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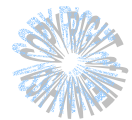
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EM300 Module

Module/Data Card integration guide

Ver: 1.0



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2008/12/01

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Document Revision History

Rev.	ECO #	Date	Brief Description of Change	Originator	Approved by
Draft		Nov 25 th 2008	Initial release of Draft Version for Customer Review and Feedback	Richard Hsieh	
Check		Dec 1 st 2008	Check and Review	Brian Yang	

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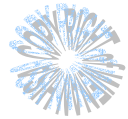
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Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.

The user manual which is provided by OEM integrators for end user must include the following the information in a prominent location.

"TO comply with FCC RF exposure compliance requirements, the antenna use for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna transmitter.

Frequency range, the warning statement in the user manual of the end product should include the restriction of operating this device in indoor could void the user's authority to operate the equipment."

Label for end product must include "Contains FCC ID:PU5-EM300" or "A RF transmitter inside' FCC ID :PU5-EM300".

Reference Documents

Phone module

EM300 module Electromechanical Specification Revision 1.0 June 25, 2008

EM300 HW specification Version 1.1 June 25, 2008

3GPP References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

For a specific reference, subsequent revisions do not apply.

For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

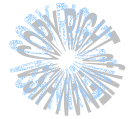
- [1] Void.
- [2] 3GPP TS 23.038: "Alphabets and language-specific information".
- [3] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".
- [4] 3GPP TS 23.041: "Technical realization of the Cell Broadcast Service (CBS)".
- [5] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".
- [6] 3GPP TS 24.011: "Short Message Service (SMS) support on mobile radio interface".
- [7] 3GPP TS 24.012: "Cell Broadcast Service (CBS) support on the mobile radio interface".
- [8] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".
- [9] 3GPP TS 27.007: "AT command set for User Equipment (UE)".
- [10] 3GPP TS 51.011: "Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".
- [11] ITU-T Recommendation V.25ter: "Serial asynchronous automatic dialing and control".
- [12] ITU-T Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".
- [13] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

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- [14] ITU-T Recommendation E.163: "Numbering plan for the international telephone service".
- [15] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [16] 3GPP TS 31.102: "Characteristics of the USIM application."

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Notices

Safety Warning

Neither the nor EM300 MODULE / Data Card products may be used in an environment where radio frequency equipment is prohibited or restricted in its use. This includes aircraft/airports, hospitals, and other sensitive electronic areas.

Do not operate RF devices in an environment that may be susceptible to radio interference resulting in danger, specifically:

- **Areas where prohibited by the law**
Follow any special rules and regulations and obey all signs and notices. Always turn off the host device when instructed to do so, or when you suspect that it may cause interference or danger.
- **Where explosive atmospheres may be present**
Do not operate your modem in any area where a potentially explosive atmosphere may exist. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death. Be aware and comply with all signs and instructions.
- **Users are advised not to operate the modem while at a refueling point or service station.**
Users are reminded to observe restrictions on the use of radio equipment in fuel depots (fuel storage and distribution areas), chemical plants or where blasting operations are in progress.
- **Areas with a potentially explosive atmosphere are often but not always clearly marked.**
Potential locations can include gas stations, below deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), areas where the air contains chemicals or particles, such as grain, dust or metal powders, and any other area where you would normally be advised to turn off your vehicle engine.
- **Near Medical and life support equipment**
Do not operate your modem in any area where medical equipment, or life support equipment may be located, or near any equipment that may be susceptible to any form of radio interference. In such areas, the host communications device must be turned off. The modem may transmit signals that could interfere with this equipment.
- **On an aircraft, either on the ground or airborne**
In addition to FAA requirements, many airline regulations state that you must suspend Corporation operations before boarding an airplane. Please ensure that the host device is turned off and your modem is removed from the card slot prior to boarding aircraft in order to comply with these regulations. The modem can transmit signals that could interfere with various onboard systems and controls.
- **While operating a vehicle**
The driver or operator of any vehicle should not operate a Corporation data device. Doing so will detract from the driver or operator's control and operation of that

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vehicle. In some countries, operating such communication devices while in control of a vehicle is an offence.

