ERMO 482x PRO

External Microwave Protection Barrier
Installation Handbook

Edition 4.4

1. DESCRIPTION

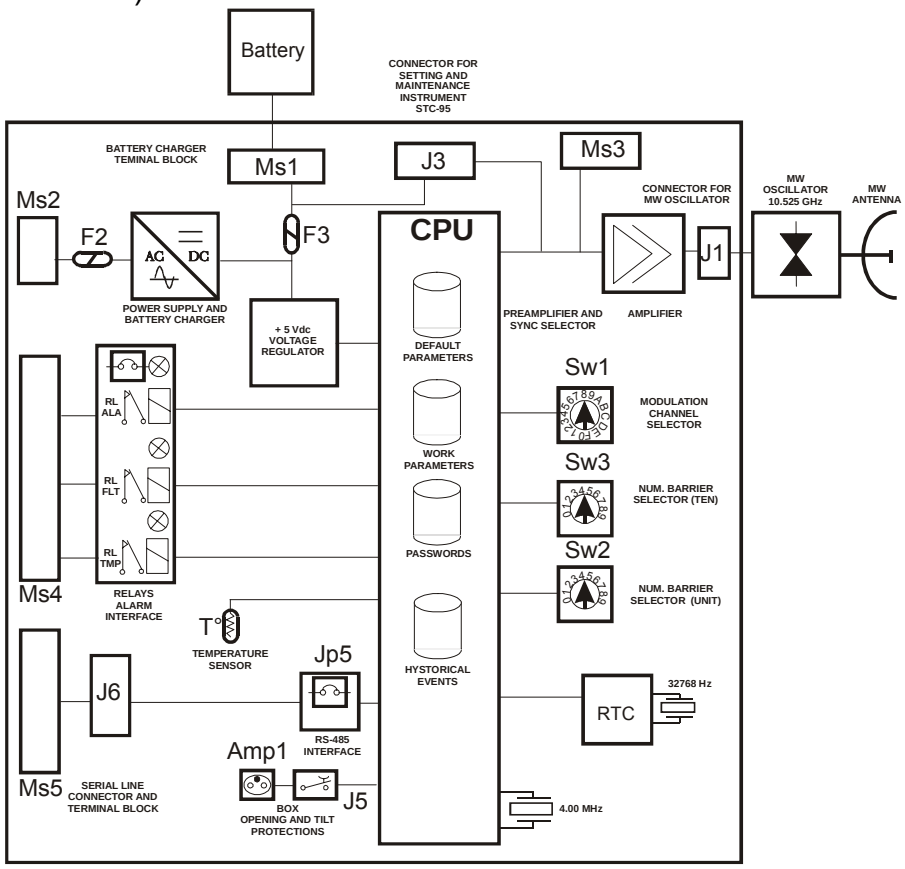
1.1 Description

The Ermo 482x PRO equipment is a digital microwave barrier of CIAS, for internal and external volumetric protection. Such a system can detect the presence of somebody or something moving within the sensitive field present between a transmitter (Tx) and a receiver (Rx).
The received signal is processed in digital way and analysed with “Fuzzy” logic in order to obtain maximum performances and a minimum of false alarm rate.
The Ermo 482x PRO equipment is available with the following field range:

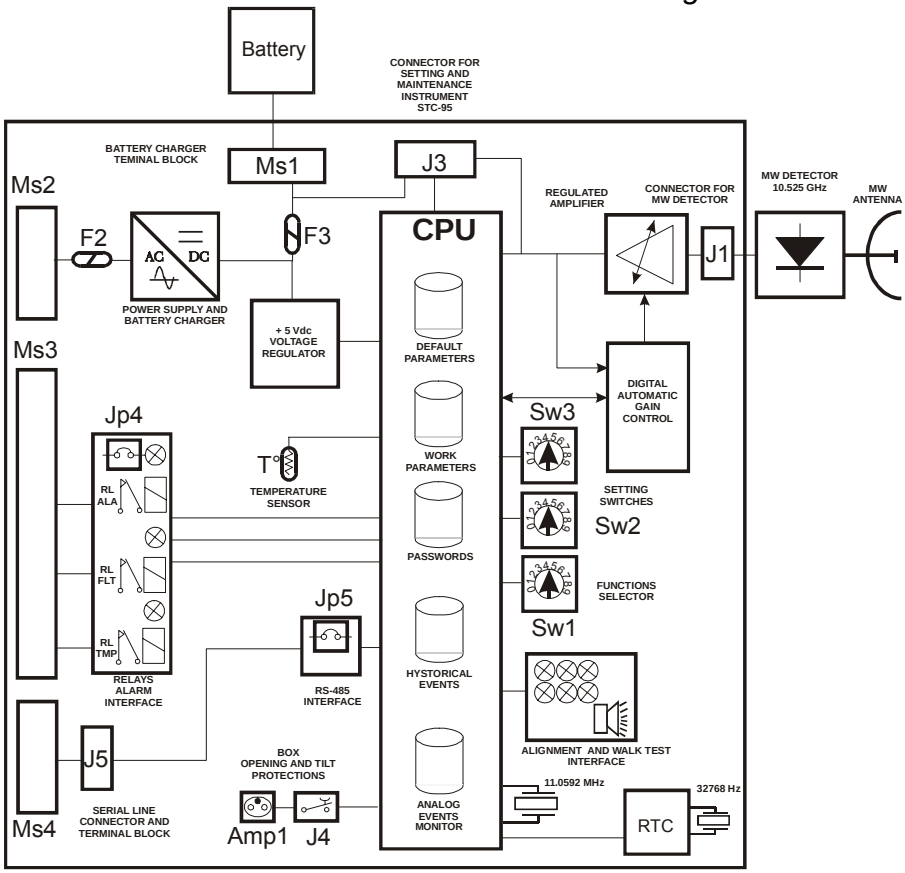
- ERMO 482x PRO / 50 Range 50 meters
- ERMO 482x PRO / 80 Range 80 meters
- ERMO 482x PRO / 120 Range 120 meters
- ERMO 482x PRO / 200 Range 200 meters
- ERMO 482x PRO / 250 Range 250 meters

1.2 Block Diagram

In the following diagrams are showed the functional block of the complete Ermo 482X Pro (Transmitter and Receiver).



Ermo 482X Pro Transmitter Block Diagram



Ermo 482X Pro Receiver Block Diagram

2. INSTALLATION

2.1 Preliminary Information

Due to the various types of ERMO 482x PRO barrier, there are some different kinds of installation and fixing unit types related to user requirements.

2.2 Number of Sections

Having to design protection with volumetric barriers of a closed perimeter**,** besides having to split the perimeter within a certain number of sections that take into account the management need of the entire plant, it must be remembered that it is always preferable to install an **even number of sections**. This consideration is bound to the fact that the likely reciprocal interferences between adjacent sections are annulled should at the vertices **(cross)** of the polygon, resulting from the installation of the various sections, be installed **two equipment with the same name, two transmitters or two receivers**. It is evident that this might occur only if the number of sections is even. Should it not be possible to have an even number of sections then some careful considerations must be made on interferences that might likely occur in order to find the vertex point where retained best to place the transmitter near the receiver. The following pictures show some typical cases for which the most correct solution is given (see figure 1).

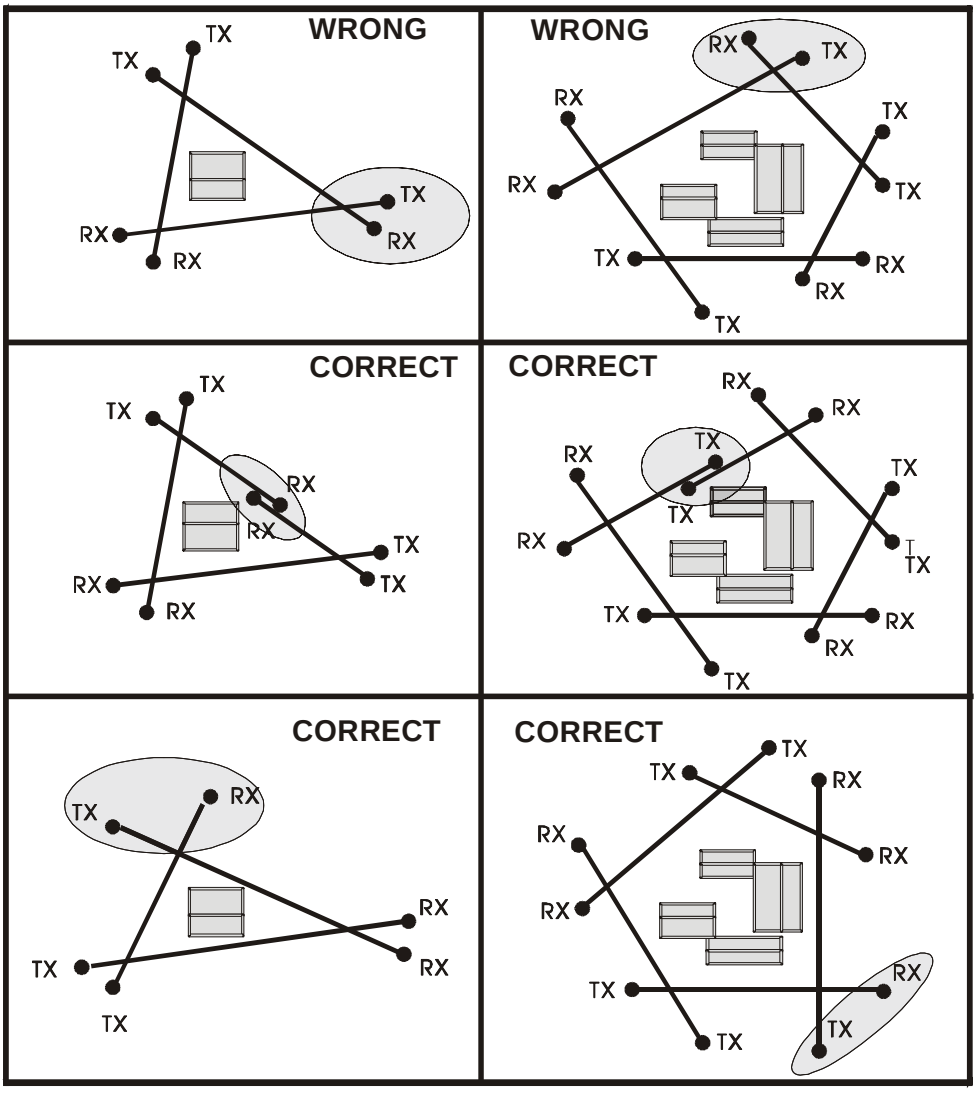


Figure 1

2.3 Ground conditions

It is inadvisable to install the equipment along sections with tall grass (more than 10 cm), ponds, longitudinal waterways, and all those types of grounds whose structure is rapidly mutable.

2.4 Presence of Obstacles

The **fences**, are generally **metallic** therefore highly reflecting hence causing various problems, for this reasons some precautions are suggested:

- first of all, make sure that the fence has been properly **fixed** in order that the wind does not move;
- if it is possible the microwave beam should **not** be placed in **parallel** to a metallic fence, is necessary to create a corner with it;
- metal fences placed behind the equipment night cause distortions to the sensitive beam especially, and might cause movement detection in unexpected spots, with subsequent likely generation of false alarms;
- in case of Mw barrier should be installed in a corridor between two metallic fences, the width of the **corridor** should be not less to **5 m**; if less contact CIAS technical assistance

Along the section, within the area of the protection field, are allowed pipes, poles or similar (e.g., lamp posts) as long as their dimensions, with respect to the protection beam, are not too excessive. **The trees, hedges, bushes in general**, need **very great attention** if near or within the protection beams. These obstacles vary in size and position, in fact they grow and they can be moved by the wind. Therefore, it is absolutely inadvisable to tolerate the presence of the cited obstacles within the protection sections.

