Wireless Multi-Sensor Device

RA08Dxx(S) Series
User Manual

Table of Contents

1. Introduction

The RA08Dxx and RA08DxxS series are multi-sensor devices that help users monitor air quality. They can support various combinations of detection devices composed of sensors for temperature, humidity, TVOC, illuminance, air pressure, PIR, CO2, NH3, H2S, O3, HCHO, PM2.5, and CO.

The difference between the two series is that the RA08DxxS series has an e-paper display.

RA08Dxx(S) Series

Sensor / Model	TH	TVOC	Light	Air Pressure	PIR	CO2	NH3 (Ammonia) + H2S	O3	HCHO (CH2O)	PM2.5	CO
	Built-in										External
RA08D01(S)	V	V	V	V	V	V					
RA08D02(S)	V	V	V	V	V	V					V
RA08D03(S)	V	V	V	V	V	V		V			
RA08D04(S)	V	V	V	V	V	V			V		
RA08D05(S)	V	V	V	V	V					V	
RA08D06(S)	V	V	V	V	V	V		V			V
RA08D07(S)	V	V	V	V	V	V			V		V
RA08D08(S)	V	V	V	V	V					V	V
RA08D09(S)	V	V	V	V	V	V	V				
RA08D10(S)	V	V	V	V	V	V	V				V

Note:

(1) RA08DxxS refer to devices with e-paper displays.

(2) CO2 and PM2.5 sensors cannot be equipped in the same RA08Dxx(S) due to limited space of device.

LoRa Wireless Technology

LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extend the communication distance. It can be widely used in any use case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong anti-interference ability and so on.

