

**Model: IW06**

# **User Guide**

**Version 2.0.6.2**

**2016-10-29**

## **User Guide for the IW06**

Version 2.0.6.1

Firmware version 2.0.X

Printed in Korea

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### **Notice to Users**

When a system failure may cause serious consequences, protecting life and property against such consequences with a backup system or safety device is essential. The user agrees that protection against consequences resulting from system failure is the user's responsibility.

This device is not approved for life-support or medical systems.

Changes or modifications to this device not explicitly approved by Sena Technologies will void the user's authority to operate this device.

### **Precautions and Safety**

#### **Electricity**

Use only the supplied AC adapter. Use of unauthorized power adapter is not recommended. Electrical shock may result.

Do not kink or crease the power cable or place heavy objects on the power cable. Fire can result from damaged power cables.

Do not handle power plug and adapter with wet hands. Electrical shock may result.

Immediately power off the product and unplug the AC adapter if smoke or odors emit from the product and adapter. Fire can result from improper use.

Immediately power off the product and unplug the AC adapter if water or other liquids are present. Fire can result from improper use.

#### **Product**

IW06 meets the RS-232 standards. Do not wire with non-standard products. Damage to your products may result from improper use.

Do not drop or subject the device to impact. Damage to your products may result from improper use.

Keep away from harsh environments including humid, dusty, and smoky areas. Damage to your products may result from improper use.

Do not use excessive force on the buttons or attempt to disassemble the device. Damage to your products may result from improper use.

Do not place heavy objects on the product. Damage to your products may result from improper use.

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# Revision History

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|----------|------------|---------|------------------------------------------------------------|
| V1.0.0   | 2009-09-29 | Yh Moon | Initial Revision History                                   |
| V2.0.0   | 2009-11-19 | Yh Moon | Multiple connection mode                                   |
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| V2.0.3   | 2010-09-03 | Yh Moon | Update Table 3-3                                           |
| V2.0.4   | 2011-01-31 | Jh Park | Add remote configuration                                   |
| V2.0.4.1 | 2011-12-26 | HR Zo   | Package does not contain CD-ROM                            |
| V2.0.5   | 2012-01-18 | Jh Park | Modify contents about page timeout and node switching mode |
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| V2.0.6.1 | 2015-09-10 | TM Kim  | Change the website address                                 |

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# 1. Introduction

## 1.1. Overview

IW06 is a module device for wireless serial communication using Bluetooth technology that is international a standard for short range wireless communications. IW06 can communicate with other Bluetooth devices that support the Serial Port Profile.

The working distance of IW06 with default antenna is 100m. The IW06 delivers better quality of communication than a standard RS232 cables.

IW06 has a compact design and can be placed conveniently into devices or equipment. Its detachable antenna optimizes the quality and distance for wireless communications.

IW06 supports FHSS (Frequency Hopping Spread Spectrum), which is a technique, native to Bluetooth that allows the IW06 minimize radio interference while decreasing the likelihood of over-air hijacking. IW06 also supports authentication and Bluetooth data encryption.

IW06 can be configured and controlled by typical AT commands. Users can easily configure IW06 by using a terminal program such as HyperTerminal and can use Bluetooth wireless communication without modifying user's existing serial communication program. In addition to the basic AT commands, IW06 provides some expanded AT commands for various functions. User friendly ParaniWizard and ParaniWIN are also provided for easy setup on Microsoft Windows.

## 1.2. Package Check List

### 1.2.1. Single/Bulk Unit Package

- IW06
  - IW06 Module (on-board chip antenna)
- IW06
  - IW06 Module
  - Stub Antenna
  - Antenna extension cable

### 1.2.2. Starter Kit

- Development board
- Serial data cable
- DC Power Adapter
- A hardcopy of Quick Start Guide

### 1.3. Product Specification

|                            | IW06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------|---------------------|------------|---------------------|---|-----------------------|------------|-----------------------|---|-----------------------|------------|-----------------------|---|------------------------|------------|-----------------------|---|-----------------------|
| <b>Serial Interface</b>    | Serial UART speed up to 921.6kbps<br>CTS/RTS flow control, DTR/DSR for loop-back & full transfer                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | 2.54mm Pin Header 2X6 (12pin)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Bluetooth Interface</b> | Bluetooth v2.0 + EDR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | Profile: Serial Port Profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | Class 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | Working distance:<br>- IW06:<br>Nominal 100m<br>- IW06:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | <table border="0"> <tr> <td>Ant (AN2400-3306RS)</td> <td>-</td> <td>Ant (AN2400-3306RS)</td> <td>100 meters</td> </tr> <tr> <td>Ant (AN2400-3306RS)</td> <td>-</td> <td>Ant (R-AN2400-5801RS)</td> <td>150 meters</td> </tr> <tr> <td>Ant (R-AN2400-5801RS)</td> <td>-</td> <td>Ant (R-AN2400-5801RS)</td> <td>200 meters</td> </tr> <tr> <td>Ant (R-AN2400-5801RS)</td> <td>-</td> <td>Ant ( R-AN2400-1901RS)</td> <td>300 meters</td> </tr> <tr> <td>Ant (R-AN2400-1901RS)</td> <td>-</td> <td>Ant (R-AN2400-1901RS)</td> <td>400 meters</td> </tr> </table> | Ant (AN2400-3306RS)    | -          | Ant (AN2400-3306RS) | 100 meters | Ant (AN2400-3306RS) | - | Ant (R-AN2400-5801RS) | 150 meters | Ant (R-AN2400-5801RS) | - | Ant (R-AN2400-5801RS) | 200 meters | Ant (R-AN2400-5801RS) | - | Ant ( R-AN2400-1901RS) | 300 meters | Ant (R-AN2400-1901RS) | - | Ant (R-AN2400-1901RS) |
| Ant (AN2400-3306RS)        | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant (AN2400-3306RS)    | 100 meters |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| Ant (AN2400-3306RS)        | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant (R-AN2400-5801RS)  | 150 meters |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| Ant (R-AN2400-5801RS)      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant (R-AN2400-5801RS)  | 200 meters |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| Ant (R-AN2400-5801RS)      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant ( R-AN2400-1901RS) | 300 meters |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| Ant (R-AN2400-1901RS)      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant (R-AN2400-1901RS)  | 400 meters |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Configuration</b>       | ParaniWIN, ParaniWizard, Modem AT command set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Firmware Update</b>     | ParaniUpdater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Power</b>               | Supply voltage: 3.3V DC<br>Supply current::10mA – 60mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Environmental</b>       | Operating temperature: -30 ~ 80 °C<br>Storage temperature: -40 ~ 85 °C<br>Humidity : 90% (Non-condensing)                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Physical properties</b> | IW06 Dimension<br>27.5 mm L (1.08 in )<br>30.0 mm W (1.18 in )<br>14.0 mm H (0.55 in )                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
|                            | Weight<br>6 g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Approvals</b>           | FCC, CE, KCC, TELEC, SIG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |
| <b>Warranty</b>            | 1-year limited warranty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |            |                     |            |                     |   |                       |            |                       |   |                       |            |                       |   |                        |            |                       |   |                       |



**Note \*** :

**Bluetooth v2.0 supports improved AFH function. AFH function is to mitigate the interference between WiFi and Bluetooth radios by automatically avoiding the active WiFi channel from Bluetooth link. However, AFH does not provide a complete solution making WiFi and Bluetooth work together in harmony. It is highly recommended for users to test their wireless system enough before deployment since the overall system performance is affected by various environmental factors such as distance between them.**



## 2. Getting Started

This chapter describes how to set up the IW06 for the first time.

- 2.1 Panel Layout explains the panel layout.
- 2.2 Connecting the Hardware describes how to connect the IW06, the power, and the serial device to the Jig Board.

Following items are pre-required to get started.

- One Jig Board (included in the Starter Kit package).
- One DC power adapter or one USB power cable (included in the Starter Kit package).
- One serial console cable for configuration (included in the Starter Kit package).
- One PC with RS232 serial port.
- Terminal emulation program running on the PC

### 2.1. Panel Layout

This section describes the panel layout of the Development Board.

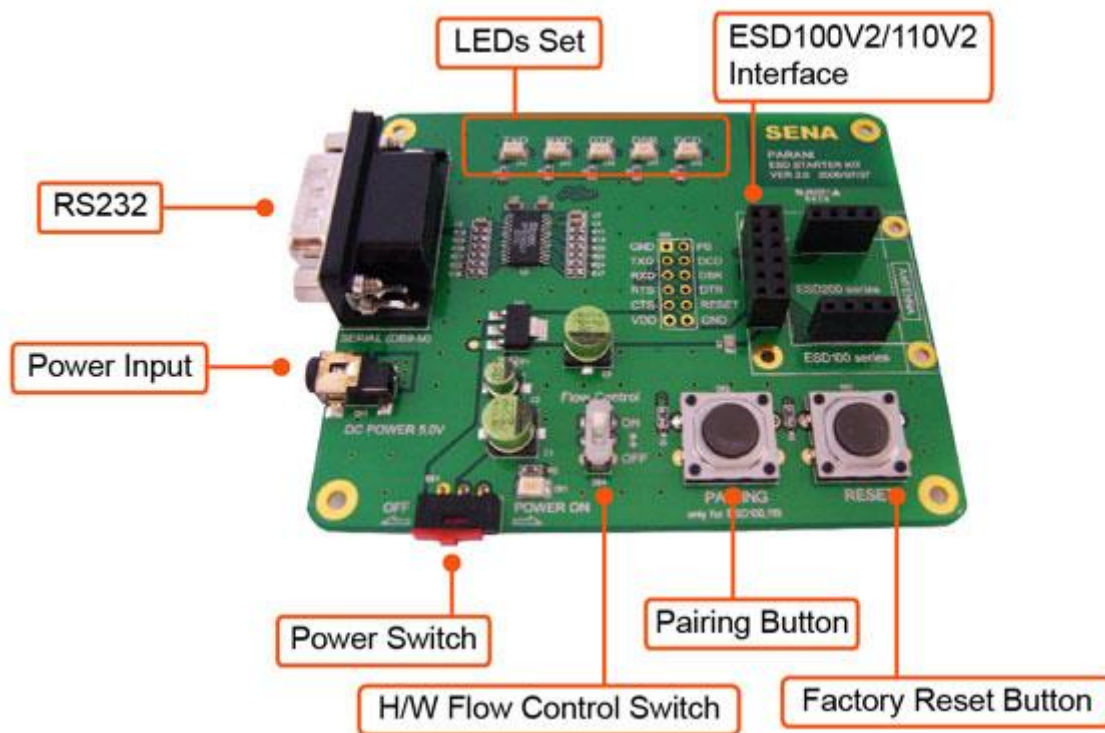


Figure 2-1 The Panel Layout of Development Board

### 2.2. Connecting the Hardware

This section describes how to connect the IW06 to the Development Board and the Development Board to the serial device for initial testing.

- Connect the IW06 to the Development Board.
- Connect a power source to the Development Board for the IW06.
- Connect the Development Board for the IW06 to a serial device.

### 2.2.1. Connecting IW06 to Development Board

Connect the IW06 to the Development Board as shown below.

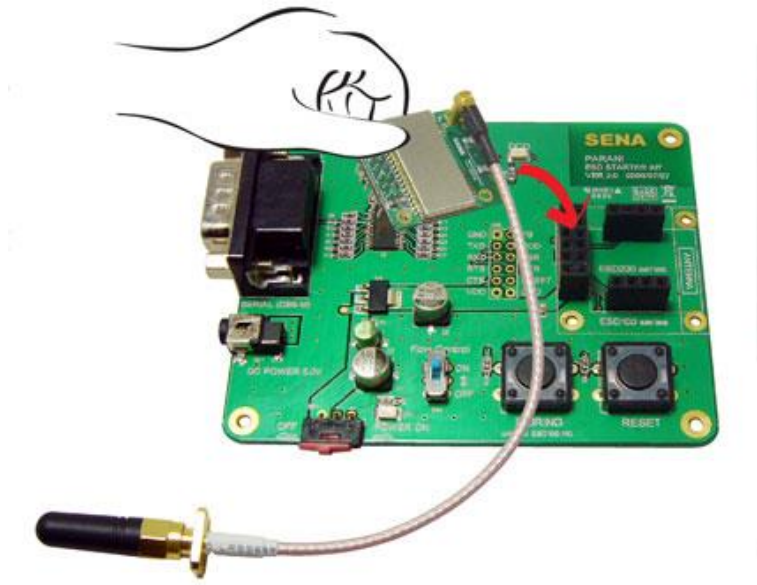


Figure 2-2 Connecting IW06 to Development Board

### 2.2.2. Connecting Power to Development Board

Connect the power plug to the power connector of the Development Board for the IW06 using the DC power adapter or USB power cable that is included in the package.

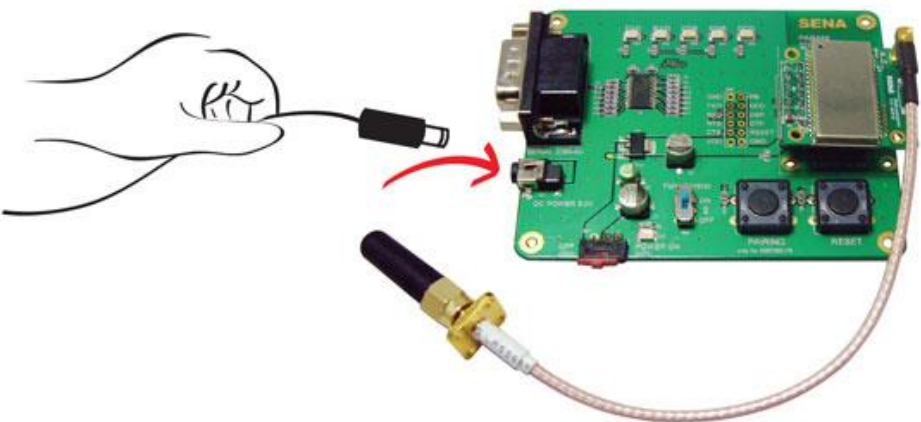


Figure 2-3 Connecting Power to Development Board

### 2.2.3. Connecting a Device to Development Board

Connect the serial data cable between the Development Board and the serial device. If necessary, supply power to the serial device attached to the Development Board.

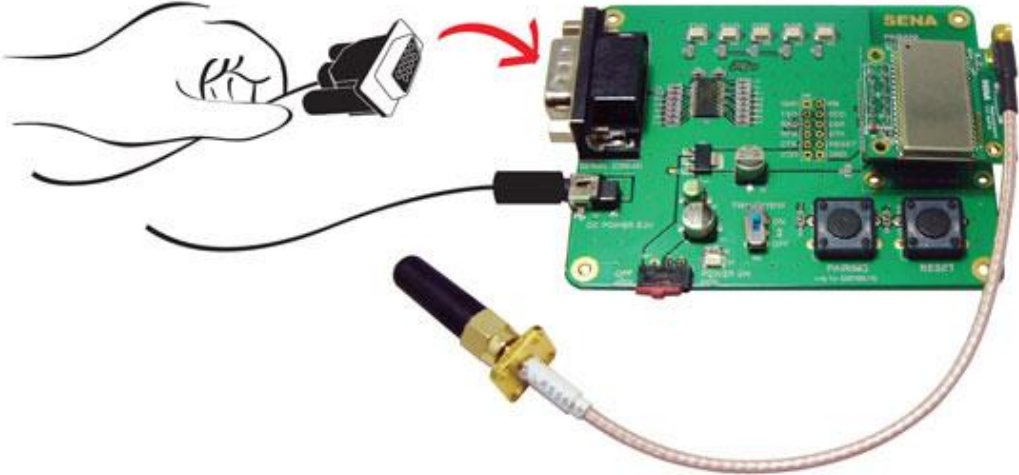


Figure 2-4 Connecting a Device to Development Board

## 3. Configuration

### 3.1. Operation Modes

In addition to the serial port configurations, the IW06 requires also includes some settings for Bluetooth. For getting the most out of IW06, user should understand the following Bluetooth connection schemes.

