DATA LOGGER
MICROPROCESSOR-BASED
RPM – 416

OPERATING MANUAL

Quality control system on the development and production complies with requirements ISO 9001:2015

Dear customer,
Company NOVATEK-ELECTRO LTD. thanks you for purchasing our products.
You will be able to use properly the product after carefully studying the Operating Manual.
Keep the Operating Manual throughout the service life of the product.

ATTENTION! ALL REQUIREMENTS OF THIS OPERATION MANUAL ARE COMPULSORY TO BE MET!

WARNING! – PRODUCT TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE

TO ENSURE THE PRODUCT SAFE OPERATION IT IS STRICTLY FORBIDDEN THE FOLLOWING:

– **TO CARRY OUT MOUNTING WORKS AND MAINTENANCE <u>WITHOUT DISCONNECTING THE PRODUCT FROM THE MAINS;</u>**

– **TO OPEN AND REPAIR THE PRODUCT INDEPENDENTLY;**

– **TO OPERATE THE PRODUCT WITH MECHANICAL DAMAGES OF THE CASE.**

IT IS NOT ALLOWED WATER PENETRATION ON TERMINALS AND INTERNAL ELEMENTS OF THE DEVICE.

During operation and maintenance the regulatory document requirements must be met, namely:

Regulations for Operation of Consumer Electrical Installations;
Safety Rules for Operation of Consumer Electrical Installations;
Occupational Safety when in Operation of Electrical Installations.

Installation, adjustment and maintenance of the product must be performed by qualified personnel having studied this Operating Manual.

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.

The data logger connection, setting and maintenance should be made only by authorized personnel who have studied this operating manual.

While repair work, maintenance work, installation work it is necessary **to disconnect the data logger and incoming measuring lines from the power supply.**

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

CONTENT

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»).

The product meets the requirements of the following:

- EN 60947-1;
- EN 60947-6-2;
- EN 55011;
- EN 61000-4-2.

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

Terms and abbreviations:

❖ **Twisted pair** – a pair of isolated signal line wires in cable twisted between themselves for reduction of transmitted signals distortions;

❖ **THDr** - total harmonic distortion, of a signal is a measurement of the harmonic distortion present and is defined as the ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency. THD is used to characterize the linearity of power quality of electric power systems.

❖ **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;

❖ **OS** – Operating System;

❖ **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. PURPOSE

1.1 *UNIT’S PURPOSE*

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 Expansion “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.

RPM-416 can connect to the system Overvis (monitoring and remote control **www.overvis.com**).

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. FTP provides remote access to the memory card to retrieve or delete files.

1.2 *CONTROLS, OVERALL AND INSTALLATION DIMENSIONS*

1.2.1 Overall and installation dimensions

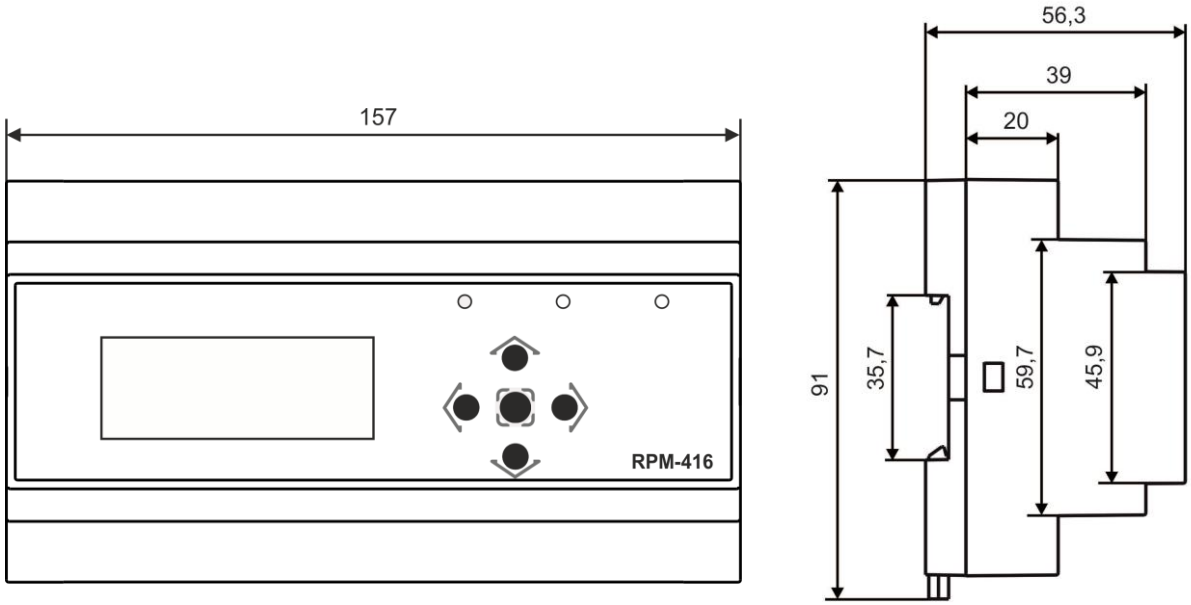
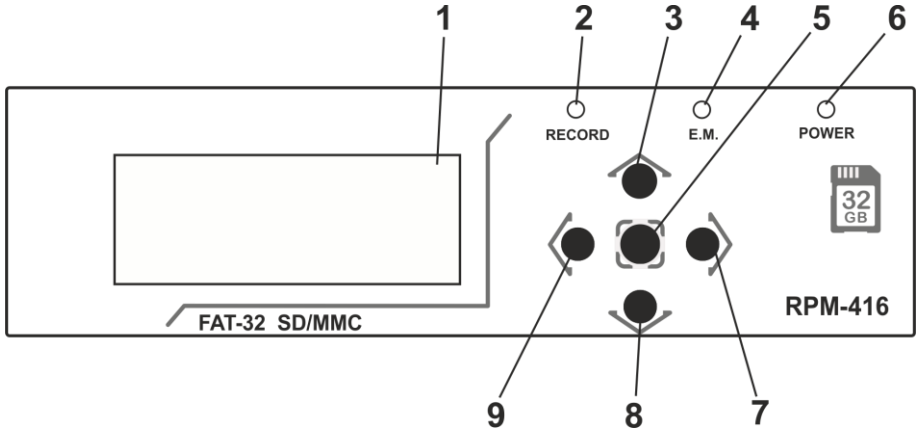


Figure 1.1 *– Data logger design with overall and fixing dimensions*

1.2.2 *Controls*

On the data logger front panel there are located the elements of control (five-button keyboard) and indication (LED symbolic display), Fig. 1.2. 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.



1 – Display (yellow-green indication);
2 – 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);
3 – Button ▲ (up) is used for moving the indicator upwards or for increasing parameter value;
4 – LED indicator **E.M.** (E.M. light on – when at least one expansion module is connected, flickering – when there is data transmitting between expansion modules, light off – when the expansion modules are not connected);
5 – Button ◙ (enter) is used for value entry approval or menu item choice;
6 – LED indicator **POWER** (light on – when the power is on, light off – when the power is off);
7 – Button ► (right) is used for moving the indicator to the right;
8 – Button ▼ (down) is used for moving the indicator downwards or for decreasing the parameter value;
9 – Button ◄ (left) is used for moving the indicator to the left.

Figure 1.2 *– The data logger controls*

1.3 WORKING CONDITIONS

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

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

ATTENTION! The product **is not intended** for operation in the following conditions*:*

- Significant vibration and shocks;
- High humidity;
- Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

2. COMPLETENESS OF SET

Delivery set is given in Table 2.1.

Table 2.1 – Delivery Set

Name	Quantity, pcs.
RPM-416	1
External memory storage (memory card)	1
Connection cable with Ethernet network	1
Operating Manual	1
Package	1

3. TECHNICAL SPECIFICATION OF RPM-416

3.1 BASIC TECHNICAL FEATURES

The basic technical features of RPM-416 are resulted in Table 3.1.

Table 3.1 *– Basic technical features*

Item	Value
Nominal operating supply voltage (⁓), V	230/240
Performance capacity voltage (⁓ / ⎓), V	24 – 265
Power-line frequency, Hz	45 – 65
Power consumption (from line ~220 V), W, not more	6.0
Power consumption (from power source +24 V), W, not more	2.2
Period of data recording to the memory card, sec.	0.001 – 3600
External memory storage (memory card)	SD (v1.0, v1.1) / SDHC, Class 4, 6, 10
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 (20 parameters), byte	88
Error of clock run, at temperature 25 ºC, not more, sec / day	1
Connection to Ethernet or PC	10Base-T / 100Base-T
Modbus TCP	yes
Web-interface	yes
FTP	yes
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
Climatic version	NF 3.1 (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, mm²	0.2 – 2.5
Terminal screw, N*m	0.4
Weight, kg, not more	0.5
Overall dimensions, mm	91 x 157 x 56.3
Assembling is designed on standard DIN-rack 35 mm	
Orientation, user-defined	

3.2 INPUT CHARACTERISTICS

Input characteristics of RPM-416 are resulted in Table 3.2.

Measurement error is resulted in ± % of scale value.

Table 3.2 *– Inputs characteristics*

Item	Value
Voltage input	3 channels
Voltage measuring range, V	3 – 450
Voltage measuring error (for a sine signal)	to 300 V ± 1 % exceed 300 V ± 1.5%
Voltage measuring type	RMS / Instant / Peak
Voltage frequency measuring range, Hz	25.00 – 70.00
Voltage frequency measuring error (for sine signal), Hz	± 0.05
THDr measuring range	0 – 100 %
THDr measuring error (if the signal level more than 14% of the range)	± 2 %
Current input	4 channels
Current measuring range, A	0.05 – 10.00
Current measuring error (for a sine signal)	± 2.5 %
Current measuring type	RMS / Instant / Peak
Current sensor type	CT with output 5 A
Supported rating values CT, 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)	± 0.05 %
Overload capability 50 A (not often than once a minute), not more, sec	0.3
THDr measuring range	0 – 100 %
THDr measuring error (if the signal level more than 14% of the range)	± 2 %
***Working power input**	3 channels
Active power measuring range, W	30 – 200 000 000
Reactive power measuring rate, VAr	30 – 200 000 000
Gross power measuring range, VA	30 – 200 000 000
Power factor measuring range, cos φ	0.01 – 1.000
Power measuring error (for a sine signal)	± 3.5 %
Maximum value of active energy scaler, kW*h	999 999 999
Maximum value of reactive energy scaler, kVAr*h	999 999 999
Temperature input	2 channels
Temperature sensor type	PTC1000 / PT1000
Temperature measuring range for PTC1000, ºC	from -50.0 to +120.0
Temperature measuring range for PT1000, ºC	from -50.0 to +250.0
Temperature measuring error	± 1.5 °C
Voltage input 0 – 10 V (⎓)	1 channel
Voltage measuring range, V	0.01 – 10.00
Voltage measuring error	± 1.0 %
Voltage sensor type	0 – 10 V
Current input 0 – 20 mA (⎓)	1 channel
Current measuring range, mA	0 – 20
Current measuring error	± 1.0 %
Current sensor type	0 – 20 mA
Digital input	4 channels
Measuring range	closed – opened
Digital signal sensor type	Dry contact
Pulse frequency measurement range, Pulse * min	1 – 15000
Maximum value of pulse scaler	999999999
---------- * - power input has no physical connection terminals, the power parameters are calculated on basis of measured values of voltage and current.	

4. DESIGN AND OPERATION PRINCIPLE OF RPM-416

4.1 DESIGN

The data logger is constructively made in plastic case intended for fixing on DIN-rack 35 mm, case dimensions (91x157x56.3 mm) 9 modules of S type. The case is made of crashworthy, self-extinguishing material.

4.2 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).

4.3 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 ºC). In case of data logger operation at temperatures on the limits of working range the working period of clock decreases.

5. CONNECTION OF RPM-416

5.1 PREPARING FOR CONNECTION:

- Unpacking the unit (we recommend to save the original package throughout the guarantee life period of the unit);
- Ensure that unit has no damages after transportation, in case of such refer to supplier or maker;
- Check the completeness of set (i. 2), in case of non-completeness refer to supplier or maker;
- Study User's Manual carefully (**special attention should be paid to power supply connection diagram of the unit**);
- If there are issues concerning unit's installation, please, refer to maker by phone, indicated in the end of this Manual.

5.2 GENERAL INSTRUCTIONS

If the temperature of the product after transportation or storage differs from the environment temperature at which it is expected to operate, then before connection to electric mains keep the product under the operating conditions within two hours (because the product elements may have moisture condensation).

ATTENTION! ALL CONNECTIONS MUST BE PERFORMED WHEN THE PRODUCT IS DE-ENERGIZED.

Error when performing the installation works may damage the product and connected devices.

To ensure the reliability of the electrical connections one should use flexible (stranded) wires with insulation for a voltage not less than 450 V. Recommended cable cross-section to measure current is within 1,5 – 2,5 mm², for the rest of connections it is within 0.75 – 2.5 mm². The wire ends should be cleared from insulation for 5±0,5 mm and clamped by a sleeve lug. Fixation of wires should exclude mechanical damages, twisting and abrasion of wires' insulation

IT IS NOT ALLOWED TO LEAVE EXPOSED PORTIONS OF WIRE PROTRUDING BEYOND THE REMOVABLE TERMINAL BLOCK.

For reliable contact it is necessary to perform tightening of screws of removable terminal block with the force specified in Table 3.1.

When reducing the tightening torque, the junction point is heated, terminal block may be melted and wire cane burn. If you increase the tightening torque, it is possible to have thread failure of terminal block screws or the compression of the connected wires.

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 expansion modules is made with the help of cable CEM-11-1 (see Item 5.4, the cable is supplied along with every expansion 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 5.5, 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.

To improve operational properties of the product it is recommended to install the fuse (fuse element), or the equivalent for current of 3.15 A in power supply circuit for RPM-416.

