

Solo 400 Series

Operation Manual

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1. **INTRODUCTION**

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

The Solo 400 Series radio control system has redundant safety circuits that guaranty maximum security and ensures the system is resistant to outside interference. The major features of the Solo 400 are as follow:

- * The system uses an advanced microprocessor at both the transmitter and the receiver unit which utilizes highly evolved software that has redundant error checking and correcting to ensure 100 % error-free transmission, decoding, and control of the output relays. This highly evolved software includes CRC (Cyclic Redundancy Check codes) and Hamming Codes.
- * To insure maximum operating safety; low voltage warning, receiver self-diagnosing, transmitter pushbutton self-diagnosing, transmitter low voltage detection and warning are some of the important standard features included with the system.
- * The encoder/decoder system utilizes advanced microprocessor. The availability of 32,768 sets of unique ID code will ensure that only commands from the matching control transmitter can be carried out without any interference from other radio systems. A special programmable integrated circuit is used to insure the unit cannot simultaneously command conflicting movements.
- * The RF modules are fully SMT designed for stability, combined with resistance M-type coupling and multi-impedance circuits to lower the harmonic and unnecessary radiated interference.

The Solo 400 Series radio control system consists of a transmitter and a receiver unit. The transmitter casing is molded using an industrial strength plastic material which is 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 materials for up to 1.5 million cycles. The transmitter unit uses a special high efficiency power saving circuit that requires only three AA size batteries.

1. SAFETY INSTRUCTION

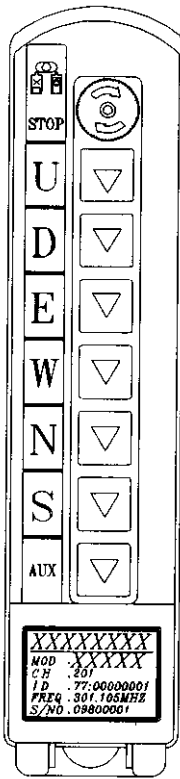
The Solo 400 system is relatively simple to use. However, it is very important to observe the proper safety procedures during operation. When use properly the Solo 400 will enhance productivity and efficiency in the workplace.

The following instructions should be strictly followed:

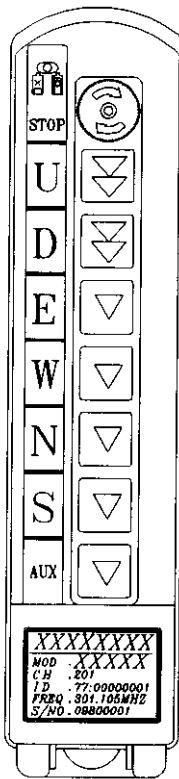
1. Make a daily check of the transmitter casing and pushbuttons. Should it appear that anything could inhibit the proper operation of the transmitter unit, it should be immediately removed from service.
2. The transmitter voltage should be checked on a daily basis. If the voltage is low, the three AA alkaline batteries should be replaced.
3. The emergency stop pushbutton (EMS) should be checked at the beginning of each shift to ensure they are in the proper working order.
4. In the event of an emergency, activate the emergency stop pushbutton immediately. Then turned the power "off" from the main power source of the equipment.
5. The power switch should be turned "off" after use and should never left the power "on" when the unit is unattended.
6. Do not use the same RF channel and ID code as any other unit in use at the same facility.
7. Ensure the wrist strap is worn at all time during operation to avoid accidental dropping.

3. PUSHBUTTON CONFIGURATION

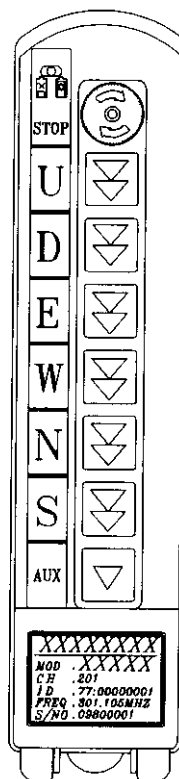
1. Solo 400 : 3 motions, single speed bridge, trolley, and hoist, EMS Stop, AUX.
2. Solo 410 : 3 motions, single speed bridge/trolley, dual speed hoist, EMS Stop, AUX.
3. Solo 420 : 3 motions, dual speed bridge, trolley, and hoist, EMS Stop, AUX.
4. Solo 430 : 4~5 motions, dual speed bridge, hoist/trolley 1 and hoist/trolley 2, EMS Stop.