A Bluetooth device can play a role as a master or slave. Master tries to connect itself to other Bluetooth devices, and slave is waiting to be connected from other Bluetooth devices. A Bluetooth connection is always made by a pair of master and slave devices. A slave can be in two modes, Inquiry Scan or Page Scan mode. Inquiry Scan mode is waiting for a packet of inquiry from other Bluetooth device and Page Scan mode is waiting for a packet of connection from other Bluetooth device. Every Bluetooth device has its unique address, called BD (Bluetooth Device) address, which is composed of 12 hexa-decimal numbers.

IW06 has 4 operation modes as follows:

*Table 3-1 The IW06 Operation Modes*

| <b>Mode</b>  | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mode0</b> | <p>In this mode, there is no response when power on or software reset, and IW06 is just waiting for AT command input. Neither master nor slave is assigned to IW06 in mode0. User can change the configuration parameters of IW06 in this mode.</p> <p>IW06 must be in Mode0, when it is directly controlled by AT commands.</p> <p>The factory default is set to Mode0.</p>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Mode1</b> | <p>IW06 tries to connect the last connected Bluetooth device.</p> <p>IW06 in Mode1 is to be a master and tries to connect the last connected Bluetooth device. IW06 always stores the BD address of the Bluetooth device to which IW06 has connected last. When IW06 is initially used or after hardware reset, there is no BD address stored in IW06. In this case, Mode1 will not be able to work properly. The mode change to Mode1 can be made after IW06 succeeds to connect to one other Bluetooth device. Once changed to Mode1, IW06 will try to connect automatically the last connected Bluetooth device whenever the unit is powered on or software reset.</p> <p>IW06 in Mode1 cannot be discovered or connected by other Bluetooth devices.</p> |
| <b>Mode2</b> | <p>IW06 is waits for a connection from the last connected Bluetooth device.</p> <p>IW06 in Mode2 is to be a slave and waiting for the connection only from the last connected Bluetooth device. Just like Mode1, if there is no BD address stored in IW06, the mode change from other operation modes to Mode2 is not work properly. Once changed to Mode2, IW06 will wait for the connection from the last connected Bluetooth device whenever the unit is powered on or software reset.</p> <p>IW06 in Mode2 cannot be discovered or connected to Bluetooth devices other than the last connected device.</p>                                                                                                                                              |
| <b>Mode3</b> | <p>IW06 is waiting for the connection from any other Bluetooth devices. In Mode 3 the IW06 is discoverable and can be connected to by other Bluetooth devices.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 3.2. Serial Ports

The applicable settings for serial ports are as follows.

Table 3-2 The IW06 Serial Port Settings

| Serial Port Settings  | Values                                                                                                                                            |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Baud rate             | 1200, 2400, 4800, <span style="border: 1px solid black; padding: 0 2px;">9600</span> , 14400, 19200, 38400, 57600, 115200, 230400, 460800, 921600 |
| Data bite             | <span style="border: 1px solid black; padding: 0 2px;">8</span>                                                                                   |
| Parity                | <span style="border: 1px solid black; padding: 0 2px;">No parity</span> , Even parity, Odd parity                                                 |
| Stop bit              | <span style="border: 1px solid black; padding: 0 2px;">1</span> , 2                                                                               |
| Hardware Flow Control | <span style="border: 1px solid black; padding: 0 2px;">Use</span> , No Use                                                                        |

The values in box are the factory default settings.

## 3.3. Data Bit

IW06 supports only 8 data bit. In the case of 7 data bit and even/odd parity, use IW06 8 data bit and none parity. At this time, master and slave are Parani-SD, IW06 or Parani-MSP1000 series. But 7 data bit and none parity is not support.

## 3.4. Hardware Flow Control

IW06 plugged into its host system transmits data from host to the other side Bluetooth device. This data is saved temporarily in the internal buffer of IW06 and sent repeatedly until the transmission is completed packet by packet. When the radio transmission condition is not good enough to send data promptly, it can cause a transmission delay. If the host sends more data when the buffer is full, buffer overflow will make IW06 malfunction consequently. In order to prevent this buffer overflow, IW06 works as follows.

When using hardware flow control, IW06 disables RTS so that it stops receiving any further data from the host when the buffer becomes full. RTS will be re-enabled again to begin receiving data from the host when the buffer has created more room for more data.

When hardware flow control is not being used, the IW06 clears the buffer to secure room for the next data when the buffer becomes full. This can mean a loss of data may occur. As the transmission data becomes large, the possibility of data loss becomes greater.

For large data transmissions, the use of hardware flow control is highly recommended. (Not support flow control in Multi-Drop Mode.)

## 3.5. Remote Configuration

Parani-SD1000 supports remote configuration. After connecting to the Parani-SD1000 through Bluetooth, before sending any other character, send three escape character (default :+). Then, the Parani-SD1000 will enter remote configuration mode and print "Please Enter Password". You have to enter the password with "AT+PASS" command within 2 minutes. After the password authentication, you are able to enter any at command except "ATH", "ATO", "ATD", "AT+BTSCAN", "AT+BTINQ?" and "AT+BTCANCEL". The default password is "0000" and it is configurable with "AT+CHPASS" command.

Example of remote configuration mode.

```
CONNECT 000195000001
+++
Please Enter Password
AT+PASS=0000
Remote Configuration Enabled
AT+BTINFO?
000195000001,SD1000v2.0.3-095515,MODE0,CONNECT,0,0,HWFC
```

### 3.6. Software and Utility

This configuration software and utility for firmware update is included with the product, which also can be downloaded from <http://www.senaindustrial.com>

Table 3-3 Configuration Software

| Software          | Purpose               | Operating System          |
|-------------------|-----------------------|---------------------------|
| ParaniWIN         | Configuration         | MS Windows 98SE or Higher |
| ParaniWizard      | Pairing Configuration | MS Windows 98SE or Higher |
| ParaniMultiWizard | Multi Configuration   | MS Windows 98SE or Higher |
| ParaniUpdater     | Firmware Update       | MS Windows 98SE or Higher |

### 3.7. ParaniWIN

ParaniWIN is a program that runs on Microsoft Windows for the configuration of IW06. Install ParaniWIN on your computer. Plug a IW06 into the serial port of the computer and turn on the power. Run ParaniWIN.

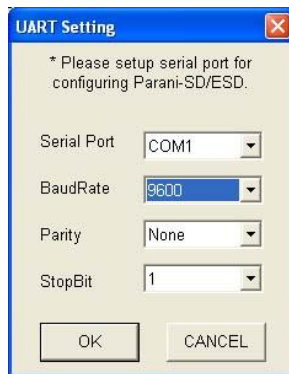


Figure 3-1 Serial Port Setting

Set each option properly and click [Confirm]. If the settings of the IW06 are different from the ParaniWin, an error message will pop up. If the IW06 is in the status of connection, warning message will pop up. Then the current connection can be cancelled by [Disconnect] button on the main window.

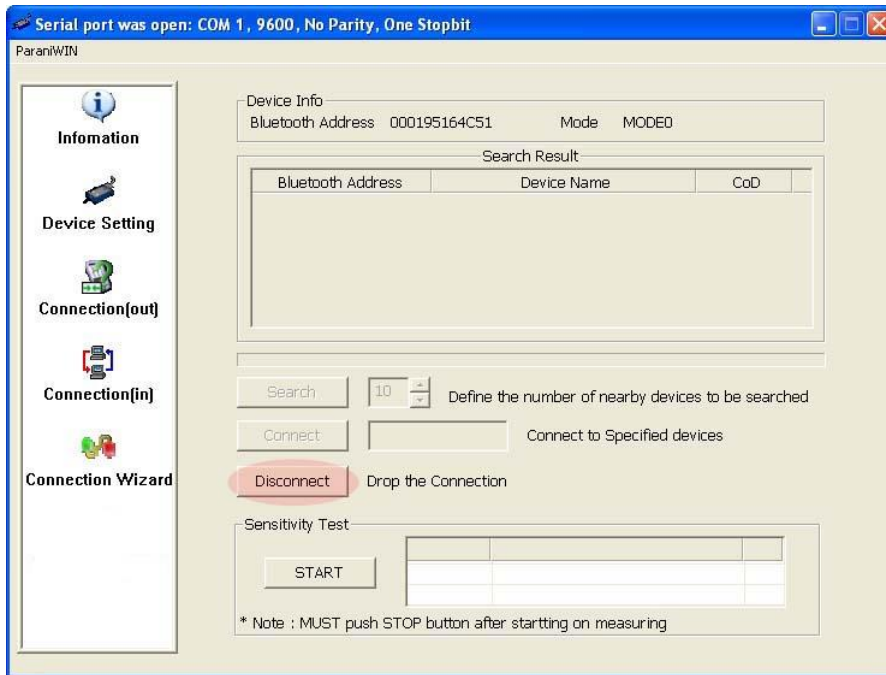


Figure 3-2 Main Window

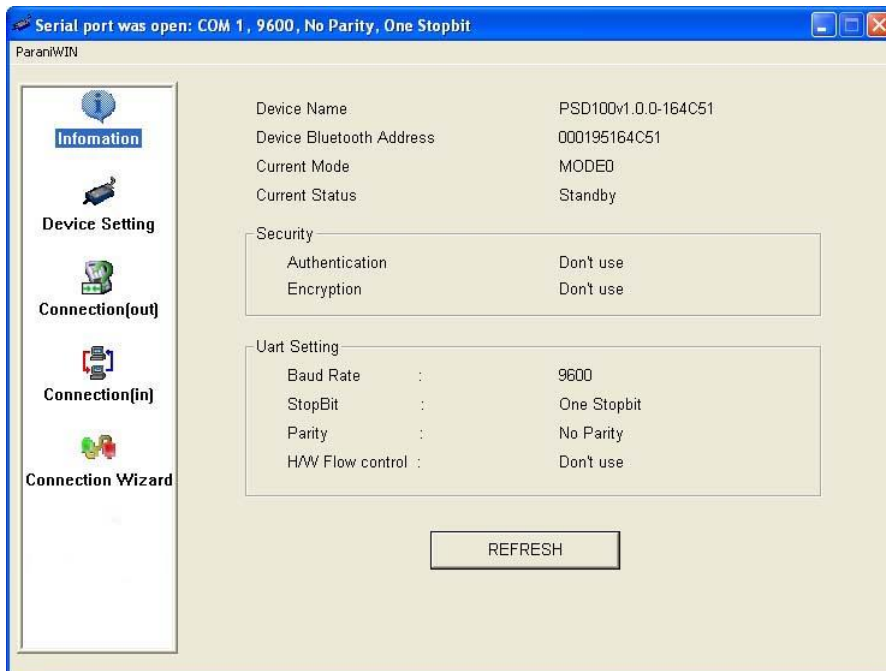


Figure 3-3 Information Window

Serial port settings can be changed by <Start Configuration> and <ParaniWIN Configuration> of ParaniWIN in the menu bar at upper left corner of the window without re-running the ParaniWIN program.



Figure 3-4 Menu Bar at Upper Left corner of ParaniWIN

When the ParaniWin software is able to access the IW06 properly, the icons in the left side window come will become available for use.

In device configuration window, hardware reset can be executed or operation mode and RS232 can be configured as well. Security option also can be configured in this window.

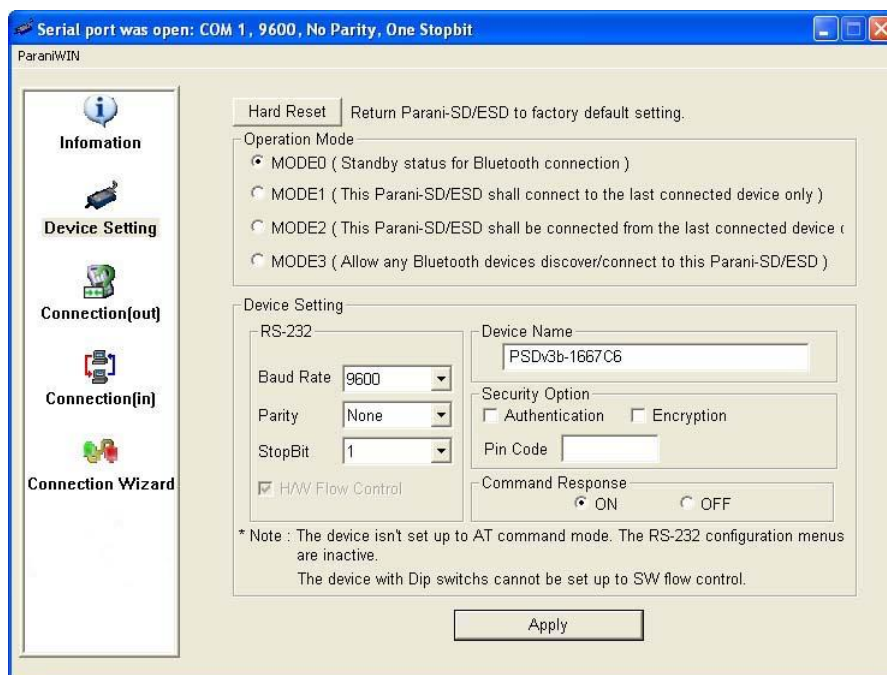


Figure 3-5 Device Setting Window

IW06 supports two security options, Authentication and Encryption. If you check the Authentication option, you must also enter the Pin Code value. If the authentication is activated, the connection, only between the Master and Slave device that share the same Pin Code, is established. IW06 supports two security options, Authentication and Encryption. If you enable the Authentication option, you must



also enter a Pin Code value. If the authentication is enabled, the connection, between the Master and Slave device must share the same Pin Code. In case that IW06 connects to another Bluetooth device, that requires authentication, you must know the other device's Pin Code. In general, most Bluetooth devices have a pincode of 1234 or 0000. If you check Encryption option, the IW06 will encrypt packets and sent to the device. The Encryption options works well in case that only one of the devices between Master and Slave use the Encryption option.

IW06 has 4 response messages, 'OK', 'ERROR', 'CONNECT', and 'DISCONNECT'. In some cases, these responses can affect the host system unexpectedly. To prevent this, user can set the Command response to ON or OFF.

Click [Apply] button to apply any changes made to the IW06.

Connection(out) icon will show the following window to search and connect other Bluetooth devices.

