logger by random choice).

Use of FTP protocol enables via TCP-networks to receive remote files recorded by the data logger on the memory card.

Files’ receiving is carried out with the help of program RPM-416 Data Analysis or any other software which support the files receiving via FTP.

In the data logger server FTP operates in passive mode (waiting the client’s connection).

At connection to the data logger via FTP it is necessary to write the name of the user “**ftp**” and password (factory variant “**admin**”).

Used commands:

- **ABOR** – Abort the file transmitting;
- **CDUP** – Change the directory upward;
- **CWD** – Change the directory;
- **LIST** – Restore the list of current directory files;
- **NLST** – Restore the list of current directory files in brief format;
- **NOOP** – No operation (is used for timeout reset);
- **PASV** – Enter in passive mode and restore address of connection;
- **PWD** – Restore the current directory;
- **QUIT** – Switch off;
- **RETR** – Download the file. Before RETR operation there should be a command PASV;
- **SYST** – Return the system type (UNIX);
- **TYPE** – Define the type of file transmitting (“**I**” – binary);
- **USER** – User’s name for input on the server;
- **PASS** – Password for the server.

If there is no data exchange during 300 seconds (time period can be set by the user, item 7.8.3.3), the data logger automatically breaks the connection with a client.



The data logger has restriction of number of simultaneously connected FTP clients (not more than two). All connections exceeding the limit will be automatically closed.

6.5 Inserting and pulling out of the memory card

Insert the memory card in the slot situated on the side wall of the data logger, as shown in the figure 5.1 and press it till there is a click.

In order to pull the memory card out, press it till a click and release it – the memory card will go out from the slot about 3-5 mm, after that you can pull it out.

During inserting and pulling out of the memory card do not use much effort.



Do not pull out the memory card during data recording to the data logger – it can result in recorded data loss. The procedure of safety pulling out of the memory card is described in item 7.6.2.

6.6 RPM-416 Data Analysis software installation.

For proper work of the software on the computer there should be installed Operational System Windows 2000, Windows XP, Windows Vista or Windows 7. The installation is initiated by starting the installation file “rpm416da_setup.exe” (not included in the supply scope). After starting of the installation, the program performs the installation guided by the instructions of installation master. If the previous version of the program has been already installed on the computer it should be deleted before a new installation.

The latest version of the program is available on the web site <http://www.novatek-electro.com> in section “Software support”.

To delete the program you should use Windows master of installation and deleting.

6.7 Installation and connection of software for memory card-reader

The procedure and installation of software for memory cards reading depends on the model and manufacturer of the device. All installation instructions are resulted in the card reader manual.

6.8 Review of the recorded data

Pull out the memory card from the data logger (pulling out of the memory card is described in the item 6.5) and insert it in the card reader on the PC.

Review and analysis of the data is carried out with program software “RPM-416 Data Analysis” installed on the PC (installation of the software is described in item 6.6).

Program “RPM-416 Data Analysis” enables to make the analyses of data, to compare it (in form of numeral information or diagrams) and output the results of the analysis for printing. The program can also perform a remote configuration of the data logger and monitor its operation in real time mode via protocol Modbus TCP.

7 SETTING OF RPM-416 REGISTER

The description of settings is based on the factory parameters settings.

The parameters are saved in the nonvolatile memory (period of storage is not less than 10 years).

For restoring the main menu of the data logger it is necessary to perform the actions described in item 6.1.6 “Main menu of the data logger RPM-416”.

Total list of main menu items:

- “Date and Time” – for setting the date and time;
- “Channels” – for setting the channels (inputs of the data logger);
- “Display” – for setting the display;
- “Record of data” – for setting the data recording to the memory card;
- “Record of events” – for setting the events;
- “Memory card” – for setting the memory card;
- “Exp. modules” – for setting the extension modules;
- “Network” – for setting Ethernet interface;
- “Password” – for setting the access restriction to the data logger;
- “Reset all settings” – for total reset of all default settings of the data logger;
- “Device version” – for information about the version of the data logger.

The selection of the menu items is performed by buttons ▲ (up) or ▼ (down) (the selected item is underlined by the cursor), confirmation of the selection is made by pressing the button ■ (enter).

For escape from the menu press the button ◀ (left).

7.1 Setting of the date and time (“Date and Time”)

For setting the date and time it is necessary: in the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item “Date and time”, confirm the selection by pressing the button ■ (enter). On the display of the data logger there will be the list of available menu items for setting the date and time:

“Date” – menu item for setting the date;

“Time” – menu item for setting the time.

By buttons ▲ (up) or ▼ (down) make the selection of the corresponding menu item, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.1.1 Setting of Date (“Date”)

At selection of this item on the display of the data logger there will be a screen of the date setting, resulted in the figure 7.1.1.



Fig. 7.1.1 – Screen of date setting

On this screen the date is resulted in format “DDD dd.mm.yyyy”, where:

- DDD - day of week:
 - Mo - Monday;
 - Tu - Tuesday;
 - We - Wednesday;
 - Th - Thursday;
 - Fr - Friday;
 - Sa - Saturday;
 - Su - Sunday.
- dd - date (from 1 to 31);
- mm - month (from 1 to 12);
- yyyy - year (from 1980 to 2107);

By buttons ◀ (left), ▶ (right), ▲ (up) and ▼ (down) make a selection of the necessary parameter (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of the parameter. After completion it is necessary to press again the button ■ (enter) – to escape from the mode of setting and saving of the changed parameter. The parameter stops blinking.

In case of necessity repeat the same procedure with other parameters.

To restore the previous menu it is necessary by button ▼ (down) select the position “BACK” and press the button ■ (enter).

7.1.2 Setting of Time (“Time”)

At selection of this item on the display of the data logger there will be a screen of the time setting, resulted in the figure 7.1.2.



Fig. 7.1.2 – Screen of time setting

On this screen the time is resulted in format “HH:MM:SS CC”, where:

- HH - hours (from 0 to 23)
- MM - minutes (from 0 to 59)
- SS - seconds (from 0 to 59)
- CC - correction sec / day (from -5.2 to +5.2)

By buttons ◀ (left), ▶ (right), ▲ (up) and ▼ (down) make a selection of the parameter (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ◻ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of the parameter. After completion of change it is necessary to press the button ◻ (enter) again – to escape from the mode of setting and saving of the changed parameter. The parameter stops blinking.

In case of necessity, repeat the same procedure with other parameters.

In case of necessity, repeat the same procedure with other parameters.

To restore the previous menu it is necessary by button ▼ (down) select the position “**BACK**” and press the button ◻ (enter).

7.2 Setting of Channels (“Channels”)

The data logger – is a multichannel device, which has different inputs (voltage, current, temperature, discrete inputs etc.) requiring individual setting.

For channels setting it is necessary in the main menu by buttons ▲ (up) or ▼ (down) select the item “**Channels**”, confirm the selection by pressing the button ◻ (enter). On the display of the data logger there will be the list of available channels:

“**Channel 1**” (2 and 3) – menu items for setting the channels of voltage;

“**Channel 4**” (5, 6 and 7) – menu items for setting the channels of current;

“**Channel 8**” (9) – menu items for setting the channels of temperature;

“**Channel 10**” – menu item for setting the channel of analog voltage 0-10 V;

“**Channel 11**” – menu item for setting the channel of analog current 0-20 mA;

“**Channel 12**” (13, 14 and 15) – menu items for setting the channels of discrete signal;

“**Channel 16**” (17 and 18) – menu items for setting the channels of power.

By buttons ▲ (up) or ▼ (down) make selection of necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.1 Setting of the channel of voltage (“Channel 1” (2 and 3))

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of voltage:

“**Information**” – menu item with a brief information and description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Voltage sensor**” – menu item for setting the coefficient of voltage transfer (with voltage transformers switched on).