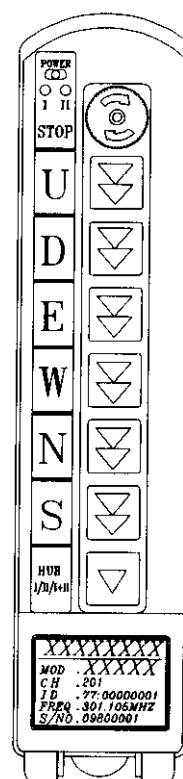
(Solo 400)



(Solo 410)



(Solo 420)



(Solo 430)*

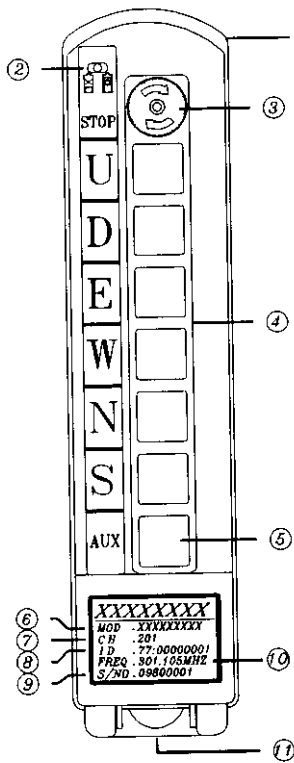
- * For Solo 430 w/ 4 motions, press "HUB" to select which Hoist will be active.

LED I lid up → Hoist I active.
 LED II lid up → Hoist II active.
 LED I & II lid up → Hoist I & II both active.

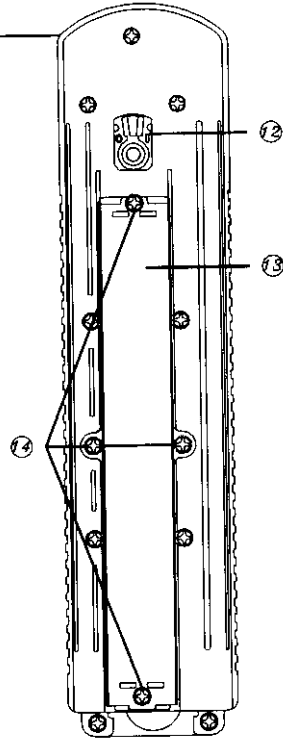
- * For Solo 430 w/ 5 motions, press "HUB" to select which Trolley/Hoist will be active.

LED I lid up → Trolley/Hoist I active.
 LED II lid up → Trolley/Hoist II active.
 LED I & II lid up → Trolley/Hoist I and Trolley/Hoist II both active.

