868MHz Wireless actuator for home automation developed using ARDUINO microcontroller, composed by a SEND unit (ARDUINO Wireless) and by one or more ACTUATOR units with the possibility to switch from a minimum of 8 up to a maximum of 80 devices (relays). This wireless control system is designed for the most varied requirements in the field of Home automation, it can be used to activate all kinds of lighting, as other applications, for example heating / cooling, electric gates, automatic doors and industrial controls. It’s possible to have a "point to point" configuration (No.1 ARDUINO Wireless unit - No.1 ACTUATOR unit) or a "point-multipoint" configuration (No. 1 ARDUINO Wireless unit more ACTUATOR units, max 10) up to the possibility of switching 80 users (relays).

The SEND unit is composed of Arduino microcontroller + RadioControlli Shield (Shield Radio + Keyboard + display) and from the software available free on the website www.radiocontrolli.com.

The ACTUATOR units are powered using a normal 5V power supply and can control relays boards (Relay Commercial Board) or solid-state actuators board (designed and produced by RadioControlli).

Point to point configuration:

--- Sending a switch command to the Actuator unit, to switch 1 of the 8 relays or a relays combination.
--- For each switch command received, the Actuator unit sends a feedback.
--- It’s possible to know the state of the individual relays of a specific ACTUATOR unit anytime.
--- You can send commands to switch more ACTUATOR units simultaneously (broadcast function).
--- Each ACTUATOR unit periodically sends to its SEND unit reference, a word containing the status of the outputs (wake up timer); this time by default is set at 30 seconds but it can be changed and even canceled.
--- Each ACTUATOR unit has on-board an temperature sensor, it’s possible, by sending a command, to know the temperature’s value of the ACTUATOR unit.
Point to point configuration:

Features:

--- Possibility to control N. 10 ACTUATOR units (up to 80 users/relays).
--- GFSK 19.2Kbps Modulation - Frequency 869.5MHz - Power Output = +20dBm (100mW)
--- Distance: up to 500 meters in open field with maximum transmission power (distance between SEND unit and ACTUATOR unit)
--- Possibility to transmit a command to all ACTUATOR units (broadcast).
--- Possibility to know the temperature value for every ACTUATOR units.
Wireless actuator for home automation using ARDUINO

You can control everything..... anywhere

SEND

868MHz Antenna
Display
Shield
Keyboard
Arduino
Mechanical support

RECEIVER

RadioControlli Actuator board
Power Supply connector
Relays commercial board

Vertical mounting
Mounting with cable
RadioControlli ACTUATOR Board

The ACTUATOR unit are powered by a normal 5V power supply and can control relay boards (Relay Commercial Board) or solid-state actuators board (designed and produced by RadioControlli).

Each ACTUATOR can manage 8 users / relays.

Each ACTUATOR is supplied from the factory with its own unique and unchangeable ID Address (4byte).

The ACTUATOR unit is equipped with an RS232 serial interface.

You can control everything..... anywhere

RadioControlli S.r.l.
Via Carditello 10
81050 San Tammaro (CE)
sales@radiocontrolli.com

www.radiocontrolli.com
RadioControlli Arduino Shield

The shield below represented is the interface between the wireless ACTUATOR (RECEIVER) and the ARDUINO logic control.

The management of the ACTUATORS is performed by an application resident on ARDUINO, downloadable from the website RadioControlli.

The shield is supplied from the factory with its own unique ID Address and unchangeable (4byte) in this case 1E100001.
RadioControlli Evaluation Kit

- Shield with 868MHz Antenna
- Actuator Unit
- Keyboard
- Display
- 5 Volt Power Supply
- Relays Commercial board

KIT ARD-1 (Essential)

1) N. 1 ARDUINO Shield equipped with 868MHz Antenna, keyboard and display.
2) N. 1 Actuator Unit equipped with 868MHz Antenna
3) N.1 5Volt Power Supply for Actuator Unit
4) N.1 Relays Commercial Board

KIT ARD-2

1) N.1 ARDUINO Shield equipped with 868MHz Antenna, Keyboard and display.
2) N. 2 Actuator Units equipped with 868MHz Antenna
3) N. 2 5Volt Power Supply for Actuator Unit
4) N. 2 Relays Commercial Board
## QUICK GUIDE Evaluation Kit

**STEP 1** Download the software denominated "ArduinoWireless" by the website www.radiocontrolli.com, if you have some compilation problem can you download also the library denominated : keypad.zip.