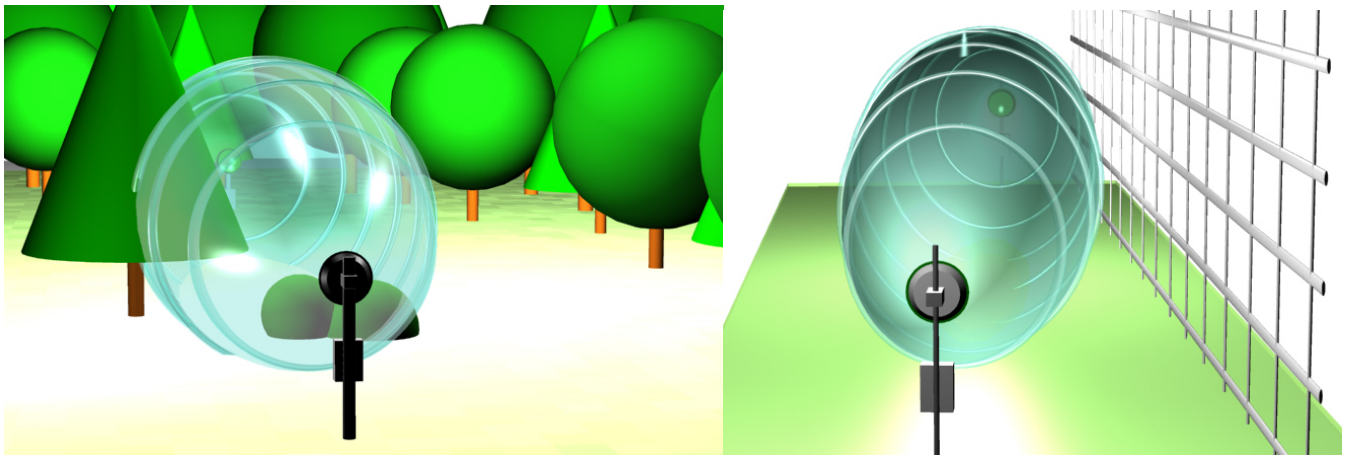


Figure 2

It is possible to tolerate the presence of these elements near the protection sections only if their growth is limited through routine maintenance, and if their movement is stopped through containment barriers. Various **Obstacles** might be present along the protection sections. For them there is the need to make the same considerations and take the same necessary precautions adopted for the above cases. This cause of **Dead zones** not protected and **Hypersensitive zones** which cause false alarm.

2.5 Amplitude of the Sensitive Beam

The amplitude of the **Sensitive Beam depends** on the distance between the transmitter and the receiver, on the **antenna type** and on the **sensitivity** adjustment set. The figures below state the diameter half-way of the sensitive beam section (based on the length of the section) in case of maximum and minimum sensitivity (see next figures).

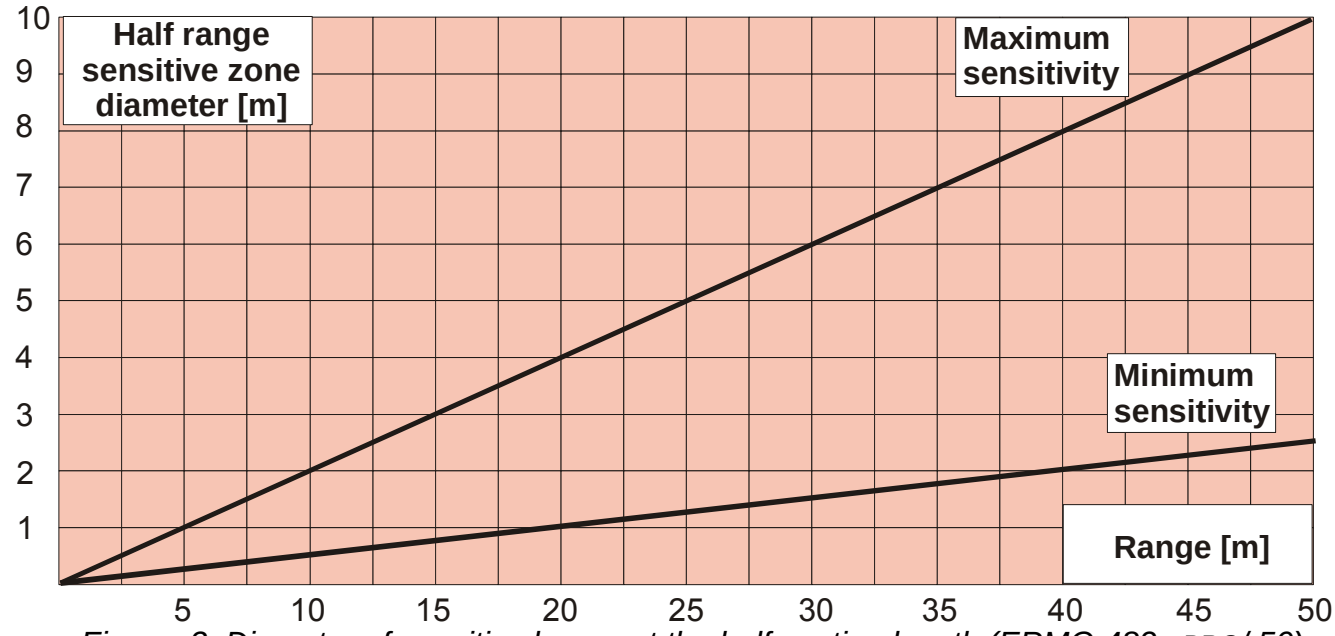


Figure 3 Diameter of sensitive beam at the half-section length (ERMO 482x PRO/ 50)

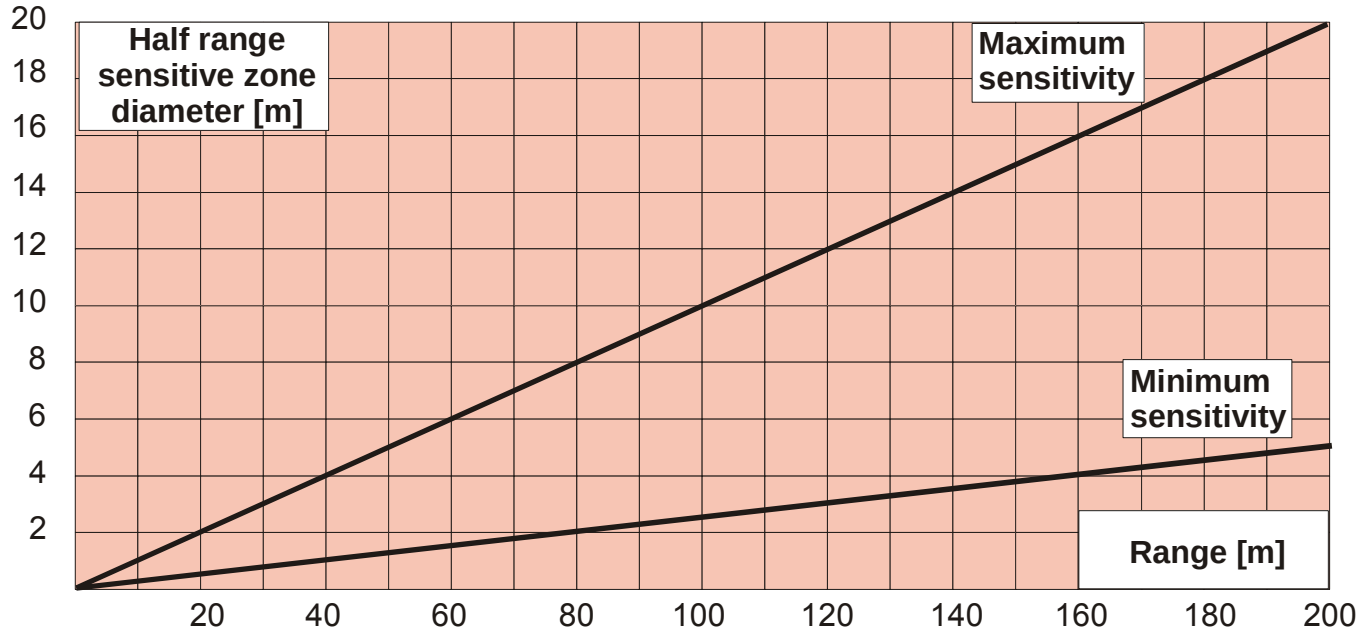


Figure 4 Diameter of sensitive beam at the half-section length (ERMO 482x PRO/ 80-120-200)

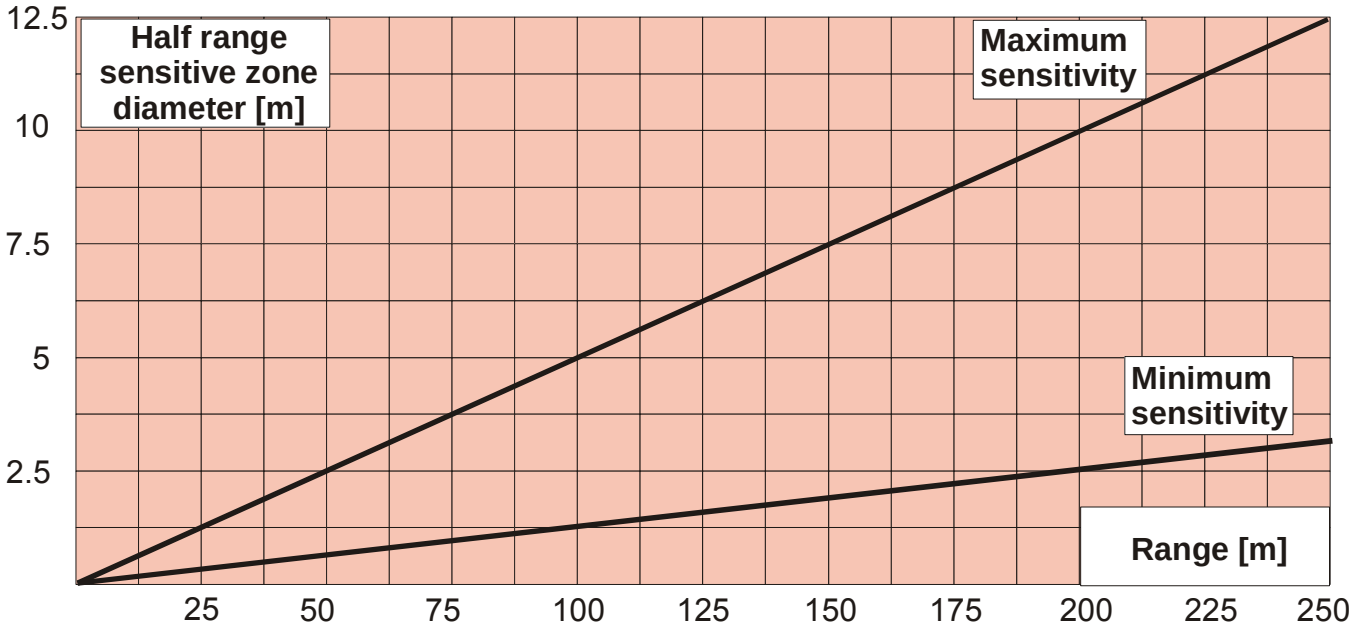


Figure 4bis Diameter of sensitive beam at the half-section length (ERMO 482x PRO/ 250)

Remark: that for the ERMO 482x PRO equipment, the sensitivity regulation to be considered to obtaining the dimensions of the sensitivity beam at half- section length, is that of the pre-alarm threshold. **The higher the pre-alarm threshold the lower the sensitivity, and vice versa.**

It's important to keep in mind that the **pre-alarm threshold** determines **the beginning of the intelligent analysis:** all signals below this threshold, are considered noise, and anyway of low importance. All the signals higher this threshold are analyzed following Fuzzy rules.

