

Alpha 6000

Industrial Radio Remote Control System

Operation Manual

Fomotech International Corp.

TABLE OF CONTENTS

	Page
1. INTRODUCTION	3
2. SAFETY INSTRUCTIONS	5
3. SYSTEM DESCRIPTIONS	
3.1 TRANSMITTER OUTLINE.....	6
3.1.1 TRANSMITTER EXTERNAL DESCRIPTIONS.....	6
3.1.2 TRANSMITTER INTERNAL DESCRIPTIONS.....	7
3.1.3 RECHARGEABLE BATTERY, BATTERY CHARGER AND SHOULDER BELT VIEWS	7
3.2 RECEIVER OUTLINE	8
3.2.1 RECEIVER EXTERNAL DESCRIPTIONS	8
3.2.2 RECEIVER INTERNAL DESCRIPTIONS	8
3.2.3 RECEIVER MOUNTING DIMENSION.....	9
3.2.4 CARDS INSIDE RECEIVER	9
4. SYSTEM FUNCTIONS	
4.1 TRANSMITTER JOYSTICK DESCRIPTIONS	12
4.2 TRANSMITTER PUSHBUTTON DESCRIPTIONS	22
4.2.1 PUSHBUTTON TYPES	22
4.2.2 FUNCTION SETTINGS	25
4.2.2.1 TRANSMITTER FUNCTION SETTINGS.....	25
4.2.2.2 RECEIVER FUNCTION SETTINGS.....	28
4.3 SPECIAL TYPES	32
4.4 CUSTOMIZED TYPES.....	34
4.5 FREQUENCY TABLE.....	34
5. SYSTEM SETTINGS	
5.1 TRANSMITTER LCD FUNCTION SETTINGS.....	36
5.2 LCD DISPLAY DESCRIPTIONS.....	36
6. RECEIVER STATUS LIGHT AND INSTALLATION	
6.1 RECEIVER STATUS LIGHT.....	41
6.2 RECEIVER LED STATUS.....	41
6.3 PREPARATION.....	42
6.4 STEPS-BY-STEPS INSTALLATION.....	43
6.5 WIRING DIAGRAM	44
6.6 SYSTEM TESTING.....	44

7. TRANSMITTER OPERATING INSTRUCTION	
7.1 POWER “ON” THE SYSTEM	44
7.2 TRANSMITTER SYSTEM STATUS DISPLAY	45
7.2.1 TRANSMITTER LED DISPLAY	45
7.2.2 TRANSMITTER LED STATUS TABLE	45
7.3 JOYSTICK CALIBRATION	
7.3.1 REASONS FOR JOYSTICK CALIBRATION.....	46
7.3.2 ENTER JOYSTICK CALIBRATION MODE.....	47
7.3.3 JOYSTICK CALIBRATION STEPS.....	47
7.3.4 EXIT	48
7.3.5 FUNCTION CHANGE SETTINGS.....	49
8. BATTERY CHARGING	50
9. TROUBLE SHOOTING	51
10. SYSTEM SPECIFICATION	52
11. PARTS LIST	54

1. INTRODUCTION

The Alpha 6000 is a highly sophisticated industrial radio remote control system. The versatile features of Alpha 6000 permits its usage in a wide range of industrial applications. The system can be used to control all types of industrial cranes, tower cranes, building construction equipment, automatic control systems, mining equipment, and many others.

The Alpha 6000 incorporates numerous advanced safety features and software programming that will ensure maximum security and safety in the workplace. The major features of Alpha 6000 industrial radio remote control system are as follow:

- * The system is equipped with highly evolved software that has redundant error checking and correcting capabilities to ensure 100% error-free transmission, decoding, and control of all output relays. This highly evolved software includes CRC (Cyclical Redundancy Check) and Hamming Codes (Error Recovery) programming. The responding time from system error to receiver auto-shutdown is maximum 1 second.
- * The encoding system utilizes advanced microprocessor control for 100% error-free data transmission. The availability of 65,536 sets of unique security ID codes + 68 distinct RF channels will ensure that only commands from a matching control transmitter can be carried out without any interference from other radio systems.
- * The decoding system utilizes dual-microprocessor control, which will ensure 100% error-free calculating, bit checking and correcting of all incoming data.
- * The system also utilizes an additional central microprocessor for data comparison and crosschecking between the two decoding microprocessors. When faults are detected via this central microprocessor, for maximum safety, the entire system will be shutdown immediately to avoid possibility of any accidents occurring.
- * The system utilizes PLL synthesized RF transmission. It allows the user to select from 68 sets of frequency channels best suited for the environment. The frequency channel for transmitter and receiver is selected via programming software. The receiver also has the ability to auto-scan from these 68 sets of frequency channels. The receiver will search and locked on to the intended matching control transmitter.
- * For added safety the receiver also utilizes dual Safety Relays for the receiver MAIN relay circuit. If the receiver MAIN relay is defective (example: fails to open or close during operation or not respond to a "Stop" command) a fault will be detected and the system will be shut down immediately to avoid possibility of any accidents occurring.
- * The Alpha 6000 is equipped with numerous self-diagnosing functions, which include transmitter low-voltage detection/warning, faulty pushbutton/joystick detection, faulty safety MAIN relays detection, faulty relay boards detection, faulty EEPROM detection, faulty RX module detection, incorrect ID code detection, and receiver MAIN auto-deactivation when transmitter low-voltage is detected, when encountering strong radio interference, and when the transmitter/operator is out of receiving range.
- * The transmitter is equipped with power auto shutdown function: After 5 minutes of inactivity, that is 5 minutes after the last pushbutton is released, the transmitter power will shut off automatically.

(0-120 minutes or no auto shutdown is selectable)

- * The transmitter casing is composed of special engineering plastic and pushbutton waterproof layer. The engineering plastic is featured with wearable, oil-proof, acid-proof, alkaline-proof, high temperature resistance, anti-UV, water-proof and dust-proof. With the self-developed no contact cross type and single axis joystick, there is no disadvantage of friction and non-durability as the operation of direct contact. The operation life and reliability is for a minimum of 1 million operating cycles.
- * The receiver enclosure is composed of 100% aluminum alloy. It may eliminate the static completely and avoid interference from radio radiation.
- * The relay and proportional joystick output can be sent via RS485 interface (optional) to the interfaces such as PLC and PC. It is also applicable on internet type control.
- * Receiver internal circuits are completely modularized, including: receiving RF module, decoding module, relay module, proportional output module, LCD display module and power module. It is easy for users to replace and extend.
- * The LCD display module shows the current receiver status, including the individual relay output, proportional output, receiving signal strength, error messages...etc.
- * Maximum number of joysticks and pushbuttons on each transmitter:
 - a. 2 double axes joysticks plus 16 single speed pushbuttons
 - b. 8 single axis joysticks plus 12 single speed pushbuttons
 - c. If there is no joystick on the transmitter, maximum 32 single speed pushbuttons can be installed on each transmitter.
- * Relay and proportional output:
 - a. Maximum 32 relays for each receiver. 8pcs relays on each relay interface card, maximum 4 relay interface cards.
 - b. Proportional output interface cards available:
 - Standard: By voltage/current: 0~+5V, 0~+10V, 0~±5V, 0~±10V, 4~20mA, 0~20mA & 0~24mA
 - Customized: Customized proportional output interface card (optional).
- * All Alpha 6000 function setting and selection can be done via the Alpha 6000 software.

2. SAFETY INSTRUCTIONS

The Alpha 6000 system is relatively simple to use. However, it is very important to observe the proper safety procedures before, during, and after operation. When using properly the Alpha 6000 systems will enhance productivity and efficiency in the workplace.

The following instructions should be strictly followed:

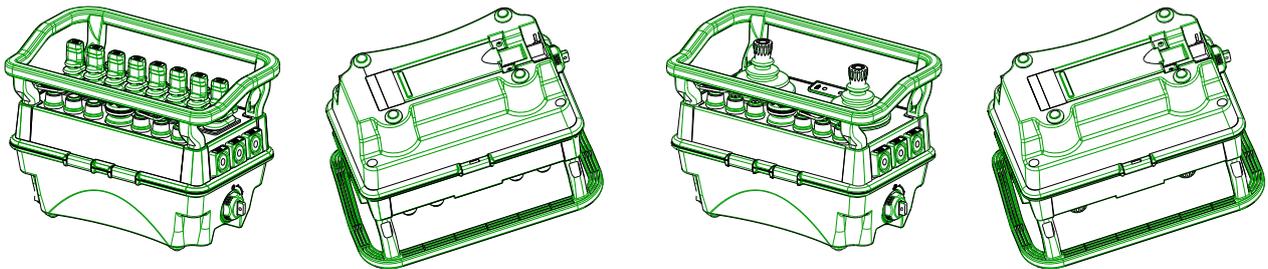
1. Make a daily check of the transmitter casing, joysticks and pushbuttons. Should it appear that anything could inhibit the proper operation of the transmitter unit, it should be immediately removed from service.
2. The transmitter voltage should be checked on a daily basis. If the voltage is low, the battery pack should be recharged or replaced (refer to page 45 for battery power status LED display).
3. The emergency stop button (EMS) should be checked at the beginning of each shift to ensure they are in the proper working order.
4. In the event of an emergency, activate the emergency stop button immediately by pressing the red EMS button down. This will immediately disconnect the transmitter power and receiver MAIN relays. Then turn the power “off” from the main power source of the equipment.
5. The transmitter power key, which is located on the right side of the transmitter box, should be turned “off” after each use and should never leave the power key in “on” position when the unit is unattended.
6. Do not use the same frequency channel and ID code as any other unit in use at the same facility or within distance of 300 meters to avoid interference.
7. Ensure the waist belt and the shoulder strap is worn at all time during operation to avoid accidental damages to the transmitter box.
8. Never operate a crane or equipment with two (2) transmitter units at the same time with same frequency channel and ID code.
9. Please ask the professional technician for any repair or adjustment.

3. SYSTEM DESCRIPTIONS

3.1 Transmitter Outline

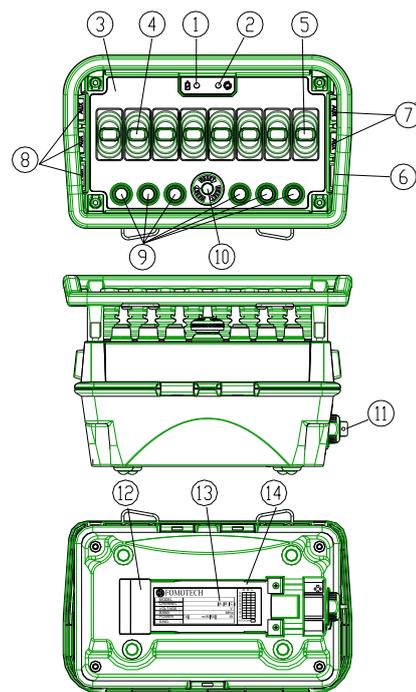
3.1.1 Transmitter External Descriptions

268mm × 162mm × 178.5mm



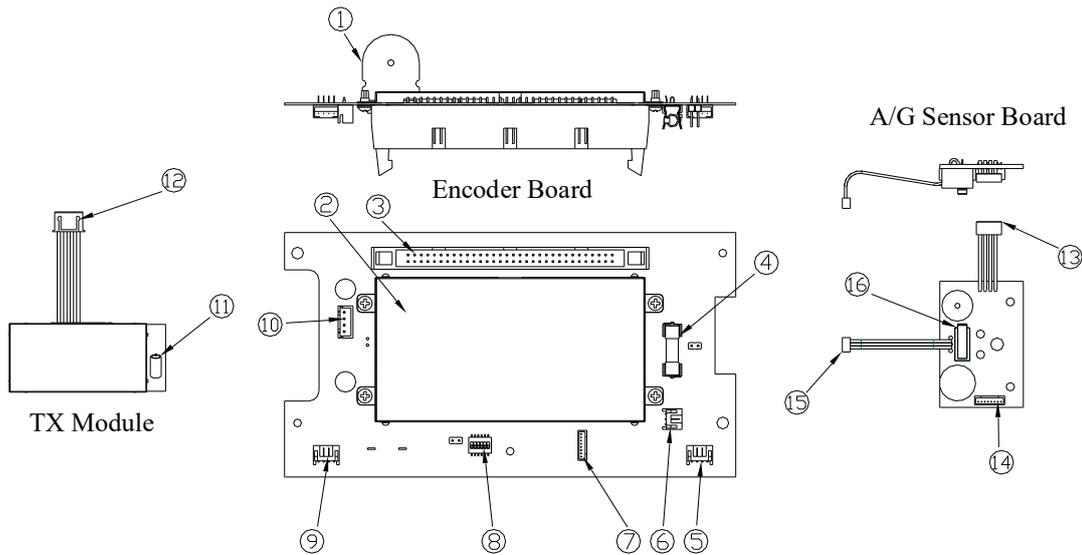
(Fig. 1) Transmitter Top & Bottom View

1. Battery Power LED Display
2. Status LED Display
3. Information Top Plate (engraved)
4. Joystick Rubber Boot
5. Joystick Rubber Boot
6. START Pushbutton
7. AUX/RES Pushbutton (side panel)
8. AUX/RES Pushbutton (side panel)
9. AUX/RES Pushbutton (top panel)
10. Emergency Stop Button (EMS)
11. Power Key (detachable)
12. Battery Contact (gold-plated)
13. System Information
14. Battery Slot



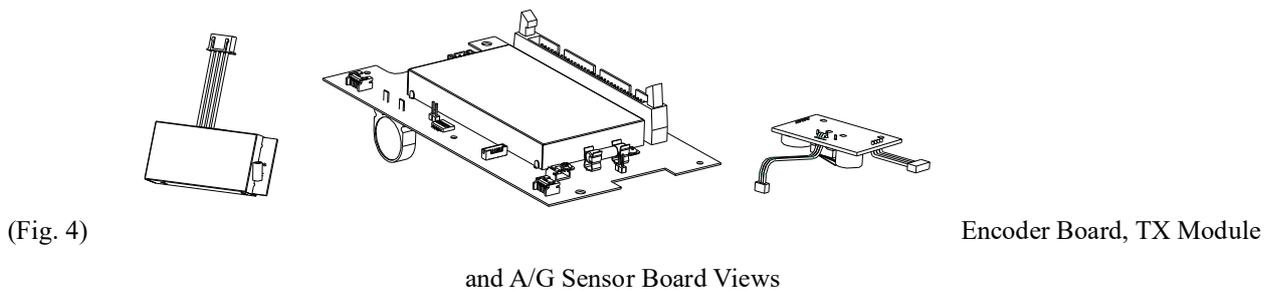
(Fig. 2) Transmitter Exterior Views

3.1.2 Transmitter Internal Descriptions



(Fig. 3) TX Module, Encoder Board and A/G Sensor Board Views

- | | |
|--|--|
| 1. Buzzer | 9. TX Module Connector Dip-Switch |
| 2. Encoder Anti-Magnetic Shielding Plate | 10. Power Input Connector Port |
| 3. Ribbon Type Connector Port | 11. Antenna Port |
| 4. Power Fuse (0.5A) | 12. TX module Connector |
| 5. A/G Sensor Ribbon Type Connector Port | 13. A/G Sensor Ribbon Type Connector |
| 6. Power Key Switch Connector Port | 14. External Programming Port |
| 7. External Programming Port | 15. Power Key Switch Ribbon Type Connector |
| 8. Function Setting Dip-Switch (incl. joystick correction) | 16. Power Key Switch |

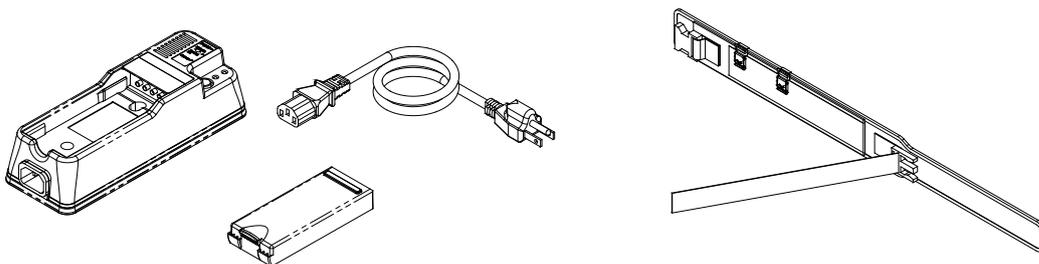


(Fig. 4)

Encoder Board, TX Module

and A/G Sensor Board Views

3.1.3 Rechargeable Battery, Battery Charger and Shoulder Belt Views



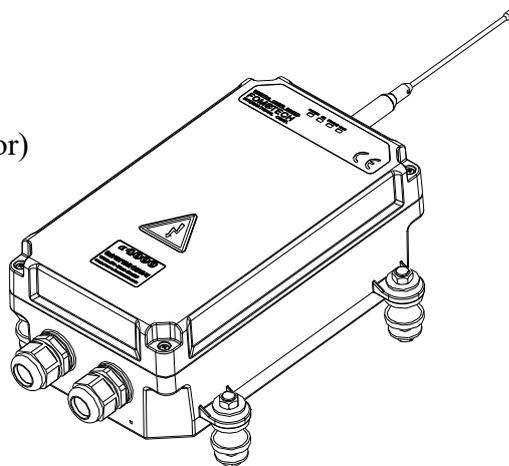
(Fig. 5) Rechargeable battery、Battery Charger、Shoulder Belt Views