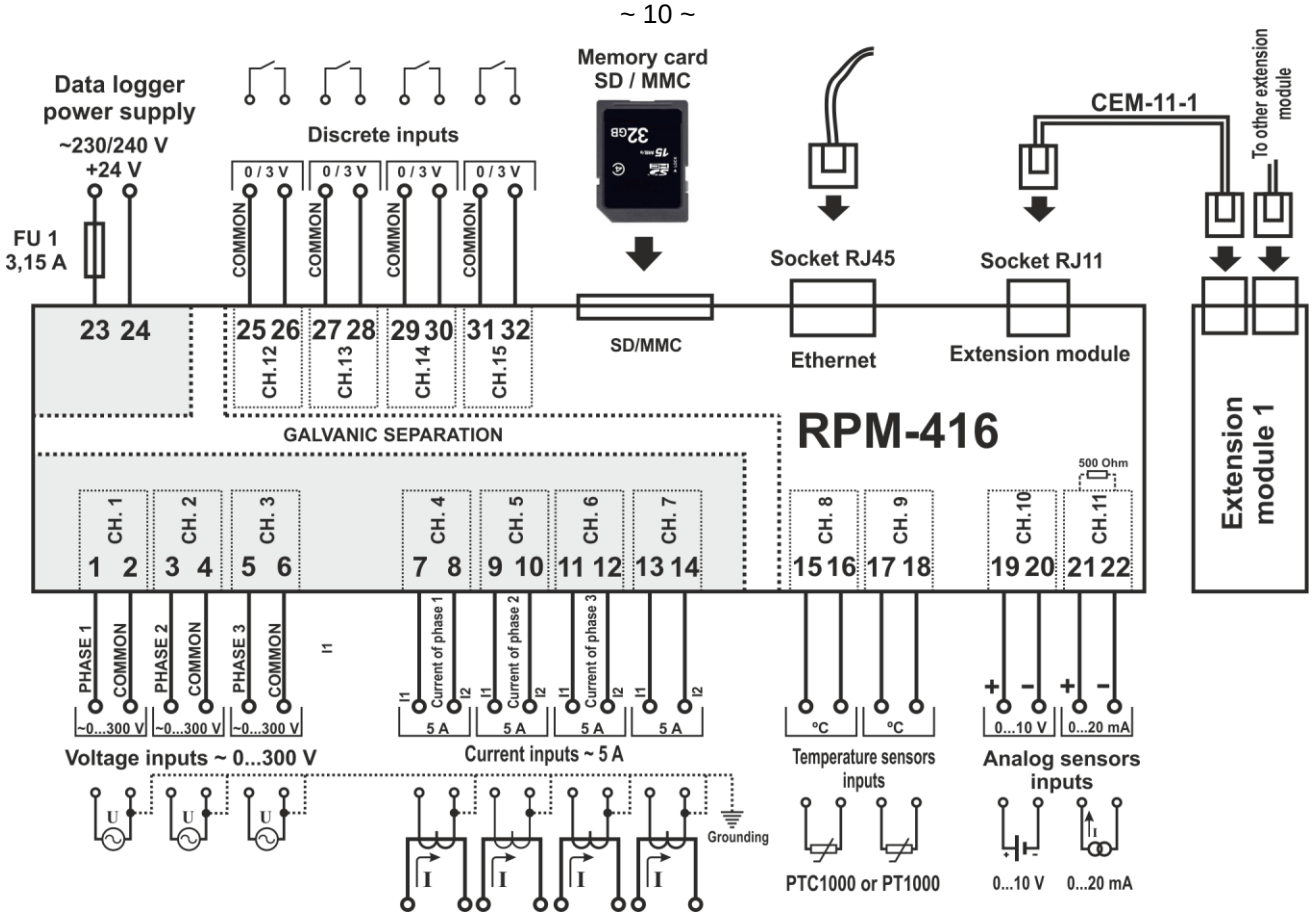
5.3 CONNECTION

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

In order to improve safety in the power circuit logger is recommended to install a fuse nominal value of 3.15 A.

NOTE: TERMINALS (23, 24) FOR CONNECTION TO POWER SUPPLY ARE DESIGNED FOR THE MAXIMUM VOLTAGE OF 265 V, AND TERMINAL FOR VOLTAGE MEASUREMENT (1, 2, 3, 4, 5, 6) ARE DESIGNED FOR THE MAXIMUM VOLTAGE OF 450 V. TO AVOID THE ELECTRICAL INSULATION BREAKDOWN, **DO NOT CONNECT** THE VOLTAGE SOURCES EXCEEDING THE SPECIFIED VALUES.

ATTENTION! THE DATA LOGGER RPM-416 MEASURES THE CURRENTS IN CHANNELS 4, 5, 6 AND 7 USING ONLY CURRENT TRANSFORMERS WITH STANDARD OUTPUT OF 5 A.CONNECTING THE CURRENT SOURCES WITHOUT CURRENT TRANSFORMERS WILL LEAD TO THE FAILURE OF THE DATA LOGGER RPM-416.



FU1 – The fuse (circuit breaker) for current 3.15 A

Figure 5.1 *– Connection diagram of RPM-416*

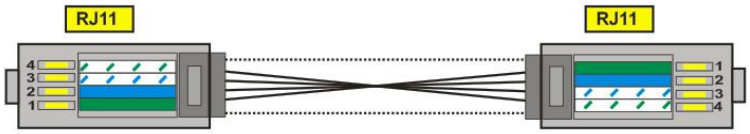
5.4 CONNECTION OF EXPANSION MODULES TO RPM-416

Up to 4 expansion 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 expansion 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

Figure 5.2 *– Number 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 expansion module.

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

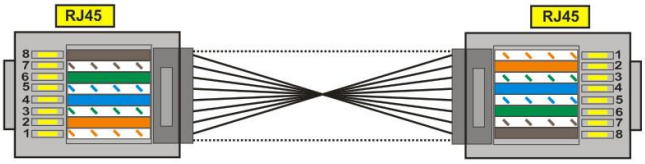
The cable CEM-11-1 is supplied with every expansion module.

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

5.5 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.



#	Color	Function
1	white-orange	TX+
2	orange	TX-
3	white-green	RX+
4	blue	none
5	white-blue	none
6	green	RX-
7	white-brown	none
8	brown	none

#	Color	Function
1	white-orange	TX+
2	orange	TX-
3	white-green	RX+
4	blue	none
5	white-blue	none
6	green	RX-
7	white-brown	none
8	brown	none

Figure 5.3 *– Numeral 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. 1.2 item 6) and on the display (Fig. 1.2 item 1) there is a printed message shown in the picture 6.1.

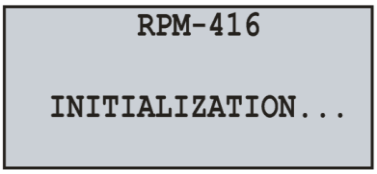
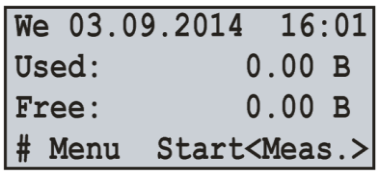


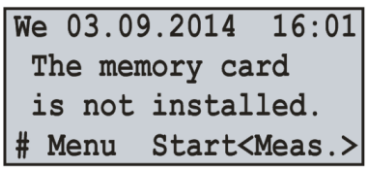
Figure 6.1 *–Initialization of Data logger*

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.



With memory card



Without memory card

Figure 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 DD dd mm yyyy HH:MM, where:

DD - 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".

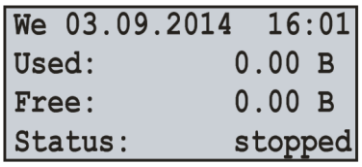
In the fourth line there are shown the main menu items of the data logger control. The choice of the menu items is made by buttons ◄ (left) or ► (right) (the selected item of the menu is illuminated by indicator "◄ ►"), the conformation of the item is made by pressing the button ◙ (enter).

The main menu items of the Data logger:

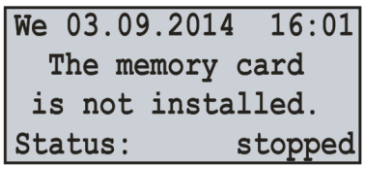
"**Menu**" – opens the menu of the data logger control;
"**Start**" – starts the process of data recording to the memory card;
"**Stop**" – stops the process of data recording to the memory card;
"**Pause**" – pauses the process of data recording to the memory card;
"**Cont.**" – resumes the process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

6.1.3 Main screen menu items dissimulation

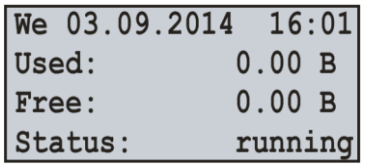
If during 10 seconds no button on the front panel was pressed the menu items of data logger control will be dissimulated and instead of them there will be shown the current state of the data logger (Fig. 6.3).



With memory card and recording process stopped



Without memory card and recording process stopped



With memory card and recording process started

Figure 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).

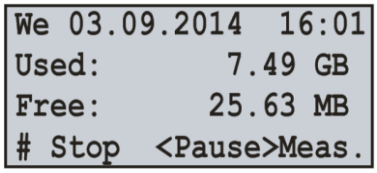
6.1.4 Starting up and finishing of data recording process

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. 1.2 item 2). After 3 seconds the main screen (Fig. 6.4) will be shown on the data logger display.

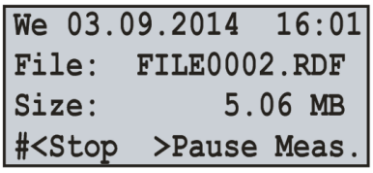
On the main screen there will be alternatively shown information of the free and occupied space on the memory card (Fig. 6.4 – Main screen (variant 1)), as well as the name and size of the last recorded file (Fig. 6.4 – Main screen (variant 2)).

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

Message of data recording process start



Main screen (variant 1)



Main screen (variant 2)

Figure 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. 1.2, item 2) will start flickering indicating that there is a mistake in the data logger operation.

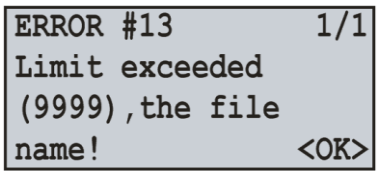


Figure 6.5 *– The message about an error when the file name reaches the limit*

For confirming the error it is necessary to press the button ◙ (enter) (Fig. 1.2, item 5). The LED indicator **RECORDING** (Fig. 1.2, item 2) 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 20), one data block size being recorded to the memory card for 20 readings is 88 bytes.

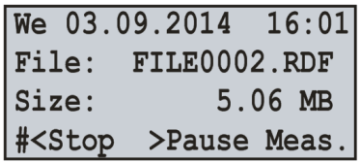
The stream of recorded data at discretion 1 ms for 20 readings is:

88 KB / sec, 5.28 MB / min or 316.8 MB / hour.

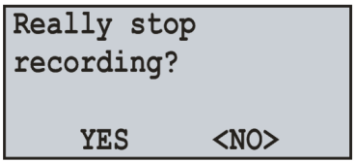
stream of recorded data at discretion 1 s for 20 readings is:

88 byte / sec, 5.28 KB / min or 316.8 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”

Figure 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. 1.2, item 2) 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.

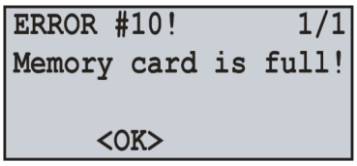


Figure 6.7 *– A message about an error when there is no free space on the memory card*

“**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.

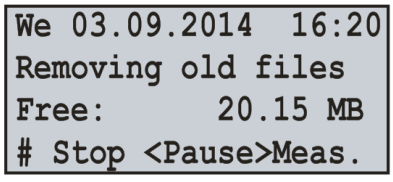


Figure 6.8 *– A screen of old files deleting*

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 7.6).

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 1480 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.

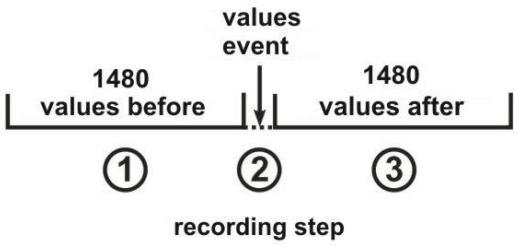


Figure 6.9 *– Data recording at event (stages)*

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.

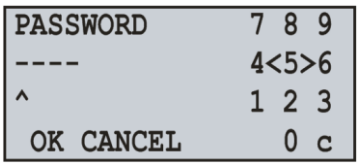
The number of values recorded before and after the event is set by parameters "**Points before**" and "**Points after**" in the menu of events setting (Chapter 7, item 7.6.2).

If the limit of the event is set for a single recording ("**ONCE**" Chapter 7, item 7.6.4.2), 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.

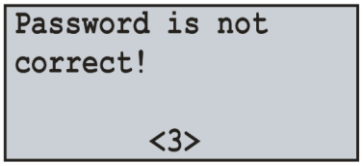
If the event limit is set on continuous recording ("**LONG**" Chapter 7, item 7.6.4.2), then after the event happens the data recording will continue, until the measured value is higher (up level) or lower (down level) of specified limits.

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.

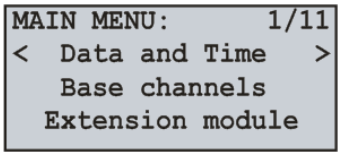


Figure 6.11 *– Screen of the data logger main menu*

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).

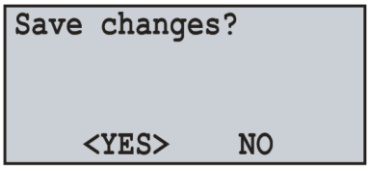


Figure 6.12 *– Screen of saving the changes*

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 shows the first of a list of available channels and the measured values.

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

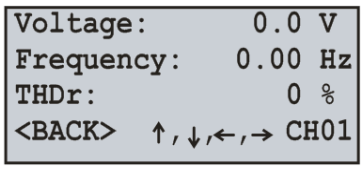


Figure 6.13 *– Screen of measured values for channel 1*

The first three lines are displayed measured values available for this channel.

The fourth line displays the menu item "BACK" navigation direction symbols and channel number ("CH01").

