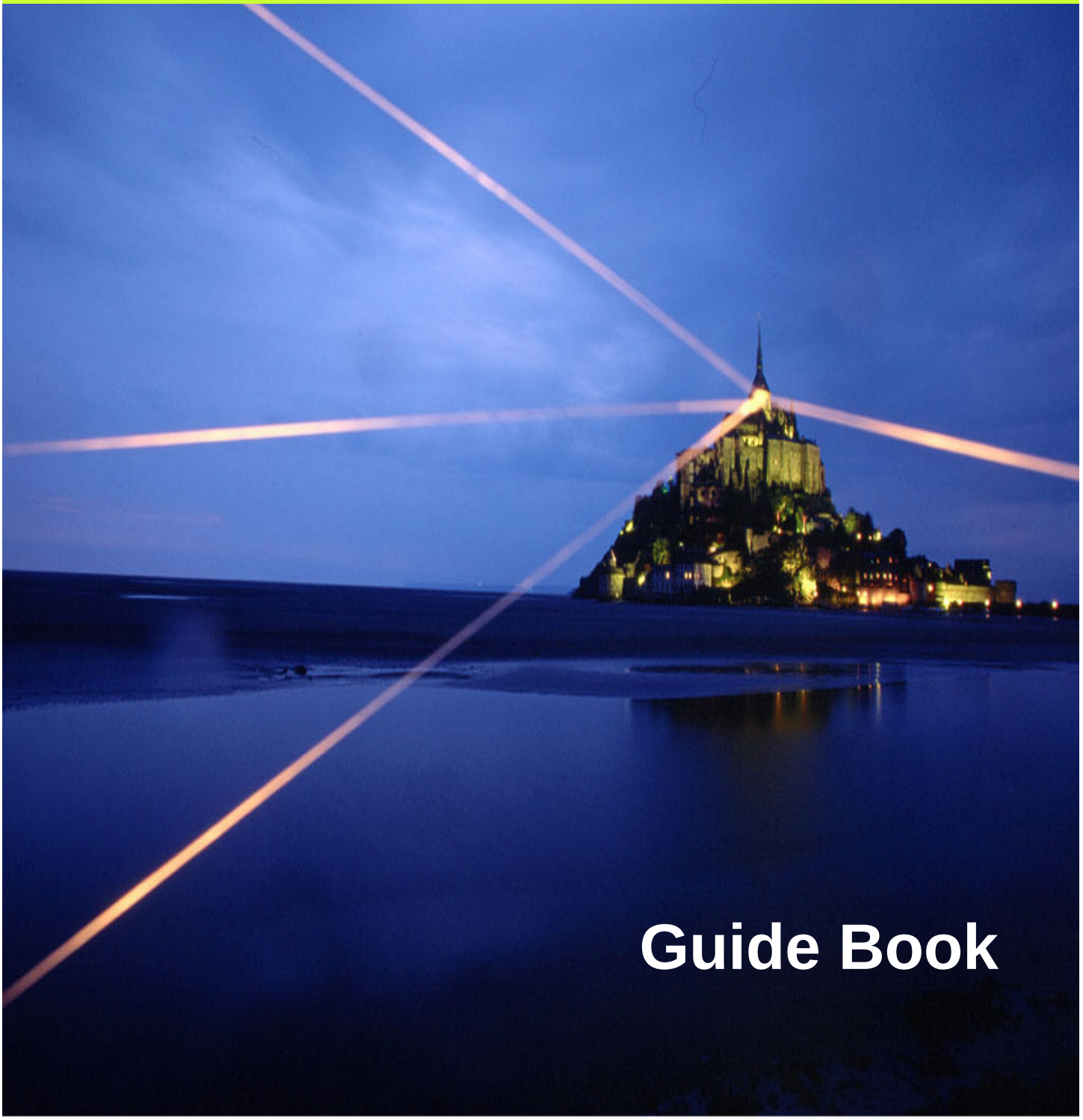
Internet @ Broadband Wireless

# Wireless LAN Bridge FWB 2411



## Guide Book

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jMP SYSTEMS

BROADBAND WIRELESS SYSTEM PROVIDER

**For effective use of this product, please read this manual to the end attentively.**

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**NOTE : The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.**

**FCC RF Radiation Exposure Statement**

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

# J-MAC Technology Information Sheet

Certified as an 'Excellent Information Technology'
by 'Korean Ministry of Information and Communication'
(Mac Protocol Technology for Wireless LAN Bridge)

**8Mbps Real Speed-Wireless Bridge**

**Published by JMP Systems Co., Ltd**

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## 1. What is J-MAC ?

**In a word, J-MAC is MAC(Media Access Control) protocol that is the most suitable for outdoor high-speed WLAN Bridge.**

## 2. Development History

**WLAN protocol had fixed by IEEE(IEEE802.11b), and is used commonly over the world. But, MAC protocol is not fit for 11Mbps speed which Physical Layer provides.**

**The main reason of speed-drop is based on that MAC technology is developed for indoor use. That is, the MAC's algorithm is not to utilize the best speed supplied by Physical Layer, but to manage participation and departure of notebook computer and etc – is called 'Station' - in wireless network area. So, with the MAC protocol, fixed WLAN bridge performs very lower speed than 11Mbps.**

**When 1 unit Access point transmit data, at the fastest speed, by use of FTP, to 1 WLAN Card, IP packet's transmission speed is about 4.8Mpbs(600Kbyte/sec), which does not reach half of 11Mbps. This real speed can be easily ascertained by FTP transmission test, which is displayed on PC monitor.**

**J-MAC applied WLAN bridge is not for indoor communication, but for WAN communication - building to building, client side's facilities of ultra high-speed internet service, etc.**

**J-MAC technology's first objective is to 1) realize the maximum data speed and 2) be in pursuance of Physical Layer protocol at the same time, but MAC technology is self-developed by JMP Systems Co., Ltd.**

**J-MAC technology employs two kinds of concepts simultaneously. One is polling CCA(Channel Clear Assessment) and capture the opportunity to transmit. The other is Fair Transmit Opportunity concept, which gives transmit opportunity to data packet-received side fairly.**

To do so, the most important issue was the best harmony of hardware and software. So, to come true them, the following development task had been progressed.

