NOVATEK-ELECTRO LTD
Research-and-Manufacture Company

RN-16TM

LIGHT-SENSITIVE MULTIFUNCTIONAL DAILY-WEEKLY TIMER

SERVICE MANUAL

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1 APPLICATION

Multifunctional relay RN-16TM (hereinafter **RN-16TM**) performs the following functions:

- Programmable real time switch (daily-weekly timer)
- MIN/MAX voltage relay
- Light-sensitive photo relay
- Voltage indicator

The RN-16TM is designed for:

- Turning ON/OFF the power load (equipment) according to the time schedule preset by the user;

- Turn OFF home used or industrial single phase (240V / 50Hz) power load (equipment) in case the unallowable voltage fluctuations are detected. When the voltage returns back to normal parameters - the device will automatically turn ON the power load (equipment) with the user defined time delay;

- Turn ON/OFF the power load according to the curtain illumination level that the user may set

Relay works in 3 basic operation modes (I-III) and 2 mixed modes (IV-V):

I. H – daily-weekly timer;
II. U – MIN/MAX voltage relay;
III. F – photo-relay;
IV. HU – daily-weekly timer with voltage control function;
V. FU – photo-relay with voltage control function.

Depending on the preset operation mode the LED display of the RN-16TM indicates the following information (please see article “6” on Figure1).

I. **Mode H** - current time in format : hours – blinking point - minutes

16.45 16 hours 45 minutes

II. **Mode U** - present voltage level correct to the nearest tenth

221.5 221.5 Volts

III. **Mode F** - letter F - space – illumination level

F 35 illumination level 35

IV. **Mode HU** - time and voltage values are shown one after another divided by dashed line

16.45 **- - - -** **221.5** **- - - -**

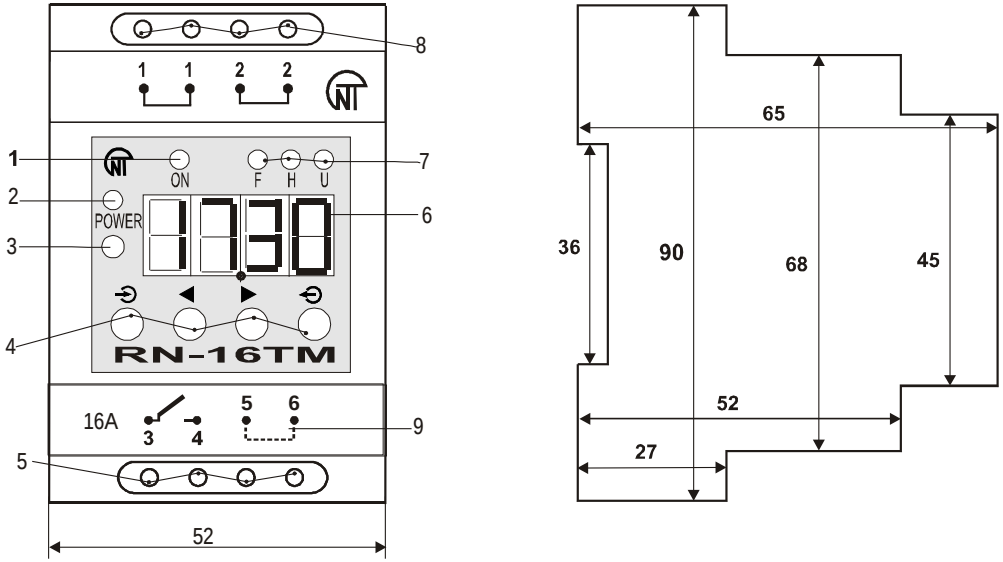
V. **Mode FU** - illumination level and voltage level are shown one after another divided by dashed line

F 35 **- - - -** **221.5** **- - - -**

The User may create 2 different independent sets of parameters **SP1**, **SP2** and may delete any of these sets if necessary. Thus the client may save in the device memory 2 different settings for curtain cases.

