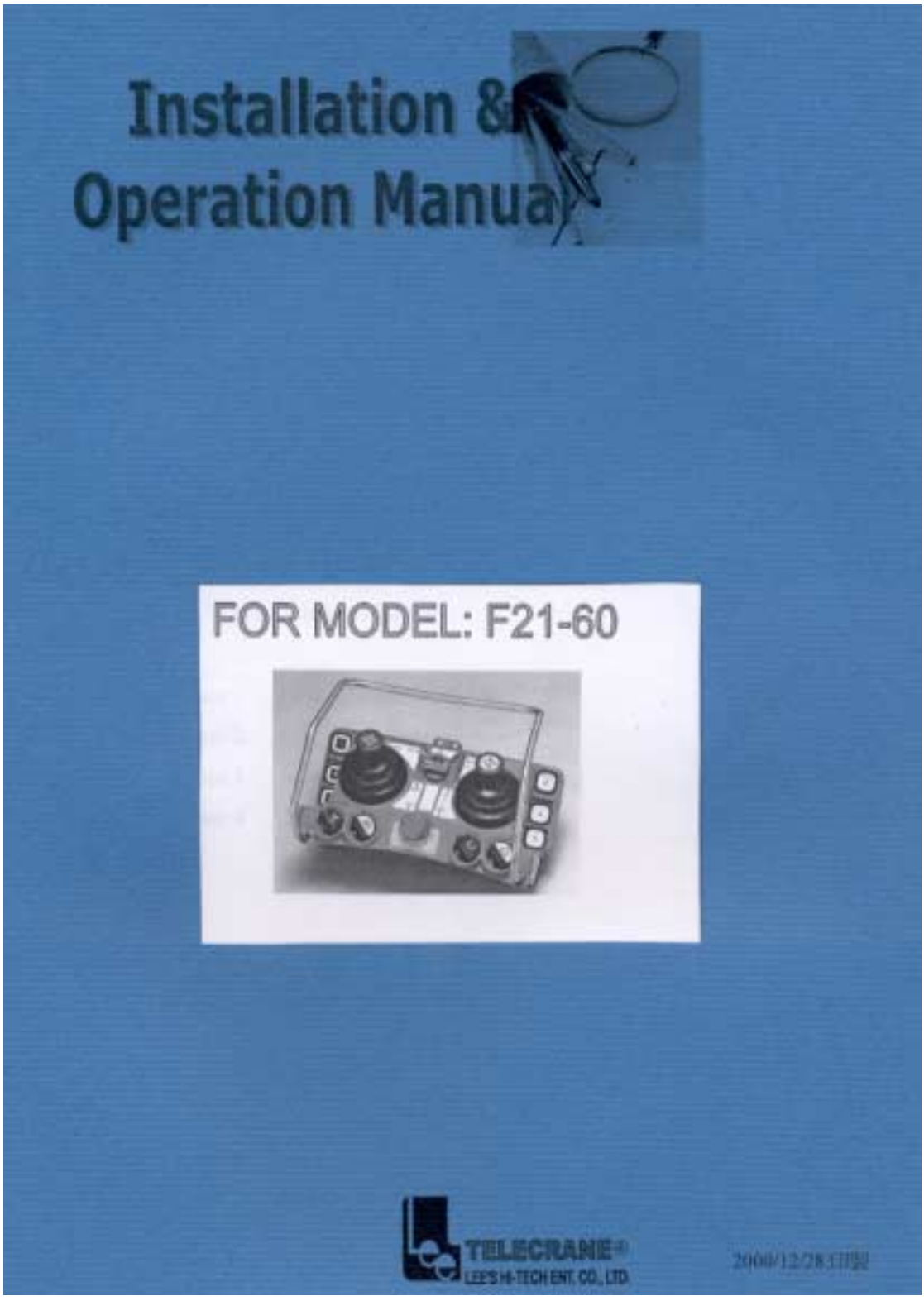


Model: F21-60

FCC ID: LWNF21-60

FEDERAL COMMUNICATIONS COMMISSION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiated 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:

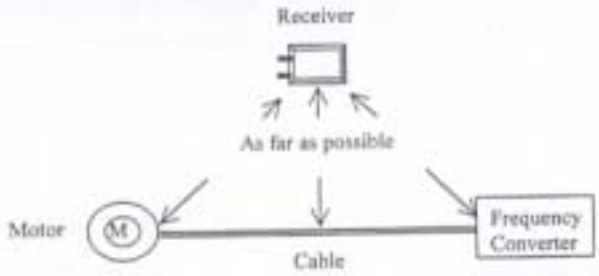
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user‘s authority to operate the equipment.

