



User Manual

WISE-1020

ADVANTECH

Enabling an Intelligent Planet

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Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

Boards

- WISE-1020 (P/N: WISE-1020-0S01E or WISE-1020-0C01E)

Antenna

- * 2dBi 2.4GHz Antenna (WISE-1020-0S01E only, P/N: 1750000318)

Accessories (Optional)

- Debug Port Adapter Board (P/N: TBD)
- A Cable USB-A 4P(M)/Micro YSB 5P(M) 1m (P/N: 1700023619-01)

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -40° C (-40° F) OR ABOVE 85° C (185° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Contents

Chapter 1	General Introduction	1
1.1	Introduction	2
1.2	Features	2
1.3	Product Specifications.....	2
1.4	Board Dimension.....	3
Chapter 2	H/W Installation.....	5
2.1	Switch and Jumper.....	6
2.2	Connectors and Headers	6
2.3	Locating Connectors	7
2.4	Block Diagram.....	7
2.5	Setting Switch	7
2.5.1	System Power Switch (SW1)	7
2.5.2	Reset Button (SW2)	8
2.6	Setting Jumper.....	8
2.6.1	Jumper Description	8
2.6.2	LED1 Power On/Off (CN6).....	9
2.6.3	Micro USB Power On/Off (CN7)	9
2.7	Power Connector	9
2.7.1	Micro USB Power Connector (USB_1)	9
2.7.2	3-Pin DC Input Power Connector (BATT_PWR1).....	9
2.8	GPIO Connector (CN1).....	10
2.9	Analog Input Connector (CN2).....	10
2.10	Sensors Connector	11
2.10.1	Sensor Connector (CN3)	11
2.10.2	Sensor Connector (CN4)	11
2.11	LED Indication.....	12
Chapter 3	Radio.....	15
3.1	Radio Specifications.....	16
Chapter 4	SmartMesh Solution	17
4.1	Introduction	18
4.2	Programmatic Joining	18
4.2.1	Network ID	18
4.2.2	Join Key	18
4.3	Auto Join	18
4.4	Node Behavior	19
4.4.1	Mode.....	19
4.4.2	Master Mode Behavior.....	19
4.5	Factory Default Settings.....	19
Chapter 5	Software Introduction & Installation	21
5.1	Introduction	22
Chapter 6	Advantech Service	27

6.1	Contact Information.....	28
6.2	Global Service Policy	28
6.2.1	Warranty Policy.....	28
6.2.2	Repair Process	29

Chapter 1

General Introduction

1.1 Introduction

WISE-1020 series is a wireless IoT node with a Linear/Dust Network ARM Cortex-M3 Processor. It is a self-forming and self-healing mesh network device compliant to 6LoWPAN Internet Protocol (IP) and IEEE802.15.4e standard. With time synchronization, channel hopping and full mesh network, it offers wire-like reliability and the world's lowest power WSN solution.

