IT9500 Series —
API TestKit User Guide

Revision History

Revision	Date	Description
1.0	06/13/2012	Initial Release
1.1	09/27/2012	i. Update API to V1.0.20120831.0 ii. Add CMD: 6. Set device type 7. Get device type 8. Access Fw PSI table 9. Set Fw PSI table timer
1.5	01/30/2013	Rewritten for new API structure
1.6	06/06/2013	Update API to V1.2.20130606.0

Table of Contents

Figures

Tables

1. Introduction

This document briefs how to use IT9500 API Testkit in PC Windows environment. IT9500 family includes IT9507 and IT9503. IT9507 is full featured modulator while IT9503 is capable of QPSK modulation only.

2. Hardware Installation

2.1. IT9500 EVB and USB Dongle

There are two types of IT9500 evaluation kits, USB dongle and EVB, as shown in figure 1 & 2.
The USB dongle can only support USB interface, and only USB operation mode is supported, while EVB is full featured which can support both USB and IIC interface and all operation modes are supported. For more details about the EVB configurations and options, please refer to IT9500 EVB user's guide.

Figure 1 IT9500 USB Dongle

Figure 2 IT9500 EVB

2.2. Setup device for USB control interface test

For USB dongle, no special step is required. You may just plug it to PC USB socket.

For EVB, please set the operation mode to either TS/USB or USB mode properly according to table 1. If not familiar with it, please set it to USB mode by setting S*104 dip switch #2 & #3 ON(1).* Connect a DC 5V adapter to the DC-in jack, switch the power on, and connect the USB connector to a PC host. Refer to the following picture.

