

# *FLEX8EX-T*

## User's Manual

(Tandem System - Slave)

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# 1. Introduction

The **FLEX** radio remote control systems are designed for control of industrial equipment and machinery such as overhead traveling cranes, jib cranes, gantry cranes, tower cranes, electric hoists, winches, monorails, conveyor belts, mining equipment and other material handling equipment where wireless control is preferred.

Each **FLEX** system consists of a transmitter handset and receiver unit. Other standard-equipped accessories include transmitter waist belt, spare transmitter power key, clear vinyl pouch, “AA” alkaline batteries, compass direction decal sheet and user’s manual.

List of notable features include:

- \* Over one million unique ID codes (20bit) – Each and every Flex system has its own unique ID codes and serial number, never repeats.
- \* Advanced controls – The Flex system utilizes advanced microprocessor controls with 32bit CRC and Hamming Code, which provide ultra fast, safe, precise, and error-free encoding and decoding.
- \* Unique I-CHIP design – The I-CHIP functions in a way that is very similar to SIM card used on mobile phones, with the ability to transfer system information and settings from one transmitter to another without the hassle of resetting the spares.
- \* Reliable push buttons – The in-house designed push buttons with gold-plated contacts are rated for more than one million press cycles.
- \* Low power consumption – Requires only two “AA” Alkaline batteries for more than 150 hours of operating time between replacements.
- \* Ultra-durable nylon and fiberglass composite enclosures – Highly resistance to breakage and deformation even in the most abusive environments.
- \* Full compliance – All systems are fully complied with the FCC Part-15 Rules, European Directives (Safety, EMC, R&TTE, Machinery) and Industry Canada Specifications (IC).

## 2. Radio Controlled Safety

Flex radio remote control system should be operated by persons with sufficient amount of knowledge and skill in crane operation and safety. Persons being trained to operate a radio remote controlled crane should possess the knowledge of all hazards peculiar to radio remote controlled crane operation, ability to judge distance and moving objects, equipment capacity and radio remote controlled safety rules. Radio remote controlled cranes should not be operated by any person with insufficient eyesight, hearing, illness, and under influence of drugs and medications that may cause loss of crane control.

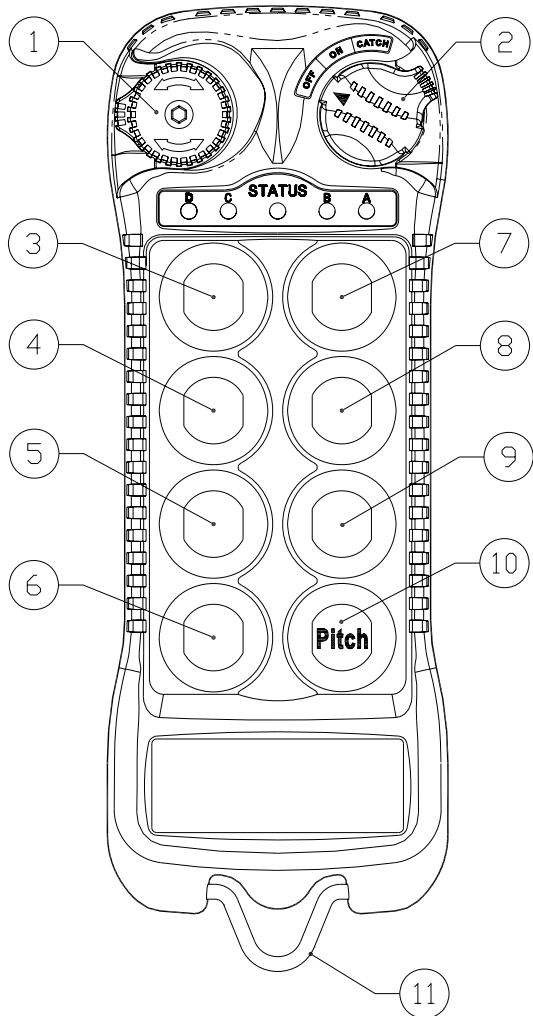
Below are some general operating safety tips that should be strictly followed when operating a radio remote controlled crane.

1. Prior to crane operation always check the transmitter handset for any damage that might inhibit proper crane operation.
2. Always check if the red emergency stop button is working properly prior to crane operation.
3. Check the Status LED on the transmitter for any signs of low battery power (refer to page 24).
4. Check the Status LED on the transmitter for any signs of irregularities (refer to page 24).
5. The crane limit switches should be checked prior to crane operation or at the beginning of each shift. When checking limit switches the hoist should be centered over an area free of personnel and equipment.
6. If the power to the crane is removed, the operator should turn off the transmitter power immediately until the power to the crane is restored.
7. If the crane fails to respond properly to operator's command the operator should stop operation, turn the transmitter power off, and then report the condition to their supervisor.
8. The transmitter power should be turned off after each use. If the transmitter handset is not in use always turn the power off and stored it in a safe or designated location. Never leave the transmitter handset unattended in the working area.
9. Make sure the system is not set to the same channel as any other Flex systems in use within a distance of 300 meters (900 feet).

