



# INSTALLATION MANUAL RF RECEIVER



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## **REVISION INDEX**

DATE	REVISION NUMBER	DESCRIPTION
19-07-13	0	FIRST VERSION

## TECHNICAL DESCRIPTION

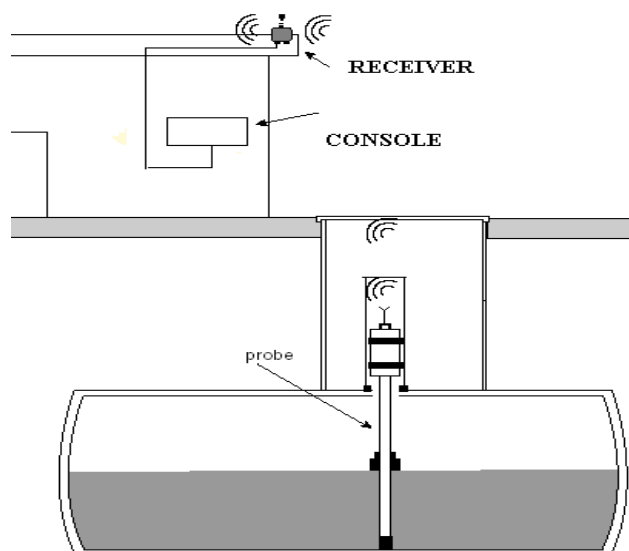
The RF Receiver device allows to receive:

- Wireless probes model XMT-SI-RF 169,4 MHz
- TPC Theft Protection Cover Sensor 434 MHz

The same product, depending on the settings, can be used also as a receiver. This is useful in those cases of critical conditions due to the distance rather than the infrastructures present.

The RF Receiver has independent serial RS232 and RS485 available, which allows to manage two different controllers at the same time.

<b>Power Supply</b>	<b>12-24V</b>
RF Module 169MHZ	1
RF Module 434MHz	1
Serial RS232 su DB9 (parallel to the terminals)	1
Serial RS232 on terminals (parallel to DB9)	1
Serial RS485	1
Antenna 169,4 MHz	1
Antenna 434 MHz	1
LED Diagnostics TX-RX	4
LED Diagnostics functioning	4
Repeater/Receiver functionality	SI
Power supply 220Vac	Optional
Antenna Harmattan 169,4MHz	1
Dipswitch functions programming	4 ways



