TELECRANE REMOTE CONTROLS
F21 12/6 S/D
MANUAL

CONTENTS

INSTALLATION & OPERATION

PRECAUTIONS OF OPERATION

ATTENTION

Please carefully read the manual before installing and operating this device.

Due to the complex nature of this equipment it is necessary to read the entire manual before installation.

Never dismantle the equipment by any unauthorized personnel, or equipment may be damaged.

This manual is for reference only. Pleases consult your distributor for further assistance.

The equipment has been strictly tested for quality before delivery from our plant. However, this equipment must not be used in dangerous situations or where damage may result.

After finishing operation of TELECRANE shut off main power to the crane, power to receiver, and remove transmitter key. If transmitter's power is controlled by "rotary key switch", then turn the key to "OFF" position and remove it.

Transmitter should be placed in a safe area when not in use to avoid accidental pressing of buttons.

The crane should be equipped with main power relay, limit switch and other safety devices.

The GND (ground) of the receiver must be in contact with the metal part of the crane or electrical shock may occur.

Don't use equipment during lightening or high electrical interference conditions.

Make sure that the batteries are in good condition and power for receiver is correct.

Installation and maintenance should only be done while the crane's main power is off to prevent electrical shock.

The contents of this manual may be amended by the manufacturer without notice.

The manufacturer may introduce new functions to the equipment as necessary; therefore, the descriptions may change.

The patent and related documents for the equipment belong to The Manufacturer and they aren't allowed to be used by others without permission.

F21 series systems adopt many of patents belong to The Manufacturer. and its associated companies.

PRECAUTIONS

Operating in an industrial facility is highly dangerous; therefore, operator must have adequate training in using TELECRANE with this in mind.

Those who operate the machine should be healthy and have good judgment in regards to safety.

Although the F21 transmitter is very durable and weather resistant care should be taken not to expose it to severe impact or pressure.

During operation, if the power supplied from transmitter's batteries is insufficient, the transmitter will send out EMS signal first to de-energize all of motion relays inside the receiver to stop crane's moving (Notice: the motions which are set as "Bypass EMS" will continuously move.), and then the LED indicator and buzzer on transmitter will light and sound continuously. At this time, they need to be replaced with AA size alkaline batteries. All four batteries should be replaced at the same time. Don't use manganese-zinc batteries because of their corrosive properties.

If the severe interference occurs you should stop using the equipment at once.

The standard voltage of rechargeable nickel-cadmium battery is 1.2 volts with capacity 500-800 mAH. When they are used in F21 system, the operating time will be shorter.

Please take the battery out when the equipment will not be used for a long time.

Be sure to know the "Procedures of emergency" in case of emergency.

PROCEDURES OF EMERGENCY

The F21 system has various protections to guard against different emergencies including strict security code checking and automatic monitoring of parts failure. The F21 system has isolation circuitry to protect from outside voltage surges and interference. In the event of sensing an emergency situation the F21 will perform an emergency stop of the equipment. It is important to properly install the F21 system so it can perform the emergency shutdown properly.

In case of an Emergency, please follow the steps below and ask the distributor for service immediately.

(1) Press EMS button.
(2) Pull the magnetic key out of the transmitter. If transmitter's power is controlled by "rotary key switch", then you need turn the key to "OFF" position to remove it.
(3) Switch off the main power of crane.
(4) Advise the distributor to find out the reason.

GENERAL CHARACTERISTIC

GENERAL SPECIFICATIONS

- Operating Frequency-------------------- : 415 ~ 483 MHz (set by software)

- Hamming Distance ---------------------- : $\geqq$ 4

- I.D. Code-------------------------------- : 232; more than 4 billion sets (set by factory, never repeated)

- Temperature Range---------------------- : -35℃ ~ +75℃

- Channel Spacing------------------------- : 5KC/6.25KC or integral multiple (set by software)

- Maximum Operating Range------------ : Up to 100 Meters

- Structure-------------------------------- : Fibre-Nylon

- Protection Degree----------------------- : IP 65

TRANSMITTER SPECIFICATIONS

- Power Supply--------------------------- : Four 1.5volt Alkaline or Rechargeable Batteries (AA Size)

- RF Power-------------------------------- : < 10 mW

- Modulation------------------------------ : $\leq \pm 2.5$KHz; NBFM

- Pushbutton Type------------------------ : Two step Mechanical Switch

- Dimensions------------------------------ : 186x61x51mm (excluding protrusion)

- Weight----------------------------------- : about 360g (including batteries)

RECEIVER SPECIFICATIONS

- Power Supply--------------------------- : AC 110/220/380V (50/60Hz) (tolerance$\pm$10%)

- Sensitivity------------------------------ : -110DBm (Date Error Rate < 10–3)

- Image Rejection------------------------- : > 60dB

- Rejection of Adjacent Channels ------- : > 80dB ($\pm$ 20KC)

- Output Relays--------------------------- : 10A/250VAC; 8A/30VDC

- Dimensions------------------------------ : 200x162x107mm (excluding protrusion)

- Weight----------------------------------- : about 1640g (excluding wire cable)

F21-12D/12S SYSTEM

F21-6D/6S SYSTEM:

TRANSMITTER PARTS

Stop Button

LED indicator

Motion Buttons

Auxiliary Buttons

ANTENNA

Rotary Key Switch

Motion Buttons

Auxiliary Buttons

Battery Cover

Receiver's parts

Antenna

Receiver/
Decoder
Module
(inside)

Relay
Module
(inside)

