Flex Duo System
Radio Control Equipment
Technical Manual

MAGNETEK

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PRODUCT SAFETY INFORMATION

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products, adjustable frequency drives, and industrial braking systems for numerous industries including overhead lifting and mobile hydraulics. 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 and national codes / laws, ordinances, standards and requirements such as OSHA and CE

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.

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1 Introduction

The Flex Duo radio remote control systems are designed for control of industrial equipment and machinery such as electric hoists, winches, monorails, conveyor belts, mining equipment, hydraulic valves controlled by electric solenoids and all other material handling equipment where wireless control is preferred.

Each Flex Duo system consists of a transmitter handset and a receiver unit. Other standard-equipped accessories include transmitter lanyard, vinyl pouch, pushbutton labels, output cable, and quick start guide.

This manual covers both FCC/IC and CE versions of the Flex Duo. All settings and functions listed within this manual are the same between the two versions except where noted inside specific sections where the two versions perform differently.

The list of notable features includes:

- **62 User-programmable Channels** – advanced synthesized radio frequency (RF) controls with 62 built-in programmable channels set via pushbuttons (transmitter) and dipswitches (receiver).
- **Wireless Remote Pairing Function** – system pairing and cloning can be done easily and wirelessly.
- **Over One Million Unique Address Codes** – each and every Flex Duo system has its own address code and serial number, never repeats.
- **Advanced Controls** – the Flex Duo system utilizes dual advanced microprocessor controls with 32-bit CRC and Hamming Code, which provide ultra fast, safe, precise, and error-free encoding and decoding.
- **Two-way Transmission** – transmitter and receiver communicate with one another for safe, precise and uninterrupted operation (for example, receiver status feedbacks).
- **Reliable Pushbuttons** – the pushbuttons are rated for more than one million press cycles.
- **Low Power Consumption** – requires only two “AA” alkaline batteries for more than 150 hours of uninterrupted operation between replacements.
- **Durable Nylon and Fiberglass Composite Enclosures** – high resistance to breakage and deformation even in the most abusive environments. The receiver enclosures and output cables are UL94-V0 rated.
- **Fully Sealed Enclosures** – the transmitter and receiver enclosures are IP66 rated.
- **Full Compliance** – all systems are compliant with FCC, IC and CE.
- **Other Optional Accessories and Features** – transmitter magnet mount, transmitter belt clip, transmitter waist belt, ring hook, transmitter rubber guards, charging station, external antenna kit, removable mounting bracket, 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

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

CAUTION

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

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, such as magnets, vacuum lifts, pumps, and emergency equipment. 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 mobile hydraulic 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 Equipment

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

Radio-controlled cranes, hoists, lifting devices and other mobile hydraulic 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 mobile hydraulic 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 machine 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 mobile hydraulic 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 mobile hydraulic equipment to support or transport people
- lift or carry any loads over people
- operate the crane, hoist or mobile hydraulic equipment unless all persons, including the operator, are and remain clear of the supported load and any potential pinch points
- operate a crane, hoist or lifting device when the device is not centered over the load
- operate a crane, hoist or lifting device if the chain or wire rope is not seated properly in the sprockets, drum or sheave
- operate any damaged or malfunctioning crane, hoist, lifting device or other material handling equipment
- change any settings or controls without authorization and proper training
- remove or obscure any warning or safety labels or tags

- leave any load unattended while lifted
- leave power on the radio-controlled equipment when the equipment is not in operation
- operate any material handling equipment using a damaged controller because the unit may be unsafe
- operate manual motions with other than manual power
- operate radio-controlled equipment when low battery indicator is on

WARNING

The operator should not attempt to repair any radio controller. If any product performance or safety concerns are observed, the equipment should immediately be taken out of service and be reported to the supervisor. Damaged and inoperable radio-controller equipment should be returned to arc for evaluation and repair. Failure to follow this warning could result in serious injury or death and damage to equipment.

2.5 Transmitter Unit

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

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

2.6 Pre-Operation Test

At the start of each work shift, or when a new operator takes control of the equipment, 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 machine stop function

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 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.

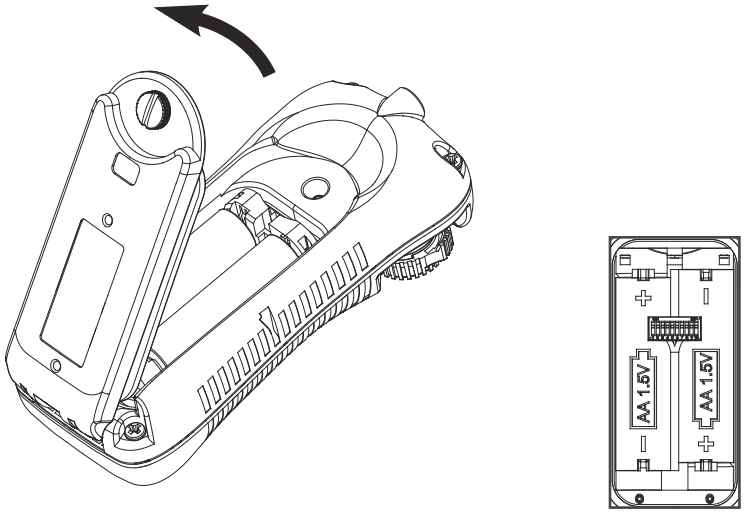


Figure 2-1

2.9 Battery Charger (Optional)

WARNING

Do not attempt to charge non-rechargeable battery packs in the charger.

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

Avoid charging partially discharged rechargeable batteries to help prolong battery life cycle.

Do not charge batteries in a hazardous environment.

Do not attempt to charge a damaged battery.

Do not attempt to use a battery that is leaking, swollen or corroded.

Do not short the charger.

The Flex Duo Charger does <u>not</u> come standard with Flex Duo systems or spare transmitters.

2.9.1 Charging Cradle Top View

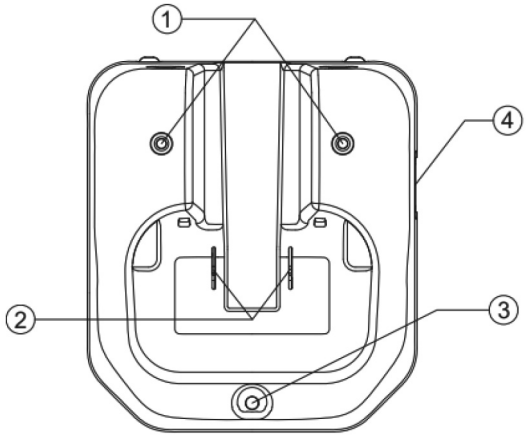


Figure 2-2

1. Rubber Safety Belt Attachment Slot
2. Charging Contacts
3. Charging Status LED
4. Power USB Input

2.9.2 Power Supply

The Flex Duo charging cradle uses any off-the-shelf Micro USB-to-USB cable and USB power adapter with 5V at 2A output (optional).

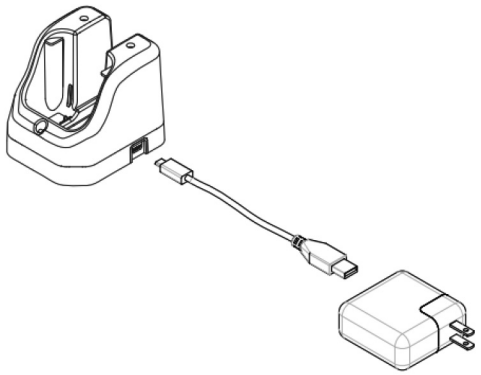


Figure 2-3

2.9.3 Charging

1. The Flex Duo transmitters are designed to accept any off-the-shelf Ni-MH rechargeable batteries.
2. Depending on the battery capacity the average charging time is approximately 1.5 hours from completely drained to fully charged.
3. Solid red on the LED represents charging in progress, solid green represents batteries fully charged, and LED off represents no batteries detected.

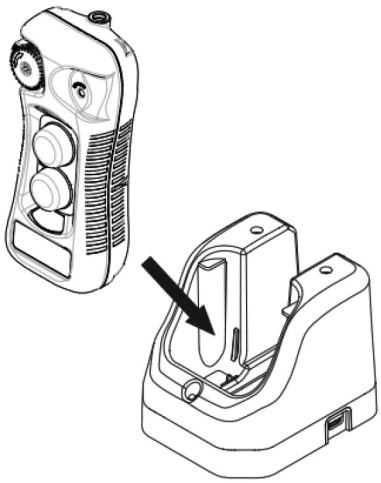


Figure 2-4

WARNING

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

2.9.4 Retaining Belt

For mobile applications, the retaining belt can be used to prevent the transmitter from becoming loose in the cradle or falling out when the equipment moves through rough terrain.

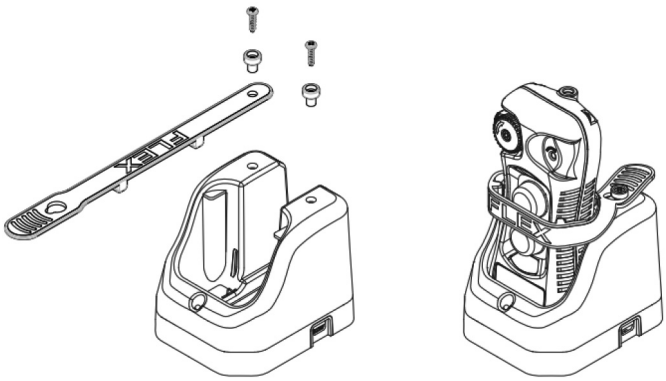


Figure 2-5

2.9.5 Wall Mounting the Charger

The Flex Duo charging cradle has two holes located in the back, vertical face of the unit. These holes allow the cradle to be mounted on a wall by sliding the cradle over the two screws and then sliding down to secure the cradle onto the screw heads.