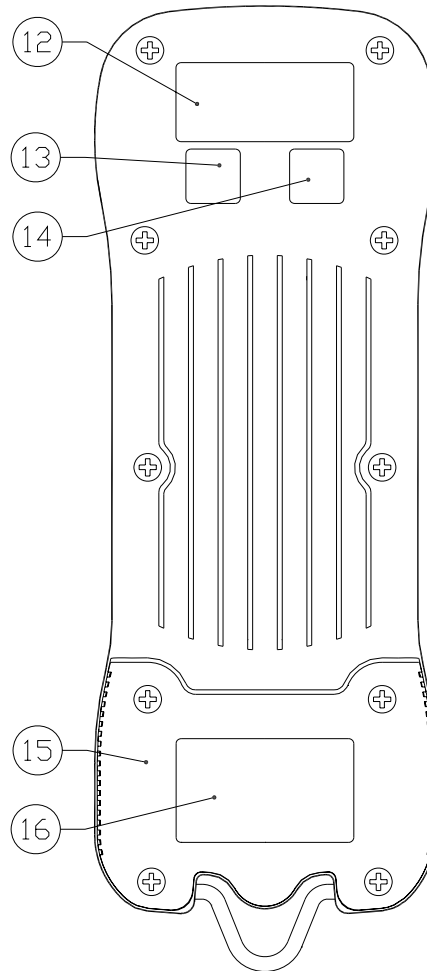
# 3. General System Information

## A. TRANSMITTER HANDSET

### 1. External Illustration (Tandem-Slave Configuration)



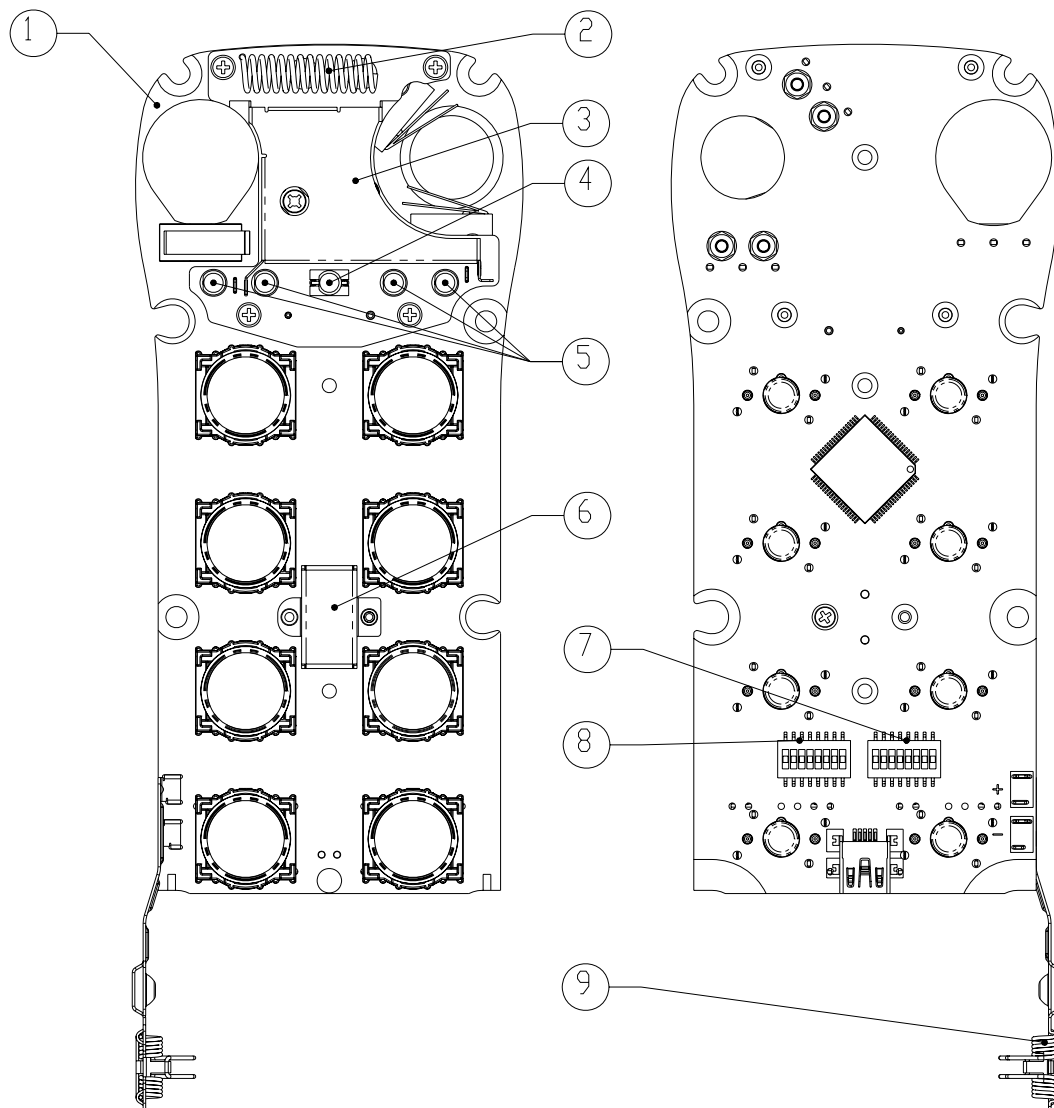
(Fig. 01)



(Fig. 02)

- |                               |                            |
|-------------------------------|----------------------------|
| 1. Emergency Stop Button      | 9. Push Button #5          |
| 2. Removable Power Key Switch | 10. Push Button #7 (Pitch) |
| 3. Push Button #2             | 11. Strap Ring             |
| 4. Push Button #4             | 12. System Information     |
| 5. Push Button #6             | 13. System Channel         |
| 6. Not used                   | 14. Crane Number           |
| 7. Push Button #1             | 15. Battery Cover          |
| 8. Push Button #3             | 16. Approval Information   |

## 2. Internal Illustration



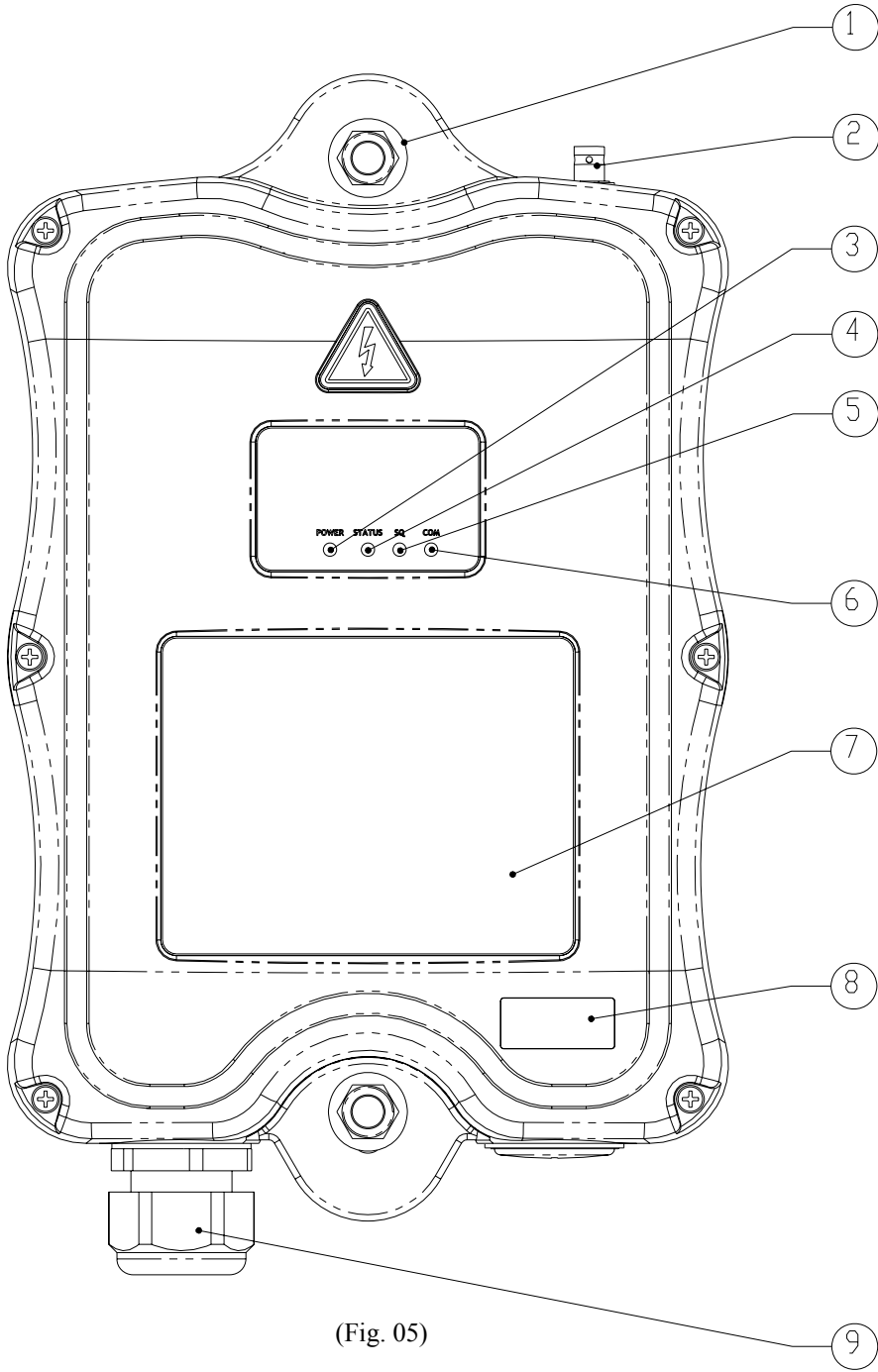
(Fig. 03)

(Fig. 04)

- |    |                       |    |                           |
|----|-----------------------|----|---------------------------|
| 1. | Encoder Board         | 6. | I-CHIP                    |
| 2. | Arial Antenna         | 7. | Function Dip-Switch       |
| 3. | Transmitting Module   | 8. | Channel Dip-Switch        |
| 4. | Status LED Display    | 9. | Battery Contact Mechanism |
| 5. | Function LED Displays |    |                           |

