

# ECO12S/X

## Instruction Manual

(Standard, AB and Tandem models)



# Service Information

## Your New Radio Remote Control System

Thank you for your purchase of ARC Flex ECO radio remote control system. Without a doubt, our Flex ECO system is the ultimate solution for providing precise, undeterred, and safe control of your material.

If your product ever needs modification or service, please contact our representative in your country or at the following location:

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## PRODUCT MANUAL SAFETY INFORMATION

Advanced Radiotech Corporation (ARC) offers a broad range of radio remote control product for material handling applications. This manual has been prepared by ARC to provide information and recommendations for the installation, use, operation and service of ARC's material handling products and systems (ARC Products). Anyone who uses, operates, maintains, services, installs or owns ARC Products should know, understand, and follow the instructions and safety recommendations in this manual for ARC Products.

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists lifting devices or other material handling equipment which use or include ARC Products:

- Instructions, manuals, and safety warnings of the manufacturers of the equipment where the radio system is used.
- Plant safety rules and procedures of the employers and the owners of facilities where the ARC Products are being used.
- Safety standards and practices for the industries in which ARC Products are used.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users and operators of the ARC Products to know, understand and follow all of these requirements. It is the responsibility of the employer to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use ARC Products prior to becoming familiar with and being trained in these requirements and the instructions and safety recommendations in this manual.**

## WARRANTY INFORMATION

For information on ARC's product warranties, please contact ARC representative nearest to you or visit [www.advanced-radiotech.com](http://www.advanced-radiotech.com).

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# 1. Introduction

The **Flex ECO** 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 all other material handling equipment where wireless control is preferred.

Each **Flex ECO** system consists of a transmitter handset and a receiver unit. Other standard-equipped accessories include transmitter lanyard, vinyl pouch, pushbutton labels, output cable, and instruction manual CD.

List of notable features include:

- \* **62 User-programmable Channels** – advanced synthesized RF controls with 62 built-in programmable channels set via pushbuttons and dipswitches.
- \* **Wireless Remote Pairing Function** – system pairing and cloning can be done easily and wirelessly.
- \* **Over One Million Unique Address Codes** – each and every Flex ECO system has its own address code and serial number, never repeats.
- \* **Advanced Controls** – the Flex ECO system utilizes dual advanced microprocessor controls with 32bit CRC and Hamming Code, which provide ultra fast, safe, precise, and error-free encoding and decoding.
- \* **Two-way Transmission** – transmitter and receiver communicate with one another for safe, precise and uninterrupted operation (e.g., receiver status feedbacks).
- \* **Programmable Transmitter Access Card (TAC)** – the optional transmitter access card feature (TAC) further guard against any unauthorized personnel from operating the transmitter. The TAC can also be individually programmed unlocking any specific function or functions on the transmitter allowing a more experienced or qualified user to operate.
- \* **Reliable Pushbuttons** – the pushbuttons are rated for more than one million press cycles.
- \* **Low Power Consumption** – requires only two “AA” alkaline batteries for more than 150 hours of uninterrupted operation between replacements.
- \* **Durable Nylon and Fiberglass Composite Enclosures** – highly resistance to breakage and deformation even in the most abusive environments. The receiver enclosures and output cables are UL94-V0 rated.
- \* **Fully Sealed Enclosures** – the transmitter and receiver enclosures are IP66 rated.
- \* **Full Compliance** – all systems are fully complied with the FCC Part-15 Rules and European Safety Standards.
- \* **Other Optional Accessories and Features** – transmitter magnet mount, transmitter belt clip, transmitter waist belt, 2 and 3 positions rotary switches, transmitter rubber guards, miniature indicator light and buzzer, charging station, external antenna kit, dual-crane tandem function, multi-crane random access function, and many others.

## 2. Radio Controlled Safety

### **WARNINGS and CAUTIONS**

Throughout this document WARNING and CAUTION statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.

**WARNING** – A warning highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in injury or death of personnel, or long term physical hazards. Warnings are highlighted as shown below:



**WARNING**

**CAUTION** – A caution highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in damage to, or destruction of equipment, or loss of functional effectiveness. Cautions are highlighted as shown below:



**CAUTION**

### **WARNINGS and CAUTIONS SHOULD NEVER BE DISREGARDED.**

The safety rules in this section are not intended to replace any rules or regulations of any applicable local, state, or federal governing organizations. Always follow your local lockout and tagout procedure when maintaining any radio equipment. The following information is intended to be used in conjunction with other rules or regulations already in existence. It is important to read all of the safety information contained in this section before installing or operating the Radio Control System.

## 2.1 CRITICAL INSTALLATION CONSIDERATIONS



### WARNING

PRIOR TO INSTALLATION AND OPERATION OF THIS EQUIPMENT, READ AND DEVELOP AN UNDERSTANDING OF THE CONTENTS OF THIS MANUAL AND THE OPERATION MANUAL OF THE EQUIPMENT OR DEVICE TO WHICH THIS EQUIPMENT WILL BE INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

ALL EQUIPMENT MUST HAVE A MAINLINE CONTACTOR INSTALLED AND ALL TRACKED CRANES, HOISTS, LIFTING DEVICES AND SIMILAR EQUIPMENT MUST HAVE A BRAKE INSTALLED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

AN AUDIBLE AND/OR VISUAL WARNING MEANS MUST BE PROVIDED ON ALL REMOTE-CONTROLLED EQUIPMENT AS REQUIRED BY CODE, REGULATION, OR INDUSTRY STANDARD. THESE AUDIBLE AND/OR VISUAL WARNING DEVICES MUST MEET ALL GOVERNMENTAL REQUIREMENTS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

FOLLOW YOUR LOCAL LOCKOUT TAGOUT PROCEDURE BEFORE MAINTAINING ANY REMOTE-CONTROLLED EQUIPMENT. ALWAYS REMOVE ALL ELECTRICAL POWER FROM THE CRANE, HOIST, LIFTING DEVICE OR SIMILAR EQUIPMENT BEFORE ATTEMPTING ANY INSTALLATION PROCEDURES. DE-ENERGIZE AND TAGOUT ALL SOURCES OF ELECTRICAL POWER BEFORE TOUCH-TESTING ANY EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

THE DIRECT OUTPUTS OF THIS PRODUCT ARE NOT DESIGNED TO INTERFACE DIRECTLY TO TWO STATE SAFETY CRITICAL MAINTAINED FUNCTIONS, I.E., MAGNETS, VACUUM LIFTS, PUMPS, EMERGENCY EQUIPMENT, ETC. A MECHANICALLY LOCKING INTERMEDIATE RELAY SYSTEM WITH SEPARATE POWER CONSIDERATIONS MUST BE PROVIDED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH OR DAMAGE TO EQUIPMENT.

## 2.2 GENERAL

Radio controlled material handling equipment operates in several directions. Cranes, hoists, lifting devices and other material handling equipment can be large, and operate at high speeds. Quite frequently, the equipment is operated in areas where people are working in close proximity to the material handling equipment. **The operator must exercise extreme caution at all times.** Workers must constantly be alert to avoid accidents. The following recommendations have been included to indicate how careful and thoughtful actions may prevent injuries, damage to equipment, or even save a life.

## 2.3 PERSONS AUTHORIZED TO OPERATE RADIO CONTROLLED CRANES

Only properly trained persons designated by management should be permitted to operate radio controlled equipment.

Radio controlled cranes, hoists, lifting devices and other material handling equipment should not be operated by any person who cannot read or understand signs, notices and operating instructions that pertain to the equipment.

Radio controlled equipment should not be operated by any person with insufficient eyesight or hearing or by any person who may be suffering from a disorder or illness, is taking any medication that may cause loss of equipment control, or is under the influence of alcohol or drugs.

## 2.4 SAFETY INFORMATION AND RECOMMENDED TRAINING FOR RADIO CONTROLLED EQUIPMENT OPERATORS

Anyone being trained to operate radio controlled equipment should possess as a minimum the following knowledge and skills before using the radio-controlled equipment.

### The operator should:

- have knowledge of hazards pertaining to equipment operation
- have knowledge of safety rules for radio-controlled equipment
- have the ability to judge distance of moving objects
- know how to properly test prior to operation
- be trained in the safe operation of the radio transmitter as it pertains to the crane, hoist, lifting device or other material handling equipment being operated
- have knowledge of the use of equipment warning lights and alarms
- have knowledge of the proper storage space for a radio control transmitter when not in use
- be trained in transferring a radio control transmitter to another person
- be trained how and when to report unsafe or unusual operating conditions
- test the transmitter emergency stop and all warning devices prior to operation; testing should be done on each shift, without a load
- be thoroughly trained and knowledgeable in proper and safe operation of the crane, hoist, lifting device, or other material handling equipment that utilizes the radio control
- know how to keep the operator and other people clear of lifted loads and to avoid “pinch” points
- continuously watch and monitor status of lifted loads
- know and follow cable and hook inspection procedures
- know and follow the local lockout and tagout procedures when servicing radio-controlled equipment
- know and follow all applicable operating and maintenance manuals, safety procedures, regulatory requirements, and industry standards and codes

### The operator shall not:

- lift or move more than the rated load
- operate the material handling equipment if the direction of travel or function engaged does not agree with what is indicated on the controller
- use the crane, hoist or lifting device to lift, support or transport people
- lift or carry any loads over people
- operate the crane, hoist or lifting device unless all persons, including the operator, are and remain clear of the supported load and any potential pinch points
- operate a crane, hoist or lifting device when the device is not centered over the load
- operate a crane, hoist or lifting device if the chain or wire rope is not seated properly in the sprockets, drum or sheave
- operate any damaged or malfunctioning crane, hoist, lifting device or other material handling equipment



- change any settings or controls without authorization and proper training
- remove or obscure any warning or safety labels or tags
- leave any load unattended while lifted
- leave power on the radio-controlled equipment when the equipment is not in operation
- operate any material handling equipment using a damaged controller because the unit may be unsafe
- operate manual motions with other than manual power
- operate radio-controlled equipment when low battery indicator is on



## WARNING

THE OPERATOR SHOULD NOT ATTEMPT TO REPAIR ANY RADIO CONTROLLER. IF ANY PRODUCT PERFORMANCE OR SAFETY CONCERNS ARE OBSERVED, THE EQUIPMENT SHOULD IMMEDIATELY BE TAKEN OUT OF SERVICE AND BE REPORTED TO THE SUPERVISOR. DAMAGED AND INOPERABLE RADIO CONTROLLER EQUIPMENT SHOULD BE RETURNED TO ARC FOR EVALUATION AND REPAIR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

## 2.5 TRANSMITTER UNIT

Transmitter switches should never be mechanically blocked ON or OFF. When not in use, the operator should turn the transmitter OFF. A secure storage space should be provided for the transmitter unit, and the transmitter unit should always be placed there when not in use. This precaution will help prevent unauthorized people from operating the material handling equipment.

Spare transmitters should be stored in a secure storage space and only removed from the storage space after the current transmitter in use has been turned OFF, taken out of the service area and secured.

## 2.6 PRE-OPERATION TEST

**At the start of each work shift, or when a new operator takes control of the crane, operators should do, as a minimum, the following steps before making lifts with any crane or hoist:**

Test all warning devices.

Test all direction and speed controls.

Test the transmitter emergency stop.

## 2.7 BATTERIES



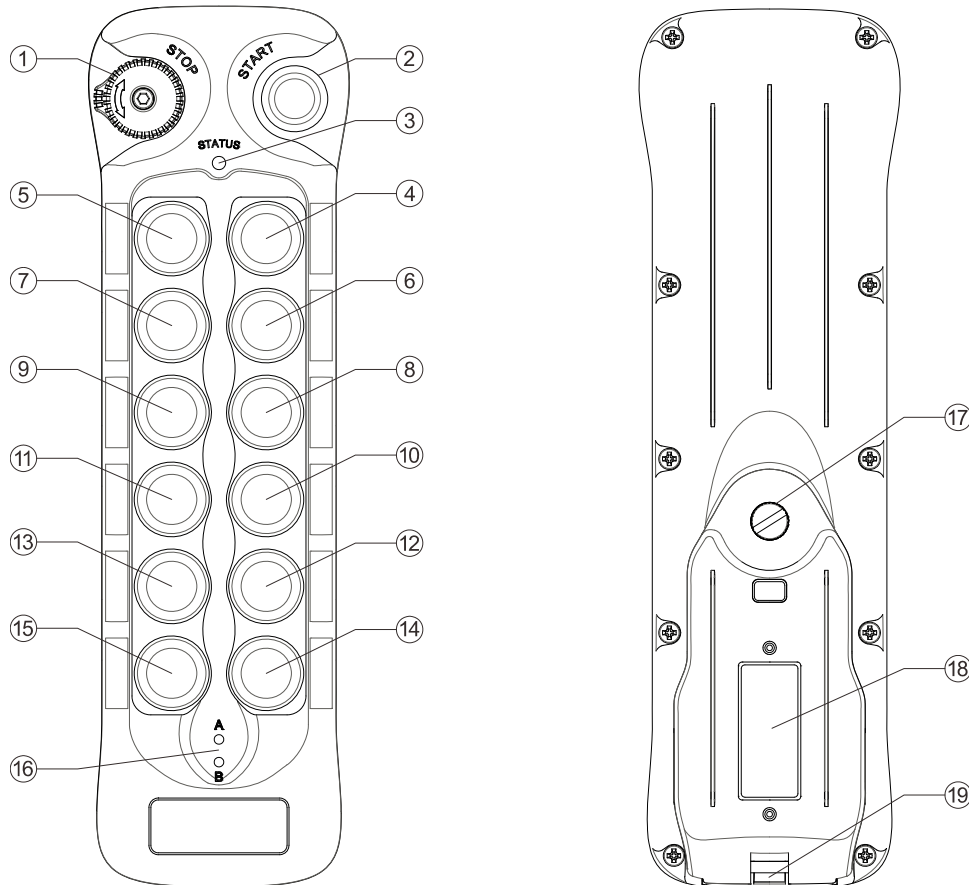
## WARNING

KNOW AND FOLLOW PROPER BATTERY HANDLING, CHARGING AND DISPOSAL PROCEDURES. IMPROPER BATTERY PROCEDURES CAN CAUSE BATTERIES TO EXPLODE OR DO OTHER SERIOUS DAMAGE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

