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EP5000-XX Indoor Air Quality Sensor Maintenance and Repair Manual

Ver	Date	Modification / Update
V1	13/12/2019	Initial Version

Summary

1 Introduction

NanoSense produces since nearly twenty years' air quality probes with modular architectures with sensitive elements that can be changed (after approximately 10 to 15 years) in order to extend the life span of the product and keep the initial setting. A BIT (**B**uilt **I**n **T**est) allows to identify most of defaults via LEDs alerts and digital protocols.

On the EP5000 range, the BIT is associated to a BITE (**B**uilt **I**n **T**est **E**quipment) which identifies the defective replaceable unit in order to facilitate on-site maintenance and reduce downtime.

2 Principle

The probe motherboard has a built-in test function for each FRU (**F**ield **R**eplaceable **U**nit) with a status report via digital communication and the LED interface.
Each replaceable unit is designed to be a FRU.

In case of failure, each item can be ordered from the manufacturer and replaced by a technician or even a qualified end user in accordance with this repair manual.

IAQ sensors with a lifespan of 10 to 15 years are pluggable and considered as FRU: Particles, CO2, VOC, NOx & Ozone.

Most of other sensors are digital MEMS sensors soldered on the boards with an insignificant drift over the life of the probe or FRU.

Board organization is made by function and each one is a FRU.

Changing a FRU requires only a simple screwdriver.

Mechanical parts are also FRU s and can be ordered separately as part of the repairability and durability policy. See the list of FRU in the appendix.

3 Identification of defective FRU

3.1 Via LEDs

At the first start-up, the probe interrogates and identifies all sensors, memories and radio transceiver present then compare with the configuration of the product and records data in a table. The supply voltages are also checked and compared to required nominal values.

The **B**uilt **I**n **T**est (BIT) identifies failures and BITE (**B**uilt **I**n **T**est **E**quipment) identify the defective FRU to be changed by comparing the array of present elements and those that no longer respond. If supply voltages do not meet the specifications, the power supply board is declared defective. However, this test is not entirely foolproof because an abnormal overconsumption of a component could be the cause but it is impossible to have a BIT/BITE which covers 100% of failures. However, overheating can be suspected when the internal temperature measurement of the microcontroller is too far from the ambient temperature. In the event of a total failure of the power supply board, the microcontroller

being no longer supplied with power, it is impossible to perform a self-test. We must therefore base ourselves on the non-activation of the LEDs on the front panel and data transmission.

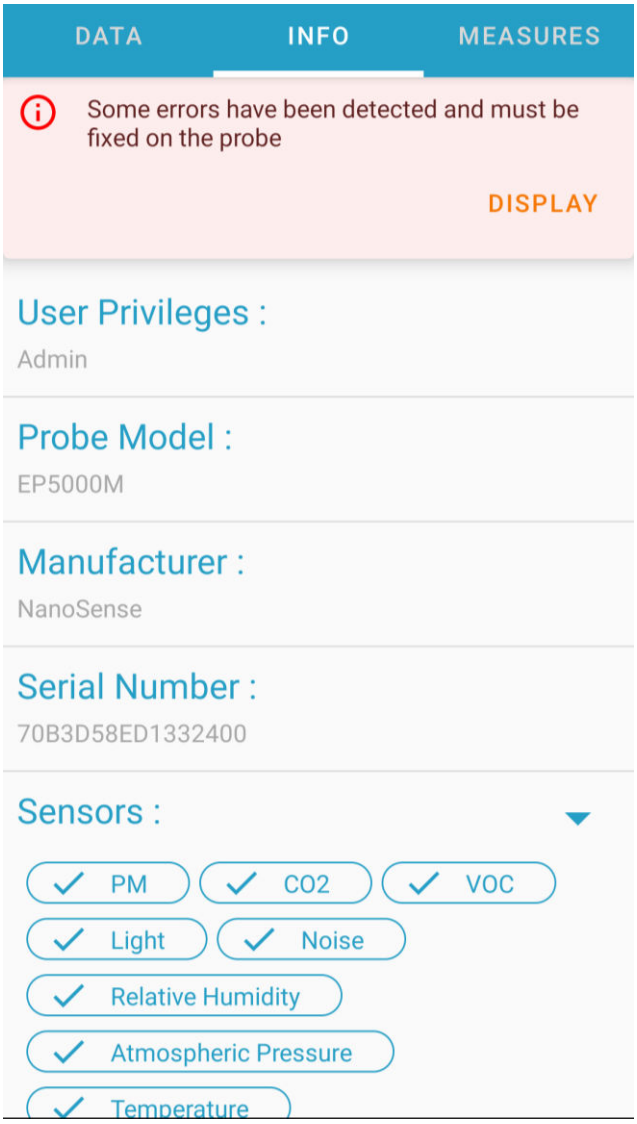
The identified FRU is characterized by an identification number (ascending order from front to back of the probe) as shown below and in the appendix.
The defective identified FRU is sent in a digital telegram depending of the way of communication (Enumeration).

