Appendix L: Manual

Please see the following pages.

IKUSI

OPERATION & INSTALLATION MANUAL

TM70

CONSOLE BOX TRANSMITTER
T70/3/4/5/6/7/8 MODELS

i-KONTROL

TM70Pi V3.2 (11/03) 120021.pdf.

IKUSI

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IKUSI

1.- DECLARATION OF CONFORMITY (870MHz ISM BAND)

DECLARACION DE CONFORMIDAD
CONFORMITY DECLARATION
KONFORMITÄTSERKLÄRUNG
DECLARATION DE CONFORMITE
DICHIARAZIONE DI CONFORMITA'
DECLARAÇAO DE CONFORMIDADE
VERKLARING VAN GELIJK VORMIGHEID

CE 0341

El Fabricante / The Manufacturer / Der Hersteller / Le Fabricant / Il Fabbricante / O Fabricante / De Fabrikant

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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
Verklaart dat het product: Radiobesturing IKUSI

TM70/3/4/5/6/7/8 - 870
TM70/3/4/5/6/7/8 – 870
TM70/i-KONTROL -870

SERIAL NUMBER:

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:
Conform is met de richtlijnen van de Raad:

2006/42 EEC MACHINERY
99/5 EEC R&TT

Normas armonizadas utilizadas:
Applied harmonized standards:
Angewendete harmonisierte Normen:
Normes harmonisées utilisées:
Norme armonizate utilizzate:
Normas harmonizados aplicados:
Volgens geharmoniseende normen:

ETSI EN 300220-1 V1.3.1
ETSI EN 300220-3 V1.1.1
ETSI EN 301489-1 V1.6.1
ETSI EN 301489-3 V1.4.1
EN 55022 : 1994
EN 61000-4-2 : 1995
EN 61000-4-3 : 1996
EN 61000-4-4 : 1995
EN 61000-4-5 : 1995
EN 61000-4-6 : 1996
EN 61000-4-11 : 1994
EN 61000-3-2 : 1995
EN 61000-3-3 : 2001
EN 60950-1 : 2001
EN 50178 : 1998
EN 60204-32 : 2001
EN 60529 : 2000
EN 13557 : 2004
EN-954-1 o EN 13849 : 2004
prEN 280:2009

San Sebastián

Luis Ayuso Jauregui

Director de Calidad

02/07/2007

IKUSI

2. - DECLARATION OF CONFORMITY (433MHz ISM BAND)

DECLARACION DE CONFORMIDAD
CONFORMITY DECLARATION
KONFORMITÄTSERKLÄRUNG
DECLARATION DE CONFORMITE
DICHIARAZIONE DI CONFORMITA'
DECLARAÇAO DE CONFORMIDADE
VERKLARING VAN GELIJK VORMIGHEID

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El Fabricante The Manufacturer Der Hersteller Le Fabricant Il Fabbricante O Fabricante De Fabrikant	ANGEL IGLESIAS, S.A. Paseo Miramón 170 SAN SEBASTIAN - SPAIN NIF: A-20-036.018 Tel : (+34) 943 448800 Fax: (+34) 943 448819 www.ikusi.com

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Erklärt, dass das Produkt: Funkfernsteuerung IKUSI
Déclare que le produit: Télécommande IKUSI
Dichiara che il prodotto: Radiocomando IKUSI
Declara que o produto: Radiocomando IKUSI
Verklaart dat het product: Radiobesturing IKUSI

TM70/3/4/5/6/7/8 - 433
TM70/3/4/5/6/7/8 – 433
TM70/i-KONTROL - 433

SERIAL NUMBER:

Cumple con las Directivas de Consejo:
Complies with the provisions of Council:
Erfüllt die Richtlinien des Rates:
Accompli les Directives du Conseil:
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2006/42 EEC MACHINERY
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EN 61000-4-5 : 1995
EN 61000-4-6 : 1996
EN 61000-4-11 : 1994
EN 61000-3-2 : 1995
EN 61000-3-3 : 2001
EN 60950-1 : 2001
EN 50178 : 1998
EN 60204-32 : 2001
EN 60529 : 2000
EN 13557 : 2004
EN-954-1 o EN 13849 : 2004
prEN 280:2009

San Sebastián

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02/07/2007

3.- SYSTEM DESCRIPTION

The TM70/3, TM70/4, TM70/5, TM70/6, TM70/7, and TM70/8 console type transmitter radio remote control systems, are designed for the remote control of hoists and cranes (overhead cranes, tower cranes, hydraulic loader cranes, concrete pumps, driverless vehicles, etc) and are particularly suitable for applications when the operator needs to be able to choose the est 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. Main technical characteristics:

TM70 System

Frequency band	869,700 to 870,000 MHz; ERP <5mW 433,050 to 434,040 MHz; ERP <1mW 434.040 to 434.790 MHz; ERP <10mW 902.000 to 928.000 MHz; ERP <1mW
Response Time	100 ms
Temperature range	-20º a +70ºC

Transmitters T70/3, T70/4, T70/5, T70/6, T70/7 y T70/8

Ingress protection	IP65

Receivers: R70/13, R70/21, R70/29 y R70/36, R70/13A4V, R70/13A6V, R70/13A8V, R70/13A4I, R70/13A6I , R70/13A8I and R70/XX

Power supply	48, 115, 230 Vac ± 10%, 50/60 Hz Optional 12 ó 24 Vdc
Consumption	20 W
Relays	230 Vca/8 A
STOP Relays	230 Vca/6 A
Protection	IP65
Electrical Safety	Class II (EN50178)
Storage temperatura range (24h)	-25°C / +75°C (-13°F / 167°F)
Storage temperatura range —long periods-	-25°C / +55°C (-13°F / 131°F)
Relative humidity:	Máx. 95% (without condensation)
LR71-AC: Input protection (F1)	Fuse: 0,5A/250V FAST
LR72-AC:Input protection (F1)	Fuse: 0,63A/250V FAST
LR71-DC y LR72-DC:Input protection (F1)	Fuse: 2A/250V FAST

The CB70/BC70K battery charger

Power supply	230 Vac ± 10%, 50 Hz; optional 115 Vca, 60 Hz; DC Range : from 10,5v to 35v.

Batteries:	**BT20K**
Voltage	4,8 V
Capacity	2000 mAh NiMH
Charging temperature	0º a 45ºC
Discharge temperature	-20º a 50ºC
Battery life	12 a 18h

4.- 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 in potentially explosive atmospheres.

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

4.1 - 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.
- 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.

4.2 - 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.

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

4.3 - FCC RECOMENDATIONS (Only valid for equipment that works in 915MHz ISM band)

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.

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le *fonctionnement.*

5.- INSTALLATION

5.1 - CB70 (BC70K) BATTERY CHARGER

The battery charger CB70 has two charging compartments that can simultaneously charge battery types BT06, BT12 (TM60 series) and BT06K, BT20K (TM70 series).

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 0ºC and that the power supply must be left on all night.

Place the batteries in the charger. Please wait about 5 seconds between consecutive insertions of batteries in their locations.

Each battery location has a green led indicator associated.

Green led indications:

1) Green led blinking: it indicates that the battery is excessively unloaded ; when the led finishes blinking it indicates that the normal loading operation mode has begun.

2) Green led permanently lightning: it indicates normal loading operation mode.

3) Green led extinguished: it indicates that the battery loading process has finished.

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 moment.
- Always charge the batteries at temperatures between 0º and 45ºC (the batteries will not become fully charged at temperatures exceeding 45ºC). Remember that the charger must not be left in direct sunlight.
- 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.

Warning: if the battery charger is powered with lower voltage than 10,3v DC, the green led indicates battery in charging process, even if there is no battery placed in the charger.

- **Only use IKUSI manufactured batteries**
- **The exhausted batteries must be disposed of or recycled safely according to local standards**

- **The IKUSI - ATEX batteries (BT06K-ATEX and BT20K-ATEX), only can be re-charged with the BC70K or CB70 battery charger. Remark: these batteries will damage when using IKUSI's CB60 battery charger.**

5.2 - 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, disconnecting the wiring and connector between the receiver and the electrical cabinet of the machine.
Remember that the receiver has several voltage-powered circuits. Even when the power has been cut off, there is still a risk of electrical shocks.

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 (M8).

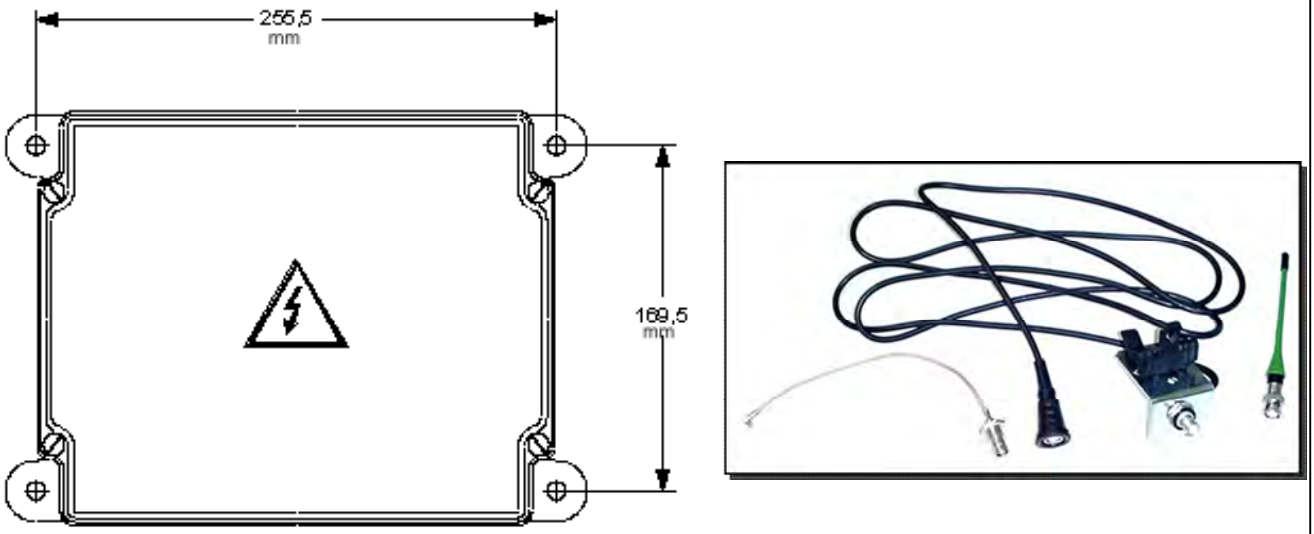

Figure 5. Receiver, external antenna and cable extension cables kit.

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 y 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/SAFETY 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.

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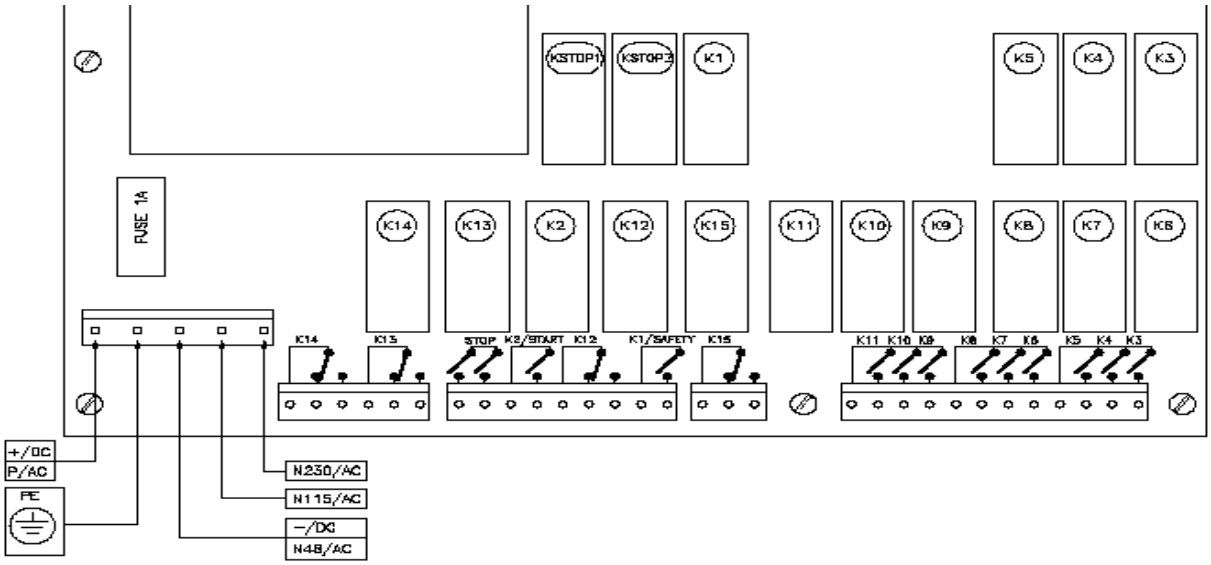

Figure 6. Receiver’s electronic card

Remember to connect the ground cable.
Only use fireproof cables for connections.
Select the appropriate voltage on the receiver, (230, 115 or 48 Vac – 12 or 24 Vcc)

5.3 - 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. First of all the LEDs will light on an instant to test that all are all right, after this the receiver will enter into a 'SCANNING' mode and the following LED's will be lit in the receiver;

POWER (1):	ON, indicates that the power supply is correct.
HARDOK (2):	ON, indicates the absence of faults on the boards.
SIGNAL (3):	OFF, in the case of the channels being signal free. Blinks ON when there is a RF signal on the channels.
DATA (4):	OFF, when there is not another TM70 system active in the area. Blinks ON in the opposite case.
ID (5):	OFF
CAN_RUN (6):	ON, Indicates that CAN communications with expansion boards are OK.
CAN_ERR (7):	OFF
ORDER (8):	OFF
RELAY (9):	OFF

Figure 7. Signalling LEDs in the receiver.

1.-Label for crane identification.

2.-LED.

3.-Command elements.

4.-Contact key.

5.-Start button.

6.-STOP button.

7.-Option: LA70 Range Limitation.

8.-Optional: LCD70 Display + LA70 (able to be activated by EEPROM).

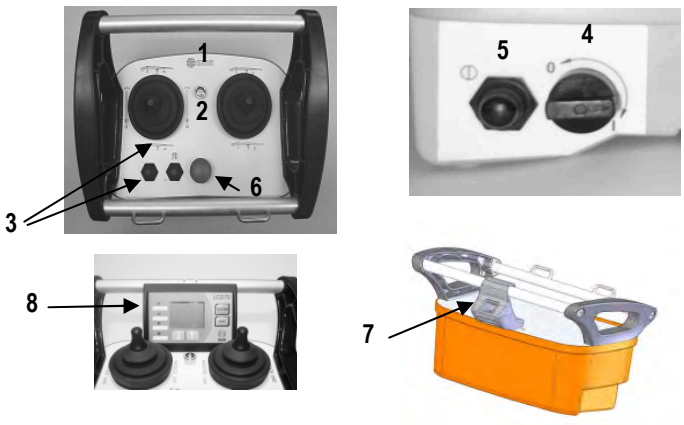

Figure 8. Command and signalling elements in the transmitter

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 orange-green). 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.

On receiving a signal from the transmitter, the receiver enters in OPERATION mode; 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.
CAN_RUN:	ON, Indicates that communications with CAN expansion boards are OK.
CAN_ERR:	OFF
ORDER:	ON, Indicates the activation of any digital manoeuvre
RELAY:	ON, Indicates the activation of STOP relays

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.

IMPORTANT REMARK:

IKUSI does not take responsibility of an incorrect installation, interferences produced by collision of frequencies, nor of the management of the working frequencies in fixed facilities, where several radio remotes systems, share or can share, the same zone or working area.

6.- 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, (ANNEX B). It will allow to the operator to identify the machine before the starting of the equipment.

  When modified the Machine Identification Label in the transmitter, it do not get updated in the receiver's EEPROM. To do so proceed to copy the transmitter's EEPROM into the receiver's EEPROM.

- 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-green pulse; 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 3 of this manual must be strictly adhered to.

7.- MAINTENANCE

7.1 - 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.

7.2 - 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 pushbutton 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.

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7.3 - TROUBLESHOOTING

The transmitter and receiver 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	FLASHING	OFF
POWER	Power Supply OK	--	Power Supply not OK
HARDOK	Board OK	Slow: fault in the board Fast: error in EEPROM	Fault in the board
SIGNAL	RF signal OK	RF signal detection in SCANNING mode	The receiver is not receiving RF signals
DATA	--	Is receiving the correct data from a TM70	Signal received is not correct
ID	--	ID Code OK	ID not recognised
ORDER	Any digital manoeuvre ON	--	No digital manoeuvre ON
RELAY	STOP relays ON	--	STOP relays OFF

There are also two LEDs in the received which will describe the status of the CAN-BUS. If the CAN connection is not working, check the status of next LEDs:

LED	LIT	FLASHING	OFF
CAN_RUN	Operating status	Pre-operating status	CAN communication non active
CAN_ERR	Communication OK	Communication error	CAN controller disconnected

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.

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.

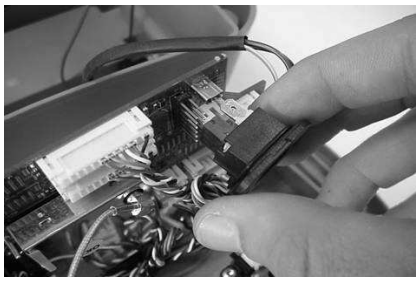
These parameters are stored in an EEPROM memory module EP70, accessible from the exterior of the transmitter. Switch off the damaged transmitter and extract the EP70 module by unloosening the four screws, as shown, and then incorporate this module into the spare transmitter.

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

To achieve this, proceed as follows:

SQUARE: The actuator or mechanism associated to this symbol will be used to copy the EEPROM.

7. Please indentify in the console upper part the symbol associated to the special function“Copy EP” (SQUARE).
8. Being the spare transmitter off, remove its empty EP70 module as described above, and insert the EP70 module from the receiver.
9. Introduce a charged battery, turn on the ON/OFF key, push and extract the STOP button. The LED will pulse green for around 15 seconds.
10. To copy its contents into the internal memory of the transmitter press the actuator or mechanism identified as “**Copy EP**” followed by START, keeping both buttons pressed together while LED blinks red. Once the LED start to blink orange, release the pushbuttons and LED will lit green. In the LCD display models the words “Reading...” and “Reading ok Change EEP” will be indicated. In case the LED remains in red colour, (or the LCD displays “Reading nok”), repeat the process.



11. When the copying process has completed, extract the EP70 and replace it into the receiver. Insert a new EP70 module into the spare transmitter and again press the actuator or mechanism identified as **“Copy EP”**. The LED will flash orange, which indicates that the empty EP70 is being written with the stored parameters In the LCD display models the words “Writing...” and “Writing ok” will be indicated. In case the LED remains in red colour, (or the LCD displays “Writing nok”), repeat the process.
12. 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 program a machine identification label of up to 24 text characters. This identification is displayed on transmitter starting-up.

This text must identify the machine with a name that is commonly known by the workmen.

When first starting the transmitter you can edit/introduce this text as follows:

11. Identify in the Technical Data Sheet supplied with your system the actuator assigned to the functions "**Configuration"**, **"ENTER", "UP", "DOWN"** y **"ESC"**
12. Introduce a battery and turn the ON/OFF key to ON .
13. Push in and then extract the STOP button and you will observe the LED pulse orange-green.
14. Press pushbutton "**Configuration** followed by START button and keep both pressed together for 2 seconds and then you will enter the CONFIG mode.
15. Push **"ENTER"** to get into the Menu.
16. Move through the menu with pushbuttons **"UP"** y **"DOWN"** until reaching the EDIT LABEL menu.
17. Push **"ENTER"**
18. 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 "Down", "Up", "Enter" and "Escape", whose functions are described as follows:
    - **"DOWN"**: To move for the list of established characters in descending order
    - **"UP"**: To move for the list of characters established in ascending order
    - **"ESC"**: To return to the previous character in the display.
    - **"ENTER"**: To validate the published character and move to the following one, (towards the right hand)
19. Push START to store the edited text. LCD will show the message "SAVED" for 2 seconds.
20. You exit the EDITING mode by pressing the STOP.

ANNEX C.- BASE CHANNEL CHANGING.

Console box transmitters with software version V2.4 have implemented the base channel changing functionality in a standard way (assigning symbols to mechanisms).

8) Identify the "▲" symbol associated to the corresponding maneuver (base channel tens modification) and the "■" symbol associated to the corresponding maneuver (base channel units modification), preferably associated to the following mechanisms: pushbuttons, selectors, joysticks, etc.
9) With the transmitter switched on, release the STOP button. Press the mechanism identified with the symbol "▲" (pushbutton, selector, joystick, etc.) and then the "Start" pushbutton. Although the "active order" status is signalized (red LED blinking and buzzer active), wait until the LED is signaling orange continously.
10) The LED wiil show the current base channel information, using red and green pulses:
    Number of green pulses = number of tens of the current base channel.
    Number of red pulses = number of units of the current base channel.
11) Then the LED will light in orange colour continously.
12) Changing to the new base channel:
    New channel "units": press the "■" symbol as many times as the number of units of the new base channel.
    New channel "tens": press the "▲" symbol as many times as the number of tens of the new base channel.
13) The LED will show the new base channel information following the procedure of point 3).
14) Press STOP pushbutton; the new base channel will be recorded and the transmitter will be ready to work in the new channel.

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8.- CAN OPEN INTERFACE V 2.4

CANopen INTERFACE V2.4

TM70

8.1 - INTRODUCTION

The TM70 system with CANopen interface is integrated in CANopen networks where it will work in slave mode. It handles the Bus the state of the Pushbuttons of the TM70 transmitter, such that any external device can react consequently.

The functionality of the system is according the CiA DS-301 v4.0.2. specification. The implemented profile is described in CiA DS-401 v2.1 (Input/Output standard), where the pushbutton manoeuvres are considered as digital inputs.

The implemented characteristics are:

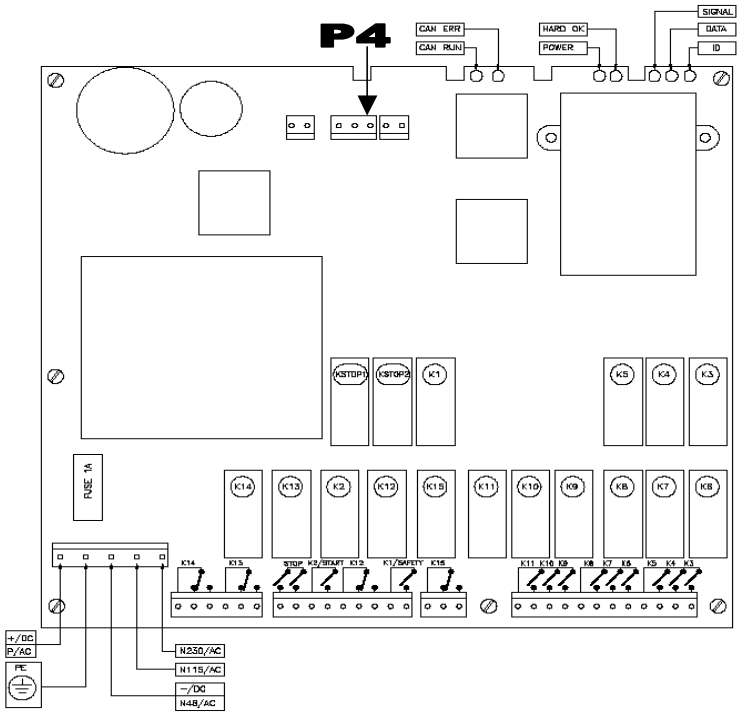
NMT Functioning: slave.
NodeID: EEPROM configurable, from 1 to 127.
Baud rate: EEPROM configurable. Supported speeds: 10, 20, 50, 100, 125, 250, 500, 800 and 1000 Kbps.
Error control: it can work “Heartbeat” as well as “Node/life guarding”. EEPROM configurable.
Number of PDO’s: 2 TPDO (manoeuvres state).

- Objects 1800 – 1A00
- Objects 0x1801 – 0x1A01

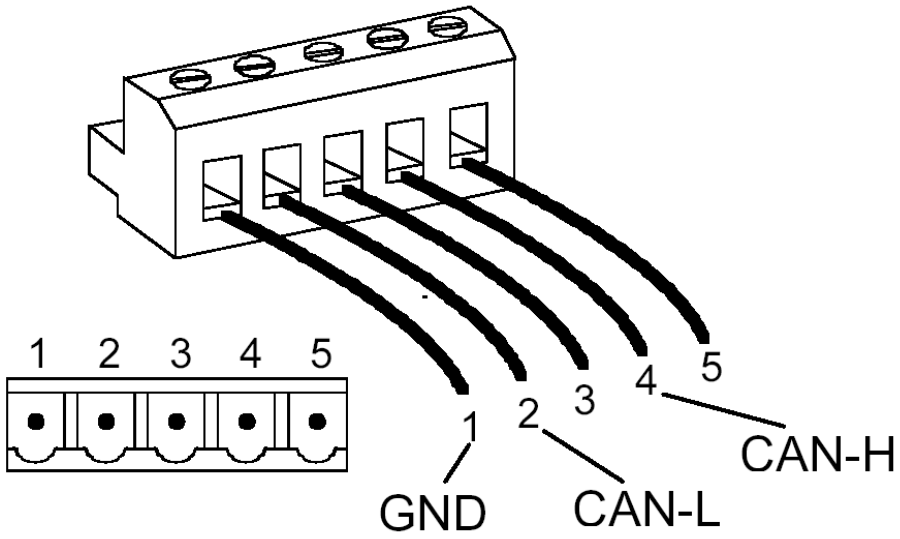
2 RPDO (receiver PDOs)
EEPROM parameters recording: not supported.

8.2 - CAN BUS CONNECTION

In order to connect the CAN bus to the LR72 pcb, it contains a 5 poles connector (P4).



