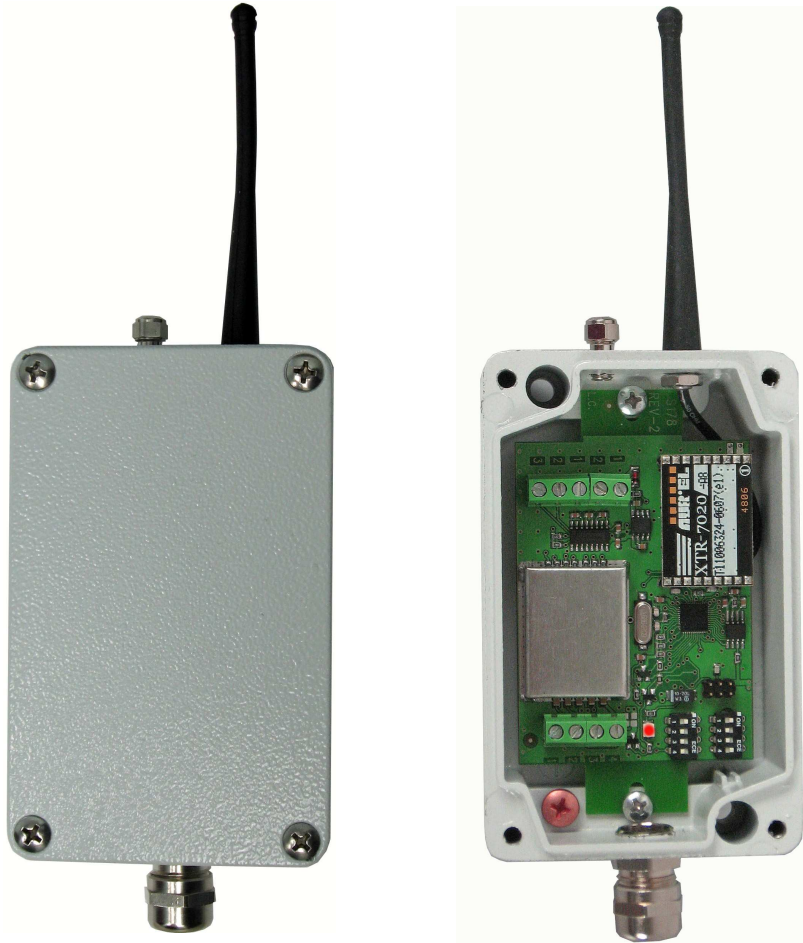


WEIGHT RADIO TRANSMITTER TRF



INSTALLATION AND OPERATING MANUAL

SOFTWARE CODE: PTRF01

VERSION: Rev.1.0 (HW S178R2)

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PRODUCT DESCRIPTION

TRF is a digital wireless weight transmitter for load cells, it is able to transmit via radio the measured weight value using the specified protocol.

TRF can operate in continuous transmission mode of the data (like a weight indicator), with a settable transmission frequency from 1 Hz to 5 Hz, like illustrated in Fig. A.

Otherwise the TRF can operate in slave mode, in this case it is possible to set a wireless network up to 15 TRF by setting the communication address in each TRF, like illustrated in Fig. B.