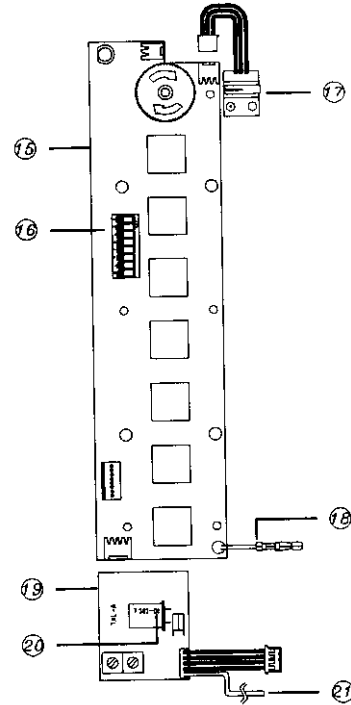
4. TRANSMITTER OUTLINE



(Fig. 1)
Front View



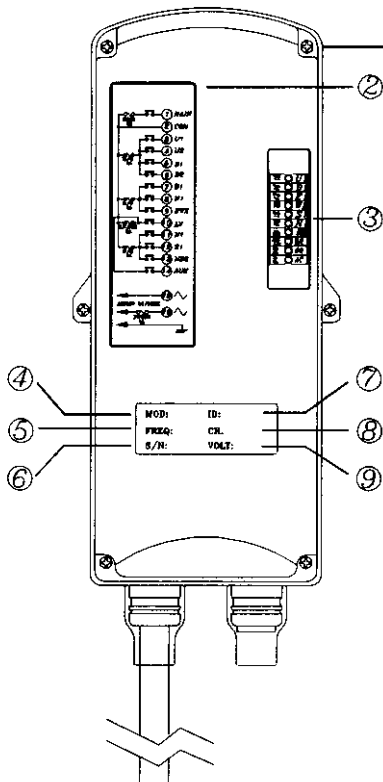
(Fig. 2)
Back View



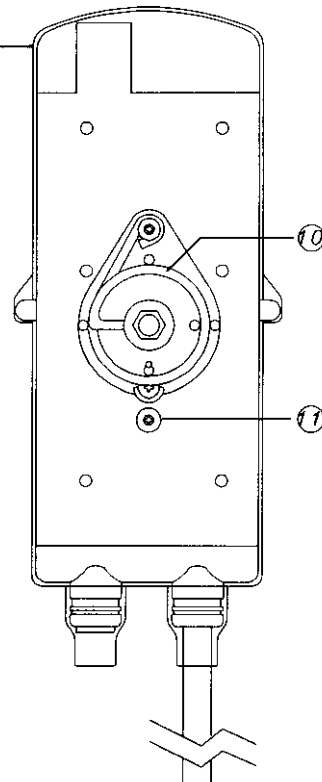
(Fig. 3)
PCB Assembly

- | | | |
|----------------------------|--------------------------|----------------------------|
| 1) Transmitter Enclosure | 8) Security Code (ID) | 15) Encoder Board |
| 2) Battery Power Indicator | 9) Serial Number (S/N) | 16) ID Code Dip-Switch |
| 3) Emergency Stop (EMS) | 10) Frequency (FREQ) | 17) EMS On/Off Switch |
| 4) Pushbutton Rubber | 11) Strap Ring | 18) Grounding of TX Module |
| 5) AUX (See Page 9) | 12) Power Switch | 19) TX Module |
| 6) Model (MOD) | 13) Battery Cover | 20) RF Crystal |
| 7) Frequency Channel (CH) | 14) Battery Cover Screws | 21) Antenna (Aerial) |