Output terminals of the RN-16TM may commutate the power load up to 3,5 kW (16A). If total power load connected to the RN-16TM is more than 3,5 kW (16A) then it will be necessary to commutate the required power load with a use of appropriate contactor

(magnetic starter). The RN-16TM should operate with the magnetic coil of contactor and thus the required power load will be turned ON/OF. Please kindly note that the contactor is not a part supplied along with the RN-16TM.



1 – green LED indicates the "ON" state of relay;
2 – green/red LED signal indicates the input voltage presence;
3 – light sensor (photodiode); 4 – menu control buttons:
– entry into menu, parameter input;
– save the parameter and menu exit;
◄► – scrolling buttons;
5, 8 – wiring terminals; 6 – seven-segment indicator (display);
7 – green LEDs to indicate the operation mode of the relay;
9 – strap of internal accumulator (set at the use of relay), during storage to take off a strap.

FIGURE 1. Controls description and dimension diagrams

2 TECHNICAL PARAMETERS

Rated voltage, V	240
Lowest voltage level sufficient for the RN-16TM operation, V	140
Highest permissible voltage, V	320
Tripping voltage thresholds, V: - Lower threshold…… - Upper threshold…..……..	 150 - 210 230 - 320
Adjustment accuracy for the voltage tripping thresholds, V	1
Illumination level adjustment range, Lx	0 - 175

Voltage measurement accuracy, V (doesn't exceed)	1
Voltage hysteresis (returning ratio), V	± 5
Illumination level hysteresis (returning ratio), %	12
Adjustable reaction time delay to Max/Min voltage interruptions, sec	0– 9,9
Autoreclosing time delay (the RN-16TM will automatically close the contacts (turn ON the power load) as soon as the tripping parameters return to normal values), sec	0– 9,9
Fixed reaction time to changes in illumination level, sec	12
Accuracy of the time clocks, seconds per day (not exceed)	3
Accuracy to adjust schedule time setting, min (not exceed)	1
Maximal number of events per day, Include : - switching ON…….. - switching OFF…… Events per week……	60 30 30 60x7=420
Endurance to the voltage absence (retention of settings when supply voltage is absent, no less than)	1 month
Protection degree: - relay - terminal	IP40 IP20
Commutation life for the output contacts: -- under load 16A, no less than, operations -- under load 5A, no less than, operations	 100 000 1 000 000
Power consumption (under load), VA, not more than	3,0
Weight, not more than, kg	0,150
Dimensions, mm	50x88x65
Operating temperature, °C	from -10 to +55
Storage temperature, °C	from -20 to +70

3 GENERAL DESCRIPTION

The mains power supply 240V 50Hz should be connected to ***«(1-1) – (2-2)»*** terminals of the **RN-16TM**. For wiring convenience terminals **1-1** are the one connection point and **2-2** terminals - another connection point. Output contacts have changeover relay **3 – 4**.

In a time of exploitation of relay a strap is set 5-6.This strap is connect the internal accumulator of reserve clock motion. For warehousing of device it is recommended to take off this strap that will substantially increase lifetime of accumulator.

Power load is being connected using terminals **3-4**.

Output contacts characteristics (terminals 3-4-4-5)

	Max. current under U~250V A.C.	**Max. power when contacts are closed**	**Max. switch. power**	**Max. long-term safe voltage A.C./D.C.**	**Max. current under U=30V D.C.**
Cosφ=0.4	5A	5000VA	4000VA	380/150 V	5A
Cosφ=1.0	16A				

If the **RN-16TM** detects the unallowable OVER/UNDER voltage, then it will turn **OFF** the power load by opening the contacts **3-4** and in case of using the contactor that will turn **OFF** the power for the magnetic coil of the contactor and thus disconnect any required equipment. As soon as voltage parameters restore and return back to normal values – **RN-16TM** will automatically turn ON the power load within the preset autoreclosing time delay.

Present status of the relay - **ON/OFF** states of the output contacts are indicated by green LED light "**ON**" in the left upper corner of the front panel (Figure 1; point – 1). Current operation mode of the **RN-16TM** is marked by green LEDs **"F"**, **"U"**, **"H"** on the front panel (Figure 1; point – 7).

All the adjustments and parameter settings could be subdivided into two groups: BASIC and PARAMETER settings.