A. Hardware : FPGA chip, which is charge of MAC function for high speed WLAN bridge.

B. Software : Device Driver and WLAN bridge software module, which is charge of MAC function for high speed WLAN bridge.

C. System : Test set which above H/W and S/W are applied.

In conclusion, J-MAC technology is self-developed MAC protocol by JMP Systems Co., Ltd., and the main objective is to improve transmission ability up to 2 times than existed WLAN system.

## 3. Significance of J-MAC protocol

WLAN worldwide standard, IEEE 802.11 is created through study and examination of numbers of scholar and high technicians who work for the best technical companies. So, IEEE 802.11 has technical profundity and without full understanding and practical experience about IEEE 802.x - worldwide standard of WLAN technology, network technology, Ethernet, bridge and internet protocol - it is very hard to approach to IEEE 802.11.

The number of companies who develop IEEE 802.11b WLAN's MAC protocol is a few in the world, and most of those companies use their firmware as it is. That is, it is said that this field has very high technical barrier, H/W and S/W should be most suitable harmonic.

At present, for most of WLAN products, Intersil's MAC chip and Firmware is utilized. So, their real data speed is limited to 4.8Mbps, which is existed indoor WLAN data speed. In conclusion, when outdoor WLAN bridge is needed, indoor-purpose AP is used with very expensive antennas and real performance is poor.

J-MAC technology was created based on 1) full understanding about theory about

802.11 and 2) enough experience for them. And J-MAC was also created to apply wireless communication protocol to common-use WAN system, not LAN system.

So, the most important aim of development was improve real data speed epochally. That is, J-MAC technology improved data speed up to 60% and more than by applying our J-MAC's S/W and H/W solution to WLAN bridge.

## 4. Strong points of J-MAC technology

### 1) Improvement data speed

The strong point of 802.11x is to make it possible to buy high bandwidth wireless product with cheap price thanks to chip mass production. But unfortunately, actual throughput can't come up to even half than PHY's transmission performance.
The epochal protocol improving this matter, that is J-MAC technology.

### 2) Perfect security

- 168bit encryption
- Another hardware security module
- Basically, J-MAC protocol is non-compliant with 802.11b, so it is impossible to hack with other WLAN products.
- In case of P2MP, communication is perfectly separated on Layer 2, so hacker can't send or receive packets without passing through latter network which ISP manages and supervises.

### 3) Stability and Channel-occupancy capacity

As there are no burden on management of stations' participation and departure, protocol is simple and stable. Moreover, wireless bridge is like backbone of wired system, stability is very important factor.

J-MAC is designed to have excellent capacity to occupy 'idle' conditioned channel than 802.11b type WLAN. So, without 802.11b's interference, it is possible to communicate having priority.

**4) Flexible and quick response to customers' demands**

**Until now, it takes long time to stable developed MAC protocol Firmware, so it usually takes about 1 year to commercialize after finishing development high-speed Modem chipset.**

**With J-MAC technology, it is simple to use developed or developing high-speed WLAN Modem chipset, as like 22Mbps, 54Mbps, and etc.**

**And it is capable to add customers' new demands anytime. As we can modify or revise even Firmware, we can meet customers' demands.**

## 5. Applications of J-MAC technology

**The demand for ultra high-speed internet service is increasing continuously. But wire-network construction needs so much cost investment from ISPs, and Aerial line construction is too restrictive. So, the substitute for wired networks' these problems is WLAN bridge, which is the most highlighted among existing solutions.**

**J-MAC bridge gives solution to open internet service instantly without network lead-in construction.**

**Application 1. Small and Medium ISPs**

**Small and Medium ISPs serve internet service in limited small area, so they don't have themselves' subscriber network, pay rental charge to big ISPs. As they connect network to service area with JMP wireless bridge, they can serve internet service for subscriber with just network connection cost, without expensive rental charge.**

**Application 2. Big ISPs**

**For the areas that they have not served internet service due to economical efficiency, as like low apartment, farming and fishing villages, big ISPs can continue to increase subscribers by use of JMP wireless bridge, which doesn't need network lead-in construction and is capable to open internet service instantly.**

## Application 3. Overseas Area

For Africa, China, South-East Asia, and some other areas, ISPs have had difficulties to run internet service business due to economical efficiency from 1999 to 2000.
It is very effective to use JMP wireless bridge to open internet service instantly.

## Application 4. Building to building

As companies expend their business, they need additional factories or offices. But sometimes it is impossible to expand office or factory in the existed same building. Connection existed building's network to new building with JMP wireless bridge, it is possible to open intranet of the company instantly without leased line.

## Application 5. Hotspot service

Hotspot service is popularized areas of cafes, parks, airports, school campus, and etc. Hotspot service utilize WLAN technology. With wired network lead-in construction to Hotspot areas, cost and construction difficulties become issues.
To settle down these problems, it is effective to connect multi(2~10) APs to wireless bridge and then up-link this to one E1. For this solution, wireless bridge should 1) be non-compliant with 802.11b, 2) have wide and stable bandwidth, 3) have excellent channel-occupancy capacity comparing with 802.11b. Therefore, JMP's J-MAC wireless bridge is the best solution.

# FWB2411

# User Manual

**Published by JMP Systems Co., Ltd**

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# 1. Definition

- FWB : Fixed Wireless Bridge developed by JMP Systems Co., Ltd.

- 2411 : 11Mbps PHY speed at 2.4GHz

- J-MAC technology : Self-developed MAC protocol, which is core technology of communication, overcomes 802.11b's weakness outdoors.