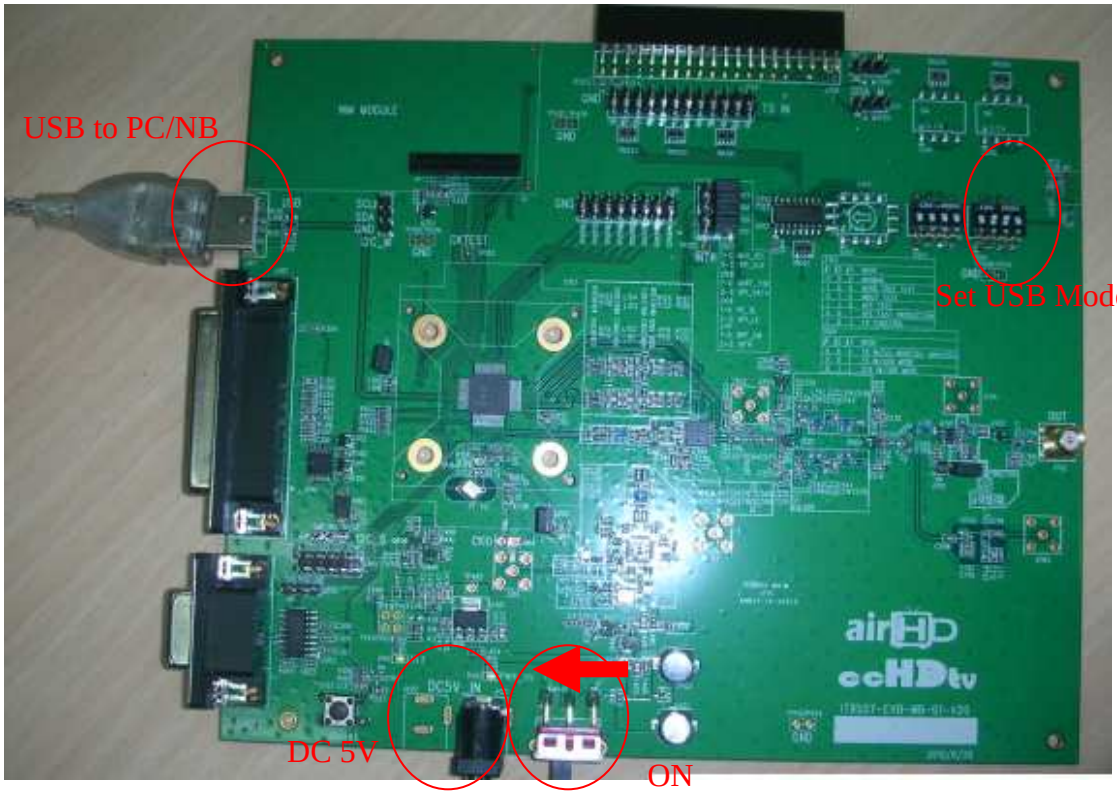


Figure 3 IT9500 EVB setup for USB mode test

Table 1 EVB S104 dip switch setting for operation modes

Dip switch #2 GPIOH6	Dip switch #3 GPIOH7	Operation mode	Data Path	Control Path
0	0	TS/I2C	TS	IIC
0	1	TS/USB	TS	USB
1	1	USB	USB	USB

Then, it's required to install IT9500 Windows USB driver. If the driver is installed well, the device manager will show a device named "IT9507 TX Device", as shown in the following figure.

IT9500 driver can be found in the folder <IT950x_Driver_XXX>of this package.

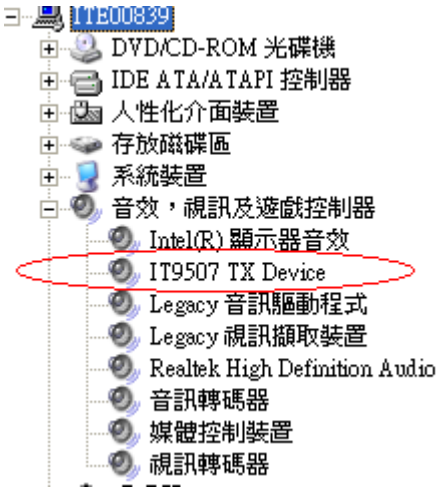


Figure 4 IT9500 USB device shown in Windows device manager

2.3. Setup device for IIC control interface test

Only IT9500 EVB can support IIC control bus.

TestKit supports two IIC bus implementations for PC Windows to control IT9500. One is PC printer port IIC and the other is AF9035 USB I2C adaptor board.

First of all, set S*104 dip & #3 OFF(0) for IT9500 IIC control mode.*
Refer to Table 1.

2.3.1. Printer port IIC

To use printer port IIC, you need a cable, whose both ends are 25 pin DSUB male connectors, as shown below.

Connect one end of the cable to the PC's printer port, and the other end to 9500 EVB. Connect a DC 5V adapter to the DC-in jack, switch the power on.. Refer to the

following picture.

