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DEC 2006

738 USER & APPLICATION PROGRAMMING MANUAL FOR WINCE.NET 4.2

VERSION 1.3

ID:81-010-008-012

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WARNING

Before the operation the device, the following procedures are required to be adhering:

1) Do not use the device if the GPRS/GSM or GPS antenna shows any visible signs of damage.

2) Ensure that the SIM Card cover is in place after the SIM Card is being inserted for the electrical safety of the device.

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DOCUMENT REVISION RECORD

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1.0	25 Oct 2004	Priya	Initial Release
1.1	27 Oct 2004	Priya	Modifications made in accordance with CET checklist
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1.3	20 Oct 2006	Chua KH	Added in Regulatory notice

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ABSTRACT

This document gives a detailed account on the Waveon738 product's setup, installation, usage and troubleshooting. The setup procedures entail the whole installation of the peripherals and cables with the MT and the cradle with illustrated pictures. In the later sections the procedures such as saving registry settings to the on-board Flash disk, DOC, configuration of the buttons, creating dialup connection to GPRS (General Packet Radio Service) etc., will be discussed.

The contents of this paper also describe some brief but comprehensive procedures for the application programmers to follow while customizing software functions to suit their needs. The source codes cited in this paper are C Language. Some of the important embedded Visual C++ APIs is discussed pertaining to the sound drivers, port controls, communication etc. Lastly, in the FAQ Section, some common questions posed by customers such as setting application to run at startup etc will be answered.

NOTATIONAL CONVENTIONS

i. In this documentation, Waveon738 is referenced as W738 or Mobile Terminal (MT) and the Server end is referred to as host.

ii. The mobile station (MS) represents the GPRS module plus SIM Card. The module excluding SIM card is known as Mobile Equipment (ME). The computer or PDA is known as Terminal Equipment (TE)

iii. In this document, the notation "->" is used to refer to a command selected from a menu. E.g. Open command on the File menu is File-> Open. The programming sections are denoted by ***(PROGRAMMING SECTION)***

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CHAPTER 1

INTRODUCTION

1.1 Product Brief

Learning from the past experience in the design and manufacturing of the In-Vehicle Terminal over the recent years, InfoWave Pte Ltd has developed the latest generation of the Mobile Data Terminal, the Waveon738 for fleet management solutions. Specially designed to meet the high end multiple functional demands in today's market, this state-of-art equipment is catered for extreme conditions in any vehicles such as vibration and EMI (electromagnetic) shielding. Its functions are multi-folded with Built-in GPS module for navigation, General Packet Radio System (GPRS)/GSM that allows data and voice communication over the air.

Essentially Waveon738 will house the necessary functions and unique features within the single unit and concept of add on modules to cater to different customers' needs.

1.2 Specifications

Waveon738 (See Figure 1) utilizes the Intel XScale PXA255 400MHz RISC processor, with Windows CE version 4.2 as the Operating System (OS) to deliver robust real time application as well as web browsing and multimedia capabilities. In addition, large memory space has been incorporated within the system to meet the high data storage capacity required through on-board 64MB SDRAM, 32MB Flash ROM and optional 16 or 32 MB Disk-on-Chip. For interface with external peripherals such as smart card reader etc, the equipment has 5 x RS232 ports, 4 x digital input and 4 x digital output ports, 2 x USB port etc. Details on the specifications of Waveon738 are appended in **Appendix A**.

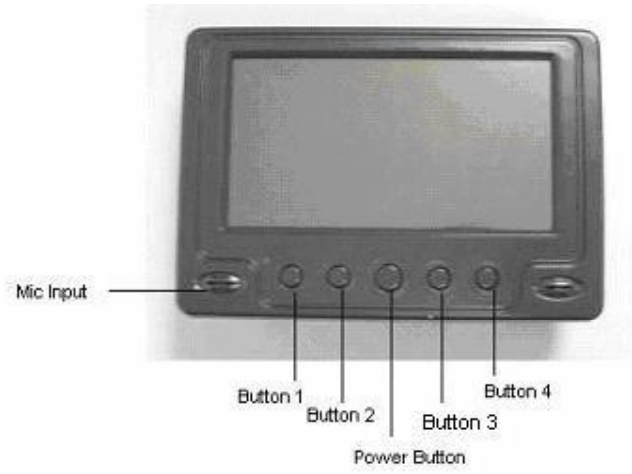


Figure 1 Front View of Waveon738 MT

Figure 2 Rear View of Waveon738 MT

1.3 Cradle

The Cradle board (See Figure 9a & b) extends Waveon738 product connectivity. The COM port configuration can be referred in **Appendix C**.

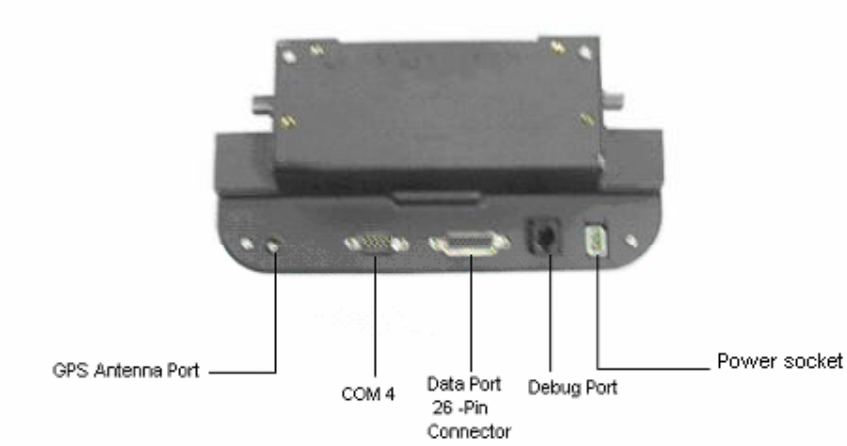


Figure 9 Cradle Board Rear View

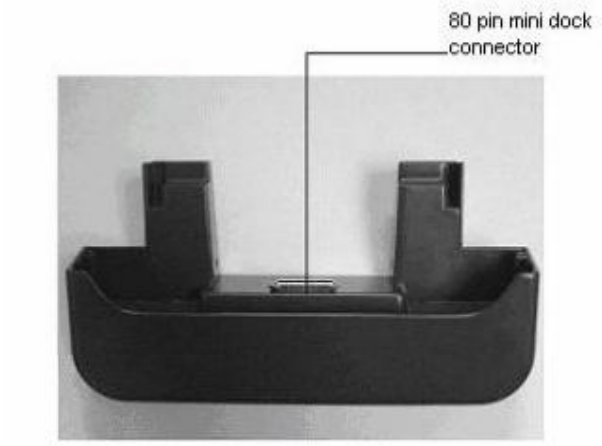


Figure 10 Cradle Board Front View

1.4 Features

The Waveon738 product has the following features instilled within as follows:

1) Ruggedised in-vehicle unit

2) Excellent touch sensitivity

3) High brightness

4) 800 x 480 high screen resolution, 16-bit color

5) External antenna connectivity for strong signal reception and propagation.

6) Integrated GPRS and GSM communication

7) Integrated GPS receiver

8) Customizable buttons function.

9) Toggle brightness setting from button.

10) Switch Terminal to Power Save Mode from software.

11) Enabled USB keyboard and mouse support.

12) Wired LAN card driver supported

CHAPTER 2

INSTALLATION GUIDE

2.1 Package List

Inside the package, you should have the following as listed out in the table below:

Item	Description	Quantity
	Equipment	
1	Waveon738 Mobile Data Terminal	1
2	Cradle	1
	Mounting Bracket	
3	Swivel Joint	1
4	W738 Mounting Bracket	1
	Cable	
5	26 Pin Data Cable	1
6	W738 power cable	1
	Antenna	
7	GPS Patch Antenna	1
8	GSM Dual Band Antenna	1

Table 1 Package List

These peripherals and cables are as illustrated in the pictures below:

Figure 3: GPS Antenna

Figure 4: Power cable

Figure 5: 26 Pin Data Cable

Figure 6: GPRS/GSM Antenna

Figure 7: Mounting Bracket

Figure 8: Swivel Joint Bracket

2.2 Setting up of Waveon738 System

2.2.1 Standalone Setup Overview

After you have checked the package list, set up the system as illustrated in the block diagram below. Refer to Section 2.3.2 to 2.3.6 for detailed installation on the vehicle mount of the MT.

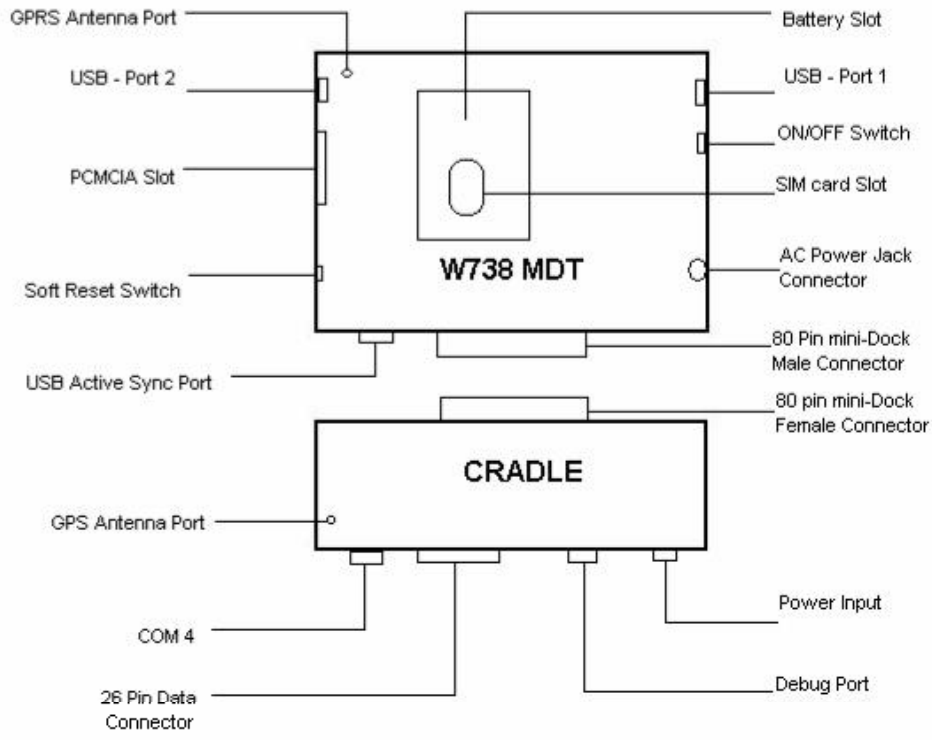


Figure 11 System Setup Overview

The installation procedures are as follows:

1) Install the SIM card and the battery to the MT.
2) Insert the MT into the cradle.
3) Connect the GPRS Antenna to the GPRS Antenna Port of W738.
4) Connect the GPS Antenna to the GPS Antenna Port of W738.
5) Lastly connect the power input supply.

