



# Flex Wave™ CE System Radio Control Equipment Operator Manual



**MAGNETEK**

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# SERVICE INFORMATION

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# PRODUCT SAFETY INFORMATION

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

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists and lifting devices:

- 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 Magnetek Products are being used,
- Applicable local, state or federal codes, ordinances, standards and requirements, or
- Safety standards and practices for the overhead material handling industry

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 Magnetek Products to know, understand and follow all of these requirements. It is the responsibility of the owner of the Magnetek Products 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 Magnetek Products prior to becoming familiar with and being trained in these requirements.**

## WARRANTY INFORMATION

For information on Magnetek's product warranties by product type, please visit [www.columbusmckinnon.com/magnetek](http://www.columbusmckinnon.com/magnetek).

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# 1 Introduction

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

Each Flex Wave system consists of a transmitter handset, receiver unit, and operator manual. Other standard-equipped accessories include transmitter waist belt, spare transmitter power key, vinyl pouch, "AA" alkaline batteries, pushbutton labels, LED labels, and output cable. Visit [www.columbusmckinnon.com/magnetek](http://www.columbusmckinnon.com/magnetek) for full instruction manual.

The list of notable features includes:

- **Advanced Controls** – the system utilizes dual advanced microprocessor controls with 32-bit CRC and Hamming Code, providing ultra-fast, safe, precise, and error-free encoding and decoding.
- **Frequency Hopping RF Transceiver** – the system automatically searches and locks onto a free and uninterrupted channel at every system start-up or during operation when encountering radio interference. The system is also capable of two-way communication between the transmitter and receiver as well as receiver-to-receiver with system status and relay output feedbacks.
- **Zero-G Sensor Embedded** – 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 2 million press cycles. The defined snap-action steps provide positive tactile feedback even through 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 resistant to breakage and deformation even in the most abusive environments. The receiver enclosures and output cables are CE rated. The transmitter and receiver enclosures are IP66 rated.
- **Full Compliance** – all systems fully comply with CE and European Safety Standards.
- **Optional Accessories** – transmitter belt clip, transmitter lanyard, transmitter rubber guard, buzzer, charging station, and many others.

## 2 Radio-Controlled Safety

### WARNING, CAUTION and NOTE Statements

Read and understand this manual before installing, operating or servicing this product. Install the product according to this manual and local codes.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.

#### 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 indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

**NOTE:** A NOTE statement is used to notify people of installation, operation, programming or maintenance information that is important, but not hazard-related.

#### 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



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, such as 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 can operate at high speeds. The equipment is often 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, prevent damage to equipment, or even save a life.

## 2.3 Persons Authorized to Operate Radio-Controlled Equipment

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 that may cause them to lose control of the equipment, 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 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:

- operate the material-handling equipment if the direction of travel or function engaged does not agree with what is indicated on the controller
- 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-controlled 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 perform, at 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.

## 2.7.1 Changing Batteries

Change 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.

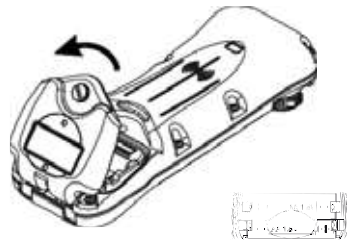


Figure 2-1

## 2.7.2 Battery Charging

The transmitter is designed to accept any off-the-shelf Nickel Metal Hydride (Ni-MH) rechargeable batteries. When charging both transmitter and individual batteries at the same time the priority always goes to the transmitter charging. The individual battery charging begins only after the transmitter charging is completed. Depending on the battery capacity the average charging time is approximately 3 hours from completely drained to fully charged. Solid red on the LED represents charging in progress, solid green represents batteries fully charged, and LED off represents no batteries detected.

