



InfoWave™ User's Guide

(Model 9008 and Model 9208)

Version 1.0

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Preface

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FCC Certification

This device has been tested and complies with Part 15 of FCC rules. Operation is subject to two conditions: (1) This device may not cause harmful interference. (2) This device must accept any interference received including interference that may cause undesirable operations. If this device causes or receives interference from other equipment, the user can reorient the device's antenna or move the device to a different location. Modifications to this device without the manufacturer's approval could void the user's authority to operate this device.

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For troubleshooting tips and frequently asked questions, visit our Web site at:

<http://www.innomedia.com/wireless/>

The InnoMedia Wireless Group

The InnoMedia Wireless Group offers wireless products ranging from OEM components to complete end-user products. With expertise in radio design, baseband signal processing, firmware, device drivers, spread-spectrum technology, and communications system design, the InnoMedia Wireless Group is dedicated to working with its OEM customers and business partners to help them develop innovative wireless products.

The InfoWave product family consists of InfoWave and OEM transceiver, transmitter, and receiver modules. All members of the InfoWave families use direct-sequence spread-spectrum (DSSS) technology and, depending on country-specific regulations, can be customized to operate in either 902-928 MHz or 2.4-2.483 GHz bands.

The InfoWave unit has been certified by FCC and Industry Canada. For users who prefer to directly control the transceiver, transmitter, or receiver, InfoWave OEM modules can be customized to meet their requirements. InfoWave technology has been used to support wireless data collection, home security systems, and the control of such devices as mobile robots, surveillance cameras, studio lighting systems, and electronic white boards.

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Introducing InfoWave

Congratulations on purchasing InfoWave! You have made the right decision to bring the power of wireless technology into your hands, and you will soon discover the many delightful advantages and the wonderful benefits made possible through the magic of wireless connectivity.

This chapter will introduce you to InfoWave and describe some of the advantages and possible uses of your new product.

What is InfoWave?

InfoWave is a low-cost solution for such applications as cable replacement, wireless home networking, and remote data collection and control. Using the digital spread-spectrum technology, InfoWave is a plug-and-play RS-232 cable replacement -- just connect it to a serial port and it provides transparent wireless connectivity. InfoWave offers reliable and secure communications between computers or data devices at distances of up to 350 feet indoors and 1000 feet outdoors.

PC to PC Networking (Model: 9209)

By simply connecting an InfoWave unit to each computer's serial port, the two InfoWave units establish a point-to-point connection between two computers. You can download and install the InfoWave Networking Software from InnoMedia's web site or use other software applications such as HyperTerminal and pcANYWHERE™.

The **InfoWave Networking Software** turns two computers into a mini-network. Now, the peripherals and files of the two computers can allow two users to print with the same printer, fax or email with same modem, exchange files, and play games with each other. Moreover, both users can simultaneously and independently surf the Web using the same phone line and the same Internet Service Provider account. *Users can download the InfoWave Networking software from our web site <http://www.innomedia.com/wireless/>.*

PC to Peripheral Connection (Model: 9210)

Two InfoWave units can provide a point-to-point communication between a PC and a data communication device like an external V.90 modem without any software installation.

PC to Multiple Devices Communication (Model: 9208)

For point-to-multipoint applications, one InfoWave unit can serve as a base station to poll many remote stations. For example, one computer can control multiple mobile robots by using the InfoWave units. Using a simple InfoWave command set, users can easily integrate the InfoWave into their remote data collection and control applications.

Installing InfoWave

InfoWave can be installed in just minutes. This chapter discusses the hardware installation of the InfoWave system, including a description of the InfoWave hardware components and an installation procedure.

The InfoWave kit consists of:

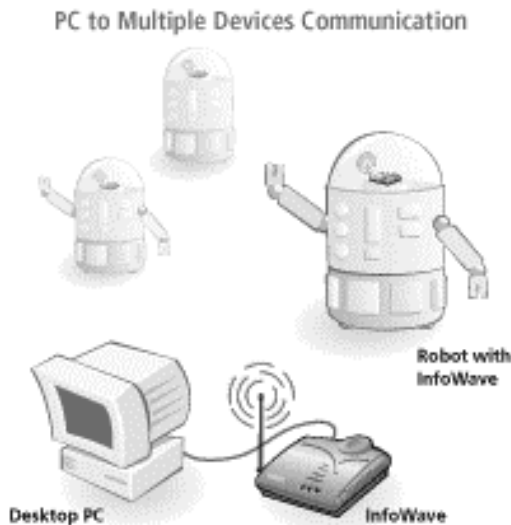
Model 9208

1. 2 InfoWave units,
2. 2 Power adapters,
3. 1 mini-Din PS/2 power cable,
4. 1 Din power cable,
5. 2 9-pin-to-25-pin adapters,
6. 2 9-pin-to-9-pin RS-232 cables,
7. 1 User's manual, and
8. 1 one-year warranty card.