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.1.1 Switching on and switching off of the channel of voltage (“ON / OFF”)

At selection of this item on the display of the data logger there will be a screen of switching on and off of the channel, resulted in the figure 7.2.1.

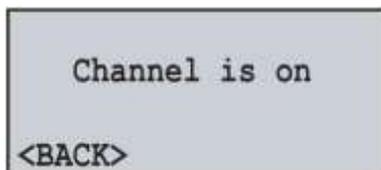


Fig. 7.2.1 – Screen of channel switching on and off

On this screen you can set the state of the channel: “**Channel is on**” or “**Channel is off**”. It helps to review the measured values, as the switched off channel are not resulted during the review.

By button ▲ (up) select item “**Channel is on**” (the selected parameter is highlighted by the cursor).

By pressing the button ◻ (enter) change the state of the channel.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ◻ (enter).

7.2.1.2 Setting of voltage sensor (“Voltage sensor”)

At selection of this item on the display of the data logger there will be the screen of setting of voltage conversion ratio, resulted in the figure 7.2.2.



Fig. 7.2.2 – Screen of setting of voltage conversion ratio

On this screen you can set the voltage conversion ratio from **1.0** to **99.9**.

By button ▲ (up) select the parameter “**1.0**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of the parameter. After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.2.2 Setting of the channel of current (“Channel 4” (5, 6 and 7))

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of current:

“**Information**” – menu item with a brief description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Current sensor**” – a menu item for setting the current transformer nominal.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.2.1 Switching on and switching off of channel of current (“ON / OFF”)

Switching on and switching off of the channel of current is performed by the method described in item 7.2.1.1.

7.2.2.2 Setting of current sensor (“Current sensor”)

At selection of this item on the display of the data logger there will be the screen of setting of current transformer rated, resulted in the figure 7.2.3.

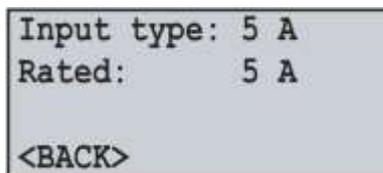


Fig. 7.2.3 – Screen of setting of current transformer rated

On this screen you can set the rated of used current transformer from the following row: **5 A, 10 A, 15 A, 20 A, 30 A, 40 A, 50 A, 75 A, 100 A, 150 A, 200 A, 300 A, 400 A, 600 A, 800 A, 1000 A, 1500 A, 2000 A**.

By button ▲ (up) select the parameter “**Rated**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of the parameter. After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.2.3 Setting of the channel of temperature (“Channel 8” (9))

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of temperature:

“**Information**” – menu item with a brief description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Temperature sensor**” – a menu item for setting the type of sensor and for making correction of the temperature.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.3.1 Switching on and switching off of channel of temperature (“ON / OFF”)

Switching on and switching off of the channel of temperature is performed by the method described in item 7.2.1.1.

7.2.3.2 Setting of temperature sensor (“Temperature sensor”)

At selection of this item on the display of the data logger there will be a screen of setting of temperature sensor, resulted in the figure 7.2.4.

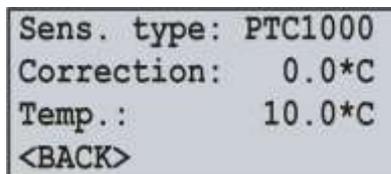


Fig. 7.2.4 – Screen of temperature sensor setting

On this screen you can set the type of the used sensor: **PTC1000** or **PT1000**.

At the necessity you can perform the calibration of temperature range from **minus 9.9 °C to +9.9 °C**.

By buttons ▲ (up) or ▼ (down) select the necessary parameter (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of the parameter. After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

After connection (or replacement) of temperature sensor it should be calibrated. The calibration consists of summing of correcting coefficient and measured temperature. For temperature calibration you will need a calibration thermometer with grade not less than 0.1 °C.

The sensor of calibration thermometer and sensor of calibrated channel should be located as close to each other as possible.

The correcting coefficient is calculated by the following relation:

$$T_{cc} = T_{ct} - T_{tmr}, \text{ where:}$$

T_{cc} – value of correcting coefficient, °C;

T_{ct} – temperature value of calibration thermometer, °C;

T_{tmr} – temperature value measured by the data logger, °C.

During calculating of correcting coefficient you should wait for some time (about 5 minutes) for stabilization of temperature values.

7.2.4 Setting of the channel of analog voltage 0-10 V (“Channel 10”)

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of analog voltage 0-10 V:

“**Information**” – menu item with a brief description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Voltage sensor**” – a menu item for setting the type of analog voltage sensor 0-10 V.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.4.1 Switching on and switching off of channel of analog voltage 0-10 V (“ON / OFF”)

Switching on and switching off of the channel of analog voltage 0-10 V is performed by the method described in item 7.2.1.1.

7.2.4.2 Setting of the sensor of analog voltage 0-10 V (“Voltage sensor”)

At selection of this item on the display of the data logger there will be a screen of setting the analog voltage sensor 0-10 V, resulted in the figure 7.2.5.

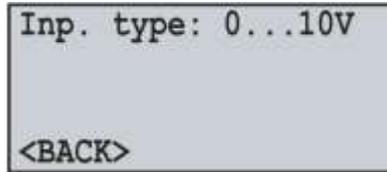


Fig. 7.2.5 – Screen of setting the analog voltage sensor

On this screen you can set the type of used sensor: **0...10V** or **2...10V**.

By button ▲ (up) select the parameter “**Inp. type**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the type of used sensor.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.2.5 Setting of the channel of analog current 0-20 mA (“Channel 11”)

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of analog current 0-20 mA:

“**Information**” – menu item with a brief description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Sensor of current**” – a menu item for setting the type of analog current sensor 0-20 mA.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.5.1 Switching on and switching off of channel of analog current 0-20 mA (“ON / OFF”)

Switching on and switching off of the channel of analog current 0-20 mA is performed by the method described in item 7.2.1.1.

7.2.5.2 Setting of the sensor of analog current 0-20 mA (“Current sensor”)

At selection of this item on the display of the data logger there will be a screen of setting the analog current sensor 0-20 mA, resulted in the figure 7.2.6.



Fig. 7.2.6 – Screen of setting the analog current sensor

On this screen you can set the type of used sensor: **0...20 mA** or **4...20 mA**.

By button ▲ (up) select the parameter “**Inp. type**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the type of used sensor.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.2.6 Setting of the channel of discrete signal (“Channel 12” (13, 14 and 15))

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of discrete signal:

“**Information**” – menu item with a brief description;

“**On / Off**” – menu item for switching on and switching off of the channel;

“**Digital input**” – a menu item for setting the type of discrete signal.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.6.1 Switching on and switching off of channel of discrete signal (“On / Off”)

Switching on and switching off of channel of discrete signal is performed by the method described in item 7.2.1.1.

7.2.6.2 Setting of the type of discrete signal (“Digital input”)

At selection of this item on the display of the data logger there will be a screen of setting of the type of discrete signal, resulted in the figure 7.2.7.

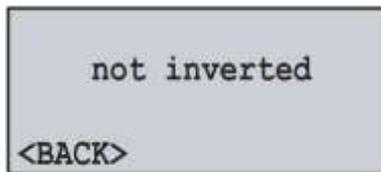


Fig. 7.2.7 – Screen of setting of the type of discrete signal

On this screen you can set a type of discrete signal: **not inverted** or **inverted**.

By button ▲ (up) select the parameter “**not inverted**” (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the type of discrete signal.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.2.7 Setting of the channel of power (“Channel 16” (17 and 18))

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the channel of power:

“**Information**” – a menu item with a brief description;

“**On / Off**” – a menu item for switching on and switching off of the channel.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.2.7.1 Switching on and switching off the channel of power (“On / Off”)

Switching on and switching off of the channel of power is performed by the method described in item 7.2.1.1.

