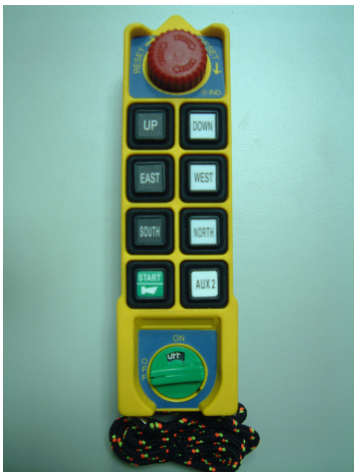
Installation & Operation Manual

SAGA1-K Series *Industrial Radio Remote Control*



Gain Electronic Co. Ltd.

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Safety Considerations

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

Safety Symbols — The following symbols may be found on the remote control or throughout the remote control's documentation.

Refer to Manual

When product is marked with this symbol refer to instruction manual for additional information.

High Voltage

Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury.

Warning

Denotes a hazard. Included text gives proper procedures. Failure to follow instructions could result in severe personal injury and/or property damage.

Caution

Denotes a hazard. Included text gives proper procedures. Failure to follow instructions could result in minor personal injury and/or properly damage.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Part 1. Operator's Manual

Chapter 1 Warranty

1-1 ***Warranty***

Gain Electronic Co., Ltd. guarantees that this product meets its published specifications at the time of shipment from the factory. Under proper installation it should work as expected.

1-2 ***Warranty Period***

This equipment is warranted against defects in material and manufacturing for a period of one year from the date of shipment. During the warranty period, Gain is responsible for necessary repairs as long as the product can be proved to be defective.

For warranty service or repair this product must be returned to a service facility designated by Gain. Buyer will pay shipping charges to Gain while Gain will pay return shipping charges.

1-3 ***Excluded Items***

This warranty does not include consumptive parts such as batteries, fuses, buttons, and relays. Also this warranty does not cover defects caused by improper installation, improper or insufficient maintenance, unauthorized modification, improper operation, ignorance of environmental specifications, or improper software or interfacing.

1-4 ***Remarks***

◎ No other warranty is expressed or implied, except for the above mentioned.

◎ The remedies provided herein are the buyer's sole and exclusive remedies.

Gain shall not be liable for any direct, indirect, special, incidental or consequential damages.

Chapter 2 Precautions of Operation

2-1 Attention

◎Please carefully read the manual before installing and operating this device.
◎Due to the complex nature of this equipment it is necessary to read the entire manual before installation.
◎Never dismantle the equipment by any unauthorized personnel, or equipment may be damaged.
◎This manual is for reference only. Pleases consult your distributor for further assistance.
◎The equipment has been strictly tested for quality before delivery from our plant. However, this equipment must not be used in dangerous situations or where damage may result.
◎After operation, shut off main power to the crane, power to receiver, and remove transmitter key.
◎Transmitter should be placed in a safe area when not in use to avoid accidental pressing of buttons.
◎The crane should be equipped with main power relay, limit switch and other safety devices.
◎Don't use equipment during lightening or high electrical interference conditions.
◎Make sure that the batteries are in good condition and power for receiver is correct.
◎Maintenance should only be done while the crane's main power is off to prevent electrical shock.
◎The contents of this manual may be amended by the manufacturer without notice.
◎The manufacturer may introduce new functions to the equipment as necessary, therefore, the descriptions may change.

According to FCC Part 15.21 Information to user.

Caution :

The user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2-2 Precautions

☆ Operating in an industrial facility is relatively dangerous; therefore, operator must have taken the adequate trainings in using SAGA1-K system.
☆ Those who operate the machine should be healthy and have good judgment in regard to safety.
☆ Although the SAGA1-K transmitter is so durable and resistant for the fluctuating temperature, care still need be taken to prevent it from the severe impact or pressure.
☆ During operation, if the power supply of the transmitter's batteries is insufficient, the transmitter will send out EMS signal first to de-energize all of motion relays inside the receiver to stop crane's moving, and then the LED indicator on transmitter will flash in red constantly. At this moment, the batteries need to be replaced and all of four batteries should be replaced at the same time.
☆ If the severe interference occurred the equipment should be stopped at once.
☆ Please take the batteries out when the equipment will not be used for a long time.
☆ Be sure to know the "Procedures of Emergency " as follows.

