

Communication

Mode	Protocol	IF	Document/Tool
Client Mode (Master)	MQTT	TCP/1883	iAeris MQTT_Client Specification.docx
	Web Service (to Web Server API)	TCP/80	iAeris Data Upload Specification_ver2.docx
	NTP	UDP/123	-
Server Mode (Slave)	JSON	TCP/80 (http)	iAeris JSON Format and Example.docx
	ModbusTCP	TCP/ (80 or 502)	iAeris1_ModBus_V008-M.pdf
	ModbusRTU	RS485	
Flash Dump	ModbusRTU	RS485	iAeris_Vxxxx_C.exe
	ModbusTCP	TCP/(80 or 502)	TcpDump.exe

■ Client Mode

■ MQTT

	Specification	Note
Protocol	MQTT	TCP/IP
HOST Name of broker	Domain Name or IP address	"Abc.com" for internet "192.168.0.100" for intranet
Port	1883	-
Username	xxxx	User account
Password	xxxx	User password
topic	Topic name in broker	/xxx/xxxx
QoS	0	-
Publish payload Data Format	{ "id": "0000000000000320", "model": "iAeris2", "time": "2018-12-17 9:56:0", "data": { "temp": 22.0, "rh": 50.7, "pm2_5": 33.4, "pm10": 38.7, "hcho": 0, "tvoc": 0, "co": 0, "co2": 450 } }	id: serial no for iAeris device. Model: pid for iAeris device. Time: measurement date & time for data. "data" : temperature: 25.0 °C, rh : 50.70% (Humidity) pm2.5 : 33.4 ug/m ³ , pm10: 38.7ug/m ³ hcho: 0 ppm, tvoc: 0ppm, CO: 0ppm, CO ₂ : 450ppm
Period	6 mins	Settable
payload Encode	Not support yet	-
Mqtt-SSL	Not support	

■ Web Server

	Specification	Note
Protocol	HTTP	-
Method	POST	-
HOST Name	Domain Name or IP address	"Abc.com" for internet "192.168.0.100" for intranet (Settable)
Path	API* location in Server	/dir/receive.php (Settable)
Port	80	(Settable)
Response	"OK"	API Response to client if process OK
Data Format	HCHO=0.010&CO2=481&RH=61.0&TEMPERATURE=25.4&PM10=7.0&PM2d5=5.0&CO=0&TVOC=0&DEVSNO=0000F84125B60002&CREATE_DATE_TIME=2017-4-5 14:42:0	HCHO : formaldehyde , 0.010 ppm CO ₂ : CO ₂ , 481 ppm RH : Relative Humidity, 61.0% TEMPERATURE : 25.4 °C PM10 : 7.0 ug/m ³ PM2d5 : PM _{2.5} , 5.0 ug/m ³ CO : 0 ppm TVOC : Total VOC, 0 ppb DEVSNO : Device Serial Number CREATE_DATE_TIME : Date & Time of Data
Period	6 mins	Settable
Data Encode	Option Method : AES128(CBC) + Base64 Define KEY & IV with Customer. Data pack format could be redefined after encode.	

