CIRCUTOR

Remote Network Analyser

AirHANDZER

INSTRUCTIONS MANUAL

M98250801-03-13A

CE

Safety Warnings & Symbols

DANGER ⚡	Death, serious injury, or fire hazard could result from improper connection of this equipment. Read and understand this manual before connecting the equipment. Follow all installation and operating instructions while using the instrument.
	Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."
	Use always the required personal protective equipment

WARNING ⚠	Read the instructions manual before using the equipment.
	If the instructions preceded by this symbol are not met or applied correctly, this can cause personal injury or equipment and / or facilities damage.

Liability limitations

CIRCUTOR, SA reserves the right to make changes, without previous notice, to devices or specifications of equipment shown in this manual.

The term of the CIRCUTOR guarantee is two years from the date of purchase and is limited to refund of the purchase price, repair free of charge, or replacement of defective equipment that is returned to CIRCUTOR post-sales service within the term of the guarantee.

The latest versions of specifications and the most up to date manuals this equipment are available to CIRCUTOR, SA customers on its web site: www.circutor.com.

Recommendations prior to use

⚠	In order to use the equipment safely, it is critical that individuals who handle it, follow the safety measures set out in the standards of the country where it is being used, use the necessary personal protection equipment, and pay attention to the various warnings set forth in this instruction manual.

Before handling, modifying the connection or replacing the equipment, the power supply must be switched off, and the equipment disconnected.

It is important to use only the connection cables and accessories that are delivered along with the equipment . These products are specially designed for use with this apparatus and comply with current safety standards. Also, it is critical to keep the cables in perfect condition in order to avoid accidents, personal injury and damage to installations.

The manufacturer of the equipment is not responsible for any damages resulting from failure by the user or installer to heed the warnings and/or recommendations set out in this manual, nor for damages resulting from the use of non-original products or accessories or those made by other manufactures.

We recommend using only the original material delivered with the equipment in order to ensure the safety of individuals who handle it and the integrity of the equipment itself.

Inspect the work area before install. Do not use the device in dangerous areas or where there is a risk of explosion. Avoid using the device in wet areas

CONTENTS

1   GENERAL OVERVIEW

1.1   INITIAL CHECK OVER

Upon receiving the equipment, test the following points:
The equipment meets the specifications of your order
It has not been damaged during shipping.
The shipment includes the accessories requested from the manufacturer.

1.2   STANDARD COMPONENTS AND ACCESORIES

With the device you should receive 3 batteries AAA.

2   GENERAL FEATURES

The Remote Network Analyser (Z-HANDZER-M), hereinafter referred to as simply HandZer, is a device which provides aid in the installation, testing and maintenance of ZB-Connection networks. Its use is not necessary during normal operation of the network , but in the limited time of operation within a network, the HandZer works like a Router without the normal radio traffic maintenance functions.

Its role , from the physical location where it works, is essentially to identify which and how many Routers are reachable and what is radio signal level of each Router. Therefore it allows identifying whether the location chosen for installation of a new device is sufficiently covered by the infrastructure of the Routers already operating in the network.

See also the manual on ZigBee network Configuration (M98253901-40-13A)

3   TECHNICAL CHARACTERISTICS

Supply	
Battery	3 x AAA ; 1,5 Vcc

COMMUNICATIONS	
Radio standard	IEEE 802.15.4 compliant
RF range	2405 MHz ÷ 2480 MHz
Modulation	DSSS
RF transmission power	0 dBm (1mW)
Protocol	Stack EmberZNet3.5.x Stack version 0 Proprietary profile ID Proprietary encryption key

USER INTERFACE	
Display	63 x 33 mm

ENVIRONMENT FEATURES	
Working temperature	0 … 50 ºC
Storage temperature	-10 … 60 ºC
Relative humidity (without condensation)	95 %
Maximum altitude (m)	2.000
Pollution resistance	II
Degree of protection	IP40

MECHANICAL FEATURES	
Weight	171 g
Materials	Polycarbonate
Dimensions (mm)	165 x 75 x 25

STANDARDS	
General Legislation	99/5 EEC (R&TTE Directive) 2004/108 EEC (EMC Directive)
Electrical and radiation safety	EN 60950-1 (2006) +A11 (2009) EN 62479 – (2010)
Electromagnetic Compatibility	EN 61000-6-2 (2005) EN 61000-6-3 (2007)
Electromagnetic compatibility and Radio spectrum Matters (ERM)	ETSI EN 301 489-1 v1.8.1 ETSI EN 300 328 v1.7.1 ETSI EN 301 489-17 v1.2.1
Communications	IEEE 802.15.4 ZigBee , MiWi compatible

