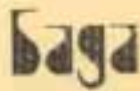


User's Manual

SAGA1 -C

Industrial Radio Remote Controller



SAGA Gain Electronic Co., Ltd.

Model: SAGA1-C

FCC ID: NCTSAGA1-C

FEDERAL COMMUNICATIONS COMMISSION

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.

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. 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:

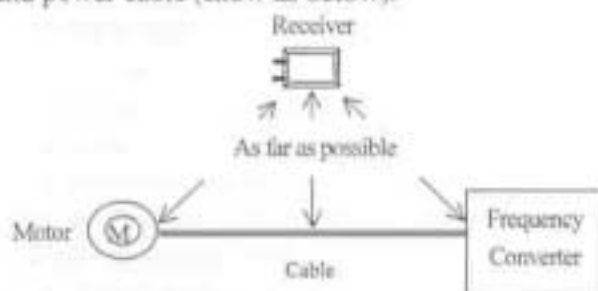
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

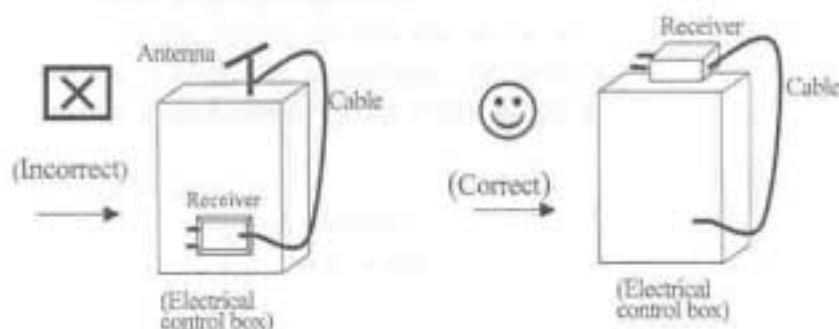
Chapter 3. Installation and Function Setting

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. Two external antennas must be used when receiver is installed in a metal box.
6. Before installation, inspect the crane's safety devices, and make sure everything is in proper working condition.
7. Make sure you understand the crane circuits and power distribution as well as the function setting of remote controller, to avoid incorrect wiring.
8. To avoid any interference, the Receiver must be away from motors, frequency converter and power cable (show as below).



9. The Receiver should be installed on the top of the electrical control box. To mount the receiver inside the electrical control box is not correct.



3-2 Transmitter Installation Instructions

3-2-1 Installation of batteries in the transmitter:

Put batteries in proper direction into battery compartment, and screw up Transmitter's bottom cover, after then it will sound two long sound ("— —": "—" indicates 0.5 second sound and the short interval lasts 0.5 second) to indicate proper installation.

3-2-2 Installation of function setting software in the transmitter:

When change a new transmitter or change remote controller's function settings (such as change receiver's function settings, or channel dip switch settings), one must follow the procedures below (please refer to section 3-4) to install the function setting software in the transmitter, in order to pair the transmitter and receiver.

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 48VAC/110VAC , 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

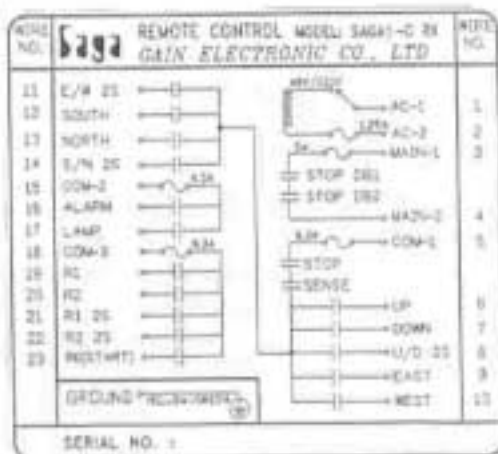
1. Turn off the main power for crane.
2. Find a proper place for the receiver.
3. Drill the holes for screw, install receiver and then fix the receiver with 6mm ϕ screw nut on vibration- Resistant.