3.2 Receiver Outline

3.2.1 Receiver External Descriptions

300mm×171mm×115mm

(excluding antenna and plug-in connector)



(Fig. 6) Receiver External Descriptions

3.2.2 Receiver Internal Descriptions

1. Antenna
2. Antenna Port
3. AC Power Display
4. SQ Status Display
5. Status Display
6. Main Relay Display
7. System Information Plate
8. Shock Absorber*4
9. Cable Gland*2
10. RX Module Card
11. Output relay Card I
12. Output relay Card II
13. Output relay Card III
14. Output relay Card IV
15. Decoder Module Card
16. LCD Display
17. Proportional Output Module Card
18. Power Module Card

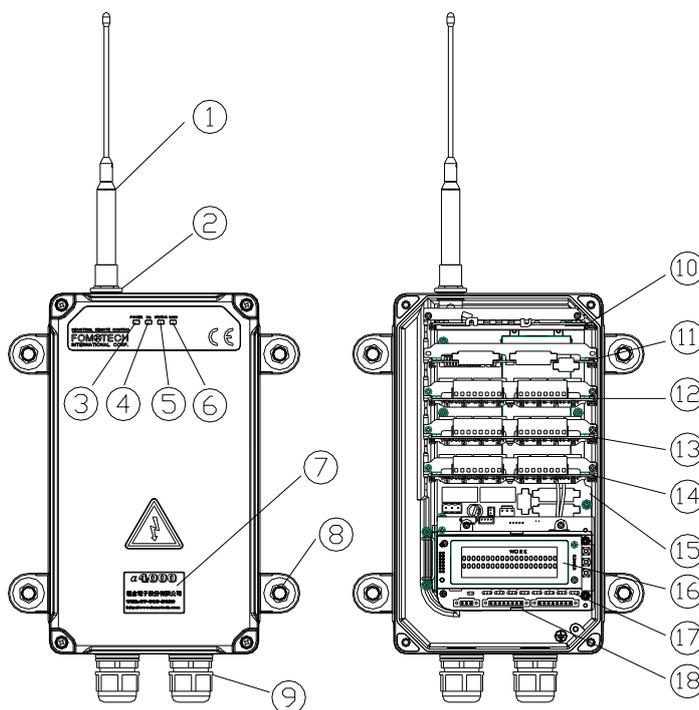
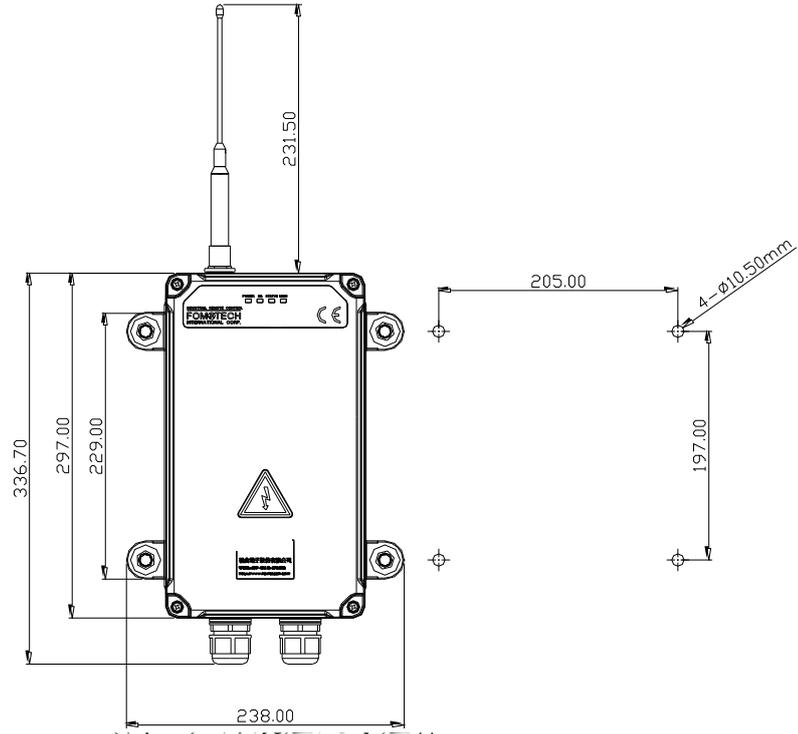
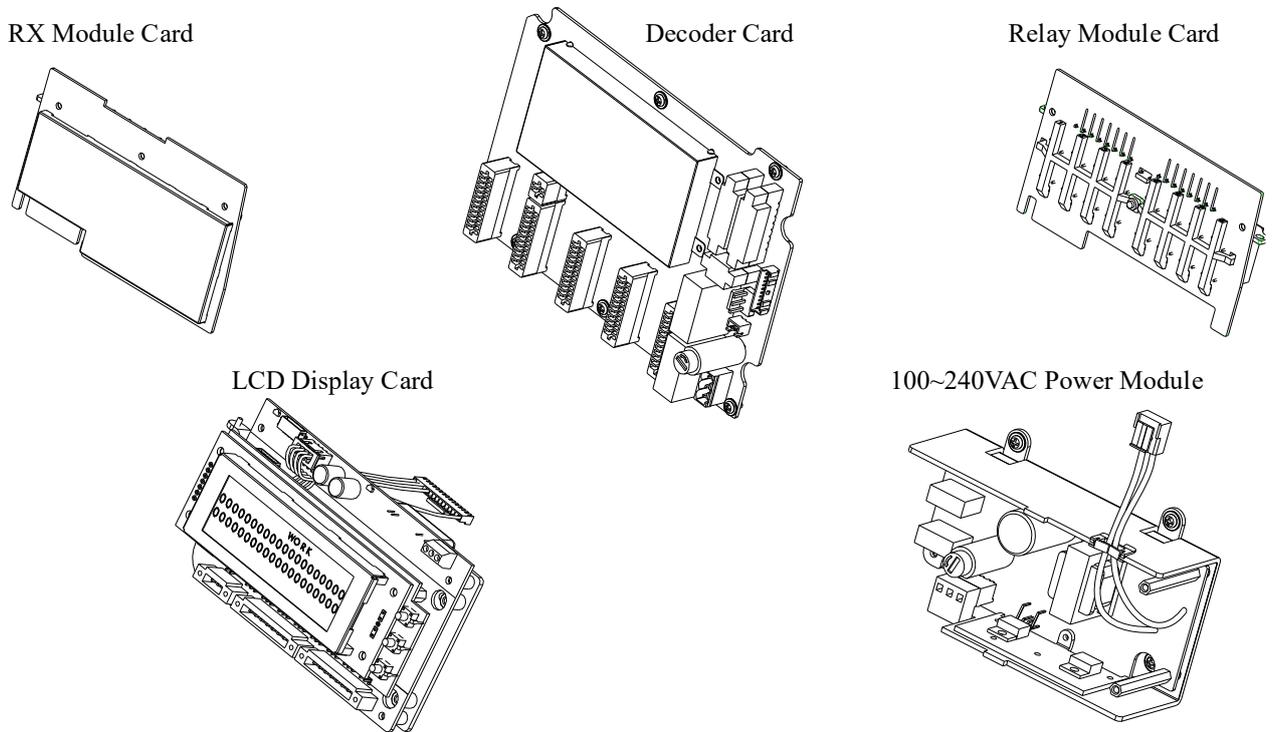


Fig. 7) Receiver External/Internal Descriptions

3.2.3 Receiver Mounting Dimension

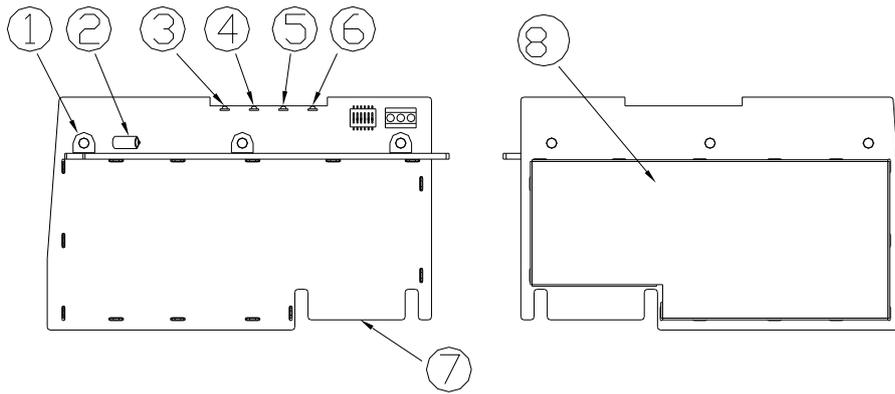


3.2.4 Cards Inside The Receiver



(Fig. 8) Cards inside the receiver

(1) RX Module Card

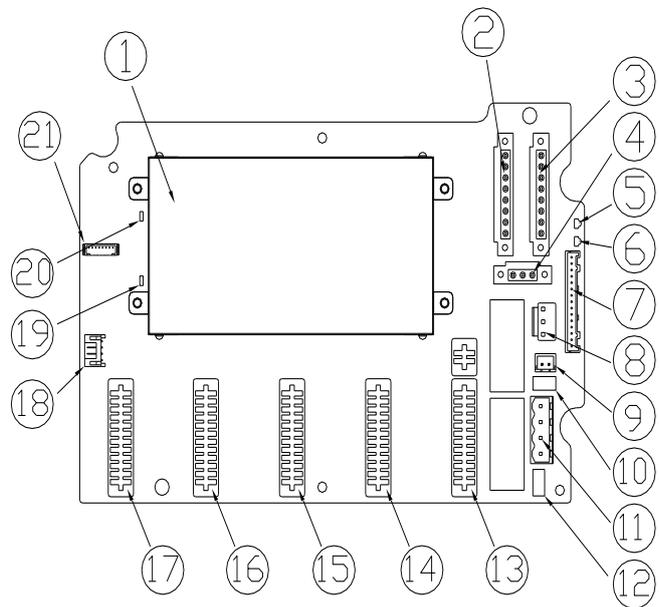


(Fig. 9) RX Module Card

- | | |
|-----------------------------------|---------------------------------|
| 1. RX Module Card Release Clip | 6. Receiver Power LED Display |
| 2. RX-1 Antenna Port | 7. RX Module Golden Finger Slot |
| 3 Receiver MAIN Relay LED Display | 8. RX Module Anti-Magnetic |
| 4. Receiver Status LED Display | |
| 5. Receiver SQ Status LED Display | |

(2) Decoder Card

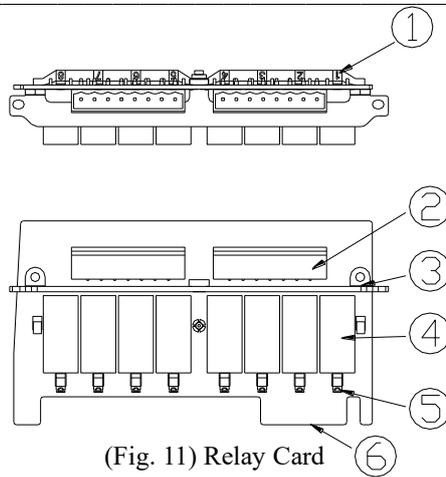
1. Decoder Card Anti-magnetic Shielding Plate
2. SICK LASER Input Contact CN13
3. SICK LASER Input Contact CN14
4. SICK LASER Contact Power
5. Relay Power(COM) LED Display
6. MAIN Relay Status LED Display
7. "Proportional Output Module" Connecting Port
8. DC12V Power Input
9. Spare DC12V Power Output
10. MAIN Relay 1 Fuse F3 250V/5A
11. MAIN Relay Contact
12. MAIN Relay 2 Fuse F5 250V/5A
13. Relay Module Card Golden Finger Slot IV(K25~K32)
14. Relay Module Card Golden Finger Slot III(K17~K24)
15. Relay Module Card Golden Finger Slot II(K09~K16)
16. Relay Module Card Golden Finger Slot I (K01~K08)
17. RX Module Golden Finger Slot
18. External Extension Contact
19. Decoder Card Power LED Display
20. Status LED Display
21. Programming Port



(Fig. 10) Decoder Card

(3) Relay Card

1. Relay LED Display Pole
2. Relay Output Contact Connector Port
3. Relay Fixing Frame
4. Relay
5. Relay LED Display
6. Relay Card Golden Finger Slot

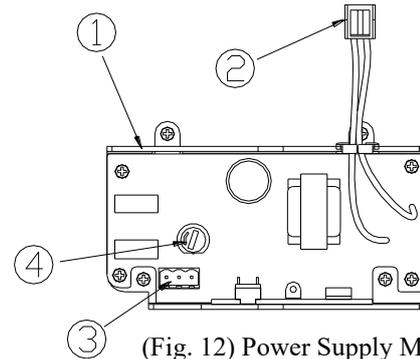


(Fig. 11) Relay Card

(4) Power Supply Module

1. Aluminum Base for Power Supply Card
2. Power DC12V/2A Output Connector
3. Power Input Connector
4. Fuse Holder
5. Input Fuse: 3A (100-240VAC)
5A (48VAC)

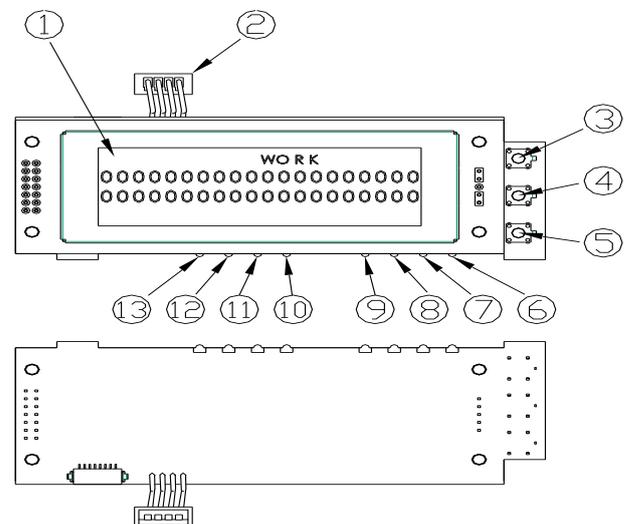
Power supply module	Fuse
AC100~240V	3A fast acting glass tube fuse
AC380~460V	3A tube fuse (with terminal/fast acting type)
AC28~48V	5A fast acting glass tube fuse
DC12~24V	5A fast acting glass tube fuse



(Fig. 12) Power Supply Module

(5) LCD Display

1. LCD Screen
2. Input / Output connecting Port
3. Pushbutton 1
4. Pushbutton 2
5. Pushbutton 3
6. Joystick 8/VR8 Output Status LED
7. Joystick 7/VR7 Output Status LED
8. Joystick 6/VR6 Output Status LED
9. Joystick 5/VR5 Output Status LED
10. Joystick 4/VR4 Output Status LED
11. Joystick 3/VR3 Output Status LED
12. Joystick 2/VR2 Output Status LED
13. Joystick 1/VR1 Output Status LED

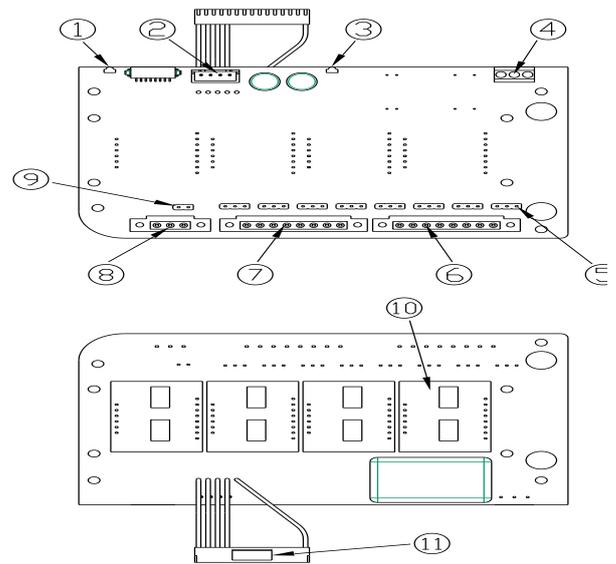


(Fig. 13) LCD Display

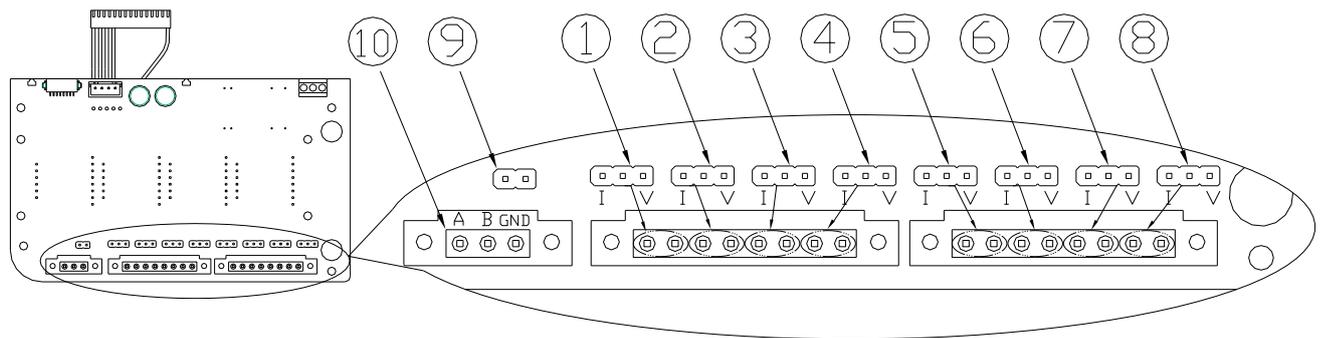
Joystick 1/VR1 ~ joystick 8/VR8 output status LED: Each joystick/VR is equipped with one red/green dual color output status LED. Both red and green status LED will not ON when there is no output from joystick. When the joystick output does not reach to the highest point, green status LED blinks. The lower the joystick output, the slower the green LED blinks. The higher the joystick output, the faster the green LED blinks. When the output reaches to the highest point, green LED OFF and red LED steady ON.

