

## SETTING THE SIGNAL STRENGTH LEVEL IN THE TRANSMITTER AND RECEIVER

Set the strength of transmission at a desired value using the P-411 remote control. Settings are made with the use of correct commands, separate for the remote and for the receiver. In the case of a receiver who is supplied with direct current from the grid, signal strength can be set at the maximum value, i.e. 20 dBm (default setting). In the case of a remote control, the transmission strength value is of key importance for battery life. This is particularly important for P-411/M remote controls powered by 1/2 AA batteries. By default, the signal strength value in P-411/M and P-411/D remote controls is set at 14 dBm and if the application does not require it (sufficient range), this value should not be increased.

### NOTE!

Setting the highest signal strength value will increase power consumption at the level of 120 mA during transmission. This may lead to a rapid discharge of batteries in the remote control.

COMMAND	FUNCTION PERFORMED
<b>TEST + [BAA]</b> (long signal), TEST button released	Sets the strength in the receiver at - 11 dBm
<b>TEST + [BAB]</b> (long signal), TEST button released	Sets the strength in the receiver at - 14 dBm
<b>TEST + [BAC]</b> (long signal), TEST button released	Sets the strength in the receiver at - 17 dBm
<b>TEST + [BAD]</b> (long signal), TEST button released	Sets the strength in the receiver at - 20 dBm
<b>TEST + [CAA]</b> (long signal), TEST button released	Sets the strength in the transmitter at - 11 dBm

<b>TEST + [CAB]</b> (long signal), TEST button released	Sets the strength in the transmitter at - 14 dBm
<b>TEST + [CAC]</b> (long signal), TEST button released	Sets the strength in the transmitter at - 17 dBm
<b>TEST + [CAD]</b> (long signal), TEST button released	Sets the strength in the transmitter at - 20 dBm

### DISABLING ACOUSTIC SIGNALING IN THE REMOTE CONTROL

P-411/M and P-411/D remote controls have a 'buzzer' for acoustic signaling. By default, acoustic signaling is enabled, which results in the emission of a short sound when a button is released. Acoustic signaling can be disabled at any time by sending a command from the remote:

**TEST + [CAE]** (long signal), TEST button released

### ENABLING ACOUSTIC SIGNALING IN THE REMOTE CONTROL

If acoustic signaling is disabled, it can be enabled at any time by sending a command from the remote:

**TEST + [CAF]** (long signal), TEST button released

### VERIFICATION OF OUTPUT STATUSES ON THE REMOTE CONTROL

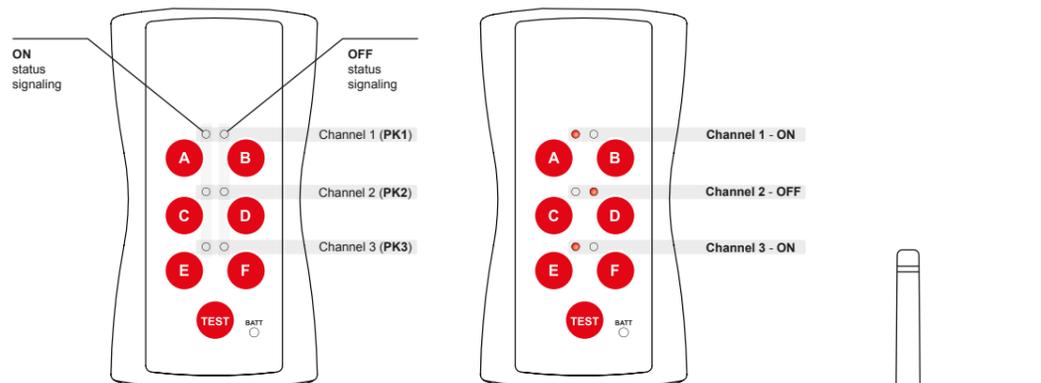
The status of outputs of the RWS-411 receiver can be checked at any time using a remote control assigned to the receiver. This is performed by a short press on the button **TEST**.

Depending on the status of a given channel, the right LEDs on the remote will flash. Figure 1.

