MICROCYBER

User Manual of WH-M *Wireless*HART Module

Microcyber Corporation

Terms and Abbreviations

*Wireless*HART	
WH-M	*Wireless*HART Module
HCF	HART Communication Foundation
DSSS	Direct Sequence Spread Spectrum
Delimiter	Delimiter
Address	Address
Command	
Payloadlength	
Payload	
Checksum	
STX	Transmission Frame Start
ACK	Acknowledgement
Burst	Active Data Transmission Mode
MasterAddress	
SlaveAddress	
device status	
extended device status	
standardized status 3	
configuration changed counter	
Device malfunction	
Configuration changed	
Cold start	
More status available	
Loop current fixed	
Loop current saturated	
Non-primary variable out of limits	
Primary variable out of limits	

1 Summary

1.1 *Wireless*HART Network Overview

*Wireless*HART standard is developed together by HCF member companies, main wireless device manufacturers and industrial users under the guidance of the HART Communication Foundation (HCF). WirelessHART is a wireless mesh network communications protocol, specially designed for process automation application.

*Wireless*HART adopts mesh topology network technology, safe and stable with 2.4 GHz ISM frequency band, and all the information is packaged in one packet, to realize data transmit through DSSS (Direct Sequence Spread Spectrum) based on IEEE802.15.4. A *Wireless*HART network consists of three key elements: *Wireless*HART field devices, *Wireless*HART gateway and *Wireless*HART network manager, also supports WirelessHART adapter, to let existing HART devices access *Wireless*HART network, and supports *Wireless*HART devices, to connect adjacent *Wireless*HART devices. Figure 1.1 shows the complete *Wireless*HART network structure.

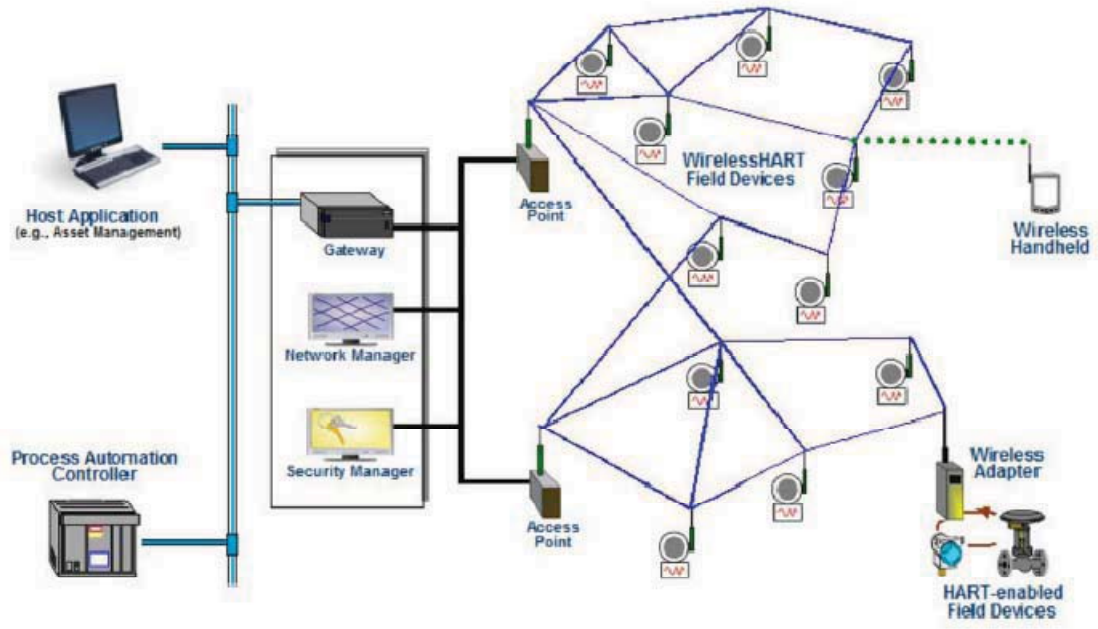


Figure 1.1 *Wireless*HART Network Structure

1.2 Summary of WH-M *Wireless*HART Module

WH-M *Wireless*HART module is a wireless communication module compliant with HART7.4 protocol, and is the core part of *Wireless*HART field device, as shown in Figure 1.2. WH-M periphery provides TTL serial port and control interface. Through the serial port, the WH-M communicates with special customized instrument board, to combine a complete *Wireless*HART field device. The control interface is used to control input and output of the serial port. WH-M supports all the mandatory commands of fieldbus device in HART7.4 protocol and Burst mode.