# 3. General System Information

## 3.1 Transmitter

### 3.1.1 External Illustration

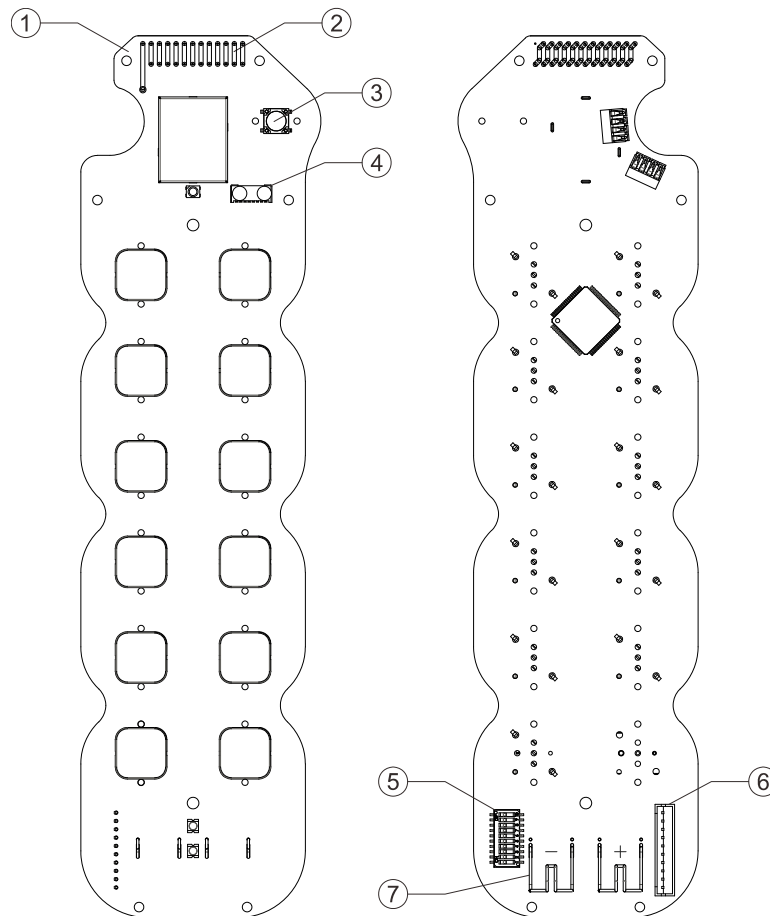


1. STOP Button
2. START Button
3. Status LED Indicator
4. Pushbutton 1 (PB1)
5. Pushbutton 2 (PB2)
6. Pushbutton 3 (PB3)
7. Pushbutton 4 (PB4)
8. Pushbutton 5 (PB5)
9. Pushbutton 6 (PB6)
10. Pushbutton 7 (PB7)

11. Pushbutton 8 (PB8)
12. Pushbutton 9 (PB9)
13. Pushbutton 10 (PB10)
14. Pushbutton 11 (PB11)
15. Pushbutton 12 (PB12)
16. A/B LED Indicators
17. Battery Cover Screw
18. System Information
19. Lanyard and Waist Belt Attachment Slot

**Note:** Flex ECO 12S-AB, 12X-AB, 12S-T and 12X-T models are with A/B/A+B rotary switch on PB12 slot.

### 3.1.2 Internal Illustration

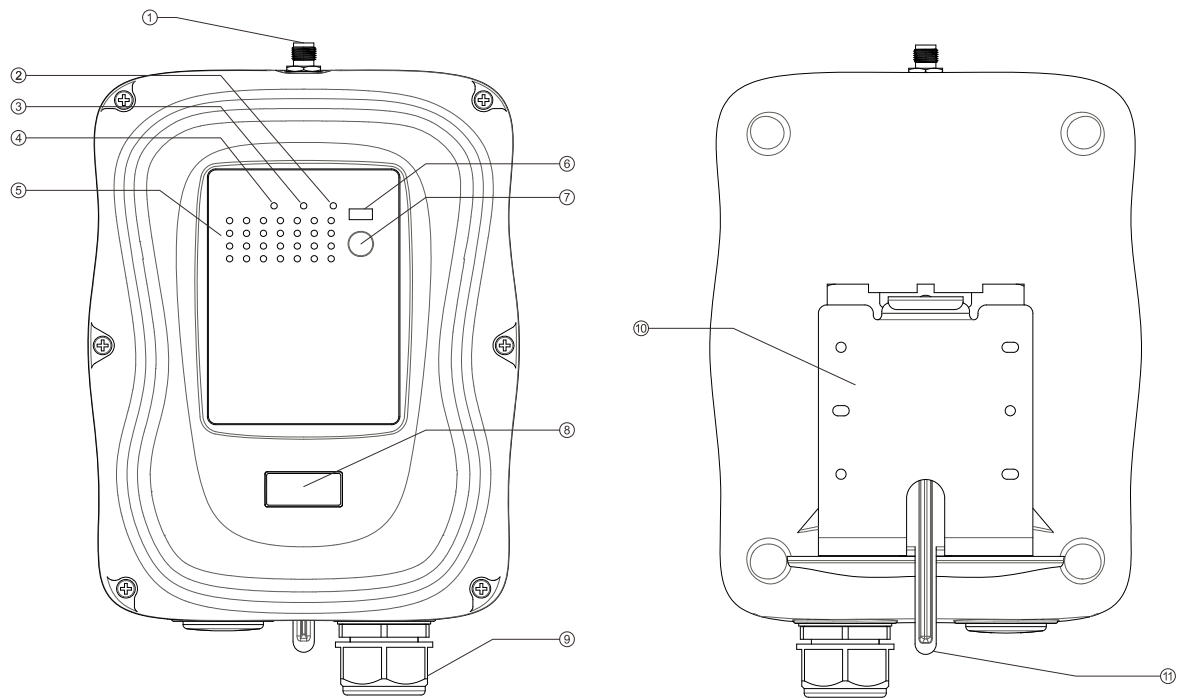


- |    |                  |    |                    |
|----|------------------|----|--------------------|
| 1. | RF/Encoder Board | 5. | Function Dipswitch |
| 2. | Antenna          | 6. | Programming Port   |
| 3. | START Button     | 7. | Battery Contacts   |
| 4. | Infrared Sensors |    |                    |

**Note:** Flex ECO 12S-AB, 12X-AB, 12S-T and 12X-T models are with A/B/A+B rotary switch on PB12 slot.

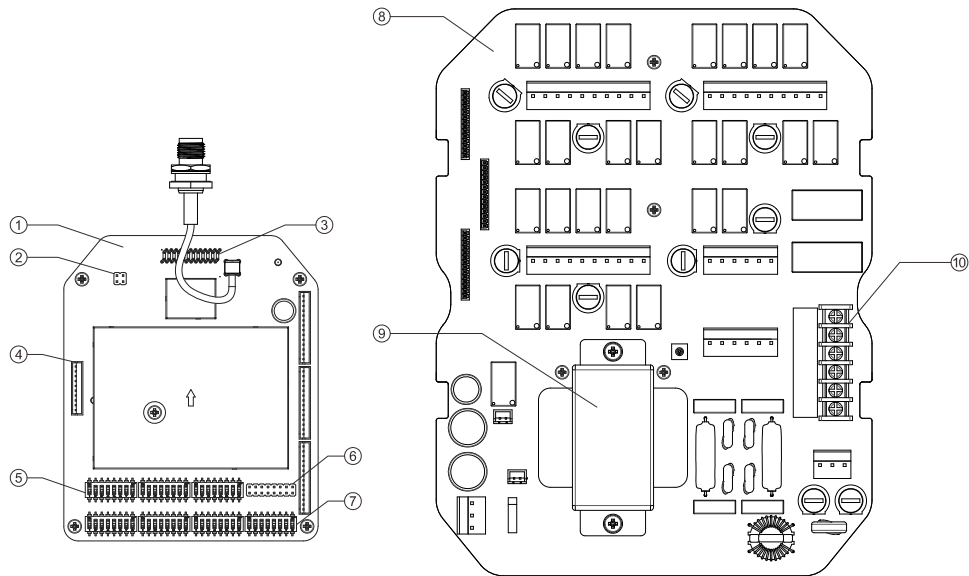
## 3.2 Receiver

### 3.2.1 External Illustration



- |    |                                  |     |                          |
|----|----------------------------------|-----|--------------------------|
| 1. | External Antenna Port (optional) | 7.  | Remote Pairing Button    |
| 2. | COM LED Indicator                | 8.  | System Information       |
| 3. | Status LED Indicator             | 9.  | Cord Grip                |
| 4. | Power LED Indicator              | 10. | Mounting Bracket         |
| 5. | Output Relay LED Indicators      | 11. | Mounting Bracket Release |
| 6. | Infrared Sensors                 |     |                          |

### 3.2.2 Internal Illustration



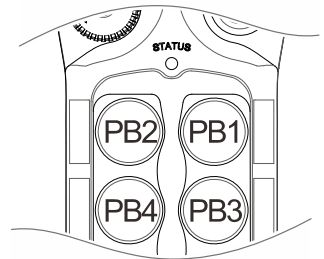
- |    |                         |     |                            |
|----|-------------------------|-----|----------------------------|
| 1. | RF/Decoder Board        | 6.  | Function Jumpers           |
| 2. | INT/EXT Antenna Jumpers | 7.  | Channel Dipswitch          |
| 3. | Internal Antenna        | 8.  | AC Line Filter/Relay Board |
| 4. | Programming Port        | 9.  | Power Transformer          |
| 5. | Function Dipswitches    | 10. | Voltage Selector           |

# 4. Function Settings

## 4.1 Transmitter

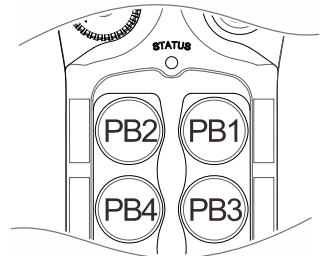
### 4.1.1 Transmitter Firmware Version

- 1) Press down the STOP button (transmitter power off).
- 2) Press and hold PB1 and PB3 at the same time.
- 3) Reset the STOP button by rotating it clockwise or counter clockwise, it will pop up (transmitter power on).
- 4) Let go PB1 and PB3 at the same time. The Status LED displays firmware version with red, green and orange blinks.
- 5) Exit Firmware Version mode by pressing down the STOP button (transmitter power off).



### 4.1.2 Transmitter Channel Settings

- 1) Press down the STOP button (transmitter power off).
- 2) Press and hold PB1 and PB2 at the same time.
- 3) Reset the STOP button by rotating it clockwise or counter clockwise, it will pop up (transmitter power on).
- 4) Let go PB1 and PB2 at the same time. The Status LED displays current channel setting with red and green blinks. A green blink represents the tens (+10) and a red blink represents the units (+1). For example, 1 green blink followed by 5 red blinks is channel 15. LED-A also lights up during channel setting mode.
- 5) Change transmitter channel by pressing PB1 to increment the units (+1) and PB2 to increment the tens (+10). For example, press PB2 two times and then PB1 four times is channel 24 (Status LED blinks 2 greens and 4 reds). Make sure the newly selected channel is shown on the Status LED before proceeding to the next step below.
- 6) Transfer the newly selected channel to the receiver by press and hold the START button until the Status LED turns to constant green (transfer complete). Press down the STOP button if constant green is not shown on the Status LED after more than 10 seconds (transfer incomplete); the transmitter will revert back to its previous channel setting. Make sure the receiver power is turned on and within the operating distance during the entire process. **Skip step 6 if changing receiver channel is not required.**
- 7) Exit Channel Setting mode by pressing down the STOP button (transmitter power off).



**Note:** When selecting a new channel, make sure each button press does not exceed 3 seconds.

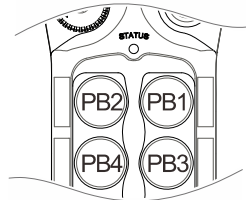
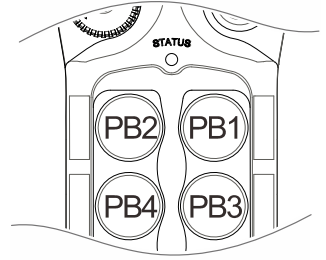
### Important Note:

Step 6 illustrated above is strictly required if you are intending to change the entire system channel (both transmitter and receiver). The entire system no longer works if step 6 is skipped because the transmitter and receiver channels are now different (new vs. old). In this case you would have to redo step 1~4 and step 6 to transfer the newly selected transmitter channel to the receiver.