BASIC SETTINGS:

P = __ - to set the operation mode (**"F"**, **"U"**, **"H")** of the **RN-16TM**;

SP 1 - to set the operation mode and curtain user required set of parameters (there are 2 independent sets of parameters (programs) that the user may keep in the device memory);

SE 1 - to choose one of the available set of parameters (**SP1** or **SP2**);

CL 1 - to clear (delete) current set of parameters.

PARAMETER SETTINGS:

SCAN - to view the events (parameters) preprogrammed in the **RN-16TM**;

H-PA - to enter the menu for adjustment of parameters (events);

CLOC - current time setting menu;

E01.x - time setting for turn **ON**;

d01.x - time setting for turn **OFF**;

DAY_ - setting for the required day of the week;

U-PA - menu to set the voltage threshold values;

H_ _ - upper voltage threshold setting;

L_ _ - lower voltage threshold setting;

dH._ - time delay to turn **OFF** when high voltage detected (if voltage is more than upper voltage threshold value);

dL._ - time delay to turn **OFF** when low voltage is detected (if voltage is less than lower voltage threshold value);

dE._ - time delay to turn **OFF** when high voltage is detected (if voltage is more than upper voltage threshold value);

L_ _ - illumination level threshold setting.

Important notes:

*Quality of the mains voltage power supply doesn't influence on the preprogrammed operation schedule of the **RN-16TM**. So after the normalization of the voltage parameters power load will be turned ON again, but according to the time schedule preset by the user.*

*If mains voltage was absent not more than 1 month (device was disconnected for 30 days) all the parameters and settings will be safely kept in the **RN-16TM** memory. Output contacts of the relay will be kept in a cold initial state.*

*For example RN-16TM was preprogrammed such a way that every day of a week it turn **ON** the power load at 22:00 and then at 8:00 in the morning of next day it turns the power load **OFF**. Let's assume that at 22:30 on Monday mains voltage disappeared and then recovered back only on Wednesday at 6:00 in the morning. So when voltage disappeared contacts **3-4** opened.*

*As soon as the power load restore and return back to normal values **RN-16TM** will turn ON the power load again but according to the preprogrammed schedule of operation. So at 6:00 when the power return – it will turn **ON** the power load and at 8:00 in the morning that will turn it **OFF** according the schedule.*

4 FIRST STARTUP PROCEDURES AND OPERATION ALGORHYTM

For preservation of working capacity of an inner clock when disappearance of voltage, it is necessary to establish a strap 5-6 (Figure 1).

Preliminary start up procedures include the following steps:

- setting of the current time and the day of a week;
- setting the schedule of events (exact time values and days of a week when the power load should be turned **ON** and turned **OFF** as per users requirements);
- setting the voltage tripping thresholds for MIN/MAX allowed voltage values
- setting the delay times to turn **ON** for UPPER/LOWER voltage thresholds
- setting the autoreclosing time delay
- setting the level of illumination (if necessary)

If in the menu some parameter or event is seen blank ("_") then the event or parameter in not set.

When setting the time event schedule it's possible to adjust the following parameters:

E01.x - turn **ON** time; **d01.x** - turn **OFF** time; **CLOC** - current time

where: "01" – is number of event (**ON/OFF**);

x – days of a week, it's possible to set 1-7 values (Monday – 1; Tuesday – 2; Wednesday – 3; Thursday – 4; Friday – 5; Saturday – 6; Sunday – 7);

A – equal time-schedule for all days of a week;

B – equal time-schedule for working days (Monday-Friday);

C – equal time-schedule events for weekend days (Saturday-Sunday);

To give the power supply to the RN-16TM it's necessary to connect mains voltage wires to 1-1 and 2-2 input contact terminals.

ATTENTION! All connections of terminals should be performed strictly according to safety regulations and in the absence of voltage in the mains. So before wiring make sure that the wire terminals are not under voltage.

To every operation mode there is a curtain set of the items in menu shown on display (please see Figure 1; point 6). To view all those items it's necessary to press ⊙→ button and then scroll the parameters by pressing ► button.

