

INSTALLATION MANUAL

J07H081

ThinkPad Bluetooth with Enhanced Data Rate

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■ Section One: Introduction

The Bluetooth Module use a monolithic single-chip, Broadcom BCM2045 and it can compliant Bluetooth 2.0. This Bluetooth module is base on the highly integrated BCM2045 stand-alone baseband processor with an integrated 2.4GHz transceiver. It is fully compliant with the Bluetooth radio specification and incorporates new modulation schemes to support enhanced data rate(EDR) of 3Mbps.

1.1 Features

1.1.1 Bluetooth Function

- Bluetooth radio firmware is upgradeable for bug fixes, initial version compatible with Bluetooth specification version 2.0
- Fully compliant to Bluetooth SIG (BQB) compatibility testing.
- USB Pin assignment is to use MDC reserve pin to communicate with Host.interface
- Bluetooth Profile Support
 - Pim Item Transfer
 - Pim Synchronization
 - Network Access
 - Dial-up Networking
 - Bluetooth Serial Port
 - Fax
 - Audio Gateway
 - Headset
 - Bluetooth Imaging
- Drivers support Windows 98, 98SE, ME, 2000, XP.
- Supports Power Management

1.2 Hardware Requirements

Supply Voltage	3.3V
Frequency Range	2.400-2.4835 GHz
Antenna Load	50 Ohm
Receive Sensitivity	-78 dBm@0.1% BER
Maximum Receiver Signal	-20 dBm
TX Power	4 dBm maximum (class 2)
RF Power Control Step Size	2 dB
Range	10 meters at 0 dBm TX power (class 2)
Radio	Compliant with Bluetooth radio specification and incorporates new modulation schemes to supports enhance data rate (EDR)

	of 3Mbps
Pico Net	1 master to 7 slaves
Operating Channels	79 channels of 1 MHz BW
Security	Full support of Bluetooth security provisions including hardware support for full length 128 bit encryption keys.
Host Interface (USB)	USB specification 2.0 compliant and using MDC reserve pin to communicate with Host
Software Requirements	Windows 98SE, ME, 2000, XP.
Mechanical Requirements	26mm x 14mm

■ Section Two: Bluetooth Installation

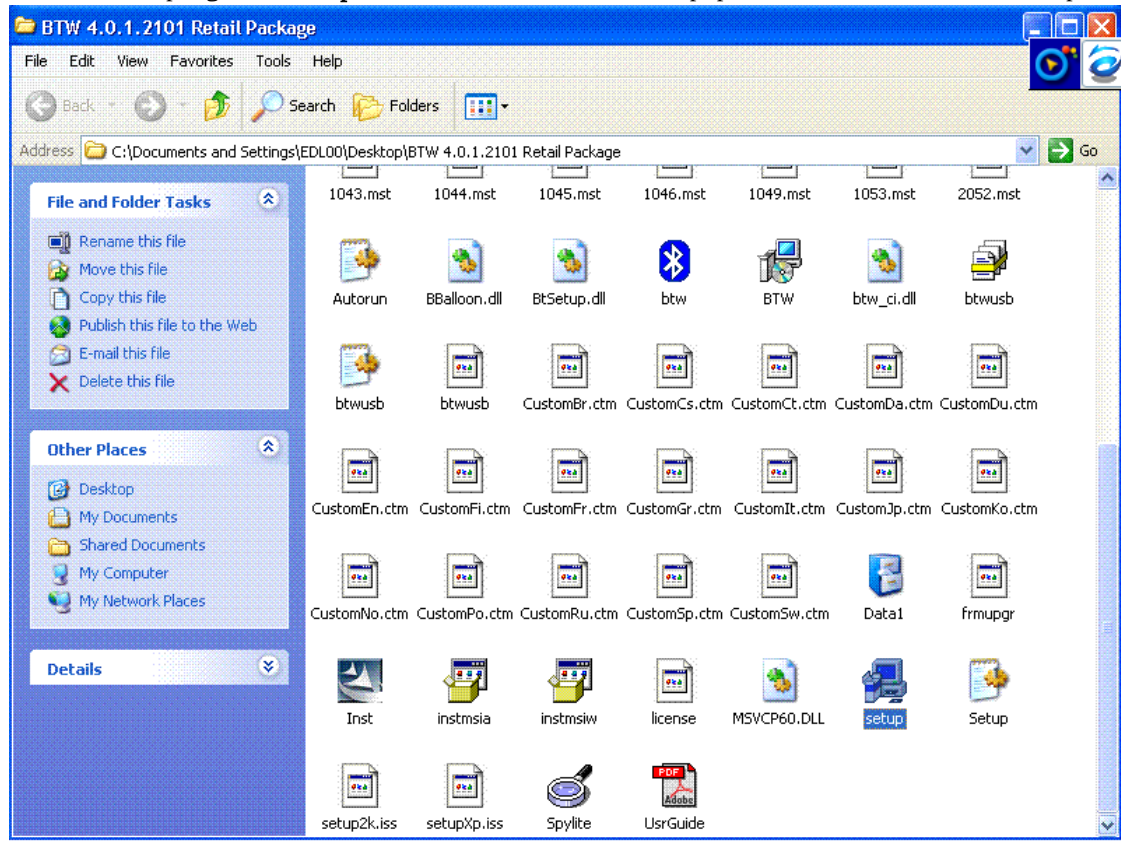
The following steps provide instructions for installing Bluetooth.

