



APPENDIX G
: USER'S MANUAL

HWM-300
Wi-Fi Network Controller Module
User Manual

Contact Us

Tel. :

Weekday: AM 10 : 00 ~ PM 5 : 00

(Customer support time could be change, according to company's circumstances)

Homepage :

Location :

LG Electronics

Document Revision History

Date	Revision	Changes

Table of Contents

1 System Descriptions.....	6
1.1 Applications	6
1.2 Module Summary	6
1.3 Block Diagram	6
2 Mechanical Specifications.....	7
2.1 Module dimension.....	7
2.2 Module Pin-out	7
3 DC Electrical Specifications	7
3.1 Typical Power Consumption.....	7
4 RF Specifications	8
4.1 RF Characteristics for IEEE 802.11b.....	8
4.2 RF Characteristics for IEEE 802.11g	9
5 Environmental Specifications.....	9
5.1 Absolute maximum ratings	9
5.2 Recommended Operating Conditions.....	10
6 TELNET or HyperTerminal	10
6.1 Demonstration and Test	10
7 Serial Configuration.....	13
7.1 Serial Command	13
7.2 Demonstration and Test	13
8 RoHS Declaration.....	14
※ FCC Notice.....	14

Figures

Figure 1. HWM-300-L BLOCK DIAGRAM.....	6
Figure 2. HWM-300 Dimensions (unit : mm).....	7
Figure 3. HWM-300 module Communication Port settings.....	10
Figure 4. Serial Terminal Program configuration.....	11
Figure 5. Network Terminal Program configuration.....	12
Figure 6. Received Data by Network Terminal Program.....	12
Figure 7. Serial to Wireless LAN configuration.....	12

Tables

Table 1. Interface Connector PIN Assignment.....	7
Table 2. Typical Power Consumption.....	7
Table 3. RF Characteristics for IEEE 802.11b.....	8
Table 4. RF Characteristics for IEEE 802.11g.....	9
Table 5. Absolute Maximum Rating.....	9
Table 6. Recommended Operating Conditions.....	10

1 System Descriptions

1.1 Applications

HWM-300 is a complete low power self-contained embedded wireless solution to address the connectivity demand in M2M applications. It integrates micro-controller, Wi-Fi BB/MAC/RF IC, RF front end, clocks, and on-board antenna into a small form factor module. HWM-300 can be controlled by a host device through a serial interface; it can also serve as a stand-alone Wi-Fi station or network controller. Thus, it can be used to enable wireless connectivity to the simplest products with minimal engineering resources.

The HWM-300 provides standard IEEE802.11 b/g functions. The integrated CPU supports software. It can be used for a variety of different applications, such as wireless sensor node, serial to Wi-Fi transceiver, Wi-Fi network controller, Wi-Fi gateway/bridges plus internet server.

When used in a system where the HWM-300 is controlled by a host CPU, the serial host interface makes it very easy to integrate. When used in a system without a host CPU, the integrated ARM9 CRUNOS can be used to run a variety of applications.

1.2 Module Summary

- 2.4GHz IEEE 802.11b/g radio technology
- Dimension: 33 mm x 48 mm x 1.2 mm
- On-board antenna
- Transmit power: +17 dBm @ 11b /11Mbps
- Max receive sensitivity: -92dBm
- CPU: ARM9 CRUNOS
- Diverse serial interface: UART
- Operating temperature range: -30°C to 85°C
- RoHS compliant