The LED signalling is the one recommended by the CiA (CAN in Automation) Organisation in its document DR-303-1:



Bus Termination

Next to the connector, there is one jumper that allows to connect/disconnect the bus termination. It is important for a correct bus operation that bus terminations are connected in both ends, and disconnected in the intermediate nodes.

8.3 - TRANSMITTER DATA DICTIONARY

The dictionary objects supported by the TM70 are:

1000: DEVICE TYPE
1001: ERROR REGISTER
1002: STATUS REGISTER
1003: PREDEFINED ERROR FIELD
1003.0: number of errors
1003.x: standard error field
1005: COB-ID SYNC
1006: COMMUNICATION CYCLE PERIOD
1007: SYNCHRONOUS WINDOW LENGTH
1008: MANUFACTURER DEVICE NAME
1009: MANUFACTURER HARDWARE VERSION
100A: MANUFACTURER SOFTWARE VERSION
100C: GUARD TIME
100D: LIFE TIME FACTOR
1014: COB-ID EMCY
1015: INHIBIT TIME EMERGENCY
1017: PRODUCER HEARTBEAT TIME
1018: IDENTITY OBJECT

1018.0: number of entries
- 1018.1: Vendor ID
- 1018.2: Product Code
- 1018.3: Revision Number
- 1018.4: Serial number

1800: TRANSMIT PDO COMMUNICATION PARAMETER
- 1800.0: number of entries
- 1800.1: COB-ID
- 1800.2: Transmission type
- 1800.3: Inhibit time
- 1800.4: Event timer

1801: TRANSMIT PDO COMMUNICATION PARAMETER
- 1800.0: number of entries
- 1800.1: COB-ID
- 1800.2: Transmission type
- 1800.3: Inhibit time
- 1800.4: Event time

1A00: TRANSMIT PDO MAPPING PARAMETER
- 1A00.0: number of entries
- 1A00.1: PDO mapping entry
- 1A00.2: PDO mapping entry
- 1A00.3: PDO mapping entry
- 1A00.4: PDO mapping entry

1A01: TRANSMIT PDO MAPPING PARAMETER
- 1A01.0: number of entries
- 1A01.1: PDO mapping entry
- 1A01.2: PDO mapping entry
- 1A01.3: PDO mapping entry
- 1A01.4: PDO mapping entry

6000: DIGITAL INPUT 8 BITS
- 6000.0: number of entries
- 6000.1: start and stop buttons (start1, start2, stop)
- 6000.2: Inputs 1-8
- 6000.3: Inputs 9-16
- 6000.4: Inputs 17-24
- 6000.5: Inputs 25-32
- 6000.6: Inputs 33-40
- 6000.7: Inputs 41-48
- 6000.8: Inputs 49-56
- 6000.9: Inputs 57-64
- 6000.10: Inputs 65-72
- 6000.11: Inputs 73-80
- 6000.12: Display status (CAN return)

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8.4 - PUSHBUTTONS AND CONSOLE BOX PDOs

PUSHBUTTONS

The system is provided with a 4 byte configured transmission PDO (bytes with information):

1st byte	2nd byte	3rd byte	4th byte
Object 6000.1	Object 6000.2	Object 6000.3	Object 6000.4
Start1	M1	M9	M17
Start2	M2	M10	M18
Stop	M3	M11	M19
0	M4	M12	M20
0	M5	M13	A1
0	M6	M14	A2
0	M7	M15	0
0	M8	M16	0

The PDO transmission is configured by default as “event driven”, this is, it is sent every time there is a change on any input.

CONSOLE BOX

The system is provided with 12 byte configured transmission PDO (bytes with information). The 12th byte includes one bit (“0” or “1”), corresponding with the ***display status*** **-> Ready (0) Busy (1)**

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte
Objeto 6000.1	Objeto 6000.2	Objeto 6000.3	Objeto 6000.4	Objeto 6000.5	Objeto 6000.6	Objeto 6000.7
Start1	I1	I9	I17	I25	I33	I41
Start2	I2	I10	I18	I26	I34	I42
Stop	I3	I11	I19	I27	I35	I43
0	I4	I12	I20	I28	I36	I44
0	I5	I13	I21	I29	I37	I45
0	I6	I14	I22	I30	I38	I46
0	I7	I15	I23	I31	I39	I47
0	I8	I16	I24	I32	I40	I48

8th byte	9th byte	10th byte	11th byte	12th byte
Objeto 6000.8	Objeto 6000.9	Objeto 6000.10	Objeto 6000.11	Objeto 6000.12
I49	I57	I65	I73	“0” o “1”
I50	I58	I66	I74	
I51	I59	I67	I75	
I52	I60	I68	I76	
I53	I61	I69	I77	
I54	I62	I70	I78	
I55	I63	I71	I79	
I56	I64	I72	I80	

The PDO transmission is configured by default as “event driven”, this is, it is sent every time there is a change on any input.

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8.5 - RECEIVER DATA DICTIONARY

NumRPDO: it is a variable which must be configured to use CAN return or not. The value to activate CAN return is 2. The value to deactivate CAN return is 0.

1400: RECEIVE PDO1 COMMUNICATION PARAMETER
- 1400.0: number of entries
- 1400.1: COB-ID
- 1400.2: Transmission type
- 1400.3: Inhibit time
- 1400.4: Event timer

1401: RECEIVE PDO2 COMMUNICATION PARAMETER
- 1401.0: number of entries
- 1401.1: COB-ID
- 1401.2: Transmission type
- 1401.3: Inhibit time
- 1401.4: Event timer

1600: RECEIVE PDO1 MAPPING PARAMETER
- 1600.0: number of entries
- 1600.1: PDO mapping entry
- 1600.2: PDO mapping entry

1601: RECEIVE PDO2 MAPPING PARAMETER
- 1601.0: number of entries
- 1601.1: PDO mapping entry
- 1601.2: PDO mapping entry
- 1601.3: PDO mapping entry
- 1601.4: PDO mapping entry
- 1601.5: PDO mapping entry
- 1601.6: PDO mapping entry
- 1601.7: PDO mapping entry
- 1601.8: PDO mapping entry

6200: DIGITAL OUTPUT 8 BITS
- 6200.0: number of entries
- 6200.1: LEDs
- 6200.2: Buzzer

6411: ANALOGUE OUTPUT 16 BITS
- 6411.0: number of entries
- 6411.1: LCD1
- 6411.2: LCD2
- 6411.3: LCD3
- 6411.4: LCD4
- 6411.5: LCD5
- 6411.6: LCD6
- 6411.7: LCD7
- 6411.8: LCD8

When the receiver is configured as an SLAVE in the CANOpen standard bus it can communicate with other devices in the CAN bus. In this operating mode (CAN return) the receiver can trasnmitt information to control for example leds, the buzzer and the messages to show in the LCD70 display for the console box and only messages in the pushbutton models.

CONSOLE BOX:

The receiver can accept a maximun of 2 frames of data; the first frame contains 2 bytes of data. The first byte controls the led status and the second byte controls the buzzer state.
The second frame contains 8 bytes of data. These bytes contains the information that can be displayed in the display using VT100 commands which control the editing format of the data in the display.

PUSHBUTTON:

In this case, the VT100 commands are different from the console box because the display layout and the functionality are also different.

RETURN IFORMATION MANAGEMENT EXAMPLE

Data transmission and reception:

The external device and the remote control receiver can communícate through the CAN bus. Both devices can interchange data frames called PDOs (Programming Device Objects)

The external device will send to the remote control receiver 2 data frames to be sent to the remote transmitter. There will be two different data frames: RPDOs (Reception Programming Device Object) input data frames from the external device to the radio remote receiver; TPDOs (Transmission Programming Device Object) from the radio remote receiver to the external device.

RPDO

The user, depending on the external device can control the messages to edit in the LCD display as well as the LEDs and the internal buzzer.

In case of handheld pushbutton transmitters the system only can send messages to the display. In case of console box transmitters, the system can managed messages, LEDs and internal buzzer. Two RPDOs will be received

RPDO1:

In this data frame, the receiver will obtain the information about the LEDs status and the buzzer status, as digital data input.

COB-ID = RPDO1_ID + Node_ID = 0x200 + 100

Two data will be received:

6200 object, sub-index 1 (LEDs)

6200 object, sub-index 2 (buzzer)

RPDO2:

This data frame contains the information to be shown in the display. This data package contains 8 byes: VT100 commands or data to be shown in the display

COB-ID = RPDO2_ID + Node_ID = 0x300 + 100

Eight data will be received:

6410 object, sub-index 1 to 8 (8 bytes with VT100 compatible commands)

The received display commands will be 8 bytes grouped frames. If the length of the frame is higher the radio remote receiver will split the data in 8 bytes data frames. For the radio remote receiver the received data are transparent; the receiver does not process the information.

8.6 -RECEIVER'S SIGNALLING

The receiver is furnished with two signalling LEDs, controlled according to CIA DR-303-3 recommendation:
CAN-RUN (green): indicates the system state inside the CANopen machine state:

- Blinking every 200 ms. In preoperational state.
- Solid green permanently in operational state.
- One blink every second in stop state.

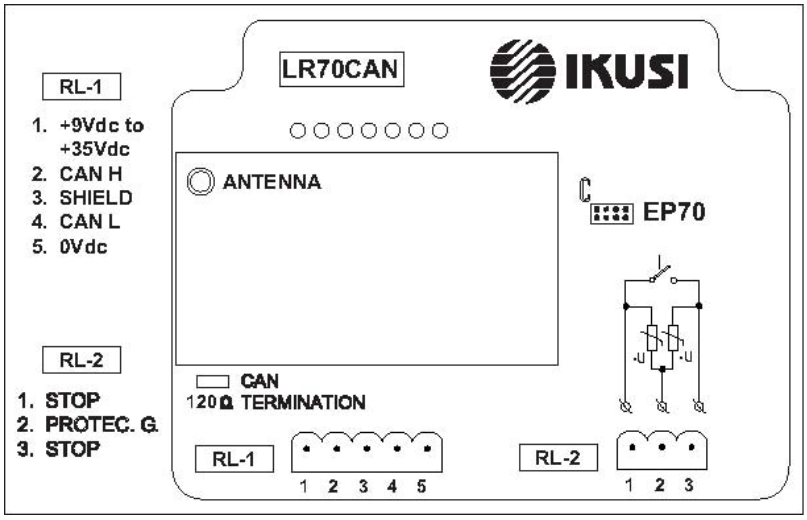
CAN-ERR (red): indicates error if switched on; in normal conditions it must be switched off.

8.7 - TM70 CAN RECEIVERS

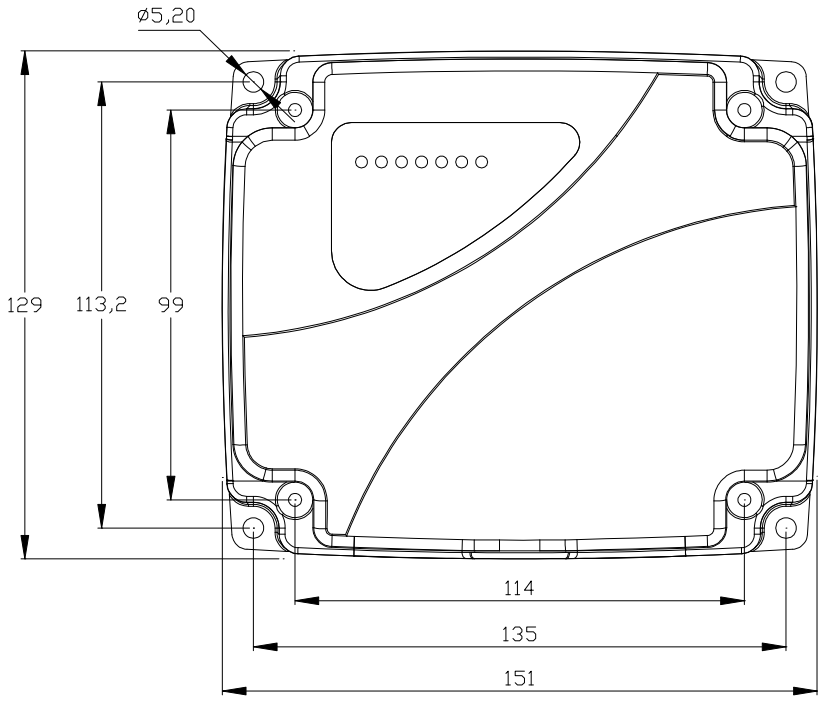
Ref. 3302750 (7503 70GR401 RX R70CANC3 433)
Ref. 3302751 (7504 70GR903 RX R70CANC3 915)

70GR902 RX-RCANNOCE Ref. 3302626	Specifications
Available frecuencies (ISM bands)	915MHz (FCC certified) 433MHz
Power supply / Maximum consumption	9-35v DC / 5W maximum
Inputs / Outputs interface	CAN:Standard CAN Open protocol 401 (CIA DS401)
Ingress protection	IP67 / NEMA-6
Antenna	External: NEARSON S325TR-015 or equivalent
Working frequency selection	Automatic: LBT (listen before talking)
Weight	430 gr.
Dimensions	Long = 151mm / Width = 129mm (160mm with PG) / Height = 61mm
EEPROM	Extractable EP70 module
Signalling	MultiLED: 7 external LEDS (6 green + 1 bicoloured) 2 internal LEDS (CAN status: 1 red + 1 green)
Connexions	Fast PLUG-IN plugs and 2 x M16 cable glands 1) Power supply cable gland: M16 / IP67 2) Inputs / Outputs interface cable gland: M16 / IP67
STOP function	Cat. 3 EN-954-1 / 2 STOP relays: 250V / 6A maximum STOP response time = 50 miliseconds
CAN BUS termination (120 Ohm)	ON / OFF jumper (internal)
Passive STOP time	Programmable: 0,5 to 2 seconds (máx)
Input protection	PTC / 0,3A fuse
Output protections (STOP)	VDR in contacts
Operating mode temperatura range	-20ºC / +70ºC (-4ºF / 158ºF)
Storage temperatura (24h)	-25ºC / +75ºC (-13ºF / 167ºF)
Storage temperature –long periods-	-25ºC / +55ºC (-13ºF / 131ºF)
TM70 range supported transmitters	T70/1/2; T70/3/4; T70/5/6; T70/7/8

Connections scheme :



Receiver's dimensions in milimeters:



It is also available the option Ref. IKUSI 3302620 "Fast fixation kit", including a set of 4 magnets and 4 shock absorbers

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Maintenance and troubleshooting / LED's signaling

RECEIVER'S LED SIGNALING				
LED	***COLOUR***	**STATUS**	**REMARKS**	**PROPOSED ACTION**
POWER	GREEN	Switch On if powered	Power supply OK	Check the power supply
HARDOK	GREEN	Solid green LED if no error detected Blinking during start up process	Receiver hardware OK	OK Please wait to finish the start up process
HARDOK	RED	Solid red LED if one of these errors appears: - Watchdog activated / Oscillator breakdown / wrong ROM checksum - Reset activated Blinking fast : wrong EEPROM checksum / Data corrupted / CAN Bus error	Electronic board hardware breakdown ----------	Replace the electronic board Reprogramme EEPROM
SIGNAL	GREEN	LED Off if no radio signal detected (Squelch)	- LED On and the transmitter switched Off indicates occupied radio channel - LED On and DATA switched Off indicates radio channel occupied by a non IKUSI system	Verify transmitter's radio and battery
DATA	GREEN	LED Off if a wrong frame is received Blinking if receiving good frames	LED Off and SIGNAL LED On: Radio breakdown	Replace radios
ID	GREEN	Blinking if a correct ID is received	Switched Off and DATA LED switched On: no valid ID	If the radio channel is not busy: verify transmitter's selected ID or reset receiver ID
			SIGNAL; DATA and ID LED On, indicates valid frames from the transmitter. Correct link.	OK
RELAY	GREEN	STOP relay activated	----------	----------
ORDER	GREEN	----------	----------	----------

Internal LEDS signaling

CAN-RUN (green): indicates the system state inside the CANopen machine state:

- Blinking every 200 ms. In preoperational state.
- Solid green permanently in operational state.
- One blink every second in stop state.

CAN-ERR (red): indicates error in the field-bus; if switched on; in normal conditions it must be switched off.

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9.- LCD70 DISPLAY OPTION

LCD70 DISPLAY OPTION

TM70

9.1 - INTRODUCTION and FUNCTIONAL DESCRIPTION

The LCD70 is a 102x80 dot matrix display that can be configured as follows: 4 function customized keyboard and a 4 function standard keyboard (ENTER/ESC/UP/DOWN), both with 4 bicoloured LEDS.

LCD70 MODULE:

The LCD70 has a configuration of 120x80 points and supports the following representation format : 2 lines x12 characters / line + icons

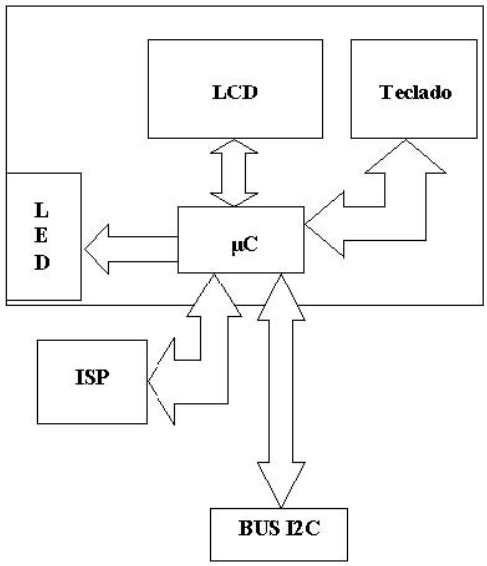
KEYBOARD:

The hardware of the LCD70 is ready to connect to 4 functions keyboard.

LEDS and BACKLIGHT

The LCD70 display has 4 bicoloured LEDS (red, green and orange colours) and it also supports a backlight of 15 seconds.

BLOCK DIAGRAM:

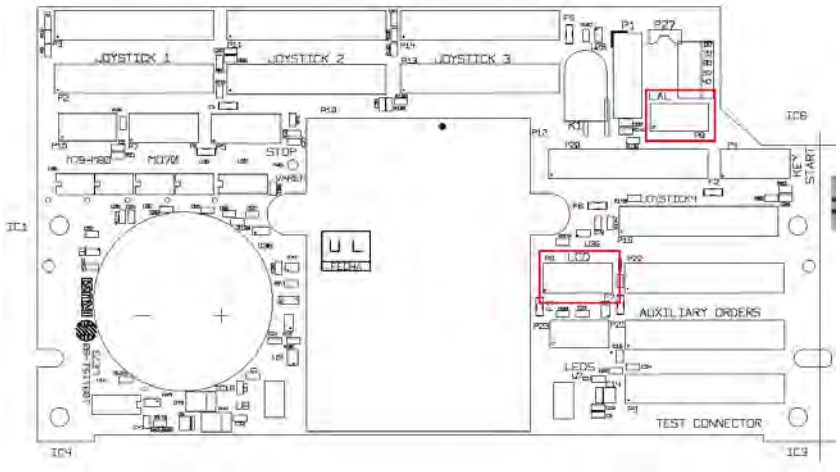


9.2 - INTERNAL CONNECTION

POWER SUPPLY and I2C BUS

The LE73/74/7EF card provides 3V3 and GND signals to power on the display module through P6 connector marked as “LCD” in the PCB, as well as the SDA and SCL I2C bus signals, using a 4 wire coloured braid cable, code IKUSI 1095083.

PIN	NAME	DESCRIPTION
1	3V3	3.3 V DC Power Supply
2	SCL	I2C Clock
3	SDA	I2C Data
4	GND	Ground

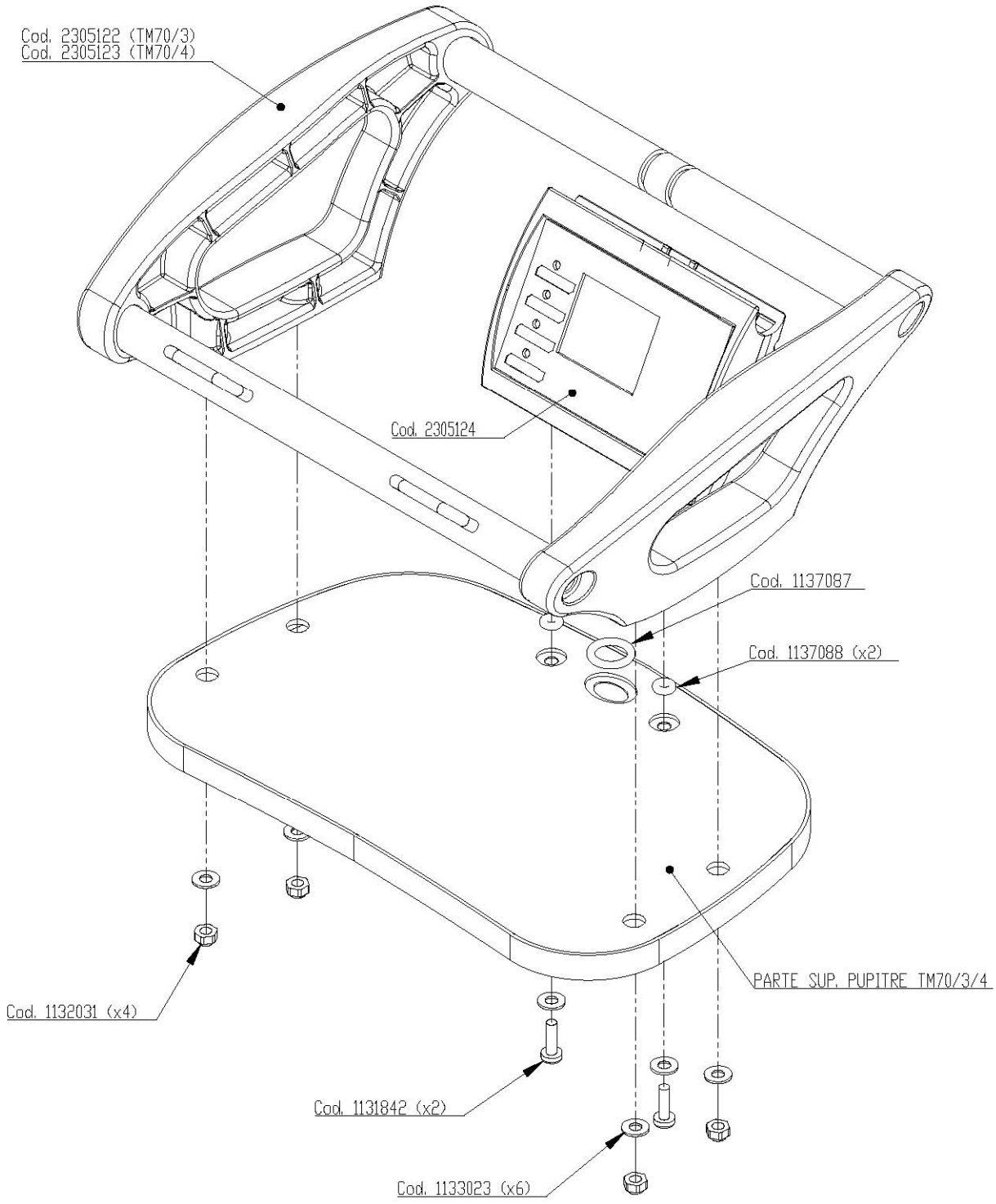


RANGE LIMITER

The LCD70 display provides a connector for the range limit option; the used cables and signals are as follows: 5V, DATA y GND. These cables are connected to the LE73/74/7EF card through P8 connector, “LAL” marked in the PCB, using a 3 colour braid cable code IKUSI 1095082.

PIN	NAME	DESCRIPTION
1	5VIR	5 V DC power supply
2	DATA	Range Limiter Data
3	GROUND	Ground

9.3 - T70 TRANSMITTER and LCD70 DISPLAY ASSEMBLY



9.4 - LCD70 DISPLAY OPERATING MODES.

OPERATING MODES:

The LCD70 display allows entering in these operating or special modes:

- EDIT CRANE LABEL: To edit the crane's name.
- INPUT CALIBRATION: To calibrate the analogue voltage feedback 0–10v.
- OUTPUT CALIBRATION: To adjust through Tele Alignment option, the analogue outputs.
- To enter to special operating modes, like "Programming a spare transmitter" (with the "copy EEPROM" functionality) and "Base channel changing" (see Annex A and Annex C).

TRIANGLE: Associated with the corresponding mechanism, it allows to enter to the base channel changing mode and to increase the number of "tens" of the new base channel.

SQUARE: Associated with the corresponding mechanism, it allows to enter to the "Copy EEPROM" functionality, and to increase the number of "units" of the new base channel.

Entering to the "Base channel changing" mode:

Press the mechanism associated with the triangle symbol "▲" (see the icon in the console box front plate), and then press "Start" button.

Entering to the "Copy EEPROM" mode:

Press the mechanism associated with the square symbol "■" (see the icon in the console box front plate), and then press "Start" button.

Entering in configuration mode:

1. To access the Tele-Alignment menu must be pressed in sequence the "ENTER" (default configuration) + "START".
2. The buttons ▲ "UP" and ▼ "DOWN" allow to navigate in the software and to select the required option.
3. The "ENTER" function validates the selected option and with the ▲ "UP" and ▼ "DOWN". It also allows choosing the required value If there is a range of values available or for going to a lower level of the software's menu.
4. The "ESC" function aborts any selected option of the menu and it also allows returning to an upper level of the software's menu.

9.5 - DATA FEEDBACK OPERATING MODE

The data feedback selection (returned information), can be performed by (a) software or by (b) hardware (i.e. using a rotatory selector).