7.3 Setting of Display (“Display”)

For setting of the display it is necessary in the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item “**Display**”, confirm the selection by pressing the button ■ (enter). On the display of the data logger, there will be a list of available items for display setting:

“**Backlight settings**” – a menu item for setting the backlight mode of the display.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of the menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.3.1 Setting of the display backlight mode (“Backlight settings”)

At selection of this item on the display of the data logger there will be a screen of setting the display backlight mode, resulted in the figure 7.3.1.



Fig. 7.3.1 – Screen of setting of display backlight mode

On this screen you can set the display illuminating mode: **Off**, **On continuously** or **Off in 30 sec**.

By button ▲ (up) select the parameter "**Off after 30sec**" (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the backlight mode of display.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position "**BACK**" and press the button ■ (enter).

7.4 Setting of Record of data mode ("Record of data")

For setting the mode of data recording it is necessary in the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item "**Record of data**", confirm the selection by pressing the button ■ (enter). On the display there will be a screen with a list of available items for setting the modes of data recording:

"**Record type**" – a menu item for setting the type of data recording;

"**Recording period**" – a menu item for setting the period of data recording;

"**File size**" – a menu item for setting the size of recorded file;

"**Choice of data**" – a menu item for setting the measuring values for recording.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.4.1 Setting of data recording type ("Record type")

At selection of this item on the display of the data logger there will be a screen of setting the type of recording, resulted in the figure 7.4.1.

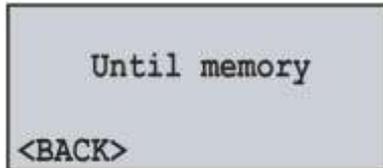


Fig. 7.4.1 – Screen of setting the type of recording

On this screen you can set the type of data recording: **Until memory** or **The ring**.

By button ▲ (up) select the parameter "**Until memory**" (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the type of data recording.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position "**BACK**" and press the button ■ (enter).

7.4.2 Setting of recording period ("Recording period")

At selection of this item on the display of the data logger there will be a screen of setting the period of data recording, resulted in figure 7.4.2.

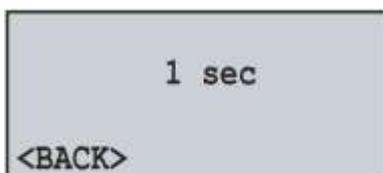


Fig. 7.4.2 – Screen of setting the period of data recording

On this screen you can set the period of data recording from **1 ms** to **60 min**.

By button ▲ (up) select the parameter "**1 sec**" (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button **■** (enter), the selected parameter starts to blink.

By buttons **▲** (up) or **▼** (down) change the period of data recording.

After completion of change it is necessary to press the button **■** (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button **▼** (down) locate the cursor in position **“BACK”** and press the button **■** (enter).



NOTE: Short period of data recording result in quick completion of free space on the memory card. It is recommended to set the short period of recording only when measuring the fast running processes.

7.4.3 Setting of the size of data file (“File size”)

At selection of this item on the display of the data logger there will be a screen of setting the size of data file, resulted in figure 7.4.3.



Fig. 7.4.3 – Screen of setting the size of data file

On this screen you can set the size of data file from **32 KB** to **512 MB**.

By button **▲** (up) select the parameter **“16 MB”** (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button **■** (enter), the selected parameter starts to blink.

BY buttons **▲** (up) or **▼** (down) change the size value of data file.

After completion of change it is necessary to press the button **■** (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button **▼** (down) locate the cursor in position **“BACK”** and press the button **■** (enter).

7.4.4 Selection of recorded data (“Choice of data”)

At selection of this item on the display of the data logger there will be a screen of setting the recorded data, resulted in figure 7.4.4. Recorded data represents the single block consisting of 15 cells (of measured values).

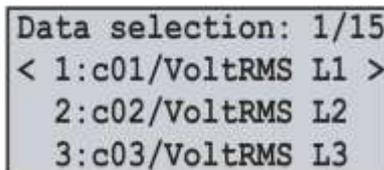


Fig. 7.4.4 – Screen of setting the recorded data

Where:

“1/15” – number of selected cell (1 of 15);

“1:, 2:, 3:” – order number of cell (from 1 to 15);

“c01/VoltRMS L1” – name of value (Channel 1 – RMS voltage Phase 1).

By buttons **▲** (up) or **▼** (down) select the number of cell (selected cell is highlighted by the cursor).

For starting the change of cell it is necessary to press the button **■** (enter), on the display of the data logger there will be the list of measured values, as resulted in figure 7.4.5.

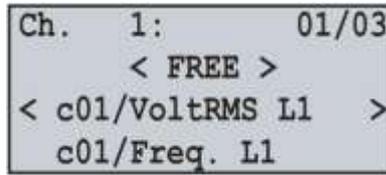


Fig. 7.4.5 – Screen of the list of measured values

Where:

- “Ch. 1” – channel number;
- “01/03” – channel value number (1 of 3 for this channel);
- “<FREE>” – empty value;
- “c01/VoltRMS L1” – name of the value (Channel 1 – RMS Voltage Phase 1).

Shifting to the next available channel is performed by pressing the button ◀ (left) or ▶ (right), and by buttons ▲ (up) or ▼ (down) you can scroll the list of available measuring.

The total list of measured values is described in item 6.1.7, table 6.1.

If the value “<FREE>” is selected – the cell is marked as free and will not be recorded to the memory card.

To confirm the selection it is necessary to press the button ◻ (enter), the display will return to initial state (Fig. 7.4.4).

To escape from the menu “Choice of data”, press the button ◀ (left).

7.5 Setting of the modes of data recording at event (“Record of event”)

For setting the modes of data recording at event it is necessary in the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item “Record of event”, confirm the selection by pressing the button ◻ (enter). On the display of the data logger there will be the screen with a list of available items for setting the modes of recording at event:

- “On / Off” – a menu item for switching on and off the data recording at event;
- “Recording time” – a menu item for setting the time of event recording;
- “Discreteness” – a menu item for setting the frequency of discretion of events;
- “Event 1” (2, 3, 4 и 5) – a menu item for setting the event at which the data recording will start.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

7.5.1 Switching on and switching off the data recording at event (“On / Off”)

At selection of this item on the display of the data logger there will be a screen of switching on and switching off the data recording at event, resulted in figure 7.5.1.

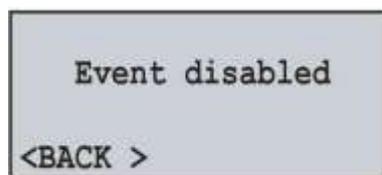


Fig. 7.5.1 – Screen of switching on and switching off the event for data recording

On this screen you can switch on or switch off the data recording at event: **Event enabled** or **Event disabled**.

By button ▲ (up) select the parameter “Event disabled” (the selected parameter is highlighted by the cursor).

By pressing the button ◻ (enter) change the state of data recording at event.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “BACK” and press the button ◻ (enter).

Note – if the period of data recording is set less than 10 ms, due to futility of events use they will be automatically switched off. For switching on the event, it is necessary to set the period of data recording equal to 10 ms and more.

7.5.2 Setting of the time of data recording at event (“Recording time”)

At selection of this item on the display of the data logger there will be a screen of setting the time of data recording at event, resulted in figure 7.5.2.

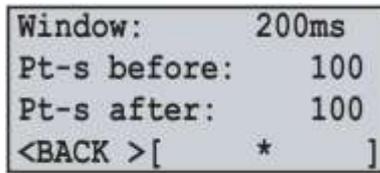


Fig. 7.5.2 – Screen of setting the time of data recording at event

On this screen you can set the number of points of recording before the event “**Pt-s before**” in range from **0** to **1920**, and number of points of recording after the event “**Pt-s after**” in range from **0** to **1920**.