1.2 Features

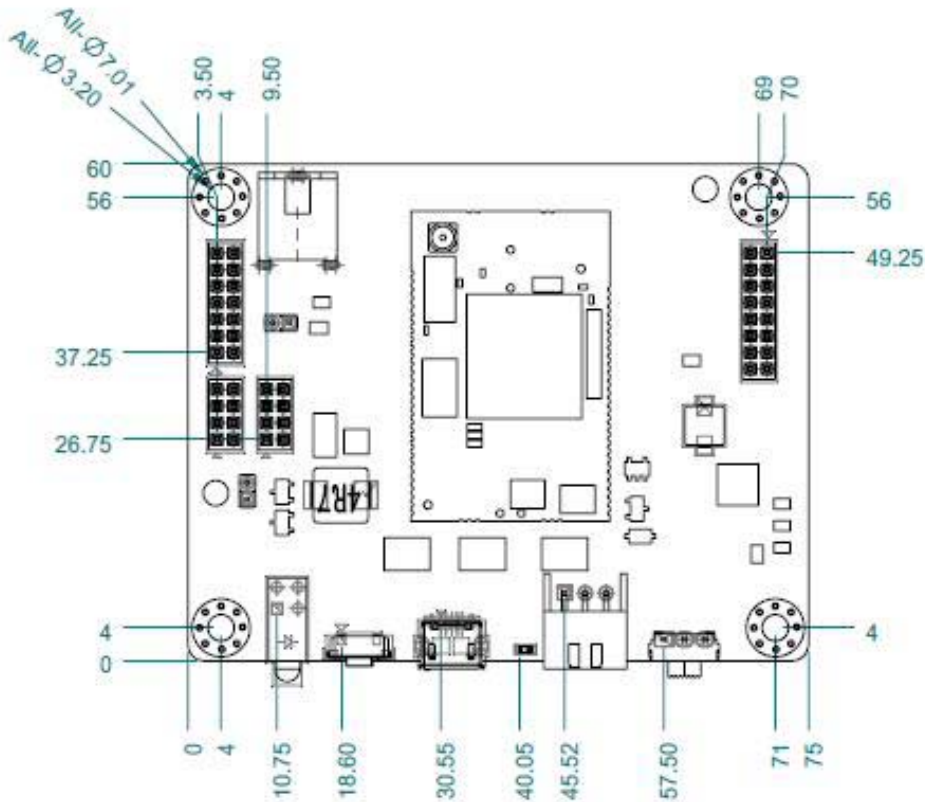
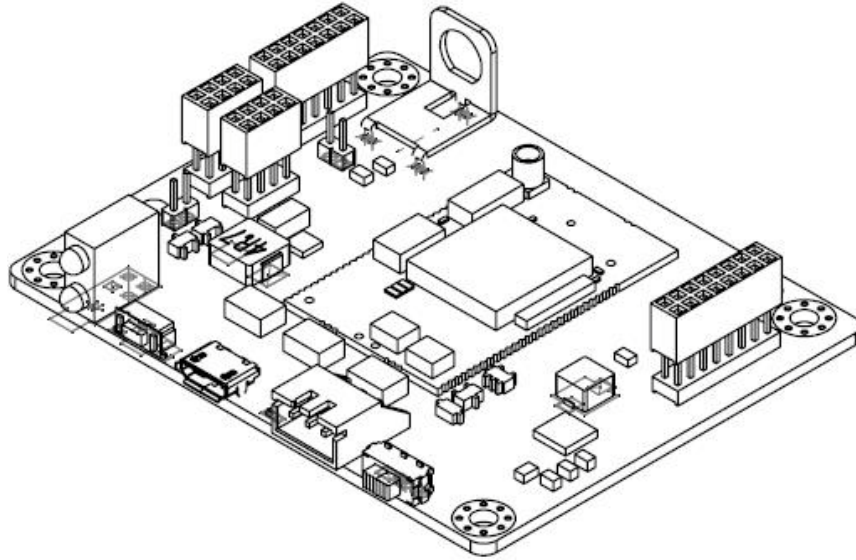
- Self-forming and self-healing mesh network
- Interference robust by time synchronization and transmission frequency hopping design
- Network-wide reliability and power optimization
- AES-128 bit encryption security
- Compliant to 6LoWPAN Internet Protocol (IP) and IEEE 802.15.4e
- Industry-leading low power radio technology with:
 - > 4.5mA to Receive a packet
 - > 5.4mA to Transmit at 0dBm
 - > 9.7mA to Transmit at 8dBm
- Supports various power inputs: USB DC power, 3-pin DC input power

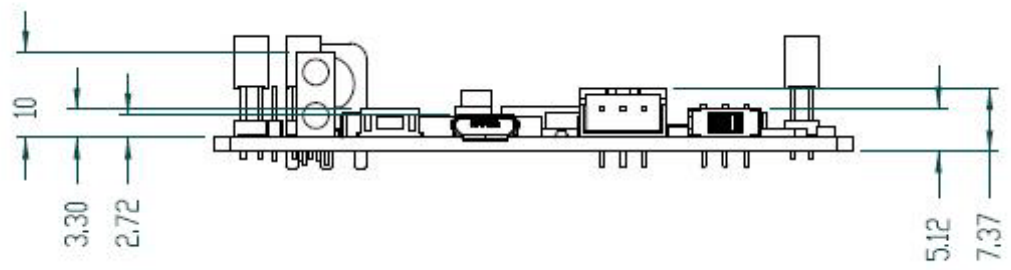
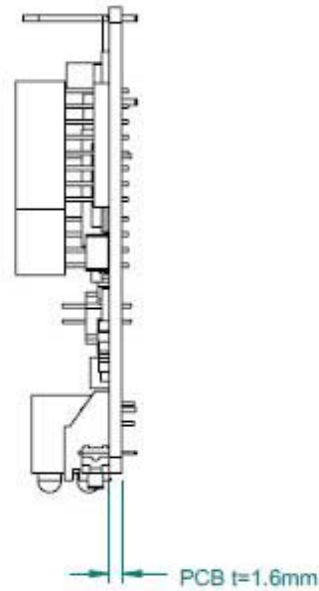
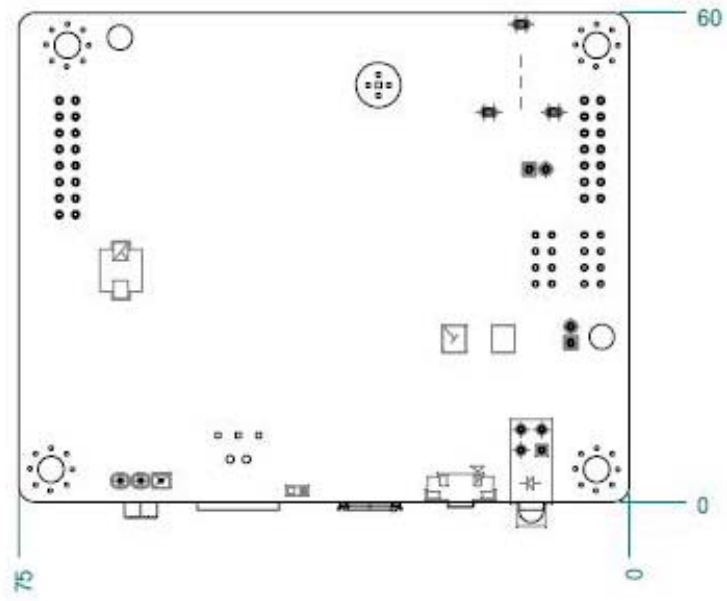
1.3 Product Specifications