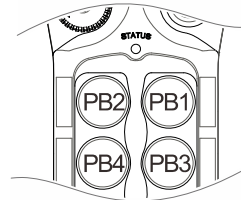
### 4.1.3 Remote Pairing

#### A. Transmitter-to-Transmitter Pairing:

- 1) Press down the STOP button (transmitter power off).
- 2) Press and hold PB1 and PB3 at the same time.
- 3) Reset the STOP button by rotating it clockwise or counter clockwise, it will pop up (transmitter power on).
- 4) Let go PB1 and PB3 at the same time (entered Remote Pairing mode). The Status LED displays firmware version with red, green and orange blinks.
- 5) Output data (original transmitter) by press and hold PB2 (Status LED off and LED-B constant red).
- 6) Receive data (new transmitter) by press and hold PB1 (Status LED blinks green and LED-A constant red).
- 7) When the Status LED (receiving data end) turns to constant green while both pushbuttons are still pressed down the pairing is completed.
- 8) Exit Remote Pairing mode by pressing down the STOP button (transmitter power off).



Output data – original transmitter  
(press and hold PB2)



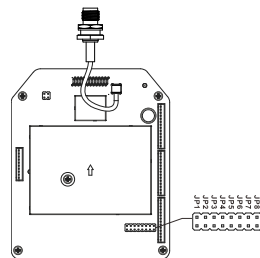
Receive data – new transmitter  
(press and hold PB1)

**Note:** During remote pairing make sure the distance between the two transmitters is within 1 meter.

#### B. Receiver-to-Transmitter Pairing:

**JP8 Open Method:** After the transmitter enters the Remote Pairing mode, output receiver data by press and hold the PAIRING button located on the receiver cover and receive data by press and hold PB3 on the transmitter, both at the same time. When the transmitter Status LED turns to constant green while both pushbuttons are still pressed down the pairing is completed.

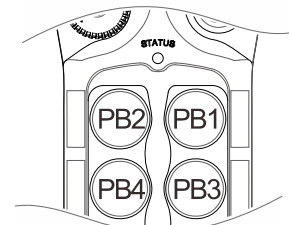
**During pairing process, the receiver MAIN relays must be deactivated (relay open).**



Set JP8 to "Open"



Output data – receiver  
(press and hold the Pairing button)



Receiving data – transmitter  
(press and hold PB3)

**JP8 Short Method (press Pairing button not required):** After the transmitter enters the Remote Pairing mode, press and hold PB3 on the transmitter until the Status LED turns to constant green the pairing is completed. **Make sure the pairing process is executed within distance of 10 meters from one another and no other active receivers nearby. During pairing process, the receiver MAIN relays must be deactivated (relay open). For tandem systems make sure the receiver is not locked to any of its existing transmitters.**

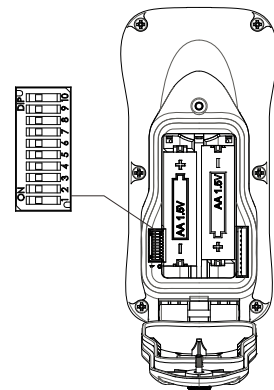
## C. Transmitter-to-Receiver Pairing:

**JP8 Open Method:** After the transmitter enters the Remote Pairing mode, output transmitter data by press and hold PB4 on the transmitter and receive data by press and hold the PAIRING button on the receiver cover, both at the same time. When the transmitter Status LED turns to constant green while both pushbuttons are still pressed down the pairing is completed. **During pairing process, the receiver MAIN relays must be deactivated (relay open).**

### 4.1.4 Transmitter Start Function Settings

When transmitter goes into sleep mode the system is temporarily deactivated (MAIN relays opened). Press the START button or any pushbutton to wake up the system (MAIN relays closed).

|   | Dipswitch Settings | Function                   |
|---|--------------------|----------------------------|
| 1 | xxxxxxx0           | START<br>Reactivation      |
| 2 | xxxxxxx1           | Any Button<br>Reactivation |



### 4.1.5 Transmitter Inactivity Timer Settings

Set how long the transmitter enters the sleep mode when not in use (pushbutton not pressed). When transmitter goes into sleep mode the receiver MAIN relays are deactivated.

|   | Dipswitch Settings | Time       |   | Dipswitch Settings | Time                                 |
|---|--------------------|------------|---|--------------------|--------------------------------------|
| 1 | xxx000xxx          | 1 minute   | 5 | xxx100xxx          | 10 minutes                           |
| 2 | xxx001xxx          | 20 seconds | 6 | xxx101xxx          | 30 minutes                           |
| 3 | xxx010xxx          | 3 minutes  | 7 | xxx110xxx          | 60 minutes                           |
| 4 | xxx011xxx          | 5 minutes  | 8 | xxx111xxx          | Constant On<br>(sleep mode disabled) |

### 4.1.6 Transmitter Output Power Settings

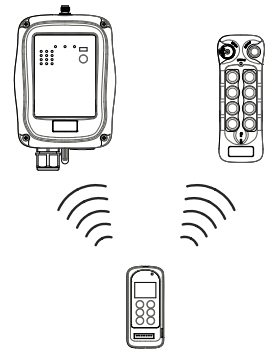
1mW offers the shortest operating range with lowest battery consumption while 10mW offers the longest operating range with highest battery consumption (manufacture preset at 2mW).

|   | Dipswitch Settings | Output Power |   | Dipswitch Settings | Output Power |
|---|--------------------|--------------|---|--------------------|--------------|
| 1 | 000xxxxxxx         | 1mW          | 5 | 100xxxxxxx         | 5mW          |
| 2 | 001xxxxxxx         | 2mW          | 6 | 101xxxxxxx         | 6mW          |
| 3 | 010xxxxxxx         | 3mW          | 7 | 110xxxxxxx         | 8mW          |
| 4 | 011xxxxxxx         | 4mW          | 8 | 111xxxxxxx         | 10mW         |



## 4.1.7 Infrared Programming

Other custom functions and settings not listed in this manual can be programmed via the infrared IR programmer unit, such as the system serial number, frequency range, new and updated functions, plus many others. Please contact ARC representative for more details.

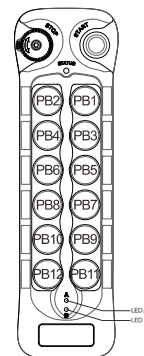


## 4.1.8 Pushbutton Function Settings

- 1) Press down the STOP button (transmitter power off).
- 2) Press and hold PB3 and PB4 at the same time.
- 3) Reset the STOP button by rotating it clockwise or counter clockwise, it will pop up (transmitter power on).
- 4) Let go PB3 and PB4 at the same time (entered Pushbutton Function mode). LED-B lights up during pushbutton function setting mode.
- 5) The Status LED displays current pushbutton function setting with orange, green and red blinks. An orange blink represents the hundreds (+100), a green blink represents the tens (+010) and a red blink represents the units (+001), and constant orange represents no function (000), and constant orange represents no function (000). For example, 1 orange blink followed by 2 green blinks and 5 red blinks is pushbutton function no. 125. Pushbutton function number with "0" is represented by no orange, green or red blink. For example, 1 orange blink followed by 5 red blinks is pushbutton function no. 105.
- 6) Set pushbutton function number by pressing PB3 to increment the hundreds (+100), PB2 to increment the tens (+010), PB1 to increment the units (+001), and PB4 to reset (000 - constant orange). For example, press PB3 one time, PB2 four times, PB1 six times is pushbutton function no. 146 (Status LED blinks 1 orange, 4 greens and 6 reds)
- 7) Exit Pushbutton Function mode by pressing down the STOP button (transmitter power off).

### 4.1.8.1 Toggled Pushbutton with LED Indication – Standard Right/Left Pushbutton Configuration

Set pushbutton toggled function (latching output relay) with LED indications. LED A and LED B shown inside the shaded box illustrates which LED on the transmitter lights up when the designated pushbutton is pressed.



| Function Number | Display Type     | PB1    | PB2    | PB3    | PB4    |
|-----------------|------------------|--------|--------|--------|--------|
| 1               | 1 Red            | LED A  | Normal | Normal | Normal |
| 2               | 2 Reds           | Normal | LED B  | Normal | Normal |
| 3               | 3 Reds           | Normal | Normal | LED A  | Normal |
| 4               | 4 Reds           | Normal | Normal | Normal | LED B  |
| 13              | 1 Green + 3 Reds | LED A  | LED B  | Normal | Normal |
| 14              | 1 Green + 4 Reds | Normal | Normal | LED A  | LED B  |

| Function Number | Display Type     | PB5    | PB6    | PB7    | PB8    |
|-----------------|------------------|--------|--------|--------|--------|
| 5               | 5 Reds           | LED A  | Normal | Normal | Normal |
| 6               | 6 Reds           | Normal | LED B  | Normal | Normal |
| 7               | 7 Reds           | Normal | Normal | LED A  | Normal |
| 8               | 8 Reds           | Normal | Normal | Normal | LED B  |
| 15              | 1 Green + 5 Reds | LED A  | LED B  | Normal | Normal |
| 16              | 1 Green + 6 Reds | Normal | Normal | LED A  | LED B  |

| Function Number | Display Type     | PB9    | PB10   | PB11   | PB12   |
|-----------------|------------------|--------|--------|--------|--------|
| 9               | 9 Reds           | LED A  | Normal | Normal | Normal |
| 10              | 1 Green          | Normal | LED B  | Normal | Normal |
| 11              | 1 Green + 1 Red  | Normal | Normal | LED A  | Normal |
| 12              | 1 Green + 2 Reds | Normal | Normal | Normal | LED B  |
| 17              | 1 Green + 7 Reds | LED A  | LED B  | Normal | Normal |
| 18              | 1 Green + 8 Reds | Normal | Normal | LED A  | LED B  |

\* PB1...PB12 → Pushbutton number.

\* Normal → Normal momentary contact.

\* LED A & LED B → Pushbutton toggled function with designated LED indication.

#### 4.1.8.2 A/B Pushbutton Select with LED Indication – Standard Right/Left Pushbutton Configuration

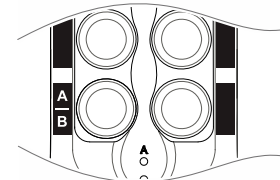
There are 4 different types of A/B selector sequence available. Choose one that is most suitable for your application. Refer to section 5.1 output relay connections.

Type-A selector sequence : A → B

Type-B selector sequence : Off → A → B

Type-C selector sequence : A → B → A+B

Type-D selector sequence : Off → A → B → A+B



| Function Number | Display Type      | PB9    | PB10   | PB11   | PB12   |
|-----------------|-------------------|--------|--------|--------|--------|
| 41              | 4 Greens + 1 Red  | Normal | Normal | A/1&2  | Normal |
| 42              | 4 Greens + 2 Reds | Normal | Normal | B/1&2  | Normal |
| 43              | 4 Greens + 3 Reds | Normal | Normal | C/1&2  | Normal |
| 44              | 4 Greens + 4 Reds | Normal | Normal | D/1&2  | Normal |
| 45              | 4 Greens + 5 Reds | Normal | Normal | Normal | A/1&2  |
| 46              | 4 Greens + 6 Reds | Normal | Normal | Normal | B/1&2  |
| 47              | 4 Greens + 7 Reds | Normal | Normal | Normal | C/1&2  |
| 48              | 4 Greens + 8 Reds | Normal | Normal | Normal | D/1&2  |

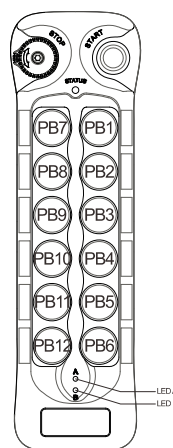
\* PB9...PB12 → Pushbutton number.

\* Normal → Normal momentary contact.

\* A/1&2 ~ D/1&2 → A/B pushbutton select function with designated LED indication.

### 4.1.8.3 Toggled Pushbutton with LED Indication – Inline Top/Bottom Pushbutton Configuration

Set pushbutton toggled function (latching output relay) with LED indications. LED A and LED B shown inside the shaded box illustrates which LED on the transmitter lights up when the designated pushbutton is pressed. Refer to section 4.2.4 JP4/JP5 inline jumper settings.



| Function Number | Display Type     | PB1    | PB2    | PB3    | PB4    |
|-----------------|------------------|--------|--------|--------|--------|
| 1               | 1 Red            | LED A  | Normal | Normal | Normal |
| 3               | 3 Reds           | Normal | LED B  | Normal | Normal |
| 5               | 5 Reds           | Normal | Normal | LED A  | Normal |
| 7               | 7 Reds           | Normal | Normal | Normal | LED B  |
| 19              | 1 Green + 9 Reds | LED A  | LED B  | Normal | Normal |
| 20              | 2 Greens         | Normal | Normal | LED A  | LED B  |

| Function Number | Display Type      | PB5    | PB6    | PB7    | PB8    |
|-----------------|-------------------|--------|--------|--------|--------|
| 9               | 9 Reds            | LED A  | Normal | Normal | Normal |
| 11              | 1 Green + 1 Red   | Normal | LED B  | Normal | Normal |
| 2               | 2 Reds            | Normal | Normal | LED A  | Normal |
| 4               | 4 Reds            | Normal | Normal | Normal | LED B  |
| 21              | 2 Greens + 1 Red  | LED A  | LED B  | Normal | Normal |
| 22              | 2 Greens + 2 Reds | Normal | Normal | LED A  | LED B  |

| Function Number | Display Type      | PB9    | PB10   | PB11   | PB12   |
|-----------------|-------------------|--------|--------|--------|--------|
| 6               | 6 Reds            | LED A  | Normal | Normal | Normal |
| 8               | 8 Reds            | Normal | LED B  | Normal | Normal |
| 10              | 1 Green           | Normal | Normal | LED A  | Normal |
| 12              | 1 Green + 2 Reds  | Normal | Normal | Normal | LED B  |
| 23              | 2 Greens + 3 Reds | LED A  | LED B  | Normal | Normal |
| 24              | 2 Greens + 4 Reds | Normal | Normal | LED A  | LED B  |

\* PB1...PB12 → Pushbutton number.

