



**MOTOROLA**

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**Exhibit 8 – Users Manual**

**DSMODEM/RTC**

**Wireless LAN**

FCC ID: E9UDSMODEM-RTC

Model No. DSMODEM/RTC

**8.0 DSMODEM/RTC Users Manual**



**902 ~ 928 MHz Wireless-LAN  
WS200 / WM200 User Manual**

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WS200 / WM200 User Manual**

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This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference. And (2) this device must accept any interference received, including interference that may cause undesired operation.

**1. Introduction and Features**

1.1. WS200 / WM200 ( MSSK' s RF-LAN ) receives and transmits data in the Industrial, Scientific and Medical (ISM) band of 902 to 928 MHz by half-duplex mode. WS200

/ WM200 wireless-LAN uses a standard RS-232C serial data external-interface that can be driven asynchronously. WS200 / WM200 wireless-LAN uses direct sequence spread spectrum technology implemented with Spread Spectrum Technology (SST). This can be applied for multiple-access networking or point-to-point, point-to-multiple, and multiple-to-multiple communication.

1.2. WS200 / WM200 is consisting with Station(WS200) and Mobile(WM200) Parts. Mobile(WM200) is connected by Validator, and Station(WS200) is connected by BMS (Data Gathering System). Mobile and Station can RF-communication with each other.

1.3. Major features of the WS200 / WM200 wireless-LAN include:

- Designed for 902-928 MHz ISM band
- Auto channel scan and channel indication
- Auto channel change when interfered
- Spurious emission meets FCC part 15 class B and 15.247
- High immunity to interference and jamming
- Long range
- High security
- Compact size
- Easy to operate
- Low cost



<Figure 1-1, OneValidator connection with one BMS, via Mobile and Station.>

## 2. Outside & Configuration

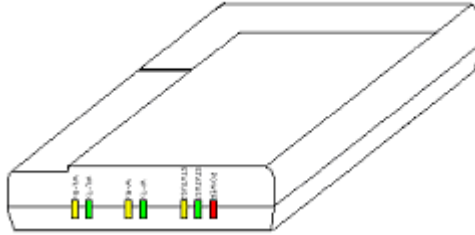


## 2.1. Mobile has one connector, LED indicators.

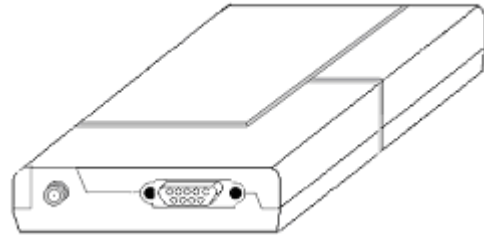
|    |                          |   |  |
|----|--------------------------|---|--|
| 1. | RS-232 & Power Connector | A DB-9 connector for connecting to data terminal equipment (DTE) and +12~+24V DC power input. |  |
|    | 1,6                      | Power   | +12~+24V DC power input.                 |
|    | 2                        | TX of RF-LAN  | RS-232C communication TX-line of RF-LAN. |
|    | 3                        | RX of RF-LAN  | RS-232C communication RX-line of RF-LAN. |
|    | 4,5,9                    | GND   | GND                                      |
| 2. | Power LED                | This LED turns on when DC-Power on.   |  |
| 3. | Status 1 LED             | This LED display Wireless-LAN's Status.   |  |
| 4. | Status 2 LED             | This LED display Wireless-LAN's Status.   |  |
| 5. | Wired TX LED             | This LED turns on when Wired TX-signal is.  |  |
| 6. | Wired RX LED             | This LED turns on when Wired RX-signal is.  |  |
| 7. | Wireless TX LED          | This LED turns on when Wireless TX-signal is.   |  |
| 8. | Wireless RX LED          | This LED turns on when Wireless RX-signal is.   |  |
| 9. | DIP Switch               | (Not Defined.)<br><br>Inside located. (Can't view on outside.)                                |  |

