Sniffer

IrDA-Control Packet Sniffer Kit

Users' Manual

Version 1.02

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SHARP CORPORATION

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Record Of Modification

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0.1	June 3rd, 1998	First Edition (for Public Release)
1.02	October 7th,1998	Modification and addition to the First Edition

1. Introduction

The Sharp IrDA-Control Packet Sniffer Kit (Sniffer Kit) is a development support tool to help users develop IrDA-Control specification compliant peripheral devices. Because the Sharp Sniffer Kit includes a sniffer board and sniffer program (for PC), users can analyze the packets of IrDA-Control infrared communication.
Figure 1.1 shows the evaluation system structure with Sharp Sniffer Kit. This system enables users to evaluate and analyze the infrared signal packet data, where the data transaction occurs between the Host device and the Peripheral device.

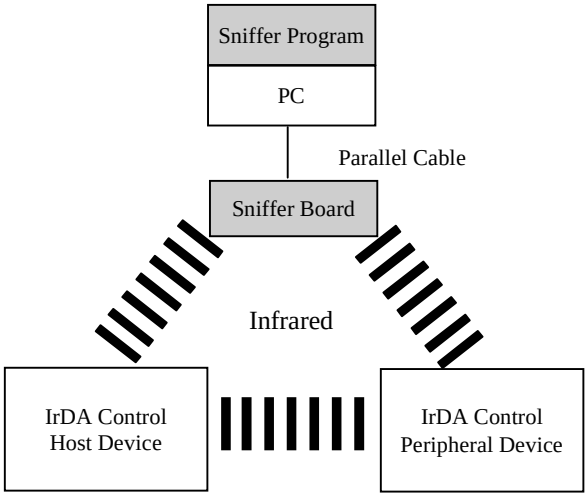


Figure 1.1 Evaluation System

2. Before Using Sniffer Kit

2.1 Enclosed Tools

The Sharp Sniffer Kit contains following tools in its package:

- **Sniffer Board** — Evaluation board. A PWB, on which an infrared transceiver, and IrDA-Control IC are mounted, together with parallel interface circuit for PC connection is designed.
- **Parallel Cable**
- **Power Supply Adapter**
- **Floppy Disk** — This FD provides PC sniffer program (sniffer.exe) that runs on PC/AT compatible.

2.2 Sniffer Kit System Set Up

The Sharp Sniffer Kit system should be set up by following the steps described below:
1). Install Sniffer program on the PC prepared for the evaluation.
2). Connect the Sniffer Board and PC with the enclosed parallel cable.
3). Configure the PC Printer (parallel) port.
4). Supply power to the Sniffer Board

(IMPORTANT NOTICE)
In case of using external power supply, the rated power supply on the enclosed AC adapter must be applied to the Sniffer board. ([INPUT] AC 120 V, 50/60 Hz, 18 W [OUTPUT] DC 6 V, 2 A)

Details of each step described above are provided in following chapters, and set up must be complete by the instructions provided therein.

2.3 Sniffer Program Installation

Sniffer program can only be executed in DOS mode at this moment. The software can be installed on any desired directory (folder). Please create the directory (folder) and copy “sniffer.exe” in FD that comes with the Sniffer Kit. Following is an example of installing Sniffer program to C:\SNIFFER (suppose FD drive is assigned to A:\);

```
MKDIR C:\SNIFFER
COPY A:\SNIFFER.EXE C:\SNIFFER
```

(NOTE)
PC for the Sniffer Kits must meet following requirements:

- Hardware: PC/AT Compatible
- Software: MS-DOS (DOS/V or Windows 95 DOS mode)

2.4 Sniffer Board Set up

Figure 2.1 shows rough drawing of the Sniffer Board that comes in the Sniffer Kit. Referring to the figure shown below, following set up must be completed:

- One side of the enclosed parallel cable must be connected to CN1 of the Sniffer Board, and the other end to the prepared PC. (Any side can be connected to PC or the Sniffer Board.) In case that the enclosed parallel cable will not be used, a DB25 (25 pin - 25 pin, male to male) straight cable must be used with full connection.
- CN2 must be connected to the enclosed power supply adapter.