The prealarm and alarm thresholds, are settable both with software WAVE-TEST and with rotary switches on board on each receiver. Default setting corresponds to a medium sensitivity fightable for most of the cases.

2.6 Length of the Dead Zones near the equipment

The length of the **Dead Zones** near the equipment is based on the distance of the equipment from ground, on the sensitivity set on the receiver and on the type of antenna used.
With regard to the considerations stated above, and based on plant requirements, the equipment must be installed at a certain height from ground. **In mean plant the height must be 80 cm. from the ground and the centre of the equipment (90 cm for 250m barriers).** With medium sensitivity setting, the suggested **crossing** overlap is **5 m**., for the 80-120-200 m. **12.5 m** for 250 m barriers versions and **3,5 m**. for the 50 m. version.

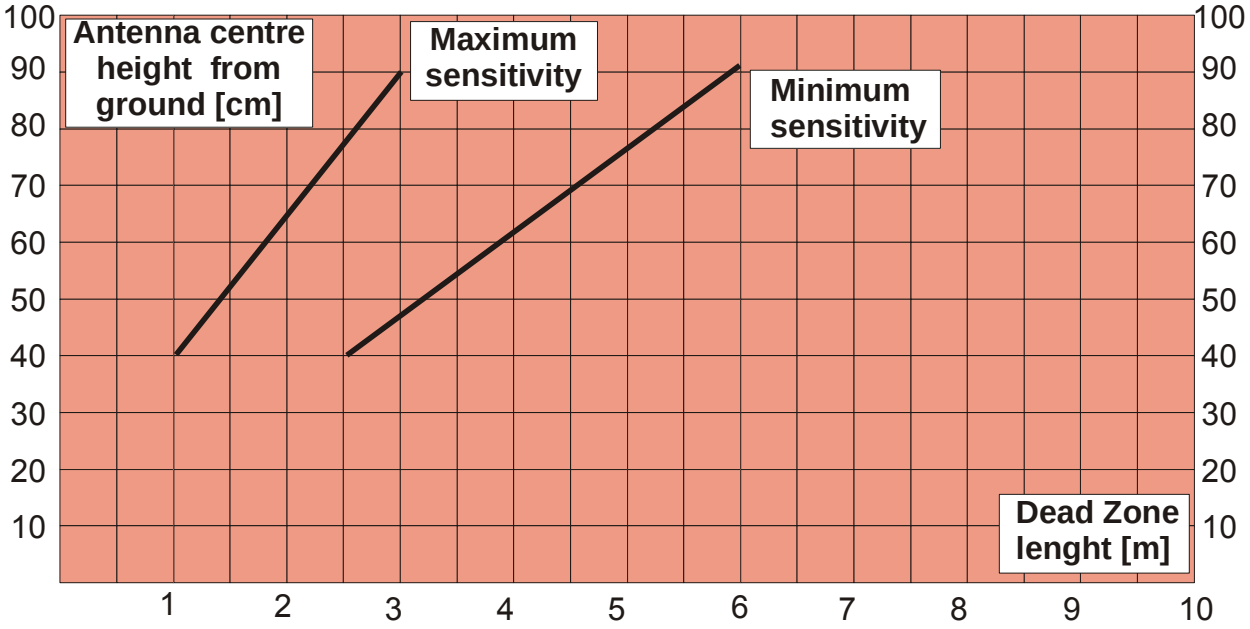


Figure 5 ERMO 482x PRO-50: Dead zone length near the equipment versus installation height.

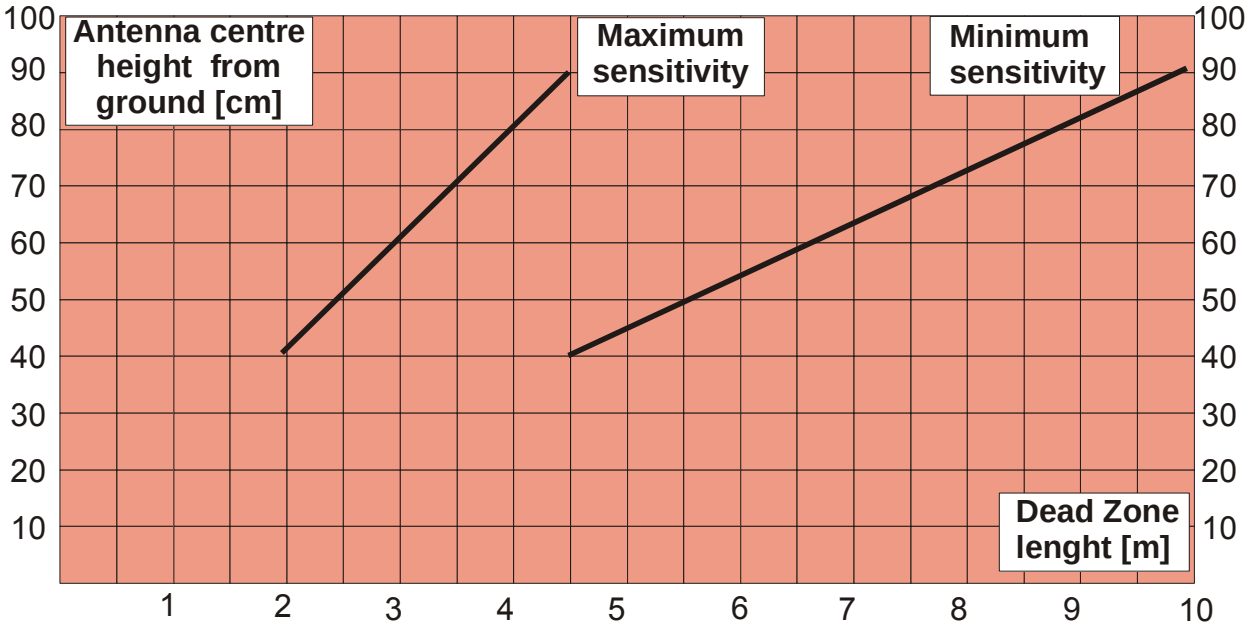


Figure 6 ERMO 482 X PRO. 80-120-200: Dead zone length near the equipment versus installation height.

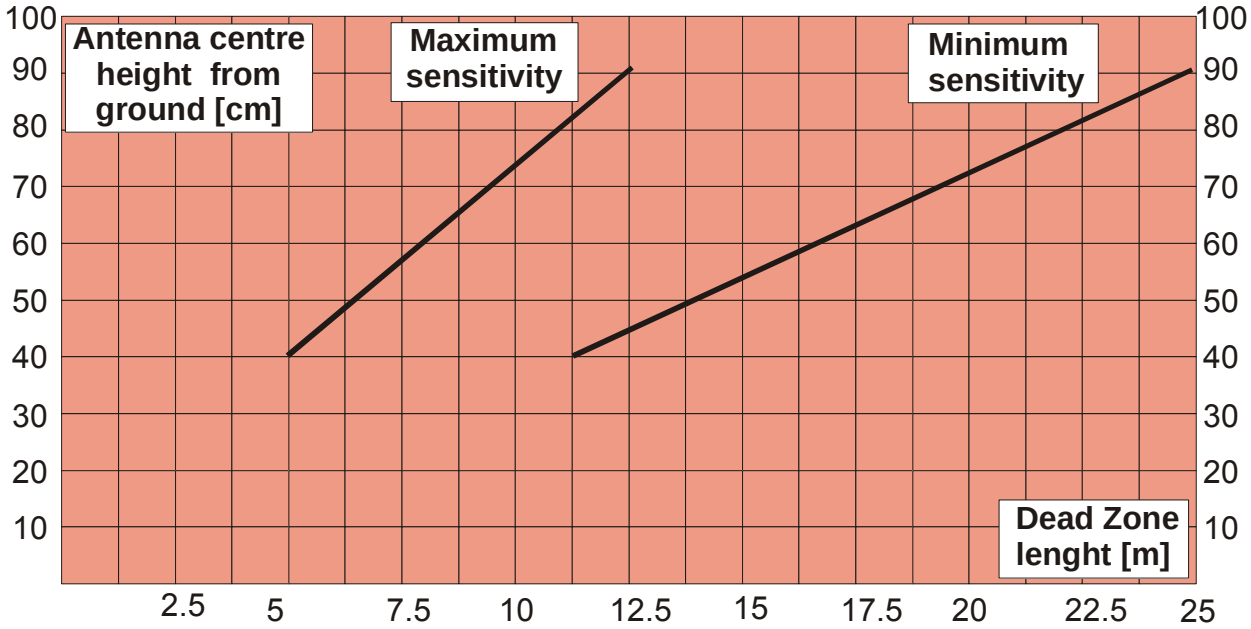
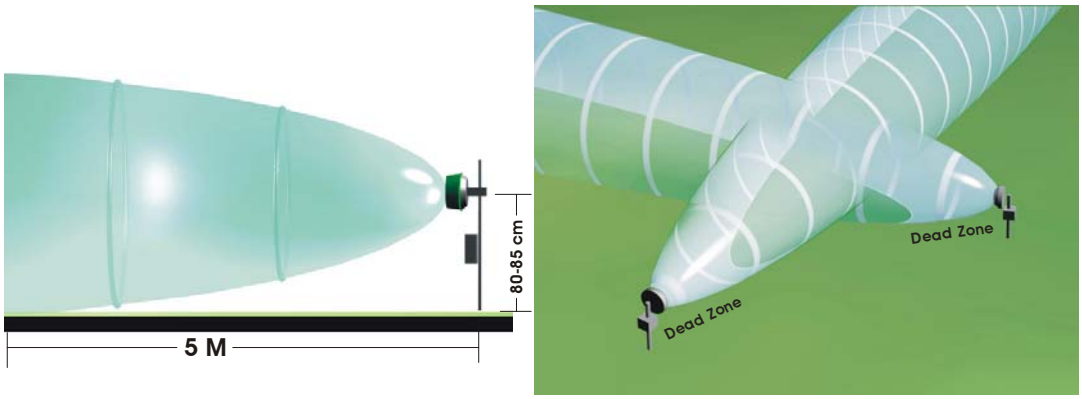


Figure 6bis ERMO 482 X PRO. 250: Dead zone length near the equipment versus installation height.