4. Connect cables to the control circuit of crane according to the receiver's wiring table and control contacts diagram.

Note:

- 1) Inspect and make sure that all wires are connected correctly.
 - 2) Earth ground for remote control and crane must be properly connected to ensure safety.
 5. Secure the cables between the receiver and crane so that cable sheath will not wear out due to the vibration of the crane.
 6. Open the top cover of the receiver and turn Relay module's Run/Test switch to "Test" position.
 7. Turn on the main power for crane.
 8. Operate the transmitter to test every function and make sure they are all correct (read by LED indicator).
- Note:** When Run/Test switch is set at "Test" position, relay will not function, but LED will display.
9. Turn Run/Test switch to "Run" position and secure the top cover to the receiver with screws.
 10. This completes the installation of receiver.

3-3-3 Wire Diagram



3-3-4 Installation of function setting software in the receiver:

When change a new receiver or change remote controller's function settings (for example: direct loading of function setting software from PC or maintenance kit into the transmitter). One must follow the procedures below (please refer to section 3-4) to install the function setting software in the receiver, in order to pair the receiver and transmitter.

3 – 4 Function setting software installation instructions

The installation procedures mentioned here refer to the process of the receiver's direct loading (copying) of function setting software into the transmitter or vice versa. The PC or maintenance kit will not be discussed here.

Note: For SAGA remote controller, one can write the function setting software from PC or Maintenance Kit into transmitter only. It is impossible to write into receiver. Therefore, the following procedure is the only way to pair the transmitter and the receiver

Warning:

Before execution of the following procedure, one must make sure that the receiver is in the "Power-Off" mode, as that the crane will not move.

Installation Procedures:

Step	Operation	Remark
1.	Transmitter: 1. Press EMS mushroom. 2. Turn security key count-clockwise from "On" to "Off" position. 3. Remove the battery cover of transmitter. 4. Remove the screws and the back cover.	
2.	Receiver: 1. Remove the screws and the top cover. 2. Turn the "Run/Test" switch in the Relay module to "Test" position. 3. Turn on the power of receiver.	LED will turn on when "Run/Test" switch is on "Test" position, but relay will be inactive.

3.	Select the copying direction: 1. If copy the function setting software from receiver to transmitter then set sw8 of function dip switch of "Receiver/Decoder" module to "OFF" position. 2. IF copy the function setting software from transmitter to receiver then set sw8 of function dip switch of "receiver/decoder" module to "ON" position.	
4.	Push "Pgm" button in the "Receiver/Decoder" module.	Push "Pgm" button, then "Alarm" LED will rapidly flash to indicate program has entered into "WRITE" mode. At this time, one can proceed to the next step.
5.	Connect 7-pin cable from "Receiver/Decoder" module to transmitter's "Encoder" module.	
6.	Push "Pgm" button in the "Receiver/Decoder module".	After push "Pgm" button, the "Alarm" LED will display "• - -" signal to indicate the software writing is completed and then the "Alarm" LED will rapidly flash to indicate that one can proceed to the next step. Note: If alarm LED displays "• • • -" which indicates an error in software writing. Maintenance personnel must be contacted to solve the problem.
7.	Remove the 7-pin cable.	The software of transmitter will reset automatically and the buzzer will sound two long-sound to indicate proper installation, after the battery cover is inserted.

8.	Push "Pgm" button in the "Receiver/Decoder" module.	The "Alarm" LED will stop flashing and the software of receiver will automatically reset, after the "Pgm" button is pushed. At this moment, the program has entered into "normal operation" mode.
9.	1. Turn "Run/Test" switch of Relay module to "Run" position. 2. Attach back panel with 6 screws.	
10.	Power-on according to the proper procedure and return to normal operation.	

3-5 Function Setting by Dip Switch

There are two dipswitches located at "Receiver/Decoder" module in the receiver unit. Each dipswitch has 8 sets of switches for the setting of channels and function.

- **Note:** When change the setting value of dip switch (includes channel and function dip switch), one must reset the receiver's power (i.e. turn off the AC power of receiver for 5 seconds then turn on again), otherwise the setting is not available.

3-5-1 Setting of channels:

Dip switch for channel setting is 7-bits (binary) for a total of 128 channel settings. (For example; When dip switch 1, 2, 3, 5, 6 are on the "on" position, it is set for the 56th channel; No. of channel = $1 + 2^0 + 2^1 + 2^2 + 2^4 + 2^5$). The formula for frequency calculation is as follows:

Operation frequency = initial frequency + channel spacing $\times$ (No. of channel - 1).

