User's Manual

SAGA1 -D

SAGA Gain Electronic Co., Ltd.

Model: SAGA1-D
FCC ID: NCTSAGA1-D

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 radiated 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 1 General Characteristic

1 – 1 General Specifications

- Operation Frequency---------- : 433.05 ~ 434.79MHz (set by software)
- Hamming Distance ----------: ≧ 4
- I.D. Code---------- : 2^{32} ; more than 4 billion sets (set by factory, never be repeated)
- Temperature Range---------- : -20℃ ~ +65℃
- Channel Spacing---------- : 25KHZ
- Maximum Operation Range---------- : Up to 100 Meters
- Structure---------- : Fiber-Nylon
- Protection Degree---------- : IP – 65

1 – 2 Transmitter Specifications

- Power Supply---------- : Six 1.5volts Alkaline or Rechargeable Batteries (AA Size)
- RF Power---------- : < 7.85 nW (3m)
- Modulation---------- : ≤ ±2.5KHz; NBFM
- Pushbutton Type---------- : Two-step Mechanical Switch
- Dimensions---------- : 274×77×42 mm (L×W×H)
- Weight---------- : 660 g

1 – 3 Receiver Specifications

- Power Supply---------- : AC 48V/110V(50/60Hz)
- Sensitive---------- : –110DBm (Date Error Rate < 10^{-3})
- Image Rejection---------- : > 60DB
- Rejection of Adjacent Channels-------- : > 80DB (± 20kHz)
- Output Relays---------- : 10A/250VAC; 8A/30VDC
- Dimensions---------- : 253×267×150 mm (L×W×H)
- Weight---------- : 3 Kg

Chapter 2 System Configuration

2 – 1 Transmitter Unit

Transmitter unit consists of Encoder Module and Transmitter RF Module, for transmitting "control data" to the receiver for remote control applications.

2-1-1 Encoder Module:

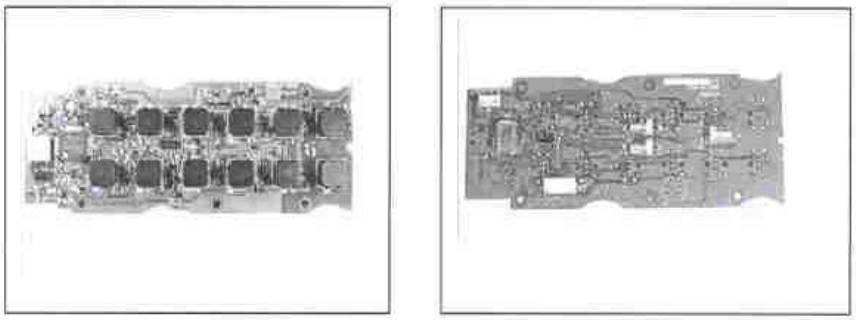
A micro control unit (MCU) is used for the main processing, MCU reads the pushbutton data and combines with the ID Code, Hamming Code, and Function Setting. After producing control data by encoding, it generates TXFSK signal to transmitter's RF module via FSK circuit.

2-1-2 Transmitter RF Module:

The sequence of RF module is shown as follows: Encoder→TXFSK→ modulates a RF carrier → amplification → antenna.

This RF Module uses Phase Locked Loop (PLL), Voltage Controlled Oscillator (V.C.O.) with lowest side-band noise, SMT advanced technologies. It has power-saving, high efficiency, high reliability and low harmonic NBFM transmitting circuit.

2-1-3 Parts Name and Illustration



Top View Bottom View

Figure 2-1-1 Encoder Module

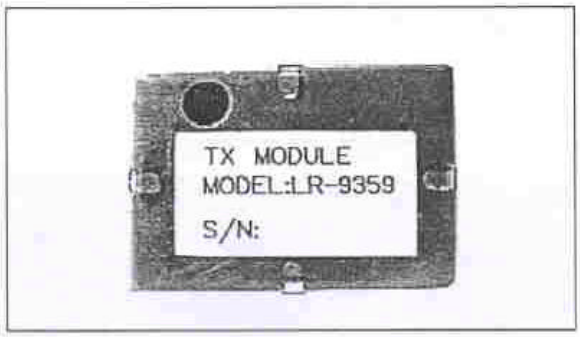


Figure 2-1-2 Transmitter RF Module

2 – 2 Receiver Unit

Receiver unit consists of Receiver/Decoder Module and Relay Module, This unit receives the control data from the transmitter, decodes the data, generates control commend, and drives relay circuit to control the motions of cranes (or the lifting machine).

2-2-1 Receiver/Decoder Module:

This module consists of high frequency receiver circuit and micro control unit. Its main functions are to receive RF signal from transmitter, to detect and correct the received data message, to decode and to send commends to the relay module. This module has high-receiving gain, high-signal selectivity, high-image rejection rate, and low-noise figure. In addition, this module uses special design of "Diversity Reception" and "Frequency Deviation Direction Indicator" (FDDI) to eliminate ate communication dead spot and the adverse effect of environmental change, such as temperature.

