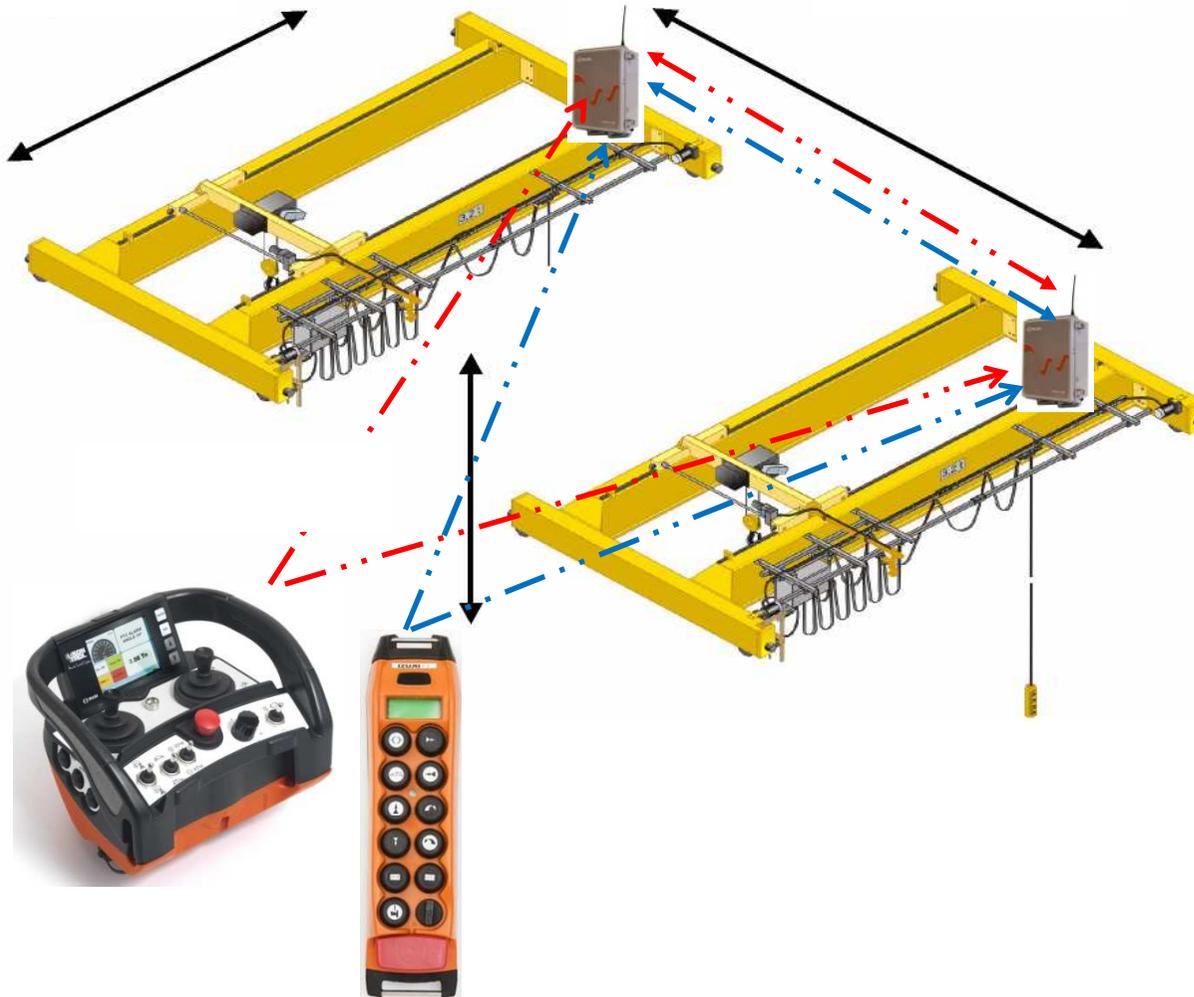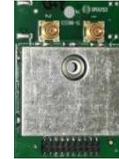# TWIN SYNCHRO / TANDEM SW 5.1.0

TWIN SYNCHRO Functionality for TANDEM SYTEMS
01/01/2014

TR800CE RADIO OPERATING MODE IN "FULL DUPLEX"

"FULL DUPLEX":
-Two transceivers working in two different ISM bands simultanously
-Txs use a transceiver to communicate with the Rxs and the Rxs use the second transceiver to cummunicate and to exchange information between them.
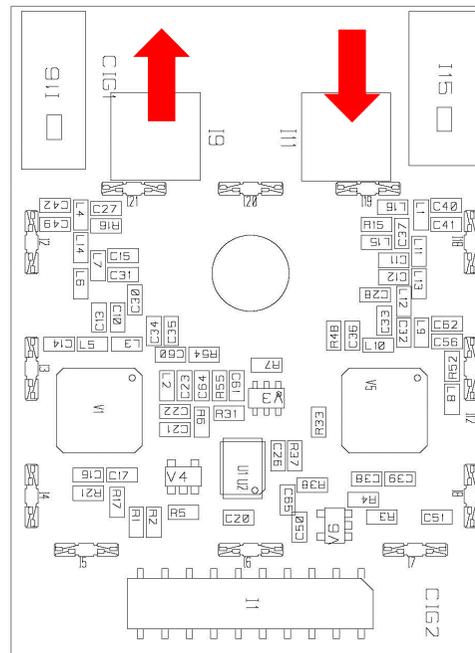
VHF (ISM BANDS):
418MHz China
433MHz CE & ROW
456MHz USA