(a) Software selection (by default): with the ▲ "UP" and ▼ "DOWN" options, the desire feedback information can be sequentially selected.
(b) Hardware selection: the remote's technical datasheet must include and to identify, the mechanism that will allow this selection.

Remarks (for multiple returns / multiple feedback):

The transmitter can process multiple feedbacks but only one information can be displayed at the same time.

There are two possibilities for the multiple feedback:

1) CAN return + one direct input in the receiver.
In this case the receiver must have an analogue electronic card (IN010V or IN0450P) or a digital electronic card (IN4D) connected to the LR70 card. The INCAN configuration is not allowed in this case.
In the CAN bus the receiver works as a slave.

2) INCAN electronic board + one direct input in the receiver.
In this case any amount of analogue or digital cards can be connected directly or using the INCAN expansion card; the CAN return will be disabled.
In the CAN bus the receiver works as a master.

Systems including software revision 2.4.x., will only support the feedback signal directly connected to the LR70 electronic card. Nevertheless, and due to the INCAN card option the system will be able to manage several feedback information at the same time with software revision 3.1.x. or greater.

The user will be able to select the feedback information he wants to show in the LCD70 display. For this purpose a software or hardware selector will be used. With the software selector and after pressing the corresponding manoeuvre (Mi) –mechanism or any display function assigned-, the position of the selector will increase showing the next configured feedback information and pressing another manoeuvre (Mi) the position will decrease. Thus the selection will be in both senses. Depending on the position of the selector the transmitter will show a feedback or another configured one and the display's message will change sequentially.

The first feedback will be the information corresponding to the INxxxx card connected directly to the receiver LR70 board, and then the following INxxxx associated to the INCAN inputs, depending in the order they are connected, from the lower to the higher position.

Into the EEPROM, and the INCAN file all the parameters will be configured to specify the LCD70 display feedback edition.

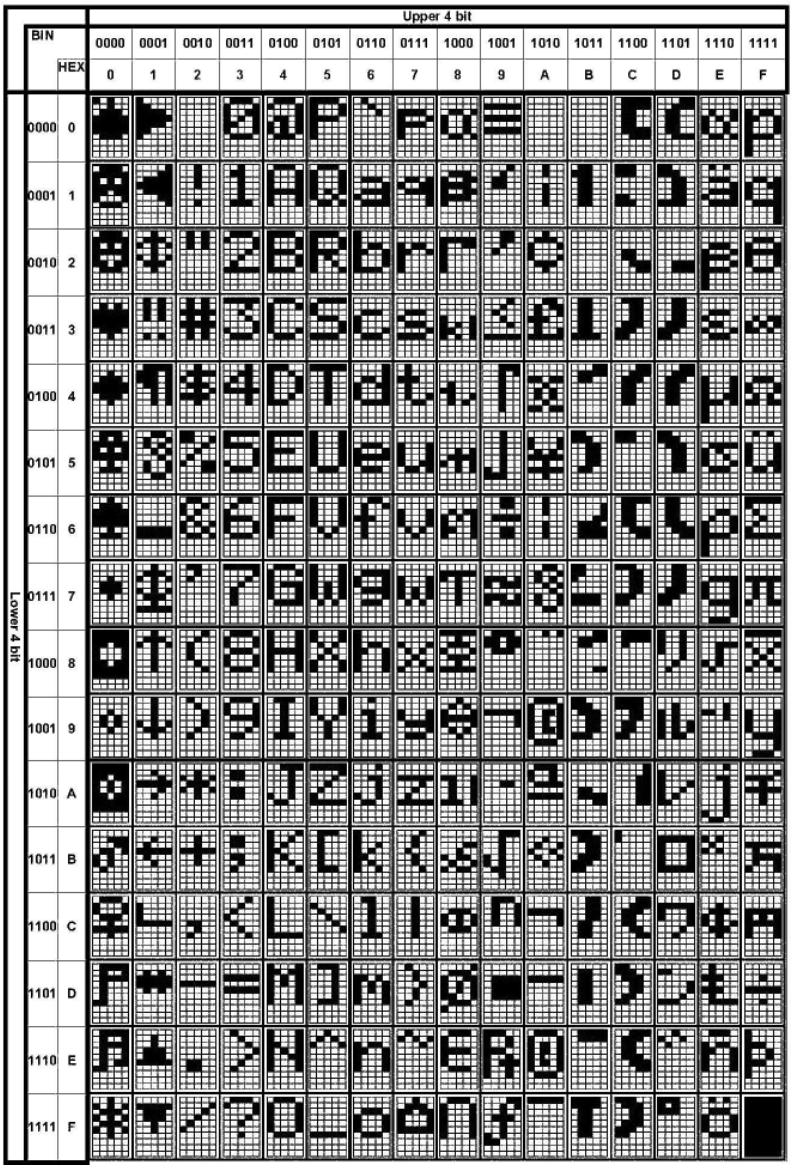
9.5.1 CHARACTERS MAP

The characters of the table correspond to ASCII standard. Also, you can build big numeric characters combining four of them: two in the upper line and another two in the lower line.

The characters that have been used to build the bigger one are beginning from B0h direction. Therefore, for write a big '1' we will write consecutively the character of the B0h and B1h directions on the upper line and the character of the B2h and B3h directions on the lower line.

On the other hand, it exist the following special characters:

- km/h in 3 characters: 0x83, 0x84, 0x85
- ft in 1 character: 0x86
- lbs in 2 separated characters: 0x8A, 0x8B



9.5.2 AVAILABLE ICONS:

The available icons for the display are:

- Battery: 43h direction. This icon is composed by other 4 icons
  - Cover of the battery
  - Left cell
  - Central cell
  - Right cell
- NEW: 2h direction. If the level is different from zero, will appear

9.5.3 DISPLAY CONTROL BY VT100

CONTROL CHARACTERS

The VT100 control characters recognized by the LCD70 display are:

- ESC (1Bh): Control character that initialises a control sequence.
- NUL (00h): Ignored on input (not stored in input buffer).

All the other control characters cause no action to be taken.

VALID CONTROL SEQUENCES

Definitions:

The following listing defines the basic elements of the ANSI mode control sequences.

1. Control Sequence Introducer (CSI): in the VT100 the CSI is **ESC [**
2. Parameter string: a string of parameters separated by a semicolon **(3Bh)**
3. Final character: a character whose bit combination terminates an escape or control sequence **('m', 6Dh)**

Control Sequences

- **ESC [0** (1Bh 5Bh 30h): Control sequence to turn off all character attributes ('0' is the optional, default value)
- **ESC [Pn ; Pn H** (1Bh 5Bh line 3Bh column 48h): moves the active position of the cursor to the position specified by the parameters. The default condition with no parameters present is equivalent to a cursor to home action. Lines are numbered consecutively, with the origin being line 1, column 1. The cursor is not allowed to be positioned outside the margins (lines 1 to 4, columns 1 to 12). A sequence with one Pn numeric parameter with a default (0) parameter will be interpreted as wrong sequence. Example: **ESC [2 ; 0 H** or **ESC [2 ; H** are wrong sequences !
- **ESC [2 J** (1Bh 5Bh 32h 4Ah): all lines are erased, and the cursor does not move
- **ESC [4** (1Bh 5Bh 34h): All following characters transmitted are underscored until receiving an escape sequence ESC [0 m

- **ESC [5** (1Bh 5Bh 35h): All following characters transmitted are blink until receiving an escape sequence ESC [0 m
- **ESC [7** 1Bh 5Bh 37h): All following characters transmitted are negative (reverse) image until receiving an escape sequence ESC [0 m

All other control sequences or wrong sequences cause no action to be taken.

Example: Control Sequence to turn off all character attributes, and then turn on underscore and blink attributes simultaneously. Alternative sequences which will accomplish the same thing:

In only one sequence:

ESC [; 4 ; 5 ; m (1Bh 5Bh 3Bh 34h 3Bh 35h 3Bh 6Dh)

Same but divided in three independent sequences:

ESC [m (1Bh 5Bh 6Dh)
ESC [4 m (1Bh 5Bh 34h 6Dh)
ESC [5 m (1Bh 5Bh 35h 6Dh)

BUFFERED MESSAGES

When the application interest is refreshing a full screen, or a line, only after completely received, two control charters, STX and ETX, allow to store the partially received text in a internal buffer until complete reception, and then it will be written in the LCD.

ASCII Control Character Codes Implemented

- **STX** (02h): start of text. Init entering text in the input buffer
- **ETX** (03h): end of text. Finish entering data in the input buffer and writes the buffer contents in the LCD display

If these ASCII Character Codes are not used, data will be immediately represented as soon as it is received by the display. STX and ETX ASCII control characters can not be used as parameters of a VT100 control sequence. Buffered messages can include control sequences with arrays of characters.

Example: VT100 data feedback

Write messages on display

The texts are sent in 8 packages of 8 bytes each, preceded by an identifier COB_ID=0x300+node_ID. Inside these packages, you can send texts by different modes for view the same message. For example, the next text:

		Column											
		1	2	3	4	5	6	7	8	9	10	11	12
File	1	**I**	**K**	**U**	**S**	**I**							
	2	**I**	**K**	**U**	**S**	**I**		**I**	**K**	**U**	**S**	**I**	

We can write the next message differently:

a) First, will appear 'IKUSI' text, then we will move the position of the cursor to line2-column 1, and finally we will visualize the text 'IKUSI IKUSI' on the second line.

Text			Shift command			Text			Text		
Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning
LCD1	**49**	I	LCD1	**1B**	ESC	LCD1	**49**	I	LCD1	**49**	I
LCD2	**4B**	K	LCD2	**5B**	[	LCD2	**4B**	K	LCD2	**4B**	K
LCD3	**55**	U	LCD3	**32**	Line 2	LCD3	**55**	U	LCD3	**55**	U
LCD4	**53**	S	LCD4	**3B**	;	LCD4	**53**	S	LCD4	**53**	S
LCD5	**49**	I	LCD5	**31**	Column 1	LCD5	**49**	I	LCD5	**49**	I
LCD6	**00**		LCD6	**48**		LCD6	**20**	Space	LCD6	**20**	Space
LCD7	**00**		LCD7	**6D**	Final command 'm'	LCD7	**00**		LCD7	**00**	
LCD8	**00**		LCD8	**00**		LCD8	**00**		LCD8	**00**	

b) We can write the same message like this:

Text			Shift command			Text			Text		
Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning
LCD1	**49**	I	LCD1	**1B**	ESC	LCD1	**49**	I	LCD1	**55**	U
LCD2	**4B**	K	LCD2	**5B**	[	LCD2	**4B**	K	LCD2	**53**	S
LCD3	**55**	U	LCD3	**32**	Line 2	LCD3	**55**	U	LCD3	**49**	I
LCD4	**53**	S	LCD4	**3B**	;	LCD4	**53**	S	LCD4	**20**	Space
LCD5	**49**	I	LCD5	**31**	Column 1	LCD5	**49**	I	LCD5	**00**	
LCD6	**00**		LCD6	**48**		LCD6	**20**	Space	LCD6	**00**	
LCD7	**00**		LCD7	**6D**	Final command 'm'	LCD7	**49**	I	LCD7	**00**	
LCD8	**00**		LCD8	**00**		LCD8	**4B**	K	LCD8	**00**	

c) Or we can visualize all the text at once:

Text			Shift command			Text			Text		
Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning	Position	**Message (Hex)**	Meaning
LCD1	**02**	Start 'STX'	LCD1	**1B**	ESC	LCD1	**49**	I	LCD1	**49**	I
LCD2	**49**	I	LCD2	**5B**	[	LCD2	**4B**	K	LCD2	**4B**	K
LCD3	**4B**	K	LCD3	**32**	Line 2	LCD3	**55**	U	LCD3	**55**	U
LCD4	**55**	U	LCD4	**3B**	;	LCD4	**53**	S	LCD4	**53**	S
LCD5	**53**	S	LCD5	**31**	Column 1	LCD5	**49**	I	LCD5	**49**	I
LCD6	**49**	I	LCD6	**48**		LCD6	**20**	Space	LCD6	**20**	Space
LCD7	**00**		LCD7	**6D**	Final command 'm'	LCD7	**00**		LCD7	**03**	End 'ETX'
LCD8	**00**		LCD8	**00**		LCD8	**00**		LCD8	**00**	

Once that we have completed the 24 characters, we have to write the command for send the cursor to line 1-column 1. Otherwise, we will lose everything we write. We have still used only 4 packages of 8 bytes; therefore, we have other 4 available for example to send the state of LEDs and Buzzer.

Switching-on the LEDs & Buzzer

For establish the state of the LEDs and the buzzer we have to send a package of 2 data. This package have to be preceded by an identifier COB_ID=0x200+node_ID.

LEDs ➔ From 0 to 255 value
BUZZER ➔ 0 or 1 value

The first data says if the LEDs are lit in green, red or amber (combining green and red). It is a binary code that reads as follows, for example:

	LED 4		LED3		LED 2		LED 1	
	Red	Green	Red	Green	Red	Green	Red	Green
	128	64	32	16	8	4	2	1
➔ Data	0	0	1	1	1	0	0	1

= 57h

The second data says if the buzzer is ON (1) or OFF (0). This is the complete package:

LEDs & Buzzer		
Position	**Message (Hex)**	Meaning
LCD1	**57**	Led1=Green; Led2=Red; Led3=Amber; Led4=Off
LCD2	**01**	Buzzer ON
LCD3		
LCD4		
LCD5		
LCD6		
LCD7		
LCD8		

Important: The last byte of the second package that the systems transmit could have different values:

- If the value is 1, means that the CAN message from the master is already sent to the transmitter and the receiver could receive one more message and save it to send later to the transmitter.
- If the value is 0, means that the transmitter has already received CAN message and is ready to receive another one.
- If the value is 3, means that the buffer is full and is waiting for the confirmation from the transmitter. If you send a message in this state, because it has nowhere to store it, be lost.

IKUSI

10.- “FIRST COME – FIRST SERVED”

“FIRST COME – FIRST SERVED” OPERATION

TM70

TM70 – "FIRST COME – FIRST SERVED" OPERATION

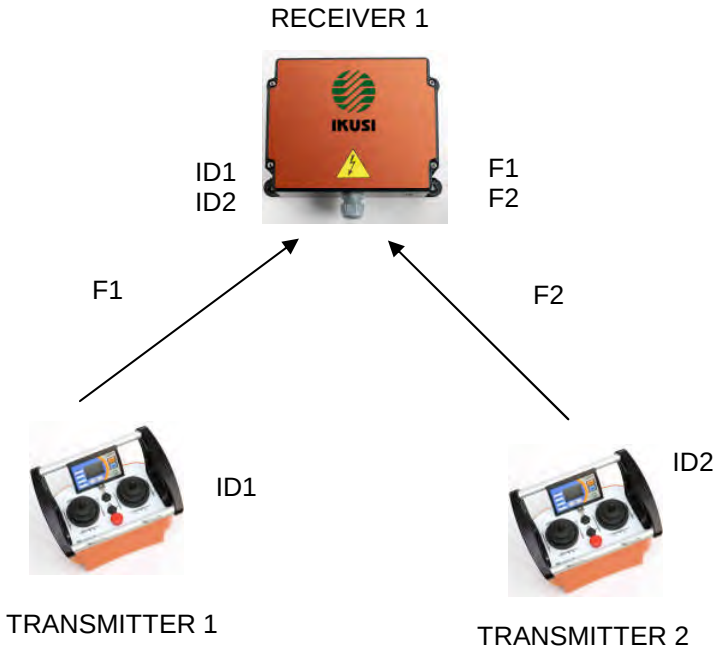
10.1 - INTRODUCTION

This option allows the operation of one crane individually by using two transmitters with two different ID codes, which determine which transmitter is governing the crane at a certain time. For First come – First served applications the receiver is required to scan the radio channels in order to receive radio signals from different transmitters.

The First come – First served mode is defined by EEPROM, and the transmitters do not need to have a selector. The First come – First served mode consists of a receiver which liberates the ID code every time the receiver is switched off, and hence it starts searching for IDs defined in the EEPROM ID code list. The first valid ID code found is selected, and locked on to it until the operator releases the crane by pressing the Stop button. After a time defined in EEPROM (0.1 – 25 seconds, default 4 seconds), the receiver liberates the ID to which it was locked and starts scanning IDs and radio channels. The first transmitter switched on is the First transmitter to hold control of the crane, and it will not let any other transmitter to have control of the crane until the transmitter is switched off.

A First Come – First Served operation with cranes is always delicate, given that the receiver is FREE every time the STOP button is pressed or there is a radio link failure.

10.2 - TWO TRANSMITTERS SYSTEMS



Transmitters 1 and 2 have two different IDs and transmit in two different radio channels. Once the receiver is switched off by any of the transmitters, after the liberation time defined in the EEPROM, the receiver starts scanning for IDs and radio channels, looking for a frame with the start order pressed.

A First come – First served system can have up to 32 different transmitters governing a single receiver.

LA70 & LA70M RANGE LIMITER OPTION

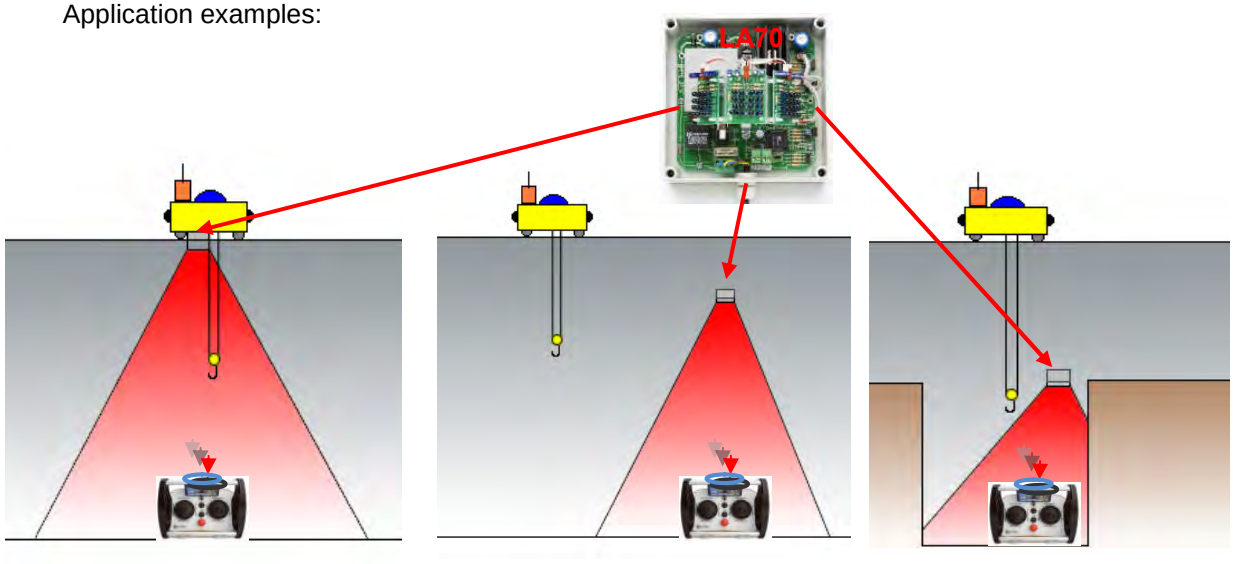
TM70

11.1.1 - SYSTEM DESCRIPTION

TM70 radio remote control systems can be equipped with a range limitation option for overhead cranes, through which, the system is able to determine if the transmitter is located outside of a zone, defined as a working area, and deactivates the controls when these situations arise.

The system consists of one or more Infrared transmitters LA70, installed either in fixed positions or on the controlled crane, oriented in such a way that it covers the targeted working zone. In these cases the transmitters of the remote control sets are equipped with a sensor which receives the information coming from the LA70 transmitter. This information is analysed by transmitter microprocessor, which, in this way knows when the operator has left the working area. Consequently, outputs are deactivated.

Application examples:



11.1.2 - INFRARED SENSOR

As explained in the above, the sensor element is located in the remote control transmitter and its function is to receive the infrared information coming from the LA70 transmitter. The location of this sensor is the following:

The transmitter microprocessor receives the information from the sensor and checks the identity of the crane. As soon as the sensor stops receiving the signal coming from the crane, the transmitter LED, which was green, begins to flash in red, (in case of belly box transmitters, a buzzer also sounds), in order to let the operator know that he has moved too far away. If this situation lasts longer than 4 seconds, all the active commands are cancelled, although communication is maintained with the receiver. In this way the main contactor and the selection orders are maintained.

In order to return to the operating mode, all the worker has to do is move back into the working zone. Movement orders must be disabled in order to restart movement. Once the transmitter enters the working area, movement orders will not be ready to be used unless they have gone to zero. This is to make movements start in first speed. If the remote control is provided with a Display, whenever the transmitter is out of range, the message “Out of Range” will be displayed.

The remote control has got 4 modes of operation defined in the EEPROM:

1.- Range Limiter only at start up (Electronic Key): In order to make the transmitter work, it is necessary that the transmitter is inside the starting zone, defined by the position of the infrared transmitter.

2.- Range Limiter only in operation: The transmitter can be started anywhere inside or outside of the working area, but the movement orders will not work until the transmitter is inside the working zone.

3.- Range Limiter at startup and operation: The transmitter in order to work must be inside the working zone always.

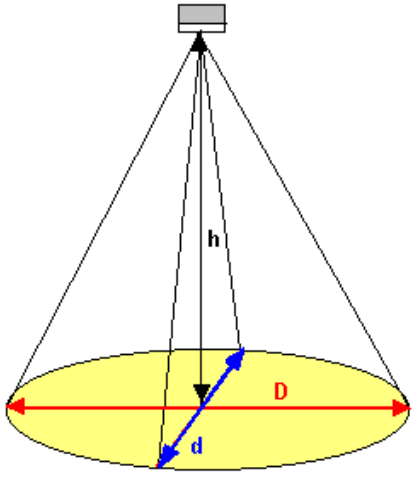
4.- Range Limiter only as an output Relay: This functionality makes the transmitter not to show In range or Out of range situation in the transmitter itself. It will not mask any order. The information will be sent to the receiver in order to process the information as an output relay or a condition to the relay table.

11.2.1 – Ia70 INFRARED TRANSMITTER

This is the element installed in the crane, which generates the infrared modulated radiation with an identity code, which permits the sensor its identification.

Emission angle in long travel direction is wider than those of cross travel direction. In this way, the working area covered by a transmitter is similar in shape to an ellipse, whose dimensions depend on the height of the bridge over the ground. Approximately, the diagonals of the ellipse according to the height are the following:

h (m)	D (m) ±63º	d (m) ±40º
6	24	10
8	32	13
10	40	17
12	48	20
14	56	23
16	64	26
18	68	29
20	70	32



In cases in which it is believed that the area covered by one transmitter is not enough, more slave transmitters can be installed.

11.2.2 – LA70 INSTALLATION

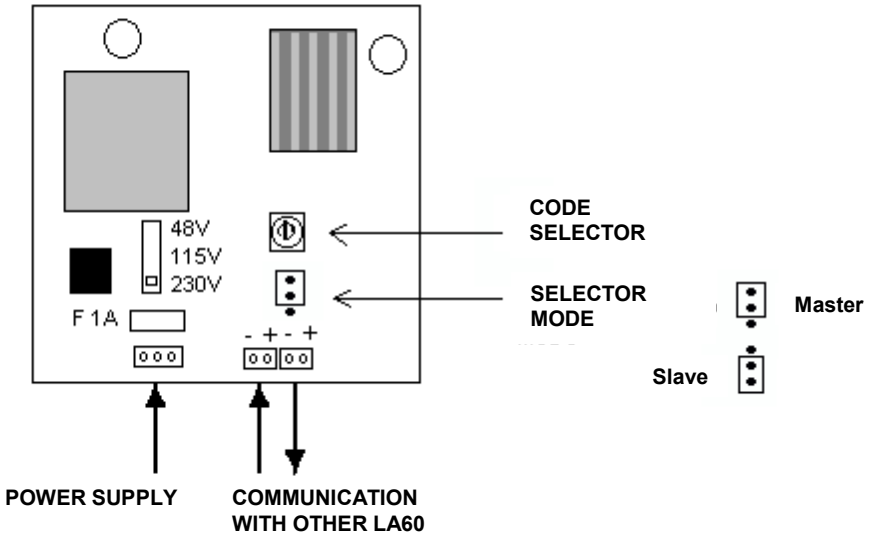
Make sure that the crane is switched off during the assembly operation. Clear the work area and use security clothing.

Check the power supply and disconnect the power supply to the crane.

Do not forget to connect the earth cable.

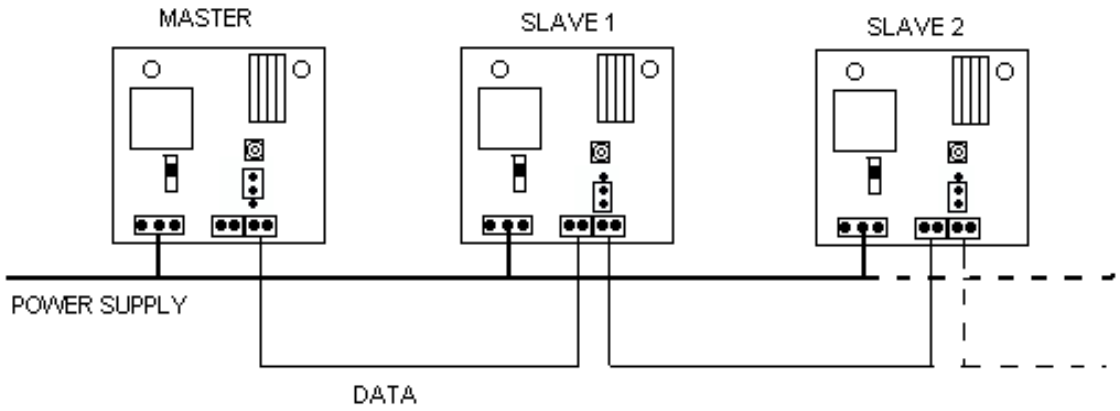
Use flame resistant cables for the connections.