# B. RECEIVER UNIT

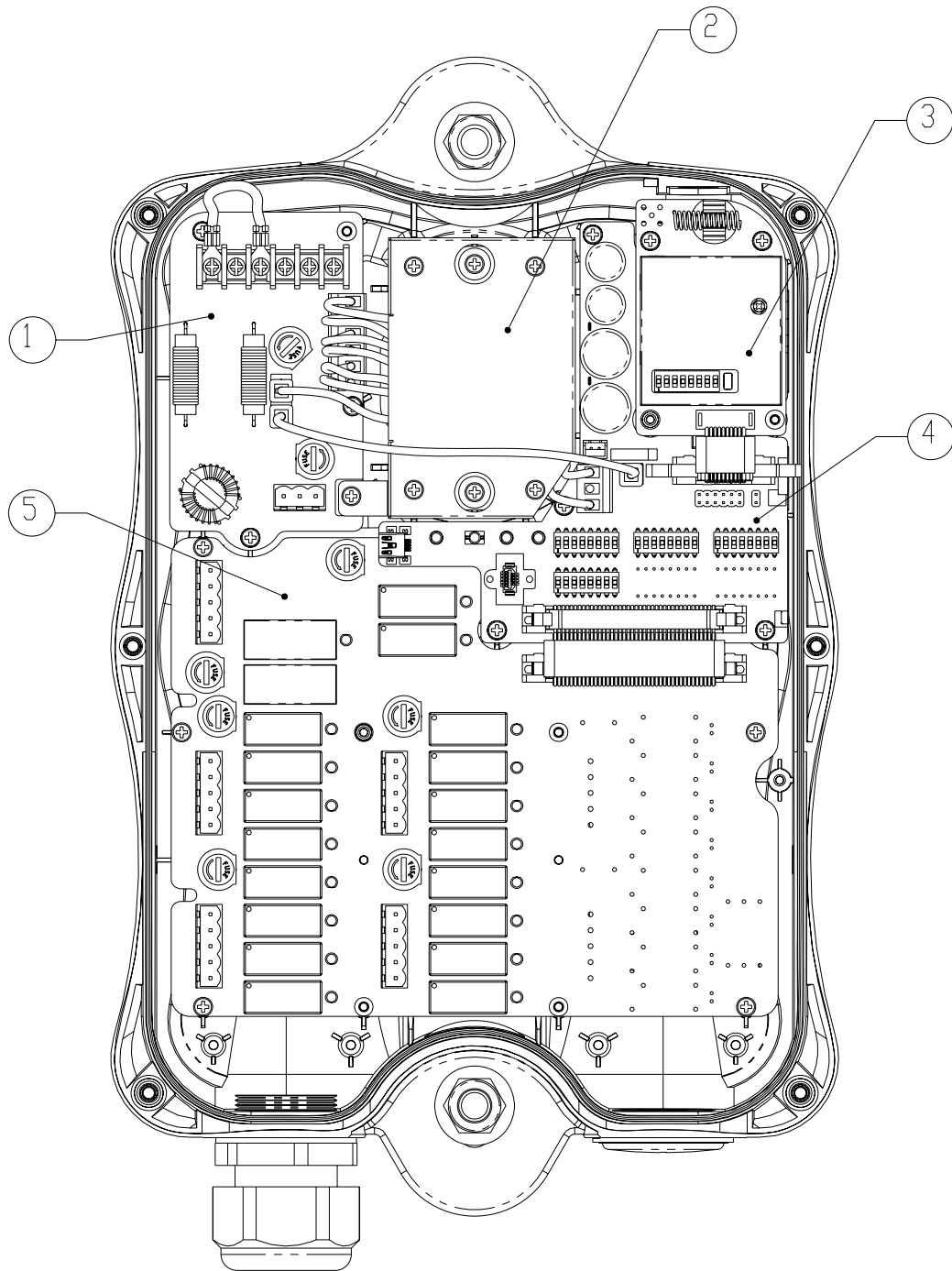
## 1. External Illustration



(Fig. 05)

- 1. Shock Mount
- 2. External Antenna Jack
- 3. Power LED Display
- 4. Status LED Display
- 5. SQ LED Display
- 6. COM LED Display
- 7. Output Contact Diagram
- 8. System Information
- 9. Cord Grip

## 2. Internal Illustration



(Fig. 06)

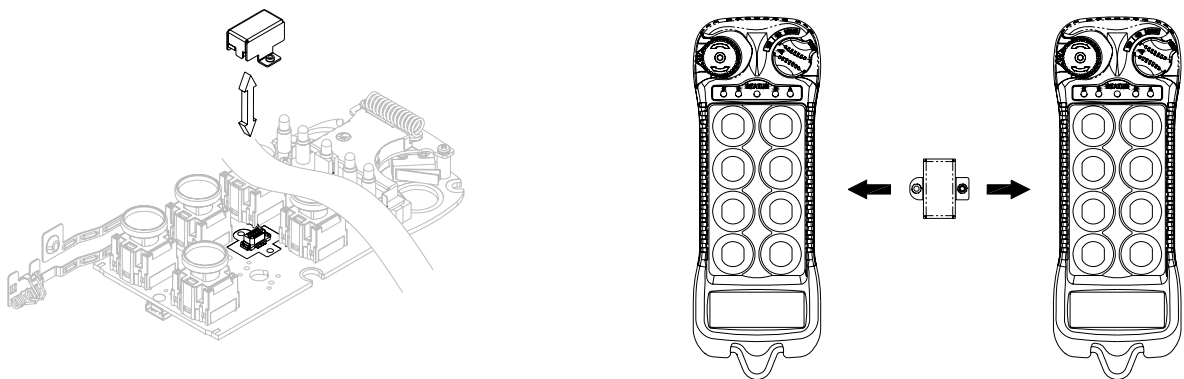
- |                      |                       |
|----------------------|-----------------------|
| 1. AC Line Filter    | 4. Decoder Module     |
| 2. Power Transformer | 5. Output Relay Board |
| 3. Receiving Module  |                       |

# 4. I-Chip Programming

I-Chip functioned in a way that is very similar to a SIM card inside a mobile phone, which stores system information such as your phone number, account number, phone book and other settings. I-CHIP works exactly the same way, as it stores information such as system serial number/ID code, channel and push button configurations.

When replacing a transmitter handset, just take the I-CHIP out of the old transmitter and install it into the new one (refer to Fig. 07 below). For complete information transfer, do make sure both the Channel and Function dip-switch is set to all "1". If both dip-switches are set to all "1", then the transmitter will operate according to the push button configurations and channel stored inside the I-CHIP. If both Channel and Function dip-switch is set to other values other than all "1", then the transmitter will operate according to the channel and push button configurations set on these two dip-switches, not the ones stored inside the I-CHIP. Every time when the settings on these two dip-switches have changed, the new settings will be stored into the I-CHIP automatically. In this case the previous channel and push button configurations stored inside the I-CHIP will be erased and be replaced by the new settings.

For safety purposes, system serial number/ID code stored inside the I-CHIP can not be changed directly on the transmitter encoder board. Only channels and push button configurations can be changed directly on the encoder board via Channel and Function dip-switches. There are only two ways that you can change transmitter serial number/ID code; 1) via I-CHIP programming port located on the decoder module inside the receiver unit, please refer to page 16 on how to program the I-CHIP (serial number/ID code) via receiver unit; 2) via an external I-CHIP programmer or duplicator unit available from the factory. Please ask your local dealers for assistance if your system requires serial number/ID code adjustments.



(Fig. 07)

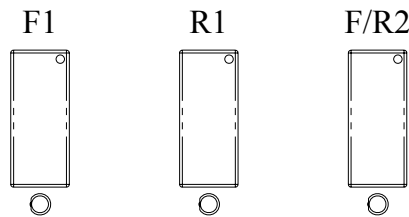
# 5. System Programming

## A. OUTPUT RELAY CONFIGURATIONS

### 1. Output Relay Types

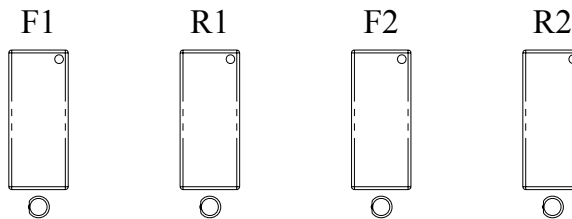
#### a. Three (3) output relays per motion – shared 2<sup>nd</sup> speed output relay

Output relays with Forward 1<sup>st</sup> speed (F1), Reverse 1<sup>st</sup> speed (R1) and Forward/Reverse 2<sup>nd</sup> speed (F/R2). Forward and Reverse 2<sup>nd</sup> speed (F/R2) shared the same output relay.



