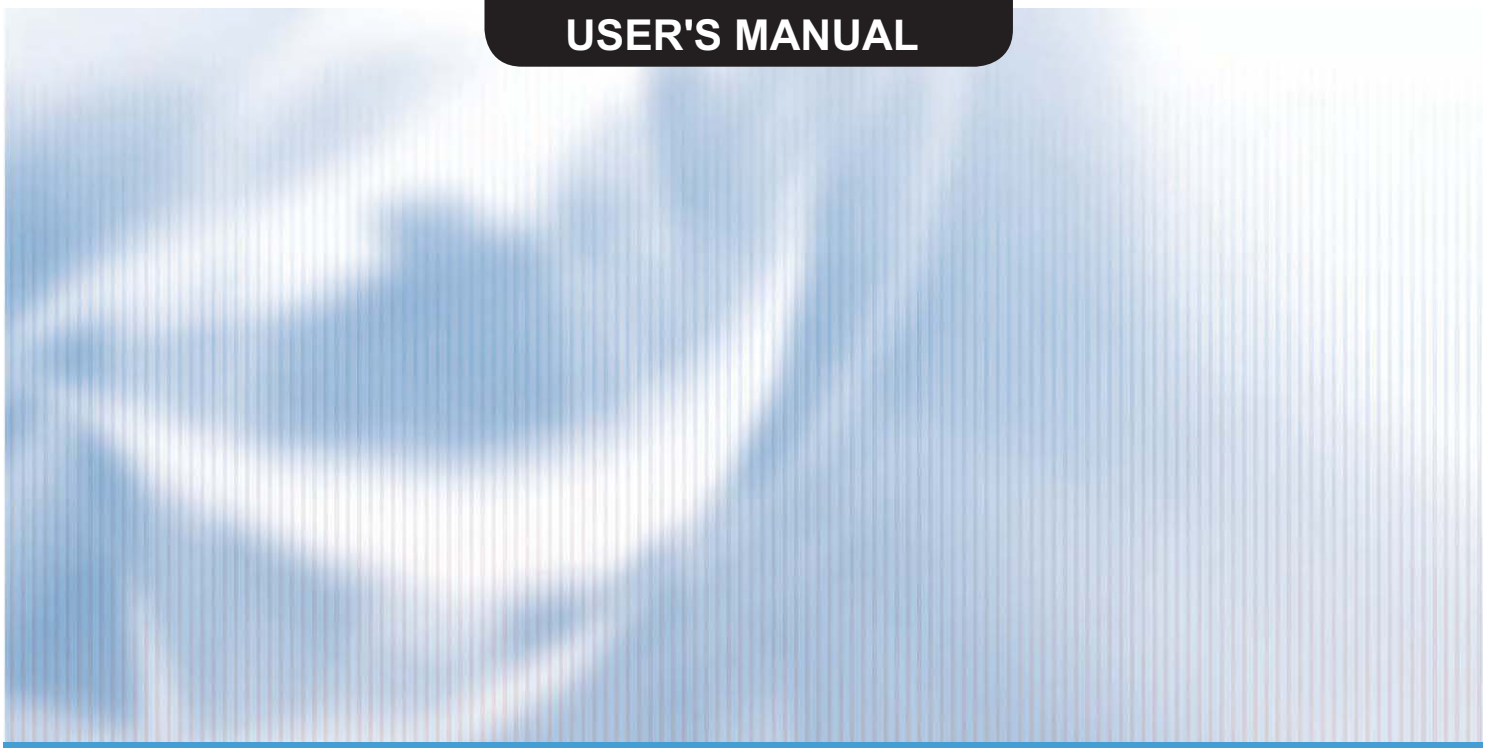
EN

USER'S MANUAL



BACnet Gateway

SBG-01

sinclair
AIR CONDITIONING

“Original instructions”

IMPORTANT NOTE:

Read this manual carefully before installing or operating your new air conditioning unit. Make sure to save this manual for future reference.

User Notice

Dear customer：

Please read this manual carefully prior to installation and operation and strictly observe all installation and operation instructions covered in the manual.

Special attentions shall be paid to the following marks：

⚠ WARNING!	This mark indicates operation, which if improperly performed, might lead to the death or serious injury of the users.
❗ CAUTION!	This mark indicates operation, which if improperly performed, might possibly result in damage to the device.

⚠WARNING!
(1) Installation shall be performed by the qualified personnel; otherwise it would result in a fire hazard or electric shock.
(2) Do not place the plug of the power supply into the socket before it is dried and cleaned.
(3) Cut off the power supply before touching the electric element.
(4) Do not touch this device with wet hands; otherwise it would result in electric shock.
(5) Do use the power cable specified in this manual; otherwise it would result in a fire hazard.
(6) When the power cable is reversely connected or the power supply is beyond the rated range, it would result in a fire hazard or even damages to this device.
(7) For PLUGGABLE EQUIPMENT,the socket-outlet shall be installed near the equipment and shall be easily accessible.
(8) Do install this device inside the electric control cabinet which is located indoor and then is locked.
(9) Do install this device where it will not be subject to the electromagnetic interference or heavy dust.

CAUTION!
(1) Be sure the specified adaptor is used; otherwise this device would work improperly or even be damaged.
(2) Be sure this device is setup in place; otherwise it would result in communication fault.
(3) Be sure the communication line is connected to the correct interface; otherwise it would result in communication fault.
(4) After connection, lines should be protected with insulating tape to avoid oxidation and short circuits.
(5) Risk of explosion if battery is replaced by an incorrect type,dispose of used batteries according to the instructions.
(6) Normal working conditions for BACnet gateway： ① Temperature : 0~55℃; ② Humidity: less than 85%,except for the condensation of dew; ③ Location: indoor (it is highly recommended to install this product in the electric control cabinet), not subject to direct sunlight, rain and snow etc.
(7) Graphics in the instruction manual are for reference only.
(8) Before energizing BACnet gateway, the unit shall be in energizing status, and normal communication between units.
(9) For the first time energizing BACnet gateway, enter the gateway configuration page settings, restart the gateway after setting up, and operation gateway after wait for 10 minutes(Generally, it is related to the number of units. The more units, the longer the time).