Transformer
(inside)
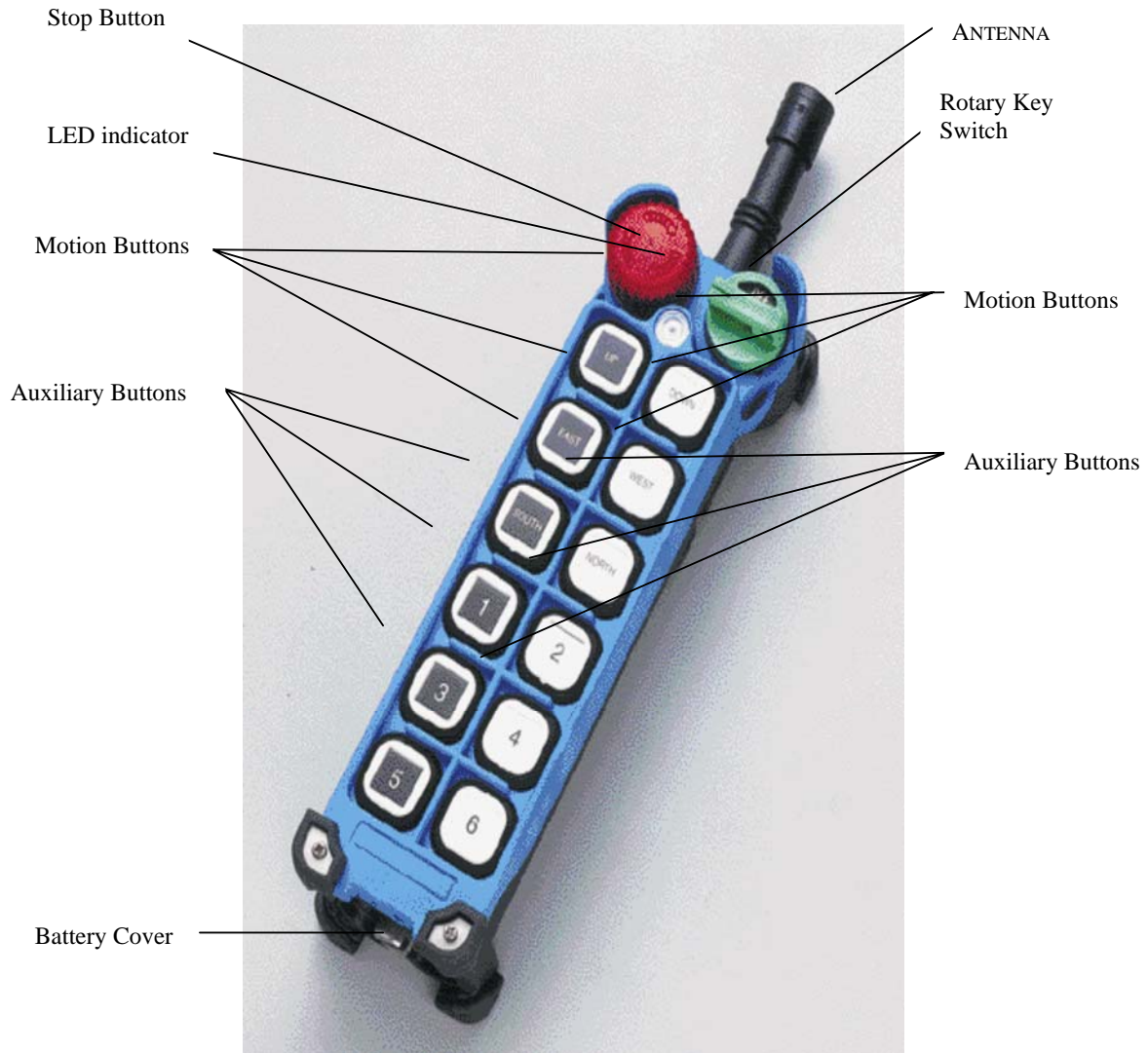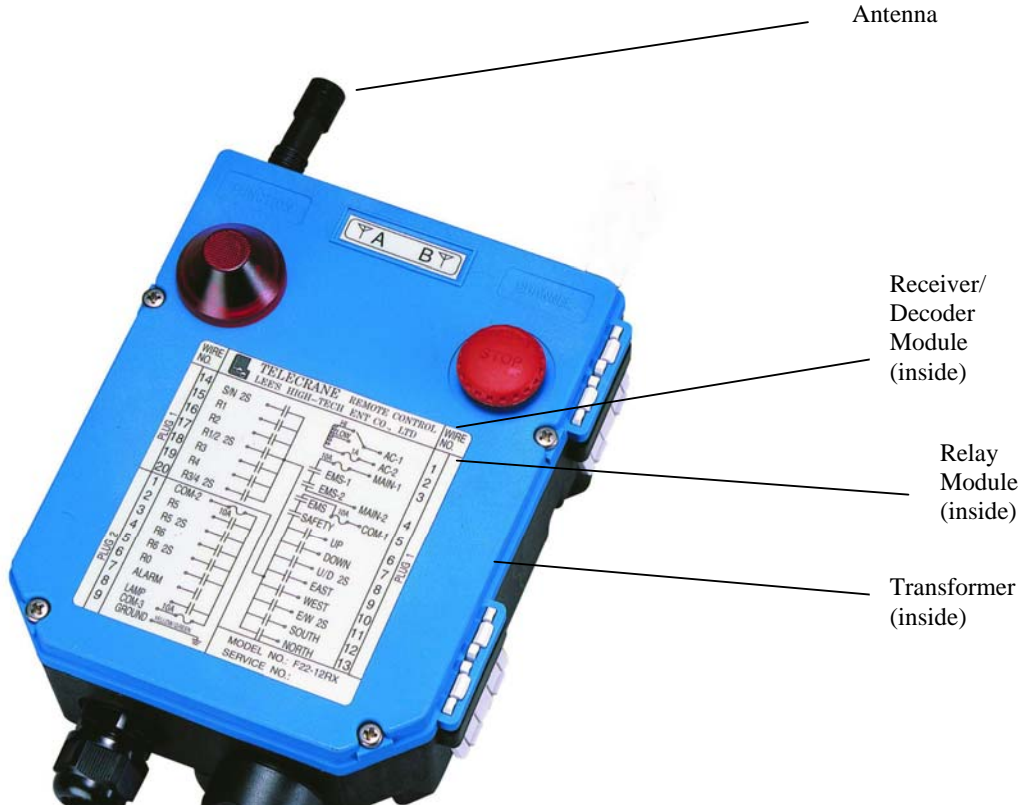
INSTALLATION