#### b. Four (4) output relays per motion – separate 1<sup>st</sup> and 2<sup>nd</sup> speed output relays

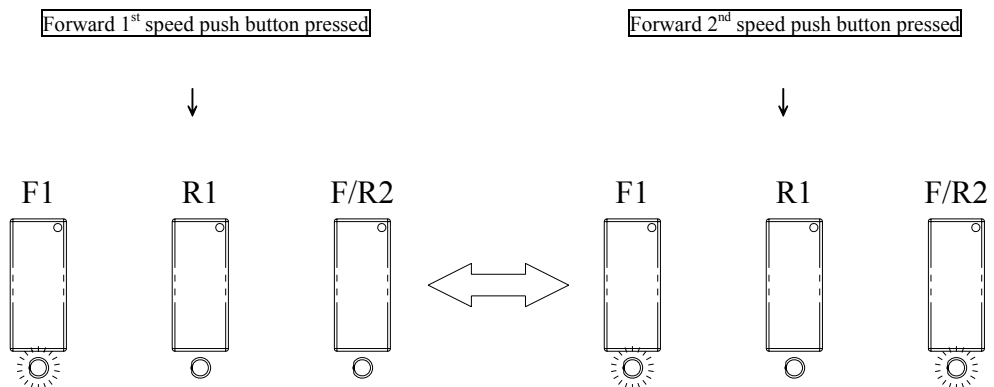
Output relays with Forward 1<sup>st</sup> speed (F1), Reverse 1<sup>st</sup> speed (R1), Forward 2<sup>nd</sup> speed (F2) and Reverse 2<sup>nd</sup> speed (R2). Forward and Reverse 2<sup>nd</sup> speed with separate output relays.



### 2. Output Relay Actions at 2<sup>nd</sup> Speed

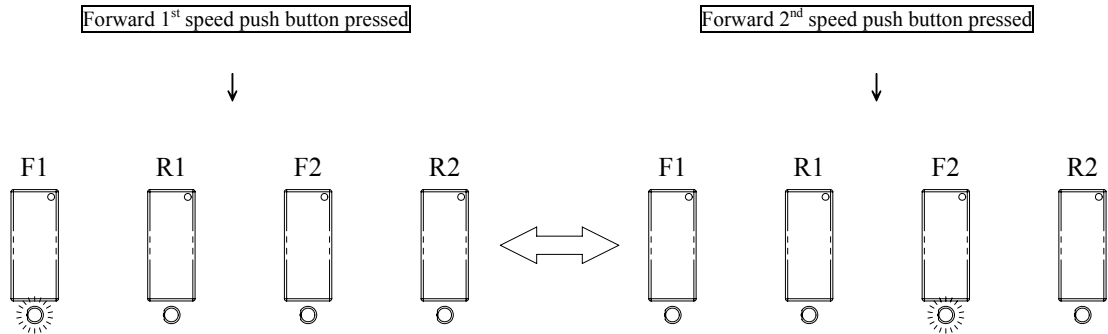
#### a. 3-output relays configuration with Closed/Closed contact at 2<sup>nd</sup> speed

At 2<sup>nd</sup> speed, both 1<sup>st</sup> speed (F1 or R1) and 2<sup>nd</sup> speed (F/R2) output relays are closed (refer to page 13 on how to set to this function).



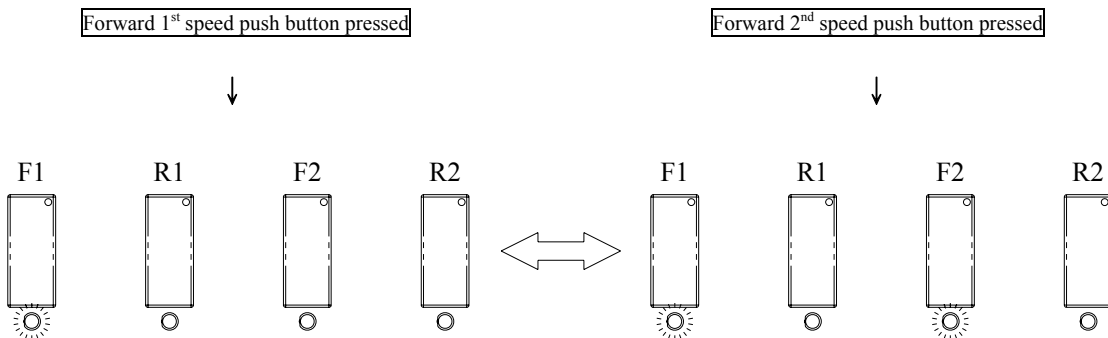
**b. 4-output relays configuration with Opened/Closed contact at 2<sup>nd</sup> speed**

At 2<sup>nd</sup> speed, only the 2<sup>nd</sup> speed (F2 or R2) output relay is closed (refer to page 13 on how to set to this function).



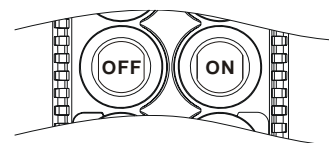
**c. 4-output relays configuration with Closed/Closed contact at 2<sup>nd</sup> speed**

At 2<sup>nd</sup> speed, both 1<sup>st</sup> speed (F1 or R1) and 2<sup>nd</sup> speed (F2 or R2) output relays are closed (refer to page 13 on how to set to this function).



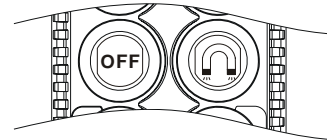
**3. ON/OFF Push Button Function**

The user can set any of the two adjacent push buttons on the transmitter to behave like a mechanical ON & OFF rocker switch (refer to page 13 on how to set to this function). When "On" output relay is closed ("On" push button pressed), the "Off" output relay will open automatically, or vice versa.



#### 4. Magnet ON/OFF Push Button Function

The user can set any of the two adjacent push buttons on the transmitter to control a magnet. To activate the magnet just press the push button with the Magnet symbol. To deactivate the magnet, for safety purpose, you must first press and hold the Magnet push button and then press the OFF push button. Press the OFF push button by itself can not deactivate the magnet (refer to page 13 on how to set to this function).



#### 5. Brake Function

When the transmitter push button is released from 2<sup>nd</sup> speed up to 1<sup>st</sup> speed, both 1<sup>st</sup> and 2<sup>nd</sup> speed output relays will open for up to 1.0 second and then with 1<sup>st</sup> speed output relay closed thereafter (refer to page 13 on how to set to this function).

#### 6. External Warning Function

The user can install an external warning device (rotating lights, horn, etc...) to a special “Function output relay” located inside the receiver. The user can choose which push button pairs or crane motions he desired to have external warnings when push button is pressed (refer to page 13 on how to set to this function).

#### 7. Momentary Contact

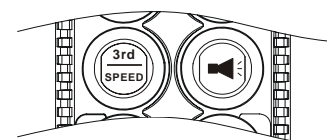
When push button is released the output relay corresponds to that push button will open (refer to page 14 on how to set to this function). This type of contact is usually applies to external application such as horns or buzzers.

#### 8. Toggled Contact

When push button is released the output relay corresponds to that push button will remained closed (maintained contact) until next time the user presses the same push button again (refer to page 14 on how to set to this function). This type of contact is usually applies to external application such as lights.

#### 9. 3<sup>rd</sup> Speed Push Button Function

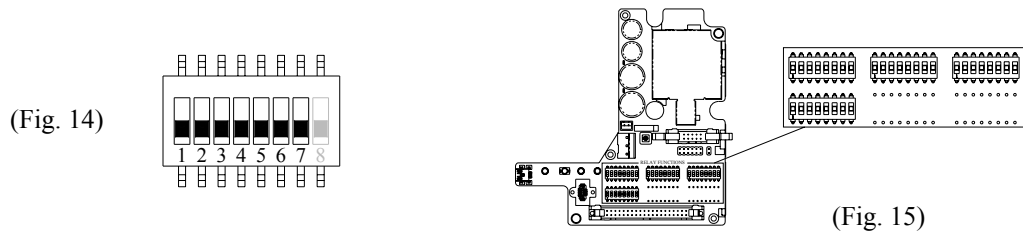
This function allows the crane to travel an additional step beyond 2<sup>nd</sup> speed. For example, if the operator is pressing the “UP” push button down to 2<sup>nd</sup> speed, pressing the 3<sup>rd</sup> speed push button (with “UP” push button still hold at 2<sup>nd</sup> speed) will toggle between 2<sup>nd</sup> speed and 3<sup>rd</sup> speed (refer to page 14 on how to set to this function).



