

Industrial radio remote control system

FLEX12EPV

FLEX8EPV

Instruction Manual

Service Information

Your New Radio Remote Control System

Thank you for your purchase of ARC Flex EPV radio remote control system. Without a doubt, our Flex EPV 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.

FCC WARNINGS and CAUTIONS

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.
- Any changes or modifications not expressly approved by the party responsible for compliance

could void the authority to operate equipment.

- This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
- End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.
- For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible

FCC MPE : This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment for body-worn configuration in direct contact to the phantom.

IC WARNINGS

RSS-Gen Issue 4 8.4

According to RSS-Gen Issue 4 section 8.4, User manuals for licence-exempt radio apparatus shall contain the following text, or an equivalent notice that shall be displayed in a conspicuous location, either in the user manual or on the device, or both:

(English)

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

(French)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Industry Canada ICES-003 Compliance Label:

CAN ICES-3 (B)/NMB-3(B)

IC MPE: This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition au rayonnement ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps

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1. Introduction

The **Flex EPV** 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 EPV** system consists of a transmitter handset and a receiver unit. Other standard-equipped accessories include transmitter waist belt, vinyl pouch, pushbutton labels, LED labels, output cable and instruction manual CD.

List of notable features include:

- * **Advanced Controls** – the system utilizes dual advanced microprocessor controls with 32bit CRC and Hamming Code, providing ultra fast, safe, precise, and error-free encoding and decoding.
- * **Frequency Hopping RF Transceiver** – the system automatically search and lock onto a free and uninterrupted channel at every system startup or during operation when encountering radio interference. The system is also capable of two-way communication between the transmitter and receiver and as well as receiver to receiver with system status and relay output 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.
- * **Zero-G Sensor Imbedded** – the transmitter is embedded with a Zero-G sensor to guard against any unintended control of the crane or equipment when transmitter is thrown or dropped.
- * **Wireless Remote Pairing Function** – system information can be transferred wirelessly between two transmitters or between a transmitter and a receiver without the hassle of resetting the spares.
- * **Reliable Pushbuttons** – the pushbuttons have gold plated contacts and are rated for more than two million press cycles. The defined snap-action steps provide positive tactile feedback even wearing gloves.
- * **Low Power Consumption** – requires only two “AA” alkaline batteries for more than 100 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. 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 lanyard, transmitter rubber guard, miniature indicator light and buzzer, TAC, contact and contactless (inductive) charging stations, Ni-MH rechargeable batteries, tandem function, 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:



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:



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 MAGNETEK 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



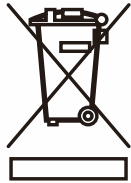
WARNING

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.

2.8. Used symbol description



danger electric shock risk



Equipment Recycling: The production and operation of this equipment requires the recycling and utilization of natural resources. If the product is not processed properly when it is scrapped, this device may contain substances that are harmful to the environment or human health. To avoid the release of such substances into the environment and to reduce the use of natural resources, it is recommended that you recycle this product through a suitable system to ensure that most of the materials are properly recycled or reused.



earth; ground

protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.

2.9. Method cleaning products

Wipe the dust, smudges and stains on the surface of the product with a damp, lint-free cloth.

2.10. Product Maintenance

Do not drop or damage the controller. Drop controllers can cause delicate electronic parts to loosen and affect the use of functions