\* Normal → Normal momentary contact.

\* LED A & LED B → Pushbutton toggled function with designated LED indication.

#### 4.1.8.4 A/B Pushbutton Select with LED Indication – Inline Top/Bottom Pushbutton Configuration

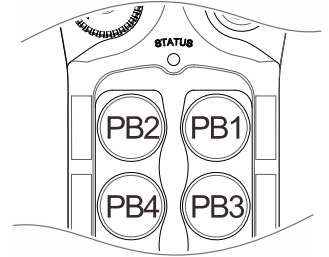
There are 4 different types of A/B selector sequence available. Choose one that is most suitable for your application. Refer to section 4.2.4 JP4/JP5 inline jumper settings and section 5.1 output relay connections.

Type-A selector sequence : A → B

Type-B selector sequence : Off → A → B

Type-C selector sequence : A → B → A+B

Type-D selector sequence : Off → A → B → A+B



| Function Number | Display Type      | PB9    | PB10   | PB11   | PB12   |
|-----------------|-------------------|--------|--------|--------|--------|
| 57              | 5 Greens + 7 Reds | Normal | Normal | A/1&2  | Normal |
| 58              | 5 Greens + 8 Reds | Normal | Normal | B/1&2  | Normal |
| 59              | 5 Greens + 9 Reds | Normal | Normal | C/1&2  | Normal |
| 60              | 6 Greens          | Normal | Normal | D/1&2  | Normal |
| 45              | 4 Greens + 5 Reds | Normal | Normal | Normal | A/1&2  |
| 46              | 4 Greens + 6 Reds | Normal | Normal | Normal | B/1&2  |
| 47              | 4 Greens + 7 Reds | Normal | Normal | Normal | C/1&2  |
| 48              | 4 Greens + 8 Reds | Normal | Normal | Normal | D/1&2  |

\* PB9...PB12 → Pushbutton number.

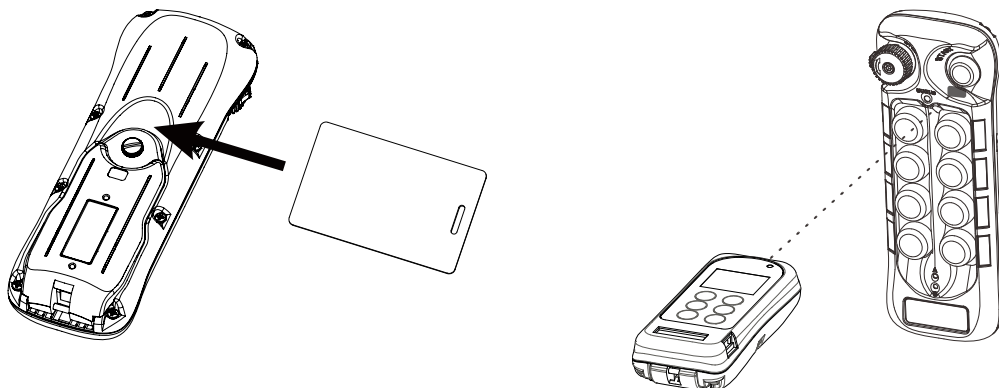
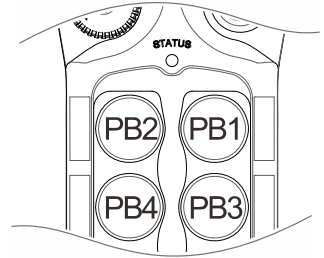
\* Normal → Normal momentary contact.

\* A/1&2 ~ D/1&2 → A/B pushbutton select function with designated LED indication.

## 4.1.9 Transmitter Access Card (TAC) Settings

Follow the instruction below on how to program the TAC into the transmitter. The infrared IR programmer unit is required to complete the programming. Please contact ARC representative for more details.

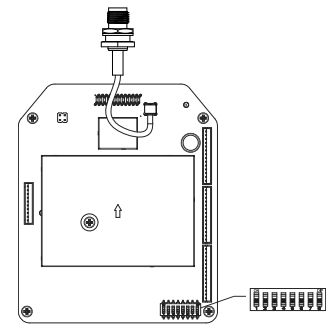
- 1) Press down the STOP button (transmitter power off).
- 2) Press and hold PB1, PB2, PB3 and PB4 at the same time.
- 3) Reset the STOP button by rotating it clockwise or counter clockwise, it will pop up (transmitter power on).
- 4) Let go PB1, PB2, PB3 and PB4 at the same time, the Status LED displays orange fast blinks (entered TAC mode).
- 5) Placed the access card over the RFID marking located on the backside of the transmitter.
- 6) Status LED with 1 second green means the access card is being programmed into the transmitter.
- 7) Status LED with 1 second orange means the access card is already programmed into the transmitter.
- 8) Status LED with 1 second red means unable to store any more access cards. Each transmitter can only store up to 16 access cards.
- 9) Use the infrared IR programmer unit to extract all access card information stored inside the transmitter for further programming. Other than restricting any unauthorized personnel from using the transmitter, it can also be individually programmed unlocking any specific function or functions on the transmitter allowing a more experienced or qualified user to operate, such as the magnet lift, tandem operation, entering restricted areas, etc...
- 10) Exit TAC mode by pressing down the STOP button (transmitter power off).



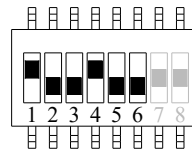
## 4.2 Receiver

### 4.2.1 Receiver Channel Settings

Set the receiver channel by configuring the channel dipswitch located on the RF/decoder board, only the first 6 dip positions are used for channel programming. The system channels table on section 4.2.8 illustrates which dipswitch setting corresponds to which channel. Once the receiver channel is altered do make sure to change the transmitter channel as well. The channel on both transmitter and receiver must be identical in order for the system to work (refer to section 4.1.2 Transmitter Channel Settings).



**Example:**



Top position → "1"  
Bottom position → "0"

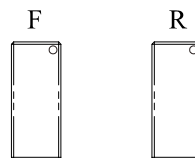
The above dipswitch setting "1 0 0 1 0 1 0 0" corresponds to "channel 36" in the system channels table on section 4.2.8.

### 4.2.2 Output Relay Configurations

#### 4.2.2.1 Output Relay Types

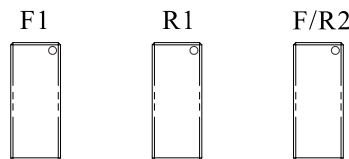
**1. 2 output relays per motion – single speed only**

Output relays with Forward (F) and Reverse (R) 1<sup>st</sup> speed only.



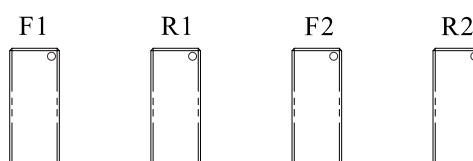
**2. 3 output relays per motion – shared 2<sup>nd</sup> speed output relay**

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.



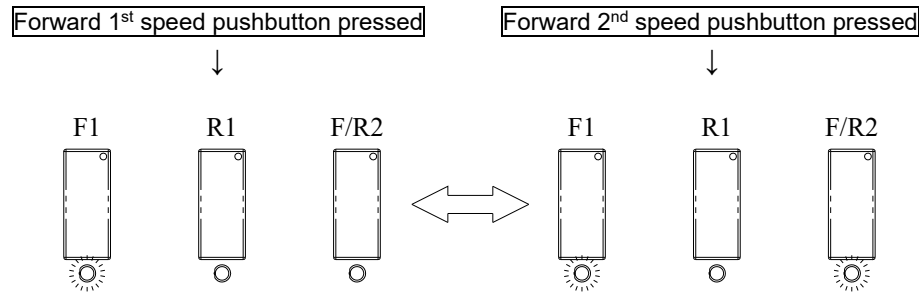
**3. 4 output relays per motion – separate 1<sup>st</sup> and 2<sup>nd</sup> speed output relays**

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 are separate output relays.

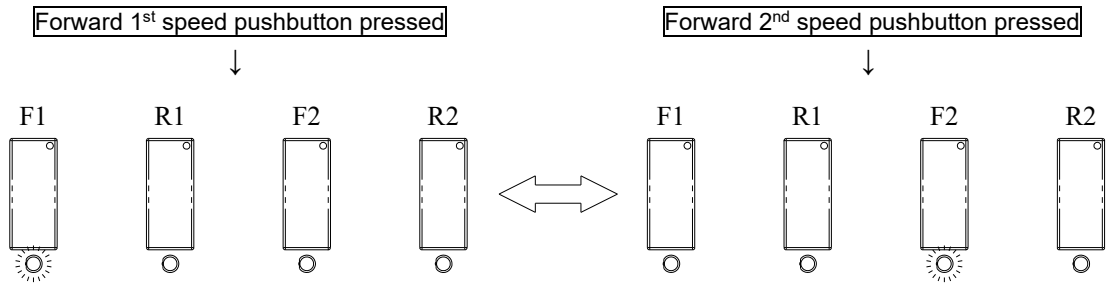


### 4.2.2.2 Output Relay Actions at 2<sup>nd</sup> Speed (Flex ECO 12X only)

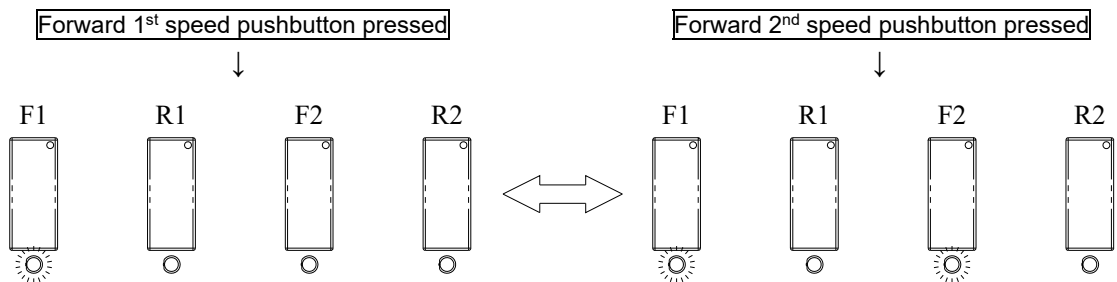
- 3 output relays configuration with Closed/Closed contact at 2<sup>nd</sup> speed**  
F1 (or R1) output relay closed at 1<sup>st</sup> speed and F1 + F/R2 (or R1 + F/R2) output relays closed at 2<sup>nd</sup> speed. Refer to section 4.2.3.1 on how to set to this function.



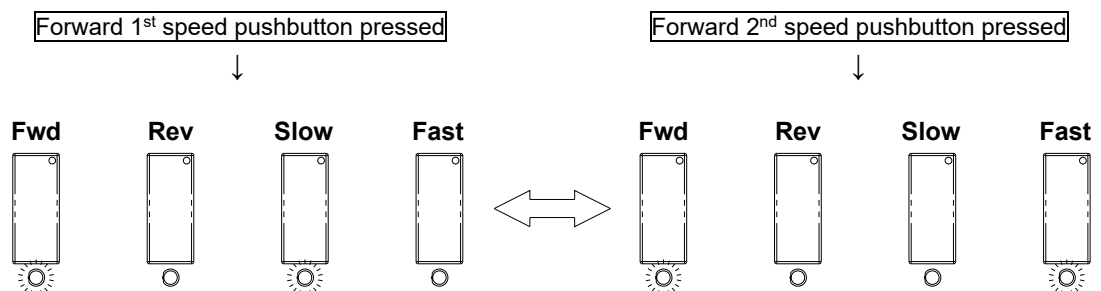
- 4 output relays configuration with Opened/Closed contact at 2<sup>nd</sup> speed**  
F1 (or R1) output relay closed at 1<sup>st</sup> speed and F2 (or R2) output relay closed at 2<sup>nd</sup> speed. Refer to section 4.2.3.1 on how to set to this function.



- 4 output relays configuration with Closed/Closed contact at 2<sup>nd</sup> speed**  
F1 (or R1) output relay closed at 1<sup>st</sup> speed and F1 + F2 (or R1 + R2) output relays closed at 2<sup>nd</sup> speed. Refer to section 4.2.3.1 on how to set to this function.