# ELECTRICAL CONNECTION

## WIRING RS485

### Power supply

White terminal GND.....	4
Red terminal +Vcc.....	1

### Data RS485

Blue Data RS485 A.....	3
Brown Data RS485 B.....	2

## WIRING RS232

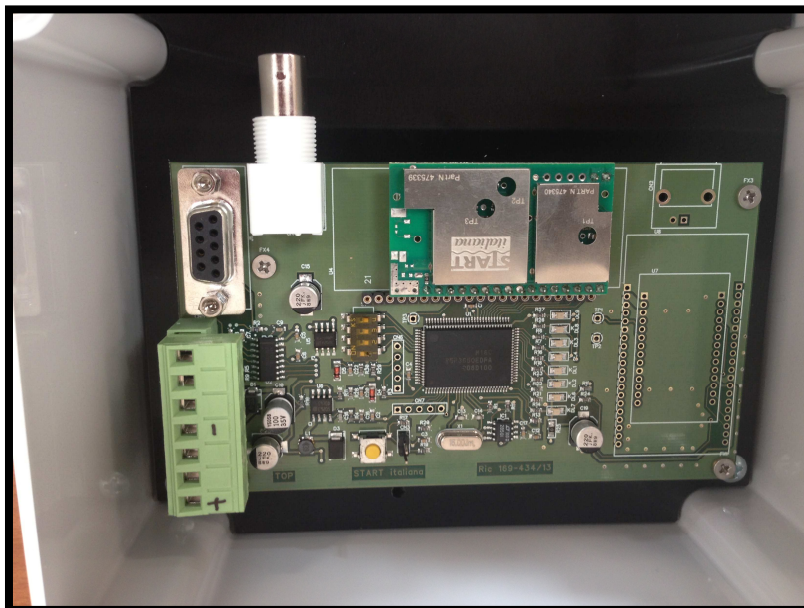
### On terminals

### Power supply

White terminal GND.....	4
Red terminal +Vcc.....	1

### Data RS232

Tx Out.....	6
Rx In.....	7
GND.....	5



CONNECTOR

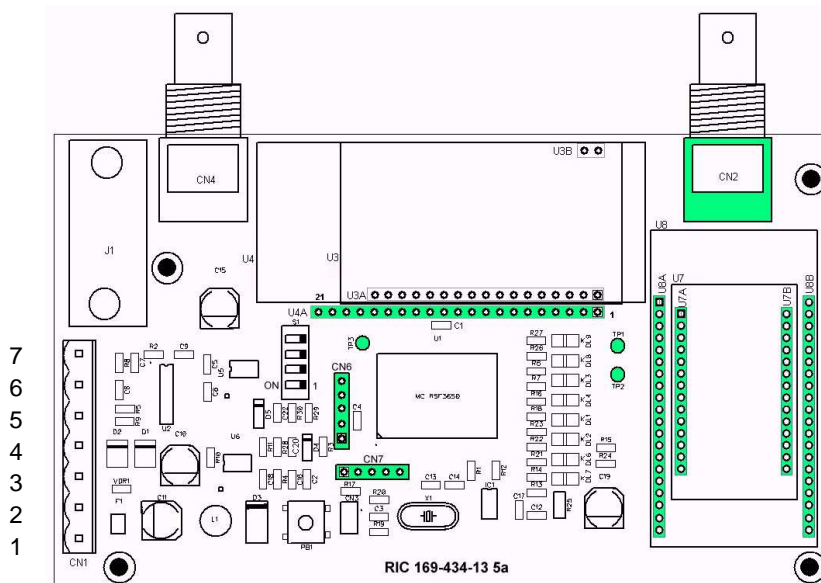
ANTENNA

169,4MHz

434MHz

## CONNECTOR RS232 DB9 DCE

Tx Out.....	2
Rx In.....	3
GND.....	5



## CHARACTERISTICS OF LOW GAIN 169 MHz ANTENNA



### ELECTRICAL

Frequency range:	162-174 MHz
Impedance:	50 $\Omega$
V.S.W.R.:	< 2,1 : 1
Max power:	10 W
Irradiation:	Omnidirectional
Gain:	-1 dBi

### MECHANICAL

Dimensions (approximately):	Ø 14x99 mm
Connection:	BNC male
Operating temperature range:	-40° / +80°C
Weight:	0,050 kg
Radome material:	Thermoplastic polymer
Radiating element material:	Copper clad steel

## CHARACTERISTICS OF HIGH GAIN HARMATTAN 169 MHz ANTENNA



### ELECTRICAL

Frequency range:	162-174 MHz
(V.S.W.R. < 2 : 1)	
Impedance:	50 $\Omega$
V.S.W.R. at 169 Mhz:	< 2 : 1
Max power:	15 W
Polarization:	Linear
Irradiation:	Omnidirectional
Gain at 169 MHz:	2,1 dBi

### MECHANICAL

Dimensions (approximately):	830 x 150 x 85 mm
Connection:	BNC male
Operating temperature range:	-40° / +80°C
Weight:	0,250 kg
Radiating element material:	Whip made of steel and brass, overprinted and covered with thermoretractable sheath.
Accessories:	Bracket for pole mounting [from Ø min.40mm to max. 60 mm]

## **HOW TO INSTALL THE ANTENNA**

Each antenna has its own radiation diagram.

The radiation diagram indicates which are the directions into the space under which the antenna is able to transmit the signal with major efficacy.

The diagram shown on the right is related to the antenna mounted on the probe and that mounted on the receiver.

In order to have an excellent reception without losing the signal the antenna must be oriented so that the two diagrams, one of the receiving antenna and the transmitting antenna, are oriented in the same way.

For example it's not possible to put the receiving antenna horizontally if all transmitters are vertically, as it would have almost total loss of signal as well as a different polarization (horizontal instead of vertical).