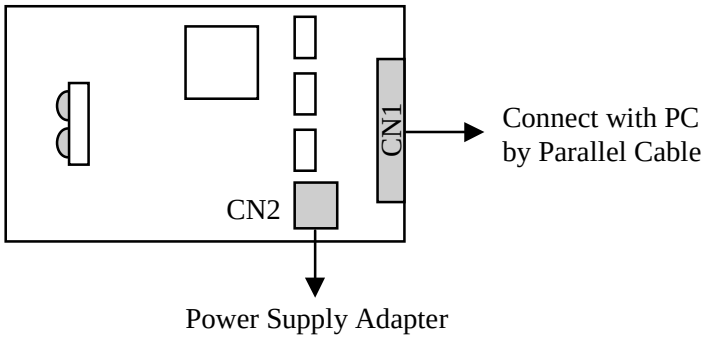


Figure 2.1 Core Board Rough Drawing

2.5 PC Printer Port (Parallel Port) Configuration

The printer port of the PC used with the Sniffer Kit must be selected to one of the combinations provided in table 2.1. (For the port configuration, the procedure provided in the PC BIOS must be used.) It is recommended to select "Port 2" printer port unless otherwise the system has some specific problems:

The Port Mode must also be configured to the Bi-directional mode (PS/2 compatible mode), following the setup instructions provided by PC BIOS. Boot the PC by DOS mode, which an instruction for Windows OS Environment is provided below.

Note that the Port number does not directly correspond to the U.S. standard "LPT" port convention used in the United States. The standard default in the U.S. is port 2, which corresponds to LPT1.

- Windows OS Environment:
DOS mode of Windows 95 will be used. Press F8 when booting the PC, and select the Windows 95 boot menu when displayed on the PC. Select "Command Prompt Only", and continue. Change directory to the location where the Sniffer execution file is installed, and execute the program.
Note that this software will not run in DOS mode from the Windows 95 start menu, or Windows DOS window.

Port	Port Address	Interrupt	U.S. Printer Port
Port 1	3BCh	IRQ7	
Port 2	378h	IRQ7	LPT1
Port 3	278h	IRQ5	LPT2

Table 2.1 Parallel Port Configuration

3. Basic Operation of Sniffer Program

3.1 Executing Software

The Sniffer software runs in DOS mode. The execution file name for this software is "`SNIFFER.EXE`". This program can also be operated with different configurations of printer port. Adding the following option when executing the Sniffer program can change the printer port configuration:

Option : `-pN` (`N` represents # of port, 1 to 3 can be applicable. Default is 2)

e.g.) Connecting Sniffer board with printer port 1:

Command : `sniffer -p1`

In addition, the monitored packet data will be displayed to the standard output of PC. However, if one wishes to output the monitored packet data to a file, file name should be added following the Sniffer command and executed. Names for the data file can be any name, so that overwriting the file can be avoided.

e.g.) Output the packets to be monitored to the file, named "ir_packet.dat":

Command : `sniffer ir_packet.dat`

3.2 Sniffer Program Operation Display

When Sniffer program is correctly executed the operation console such like Figure 3.1 will be displayed on the PC.

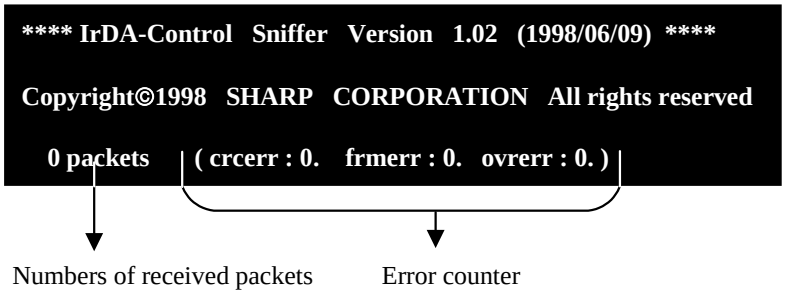


Figure 3.1 Sniffer Program Operation Display

Descriptions of error counters are provided in the table 3.1 shown below:

Display	Error Description
crcerr	Numbers of packets had errors at CRC check
frmerr	Numbers of packets had frame errors
ovrerr	Numbers of packets had receipt over-run

Table 3.1 Descriptions of Error Counter

3.3 Quitting Sniffer Program

To quit (exit) the Sniffer program, press [q]. Note that the Sniffer program will automatically closed when the receiving memory became full. To shutdown the Sniffer program, press [Ctrl] + [C]. When you shutdown the program, all received data will be eliminated.

