

2.4 GHz wireless remote control system

Water proof remote controller

KST2.4W



Operation Guide

Version 1.0 (Oct. 2017)

- This product requires electrical and radio knowledge for setup and operation.
- To ensure proper and safe operation, please read this operation guide thoroughly prior to use.
- Please keep this operation guide for future reference.

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1. Outline

KST2.4 W is a high-reliable wireless remote controller that can be used safely even in outdoor work and harsh environments by enhancing robustness and waterproofness and suitable for various industrial applications such as civil engineering / construction, vehicles, welfare, agriculture.

KST2.4W can be selected from 2 button, 3 button, 4 button type according to usage.

Wireless remote control system can be realized by combining with the remote control receiver KSR2.4 or telecommand module NK - 2.4Y. The communication mode is 1:1 only and neither 1:N nor N:1 is possible.

Frequency hopping scheme enables simultaneous use of multiple systems within one area. Also, you can always check the communication status with the Link LED.

2. Features and applications

Features

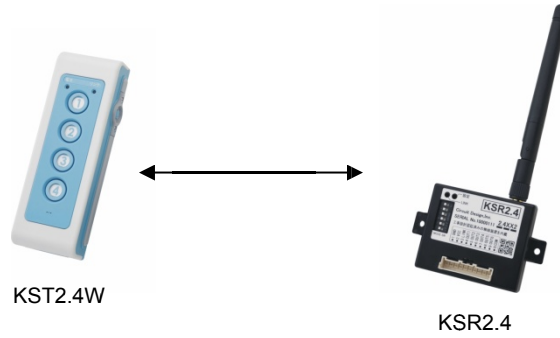
- ARIB STD-T66, FCC Part 15 compliant
- IP55
- 2 to 4 control contacts
- Frequency hopping scheme enabling simultaneous use of multiple systems within one area.
- Communication status monitor via Link LED.
- CRC-16 and Hamming distance of 6 to minimize malfunction
- Long and stable operation on 2 x AAA batteries.
- 1 : 1 communication with KSR2.4 or NK-2.4Y
- Communication range 100 m LOS (depends on the operation circumstances and the equipment to be controlled.)

Applications

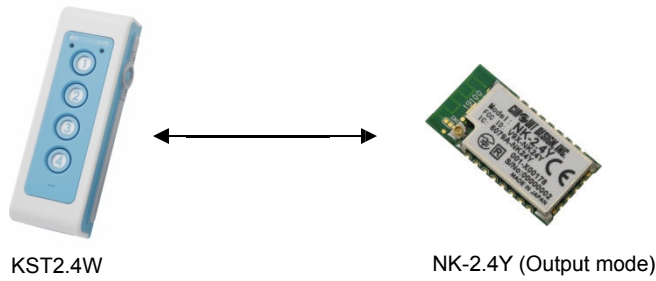
- Control of construction, civil engineering, forestry machinery
- Control of traffic light for road construction
- Operation of agricultural machinery
- Electric shutter, electric blind, garage door
- Rotary lights, alarm devices
- Calling device

3. System example

3.1 Controls the KSR2.4

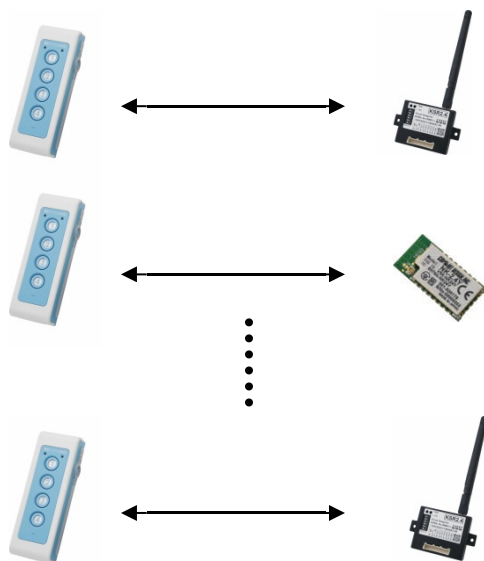


3.2 Controls the NK-2.4Y



- 1 : 1 communication only
- Pairing is needed for communication.