**STEP 2** Connect the Shield RadioControlli, including keyboard and display to ARDUINO microcontroller.

**STEP 3** Load the software on ARDUINO device making sure that the dip-switch of the shield are positioned to OFF.

**STEP 4** Set to the desired mode of the display brightness using the following potentiometer.

**STEP 5** After you load the software, place the dip-switch in **ON** position (as in the figure above).

**STEP 6** Connect the Actuator unit to the relays board choosing the type of connection desired:
- Horizontal mounting
- Vertical mounting
- Mounting with a cable

Moreover, power ON the Actuator unit using the power supply 5Volt supplied.
STEP 7  After the start-up screen will appear the following screen:

M1 means Menù N.1, the menus of the application are 5 from M1 to M5.

Present 0, it means the system has not saved any Actuator in memory.

STEP 8  Press the key A (scrolling menu) until you get to the menu M5:

STEP 9  Verify that the concentrator code (in this case 1E100001) corresponds to what is indicated on the label of the ARDUINO shield (see page 5). If the code does not match to perform the insertion by pressing the C key.

Enter the new code, for example 4E100008.

Using the keyboard press the numeric keys and accept them (one at a time) with the button "C".

to insert the alphanumeric codes (for example "E") press the "9" button and advance by pressing the "A" button accept the value by pressing the "C" button.

press the C key to accept, the following screen appears:
After the start-up screen will appear the following screen:

M5 means Menù N.5, the menus of the application are 5 from M1 to M5.

**STEP10** Press the key A (scrolling menu) until you get to the menu M2:

The system is searching for Actuators in its area of action.

The device has found the actuator N. 1E20000D.

**STEP11** Power ON the actuator supplied, and press the C key (Enter) to activate the "Search Actuators" function.

**STEP12** Press the "C" key (yes) to save this actuator in memory.
**QUICK GUIDE Evaluation Kit**

**STEP13** Using the keys A and B (scrolling menu) go on the menu M1, this time will be presented the following screen:

Present 1, it means the system has stored N.1 actuator in memory.

**STEP14** Press the "C" key (START), the following screen appears:

ATT1 = Actuator N.1
1E20000D = Actuator code
00 = word sent by ARDUINO device

**STEP15** Pressing keys 1 to 8 will be activated the relays corresponding, for example by pressing buttons 1 and 5:

The relays 1 and 5 actuator N.1 1E20000D are ON STATE ---> 1 while the remaining relays are OFF STATE -> 0.

**STEP16** Also to perform the deactivation of the relays you must press the corresponding keys, for example by pressing buttons 1 and 5, the situation will be:

The relay 1 and 5 of the Actuator N.1 1E20000D are in OFF STATE ---> 0.
QUICK GUIDE Evaluation Kit

**STEP 17**  “key 9” function (All relays of the Actuator in ON STATE)
Pressing the key 9, the new situation will be:

```
<table>
<thead>
<tr>
<th>ATT1</th>
<th>1E20000D</th>
<th>FF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
```

All the relay of the Actuator N.1
1E20000D in ON STATE -----> 1

**STEP 18**  “key 0” function (All relays of the Actuator in OFF STATE)
Pressing the key 0, the new situation will be:

```
<table>
<thead>
<tr>
<th>ATT1</th>
<th>1E20000D</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
```

All the relay of the Actuator N.1
1E20000D in OFF STATE -----> 0.

**STEP 19**  “key #” function (Broadcasting command) all the relays of all the Actuator Unit in ON STATE.
All relays of all the Actuators unit connected to the ARDUINO system will be closed simultaneously (ON STATE -----> 1).