LoRaWAN

LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

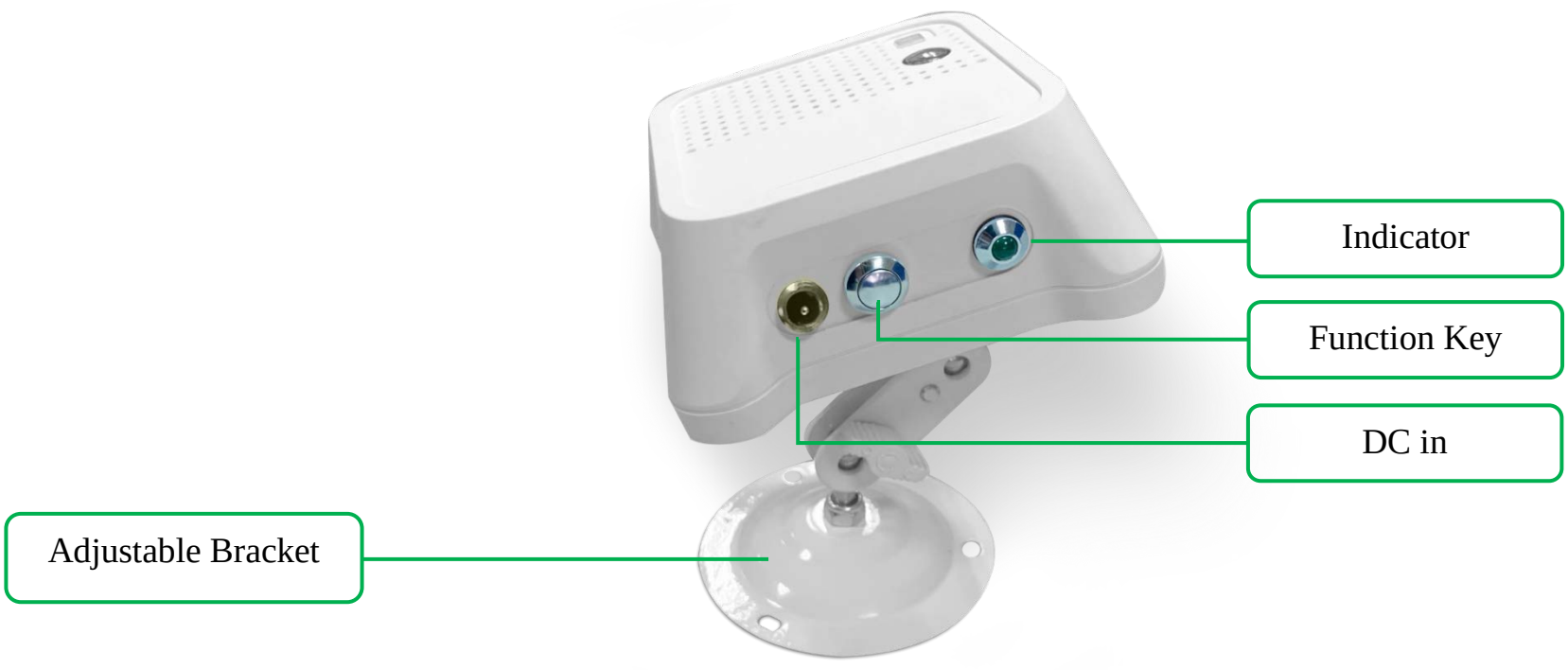
2. Appearance

RA08Dxx

RA08DxxS

RA08Dxx+CO Sensor

RA08DxxS+CO Sensor



3. Features

- Powered by DC 12V adapter
- SX1262 wireless communication module
- Compatible with LoRaWAN™ Class A device
- Frequency hopping spread spectrum
- Support third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne

4. Setup Instruction

4.1 On/Off

Power on	Connect to power supply.
Turn on	The green indicator flashes once.
Reboot	Press and hold the function key for 5 seconds until green indicator flashes once. Then release the function key. The device will automatically shut down after the indicator flashes 10 times.
Reset to factory setting	Press and hold the function key for 10 seconds until green indicator flashes fast for 20 times. The device will reset to factory setting and automatically shut down.
Power off	Disconnect the power supply.
Note	1. 5 seconds after power on, the device will be in engineering test mode. 2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.

4.2 Network Joining

Never joined the network	Turn on the device to search the network to join. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Had joined the network (without factory resetting)	Turn on the device to search the previous network to join. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Fail to join the network	Please check the device verification information on the gateway or consult your platform server provider.

4.3 Function Key

Press and hold for 5 seconds	Turn off and Restart Long press the function key for 5 seconds and the green indicator flashes 10 times. Release the function key and the green indicator flashes 10 times. The green indicator remains off: Fail
Press and hold for 10 seconds	Reset to factory setting / Turn off The green indicator flashes 20 times: Success The green indicator remains off: Fail
Short press	The device is in the network: green indicator flashes once, screen refreshes once, and send a data report. The device is not in the network: screen refreshes once and the green indicator remains off
Note	User should wait at least 3 seconds to press the function key again or it would not work properly.

4.4 Sleeping Mode

The device is on and in the network	Sleeping period: Min Interval. When the reportchange exceeds the setting value or the state changes, the device will send a data report based on the Min Interval.
The device is on but not in the network	1. Users should disconnect the power supply when the device is not in use. 2. Please check the device verification information on the gateway.

5. Data Report

After powering on, the device would refresh the information on the screen and send a version packet report along with an uplink packet.

The device sends data based on the default configuration before any configuration is done. Please do not send commands without turning on the device.

Default Setting:

Max Interval: 0x0384 (900s)

Min Interval: 0x0384 (900s)

// The Max and Min Intervals shall not be less than 5 minutes for devices with HCHO and O_3 sensors.

// The Max and Min Intervals shall not be less than 3 minutes for the rest of the devices.

IRDisableTime: 0x001E (30s)

IRDectionTime: 0x012C (300s)

CO_2:

Fluctuation of CO_2 data caused by delivery and storage time could be calibrated.

Please refer to 5.2 Example of ConfigureCmd and 7. CO_2 Sensor Calibration for detailed information.

TVOC:

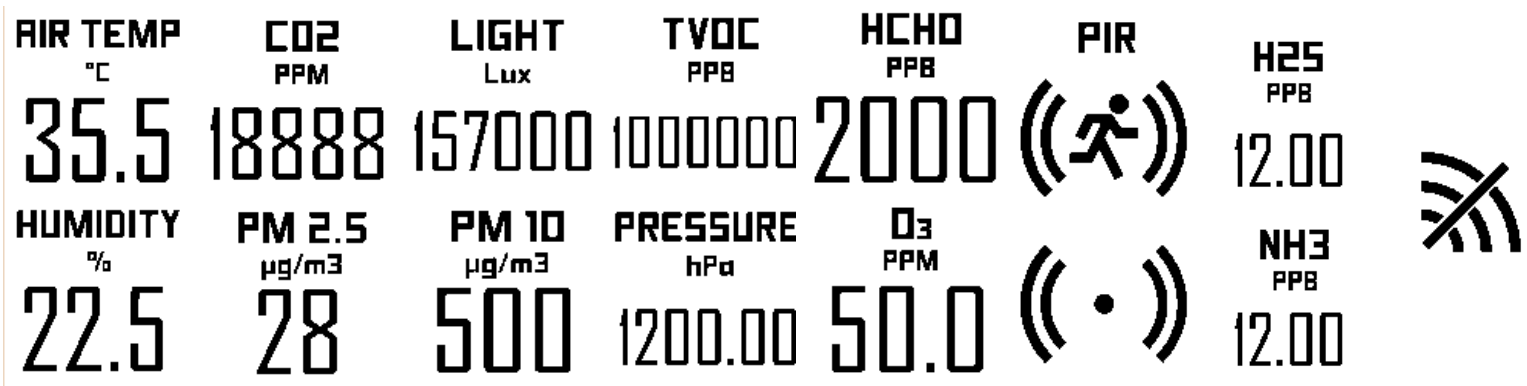
(1) Two hours after powering on, the data sent by devices with TVOC sensors are for reference only.

(2) If the data is way higher or below the setting, the device should be placed in an environment with fresh air for 24 to 48 hours until the data is back to normal value.

(3) TVOC level:

Very good	< 150 ppm
Good	150-500 ppm
Medium	500-1500 ppm
Poor	1500-5000 ppm
Bad	> 5000 ppm

Data shown on the RA08DxxS e-paper display:



The information shown on the screen is based on user's choice of sensor. It would be refreshed by pressing the function key, triggering the PIR, or refreshed based on the report interval.

// FFFF of reported data and "—" on the screen means the sensors are turning on or disconnected and errors of sensors.

Data collecting and transmission:

(1) Join the network:

Press the function key (indicator flashes once) / trigger PIR, read data, refresh screen, report detected data (based on the report interval)

(2) Without joining the network:

Press the function key / trigger PIR to get data and refresh the information on the screen.

// The interval of data packets would be 10 seconds by default.

// When the ack = 0x01, the intervals would be 30 seconds.

Note:

Please refer Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://www.netvox.com.cn:8888/cmddoc to resolve uplink data.

Data report configuration and sending period are as follows:

Min. Interval (Unit: second)	**Max. Interval (Unit: second)**	**Detection Interval**	**Report Interval**
180/300 to 65535	180/300 to 65535	MinTime	Exceed the setting value: report based on the MinTime or the MaxTime interval

5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1 Byte	1 Byte	1 Byte	Var (Fix = 8 Bytes)
	Version	DevieType	ReportType	NetvoxPayLoadData

Version– 1 bytes –0x01——the Version of NetvoxLoRaWAN Application Command Version

DeviceType– 1 byte – Device Type of Device

ReportType – 1 byte – the Presentation of the NetvoxPayLoadData, according the devicetype

NetvoxPayLoadData– Fixed bytes (Fixed =8bytes)

Tips

1. Battery Voltage:

If the battery is equal to 0x00, it means that the device is powered by a DC power supply.

2. Version Packet:

When Report Type=0x00 is the version packet, such as 01A0000A01202307030000, the firmware version is 2023.07.03.

3. Data Packet:

When Report Type=0x01 is data packet.

(If the device data exceeds 11 bytes or there are shared data packets, the Report Type will have different values.)

4. Signed Value:

When the temperature is negative, 2's complement should be calculated.