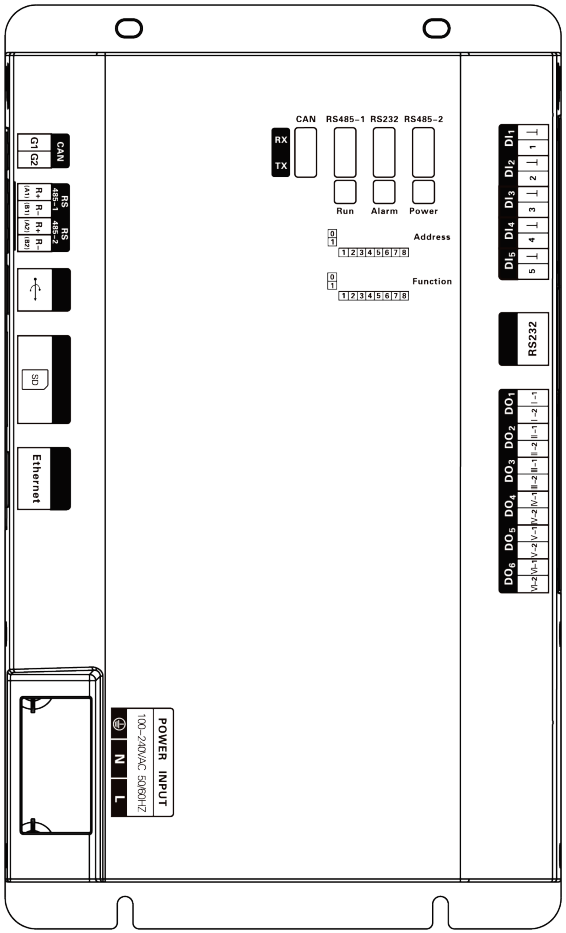
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1 Function and Parameter

1.1 Functional Overview

BACnet gateway SBG-01 is intended to realize the data exchangebetween the air conditioning unit and BMS system, and providing standardBACnet/IP building interface and 10 I/Os (five inputs are DI1, DI2, DI3, DI4, DI5 and five outputs are DO1, DO2, DO3, DO4, DO5). DI1 is the fire alarm interface. The status of other I/Os are mapped to the specific objects of the BACnet/IP bus and are defined by the user. Applicable models for this gateway are listed in Attachment B.



1.2 Parameter Specifications

1.2.1 BACnet gateway TCP/IP Parameter (Default)

IP Address：192.168.1.150

Subnet Mask：255.255.255.0

Default gateway：192.168.1.1

CAUTION!

Please reenergize the gateway to make the modified TCP/IP data effective.

1.2.2 BACnet Gateway Building Interface Parameter

Parameters of all kinds of supportive air conditioners shall refer to Attachment A: Parameter of Air Conditioner.

2 Parts and Assembly

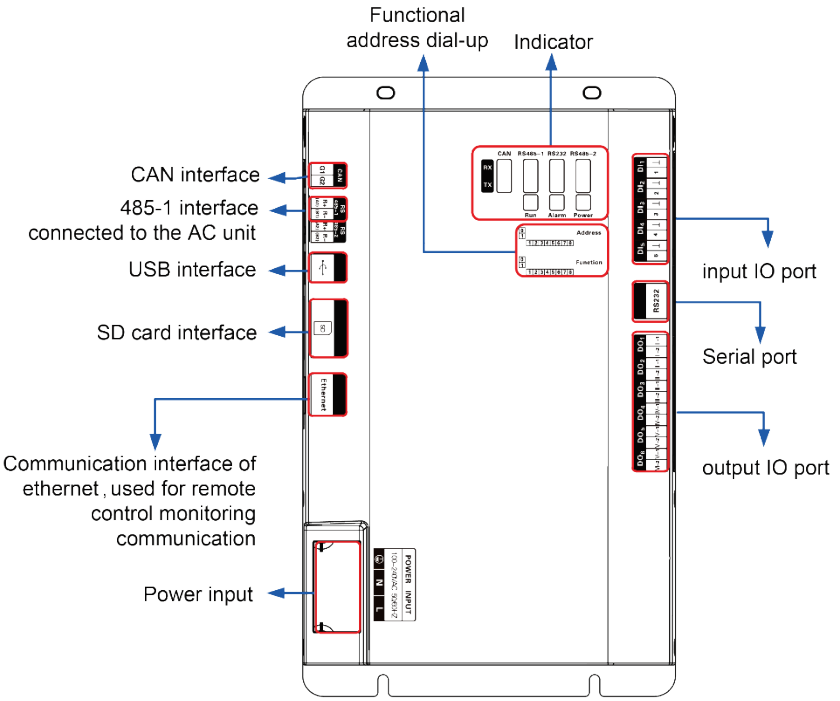
This kit includes the following parts. Please check before installation.

BACnet gateway	1 set
Instruction manual	1 set

3 Introduction for BACnet Gateway

3.1 Interface

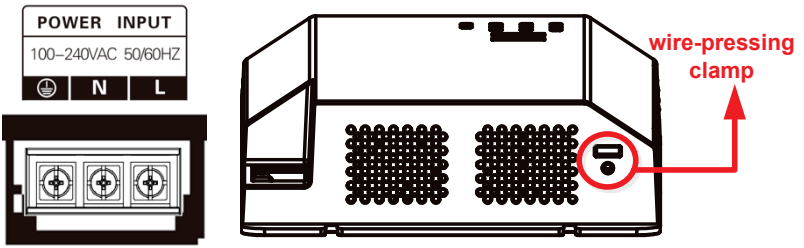
3.1.1 Diagram of Interface Function



3.1.2 Power

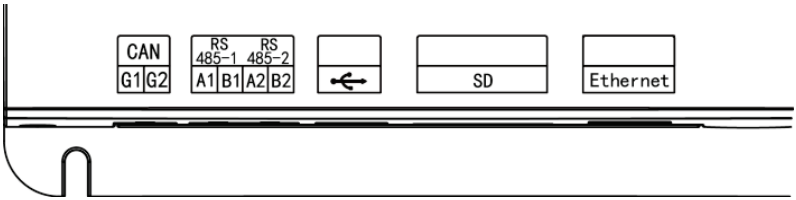
The input power is 100VAC-240VAC and 50/60Hz.

⚠ **WARNING!**The ground protection of power input port must be connected, otherwise it might be dangerous; besides, when the gateway is energized, don't touch the power input.



Notice ! The power cord should pass through the wire-pressing clamp for fixing.The power cord with the diameter of 3×1.0mm² is suggested to be used.As shown in the figure.

3.1.3 Communication Interface



CAN communication interface: this device will not use this communication interface temporarily.