Processor System	MCU	Linear/ Dust Network ARM Cortex-M3 Processor
	SRAM	72kB
	Flash	512kB
Radio	Frequency Band	2.4000 ~ 2.4835 GHz
	Number of Channels	15
	Channel Separation	5 MHz
	Modulation	IEEE 802.15.4 Direct Sequence Spread Spectrum (DSSS)
	Raw Data Rate	250 kbps
	Antenna Pin ESD protection	±6000 V
	Analog (I)	3
I/O Interface	Digital (I/O)	DI 4/DO 3 (up to 16 DIO by OCSDK development request)
	UART	1
Power Source	Micro USB DC Power	DC 5V
	3-Pin DC Input Power	DC 5-12V
Radio Power Consumption	Receive a Packet	4.5mA
	Transmit at 0dBm	5.4mA
	Transmit at 8dBm	9.7mA
Mechanical	Dimensions (LxW)	75 x 60 mm
	Weight	35g

Environment	Operating Temperature	-40 ~ 85° C
	Operating Humidity	5% ~ 95% Relative Humidity, non-condensing

1.4 Board Dimension





Chapter 2

H/W Installation

2.1 Switch and Jumper

The WISE-1020 series has two switches and two connectors that allow you to change the settings. The table below lists the functions of the various switches and connectors.

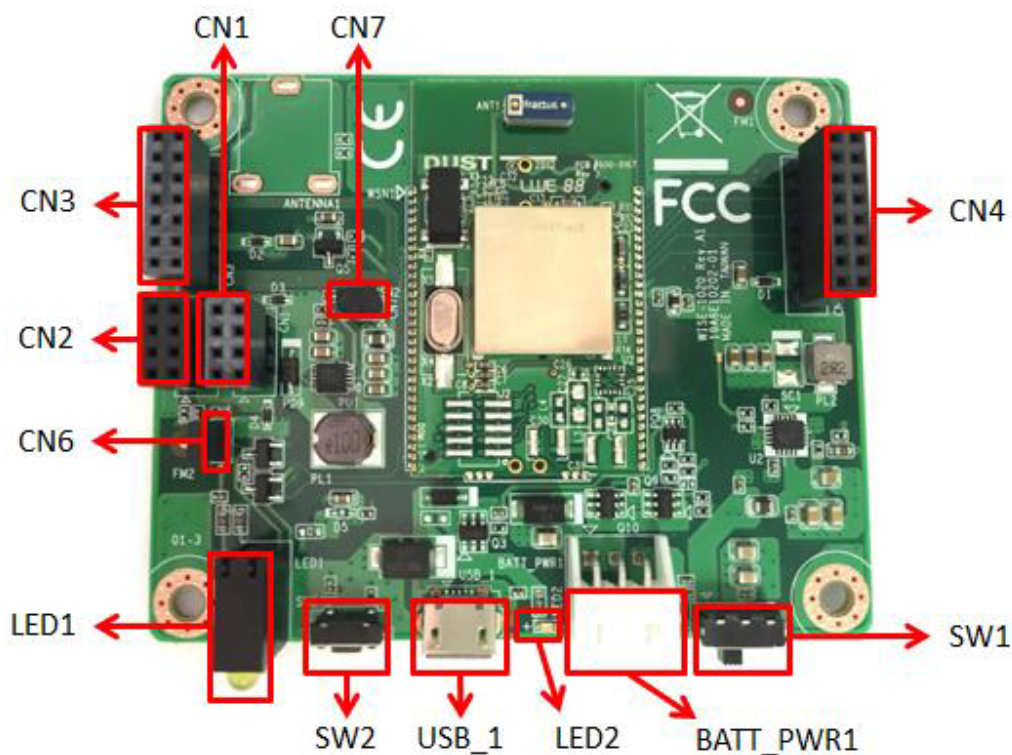
Label	Function
SW1	System Power Switch
SW2	Reset Button
CN6	LED1 Power On/Off
CN7	Micro USB Power On/Off

2.2 Connectors and Headers

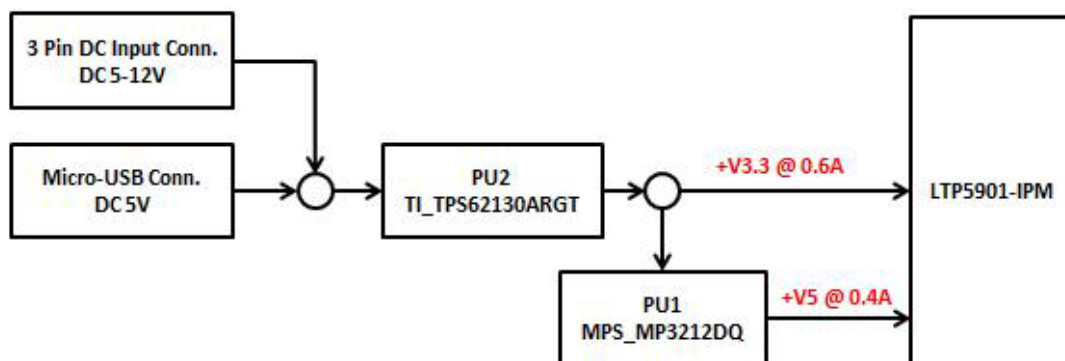
Onboard connectors link WISE-1020 to external devices such as sensor board and peripheral devices. The table below lists the function of each of the board's connectors.