■ NTP

-

■ Server Mode

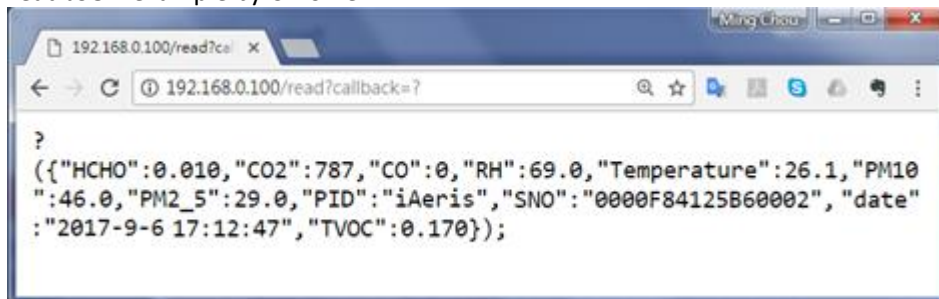
■ JSON

1. HOST IP : Device IP by WiFi-AP (ex. 192.168.0.100)
2. Path : /read
3. jQuery API Call Example (html5 / javascript) :
 - i. include jQuery API :


```
<script type="text/javascript"
src="https://ajax.googleapis.com/ajax/libs/jquery/1.8.2/jquery.min.js">
</script>
```
 - ii. API Call


```
$.getJSON(http://192.168.0.100/read?callback=?,option)
```
 - iii. Output example :


```
jQuery182007646825802429658_1491373328744({"HCHO":0.010,"CO2":787,"CO":0,"RH":69.0,"T
emperature":26.1,"PM10":46.0,"PM2_5":29.0,"PID":"iAeris","SNO":"0000F84125B60002","date":
"2017-9-6 17:12:47","TVOC":0.170});
```
 - iv. Read JSON example by Chrome:



4. JSON data :
 - i. HCHO : formaldehyde, unit : ppm
 - ii. CO₂ : carbon dioxide, unit : ppm
 - iii. CO : carbon monoxide, unit : ppm
 - iv. RH : humidity, unit : %
 - v. Temperature : temperature, unit : degree C
 - vi. PM₁₀ : suspended particles, unit : ug/m3
 - vii. PM_{2.5} : fine particles, unit : ug/m3
 - viii. PID : Device PID Name.
 - ix. SNO : Device SNO
 - x. date : data created DateTime.
 - xi. TVOC : total volatile organic compounds, unit : ppm

■ ModBus

■ Specification

1. Byte format:
Coding system : 8-bit binary
Start bit : 1 start bit 1 start bit
Data & endian : 8 data bits, least significant bit first
Parity : NO parity
Stop bit : 1 stop bit
2. Baud rate:
The iAeris 2 has baud rate of 19200 bps as default. User also can change below rate by use device keypad.
600 bps , 1200 bps , 2400 bps , 4800 bps , 9600 bps , 19200 bps
3. Physical layer:
The iAeris2 has support RS-485 signal level.
4. BLE command
 - SPS Service
UUID : 0x1820
 - SPP Characterstic
UUID : 0x2A80
 - Properties :
 - Notify - transmit data from module to smart phone app or other module.
 - Write - transmit data to module.

■ Addressing rule

Address (ID)	iAeris
0	No broadcast commands currently implemented
1~247	Slave individual address
248~253	Nothing
254	Any sensor
255	Nothing

1. "Nothing" means that sensor doesn't recognize Modbus serial line PDUs with this address as addressed to the sensor. Sensor does not respond.
2. "Any sensor" means that any sensor with any slave individual address will recognize serial line PDUs with address 254 as addressed to them. They will respond. So that this address is for production / test purposes only. It must not be used in the installed network.
3. This is a violation against the Modbus specification.

■ Function codes description

The iAeris2 has support 03h,06h and 10h command.

■ 03h Command (Read Registers command) :

Master Transmit :	1	2	3	4	5	6	7	8	
	ID	03h	Address		Quantity		CRC16		
			High byte	Low Byte	High byte	Low Byte	High byte	Low Byte	
Slave Reply :	1	2	3	4	5	3+n	4+n	5+n
	ID	03h	Bytes (n)	Register Value				CRC16	
				1-byte	2-byte	n-byte	High byte	Low Byte

■ 06h Command (Write Single Registers command) :

Master Transmit :	1	2	3	4	5	6	7	8
	ID	06h	Address		Register Value		CRC16	
			High byte	Low Byte	High byte	Low Byte	High byte	Low Byte
Slave Reply :	1	2	3	4	5	6	7	8
	ID	06h	Address		Register Value		CRC16	
			High byte	Low Byte	High byte	Low Byte	High byte	Low Byte

■ 10h Command (Write Multiple Registers command) :