UHF (ISM BANDS):
870MHz CE
915MHz (FCC) USA & CANADA
918MHz Australia
865MHz India

Tx1
VHF

Tx2
UHF

SYNCHRONIZATION BETWEEN RECEIVERS
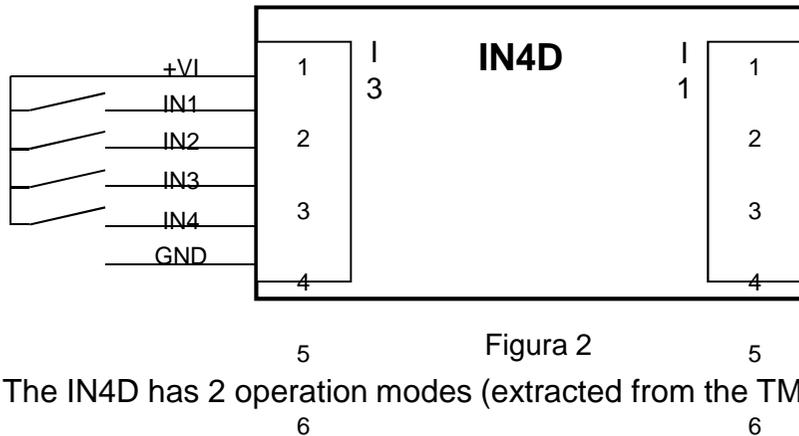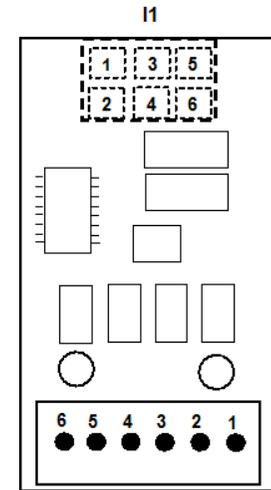
DIGITAL INPUTS ("IN4D" CARD")

Figura 2

IN4D CARD:
- Up to 4 opto-coupled digital inputs
Logic level "0" entry level between 0 & 4vDC
Logic level "1" entry level between 8 & 28vDC

Figura 4

The IN4D has 2 operation modes (extracted from the TM70 User's Manual):

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 4. 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.
+ Vi is not used/need/connected anymore -> so the inputs does not have any internal voltage. These signals come for external devices like limit switches.-> normally "0" level when active and "1" level when rest position

See I3 connector: 1 to 6 pins.
Very important remark: 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.
+ Vi in this case is used/needed, because of the lack of external voltage inputs,