## B. DIP-SWITCH SETTINGS

### 1. Interlocked Functions

Interlocked means the two adjacent push buttons can not be activated simultaneously at the same time as it will cancel each other out. Interlocked settings are usually applied to crane's forward and reverse motions. Each dip-switch on the decoder module corresponds to one (1) motion or two (2) adjacent push buttons (refer to Fig. 14 & 15 below). Only the first 7 dip-switch positions are used (counting from left to right), the 8<sup>th</sup> dip-switch position (far right) is not used.



■ Manufacture preset

Dip Settings	Function Descriptions	# of Relays Used
0000000	Normal (single speed only, F2 & R2 relays not used)	2
0000001	Closed/Closed Relay Action at 2 <sup>nd</sup> Speed (separate 2 <sup>nd</sup> speed relay)	4
0000010	Closed/Closed Relay Action at 2 <sup>nd</sup> Speed (shared 2 <sup>nd</sup> speed relay)	3
0000011	Opened/Closed Relay Action at 2 <sup>nd</sup> Speed (separate 2 <sup>nd</sup> speed relay)	4
0000110	On (right button) & Off (left button)	2
0001001	On + Start / Off + Start -- Prior to pressing the button you must first rotate and hold the power key switch at START position to activate On or Off relays.	2
0000111	Safety Magnet On & Off	2
0010000	Normal + External Warning*	2
0010001	Closed/Closed Relay Action + External Warning*	4
0010010	Closed / Closed Relay Action + External Warning*	3
0010011	Opened/Closed Relay Action + External Warning*	4
0100001	Closed/Closed + Brake	4
0100010	Closed/Closed Relay Action + Brake	3
0100011	Opened/Closed Relay Action + Brake	4
0110001	Closed/Closed Relay Action + Brake + External Warning*	4
0110010	Closed/Closed Relay Action + Brake + External Warning*	3
0110011	Opened/Closed Relay Action + Brake + External Warning*	4

\* External warning function requires installing an external warning device such as horn and rotating lights to the function relay output.

## 2. Non-interlocked Functions

Contrary to interlocked settings, non-interlocked settings allow the two adjacent push buttons be used simultaneously at the same time. Non-interlocked settings are usually applied to crane's auxiliary functions such as lights, horn and 3<sup>rd</sup> speed. Each dip-switch on the decoder module corresponds to one (1) motion or two (2) adjacent push buttons (left & right push buttons).

Function Code	Dip Position Setting #1	Dip Position Setting #2 ~ #4 (left button) & #5 ~ #7 (right button)	Function Description
A	1	000	Normal (momentary) contact.
B	1	001	Toggled (latching) contact.
C	1	010	Acceleration (3 <sup>rd</sup> speed).
D	1	100	Normal + Start function. For added safety, you must first rotate and hold the power key switch at "START" position and then press the intended push button at the same time to activate the output relay.

Example #1: Left button (set to function code A) / right button (set to function code A) → **1 000 000**

Example #2: Left button (set to function code B) / right button (set to function code B) → **1 001 001**

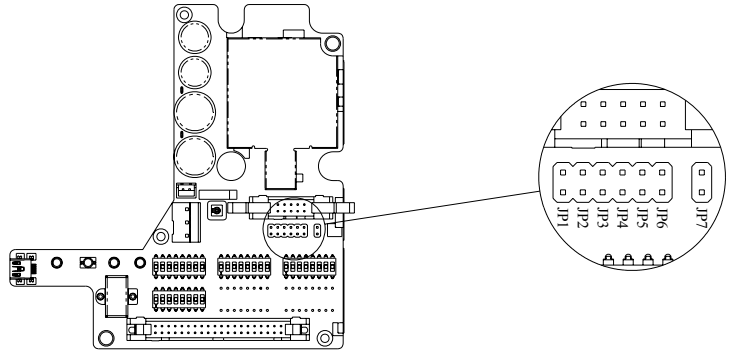
Example #3: Left button (set to function code A) / right button (set to function code C) → **1 000 010**

Example #4: Left button (set to function code C) / right button (set to function code D) → **1 010 100**

## C. JUMPER SETTINGS

The jumpers #6 & #7 is located on the decoder module above the four (4) dip-switches (refer to Fig.10 below). For Tandem systems only JP6 & JP7 is applicable, JP1~JP5 are unused.

(Fig. 10)

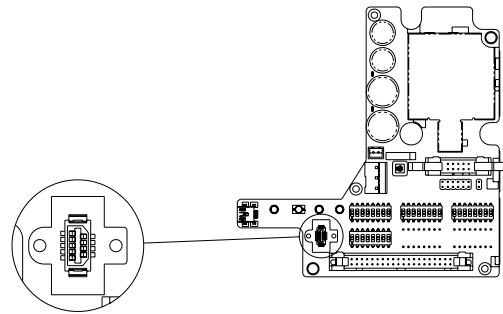


■ Manufacture preset

Jumper Settings	Function
JP6 (Blank)	Program system serial number/ID code and channel from decoder module to I-CHIP.
JP6 (Inserted)	Program system serial number/ID code and channel from I-CHIP to decoder module.
JP7 (Inserted)	For system test only, receiver MAIN disabled.

## D. I-CHIP PROGRAMMING PORT

(Fig. 11)



I-CHIP programming port located on the decoder module (refer to Fig. 11 above) inside the receiver is designed for the purpose of transferring system serial number/ID code either from I-CHIP to receiver or from receiver to I-CHIP. If you wish to transfer system information from receiver to I-CHIP, just insert the I-CHIP onto the programming port (JP6 jumper not inserted), wait until the Status LED on the decoder module turned constant green (within 2 seconds), and then take the I-CHIP out of the programming port (programming completed). At this time the I-CHIP should also possess the same serial number/ID code as the receiver. If the Status LED on the decoder module displayed a constant red light after inserting the I-CHIP (programming failed), then you must reinsert the I-CHIP one more time. On the other hand, if you wish to transfer system information from I-CHIP to receiver, then you must first insert JP6 jumper prior to inserting the I-CHIP, then wait for the green light to appear on the Status LED. At this time the receiver should also possess the same system information as the I-CHIP. Please note that the receiver unit must be powered in order to proceed with the programming.

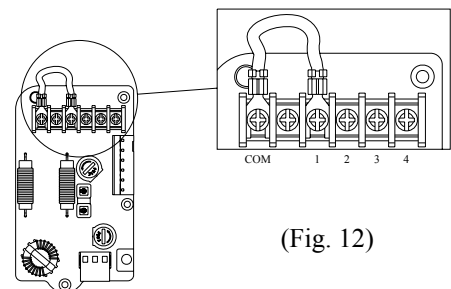
## E. VOLTAGE SETTINGS

Prior to installation always check the voltage setting is correct for your application (refer to Fig. 12 below).

- Position 1 → 110~120VAC
- Position 2 → 220~240VAC or 24VAC\*
- Position 3 → 380~400VAC or 42VAC\*
- Position 4 → 410~460VAC or 48VAC\* or 12~24VDC\*\*

\* For system with 24/42/48VAC power supply.

\*\* For system with 12~24VDC power supply.