Connector Name	Function
CN1	Reverse GPIO Connector
CN2	Analog Input Connector
CN3	Sensor Board Connector
CN4	Sensor Board Connector
USB_1	USB Power Connector
BATT_PWR1	3-Pin DC Input Power Connector

2.3 Locating Connectors

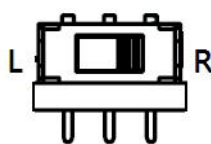


2.4 Block Diagram



2.5 Setting Switch

2.5.1 System Power Switch (SW1)



Setting	Function
---------	----------

Switch right	Power off (default)
Switch left	Power on

2.5.2 Reset Button (SW2)

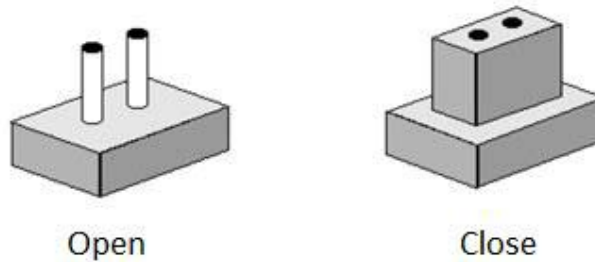


Setting	Function
Push reset button	System reset

2.6 Setting Jumper

2.6.1 Jumper Description

You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper, you connect the pins with the clip. To “open” a jumper, you remove the clip.



The jumper settings are schematically depicted in this manual as follows.



A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes. Generally, you simply need a standard cable to make most connections.

2.6.2 LED1 Power On/Off (CN6)

Setting	Function
Close	LED1 Power On (default)

Open	LED1 Power Off
------	----------------

2.6.3 Micro USB Power On/Off (CN7)

Setting	Function
Close	Micro USB Power On (default)
Open	Micro USB Power Off

2.7 Power Connector

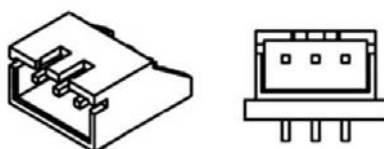
2.7.1 Micro USB Power Connector (USB_1)



Pin	Signal Name
1	+5V_USB
2	N/A
3	N/A
4	GND

2.7.2 3-Pin DC Input Power Connector (BATT_PWR1)

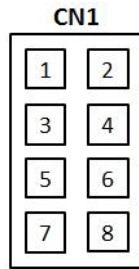
WISE-1020 supports 5~12V DC input, users can connect battery or DC power adapter through this connector.



Pin	Signal Name
1	+Vin_Cell
2	+Vin_Cell
3	GND

2.8 GPIO Connector (CN1)

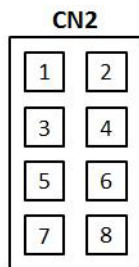
WISE-1020 supports 8-bit GPIO by default, this is reserved for OCSDK development.



Pin	Pin Name	Function
1	RFU	Reserved for OCSDK Development (Master mode only)
2	GPIO20	System Power LED
3	RFU	Reserved for OCSDK Development (Master mode only)
4	RFU	Reserved for OCSDK Development (Master mode only)
5	RFU	Reserved for OCSDK Development (Master mode only)
6	RFU	Reserved for OCSDK Development (Master mode only)
7	RFU	Reserved for OCSDK Development (Master mode only)
8	RFU	Reserved for OCSDK Development (Master mode only)

2.9 Analog Input Connector (CN2)

In master mode, users can get analog input through this connector, it accepts 3 analog signals and supports 3.3 V and 5 V power.

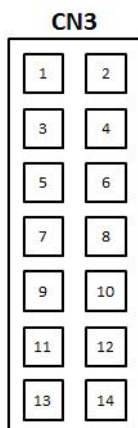


Pin	Pin Name	Function
1	AI_3	Default for 3-Pin DC input power detection (Only for slave mode usage)
2	CB power-on_+3.3V	Provide sensor board power
3	AI_2	Analog Input (Voltage 0~+1.8V)
4	N/A	N/A
5	AI_1	Analog Input (Voltage 0~+1.8V)
6	GND	Ground
7	AI_0	Analog Input (Voltage 0~+1.8V)
8	CB power-on_+5V	Provide sensor board power

2.10 Sensors Connector

2.10.1 Sensor Connector (CN3)

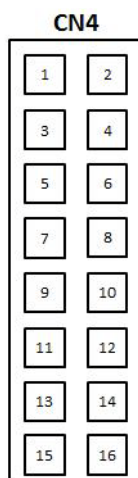
In slave mode, users can gather the sensor board data from this connector.