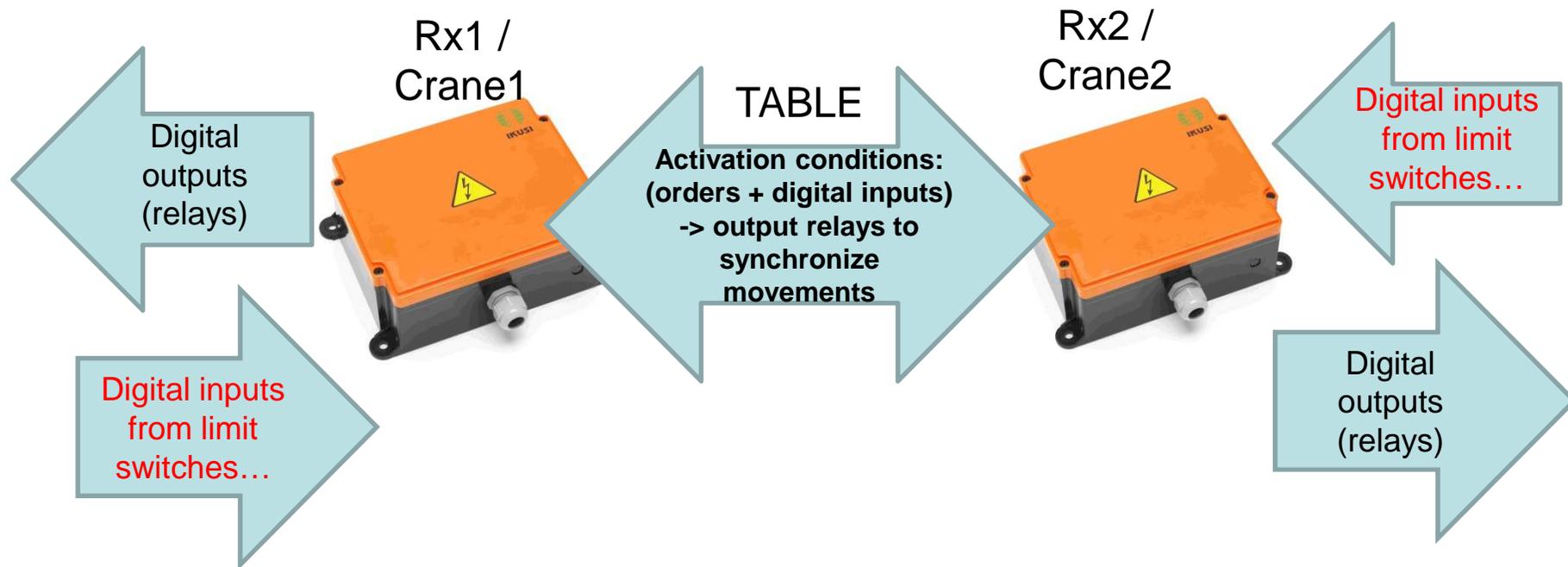# SYNCHRONIZATION BETWEEN RECEIVERS

DIGITAL INPUTS ("IN4D" CARD")
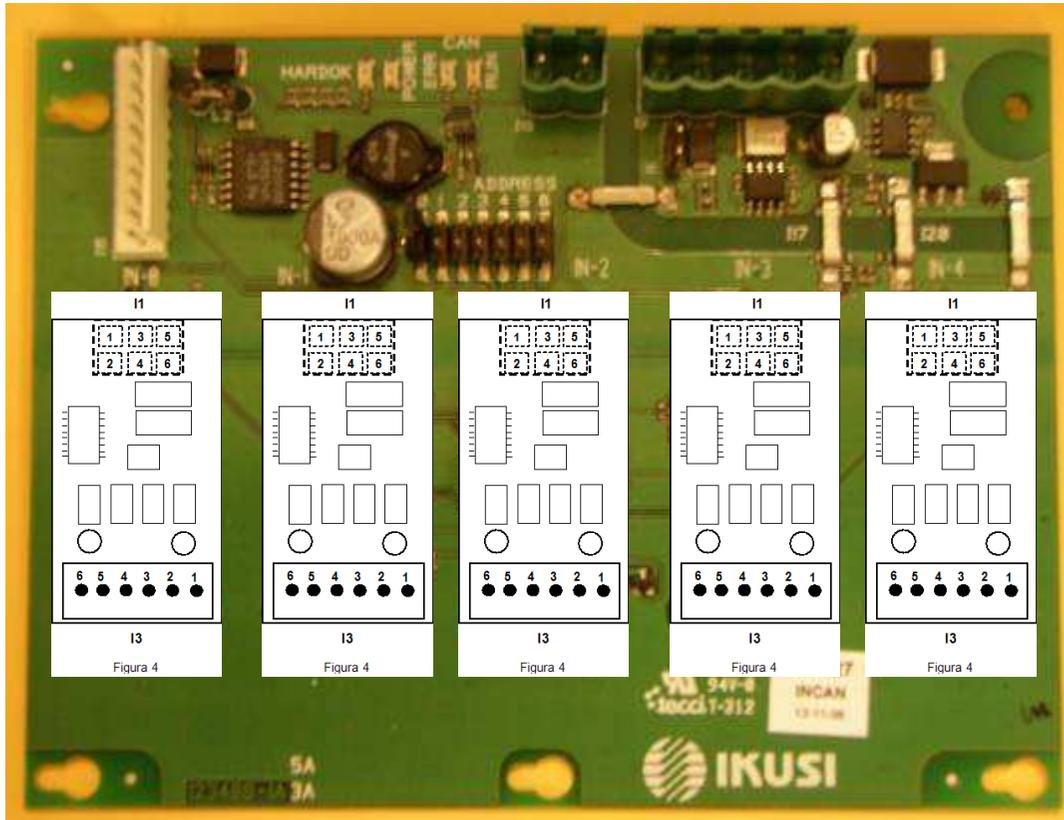
INCAN BOARD:
- Up to 5 IN4D cards -> up to 20 digital inputs

RECEIVERS SYNCHRONIZATION(1)

R70 RECEIVER(1)

Rx1 / Crane1

Digital outputs (relays)

Digital inputs from limit switches…

TABLE

Activation conditions: (orders + digital inputs) -> output relays to synchronize movements

Rx2 / Crane2

Digital inputs from limit switches…

Digital outputs (relays)