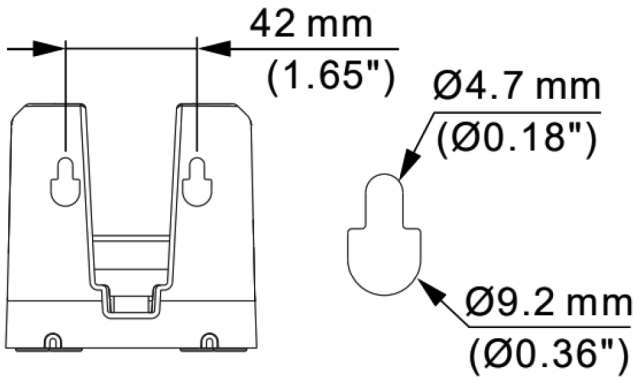


Figure 2-6

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. Transmitter is powered on when the STOP button is elevated.
2. After turning on the transmitter power, check the Status LED on the transmitter for any sign of system irregularities. ***See Section 6.1 on page 41.*** 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. Press and hold both PB1 and PB2 at the same time for 1 second to activate the receiver MAIN relays (Status LED solid green). When the receiver MAIN relays are activated, the Status LED will change from solid green to solid orange (system on). Then press any pushbutton on the transmitter to begin operation. Pressing any pushbutton prior to executing the START command at startup will result in no signals transmitted (Status LED blinks orange).

   NOTE: *If the Status LED does not change from green to orange, confirm that the serial number and channel match between the transmitter and receiver.*
4. In case of an emergency, press down the STOP button to disconnect the receiver MAIN relays and the transmitter power (Status LED blinks 3 reds and then shuts off). To resume operation after confirming safe conditions are present, rotate the STOP button clockwise or counterclockwise; the button will pop up. Then press and hold both PB1 and PB2 pushbuttons at the same time for 1 second to reconnect the receiver MAIN relays.
5. After 5 minutes of inactivity (pushbutton not pressed) the receiver MAIN relays are temporarily disconnected. ***See Section 4.1.5 on page 27.*** The Status LED blinks 3 reds and then shuts off. Press and hold both PB1 and PB2 to resume operation. ***See Section 4.1.6.2 on page 28.***
6. Turn off the transmitter power by pressing down the STOP button. It will disconnect the transmitter power and the receiver MAIN relays altogether (Status LED blinks 3 reds and then shuts off).

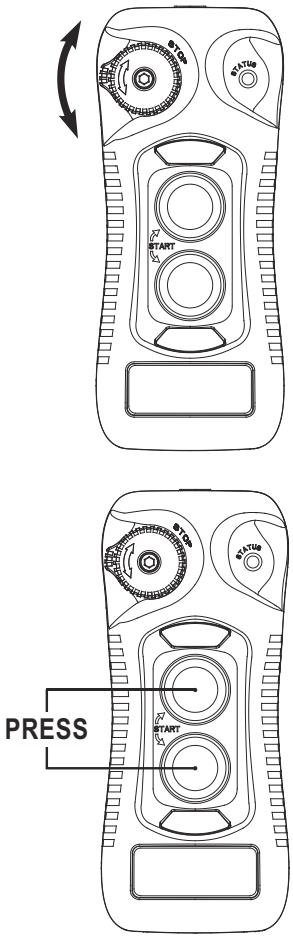


Figure 3-1

3.2 Transmitter

3.2.1 External Illustration

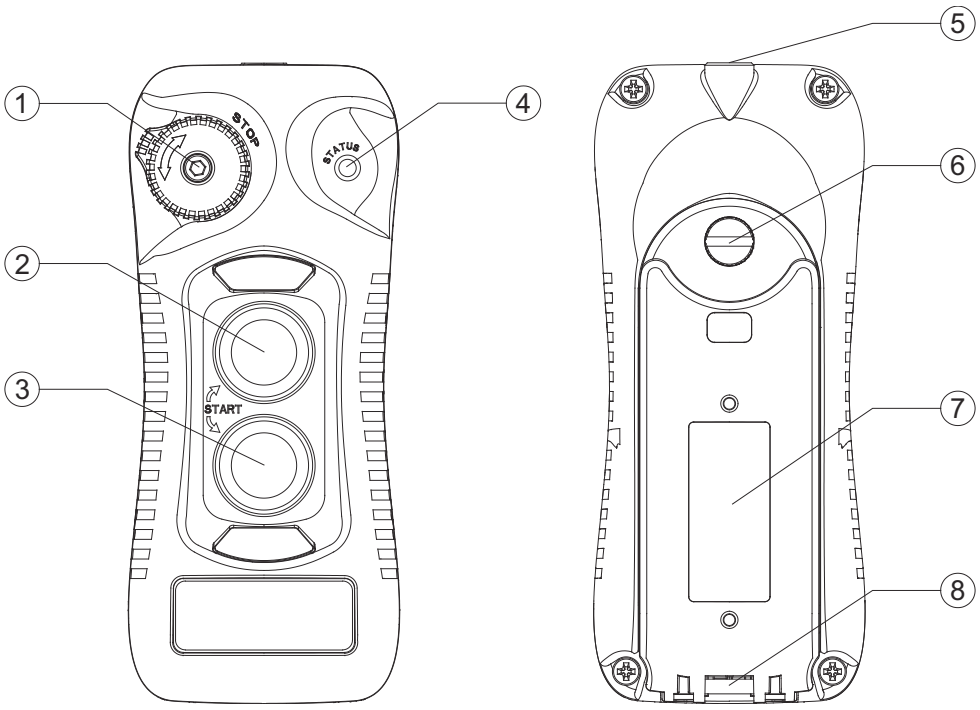


Figure 3-2

1. STOP Button
2. Pushbutton 1 (PB1)
3. Pushbutton 2 (PB2)
4. Status LED Indicator
5. Ring Hook Attachment Slot
6. Battery Cover Screw
7. System Information
8. Lanyard and Waist Belt Attachment Slot

3.2.2 Internal Illustration

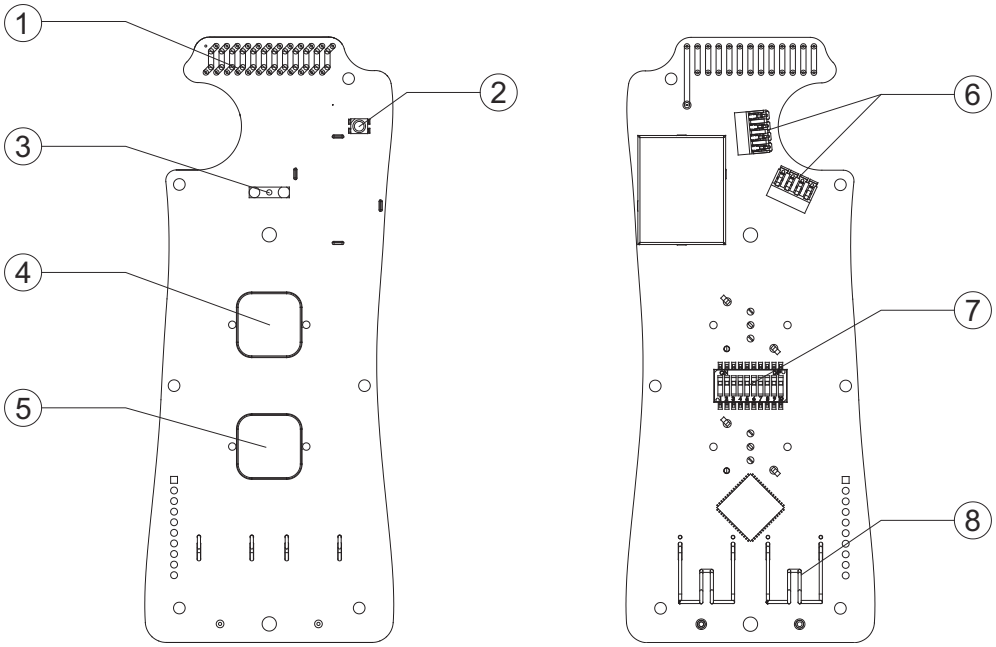


Figure 3-3

1. RF/Encoder Board
2. Status LED Indicator
3. Infrared Sensors
4. Pushbutton 1 (PB1)
5. Pushbutton 2 (PB2)
6. STOP Button Contacts
7. Function Dipswitch
8. Battery Contacts

