Solo 400 Series

Industrial Wireless Pendant System

Operation & Parts Manual

(i)Improved Series

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IMPOR TANT NOTES!

1. **Startup Procedure** _ You must make sure that the red EMS button is elevated prior to turning "on" the transmitter power (battery) switch, by twisting it 1/4 turn clockwise, it will pop up. Then turn "on" the power (battery) switch located on the backside of the transmitter, top center, by pushing it to the right. The Status LED on the face of the transmitter will display a green light for up to two seconds when the power switch is turned "on".

   Note A: Whenever the EMS button is depressed you must reenact the Startup Procedure, that is, elevate the EMS button then turn the power (battery) switch "Off" then back "On

   Note B: Depressing (holding down) any buttons during the "Startup Procedure" will disable the transmitter.

2. **Receiver Main Relay will remain closed until the Stop command is received**. The factory default setting for the "JP2" Jumper is open; that is, the Main Relay will remain closed until the Stop command has been received. Replacing the "JP2" Jumper (shorted) will cause the Main Relay to time open 5 minutes after the last command was received. Note that depressing any transmitter button (except select) will close the Main Relay and instituted the appropriate command. If your crane or hoist is equipped with a VFD drive shorting the "JP2" can cause an unacceptable delay, in this situation we suggest you leave the JP2 jumper off (open), then the Main relay will remain closed until the Stop command is received, see Section 7.1 for details.

3. **BNC Antenna Jack** _ Note that your receiver is equipped with an internal antenna, which will provide satisfactory reception in most applications. <u>The BNC jack located on the top of the receiver is not active</u>, it requires that you to *open the receiver case and insert the BNC lead wire into the connector located on the RX module to become functional. The internal antenna must be removed at this time. We suggest installation of our optional external 1/2 wave antenna for all outdoor applications or on high-speed cranes or runways longer than 200ft.

   **** Caution! Turn the power off before opening the receiver case.***

4. **Caution! Improper Storage of your Spare Transmitter is a Safety Hazard!** _ During the initial installation of your remote control system the spare (second) transmitter should be tested to confirm that it is functioning properly and then the batteries must be removed and the transmitter stored in a secured place. **<u>Failure to follow this safety procedure can result in the inadvertent operation of your crane or hoist by unauthorized personnel resulting in serious injury or death!</u>**

TABLE OF CONTENTS

1. INTRODUCTION

The Solo 400i Series is a highly reliable industrial radio remote control system. The versatile features of the Solo 400i permit its use in many different remote control applications. The system can be used to control cranes, multiple hoists, trolleys, mining equipment, building construction equipment, automatic control systems, and many others.

The Solo 400i Series Radio Remote Control System incorporates numerous redundant safety circuits that guaranty maximum security and ensure the system is resistant to outside interference. The major features of the Solo 400i Series are as follow:

* The system uses advanced microprocessors with highly evolved software that has redundant error checking and correcting capabilities to ensure 100% error-free transmission, decoding, and control of all output relays. This highly evolved software includes CRC (cyclical redundancy check codes) and Hamming Codes (error recovery).

* To insure maximum operating safety, the Solo 400i series incorporates numerous safety features. Some of these built in safety features include transmitter pushbutton self-diagnosing, transmitter low-voltage detection and warning, receiver self-diagnosing, long travel start-up warning, MAIN deactivation during transmitter low-voltage and when the transmitter is in sleep mode.

* For added safety, the system also incorporates a special type of MAIN Safety Relay. If the receiver MAIN safety relay is defective (fails to open or close during operation), this safety relay will signal the system to shut down immediately to avoid the possibility of any accidents occurring.

* The transmitter encoder and receiver decoder both utilize advanced microprocessor control. The availability of 32,768 sets of unique ID codes + 30 distinct RF channels will ensure that only commands from the matching control transmitter can be carried out without any interference from other radio systems.

* PLL synthesized receiving RF module with 30 user-selectable channels (frequencies).

The Solo 400i Series Radio Remote Control System consists of a water-resistant IP 66 and NEMA 4 rated handheld transmitter and a pre-wired receiving unit with a 6-foot output cable. The transmitter casing is molded using industrial strength composite materials which are impervious to dust, water, oil, acids, alkaline, heat and sunlight as well as being resistant to deformation due to long term use in harsh environments. The pushbuttons are also constructed from industrial strength composite materials with a minimum of up to one million press cycles. For power savings, the transmitter was designed with a special high efficiency power saving circuit that requires only three “AA” size alkaline batteries for more than 200 hours of continuous operation.

2. SAFETY INSTRUCTION

The Solo 400i system is relatively simple to use, however, it is very important to observe the proper safety procedures before, during, and after operation. When used properly our Solo 400i Series remote controls will enhance safety, productivity and efficiency in the workplace.

The following procedures should be strictly followed:

1. Check the transmitter casing and pushbuttons daily. Should any damage that could inhibit the proper operation of the transmitter be found the unit should be immediately removed from service.

2. The transmitter voltage should be checked on a daily basis. If the voltage is low (red status light blinking), the three "AA" alkaline batteries should be replaced.

3. The red mushroom type emergency stop button (EMS) should be checked at the beginning of each shift to ensure it is in proper working order and the Stop command is being received.

4. In the event of an emergency, depress the red mushroom type emergency stop button (EMS) immediately, this sends the Stop command and deactivates the Main relay in the receiver. Then turned the power "off" from the main power source to the crane or equipment.

5. The power switch on the back of the transmitter should be turned "off" after each use and should never be left in the power "on" state when the unit is unattended.

6. Do not use the same channel (frequency) and ID code as any other system in use at the same facility or within 400 feet.

7. Ensure the wrist strap or the belt clip is worn at all time during operation to avoid accidental damage to the transmitter.

8. Never operate a crane or equipment with two (2) transmitter units at the same time with the same channel (frequency) and ID code.

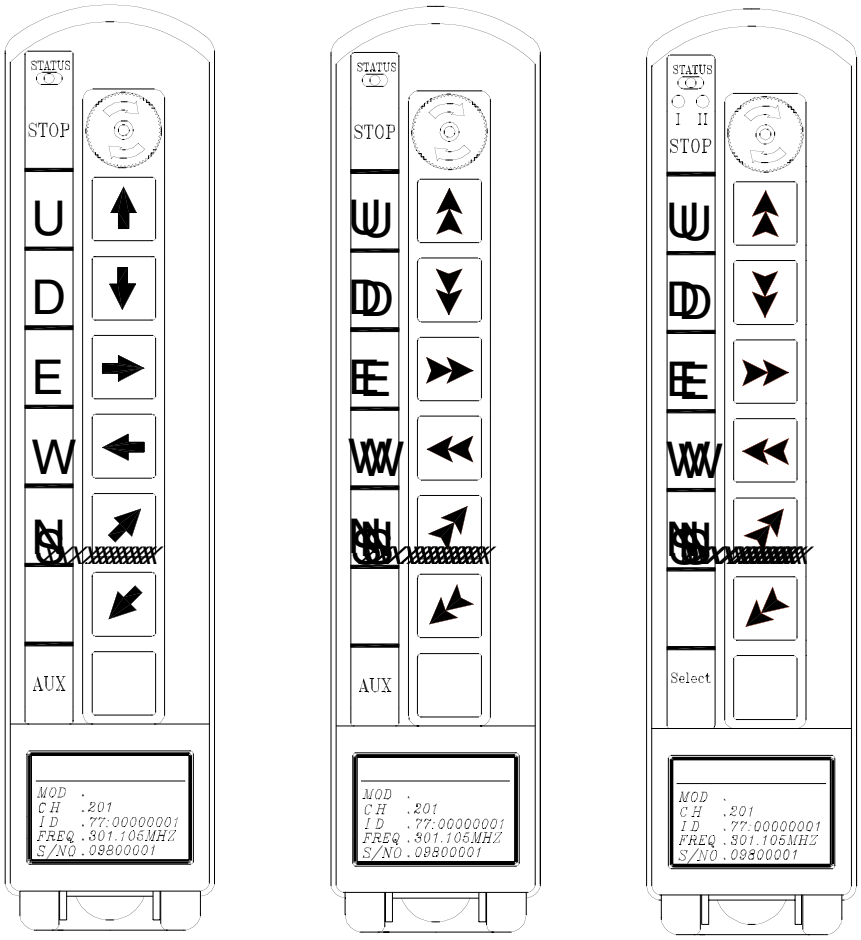
9. Check the hoist and or trolley/bridge limit switches at the beginning of each shift. Make sure the transmitter direction labels match the actual hoist, trolley and bridge motions.