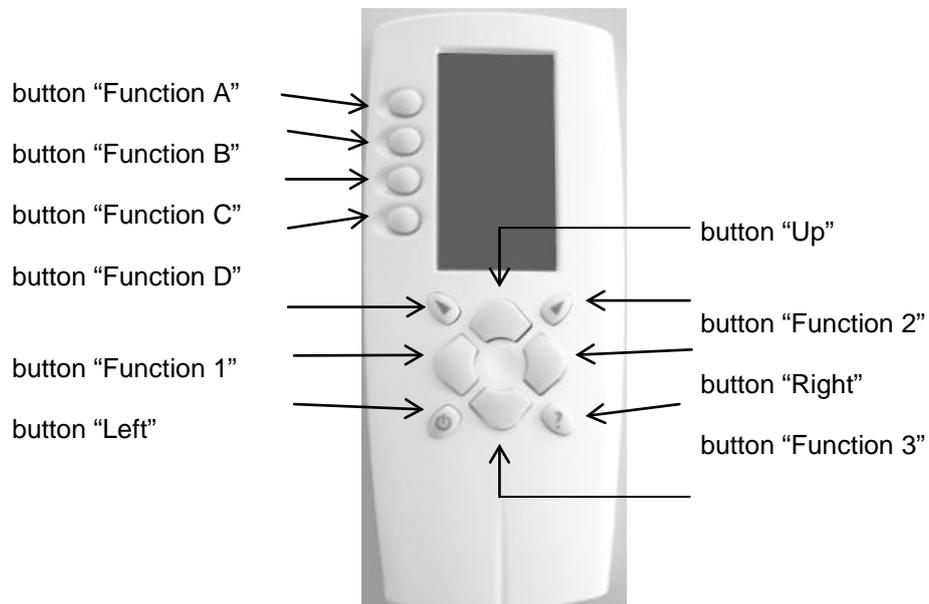## 4   DEVICE LAYOUT – BUTTONS NAME DEFINITIONS

Fig. 4-1.- Front view

5   START-UP SCREEN

After a reset, the HandZer shows the following screens in rapid succession:
- Whole screen black
- Boot loader screen
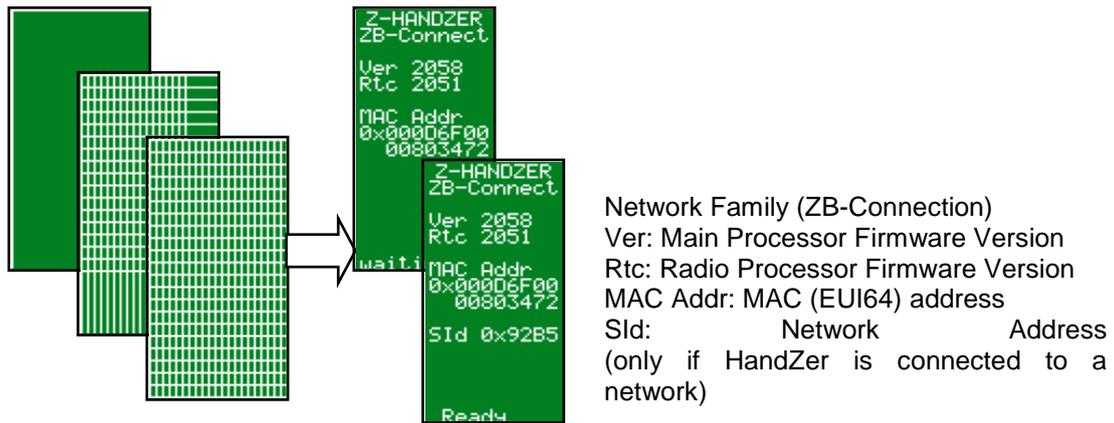- Start-up animation
- Firmware version screen.

Network Family (ZB-Connection)
Ver: Main Processor Firmware Version
Rtc: Radio Processor Firmware Version
MAC Addr: MAC (EUI64) address
SId: Network Address
(only if HandZer is connected to a network)

Fig. 5-1.- Start up screen

6 WORKING MODES

6.1 HANDZER NOT JOINED

If the device is not connected to any wireless network, it may join to a network or it can scan the energy of all the radio channels. Pressing the "Up" and "Down" changes the menu line selected, pressing the "Right" to activate the selected function.

The functions available in this mode are:

- Joining Scan   (menu "Join to Network")
- Network Scan   (menu "Network Scanning")
- Advanced Commands   (menu "Advanced Control")

Fig. 6-1.- Start up screen

6.2 HANDZER JOINED TO A NETWORK

If the device is connected to a compatible network (ZB-Connection) , and only in this mode, it can activate the testing task (Ping Test). Pressing the "Up" and "Down" keys it changes the menu line selected and pressing the "Right" key it activates the selected function.

The functions available in this mode are:

- Ping Test   (menu "Ping Test")
- Leave Network   (menu "Leave Network")
- Advanced Commands   (menu "Advanced Control")

Fig. 6-2.- Testing task

7 JOIN OPEN NETWORK (HANDZER NOT JOINED)

This process analyses all the 16 radio channels available, seeking a network compatible and opened. If a network is found, having a suitable characteristic, the HandZer attempts to join it. The duration of the whole process is, maximum, 25 seconds.
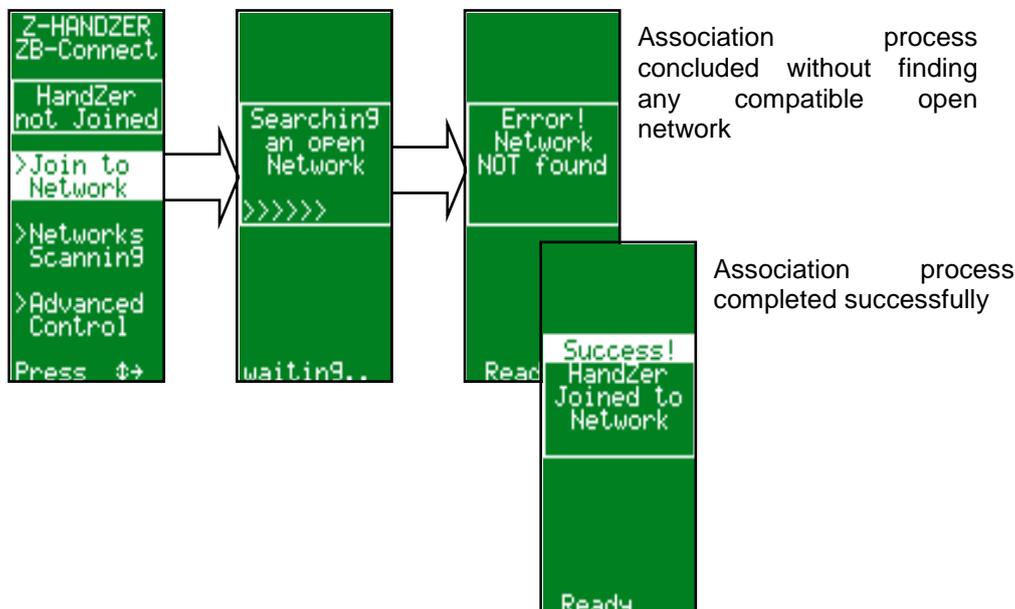
Association process concluded without finding any compatible open network