1. Make sure your Bluetooth device already insert into your notebook.
2. Make sure your notebook operating system support Windows 98SE or ME or 2000 or XP.

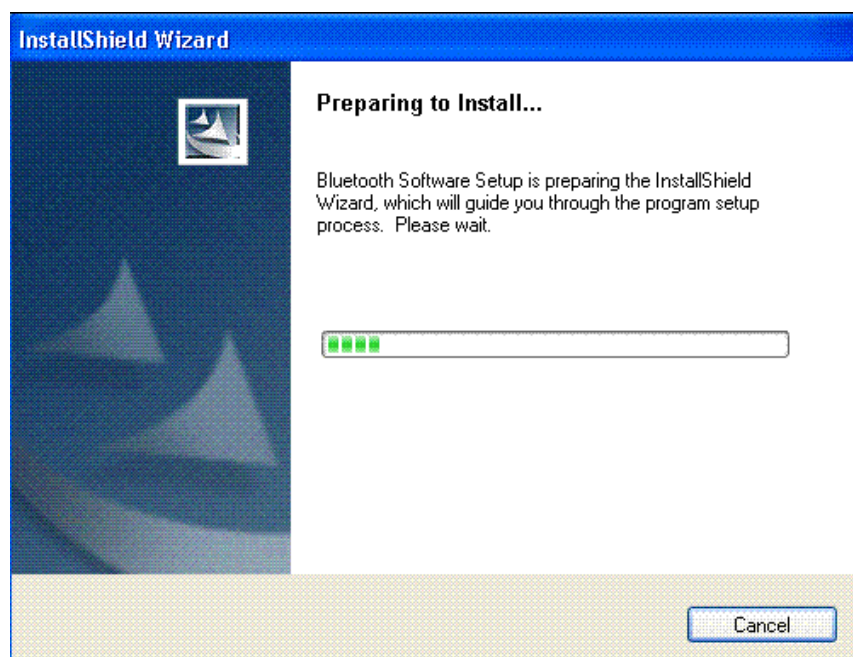
2.1 Bluetooth Installation

Proceed to the following section.

