

Rhein Tech Laboratories
360 Herndon Parkway
Suite 1400
Herndon, VA 20170
<http://www.rheintech.com>

Report #: 2004079
FCC: Part 15.249
IC: RSS-210
FCC ID: PVTTR800-US
M/N: TR800

APPENDIX J: MANUAL

Please see the following pages.



**OPERATION & INSTALLATION
MANUAL**

**TM70
PUSHBUTTON TRANSMITTERS**



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1.- DECLARATION OF CONFORMITY

DECLARACION DE CONFORMIDAD
DECLARATION OF CONFORMITY
KONFORMITÄTSEKTLÄRUNG
DECLARATION DE CONFORMITE
DICHIARAZIONE DI CONFORMITA'
DECLARAÇÃO DE CONFORMIDADE

C **CE0341** !

El Fabricante	ANGEL IGLESIAS, S.A.
The Manufacturer	Pol. Ind. 27, nº 30 20014
Der Hersteller	SAN SEBASTIAN - SPAIN
Le Fabricant	NIF: A-20-036.018
Il Fabbricante	Tel : (+34) 943 448800
O Fabricante	Fax: (+34) 943 448816

Declara que el producto: Telemando IKUSI
Declares that the product: Remote Control IKUSI
Erklärt, dass das Produkt: Funkfernsteuerung IKUSI
Déclare que le produit: Télécommande IKUSI
Dichiara che il prodotto: Radiocomando IKUSI
Declara que o produto: Radiocomando IKUSI

TM70/1
TM70/2

Cumple con las Directivas de Consejo:
Complies with the provisions of Council:
Erfüllt die Richtlinien des Rates:
Accompli les Directives du Conseil:
E' conforme alle Direttive del Consiglio:
Cumpre as Directivas del Consello:

93/44 EC
99/5 EC

Normas armonizadas utilizadas:	ETSI EN 300220	EN 61000-3-2
Applied harmonized standards:	ETS EN 301489-3	EN 61000-3-3
Angewendete harmonisierte Normen:	EN 55022	EN 60950-1
Normes harmonisées utilisées:	EN 61000-4-2	EN 50178
Norme armonizzate utilizzate:	EN 61000-4-3	EN 60204-32
Normas armonizadas utilizadas:	EN 61000-4-4	EN 60529
	EN 61000-4-5	PrEN 13557
	EN 61000-4-6	PrEN 12077-1
	EN 61000-4-11	

Angel Iglesias, S.A.
Polígono Industrial 27 Nº 30
Barrio Martutene
20014-SAN SEBASTIAN

San Sebastián, 30/04/03
Susana Surutusa
Quality Dpt.



2.- SYSTEM DESCRIPTION

The TM70/1 and TM70/2 push-button transmitter type, radio remote control systems are designed for the remote control of hoists and cranes, and are particularly suitable for applications when the operator needs to be able to choose the best location from which to carry out an operation.

The system consists of a transmitter for selecting commands and a receiver, which is connected to the electrical system of the machine to be operated. The system also comes with a battery charger and two rechargeable batteries.

The main specifications are as follows:

The TM70

Frequency band	869,700 a 870,000 MHz; ERP <5mW Optional: 433,050 a 434,040 MHz; ERP <1mW 434.040 a 434.790 MHz; ERP <10mW 914.150 a 915.875 MHz; ERP <1mW
Response Time	100 ms
Temperature range	-20° a +65°C

The T70/1 and T70/2 Transmitters

Protection	IP65
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The R70/13 and R70/21 Receivers

Power supply	48, 115, 230 Vac $\pm$ 10%, 50/60 Hz Optional 12 or 24 Vdc
Consumption	20 W
Relays	230 Vac/8 A
STOP Relays	230 Vac/6 A
Protection	IP55
Electrical Security	Class II (EN50178)

The CB60 battery charger

Power supply	230 Vac $\pm$ 10%, 50Hz; optional 115 Vac, 60 Hz; 24 Vcc; 12 Vcc
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The BT06K batteries

Voltage	4.8 V
Capacity	750 mAh NiMH
Charging temperature	0° to 45°C
Discharge temperature	-20° to 50°C
Autonomy	10 h (operating at 50%)

3.- SAFETY INSTRUCTIONS

These instructions must be read carefully in order to install and use the set properly and to keep it in perfect working condition and to reduce the risks of misuse.