PRECAUTIONS DURING INSTALLATION

(1)   Observe all safety precautions when climbing the crane.
(2)   Turn off the main power source of crane before installation to avoid electric shock.
(3)   Receiver must be installed in such a way that it will not touch any part of the building during the operation.
(4)   Receiver must be fastened securely.
(5)   Two external antennas must be used when receiver is installed in a metal box.
(6)   Before installation, inspect the crane's safety devices, and make sure everything is in proper working condition.
(7)   Make sure you understand the crane circuits and power distribution as well as the function setting of remote controller, to avoid incorrect wiring.
(8)   To avoid any interference, the Receiver must be away from motors, frequency converter and power cable (show as below).
(9)   The Receiver should be installed on the top of the electrical control box. Don't mount the receiver inside   .
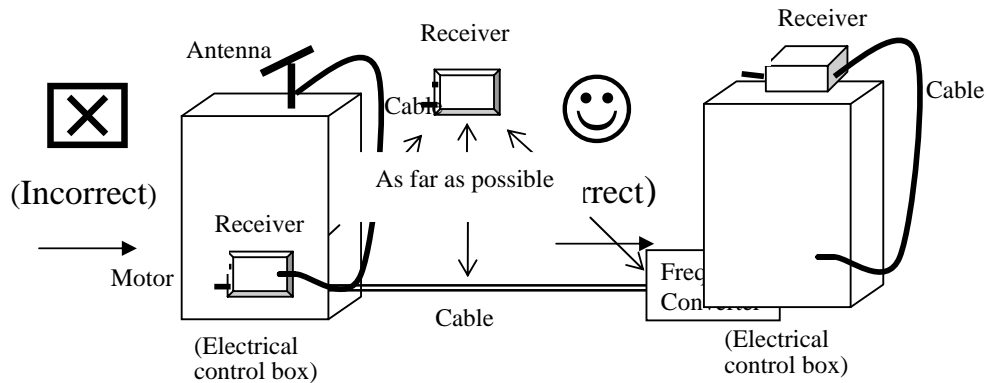
RECEIVER INSTALLATION INSTRUCTIONS

PREPARATION FOR INSTALLATION

   (1)   Provide all necessary tools.
   (2)   Select a proper location.
   (3)   Select a stable place.
   (4)   Select a place where you can see the Receiver or Antenna.
   (5)   Select a place where there are no sparks, e.g. keep away from motors, relays, magnetic switches and power cables.
   (6)   Keep away from high-voltage wiring and devices.
   (7)   The Receiver case must be at least 3 cm away from other obstacles.

INSTALLATION OF PROPER POWER SOURCE

The input power source for the receiver can be 110/220/380 VAC (50/60 Hz) etc. After the power source is confirmed, one must select the proper connector for the voltage applied to the relay module transformer primary winding.

Selective power supply for F21-12S/12D as illustration as below:
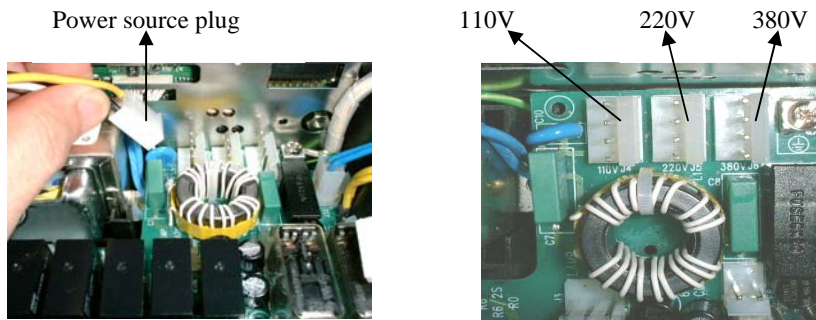
There are 3 kinds of voltage (110V/220V/ 380V) supplied in F21-12S/12D
This could be set as required before shipment, or follow the procedures to change the voltage you need.
   (1)   Turn off the Receiver.
   (2)   Pull out the power source plug from the previous voltage position
   (3)   Plug in the power source plug to the voltage you need.
   (4)   Complete.

Note: If the voltage you need is 48V/62V/110V, please contact distributor.

Selective power supply for F21-6D as illustration as below:
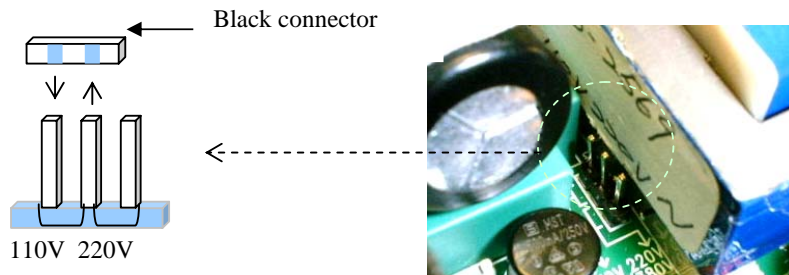
There are 2 kinds of voltage (110V/220V) supplied in F21-6D
This could be set as required before shipment, or follow the procedures to change the voltage you need.
   (1)   Turn off the Receiver.
   (2)   Using tool to pull out the black connector from the previous voltage position.
   (3)   Using tool to plug in the black connector to the voltage you need.
   (4)   Complete.

INSTALLATION SEQUENCE

(1)   Turn off the main power for the crane.
(2)   Attach the template (provided) for the receiver to the proper place.
(3)   Drill the holes for the screws, mount receiver, and then secure the receiver with 6mm nuts on the vibration-resistant feet.
(4)   Connect the cables to the control circuit of the crane according to the receiver's wiring chart and control contact diagram.
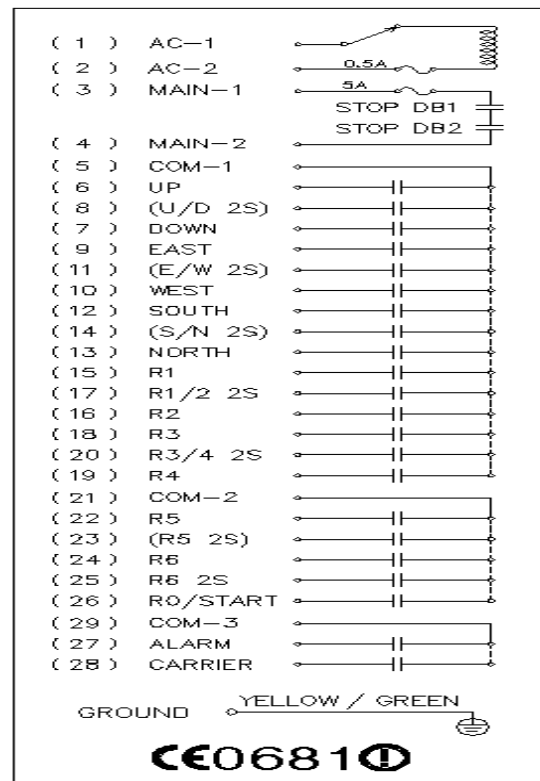
NOTES

(1)   Inspect and make sure that all wires are connected correctly.
(2)   The earth ground for the remote controller and crane must be properly connected to ensure safety.
(3)   Secure the cables between the receiver and crane so that the cable bracket will not wear through due to the vibration of the crane.
(4)   Open the top cover of the receiver and turn the Relay module's Run/Test switch to the "Test" position.
(5)   Turn on the main power for the crane.
(6)   Operate the transmitter to test all functions and make sure they all operate correctly as shown by the LED indicators.
(When the Run/Test switch is set to the "Test' position, the relays will not function, but the LEDs will display)
(7)   Turn the Run/Test switch to the "Run" position and secure the top cover to the receiver with screws.
(8)   This completes the installation of the receiver.