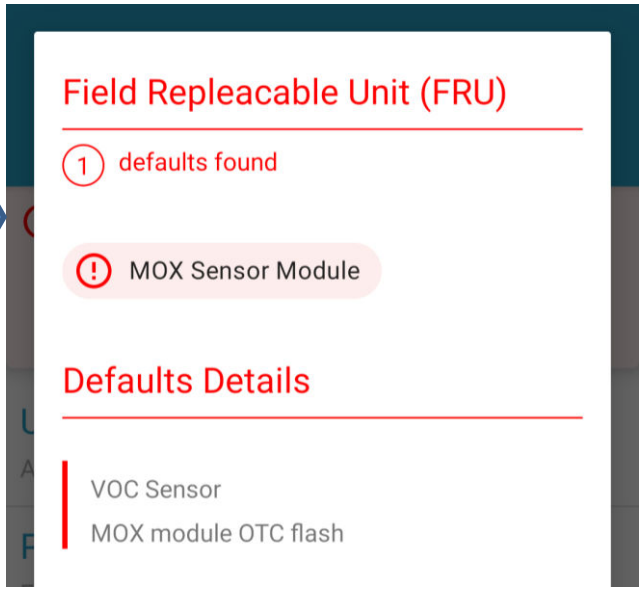
This same defect identification number is used when the LEDs flashes as follows:

LED code on the front panel	Identification #	Defective FRU
No LED active	NA	Power supply failure suspected or probe power supply board
Red LED on for 5 seconds		
Followed by an orange flash	1	Front panel board.
Followed by 2 orange flashes	2	Single band CO2 sensor module.
Followed by 3 orange flashes	3	Dual band CO2 sensor module
Followed by 4 orange flashes	4	VOC sensor module
Followed by 5 orange flashes	5	Motherboard
Followed by 6 orange flashes	6	Interconnection board
Followed by 7 orange flashes	7	Particle sensor board
Followed by 8 orange flashes	8	Power supply board
Red LED blinking	9	Multiple failures
Alternation Red Blue	10	Perishable sensor reaching the end of life.
All LED blinking simultaneously	NA	No communication between probe and front board (after 30 seconds)

In the event of a multiple failures, the flashing of the LEDs does not identify the defective FRU, it is then necessary to refer to the sent digital message.

3.2 Via the smartphone





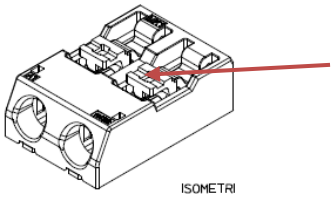
4 Dismantling

4.1 Removing the front panel from the wall

Insert the flat part of a small screwdriver between the wall and the front panel (there are small spaces between the probe and the wall for this purpose). Unclip the front panel by pulling out of the wall using the screwdriver.