(6) Voltage/Current Proportional Output Module

1. Status LED
2. " LCD Display" Connector
3. RESET Status LED
4. External Power Input
5. Joystick/VR Output Voltage & Current Setting JUMPER
6. Joystick 5/VR5 ~ Joystick 8/VR8 Voltage & Current Output
7. Joystick 1/VR1 ~ Joystick 4/VR4 Voltage & Current output
8. RS485 Output Interface (optional)
9. RS485 Terminal Resistance Setting JUMPER
10. Proportional Output Module Card
11. Output Module to Decoder Card Connecting Port



(Fig. 14) Voltage/current proportional output module



- ① ~ ⑧ Corresponding joystick 1/VR1 ~ joystick 8/VR8

* Plug short pin into the 3-pin JUMPER left ("I" mark): Select "current" output and plug short pin into the 3-pin JUMPER right ("V" mark): Select "voltage" output ◦

Current output: Software setting(0~20mA、0~24mA & 4~20mA available) and plug the short pin into the 3-pin JUMPER left.("I" mark)

Voltage output: Software setting (0~+5V、0~+10V、0~±5V & 0~±10V available) and plug the short pin into the 3-pin JUMPER right.("V" mark)

* Each joystick/VR corresponds to the 2-pin output terminal. Left terminal is for voltage/current output and right terminal is for GND.

- ⑨ RS485 output terminal with 150Ω resistance. Plug in short pin: Use terminal resistance; not using short pin: Not using terminal resistance.
- ⑩ RS485 output

4. SYSTEM FUNCTIONS

4.1 Transmitter Joystick Descriptions

Joystick types can be customized by the demand per different customer. The available ones are described as below:

JOYSTICK TYPE	DESCRIPTION
Proportional joystick	<p>Double axes joystick Neutral angle range $0^{\circ} \pm 5^{\circ}$, max. motion angle $\pm 40^{\circ}$ Joystick Up/Left axis $+6^{\circ} \sim +40^{\circ}$ for $0 \sim +\text{MAX}$ proportional output. (127 steps resolution) Joystick Down/Right axis $-6^{\circ} \sim -40^{\circ}$ for $0 \sim +\text{MAX}$ or $0 \sim -\text{MAX}$ proportional output. (127 steps resolution)</p> <p>Single axis joystick Neutral angle range $0^{\circ} \pm 3^{\circ}$, max. motion angle $\pm 35^{\circ}$ Joystick Up axis $+4^{\circ} \sim +35^{\circ}$ for $0 \sim +\text{MAX}$ proportional output. (127 steps resolution) Joystick Down axis $-4^{\circ} \sim -35^{\circ}$ for $0 \sim +\text{MAX}$ or $0 \sim -\text{MAX}$ proportional output. (127 steps resolution)</p> <p>* Move joystick to any angle and release, joystick will auto return to neutral position. * Back to zero checking after transmitter joystick startup.</p>
Single-side type VR(#)	<p>* 0° on the start position of the rotary switch left. Rotating clock-wisely $0^{\circ} \sim 240^{\circ}$ for $0 \sim +\text{MAX}$ proportional output (255 steps resolution) * Rotate switch to any angle and release, rotary switch will remain at that angle and will not auto return to 0°. * Pre-set transmitter startup as not having back to zero check. * Proportional output available: Interface card with voltage/current proportional output: $0 \sim +5\text{V} / 0 \sim +10\text{V} / 4 \sim 20\text{mA} / 0 \sim 20\text{mA} / 0 \sim 24\text{mA}$ (not-selectable: $0 \sim \pm 5\text{VDC} / 0 \sim \pm 10\text{VDC}$)</p>
Neutral type VR	<p>* 0° as the rotating central position. Clockwise $0^{\circ} \sim +120^{\circ}$, counterclockwise $0^{\circ} \sim -120^{\circ}$. * $0^{\circ} \sim +120^{\circ}$, rotating range for $0 \sim +\text{MAX}$ proportional output. (127 steps resolution) * $0^{\circ} \sim -120^{\circ}$, rotating range for $0 \sim +\text{MAX}$ or $0 \sim -\text{MAX}$ proportional output. (127 steps resolution) * Rotate switch to any angle and release, rotary switch will remain at that angle and will not auto return to 0°. * Pre-set transmitter startup as not having back to zero check. * Proportional output available: By voltage/current: $0 \sim +5\text{V}, 0 \sim +10\text{V}, 0 \sim \pm 5\text{V}, 0 \sim \pm 10\text{V}, 4 \sim 20\text{mA}, 0 \sim 20\text{mA} \& 0 \sim 24\text{mA}$. * To use output not within $0 \sim \pm 5\text{VDC} / 0 \sim \pm 10\text{VDC}$, axis relay 2pcs is needed. 1. When VR is at 0°, 2 axis relays are OFF. 2. When VR is at 0°, rotate it clockwise. Upper axis relay is ON; Lower axis relay is OFF. 3. When VR is at 0°, rotate it counter-clockwise. Upper axis relay is OFF; Lower axis relay is ON.</p>

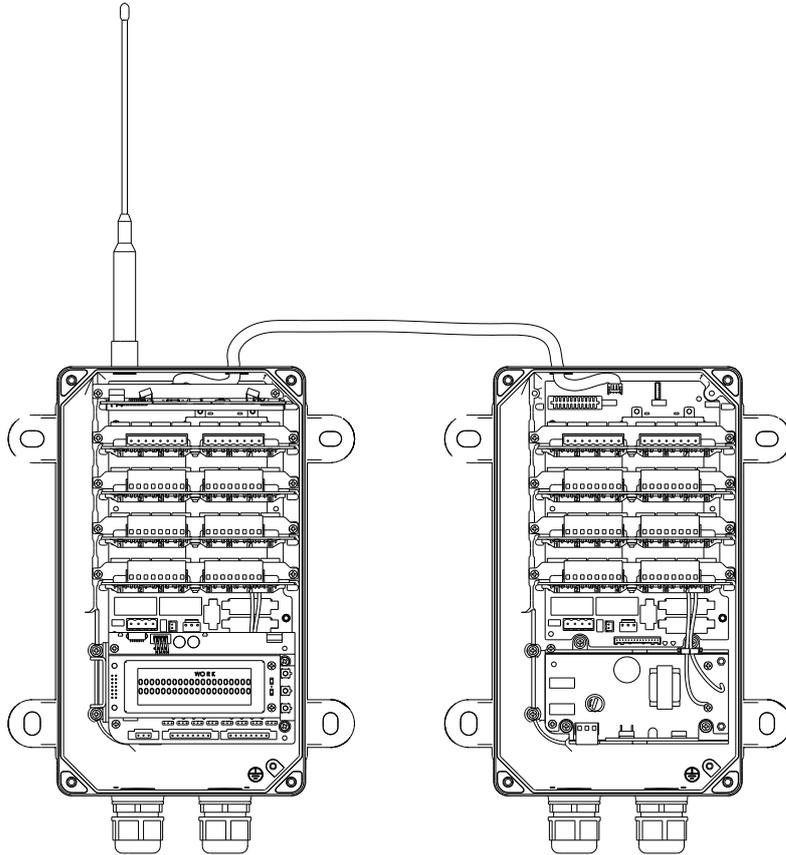
1-speed joystick	<p>* Joystick back to zero check after transmitter startup</p> <table border="1" data-bbox="424 163 1099 376"> <thead> <tr> <th></th> <th>Neutral relay (optional)</th> <th>Up 1-speed relay</th> <th>Down 1-speed relay</th> </tr> </thead> <tbody> <tr> <td>Joystick neutral</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Joystick Up 1-speed</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>Joystick Down 1-speed</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> </tbody> </table>		Neutral relay (optional)	Up 1-speed relay	Down 1-speed relay	Joystick neutral	ON	OFF	OFF	Joystick Up 1-speed	OFF	ON	OFF	Joystick Down 1-speed	OFF	OFF	ON																																																						
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Joystick neutral	ON	OFF	OFF	OFF	OFF																																																																		
Joystick Up 1-speed	OFF	ON	OFF	OFF	OFF																																																																		
Joystick Up 2-speed	OFF	ON	ON	OFF	OFF																																																																		
Joystick Down 1-speed	OFF	OFF	OFF	ON	OFF																																																																		
Joystick Down 2-speed	OFF	OFF	OFF	ON	ON																																																																		
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5-speed joystick (2nd, 3rd, 4th & 5th speed share the same relay)	* Joystick back to zero check after transmitter startup							
		Neutral relay (optional)	Upper relay	Lower relay	2-speed relay	3-speed relay	4-speed relay	5-speed relay
	Joystick neutral	ON	OFF	OFF	OFF	OFF	OFF	OFF
	Joystick Up 1-speed	OFF	ON	OFF	OFF	OFF	OFF	OFF
	Joystick Up 2-speed	OFF	ON	OFF	ON	OFF	OFF	OFF
	Joystick Up 3-speed	OFF	ON	OFF	ON	ON	OFF	OFF
	Joystick Up 4-speed	OFF	ON	OFF	ON	ON	ON	OFF
	Joystick Up 5-speed	OFF	ON	OFF	ON	ON	ON	ON
	Joystick Down 1-speed	OFF	OFF	ON	OFF	OFF	OFF	OFF
	Joystick Down 2-speed	OFF	OFF	ON	ON	OFF	OFF	OFF
	Joystick Down 3-speed	OFF	OFF	ON	ON	ON	OFF	OFF
	Joystick Down 4-speed	OFF	OFF	ON	ON	ON	ON	OFF
Joystick Down 5-speed	OFF	OFF	ON	ON	ON	ON	ON	
Outer extension, 1-speed joystick	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 1-speed joystick.							
Outer extension, 2-speed joystick (Not to share the 2nd speed relay)	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 2-speed joystick. (not share the 2nd speed relay)							
Outer extension, 2-speed joystick (Not to share the 2nd speed relay. 1st & 2nd speed relays do not activate at the same time)	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 2-speed joystick. (Not share the 2nd speed relay. 1st & 2nd speed relays do not activate at the same time)							
Outer extension, 3-speed joystick (2nd & 3rd speed share the same relay)	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 3-speed joystick. (2nd & 3rd speed share the same relay)							
Outer extension, 4-speed joystick (2nd, 3rd & 4th speed share the same relay)	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 4-speed joystick. (2nd, 3rd & 4th speed share the same relay)							
Outer extension, 5-speed joystick (2nd, 3rd, 4th & 5th speed share the same relay)	Not included in the receiver 32pcs relays. The maximum number of outer extensive relay is 32. Same function as 5-speed joystick. (2nd, 3rd, 4th & 5th speed share the same relay)							

(#) VR = Variable Resistor
 By using a 4-cord cable, you may connect the main receiver (left) and the extension one (right) as shown on below figure.

Please refer to “18. External Extension Contact”
of figure 10 (Decoder Card) on page 10 for the position of connecting port.

Maximum number of relay for
extension receiver is 32pcs.



Please note that the extension receiver is for external extension only, not for main receiver.

JOYSTICK FUNCTION	REQUEST	DESCRIPTION
<p>0~±10V 0~±5V</p>	<p>* Installation: Interface card is needed for voltage/current proportional output. Please make sure the JUMPER in front of the output PORT is plugged in the 'V' mark position.</p> <p>* Availability: All are available except for the digital joysticks.</p>	<p><i>Double axes proportional joystick:</i></p> <ul style="list-style-type: none"> * Neutral position as 0°, output 0V. * Joystick Upper/Left axis 0° ~ +40° for 0 ~ +10V / 0~+5V proportional output. (127 steps resolution) * Joystick Lower/Right axis 0° ~ -40° for 0 ~ -10V / 0~-5V proportional output. (127 steps resolution) <p><i>Single axis proportional joystick:</i></p> <ul style="list-style-type: none"> * Neutral position as 0°, output 0V. * Joystick Upper axis 0° ~ +35° for 0 ~ +10V / 0 ~ +5V proportional output. (127 steps resolution) * Joystick Lower axis 0° ~ -35° for 0 ~ -10V / 0 ~ -5V proportional output. (127 steps resolution) <p><i>Neutral type VR:</i></p> <ul style="list-style-type: none"> * 0° as the rotating central position. Output 0V. * Clockwise 0° ~ +120° for 0~+10V / 0~+5V proportional output. (127 steps resolution) * Counterclockwise 0° ~ -120° for 0~-10V / 0~-5V proportional output. (127 steps resolution)
<p>0~+10V 0~+5V</p>	<p>* Installation: Interface card is needed for voltage/current proportional output. Please make sure the JUMPER in front of the output PORT is plugged in the 'V' mark position.</p> <p>* Availability: All are available except for the digital joysticks.</p>	<p><i>Double axes proportional joystick:</i></p> <ul style="list-style-type: none"> * Neutral position, output 0V. Upper and Lower axis relays are OFF. * Joystick Upper/Left axis 0° ~ +40° for 0~+10V / 0~+5V proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF. * Joystick Lower/Right axis 0° ~ -40° for 0~+10V / 0~+5V proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON. <p><i>Single axis proportional joystick:</i></p> <ul style="list-style-type: none"> * Neutral position, output 0V. Upper and Lower axis relays are OFF. * Joystick Upper axis 0° ~ +35° for 0~+10V / 0~+5V proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF. * Joystick Lower axis 0° ~ -35° for 0~+10V / 0~+5V proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON. <p><i>Neutral type VR:</i></p> <ul style="list-style-type: none"> * 0° as the rotating central position, output 0V. Upper and Lower axis relays are OFF. * Clockwise 0° ~ +120° for 0~+10V / 0~+5V proportional output. (127 steps resolution)

		<p>Upper axis relay is ON, Lower axis relay is OFF.</p> <p>* Counterclockwise 0° ~ -120° for 0~-10V / 0~-5V proportional output. (127 steps resolution)</p> <p>Upper axis relay is OFF, Lower axis relay is ON.</p> <p>Single type VR:</p> <p>* 0° as the rotating central position, output 0V.</p> <p>* Clockwise 0° ~ +240° for 0~+10V / 0~+5V proportional output. (255 steps resolution)</p>
<p>0~20mA 0~24mA</p>	<p>* Installation: Interface card is needed for voltage/current proportional output. Please make sure the JUMPER in front of the output PORT is plugged in the 'I' mark position.</p> <p>* Availability: All are available except for the digital joysticks.</p>	<p>Double axes proportional joystick:</p> <p>* Neutral position, output 0mA. Upper and Lower axis relays are OFF.</p> <p>* Joystick Upper/Left axis 0° ~ +40° for 0~20mA / 0~24mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF.</p> <p>* Joystick Lower/Right axis 0° ~ -40° for 0~20mA / 0~24mA proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON.</p> <p>Single axis proportional joystick:</p> <p>* Neutral position, output 0mA. Upper and Lower axis relays are OFF.</p> <p>* Joystick Upper axis 0° ~ +35° for 0~20mA / 0~24mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF.</p> <p>* Joystick Lower axis 0° ~ -35° for 0~20mA / 0~24mA proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON.</p> <p>Neutral type VR:</p> <p>* 0° as the rotating central position, output 0mA. Upper and Lower axis relays are OFF.</p> <p>* Clockwise 0° ~ +120° for 0~20mA / 0~24mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF.</p> <p>* Counterclockwise 0° ~ -120° for 0~20mA / 0~-5V proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON.</p> <p>Single type VR:</p> <p>* 0° in the left start position within rotating range. Output 0mA.</p> <p>* Clockwise 0° ~ +240° for 0~20mA / 0~24mA proportional output. (255 steps resolution)</p>
<p>4~20mA</p>	<p>* Installation: Interface card for voltage/current proportional output. Please make sure the JUMPER in front of the output PORT is plugged</p>	<p>Double axes proportional joystick:</p> <p>* Neutral position, output 4mA. Upper and Lower axis relays are OFF.</p> <p>* Joystick Upper/Left axis 0° ~ +40° for 4~20mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF.</p> <p>* Joystick Lower/Right axis 0° ~ -40° for 4~20mA proportional output. (127 steps resolution)</p>

	<p>in the I mark position.</p> <p>* Availability: All are available except for the digital joystick.</p>	<p>Upper axis relay is OFF, Lower axis relay is ON.</p> <p>Single axis proportional joystick:</p> <ul style="list-style-type: none"> * Neutral position, output 4mA. Upper and Lower axis relays are OFF. * Joystick Upper axis 0° ~ +35° for 4~20mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF. * Joystick Lower axis 0° ~ -35° for 4~20mA proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON. <p>Neutral type VR:</p> <ul style="list-style-type: none"> * 0° as the rotating central position, output 4mA. Upper and Lower axis relays are OFF. * Clockwise 0° ~ +120° for 4~20mA proportional output. (127 steps resolution) Upper axis relay is ON, Lower axis relay is OFF. * Counterclockwise 0° ~ -120° for 4~20mA proportional output. (127 steps resolution) Upper axis relay is OFF, Lower axis relay is ON. <p>Single type VR:</p> <ul style="list-style-type: none"> * 0° as the left start position within the rotating range, output 4mA. * Clockwise 0° ~ +240° for 4~20mA proportional output. (255 steps resolution)
Customized (optional) proportional output card	* Base on customers' requests	Base on customers' requests
Neutral check	<ul style="list-style-type: none"> * Digital / Proportional is compelled to have neutral check * Selectable at VR 	When transmitter is ON, the joystick / VR has to be checked at neutral/0° position, then transmitter can be started. If not, the error status light will be displayed as "pushbutton jammed / joystick is not at neutral position" (Please refer to encoder status table.) and the transmitter cannot be started.
Plus/Minus (+/-)voltage exchange	<ul style="list-style-type: none"> * Only for proportional joystick or neutral type * Select 0~±5V or 0~±10V 	<p>Plus(+) / Minus(-) output reverse</p> <p>Example: Original => -5V(Lower axis)~ 0V(Neutral) ~(Upper axis)+5V Select this function => +5V(Lower axis)~0V(Neutral)~(Upper axis) -5V</p>
Axis relay	<ul style="list-style-type: none"> * Both single-side type VR and digital joystick are not selectable. (digital joystick is available with axis relay) 	<ul style="list-style-type: none"> * There are 2pcs of relay for Axis relay. One is Upper/Left axis, the other is Lower/Right axis. * Joystick is in neutral position or when neutral type VR is at 0° position, 2-axis relays are OFF. * Joystick Upper/Left axis or neutral VR operated clockwise: Upper/Left axis relay is ON, Lower/Right axis relay is OFF. * Joystick Lower/Right axis or neutral VR operated counter-clockwise: Upper/Left axis relay is OFF, Lower/Right axis relay is ON.