4. Evaluation of Packet Data

4.1 Packet Data Analysis

The monitored packet data will be outputted in the format shown in Figure 4.1.

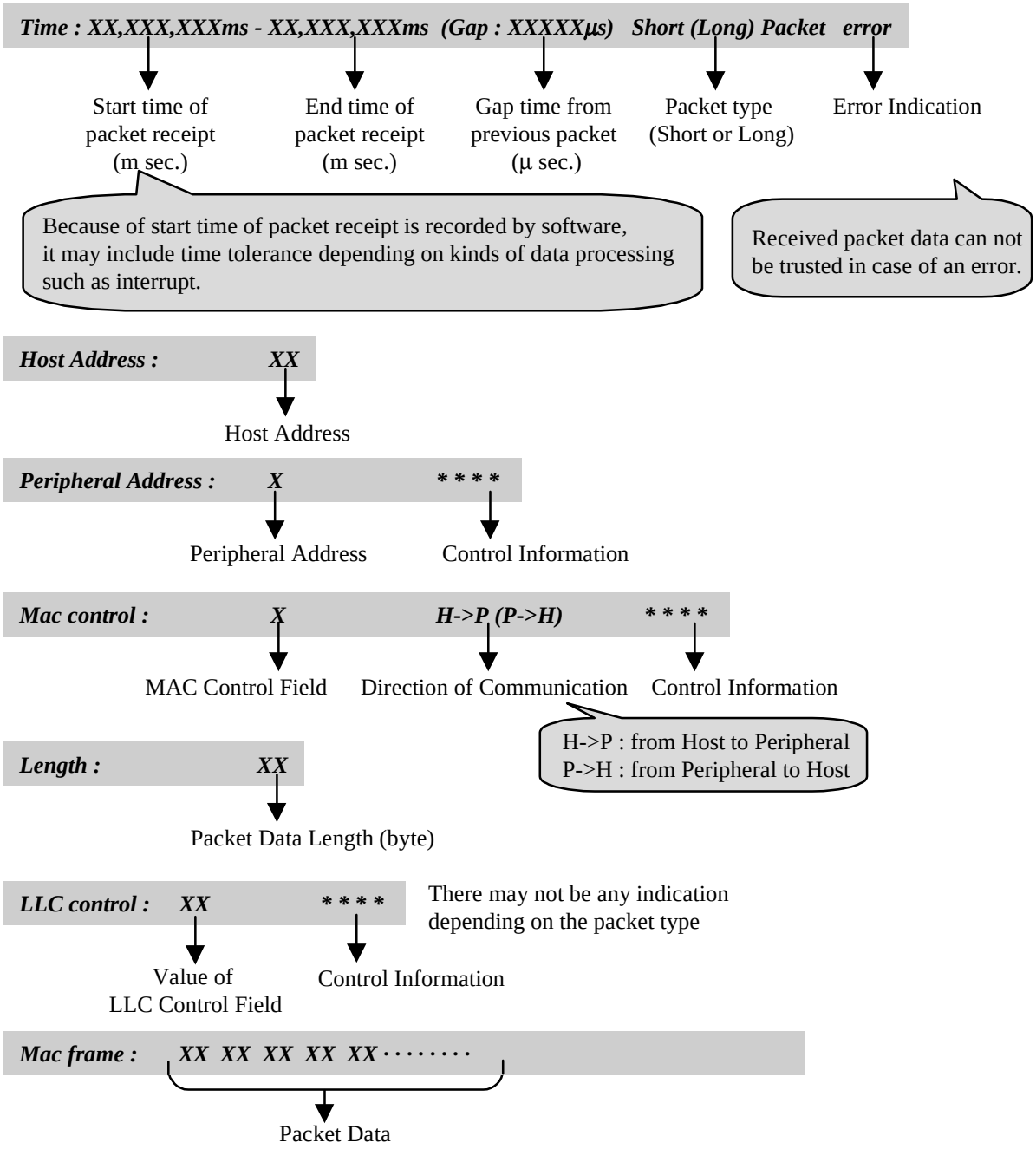


Figure 4.1 Packet Data Format

4.2 Example of Packet Data

Figure 4.2 shows a monitoring example of the packet transmitted/received between the Host and the Peripheral device.