1.3 Block Diagram

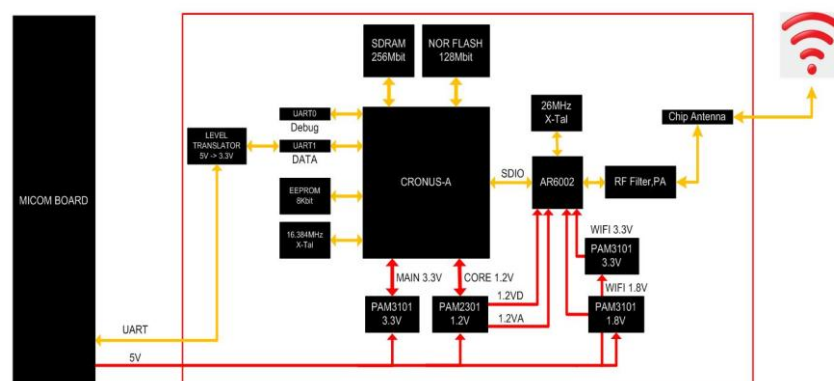


Figure 1. HWM-300-L BLOCK DIAGRAM

2 Mechanical Specifications

2.1 Module dimension

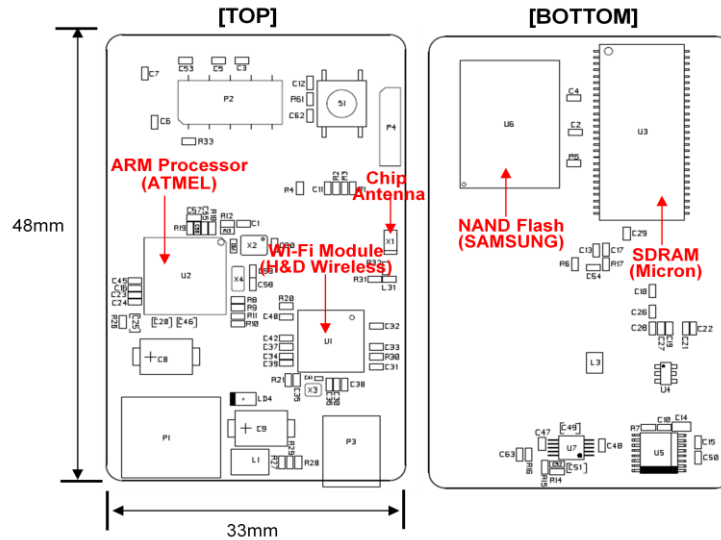


Figure 2. HWM-300 Dimensions (unit : mm)

2.2 Module Pin-out

No	Pin Name	Descriptions
1	5V	Input Voltage
2	TX	UART TX DATA
3	RX	UART RX DATA
4	GND	Ground

Table 1. Interface Connector PIN Assignment

3 DC Electrical Specifications

3.1 Typical Power Consumption

Condition: 25C, includes both Wi-Fi chip and microcontroller

Item	Condition	Values			Units
		Min	Typ	Max	
11b	Receive mode	-	77	-	mA
	Transmit mode (17dBm/100% Duty Cycle)	-	300	-	mA
11g	Receive mode	-	77	-	mA
	Transmit mode (15dBm/100% Duty Cycle)	-	237	-	mA

Table 2. Typical Power Consumption

4 RF Specifications

Items	Contents
Technology	IEEE 802.11b/g, WiFi compliant
Frequency	2.4 ~ 2.4835 GHz (US/Canada/Europe) 2.4 ~ 2.497 GHz (Japan)
Modulation Technology	DSSS, CCK, OFDM
Modulation Type	DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM
Network Access Modes	Access Point, Infrastructure
Channels	USA/Canada: 11 channels Europe: 13 channels France: 7 channels Japan: 14 channels (13 channels for 802.11g)
Wireless Data Rate	802.11b = 11, 5.5, 2, 1 Mbps 802.11g = 54, 48, 36, 24, 18, 12, 9, 6 Mbps
MAC	CSMA/CA with ACK, RTS, CTS
Network Protocols	TCP/IP, ARP, ICMP, DHCP, DNS, UDAP, TFTP, UDP, PING
Security Protocols	Disabled, WEP 64 & 128bit, WPA (TKIP), WPA (AES), WPA2 (AES), 802.1x (EAP) Supplicant 802.11i, WPA & WPA2 Enterprise supplicants (EAP-TLS, EAP-TTLS(MSCHAPv2), EAPTTLS(MDS5), EAP-PEAPv0(MSCHAPv2, LEAP), EAP-FAST, LEAP) Supports Certificates and Private Key Upload and Storage (Multiple) *Enterprise and EAP available in client mode only
Antenna	coaxial connectors, 50 ohms

4.1 DC/RF Characteristics for IEEE 802.11b

Conditions: 25deg.C, VDD_WIFI_IN=5V, VDD= 3.3V (11Mbps mode unless otherwise specified.) Measured at 50Ω terminal load connected to the RF Pad

Items	Contents			
	Min.	Typ.	Max.	unit
Tx Power Levels 1Mbps	17	18	20	dBm
Tx Power Levels 11Mbps	17	18	20	dBm
Tx Spectrum Mask Fc ± 11MHz		-40	-30	dBr
Tx Spectrum Mask Fc ± 20MHz		-54	-50	dBr
Tx RF Carrier Suppression			-15	dB
Tx Modulation Accuracy(EVM)		17	35	%
Tx OBW(Occupied Bandwidth)		20		MHz
Rx Minimum input Level Sensitivity 1Mbps (FER≤8%)		-92	-80	dBm
Rx Minimum input Level Sensitivity 11Mbps (FER≤8%)	-87	-85	-76	dBm
Rx Maximum Input Level (FER≤8%)	-10			dBm

