

Industrial radio remote control system

FLEX12VRX

FLEX8VRX

Instruction Manual

Service Information

Your New Radio Remote Control System

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

Table of Contents

	Page
1. Introduction	5
2. Radio Controlled Safety	6
2.1. CRITICAL INSTALLATION CONSIDERATIONS	7
2.2. GENERAL	7
2.3. PERSONS AUTHORIZED TO OPERATE RADIO CONTROLLED CRANES	7
2.4. SAFETY INFORMATION AND RECOMMENDED TRAINING FOR RADIO CONTROLLED EQUIPMENT OPERATORS	8
2.5. TRANSMITTER UNIT	9
2.6. PRE-OPERATION TEST	9
2.7. BATTERIES	9
2.8. Used symbol description	10
2.9. Method cleaning products	10
2.10. Product Maintenance	10
2.11. Power Supply	10
3. General System Information	11
3.1. Receiver	11
3.1.1. 12VRX/8VRX External Illustration	11
4. Function Settings	12
4.1. Receiver	12
4.1.1. Output Relay Configurations	12
4.1.2. Voltage Settings	12
4.1.3. Indicator Light and Buzzer Installation	12
4.1.4. Other Function Output Relays Settings	13
5. Receiver Installation	14
5.1. Output Relay Contact Diagrams	14
5.2. Pre-installation Precautions	16
5.3. Step-By-Step Installation	16
6. Operating Procedures	19
6.1.1. Receiver Status Indications	19
6.1.2. Receiver Power Indications	19
6.1.3. Receiver COM Indications	19
7. General Specifications	20

1. Introduction

The **Flex VRX** 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 VRX** 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



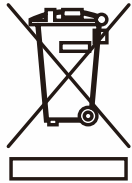
WARNING

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.

