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### **3. SAFETY INSTRUCTION**

The Twister 2X system is relatively simple to use. However, it is very important to observe the proper safety procedures before, during, and after operation. When use properly the Twister 2X 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 23 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 turned 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 left 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.
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.

## 4. INTRODUCTIONS

### 4.1 System Types

4.1.1 8-pushbutton types :

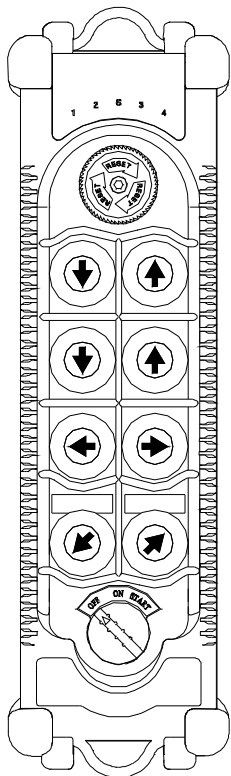
4008-1: 8 single speed pushbuttons

4008-1S: 7 single speed pushbuttons + 1 selector switch

4008-2: 8 double speed pushbuttons

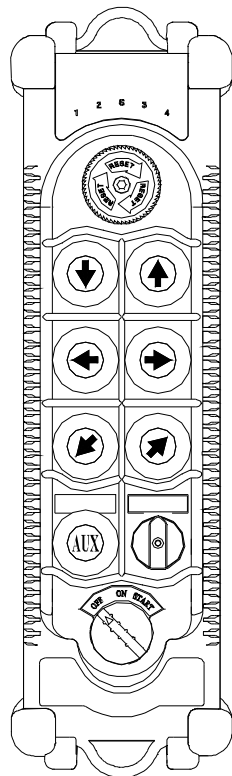
4008-3: 6 double speed pushbuttons + 2 single speed pushbuttons

4008-3S: 6 double speed pushbuttons + 1 single speed pushbutton + 1 selector switch



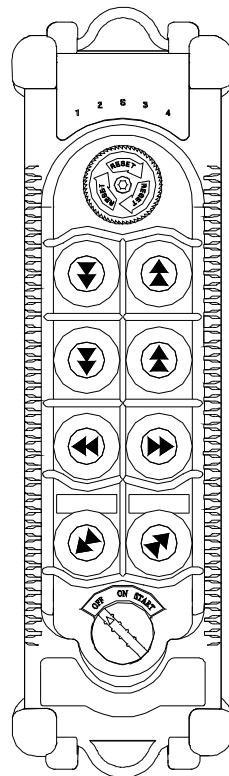
4008-1

8點單速



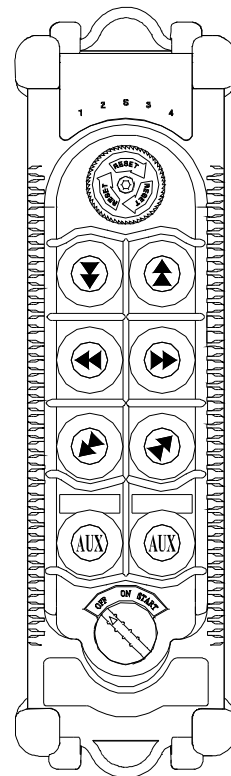
4008-1S

7點單速+  
1選擇開關



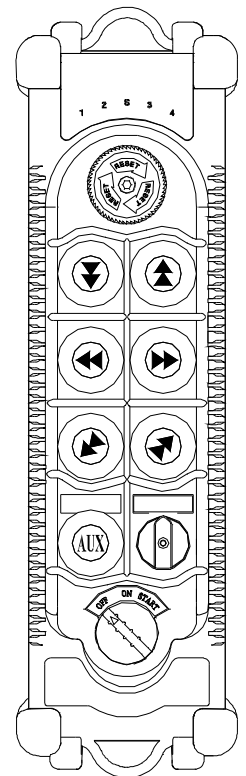
4008-2

8點雙速



4008-3

6點雙速+  
2點單速



4008-3S

6點雙速+  
1點單速+  
1選擇開關

4.1.2 12-pushbutton types :

4012-1: 12 single speed pushbuttons

4012-1S: 11 single speed pushbuttons + 1 selector switch

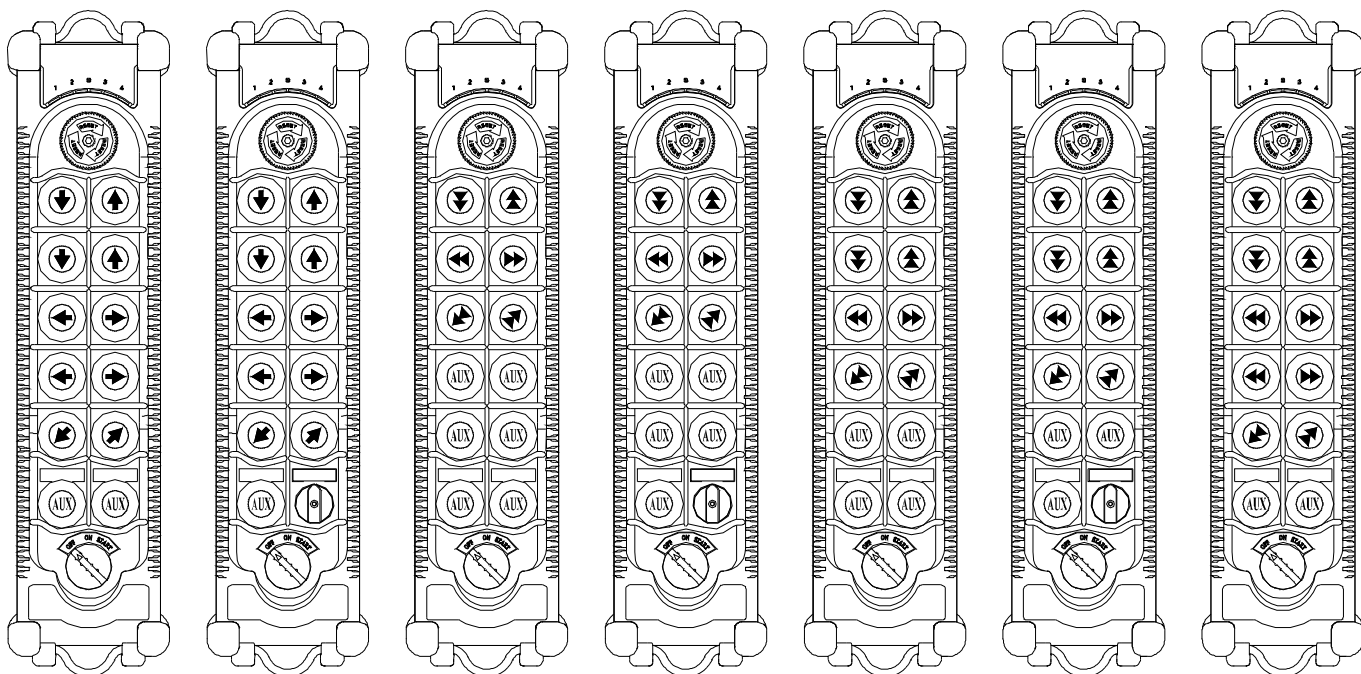
4012-2: 6 double speed pushbuttons + 6 single speed pushbuttons