(For the detail information, Refer to 'J-MAC technology Information')

# 2. Package Contents

## 1) Package Contents

FWB 2411 1set / Power Adapter 1EA / Console Cable 1EA

/ User Manual 1EA / CD 1EA

* Option items : Antenna

## 2) CD's contents

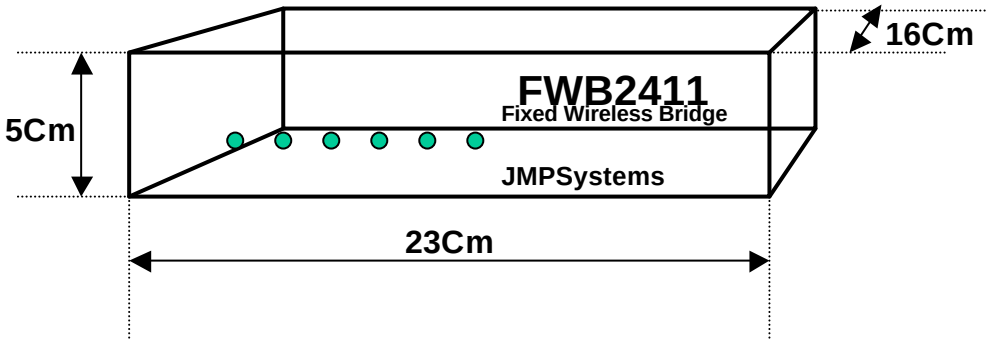
| | |
|---|---|
| /manual | - Serves various kinds of documents as PDF type. |
| /fwb_mon | - Serves FWB2411 Monitor Program. |
| /tftp_srv | - TFTP Server program for Windows95/98/2000. |
| /acrobat | - Servers Acrobat Reader to read PDF files. |
| /term | - Servers terminal emulation program. |
| /mov | - Serves movie shows installation process. |

* Files and contents in CD would be changeable.

# 3. Dimension & Weight

## 1) FWB2411 only

- Dimension

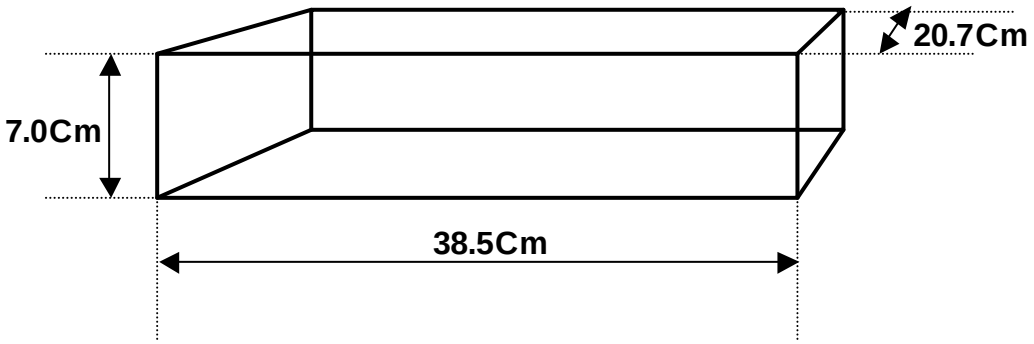



- Weight : 1250g

## 2) In Box

( Including Power Adapter 1, Console Cable 1, CD 1, Manual 1 )

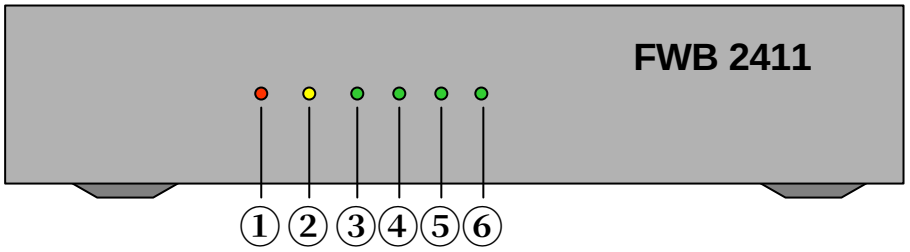
- Dimension




- Weight : 1900g

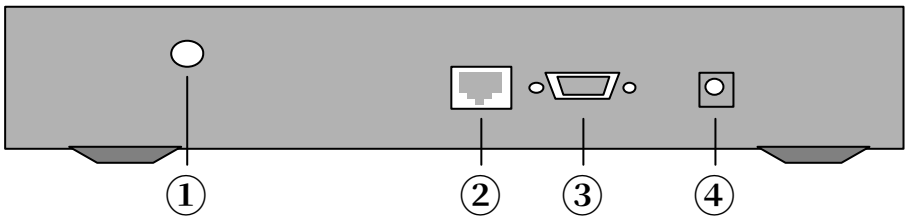
# 4. Parts and Functions

## 1) Front Side




① Power LED : Indicates whether Power is ON or OFF
② Link LED : Refer to ‘ Installation Manual’
③ RD LED : Indicates Wire Data-Receive situation
④ TD LED : Indicates Wire Data-Transmission situation
⑤ RX LED : Indicates Wireless Data-Receive situation
⑥ TX LED : Indicates Wireless Data-Transmission situation

## 2) Back Side




① ANT : Port to connect Antenna.
② Ethernet : Port to connect Ethernet RJ-45.
③ RS-232C : Port to connect Console 9-pin Male Serial cable
④ Power : Port to connect DC 5V adapter.

● Reset Switch : Bottom side of FWB2411

# 5. Distinctions

## 1) Speed

- The fastest speed in the world : 11Mbps PHY speed, 8Mbps real data speed
- Twice faster than conventional wireless LAN Bridge
- Support Fast Ethernet (10/100Mbps Full Duplex)

## 2) Communication Distance

-Defends on separation

- Most suitable RF RX/TX design

## 3) P2MP(Point to Multi Point)

- More than 1:16 multi points communication ( Sharing type)
- No hidden station problem : Separates each communication area
- Network Segment (Network Group) Separation/unity selection function

## 4) Stability

- H/W & S/W watchdog
- Auto Reset Algorithm
- Superior RF technology

## 5) Management

- Support Telnet, ICMP, SNMP, http(Web management)
- Support NMS(SNMP Agent)
- Miniview, NMS S/W (free supplied) : Self-Monitoring + available to Antenna installation