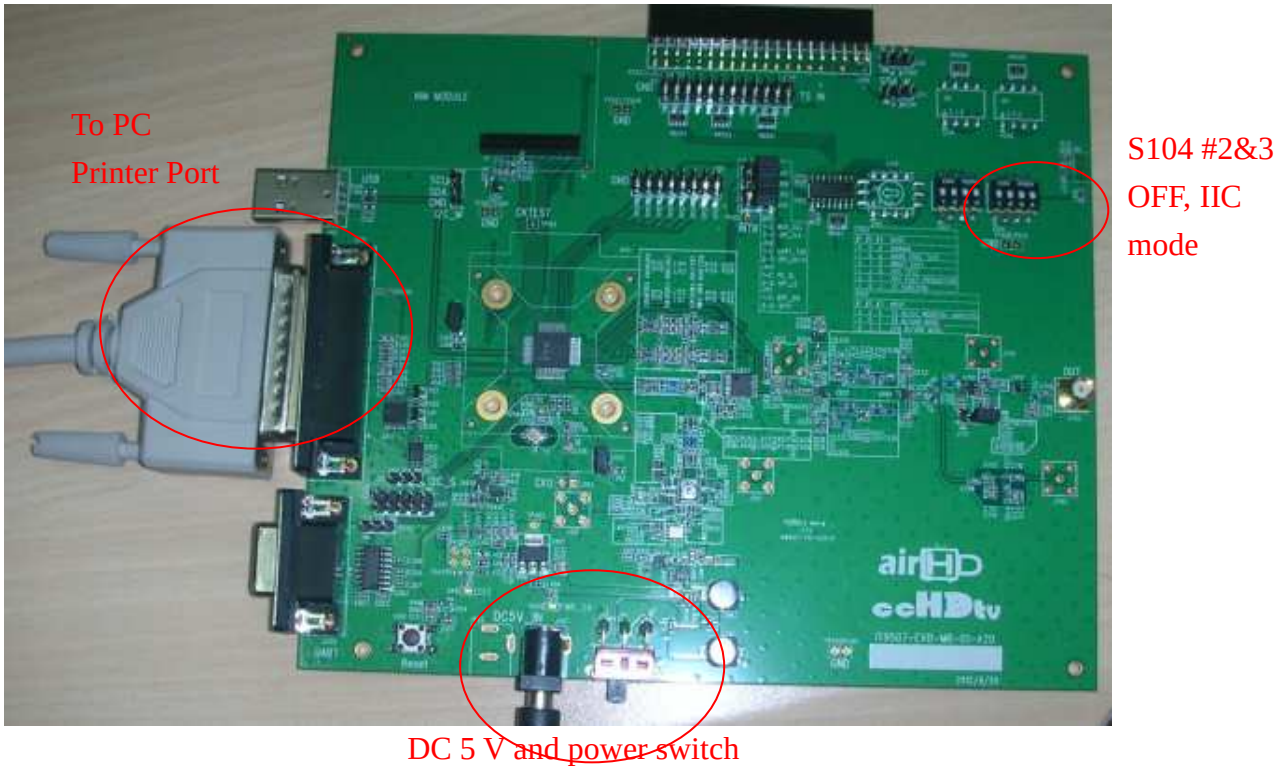


Figure 5 Control IT9500 EVB with printer port IIC

2.3.2. AF9035 USB to IIC adaptor board

There are two models of AF9035 USB to IIC adaptor boards, as shown below.

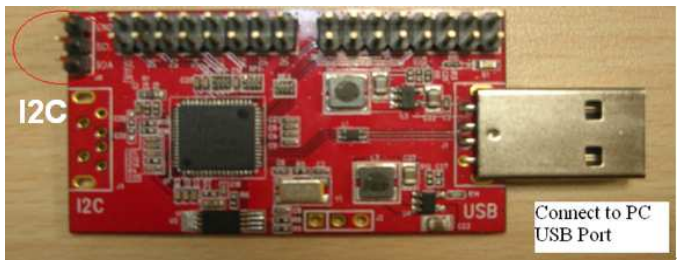


Figure 6 AF9035 USB to IIC adaptor board type-A

Figure 7 AF9035 USB to IIC adaptor board type-B

The following picture shows how type-A board is connected with 9500 EVB.