Association process completed successfully

Fig. 7-1.- Join to open network

8 NETWORK SCAN (HANDZER NOT JOINED)

Network Scan process analyses all the 16 radio channels available, seeking compatible networks. The duration of the whole process is approximately 20 seconds. At the end of the process the HandZer shows the list of the detected networks.
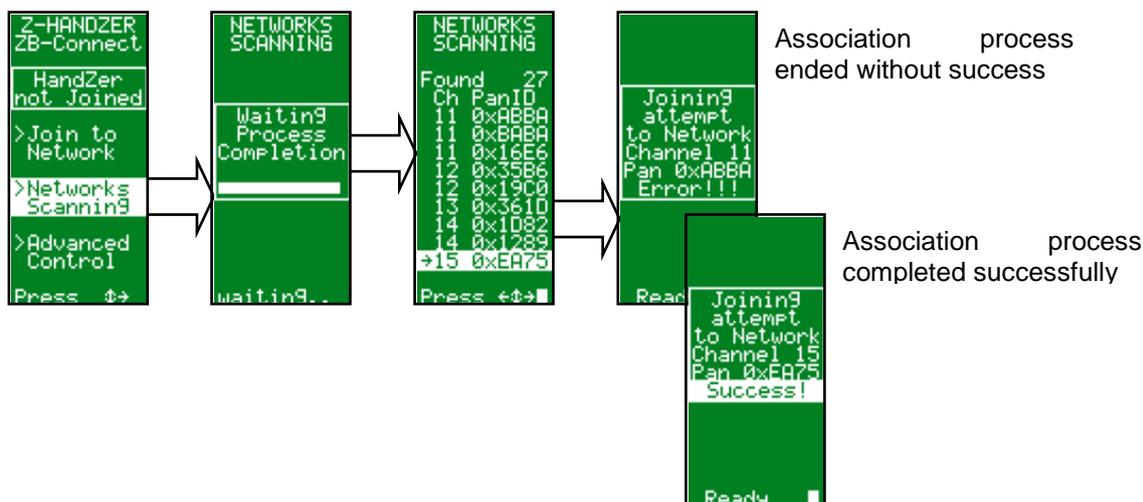
Association process ended without success

Association process completed successfully

Fig. 5-1.- Network scanning

Pressing the buttons "Up" and "Down" allows the choice of the desired network.
Pressing button "Left" returns to the main menu.
Pressing button "Right" executes the join attempt to the desired network.

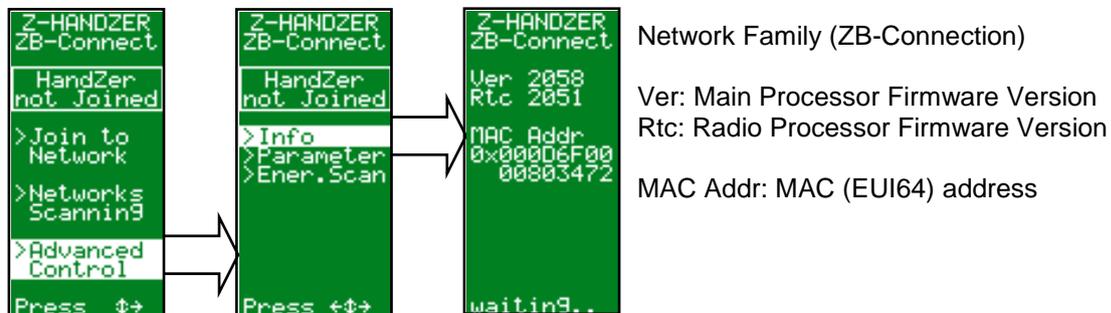# 9 ADVANCED COMMANDS (HANDZER NOT JOINED)

9.1 Information about airHANDZER

Network Family (ZB-Connection)

Ver: Main Processor Firmware Version
Rtc: Radio Processor Firmware Version

MAC Addr: MAC (EUI64) address

Fig. 9-1.- Advanced control: Info

9.2 HandZer Parameters

Setting the Contrast

Setting the Language (Italian / English)