Device	Device Type	Report Type	NetvoxPayLoadData				
RA08D	0xA0	0x01	Battery (1Byte) unit:0.1V	Temperature (Signed 2Bytes) unit:0.01°C	Humidity (2Bytes) unit:0.01%	CO2 (2Bytes) Unit:1ppm	Occupy (1Byte) 0:Un Occupy 1: Occupy
		0x02	Battery (1Byte) unit:0.1V	AirPressure (4Bytes) unit:0.01hPa		Illuminance (3Bytes) unit:1Lux	
		0x03	Battery (1Byte) unit:0.1V	PM2.5 (2Bytes) Unit:1 ug/m^3	PM10 (2Bytes) Unit: 1ug/m^3	TVOC (3Bytes) Unit:1ppb	
		0x04	Battery (1Byte) unit:0.1V	HCHO (2Bytes) unit:1ppb	O3 (2Bytes) unit:0.1ppm	CO (2Bytes) unit:0.1ppm	Reserved (1Byte) fixed 0x00
		0x05	Battery (1Byte) unit:0.1V	ThresholdAlarm (4Bytes) Bit0:TemperatureHighThresholdAlarm, Bit1: TemperatureLowThresholdAlarm, Bit2:HumidityHighThresholdAlarm, Bit3: HumidityLowThresholdAlarm, Bit4:CO2HighThresholdAlarm, Bit5:CO2LowThresholdAlarm, Bit6: AirPressure HighThresholdAlarm, Bit7: AirPressure LowThresholdAlarm, Bit8: illuminanceHighThresholdAlarm, Bit9: illuminanceLowThresholdAlarm, Bit10: PM2.5HighThresholdAlarm, Bit11: PM2.5LowThresholdAlarm, Bit12: PM10HighThresholdAlarm, Bit13: PM10LowThresholdAlarm, Bit14: TVOCHighThresholdAlarm, Bit15: TVOCLowThresholdAlarm, Bit16: HCHOHighThresholdAlarm, Bit17: HCHOLowThresholdAlarm, Bit18:O_3HighThresholdAlarm, Bit19: O_3LowThresholdAlarm, Bit20:COHighThresholdAlarm, Bit21: COLowThresholdAlarm,			Reserved (3Byte) fixed 0x00

				Bit22:H2SHighThresholdAlarm, Bit23:H2SLowThresholdAlarm, Bit24:NH3HighThresholdAlarm, Bit25:NH3LowThresholdAlarm, Bit26-31:Reserved		
		0x06	Battery (1Byte, unit:0.1V)	H2S (2Bytes,Unit:0.01ppm)	NH3 (2Bytes,Unit:0.01ppm)	Reserved (3Byte,fixed 0x00)

Uplink:

Data #1 01A00100097A151F020C01

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (01): ReportType

4th byte (00): Battery—DC power supply

5th 6th byte (097A): Temperature—24.26℃, 97A (Hex)= 2426 (Dec), 2426*0.01℃ = 24.26℃

7th 8th byte (151F): Humidity—54.07%, 151F (Hex) = 5407 (Dec), 5407*0.01% = 54.07%

9th 10th byte (020C): CO_2—524ppm , 020C (Hex) = 524 (Dec), 524*1ppm = 524ppm

11th byte (01): Occupy— 1

Data #2 01A002000001870F000032

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (02): ReportType

4th byte (00): Battery—DC power supply

5th - 8th byte (0001870F): Air Pressure—1001.11hPa, 0001870F (Hex) = 100111 (Dec), 100111 * 0.01 hPa = 1001.11 hPa

9th - 11th byt e(000032): illuminance—50Lux, 000032 (Hex) = 50 (Dec), 50 * 1Lux = 50Lux

Data #3 01A00300FFFFFFFF000007

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (03): ReportType

4th byte (00): Battery—DC power supply

5th-6th (FFFF): PM2.5 —FFFF (N/A)

7th-8th byte (FFFF): PM10—FFFF (N/A)

9th-11th byte (000007): TVOC/VOC—7ppb, 000007 (Hex) = 7 (Dec), 7*1ppb = 7ppb

Data #4 01A00400000AFFFFFFFF00

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (04): ReportType

4th byte (00): Battery—DC power supply

5th-6th (000A): HCHO—10ppb, 000A (Hex) = 10 (Dec), 10 * 1ppb = 10ppb

7th-8th byte (FFFF): O_3—FFFF (N/A)

9th-10th byte (FFFF): CO—FFFF (N/A)

11th byte (00): Reserved

Data #5 01A0050000000001000000

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (05): ReportType

4th byte(00): Battery—DC power supply

5th-8th (00000001): ThresholdAlarm—1 = 00000001(binary), bit0 = 1 (TemperatureHighThresholdAlarm)