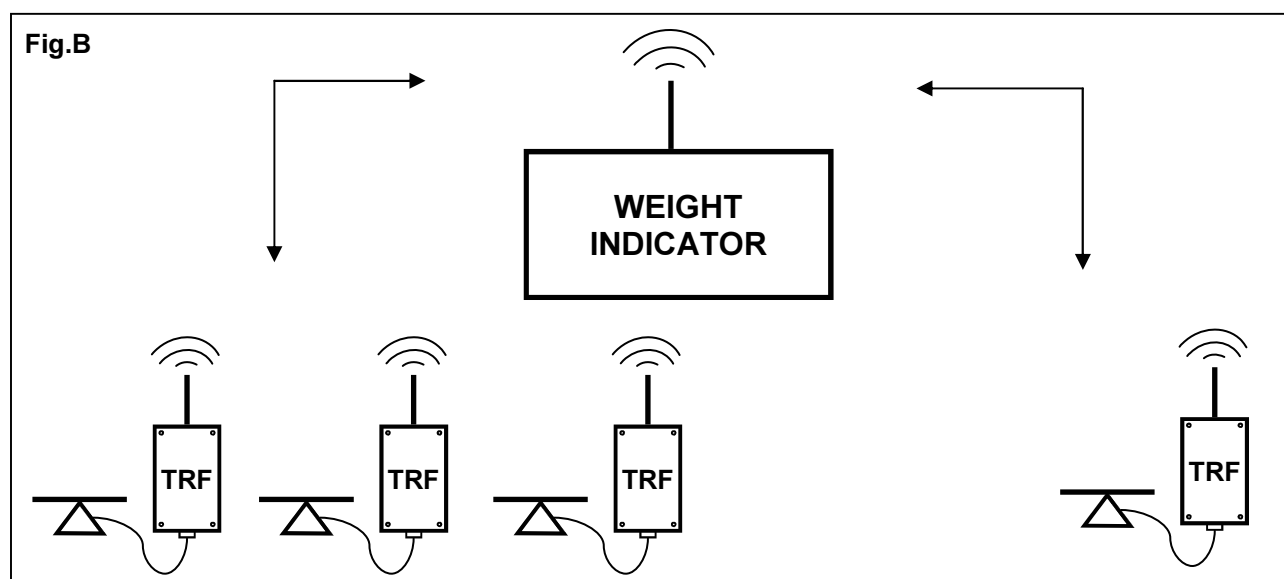
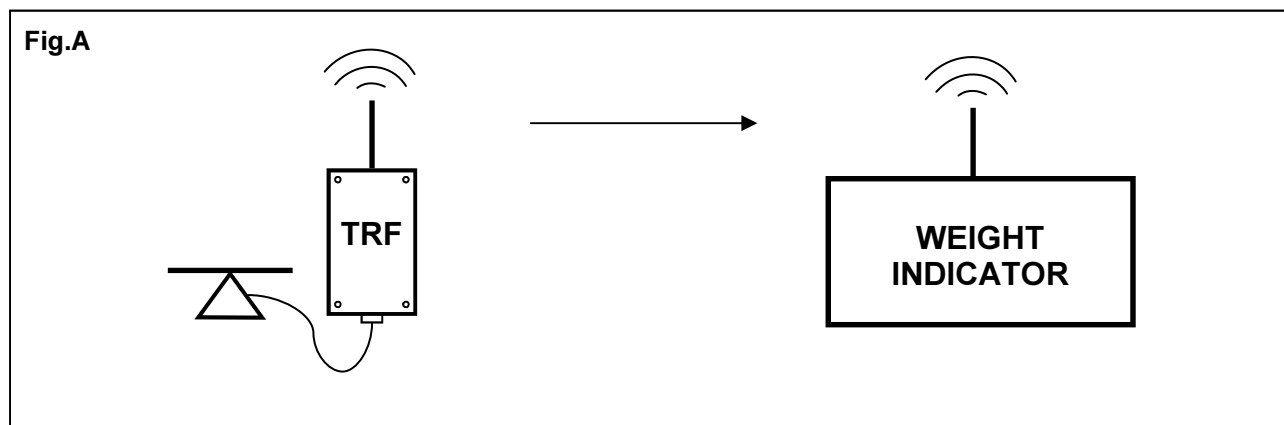
It is also available a transceiver RF to be associated to the TRF, with USB/Rs232/Rs422 interface.

The RF communication frequency is 868Mhz, with power up to 10mW and 7 working channels selectable from dip-switch if there are several RF devices.

Power is supplied with 4 rechargeable batteries NI-MH 1,2V 2500mA, supplied with its charger. Otherwise it is possible to power the instrument with 5-15 Vdc stabilized.

It is possible to set the parameter "Power Mode", which allows to set 3 different working mode: configuration with low energy consumption (SAVE, the RF and weight acquisition functions are intermittently active); configuration for maximum performance (FULL, increase in consumption); intermediate configuration (MEDIUM, the RF functions are intermittently active).

The TRF also has a weight calibration procedure, with setting of the parameter "digital filter". The setting of the operation parameters and the calibration are executed using the application for PC provided with the TRF. It's also possible receive data through a RS232 connection.