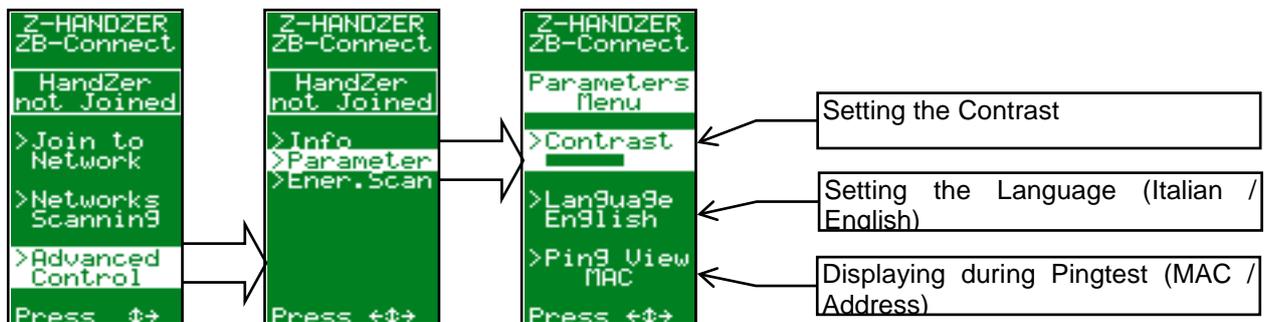Displaying during Pingtest (MAC / Address)

Fig. 9-2.- Advanced control: Parameters

9.3 ENERGY SCAN

Energy Scan process measures the maximum value of RSSI (Received Signal Strength Indication) found for each of the 16 radio channels. This value gives an indication of electromagnetic pollution level present in each channel. The duration of the whole process is approximately one minute.
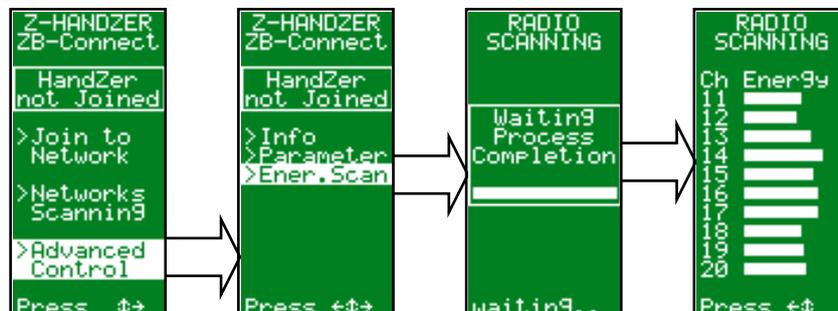

Fig. 9-3.- Advanced control: Energy scan

Pressing the buttons "up" and "down" the user can control the display scroll for displaying all values. Pressing button "left" returns to the main menu.

10 PING TEST (HANDZER JOINED TO A NETWORK)

Ping Test is the main task of HandZer.

With it, the user can know the router inside the range of action of HandZer which is operating in the same network where HandZer is joined. For each of the intercepted Routers, the level of radio signal with which HandZer receives messages is shown. Routers are presented with the logical address or the MAC address (only the 2 least significant bytes) depending on a parameter changed in the menu "Advanced Commands / Parameters".

An asterisk at the left of MAC address indicates that node is the coordinator

Routers
Presented with
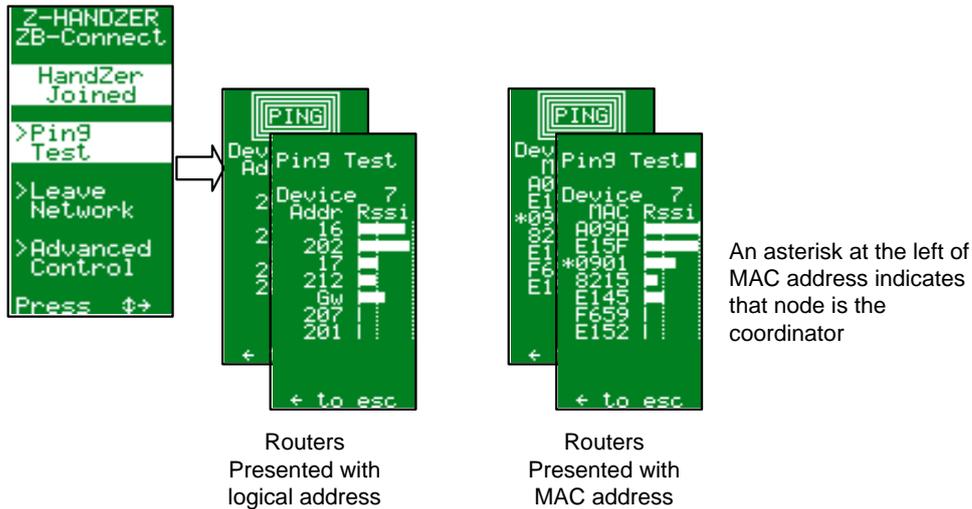logical address

Routers
Presented with
MAC address

Fig. 10-1.- Ping test

During the Ping Test, HandZer sends at regular interval (3 seconds) radio messages to all Routers in its range (broadcast request with unitary radius).

When this message is transmitted, a "PING" message appears in the high area of the display. Routers that receive this message respond with a message addressed to HandZer, this answer contains the Router address. Messages received by HandZer are used to update values displayed.

The three vertical lines, where the RSSI level is drawn, represent from left to right the values of -90dB, -80dB, -60dB. The intermediate line of -80dB represents the value below which the signal is considered to be poor and above which is considered to be good.

Signal indication detail

-90db   -80db   -60db

Fig. 10-2.- Signal level indicator
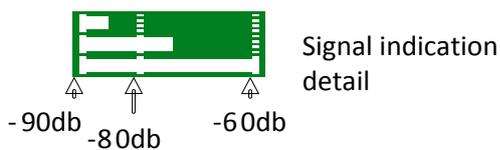
The Ping Test has a duration of four minutes, after which HandZer jumps back to the main menu. Alternatively, Ping Test may be terminated by pressing the "Left" button.