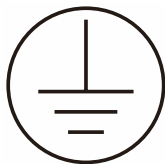
2.8. Used symbol description



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

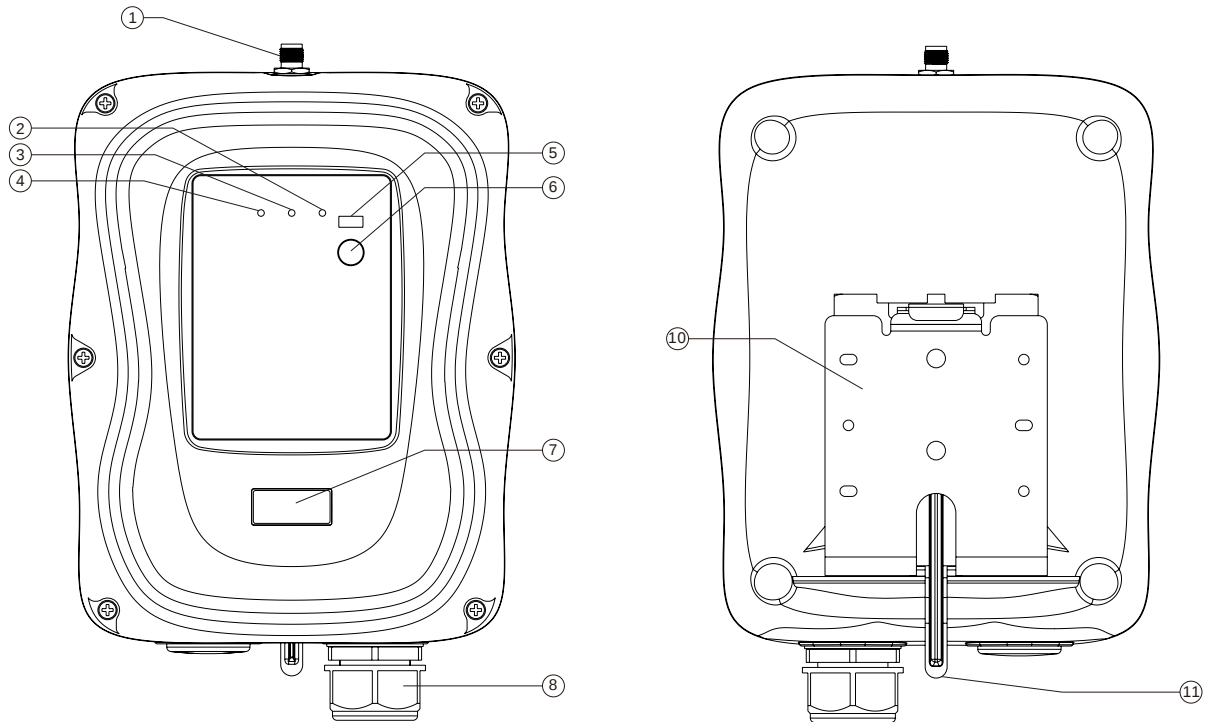
2.11. Power Supply

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

3. General System Information

3.1. Receiver

3.1.1. 12VRX/8VRX External Illustration



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

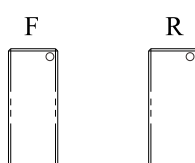
4. Function Settings

4.1. Receiver

4.1.1. Output Relay Configurations

4.1.1.1. Output Relay Types

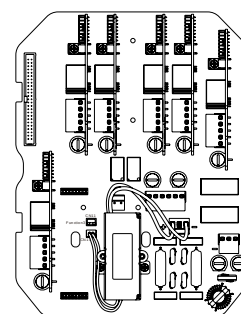
1. **2 output relays per motion – single speed only**
Output relays with Forward (F) and Reverse (R) 1st speed only.



4.1.2. Voltage Settings

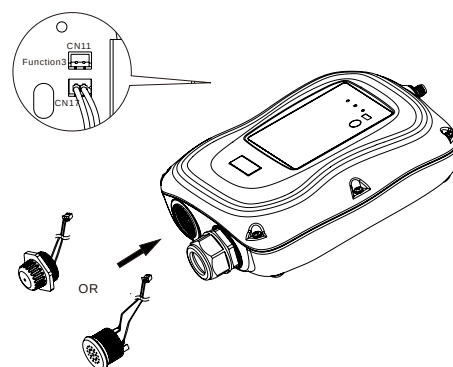
Prior to installation always check the voltage setting is correct for your application.

FUSE #	110~120VAC	220~240VAC
F3 ~ F10	5.0A	5.0A
F1 ~ F2	1.0A	1.0A



4.1.3. 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 vise 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.



4.1.4. 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. The relay opens when STOP button is pressed down and transmitter power off.

S/P → Function relay closes when START command is executed and opens only when transmitter power is turned off.

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 executed at transmitter power on and then becomes a normal momentary output thereafter.

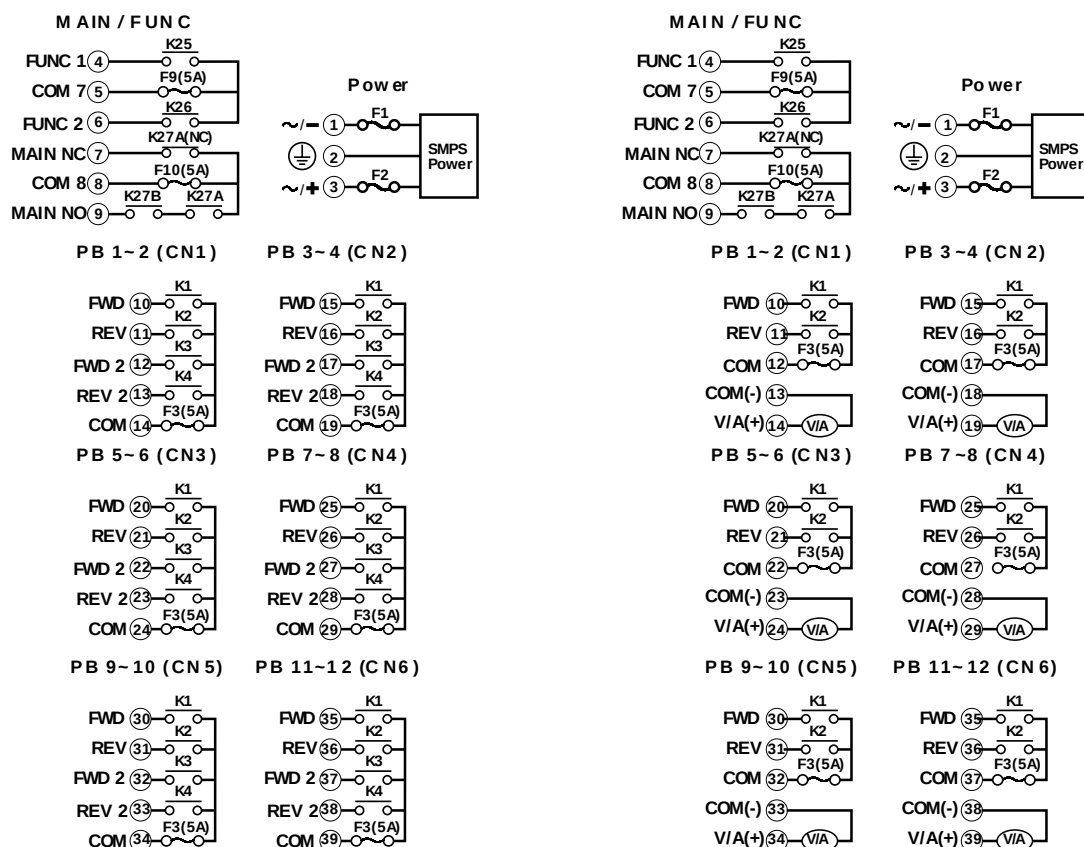
G SENSOR → Function relay closes when Zero-G sensor is triggered (receiver MAIN relays deactivated) and opens when receiver MAIN relays are reactivated.