Table 3. RF Characteristics for IEEE 802.11b

4.2 DC/RF Characteristics for IEEE 802.11g

Conditions: 25deg.C, VDD_WIFI_IN=5V, VDD= 3.3V (54Mbps mode unless otherwise specified.) Measured at 50Ω terminal load connected to the RF Pad

Items	Contents			
	Min.	Typ.	Max.	unit
Tx Power Levels 6Mbps	15	16	18	dBm
Tx Power Levels 24Mbps	15	16	18	dBm
Tx Power Levels 54Mbps	13	14	16	dBm
Tx Spectrum Mask Fc ± 11MHz		-34	-20	dBr
Tx Spectrum Mask Fc ± 20MHz		-50	-28	dBr
Tx Spectrum Mask Fc ± 30MHz		-58	-40	dBr
Tx Constellation Error (EVM) 6 Mbps		-30	-5	dB
Tx Constellation Error (EVM) 24 Mbps		-30	-16	dB
Tx Constellation Error (EVM) 54 Mbps		-30	-25	dB
Tx Modulation Accuracy(EVM)		17	35	%
Tx OBW(Occupied Bandwidth)		20		MHz
Rx Minimum input Level Sensitivity 6Mbps (FER≤10%)	-87	-85	-82	dBm
Rx Minimum input Level Sensitivity 24Mbps (FER≤10%)	-75	-82	-74	dBm
Rx Minimum input Level Sensitivity 54Mbps (FER≤10%)	-72	-72	-65	dBm
Rx Maximum Input Level (FER≤10%)	-10			dBm

Table 4. RF Characteristics for IEEE 802.11g

5 Environmental Specifications

5.1 Absolute maximum ratings

Symbol	Description	Min	max	Unit
T _{op}	Operating temperature	-30	85	°C
T _{st}	Storage temperature	-40	85	°C
VBAT	Power supply for backup circuitry when VDD is not present	0	5.0 V	V
VDD_WiFi	Wi-Fi Power supply	0	3.3V	V
RFin	RF input power		0 dB	Bm
RoHS R	Restriction of Hazardous Substances	Compliant		

Table 5. Absolute Maximum Rating

5.2 Recommended Operating Conditions

Parameter	min	typ	max	Unit
VBAT	4.55	5.0	5.5	V
CORE_1.2	1.1	1.2	1.3	V
MAIN_3.3	3.1	3.3	3.5	V
WIFI_1.2	0.9	1.2	1.35	V
WIFI_1.8	1.5	1.8	2.5	V
WIFI_3.3	3.0	3.3	4.0	V

Table 6. Recommended Operating Conditions

6 TELNET or HyperTerminal

You can configure the HWM-300 module by TELNET

STEP1: HWM-300 module with Serial to USB Cable to connect to PC.

STEP2: HWM-300 module connected to the power adapter.

STEP3: Drive Installation and Communication Port settings.

- Port Configuration from the Control Panel - System - Hardware - Device Manager, check.
- Check the USB Serial port assigned.

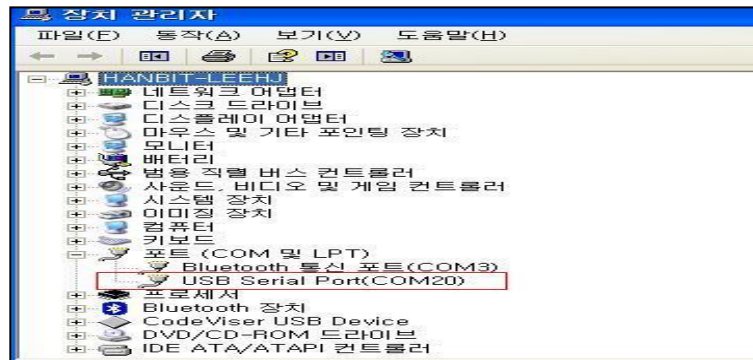


Figure 3. HWM-300 module Communication Port settings.

STEP4: HWM-300 module and the PC IP address settings.

- HWM-300 module and wireless connection settings.
The HWM-300 module Default SSID is "WLANAP".
- HWM-300 module Default IP address is 192.168.1.254.
Set to the PC IP address to match the IP band 192.168.1.XXX.

6.1. Demonstration and Test

Configure test the functionality of the HWM-300 module.

< Hardware >

- The PC equipped with a USB Port
- HWM-300 JIG board

- HWM-300 and JIG Board Connecting Cable
- PC and connect JIG Board Serial to USB Cable

<Software>

- TELNET or HyperTerminal

STEP1.