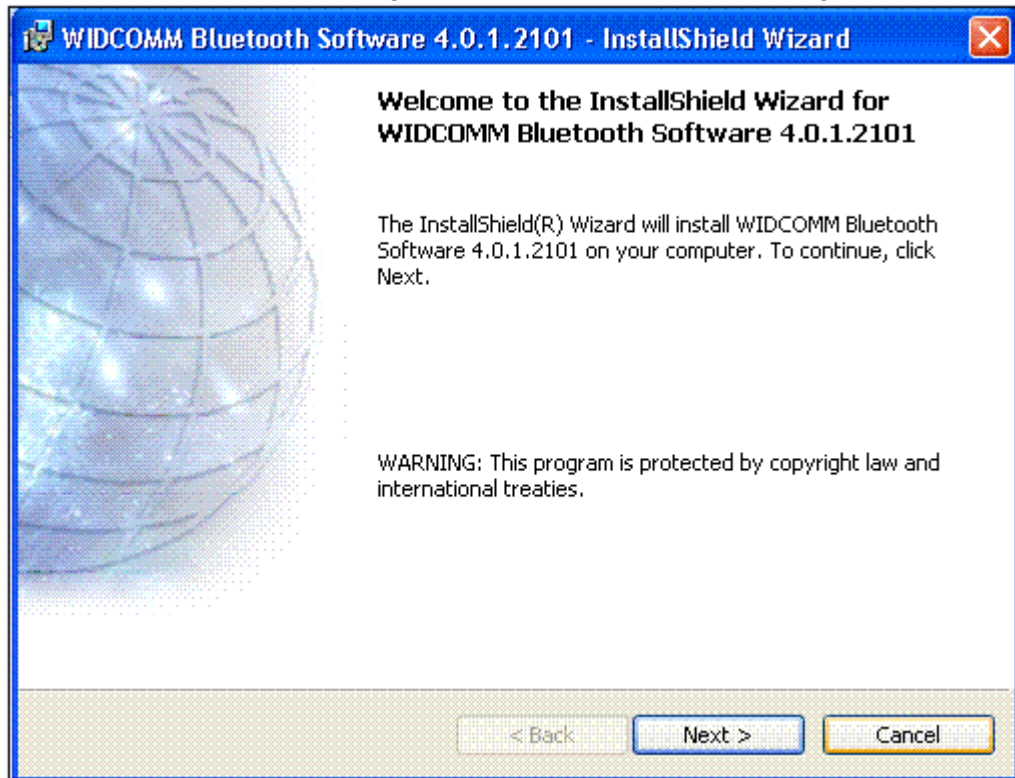
Double click the program “Setup.exe” to execute the setup procedure in the software package :



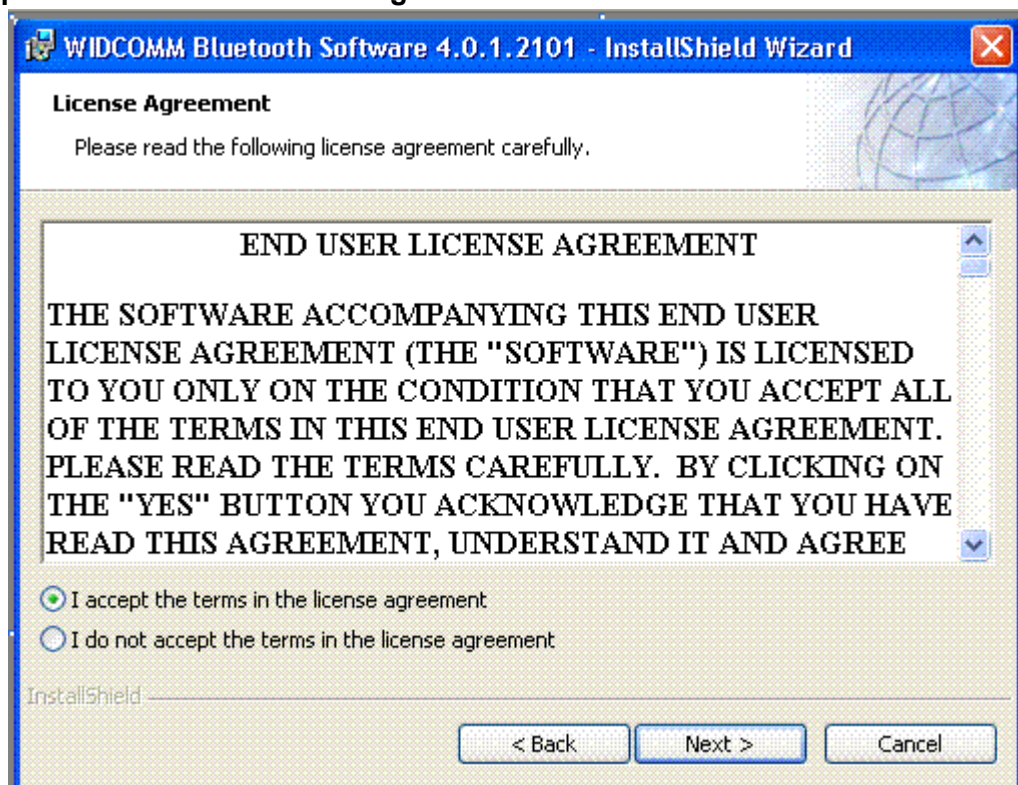
1. Windows shows the dialog as below to check your operation system version :