- Find a suitable place for the installation of the infrared transmitter, away from elements, which could generate intense electrical disturbances and obstacles to the transmission of light.
- Choose the correct power supply and connect it.
- Fit the jumper selector in master position.
- Select the code programmed in the EEPROM memory of the transmitter.



In cases in which the area covered by a transmitter is not sufficient, other LA70 transmitters can be connected in series, programmed as slaves in the selector. In this case the code emitted corresponds with the selector in the master transmitter.

The communication connection between transmitters must be done with shielded wires.



11.2.3 – LA70 TECHNICAL CHARACTERISTICS

Infrared Transmitter

Power supply	48, 115, 230 Vac ± 10%; 50/60 Hz
Operating temperature	-20 a +65ºC
Protection	IP55

11.3.1 – LA70M INFRARRED TRANSMITTER

The new LA70M range limiter is a modular and more compact re-styling of the current LA70 range limiter; fully compatible with TM60 and TM70 IKUSI's radio remote control systems

References and descriptions of the modules and slave (expansions) connection cable.

S.A. Cod.	DESCRIPTION	CODE	COM. REF.
	LA70M MODULE WITH DC PS	2305228	LA70M DC
	LA70M MODULE WITH AC PS	2305229	LA70M AC
	LA70M EXPANSION MODULE (SLAVE)	2305230	LA70M EX
7505	70GU101 CABLE CONEX-M12 10MT	2301234	CABLE CONEX-M12

LA70M AC / LA70M DC

LA70M EX

LA70M specifications:

Modules: LA70M AC / LA70M DC	SPECIFICATIONS
AC Power Supply	48/115/230v AC +/-20% 50/60Hz
DC Power Supply	8-35v DC
AC Power Supply Fuse	0,63A /250v
DC Power Supply Fuse	2A/250v
Maximum power consumption	20VA
Operating temperatura range	-20/+70 ºC
IP ingress protection rating	IP67
Maximum range	50 meters
External connection	M12 conector -5 poles- (female)
I8 Jumper	ON/OFF load resistor terminal
I14 Jumper	TM60 or TM70 range compatible selector mode
I3 Jumper	ID selector code / ID codes: "2" to "F" / ID ="3" by default
I2 jumper	*(Not available functioality)*
Module LED Status	HARDWARE OK –green blinking- / ERROR –switched off-
Fast assembly	By magnets (standard configuration)
External dimensions	80 mm x 160 mm x 65 mm (Length x Width x Height)

Module: LA70M EX	SPECIFICATIONS
DC power supply	Provided by the Master module
Operating temperatura range	-20/+70 ºC
IP ingress protection rating	IP67
Maximum range	50 meters
External connections	2 x M12 connectors -5 poles- (male - female)
Maximum number of expansions	2 (for each Master module)
LA70M XX / LA70M EX connection cable	10 meters M12 –female/male- (supplied as spare part)
LED signalling	Hardware OK –green blinking- / ERROR –switched off-
Fast assembly	By magnets (standard configuration)
External dimensions	82 mm x 80 mm x 65 mm (Length x Width x Height)

PC enclosure specifications:

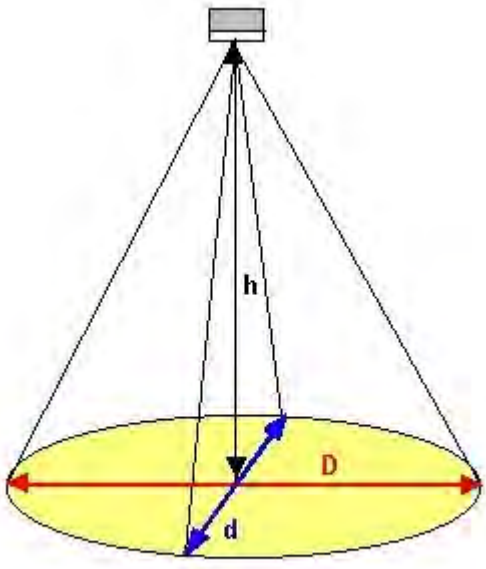
MATERIALS		RATING	
Material	Polycarbonate	Ingress Protection	IP67 EN 60529
Base colour	RAL 7035	Impact Resistance	IK07 EN 62262
Cover colour	Clear transparent	Electrical Isulation	Totally insulated
Cover screws material	Stainless steel	Halogen free	SI / DIN-VDE 0472 Part 815
Gasket material	Polyurethane	UV resistance	UL 508
TEMPERATURES		Flammability rating	UL 746 C 5: UL 94 5V
Short term	-40…..+120 ºC	Glow Wire Test	IEC (695-2-1) ºC:960
Continous	-40…..+ 80 ºC	NEMA Class	NEMA 1,4,4X,12,13

The operating mode is the same as described in points 11.1 and 11.2 included in this chapter.

The covered working zone can be **circular** (**standard configuration**) or **elliptical** (**if required as an option, opening the LEDS about ±20º among them in one direction -> D**) for each LA70M or LA70M Ex module

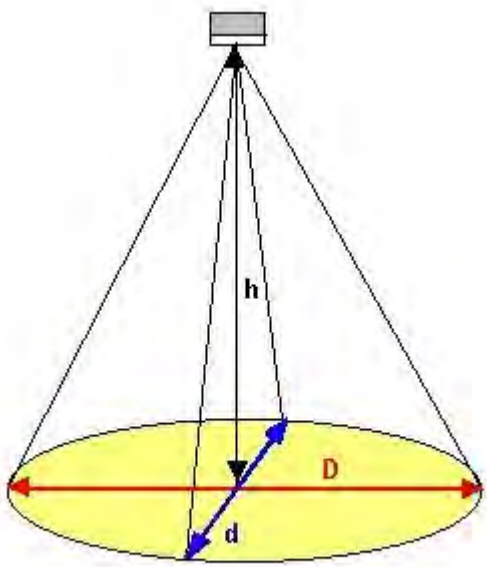
Infrared emission for a **Circular** covered zone (D=d)
ALL LEDs in paralell assembly mode

h (m)	D (m) ± 0º	d (m) ±0º
6	2	2
8	3	3
10	4	4
12	4	4
14	5	5
16	6	6
18	6	6
20-35	7	7



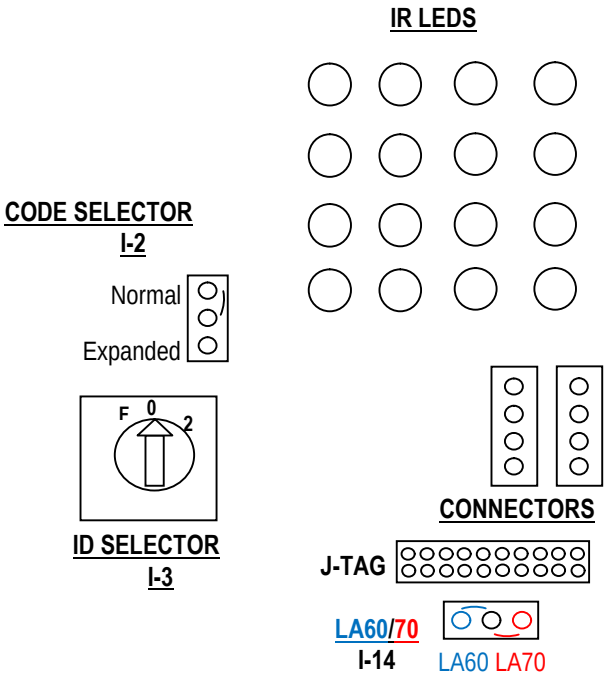
Infrared emission for an **Elliptical** covered zone (D≠d)
ALL LEDs in wide assembly mode

h (m)	D (m) ±20º	d (m) ± 0º
6	7	2
8	9	3
10	12	4
12	14	4
14	16	5
16	18	6
18	21	6
20	23	7



Jumper's configuration and ID selector for the Master mc

I3: ID selector / Allowed range "2,3…..8,9,A,B….F" -> **14 positions.** Default configuration, ID=3 (*)
I14: TM60 or TM70 compatibillity selector
I2: NON available functionallity ("Normal" position by default)



11.3.2.- LA70M INSTALLATION AND CONNECTIONS

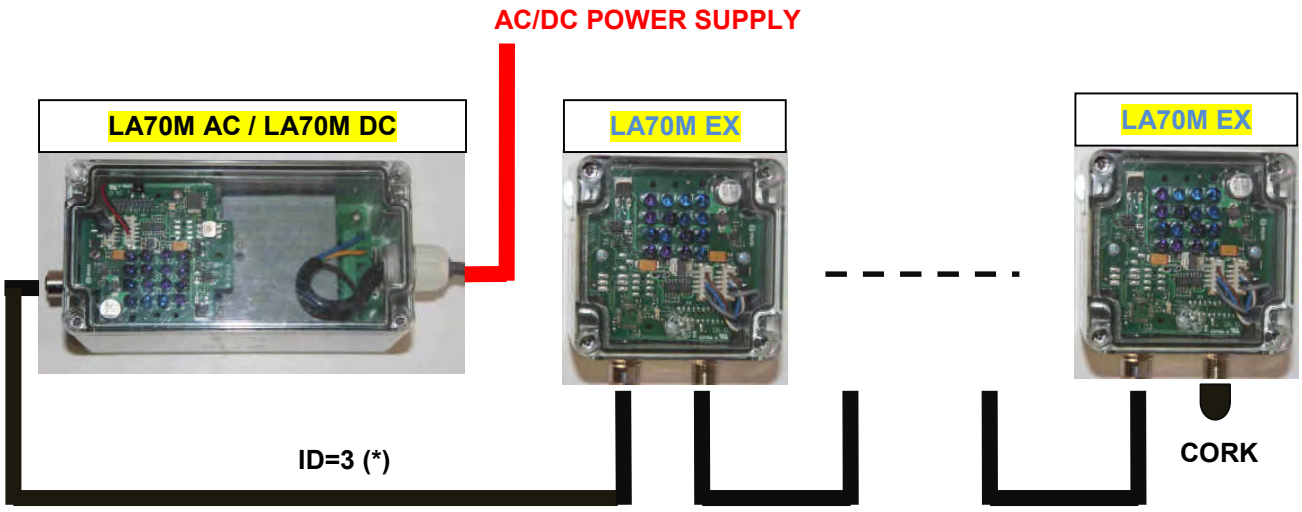
Make sure that the machine is switched off during the assembly operation. Clear the work area and use security clothing.

Check the power supply and disconnect the power supply to the crane.

Do not forget to connect the earth cable.

Use only cables supplied by the manufacturer for the connections between the Master module and the Slaves (or expansions).

- Find a suitable place for the installation of the infrared transmitter, away from elements, which could generate intense electrical disturbances and obstacles to the transmission of light.
- Choose the correct power supply and connect it.
- Fit the jumper selector in master position.
- Select the code programmed in the EEPROM memory of the transmitter.
- Make sure to put the protection cork supplied with the Master module in the last expansion module installed.



Maximum number of expansions (for each Master module) = 2

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12.- “PITCH & CATCH” OPERATION

“PITCH & CATCH” OPERATION

TM70

TM70 – "PITCH & CATCH" OPERATION

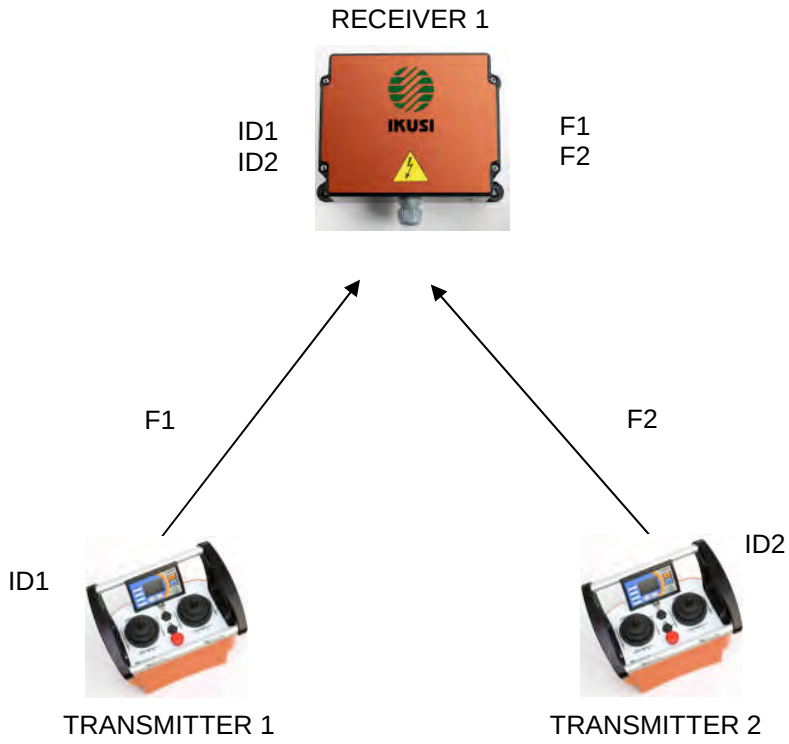
12.1 - INTRODUCTION

This option allows the operation of one crane by two transmitters, through the selection of ID codes, which determine the mode of operation. For this application, the SCAN option for the receivers is required in order to receive transmitters in different channels.

This mode of operation consists of the use of a crane by two different transmitters. The first transmitter governing the crane gets hold of the crane until it as switched off (in principle exactly as the First come – First served mode of operation). In the event of pressing the STOP pushbutton, the other transmitter is switched on and the START order is being pressed, the second transmitter gets hold of the crane without falling the STOP relays. This way, users of the same crane with different transmitters can pass each other the crane without falling the STOP relays. As the START pushbutton must be pressed when transferring the crane if the START relay has got a connected Horn, when the transfer is done an audible sound can be produced.

Pitch & Catch operation is always delicate, given that the receiver is FREE every time the STOP button is pressed or there is a radio link failure.

12.2 - TWO TRANSMITTERS SYSTEMS



Transmitters do not need selectors. The receiver is the one that Frees its ID code.

When a Pitch & Catch operation needs to be performed, the user of the transmitter that wants to Catch the crane must ask the user holding the crane to release the crane. The procedure is the following: The owner of the crane must press the STOP button while the user that wants to Catch the crane must be pressing the START button. The receiver will free the ID code and will SCAN new ID codes and new channels, if in the lapse of time of a passive STOP, it encounters the new ID it will keep on going without falling the STOP relays.

In the event that the transmitter governing the crane stops while the second transmitter is switched off, the system will STOP normally and will be free until one transmitter with a valid ID presses the START button.

When a Pitch & Catch operation is finished, the first transmitter to press START will get hold of the crane.

This mode of operation is personalised in the remote control EEPROM and must be done by IKUSI personnel only.

13.- TANDEM OPERATION

TANDEM OPERATION

TM70

TM70 – TANDEM OPERATION

13.1 - INTRODUCTION

This option allows the operation of two cranes individually or in tandem by using one transmitter by the selection of ID codes, which determines the mode of operation. For tandem applications both receivers are required to scan the radio channels in order to receive radio signals from different transmitters.

Once a mode has been selected, the access to the selected receiver or receivers will be blocked for other transmitters, until they have not been liberated by the transmitter having the control. This blocking is maintained even in case that the equipment is switched off.

When a selection is made with the transmitter disconnected, the transmitter will not start and shows in the LED that the selection made is not correct with 0,4s red pulses. The transmitter must be switched off and restart it with the selection with which it was switched off.

A Tandem operation with cranes is always delicate.

Remember that there are safety devices, (limit switches, anti collision guard systems, etc.), which can affect and stop one of the cranes, while the other continues working.

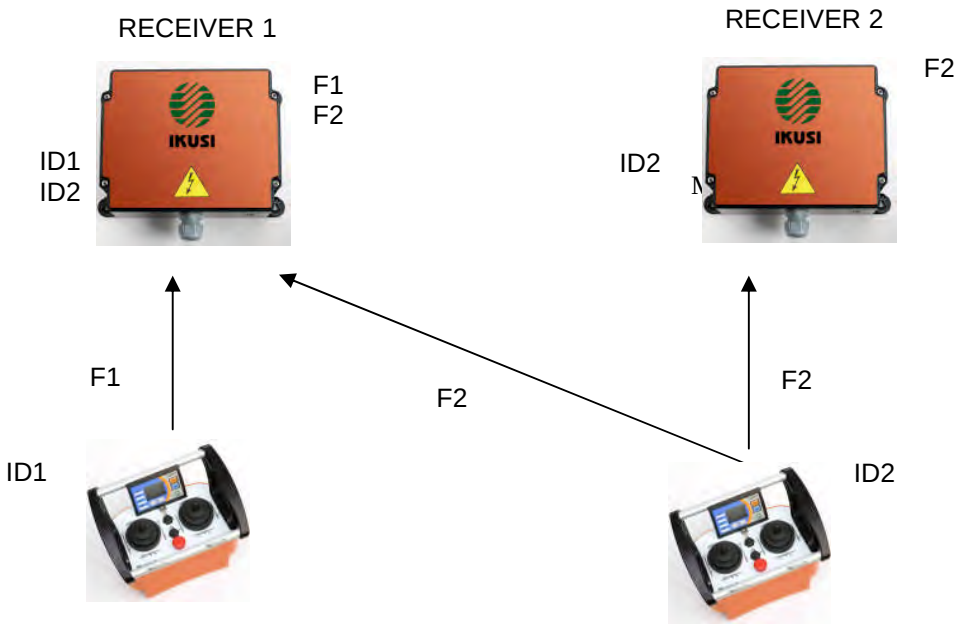
In the tandem systems with LCD Display option, in the 1st line of the display will be shown the crane 1 name and in the 2nd line the crane 2 name. With the selector switch in position 1+2 both names will be shown.

You can personalize the name of the 2 cranes following the description in ANNEX A in this manual.

The modified name of the crane in the transmitter will not be updated in the receiver EEPROM. In order to do it, please copy the new information located in the transmitter EEPROM into the receiver one.

IMPORTANT REMARK:
The frequency set up of tándem systems supplied from IKUSI is by default F1= CB / F2 = CB+4
By default CB = CT.

13.2 - ONE MASTER TRANSMITTER SYSTEMS



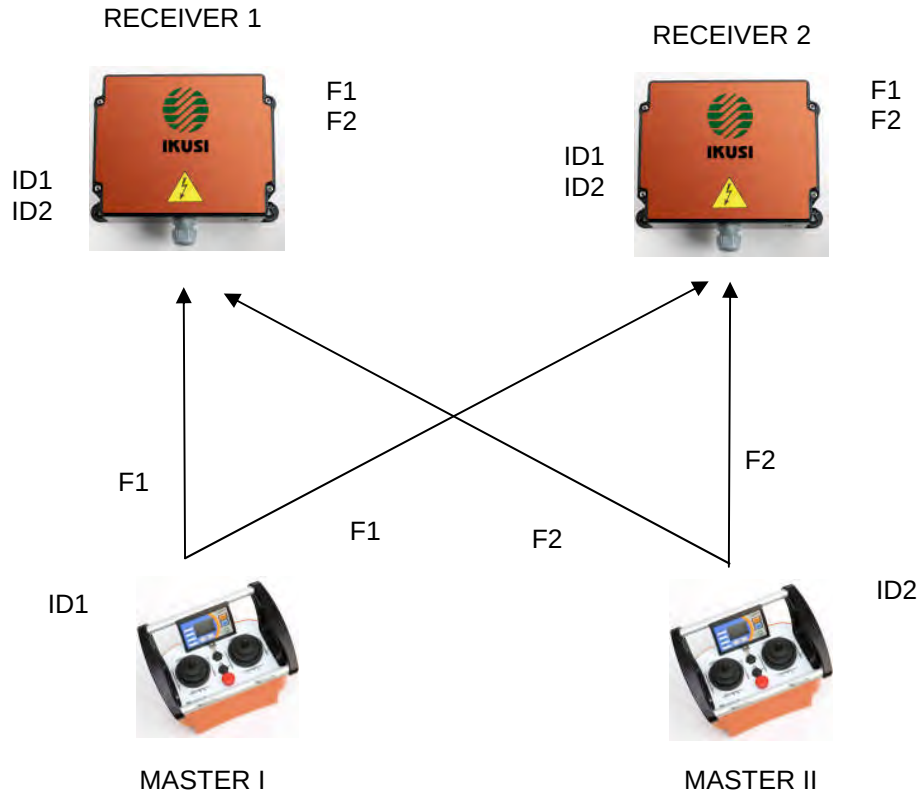
The Master Transmitter has got a crane selector “1 / 1+2 / 2”, while the slave transmitter has only got a release “R” push button.

When a tandem operation is needed, the operator of the master transmitter must require the slave transmitter operator the liberation of receiver 1. In order to do it, it has to be pressed simultaneously the release “R” push button and the Start button. The transmitter will send receiver 1 the liberation order, remaining like that disconnected and ready to accept a new ID code.

When arriving to this stage, the position “1+2” may be selected in the master transmitter and then press the Start button until the Green LED is switched on. By doing this, the transmitter will send the liberation order to receiver 2 and following that, it will send the new ID code. Both receivers, 1 and 2, will then be started and ready to tandem operation.

When tandem operation has finished, the master transmitter must select position 2 again and press the Start button. By doing this, receiver 1 is again ready to be used by the slave transmitter, and the master transmitter only controls receiver 2.

13.3 - TWO MASTER TRANSMITTERS SYSTEMS



In the event of push button systems in tandem operation, with two Master transmitters, both of them will have a “1 / 1+2 / 2” selector and a release pushbutton “R”.

When one of the transmitters must work in tandem, the operator must require his workmate the use of the crane. To liberate the crane the operator will have to press “R” and Start simultaneously in his transmitter. The receiver in which, the operator was working will be liberated and ready to accept another ID code within the list, and the transmitter gets disconnected.

Following this, the transmitter that is going to perform the tandem operation, the position “1+2” should be selected and then press the Start button until the green LED light is switched on. Both receivers will be connected with the transmitter.

When the operation has been finalised, the “R” and Start buttons must be pressed simultaneously, to liberate both receivers, and be able to do new operations.

With console transmitters, the function “R” is included in a four step rotary selector “R / 1 / 1+2 / 2”. The way of operation is the same in both cases.

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14.- ANALOGUE FEEDBACK / IN 0-10V OPTION / CALIBRATION

ANALOGUE FEEDBACK
IN 0-10v OPTION
CALIBRATION

TM70

TM70 – ANALOGUE FEEDBACK CALIBRATION

14.1 - INTRODUCTION

Systems with analogue feedback need to have the options Display and Analogue Feedback.

Systems with analogue feedback need at startup the calibration of the analogue input by the distributor or the user. The following steps need to be done:

14.2 - CALIBRATION OF THE ANALOGUE FEEDBACK WITH LCD DISPLAY

Transmitters with display option, allow the operator the calibration of the analogue input through the edition of a three digit value plus a comma and a measurement unit up to three characters.

The modified feedback calibration data will not be updated in the receiver EEPROM. In order to do it, please copy the new information located in the transmitter EEPROM into the receiver one.

At the remote control start up the Calibration must be done as follows:

1. Insert a fully charged battery and turn ON the contact key.
2. Push and Pull the STOP pushbutton. An orange blink will be seen on the LED followed by green pulses and the LED switches off.
3. Place a known load on the crane in order to introduce the First value in Calibration mode.
4. Switch off the remote control and start the system entering in CALIBRATION mode. In order to do so, it is necessary to do the following:
5. Press LCD70 push button “ENTER” (default value) and press START pushbutton. Keep both pushbuttons pushed for a couple of seconds until the CONFIG option appears on the display.

   Remark: It is possible using the TMConfig tool to assign a different function; this function must defined and written in the equipment technical datasheet
6. Press the push button “ENTER” to go into the MENU.

7. To move through the menu, use “UP” (▲) and “DOWN” (▼) functions the CALIBRATION menu appears.
8. Press “ENTER” function.

9. In CAL.ENTER mode, choose one of the following options: 2.1- > VALUE 1; 2.2 -> VALUE 2 and 2.3 -> UNITS. Pressing “ENTER” function the required option is selected.
   - “DOWN” function (▼) : To move through the character list in a descending order.
   - “UP” function (▲) : To move through the character list in an ascending order.
   - “ESC” function: To return to the previous character or previous menu in the display.
   - “ENTER” function: To validate the edited character and move to the next character.
10. Once the corresponding value to the pending load has been assigned, the value in the display will be of three digits plus a comma. Units must be edited such that the value represented and the units are coherent. Validate the value inserted pressing START. VALUE 1 will be memorised.
11. Press “ESC” to return to the previous menu in order to edit the units. Units must have no more than three characters.
12. Press STOP and restart the crane again. Replace the load with another known load.
13. Repeat the process again (steps 4 to 8) selecting VALUE 2 in the Calibration menu.
14. Once finished the feedback calibration process, the system will be calibrated.

At this point the system is ready to work normally. Until calibration is performed, data appearing in the display will be inconsistent.