5. RECEIVER OUTLINE



(Fig. 4) Front View



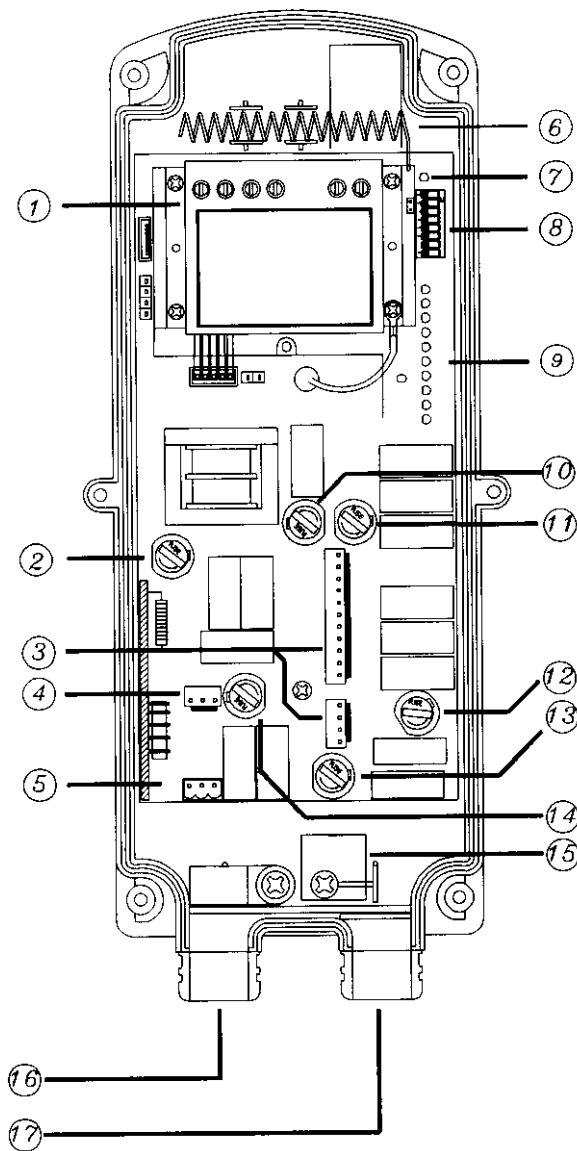
(Fig. 5) Back View

- | | |
|-------------------------------|----------------------------|
| 1) Receiver Enclosure | 6) Serial Number (S/N) |
| 2) Wiring Diagram | 7) Security Code (ID) |
| 3) Contact Relay LED Display* | 8) Channel (CH) |
| 4) Model (MOD) | 9) Supplied Voltage (VOLT) |
| 5) Frequency (FREQ) | 10) Anti-Shock Spring |
| | 11) Grounding (GND) |

* M ~ MAIN contact relay.

* SQ ~ Display of red light upon receiving frequency signals from the transmitter unit.

* AC ~ Power Source (Should be "on" at all time during remote operation).

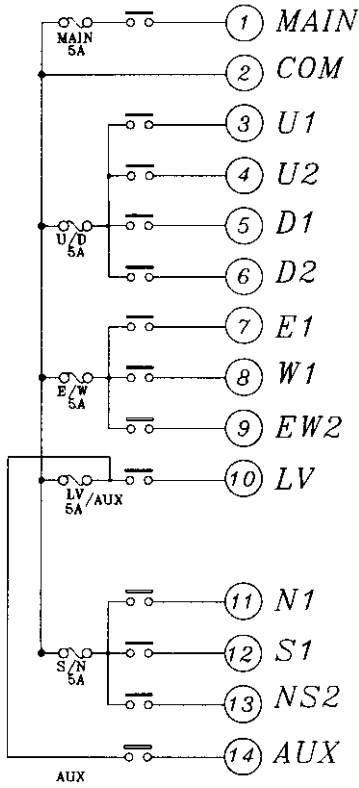


(Fig. 6) Internal Parts Assembly

- | | |
|----------------------------------|--------------------------------------|
| 1) RX Module | 9) Contact Relay LED Display |
| 2) Power Fuse (AC) | 10) MAIN Contact Fuse |
| 3) CN3, CN4 (Contact Output) | 11) Up / Down Fuse |
| 4) CN5 (Reserved Contact Output) | 12) East / West Fuse |
| 5) CN2 (AC Power Connector) | 13) North / South Fuse |
| 6) Antenna (Aerial) | 14) Low Voltage Fuse (LV) |
| 7) System Status LED Display | 15) Spare Fuse & Jumpers |
| 8) ID Code Dip-Switch | 16) Output Mouth |
| | 17) Output Mouth (Reserves-Solo 430) |