(Fig. 12)

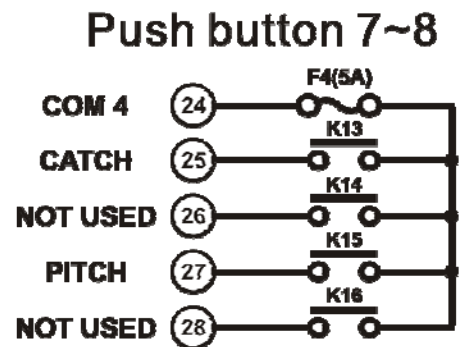
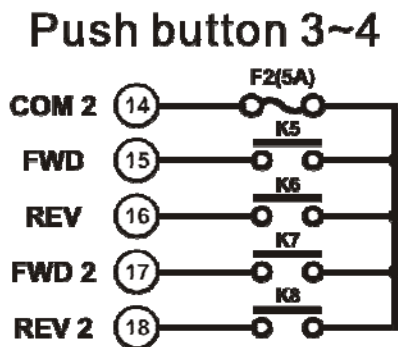
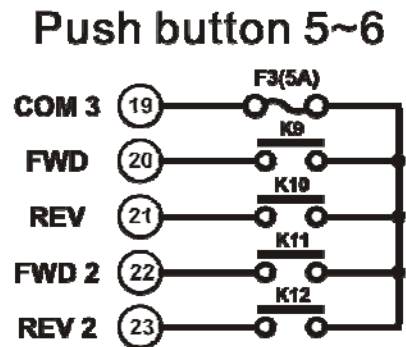
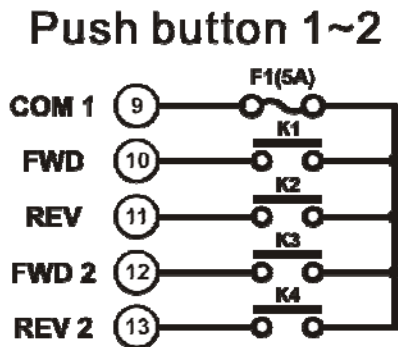
### F9 and F10 power fuse ratings:

FUSE #	110~120VAC	220~240VAC	380~400VAC	410~460VAC	24VAC	42 & 48VAC	12~24VDC
F9	1.0A (red)	1.0A (red)	1.0A (red)	0.5A (blue)	3.0A (yellow)	2.0A (purple)	2.0A (purple)
F10	1.0A (red)	1.0A (red)	1.0A (red)	0.5A (blue)	3.0A (yellow)	2.0A (purple)	2.0A (purple)

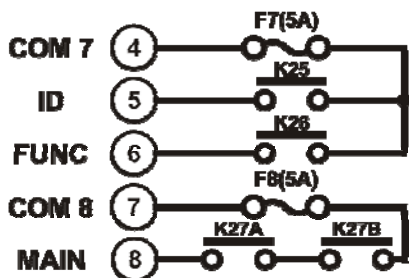
\* Output relay fuse → 5.0A (clear)

# 6. Receiver Installation

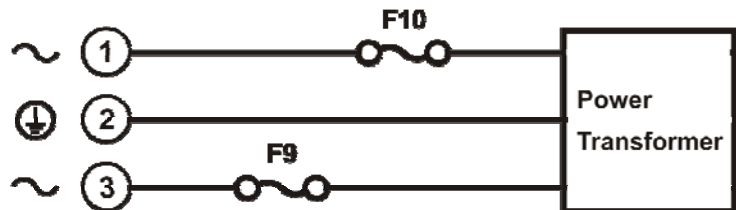
## A. OUTPUT RELAY CONTACT DIAGRAM



### MAIN/ID/Function



### Power



Note A: For 3-relay (shared 2<sup>nd</sup> speed) and 4-relay (separate 2<sup>nd</sup> speed) configuration please refer to page 10~13.

Note B: For 4-relay closed/closed and 4-relay opened/closed relay configuration please refer to page 10~13.

Note C: For different voltage settings please refer to page 16.

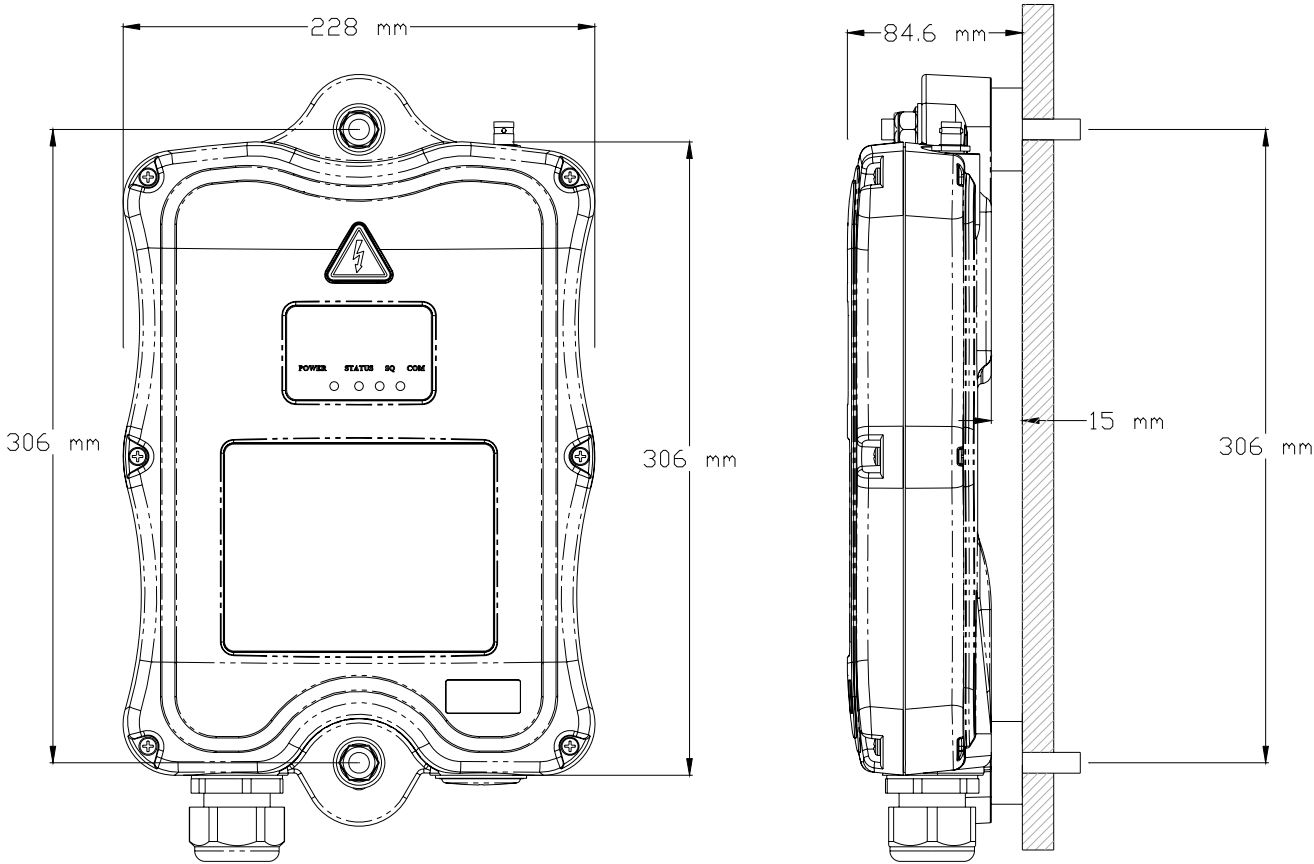
Note D: For F9 and F10 power fuse ratings please refer to page 16.

Note E: For 12~24VDC power supply, wire #1 corresponds to the negative charge (-) and wire #3 corresponds to the positive charge (+), wire #2 is for GROUND.

## B. PRE-INSTALLATION PRECAUTIONS

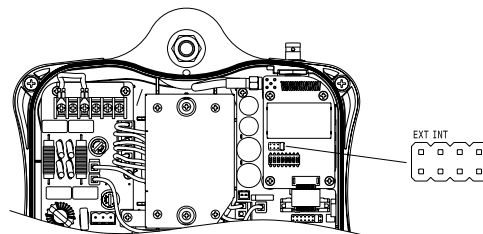
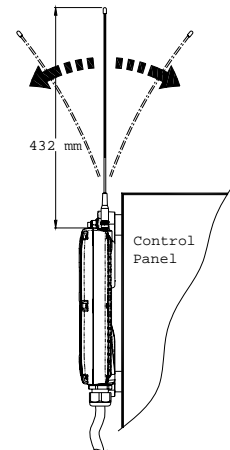
1. Make sure the transmitter and receiver are with identical serial number/ID code and channel.
2. Make sure the receiver is not set to the same channel as any other systems in use in the surrounding area.
3. Make sure that the crane or equipment is working properly prior to installation.
4. Make sure the power source to the receiver is set correctly.
5. Switch off the main power source to the crane or equipment prior to installation.