2-3 Procedures of emergency

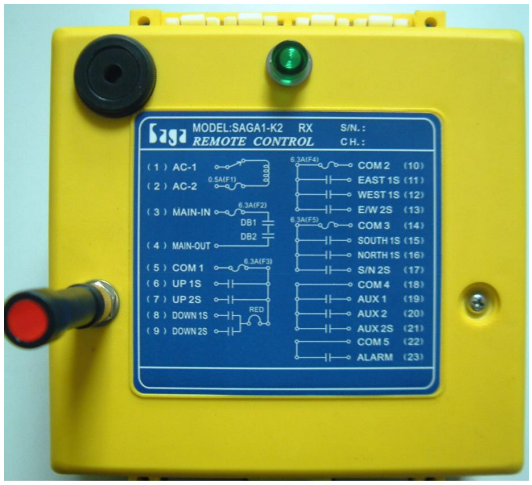
In case of an Emergency, please follow the steps below and ask the distributor for service immediately.

1. Press "EMS" button.
2. Turn the key to "OFF" position and remove it.
3. Switch off the main power of crane.
4. Advise the distributor to find out the reason.

Chapter 3 SAGA1-K Standard Accessories

When you acquire a standard and full set of SAGA1-K system, it includes the following items.

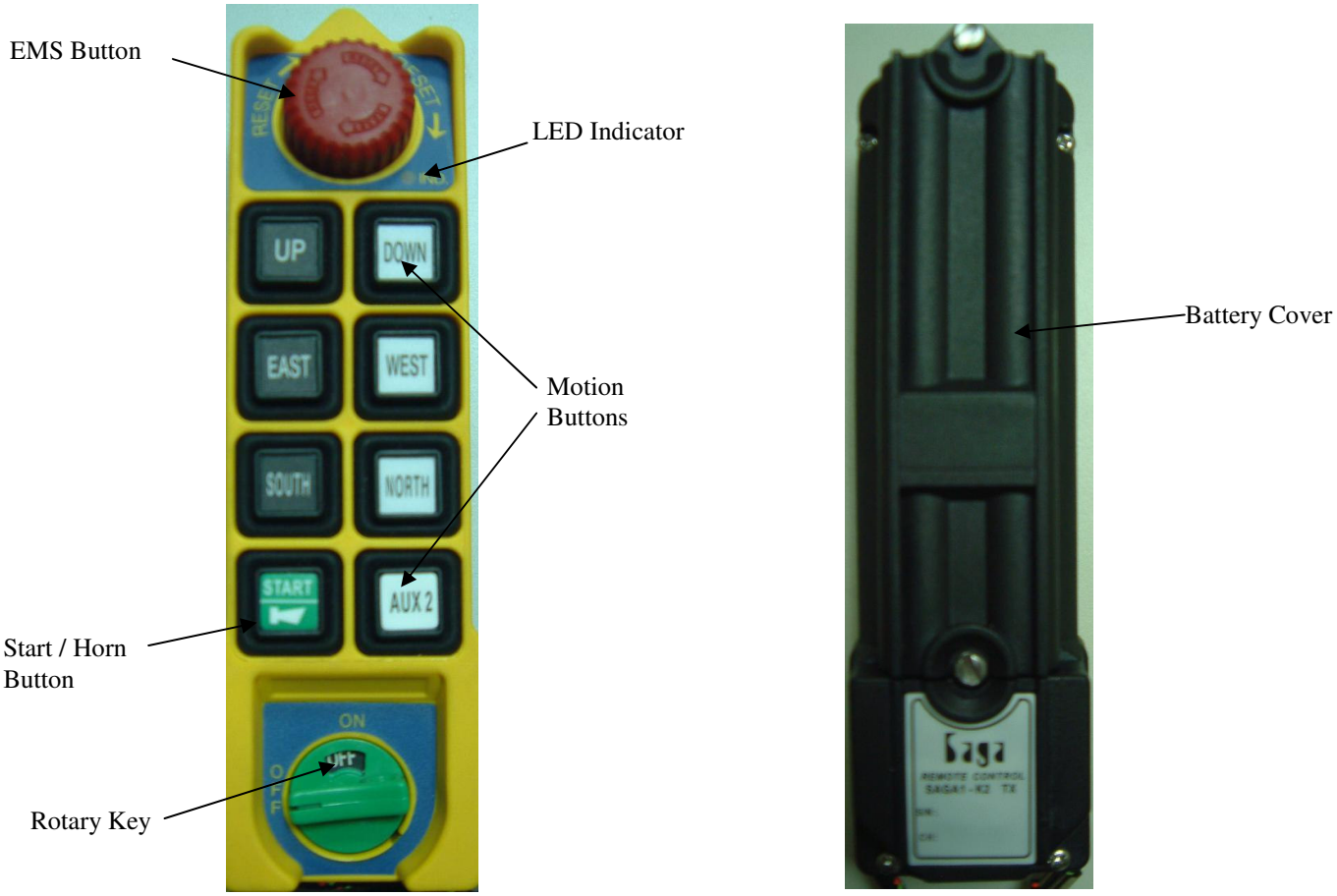
(1)Transmitter, one unit.