2-2-2 Relay Module:

This module receive and process control commends to drive corresponding relay in order to control the motion of cranes (or the lifting machine). The operation safety is especially important. This module consists of relay contact jammed-detection circuit, relay coil test circuit, relay operating voltage test circuit, and the protection circuit for micro control unit, to ensure operation safety.

2-2-3 Parts Name and Illustration

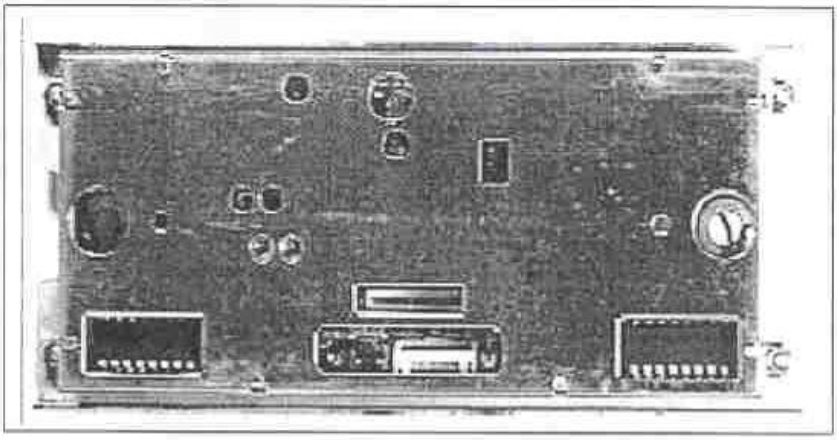


Figure 2-2-1 "Receiver/Decoder" Module

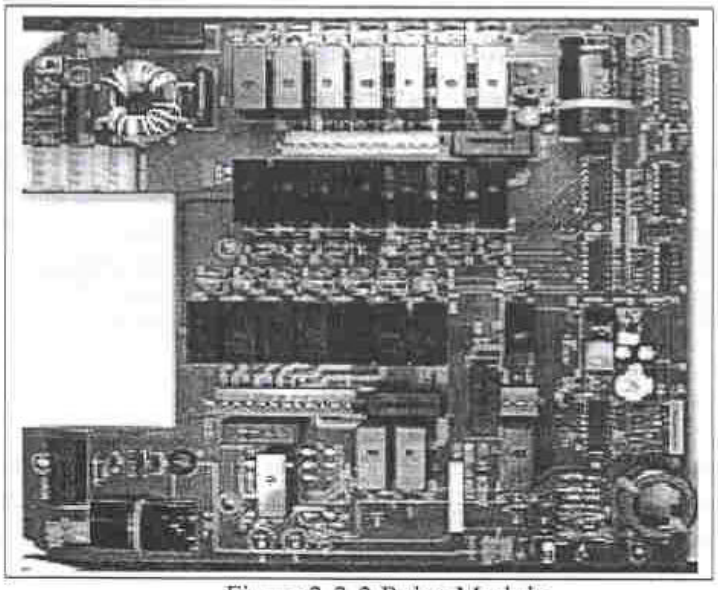


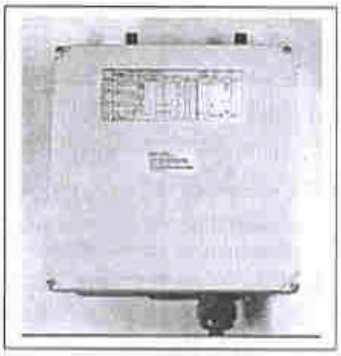
Figure 2-2-2 Relay Module

Chapter 3 Standard Accessories

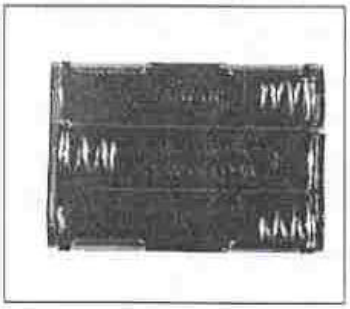
A standard and full set of SAGA consists of:

(1)Transmitter (strap included), 1 unit

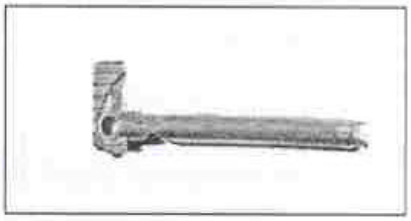
(2) Receiver, 1 unit



(3) Battery Box (empty), 1 pcs



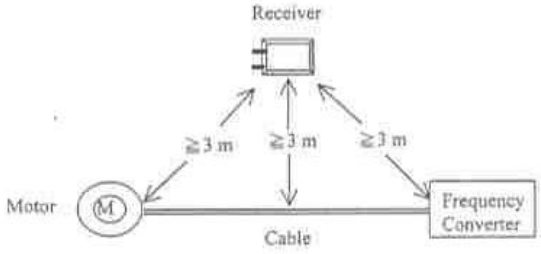
(4) Reserved Key, 1 pcs



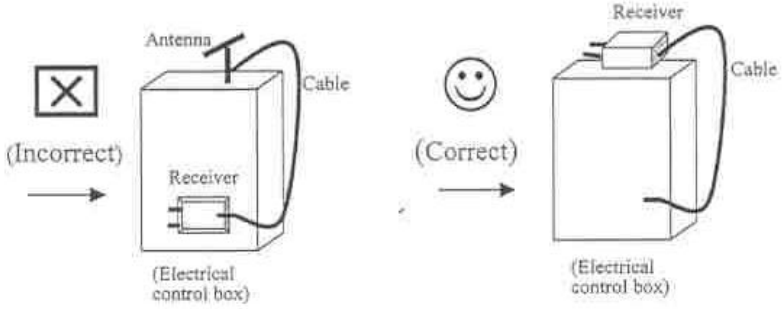
Chapter 3 Installation and Function Setting

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 at least three (3) meters 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:

Insert batteries in proper direction into battery cover. Insert the battery cover into transmitter. Transmitter 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 48/110VAC , 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. Attach the template (provided) for the receiver to a proper place.
3. Drill the holes for screws, 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:

NInspect and make sure that all wires are connected correctly.

3Earth ground for roomette controller and crane must be properly connected to ensure safety.

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.
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 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 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.	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 Function:
Function setting can be used to set the "Power-On" mode, the function of "F1" 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 pushbutton 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. 1. Any pushbutton Power-On? Or Start pushbutton Power-On? 2. Transmitter is in the continuous mode? Or non-continuous mode? 3. Transmitter Auto Power-Off? Duration of non-operation before Auto Power-Off? 4. 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.

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 F1 pushbutton.

Dip Switch		Remark
Sw3	Sw4	

OFF	OFF	F1 pushbutton setting: "Normal" function.
ON	OFF	F1 pushbutton setting: "Toggle" function.
OFF	ON	F1 pushbutton setting: "Inching" function.
ON	ON	F1 pushbutton setting: 'Acceleration" function.

3. Use of SW5 to set "Inching Time"
   SW5 = OFF ⇒ Inching Time = 0.05 sec.
   SW5 = ON ⇒ 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 ⇒ Copy the function (channel) setting software from RECEIVER to TRANSMITTER.
   SW8 = ON ⇒ Copy the function (channel) setting software from TRANSMITTER to RECEIVER.

3 – 6 Password setting

The function of password code can be set by pushbutton or by software in order to avoid unauthorized people to use remote controller. If select "by pushbutton" then the procedure of password code setting is as below:

1. Depress EMS mushroom and turn security key to "off" position.

2. Depress and hold "UP" & "DOWN" two pushbuttons and then turn key from "off" to "on" position simultaneously. At this time, LED will flash with red and green color alternately for 10 seconds.
3. Press the pushbutton sequentially to key in new password within 10 seconds. The buzzer will sound three-long sound if the procedure of setting password is finished. The length of password is four-digits, for example: Up, Up, Down, Up.
4. Rotate EMS mushroom clockwise 45° and pull out, enter new password to turn on transmitter.

3 – 7 Radio remote setting

The operation procedures mentioned herein refer to the process of the transmitter's remote writing of function setting software into the receiver. It means that to preserve the required setting in transmitter in advance then sends out the radio signal to receiver at workshop. This performance can eliminate the trouble of climbing to the receiver. Radio setting includes "Channel setting" and "Function Setting".

Note:

1. Before operating, one must make sure that all of the relays are at "off" status (i.e. the receiver is in "Power-Off" mode).
2. Before operating, one must make sure that the communication status between transmitter and receiver is at good condition.

3-7-1 "Channel setting" by radio:

1. Using PC or Maintenance Kit to install channel setting into transmitter in advance.
2. Depress EMS mushroom and turn security key to "off" position.
3. Depress and hold "East" & "West" two pushbuttons and turn security key from "off" to "on" position simultaneously.
4. Release "East" & "West" two pushbuttons. At this time, LED indicator will flash with yellow and green color alternately.
5. After the alarm of receiver sound one-long sound "–" (one-long sound means that channel setting is completed), turn security key from "on" to "off" position.
6. "Power-On" according to the proper procedure and return to normal operation.

3-7-2 "Function setting" by radio:

1. Using PC or maintenance kit to install function setting into transmitter in advance.
2. Depress EMS mushroom and turn security key to "off position.
3. Depress and hold "Up" & "East" two pushbuttons and turn security key from "off" to "on" position simultaneously.
4. Release "Up" & "East" two pushbuttons. At this time, LED indicator will flash with yellow and red color alternately.
5. After the alarm of receiver sound two-short sound and one-long sound "••–" (two-short sound and one-long sound means that function setting is completed), turn security key from "on" to "off" position.
6. "Power-On" according to the proper procedure and return to normal operation.

3 – 8 Software Setting

In addition to the dip switch setting mentioned in section 3-5, this remote control system can be set according to the working condition and operator's need for the following promotes: pushbutton function, "Bypass EMS" function, search function, "Passive EMS" function...etc. This enables the remote controller to perform the most effective operation and to provide the safest operation. Please refer to the manual of software setting.