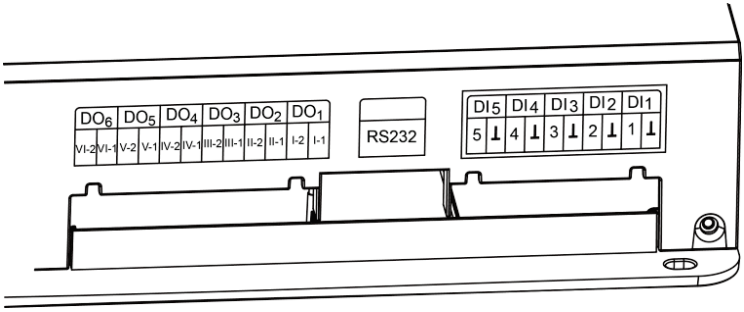
RS485-1 communication interface: connect it to the AC unit through the 2-core communication line to realize the communication between BACnet gateway and the AC which adopts 485 bus.

RS485-2 communication interface: this device will not use this communication interface temporarily.

USB and SD card interface: this device will not use this interface temporarily.

Ethernet interface: realize communication through network cable and BMS.

3.1.4 Input/Output of DI/DO Digital Quantity



So far, this gateway supports 5 DIs (digital input) and 5 Dos (digital output), DO6 is reserved.

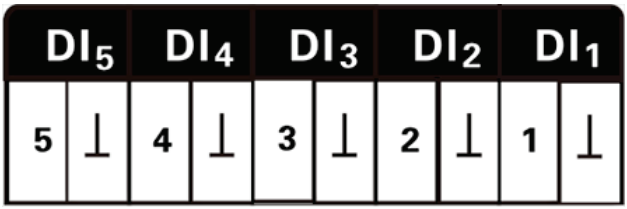
(1) DI1...DI5

Digital input 0/1 digital signal (binary system), apply to active input.

DI 1: In 485 network, fire alarm signal, connect “1” to the power of 12V, input fire alarm signal “1” in DI 1 port, then BACnet gateway will give out control, all units stop operation immediately; disconnect “1” or connect to “0”, input signal “0” in DI 1 port,

resume operation of IDUs manually.

DI 2...DI 5: Defined by the user.



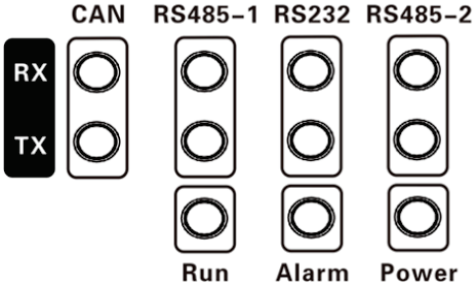
(2) DO1...DO5

Digital output Relay output, turn on the contactor oftentimes.

Maximum admissible electric quantity: 250VAC, 3A; 30VDC, 3A

Usage example: Input "1" in DO 5 of BACnet protocol, the two contactors of DO5 relay will close; input "0" in DO 5 of BACnet, the two contactors of DO 5 will cut off.

3.2 LED Display



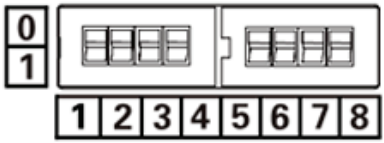
The above LED indicator is mainly consist of two parts: status indicator (run, alarm, power) and communication indicator (CAN, RS485, RS2332). The following table is the working status of each indicator.

CAN	RX	This device does not use this LED indicator.
CAN	TX	This device does not use this LED indicator.
RS485-1	RX	When receiving the data of equipment (eg. AC unit) which connects to BACnet gateway, it blinks.
RS485-1	TX	When transmitting data to the equipment (eg. AC unit) which connects to BACnet gateway, it blinks.
RS232	RX	This device does not use this LED indicator.
RS232	TX	This device does not use this LED indicator.
RS485-2	RX	This device does not use this LED indicator.
RS485-2	TX	This device does not use this LED indicator.
Power		When power supply of BACnet gateway is normal, it is on.
Run		When BACnet gateway is running normally, it blinks.
Alarm		This device does not use this LED indicator.

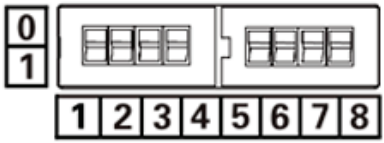
3.3 Dial-Up

Notice! Before using this device, please conduct dial-up setting first, otherwise the unit will not function normally!

Gateway dial-up setting area is consisting of address dial-up machine and function dial-up machine.

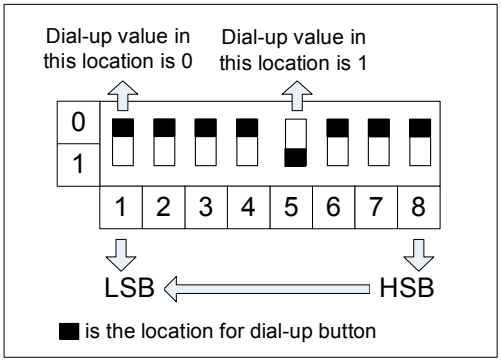


Address



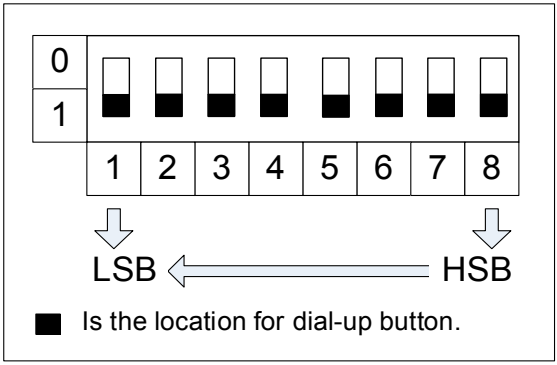
Function

3.3.1 Diagram of dial-up machine



3.3.2 8 Address dial-up buttons--Gateway reset configuration

If information such as BACnet gateway IP address configured on the webpage, subnet mask, default gateway, gateway name, gateway ID and model configuration are mistaken, and the webpage cannot be visited, dial up the 8 address dial-up buttons to “1”, after all indicating lights (except power indicating light) are blinking, reset the dial-up button and restart the gateway, then the default information in gateway manufacture setting can be restored.



3.3.3 Function DIP Switch-RS485 Bus Matched Resistance Setting

Notice! If any fault is found during engineering debugging, please set the unit or gateway under the front and end systems of 485 bus as with matched resistance, otherwise, it cannot communicate normally. Detailed situation depends on the actual project!