4012-2S: 6 double speed pushbuttons + 5 single speed pushbuttons + 1 selector switch

4012-3: 8 double speed pushbuttons + 4 single speed pushbuttons

4012-3S: 8 double speed pushbuttons + 3 single speed pushbuttons + 1 selector switch

4012-4: 10 double speed pushbuttons + 2 single speed pushbuttons



4012-1  
12點單速

4012-1S  
11點單速+  
1選擇開關

4012-2  
6點雙速+  
6點單速

4012-2S  
6點雙速+  
5點單速+  
1選擇開關

4012-3  
8點雙速+  
4點單速

4012-3S  
8點雙速+  
3點單速+  
1選擇開關

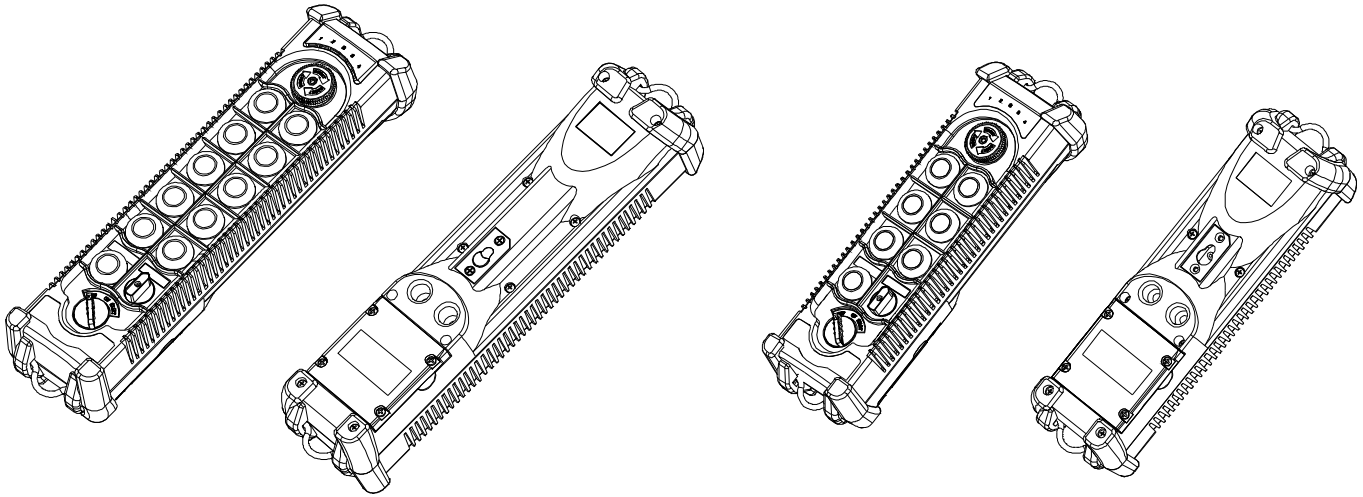
4012-4  
10點雙速+  
2點單速

## 4.2 Transmitter Outline

### 4.2.1 Transmitter External Descriptions

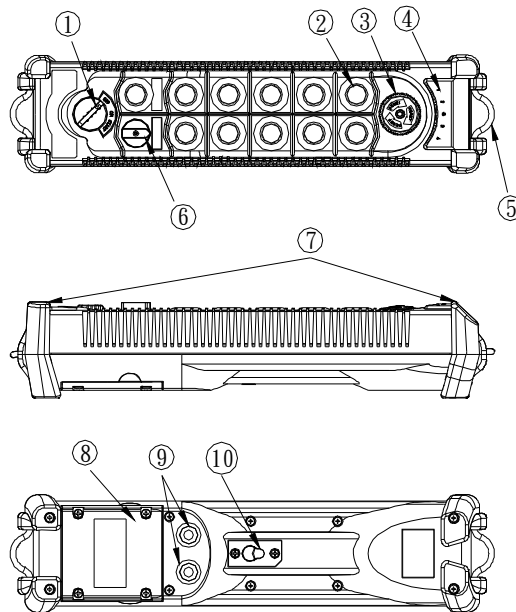
12 pushbuttons: 272mm × 65mm × 52mm

8 pushbuttons: 231mm × 65mm × 52mm



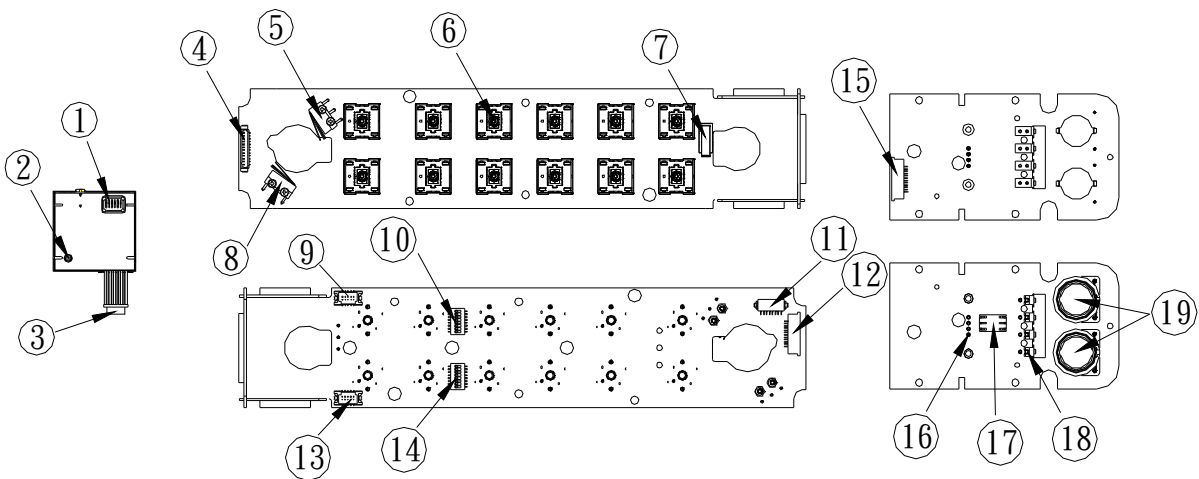
(Fig. 1) Transmitter Top / Bottom View

1. On / Off switch
2. function key
3. Emergency Stop Button (EMS)
4. Status LED Display
5. Shoulder Strap holder
6. Selector Switch
7. Anti-hit rubber
8. Lithium battery
9. Battery charging slot
- 10 Battery charging fixing hole



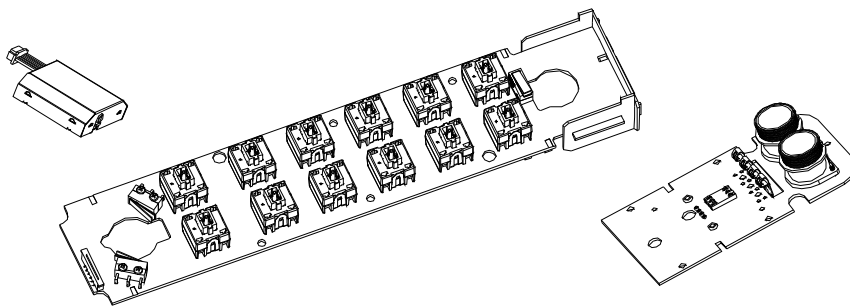
(Fig. 2) Transmitter Exterior Views

### 4.2.3 Encoder Board, TX Module, Recharging chip card and Rechargeable Battery Descriptions:



(Fig. 3) Encoder Board, RF Module, Power Card Descriptions