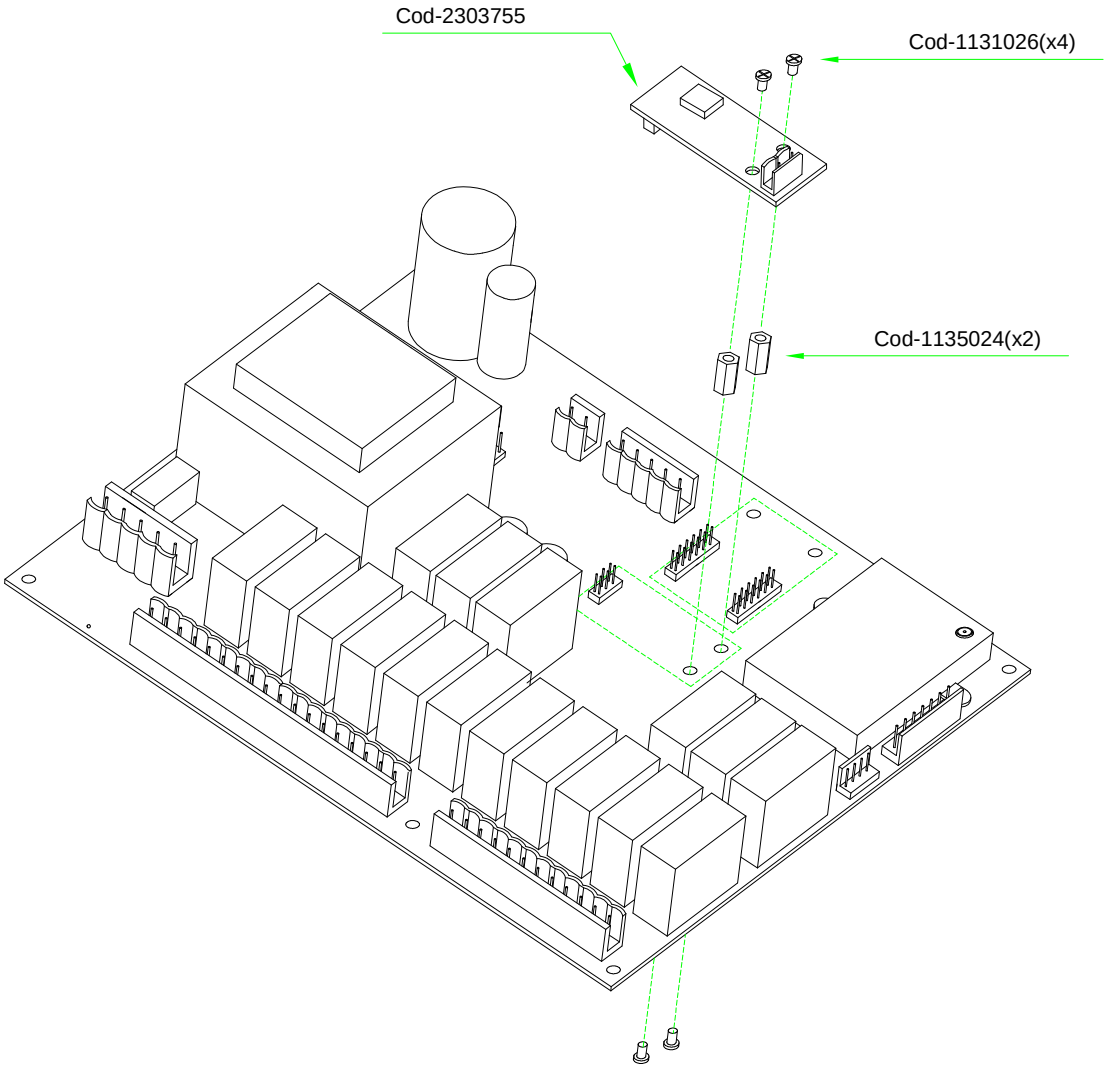
Calibration generates a linear interpolation of the possible values. This means that it can be used with all systems that generate a linear analogue outputs. For non linear systems the interpolation will not produce a correct display value. Calibration allows to obtain negative values.

Example of calibration of a load cell:

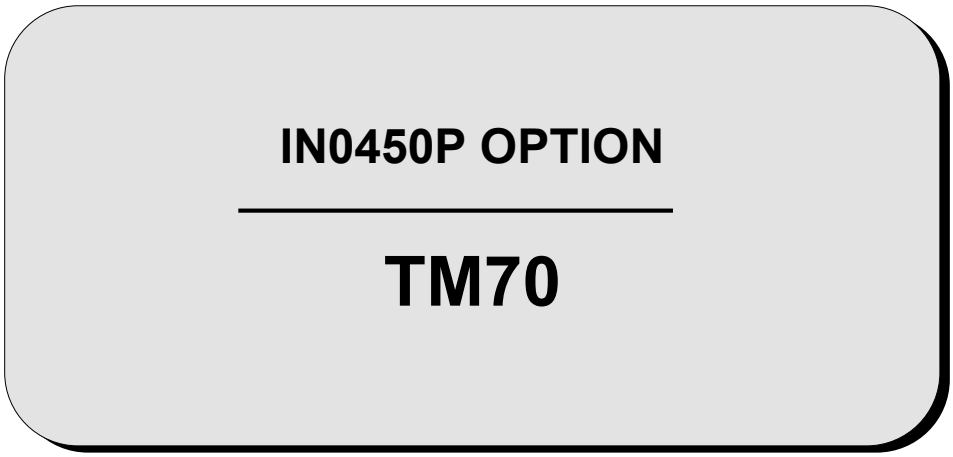
- Enter into the calibration mode and introduce the value corresponding to the hook without load (1st value).
- Validate the value pressing START. Extinguish the transmitter.
- Start the system again and raise a known load.
- Extinguish the transmitter and enter again to the calibration mode for the edition of the 2nd value.
- Press START to validate the value.
- Press pushbutton 1 to edit the units.
- Press START to validate the units.
- Extinguish the transmitter.
- The equipment is already ready to work normally.

14.3 - LR71/72 and IN0-10V ASSEMBLY

IN0-10V (Ref. 2303755)



15.- IN0450P OPTION



15.1 - INTRODUCTION and FUNCTIONAL DESCRIPTION

The IN0450P electronic card can be conected to the LR70, 0-3V analogue input and it allows to measure the frequency coming from a pulse generator operating between 0 - 450 Hz range.

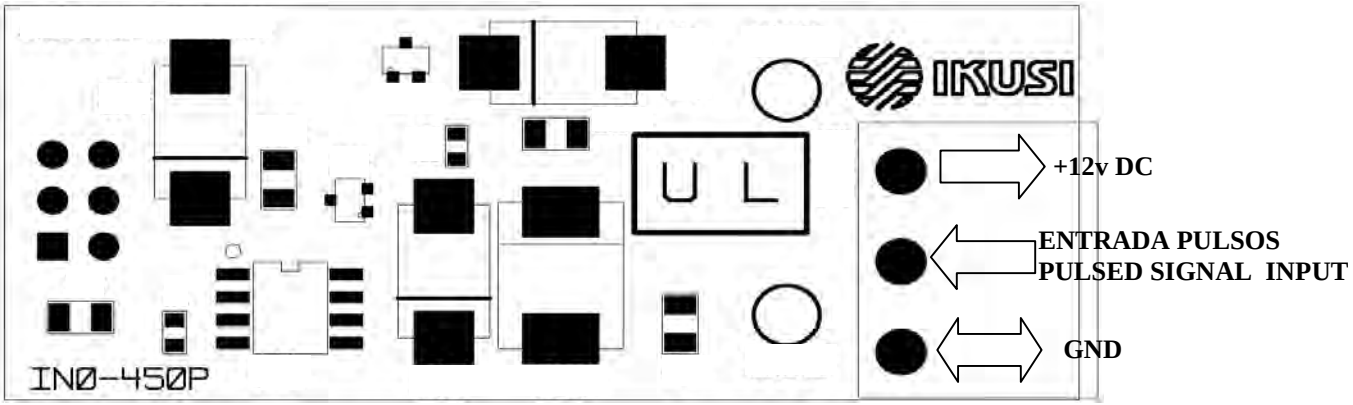
This electronic card is a frequency voltage converter and it can be used, for example, as an interface between an anemometer (sensor) that provides a pulsed signal, in order to show in the transmitter's display the speed of the wind, in real time mode, using the feedback option.

The card supplies a +12v DC voltage output to power the sensor.

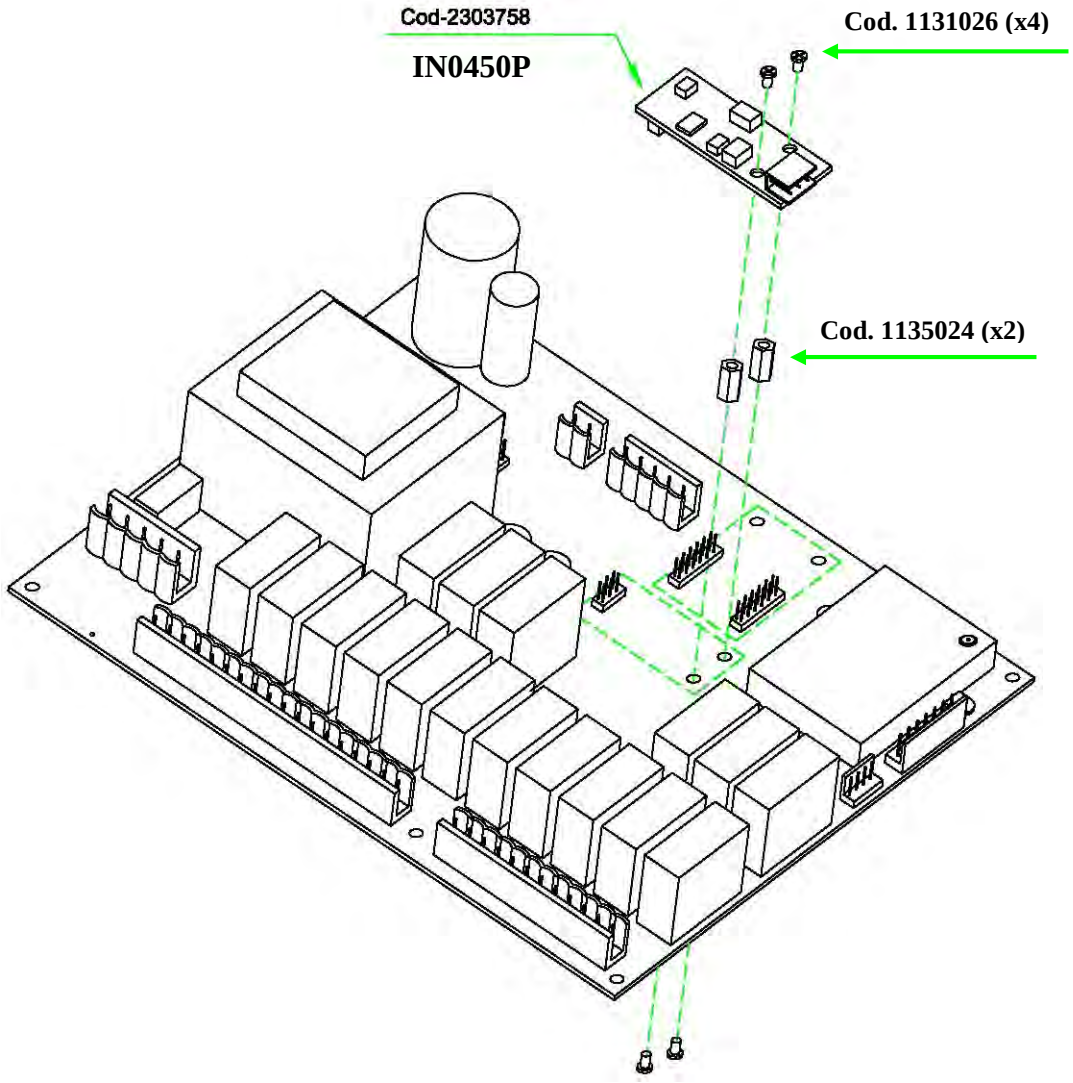
Technical characteristics:

- Maximum resolution: 8 bits.
- Input frequency range: 0 – 450 Hz.
- Galvanically isolated from the main logic board (LR70).
- Operating temperature range: –20ºC a +70ºC

Signals and connections block diagram:



15.2 - IN0450P and LR70 ASSEMBLY



16.- IN4D OPTION

IN4D OPTION

TM70

16.1 - INTRODUCTION AND FUNCTIONAL DESCRIPTION

The IN4D electronic card provides 4 digital inputs interface to the TM70 receiver. This card can be connected as an expansion -as single card- in the LR70 receiver card through P16 connector. The IN4D card can also be used as a multi-digital input using the INCAN option (multiple IN4D inputs option), as an alternative to the single one.

The IN4D card is basically a four digital to analogue signal converter. The four digital signals (IN1, IN2, IN3 and IN4) are converted to a 0 to 3 volts analogue value, available in the LR70 (or in the INCAN card). See figure 1.

The four digital inputs, IN1, IN2, IN3 and IN4 must have the following analogue values, in reference to the pin 6 (GND) ; I3 connector:

- 0 to 4V is equivalent to a deactivated state or '0' logic state.
- 8 to 28V is equivalent to an activated state or '1' logic state.

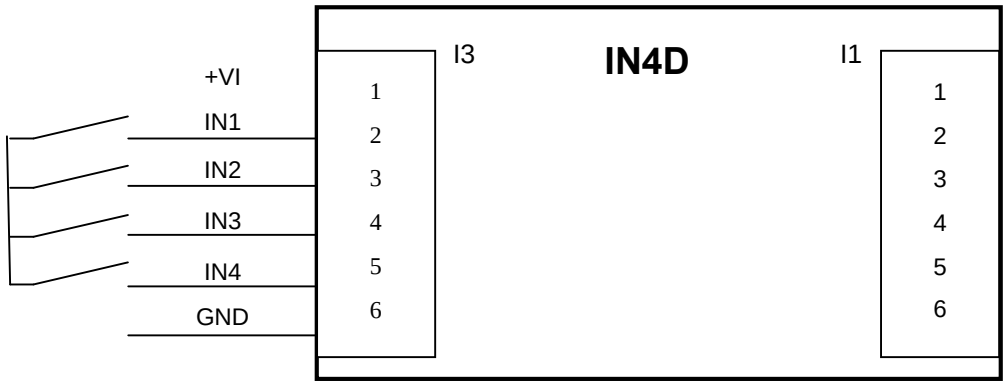


Figure 1

See I3 connector: 1 to 6 pins.

<u>Very important remark:</u> Do not apply higher voltages than 28 volts, in order to prevent card's damage.

If there is no external voltage range available, the card provides through pin number 1 (+VI), a voltage between 12 and 20 volts, to activate the inputs as shown in the figure 2.

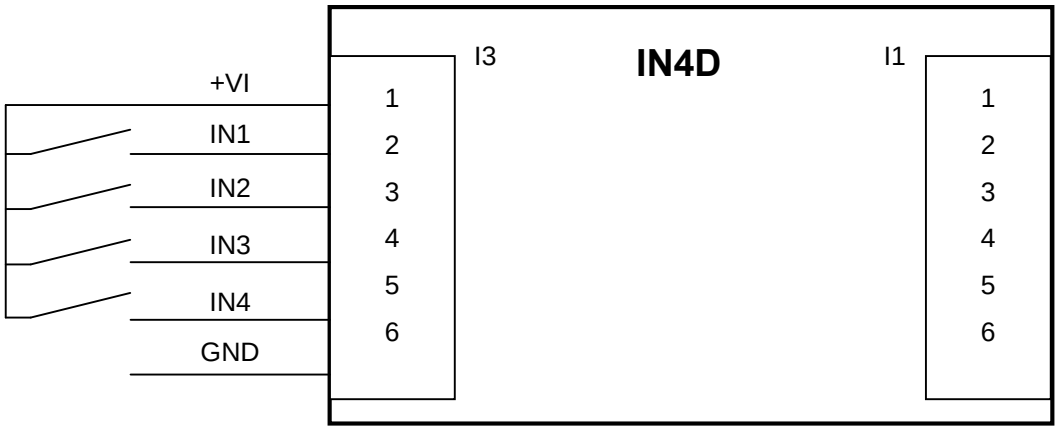


Figure 2

Block diagram of the signals (see figure 3):

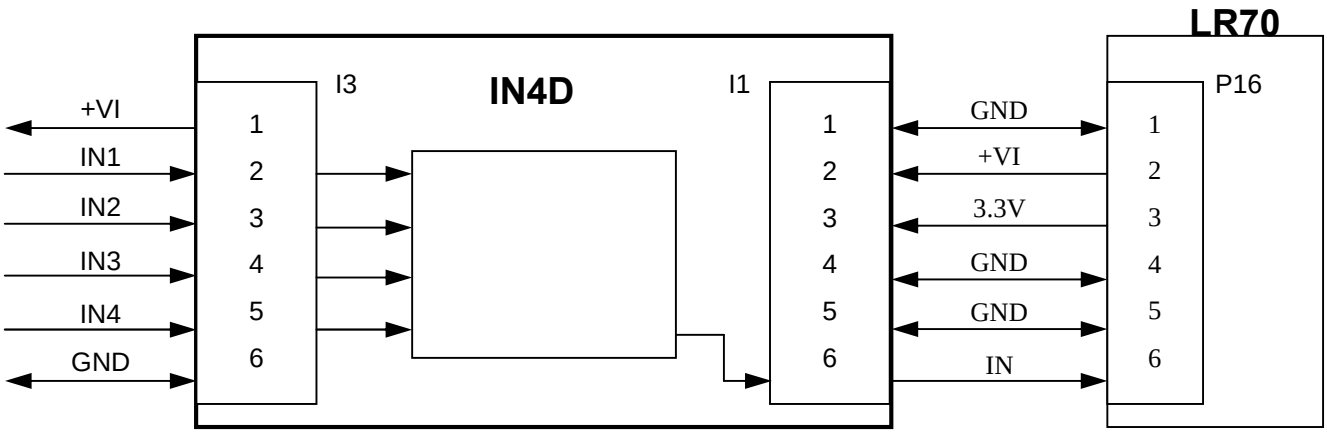


Figure 3

Electronic card top view (see figure 4).

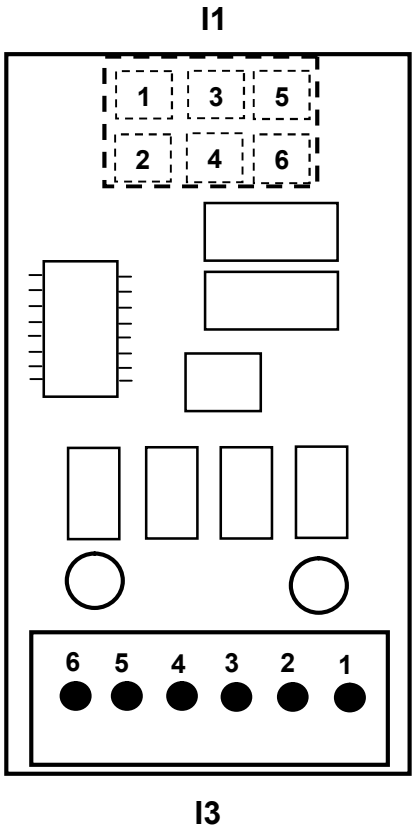
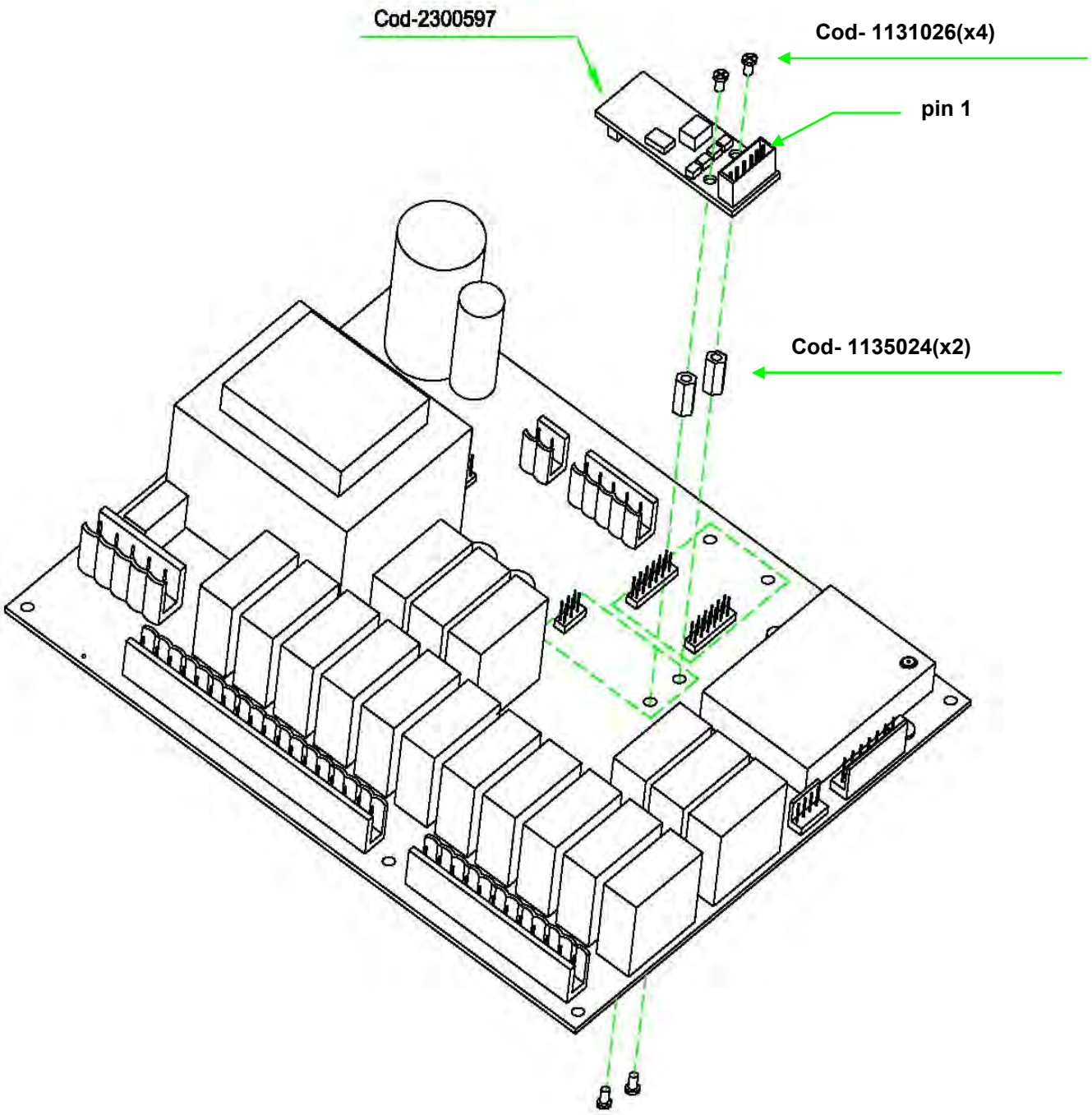


Figure 4

16.2 - IN4D AND LR71/LR72 ASSEMBLY



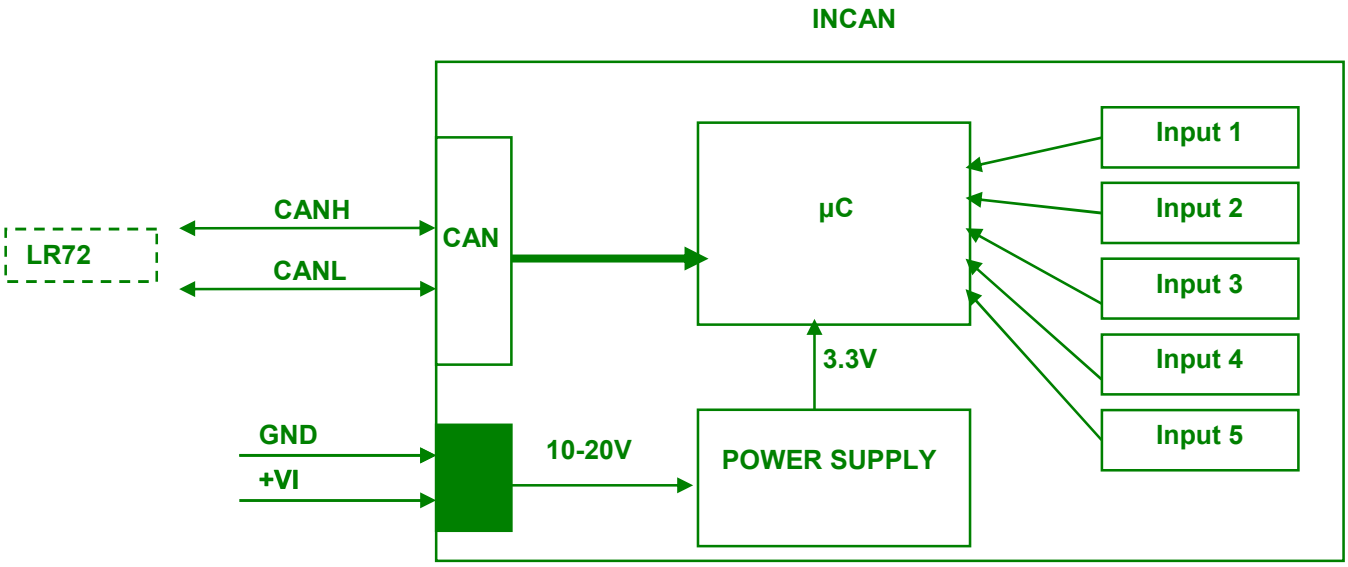
17.- INCAN OPTION

INCAN OPTION

TM70

17.1- INTRODUCTION and FUNCTIONAL DESCRIPTION

The INCAN interface allows to increase (until N*5 +1) the capacity of analogue and digital inputs in the LR72 electronic card. (N = number of INCAN cards; maximum = 2 units).



Each INCAN interface can support 5 (maximum) digital/analogue input micro-modules.

- IN4D: 4 digital inputs module (0 - 24VDC).
- IN010V: Voltage analogue input (range: 0 - 10 VDC).
- IN0450P: Pulses input (range: 0 – 450pps; pulses per second). (Example: To use with anemometer sensors).