## C. STEP-BY-STEP INSTALLATION



(Fig. 13)

1. For best reception the location of the receiver should be visible to the operator at all time.
2. The location selected should not be exposed to high levels of electric noise. Mounting the receiver next to an unshielded variable frequency drive may cause minor interference. Always locate the receiver as far away from variable frequency drive as possible.
3. Ensure the selected location has adequate space to accommodate the receiver (refer to Fig. 13 on page 18). If an external antenna is used, to avoid the possibility of antenna damage always locate the receiver where the antenna is free from any obstacles from all directions (refer to diagram at right).
4. When installing an external antenna you must connect the SMA jack located inside the receiver and make sure to set the jumper to “EXT” position (refer to diagram below).



5. For better reception, make sure the receiver is in an upright position.
6. Drill two holes (10mm in diameter) on the control panel or location where the receiver is to be installed (refer to Fig. 13 on page 18).
7. Make sure the two bolts are tightened after installation.
8. For system wiring please refer to page 17.

## D. SYSTEM TESTING

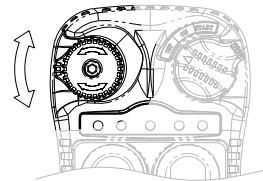
1. Turn on the power source to the receiver and test the MAIN relay output by pressing the red emergency stop button and observe that it properly opens and closes the mainline disconnect contactor.
2. Test the operation of each function to ensure it corresponds to the transmitter direction labels or the pendant it is replacing.
3. Test the limit switches (if any) to see if they are working properly.
4. If your new remote control is replacing an existing pendant, make sure it is completely disconnected and placed in a safe location to prevent unwanted control command.

# 7. Operating Procedure

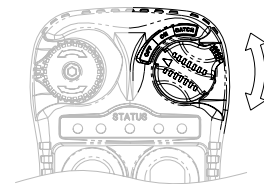
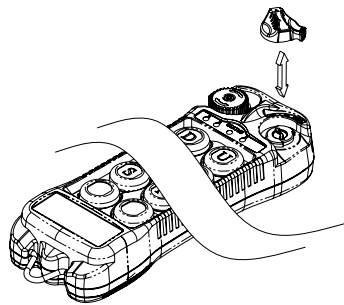
## A. TRANSMITTER OPERATION

### 1. General Operating Procedure

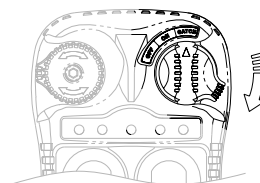
- a. Reset the red emergency stop button located on the top left hand side of the transmitter handset by rotating it either clockwise or counter clockwise, the red button will pop up.



- b. Turn on the transmitter power by inserting the black-colored key into the power key slot located on the top right hand side of the transmitter handset and rotate it clockwise to “On” position.



- c. After turning on the transmitter power, check the Status LED on the transmitter handset for any sign of system irregularities (refer to “Status Light Indicators & Warnings” on page 24). If the system is normal the Status LED will light up green for two (2) seconds.
- d. If there are no signs of any system irregularities, then rotate the power key-switch further to CATCH position for up to 2.0 seconds to activate all transmitter push button functions and as well as the receiver MAIN. Then press any push button on the transmitter to begin operation. Pressing any push button prior to initiating the CATCH command will result in no signal transmitted (blinking orange light).

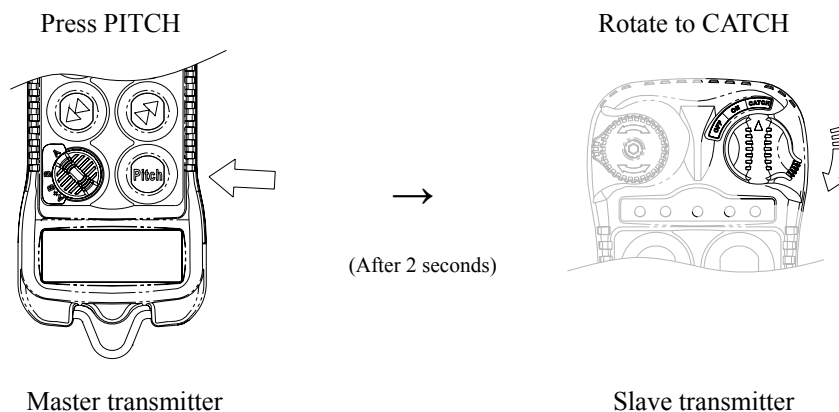
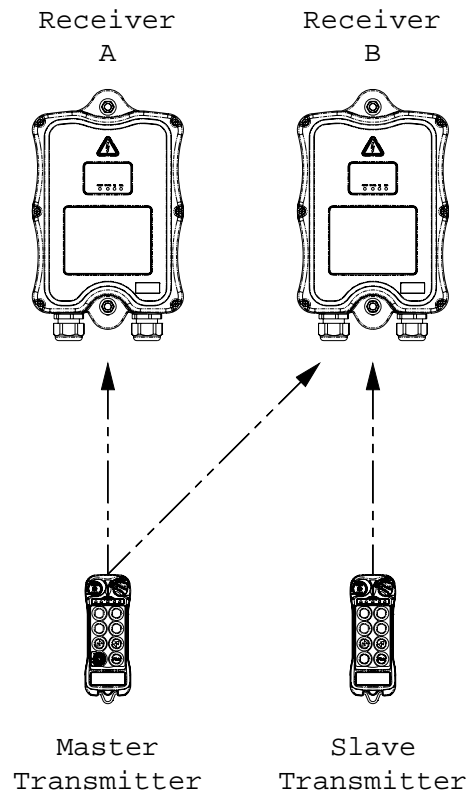


- e. In case of an emergency, press down the red emergency stop button will immediately disconnect the receiver MAIN and as well as the transmitter power. To resume operation, rotate the red button clockwise or counter-clockwise, it will pop up. Then rotate the power key-switch to CATCH position for up to 2.0 seconds to activate all transmitter push button functions and the receiver MAIN. Please note that every time when you turn the transmitter power off and back on again or after resetting the emergency stop button, all push button functions will be locked to avoid any unintentional controls. For safety, initiating the CATCH command after turning on the transmitter power or after resetting the emergency stop button is strictly required.
  
- f. After 5minutes of inactivity (push button not pressed) the receiver MAIN will be disconnected temporarily. To resume operation, you must rotate the power key-switch on the transmitter to CATCH position prior to initiating any motion commands. The receiver MAIN will also be disconnected temporarily when the receiver encounters strong radio interference or when the operator is controlling the crane or equipment beyond the transmitting range.
  
- g. Turn off the transmitter power by rotating the power key counter-clockwise to “Off” position; it will disconnect the transmitter power and the receiver MAIN altogether. Turn it further counter-clockwise to release the key.

## 2. Tandem (slave) Operation

Unlike the master transmitter, this transmitter (slave) is only capable of controlling its designated receiver (receiver B). Please follow the instruction below for safe operation.

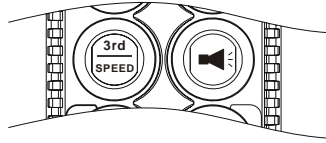
- a. To gain control of receiver B, PITCH push button on the master transmitter must be initiated prior to your takeover. For example, master transmitter must rotate the selector switch to B position and press the PITCH push button to release control of receiver B. Then slave transmitter (your transmitter) must then rotate the power key switch to CATCH position for up to 2.0 seconds to gain control of receiver B (your receiver). Make sure that the CATCH process is executed 2.0 seconds after master transmitter initiates the PITCH command (refer to diagram below). To release control of receiver B, simply press the PITCH push button on the transmitter for up to 2.0 seconds. This will allow the master transmitter to gain control of receiver B.



- b. For safety reason, there is a 2-second grace period followed after initiating the PITCH command. What this means is that when PITCH push button is pressed or initiated, rotating the power key switch to CATCH position on the other transmitter within this 2-second grace period is ineffective. In order to gain control of the other receiver you must first wait for up to 2 seconds after the other transmitter presses the PITCH push button and then execute the CATCH command.