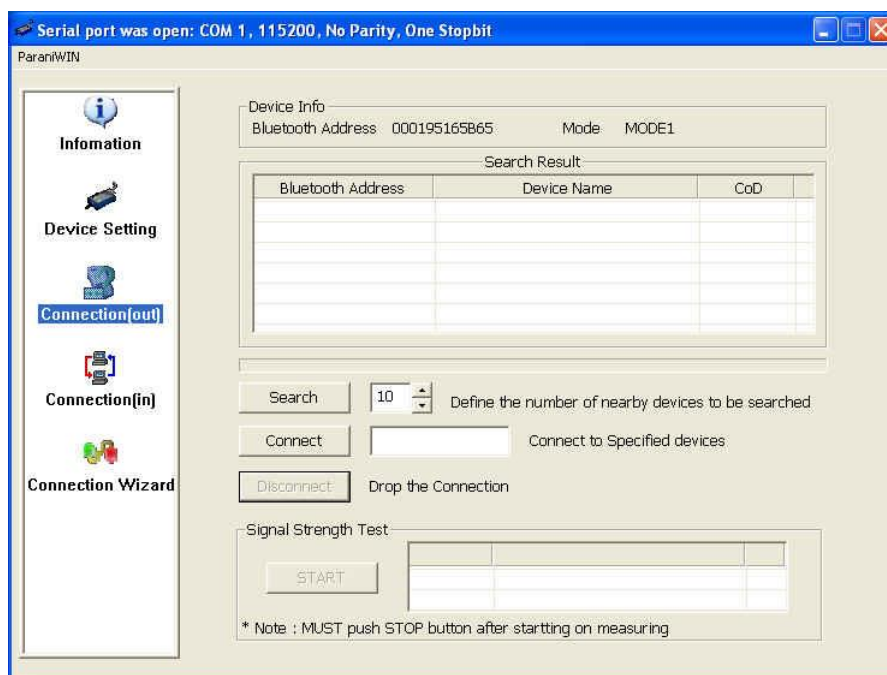
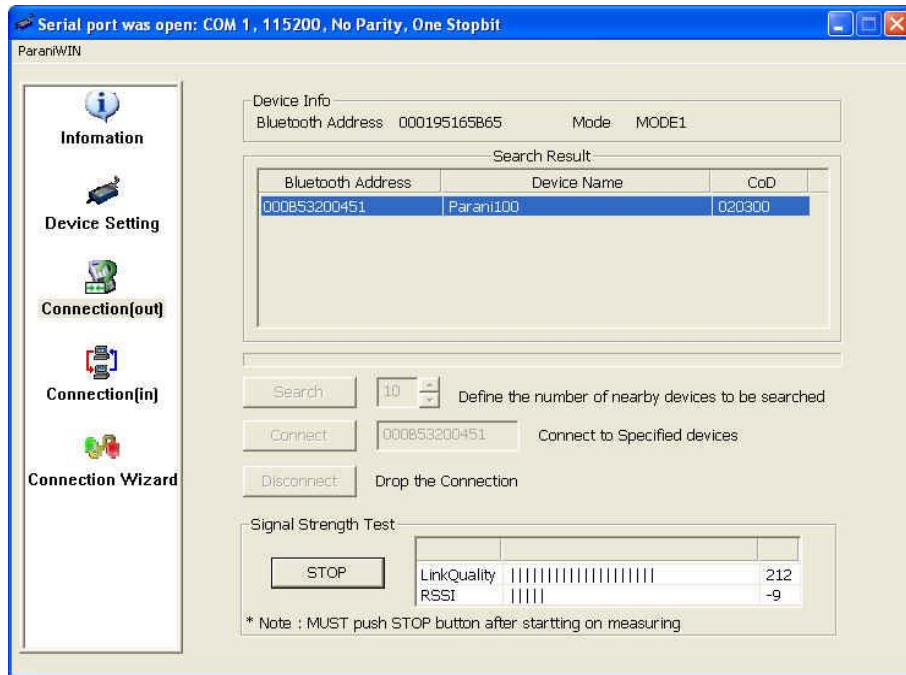


Figure 3-6 Connection(out) Window

Click [Search] button to search nearby Bluetooth devices. Once several Bluetooth devices has been found, select one of the devices and click the [Connect] button. The selected Bluetooth device must be discoverable and connectable. Click [Disconnect] button to cancel the connection.

After the connection has been established, you will be able to test signal strength by pushing the START button.



*Figure 3-7 Signal Strength Test*

The signal strength test shows LinkQuality and RSSI values. The closer LinkQuality is to 255 and RSSI is to 0, this means the IW06 has a good connection to the connected Bluetooth device. In general, the wireless connectivity is at its best within 10 meters. You can push the STOP button at anytime in order to terminate the signal strength test. The signal strength test will continue until the STOP button is pushed. If you close the ParaniWIN Window without pushing the STOP button, you must restart IW06 to terminate the test.

Connection(in) icon will show the following window, which enables the IW06 to wait for a connection from another Bluetooth device. If the waiting time is set to 0, IW06 will continually wait for connection until [Cancel] button is clicked.

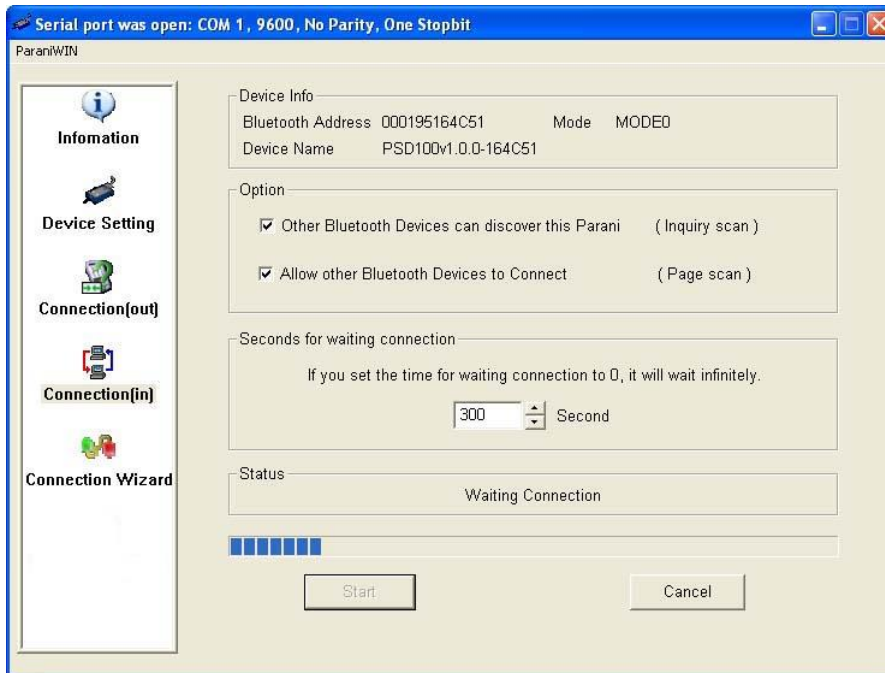


Figure 3-8 Connection(in) Window

If the Connection Wizard icon is clicked, an easy to use pairing menu will appear:

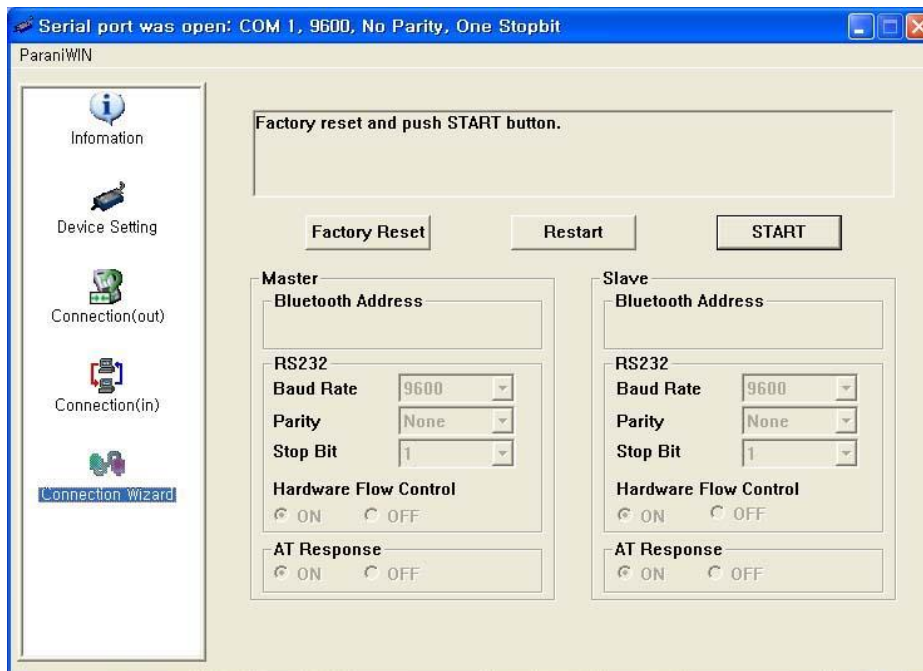


Figure 3-9 Connection Wizard Window

In this example we will refer to the two IW06s as ESD1 and ESD2 respectively. To use this menu, please do the following:

- Step 1.** Connect ESD1 and then push the START button.
- Step 2.** Disconnect ESD1, connect ESD2 and then push the Next button after setting up Slave configuration.
- Step 3.** Disconnect ESD2, once again connect the ESD1 and then push the Finish button. The pairing

configuration should be completed. Make sure that each IW06's connect LED is on. At this point, when both IW06's are restarted the connection will be established automatically.

### 3.8. ParaniWizard

ParaniWizard is a Wizard program that will allow you to configure a pair of IW06's for an automatic connection. To make connection with Bluetooth devices other than IW06, use ParaniWIN or AT commands on a terminal program.

In this example, we will refer to the two IW06's as ESD1 and ESD2 respectively.

Install and run ParaniWizard.



Figure 3-10 ParaniWizard Step 1

Plug ESD1 into the serial port of the host computer and power on the unit. Click [Wizard Setting] button to configure the serial port settings of ESD1. These settings must be the same as those of the host system, to which ESD1 will be used. Click [Next].



Figure 3-11 ParaniWizard Step 2

Click [Next] with after selecting the check box, which makes the unit discoverable, in which ESD1 can be discovered and connected from the other Bluetooth device.  
Remove ESD1 from the host computer, remember to leave the ESD1 powered on.  
Now, plug ESD2 into the serial port of the host computer and power on the unit.



Figure 3-12 ParaniWizard Step 3

Click [Wizard Setting] button to configure the serial settings of ESD2. These settings must be same as those of the host system, to which ESD2 will be used. Click [Next].

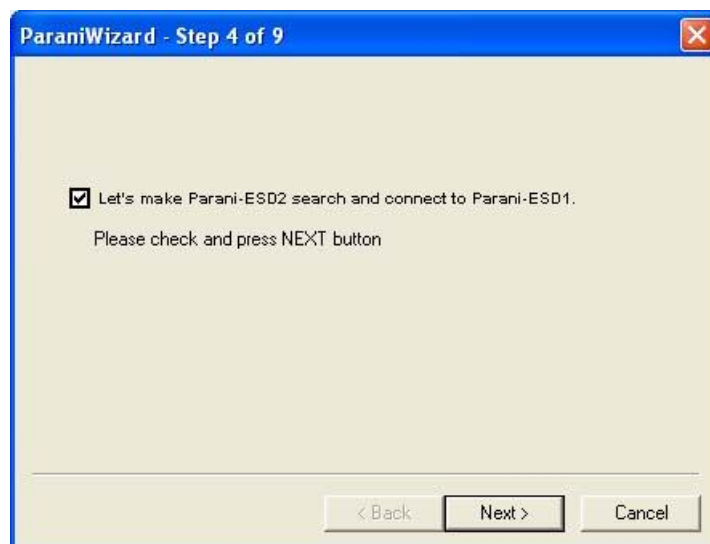


Figure 3-13 ParaniWizard Step 4

Click [Next] after selecting check box. ESD2 will then do a search nearby, and search for Bluetooth devices for 30 seconds. The program will show the Bluetooth devices with Device Address, Device Name and CoD (Class of Device).



Figure 3-14 ParaniWizard Step 5

Select the ESD1 from the list and click [Connect], then the following message box will be displayed.

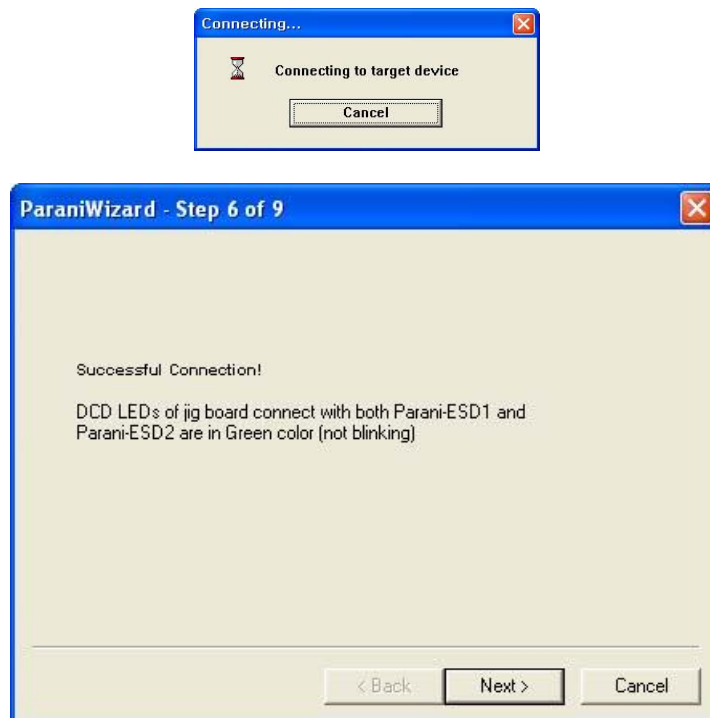


Figure 3-15 ParaniWizard Step 6

It may take about 5 seconds to complete the connection.

For the automatic connection to take place between ESD1 and ESD2, the proper operation mode of ESD1 and ESD2 have to be set.



Figure 3-16 ParaniWizard Step 7

Set the operation mode of ESD2 to Mode1.



Figure 3-17 ParaniWizard Step 8

Remove the ESD2 from the host computer and plug ESD1 into the serial port again. Set the operation mode of ESD1 to Mode2.



Figure 3-18 ParaniWizard Step 9

Now the configuration of ESD1 and ESD2 has been completed. Now when the units are turned off and then turned on again, they will make an automatic connection to each other.

### 3.9. Parani Multi Wizard

Parani Multi Wizard is the software tool for multiple connection mode configurations of the Parani-SD and IW06 products.