Do not use this set on machines for the lifting of persons or in potentially explosive atmospheres.

Any use other than that specified in this manual is dangerous. The following instructions must be strictly adhered to.

3.1.- WHAT YOU MUST DO

- Strictly adhere to the instructions for installation contained in this manual
- Make sure that professional and competent personnel carry out the installation.
- Ensure that all site and prevailing safety regulations are fully respected.
- Make sure that this manual is permanently available to the operator and maintenance personnel.
- Keep the transmitter out of reach of unauthorised personnel.
- Remove the transmission key when the set is not in use.
- On starting each working day, check to make sure that the STOP button and other safety measures are working.
- When in doubt, press the STOP button.
- Whenever several sets have been installed, make sure the transmitter you are going to use is the right one. Identify the machine controlled on the label for this purpose on the transmitter.
- Service the equipment periodically.
- When carrying out repairs, only use spare parts supplied by IKUSI dealers.

3.2.- WHAT YOU MUST NOT DO

- Never make any changes to the set, which have been studied and approved by manufacturer.
- Never power the equipment other than with the specified power supply.
- Never allow unqualified personnel to operate the equipment.
- After use, never leave the equipment ON. Always use the contact key or the STOP button to avoid accidentally activating manoeuvres.
- Do not use the set when visibility is limited.
- Avoid knocking or dropping the set.
- Do not use the set if failure is detected.



3.2.- NOTES

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

To comply with FCC RF exposure compliance requirements, this device and its antenna must not be co-located with, or operating in conjunction with, any other antenna or transmitter.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

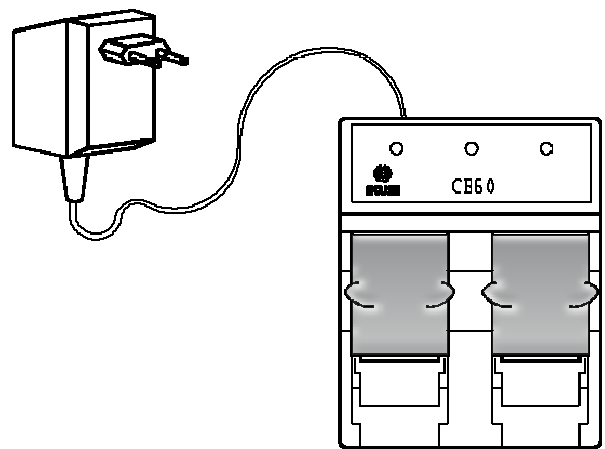
Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

4.- INSTALLATION

4.1.- THE CB60 BATTERY CHARGER

The battery charger CB60 has two charging compartments that can simultaneously charge battery types BT06, BT12, BT06K and BT08K.

Connect the charger to the mains using the power source and cable supplied. On installing the battery charger, bear in mind that the batteries must be charged at temperatures over 5°C and that the power supply must be left on all night. Also remember that the charger must not be left in direct sunlight, as the batteries will not become fully charged at temperatures exceeding 45°C.



Place the batteries in the charger.

The LED's should light up, indicating that recharging is in process. Complete recharging takes 12 hours, but the batteries may remain in the charger for an unlimited period of time.

The capacity of the batteries decreases with use. Their life span is estimated to be 500 recharging cycles, but this depends largely on the conditions of use, for which the following is recommended:

- Do not recharge the battery until it is completely flat. The transmitter indicates this.
- Always charge the batteries at temperatures between 0° and 45°C.
- Charge the batteries at least once every six months..
- Avoid short-circuits between the battery contacts. Do not carry charged batteries in toolboxes or next to other metal objects (keys, coins, etc.).
- Always keep contacts clean.
- Never leave batteries in direct sunlight.