As shown from the radiation diagram, the antenna does not transmit from its peak, but transmits through its side, the same applies to the reception. So the transmitting and receiving antennas must always be kept parallel between them.

If it becomes necessary to insert the antenna of a probe under the asphalt horizontally, the receiver also must have the antenna put horizontally and must be kept parallel between them.

Unless the antennas are not near to the receiver (in this case the signal is strong even if the polarization of the antennas are different) it is not recommended to put antennas with different polarization, as it would cause a signal loss of some of them.

Wireless probes are working with battery using a low frequency for the data transmission.

The bandwidth used is 169.4 MHz narrow canalization of 12.5 KHz.

This particular band allows to have low attenuations due to obstacles or surrounding land, as the transmission occurs underground.

This transmission must not be confused with the wi-fi which uses higher frequencies, 1.2-2.4GHz, which would not have the minimum opportunity to get out of the manhole.

If the antennas were placed outdoor, the transmission would arrive easily to 1 km. For usage at service stations where the antennas are placed underground (integrated into the probe head) the distance of transmission in normal condition is 100-200 mt.

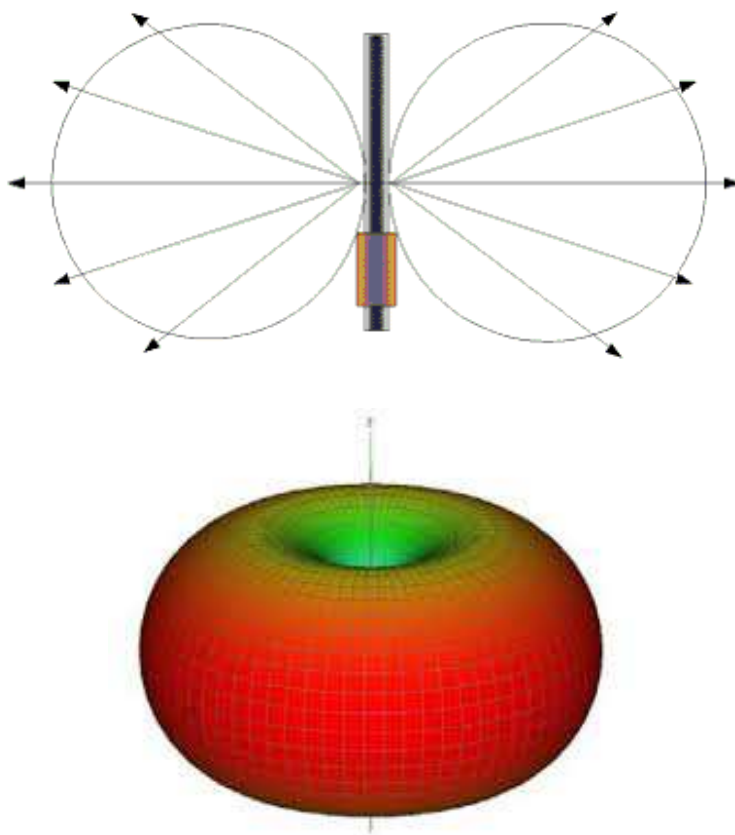
Normal conditions are those which do not require the existence of a Faraday cage that avoid the output of the radio signal.

For example it is considered a Faraday cage a manhole entirely made of iron, a reinforced concrete square with welded mesh.

Cannot be considered Faraday cage, a standard manhole with iron or cast iron leadcover, a manhole of bricks, an asphalt square, vehicles parked on manhole covers.

Below please find a table that can be considered as a guideline to value whether you can install wireless probes in order to have a signal guaranteed to the receiver.

Obviously you can install repeaters and, where possible, put the antenna of the probe outside the manhole in case of a situation of highly attenuated signal.