Pin	Pin Name	Function
1	UARTC0_TX	CLI UART 0 Transmit
2	RESET#	Reset Input, Active Low
3	UARTC0_RX	CLI UART 0 Receive
4	FLASH_P_ENn	Flash Program Enable, Active Low
5	GPIO6	Reserve GPIO Output port (Master mode only)
6	CB power-on_+5V	Provide sensor board power
7	GPIO5	Reserve GPIO Output port (Master mode only)
8	GPIO26	Reserve GPIO Input port (Master mode only)
9	GPIO4	Reserve GPIO Input port (Master mode only)
10	GPIO23	Action States LED
11	GPIO3	Reserve GPIO Input port (Master mode only)
12	GPIO22	Reserve GPIO Output port (Master mode only)
13	N/A	N/A
14	GPIO21	Reserve GPIO Input port (Master mode only)

2.10.2 Sensor Connector (CN4)

In slave mode, users can gather the sensor board data from this connector.



Pin	Pin Name	Function
-----	----------	----------

1	UART_TX	UART Transmit
2	INHIBIT	The RADIO_INHIBIT input enables an external controller to temporarily disable the radio software drivers
3	UART_TX_CTS#	UART Transmit (CTS) Clear to Send, Active Low
4	TIME#	Time Capture Request, Active Low. Strobing the TIME# input is the most accurate method to acquire the network time maintained by Eterna.
5	UART_TX_RTS#	UART Transmit (RTS) Request to Send, Active Low
6	SLEEPn	The SLEEPn function is not currently supported in software. The SLEEPn input must be tied, pulled or actively driven high to avoid excess leakage.
7	UART_RX	UART Receive
8	RESET_N	Reset Input, Active Low
9	UART_RX_CTS#	UART Receive (CTS) Clear to Send, Active Low
10	GND	Ground
11	UART_RX_RTS#	UART Receive (RTS) Request to Send, Active Low
12	CB power-on_+3.3V	Provides sensor board power
13	N/A	N/A
14	CB power-on_+3.3V	Provides sensor board power
15	N/A	N/A
16	GND	Ground

2.11 LED Indication

There are three LEDs on WISE-1020. In master mode, they represent different states; In slave mode, these LED are disabled. The following table shows the indication of the LEDs.

LED	Position	Color	LED State	NIC State
System Power LED	LED1	Green	On	System Power On
			Off	System Power Off
Action Status LED	LED1	Yellow	Blink	Connecting to Network
			On	Connection Success
			Off	Searching Network
Micro USB Power LED	LED2	Red	On	Micro USB Power On
			Off	Micro USB Power Off

Chapter 3

Radio

3.1 Radio Specifications

Parameter	Conditions	MIN	TYP	MAX	Units
Frequency Band		2.4000		2.4835	GHz
Number of Channels			15		
Channel Separation			5		MHz
Channel Center Frequency	Where k=11 to 25, as Defined by IEEE 802.15.4			$2405 + 5*(k-11)$	MHz
Modulation	IEEE 802.15.4 Direct Sequence Spread Spectrum (DSSS)				
Raw Data Rate			250		kbps
Antenna Pin ESD Protection	HBM per JEDEC JESD22-A114F		± 6000		V
Range	25°C, 50% RH, +2dBi Omni-Directional Antenna, Antenna 2m				
Indoor			50~100		m
Outdoor	Above Ground		150~200		m

Chapter 4

SmartMesh Solution

4.1 Introduction

SmartMesh Solution is a self-managing, low power Internet Protocol (IP) network built from wireless nodes. With Dust's time-synchronized SmartMesh Solution, all nodes in the network route, gather and transmit data with via a single battery power that supports many years of operation. The SmartMesh Solution is readily configured via a software Application Programming Interface (API). SmartMesh Solution Nodes deliver a highly flexible networks with proven reliability and low power performance in an easy-to-integrate platform.

SmartMesh Solution Nodes are responsible for:

- Maintaining synchronization of the network
- Forwarding data from descendants
- Generating health reports to continually update network status
- Generating alarms to indicate failures, such as a lost path
- Presenting user interfaces to a sensor application

4.2 Programmatic Joining

To join the network, the device must be configured with the following parameters that bind the device to the network.

- Network Id
- Join Key

These parameters are persistent and may be set once during commissioning.

4.2.1 Network ID

Overlapping installations can be arranged into separate networks by assigning unique Network ID to WISE-1020 and Wireless IoT Gateway in each network. WISE-1020 does not communicate with nodes or gateway using different Network IDs. You can set the Network ID through CLI command. Please refer to chapter 5 for more details.

Parameter	Parameter Range	Default Value
Network ID	1-65534	2001

4.2.2 Join Key

Nodes use a join key to encrypt the initial join request when joining a network. If the join key used by the node does not match the node's join key configured on the Wireless IoT Gateway, the gateway will not be able to decrypt the join message and will not allow the node to join the network. By default, nodes and the gateway ship with a common join key set to a default value.