Only use IKUSI manufactured batteries.

When the batteries are exhausted they can be disposed of or recycled safely according to local standards.

4.2.- RECEIVER

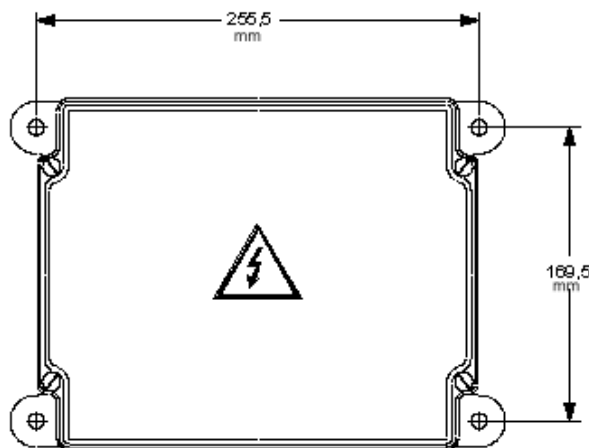
Make sure that the crane is stopped for the entire duration of the assembly process, keep the work area free and wear protective clothing.

Park the crane and position stop-ends (if these are not available use appropriate signs) at a suitable distance so that other cranes on the same runway do not hit it.

Check the power-supply voltage and turn off the mains switch.

Find a suitable location for the receiver with easy access, in a place designated for reception of the radio transmitter signal, and away from any intense radio electric disturbance sources.

Install the receiver cabinet using 4 elastic absorbers.



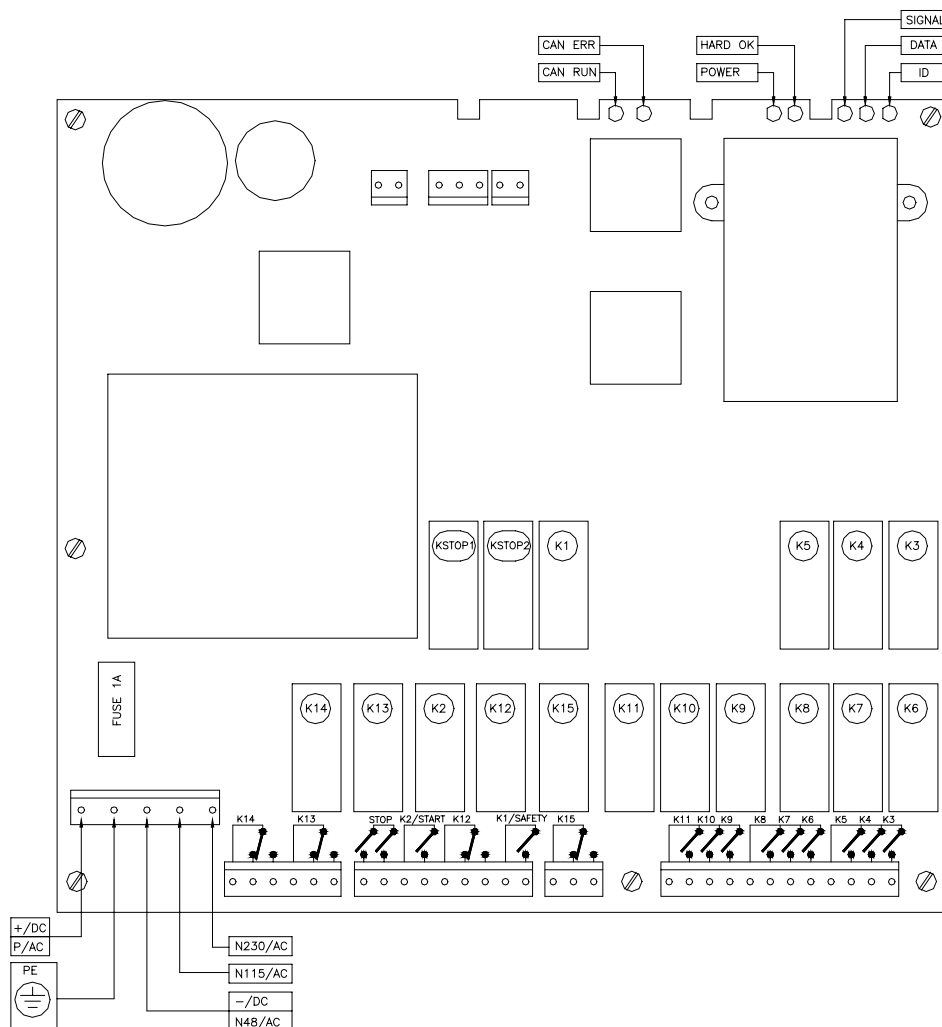
If necessary, it is possible to improve signal reception, by using the extension cables and external antenna kit. This kit is applicable only for non transmitting receivers.