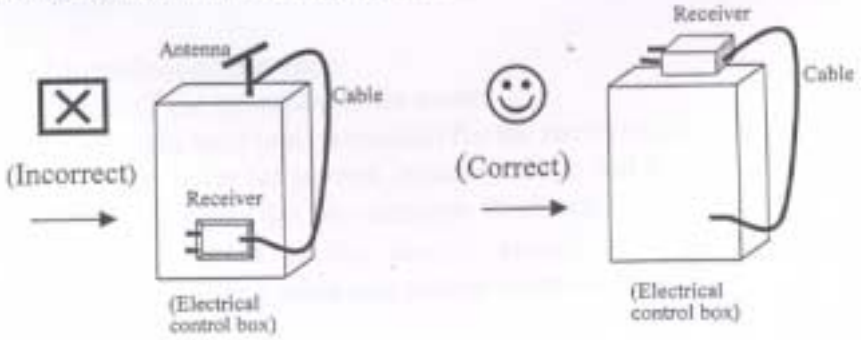
Chapter 3 Installation and Function Setting

3 – 1 Precautions during installation

1. Observe all safety precautions when climbing the crane.
2. Turn off the main power source of cranes before installation to avoid electric shock.
3. Receiver must be installed in the way that it will not touch any part of the building during the operation.
4. Receiver must be fastened safely.
5. Before installation, inspect the crane's safety devices, and make sure everything is in proper working condition.
6. Make sure you understand the crane circuits and power distribution as well as the function setting of remote controller, to avoid incorrect wiring.
7. To avoid any interference, the Receiver shall be away from motors, frequency converter and power cable (shown as below).



8. The Receiver should be installed on the top of the electrical control box. To mount the receiver inside the electrical control box is not correct.



3 – 2 Transmitter Installation Instructions

3-2-1 Installation of batteries in the transmitter:

Insert batteries in proper direction into transmitter and screw up battery cover. The LED on transmitter lights in red color and transmitter sound two long sound ("– –": "–" indicates 0.5 second sound and the short interval lasts 0.5 second) to indicate proper installation.

3-2-2 Installation of function setting software in the transmitter:

When change a new transmitter, please refer to section 3-4 to install the function setting software in the transmitter, in order to pair the transmitter and receiver.

3 – 3 Receiver Installation Instructions

3-3-1 Preparation for Installation

1. Provide all necessary tools.
2. Select a proper location.
   a. Select a stable place.
   b. Select a place where you can see the Receiver or Antenna.
   c. Select a place where there is no spark, e.g. keep away from motors, relays, magnetic switch and power cables.
   d. Keep away from high-voltage wiring and device.
   e. The Receiver's box must be at least 3 cm away from the other obstacles.
3. Installation of proper power source
   The input power source for receiver is 48V/110VAC (50/60 Hz) power source.

3-3-2 Installation Sequence

1. Turn off the main power for crane.
2. Attach the template (provided) for the receiver to a proper place.
3. Drill the holes for screws, install receiver and then fix the receiver with 6mm ϕ screw nut on vibration- Resistant.
4. Connect cables to the control circuit of crane according to the receiver's wiring table and control contacts diagram.