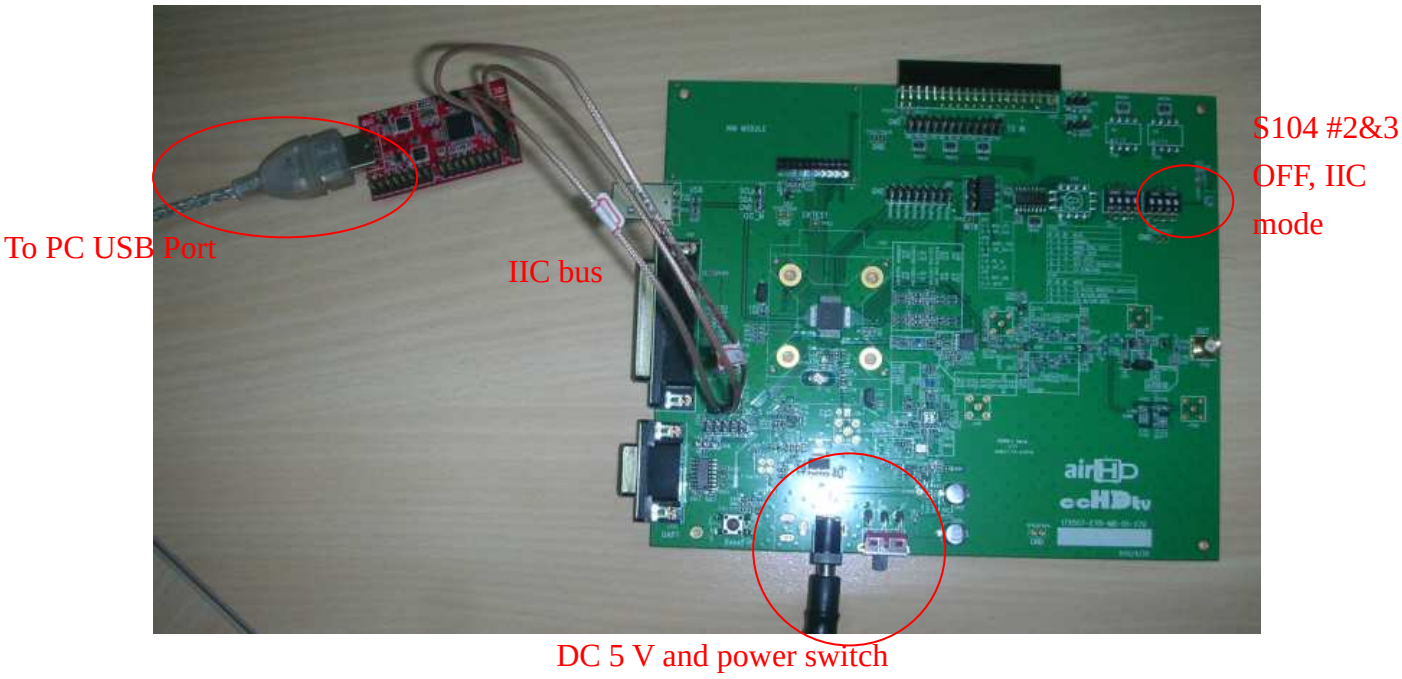


Figure 8 Control IT9500 EVB with AF9035USB I2C adaptor

Type-B board connection is similar, but there are two IIC buses on type-B adaptor. Either one can be used to connected to IT9500 IIC bus. Refer to the picture below.