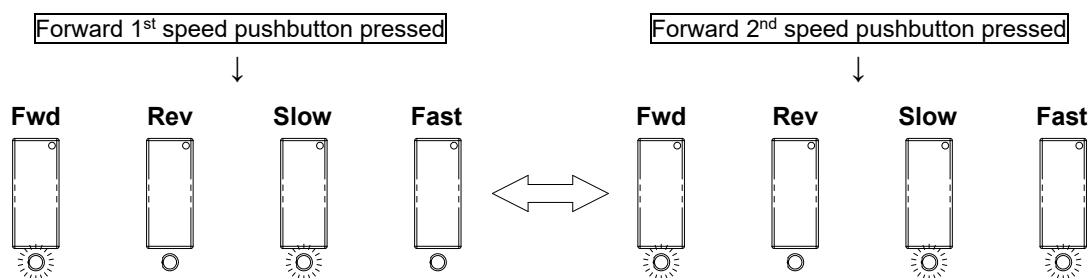


- 4 output relays configuration with Slow and Fast output relays (Type A)**  
Fwd (or Rev) + Slow output relays closed at 1<sup>st</sup> speed and Fwd (or Rev) + Fast output relays closed at 2<sup>nd</sup> speed. Refer to section 4.2.3.1 on how to set to this function.



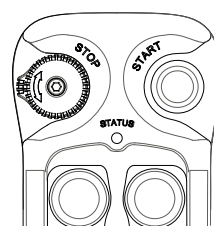
#### 5. 4 output relays configuration with Slow and Fast output relays (Type B)

Fwd + Slow (or Rev + Slow) output relays closed at 1<sup>st</sup> speed and Fwd + Slow + Fast (or Rev + Slow + Fast) output relays closed at 2<sup>nd</sup> speed. Refer to section 4.2.3.1 on how to set to this function.



#### 4.2.2.3 START + AUX Function

After executing the START function at transmitter startup, the same START button becomes an auxiliary function with momentary contact connected through K25 Function output relay. There are other types of auxiliary functions made available for K25, K26 and K30 Function output relays (refer to section 4.2.7). Please contact ARC representative if your application requires other types of auxiliary function connected to these Function output relays.

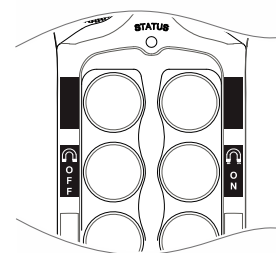


#### 4.2.2.4 ON/OFF Pushbutton Function

The user can set any of the two adjacent pushbuttons on the transmitter to behave like a mechanical ON & OFF rocker or toggle switch. ON output relay closes when ON pushbutton is pressed (OFF output relay opens) and OFF output relay closes when OFF pushbutton is pressed (ON output relay opens). Refer to section 4.2.3.1 on how to set to this function.

#### 4.2.2.5 Magnet ON/OFF Pushbutton Function

The user can set any of the two adjacent pushbuttons on the transmitter to control industrial magnet lift. Activate the magnet by pressing the Magnet ON pushbutton. Deactivate the magnet by first press and hold the Magnet ON pushbutton and then press the Magnet OFF pushbutton. Pressing the Magnet OFF pushbutton alone is unable to deactivate the magnet. Refer to section 4.2.3.1 on how to set to this function.



#### 4.2.2.6 Brake Function (Flex ECO 12X only)

When the transmitter pushbutton 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 second and then with 1<sup>st</sup> speed output relay closed thereafter. Refer to section 4.2.3.1 on how to set to this function.

#### 4.2.2.7 External Warning Function

The user can install an external warning device (rotating lights, horn, etc...) to the K26 Function output relay located inside the receiver. The user can choose which pushbutton pair (or pairs) triggers the external warning device when pressed. Refer to section 4.2.3.1 on how to set to this function.

#### 4.2.2.8 Momentary Contact

When pushbutton is released the corresponding output relay will open or deactivate. This type of relay action usually applies to external applications such as horn and buzzer. Refer to section 4.2.3.2 on how to set to this function.

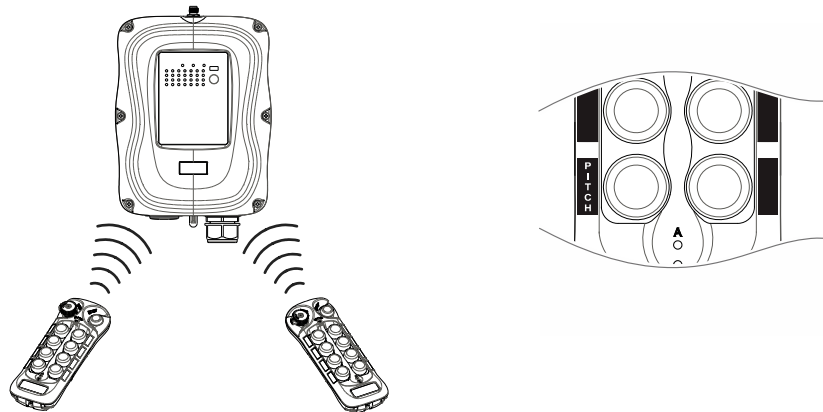


#### 4.2.2.9 Toggled Contact

When pushbutton is released the corresponding output relay will maintain contact or closure until next time the user presses the same pushbutton again. This type of relay action usually applies to external application such as lights. Refer to section 4.2.3.2 on how to set to this function.

#### 4.2.2.10 Pitch & Catch Function

This function allows two operators controlling from opposite ends of a crane or equipment. When set to “Pitch & Catch” make sure the 2<sup>nd</sup> transmitter is set to the next upper channel (channel X+1). For example, if the system is set to channel 01 then the newly added 2<sup>nd</sup> transmitter must be set to channel 02 with identical serial number. Furthermore, the Channel dipswitch position #7 and #8 on the RF/decoder board must set to “10” for 2-channel scanning (scans channel 01 and 02). Refer to section 4.2.2.11 and 4.2.3.2 on how to set to this function.



#### 4.2.2.11 Receiver Channel Scanning Function

- (1) → “00” manufacture preset (channel X)
- (2) → “01” scans 2 channels (channel X and channel X+1)
- (3) → “10” scans 3 channels (channel X... channel X+2)
- (4) → “11” scans 4 channels (channel X... channel X+3)

\* Channel X → channel set on the Channel dipswitch.

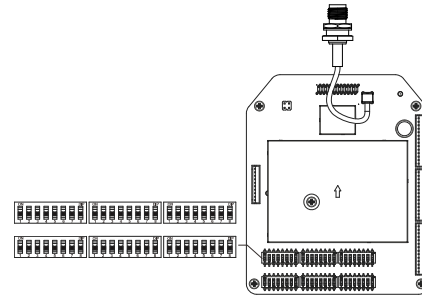
\*\* Please contact ARC representative if your application requires scanning more than 4 channels.

**Example:** If the first 6 dipswitch positions are set to channel 01 (000001), when set to 2-channel scanning (type-2 above) the receiver will only scan channel 01 and 02.

## 4.2.3 Dipswitch Settings

### 4.2.3.1 Interlocked Pushbutton Pair

Interlocked means any pushbutton pair can not be pressed simultaneously as it will cancel each other out. Interlocked setting usually applies to electric motor's forward & reverse motion and On & Off switches. Each dipswitch on the RF/decoder board corresponds to a pushbutton pair.



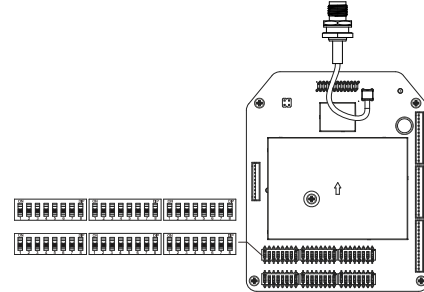
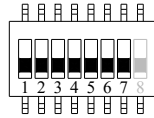
| Dip Settings | Function Descriptions                                                                                                                                                                  | # of Relays Used |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 00000000     | Single speed only                                                                                                                                                                      | 2                |
| 00000010     | 4 output relays Closed/Closed relay action at 2 <sup>nd</sup> speed (separate 2 <sup>nd</sup> speed output relays)                                                                     | 4                |
| 00000100     | 3 output relays Closed/Closed relay action at 2 <sup>nd</sup> speed (shared 2 <sup>nd</sup> speed output relay)                                                                        | 3                |
| 00000110     | 4 output relays Opened/Closed relay action at 2 <sup>nd</sup> speed (separate 2 <sup>nd</sup> speed output relays)                                                                     | 4                |
| 00001000     | Forward (or Reverse) + Fast output relays engaged at 2 <sup>nd</sup> speed                                                                                                             | 4                |
| 00001010     | Forward (or Reverse) + Slow + Fast output relays engaged at 2 <sup>nd</sup> speed                                                                                                      | 4                |
| 00001100     | On (right button) & Off (left button)                                                                                                                                                  | 2                |
| 00010010     | On + Start/Off + Start - For added safety, you must first rotate and hold the power switch key at START position and then press the On or Off pushbutton to activate the output relay. | 2                |
| 00001110     | Magnet Lift On & Off                                                                                                                                                                   | 2                |
| 00010000     | On (right button) & Off (left button) (EMS)**                                                                                                                                          | 2                |
| 00010100     | Toggled/Toggled (latching)                                                                                                                                                             | 2                |
| 00010110     | Toggled/Toggled (latching) (EMS)**                                                                                                                                                     | 2                |
| 00011110     | Toggled/Normal (EMS)**                                                                                                                                                                 | 2                |
| 00100000     | Single speed + External warning*                                                                                                                                                       | 2                |
| 00100010     | 4 output relays Closed/Closed relay action + External warning*                                                                                                                         | 4                |
| 00100100     | 3 output relays Closed/Closed relay action + External warning*                                                                                                                         | 3                |
| 00100110     | 4 output relays Opened/Closed relay action + External warning*                                                                                                                         | 4                |
| 01000010     | 4 output relays Closed/Closed relay action + Brake                                                                                                                                     | 4                |
| 01000100     | 3 output relays Closed/Closed relay action + Brake                                                                                                                                     | 3                |
| 01000110     | 4 output relays Opened/Closed relay action + Brake                                                                                                                                     | 4                |
| 01100010     | 4 output relays Closed/Closed relay action + Brake + External warning*                                                                                                                 | 4                |
| 01100100     | 3 output relays Closed/Closed relay action + Brake + External warning*                                                                                                                 | 3                |
| 01100110     | 4 output relays Opened/Closed relay action + Brake + External warning*                                                                                                                 | 4                |

\* External warning function requires installing an external warning device such as horn and lights to the K26 Function output relay.

\*\* EMS: All relay or relays opened when STOP button is pressed down.

#### 4.2.3.2 Non-Interlocked Pushbutton Pair

Non-interlocked setting allows the pushbutton pair be pressed simultaneously. It usually applies to equipment's auxiliary functions such as lights, horn or buzzer. Each dipswitch on the RF/decoder board corresponds to a pushbutton pair. Only the first 7 dipswitch positions are used (counting from left to right), the 8<sup>th</sup> dipswitch position (far right) is not used.



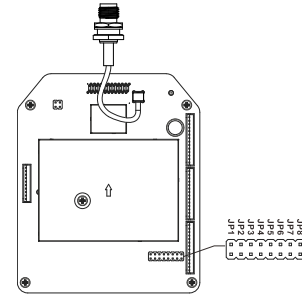
| Function Code | Dip Position #1 | Dip Position #2 ~ #4 (left button) & #5 ~ #7 (right button) | Function Description                                                                                                                                               |
|---------------|-----------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A</b>      | 1               | 000                                                         | Normal (momentary) contact                                                                                                                                         |
| <b>B</b>      | 1               | 001                                                         | Toggled/latching contact (type A)                                                                                                                                  |
| <b>C</b>      | 1               | 011                                                         | Toggled/latching contact (type B)<br><i>Output relay disconnects when STOP button is pressed</i>                                                                   |
| <b>D</b>      | 1               | 100                                                         | Normal + Start function<br><i>For added safety, must first press and hold the START button and then press the intended pushbutton to activate the output relay</i> |
| <b>E</b>      | 1               | 110                                                         | Pitch & Catch                                                                                                                                                      |
| <b>F</b>      | 1               | 111                                                         | 2 steps with Closed/Closed relay action                                                                                                                            |

Example #1: Left button (set to function code A) / right button (set to function code B) → **1 000 001**

Example #2: Left button (set to function code C) / right button (set to function code D) → **1 011 100**

## 4.2.4 Jumper Settings

Jumper setting applies to functions such as the standard or reversed logic A/B selector sequence, transmitter inline pushbutton configurations, firmware version, system testing and remote pairing methods.



| Jumper Settings   |                   | Function                                                                                                                                                               |
|-------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JP3<br>(Opened)   |                   | <b>Standard A/B selector sequence</b> - Output relay A activated at A position, output relay B activated at B position, both relays activated at A+B position.         |
| JP3<br>(Inserted) |                   | <b>Reversed logic A/B selector sequence</b> - Output relay B activated at A position, output relay A activated at B position, both relays deactivated at A+B position. |
| JP4<br>(Opened)   | JP5<br>(Opened)   | Standard right/left pushbutton configuration.                                                                                                                          |
| JP4<br>(Inserted) | JP5<br>(Opened)   | Inline top/bottom pushbutton configuration for PB1 to PB8.                                                                                                             |
| JP4<br>(Opened)   | JP5<br>(Inserted) | Inline top/bottom pushbutton configuration for PB1 to PB12.                                                                                                            |
| JP4<br>(Inserted) | JP5<br>(Inserted) | Inline top/bottom pushbutton configuration for PB1 to PB4.                                                                                                             |
| JP6<br>(Inserted) |                   | System firmware version.                                                                                                                                               |
| JP7<br>(Inserted) |                   | For system testing only (receiver MAIN relays disabled)                                                                                                                |
| JP8<br>(Opened)   |                   | Receiver-to-transmitter remote pairing.<br>(pressing the Pairing button required)                                                                                      |
| JP8<br>(Inserted) |                   | Receiver-to-transmitter remote pairing.<br>(pressing the Pairing button not required)                                                                                  |

## 4.2.5 Voltage Settings

Prior to installation always check the voltage setting is correct for your application.