![CIRCUTOR logo]

11 DISASSOCIATION PROCESS (HANDZER JOINED TO A NETWORK)

Disassociation process causes HandZer to disconnect from the network where it was previously attached.
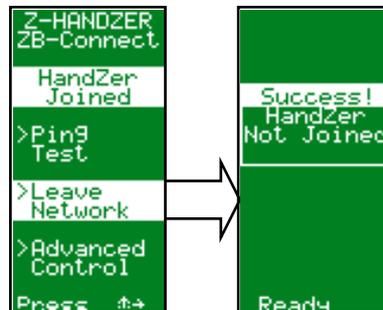

Fig. 11-1.- Disassociation

12 ADVANCED COMMANDS (HANDZER JOINED TO A NETWORK)
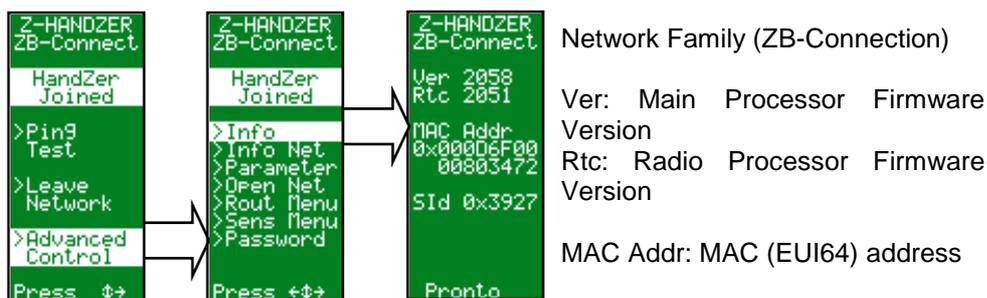
12.1 Information about HandZer

Network Family (ZB-Connection)

Ver: Main Processor Firmware Version
Rtc: Radio Processor Firmware Version

MAC Addr: MAC (EUI64) address

Fig. 12-1.- Advanced control: Info

12.2 Network Parameters

Radio Channel (number between 11 and 26)

PanID (address identification of the Network)
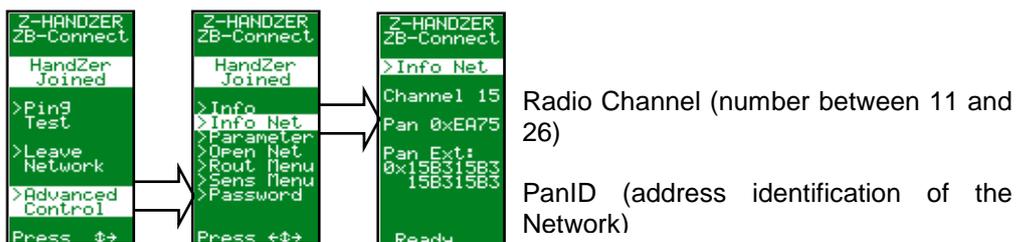
Fig. 12-2.- Advanced control: Network parameters

12.3 HandZer Parameters

Setting the Contrast
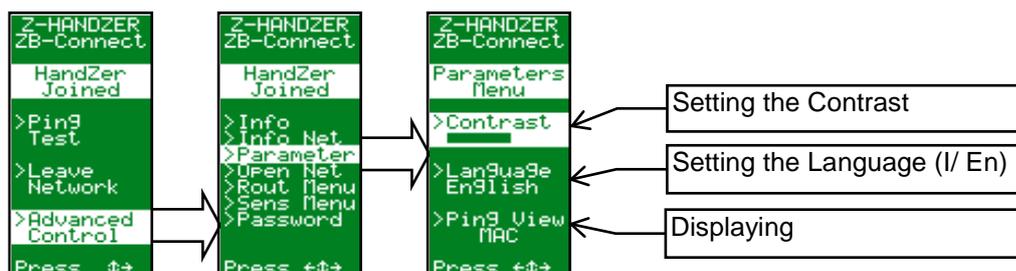
Setting the Language (I/ En)

Displaying

Fig. 12-4.- Advanced control: Other parameters

12.4 Opening a Network

This menu allows the user to send, cyclically to all routers, (including the Gateway/Coordinator) a message to open the network. During the state of openness, you can connect new devices to the network.

This state remains until there is a manual closing (pressing button "Left"), or automatically after 15 minutes. The activation of the menu is subject to the introduction of a value equal to the password of the gateway (if it is different from zero).
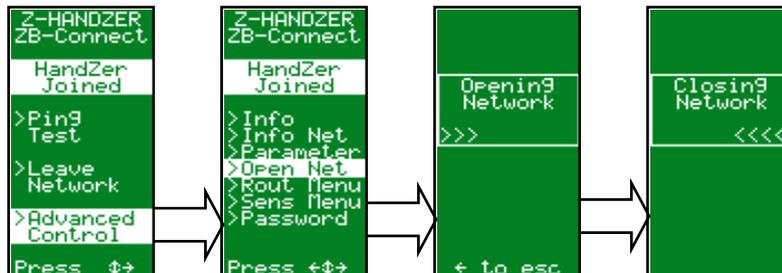

Fig. 12-5.- Advanced control: Opening a network

12.5 Router Menu

This menu allows the user to force the execution of some commands on the routers in the network.
Some of these commands can be sent simultaneously to all routers (broadcast messages) and some others can be sent to a specific router in proximity of HandZer (Unicast commands).

Broadcast commands are sent to all routers in the network. The available commands are:

- Reset All (Reset of all Routers). With this command devices perform a reset, the same as if they are switched off/on.
- Reini All (Re-Initialisation of all Routers). With this command the devices perform a re-initialization of the state of their annexation to the network, which causes the change of their network address (ShortID); This is only useful for diagnostic purposes.