Parameter	Parameter Range	Default Value
Join Key	32 hexadecimal character	4A4F494E414456414E54454348494F54

4.3 Auto Join

The node can be configured to automatically search for and start joining its network after reboot in slave mode. This setting is controlled via persistent Auto Join param-

ter. In this case, no explicit join command is required. Note that all parameters, such as Network ID, power source, etc. must be pre-configured.

Warning! *The Auto Join function can only run in slave mode. If you want to switch mode to master, you MUST set auto join off, or it will shut down.*



4.4 Node Behavior

4.4.1 Mode

Nodes have two modes that control joining and command termination behavior:

- Master, in which the node runs an application that commands and controls the join of a network. By default WISE-1020 is configured for master mode. The API support is disabled in master mode.
- Slave, a serially connected device to transmit commands and control join. By default WISE-1020 does not join a network on its own without auto join. The API is enabled in slave mode, and the device expects a serially attached application to connect to it. If auto join is enabled, the node in slave mode will join the network without requiring a serial application to issue a join command.

WISE-1020 can be set through the CLI command and persists after reset.

4.4.2 Master Mode Behavior

The **master** mode application can get the data from onboard analog and temperature sensors from a specific period of time, and read and write digital I/O. By default, the application will get and send temperature reports every 30s. A customer application can interface with the master mode application via OAP protocol.

4.5 Factory Default Settings

The WISE-1020 ships with the following factory defaults. The node can be returned to factory settings by using the restore node CLI command.

Parameter	Default Value
Network ID	1229
Transmit Power	+8dBm
Join Key (16 bytes, Hex)	44 55 53 54 4E 45 54 57 4F 52 4B 53 52 4F 43 4B
OTAP Lockout	0 (permitted)
Routing Mode	0 (enable)
Join Duty Cycle	0xFF (100%) for DC9003B, 0x40 (25%) for others
maxStCurrent	0xFFFF (no limit)
minLifetime	0 (no limit)
currentLimit	0 (none)
Auto Join	off

Chapter 5

Software Introduction
& Installation

5.1 Introduction

You can set WISE-1020 series by accessing the CLI from any serial terminal program (such as HyperTerminal):

If connecting to an evaluation board integrated with a serial-to-usb interface, the CLI will be found on a COM port mapped onto your system. The default serial port settings are as follows:

Baud Rate/ Bits per second: 9600

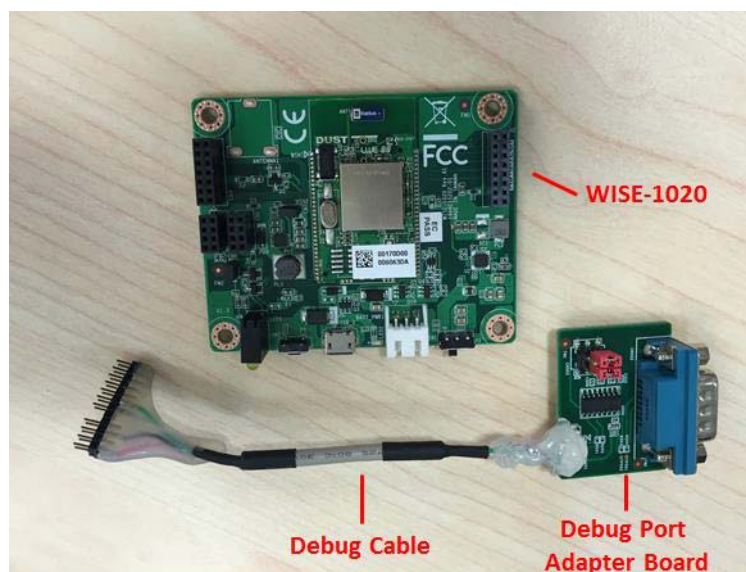
Data bits: 8

Parity: None

Stop bits: 1

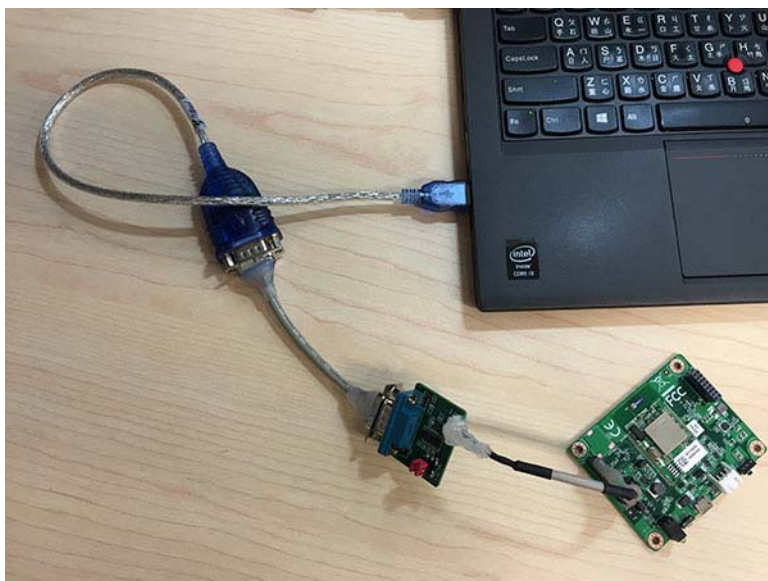
Flow control: None

1. Prepare WISE-1020 debug port adapter board (P/N: TBD).



2. Plug micro USB cable (P/N: 1700023619-01) to USB hub (This is power cable for WISE-1020 series), move switch to left side and push reset button.