2.2.2 SIM Card and Battery Installation

1. Open the battery cover at the back of W738 and unscrew the screws inside.

Figure 12a Installing SIM Card (I)

2. Open the inner cover and insert the SIM card in the socket. Then screw back the inner cover.

Figure 12b Installing SIM card (ii)

3. Open the battery cover and install the battery as shown

Figure 13 Installing Battery

4. Screw up the battery cover back.

2.3.3 Connecting Cradle Board to the MT

Insert the 80P mini dock male connector from the MT to the cradle board's mini dock female connector as shown in the figure below.

Figure 14 Connecting cradle board to MT

Ensure that the cradle board and the MT are connected firmly.

2.3.4Mounting Bracket Assembly

Before mounting onto the car, the mounting bracket has to be mounted as follows:

1) Align the Mounting Bracket to the four mounting holes at the back of the MT.

2) Then align the Swivel Joint Bracket to the Mounting Bracket and tighten with M4 screws and washes as depicted in the diagram below:

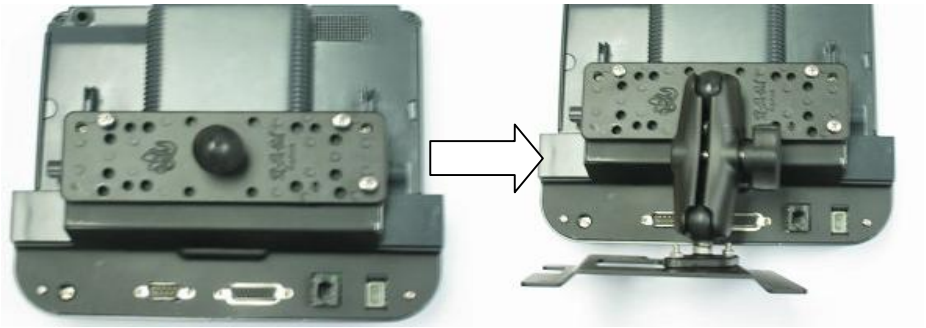


Figure 15 Screwing the Mounting Bracket onto the MT Rear

3) Lastly mount the whole assembly done in step 2 to a flat panel as shown:

Figure 16 Mounting the Swivel Joint Bracket onto the Flat Panel

2.3.5 GPRS and GPS Connectivity

1) Connect the GPRS Antenna to the MT GPRS antenna port as illustrated:

Figure 17 Connecting the GPRS Antenna to the MT Port

2) Then connect the GPS Antenna to the rear of cradle as shown:

Figure 18 Connecting GPS Antenna to the W738 Cradle GPS Port

3) The complete W738 system setup is done.

2.3.6 Vehicle Installation

Refer to following steps below:

1) Access a suitable mounting location within the vehicle. Note: ensure that the location will not obstruct any other peripherals within inside.

Figure 19 Typical Mounting of MT in the Vehicle- Front View

Figure 20 Mounting of MT in the vehicle – Rear View

2) For both the GPRS and GPS antenna, they can be pasted onto the front windscreen or dashboard with the adhesive tape provided at the back of the antenna respectively.

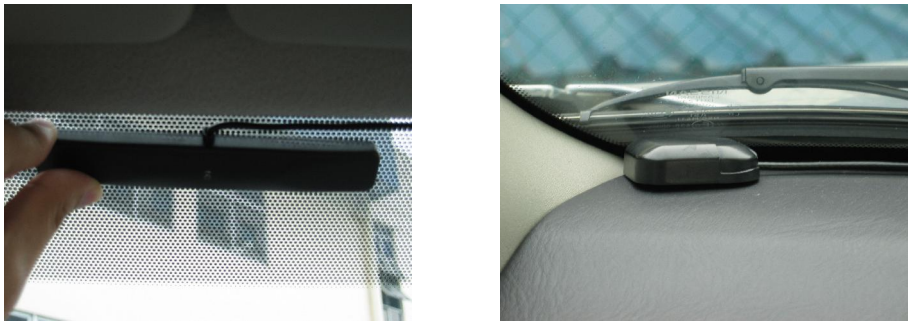


Figure 21 Pasting the Antennas onto the Window Screen & Dashboard

3) Connect the Power cable to the car battery and the data cable to corresponding car peripherals. Hide the cables carefully after installation is done. The below block diagram shows the overview of the whole vehicle installation.

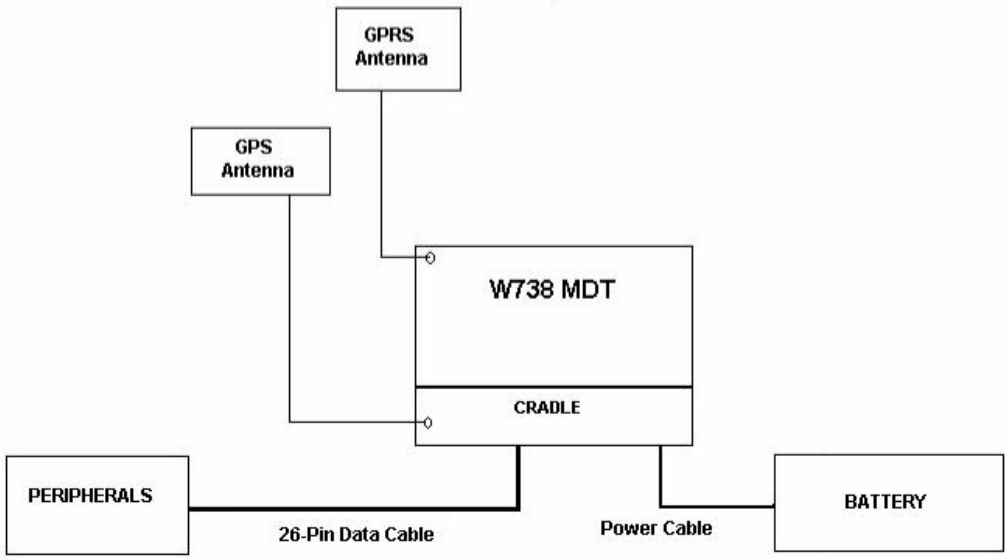


Figure 22 Vehicle Mount of the MT – Block Diagram

CHAPTER 3

WAVEON 738 DEVELOPMENT OVERVIEW

3.1 Requirements for Development

Our W738 firmware utilizes the Intel XScale PXA255 400 MHz processor, with Windows CE v4.2 as its OS. The software development tool used for the application design is Microsoft embedded Visual C++ 4.0, using an integrated development environment (IDE). The SDK offers the familiar environment of the Microsoft Win32 application programming interface (API), built-in support for communication etc. which are discussed in the later sections. ActiveSync is also provided for easy connectivity between the desktop and the embedded device, using USB port.

For installation of Microsoft embedded Visual C++ 4.0, the following hardware requirements are as follows:

1) Desktop PC with a Pentium - II Class processor. 450 MHz or faster

2) 96 MB (128 MB recommended) memory for Windows 2000 Professional or Windows XP Professional. 192 MB (256 MB recommended) memory for Windows 2000 Server

3) CD-ROM drive compatible with multimedia desktop PC specification.

4) VGA or higher resolution monitor required. A Super VGA monitor is recommended.

5) Adequate Hard Disk space (200 Mbytes is required).

The software requirements for installation of Microsoft embedded Visual C++ are: Microsoft Windows® 2000 Professional SP2, Microsoft Windows 2000 Server SP2, or Microsoft Windows XP Professional are the supported Operating systems

3.2 Setting up of the Development Environment

To ensure the functionality of the software development environment, the installation procedures are recommended to be in the following order:

1) Install Microsoft® embedded Visual C++ 4.0. For software download, refer from this following website:

http://www.microsoft.com/downloads/

2) Install the Platform SDK (Waveon738 SDK).

3) Install Microsoft® ActiveSync™ 3.7.1.

3.3 Compiling embedded Visual C++

1) Start embedded Visual C++.

2) Create a new workspace.

3) Select a WCE configuration such as Waveon738.

4) Insert your code files and compile or build.

5) To add a new supported configuration for the current platform to your project, choose Configuration from the Build menu and add a new platform.

3.4 Software Support for Waveon738

3.4.1 Value-Added Services

W738 provides the following features as depicted in Table 2 below:

No.	Features	Benefits for Customer
1.	Customized Power Management, i.e. add extra Power Save mode into kernel	■ Can Save all current working environment with high power consume device like LCD backlight, audio off, thus the driver can switch back working stage and make the peripherals immediately.
2.	Restore System Registry Data when system cold boot	■ Restore back all previous setting like touch screen calibration, volume and all application configuration data, so user do not need to reinstall all applications after total power off or battery flat ■ Make terminal more reliable and recoverable, because even terminal hangs or work in uncertain status, driver can cold reset the terminal to go back normal work state without disturb engineer. ■ Restore everything after car/truck repair.
3.	Run Autoexec.bat command script when system boot up i.e. 1. Automatically copy all necessary files from Flash ROM to RAM 2. Auto copy all the demo application shortcuts to the desktop as well as to launch the applications	■ Do not manually copy all files from flash ROM to system RAM and manually launch them ■ Restart every tasks without manually set up even if user press reset button ■ Make terminal more reliable and recoverable, because even terminal hangs or work in uncertain status, driver can warm reset the terminal to go back normal work state without disturb service engineer.