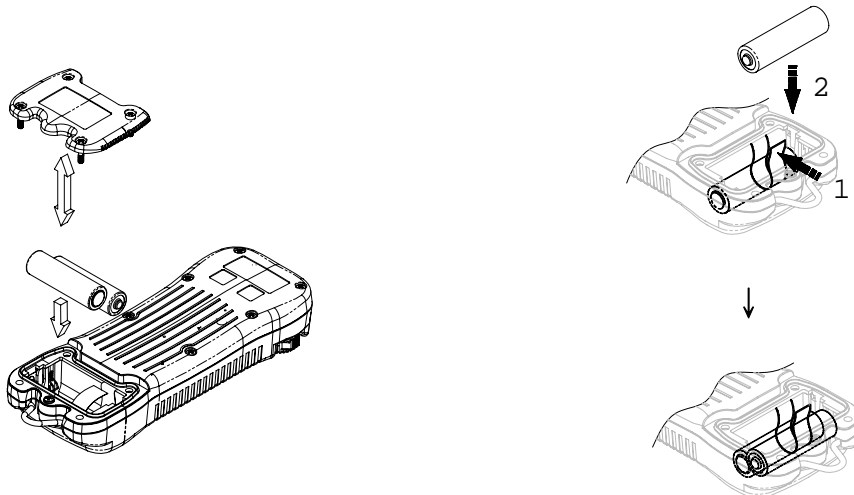
### 3. 3<sup>rd</sup> Speed Push Button Operating Procedure

When a push button is hold at 2<sup>nd</sup> speed, pressing the 3<sup>rd</sup> Speed push button one time will activate the 3<sup>rd</sup> speed output relay (toggled). If the operator wants 2<sup>nd</sup> speed again, just press the 3<sup>rd</sup> Speed push button one more time. Please refer to page 14 on how to set 3<sup>rd</sup> Speed function.



### 4. Changing Transmitter Batteries

Changing transmitter batteries by unscrewing the battery cover located on the backside of the transmitter. During battery installations make sure that the blue ribbon is centered between the two batteries. After changing the batteries also make sure that all screws are tightened to avoid water, moisture, dirt, grease, or other liquid penetration.



## B. STATUS LIGHT INDICATORS & WARNINGS

### 1. Transmitter STATUS Light Indication

Type	Display Type	Indication
1	Constant red	Voltage below 1.9V at initial power on, transmitter power and receiver MAIN shuts off.
		Voltage below 1.8V during operation, transmitter power and receiver MAIN shuts off.
2	1 red blinks followed by a 2-second pause	Voltage below 1.85V during operation, warning, change batteries suggested.
3	2 red blinks followed by a 2-second pause	The pushbutton is defective after turning on the transmitter power.
4	No light displayed	When defective push button condition occurs (2 red blinks, type 3 above), find out which push button is defective by pressing all the push buttons on the transmitter one at a time. If the push button is in good working order, the LED will not light up when pressed. If the push button is defective the LED will continue to display 2 red blinks when pressed.
5	3 red blinks followed by a 2-second pause	EEPROM error.
6	4 red blinks followed by a 2-second pause	Transmitting error, system can not locked on to the designated channel.
7	Constant green for up to 2 seconds	Transmitter power on with no faults detected
8	Blinking green	Transmission in progress.
9	Blinking orange	Transmitter push button functions locked.

## 2. Receiver STATUS Light Indication

Type	Display Type (Green & Red)	Indication
1	Fast green blinks	Decoding in process
2	Slow green blinks	Decoding on standby
3	Two red blinks	Receiver MAIN jammed or defective
4	Fast red blinks	Incorrect transmitter serial number/ID code
5	Constant red	Receiver under-voltage, LV output relay activated

## 3. Receiver SQ Light Indication

Type	Display Type (Red)	Indication
1	Fast blinks	Transmission received
2	Completely off	No transmission
3	Blinks intermittently	Other radio interference

## 4. Receiver POWER Light Indication

Type	Display Type (Red)	Indication
1	On	Power to receiver
2	Off	No power to receiver

## 5. Receiver COM Light Indication

Type	Display Type (Red)	Indication
1	On	Power to relay Board
2	Off	No power to relay board

## C. TROUBLE SHOOTING TIPS

<b>Problems</b>	<b>Possible Reasons</b>	<b>Suggestions</b>
<b>No responds when transmitter push button is pressed</b> <b>(Improper startup &amp; settings)</b>	Transmitter low battery power	Check the transmitter battery level.
	Emergency stop button activated prior to startup	Prior to turning on the transmitter power switch make sure that the red emergency stop button is elevated.
	Improper startup procedure	Redo the startup procedure.
	Incorrect system RF channel	Check and make sure that the transmitter handset and receiver unit both have the same channel.
	Incorrect system serial number/ID code	Check and make sure that the transmitter handset and receiver unit both have the same serial number/ID code.
	System out of range	Make sure that the startup procedure is initiated within 100 meters (300 feet) from the receiver location.
<b>No responds when transmitter push button is pressed</b> <b>(Damaged hardware)</b>	Defective transmitting and receiving module	Check the SQ display on the face of the receiver unit. If it does not light up when push button is pressed then either the transmitting or receiving module is defective. First replace the transmitting module. If SQ display still not lid when push button is pressed then go ahead and replace the receiving module.
	Defective encoder board or decoder module	If still no responds, then replace the transmitter encoder board. If still doesn't work then the decoder module is defective.
<b>No AC power to the receiver</b>	Incorrect input voltage	Make sure the source voltage is set correctly.
	Blown fuse	Check for any blown fuse.
	Incorrect wiring	Check input voltage connection.
<b>Outputs do not correspond to transmitter</b>	Incorrect output connection	Check the system wiring again. Please refer to the output contact diagram inside this manual or on the receiver cover.

## 8. System Specifications

Frequency Range	:	433 ~ 434 MHz
Number of Channels	:	62 channels (Standard) / 2 channels (Tandem) 3 channels (Random Access)
Channel Spacing	:	25 KHz
Modulation	:	Digital Frequency Modulation based on Manchester Code, 20bit address, 32bit CRC Parity Check and Hamming Code.
Encoder & Decoder	:	Microprocessor-controlled
Transmitting Range	:	> 100 Meters / 300 Feet
Hamming Distance	:	> 6
Frequency Control	:	Synthesized PLL (Phase Lock Loop)
Receiver Type	:	Frequency Auto Scanning
Receiver Sensitivity	:	-116Bm
Spurious Emission	:	-50dB
Antenna Impedance	:	50 ohms
Responding Time	:	40 Milliseconds (average)
Transmitting Power	:	1.0mW
Enclosure Type	:	NEMA-4X
Enclosure Rating	:	IP-66
Output Contact Rating	:	250V @ 10 Amps
Transmitter Operating Voltage	:	DC 3.0V
Receiver Power Consumption	:	11.0 VA
Operating Temperature	:	-25°C ~ 75°C / -13°F ~ 167°F
Transmitter Dimension	:	184mm (L) x 69mm (W) x 34mm (H)
Receiver Dimension	:	363mm (L) x 228mm (W) x 70mm (H)
Transmitter Weight	:	242g / 8.5oz
Receiver Weight	:	2.5kg / 5.5lb

# 9. Spare Parts

1.	Transmitting Module (433/434MHz)	TRB 01
2.	Encoder Board (complete with push buttons)	ENB 05
3.	I-CHIP (complete)	ICP 01
4.	Receiving Module	RVB 01
5.	Decoder Module	DEB 02N
6.	Receiver Relay Board	RLB 05N
7.	AC Line Filter Board	LFB 01
8.	Power Transformer	
	AC 110~120V/220~240V/380~400V/410~460V	PTF 01
	AC 24V/42V/48V	PTF 02
	DC 12V~24V	PTF 03
9.	Transmitter Top Casing	TTC 02N
10.	Transmitter Bottom Casing	TBC 02
11.	Transmitter Battery Cover	TBC 04
12.	Receiver Top Casing	RTC 01
13.	Receiver Bottom Casing	RBC 01
14.	Cord Grip	CGR 01
15.	Shock Mount	SMT 01
16.	2-Step Push Button	PBN 02
17.	3-Stage Mechanical Selector Switch	SWT 01
18.	Push Button Rubber Boot	PRB 01
19.	Emergency Stop Button	EMS 01N
20.	Transmitter Power Keys Switch	PWK 01
21.	Waist Belt	WBT 01
22.	Strap Ring	STR 01
23.	Safety MAIN relay	SMR 01
24.	Regular Output Relay	RLY 01
25.	Clear Vinyl Pouch	CVP 02
26.	External Receiver Antenna	ANT 01