3.3 Receiver

3.3.1 External Illustration

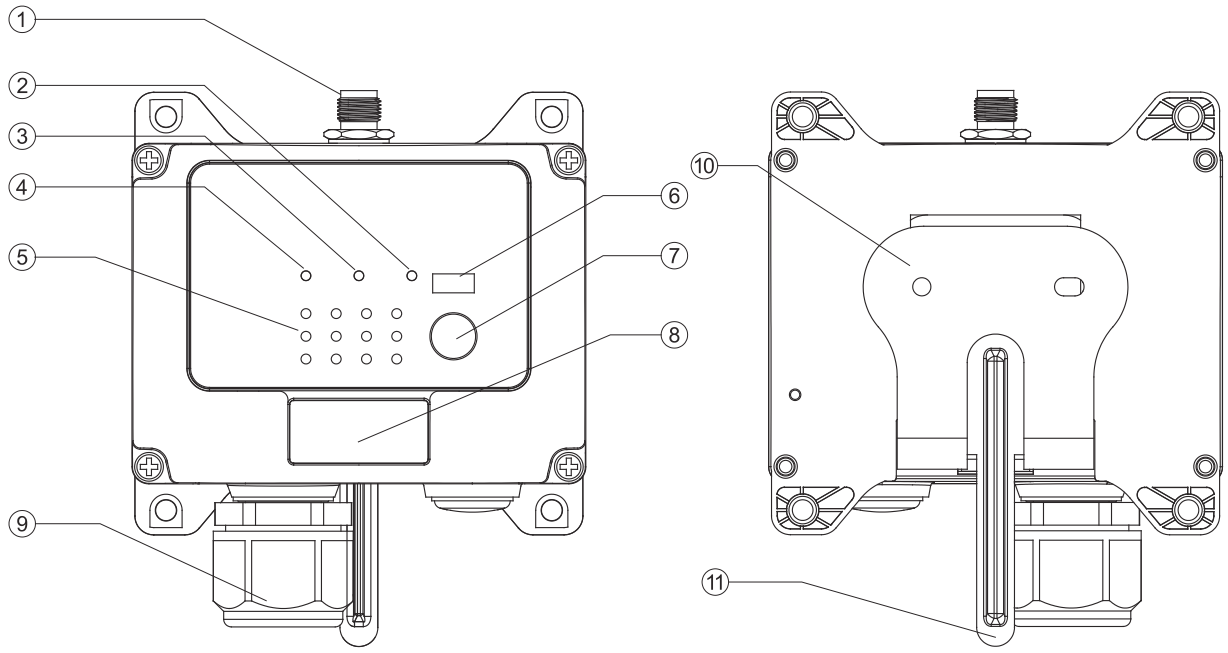


Figure 3-4

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

3.3.2 Internal Illustration

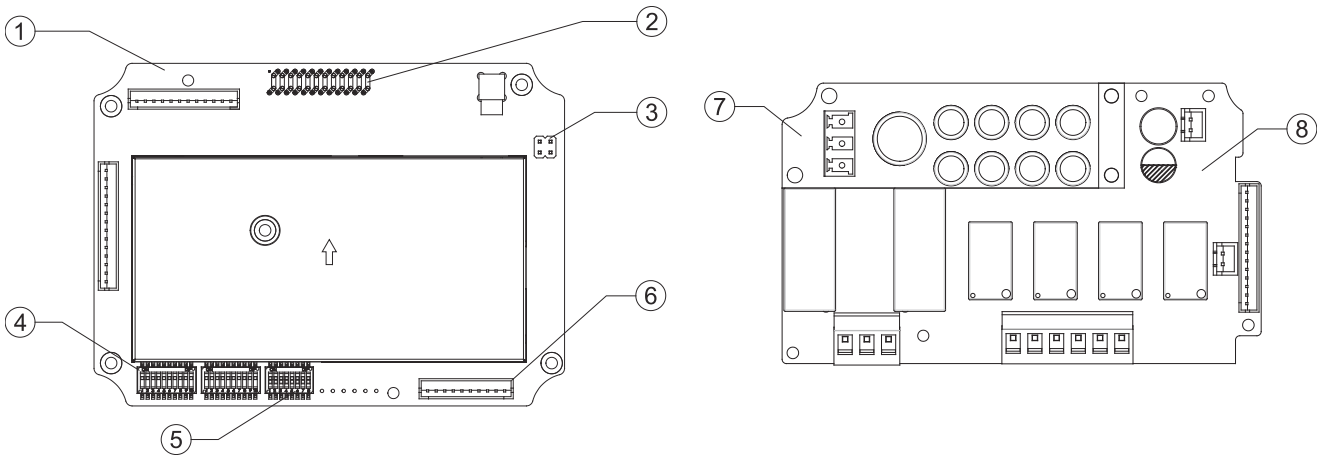
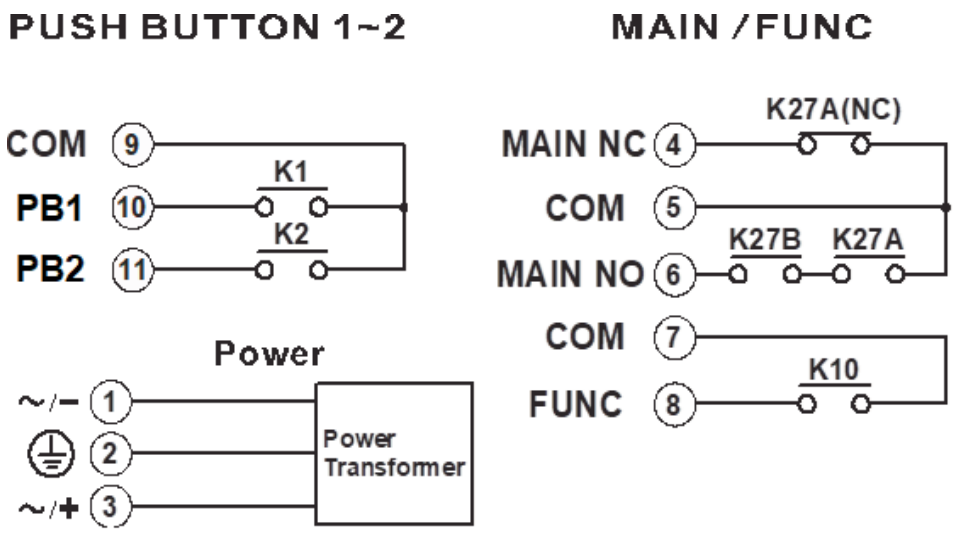


Figure 3-5

1. RF/Decoder Board
2. Internal Antenna
3. INT/EXT Antenna Jumpers
4. Function Dipswitches
5. Channel Dipswitch
6. Programming Port
7. Power Transformer
8. Relay Board

3.3.3 Output Relay Contact Diagrams

Single-speed model



Dual-speed model

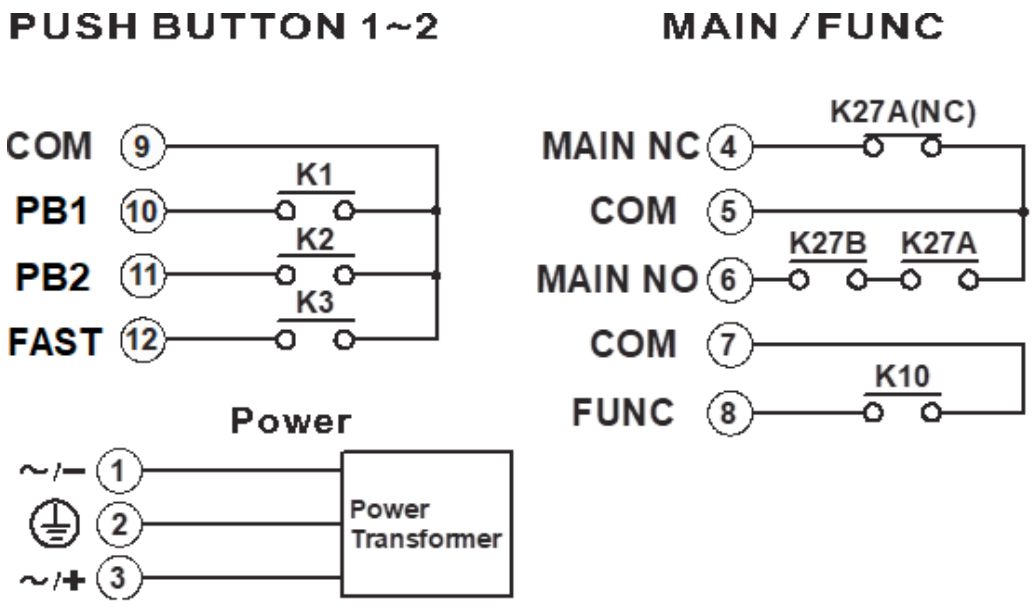


Figure 3-6

- The default operation of the Flex Duo system will have the two pushbuttons configured as a pair to perform as an interlocked motion control with the corresponding output relays setup for momentary contact closure.
- For 9-36VDC power supply, wire #1 corresponds to the negative charge (-), wire #3 corresponds to the positive charge (+), and wire #2 is for GROUND.
- The circled numbers in the output diagrams above correspond to the wire numbers in the harness.
- Suppressors are recommended on contactor, capacitive loads or inductive loads being driven by Flex relays due to the possibility of voltage spikes.

4 Function Settings

The Flex Duo system comes configured with standard settings out of the box. The following sections describe how to change or set up additional settings in the system, with the default settings being highlighted in gray.

4.1 Transmitter Settings

4.1.1 Transmitter Firmware Version

This section covers how to check the transmitter firmware version, which is mainly used for troubleshooting purposes.

1. Press down the STOP button (transmitter power off).
2. Set dipswitch position #7 to “0” (down) and #8 to “1” (up).
3. Reset the STOP button by rotating it clockwise or counterclockwise; it will pop up (transmitter power on).
4. The Status LED displays firmware version with red, green and orange blinks.
5. There are 4 numbers in the firmware sequence (red, green, orange then green).
6. The first 3 numbers are the firmware version and the 4th number indicate the system type. Example: 1 red flash, 3 green flashes, 4 orange flashes and 1 green flash is firmware 1.3.4.1.
7. Exit Firmware Version mode by resetting the dipswitch position #7 and #8 back to “00” (both down) and then press down the STOP button (transmitter power off).