OPERATION

START UP

Remove the cover of battery box.
(1) Install 4 Fresh AA-size batteries in the battery box. Make sure the "+" and "-" directions are correct.
(2) Attach back the battery cover.
Note: Transmitter will sound two-long beeps to indicate the correct installation.
(3) Turn on the power according to the "Power-On Modes" (see below).
Note: LED indicator will flash with red colour if proper procedures are not followed.
(4) Operate transmitter by pressing each pushbutton.
(5) After operation, perform the following procedures in sequence: (1) Press EMS mushroom, (2) rotate key counter-clock-wise to the "OFF" position, (3) remove key and keep it in a safe place, (4) remove batteries if not used for a long period.

POWER INDICATING FUNCTIONS OF LED DISPLAY.

Green:
Sufficient power to operate transmitter.
(In order to save power, one can program to turn off LED display when power is sufficient.)

Yellow:
Power is depleting, warning sound occurs every 4 seconds
(can be switched off and sound interval can be set by software).
Operation must be stopped immediately (for example: lower the goods to ground) to replace batteries.

Red:
Insufficient power.
In addition to red LED, warring sound will continue and transmitter will no longer function.
Transmitter will send out an emergency stop signal to the receiver due to insufficient power.
Operator should avoid this situation in order to maintain the safety of operation.

POWER-ON OPERATION

Power-on means that the Main-Relay on receiver will energize as soon as receiving the control data from transmitter and then receiver keep in condition of standby for continuous control. There are 4 different ways of "Power-On mode" could be setting.

ANY PUSHBUTTON POWER-ON MODE

(1) Rotate "EMS" mushroom clockwise 45° and pull out.
(2) Turn key clockwise to "ON" position.
(3) Press any pushbutton on the transmitter (or A, B switch). This will turn on the power as well as execute the function of pushbutton.

"START" (MAGNETIC KEY SWITCH) POWER-ON MODE

(1) Rotate "EMS" mushroom clockwise 45° and pull out.
(2) Turn Key switch clockwise to "ON" position.
(3) Turn Key switch 45° beyond "ON" position to turn on power.

Note: When setting is on "Any pushbutton power-on" or "Start pushbutton power-on", the transmitter is in the "non-continuous" mode (i.e. pushbutton must be pressed to operate the function), it can save power.

E.U. STANDARD POWER-ON MODE

      (1)   Rotate "EMS" mushroom clockwise 45º and pull out.
      (4)   Turn Key switch clockwise to "ON" position.
      (2)   Turn Key switch 45º beyond "ON" position to turn on power.
      (3)   After 3 minutes of non-operation, transmitter will send out an emergency stop signal to the receiver. When this occurs, one must turn the magnetic key counter-clockwise to the "OFF" position, then turn the key clockwise to the "ON" position, and press "Start" pushbutton to turn on the power.

Note**:** When setting is on "E.U. standard" Power-on Mode, the transmitter is in the continuous mode.

SOFTWARE POWER-ON MODE

This "Power-On" mode is controlled by the software. It consists of:

      (1)   Whether the receiver Power-Off automatically when no operation for a period of time.
      (2)   Whether a password is required to turn on power.
      (3)   Whether an "emergency stop" signal will be sent out…
           etc.

ACCELERATION / DECELERATION OPERATION

      (1)   "South" pushbutton is the acceleration pushbutton; "North" pushbutton is the deceleration pushbutton.
      (2)   When a motion is in the second speed, quick touch of acceleration pushbutton will double the speed. Repeated touch of acceleration pushbutton will increase the speed up to 5 times.
      (3)   To reduce the speed, touch the deceleration pushbutton. Repeated touch of deceleration pushbutton will reduce to the second speed.

Note:

      (1)   When accelerate/decelerate, the motion pushbutton must be depressed and held in the second speed. If motion pushbutton is released, there will be no acceleration/deceleration and speed will return to zero.
      (2)   Press "North" pushbutton will perform the "Alarm" function if the speed is reduced to the second speed.

INCHING OPERATION

      (1)   "South" pushbutton is set for "inching" pushbutton.
      (2)   Press and hold inching pushbutton.
      (3)   Press any motion pushbutton to perform the inching motion.

Note: The other pushbutton of transmitter must be released before press inching pushbutton.

CHANGE OF FREQUENCY

This remote controller provides 3 operating frequencies. When remote controller is interfered by radio wave and can't operate properly, the operator can change the transmitter's frequency according to the following procedures without changing the channel in the receiver. This eliminates the trouble of climbing to the receiver.

Note 1: From the transmitter, one can depress the corresponding pushbutton to change operation frequency. In the meantime, LED indicator displays different colours to show the operation frequency as follows:

Operation frequency	LED Colour	Corresponding pushbutton
Frequency A	Red	"Up" pushbutton
Frequency B	Yellow	"Down" pushbutton
Frequency C	Green	"East" pushbutton

Note 2: From the transmitter, one can follow to the below-mentioned procedures to check the operation frequency.

(1)   Press EMS mushroom.
(2)   Turn security key to "Off" position and then turn security key clockwise from "Off" to "On" position.
(3)   At this moment, LED indicator will display the corresponding colour to show the present operation frequency of transmitter.

Note 3: Both receiver and transmitter must be in the same operation frequency to operate properly. (e.g. both in Frequency A, or B, or C).

Note 4: Channels 1 to 256 can be set by Dip switch in the receiver or set by software.

$\downarrow \ \downarrow$ $\downarrow \downarrow \downarrow$ $\downarrow \downarrow$ $\downarrow$

$A_1 \ A_2$ ……………… …..….$A_{256} \ B_1 \ B_2$……   ……. $C_1 \ C_2$ ………………………. C_{256}

Dip switch in the receiver is an 8-bit for 256 channels. If current setting is channel 16, one can choose among frequency A16, B16, C16.

˙Bandwidth of each section and separation between channels can be set by software. e.g. A1=430,000MHz A2=430,025MHz…..
A255=436,375MHz; B1=436,400MHz…etc.