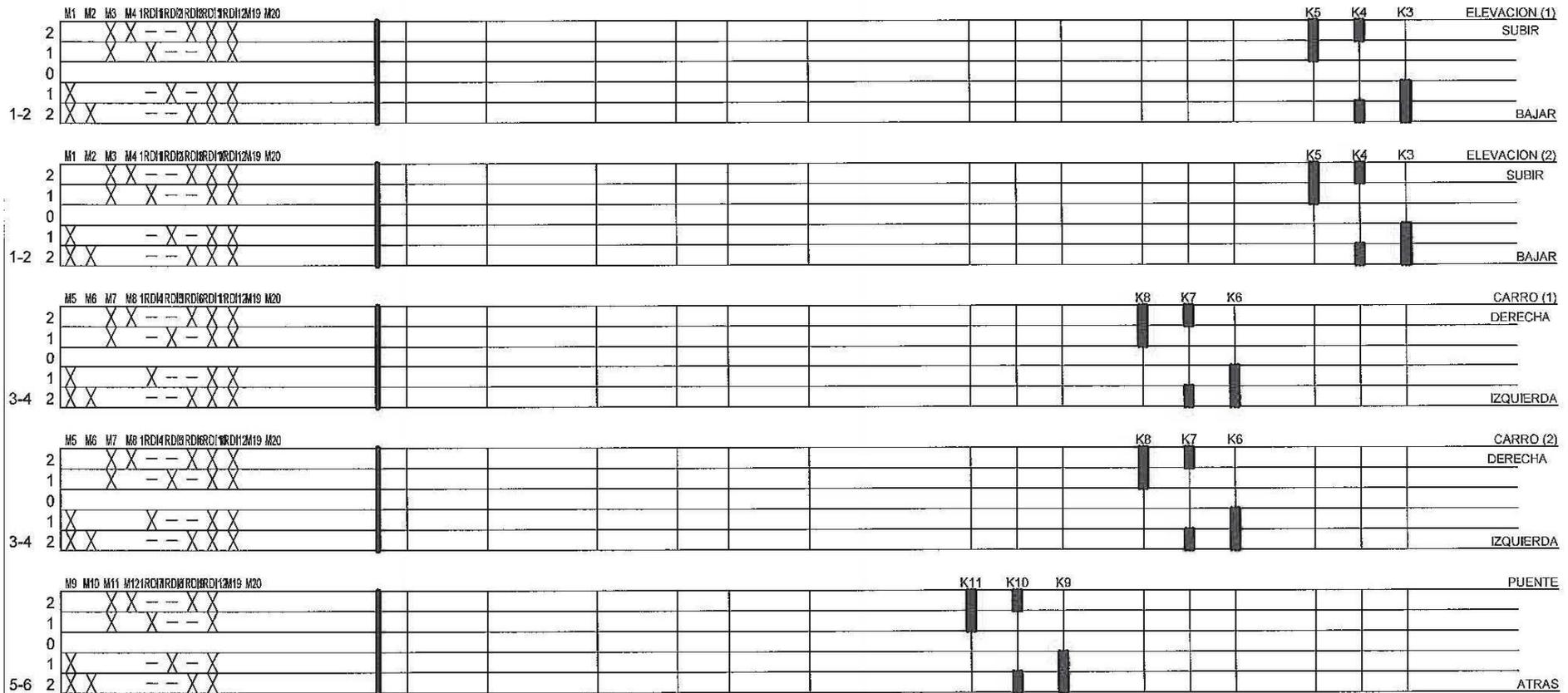**"MIX" OF POSSIBLE CONFIGURATIONS:**
"MIX" DE POSIBLES CONFIGURACIONES:
- Up to 20 opto-coupled digital inputs + 21 digitale outputs (relays)
- Hasta 20 entradas digitales optoacopladas + 21 salidas digitales (relés)

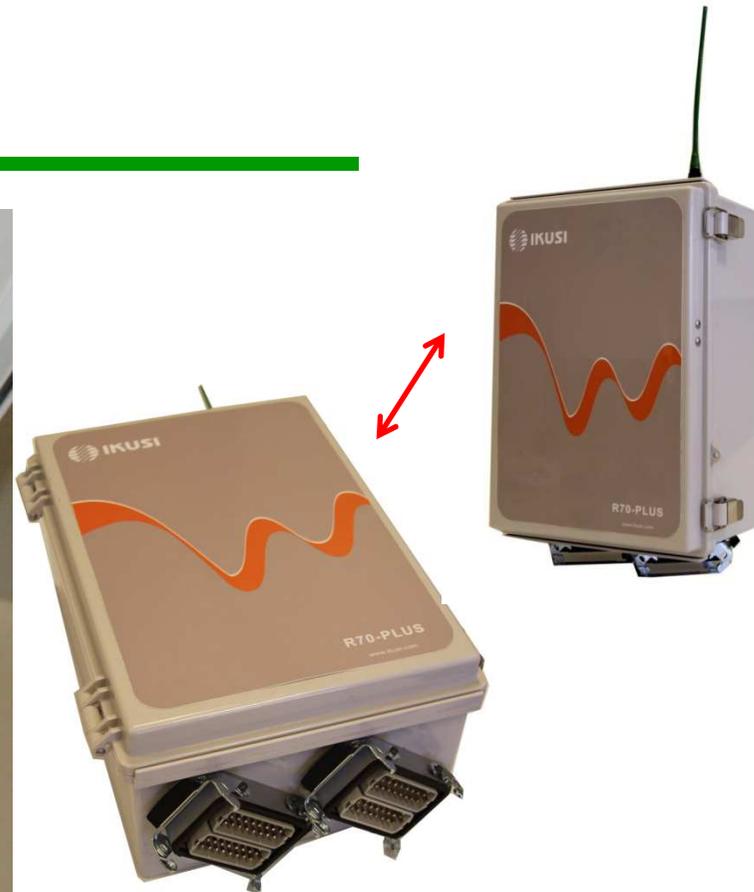**IKUSI**
www.ikusi.com

Example: Table/Activation Conditions using "Orders" and "Digital Inputs"