Position 1 → 110~120VAC

Position 2 → 220~240VAC or 48VAC\* or 24VAC\*\*

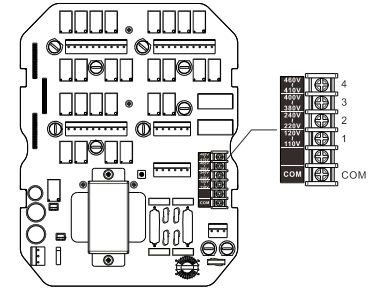
Position 3 → 380~400VAC or 110~120VAC\* or 42VAC\*\*

Position 4 → 410~460VAC or 220~240VAC\* or 48VAC\*\* or 9~36VDC\*\*\*

\* For system equipped with 48/110~120/220~240VAC power supply.

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

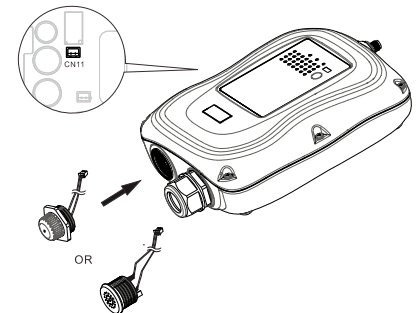
\*\*\* For system equipped with 9~36VDC power supply.



| FUSE #          | 110~120VAC | 220~240VAC | 380~400VAC | 410~460VAC | 24VAC | 42 & 48VAC | 9~36VDC |
|-----------------|------------|------------|------------|------------|-------|------------|---------|
| <b>F3 ~ F10</b> | 5.0A       | 5.0A       | 5.0A       | 5.0A       | 5.0A  | 5.0A       | 5.0A    |
| <b>F1 ~ F2</b>  | 1.0A       | 1.0A       | 1.0A       | 0.5A       | 3.0A  | 2.0A       | 3.0A    |

## 4.2.6 Indicator Light and Buzzer Installation

The miniature indicator light and buzzer can be easily fitted onto the receiver enclosure. The indicator light or the buzzer works simultaneously with the receiver MAIN relays (manufacture preset). When receiver MAIN relays are activated the indicator light or the buzzer is also activated, or vice versa. Make sure the indicator light or the buzzer is connected to the K30 Function output relay CN11 port located on the AC line filter/relay board inside the receiver. Please contact ARC representative if you would like the indicator light or the buzzer work differently than described above.



## 4.2.7 Other Function Output Relays Settings

Listed below are other types of functions that can be outputted through the three Function output relays (K25, K26 and K30) via the infrared IR programmer unit. Please contact ARC representative for more details.

**LV** → Function relay closes when receiver voltage is low.

**ID** → Function relay works simultaneously with all motion commands.

**NORMAL** → START function + AUX with normal momentary output.

**TOGGLE** → START function + AUX with toggled/latching output.

**TOG&E** → START function + AUX with toggled/latching output affected by the STOP command (Function relay opens when STOP button is pressed down).

**EXT** → Function relay works simultaneously with the receiver MAIN relays.

**TDM A+B** → Function relay closes when selector switch is rotated to the A+B position and opens when rotate to A or B positions (tandem monitoring output).

**HORN** → Function relay closes for up to 3 seconds when START command is initiated at transmitter power on and then becomes a normal momentary output thereafter.

**TANDEM C** → Function relay closes when tandem receiver C is selected or activated.

**RESET** → Function relay closes when START command is initiated and opens when let go. Works during initial transmitter startup and inactivity timer START reset.

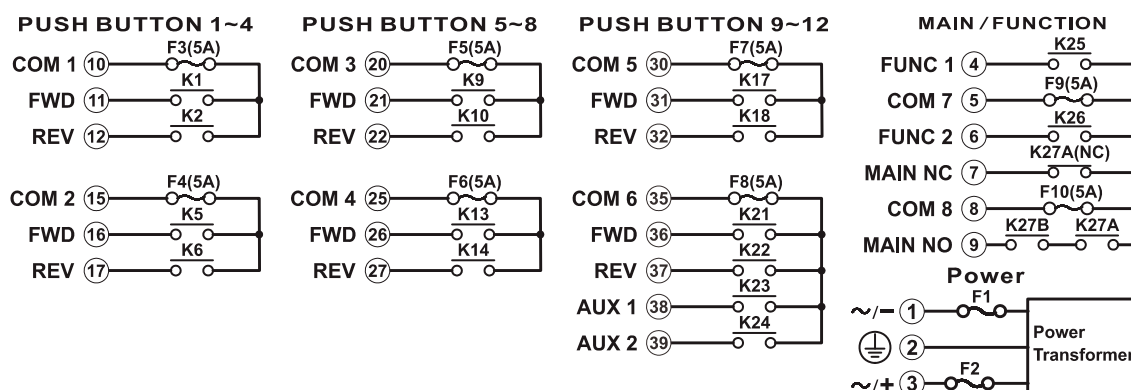
## 4.2.8 System Channels Table

| Channel | Dipswitch Setting | Channel | Dipswitch Setting |
|---------|-------------------|---------|-------------------|
| 01      | 000001            | 32      | 100000            |
| 02      | 000010            | 33      | 100001            |
| 03      | 000011            | 34      | 100010            |
| 04      | 000100            | 35      | 100011            |
| 05      | 000101            | 36      | 100100            |
| 06      | 000110            | 37      | 100101            |
| 07      | 000111            | 38      | 100110            |
| 08      | 001000            | 39      | 100111            |
| 09      | 001001            | 40      | 101000            |
| 10      | 001010            | 41      | 101001            |
| 11      | 001011            | 42      | 101010            |
| 12      | 001100            | 43      | 101011            |
| 13      | 001101            | 44      | 101100            |
| 14      | 001110            | 45      | 101101            |
| 15      | 001111            | 46      | 101110            |
| 16      | 010000            | 47      | 101111            |
| 17      | 010001            | 48      | 110000            |
| 18      | 010010            | 49      | 110001            |
| 19      | 010011            | 50      | 110010            |
| 20      | 010100            | 51      | 110011            |
| 21      | 010101            | 52      | 110100            |
| 22      | 010110            | 53      | 110101            |
| 23      | 010111            | 54      | 110110            |
| 24      | 011000            | 55      | 110111            |
| 25      | 011001            | 56      | 111000            |
| 26      | 011010            | 57      | 111001            |
| 27      | 011011            | 58      | 111010            |
| 28      | 011100            | 59      | 111011            |
| 29      | 011101            | 60      | 111100            |
| 30      | 011110            | 61      | 111101            |
| 31      | 011111            | 62      | 111110            |

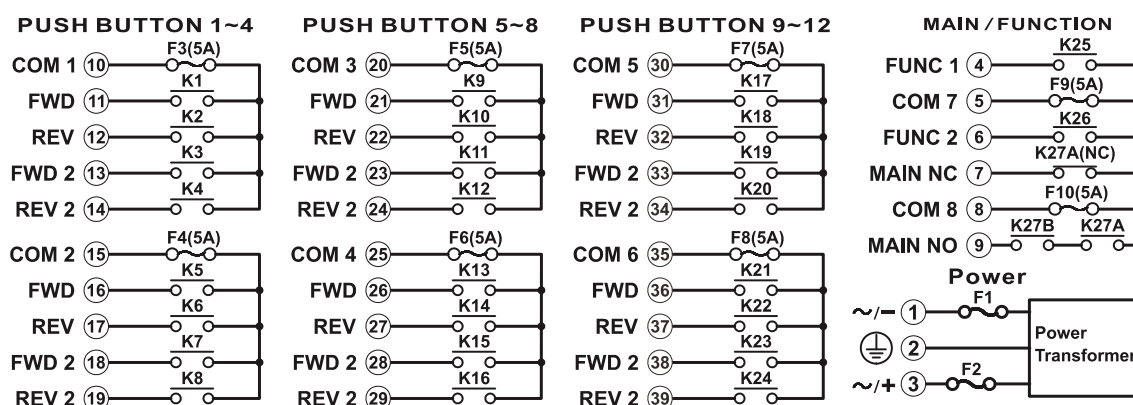
# 5. Receiver Installation

## 5.1 Output Relay Contact Diagrams

### Flex ECO 12S (single speed model)



### Flex ECO 12X (dual speed model)



\* For 9~36VDC power supply, wire #1 corresponds to the negative charge (-) and wire #3 corresponds to the positive charge (+). Wire #2 or green/yellow wire is for AC ground.

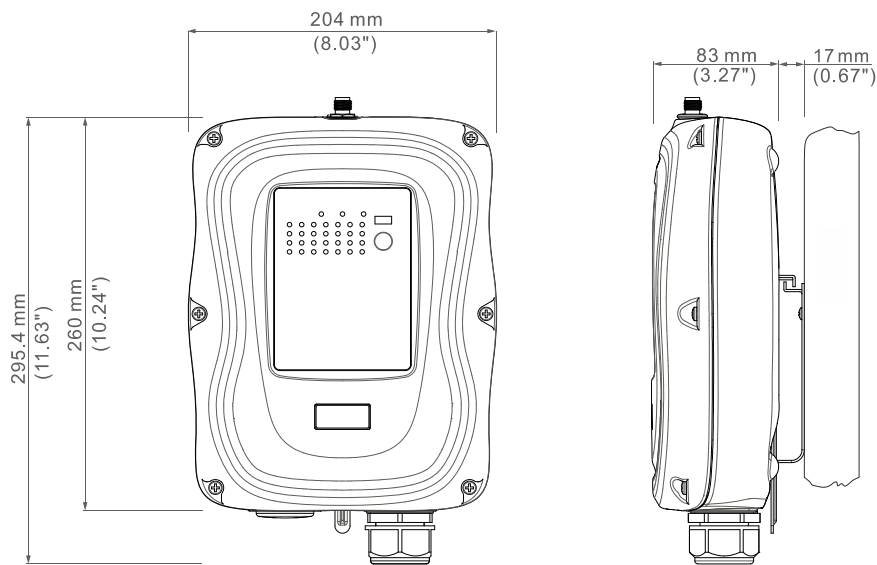
\* If PB11 (or PB12) is set to A/B pushbutton select or A/B rotary switch select function (AB models), connect output A to K21 (or K22) and output B to K23 (or K24). Refer to section 4.1.8.2 on how to set to this function.

## 5.2 Pre-installation Precautions

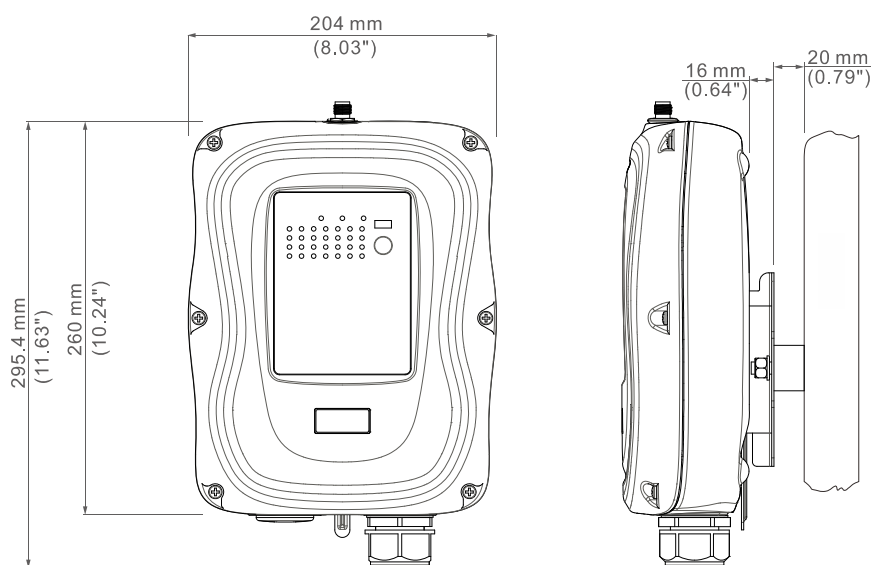
1. Make sure the transmitter and receiver are with identical serial number and channel.
2. Make sure the receiver is not set to the same channel as any other systems in use in the surrounding area.
3. Make sure the crane or equipment is working properly prior to installation.
4. Make sure the power source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

## 5.3 Step-By-Step Installation

**Mounting Bracket Type 1**

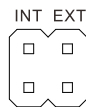
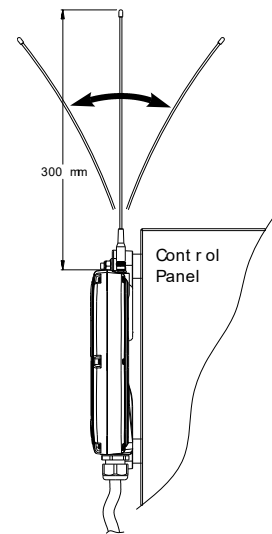


**Mounting Bracket Type 2**



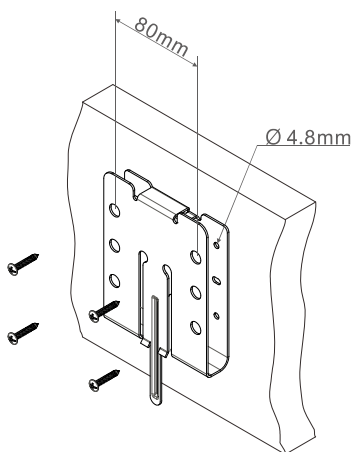


1. For best reception the location of the receiver should be visible to the operator at all time.
2. The location selected should not be exposed to high levels of electric noise. Mounting the receiver next to an unshielded variable frequency drive may cause radio interference. Always locate the receiver as far away from variable frequency drive and electric motor as possible.
3. Ensure the selected location has adequate space to accommodate the receiver. 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.
4. When installing an external antenna make sure the MCX jack located on the RF/decoder board inside the receiver is connected and jumper set to "EXT" position.