- ① PC and connect JIG Board Serial to USB Cable.
- ② HWM-300 and JIG Board Connecting Cable.
- ③ DC 5V Adaptor connection.
- ④ Power switch to the ON.

STEP2.

- ① PC's "Network Connection → Wireless Network Connection → HWM-300 wireless network view, select and connect.
- ② HWM-300 Windows Address window, enter the IP address setting screen is generated Serial input values. (default:192.168.1.254)

STEP3.

- ① PC's Hyper Terminal program execution. HWM-300 and the same baud rate as the value of Setting.
 - a) Baud Rate : 115200
 - b) Data : 8 bit
 - c) Parity : none
 - d) Stop : 1 bit
 - e) Flow Control : none

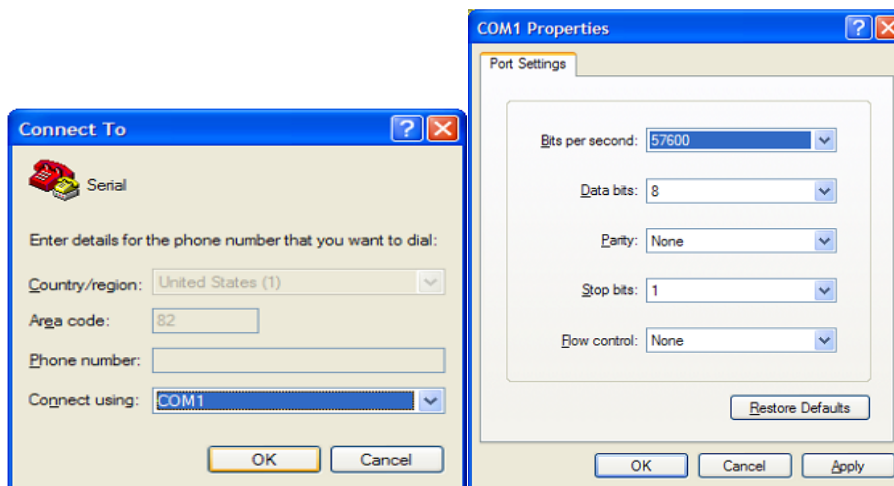


Figure 4. Serial Terminal Program configuration

Run the other HyperTerminal, Setting the IP address and Port Number.

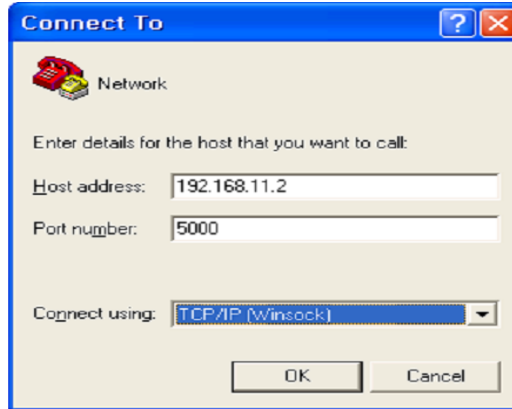


Figure 5. Network Terminal Program configuration

Input serial characters on the HyperTerminal screen. (Sample : “01234567890”) HyperTerminal even on the characters looks OK.