Under extended operation the and EM300 MODULE modem will generate a noticeable amount of heat. Like all PC Cards, the modem generates heat during normal operation and will be heated by the host computer. For this reason it is recommended that after extended periods of operation, prior to removal and handling, you allow the modem to cool down.

Federal Communications Commission Notice (FCC—United States)

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide 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 installation. , May cause harmful interference to radio communication. However, there is no guarantee that interference Will not occur in a particular installation. if this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the 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/television technician for help

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Radio Frequency Exposure Evaluation Requirements

This Corporationmodule is a radio transmitter and receiver. It is designed and manufactured not to exceed the exposure limits for radio frequency (RF) energy set by the Federal Communications Commission (FCC) of the U.S. Government. These limits are part of comprehensive guidelines and establish permitted levels of RF energy for the general population. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.

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The exposure standard for Corporation devices including mobile phones and Corporation modems uses a unit of measurement known as the Specific Absorption Rate, or SAR. Tests for SAR are conducted using standard operating positions reviewed by the FCC with the device under test.

This device is to be used only for mobile and fixed applications. The antenna installation and operating configurations of this transmitter, including any applicable source-based time-averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of §2.1091. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.



transmitting at its highest certified power level in all frequency bands. Although the SAR is determined at the highest certified power level, the actual SAR level of the phone or modem while operating can be well below the maximum value. This is because the phone or modem is designed to operate at multiple power levels so as to use only the power required to reach the network. In general, the closer you are to a Corporation base station antenna, the lower the power output.

Before this device is made available for sale to the public, it must be tested and certified to the FCC that it does not exceed the limit established by the government-adopted requirement for safe exposure. The tests are performed in positions and locations (for example, at the ear or worn on the body) as required by the FCC for each model.

In general, for the United States market, the embedded modules are treated as "mobile devices" as per FCC CFR47 paragraph 2.1091. A mobile device is defined as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." Manufactures of mobile devices may be able to submit a Maximum Exposure Rate (MPE) calculation in order to demonstrate SAR compliance.

CE (Conformité Européenne or European Conformity)

This module will be tested to and conforms to the regulatory requirements of the European Union and has attained CE Marking. The CE Mark is a conformity marking consisting of the letters "CE". The CE Mark applies to products regulated by certain European health, safety and environmental protection

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legislation. The CE Mark is obligatory for products it applies to: the manufacturer affixes the marking in order to be allowed to sell his product in the European market.

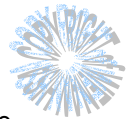
Radiocommunications and Telecommunications Terminal Equipment Industries (R&TTE)

This is mandatory for European operation and the directive applies to products using the radio frequency spectrum and all equipment attached to public telecommunications networks.

This product conforms to the essential requirements of the Radiocommunications and Telecommunications Terminal Equipment Directive (R&TTE) 1999/5/EC with respect to the following articles:

- 3.1a Safety
- 3.1b EMC
- 3.2 Spectrum

A notified body will determine that this device has properly demonstrated that the requirements of the directive have been met and has issued a favorable certificate of expert opinion. As such the device will bear the notified body number (TBD) after the CE Mark.



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Compliance & Certification Requirements

PCS Type Certification Review Board (PTCRB)

PTCRB Certification is mandated and the product is technically evaluated to meet the minimum requirements for registration on the PTCRB Operators' networks. The purpose of the PTCRB is to provide the framework within which GSM Mobile Equipment (ME) Type Certification can take place for members of the PTCRB. The PTCRB process is recommended for all Manufacturers who wish to have their products operating within the areas served by the PTCRB Operators. This includes but is not limited to determination of the test specifications and methods to implement the Type Certification process for GSM Mobile Equipment.

PTCRB type certification will be based on GSM and OMA (Open Mobile Alliance) Specifications with modifications per North American Standards and additional requirements from FCC rules, and any other government agency that may have jurisdiction and or competence in the matter. Additions to the PTCRB Specifications will be developed by the GSM operators. The additions will be limited to MS-related features. The PTCRB document NAPRD 03 (Permanent Reference Document) will be modified to include references to the above specifications once they are written and accepted by majority of the review board.