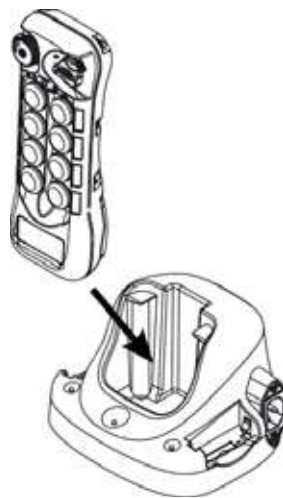


Figure 2-2



### **WARNING**

Do not use any rechargeable lithium ion batteries as they will damage both the transmitter and the charging station.

## 3 General System Information

### 3.1 General Operation

1. Reset the STOP button located on the top left-hand corner of the transmitter by rotating it clockwise or counterclockwise; the button will pop up. Turn on the transmitter power by inserting the power switch key and rotating to the ON ( I ) position.

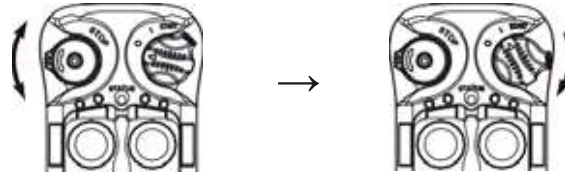


Figure 3-1

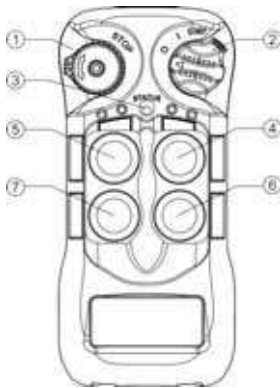
2. After turning on the transmitter power, check the Status LED on the transmitter for any sign of system irregularities. (**See Section 4.1 on page 16.**) If the transmitter is in good working order the Status LED will display solid green for up to 2 seconds at power on (no faults detected).
3. Rotate the power switch key further to the START position and hold it there for up to 2 seconds (Status LED solid green). When the receiver MAIN relays are activated the Status LED will change from solid green to solid orange (system on). The power switch key will retract back to the ON ( I ) position when released. The same START position becomes an auxiliary function thereafter. Press any pushbutton on the transmitter to begin operation. Pressing any pushbutton before executing the START command at system start-up will result in no signals transmitted (Status LED blinks orange).



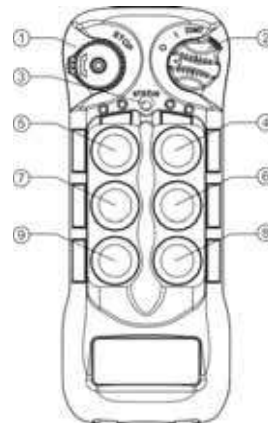
Figure 3-2

4. 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 counterclockwise; the button will pop up. Then rotate the power key to the START position to reconnect the receiver MAIN relays. For safety, executing the START command is required every time the transmitter is turned on or after every STOP button reset.
5. After 5 minutes of inactivity (pushbutton not pressed) the receiver MAIN relays are temporarily disconnected. Press any pushbutton or execute the START command to resume operation. 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.
6. Turn off the transmitter power by rotating the power switch key counterclockwise to the OFF ( 0 ) position; it will disconnect the transmitter power and the receiver MAIN relays altogether. Turn it further counterclockwise to release the key.