No.	Features	Benefits for Customer
4.	GPRS/GSM auto switch i.e. Switch to voice mode and answer the phone call when there's incoming call arrives. If GPRS is still connecting, after the phone call, the GPRS connection will be restored.	■ Customer can use voice call to contact driver while application connect to backend server through GPRS connection ■ Backend server can call in without ring, and then send back any voice inside the car without driver's notice.
5.	Auto set brightness level according to the different time periods	■ Do not bother driver to change the brightness under different sun shine condition like daylight, evening. ■ Save power supply. ■ Extend LCD lifespan.
6.	Restart terminal from application	■ Application wants to restart terminal if it cannot decode the server IP from DNS server by VB Winsock ActiveX component.

Table 2 Software Features Table

CHAPTER 4

HOW-TO RESOURCES

4.1 Power On the Device

4.1.1 Turn on Waveon738

After the power connection has been completed, switch on the unit. To enter power save mode, press the Power Button on the front panel of the unit and can be resumed by clicking the same button again. Both LCD screen and the backlight will be off (Note that the MT is still alive). Switch off the device only if not in use.

4.1.2 Debug Port

W738 can use any one of the COM ports 5,6,8,9,0 for debug message output. These COM ports are through 26 pin connector in the cradle board. The pin assignment for the 26 pin connector is given in **APPENDIX E**. The debug cable connection is shown in **APPENDIX F**. The port settings required at the host PC side are

Bits per Second = 115200

Data Bits = 8

Parity = None

Stop Bits = 1

Flow Control = None

The command used to output the debug string is

```
WriteDebugString(int portNo,char *str);
```

```
Eg; WriteDebugString(5,"Testing...\r\n");
```

This command outputs the string "Testing..." to the COM port 5.

4.2 Run GPS Applications

4.2.1 GPS Reset

When the MT is turned on, the GPS Receiver is reset using an active low signal (Reset_N) on the Reset Pin of the GPS module for a minimum of 1 µs. This signal is also being used in Push-to-Fix Mode for waking up the MT and requested a position fix.

Port Setting

GPS uses COM port 7 and the GPS device works at the baud rate of 9600 bps.

4.2.2 Using GPS Application

1) Ensure that you have the GPS antenna plugged in as and placed the antenna in **line of sight with the satellites**.

2) Double click on **CEGPS** 

icon on the WinCE desktop or double click on **My Computer** -> **Windows** -> **CEGPS** Icon.

3) The **GPS Application Window** will pop up as shown below:

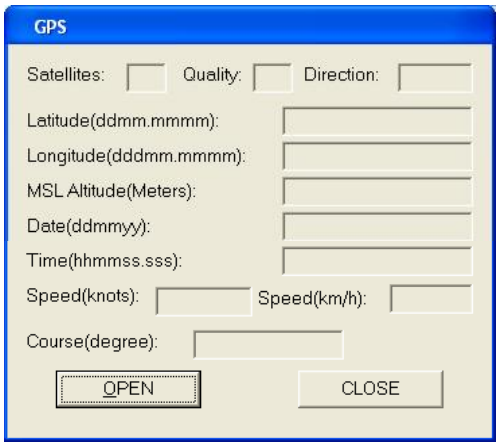


Figure 23 GPS Window

4) Click on **Open GPS** button. **GPS NMEA Protocol** appears within the **Current GPS use** text box and relevant GPS information such as the date, time, latitude, longitude, speed,

satellites etc will appear in each field box. To verify the validity of the GPS data, you can compare the date or time against the current UTC time or date

5) Click on **Close GPS** button when done.

4.3 Connect to the Internet via General Packet Radio Service (GPRS) Network

4.3.1 Port Setting

GPRS in W738 uses COM port 1 and 3.COM port 1 is full functional UART and can be used for voice calls, CSD calls, fax calls and GPRS services and for controlling the GSM engine with AT commands.COM 3 is 4-wire serial interface which includes only the data lines /TXD1 and /RXD1 plus /RTS1 and /CTS1 for hardware handshake. This port can be used for indication of incoming calls while in GPRS session.

4.3.2 Install SIM Card

To install SIM card follow procedures described in section 2.2.2

After the SIM card has being inserted, you must reboot the system for its initialization.

4.3.3 Reset GPRS

GPRS engine can be reset using the application ResetGPRS.exe. To reset the GPRS engine run ResetGPRS.exe in the windows folder

Tips: Use AT Commands to check SIM Card *(PROGRAMMING SECTION)*

You can do the following to check the GSM network,

1) At WinCE Start Menu, select Run.

2) Enter 'TTY 1' in the edit box and click on OK. The TTY Terminal will then be launched. If you are not able to see the signal, set your baud rate to the optimized rate: 115200 bps.

3) Enter 'AT'. You will get OK response. Key in AT^SCID next. The GPRS modem will respond the ^SCID: nnnnnnnnnnnnn where n stands for the SIM card number.

4) Should your SIM card installed wrongly, the modem will respond with '+CME ERROR:' instead.

5) Alternatively you can check for your network operator using the 'AT+COPS?' command.

The AT commands spelt out in the steps mentioned could be found in Siemens MC55 AT command manual.

4.3.4 Create GPRS Dialup Connection

To setup the RAS connection for your Internet Service Provider: e.g. Singnet, the steps are as:

1) Select Start -> Settings -> Network and Dial-up Connections

2) Double click on Make New Connection Icon. The Make New Dial up Connection window will be popped up.

3) Enter your connection name as for e.g. My Singnet Connection. Then select Dial-up connection for your connection type. Once done, click on Next.

4) Select GPRS modem installed on COM 1. Then click on the Configure Option. 'Device Properties' window will be popped up. At the Port Settings Tab, set your baud rate, data bits, stop bits, etc to your preferences.

5) Click on Call Options Tab next. You will see that you have the option to include extra initialization commands. Enter **\Q3+CGDCONT=1,"IP","Internet"**, where Internet is the APN (access point name). This string setting is provided from your GPRS service provider. The AT Command \Q3 is used to enable hardware handshake control (RTS/CTS). Refer to **Appendix B** for the rest of GPRS APN Settings.

6) Next select TCP/IP Settings Tab. Under the Name Servers, Enter your server name if your GPRS Service Provider requested for it (Additional command AT^SGAUTH=1 for PAP

authentication is required for some TELCO GPRS servers. So the extra command string shall be: **\Q3+CGDCONT=1,"IP","Internet"; ^SGAUTH=1**

7) **Click on Next for the Telephone Number Input.** Enter ***99***1#** in the telephone number field. Click OK.

8) Run the application SaveReg.exe. It will save the new system registry to the **DiskOnChip**. Cold- Reboot the system for the new configuration to take place.

9) On the system, Double click on Start -> Settings -> Network and Dial-up Connections -> 'My Singnet Connection' to connect to GPRS provider's IP server. You can use the application: ping command to ping for the IP address.

10) Enter your user name and password. Click on Connect Button to dial up to the network. If the connection fails, click on the dialing properties and choose the appropriate local area or country code.

Tips: GPRS Connection by User Application *(PROGRAMMING SECTION)*

The steps are as depicted below:

1) After the system boots, GPRS engine will be launched automatically.

2) The engine will then read the GMT time and set the MT system time accordingly. GSM module time will also be set to this timing with AT command '**AT+CCLK=….** '.

3) If the software application cannot retrieve the GMT time after the GPRS connection, it can still retrieve the server time from the remote server. Then the system GMT time is set accordingly.

4) The time zone is set with this API:

```
BOOL SetTimeZone Information
( const TIME_ZONE_INFORMATION *lpTimeZoneInformation );
```

5) If the SIM card is being inserted, the software will start to read its number with the AT command:

```
#define CMD_MODEM_GET_SIM_CARD_ID        "AT^SCID\r\n"
```

6) Inside the software loop, the Network Operator ID as well as Network Signal Strength are also retrieved with the following AT commands:

```
#define CMD_MODEM_GET_NETWORK_OPERATOR     "AT+COPS?\r\n"
```

```
#define CMD_MODEM_GET_SIGNAL_QUALITY       "AT+CSQ\r\n"
```

7) Once they are captured, the modem will determine if the signal quality is acceptable and network operator ID is valid, then the application breaks the loop and uses RAS to dial up the remote server in the Internet.

8) Now the GPRS communication is up.

4.4 Use DOC Applications

4.4.1 DOC Introduction

In the beginning, we have highlighted that W738 has an On-Board Flash ROM of 32 MB and 64 MB SDRAM. For the ROM itself, it has an integrated Flash disk (DiskOnChip) called "DOC" (32 MB), which enhanced the development of the applications. However, the DOC can't be used for limitless write times and its speed is slightly slower (1.4 MB/s for reading & 600 KB/s for writing) than RAM. DOC can be used to store applications.

4.4.2 Formatting DOC

1. Goto Start ->ControlPanel->Storage Properties .
2. Then select "Disk on chip" in the store info combo box.
3. Then click Format to format the DOC. Once formatted, all data will be lost as well as the Registry Backup Data. Users have to restart for the settings to take effect.

4.4.3 Save Changed Registry Settings

You may realize that after you have adjusted the window settings and does a reboot. The settings had changed back to the default which is not what you have wanted. This is because the configuration of the window settings is stored in the On-Board Flash ROM, unlike in the desktop PC where the settings (e.g. time, sound etc) are stored permanently in the hard disk itself. Whenever W738 is booted, all the programs will be mapped from the ROM to the SDRAM. To save the altered settings, follow the procedures stated below. To create

additional folder, you are required to insert the Autoexec.bat file with the command line: mkdir.