2. Windows shows the welcome dialog as below, click the “**Next**” to begin the process :

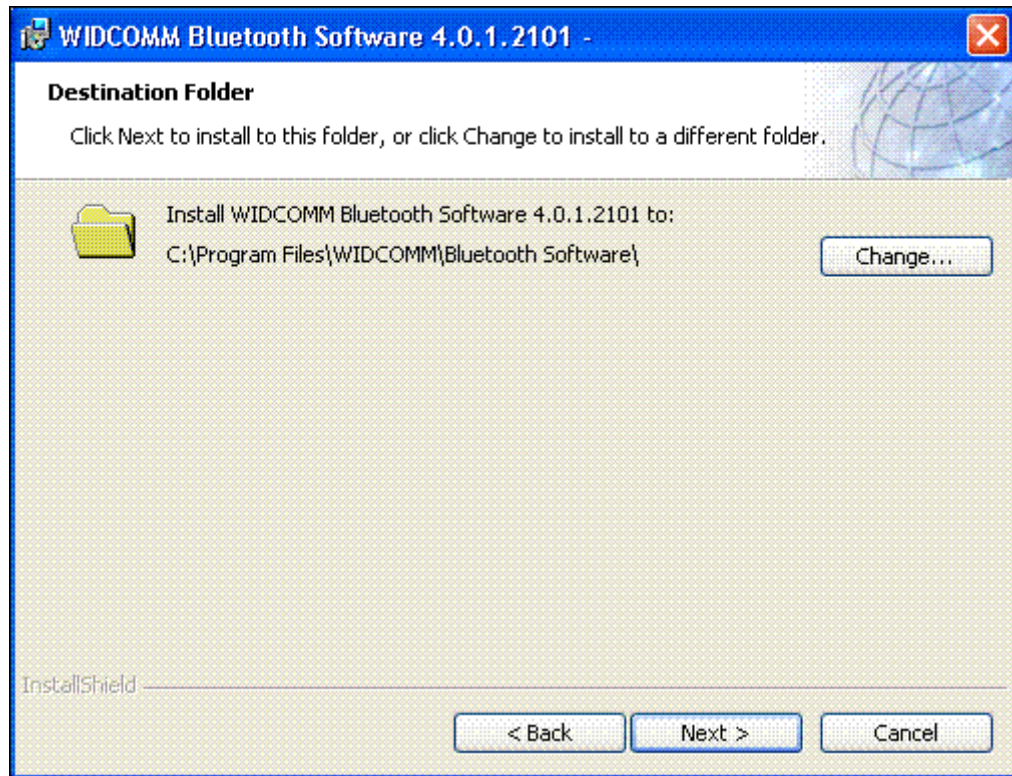


3. The license agreement dialog will pop up, please read it carefully. If you agree it, choose “**I accept the terms in the license agreement**” and click “**Next**” :