By buttons ▲ (up) or ▼ (down) select the necessary parameter (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ◻ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of parameter.

After completion of change it is necessary to press the button ◻ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ◻ (enter).

Then “**Window**” initiates the time interval that will be recorded at the event occurrence. This interval is calculated based on the sum of number of points before the event “**100**” and number of points after the event “**100**”, multiplied by discreteness of data recording “**1 ms**” (item 7.5.3).

To simplify the time perception there is a indicator in the right low corner which shows the common time interval “**200 ms**” in the square brackets [], and the moment of event occurrence, represented by an arrow down ↓.

7.5.3 Setting of discreteness of data recording at event (“Discreteness”)

At selection of this item on the display of the data logger there will be a screen for setting the discreteness of data recording at event, resulted in figure 7.5.3.

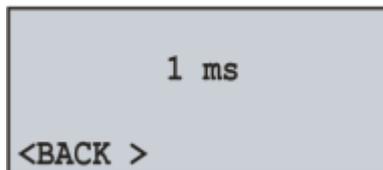


Fig. 7.5.3 – Screen of setting the discreteness of data recording at event

On this screen you can set the discreteness of recording from **1 ms** to **1000 ms**.

By buttons ▲ (up) or ▼ (down) select the parameter “**1 ms**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ◻ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of parameter.

After completion of change it is necessary to press the button ◻ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ◻ (enter).

7.5.4 Setting of event (“Event 1” (2, 3, 4 и 5))

At selection of this item on the display of the data logger there will be a screen of setting the event:

“**Source**” – a menu item for selection of source of event;

“**Upper threshold**” – a menu item for setting the value of upper threshold;

“**Lower threshold**” – a menu item for setting the value of lower threshold.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).



For setting the up or down thresholds it is necessary to select the source of event, otherwise these items will not be available.

7.5.4.1 Selecting the event source (“Source”)

At selection of this item on the display of the data logger there will be a list of measured values, as resulted in figure 7.5.4.

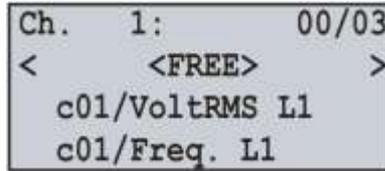


Fig. 7.5.4 – Screen of list of measured values

Where:

“Ch. 1” – number of channel;

“01/03” – value number of channel (1 of 3 for this channel);

“<FREE>” – empty value;

“c01/VoltRMS L1” – name of the value (Channel 1 – RMS Voltage Phase 1).

Shifting to the next available channel is performed by pressing the button ◀ (left) or ▶ (right), and by buttons ▲ (up) or ▼ (down) you can scroll the list of available measuring.

The total list of measured values is described in item 6.1.7, table 6.1.

If the value “<FREE>” is selected – the cell is marked as free and will not be recorded on the memory card

To confirm the selection and return to previous menu it is necessary to press the button ◻ (enter).

7.5.4.2 Setting of Upper and Lower thresholds (“Upper treshold” и “Lower treshold”)

At selection of this item on the display of the data logger there will be a screen of setting the Upper threshold and Lower threshold of events, resulted in figure 7.5.5.

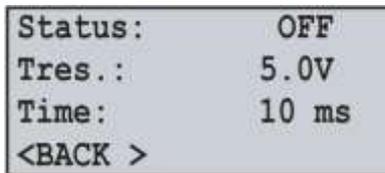


Fig. 7.5.5 – Screen of setting the Upper and Lower thresholds of event

On this screen you can set:

- Threshold state (“OFF”, “ONCE” or “LONG”);
- Threshold value (“5.0 V” interval of values depend on the used source);
- Time (“10 ms” from 1 ms to 60 sec), after that period the event will take place provided the measured value exceeds the tresholds set by the user.

By button ▲ (up) select the necessary parameter “1 sec” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ◻ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of parameter.

For setting the value of treshold, by buttons ◀ (left) or ▶ (right) change the grade of value (Fig. 7.5.6), which is located in the right low corner of the screen.

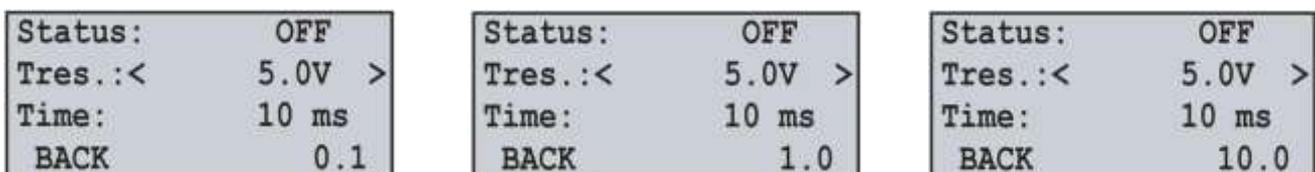


Fig. 7.5.6 – Screen of setting the value of threshold

After completion of change it is necessary to press the button **■** (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button **▼** (down) locate the cursor in position **"BACK"** and press the button **■** (enter).

7.6 Setting of memory card ("Memory card")

For setting the memory card it is necessary in the main menu of the data logger by buttons **▲** (up) or **▼** (down) select the item **"Memory card"**, confirm the selection by pressing the button **■** (enter). On the display of the data logger there will be a screen with a list of available items for setting the memory card:

- "**Information**" – a menu item with brief information about the memory card;
- "**Remove card**" – a menu item for safety removing out of the memory card;
- "**Format**" – a menu item for formatting the memory card

By buttons **▲** (up) or **▼** (down) make a selection of the necessary item of menu, confirm the selection by pressing the button **■** (enter).

To restore the previous menu, press the button **◀** (left).

7.6.1 Brief information about the memory card ("Information")

At selection of this item on the display of the data logger there will be brief information about the memory card. Example of such information screen is presented in figure 7.6.1.

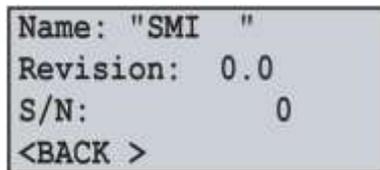


Fig. 7.6.1 – Brief information about the installed memory card

By buttons **▲** (up) or **▼** (down) you can scroll the reviewed information.

To restore the previous menu, press the button **◀** (left).

7.6.2 Safety removes of the memory card ("Remove card")

The item **"Remove card"** enables to spot the data recording on the memory card before its pulling out from the data logger.

After the data recording process is stopped there will be a message on the display, resulted in figure 7.6.2.

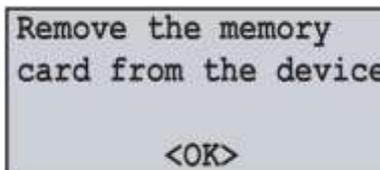


Fig. 7.6.2 – Screen of confirmation of data recording termination

Now you can safely pull out the memory card from the data logger.

To restore the previous menu, press the button **■** (enter).



Always before pulling out the memory card, observe this item of the menu because pulling out of the memory card during the process of data recording can result in data loss.

7.6.3 Formatting of the memory card ("Format")

At selection of this item on the display of the data logger there will be a warning message about data loss after formatting (Fig. 7.6.3).

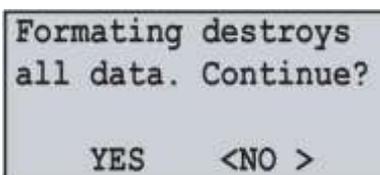


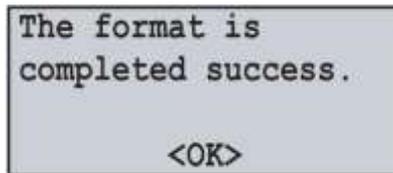
Fig. 7.6.3 – Screen with a warning message and conformation of formatting

To confirm the process of formatting it is necessary by button ◀ (left) locate the cursor in position “YES” and press the button ◻ (enter).