Time : 63,582,111ms - 63,583,604ms (Gap : 166µs) Short Packet
Host Address : fb
Peripheral Address : 1
MAC Control : 4 P->H, Polling Request
Length : 12
LLC Control : 23 EP=1, PT=DATA0
MAC Flame : fb 41 23 00 00 20 00 00 00 00 00 5b

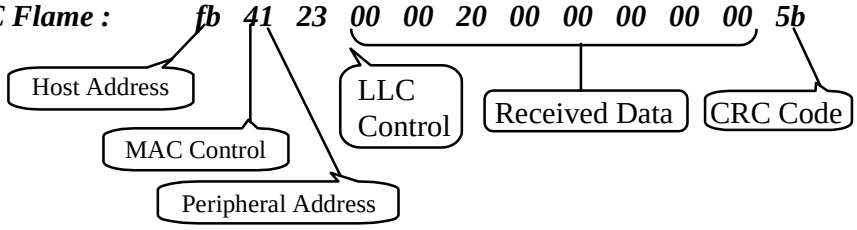


Figure 4.2 Packet Data Example

5. Trouble Shooting

The following information can be referenced for trouble shooting. Please read through the following information before contacting any of Sharp local sales for malfunctions of the Sniffer board:

- "No Memory for...." error message appeared in executing the Sniffer kit;

  The recommended memory size must be allocated to the conventional area by not loading other drivers. This Sniffer program requires conventional memory size of as much as 450Kbytes.

- "Hardware Error!!" error message appeared in executing the Sniffer kit; Please check your system and see whether your case would fit to the following:

  (1) Power supply is not applied to the Sniffer board:
  ➔ Please connect the enclosed AC adapter to CN2 and apply appropriate power supply.

  (2) PC BIOS is not appropriately configured:
  ➔ Please configure the port mode to bi-directional (bi-directional) mode.
  ➔ Please re-configure the printer port configuration (port address, IRQ) by referring to the Table 2.1 provided in Section 2.5.

6. Appendix: Packet Data Example

In this section, using the examples provides the explanation on actual packet transactions between the Host device and the Peripheral device. Example 1 is for Enumeration sequence, Example 2 for USB-Enumeration sequence, and Example 3 for the Sniffer log at data input/output.

(Example 1: Enumeration)

Peripheral control information at the Enumeration sequence can be briefly explained as described below:

1. Enum-Wakeup — Request to the Host device for polling so that the Peripheral device can perform the operations required for the Enumeration with the Host.
   (Polling ... Host device will give "Response Permission" to the Peripheral device.)
2. Enum-Hailing — Host to perform Hailing so that the Host device can obtain information from the Peripheral devices for Enumeration.
3. Enum-Request — Peripheral to request Enumeration with the Host device once the Peripheral device already obtained the specific Host device information (Host ID, Host specific information).
4. Enum-Response — Host to inform the Peripheral device that the Enumeration with the Peripheral device is completed by Enum-Response.

The peripheral control information that can be obtained by the Sniffer log at the Enumeration sequence generally appears as follows:

Enum-Wakeup(P→H) Enum-Hailing(H→P) Enum-Request(P→H) Enum-Response(H→P)

Following is an example of the actual information transaction between the Host and the Peripheral in its procedure order. Explanation for each procedure is also provided on the right side, enclosed by the box:

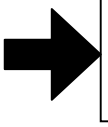
```
**** IrDA-Control Sniffer Version 1.02 (1998/06/09) ****
Fri Sep 04 17:11:40 1998
12 packets received (crcerr:0, frmerr:0, ovrerr:0)

#0 Time:5,603.083ms-5,603.616ms(Gap:5603083us) Short Packet
        Host Address:           00
        Peripheral Address:     f Enum-Wakeup
        Mac control:            4 P->H, PollingRequest
        Length: 3
        MAC frame:    00 4f df
```

→ Peripheral device to give Enum-Wakeup to the Host device

```
#1 Time:5,624.670ms-5,625.630ms(Gap:21054us) Short Packet
        Host Address:           12
        Peripheral Address:     f Enum-Hailing HostID=CA61,HInfo=0001
        Mac control:            9 H->P, Hailing
        Length: 7
        MAC frame:    12 9f 61 ca 01 00 56

        --- (CONTINUE TO THE NEXT PAGE) ---
```

→ Upon the receipt of the Polling request from the Peripheral device, the Host device (HostID: CA61) will give Enum-Hailing so that Enum-Request can be received.