Model 9008

1. 1 InfoWave unit,
2. 1 Power adapter,
3. 1 mini-Din PS/2 power cable,
4. 1 9-pin-to-25-pin adapter,
5. 1 9-pin-to-9-pin RS-232 cable,
6. 1 User's manual, and
7. 1 one-year warranty card.

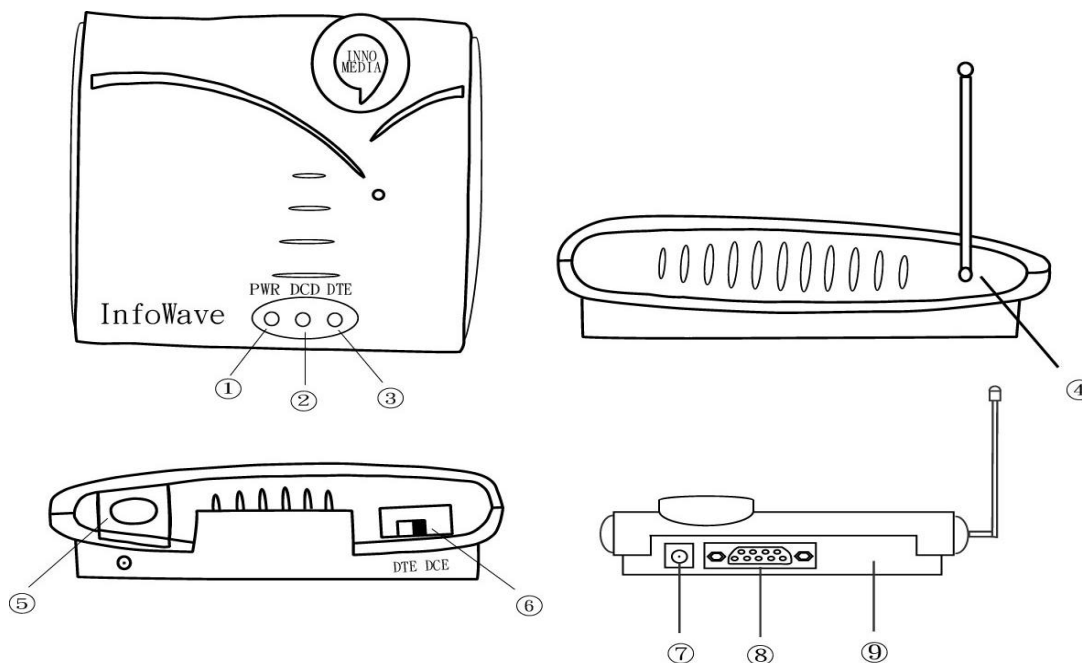
The illustrations below show the typical applications for the InfoWave.



Model 9008 and Model 9208

InfoWave Hardware

The following figure and table describe the InfoWave hardware.

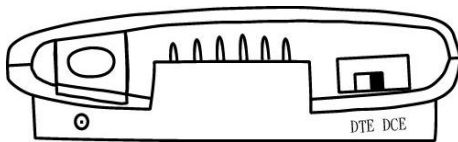


Reference	Function	Description
1	Power Indicator	Indicates power is on when lit.
2	DCD Indicator	Indicates unit is connected when lit. Light blinks when transferring data and turns off after 30 seconds of inactivity.
3	DTE Indicator	Set unit to DCE mode for connection to a computer or to DTE mode for connection to a peripheral. When it turns on, the unit is in the DTE mode.
4	Antenna	Transmits/Receives signal to/from another unit.
5	Power Switch	Press into the lock position to turn on the unit. Press again to turn off the unit.
6	DTE-DCE Switch	Select DCE to connect a computer-like device and DTE to connect a modem-like device.
7	DC Power Input	+5V DC power input. Positive polarity is at the center.
8	9-pin Serial Port	Female 9-pin connector for serial connection to a PC or serial communication device.
9	25-pin Parallel Port (Optional)	Reserved for OEM use