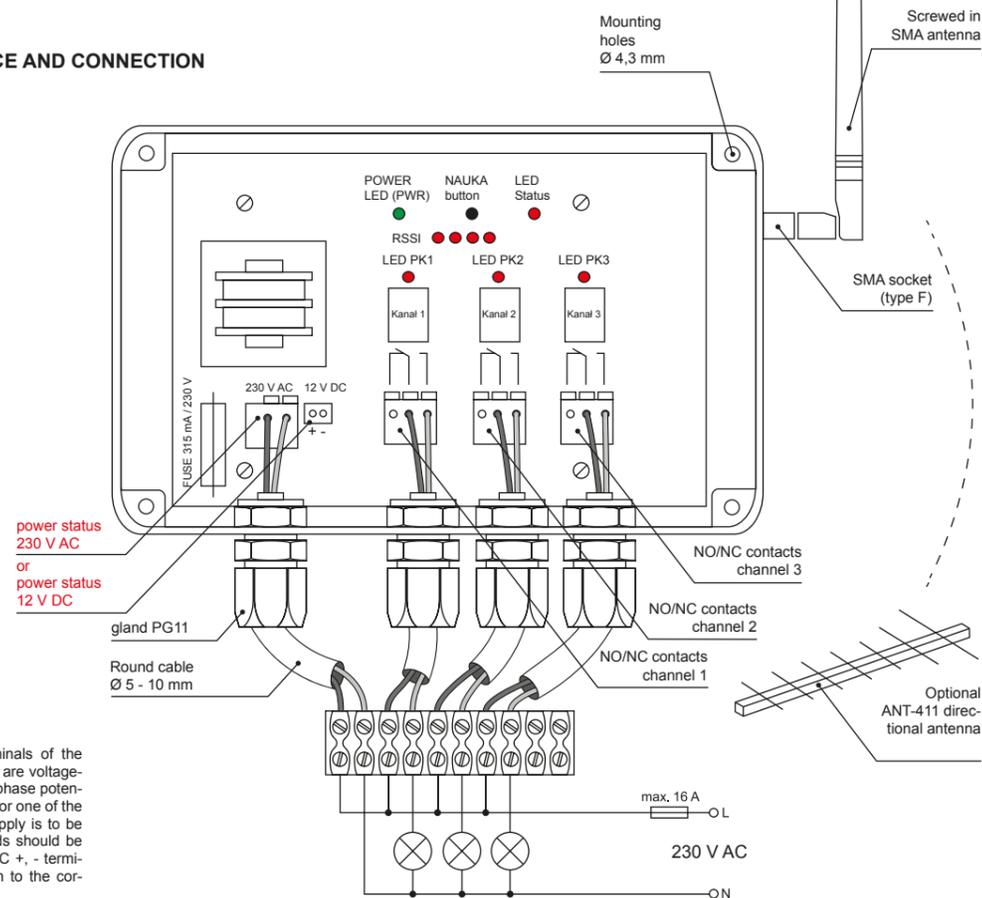
### LOW BATTERY SIGNAL

Low battery is signaled by a flash of the BATT LED when A-F buttons are pressed.

Figure 1.



## 7. APPEARANCE AND CONNECTION



### UWAGA!

The connection terminals of the PK1, PK2, PK3 relay are voltage-free terminals – the phase potential should be stated for one of the poles. If 12 V DC supply is to be used, the power cords should be connected to 12 V DC +, - terminals, paying attention to the correct polarization.

# RWS-411 THREE-CHANNEL RADIO POWER SWITCH USER MANUAL

zamel

## 1. TECHNICAL DATA:

Rated supply voltage:	230 V AC / 12 V DC
Rated power consumption:	230 V AC: 1,6 W - standby, 5 W - all 12 V DC channels switched on; 0,35 W - standby, 1,7 W - all channels switched on radio 868,9 MHz
Transmission:	based on the LORA technology
Transmission method:	variable code - key 128 bit
Encoding:	as per the Range table (pt. 2)
Operating range:	3
Number of outputs:	16 A / 250 V AC 4000 VA AC1
Load capacity per channel:	NO / NC voltage-free
Contact layout:	yes - 3 red LEDs
Output status indication:	yes - red LED
Transmission signaling:	yes - 4 red LEDs
Signal strength signaling (RSSI):	yes - green LED
Power status signaling:	P-411/D and P-411/M
Remote control:	20
Maximum number of remote controls:	ON / OFF, bistable, timer
Operating modes supported:	0 s - 260 h
Time setting range:	Dipol SMA (in a set with a receiver), an ANT-411 directional antenna can be also connected
Antenna:	13
Number of connection terminals:	2,5 mm <sup>2</sup>
Maximum conductor section:	PG11 (wires with external diameter between 5 and 10 mm)
Cable glands used:	surface-mounted
Installation method:	IP65
Housing protection rating:	Operating temperature range: -20°C do +55°C
Operating temperature range:	II
Protection class:	180 x 155 x 60 mm
Dimensions:	700 g
Weight:	P-411/M: 3,6 V 1/2 AA, P-411/D: 2 x 1,5 V AAA
Remote control battery type:	