Master Transmit :	1	2	3	4	5	6	7	8	...	7+n	8+n	9+n
	ID	10h	Address		Quantity		Bytes (n)	Register Value			CRC16	
			High byte	Low Byte	High byte	Low Byte		1-byte	...	n+byte	High byte	Low Byte
Slave Reply :	1	2	3	4	5	6	7	8				
	ID	10h	Address		Quantity		CRC16					
			High byte	Low Byte	High byte	Low Byte	High byte	Low Byte				

■ Parameter address map :

■ 00h ~ FFh :

Address 00n~07h	00h	01h	02h	03h	04h	05h	06h	07h
	PID				FW-Ver			
Address 08n~0Fh	08h	09h	0Ah	0Bh	0Ch	0Dh	0Eh	0Fh
	S/N							
Address 10n~17h	10h	11h	12h	13h	14h	15h	16h	17h
	YYYY	MM	DD	hh	mm	ss	D7	Mod-Ver
Address 18n~1Fh	18h	19h	1Ah	1Bh	1Ch	1Dh	1Eh	1Fh
	HCHO	CO2	T	RH	CO	PM10	PM2.5	TVOC
Address 20n~27h	20h	21h	22h	23h	24h	25h	26h	27h
	HCHO_Adj	CO2_Adj	T_Adj	RH_Adj	CO_Adj	PM10_Adj	PM2.5_Adj	TVOC_Adj
Address 28n~2Fh	28h	29h	2Ah	2Bh	2Ch	2Dh	2Eh	2Fh
	HCHO_Slope	CO2_Slope	T_Slope	RH_Slope	CO_Slope	PM10_Slope	PM2.5_Slope	TVOC_Slope
Address 30n~37h	30h	31h	32h	33h	34h	35h	36h	37h
	HCHO_LH	CO2_LH	T_LH	RH_LH	CO_LH	PM10_LH	PM2.5_LH	TVOC_LH
Address 38n~3Fh	38h	39h	3Ah	3Bh	3Ch	3Dh	3Eh	3Fh
Address 40n~47h	40h	41h	42h	43h	44h	35h	46h	47h
	Capacity	Usage	End	Clear	Meas_SW		BAUD	
Address 48n~4Fh	48h	49h	4Ah	4Bh	4Ch	4Dh	4Eh	4Fh
Address 50n~57h	50h	51h	52h	53h	54h	55h	56h	57h
	Packet-data							
Address 58n~5Fh	58h	59h	5Ah	5Bh	5Ch	5Dh	5Eh	5Fh
	Packet-data							

Note:

1. Red : Read Only Memory
2. Blue : Read/ Write Memory

■ Parameter description:

1. Device Status and Information:

PID	Length	4 Words (8 bytes)
	Statement	Product ID Return device product code. (ASCII Code format.) e.g. iAeris1 iAeris2
FW-Ver	Length	4 Words (8 bytes)
	Statement	Firmware version Return device firmware version. (ASCII Code format.) e.g. 000.6
S/N	Length	8 Words (16 bytes)
	Statement	Serial Number Return device serial Number. (ASCII Code format.)
YYYY,MM,DD hh,mm,ss,D7	Length	1 Words (2 bytes)
	Statement	time-stamped. YYYY : year MM : month DD : day hh : hour mm : minute ss : second D7 : The day of week 1:Monday ~ 7:Sunday
BAUD	Length	1Words (2 bytes)
	Statement	Baud rate index: Return and set device Baud rate (The Baud rate setting must be valid after device re-boot again.)。 [BAUD = 0] : 600 bps [BAUD = 1] : 1200 bps [BAUD = 2] : 2400 bps [BAUD = 3] : 4800 bps [BAUD = 4] : 9600 bps [BAUD = 5] : 19200 bps
Meas_SW	Length	1 Words (2 bytes)
	Statement	Return the measuring switch: Bit.15~8 : reserve Bit.7 : TVOC switch. (1=ON , 0=OFF) Bit.6 : PM2.5 switch. (1=ON , 0=OFF) Bit.5 : PM10 switch. (1=ON , 0=OFF) Bit.4 : Carbon monoxide switch. (1=ON , 0=OFF) Bit.3 : Relative humidity switch. (1=ON , 0=OFF) Bit.2 : Temperature switch. (1=ON , 0=OFF) Bit.1 : Carbon dioxide switch. (1=ON , 0=OFF) Bit.0 : Formaldehyde switch. (1=ON , 0=OFF)