PROCEDURE FOR CHANGING OPERATION FREQUENCY:

Step	Action	Remark
1	Press EMS mushroom.	1. "Up" pushbutton = Frequency A
2	Turn key to "Off" position.	2. "Down" pushbutton = Frequency B
3	Depress and hold the pushbutton in accordance with the frequency that you want to change. **Note:** The pushbutton must be depressed and held until step 6 is completed.	3. "East" pushbutton = Frequency C
4	Turn key clockwise from "Off" to "On" position	
5	Turn key counter-clockwise from "On" to "Off" position once LED indicator is ceased flashing.	
6	Compete	
7	Power-On according to the proper procedure described previously and return to normal operation.	

ENTER PASSWORD OPERATION

(1)   Rotate "EMS" mushroom clockwise 45° and pull out.
(2)   Turn key clockwise to "ON" position.
(3)   Press the pushbutton sequentially to enter password within 10 seconds. (Remark: This time duration of "Password Complete" can be set by software. At the duration of "Password Complete" the LED indicator will flash with Green colour.)
(4)   The buzzer of transmitter will sound one-long sound to indicate the password is correct. After buzzer turns off, Power-On according to the proper procedure and return to normal operation.
(5)   If password is incorrect then the buzzer will sound with two-short sound and one–long sound. Enter the correct password again after buzzer is turned off.

Note 1: The function of password can be set by software in order to avoid unauthorized people to use remote controller.

Note 2: One must re-enter password to return to normal operation if EMS mushroom has been pressed (or "emergency stop" signal has been transmitted due to transmitter auto power off).

FUNCTION SETTING

The operation of the controller can be modified to suit a specific application, using a PC with a special interface cable.

For further information please contact your distributor.

START SWITCH FUNCTION SETTING:

Item	Title	Options	Description
A	Function	1. No Function 2. Alarm 3. Normal 4. Toggle	This function is available only when remote controller is in "Power-On" mode. **"Alarm":** The alarm relay will close and the receiver alarm will sound if the rotary key switch is rotated to the "Start" position, and the alarm relay will turn off when the rotary key switch is released. **"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off".

UP/DOWN PUSHBUTTON FUNCTION SETTING:

Item	Title	Options		Description
A	Interlock	1. Interlock 2. Non-Interlock		**"Interlock":** If the motions cannot be operated simultaneously then select "Interlock". **"Non-Interlock":** If the motions are allowed to operate simultaneously then select "Non-Interlock". This item is selectable only when UP and DOWN pushbuttons are set at "Normal" function.
B	Function	UP:	DOWN:	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"ON & OFF":** The two pushbuttons are set to respectively control the same relay. If a pushbutton set as "on" is pressed and released, then the relay remains closed. No other pushbutton can change the status of this relay except the pushbutton set as "off".
		1. Normal	Normal	
		2. Toggle	Normal	
		3. Toggle	Toggle	
		4. On	Off	

EAST/WEST PUSHBUTTON FUNCTION SETTING:

Item	Title	Options		Description
A	Interlock	1. Interlock 2. Non-Interlock		**"Interlock":** If the motions cannot be operated simultaneously then select "Interlock".
				"Non-Interlock": If the motions are allowed to operate simultaneously then select "Non-Interlock". This item is selectable only when East and West pushbuttons are set at "Normal" function.
B	Function	East:	West:	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"ON & OFF":** The two pushbuttons are set to respectively control the same relay. If a pushbutton set as "on" is pressed and released, then the relay remains closed. No other pushbutton can change the status of this relay except the pushbutton set as "off".
		1. Normal	Normal	
		2. Toggle	Normal	
		3. Toggle	Toggle	
		4. On	Off	

SOUTH/NORTH PUSHBUTTON FUNCTION SETTING:

Item	Title	Options		Description
A	Interlock	1. Interlock 2. Non-Interlock		**"Interlock":** If the motions cannot be operated simultaneously then select "Interlock". **"Non-Interlock":** If the motions are allowed to operate simultaneously then select "Non-Interlock". This item is selectable only South and North pushbuttons are set at "Normal" function.
B	Function	South:	North:	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"ON & OFF":** The two pushbuttons are set to respectively control the same relay. If a pushbutton set as "on" is pressed and released, then the relay remains closed. No other pushbutton can change the status of this relay except the pushbutton set as "off".
		1. Normal	Normal	
		2. Toggle	Normal	
		3. Toggle	Toggle	
		4. On	Off	

R1/R2 PUSHBUTTON FUNCTION SETTING:

Item	Title	Options		Description
A	Interlock	1. Interlock 2. Non-Interlock		**"Interlock":** If the motions cannot be operated simultaneously then select "Interlock". **"Non-interlock":** If the motions are allowed to operate simultaneously then select "Non-Interlock". This item is selectable only when R1 and R2 pushbuttons are set at "Normal" function.
B	Function	R1:	R2:	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"ON & OFF":** The two pushbuttons are set to respectively control the same relay. If a pushbutton set as "on" is pressed and released, then the relay remains closed. No other pushbutton can change the status of this relay except the pushbutton set as "off".
		1. Normal	Normal	
		2. Toggle	Normal	
		3. Toggle	Toggle	
		4. On	Off	

R3/R4 PUSHBUTTON FUNCTION SETTING:

Item	Title	Options		Description
A	Interlock	1. Interlock 2. Non-Interlock		**"Interlock":** If the motions cannot be operated simultaneously then select "Interlock". **"Non-interlock":** If the motions are allowed to operate simultaneously then select "Non-Interlock". This item is selectable only R3 and R4 Pushbuttons are set at "Normal" function.
B	Function	R4:	R3:	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"ON & OFF":** The two pushbuttons are set
		1. Normal	Normal	
		2. Toggle	Normal	
		3. Toggle	Toggle	
		4. On	Off	
				To respectively control the same relay. If a pushbutton set as "on" is pressed and released, then the relay remains closed. No other pushbutton can change the status of this relay except the pushbutton set as "off".