The unicast commands are sent to a specific router present near HandZer (selected via menu). The available commands are:

- Information Menu : Here are shown some information about the selected router (firmware version, number of children End-Device, Modbus address, MAC address, Network Address (ShortID)).
- Reset One : With this command the selected router will reset, as if it is switched off/on.
- Leave One : With this command, the selected router will leave the radio network.
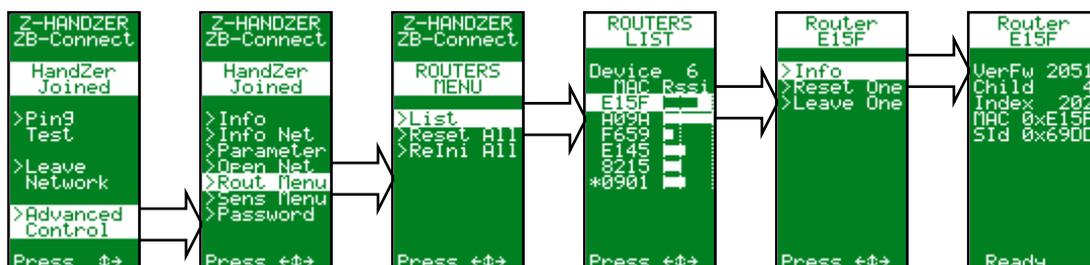

Fig. 12-6.- Router menu

12.6 Sensors Menu

This menu allows the user to force the execution of some commands related with the sensors in the network.
The available commands are:

- Sensor List : This command allows viewing the whole list of the sensors present in a network. For each individual sensor you can send a command to perform the following functions:
  o Information Menu
  o Reset One
  o Leave One

Sensors Addressing.
The sub-menu "Set Addr" allows assigning the Modbus address to special sensors (sensors without dip-switch). See paragraph 13 for more information.
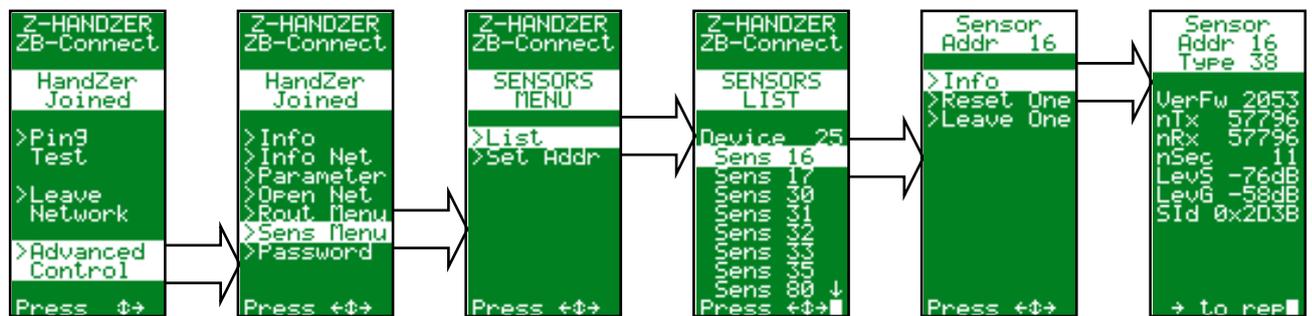

Fig. 12-7.- Advanced control: Sensor menu

12.7 SET PASSWORD MENU

This menu allows the programming of passwords in the Gateway.
Changing the password requires the prior introduction of its current value (if this is different from zero).
Allowed values for the password of the gateway are the numbers between 0 and 65534.
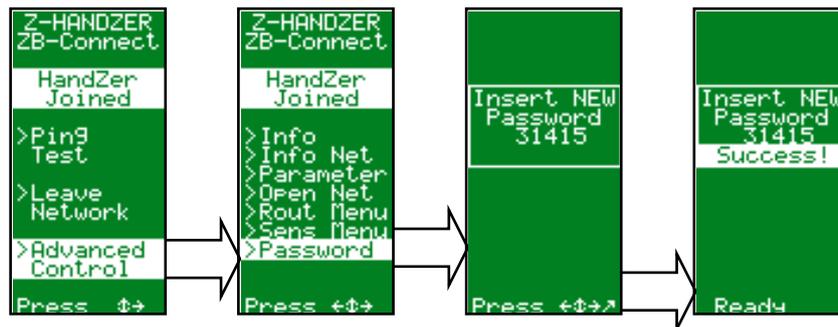
Fig. 12-8.- Advanced control: Set password menu

Setting a value other than zero protects the access to the menu "Open Network", menu "Router", menu "Sensor" and menu "Password" , which is subject to the introduction of a safety code which must be equal to the value of the password ; in this way these functions are protect against unwanted access.
The password values reside in the gateway, thereby also changing HandZer the access to these management functions is protected.

13 SETTING ADDRESSES FOR SPECIAL SENSORS (HANDZER JOINED TO A NETWORK)

This Menu allows the assignment of the Modbus address to special sensors (sensors without dip-switch). See Fig. 13-1

Choose "No" if the sensor is already part of the network (sensor already associated).
Choose "Yes" if the sensor has not yet been associated.

"Stimulate Sensor" message is flashing.

With this message HandZer requests that sensor is stimulated.

Process aborted by user.