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*

Ch.	Number values					
	1	2	3	4	5	6
1	Voltage RMS, V	Frequency, Hz	THDr, %	Peak + voltage, V	Peak - voltage, V	Instantaneous voltage, V
2	Voltage RMS, V	Frequency, Hz	THDr, %	Peak + voltage, V	Peak - voltage, V	Instantaneous voltage, V
3	Voltage RMS, V	Frequency, Hz	THDr, %	Peak + voltage, V	Peak - voltage, V	Instantaneous voltage, V
4	Current RMS, A	Frequency, Hz	THDr, %	Peak + current, A	Peak – current, A	Instantaneous current, A
5	Current RMS, A	Frequency, Hz	THDr, %	Peak + current, A	Peak - current, A	Instantaneous current, A
6	Current RMS, A	Frequency, Hz	THDr, %	Peak + current, A	Peak - current, A	Instantaneous current, A
7	Current RMS, A	Frequency, Hz	THDr, %	Peak + current, A	Peak - current, A	Instantaneous current, A
8	Temperature, ºC	-----	-----	-----	-----	-----
9	Temperature, ºC	-----	-----	-----	-----	-----
10	Analog voltage, V	User’s Value	-----	-----	-----	-----
11	Analog current, mA	User’s Value	-----	-----	-----	-----
12	Digital input	Frequency, Pulse*min	Pulse Scaler	-----	-----	-----
13	Digital input	Frequency, Pulse*min	Pulse Scaler	-----	-----	-----
14	Digital input	Frequency, Pulse*min	Pulse Scaler	-----	-----	-----
15	Digital input	Frequency, Pulse*min	Pulse Scaler	-----	-----	-----
16	Active power, W	Reactive power, var	Full power, VA	Power factor, cos φ	Active Energy Scaler, kW*h	Reactive Energy Scaler, kVAr*h
17	Active power, W	Reactive power, var	Full power, VA	Power factor, cos φ	Active Energy Scaler, kW*h	Reactive Energy Scaler, kVAr*h

Table 6.1 (continued)

Ch.	Number values					
	1	**2**	**3**	**4**	**5**	**6**
18	Active power, W	Reactive power, var	Full power, VA	Power factor, cos φ	Active Energy Scaler, kW*h	Reactive Energy Scaler, kVAr*h
19	Line voltage AB, V	Line voltage BC, V	Line voltage CA, V	Negative sequence voltage, V	Positive sequence voltage, V	Zero sequence voltage, V
20-40	The names of the measured values depends on the connected expansion modules					

Channels 16, 17, 18 and 19 do not have a physical connection of the terminals, their values are calculated from the measured values of the respective current and voltage: - Channel 16 = Channel 1 and Channel 4; - Channel 17 = Channel 2 and Channel 5; - Channel 18 = Channel 3 and Channel 6; - Channel 19 = Channel 1, Channel 2 and Channel 3						

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.

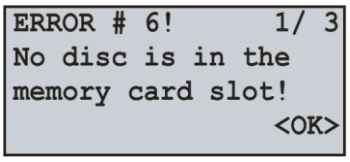


***Figure 6.14** – Screen with an error message*

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 **RECORD** 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 **RECORD** 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	Cannot create file!	
#16	Unable to write to file!	

Table 6.2 (continued)

Error code	Error message	Troubleshooting method
#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	Memory overflow	Switch off and switch on again the data logger.
#21 - #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.
---	HARDFAULT_HANDLER	
---	MEMMANAGE_HANDLER	
---	BUSFAULT_HANDLER	
---	USAGEFAULT_HANDLER	
---	STACK_OVERFLOW	
---	LCD_Init	
---	SETTINGS_Init	
---	TIM2_Config	
---	ETH_Config	
---	SPI1_Config	
---	SPI3_Config	
---	ADC1_Config	
---	USART2_Config	
---	NVIC_Config	
---	BUTTON_Init	
---	DIGINP_Init	
---	SD_Init	
---	SRAM_Init	
---	RTC_Init	
---	ADCM_Init	
---	USART2_Init	
---	Modules_Init	
---	TCPStack_Init	
---	OVERVIS_Init	
---	HTTP_Init	
---	MODBUS_Init	
---	FTP_Init	
---	TWRITE_Create	
---	TCOLL_Create	
---	TGUI_Create	
---	TGKeep_Create	

6.2 USE OF HTTP SERVER (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 setting**". 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 "**Exit**", 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 Five***). All connections exceeding the limit will be automatically closed.

6.3 USE OF MODBUS TCP SERVER

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- 63 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 6.5).

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 register of commands is not used for a long period of time it is necessary to block the access to them by writing in registries 51-63 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 al 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 types of parameters and their names are given in Table 6.3.

The list of supported functions (Modbus) is resulted in the Table 6.4.

The address of command registry is resulted in Table 6.5.

Addresses of additional registries are resulted in Table 6.6.

Addresses of the registers of the measured parameters of the base channels are given in Table 6.7.

Register addresses parameters measured expansion modules are shown in Table 6.8.

Addresses of registries of programmable parameters are resulted in Table 6.9.

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 – *Types of parameters and their names*

Type	Name	Unit of measurement	Resolution
0	Unknown (parameter not use)	---	---
1	Voltage RMS	V	0.1
2	Voltage Instantaneous	V	0.1
3	Peak + voltage (positive half wave)	V	0.1
4	Peak – voltage (negative half wave)	V	0.1
5	Current RMS	A	0.01
6	Current Instantaneous	A	0.01
7	Peak + current (positive half wave)	A	0.01
8	Peak – current (negative half wave)	A	0.01
9	Frequency	Hz	0.01
10	THDr	%	1
11	Temperature	ºC	0.1
12	Analog voltage 0-10 V	V	0.01
13	Analog current 0-20 mA	mA	0.01
14	Digital input (ON / OFF)	---	1
15	Full power	VA	0.1
16	Active power	W	0.1

Table 6.3 (continued)

Type	Name	Unit of measurement	Resolution
17	Reactive power	Var	0.1
18	Power factor (cos φ)	---	0.001
19	Active Energy Scaler	kW*h	0.1
20	Reactive Energy Scaler	kVAr*h	0.1
21	User's Value	---	0.01
22	Pulse Frequency	Pulse*min	0.1
23	Pulse Scaler	---	1
24	Line voltage AB	V	0,1
25	Line voltage BC	V	0,1
26	Line voltage CA	V	0,1
27	Negative sequence voltage	V	0,1
28	Positive sequence voltage	V	0,1
29	Zero sequence voltage	V	0,1

***Table 6.4** – List of supported functions*

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

***Table 6.5** – 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. 0x3010 – energy scalers reset (phase 1, channel 16); 0x3011 – energy scalers reset (phase 2, channel 17); 0x3012 – energy scalers reset (phase 3, channel 18); 0x3020 – pulse scalers reset (channel 12); 0x3021 – pulse scalers reset (channel 13); 0x3022 – pulse scalers reset (channel 4); 0x3023 – pulse scalers reset (channel 15).	WR	50
Modbus password (13 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	51-63

WR/RD – access type to registry Recording / Reading.
Address view "**50**" means value 16 bit (UINT).
Address view "**51-63**" means a range of 16 bit values.

***Table 6.6** – 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	1.8	RD	1
	bit 7 – bit 0	8			
MAC address	MAC address RPM-416 (example: 00-04-A3-8F-EF-3C)			RD	2-7
Registry of state	bit 0	0 : no errors in the data logger 1 : some errors (see errors flags)		RD	8:9
	bit 1	0 : data recording stopped 1 : data recording started			
	bit 3	0 : no disc in the card slot 1 : a disc in the card slot			

Table 6.6 (continued)

Name	Description		WR/RD	Address (DEC)
Registry of state	bit 4	0 : memory card is not initialized 1 : memory card is initialized	RD	8:9
	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		
	bit 10	1: expansion module 1 connected		
	bit 11	1: expansion module 2 connected		
	bit 12	1: expansion module 3 connected		
	bit 13	1: expansion module 4 connected		
	bit 14	1: Overvis connected		
	Bits from 15 to 31 are reserved			
Registry of errors	bit 0	Real time clock failure	RD	10:11
	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.		
	bit 19	Memory overflow		
	Bits from 20 to 31 are reserved			
Memory card capacity	Multiply by 512 for value in bytes		RD	12:13
Free space on the memory card	Multiply by 512 for value in bytes		RD	14:15
File identifier	File identifier 0 – 9999 (FILE0001.RDF)		RD	16
File size, byte	Data file size		RD	17:18
Operation time, sec	Time since the last switching on		RD	19:20
System time, sec	Time is counted since 01.01.1980 / 00:00:00		WR/RD	21:22
Last event, s	Time of the last event since 01.01.1980 / 00:00:00		RD	23:24
Event counter	The event counter since the power was supplied		RD	25:26

WR/RD – access type to registry Recording / Reading.
Address view "**1**" means value 16 bit (UINT).
Address view "**2-7**" means a range of 16 bit values.
Address view "**8:9**" means value 32 bit (ULONG).

Table 6.7 – *R*egisters of the measured parameters of the base channels RPM-416

Ch.	Value	Name	Type	WR/RD	Address (DEC)
1	1	Value type [1] (Voltage RMS L1)	UINT	RD	100
		Value	ULONG	RD	101:102
	2	Value type [9] (Voltage frequency L1)	UINT	RD	103
		Value	ULONG	RD	104:105

Table 6.7 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
1	3	Value type [10] (Voltage THDr L1)	UINT	RD	106
		Value	ULONG	RD	107:108
	4	Value type [3] (Peak + voltage L1)	UINT	RD	109
		Value	ULONG	RD	110:111
	5	Value type [4] (Peak - voltage L1)	UINT	RD	112
		Value	ULONG	RD	113:114
	6	Value type [2] (Instantaneous voltage L1)	UINT	RD	115
		Value	ULONG	RD	116:117
2	1	Value type [1] (Voltage RMS L2)	UINT	RD	118
		Value	ULONG	RD	119:120
	2	Value type [9] (Voltage frequency L2)	UINT	RD	121
		Value	ULONG	RD	122:123
	3	Value type [10] (Voltage THDr L2)	UINT	RD	124
		Value	ULONG	RD	125:126
	4	Value type [3] (Peak + voltage L2)	UINT	RD	127
		Value	ULONG	RD	128:129
	5	Value type [4] (Peak - voltage L2)	UINT	RD	130
		Value	ULONG	RD	131:132
	6	Value type [2] (Instantaneous voltage L2)	UINT	RD	133
		Value	ULONG	RD	134:135
3	1	Value type [1] (Voltage RMS L3)	UINT	RD	136
		Value	ULONG	RD	137:138
	2	Value type [9] (Voltage frequency L3)	UINT	RD	139
		Value	ULONG	RD	140:141
	3	Value type [10] (Voltage THDr L3)	UINT	RD	142
		Value	ULONG	RD	143:144
	4	Value type [3] (Peak + voltage L3)	UINT	RD	145
		Value	ULONG	RD	146:147
	5	Value type [4] (Peak - voltage L3)	UINT	RD	148
		Value	ULONG	RD	149:150
	6	Value type [2] (Instantaneous voltage L3)	UINT	RD	151
		Value	ULONG	RD	152:153
4	1	Value type [5] (Current RMS L1)	UINT	RD	154
		Value	ULONG	RD	155:156
	2	Value type [9] (Current frequency L1)	UINT	RD	157
		Value	ULONG	RD	158:159
	3	Value type [10] (Current THDr L1)	UINT	RD	160
		Value	ULONG	RD	161:162
	4	Value type [7] (Peak + current L1)	UINT	RD	163
		Value	ULONG	RD	164:165
	5	Value type [8] (Peak - current L1)	UINT	RD	166
		Value	ULONG	RD	167:168
	6	Value type [6] (Instantaneous current L1)	UINT	RD	169
		Value	ULONG	RD	170:171
5	1	Value type [5] (Current RMS L2)	UINT	RD	172
		Value	ULONG	RD	173:174
	2	Value type [9] (Current frequency L2)	UINT	RD	175
		Value	ULONG	RD	176:177
	3	Value type [10] (Current THDr L2)	UINT	RD	178
		Value	ULONG	RD	179:180
	4	Value type [7] (Peak + current L2)	UINT	RD	181
		Value	ULONG	RD	182:183
	5	Value type [8] (Peak - current L2)	UINT	RD	184
		Value	ULONG	RD	185:186
	6	Value type [6] (Instantaneous current L2)	UINT	RD	187
		Value	ULONG	RD	188:189
6	1	Value type [5] (Current RMS L3)	UINT	RD	190
		Value	ULONG	RD	191:192
	2	Value type [9] (Current frequency L3)	UINT	RD	193
		Value	ULONG	RD	194:195

Table 6.7 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
6	3	Value type [10] (Current THDr L3)	UINT	RD	196
		Value	ULONG	RD	197:198
	4	Value type [7] (Peak + current L3)	UINT	RD	199
		Value	ULONG	RD	200:201
	5	Value type [8] (Peak - current L3)	UINT	RD	202
		Value	ULONG	RD	203:204
	6	Value type [6] (Instantaneous current L3)	UINT	RD	205
		Value	ULONG	RD	206:207
7	1	Value type [5] (Current RMS)	UINT	RD	208
		Value	ULONG	RD	209:210
	2	Value type [9] (Current frequency)	UINT	RD	211
		Value	ULONG	RD	212:213
	3	Value type [10] (Current THDr)	UINT	RD	214
		Value	ULONG	RD	215:216
	4	Value type [7] (Peak + current)	UINT	RD	217
		Value	ULONG	RD	218:219
	5	Value type [8] (Peak - current)	UINT	RD	220
		Value	ULONG	RD	221:222
	6	Value type [6] (Instantaneous current)	UINT	RD	223
		Value	ULONG	RD	224:225
8	1	Value type [11] (Temperature)	UINT	RD	226
		Value	ULONG	RD	227:228
	2 - 6	reserved	---	RD	229-243
9	1	Value type [11] (Temperature)	UINT	RD	244
		Value	ULONG	RD	245:246
	2 - 6	reserved	---	RD	247-261
10	1	Value type [12] (Analog voltage 0-10 V)	UINT	RD	262
		Value	ULONG	RD	263:264
	2	Value type [21] (User's Value)	UINT	RD	265
		Value	ULONG	RD	266:267
	3 - 6	reserved	---	RD	268-279
11	1	Value type [13] (Analog current 0-20 mA)	UINT	RD	280
		Value	ULONG	RD	281:282
	2	Value type [21] (User's Value)	UINT	RD	283
		Value	ULONG	RD	284:285
	3 - 6	reserved	---	RD	286-297
12	1	Value type [14] (Digital input)	UINT	RD	298
		Value	ULONG	RD	299:300
	2	Value type [22] (Pulse frequency)	UINT	RD	301
		Value	ULONG	RD	302:303
	3	Value type [23] (Pulse scaler)	UINT	RD	304
		Value	ULONG	RD	305:306
	4 - 6	reserved	----	RD	307–315
13	1	Value type [14] (Digital input)	UINT	RD	316
		Value	ULONG	RD	317:318
	2	Value type [22] (Pulse frequency)	UINT	RD	319
		Value	ULONG	RD	320:321
	3	Value type [23] (Pulse scaler)	UINT	RD	322
		Value	ULONG	RD	323:324
	4- 6	reserved	---	RD	325–333
14	1	Value type [14] (Digital input)	UINT	RD	334
		Value	ULONG	RD	335:336
	2	Value type [22] (Pulse frequency)	UINT	RD	337
		Value	ULONG	RD	338:339