TOPIC	INFORMATION NEEDED	Notes to be filled in by the installer to allow prior verification of feasibility
Environment	Depot or service station	
Manhole	Type of material	
	Type of manhole material (iron, cast iron, composite, ..)	
	Depth of the manhole	
	Riser installation or with sliding connection	
	Carriageable or isolated	
	Possibility to park over	
	Normally empty and clean or water-filled	
Distance from the receiver	Minimum and maximum distance from the receiver in meters	
	The tanks are located in one area or in different areas	
	Number of tanks	
	Among the tanks and the receiver there are permanent obstructions, of what kind	
	Among the tanks and the receiver there are NOT permanent obstacles, what kind and how long they can stay there	
Floor	Type of material	
	Indicate presence of welded net	
Repeater	If a repeater is needed, the presence of external power supply.	
	Possibility to install the antenna on a pole or wall	
Tank	Buried, diameter	
	Aerial, height	
Antenna	Possibility to install on the pole or wall but NOT in front of a metal surface	



## LED DIAGNOSTICS FUNCTIONING

On startup **DL2** refers to RUN, must flash and indicates that the board is working properly.

**DL8**: wired on RX line of the 169,4MHz module, flashing indicates that a valid frame has been received by the module and transmitted to the microprocessor.

**DL9**: wired on TX line of the 169,4MHz module, flashing indicates that a valid frame has been sent to the module in order to be transmitted.

Information about the probes registered and received:

**DL4** refers to the units, flashes from 0 to 9

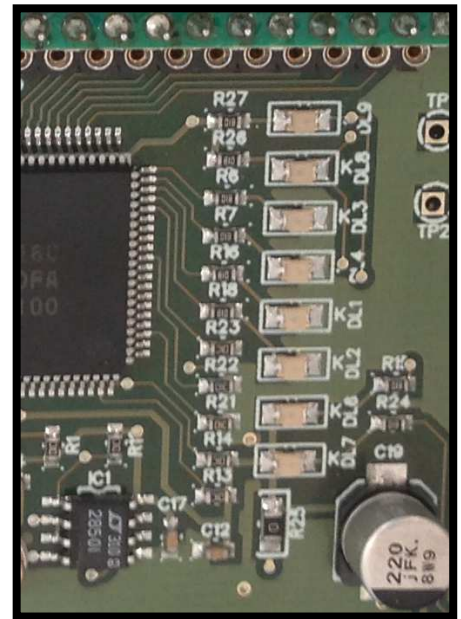
**DL1** refers to the tens, flashes from 0 to 6

For example if 16 probes have been registered there will be 1 flash for DL1 and 6 flashes for DL4.

**DL3**:

if switched off DL1 and DL4 refer to received probe 169 side

if switched on DL1 and DL4 refer to received TPC 434 MHz side

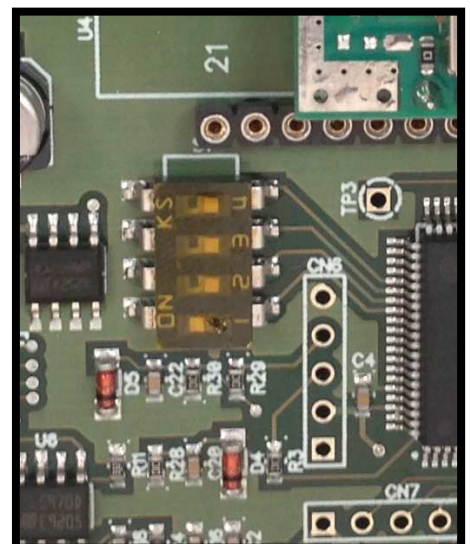


## DIPSWITCH SETTINGS

Refers to the DIPSWITCH setting in binary combination.

Please refer to the table below:

SETTING	DIPSW1	DIPSW2	DIPSW3	DIPSW4
0	OFF	OFF	OFF	OFF
1 (default)	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON





**Setting 1:**

Normal functioning, answers through the new protocol both on RS485 and RS232.

*Example:*

D) M03744+chr(13)

R) 03744N0=+250=00129.37=00031.00=082+chr(10)+chr(13)

Probe address: 03744

Probe status: (0 = OK) in case of error status=1

Temperature: +25,0 C°

Product level: 129,37 mm

Water level: 31,00 mm

**Setting 2:**

Normal functioning, answers through the old protocol both on RS485 and RS232.