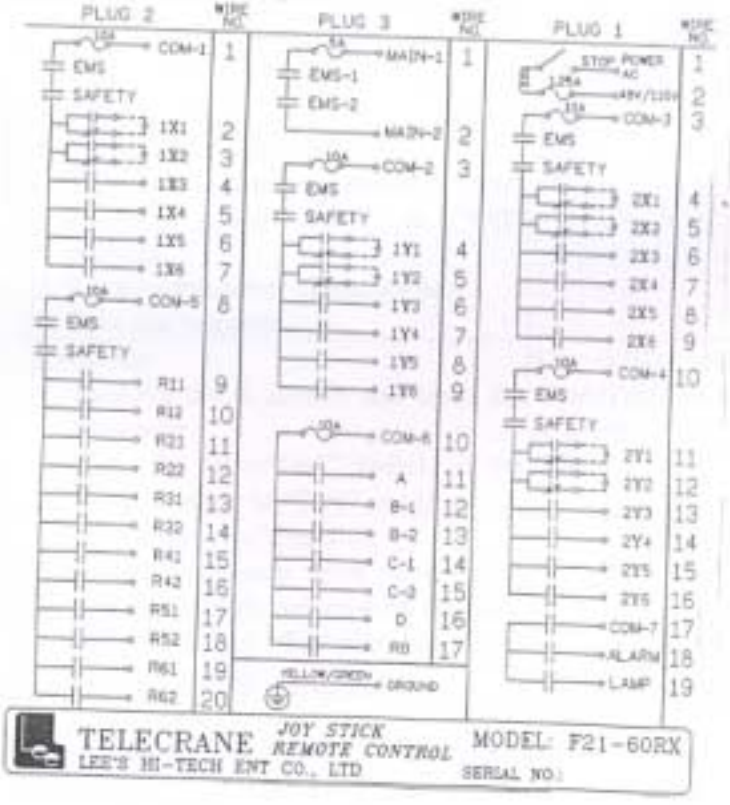
Note:

※Inspect and make sure that all wires are connected correctly.

3Grounding for remote controller and crane must be properly connected to ensure safety. (Grounded wire isn't attached from factory due to different requirement in length.)

5. Secure the cables between the receiver and crane so that cable cover (wrapper) will not wear out due to the vibration of the crane.
6. Open the top cover of the receiver and turn Relay module's Run/Test switch to "Test" position.
7. Turn on the main power for crane.
8. Operate the transmitter to test every function and make sure they are all correct (read by LED indicator).
   Note: When Run/Test switch is set at "Test' position, relay will not function, but LED will display.
9. Turn Run/Test switch to "Run" position and secure the top cover to the receiver with screws.
10. Complete.

3-3-3 Diagram of control contact



3-3-4 Installation of function setting software in the receiver:

When change a new receiver, one must follow the procedures below (please refer to section 3-4) to install the function setting software in the receiver, in order to pair the receiver and transmitter.

3 – 4 Instructions of software installation by interface cable

The installation procedures mentioned here refer to the process of the receiver's direct loading (copying) of function setting software into the transmitter, and vice versa. The PC or maintenance kit will not be discussed here.

Note: For F21 remote controller, one can write the function setting software from PC or Maintenance Kit into transmitter only. It is impossible to write into receiver. Therefore, the following procedure is the only way to pair the transmitter and the receiver.

Warning:

Before execution of the following procedure, one must make sure the receiver is in the "Power-Off" mode, so that the crane will not move.

Installation Procedures:

Step	Operation	Remark
1.	Transmitter: 1. Press EMS mushroom. 2. Turn key(rotary key switch) count-clockwise from "On" to "Off" position. 3. Remove the cover of battery box. 4. Take out batteries.	
2.	Receiver: 1. Remove the 4 screws and open the top cover. 2. Turn the "Run/Test" switch in the Relay module to "Test" position.	The LED will light when "Run/Test" switch is in "Test" position, but relay will be inactive.
3.	Select the copying direction: 1. If copy software from receiver to transmitter then set sw4 of function dip switch on "Encoder board" to "OFF" position.	

	2. IF copy software from transmitter to receiver then set sw4 of function dip switch on "Encoder board" to "ON" position.	
4.	Push "Pgm" button in the "Receiver /Decoder" module.	Push "Pgm" button, then "Alarm" LED will rapidly flash to indicate program has entered into "WRITE" mode. At this time, one can proceed to the next step.
5.	Connect 7-pin cable from "Receiver/ Decoder" module to transmitter's "Encoder" module.	
6.	Push "Pgm" button in the "Receiver/ Decoder module".	After push "Pgm" button, the "Alarm" LED will display "- . -" signal to indicate the software writing is completed and then the "Alarm" LED will rapidly flash to indicate that one can proceed to the next step. **Note:** If alarm LED displays ". . . . ." which indicates an error in software writing. Maintenance personnel must be contacted to solve the problem.
7.	Remove the 7-pin cable.	After remove the 7-pin cable from transmitter, once put in Batteries and screw up battery cover the buzzer on transmitter will sound "- -" indicating correct installation procedure.
8.	Push "Pgm" button in the "Receiver/ Decoder" module.	After push "Pgm" button, the "Alarm" LED will stop flashing to indicate program has entered into "normal operation" mode.

		operation" mode.
9.	1. Turn "Run/Test" switch of Relay module to "Run" position. 2. Attach back the receiver's covers.	
12.	Power-on according to the proper procedure and return to normal operation.	