3.1 Terminal Blocks, Connectors and Circuits Functions

3.1.1 Transmitter Circuit

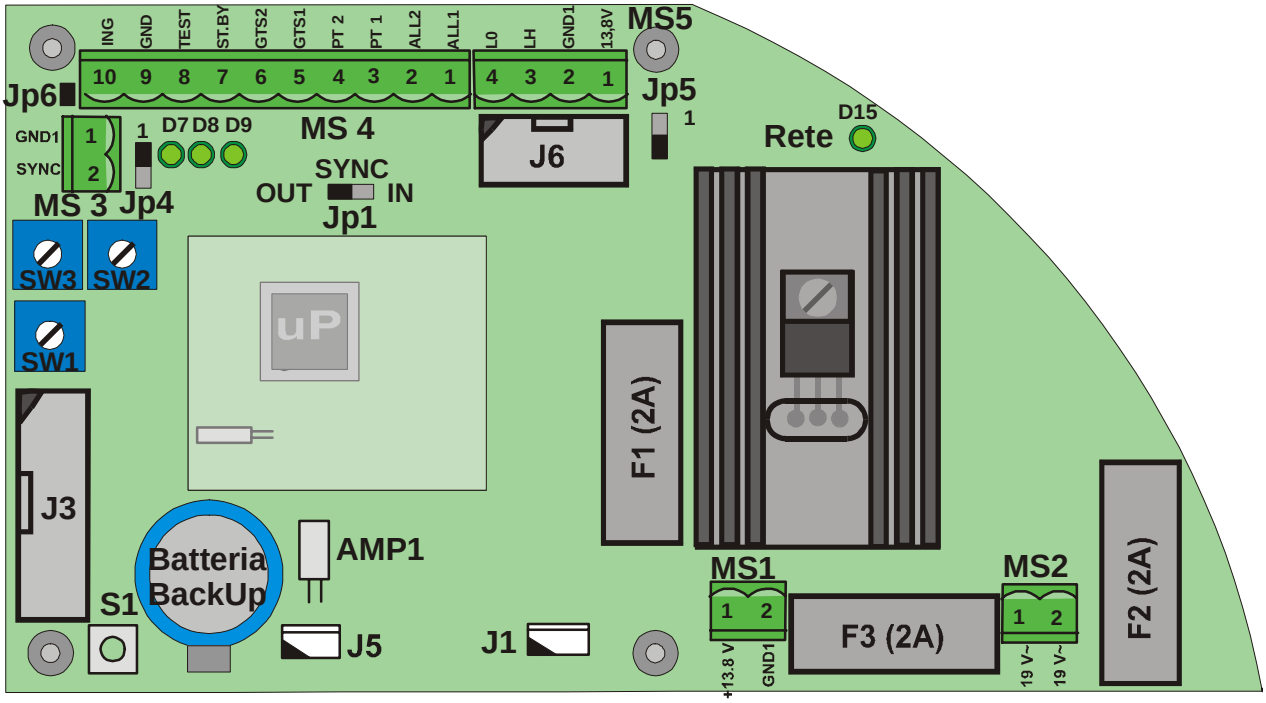


Figure 8 *Layout of connectors, jumpers, LEDs and presetting in transmitter board*

The following tables shows the connector pin functions present on ERMO 482x PRO Transmitter

TRANSMITTER TERMINAL BLOCK MS2		
Term	**Symbol**	**Function**
1	19 V~	Mains ac power supply input (19 V~) or (24V⎓)
2	19 V~	Mains ac power supply input (19 V~) or (24V⎓)

TRANSMITTER TERMINAL BLOCK MS4		
Term	**Symbol**	**Function**
1	ALL 1	Alarm relay contact (Normally Closed)
2	ALL 2	Alarm relay contact (Normally Closed)
3	PT 1	Tamper relay contact (Normally Closed) + bulb contact (AMP1)
4	PT 2	Tamper relay contact (Normally Closed) + bulb contact (AMP1)
5	GST 1	Fault relay contact (Normally Closed)
6	GST 2	Fault relay contact (Normally Closed)
7	ST BY	Auxiliary input for Stand-By command (Norm. Open from GND)
8	TEST	Auxiliary input for Test command (Norm. Open from GND)
9	GND	Ground auxiliary connection
10	ING	Balanced Line Input for external device (detector)

TRANSMITTER TERMINAL BLOCK MS5		
Term	**Symbol**	**Function**
1	+13,8	Dc Power Supply (13,8 V⎓) for RS-485/232 converter
2	GND 1	Ground connection for Data and Power Supply
3	LH	+ RS 485 (High Line)
4	LO	- RS 485 (Low Line)

TRANSMITTER TERMINAL BLOCK MS1		
Term	**Symbol**	**Function**
1	13,8V	+13,8 VDC Connection for Battery (Protection Fuse F3 = T2A)
2	GND 1	Ground connection for Battery

TRANSMITTER TERMINAL BLOCK MS3		
Term	**Symbol**	**Function**
1	GND 1	Ground connection for sync cable
2	SYNC	Sync In/Out connection to perform Slave/Master operation setting JP1

TRANSMITTER CONNECTOR J1 Connector for MW oscillator (DRO)		
Term	**Symbol**	**Function**
1	GND	Ground connection for MW oscillator
2	DRO	Modulation Frequency connection for MW oscillator
3	GND	Ground connection for MW oscillator

TRANSMITTER CONNECTOR J3 Measure Connector		
Term	**Symbol**	**Function**
1/3	N.C.	Not Connected
4	GND	Ground
5	N.C.	Not Connected
6	+13,8	Power Supply (13,8 V⎓)
7/11	N.C.	Not Connected
12	+5V	Internal Power Supply (5 V⎓)
13	OSC	Oscillator functioning Measure (+ 4V⎓ = OK)
14/15	N.C.	Not Connected
16	+8V	Internal Power Supply (8 V⎓)

TRANSMITTER CONNECTOR J5 Micro switch Connector for Radome Tamper		
Term	**Symbol**	**Function**
1	GND	Ground connection for Tamper
2	ING	Tamper Input
3	GND	Ground connection for Tamper

TRANSMITTER CONNECTOR J6 10 pin Connector for direct PC Serial Line connection (Wave-Test SW)		
Term	**Symbol**	**Function**
1/2	N.C.	Not Connected
3	+13,8	Power Supply (13,8 V⎓) Converter interface RS-485/232
4	N.C.	Not Connected
5	LO	Low Line for RS 485
6	N.C	Not Connected
7	LH	High Line for RS 485
8	N.C.	Not Connected
9	GND	Ground
10	N.C.	Not Connected

TRANSMITTER CHANNELS SWITCH		
N°	**Symbol**	**Function**
1	SW1	Hexadecimal Modulation Channel Selector

TRANSMITTER NUMBER OF BARRIER SWITCHES SW2 SW3		
N°	**Symbol**	**Function**
2	SW2	Barrier Number selector (units column)
3	SW3	Barrier Number selector (tens column)

TRANSMITTER FUSES		
N°	**Symbol**	**Function**
1	F1	Tx Circuit Power supply (13,8 V⎓) protection fuse (T2A-250V slow blow)
2	F2	AC Power supply protection fuse 19 V~ (T2A-250V slow blow)
3	F3	Power supply protection fuse for Battery 13,8 V⎓ (T2A-250V slow blow)

TRANSMITTER LEDS			
N°	**Symbol**	**Function**	**Default**
7	D7	Fault indication. (OFF by means of Jp4)	**ON**
8	D8	Tamper indication. (OFF by means of Jp4)	**ON**
9	D9	Alarm indication. (OFF by means of Jp4)	**ON**
15	D15	Main presence indication	**ON**

TRANSMITTER JUMPERS			
N°	**Symbol**	**Function**	**Default**
1	Jp1	Internal Modulation signal (Tx-Master, Sync-Out) or External Modulation signal (Tx Slave, Sync-In)	**OUT**
4	Jp4	Exclusion for fault, tamper and alarm indication Leds (Jp4 DOWN leds OFF)	**ON**
5	Jp5	RS485 Line termination (Jp5 DOWN line terminated)	**OFF**
6	Jp6	Enable / Disable Balanced Line Input (Closed = Input disabled)	**OFF**

3.1.2 Receiver Circuit

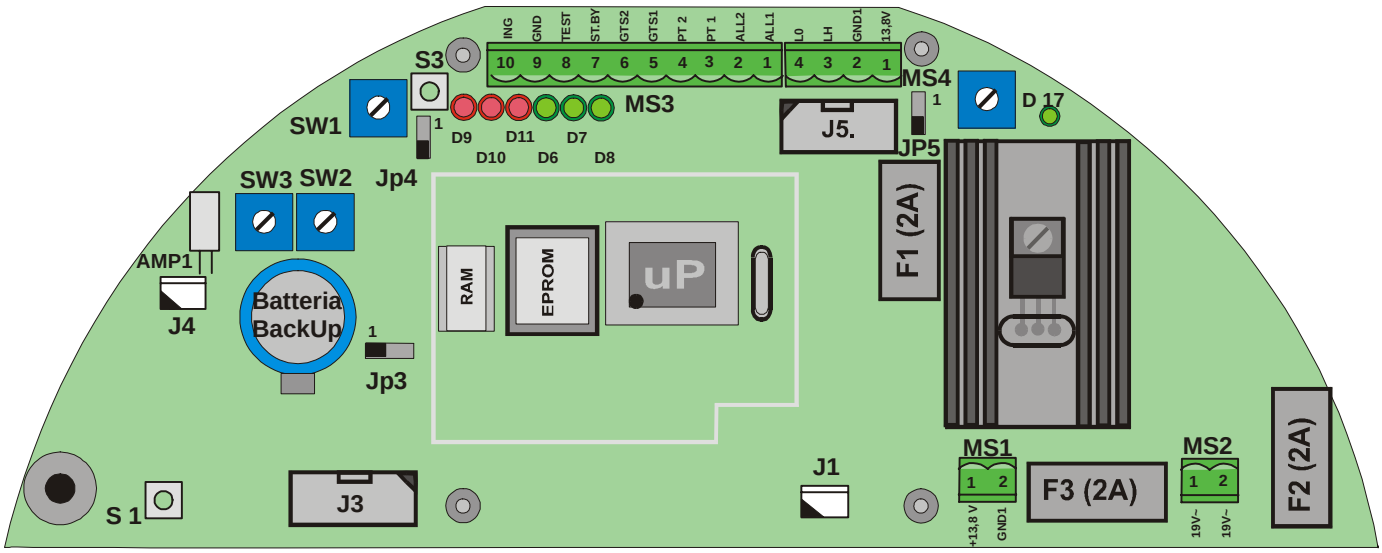


Figure 9 *Layout of connectors, jumpers, LED and presetting in receiver board*

The following tables shows the connector pin functions present on ERMO 482x PRO Receiver board.