10. Read this operation manual in its entirety as well as your bridge or hoist operations manual before operating your remote control.

3. TRANSMITTER PUSHBUTTON CONFIGURATIONS

1. Solo 400i: 6 single-speed pushbuttons + AUX + EMS, 5 common circuits + 5 common circuits.
2. Solo 410V5: 2 dual-speed pushbuttons + 4 single-speed pushbuttons + AUX + EMS + 5 common circuits.
3. Solo 420i: 6 dual-speed pushbuttons + AUX + EMS, 5 common circuits + 5 common circuits.
4. Solo 430i: 6 dual-speed pushbuttons + SELECT pushbutton for dual hoist and trolley + EMS + 5 common circuits.
5. Solo 430AV5: 6 dual-speed pushbuttons + 3rd speed/AUX pushbutton + EMS + 5 common circuits.

(Solo 400i) **(Solo420i)** **(Solo430i)**

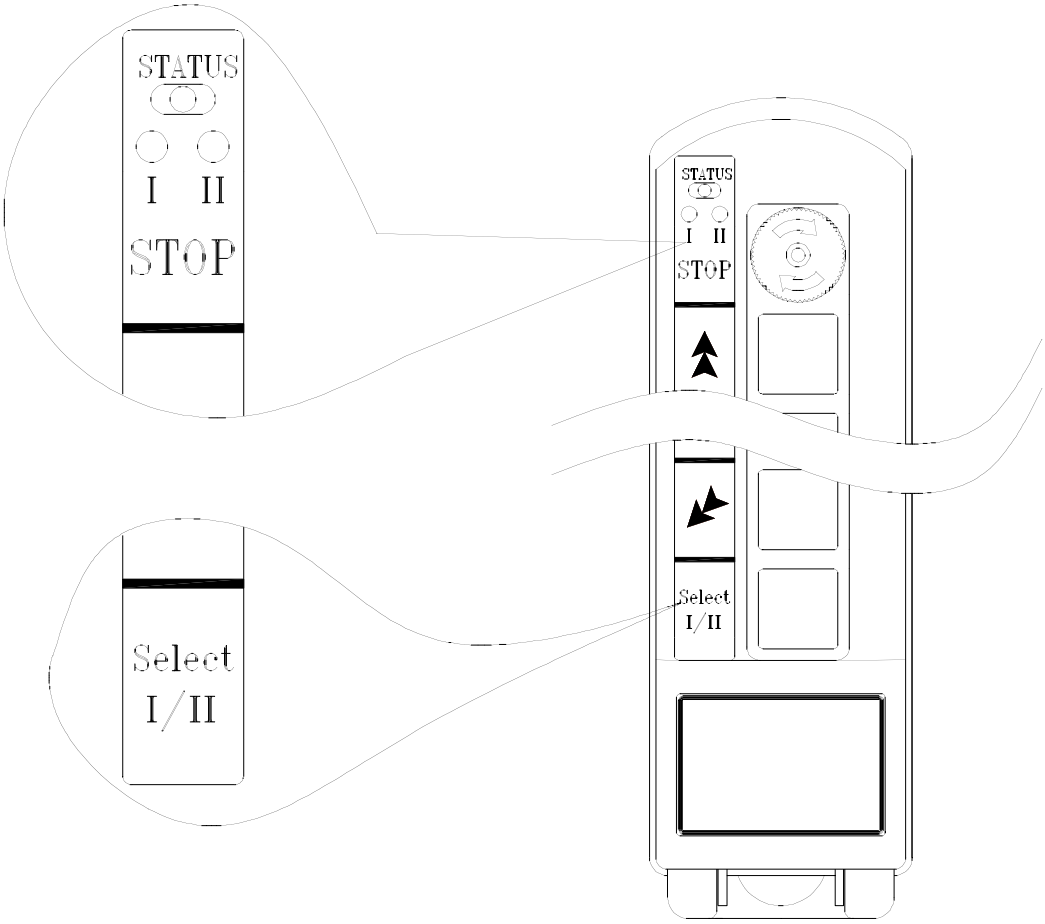


3.1 Solo 430i Select Pushbutton Functions

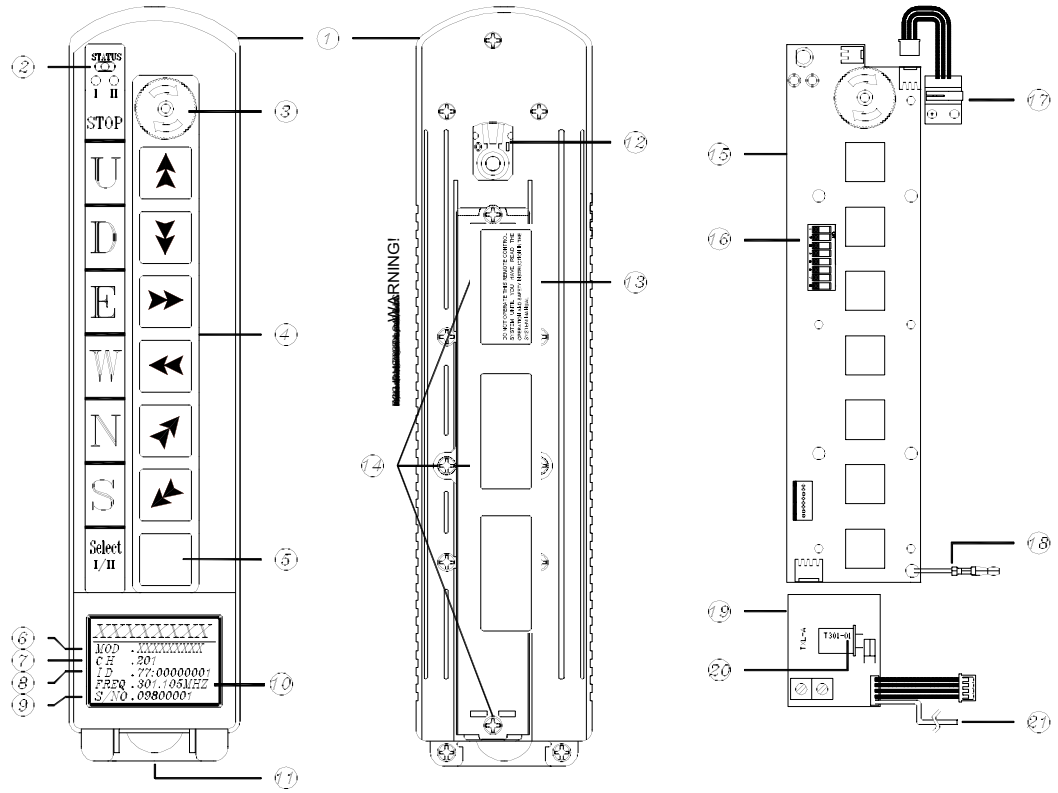
For crane systems with main and auxiliary hoist and/or trolley, depress “Select” pushbutton in sequence to choose between the two hoists and trolleys.