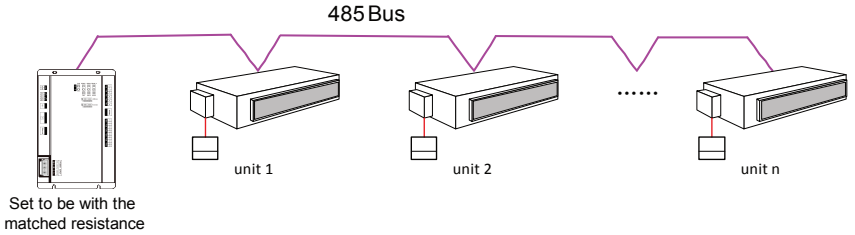
485 bus: specific meaning shall refer to the specification Internet topological graph.

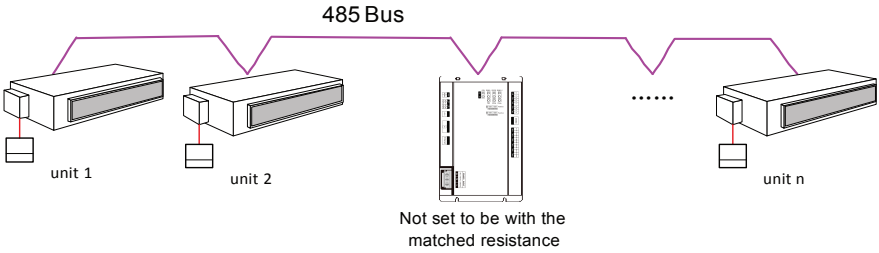
The No.7 dial-up button in function dial-up machine shall be used in the setting in the matched resistance of 485 bus in this gateway.

When the gateway is at the top/end of 485 bus, the gateway shall be with the matched resistance, then dial the No.7 function dial-up machine to 0;

When the gateway is not at the top/end of 485 bus, the gateway is not with the matched resistance, then dial it to 1.

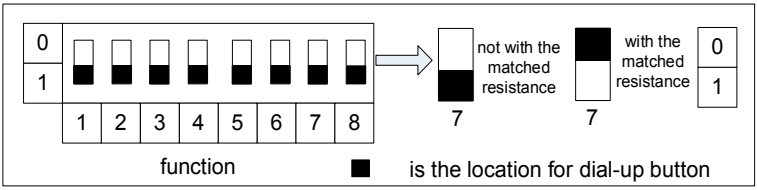
Setting of gateway network position and matched resistance:





n is the unit quantity (refer to Chapter 4.2).

Dial-up setting graph for the matched resistance：



4 Application

Generally, the application occasion for BACnet gateway is building management system.

4.1 Building Management System (BMS)

This gateway adops BACnet standard protocol. It can connect to BAS system or Builidng Management System（BMS，Building Management System). It realizes the monitor of building management system to unit (RS485 Bus) through BACnet gateway.

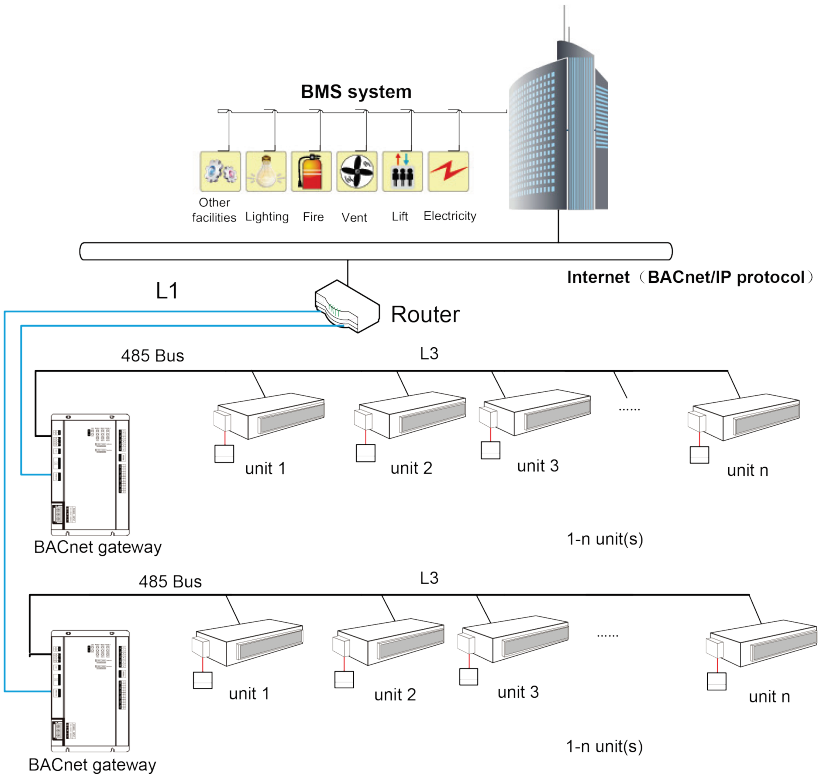
4.2 Internet Topological Graph

Network topology instruction of 485 bus:

Internet for RS485 bus: the black wire is RS485 bus, which is consisting of BACnet gateway and all IDUs and ODUs of the system. One RS485 Bus internet can be connected to maximum N unit(s).

System: one system is a bus internet, consisting of one gateway and 1-N unit(s) (including the subordinate IDU and ODU).

The admissible unit quantity for BACnet gateway: one BACnet gateway can be connected to a maximum of N unit(s) (including the subordinate IDU and ODU).