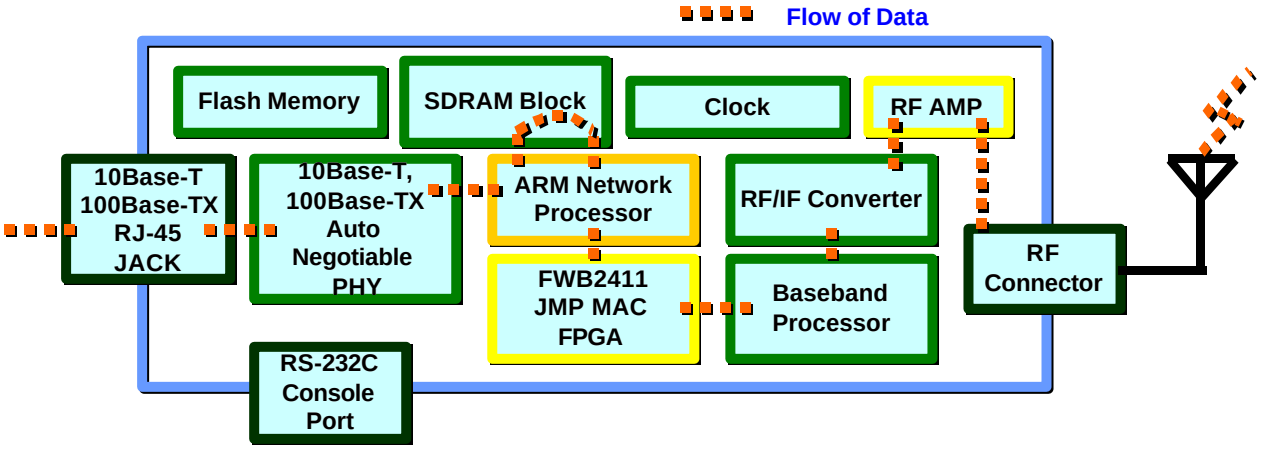
## 6) Security ( Multi-layer security devices)

- Non-compliant with 802.11b : impossible hacking with other 802.11b products
- MAC address perception function : Without knowing FWB2411' s MAC address, impossible to communicate and hacking
- IP and Password function on console S/W
- Telnet port management : Standard port + Port Selection function
- Abnormal ping attack cut-off function
- Perfect prevention against Hacking and virus

* For whom want stronger security

→ FWB2411A recommended : Triple DES & 168bit encryption

# 6. FWB2411 Block Diagram



# 7. Specification ( Refer to 5. Distinctions )

| RF | |
|---|---|
| Channel | 11ch ( Center Frequency 2412 ~ 2472) |
| Non-overlapping Channel | 4ch (1,5,9 recommended) |
| Output Power | Typ. 22dBM |
| Receive Sensitivity | -82dBm over for 11Mbps |
| Bandwidth | +/ - 11MHz |
| Modulation Type | DBPSK, DQPSK, CCK |
| Spread Spectrum Type | DSSS |
| Data Rate(Real data speed) | 11Mbps PHY speed ( P2P 8Mbps/P2MP 6Mbps ) |
| **Software and Functions** | |
| MAC | CSMA/CA and Token type by J-MAC technology |
| Security | Refer to 5. Distinctions |
| IP Network | Bridging, Routing-table function |
| Management | Telnet, SNMP(including Trap), RS232C, Http(Web) |
| Stability | S/W and H/W watchdog Timer, Auto Reset (Temperature Sensing & Network Alarming) |
| Etc | Self- Monitoring NMS S/W(Miniview) for Windows |
| **General** | |
| Distance | Defend on separation of Antenna) |
| Current Consumption | Tx : 870mA Rx : 600mA Normal : 700mA |
| Size | 23 * 16 * 5 (cm) |
| Power | 5V, 1A Adapter |
| Weight | 1250g |
| Port | RF connector, Ethernet(10/100 BaseT), RS232C |
| Operating Temperature | -20℃ ~ 70 ℃ |
| Storage Temperature | -30℃ ~ 80 ℃ |

# 8. Attentions !

## 1) Area to Install

No Sunshine,  No High heat

No Raindrops,  No High Humidity

No Vibration

## 2) Transportation

No Impact

No Drop down

After off power & off cables, carry FWB2411

## 3) Power

Supply stable power.