R5/R6 PUSHBUTTON FUNCTION SETTING

(The function of R5 pushbutton also can be set by dip switch that locate on the Receiver/Decoder Module)

Item	Title	Options	Description
A	EMS	1 Bypass. EMS 2. Control by EMS	**"Bypass EMS"** means that the relays associated with the R5/R6 pushbuttons will not be controlled by the EMS mushroom or an emergency stop signal. **"Control by EMS"** means that the relays associated with the R5/R6 pushbuttons are controlled by the EMS mushroom or an emergency stop signal.
B	R5 Function	1.Normal 2.Toggle 3.Inching 4.Acceleration	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"Inching":** Inching means that when the pushbutton is pressed then the associated relay will be closed for a certain time, in order to operate with short, precise movements. Press and hold inching pushbutton and then press a motion pushbutton to perform the inching motion. "Inching time" is from 0.1~0.5 sec and 0.01~0.09 sec, and can be set by software or DIP switch. **"Acceleration":** The R5 pushbutton can be selected as an acceleration pushbutton if the crane's speed is three or more speeds. When a motion is in the 2nd speed, a quick touch of the acceleration pushbutton will increase by one speed and the associated relay of R5 will close. When using acceleration, the motion pushbutton must be depressed and held in the 2nd speed. If the motion pushbutton is released, there will no acceleration and the speed will return to zero.
C	R6 Function	1. Normal 2. Toggle 3. Deceleration 4. No function	**"Normal":** The associated relay is "on" when the pushbutton is pressed and held, and is "off" when the pushbutton is released. **"Toggle":** Press the pushbutton and release once for "on", re-press and release for "off". **"Deceleration":** Touch deceleration pushbutton to reduce speed. Repeat touches of deceleration pushbutton will reduce to 2nd speed.
D	Inch. Time	1. 0.2sec 2. 0.1~0.5 sec 3. 0.01~0.09 sec	**"Inching time"** can be set from 0.1~0.5 sec and 0.01~0.09sec. This function is used for operating the crane with short and precise movements (e.g. accurate position). "Inching Time" is the amount of time the associated relay is.

OTHER TRANSMITTER FUNCTIONS

Item	Title	Options	Description
A	Power-On	1. Mushroom or key 2. Mushroom 3. Key 4. Any pushbutton 5. Start pushbutton 6. E.U. (standard) 7. E.U. (simple)	**"Power-ON":** It means that the stop relay of receiver is energized. **"Mushroom or Key Power-On mode":** This mode means that the receiver will be in the Power-On mode if one of the "Mushroom Power-On" or "Key Power-On" is executed. **"Mushroom Power-On mode":** The receiver will be in the Power-On mode when the mushroom is pulled out, when the key is in the "on" position. **"Key Switch Power-On mode":** The receiver will be in the "Power-On" mode when the rotary key switch is turned from "off" to "on" position, when the mushroom is in the "off" position (i.e. mushroom is pulled up). **"Any pushbutton Power-On mode":** The receiver will be in the "Power-On" mode when any pushbutton on the transmitter is pressed, when mushroom is at "off" (i.e. pulled out) position and key is at "on" position. **"Start pushbutton Power-On mode":** The receiver will be "Power-On" once Start pushbuttons is pressed, when mushroom is at "off" position and key is at "on" position. **"E.U. (standard) Power-On mode":** The receiver will be in the "Power-On" mode when the rotary key switch is rotated to the "Start" position, when the mushroom is at "off" position. In case the receiver is Powered off due to the mushroom being pressed or "Auto Off", one must turn the rotary key switch to "off" position, then turn to "on" position, and to "Start" position to turn on the power. This mode is continuously transmitting and will automatically turn off after 3 minutes of non-operation. **"E.U. (simple) Power-On mode":** The receiver will be in the "Power-On" mode once the rotary key switch is rotated to "Start" position, when mushroom is at "off" position and key is at "on" position. The only difference from "E.U. (standard)" is that in this mode, one doesn't need to turn the rotary key switch to "off" position and then to "on" position to re-start.
B	Auto Off	1. No 2. Yes	**"Auto Off":** The transmitter will turn off the power supply automatically if there is no operation for a certain time. Whether to transmit an EMS signal to "Power-Off" the receiver before the transmitter turns off can be set by this function. **"Power-off"** means that the Stop Relay of receiver is de-energized. Hence, one must perform the "Power-On" procedure to turn on the receiver power.
C	Transmit	1. Non-continuous 2. Continuous	**"Non-continuous transmitting mode":** After "Power-On", the transmitter will transmit a signal only when the pushbutton is pressed. This mode can save the transmitter battery power. **"Continuous transmitting mode":** The transmitter will continuously transmit a signal while Powered on.

D	Save Power	1. 3 min. 2. 30 sec, 1 min, 90 sec, 2 min 3 min, 4 min, 5 min, Not execute	**"Save Power":** The transmitter will turn off the power supply automatically if there is no operation for a certain time, in order to save power. Only the transmitter is in the "continuous transmitting" mode is this function available..
E	Alarm mode	1. Simple alarm mode 2. Morse alarm mode	**"Simple alarm mode":** If the self-diagnostic detects a malfunction then the buzzer will sound to indicate the error message, one long sound means Encoder module malfunction, two long sounds mean transmitter RF module malfunction, three long sounds mean power supply malfunction. During operation this mode is used to indicate a fault situation. **"Morse alarm mode":** There are 5 kinds of Morse code to report a detailed error message. Normally this mode is used to indicate individual malfunctioning parts.
F	Password	1. No 2. Yes	This item is used to set the password function. The operator has to enter the password before turning on the transmitter if **"Yes"** is selected. This function is like an electronic-key that can prevent unauthorized persons from operating the remote controller. **"Password entry procedure":** When the EMS mushroom is in the "off" (pulled up) position and the rotary key switch is in the 'on" position, press the pushbuttons sequentially to enter the password (During the password entry period, "Password Complete", the LED indicator will flash green). The transmitter buzzer will sound one long beep if password is correct. After buzzer turns off, power-on according to the proper procedure and return to normal operation. If the password is incorrect then the buzzer will sound with two short beeps and one long beep ("• • –"). Enter the correct password again after buzzer turns off.
G	Password set	1. By pushbutton 2. By software	If the password function is set as "Yes" then the Password code can be set by pushbutton or by software. **Setting password by pushbutton:** Depress the EMS mushroom and turn the rotary key switch to the "off" position. Depress and hold both "UP" & "DOWN" pushbuttons and then turn the rotary key switch from "off" to "on" position simultaneously. At this time, the LED will flash red and green alternately for 10 seconds. Press the pushbuttons sequentially to key in a new password within 10 seconds. The buzzer will sound three long beeps when the password setting procedure is finished. The length of the password is four-digits, for example: Up, Up, Down, Up. Pull up EMS mushroom and enter new password to turn on transmitter. This function is designed for authorized and qualified operators to set or change the password if they forget the original one. Because other people do not understand this procedure, it can prevent unauthorized persons from operating the remote controller. **"Setting password by software":** It means that the password can only be set by software.