A TM70 system can operate with**_2 INCAN electronic cards (maximum capacity)**, so the following configurations will be supported:

- 40+ (4) IN4D card directly connected to the LR72 ➔ max. 44 digital inputs (0-24VDC).
- 10+ (1) IN10V card directly connected to the LR72 ➔ max. 11 analogue inputs (8 bit resolution).
- 10+ (1) IN450P card directly connected to the LR72 ➔ max. 11 input pulsed signal counter (0-450 pps).

17.2– CONNECTIONS & CONFIGURATION JUMPERS

The INCAN expansion is connected to LR72 electronic card through two connectors: RL4 (2 pins -> +VI and GND signals) and RL3 (5 pins) for CAN bus signals. in practice GNDCAN and SHLCAN are connected.

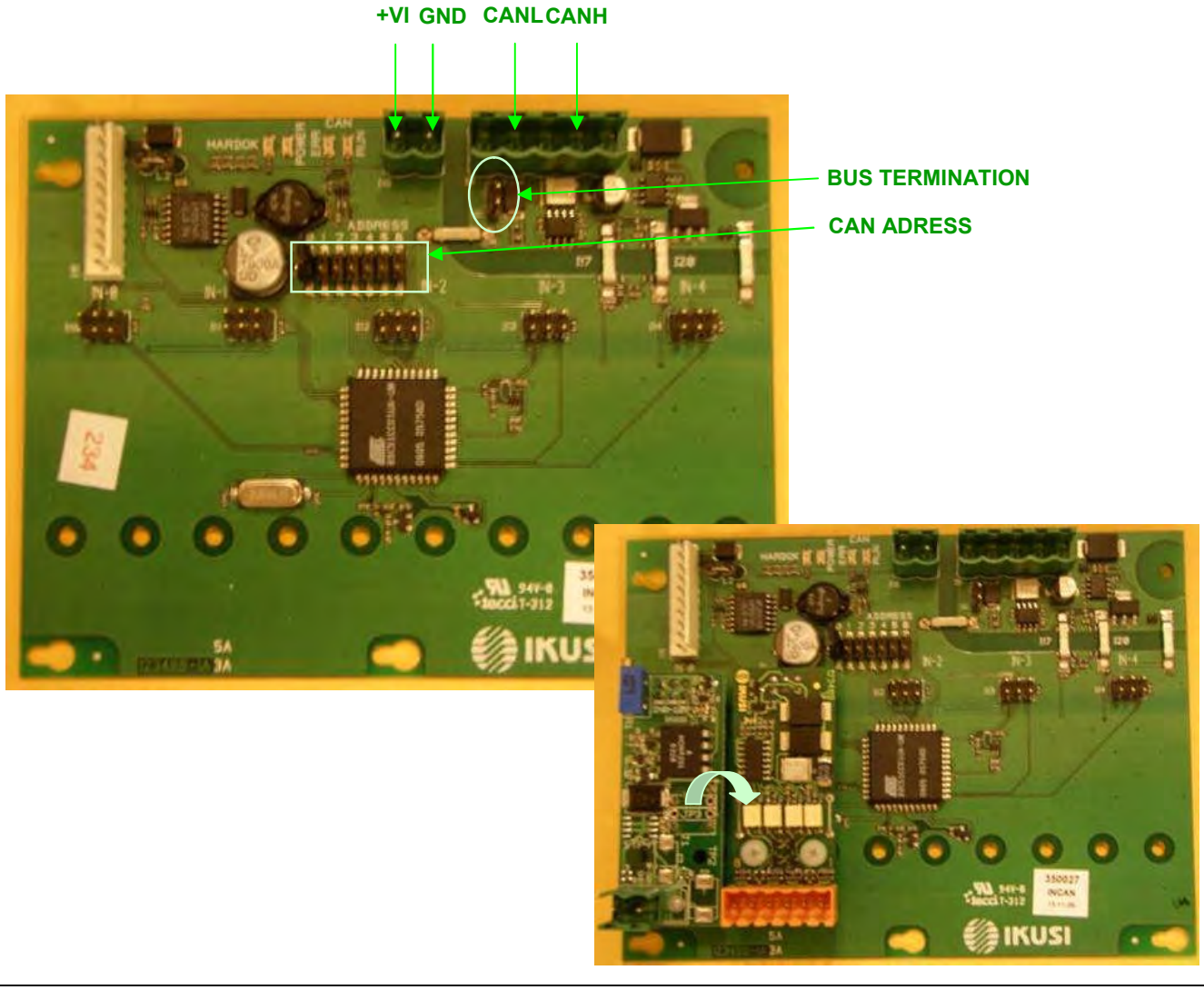
RL4

Pin	Name	Function
+	+VI	DC power supply between 8 and 30V.
-	GND	Ground

RL3

Pin	Name	Function
1	GNDCAN	CAN Ground
2	CANL	CANL bus signal (CAN low signal)
3	SHLCAN	Shielding
4	CANH	CANH bus signal (CAN High signal)
5	VCAN	Power supply

The positioning of the 5 analogue/digital input micro-modules will be consecutively from left to right as shown in the picture below:



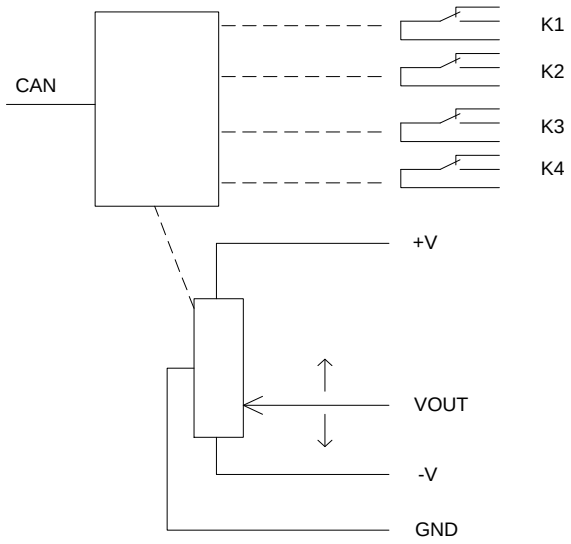
18. - A1P4RCAN OPTION

A1P4RCAN OPTION

TM70

18.1.- INTRODUCTION and FUNCTIONAL DESCRIPTION

The A1P4RCAN CAN expansion module provides to the TM70 receiver, 4 relays output and an analogue output at the same time. The analogue output simulates a digital potentiometer with 64 steps available in each semi-axis of the power supply. See the diagram block below (**size ½ of LR72**):



This CAN expansion provides to the user the following outputs :

- An analogue output simulated by a digital potentiometer with 128 steps and galvanically isolated.
- Free to use four relays outputs, K1, K2,K3 and K4.

These outputs are controlled by CAN BUS, writing in its addresses CANOpen frames. The CAN address of the electronic card is conformed using the 7 jumpers of P1 connector. Jumper in position 1 corresponds with the first bit of the CAN address. Thus, inserting several bridges it is possible to select different addresses from «1 » until «127» (2^7), maximum.

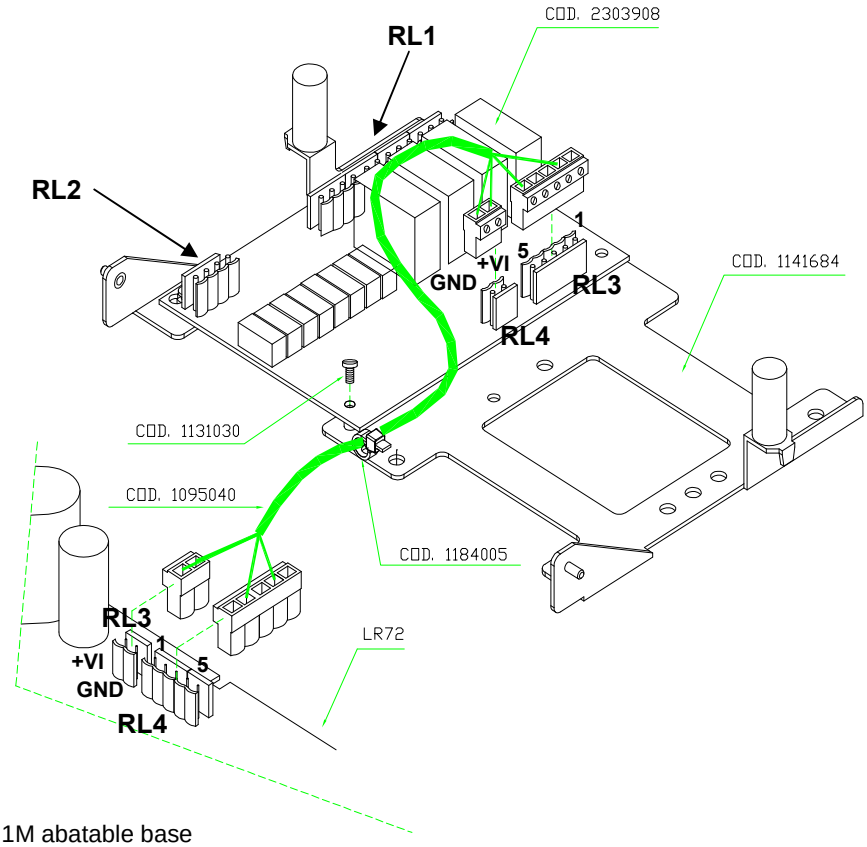
Very important : The address « 0 » is not a valid address ; so the board allways must be fitted with at least one jumper. With one jumper it is possible to configure 7 different addresses.

18.2.- CONNECTIONS & JUMPERS CONFIGURATION

LR72 ELECTRICAL CONNECTION

This expansion is connected to the LR72 board using two connectors; 2 pins connector labeled RL4 for power supply 8-30V (+VI and GND); 5 pins connector labeled RL3 for CAN Bus connection with the following signals :

Pin	Name	Function
1	GNDCAN	Ground
2	CANL	CANL bus signal (CANLow signal)
3	SHLCAN	Shielding
4	CANH	CANH bus signal (CANHigh signal)
5	VCAN	Power Supply



Cod. 1141684: TM70 1M abatable base
Cod. 1184005: UNEX 2221-0 clip
Cod. 1095040: CAN RC70 1 expansion cable
Cod. 1131030: M3x6 C/R DIN84 screw
Cod. 2303908: A1P4RCAN electronic board

RELAY OUTPUTS

The following connections are available for each relay: normally open (NO), normally closed (NC) and common, in the RL1 connector as shown in the following table. **Disposition of 4 manoeuvre relays of 250V/8A.**

Pin	Function
1	K1 contact: normally closed
2	K1 common contact
3	K1 contact: normally opened
4	K2 contact: normally closed
5	K2 common contact
6	K2 contact: normally opened
7	K3 contact: normally closed
8	K3 common contact
9	K3 contact: normally opened
10	K4 contact: normally closed
11	K4 common contact
12	K3 contact: normally opened

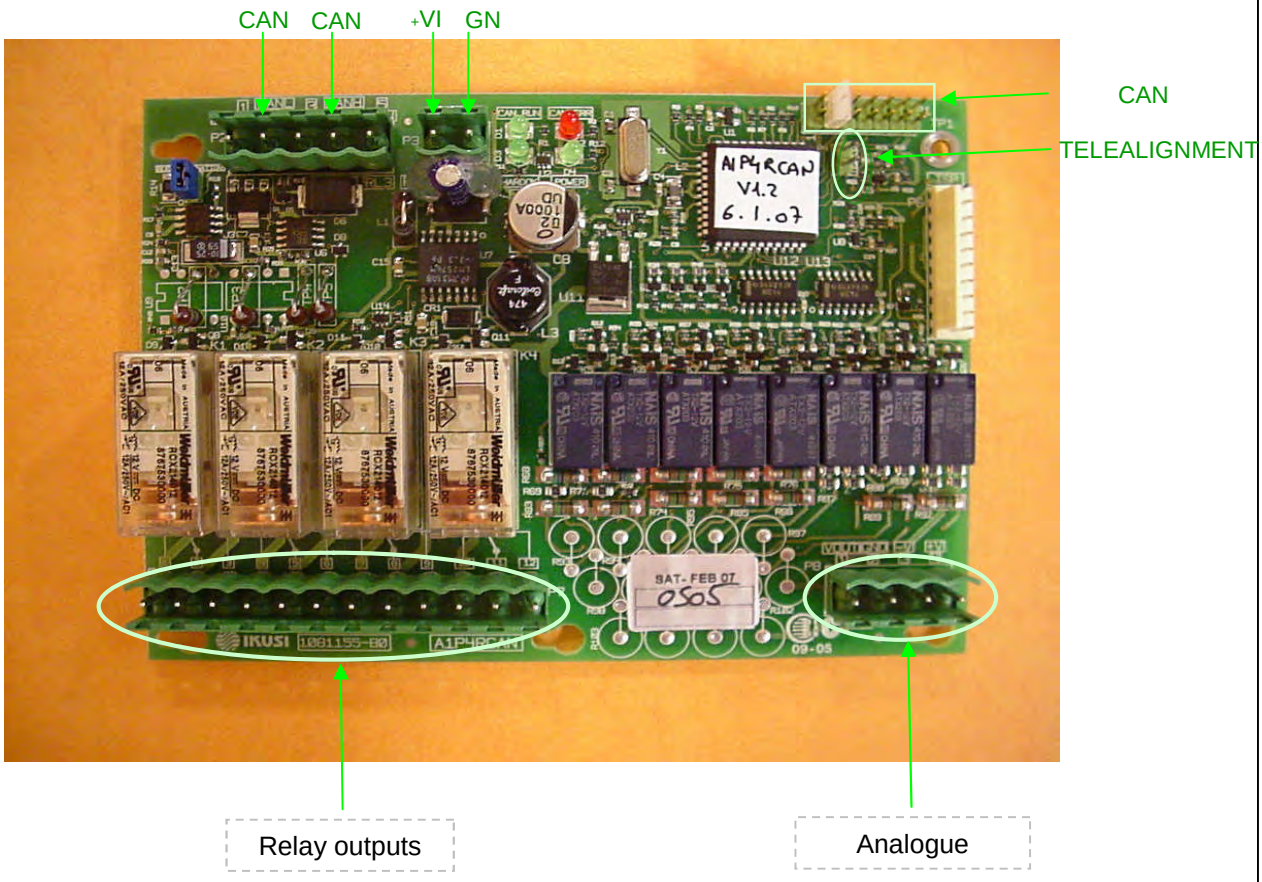
ANALOGUE OUTPUT

The analogue output is connected through RL2 connector with the following signals (Imax=15mA):

Pin	Name	Function
1	VOUT	Analogue Output
2	GND	Potentiometer's middle point
3	-V	Negative power supply (Minimun: -50V)
4	+V	Positive power supply (Maximun: 50V)

TELE-TEACHING (V3.1 OF SOFTWARE OR HIGHER VERSIONS)

Through Tele-Alignment can set the maximum and minimum values, the polarity inversion, acceleration or deceleration ramp and curve type of the analogue output. To change to Tele-Alignment mode is necessary to introduce a bridge in the jumper P5 (see Jumpers configuration). **Only available for TM70 consol box from 3.1 software version or higher.**



19.- A2ICAN OPTION

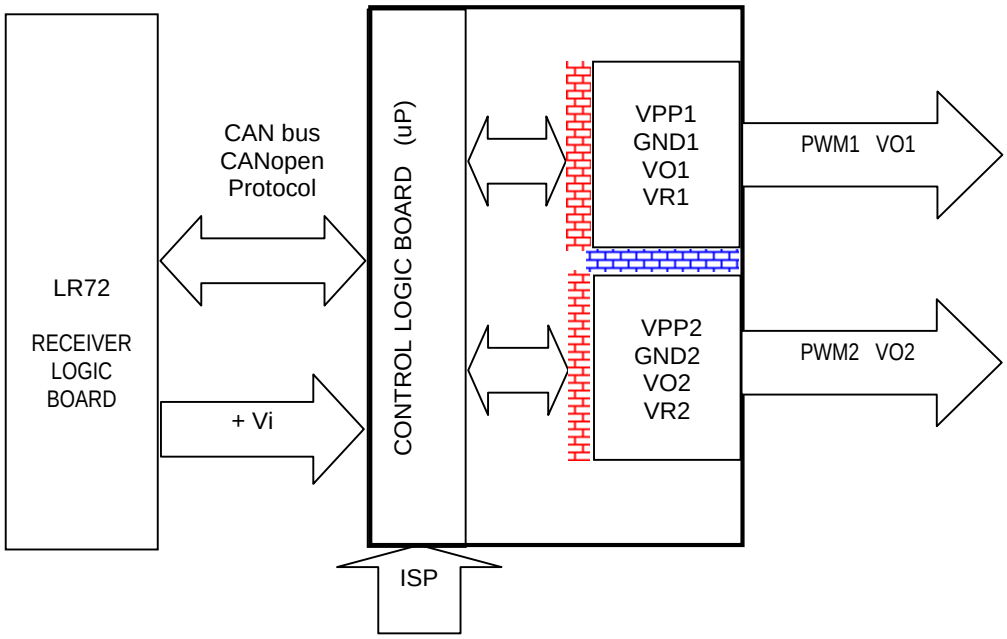
A2ICAN OPTION

TM70

19.1- INTRODUCTION & FUNCTIONAL DESCRIPTION

The A2VCAN electronic board gives to the modular TM70 systems an analogue output in current (PWM), allow the government of electro-hydraulic proportional valves with input reference in current. The electronic board contains two output stages galvanically each other separated and from the control common logic.

A2ICAN



A2ICAN electronic board is an expansion of two analogue outputs controlled by the CANopen interface.

The A2ICAN electronic board implement, for integration into the TM70 system, an own resident software in its microprocessor, that performs the following functions:

- Communication with the LR72 electronic board through CANOpen protocol, using the standard profile 401, input/output digital/analogue (CIA DS401 - CANopen Device Profile for Generic I/O Modules).
- Generates two analogue outputs in current according to the received instructions and the settings for each output.

There are two types of response curves for each output:

- Linear: response of the analogue output proportional to the input
- Non-linear: the response of the analogue output is exponentially regarding the input. Variations of the joystick inputs at the beginning of his movement will result in small changes of the output voltage, while the same variations of the joystick input at the end of the movement will result in major changes in the output voltage.

The choice of one or another profile is decided by a customization parameter P (customizable by EEPROM or Tele-Alignment), which uses 0 for linear curve and 1, 2 or 3 for exponential curves from low to high grade.

It also can be programmed exit ramps on rise and/or fall per semiaxis. The form of response of the ramps is under defined output type: linear or nonlinear.

The ramp speed is defined for each semiaxis by a parameter that can take a value between 0 and 15, by default 0. Each of these values corresponds to a ramp time from minimum to maximum value given by the following table:

0 ➔ without ramp	4 ➔ 0,4 s	8 ➔ 1,0 s	12 ➔ 2,0 s
1 ➔ 0,1 s	5 ➔ 0,5 s	9 ➔ 1,2 s	13 ➔ 2,5 s
2 ➔ 0,2 s	6 ➔ 0,6 s	10 ➔ 1,5 s	14 ➔ 3,5 s
3 ➔ 0,3 s	7 ➔ 0,8 s	11 ➔ 1,7 s	15 ➔ 5,0 s

Each output is a PWM signal with current feedback in which is possible the control and compensation of the switching frequency and pulse width. It also implements a superimposed "dither" signal on the output, with variable frequency and amplitude, to soften the response of certain hydraulic valves. The "dither" is available only when the switching frequency of the PWM output is 5 kHz:

- PWM Frequency range: 33,35,40,45 ... 1275 and 5000 Hz
- Dither Frequency range: 33 ... 255 Hz
- Dither Amplitude range: 0 ... 50%

Through Tele-Alignment can set the maximum and minimum values, the polarity inversion, acceleration or deceleration ramp and curve type of the analogue output. To change to Tele-Alignment mode is necessary to introduce a bridge in the jumper P6 (see Jumpers configuration). **Only available for TM70 consol box from 3.1 software version or higher.**

Other features of the PWM current outputs:

- Power supply range of the expansion 8-30V, and of the outputs 5-35V.
- Each output channel has 2 outputs only one of which will be connected, according to the sign of the input. 2 PWM outputs are identical and independent.
- The output resolution is 128 steps by semiaxis (256 max – 8 bit), corresponding to step 0 a null output and step 127 to obtained from the permanent exit from the positive supply.
- Max current = 5A (each output).
- Outputs protected against short-circuit.

19.2- CONNECTIONS & JUMPERS CONFIGURATION

CONNECTIONS WITH THE LR72

The expansion connects to the LR72 electronic board through two connectors, one of 2 pin for power supply (VI + and GND) and the other of 5 pin for the CAN bus with the following signals:

Power connector	
Pin number	Function
GND	Ground
+VI	DC between 8 y 30V

CAN bus connector	
Name	Function
VCAN	Power supply
CANH	CANH pin of the CAN bus
GNDCAN	Ground (Shielding)
CANL	CANL pin of the CAN bus
GNDCAN	Ground

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OUTPUTS

Each analogue output has two serial relays that switch the output signal to one of two ways, the direct or the inverse. If not activate any of the relays, both outputs (the direct and inverse) are disconnected.

OUTPUT PWM1

The connections of the output 1 are through 4 pole terminal plug, with the follow pin assignment:

Output 1 connector	
Pin Name	Function
VPP1	Power of channel 1
GND1	Ground of channel 1
VO1	DIRECT analogue PWM output of channel 1
VR1	INVERSE analogue PWM output of channel 1

OUTPUT PWM2

The connections of the output 1 are through 4 pole terminal plug, with the follow pin assignment:

Output 2 connector	
Pin name	Function
VPP2	Power of channel 2
GND2	Ground of channel 2
VO2	DIRECT analogue PWM output of channel 2
VR2	INVERSE analogue PWM output of channel 2

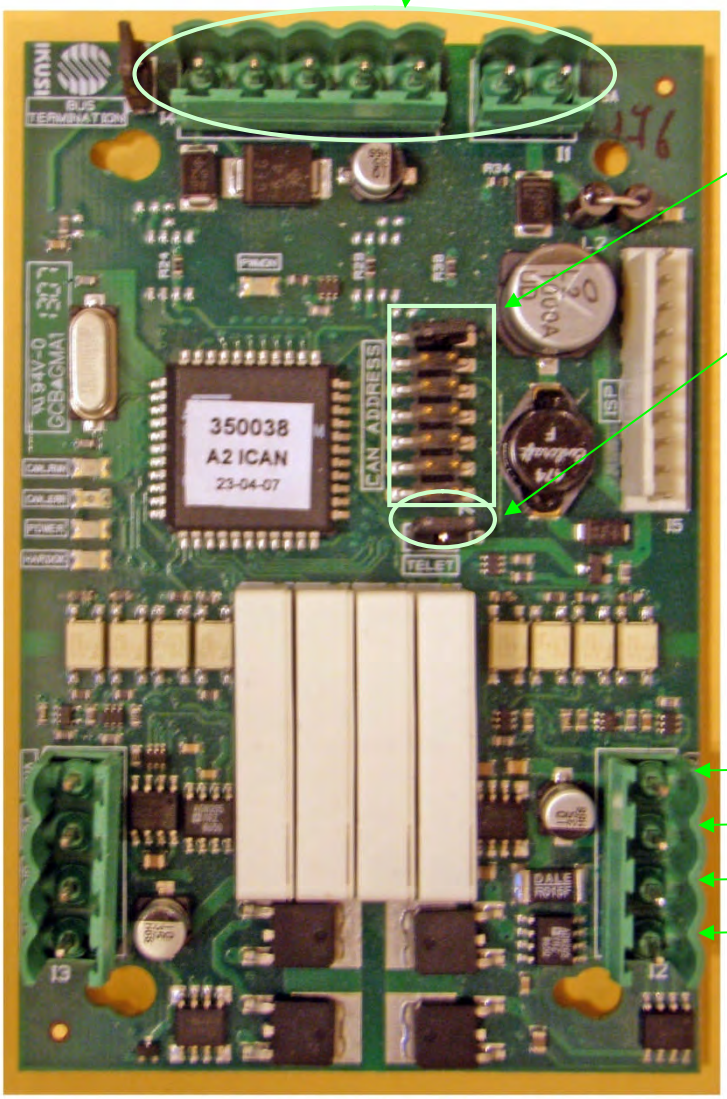
ISP (PROGRAMACION "IN CIRCUIT" / "IN SYSTEM")

The expansion has a connector to record "In-System" (eg. Microprocessor software update). This connector has 10 pins:

ISP connector	
Pin name	Function
ISP2	Input connected to the ground to place the microcontroller in recording mode
TX2	Not used
RX2	Receiving data signal
GND	Ground
RX1	Receiving data signal
TX1	Transmisión data signal
ISP	Not used
VCC	Power supply output at 3,3 V
MRNOT	Reset input, active when it is connected to ground
+VI	Power supply output at 12 V (not stabilized, can vary between 8 y 22 V)

JUMPERS CONFIGURATION

Size ¼ of LR72



20.- A2VCAN OPTION

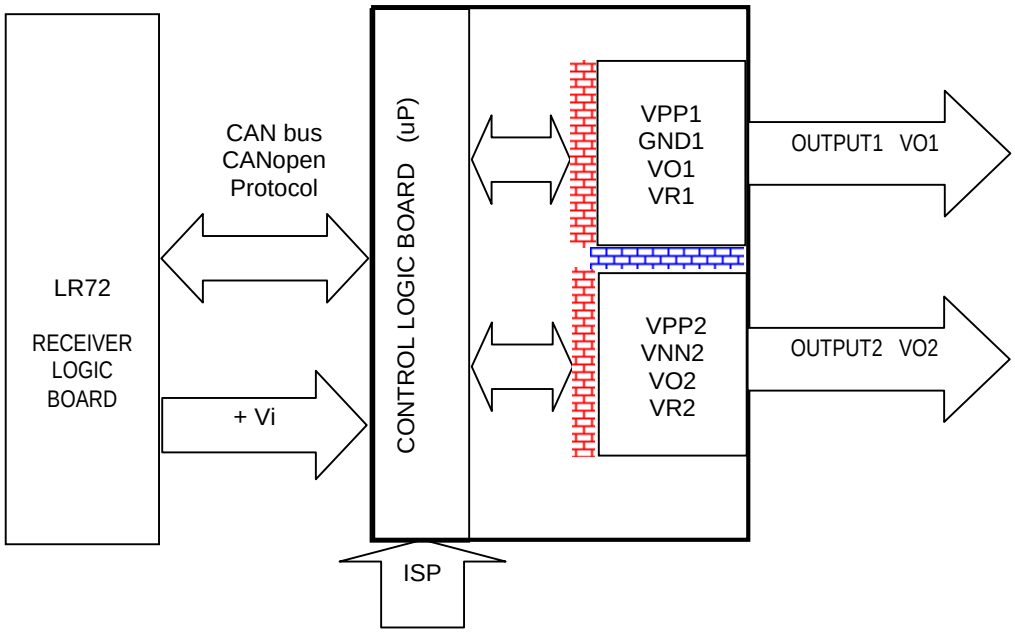
A2VCAN OPTION

TM70

20.1- INTRODUCTION & FUNCTIONAL DESCRIPTION

The A2VCAN electronic board gives to the modular TM70 systems an analogue output in voltage option, allow the government of variable frequency drives with voltage control, electro-hydraulic proportional valves with input reference in voltage, etc. The electronic board contains two output stages galvanically each other separated and from the control common logic.