## 2.2. Mobile Configuration

### A. Mobile



<Figure 2-1, Mobile LEDs >



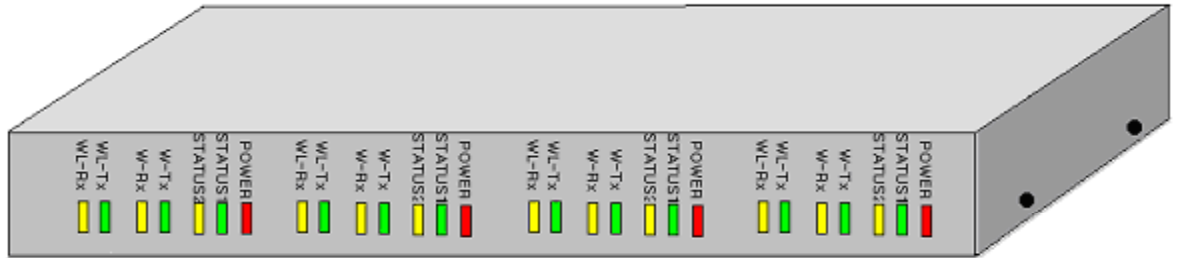
<Figure 2-2, Mobile connectors >

### B. Mobile's Antenna & Antenna Cable

### C. Mobile's Communication/Power Cable

## 2.3. Station Configuration

### A. Station



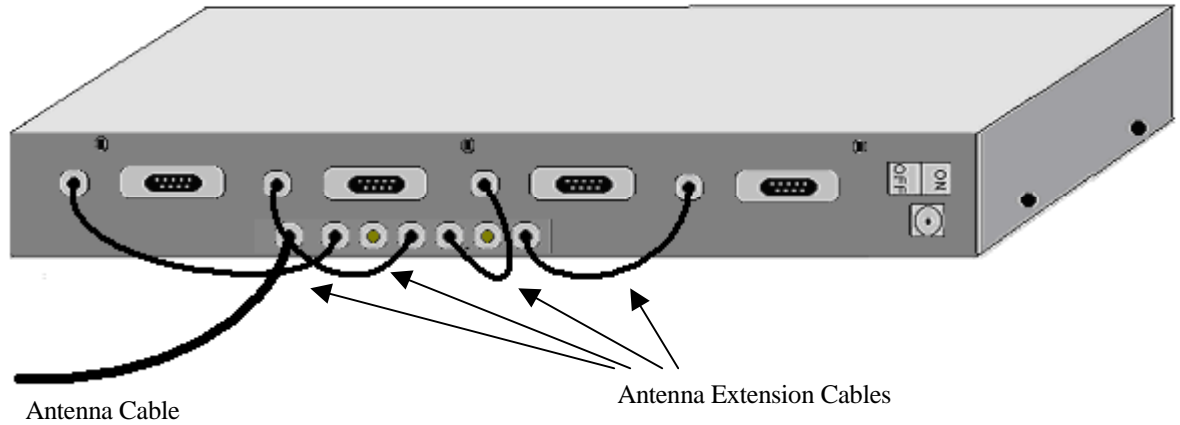
<Figure 2-3, Station LEDs >



<Figure 2-4, Station connectors >

B. Station's Antenna & Antenna Cable

C. Station's Antenna Extension Cables

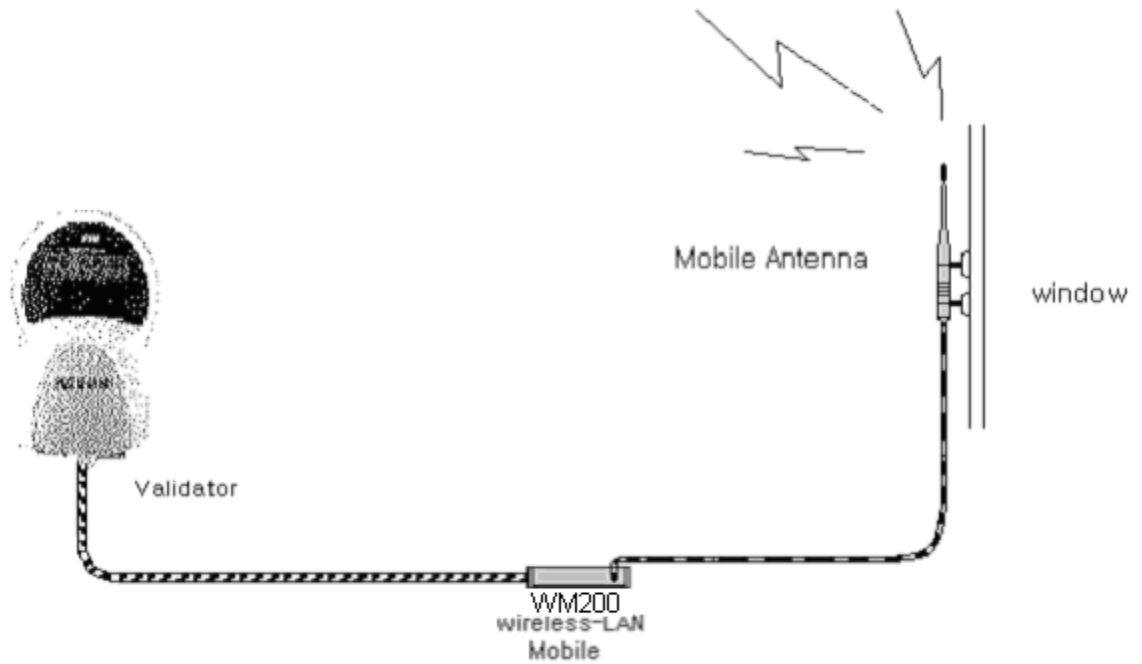


*<Figure 2-5, Station's Antenna connection >*

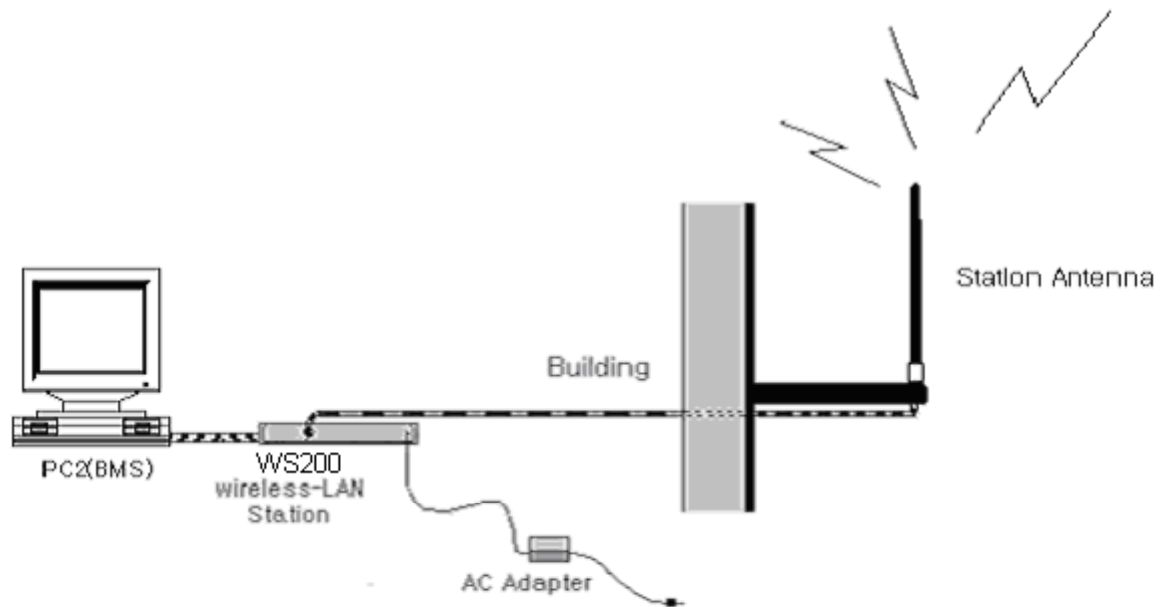
D. Station's Communication Cables

E. Station's Power Adapter & Power Cable

### 3. Setting and Using



<Figure 3-1, Mobile connection with Validator, Antenna >





<Figure 3-2, Mobile connection with Validator, Antenna and AC adapter>