## 2. TABLE OF COVERAGE:

RC model	RWS-411 + DIPOL antenna	RWS-411 + ANT-411 directional antenna
P - 411/M	do 1,3 km	do 50 km
P - 411/D	do 2,6 km	do 50 km

\*The specified range applies to ideal conditions (no obstacles) with direct dispersion of radio waves between mutually visible antennas.

## 3. DESCRIPTION:

Receiver RWS-411 enables remote control of various receivers in home and industrial installations. It is a perfect solution for switching devices which are inaccessible or situated far away from the transmitter on and off. This function is supported by a radio module operating in the LORA technology. The module provides a very large range of coverage - typically of 1.3/2.6 km (depending on the remote control applied). Communication between the remote control and the receiver is bidirectional, thanks to which the user can check the status of individual channels using the remote control, remotely add or delete a new transmitter, change the operating parameters, etc. RWS-411 has 3 independent channels in the form of voltage-free NO/NC contacts with maximum current capacity of 16 A / channel. The device can be powered at 230 V AC or 12 V DC. With the hermetic enclosure offering the IP65 protection level, the receiver can be safely installed outdoors, in difficult and changing weather conditions. If the ANT-411 directional antenna is used, the effective range can be increased to 50 km in ideal transmission conditions.

## 4. INSTALLATION OF THE RECEIVER

- Check that the power supply corresponds to the rated voltage of the device, i.e. 230 V AC or 12 V DC.
- Switch off the voltage in the system by disconnecting the power supply circuit with an appropriate fuse or disconnector switch.
- Make sure to confirm that the system is de-energized using an adequate instrument.
- Unscrew the upper cover.
- Screw in the cover in a selected place using four mounting screws. Dedicated factory installation holes, created in the housing, are used to guide in the screws. The holes are fitted with sealing gaskets. Use screws with the maximum diameter of 4.3 mm, whereas the diameter of the head must not exceed 7.5 mm (screws are provided with the receiver).
- Guide the wires through glands into the housing interior (PG11 glands were used in RWS-411, which are used to install cables with an external diameter of 5 to 10 mm).
- Remove the connector used for connecting wires from appropriate sockets. This will facilitate access to screw terminals. Connect the cables according to the electrical diagram in pt. 7. If 230 V AC supply is used, connect the power cords to the 230 V AC terminals. If 12 V DC supply is used, connect the power cords to 12 V DC +, - terminals, paying attention to the correct polarization.

### NOTE!

The 12 V DC connector is not detachable. The connectors used allow for installation of wires with a maximum cross-section of 2.5 mm<sup>2</sup> (excluding the 12 V DC connector).

- Screw in the antenna.
- Install the cover. Switch on the device - the „LED PWR Power supply“ diode should be green. The remaining diodes should be off.

Perform the procedure for registering the remote control into the RWS-411 receiver using the „NAUKA“ button (see pt. 6)

- If a remote is already registered in the receiver using the „NAUKA“ button, the remaining remotes can be programmed remotely, from the level of individual remote controls.
- After programming, check the operation of the receiver. If everything is working correctly, screw the cover with the housing.
- If a remote is already registered in the RWS-411, all operations related to its configuration and to adding / removing remotes can be performed remotely from the level of the remote control (without access to the receiver).

### NOTE!

The device should be installed by a properly licensed and qualified person. During installation, the following recommendations should be observed:

- the cable section should be selected according to the power of devices connected to the outputs of the RWS-411 device.
- the receiver must be mounted as high as possible. Cable glands should be facing downwards.
- in order to achieve the maximum range, it is necessary to use the ANT-411 directional antenna and ensure direct visibility between the antenna and the remote.
- the power supply circuit should be protected by an appropriate circuit breaker.
- the housing must be tightly screwed to protect the electronics against water penetration and steam condensation.
- all operations related to configuration (adding / deleting remote controls, time programming, etc.) may be performed remotely from the level of P remotes - 411/M or P-411/D, without direct access to the receiver (this requires registering one remote control using the „NAUKA“ button).
- the 'RSSI' LEDs in the receiver indicate the signal power visually (the range between the remote control and the receiver). The LEDs are lit only after entering the remote control to the receiver and controlling any of the channels - all 4 LEDs will be on at 100% reach. As the distance between the receiver and the remote control is increased, the LEDs successively go off, starting from the edge.