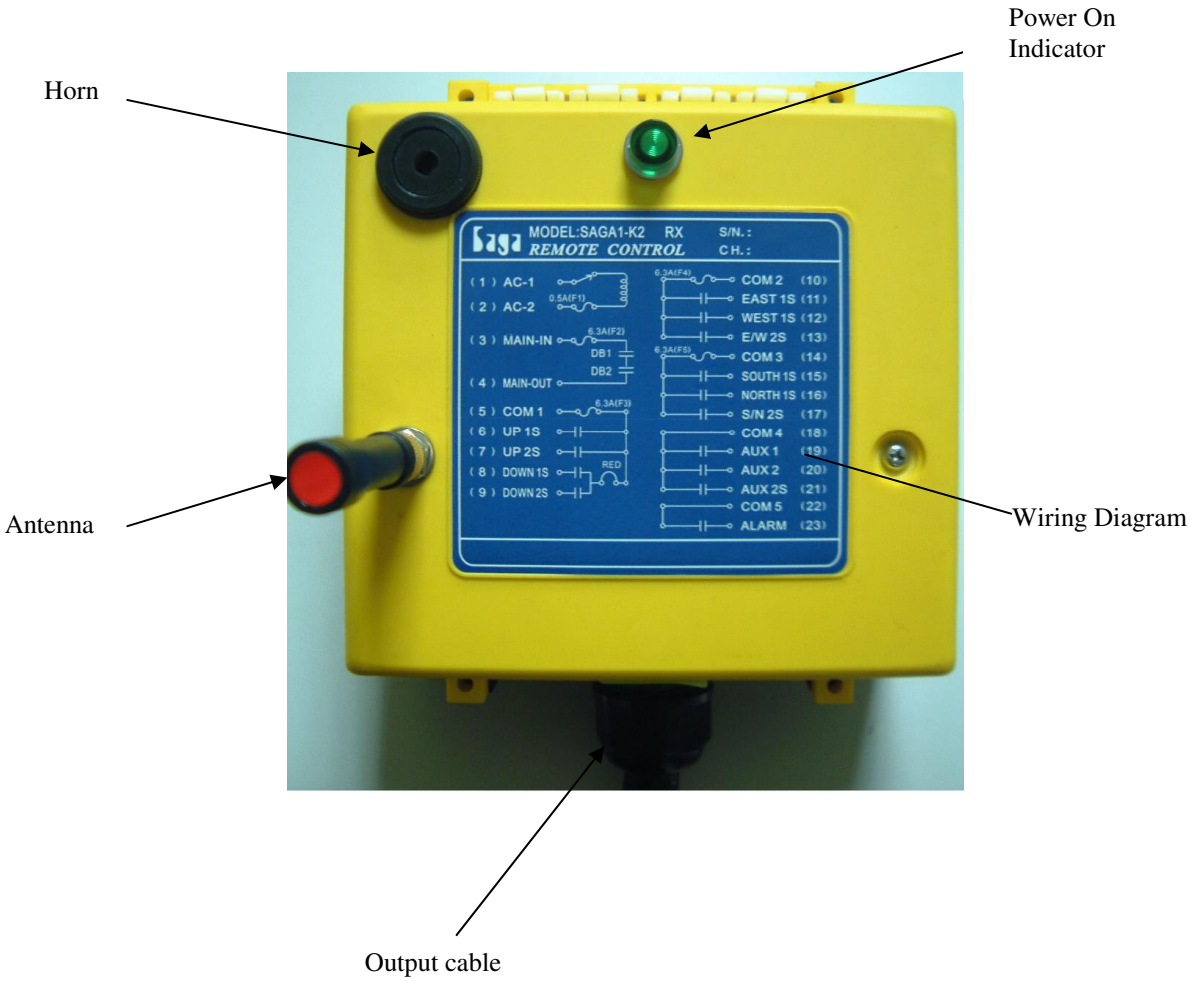
(2)Receiver, one unit.