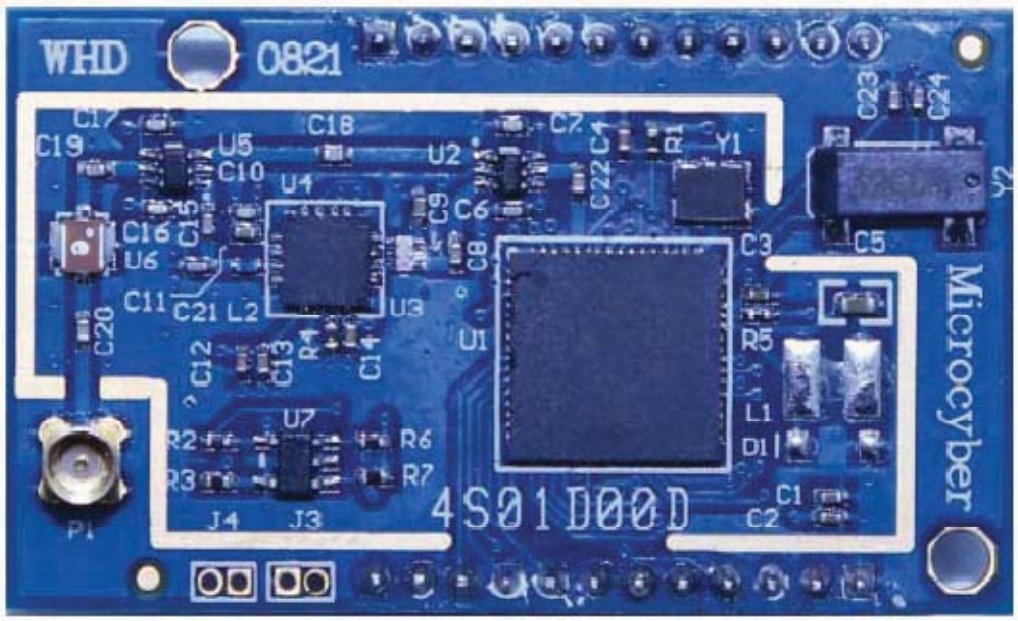


Figure 1.2 WH-M Module Photo

1.3 Reference Specifications

Wireless Command Specification – HCF_SPEC-155 v2.0
HART Field Communication Protocol Specification – HCF_SPEC-13 v7.4
Command Summary Specification– HCF_SPEC-99 v9.0
Command Tables Specification–HCF_SPEC-183 v23.0

2 WH-M Module Composition and Overall Framework

Serial port communication mode is used between WH-M module and instrument board, with half-duplex communication mechanism, to complete information interaction between the instrument board and WH-M module. Instrument board provides maintenance port to realize parameter configuration of WH-M module, process monitoring, and other functions. Typical application scenarios of WH-M module are shown in Figure 2.1 below.