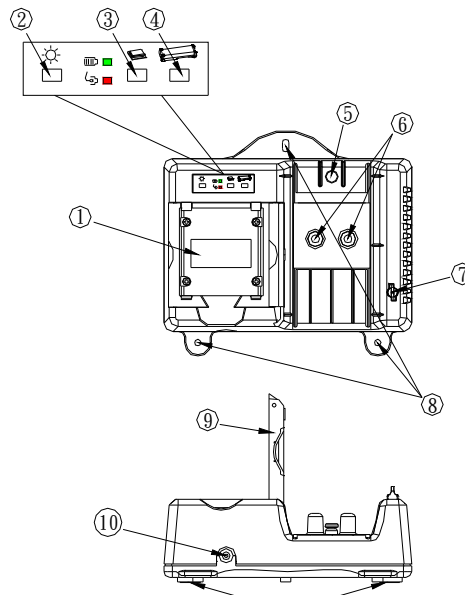
- |   |                                    |  |  |   |
|---|------------------------------------|--|--|---|
| 1. Transmitting channel dip-switch                      | 5. Start Switch                    | 9. LED Display cable port  | 13. Transmitting RF module cable port                  | 17. Chip Card Holder                    |
| 2. Adjustable capacitor for PLL frequency compensation  | 6. One/Two speed pushbutton        | 10. AUX dip-switch   | 14. ID code dip-switch                                 | 18. Battery pack contact spring         |
| 3. Transmitting RF module cable                         | 7. Emergency Stop Pushbutton (EMS) | 11. Micro-Processor Programming Port                             | 15. Battery charging board to encoder board cable port | 19. Battery charging wiring loop holder |
| 4. Port of Encoder board to battery charging board port | 8. Power Switch (ON/OFF)           | 12. Extra 2 aux. pushbuttons and selector switch cable connector | 16. Chip card special setting port                     |   |



(Fig. 4) Encoder Board, TX Module and Power Card Interior Descriptions

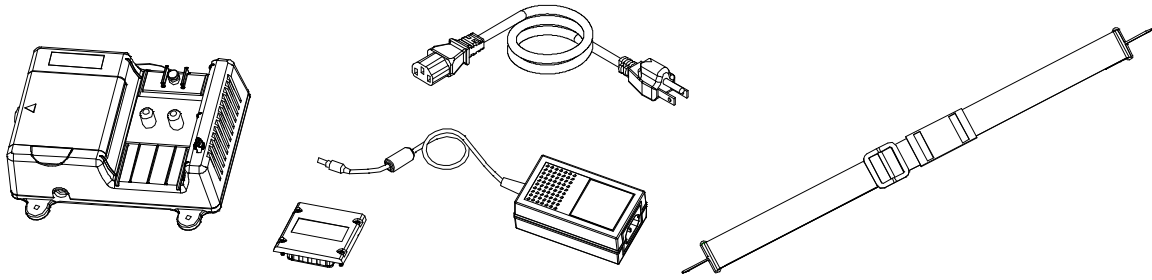
#### 4.2.4 Battery Charger Exterior Descriptions