H	E.U. Start	1. EU (Standard) 2. EU (Simple)	**"E.U. Start":** If "E.U.(standard)" is selected is the mode for "Power-On", when the EMS signal is automatically sent out by the Transmitter and the Main Relay in the Receiver is turned off in the auto off mode, to start the "Power-On" operation again by the Transmitter, if "E.U. (Standard)" is selected , one must turn the rotary key switch to the positions ON→OFF→ON→START in order to set the receiver to "Power-On" mode, if "E.U. (Simple)" is selected only rotate the rotary key switch" to the "Start" position to "Power-On" the Receiver. **Note:** "Auto Off" means that the Transmitter will turn off the power supply automatically if there is no operation for a certain time. If "E.U.(standard) is selected for the "Power-On", mode, to turn the rotary key switch according to the positions ON→OFF→ON→START in order to "Power-On" the Receiver after the EMS mushroom is pressed.
I	Normal OP	1. LED-off 2. LED-on	**"LED-off":** The LED indicator will be shut off during normal operation in order to save power. But it is still available for warning and fault indication. **"LED-on":** LED indicator will light up green when transmitter is transmitting. It is still available for warning and fault indication with first priority.
J	Password Complete	1. 10 Seconds 2. 4, 5, 10, 15, 20, 25, 30, 40, 50, 60 sec.	**"Password Complete":** If the password function is selected, this function determines the time to enter the password. If the password is not entered within the password complete time, it must be re-entered from the beginning.

OTHER RECEIVER FUNCTIONS:

Item	Title	Options	Description
A	Auto Off	1. 1 hour 2. 10 minutes 20 minutes 30 minutes 1 hour 2 hours 3 hours 4 hours not execute	**"Receiver Auto Power-Off":** If the receiver doesn't receive the correct control data within a certain time, then the Stop relay on the receiver will be de-energized automatically (i.e. receiver Power-Off). Normally this function is used with the "non-continuous transmitting mode" to shut the crane off if the operator forgot to turn off the transmitter.
B	Function dip	1. Enable 2. Disable	**"Function DIP":** This setting determines whether the DIP switch on the Receiver/Decoder module of Receiver is used to set functions. If " **Disable"** is selected, then the function setting is fully controlled by software.
C	Alarm mode	1. Simple alarm mode 2. Morse alarm mode	**"Simple alarm mode":** If the self-diagnostic detects a malfunction then the alarm will sound to indicate the error message, one long sound means Relay module malfunction, two long sounds mean Receiver/Decoder module malfunction, three long sounds mean power failure. During operation, this mode is used to indicate fault situation. **"Morse alarm mode":** There are 22 kinds of Morse code to report a detailed error message. Normally this mode is used to indicate individual malfunctioning parts.
D	Acc. delay	1. 2 sec. 2. 0 sec, 0.5 sec 1 sec, 1.5 sec 2 sec, 3 sec 4 sec	**"Acceleration delay time":** This function is used to set the time interval between acceleration relays closing. It is used for accelerating operations only in order to prevent the crane from running directly to the highest speed which can damage the motor.
E	Channel DIP	1. Enable 2. Disable	**"Channel Dip":** This setting determines whether the DIP switch on the Receiver/Decoder module of the Receiver is used to set the channel. If **"Disable"** is selected, then the channel setting is fully controlled by software.

SETTING OF CHANNELS

Item	Title	Options	Description
A	Channel	1 ~ 256	**"Channel setting":** This remote controller provides three frequency ranges A, B and C, that can be changed by transmitter's pushbuttons directly. Each frequency range has 256 channels. The operating channel in each range will be changed simultaneously if a new channel number is set by DIP switch or software. For example: If the original channel number is 1, then the operating channels are A_1, B_1 and C_1. If the channel number is changed from 1 to 24 then the operating channels will be A_{24}, B_{24} and C_{24}. The operating frequency of A_{24} is equal to "A_1 + channel spacing $\times$ (24 – 1)".

PASSWORD CODE SETTING

Item	Title	Options	Description
A	Password code	0 ~ 9	This item is available when the "Password set" function is set as "By software". **"Password code"** Sets the password code. The code length is four-digits. These numbers 0~9 are used to indicate the corresponding pushbutton.

FUNCTION SETTING BY RADIO:

(1) Use a PC or maintenance kit to program the function settings into the transmitter in advance.
(2) Depress EMS mushroom and turn rotary key switch to the "off" position.
(3) Depress and hold both "Up" & "East" pushbuttons and turn key from "off" to "on" position simultaneously.
(4) Release "Up" & "East" pushbuttons. At this time, the LED indicator will flash with yellow and red colour alternately.
(5) After the receiver alarm sounds two short beeps and one long beep "● ● –" (two short beeps and one long beep means that function setting is completed), turn key from "on" to "off" position.
(6) "Power-On" according to the proper procedure and return to normal operation.

INSPECTION AND MAINTENANCE

INSPECTION

Daily inspection is important and will ensure the safety of operation. Inspection should include "emergency stop" and other safety devices and functions. If there is any doubt, operation must be stopped immediately and problems must be solved before resume of operation.
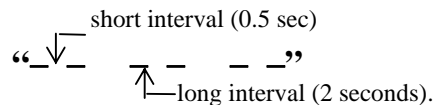
MAINTENANCE

This remote controller is equipped with self-diagnostic device. During the operation and the change of batteries, self-diagnostic device will activate the warning alarm if any malfunction is detected. Operator must understand the malfunction signals and notify the maintenance personnel. Malfunctions and warning alarm are listed as follows:

Note: When dip switch setting is on "Simple alarm mode", alarm signals are shown on the list; when dip switch setting is on "Morse alarm mode", please refer to Technician's Manual.)

Malfunction Part	Error message	Alarm Signal	Remark
Transmitter	Encoder Module malfunction	–	Alarm lasts 0.5 second repeats every 2 seconds
	RF Module malfunction	– –	Refer to Note below
	Insufficient power to operate transmitter	– – –	Refer to Note below
Receiver	Relay Module malfunction	–	Alarm lasts 0.5 second repeats every 2 seconds
	Receiver/Decoder Module malfunction	– –	Refer to Note below
	Power failure	– – –	Refer to Note below

Note: Each "–" indicates 0.5 second alarm. Each short interval lasts 0.5 second, and long interval lasts 2 seconds. For example, the error message of RF Module Malfunction:

short interval (0.5 sec)

"_↓_   _ _   _ _"

↑—long interval (2 seconds).

