

Modbus Protocol V1.10

AirWatch MK1.2 Required firmware: v298+

Note: V1.0+ has significant changes to register map!



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1. CHANGELOG

V.03

- Modified address ranges so that all addresses are unique.
- Added commands to read and reset the pump count.
- Changed default value for baudrate.

V1.0

- Dropped support for wireless module.
- Switched register numbers for upper and lower serial number.
- Changed format of sensor data. Now equal to the display value, shifted to the left of the dot if necessary.
- Changed register layout to accommodate more sensors for future gas detectors (up to 32).

V1.1

- Now sending 0xFFFF as (invalid) sensor value if the AirWatch is still booting (while countdown is active).

V1.2

- Added table of sensor status IDs.
- Renamed “sensor type” to “gas type”.
- Added gas types 12-20.

V1.3

- The values “user pump count” and “internal pump count” were switched. This has been corrected in this manual.

V1.4

- Added a new register that contains the protocol version. Requires firmware version 272+.

V1.5

- Added new registers for readout of raw counts.
- Added new registers for readout of sensor ID.

V1.6

- Added wiring diagram MK1.2.
- Added connector instructions.

V1.7

- Layout document improved.

V1.8

- Added notes 1 / 2.

V1.10 26-11-2023

- Added more detail on protocol and data bits config.

2. SETTINGS

The following configuration options are available in the AirWatch Configurator:

OPTION	DEFAULT VALUE	VALID RANGE	DESCRIPTION
Modbus ID	0 (disabled)	0 (disabled)	
Baudrate	9600	9600-19200	Baudrate in symbols

The following settings are needed to interface an airwatch using a modbus compatible transceiver.

Protocol	Modbus RTU		
Data bits	8		
Stop bits	1		
Parity	None		
Node ID	<<Airwatch node ID>>		

3. SUPPORTED CODES

The following configuration options are available in the AirWatch Configurator:

FUNCTION CODE	FUNCTION NAME	USED FOR
3	Read holding registers	Reading registers (up to 16 register per command)
5	Write single	Setting/resetting of features

4. READING DATA

Data can be read using the Read Holding Registers command. A memory map detailing all useful locations is listed below:

ADDRESS	CONTENT	UNIT
0x0000	Sensor 0 value (default: LEL)	View note [1]; 16 bit unsigned integer
0x0001	Sensor 1 value (default: CO)	View note [1]; 16 bit unsigned integer
0x0002	Sensor 2 value (default: H2S)	View note [1]; 16 bit unsigned integer
0x0003	Sensor 3 value (default: O2)	View note [1]; 16 bit unsigned integer
0x0004-0x001F	Reserved for more sensors	
0x0020	Sensor 0 status	View note [2]; 16 bit unsigned integer
0x0021	Sensor 1 status	View note [2]; 16 bit unsigned integer
0x0022	Sensor 2 status	View note [2]; 16 bit unsigned integer
0x0023	Sensor 3 status	View note [2]; 16 bit unsigned integer
0x0024-0x003F	Reserved for more sensors	
0x0040	Status register	16-bit status register
0x0041	Internal pump count (read only)	Hours
0x0042	User pump count	Hours
0x0043-0x00FF	Reserved for future dynamic data	
0x0100	Serial number	Lower 16 bits
0x0101	Serial number	Upper 16 bits
0x0102	Protocol version	Version number multiplied by 100 (uint16)
0x0102-0x01FF	Reserved for future static data	
0x0200	Sensor 0 lower alarm limit	View note [1]; 16 bit unsigned integer
0x0201	Sensor 1 lower alarm limit	View note [1]; 16 bit unsigned integer
0x0202	Sensor 2 lower alarm limit	View note [1]; 16 bit unsigned integer
0x0203	Sensor 3 lower alarm limit	View note [1]; 16 bit unsigned integer
0x0204-0x021F	Reserved for more sensors	
0x0220	Sensor 0 upper alarm limit	View note [1]; 16 bit unsigned integer
0x0221	Sensor 1 upper alarm limit	View note [1]; 16 bit unsigned integer
0x0222	Sensor 2 upper alarm limit	View note [1]; 16 bit unsigned integer
0x0223	Sensor 3 upper alarm limit	View note [1]; 16 bit unsigned integer
0x0224-0x023F	Reserved for more sensors	
0x0240	Sensor 0 gas type	16-bit signed integer identifying gas type
0x0241	Sensor 1 gas type	16-bit signed integer identifying gas type
0x0242	Sensor 2 gas type	16-bit signed integer identifying gas type
0x0243	Sensor 3 gas type	16-bit signed integer identifying gas type
0x0244-0x025F	Reserved for more sensors	Sensor 3 gas type

Notes: [1] The measured value is multiplied by either 1, 10, 100 or 1000 to ensure the resulting number is an integer. For example, a CO sensor already produces a whole integer and therefore is sent directly. An oxygen sensor value is multiplied by 10 to obtain the integer 209. The maximum value is 0xFFFE. 0xFFFF is returned if there is an error with the sensor. Read sensor status to find the error.