MAIN TECHNICAL FEATURES OF THE INSTRUMENT

POWER REQUIREMENTS	
Power supply	4 rechargeable batteries AA 1.2V Ni-Mh, otherwise 4.8 Vdc / 15 Vdc.
Power consumption	<p>Power Mode SAVE 7 mA with 1 load cell 350 Ω, continuous transmission 2 Hz 10 mA with 4 load cells 350 Ω, continuous transmission 2 Hz 15 mA with 1 load cell 350 Ω, slave mode (multi) a 4 Hz</p> <p>Power Mode MEDIUM 16 mA with 1 load cell 350 Ω, continuous transmission 2 Hz 44 mA with 4 load cells Ω, continuous transmission 2 Hz 22 mA with 1 load cell 350 Ω, slave mode (multi) a 4 Hz</p> <p>Power Mode FULL 43 mA with 1 load cell 350 Ω, continuous transmission 2 Hz 70 mA with 4 load cells 350 Ω, continuous transmission 2 Hz 50 mA with 1 load cell 350 Ω, slave mode (multi) a 4 Hz</p>
Battery life (2500 mAh)	<p>Power Mode SAVE ~350 h with 1 load cell 350 Ω, continuous transmission 2 Hz ~250 h with 4 load cells 350 Ω, continuous transmission 2 Hz ~150 h with 1 load cell 350 Ω, slave mode 4 Hz</p> <p>Power Mode MEDIUM ~150 h with 1 load cell 350 Ω, continuous transmission 2 Hz ~50 h with 4 load cells 350 Ω, continuous transmission 2 Hz ~100 h with 1 load cell 350 Ω, slave mode 4 Hz</p> <p>Power Mode FULL ~50 h with 1 load cell 350 Ω, continuous transmission 2 Hz ~30 h with 4 load cells 350 Ω, continuous transmission 2 Hz ~40 h with 1 load cell 350 Ω, slave mode 4 Hz</p>
ENVIRONMENTAL	
Operating temperature	-10°C , +50°C (max humidity 85% non condensing)
Storage temperature	-20°C , +60°C
PHYSICAL CHARACTERISTICS	
Overall dimensions	126 mm x 79 mm x 41 mm (l x h x p) excluding antenna and connector
Enclosure	Cast aluminium
Protection degree	IP65
Connection	Terminal blocks pitch 5,08 mm cable gland / 5 pin connector
LOAD CELL	
Maximum number of load cells	Max 4 load cells 350 Ω
Input sensitivity	0.02 μ V min.
Linearity	< 0.01% of full scale
Temperature drift	< 0.001% of full scale / C°
A/D converter resolution	24 bit
Input signal range	From -3.9 mV/V to +3.9 mV/V
Load cells power supply	3.3 Vcc
RF	
Frequency	866-868 MHz
RF channels	7 selectable via DIP SWITCH
Network addresses	15 selectable via DIP SWITCH
Signal coverage	50 mt.
CE	
Conformity to standards	EN 300 220 - EN 301 489 - EN60950 EN61000-6-2, EN61000-6-3, EN61010-1

MAIN TECHNICAL FEATURES OF THE BATTERY CHARGER

Input	230 Vca 50Hz
Rechargeable cell	2 or 4 cells AA NI-MH 1,2 V 2500 mAh
Charging current	250 mA
Charging time	6 h (2 batteries), 14 h (4 batteries)
Charging indicator	Red led

SYMBOLS

Here are the symbols used in the manual to draw the reader's attention:



Warning! Risk of electric shock.



Warning! This must be done by qualified personnel.



Pay particular attention to the following information.

WARNINGS

The purpose of this guide is to inform the operator with text and illustrations of the installation methods and of the correct use of the instrument.

- The equipment must be installed only by qualified personnel who must have read and understand this manual. The “qualified personnel” is the personnel selected and authorized by the responsible of the security to perform the installation.
- Power the unit with batteries whose characteristics fall within the limits specified.
- Is your responsibility to ensure that the installation complies with the provisions.
- For each anomaly contact your nearest Service Centre. Any attempt to disassemble the instrument or any modification of the instrument not expressly approved will void the warranty and will relieve the Manufacturer from all liability.

IDENTIFICATION DATA PLATE

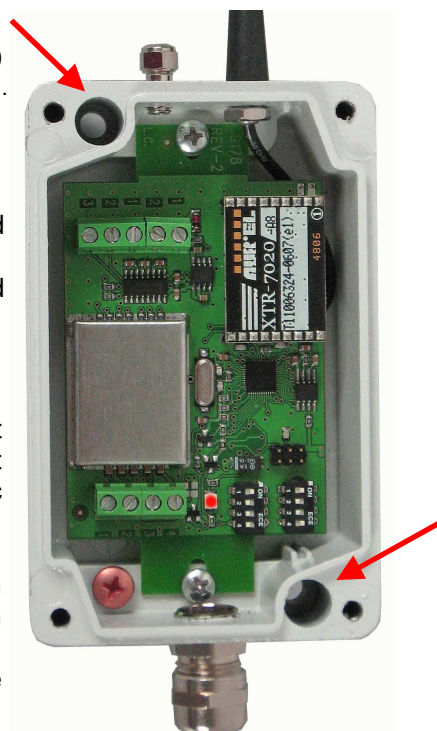


It is important to communicate these data in case of request for information or indications concerning the instrument, also communicate the program and the version number that are shown on the cover of the manual and are displayed during the start-up of the instrument.