To learn more about device certifications, please visit the [PTCRB Website](#). You must sign up as a member to gain access

Global Certification Forum (GCF),

The Global Certification Forum (GCF) is an independent organization with a wide-ranging membership of operators, equipment manufacturers and other interested parties. The actions of the Forum are actively supported by key staff from the Association Technical Projects operation and by the Association Executive Management Committee.

GCF is recommended but not mandatory for attachment to the European network. It is a partnership between network operators and terminal manufacturers and allows independent interoperability validation of the 2G and 3G mobile Corporationterminal. GCF is typically required for formal carrier technical acceptance of the mobile Corporationterminal.

Membership of GCF is entirely voluntary. Full GCF membership is open to mobile terminal manufacturers and network operators. Other interested members of the mobile wireless community, including test laboratories and test equipment manufacturers, may participate in GCF as observers.

The current membership includes almost 150 network operators worldwide, more than 35 leading terminal manufacturers and over 50 test equipment manufactures. Members decide the organization and administration of the forum at regular Steering Group meetings. Technical issues associated with testing new terminals and features are reviewed at regular Agreement Group meetings by manufacturers, test laboratories and other observers.

To learn more about device certifications, please visit the [GCF Website](#). The website identifies manufacture, terminal names and the date which the terminal was certified. You must sign up as A member to gain full access.

Getting Started

General

The purpose of this document is to provide advance design and integration information to assist in the integration planning and evaluation of Wistron Corporation USB Cards. This document is intended to specify key components of the integration tools available for the Wistron Corporation line of USB Cards.

The EM300 MODULE are Wistron Wireless' versatile modules that add WWAN capability to other devices. They were developed to be integrated into other devices based on the USB Card specification 1.2

The EM300 MODULE will work with all Windows driven laptops given the drivers are properly installed. When MobiLink™ is installed on a Windows OS system it will automatically include the drivers necessary to communicate with the USB Card. MobiLink™ is Wistron's Windows application manager for the EM300 module. MobiLink provides an easy interface to make a data connection, change operating parameters, and view alerts such as

SMS or signal strength indicator. However, anyone can still install the drivers manually. In addition, once the drivers are installed, following the Wistron Client API functions, anyone could develop their Client side software manager to interact with the USB Card.

When using any of these devices, EM300 MODULE, activation is required for the device to be allowed on the operator's network. For example, Sprint requires the customer to run IOTA (Internet Over-The-Air) provisioning to prepare the device to work on the Corporation network. Please refer to the Customer Configuration section on provisioning with IOTA for assistance.

The EM300 MODULE and require a valid SIM card before it can be used on the operator's Corporation network. Please refer to the Customer Configuration section on PRI for further information.

Setting Up

The purpose of this section is to assist in the initial connection and provide the reader with instructions for how to setup and establish communication with the Wistron Corporation line of USB Card. The following setup guide refers to an EM300 MODULE HSDPA Mini-card for convenience of the set up discussion. The same setup is valid for both the EM300 MODULE EDGE and Mini-cards.

Setting up and establishing communication with the Wistron Corporation USB Card involves:

- Connecting the USB Card to the computer and the Development Board.
- Establishing communication with the USB Card and determining the computer COM Port being used.
- Setting up and using the HyperTerminal program to communicate with the Mini-card

CONNECTING THE USB CARD TO THE COMPUTER AND THE DEVELOPMENT BOARD

Insert the USB Card into the Development Board (Wistron Corporation Part # 01017568) by sliding the connector end of the Mini-card into the Molex connector. Push down on the opposite end of the Mini-card until the 2 black locking tabs snap into place.