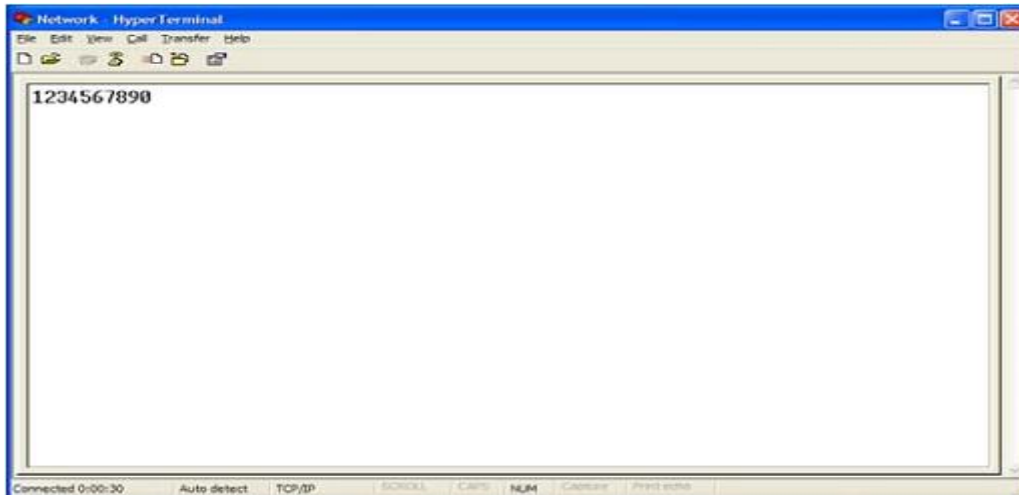


Figure 6. Received Data by Network Terminal Program

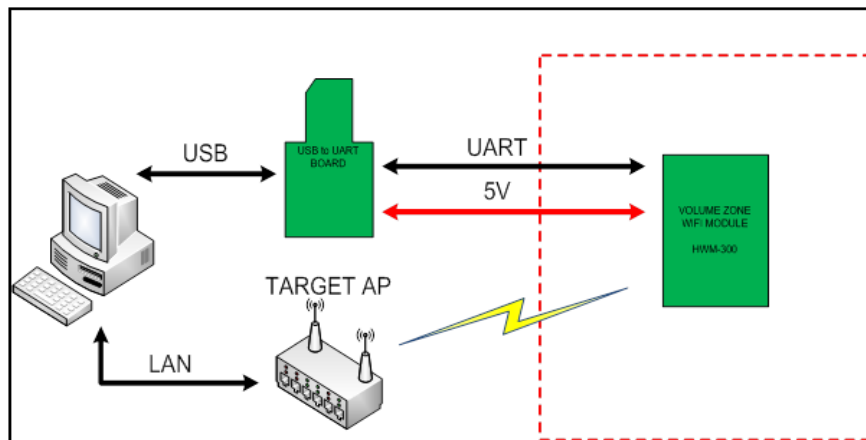


Figure 7. Serial to Wireless LAN configuration

Network HyperTerminal put words on the same word, the serial data are shown in the HyperTerminal.

7 Serial Configuration

7.1 Serial Command

Using Serial Command HWM-300 AP set. AP Setup mode, the operation mode, access mode. In addition, Scan, Wireless Controller, that can determine the behavior of the command iwconfig. Command console window on the screen when you type iwconfig-h command displays the contents.

7.2 Demonstration and Test

The PC is set to the default IP 192.168.120.254, Host behavior when checking ping 192.168.120.254, because the command Host host to confirm the action. Client behavior when checking the console by typing ping www.google.co.kr and ping to verify.

<AP operation mode>

```
#!/bin/sh
```

```
#
```

```
iwconfig eth1 essid off
```

```
sleep 3
```

```
killall udhcpc
```

```
killall udhcpd
```

```
killall httpd
```

```
killall wpa_supplicant
```

```
iwconfig eth1 mode Master
```

```
iwconfig eth1 channel 1
```

```
iwconfig eth1 essid 1234567890 # SSID 1234567890, SSID will be required to change.
```

```
iwconfig eth1 commit
```

```
ifconfig eth1 down
```

```
ifconfig eth1 192.168.120.254 # Default IP Address, DO NOT change.
```

```
ifconfig eth1 up
```

```
sleep 2
```

```
httpd -h /root/web1/www
```

```
udhcpd &
```

<AP access mode>

```
iwconfig eth1 essid off
```

```
sleep 3
```

```
killall udhcpd
```

```
killall udhcpc
```

```
killall wpa_supplicant
```

```
killall getutctime
```

```
killall ndm_daemon
```

```
iwconfig eth1 mode Managed
```

```
export NETIF=eth1
```

```
/root/RUN/image/wmiconfig --startscan --forceScanFlags 0 1 0
```

```
iwconfig eth1 essid 1234567890 # Access SSID
ifconfig eth1 down
ifconfig eth1 up
sleep 2
```

```
udhcpc -i eth1 &
```

8 RoHS Declaration

To the best of our present knowledge, given our supplier declarations, this product does not contain substances that are banned by Directive 2002/95/EC or contain a maximum concentration of 0.1% by weight in homogeneous materials for

- Lead and lead compounds
- Mercury and mercury compounds
- Chromium (VI)
- PBB (polybrominated biphenyl)
- PBDE (polybrominated biphenyl ether) And a maximum concentration of 0.01% by weight in homogeneous materials for
- Cadmium and cadmium compounds

FCC Notice

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 UNDERSIRED OPERATION.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures :

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer of an experienced radio/TV technician for help.

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.

End product labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and user. The final end product must be labeled in an visible area with the following "Contain FCC ID: BEJWB3012". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

IMPORTANT NOTE

- (1) Warning that this module is not approved to be operated simultaneously with other radios.
Further certification requirement may required when installed and operated simultaneously with other radios.
- (2) Confirming of approved antenna, and advice that used other type of antenna or same type with higher gain will required additional certification.