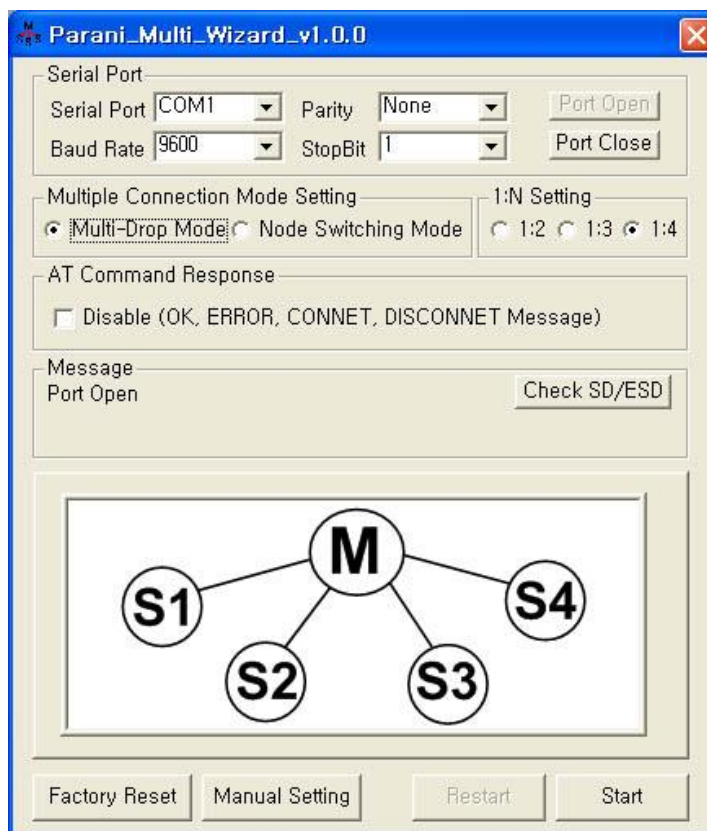


Figure 3-19 Parani Multi Wizard Window



Parani Multi Wizard supports the Wizard mode and the Manual mode. The Wizard mode provide the user step-by-step instructions for multiple mode configurations. To run the Wizard mode, select “Multiple connection mode setting” and “1:N setting”, press “Start” button and follow the instructions.

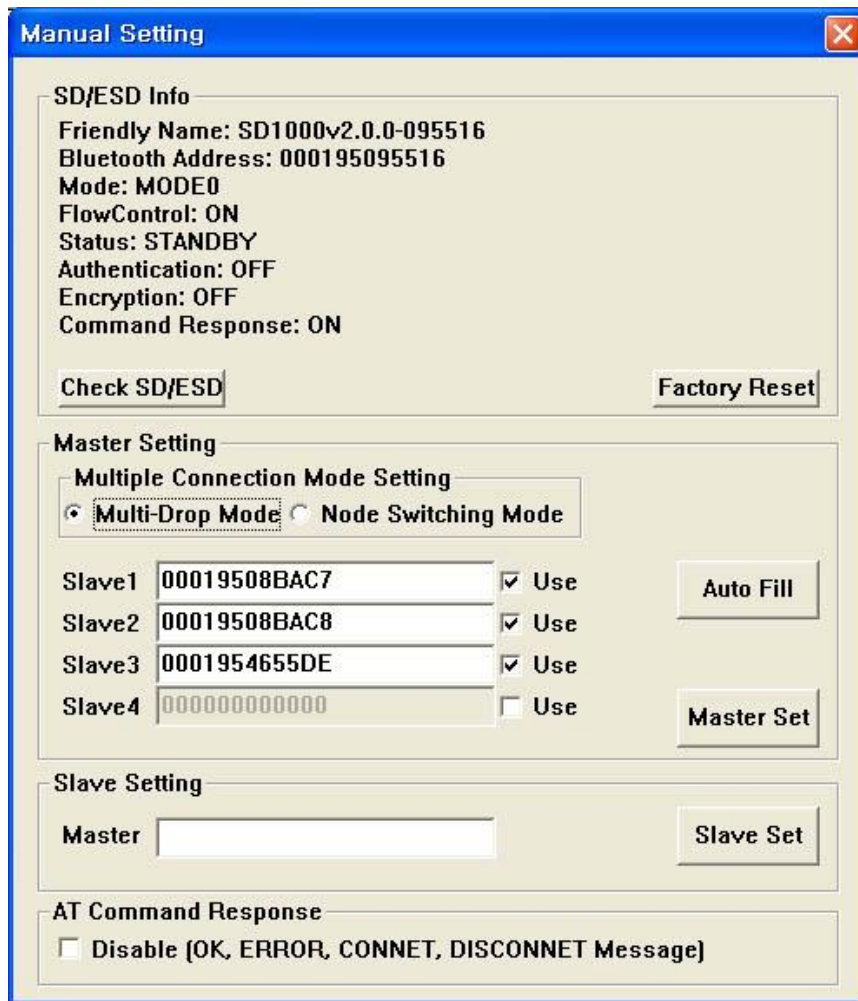


Figure 3-20 Manual Setting Window

In the Manual mode, all settings for the multiple connection mode can be configured in one window. If a Use field is unchecked or a slave address is entered as 000000000000, it is excluded from the Slave settings.

The Auto Fill button will load the existing multiple connection mode settings from the Parani-SD/ESD connected, which can be useful when only some parts of the settings are changed.

If the AT Command Response Disable check box is checked on, the AT command responses such as OK, ERROR, CONNECT, DISCONNECT are suppressed.

### 3.10. ParaniUpdater

IW06 supports firmware updates. You can download new firmware images for the IW06 at <http://www.senaindustrial.com>. With the ParaniUpdater, you can update the firmware of IW06 by selecting the firmware image file and pushing Start button.

\* Note: DO NOT power off IW06 while the firmware update is progressing, this may damage the IW06.

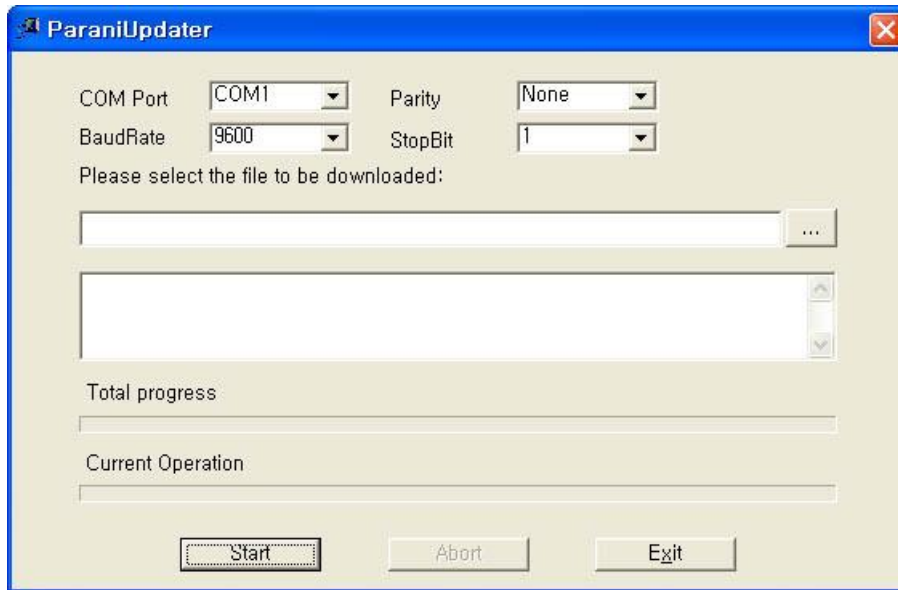


Figure 3-21 ParaniUpdater Window

### 3.11. Terminal Program

A terminal program is typically an application that will enable a PC to communicate directly with a modem. If you are using Windows 98SE or higher version of Windows, HyperTerminal program is included as part of the operating system. IW06 provides some extended AT commands for configuration of the IW06.

This manual will explain the method using HyperTerminal. If you need to install HyperTerminal, click start>setting>control panel>add/remove programs. For more precise details on HyperTerminal installations, please refer to Microsoft Windows Help section.

Attach IW06 to serial port of host computer and power on the unit.

Launch HyperTerminal. It can be found in start menu >programs >accessories >communication >HyperTerminal. Select the Serial port that IW06 will be connected to.

Input the same settings into Serial port configuration window as IW06 settings.

Select the Serial port setting in the window displayed, please make sure the serial settings in Hyperterminal are set to the same settings as the IW06's serial settings.

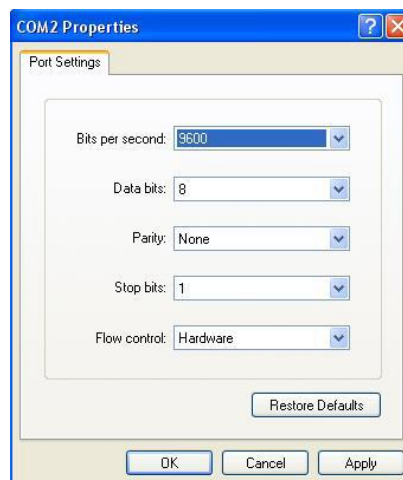


Figure 3-22 HyperTerminal

To view the AT commands that are being typed, you will need to enable the local echo option. Go to File->Properties->Settings->ASCII setup and select the "Echo typed characters locally" option. For expanded AT commands, please refer to Appendix A. AT commands.

Example of AT commands:

```
at
OK
at+btinfo?
000195000144,ESD100V3_v2.0.0-000144,MODE0,STANDBY,0,0,NoFC
OK
at+btinq?
000B5320070E,Promi-MSP_20070E,020300
0009DD500027,LEECOM,1E010C
OK
atd000b5320070e
OK
CONNECT 000B5320070E
```

# 4. Multiple Connection Mode

## 4.1. Overview

IW06 supports multiple connections up to 4 slave units. There are two types of multiple connection modes: Multi-Drop Mode and Node Switching Mode.

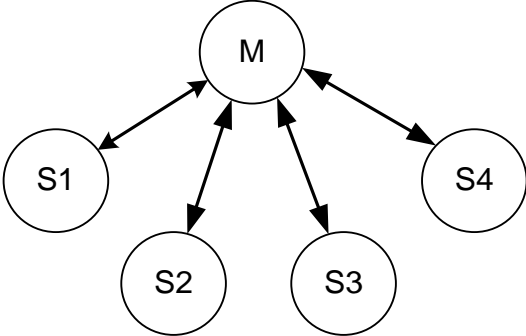


Figure 4-1 Multi-Drop Mode

In Multi-Drop Mode a master unit can connect to maximum 4 slave units at the same time and they transfer data bi-directionally as in Figure 4-1.

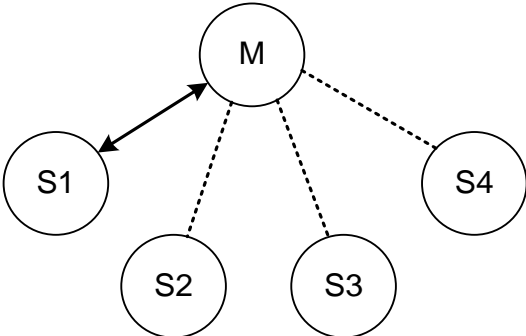


Figure 4-2 Node Switching Mode

In Node Switching Mode, the master unit maintains multiple connections with maximum 4 slave units but only one connection with one slave unit is active and data is transferred as shown in Figure 4-2. After connected to slave, master acts command mode. Active slave is selected by AT commands.

```
On communication after connecting
AT01 - Communicating with #1 Slave
+++
OK
AT0000195000003 - Communicating with slave of BD 000195000003
```

## 4.2. Configuration

All the slaves should be in the status of waiting for connection either in Mode 2 or Mode 3 and the master unit tries to connect to the slave units. The master unit needs to be configured to work in a multiple connection mode using AT+MULTI,x command, which makes master reboots after execution.

Table 4-1 AT+MULTI,x

|                   |                        |
|-------------------|------------------------|
| <b>AT+MULTI,0</b> | Single Connection Mode |
| <b>AT+MULTI,1</b> | Multi-Drop Mode        |
| <b>AT+MULTI,2</b> | Node Switching Mode    |

Table 4-2 Configuration of a Multiple Connection Mode

| Manual Connection                                   | Automatic Connection                                                                |
|-----------------------------------------------------|-------------------------------------------------------------------------------------|
| ATD000195000001<br>CONNECT000195000001<br>+++<br>OK | ATS46=000195000001<br>OK                                                            |
| ATD000195000002<br>CONNECT000195000002<br>+++<br>OK | ATS54=000195000002<br>OK                                                            |
| ATD000195000003<br>CONNECT000195000003<br>+++<br>OK | ATS55=000195000003<br>OK                                                            |
| ATD000195000004<br>CONNECT000195000004<br>+++<br>OK | ATS56=000195000004<br>OK                                                            |
|                                                     | AT+MULTI,1 or AT+MULTI,2<br>OK                                                      |
|                                                     | AT+BTMODE,1<br>After rebooted automatically<br>master tries to connect to<br>slaves |

After input the BD addresses of the slave units into 4 S-registers S46, S54, S55 and S56 and then set operation mode as MODE1, users can use multiple connection function. If S-registers have available slaves' address, AUTO CONNECT message will be displayed following corresponding TASK.

```
TASK1 OK - AUTO CONNECT
TASK2 OK
TASK3 OK - AUTO CONNECT
TASK4 OK
```

## 4.3. AT Commands

### 4.3.1. AT+MULTI,n

Select a multiple connection mode. Refer to Table 4-1 for descriptions.

### 4.3.2. AT+MLIST?

It shows the current mode, the connection status and the BD addresses of slaves.

```
at+mlist?  
  
CURRENT MODE: MULTI DROP  
  
TASK1 - 000195000001  
  
TASK2 - 000195000002  
  
TASK3 - DISCONNECT  
  
TASK4 - 000195000004  
  
OK
```

### 4.3.3. ATHx, ATHbdaddr

Using the ATH command, connections with all slaves or only connections with specific slaves can be disconnected selectively

Table 4-3 ATH

|                                      |                                                   |
|--------------------------------------|---------------------------------------------------|
| <b>ATH</b>                           | Disconnect all the slaves.                        |
| <b>ATHx (ATH1, ATH2, ATH3, ATH4)</b> | Disconnect the slave which belongs to the TASK x. |
| <b>ATHbdaddr (ATH000195000001)</b>   | Disconnect the slave with specified BD address.   |

### 4.3.4. ATOx, ATObdaddr

Using the ATO command, the communication status with the last active slave or a specific slave can be set to online (only in Node Switching Mode).

Table 4-4 ATO

|                                      |                                                         |
|--------------------------------------|---------------------------------------------------------|
| <b>ATO</b>                           | Communicate with the slave recently communicated.       |
| <b>ATOx (ATO1, ATO2, ATO3, ATO4)</b> | Communicate with the slave which belongs to the TASK x. |
| <b>ATObdaddr (ATO000195000001)</b>   | Communicate with the slave with specified BAddress.     |

## 4.4. Notes

When large data exchange occurs in Multi-drop mode without flow-control enabled, the master unit may experience data loss. It may also experience occasional disconnections and/or system rebooting especially when bi-directional communication happens. It is strongly recommended to perform extensive performance test before any real world field applications.

The master unit would try to connect all slave units specified by S-register 46, 54, 55 and 56. If non-existing or inactive slave addresses are entered in these S-registers, the overall performance will degrade due to frequent connection trials to non-existing/inactive slaves. It may also force disconnections for overall performance and outputs disconnect messages repeatedly.

Node-switching mode provides nearly equivalent performance as single connection mode. It is always recommended to use flow-control for both of Multi-Drop Mode and Node Switching Mode.