Note: After set a new channel by "channel dip switch" on transmitter, if use the above installation procedure to copy the new channel from transmitter to receiver, one must follow the procedure below to renew transmitter itself first:

1. Loose screws and open the bottom cover of transmitter, then adjust dip switch(8-bits) on Encoder board to a new channel setting.
2. Screw up the bottom cover of transmitter, pressing Emergency stop button.
3. Turn the key(rotary key switch) in "OFF" position.
4. Open the battery cover and take out batteries.
5. Press and hold R1 pushbutton.
6. Put in batteries.
7. The buzzer on transmitter will sound " - - ".
8. Release R1 pushbutton and screw up the battery cover.

3 – 5 Channel setting and Function setting by Dip Switch

There are two dip switch on "Encoder board" of transmitter's "Encoder Module". The dip switch for Channel setting is 8-bit and the other one for function setting is 4-bit.

Note: When change the setting value of dip switch (including channel and function dip switch), one must loose screws and open the bottom cover of transmitter.

3-5-2 Function setting by dip switch:

Transmitter's dip switch(4-bit) for function setting can be used to set the "Proportional function", "Radio remote setting", "Alarm mode" and " Software copy way" as follows:

3-5-2-1.Use of SW1 to set "Proportional function"

Dip Switch	Remark
Sw1	
ON	Enable "Proportional function"(response time:98ms)
OFF	Disable "Proportional function"(response time:65ms)

Note: The response time for *Enable "Proportional function"* would be longer(98ms) due to transmitting proportional data.

3-5-2-2. Use of SW2 to set "Radio remote setting"

Dip Switch	Remark
Sw2	
ON	Disable "Radio remote setting"
OFF	Enable "Radio remote setting"

Note: If "Enable", some applications executed by "Radio remote setting" include (1) change of operating frequency A,B,C (2)forcing receiver's frequency changed (3)renew the required channel set by software or dip switch (4)renew the required functions set by software

3-5-2-3. Use of SW3 to set "Alarm mode"

Dip Switch	Remark
Sw3	
ON	Morse alarm mode
OFF	Simple alarm mode

4.Use of SW4 to set "Software copy way"

Dip Switch	Remark

Sw4	
ON	Copy functions and/or channel from transmitter to receiver
OFF	Copy functions and/or channel from receiver to transmitter

3 – 6 Radio remote setting

The operation procedures mentioned herein refer to the process of the transmitter's remote writing of function setting software into the receiver. It means that to preserve the required setting in transmitter in advance then sends out the radio signal to receiver at workshop. This performance can eliminate the trouble of climbing to the receiver. Radio remote setting includes "Channel setting by radio" and "Function Setting by radio".

Note:

1. Before operating, one must make sure that the receiver is in "power-off" and all of the relays are at "off" status.(i.e. pressing transmitter's Emergency stop button during receiver is supplying with power.)
2. Before operating, one must make sure that the communication status between transmitter and receiver is in good condition.(i.e. the same frequency without interference, and the same model and ID code.)
3. Come as near as possible the receiver when operating, e.g. under the crane.

3-6-1 Channel setting by radio:

1. Using PC or Maintenance Kit to install channel setting into transmitter in advance, or set a new channel by dip switch on transmitter.
2. Depress EMS mushroom and turn key to "off" position.
3. Operate "Joystick 2" to the left and hold, meanwhile, turn the key(rotary key switch from "off" to "on" position simultaneously.
4. Release "Joystick 2", at this time, LED indicator will flash with yellow and green color alternately.
5. After the alarm of receiver sounds "– • – •" means that channel setting by radio is completed, then turn the key from "on" to "off" position.
6. "Power-On" according to the proper procedure and return to normal operation.

3-6-2 "Function setting" by radio:

1. Using PC or maintenance kit to install function setting into transmitter in advance.
2. Depress EMS mushroom and turn key to "off position.