INSTRUMENT INSTALLATION

The instrument is secured by 2 screws inserted into holes (diameter 6 mm) indicated by the arrows in the figure. Distance between holes 108 x 45 mm. The overall dimensions are (122 x 75 x 42 mm) excluding antenna and connector / cable gland.



- The following procedures must be performed by qualified personnel.
- All connection must be performed with instrument turned off.



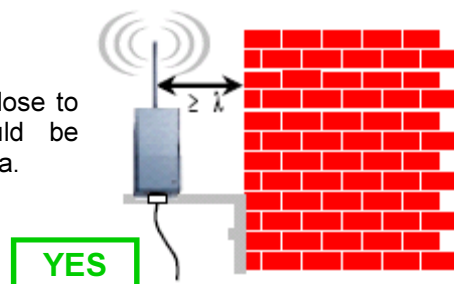
- Do not install the instrument near power equipment (motors, inverters, contactors, etc.) or near equipment that do not comply with CE standards for electromagnetic compatibility.

- **The antenna placement is crucial for maximum performance, both for the transmitter and for the receiver. Here are some things in this regard:**
 - Avoid installing the unit transmitters and receivers at a distance exceeding 50 meters.
 - If it is possible do not place the antenna in close proximity to people or things moving.

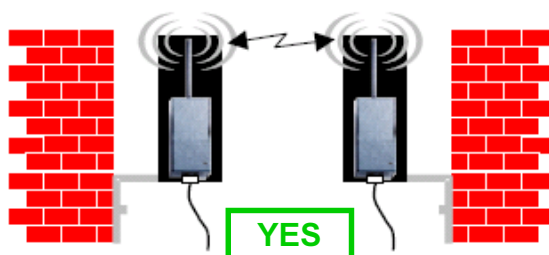
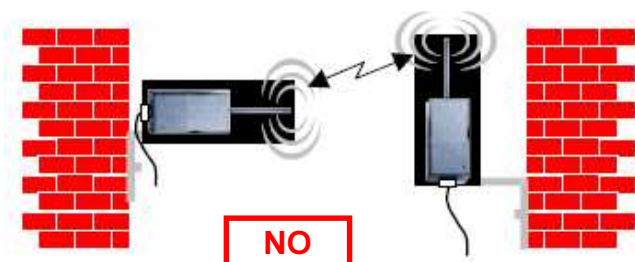
- In addition:



Do not install the instrument too close to walls. The ideal distance should be greater than 35 cm from the antenna.



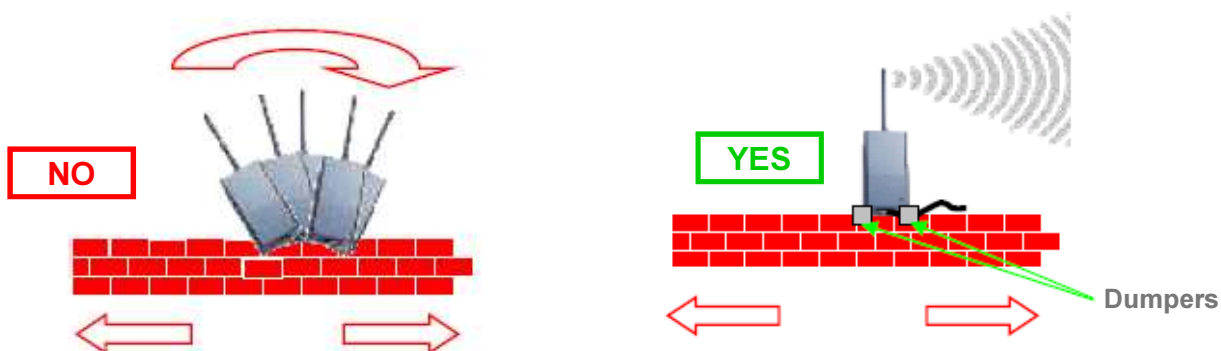
Keep as much as possible the same antenna orientation, possibly oriented in vertical.



Install the instrument away from metal parts.

INSTRUMENT INSTALLATION

The transmission efficiency is sensitive to vibration. Fasten the instrument and use the dumpers.