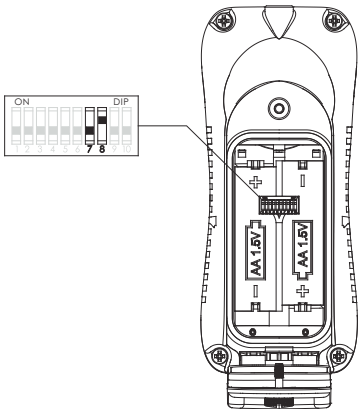


Figure 4-1

4.1.2 Transmitter Channel Settings

In a Flex Duo system, the transmitter channel setting is set to match the receiver it is shipped with. In the case where a different channel is desired, follow the steps below to change the channel in the transmitter. When changing the channel of the system the receiver channel will need to be updated to match. ***See Section 4.2.1 on page 30*** through ***Section 4.2.3 on page 31*** for information on how to change the receiver channel.

NOTE: *Both channel and serial number must match for a transmitter and receiver to pair.*

1. Press down the STOP button (transmitter power off).
2. Press and hold PB1 and PB2 at the same time.
3. Reset the STOP button by rotating it clockwise or counterclockwise; it will pop up (transmitter power on).
4. Release PB1 and PB2 at the same time. The Status LED displays current channel setting with red and green blinks. A green blink represents the tens (+10) and a red blink represents the units (+1). For example, 1 green blink followed by 5 red blinks is channel 15.
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 for channel 24 (Status LED blinks 2 greens and 4 reds). Make sure the newly selected channel is shown on the Status LED before proceeding to the next step below. **Skip step 6 if changing receiver channel is not required.**

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

6. Transfer the newly selected channel to the receiver by pressing and holding both PB1 and PB2 at the same time until the Status LED turns to solid green (transfer complete).

7. Press down the STOP button if solid green is not shown on the Status LED after more than 10 seconds (transfer incomplete); the transmitter will revert to its previous channel setting. Make sure the receiver is powered on and within the operating distance during the entire process.
8. Exit Channel Setting mode by pressing down the STOP button (transmitter power off).

Important Note:

Step 6 described above is required if you are intending to change the entire system channel (both transmitter and receiver). If step 6 is skipped the system will no longer work 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

The Flex Duo systems come fully set up out of the box. However, if a spare transmitter is to be paired with an existing receiver, choose one of the pairing methods below to quickly and easily pair a new transmitter. Note that the remote pairing will change the serial number and channel to match whatever is being paired. In this case, the serial number on the label will no longer be accurate.

NOTE: *Both channel and serial number must match for a transmitter and receiver to pair.*

NOTE: *The Flex Duo transmitters are not compatible with Flex EX, Flex EM, Flex Mini, or the Flex EX2 receivers.*

A. Transmitter-to-Transmitter Pairing:

1. Press down the STOP button on both transmitters (transmitter power off).
2. On both transmitters, set dipswitch position #7 to “0” (down) and #8 to “1” (up).
3. Reset the STOP buttons by rotating them clockwise or counterclockwise; they will pop up (transmitter power on).
4. The Status LED will display the firmware version with red, green and orange blinks.
5. On the original transmitter, output pairing data by pressing and holding PB2 (Status LED off).
6. On the new transmitter, receive pairing data by pressing and holding PB1 (Status LED blinks green).

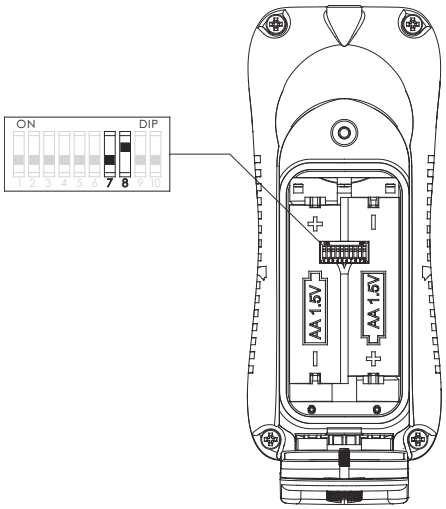
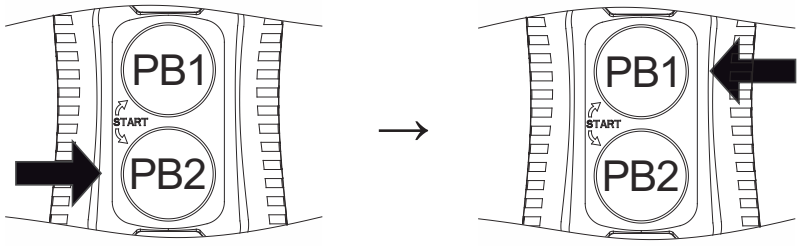


Figure 4-2



Output data – original transmitter
(press and hold PB2)

Receive data – new transmitter
(press and hold PB1)

Figure 4-3

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

7. When the Status LED on the new transmitter turns to solid green (while the pushbuttons are still being pressed down on both transmitters), then the pairing is completed.
8. Release PB2 on original transmitter and PB1 on new transmitter.
9. Exit Remote Pairing mode on both transmitters by resetting dipswitch position #7 and #8 back to “00” (both down).
10. Press down the STOP buttons (transmitter power off).

B. Receiver-to-Transmitter Pairing (Option 1)

With this method, the use of the remote pairing button on the receiver is required. ***See Section 3.3.1 on page 19*** for the location of the pairing button on the receiver.

1. Press down the STOP button on the transmitter (transmitter power off).
2. On the transmitter, set dipswitch position #7 to “1” (up) and #8 to “0” (down).

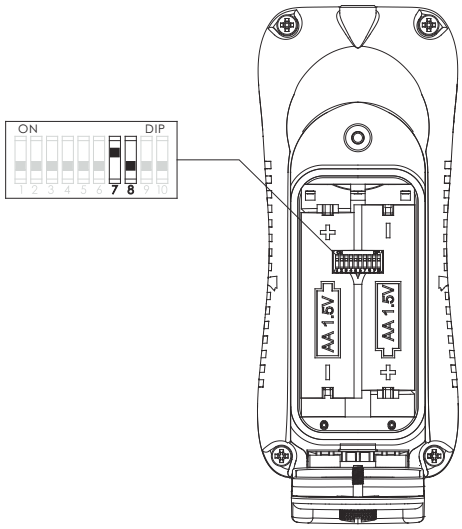
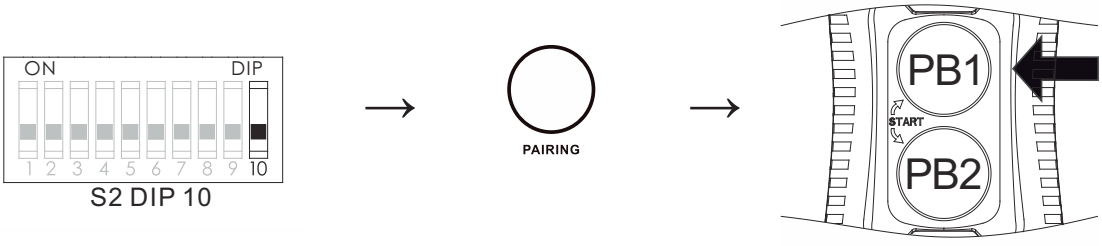


Figure 4-4

3. Reset the STOP button by rotating it clockwise or counterclockwise; it will pop up (transmitter power on).
4. The Status LED displays firmware version with red, green and orange blinks.
5. In the receiver, dipswitch S2 position #10 is set to “0” (down). This is the factory default setting and only requires changing if it has been altered from the default setting.
6. The MAIN relays in the receiver must be deactivated (open) for this pairing to work.
7. Output data from the receiver by pressing and holding the PAIRING button on receiver.
8. Receive data in the transmitter by pressing and holding PB1 on the transmitter (Status LED blinks green).
9. When the transmitter Status LED turns to solid green (while the receiver pairing button and transmitter PB1 are still being pressed down) the pairing is completed.
10. Exit Remote Pairing mode by resetting the transmitter dipswitch position #7 and #8 back to “00” (both down).
11. Press down the STOP button (transmitter power off).



S2 dipswitch position 10 set to “0” in the receiver

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

Receiving data – transmitter (press and hold PB1)

Figure 4-5

C. Receiver-to-Transmitter Pairing (Option 2)

With this method, the use of the remote pairing button on the receiver is **not** required.

Important Note:

This feature makes pairing transmitters to receivers very easy without the need to access the pairing button on the receiver to complete the pairing. This option should only be used in well-monitored operations to prevent pairing a transmitting with an unintended receiver, resulting in a potentially unsafe condition.

1. Press down the STOP button on the transmitter (transmitter power off).
2. On the transmitter, set dipswitch position #7 to “1” (up) and #8 to “0” (down).
3. Reset the STOP button by rotating it clockwise or counterclockwise; it will pop up (transmitter power on).
4. The Status LED displays firmware version with red, green and orange blinks.
5. In the receiver, set S2 dipswitch position #10 to “1” (up). This is not the factory default setting and will require the switch to be changed.
6. The MAIN relays in the receiver must be deactivated (open) for this pairing to work.
7. Receive data in the transmitter by pressing and holding PB1 (Status LED blinks) until the Status LED turns to solid green, then the pairing is completed.
8. Exit Remote Pairing mode by resetting the transmitter dipswitch position #7 and #8 back to “00” (both down).
9. Press down the STOP button (transmitter power off).