*Example:*

D) M03744+chr(13)

R) 03744=0=+250=01294=0031=237+chr(10)+chr(13)

Probe address: 03744

Probe status: (0 = OK) in case of error status=1

Temperature: +25,0 C°

Product level: 129,4 mm

Water level: 31,00 mm

**Setting 3:**

Inside the receiver 10.000 is added to the wireless probe address, answers through the new protocol both on RS485 and RS232.

Please use this setting in case two receivers have been installed to have a major coverage. The two receivers must be connected in parallel on line RS485, one of them must work with this setting because if a probe is received from both receivers the console has to get information only by one of them in order to avoid conflicts on the transmission bus.

Then configure the console with the probe address or with the probe address +10.000 in order to receive the message from the receiver that has the major success on receipt.

*Example:*

*If the wireless probe has address **03744**, it is necessary to query the receiver adding 10.000*

D) M13744+chr(13)

R) 13744N0=+250=00129.37=00031.00=083+chr(10)+chr(13)

Probe address: 03744

Probe status: (0 = OK) in case of error status=1

Temperature: +25,0 C°

Product level: 129,37 mm

Water level: 31,00 mm

**Setting 4:**

Inside the receiver 10.000 is added to the wireless probe address, answers through the old protocol both on RS485 and RS232.

Please use this setting in case two receivers have been installed in to have a major coverage. The two receivers must be connected in parallel on line RS485, one of them must work with this setting because if a probe is received from both receivers the console has to get information only by one of them in order to avoid conflicts on the transmission bus.

Then configure the console with the probe address or with the probe address +10.000 in order to receive the message from the receiver that has the major success on receipt.

*Example:*

*If the wireless probe has address **03744**, it is necessary to query the receiver adding 10.000*

D) M03744+chr(13)

R) 03744=0=+250=01294=0031=237+chr(10)+chr(13)

Probe address: 03744

*Probe status: (0 = OK) in case of error status=1*  
*Temperature: +25,0 C°*  
*Product level: 129,4 mm*  
*Water level: 31,00 mm*

**Setting 8:**

Repeater mode, everything received on the radio channel is immediately retransmitted always on the radio channel. Transmission always done with frame recognition: the receiver wait a silence of at least 20ms on the radio channel in order to determine the end of a transmission and proceed with the retransmission.  
Answers with the new protocol both on RS485 and RS232.

**Setting 15:**

ByPass functioning, can be used only during the test of the system. Everything received on the radio channel is retransmitted on RS232 as a character. Does not reply to any command.

## **AVAILABLE COMMANDS**

### **Command M**

Ask for the measure, see previous examples.

### **Command D**

Ask for the diagnostics

*Example:*

D) D14832+chr(13)

R) 14832D105=00000118=00006721=00000118=001=005=200=015=048=113=078=045=100=071=197

Probe address: 14832

Window of the signal: 105

Packets transmitted by the probe: 118

Counter of packets of the probe: 6721 (shows how long the probe has been switched on)

Packets received by the receiver: 118

Number of floats: 1

Transmission channel: 5

Signal power: 200

Operating mode: 15

Level of the local signal: -48 dB

Level of the local noise: -113 dB

Tension of the receiver: 78/21.1=3,7V (value transmitted to be divided by 21,1)

Level of the probe signal: -45 dB

Level of the probe noise: -100 dB

Tension of the receiver: 71/21.1=3,4V (value transmitted to be divided by 21,1)

### **Command V**

Ask for the version.

### **Command C**

Ask for the list of all the registered probes.

*Example:*

D) D14832+chr(13)

R)

03746N0=+290=00105.68=00028.64=102

03967N0=+290=00092.30=00016.32=093

03745N0=+290=00090.78=00015.47=102

03962N0=+280=00090.57=00015.61=095

14832N0=+260=00254.01=00000.00=069

## **ORDER CODE**

When you place your order please use the following order codes:

### **POWER SUPPLY 24V**

RECEIVER WITH LOW GAIN ANTENNA:

RECEIVER WITH HIGH GAIN HARMATTAN ANTENNA:

RIC-RF

RIC-RF-HARM

### **POWER SUPPLY 220Vac**

RECEIVER WITH LOW GAIN ANTENNA:

RECEIVER WITH HIGH GAIN HARMATTAN ANTENNA:

RIC-RF-220

RIC-RF-HARM-220



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