1) Change your settings.

2) Then click on Start -> Window Explorer. Inside the folder, run the program **SaveReg.exe**.

3) Wait until the windows Save Registry success pops up. Click Ok in the popped up window. This will save your changes into the DOC.

4) So the next time you reboot your system the new registry settings will automatically take effect.

4.4.4 Edit Autoexec.bat *(PROGRAMMING SECTION)*

Inside the DOC Folder, there is a sub folder: **DoNotDelete.** In this DoNotDelete folder, you can add the Autoexec.bat file. Take note that you are required to uncheck the hidden file extension for the file to show the .bat extension. Follow the steps below:

1)Double click on the DOC Folder, then double click on **DoNotDelete** Folder.

2) Rename the file name Autoexec.bat to Autoexec.txt.

3) Edit the Autoexec.txt file. For example, you can create additional folder or avoid booting of some unwanted applications as follows:

```
@echo Run Autoexe.bat now, please wait...
copy  \DOC\Need2Copy\*.*   \Windows
copy  \IDOC\Need2Copy\*.lnk   \Windows\Desktop
```

4) Rename the Autoexec.txt to Autoexec.bat.

Now each time the system in Cold booted autoexec.bat file will run.

4.5 Use Button Applications

4.5.1Reset Button

Software Reset

Situated at the right side of W738, is the Reset Button. (Figure 2).Its function caters to the WinCE Software Reset. Reachable from the side with a touch pen point, simply press for the reset to occur.

Hardware Reset

For the system to go into Cold reboot, the SYSTEM ON/OFF Button has to be pressed to OFF and then to ON. (The Power ON/OFF Button is at the left side of the Unit). (Figure 2)

4.5.2 Buttons Functions at Application Level

W738 has five Operation Button Functions seated at the front display, four of which are user customized (Buttons 1 to 4). The middle button is the Power ON/OFF.W738 also has 2 emergency buttons. The button functions for these buttons can be customized as:

1) Page Up or Page down (all 4 directions)
2) Brightness Control
3) Volume Setting
4) Keyboard Launch
5) Dial up application etc

4.5.3 Configure Buttons *(PROGRAMMING SECTION)*

The buttons can configured as your own application launchers or otherwise. The procedures are as follow:

1) Double click on the **ButtonConfig.exe** on My Computer/windows folder and a window will pop up as shown.

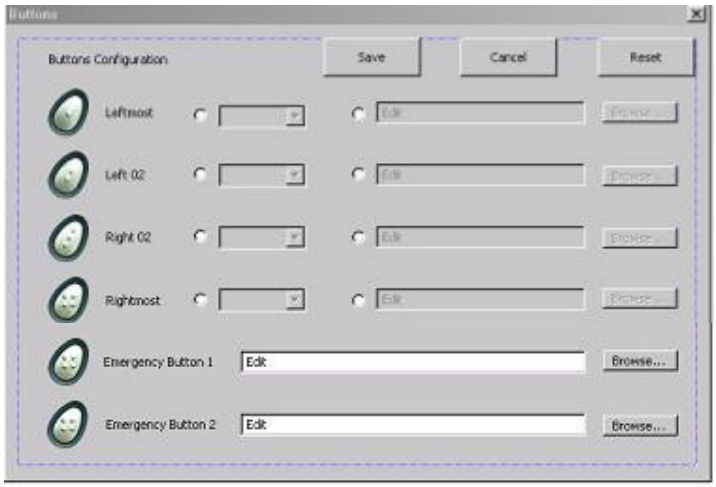


Figure 24 Button Configuration Window

2) To use the buttons as **arrow keys**, click on the button within **Use as a key** panel. In the drag down box options, select either←,↑,→,↓.

3) Alternatively, you can use the buttons on W738 to start an application. Click on Browse button for Leftmost button (Button 1 of W738) and select **waveontest.exe** for example.

4) Click on OK. Then a message box "Do you want to restart to take effect now?" will pop up. Select OK.

5) Repeat step 2 or 3 for the rest of W738 Functional Buttons. There are 5 Functional Buttons on the front panel and 2 emergency buttons however the **middle button in** the front panel is not configurable. It is **ON/OFF Display**.

6) Close the window if you are finished with your configuration.

4.6 Configure the Audio Sound

The terminal has a **Built-In Mono Speaker** for audio output and for GSM Phone. Inclusion, there is also a Microphone that can pick up signal within 2m radius range. The volume setting can be adjusted in the WinCE Control Panel. Once done, you have to save the configuration to the DOC mentioned in Section 3.4.3. The sections below highlighted the use of WinCE APIs behind the usage of sound device for our applications.

4.6.1 Configure Sound Driver *(PROGRAMMING SECTION)*

Firstly you determine what drivers are available for audio I/O on the device, and then open those drivers for recording or playback mentioned below. Then close the operation when ended. However if the device is still playing a waveform-audio file, the close operation will fail. Hence you have to use the **waveOutReset** function to terminate the playback before calling **waveOutClose**.

First, retrieve the number of waveform output devices present in the system.

1) Then check out their capabilities as follows:

```
MMRESULT waveOutGetDevCaps ( UINT uDeviceID,
LPWAVEOUTCAPS pwoc,
UINT cbwoc );
```

2) Open the specified waveform audio output device which you want. See below:

```
MMRESULT waveOutOpen ( LPHWAVEOUT phwo,
UINT uDeviceID,
LPWAVEFORMATEX pwfx,
DWORD dwCallback,
DWORD dwInstance,
DWORD fdwOpen );
```

3) Prepare the waveform data block for playback with the API:

```
MMRESULT waveOutPrepareHeader ( HWAVEOUT hwo,
LPWAVEHDR pwh,
```

```
UINT cbwh );
```

4) After opening output device driver successfully and preparing the header file, sound can be played by using this function for sending data blocks to the audio device:

```
MMRESULT waveOutWrite ( HWAVEOUT hwo,
LPWAVEHDR pwh,
UINT cbwh );
```

5) After the device driver is finished with a data block, free the data buffer using:

```
MMRESULT waveOutUnprepareHeader ( HWAVEOUT hwo,
LPWAVEHDR pwh,
UINT cbwh );
```

6) Lastly, close the audio device file with this API:

```
MMRESULT waveOutClose ( HWAVEOUT hwo );
```

4.6.2 Change the Audio Volume, Pitch or Playback Rate *(PROGRAMMING SECTION)*

The volume can be adjusted with these following APIs:

1) Set the volume output with:

```
MMRESULT waveOutSetVolume ( HWAVEOUT hwo, DWORD dwVolume );
```

2) Restart the waveform audio device for your changed volume settings:

```
MMRESULT waveOutRestart ( HWAVEOUT hwo );
```

The audio I/O devices can be used to adjust the pitch and playback rate of waveform audio data. To determine if your device supports either of these capabilities, query your device using waveOutGetDevCaps function. Then change the settings using the functions stated below:

1) Setting waveform pitch:

```
MMRESULT waveOutSetPitch ( HWAVEOUT hwo, DWORD dwPitch );
```

2) Setting the playback rate:

```
MMRESULT waveOutSetPlaybackRate ( HWAVEOUT hwo, DWORD dwRate );
```

4.6.3 Play Audio Files

Most audio files use the .wav file name extension. To play such file, you can use this API: **PlaySound**. This function plays the default system sound if a specified file does not exist. However if the default system is not defined too, PlaySound will fail to work.

PlaySound (TEXT("\\SOUNDS\\BELLS.WAV"), NULL, SND_SYNC);

Tips: System Sounds

The message boxes often or not pop up showing warnings or errors etc, whilst you will also hear the system producing message sound. This is implemented by the following API:

```
BOOL MessageBeep ( UINT uType );
```

You can disable the warning though in our application from the WinCE Control Panel.

4.6.4 Recording Using MicroPhone

To record simple audio sounds in W738, W738 has a simple recording utility called recorder.exe in DOC folder.By default this application captures the sound for 5 seconds in a wavefile wavrec.wav at a samplaing rate of 11.025Khz and 16 bit samples.

The default options can be changed by passing suitable arguments in the command line.

/DOC/recorder –f <filename> –t <time> -r <samplerate>

To record streaming audio Windows CE audio API should be used. Refer to MSDN

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnnetcomp/html/WaveInOut.asp

4.7 I/O Control

4.7.1 Device I/O Controls *(PROGRAMMING SECTION)*

To specify the type of operations to be performed by each and individual General Purpose Input/Output (GPIO), you can use these Device I/O functions as stated in the table below. These functions are implemented in the DLL file: "Waveon738IO.dll"

Function Prototype	Return Values	Parameter
extern "C" UINT APIENTRY SetOutputPort ( )	0: failure 1: success	long nPortNumber: 1,2,3,4
extern "C" UINT APIENTRY ResetOutportPort ( )	0: failure 1: success	long nPortNumber: 1,2,3,4
extern "C" UINT APIENTRY GetInputPortState ( )	1: high 0: low	long nPortNumber: 1: Input pin 1 2: Input pin 2 3: Input pin 3 4: Input pin 4
extern "C" UINT APIENTRY GetLcdBrightnessLevel ( )	0: Failure 1: Dim … 5: Brightest	dummy long integer value
extern "C" UINT APIENTRY SetLCDBrightnessLevel ( )	0: Failure 1: Success	long nLevel 1 - Dim … 5 - Brightest
extern "C" UINT APIENTRY WarmResetTerminal ( )	0: Failure 1: Success	dummy long integer value

Table 3 I/O Control Function Prototypes

4.7.2 Connect Input Ports & Output Ports to External Device

Connect Input Port to an External Device

To connect your external device to your W738 Input Ports, you can follow the example as illustrated below:

The diagram (See below) illustrates a possible connection to tap the ON/OFF status of an external device (in the following example the taximeter rooftop light). The taximeter normally has a control pin to drive an external +12V Relay (as shown below) or the rooftop light directly.