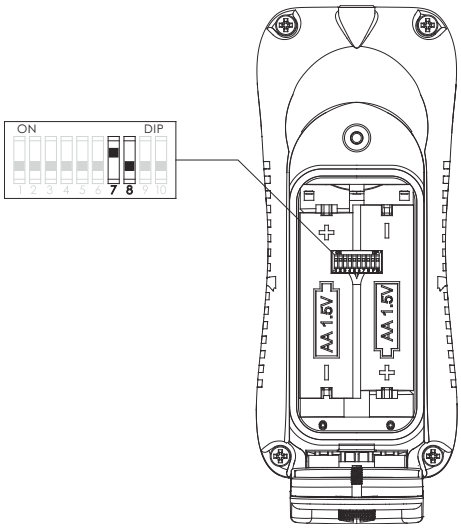
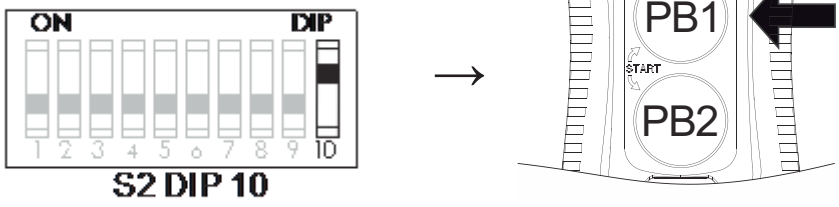


Figure 4-6



S2 dipswitch position 10 set to “1” in the receiver

Receiving data – transmitter (press and hold PB1)

Figure 4-7

Important Note:

Make sure the pairing process is executed with less than 10 meters between the transmitter and the intended receiver while no other active receivers are nearby. If there are other active receivers in the area with S2 dip 10 set to “1”, then pairing issues could occur, resulting in the transmitter pairing with an unintended receiver.

D. Transmitter-to-Receiver Pairing:

With this method, the use of the remote pairing button on the receiver is required. ***See Section 3.3.1 on page 19*** for the location of the pairing button on the receiver.

1. Press down the STOP button on the transmitter (transmitter power off).
2. On the transmitter set dipswitch position #7 to “1” (up) and #8 to “0” (down).
3. Reset the STOP button by rotating it clockwise or counterclockwise; it will pop up (transmitter power on).
4. The Status LED displays firmware version with red, green and orange blinks.
5. Output data by pressing and holding PB2 on the transmitter (Status LED off).
6. Receive data by pressing and holding the PAIRING button on receiver.
7. The MAIN relays in the receiver must be deactivated (open) for this pairing to work.
8. When the transmitter Status LED turns to solid green (while transmitter PB1 and receiver pairing button are still being pressed down) the pairing is completed.
9. Exit Remote Pairing mode by resetting the transmitter dipswitch position #7 and #8 back to “00” (both down) and press down the STOP button (transmitter power off).

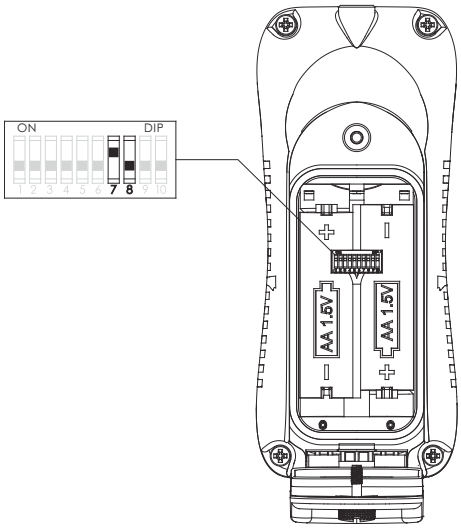


Figure 4-8

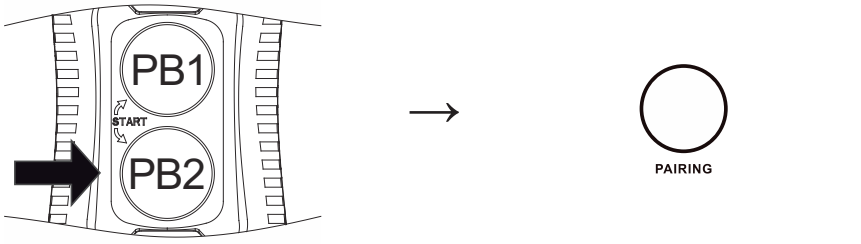


Figure 4-9

4.1.4 Transmitter Output Power Settings

A. FCC/IC Transmitters

The transmitter is set to 1mW by default as that is the maximum allowed due to FCC regulations. If an output power less of than 1mW is required, please refer to the Flex IR Programmer manual or contact Magnetek field service.

	Dipswitch Settings	Output Power
1	**000**xxxxxxx	1mW

B. CE Transmitters

The transmitter is set to 2mW for CE compliance. If an output power less than 2mW is required, refer to the Flex IR Programmer manual or contact Magnetek field service.

	Dipswitch Settings	Output Power
2	**001**xxxxxxx	2mW

4.1.5 Transmitter Inactivity Timer Settings

After 5 minutes (default) of the transmitter pushbuttons not being pressed, the system will enter a sleep mode and the receiver MAIN relays will be deactivated.

	Dipswitch Settings	Time		Dipswitch Settings	Time
1	xxx**000**xxxx	1 minute	**5**	xxx**100**xxxx	10 minutes
2	xxx**001**xxxx	20 seconds	**6**	xxx**101**xxxx	30 minutes
3	xxx**010**xxxx	3 minutes	**7**	xxx**110**xxxx	60 minutes
4	xxx**011**xxxx	5 minutes	**8**	xxx**111**xxxx	Constant On (sleep mode disabled)

4.1.6 Transmitter Start Function Settings

4.1.6.1 During Initial Transmitter Power On

When transmitter is powered on (Stop button elevated), press both PB1 and PB2 at the same time (default) or press any pushbutton to activate the receiver (MAIN relays closed).

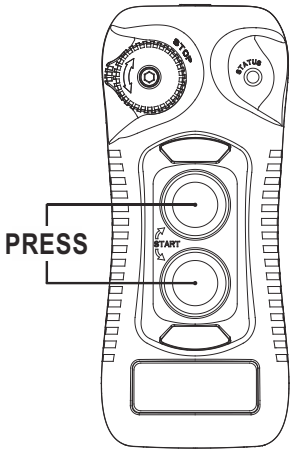


Figure 4-10

	Dipswitch Settings	Function
1	xxxxxxxx**0**x	PB1 + PB2 Activation
2	xxxxxxxx**1**x	Any Pushbutton Activation

NOTE: *When set to Any Pushbutton Activation, the system startup time is 3 seconds after transmitter power on (Stop button elevated). Pressing any pushbutton for less than 3 seconds will not start the system.*

4.1.6.2 During Sleep Mode

When the transmitter enters sleep mode the system is temporarily deactivated (MAIN relays opened). Press both PB1 and PB2 at the same time (default) or press any pushbutton to wake up the system (MAIN relays closed).

	Dipswitch Settings	Function
1	xxxxxxxxx**0**	PB1 + PB2 Reactivation
2	xxxxxxxxx**1**	Any Pushbutton Reactivation

4.1.7 Infrared Programming

Other custom functions and settings not listed in this manual can be programmed via the Flex IR programmer unit. Refer to the Flex IR Programmer manual or contact Magnetek field service for more information.

The infrared programmer needs to have firmware V176 or newer to support the Flex Duo.

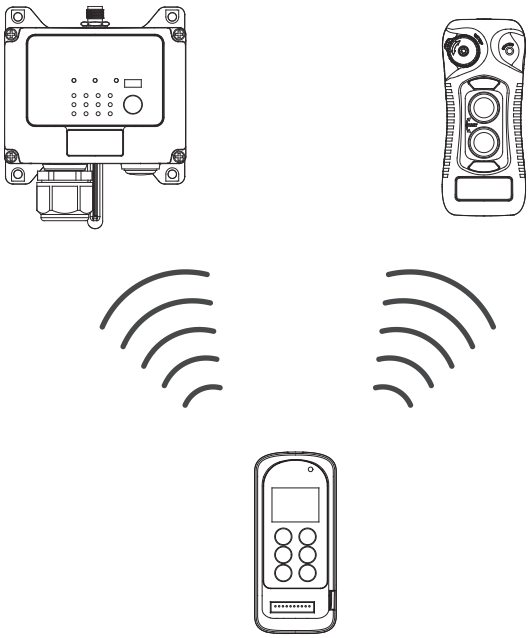


Figure 4-11

4.2 Receiver

4.2.1 Receiver Channel Settings

Set the receiver channel by configuring the S3 channel dipswitch located on the RF/decoder board. Only the first 6 dip positions are used for channel programming. The system channels table in ***Section 4.2.3 on page 31*** illustrates which dipswitch setting corresponds to which channel. Once the receiver channel is altered, make sure to change the transmitter channel as well. The channel (and serial number) on both transmitter and receiver must be identical for the system to communicate. ***See Section 4.1.2 on page 22*** for transmitter channel settings.