3.3 Operation of multiple systems in one area



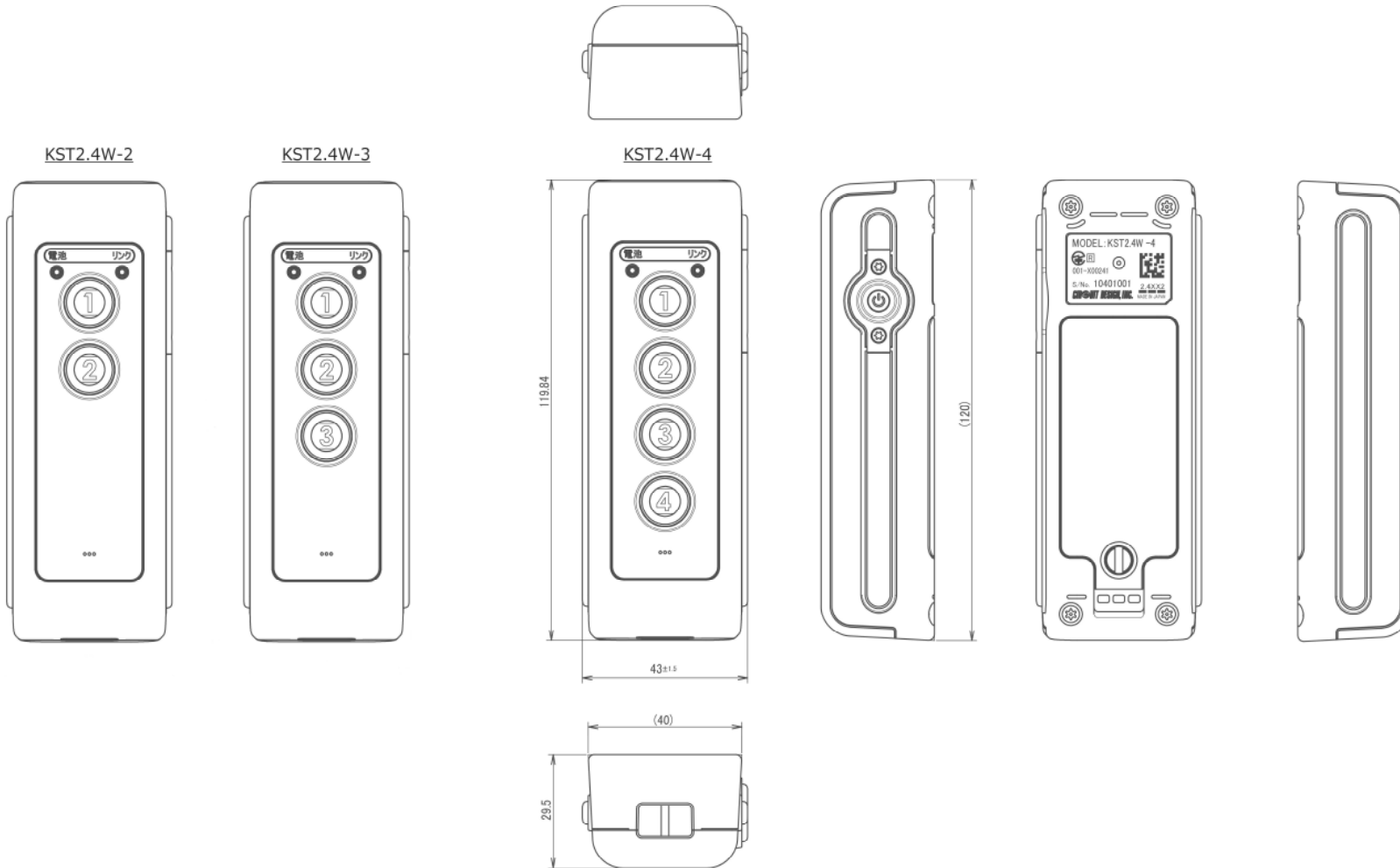
- Up to 10 systems are feasible for simultaneous operation in one area.