Instant power-off may cause cut off communication

## 4) Connector

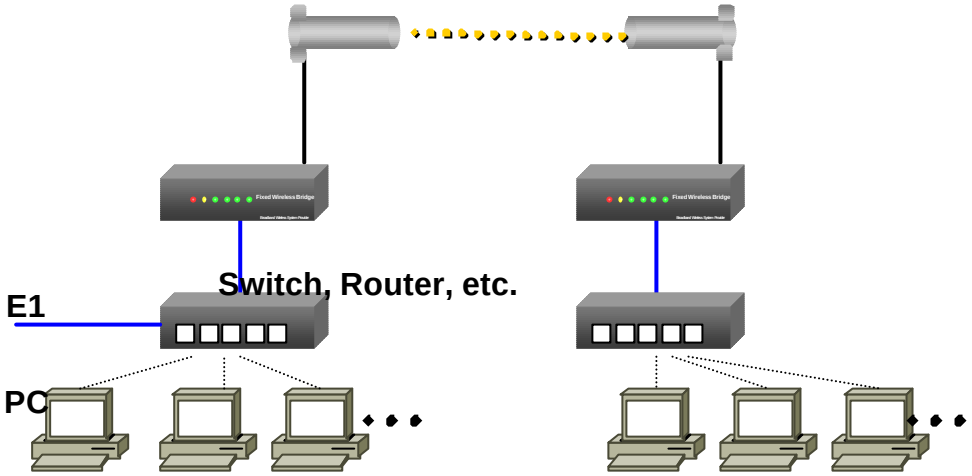
- Antenna Connector : Fix firmly

## 5) Out of Order

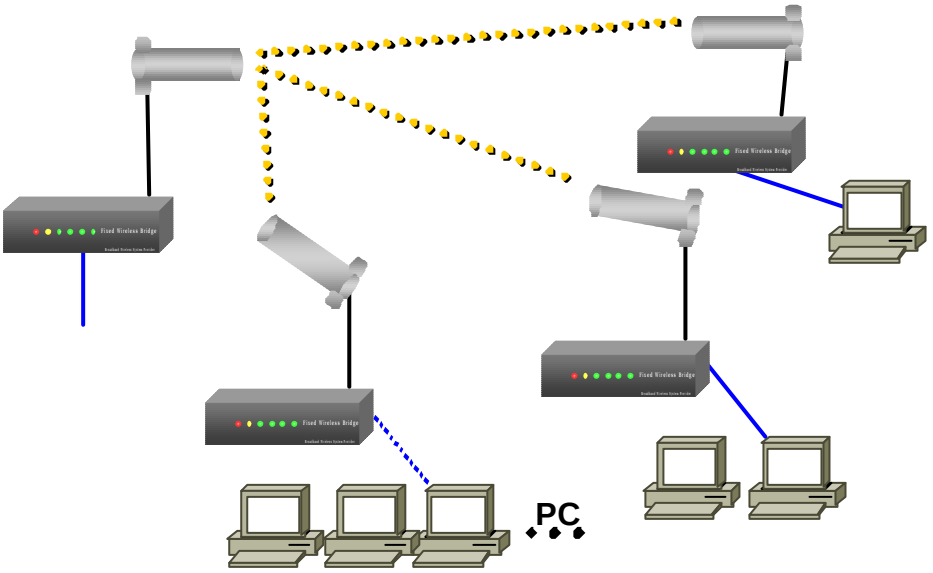
- No Disassembly
- Request A/S from seller

# 9. Network Configuration

## 1) P2P(Point to Point)




## 2) P2MP(Point to Multi Point) : N slaves to 1 Master



# 10. Installation Process

**Before installation …**

**-Be well aware of followings**

**-Recommends to discuss with Network Manager enough**

## 1) Step1 : Check ‘Package Contents’. Refer to No.2 of this User Manual

## 2) Step2 : Decide where to install in building

**Antenna is the component having an much effect on performance.**

**So, it is very important to install rightly and firmly.**

**(1) Area to install**

**When antenna is installed in view, performance is better.**

**Select an area to fix antenna firmly.**

**(2) Height to install**

**The higher antenna is installed, the better performance and quality outcomes.**

**(3) LOS(Line of Sight)**

**It may be impossible to communicate if sight between antennas is not guaranteed due to building.**

## 3) Step3 : Connection cable

Connect cable in following order.

(1) Connect antenna & FWB2411I

For best performance, install in clear sight.

To prevent deterioration of performance or trouble, make tight.

(2) Connect Ethernet cable (Refer to Appendix 1. Ethernet Cable)

Connect 100baseT Full duplex Ethernet cable.

To connect to Router, Switch, or Hub, use UTP Cat.5, straight type cable.

To connect to NIC like server or PC directly, use Cross over type cable.

(3) Connect Console cable (Refer to Appendix 2. RS-232C Pin)

Connect RS-232C cable to PC or server. Refer to Appendix 2. 'Connector Pin'

(4) Connect Power Adapter

Connect DC 5V power adapter that provided by JMP System.

By different adapter, it may cause troubles.

## 3) Step4 : LED and Console connection setting

(1) LED.

- Power 'ON' → Power LED(Red) 'ON'
- Ethernet cable is connected → LINK LED(Yellow) 'ON'
- RX LED(Green) is 'ON' on the initial state of not-setting

(2) Setting console serial port

With terminal emulator program of PC or server which is connected with console cable, set console serial port.

8bit, No Parity, 1bit stop, No F Control, 57600 Baud Rate for FWB2411.

After console serial port setting, configure FWB2411 through terminal.

# 11. Console Setting

## 1) Step1 : Basic Setting

**- Connect Console and supply power**

**- Next Screen is activated**

**( In case of P2MP bridge, ‘FWB-P2MP’ message is activated.**

```
Setup system configuration
JMPsystems
Setup network configuration : eth0
Setup RF configuration : eth1
Starting FWB routine

  FFFFFFFFF W   W   W BBBBBBBB        PPPPP          PPPPP
  F         W   W   W B       B       P    P         P    P
  F         W   W   W B       B       P    P   222   P    P
  FFFFFFFFF W   W   W BBBBBBBB  ----  PPPPP  22  22  PPPPP
  F         W   W   W B       B       P        22   P
  F          W W W W  B       B       P       22    P
  F           W   W   BBBBBBBB        P      222222 P
 ------------------------------------------------------------
    http://www.jmpsystem.com   /  info@jmpsystem.com
 ------------------------------------------------------------

  Linux Version 2.2.14-v1.1.61.P2P, Compiled #4976 목 6월 28 16:44:19 KST 2001
       One S3C4510/SEC ARM7TDMI Processor, 16M RAM, 44.34 Bogomips Total
                                   JMPsystems

login_fwb:
```

**- Default ID is ‘root’ and password is ‘fwb2411’**

**- A prompt is activated**

**- Write ‘ sysconf set’ , and setting screen is activated.**

**( IP, subnet IP, Gateway IP, Channel, etc )**

**For detail information, refer to CD**

```
# sysconf set

Creating System Configuration Table ...... Ok.

Setup Boot Configuration Table ...
 * Boot Method ("auto","manual","net","serial","parallel" : manual) ?
 * Vendor Name (JMP Systems) ?
 * Boot File Name (/home/tftp/vLinux.bin) ?
 * TFTP Server IP Address (192.168.0.253) ?

Setup Host Name Table ...
 * Host Name ( ) ?
 * Ethernet IP Address (192.168.0.173) ?
 * Ethernet Default Gateway (192.168.0.1) ?
 * Ethernet Default Subnet Mask (255.255.255.0) ?
 * Ethernet Default DNS Server (0.0.0.0) ?
 * PHY Duplex ("auto","full","half" : auto) ?
 * PHY Speed ("auto","10","100" : auto) ?
 * RF Channel (1) ?
```

## 2) Step1 : Input MAC Address of the other party

**FWB2411 minimize interference with other products by registration MAC address of both parties. So, after registration MAC address of the other party, communication in available.**

**- Write ‘ rfdst’ . It is possible to discern MAC of other party**

```
# rfdst
        ************************************
                    RF DST MAC
        ************************************
  0] ff:ff:ff:ff:ff:ff
  1] ff:ff:ff:ff:ff:ff
  2] ff:ff:ff:ff:ff:ff
  3] ff:ff:ff:ff:ff:ff
  4] ff:ff:ff:ff:ff:ff
  Continue ?[Y/n]n
   #
```