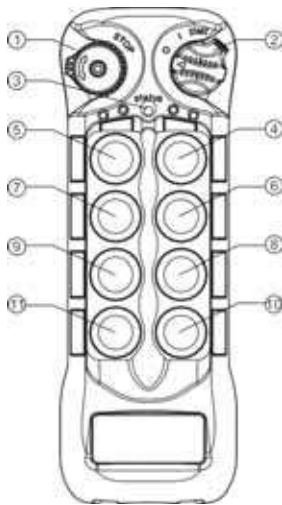
## 3.2 Transmitter Diagrams



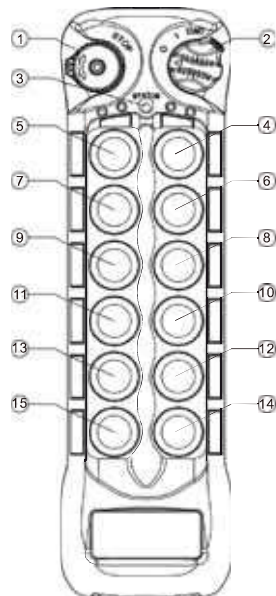
4Wave Transmitter – Front



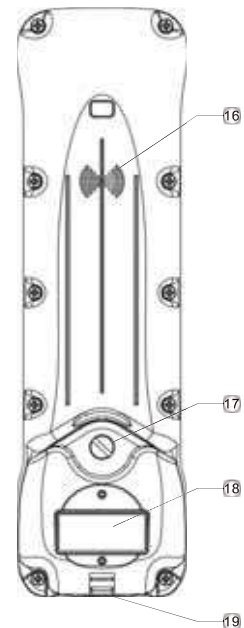
6Wave Transmitter – Front



8Wave Transmitter – Front



12Wave Transmitter – Front

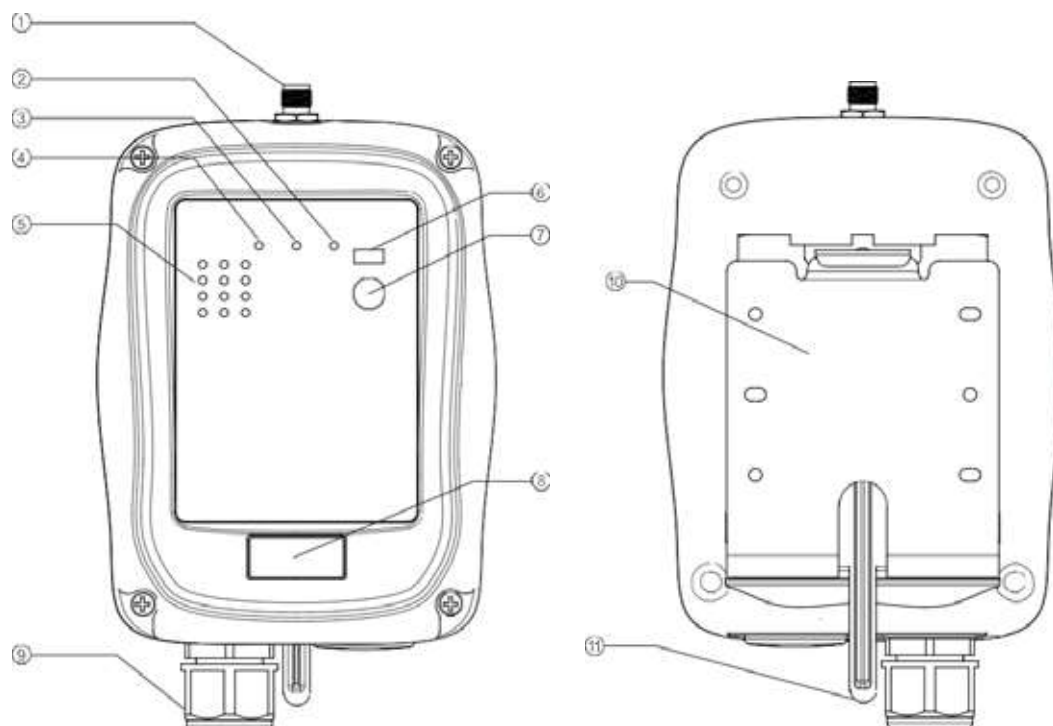


12Wave Transmitter – Back

- |                         |  |
|-------------------------|--|
| 1. STOP Button          | 11. Pushbutton 8 (PB8)                     |
| 2. Power Key Switch     | 12. Pushbutton 9 (PB9)                     |
| 3. Status LED Indicator | 13. Pushbutton 10 (PB10)                   |
| 4. Pushbutton 1 (PB1)   | 14. Pushbutton 11 (PB11)                   |
| 5. Pushbutton 2 (PB2)   | 15. Pushbutton 12 (PB12)                   |
| 6. Pushbutton 3 (PB3)   | 16. Future Feature                         |
| 7. Pushbutton 4 (PB4)   | 17. Battery Cover Screw                    |
| 8. Pushbutton 5 (PB5)   | 18. System Information                     |
| 9. Pushbutton 6 (PB6)   | 19. Lanyard and Waist Belt Attachment Slot |
| 10. Pushbutton 7 (PB7)  |  |