5. REGISTER DESCRIPTION

The following gas types are defined:

5.1 OVERALL STATUS

NUMBER	DISPLAY NAME	NAME
-1	FAIL	Invalid configuration
0	NONE	No sensor installed
1	H ₂ S	H2S sensor installed
2	CO	CO sensor installed
3	LEL	LEL sensor installed
4	OXY	O2 sensor installed
5	SO ₂	SO2 sensor installed
6	NO	NO sensor installed
7	NO ₂	NO2 sensor installed
8	O ₃	O3 sensor installed
9	CO ₂	CO2 sensor installed
10	NH ₃	NH3 sensor installed
11	PH ₃	PH3 sensor installed
12	CL ₂	CL2 sensor installed
13	HCHO	HCHO sensor installed
14	ETO	ETO sensor installed
15	HCN	HCN sensor installed
16	H ₂	H2 sensor installed
17	CLO ₂	CLO2 sensor installed
18	CH ₃ SH	CH3SH sensor installed
19	ISO	ISO sensor installed
20	ACN	ACN sensor installed
21+		Reserved for future use (new sensor types)

The sensor status registers contain the current status of the sensor (safe, alarm, ...).

5.2 SENSOR STATUS

VALUE	DISPLAY	DESCRIPTION	RAISES ALARM
0	NEG	Value is negative	Yes
1	LOW	Value is above lower threshold	Yes
2	HIGH	Value is above upper threshold	Yes
3	OVR	Value is above range of sensor	Yes
4	SAFE	Value is within alarm limits	No
5	CLEAR	Value is within dead band (display value is zero)	No
6	FAIL	Sensor is failing	Yes
7	CAL	Sensor requires calibration	Yes
8	NONE	No sensor is installed	No
9	OVR	Value is above range (for dual range sensor setup)	Yes
10	FAIL ₂	Error code 2	Yes
11	FAIL ₃	Error code 3	Yes
12	FAIL ₄	Error code 4	Yes

The status register is a 16-integer that contains the AirWatch status. The status register contains the sum (OR) of all active states listed below.

5.3 OVERALL STATUS

BIT	DECIMAL VAL	STATUS
Bit 15	32768	Reserved
Bit 14	16384	Reserved
Bit 13	8192	Reserved
Bit 12	4096	Reserved
Bit 11	2048	Reserved
Bit 10	1024	Reserved
Bit 9	512	Reserved
Bit 8	256	Reserved
Bit 7	128	Reserved
Bit 6	64	In menu or calibration (=1)
Bit 5	32	Booting (=1)
Bit 4	16	On battery power (=1)
Bit 3	8	Relay on/off
Bit 2	4	Pump alarm active (=1)
Bit 1	2	Gas alarm active (= 1)
Bit 0	1	Overall status (1 = unsafe)

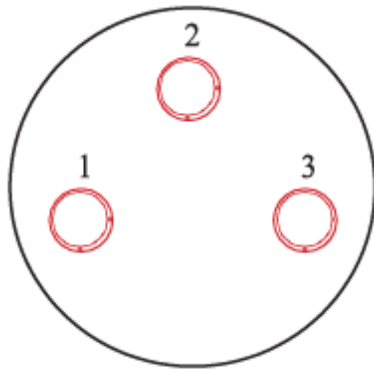
6. SENDING COMMANDS

Using the Modbus Write Single Coil (5) command, it is possible to control some features of the AirWatch remotely. A list of these feature(s) is given below.

ADDRESS	ACTION WHEN OFF(0X0000)	ACTION WHEN ON (0X00FF OR 0XFF00)
0x1001	Nothing	Pump is reset (Reset pump remotely)
0x1002	Nothing	Pump count is set to 0 (Clear user pump count)
0x1003-0x1FFF		(Reserved for future use)

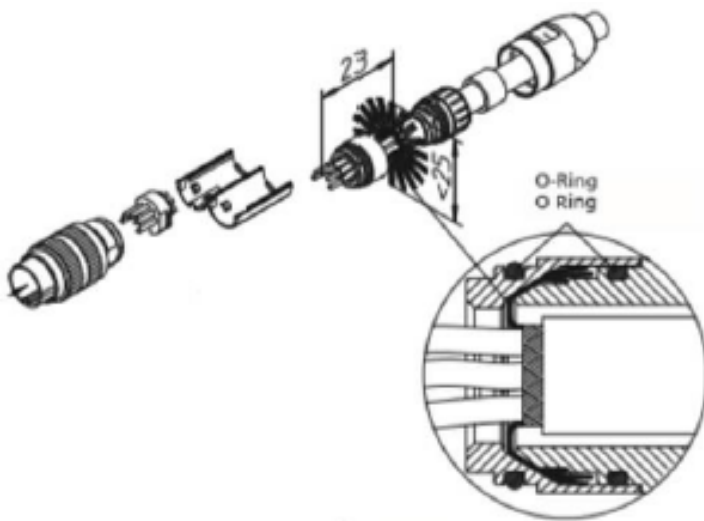
7. WIRING DIAGRAM

Pin out of the 3 pins modbus connector.



1. Modbus B
2. GND
3. Modbus A

Pin out of the 3 pins modbus connector



Modbus Connector assembly P/N: 501138