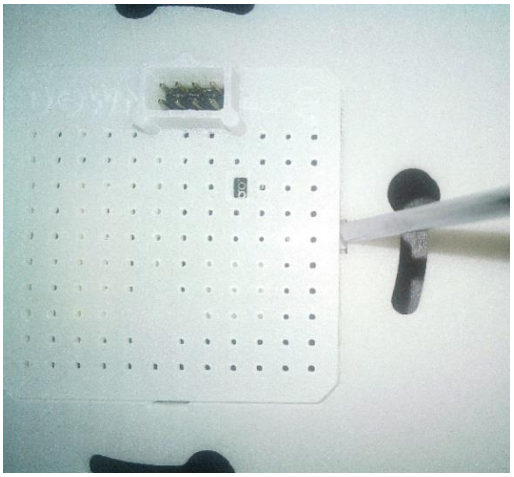
4.2 Flushed mount casing

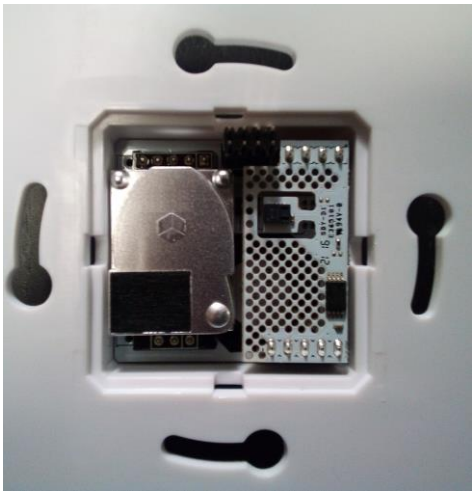
If the FRU to be changed is in the casing (identifier> 1), the board must be removed from the casing:
Unscrew the two screws which connect the casing to the wall box.
Switch off the 24V power supply to avoid any short circuit.
Disconnect the power by pushing with the screwdriver on the connector slots.



4.3 Opening the flushed mount casing

Slide the screwdriver into the notches on the casing cover and pry.



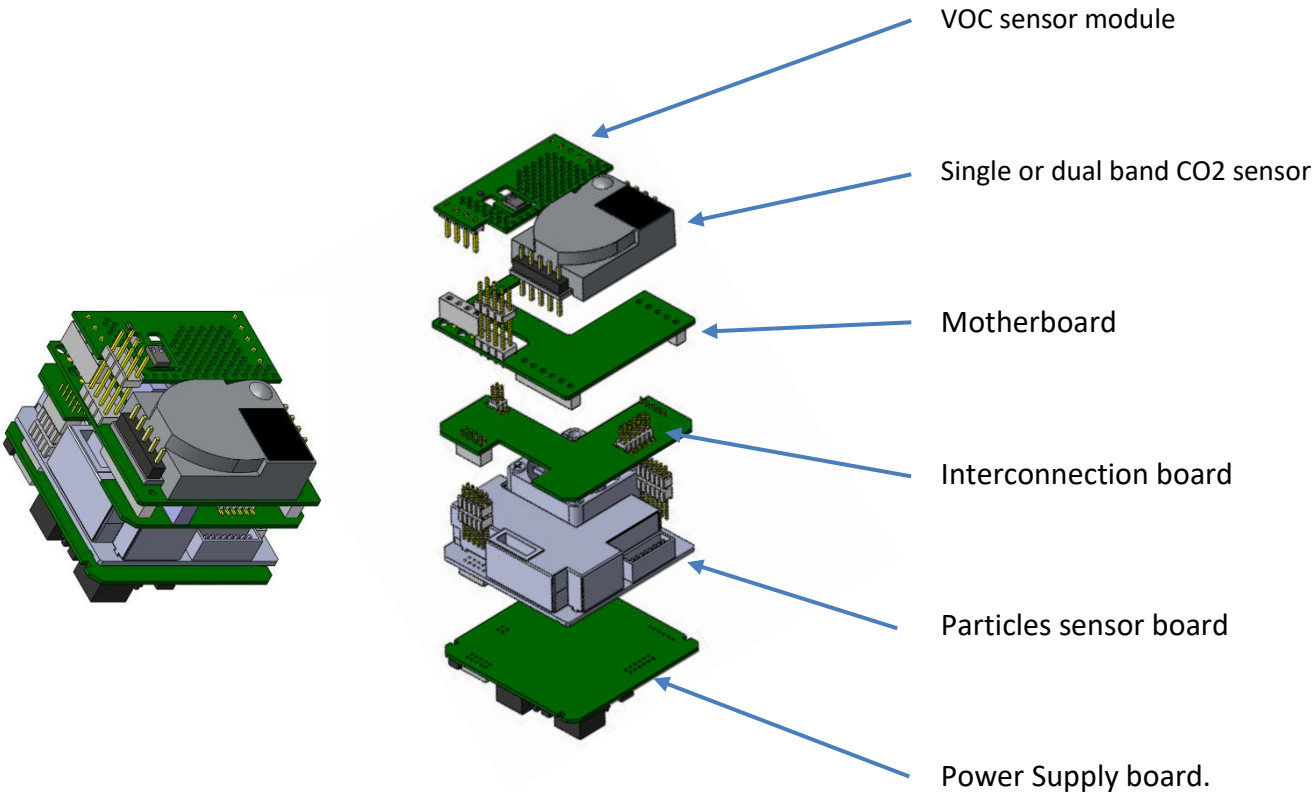


Cover removed

The boards shall now be extracted from the casing:
Turn the casing over and insert the screwdriver into the larger clip that holds the board supporting connectors, pry and push on the card. Do the same with the opposite clip and push the card on the connectors with a finger. Balance by holding the sensor at the front to pull out the cards without forcing.