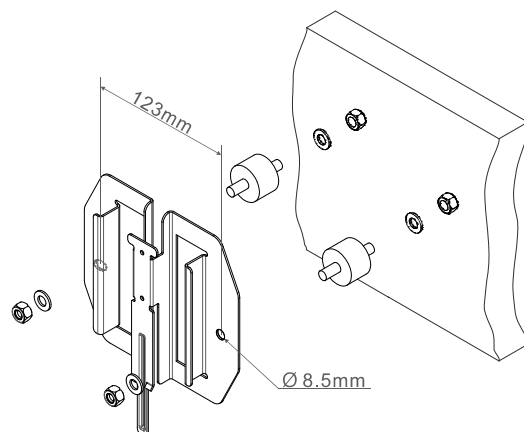


5. For better reception, make sure the receiver is in an upright position.
6. Drill four holes for mounting bracket type 1 and two holes for mounting bracket type 2 on the control panel, wall or location where the receiver is to be installed.
7. Make sure the screws, bolts or shock absorbers are tightened after installation (not provided with the system).

#### Mounting Bracket Type 1



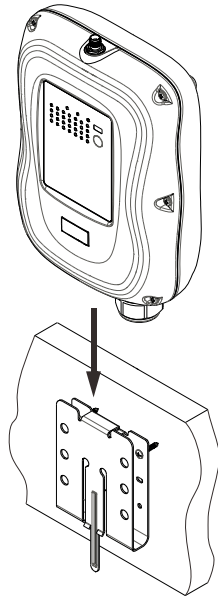
#### Mounting Bracket Type 2



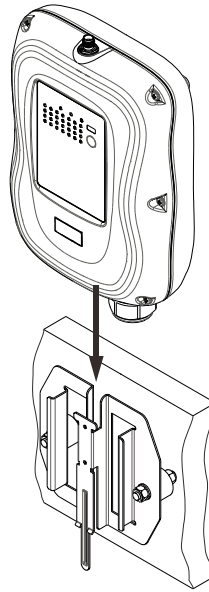
8. Slide down the receiver along the guided track to secure the receiver to the mounting bracket.
9. Remove the receiver by pressing down the bracket release and pull the receiver upward until it clears the guided track.

## Install

**Mounting Bracket Type 1**

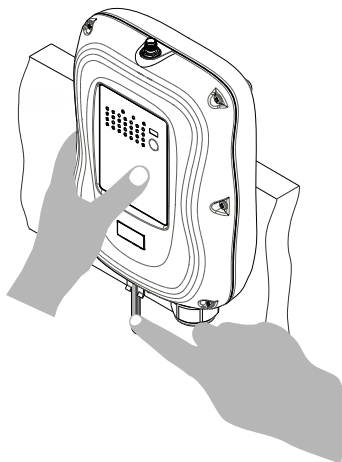


**Mounting Bracket Type 2**

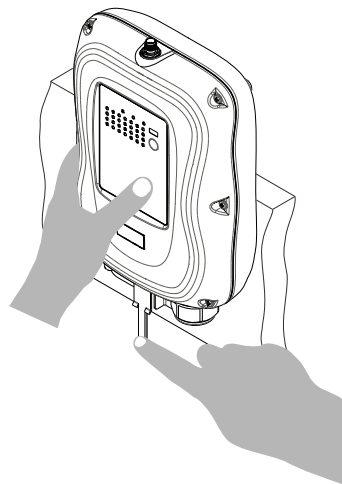


## Remove

**Mounting Bracket Type 1**



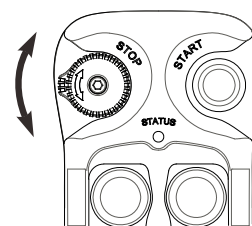
**Mounting Bracket Type 2**



# 6. Operating Procedures

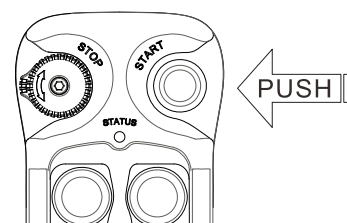
## 6.1 General Operation

- a. Reset the STOP button located on the top left-hand corner of the transmitter by rotating it clockwise or counter clockwise, the button will pop up. Transmitter is powered on when the STOP button is elevated.



- b. After turning on the transmitter power, check the Status LED on the transmitter for any sign of system irregularities (refer to section 6.9.1 Transmitter Status Indications). If the transmitter is in good working order, the Status LED will display constant green for up to 2 seconds at power on (no faults detected).

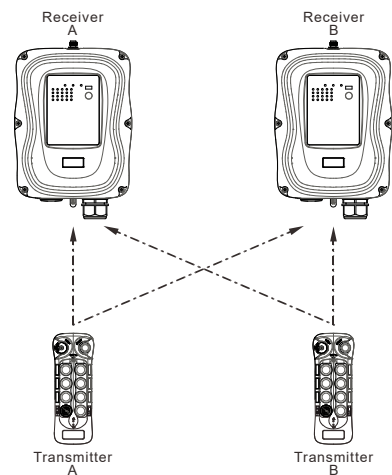
- c. Press the START button for up to 1 second to activate the receiver MAIN relays (Status LED constant green). When the receiver MAIN relays are activated, the Status LED will change from constant green to constant orange (system on). The same START button becomes an auxiliary function thereafter (refer to section 4.2.2.3 START + AUX Function).



- Then press any pushbutton on the transmitter to begin operation. Pressing any pushbutton prior to executing the START command at startup will result in no signals transmitted (Status LED blinks orange).
- d. In case of an emergency, press down the STOP button to disconnect the receiver MAIN relays and the transmitter power. To resume operation, rotate the STOP button clockwise or counter clockwise, the button will pop up. Then press the START button for up to 1 second to reconnect the receiver MAIN relays. For safety, pressing the START button is strictly required every time when the transmitter is turned on or after every STOP button reset.
- e. After 1 minute or 5 minutes of inactivity (pushbutton not pressed), the receiver MAIN relays are temporarily disconnected (refer to section 4.1.5 Inactivity Timer Settings). Press any pushbutton or the START button to resume operation (refer to section 4.1.4 Start Function Settings). The receiver MAIN relays are also temporarily disconnected when the system encounters strong radio interference, dead spots, low battery condition, and system out of operating range.
- f. Turn off the transmitter power by pressing down the STOP button, it will disconnect the transmitter power and the receiver MAIN relays altogether.

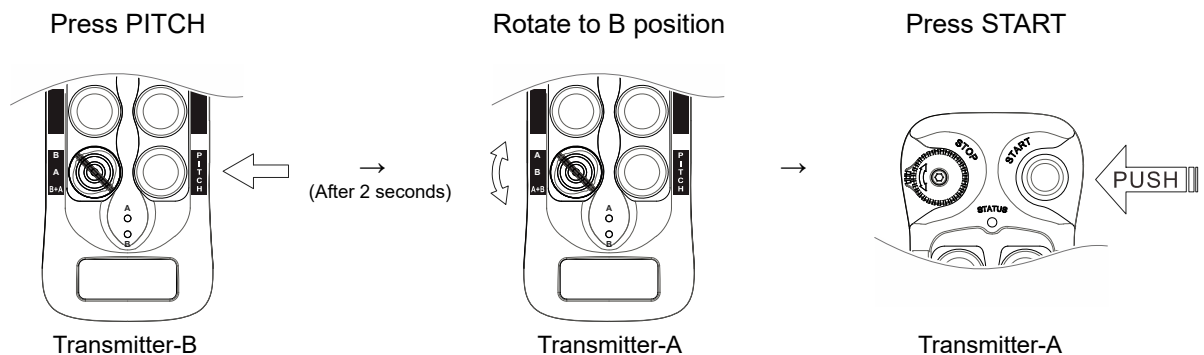
## 6.2 Master/Master Tandem Operation (Tandem models)

- a. To gain control of one or both receivers, first rotate the selector switch to either A, B or A+B position and then press the START button for up to 1 second to activate the receiver MAIN relays inside receiver A, receiver B, or both receivers (depending on the selector switch position). In order to gain control of a receiver, the PITCH pushbutton on the other transmitter must be pressed prior to your takeover. For example, in order for transmitter-A to gain control of receiver-B, transmitter-B must first release its control of receiver-B by first rotate the selector switch to B position and then press the PITCH pushbutton for up to 2.0 seconds.

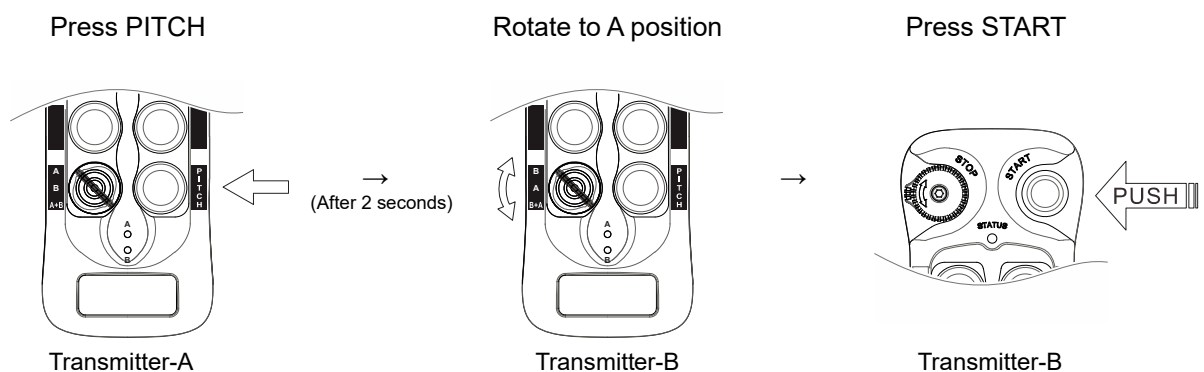


This action releases transmitter-B control of receiver-B. Transmitter-A is then able to take control of receiver-B by first rotate the selector switch to B position and then press the START button for up to 1 second. Make sure the START command is executed 2.0 seconds after transmitter-B presses the PITCH pushbutton (refer to diagram below).

### Master Transmitter-A Takeover Procedure



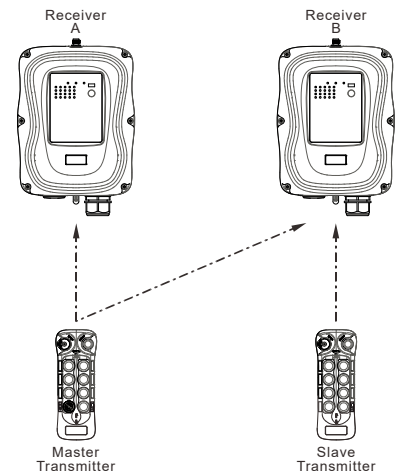
### Master Transmitter-B Takeover Procedure



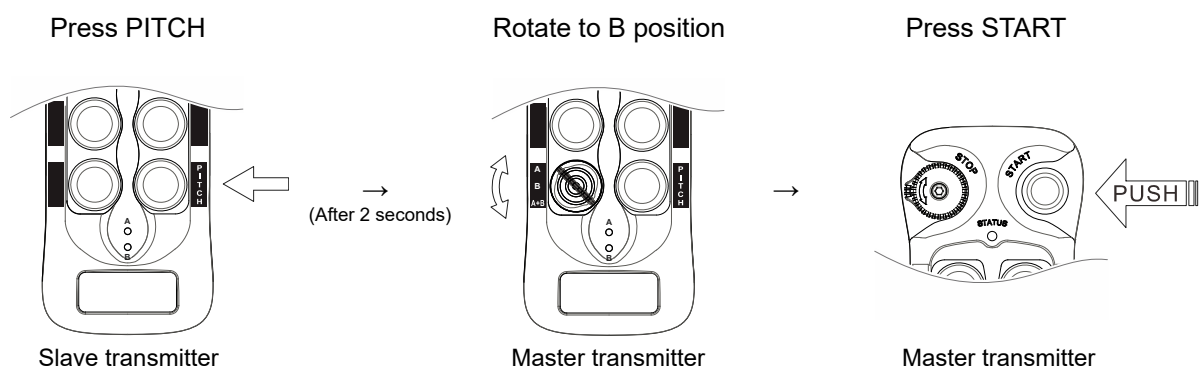
- b. Once the transmitter is locked on to both receivers, then rotate the selector switch to either A, B, or A+B position for independent or simultaneous operation.
- c. At beginning of each shift prior to turning on the transmitter power, always check if the selector switch is correctly positioned for the intended receiver or receivers.
- d. For safety, there is a 2-second grace period followed after executing the PITCH command. What this means is that when PITCH pushbutton is pressed, executing the START command 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 pushbutton and then for you to execute the START command thereafter.