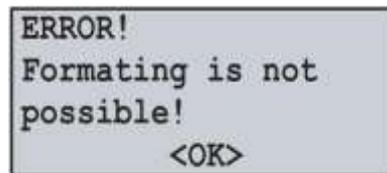
To cancel the process of formatting it is necessary by button ▶ (right) locate the cursor in position “NO” and press the button ◻ (enter). The process of formatting will be canceled and the data logger returns to the previous item.

While the process of formatting DO NOT switch off the power and make NO operations with the data logger until the formatting is finished.

After completion of formatting there will be a message on the display of the data logger (Fig. 7.6.4). If during the formatting there are errors, there will be a message on the display about an error and impossibility of memory card formatting (Fig. 7.6.4).



Screen of successful formatting



Screen of impossibility of formatting

Fig. 7.6.4 – Possible screens of formatting results

For confirmation and restore of the previous menu, press the button ◻ (enter).



NOTE: THE MEMORY CARD FORMATTING WILL CAUSE THE LOSS OF ALL INFORMATION (WITHOUT POSSIBILITY TO RESTORE IT).

7.7 Expansion modules (“Exp. modules”)

In this version of the data logger “1.0”, the use of extension modules **is not** provided.

7.8 Setting of Ethernet network (“Network”)

For setting Ethernet network it is necessary in the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item “Network”, confirm the selection by pressing the button ◻ (enter). On the display of the data logger there will be a screen with a list of available items for setting Ethernet interface:

“Modbus TCP” – a menu item for setting of Modbus TCP server;

“HTTP” – a menu item for setting Web-server;

“FTP” – a menu item for setting Ftp-server;

“TCP / IP” – a menu item for setting the Ethernet main parameters.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

7.8.1 Setting of Modbus TCP server (“Modbus TCP”)

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the Modbus TCP server:

“On / Off” – a menu item for switching on and switching off the server;

“Port” – a menu item for setting the port for connection to server;

“Timeout” – a menu item for setting the timeout of connection;

“Reset password” – a menu item for resetting the password of access to Modbus TCP.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

Note – the change of password is possible only by the software RPM-416 Data Analysis, Web interface of the data logger or Modbus TCP.



These parameters will become operative only after saving of settings and restarting of the data logger.

7.8.1.1 Switching on and switching off of Modbus TCP server

At selection of this item on the display of the data logger there will be a screen of switching on and switching off of Modbus TCP server, resulted in figure 7.8.1.

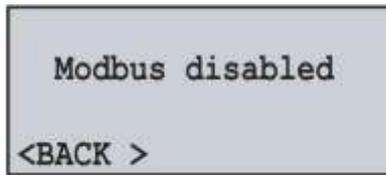


Fig. 7.8.1 – Screen of switching on and switching off of Modbus TCP server

On this screen you can set the state of Modbus TCP server: “**Modbus disabled**” or “**Modbus enabled**”. By button ▲ (up) select the parameter “**Modbus disabled**” (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the state of the server.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.1.2 Setting of connection port (“Port”)

At selection of this item on the display of the data logger there will be a screen of setting the port of connection to Modbus TCP server, resulted in figure 7.8.2.



Fig. 7.8.2 – screen of setting the port of connection to server

On this screen you can set the number of port for connection to Modbus TCP server from **1** to **65535**.

By button ▲ (up) select the parameter “**502**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the number of port.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.1.3 Setting of connection timeout (“Timeout”)

At selection of this item on the display of the data logger there will be a screen of setting the timeout of connection to Modbus TCP server, resulted in the figure 7.8.3.



Fig. 7.8.3 – Screen of setting the timeout of connection to Modbus TCP server

On this screen you can set the timeout of the connection to Modbus TCP server from **60 sec** to **3600 sec**.

By button ▲ (up) select the parameter “**60 sec**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of timeout.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ◻ (enter).

7.8.1.4 Reset of password of access to Modbus TCP (“Reset password”)

At selection of this item on the display of the data logger there will be a screen with a message asking to confirm the reset of password of access to Modbus TCP (Fig. 7.8.4).

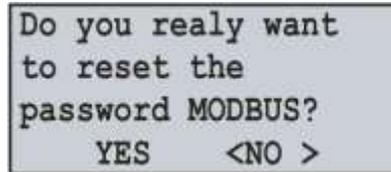


Fig. 7.8.4 – Screen of conformation for password reset

For password reset it is necessary by button ◀ (left) locate the cursor in position “**YES**” and press the button ◻ (enter). The password will be reset to default value “**admin**”.

To cancel the password reset it is necessary by button ▶ (right) locate the cursor in position “**NO**” and press the button ◻ (enter). The password reset will be canceled and the data logger returns to the previous item of menu.

7.8.2 Setting of Web-server (“HTTP”)

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting the Web-server:

“**On / Off**” – a menu item for switching on and switching off the server;

“**Port**” – a menu item for setting the port for connection to server;

“**Timeout**” – a menu item for setting the timeout of connection;

“**Reset password**” – a menu item for resetting the password of access to server.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

Note – the change of password is possible only by the software RPM-416 Data Analysis, Web interface of the data logger or Modbus TCP.



These parameters will become operative only after saving of settings and restarting of the data logger.

7.8.2.1 Switching on and switching off of Web-server

At selection of this item on the display of the data logger there will be a screen of switching on and switching off Web-server, resulted in figure 7.8.5.

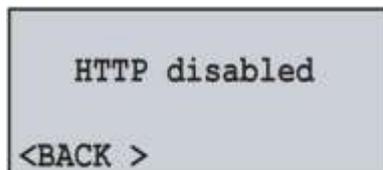


Fig. 7.8.5 – Screen of Switching on and switching off the Web-server

On this screen you can set the state of Web-server: “**HTTP disabled** or “**HTTP enabled**”.

By button ▲ (up) select the parameter “**HTTP disabled**” (the selected parameter is highlighted by the cursor).

By pressing the button ◻ (enter) change the state of the server.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ◻ (enter).

7.8.2.2 Setting of connection port (“Port”)

At selection of this item on the display of the data logger there will be a screen of setting the port of connection to Web-server, resulted in figure 7.8.6.

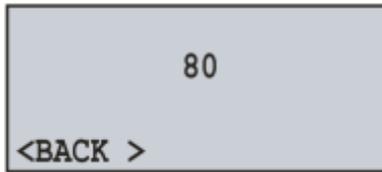


Fig. 7.8.6 – Screen of setting the port of connection to Web-server

On this screen you can set the number of port of connection to Web-server from **1** to **65535**.

By button ▲ (up) select the parameter “**80**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the number of port.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.2.3 Setting of connection timeout (“Timeout”)

At selection of this item on the display of the data logger there will be a screen of setting the timeout of connection to Web-server, resulted in figure 7.8.7.



Fig. 7.8.7 – Screen of setting the timeout of connection to Web-server

On this screen you can set the timeout of connection to Web-server from **60 sec** to **3600 sec**.

By button ▲ (up) select the parameter “**300 sec**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of timeout.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.2.4 Reset of password of access to Web-server (“Reset password”)

At selection of this item on the display of the data logger there will be a screen with a message asking to confirm the reset of password of access to Web-server (Fig. 7.8.8).

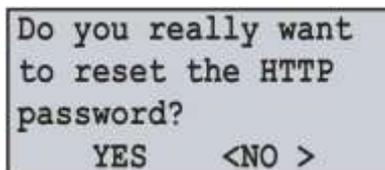


Fig. 7.8.8 – Screen of conformation for password reset

For password reset it is necessary by button ◀ (left) locate the cursor in position “**YES**” and press the button ■ (enter). The password will be reset to default value “**admin**”.