3. Forward or backward "Joystick 2" and hold, meanwhile, turn the key(rotary key switch from "off" to "on" position simultaneously.
4. Release "Joystick 2", at this time, LED indicator will flash with yellow and red color alternately.
5. After the alarm of receiver sound "– • – •" means that function setting by radio is completed, then turn the key from "on" to "off" position.
6. "Power-On" according to the proper procedure and return to normal operation.

3–7 Software Setting

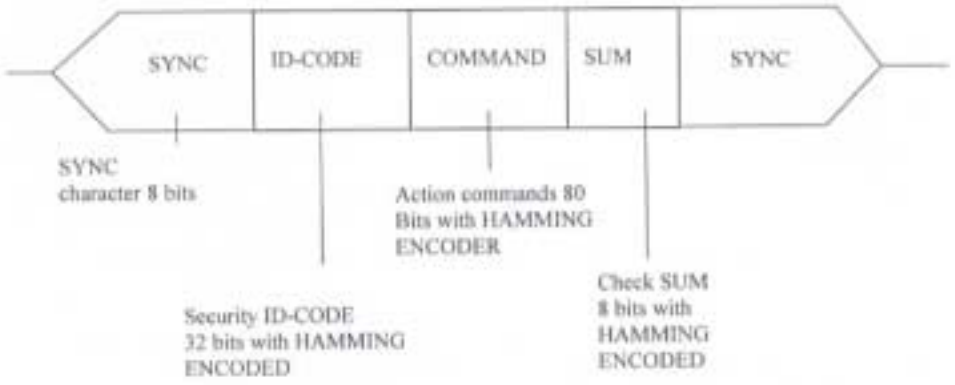
In addition to the dip switch setting mentioned in section 3-5, this remote control system can be set according to the working condition and operator's need, such as "Pushbutton function", "EMS neglected function", "search function", "interference neglected time"...etc. This enables the remote controller to perform the most effective operation and to provide the safest operation. Please refer to the manual of software setting.

3 – 8 Error detection/Error correction by software

F21-60 system employs the theory of "Error-Control Coding" used on Computer system, and incorporates the "Control Data Code" and the principle of "Error detection/Error correction" of Hamming Distance to edit and complete the "Code Word" was so-called "Hamming Code" which may ensure the control data with accuracy in process of transmission, and also equip with function of automatic "Error detection"/"Error correction" to make sure the safety in operation of F21-60 system remote control.

3-8-1 Data Stream

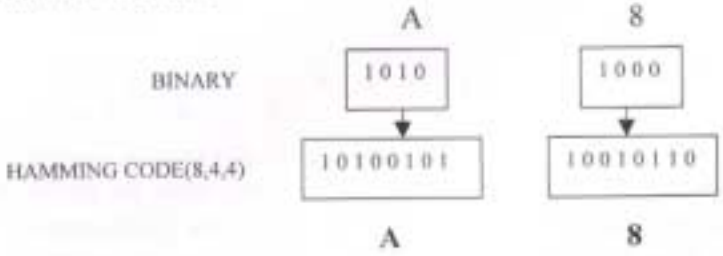
As shown as below, before the receiver's relays output to control the equipment's movement, the data including SYNC, ID-CODE, COMMAND and SUM must be checked twice to further make sure, so the data transmission becomes more safe and reliable.



TOTAL DATA LENGTH=128 bits

3-8-2 Hamming Code

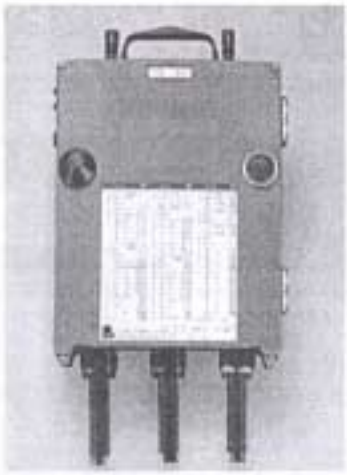
As shown as below, the Code Word length is equal to 8, the Data Bit is equal to 4, the Hamming Distance is equal to 4, it means that HAMMING CODE (8,4,4) can correct single-bit errors and also detect double-bit errors.