5. Receiver Installation

5.1. Output Relay Contact Diagrams

Flex 12EPV (dual speed model)

Flex 12EPV (analog model)



* 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 4.1.7 on how to set to this function.

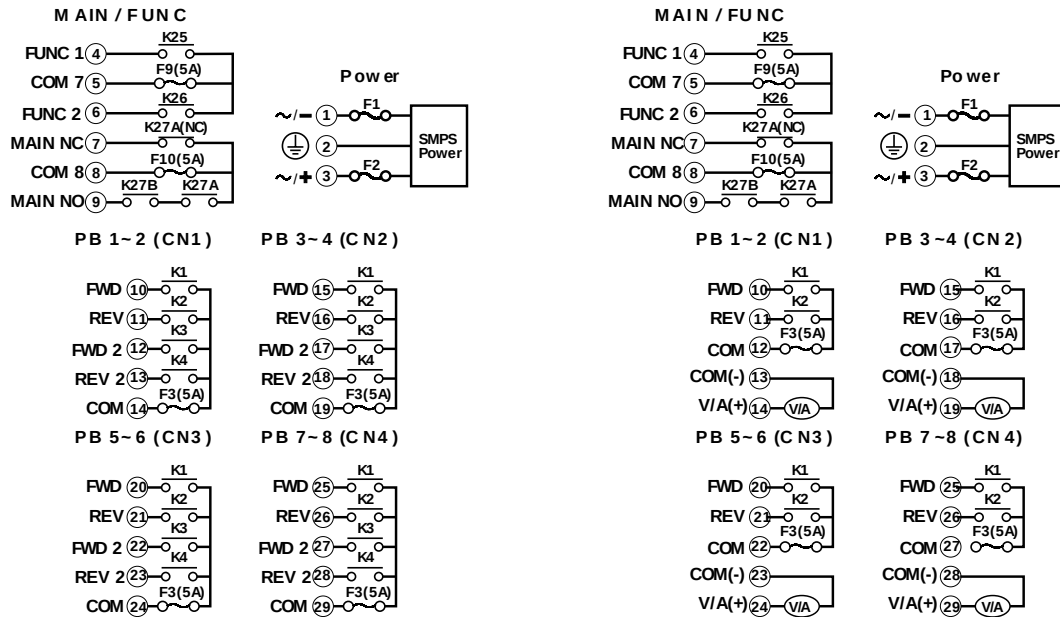
* Power Cord Specifications

Wire diameter : 0.75mm²

Withstand voltage / current : 600V / 7A

Flex 8EPV (dual speed model)

Flex 8EPV (analog model)



* If PB7 (or PB8) is set to A/B pushbutton select or A/B rotary switch select function (AB models), connect output A to K13 (or K14) and output B to K15 (or K16). Refer to section 4.1.7 on how to set to this function.