1) Power "on" _ LED I "lit” _ Main hoist and/or trolley activated.
2) Depress ”Select” _ LED II "lit" _ Auxiliary hoist and/or trolley activated.
3) Depress “Select” again _ LED I & II "lit" _ Both main and auxiliary hoist and/or trolley activated with duplicate movements.
4) Depress “Select” again _ “Select” mode returned to LED I with only the main hoist and/or trolley activated.

(Solo430i)



4. TRANSMITTER OUTLINE, TYPICAL

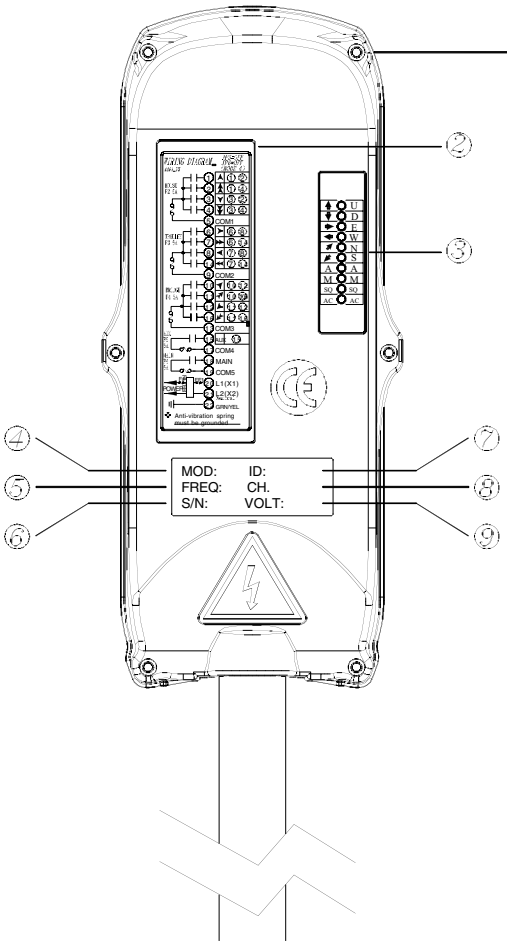


1) Transmitter enclosure
2) Status indicator
3) Emergency stop (EMS)
4) Pushbutton rubber boot
5) Select* / AUX**
6) Model type
7) System channel
8) Security ID code
9) Serial number
10) System frequency
11) Strap & belt clip slot
12) Power switch
13) Battery cover
14) Battery cover screws
15) Encoder board
16) ID code dip-switch
17) EMS On/Off Switch
18) TX Grounding
19) TX module
20) TX quartz crystal
21) Antenna

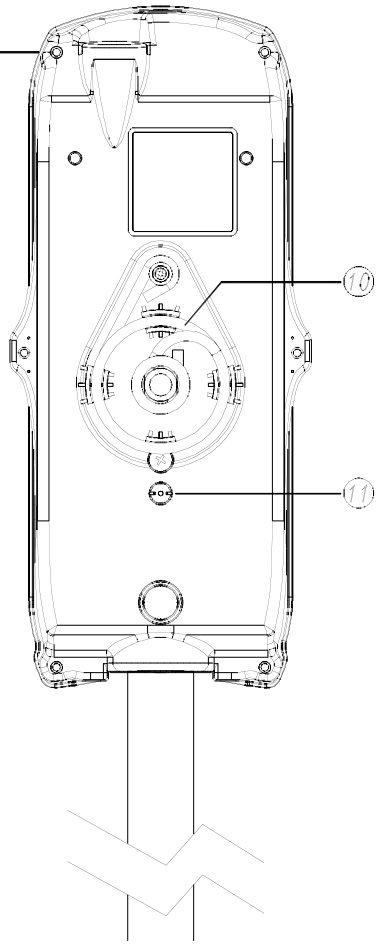
* Solo 430i models.

** Solo 400i/410/420i/430A models.

5. RECEIVER OUTLINE, TYPICAL



(Fig. 4) Front View



(Fig. 5) Back View

1)	Receiver enclosure	5)	System frequency	9)	Supplied voltage
2)	Wiring diagram	6)	System serial number	10)	Anti-vibration spring
3)	Receiver LED displays*	7)	System ID code	11)	Grounding (GND)
4)	Type model	8)	System RF channel		

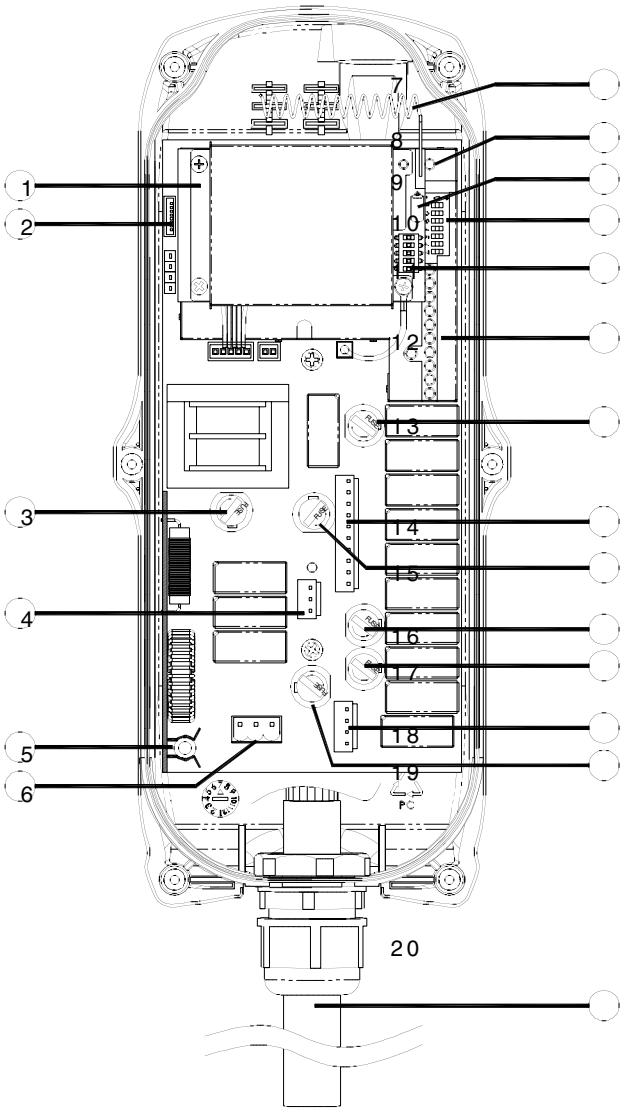
* **A** ~ 1) AUX pushbutton LED indicator (for Solo 400i/410/420/430A/430B models).
2) SELECT pushbutton LED indicator (for Solo 430 models only).
a) Green "on" _ I
b) Red "on" _ II
c) Orange "on" _ I&II.

* **M** ~ MAIN and 2nd speed LED indicator.
Green "on" _ MAIN activated.
Red "on" _ 2nd speed activated.

* **SQ** ~ Frequency signal LED indicator (Red).
"on" _ RF signals received.
"off" _ RF signals not received.
Blinking (buttons not depressed) _ Radio interference encountered.

* **AC** ~ Power source LED indicator "on" _ AC input power supplied.
"off" _ No AC input power.