1. Lithium charging holder
2. Power Status LED
3. Low Battery Charging Status LED
4. Transmitter Charging Status LED
5. Transmitter Charging Fixing Pole
6. Transmitter Charging Pole
7. Cleaning Tool for Charging Hole
8. Battery Charger Fixing Holes
9. Lithium Battery Cover
- 10 Power Socket
11. Anti-Slippery Pads



(Fig. 2) Battery Charger Exterior Descriptions

#### 4.2.4 Rechargeable Battery 、 Battery Charger and Shoulder Strap Outline



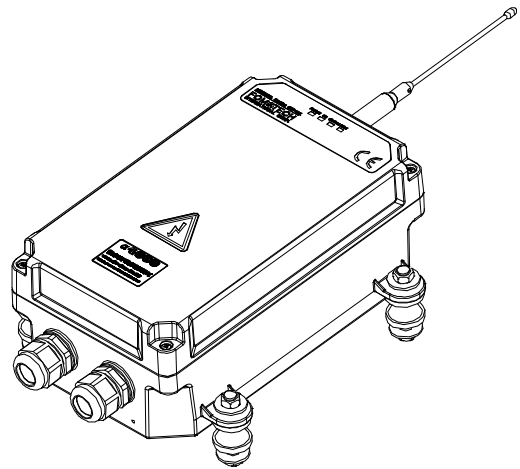
(Fig. 5) Rechargeable Battery 、 Battery Charger and Shoulder Strap Outline

### 4.3 Receiver Introductions

#### 4.3.1 Receiver Outline

300mm × 171mm × 115mm

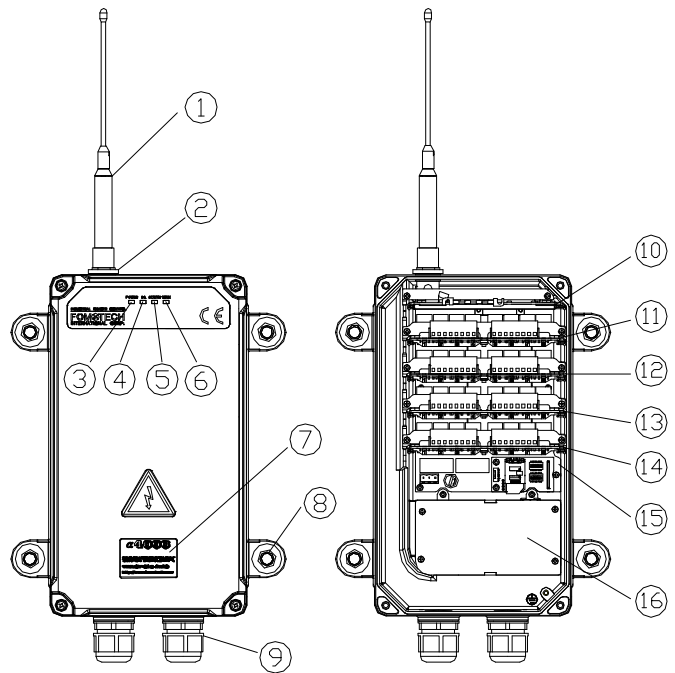
(Antenna and Plug-in Socket Excluded)



(Fig. 6) Receiver Outline

#### 4.3.2 Receiver Exterior Descriptions:

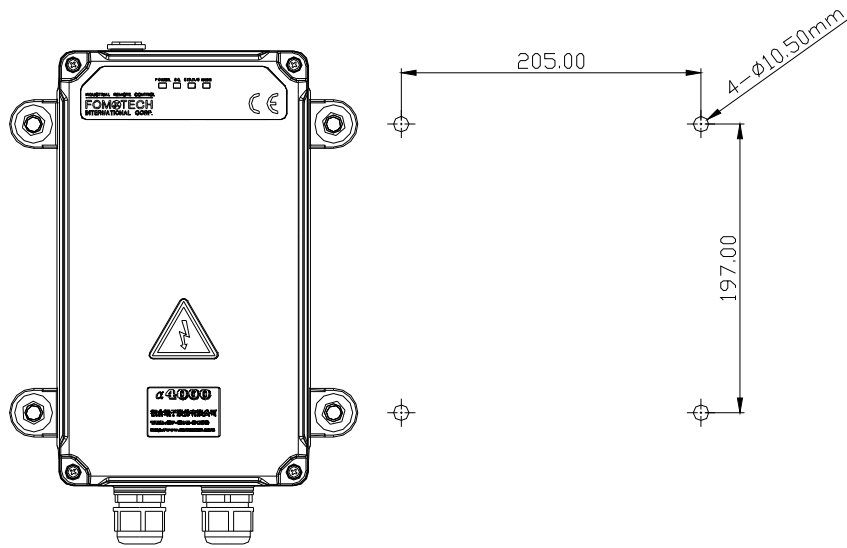
1. Antenna
2. Antenna holder
3. Receiver power source indicator
4. Receiver RF signal indicator
5. Receiver status indicator
6. Receiver main indicator
7. Model / Specification label
8. Anti-vibration fixing pole\*4
9. cable gland\*2
- 10.RX module card
- 11.Output relay card I
- 12.Output relay card II
- 13.Output relay card III
- 14.Output relay card IV
- 15.Decoder card
- 16.Power supply card