MODE	MENU INDICATION
H	SP 1 SCAN H-PA
U	SP 1 U-PA
F	F-PA
HU	SP 1 SCAN H-PA U-PA
FU	SP 1 F-PA U-PA

Kindly remember that maximal number of events in **H** mode is 60 (30 Turn **ON** events and 30 turn **OFF** events). Number of **ON/OFF** events is not necessarily the same.

Notes: To set the time it's necessary to input all digits including "0". For example 7:35 morning time should be set as 07:35.

After setting the schedule of events for RN-16TM it's necessary to connect the power load to the output contacts of **RN-16TM.**

ATTENTION! In order to prevent possible electric shock all the connections of the power load should be performed according safety regulations and on the de-energized RN-16TM.

To preprogram the **RN-16TM** according to the desired mode of operation and input the required time schedule it's necessary to follow the steps shown in the table below:

(in table example values of parameters are shown and the User may change them as per requirements)

Steps	Action	Button	Indication	Button	Action	Indication
1. TO SET THE REQUIRED MODE OF OPERATION:						
1	Press and enter the menu	⊙→	SP 1			
2	Press	⊙→	P=			
3	Press again and while keeping button pressed choose the required operation mode	⊙→	P.= (blinking dot)	◄►	Choose the operation mode	P.= U P.= H P.= F P.= HU P.= FU
4	Press	←⊙	P= H	←⊙	To exit menu press 2 times	SP 1

2. TO SET MIN/MAX VOLTAGE THRESHOLDS AND TIME DELAY SETTINGS						
Perform steps 1-4 from the previous table section “1” (choose the operation mode).						
Steps	**Action**	**Button**	**Indication**	**Button**	**Action**	**Indication**
1	Press end enter the menu		**SP 1**			
2	By scrolling buttons find **U-PA** mode	◄►	**U – PA**			
3	Press and choose upper voltage threshold		**H_ _ _**			
4	Press and while keeping button pressed set the required upper voltage threshold, then release the button when the setting is done		**H._ _ _** (blinking dot)	◄►	Set upper voltage threshold value in the range 230-320	**H.240** (blinking dot)
5	Press and save the selected value in the device memory (Save and Exit)		**H240**			
6	Select LOWER voltage threshold	◄►	**L_ _ _**			
7	Press and while keeping button pressed set the required lower voltage threshold, then release the button when the setting is done		**L._ _ _** (blinking dot)	◄►	Set lower voltage threshold value in the range 150-210	**L.205** (blinking dot)
8	Press and save the selected value in the device memory (Save and Exit)		**L205**	◄►	Press (calibration of the present voltage)	**221.5** **NOT RECOMMENDED TO MAKE ANY CHANGES ON THIS STEP!**
This function allows to perform precise calibration to the curtain power supply circuit. If there is strong requirement it’s possible to change calibration voltage when having voltmeter connected in parallel and setting the value shown on the voltmeter.						
9	Press and while keeping button pressed set the required value, then release the button when the setting is done		***221.5*** (blinking dot)	◄►	Set the voltage shown on voltmeter	

10	Press and save the selected value in the device memory (Save and Exit)	←				
Steps	**Action**	**Button**	**Indication**	**Button**	**Action**	**Indication**
ATTENTION! The turn **ON/OFF** delay time values are set in tenths of second, i.e. value 10 to the right from dot mean one second, and etc.						
11	Select dH.10 item	◄►	**dH.10** (blinking dot)	(turn **OFF** time delay in case overvoltage detected)		
12	Press and while keeping button pressed set the required value, then release the button when the setting is done	→	**dH.10** (blinking dot)	◄►	Set the desired value	**dH.15** (blinking dot)
13	Press and save the selected value in the device memory (Save and Exit)	←	**dH.15**			
14	Select dL.90 item	◄►	**dL.90** (blinking dot)	(turn **OFF** time delay in case undervoltage detected)		
15	Press and while keeping button pressed set the required value, then release the button when the setting is done	→	**dL.95** (blinking dot)	◄►	Set the desired value	**dL.95** (blinking dot)
16	Press and save the selected value in the device memory (Save and Exit)	←	**dL.95** (blinking dot)			
17	Select dE.50 item	◄►	**dE.50** (blinking dot)	(turn **ON** time delay)		
18	Press and while keeping button pressed set the required value, then release the button when the setting is done	→	**dE.50** (blinking dot)	◄►	Установить значение	**dE.55** (blinking dot)
19	Press and save the selected value in the device memory (Save and Exit)	←	**dE.55** (blinking dot)	←	Press and exit the menu	
3. CURRENT TIME SETTING						