Connect the power supply and the receiver outputs on the corresponding relay board plug-in terminals. Do this following the outputs diagram, which is supplied with the set. This diagram indicates the correspondence between the transmitter commands and the receiver outputs.

The STOP relays KSTOP1 and KSTOP2 are in series and must be connected to the main contactor coil circuit.

The K2/START is activated once the start-up command is held down.

The K1/SEC relay is a safety relay, which is activated when certain commands predefined as “active” on configuration of the set, (i.e. commands which give rise to manoeuvres), are activated.



**Remember to connect the ground cable.
Only use fireproof cables for connections.
Select the appropriate voltage on the receiver, (230, 115 or 48 Vac)**

4.3.- STARTING UP

Proceed with caution; the equipment may not be connected correctly which may lead to unforeseeable movements on starting-up.

Once the receiver has been connected, disconnect the power supply to the motors, (for example, by removing the fuses) and power on the receiver. With this, the receiver will enter into a 'SCANNING' mode and the following LED's will be lit in the receiver;

POWER: ON, indicates that the power supply is correct.

HARDOK: ON, indicates the absence of faults on the boards.

SIGNAL: OFF in the case of the channels being signal free. Blinks ON when there is a RF signal on the channels

DATA: OFF; when there is not another TM70 system active in the area. Blinks ON in the opposite case..

ID: OFF

Next, turn transmitter ON to OPERATION mode, as follows:

- Place a charged battery in the transmitter.
- Turn the contact key.
- Push and pull out the STOP button. LED flashes once orange and then green for 3 seconds. If the transmitter has LCD, it displays the identification of the machine, as well as the battery level.
- Press the start button. The green LED should now light indicating that the transmitter is transmitting.

1.- Label for crane identification.
Optional: LCD Display

2.- LED.

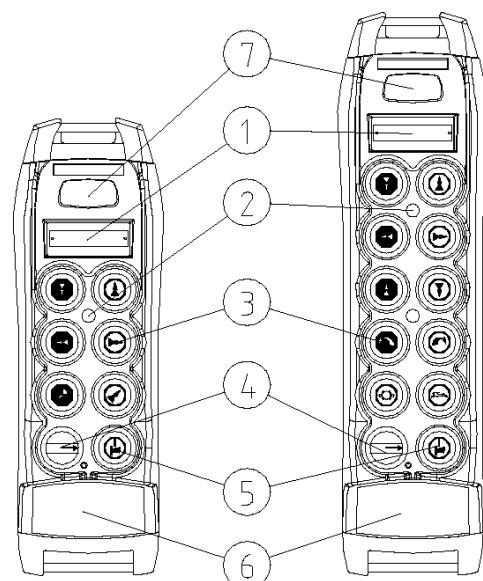
3.- Manoeuvre button

4.- Contact key

5.- Start button

6.- STOP button

7.- Option: Range Limitation





On receiving a signal from the transmitter, the following LED's will light up on the receiver:

POWER: ON, indicates that the power supply is correct.