RECEIVER TERMINAL BLOCK MS2		
Tem	**Symbol**	**Function**
1	Vac	Mains ac power supply input (19 V~) or (24V⎓)
2	Vac	Mains ac power supply input (19 V~) or (24V⎓)

RECEIVER TERMINAL BLOCK MS3		
Term	**Symbol**	**Function**
1	ALL 1	Alarm relay contact (Normally Closed)
2	ALL 2	Alarm relay contact (Normally Closed)
3	PT 1	Tamper relay contact (Normally Closed) + bulb contact
4	PT 2	Tamper relay contact (Normally Closed) + bulb contact
5	GST 1	Fault relay contact (Normally Closed)
6	GST 2	Fault relay contact (Normally Closed)
7	ST BY	Auxiliary input for Stand-By command (Norm. Open from GND)
8	TEST	Auxiliary input for Test command (Norm. Open from GND)
9	GND	Ground auxiliary connection
10	ING	Balanced Line Input for external device (detector)

RECEIVER TERMINAL BLOCK MS1		
Term	**Symbol**	**Function**
1	+13,8	+ 13,8 VDC Connection for Battery (Protection Fuse F3 =T2A)
2	GND 1	Ground connection for Battery

RECEIVER TERMINAL BLOCK MS4		
Term	**Symbol**	**Function**
1	+13,8	Dc Power Supply (13,8 V⎓) for RS-485/232 converter
2	GND 1	Ground connection for Data and Power Supply
3	LH	+ RS 485 (High Line)
4	LO	- RS 485 (Low Line)

RECEIVER CONNECTOR J1 Connector for MW detector		
Term	**Symbol**	**Function**
1	GND	Ground connection for MW oscillator
2	DET	Connection for MW detector
3	GND	Ground connection for MW oscillator

RECEIVER CONNECTOR J3 Measure Connector		
Term	**Symbol**	**Function**
1/3	N.C.	Not Connected
4	GND	Ground
5	N.C	Not Connected
6	+13,8	Power Supply (13,8 V⎓)
7/8	N.C	Not Connected
9	0,2V.	Detected Signal 200 mVpp
10/11	N.C.	Not Connected
12	+5V	Internal Power Supply (5 V⎓)
13	N.C	Not Connected
14	VRAG	Automatic Gain Control Voltage
15/16	N.C.	Not Connected

RECEIVER CONNECTOR J4 Micro switch Connector for Radome Tamper		
Term	**Symbol**	**Function**
1	GND	Ground connection for Tamper
2	ING	Tamper input
3	GND	Ground connection for Tamper

RECEIVER CONNECTOR J5 10 pin Connector for direct PC Serial Line connection (Wave-Test SW)		
Term	**Symbol**	**Function**
1/2	N.C.	Not Connected
3	+13,8	Power Supply (13,8 V⎓) converter interface RS-485/232
4	N.C.	Not Connected
5	LO	Low Line for RS 485
6	N.C	Not Connected
7	LH	High Line for RS 485
8	N.C.	Not Connected
9	GND	Ground
10	N.C.	Not Connected

RECEIVER FUSES		
N°	**Symbol**	**Function**
1	F1	Power supply (13,8 V⎓) protection fuse (T2A-250V slow blow)
2	F2	AC Power supply protection fuse 19 V~ (T2A-250V slow blow)
3	F3	Power supply protection fuse for Battery 13,8 V⎓ (T2A-250V slow blow)

RECEIVER JUMPERS			
N°	**Symbol**	**Function**	**Default**
3	Jp3	Data and Parameters Battery Back-Up OFF (Jp3 right position = battery connected (ON)	**ON**
4	Jp4	Leds OFF from D6 to D11 (Jp4 UP = Leds OFF)	**ON**
5	Jp5	RS 485 Line termination (Jp5 DOWN line terminated)	**OFF**

RECEIVER LEDS			
N°	**Symbol**	**Function**	**Default**
6	D6	Fault indication + Alignment and setting functions	**ON**
7	D7	Tamper indication + Alignment and setting functions	**ON**
8	D8	Alarm indication + Alignment and setting functions	**ON**
9	D9	Alignment and setting functions	**OFF**
10	D10	Alignment and setting functions	**OFF**
11	D11	Alignment and setting functions	**OFF**
17	D17	Main presence indication	**ON**

SET –UP BUTTON FOR ALIGNEMENT AND SETTING		
N°	**Symbol**	**Function**
1	S3	Button to accept data in alignment operation and to write parameter in setting operations

RECEIVER FUNCTION SWITCH SW1		
N°	**Symbol**	**Function**
1	SW1	10 positions functions rotary switch: Position 1 = Barrier alignment Position 2 = acquisition, of the installation values (Channel number and AGC Voltage) Position 3 = Prealarm thresholds Read/Write Position 4 = Alarm thresholds Read/Write + Walk-Test Position 5 = Masking thresholds Read/Write Position 6 = Upper Prealarm thresholds Read/Write (FSTD) Position 7 = Lower Prealarm thresholds Read/Write (FSTD) Position 8 = Barrier number Read/Write Position 9 = Alignment procedures ending (balanced line Active) Position 0 = Alignment procedures ending (balanced line Inactive)

PARAMETERS AND BARRIER NUMBER READING AND SETTING SWITCHES SW2- SW3		
N°	**Symbol**	**Function**
2	SW2	Decimal rotary switch to read or to set parameters during the alignment operations (units column)
2	SW3	Decimal rotary switch to read or to set parameters during the alignment operations (tens column)

3.2 Equipment Connection to the Power Supply

Even if the equipment is Direct Current powered (13,8 V⎓), they still operate properly, but it is advisable to power it by Alternating Current (19 V~) or (24 V⎓).

3.2.1 Connection to the Power Supply

The connection between the equipment and the transformer must be as short as possible (less then 4 meters), and the section of the conductor must not be less than 1.5 mm².. The connection between the transformer and the 230 V~ mains will be as that of the previous one.The power supply cables connecting transformer with equipment, must be of shielded type with shield connected to ground. The connection between unit and the power supply must be realised with cables of correct section, the cables section must be computed keeping in account connection length and unit current absorption. For the power supply connection (Alternating Current) 19V~, to make connect term 1/2 on the terminal strep MS2 of the Rx and Tx circuit.
The included **ferrite** shall be installed on the power input cable 19V~ (2 turns)
The protection fuse is F2 is 2 A (T2A) slow-blow type
Use only safety **transformers** with the following characteristics:

- primary voltage: 230 V~
- secondary voltage 19 V~
- minimum power 30 VA

Remark: use only safety transformers (example Certified EN 60950)
Make sure to connect the body of the transformer to hearth tap.
The transformer connection to the main (230 V~), must be carried out through one circuit breaker having the following characteristics:

- bipolar with minimum distance between contacts equal to 3 mm
- provided in the fix part of cabling
- easily accessible

However laws and standards concerning installations of devices permanently connected to the main (230 V~), must be strictly respected (in Italy Law 46/90 and standard CEI 64-8).

Remark: if the barrier power supply is an external dc voltage (13,8V⎓), to avoid the activation of the fault contact, due to main missing for more than 3 hours, it's necessary to connect the positive incoming voltage (13,8V⎓), also to the terminal **1** or **2** of the terminal block **MS2** either on transmitter and receiver PCB

3.2.2 Connection of stand-by Battery

Into each equipment heads there is the housing for an optional rechargeable back-up lead Battery 12 V⎓ – 1.9 Ah (optional). The battery is charged by the internal power supply, through the red and black fastons and wires connected to the terminals 1 and 2 of the terminal block MS1 of the Rx and Tx circuit. The provided protection fuse (against overload and/or battery polarity inversion) F1 is 2A (T2A) slow-blow type The back-up lead battery allows to the barrier head (TX or RX), at least 12 hours of perfect working, in case of mains missing.

Remark: package, of the optional standby battery, must have a flame class equal or better than HB (UL 94 Standard).

3.3 Connection to the Control Panel

3.3.1 Alarm contacts: Alarm, Tamper, Fault

On transmitter and receiver PCB are present 3 relays. These Relays are static with dry contacts normally closed. By means of these contacts it's possible to communicate to the control panel the following conditions:

- **ALARM, TAMPER, FAULT**

There are also 3 inputs to activate the following functions:

- **Test (TX and RX)**
- **Stand-by (TX and RX)**
- **Synchronism (only TX)**

The output contacts for alarm, tamper and fault, both on transmitter and receiver, are made by Static Relays with maximum current of 100 mA.

Remark: in closed condition the resistance of these contact is about 40 ohm.
The connections to control panel must be made by means of shielded cables.
The relays are activated for the following reasons:

- ALARM RELAYS

1- Pre-alarm on receiver **(Remark1)**
2- Intrusion alarm on receiver
3- Receiver masking condition alarm
4- Alarm of external detector connected at Auxiliary Balanced Line
5- Successful result of test procedure operation on receiver
6- Insufficient received signal (V RAG >6,99V)
7- Channel alarm.

- TAMPER RELAYS

1- Cover removing (radome) (TX and RX)
2- Tilt Bulb position (TX and RX)
3- Tampering of external detector connected at Auxiliary Balanced Line
4- Cut of Auxiliary Balanced Line
5- Short circuit of Auxiliary Balanced Line.

- FAULT RELAYS

1- Battery voltage low (< +11V⎓)
2- Battery voltage high (> +14.8V⎓)
3- Temperature low (< -35°C internal)
4- Temperature high (> +75°C internal)
5- Fault of external detector connected at Auxiliary Balanced Line
6- RF (radio frequency) or BF (low frequency) Oscillator fault on Transmitter
7- Mains missing or power supply fault (more then 3 hours)

Remark 1: if the intrusion signal, after overcoming the pre-alarm threshold, stays for 40 sec between pre-alarm and alarm threshold, the barrier gives a "pre-alarm" event, and the alarm output is activate (the contact become opened).

3.3.2 Synchronism connection

For the Synchronism operation between two Transmitters, it is necessary to interconnect the terminals 2 **"SYNC"** and 1 **"GND1"** of terminal block MS3 of both Transmitters.
It is also necessary to select one Transmitter as "**Master**" and the other as "**Slave**", by means of jumper Jp1.

- Jp1 = **"IN"** position, the terminal 1 of MS3 is the input for an external synchronism signal, so the Transmitter is "**Slave**".
- Jp1 = **"OUT"** position, the terminal 1 of MS3 is the output for the synchronism signal internally produced, so the Transmitter is "**Master**"

Remark: the cable connecting the two transmitters, must be as short as possible and not more than 10 meters. If cables longer than 10 meters are required, it is necessary to use the synchronism repetition circuit mod. SYNC 01.

3.3.3 Stand-by connection

For the Stand-by function activation, it is necessary connect to ground the terminal 7 "STBY" of MS3 terminal block for the receiver circuit and connect to ground the terminal 7 "STBY" of MS4 terminal block for the transmitter circuit.

Remark: the Stand-by operation, doesn't inhibit the barrier functionality, but deactivate the record of events into "historical file" (TX and RX) and in the monitor file (RX).

3.3.4 Test connection

The Test function will be activated connecting to ground the terminal 8 "TEST" of the terminal block MS4 on Transmitter circuit. If the test procedure is successful done, the alarm relays on Receiver circuit will be activated later 10 second.

Remark: for high risk protection it's necessary a Periodic Test for the equipments. By means for these control panel will be able to detect tamper action. For the Test function activation it witch have Ermo-Test instrument; it's possible to test the microwave barrier, temporary switching-off the transmitter.