(Fig.7) Receiver External Descriptions

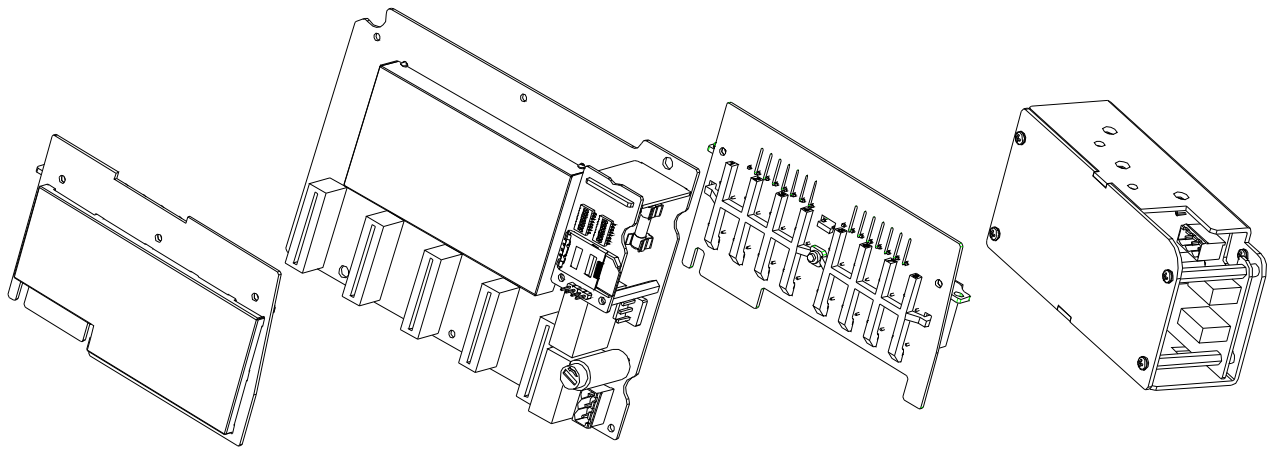


### 4.3.3 Receiver Mounting Dimension



(fig.8) Receiver Mounting Dimension

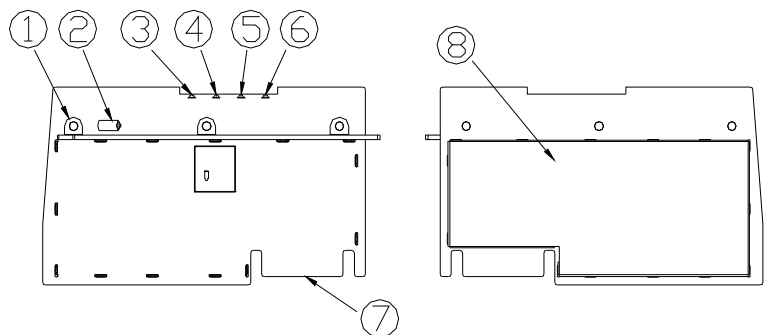
### 4.3.4 (1) RX Module Card (2) Decoder Card (3) Output Relay Card (4) Power Supply Card



(fig.9)

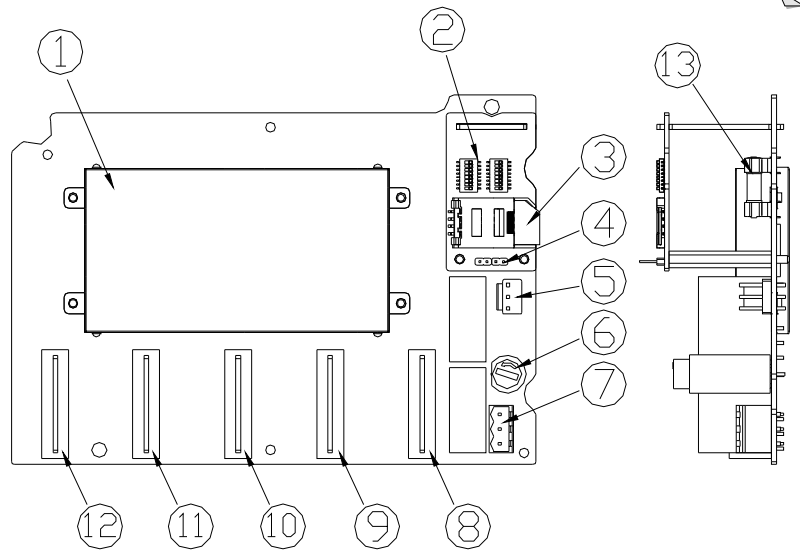
#### (1) RX Module

1. RX module card fixing holder
2. Antenna port
3. Receiver main indicator
4. Receiver status indicator
5. Receiver signal indicator
6. Receiver power source indicator
7. RX module edge connector
8. RX module shielding plate



(2) Decoder card (Fig. 11)

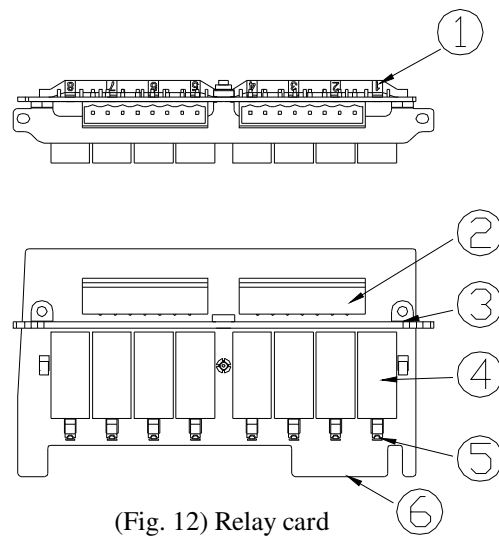
1. Decoder card shielding plate
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.RX module edge connector
- 13.