* Power Cord Specifications

Wire diameter : 0.75mm^2

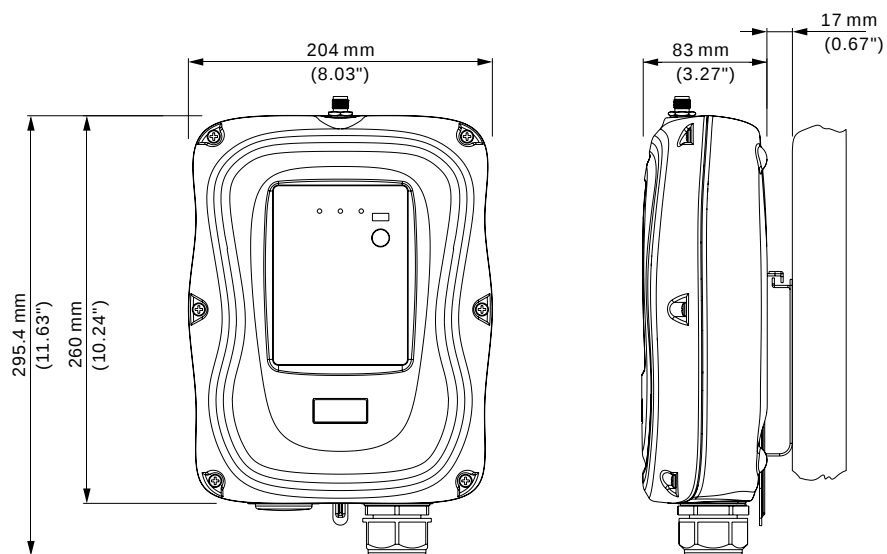
Withstand voltage / current : 600V / 7A

5.2. Pre-installation Precautions

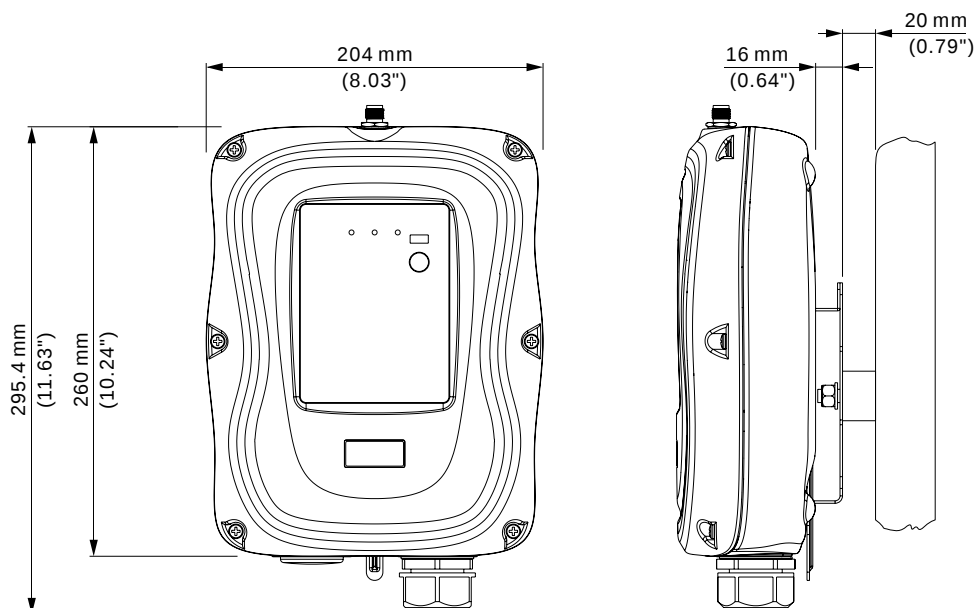
1. Make sure the transmitter and receiver are with identical serial number and channel.
2. Make sure the receiver is not set to the same channel as any other systems in use in the surrounding area.
3. Make sure the crane or equipment is working properly prior to installation.
4. Make sure the power source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

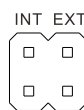
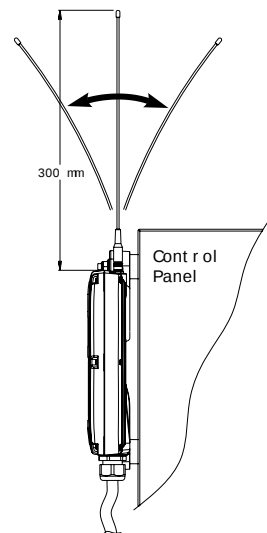
Mounting Bracket Type 1



Mounting Bracket Type 2

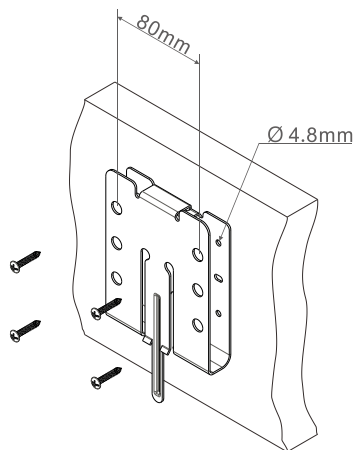


1. For best reception the location of the receiver should be visible to the operator at all time.
2. The location selected should not be exposed to high levels of electric noise. Mounting the receiver next to an unshielded variable frequency drive may cause radio interference. Always locate the receiver 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 decoder board inside the receiver is connected and jumper set to "EXT" position.