Chapter 4 Operation

4-1 SAGA1-K Transmitter's parts



4-2 SAGA1-K Receiver's parts



4–3 General Operation

1. Turn on the main power switch of the equipment (Crane).
2. Install four AA size batteries in the transmitter make sure the "+" and "-" direction are correct.
3. Rotate "EMS" mushroom clockwise 45° and pull out.
4. Turn the rotary key clockwise to "ON" position, then press the "Start" pushbutton to Power-On.
5. Operate normally according to the function setting has done.
6. Please proceed the following procedure after operation.
   a) Press EMS mushroom and turn the rotary key of the transmitter to "OFF" position to shut off the motion of the receiver and remove the key.
   b) Switch off the main power switch of the equipment (Crane).
   c) Remove the batteries when the equipment is not going to be in use for a long period of time

Note:

1. Four AA size batteries are required for the transmitter. There is a 3-stage power indicating function with LED display.
   "Green color": Sufficient power to operate transmitter.
   "Yellow color": Power is depleting. Operation must be stopped immediately (for example: down the goods to ground) to replace batteries.
   "Red color": Insufficient power. Transmitter will send out an emergency stop signal to the receiver due to insufficient power. Operator should avoid this situation in order to maintain the safety of operation.
2. Turn the rotary key of the transmitter to "OFF" position; it will not only shut off the motion of the receiver but also save the power. Otherwise, the transmitter will keep staying in the standby mode and causing more power consumption.

Chapter 5. Inspection and Fault Detection

5–1 Inspection

Daily inspection is important and will ensure the safety of operation. Inspection should include "emergency stop" and other safety devices and functions. If there is any doubt, operation must be stopped immediately and problems must be solved before resume of operation.

5–2 Fault Detection

5-2-1 Transmitter Malfunction Detection

If the LED light on the transmitter is fast flashing in red, then there must be the causes as follows:

1. Some of the push buttons are jammed or stock.
2. EMS button has not been released.
3. Fail to follow the correct Power-On procedure.

5-2-2 Receiver Malfunction Detection

This receiver is equipped with simple self-diagnostic circuits and indicators. During the operation, self-diagnostic circuits will indicate the corresponding lights if any malfunction is detected. Operator must understand the malfunction signals and notify the maintenance personnel. Malfunction Type and indicator are listed as follows:

G1	R1	G2	R2	Malfunction Type
			On	MCU1 Fault
Blink Simultaneously with R1	Blink Simultaneously with G1			Main (EMS) Relays Fault
Blink Alternately with R1	Blink Alternately with G1			Relay Driver Buffer Fault
	Blink			Some of the Relays are Jammed

Chapter 6 FAQ

The followings are some common questions that our customers have frequently asked with answers provided.