### 3.1. Prepare the WS200 / WM200 wireless-LAN

**The following sections describe how to connect the WS200 / WM200 wireless-LAN to External Device and how to set up and operate the WS200 / WM200 wireless-LAN.**

- 3.1.1. Those following equipment will be used to set up the system, but the system operation should be verified by qualified personnel in MSSK and professionally installed.
- 3.1.2. One **Validator** and One **PC** for BMS.
- 3.1.3. One **WM200 Mobile**.
- 3.1.4. One RS-232 cable (with power-line) for Mobile.
- 3.1.5. One Mobile (WM200)'s Antenna & Antenna Cable (200mm Dipole Antenna : specified by MSSK).
- 3.1.6. One **WS200 Station**.
- 3.1.7. Four RS-232 cables (with no power-line) for Station. (Station use AC-Power adapter.)
- 3.1.8. Four Station (WS200)'s Antenna Extension Cables
- 3.1.9. One Station (WS200)'s Antenna & Antenna Cable (800mm Whip Antenna : specified by MSSK).
- 3.1.10. AC Power Adapter & Cable for Station.

### 3.2. Connecting WS200 / WM200 wireless-LAN

**To connect both the wireless modems, please do the following procedures.**

**For Mobile,**

- A. **One side of RS-232 cable connects the serial port of Validator , and the other side connects with the rear of Mobile.**
- B. Mobile's antenna & antenna cable connects with Mobile. (Please, do not use other device might cause the rf-power variation.)
- C. Place the antenna on window of BUS.
- D. Validator power on, then the power indicator-LED on Mobile will turn on. (+24V power deriving by Validator)

For Station,

- A. One side of the RS-232 cable connects connector on the rear panel of Station, and the other side connects with the serial port of PC (BMS).
- B. Four-antenna extension cables connect on each point. (See *Figure 2-5*)
- C. Station's antenna & antenna cable connects with Station. (Please, do not use other device might cause the rf-power variation.)
- D. Place the antenna on higher position.
- E. Plug the AC power adapter (AC to 24VDC) into power inlet of the Station and power on.
- F. Then power indicator-LED on the Station will turn on.