HARDOK: ON, indicates that defects have not been detected on the board.

SIGNAL: ON, indicates that it is receiving a RF signal at the working frequency.

DATA: When ON indicates that the data received has a correct format.

ID: When ON indicates that the receiver has recognised the transmitter's identification code..

Now, the STOP relays KSTOP1 and KSTOP2 will be activated. The K2/START relay is activated once the start button is pushed.

Press on any of the transmitter's manoeuvre buttons and its corresponding relay will be activated. In case of an active manoeuvre, the safety relay K1/SAFETY will also activate.

Check to make sure all the other manoeuvres work in this way.

Turn off the transmitter using the STOP button, and make sure that on doing so the relays are deactivated and the DATA, ID and SIGNAL LED's go out. They behave exactly as in 'SCANNING' mode.

Reconnect the power supply to the motors, move to the usual work position and check to see if all the manoeuvres and the stop button are functioning correctly.

5.- USING THE SET

To ensure correct use of the equipment, follow the instructions below:

- Make sure the transmitter you are going to use is the right one, identifying the machine on the identification label. In the case of transmitters with LCD display, you are able to edit the machine identification label, refer to ANNEX B. It will allow to the operator to identify the machine before the starting of the equipment.
- Attach the belt to the transmitter unit. Its use is recommended to prevent the equipment from falling.
- Introduce a charged battery, turn the contact key and activate the transmitter.
- To activate the system, you must first pull out the STOP button, the LED should then give an orange pulse followed by green pulses; then press the START button. If you find that the STOP button has already been pulled out, it is necessary to push it in and then pull it out again, as this sequence will allow the check in of the STOP circuit. If the unit has experienced a time-out auto-disconnection, it is not necessary to repeat the STOP button procedure, simply push the START button for 1 second.
- The green LED should light up, indicating that the transmitter has started transmitting. From now on, if any of the transmitter's command buttons are pressed, the corresponding manoeuvre will be activated.
- To be able to start up the transmitter, all the command controls associated with active manoeuvres must be in the neutral position (not activated). This is not the case for the selection functions.
- When 4 minutes have passed and no active manoeuvre command has been activated, the transmitter automatically goes to STAND BY mode, indicated by green pulses each 3 seconds. To start it up once more, press the start button.
- The transmitter is equipped with a circuit for monitoring the battery level. When this level drops below a pre-established limit, the transmitter LED starts to flash in red; 5 minutes later the transmitter switches off, and the machine's main contactor is deactivated. During this time, the load has to be located on a safe position. If the STOP button is activated during this time, transmitter will not start again, unless battery is replaced.
- In transmitters with LCD, the battery power level is indicated as follows:
 - 3 segments: charge greater than 50%.
 - 2 segments: charge between 50 and 10%.
 - 1 segment: charge between 10 and 5%.
 - Nothing: charge lower than 5%.
- To switch off the transmitter, press the STOP button or turn off the contact key.

Remember that you are going to remote control a moving piece of machinery. The safety instructions described in chapter 2 of this manual must be strictly adhered to.



6.- MAINTENANCE

6.1.- WARRANTY

IKUSI guarantees the **TM70** remote control sets for a period of up to one year after the date of delivery. This guarantee covers repairs and the replacement of defective pieces at our Technical Service Department. Both the transmitter and receiver will be necessary if any repairs or replacements need to be carried out.

The guarantee does not cover damage resulting from the following:

- Transport,
- Incorrect installation,
- Repairs or alterations made to the equipment by personnel other than from IKUSI,
- Obvious misuse or incorrect maintenance of the equipment.

Our Technical Service reserves the right to evaluate breakdowns and damage.

Under no circumstances will IKUSI be held responsible for hold-ups at work, accidents or expenses incurred as a result of equipment malfunctioning.