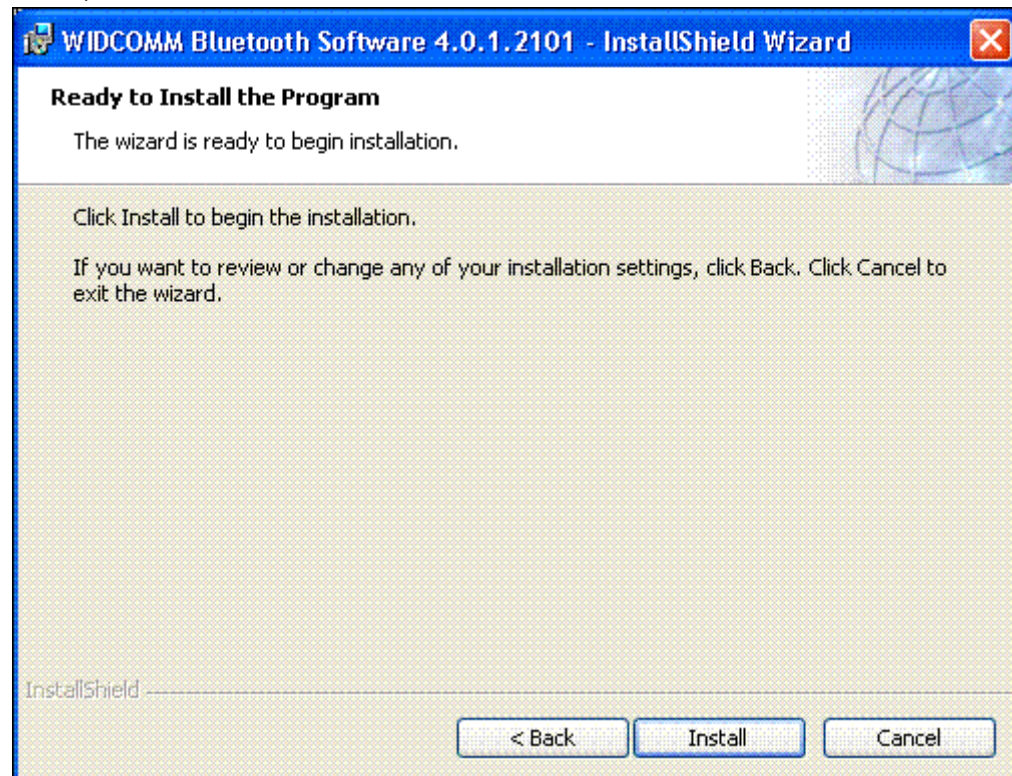


4. Specify the destination folder in your local system, which you want the software install to.

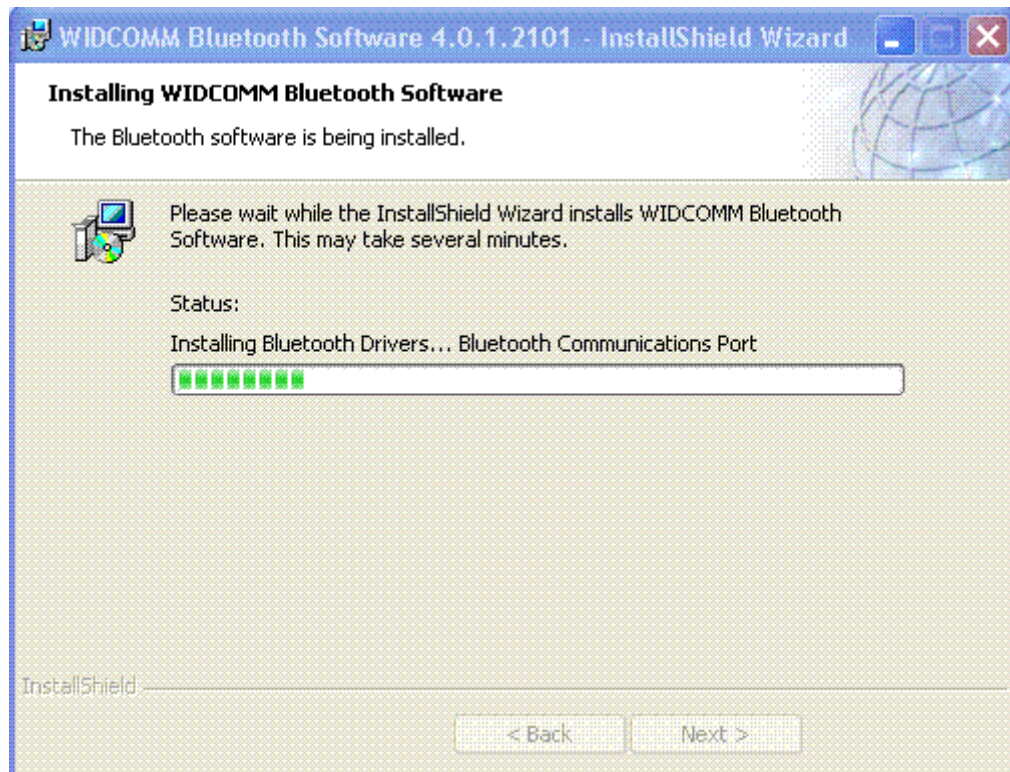
You may use the default folder or click “**Change**” to install to different folder, then click “**Next**” :