		<p>* The proportional output voltage/current can be wired to Upper/Lower axis relay at the same time. So when the joystick is operated, the proportional output voltage/current will output via the corresponding axis relay.</p>
<p>Smooth output for unexpected acceleration</p>	<p>* Both joystick & VR are selectable</p> <p>* Each joystick or VR can be selected respectively or not to select.</p> <p>* All the joysticks which activate the smooth output share the setting time.</p>	<p>* For example: joystick with proportional output 0~5V, smooth output time 3 seconds.</p> <p>Operate joystick from neutral to the biggest angle swiftly and stop. The output increases linearly from 0V, then gradually to 5V at the 3rd second and stops at 5V.</p> <p>* Time needed from the lowest to the highest output.</p> <p>* Range selectable 1.5 - 5 seconds.</p>
<p>Joystick neutral relay</p>	<p>* Both joystick & VR are selectable</p>	<p>* Neutral position ON</p> <ol style="list-style-type: none"> 1. Joystick: When it is in the neutral position, neutral relay ON; when it is not in the neutral position, neutral relay OFF. 2. Neutral type VR: Within neutral position of rotating range, neutral relay ON; Out of neutral position of rotating range, neutral relay OFF. <p>* Neutral position OFF (reverse function to neutral position ON)</p> <ol style="list-style-type: none"> 1. Joystick: When it is in the neutral position, neutral relay OFF; when it is not in the neutral position, neutral relay ON. 2. Neutral type VR: Within neutral position of rotating range, neutral relay OFF; Out of neutral position of rotating range, neutral relay ON. 3. Single type VR: When the VR is in the left START position, neutral relay OFF; when VR is not in the left START position, proportional output activated and neutral relay ON.
<p>Joystick direction Up/Down or Left / Right exchange</p>	<p>* For digital joystick, proportional joystick and neutral type VR.</p>	<p>* Joystick Up axis is changed to Down axis and Down axis is changed to Up axis.</p> <p>* Joystick Left axis is changed to Right axis and Right axis is changed to Left axis.</p> <p>* Neutral type VR: The clockwise output is changed to counterclockwise output and counterclockwise output is changed to clockwise output.</p> <p><i>Remark: When the right cross type lever of joystick is used, please enable software setting of up & down axis as "Joystick [up and down] or [left and right] direction swap" to make the operating direction of up & down correct.</i></p>
<p>Activate the shared accelerator relay</p>	<p>* Both joystick & VR are selectable</p>	<p>* The selected joystick or VR share the same relay which is called shared accelerator relay.</p> <p>* On: 1. Either the selected joystick or VR is not in the neutral/0° position (with output) and the joystick with shared accelerator is ON.</p> <p>2. The selected joystick or VR is back to the neutral/0° position and the joystick with shared accelerator is OFF.</p> <p>* Off: 1. Either the selected joystick or VR is not in the neutral/0° position (with output) and the joystick with shared accelerator is OFF.</p> <p>2. The selected joystick or VR is back to the neutral/0°</p>

		position and the joystick with shared accelerator is ON.
Opposite side protection of joystick spring return	<ul style="list-style-type: none"> * For digital and proportional joysticks only. * For cross type joystick, not for small single axis joystick. 	<ul style="list-style-type: none"> * When the joystick is back to neutral position, if the spring inertia is too strong, the joystick will spring back to the opposite position. With this function, the opposite relay output will be inhibited.
Select the 8th axis as the analog output with shared accelerator	<ul style="list-style-type: none"> * Digital joystick is not available with this function. * All the activated joysticks/VR with the same style. * Not to use the 8th joystick/VR (reserved for sharing the same accelerator output) 	<ul style="list-style-type: none"> * The 8th joystick & VR are reserved for shared accelerator output and cannot be used for general joystick. * The selected joystick or VR with the same highest output level “absolute value” (output without minus voltage) as joystick or VR with shared accelerator output. * The selected joystick or VR is back to the neutral /0° position. Joystick & VR with shared accelerator analog output will be back to the neutral/0° position output.
Particular joystick function (1 out of 8 joysticks is functioning)	<ul style="list-style-type: none"> * Either cross type joystick limit or particular joystick function is selectable. 	<ul style="list-style-type: none"> * Without considering “joystick/VR with shared accelerator analog output”, only 1 out of 8 joysticks with output. * This function is for “proportional output joystick” and “digital output joystick” only, VR excluded. * Detect joysticks 1~8 by following the sequence 1, 2, 3...8. Then the 1st functioning joystick (the joystick that first leaves the neutral position) with output, the rest without output. After “all joysticks (including the one without function)” are back to the neutral/0° position, output will also be back to the neutral/0° position. Then you may start to operate the joystick again.
Cross type joystick limit	<ul style="list-style-type: none"> * Joystick only. * Either particular joystick function or cross type joystick limit is selectable. * Only for each two joysticks 1-2, 3-4, 5-6 & 7-8. 	<ul style="list-style-type: none"> * Take 1-2 cross type joystick limit as an example: For Joystick 1 or 2, when either one leaves neutral position and with output, the other joystick shall not have any output. (If 1&2 joysticks leave neutral position at the same time, joystick 1 has the priority to have output.) When joystick 1&2 are back to neutral position, output will also be back to neutral position. Then you may start to operate the joystick again.
SICK LASER	<ul style="list-style-type: none"> * Single side VR is not selectable 	<ul style="list-style-type: none"> * SICK LASER “NORTH” is to limit the Up axis for the very north positioning. * SICK LASER “SOUTH” is to limit the Down axis for the very south positioning. * Joystick 1 is to CN13 1N(Up axis)/1S(Down) input detecting point. * Joystick 2 is to CN13 2N(Up axis)/2S(Down) input detecting point. * Joystick 3 is to CN13 3N(Up axis)/3S(Down) input detecting point. * Joystick 4 is to CN13 4N(Up axis)/4S(Down) input detecting point. * Joystick 5 is to CN14 5N(Up axis)/5S(Down) input detecting point. * Joystick 6 is to CN14 6N(Up axis)/6S(Down) input detecting point. * Joystick 7 is to CN14 7N(Up axis)/7S(Down) input detecting point. * Joystick 8 is to CN14 8N(Up axis)/8S(Down) input detecting point. * CN2 +0V supplies trigger purpose power level. <p>Example: With 0~±10V output, SENSORS are equipped at the North/South</p>

		<p>ends of the crane rail:</p> <p>When the crane does not reach the North SENSOR, the input detecting point that is sent from the SENSOR to CN13 1N will not be triggered; When the crane reaches the North SENSOR, the SENSOR will send input detecting point 0V to CN13 1N;</p> <p>When the crane does not reach the South SENSOR, the input detecting point that is sent from SENSOR to CN13 1S will not be triggered;</p> <p>When the crane reaches the South SENSOR, the SENSOR will send input detecting point 0V to CN13 1S.</p> <p>When joystick is operated to the Up axis position, the crane will go to North. Before crane reaches the North SENSOR, the detecting point of CN13 1N input will not be triggered. Depending on joystick Up axis angle 0~+10V output, crane will go North continuously.</p> <p>When crane reaches the North SENSOR, the detecting point of CN13 1N input will be 0V. The decoding firmware will limit the North output. That is, when joystick is operated to Up axis position, the output will be 0V and crane cannot go North anymore.</p> <p>When joystick is operated to the Down axis position, the crane will go South. Before crane reaches the South SENSOR, the detecting point of CN13 1S input will not be triggered. Depending on the joystick Down axis angle 0~-10V output, crane will go South continuously.</p> <p>When crane reaches the North SENSOR, the detecting point of CN13 1S input will be 0V. The decoding firmware will limit the South output. That is, when joystick is operated to Down axis position, the output will be 0V and crane cannot go South anymore.</p>
Selection of linear output curve: linear	* For proportional joystick and VR only	<ul style="list-style-type: none"> * The tilt percentage of input and output is fixed so output from neutral position to maximum value is a straight line. * Joystick & VR angle outputs correspond to this straight line.
Selection of linear output curve: curve	* For proportional joystick and VR only	<ul style="list-style-type: none"> * Forward/reverse parabola curves may be changed by dragging the mouse. * Joystick & VR angle outputs correspond to this curve.
Selection of linear output curve: logic	* For proportional joystick and VR only	<ul style="list-style-type: none"> * Output status is only available with neutral and highest level, no level in between. * When joystick operates/VR rotates to "certain angle", the output will be immediately changed from neutral to the highest point of the axis. * Certain angle: Changeable by dragging the mouse.
Non-symmetry	* For proportional joystick and	<ul style="list-style-type: none"> * Up/Down axis setting is independent.

neutral VR only
 * When “curve” or
 “logic” is selected

4.2 Transmitter Pushbutton Descriptions

4.2.1 Pushbutton Types:

Pushbutton Type	Not control by EMS button	Pushbutton share the same accelerator relay	Transmitter start without checking if pushbutton is locked	Function																																																																					
Single speed	Software selectable	Software selectable	Software selectable	* Without pressing pushbutton, relay OFF Press pushbutton, relay ON																																																																					
Double speed	“Press EMS and compel double speed relay open” is not selectable	Software selectable	Software selectable	* Without pressing pushbutton: 1-speed relay OFF , 2-speed relay OFF * Press pushbutton 1-speed: 1-speed relay ON , 2-speed relay OFF * Press pushbutton 2-speed: 1-speed relay ON , 2-speed relay ON																																																																					
Single speed in pairs, interlocked	Software selectable	Software selectable	Software selectable	* Two single-speed pushbuttons, each pushbutton has one relay. Two interlocked relays are not ON at the same time.																																																																					
Double speed in pairs, interlocked	“Press EMS and compel double speed relay open” is not selectable	Software selectable	Software selectable	<table border="1"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="2">PB 1</th> <th colspan="2">PB 2</th> </tr> <tr> <th>1-spд relay</th> <th>2-spд relay</th> <th>1-spд relay</th> <th>2-spд relay</th> </tr> </thead> <tbody> <tr> <th rowspan="2">PB 2</th> <th>PB 1</th> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>OFF</th> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <th>OFF</th> <th>1-spд</th> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <th>OFF</th> <th>2-spд</th> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <th>1-spд</th> <th>OFF</th> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <th>1-spд</th> <th>1-spд</th> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <th>2-spд</th> <th>OFF</th> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <th>2-spд</th> <th>1-spд</th> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <th>1-spд</th> <th>2-spд</th> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <th>2-spд</th> <th>2-spд</th> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table>			PB 1		PB 2		1-spд relay	2-spд relay	1-spд relay	2-spд relay	PB 2	PB 1					OFF	OFF	OFF	OFF	OFF	OFF	1-spд	ON	OFF	OFF	OFF	OFF	2-spд	ON	ON	OFF	OFF	1-spд	OFF	OFF	OFF	ON	OFF	1-spд	1-spд	OFF	OFF	ON	OFF	2-spд	OFF	OFF	OFF	ON	ON	2-spд	1-spд	OFF	OFF	OFF	OFF	1-spд	2-spд	OFF	OFF	OFF	OFF	2-spд	2-spд	OFF	OFF	OFF	OFF
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Toggle switch. Press EMS button and MAIN relay remains activate	“EMS not to deactivate” is not selectable	“No function ”is not selectable	Software selectable	* Press button and relay become OFF to ON or ON to OFF. * Press EMS button or receiver receives no signal from transmitter, relay remains latched.
Toggle switch. Press EMS button and MAIN relay deactivates	“Press EMS and compel toggle switch relay open” is not selectable	“No function ”is not selectable	Software selectable	* Press button and relay become OFF to ON or ON to OFF. * Press EMS button or receiver receives no signal from transmitter, relay off.
2 nd EMS button	Software is not selectable	“No function ”is not selectable	“Compulsory check” is not selectable	* Receiver power ON, if no signal is received, 2 nd EMS relay will be OFF. * After transmitter is ON (no to press dual EMS button), relay ON. * Press dual EMS button relay OFF. * Not to press dual EMS button but press START button, relay ON.
Standard selector switch. Press EMS button and standard selector switch relay close	“EMS not to deactivate” is not selectable	“No function ”is not selectable	Pre-set as “No check” is selectable	* Switch ON, relay ON; switch OFF, relay OFF. * Press EMS button or receiver receives no signal from transmitter, standard selector switch relay off.
Standard selector switch. Press EMS and standard selector switch relay open	“Press EMS and compel standard selector switch relay open” is not selectable	“No function ”is not selectable	Pre-set as “No check” is selectable	* Switch ON, relay ON; switch OFF, relay OFF * Press EMS button or receiver receives no signal from transmitter, relay off.
Speed limit switch	“No function ”is not selectable	“No function ”is not selectable	“No check compelled” is not selectable	* Switch types selectable: 3-position or 3-stage rotary selector switch. * The joystick/VR output can be changed by the 3-stage limit switch * 1 st stage output 25%, 2 nd stage output 50% & 3 rd stage output 100%.
Mix mode selector switch	“No function ”is not selectable	“No function ”is not selectable	* 1 wire to 1 switch: software non-selectable, compel to check * 3 wires encoding type: software is not selectable, compel not to check	* Each stage of 2~8 stage selector switch may change function for CHANNEL, LID & EID. * Switch condition- 1 wire to 1 switch: 2-stage rotary selector switch to 2 wires, 3-stage to 3 wires..., 8-stage to 8 wires. * Switch condition- 3-wire encoding type, 8-stage: 3 wires to 8-stage rotary selector switch. Non-changeable. * Switch condition – change directly: The stage of rotary selector switch is changed, transmitter is set to the CHANNEL/LID/EID of that stage. * Switch condition- Re-start the power to change: The setting position of rotary selector switch is used after transmitter power is ON. No other stage of rotary selector switch can be used only after next time transmitter power is ON. * Switch condition- Press START to change: Press START and use the current CHANNEL/LID/EID setting on rotary selector switch. * Use channel selection to assign channel on each stage. * Select EID ENABLE then to either assign EID on each stage or set EID on pushbutton. * Select LID ENABLE then to either assign LID on each stage or set LID on pushbutton.
Group mode selection switch	“No function ”is not selectable	“No function ”is not selectable	“Compulsory check” is not selectable	* Stage available: 2~8-stage rotary selector switch (wiring: 1 wire to 1 stage) * Select relay of each stage from relay 1~8. * Different stage may assign the same relay repeatedly.
EID switch	“No function ”is not selectable	“No function ”is not selectable	“No check compelled” is not selectable	* Change transmitter EID b0~b3 * Switch ON, EID bit=1; switch OFF, EID bit=0. * Either mix mode selector switch or EID ENALE is selectable * Receiver with AUTOSCAN function select EID bit match or bit or function
LID switch	“No function ”is not selectable	“No function ”is not selectable	“No check compelled” is not selectable	* Change transmitter LID b0~b3 * Switch ON, LID bit=1; switch OFF, LID bit=0. * Only 1 out of 2 LID ENALE function is selectable for mix mode selector switch
Digital joystick 2~5 speeds activating button	“No function ”is not selectable	“No function ”is not selectable	“Pre-checking” is selectable	* Select the pushbutton so that the pushbutton may control the digital joystick. * When the pushbutton is not depressed, only 1-speed is activated even if the joystick is operated to 2~5 speeds. * Joystick 2~5 speeds only activated with relay output when the pushbutton is depressed without releasing. * Maximum 4pcs pushbuttons. * Pushbutton or auto-return toggle switch is acceptable. No corresponding relay output. * If the digital joystick is not controlled by this pushbutton, then the 2~5 speeds is not limited at 1 speed.

* EMS button: In case of an emergency, press down the red emergency stop button (EMS) will immediately deactivates the transmitter and receiver MAIN relay. This is the rotary return type.

After the emergency stop button is elevated, please refer to “Transmitter startup condition” on Page 28 to restart.