9th-11th byte (000000): Reserved

Data #6 01A0060000030000000000

1st byte (01): Version

2nd byte (A0): DeviceType 0xA0 — RA08D Series

3rd byte (06): ReportType

4th byte(00): Battery—DC power supply

5th-6th (0003): H_2S—0.03ppm, 3 (Hex) = 3 (Dec), 3*0.01ppm = 0.03ppm

7th-8th (0000): NH_3—0ppm

9th-11th byte (000000): Reserved

5.2 Example of ConfigureCmd

FPort: 0x07

Bytes	1	1	Var (Fix = 9 Bytes)
	CmdID	DeviceType	NetvoxPayloadData

CmdID– 1 byte

DeviceType– 1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype.doc

NetvoxPayLoadData– var bytes (Max=9bytes)

Description	Device	Cmd ID	Device Type	NetvoxPayloadData		
ConfigReport Req	RA08D	0x01	0xA0	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (2Bytes,Fixed 0x00)
ConfigReport Rsp		0x81		Status (0x00_suA0ess)	Reserved (8Bytes,Fixed 0x00)	
ReadConfig ReportReq		0x02		Reserved (9Bytes,Fixed 0x00)		
ReadConfig ReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (2Bytes,Fixed 0x00)
CalibrateCO2 Req		0x03		CalibrateType(1Byte, 0x01_TargetCalibrate, 0x02_ZeroCalibrate, 0x03_BackgroudCalibrate, 0x04_ABCCalibrate)	CalibratePoint (2Bytes,Unit:1ppm) Only valid in targetCalibrateType	Reserved (6Bytes,Fixed 0x00)
CalibrateCO2 Rsp		0x83		Status (0x00_suA0ess)	Reserved (8Bytes,Fixed 0x00)	
SetIRDisable TImeReq		0x04		IRDisableTime(2bytes Unit:s)	IRDectionTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
SetIRDisable TImeRsp		0x84		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
GetIRDisable TImeReq		0x05		Reserved (9Bytes,Fixed 0x00)		
GetIRDisable TImeRsp		0x85		IRDisableTime (2bytes Unit:s)	IRDectionTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)

(1) Configure device parameters

MinTime = 900s (0x0384), MaxTime = 900s (0x0384)

Downlink: 01A00384038400000000000

Response: 81A000000000000000000000 (Configuration success)

81A001000000000000000000 (Configuration failure)

(2) Read device configuration parameters

Downlink: 02A0000000000000000000

Response: 82A00384038400000000000 (Current configuration)

(3) Calibrate CO_2 sensor parameters

Downlink: 03A00103E8000000000000 //Choose Target-calibrations

(calibrate as the CO_2 level reaches 1000ppm) (CO_2 level could be configured)

03A0020000000000000000 //Choose Zero-calibrations (calibrate as the CO_2 level is 0ppm)

03A0030000000000000000 //(calibrate as the CO_2 level is 400ppm)

03A0040000000000000000 //Choose ABC-calibrations

(Note: The device would auto-calibrate as it turns on. The interval of auto-calibration would be 8 days. The device shall be exposed to the environment with fresh air at least 1 time to ensure the accuracy of the results.)

Response: 83A0000000000000000000 (Configuration success) // (Target/Zero/Background/ABC-calibrations)

83A0010000000000000000 (Configuration failure) // After calibration, the CO_2 level exceeds the accuracy range.

(4) SetIRDisableTImeReq

Downlink: 04A0001E012C0000000000

Response: 84A0000000000000000000 (Current configuration)

(5) GetIRDisableTImeReq

Downlink: 05A0000000000000000000

Response: 85A0001E012C0000000000 (Current configuration)

5.3 ReadBackUpData

FPort: 0x0C

Description	Cmd ID	Payload				
ReadBackUpData Req	0x01	Index(1Byte)				
ReadBackUpData RspWithOutData	0x81	None				
ReadBackUpData RspWithDataBlock	0x91	Temperature (Signed 2Bytes, unit:0.01°C)	Humidity (2Bytes, unit:0.01%)	CO2 (2Byte, 1ppm)	Occupy (1Byte 0:Un Occupy 1: Occupy)	illuminance (3Bytes,unit:1Lux)
ReadBackUpData RspWithDataBlock	0x92	AirPressure (4Bytes,unit:0.01hPa)		TVOC (3Bytes, unit:1ppb)		Reserved (3Bytes,fixed 0x00)
ReadBackUpData RspWithDataBlock	0x93	PM2.5 (2Bytes, Unit:1 ug/m^3)	PM10 (2Bytes, Unit:1ug/m^3)	HCHO (2Bytes, unit:1ppb)	O3 (2Bytes, unit:0.1ppm)	CO (2Bytes, unit:0.1ppm)
ReadBackUpData RspWithDataBlock	0x94	H2S (2Bytes, unit:0.01ppm)	NH3 (2Bytes, unit:0.01ppm)	Reserved (6Bytes,fixed 0x00)		