3.3.5 Balanced Line connection

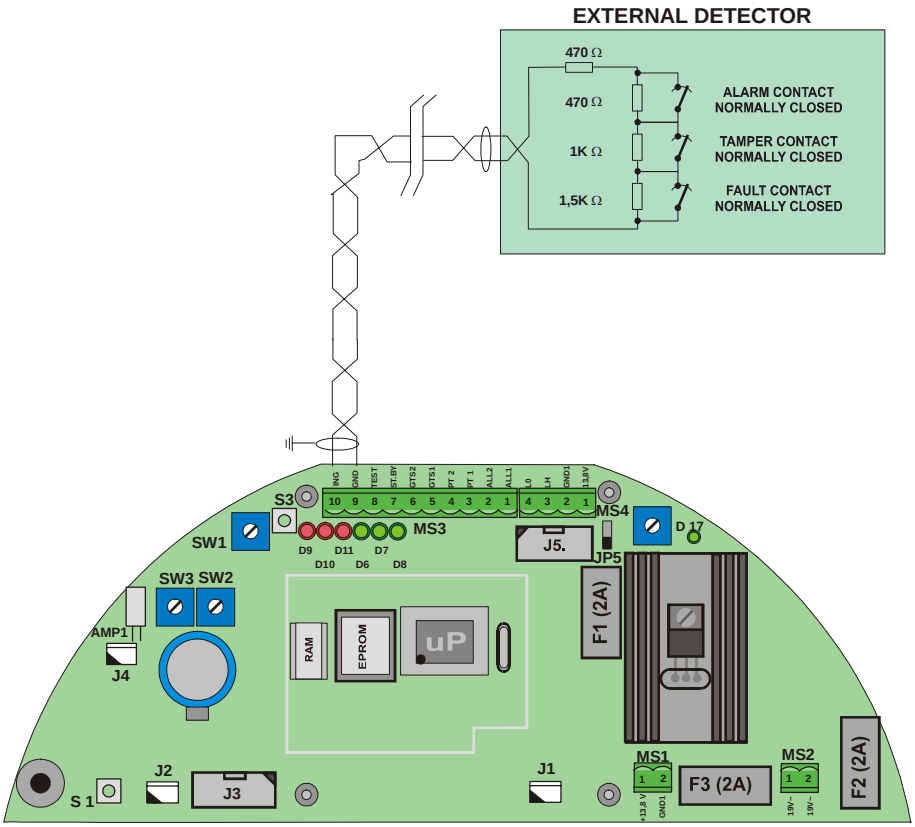
Either on transmitter and receiver PCB is provided a Balanced input were it's possible to connect an external detector and manage its activity trough each head (TX or RX). To activate this function on the TX PCB, it's necessary to open Jp5 jumper. To activate this function on the RX PCB, it's necessary to end the alignment procedure, leaving the function selector SW1 in position 9 instead of 0. The balanced inputs are provided at terminals 10 (ING) and 9 (GND) on terminal block MS4 of the transmitter PCB, and MS3 of the receiver PCB. By these inputs it's possible to manage the following conditions of external detectors:

- rest condition of external detector
- alarm condition of external detector
- tamper condition of external detector
- fault condition of external detector

In addition it's possible to manage the following conditions:

- Line cut condition of the wires connecting the external detector at TX or RX PCB
- Short Circuit condition of the wires connecting the external detector at TX or RX PCB

To manage all these conditions it's necessary to use weighting resistors connected like that showed in the following picture.



In the following table are indicated the voltage values present at balanced inputs for the possible, detector and line, conditions. It is possible to read this values, also by means of MWA TEST SW in the "Analogue values" window. **(PC in local or remote connection)**

CONDITIONS	INPUT VOLTAGE [V dc]		
	Min.	Average	Max.
LINE CUT	4.5	-	5
FAULT	3.5	4	4.5
TAMPER	2.5	3	3.5
ALARM	1.5	2	2.5
REST	0.5	1	1.5
LINE SHORT CIRCUIT	0	-	0.5

3.4 Serial Line RS-485

3.4.1 RS - 485 / 232 Network Connection Interface

A standard RS 485 serial interface is provided on both transmitter and receiver of the ERMO 482 X PRO barrier. The communication parameters are the following:

Mode:	Asynchronous - Half-Duplex
Baud rate:	9600 b/s
Character length:	8bit
Parity control:	No Parity
Stop bit:	1

3.4.2 RS -485 Serial Line connections

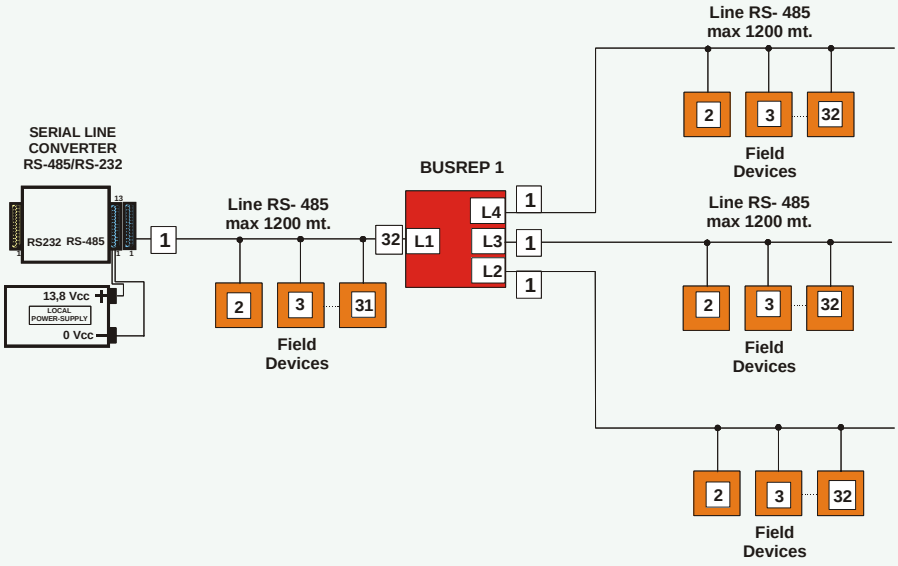
The way of laying down the cable must be “multidrop” type (BUS), and the derivations for units connection as short as possible. It is possible to use others cabling configurations like:full Star type, mixed, Star and BUS type. Connect to the terminal 4 “LO” (“RS 485 –“ negative data line); to the terminal 3 “LH” (“RS 485+” positive data line) and to the terminal 2 “GND1” (data ground line) of the terminal block MS4 for the Receiver PCB and MS5 for the Transmitter PCB. To connect a PC on serial line is necessary to use a serial line converter RS 485/232 included in MWA TEST sw.

Cable for connection of all the heads Rx and Tx To the maintenance P. C. with MWA TEST Software			
Connector interface MS4(Tx), MS5(Rx	**Connector 25 pin**		
N°	**N°**	**Symbol**	**Function**
1	**12**	+13,8	Power supply (13,8 VDC) per for 485/232 converter
2	**9**	GND	Ground data and power supply for 485/232 converter
3	**10**	LH 485	High Line for RS 485
4	**11**	LO 485	Low Line for RS 485

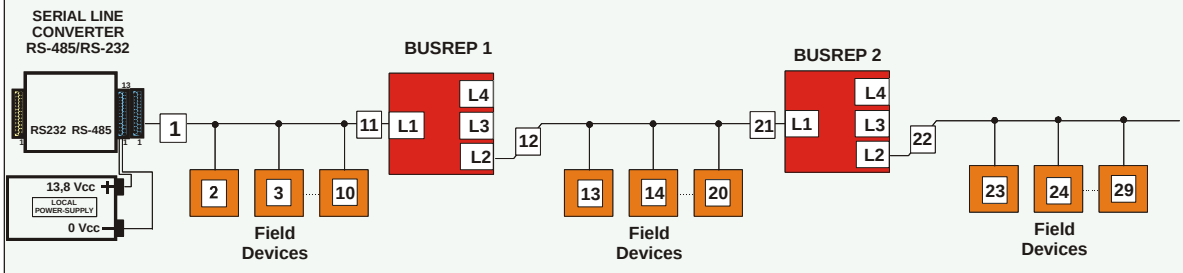
3.4.3 Network Configuration and Signal Repeaters

The interconnection cable concerning barrier management through a remote P.C. must be suitable for a RS485 serial data line, i.e., it must be a **low capacity cable with 3 twisted and shielded leads (70 pF/mt**.) for example “Belden 9842”.The limit distances of the RS 485 connection is 1200 meters. For longer distances use one or more interface Regenerators (BUS REP), see figure 11. The way of laying down the cable must be of BUS type, and the derivations for units connection as short as possible. It is possible to lay down the cable in different manner: full stellar; mixed, stellar and BUS type, using Repeaters / Regenerators and interface multipliers (BUS REP), see figure 11. The total number of units (Tx and Rx) that can be connected to the line are 32, for an higher number of units, it is necessary the use of one or more line regenerator RS 485, this is true also in case of cable length lower than 1200 metres. Screen connection continuity must be guaranteed to properly protect the cited line from induced noise. To this concern the screen will have to be GROUNDED only in one point, i.e., near the power supply unit. The power supply voltage to the RS485 / RS 232 interface converter must be delivered by a local power supply unit, which will have to be placed near the converter proper For the central COM-BS connection, the serial line coming from the barriers can be used directly without any conversion.

"STAR" NETWORK ARCHITECTURE USING "BUSREP" AS A MULTIPLIER



The figure shows a system which requires a RS 485 serial line with several branch loops("Star" network architecture) This architecture is created using a BUSREP as a multiplier.The 4 resulting sections can be up to 1,200 mt. long each and a maximum of 32 devices,including the BUSREP, can be connected to each one. The first section includes the seriale line converter



The figure shows a system which requires a RS 485 serial line that is longer than 1,200 metres. Using two BUSREPs as regenerators, it was divided up into 3 sections each of which was shorter in length. In this case there are less than 32 field devices, but they can be distributed on 3,600 metres-long line.

4. ADJUSTMENT AND TESTING

4.1 Adjustment and Testing

A built in electronic alignment, parameter set and test tool, is provided in the receiver head of the ERMO 482X PRO barrier. This is a very useful system both for installation and periodical maintenance.

4.1.1 Transmitter Setting-up

To remove the radome unscrew the 6 screws until they turn loose, then release them out gently without remove them completely. Rotate the radome anticlockwise (about 20°) and release it. To close the MW head, fit the radome to it keeping the central logo rotated 20° anticlockwise. Rotate the radome clockwise till the central logo is correctly positioned and then tight the 6 screws.

- Check the a.c. power voltage (19 V~) or d.c. (24 V⎓) at terminals 1 and 2 on terminal block MS2 (Fig. 7).
- Disconnect the battery and check on the “fastons” the d.c. power supply voltage presence (13.8V⎓).
- Reconnect the “fastons” to the battery paying attention to the polarity:
  red wire (terminal 1 of MS2) to battery positive terminal
  black wire (terminal 2 of MS2) to battery negative terminal.

  Remark: any battery polarity reversal, blows the relative fuse (F2). The equipment will operate properly after having correctly inserted the “fastons” and after having replaced the blown fuse (T2A).

- Select, one of the 16 modulation channel available, by the hexadecimal switch (within 0 and F). To increase the resistance to tampering actions, it is a good rule to preset different channels for the different barriers installed in the same site. The use of different channel doesn’t affect the detection ability of the barrier.

  Remark: if one RX receives MW signal from its own transmitter and from another interfering transmitter (for example due to reflections or any other field reason), it is necessary to synchronize the two transmitters, selecting one as Master and the other as Slave. In this case the modulation channel, for the slave transmitter, is the same selected on the Master regardless its own selection.