For example, if initial frequency is 430 MHz and channel spacing is 5kHz, and dip switch is set at 56th channel, then

Operation frequency = 433.05MHz + 12.5kHz $\times$ (56 - 1) = 433.7375MHz

Note:

1. Initial frequency and channel spacing are set by software.
- 2. When change operation frequency (i.e. channel), you must write the setting value from the receiver to the transmitter.

3-5-2 Setting of Function:

Function setting can be used to set the "Power-On" mode, the function of "R2" pushbutton, inching time, acceleration-delayed time, and copy direction as follows:

1. Use of SW1 and SW2 to set the "Power-On" mode

Dip Switch		Remark
Sw1	Sw2	
OFF	OFF	Any pushbutton Power-On mode
ON	OFF	Start rotary key switch Power-On mode
OFF	ON	E.U. standard Power-On mode
ON	ON	Software Power-On: It uses software to set the activity of transmitter and receiver according to the operator's need. - Any pushbutton Power-On? Or Start rotary key switch Power-On? - Transmitter is in the continuous mode? Or non-continuous mode? - Transmitter Auto Power-Off? Duration of non-operation before Auto Power-Off? - Receiver Auto power-off? Duration of non-operation before Auto Power-Off? Note: Pre-setting at factory: (1) E.U. Simple Power-On (2) Transmitter Auto Power-Off after 180 seconds of non-operation, and transmit EMS signal to "Power-Off" the receiver before transmitter turned off (4) Receiver Auto Power-Off after 2 hours of non-operation.

- 6 **Note:** When change Power-On mode, you must write the setting from the receiver to the transmitter.

2. Use of SW3 and SW4 to set the function of R2 pushbutton.

Dip Switch		Remark
Sw3	Sw4	
OFF	OFF	R2 pushbutton setting: "Normal" function.
ON	OFF	R2 pushbutton setting: "Toggle" function.
OFF	ON	R2 pushbutton setting: "Inching" function.
ON	ON	R2 pushbutton setting: "Acceleration" function.

3. Use of SW5 to set "Inching Time"

SW5 = OFF $\Rightarrow$ Inching Time = 0.05 sec.

SW5 = ON $\Rightarrow$ Inching Time set by software based on operator's need.

Note: Factory setting is 0.2sec

4. Use of SW6 and SW7 to set Acceleration delayed time

Dip Switch		Remark
Sw6	Sw7	
OFF	OFF	No Acceleration delayed
ON	OFF	Acceleration delayed time : 1 second
OFF	ON	Acceleration delayed time : 3 seconds
ON	ON	Acceleration delayed time set by software based on operation's need. Note: Factory setting is 2 seconds.

5. Use of SW8 to set the copying direction

SW8 = OFF $\Rightarrow$ Copy the function (channel) setting software from RECEIVER to TRANSMITTER.

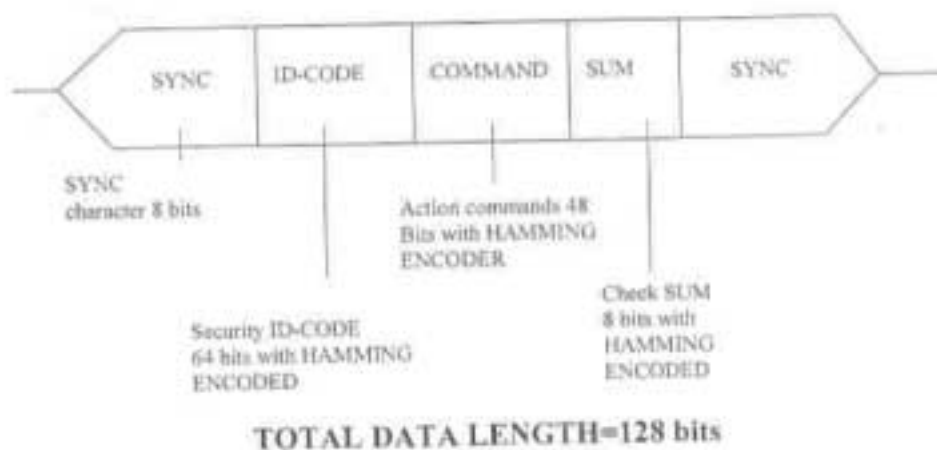
SW8 = ON $\Rightarrow$ Copy the function (channel) setting software from TRANSMITTER to RECEIVER.