EN ISO 13849-1 type: Press emergency stop button and switch off the transmitter power immediately, then the transmitter will stop sending commands. After the receiver is not receiving any signal for 1 second, MAIN relay will be off.

Regular type: Press emergency stop button and the transmitter will be sending emergency stop command. As soon as the receiver receives stop command, the MAIN relay will be off. When the emergency stop button is pressed for more than 1.5 seconds, the transmitter power will be switched off automatically.

* START button: Press to start the system and activate the receiver MAIN relay at the same time

* KEY: Power switch

4.2.2 Function Settings:

* ID: Range 00000~FFFF (hex), length 20bit. Total 1,048,576 sets of unique ID codes. Each Alpha 6000 system with unique manufacturing ID setting. This will ensure that only commands from the matching control transmitter can be carried out without any interference from other radio systems.

Remark 1: ID with 4 lower digit b[3:0] is called LID

Remark 2: Transmitter with function "mix mode selector switch-LID function" or "LID switch" will replace the original LID.

Remark 3: Receiver with function "LID bit match" or "LID bit" from AUTOSCAN will replace the original LID.

* Channel: The channel in use assigned

Remark 1: transmitter with function "mix mode selector switch-channel in use function" or "intelligent channel change" will replace the original channel in use.

Remark 2: Receiver with channel assigned from AUTOSCAN will replace the original channel in use.

* Service number: Alpha 6000 manufacturing serial number, for after service purpose.

* Manufacturing date: manufacturing date

* Customer remark: 16 alphabets or numbers recordable

4.2.2.1 Transmitter Function Settings

* Transmitter startup condition:

- ⊙ Power key startup: Rotate the power key clockwise to “ON” position to turn on the transmitter power.
- ⊙ START button/press START to activate MAIN relay: Rotate the power key clockwise to “ON” position, then press START to turn on the transmitter power.

* Transmitter power on, EMS button press / release function compel to check

- ⊙ Not enable:
- ⊙ Enable: After transmitter power is turned on and before EMS button is not depressed, the status LED is displayed as: green LED ON_0.1sec, OFF_0.9sec blink. Depress EMS button and elevate it to re-start the transmitter. This is to ensure no function error on EMS button before operation.

Remark: After transmitter power is turned on, the status LED is displayed as “green LED ON_0.1sec,OFF_0.9sec blink”. It means transmitter power is turned on and EMS button press/release function is checked.

* Transmitter inactivity overtime and then enter sleep mode:

- ⊙ Immediate : No press down pushbutton and joystick back to neutral, the transmitter will enter sleep mode immediately.
- ⊙ 1~120mins : No press down pushbutton and joystick back to neutral, after 1~120mins (selectable)/ 5 minutes manufacture setting, the transmitter will enter sleep mode immediately.
- ⊙ No auto shutdown/never shutdown: Transmitter without sleeping mode.

Remark : Transmitter enter sleep mode- Status LED OFF, power green LED ON, RF module and A/G sensor module OFF, then enter power saving mode.

* After transmitter enter sleep mode, re-awakening condition:

- ⊙ Re-start: Power key -> OFF -> ON
- ⊙ Joystick /any pushbutton: Pushbutton is pressed or joystick/VR is operated/rotated or power key -> OFF -> ON
- ⊙ START button: Joystick is back to neutral position and release pushbutton. Press START button to awaken transmitter. (Press START button when joystick is not in neutral position or pushbutton is pressed, red status LED on and transmitter cannot be awakened)

* Abnormal buss from transmitter:

- ⊙ Not enable: Buzz from transmitter START/LV/joystick correction no need to enable.
- ⊙ Enable: Buzzer sound when transmitter error status LED is flash.

* Transmitting power

- ⊙ -2~+20 dbm: Default setting is based on the transmitting power where the area/country is regulated. For any changes, please note if the setting meet the requirement of area/country.

* Transmitter drop protection:

- ⊙ Not enable:
- ⊙ Enable: If transmitter drops during operation, transmitter will send emergency stop signal to receiver and MAIN relay will be OFF. (Transmitter should equip with A/G SENSOR module)
 - ⊙ Sensitivity -3 ~ +3 : Range of sensitivity adjustment for dropping detection. The sensitivity is pre-set as standard one.
 - ⊙ Shutoff transmitter power: When transmitter drops over the range of detective sensitivity, signal transmission from transmitter to receiver

will be shutoff. Buzzer and error status LED display will continue to warn the operator. MAIN relay will be deactivated after the receiver receives no signal from the transmitter.

Re-start the transmitter:

1. Rotate the power switch to 'OFF' position and then 'ON' and start the transmitter again.
2. Press the emergency stop button, elevate it again and then start the transmitter again.

⊙ Inhibit the joystick and button functions:

When transmitter drops to the sensor sensitivity limit, control actively to all the joysticks in use to become neutral output status. VR output remains on the point where transmitter is dropped. Pushbutton types that control automatically: single speed / single speed interlock / double speed / double speed interlock pushbuttons are all released. Other pushbuttons or switches output remains locking on the status of transmitter dropping. The transmitter buzzer and error status light will be ON continuously to warn the operator.

To release joystick and pushbutton function:

- a. To release joystick and pushbutton function, when joysticks are neutral (*) and pushbuttons / switches are released, press START button to release "Inhibit the joystick and button functions". (* VR output remains on the point where transmitter is dropped and cannot be changed until START button is pressed, transmitter is switched off or EMS is pressed)
- b. Press EMS button and release, then start the system again by following the "Transmitter boot condition".

* Transmitter tilt protection:

- ⊙ Not enable:
- ⊙ $> \pm 30^{\circ} \sim \pm 50^{\circ}$:

Transmitter in operation, when the tilt angle is bigger than default setting, the transmitter will send emergency stop signal to the receiver and MAIN relay will be OFF. (Transmitter should equip with an A/G SENSOR module) The initial press angle of the transmitter power / START button is defined as 0° .

⊙ Switch off transmitter power:

When the transmitter tilt angle is bigger than the default setting, the signal transmission from transmitter to receiver will be disabled automatically. The transmitter buzzer and error status LED will be ON continuously to warn the operator that the receiver cannot receive any signal from the transmitter and the MAIN relay will be deactivated. To restart the transmitter, rotate the power switch to OFF and then to ON position. Then start the system again by following the "Transmitter boot condition".

⊙ Inhibit the joystick and pushbutton function:

When the transmitter tilt angle is bigger than the default setting, all the joysticks will be inhibited as neutral output status automatically. VR output remains at the point where transmitter is dropped. Pushbutton types that control automatically: single speed / single speed interlock / double speed / double speed interlock pushbuttons are all released. The transmitter buzzer and error status light will be ON continuously to warn the operator. To release the inhibited joystick and pushbuttons function

by the error status light:

1. To release “Inhibit the joystick and pushbutton function“, press START button when the joystick position is neutral (unrelated to VR) and pushbutton is released. The transmitter buzzer and error status light will be OFF then back to normal operation.
2. After the emergency stop button is elevated, start the system again by following the “Transmitter boot condition”.

Note: Transmitter drop and tilt protection are sharing the same method.

* Transmitter transmission intermittently

- Not enable: Transmitter sends signal 10 times every second.
- Enable: Transmitter sends signal 4 times every second.

* Transmitter battery replacement, auto-recovery

- Not enable:
- Enable: The batteries can be replaced during transmitter operation. (without pressing EMS button or turning off the power) After the batteries are replaced, the transmitter can be operated normally. Transmitter START button startup and EMS button press/release check will be omitted.

Remark: This function is only for the transmitter. When the battery is removed from the transmitter, there will be no signal on the receiver and MAIN relay will be deactivated.

- A. If “receiver MAIN activate term: ID matches” is selected: Signal will be sent as soon as transmitter battery is inserted. When ID matches and receiver receives signal from the transmitter, MAIN relay will be activated.
- B. If “receiver MAIN activate term: START button” is selected: Signal will be sent as soon as transmitter battery is inserted. When ID matches and receiver receives signal from the transmitter, MAIN relay will not be activated until START button is pressed.

* Transmitter power ON, emergency stop button press/release check

- Not enable:
- Enable: After the transmitter power key is rotated to ON position and before the emergency stop button is pressed, the LED status: green LED blinks ON_0.1sec, OFF_0.9sec. Press and release emergency stop button, then transmitter will be started. This is to ensure the emergency stop button function without problem before transmitter operation.

4.2.2.2 Receiver Function Settings

* Receiver MAIN relay activate condition

- ID match: Transmitter and receiver ID is identical
- START button: Make sure transmitter and receiver ID is identical, then press START button on the transmitter.

* Receiver MAIN relay dynamic check

- Not enable:
- Enable: Before MAIN relay is ON, first proceed with dynamic check. If pass, then MAIN relay is ON; if NG, then error status “MAIN relay lock” appear.
- Receiver power ON: Proceed with dynamic check when receiver power is ON. If pass, then start

the system; if NG, then error status “MAIN relay lock” appear.

- ◎ START and receiver power ON: Dynamic check for both operation and power ON conditions.

Remark 1: When MAIN relay is on dynamic check status, MAIN1 relay close and MAIN2 relay open. After MAIN1 relay feedback normally, MAIN2 relay close and MAIN1 relay open, then check MAIN2 relay feedback.

* Receiver channel auto-scan

- ◎ Not enable: Receiver receives channel regularly
- ◎ Enable and transmitter power ON enables intelligent channel change: “receiver auto-scan channels” and “transmitter power ON intelligent channel change” activate at the same time.

Transmitter power On intelligent frequency change:

1. When the software setting is started, there will have 8 channels available automatically. The 8 channels are used for receiver auto scanning and the transmitter can also select the best communication channel from them.
2. It takes 1~3 seconds for every channel selection when transmitter is started. Time for receiver channel auto scanning is 1~6 seconds. (pre-set as master / slave channel exchange scanning mode)
3. Transmitter encoder version has to be V02.08 (incl.) or above and setting software has to be V03.05 (incl.) or above.

- ◎ Enable **Channel stage selection:**

2~16 stages are available. Each stage may assign receiving channel, LID & EID.

Delay time for entering auto-scan channel:

0~3 seconds are available. Before entering channel auto-scan, the search will stay for 0~3 seconds at the original channel (optional). If transmitter signal is received and matches the frequency auto-scan lock condition, then the system enters operation status again. If delay time over 0~3 seconds, the system will enter frequency auto-scan status again.

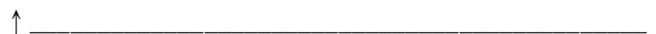
Master/slave channel auto-scan exchange mode:

Master channel is the previous channel in use; the rest 1~16 channels are slave channels.

Master/slave channel auto-scan exchange sequence: Master channel ->1st setting channel -> Master channel -> 2nd setting channel Master channel -> Last setting channel



Non-master/slave channel auto-scan exchange sequence: 1st setting channel ->2nd setting channel Last setting channel



- ◎ Auto-scan lock, LV relay ON for 3 seconds: Enable LV relay first to select. The function is the same as ALARM relay.

- ◎ Auto-scan master channel lock condition

ID match_It is used only for master channel under auto-scan condition which transmitter ID matches receiver one.

START button_It is used only for master channel under auto-scan condition which transmitter ID matches receiver one. The transmitter START button has to be pressed down at the same time.

◎ Auto-scan slave channel lock condition

ID match: It is used only for slave channel under auto-scan condition which transmitter ID matches receiver one.

START button: It is used only for slave channel under auto-scan condition which transmitter ID matches receiver one. The transmitter START button has to be pressed down at the same time.

◎ Slave channel lock time: 0~3 seconds. (optional) Only when auto-scan slave channel is locked for 0~3 seconds, then it is confirmed to be locked. (MAIN RELAY ON)

◎ LID **Disable:** Not in use

Bit match: The LID setting within 1~16 stages will replace the original LID of ID and become new 20bit ID. The 20bit ID has to be identical to the ID received.

Bit or: The LID setting within 1~16 stages will replace the original LID of ID. Please refer to below for the “bit or” comparison table. ”∨” means accept.

<i>LID received</i> AUTOSCAN <i>LID setting</i>	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0001		∨		∨		∨		∨		∨		∨		∨		∨
0010			∨	∨			∨	∨			∨	∨			∨	∨
0100					∨	∨	∨	∨					∨	∨	∨	∨
1000									∨	∨	∨	∨	∨	∨	∨	∨

◎ EID **Disable:** Not in use

Bit match: In addition to 20bit ID, all the 1~16 EID setting and the EID received have to match.

Bit or: In addition to 20bit ID, all the 1~16 EID setting and the EID received, the “EID bit or” also has to match. Please refer to below for the “EID bit or” comparison table. ”∨” means accept.

<i>EID received</i> AUTOSCAN <i>EID setting</i>	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0001		∨		∨		∨		∨		∨		∨		∨		∨
0010			∨	∨			∨	∨			∨	∨			∨	∨
0100					∨	∨	∨	∨					∨	∨	∨	∨
1000									∨	∨	∨	∨	∨	∨	∨	∨

* The assigned pushbutton enter AUTOSCAN function: When MAIN relay is ON, the transmitter will pass its operation priority to the other one.

Setting request: Transmitter 1 is set as channel 1 and transmitter 2 is set as channel 2. AUTOSCAN enable is set as 2 stages. 1st stage is set as the channel for transmitter 1 and 2nd stage is set as the channel for transmitter 2. Select one single speed pushbutton and set as “assigned pushbutton enter AUTOSCAN function”. Except for different channels, setting for transmitter 1 & 2 has to be completely identical.

Enable method: When the original transmitter in operation, receiver MAIN relay is ON, joystick or

neutral VR back to neutral position and single side VR back to 0° position, press down the assigned pushbutton, then the receiver enters AUTOSCAN status and searches for the other transmitter. The other transmitter has to START and standby, but no assigned pushbutton is pressed. After receiver successfully catches the other transmitter, the AUTOSCAN function will stop and the operation priority is transferred.

* Receiver relay setting

- ◎ LV relay: Transmitter low voltage relay or AUTOSCAN channel lock instruction

Function { **ON:** Transmitter low voltage, LV relay ON
ON 2sec & OFF 2sec repeatedly: Transmitter low voltage, LV relay ON 2sec & OFF 2sec repeatedly
ON 1sec & OFF 1sec repeatedly: Transmitter low voltage, LV relay ON 2sec & OFF 2sec repeatedly

Shutoff { **Transmitter battery change or transmitter shutoff:** Transmitter shutoff or change fully charged battery.
 (Not suitable for receiver channel AUTOSCAN enable)
Transmitter battery change: Transmitter should change the fully charged battery.

- ◎ STOP relay: **Emergency stop relay**
RELAY ON: Press emergency stop button when MAIN relay is ON. Or, receiver is started but transmitter emergency stop button is pressed.
RELAY OFF: To activate emergency relay, transmitter non-emergency code has to be received and receiver startup request has also to be met, that is, MAIN relay is activated.

- ◎ ID relay: Identical to MAIN relay ON/OFF.

- ◎ START relay: Press START button on transmitter, START relay ON; release START button then START relay OFF

- ◎ ALARM relay { MAIN relay ON { Not in use.
 ON 1~3sec: When MAIN relay ON, ALARM relay ON 1~3sec
 MAIN relay OFF { Not in use.
 ON 1~3sec: When MAIN RELAY OFF, ALARM relay ON 1~3sec

* RELAY K1~K32 output position exchange: Corresponding function for relay K1~K32 is exchangeable at will.

Case 1: Each relay module is available with DC output relay up to 8pcs. (The change of AC output relay is available upon request) That is each DC voltage output module is available with 8pcs of DC voltage relay output. Whenever two types of voltage output, including relay and DC voltage output, are mix distributed, relay K1~K32 may be applied to exchange output position. Arranging relay output to relay module and DC voltage output voltage to AC voltage output module.

For example: 14-relay output and 7 DC voltage output are needed.

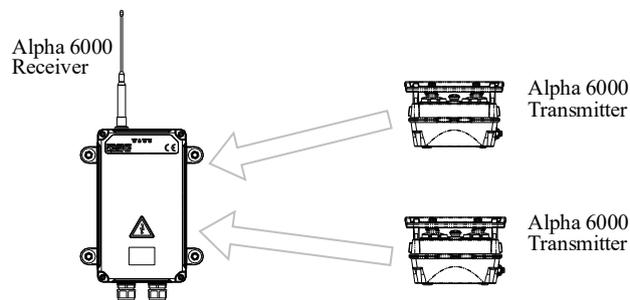
If you apply relay K1~K32 output position to exchange functions, the 14 relays will be arranged from K1 to K14. Each receiver relay module, including slot I and II, with one relay module. Keep K15 & K16 empty and then arrange 7 DC voltage output from K17 to K23. Insert DC voltage output module to receiver relay module slot III.

Case 2: After the wiring for receiver relay output is completed, if more or less function is needed, relay number and sequence will have to be changed and the re-wiring is needed. Relay K1~K32 output can be applied to exchange function. For increasing relay numbers, the new wiring sequence can be re-arranged manually to match the original wiring arrangement. Then move the increasing relays to the last position in sequence, so that only the increased relay contacts need to be wired, the original wiring will remain unchanged. For decreasing relay numbers, the new wiring sequence can be re-arranged manually to match the original wiring arrangement. Then keep the decreasing relay positions empty, so the original wiring will remain unchanged.