## 5. Approval Information

### 5.1. FCC

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

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

This device 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.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with minimum distance 20cm between the radiating element of this device and the user. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is intended only for OEM integrators and following statements shall be included to host user manual

- 1) The antenna must be installed such that 20cm is maintained between the antenna and users.
- 2) This module may not be co-located with any other transmitters or antennas.

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 with this module installed. In the event that these conditions cannot be met, then the FCC authorizations are no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product including this module and obtaining separate FCC authorizations.

The module is labeled with its own FCC ID and IC Certification Number. If the FCC ID and IC Certification Number are not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: S7A-IW06

"Contains IC: 8154A-IW06



## 5.2. IC

This device complies with Industry Canada license-exempt RSS standard(s).

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et.
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radio électrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The antenna must be installed so as to maintain at all times a distance minimum of at least 20 cm between the radiation source and any individual. This device may not be installed or used in conjunction with any other antenna or transmitter.

L'antenne doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation et toute personne physique. Cet appareil ne peut pas être installé ou utilisé avec une autre antenne ou émetteur.

This radio transmitter (Model: IW06) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet émetteur radio (modèle: IW 06) a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes répertoriés ci-dessous avec le gain maximal autorisé indiqué. Les types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

| Type           | Frequency[MHz] | Max gain[dBi] |
|----------------|----------------|---------------|
| Dipole antenna | 2402~2480      | 5.70          |
| Chip antenna   | 2402~2480      | 1.00          |

\*In case of dipole antenna, it is maximum gain **5.2dBi including cable loss**.

Étiquetage du produit final (IC)

Le module est étiqueté avec sa propre identification FCC et son propre numéro de certification IC. Si l'identification FCC et le numéro de certification IC ne sont pas visibles lorsque le module est installé à l'intérieur d'un autre dispositif, la partie externe du dispositif dans lequel le module est installé devra également présenter une étiquette faisant référence au module inclus. Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations suivantes :

- « Contient module émetteur identification FCC ID : S7A-IW06
- « Contient module émetteur IC : 8154A-IW06

## 5.3. CE

Hereby, SENA TECHNOLOGIES.Inc Declares that this IW07 is in compliance with the essential requirements and other relevant provisions of directive 1999/5/EC.

## 6. RF Information

### 6.1. Radio Frequency Range

2.402~2.480GHz

### 6.2. Number of Frequency Channel

79 channels

### 6.3. Transmission Method

FHSS(Frequency Hopping Spread Spectrum)

### 6.4. Modulation Method

1Mbps: GFSK(Gaussian Frequency Shift Keying)

2Mbps:  $\pi/4$  DQPSK( $\pi/4$  rotated Differential Quaternary Phase Shift Keying)

3Mbps: 8DPSK(8 phase Differential Phase Shift Keying)

### 6.5. Receiving Sensitivity

| Products | Receiving Sensitivity |
|----------|-----------------------|
| IW06     | -90dBm                |

### 6.6. Power Supply

| Products | Power Supply |
|----------|--------------|
| IW06     | DC3.3V       |

# Appendix A: Connections

## A.1. Pin Assignment

### A.1.1. IW06

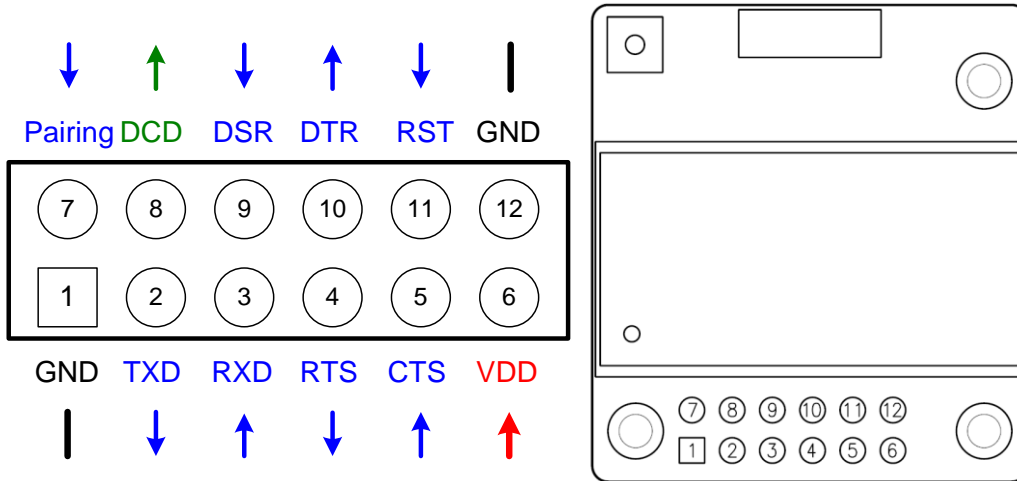


Figure A-1 Pin Assignment of IW06

Table A-1. Pin Assignment of IW06

| Pin # | Signal  | Direction | Description                           | Signal Level |
|-------|---------|-----------|---------------------------------------|--------------|
| 1     | GND     | -         | Power Ground                          | Ground       |
| 2     | TxD     | Output    | UART Data Output                      | TTL          |
| 3     | RxD     | Input     | UART Data Input                       | TTL          |
| 4     | RTS     | Output    | UART Ready to Send                    | TTL          |
| 5     | CTS     | Input     | UART Clear to Send                    | TTL          |
| 6     | VDD     | Input     | DC Input (3.0~3.3V)                   | Power        |
| 7     | Pairing | Input     | Pairing Input (Active Low)            | TTL          |
| 8     | DCD     | Output    | Bluetooth Connect Detect (Active Low) | TTL          |
| 9     | DSR     | Input     | Data Set Ready                        | TTL          |
| 10    | DTR     | Output    | Data Terminal Ready                   | TTL          |
| 11    | RST     | Input     | Reset (Active Low)                    | TTL          |
| 12    | GND     | -         | Power Ground                          | Ground       |

### A.1.2. DCD Signal (Status: Bluetooth Connect Detect)

Status of Bluetooth connection will be delivered to Host PC via DCD line. When Bluetooth connection is made, DCD signal will be to low.

### A.1.3. Factory Reset Signal

Factory reset signal will be used for setting the IW06 to factory defaults. Factory reset signal should be on 0V status for at least 1 second for the reset to occur.

### A.1.4. Pairing (BT\_MODE) Signal (Single Connection Mode Only)

IW06 provides a pairing signal input for instant configuration and automatic connection to two IW06s. In this example, we will name the two IW06s as ESD1 and ESD2. In pairing mode.

**Step 1.** Turn on ESD1 and ESD2 and do factory default both of them by using RST signal.

**Step 2.** Set the pairing signal of ESD1 to a low state and hold the signal for 2 seconds.

**Step 3.** Set the pairing signal of ESD2 to a low state and hold the signal for 2 seconds.

Set the pairing signal of ESD2 to high state and hold the signal for 2 seconds. Now Set the pairing signal of ESD2 to low state and hold it for 2 seconds

**Step 4.** Wait for ESD1 & ESD2 to connect to each other. It may take about 10 seconds to make a connection. If there are many Bluetooth devices nearby, the connection time may increase.

**Step 5.** At this point your pair of IW06 is configured to make automatic connection to each other.

You can now use this pair of IW06's like virtual serial cable.

\* Note : During the pairing process, by way of the pairing signal, the Command Response will be deactivated. Thus, the IW06 will not send the response messages such as OK, Connect and Disconnect.

*Table A-2 Pairing Process by Pairing Signal*

| ESD1                     | Status | Pairing Signal | ESD2                     | Status | Pairing Signal |
|--------------------------|--------|----------------|--------------------------|--------|----------------|
| 1. Reset                 | Mode0  | HIGH           | 1. Reset                 | Mode0  | HIGH           |
| 2. Drop pairing signal   | Mode3  | LOW            | 2. Drop pairing signal   | Mode3  | LOW            |
| 3.Restore pairing signal | Mode3  | HIGH           | 3.Restore pairing signal | Mode3  | HIGH           |
|                          |        |                | 4. Drop pairing signal   | Mode1  | LOW            |
|                          |        |                | 5.Restore pairing signal | Mode1  | HIGH           |
| 6. Connected             | Slave  | HIGH           | 6. Connected             | Master | HIGH           |

Using pairing button, users can make a pairing connection between a IW06 unit and other Bluetooth devices.

**Step 1.** Turn on ESD1 and do factory default by using RST signal.

**Step 2.** Set the pairing signal of ESD1 to a low state and hold the signal for 2 seconds.

**Step 3.** Users can discover and connect to ESD1 by using the software or user interface of other Bluetooth device that they want to connect from.

**Step 4.** Wait for ESD1 & other Bluetooth device to connect to each other. It may take about 10 seconds to make a connection. If there are many Bluetooth devices nearby, the connection time may increase.

**Step 5.** Now ESD1 is waiting for a connection from the last connected Bluetooth device. The last connected Bluetooth device can connect to ESD1.

Table A-3 Pairing Process with other Bluetooth device by Pairing Signal

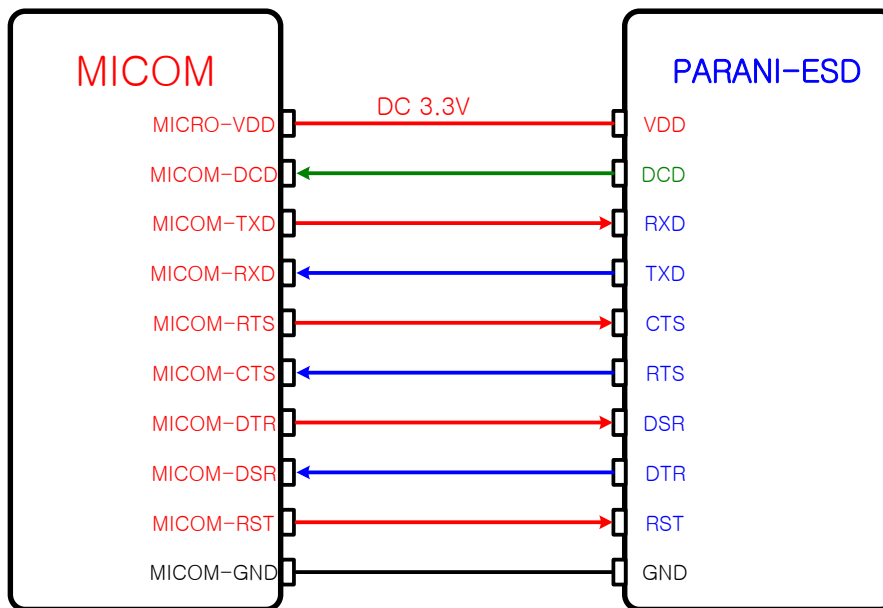
| ESD1                   | Status | Pairing Signal | Other Bluetooth Device         | Status |
|------------------------|--------|----------------|--------------------------------|--------|
| 1. Reset               | Mode0  | HIGH           |                                |        |
| 2. Drop pairing signal | Mode3  | LOW            |                                |        |
|                        |        |                | 3. Inquiry and connect to ESD1 |        |
| 4. Connected           | Slave  | HIGH           | 4. Connected                   | Master |

\*Caution : When you are designing a new hardware, you must maintain the pull up status by hardware for pairing signals. If pairing signals are floating by hardware, unexpected errors may occur.

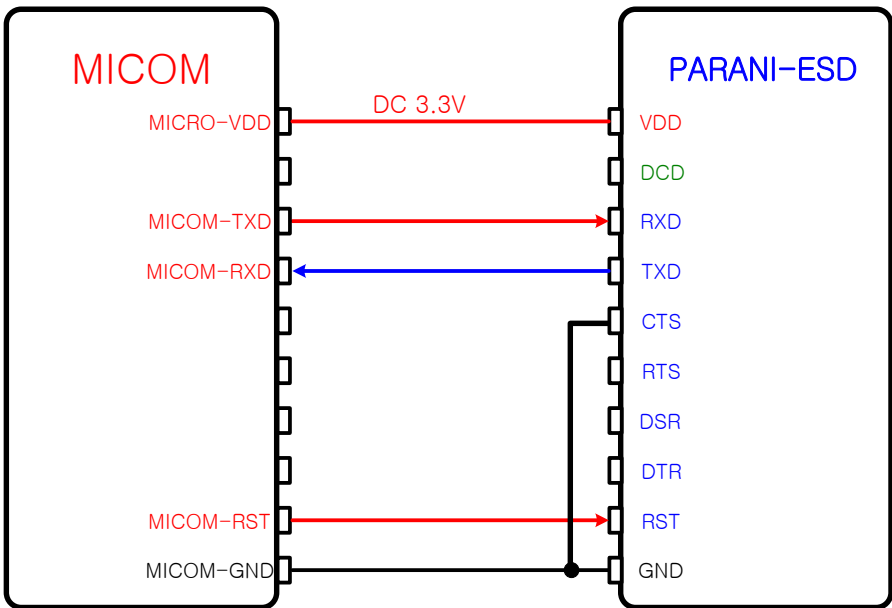
## A.2. Connection Diagram

### A.2.1. IW06

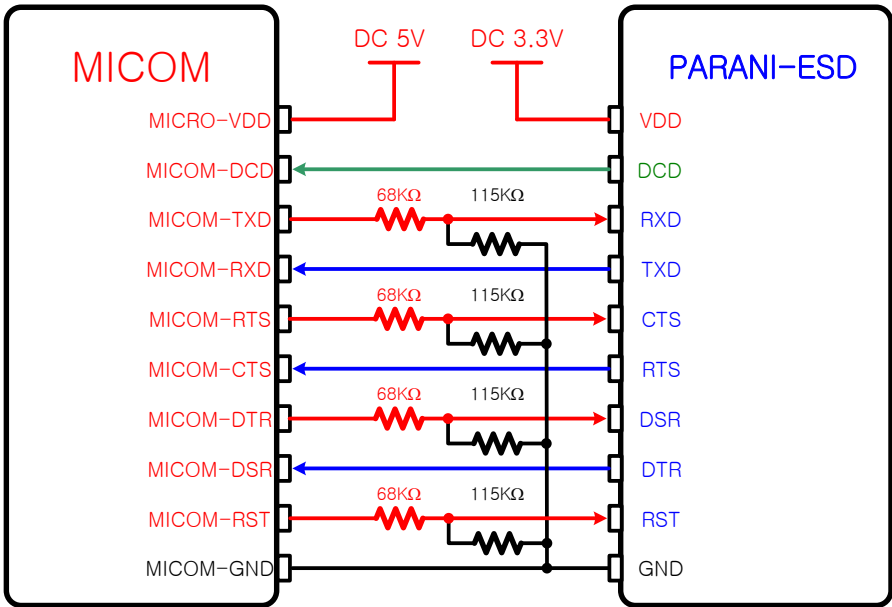
#### A.2.1.1. When TTL level of MICOM is 3.3V