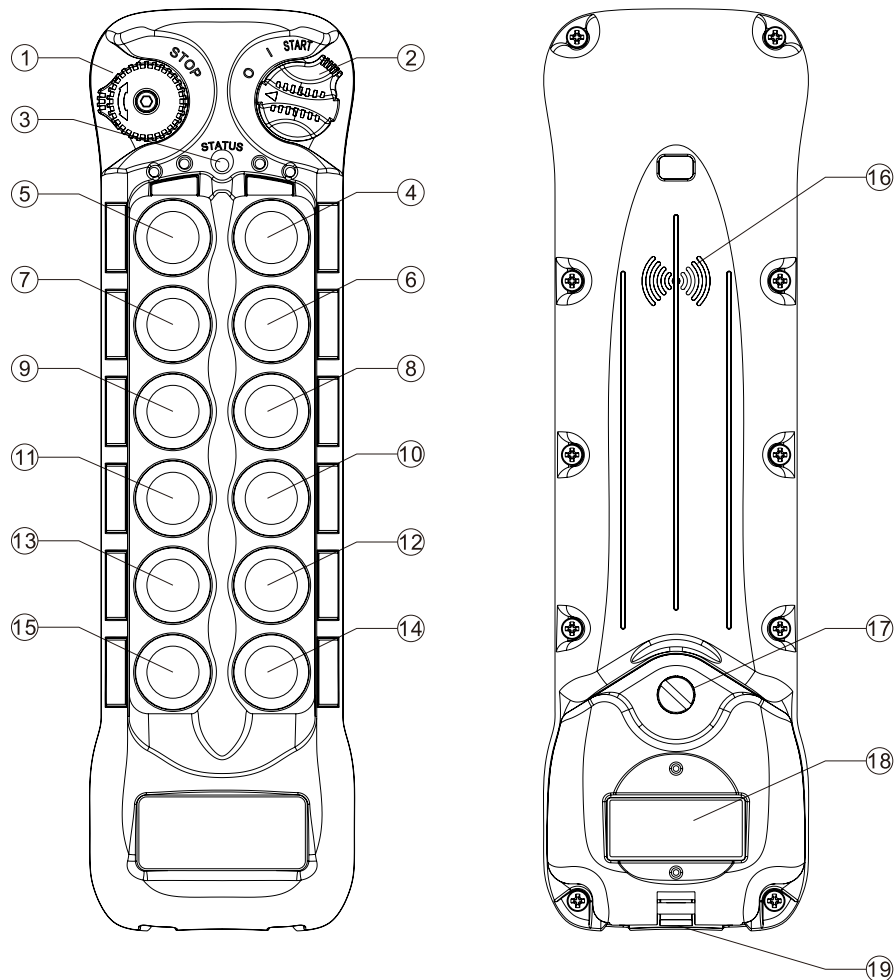
2.11. Power Supply

The POWER front end must be equipped with circuit breaker as the way to power off the product.

3. General System Information

3.1. Transmitter

3.1.1. 12EPV External Illustration



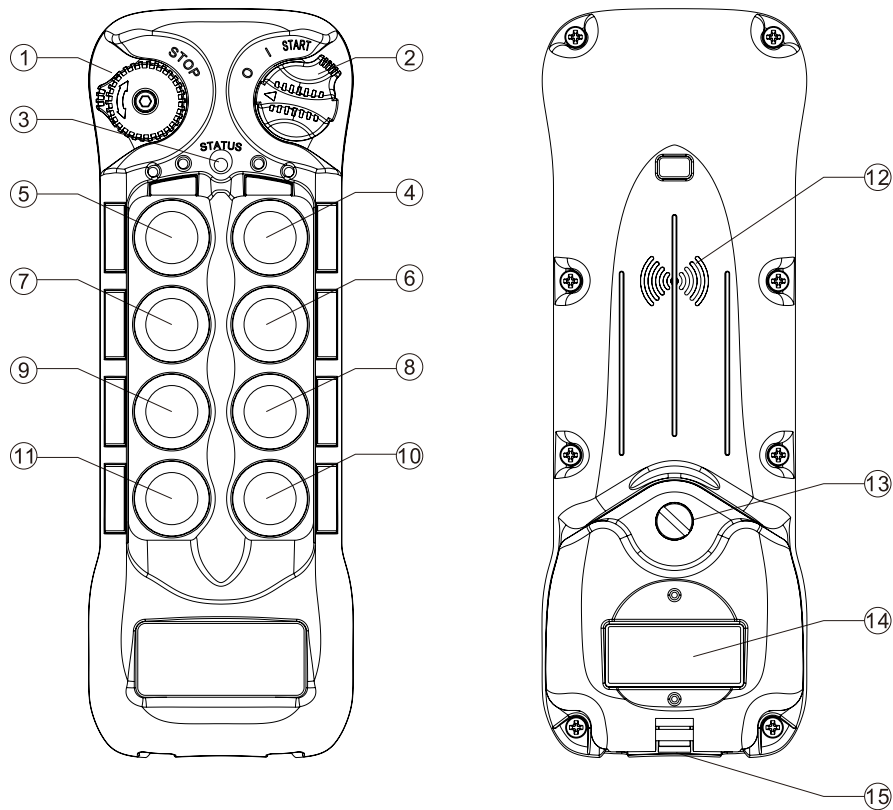
- 1. STOP Button
- 2. Power Key Switch
- 3. Status LED Indicator
- 4. Pushbutton 1 (PB1)
- 5. Pushbutton 2 (PB2)
- 6. Pushbutton 3 (PB3)
- 7. Pushbutton 4 (PB4)
- 8. Pushbutton 5 (PB5)
- 9. Pushbutton 6 (PB6)
- 10. Pushbutton 7 (PB7)