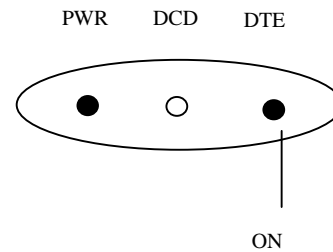
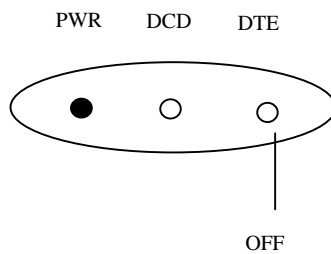
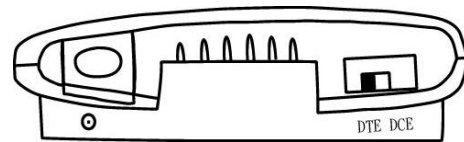
InfoWave Model 9008 and 9208

The InfoWave units of Model 9008 and Model 9208 can be set to be connected to computer-like devices or modem-like devices. The selection is done by setting the DTE-DCE switch. The following figure shows that one unit is set to the DCE mode and the other one is set to the DTE mode.

Unit connected to
computer-like (DTE)
devices
(Set to DCE mode)



Unit connected to
modem-like (DCE)
devices
(Set to DTE mode)

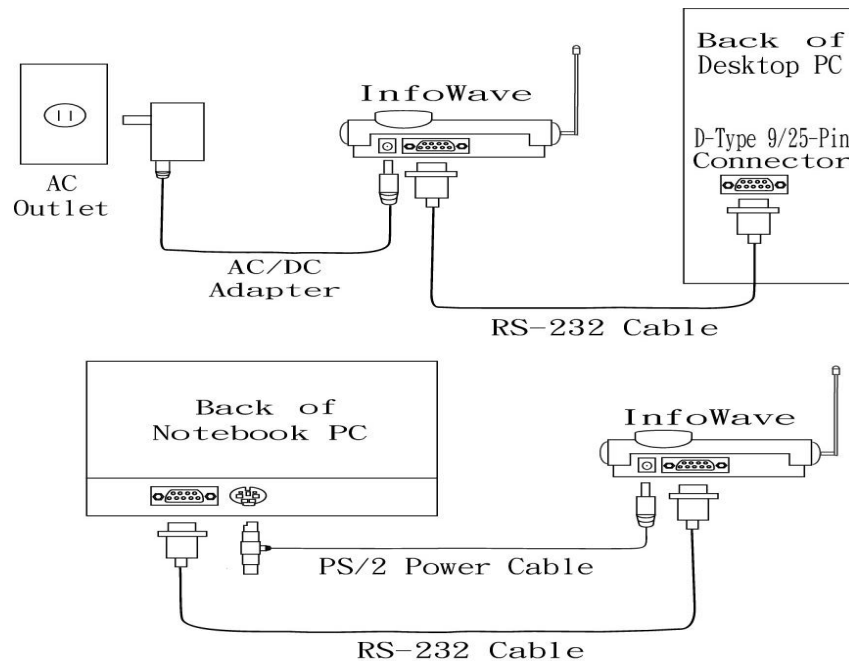


Installing the Hardware

The steps below show you how to connect a InfoWave unit to a computer.

1. Power off the computer.
2. Take one serial cable out of the InfoWave kit. Connect one end of the serial cable to the 9-pin male communications (COM) port on your computer. If your computer has a 25-pin COM port, use the 9-to-25-pin adapter included in the package.
3. Connect the other end of the serial port to the 9-pin female COM port on the back of the InfoWave unit.
4. Plug the power supply pack into the +5V DC power input in the back of your InfoWave unit.

Hardware installation is now completed on one computer. Remember to perform the entire procedure for the other computer to be networked.



Using the Power Adapter Cables

Two power adapter cables are included in the InfoWave kit. The power adapter cable allows you to power up the InfoWave unit from a desktop or notebook PC instead of using the DC power supply.