## 5. REGISTERING THE REMOTE CONTROL USING THE 'NAUKA' BUTTON:

- Turn the RWS-411 receiver on.
- Press the 'NAUKA' button briefly (0.5 s).
- The STATUS LED will light up red.
- Briefly press any button on the P-411 remote control.
- The 'STATUS' LED will blink and go out.

If the remote control is assigned to the RWS-411 receiver using the 'NAUKA' button, it will operate in the following manner:

A - PK1 is switched on (PK1_ON)	B - PK1 is switched off (PK1_OFF)
C - PK2 is switched on (PK2_ON)	D - PK2 is switched off (PK2_OFF)
E - PK3 is switched on (PK3_ON)	F - PK3 is switched off (PK3_OFF)

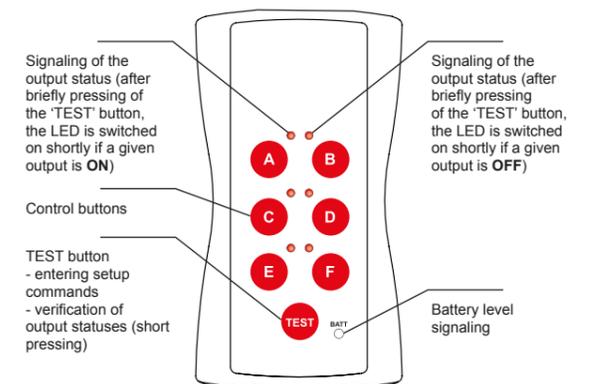
After registering the remote control, check each device connected to a given output for correct operation. The status of each output is signaled by the illumination of corresponding LEDs PK1', 'LED PK2', 'LED PK3'.

## 6. SETUP COMMANDS:

After correctly assigning a remote control to a receiver using the 'NAUKA' button, this remote control can be used for remote configuration without accessing the RWS-411 (new remotes can be remotely added and deleted, timers can be programmed). Setup is performed using the commands given in TABLE 1. A command is a predetermined formula based on A to E+ keys. In certain cases, a command may include additional values, such as time, button or channel numbers.

SETUP COMMANDS ARE ENTERED WITH THE **TEST** BUTTON PRESSED. THE BUTTON MUST BE RELEASED TO CONFIRM THE COMMAND.

Individual buttons of P - 411 remote controls are described by letters A, B, C, D, E, F. These letters correspond to digits (A-1, B-2, C-3, D-4, E-5, F-6)



View of the P-411/D remote control

If acoustic signaling (buzzer) is enabled in the remote control, each pressing of the button is confirmed by a short sound signal. When a setup command is correctly entered, the device emits a long acoustic signal.

**TABLE 1 SHORT LIST OF COMMANDS AVAILABLE AT P-411/D AND P-411/M REMOTE CONTROL LEVEL**

Setup commands are entered with the 'TEST' button pressed. After entering a command, release the 'TEST' button.