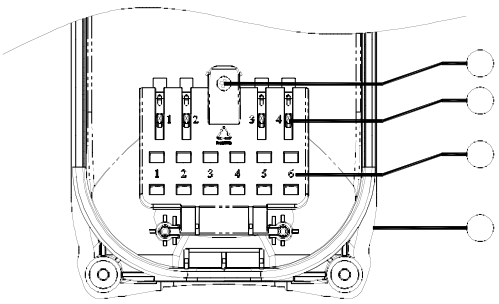
(Fig. 16) Internal Parts Assembly



1) Receiving RF module
2) External programming port
3) Secondary power AC fuse (0.50A)
4) Contact output seat (CN8)
5) Primary power AC fuse (1.0A)
6) AC power input seat (CN2)
7) Internal Antenna
8) System Status LED display*
9) External antenna port **
10) ID code dip-switch
11) RF channel dip-switch
12) Contact relay LED display
13) ▲ ▼ fuse (5.0A)
14) Contact output seat (CN3)
15) MAIN contact fuse (5.0A)
16) ◀ ▶ fuse (5.0A)
17) ➤ ➤ fuse (5.0A)
18) Contact output seat (CN4)
19) LV & AUX fuse (5.0A)
20) Cable gland & output cable

* Please refer to page 21 for system status LED display information.

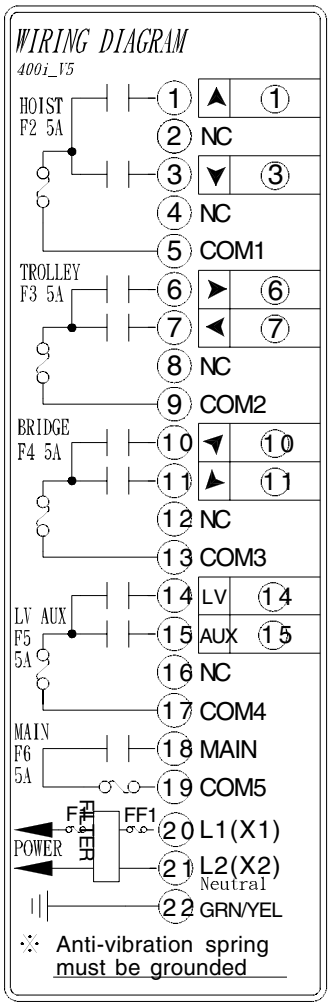
** All Solo 400i series receivers are equipped with an external BNC jack for use with our optional 1/2 wave high gain antenna. Caution! Do not plug the BNC jack into the external antenna port on the RF board unless the optional 1/2 wave external antenna is used, then the internal 1/4 antenna must be removed.



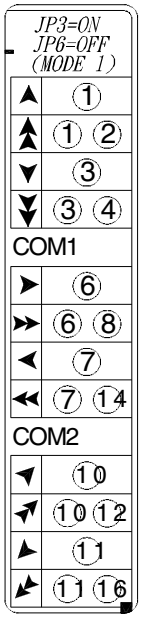
1) Spare fuse & jumper compartment
2) Spare Jumper slots
3) Spare fuse slots
4) Receiver top casing

6. RECEIVER OUTPUT CONTACT DIAGRAMS

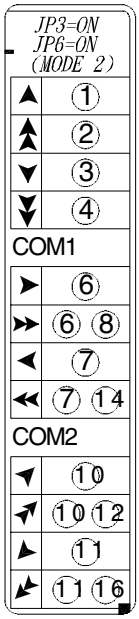
(*Solo 400i_V5)



(Solo 420i_V5)
Mode #1: Cumulative



(Solo 420i_V5)
Mode #2: Break before Make

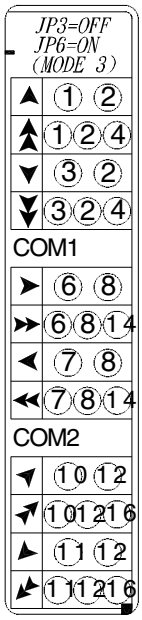


FILTER

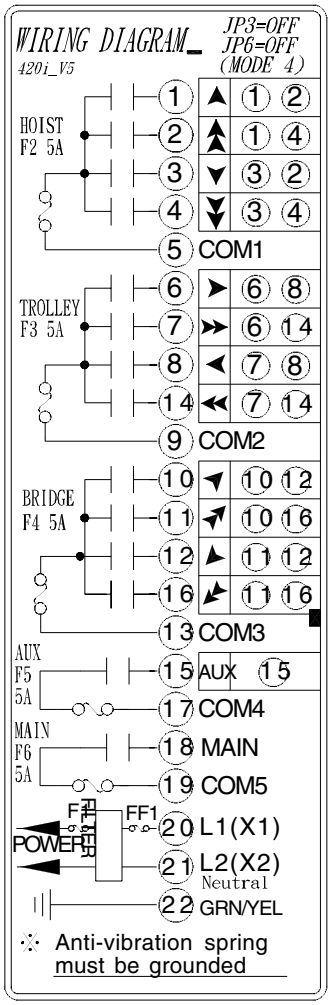
NC _ No Connection Required

*Note: LV relay closes and times open whenever the Bridge motion buttons are depressed. (5th and 6th pushbuttons).

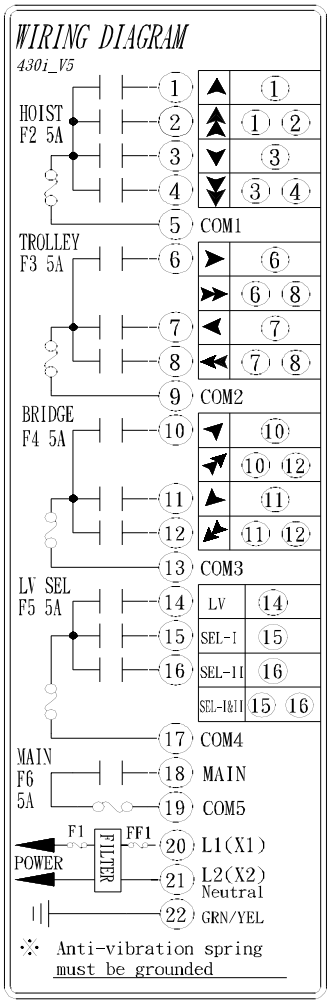
(Solo 420i_V5)
Mode #3: Cumulative (Extend.)