Uplink

Data #1 91099915BD01800100002E

1st byte (91): CmdID

2nd- 3rd byte (0999): Temperature1—24.57°C, 0999 (Hex) = 2457 (Dec), 2457 * 0.01°C = 24.57°C

4th-5th byte (15BD): Humidity—55.65%, 15BD (Hex) = 5565 (Dec), 5565 * 0.01% = 55.65%

6th-7th byte (0180): CO_2—384ppm, 0180 (Hex) = 384 (Dec), 384 * 1ppm = 384ppm

8th byte (01): Occupy

9th-11th byte (00002E): illuminance1—46Lux, 00002E (Hex) = 46 (Dec), 46 * 1Lux = 46Lux

Data #2 9200018C4A000007000000

1st byte (92): CmdID

2nd- 5thbyte (00018C4A): AirPressure—1014.50hPa, 00018C4A (Hex) = 101450 (Dec), 101450 * 0.01hPa = 1014.50hPa

6th-8th byte (000007): TVOC—7ppb, 000007(Hex)=7(Dec),7*1ppb=7ppb

9th-11th byte (000000): Reserved

Data #3 93FFFFFFFFFFF0000FFFF

1st byte (93): CmdID

2nd- 3rdbyte (FFFF): PM2.5—FFFF(N/A)

4th-5th byte (FFFF): PM10—FFFF(N/A)

6th-7th byte (FFFF): HCHO—FFFF(N/A)

8th-9th byte (0000): O_3—0.0ppm, 0000 (Hex) = 0 (Dec), 0 * 0.1ppm = 0.0ppm

10th-11th byte (FFFF): CO—FFFF(N/A)

Data #4 940001000000000000000

1st byte (94): CmdID

2nd- 3rdbyte (0001): H_2S — 0.01ppm, 001 (Hex) = 1(Dec), 1* 0.01 = 0.01ppm

4th-5th byte (0000): NH_3 — 0ppm

6th-11th byte (000000000000): Reserved

5.4 Example of GlobalCalibrateCmd

FPort: 0x0E

<table>
<tr><td>Description</td><td>CmdID</td><td>Sensor Type</td><td colspan="5">PayLoad (Fix =9 Bytes)</td></tr>
<tr><td>SetGlobalCalibrate Req</td><td>0x01</td><td rowspan="5">See below</td><td>Channel (1Byte)
0_Channel1
1_Channel2,etc</td><td>Multiplier
(2bytes,
Unsigned)</td><td>Divisor
(2bytes,
Unsigned)</td><td>DeltValue
(2bytes,Signed)</td><td>Reserved
(2Bytes,Fixed 0x00)</td></tr>
<tr><td>SetGlobalCalibrate Rsp</td><td>0x81</td><td colspan="2">Channel (1Byte)
0_Channel1
1_Channel2,etc</td><td colspan="2">Status
(1Byte,
0x00_success)</td><td>Reserved
(7Bytes,Fixed 0x00)</td></tr>
<tr><td>GetGlobalCalibrate Req</td><td>0x02</td><td colspan="3">Channel (1Byte)
0_Channel1
1_Channel2,etc</td><td colspan="2">Reserved
(8Bytes,Fixed 0x00)</td></tr>
<tr><td>GetGlobalCalibrate Rsp</td><td>0x82</td><td>Channel (1Byte)
0_Channel1
1_Channel2,etc</td><td>Multiplier
(2bytes,
Unsigned)</td><td>Divisor
(2bytes,
Unsigned)</td><td>DeltValue
(2bytes,Signed)</td><td>Reserved
(2Bytes,Fixed 0x00)</td></tr>
<tr><td>ClearGlobal CalibrateReq</td><td>0x03</td><td colspan="5">Reserved
(10Bytes,Fixed 0x00)</td></tr>
<tr><td>ClearGlobal CalibrateRsp</td><td>0x83</td><td colspan="2">Status
(1Byte,0x00_success)</td><td colspan="3">Reserved
(9Bytes,Fixed 0x00)</td></tr>
</table>