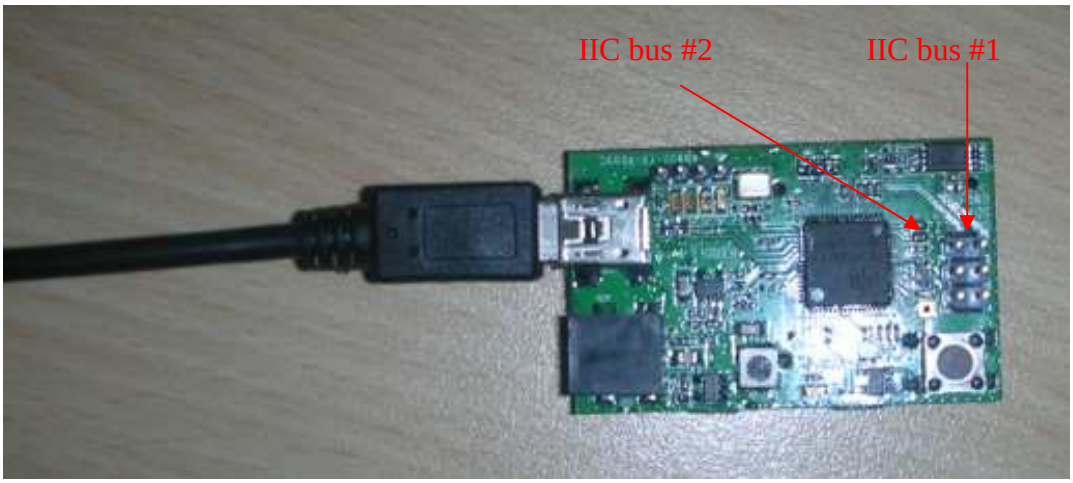


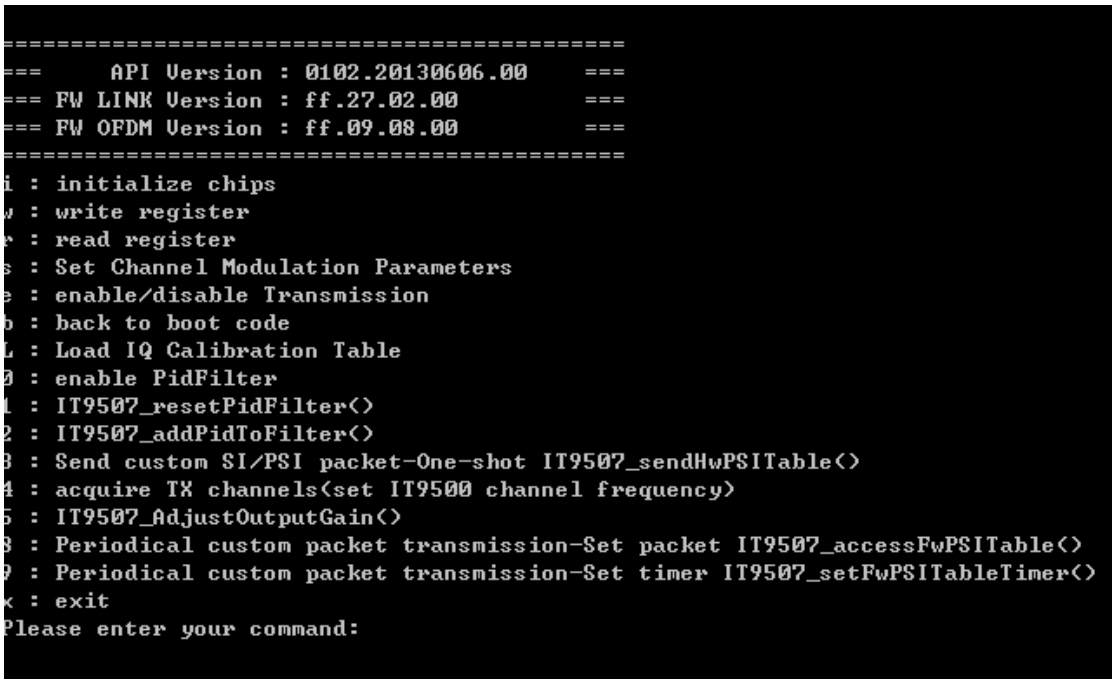
Figure 9 IIC buses of type-B AF9035USB I2C adaptor type B

When AF9035 USB I2C adaptor board is connected to PC, it may prompt to install USB driver in first time installation. The driver is included in this package. AF9035 driver can be found in the folder < AF9035 U2I_Driver_XXX> of this package.

3. Testkit Usage

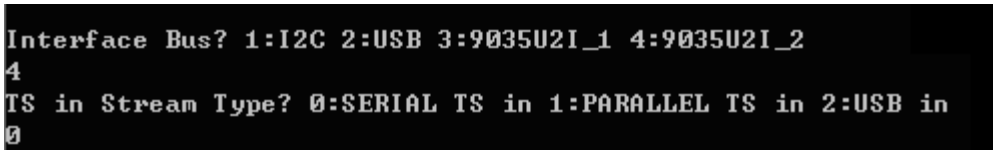
Launch ***EagleAPI.exe***.