4. Main specifications

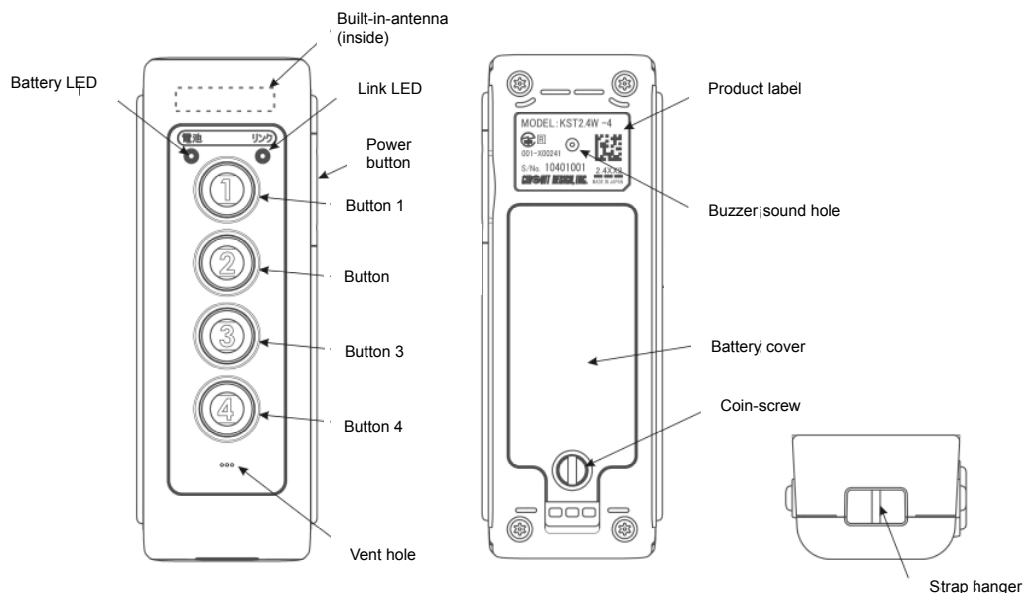
Item	Specification	Remarks
Compatible standards	ARIB STD-T66 FCC Part 15	
Frequency range	2403 to 2479 MHz	
Communication method	Frequency hopping, two- way	
Modulation method	GFSK	
Communication bit rate	250 kbps	
Error check method	Payload CRC16 + Packet CRC16	
Hamming distance	6	
RF output power	< 1 mW (nominal)	
Number of operation buttons	KST2.4W-2: 2 buttons + power button KST2.4W-3: 3 buttons + power button KST2.4W-4: 4 buttons + power button	
Buzzer	Buzzer sound corresponding to each button operation	Mute setting available
Operation response	< 70 ms	Button operation -> Output on the receiver unit
ID code length	40 bits in the payload	
Antenna	Built-in pattern antenna	
Batteries	AAA x 2	
Battery life	Approx. 150 hours continuous use	
Operating temperature range	-20 °C to +60 °C	
IP rating	IP55	
Button durability	50,000 times	Operation button 1 to 4
External dimensions	120 × 43 × 29.5 mm	Excluding protrusions
Weight	130 g	Including batteries

*Communication rang: approx. 100 m LOS (communication with KSR2.4+ANT-2400-SF)

5. External dimensions



6. Part names and functions



Built-in antenna	A built-in antenna is included. Do not cover this part with your hand.
Power button	Press and hold to turn the power on/off.
Button 1 to 4	KST2.4W-2, KST2.4W-3, KST2.4W-4 have two, three, four buttons, respectively.
Link LED	Lights green when communication is established. Flashes when communication is not established. It turns off when the power is OFF.
Battery LED	Flashes in red when the battery voltage is low. Please replace the batteries.
Buzzer sound hole	When the operation button is pressed and the communication is established, the operation sound corresponding to each button is emitted. Button 1 ...peep (one time) Button 2 ...peep-peep (two times) Button 3 ...toot (one time) Button 4 ... toot-toot (two times) When the battery voltage decreases, the battery LED turns red and the operation sound goes low. If the operation sound changes, replace the battery immediately. If mute is set, no operation sound will be emitted.
Product label	Do not remove. The label includes FCC ID and Technical Conformity Mark (Japan).
Battery cover	Open the cover for battery replacement.
Strap hanger	Hanger for strap and key ring.
Vent hole	Do not cover the hole.

7. Power button

By pressing and holding the power button, the power is turned on with a buzzer sound and communication with the receiver unit starts. When communication is not established, the Link LED blinks in green, and the Link LED lights when communication is established.

While the power is on, communication is performed regardless of the state of 1 to 4 buttons, so you can determine whether communication is possible before operation.