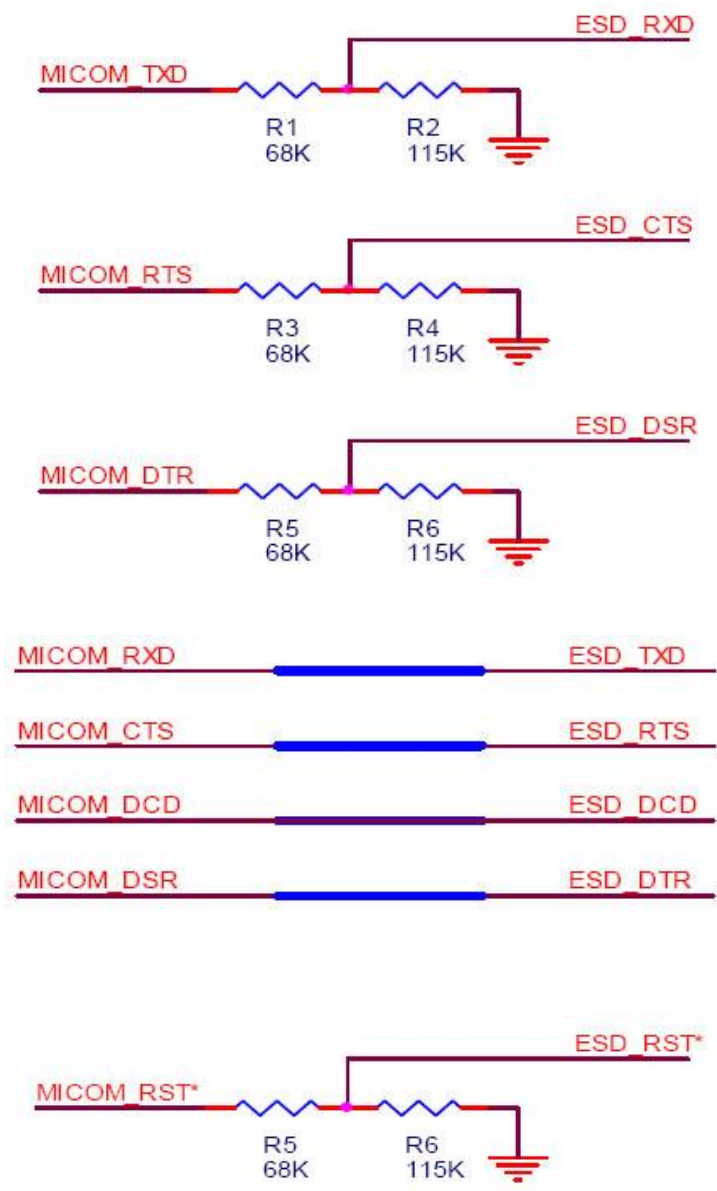


**A.2.1.2. When TTL level of MICOM is 3.3V and Hardware Flow Control is not used**



**A.2.1.3. When TTL level of MICOM is 5V**





# Appendix B: AT Commands

## B.1. Terminology

### B.1.1. AT Command

AT command set is a in fact standard language for controlling modems. The AT command set was developed by Hayes and is recognized by virtually all personal computer modems. IW06 provides the extended AT command set to control and configure the serial parameters and Bluetooth connection.

### B.1.2. AT Response

IW06 replies to AT commands with 4 kinds of message, 'OK', 'ERROR', 'CONNECT' and 'DISCONNECT'.

### B.1.3. Operation Mode

| Mode  | Description                                                       |
|-------|-------------------------------------------------------------------|
| Mode0 | Waiting for AT commands                                           |
| Mode1 | Attempting to connect to the last connected Bluetooth device      |
| Mode2 | Waiting for a connection from the last connected Bluetooth device |
| Mode3 | Waiting for the connection from another Bluetooth device          |

### B.1.4. Operation Status

| Status  | Description             |
|---------|-------------------------|
| Standby | Waiting for AT commands |
| Pending | Executing tasks         |
| Connect | Transmitting data       |

### B.1.5. Security

| Security       | Description            |
|----------------|------------------------|
| Authentication | Pin Code (or Pass key) |
| Encryption     | Data encryption        |

### B.1.6. Symbols

The symbols are used for the description of command syntax as follows:



| Symbols      | Meaning                     | ASCII Code |
|--------------|-----------------------------|------------|
| ↵            | Carriage return             | 0x0D       |
| ↵            | Line feed                   | 0x0A       |
| ↵↵           | Carriage return + Line feed |            |
| 112233445566 | Bluetooth device address    |            |
| N or m       | One digit decimal number    |            |
| To           | Timeout in seconds          |            |

## B.2. Command Category

| Command Category |                      | Index                       | AT Commands                                                                    |                                        |                                                                                                      |                                                                        |
|------------------|----------------------|-----------------------------|--------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| RESET            |                      | 1<br>2                      | ATZ<br>AT&F                                                                    |                                        |                                                                                                      |                                                                        |
| SERIAL PORT      |                      | 3<br>4                      | AT<br>AT+UARTCONFIG,b,p,s,h                                                    |                                        |                                                                                                      |                                                                        |
| BLUETOOTH        | Information          | 5<br>6<br>7<br>8<br>9<br>10 | AT+BTINFO?<br>AT+BTINQ?<br>AT+BTLAST?<br>AT+BTVER?<br>AT+BTRSSI,n<br>AT+MLIST? |                                        |                                                                                                      |                                                                        |
|                  |                      | Mode                        | 11<br>12                                                                       | AT+BTMODE,n<br>AT+MULTI,n              |                                                                                                      |                                                                        |
|                  |                      |                             | Status                                                                         | 13<br>14<br>15<br>16<br>17<br>18<br>19 | +++<br>AT+SETESC,nn<br>ATO<br>AT+BTCANCEL<br>AT+BTSCAN<br>AT+BTSCAN,n,to<br>AT+BTSCAN112233445566,to |                                                                        |
|                  |                      | Connection                  |                                                                                | 20<br>21<br>22<br>23<br>24             | ATD<br>ATD112233445566<br>ATA<br>ATA112233445566<br>ATH                                              |                                                                        |
|                  |                      |                             |                                                                                | Security                               | 25<br>26<br>27<br>28<br>29                                                                           | AT+BTKEY=\$string<br>AT+BTSD?<br>AT+BTCSD<br>AT+BTFP,n<br>AT+BTSEC,a,e |
|                  |                      |                             |                                                                                |                                        | Miscellaneous                                                                                        | 30<br>31                                                               |
|                  | REMOTE CONFIGURATION |                             |                                                                                |                                        |                                                                                                      | 32<br>33                                                               |
|                  | S-REGISTER           |                             |                                                                                |                                        | 34<br>35<br>36                                                                                       | AT&V<br>ATSnn?<br>ATSnn=mm                                             |

## B.3. Command Description

### B.3.1. ATZ↵

|                    |                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                                                                                                                        |
| <b>Purpose</b>     | Software Reset                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This has the same effects as Powercycling the unit.<br>This command disconnects any connected Bluetooth device, and stops ongoing tasks. After rebooting, the status will be decided by the preset operation mode.<br>Some AT commands require the ATZ command be run so that the commands can take effect. |

### B.3.2. AT&F↵

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                   |
| <b>Purpose</b>     | Hardware reset                                                                                                                         |
| <b>Description</b> | This has the same effect as initialization by pressing the factory reset button.<br>All parameters are initialized to factory defaults |

### B.3.3. AT↵

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                                                                     |
| <b>Purpose</b>     | Check the connection status with host equipment                                                                                                                                                                                                          |
| <b>Description</b> | Check if the connection to host equipment is operating normally. The serial parameters of IW06 must be same as those of host equipment. If not, the IW06 will not respond or 'ERROR' message will appear or an abnormal sequence of strings will appear. |

### B.3.4. AT+UARTCONFIG,Baudrate,Parity,Stopbit,Hwfc↵

|                    |                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                  |
| <b>Purpose</b>     | Set Serial parameters                                                                                                                                                                                 |
| <b>Parameters</b>  | Baudrate=1200/2400/4800/9600/14400/19200/38400/57600/115200/230400/460800/921600 (Default=9600)<br>Parity=N/E/O (Default=N)<br>Stopbit=1/2 (Default=1)<br>Hwfc(Hardware Flow Control)=0/1 (Default=1) |
| <b>Description</b> | The Serial parameters can be set or changed. The factory default is 9600, N, 1, 1.<br>To take effect the ATZ command must be used or Powercycle the unit.                                             |
| <b>Example</b>     | AT+UARTCONFIG,115200,N,1,1                                                                                                                                                                            |

### B.3.5. AT+BTINFO?↵

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵112233445566,DeviceName,Mode,Status,Auth,Encryp,FlowControl↵<br>↵OK↵                                                                                                |
| <b>Purpose</b>     | Display Bluetooth settings                                                                                                                                           |
| <b>Description</b> | The current Bluetooth settings are displayed including BD address, Device name, Operation mode, Operation status, Authentication, Data Encryption, and Hardware Flow |

|                |                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Control. The initial value of Device name is 'ESD100V3_v2.0.0-445566'. ESD stands for IW06, v2.0.0 for the version of firmware, and 445566 for the last 6 digits of BD address.<br>Mode=MODE0/MODE1/MODE2/MODE3<br>Status=STANDBY/PENDING/CONNECT<br>Auth=0/1 (Authentication is not activated when 0)<br>Encrypt=0/1 (Encryption is not activated when 0)<br>FlowControl=HWFC/NoFC |
| <b>Example</b> | ↵000B530011FF,SENA,MODE0,PENDING,1,1,HWFC↵                                                                                                                                                                                                                                                                                                                                          |

### B.3.6. AT+BTINQ?↵

|                    |                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵112233445566,FriendlyName,CoD↵<br>↵112233445566,FriendlyName,CoD↵<br>↵112233445566,FriendlyName,CoD↵<br>↵OK↵                                                                                                     |
| <b>Purpose</b>     | Search Bluetooth devices nearby                                                                                                                                                                                   |
| <b>Description</b> | The Bluetooth devices in Inquiry scan mode nearby are displayed with their BD addresses, Device names, and Class of device.<br>Maximum 15 devices are scanned for 30 seconds. (Default 15 value in S-register 24) |

### B.3.7. AT+BTLAST?↵

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵112233445566↵                                                                     |
| <b>Purpose</b>     | Display the BD address of the last connected device                                |
| <b>Description</b> | The Bluetooth device last connected to this IW06 is displayed with its BD address. |

### B.3.8. AT+BTVER?↵

|                    |                                 |
|--------------------|---------------------------------|
| <b>Response</b>    | ↵ESD100V3_v2.0.0↵<br>↵OK↵       |
| <b>Purpose</b>     | Display device firmware version |
| <b>Description</b> | Display device firmware version |

### B.3.9. AT+BTRSSI,n↵(Single Connection Mode Only)

|                    |                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵0,255,0,0↵ (repeatedly)                                                                                                                                                                                                                                                          |
| <b>Purpose</b>     | Test signal strength                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | n=0: Stop signal strength test<br>n=1: Start signal strength test                                                                                                                                                                                                                         |
| <b>Description</b> | When Bluetooth connection is established, you can use this command in Standby status. The signal strength will be displayed repeatedly in order of Status, LinkQuality, Status, RSSI. If the LinkQuality is close to 255 and RSSI is close to 0, the signal strength is in good standing. |
| <b>Example</b>     | +++<br>AT+BTRSSI,1<br>↵OK↵<br>0,255,0,0                                                                                                                                                                                                                                                   |

### B.3.10. AT+MLIST?

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵CURRENT MODE:SINGLE CONNECTION MODE↵<br>↵OK↵                                                                                          |
| <b>Purpose</b>     | Display the current multiple connection mode and connected slave's Bluetooth addresses.                                                |
| <b>Description</b> | Display current mode(SINGLE CONNECTION MODE , MULTI-DROP MODE, NODE SWITCHING MODE) and connected slave Bluetooth address.             |
| <b>Example</b>     | AT+MLIST?<br>CURRENT MODE: MULTI-DROP MODE<br>TASK1 – 000195000001<br>TASK2 – DISCONNECT<br>TASK3 – DISCONNECT<br>TASK4 – 000195000004 |

### B.3.11. AT+BTMODE,n

|                    |                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                       |
| <b>Purpose</b>     | Set operation mode                                                                                                                                                                         |
| <b>Parameters</b>  | n=0: MODE0 (Default)<br>n=1: MODE1<br>n=2: MODE2<br>n=3: MODE3                                                                                                                             |
| <b>Description</b> | When the operation status is 'Pending' currently, change the status to 'Standby' with AT+BTCANCEL prior to this command.<br>To take effect the ATZ must be executed or Powercycle the unit |
| <b>Example</b>     | AT+BTMODE,2<br>↵OK↵<br>ATZ                                                                                                                                                                 |

### B.3.12. AT+MULTI,n

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| <b>Response</b>    | (n = 0)<br>↵OK↵<br>(n = 1 or n = 2)<br>↵TASK1 OK↵<br>TASK2 OK↵<br>TASK3 OK↵<br>TASK4 OK↵  |
| <b>Purpose</b>     | Set multiple connection mode                                                              |
| <b>Parameters</b>  | n=0: Single Connection Mode (Default)<br>n=1: Multi-Drop Mode<br>n=2: Node Switching Mode |
| <b>Description</b> | Set single connection mode, multi-drop mode or node switching mode.                       |

### B.3.13. +++

|                    |                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                                                                                    |
| <b>Purpose</b>     | Convert the operation status of 'Connect' to 'Standby'                                                                                                                                                                                                                  |
| <b>Description</b> | In 'Connect' status, data from host is transmitted to the other side Bluetooth device, and any AT command is not accepted but this command, which is not echoed on the screen. When IW06 encounters a character '+' from host, it stops the data transmission and waits |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>for next 2 characters. If the next 2 characters aren't both '+', it restart to transmit data including the first '+' as well. If not, it converts the operation status to 'Standby'.<br/>         If the data from host includes '+++', it will convert the operation status to 'Standby'. Notice that IW06 holds data transmission when it encounters '+', until receiving next character.<br/>         '+' is an escape sequence character by default, which is changeable by AT+SETESC.<br/>         * Caution : In low power mode, you cannot change online status to command waiting status by using the '+++' string. Entering the '+++' string during low power mode and online status may entail unexpected errors.</p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### B.3.14. AT+SETESC,nn

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                              |
| <b>Purpose</b>     | Change the escape sequence character                                                                              |
| <b>Description</b> | Escape sequence character set to '+' by default is changeable.<br>The parameter nn must be a printable character. |
| <b>Example</b>     | AT+SETESC,42                                                                                                      |

### B.3.15. ATO (ATOx, ATObdaddr)

|                    |                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | None                                                                                                                                                                                                                                          |
| <b>Purpose</b>     | Convert the operation status of 'Standby' to 'Connect'                                                                                                                                                                                        |
| <b>Description</b> | You can convert the operation status of 'Standby' to 'Connect' ready to transmit data. In Node Switching mode, a specific slave can be specified to become an active connection by specifying the connection number or the Bluetooth address. |
| <b>Example</b>     | ATO<br>ATO3<br>ATO000195000001                                                                                                                                                                                                                |

### B.3.16. AT+BTCANCEL

|                    |                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                          |
| <b>Purpose</b>     | Terminate the current executing task                                                                                          |
| <b>Description</b> | This terminates a current executing task, such as Inquiry scan and Page scan, then converts the operation status to 'Standby' |