Process aborted after two minutes

Detected compatible device
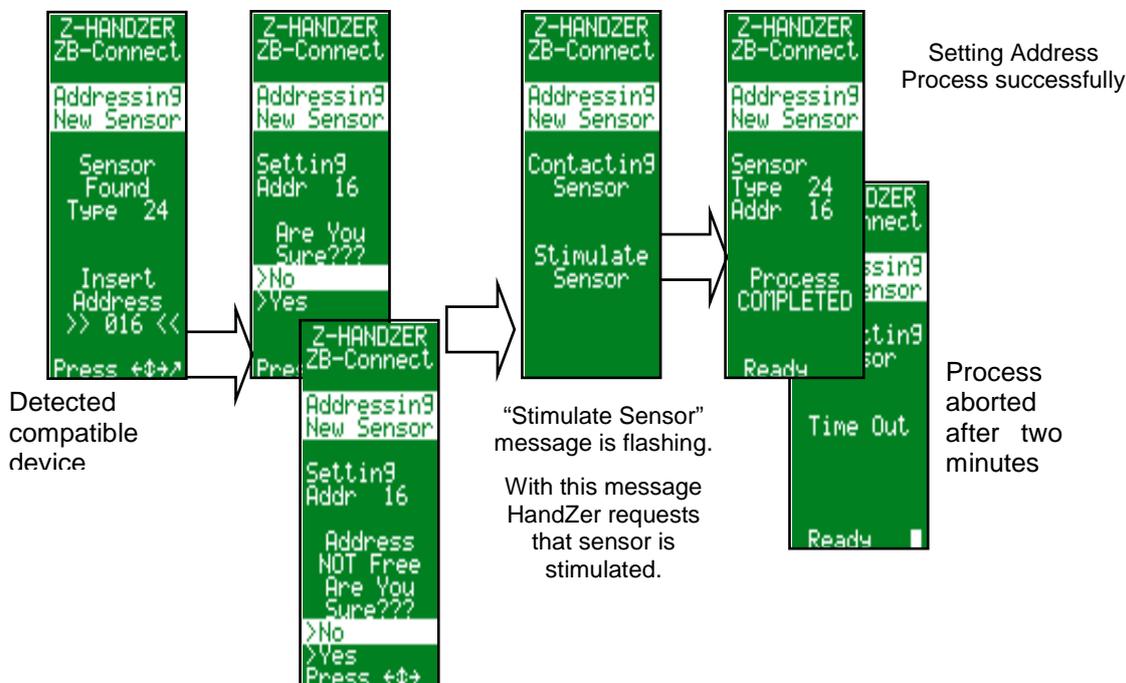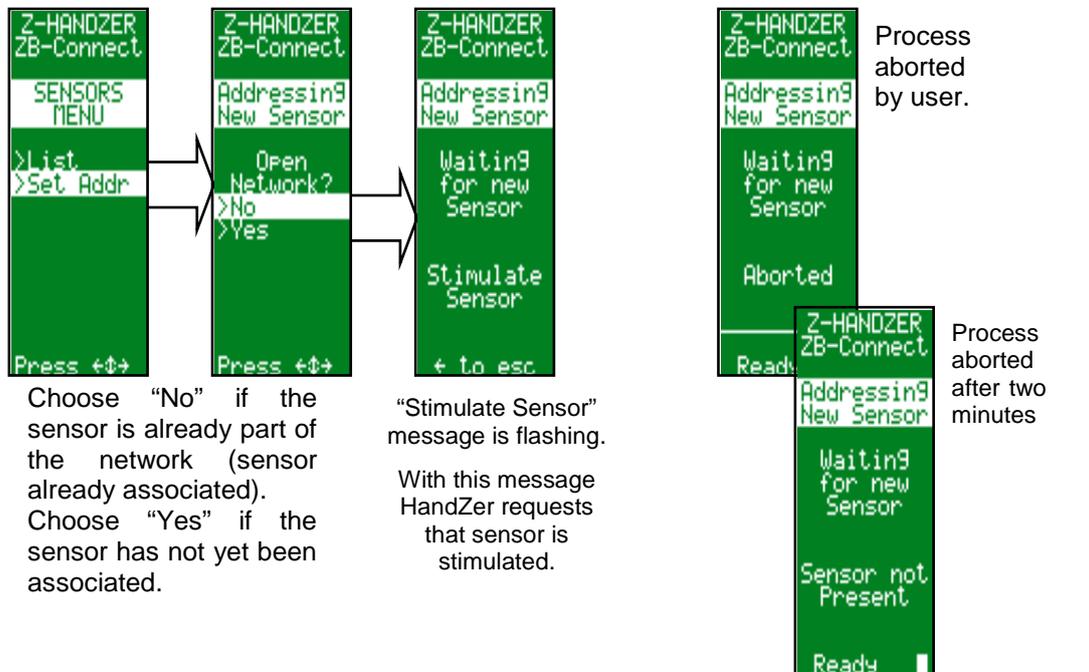
If the chosen address is already in use HandZer asks for further confirmation.

"Stimulate Sensor" message is flashing.

With this message HandZer requests that sensor is stimulated.

Setting Address Process successfully

Process aborted after two minutes

Fig. 13-1.- Setting addresses for special sensors

14 TURNING OFF HANDZER

After four minutes of inactivity , the HandZer automatically enters in a state of low consumption to preserve battery life. Alternatively it is possible to enter before into the power-down state by pressing "Turn off" button. From the power-down state a pressing of any button forces HandZer to come back to the state previous the turning off.

Note: During the Ping Test pressing "Turn Off" button causes shut-down only for few seconds.
Note: Even though the energy consumption during power-down is very low, it is preferable to remove the batteries in case of a prolonged non-use period.

15 BATTERIES LIFETIME

The lifetime of the batteries is estimated to be approximately one day of continuous use of the device.