Steps	Action	Button	Indication	Button	Action	Indication
Perform steps 1-4 from the previous table section “1” (choose the operation mode).						
1	Press and enter the menu	→	SP 1			
2	By scrolling the menu items find **H-PA**	◄►	H – PA			
3	Press and enter the menu	→	CLOC			
4	Press and enter the menu	→	dAY._	◄►	Set the value in the range 1-7 that corresponds to the actual day of a week	dAY.1
5	Press and enter the menu to set the current hour	→	_ _. _ _ (blinking tens of hours position)	◄►	Set the value from 0 to 2 to that corresponds to current hour	1 _. _ _
6	Press and set the current hours	→	1 _. _ _ (blinking hours position)	◄►	Set the value from 0 to 9 to that corresponds to current hour	1 5. _ _
7	Press and set current minutes	→	1 5. _ _ (blinking tens of minutes position)	◄►	Set the value from 0 to 5 that corresponds to current tens of minutes	1 5. 2 _
8	Press and set current minutes	→	1 5. 2 _ (blinking minutes position)	◄►	Set the value from 0 to 9 that corresponds to current of minutes	1 5. 2 5
9	Press and Exit the menu if the time was set successfully	←	CLOC			
4. SETTING THE TIME SCHEDULE						
1	Perform steps 1-3 of the previous section 3.		CLOC			
2	Select E01. item	◄►	E01._			

3	Press and set the day of a week	→	**dAY._**	◄►	Set the day of a week (1-7, A, b, c, _)	**dAY.3**
4	Press and set time to turn **ON** the power load	→	**_ _. _ _**		Repeat Steps 5-8 of section 3	**1 0. 2 5**

Steps	Action	Button	Indication	Button	Action	Indication
5	Press and exit the menu	←	**E01.3**	◄►	Set the next turn **ON** time if necessary	**E02._**
*To set the time program for all next turn **ON** events it's necessary to perform 2-5 points of section "4".*						
6	Select d01. item	◄►	**d01._**			
7	Perform steps 3-5 of the section "4"		←	←	Exit the menu	

5. SETTING THE ILLUMINATION LEVEL THRESHOLD

Perform steps 1-4 from the previous table section "1" (choose the operation mode).

1	Press and enter the menu	→				
2	By scrolling find **F-PA** mode	◄►	**F-PA**			
3	Press and while keeping button pressed set the required value, then release the button when the setting is done	→	**L. _ _ _** (blinking dot)	◄►	Set the value in the range 0-175	(blinking dot)
4	Press (calibration of the illumination level)	◄►	**F 127** **NOT RECOMMENDED TO MAKE ANY CHANGES ON THIS STEP!**			**L. 55**

This function allows to perform precise calibration of the illumunation level. It it is really necessary to calibrate the illumination level turn the Luxmeter ON and expose to equally lightened surface or wall. Make sure that there are no undesired shadows on it. Then set the the values shown on Luxmeter into the RN-16TM according to the point 3 of section "5".

6. VIEW OF THE PREPROGRAMMED TIME SCHEDULE

Perform steps 1-4 from the previous table section "1" (choose the operation mode).