- 11. Pushbutton 8 (PB8)
- 12. Pushbutton 9 (PB9)
- 13. Pushbutton 10 (PB10)
- 14. Pushbutton 11 (PB11)
- 15. Pushbutton 12 (PB12)
- 16. TAC* and Inductive Charging Slot
- 17. Battery Cover Screw
- 18. System Information
- 19. Lanyard and Waist Belt Attachment Slot

* Transmitter Access Card

Note: Flex 12EPV-AB and 12EPV-T models are with A/B/A+B rotary switch on PB12 slot.

3.1.2. 8EPV External Illustration



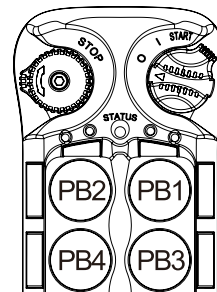
- | | | | |
|----|----------------------|-----|----------------------------------|
| 1. | STOP Button | 9. | Pushbutton 6 (PB6) |
| 2. | Power Key Switch | 10. | Pushbutton 7 (PB7) |
| 3. | Status LED Indicator | 11. | Pushbutton 8 (PB8) |
| 4. | Pushbutton 1 (PB1) | 12. | TAC* and Inductive Charging Slot |
| 5. | Pushbutton 2 (PB2) | 13. | Battery Cover Screw |
| 6. | Pushbutton 3 (PB3) | 14. | System Information |
| 7. | Pushbutton 4 (PB4) | 15. | Lanyard and Waist Belt |
| 8. | Pushbutton 5 (PB5) | | Attachment Slot |

4. Function Settings

4.1. Transmitter

4.1.1. Transmitter Firmware Version

- 1) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1 and PB3 at the same time.
- 3) Rotate the power switch key to ON (1) position.
- 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 rotate the power switch key to OFF (0) position.

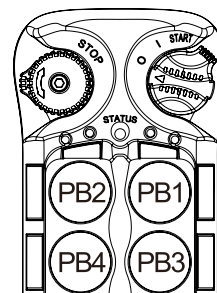


4.1.2. Transmitter Channel Settings

A. Unassigned Channel Scheme (no preset system channel)

When both transmitter and receiver is set to unassigned channel scheme (no preset channel) the system automatically search and lock onto a free and uninterrupted channel at every transmitter startup. Pitch & Catch, t-type, and multi-receiver configurations can not set to unassigned channel scheme.

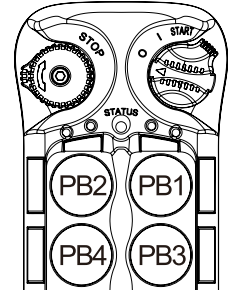
- 1) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1 and PB2 at the same time.
- 3) Rotate the power switch key to ON (1) position.
- 4) Let go PB1 and PB2 at the same time (entered Channel Setting mode). The Status LED displays current channel 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. Channel unassigned is represented by constant orange on the Status LED.
- 5) Change transmitter channel to “channel unassigned” by pressing PB4 one time (Status LED displays constant orange).
- 6) Transfer “channel unassigned” setting to the receiver by rotate and hold the power switch key at START position until the Status LED turns to constant green (transfer complete). Turn off the transmitter power 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. When transmitter is set to “channel unassigned” the receiver must also set to “channel unassigned” in order for the entire system to work.
- 7) Exit Channel Setting mode by rotate the power switch key to OFF (0) position.



B. Assigned Channel Scheme (preset system channel)

Both transmitter and receiver is assigned with a matching preset channel (channel 01~62). Pitch & Catch, t-type, and multi-receiver configurations must set to assigned channel scheme.

- 1) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1 and PB2 at the same time.
- 3) Rotate the power switch key to ON (I) position.
- 4) Let go PB1 and PB2 at the same time (entered Channel Setting mode). 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. Channel unassigned is represented by constant orange on the Status LED.
- 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).
- 6) Transfer the newly selected channel to the receiver by rotate and hold the power switch key at START position until the Status LED turns to constant green (transfer complete). Turn off the transmitter power 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 rotate the power switch key to OFF (0) position.