6. OUTPUT CONTACT DIAGRAM

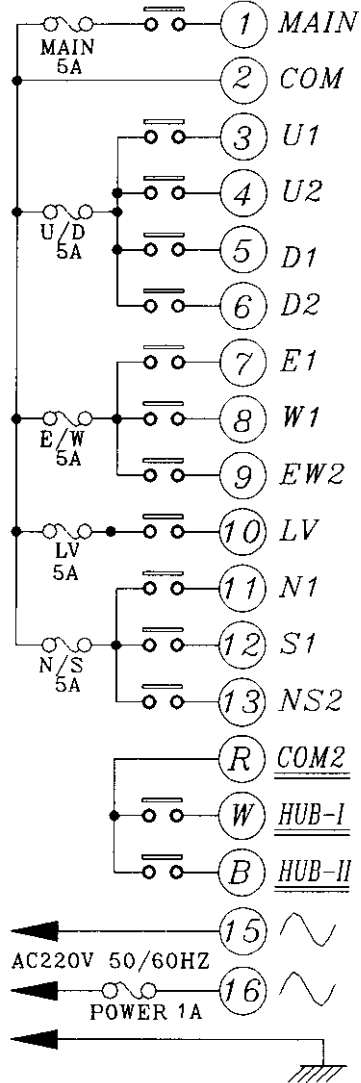
Solo 400/ 410/ 420



← (15) AC 220V 50/60HZ

← (16) POWER 1A

Solo 430



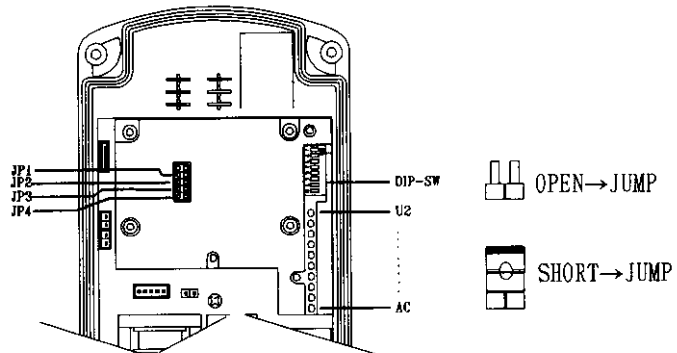
← (15) AC 220V 50/60HZ

← (16) POWER 1A



7. SYSTEM SETTING CONFIGURATION

7.1 How To Set Jumper Functions



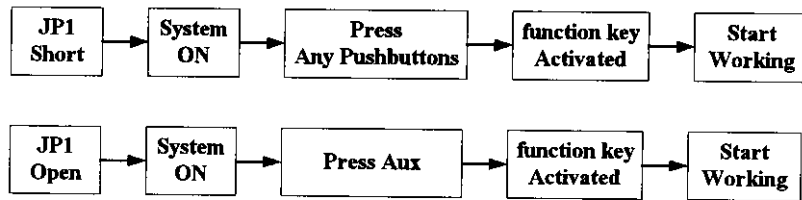
Manufacture settings.

JP1	Open	Press "AUX" for key function and MAIN contact relay activation after power "on" and EMS reset.
	Short	Press any pushbutton for key function and MAIN contact relay activation after power "on" and EMS reset.
JP2	Open	MAIN contact relay "on" constantly.
	Short	After 5 minutes of non-transmitted signal from the transmitter unit, the MAIN contact relay will be deactivated (see note A).
JP3	Open	LV warning only, MAIN and LV will not be deactivated.
	Short	TX low battery for period of one minutes, MAIN and the LV will be deactivated (see note B).
JP4	Open	AUX with normal key function.
	Short	AUX with toggle key function.

Note A MAIN contact relay cut-off time can be set from 0~30 minutes via external programmer; manufacture preset at 5 minutes.

Note B: In case of transmitter low voltage, the transmitter will send a low voltage signal (LV) to the decoder unit. After one minute of LV warning, the MAIN and LV relays from the receiver unit will be deactivated (system "off" temporarily). Within that one minute of LV warning, the LV contact relay from the receiver unit will open and close at every one-second interval. By connecting a horn, light, or siren to the LV contact relay will ensure that the operator will definitely notice the transmitter low-voltage even in hard to see or hear environments. After changing a set of new batteries and press "AUX" or any pushbutton (see JP1 setting) to reactivate the MAIN and LV contact relay again.