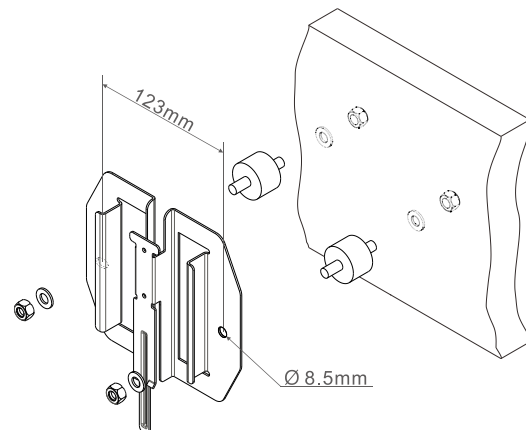


5. For better reception, make sure the receiver is in an upright position.
6. Drill four holes for mounting bracket type 1 and two holes for mounting bracket type 2 on the control panel, wall or location where the receiver is to be installed.
7. Make sure the screws, bolts or shock absorbers are tightened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

Mounting Bracket Type 1



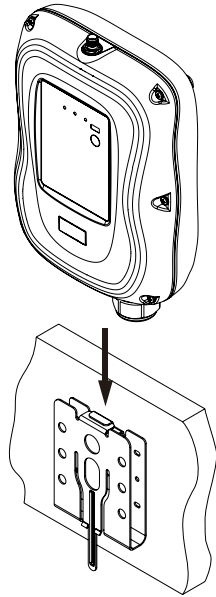
Mounting Bracket Type 2



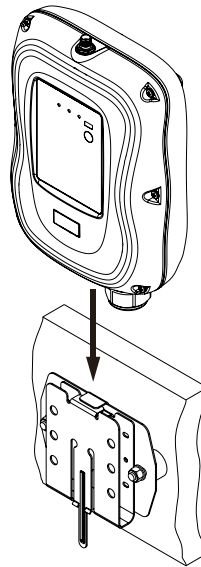
8. Slide down the receiver along the guided track to secure the receiver to the mounting bracket.
9. Remove the receiver by pressing down the bracket release and pull the receiver upward until it clears the guided track.

Install

Mounting Bracket Type 1

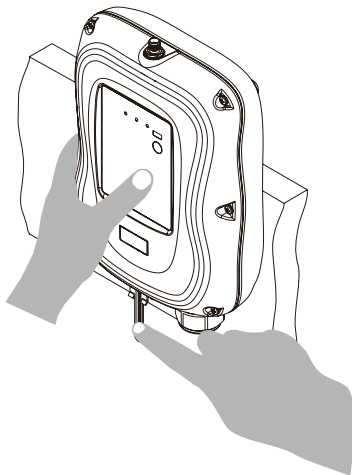


Mounting Bracket Type 2

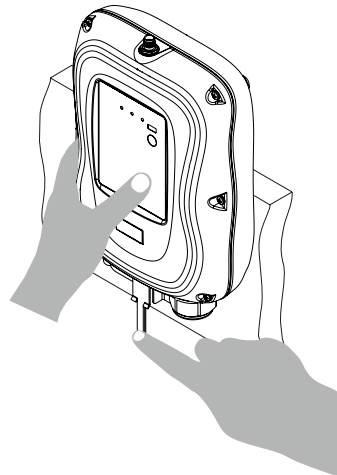


Remove

Mounting Bracket Type 1



Mounting Bracket Type 2



6. Operating Procedures

6.1.1. 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 board defective
6	Fast red blinks	Incorrect transmitter serial number
7	Constant red	Receiver low voltage
8	No light displayed	Decoding processors defective

6.1.2. Receiver Power Indications

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

6.1.3. 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	:	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
Receiver Type	:	Frequency Auto Scanning
Receiver Sensitivity	:	-116dBm
Spurious Emission	:	-50dB
Antenna Impedance	:	50 ohms
Enclosure Type	:	NEMA4
Enclosure Rating	:	IP66
Output Contact Rating	:	250V @ 8 Amps
Receiver Power Consumption	:	22VA (max)
Available Receiver Voltages	:	110~240VAC , 0.3A , 50/60HZ
Operating Temperature	:	-25°C ~ 50°C / -13°F ~ 167°F
Receiver Dimension	:	260mm (L) x 204mm (W) x 83mm (H)
Receiver Weight	:	3.15kg / 6.9lb (include output cable)

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)