POWER SUPPLY

- The instrument is powered by 4 rechargeable batteries NI-MH 1.2 V / 2500mAh supplied with the instrument.
- It is possible to use other batteries with the same technical features, also with capacity different from 2500mAh. CAUTION: this feature can affect the autonomy of the power supply.
- The state of battery power is transmitted by the instrument associated with the weight value.
- The instrument can be powered with a voltage stabilized at 5 Vdc / 15 Vdc ($\pm 10\%$)

Feed supply through the hole located near the antenna. Connect the cable to the 2-pin terminal block as shown in the table below.

Pin 1	+ 5 Vdc / + 15 Vdc
Pin 2	Ground (-)



ATTENTION:

Observe battery polarity indicated on the battery.

Charge the battery with the charger, inserting them into a power outlet 230V AC 50Hz. Observe the polarity of the batteries on the body inside the charger.



Full-charge time is approximately 14 hours. Do not leave batteries on charge longer than necessary.

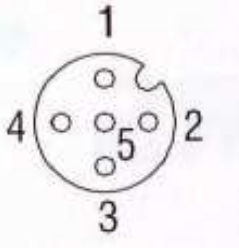


LOAD CELLS WIRING




- The load cell cable should not be channelled to other cables (for examples cables connected to contactors or power cables) but must follow its own path.
- Any extension of the cable connections must be shielded carefully, observing the color code and using the cable of the kind supplied by the manufacturer. The connections of extension must be made by welding or through terminal block or through the junction box supplied separately.
- The cable of the cell must have a number of conductors that does not exceed those used (4 or 6). In the case of 6-conductor cable (of which are used only 4 conductors, "signal" and "power") connect the wires of the reference to the wires of the power supply (attention to the polarity of the wires).

It is possible to connect up to a maximum of 4 load cells, 350 ohm in parallel. The load cell voltage is 3.3 Vdc and is protected from temporary short circuit. The measurement range of the instrument involves the use of load cells with a sensitivity of 1 mV / V to 3.9 mV / V.

CONNECTOR VERSION	Pin 1	Excitation (+)	
	Pin 2	Signal (+)	
	Pin 3	Signal (-)	
	Pin 4	Excitation (-)	
	Pin 5	Shield	

Collegare il cavo alla morsetteria all'interno dello strumento.
Collegare lo schermo nel punto indicato

CABLE GLAND VERSION	Pin 1	Excitation (-)	
	Pin 2	Excitation (+)	
	Pin 3	Signal (-)	
	Pin 4	Signal (+)	
		Shield	

INSTRUMENT POWER ON/OFF

The instrument comes into operation when it is powered, there is not a start-up procedure.



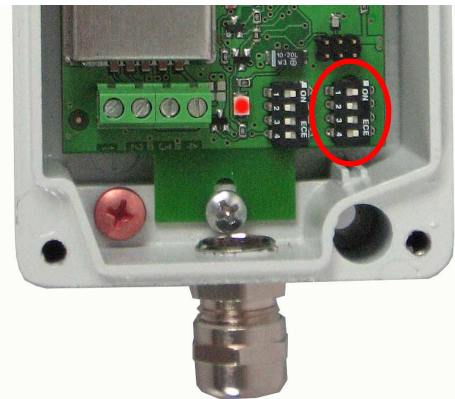
Do not leave unnecessarily turned on the instrument to prevent draining the batteries.

In case of operation with continuous transmission, the weight is transmitted from 20 seconds after start up.

RF CHANNEL SELECTION

The RF channel selection is done by dip-switch, accessed by removing the instrument cover. The dip-switch group concerned is close to the edge of the container, as shown in figure.

<i>RF channel</i>	<i>dip-switch position</i>
0 (868,19 MHz)	1=OFF, 2=OFF, 3=OFF
1 (868,34 MHz)	1=ON, 2=OFF, 3=OFF
2 (868,49 MHz)	1=OFF, 2=ON, 3=OFF
4 (868,80 MHz)	1=ON, 2=ON, 3=OFF
5 (868,95 MHz)	1=OFF, 2=OFF, 3=ON
6 (869,11 MHz)	1=ON, 2=OFF, 3=ON
11 (869,87 MHz)	1=OFF, 2=ON, 3=ON



During normal operation keep the dip-switch 4 = OFF.