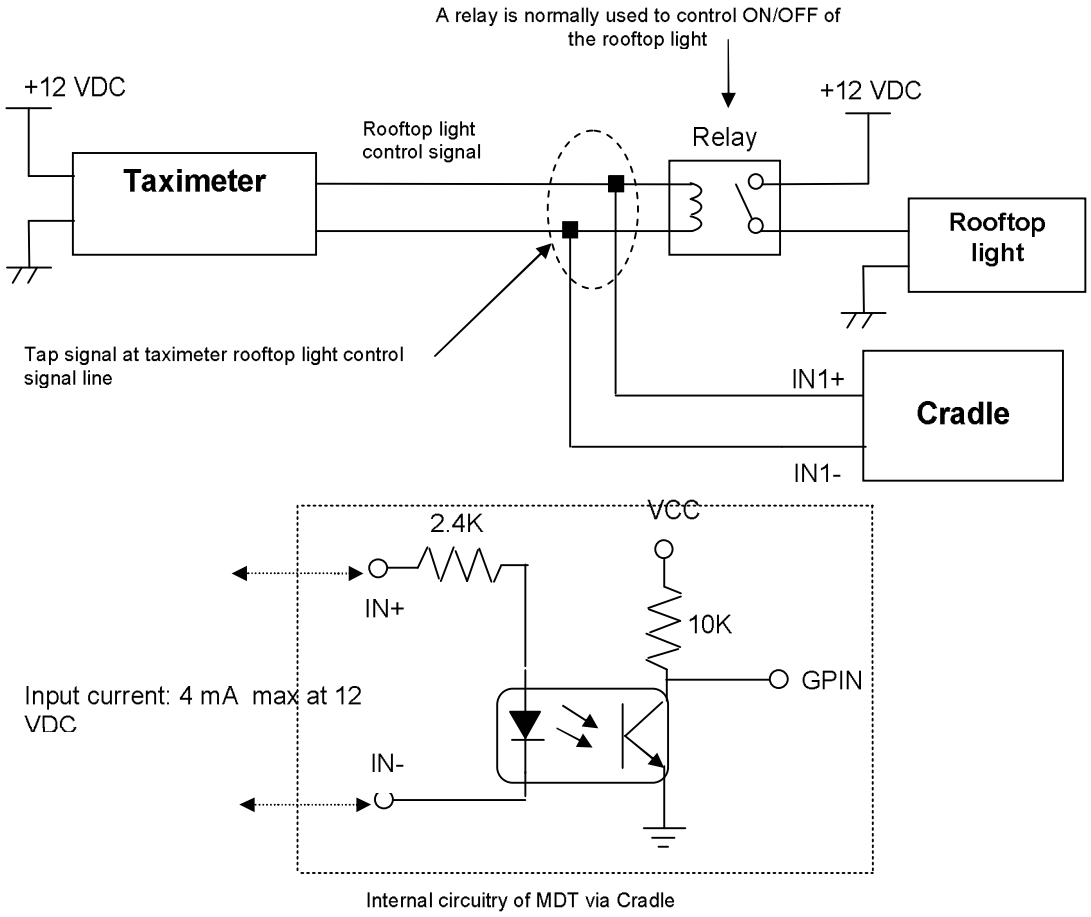


Figure 25 Input Port Connection Diagram

Connect the Output Port to an External Device

In addition to the configuration of the Input Ports, you can configure your output ports to control the external device as mentioned in the example below:

The following diagram shows a typical connection to control the triggering of an external device. The OUT+ is connected to +12 VDC, and the OUT- is driven by software to **Open/Close** the circuit current loop. It is recommended to have an **external relay** to (as shown below) to control the external device.

Figure 26 Output Port Connection Diagram

4.7.3 Configure LCD Brightness thru Button Function

To adjust the LCD brightness on your screen, you can double click on My Computer -> Windows Folder -> **WaveonBright.exe** application or alternatively use the button on your W738 to 'fire' out the LCD brightness control as mentioned in Section 3.5.3 --Configure Buttons. After the configuration, whenever you pressed the configured button, the current LCD brightness value will be read thru the I/O Port and increment to another higher value (higher brightness). If the max brightness (5) is read, the next value will revert to a lower brightness of 1 and so on.

4.8 USB Device

W738 supports both USB host and USB client. USB Client is used for ActiveSync Application. USB host port can support USB HID device and USB Storage device.

4.9 Port the Software Applications *(PROGRAMMING SECTION)*

W738 uses the **RS-232-C standard** to exchange data with serial devices and other PC by way of a serial connection. When a serial connection is established between two devices, our software designates one device as the DCE and the other device as the DTE. Refer to **Appendix C** for the COM Ports configuration. You can write an application initialization file for your COM Port as follows:

Config.ini:

```
Printer = Com 8;
MSR    =Com 2;
GPS    = Com 6;
```

So you can just simply change the COM Port name to test your applications on any MT.

4.10 Calibrate Touch Screen

If the LCD Touch Screen doesn't respond properly to your tap, you can do the following:

1. Select Start -> Settings ->Control Panel.
2. Double click on Stylus Icon.
3. 'Stylus Properties' window will be popped up. There are two submenus which you can select: **Double Tap** & **Calibration**.
4. Double Tap option allows you to select your double tap sensitivity settings. After which you can do a test on the adjustment. There's no right click option here.
5. If the MT is not responding properly to the tap, select Calibration menu and click on '**Recalibrate'** to recalibrate the screen.
6. Save your settings to DOC at the end (in Section 3.4.3).

4.11 Connect to the LAN

To connect the wired or wireless LAN between your MT and other PCs, follow the steps as mentioned:

1) If you use wired LAN PC card, connect the cable from your office LAN to a mini hub. Then from the hub to your desktop PC Ethernet point (Now you can see the Local Area Connection Icon activated in WinCE system tray. If not, double check the connection and your Ethernet card again).

2) Then insert the LAN Card into the right slot of Waveon738 until it is clicked.

3) Connect another cable from the MT LAN point to the hub.

4) Once done, go to the control panel in WinCE; double click on the **Network and Dial up connections Icon.** Select 'NE20001:NE2000 Compatible Ethernet Driver' for NE2000 compatible Ethernet CF Card or any other Ethernet PC card device driver for WinCE 4.2.

5) Lastly, click on properties, specify your IP address and Subnet Mask ID. Under the Name Severs, enter your **DNS resolvers**.

6) Double click on the IE explorer to hook up to the Internet.

4.12 Communicate between Applications

ActiveSync provides the Mobile Devices Folder in WinCE Explorer on your W738. This folder provides a view of the files and folders on the W738 device. So you can move, copy, and transfer files between your device and PC by dragging them to and from this folder. In addition, the application manager enables you to add or remove programs from the device. Lastly ActiveSync can also be used to debug software application on the PC and test run on the terminal itself.

4.12.1 Connect ActiveSync Cable

From the W738 terminal USB client port connect USB mini-B to A cable with the mini-B end connecting to the W738 and A end to the host PC.

The configuration steps are as follows:

1) First, install Microsoft ActiveSync 3.7.1 in your Desktop PC. Select any available USB Host port as your ActiveSync Port on PC.

2) On the desktop computer, click **Start**, point to **Programs**, and then click **Microsoft ActiveSync**.

3) On the **File** menu, click **Connection Settings**.

4) Make sure that the **Allow USB connection with this desktop computer** check box is selected, and then click **OK**.

5) Connect USB mini-B cable to W738 first.

6) Then Connect USB – A end to the PC. As soon as it is connected active sync connection should be established.

7) If the connection fails, click **Connect to PC** icon on the W738 desktop for connection.

8) To debug the software applications, Choose **Waveon738** for your active WCE configuration and **Win32(WCE ARM) Debug** for Select Active Configuration in the Microsoft

embedded Visual C++ Program. Once the program is being built, ActiveSync will start downloading the executable files to the mobile terminal.

9) Below illustrated a typical example of the Mobile Device Folder in your PC end.

Figure 27 Mobile Device Folder

4.13 Microsoft Speech API:

The Microsoft® Speech SDK 5.0 is the developer kit for the Microsoft® Windows environment. Tools, information, and applications are provided to help you integrate and optimize your speech recognition and speech synthesis engines with the new Microsoft Speech API 5.0 (SAPI 5.0). The SAPI 5.0 API dramatically reduces the code overhead required for an application to use speech recognition and synthesis, making speech more useable for more applications by more developers. For documentation of Microsoft speech API, refer to

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/wcesapi/html/ceconSAPIReference.asp

4.14 Software-Based Input Panel

W738 has a software-based input panel that functions through a touch screen. This software-based input panel architecture is an IM that enables your application to accommodate input in multiple forms. The Windows CE IM requires two parts: the software-based input panel subsystem and the IMs. The primary difference between Windows CE IMs and usual keyboard input is that an additional level of interpretation is necessary in Windows CE to convert non-keyboard input into a keyboard event. This conversion is handled by the software-based input panel subsystem in the OS, which also manages software input methods.

This Soft keyboard can be invoked by clicking the red pen icon in the system tray, near the time display in the task bar, and selecting the **'LargeKB'**. The soft keyboard can be hidden by clicking the red icon again and selecting **'Hide Input panel'**.

4.15 Memory Allocation

By default 30MB of RAM is allocated for DATA and 30 MB of RAM for program memory. It can be changed using control panel if necessary following the steps below:

1. Goto ControlPanel->System
2. Goto Memory Tab.
3. Slide the sliding bar accordingly to how you may want to allocate memory for data and program
4. Save the settings using savereg.exe so that the registry settings are stored

4.16 Microsoft Battery Status Information

This function retrieves battery status information, such as ACLineStatus, BatteryLifePercent, BatteryLifeTime etc. This information can be used for power monitoring, e.g. detecting whether external battery is connecting, battery voltage etc.