Chapter 3 F21-60 Standard Accessories

When you get a standard and full set of F21-60 system, it includes the following item.:

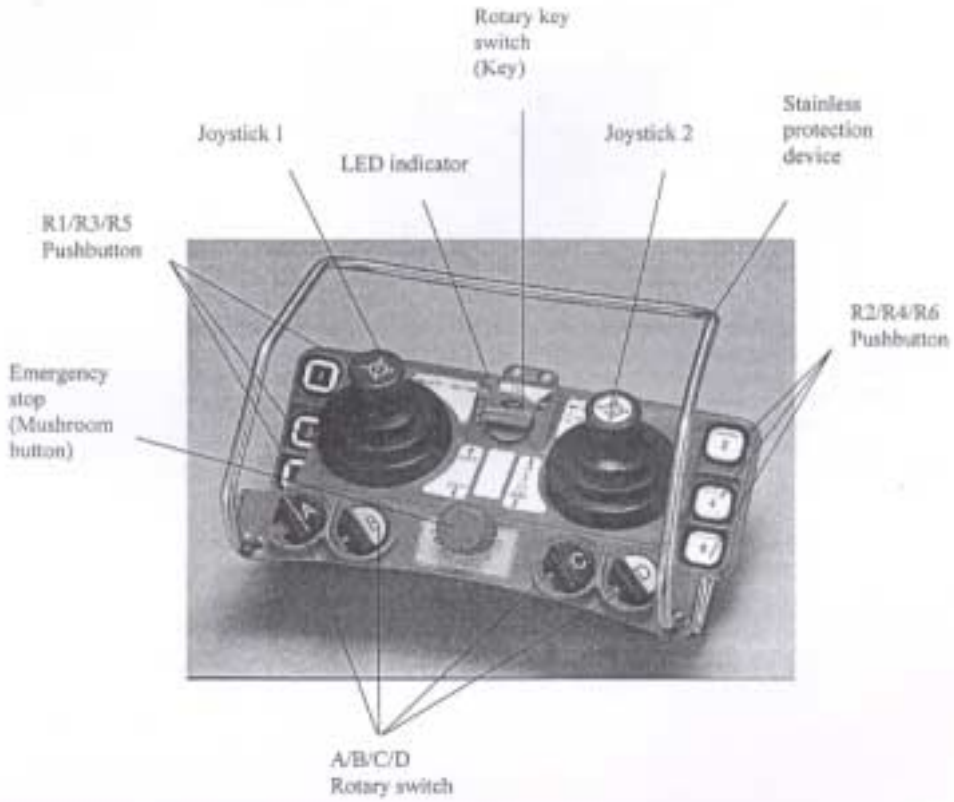
(1)Transmitter, one unit.



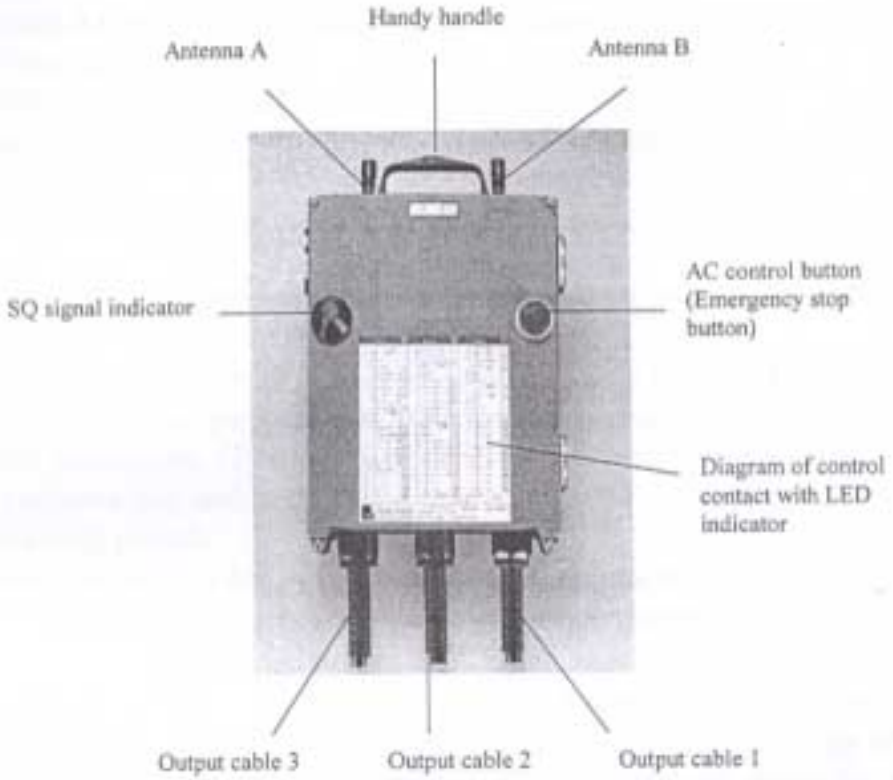
(2)Receiver, one unit.