  It is possible to **address** each Transmitter Head thanks to the selectors SW2 and SW3.
  How to write the address in the TX head: it is enough to select a number between **01** and **99** (00 means barrier 100), by the two rotary switches **SW2** (units column) and **SW3** (tens column).
- Close the radome. To do this operation place the Radome near the back cover, keeping the central logo rotated anticlockwise of 20°. Before to close the head ensure that the tilt switch is vertically positioned. Then fit the front cover to the back cover and rotate it clockwise until the central logo will be correctly positioned and tighten the screws.

4.1.2 Receiver Setting-up

- To remove the radome unscrew the 6 screws until they turn loose, then release them out gently without remove them completely. Rotate the radome anticlockwise (about 20°) and release it. To close the MW head, fit the radome to it keeping the central logo rotated 20° anticlockwise. Rotate the radome clockwise till the central logo is correctly positioned and then tight the 6 screws.
- Check the a.c. power voltage (19 V~) or d.c. (24 V⎓) at terminals 1 and 2 on terminal block MS2 (Fig. 8).
- Disconnect the battery and check on the "fastons" the d.c. power supply voltage presence (13.8Vdc).
- Reconnect the "fastons" to the battery paying attention to the polarity:
  red wire (terminal 1 of MS2) to battery positive terminal
  black wire (terminal 2 of MS2) to battery negative terminal.

Remark: any battery polarity reversal, blows the relative fuse (F2). The equipment will operate properly after having correctly inserted the "fastons" and after having replaced the blown fuse (T2A).

- To make the barrier alignment and parameters setting of the barrier using the built in tool, make a preliminary visual mechanical alignment see the following instructions:

a. Be sure that the tamper switch is activated (Open circuit)

b. Select by the "function switch" **SW1 position 1**. The electronic alignment phase is activated.

c. Push S3 button. This action adjust the signal level and freeze, after some seconds, the Automatic Gain Control. In that condition red leds D9, D10, D11 will be ON and green leds D6, D 7, D8 will be OFF, and the buzzer BZ1 will produce a pulsed sound, this means that the field signal has reached the proper working level.

d. Unscrew lightly the bracket screws and move the horizontal alignment of the receiver, looking for the maximum received signal.

e. If, during the alignment, one or more green leds become ON means that the received signal level is increased compared with the previous. In this case also the pulse frequency of the sound produced by the on board buzzer, increase. Push again the button S3 and when the green leds become OFF (proper working level), move horizontally in the same direction.
   If during the movement for the alignment, instead of become ON the green leds, become OFF one o more red leds, and the pulse frequency of the sound produced by the buzzer, decrease, means that the received signal level is decreased compared with the previous, so it is necessary to move back in the other horizontal direction and look for a better received signal. If there is not a new maximum level, means that the present horizontal alignment is the best.

f. Unscrew lightly the bracket screws of the transmitter and move the horizontal alignment, looking for the maximum received signal on the receiver head like indicated in the previous point "e".

g. Once the best alignment is reached (maximum signal available), screw strongly the bracket screws, both on transmitter and receiver, to block the horizontal movement.

h. Unblock the vertical movement of the receiver and move it slightly upward. Push S3 button and then move the head downward looking for the maximum signal like indicated in the previous point "e".

i. Unblock the vertical movement of the transmitter and repeat the operation described for the receiver vertical alignment. Once the best vertical alignment is reached (maximum signal available), block the vertical movement both on transmitter and receiver.

j. Select by the "function switch" **SW1 position 2**. The acquisition, of the installation values, phase is activated. The installation values are the AGC voltage (V RAG) and the modulation channel number. To complete the phase it is necessary to be sure that nothing change the MW field state (for example the installer himself), then push the button **S3** and wait few seconds. When only the three green leds become ON, the phase is successfully completed. If also the three red leds become ON means that the barrier will works but the signal received was bed (too much noise or something interfering in the MW field). Push again the button S3 been sure that nothing interferes. If only the three red leds become ON the phase is completely aborted, it is necessary to repeat the alignment phase, starting from the previous point "e", being sure that no obstacles are present in the MW field.

k. Select by the "function switch" **SW1 position 3**. The **prealarm thresholds** adjusting phase is activated. The two prealarm thresholds are set under and over the rest field value. The analysis process begin when the field value, overcomes one of them. If the field value remain between the prealarm and the alarm threshold continuously for about 40 seconds, a prealarm event is generated and the alarm relay is activated.
   To **read** the present prealarm threshold value operate as follow:
   - Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
   - Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

   The reading values will be included between 01 and 80 (**default value 15**) Decreasing the threshold value the sensitivity increase like the beam dimension.
   To **modify** the present value increasing the sensitivity it is necessary to set, by means of the two switches SW3 and SW2 a lower value and then push the button S3. To decrease the sensitivity, it is necessary to set by means of the two switches SW3 and SW2, a higher value and then push the button S3.

l. Select by the "function switch" **SW1 position 4**. The **alarm thresholds** adjusting phase and the **walk test** phase are activated. The two alarm thresholds are set under and over the rest field value. They are higher compared with the corresponding prealarm threshold, and are used to evaluate, at the end of the analysis process, if the field value change is enough to generate an alarm event.
   To **read** the present alarm threshold value operate as follow:
   - Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
   - Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

   The reading values will be included between 01 and 80 (**default value 30**)Decreasing the threshold value the sensitivity increase like the beam dimension.
   To **modify** the present value increasing the sensitivity it is necessary to set, by means of the two switches SW3 and SW2, a lower value and then push the button S3. To decrease the sensitivity, it is necessary to set, by means of the two switches SW3 and SW2, a higher value and then push the button **S3**. During this phase (**SW1 position 4**) it is also possible to make the walk test. The barrier works using the present thresholds, and any change in MW field strength received (for example due to an intruder moving in the sensible beam), causes the activation of a pulsed sound produced by the on board buzzer. The pulse frequency is proportional to the level change of the received microwave signal. If the pulse frequency increases it means that, the level change of the received microwave signal, is increased and therefore, it means, that the intruder is penetrated, deeply, in the protection beam. If at the end of the analysis process, an alarm event is generated, the sound of the buzzer become continuous (not pulsed). This allow to check the actual dimension of the protection beam an also to verify if something movable in the protected area, like not well fixed fences, can produce some trouble.

m. Select by the "function switch" **SW1 position 5**. The **masking thresholds** adjusting phase is activated. The two masking thresholds are set under and over the installation absolute field value (VRAG) memorized during the phase 2 (see previous point j). They are used to check if the changes of the absolute microwave field received are so large to decrease or cancel the detection ability of the barrier. A thick layer of snow can produce this kind of changes, but someone can produce them intentionally, in order to mask the receiver.
To **read** the present masking threshold value operate as follow:
- Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
- Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

The reading values will be included between 01 and 80 (**default value 60**)
Decreasing the threshold value the sensitivity of the anti masking evaluation increase. To **modify** the present value increasing the sensitivity (smaller changes produce masking alarm) it is necessary to set, by means of the two switches SW3 and SW2, a lower value and then push the button S3. To decrease the sensitivity (bigger changes produce masking alarm), it is necessary to set, by the two switches SW3 and SW2, a higher value and then push the button S3.

n. Select by the "function switch" **SW1 position 6**. The **higher prealarm threshold** adjusting phase is activated. During the phase k the two prealarm thresholds are positioned at the same value. Increasing the value of the higher prealarm threshold, it is possible to activate the **Fuzzy Side Target Discrimination (FSTD)**, system. This unique system present in ERMO 482x PRO barriers, allows to filter or completely reject, signals generated from something moving on both side of protection beam, for example: not well fixed fences or bushes. The resulting beam has an ellipsoidal shape.
To **read** the present higher prealarm threshold value operate as follow:
- Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
- Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

The reading values will be included between 01 and 80 (**default value 15**), and is the same set at point k.
Increasing the higher prealarm threshold value the side sensitivity decrease like the side beam dimension. To decrease the side sensitivity, it is necessary to set by
means of the two switches SW3 and SW2, a higher value and then push the button S3 Select by the "function switch" SW1 position 7. The higher alarm threshold adjusting phase is activated. As at previous point "n", to activate the Fuzzy Side Target Discrimination (FSTD) system, it is necessary increase also the higher alarm threshold (generally the same quantity changed in previous point n)
To **read** the present higher prealarm threshold value operate as follow:
- Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
- Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

The reading values will be included between 01 and 80 (**default value 30**), and is the same set at point k.
Increasing the higher alarm threshold value the side sensitivity decrease like the side beam dimension. To decrease the side sensitivity, it is necessary to set by
means of the two switches SW3 and SW2, a higher value and then push the button S3.

o. Select by the "function switch" **SW1 position 8**. The **barrier number** setting phase is activated. To communicate by the standard RS 485 serial interface provided on receiver of the ERMO 482 X PRO barrier, it is possible to select one different barrier number for each receiver installed in the specific site. This allows to communicate through the same bus with the different barriers.

To **read** the present barrier number selected operate as follow:

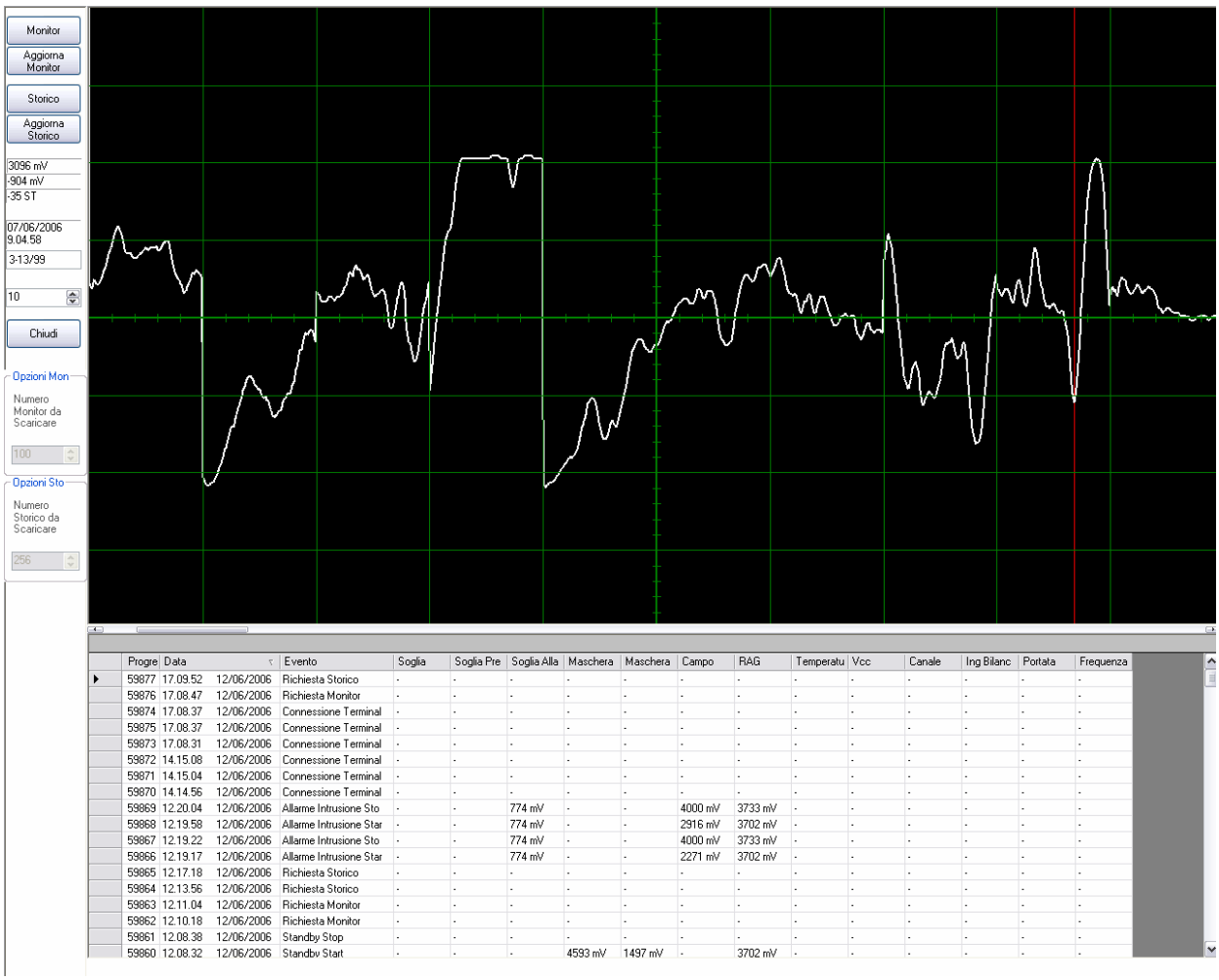
- Rotate decimal switch **SW3** (tens column) until the first red led (**D9**) becomes ON .
- Rotate decimal switch **SW2** (units column) until the second red led (**D10**) becomes ON .