**STEP 20**  “key *” function (Broadcasting command) all the relay of all the Actuator unit in OFF STATE.
All relays of all the Actuator unit connected to the ARDUINO system will be open simultaneously (OFF STATE -----> 0).

QUICK GUIDE Evaluation Kit - Temperature Measure

In this position of the menu if you press the C key is supplied for a certain time (about 5 seconds) the measurement of temperature in °C.
Referring to the Actuator N.1.

```
<table>
<thead>
<tr>
<th>ATT1</th>
<th>1E20000D</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>ATT1</th>
<th>1E20000D</th>
<th>Temp. 16.46</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>16.46</td>
</tr>
</tbody>
</table>
```

16.46°C is the temperature measured on the Actuator N.1.
**Keyboard Functions**

**Keys 1-8**  
Allows the activation and deactivation of the single relays of the single actuator.

**Key N.9**  
Allows the simultaneous activation of all 8 relays of a given Actuator.

**Key N.0**  
Allows the simultaneous deactivation of all 8 relays of a given Actuator.

**Keys A - B**  
Scrolling menu above / below

**Key C**  
ENTER

**Key D**  
ESC

**Key #**  
It allows the simultaneous activation of all 8 relays of all Actuators unit connected to the ARDUINO system.

**Key ***  
It allows the simultaneous deactivation of all 8 relays of all Actuators unit connected to the ARDUINO system. (Broadcast).
APPLICATION MENU’

Menù M1

PRESENT = 1
It means that at this moment the device has stored N.1 Actuator unit.

START
In presence of Actuators already stored you can start the program (START) by pressing the C key on the keyboard.

After pressing START you can access to the operating menu.
It’s possible:
- With the A and B keys move to different Actuators
- With the 1-8 keys to change the status of individual relays
- With the 0 and 9 keys change the status of all the relays
- With the # and * keys send broadcast commands
- With the D key exit from this menu

Menù M2

Found = 1
Actuator found.

Sear Actuators
With this menu option, activatable by pressing the "C" key, you can put the device in search of new actuators.

Store ? Y/n
has been found a new device Actuator, this device is not registered on the network, to register press y (C) or n (D).

WAIT
Actuator unit currently being recorded.
**APPLICATION MENU’**

**Menù M2**

Press the C key (y) to save into memory

The display will show that the device have found No.1 Actuator.

**Menù M3**

N. 2 Actuators unit recognized by the ARDUINO system. Press C key to enter

Actuator N.1 1E20000D
Press the A button (scroll) to verify the presence of other actuators

In fact, there is also the Actuator N.2 1E200011
Press C (enter) to enter edit menu.
APPLICATION MENU’

Menù M3

Press C key to delete this actuator.

To cancel this Actuator press the C key (yes), press D key (no) for not canceling. By pressing the D key returns you to the following menu:

In this condition by pressing the A or B keys, the actuator can be moved from position

Menù M4

With this menu you can clear the data in EEPROM. To proceed, press C key.

Confirmation is requested C (y) D (no).
APPLICATION MENU’

Menù M5

This menu must be used when you want to add other devices Actuators on the evaluation kit RadioControlli.

In this case you must enter the Concentrator/Arduino device code.

Each RadioControlli shield has a serial number, this serial number is transcribed with a label on the transceiver.

In our case (see sheet N.7 of this document) the serial number is 1E100001.

Press C key to enter the code

Insert the code 1E100001
Enter a first digit and press C key (enter) every
RESET procedure

After the configuration and the association between the Actuator units and Arduino (previous chapters) to be able use the same Actuator unit with different Arduino devices it is necessary to do the following procedure:

1) Power ON the Actuator unit.
2) Press and hold down the button RESET will light 1 the LED (orange).
3) Press and release the button RESET1
4) Release (about 3 seconds) the button RESET1
5) They will start a series of green flashes on LED1
6) During these flashes press and release again the button RESET1