To use the cable, do the following:

1. Connect one end to the InfoWave DC power supply, and connect the other end of the cable to a PS/2 pass-through connector.
2. Remove either the PS/2 mouse or keyboard connector first, then plug in the PS/2 pass-through connector. Finally, plug in the PS/2 mouse or keyboard connector on top of the PS/2 pass-through connector.

InfoWave Command Set

InnoMedia Wireless Group offers a “WM” command set for the InfoWave spread-spectrum data modem and development tools. This command set allows users to rapidly develop wireless prototypes and applications before going through lengthy hardware development cycles.

Each command is prefixed by two letters “WM”, followed by some other characters as parameters, and then ended by a carriage return <CR>. Please note that these commands can only be used in the Data Communication Equipment (DCE) mode. This command set is not supported in the Data Terminal Equipment (DTE) mode.

Definitions:

- **Point-to-Point Connection:** InfoWave only supports one point-to-point connection at a time. A polling or inquiry scheme is needed to implement point-to-multipoint communication.
- **Primary Station:** The station that initiates a connection.
- **Secondary Station:** The station that communicates with a Primary station.
- **My Address:** The address of the local station.
- **Partner Address:** The address of the remote station.
- **Default Baud Rate:** The baud rate used by the RS-232 interface at a Secondary Station.
- **Auto-Channel Scan:** InfoWave will automatically scan all the available RF channels and record the interference level of each channel after a power-up initialization.
- **Auto Channel Change:** InfoWave will automatically choose a clear channel if any interference occurs and disturbs the data transmission during a radio connection.
- **Group ID:** Each station has a Group ID and can only communicate with other stations with the same Group ID.
- **PN Code:** Pseudo-random (PN) code used by InfoWave that is a direct-sequence spread-spectrum communication system. InfoWave™ has 20 sets of PN codes. This allows two sets of InfoWave to operate in close proximity by choosing different PN codes.
- **Create_Link Time Constant:** After receiving set-up link command, a Primary Station continuously tries to create a radio link with a Secondary Station for a "CREATE_LINK" duration. If the timer times out and the Primary Station still could not find the target Secondary Station, Primary Station will get a message as “Partner Not Found”.
- **Both_Idle Time Constant:** If a radio link is established and there is no data to be sent between two stations for a “BOTH_IDLE” period, the radio transmission power will

automatically be turned off. Whenever any station has data to send, the radio will turn on again. This avoids mutual interference if there are more than one set of InfoWave located in close proximity.

Command	Description
WMA	Query the setting of auto channel scan function.
WMAx	Set up the auto-channel scan function. x='0' : Disable scan channel,, x='1' : Enable scan channel.
WMB	Query the setting of default baud rate.
WMBx	Set up the default baud rate. x='1' : 115200 , x='2' : 57600 , x='3' : 38400 , x='4' : 19200 , x='5' : 9600.
WMC	Query the setting of auto channel change function.
WMCx	Set up the auto channel change function. x='0' : Disable auto change , x='1' : Enable auto change.
WMD	Disconnect the radio link established previously.
WME	Query the setting of echo and response function.
WMEx	Set up the echo and response function. x= 'A' ~ 'P'. For detailed definition, see Table 2.
WMF	Query the setting of number of maximum bytes in one packet.
WMFxxxx	Set up the number of maximum bytes in one packet. xxxx cannot exceed a 4-digit decimal number ranging from 1 to 1024.
WMI	Query the setting of group ID.
WMIxxxxxx	Set up the group ID. xxxxxx must be exactly a 6-digit hexadecimal number. A station can only communicate with other stations with the same Group ID.
WMJ	Query station name.
WMJxxx...	Set up the station name to be xxx.... The length of xxx... cannot exceed 31 characters and it can not contain '\$'.
WML	List current setting of important parameters. The format is as follows: Version=InfoWave.VG0 Date=05-15-1999 PN4=B386A45E5F670D4848BECE1A1A917D9C ID=010203 My Address=1 Maximum Frame Length=512 Echo=ON Response=ON Auto Scan Channel=On Auto Channel Change=On Current RF Channel=8 Type of RS232 Port=DCE Current Baud Rate=115200 Default Baud Rate=115200 Wireless Link=Disconnected Identification Name=INNOMEDIA TECHNOLOGY INC .