Table 6.7 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
14	3	Value type [23] (Pulse scaler)	UINT	RD	340
		Value	ULONG	RD	341:342
	4 - 6	reserved	---	RD	343–351
15	1	Value type [14] (Digital input)	UINT	RD	352
		Value	ULONG	RD	353:354
	2	Value type [22] (Pulse frequency)	UINT	RD	355
		Value	ULONG	RD	356:357
	3	Value type [23] (Pulse scaler)	UINT	RD	358
		Value	ULONG	RD	359:360
	4 - 6	reserved	---	RD	361–369
16	1	Value type [15] (Full power L1)	UINT	RD	370
		Value	ULONG	RD	371:372
	2	Value type [16] (Active power L1)	UINT	RD	373
		Value	ULONG	RD	374:375
	3	Value type [17] (Reactive power L1)	UINT	RD	376
		Value	ULONG	RD	377:378
	4	Value type [18] (Power factor (cos φ) L1)	UINT	RD	379
		Value	ULONG	RD	380:381
	5	Value type [19] (Active Energy Scaler L1)	UINT	RD	382
		Value	ULONG	RD	383:384
	6	Value type [20] (Reactive Energy Scaler L1)	UINT	RD	385
		Value	ULONG	RD	386:387
17	1	Value type [15] (Full power L2)	UINT	RD	388
		Value	ULONG	RD	389:390
	2	Value type [16] (Active power L2)	UINT	RD	391
		Value	ULONG	RD	392:393
	3	Value type [17] (Reactive power L2)	UINT	RD	394
		Value	ULONG	RD	395:396
	4	Value type [18] (Power factor (cos φ) L2)	UINT	RD	397
		Value	ULONG	RD	398:399
	5	Value type [19] (Active Energy Scaler L2)	UINT	RD	400
		Value	ULONG	RD	401:402
	6	Value type [20] (Reactive Energy Scaler L2)	UINT	RD	403
		Value	ULONG	RD	404:405
18	1	Value type [15] (Full power L3)	UINT	RD	406
		Value	ULONG	RD	407:408
	2	Value type [16] (Active power L3)	UINT	RD	409
		Value	ULONG	RD	410:411
	3	Value type [17] (Reactive power L3)	UINT	RD	412
		Value	ULONG	RD	413:414
	4	Value type [18] (Power factor (cos φ) L3)	UINT	RD	415
		Value	ULONG	RD	416:417
	5	Value type [19] (Active Energy Scaler L3)	UINT	RD	418
		Value	ULONG	RD	419:420
	6	Value type [20] (Reactive Energy Scaler L3)	UINT	RD	421
		Value	ULONG	RD	422:423
19	**1**	Value type [24] (Line voltage AB)	UINT	RD	424
		Value	ULONG	RD	425:426
	2	Value type [25] (Line voltage BC)	UINT	RD	427
		Value	ULONG	RD	428:429
	3	Value type [26] (Line voltage CA)	UINT	RD	430
		Value	ULONG	RD	431:432
	4	Value type [27] (Negative sequence)	UINT	RD	433
		Value	ULONG	RD	434:435
	5	Value type [28] (Positive sequence)	UINT	RD	436
		Value	ULONG	RD	437:438
	6	Value type [29] (Zero sequence)	UINT	RD	439
		Value	ULONG	RD	440:441

The types of parameters are described in Table 6.3.
WR/RD – access type to registry Recording / Reading.
Address view "**100**" means value 16 bit (UINT).
Address view "**106-109**" means a range of 16 bit values.
Address view "**110:111**" means value 32 bit (ULONG).

Table 6.8 – Registers of the measured parameters of the expansion modules

Ch.	Value	Name	Type	WR/RD	Address (DEC)
20	1	Value type	UINT	RD	442
		Value	ULONG	RD	443:444
	2	Value type	UINT	RD	445
		Value	ULONG	RD	446:447
	3	Value type	UINT	RD	448
		Value	ULONG	RD	449:450
	4	Value type	UINT	RD	451
		Value	ULONG	RD	452:453
	5	Value type	UINT	RD	454
		Value	ULONG	RD	455:456
	6	Value type	UINT	RD	457
		Value	ULONG	RD	458:459
21	1	Value type	UINT	RD	460
		Value	ULONG	RD	461:462
	2	Value type	UINT	RD	463
		Value	ULONG	RD	464:465
	3	Value type	UINT	RD	466
		Value	ULONG	RD	467:468
	4	Value type	UINT	RD	469
		Value	ULONG	RD	470:471
	5	Value type	UINT	RD	472
		Value	ULONG	RD	473:474
	6	Value type	UINT	RD	475
		Value	ULONG	RD	476:477
22	1	Value type	UINT	RD	478
		Value	ULONG	RD	479:480
	2	Value type	UINT	RD	481
		Value	ULONG	RD	482:483
	3	Value type	UINT	RD	484
		Value	ULONG	RD	485:486
	4	Value type	UINT	RD	487
		Value	ULONG	RD	488:489
	5	Value type	UINT	RD	490
		Value	ULONG	RD	491:492
	6	Value type	UINT	RD	493
		Value	ULONG	RD	494:495
23	1	Value type	UINT	RD	496
		Value	ULONG	RD	497:498
	2	Value type	UINT	RD	499
		Value	ULONG	RD	500:501
	3	Value type	UINT	RD	502
		Value	ULONG	RD	503:504
	4	Value type	UINT	RD	505
		Value	ULONG	RD	506:507
	5	Value type	UINT	RD	508
		Value	ULONG	RD	509:510
	6	Value type	UINT	RD	511
		Value	ULONG	RD	512:513
24	1	Value type	UINT	RD	514
		Value	ULONG	RD	515:516
	2	Value type	UINT	RD	517
		Value	ULONG	RD	518:519

Table 6.8 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
24	3	Value type	UINT	RD	520
		Value	ULONG	RD	521:522
	4	Value type	UINT	RD	523
		Value	ULONG	RD	524:525
	5	Value type	UINT	RD	526
		Value	ULONG	RD	527:528
	6	Value type	UINT	RD	529
		Value	ULONG	RD	530:531
25	1	Value type	UINT	RD	532
		Value	ULONG	RD	533:534
	2	Value type	UINT	RD	535
		Value	ULONG	RD	536:537
	3	Value type	UINT	RD	538
		Value	ULONG	RD	539:540
	4	Value type	UINT	RD	541
		Value	ULONG	RD	542:543
	5	Value type	UINT	RD	544
		Value	ULONG	RD	545:546
	6	Value type	UINT	RD	547
		Value	ULONG	RD	548:549
26	1	Value type	UINT	RD	550
		Value	ULONG	RD	551:552
	2	Value type	UINT	RD	553
		Value	ULONG	RD	554:555
	3	Value type	UINT	RD	556
		Value	ULONG	RD	557:558
	4	Value type	UINT	RD	559
		Value	ULONG	RD	560:561
	5	Value type	UINT	RD	562
		Value	ULONG	RD	563:564
	6	Value type	UINT	RD	565
		Value	ULONG	RD	566:567
27	1	Value type	UINT	RD	568
		Value	ULONG	RD	569:570
	2	Value type	UINT	RD	571
		Value	ULONG	RD	572:573
	3	Value type	UINT	RD	574
		Value	ULONG	RD	575:576
	4	Value type	UINT	RD	577
		Value	ULONG	RD	578:579
	5	Value type	UINT	RD	580
		Value	ULONG	RD	581:582
	6	Value type	UINT	RD	583
		Value	ULONG	RD	584:585
28	1	Value type	UINT	RD	586
		Value	ULONG	RD	587:588
	2	Value type	UINT	RD	589
		Value	ULONG	RD	590:591
	3	Value type	UINT	RD	592
		Value	ULONG	RD	593:594
	4	Value type	UINT	RD	595
		Value	ULONG	RD	596:597
	5	Value type	UINT	RD	598
		Value	ULONG	RD	599:600
	6	Value type	UINT	RD	601
		Value	ULONG	RD	602:603
29	1	Value type	UINT	RD	604
		Value	ULONG	RD	605:606

Table 6.8 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
29	2	Value type	UINT	RD	607
		Value	ULONG	RD	608:609
	3	Value type	UINT	RD	610
		Value	ULONG	RD	611:612
	4	Value type	UINT	RD	613
		Value	ULONG	RD	614:615
	5	Value type	UINT	RD	616
		Value	ULONG	RD	617:618
	6	Value type	UINT	RD	619
		Value	ULONG	RD	620:621
30	1	Value type	UINT	RD	622
		Value	ULONG	RD	623:624
	2	Value type	UINT	RD	625
		Value	ULONG	RD	626:627
	3	Value type	UINT	RD	628
		Value	ULONG	RD	629:630
	4	Value type	UINT	RD	631
		Value	ULONG	RD	632:633
	5	Value type	UINT	RD	634
		Value	ULONG	RD	635:636
	6	Value type	UINT	RD	637
		Value	ULONG	RD	638:639
31	1	Value type	UINT	RD	640
		Value	ULONG	RD	641:642
	2	Value type	UINT	RD	643
		Value	ULONG	RD	644:645
	3	Value type	UINT	RD	646
		Value	ULONG	RD	647:648
	4	Value type	UINT	RD	649
		Value	ULONG	RD	650:651
	5	Value type	UINT	RD	652
		Value	ULONG	RD	653:654
	6	Value type	UINT	RD	655
		Value	ULONG	RD	656:657
32	1	Value type	UINT	RD	658
		Value	ULONG	RD	659:660
	2	Value type	UINT	RD	661
		Value	ULONG	RD	662:663
	3	Value type	UINT	RD	664
		Value	ULONG	RD	665:666
	4	Value type	UINT	RD	667
		Value	ULONG	RD	668:669
	5	Value type	UINT	RD	670
		Value	ULONG	RD	671:672
	6	Value type	UINT	RD	673
		Value	ULONG	RD	674:675
33	1	Value type	UINT	RD	676
		Value	ULONG	RD	677:678
	2	Value type	UINT	RD	679
		Value	ULONG	RD	680:681
	3	Value type	UINT	RD	682
		Value	ULONG	RD	683:684
	4	Value type	UINT	RD	685
		Value	ULONG	RD	686:687
	5	Value type	UINT	RD	688
		Value	ULONG	RD	689:690
	6	Value type	UINT	RD	691
		Value	ULONG	RD	692:693
34	1	Value type	UINT	RD	694
		Value	ULONG	RD	695:696

Table 6.8 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
34	2	Value type	UINT	RD	697
		Value	ULONG	RD	698:699
	3	Value type	UINT	RD	700
		Value	ULONG	RD	701:702
	4	Value type	UINT	RD	703
		Value	ULONG	RD	704:705
	5	Value type	UINT	RD	706
		Value	ULONG	RD	707:708
	6	Value type	UINT	RD	709
		Value	ULONG	RD	710:711
35	1	Value type	UINT	RD	712
		Value	ULONG	RD	713:714
	2	Value type	UINT	RD	715
		Value	ULONG	RD	716:717
	3	Value type	UINT	RD	718
		Value	ULONG	RD	719:720
	4	Value type	UINT	RD	721
		Value	ULONG	RD	722:723
	5	Value type	UINT	RD	724
		Value	ULONG	RD	725:726
	6	Value type	UINT	RD	727
		Value	ULONG	RD	728:729
36	1	Value type	UINT	RD	730
		Value	ULONG	RD	731:732
	2	Value type	UINT	RD	733
		Value	ULONG	RD	734:735
	3	Value type	UINT	RD	736
		Value	ULONG	RD	737:738
	4	Value type	UINT	RD	739
		Value	ULONG	RD	740:741
	5	Value type	UINT	RD	742
		Value	ULONG	RD	743:744
	6	Value type	UINT	RD	745
		Value	ULONG	RD	746:747
37	1	Value type	UINT	RD	748
		Value	ULONG	RD	749:750
	2	Value type	UINT	RD	751
		Value	ULONG	RD	752:753
	3	Value type	UINT	RD	754
		Value	ULONG	RD	755:756
	4	Value type	UINT	RD	757
		Value	ULONG	RD	758:759
	5	Value type	UINT	RD	760
		Value	ULONG	RD	761:762
	6	Value type	UINT	RD	763
		Value	ULONG	RD	764:765
38	1	Value type	UINT	RD	766
		Value	ULONG	RD	767:768
	2	Value type	UINT	RD	769
		Value	ULONG	RD	770:771
	3	Value type	UINT	RD	772
		Value	ULONG	RD	773:774
	4	Value type	UINT	RD	775
		Value	ULONG	RD	776:777
	5	Value type	UINT	RD	778
		Value	ULONG	RD	779:780
	6	Value type	UINT	RD	781
		Value	ULONG	RD	782:783
39	1	Value type	UINT	RD	784
		Value	ULONG	RD	785:786

Table 6.8 (continued)

Ch.	Value	Name	Type	WR/RD	Address (DEC)
39	2	Value type	UINT	RD	787
		Value	ULONG	RD	788:789
	3	Value type	UINT	RD	790
		Value	ULONG	RD	791:792
	4	Value type	UINT	RD	793
		Value	ULONG	RD	794:795
	5	Value type	UINT	RD	796
		Value	ULONG	RD	797:798
	6	Value type	UINT	RD	799
		Value	ULONG	RD	800:801
40	1	Value type	UINT	RD	802
		Value	ULONG	RD	803:804
	2	Value type	UINT	RD	805
		Value	ULONG	RD	806:807
	3	Value type	UINT	RD	808
		Value	ULONG	RD	809:810
	4	Value type	UINT	RD	811
		Value	ULONG	RD	812:813
	5	Value type	UINT	RD	814
		Value	ULONG	RD	815:816
	6	Value type	UINT	RD	817
		Value	ULONG	RD	818:819

The types of parameters are described in Table 6.3.
WR/RD – access type to registry Recording / Reading.
Address view "**100**" means value 16 bit (UINT).
Address view "**106-109**" means a range of 16 bit values.
Address view "**110:111**" means value 32 bit (ULONG).