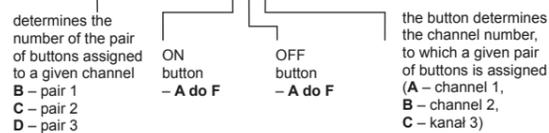
COMMAND	FUNCTION PERFORMED	NOTES
<b>TEST + [BCB + XYZ]</b>	Remotely assigns the first pair of buttons to a given channel	<b>XYZ</b> – a combination of buttons A-F <b>X</b> – ON button A-F <b>Y</b> – OFF button A-F <b>Z</b> – determines the channel number, to which a given pair of buttons is assigned A-channel 1, B-channel 2, C-channel 3
<b>TEST + [BCC + XYZ]</b>	Remotely assigns the second pair of buttons to a given channel	
<b>TEST + [BCD + XYZ]</b>	Remotely assigns the third party pair of buttons to a given channel	
<b>TEST + [BCB]</b>	Deleting a remote from channel 1 (PK1)	
<b>TEST + [BCC]</b>	Deleting a remote from channel 2 (PK2)	
<b>TEST + [BCD]</b>	Deleting a remote from channel 3 (PK3)	
<b>TEST + [BEC]</b>	Deleting the remote control from the receiver	
<b>TEST + [FFF]</b>	The receiver's memory is erased	
<b>TEST + [AAA + czas]</b>	Programming the time for channel 1 (PK1)	<b>time</b> – timer value from 1 s to 18 h. Time is entered as a specific combination of A-F buttons (see 'Programming timers')
<b>TEST + [AAB + czas]</b>	Programming the time for channel 2 (PK2)	
<b>TEST + [AAC + czas]</b>	Programming the time for channel 3 (PK3)	
<b>TEST + [AAA]</b>	Deleting the time for channel 1 (PK1)	
<b>TEST + [AAB]</b>	Deleting the time for channel 2 (PK2)	
<b>TEST + [AAC]</b>	Deleting the time for channel 3 (PK3)	
<b>TEST + [BDA + A]</b>	Enabling status memory for channel 1	
<b>TEST + [BDA + AB]</b>	Enabling status memory for channels 1 and 2	
<b>TEST + [BDA + ABC]</b>	Enabling status memory for channels 1, 2 and 3	
<b>TEST + [BDA]</b>	Disabling status memory for all channels	
<b>TEST + [BCE]</b>	Signal strength verification (RSSI) from the remote control level	
<b>TEST + [BAA]</b>	Sets the strength in the receiver at 11 dBm	
<b>TEST + [BAB]</b>	Sets the strength in the receiver at 14 dBm	
<b>TEST + [BAC]</b>	Sets the strength in the receiver at 17 dBm	
<b>TEST + [BAD]</b>	Sets the strength in the receiver at 20 dBm	
<b>TEST + [CAA]</b>	Sets the strength in the transmitter at 11 dBm	
<b>TEST + [CAB]</b>	Sets the strength in the transmitter at 14 dBm	
<b>TEST + [CAC]</b>	Sets the strength in the transmitter at 17 dBm	
<b>TEST + [CAD]</b>	Sets the strength in the transmitter at 20 dBm	

<b>TEST + [BCA]</b>	Remotely assigns a new remote control using a remote control which has already been assigned to the receiver	After entering the command using a remote assigned to the receiver, press any button on the new remote control
<b>TEST + [CAE]</b>	Acoustic signaling is disabled (for remote buttons)	
<b>TEST + [CAF]</b>	Acoustic signaling is enabled (for remote buttons)	
<b>TEST</b>	Verification of the output statuses	Short pressing of the 'TEST' button

After pressing the 'TEST' button, each command is confirmed by a flash of the 'STATUS' LED in the receiver.

**REMOTE ASSIGNMENT OF BUTTONS TO A GIVEN RECEIVER CHANNEL**  
To remotely assign individual pairs of buttons to selected channels of the receiver, use the following command:

**TEST + [BCX (long signal) + XYZ]** TEST button released



If the bistable mode is programmed, the ON button is the same as the OFF button (treated as a single pair of buttons). Examples of commands:

COMMAND	ACTION
<b>TEST + [BCB (long signal) + ABA]</b> , TEST button released	First pair of buttons (A and B) assigned to channel 1; Button A - ON, Button B - OFF
<b>TEST + [BCB (long signal) + BAA]</b> , TEST button released	First pair of buttons (A and B) assigned to channel 1; Button B - ON, Button A - OFF
<b>TEST + [BCC (long signal) + CDA]</b> , TEST button released	Second pair of buttons (C and D) assigned to channel 1; Button C - ON, Button D - OFF
<b>TEST + [BCD (long signal) + EFA]</b> , TEST button released	Third pair of buttons (E and F) assigned to channel 1; Button E - ON, Button F - OFF
<b>TEST + [BCB (long signal) + AAB]</b> , TEST button released	First pair of buttons (A and A - bistable mode) assigned to channel 2 Button A - relay ON / OFF
<b>TEST + [BCC (long signal) + BBB]</b> , TEST button released	Second pair of buttons (A and A - bistable mode) assigned to channel 2 Button B - relay ON / OFF

**NOTE!**  
Buttons assigned to a given channel within one remote control are overwritten. For example, if the „A“, „B“ buttons are responsible for switching channel 1 on and off, and then the „C“ and „D“ buttons of the same remote control were added to this channel, then the „A“ and „B“ buttons are automatically deleted, and the ON/OFF function is performed by „C“ and „D“ buttons. If, for example, buttons A and B are to be assigned to channels 1, 2 and 3, such assignment can be made through the following sequence of commands:

- TEST + [BCB (long signal) + ABA]**, TEST button released – A, B to channel 1
- TEST + [BCC (long signal) + ABB]**, TEST button released – A, B to channel 2
- TEST + [BCD (long signal) + ABC]**, TEST button released – A, B to channel 3

This can also be done by sending one command:

- TEST + [BCB (long signal) + ABABC]**, TEST button released – A,B to channels 1, 2 and 3

**A maximum of 20 remote controls can be assigned to one receiver.**

**REMOTELY DELETING A REMOTE CONTROL FROM A GIVEN RECEIVER CHANNEL**

The following commands can be used to remotely delete a remote control from a channel:

- TEST + [BCB (long signal)]**, TEST button released – deleting a remote from channel 1 (PK1)
- TEST + [BCC (long signal)]**, TEST button released – deleting a remote from channel 2 (PK2)
- TEST + [BCD (long signal)]**, TEST button released – deleting a remote from channel 3 (PK3)

**The commands are entered using the remote control, which is to be deleted from a given channel.**

**REMOTELY DELETING A REMOTE CONTROL FROM A RECEIVER**

In order to delete a complete remote control (globally from all RWS receiver channels - 411), the following command should be sent from the level of that remote control:

**TEST + [BEC (long signal)]**, TEST button released

**FORMATTING THE RECEIVER**

In order to format a receiver, send the following command from the level of any remote control:

**TEST + [FFF (long signal)]**, TEST button released

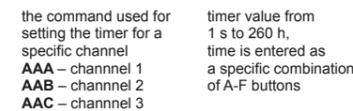
**After this command is sent, all remote controls registered in the receiver's memory will be deleted.** When the receiver is formatted, the 'STATUS' LED will blink red.

**NOTE!**  
After this operation is completed, the 'NAUKA' button must be pressed to assign the first remote control.

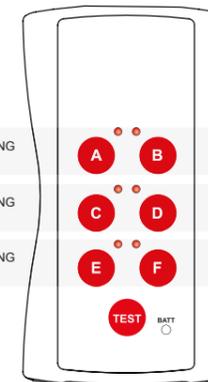
**PROGRAMMING TIMERS FOR RECEIVER CHANNELS**

The timers for each channel on the RWS-411 receiver are programmed with the use of the following command:

**TEST + [AAA (long signal) + time]**, TEST button released



**Setting the timer using A-F buttons on the P-411 remote control.**



SETTING THE HOUR (1-255)	DECREMENTING VALUES (-)	A B	INCREMENTING VALUES (+)
SETTING THE MINUTE (1-59)	DECREMENTING VALUES (-)	C D	INCREMENTING VALUES (+)
SETTING THE SECOND (1-59)	DECREMENTING VALUES (-)	E F	INCREMENTING VALUES (+)

Every time the button is pressed, the timer value will be either increased or decreased for seconds, minutes and hours.

TIMER SET	COMBINATION OF A-F BUTTONS
5 s	pressing the 'F' button five times
2 min_10 s	pressing the 'D' button twice and pressing the 'F' button ten times
2 h_3 min_4 s	pressing the 'B' button twice, pressing the 'D' button three times and pressing the 'F' button four times

**NOTE!**  
The timer set for a channel is directly linked to the remote control, from which it was programmed.

**Example.**  
Two P-411 remote controls are assigned to channel 1. In each instance, buttons 'A' and 'B' perform the ON / OFF functions. Using remote control 1, the timer was programmed for channel 1 - 30 s. After this operation is completed, the remote will automatically switch channel 1 off after 30 s from pressing button 'A'. Remote no. 2 will perform the ON/OFF function without a timer.

Time is measured regardless of whether the buttons are registered in the ON/OFF mode or in the bistable mode. Time measurement is performed with retriggering - each pressing of the ON button when time is measured causes the timer to be reset. When the timer is set, one button increases the value while the second button decreases it (e.g. when setting the seconds, the F button increases the value and the E button reduces it).