3. Debug port adapter board plug to PC/NB. PC/NB set baud rate 9600, stop 1, none parity.



4. Basic Setting

■ Getting network-related information

Use the minfo command to get network-related information about WISE-1020.

```
> minfo
Net stack v1.1.0.0
state: Search
mac: 00:17:0d:00:00:38:03:48
moteid: 0
netid: 423
blSwVer: 9
ldrSwVer: 1.0.3.12
UTC time: 1025665219:790010
reset st: 600, b96bf7dd
```

■ Reset

If you insert the CLI commands, you should use the reset command to reset the node after inserted command.

```
> reset
```

By default, WISE-1020 is configured for master mode. To read the current configuration, connect WISE-1020 to a computer via a USB cable and use the get mote CLI command. Use the get mode command to see the current mode:

```
> get mode
master
```

- Switching to slave mode

To configure the node for slave mode, use the set mode CLI command:

```
> set mode slave
> reset
```

- Switching to Master Mode

To configure the node for master mode, use the set mode CLI command:

```
> set mode master
> reset
```

- Set node to auto-join mode

The netlayer will automatically try to join to the network when mget=1 but the default is mget=0 so the node does not auto-join in slave mode by default. Use the mget autojoin CLI command to check the status:

```
> mget autojoin
autojoin = 0
```

Use mset autojoin <value> CLI command to set the status.

```
> mset autojoin 1
> reset
> mget autojoin
autojoin = 1
```

Warning! *The auto-join function only can run in slave mode. If you want to switch mode to master, you MUST set Auto Join off or it will shut down.*



- Changing Network ID

The network identifier (or netid) is a 16-bit identifier of your network. It is set to 2001 by default. The following commands are setting the network id to 100.

```
> mset netid 100
> mget netid
netid=100
> reset
```

- Set Join key

The join key is a 16-bit hexadecimal password for join the network. It is set to "JOIN-ADVANTECHIOT" (decimal) by default.

```
> mset jkey 4A4F494E414456414E54454348494F54  
> reset
```

■ Restore

You can use the restore command to clear all settings and parameters to the factory default values.

```
> restore
```


Chapter 6

Advantech Service

6.1 Contact Information

Below is the contact information for Advantech customer service

Region/Country	Contact Information
America	1-888-576-9688
Brazil	0800-770-5355
Mexico	01-800-467-2415
Europe (Toll Free)	00800-2426-8080
Singapore & SAP	65-64421000
Malaysia	1800-88-1809
Australia (Toll Free)	1300-308-531
China (Toll Free)	800-810-0345 800-810-8389 Sales@advantech.com.cn
India (Toll Free)	1-800-425-5071
Japan (Toll Free)	0800-500-1055
Korea (Toll Free)	080-363-9494 080-363-9495
Taiwan (Toll Free)	0800-777-111
Russia (Toll Free)	8-800-555-01-50

On the other hand, you can reach our service team through below website, our technical support engineer will provide quick response once the form is filled out:

http://www.advantech.com.tw/contact/default.aspx?page=contact_form2&subject=Technical+Support

6.2 Global Service Policy

6.2.1 Warranty Policy

Below is the warranty policy of Advantech products:

6.2.1.1 Warranty Period

Advantech branded off-the-shelf products and 3rd party off-the-shelf products used to assemble Advantech Configure to Order products are entitled to a 2 years complete and prompt global warranty service. Product defect in design, materials, and workmanship, are covered from the date of shipment.

All customized products will by default carry a 15 months regional warranty service. The actual product warranty terms and conditions may vary based on sales contract.

All 3rd party products purchased separately will be covered by the original manufacturer's warranty and time period, and shall not exceed one year of coverage through Advantech.

6.2.1.2 Repairs under Warranty

It is possible to obtain a replacement (Cross-Shipment) during the first 30 days of the purchase, thru your original ADVANTECH supplier to arrange DOA replacement if the products were purchased directly from ADVANTECH and the product is DOA (Dead-on-Arrival). The DOA Cross-Shipment excludes any shipping damage, customized and/or build-to-order products.

For those products which are not DOA, the return fee to an authorized ADVANTECH repair facility will be at the customers' expense. The shipping fee for reconstructive products from ADVANTECH back to customers' sites will be at ADVANTECH's expense.

6.2.1.3 Exclusions from Warranty

The product is excluded from warranty if

- The product has been found to be defective after expiry of the warranty period.
- Warranty has been voided by removal or alternation of product or part identification labels.
- The product has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused which ADVANTECH is not responsible whether by accident or other cause. Such conditions will be determined by ADVANTECH at its sole unfettered discretion.
- The product is damaged beyond repair due to a natural disaster such as a lightning strike, flood, earthquake, etc.
- Product updates/upgrades and tests upon the request of customers who are without warranty.