4.3 Special Types:

*** “Pitch and Catch” Feature/Assigned button AUTOSCAN as below:**

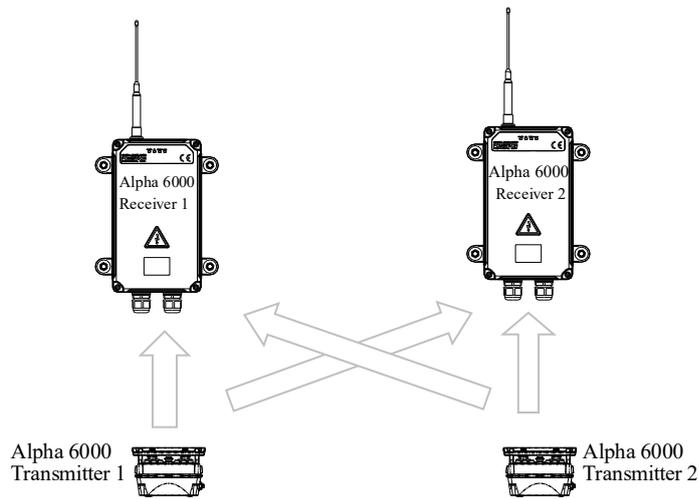
- (1) Two transmitters (or more) take turn to control one receiver.
- (2) Move the transmitter joystick and VR in operation back to neutral position and depress assigned pushbutton for 0~3 seconds (by following “enter auto-scan channel delay time”).
- (3) After the assigned pushbutton signal is received by the receiver, the receiver will look for the transmitter which is going to take turn by AUTOSCAN.
- (4) Press START button on the transmitter that catches the signal for 0~3 seconds (No assigned pushbutton is pressed. Please follow “time for slave channel lock” setting).
- (5) After the receiver has scanned and caught the transmitter that takes over, the AUTOSCAN control will also be taken over by the transmitter that takes over.
- (6) Please turn off the original transmitter in operation.



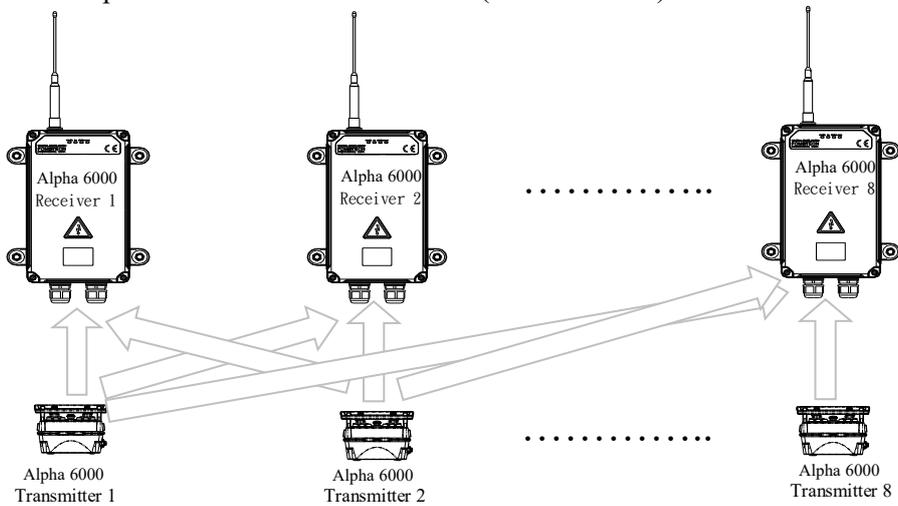
*** One Transmitter to Two Receivers Feature (Tandem Mode):** two operation types

- (1) Transmitter 1 operates receiver 1 or receiver 2 independently; transmitter 2 operates receiver 1 or receiver 2 independently.
- (2) Transmitter 1 operates receiver 1 & 2 at the same time, or transmitter 2 operates receiver 1 & 2 at the same time.

* The transmitter that controls the receiver gets the control priority.



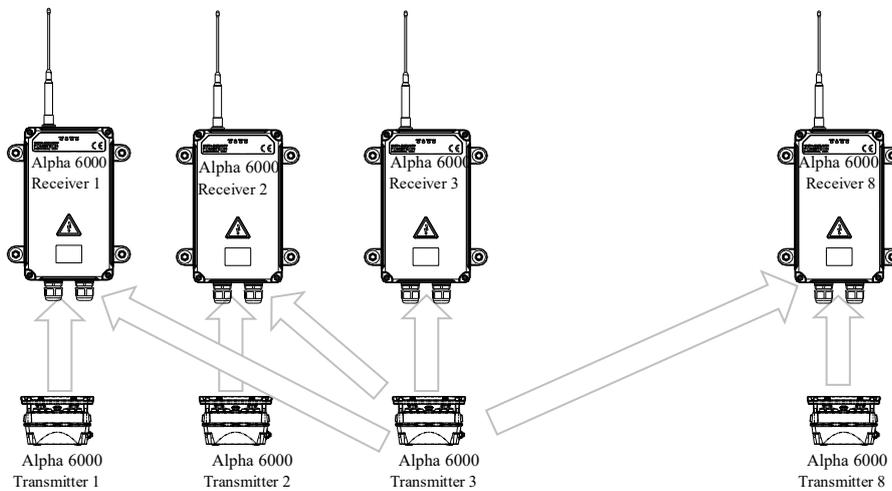
(3) Maximum up to 1 transmitter to 8 receivers (Tandem mode)



*** Random Access Feature:**

- (1) This feature allows for up to 8 operators randomly accessing up to 8 crane systems.
- (2) 8 receivers with respective channels.
- (3) The channel changes can be done via a multi-position selector switch on each transmitter.

** Do not control one receiver with two or more than two transmitters at the same time.*



4.4 Customized Types

There are many types of customized system available with the combination of single-axis joystick, double-axis joystick, pushbuttons and switches for the Alpha 6000. Please talk to the manufacturer for more information.

4.5 Frequency Table

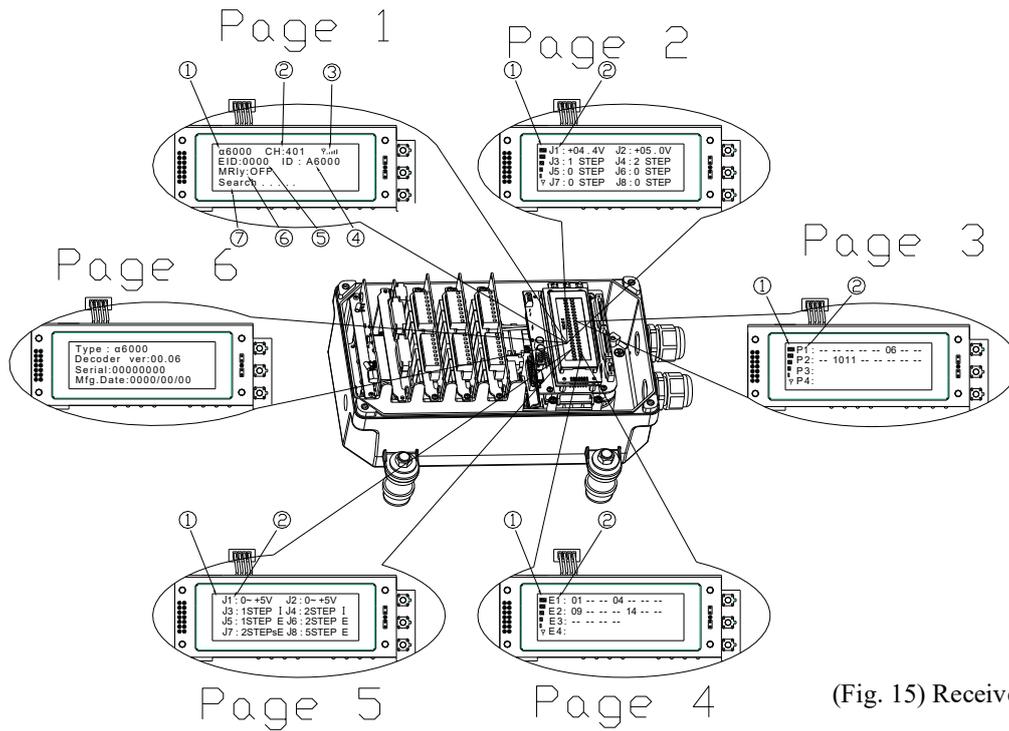
CHANNEL	433MHz/25k	CHANNEL	447MHz/12.5k
401	433.0750 MHz	701	447.8750 MHz
402	433.1000 MHz	702	447.8875 MHz
403	433.1250 MHz	703	447.9000 MHz
404	433.1500 MHz	704	447.9125 MHz
405	433.1750 MHz	705	447.9250 MHz
406	433.2000 MHz	706	447.9375 MHz
407	433.2250 MHz	707	447.9500 MHz
408	433.2500 MHz	708	447.9625 MHz
409	433.2750 MHz	709	447.9750 MHz
410	433.3000 MHz	710	447.9875 MHz
411	433.8250 MHz	711	448.0000 MHz
412	433.8500 MHz	712	448.0125 MHz
413	433.8750 MHz	713	448.0250 MHz
414	433.9000 MHz	714	448.0375 MHz
415	433.9250 MHz	715	448.0500 MHz
416	433.9500 MHz	716	448.0625 MHz
417	433.9750 MHz	717	448.0750 MHz
418	434.0000 MHz	718	448.0875 MHz
419	434.0250 MHz	719	448.1000 MHz
420	434.0500 MHz	720	448.1125 MHz
421	434.0750 MHz	721	448.1250 MHz
422	434.1000 MHz	722	448.1375 MHz
423	434.1250 MHz	723	448.1500 MHz
424	434.1500 MHz	724	448.1625 MHz
425	434.1750 MHz	725	448.1750 MHz
426	434.2000 MHz	726	448.1875 MHz
427	434.2250 MHz	727	448.2000 MHz
428	434.2500 MHz	728	448.2125 MHz
429	434.2750 MHz	729	448.2250 MHz
430	434.3000 MHz	730	448.2375 MHz
431	434.3250 MHz	731	448.2500 MHz
432	434.3500 MHz	732	448.2625 MHz

CHANNEL	433MHz/25k
433	434.3750 MHz
434	434.4000 MHz
435	434.4250 MHz
436	434.4500 MHz
437	434.4750 MHz
438	434.5000 MHz
439	434.5250 MHz
440	434.5500 MHz
441	434.5750 MHz
442	434.6000 MHz
443	434.6250 MHz
444	434.6500 MHz
445	434.6750 MHz
446	434.7000 MHz
447	434.7250 MHz
448	434.7500 MHz
449	434.7750 MHz
450	433.3250 MHz
451	433.3500 MHz
452	433.3750 MHz
453	433.4000 MHz
454	433.4250 MHz
455	433.4500 MHz
456	433.4750 MHz
457	433.5000 MHz
458	433.5250 MHz
459	433.5500 MHz
460	433.5750 MHz
461	433.6000 MHz
462	433.6250 MHz
463	433.6500 MHz
464	433.6750 MHz
465	433.7000 MHz
466	433.7250 MHz
467	433.7500 MHz
468	433.7750 MHz

CHANNEL	447MHz/12.5k
733	448.2750 MHz
734	448.2875 MHz
735	448.3000 MHz
736	448.3125 MHz
737	448.3250 MHz
738	448.3375 MHz
739	448.3500 MHz
740	448.3625 MHz
741	448.3750 MHz
742	448.3875 MHz
743	448.4000 MHz
744	448.4125 MHz
745	448.4250 MHz
746	448.4375 MHz
747	448.4500 MHz
748	448.4625 MHz
749	448.4750 MHz
750	448.4875 MHz
751	448.5000 MHz
752	448.5125 MHz
753	448.5250 MHz
754	448.5375 MHz
755	448.5500 MHz
756	448.5625 MHz
757	448.5750 MHz
758	448.5875 MHz
759	448.6000 MHz
760	448.6125 MHz
761	448.6250 MHz
762	448.6375 MHz
763	448.6500 MHz
764	448.6625 MHz
765	448.6750 MHz
766	448.6875 MHz
767	448.7000 MHz
768	448.7125 MHz

5. SYSTEM SETTINGS

5.1 Receiver LCD Function Settings



(Fig. 15) Receiver LCD Displays

5.2 LCD Display Descriptions:

Pushbutton 1 page change: Page 1 → Page 2 → Page 3 → Page 4 → Page 5 → Page 6 → Page 1 →

Pushbutton 2 page change: Page 1 → Page 6 → Page 5 → Page 4 → Page 3 → Page 2 → Page 1 →

Pushbutton 3: Reserved.

1) When the receiver power is ON, the initial display on LCD is “α6000 decoder loading....”.

2) When internal interface is connected correctly, the first LCD display would be “page1”.

Line 1:

- ① α6000 → System Type
- ② CH: 401 → 1st code is frequency band code, the 2nd and 3rd is for channel 01~68.

BAND CODE	FREQUENCY BAND
4	433 MHz
7	447 MHz

- ③  Signal strength, 5 sections in total. Full 5-section is for the strongest signal and empty 5-section is for the weakest signal.

Line 2:

- ④ EID:0000 → 4 bits (4 bits/binary), after AUTOSCAN EID function enable.
For receiver ID comparison.
- ⑤ ID:12345 → ID for receiver comparison, 5 bits (20 bits/ Hexadecimal)

Line 3:

- ⑥ MRly OFF → MAIN relay deactivated
MRly ON → MAIN relay activated

Line 4: Message

- ⑦ Search..... → Searching transmitter ID
Scan>>>>>>> → AUTO channel searching
Work>>>>>>> → Functioning

Error Message	Description
Error:Eeprom ack	Decoder EEPROM read-out/write-in error
Error:Eeprom id	Decoder EEPROM ID setting error
Error:Eeprom crc	Decoder EEPROM data CRC error
Error:Relay > 32pcs	Decoder relay setting over 32pcs
Error:Rf usart	Decoder to RX module interface faulty
Error:Rf module	RX module faulty
Error:Com or 2803	Decoder relay power faulty
Error:Main relay	Decoder MAIN relay faulty
Error:V&I card	Error on the voltage/current proportional output of interface card
Error:PWM card	Error on PWM proportional output interface card
Error: Watchdog	Faulty on watch-dog layout of decoder externals
Receiver voltage low	Decoder voltage is too low <10VDC
ID not match	Receiver with un-identical ID
Emergency Stop	Decoder receives stop command
Error:Main1 LOOP OUT	Main relay 1 control module faulty, LOOP OUT
Error:Main2 LOOP OUT	Main relay 2 control module faulty, LOOP OUT
Error:Main1 CAN LOSS	Main relay 1 control module faulty, CANBUS LOSS
Error:Main2 CAN LOSS	Main relay 2 control module faulty, CANBUS LOSS
Error:Main1 RF LOSS	Main relay 1 control module faulty, receiving RF module misses the signal
Error:Main2 RF LOSS	Main relay 2 control module faulty, receiving RF module misses the signal
Error:Main1 STOP	Main relay 1 control module faulty, STOP
Error:Main2 STOP	Main relay 2 control module faulty, STOP
Error:Main1 pre-on	Main relay 1 control module faulty, Pre-START overtime

P4 is to relay module card IV. P4: In sequence to relay K25 ~ K32

“25” is K25 RELAY ON, “--” is K25 RELAY OFF, “ ”(empty) is K25 RELAY not in use.

⋮ ⋮ ⋮

“32” is K32 RELAY ON , “--” is K32 RELAY OFF, “ ”(empty) is K32 RELAY not in use.

5) Page 4: External extension relay function display

- ① Signal strength, 5 sections in total. Full 5-section is for the strongest signal and empty 5-section is for the weakest signal.
- ② External extension relay output

Line 1: E1: 01 02 03 -- -- -- 08

E1 is in the CN7 slot of external extension system, relay module card I.

E1: In sequence to external relay K01 ~ K08

“01” is external K01 RELAY ON , “--” is external K01 RELAY OFF, ” “ (empty) is external K01 RELAY not in use

⋮ ⋮ ⋮

“08” is external K08 RELAY ON , “--” is external K08 RELAY OFF, ” “ (empty) is external K08 RELAY not in use

Line 2: E2: 09 -- -- -- -- 16

E2 is in the CN8 slot of external extension system, relay module card II.

E2: In sequence to external relay K09 ~ K16

“09” is external K09 RELAY ON , “--” is external K09 RELAY OFF, ” “ (empty) is external K09 RELAY not in use

⋮ ⋮ ⋮

“16” is external K16 RELAY ON , “--” is external K16 RELAY OFF, ” “ (empty) is external K16 RELAY not in use

Line 3: E3: 17 -- -- -- -- 24

E3 is in the CN9 slot of external extension system, relay module card III.

E3: In sequence to external relay K17 ~ K24

“17” is external K17 RELAY ON , “--” is external K17 RELAY OFF, ” “ (empty) is external K17 RELAY not in use

⋮ ⋮ ⋮

“24” is external K24 RELAY ON , “--” is external K24 RELAY OFF, ” “ (empty) is external K24 RELAY not in use

Line 4: E4: 25 -- -- -- -- 32

E4 is in the CN10 slot of external extension system, relay module card IV.