**DISABLING THE TIMER FOR RECEIVER CHANNELS**

To disable the timer for a given channel, send the following commands from the remote control which was used to program the timer:

COMMAND	FUNCTION PERFORMED
<b>TEST + [AAA (long signal)]</b> , TEST button released	deleting the time for channel 1 (PK1)
<b>TEST + [AAB (long signal)]</b> , TEST button released	deleting the time for channel 2 (PK2)
<b>TEST + [AAC (long signal)]</b> , TEST button released	deleting the time for channel 3 (PK3)

**ASSIGNING A NEW REMOTE CONTROL USING A REMOTE CONTROL WHICH IS REGISTERED ON THE RECEIVER**

This operation is performed to remotely add a new remote control to a receiver using a remote control which has already been assigned to it. This is particularly useful when the receiver is installed in an inaccessible place, where the user cannot access the 'NAUKA' button.

**To add a new remote control:**

1. Using a remote control which has already been assigned to the receiver, send the following command:

**TEST + [BCA (long signal)]**, TEST button released

2. After receiving this command, the receiver will enter the programming mode and the red 'STATUS' LED in the receiver will go on.

3. Press any button on the new remote control to be assigned to the receiver.

4. The 'STATUS' LED will blink a few times and go out. After this operation is completed, the remote control will be assigned to the receiver and will be ready to work.

**ENABLING STATUS MEMORY FOR OUTPUTS**

After this function is activated, the status of a given output is saved as of the moment of a power failure. After the device is switched on again, the output status is restored. The following command is used to enable status memory for individual outputs:

**TEST + [BDA (long signal) + channel\_code]**, TEST button released

a combination of A, B, C buttons  
A – channel 1, B – channel 2, C – channel 3

Przykłady:

COMMAND	FUNCTION PERFORMED
<b>TEST + [BDA (long signal) +A]</b> , TEST button released	status memory enable only for channel 1 (PK1)
<b>TEST + [BDA (long signal) +AB]</b> , TEST button released	status memory enable for channels 1 and 2 (PK1, PK2)
<b>TEST + [BDA (long signal) +ABC]</b> , TEST button released	status memory enable for channels 1, 2 and 3 (PK1, PK2, PK3)
<b>TEST + [BDA (long signal) +AC]</b> , TEST button released	status memory enable for channels 1 and 3 (PK1, PK3)

**NOTE!**  
Output status memory can be selectively disabled. For instance, if status memory is enabled for all 3 channels, and the user then wants to have it enabled for channels 1 and 3 only, the following command should be sent:

**TEST + [BDA (long signal) +AC]**, TEST button released

**DISABLING STATUS MEMORY FOR ALL OUTPUTS**

To globally disable the status memory for all outputs, use the following command:

**TEST + [BDA (long signal)]**, TEST button released

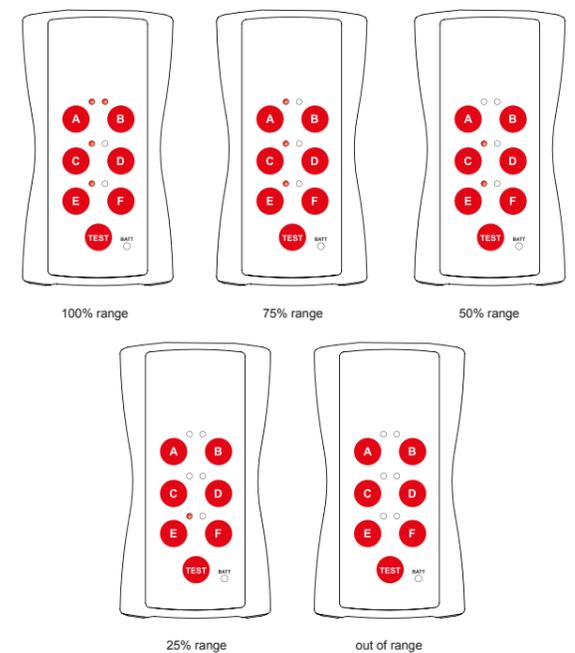
When the status memory is switched off after turning the device off, all channels are OFF.

**CHECKING THE SIGNAL STRENGTH (RANGE) BETWEEN THE TRANSMITTER AND THE RECEIVER USING THE REMOTE CONTROL**

Use the correct command sent from the remote control to check the signal strength between the transmitter and the receiver. This function verifies the quality of radio transmission between the remote control and the receiver. To check the range using the remote control, enter the following command:

**TEST + [BCE (long signal)]**, TEST button released

Range is signaled by lighting the corresponding number of LEDs in the remote control right after the command is sent.



When the remote control is out of range, increase the signal strength in the transmitter / receiver. When the distance to the receiver is large, install the ANT-411 directional antenna and ensure direct visibility between the transmitter and the receiver.