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EM300 MODULE EDGE Module Key Feature List

Feature	Implementation
General	
Frequency bands	UMTS/HSDPA: Triple band, 850//1900/2100MHz GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz
GSM class	Small MS
Output power (according to Release 99, V6)	Class 4 (+33dBm ±2dB) for EGSM850 Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900 Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 1900,WCDMA FDD BdII Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV
Power supply	3.2V to 4.3V
Ambient operating temperature according to IEC 60068-2	Normal operation -20°C to +70°C
Physical	Stand Mini PCI-E Weight: approx. 10g

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RoHS	All hardware components fully compliant with EU RoHS Directive
	HSDPA features
3GPP Release 6	DL 7.2 Mbps, UL 384 kbps (HSDPA) UE CAT. [1-8], 11, 12 supported Compressed mode (CM) supported according to 3GPP TS25.212
	UMTS features
Release 99, June 2004, WCDMA FDD standard	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64 kbps DL / 64 kbps UL
	GSM / GPRS / EGPRS features
Data transfer	<p>GPRS</p> <ul style="list-style-type: none"> • Multislot Class 12 • Full PBCCH support • Mobile Station Class B • Coding Scheme 1 – 4 <p>EGPRS</p> <ul style="list-style-type: none"> • Multislot Class 12 • EDGE E2 power class for 8 PSK • Downlink coding schemes – CS 1-4, MCS 1-9 • Uplink coding schemes – CS 1-4, MCS 1-9 • BEP reporting • SRB loopback and test mode B • 8-bit, 11-bit RACH • PBCCH support • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B <p>CSD</p> <ul style="list-style-type: none"> • V.110, RLP, non-transparent • 9.6 kbps

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SMS (for pc default non)	<ul style="list-style-type: none"> • Point-to-point MT and MO • Cell broadcast • Text and PDU mode • Storage: SIM card plus 25 SMS locations in mobile equipment • Transmission of SMS alternatively over CSD or GPRS. <p>Preferred mode can be user defined.</p>
Fax (default non)	Group 3; Class 1
Audio (for pc default non)	<p>Audio speech codecs GSM: AMR, EFR, FR, HR 3GPP: AMR One ringing melody supported CEPT supervisory tones supported DTMF supported 6 audio modes: Approval, Router, Handset, Headset, Speakerphone and Transparent mode TTY support selecting a dedicated audio mode Download of audio parameters Gains and volumes can be controlled by AT commands Several additional ringing melodies CEPT and ANSI supervisory tones supported</p>
Software	
AT commands	AT command
Microsoft TM pc drive	Windws 2000/XP/Vista 32/64 (INTEL & AMD)install drive
SIM Application Toolkit	SAT Release 99
TCP/IP stack	Access by AT commands
IP addresses	IP version 6

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<p>Remote SIM Access By case (Standard none support)</p>	<p>EM300 supports Remote SIM Access. RSA enables EM300 to use A remote SIM card via its serial interface and an external application, in addition to the SIM card locally attached to the dedicated lines of the application interface. The connection between the external application and the remote SIM card can be a Bluetooth wireless link or a serial link. The necessary protocols and procedures are implemented according to the "SIM Access Profile Interoperability Specification of the Bluetooth Special Interest Group" (SAP).</p>
<p>Firmware update</p>	<p>Windows executable for update over serial interface and USB port.</p>
<p>1 serial interfaces 1 USB interfaces</p>	<ul style="list-style-type: none"> • 8-wire modem interface with status and control lines, unbalanced, asynchronous • Fixed bit rates: 300bps to 460,800bps • Autobauding: 1,200bps to 460,800bps • Supports RTS0/CTS0 hardware handshake and software XON/XOFF flow control. • Multiplex ability according to GSM 07.10
<p>Interfaces</p>	
<p>Audio (default non)</p>	<ul style="list-style-type: none"> • 2 analog interfaces
<p>SIM interface</p>	<p>Supported SIM cards: 3V, 1.8V</p>
<p>SIM Application Toolkit</p>	<p>SAT Class C</p>

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Antenna	50Ohms. External antenna can be connected via antenna connector or solderable pad (support diversity and non-diversity default non diversity).
Module interface	Stand Mini PCI-Express
USB	Supports a USB 2.0 Full Speed (12Mbit/s) device interface.
Mini PCI Express interface	NB standard Mini PCI Express (USB interface)
Power on/off, Reset	
Power on/off	<ul style="list-style-type: none"> • Switch-on/off by hardware pin • Switch-off by AT command
Reset	<ul style="list-style-type: none"> • Emergency off reset by hardware pins
Special features	
Real time clock	Timer functions via AT commands
Phonebook	SIM and phone
Evaluation kit	
EM300 evaluation board	EM300 evaluation board Evaluation Board designed to test and type approve Wistron cellular engines and provide a sample configuration for application engineering.