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

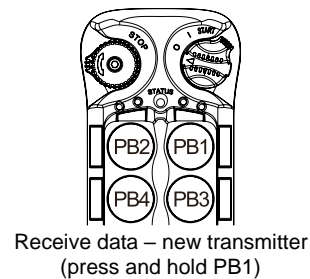
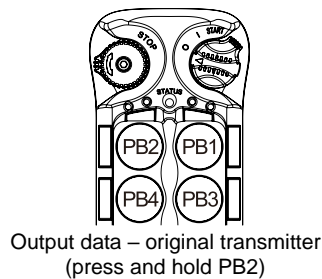
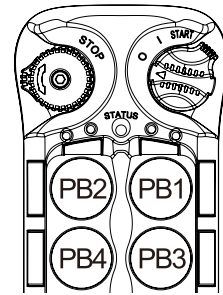
Important Note:

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) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1 and PB3 at the same time.
- 3) Rotate the power switch key to ON (I) position.
- 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).
- 6) Receive data (new transmitter) by press and hold PB1 (Status LED blinks green).
- 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 rotate the power switch key to OFF (0) position.

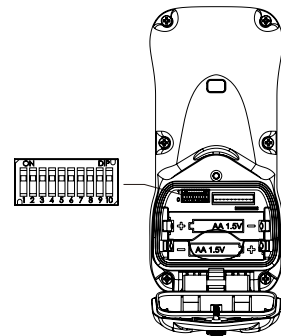


Note: During remote pairing make sure the distance between the two transmitters is within 1 meter.

4.1.4. Transmitter Start Function Settings

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

	Dipswitch Settings	Function
1	xxxxxxx0	START Reactivation
2	xxxxxxx1	Any Button 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.

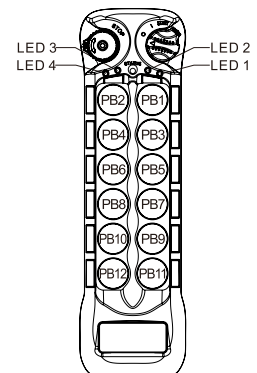
	Dipswitch Settings	Time		Dipswitch Settings	Time
1	xxx000xxxx	1 minute	5	xxx100xxxx	10 minutes
2	xxx001xxxx	20 seconds	6	xxx101xxxx	30 minutes
3	xxx010xxxx	3 minutes	7	xxx110xxxx	60 minutes
4	xxx011xxxx	5 minutes	8	xxx111xxxx	Constant On (sleep mode disabled)

4.1.6. Pushbutton Function Settings

- 1) Rotate the power switch key to OFF (0) position..
- 2) With the STOP button elevated, press and hold PB3 and PB4 at the same time.
- 3) Rotate the power switch key to ON (I) position.
- 4) Let go PB3 and PB4 at the same time (entered Pushbutton Function 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). 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 rotate the power switch key to OFF (0) position.

4.1.6.1. Toggled Pushbutton with LED Indication – Standard Right/Left Pushbutton Configuration

Set pushbutton toggled function (latching output relay) with LED indications. LED 1 ~ 4 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	Normal	Normal	Normal	LED 4
2	2 Reds	Normal	Normal	LED 3	LED 4
3	3 Reds	Normal	LED 2	LED 3	LED 4
4	4 Reds	LED 1	LED 2	LED 3	LED 4

Function Number	Display Type	PB5	PB6	PB7	PB8
5	5 Reds	Normal	Normal	Normal	LED 4
6	6 Reds	Normal	Normal	LED 3	LED 4
7	7 Reds	Normal	LED 2	LED 3	LED 4
8	8 Reds	LED 1	LED 2	LED 3	LED 4

Function Number	Display Type	PB9	PB10	PB11	PB12
13	1 Green + 3 Reds	Normal	Normal	Normal	LED 4
14	1 Green + 4 Reds	Normal	Normal	LED 3	LED 4
15	1 Green + 5 Reds	Normal	LED 2	LED 3	LED 4
16	1 Green + 6 Reds	LED 1	LED 2	LED 3	LED 4

* PB1...PB12 → Pushbutton number.

* Normal → Normal momentary contact.

* LED 1 ~ LED 4 → Pushbutton toggled function with designated LED indication.