## 6.3 Master/Slave Tandem Operation (Tandem models)

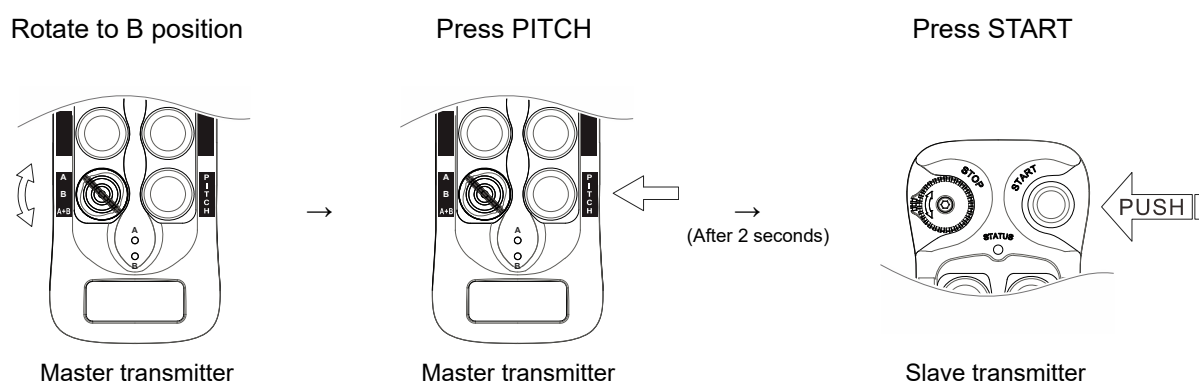
- a. To gain control of one or both receivers, first rotate the selector switch to either A, B or A+B position and then press the START button for up to 1 second to activate the receiver MAIN relays inside receiver A, receiver B, or both receivers (depending on the selector switch position). In order to gain control of a receiver, the PITCH pushbutton on the other transmitter must be pressed prior to your takeover. For example, in order for Master transmitter to gain control of the Slave receiver (receiver-B), Slave transmitter must first release control of its receiver (receiver-B) by pressing the PITCH pushbutton for up to 2.0 seconds. This action releases Slave transmitter control of its receiver (receiver-B). Master transmitter is then able to take control of the Slave receiver (receiver-B) by first rotate the selector switch to B position and then execute the START command. Make sure the START command is executed 2.0 seconds after Slave transmitter presses the PITCH pushbutton (refer to diagram below).



### Master Transmitter Takeover Procedure



## Slave Transmitter Takeover Procedure



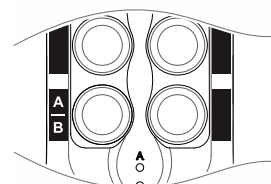
- b. Once the transmitter is locked on to both receivers, then rotate the selector switch to either A, B, or A+B position for independent or simultaneous operation.
- c. At beginning of each shift prior to turning on the transmitter power, always check if the selector switch is correctly positioned for the intended receiver or receivers.
- d. For safety, there is a 2-second grace period followed after executing the PITCH command. What this means is that when PITCH pushbutton is pressed, executing the START command 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 pushbutton and then for you to execute the START command thereafter.

## 6.4 A/B Pushbutton Select Operation

Press the "A/B" pushbutton repeatedly toggles between output relay A, B and A+B respectively. There are 4 different types of Select A/B sequence available (refer to section 4.1.8.2).

**Standard** – Output relay A activated at A position, output relay B activated at B position, both output relays activated at A+B position.

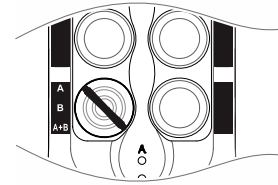
**Reversed logic** - Output relay A activated at B position, output relay B activated at A position, both output relays deactivated at A+B position. Refer to section 4.2.4 JP3 jumper settings.



## 6.5 A/B Rotary Select Operation (AB models)

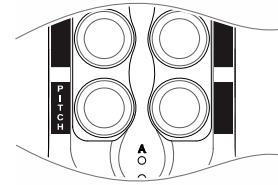
**Standard** - Rotate to A position activates output relay A, rotate to B position activates output relay B, rotate to A+B position activates both output relays.

**Reversed logic** - Rotate to A position activates output relay B, rotate to B position activates output relay A, rotate to A+B position deactivates both output relays. Refer to section 4.2.4 JP3 jumper setting.



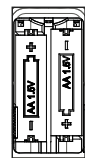
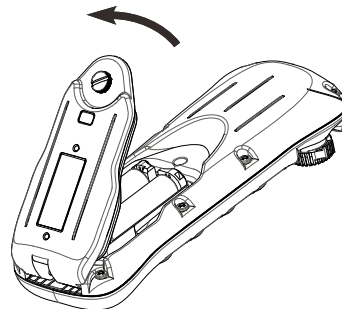
## 6.6 Pitch & Catch Operation

Press the “PITCH” pushbutton for up to 2 seconds to release control of the receiver. After 2-second grace period, press the START button for up to 1 second to gain control of the receiver. The 2<sup>nd</sup> operator is unable to take control of the receiver unless the 1<sup>st</sup> operator presses the “PITCH” pushbutton. Refer to section 4.2.2.10 and section 4.2.3.2 on how to set to this function.



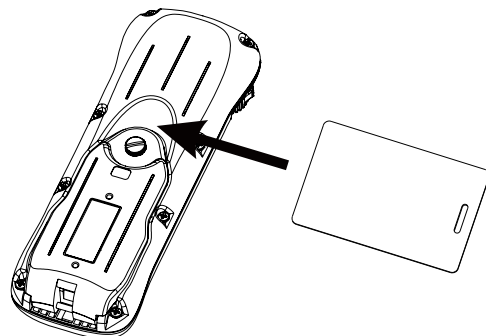
## 6.7 Changing Batteries

Changing transmitter batteries (“AA” alkaline battery x 2) by unscrewing the battery cover located on the backside of the transmitter. During battery installation make sure the batteries are installed correctly, with “+” to “+” charge and “-” to “-” charge. Also make sure the screw is tightened after battery installation to avoid water, moisture, dirt, grease, and other liquid penetration. ***Please refer to the charging station instruction manual if this system is equipped with one.***



## 6.8 Transmitter Access Card (TAC) Operation

After turning on the transmitter power, place the TAC directly over the RFID marking located on the backside of the transmitter. A 2-second green on the Status LED represents access card accepted. Status LED with red blinks represents invalid access card. Then press the START button for up to 1 second to begin operation. TAC is not required after every transmitter inactivity restart, only during initial transmitter power on.



## 6.9 System Status Light Indications

### 6.9.1 Transmitter Status Indications

| Type | Display Type                                                                        | Indication                                                                                                                                                                                                                                                                                                           |
|------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Constant red                                                                        | Voltage below 1.8V at initial power on or during operation                                                                                                                                                                                                                                                           |
| 2    | Constant red → off                                                                  | Voltage below 1.75V during operation (receiver MAIN relays shut off)                                                                                                                                                                                                                                                 |
| 3    | 1 red blink followed by a 2-second pause                                            | Voltage below 1.85V during operation (change batteries suggested)                                                                                                                                                                                                                                                    |
| 4A   | 2 red blinks followed by a 2-second pause                                           | Defective or jammed pushbutton detected at initial power on                                                                                                                                                                                                                                                          |
| 4B   | No light displayed                                                                  | When defective pushbutton condition occurs (2 red blinks, type 4A above), find out which pushbutton is defective by pressing all of them one at a time. If the pushbutton is in good working order when pressed, the Status LED is off. If the Status LED maintained 2 red blinks, then the pushbutton is defective. |
| 5    | 4 red blinks followed by a 2-second pause                                           | Transmitter is unable to lock onto the assigned channel                                                                                                                                                                                                                                                              |
| 6    | Constant green for up to 2 seconds                                                  | Transmitter power on with no faults detected                                                                                                                                                                                                                                                                         |
| 7    | Blinking green                                                                      | Transmission in progress                                                                                                                                                                                                                                                                                             |
| 8    | Blinking orange                                                                     | Pressing any pushbutton prior to executing the START command at power on                                                                                                                                                                                                                                             |
| 9    | 2 orange blinks followed by a 2-second pause                                        | Receiver MAIN relays jammed or defective                                                                                                                                                                                                                                                                             |
| 10   | 3 orange blinks followed by a 2-second pause                                        | Decoding processors defective                                                                                                                                                                                                                                                                                        |
| 11   | Constant orange when the START button is pressed and hold at initial system startup | Receiver MAIN relays activated                                                                                                                                                                                                                                                                                       |



### 6.9.2 Receiver Status Indications

| Type | Display Type (Green & Red) | Indication                               |
|------|----------------------------|------------------------------------------|
| 1    | Fast green blinks          | Decoding in process                      |
| 2    | Slow green blinks          | Decoding on standby                      |
| 3    | 2 red blinks               | Receiver MAIN relays jammed or defective |
| 4    | 3 red blinks               | Decoding processors defective            |
| 5    | 4 red blinks               | Receiving RF defective                   |
| 6    | Fast red blinks            | Incorrect transmitter serial number      |
| 7    | Constant red               | Receiver low voltage                     |
| 8    | No light displayed         | Decoding processors defective            |

### 6.9.3 Receiver Power Indications

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

### 6.9.4 Receiver COM Indications

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

## 7. General Specifications

|                               |   |                                                                                                   |
|-------------------------------|---|---------------------------------------------------------------------------------------------------|
| Frequency Range               | : | 433.050MHz ~ 434.575MHz                                                                           |
| Number of Channels            | : | 62 channels                                                                                       |
| Channel Spacing               | : | 25 KHz                                                                                            |
| Modulation                    | : | Digital Frequency Modulation based on Manchester Code, 20bit address, 32bit CRC and Hamming Code. |
| Encoder & Decoder             | : | Microprocessor-controlled                                                                         |
| Transmitting Range            | : | > 100 Meters (300 feet)                                                                           |
| Hamming Distance              | : | > 6                                                                                               |
| Frequency Control             | : | Synthesized PLL                                                                                   |
| Receiver Type                 | : | Frequency Auto Scanning                                                                           |
| Receiver Sensitivity          | : | -116dBm                                                                                           |
| Spurious Emission             | : | -50dB                                                                                             |
| Antenna Impedance             | : | 50 ohms                                                                                           |
| Responding Time               | : | 40mS (average)                                                                                    |
| Transmitting Power            | : | 2.0mW                                                                                             |
| Enclosure Type                | : | NEMA4                                                                                             |
| Enclosure Rating              | : | IP66                                                                                              |
| Output Contact Rating         | : | 250V @ 8 Amps                                                                                     |
| Transmitter Operating Voltage | : | 3.0VDC                                                                                            |
| Receiver Power Consumption    | : | 22VA (max)                                                                                        |
| Available Receiver Voltages   | : | 9~36VDC<br>24VAC<br>42VAC<br>48VAC<br>110~120VAC<br>220~240VAC<br>380~400VAC<br>410~460VAC        |
| Operating Temperature         | : | -25°C ~ 75°C / -13°F ~ 167°F                                                                      |
| Transmitter Dimension         | : | 233mm (L) x 69mm (W) x 38mm (H)                                                                   |
| Receiver Dimension            | : | 260mm (L) x 204mm (W) x 83mm (H)                                                                  |
| Transmitter Weight            | : | 293g / 10.3oz (include batteries)                                                                 |
| Receiver Weight               | : | 2.5kg / 5.5lb (include output cable)                                                              |

# CE EU Declaration of Conformity CE

## (RED, LVD & Machinery)

### *For the following equipment:*

Product : Flex ECO Series Radio Remote Control System  
Multiple Listee Model No. : Flex ECO 4S/4X, 6S/6X, 8S/8X and 12S/12X  
Manufacturer's Name : Advanced Radiotech Corporation  
Manufacturer's Address : No.3, South 1<sup>st</sup> Road, Chien Chen District,  
Kaohsiung, Taiwan

We hereby declare, that all major safety requirements, concerning the CE Mark Machinery Directive 2006/42/EC, Low Voltage Directive 2014/35/EU (LVD) and Radio Equipment Directive of 2014/53/EU (RED) are fulfilled, as laid out in the guideline set down by the member states of the EEC Commission.

### *The standards relevant for the evaluation of the electrical safety requirements are as follow:*

RED (EMC) : EN 301 489-1 V2.2.0 + EN 301 489-3 V2.1.1  
RED (RF) : EN 300 220-1 V3.1.1 + EN 300 220-2 V3.1.1  
LVD : EN 60950:2006+A1+A11+A12  
MACHINERY : EN 60204-32:2008, EN ISO 13849-1:2015 (PLd)  
EN 13557:2003+A2:2008  
OTHERS : EN 60529 (IP66), EN 62479, EN 55032 + EN 55024

### *Test reports issued by:*

RED (EMC) : SGS  
RED (RF) : SGS  
LVD : SGS  
MACHINERY : SGS  
OTHERS : SGS

### *Person responsible for making this declaration:*



Tom Jou / President

Name and signature of authorized person