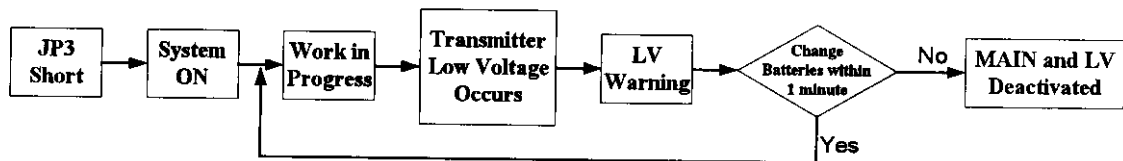
JP1



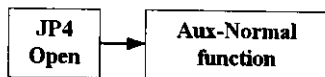
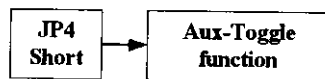
JP2



JP3



JP4



8. RECEIVER INSTALLATION

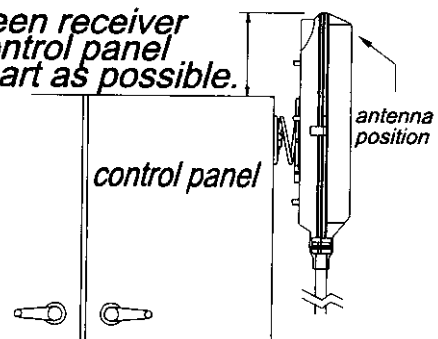
8.1 Preparation For Installation

1. Required Tools:
 - (1) Flat Head Screwdriver (-)
 - (2) Phillips Head Screwdriver (+)
 - (3) Multi-Meter
 - (4) 14mm Wrench x 2
 - (5) 10.5mm Drill-Bit
2. Ensure receiver is not set to the same channel and ID code as any other units in operation at the same facility.
3. Prior to installation, make sure that the crane system itself is working properly.
4. Use the multi-meter to check the voltage source available and ensure receiver voltage setting is correct for this voltage.
5. Prior to installation, switch off the main power source to the equipment.

8.2 Step By Step Installation

1. Select a suitable location to mount the receiver.
 - (1) The location selected should have the antenna visible from all areas where the transmitter is to be used.
 - (2) The location selected should not be exposed to high levels of electrical noise.
 - (3) Ensure the selected location has adequate space to accommodate the receiver enclosure.
 - (4) Make sure that the receiver unit is in upright position (vertical).
 - (5) The distance between the antenna and the control panel should be as far apart as possible (see diagram next page).
 - (6) Drill a hole on the control panel (10.5mm)
 - (7) Tightened the two screws provided.
 - (8) If the control panel has a plastic surface, extended grounding wire should be used.
 - (9) For system wiring, please refer to the output contact diagram on page 8 or on the receiver enclosure.
 - (10) Ensure all wiring is correct and safely secured and all screws are tight.

The distance between receiver antenna and the control panel should be as far apart as possible.

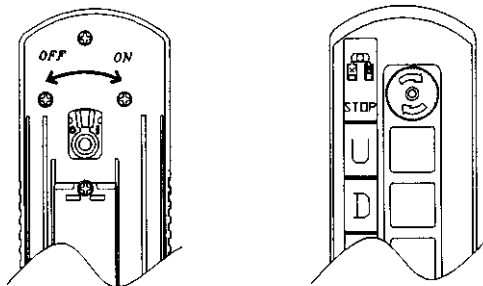


8.3 System Testing

1. Connect the power source to the receiver and test the operation of each function to ensure it operates in the same manner as the pendant controller.
2. Ensure the MAIN contact relay can be properly controlled by the remote control.
3. Ensure the limit switches on the crane that limit the travel of the crane is working properly.
4. Ensure the pendant controller is located in a safe location where it would not interfere with remote operation.

9. TRANSMITTER OPERATION

1. Make sure the three (3) alkaline batteries are installed correctly.
2. Turn “on” the power switch located on the backside of the transmitter unit (see diagram below). Immediately after turning “on” the transmitter unit, the status LED indicator at the top left hand corner of the transmitter unit will display a green light for up to two (2) seconds, do make sure that the red EMS pushbutton is in “up” position. Press “AUX” or any pushbutton to activate the transmitter key function and the receiver MAIN contact relay (see JP1 setting on page 9). If the status LED displays a red blinking light or no light at all, then you must replace a set of new batteries before operation.
3. When command pushbuttons are pressed, the status LED indicator on the transmitter unit will display a short blinking green light to indicate signal transmitted.
4. In case of an emergency, press down the red EMS pushbutton will immediately deactivates the MAIN contact relay from the receiver unit and the key function of the transmitter unit. The status LED indicator on the transmitter unit will show a continuous blinking red light when EMS is activated. To resume back to operational status, turn the red EMS pushbutton clockwise, it will pop up to its non-active state, and then press the “AUX” pushbutton or any pushbuttons to reactivate the MAIN contact relay and the transmitter key function (see JP1 settings on page 9).
5. Please note that the conflicted movements are interlocked to one another for safety purpose, it can also be set at a non-interlocked state via external programmer. Pressing conflicted commands at the same time will result in a non-transmission. (i.e. Press “U” & “D” at the same time, no action will be carried out)