Default: Channel = 0x00 (cannot be configured)

SensorType - byte

0x01_Temperature Sensor

0x02_Humidity Sensor

0x03_Light Sensor

0x06_CO2 Sensor

0x35_Air PressSensor

Channel - byte

0x00_ CO2

0x01_ temperature

0x02_ humidity

0x03_ light

0x04_ air press

(1) SetGlobalCalibrateReq

Calibrate the RA08D CO_2 sensor by increasing 100ppm

SensorType: 0x06; channel: 0x00; Multiplier: 0x0001; Divisor: 0x0001; DeltValue: 0x0064

Downlink: 0106000001000100640000

Response: 8106000000000000000000

(2) GetGlobalCalibrateReq

Downlink: 0206000000000000000000

Response: 8206000001000100640000

(3) Calibrate the RA08D CO_2 sensor by decreasing 100ppm

SensorType: 0x06; channel: 0x00; Multiplier: 0x0001; Divisor: 0x0001; DeltValue: 0xFF9C

SetGlobalCalibrateReq:

Downlink: 01060000010001FF9C0000

Response: 810600000000000000000

GetGlobalCalibrateReq:

Downlink: 020600000000000000000

Response: 82060000010001FF9C0000

(4) ClearGlobalCalibrateReq:

Downlink: 030000000000000000000

Response: 830000000000000000000

5.5 Set/GetSensorAlarmThresholdCmd

FPort: 0x10

CmdDescriptor	CmdID (1Byte)	Payload (10Bytes)			
SetSensorAlarmThresholdReq	0x01	Channel(1Byte, 0x00_Channel1, 0x01_Channel2, 0x02_Channel3,etc)	SensorType(1Byte, 0x00_Disable ALL SensorthresholdSet 0x01_Temperature, 0x02_Humidity, 0x03_CO2, 0x04_AirPressure, 0x05_illuminance, 0x06_PM2.5, 0x07_PM10, 0x08_TVOC, 0x09_HCHO, 0x0A_O_3 0x0B_CO, 0x17_ H_2S, 0x18_ NH_3,	SensorHighThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLErHighThreshold)	SensorLowThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLErHighThreshold)
SetSensorAlarmThresholdRsp	0x81	Status (0x00_success)	Reserved (9Bytes,Fixed 0x00)		
GetSensorAlarmThresholdReq	0x02	Channel(1Byte, 0x00_Channel1, 0x01_Channel2, 0x02_Channel3,etc)	SensorType (1Byte,Same as the SetSensorAlarmThresholdReq's SensorType)	Reserved (10Bytes,Fixed 0x00)	
GetSensorAlarmThresholdRsp	0x82	Channel(1Byte, 0x00_Channel1, 0x01_Channel2, 0x02_Channel3,etc)	SensorType (1Byte,Same as the SetSensorAlarmThresholdReq's SensorType)	SensorHighThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLErHighThreshold)	SensorLowThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLErHighThreshold)

(1) Set the temperature HighThreshold as 40.05℃ and LowThreshold as 10.05℃

SetSensorAlarmThresholdReq: (when the temperature is higher than the HighThreshold or lower than the LowThreshold, the device would upload reporttype = 0x05)

Downlink: 01000100000FA5000003ED // 0FA5 (Hex) = 4005 (Dec), 4005 * 0.01°C = 40.05°C,

03ED (Hex) = 1005 (Dec), 1005 * 0.01°C = 10.05°C

Response: 810001000000000000000000

(2) GetSensorAlarmThresholdReq

Downlink: 020001000000000000000

Response: 82000100000FA5000003ED

(3) Disable all sensor thresholds. (Configure the Sensor Type to 0)

Downlink: 0100000000000000000000

Response: 8100000000000000000000

5.6 Set/GetNetvoxLoRaWANRejoinCmd

(To check if the device is still in the network. If the device is disconnected, it will automatically rejoin back to the network.)