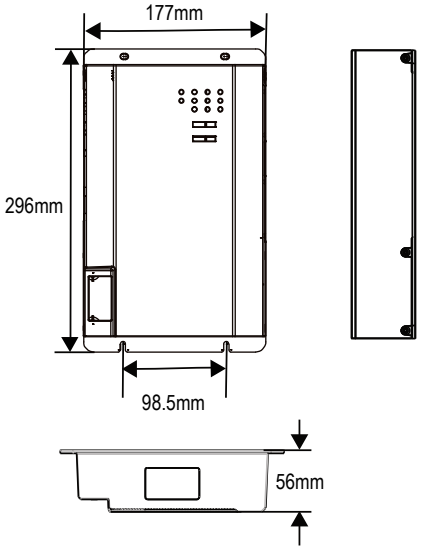
Notice:

1. L1 is the standard network cable and L3 is the twisted pair line.
   1) Residential split type unit can be connected with 255 wired controllers in maximum;
   2) UNI SPLIT series unit can be connected with 255 indoor units in maximum (new models need transition through Modbus gateway, please refer to Chapter 5.2.3);
   3) Centrifugal chiller can be connected with 8 touch screens in maximum;
   4) Air-cooled screw chiller can be connected with 9 wired controllers in maximum;
   5) Water-cooled screw chiller can be connected with 9 touch screens in maximum;

5 Product Installation

5.1 Product Size and Spatial Size for Electric Control Cabinet Installation

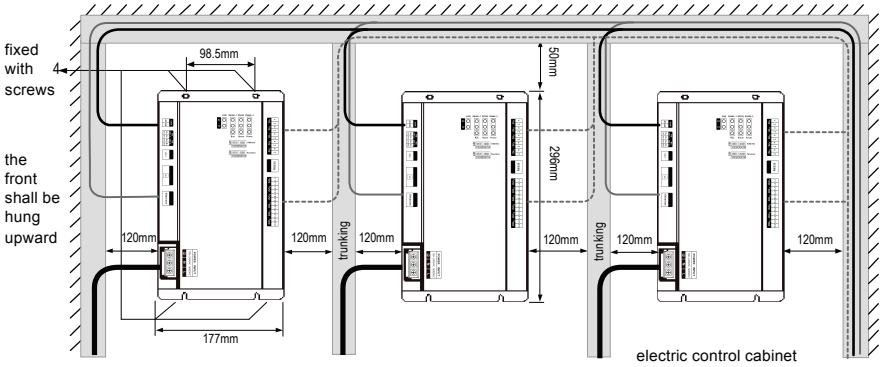
5.1.1 Product Size



L × W × H：296×177×56（mm）

5.1.2 Spatial Size for Electric Control Cabinet Installation

BACnet gateway shall be installed in electric control cabinet; the front of gateway shall be hung upward and fixed with 4 screws. See the following fig (for reference).



⚠**Warning!** Power cord and communication line of BACnet gateway must conduct routing separately(the distance shall be over 15cm); otherwise, it might lead to BACnet gateway communication malfunction!

The thin dotted line is communication line and the thick dotted line is the heavy current wire, the routing shown is for reference only.

5.2 Communication Connection

BACnet gateway communication system includes：

(1) The communication between BACnet gateway and BMS;

(2) The communication between BACnet gateway and AC units.

5.2.1 Material Selection for Communication Line

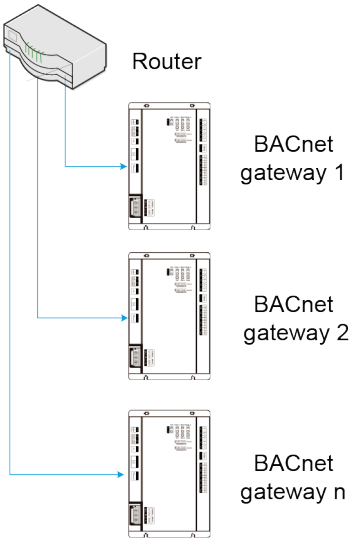
(1) Model selection of BACnet gateway and BMS communication line shall use standard Ethernet communication line, the length of network cable between gateway and router (computer, switchboard, etc.) shall not exceed 80m;

(2) Communication line model selection for BACnet gateway and AC unit：

Wire type	L(m)Communication line between gateway and AC units	Wire diameter (mm^2)	Wire standard	Remark
Shielding light/general PVC sleeve twisted pair copper core soft wire (RVVSP)	L≤500	≥2×0.75	IEC6022 7-5:2007	Total communication length shall not exceed 500m

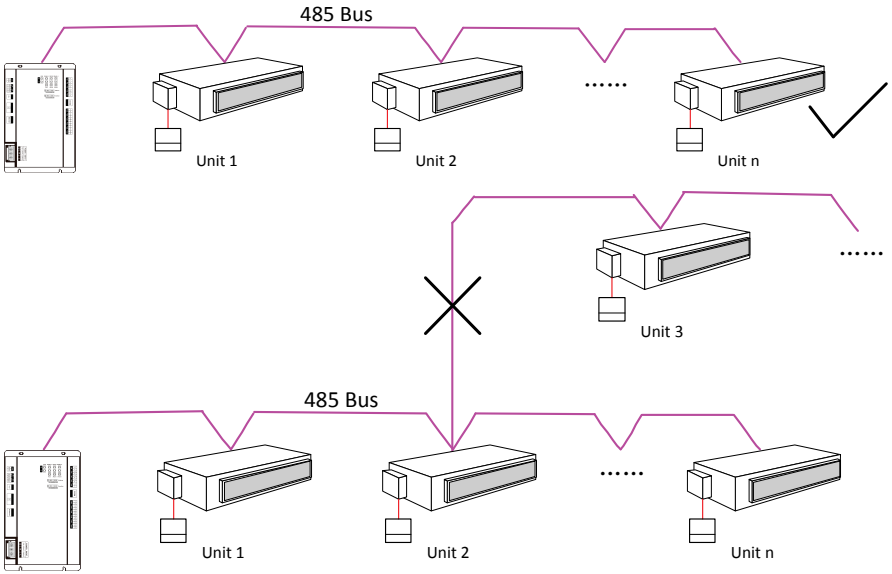
5.2.2 Communication Connection Method

(1) Communication connection between BACnet gateway and BMS;



(2) Communication connection between BACnet gateway and AC units.

Notice! All communication connection lines under BACnet gateway must be in series connection, star connection shall not be adopted.



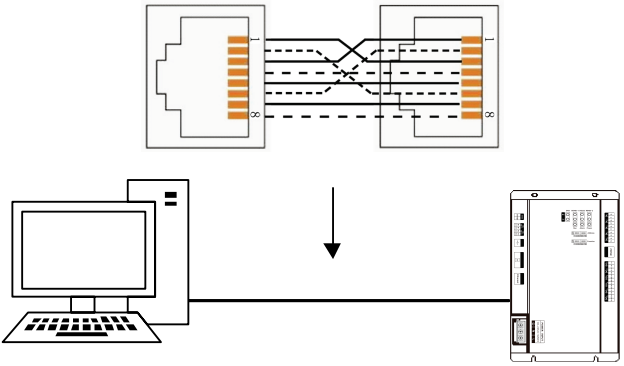
5.2.3 Communication Connection Configuration

(1) Communication line connection between BACnet gateway and PC:

Connection diagram between BACnet gateway and PC user side:

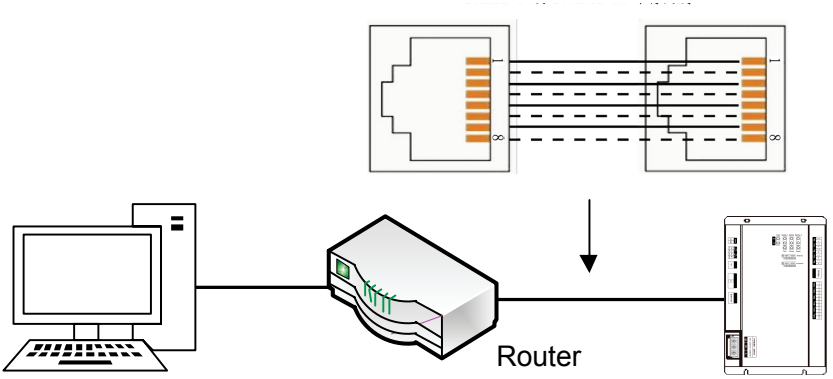
1) Adopt cross connection (or parallel) network cable, BACnet gateway shall directly connect to PC.

10BASE-T or 100BASE-TX cross network cable



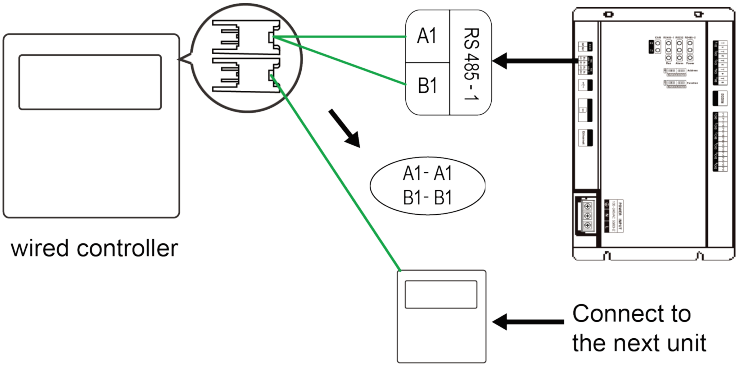
2) Adopt parallel(or cross)network cable, BACnet gateway shall go through router to connect to PC.

10BASE-T or 100BASE-TX parallel network cable

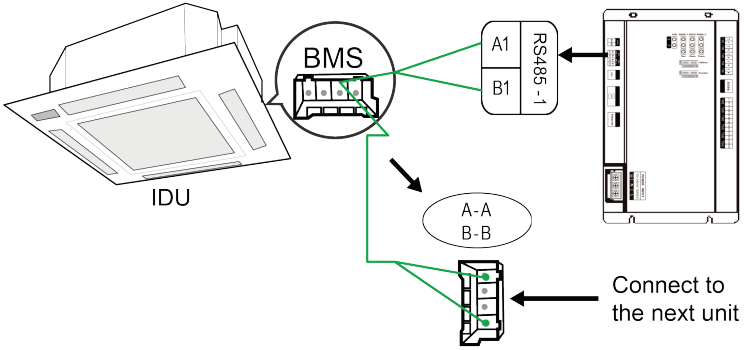


(2) Communication line connection between BACnet gateway and AC units:

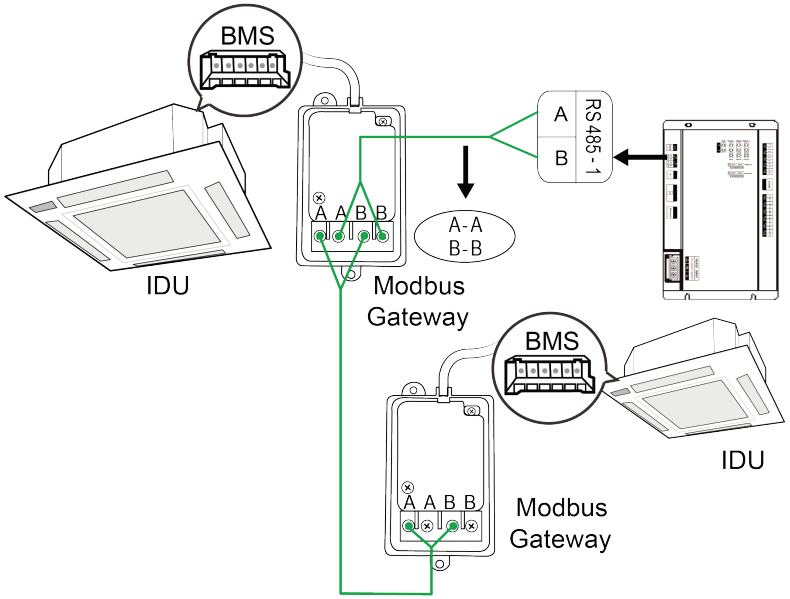
Model for residential split type:



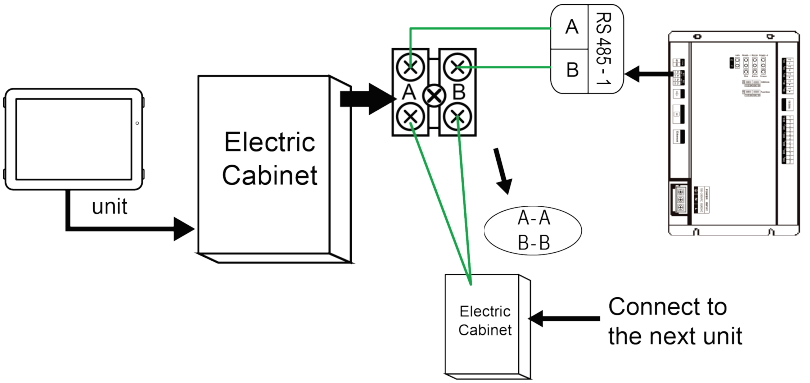
Models of UNI SPLIT unit (old models, please refer to Annex B):



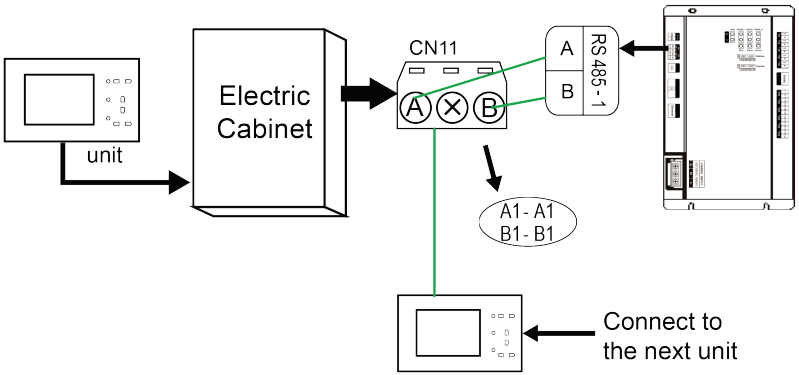
Models of UNI SPLIT unit (new models, please refer to Annex B):