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General

The EM300 MODULE are designed to meet the EM300 module electro-mechanical card standard with some exceptions to accommodate the power requirements. These modules all support only the USB portion of the minicard standard.

Chipset

The MSM 6281 baseband processor, PM6658 power management IC, RTR 6285 shall be the chipset used for RF transceiver.

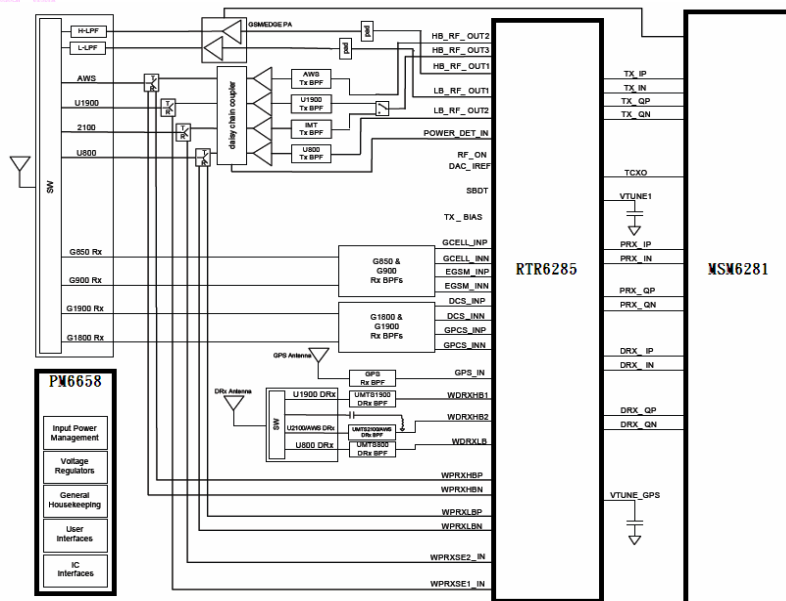
EM300 MODULE

Mobile stations are limited to 2 watts maximum EIRP. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

The power is supplied to EM300 through the PCI Express Mini Card interface, while VBAT is supplying voltage to the baseband section. It must be able to provide sufficient current to the power amplifier during the transmission period.

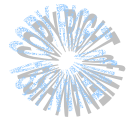
The analog baseband IC on EM300 has a power management section which controls the voltage distribution to all functions on the module. The power management section has the following features:

- With low drop linear voltage regulators, the voltages supplied to the GSM baseband can be stabilized.
- During the power-up and power-down procedures, it controls the voltages of the module.
- It provides VREG_MSMP for all external applications. However, in power-down mode, this voltage is not present.
- It also provides various voltages for the SIM.



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ESTABLISHING COMMUNICATION WITH THE USB CARD AND DETERMINING THE COMPUTER COM PORT BEING USED

Once the modem is powered up and connected, you should hear a sound indicating the computer has recognized the modem.

Setup

Determining the Computer's Active Primary COM Port

To verify the computer's recognition of the modem and to verify which Primary COM Port it is connected to, navigate to Start\Control Panel\Phone and Modem Options and then click on the Modems tab within the Phone and Modem Options window. Refer to Figure 2 below.