RECEIVERS SYNCHRONIZATION

R70 PLUS RECEIVER

"MIX" OF POSSIBLE CONFIGURATIONS:
- Up to 44 opto-coupled digital inputs + 37 digital outputs (relays)
- Up to 24 opto-coupled digital inputs + 45 digital outputs (relays)

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SYNCHRONIZATION BETWEEN RECEIVERS

TANDEM APPLICATION / NEW STANDARD EN15011:2011

KEY CONCLUSIONS:

5.3.5.3 Emergency stop devices:

When the wireless control station is the single control station of a bridge crane, an additional emergency stop pushbutton is not required in addition to the EMS puhbutton of the radio remote control device, when the following conditions are given:

✓ a missing radio remote control device is not able to send any start command;
✓ the crane operator cannot access to the crane;
✓ the crane path tread has no acces point from the floor;

5.4.8.5 Several cranes/hoists working under a single control station.

When two or more cranes/hoists are used to manipulate a single load from a single control system or control station, the control systems of the cranes must be interconnected to asure that in the general working conditions:

✓ **hoisting speeds are the same under the tolerances applied to the particular application;**
✓ **traslation speeds are the same under the tolerances applied to the particular application;**
✓ **a single interruption on the working conditions due to a movement limiter or an overload limit switch of a crane/hoist must have the corresponding effect in the other one.**

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SYNCHRONIZATION BETWEEN RECEIVERS (1)

TANDEM SYSTEMS APPLICATION (1)