Table 6.9 *– Programmable parameters RPM-416*

Name	Value	Factory value	Type	WR/RD	Address (DEC)
Time correction, sec / day	-99.9… +99.9	0,0	INT	RW	2000
Voltage sensor coefficient L1 (Channel 1)	1.0 … 5000.0	1,0	UINT	RW	2001
Voltage sensor coefficient L2 (Channel 2)	1.0 … 5000.0	1,0	UINT	RW	2002
Voltage sensor coefficient L3 (Channel 3)	1.0 … 5000.0	1,0	UINT	RW	2003
Nominal CT L1 (Channel 4), A	5 … 2000	5	UINT	RW	2004
Nominal CT L2 (Channel 5), A	5 … 2000	5	UINT	RW	2005
Nominal CT L3 (Channel 6), A	5 … 2000	5	UINT	RW	2006
Nominal CT (Channel 7), A	5 … 2000	5	UINT	RW	2007
Temperature correction (Channel 8), ºC	-9.9 … +9.9	0.0	INT	RW	2008
Temperature correction (Channel 9), ºC	-9.9 … +9.9	0.0	INT	RW	2009
Temperature sensor type (Channel 8) [0 – PTC1000; 1 – PT1000]	0…1	1	UINT	RW	2010
Temperature sensor type (Channel 9) [0 – PTC1000; 1 – PT1000]	0 …1	1	UINT	RW	2011
Temperature filter (Channel 8), sec	0.0 … 10.0	1.5	UINT	RW	2012
Temperature filter (Channel 9), sec	0.0 … 10.0	1.5	UINT	RW	2013
An. voltage sensor type 0-10 V (Channel 10) [0 – 0…10 V; 1 – SCALE]	0 … 1	0	UINT	RW	2014
An. voltage sensor filter (Channel 10), sec	0.0 … 10.0	1.5	UINT	RW	2015
Analogue Voltage Scale (channel 10)					
input value, V, from	0.00…10.00	0.00	UINT	RW	2214
input value, V, to	0.00…10.00	10.00	UINT	RW	2215
output value, from	-999.9…0	0.0	INT	RW	2216
output value, to	0…999.9	10.0	INT	RW	2217
An. current sensor type 0-20 mA (Channel 11) [0 – 0…20 mA; 1 – SCALE]	0 … 1	0	UINT	RW	2016
An. current sensor filter (Channel 11), sec	0.0 … 10.0	1.5	UINT	RW	2017

Table 6.9 (continued)

Name	Value	Factory value	Type	WR/RD	Address (DEC)
Analogue Current Scale (channel 11)					
input value, mA, from	0.00…20.00	0.00	UINT	RW	2218
input value, mA, to	0.00…20.00	20.00	UINT	RW	2219
output value, from	-999.9…0	0.0	INT	RW	2220
output value, to	0…999.9	20.0	INT	RW	2221
Discrete input type (Channel 12) [0 – not invert.; 1 – invert.]	0…1	0	UINT	RW	2018
Digital Signal Capture (channel 12) [0 – by fallout; 1 – by front]	0…1	1	UINT	RW	2206
Discrete input type (Channel 13) [0 – not invert; 1 – invert.]	0…1	0	UINT	RW	2019
Digital Signal Capture (channel 13) [0 – by fallout; 1 – by front]	0…1	1	UINT	RW	2207
Discrete input type (Channel 14) [0 – not invert; 1 – invert.]	0…1	0	UINT	RW	2020
Digital Signal Capture (channel 14) [0 – by fallout; 1 – by front]	0…1	1	UINT	RW	2208
Discrete input type (Channel 15) [0 – not invert; 1 – invert.]	0…1	0	UINT	RW	2021
Digital Signal Capture (channel 15) [0 – by fallout; 1 – by front]	0…1	1	UINT	RW	2209
Event 1, up limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2022
Event 2, up limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2023
Event 3, up limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2024
Event 4, up limit [0 – off: 1 – momentary; 2 – continued]	0…2	0	UINT	RW	2025
Event 5, up limit [0 – off: 1 – momentary; 2 – continued]	0 …2	0	UINT	RW	2026
Event 1, down limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2027
Event 2, down limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2028
Event 3, down limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2029
Event 4, down limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2030
Event 5, down limit [0 – off: 1 – momentary; 2 – continued]	0 … 2	0	UINT	RW	2031
Event 1, up limit value	--- … ---	0	LONG	RW	2032:2033
Event 2, up limit value	--- … ---	0	LONG	RW	2034:2035
Event 3, up limit value	--- … ---	0	LONG	RW	2036:2037
Event 4, up limit value	--- …---	0	LONG	RW	2038:2039
Event 5, up limit value	--- … ---	0	LONG	RW	2040:2041
Event 1, down limit value	--- … ---	0	LONG	RW	2042:2043
Event 2, down limit value	--- … ---	0	LONG	RW	2044:2045
Event 3, down limit value	--- … ---	0	LONG	RW	2046:2047
Event 4, down limit value	--- … ---	0	LONG	RW	2048:2049
Event 5, down limit value	--- … ---	0	LONG	RW	2050:2051
Event 1, up limit time, ms	1 ms…60 s	10	UINT	RW	2052
Event 2, up limit time, ms	1 ms…60 s	10	UINT	RW	2053
Event 3, up limit time, ms	1 ms…60 s	10	UINT	RW	2054
Event 4, up limit time, ms	1 ms…60 s	10	UINT	RW	2055
Event 5, up limit time, ms	1 ms…60 s	10	UINT	RW	2056
Event 1, down limit time, ms	1 ms …60 s	10	UINT	RW	2057
Event 2, down limit time, ms	1 ms …60 s	10	UINT	RW	2058
Event 3, down limit time, ms	1 ms…60 s	10	UINT	RW	2059

Table 6.9 (continued)

Name	Value	Factory value	Type	WR/RD	Address (DEC)
Event 4, down limit time, ms	1 ms…60 s	10	UINT	RW	2060
Event 5, down limit time, ms	1 ms … 60 s	10	UINT	RW	2061
Event 1, value source [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	ULONG	RW	2062:2063
Event 2, value source [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	ULONG	RW	2064:2065
Event 3, value source [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	ULONG	RW	2066:2067
Event 4, value source [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	ULONG	RW	2068:2069
Event 5, value source [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	ULONG	RW	2070:2071
Display illuminating mode [0 – off; 1 – always on; 2 – will be off in 30 sec]	0…2	2	UINT	RW	2072
Source of data to be written 1 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2073:2074
Source of data to be written 2 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2075:2076
Source of data to be written 3 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2077:2078
Source of data to be written 4 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2079:2080
Source of data to be written 5 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2081:2082
Source of data to be written 6 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2083:2084
Source of data to be written 7 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0 …17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2085:2086
Source of data to be written 8 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2087:2088
Source of data to be written 9 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2089:2090

Table 6.9 (continued)

Name	Value	Factory value	Type	WR/RD	Address (DEC)
Source of data to be written 10 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2091:2092
Source of data to be written 11 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2093:2094
Source of data to be written 12 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2095:2096
Source of data to be written 13 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2097:2098
Source of data to be written 14 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2099:2100
Source of data to be written 15 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2101:2102
Source of data to be written 16 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2103:2104
Source of data to be written 17 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2105:2106
Source of data to be written 18 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0 … 17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2107:2108
Source of data to be written 19 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2109:2110
Source of data to be written 20 [bit31 – bit24 : channel number; bit23 – bit16 : value number; bit15 – bit0 : value type]	Ch. 0…17 Val. 0…5 Type 0…18	4294967295	UINT	RW	2111:2112
Write period, ms	1 ms…60 m	1000	ULONG	RW	2113:2114
File size, byte	32 kB…512 MB	32768	ULONG	RW	2115:2116
Write type [0 – until memory; 1 – the ring]	0…1	0	UINT	RW	2117
Write event [0 – disabled; 1 – enabled]	0…1	0	UINT	RW	2118
Points before event	0…1920	100	UINT	RW	2119
Points after event	0 …1920	100	UINT	RW	2120
Discreteness event writing, ms	1 ms…1000 ms	1	UINT	RW	2121
Password protection [0 – disabled; 1 – enabled]	0…1	0	UINT	RW	2122
Access Password Value (6 symbols of ASCII)	A-Z, a-z, 0-9	1234	UINT	RW	2123:2128
Expansion modules [0 – disabled; 1 – enabled]	0 … 1	0	UINT	RW	2129
Type of module 1	0 …1	0	UINT	RW	2130
Type of module 2	0 …1	0	UINT	RW	2131

Table 6.9 (continued)

Name	Value	Factory value	Type	WR/RD	Address (DEC)
Type of module 3	0 …1	0	UINT	RW	2132
Type of module 4	0 … 1	0	UINT	RW	2133
DHCP [0 – disabled; 1 – enabled]	0 …1	0	UINT	RW	2134
IP-address	--- … ---	192.168.0.2	ULONG	RW	2135:2136
Mask	--- … ---	255.255.255.0	ULONG	RW	2137:2138
Main Gateway	--- … ---	192.168.0.1	ULONG	RW	2139:2140
Server address DNS 1	--- … ---	192.168.0.1	ULONG	RW	2141:2142
DNS 2	--- … ---	8.8.8.8	ULONG	RW	2143:2144
Modbus TCP server [0 – disabled; 1 – enabled]	0 … 1	1	UINT	RW	2145
Modbus TCP port	1 … 65535	502	UINT	RW	2146
Modbus UID	0…255	0	UINT	RW	2205
Modbus TCP timeout, sec	60 …3600	60	UINT	RW	2147
MODBUS password (13 chars ASCII)	A-Z, a-z, 0-9	“admin”	STR	RW	2148-2160
HTTP server [0 – disabled; 1 – enabled]	0 … 1	1	UINT	RW	2164
HTTP port	1 … 65535	80	UINT	RW	2165
HTTP timeout, sec	60 … 3600	300	UINT	RW	2166
HTTP password (13 chars ASCII)	A-Z, a-z, 0-9	“admin”	STR	RW	2167-2179
FTP server [0 – disabled; 1 – enabled]	0 … 1	0	UINT	RW	2183
FTP port	1…65535	21	UINT	RW	2184
FTP timeout, sec	60…3600	300	UINT	RW	2185
FTP password (13 chars ASCII)	A-Z, a-z, 0-9	“admin”	STR	RW	2186-2198
Overvis client [0 – disabled; 1 – enabled]	0…1	0	UINT	RW	2202
Overvis port	1…65535	20502	UINT	RW	2203
Overvis timeout, sec	60…3600	90	UINT	RW	2204

WR/RD – access type to registry Recording / Reading.
Address view “**2000**” means value 16 bit (UINT).
Address view “**2140-2155**” means a range of 16 bit values.
Address view “**2028:2029**” means value 32 bit (ULONG).

6.4 USE OF FTP SERVER

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 (UINIX);
- **TYPE** – Define the type of file transmitting (“**I**” – binary);
- **USER** – User’s name for input on the server;

- **PASS** – Password for the server;
- **STRU** – Set file transfer structure. (“F” – file);
- **MODE** – Sets the transfer mode (“S” – Stream);
- **REIN** – Re-initialize the connection;
- **PORT** – Specifies an address and port to which the server should connect;
- **MKD** – Make directory;
- **RMD** – Remove a directory;
- **STOR** – Accept data and store data as a file at the server site;
- **DELE** – Delete file.

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 USE OF OVERVIS CLIENT

Overvis is a system for monitoring, visualization and remote control of technological processes.

Overvis enables:

- to read the data from the instruments, including with the recording system;
- to perform 24-hour cyclical readout of data;
- to save the data automatically in its own database;
- to display the data in the convenient form;
- to receive alarm reports in the form of SMS or E-Mail.

More detailed information can be found at the official website www.overvis.com.

Overvis system acts as a collection server of data from the recording system and other devices connected simultaneously, and it provides access to data in real time only with the permission of the owner of the recording system.

Factory settings of the recording system are prepared to connect to the server of Overvis, in this case the Overvis client in the recording system is disabled and should be enabled manually by the user.

To connect the recording system to the system of Overvis it is required:

- to configure the recording system to access the internet;
- to enable Overvis Client;
- in the Overvis settings to make sure that there is connection to the server and the activation code is received;
- using the instructions at Overvis website, to connect to the recording system with the activation code.

Note: *When you connect the register to Overvis system for the first time, Overvis activation settings indicate that connection is activated. To ensure safety one should select RESET item, to remove the unit from Overvis system. Thus it guarantees, that the register connected is to be used by users possessing rights.*

6.6 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 7.7.2.

6.7 RPM-416 DATA ANALYSIS SOFTWARE INSTALLATION

For proper work of the software on the computer there should be installed Operational System Windows XP, Windows Vista or Windows 7/8/10. 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 **https://novatek-electro.com/en/** in section “Software”.

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

NOTE - For Windows Vista 7/8/10 Program must be performed with administrator rights.

6.8 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.

6.9 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 6.6) 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 6.7).

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

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;
"**Base Channels**" – for setting the base channels (inputs of the data logger);
"**Exp. modules**" – for setting the expansion modules;
"**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;
"**Network**" – for setting Ethernet interface;
"**Password**" – for setting the access restriction to the data logger;
"**General settings**" – allows you to perform additional actions with settings;
"**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.

Figure 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.

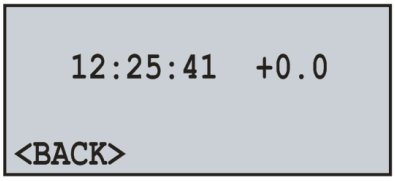


***Figure 7.1.2** – Screen of time setting*

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 -99,9 to +99,9)

WARNING! Incorrect time correction can lead to a temporary error of up to ± 2 ms per second during data recording.

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 BASE CHANNELS ("BASE 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;
"**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 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 7.2.1.