NOTE: *Transmitter-to-receiver remote pairing (**Section 4.1.3 on page 23**) will override the channel dipswitch setting in the receiver.*

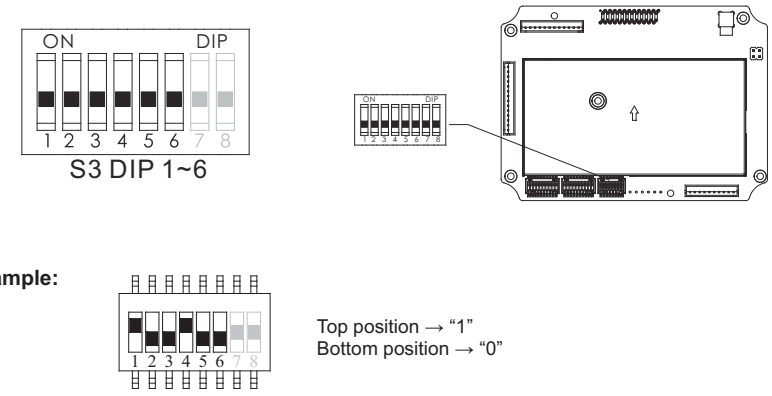


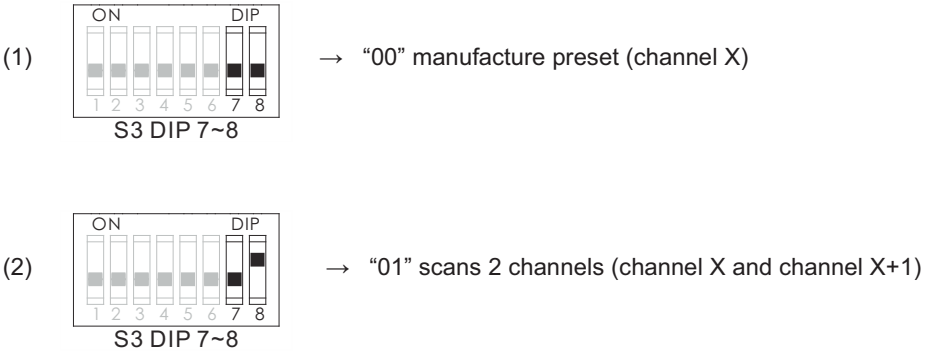
Figure 4-12

*The above dipswitch setting "1 0 0 1 0 0" corresponds to "channel 36" in the system channels table in **Section 4.2.3 on page 31**.*

4.2.2 Receiver Channel Scanning Function

By default, the Flex Duo receiver will not have channel scanning enabled, but rather be set to a single channel. However, the receiver can be set up to scan multiple channels in cases when it is needed for one transmitter to lock out the other transmitter during operation. To do this, set the second transmitter channel to be one higher than the first transmitter channel (***Section 4.1.2 on page 22***), then see below on how to set the channel scanning function to scan 2 channels.

NOTE: *Once one transmitter takes control of the receiver, the other transmitters will be locked out until the active transmitter is powered off or inactivity timer is reached.*



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

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

4.2.3 System Channels Table

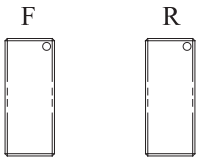
Channel	Receiver Dipswitch Setting	Frequency	Channel	Receiver Dipswitch Setting	Frequency
01	000001	433.050MHz	**32**	100000	433.825MHz
02	000010	433.075MHz	**33**	100001	433.850MHz
03	000011	433.100MHz	**34**	100010	433.875MHz
04	000100	433.125MHz	**35**	100011	433.900MHz
05	000101	433.150MHz	**36**	100100	433.925MHz
06	000110	433.175MHz	**37**	100101	433.950MHz
07	000111	433.200MHz	**38**	100110	433.975MHz
08	001000	433.225MHz	**39**	100111	434.000MHz
09	001001	433.250MHz	**40**	101000	434.025MHz
10	001010	433.275MHz	**41**	101001	434.050MHz
11	001011	433.300MHz	**42**	101010	434.075MHz
12	001100	433.325MHz	**43**	101011	434.100MHz
13	001101	433.350MHz	**44**	101100	434.125MHz
14	001110	433.375MHz	**45**	101101	434.150MHz
15	001111	433.400MHz	**46**	101110	434.175MHz
16	010000	433.425MHz	**47**	101111	434.200MHz
17	010001	433.450MHz	**48**	110000	434.225MHz
18	010010	433.475MHz	**49**	110001	434.250MHz
19	010011	433.500MHz	**50**	110010	434.275MHz
20	010100	433.525MHz	**51**	110011	434.300MHz
21	010101	433.550MHz	**52**	110100	434.325MHz
22	010110	433.575MHz	**53**	110101	434.350MHz
23	010111	433.600MHz	**54**	110110	434.375MHz
24	011000	433.625MHz	**55**	110111	434.400MHz
25	011001	433.650MHz	**56**	111000	434.425MHz
26	011010	433.675MHz	**57**	111001	434.450MHz
27	011011	433.700MHz	**58**	111010	434.475MHz
28	011100	433.725MHz	**59**	111011	434.500MHz
29	011101	433.750MHz	**60**	111100	434.525MHz
30	011110	433.775MHz	**61**	111101	434.550MHz
31	011111	433.800MHz	**62**	111110	434.575MHz

4.2.4 Output Relay Configurations

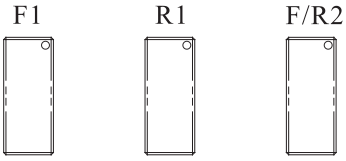
4.2.4.1 Output Relay Types

The output relay functions described below and on the next page pertain to the settings discussed in ***Section 4.2.5.1 on page 34*** as well as ***Section 4.2.5.2 on page 35***.

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

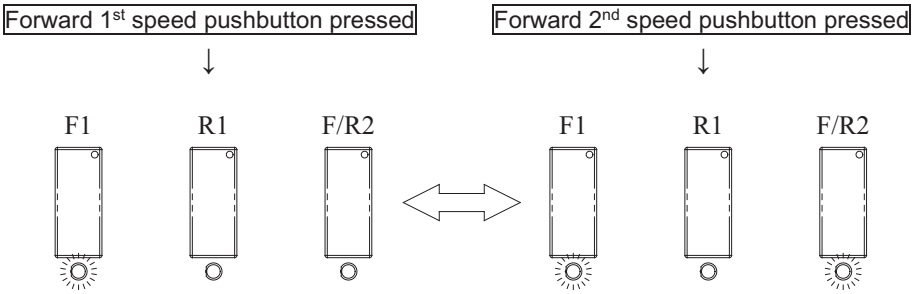


2. **3 output relays per motion with shared 2nd-speed output relay**
   Output relays with Forward 1st speed (F1), Reverse 1st speed (R1) and Forward/Reverse 2nd speed (F/R2). Forward and Reverse 2nd speed (F/R2) share the same output relay.



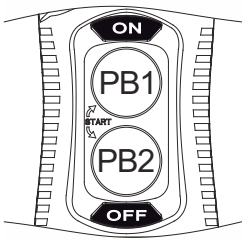
4.2.4.2 Output Relay Actions at 2nd Speed

1. **3 output relays configuration with Closed/Closed contact at 2nd speed**
   F1 (or R1) output relay closed at 1st speed and F1 + F/R2 (or R1 + F/R2) output relays closed at 2nd speed. ***See Table 4.2.5.1 on page 34*** on how to set to this function.



4.2.4.3 ON/OFF Pushbutton Function

The user can set any of the two pushbuttons on the transmitter to behave like a mechanical ON and OFF rocker or toggle switch. The ON output relay closes when ON pushbutton is pressed (OFF output relay opens) and OFF output relay closes when OFF pushbutton is pressed (ON output relay opens). ***See Table 4.2.5.1 on page 34*** on how to set to this function.



4.2.4.4 Brake Function (dual-speed systems only)

When the transmitter pushbutton is released from 2nd speed up to 1st speed, both 1st and 2nd speed output relays will open for up to 1 second and then with 1st speed output relay closed thereafter. ***See Section 4.2.5.1 on page 34*** for how to set to this function.

4.2.4.5 External Warning Device

The user can install an external warning device (rotating lights, horn, etc.) to the K10 Function output relay of the receiver. There are several settings for how this relay operates and are shown in ***Section 4.2.7 on page 36***.

4.2.4.6 Momentary Contact

When pushbutton is released, the corresponding output relay will open or deactivate. This type of relay action usually applies to external applications such as a horn or buzzer. ***See Section 4.2.5.2 on page 35*** on how to set to this function.

4.2.4.7 Toggled Contact

When pushbutton is released, the corresponding output relay will remain closed until next time the user presses the same pushbutton again which will open the relay contacts. This type of relay action usually applies to external application such as lights. ***See Section 4.2.5.2 on page 35*** for the settings that operate this relay.

4.2.5 Dipswitch Settings

4.2.5.1 Interlocked Pushbutton Pair

Interlocked means that when both buttons are pressed at the same time no relay outputs will be commanded. Pressing both buttons simultaneously will cancel each other out. Interlocked setting usually applies to electric motor's forward and reverse motion and On and Off switches.

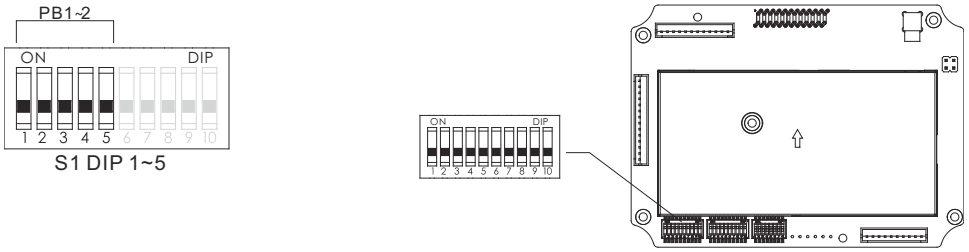


Figure 4-13

NOTE: *Five dip positions correspond to a pushbutton pair.*

Dip Settings	Function
00000	Single-speed only (default setting for Single Speed Systems)
00001	3 output relays Closed/Closed relay action at 2nd speed (default setting for Two-Speed Systems)
00010	On (PB1) & Off (PB2)
00100	On (PB1) & Off (PB2) with EMS (EMS → all relays deactivate when STOP button is pressed)
00110	FWD (PB1) / REV (PB2) toggled
00111	FWD (PB1) / REV (PB2) toggled (EMS → all relays deactivate when STOP button is pressed)
01000	Single speed + External warning*
01001	3 output relays Closed/Closed relay action + External warning*
01010	3 output relays Closed/Closed relay action + Brake
01011	3 output relays Closed/Closed relay action + Brake + External warning*

** External warning function requires installing an external warning device to the K10 Function output relay.*

4.2.5.2 Non-Interlocked Pushbutton Pair

Non-interlocked means that when both buttons are pressed at the same the time, the receiver will respond to each button press by commanding relays as configured. Pressing both buttons at the same will not cancel each other out. It usually applies to equipment's auxiliary functions such as lights, horn, or buzzer.