(Fig. 11) Decoder card

(3) Relay card (Fig.12)

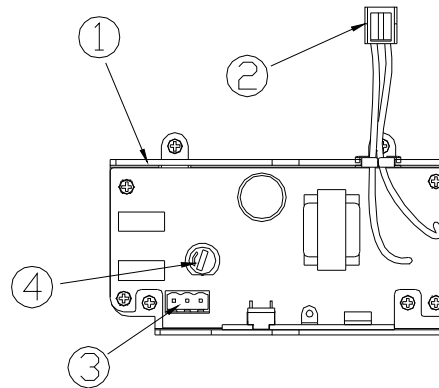
1. Relay light pipe LED
2. Relay contact
3. Relay fixing holder
4. Relay
5. Relay indicator
6. Relay card edge connector



(Fig. 12) Relay card

(4) Power board (Fig. 13)

1. Power board aluminum holder
- 2.
- 3.
- 4.



(Fig. 13) Power Board

**4.4 Output Wiring diagram**

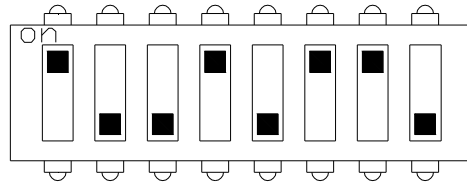
Enclosed inside receiver enclosure lid.

## 5. SYSTEM SETTINGS

### 5.1 Transmitter ID Code Settings

Transmitter ID code are set via an 8-position dip-switch located on the encoder board (refer to fig.3 on page 6)

Example: ID code → 10010110



(fig.14) dip switch

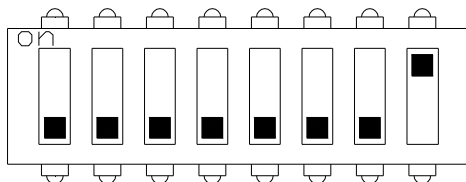
Top location: “1”

Bottom location: “0”

### 5.2 Transmitter Frequency Channel Settings

The transmitter frequency channel is also set via an 8-position dip-switch located on the encoder board (refer to fig.3 on page 6)

Example: frequency 433.075MHZ/channel 01(00000001)



(fig.15) frequency dip switch

Top location: “1”

Bottom location: “0”

### 5.3 Transmitter Function Settings:

Not yet available.

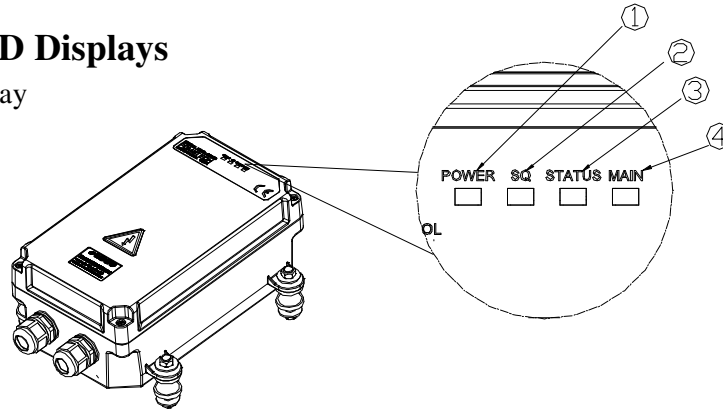
## 5.4 Frequency Channel Table

<b>FREQUENCY</b>	<b>DIP-SWITCH SETTING</b>	<b>CHANNEL</b>
433.075 MHz	00000001	01
433.100 MHz	00000010	02
433.125 MHz	00000011	03
433.150 MHz	00000100	04
433.175 MHz	00000101	05
433.200 MHz	00000110	06
433.225 MHz	00000111	07
433.250 MHz	00001000	08
433.275 MHz	00001001	09
433.300 MHz	00001010	10
433.825 MHz	00001011	11
433.850 MHz	00001100	12
433.875 MHz	00001101	13
433.900 MHz	00001110	14
433.925 MHz	00001111	15
433.950 MHz	00010000	16
433.975 MHz	00010001	17
434.000 MHz	00010010	18
434.025 MHz	00010011	19
434.050 MHz	00010100	20

# 6 RECEIVER INSTALLATION

## 6.1 Receiver Status LED Displays

### 1. Receiver Status LED Display



(Fig 17) Receiver Status LED Display

- 1. Receiver Power Display
- 2. Receiver SQ Status Display
- 3. Receiver Status Display
- 4. Receiver MAIN Display

### 2. Receiver Central CPU Status LED Display

LED INDICATION	REASON
Slow Blinks (Green)	Standby
Fast Blinks (Green)	Transmitted signals received
Fast Blinks (Red)	MAIN contact relays jammed or defective
3 Fast Blinks (Red)	RX module defective
4 Fast Blinks (Red)	EEPROM error
5 Fast Blinks (Red)	Incorrect transmitted ID code
6 Fast Blinks (Red)	Incorrect system type
Slow Blinks (Green)	Standby

## 6.2 Preparation

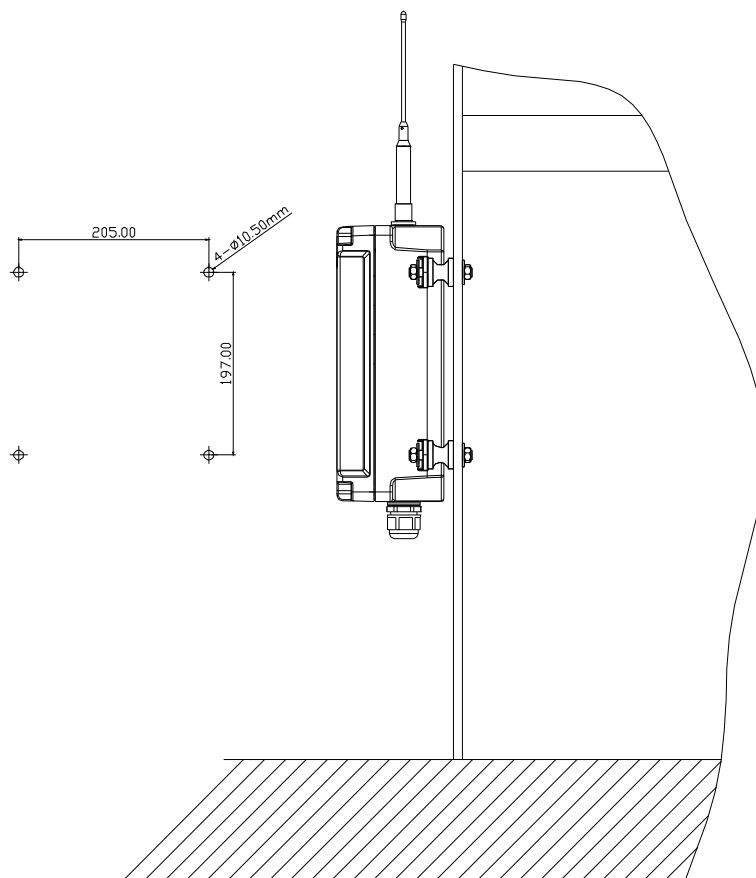
### 1. Required Tools:

- (1) Flat Head Screwdriver (-)
- (2) 5mm Wrench X 6
- (3) Multi-Meters
- (4) Box end wrench or 14 mm Wrench X 2
- (5) Power Drill
- (6) Power Drill with  $\phi 10.5$  mm ~  $\phi 11$  mm Drill-Bit
- (7) Long nose plier
- (8) Cutter plier
- (9) Output Cables ( $\phi 12.5$  mm ~  $\phi 19.5$  mm) and wiring materials

2. 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.
3. Prior to installation, make sure that the crane system itself is working properly.
4. 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.

### 6.3 Step-by-Step Receiver Installation

1. Decide system wiring first for cable arrangement. If cable gland is used, please stuff those cable glands which are not used. (All the cable glands are stuffed prior to the shipment.)
2. Select a suitable wiring location:
  - (1) The location selected should have the antenna visible from all areas where the receiver is fixed.
  - (2) Select the location which is far from high voltage wiring or equipment, e.g. motor, relay...etc.
  - (3) The location selected should not be blocked. Coaxial cable is suggested to be used to move the location of antenna if needed.
  - (4) Please refer to Fig. 18 Receiver Mounting Size for the selection of better installing location.
3. Please refer to Fig. 18 Anti-Vibration Spring Location. Drill 4 fixing holes (11mm).
  - \* **Note: The higher the receiver, the better.**
4. Tighten 4 screws provided on receiver.
5. Power cable has to be connected to AC position and ground cable has to be connected to GND position. It is also acceptable to connect ground cable to screw fixing hole on receiver.
6. Ensure all wiring is correct and safely secured and all screws are fastened.

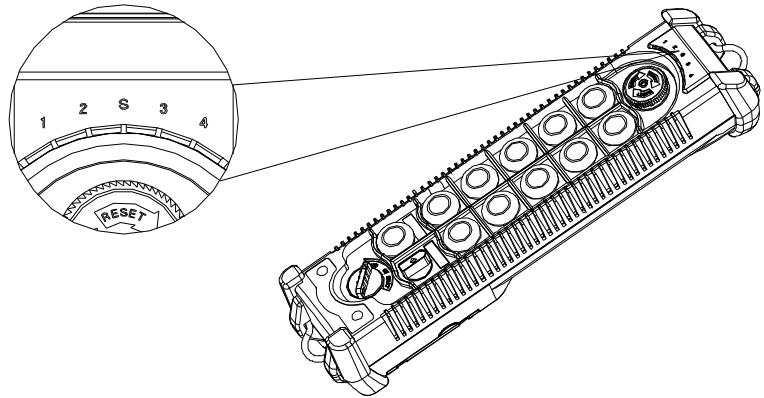


(Fig. 18) Receiver mounting size

# 7. TRANSMITTER INSTALLATION

## 7.1 Transmitter System Status Displays

### 1. Transmitter LED Display



(Fig 19) Transmitter LED Display

(1) Battery Power LED Display: green light for having enough power, read light for insufficient power.

(2) Transmitter Status LED Display: green light for normal status, red light for abnormal status.

### 3. Transmitter Status LED Display:

STATUS DISPLAY	REASON
No Light Displayed	Transmitter in sleep mode with receiver MAIN relay deactivated
Slow Blinks (Green)	Transmitter on standby
Fast Blinks (Green)	Transmitter active
Constant Red Light	Jammed or defective pushbutton, switch or joystick contacts
Fast Blinks (Red)	The contact point currently in use is operative (refer to note A)
3 Fast Blinks (Red)	PLL TX module defective
4 Fast Blinks (Red)	EEPROM error

**Note A:** When there is a defective or jammed pushbutton, switch or joystick contacts, the transmitter status LED will display a constant red light without flashes. To find out which contact is defective or jammed, activate each pushbuttons, switches or joysticks a step at a time by holding at each position for up to 2 seconds. If a flashing red light (blinks rapidly) is displayed at a specific position, it means that the contact point for that particular position is operative. If the lights remained constantly red at a certain position, then it means that this position's contact is either jammed or defective. The main purpose of function is to let the user realize which contact on the transmitter is not working properly and required service immediately.

#### 4. Transmitter Battery Power LED Display

<b>POWER DISPLAY</b>	<b>REASON</b>
Constant Green	Battery level normal
Slow blinking Red	1. Low battery power (1 <sup>st</sup> warning) 2. Battery below average. Replace battery immediately.
Fast blinking Red	1. Low battery power (2nd warning) 2. Transmitter unit will stop transmitting at anytime
Constant Red	1. Low battery power (3rd warning) 2. Transmitter power and receiver MAIN relay deactivated



## 8.1 BATTERY CHARGING

1. Plug in the power cord and the power indicator will light up.
2. When a battery pack is inserted, the green charging light will blink to indicate charging is taking place at the current moment.
3. If discharging of battery pack is desire, press the “DISCHARGE” button. (Discharged voltage about 30mA) 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.
4. When discharging is completed, the charger will automatically switch to the charging mode where the green blinking light will reappear again.
5. The charging time for a **600mA NiCd** battery pack is approximately 3 ~ 6 hours. As for the **1450mA NiMH** battery pack, the charging time is approximately 7 ~ 9 hours.
6. When charging is completed, a constant green light will appear to indicate that the battery pack is fully charged. (Battery tepid is normal) ◦
7. 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.
8. When the battery pack’s temperature exceeds 50°C, the charger will go into protective mode and charging will be discontinued.
9. To prolong the life of the battery pack, it is recommended that the battery pack be fully discharged prior to every re-charging.