6.2.2 Repair Process

6.2.2.1 Obtaining an RMA Number

All returns from customers must be authorized with an ADVANTECH RMA (Return Merchandise Authorization) number. Any returns of defective units or parts without valid RMA numbers will not be accepted; they will be returned to the customer at the customer's cost without prior notice.

An RMA number is only an authorization for returning a product; it is not an approval for repair or replacement. When requesting an RMA number, please access ADVANTECH's RMA web site: <http://erma.ADVANTECH.com.tw> with an authorized user ID and password.

You must fill out basic product and customer information and describe the problems encountered in detail in "Problem Description". Vague entries such as "does not work" and "failure" are not acceptable.

If you are uncertain about the cause of the problem, please contact ADVANTECH's Application Engineers (AE). They may be able to find a solution that does not require sending the product for repair.

The serial number of the whole set is required if only a key defective part is returned for repair. Otherwise, the case will be regarded as out-of-warranty.

6.2.2.2 Returning the Product for Repair

It is possible customers can save time and meet end-user requirements by returning defective products to an authorized ADVANTECH repair facility without an extra cross-region charge. It is required to contact the local repair center before offering global repair service.

It is recommended to send cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as CPU, DRAM, and CF Card. If you send all these parts back (because you believe they may be part of the problem), please note clearly that they are included. Otherwise, ADVANTECH is not responsible for any items not listed. Make sure the "Problem Description" is enclosed.

European Customers that are located outside European Community are requested to use UPS as the forwarding company. We strongly recommend adding a packing list

to all shipments. Please prepare a shipment invoice according to the following guidelines to decrease goods clearance time:

1. Give a low value to the product on the invoice, or additional charges will be levied by customs that will be borne by the sender.
2. Add information "Invoice for customs purposes only with no commercial value" on the shipment invoice.
3. Show RMA numbers, product serial numbers and warranty status on the shipment invoice.
4. Add information about Country of origin of goods

In addition, please attach an invoice with RMA number to the carton, then write the RMA number on the outside of the carton and attach the packing slip to save handling time. Please also address the parts directly to the Service Department and mark the package "Attn. RMA Service Department".

All products must be returned in properly packed ESD material or anti-static bags. ADVANTECH reserves the right to return unrepaired items at the customer's cost if inappropriately packed.

Besides that, "Door-to-Door" transportation such as speed post is recommended for delivery, otherwise, the sender should bear additional charges such as clearance fees if Air-Cargo is adopted.

Should DOA cases fail, ADVANTECH will take full responsibility for the product and transportation charges. If the items are not DOA, but fail within warranty, the sender will bear the freight charges. For out-of-warranty cases, customers must cover the cost and take care of both outward and inward transportation.

6.2.2.3 Service Charges

The product is excluded from warranty if:

- The product is repaired after expiry of the warranty period.
- The product is tested or calibrated after expiry of the warranty period, and a No Problem Found (NPF) result is obtained.
- The product, though repaired within the warranty period, has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused which ADVANTECH is not responsible whether by accident or other cause. Such conditions will be determined by ADVANTECH at its sole unfettered discretion.
- The product is damaged beyond repair due to a natural disaster such as a lightning strike, flood, earthquake, etc.
- Product updates and tests upon the request of customers who are without warranty.

If a product has been repaired by ADVANTECH, and within three months after such a repair the product requires another repair for the same problem, ADVANTECH will do this repair free of charge. However, such free repairs do not apply to products which have been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused which ADVANTECH is not responsible whether by accident or other cause.

Please contact your nearest regional service center for detail service quotation.

Before we start out-of-warranty repairs, we will send you a pro forma invoice (P/I) with the repair charges. When you remit the funds, please reference the P/I number listed under "Our Ref". ADVANTECH reserves the right to deny repair services to

customers that do not return the DOA unit or sign the P/I. Meanwhile, ADVANTECH will scrap defective products without prior notice if customers do not return the signed P/I within 3 months.

6.2.2.4 Repair Report

ADVANTECH returns each product with a "Repair Report" which shows the result of the repair. A "Repair Analysis Report" is also provided to customers upon request. If the defect is not caused by ADVANTECH design or manufacturing, customers will be charged US\$60 or US\$120 for in-warranty or out-of-warranty repair analysis reports respectively.

6.2.2.5 Custody of Products Submitted for Repair

ADVANTECH will retain custody of a product submitted for repair for one month while it is waiting for return of a signed P/I or payment (A/R). If the customer fails to respond within such period, ADVANTECH will close the case automatically. ADVANTECH will take reasonable measures to stay in proper contact with the customer during this one month period.

6.2.2.6 Shipping Back to Customer

The forwarding company for RMA returns from ADVANTECH to customers is selected by ADVANTECH. Per customer requirement, other express services can be adopted, such as UPS, FedEx and etc. The customer must bear the extra costs of such alternative shipment. If you require any special arrangements, please indicate this when shipping the product to us

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