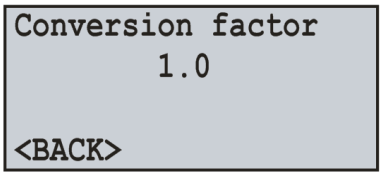


Figure 7.2.1 *– Screen of setting of voltage conversion ratio*

On this screen you can set the voltage conversion ratio from **1.0** to **5000.0**.

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;

“**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 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 7.2.2.

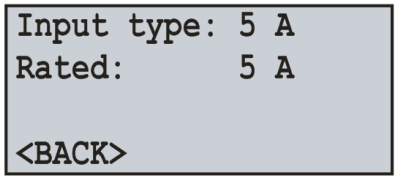


Figure 7.2.2 *– Screen of setting of current transformer rated*

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;

“**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 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 7.2.3.

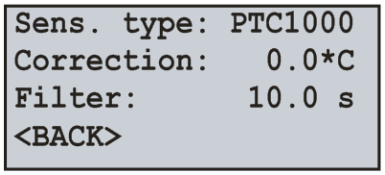


Figure 7.2.3 *– Screen of temperature sensor setting*

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 ºC to +9.9 ºC**.

Temperature filter range from **0.0 sec** (disabled) to **10.0 sec**.

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 ºC.

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:

Tcc = Tct – Ttmr, where:

Tcc – value of correcting coefficient, ºC;
Tct – temperature value of calibration thermometer, ºC;
Ttmr – temperature value measured by the data logger, ºC.

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;
"**Voltage sensor**" – a menu item for setting the type of analog voltage sensor.
"**Scaling**" – menu item, that allows to set analogue voltage sensor scaling.

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 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 7.2.4.

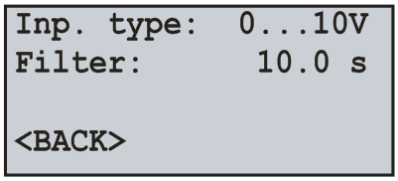


Figure 7.2.4 *– Screen of setting the analog voltage sensor*

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

Analog voltage filter range from **0.0 sec** (disabled) to **10.0 sec**.

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).

7.2.4.2 *Analogue voltage sensor scaling settings ("Scaling")*

When selecting this menu item the register's display shows the screen of scale setting for analogue voltage sensor, given in the Fig. 7.2.5.

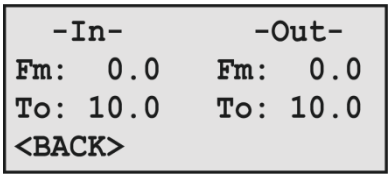


Figure 7.2.5 *– Analogue Voltage Sensor Scale Setting Screen*

On this screen, you can set the input voltage value of the sensor from **0.0** to **10.0** V and the final scale value from **-999.9** to **999.9**.

Via arrow keys ▲ (up) or ▼ (down) select required parameter (the selected parameter is highlighted by the cursor).

To edit parameter one should:

- press ◙ (enter) key, the parameter starts to flash;
- via arrow keys ▲ (up) or ▼ (down) change the parameter value;
- after changing the value press ◙ (enter) button again to exit edit mode and save the value set, the parameter stops to flash.

To return to the previous menu via ▼ (down) arrow button set the cursor in "RETURN" position and press ◙ (enter) button.

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;

"**Sensor of current**" – a menu item for setting the type of analog current sensor.

"**Scaling**" – menu item, that allows to set analogue current sensor scaling.

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 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.

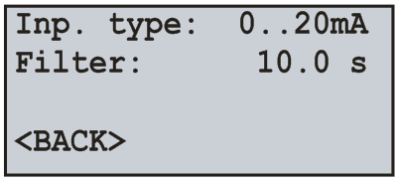


Figure 7.2.6 *– Screen of setting the analog current sensor*

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

Analog current filter range from **0.0 sec** (disabled) to **10.0 sec**.

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).

7.2.5.2 *Analogue current sensor scaling setting ("Scaling")*

When selecting this menu item the register's display shows the screen of scale setting for analogue current sensor, given in the Fig. 7.2.7.

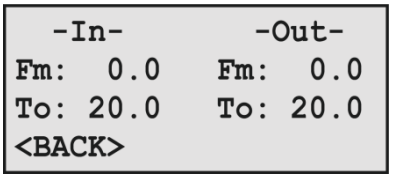


Figure 7.2.7 *– Analogue Current Sensor Scale Setting Screen*

On this screen, you can set the input value of the sensor current from **0.0** to **20.0** mA and the final scale value from **-999.9** to **999.9**.

Via arrow button ▲ (up) or ▼ (down) select required parameter (the selected parameter is highlighted by the cursor).

To edit parameter one should:

- press ◙ (ENTER) button, the parameter starts to flash;
- via arrow buttons ▲ (up) or ▼ (down) change the parameter value;
- after changing the value press ◙ (enter) button again to exit edit mode and save the value set, the parameter stops to flash.

To return to the previous menu via ▼ (down) arrow button set the cursor in "RETURN" position and press ◙ (enter) button.

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;

"**Signal inversion**" – menu item, that allows to set the signal inversion;

"**Signal capture**" – menu item, that allows to set the signal capture method.

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 ***Signal inversion setting ("Signal inversion")***

At selection of this item on the display of the data logger there will be a screen of setting of the type of signal inversion setting, resulted in the figure 7.2.8.

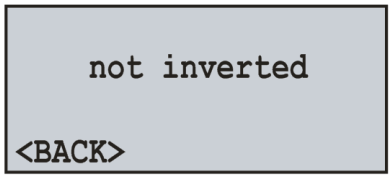


Figure 7.2.8 *– Screen of setting of the type of signal inversion*

On this screen you can set a type of signal inversion: **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).

7.2.6.2 *Signal capture method setting ("Signal capture")*

When selecting this menu item the register's display shows the screen of signal capture method setting, given in the Fig. 7.2.9.

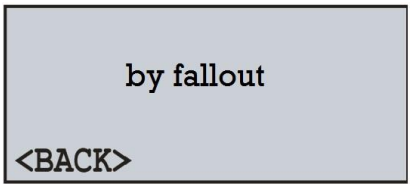


Figure 7.2.9 *– Signal Capture Method Setting Screen*

On this screen you can set the signal capture method: "**by fallout**" or "**by front**".

Via ▲(up) arrow button select "**by fallout**" parameter (the selected parameter is highlighted by the cursor).

By pressing ◙ (enter) button change the digital signal type.

To return to the previous menu via ▼ (down) arrow key set the cursor in "RETURN" position and press ◙ (enter) button.

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;

"**Scalers reset**" – menu item, that allows to reset active and reactive energy scalers.

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).

7.3 EXPANSION MODULES

When you select this menu item on the display of the recording system the screen will be displayed with the list of available menu options for configuring expansion modules:

"**On/Off**" menu item allows you to enable or disable the expansion modules;

"**Module 1**" **(2, 3 and 4)** – menu item that allows you to configure the appropriate expansion module;

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

To return to the previous menu, press the button ◄ (left).

7.3.1 Turning the power on and off for expansion modules ("On/Off")

When you select this menu item on the display of the recording system the screen displays on and off for expansion modules shown in Fig. 7.3.1.

On this screen you can enable or disable the extension modules: **Modules Off** or **Modules On**.

Using the button ▲ (up) select the parameter "**Modules Off**" (the selected parameter is highlighted by the cursor).

By pressing the button ◙ (enter) change the state of expansion modules.

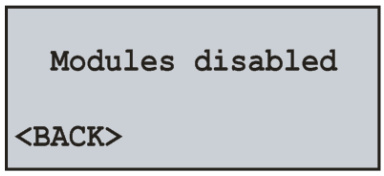


***Figure 7.3.1** – Screen for expansion modules on and off*

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.3.2 Expansion module ("Module 1" (2, 3 and 4)) setting

When you select this menu item on the display of the recording system the screen displays the settings for expansion module shown in Fig.7.3.2.

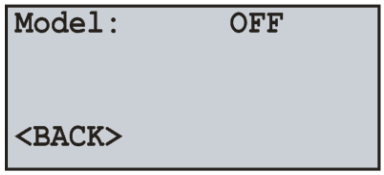


***Figure 7.3.2** – Screen for expansion module settings*

On this screen you can set the model of the connected expansion module:

- **OFF** – the expansion module is off;
- **MP-01** – the module MP-01 is on.

Using the button ▲ (up) set the cursor in the position "**OFF**" (the selected parameter is highlighted by the cursor).

To edit parameter you should press the button ◙ (enter), the selected parameter will blink.

Using buttons ▲ (up) or ▼ (down), change the parameter value.

After the value change it is necessary to press again the button ◙ (enter) – to exit the edit mode and save the value entered. The parameter stops blinking.

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.4 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).

7.4.1 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 7.4.1.

***Figure 7.4.1** – Screen of setting of display backlight mode*

On this screen you can set the display illuminating mode: **Off, On continuously** or **Off after 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).

7.5 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 recoded 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).

7.5.1 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 7.5.1.

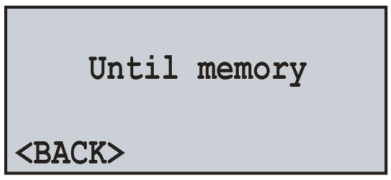


Figure 7.5.1 *– Screen of setting the type of recording*

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).

7.5.2 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 7.5.2.

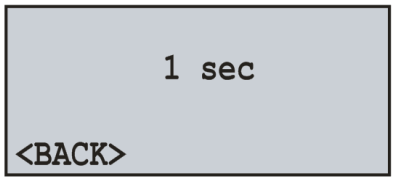


Figure 7.5.2 *– Screen of setting the period of data recording*

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.

7.5.3 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 7.5.3.

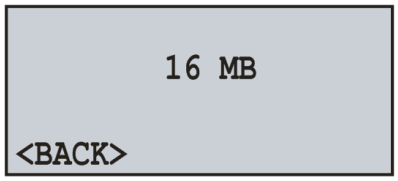


Figure 7.5.3 *– Screen of setting the size of data file*

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).

7.5.4 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 7.5.4. Recorded data represents the single block consisting of 20 cells (of measured values).

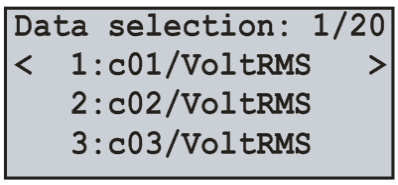


Figure 7.5.4 *– Screen of setting the recorded data*

Where:

"**1/20**" – number of selected cell (1 of 20);

"**1:**, **2:**, **3:**" – order number of cell (from 1 to 20);
"**c01/VoltRMS L1**" – name of value (Channel 1 – RMS voltage).

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

To edit the box press the button ◙ (enter), on the display of the data logger there will be the list of measured values, as resulted in figure 7.5.5.

Figure 7.5.5 *– Screen of the list of measured values*

Where:
"**Channel 1**" – channel number;
"**01/06**" – channel value number (1 of 6 for this channel);
"**<FREE>**" – empty value;
"**c01/VoltRMS**" – name of the value (Channel 1 – RMS Voltage).

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. 7.5.4).

To escape from the menu "**Choice of data**", press the button ◄ (left).

7.6 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).

7.6.1 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 7.6.1.

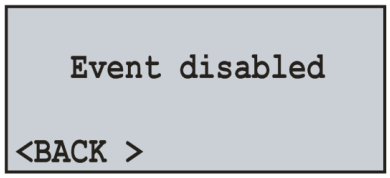


Figure 7.6.1 *– Screen of switching on and switching off the event for data recording*

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.*

7.6.2 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 7.6.2.

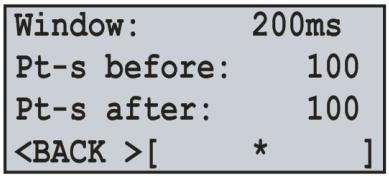


Figure 7.6.2 *– Screen of setting the time of data recording at event*

On this screen you can set the number of points of recording before the event "**Pt-s before**" in range from **0** to **1480**, and number of points of recording after the event "**Pt-s after**" in range from **0** to **1480**.

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 7.6.3).

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 ↓.

7.6.3 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 7.6.3.

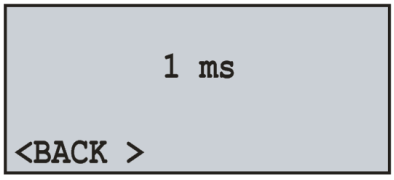


Figure 7.6.3 *– Screen of setting the discreteness of data recording at event*

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).

7.6.4 Setting of event ("Event 1" (2, 3, 4 and 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 treshold**" – a menu item for setting the value of upper threshold;

"**Lower treshold**" – 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.

7.6.4.1 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 7.6.4.

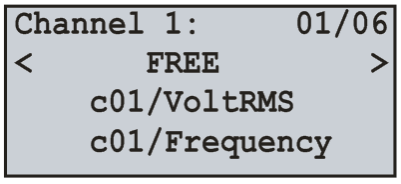


Figure 7.6.4 *– Screen of list of measured values*

Where:

"**Channel 1**" – number of channel;

"**01/06**" – value number of channel (1 of 3 for this channel);

"**<FREE>**" – empty value;

"**c01/VoltRMS**" – name of the value (Channel 1 – RMS Voltage).

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).

7.6.4.2 Setting of Upper and Lower thresholds ("Upper treshold" u "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 7.6.5.

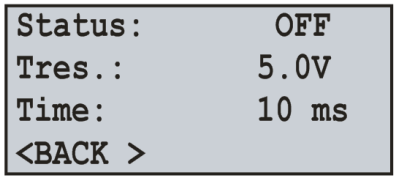


Figure 7.6.5 *– Screen of setting the Upper and Lower thresholds of event*

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. 7.6.6), which is located in the right low corner of the screen.

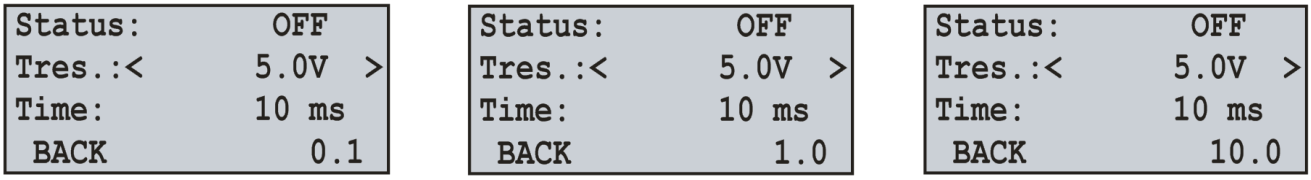


Figure 7.6.6 *– Screen of setting the value of threshold*

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).