2. Sensor Data:

HCHO	Length	1 Word (2 bytes)
	Statement	Formaldehyde concentration (unit : 0.01ppm) e.g. 1 = 0.01ppm e.g. 100 = 1.00ppm
CO ₂	Length	1 Word (2 bytes)
	Statement	Carbon dioxide concentration (unit : 1ppm)
T	Length	1 Word (2 bytes)
	Statement	Temperature (unit : 0.01 °C) e.g. 2500 = 25.00°C
RH	Length	1 Word (2 bytes)
	Statement	Relative humidity (unit : 0.01%) e.g. 5000 = 50.00 %
CO	Length	1 Word (2 bytes)
	Statement	Carbon monoxide concentration (unit : 1ppm)
PM ₁₀	Length	1 Word (2 bytes)
	Statement	PM ₁₀ concentration (unit : 0.1 ug/m3) e.g. 100 = 10.0 ug/m3
PM _{2.5}	Length	1 Word (2 bytes)
	Statement	PM _{2.5} concentration (unit : 0.1 ug/m3) e.g. 100 = 10.0 ug/m3
TVOC	Length	1 Word (2 bytes)
	Statement	TVOC concentration (unit : 0.001ppm) e.g. 500 = 0.5 ppm

3. Adjustment function:

HCHO_Adj HCHO_Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for Formaldehyde. $Y = (X + Adj) \times Slope$
CO ₂ _Adj CO ₂ _Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for Carbon dioxide. $Y = (X + Adj) \times Slope$
T_Adj T_Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for Temperature. $Y = (X + Adj) \times Slope$
RH_Adj RH_Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for Relative humidity. $Y = (X + Adj) \times Slope$
CO_Adj CO_Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for Carbon monoxide. $Y = (X + Adj) \times Slope$
PM ₁₀ _Adj PM ₁₀ _Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for PM ₁₀ . $Y = (X + Adj) \times Slope$
PM _{2.5} _Adj PM _{2.5} _Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for PM _{2.5} . $Y = (X + Adj) \times Slope$
TVOC_Adj TVOC_Slope	Length	1 Word (2 bytes)
	Statement	Calibration parameter for TVOC. $Y = (X + Adj) \times Slope$

4. Alarm function:

HCHO_LH	Length	1 Word (2 bytes)
	Statement	The warning level with Formaldehyde.
CO ₂ _LH	Length	1 Word (2 bytes)
	Statement	The warning level with Carbon dioxide.
T_LH	Length	1 Word (2 bytes)
	Statement	The warning level with Temperature.
RH_LH	Length	1 Word (2 bytes)
	Statement	The warning level with Relative humidity.
CO_LH	Length	1 Word (2 bytes)
	Statement	The warning level with Carbon monoxide.
PM ₁₀ _LH	Length	1 Word (2 bytes)
	Statement	The warning level with PM ₁₀ .
PM _{2.5} _LH	Length	1 Word (2 bytes)
	Statement	The warning level with PM _{2.5} .
TVOC_LH	Length	1 Word (2 bytes)
	Statement	The warning level with TVOC.