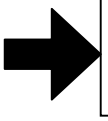
#2 Time:5,628.203ms-5,629.163ms(Gap:2573us) Short Packet
Host Address: 12
Peripheral Address: f Enum-Hailing HostID=CA61, HInfo=0001
Mac control: 9 H->P, Hailing
Length: 7
MAC frame: 12 9f 61 ca 01 00 56



(#2 same as #1)
the Host device (HostID: CA61) will continue giving Enum-Hailing so that Enum-Request can be received.

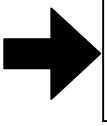
(• Snipped •)

#10 Time:5,684.243ms-5,685.629ms(Gap:180us) Short Packet
Host Address: 12
Peripheral Address: f Enum-Request PFID=A31810F1, PInfo=0001,HostID=CA61
Mac control: 4 P->H, PollingRequest
Length: 11
MAC frame: 12 4f f1 10 18 a3 01 00 61 ca 51



The Peripheral device (PFID = A31810F1) that received the Enum-Hailing will send Enum-Request to the Host device.

#11 Time:5,699.903ms-5,700.863ms(Gap:14274us) Short Packet
Host Address: 12
Peripheral Address: f Enum-Response PFID=A31810F1
Mac control: 8 H->P
Length: 7
MAC frame: 12 8f f1 10 18 a3 5d



The Host will then give Enum-Response to the Peripheral device to inform of the Enumeration completion.

Above log can generally be obtained from the Sniffer log at the Enumeration sequence. The example of USB-Enum sequence is provided in the next example.

(Example 2: USB-Enum)

The USB-Enum sequence is to provide the Peripheral device's Descriptor information to the Host device between the Host and the Peripheral.

Binding procedure will take place between the Host and the Peripheral at the USB-Enum sequence. The Bind sequence is the same as the Enumeration sequence, in which the obtained peripheral control information generally appears as follows:

Bind-Wakeup(P→H) Bind-Hailing(H→P) Bind-Request(P→H) Bind-Response(H→P)

[Each control information for Bind (Bind-Wakeup, Bind-Hailing, Bind-Request, and Bind-Response) are all corresponding to the control information described in the Enumeration sequence.]

Following is an example of the actual information transaction between the Host and the Peripheral in this sequence order. Explanation for each procedure is also provided on the right side, enclosed by the box:

```
**** IrDA-Control Sniffer Version 1.02 (1998/06/09) ****
Mon Sep 21 17:41:39 1998
1157 packets received (crcerr:0, frmerr:0, ovrerr:0)

#0 Time:2,142.877ms-2,143.623ms(Gap:2142877us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Wakeup HostID=1CE1
        Mac control:            4 P->H, PollingRequest
        Length: 5
        MAC frame:    28 40 e1 1c b4
```

→ Enumeration between the Host and the Peripheral now completed. The Peripheral then gives Bind-Wakeup to the Host.

```
#1 Time:2,165.200ms-2,165.946ms(Gap:21577us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Hailing HostID=1CE1
        Mac control:            9 H->P, Hailing
        Length: 5
        MAC frame:    28 90 e1 1c 37
```

→ The Host (HostID: 1CE1) received the Polling request from the Peripheral the gives the Bind-Hailing in order to receive the Bind-Request.

```
#2 Time:2,166.115ms-2,167.075ms(Gap:169us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Request PFID=8F932776
        Mac control:            4 P->H,PollingRequest
        Length: 7
        MAC frame:    28 40 76 27 93 8f cd
```

→ The Peripheral (PFID = 8F932776) gives the Bind-Request to the Host that has sent the Bind-Hailing.

```
#3 Time:2,181.860ms-2,182.926ms(Gap:14785us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Response PFID=8F932776,PADD=01
        Mac control:            c H->P, BindTimerRestarted
        Length: 8
        MAC frame:    28 c0 76 27 93 8f 01 67
```

→ The Host (HostID: 1CE1) will allocate the PADD = 1 to the Peripheral which requested for the Polling, to inform that Binding is now completed.