E1: In sequence to external relay K25 ~ K32

“25” is external K25 RELAY ON , ”--“ is external K25 RELAY OFF, ” “ (empty) is external K25 RELAY not in use

⋮

⋮

⋮

“32” is external K32 RELAY ON , ”--“ is external K32 RELAY OFF, ” “ (empty) is external K32 RELAY not in use

6) Page 5: Joystick/VR setting display

Line 1: J1:+-10V J2:0~24mA

J1: joystick 1 or VR1 output setting; J2: joystick 2 or VR2 output setting

Line 2: J3:+-10V J4:0~24mA

J3: joystick 3 or VR3 output setting; J4: joystick 4 or VR4 output setting

Line 3: J5:5STEP I J6:5STEP I

J5: joystick 5 or VR5 output setting; J6: joystick 6 or VR6 output setting

Line 4: J7: Not in use; J8: Not in use.

J7: joystick 7 or VR7 output setting; J8: joystick 8 or VR8 output setting

DISPLAY	OUTPUT SETTING
NO USE	Not in use
0~+5v	0~+5V
0~+10v	0~+10V
+5v	0~±5v
+10v	0~±10v
4~20mA	4~20mA
0~20mA	0~20mA
0~24mA	0~24mA
OPTIONAL	OPTIONAL
1STEP I	Single speed joystick.
2STEP I	Double-speed joystick, not to share the 2-speed relay.
2STEPs I	Double-speed joystick, not to share the 2-speed relay. 1 & 2-speed relay do not activate at the same time.
3STEP I	3-speed joystick, share the 2-speed and above relay.
4STEP I	4-speed joystick, share the 2-speed and above relay.
5STEP I	5-speed joystick, share the 2-speed and above relay.
1STEP E	External extension single-speed joystick
2STEP E	External extension double-speed joystick, not to share the 2-speed relay
2STEPs E	External extension double-speed joystick, not to share the 2-speed relay. 1 & 2-speed relay do not activate at the same time.
3STEP E	External extension three-speed joystick, share the 2-speed and above relay..
4STEP E	External extension four-speed joystick, share the 2-speed and above relay..

5STEP E	External extension five-speed joystick, share the 2-speed and above relay.
---------	--

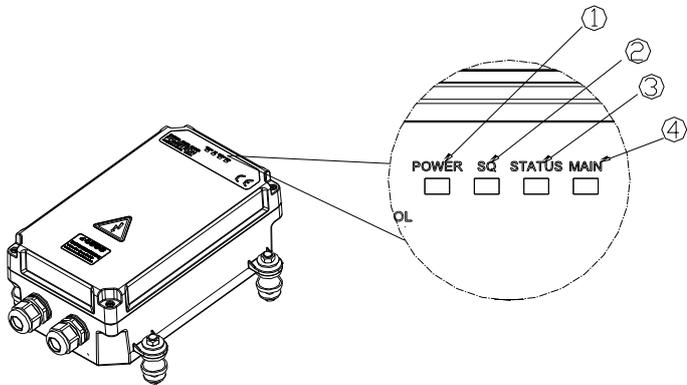
7) Page 6: Message

Line 1: Type:α6000
 Line 2: Decoder ver:00.06
 Decoder MCU firmware version
 Line 3: Serial:00000001
 Serial number
 Line 4: Mfg.Date:2013/1/23
 Manufacturing date

6. RECEIVER STATUS LIGHT AND INSTALLATION

6.1 Receiver Status Light

1. Power LED Display
2. Signal LED Display
3. Status LED Display
4. MAIN relay LED Display



6.2 Receiver LED Status

(Fig. 16) Receiver Status Light

ITEM	CONDITION	REASON	STATUS LED DISPLAY	REMARK
1	Power ON, voltage abnormal	Voltage > 15V or voltage < 10.5	Red LED ON_0.1/OFF_0.1	All output off
2	High Voltage	Voltage > 16V	Red LED ON, green LED ON	
3	System START error display	External watchdog abnormal	Red LED ON_0.1/OFF_0.3sec with 8 blinks, OFF_0.8sec	All output off
4	Low Voltage	Voltage <10V	Red LED OFF, green LED OFF	All output off
5	EEPROM invalid	EEPROM data write-in failed or data error. (ID, CRC, ...)	Red LED ON_0.1/OFF_0.3sec with 7 blinks, OFF_0.8sec	All output off
6	RELAY setting error	Internal RELAY > 32PCS	Red LED ON_0.1/OFF_0.3sec with 5 blinks, OFF_0.8sec	All output off
7	START system display error	COM or 2803 feedback check abnormal	Red LED ON_0.1/OFF_0.3sec with 8 blinks, OFF_0.8sec	All output off
8	RX module invalid	RX module faulty is detected by the decoder	Red LED ON_0.1/OFF_0.3sec with 4 blinks, OFF_0.8sec	All output off

9	MAIN RELAY jammed	MAIN relay check NG	Red LED ON_0.1/OFF_0.3sec with 3 blinks, OFF_0.8sec	All output off
10	Faulty on interface connection	Faulty on voltage, current, proportional output interface card, PWM proportional output interface card or outer extension relay module	Red LED ON_0.1/OFF_0.3sec with 6 blinks, OFF_0.8sec	All output off
11	ID error	ID error	Red LED ON_0.1/OFF_0.3sec with 2 blinks, OFF_0.8sec	Standby status
12	Delay on AUTOSCAN slave channel locking	AUTOSCAN slave CH lock delay	Green LED ON	Standby status
13	Abnormal STARTUP status	MAIN RELAY is not activated. START and emergency stop commands are sending at the same time.	Red LED ON_0.1sec, green LED ON_0.1sec blink	Standby status
14	Function normally	MAIN RELAY is activated, ID is correct & SQ light has to be ON	Whenever correct transmitter ID code is received, Green LED ON_0.05sec	Standby status
15	STANDBY (working but without receiving signal)	DATA shown as noise or DC	Green LED ON_0.1sec, OFF_0.8sec blink	Standby status

MAIN Relay module board

ITEM	CONDITION	REASON	GREEN STATUS LED DISPLAY
1	Connection failure	CAN BUS receiving error	No light displayed
2	Decoder board status error	Decoder status error	Green LED continuous ON
3	Normal operation	Normal operation	ON 0.1sec, OFF 0.1sec blink

6.3 Preparation

1. Required Tools:

- | | |
|--|---|
| (1) Flat Head Screwdriver (-) | (6) Self Drill $\phi 10.5$ mm ~ $\phi 11$ mm |
| (2) 5 mm Wrench | (7) Needle-nose pliers |
| (3) Multi-Meters | (8) Diagonal pliers |
| (4) 14 mm Box Wrench or Socket Wrench | (9) Wiring Cable(cord between 14 mm ~18 mm) and Materials |
| (5) Power Drill with 10.5~11mm Drill-Bit | |

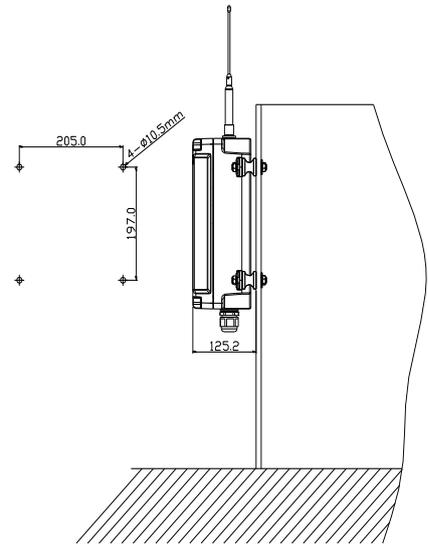
- Ensure receiver is not set to the same frequency channel and ID code as any other units in use at the same facility or within distance of 300 meters.
- Prior to installation, make sure that the crane system itself is working properly.
- Use the multi-meter to check the voltage source available and ensure receiver voltage

setting is correct for this voltage.

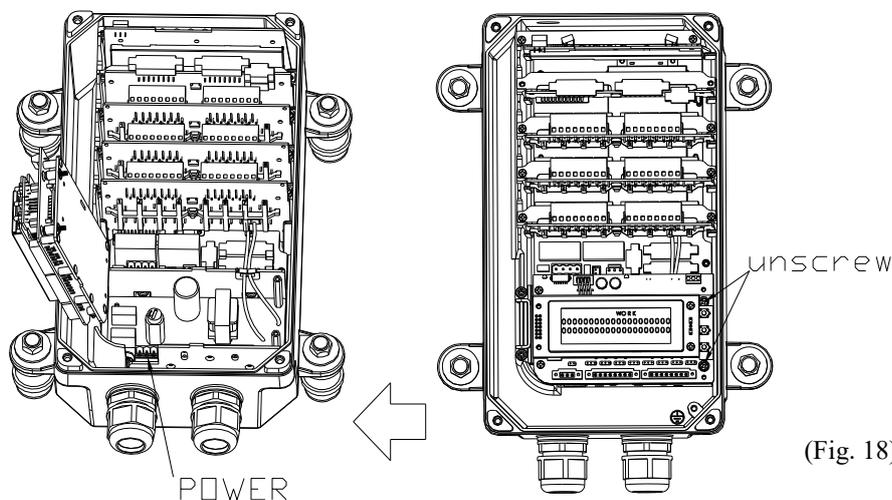
5. Prior to installation, switch off the main power source to the equipment.

6.4 Steps-By-Steps Installation

1. Be sure to put a stopper in the cable gland not in use after wiring is completed.
2. Select a suitable location that is far from high voltage wiring or equipment, such as motor, relay...etc., to mount the receiver.
3. As much as possible, the location selected should have the antenna visible from all areas where the transmitter is to be used.
4. The location selected should not be exposed to high levels of electrical noise.
5. Ensure the selected location has adequate space to accommodate the receiver enclosure.
6. The distance between the antenna and the control panel should be as far apart as possible.
7. The use of an external axial cable to move the receiving antenna to the position for better signal receipt where it is necessary.
8. Drill four holes on the control panel (11 mm).
9. Tightened all screws provided.
10. For system wiring, please refer to the wiring diagram located on the last page of this manual and on the backside of the receiver cover plate.
11. Ensure all wiring is correct and safely secured and all screws are fastened.
12. The power cable has to be connected to the AC position of power terminal block; the ground wire has to be connected to the GND position (crane metal frame) or to the screw fixing hole of ground wire on the receiver.
13. Please refer to below figures. To open the metal cover, unscrew the power module cover as positioned.



(Fig. 17) Receiver Installation



(Fig. 18)

6.5 Wiring Diagram

Please refer to the wiring diagram specifically for the system ordered located on the last page of this manual and on the backside of the receiver top enclosure.

6.6 System Testing

1. Connect the power source to the receiver and test the operation of each function to ensure it operates in the same manner as the pendant controller.
2. Ensure the MAIN contact relay can be properly controlled by the remote control.
3. Ensure the limit switches on the crane that limit all travels are working properly.
4. Ensure the pendant controller is located in a safe location where it would not interfere with remote operation.

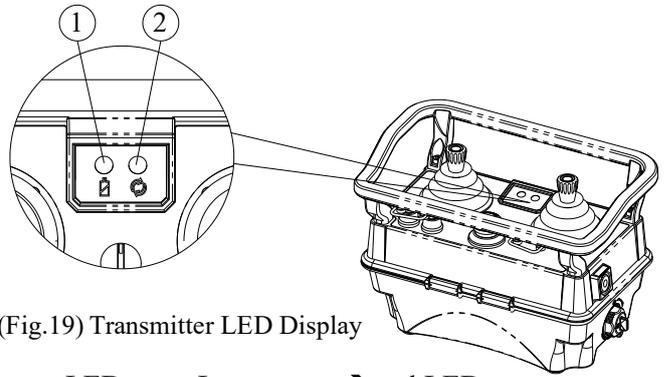
7. OPERATING INSTRUCTION

7.1 Power “ON” the System

1. Insert the transmitter power key into the key-switch slot located on the right side of the transmitter belly box.
2. Push the transmitter power key inward and then rotate it clockwise to “1” position.
“1” → “ON” “0” → “OFF”
3. To activate the system, first turn the EMS button clockwise so that the red button pops up. To activate the function “When transmitter power is turned on, emergency stop button is compelled to press & release check”: Press emergency stop button and release.
4. Press the START pushbutton to activate MAIN relay and the transmitter starts to send signals.
5. After 5 minutes of inactivity, that is 5 minutes after the last pushbutton is released, the green light will disappear thus temporarily deactivating the transmitter power and the receiver MAIN. Pressing START pushbutton thereafter will close the receiver MAIN and start the timing sequence over again.
6. If any function, such as the frequency channel of the transmitter unit is altered via simple dip-switch setting inside the transmitter (refer to page 13), you must then also change the frequency RF channel in the receiver (refer to page 15~16). If the “auto-scanning feature” on the receiver is activated, you must then press and hold the START pushbutton after turning “on” the transmitter power in order for the auto-scanning receiver to identify the newly selected channel and then you may release the START pushbutton to operate.

7.2 Transmitter System Status Displays

7.2.1 Transmitter LED Display



(Fig.19) Transmitter LED Display

- (1) Battery Power LED Display : High power → green LED on; Low power → red LED on.
 (2) Transmitter Status LED Display: Normal status → green LED on; Abnormal status → red LED on.

7.2.2 Transmitter LED Status Table

Encoder-Power Status LED Display (dual colors)

ITEM	STATUS	CONDITION	LED STATUS
1	Low voltage power on	Full current, power < 6.1V	Red LED steady ON
2	Low voltage during operation (3)	Power < 5.3V	Red LED constant ON
3	Low voltage during operation (2)	Power > 5.3V < 5.6V	Red LED ON_0.1.OFF_0.1sec until power_off
4	Low voltage during operation (1)	Power > 5.6V < 6.0V	Red LED ON_0.1.OFF_0.9sec until power off
5	Joystick correction mode	Enter joystick calibration	Orange LED ON (red and green LED steady ON)
6	Emergency stop button is not pressed	Checking the press & release function of emergency stop button when emergency stop button is not pressed.	Green ON_0.1sec, OFF_0.9sec blink
7	Normal operation	Power > 6.0V	Green LED ON

* Several minutes after transmitter battery low voltage during operation (3V) < 5.3V, both power and status indicator lights are off. Then the transmitter enters the status of power failure protection.

* Under power failure protection, battery voltage is increasing slowly. When the battery voltage is increasing to 6.3V, power failure protection will stop. Then transmitter power will be activated again and the power indicator light is steady on.

* Before START button is pressed, battery voltage will decrease gradually. Few minutes later, when the voltage is lowered to 6.1V, the power LED will be steady red on. If the buzzer is activated, it will long beep when the power indicator light is red. After battery voltage is back to under 5.3V, the beep will stop and the transmitter will enter the condition of power failure protection again.

* When the transmitter power key is at "I" position, above status will repeat for several times until battery voltage can no longer be back to 6.3V.

Encoder-Status LED Display (dual colors)

ITEM	STATUS	CONDITION	LED STATUS
1	Low power power_on	Power<6.1V	All LED states lights OFF
2	Low voltage during operation	Power < 5.3V	All LED status lights off
3	System error	Failed on external Watchdog wiring check or ADC reference voltage error	Red LED ON_0.1/OFF_0.3sec with 8 blinks, OFF_0.8sec
4	Check pushbuttons, increase resistance value	Pushbutton and increase resistance value error	Red LED ON_0.1/OFF_0.3sec with 6 blinks,OFF_0.8sec
5	EEPROM error	EEPROM data read out / write in error or data error (ID, CRC, ...)	Red LED ON_0.1/OFF_0.3sec with 7 blinks,OFF_0.8sec
6	a. Pushbutton jammed or joystick is not in the neutral position b. Joystick abnormal	a. When the transmitter is on, any pushbutton is activated or joystick is not in neutral position b. Joystick self-checking error during operation.	Red LED ON_0.1/OFF_0.3sec with 2 blinks,OFF_0.8sec
7	Joystick correction has never been proceeded	Joystick correction has to be done to those joysticks with settings	Red LED ON_0.1/OFF_0.3sec with 3 blinks,OFF_0.8sec
8	Joystick correction error	Joystick correction over time or step incorrect.	Red LED ON_0.1/OFF_0.3sec with 5 blinks,OFF_0.8sec
9	Joystick correction completed	Enter joystick correction completed	Orange (red + green) LED ON_0.5sec/OFF_0.5sec blink
10	TX module invalid	TX module error is detected by the encoder	Red LED ON_0.1/OFF_0.3sec with 4 blinks,OFF_0.8sec
11	Drop or tilt protection	Protection to the transmitter which is dropped or tilt.	Red LED ON_0.2/OFF_0.2sec blink
12	Re-awake status after sleep mode: pushbutton jammed or joystick is not in the neutral position	Re-awake after sleep mode: depress START button, joystick is not in the neutral position or pushbutton jammed	Red LED ON_0.05/OFF_0.05sec blink
13	STOP button is not pressed	During e-stop button press / release check, e-stop button is not pressed	All status lights off
14	Enter STOP	Press emergency stop button	All status LEDs are OFF
15	Normal power_on	Normal voltage and some of the pushbuttons are not pressed	Green LED ON 2sec and OFF
16	Transmitter in operation	TX board signal intermittent or continue to send signals	Green LED ON_0.1sec, OFF_0.1sec blink
17	Transmitter standby	Without stopping or continue to send signals	Green LED ON_0.1sec, OFF_0.9sec blink

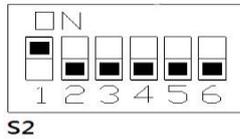
7.3 Joystick Calibration

7.3.1 When to Calibrate the Joystick

When to calibrate the joystick: Encoder board replacement, assembly or changes of any new joysticks, deviation increased after long-term operation or proportional joystick with non-proportional output. (Not caused by settings)

7.3.2 Enter Joystick Calibration Mode

Before joystick calibration is proceeding, please first rotate transmitter power key to OFF position. Dip-switch S2 on transmitter has to be set as 100000. (see below figure) After the setting of joystick calibration is done, rotate the power key to ON position. The power LED will display in orange (red and green lights are ON at the same time), and the status LED will display in fast green blinks then the transmitter enters joystick calibration mode.