Q1: Why does the relay not actuate when I operate a function on the transmitter?

A1: If the relay does not actuate, this can be due to one of the following causes:

1. The button paddle may be faulty or the buttons are jammed
2. Incorrect coding.
3. External interference.
4. No power to the receiver
5. Is the emergency stop on the transmitter and or the equipment being operated released.

Q2: The equipment operates intermittently?

A2: The most likely reason for the intermittent operation is due to interference from other equipments or other devices using the same frequency.

Q3: Why has the range become shorter?

A3: This problem can be due to antenna or its cables being damaged or incorrectly installed.

Q4: What should I do if the transmitter does not start up?

A4: If the transmitter does not start up when you press the start button, and the LED glows red, start by checking the following yourself:

1. That the key switch is not in the OFF position
2. That the emergency stop button is not depressed.
3. The start button on the transmitter is defective.
4. Button paddle is faulty or motion buttons are jammed.

Part 2. Technician's Manual

Chapter 1 General Characteristic

1–1 General Specifications

- Operation Frequency---------- : 433.05~434.79MHz
- Hamming Distance ---------- : ≧ 4
- I.D. Code---------- : 2^{20} sets (set by factory, never repeated)
- Temperature Range---------- : -40℃ ~ +85℃
- Channel Spacing---------- : 25 KHz
- Maximum Operation Range---------- : Up to 100 Meters
- Structure---------- : Reinforced Plastic and Glass Fiber
- Protection Degree---------- : IP 65

1–2 Transmitter Specifications

- Power Supply---------- : Four 1.5 volts Batteries (AA Size)
- RF Power---------- : < 10 mW
- Pushbutton Type---------- : Two step mechanical switch
- Dimensions---------- : 163x49x45mm (LxWxH)
- Weight---------- : about 265g (including batteries)

1–3 Receiver Specifications

- Power Supply---------- : 220/380VAC (50/60Hz), ±20%
- Sensitivity----------: −110dBm
- Output Relays---------- : 5A/250VAC
- Dimensions---------- : 167x154x88mm (LxWxH)
- Weight---------- : about 1220g(excluding wire cable)

Chapter 2. System Configuration

2–1 Transmitter Unit

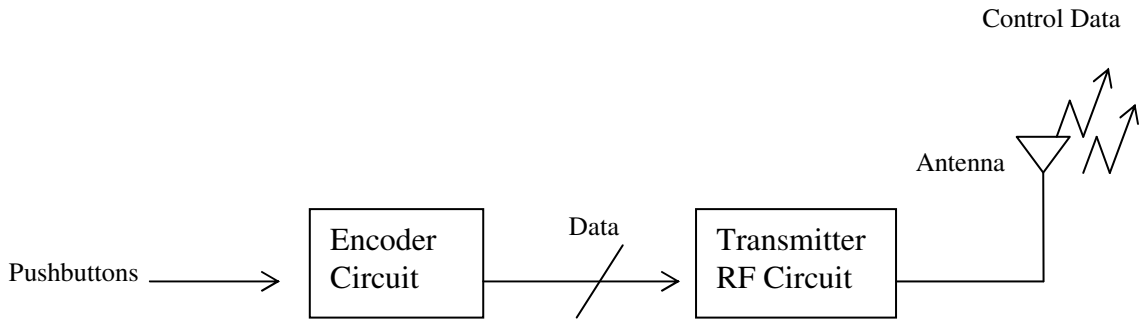


Figure A. Transmitter block diagram

The transmitter unit consists of an Encoder Circuit and a Transmitter RF Circuit. When the user presses a pushbutton on the transmitter, the Encoder Circuit senses the pushbutton's data immediately. The Encoder Circuit then encodes the pushbutton's data, combined with the ID Code and a Hamming Code to become the "control data".