WMM	Query the setting of my address.
WMMxxx	Set up my address. xxx can not exceed a 3-digit decimal number ranging from 1 to 254.
WMN	Switch to data mode from command mode.
WMO	Query the stored partner's PN code
WMOxx	Temporarily set the local PN code to the partner's PN code. xx cannot exceed a 2-digit decimal number ranging from 1 to 20.
WMP	Query the setting of PN code of local station.
WMPxx	Set up the PN code of local station. xx cannot exceed a 2-digit decimal number ranging from 1 to 20.
WMRxy	Set up the baud rate and data format of the RS-232 interface of remote station. x='A' ~ 'O', y='1' ~ '5'. For detailed definition, see Table 3.
WMSxxx	Create a radio link with a partner addressed by xxx . xxx cannot exceed a 3-digit decimal number ranging from 1 to 254. Once the radio link is established, the InfoWave™ switches from command to data mode. A ESCAPE sequence can return the InfoWave™ to the command mode. The ESCAPE sequence consists of three contiguous ' ' characters and a <CR>.
WM&Bxxx	Set up the BOTH_IDLE time constant in units of minute. xxx cannot exceed a 3-digit decimal number ranging from 0 to 255. If x=0, the BOTH_IDLE timer is disabled.
WM&Cxxx	Set up the CREATE_LINK time constant uniting in second. xxx cannot exceed a 3-digit decimal number ranging from 0 to 255. If x=0, the CREATE_LINK timer is disabled.
WM&0	Restore the default setting.

Table 1. The WM Command Set

The command could be entered in low or upper case. Note that the timing of issuing the Escape Sequence is important. Enter an escape sequence "|||" <CR>, where the "Carriage Return" or "Enter". You need to consecutively and quickly enter the three "|" and then hit the <CR>. The timing between the keystrokes should be less than 0.5 second in. After seeing the InfoWave respond with an "0" or "OK", you can then type in the WMx commands. For software programming, the detailed timing is shown below:

“|” ← T1 → “|” ← T1 → “|” ← T2 → <CR> ← T3 → “Next WM Command”

Where T1 < 500 ms, T2 < 800 ms, and T3 > 50 ms.

	Save setting to EEPROM or not 0: Don't Save 1: Save	Echo control 0: Echo On 1: Echo Off	Response control 0: Response On 1: Response Off	Text or numerical response selection 0: Text Response 1: Numerical Response
WMEA	0	0	0	-
WMEB	0	0	1	0
WMEC	0	0	1	1
WMED	0	1	0	-
WMEE	0	1	0	-
WMEF	0	1	1	0
WMEG	0	1	1	1
WMEH	1	0	0	-
WMEI	1	0	0	-
WMEJ	1	0	1	0
WMEK	1	0	1	1
WMEL	1	1	0	-
WMEM	1	1	0	-
WMEN	1	1	1	0
WMEO	1	1	1	1
WMEP	Restore previous setting			

Table 2. The Definition of WME_x Command

x	Data Format	y	Baud Rate
A	7 + N + 1	1	115200
B	7 + E + 1	2	57600
C	7 + O + 1	3	38400
E	7 + N + 2	4	19200
F	7 + E + 2	5	9600
G	7 + O + 2		
I	8 + N + 1		
J	8 + E + 1		
K	8 + O + 1		
M	8 + N + 2		
N	8 + E + 2		
O	8 + O + 2		

Table 3. The Definition of WMR_{xy} Command

	Length (Byte)	Type
Firmware Version	12	ASCII
Firmware Revised Date	4	Binary
Station Name	32	ASCII
PN Code	16	Binary
Group ID	3	Binary
My Address	1	Binary
Max Frame Length	2	Binary
Current Baud Rate	1	ASCII
Default Baud Rate	1	ASCII
Channel Number	1	Binary
Flag1	1	Binary
Flag2	1	Binary

Table 4. The Data Structure of Numerical Response of WML Command

Flag1	Description	Definition
Bit 0	Numerical or Text Response	1 : Numerical Response , 0 : Text Response.
Bit 1	Response Control	1 : Response On , 0 : Response Off.
Bit 2	Echo Control	1 : Echo On , 0 : Echo Off.
Bit 3	Save to EEPROM	1 : Save , 0 : Don't Save.
Bit 4	Auto Scan Channel Control	1 : Enabled , 0 : Disabled.
Bit 5	Auto Channel Change Control	1 : Enabled , 0 : Disabled.
Flag2	Description	Definition
Bit 0	RF Link Status	1 : Connected , 0 : Disconnected.
Bit 1	Asynchronous Interface Type	1 : DTE , 0 : DCE.