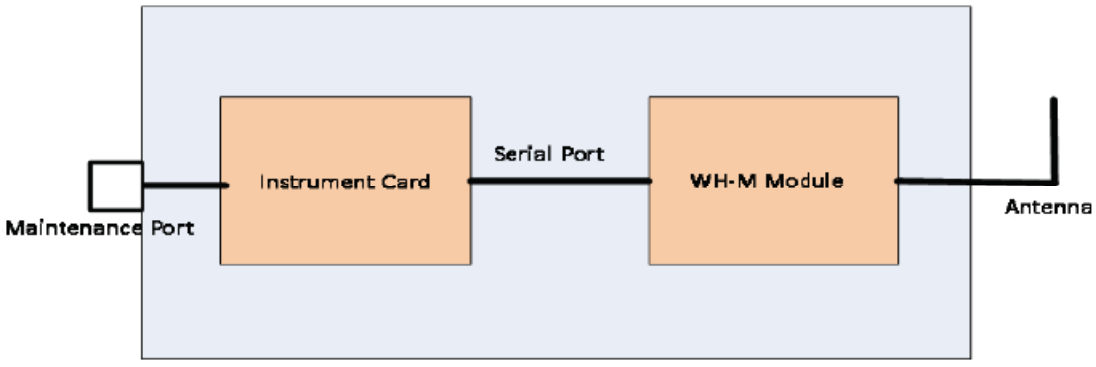


Figure 2.1 WH-M Typical Application Framework

3 Mechanical and Electrical Specifications

3.1 Mechanical Specifications

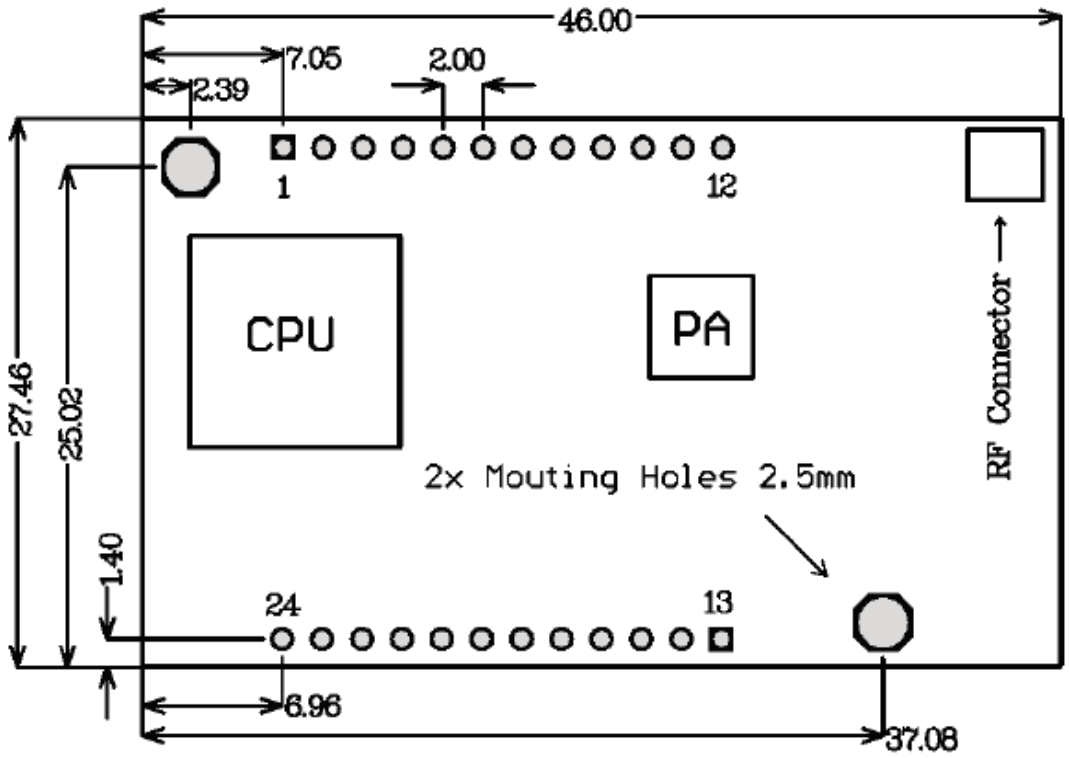


Figure 3.1 Mechanical Dimensions of the WH-M Module

3.2 Pin Assignment

Mark	Name	Direction	Description
1	GND	In	Power Groud
2	VCC	In	Power Supply +
3	RESERVED	-	Do not connect
4	RESERVED	-	Do not connect
5	RESERVED	-	Do not connect
6	RST	In	Module Reset Pin
7	RESERVED	-	Do not connect
8	RESERVED	-	Do not connect
9	RESERVED	-	Do not connect
10	RESERVED	-	Do not connect
11	RESERVED	-	Do not connect
12	RESERVED	-	Do not connect
13	TXD	Out	Data output of serial 1
14	RXD	In	Data input of serial 1
15	CD	Out	Indicating module data sending. Low level is valid.
16	RESERVED	-	Do not connect
17	RTS	In	Indicating instrument card request data sending.