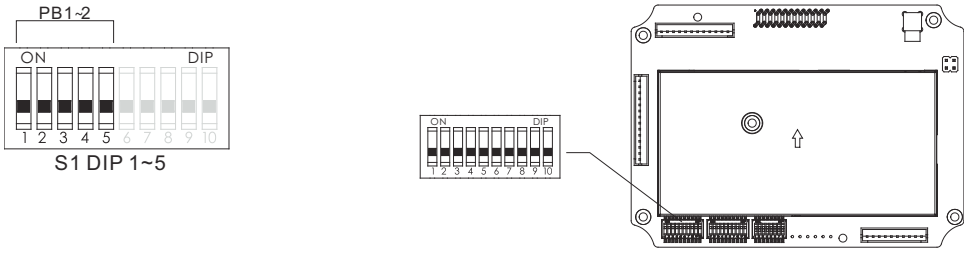


Figure 4-14

NOTE: *Five dip positions correspond to a pushbutton pair.*

Dip Settings	Bottom Pushbutton (PB2)	Top Pushbutton (PB1)
10000	Momentary	Momentary
10001	Momentary	Toggle
10010	Momentary	Toggle (EMS)
10100	Toggle	Momentary
10101	Toggle	Toggle
10110	Toggle	Toggle (EMS)
11000	Toggle (EMS)	Momentary
11001	Toggle (EMS)	Toggle
11010	Toggle (EMS)	Toggle (EMS)

* *EMS → all relays deactivate when STOP button is pressed*

4.2.6 Other Dipswitch Settings

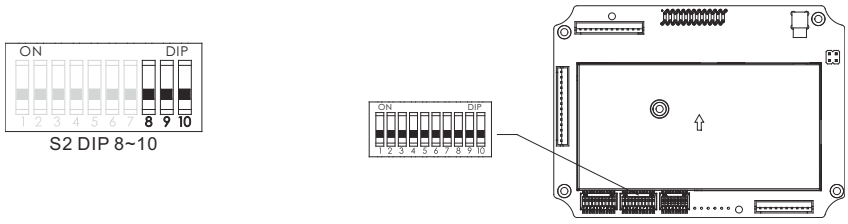


Figure 4-15

S2 Dip Position 8	Function
Dip set to “1” or up	Display system firmware version - There are 4 numbers in the firmware sequence (red, green, orange then green) - The first 3 numbers are the firmware version and the 4th number indicate the system type. Example: 1 red flash, 3 green flashes, 4 orange flashes and 1 green flash is firmware 1.3.4.1.
S2 Dip Position 9	**Function**
Dip set to “1” or up	System testing (receiver MAIN relays disabled)
S2 Dip Position 10	**Function**
Dip set to “0” or down	Receiver-to-transmitter remote pairing (pressing the Pairing button required)
Dip set to 1” or up	Receiver-to-transmitter remote pairing (pressing the Pairing button not required)

4.2.7 Other Function Output Relay Settings

Listed below are other types of functions that can be outputted through the K10 Function output via the Flex IR programmer unit. Refer to the Flex IR programmer manual or contact Magnetek field service for more details. EXT is the default setting.

EXT:	Function relay closes when START command is initiated and opens when the START commands stops.
LV:	Function relay closes when receiver voltage is low.
ID:	Function relay works simultaneously with all motion commands.
S/P:	Function relay closes when START command is initiated and opens only when transmitter power is turned off.
HORN:	Function relay closes for up to 3 seconds when START command is initiated during transmitter startup.
RESET:	Function relay closes when START command is initiated and opens when let go. Works during initial transmitter startup and inactivity timer START reset.

4.2.8 Warning Device Installation

The warning device can be easily fitted onto the receiver enclosure. The K10 relay output to the warning device can be configured to operate in several manners as described in ***Section 4.2.4.5 on page 33*** and ***Section 4.2.7 on page 36***. The warning device is connected to the CN5 port located inside the receiver.

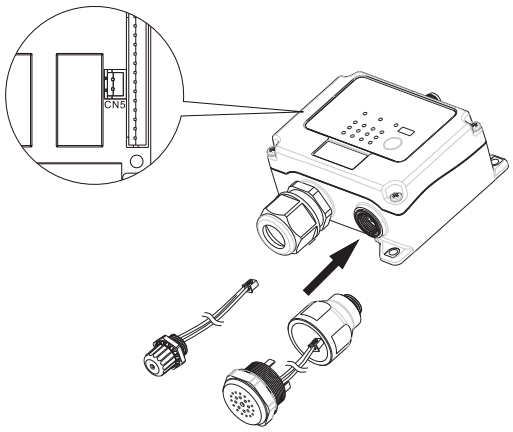


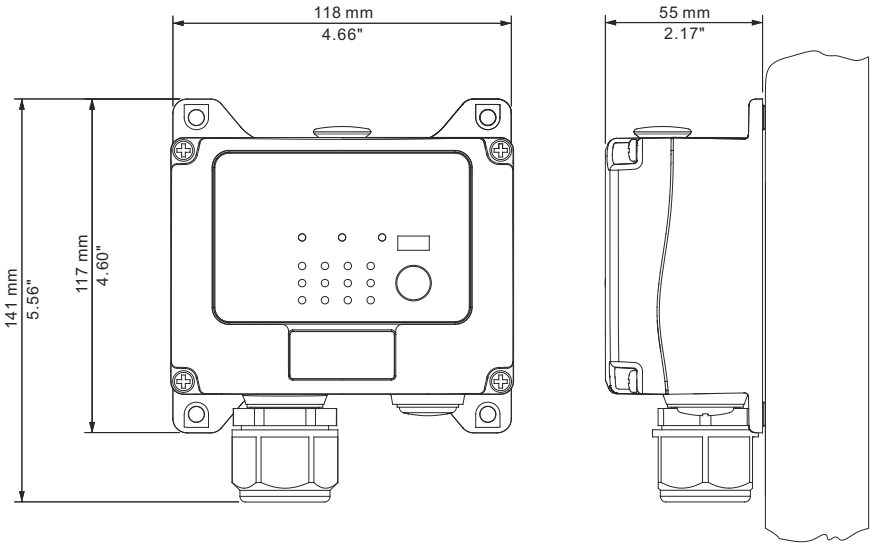
Figure 4-16

5 Receiver Installation

5.1 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. Having each system set to a different channel than other receivers in the area prevents systems from interfering with each other.
3. Make sure the hoist or equipment is working properly prior to installation.
4. Make sure the power source to the receiver matches the receiver's settings.
5. Switch off the main power source to the hoist or equipment prior to installation.

5.2 Receiver Mounting



With Optional Removable Mounting Bracket

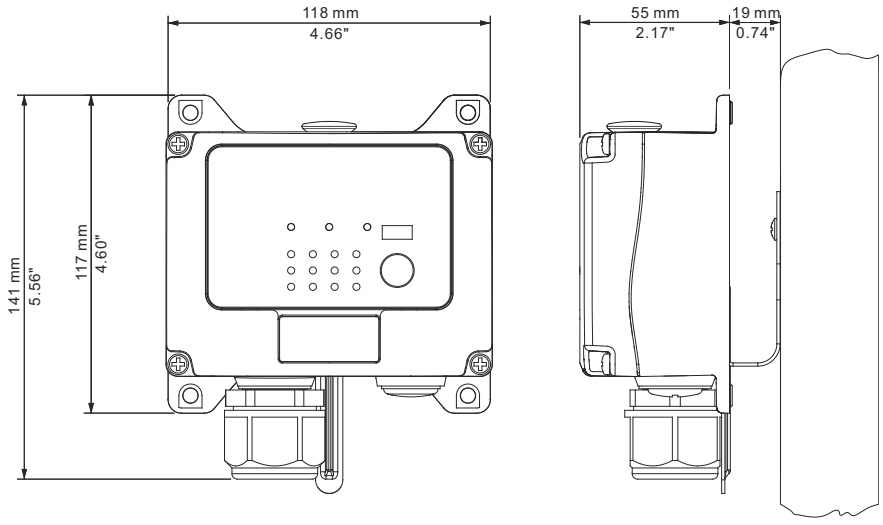
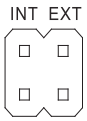


Figure 5-1

1. For best reception, the location of the receiver should be visible to the transmitter at all times with a clear line of sight.
2. The location selected should not be exposed to high levels of electric noise. Mounting the receiver next to an unshielded variable frequency drive or an electromagnetic interference / radio-frequency interference (EMI / RFI) generator may cause radio interference. Always locate the receiver as far away from variable frequency drives, electric motors, and EMI / RFI generators as possible.
3. Ensure the selected location has adequate space to accommodate the receiver and pigtail. If an external antenna is required, always locate the receiver where the antenna is free from any obstacles to avoid the possibility of antenna damage.
4. The Flex Duo receiver will be set to internal antenna by default. When installing an external antenna, make sure the MCX antenna jack located on the RF/decoder board inside the receiver is connected and the jumper is set to the “EXT” position.



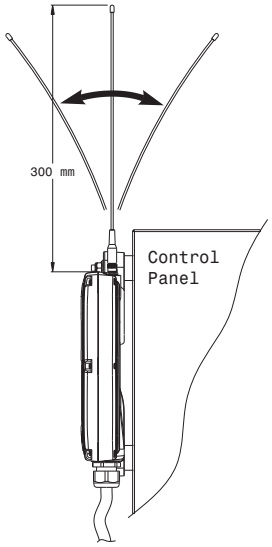


Figure 5-2

5. For better reception, make sure the receiver is in an upright position.
6. Drill four holes if mounting straight onto the panel or two holes if using the optional mounting bracket.
7. Make sure the screws are tightened after installation.