4.1.6.2. A/B Pushbutton Select with LED Indication – Standard Right/Left Pushbutton Configuration

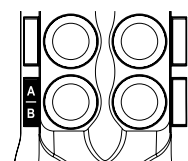
There are 4 different types of A/B selector sequence available. Choose one that is most suitable for your application. Refer to section 5.1 output relay connections.

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
65	6 Greens + 5 Reds	A/1&2	Normal	Normal	Normal
66	6 Greens + 6 Reds	B/1&2	Normal	Normal	Normal
67	6 Greens + 7 Reds	C/1&2	Normal	Normal	Normal
68	6 Greens + 8 Reds	D/1&2	Normal	Normal	Normal
69	6 Greens + 9 Reds	Normal	A/3&4	Normal	Normal
70	7 Greens	Normal	B/3&4	Normal	Normal
71	7 Greens + 1 Red	Normal	C/3&4	Normal	Normal
72	7 Greens + 2 Reds	Normal	D/3&4	Normal	Normal
73	7 Greens + 3 Reds	A/1&2	A/3&4	Normal	Normal
74	7 Greens + 4 Reds	A/1&2	B/3&4	Normal	Normal
75	7 Greens + 5 Reds	A/1&2	C/3&4	Normal	Normal
76	7 Greens + 6 Reds	A/1&2	D/3&4	Normal	Normal
77	7 Greens + 7 Reds	B/1&2	B/3&4	Normal	Normal
78	7 Greens + 8 Reds	B/1&2	C/3&4	Normal	Normal
79	7 Greens + 9 Reds	B/1&2	D/3&4	Normal	Normal
80	8 Greens	C/1&2	C/3&4	Normal	Normal
81	8 Greens + 1 Red	C/1&2	D/3&4	Normal	Normal
82	8 Greens + 2 Reds	D/1&2	D/3&4	Normal	Normal

Function Number	Display Type	PB9	PB10	PB11	PB12
83	8 Greens + 3 Reds	Normal	Normal	A/1&2	Normal
84	8 Greens + 4 Reds	Normal	Normal	B/1&2	Normal
85	8 Greens + 5 Reds	Normal	Normal	C/1&2	Normal
86	8 Greens + 6 Reds	Normal	Normal	D/1&2	Normal

87	8 Greens + 7 Reds	Normal	Normal	Normal	A/3&4
88	8 Greens + 8 Reds	Normal	Normal	Normal	B/3&4
89	8 Greens + 9 Reds	Normal	Normal	Normal	C/3&4
90	9 Greens	Normal	Normal	Normal	D/3&4
91	9 Greens + 1 Red	Normal	Normal	A/1&2	A/3&4
92	9 Greens + 2 Reds	Normal	Normal	A/1&2	B/3&4
93	9 Greens + 3 Reds	Normal	Normal	A/1&2	C/3&4
94	9 Greens + 4 Reds	Normal	Normal	A/1&2	D/3&4
95	9 Greens + 5 Reds	Normal	Normal	B/1&2	B/3&4
96	9 Greens + 6 Reds	Normal	Normal	B/1&2	C/3&4
97	9 Greens + 7 Reds	Normal	Normal	B/1&2	D/3&4
98	9 Greens + 8 Reds	Normal	Normal	C/1&2	C/3&4
99	9 Greens + 9 Reds	Normal	Normal	C/1&2	D/3&4
100	1 orange	Normal	Normal	D/1&2	D/3&4

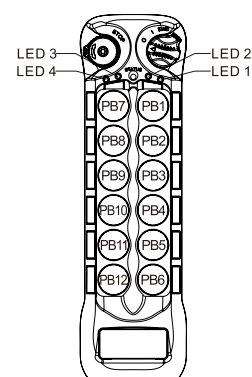
* PB9...PB12 → Pushbutton number.

* Normal → Normal momentary contact.

* A/1&2 ~ D/3&4 → A/B pushbutton select function with designated LED indication.