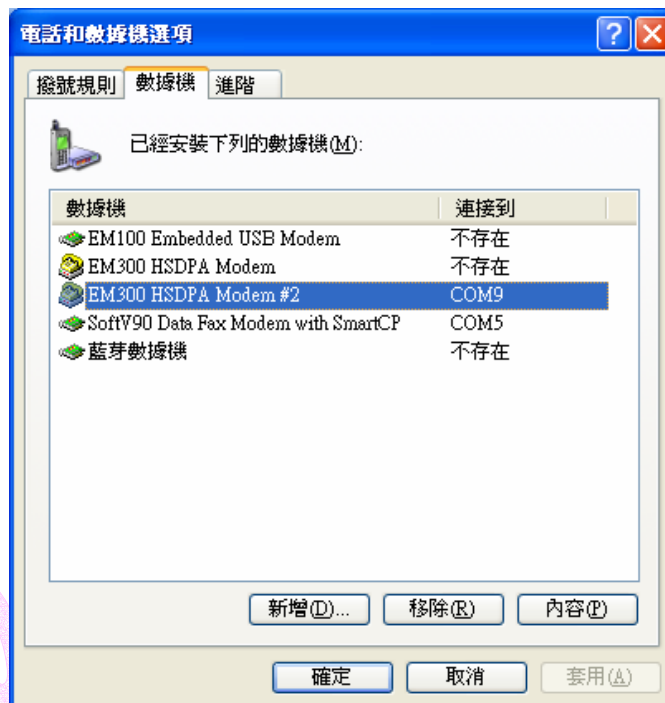


Figure 2 – Phone and Modems Options Window

Look for the Wistron CorporationMerlin EM300 MODULE EDGE Modem item on the list. To the right of this item in the 'Attached To' column, you will see a COM port number - make a note of this Primary COM Port Number. If you do not see any COM No. for this item and you only see "Not Present", then this indicates that the modem is not being recognized and is not attached to a COM Port on the computer. In this case, make sure the USB and power cable are properly connected at both ends. If the modem has properly booted up, with no SIM in the SIM holder, the WAN LED on the Development Board should be blinking at a steady rate. If there is a SIM in the SIM Holder, the LED will be solid green.

Determining the Computer's Active Secondary or Status COM Port

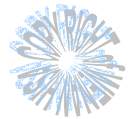
To verify which Secondary, or Status COM Port the modem is connected to, navigate to Start\Control Panel\System. After you have double-clicked on the System Icon, click on the Hardware Tab within the System Properties window. Now click on the Device Manager tab. In the Device Manager window, click on the "+" beside Modems to expand this item. You should

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now see the Wistron Corporation Expedite EM300 MODULE EDGE Modem, or something similar listed here. Refer to Figure 3 below. Now click on the "+" beside Ports (COM & LPT) to expand this item. You should now see the Wistron Corporation Expedite EM300 MODULE EDGE Status Port (COM XX) listed here. This is the Secondary or Status COM port Number. Again, refer to Figure 3 below. Make a note of this Port Number.

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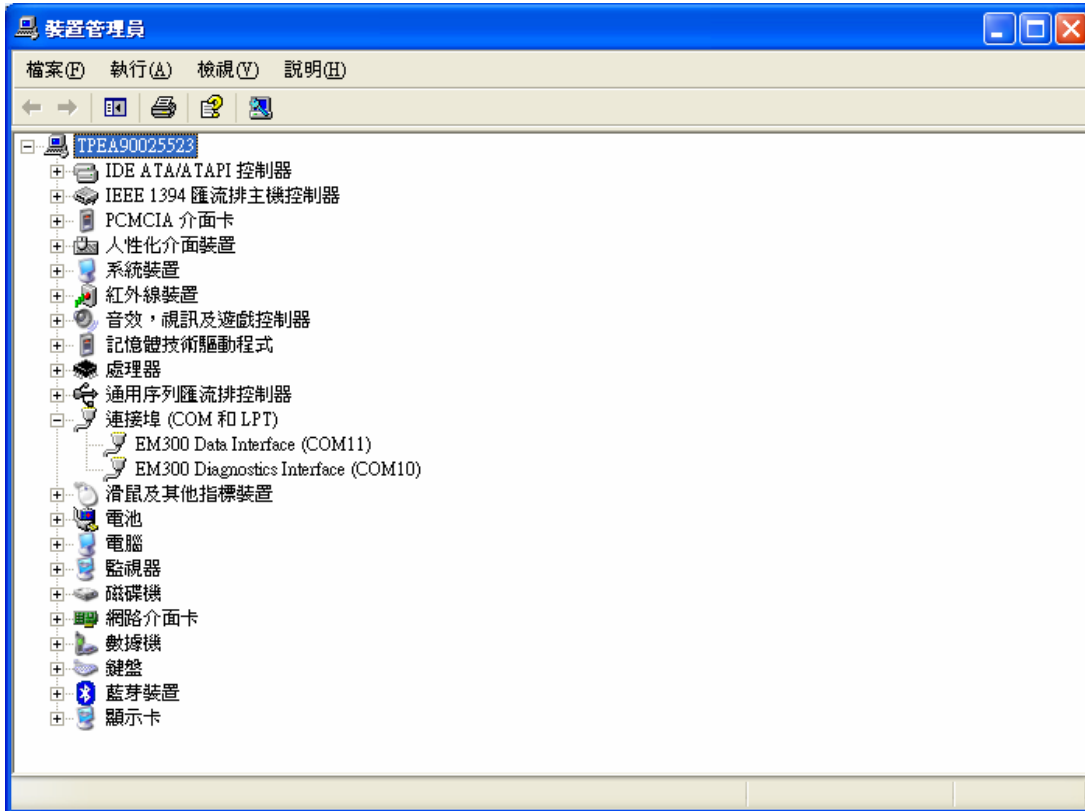