10. TROUBLE SHOOTING

Should the operator find the equipment not operating normally, please check the chart below for simple trouble shooting steps:

SYMPTOM	REASON	SOLUTION
Transmitter does not communicate to receiver.	Transmitter and the receiver are not on the same RF channel (SQ lamp not lit) or ID code.	Ensure the correct transmitter is in use. The labels on the receiver and the transmitter 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 power of the transmitter unit and EMS in "up" position. If the status LED shows red blinking light or no light at all, then turn the power "off" and replace the three alkaline AA batteries.
No power to the receiver (AC power indicator on the receiver unit 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 burned fuses.
Outputs do not operate correctly.	Receiver configuration is not set properly or output wiring is incorrect.	Please refer to section 6 and 7 to ensure receiver is correctly wired and configured for your application.

Receiver System Status LED Display (Fig.6):

TYPE	LED INDICATION (Red)	REASON
1	Constant red light without Flashes	EEPROM error, manufacture reprogramming required.
2	ON → 1 second OFF → 1 second	Incorrect ID code, please readjust accordingly.
3	No lights at all.	Under-voltage, check main power supply.
4	ON → 1.9 seconds OFF → 0.1 second	System error, manufacture reprogramming required.

IMPORTANT

“This equipment has been tested and found to comply with the limits for an intentional radiator pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:”

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment in to an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experience radio/TV technician for help.*

11. SYSTEM SPECIFICATION

11.1 Radio Transmitter

Frequency Range	:	301 - 480 MHz
Transmitting Range:	:	150-300 feet
Channel Spacing	:	25KHz
Hamming Distance	:	4
Frequency Control	:	Quartz Crystals
Frequency Drift	:	< 5ppm @ -20°C ~ +70°C
Frequency Deviation	:	< 1ppm @ 25°C
Spurious Emission	:	- 45dB
Transmitting Power	:	~1mW
Emission	:	F1D
Antenna Impedance	:	50 ohms
Enclosure	:	IP-65
Source Voltage	:	4.5VDC (AA Alkaline Batteries X 3)
Current Drain	:	7.5 ~ 18mA
Operating Temp.	:	-20°C ~ +70°C
Dimension	:	272mm X 63mm X 47mm
Weight	:	439g (Including Batteries)
Impact Durability	:	50G

11.2 Receiver

Frequency Range	:	301 ~ 480 MHz
Channel Spacing	:	25KHz
Hamming Distance	:	4
Frequency Control	:	Quartz Crystals
Frequency Drift	:	< 5ppm @ -20°C ~ +70°C
Frequency Deviation	:	< 1ppm @ 25°C
Sensitivity	:	0.4 μ V
Antenna Impedance	:	50 ohms
Data Decoder Reference	:	Quartz Crystals
Responding Time	:	40mS (Normal)
Enclosure	:	IP-65
Source Voltage	:	48 ~ 230VAC 50/60 Hz.
Power Consumption	:	11VA
Operating Temp.	:	-20°C ~ +70°C
Output Contact Rating	:	250V @ 10A
Dimension	:	310mm X 134mm X 72mm
Weight	:	1700g (Including Cable)

12. SPARE PARTS LIST

- | | |
|--------------------------------|---------|
| 1. TX Module | BTX10S |
| 2. RX Module | BRX10S |
| 3. Encoder Board w/pushbuttons | BEN420 |
| 4. Decoder Board | BDR1620 |
| 5. Transmitter Enclosure | BCT16 |
| 6. Receiver Enclosure | BCR16 |