5 Boards block and FRU Identification

Once extracted from the casing the boards form a compact block.
According to the identification number of the FRU, it must be located in the stack according to the following plan:



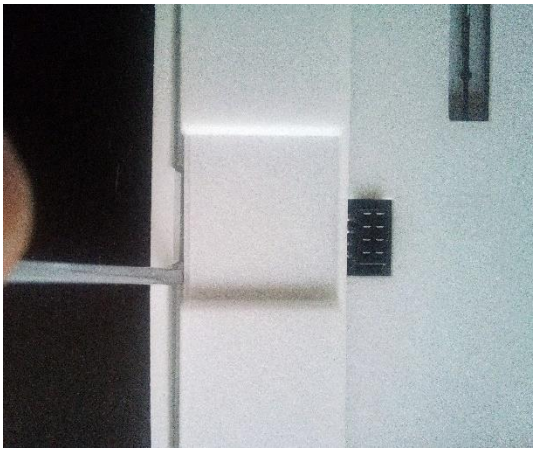
Replace the identified card and reassemble the reverse of disassembly (no need a screwdriver to clip). Do not press the CO2 sensor, as this may cause it to be decalibrated.

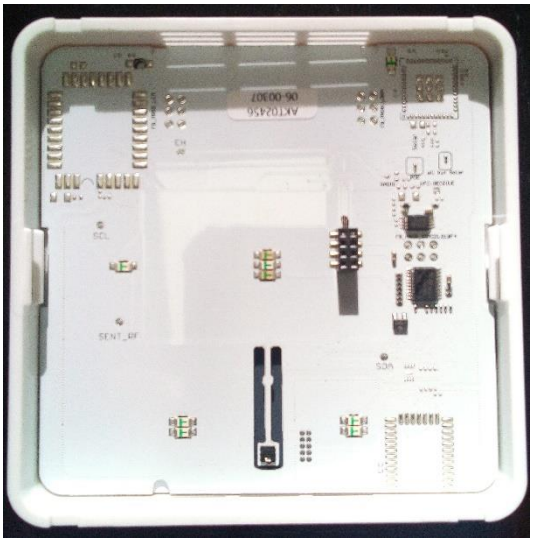
5.1 Changing sensors with limited lifespans

In order to simplify maintenance, CO2, VOC and Particles sensors can be changed together. Refer to the previous chapter to identify them.

5.2 Disassembly of the front panel

If the FRU to be changed is the board located in the front panel (identification # 1), it must be disassembled to access the card:

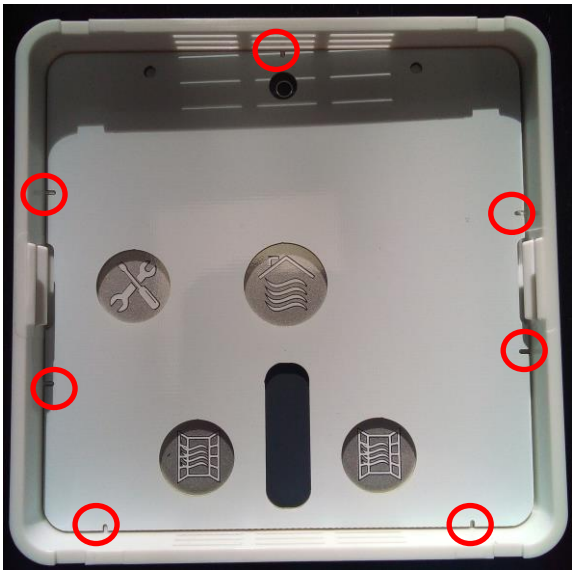


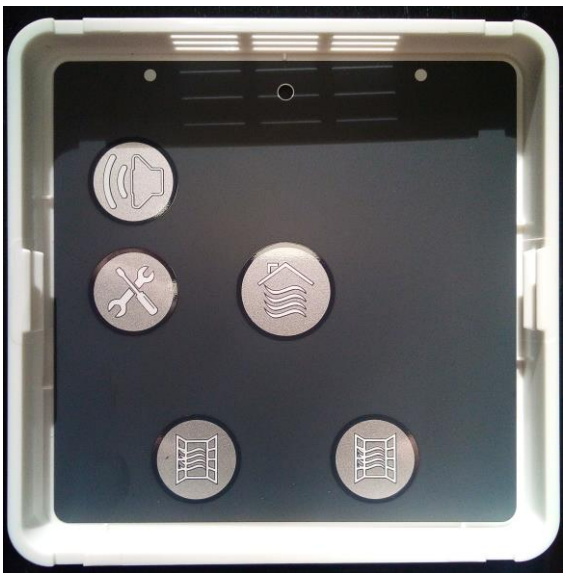


Unclip the rear cover from the front panel using the screwdriver.
Remove the cover, the board appears.
Replace the board and reassemble the reverse of disassembly (no need a screwdriver to clip).

Please pay attention that there are several front panel models. Specify the model marked on the label on the back of the casing to order the front panel board.

If changing the front glass, remove the board and the spacer.





Be careful of the orientation pins (red circles) when reassembling.

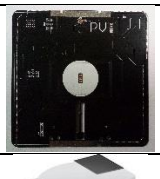
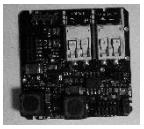
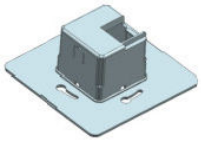
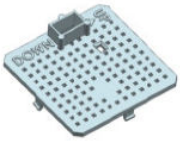
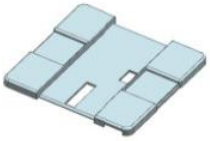
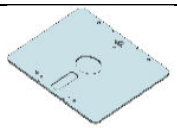
6 Pairing and settings

Radio and ModBus identifiers and settings are recorded in the front panel. In the event of a change, the commissioning must be repeated as well as all settings. See commissioning manual.

Nevertheless, the EP5000 Android App allows to copy and paste all settings.
As the radio identifier will be changed, a new pairing will be required.

It is also possible to make a full copy of the NFC memory in the front board to keep the same IDs, pairings and setting: Contact the manufacturer.

7 Annex 1, list of FRU

Denomination	Ordering Code	Identification #	Visual
PCB front	EP5-FPCB-XX-YY	1	
Single band CO2 (15 years life span)	EP5-CO2-SB	2	
Dual band CO2 (10 years life span)	EP5-CO2-DB	3	
TVOC sensor module (10 years life span)	EP5-VOCT	4	
Mother board	EP5-MB-XX	5	
Inter board	EP5-ITRB	6	
PM sensor board (10 to16 years life span)	EP5-PM2036	7	
Power supply board	EP5-PS-M (ModBus) EP5-PS-R (Radio) EP5-PS-K (KNX) EP5-PS-VM (0-10V measure) EP5-PS-VP (0-10V PI)	8	
Wall box	EP5-WB50	NA	
Casing	EP5-PP-CA	NA	
Casing cover	EP5-PP-CO	NA	
PCB cover front panel	EP5-PP-FR	NA	
Front glass spacer	EP5-PP-FS	NA	

Front glass	EP5-PP-FG	NA	
Front frame	EP5-PP-FF	NA	

8 Ordering Codes complement

To complete the ordering code, check your version and use the following table

EP5000 Line **XX5000 XX-YY**

E = CO2, COVt, PM1, PM2.5, PM10, T°, RH
P = PM1, PM2.5, PM10

M	Modbus		No Option	F	AP, Noise, lux, Color T°, flickering		Single band CO2
Z	ZigBee	E	EnOcean	N	Atm. Press., Noise, lux, Color T°	D	Dual band CO2
E	EnOcean	L	LoRaWAN	T	Atm. Press., lux, Color T°	O	Oxidizing gas (NOX, O3)
L	LoRaWAN	S	Sigfox	P	Atmospheric. Pressure (AP)		
S	Sigfox	B	BLE & iBeacon		No Option		
V	0-10V	0	No LED	C	CO2 only (VM & VP)		
T	Thread	M	0-10V Measurement (V only)	2	PM2.5 only (VM & VP)		
K	KNX	P	0-10V PI (V only)	B	CO2 and PM2.5 only(VM & VP)		
A	Autonomous	D	X3D				
I	IOT (LTE M)	I	IOT (LTE M)				
P	POE						
MM	Modbus Master						
MP	Mpbus						
MB	Bacnet MS TP						
PB	Bacnet IP POE						