## 3.3 Receiver Diagrams

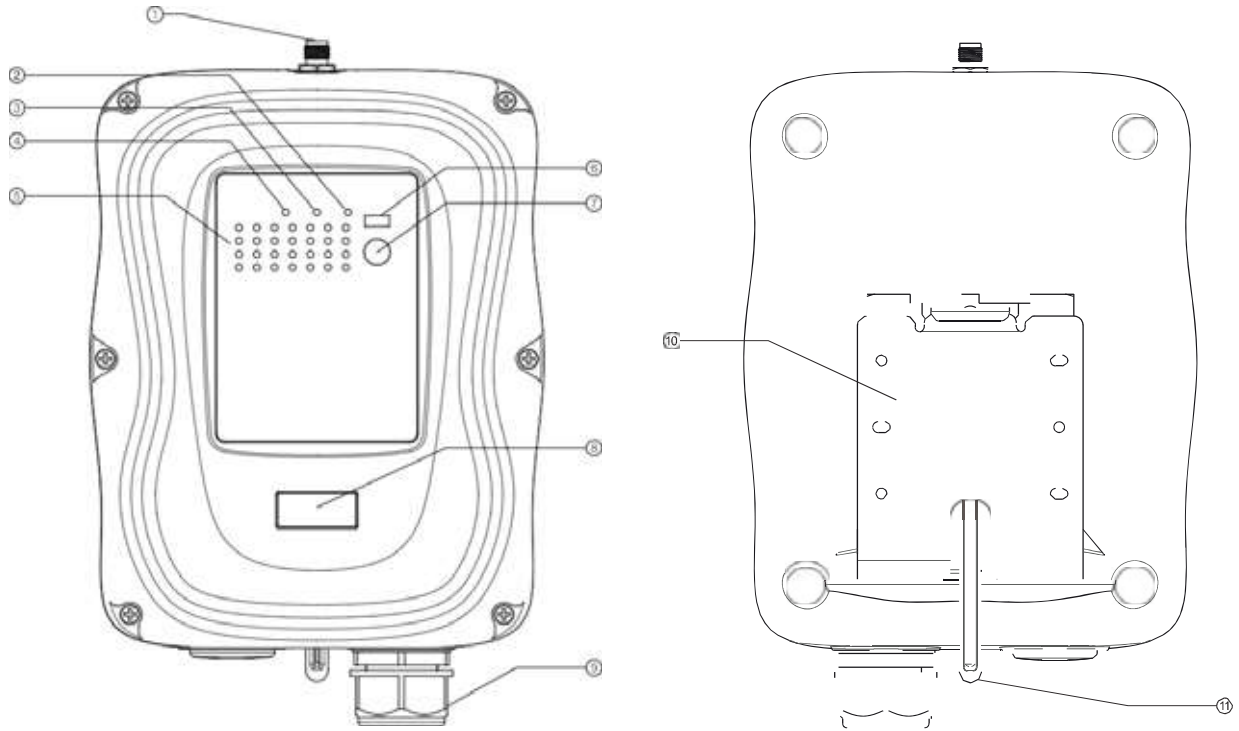
### 3.3.1 4/6Wave Receiver External Illustrations



**Figure 3-3**

- |                                |                              |
|--------------------------------|------------------------------|
| 1. External TNC Antenna Port   | 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            |                              |