TROUBLESHOOTING

SELF-DIAGNOSTICS

In order to simplify maintenance, this remote control system has been designed with a built-in self-diagnostics circuit in the transmitter and receiver. As long as the micro control unit is in proper working condition, malfunctions in the pushbutton, joystick, RF circuit, relay and relay driver circuits (including relay coil and relay contacts) can be detected. When a malfunction occurs, the transmitter or receiver will generate a simple and clear alarm. Not only can the operator and maintenance personnel fully understand the condition of the remote controller, but they can also reduce maintenance time by following the error message for repair.

NOTES:

(1)   When an error message is detected by the receiver or transmitter's self-diagnostics, an alarm will sound and "Power-OFF" will be activated. Until the malfunction has been corrected, it will be impossible to Power-On the controller.

(2)   Maintenance Technicians can use the error messages. However, we recommend the technician replace only the module. The defective module should be returned to our distributor for component-level repair. This will eliminate further damage to the controller.

(3)   If you do not understand the error message from the transmitter or receiver, or the signal is not listed in this manual, please contact our distributor for clarification and advice.

TRANSMITTER MALFUNCTIONS AND SOLUTIONS

Item	Error Message		Problem	Solution
		Morse Code		
1	C	— • — •	Malfunction of E^2PROM memory in the encoder module; cannot be read or written.	Replace encoder module. Perform the function setting procedure (Refer to section 3-4)
2	D	— • •	E^2PROM in the encoder doesn't have function settings or settings are incomplete.	Perform the function setting procedure (Refer to section 3-4)
3	F	• • — •	Malfunction of pushbutton. (shorted)	Replace encoder module. Perform the function setting procedure. (Refer to section 3-4)
4	R	• — •	Batteries dead	Replace batteries
5	S	• • •	RF module malfunction	Replace RF module **Note:** RF module's channel must be set the same as that of the receiver.

Note:

    (1)   If a pushbutton malfunction occurs the buzzer will sound and the LED indicator will flash red simultaneously when the power is reset (e. g. change of batteries).
During operation the transmitter will perform self-diagnostics when the EMS mushroom is pressed. If the malfunction in item 3 occurs, only the LED indicator (flashing red) will indicate the error message when you press the EMS mushroom.

    (2)   The alarm for the other items will sound only when you push the pushbuttons or when the power source is reset (e. g. change of batteries).

RECEIVER MALFUNCTION AND CORRECTION

Item	Error Message		Problem	Solution
		Morse Code		
1.	A	• —	"UP" relay coil damaged	Replace Relay module
2.	B	— • • •	"U/D" 2S relay coil damaged	
3.	C	— • — •	"DOWN" relay coil damaged	
4.	D	— • •	"EAST" relay coil damaged	
5.	E	•	"E/W 2S" relay coil damaged	
6.	F	• • — •	"WEST" relay coil damaged	
7.	G	— — •	"SOUTH" relay coil damaged	
8.	H	• • • •	"S/N 2S" relay coil damaged	
9.	I	• •	"NORTH" relay coil damaged	
10.	J	• — — —	"R1" relay coil damaged	
11.	K	— • —	"R1/R2 2S" relay coil damaged	
12.	L	• — • •	"R2" relay coil damaged	
13.	M	— —	"R3" relay coil damaged	
14.	N	— •	"R3/R4 2S" relay coil damaged	
15.	O	— — —	"R4" relay coil damaged	
16.	P	• — — •	"MAIN" relay coil damaged	
17.	Q	— — • —	Relay contacts are jammed (can't open) at COM 1.	
18.	R	• — •	The input power voltage is out of tolerance.	Disconnect the cable from the receiver. Turn off the main power of the crane and check the input power voltage. Check whether the voltage select plug is in the correct position Inspect and make sure the power is normal before resuming operation.
19.	S	• • •	RF circuit malfunction	Replace Receiver/decoder module

20.	Y	— • — —	Interference by the same model of remote controller	Change to a new frequency
21.	1	• — — — —	Interference by another radio signal on the same frequency.	If interference is not serious, "Power-On" the remote controller when the interference is over. If interference is serious, change to new frequency. (Refer to section 4-4-4 at operator's Manual)
22.	Z	— — • •	E^2PROM in the Receiver/ decoder doesn't have function setting s or settings are incomplete.	Contact distributor for programming of function settings.

Note:

(1) When the receiver's self-diagnostics detect a malfunction, the alarm will continue, until the malfunction has been corrected or the power to the receiver is disconnected.
(2) The receiver can be set by the software to sound the alarm or not, when an error occurs relating to item 20 ~ 21.
(3) The receiver can be set by software to stop the affected action (i.e. "Relay-Off") or "Power-Off" automatically, when the error occurs relating to items 20 ~ 21. For the other items, the receiver will enter into the Auto Power-Off mode.
(4) This receiver contains an Automatic Gain Control circuit with high sensitivity; when not in operation, it may receive weak signals from unknown sources. As long as the interference does not occur very often, it will not affect the normal operation. No frequency change is necessary.

MALFUNCTION IDENTIFICATION.

When the remote controller does not function properly (e. g. Receiver does not function correctly after pressing a pushbutton on the transmitter) and there is no malfunction alarm information, please follow the procedures below to diagnose the malfunction.

Item	Problem	Action Required
1.	Transmitter's LED and buzzer do not react at all.	Make sure battery power is normal: Check battery direction. Check battery compartment direction. Check battery condition. Make sure micro control unit (MCU) is normal: Press EMS mushroom and turn rotary key switch to "OFF" position. Remove the battery cover, wait 10 seconds, and insert the battery cover again. At this time, the buzzer should generate two long sounds. Otherwise, the MCU is out of order or the power connecting wire is bad. 3.Return for repair.
2.	Transmitter is normal but receiver's buzzer doesn't react at all.	Make sure the receiver's power source is normal: Inspect the Receiver/Decoder to see if the SQ indicator light is on and the ANT A and ANT B lights flash alternately. Inspect the AC power fuse and DC power fuse to see if a fuse is blown out. If necessary, turn off the main power and replace the fuse. Make sure the Receiver/Decoder module and "Relay" module are wired correctly. Make sure the relay output fuse is not blown. Replace fuse if necessary. Make sure the Alarm relay is not out of order. (If the Alarm LED is on, it means the relay is out of order.) 5. Return for repair.
3	A certain motion does not work.	1. Make sure the relay output fuse is not blown. Replace fuse if necessary. 2. Make sure the original control system of the crane works properly. If not, ask the original manufacturer to repair. 3. Return for repair.

REVISION HISTORY

0.0   original document created from manufacturers documents

0.1   Start operation with magnetic key switch updated