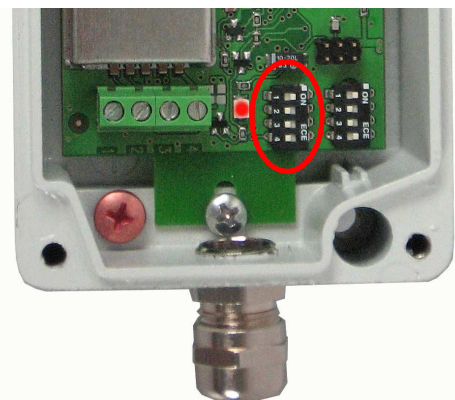
As a result of a change, power cycle the instrument to make the change effective.

COMMUNICATION ADDRESS SELECTION

In the case of slave mode with the possibility of setting up a network with more than one TRF connected to one single receiver, You must select an address for communication, different for each connected TRF. Even in other cases, the communication protocol provides for the management of a communication address of the instrument.

The selection of the address of communication takes place via the dip-switch , accessed by removing the instrument cover. The dip-switch group concerned is close to the LED , as shown in figure.

<i>Dip switch</i>	<i>Binary it</i>
1	Bit 0
2	Bit 1
3	Bit 2
4	Bit 3



Example: address 1: 1=On, 2=Off, 3=Off, 4=Off

Example: address 2: 1=Off, 2=On 3=Off, 4=Off



As a result of a change, power cycle the instrument to make the change effective.

SETTING THE PARAMETERS

The programmable parameters in the instrument are:

Communication parameters:

- Transmission frequency (da 1 a 5 Hz)
- Division frequency of continuous transmission in case of stable weight (from 1 to 4)
- RF transmission power (from 0.15mW to 10 mW)

Weight parameters:

- Weight filter
- Weight division value
- Zero calibration (theoretical or with sample weights)
- Full scale calibration (theoretical or with sample weights).

Operating mode parameters:

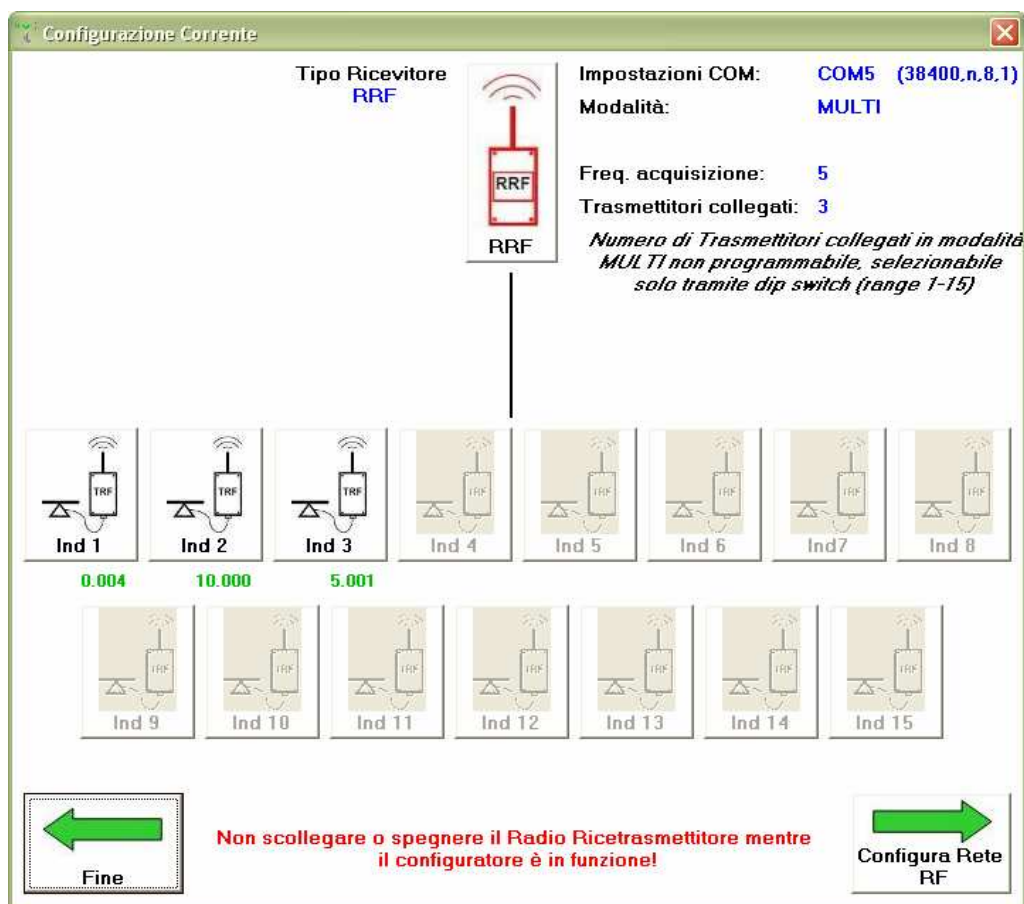
- Power Mode (0 = "FULL", 1 = "MEDIUM" e 2 = "SAVE")

The programming of these parameters is performed using the PC application "Configuratore RF" (Cod. SW PWIN38), provided with the instrument. through a RRF receiver you can configure all the TRF transmitters in the network RF. Refer to the manual relative to the PC software for programming procedures.