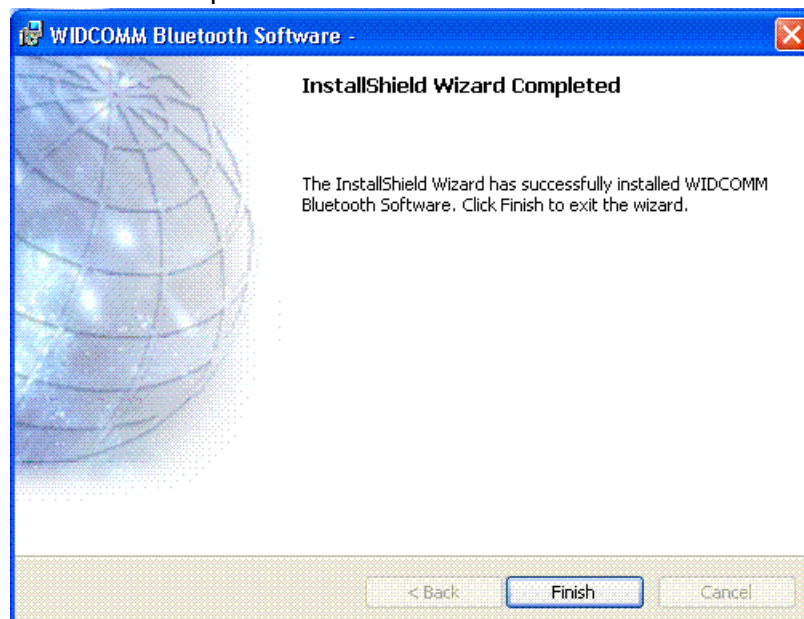
5. The dialog “**Ready to install the program**” shows. Make sure the driver software is ready to be installed, click “**Install**” :



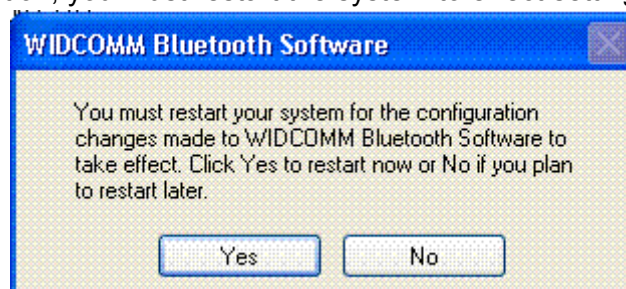
6. Windows shows the dialog as below indicate the driver software in installing :