7.3.3 Joystick Calibration Steps

Proportional joystick:

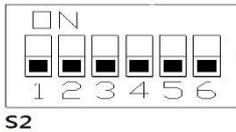
1. Select either joystick and operate it slowly. Then the buzzer will beep once briefly which means the joystick axis direction catches the start position.
2. Continue to operate the joystick swiftly to the end and hold. Then the buzzer will beep twice briefly which means the joystick axis direction catches the end position. The directional axis calibration is now completed and joystick may be back to the neutral position.
3. Repeat step 1 & 2 to calibrate the reverse directional axis of the joystick.
4. Repeat step 1~3 to complete all joysticks calibrations. After the joystick calibration is completed, the buzzer will have a long beep once and then the joystick status LED blinks in orange slowly.
5. When status LED display becomes orange blinking slowly, the setting is completed. Please refer to 8.3.4 for exiting from calibration mode.

Digital joystick 1~5 speeds:

1. Select either joystick, operate it to the 1st speed position and hold. Then press START button and the buzzer will beep once briefly. Release START button and the joystick axis direction catches the 1st speed position.
2. Locate the 2nd ~5th speeds directional axis by following step 1. Then operate the joystick back to the neutral position after the calibration is completed.
3. Repeat step 1 & 2 to calibrate the reverse directional axis of the joystick.
4. Repeat step 1~3 to complete all joystick calibrations. After the joystick calibration is completed, the buzzer will have a long beep once and then the joystick status LED blinks in orange slowly.
5. When status LED display becomes orange blinking slowly, the setting is completed. Please refer to 8.3.4 for exiting from calibration mode.

7.3.4 Exit

After joystick calibration is completed, rotate the transmitter power switch to OFF position and set dip-switch S2 as 000000 as shown on below figure, then all joysticks exit the calibration mode and back to normal operation.

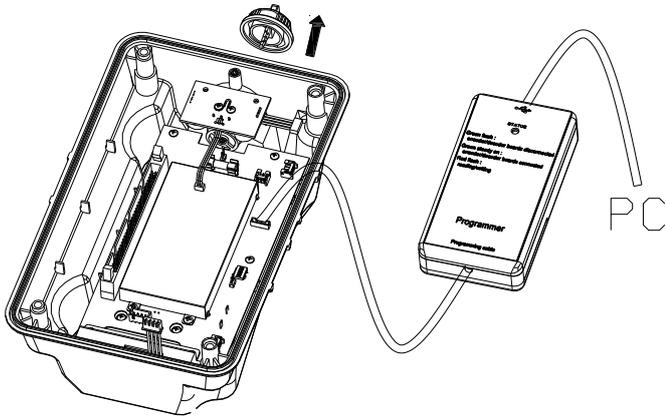


Note:

- (1) Please do not proceed with the joystick calibration when voltage is low. If voltage is low, please rotate power key switch to OFF position and replace battery.
- (2) If transmitter is available with both digital and proportional joysticks, please calibrate the joysticks by following calibration steps for digital and proportional joystick respectively.
- (3) There is no sequence request for joystick calibration. After calibration for all joysticks is completed, the status LED will continue to blink slowly in orange.
- (4) Under “Calibration Standby” condition, if no joystick is operated for more than 30 seconds, buzzer for joystick calibration overtime will have a long beep for warning. Status LED display will also show as red LED ON_0.1sec/OFF_0.3sec with 5 blinks and OFF_0.8sec, then calibration will be discontinued.
- (5) Under “Calibration” condition, if the joystick axis is not changed for more than 30 seconds or if the joystick is back to neutral position, buzzer for joystick calibration overtime will have a long beep for warning. Status LED display will also show as red LED ON_0.1sec/OFF_0.3sec with 5 blinks and OFF_0.8sec, then calibration will be discontinued. During joystick calibration, if status LED blinks in red for 5 times (please refer to “Encoder status LED display”) and there will have a long beep on the buzzer, then the calibration is failed. In this case, please shutoff the power and start the calibration again.
- (6) Under “the 2nd step Calibration” condition, only the maximum joystick axis value will be recorded. No timing will be over 30 seconds. During the 2nd step calibration, please operate the joystick forward smoothly. Do not shake the joystick or operate the joystick backward, otherwise the joystick calibration cannot be completed. Under “Calibration Mode condition”, the power status LED displays in orange and the calibration has to be completed in 3 minutes. If not, the status LED blinks in red for 5 times (please refer to “Encoder status LED display”) and there will have a long beep on the buzzer, then the calibration is failed. In this case, please shutoff the power and start the correction again.
- (7) Under “Calibration Standby” condition, if the joystick axis buzzer has three beeps, that means the joystick has been operated forward over half way. Please keep on operating the joystick forward to the axis end for calibration.

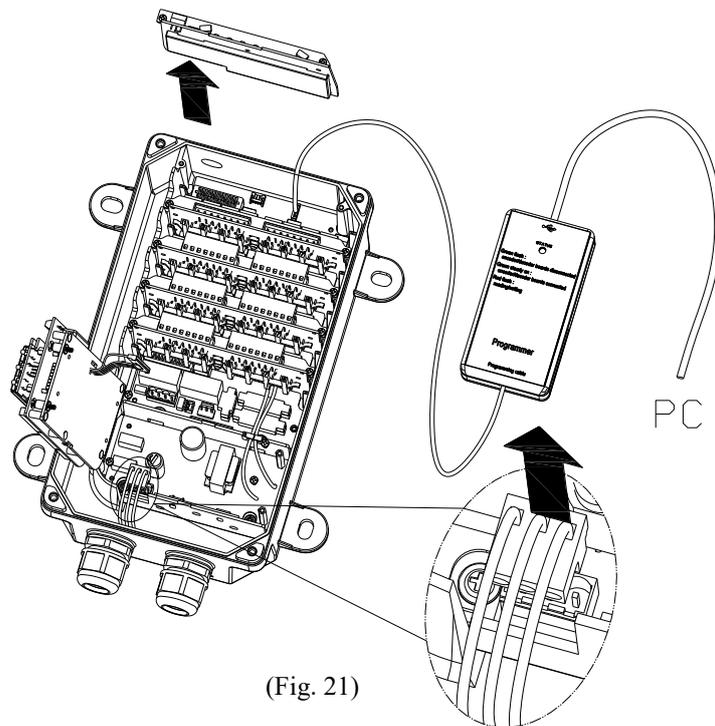
7.3.5 Function Change Settings

1. One end of the Alpha 6000 USB programming cable connects to computer, the other end connects to encoder board inside transmitter as shown below. (Remove the Power Key first)



(Fig. 20)

2. Install Alpha 6000 software and click open. (Alpha6K.exe for windows XP /Alpha6K_W64.exe for windows 7).
3. Select "Read Memory".
4. After memory data is read successfully, then enter function change setting display.
5. After function setting is completed, change the display to the last page to continue setting. Select "Write-in Memory (ROM)" to download the setting data to the transmitter.
6. After transmitter setting data is downloaded completely, remove Alpha 6000 programmer USB plug from encoder board and then plug it into decoder board as shown below. (The system has to be first shutoff.)
7. Click "Write-in Memory (ROM)", then the setting data will be downloaded to receiver and the setting is completed.

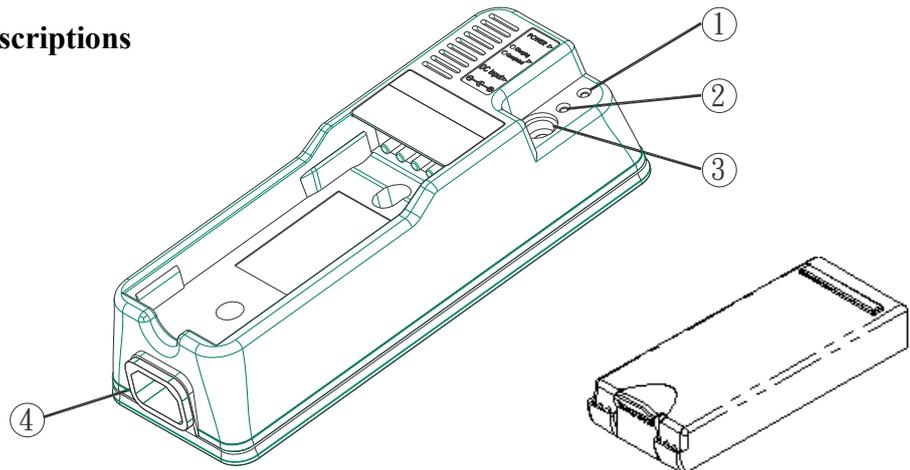


(Fig. 21)

8. BATTERY CHARGING

8.1 Charger External Descriptions

1. Power status light
2. Status light
3. DC power socket
4. AC power socket



8.2 How to use the charger

1. For household power supply, use AC100~240VAC 50/60Hz.
2. For vehicle power supply, plug the $\phi 5.5\text{mm}$  $\phi 2.5\text{mm}$ plug into the DC socket to the charger directly.
3. Plug in the power cord and the power indicator will light up.
4. When a battery pack is inserted, the green charging light will blink to indicate charging is taking place at the current moment.
5. If discharging of battery pack is desired, press the "DISCHARGE" button. At discharging mode, the green blinking light will now turned into a constant red light indicating that the battery pack is now being discharged. If you want to cancel the discharge, just press "DISCHARGE" button again
6. When discharging is completed, the charger will automatically switch to the charging mode where the green blinking light will reappear again
7. The charging time is approximately 3 ~ 6 hours.
8. When charging is completed, a constant green light will appear to indicate that the battery pack is fully charged.
9. When the battery pack is at 90% charged state, trickle charging will take over to ensure the longevity of the battery pack and as well as to ensure the battery pack is 100% charged
10. When the battery pack's temperature exceeds 50°C , the charger will go into protective mode and charging will be discontinued
11. To prolong the life of the battery pack, please fully discharge it prior to every re-charging.



Remark: Please keep battery pack contacts clean. In case of any dirt, please clean it with alcohol.

9. TROUBLE SHOOTING

Should the operator find the equipment not operating normally, please check the chart below for simple trouble shooting tips.

POSSIBLE REASON	PROBLEM JUDGEMENT	SOLUTION
Crane malfunctioned	Try to operate the crane by a pendant. If it is working, then the problem is on the crane itself.	Repair the crane
1. Transmitter power is not on. 2. Transmitter battery voltage is low.	1. Both battery and status LED not lit. 2. Turn "on" the transmitter with EMS elevated. Battery status LED red light constantly on.	1. Turn on the power 2. Replace the rechargeable battery.
No power to the receiver (AC power indicator on the receiver unit not lit).	Check if the power indicator (AC) is lighted	Ensure power input to the receiver unit is correct.
Blown fuse	Check if the fuse has blown	Replace the Fuse.
Transmitter startup, pushbutton/joystick jammed	<p>Under pushbutton jammed condition: First check which pushbutton/joystick is jammed.</p> <p>[Status LED] Red fast blinks: Without jammed Red blinks twice: Jammed</p> <p>Description: Under pushbutton jammed condition: [Status LED] two red blinks. After all pushbuttons and joysticks are released, move joystick 1. If [Status LED] red blinks quickly, it means joystick 1 is not jammed. If red LED blinks twice, it means joystick 1 is jammed.</p> <p>Please check all joysticks by following above descriptions.</p> <p>* Enable pushbutton [power startup without checking pushbutton jammed] checking bypass. * [Standard selector switch] [Mixed mode selector switch][Speed limit switch] [EID/LID switch] checking bypass.</p>	Replace/repair, pushbutton/joystick

10. SYSTEM SPECIFICATION

Transmitter Unit

Frequency Range	:	PLL 433 ~ 434 MHz / 447 ~ 448 MHz
Transmitting Range:	:	over 100 Meters
Continuous Operating Time	:	28+ Hours (2000mAh)
Operating Current	:	approx. 70mA
Sleep Mode Current	:	approx. 10mA
Charging Current	:	approx. 400mA
Security ID Code	:	1,048,576 sets (20 bit)
Shortest Pushbutton Recognizing Time	:	5mS
Channel Spacing	:	25KHz / 12.5KHz
Frequency Control	:	VTCXO + Synthesizer (PLL)
Frequency Drift	:	< 3ppm @ -10°C ~ 70°C
Frequency Deviation	:	< 1ppm @ 25°C
Spurious Emission	:	> 60dBc
Transmitting Power	:	10.0mW
Emission	:	F1D
Antenna Impedance	:	50 ohms
Encoding Reference	:	2FSK
Encoding Depth	:	+2.5KHZ
Enclosure Rating	:	IP-66
Source Voltage	:	7.2 V (2000mAH NiMH battery pack)
Operating Temperature	:	-10°C ~ +50°C
Shock Resistant	:	50G
Dimension	:	268mm X 162mm X 178.5mm
Weight	:	1,600g (with 2000mAh battery pack)

Receiver Unit

Frequency Range	:	PLL 433 ~ 434 MHz / 447 ~ 448 MHz
Channel Spacing	:	25KHz / 12.5KHz
Frequency Control	:	VTCXO + Synthesizer (PLL)
Frequency Drift	:	< 3ppm @ -10°C ~ 70°C
Frequency Deviation	:	< 1ppm @ 25°C
Sensitivity	:	≤ -120dBm
Decoding Reference	:	2FSK
Intermediate Frequency	:	21.4MHZ and 455MHZ
Antenna Impedance	:	50 ohms
Data Decoder Reference	:	Quartz Crystals
Radiation Leakage	:	< -75dBm
Proportional Voltage Output Impedance	:	≥ 1kΩ
Proportional Current Output Impedance	:	≥ 250Ω
Responding Time (pushbutton / EMS / joystick)	:	45mS ~ 150mS
MAIN off Time after RF Signal Interruption	:	Approx. 1 second
Enclosure Rating	:	IP-66
Source Voltage	:	28-48VAC, 100-240VAC, 380-460VAC & 12-24VDC @ 50/60 Hz.
Power Consumption	:	32W
Operating Temperature	:	-10°C ~ +60°C
Shock Resistant	:	40G
Output Contact Rating	:	250V @ 6A
Dimension	:	300mm X 171mm X 115mm
Weight	:	4,500g (include the cable gland)

Note: Other types of source voltages are available upon request.

11. PARTS LIST

1. TX module	TX6000
2. RX module card	RX6000
3. Proportional output module	POM6000
4. Wiring loom	WL6000
5. Encoder board	EN6000
6. Decoder card	DE6000
Decoder card (infrared)	DEIR6000
7. LCD display card	LCD6000
8. Relay card (8R)	RL6008
9. A/G sensor board	AG6000
10. Power supply module (100 ~ 240VAC)	PS6000
Power supply module (380~460VAC)	PS6001
Power supply module (12 ~ 24VDC)	PS6002
Power supply module (28~48VAC)	PS6003
11. Small single axis joystick unit (complete)	
proportional	JOY-600
1/2 speeds / steps (digital)	JOY-602
3 speeds / steps (digital)	JOY-603
4 speeds / steps (digital)	JOY-604
5 speeds / steps (digital/proportional)	JOY-605
12. Single axis joystick unit (complete)	
proportional	JOY-610
1/2 speeds / steps (digital)	JOY-612
3 speeds / steps (digital)	JOY-613
4 speeds / steps (digital)	JOY-614
5 speeds / steps (digital/proportional)	JOY-615
13. Double axis joystick unit (complete)	
proportional	JOY-620
1/2 speeds / steps (digital)	JOY-622
3 speeds / steps (digital)	JOY-623
4 speeds / steps (digital)	JOY-624
5 speeds / steps (digital/proportional)	JOY-625
14. Joystick rubber boot (for single/double-axis joystick)	JOYRB5000
15. Joystick rubber boot (for small single-axis joystick)	JOYRBS5000
16. Joystick head (for single/double-axis joystick)	JOYH5000
17. Joystick head (for small single-axis joystick)	JOYHS5000
18. 1-step pushbutton (side panel)	PB-1S
19. 1-step pushbutton (top panel)	PB-1T
20. 2-stage selector switch	SW-2T
21. 3-stage selector switch	SW-3T
22. multi-stage selector switch (4~8 stages)	SW-8T

23. 2-stage toggle switch	TW-2T
24. 3-stage toggle switch	TW-3T
25. Emergency stop button	EM5000
26. Transmitter casing (complete)	TC6000
27. Transmitter protective guardrail + hardware	PG5000
28. Transmitter power key	PW5000
29. 2000mAh NiMH battery pack	BAT2000
30. Receiver antenna (419/433/447 MHz)	ANT433
31. Receiver upper enclosure	RCU6000
Receiver bottom enclosure	RCB6000
Receiver enclosure (complete)	RC6000
32. Regular relay 12VDC	RR6000_12VDC
33. Safety relay 12VDC	SR6000_12VDC
34. Receiver shock absorber (4pcs/set)	SA4000
35. Intelligent charger (please specify voltage)	CH5000
36. Waist belt	WB5000
37. Shoulder strap	SS5000
38. Cable gland	CG4000
39. Labels for top pushbuttons	TPBL5000
40. Labels for side pushbuttons	SPBL5000
41. Joystick gates	GA5000