In case of continuous transmission selected the parameter programming is possible only if the PC application is activated within 20 seconds of the instrument start-up.

The following figure shows the basic screen of the configuration PC software.



CONSIDERATIONS ABOUT BATTERY LIFE

The programming of the communication parameters , consistent with the needs of working , can reduce the consumption of the instrument and therefore increase battery life.

Communication parameters:

- Transmission mode: continuous transmission consumes less than the on-request transmission.
- Transmission frequency: decreasing the transmission frequency decreases the consumption.
- Dividing the frequency of continuous transmission in case of stable weight decreases the consumption.
- RF transmission power: lower RF power corresponds to a lower consumption.

The operation mode of the instrument (Power Mode) will greatly affect the battery consumption.

Power Mode SAVE

In low power mode priority is given to energy saving. Devices for RF transceiver and signal acquisition of the load cells are activated for the minimum time required .

The following table shows some examples of consumption in SAVE mode.

Transmission mode	Transmission frequency	Nr. load cells (350 OHM)	Consumption (mA)
MULTI	1	1	8
MULTI	3	1	12
CONTINUOUS	2	4	10

Power Mode MEDIUM

In the intermediate operating mode signal acquisition of the load cell is always on, while the RF transceiver is activated the minimum time required; therefore the maximum selectable frequency is limited transmission (see table on next page). The following table shows some examples of consumption in operation mode MEDIUM.

Transmission mode	Transmission frequency	Nr. load cells (350 OHM)	Consumption (mA)
MULTI	1	1	18
MULTI	3	1	20
CONTINUOUS	2	4	44

Power Mode FULL

In FULL mode the circuits for signal acquisition of the load cells and the RF transceiver are always enabled, for optimum performance , but with higher consumption. The following table shows some examples of consumption in mode FULL.

Transmission mode	Transmission frequency	Nr. load cells (350 OHM)	Consumption (mA)
MULTI	1	1	44
MULTI	3	1	47
CONTINUOUS	2	4	70

CONSIDERATIONS ABOUT TRANSMISSION FREQUENCY

In case of **MULTI** configuration the maximum transmission rate depend on the number of TRF transmitters in the RF network and on the parameter **Power Mode** setting.

Power Mode **FULL**

N. of TRF	Maximum frequency
From 1 to 9	5 Hz
From 10 to 12	4 Hz
From 13 to 15	3 Hz

Power Mode **MEDIUM/SAVE**

N. of TRF	Maximum frequency
From 1 to 3	5 Hz
4	4 Hz
5	3 Hz
From 6 to 8	2 Hz
From 9 to 15	1 Hz

STATUS LED

Inside the container there is a LED indicator, which indicates the proper operation or malfunction of the instrument. The table below shows the different conditions:

N. of flashes every 5 sec.	Description
0	Instrument turned off
1	Normal operating
2	Weight out of range
3	Failure to programming RF
4	Failure to acquire weight
5	Set-up period active



Special conditions:

- LED lit: Function of the boot-loader on, waiting to receive file.
- LED blinks continuously : Function of the boot-loader in progress.

FIRMWARE BOOT-LOADER

The instrument has the boot-loader function for firmware update. Update operations can be done on instruments already installed, with an appropriate PC utility (cod. **PWIN01**) settings are **9600,N,8,1**. (The possible selection "Abilita Imp. RF" must NOT be considered)



The boot-loader function is activated at instrument power-on, by setting dip-switch 4 = ON, as shown in figure

During normal operation, keep the dip-switch 4 = OFF.