Figure 3 – Device Manager Window Showing the Computer's Active Status COM Port

SETTING UP HYPERTERMINAL TO COMMUNICATE WITH THE MODEM

Ensure that the Mini-card is still powered on with a USB connection to the computer, and that it is recognized by the computer as per the previous step.

Open up a HyperTerminal session by navigating to Start\All Programs\Accessories\Communications\HyperTerminal.

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Type in a Connection Description title, such as the Active Primary COM Port number that was identified earlier - click 'OK'. See Figure 4 below as an example:

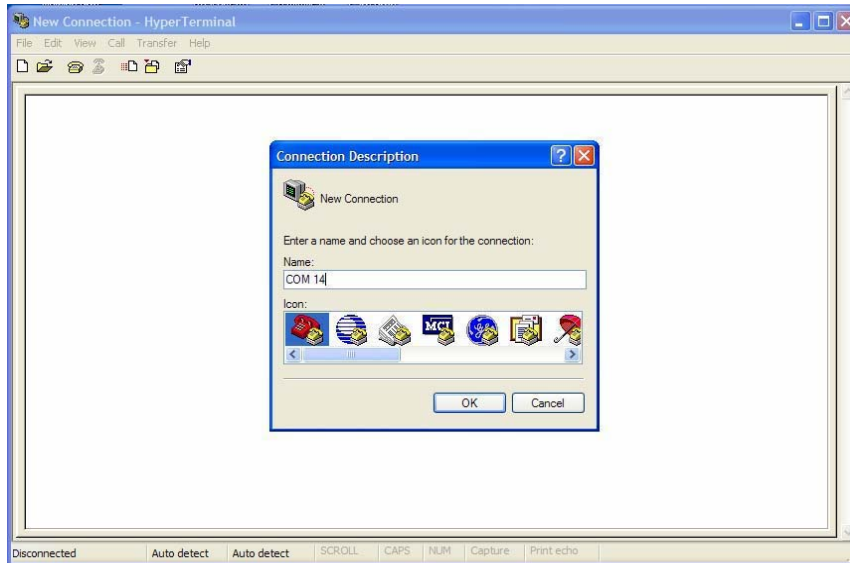


Figure 4 – HyperTerminal Connection Description Window

In the “Connect Using” pull down menu, select the proper COM port (Primary COM port number), that the computer is using to communicate with the modem, then click 'OK'. See the example in Figure 5 below:

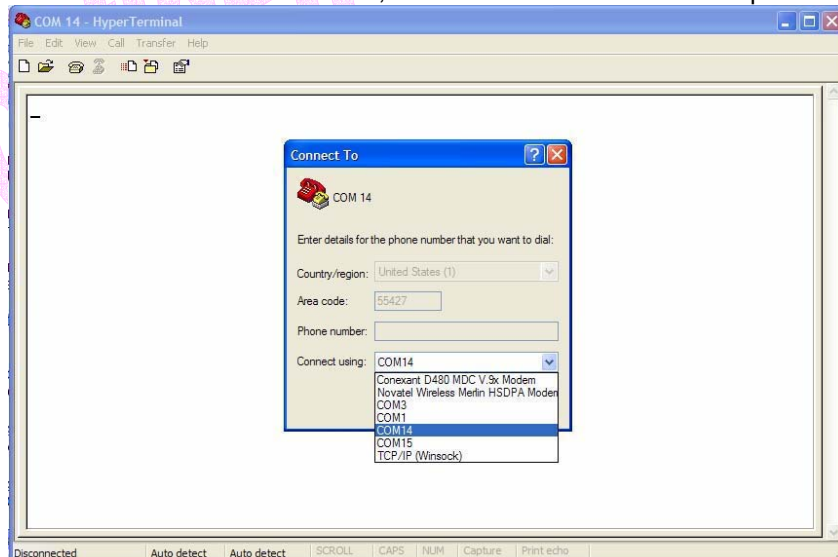


Figure 5 – HyperTerminal COM Port Selection Window

When the 'COM XX Properties' window comes up, just click on OK as there is no need to select or modify any of these settings. Refer to Figure 6 below:

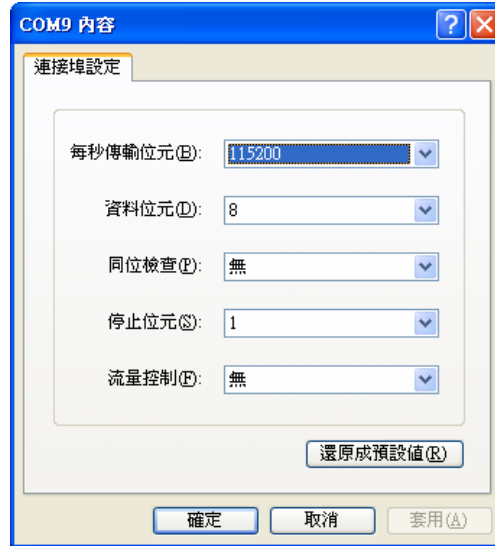


Figure 6 – HyperTerminal Properties Window

Now the modem should be automatically connected, as will be indicated in the bottom left corner of the HyperTerminal window. To further ensure there is communication to the modem, type "ATI" and press ENTER. The modem manufacturer, model number, FW revision and IMEI information will then be returned as is shown in Figure 7 below.

If no information is returned in the HyperTerminal window after typing ATI, then click on the Disconnect tab at the top of the HyperTerminal window (or click on Call\Disconnect). Reconnect by clicking on the Connect tab at the top of the HyperTerminal window (or click on Call\Connect). Now type ATE which will enable the "echo" function of the modem and therefore will allow the characters typed in the HyperTerminal window to be displayed. Once this has been done, retype the ATI command and all the modem information should now be displayed in the HyperTerminal window.

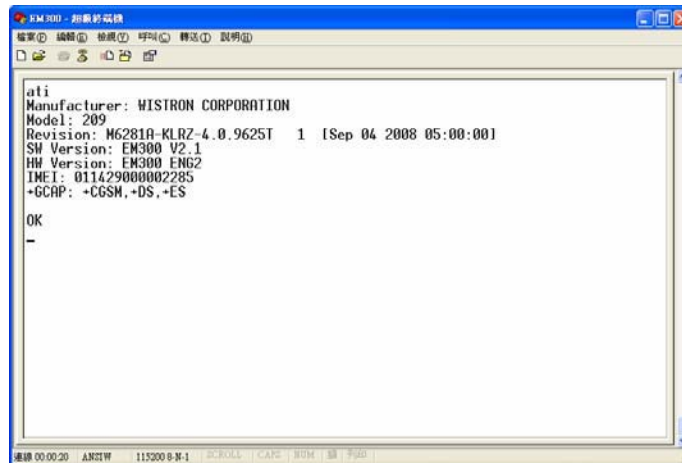


Figure 7 – HyperTerminal Communication Window