Model for Centrifugal chiller and Water-cooled Screw Chiller:

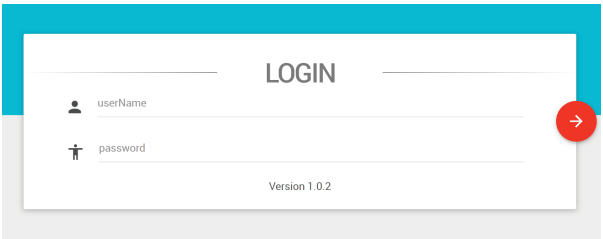


Model for Air-cooled Screw Chiller:

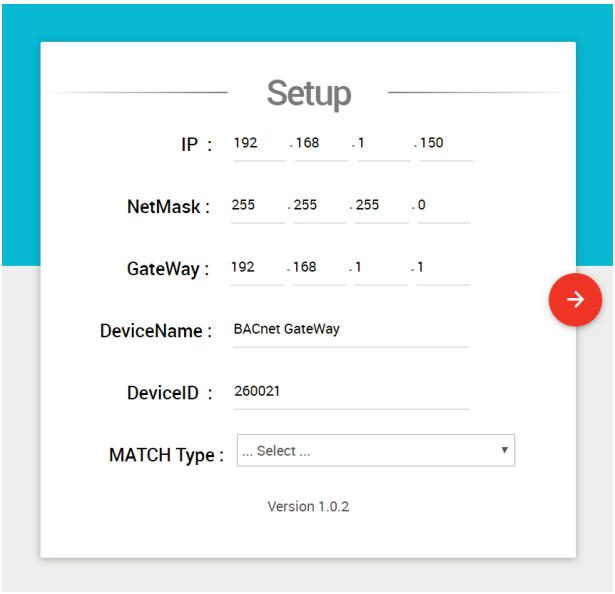


(3) BACnet gateway configuration：

One BACnet gateway connects units at the same time. The gateway parameter shall be configured after its installation, however, before this please set the IP address of the PC the same with that of the BACnet gateway, see Attachment A; then open the browser (IE10 or higher, red fox or Google), input the default IP address into the address field: http://192.168.1.150, the default user name and password are both “config”; refer to the following fig.



After input, press the button to go to the setting page.



The configurable parameters include gateway IP, subnet mask, defaulted gateway, gateway name, gateway ID and model configuration. The user can conduct configuration at his will, after that, click “arrow” button to restart the gateway.

Notice! This model configuration of BACnet Gateway is mutually exclusive.

6 BACnet Protocol

6.1 Structure of BACnet Protocol

The structure of BACnet standard protocol is specific to building self-control system characteristics, a simplified 4-layer structure from OSI 7-layer structure; this 4-layer is corresponding to the application layer, network layer, data link and physical layer in OSI model. BACnet standard protocol defines its application layer and network layer, and provides the following 5 solutions to its data link and physical layers.

<table>
<tr><th colspan="5">BACnet Layers</th><th>Equivalent OSI Layers</th></tr>
<tr><td colspan="5">BACnet Application Layer</td><td>Application</td></tr>
<tr><td colspan="5">BACnet Network Layer</td><td>Network</td></tr>
<tr><td colspan="2">ISO8802-2 (IEEE802.2) Type1</td><td>MS/TP</td><td>PTP</td><td rowspan="2">LonTalk</td><td>Data Link</td></tr>
<tr><td>ISO8802-3 (IEEE802.3)</td><td>ARCNET</td><td>EIA-485 (RS485)</td><td>EIA-232 (RS232)</td><td>Physical</td></tr>
</table>

6.2 Object and Property of BACnet Protocol

6.2.1 Definition of BACnet Object

BACnet defines a group of objects with property to represent any functions of building self-control equipment, thus provide a standard method to represent building self-control equipment. The BACnet gateway defines 9 objects, the enumeration number, name and application sample of these objects are introduced as follows.

No.	Object name	Application sample
0	Analog Input	Sensor input.
1	Analog Output	Control output.
2	Analog Value	The set valve value or other analog control system parameter.
3	Binary Input	Switch input.
4	Binary Output	Relay output.
5	Binary Value	Digital control system parameter.
13	Multi-state Input	Indicate a multi-state processing program situation, such as open/close refrigerator and defrosting cycle etc.
14	Multi-state Output	Indicate a multi-state processing program expectation status, e.g. started cooling time for refrigerator.
19	Multi-state Value	Indicate a multi-state processing program parameter, such as AC fan speed setting and mode setting, etc.
40	CharacterString Value	Represent a character parameter, for example, the unlock password and serial number

Each object has a set of property,the property value describes the features and functions of the objects.

6.2.2 Table of BACnet Protocol Point

One BACnet object ID is consist of the following 5 parts:

BACnet object ID(32bits)				
10 bits	3 bits	2 bits	9 bits	8 bits
Reserved	Model series (assigned to be 0) (M)	Equipment type (01,02,03) (D)	Equipment migration(N)	Parameter No.(P)

Model series:

Including split type unit (1) and UNI SPLIT series (2)…

Equipment type:

Include the gateway itself (0), IDU(1), ODU(2) and others (3)(I0 module). **Equipment migration:** for IDU object, it means the IDU No.;

Parameter number:

The sequence of parameter number after data conversion;

ID value of BACnet object:

BACnet ID = P+N*256+D*256*512+M*256*512*4;

For example indoor ambient temperature of object;

(IndoorUnitAmbientTemp_01_01_01), its BACnet object ID is.

(IndoorUnitAmbientTemp_01_01_01) with the following meaning:

BACnet object ID(32bits)				
10 bits	3 bits	2 bits	9 bits	8 bits
Reserved	Model series (assigned to be 0)(M)	Equipment type(01,02,03)(D)	Equipment migration(N)	Parameter No.(P)
0	0:Multi VRF	1:IDU	1	1

If the value of initial IDU engineering code object.