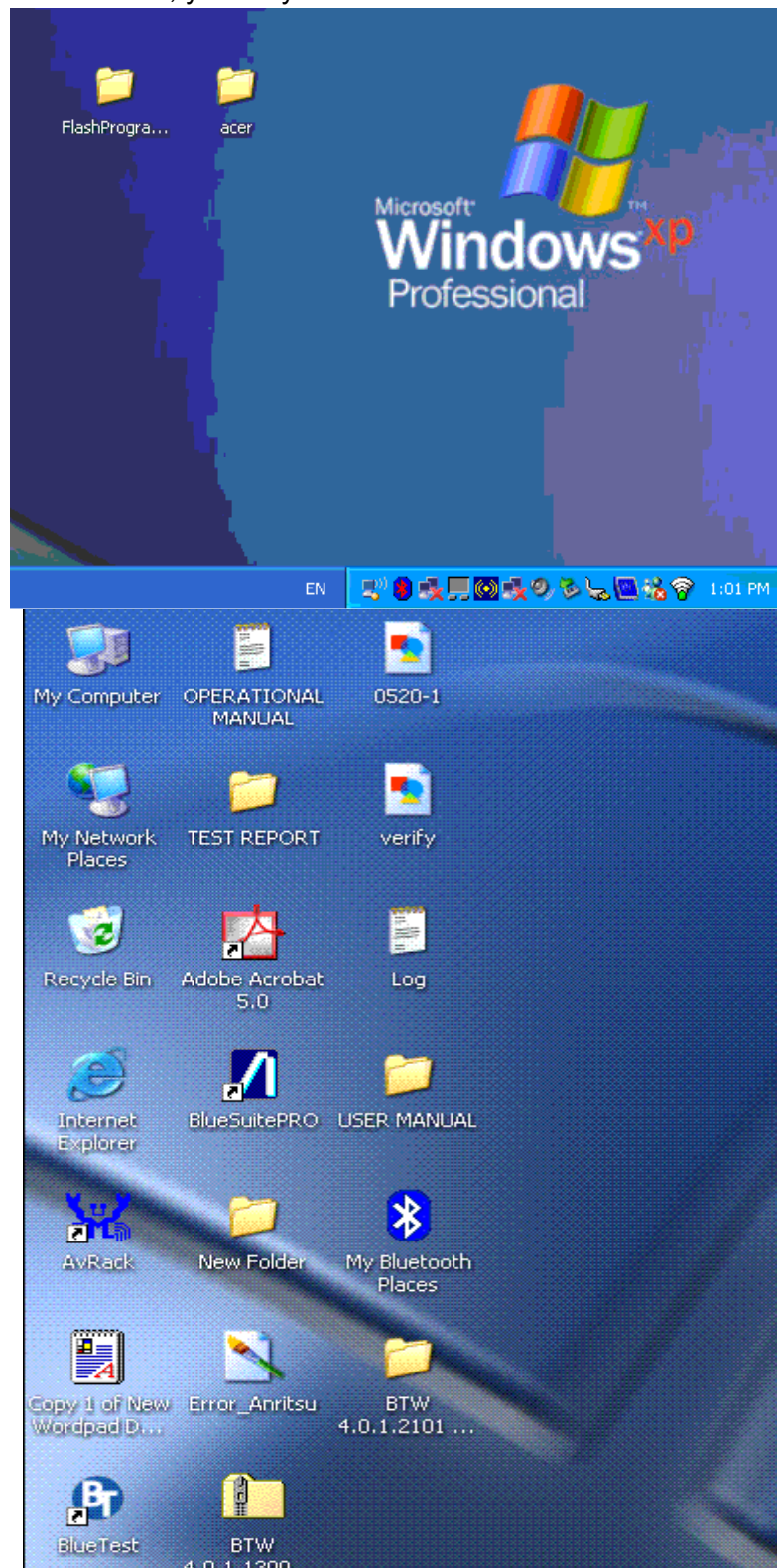
7. Click **“Finish”** to exit the setup wizard :



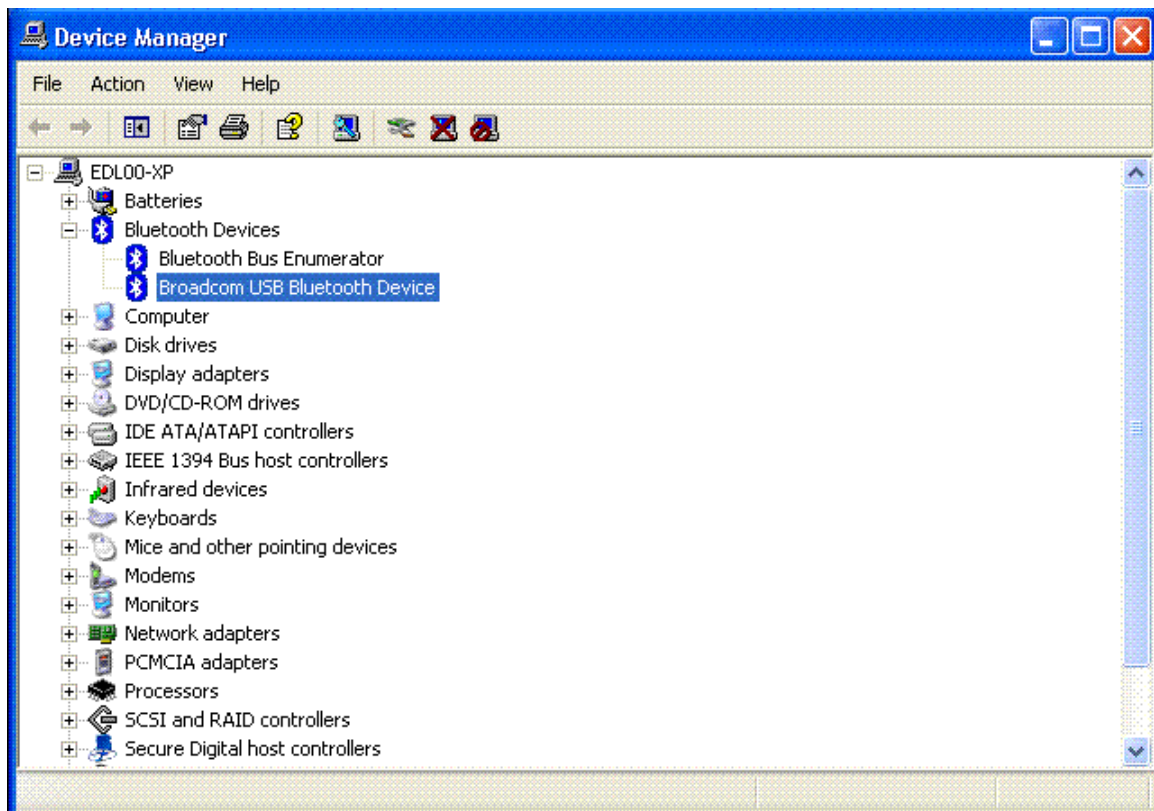
8. Finished the installation, you must restart the system to effect settings, click **“Yes”** :