To cancel the password reset it is necessary by button ▶ (right) locate the cursor in position “**NO**” and press the button ■ (enter). The password reset will be canceled and the data logger returns to the previous item of menu.

7.8.3 Setting of FTP server

At selection of this item on the display of the data logger there will be a screen with a list of available items for setting of FTP server:

“**On / Off**” – a menu item for switching on and switching off the server;

“**Port**” – a menu item for setting the port for connection to server;

“**Timeout**” – a menu item for setting the timeout of connection;

“**Reset password**” – a menu item for resetting the password of access to server.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

Note – the change of password is possible only by the software RPM-416 Data Analysis, Web interface of the data logger or Modbus TCP.



These parameters will become operative only after saving of settings and restarting of the data logger.

7.8.3.1 Switching on and switching off of FTP server

At selection of this item on the display of the data logger there will be a screen of switching on and switching off of FTP server, resulted in figure 7.8.9.

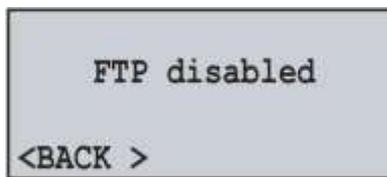


Fig. 7.8.9 – Screen of switching on and switching off of FTP server

On this screen you can set the state of Web-server: “**FTP disabled** or “**FTP enabled**”.

By button ▲ (up) select the parameter “**FTP disabled**” (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the state of the server.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.3.2 Setting of connection port (“Port”)

At selection of this item on the display of the data logger there will be a screen of setting the port of connection to FTP-server, resulted in figure 7.8.10.



Fig. 7.8.10 – Screen of setting the port of connection to FTP server

On this screen you can set the number of port of connection to FTP server from **1** to **65535**.

By button ▲ (up) select the parameter “**21**” (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the number of port.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “**BACK**” and press the button ■ (enter).

7.8.3.3 Setting of connection timeout (“Timeout”)

At selection of this item on the display of the data logger there will be a screen of setting the timeout of connection to FTP -server, resulted in figure 7.8.11.



Fig. 7.8.11 – Screen of setting the timeout of connection to FTP server

On this screen you can set the timeout of connection to FTP server from **60 sec** to **3600 sec**.

By button ▲ (up) select the parameter **"300 sec"** ((the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ■ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of timeout.

After completion of change it is necessary to press the button ■ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position **"BACK"** and press the button ■ (enter).

7.8.3.4 Reset of password of access to FTP server ("Reset password")

At selection of this item on the display of the data logger there will be a screen with a message asking to confirm the reset of password of access to FTP server (Fig. 7.8.12).

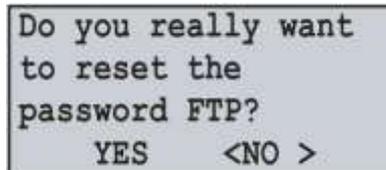


Fig. 7.8.12 – Screen of conformation for FTP server password reset

For password reset it is necessary by button ◀ (left) locate the cursor in position **"YES"** and press the button ■ (enter). The password will be reset to default value **"admin"**.

To cancel the password reset it is necessary by button ▶ (right) locate the cursor in position **"NO"** and press the button ■ (enter). The password reset will be canceled and the data logger returns to the previous item of menu.

7.8.4 Setting of main parameters of Ethernet ("TCP / IP")

At selection of this item on the display of the data logger there will be a screen of setting the main parameters of Ethernet:

"State" – a menu item showing the current state of Ethernet;

"IP config" – a menu item for setting of IP;

"DHCP config" – a menu item for setting of DHCP.

By buttons ▲ (up) or ▼ (down) make a selection of the necessary item of menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.8.4.1 Review of state of connection to Ethernet ("State")

This menu item shows the current state of network connection.

Sample of such screen is presented in figure 7.8.13.

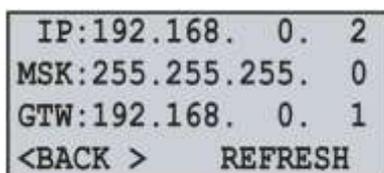


Fig. 7.8.13 – Screen of connection state

In case when the network cable is not connected or connection failed, there will be a message on the display of the data logger **"Network cable is not connected"**.

For reconnection of the data logger it is necessary by button ► (right) locate the cursor in position **“UPDATE”** and press the button ◻ (enter). The result of reconnection will be shown on the display of the data logger.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position **“BACK”** and press the button ◻ (enter).

7.8.4.2 Setting of IP-address (“IP config”)

Setting of IP-address means the setting of 3 basic parameters for work in Ethernet networks, these are:

- IP-Address of the data logger **“IP:”** (unique network address, for example “192.168.0.2”);
- Subnet mask **“MSK:”** (for example “255.255.255.0”);
- Main gateway **“GTW:”** (for example “192.168.0.1”).

In the figure 7.8.14 is shown the screen of setting of IP-address.

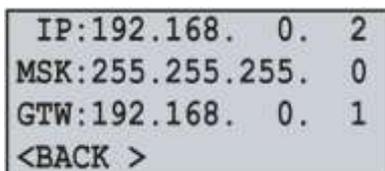


Fig. 7.8.14 – Screen of IP-address setting

By buttons ▲ (up), ▼ (down), ◀ (left) or ▶ (right) select the necessary parameter (the selected parameter is highlighted by the cursor).

For starting the changes in the parameter it is necessary to press the button ◻ (enter), the selected parameter starts to blink.

By buttons ▲ (up) or ▼ (down) change the value of parameter in range from **0** to **255**.

After completion of change it is necessary to press the button ◻ (enter) again – to escape from the mode of setting and for saving of the changed parameter. The parameter stops blinking.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position **“BACK”** and press the button ◻ (enter).

7.8.4.3 Setting of DHCP (“DHCP config”)

At selection of this item on the display of the data logger there will be a screen of setting DHCP:

“On / Off” – a menu item for switching on and switching off the use of DHCP;

By buttons ▲ (up) or ▼ (down) select the necessary item, confirm the selection by pressing the button ◻ (enter).

To restore the previous menu, press the button ◀ (left).

7.8.4.3.1 Switching on and switching off of DHCP (“On / Off”)

Switching on of DHCP enables to avoid the hand setting of Ethernet parameters and reduces the number of mistakes. DHCP protocol is used in most of TCP / IP networks.

In the figure 7.8.15 is shown the screen of switching on and switching off of DHCP.

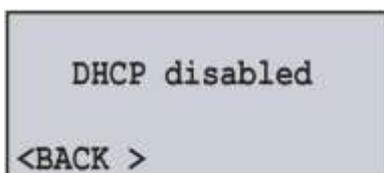


Fig. 7.8.15 – Screen of switching on and switching off of DHCP

On this screen you can set the state of DHCP: **“DHCP disabled”** или **“DHCP enabled”**.

By button ▲ (up) select the parameter **“DHCP disabled”** (the selected parameter is highlighted by the cursor).

By pressing the button ◻ (enter) change the state of DHCP.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position **“BACK”** and press the button ◻ (enter).



The switching on or switching off of DHCP totally reset the setting of IP-address.

7.9 Setting of access restriction to the data logger (“Password”)

The access password is used for protection from unauthorized termination of data recording on the memory card or changing of parameters of the data logger.

The switching on and switching off of password protection is performed with the help of the main menu item “Password”.

In the main menu of the data logger by buttons ▲ (up) or ▼ (down) select the item “Password”, confirm the selection by pressing the button ■ (enter). On the display of the data logger there will be a screen with a list of available items of the menu for setting the password protection:

“On / Off” – a menu item for activating or deactivating the password protection;

“Change” – a menu item for changing the password value

By buttons ▲ (up) or ▼ (down) select the necessary item of the menu, confirm the selection by pressing the button ■ (enter).