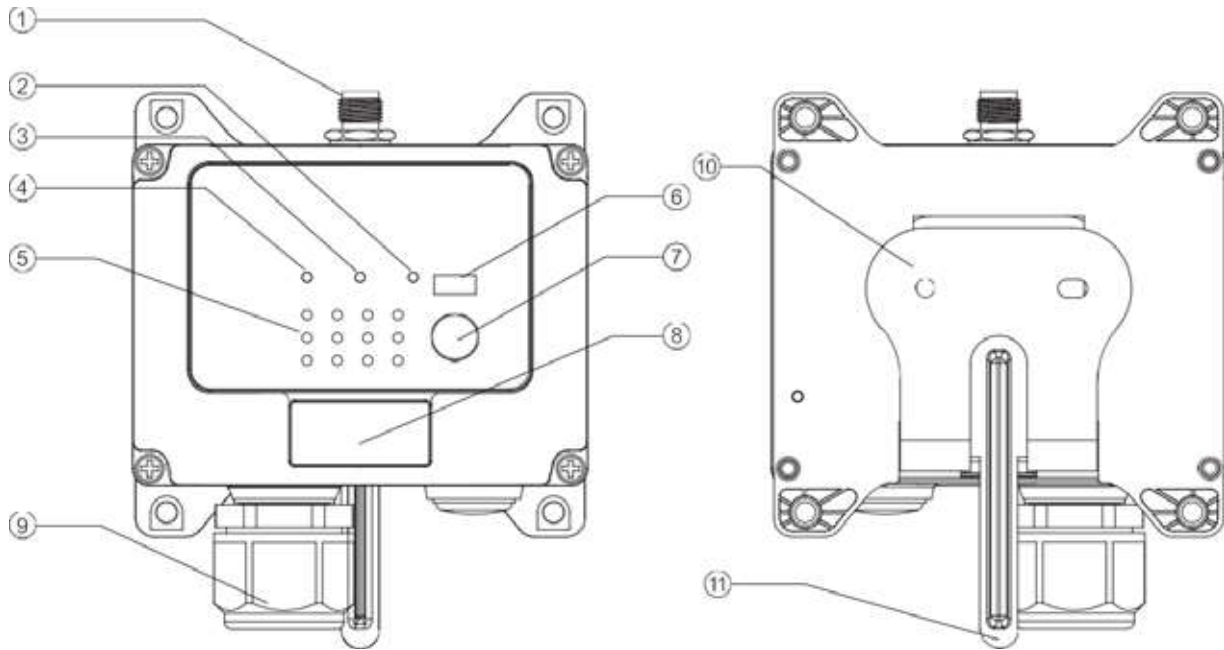
### 3.3.2 8/12Wave Receiver External Illustrations



**Figure 3-4**

- |                                |                              |
|--------------------------------|------------------------------|
| 1. External TNC Antenna Port   | 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            |                              |

### 3.3.3 4Wave-MRX and 6Wave-MRX External Illustrations



**Figure 3-5**

- |                                |                                 |
|--------------------------------|---------------------------------|
| 1. External TNC Antenna Port   | 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 (Optional) |
| 5. Output Relay LED Indicators | 11. Mounting Bracket Release    |
| 6. Infrared Sensors            |                                 |

## 4 System Status Light Indications

### 4.1 Transmitter Status Indications

Type	Display Type	Indication
1	Solid red	Voltage below 1.8V at initial power on or during operation
2	3 red blinks and then 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 (changing batteries is recommended)
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	Solid 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	Solid orange when the power switch key is rotated and held at the START position at initial system startup	Receiver MAIN relays activated



## 4.2 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 board defective
6	Fast red blinks	Incorrect transmitter serial number
7	Solid red	Receiver low voltage
8	No light displayed	Decoding processors defective