A2VCAN



A2VCAN electronic board is an expansion of two analogue outputs controlled by the CANopen interface. Can generate two analogue outputs (dependent on supply voltage) with a resolution of 10 bits (1024 steps).

The A2VCAN electronic board implement, for integration into the TM70 system, an own resident software in its microprocessor, that performs the following functions:

- Communication with the LR72 electronic board through CANOpen protocol, using the standard profile 401, input/output digital/analogue (CIA DS401 - CANopen Device Profile for Generic I/O Modules).
- Generates two analogue outputs in voltage according to the received instructions and the settings for each output.

There are two types of response curves for each output:

- Linear: response of the analogue output proportional to the input
- Non-linear: the response of the analogue output is exponentially regarding the input. Variations of the joystick inputs at the beginning of his movement will result in small changes of the output voltage, while the same variations of the joystick input at the end of the movement will result in major changes in the output voltage.

The choice of one or another profile is decided by a customization parameter P (customizable by EEPROM or Tele-Alignment), which uses 0 for linear curve and 1, 2 or 3 for exponential curves from low to high grade.

It also can be programmed exit ramps on rise and/or fall per semiaxis. The form of response of the ramps is under defined output type: linear or nonlinear.

The ramp speed is defined for each semiaxis by a parameter that can take a value between 0 and 15, by default 0. Each of these values corresponds to a ramp time from minimum to maximum value given by the following table:

0 ➔ without ramp	4 ➔ 0,4 s	8 ➔ 1,0 s	12 ➔ 2,0 s
1 ➔ 0,1 s	5 ➔ 0,5 s	9 ➔ 1,2 s	13 ➔ 2,5 s
2 ➔ 0,2 s	6 ➔ 0,6 s	10 ➔ 1,5 s	14 ➔ 3,5 s
3 ➔ 0,3 s	7 ➔ 0,8 s	11 ➔ 1,7 s	15 ➔ 5,0 s

Through Tele-Alignment can set the maximum and minimum values, the polarity inversion, acceleration or deceleration ramp and curve type of the analogue output. To change to Tele-Alignment mode is necessary to introduce a bridge in the jumper P6 (see Jumpers configuration). **Only available for TM70 consol box from 3.1 software version or higher.**

Other features of the PWM current outputs:

- Power supply range of the expansion 8-30V, and of the outputs 5-35V.
- Max current = 10 mA (each output).
- Outputs protected against short-circuit.

20.2- CONNECTIONS & JUMPERS CONFIGURATION

CONNECTIONS WITH THE LR72

The expansion connects to the LR72 electronic board through two connectors, one of 2 pin for power supply (VI + and GND) and the other of 5 pin for the CAN bus with the following signals:

Power connector	
Pin number	Function
GND	Ground
+VI	DC between 8 y 30V

CAN bus connector	
Name	Function
VCAN	Power supply
CANH	CANH pin of the CAN bus
GNDCAN	Ground
CANL	CANL pin of the CAN bus
GNDCAN	Ground

OUTPUTS

The voltage outputs are generated from PWM pulses, and them filtered result in radiometric tension outputs (dependent on supply voltage). The two outputs are electrically isolated respect to the logic and each other.

The control of relays is done via VREL1 and VREL2 signals. Also, it needs to be activated the common of both relays by VCOMREL signal. When the relays are off, the output voltage VO1 and VO2 are the values of reference voltage VR1 and VR2 connected at each output.

The output values range goes from 0 to 100% of power supplies VPP1 and VPP2 connected to each of the outputs and have a resolution of 10 bits (1024 values).

OUTPUT 1 (VO1)

The connections of the output 1 are through 4 pole terminal plug, with the follow pin assignment:

Output 1 connector	
Pin Name	Function
VPP1	Power of channel 1
GND1	Ground of channel 1
VO1	Analogue output of channel 1
VR1	Zero position signal signal to get through the output 1 when the relay is inactive

OUTPUT 2 (VO2)

The connections of the output 1 are through 4 pole terminal plug, with the follow pin assignment:

Output 2 connector	
Pin name	Function
VPP2	Power of channel 2
GND2	Ground of channel 2
VO2	Analogue output of channel 2
VR2	Zero position signal signal to get through the output 2 when the relay is inactive

ISP (PROGRAMACION "IN CIRCUIT" / "IN SYSTEM")

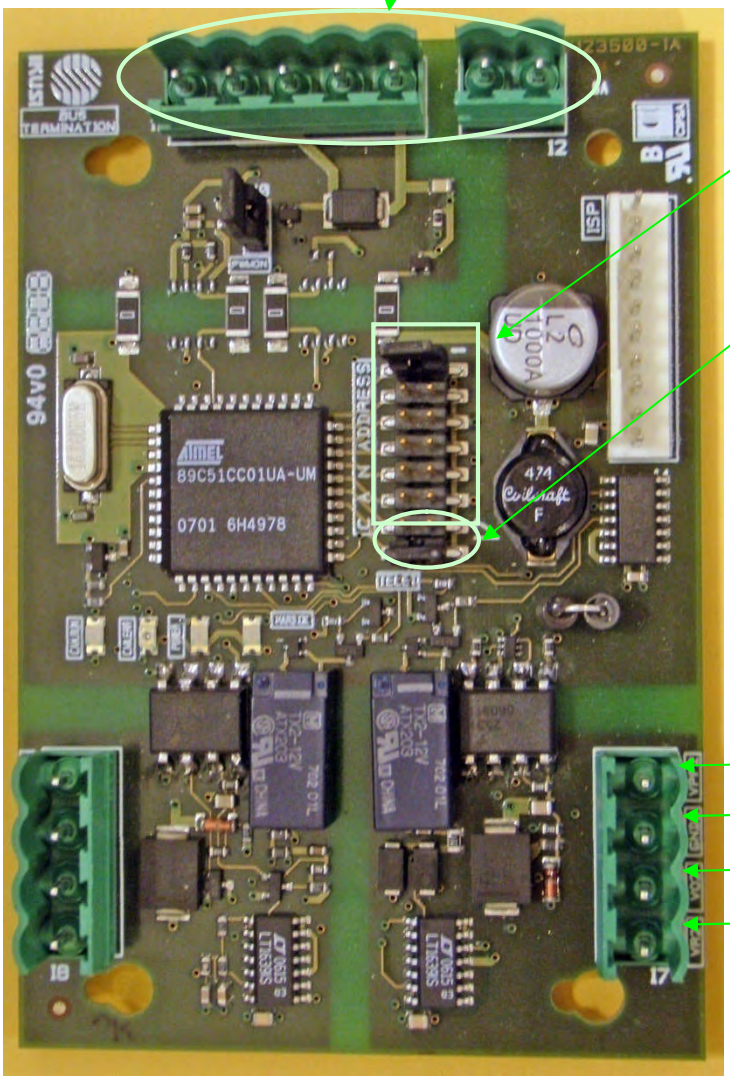
The expansion has a connector to record "In-System" (eg. Microprocessor software update). This connector has 10 pins:

ISP connector	
Pin name	Function
ISP2	Input connected to the ground to place the microcontroller in recording mode
TX2	Not used
RX2	Receiving data signal
GND	Ground
RX1	Receiving data signal
TX1	Transmisión data signal
ISP	Not used
VCC	Power supply output at 3,3 V
MRNOT	Reset input, active when it is connected to ground
+VI	Power supply output at 12 V (not stabilized, can vary between 8 y 22 V)

JUMPERS CONFIGURATION

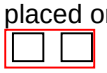
Size ¼ of LR72

Connections with the LR72



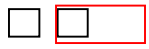
P5: "Jumper" for configuration of the CAN direction of the expansion.
"Jumper" = ON ➔ "1" logic.
Programmable addresses: 1…63 max

P6: "Jumper" to enable or disable the Tele-Alignment process.
Enabled Tele-Alignment = "jumper" placed or ON.



P6

Disabled Tele-Alignment = "jumper" eliminated or OFF.



P6

1 = VPP (channel power)

2 = GND (Channel ground)

3 = VO (Channel voltaje analogue output)

4 = VR (Zero position voltage, when K rely of each channel is inactive.

20.3- EXPANSIONS POWER SUPPLY ELECTRONIC BOARD POT70V4

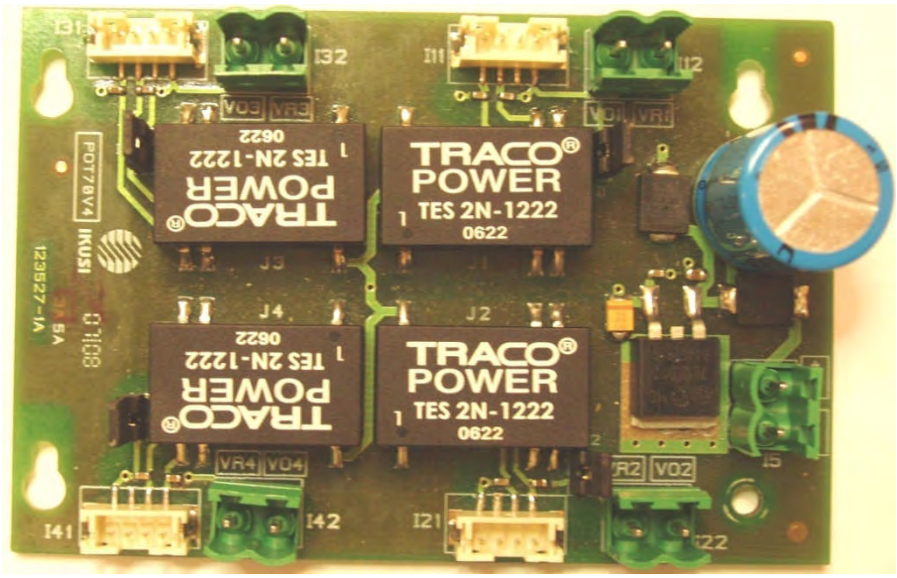
POT70V4 is an independent and isolated electronic board with 4 power supplies, which are used to supply the output stage of the A2VCAN electronic board's analogue outputs.

This expansion is mounted as datasheet; only the number of required DC/DCs (power supplies) will be mounted. **Each DC/DC can supply the outputs of two A2VCAN; 4 analogue outputs in voltage.**

The energy for POT70V4 module is provided by the LR72 board.

Technical features:

- Size ¼ of LR72
- **2 DC/DC available:**
  - **12V/0/-12V, 85mA**
  - **15V/0/-15V, 65mA**
- Power supply range of DC/DC: 9 to 18V



21.- TELEALIGNMENT OPTION

TELEALIGNMENT OPTION

TM70

21.1 - INTRODUCTION

Access to this option can be activated or deactivated by EEPROM, by EEPROM recorder and/or TM70Config, if it is connected in the expansion the **Jumper** which enables Tele-alignment. Cards that support Tele-Alignment are:

- A1P4RCAN(1 relay based potentiometric output card)
- A2VCAN (2 voltage analogue output card)
- A2ICAN (2 PWM current analogue outputs card)

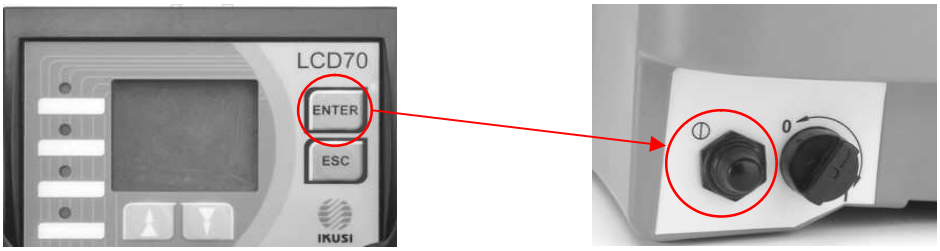
A2ICAN and A2VCAN expansion cards **are interchangeable**, but the position and number of outputs will be the same, also will require a modification of EEPROM due to differences in the output parameters. The new expansion will be automatically recognized by the system. At the time of accessing to the Tele-Alignment menu, the system makes a recognition of all the expansions connected to the CAN bus and supported outputs. All information is synchronized between the transmitter and receiver.

The Tele-Alignment process requires the use of display LCD70 option (soft. version 3.1 or higher) or the TM70 Tele-Teaching support module (IKUSI Ref. 2305120-00A) designed for that purpose.

21.2 – TELE-ALIGNMENT PROCESS

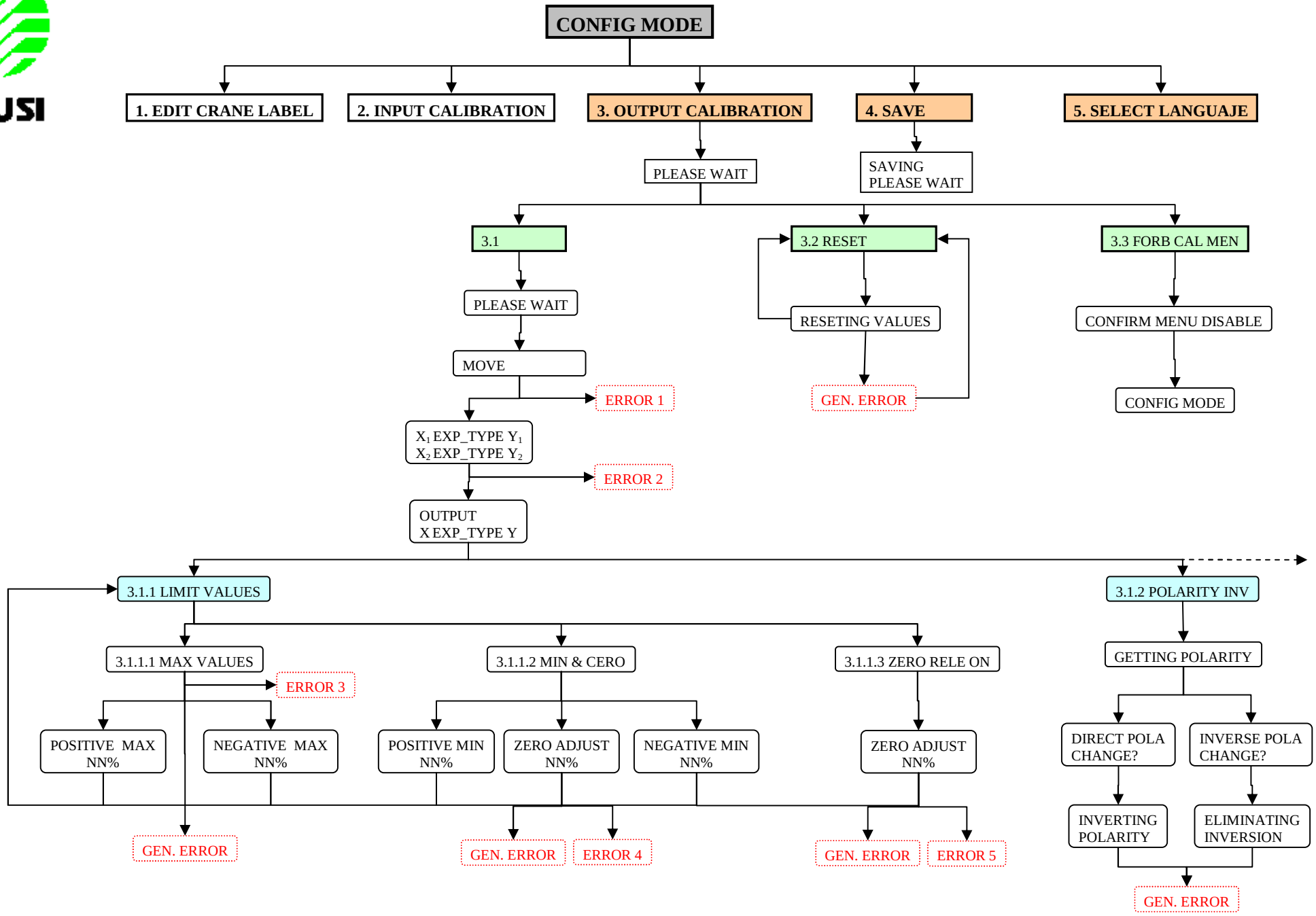
The navigation through the software will be done by using the ▲ "UP" ▼ "DOWN", ENTER (validate selection) and "ESC" (abort selection) keys, but are configurable by EEPROM and/or TM70Config. In situations where you would press "UP" or "DOWN" repeatedly, there is a progressive move by holding down the key.

To access the Tele-Alignment menu must be pressed in sequence the "ENTER" (default) + "START".



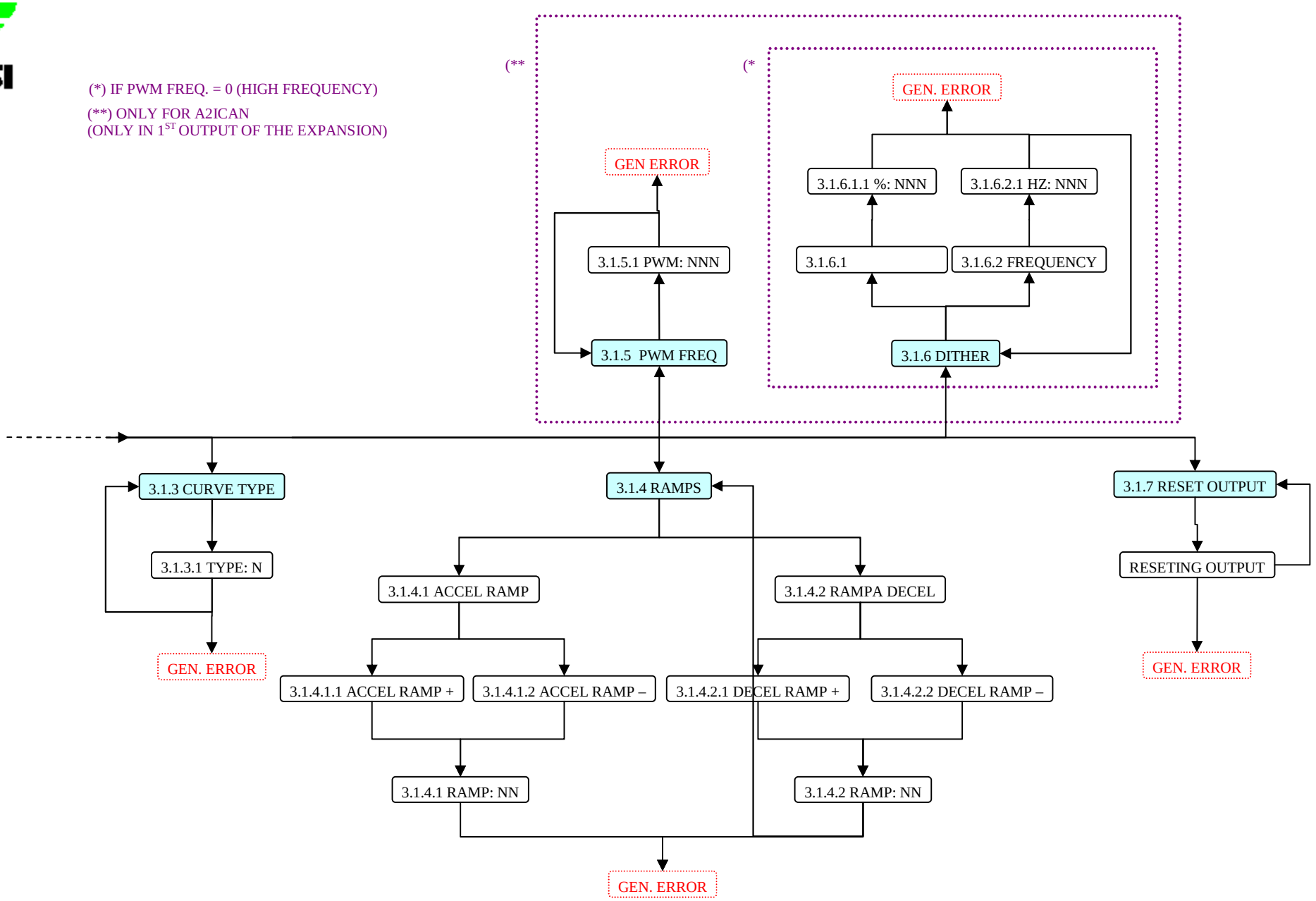
This configuration is defined by EEPROM, but ENTER function may be replaced by any other manoeuvre by TM70Config to change the access sequence to the Tele-Alignment menu.

The default menus are in English, but you can choose between English and Spanish by EEPROM and/or TM70Config or Menu option (**5. SELECT LANGUAGE**).



(*) IF PWM FREQ. = 0 (HIGH FREQUENCY)

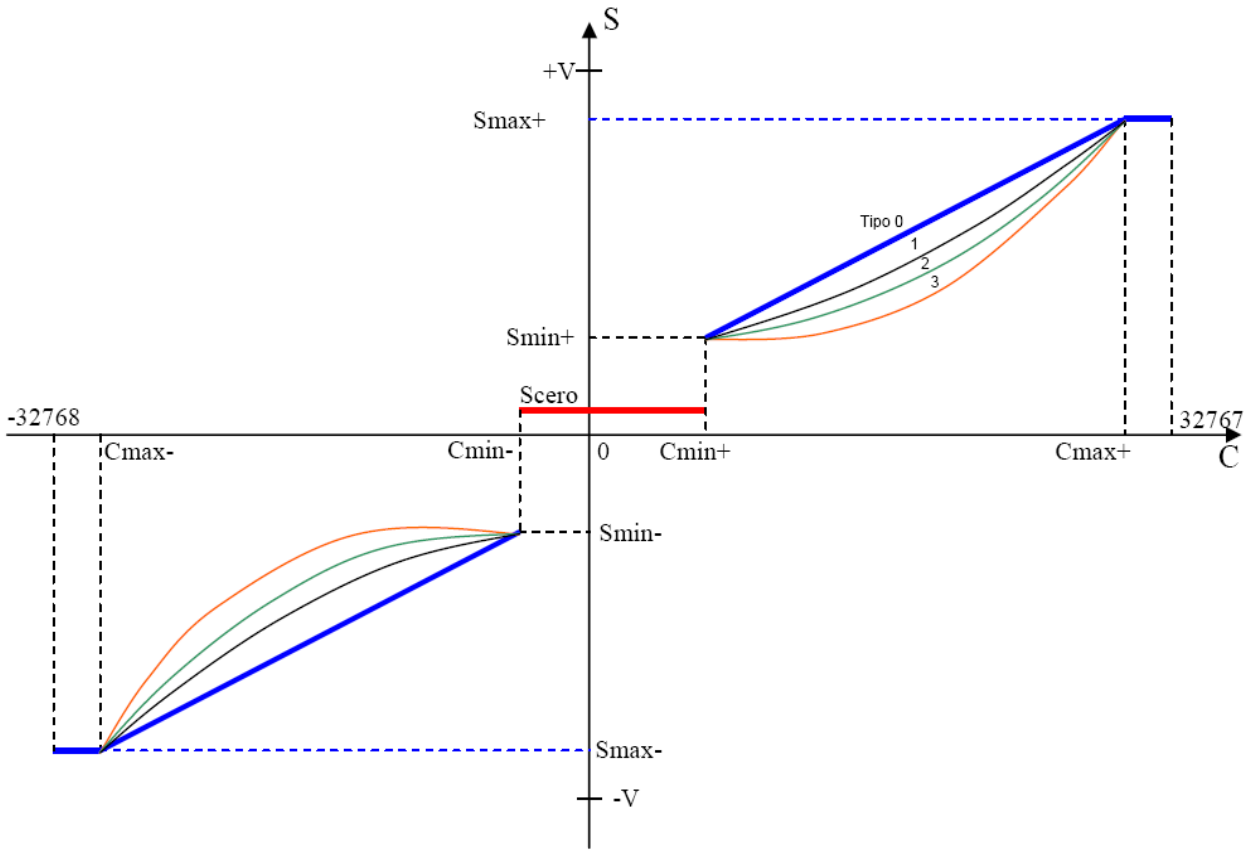
(**) ONLY FOR A2ICAN
(ONLY IN 1ST OUTPUT OF THE EXPANSION)



21.2.1 – MENU 3.1 ADJUST

IMPORTANT: After adjustment for **each parameter in each semiaxis**, validate the setting before returning back on the menu, otherwise would not be recorded. This validation is always performed by pressing START. Finally and after setting all the parameters required, validate the **4. SAVE ALL** menu to record in the EEPROM all the settings.