16 NOTES

AirHANDZER is designed to be used during installation of new ZB-Connection devices. It allows knowing the number of Routers which are accessible from the position where it runs (Ping Test). It also shows information on the radio signal strength of the nearby Routers, highlighting the connections good and poor.
Installation rules recommend that each Router is in radio range of at least two other Routers.
It is recommended that each End-Device can connect effectively with at least two different Routers.
Where installation constraints prohibit a free location choice for Routers and End-Devices, airHANDZER allows knowing the best position for additional Routers which must be added to cover positions that are not reached. See
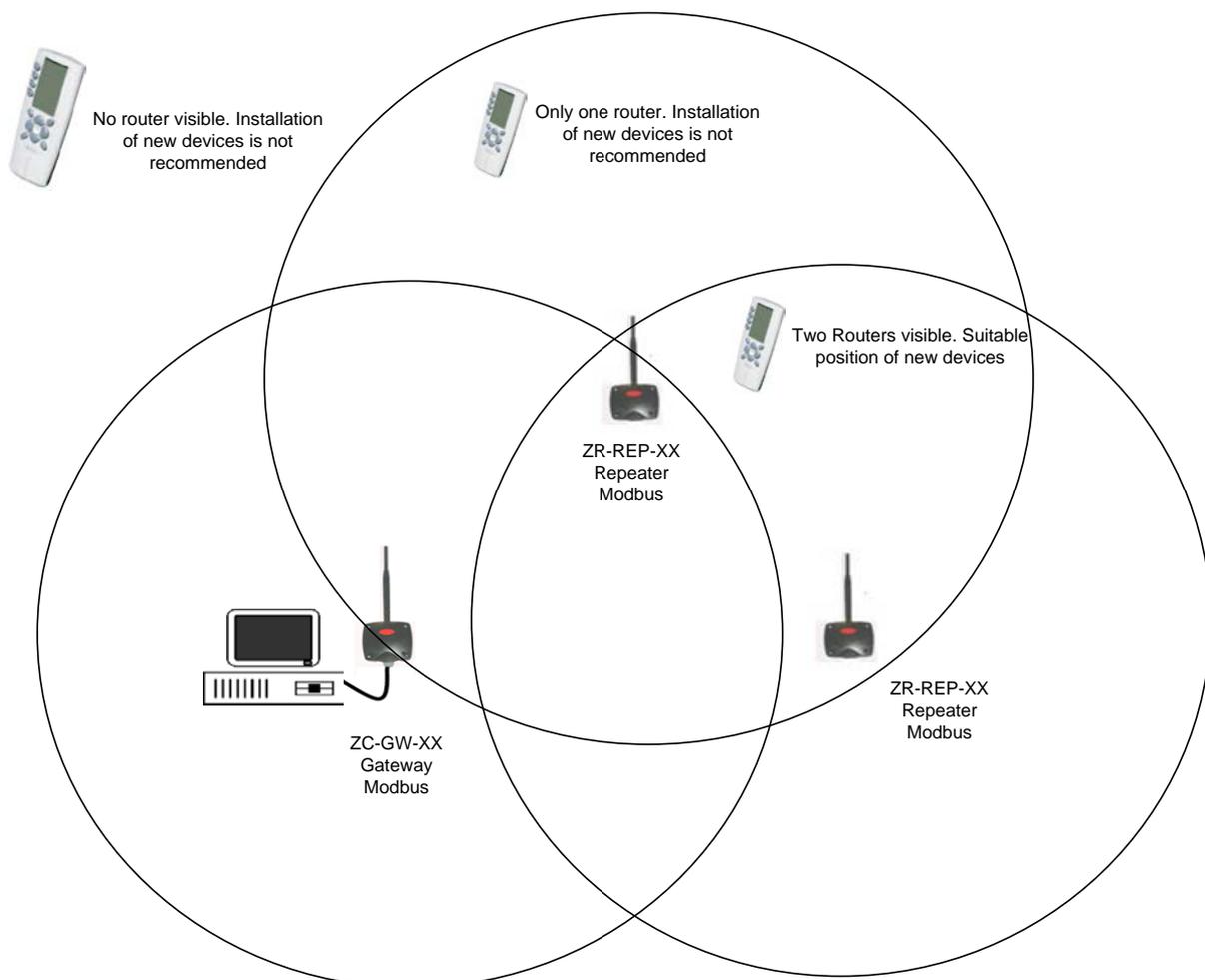
No router visible. Installation of new devices is not recommended

Only one router. Installation of new devices is not recommended

Two Routers visible. Suitable position of new devices

ZR-REP-XX
Repeater
Modbus

ZR-REP-XX
Repeater
Modbus

ZC-GW-XX
Gateway
Modbus

Fig. 16-1.- Finding the best position for new devices

17 RECYCLING OBSOLETE EQUIPMENT

The airHANDZER have been designed and manufactured with top quality components that can be recycled and reused. Electrical and electronic products contain substances that can harm the environment if they are not adequately treated. This symbol means that the electrical and electronic equipment should not be disposed of with other household waste at the end of its useful life.

Please take the obsolete products being replaced to a waste collection point or contact your local administration. The European Union has established specific collection systems for electronic and electrical equipment waste. Please help us to preserve the environment!
Record Nr. REI-RAEE: 3338

18 MAINTENANCE AND TECHNICAL SERVICE

In the event of questions or concerns regarding operation or malfunction of the analyzer, notify Technical Assistance Service (S.A.T.) of CIRCUTOR, SA.

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Vial Sant Jordi, s/n –
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