--- (CONTINUE TO THE NEXT PAGE) ---

#4 Time:2,183.130ms-2,183.663ms(Gap:204us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 4 P->H, PollingRequest
Length: 3
MAC frame: 28 41 12

#5 Time:2,195.998ms-2,196.744ms(Gap:12335us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: c H->P, BindTimerRestarted
Length: 5
LLC control: 09 EP=0,PT=GET_DESCRIPTOR(Device)
MAC frame: 28 c1 09 01 77

The Host then throws the GET-DESCRIPTOR packet to import the Peripheral Descriptor information to the EP = 0.

#6 Time:2,196.918ms-2,197.558ms(Gap:174us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 4 P->H, PollingRequest
Length: 4
LLC control: 04 EP=0,PT=ACK
MAC frame: 28 41 04 20

The Peripheral returns ACK packet to confirm the packet given in #5 procedure has been correctly received.

• • Snipped • •

#10 Time:2,223.684ms-2,224.324ms(Gap:11747us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 8 H->P
Length: 4
LLC control: 08 EP=0,PT=IN
MAC frame: 28 81 08 19

The Host then throws IN packet so that the Descriptor data can be obtained from the Peripheral device at EP = 0.

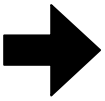
#11 Time:2,224.516ms-2,226.009ms(Gap:192us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 4 P->H, PollingRequest
Length: 12
LLC control: 0b EP=0,PT=DATA1
MAC frame: 28 41 0b 12 01 00 01 00 00 00 08 ee

The Peripheral sends DATA1 data packet to the Host.

• • Snipped • •

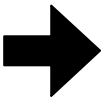
--- (CONTINUE TO THE NEXT PAGE) ---

#13 Time:2,237.462ms-2,238.102ms(Gap:10245us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: c H->P,BindTimerRestarted
Length: 4
LLC control: 04 EP=0,PT=ACK
MAC frame: 28 c1 04 c9



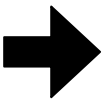
The Host then returns ACK packet to the Peripheral to confirm that the DATA1 packet given in #11 procedure has been correctly received.

#14 Time:2,238.835ms-2,239.581ms(Gap:733us) Short Packet
Host Address: 28
Peripheral Address: 0 Bind-Hailing HostID=1CE1
Mac control: 9 H->P, Hailing
Length: 5
MAC frame: 28 90 e1 1c 37



The Host continues to throw Bind-Hailing for a certain period to receive information from other Peripheral devices.

#15 Time:2,264.457ms-2,265.417ms(Gap:24876us) Short Packet
Host Address: 28
Peripheral Address: f Enum-Hailing HostID=1CE1,HInfo=0001
Mac control: 9 H->P, Hailing
Length: 7
MAC frame: 28 9f e1 1c 01 00 78



The Host also throws Enum-Hailing when it is in Bind state with the Peripheral device, to observe the existence of other Peripheral devices which needs to be Enumerated.

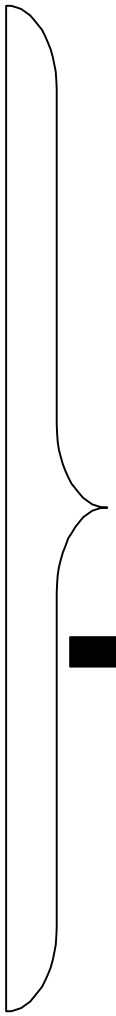
In the event that the Peripheral device holds many Descriptor information, #10, #11, and #13 log will be repeated. The Host device will also continues sending Bind-Hailing for a certain period after the Polling-Request from the Peripheral. For the meantime, the Host will keep sending Enum-Hailing so that the other Peripheral devices can be enumerated.

Above is a typical log that can be obtained at USB-Enum sequence. A typical log example for the data input/output is also provided in the next example.