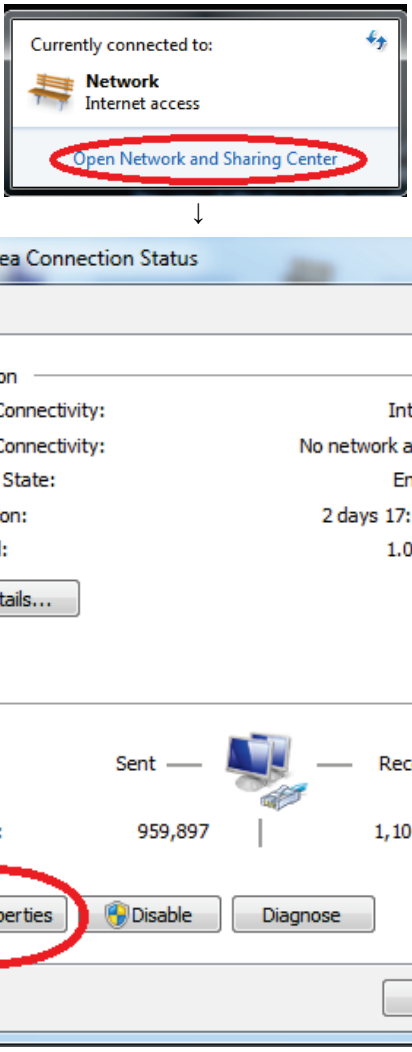
(FirstIndoorUnitNum_01_00_00 with object ID of 1) of this BACnet gateway is M, then IndoorUnitAmbientTemp_01_01_01(131329)represents a IDU parameter with the engineering code of (M+1).

Notice: for unit(RS485 Bus), equipment type 1 is the unit, 2 is for reservation.

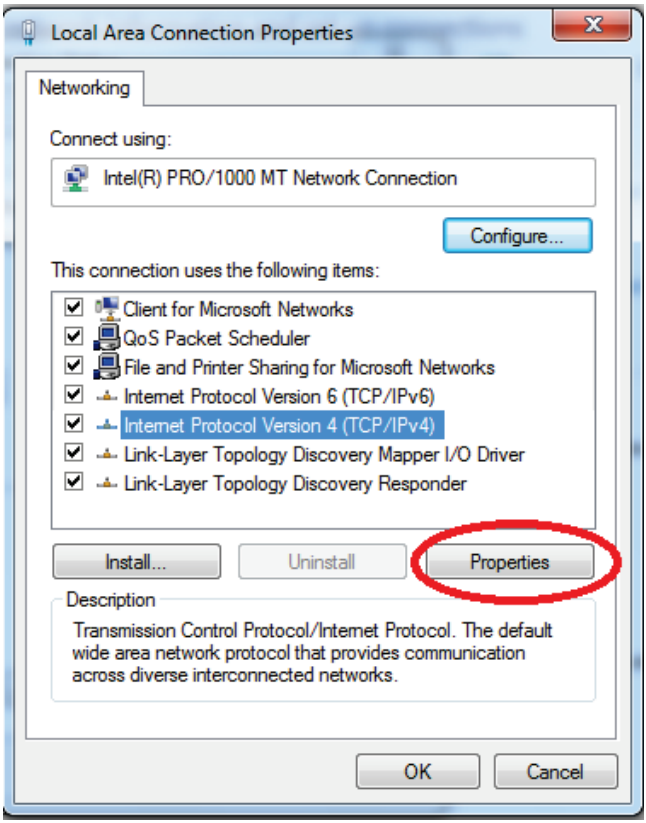
Attachment A TCP/IP Setting

Take Windows 7 as an example to demonstrate the configuration process of TCP/IP.

(1) Conduct property configuration of local connection.



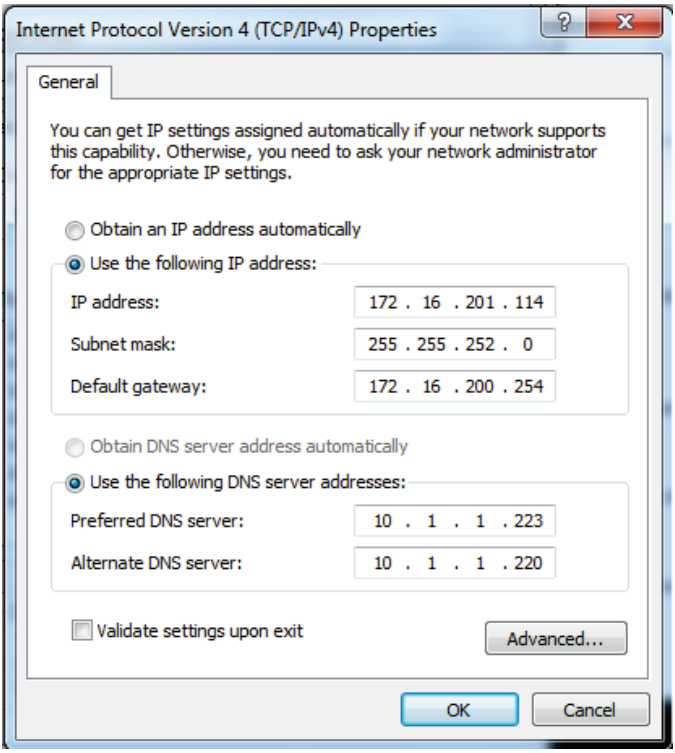
(2) Choose the item: Internet protocol (TCP/IP).



(3) Conduct TCP/IP property setting as shown in the fig(The device that connects network gateway must be consistent with the network address of the gateway).

(4) No additional configuration for DNS server, computer default setting can be retained.

(5) Click “Yes” to complete the configuration.


Internet Protocol Version 4 (TCP/IPv4) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 172 . 16 . 201 . 114
Subnet mask: 255 . 255 . 252 . 0
Default gateway: 172 . 16 . 200 . 254
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server: 10 . 1 . 1 . 223
Alternate DNS server: 10 . 1 . 1 . 220
Validate settings upon exit
Advanced...
OK
Cancel

NOTE CONCERNING PROTECTION OF ENVIRONMENT



This product must not be disposed of via normal household waste after its service life, but must be taken to a collection station for the recycling of electrical and electronic devices. The symbol on the product, the operating instructions or the packaging indicate such disposal procedures. The materials are recyclable in accordance with their respective symbols. By means of re-use, material recycling or any other form of recycling old appliances you are making an important contribution to the protection of our environment. Please ask your local council where your nearest disposal station is located.

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