This control data goes to the transmitter RF circuit to modulate a radio frequency (RF) carrier. The output FM signal from the modulator is then sent to the antenna to generate the transmission signal via an RF amplifier and a low-pass filter.

2–2 Receiver Unit

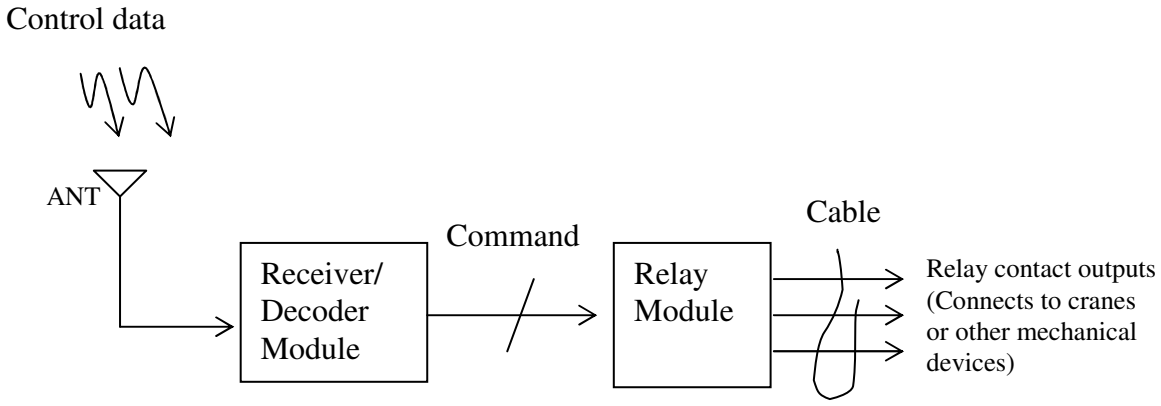


Figure B. Receiver block diagram

The receiver unit consists of the Receiver/Decoder module and the Relay module. RF signals (control data) from the transmitter are received by the antennas and sent

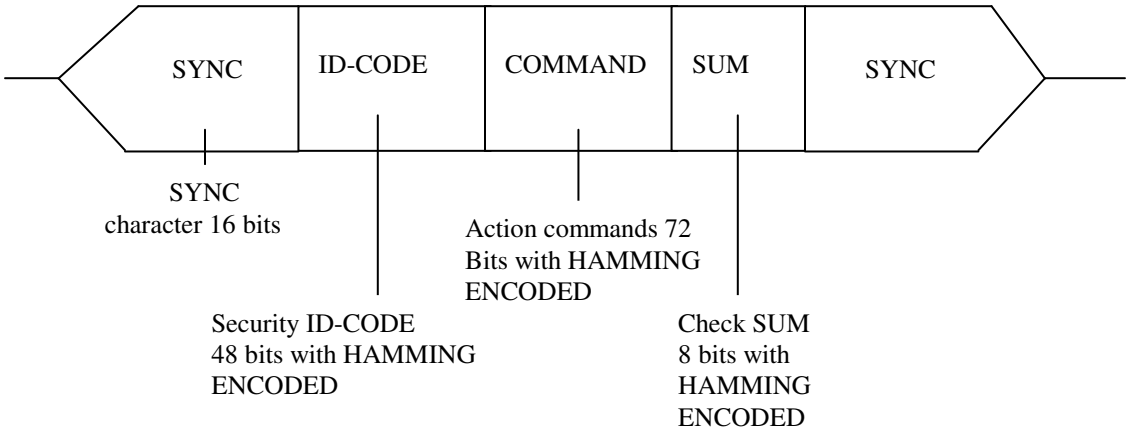
to the Receiver/ Decoder module. The main functions of the Receiver/Decoder module are to process the RF signal from the transmitter through the signal processing circuits, consisting of the band-pass filter, RF amplifier, mixer, IF amplifier, demodulator, error detection, error correction circuits, and decoder in order to generate a control command sent to the Relay module to drive the corresponding relay.
The Relay element is the interface of the Remote Controller to a crane or other mechanical device. The wiring between the relay contact outputs and the control circuit (or control box) of the crane or mechanical device can be arranged by the user.