**Default value is ff:ff:ff:ff:ff:ff**

**- To change ‘ 0]’ value, write ‘ rfdst 0’ .**

```
# rfdst 0
        ************************************
                    RF DST MAC
        ************************************

  0] ff:ff:ff:ff:ff:f  -> 00:06:7a:00:00:04
  #
```

**Caution : Should write ‘ :’ between bytes.**

**- In case of P2P or P2MP’ s slave, ‘ 0]’ term is only available.**

**- In case of P2MP’ s master, write MAC from 0 to 16 as many as slaves.**

**- Try communication by means of ‘ Ping test, FTP, etc’**

**- RD, TD, RX, TX LED blink**

## 3) Step3 : Frequency

- Basically, 11(1~11) channels are available.
- But, different country, different channel numbers
- To certify communication quality, choose not-used frequencies.
- ‘rfchscan’ instruction enable to ascertain packet number of each channels
- Choose channel having the smallest packets.
- After determination of frequency to use, write channel number by means of ‘sysconf set or ch’ instruction.

Caution : Should set the other party as same channel.

## 4) Step4 : Direction of Antenna

- When communication is frequently cut off by Ping Test, adjust direction of antenna until cutting-off phenomenon does not happen.
- Connect to FTP Server and do ‘Get-data’ or ‘Put-data’.
  Adjust direction of antenna to display maximum performance
- signal intensity : ‘Minimum 60 and over’ is recommended

Caution : Performance could be effective by

① Distance of installation

③ Performance of wire network equipments ④ Jamming ⑤ etc

## 4) Step5 : Image-Upgrade & Newest Information

- Connect FWB2411’s IP through web browser
  (For Example : FWB2411’s IP is 192.168.0.100 → http://192.168.0.100)
- It is possible to connect JMP Systems’ homepage
- Up-dated new image and information are available.
- For ‘Image Upgrade’, refer to documents in CD.

Caution : In the course of Upgrade …

①Don’t cut off power ② Communication is not available

# 12. Trouble Shooting

## Q : Supplied power, but not run

① Check whether red PWR LED blinks or not.

② Not blinks : Change power adapter and try again.

③ No problem with power adapter : Request A/S.

## Q : Connected Ethernet, but LINK LED does not blink

FWB2411 does not support MDI.

① To connect with Switch or Router : Use 'Direct' type Ethernet cable.

② To connect with PC : Use 'Crossover' type Ethernet cable.

(Refer to Appendix 2)

## Q : Connected Console, but no message on terminal

① FWB2411 support 57600 baud rate.

② Check program setting status.

③ Use supplied standard console cable (refer to Appendix).

## Q : Not available of Telnet connection or Ping

① Wrong IP setting.

② Connect console cable and reset IP, Subnet, Gateway IP.

③ Try again.

## Q : Not available communication between FWB2411s

① Check whether FWB2411s use same channel.

Channel : From 1 to 11 channel.

To communicate between FWB2411s, same channel should be used.

② When FWB2411s use same channel, check whether other side's MAC is correct or not by use of 'rfdst' instruction.

## Q : Frequent cutting-off of ping, bad performance

① On EMS software(monitor program), measure ‘Signal Quality’ and ‘Noise Level’.

② Check whether it is correct installation.

③ Check whether it is correct channel by use of ‘rfchscan’ instruction.

④ When other brand equipment use same channel with FWB2411, it could cause deterioration of communication quality.

## Q : Weak Signal intensity

① Check whether antenna is in sight.

② If you followed standard directions(refer to Appendix), check whether two antennas’ direction is right

③ When there are many products that use same channel with FWB2411 arround, it could cause deterioration of signal intensity.

## Q : Suitable Antenna and Cable, but bad communication quality

① Antenna radiation is made on the condition of green land, so in the downtown, communication distance would be shorter

② Communication distance varies according to antenna sensitively.

## Q : Unable Log-In

① To log in, ID and password are necessary.

② The initial fault is ID : root / password : fwb2411(not capital letter, but small letter.

③ When you can’t remember changed ID or changed password, request A/S.

## Q : Unable booting after upgrading-image

① This is the case that image is broken in the middle of upgrading.

② Request A/S. Upgrading requests caution.

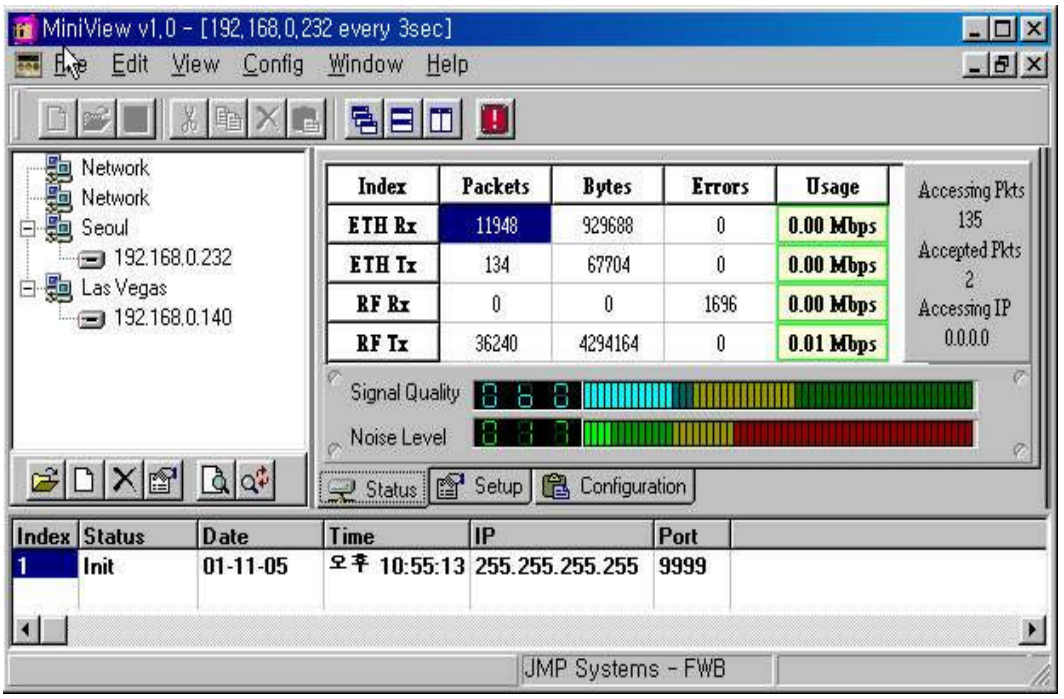
## Q : Doesn't work monitor program(EMS Software)

① FWB2411's monitor program is based on Windows 98.