## 4.3 Receiver Power Indications

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

## 4.4 Receiver COM Indications

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

# 5 General Specifications

Frequency Range:	433-050 MHz - 439.600 MHz 863.050 MHz - 869.600 MHz 921.000 MHz - 927.550 MHz (Australia only)
Number of Channels:	124 channels
Channel Spacing:	50 KHz
Modulation:	Digital Frequency Modulation based on Manchester Code, 20-bit address, 32-bit CRC and Hamming Code
Encoder & Decoder:	Microprocessor-controlled
Transmitting Range:	>100 meters
Hamming Distance:	>6
Frequency Control:	Synthesized PLL
Receiver Type:	Frequency Auto Scanning
Receiver Sensitivity:	-116 dBm
Spurious Emission:	-50 dB
Antenna Impedance:	50 ohms
Responding Time:	40 mS (average)
Transmitting Power:	2.0 mW
Enclosure Rating:	IP66
Output Contact Rating:	<b>4/6/8/12Wave:</b> 250V @ 8 Amps; <b>4/6Wave-MRX:</b> 250V @ 6 Amps
Transmitter Operating Voltage:	3.0VDC
Operating Temperature:	-25°C - 75°C
Transmitter Dimension:	<b>4Wave:</b> 152 mm (L) x 70 mm (W) x 44 mm (H) <b>6Wave:</b> 175 mm (L) x 70 mm (W) x 44 mm (H) <b>8Wave:</b> 198 mm (L) x 70 mm (W) x 44 mm (H) <b>12Wave:</b> 244 mm (L) x 70 mm (W) x 44 mm (H)
Receiver Dimension:	<b>4/6Wave:</b> 196 mm (L) x 149 mm (W) x 85 mm (H) <b>8/12Wave:</b> 260 mm (L) x 204 mm (W) x 83 mm (H) <b>4/6Wave-MRX:</b> 120 mm (L) x 90 mm (W) x 55 mm (H)
Transmitter Weight:	<b>4Wave:</b> 249 g (including batteries) <b>6Wave:</b> 270 g (including batteries) <b>8Wave:</b> 292 g (including batteries) <b>12Wave:</b> 341 g (including batteries)
Receiver Weight:	<b>4/6Wave:</b> 1.76 kg (including output cable) <b>8Wave:</b> 2.75 kg (including output cable) <b>12Wave:</b> 3.15 kg (including output cable) <b>4/6Wave-MRX:</b> 900 g (including output cable)



## EU Declaration of Conformity Certificate

### **For the following equipment:**

Product : Flex Series Radio Remote Control System  
Multiple Listee Model No. : Flex Duo, Flex Base, Flex EX2, Flex Wave  
Manufacturer's Name : Magnetek, Inc.  
Manufacturer's Address : N49W13650 Campbell Drive  
Menomonee Falls, WI 53051

The undersigned hereby declares on behalf of Magnetek, that the above-referenced product, to which this declaration relates, is in conformity with the provisions of the following directives:

- CE Mark Directive (93/68/EEC)
- Machinery Safety Directive (2006/42/EC)
- Radio Equipment Directive (2014/53/EU)
- EMC Directive (2014/30/EU)
- ROHS2 Directive (2011/65/EU)
- General Product Safety (2001/95/EC)

### **The standards relevant for the evaluation of the product referenced above conformity to the directive requirements are as follows:**

EN 301 489-1 V2.2.1  
EN 301 489-3 V2.2.1  
EN 300 220-1 V2.4.1  
EN 300 220-2 V2.4.1  
EN 60950:2006+A1+A11+A12  
EN 60204-32:2008  
EN ISO 13849-1:2015 (PLd)  
EN 13557:2003+A2:2008  
EN 60529 (IP66)  
EN 62479  
EN 55032  
EN 55024

The Technical Construction File is maintained at:

Columbus McKinnon Corporation  
13830 Ballantyne Corporate Place  
Suite 300  
Charlotte, NC 28277 USA

The European contact for technical documentation is:

Ian Knight  
STAHL CraneSystems, Ltd.  
Unit 2 Forge Mills Park  
Station Road  
Coleshill  
Warwickshire B46 1JH  
United Kingdom

Per Annex II.B of the Machinery Directive (2006/42/EC):

The machinery, product, assembly or sub-assembly covered by this Declaration of Conformity must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the applicable Directive(s). This statement is only necessary where the product is to be incorporated into a machine or system (e.g. a safety component).

### **Signature of Authorized Person:**

Benjamin J. Stoller  
Global Product Manager - Controls  
Columbus McKinnon Corporation  
Date of Issuance: 10 August 2020



Flex Wave CE System  
Radio Control Equipment Operator Manual  
December 2020