(Solo 420i_V5)
Mode #4: Factory Default, Non-Cumulative



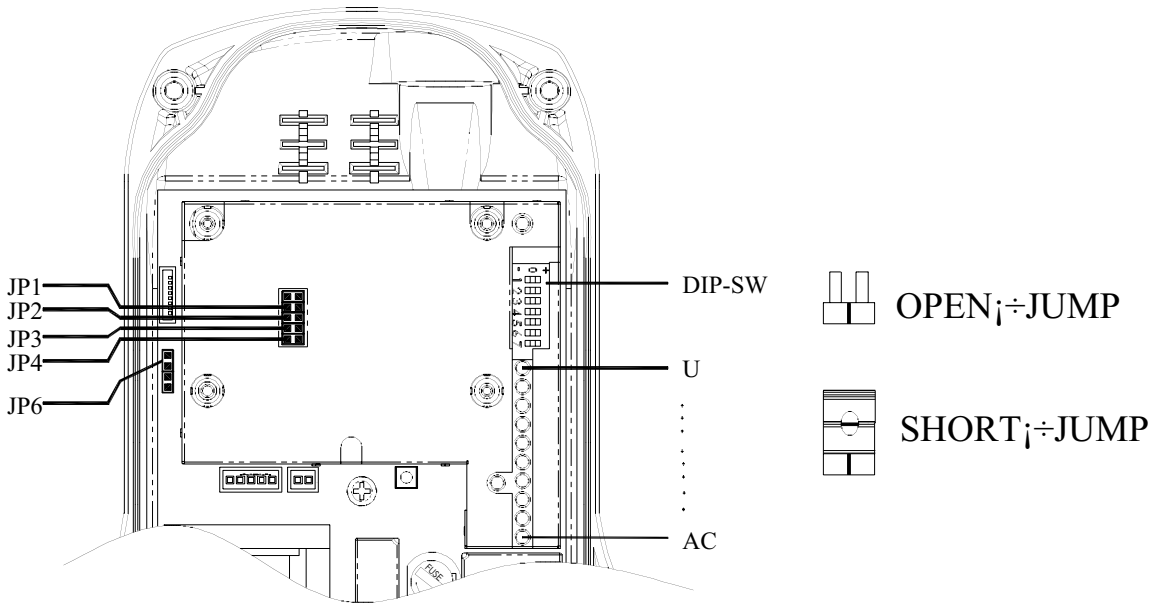
(*Solo 430i_V5)



*Note: LV relay closes and times open whenever the Bridge motion buttons are depressed. (5th and 6th pushbuttons).

7. SYSTEM CONFIGURATION

7.1 How to Set Receiver Jumper Functions



Manufacture Settings

JP1	**Open**	After turning "on" the transmitter power switch, or after EMS reset, depress "AUX" pushbutton to activate the receiver MAIN **(For Solo 430i, press any pushbutton except Select)**.
	Short	Turning "on" the transmitter power switch with the EMS button elevated will immediately activate the receiver MAIN. After EMS reset, first elevate the EMS Stop button then turn the transmitter power switch "off" and "on"' again to reactivate the receiver MAIN.
JP2	**Open**	Receiver MAIN stays "on" constantly.
	Short	After 5 minutes of transmitter non-operation, receiver MAIN will be deactivated. To reactivate the receiver MAIN after 5 minutes, just depress any pushbutton.
JP3	**Open**	Transmitter deactivates after one minute of low-voltage warning (refer to note "A" next page). **All models except Solo 420i.**
	Short	Both the transmitter unit and the receiver MAIN deactivates after one minute of transmitter low-voltage warning (refer to note "A" next page). **All models except Solo 420i.**
JP4	**Open**	AUX button with normal momentary contact
	Short	AUX button with latching (toggled) contact.
JP6	**Open**	Low voltage function (refer to JP3 setting). **All models except Solo 420i.**
	Short	JP3 defaults (refer to note B next page), long travel "start up" warning function activated (refer to note "C" next page). **All models except Solo 420i.**

Manufacture Settings (for Solo 420i model only)

JP3 & JP6	**#1**	**JP3 Short**	**JP6 Open**	**Mode #1: Cumulative** Press "U" button to 1st speed _ U contact relay activated (closed). Press "U" button to 2nd speed _ U and UD1 contact relays activated (closed). Press "D" button to 1st speed _ D contact relay activated (closed). Press "D" button to 2nd speed _ D and UD2 contact relays activated (closed). *** Same applies to trolley and bridge motions, please refer to Solo 420i output contact diagram**
	#2	**JP3 Short**	**JP6 Short**	**Mode #2: Break Before Make** Press "U" button to 1st speed _ U contact relay activated (closed). Press "U" button to 2nd speed _ UD1 contact relay activated (closed). Press "D" button to 1st speed _ D contact relay activated (closed). Press "D" button to 2nd speed _ UD2 contact relay activated (closed). *** Hoist motion only, trolley and bridge motions same as mode #1**
	#3	**JP3 Open**	**JP6 Short**	**Mode #3: Cumulative (Extended)** Press "U" button to 1st speed _ U and UD1 contact relays activated (closed). Press "U" button to 2nd speed _ U, UD1, UD2 contact relays activated (closed). Press "D" button to 1st speed _ D and UD1 contact relays activated (closed). Press "D" button to 2nd speed _ D, UD1, UD2 contact relays activated (closed). *** Same applies to trolley and bridge motions, please refer to Solo 420i output contact diagram**
	#4	**JP3 Open**	**JP6 Open**	**Mode #4: Non-Cumulative (Factory Default)** Press "U" button to 1st speed _ U and UD1 contact relays activated (closed). Press "U" button to 2nd speed _U and UD2 contact relays activated (closed). Press "D" button to 1st speed _ D and UD1 contact relays activated (closed). Press "D" button to 2nd speed _ D and UD2 contact relays activated (closed). *** Same applies to trolley and bridge motions, please refer to Solo 420i output contact diagram**

Note A: **Factory Default Setting** JP3 jumper open and JP6 jumper shorted. With JP 3 open the transmitter will be deactivated one minute after the LV (low voltage) warning. Note that the transmitter unit itself will display a visual warning by blinking the status light red when the battery power is low. With JP6 shorted a horn, siren or light can be connected to the LV contact so that when the operator depresses the bridge pushbuttons for the long travel motion (5th and 6th pushbuttons), the LV relay will close for one-second (time open) and activate a warning devise automatically. **This applies to all models except the Solo 420i.**

Note B: By removing the jumper from JP6 the LV relay reverts to its original purpose, which was to warn the operator of a low voltage condition in the transmitter. By connecting a horn, siren or lights to the LV relay output contact the operator can be notified of a transmitter low voltage condition. Note that the LV relay will open and close at one-second intervals for one minute warning the operator of the low voltage condition prior to opening the Main relay. To insure maximum safety the JP3 jumper must be shorted so that both the transmitter power and the receiver MAIN relay will be deactivated (JP3 jumper is shorted and JP6 jumper is opened). **This applies to all models except the Solo 420i.**

For Solo 400i/410_V5/420i/430i/430A_V5 models

JP1 Open	Transmitter "on"	Press AUX pushbutton	MAIN activated	**OR**	Press EMS	MAIN deactivated	Reset EMS	Press AUX	MAIN reactivated	
JP1 Short	Transmitter "on"	MAIN activated	**OR**	Press EMS	MAIN deactivated	Reset EMS	Reset transmitter power by first elevating the EMS button then turn the power switch "off" and "on" again		MAIN reactivated	

For all models

JP2 Open	Receiver MAIN stays "on" until the Stop command is received.				
JP2 Short	System "on"	Transmitter pushbutton not depressed within 5 minutes	MAIN deactivated	Press any pushbutton	MAIN reactivated

For Solo 400i/410_V5/420i/430i/430A_V5 models

JP3 Open	System "on"	Work in progress	Transmitter low voltage occurs	LV warning	Change batteries within 1 minute	YES	Work resumes
						NO	Transmitter unit will be deactivated
JP3 Short	System "on"	Work in progress	Transmitter low voltage occurs	LV warning	Change batteries within 1 minute	YES	Work resumes
						NO	Both the transmitter unit and the receiver MAIN will be deactivated

For Solo 400i/410_V5/420i/430i/430A_V5 models

JP4 Open	AUX button with normal momentary contact
JP4 Short	AUX button with latching (toggled) contact

For Solo 400i/410_V5//430i/430A_V5 models (except Solo 420i)

JP6 Open	LV function (refer to chart below for Solo 420i model)			
JP6 Short	System "on"	Work in progress	Press bridge travel buttons (5th and 6th buttons)	External horn or siren activated for 1 second