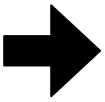
(Example 3: Data Input)

An example for the typical log at the data input (data input by a keyboard) is provided as shown below:

```
**** IrDA-Control Sniffer Version 1.02 (1998/06/09) ****
Mon Sep 21 17:42:51 1998
2294 packets received (crcerr:0, frmerr:0, ovrerr:0)

#0 Time:4,364.914ms-4,365.660ms(Gap:4364914us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Wakeup HostID=1CE1
        Mac control             4 P->H, PollingRequest
        Length: 5
        MAC frame:    28 40 e1 1c b4

#1 Time:4,387.234ms-4,387.980ms(Gap:21574us) Short Packet
        Host Address:           28
        Peripheral Address      0 Bind-Hailing HostID=1CE1
        Mac control:            9 H->P, Hailing
        Length: 5
        MAC frame:    28 90 e1 1c 37

#2 Time:4,388.143ms-4,389.103ms(Gap:163us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Request PFID=8F932776
        Mac control:            4 P->H, PollingRequest
        Length: 7
        MAC frame:    28 40 76 27 93 8f cd

#3 Time:4,403.861ms-4,404.927ms(Gap:14758us) Short Packet
        Host Address:           28
        Peripheral Address:     0 Bind-Response PFID=8F932776,PADD=01
        Mac control:            c H->P, BindTimerRestarted
        Length: 8
        MAC frame:    28 c0 76 27 93 8f 01 67

#4 Time:4,405.165ms-4,405.698ms(Gap:238us) Short Packet
        Host Address            28
        Peripheral Address:     1
        Mac control:            4 P->H, PollingRequest
        Length: 3
        MAC frame:    28 41 12

#5 Time:4,418.044ms-4,418.684ms(Gap:12346us) Short Packet
        Host Address:           28
        Peripheral Address      1
        Mac control:            8 H->P
        Length: 4
        LLC control:            28 EP=1,PT=IN
        MAC frame:    28 81 28 c0

        --- (CONTINUE TO THE NEXT PAGE) ---
```

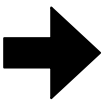


These are the Bind sequence explained in the previous example.



The Host sends IN packet so that the data can be received at EP = 1 from the Peripheral device.

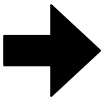
#6 Time:4,418.883ms-4,420.376ms(Gap:199us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 4 P->H, PollingRequest
Length: 12
LLC control: 23 EP=1,PT=DATA0
MAC frame: 28 41 23 00 00 04 00 00 00 00 00 5c



The Peripheral sends DATA0 data packet to the Host. (Information that the key is stroked.)

• • Snipped • •

#8 Time:4,431.822ms-4,432.462ms(Gap:10243us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: c H->P, BindTimerRestarted
Length: 4
LLC control: 24 EP=1,PT=ACK
MAC frame: 28 c1 24 10

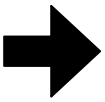


The Host returns ACK packet to confirm the receipt of the packet data (DATA0).

• • Snipped • •

#10 Time:4,445.637ms-4,446.277ms(Gap:11696us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 8 H->P
Length: 4
LLC control: 28 EP=1,PT=IN
MAC frame: 28 81 28 c0

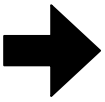
#11 Time:4,446.469ms-4,447.962ms(Gap:192us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: 4 P->H, PollingRequest
Length: 12
LLC control: 2b EP=1,PT=DATA1
MAC frame: 28 41 2b 00 00 00 00 00 00 00 00 3c



The Peripheral sends DATA1 data packet to the Host. (Information that the key is released.)

• • Snipped • •

#13 Time:4,459.471ms-4,460.111ms(Gap:10300us) Short Packet
Host Address: 28
Peripheral Address: 1
Mac control: c H->P, BindTimerRestarted
Length: 4
LLC control: 24 EP=1,PT=ACK
MAC frame: 28 c1 24 10



The Host returns ACK packet to confirm the receipt of the packet data (DATA1).

The data from the Peripheral to the Host is as #5, #6, and #8, and the data from the Host to the Peripheral is as #10, #11, and #13, where the Host sends the IN packet data to the Peripheral in order to receive the data. The Peripheral that received the IN packet from the Host then sends data to the Host, from which ACK packet would be returned, for its receipt confirmation. In the event that the Peripheral does not send any data for a certain period, this Peripheral device will shift to the Unbound state, where the Bind sequence is re-required for the data transmission.

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