② Refer to JMP's website to have new version.

# Monitoring Program

# (Miniview)

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# 1. Introduction

**Miniview 1.0 is a program for managing FWB2411 only.**

**With this program, it is easy to figure out the status of FWB2411 and change its settings without using complex protocols such as SNMP, etc.**

**Miniview 1.0 enables users to check and change the following values:**

**<u>* Checkable values</u>**
**1) Number of packets and bytes transmitted and received**
**2) Number of errors that occurs during transmission and reception**
**3) Current usage**
**4) RF Signal Quality and Noise Level**
**5) Hardware, Bios, Software version, MAC, etc.**

**<u>* Changeable values</u>**
**1) IP, Gateway, Subnet Mask**
**2) TFTP Server IP**
**3) RF Ch, Power Level, Energy Level**
**4) Backoff Time, Retry Time**

# 2. System Requirements

**-Pentium or better**
**-RAM 32M or more**
**-HDD 100M or more**
**-Microsoft Windows98**

**Miniview 1.0 is manufactured and tested on the basis of Microsoft Windows98. Although it is normally operated in such environments as Windows ME, Windows 2000 and Windows NT, sometimes it may cause malfunction.**

# 3. Installation

**It is easy to install the system by simply executing setup.exe of CD provided.**

**You can designate a folder where the program is to be installed.**
**(Default : Program Files/ FWB2411)**

**Upon installation, the following files are created in the related folder:**
**1) FWB2411V2.exe**
**2) Resetter.exe**
**3) Error.wav, nolw.wav, noreply.wav**
**4) UserManual.pdf**

# 4. How to use

**The Fig 1 below shows the initial window created when you run Miniview 1.0 for the first time.**

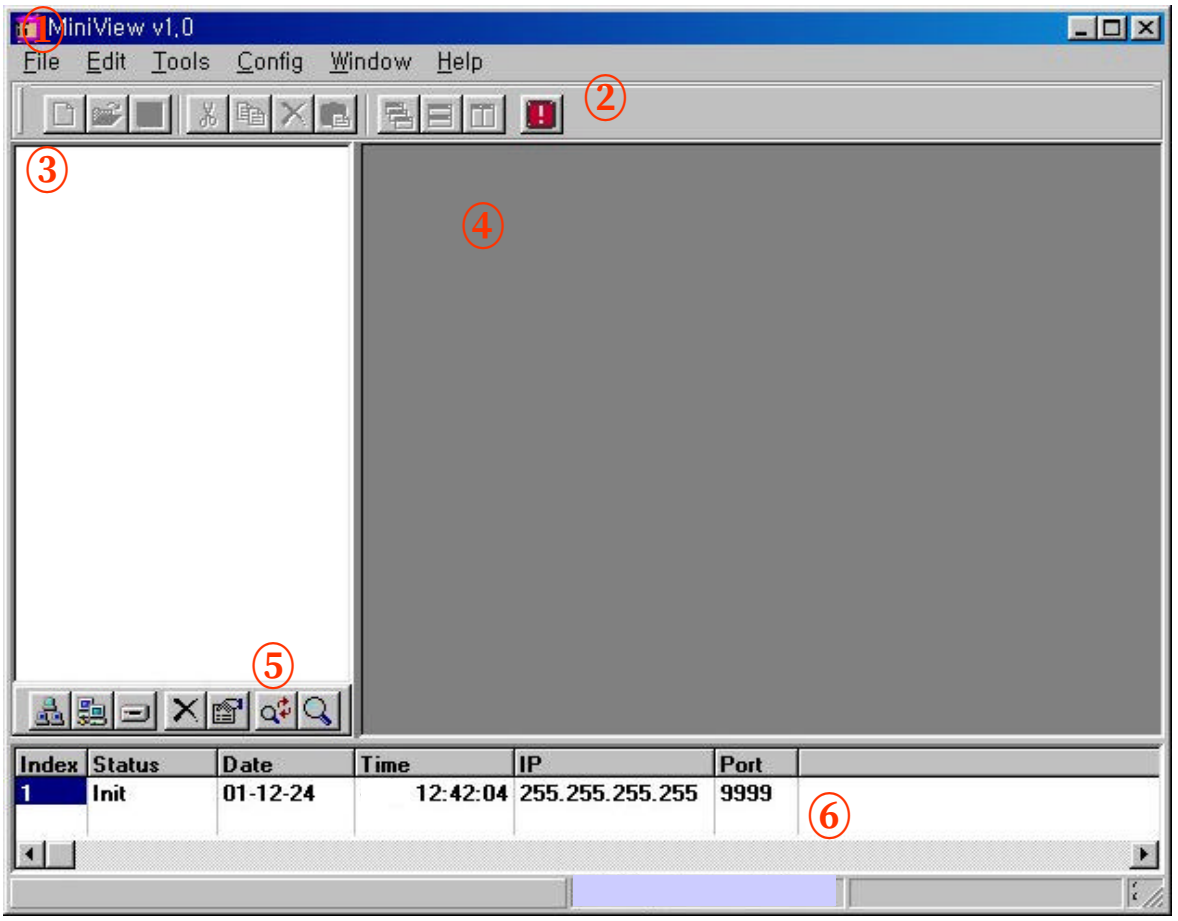


Fig1

① Menu: A menu containing all functions of MiniView1.0.
② Speed Button: A speed button for the functions frequently used.
③ FWB2411 List window: A window for registering equipment to be managed.
④ Status window: A sector where information window of FWB2411 to be managed appears.
⑤ Registration button: Speed buttons for function related to the list window.
⑥ Program status display: Displays an execution time of the program.