DWORD GetSystemPowerStatusEx2(
PSYSTEM_POWER_STATUS_EX2 *pSystemPowerStatusEx2*,
DWORD *dwLen*,
BOOL *fUpdate*
);

Parameters

pSystemPowerStatusEx2

[out] Pointer to a buffer that receives power status information.

dwLen

[in] Specifies the length of the buffer pointed to by *pSystemPowerStatusEx2*.

fUpdate

[in] Specify TRUE to get the latest information from the device driver. Specify FALSE to get cached information that may be out-of-date by several seconds.

Return Values

Length of the data returned in the *pSystemPowerStatusEx2* buffer indicates success. Zero indicates failure.

For documentation of SYSTEM_POWER_STATUS_EX2, refer to

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/wceui40/html/cerefsystem_power_status_ex2.asp

CHAPTER 5

APPLICATIONS

A wide range of corporate and consumer applications are enabled by the features of this W738 product. This section introduces some of the default applications by W738:

1) Web browsing. It has never been an enduring application for the mobile users due to the long time taken to download the data. But with Built-in GPRS module, W738 is suited for such application.

2) Mobile track and trace. Using Global Positioning System (GPS), anyone in a vehicle is able to receive its satellite position and thereby know where they are. Such application can be used for ad-hoc stolen vehicle tracking and fleet management as well.

3) Job Dispatch. Combined with vehicle positioning applications such that the nearest available suited personnel can be deployed to serve a customer. E.g. Taxi management system.

4) LAN Access. Users can connect W738 to the office LAN and thereby accessing, transferring information and browsing the Net.

CHAPTER 6

FAQ

6.1 How to Reduce Application Size while Update Application over Air?

If you have large file size and wish to reduce their size so as to reduce cost and time to download them to your MT, you may follow our recommended approaches as mentioned below:

1) Build the application in release version.

2) Separate the functions to different dynamic link libraries (dlls), then download some of the upgraded dlls instead of whole application exe files from server end.

3) Put resources (bitmaps, icons, constant strings) to resource dll.

4) Use Photoshop (Menu Image -> Mode -> Indexed color) to create index color bitmap to reduce the bitmap size to 8 bits indexed color bitmap without affecting the bitmap outlook.

6.2 How to Debug your Applications

There are a few modes of debugging as listed below:

1) To help locating bugs or errors in the codes in .c files etc, you can use the embedded Visual C++ debugger. You can check the source codes line by line or from the first sentence to the middle of source codes using the following commands:

Step into;

Run to cursor;

Go

2) You can also debug the application running on your MT after testing the application in emulation. First you have to build a debug version of your application and download it to your MT connected to your PC. The debugging commands are still the same. A point to note is when you build the application on the MT, it builds all binaries on the desktop PC and then downloads them to the device.

3) The second method will be using the PC Hyper Terminal. On your platform (desktop PC) that supports the Console, its debug version can create a console window with a rudimentary monitor prompt that allows you to peep inside the running application on the mobile terminal. For enabling the Console mode, the **debug com port** needs to be connected from the MT to PC. You can also send the debug message though the debug com port example:

```
#include <DbgAPI.h>
…
#define IS_DEBUG  1
RETAILMSG(IS_DEBUG, (_T("TEST")));
```

4) The last method is to use the log file that resides in the file directory of W728 to log and view your debug message. In your application program, you can use the **`CreateFile` & `WriteFile` API** to create your own debug messages. I.e. after you compiled the application program, the debug message will then be written into the log file.

6.3 How to make my application to run at startup?

You can have any program to run at startup by creating an autoexec.bat to run the program. For e.g,

To run a program xx.exe which is in windows folder, have the autoexec.bat file as

/windows/xx.exe

Put the autoexec.bat file in the folder /DOC/DoNotDelete

Else, the registry key can be used to launch the application at startup. In the key HKEY_LOCAL_MACHINE\Init are the entries containing executables that will be run when the device is booted.For instance it can be assigned as follows,

Launch 10 - Shell.exe
Launch20 - device.exe
Launch 30 - gwes.exe
Depend 30- 14 00

In this case, executabes will be run in the following order shell,device and gwes.The hex value DependXX represents the XX launch number to wait for.

6.4 Is there a program on W738 to edit registry?

Yes, there is a program called PRegEdit to edit the registry in W738.Goto Windows Folder and click PRegedit.exe to invoke the registry editor. Alternatively you can use the remote registry editor in EVC++ also.

6.5 Is it possible to run applications directly from the storage card?

Users can start the application from the Storage card after the system is ready. During the system startup, the PCMCIA slot driver will take some time to initialize the hardware and find the storage card; so users will need to wait some time before they can start the application from the storage card. If you were to start the application from the RAM, it will be much faster than if it starts from the Storage card, however this option will occupy some RAM space

GLOSSARY, ABBREVIATIONS, TERMS

Acronym	Definition
APG	Application Programming Guide
API	Application Programming Interface
ATM	Asynchronous Transfer Mode
APN	Access Point Name
BPS	Bits per second
CPU	Central Processing Unit
COM	Communication
DCE	Data Communication Equipment
DOC	Disk On Chip
DTE	Data Terminal Equipment
DLL	Dynamic Link Library
DNS	Domain Name Server
GPIO	General Purpose Input/Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for mobile communication
GUI	Graphic User Interface
Handler	Reference to the created or open file
IP	Internet Protocol
IE	Internet explorer
I/O	Input/Output
JB	Junction Box
LAN	Local Area Network
MMS	Multi Media Service
ME	Mobile Equipment
MIC	Microphone
OEM	Original Equipment Manufacturer
OS	Operating System
PC	Personal Computer
PDA	Personal Digital Assistant
RAS	Remote Access Service
SDK	Software Development Kit
SIM	Subscriber Identity Module
SMS	Short Message Service
TTS	Text to Speech
WINS	Windows Internet Name Service
WWW	World Wide Web

END OF DOCUMENT

InfoWave
...the next Wave

APPENDIXES

APPENDIX A TECHNICAL SPECIFICATIONS

Physical Specification	■ Dimension: 210mm x 140mm x 40mm ■ Weight: to be defined ■ Casing: Industrial Plastic, UV protection ■ Flammability:UL94-V0
Microprocessor	■ Intel X-Scale PXA255 400MHz RISC processor
Operating System	■ Windows CE .NET 4.2
Memory	■ 32MB Flash ROM ■ 64MB SDRAM ■ 16 or 32MB Disk-on-Chip
Power Consumption	■ Input Voltage: 9 -28 Vdc ,12Vdc nominal ■ Current Consumption: 2A Max
Function Buttons	■ 4 x programmable function buttons ■ 1 x Power On/Off button ■ 1 x Reset button on the side of device
Display Panel	■ 7" TFT color LCD Display ■ 800 x 480 resolution, 16-bit color ■ Resistive 4-wire touch-panel, anti-glare film
Audio	■ Built-in Speaker and Microphone ■ Built-in Mobile phone ear piece jack for hands free operation
Modem	■ Built-in GSM/GPRS module ■ GPRS class 10 Triband 900/1800/1900MHz GPRS Class B module ■ Supports both voice and data communication
GPS	■ 12 channel GPS receiver module ■ Accuracy - 15m (CEP) ■ Hot/Warm/Cold start time - 8/30/45 sec ■ Supports NMEA-0183 protocol
Communication and Interface Ports	■ 2 x CF Slot (1 Internal) ■ 1 x Full handshake RS232 port ■ 5 x RS232 ports with TXD, RXD, GND ■ 4 x Digital Input ports ■ 4 x Digital Output ports ■ 2 x USB Host ■ 1 x USB Client
Standard Software	■ Pocket Internet Explorer ■ Software Development Kit (SDK)

Operating Temperature	■ -20 degree Celsius to 55 degree Celsius ■ -20 degree Celsius to 70 degree Celsius (w/o GPRS/GSM module)
Storage Temperature	■ -30 degree Celsius to 70 degree Celsius
Relative Humidity	■ 5%-95%RH
Vibration	■ MIL-STD-810F Basic Land Transportation
EMC	■ CE, FCC Part 15C, VCA

APPENDIX B GPRS APN SETTINGS

PROVIDERS	APN	USERNAME	PASSWORD	DNS 1	DNS 2
Airtel Vodafone (Spain)	airtelnet.es	vodafone	vodafone	193.149.2.5	193.149.2.13
AIS (Thailand)	Internet	(*)	(*)	202.183.255.20	202.183.255.21
Amena (Spain)	Amenawap	CLIENTE	AMENA	213.143.33.8	213.143.32.20
Aria (Turkey)	Internet	(*)	(*)	212.156.4.4	212.156.4.20
AT&T (USA)	Proxy	(*)	(*)		
Aycell (Turkey)	Aycell	(*)	(*)	212.156.4.4	212.156.4.20
Beeline (Russia)	wap.beeline.ru	Beeline	beeline	194.190.195.066	194.190.192.034
Bite (Lithuania)	banga	(*)	(*)	213.226.131.131	193.219.32.13
Blu Contratto (Italy)	INTERNET	(*)	(*)	212.17.192.49	212.17.192.209
Blu Prepagata (Italy)	PINTERNET	(*)	(*)	212.17.192.49	212.17.192.209
Bouygues Telecom (France)	www.ebouygtel.com	(*)	(*)	62.201.129.99	
BPL (India)	bplgprs.com	bplmobile	(**)	202.169.145.34	202.169.129.40
Cellis FTML (Lebannon)	internet.ftml.com.lb	(**)	(**)		
Cesky Mobil (postpaid) (Czech Rep.)	internet	(*)	(*)	212.67.64.2	
Cesky Mobil (prepaid) (Czech Rep.)	ointernet	(*)	(*)	212.67.64.2	
China Mobile (China)	cmnet	(*)	(*)		
China Unicom (China)	none	(*)	(*)	10.0.2.100	
Chunghwa (Taiwan)	wappie	(*)	(*)	168.95.192.1	
Cingular (USA)	isp.cingular	(***)	(***)	66.209.10.201	66.209.10.202
CM Prepay (Czech Rep.)	cinternet	*)	(*)	212.67.64.2	
Connect (Austria)	web.one.at	(***)	(***)	194.024.128.100	194.024.128.102