Table 5. Definition of Flag1 and Flag2

Table 6 shows the detailed information of responses of all commands. Please note that the string enclosed by “” is ASCII character. In contrast, the number prefixed by 0x is a binary number. Another thing is that “2x” denotes 2-byte ASCII characters, “3x” denotes 3-byte ASCII characters, and so on.

	Command	Condition	Numerical Response	Text Response
1	WMA		“x”	“x” “OK”
	WMAx	Disconnected	“0”	“OK”
	WMAx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
2	WMB		“x”	“x” “OK”
	WMBx	Disconnected	“0”	“OK”
	WMBx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
3	WMC		“x”	“x” “OK”
	WMCx	Disconnected	“0”	“OK”
	WMCx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
4	WMD	Connected	“0”	Pause “Disconnected !” “OK”
	WMD	Disconnected	“0”	“Disconnected !” “OK”
5	WME		“x”	“x” “OK”
	WMEx		“0”	“OK”
	WMEx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
6	WMF		“4x”	“4x” “OK”
	WMFx	Disconnected	“0”	“OK”
	WMFx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
7	WMH		“x”	“x” “OK”
	WMHx	Disconnected	“0”	“OK”
	WMHx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
8	WMI		“6x”	“6x” “OK”
	WMIx	Disconnected	“0”	“OK”
	WMIx	Connected	“N”	“Can not set parameter during radio connection.” “OK”

9	WMJ		“31x”	“31x” “OK”
	WMJx	Disconnected	“0”	“OK”
	WMJx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
10	WML		See Table 4	“Version=InfoWave.VG0” “Date=05-15-1999” “PN4=B386A45E5F670D4848BECE1A1A917D9C” “ID=010203” “My Address=1” “Maximum Frame Length=512” “Echo=On” “Response=On” “Auto Scan Channel=On” “Auto Channel Change=On” “Current RF Channel=8” “Type of RS232 Port=DCE” “Current Baud Rate=115200” “Default Baud Rate=115200” “Wireless Link=Disconnected” “Identification Name=INNOMEDIA TECHNOLOGY INC” “OK”
11	WMM		“3x”	“3x” “OK”
	WMMx	Disconnected	“0”	“OK”
	WMMx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
12	WMN	Connected	“0”	“OK”
	WMN	Disconnect	“7”	“No Connection !” “OK”
13	WMO		“2x”	“2x” “OK”
	WMOx		“0”	“OK”
14	WMP		“2x”	“2x” “OK”
	WMPx	Disconnected	“0”	“OK”
	WMPx	Connected	“N”	“Can not set parameter during radio connection.” “OK”
15	WMRxy		“0”	“OK”
16	WMS	Disconnected	0x00 (one-byte binary number)	“Disconnected !” “OK”
	WMS or WMSx	Connected with address x (x is the current partner)	x (one-byte binary number)	“Connected with address x” “OK”
	WMSx	Create a new	“0”	“Connecting.....”

		wireless link and it is done successfully		pause "Connect to Address x" enter data mode
	WMSx	Create a new wireless link, but the desired partner not found	"D"	"Connecting...." pause "Partner Not Found !" "Disconnected !" "OK"
	WMSx	Create a new wireless link, but the desired partner is busy	"E"	"Connecting...." pause "Partner Busy !" "Disconnected !" "OK"
17	WM&B		"x"	"x" "OK"
	WM&Bx	Disconnected	"0"	"OK"
	WM&Bx	Connected	"N"	"Can not set parameter during radio connection." "OK"
18	WM&C		"x"	"x" "OK"
	WM&Cx	Disconnected	"0"	"OK"
	WM&Cx	Connected	"N"	"Can not set parameter during radio connection." "OK"
19	WM&0		"0"	"OK"
20	Invalid command		"Z"	"WM_ERROR"
21	" " <cr> Escape sequence	Data mode	"0"	"OK"