## 1) FWB2411 Registration

Make a group first in order to register FWB2411 to be managed.
Group enables you to easily categorize many equipment when managing them.

The group is created in two methods as Fig.2.
① Select Menu File->Add Group
② Use a speed button at the bottom of list window
Using one of the above two methods, a dialog box asking a group name appears (Fig.3). Enter an appropriate name for group.

*Tip : You'd better designate a group name that is easily recognized.
For further detailed management, subgroup can also be used.

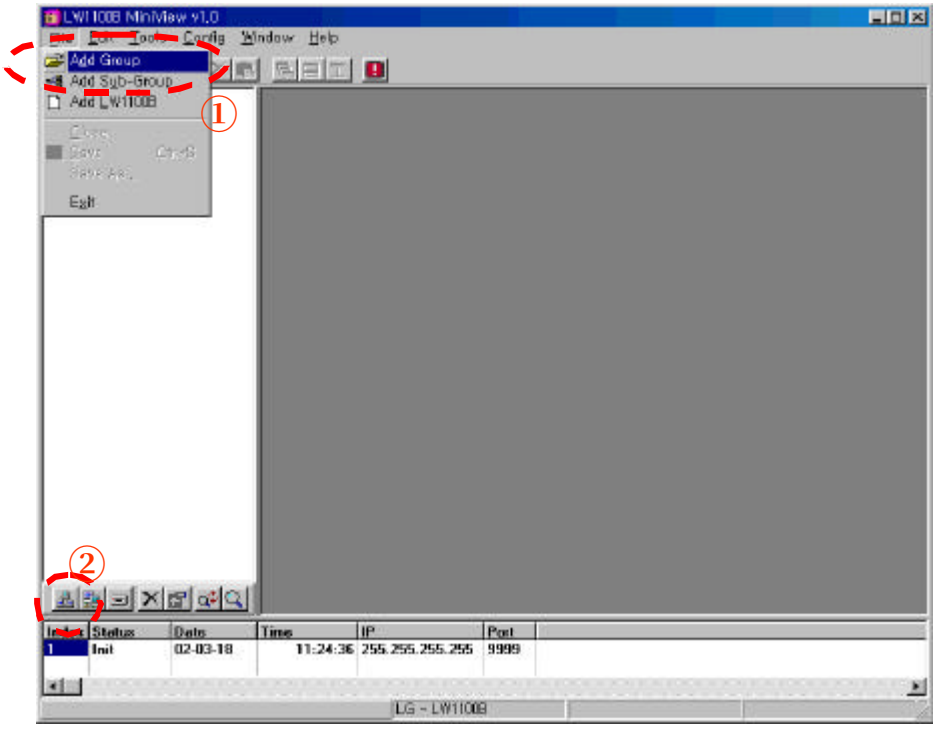


Fig2

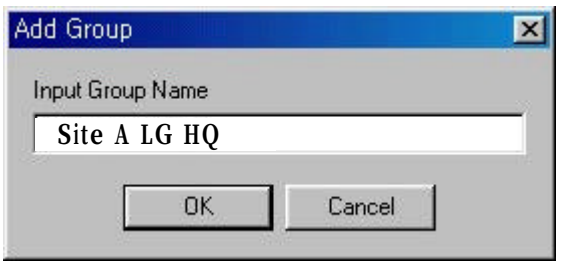


Fig3

**A group, "Site A LG HQ" is created on the list window.**
**In order to register FWB2411 equipment related to this group, click "Site A LG HQ" and then select Menu or Speed Button as shown in Fig4.**

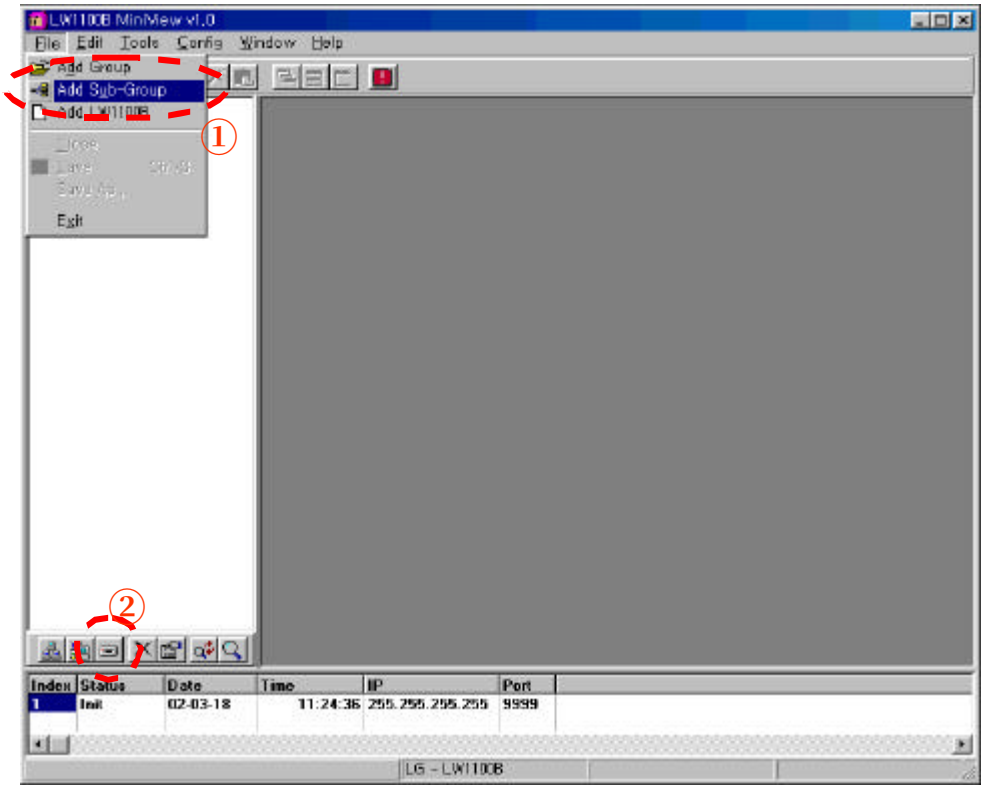


Fig4

**When the window shown in Fig.5 appears, set up the IP address and monitoring interval.**