No Mounting Bracket **Optional Mounting Bracket**

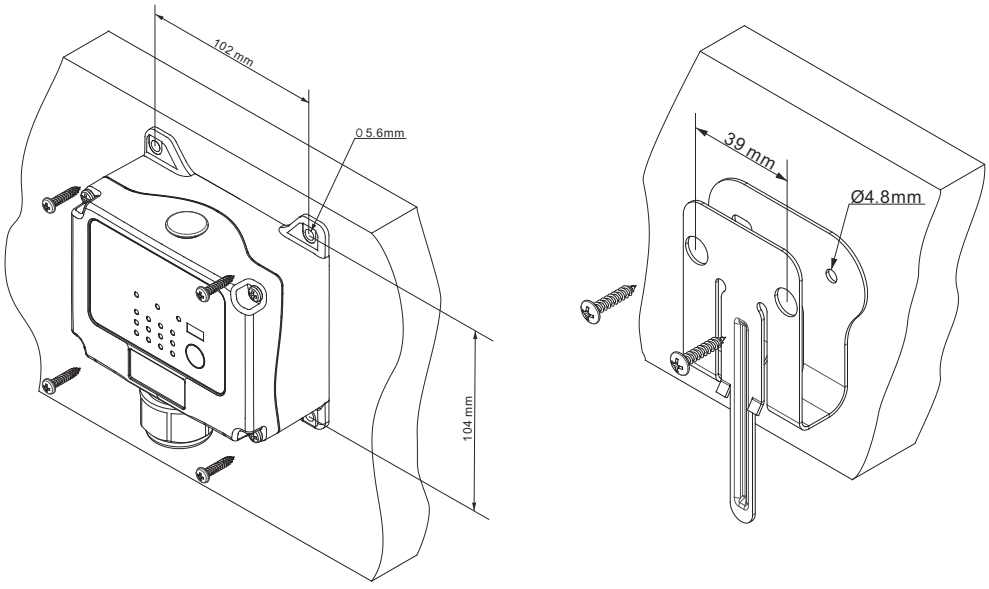


Figure 5-3

8. If using the mounting bracket, slide the receiver down along the guided track to secure the receiver to the mounting bracket. Make sure to leave enough slack in the pigtail to accommodate sliding the receiver back off the bracket in case service is ever needed in the future.
9. Remove the receiver by pressing down the bracket release and pull the receiver upward until it clears the guided track.

Install **Remove**

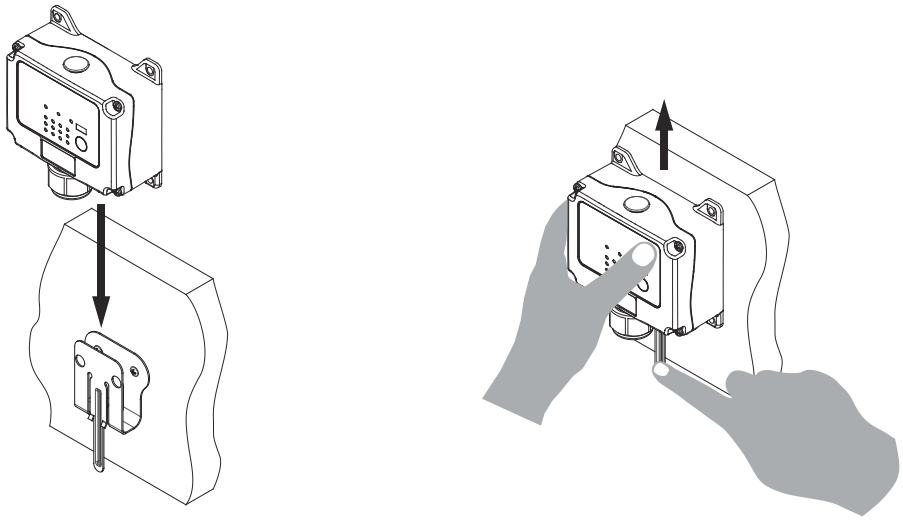


Figure 5-4

6 System Status Light Indications

6.1 Transmitter Status Indications

Type	Display Type	Indication
1	Solid red	Voltage below 1.8V at initial power on or during operation
2 (FCC)	Solid red → 3 red blinks → off	Voltage below 1.75V during operation (receiver MAIN relays shut off)
2 (CE)	Solid red → off	Voltage below 1.75V during operation (receiver MAIN relays shut off)
3	1 red blink followed by a 2-second pause	Voltage below 1.85V during operation (change batteries suggested)
4A	2 red blinks followed by a 2-second pause	Defective or jammed pushbutton detected at initial power on
4B	No light displayed	When defective pushbutton condition occurs (2 red blinks, type 4A above), find out which pushbutton is defective by pressing all of them one at a time. If the pushbutton is in good working order when pressed, the Status LED is off. If the Status LED maintained 2 red blinks then the pushbutton is defective.
5	4 red blinks followed by a 2-second pause	Transmitter is unable to lock onto the assigned channel
6	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 (FCC)	3 slow red blinks → off	STOP button pressed down
10	2 orange blinks followed by a 2-second pause	Receiver MAIN relays jammed or defective
11	3 orange blinks followed by a 2-second pause	Decoding processors defective
12	Solid orange when the START button is pressed and hold at initial system startup	Receiver MAIN relays activated

6.2 Receiver Status Indications

Type	Display Type (Green & Red)	Indication
1	Fast green blinks	Decoding in process
2	Slow green blinks	Decoding on standby
3	2 red blinks	Receiver MAIN relays jammed or defective
4	3 red blinks	Decoding processors defective
5	4 red blinks	Receiving RF defective
6	Fast red blinks	Incorrect transmitter serial number
7	Solid red	Receiver low voltage
8	No light displayed	Decoding processors defective
9	3 slow red blinks followed by slow green blinks	STOP button pressed down

6.3 Receiver Power Indications

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

6.4 Receiver COM Indications

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

7 General Specifications

Frequency Range:	433.050MHz - 434.575MHz
Number of Channels:	62 channels
Channel Spacing:	25KHz
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 (300 feet)
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:	1.0 mW
Enclosure Type:	NEMA4
Enclosure Rating:	IP66
Output Contact Rating:	250VAC/28VDC @ 6 Amps
Transmitter Operating Voltage:	3.0VDC
Receiver Power Consumption:	7VA (max)
Available Receiver Voltages:	9 - 36VDC
	24 - 48VAC
	48 - 240VAC
Operating Temperature:	-25°C - 75°C / -13°F - 167°F
Transmitter Dimension:	130 mm (L) x 55 mm (W) x 40 mm (H) 5.12 in. (L) x 2.17 in. (W) x 1.57 in. (H)
Receiver Dimension:	120 mm (L) x 90 mm (W) x 55 mm (H) 4.72 in. (L) x 3.54 in. (W) x 2.17 in. (H)
Transmitter Weight:	183 g / 6.4 oz (including batteries)
Receiver Weight:	900 g / 2.0 lb (including output cable)

7.1 Part Number Guide

FCC / IC Specific Numbers

FLEX-DUO-MRX-RX-101	Flex Duo-MRX receiver w/ 24-48 VAC Power Supply
FLEX-DUO-MRX-RX-101-CSA	Flex Duo-MRX receiver w/ 24-48 VAC Power Supply - CSA marked
FLEX-DUO-MRX-RX-102	Flex Duo-MRX receiver w/ 48-240 VAC Power Supply
FLEX-DUO-MRX-RX-102-CSA	Flex Duo-MRX receiver w/ 48-240 VAC Power Supply - CSA marked
FLEX-DUO-MRX-RX-103	Flex Duo-MRX receiver w/ 9-36 VDC Power Supply
FLEX-DUO-MRX-RX-103-CSA	Flex Duo-MRX receiver w/ 9-36 VDC Power Supply - CSA marked
FLEX-DUO-TX-1S	Flex Duo transmitter, Single speed buttons
FLEX-DUO-TX-2S	Flex Duo transmitter, Two speed buttons

CE Specific Numbers

FLEX-DUO-MRX-RX-101-CE	Flex Duo-MRX receiver w/ 24-48 VAC Power Supply
FLEX-DUO-MRX-RX-102-CE	Flex Duo-MRX receiver w/ 48-240 VAC Power Supply
FLEX-DUO-MRX-RX-103-CE	Flex Duo-MRX receiver w/ 9-36 VDC Power Supply
FLEX-DUO-TX-1S-CE	Flex Duo transmitter, Single speed buttons
FLEX-DUO-TX-2S-CE	Flex Duo transmitter, Two speed buttons

General Numbers

FLEX-DUO-CHARGER	Flex Duo charging cradle w/o USB cable or power supply
FLEX-DUO-CHARGER-AC	Flex Duo charging cradle w USB cable and 110VAC power supply (U.S. style plug)
FLEX-DUO-TX-BOOT	Molded rubber guard for Flex Duo transmitter
FLEX-DUO-TX-POUCH	Vinyl pouch for Flex Duo transmitter
FLEX-DUO-WRISTWRAP	Wrist strap
FLEX-DUO-TX-DECAL	Flex Duo transmitter label set

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

The Technical Construction File is maintained at:

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

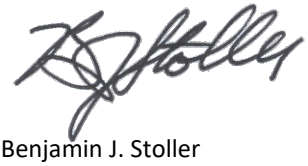
The European contact for technical documentation is:

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 Duo System
Radio Control Equipment Technical Manual
November 2020