To restore the previous menu, press the button ◀ (left).

7.9.1 Switching On and Switching Off of the Password Protection (“On / Off”)

At selection of this item of the menu on the display of the data logger there will be a screen of switching on and switching off of the Password Protection, resulted in figure 7.9.1.

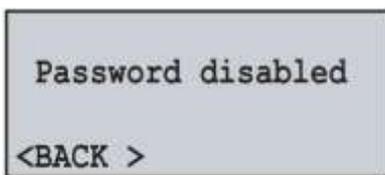


Fig. 7.9.1 – Screen of switching on and switching off of the Password Protection

On this screen you can set the state of password protection: “Password disabled” or “Password enabled”.

By button ▲ (up) select the parameter “Password disabled” (the selected parameter is highlighted by the cursor).

By pressing the button ■ (enter) change the state of the password protection.

To restore the previous menu it is necessary by button ▼ (down) locate the cursor in position “BACK” and press the button ■ (enter).



The switching off of the password protection does not cover the Modbus TCP server. At data exchange the server always checks the access password.

7.9.2 Changing of password value (“Change”)

At selection of this item on the display of the data logger there will be a message asking for confirmation of password changing. Example of such screen is resulted in the figure 7.9.2.

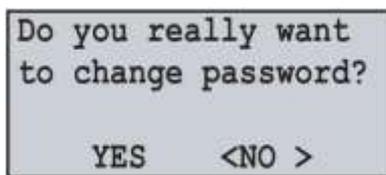


Fig. 7.9.2 – Screen of confirmation of password changing

For confirmation of the password changing it is necessary by button ◀ (left) locate the cursor in position “YES” and press the button ■ (enter). On the display of the data logger there will be a screen of a new password input (Fig. 7.9.3).

To cancel the password input it is necessary by button ▶ (right) locate the cursor in position “NO” and press the button ■ (enter). The data logger will return to the previous item of the menu.

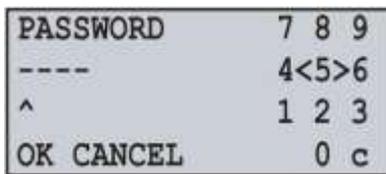


Fig. 7.9.3 – Screen of password input

The password input is carried out by the following procedure: by buttons ◀ (left), ▶ (right), ▲ (up) and ▼ (down) make the selection of one numeric character of the password (the selected figure is highlighted by the cursor), and by button ◻ (enter) make the confirmation of the password input.

Sign “^” indicates which number is used at the moment.

To delete one character of the password it is necessary to locate the cursor in position “c” and press the button ◻ (enter) (for example, in case of incorrect input).

After completion of the password input it is necessary to locate the cursor in position “OK” and press the button ◻ (enter).

In order to cancel the password input it is necessary to locate the cursor in position “CANCEL” and press the button ◻ (enter).

7.10 Reset of all settings to the factory settings (“Reset all settings”)

In RPM-416 there is a main menu item for resetting of all settings to the factory ones.

In order to reset all settings to the factory ones it is necessary by buttons ▲ (up) or ▼ (down) select the item “Reset all settings” and confirm the selection by pressing the button ◻ (enter). On the display of the data logger there will be a message asking to confirm this operation (Fig. 7.10.1).

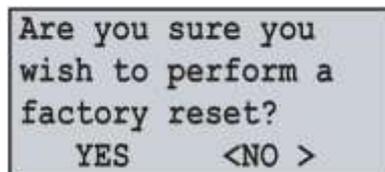


Fig. 7.10.1 – Screen of confirming the reset of all settings

In order to confirm the reset of all settings it is necessary by button ◀ (left) locate the cursor in position “YES” and press the button ◻ (enter). If the password was installed before, the data logger will ask to enter the password.

If the entered password is correct, the data logger will perform the reset of all settings to the factory ones and on the display there will be a message, resulted in figure 7.10.2.

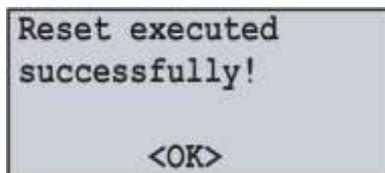


Fig. 7.10.2 – The Reset of all settings is completed successfully

To cancel the reset of all settings it is necessary by button ▶ (right) locate the cursor in position “NO” and press the button ◻ (enter). The data logger returns to the previous item of the menu.

To confirm the reset of all settings it is necessary to select the item “YES” and press the button ◻ (enter). The data logger will return to the main menu.



In case the data logger has an activated password protection, and the password value was lost, the reset of all settings to the factory ones can be performed in a following way – switch on the power supply to the data logger, and keep pressing two buttons **UP** and **DOWN** until there is a screen shown in the figure 7.10.2.

Note – at resetting of all settings to the factory ones as well are reset:

- Protection password (password value “1234”, password protection is deactivated);
- Password of Modbus TCP (password value “admin”);
- Password of Web-server (password value “admin”);
- Password of FTP server (password value “admin”);
- Time correction (value 0,0).

7.11 Review of software version (“Device version”)

This item shows the information about the software of the data logger. Example of such screen is resulted in the figure 7.11.1.

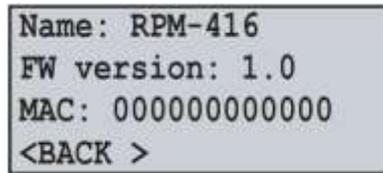


Fig. 7.11.1 – Version of the data logger software

In the first line, there is the name of the data logger “**RPM-416**”.

In the second line, there is a version of software “**1.0**”.

In the third line, there is a unique identification number of the data logger (MAC).

To restore the previous menu, press the button  (enter).

8 SCOPE OF SUPPLY

The scope of RPM-416 supply comprises:

- The data logger RPM-416 1 pcs;
- Operational Manual, Specification 1 pcs;
- Cable of connection to Ethernet 1 pcs;
- Packing box 1 pcs.

9 OPERATIONAL LIFE AND MANUFACTURER GUARANTEE

9.1 The operational life of the device is 10 years. At the end of operational life, contact the manufacturer.

9.2 The guarantee period of the data logger is 36 months since the date of sale.

Within the period of guarantee, the manufacturer performs the free of charge repair of the data logger provided the consumer observes the requirements of the Operational Manual.

The data logger is out of guarantee service in the following cases:

- the end of guarantee period;
- the presence of mechanical damages;
- the presence of moisture damages or presence of foreign objects inside the device;
- the unauthorized opening and repair of the device;
- the damages caused by the electric current or voltage which values exceed the maximum limits specified in the Operational Manual.

9.3 The guarantee service will be performed at the place of purchase.

9.4 The manufacturer guarantee does not cover the compensation of direct or indirect losses, detriments or damages connected with transportation of the device to the place of purchase or the place of manufacturer.

9.5 The post guarantee service is performed by the manufacturer (according to the established tariff rates at the moment).

10 TRANSPORTATION AND STORAGE

The data logger RPM-416 should be stored in the manufacturer’s packing in indoor area with temperature from minus 50 to +60 °C and with a relative humidity not more than 80 % with air containing no vapors that are damaging for the packing and device materials.

While transportation of the data logger RPM-416 the consumer must provide the protection of the device from the mechanical damages.

Appendix A (recommended)

Connection of the data logger to Ethernet



The connection of the data logger to Ethernet network requires the interlink compliance of settings of all connected devices. Connection to the network of not correctly adjusted data logger may result in the communication failure, as well as on other devices in the network. As a rule the connection to the network of more than 2 interconnected devices should be performed only by the qualified personnel (network administrator).