■ Memory & Dump command

1. Memory & Dump function:

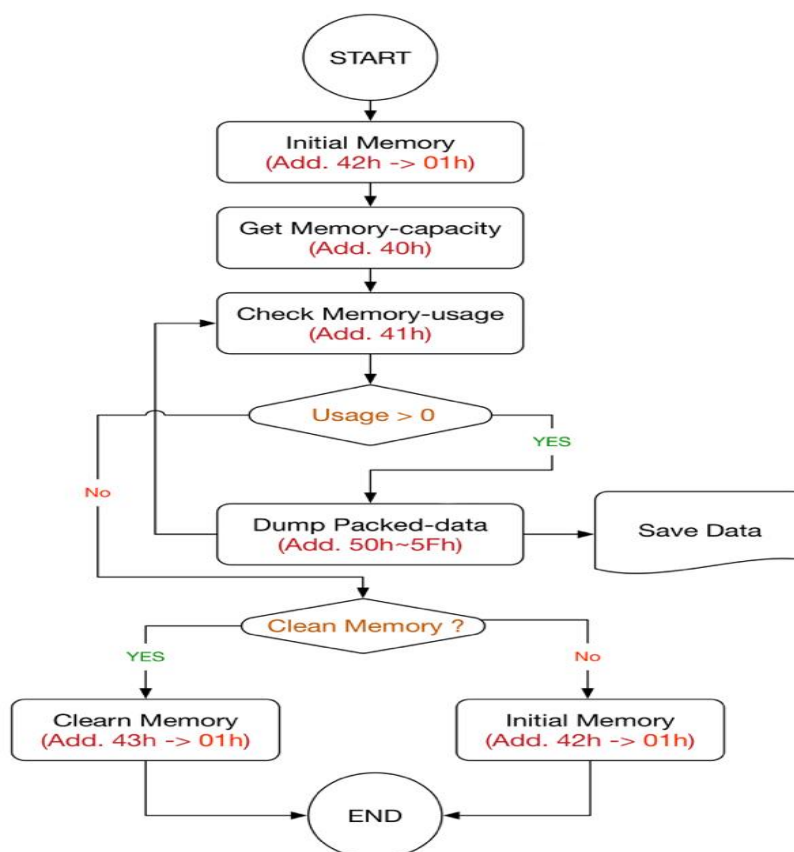
Capacity	Length	1 Words (2 bytes)
	Statement	Return device max memory capacity.
Usage	Length	1 Words (2 bytes)
	Statement	Return memory usage.
Clean	Length	1 Words (2 bytes)
	Statement	Clean device memory. (Write only memory.)
End	Length	1 Words (2 bytes)
	Statement	indication the memory dump process is finished. (Write only memory.)
Packet-Data	Length	16 Words (32 bytes)
	Statement	The packet data, please refer to the next section.

2. Packet data:

	Packet-data (16 Quantities)							
WORD	50h	51h	52h	53h	54h	55h	56h	57h
Parameter	YYYY	MM	DD	hh	mm	ss	D7	
WORD	58h	59h	5Ah	5Bh	5Ch	5Dh	5Eh	5Fh
Parameter	HCHO	CO2	T	RH	CO	PM10	PM2.5	TVOC

The packet data will be sent out by the earliest one.

3. Dump memory flow chart:



Packing Information

	Net Weight(g)	Gross Weight(g)	Carton(g)	Unit/Carton	Carton Net(g)	Unit Dimension(mm)	Carton Dimension(mm)
iAeris 1	573	1,206	1,020	5	13,080	310 x 220 x 100	530 x 332 x 255
iAeris 2	206	592	710	10	6,630	290 x 200 x 50	550 x 310 x 235

Order Information

	Temperature	Relative Humidity	CO ₂	PM _{2.5}	HCHO	PM ₁₀	TVOC	CO	OZONE
iAeris 11	✓	✓	✓						
iAeris 12	✓	✓	✓	✓					
iAeris 13	✓	✓	✓	✓	✓	✓			
iAeris 14	✓	✓	✓	✓	✓	✓	✓	✓	
iAeris 15	✓	✓	✓	✓	✓	✓	✓	✓	✓
iAeris 21	✓	✓	✓						
iAeris 22	✓	✓	✓	✓					
iAeris 23	✓	✓	✓	✓	✓	✓			
iAeris 24	✓	✓	✓	✓	✓	✓	✓	✓	
iAeris 25	✓	✓	✓	✓	✓	✓	✓	✓	✓