4.1.6.3. Toggled Pushbutton with LED Indication – Inline Top/Bottom Pushbutton Configuration

Set pushbutton toggled function (latching output relay) with LED indications. LED 1 ~ 4 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	Normal	Normal	Normal	LED 4
17	1 Green + 7 Reds	Normal	Normal	LED 3	LED 4
18	1 Green + 8 Reds	Normal	LED 2	LED 3	LED 4
19	1 Green + 9 Reds	LED 1	LED 2	LED 3	LED 4

Function Number	Display Type	PB5	PB6	PB7	PB8
5	5 Reds	Normal	Normal	Normal	LED 4
20	2 Greens	Normal	Normal	LED 3	LED 4
21	2 Greens + 1 Red	Normal	LED 2	LED 3	LED 4
22	2 Greens + 2 Reds	LED 1	LED 2	LED 3	LED 4

Function Number	Display Type	PB9	PB10	PB11	PB12
13	1 Green + 3 Reds	Normal	Normal	Normal	LED 4
26	2 Greens + 6 Reds	Normal	Normal	LED 3	LED 4
27	2 Greens + 7 Reds	Normal	LED 2	LED 3	LED 4
28	2 Greens + 8 Reds	LED 1	LED 2	LED 3	LED 4

* PB1...PB12 → Pushbutton number.

* Normal → Normal momentary contact.

* LED 1 ~ LED 4 → Pushbutton toggled function with designated LED indication.

4.1.6.4. A/B Pushbutton Select with LED Indication – Inline Top/Bottom Pushbutton Configuration

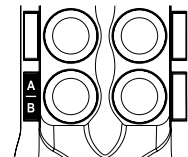
There are 4 different types of A/B selector sequence available. Choose one that is most suitable for your application. Refer to section 4.2.4 JP4/JP5 inline jumper settings and section 5.1 output relay connections.

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
115	1 orange + 1 Green + 5 Reds	A/1&2	Normal	Normal	Normal
116	1 orange + 1 Green + 6 Reds	B/1&2	Normal	Normal	Normal
117	1 orange + 1 Green + 7 Reds	C/1&2	Normal	Normal	Normal
118	1 orange + 1 Green + 8 Reds	D/1&2	Normal	Normal	Normal
51	5 Greens + 1 Red	Normal	A/3&4	Normal	Normal
52	5 Greens + 2 Reds	Normal	B/3&4	Normal	Normal
53	5 Greens + 3 Reds	Normal	C/3&4	Normal	Normal
54	5 Greens + 4 Reds	Normal	D/3&4	Normal	Normal
119	1 orange + 1 Green + 9 Reds	A/1&2	A/3&4	Normal	Normal
120	1 orange + 2 Greens	A/1&2	B/3&4	Normal	Normal
121	1 orange + 2 Greens + 1 Red	A/1&2	C/3&4	Normal	Normal
122	1 orange + 2 Greens + 2 Reds	A/1&2	D/3&4	Normal	Normal

123	1 orange + 2 Greens + 3 Reds	B/1&2	B/3&4	Normal	Normal
124	1 orange + 2 Greens + 4 Reds	B/1&2	C/3&4	Normal	Normal
125	1 orange + 2 Greens + 5 Reds	B/1&2	D/3&4	Normal	Normal
126	1 orange + 2 Greens + 6 Reds	C/1&2	C/3&4	Normal	Normal

127	1 orange + 2 Greens + 7 Reds	C/1&2	D/3&4	Normal	Normal
128	1 orange + 2 Greens + 8 Reds	D/1&2	D/3&4	Normal	Normal

Function Number	Display Type	PB9	PB10	PB11	PB12
143	1 orange + 4 Greens + 3 Reds	Normal	Normal	A/1&2	Normal
144	1 orange + 4 Greens + 4 Reds	Normal	Normal	B/1&2	Normal
145	1 orange + 4 Greens + 5 Reds	Normal	Normal	C/1&2	Normal
146	1 orange + 4 Greens + 6 Reds	Normal	Normal	D/1&2	Normal
87	8 Greens + 7 Reds	Normal	Normal	Normal	A/3&4
88	8 Greens + 8 Reds	Normal	Normal	Normal	B/3&4
89	8 Greens + 9 Reds	Normal	Normal	Normal	C/3&4
90	9 Greens	Normal	Normal	Normal	D/3&4
147	1 orange + 4 Greens + 7 Reds	Normal	Normal	A/1&2	A/3&4
148	1 orange + 4 Greens + 8 Reds	Normal	Normal	A/1&2	B/3&4
149	1 orange + 4 Greens + 9 Reds	Normal	Normal	A/1&2	C/3&4
150	1 orange + 5 Greens	Normal	Normal	A/1&2	D/3&4
151	1 orange + 5 Greens + 1 Red	Normal	Normal	B/1&2	B/3&4
152	1 orange + 5 Greens + 2 Reds	Normal	Normal	B/1&2	C/3&4
153	1 orange + 5 Greens + 3 Reds	Normal	Normal	B/1&2	D/3&4
154	1 orange + 5 Greens + 4 Reds	Normal	Normal	C/1&2	C/3&4
155	1 orange + 5 Greens + 5 Reds	Normal	Normal	C/1&2	D/3&4
156	1 orange + Greens + 6 Reds	Normal	Normal	D/1&2	D/3&4

* PB9...PB12 → Pushbutton number.