Fport: 0x20

CmdDescriptor	CmdID (1Byte)	Payload(5Bytes)	
SetNetvoxLoRaWANRejoinReq	0x01	RejoinCheckPeriod (4Bytes,Unit:1s 0XFFFFFFFF Disable NetvoxLoRaWANRejoinFunction)	RejoinThreshold(1Byte)
SetNetvoxLoRaWANRejoinRsp	0x81	Status(1Byte,0x00_success)	Reserved (4Bytes,Fixed 0x00)
GetNetvoxLoRaWANRejoinReq	0x02	Reserved (5Bytes,Fixed 0x00)	
GetNetvoxLoRaWANRejoinRsp	0x82	RejoinCheckPeriod(4Bytes,Unit:1s)	RejoinThreshold(1Byte)

Note: (a) Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.

(b) The last configuration would be kept as users reset the device back to the factory setting.

(c) Default setting: RejoinCheckPeriod = 2 (hr) and RejoinThreshold = 3 (times)

1. Configure device parameters

RejoinCheckPeriod = 60min (0x00000E10), RejoinThreshold = 3 times (0x03)

Downlink: 0100000E1003

Response: 810000000000 (configuration success)

810100000000 (configuration fail)

2. Read configuration

Downlink: 020000000000

Response: 8200000E1003

7. CO_2 Sensor Calibration

(1) Target Calibration

Target concentration calibration assumes that sensor is put into a target environment with a known CO_2 concentration. A target concentration value must be written to Target calibration register.

(2) Zero Calibration

Zero-calibrations are the most accurate recalibration routine and are not at all affected performance-wise by having an available pressure sensor on host for accurate pressure-compensated references.

A zero-ppm environment is most easily created by flushing the optical cell of the sensor module and filling up an encapsulating enclosure with nitrogen gas, N2, displacing all previous air volume concentrations. Another less reliable or accurate zero reference point can be created by scrubbing an airflow using e.g. Soda lime.

(3) Background Calibration

A "fresh air" baseline environment is by default 400ppm at normal ambient atmospheric pressure by sea level. It can be referenced in a crude way by placing the sensor in direct proximity to outdoor air, free of combustion sources and human presence, preferably during either by open window or fresh air inlets or similar. Calibration gas by exactly 400ppm can be purchased and used.

(4) ABC Calibration

The Automatic Baseline Correction algorithm is a proprietary Senseair method for referencing to "fresh air" as the lowest, but required stable, CO_2-equivalent internal signal the sensor has measured during a set time period. This time period by default is 180hrs and can be changed by the host, it's recommended to be something like an 8 day period as to catch low-occupancy and other lower-emission time periods and favourable outdoor wind-directions and similar which can plausibly and routinely expose the sensor to the most true fresh air environment.

If such an environment can never be expected to occur, either by sensor locality or ever-presence of CO_2 emission sources, or exposure to even lower concentrations than the natural fresh air baseline, then ABC recalibration can't be used. In each new measurement period, the sensor will compare it to the stored one at the ABC parameters registers, and if new values show a lower CO_2-equivalent raw signal while also in a stable environment, the reference is updated with these new values. The ABC algorithm also has a limit on how much it is allowed to change the baseline correction offset with, per each ABC cycle, meaning that self-calibrating to adjust to bigger drifts or signal changes may take more than one ABC cycle.

8. Important Maintenance Instructions

Kindly pay attention to the following in order to achieve the best maintenance of the product:

- Do not put the device near or submerge into water. Minerals in rain, moisture, and other liquids could cause corrosion of electronic components. Please dry the device, if it gets wet.
- Do not use or store the device in dusty or dirty environments to prevent damage to parts and electronic components.
- Do not store the device in high temperatures. This may shorten the lifespan of electronic components, damage batteries, and deform plastic parts.
- Do not store the device in cold temperatures. Moisture may damage circuit boards as the temperatures rise.
- Do not throw or cause other unnecessary shocks to the device. This may damage internal circuits and delicate components.
- Do not clean the device with strong chemicals, detergents, or strong detergents.
- Do not apply the device with paint. This may block detachable parts and cause malfunction.
- Do not dispose of batteries in fire to prevent explosion.

The instructions are applied to your device, battery, and accessories. If any device is not working properly or has been damaged, please send it to the nearest authorized service provider for service.