### B.3.17. AT+BTSCAN

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵CONNECT 112233445566↵                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Purpose</b>     | Wait for inquiry and connection from other Bluetooth devices                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This allows the inquiry and connection from the other Bluetooth devices. The operation status will be in 'Pending' after this command. When connection is made and released, the operation status is back to 'Pending'. To convert the operation status to 'Standby' AT+BTCANCEL must be used.<br>This has the same effect as AT+BTSCAN,3,0.<br>When connection is made with other Bluetooth device, response will be 'CONNECT' with its BD address. |

### B.3.18. AT+BTSCAN,n,to

|                    |                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵CONNECT 112233445566↵<br>or<br>↵OK↵<br>↵ERROR↵                                                                                                                                                                                                                                                                                                                                |
| <b>Purpose</b>     | Wait for inquiry and connection from other Bluetooth devices for a given duration                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | n=1: Allows Inquiry scan<br>n=2: Allows Page scan<br>n=3: Allows both of Inquiry scan and Page scan<br>to= Time duration in seconds                                                                                                                                                                                                                                                    |
| <b>Description</b> | For the given to, IW06 is waiting for the inquiry and connection from other Bluetooth devices. If the parameter of to is 0, it will wait forever.<br>When connection is made with other Bluetooth device, response will be 'CONNECT' with its BD address. If there is no connection made within this time duration, response is 'ERROR' and the operation status becomes to 'Standby'. |
| <b>Example</b>     | AT+BTSCAN,2,30                                                                                                                                                                                                                                                                                                                                                                         |

### B.3.19. AT+BTSCAN112233445566,to↵

|                    |                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵CONNECT 112233445566↵<br>or<br>↵OK↵<br>↵ERROR↵                                                                                                                                                                                                                                                                                                                    |
| <b>Purpose</b>     | Wait for connection by the Bluetooth device with given BD address                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | 112233445566=BD address<br>to= time duration in seconds                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | IW06 will wait to be connected to by the Bluetooth device with the given BD address. If the parameter of to is 0, it will wait forever.<br>When connection is made with the Bluetooth device, response will be 'CONNECT' with its BD address. If there is no connection made within this time duration, response is 'ERROR' and the operation status becomes to 'Standby'. |
| <b>Example</b>     | AT+BTSCAN000B530011FF,30                                                                                                                                                                                                                                                                                                                                                   |

### B.3.20. ATD↵

|                    |                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵CONNECT 112233445566↵<br>or<br>↵OK↵<br>↵ERROR↵                                                                                           |
| <b>Purpose</b>     | Connect to the last connected Bluetooth device                                                                                                    |
| <b>Description</b> | IW06 saves the BD address of the Bluetooth device most recently connected to. If it fails to make a connection, response will display an 'ERROR'. |

### B.3.21. ATD112233445566↵

|                 |                                                         |
|-----------------|---------------------------------------------------------|
| <b>Response</b> | ↵OK↵<br>↵CONNECT 112233445566↵<br>or<br>↵OK↵<br>↵ERROR↵ |
|-----------------|---------------------------------------------------------|

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>     | Connect to a specific Bluetooth device with a given BD address                                                                                                                                                                                           |
| <b>Parameters</b>  | 112233445566=BD address                                                                                                                                                                                                                                  |
| <b>Description</b> | IW06 attempts to connect to the Bluetooth device with the given BD address. To make successful connection, the Bluetooth device must be in Page scan mode. This attempt continues for 5 minutes.<br>If it fails to make connection, response is 'ERROR'. |
| <b>Example</b>     | ATD000B530011FF                                                                                                                                                                                                                                          |

### B.3.22. ATA<sup>⌘</sup>

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵Start ACL Open↵<br>↵ACL Connect Success↵                                                               |
| <b>Purpose</b>     | ACL connect to the last connected Bluetooth device                                                              |
| <b>Description</b> | If it make connection, response will display an 'ACL Connect Success'. Must have reboot for new ACL connection. |

### B.3.23. ATA112233445566<sup>⌘</sup>

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵Start ACL Open↵<br>↵ACL Connect Success↵                                                                                                                                                                                                                                  |
| <b>Purpose</b>     | ACL connect to a specific Bluetooth device with a given BD address                                                                                                                                                                                                                 |
| <b>Parameters</b>  | 112233445566 = BD address                                                                                                                                                                                                                                                          |
| <b>Description</b> | IW06 attempts to ACL connect to the Bluetooth device with the given BD address. To make successful ACL connection, the Bluetooth device must be in Page scan mode. If it make connection, response will display an 'ACL Connect Success'. Must have reboot for new ACL connection. |
| <b>Example</b>     | ATA0001950011FF                                                                                                                                                                                                                                                                    |

### B.3.24. ATH<sup>⌘</sup> (ATHx, ATHbdaddr)

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵<br>↵DISCONNECT↵                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Purpose</b>     | Release the current connection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | The current Bluetooth connection will be disconnected. It takes about Supervision Timeout(S37) to detect an abnormal disconnection such as power off and moving out of service range. In multiple connection modes, a specific connection can be specified to be disconnected by specifying the connection number or the Bluetooth address.<br>The response message of 'DISCONNECT' may be displayed on disconnection depending on the disconnection condition. You can make it not displayed using S10 register. |
| <b>Example</b>     | ATH<br>ATH3<br>ATH000195000001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### B.3.25. AT+BTKEY=\$string<sup>⌘</sup>

|                    |                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                   |
| <b>Purpose</b>     | Change pin code                                                                                                                                                        |
| <b>Parameters</b>  | <i>\$string</i> = New pin code (Default="1234")                                                                                                                        |
| <b>Description</b> | Pin code is a string, which allows up to 16 alpha-numeric characters. Based on this pin code, IW06 generates a link key which is used in actual authentication process |
| <b>Example</b>     | AT+BTKEY="apple"                                                                                                                                                       |

### B.3.26. AT+BTSD? ↵

|                    |                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵112233445566↵<br>↵OK↵                                                                                                                                                                                                                                                     |
| <b>Purpose</b>     | Display a list of Bluetooth devices sharing the same pin code                                                                                                                                                                                                              |
| <b>Description</b> | Once a connection is made with a pin code, IW06 saves the Bluetooth device with its link key, generated by the pin code. The connection to a device listed in IW06 can be made automatically without the authentication process. The maximum number kept on the list is 7. |

### B.3.27. AT+BTCSD ↵

|                    |                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                    |
| <b>Purpose</b>     | Clear the list of Bluetooth devices sharing the same pin code                                                                                           |
| <b>Description</b> | This clears the list of Bluetooth devices linked with the same key in flash memory. To take effect the ATZ command must be used or Powercycle the unit. |

### B.3.28. AT+BTFP,*n* ↵

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                        |
| <b>Purpose</b>     | Set generation of link key every time of connection                                                                         |
| <b>Parameters</b>  | <i>n</i> =0: Inactivate (Default)<br><i>n</i> =1: Activate                                                                  |
| <b>Description</b> | If <i>n</i> is set to 1, IW06 asks for the pin code every time a connection is made. This can be used to increase security. |

### B.3.29. AT+BTSEC,Authentication,Encryption ↵

|                    |                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                                                |
| <b>Purpose</b>     | Set authentication and data encryption                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>Authentication</i> =0: Inactivate (Default)<br><i>Authentication</i> =1: Activate<br><i>Encryption</i> =0: Inactivate (Default)<br><i>Encryption</i> =1: Activate                                                                |
| <b>Description</b> | If the authentication is activated, the pin code must be set by AT+BTKEY command. Data encryption cannot be used when authentication is not enabled, i.e. <i>Authentication</i> =0 and <i>Encryption</i> =1 will not work properly. |



### B.3.30. AT+BTNAME=\$string↵

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                           |
| <b>Purpose</b>     | Change device name                                                                                             |
| <b>Parameters</b>  | \$string= New device name (Default="ESDV2_v2.0.0-445566")                                                      |
| <b>Description</b> | IW06 can have a user friendly name for easy identification. The name allows up to 30 alpha-numeric characters. |
| <b>Example</b>     | AT+BTNAME="My-IW06"                                                                                            |

### B.3.31. AT+BTLPM,n↵

|                    |                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                         |
| <b>Purpose</b>     | Set low power mode                                                                                                                           |
| <b>Parameters</b>  | n=0: Inactivate (Default)<br>n=1: Activate                                                                                                   |
| <b>Description</b> | During no data transmission, IW06 can be in low power mode to save the power. It takes a few seconds to wake the IW06 out of low power mode. |

### B.3.32. AT+PASS=\$string↵

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| <b>Response</b>    | Remote Configuration Enabled↵                                   |
| <b>Purpose</b>     | Input password in remote configuration mode.                    |
| <b>Parameters</b>  | \$string= Password (Default="0000")                             |
| <b>Description</b> | Input password for authentication in remote configuration mode. |
| <b>Example</b>     | AT+PASS=1234                                                    |

### B.3.33. AT+CHPASS=\$string↵

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                           |
| <b>Purpose</b>     | Change password used in remote configuration mode.                             |
| <b>Parameters</b>  | \$string= New password                                                         |
| <b>Description</b> | Change password used in remote configuration mode. Password length is up to 8. |
| <b>Example</b>     | AT+CHPASS=12345678                                                             |

### B.3.34. AT&V↵

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵S0:m0;S1:m1; ...Sn:mn↵<br>↵OK↵                                                                           |
| <b>Purpose</b>     | Display all the S-registers                                                                               |
| <b>Description</b> | All parameters are stored at S-register in flash memory. These values are sustained until hardware reset. |

### B.3.35. ATSn? ↵

|                    |                                          |
|--------------------|------------------------------------------|
| <b>Response</b>    | ↵value↵<br>↵OK↵                          |
| <b>Purpose</b>     | Display a given S-register               |
| <b>Parameters</b>  | nn= Address of S-register                |
| <b>Description</b> | A specific S-register will be displayed. |

### B.3.36. AT\$nn=mm↵

|                    |                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Response</b>    | ↵OK↵                                                                                                                                                                                                           |
| <b>Purpose</b>     | Change S-register value                                                                                                                                                                                        |
| <b>Parameters</b>  | nn= Address of S-register<br>mm= New value of S-register                                                                                                                                                       |
| <b>Description</b> | Some S-registers are optimized for the overall performance and protected and cannot be changed. When users try to change these S-registers, response is 'ERROR'. For details of S-register, refer Appendix. B. |
| <b>Example</b>     | AT\$10=0                                                                                                                                                                                                       |

## B.4. Command Validity

| AT Command               | Operation Status |         |         |
|--------------------------|------------------|---------|---------|
|                          | Standby          | Pending | Connect |
| AT                       | ○                | ○       |         |
| ATZ                      | ○                | ○       |         |
| AT&F                     | ○                | ○       |         |
| AT+BINQ?                 | ⊙                |         |         |
| ATD112233445566          | ⊙                |         |         |
| ATD                      | ⊙                |         |         |
| ATA112233445566          | ⊙                |         |         |
| ATA                      | ⊙                |         |         |
| AT+BTSCAN                | ⊙                |         |         |
| AT+BTSCAN,n,to           | ⊙                |         |         |
| AT+BTSCAN112233445566,to | ⊙                |         |         |
| AT+BTCANCEL              |                  | ○       |         |
| +++                      |                  |         | ○       |
| AT+SETESC                | ⊙                |         |         |
| ATO                      | ●                |         |         |
| ATH                      | ●                |         |         |
| AT+BTSEC,Auth,Encr       | ⊙                |         |         |
| AT+BTLAST?               | ○                | ○       |         |

|                       |   |   |  |
|-----------------------|---|---|--|
| AT+BTMODEn            | ⊙ |   |  |
| AT+BTNAME="Name"      | ⊙ |   |  |
| AT+BTKEY="nnnn"       | ⊙ |   |  |
| AT+BTINFO?            | ○ |   |  |
| AT+BTLPM,n            | ⊙ |   |  |
| AT+BTSD?              | ○ | ○ |  |
| AT+BTCSD              | ⊙ |   |  |
| AT+BTFP,n             | ⊙ |   |  |
| AT+UARTCONFIG,b,p,s,h | ⊙ |   |  |
| AT+BTVER?             | ○ | ○ |  |
| AT+BTRSSI,n           | ● |   |  |
| AT+PASS="nnnnnnnn"    | ○ | ○ |  |
| AT+CHPASS="nnnnnnnn"  | ○ | ○ |  |

⊙ Valid only when IW06 is not connected to other Bluetooth device.

● Valid only when IW06 is connected to other Bluetooth device.

## Appendix C: S-Register

S-registers contain 52 parameters for the IW06. These are stored in flash memory and the values will be saved unless hardware reset is executed. The value of S-register can be accessed and changed with ATS command. Some S-registers not shown below are set to maximize the performance of IW06. Thus it is not recommended to change these S-registers.

Change the value of S-register only in Standby status. Turn IW06 off and on.

### C.1. S1: Force to Reconnect (default 1)

S1=0, IW06 in Mode1 does not try to reconnect when disconnected.

S1=1, IW06 in Mode1 keeps trying to reconnect when disconnected.

### C.2. S3: Stream UART Policy (default 0)

S3=0, the priority of UART streaming is throughput.

S3=1, the priority is latency, which minimizes the delay of data transmission. This is useful in case of transmitting very small data quickly.

When this value is 1, in order to minimize latency, IW06 sends the received data immediately. When this value is 0, the IW06 maximizes throughput, the IW06 stores received data for a short time and sends a large data packet. If the packet length is less than 100 bytes, having latency being the priority is recommended. If the packet length is more than 100 bytes, having throughput as the priority is recommended. Also, if you want to use high baud rate, throughput priority will be more effective. Just for reference, the buffer length for receiving data is 2 Kbytes.

### C.3. S4: Enable Remote Name Query (default 1)

S4=0, IW06 will query only the BD address. This speeds up the inquiry process.

S4=1, IW06 will query the BD address, device name and class of device.

When this value is 1, IW06 finds not only BD address but also friendly name. When this value is 0, IW06 finds only BD address. When set to 0 this will make queries much faster. When using the pairing button, finding friendly name will be omitted automatically.

### C.4. S6: Enable Low Power Mode (default 0)

S6=0, deactivate Low Power Mode.

S6=1, activate Low Power Mode.

This value decides whether IW06 works in Low Power Mode or not. When this value is 0, IW06 works only in active power mode. When this value is 1, IW06 will be in low power mode to save the power. Therefore, it takes a few seconds to wake the IW06 out of low power mode.

### C.5. S10: Enable Response Message (default 1)

S10=0, IW06 does not send response messages to the host system.

S10=1, IW06 sends response messages to host system.

This value decides whether IW06 sends response messages such as OK, ERROR, CONNECT, DISCONNECT or not. When this value is 0, IW06 will not send any response messages. If the response messages conflicts with your host programs or devices that is connected to IW06, change this value to 0.

### C.6. S11: Enable Escape (default 1)

S11=0, IW06 does not allow escape sequence characters. The operation status of Connect cannot be changed to Standby. Since the IW06 skips the process of detecting escape sequence characters, more efficient data transmission can be had.

S11=1, IW06 allows for the escape sequence character. Whenever it is needed, the Connect status can be changed to Standby.

### **C.7. S12: Clear Data Buffer When Disconnected (default 0)**

S12=0, IW06 does not clear the data buffer received from host system when disconnected.  
S12=1, IW06 clears the data buffer when disconnected.