6.2.- PRECAUTIONS

This equipment is designed for use in an industrial environment. However, we recommend you follow the instructions below to extend the life span of your remote control set:

- Use the belt provided with the transmitter to prevent the transmitter from falling.
- Do not clean the transmitter with solvents or pressurised water. Use a damp cloth or soft brush.
- Use and recharge the battery regularly.
- Check every day that the STOP button is working.
- Disconnect the receiver cables if soldering/welding work is going to be carried out on the crane.
- Periodically check the condition of the transmitter rubber seals. Change these over if they show signs of deterioration to ensure they remain watertight.
- Clean the battery contacts.

6.3.- FAULT FINDING

The transmitter and receiver both have status monitoring LED's, which help to identify irregularities. The most common signals are contained in the tables below:

TRANSMITTER

LED	MEANS
Solid green	Transmitter transmitting normally. OPERATION mode.
Green pulses.	Transmitter ready for start-up. STAND BY mode.
Red slow flashing	Battery level low
Red fast flashing	Probably, EEPROM module is not plugged in.
Red double flashing	Transmitter cannot start up because a manoeuvre command is present.
Solid red	Transmitter failure

RECEIVER

In OPERATION mode the 5 LED's must be lit as has been previously described in section 4.3 Starting. If this is so, press the transmitter manoeuvre buttons and observe the response of the output relays. If the response is normal, the problem is not related to the remote control equipment and the installation must be checked. If any of the relays is not activated, the problem is associated with the remote control equipment. If this happens, observe the appearance of the LED's:

LED	LIT	ON	OFF
SIGNAL	RF signal OK	RF signal detection in SCANNING mode	The receiver is not receiving RF signals
POWER	Power Supply OK		Power Supply not OK
HARDOK	Board OK	Slow: fault in the board Fast: error in EEPROM	Fault in the board
ID		ID Code OK (1)	ID not recognised
DATA		Is receiving the correct data from a TM70 (1)	Signal received is not correct

(1): DATA and ID LED's show a weak flashing when data and ID code are received correctly, but Start command has not yet been received. Once Start button is pushed ON; then, DATA and ID LED's will show the standard strong flashing.



If the problem is associated with the equipment, please send both the transmitter and the receiver to the your Technical Assistance Service Agent, together with a description of the problem and the status of the LED's.

If the transmitter becomes so damaged that a spare has to be arranged, it can be quickly substituted by following the instructions in ANNEX A.

6.4.- SPARES

BT06K Battery	2303692
CB60 Battery Charger	2303685
Power supply for CB60, 230 Vca	1106018
Power supply for CB60, 230 Vca UK	1106026
Power supply for CB60, 230 Vca AUS	1106036
Power supply for CB60, 115 Vca	1106027
Elastic Transmitter Strap	1175035
Belt B60	1175022
Reinforced Belt B60C	1175030
Reinforced Strap C60C	1175029
Pushbutton P70	2303765
Pushbutton Cover CP70	2303730
Start Key K60	2300170
Mushroom STOP EMS60	2303666
Selector Switch 1-0-1 M70	2303770
Selector Switch 1-0-1 S70	2303760
Kit antenna extension PR70 1.5	2303815
Fuse	1105001
Pushbutton Upper Part PS70/1	2303731
Pushbutton Lower Part PI70/1	2303611
Pushbutton Upper Part PS70/2	2303732
Pushbutton Lower Part PI70/2	2303616

ANNEX A - PROGRAMMING A SPARE TRANSMITTER.

In case of damage to the transmitter, it is quickly possible to restore service, if a spare transmitter is available. To achieve this we have to install into the spare transmitter the exact parameters of that to be replaced.