MASTER TRANSMITTER   SLAVE TRANSMITTER
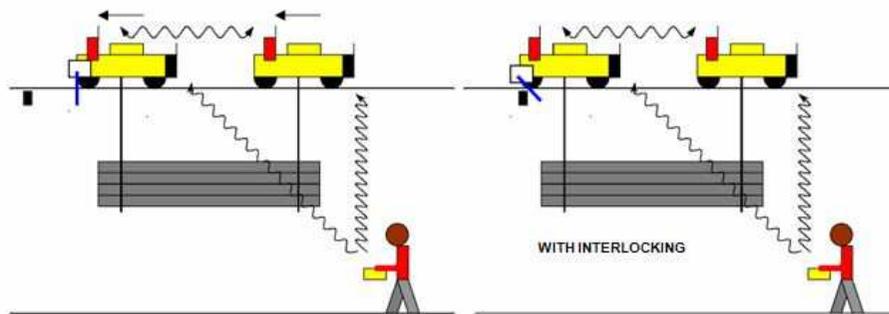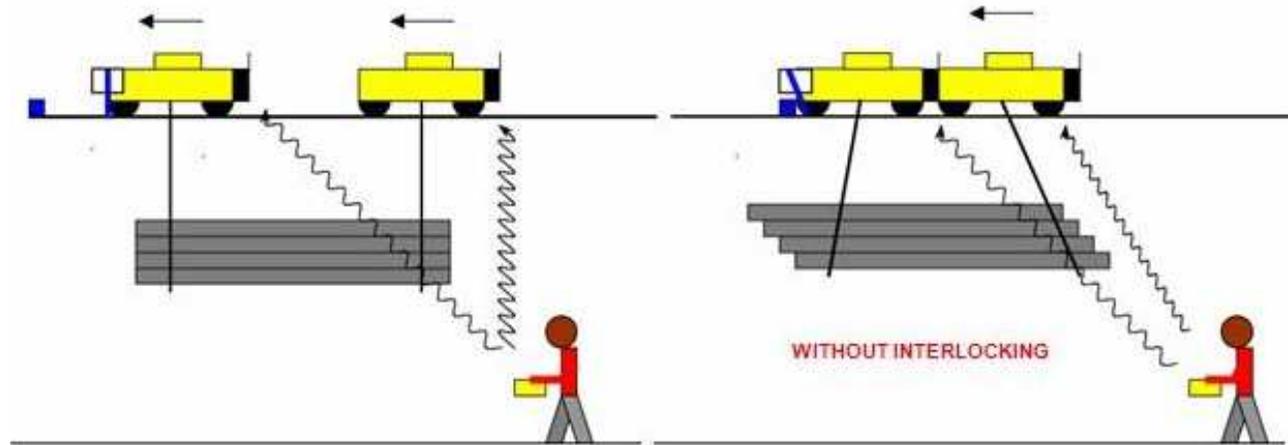
SYNCHRONIZATION BETWWEN RECEIVERS (2)
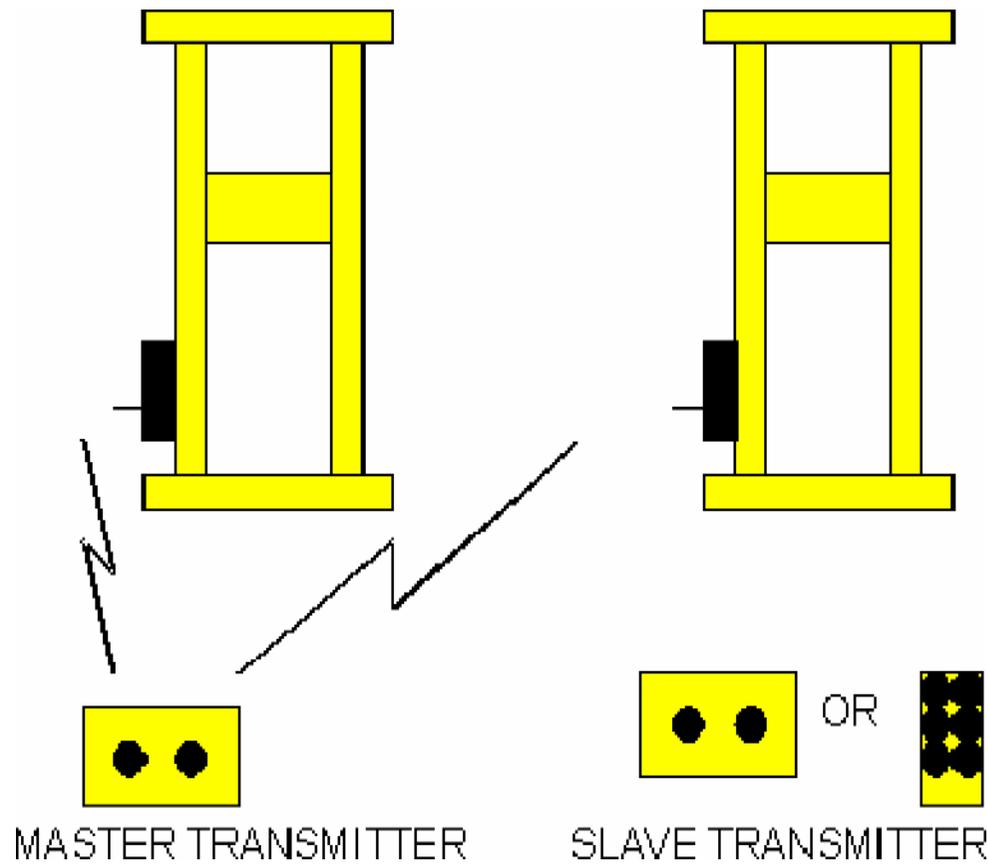
TANDEM SYSTEMS APPLICATION (2)

TANDEM systems with NO sinchronized movements can origine a hazardous situations, when the movement of a crane stops due to a failure or due to the activation of a limit switch.
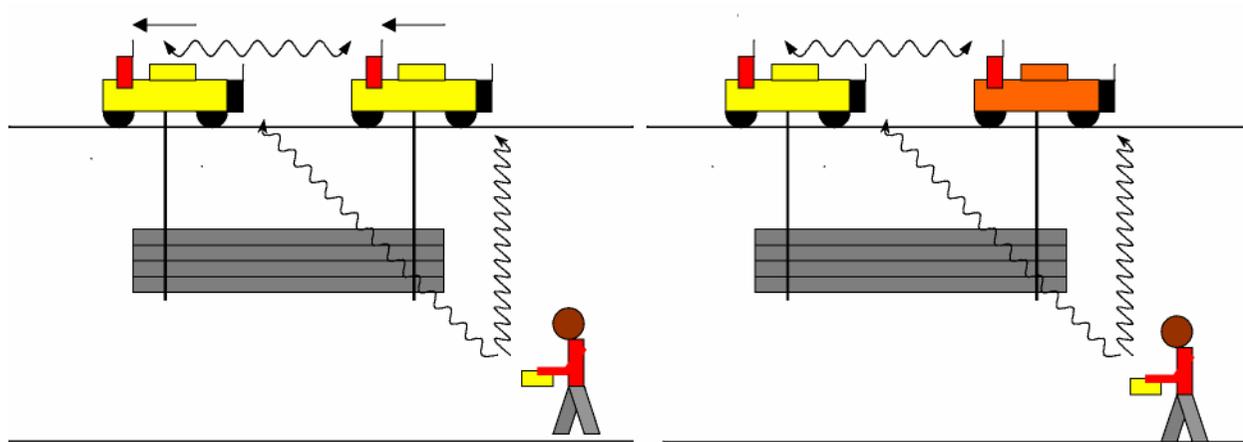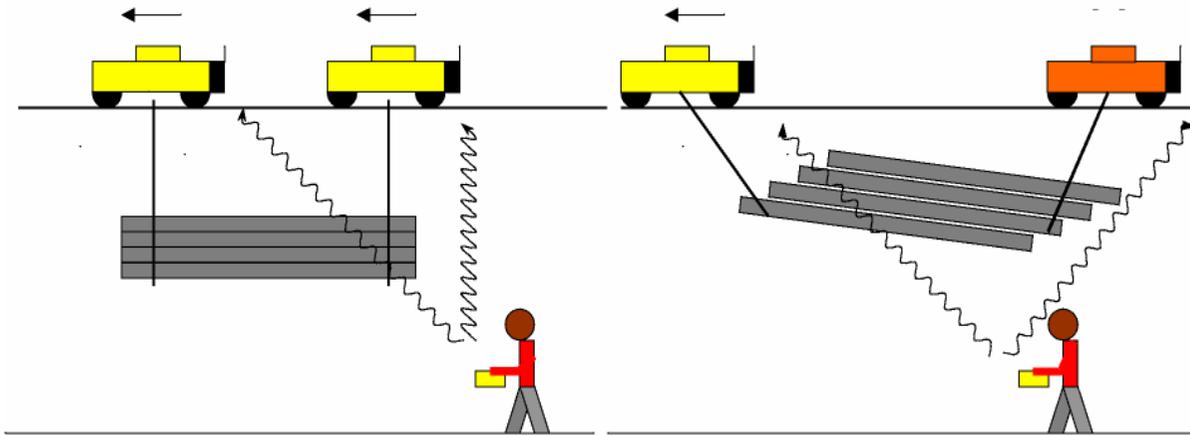
SYNCHRONIZATION BETWEEN RECEIVERS (3)