### **C.8. S13: Enable DCD Signal (default 1)**

S13=0, DCD signal off  
S13=1, DCD signal on

### **C.9. S14: Enable DTR Transfer (default 1)**

S14=0, DTR/DSR signal is transferred in a loop-back fashion..  
S14=1, DTR signal is transferred to DSR of remote device.

### **C.10. S15: Enable Disconnect by DTR (default 0)**

S15=0, DTR signal cannot release the connection.  
S15=1, The Bluetooth connection can be released when DTR signal is off.  
This value decides whether Bluetooth connection is released when DTR signal drops or not. If this value is 1, you can use DTR signal in order to disconnect Bluetooth connection.

### **C.11. S22: Faster Connection (default 3)**

S22=0, none  
S22=1, page scan  
S22=2, inquiry scan  
S22=3, page/inquiry scan  
Connecting time is average 1.5sec faster than normal mode.

### **C.12. S23: Intercharacter Timeout Setting (default 0)**

S23=0 : Not used  
S23=1 : 1 x S26  
S23=2 : 10 x S26  
S23=3 : 100 x S26

### **C.13. S24: Maximum Number of Inquiry Result (default 15)**

The maximum number of inquiry list can be controlled. If value is 0, maximum number is limitless.

### **C.14. S26: Intercharacter Timeout (default 0)**

This value describes time interval between characters used to separate the data from serial port. If there is no more data coming from serial port in this value, data is sent to client.

S23=1 x S26=50 : Timeout-> 50msec  
S23=2 x S26=50 : Timeout-> 500msec  
S23=3 x S26=3 : Timeout-> 300msec

|                          |                            |
|--------------------------|----------------------------|
| Inter Character Time Out | * Optimal Value(S23 x S26) |
|--------------------------|----------------------------|

|       |     |
|-------|-----|
| 50ms  | 180 |
| 100ms | 235 |
| 200ms | 340 |

\* When 10 bytes data are sent every intercharacter timeout, they are sent separately by 10 bytes at the optimal value. If the intercharacter timeout is set below the optimal value, the data will be put together and sent by 20, 30, 40 bytes or more.

### **C.15. S28: Escape Sequence Character (default 43)**

The decimal number of the ASCII code of escape sequence character can be controlled. The initial value is 43, the ASCII code of '+'. .

### **C.16. S31: Page Timeout (default 20)**

This is the timeout in seconds to attempt connection with the ATD command. After this timeout expires, the IW06 will restart automatically. If this value is 0, IW06 will attempt to connect without restarting. . It must set at 5 second units.

### **C.17. S33: Inquiry Timeout (default 30)**

This is the timeout in seconds to execute inquiry scan.

### **C.18. S37: Supervision Timeout (default 5)**

This is the timeout to presume disconnection, which is set to 5 seconds initially. The smaller the value becomes, the more quickly Parani-SD can detect an abnormal disconnection. But when the communication is suspended, it may be regarded as disconnection. This value should be greater than the Slave Disconnect Timeout(S57). (Slave unit depends on the value of master unit.)

### **C.19. S43: COD (default 001F00)**

This value describes the sort of the bluetooth device and is editable.

### **C.20. S44: COD Filter (default 0)**

This value is used to filter the sort of the bluetooth devices on inquiring. All the bluetooth devices are inquired in case of 0. In case of 3E0100, bluetooth devices with COD 3E0100 are inquired.

### **C.21. S45: Inquiry Access Code (default 0x9E8B33)**

Inquiry access code is used during inquiry state. The reserved IAC addresses are 0x9E8B00 ~ 0x9E8B3F. The general inquiry IAC is 0x9E8B33.

IW06 is able to find the Bluetooth devices that are configured as the same IAC.

### **C.22. S46: BD Address of Last Connected Device**

This saves the BD address of the Bluetooth device connected most recently in single connection mode. This saves the Task1 BD address of the Bluetooth device connected most recently in a multiple connection mode.

### **C.23. S48: Low Power Max Interval (default 5000)**

This is the max interval value to use low power mode, which is set to 5000 initially. (5000 x 625µsec = 3125msec)

### **C.24. S49: Low Power Min Interval (default 4500)**

This is the min interval value to use low power mode, which is set to 4500 initially. (4500 x 625µsec = 2812msec)

A small interval increases power consumption, a large interval increases latency.

### **C.25. S52: Low Power Timeout (default 5)**

This is the low power timeout value, which is set to 5 initially. (5sec)

During no data transmission in the timeout, IW06 will be in low power mode to save the power. Therefore, it takes a few seconds to wake the IW06 out of low power mode.

### **C.26. S54: BD Address of Last Connected Device**

This saves the Task2 BD address of the Bluetooth device connected most recently in a multiple connection mode.

### **C.27. TS55: BD Address of Last Connected Device**

This saves the Task3 BD address of the Bluetooth device connected most recently in a multiple connection mode.

### **C.28. S56: BD Address of Last Connected Device**

This saves the Task4 BD address of the Bluetooth device connected most recently in a multiple connection mode.

### **C.29. S57: Slave Disconnect Timeout (default 3)**

This S57 register value defines the time period in seconds that a master unit waits in case a slave unit does not receive the data sent from the master. For this time period, the master unit will not send data to all slave units if any slave unit does not receive the data. If the slave unit does not receive the data after this time period elapses, the master unit will disconnect the connection with the problematic slave unit. The value should be greater than 0 and smaller than the Supervision Timeout(S37).

### **C.30. S58: MAX TX POWER (default 0)**

This value describes the peak output power. Setting this causes rebooting and applying. (There is a little deviation according to the devices.)

| Parameter | dBm               |
|-----------|-------------------|
| 0         | Use chip setting. |
| 1         | -12               |
| 2         | -8                |
| 3         | -4                |
| 4         | 0                 |
| 5         | 4                 |
| 6         | 8                 |
| 7         | 12                |

### **C.31. S59: Current Slave in Communication (default 0)**

This value shows the current slave number in communication. The value is automatically stored when the slave is selected for communication. This value can also be set by user so the master unit connects to a specific slave to connect first in case the master unit reboots. The value range is 0~4. 0 means the maser unit never connected to a slave. The master will connect to a slave whatever responses first.

### **C.32. S60: Reconnect Time Interval (default 5)**

This value defines reconnect time interval in case a slave is disconnected in multiple connection mode. The actual reconnect time interval will be the value multiplied by two in seconds. For example, if the value is set to 5, the reconnect time interval will be 10 seconds. The value should be greater than or equal to 5. The master unit will only try to reconnect when its mode is set to Mode1.



# **Appendix D: Trouble Shooting**

## **D.1. No Data Transmission**

### **D.1.1. Device Settings**

Check whether the Baud rate of IW06 matches that of its host equipment.  
Check whether the host equipment of IW06 uses Hardware Flow Control. IW06 is initially set to Use of Hardware Flow Control. If your host equipment does not use Hardware Flow Control, please disable the Hardware flow control option by ParaniWIN or AT command.

## **D.2. Data Loss or Malfunctioning**

### **D.2.1. Hardware Flow Control**

When transmitting large amounts of data with No Hardware Flow Control, IW06 may clear the data buffer unexpectedly. The possibility becomes greater as the RF transmission environment becomes worse.

### **D.2.2. Response Message**

The messages of IW06 response may affect the function of host system. Set ATS10=0 not to send IW06 response to host system and try again. Refer Appendix B. for details.

## **D.3. Transmission Delay**

### **D.3.1. RF Processing Delay**

It takes 30msec approximately for a IW06 to complete a data transmission to the other Bluetooth device. This time delay cannot be reduced and may enlarge as the RF transmission environment becomes worse. Do not use IW06 If your applications cannot allow for this time delay.

### **D.3.2. RF Transmission Environment**

If there are many Bluetooth devices working in a small area and/or the RF communication distance is too great and/or there are some obstacles affecting RF performance, the IW06 repeats the transmission packet by packet due to interferences and/or low RF performance. This may lead to increased data transmission time delays.

## **Appendix E: Warranty**

### **E.1. GENERAL WARRANTY POLICY**

Sena Technologies, Inc. (hereinafter referred to as SENA) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at SENA's discretion, of defective or non-conforming Product, and SENA shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication or misuse of the Product; (b) failure of Customer to adhere to any of SENA's specifications or instructions; (c) neglect of, abuse of, or accident to, the Product; or (d) any associated or complementary equipment or software not furnished by SENA.

Limited warranty service may be obtained by delivering the Product to SENA or to the international distributor it was purchased through and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to SENA, and to use the original shipping container or equivalent.

### **E.2. LIMITATION OF LIABILITY**

EXCEPT AS EXPRESSLY PROVIDED HEREIN, SENA MAKES NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY EQUIPMENT, PARTS OR SERVICES PROVIDED PURSUANT TO THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER SENA NOR ITS DEALER SHALL BE LIABLE FOR ANY OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION IN CONTRACT OR TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), SUCH AS, BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS OR BENEFITS RESULTING FROM, OR ARISING OUT OF, OR IN CONNECTION WITH THE USE OF FURNISHING OF EQUIPMENT, PARTS OR SERVICES HEREUNDER OR THE PERFORMANCE, USE OR INABILITY TO USE THE SAME, EVEN IF SENA OR ITS DEALER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT WILL SENA OR ITS DEALERS TOTAL LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT.

### **E.3. HARDWARE PRODUCT WARRANTY DETAILS**

WARRANTY PERIOD: SENA warranties embedded hardware Product for a period of one (1) year, and external hardware Product for a period of three (3) or five (5) years according to the Product type.

WARRANTY PROCEDURE: Upon return of the hardware Product SENA will, at its option, repair or replace Product at no additional charge, freight prepaid, except as set forth below. Repair parts and replacement Product will be furnished on an exchange basis and will be either reconditioned or new. All replaced Product and parts become the property of SENA. If SENA determines that the Product is not under warranty, it will, at the Customers option, repair the Product using current SENA standard rates for parts and labor, and return the Product at no charge in or out of warranty.

WARRANTY EXCLUSIONS: Damages caused by

- Accidents, falls, objects striking the SENA product,
- Operating the Product in environments that exceed SENA's temperature and humidity specifications,
- Power fluctuations, high voltage discharges,
- Improper grounding, incorrect cabling,
- Misuse, negligence by the customer or any other third party,
- Failure to install or operate the product (s) in accordance to their SENA User Manual,
- Failure caused by improper or inadequate maintenance by the customer or any other third party,

- Floods, lightning, earthquakes,
- Water spills,
- Replacement of parts due to normal wear and tear,
- Hardware has been altered in any way,
- Product that has been exposed to repair attempts by a third party without SENA's written consent,
- Hardware hosting modified SENA Software, or non-SENA Software, unless modifications have been approved by SENA.
- Battery component capacity degradation due to usage, aging, and with some chemistry, lack of maintenance.

#### **E.4. SOFTWARE PRODUCT WARRANTY DETAILS**

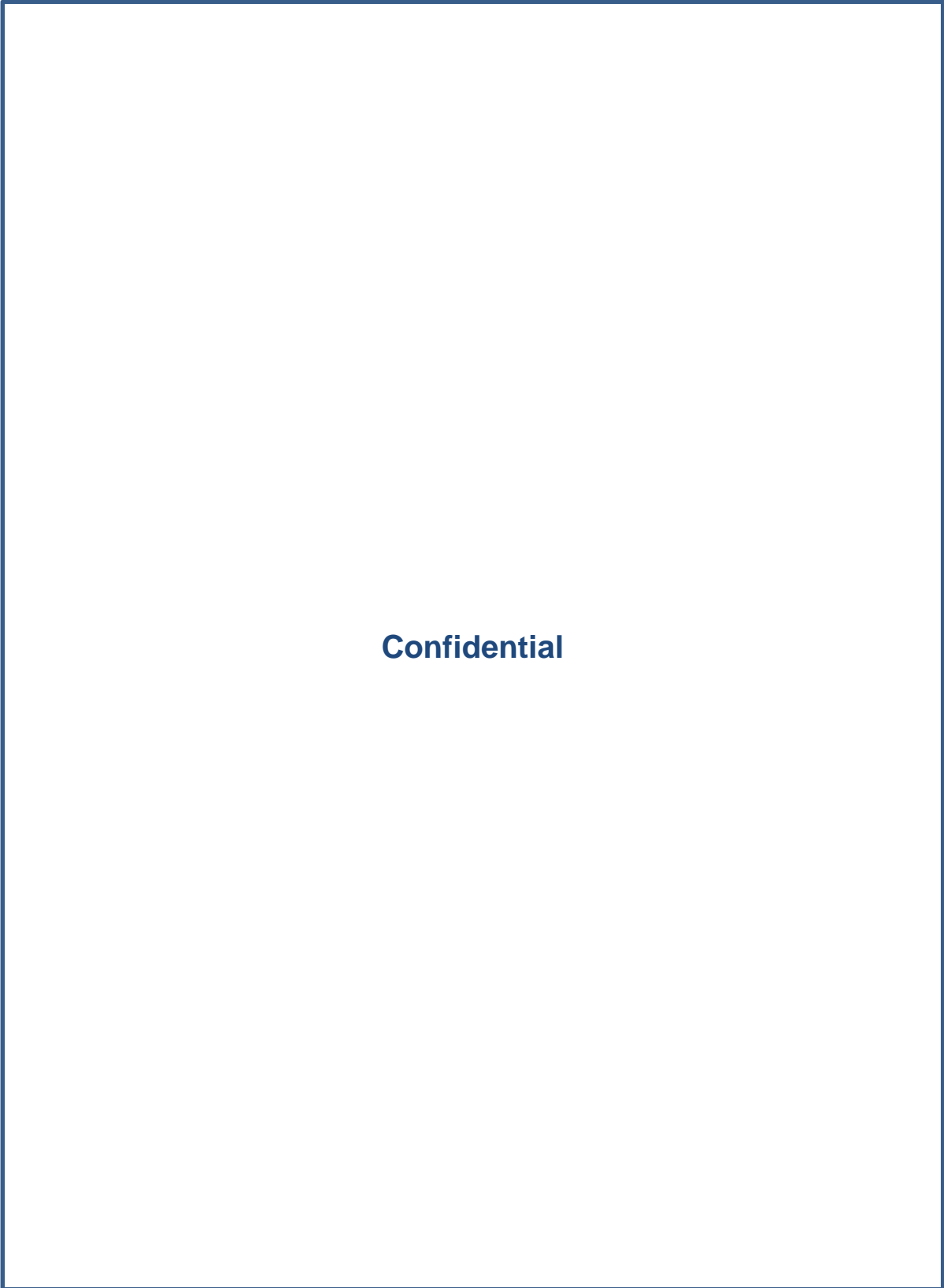
WARRANTY PERIOD: SENA warrants software Product for a period of one (1) year.

WARRANTY COVERAGE: SENA warranty will be limited to providing a software bug fix or a software patch, at a reasonable time after the user notifies SENA of software non-conformance.

#### **E.5. THIRD-PARTY SOFTWARE PRODUCT WARRANTY DETAILS**

The warranty policy of the third-party software is conformed to the policy of the corresponding vendor

**Appendix F: How to make a RS232 interface Development Board**



**Confidential**

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

# Appendix G: IW06 PCB mechanical drawing