Chapter 4 Operation

4-1 F21-60 Transmitter's parts



4-2 F21-60 Receiver's parts



4 – 3 General Operation

1. Remove the cover of battery box.
2. Install 4 Fresh AA-size batteries in the battery box. Make sure the "+" and "-" directions are correct.
3. Attach back the battery cover.
   Note: Transmitter will sound two-long sound to indicate the correct installation.
4. Turn on the power according to the "Power-On Modes" (please refer to 4-4-1).
   Note: LED indicator will flash with red color if proper procedures are not followed.
5. Properly using Joysticks to operate transmitter or by pressing pushbuttons.
6. 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.
   Note: Transmitter has power indicating functions with LED display.
   ← "Green color": Sufficient power to operate transmitter. (In order to save power, one can program to turn off LED display when power is sufficient.)
   ↑ "Yellow color": 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: down the goods to ground) to replace batteries.
   → "Red color": Insufficient power. In addition to red LED, warning sound will continue and transmitter is no longer functional. 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.

4 – 4 Special Functions Operation

4-4-1 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 7 different ways of "Power-On mode" could be setting.

A. Mushroom or Key Power-On Mode
   1. Mushroom power-on: turn the key(Rotary key switch) clockwise to "ON" position first, then it will power on once rotate "EMS" mushroom clockwise 45° and pull out.
   2. Key power-on: rotate "EMS" mushroom clockwise 45° and pull out first, then it will power on once turn the key(Rotary key switch) clockwise to "ON" position.

B. Mushroom Power-On Mode
   1. Turn the key(Rotary key switch) clockwise to "ON" position.
   2. It will power on, once rotate "EMS" mushroom clockwise 45° and pull out.

C. Key Power-On Mode
   1. Rotate "EMS" mushroom clockwise 45° and pull out.
   2. It will power on, once turn the key(Rotary key switch) clockwise to "ON" position.

D. Any pushbutton(Joysticks) Power-On Mode
   1. Rotate "EMS" mushroom clockwise 45° and pull out.
   2. Turn security key clockwise to "ON" position.
   3. Press any pushbutton(or operate Joysticks) on the transmitter. This will turn on the power as well as execute the function of pushbutton(Joysticks) .

E. "Start" rotary key switch Power-On Mode
   1. Rotate "EMS" mushroom clockwise 45° and pull out.
   2. Turn the key(Rotary key switch) clockwise to "ON" position.
   3. Continue to turn the key(Rotary key switch) clockwise to "START" position to power on. After power on, when release the key(Rotary key switch), it will return to the "ON" position.

Note: If the mode is set as "Any pushbutton(joysticks) power-on" or "Start pushbutton power-on", the transmitter is in the "non-continuous" mode, i.e.

when transmitting, pushbutton(joysticks) must be pressed(operated), it can save power.

F. E.U. standard Power-On Mode

1. Rotate "EMS" mushroom clockwise 45° and pull out.
2. Turn key(Rotary key switch) clockwise to "ON" position.
3. Continue to turn the key(Rotary key switch) clockwise to "START" position to power on. After power on, when release the key(Rotary key switch), it will return to the "ON" position.
4. 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 Continue to turn the key clockwise to "START" position to power on again. After power on, when release the key, it will return to the "ON" position.

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

G. E.U. simple Power-On Mode

1. Rotate "EMS" mushroom clockwise 45° and pull out.
2. Turn key(Rotary key switch) clockwise to "ON" position.
3. Continue to turn the key(Rotary key switch) clockwise to "START" position to power on. After power on, when release the key(Rotary key switch), it will return to the "ON" position.
4. After 3 minutes of non-operation, transmitter will send out an emergency stop signal to the receiver. When this occurs, one just only turn the key clockwise to the "START" position, it will power on again. After power on, when release the key, it will return to the "ON" position.