TANDEM SYSTEMS APPLICATION (3)

WITHOUT INTERLOCKING

WITH INTERLOCKING

SYNCHRONIZATION BETWEEN RECEIVERS (4)

TANDEM SYSTEMS APPLICATION (4)
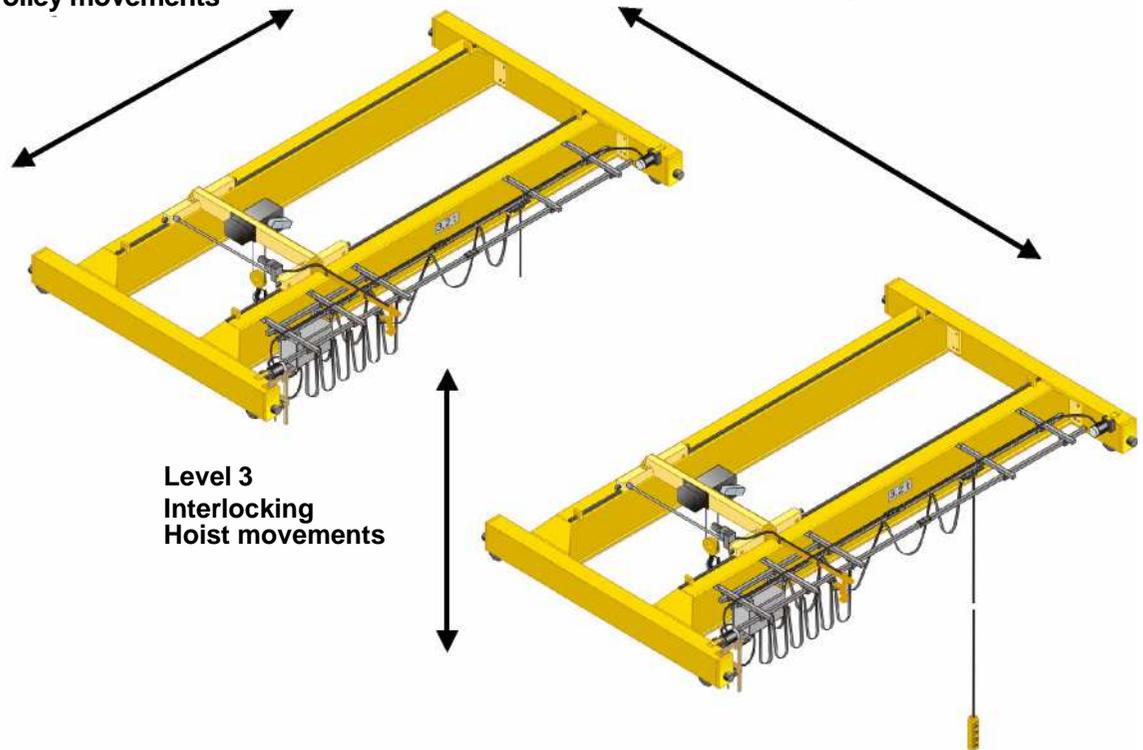
SYNCHRONIZATION BETWWEN RECEIVERS (5)

TANDEM SYSTEMS APPLICATION (5)

- **Level 0**
  Anticollision bypass
  (Tandem output)