In the next image we can see the different parameters that can be configured and will be described below:



By entering in this menu, the user is asked to activate the manoeuvre associated with the output to be adjusted. Outputs associated with the manoeuvre will be displayed in the following format:

X EXP_TYPE Y

X: Number of the analogue output
Y: Output Number of the output
EXP_TYPE: Type of analogue output (A1P4RCAN, A2VCAN, A2ICAN)

The user has to select which of the exits wants to teleadjust. To do this, interested output should be flashing. If there are two exits on screen, using the UP / DONWN can select the desired output. To confirm the selection press START. At that time, and for a time will display the output you have selected.

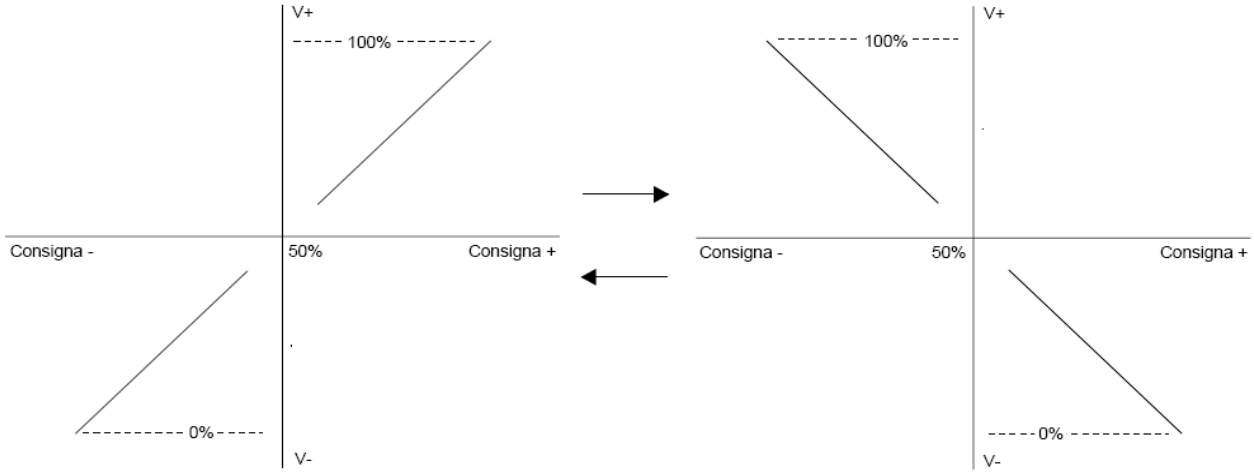
LIMIT VALUES:

Set the limits of the analogue output (+ Smin, Smin, smax + smax and Scero) ➔ **NOTE: These actions involve movement of the manoeuvre to adjust!**

- The adjustment of MAX and MIN values is performed with the manoeuvre moved for know which output and which semiaxis is going to be adjusted.
- As you are pressing UP/DOWN keys, value will be updated on the screen.
- ZERO value of the output will be adjusted with the manoeuvre in the neutral position.
- The LCD will guide at all times to report that the five possible parameters are adjusted depending on the position of the paddles.
- ZERO RELE ON: By entering this submenu is permanently activated the output of the expansion in the absence of a order. This can be used to identify potential errors that cause unwanted movements.

POLARITY INV:

It allows the reverse polarity of outlets, such as:



CURVE TYPE:

Tour types of curve available:

- Type 0: Linear response.
- Type 1, 2 y 3: Exponential responses.

RAMPS:

The acceleration and/or deceleration ramp speed is defined for each semiaxis by a parameter that can take a value between 0 and 15, default 0. Each of these values is a ramp time defined in seconds by the following table:

0 ➔ without ramp	4 ➔ 0,4 s	8 ➔ 1,0 s	12 ➔ 2,0 s
1 ➔ 0,1 s	5 ➔ 0,5 s	9 ➔ 1,2 s	13 ➔ 2,5 s
2 ➔ 0,2 s	6 ➔ 0,6 s	10 ➔ 1,5 s	14 ➔ 3,5 s
3 ➔ 0,3 s	7 ➔ 0,8 s	11 ➔ 1,7 s	15 ➔ 5,0 s

These values are modified by EEPROM recorder.

PWM FREQUENCY:
Only available for outputs with current regulation (A2ICAN). Is defined by a parameter that can take a value between 0 and 255 and equivalent to the following frequency PWM values:

Parameter	PWM Frequency
0	5000 Hz
1…5	Adjustment not valid
6	33 Hz
7…255	35…1275 Hz (Parameter x 5)

The **Tele-Alignment** of these values **will not allow** to an exit that **is not the first of each expansion module**.

DITHER:

Only available for outputs with current regulation (A2ICAN) and if "*PWM FREQ. = 0 (5000 Hz)*".

- Dither frequency range: 33...255 Hz
- Dither Amplitude range: 0...50%
- The **Tele-Alignment** of these values **will not allow** to an exit that **is not the first of each expansion module**.

RESET OUTPUT:

Allows the user to restore the data of the analogue output selected with the default values from IKUSI in EEPROM (only one exit).

TROUBLE SHOOTING

ERROR TYPE	DESCRIPTION ON SCREEN	COMMENTS
ERROR 1	HARDWARE NOT DETECTED	If more than one joystick moves together
		If doesn't have associated output
		More than two associated outputs (maximum 2 associated analogue outputs per manoeuvre)
ERROR 2	HARDWARE NOT DETECTED	Expansion is not initialized (output associated absent)
	PLACE ENABLE JUMPER	Initialized expansion, Tele-Alignment jumper not connected.
ERROR 3	TOO JOYSTICK SELECTED	When moving the analogue paddle to adjust the outputs are selected more than one axis/joystick.
	DIFFERENT JOYSTICK	If you move a different joystick than selected when start the Tele-Alignment menu.
ERROR 4	THIS ADJUST NOT POSSIBLE	If the expansions output relay only activates when exceeds Cmin.
ERROR 5	THIS ADJUST NOT POSSIBLE	When the output relay is activated whenever link exist.
	PUT JOYSTICK TO NEUTRAL	If the adjustment is possible and moves any paddle.
GEN. ERROR	NO ACCESS TO MEMORY	Not access to memory to update data.
	ADJUST NOT VALID	The expansion indicates invalid values.
	QUEST./ANSW. NOT VALID	Erroneous communication between Rx and expansions.
	NO ANSWER OF EXPANS.	Erroneous communication because the expansion doesn't answer.
	ERROR	Other error.

2.2 – MENU 3.2 RESET VALUES:

Restores all outputs that support Tele-Alignment by IKUSI default values.

2.3 – MENU 3.3 FORB CAL MEN:

To disable or cancel the entry to the Tele-Alignment menu. From this moment if you want to activate again, you should be using the recorder and/or TM70Config.

IKUSI

22.- R70/XX RECEIVERS / SOFTWARE VERSION SW 3.2 COMPATIBLE

R70/XX RECEIVERS
SW 3.2 version compatible

TM70

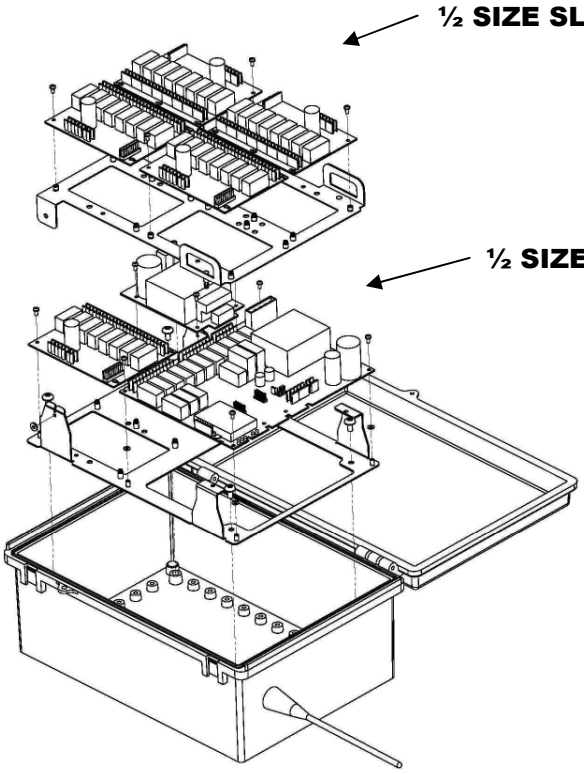
22.1 – MAIN CHARACTERISTICS

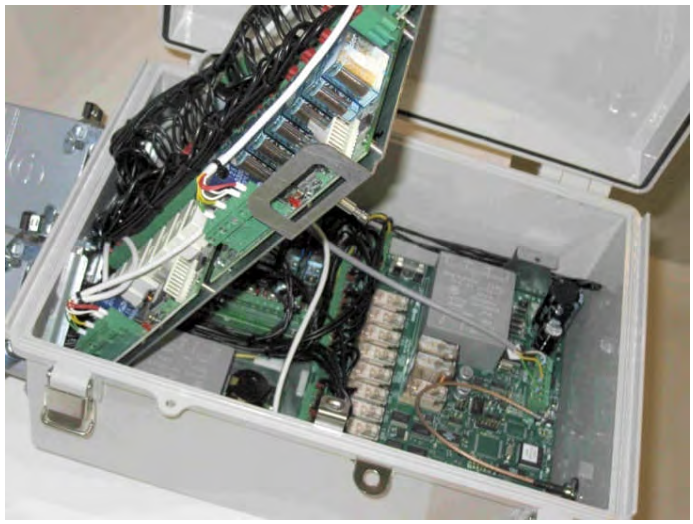
Software version 3.2:
New TM70 range software features supported:

- Up to 5 R8CAN electronic boards -> it allows to include in the same box up to 53 relays
- Up to 10 analogue outputs; maximun: 5 x A2VCAN or 5 x A2ICAN or 5 x A1P4RCAN cards or a MIX of these cards completing 10 analogue outputs
- The IN 0-4/20mA analogue current input card is supported (***when available***).
- IN4D without feedback information as a linking condition in multi-receiver systems.
- Analogue outputs with independent and progressive response. Up to 8 different and selectable progressive responses.

Hardware and mechanics compatible with software version SW 3.2:
Important Remark: ***This software versión is only compatible with LR72 E version cards or higher versions.***
The new mechanics allows to configure the R70 receiver with these 4 modular OPTIONS (maximun configurations)

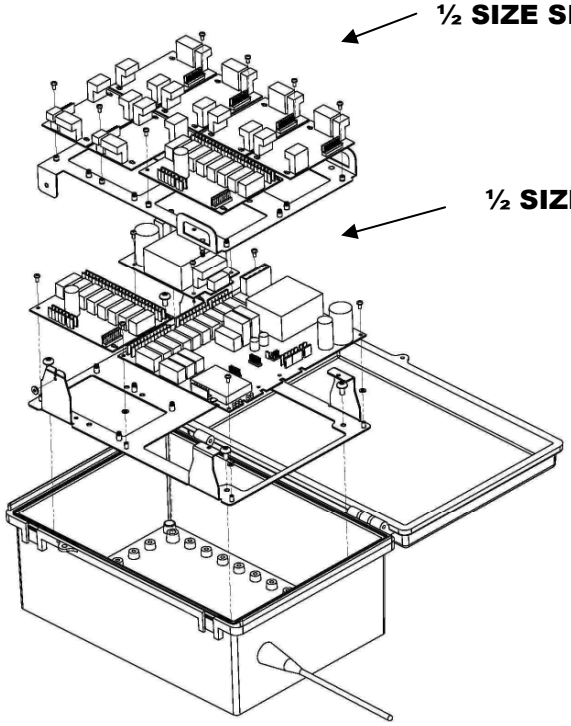
OPTION 1:



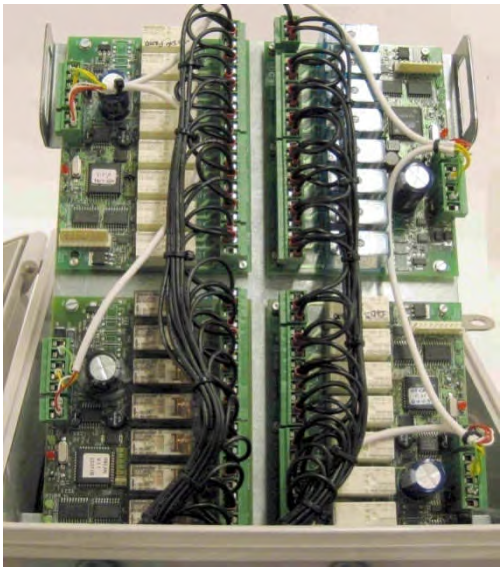


OPTION 2:

½ SIZE SLOT (x1) + ¼ SIZE SLOT (x6)

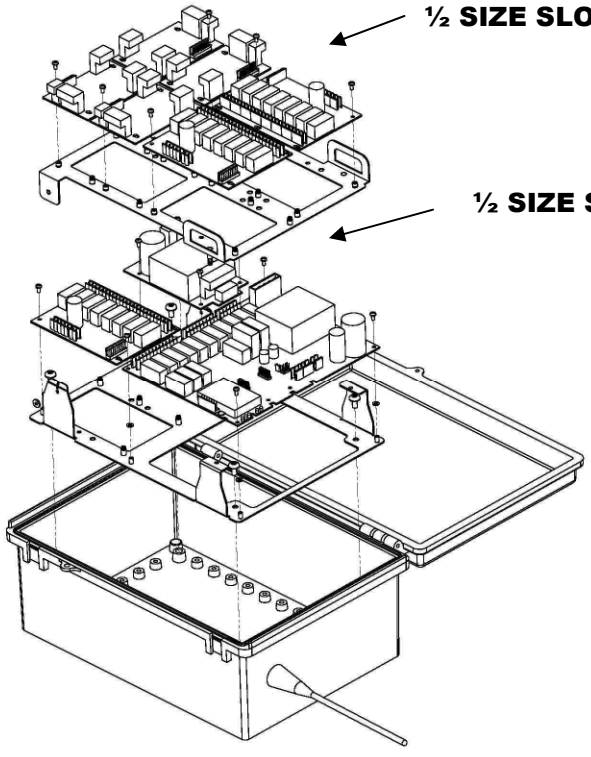


½ SIZE SLOT (x1) + P.S. (x1) + LR72 (x1)

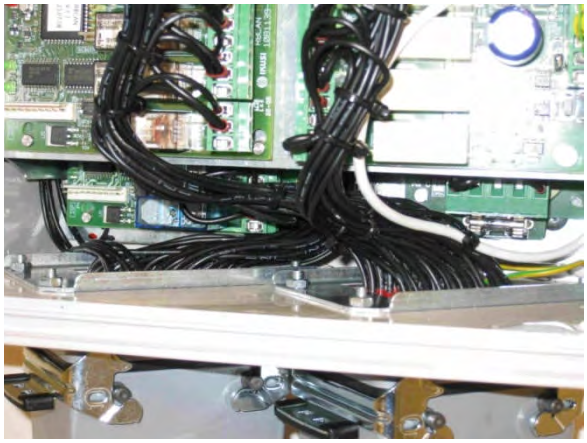


OPTION 3:

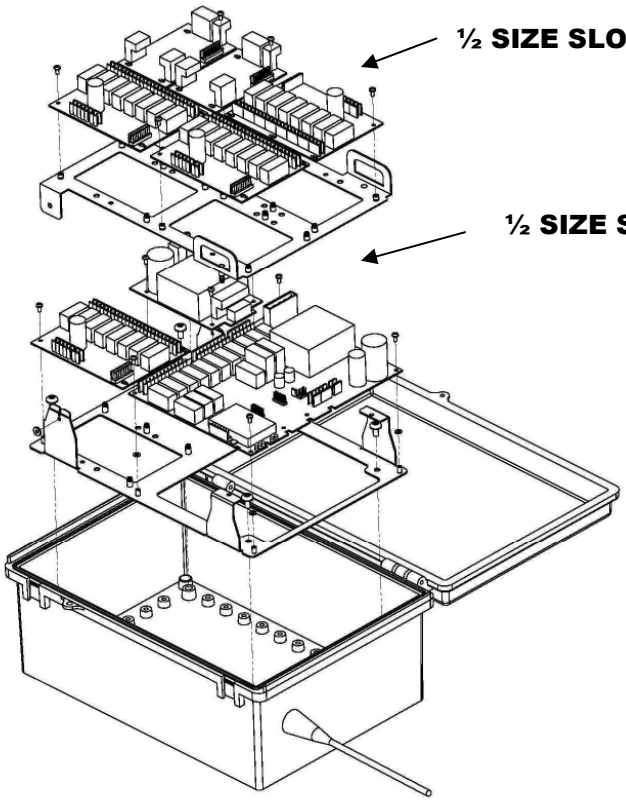
½ SIZE SLOT (x2) + ¼ SIZE SLOT (x4)



½ SIZE SLOT (x1) + P.S. (x1) + LR72 (x1)



OPTION 4:



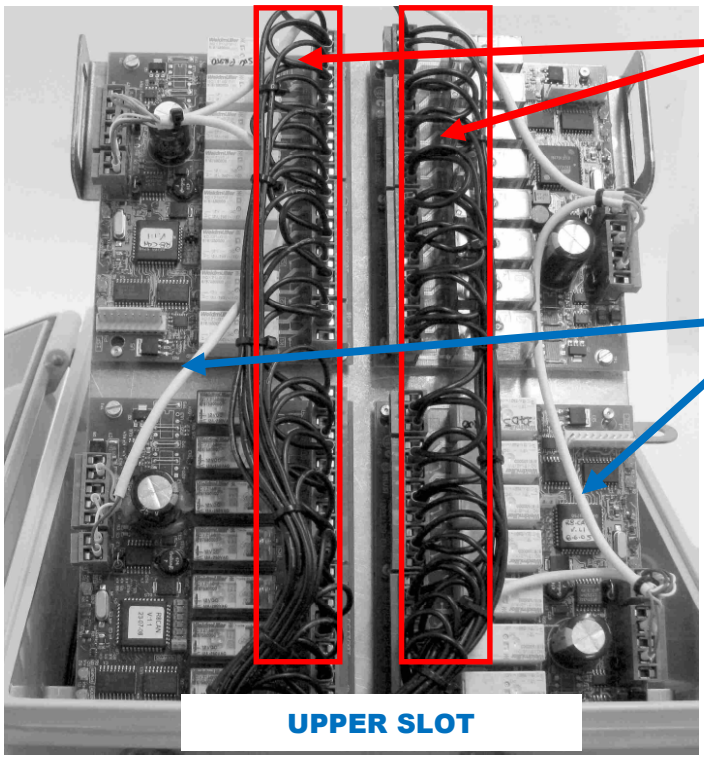
List of expansión type and slot size required:

EXPANSION TYPE ELECTRONIC CARD	*SLOT SIZE*
R8CAN	**1/2**
A1P4RCAN	**1/2**
INCAN	**½**
IN 0-10V	**Direct assembly in LR72 or INCAN cards**
IN 0-450P	**Direct assembly in LR72 or INCAN cards**
IN-4D	**Direct assembly in LR72 or INCAN cards**
A2ICAN	**¼**
A2VCAN	**¼**

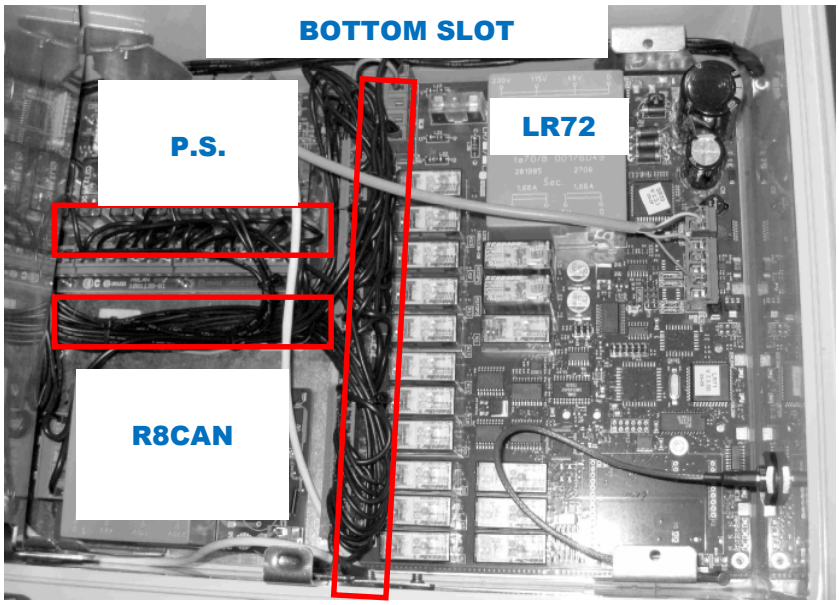
Electrical and mechanical characteristics:

R70/XX	Specifications
Available frequencies (ISM bands)	915MHz 870MHz/433MHz 419MHz
AC current power supply range	48V/115/230v AC 50/60Hz (+15% / -20% Vin)
DC current power supply range	8-32v DC
Ingress protection	IP65 / NEMA-4
Antenna	External (standard)
Working frequency channel selection	Fix or automatic (listen before talking EEPROM)
Weight	Maximum = 7 Kg (53 relays)
Dimensions	Length = 350 mm / Wide = 250 mm / Heigth = 150mm
EEPROM	Internal and extractable (EP70)
Signaling	MultiLED: internal LEDs
Connections	External input/output terminal plugs for using with cable glands and base panel connectors
Maximun current over resistive load	6ª
Operating temperature	-20ºC / +70ºC (-4ºF / 158ºF)
Storage temperature	-25ºC / +75ºC (-13ºF / 167ºF)
Storage temperature –long periods-	-25ºC / +55ºC (-13ºF / 131ºF)
Maximun comsumption	40 VA

22.2 – REMARKS FOR THE INTERNAL WIRINGS



- **The POWER cables MUST be wired and guided by the center of the slot.**
- **The rest of the CAN bus wirings can be placed without any restriction**



IKUSI

23.- i-KONTROL CONSOLE BOX

i-KONTROL CONSOLE BOX

TM70

23.1- FUNCTIONAL CHARACTERISTICS

i-KONTROL / console box transmitters for hoisting machinery applications, mobile applications with On/Off and/or proportional control

Main characteristics:

Available bands: 433/870/915/419/865/918MHz
NiMH rechargeable batteries
Fast (< 2 hours) and intelligent CB70 battery charger
New LE70IK emitter logic board
Fully compatible with TM70 remote control range products
Main mechanisms:
- Two axes multi step or stepless MO70 joysticks compatible / Single axis resistive analogue manipulator / Two axis resistive analogue manipulator

Auxiliary mechanisms:
- 1-0-1 position selector switches with maintained position or forced return to 0 position
- 0-1 position selector switches with maintained position or forced return to 0 position
- 6, 16 and 24 positions binary and rotary switches
- Potentiometers

Easy and fast working frequency channel change by software and/or automatic working channel selection
CAN bus physical layer compatible receiver with CANopen communication protocol; other available communication protocols, IQAN, SAE J1939, Profibus DP and RS-232 / RS-485 (optional)
TFT colour display option for feedback information. Warning and alarm signals management with feedback option, using the graphic display and/or the bicoloured leds. Feedback of digital and/or analogue signals to the machine/user's interface.
LA70 range limiter (optional). Specified working area limit range under defined working conditions.

NOTA IMPORTANTE:
Systems with wired cable connection option available, it is highly recommended to disconnect and to remove this cable of the system if the system is not working with this option or it is not necessary.

i

1-> LA70 Range limiter (optional)
2-> TFT colour display (optional)
3-> Signalling LED
4-> Two axes (step or stepless) joysticks / One or two axis analogue resistive manipulators
5-> Auxiliary functions
6-> STOP push button
7-> EP70 external and removable EEPROM
8-> Rechargeable battery
9-> Cable connection option

23.2 – TECHNICAL SPECIFICATIONS

TRANSMITTER TECHNICAL SPECIFICATIONS	
IP / NEMA ingress protection	IP65 / NEMA4
Type of display	TFT colour
EEPROM	External and extractable EP70 / Fast maintenance
Emitter logic	LE70IK (new emitter logic)
Anti-condensation system	Goretex blade or similar
Material	Polyamide (high impact resistance)
Cable connection	M12 connector
Battery life	16 h (50% duty cycle)
Confort belt anchorages	Belt hooks or integrated
Operating temperatura range	-20ºC +70ºC
Maximum number of joysticks Maximum number of one axis electrical paddles Maximum number of two axis electrical paddles Maximum number of auxiliary sided pushbuttons	2 (MO70) 6 (MA70) 3 (EUCHNER) 6 (3+3)
Weight (battery included)	1780g

RECEIVER TECHNICAL SPECIFICATIONS	
Type of receiver	R70/XX
Power supply (AC) / LR70 (AC)	48,115,230 Vac ± 10%; 50/60Hz
Power supply (DC) / LR70 (DC)	12 o 24Vdc
Dimensions	285x200x110 mm
Operating temperatura range	-20ºC +70ºC
IP / NEMA ingress protection	IP65 / NEMA-4
Auxiliary relays	START + STOP(2) + SEGURIDAD (KSAFETY)
STOP function	Category 3 according to EN-954-1 or EN 13849 safety standards
OUTPUT relay characteristics	230 Vac / 8A ACI
STOP relay characteristics	230 Vac / 6A ACI

BATTERY CHARGER TECHNICAL SPECIFICATIONS	
Power supply (AC)	115, 230 Vac ± 10%; 50/60Hz (depending on the model)
Power supply (DC)	10,5 – 35 Vdc
Charging mode	Fast (< 2 hours) and intelligent (charging mode adapted to battery model)

BATTERY TECHNICAL SPECIFICATIONS	
Model	BT20K
Type	NiMH
Capacity	2000 mAh, 4,8 V
Charging temperature range	0 a 40ºC

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