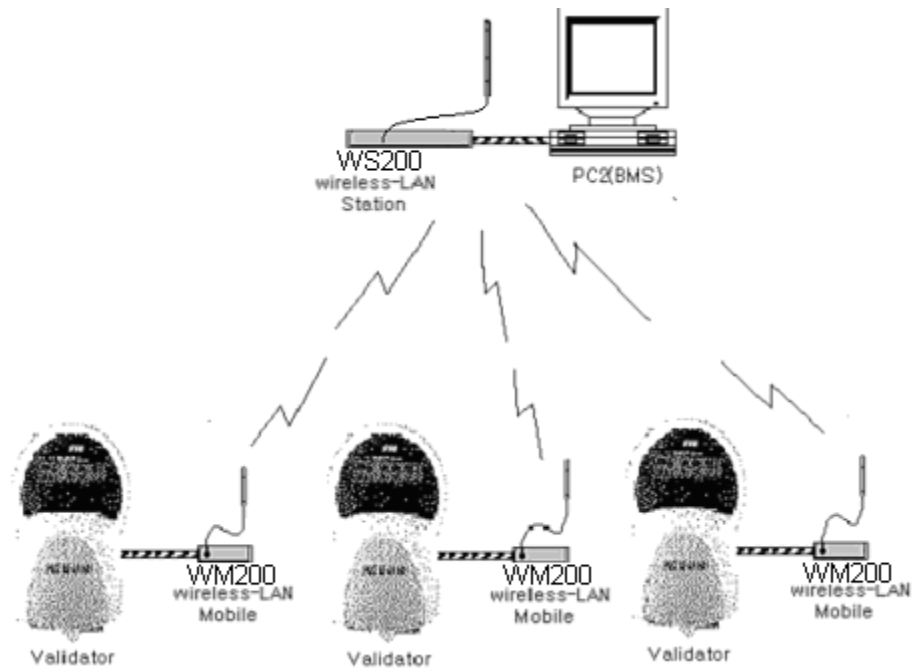


**<Figure 3-3, One Validator connection with one BMS, via Mobile and Station.>**

#### 4. Applications

##### ***Wireless Networking***

With appropriate operating(wireless application program), data of the WS200 / WM200 within a workgroup may be shared without physically connect them together.



<Figure 4-1, Three Validators is connecting with one BMS, via Mobiles and Station.>

## 5. Technical Specifications

|                    |            |
|--------------------|------------|
| RF-Frequency Range | 902-928MHz |
|--------------------|------------|

|                                |   |
|--------------------------------|---|
| RF-Channel Spacing             | 2.048 MHz                                       |
| RF-Transmission Power          | 20 ± 2 dBm                                      |
| RF-Modulation Scheme           | GMSK  |
| RF-Radio Technique             | Direct Sequence Spread Spectrum                 |
| RF-Duplex Mode                 | Half-duplex                                     |
| RF-Number of Channel           | 10  |
| RF-Operation Mode              | Point-to-point                                  |
| RF-PN Code Chip Rate           | 1.365 M chips/sec                               |
| RF-Data Format                 | Async, 170 Kbps, 8-bit, Even-parity, 1-Stop-bit |
| Wired External Interface       | RS-232-C, DB-9 Connector (with Power Pin)       |
| Wired Data Format              | Async, 115 Kbps, 8-bit, No-parity, 1-Stop-bit   |
| DATA FORMAT                    | Transparent                                     |
| Data Bit Error Rate            | 10 <sup>-3</sup> @ -100 dBm                     |
| Operating Temperature          | 0 °C to 60 °C                                   |
| Storage Temperature            | -30 °C to 70 °C                                 |
| Supply Voltage                 | +12~24 VDC                                      |
| Transmitter CurrentConsumption | < 200mA @ 24VDC                                 |
| Receiver Current Consumption   | < 150mA @ 24VDC                                 |
| Power Consumption              | < 4.8W (Mobile)/ < 20W (Station)                |
| Spurious Emission              | Compliance FCC part 15 class B and 15.247       |
| Antenna                        | 50 ohms (omni-directional)                      |

## 6. Trouble Shooting

### 6.1. When Mobile/Station do not display power LED.



- A. Check wired connection condition.
  - B. Reconnect wired connection.
  - C. Please. Call repair-department.
- 6.2. When Status LED didn't flicker by 10-second, periodically.
- A. Check wired connection condition.
  - B. Reconnect wired connection. (And, Please. Call repair-department.)
- 6.3. When Validator display "RF1"-> "Fail" (Mobile can't wired-communicate with validator).
- A. Check wired connection condition.
  - B. Reconnect wired connection. (And, Please! Call repair-department.)
- 6.4. When BMS display "Wired communication is failed"(Station can't wired-communicate with BMS).
- A. Check wired connection condition.
  - B. Reconnect wired connection. (And, Please. Call repair-department.)
- 6.5. When Mobile can't communicate with Station (Wireless-communication can't more). Validator's display : "RF2 -> Fail", BMS's display : "Wireless communication is failed"
- A. Check Mobile condition.
  - B. Check distance of Mobile and Station.
  - C. Check Mobile antenna right up and antenna's connectors.  
(Antenna condition checking.)
  - D. Check Station antenna right up and antenna's connectors.  
(Antenna condition checking.)
  - E. Please. Call repair-department