Cosmote (Greece)	internet	(*)	(*)	195.167.65.194	
CSL (Hong-Kong)	internet	(*)	(*)	202.84.255.1	203.116.254.150
D1 (T-mobile) (Germany)	internet.t-d1.de	(*)	t-d1	193.254.160.1	
DIGI (Malaysia)	diginet	(*)	(*)	203.92.128.131	203.92.128.132
Digicel (Jamaica)	web.digiceljamaica.com	wapuser	wap03jam		
Dna (Finland)	internet	(*)	(*)	217.78.192.78	217.78.192.22
DTAC (Thailand)	www.dtac.co.th	(*)	(*)	203.155.33.1	203.44.144.33
EMT (Estonia)	internet.emt.ee	(*)	(*)	217.71.33.200	217.71.32.20
Entel PCS (Chile)	imovil.entelpcs.cl	entelpcs	entelpcs		
E-Plus (Germany)	internet.eplus.de	eplus	Gprs	212.23.97.2	212.23.97.3
ERA (Poland)	erainternet	erainternet	erainternet	213.158.194.1	
Etisalat (UAE)	mnet	Mnet	Mnet	194.170.1.6	194.170.1.7
Europolitan (Sweden)	none	(*)	(*)	192.165.99.231	192.165.99.232
EuroTel (Czech Rep.)	internet	(*)	(*)	160.218.10.201	194.228.2.1
EuroTel (Slovakia)	internet	(*)	(*)	194.154.230.64	194.154.230.74
Fido (Canada)	internet.fido.ca	(*)	(*)	204.92.15.211	
France Telecom (France)	orange.fr.mnc001.mcc208.gprs	gprs	(***)		
Globe Telecom (Philippines)	www.globe.com.ph	globe	Globe	203.127.225.10	203.127.225.11
Globtel (Slovakia)	internet	(*)	(*)	213.151.200.3	195.12.140.130
Hinet (Taiwan)	internet	(***)	(***)		
HTmobile (Croatia)	www.htgprs.hr	(*)	(*)	10.12.0.1	
Idea (Poland)	www.idea.pl	idea	Idea	194.204.159.1	194.9.223.79
IM3 (Indonesia)	www.imdosat-m3.net	gprs	im3		
Islandssími (Island)	gprs.islandssimi.is	(***)	(***)	213.176.128.51	213.176.128.50
Jersey Telecom (UK)	pepper	(**)	(**)	212.9.0.135	212.9.0.136
KGT Online (Taiwan)	internet	(***)	(***)		
KPN Mobile (Netherlands)	internet	KPN	Gprs	62.133.126.29	62.133.126.29

LibanCell (Lebanon)	isurf.libancell.com.lb	(***)	(***)		
LUXGSM (Luxembourg)	web.pt.lu	(*)	(*)	194.154.192.101	194.154.192.102
M1 (Singapore)	mobilenet	(*)	(*)	202.79.64.21	202.79.64.26
Max (Business) (Austria)	Business.gprsinternet	(*)	(*)	213.162.64.1	213.162.64.2
Max (Metro) (Austria)	gprsmetro	(***)	(***)	213.162.64.1	213.162.64.2
Maxis (Malaysia)	internet.gprs.maxis	(*)	(*)	202.75.129.101	10.216.4.21
Max Mobil (Austria)	gprsinternet	GPRS	(**)	213.162.64.1	213.162.64.2
Max Online (Austria)	gprsinternet	GPRS	(**)	213.162.64.1	213.162.64.2
Mobilkom (Austria)	A1.net	gprs@a1plus.at	(**)	194.48.124.200	194.48.139.254
Mobiltel (postpaid) (Slovenia)	internet	(*)	(*)		
Mobiltel (prepaid) (Slovenia)	internetpro	(*)	(*)		
Mobistar (Belgium)	web.pro.be	mobistar	mobistar	212.65.63.10	212.65.63.145
MTS (Russia)	internet.mts.ru	mts	Mts	213.087.000.001	213.087.001.001
Netcom (Norway)	wap.netcom.no	wap	netcom	212.45.188.43	212.45.188.44
New World (Hong-Kong)	internet	(*)	(*)		
Nordea (Estonia)	internet.emt.ee	(***)	(***)		
O2 (Germany)	internet	(***)	(***)		
O2 (Ireland)	open.internet	gprs	Gprs	62.40.32.33	62.40.32.34
O2 (Netherlands)	internet	(*)	(*)		
O2 (UK)	mobile.o2.co.uk	web	password	193.113.200.200	193.113.200.201
O2 (pre-pay) (UK)	payandgo.o2.co.uk	payandgo	payandgo		
O2 Viag Interkom (Germany)	internet	(*)	(*)	195.182.96.28	195.182.96.61
Oi (Brazil)	gprs.oi.com.br	(***)	(***)		
Omnitel (Italy)	web.omnitel.it	(*)	(*)		
Omnitel (Lithuania)	gprs.omnitel.net	(*)	(*)	194.176.32.129	195.22.175.1
OneNet (Austria)	web.one.at	(***)	(***)	192.24.128.100	192.24.128.102
Optimus	internet	(*)	(*)	194.79.69.129	

(Portugal)					
Optus (Australia)	int.optus.net.au	(*)	(*)	202.139.83.3	192.65.91.129
Orange (Belgium)	orangeinternet	(*)	(*)		
Orange (Denmark)	web.orange.dk	(*)	(*)	212.97.206.131	212.97.206.161
Orange (France)	orange.fr	orange	orange	194.51.3.49	194.51.3.56
Orange (Hong Kong)	web.orangehk.com	(*)	(*)		
Orange (India)	portalnmms	(*)	(*)	10.11.206.51	10.11.206.50
Orange (Romania)	internet	(***)	(***)		
Orange (Slovakia)	internet	(*)	(*)		
Orange (Switzerland)	internet	(*)	(*)	213.55.128.1	213.55.128.2
Orange contract (UK)	orangeinternet	(*)	(*)	158.43.192.1	158.43.128.1
Orange JustTalk (UK)	payginternet	(*)	(*)	158.43.192.1	158.43.128.1
Orange MIB (France)	orange-mib	mportail	Mib		
Oscar (Czech Rep.)	internet	wap	Wap	217.77.161.131	
Paegas Internet (Czech Rep.)	internet.click.cz	(*)	(*)	62.141.0.1	62.141.0.2
Paegas Profil (Czech Rep.)	profil.click.cz	(*)	(*)	62.141.0.1	62.141.0.2
PannonGSM (elõf.) (Hungary)	netx	(*)	(*)	193.225.155.254	194.149.0.157
PannonGSM (felt.) (Hungary)	net	(*)	(*)	193.225.155.254	194.149.0.157
People (Hong-Kong)	internet	(*)	(*)		
Polkomtel (Poland)	www.plusgsm.pl	(*)	(*)	212.2.96.62	212.2.96.52
Proximus Inter (Belgium)	internet.proximus.be	(*)	(*)	195.238.2.21	195.238.2.22
Proximus Intra (Belgium)	intraprox.be	(*)	(*)	195.238.2.21	195.238.2.22
Quam (Germany)	quam.de	quam	Quam	193.189.244.192	193.189.244.205
Radiolinja (Estonia)	internet	(*)	(*)	194.204.0.1	

Radiolinja (Finland)	internet	(*)	(*)	213.161.33.200	212.226.226.001
Radiomibil (Czech Rep.)	internet.click.cz	(*)	(*)		
Rogers AT&T (Canada)	internet.com	wapuser1	Wap	207.181.101.4	207.181.101.5
SFR (France)	websfr	(*)	(*)	172.20.2.10	
Simobil (Slovenia)	none	(*)	(*)	121.30.86.130	193.189.160.11
SingTel (Singapore)	internet	(*)	(*)	165.21.100.88	165.21.83.88
Smart (Philippines)	internet	(*)	(*)	202.57.96.3	202.57.96.4
SmarTone (Hong-Kong)	internet	(*)	(*)	202.140.96.51	202.140.96.52
Sonera (Finlan)	internet	(*)	(*)	192.89.123.230	192.89.123.231
Sonera (Finland)	internet	(*)	(*)	192.89.123.230	192.89.123.23
Sonofon (Denmark)	none	(*)	(*)	212.88.64.14	212.88.64.15
Starhub (Singapore)	shwapint	(*)	(*)	203.116.1.78	203.116.254.150
Sunday (Hong-Kong)	internet	(*)	(*)		
Sunrise (Switzerland)	internet	internet	internet	212.35.35.35	212.35.35.5
Swisscom (Switzerland)	gprs.swisscom.ch	gprs	Gprs	164.128.36.34	164.128.76.39
TDC (Denmark)	internet	(*)	(*)	193.162.146.9	193.162.153.31
Telefonica (Spain)	movistar.es	movistar	movistar	194.179.1.100	194.179.1.101
Telenor (Norway)	internet	dj	Dj		
Telering (Austria)	web	web@telering.at	Web	212.95.31.11	212.95.31.35
Telering (Taiwan)	web	web@telering.at	Web	212.95.31.11	212.95.31.35
Telestet (Greece)	gnet.b-online.gr	(***)	24680	212.152.79.19	212.152.79.20
Telfort (Netherlands)	internet	(***)	(***)		
Telia (Sweden)	online.telia.se	(*)	(*)	10.254.254.254	
Telsim (Turkey)	telsim	telsim	Telsim	212.65.136.226	
Telstra Mobiles (Australia)	telstra.internet	(*)	(*)	139.130.4.4	203.50.170.2
Three (Australia)	3netaccess	a	A	202.124.68.130	202.124.76.66