For Solo 420i models only

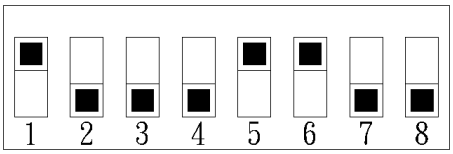
Mode #1: Cumulative					
JP3 Short	**JP6 Open**	Press " ▲ " button to 1st speed	U contact relay closed	Press " ▲ " button to 2nd speed	1 & 2 contact relays closed
Mode #2: Break Before Make					
JP3 Short	**JP6 Short**	Press " ▲ " button to 1st speed	1 contact relay closed	Press " ▲ " button to 2nd speed	1 contact relay opened, 2 contact relay closed
		Press " ▼ " button to 1st speed	3 contact relay closed	Press " ▼ " button to 2nd speed	3 contact relay opened, 4 contact relay closed
Mode #3: Cumulative (Extended)					
JP3 Open	**JP6 Short**	Press " ▲ " button to 1st speed	1 & 2 contact relays closed	Press " ▲ " button to 2nd speed	1, 2, 4 contact relays closed
		Press " ▼ " button to 1st speed	3 & 2 contact relays closed	Press " ▼ " button to 2nd speed	3, 2, 4 contact relays closed
Mode #4: Non-Cumulative (Factory Default)					
JP3 Open	**JP6 Open**	Press " ▲ " button to 1st speed	1 & 2 contact relays closed	Press " ▲ " button to 2nd speed	1 & 4 contact relays closed
		Press " ▼ " button to 1st speed	3 & 2 contact relays closed	Press " ▼ " button to 2nd speed	3 & 4 contact relays closed

7.2 Security ID Code Setting

The ID code dipswitch is located on the encoder and decoder/relay board; please refer to fig. 3 on page 6 and fig. 6 on page 8. When you change the ID code please make sure the "1" value added up to be an odd number.

Example: ID code _ 10001100 _ Odd number _ Correct setting

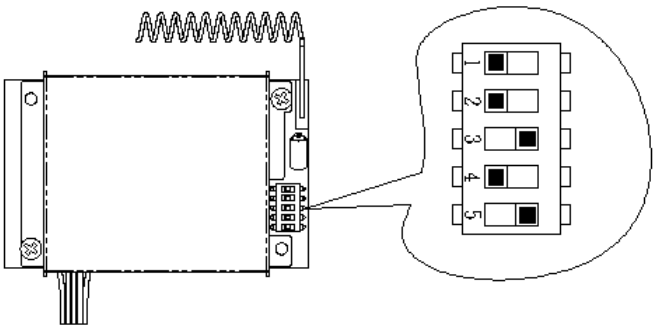
Top location: "1"
Bottom location: "0"



Note: The ID code on both the encoder and decoder/relay board must be identical.

7.3 Receiver Channel Setting

There are 30 receiver channels (frequencies) available for the Solo 400i series. The channel dipswitch is located on the right side of the receiver RF module.



Example: For the above dipswitch with 00101 setting, the channel would be "205", which represents frequency "301.205MHz". Please refer to frequency/channel table on page 15 or on the PLL RX module.

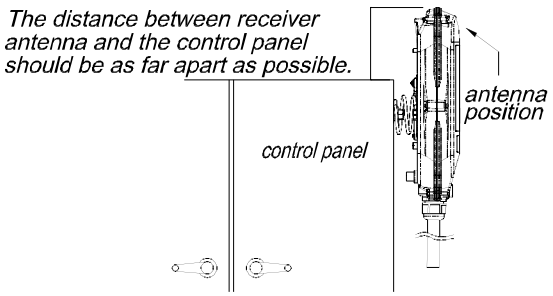
Note: The channel on both the transmitter unit and the receiver unit must be identical.

7.4 Frequency/Channel Table

FREQUENCY	DIP-SWITCH SETTING	CHANNEL
301.105 MHz	00001	201
301.130 MHz	00010	202
301.155 MHz	00011	203
301.180 MHz	00100	204
301.205 MHz	00101	205
301.230 MHz	00110	206
301.255 MHz	00111	207
301.280 MHz	01000	208
301.305 MHz	01001	209
301.330 MHz	01010	210
301.355 MHz	01011	211
301.380 MHz	01100	212
301.405 MHz	01101	213
301.430 MHz	01110	214
301.455 MHz	01111	215
301.480 MHz	10000	216
301.505 MHz	10001	217
301.530 MHz	10010	218
301.555 MHz	10011	219
301.580 MHz	10100	220
301.605 MHz	10101	221
301.630 MHz	10110	222
301.655 MHz	10111	223
301.680 MHz	11000	224
301.705 MHz	11001	225
301.730 MHz	11010	226
301.755 MHz	11011	227
301.780 MHz	11100	228
301.805 MHz	11101	229
301.830 MHz	11110	230

8. RECEIVER INSTALLATION

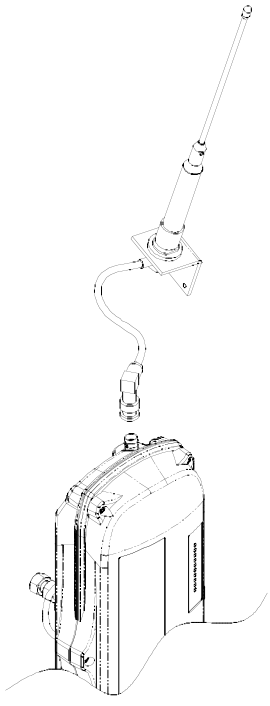
8.1 Preparation For Installation



1. Required Tools:
   (1) Flat Head Screwdriver (-)
   (2) Phillips Head Screwdriver (+)
   (3) Multi-Meter
   (4) 14mm Wrench x 2
   (5) Power Drill with 7 /16" Drill-Bit
2. Check to ensure that your receiver is not set to the same channel (frequency) and ID code as any other systems in operation at the same facility (within 400 feet).
3. Prior to installation, make sure that the crane or equipment itself is working properly.
4. Use a multi-meter to check the voltage source available and ensure that the receiver voltage setting matches your power source.
5. Prior to installation, switch off the main power source to the crane or equipment.

8.2 Step-By-Step Installation

1. Select a suitable location to mount the receiver.
2. The location selected should have the antenna visible from all areas where the transmitter is to be used.
3. The location selected should not be exposed to high levels of electrical noise.
4. Ensure the selected location has adequate space to accommodate the receiver enclosure. Note that the receiver must be mounted vertical.
5. The distance between the antenna and the control panel should be as far apart as possible (refer to the diagram above).
6. Drill a hole on the control panel 10.5mm (7/16").
7. Install the mounting spring stud and tightened the two nuts.
8. If the control panel has a plastic surface, the extended grounding wire should be used.
9. For system wiring, please refer to the output contact diagram on page 9~10 or on the face of the receiver enclosure.
10. Ensure all wiring is correct and safely secured and that all fasteners are tightened.
11. If an external antenna is used, make sure that the location of the antenna is visible to the ground below (refer to the diagram at right).



8.3 System Testing

1. Connect the power source to the receiver and test the MAIN relay output (EMS button) and observe that it properly opens and closes the main line disconnect contactor.
2. Test the operation of each function to ensure it corresponds to the transmitter direction labels and/or the pendant it is replacing.
3. Test the limit switches on the hoist and/or crane and verify they are working properly.
4. If your new remote control is replacing an existing pendant make sure it is completely disconnected to prevent unwanted control commands.
5. If your new remote control is replacing an existing pendant make sure the pushbutton is stored in a safe location where it will not interfere with remote operation (get torn off).