3-5 Error detection/Error correction by software

SAGAI-C 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 SAGAI-C system remote control.

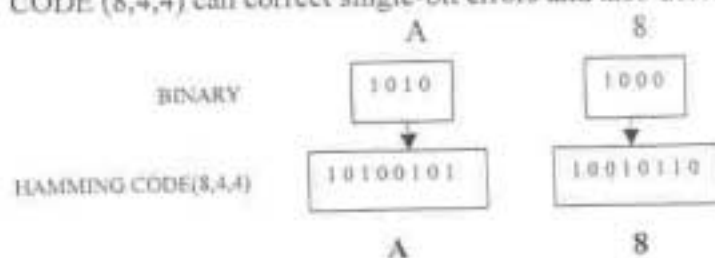
3-5-1 Data Stream

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.



3-5-2 Hamming Code

As 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.

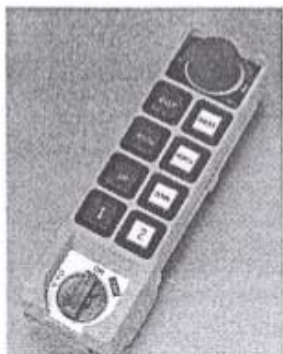


Chapter 3. Standard Accessories

A standard and full set of SAGA1-C consists of:

(1) Transmitter, 1 unit

(2) Receiver, 1 unit



Chapter 4. Operation

4 – 1 Transmitter Configuration

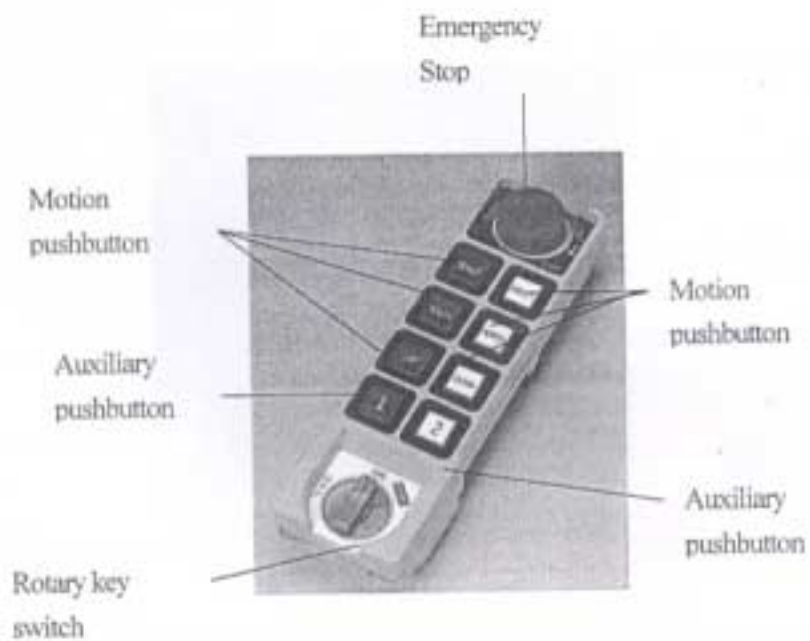


Figure 4-1 Transmitter Configuration

4-2 Receiver Configuration

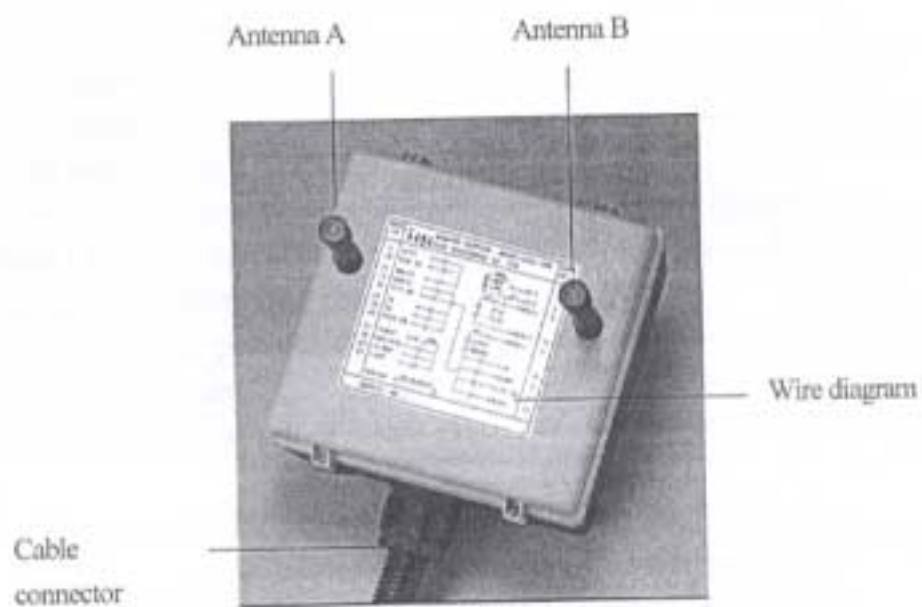


Figure 4-2 Receiver Configuration

4-3 General Operation

1. Install 4 Fresh AA-size batteries in the battery box. Make sure the "+" and "-" directions are correct.
2. Put batteries into battery compartment then screw up transmitter's bottom cover.
Note: Transmitter will sound two-long sound to indicate the correct installation.
3. Insert security key in the "OFF" position.
4. Turn on the power according to the "Power-On Modes" (please refer to 4-4-1).
Note: LED indicator will flash with red color if proper procedures are not followed.
5. Operate transmitter by pressing each pushbutton.
6. After operation, perform the following procedures in sequence: (1) Press EMS mushroom, (2) turn rotary key switch counter-clock-wise to the "OFF" position, (3) remove key and keep it in a safe place, (4) remove batteries if not used for a long period.

Note: Transmitter has power indicating functions with LED display.

← "Green color": Sufficient power to operate transmitter. (In order to save power, one can program to turn off LED display when power is sufficient.)

- ① ↑ "Yellow color": Power is depleting, warning sound occurs every 4 seconds (can be switched off and sound interval can be set by software). Operation must be stopped immediately (for example: down the goods to ground) to replace batteries.

- ② → "Red color": Insufficient power. In addition to red LED, warning sound will continue and transmitter is no longer functional. 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.

4-4 Special Functions Operation

4-4-1 Power-On operation

Power-on means that the Main-Relay on receiver will energize as soon as receiving the control data from transmitter and then receiver keep in condition of standby for continuous control. There are 4 different ways of "Power-On mode" could be setting.

A. Any pushbutton Power-On Mode

1. Rotate "EMS" mushroom clockwise 45° and pull out.
2. Turn rotary key switch clockwise to "ON" position.
3. Press any pushbutton on the transmitter. This will turn on the power as well as execute the function of pushbutton.

B. "Start" pushbutton Power-On Mode

1. Rotate "EMS" mushroom clockwise 45° and pull out.
2. Turn rotary key switch clockwise to "ON" position.
3. Continue to turn rotary key switch to "START" position to turn on power. (after release rotary key switch, it will automatically back to "ON" position.)

Note: When setting is on "Any pushbutton power-on" or "Start pushbutton power-on", the transmitter is in the "non-continuous" mode (i.e. pushbutton must be pressed to operate the function), it can save power.

C. E.U. standard Power-On Mode

1. Rotate "EMS" mushroom clockwise 45° and pull out.
2. Turn rotary key switch clockwise to "ON" position.
3. Continue to turn rotary key switch to "START" position to turn on power. (after release rotary key switch, it will automatically back to "ON" position.)
4. After 3 minutes of non-operation, transmitter will send out an emergency stop signal to the receiver. When this occurs, one must turn rotary key switch counter-clockwise to the "OFF" position, then turn the key clockwise to the "ON" position, and continue to turn rotary key switch to "START" position to turn on the power.

Note: When setting is on "E.U. standard" Power-on Mode, the transmitter is in the continuous mode.

D. Software Power-On Mode

This "Power-On" mode is controlled by the software. It consists of (1) Whether the receiver Power-Off automatically when no operation for a period of time. (2) Whether a password is required to turn on power. (3) Whether an "emergency stop" signal will be sent out... etc.