The reading values will be included between 01 and 99. The value 00 means barrier 100, this is the default value, used when a fatal error occurs and the default parameters are automatically used. To modify the present barrier number it is necessary to set, by means of the two switches SW3 and SW2 a new value and then push the button S3.

p. On the receiver PCB is provided a **balanced input** were it's possible to connect an external detector and manage its activity trough the head. To activate this function on the RX PCB, it's necessary to end the alignment procedure, leaving the function selector in position 9 (balanced line active) instead of 0 (balanced line inactive). The alignment procedure is closed when the radome will be closed and the tilt switch results in vertical position.

4.2 Adjustment and Testing with Software

Use a PC with **WAVE-TEST CIAS** program so as to view and manage all the software parameters of the barrier, including the analogue levels of the thresholds and of the received signal. The connections and/or software functions management procedures are specified in this program's technical documentation.



Progre	Data		Evento	Soglia	Soglia Pre	Soglia Alla	Maschera	Maschera	Campo	RAG	Temperatu	Vcc	Canale	Ing Bilanc	Portata	Frequenza
59877	17.09.52	12/06/2006	Richiesta Storico	-	-	-	-	-	-	-	-	-	-	-	-	-
59876	17.08.47	12/06/2006	Richiesta Monitor	-	-	-	-	-	-	-	-	-	-	-	-	-
59874	17.08.37	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59875	17.08.37	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59873	17.08.31	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59872	14.15.08	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59871	14.15.04	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59870	14.14.56	12/06/2006	Connessione Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-
59869	12.20.04	12/06/2006	Allarme Intrusione Sto	-	-	774 mV	-	-	4000 mV	3733 mV	-	-	-	-	-	-
59868	12.19.58	12/06/2006	Allarme Intrusione Star	-	-	774 mV	-	-	2916 mV	3702 mV	-	-	-	-	-	-
59867	12.19.22	12/06/2006	Allarme Intrusione Sto	-	-	774 mV	-	-	4000 mV	3733 mV	-	-	-	-	-	-
59866	12.19.17	12/06/2006	Allarme Intrusione Star	-	-	774 mV	-	-	2271 mV	3702 mV	-	-	-	-	-	-
59865	12.17.18	12/06/2006	Richiesta Storico	-	-	-	-	-	-	-	-	-	-	-	-	-
59864	12.13.56	12/06/2006	Richiesta Storico	-	-	-	-	-	-	-	-	-	-	-	-	-
59863	12.11.04	12/06/2006	Richiesta Monitor	-	-	-	-	-	-	-	-	-	-	-	-	-
59862	12.10.18	12/06/2006	Richiesta Monitor	-	-	-	-	-	-	-	-	-	-	-	-	-
59861	12.08.38	12/06/2006	Standby Stop	-	-	-	-	-	-	-	-	-	-	-	-	-
59860	12.08.32	12/06/2006	Standby Start	-	-	-	4593 mV	1497 mV	-	3702 mV	-	-	-	-	-	-

5. MAINTENANCE AND ASSISTANCE

5.1 Troubleshooting

In case of false alarm, check the parameters recorded during the **Installation** phase (on attached **Test Sheet**), if there are divergences with permitted limits check again the related points in chapter "Adjustment and Testing (4)"

Defect	Possible Cause	Possible Solution
Main Power supply LED off Tx and/or Rx	Power Supply 19 V~ or 24V⎓ missing	Check out the Primary and Secondary power supply of the Transformer
	Connections broken	Ad just the connections
	Power Supply circuit broken	Change the Electronic board
Fault Led OFF	Power too high or too low	Check the battery voltage and the power supply
	Temperature too high or too low	Check the temperature of the barrier
	Tx Oscillator Fault	Change the Oscillator
	Tx or Rx failures	Change the Electronic board
Alarm Led OFF	Movement or obstacles in the protected field	Check out that the protected field is free from obstacles and free from objects and/or person moving.
	Barrier not properly aligned	Re do the alignment procedure as described in points: a,b,c,d,e,f,g,h,i of charter 4.1.2
	Wrong channel selections	Do again the Channel acknowledge procedure as described in point j of charter 4.1.2
	Alarm of sensor connected on the balanced line input.	Check out the sensor connected to the balanced line input. If no sensors are connected ensure to finish the installation with selector SW3 in position 0. See chapter 4.1.2 point q,
High AGC Voltage	Barrier not properly aligned	Re do the alignment procedure as described in points: a,b,c,d,e,f,g,h,i of charter 4.1.2
	obstacles in the protected field	Remove obstacles
	Too low signal transmitted	Check the transmitter
	Rx circuit fault	Change the Rx circuit
	Rx MW part fault	Change the RX MW part
Tamper Led OFF	Micro switch open	Check the micro switch position
	Tilt bulb in wrong position	Check the position of the tilt bulb
Fault Led Off only on TX circuit	BF Oscillator Fault	Change the TX circuit
	MW oscillator Fault	Change the MW part

5.2 Maintenance kits

The **Maintenance Kits** are composed by circuits equipped with microwave cavities, their substitution is very easy:
Unlock the only one fixing screw and install the new circuit into related plastic guides present on the bottom box.
The circuit and cavity substitution on boot transmitter and receiver heads doesn't changes the heads alignment, and so no new alignment is required

6. CHARACTERISTICS

6.1 Technical characteristics

TECHNICAL CARACTERISTICS	Min	Nom	Max	Note
Frequency	9,46 GHz		24,25 GHz	-
Maximum power	20mW		500 mW	e.i.r.p.
Modulation	-	-	-	on/off
Duty-cycle	-	50/50	-	-
Number of channels	-	-	16	-
Range:				
ERMO 482X PRO/50	-	50 m	-	-
ERMO 482x PRO/80	-	80 m	-	-
ERMO 482x PRO/120	-	120 m	-	-
ERMO 482x PRO/200	-	200 m	-	-
ERMO 482x PRO/250	-	250 m	-	-
Power supply (V ~)	17 V	19 V	21 V	-
Power supply (V ⎓)	11,5 V	13,8 V	16 V	-
Current absorption TX in surveillance (mA ~)	-	159	-	-
Current absorption TX in alarm (mA ~)	-	150	-	-
Current absorption RX in surveillance (mA ~)	-	170	-	-
Current absorption RX in alarm (mA ~)	-	160	-	-
Current absorption TX in surveillance (mA ⎓)	-	80	-	-
Current absorption TX in alarm (mA ⎓)	-	73	-	-
Current absorption RX in surveillance (mA ⎓)	-	90	-	-
Current absorption RX in alarm (mA ⎓)	-	84	-	-
Housing for battery	-	-	-	12Vn/1,9Ah
Intrusion alarm contact (TX+RX)	-	-	100mA	C-NC
Radome removal contact (TX+RX)	-	-	100mA	C-NC
Fault contact (TX+RX)	-	-	100mA	C-NC
Intrusion alarm (TX+RX) Green LED ON	-	-	-	Not active
Radome removal (TX+RX) Green LED ON	-	-	-	Not active
Fault alarm (TX+RX) Green LED ON			-	Not active
Threshold adjustment	-	-	-	On board + SW
Weight without battery (TX)	-	2930 g	-	-
Weight without battery (RX)	-	2990 g	-	-
Diameter	-	-	305 mm	-
Deep, brackets included	-	-	280 mm	-
Working temperature	-25 °C **	-	+55 °C **	-
Performance level	3°	-	-	-
Box protection level	IP55	-	-	-

****** The manufacturer declares that the operational working temperatures for this device are included within the range -35°C /+65°C

6.2 Functional Characteristics

1)	Analysis	Signal processing according to behaviour model.
2)	Analysis	Modulation channel frequency processing (16 channels)
3)	Analysis	Absolute received signal value processing, To guarantee the S/N optimal value (Low level signal).
4)	Analysis	Absolute received signal value processing, for fault detection, behaviour deterioration, masking.
5)	Analysis	Signal trend to select various cases of AGC behaviour..
6)	Analysis	DC Power supply voltage processing (battery charger), High or Low.
7)	Analysis	AC Power supply voltage processing, Presence or Absence.
8)	Analysis	Ambient temperature processing, detection of permitted working range
9)	Analysis	Tampering of Tx and Rx heads.
10)	Availability	Stand-by input control, for monitor adjustment and historical inhibition, living always active the alarm status generation.
11)	Availability	Test input control, to procure on receiver the alarm relay activation in case of positive result.
12)	Availability	Auxiliary balanced line allowing connection of additional sensor. Over two connection conductors between sensor and Tx or Rx head. The capability is to discriminate the following events: alarm, tamper, fault , line cutting, line short circuit
13)	Activation	Three static relay output for alarm, tamper, fault on receiver and transmitter.
14)	Activation	Three signalling LED for alarm, tamper, fault on receiver and transmitter
15)	Activation	Synchronism signal output of transmitter for the other transmitters synchronization
16)	Activation	Synchronism signal input on transmitter for the local transmitter synchronization
17)	Availability	Output terminal block for the battery 12 V/2 Ah connection in case of mains absence.
18)	Availability	16 positions switch for modulation channel frequency choice. During the installation phase the receiver identifies and store automatically which channel must be used during working phase.
19)	Availability	Lithium battery on transmitter and receiver for data storage, also in case of power supply completely OFF
20)	Availability	Calendar watch on transmitter and receiver, for the event storage timing. Booth for analogue events monitoring and historical events record.
21)	Availability	Historical event records on transmitter and receiver, for the last 256 events (RX) 128 (TX) occurred, with the value (if any), data, time and event types indication. The data acquisition can be done with WAVE-TEST software, the data will be stored in historical files (for read and print).
22)	Availability	Up to 100 event records (2.5 seconds each) stored in receiver memory, related to detected analogue signal if higher then user preset value (called monitor threshold).
23)	Availability	A default parameters set, for transmitter and receiver, to use whenever absent or if the self diagnosis detects a wrong parameter.
24)	Availability	connector on transmitter and receiver, for external measures
25)	Availability	P. C. connector on transmitter and receiver, for serial line RS485 connection, used with software WAVE-TEST for tests, settings and management of barrier.