7.7 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).

7.7.1 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 7.7.1.

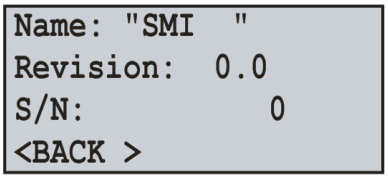


Figure 7.7.1 *– Brief information about the installed memory card*

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

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

7.7.2 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 7.7.2.

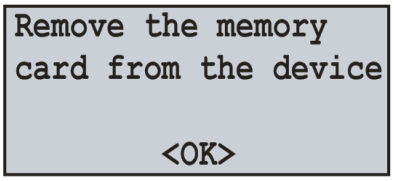


Figure 7.7.2 *– Screen of confirmation of data recording termination*

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.

7.7.3 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. 7.7.3).

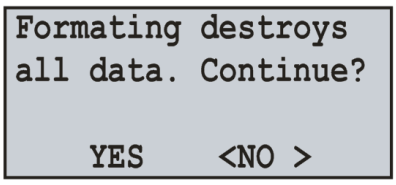


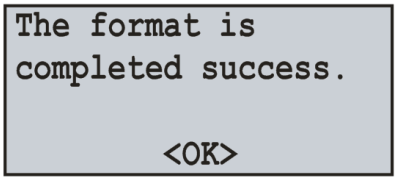
Figure 7.7.3 *– Screen with a warning message and conformation of formatting*

To confirm the process of formatting it is necessary by button ◄ (left) locate the cursor in position "**YES**" and press the button ◙ (enter).

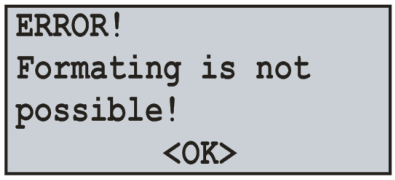
To cancel the process of formatting it is necessary by button ► (right) locate the cursor in position "**NO**" and press the button ◙ (enter). The process of formatting will be canceled and the data logger returns to the previous item.

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. 7.7.4). 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. 7.7.4).



Screen of successful formatting



Screen of impossibility of formatting

Figure 7.7.4 *– 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).

7.8 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;
"**Overvis**" – a menu item, for setting the Overvis client;
"**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:

"**State**" – a menu item for view current state server;
"**On / Off**" – a menu item for switching on and switching off the server;

"**Identifier**" – menu item, that allows to set the unit identifier;
"**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.

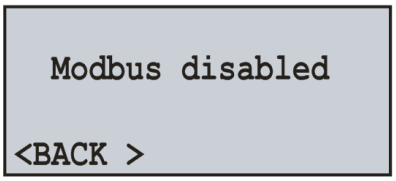


Figure 7.8.1 *– Screen of switching on and switching off of Modbus TCP server*

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 *Unit identifier setting ("Identifier")*

When selecting this menu item the register's display shows the screen of unit identifier setting, given in the Fig. 7.8.2.

Figure 7.8.2 *– Unit Identifier Setting Screen*

On this screen you can set the unit identifier from **0** to **255**.

Via▲ (up) arrow button select "**0**" parameter (the selected parameter is highlighted by the cursor).

To edit parameter one should:

- press ◙ (enter) button, the parameter starts to flash;
- via arrow buttons▲ (up) or ▼ (down) change port number;
- after changing the value press ◙ (enter) button again to exit edit mode and save value set, the parameter stops to flash;
- to return to the previous menu via ▼ (down) arrow button set the cursor in "RETURN" position and press ◙ (enter).

Note *– if the identifier value is 0, RPM-416 ignores the UID line check in Modbus overshoot.*

7.8.1.3 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 7.8.3.

Figure 7.8.3 *– 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).

7.8.1.4 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 7.8.4.

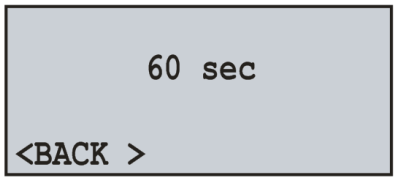


Figure 7.8.4 *– Screen of setting the timeout of connection to Modbus TCP server*

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).

7.8.1.5 Change the password to access Modbus TCP ("Change password")

When selecting this menu item the register's display shows the message, requiring to confirm password change to access Modbus TCP (Fig. 7.8.5).

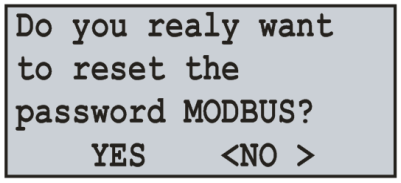


Figure 7.8.5 – Modbus TCP Password Change Confirmation Screen

To confirm password change one should via ◄ (left) arrow button set the cursor in "**YES**" position and press ◙ (enter) button. The register's display shows the password input dialogue.

Enter new password, set the cursor in "**OK**" position and press ◙ (enter) button.

To cancel password change via ► (right) arrow button set the cursor in "NO" position and press ◙ (enter) button. The password change is not made, the register returns to the previous menu item.

7.8.2 Setting of HTTP 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:

"**State**" – a menu item for view current state 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;
"Change password" – menu item, that allows to change.

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).

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 HTTP server

At selection of this item on the display of the data logger there will be a screen of switching on and switching off HTTP server, resulted in figure 7.8.6.

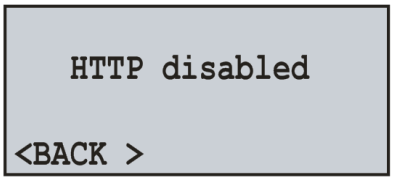


Figure 7.8.6 *– Screen of Switching on and switching off the Web-server*

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 7.8.7.

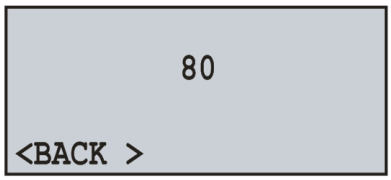


***Figure 7.8.7** – Screen of setting the port of connection to Web-server*

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 7.8.8.

***Figure 7.8.8** – 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 Change the password to access HTTP server ("Change password")

When selecting this menu item the register's display shows the message, requiring to confirm password change to access HTTP server (Fig. 7.8.9).

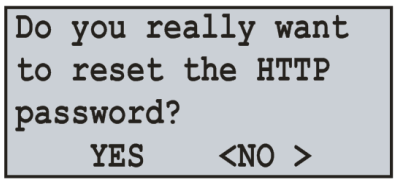


***Figure 7.8.9** – HTTP Server Password Change Confirmation Screen*

To confirm password change via ◄ (LEFT) arrow button set the cursor in "YES" position and press ◙ (ENTER) button. The register's display shows the password input dialogue.

Enter new password, set the cursor in "**OK**" position and press ◙ (ENTER) button.

To cancel password change via ► (RIGHT) arrow button set the cursor in "NO" position and press ◙ (ENTER) button. The password change is not made, the register returns to the previous menu item.

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:

"**State**" – a menu item for view current state 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).

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 7.8.10.

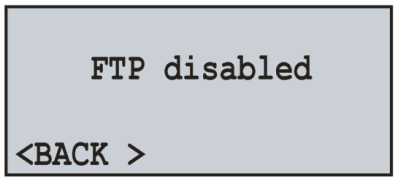


Figure 7.8.10 *– Screen of switching on and switching off of FTP server*

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 7.8.11.

Figure 7.8.11 *– 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 7.8.12.

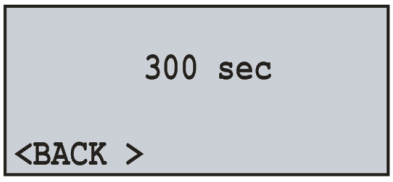


Figure 7.8.12 *– Screen of setting the timeout of connection to FTP server*

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. 7.8.13).

For password reset it is necessary by button ◄ (left) locate the cursor in position "**YES**" and press the button ◙ (enter). The register's display shows the password input dialogue.

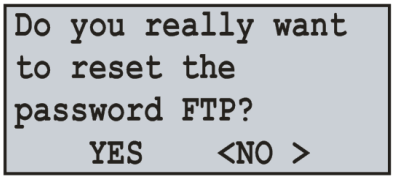


Figure 7.8.13 *– Screen of conformation for FTP server password reset*

Enter new password, set the cursor in "**OK**" position and press ◙ (enter) button.

To cancel password change via ► (right) arrow button set the cursor in "**NO**" position and press ◙ (enter) button. The password change is not made, the register returns to the previous menu item.

7.8.4 Overvis Client setting

When you select this menu item on the display of the recording system the screen will be displayed with the list of available menu options for Overvis Client setting:

"**Status**" – menu item that allows you to see the current connection status;
"**On / Off**" – menu item allows you to enable or disable the client;
"**Port**" – menu item that allows you to specify the port for connection to the server;
"**Timeout**" – menu item that allows you to set the timeout of the connection;
"**Activation**" – menu item that allows you to activate the connection.

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

To return to the previous menu, press the button ◄ (left).

These settings will take effect only after saving the settings and restarting the recording system.

7.8.4.1 Turning the power on and off for Overvis Client

When you select this menu item on the display of the recording system the screen displays on and off for Overvis Client shown in Fig. 7.8.14.

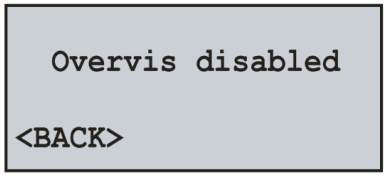


Figure 7.8.14 *– Screen for Overvis Client on and off*

On this screen you can set the status for Overvis client: "**Overvis OFF"** or **"Overvis ON"**.

Using the button ▲ (up) select the parameter "**Overvis OFF**" (the selected parameter is highlighted by the cursor).

By pressing the button ◙ (enter) change the status of the server.

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.8.4.2 Setting for connection port ("Port")

When you select this menu item on the display of the recording system the screen displays the settings for the port of connection to Overvis server shown in Fig. 7.8.15.

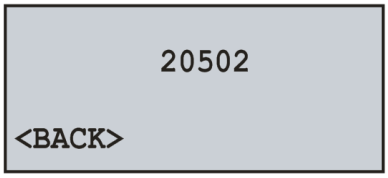


Figure 7.8.15 *– Screen for settings of the port for connection to Overvis server*

On this screen you can set the port number to connect to the Overvis server from **1** to **65535**.

Using the button ▲ (up) select the parameter "**20502**" (the selected parameter is highlighted by the cursor).

To edit the parameter you should press the button ◙ (enter), the selected parameter will blink.

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

After the value change it is necessary to press again the button ◙ (enter) – to exit the edit mode and save the value entered. The parameter stops blinking.

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.8.4.3 Setting for connection timeout ("Timeout")

When you select this menu item on the display of the recording system the screen displays the settings for the timeout of connection to Overvis server shown in Fig. 7.8.16.

On this screen you can set the timeout of connection to Overvis server from **20 sec** to **3600 sec**.

Using the button ▲ (up) select the parameter "**90 sec**" (the selected parameter is highlighted by the cursor).

To edit the parameter you should press the button ◙ (enter), the selected parameter will blink.

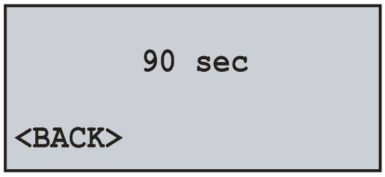


Figure 7.8.16 *– Screen for settings of the timeout for connection to Overvis server*

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

After the value change it is necessary to press again the button ◙ (enter) – to exit the edit mode and save the value entered. The parameter stops blinking.

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.8.4.4 Activation of connection to Overvis server ("Activation")

When you select this menu item on the display of the recording system the screen displays the activation code (Fig. 7.8.17).

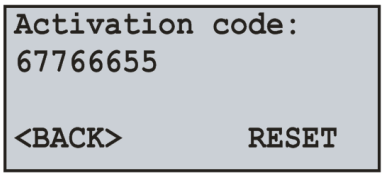


Figure 7.8.17 *– Screen for activation of connection to Overvis server*

If the connection to the Overvis server is activated, instead of the activation code the inscription "**Already activated**" appears.

To cancel the activation it is necessary using the button ► (right) to set the cursor to "**RESET**" and press the button ◙ (enter). This will cancel the activation of connection to Overvis server.

7.8.5 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;
"**IPv4 config**" – a menu item for setting of IPv4;
"**DNS config**" – a menu item for setting of DNS;
"**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).

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

This menu item shows the current state of network connection:

- " **IP**" – IP - address;
- "**MSK**" – Mask;
- "**GTW**" – Gateway;
- "**HCP**" – DHCP address;
- "**DNS**" – DNS address.

Sample of such screen is presented in figure 7.8.18.

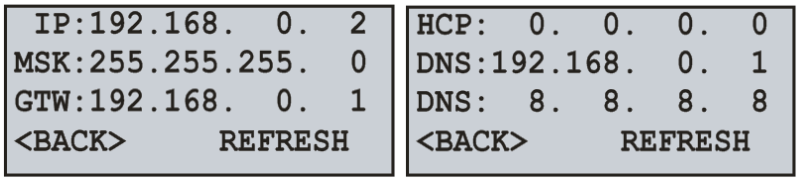


Figure 7.8.18 *– Screen of connection state*

Use the ▲ (up) or ▼ (down) to switch between screens condition.

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).

7.8.5.2 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 7.8.19 is shown the screen of setting of IP-address.

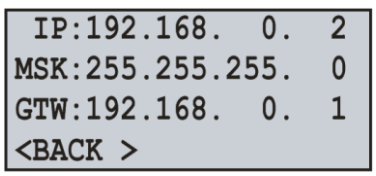


Figure 7.8.19 *– Screen of IP-address setting*

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).

7.8.5.3 Setting for DNS addresses ("DNS setting")

In the Fig. 7.8.20 the DNS addresses setting screen is displayed.