A.1 IP-addressing

At communication of the device via Ethernet network over TCP / IP protocol, in order to distinguish the data transmitter and recipient every device uses a special settings of IP-addressing.

The device keeps in memory its own unique IP-address within one subnet (four bytes are recorded in way of four integral numbers in range 0 - 255, separated by dots), subnet mask, which is the same for all devices in the subnet (is written similarly to IP-address) and IP-address gateway, which is used for communication with other networks.

For correct communication of the devices in the subnet it is necessary to observe the following provisions:

- The subnet mask should be the same for all devices in that sub network. As a rule in small local sub networks, the mask 255.255.255.0 is used. The mask begins with a group of bits set in 1, followed by the group of bits set in 0;
- Group of Bits, in IP-addresses of devices, which are set in mask in 1, are similar and represent the address of subnet. For mask 255.255.255.0 in local subnets more often are used the addresses, beginning with **192.168.0.1**;
- Group of Bits, in IP-addresses of devices, which are set in mask in 0, is unique for every device within one sub network.

In most of the cases, a new device (for example, a router) which is connected to network already has connection with other networks. Often the addresses 192.168.0.1, 192.168.0.100 or 192.168.0.101 are reserved for it. In this case, other devices in the network receive IP-Address of this device as an address gateway. Indication of this address is not obligatory for communication between the devices in subnet and is used only for communication of devices of one subnet with devices in other subnets.

The factory settings of addressing of the data logger RPM-416 are resulted in Table A.1.

Table A.1

Parameter	Value
IP-address	192.168.0.2
Subnet mask	255.255.255.0
Gateway	192.168.0.1

For the data logger communication with a client-device (and any other devices in the same subnet) the mask 255.255.255.0 and address starting with 192.168.0 are used. The fourth byte of address can be of any value in range 1–255, except 2.

In case of indirect connection (between RPM-416 and client-device), and in network with several devices, address can not be equal to any of addresses of other devices in the subnet.

A.2 Setting of client-device

Setting of addressing of client-device should be performed according to the documentation of this device and to the software used in it.

There is an example of setting the personal computer (PC) with operational system (OS) Windows XP or Windows 7 for direct connection to RPM-416 with factory settings.

For setting the network address in operational system (OS) Windows you should open the list of network connections OS. For this, depending on the version of OS, perform the following operations:

- For OS Windows XP:
 - 1) Enter into OS with profile of administrator;
 - 2) Select «Start->Control panel»;
 - 3) Select category «Net and Internet connection»;
 - 4) Open item «Network connections».

- for OS Windows 7:
 - 1) Enter into OS with profile of administrator;
 - 2) Select «Start->Control panel»;
 - 3) Select category «Net and Internet»;
 - 4) Open item «Center of net and common access management»;
 - 5) In the list of tasks (on the left of panel) select «Adapter parameters change».

In the opened screen of connections, select the adapter which addressing should be changed. Many computers have only one adapter, which will be shown in this screen.

Click on the icon of the selected adapter with mouse right button, in the appeared menu select the item «Properties». The screen of properties will open, an example of such screen is resulted in the figure A.1.

In the opened screen in the list of connection components select «Internet Protocol (TCP/IPv4)». Make sure that component is activated (marked by sign in the list).

Press the button «Properties». The screen of the properties of TCP/IPv4 will open, an example of such screen is resulted in figure A.2.

Select the option «Use the next IP-address».

In field «IP-Address» write the address in range 192.168.0.1–192.168.0.255 (except 192.168.0.2, which is used by the data logger).

In field «Mask of subnet» write «255.255.255.0».

The fields «Main gateway», «Preferable DNS-server», «Alternative DNS-server» should be left blank.

Press «OK» for closing the window of protocol setting.

Press «OK» for closing the window of adapter setting.

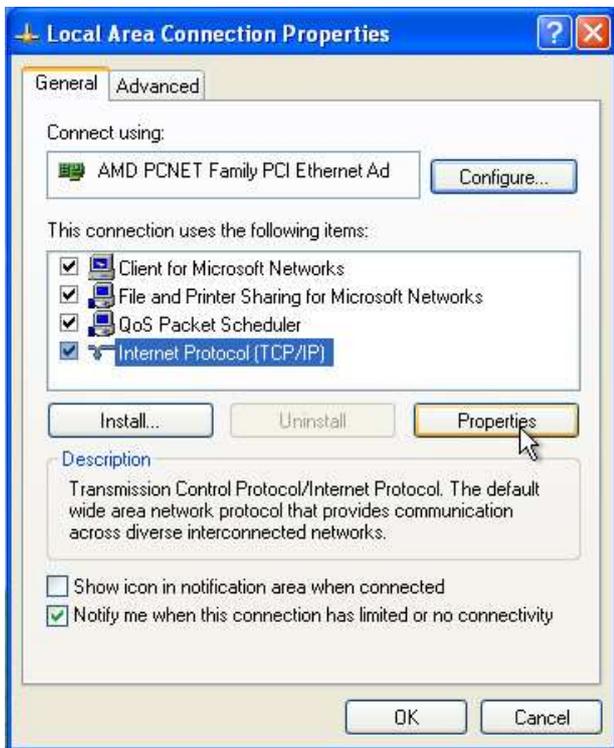


Fig. A.1 – Example of connection properties screen in Windows 7

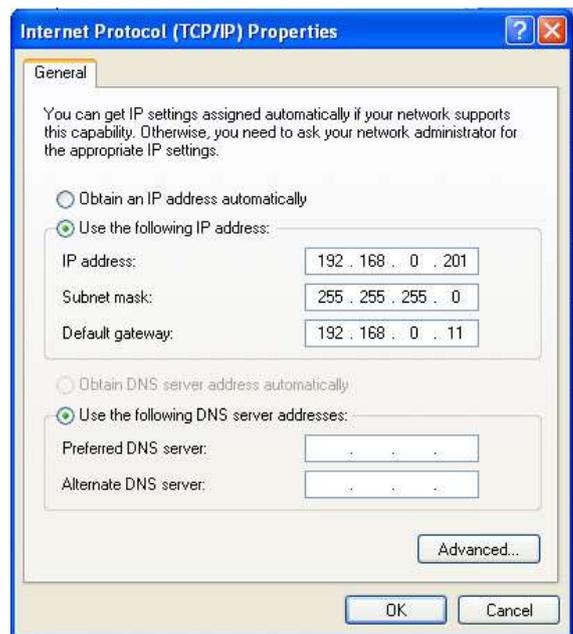


Fig. A.2 – Example of protocol TCP/IPv4 properties screen in Windows 7

Appendix B (recommended)

Connection of the Data logger to Internet



It is strongly recommended that connection of the data logger to Internet is carried out under supervision of system administrator of local network or representative of internet provider.

For connection of the data logger to Internet use the following recommendations:

- obtain a dedicated line with a static IP-address from internet provider (further in text the provider);
- inform the provider about MAC-address of the data logger

The direct connection of the data logger to the provider's cable is not recommended.

At connection of the data logger via a router (routing gateway) the provider's cable should be connected to a router slot "WAN" (usually with a color indication without number, depending on the router manufacturer the indication can differ, see the router documentation).

The connection Ethernet cable is used for connection of the data logger to the router (supplied with the data logger).

Guided by the router manual adjust the router for connection to Internet network according to the provider's recommendations. In the router settings switch on the redirection of incoming packages to IP-Address of the data logger (factory setting – 192.168.0.2).

At addressing to the data logger in Internet network you should used the IP-Address obtained from the provider.

The integrated in RPM-416 security access features are not intended against malicious network attacks (especially the attacks which purpose is blocking the access to the device).

You should secure the connection of the data logger to Internet network by standard means of protection (for example, Firewall).