			Low level is valid.
18	RESERVED	-	Do not connect
19	RESERVED	-	Do not connect
20	RESERVED	-	Do not connect
21	RESERVED	-	Do not connect
22	RESERVED	-	Do not connect
23	RESERVED	-	Do not connect
24	RESERVED	-	Do not connect

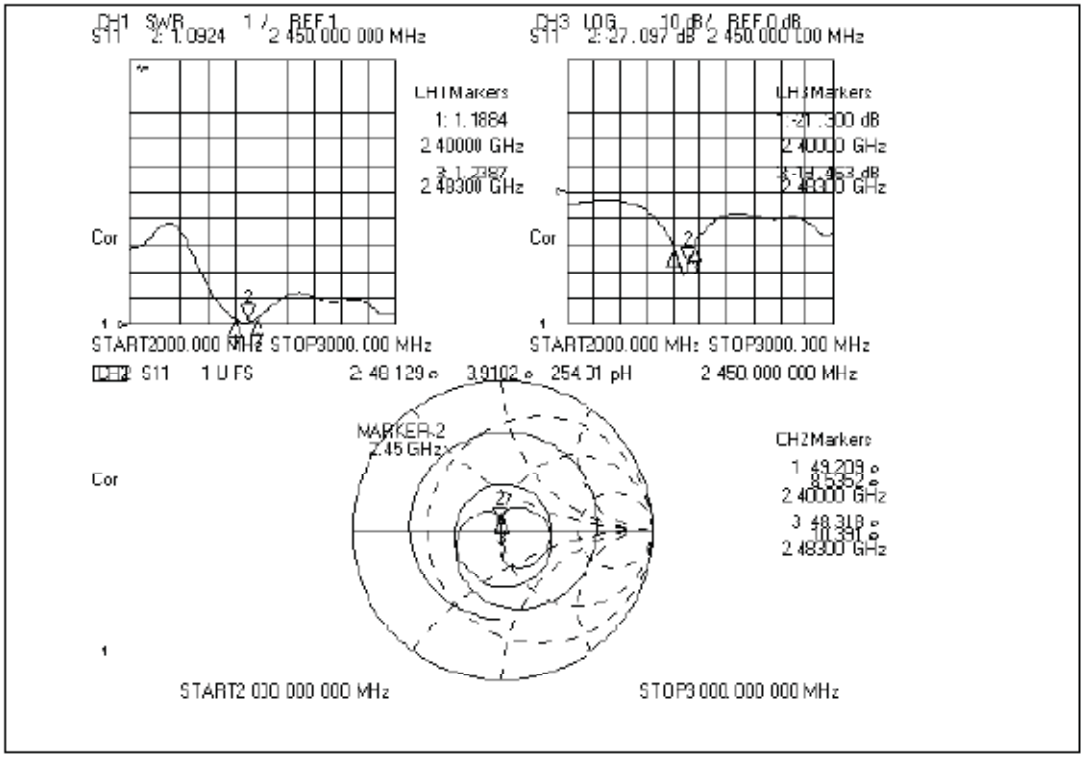
3.3 Electrical Specifications

Operating Conditions	
Supply Voltage	2.7V - 3.3V
Operating Temperature	-40°C - +85°C
Relative Humidity	<90%
Current Consumption	
Transmitting Current	58mA(10dBm)
Receiving Current	27mA
Sleep Current	25uA
Digital IO	
V_{IH}	0.7*Vcc
V_{IL}	0 - 0.3*Vcc
V_{OH}	0.8*Vcc
V_{OL}	0 - 0.2*Vcc
RF Characteristics	
Frequency Band	2.405GHz - 2.475GHz
Number of Channels	25
Channel Separation	2.9MHz
Occupied Bandwidth	1.5MHz
Transmission Rate	250Kbps
Receiver Sensitivity	-90dBm
Output Power	12dBm
Output Impedance	50Ω
Frequency Accuracy	-40ppm - 40ppm
Modulation type	**DSSS**

3.4 Antenna Specifications

Antenna supplier	**SHENZHEN B&T TECHNOLOGY Co,. Ltd**
Input electrical impedance	50ohm
Standing-wave ratio	<2.0
Length	60±3mm
Gain	1dBi
Antenna model number	C3
Color	black

S11 Parameter



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2ADYA-M1100 Or Contains FCC ID: 2ADYA-M1100 "

When the module is installed inside another device, the user manual of this device must contain below warning statements;
1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product