Order	Status Display	Reason	LED Display Status
1	Charge	Hang the transmitter on the charger	Refer to (charger LED display)
2	CPU I/O error	Set the 47k ground resistor on CPU I/O button open.	Red light ON_0.1 sec./OFF_0.3 sec. 8 times, OFF_0.8 sec.
3	2 <sup>nd</sup> warning	Lithium battery 2.8V or regular 2.4V turns all the power off	Red light ON_0.1 sec./OFF_0.3 sec. twice, OFF_0.8 sec.
4	EEPROM fails	EEPROM data write-in fail	Red light ON_0.1 sec./OFF_0.3 sec. 7 times, OFF_0.8 sec.
5	Chip card fails (not inserted)	No chip card or write-in error	Red light ON_0.1 sec./OFF_0.3 sec. 5 times, OFF_0.8 sec.
6	Chip card data error	Chip card data does not match data in CRC 8. System type is not identical.	Red light ON_0.1 sec./OFF_0.3 sec. 6 times, OFF_0.8 sec.
7	TX module fails	RF module error tested by encoder	Red light ON_0.1 sec./OFF_0.3 sec. 4 times, OFF_0.8 sec.
8	Pushbuttons locked	Power on when part of the pushbuttons are connected	Red light ON_0.1 sec./OFF_0.3 sec. 3 times, OFF_0.8 sec.

9	STOP status or POS activates	Depress STOP button or power switch OFF	Red light ON_0.1 sec., OFF_0.1 sec. blinks
10	STOP status and function button is depressed	Depress STOP button and then function buttons	
11	1 <sup>st</sup> warning	Lithium battery 3.2V or regular 3.0V	Red light ON_0.1 sec., OFF_0.9 sec. blinks
12	Regular power on	Normal voltage. Some buttons are not depressed	0.2 sec. red light S→(2+S+3) →(1+2+S+3+4) →green light S→(2+S+3) →(1+2+S+3+4)
13	operating	TX board sends signal remittently or continuously	Green light ON_0.1 sec., OFF_0.1 sec. blinks
14	Standby status	Without sending signals remittently or continuously	Green light ON_0.1 sec., OFF_0.9 sec. blinks
15	Chip card updated	CRC in chip card changed 晶片卡CRC改變	0.5 sec. green light 1→(1+2)→(1+2+S) →(1+2+S+3) →(1+2+S+3+4)
16	Copy data in CPU to chip card	JP2 short	0.5 sec. green light 4→(3+4)→(S+3+4) →(2+S+3+4) →(1+2+S+3+4)

## 9.1 TROUBLE SHOOTING

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

PROBLEM	POSSIBLE REASON	SOLUTION
Transmitter does not communicate with the receiver	Use pendant handset to operate but not work	Repair crane
1. Transmitter is not turned on 2. Transmitter low battery power	1. Battery and status LED does not lit 2. Turn on the transmitter power. Release EMS button and battery indicator constantly red	1. Turn on the power 2. Replace rechargeable battery
No power to the receiver (AC power indicator on the receiver unit not lit)	Check if the receiver power board is lit, if not	Ensure receiver is correctly wired
Receiver fuse burn down	Check if receiver fuse is burn down, if so	Replace fuse

## 10. SYSTEM SPECIFICATION

## Transmitter Unit

Frequency Range	:	PLL 433MHz
Transmitting Range:	:	70 Meters
Continuous Operating Time	:	8 Hours
Security ID Code	:	65,536 sets (16 + 1 bit)
Channel Spacing	:	25KHz
Hamming Distance	:	$D \geq 4 + \text{CRC8}$
Frequency Control	:	Quartz Crystals (PLL)
Frequency Drift	:	$< 5\text{ppm @ } -10^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Frequency Deviation	:	$< 1\text{ppm @ } 25^{\circ}\text{C}$
Spurious Emission	:	$> 50\text{dBc}$
Transmitting Power	:	$\sim 1.0\text{mW}$
Emission	:	F1D
Antenna Impedance	:	50 ohms
Enclosure Rating	:	IP-66
Source Voltage	:	4.2VDC lithium / 1800mA
Current Drain	:	$\sim 20\text{mA @ } 3.7\text{V}$
Operating Temperature	:	$-10^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Dimension	:	273mm X 65mm X 52mm (12 pushbuttons) 228mm X 65mm X 52mm (8 pushbuttons)
Weight	:	615g (with 1800mA lithium battery)

Note: Longer or shorter transmitting ranges are available upon request.

## Receiver Unit

Frequency Range	:	PLL 433 MHz
Channel Spacing	:	25KHz
Hamming Distance	:	$D \geq 6 + CRC8$
Frequency Control	:	RX module card or synthesizer (PLL)
Frequency Drift	:	$< 5\text{ppm @ } -10^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Frequency Deviation	:	$< 1\text{ppm @ } 25^{\circ}\text{C}$
Sensitivity	:	$< -125\text{dBm}$
Antenna Impedance	:	50 ohms
Data Decoder Reference	:	Quartz Crystals
Responding Time	:	50mS ~ 150mS
Enclosure Rating	:	IP-66
Source Voltage	:	100 ~ 240VAC @ 50/60 Hz. (standard equipped)
Power Consumption	:	MAX 32W@240VAC 50Hz
Operating Temperature	:	$-10^{\circ}\text{C} \sim +75^{\circ}\text{C}$
Output Contact Rating	:	250V @ 10A
Dimension	:	300mm X 171mm X 115mm
Weight	:	4,500g (without the output cable)

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

15.21 "Changes or modifications are not expressly approved by the manufacturer could void the user's authority to operate the equipment. Changes or modifications to the device may void FCC and CE compliance. In frequently used radio links should be tested regularly to protect against undetected interference or fault."

"Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."