9. After starting the Windows, you may check the Bluetooth Icon has show in your system :



10. you could open the Windows “**Device Manage**” and check the Bluetooth device is running :



■ Section Three: FCC Notice

3.1 FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio 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 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/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

HON HAI PRECISION IND. CO., LTD. declared that J07H081 is limited in CH0~78 from 2402 to 2480 MHz by specified firmware controlled in USA.

This device is intended only for OEM integrators under the following conditions:

The antenna must be installed such that 20 cm is maintained between the antenna and users, and
The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: MCLJ07H081".

Manual Information That Must be Included

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 users manual of the end product which integrate this module.

The users manual for OEM integrators must include the following information in a prominent location
"IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna 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.

Industry Canada Statement

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

Appendix

Frequency Range of a Bluetooth Device

Hereby we declare that the maximum frequency range of this device is : 2402 – 2480 MHz. This is according to the Bluetooth Core Specification V 1.1 for devices which will be operated in the USA. Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according to the Core Specification are **not** supported by this device.

Co-ordination of the Hopping Sequence in Data Mode to Avoid Simultaneous Occupancy by Multiple Transmitters

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consists of maximum of 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for every Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

Example of a hopping sequence in data mode

Example of a 79 hopping sequence in data mode:

40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04.

Equally Average Use of Frequencies in Data Mode and Behaviour for Short Transmissions

The generation of the hopping sequence in connection mode depends essentially on two input values :

1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 bit BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 bit BD_ADDRESS. The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units, only offset values are added to this clock. It has no relation to the time of day. Its resolution is at least half RX/TX slot length of 312.5 μ s. The clock has a cycle of about one day (23h30). For the deriving of the hopping sequence the entire LAP (24bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding shorts transmissions the Bluetooth system has the following behaviours: The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 μ s). The hopping sequence will always differ from the first one.

Receiver Input Bandwidth and Behaviour for Repeated Single or Multiple Packets

The input bandwidth of the receiver is 1 MHz.

In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be sent on the same frequency, it is sent on the next frequency of the hopping sequence.

Channel Separation in Hybrid Mode

As mentioned before, the nominal channel spacing of the Bluetooth system is 1 MHz independent of the operating mode. In other words, the channel spacing in hybrid mode (inquiry and page mode) is still 1 MHz without any change.

Derivation and Examples for a Hopping Sequence in Hybrid Mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used, but this time with different input vectors:

For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.

For the page hop sequence, the device address of the paged unit is used as input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies. So it is also ensured that in hybrid mode the frequency use equally averaged.

Example of a hopping sequence in inquiry mode :

48, 50, 09, 13, 52, 54, 41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode :

08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, a special access code, derived from the BD_ADDRESS of the paged device will be sent by the master in this connection. Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced considerably.

Receiver Input Bandwidth and Synchronization in Hybrid Mode :

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code, the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new