By pressing and holding the power button while the power is on, the power is turned off with a buzzer sound. Also, if the auto power off function continues for 10 minutes (when the initial setting) the button 1 to 4 are not operated, the power turns off automatically. * When the mute setting is ON, it does not sound that the buzzer does not occur ※ Please contact us for changes in auto power off time.

If the state in which no button (1 to 4) are operated continues for 10 minutes (initial setting), the auto-power-off function automatically turns off the power.

*When the mute setting is ON, the buzzer does no function.

* For details on changing the auto power off time, please consult Circuit Design, Inc..

8. Buzzer sound for buzzer operation

Since the KST-2.4W will emit a buzzer sound as an operation sound only when the buttons 1 to 4 are operated with communication established, you can check whether the operation was reliably transmitted to the receiver unit.

*When the mute setting is ON, the buzzer does no function.

9. Mute setting

With the KST-2.4W, the buzzer sound can be muted by setting the mute function ON.

The mute ON/OFF setting procedures are as follows:

Procedures		Buzzer sound / LED
Step 1	Hold down the power button while pressing the buttons 1 and 2. The buzzer sounds after 3 seconds.	Buzzer: Long peep (repeated) Link LED: Blink
Step 2	Release the button 1. The buzzer sound changes after 3 seconds. *The power turns off after 10 seconds elapse without operation.	Buzzer: Short peep.(repeated). Link LED: Blink
Step 3	Release the button 2. The buzzer peeps twice. *The power turns off after 10 seconds elapse without operation.	Buzzer: Peep-peep (twice) Link LED: Blink
Step 4	Release the power button. The buzzer pips twice. *The power turns off after 10 seconds elapse without operation.	Buzzer: Pip-pip (twice) Battery LED: On Link LE: Off
Step 5	Press the button 1. The buzzer peeps once. *To stop mute setting, press and hold the power button.	Buzzer: Short peep (once) Battery LED: Off Link LED: On

Step 6	To set the mute function to OFF, press the button 1. The buzzer peeps once. To set the mute function to ON, press the button 2. The buzzer peeps twice. *To stop mute setting, press and hold the power button.	Mute OFF Buzzer sound: Peep (once) Mute ON Buzzer sound: Peep-peep (twice)
End	When setting is done, the power turns off automatically.	•LEDs off

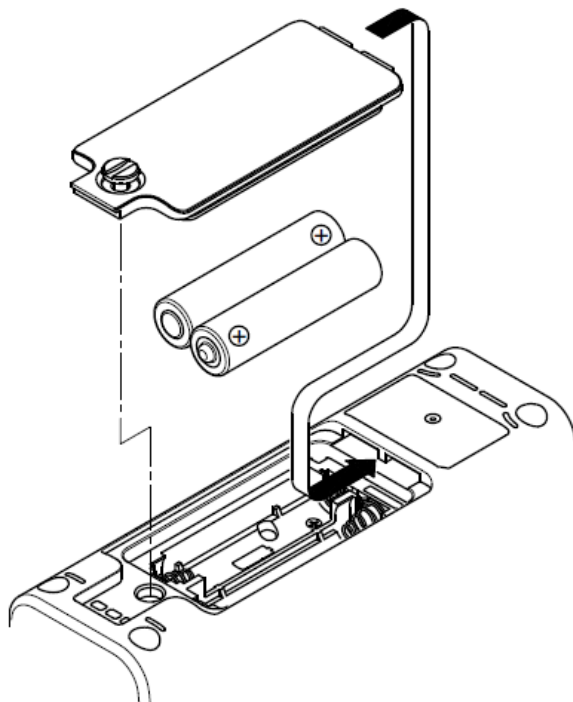
10. Link LED

The Link LED is on when the KST2.4W is communicating with the receiver unit. If the communication link is disconnected while the button is ON, the Link LED blinks and then if the communication restarts while the button is still ON, the link LED goes into a high-speed blinking state in which the KST2.4W cannot control the receiver unit. In this case, by releasing the button, normal operation restarts and the Link LED will turn back on.

11. Battery replacement

The Battery LED will flash when the battery voltage is low. If it declines further, the operation buzzer sound will become low. When the Battery LED flashes, replace the batteries according to the following procedure (AAA batteries × 2).

1. Remove the battery cover.
2. Replace the battery paying attention to the polarity.



3. Replace the battery cover and tighten the screw securely.

12. Pairing with the receiver unit

In order to use the KST2.4W, it is necessary to pair with the target receiver. The KST2.4W communicates on a 1: 1 basis.