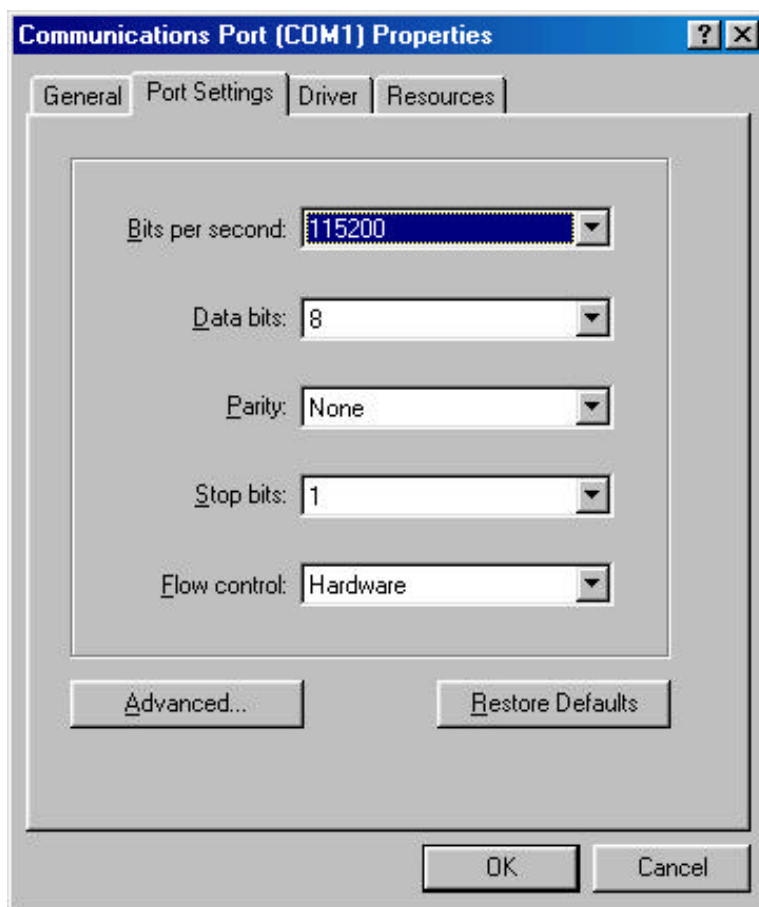
Table 6. The Responses of WM Command Set

Configuring Your Computer's Serial Port

InfoWave uses hardware flow control to ensure reliable data transmission. Your PC COM port needs to be configured as shown below. To configure the serial port, do the following:

1. At Windows 95 and 98 desktop area, issue the command sequences:

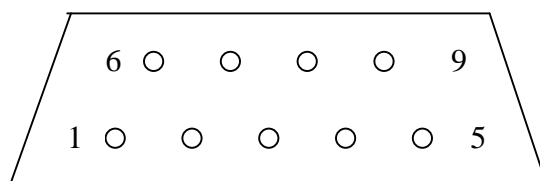
Start → Settings → Control Panel → System → Device Manager → Ports → COM1 or COM2



All the parameters should be set as shown in the above figure except the "Bits per second" box. Choose the correct baud rate that matches your InfoWave setting.

Changing Your Cable Wiring to Bypass InfoWave Hardware Flow Control

For a device does not support hardware flow control, special cable wiring is needed to bypass the hardware flow control. *Pin 4, 6, and 7 of the InfoWave female connector need to be connected together.* The following figure and table show the female connector layout and pin assignment respectively. Note that once the hardware flow control is disabled, the user needs to exercise caution to prevent data overrun that can result in loss of data packets.



Female Connector of InfoWave Unit

Pin No.	Pin Name	I/O (DCE)	I/O (DTE)	Comments
1	/DCD	O	I	In DCE mode, when the radio link is established, DCD is asserted. When the link is torn down, DCD becomes de-asserted.
2	RXD	O	I	
3	TXD	I	O	
4	/DTR	I	O	In DCE mode, DTR must be asserted before data can be sent out normally.
5	GND	-	-	
6	DSR	O	I	
7	/RTS	I	O	Hardware flow control signal.
8	/CTS	O	I	Hardware flow control signal.
9	/RI	O	I	

For device does not support hardware flow control, *Pin 4, 6, and 7 of the InfoWave female connector need to be connected together.*