TIM (Brazil)	tim.br	tim	Tim		
TIM (Italy)	uni.tim.it	WAPTIM	(***)	213.26.205.1	
TIM (new) (Italy)	uni.tim.it	(***)	(***)		
Timecel (Malaysia)	timenett.com.my	(*)	(*)	203.121.16.85	203.121.16.120
TMN (Portugal)	internet	(*)	(*)	194.65.3.20	194.65.3.21
T-Mobil (Czech Rep.)	internet.t-mobile.cz	(***)	(***)		
T-Mobile (Netherlands)	internet-act	(*)	(*)	193.79.251.39	193.79.237.39
T-Mobile (VPN) (USA)	internet3.voicestream.com	(*)	(*)	216.155.175.40	216.155.175.41
T-Mobile One2One (UK)	general.one2one.uk	User	mms		
T-Mobile VoiceStream (USA)	internet2.voicestream.com	(*)	(*)	216.155.175.170	216.155.175.171
TM Touch (Malaysia)	internet	(*)	(*)	202.188.0.133	
TransAsia (Taiwan)	internet	(***)	(***)		
Turkcell (Turkey)	none	(*)	(*)	212.252.168.240	212.252.119.4
VIPNET (Croatia)	gprs.vipnet.hr	(*)	(*)	195.29.159.15	
Vodafone (Australia)	vfinternet.au	(*)	(*)	203.2.193.124	203.8.183.1
Vodafone (Greece)	internet.vodafone.gr	(***)	(***)		
Vodafone (Ireland)	isp.vodafone.ie	vodafone	vodafone		
Vodafone (Netherlands)	web.vodafone.nl	Vodafone	Vodafone		
Vodafone (New Zealand)	www.vodafone.net.nz	(*)	(*)	202.20.93.10	203.97.191.189
Vodafone (Sweden)	none	(*)	(*)		
Vodafone (UK)	internet	web	Web		
Vodafone (Portugal)	internet.vodafone.pt	(*)	(*)	212.18.160.133	212.18.160.134
Vodafone (Omnitel) (Italy)	web.omnitel.it	(*)	(*)	194.185.97.134	
Vodafone (Telecel) (Portugal)	internet.vodafone.pt	(*)	(*)	212.18.160.133	212.18.160.134
Vodafone (tömörítetlen) (Hungary)	standardnet.vodafone.net	vodawap	vodawap	80.244.97.30	80.244.96.1

Vodafone (tömörített) (Hungary)	internet.vodafone.net	vodawap	vodawap	80.244.97.30	80.244.96.1
Vodafone (D2) (Germany)	web.vodafone.de	(*)	(*)	139.7.30.125	139.7.30.126
Vodafone Japan (Japan)	phone	j@phone	Jphone	61.195.195.153	61.195.194.26
VoiceStream (USA)	internet2.voicestream.com	(***)	(***)	216.155.175.40	216.155.175.41
VoiceStream Central (USA)	internet2.voicestream.com	(***)	(***)	216.155.175.105	216.155.175.106
Westel900 (Hungary)	internet	(***)	(***)	194.176.224.3	194.176.224.1
Wind (Italy)	internet.wind	(*)	(*)	212.245.255.2	

(*)=anything

(**)=Leave empty

(***)=Ask your provider

(****)= (you're mail@e-merge.ie)

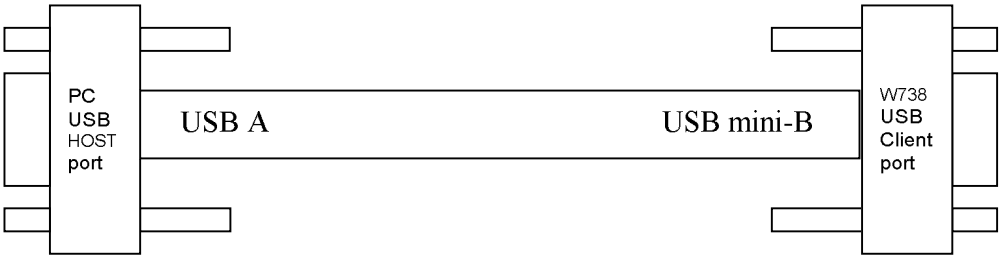
APPENDIX C COM PORT CONFIGURATIONS

Com Port	Pin No	Description	Comments
Com 1	-	-	Used for internal GPRS/GSM Module
Com 2	-	-	USB client port (For ActiveSync)
Com 3	-	-	Used for internal GPRS/ GSM module
Com 4	1	CD	Full-Functional UART(User Defined)
	2	RXD	
	3	TXD	
	4	DTR	
	5	GND	
	6	DSR	
	7	RTS	
	8	CTS	
	9	RI	
Com 5	1, 4, 6, 7, 8	NC	User defined
	2	RXD	
	3	TXD	
	5	GND	
Com 6	1, 4, 6, 7, 8	NC	User defined
	2	RXD	
	3	TXD	
	5	GND	
Com 7	-	-	Used for internal GPS Receiver
Com 8	1, 4, 6, 7, 8	NC	User defined
	2	RXD	
	3	TXD	
	5	GND	
Com 9	1, 4, 6, 7, 8	NC	User defined
	2	RXD	
	3	TXD	
	5	GND	
Com 0	1, 4, 6, 7, 8	NC	User defined
	2	RXD	
	3	TXD	
	5	GND	
Debug Port	1,3, 4, 6, 7, 8	NC	Debug Port for WinCE debugging
	2	TXD	
	5	GND	

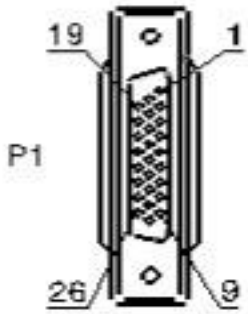
Default COM Port Configuration Summary:

Com Port	Wire No	Comments
Com1	Full	Internal GPRS/GSM , built-in modem port
Com2	USB Client	ActiveSync
Com3	2	Internal GPRS/GSM , built-in modem port
Com4	Full	Any usage.
Com5	2	RX, TX. Any Usage
Com6	2	RX, TX. Any Usage
Com7	2	Internal GPS COM Port
Com8	2	RX, TX. Any Usage
Com9	2	RX, TX. Any Usage
Com0	2	RX, TX. Any Usage
-	2	RX, TX, Debug message port. Fixed 38400-8-1-n. No Name in CE

APPENDIX D ACTIVESYNC CABLE CONNECTION



APPENDIX E 26 PIN CONNECTOR PIN LAYOUT



PIN LAYOUT					
P1		LABEL			
1	P2	GND			
2		DIGIT_OUT1			
3		DIGIT_OUT2			
4		DIGIT_OUT3			
5		DIGIT_OUT4			
P1		LABEL			
19	P3	DIGIT_IN1+			
20		DIGIT_IN1-			
21		DIGIT_IN2+			
22		DIGIT_IN2-			
23		DIGIT_IN3+			
24		DIGIT_IN3-			
25		DIGIT_IN4+			
26		DIGIT_IN4-			
P1		COLOR	FUNCTION	ASSIGNMENT	LABEL
6	P4	RED	RX	COM 5	COM 1B
7		WHITE	TX		
18		BLACK	GND		
8	P5	RED	RX	COM 6	COM 1C
9		WHITE	TX		
18		BLACK	GND		
10	P6	RED	RX	COM 8	COM 2A
11		WHITE	TX		
18		BLACK	GND		
12	P7	RED	RX	COM 9	COM 2B
13		WHITE	TX		
18		BLACK	GND		
14	P8	RED	RX	COM 0	COM 2C
15		WHITE	TX		
18		BLACK	GND		
16	P9	RED	RX	UNUSED	COM 2D
17		WHITE	TX		
18		BLACK	GND		

APPENDIX F DEBUG PORT CONNECTION

Connect the TX,RX and GND lines from the COM port of 26 pin connector in the cradle board to the serial port DB-9 Female Connector as shown in figure below.

Hereby, **InfoWave Pte Ltd** declares that this **Waveon 738P and Waveon 738G Mobile Data Terminal**, are in conformity with the following standards and/or other normative documents.

EMC	**EN 301 489-1, EN 301 489-7**
RF Exposure	**IEC 50371**

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity to all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10 and detailed in Annex [IV] of the Directive 1999/5/EC has been followed with the involvement of the Notified Body:

TIMCO Engineering Inc.
849 N.W.State Road 45, Newberry, Florida 32669 USA

Identification mark: **1177**

The technical documentation relevant to the above equipment will be held at:

InfoWave Pte Ltd
600 Sin Ming Avenue 4TH Floor Singapore 575733

European Union Regulatory Notice

This product complies with the essential requirements of following EU directive:

❖ R&TTE Directive 1999/5/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by InfoWave for this product or product family. This compliance is indicated by the following conformity marking placed on the product:

 1177

The 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 communications. 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 or an experienced radio or television technician for help

- Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by InfoWave may void the authority to operate the equipment.

- Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

As with other mobile radio transmitting equipment, users are advised that for satisfactory operation of the equipment and for the safety of personnel, it is recommended that no part of the human body be allowed to come too close to the antenna during operation of the equipment.

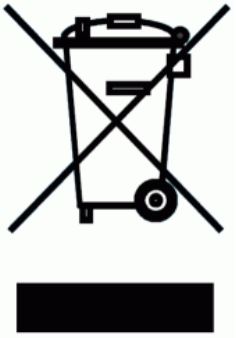
Battery Warning

Warning: This product contains a lithium-ion rechargeable battery. To reduce the risk of fire or burns, do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water. Replace only with InfoWave battery. Replacing with a non-approved battery will void the warranty.

Caution: Risk of explosion if battery is replaced by an incorrect type. Dispose of batteries according to local regulations. Do not dispose as office waste.

European Union CENELEC Waste Notice

This product complies with the following WEEE Directive 2002/96/EC:



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Disclaimer

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Warranties Exclusive

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In no event will InfoWave be liable for any damages, including loss of data, loss of profits, cost of cover or other incidental, consequential or indirect damages arising out the installation, maintenance, use, performance, failure or interruption of a InfoWave product, however caused and on any theory of liability. This limitation will apply even if InfoWave has been advised of the possibility of such damage.

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