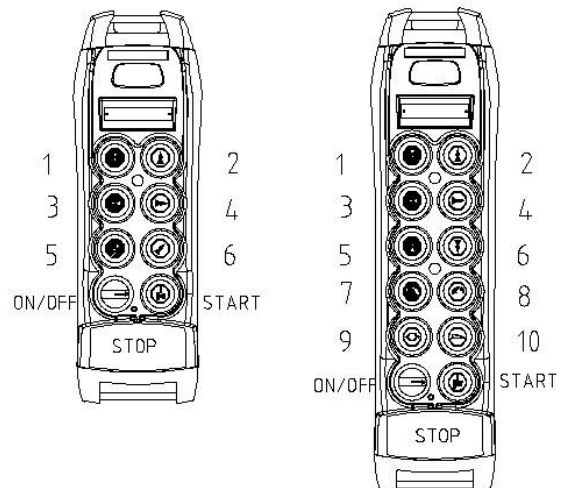
These parameters are stored in an EEPROM memory module EP70, easily accessible from the exterior of the transmitter. The process consists of extracting the EP70 module from the damaged transmitter by unloosening the two screws as shown, and then incorporating this module into the spare transmitter.



In cases where the damage to the transmitter prevents removal of the EP70 module, the spare transmitter can be programmed by removing the memory module found inside the receiver.

To achieve this, proceed as follows:

1. Being the spare transmitter off, insert the EP70 module from the receiver.
2. Turn on the ON/OFF key and extract the STOP button. The LED will pulse orange and then green for 15 seconds..
3. To copy its contents into the internal memory of the transmitter press 6 followed by START, keeping both buttons pressed together for 5 seconds. The LED will blink orange during the copying process (in the LCD display models the word 'Reading...' will be indicated).
4. When the copying process has completed, extract the EP70 and replace it into the receiver. Later when a spare EP70 has been supplied, insert this into the transmitter and again press 6. the LED will again flash orange which indicates that the new EP70 is being written with the stored parameters (in the LCD display models the word 'Writing...' will be indicated).
5. Afterwards press the STOP. This completes the programming processes.

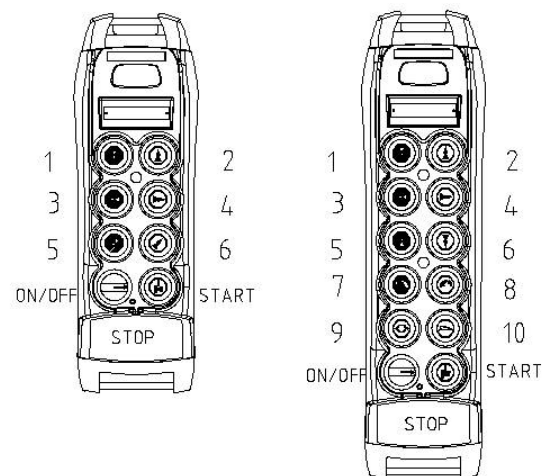


ANNEX B.- PROGRAMMING THE MACHINE IDENTIFICATION IN LCD TRANSMITTERS.

Transmitters with the LCD display option allow the operator to programme a machine identification label of up to 24 text characters. This identification displays on transmitter start-up.

This text must identify the machine with a that is commonly known by the workmen. When first starting the transmitter you can edit/introduce this text as follows;

1. Introduce a battery and turn the ON/OFF key to ON.
2. Push in and then extract the STOP button and you will observe the LED pulse orange followed by green pulses.
3. Press pushbutton 4 to the second step and then push the START button. Keep both pressed together for 2 seconds and then you will enter the 'EDITING' mode.
4. Once you have entered into 'EDITING' mode, there appears in the display the text "CRANE ??" in which the first character blinks. From this point you can edit the name of the machine by means of the push buttons 1 to 4, whose functions are described as follows;



- Pushbutton 1: To move for the list of established characters in descending order.
 - Pushbutton 2: To move for the list of characters established in ascending order.
 - Pushbutton 3: To return to the previous character in the display.
 - Pushbutton 4: To validate the published character and move to the following one, (towards the right hand)
5. Push START to store the edited text. LCD will show the message "SAVED" for 2 seconds.
 6. Once the last character has been edited, you exit the 'EDITING' mode by pressing the STOP.