2-3 Error detection/Error correction by software

F25 system employs the theory of "Error-Control Coding" used on Computer system, and incorporates the "Control Data Code" and the principle of "Error detection/Error correction" of Hamming Distance to edit and complete the "Code Word" was so-called "Hamming Code" which may ensure the control data with accuracy in process of transmission, and also equip with function of automatic "Error detection/Error correction" to make sure the safety in operation of F25 system remote control.

2-3-1 Data Stream

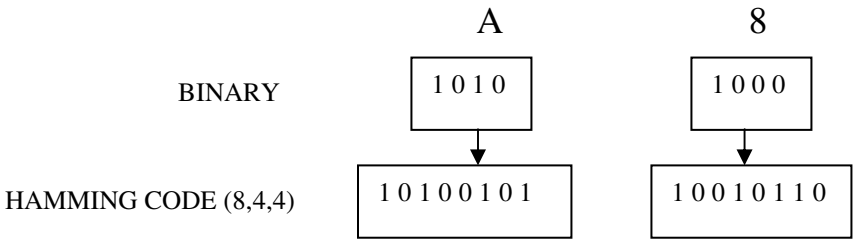
As shown as below, before the receiver's relays output to control the equipment's movement, the data including SYNC, ID-CODE, COMMAND and SUM must be checked twice to further make sure, so the data transmission becomes more safe and reliable.



TOTAL DATA LENGTH= 144 bits

2-3-2 Hamming Code

It is shown as below, the Code Word length is equal to 8, the Data Bit is equal to 4, the Hamming Distance is equal to 4, it means that HAMMING CODE (8,4,4) can correct single-bit errors and also detect double-bit errors.



Chapter 3. Installation

3–1 Precautions during installation

1. Observe all safety precautions when climbing the crane.
2. Turn off the main power source of cranes before installation to avoid electric shock.
3. Receiver must be installed in the way that it will not touch any part of the building during the operation.
4. Receiver must be fastened safely.
5. Before installation, inspect the crane's safety devices, and make sure everything is in proper working condition.
6. Make sure you understand the crane circuits and power distribution as well as the function setting of remote controller, to avoid incorrect wiring.

3–2 Transmitter Installation Instructions

Installation of batteries in the transmitter:

Insert batteries in proper direction into battery compartment. Attach and screw the battery cap on the bottom of the transmitter.

3–3 Receiver Installation Instructions

3-3-1 Preparation for Installation

1. Provide all necessary tools.
2. Select a proper location.
   a. Select a stable place.
   b. Select a place where you can see the Receiver or Antenna.

c. Select a place where there is no spark, e.g. keep away from motors, relays, magnetic switch and power cables.
d. Keep away from high-voltage wiring and device.
e. The Receiver's box must be at least 3 cm away from the other obstacles.

3. Installation of proper power source

The input power source for receiver can be 48 VAC 50/60 Hz, 110VAC, 50/60 Hz or 220VAC, 50/60 Hz., or 380VAC, 50/60 Hz. After power source is confirmed, one must connect the connector of initial coil of transformer to the relay module properly.

3-3-2 Installation Sequence

1. Turn off the main power for crane.
2. Drill the holes for screws, install receiver and then fix the receiver with 6mm screw nut on vibration- Resistant.
3. Connect the cable-assembly (provided) to the receiver and tighten the cables.
4. Connect cables to the control circuit of crane according to the receiver's wiring table and control contacts diagram.

Note:
Inspect and make sure that all wires are connected correctly.

5. Secure the cables between the receiver and crane so that cable cover (wrapper) will not wear out due to the vibration of the crane

3-3-3 Control Contacts Diagram