8.4 Installation Tips

We recommend that a separate ungrounded isolation transformer be installed to supply power to the remote control receiver, 50VA in size. It is also recommended that noise suppression device (Snubbers) be installed on all contactor coils, brake coils, etc., to reduce any possibility of interference.

Furthermore, mounting the receiver unit next to an unshielded variable frequency control (inverter) may cause interference; i.e. the receiver unit will shut down intermittently. Always locate the receiver unit as far away from inverter controls as possible.

The Solo 400i receiver RF board is equipped with one additional antenna jack for installation of an external antenna. Plugging a wire into the antenna jack and running it out the bottom of the receiver (through the second inlet hole at the bottom right) and extending it below the crane girder could increase reception.

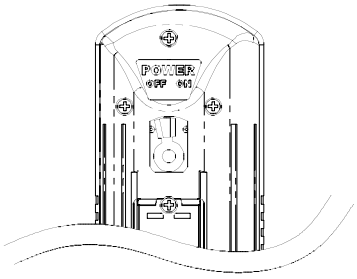
Caution! Do not plug the BNC jack into the external antenna port on the RF board unless the optional _ wave external antenna is used, then the internal _ antenna must be removed!

The Solo 400i receiver housing has provisions for an external factory installed antenna available as an option, contact your dealer for price and delivery.

9. TRANSMITTER OPERATION

2. **Batteries** _ Make sure the three "AA" alkaline batteries are installed correctly. Use alkaline type batteries for optimum time between replacements. Do not use rechargeable batteries unless rated 1600mA or above.

3. **Startup Procedure** _ You must first make sure that the red EMS button is elevated prior to turning "on" the transmitter power (battery) switch, by twisting it 1/4 turn clockwise, it will pop up. Then turn "on" the power (battery) switch located on the backside of the transmitter, top center, by pushing it to the right. The Status LED on the face of the transmitter will display a green light for up to two seconds when the power switch is turned "on".



Note A: When ever the EMS button is depressed you must reenact the Startup Procedure, that is, elevate the EMS button then turn the power (battery) switch "Off" then back "On".

Note B: Depressing (holding down) any buttons during the "Startup Procedure" will disable the transmitter.

3. **Status Lights** _ If the Status LED displays a red blinking light that is "on" _ 0.1 second and "off" _ 2.0 seconds or no light at all, this indicates that the three "AA" batteries in the transmitter must be replaced. If the Status LED light is blinking red, "on" _ 2.0 seconds and "off" _ 0.1 second, it means that the transmitter unit is locked due to a damaged or closed pushbutton contact. Possibly the operator is depressing a button while going through the start up sequence? This important safety feature is designed to prevent any unexpected crane movement at system start-up caused by closed or defective pushbutton contacts. Also, if the Status LED displays a constant red light without flashing, this indicates that the transmitter ID code is set incorrectly (refer to section 7.2 on page 14).

   Please note that the receiver unit must received an **"Initial Startup Code"** from the transmitter in order for its MAIN contact relay to be energized. What this means is that the transmitter can only activate the MAIN contact relay as long as the operator is within the receiving range. For example, if the operator turned "on" the transmitter in a different area of the facility (beyond 200 feet from the receiver location), then he will not be able to control the crane at all. If this happens, the operator would have to resent the initial startup code by turning the transmitter power "off" and then "on" again.

4. **Receiver Main Relay will remain closed until the Stop command is received**. The factory default setting for the "JP2" Jumper is open; that is, the Main Relay will remain closed until the Stop command has been received. Replacing the "JP2" Jumper (shorted) will cause the Main Relay to time open 5 minutes after the last command was received. Note that depressing any transmitter button (except select) will close the Main Relay and instituted the appropriate command. If your crane or hoist is equipped with a VFD drive shorting the "JP2" can cause an unacceptable delay, in this situation we suggest you leave the JP2 jumper off (open), then the Main relay will remain closed until the Stop command is received, see Section 7.1 for details.

5. **EMS & Restarting** _ In case of an emergency, depressing the Red EMS button will send the Stop command which will immediately deactivate the receiver MAIN relay. When the red EMS button is depressed the transmitter Status LED will display a blinking red light that is "on" _ 0.5 second and "off" _ 0.5 second, telling the operator that the "Stop" command is being sent to the receiver. To reactivate the system, turn the EMS pushbutton clockwise 1/4 turn so that the red button pops up, then turn the battery power switch "off" and then back "on" again.

6. **Solo 430i Model** _ When the transmitter is turned “on”, LED-I will light up to indicate the main hoist and/or trolley is activated. To activate the auxiliary hoist and/or trolley, depress the "Select" pushbutton, the LED light display will switch from LED-I to LED-II, indicating that the main hoist and/or trolley is deactivated and the auxiliary hoist and/or trolley is now activated. Depress the "Select" pushbutton again to have both main and auxiliary hoist and/or trolley activated at the same time (both LED-I and LED-II lit). To switch back to the main hoist and/or trolley, just depress the "Select" pushbutton again (refer to section 3.1 on page 5). Note that each time the transmitter is turned “off” and then “on” again the "Select " setting will default to LED-I.

7. **Solo 430A_V5 Model** _ During operation, when a particular command pushbutton is in the 2nd speed position (command pushbutton fully depressed) depressing the AUX once will activate the 3rd speed for that particular command pushbutton. If the operator depresses the AUX pushbutton again the command pushbutton currently in use will return to the 2nd speed position. If the command pushbutton currently in use is elevated to its 1st speed position, the 3rd speed function will be canceled, and the command pushbutton in use will now be in 1st speed position. When all command pushbuttons are in their neutral position (not pressed), instead of 3rd speed function, the AUX pushbutton will now become an auxiliary function. In auxiliary mode, the AUX pushbutton can be set either for toggle (latched) or normal function, which can be used for other external applications (refer to JP4 setting on page 11).

8. **Interlocking Pushbuttons** _ Note that three commands can be sent at one time with all three motions taking place simultaneously, for example, hoist, trolley and bridge. But each set of motions is interlocked to its self so no conflicting commands can take place for safety purpose. For example, depressing the hoist UP and DOWN pushbutton simultaneously will result in no command being sent.

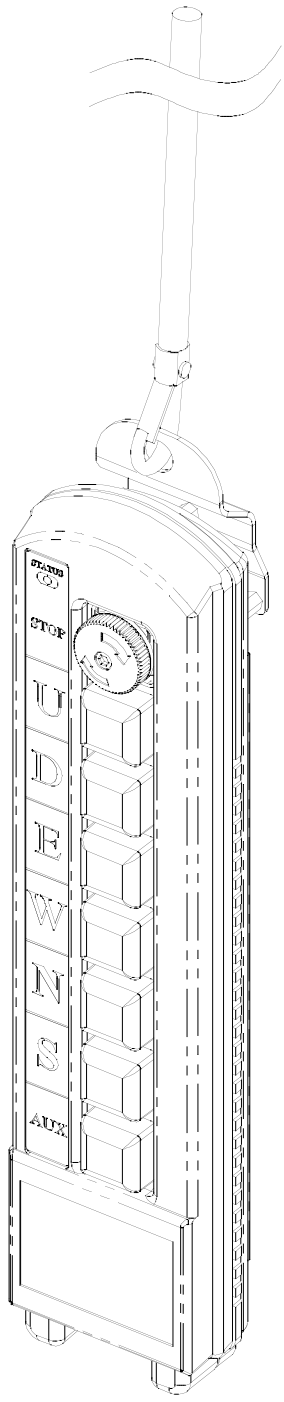
9. **BNC Antenna Jack** _ Note that your receiver is equipped with an internal antenna, which will provide satisfactory reception in most applications. The BNC jack located on the top of the receiver is not active, it requires that you to *open the receiver case and insert the BNC lead wire into the connector located on the RX module to become functional. The internal antenna must be removed at this time. We suggest installation of our optional external 1/2 wave antenna for all outdoor applications or on high-speed cranes or runways longer than 200ft.