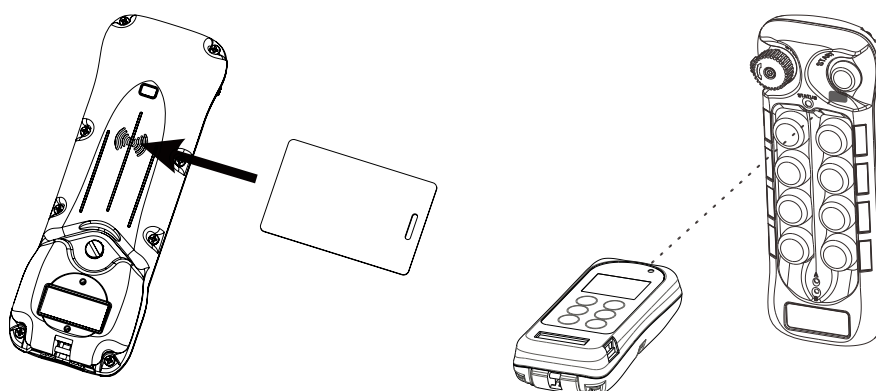
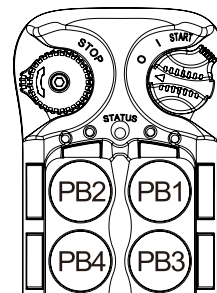
* Normal → Normal momentary contact.

* A/1&2 ~ D/3&4 → A/B pushbutton select function with designated LED indication.

4.1.7. Transmitter Access Card (TAC) Settings

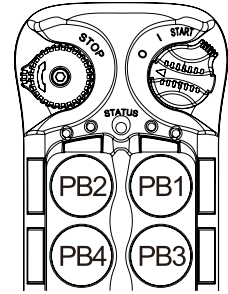
Follow the instruction below on how to program the TAC into the transmitter. The infrared IR programmer unit is required to complete the programming. Please contact ARC representative for more details.

- 1) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1, PB2, PB3 and PB4 at the same time.
- 3) Rotate the power switch key to ON (1) position.
- 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 rotate the power switch key to OFF (0) position.



4.1.8. Display Frequency Band

- 1) Rotate the power switch key to OFF (0) position.
- 2) With the STOP button elevated, press and hold PB1 and PB3 at the same time.
- 3) Rotate the power switch key to ON (I) position.
- 4) Let go PB2 and PB4 at the same time (entered Frequency Band Display mode).
- 5) The Status LED displays the preset transmitter frequency band with orange, green and red blinks. An orange blink represents the hundreds (+**1**00), a green blink represents the tens (+0**1**0) and a red blink represents the units (+00**1**). For example, **8** orange blinks followed by **6** green blinks and **3** red blinks is **863**MHz.
- 6) Exit Frequency Band Display mode by rotate the power switch key to OFF (0) position.



4.1.9. Output Feedback Settings

Up to 4 assignable relay outputs can be programmed into the system and feedback to the transmitter LED indicators during operation. These settings require using the infrared IR programmer unit. Please contact ARC representative for more details.

4.1.10. Infrared Function Settings

The transmitter is embedded with infrared sensors for infrared start function. These settings require using the infrared IR programmer unit. Please contact ARC representative for more details.

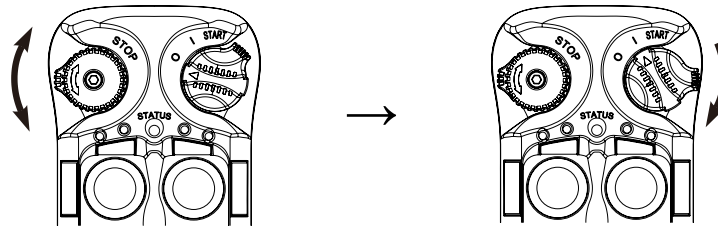
4.1.11. Zero-G Sensor Settings

The transmitter is embedded with a Zero-G sensor to guard against any unintended control of the crane or equipment when transmitter is thrown or dropped. When triggered, the receiver MAIN relays are deactivated with the exception of the horn output that can be assigned to any of the Function output relays (K25, K26 or K30). This horn output setting requires the infrared IR programmer unit. Please contact ARC representative for more details.