**Level 2
Interlocki ng
Trolley movements**
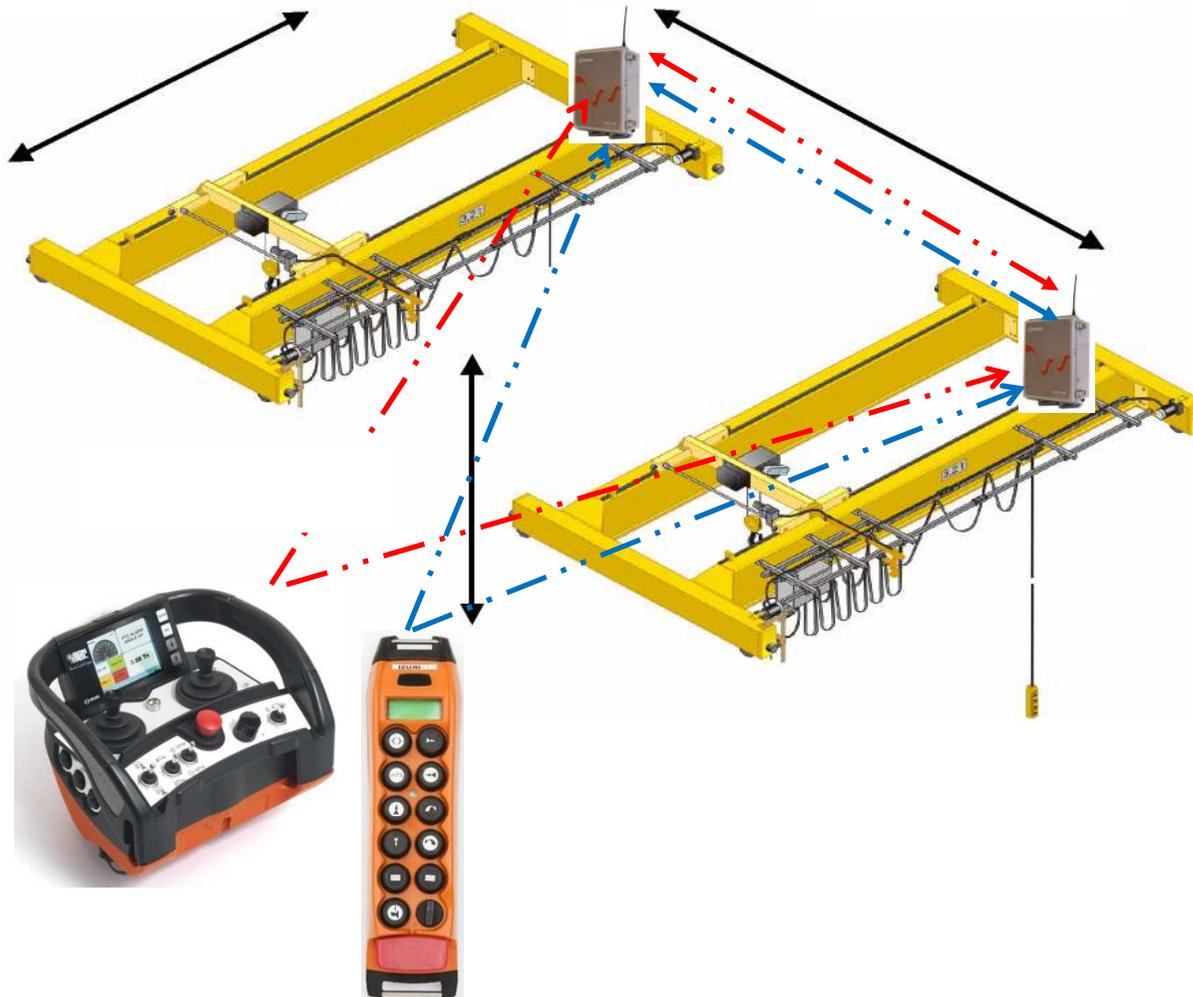
**Level 1 Interlocking
Bridge movements**

**Level 3
Interlocking
Hoist movements**

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SYNCHRONIZATION BETWEEN CRANES(6)

TANDEM SYSTEMS APPLICATION(6)

SYNCHRONIZATION BETWEEN CRANES(7)

TANDEM SYSTEMS APPLICATION(7)

RESTRICTIONS /FUNCTIONALITIES NOT SUPPORTED in this 5.1.0 SW version

- To perform comunication between receivers at least one Tx must be linked.
- In case of radiolink lost, there is no authomatic start up of the comunication between receivers
- It is not available the possibility to have an authomatic either manual or authomatic START functionality between the receivers (like current TM70 Fixed-Fixed system) when switch on operation of the Tx.
- It is no possible to include the STOP order in the activation of the conditions (table). Only from the Tx EMS STOP.
- The HW limitations are the same as the current ones concerning the R70 model receivers
- It is not possible to use the same ISM band for radio "full duplex" functionality (e.g. T1=433 + T2=433)

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