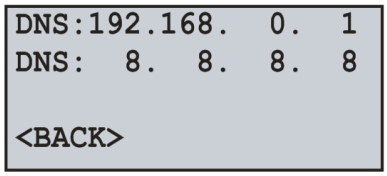


Figure 7.8.20 *– Screen for DNS addresses setting*

Using the buttons ▲ (up), ▼ (down), ◄ (left) or ► (right) select the required parameter (the selected parameter is highlighted by the cursor).

To edit the parameter you should press the button ◙ (enter), the selected parameter will blink.

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

After the value change it is necessary to press again the button ◙ (enter) – to exit the edit mode and save the value entered. The parameter stops blinking.

To return to the previous menu, pressing the button ▼ (down) set the cursor to "**BACK**" and press the button ◙ (enter).

7.8.5.4 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).

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 7.8.21 is shown the screen of switching on and switching off of DHCP.

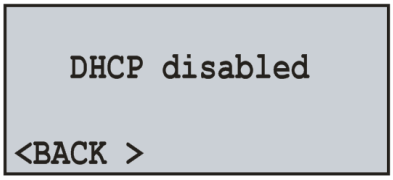


Figure 7.8.21 *– Screen of switching on and switching off of DHCP*

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).

Warning! 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.

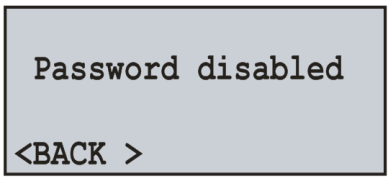


Figure 7.9.1 *– Screen of switching on and switching off of the Password Protection*

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.

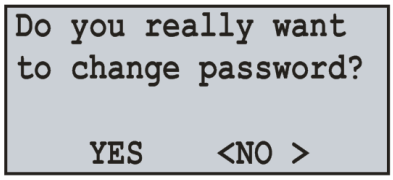


Figure 7.9.2 *– Screen of confirmation of password changing*

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.

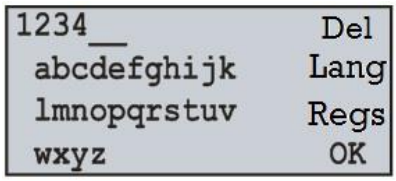


Figure 7.9.3 *– Screen of password input*

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.

A flashing "_" sign indicates, which password order is entered at this moment.

To delete one password order set the cursor in "Del" position and press ◙ (enter) key (e.g., in case of incorrect input).

To change symbol registry set the cursor in "**Regs**" (Register) position and press ◙ (enter) button.

To change symbol page set the cursor in "**Lang**" (Language) position and press ◙ (enter) button.

After completion of the password input it is necessary to locate the cursor in position "**OK**" and press the button ◙ (enter).

7.10 **General settings of the data logger ("General settings")**

When this menu item is selected, the screen with the following list of menu items will be displayed on the recorder display:

- "**Save to Card**" - a menu item that allows you to save all the settings of the data logger to the memory card;
- **"Download from Card"** - a menu item that allows you to download all the settings of the data logger from the memory card;
- **"Reset settings"** - a menu item that allows you to reset all data logger settings to their factory settings;

Press the ▲ (UP) or ▼ (DOWN) buttons to select the desired menu item and confirm the selection by pressing the ◙ (ENTER). To return to the previous menu, press the ◄ (LEFT) button.

7.10.1 *Save all settings to the memory card ("Save to Card")*

If this menu item is selected, a message will be displayed on the data logger display, which will require confirmation of this operation (Fig. 7.10.1).

Figure 7.10.1 *– Screen of confirmation of saving settings*

To confirm that the settings are saved, use the ◄ (LEFT) button to move the cursor to the "**YES**" position and press the ◙ (ENTER) button. In this case, if a password was set, the data logger will prompt you to enter it.

If the password is entered correctly, the data logger will save all settings to the memory card and the message shown in Fig. 7.10.2 will be displayed.

Figure 7.10.2 *– Saving all settings is completed*

To cancel saving all settings, press the ► (RIGHT) button to move the cursor to the "**NO**" position and press the ◙ (ENTER) button. The recorder will return to the previous menu item.

To confirm the message, press the ◙ (ENTER) button. In this case, the recorder will return to the menu item ("General settings").

7.10.2 *Loading all settings from the memory card ("Download from Card")*

If this menu item is selected, a message will be displayed on the data logger display, which will require confirmation of this operation (Fig. 7.10.3).

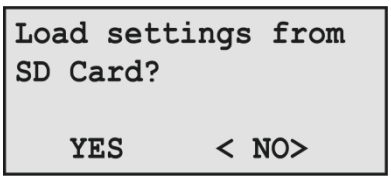


Figure 7.10.3 *– Screen of confirmation of the settings download*

To confirm that the settings are loaded, use the ◄ (LEFT) button to move the cursor to the "**YES**" position and press the ◙ (ENTER) button. In this case, if a password was set, the recorder will prompt you to enter it.

If the password is entered correctly, the data logger will load all settings from the memory card and the message shown in Fig. 7.10.4 will be displayed.

Figure 7.10.4 *– All settings are downloaded*

To cancel the download of all settings, press the ► (RIGHT) button to move the cursor to the "**NO**" position and press the ◙ (ENTER) button. The data logger r will return to the previous menu item.

To confirm the message, press the ◙ (ENTER) button. In this case, the data logger will return to the menu item ("General settings").

7.10.3 *Reset all settings to the factory settings ("Reset settings")*

If this menu item is selected, a message will be displayed on the data logger display, which will require confirmation of this operation (Fig. 7.10.5).

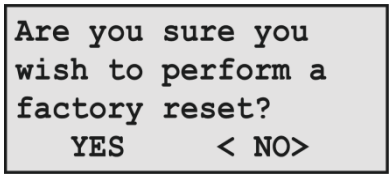


Figure 7.10.5 *– Screen of confirmation of the settings reset*

To confirm resetting all settings to the factory settings, use the ◄ (LEFT) button to move the cursor to the "**YES**" position and press the ◙ (ENTER) button. In this case, if a password was set, the data logger will prompt you to enter it.

If the password is entered correctly, the data logger will reset all settings to the factory settings and the message shown in Fig. 7.10.6 will be displayed.

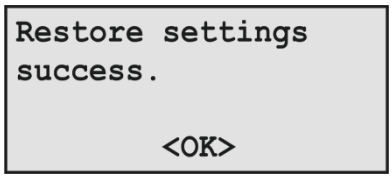


Figure 7.10.6 *– Reset of all settings is completed*

To cancel the reset of all settings, press the ► (RIGHT) button to place the cursor in the "**NO**" position and press the ◙ (ENTER) button. The data logger will return to the previous menu item.

To confirm the message, press the ◙ (ENTER) button. In this case, the data logger will return to the menu item ("General settings").

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 perform 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 7.10.6.

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.

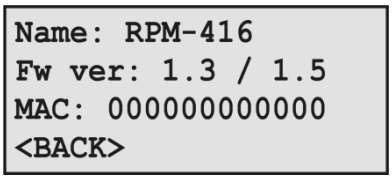


Figure 7.11.1 *– Version of the data logger software*

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

The second line shows the hardware and software version of the product: "**1.3 / 1.5**", where:

1.3 – the hardware version of the product;

1.5 – software version.

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. MAINTENANCE

8.1 Safety precautions

THE TERMINALS AND THE RPM-416 INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.
DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE DATA LOGGER AND CONNECTED DEVICES FROM THE MAINS

8.2 Maintenance of the device must be performed by qualified service personnel.

8.3 Recommended frequency of maintenance **is every six months.**

8.4 Maintenance procedure:

1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 3.1;

2) Visually check the integrity of the housing, in case of detection of cracks and damages to remove the device from service and send for repair;

3) If necessary, wipe with cloth the front panel and the product housing.

Do not use abrasives and solvents for cleaning.

9. SERVICE LIFE AND MANUFACTURER WARRANTY

9.1 The lifetime of the data logger is 10 years. Upon expiration of the service life, contact the manufacturer.

9.2 Shelf life is 3 years.

9.3 Warranty period of the RPM-416 operation is 5 years from the date of sale.

During the warranty period of operation (in the case of failure of the data logger) the manufacturer is responsible for free repair of the product.

ATTENTION! IF THE PRODUCT HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS MANUAL, BUYER WILL FORFEIT THE RIGHT TO WARRANTY SERVICE.

9.4 Warranty service is performed at the place of purchase or by the manufacturer of the product.

9.5 Post-warranty service of the data logger is performed by the manufacturer at current rates.

9.6 Before sending for repair, the data logger should be packed in the original or other packing excluding mechanical damage.

***Earnest request**: indicate the reason for return in the notice of faults field at the return of the device or in case of submitting for warranty service or post-warranty service.*

10. TRANSPORTATION AND STORAGE

The data logger in the original package is permitted to be transported and stored at the temperature from minus 45 to +60°C and relative humidity of 80%.

11. ACCEPTANCE CERTIFICATE

RPM-416 has been manufactured and accepted in accordance with the requirements of current technical documentation and classified as fit for operation.

Seal Chief of QCD _____ Date of manufacture _____

Date of sale _____

12. NOTICES OF CLAIMS

_____
_____
_____
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_____
_____
_____

The Company is grateful to you for the information about the quality of the device and suggestions for its operation.

♦♦♦♦♦

In case of any questions, please, contact the manufacturer.

"NOVATEK-ELECTRO", LTD
Admiral Lazarev Str., 59,
65007, Odessa, Ukraine;
tel. (+38 048) 738-00-28,
tel/fax (+38 0482) 34-36-73
www.novatek-electro.com

VN210505

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 7/8/10 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 7/8/10:
  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.

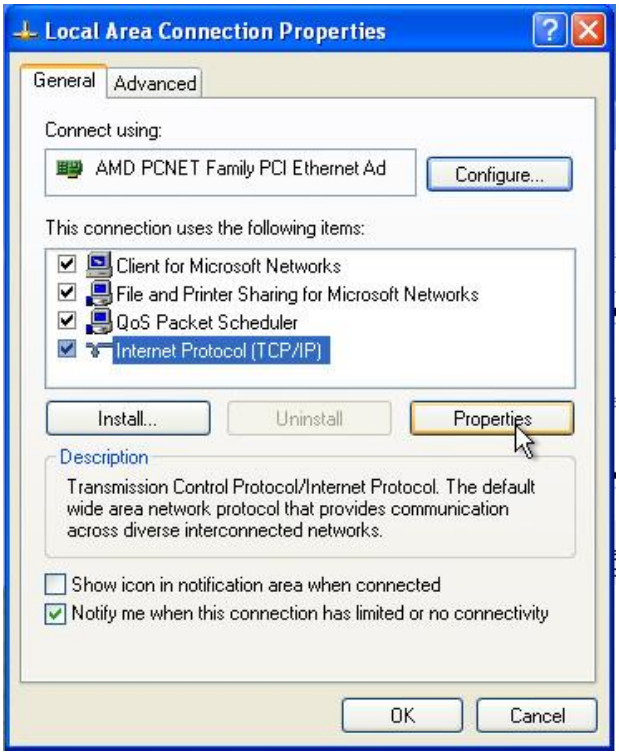

Fig. A.1 *– Example of connection properties screen in Windows 7*

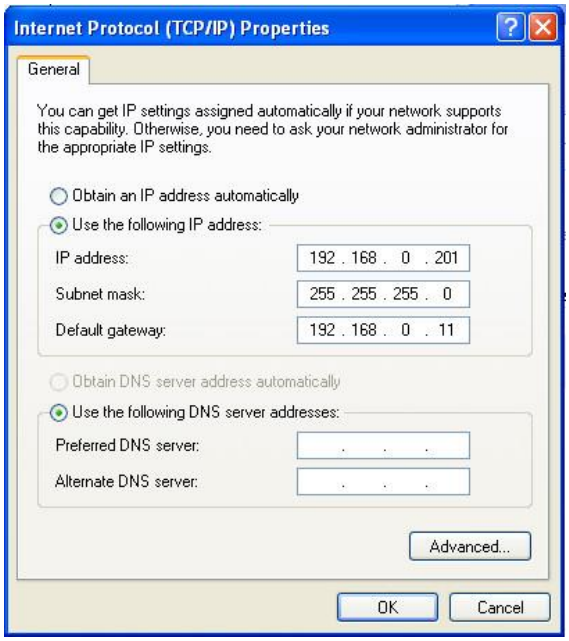

Fig. A.2 *– Example of protocol TCP/IPv4 properties screen in Windows 7*

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).

Appendix C
(reference)

RPM-416 SOFTWARE VERSION

Version	Description
v1.0 30/08/2014	The first version of the software.
v1.1 12/11/2014	The folder names have been corrected when working with FTP. Minor corrections.
v1.2 28/07/2015	It was added measurements: harmonics of voltage and current, peak values of voltages and current. It was added the support for expansion modules. It was added the ability to connect to the server Overvis. It was completely rewritten protocols: Modbus, Ftp and Http. It was improved the correction of the real-time clock.
v1.3 21/07/2016	It was added scaling of analog signals for channels 10 and 11. Electric power meters have been added. Counters of discrete signals have been added. It was added the ability to change the password from the front panel (Modbus, Ftp, Http). Modbus network identifier has been added. It was corrected the removal of old files in the write mode by the ring.
v1.4 11/04/2017	Line voltage measurement has been added (channel 19). It was corrected the scaling of analog signals (channels 10 and 11). It was improved the time correction to 99.9 s per day. It was repaired hang-up of Ethernet DMA when pinging the product in large packets of 65,500 bytes.
v1.5 03/08/2018	The event counter has been added when the power was applied to the product, as well as the time of recording the last event (registers 23:24 and 25:26). It was added the ability to save (load) all settings to a memory card. It was changed the scaling of analog channels (10 and 11), now it is necessary to set the input and output range of values. The FatFs file system library has been updated to version 13b. It was improved the password entry screen (after removing the password character on the screen there were random characters). It was corrected the error #5 when recording events in the ring mode. It was optimized the SPI frequency to support slower cards. The time synchronization with PC has been optimized. It was optimized the display of measured values on the front panel of the product. The algorithm for determining the Ethernet cable connection has been optimized. It was corrected the critical error that caused the device to reboot after a random period of time. It was performed some improvements in system performance in general.
v1.6 21/12/2018	Formatting of the memory card is corrected.
v1.7 08/04/2019	Casual reset of the device in mode of sitting is corrected.
v1.8 27/10/2020	Data recording loss at maximum speed (1ms) is fixed