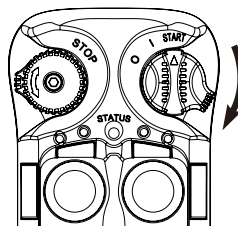
5. Operating Procedures

5.1. 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. Turn on the transmitter power by inserting the power switch key and rotate to ON (I) position.



- b. After turning on the transmitter power, check the Status LED on the transmitter for any sign of system irregularities (refer to section 6.10.1 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. Rotate the power switch key further to the START position and hold it there for up to 2 seconds (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 power switch key will retract back to the ON (I) position when let go (Status LED blinks green). The same START position 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 system startup will result in no signals transmitted (Status LED blinks orange).

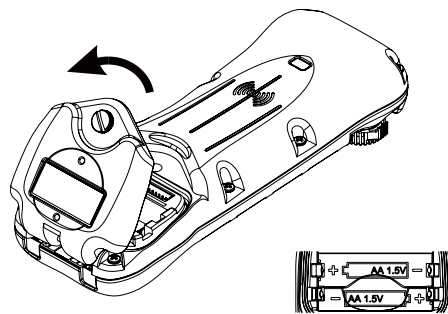


- d. In case of an emergency, press down the STOP button to disconnect the receiver MAIN relays and the transmitter power. To resume operation, rotate the STOP button clockwise or counter clockwise, the button will pop up. Then rotate the power switch key to the START position for up to 2 seconds to reconnect the receiver MAIN relays. For safety, executing the START command 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 execute the START command 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 rotating the power switch key counter clockwise to Off (0) position; it will disconnect the transmitter power and the receiver MAIN relays altogether. Turn it further counter clockwise to release the key.

5.2. 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.



5.3. System Status Light Indications

5.3.1. Transmitter Status Indications

Type	Display Type	Indication
1	Constant red	Voltage below 1.8V at initial power on or during operation
		Voltage below 1.75V during operation (receiver MAIN relays shut off)
2	1 red blink followed by a 2-second pause	Voltage below 1.85V during operation (change batteries suggested)
3A	2 red blinks followed by a 2-second pause	Defective or jammed pushbutton detected at initial power on
3B	No light displayed	When defective pushbutton condition occurs (2 red blinks, type 3A 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.
4	4 red blinks followed by a 2-second pause	Transmitter is unable to lock onto the assigned channel
5	Constant green for up to 2 seconds	Transmitter power on with no faults detected
6	Blinking green	Transmission in progress
8	3 orange blinks followed by a 2-second pause	Decoding processors defective
9	Blinking orange	Pressing any pushbutton prior to executing the START command at power on

6. General Specifications

Frequency Range	:	433MHz ~ 440MHz (FCC) 863MHz ~ 870MHz (CE)
Number of Channels	:	141 channels(FCC)/62 channels(CE)
Channel Spacing	:	50K(FCC) / 100 KHz(CE)
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
Spurious Emission	:	-50dB
Antenna Impedance	:	50 ohms
Responding Time	:	50mS (average)
Transmitting Power	:	1.0mW
Enclosure Type	:	NEMA4
Enclosure Rating	:	IP66
Output Contact Rating	:	250V @ 8 Amps
Transmitter Operating Voltage	:	3.0VDC @ 40mA
Receiver Power Consumption	:	22VA (max)
Available Receiver Voltages	:	110~240VAC , 0.3A , 50/60HZ
Operating Temperature	:	-25°C ~ 50°C / -13°F ~ 167°F
12EPV Transmitter Dimension	:	244mm (L) x 70mm (W) x 44mm (H)
8EPV Transmitter Dimension	:	198mm (L) x 70mm (W) x 44mm (H)
Transmitter Weight	:	341g / 12.0oz (include batteries)

Environment Condition

- a) outdoor use
- b) altitude up to 2000 Meters (6500 feet)
- c) Maximum Relative Humidity 90%
- d) MAINS supply voltage fluctuations up to $\pm 10\%$
- e) OVERVOLTAGE CATEGORY II
- f) WET LOCATION, applicable
- g) applicable POLLUTION DEGREE of the intended environment
(POLLUTION DEGREE 2 IN MOST CASES)