Connections

Connect Rs232 PC serial port



Pin 1	GND
Pin 2	TXD
Pin 3	RXD

SERIAL PROTOCOL

The transmission strings are as follows:

Binary Encoding:

<ADDR>	<FLAGS>	<HW>	<MW>	<LW>	<VBAT>	<CS>	EOT
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Where:

- **<ADDR>**: Communication address added to 0x80 (Example address 1, <ADDR> = 0x81)
- **<FLAGS>** : Register of flags, encoded as shown in the table below:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	Out of range	Overload	0	Stable weight	Negative sign

- **<HW>**: Most significant byte (bit 23 ... bit 16) of the weight value in 24-bit
- **<MW>**: Intermediate Byte (bit 15 ... bit 8) of the weight value in 24-bit
- **<LW>**: Least significant byte (bit 7 ... bit 0) of the weight value in 24-bit
- **<VBAT>**: Battery voltage in tenths of Volts (binary data)
- **<CS>**: Checksum calculated as the sum of the first 6 bytes in binary 2's complement (0xFF - sum)
- **EOT**: end of transmission; character of end string (ASCII value 0x04).

ASCII Encoding:

<ADDR>	<STATO>	<PESO>	<BATT>	ETX	<CHKSUM>	EOT
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Where:

- **<ADDR>**: Communication address added to 0x80 (Example address 1, <ADDR> = 0x81)
- **<STATO>** : weight status, can take the values summarized in the following table:

“S”	“M”	“E”	“O”	“Z”
Stable weight	Weight in motion	Out of range	Overweight	initial zero not performed

- **<PESO>**: ASCII string of weight expressed with 8 characters right justified, with any decimal point and minus sign.
- **<BATT>**: ASCII string of voltage battery, 2 characters expressed in tenths of Volts.
- **ETX**: end of text; text end character (ASCII value 0x03).
- **<CHKSUM>**: two-character checksum of string data. It is calculated by performing the exclusive OR (XOR) of all the characters from ADDR to ETX, ADDR and ETX excluded. The result of the XOR is decomposed into two separate characters, considering separately the upper 4 bits (first character) and the lower 4 bits (second character). The two obtained characters are then encoded ASCII. (Example: XOR = 5Dh; C C = «5D» that is 35h and 44h).
- **EOT**: end of transmission; character of end string (ASCII value 0x04).

Request string weight:

In case of transmission on request, for both encoding type, The request string is as follows:

<ADDR>	“N”	EOT
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Where:

- **<ADDR>**: Communication address added to 0x80 (Example address 1, <ADDR> = 0x81)
- **“N”**: character identifier of the request (ASCII value 0x4E).
- **EOT**: end of transmission; character of end string (ASCII value 0x04).

SERIAL PROTOCOL RS232

Request string weight:

In case of transmission on request, for both encoding type, The request string is as follows:

STX	“N”	EOT
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Where:

- **STX**: start of text, character of start string (ASCII value 0x02).
- **“N”**: character identifier of the request (ASCII value 0x4E).
- **EOT**: end of transmission; character of end string (ASCII value 0x04).

Tool answer:

STX	<STATO>	<PESO>	<BATT>	ETX	<CHKSUM>	EOT
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Where:

- **STX**: start of text, character of start string (ASCII value 0x02).
- **<STATO>** : weight status, can take the values summarized in the following table:

“S”	“M”	“E”	“O”	“Z”
Stable weight	Weight in motion	Out of range	Overweight	initial zero not performed

- **<PESO>**: ASCII string of weight expressed with 8 characters right justified, with any decimal point and minus sign.
- **<BATT>**: ASCII string of voltage battery, 2 characters expressed in tenths of Volts.
- **ETX**: end of text; text end character (ASCII value 0x03).
- **<CHKSUM>**: two-character checksum of string data. It is calculated by performing the exclusive OR (XOR) of all the characters from ADDR to ETX, ADDR and ETX excluded. The result of the XOR is decomposed into two separate characters, considering separately the upper 4 bits (first character) and the lower 4 bits (second character). The two obtained characters are then encoded ASCII. (Example: XOR = 5Dh; C C = «5D» that is 35h and 44h).
- **EOT**: end of transmission; character of end string (ASCII value 0x04).

Connect Rs232 PC serial port



Pin 1	GND
Pin 2	TXD
Pin 3	RXD

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
The instrument does not transmit	Instrument turned off	Verify that the instrument is turned on referring to this manual
	Dead batteries	Recharge or replace batteries
	No radio communication	Verify the installation by referring to this manual
	Hardware failure	Use the diagnostic LED to indicate the fault detected
The receiver does not receive the correct string	Incorrect communication parameters	Correctly program the communications parameters referring to this manual
The received weight is not correct	weight calibration not executed	Perform the calibration weight referring to this manual
	“Weight filter” parameter not correct	Correctly program the “weight filter” parameter referring to this manual