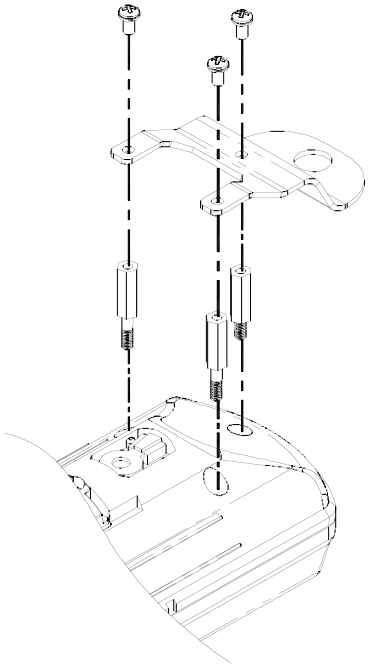
   * Caution! a. Turn the power off before opening the receiver case.
   b. Do not plug the BNC jack into the external antenna port on the RF board unless the optional 1/2 wave external antenna is used, then the internal 1/4 antenna must be removed!

10. **Caution! Improper Storage of your Spare Transmitter is a Safety Hazard!** _ During the initial installation of your remote control system the spare (second) transmitter should be tested to confirm that it is functioning properly and then the batteries must be removed and the transmitter stored in a secured place. Failure to follow this safety procedure can result in the inadvertent operation of your crane or hoist by unauthorized personnel resulting in serious injury or death!

10. WIRELESS PENDANT

A bracket is available that can be used to suspend the transmitter in a fixed position (refer the diagram below), for example from your hoist or bridge track system.





11. TROUBLE SHOOTING

Should problems occur, please check the chart below for trouble shooting tips.

SYMPTOM	REASON	SOLUTION
Transmitter does not communicate to receiver.	Transmitter and the receiver are not on the same RF channel or ID code. (SQ lamp not lit)	Ensure the correct transmitter is in use. The labels on the receiver and the transmitter unit will identify the RF channel and ID code in use.
Transmitter does not communicate to receiver.	Low or no transmitting power from the transmitter unit.	Turn "On" the transmitter unit and EMS in its elevated position. If the status LED displays a red blinking light or no light at all, then turn the power "Off" and replace the three "AA" alkaline type batteries.
No power to the receiver (AC power indicator on the receiver front panel not lit).	Blown fuse or no input power connection.	Ensure power input to the receiver is correct. If power indicator (AC) is still not lit, please check the receiver for any open fuses.
Outputs do not operate correctly.	Receiver configuration is not set properly or output wiring is incorrect.	Please refer to section 6 ~ 8 to ensure receiver is correctly wired and configured for your application.

Receiver System Status LED Display (refer to Fig.6 on page 8)

TYPE	LED INDICATION (Red Light)	PROBLEM AND SOLUTION
1	Constant red light.	EEPROM error – reprogramming required.
		Incorrect receiver ID code setting (see note below).
2	ON _ 1.0 second OFF _ 1.0 second	ID code not matched on both the transmitter and receiver unit, please readjust accordingly.
3	Dim or no light.	Under-voltage, check the main power-supply.
4	ON _ 2.0 seconds OFF _ 0.1 second	MAIN contact relay jammed or defective.
5	ON _ 0.1 second OFF _ 2.0 seconds	System normal with transmitter pushbutton either in neutral or in transmitter power "off" position.
6	ON _ 0.1 second OFF _ 0.1second	System normal with transmitter pushbutton in non-neutral position (pushbutton depressed).

Note: When changing the ID code on both the transmitter and receiver unit, you must make sure that the "1" value on the dip-switch added up to be an odd number. Example: 04:0000111 would be an odd number.

12. SYSTEM SPECIFICATIONS

12.1 Transmitter Unit

Frequency Range	:	301 MHz
Transmitting Range:	:	Internal Antenna @ 200 feet
		External Antenna @ 300 feet
Channel Spacing	:	25KHz
Hamming Distance	:	6
Frequency Control	:	Quartz Crystals
Frequency Drift	:	< 5ppm
Frequency Deviation	:	< 1ppm
Spurious Emission	:	- 45dB
Transmitting Power	:	~0.3mW
Emission	:	F1D
Antenna Impedance	:	50 ohms
Enclosure Rating	:	IP-66
Source Voltage	:	4.5V ("AA" alkaline batteries X 3)
Current Drain	:	7.5 ~ 18mA
Operating Temperature	:	-13_ ~ 158_
Dimension	:	10.7in X 2.48in X 1.85in
Weight	:	15.5oz. (include batteries)

12.2 Receiver Unit

Frequency Range	:	301 MHz
Channel Spacing	:	25KHz
Hamming Distance	:	6
Frequency Control	:	Synthesizer (PLL)
Frequency Drift	:	< 5ppm
Frequency Deviation	:	< 1ppm
Sensitivity	:	-120dBm
Antenna Impedance	:	50 ohms
Data Decoder Reference	:	Quartz Crystals
Responding Time	:	40mS
Enclosure Rating	:	IP-65
Source Voltage	:	110 ~ 120 VAC 50/60 Hz (standard equipped)
Power Consumption	:	11VA
Operating Temperature	:	-13_ ~ 158_
Output Contact Rating	:	250V @ 10A
Dimension	:	12.2in X 5.3in X 2.8in
Weight	:	4.0lb (include output cable)

13. PARTS LIST

1.	TX Module (All Models)	BTX-10S
2.	PLL Receiver RF Module (All Models)	BRX-301
3.	Encoder Board w/ Pushbuttons	
	Solo 400i	BEN-400i
	Solo 410_V5	BEN-410_V5
	Solo 420_V5	BEN-420_V5
	Solo 430i	BEN-430i
	Solo 430A_V5	BEN-430A_V5
	Solo 420i	BEN-420i
4.	Decoder/Relay Board	
	Solo 400i	BDR-1600
	Solo 410_V5	BDR-1610
	Solo 420_V5	BDR-1620
	Solo 430i	BDR-1630
	Solo 430A_V5	BDR-1630A
	Solo 420i	BDR-1630B
5.	Transmitter Enclosure	
	Solo 400i/410_V5/420_V5/430A_V5/420i	BCT-1600
	Solo 430i	BCT-1630
6.	Receiver Enclosure (All Models)	BCR-1600
7.	Pushbutton Rubber Boot (All models)	HC-00002
8.	2-Speed Pushbutton (All Models)	B-50001
	1-Speed Pushbutton (All Models)	B-50002
9.	Transformer (12/24VDC)	T12V
	Transformer (24VAC)	T24V
	Transformer (48VAC)	T48V
	Transformer (100~120 VAC)	T120V
	Transformer (220~230 VAC)	T230V
	Transformer (380 VAC)	T380V
10.	Suspension Brackets (All Models)	SB1600
11.	Belt Clip (All Models)	BC1600
12.	Emergency Stop Mechanism (All Models)	EM1600
13.	EMS Red Cap (All Models)	RC1600
14.	Compass Direction Labels (All Types)	DL1600
15.	Contact Relay (All Models)	CR1600
16.	MAIN Safety Relay (All Models)	SR1600
17.	Vinyl Protective Cover (All Models)	VC1600
18.	Cable Grip (All Models)	CG1600
19.	External Antenna	ANT301
20.	BNC Connector for External Antenna	BNC301