- The KST2.4W is shipped from the factory without pairing.
- When pairing is newly performed with another receiver unit, the previous pairing will be invalid.

Pairing procedure		Buzzer sound /LED
Preparation	Put the target receiver in the pairing standby state. *Please see the operation manual of the target receiver unit.	
Step 1	Set the KST2.4W to the pairing mode. Hold down the power button while pressing the button 1.	Buzzer: Peep-peep (twice) Link LED: Blink
Step 2	Release the button 1 and power button.	Buzzer: Pip-pip (twice) Battery LED: On Link LED: Off
Step 3	<u>Registration 1</u> Press the button 1. The LED of the target receiver units is turned on.	Buzzer: Short peep (once) Battery LED: Off Link LED: On
Step 4	<u>Registration 2</u> Press the button 2. The LED of the target receiver units is turned on.	Buzzer: Peep-peep-pee (three times) Battery LED: On Link LED: On
End	When pairing is done, the power turns off automatically. The target receiver unit goes back to the normal operation (standby state).	LEDs off

* When pairing is done, the power turns off automatically. Press and hold the power button again to restart.

Regulatory compliance information

Regulatory Statement for FCC

FCC ID: V9X-KST24W

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Caution: Any changes or modifications not expressly approved by the party responsible for product compliance could void the user's authority to operate the equipment.

Caution: Exposure to radio frequency radiation

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment has very low levels of RF energy that is deemed to comply without testing of specific absorption rate (SAR)

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Important notice

- Customers are advised to consult with Circuit Design sales representatives before ordering. Circuit Design believes the provided information is accurate and reliable. However, Circuit Design reserves the right to make changes to this product without notice.
- Circuit Design products are neither designed nor intended for use in life support applications where malfunction can reasonably be expected to result in significant personal injury to the user. Any use of Circuit Design products in such safety-critical applications is understood to be fully at the risk of the customer and the customer must fully indemnify Circuit Design, Inc for any damages resulting from any improper use.
- As the radio module communicates using electronic radio waves, there are cases where transmission will be temporarily cut off due to the surrounding environment and method of usage. The manufacturer is exempt from all responsibility relating to resulting harm to personnel or equipment and other secondary damage.
- The manufacturer is exempt from all responsibility relating to secondary damage resulting from the operation, performance and reliability of equipment connected to the radio module.

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Cautions

- Do not use the equipment within the vicinity of devices that may malfunction as a result of electronic radio waves from the radio module.
- Communication performance will be affected by the surrounding environment, so communication tests should be carried out before actual use.
- Ensure that the power supply for the radio module is within the specified rating. Short circuits and reverse connections may result in overheating and damage and must be avoided at all costs.
- Ensure that the power supply has been switched off before attempting any wiring work.
- The case is connected to the GND terminal of the internal circuit, so do not make contact between the '+' side of the power supply terminal and the case.
- When batteries are used as the power source, avoid short circuits, recharging, dismantling, and pressure. Failure to observe this caution may result in the outbreak of fire, overheating and damage to the equipment. Remove the batteries when the equipment is not to be used for a long period of time. Failure to observe this caution may result in battery leaks and damage to the equipment.
- Do not use this equipment in vehicles with the windows closed, in locations where it is subject to direct sunlight, or in locations with extremely high humidity.
- The radio module is neither waterproof nor splash proof. Ensure that it is not splashed with soot or water. Do not use the equipment if water or other foreign matter has entered the case.
- Do not drop the radio module or otherwise subject it to strong shocks.
- Do not subject the equipment to condensation (including moving it from cold locations to locations with a significant increase in temperature.)
- Do not use the equipment in locations where it is likely to be affected by acid, alkalis, organic agents or corrosive gas.
- Do not bend or break the antenna. Metallic objects placed in the vicinity of the antenna will have a great effect on communication performance. As far as possible, ensure that the equipment is placed well away from metallic objects.
- The GND for the radio module will also affect communication performance. If possible, ensure that the case GND and the circuit GND are connected to a large GND pattern.

Warnings

- Do not take apart or modify the equipment.
- Do not remove the product label (the label attached to the upper surface of the module.) Using a module from which the label has been removed is prohibited.

Revision History

Version	Date	Description	Remark