1	Press and enter the menu	→	**SP 1**			
2	By scrolling find **SCAN** mode	◄►	**SCAn**			
3	Press and enter the menu	→	**CLOC**	Automatic view of the parameters followed by exit to the initial indication		
Steps	**Action**	**Button**	**Indication**	**Button**	**Action**	**Indication**
7. CHANGING THE SET OF PARAMETERS						
1	Press and enter the menu	→	**SP 1**			
2	Press	→	**P= _ _**			
3	By scrolling find **SE 1** item in the menu	◄►	**SE 1**			
4	Press and while keeping button pressed set the required value, then release the button when the setting is done	→	**SE.1** (blinking dot)	◄►	Press 5 times to change the value	**SE.2** (blinking dot)
5	Press and Exit the menu	←				
8. TO DELETE CURRENT SET OF ADJUSTMENTS						
1	Perform steps 1-2 of the section "7"		**CL 1**			
2	Press and while keeping button pressed delete the settings, then release the button	→	**CL.1** (blinking dot)	►	Press 5 times to delete all settings	**CL.1c**
3	Press and Exit the menu	←				

ATTENTION! *While making changes in time schedule the numeration of the settings doesn't change so when viewing them on the display there will be shown all settings made (those that are valid and the deleted (not active events) settings also).*

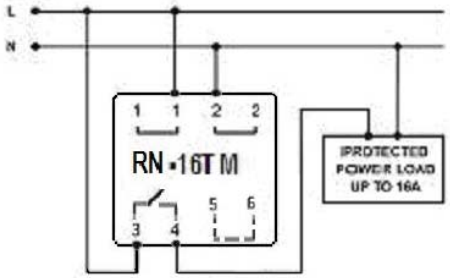
To set the time schedule for the **RN-16TM** it's recommended to prepare first such a table and then to preprogamm the device.

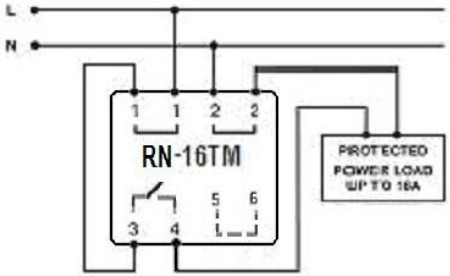
Event №	Turn **ON** №	Turn **ON** comments	Turn **OFF** №	Turn **OFF** comments

5 WIRING DIAGRAMMS

VARIANT A

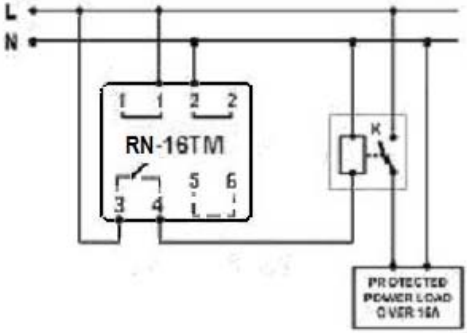
IF THE POWER LOAD IS LESS THEN 16A (3.5 KW) THE RELAY MAY OPERATE WITH THE LOAD DIRECTLY

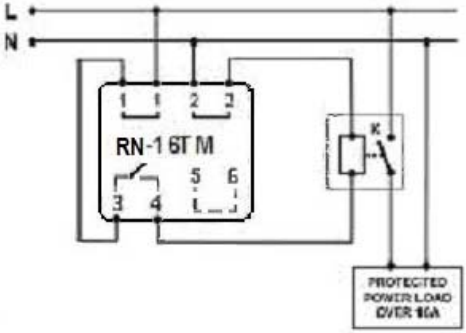




VARIANT B

IF THE POWER LOAD IS MORE THEN 16A (3.5 KW). THE RELAY MUST OPERATE WITH THE POWER LOAD USING THE ADDITIONAL MAGNETIC CONTACTOR THAT WILL COMMUTATE ANY REQUIRED POWER LOAD





NOTES: TERMINALS 3 AND 4 MAY BE USED IN THE SIGNALIZATION CIRCUITS

6 STORAGE AND SHIPPING CONDITIONS

The RN-16TM in manufacturer package should be stored in enclosed rooms at from –45 to +75 ºC and exposed to no more than 80% of relative humidity when there are no fumes in the air that exert a deleterious effect on package and the RN-16TM material.

The Buyer must provide the protection of the timer against mechanical damages in transit.

7 WARRANTY AND CLAIMS CONDITIONS

Novatek-Electro Ltd. company warrants a trouble-free operation of the RN-16TM device within three years from the date of sale, on condition that following terms are provided:

-- the proper connection;

-- the safety of the inspection quality control department seal;

-- the integrity of the case, no traces of opening, cracks, spalls etc.