The following menu shows in a console window.



3.1. Initialization

Select “i”.



Interface Bus:

If the control bus is printer port: select 1

If the control bus is USB: select 2

If the control bus is type-B 9035 USB to IIC adaptor and its IIC bus #1 used, select 3

If the control bus is type-B 9035 USB to IIC adaptor and its IIC bus #2 used, select 4

If the control bus is type-A 9035 USB to IIC adaptor, select 4

TS in Stream Type:

It specifies the TS stream source to be transmitted by IT9500.
It could be from serial TS interface, parallel TS interface or USB.

If the initialization successes, the message “IT9507_TXinitialize successful” will show. If fails, there will be an error message with error code.

3.2. Set Channel Modulation Parameters

Select “s”.

```
constellation type? 0:QPSK 1:16QAM 2:64QAM

0
coding rate? 0:1/2, 1:2/3, 2:3/4, 3:5/6, 4:7/8
1
guard interval? 0:1/32, 1:1/16, 2:1/8, 3:1/4
2
transmission Mode? 0:2k, 1:8k
1
```

Set the parameters properly as you need.
If the setting fails, there will be an error message with error code.

3.3. Acquire Channel (Set Channel Frequency)

Select “4” to set transmission frequency. The input channel frequency and bandwidth are in units of KHz. The channel specified in the following example is frequency:666MHz and bandwidth:8MHz.

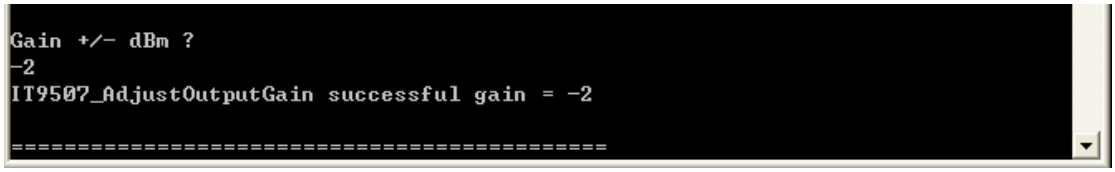
```
Input channel frequency in KHz?
666000
Bandwidth in KHz?
8000
```

3.4. Enable Transmission

Select “e”.to start or stop transmission. When started, the digital TV RF begins to be broadcast. Even there is no TS input, null packets will be filled and sent in the designated channel.

3.5. Set Output Gain/Attenuation

The user can use this command to adjust IT9500 output gain and get the real setting value. A negative number is for RF attenuation, while positive number for increasing RF power. The number is in units of dB.
Typical value is -15~+6dB, and default 0 dB.
The gain adjustment is implemented digitally before the on-chip ADC, so there will be MER loss (signal distortion) in higher gain or lower attenuation.
Recommend range is between -10db~+3 db.



3.6. Load Calibration Table

IT9500 performance can be further optimized with IQ calibration. The fine-tuned parameters are stored in a bin file. This command is used to load the calibration data.
Note: the calibration data bin file is board dependent. Loading wrong calibration file may get the performance worse.

3.7. Miscellaneous Commands

w. write register / r. read register
The user can use this command to read/write registers of IT9500.
There are two micro processors in IT9500, Processor_LINK, and Processor_OFDM. Registers with address 0xDxxx belong to Processor_LINK group, and those with address 0xFxxx belong to the processor Processor_OFDM.
Refer to the IT9500_Programming Guide for the complete register list table.

```
which processor to write? 0:LINK / 1:OFDM
1
which register to write?(HEX)
46
value?(HEX)
51
IT9507 write register(ofdm) successful

==========================================
```

```
which processor to read? 0:LINK / 1:OFDM
0
which register to read?(HEX)
d830
IT9507 value = 0x00
```

b. Back to boot code

This command is used for shutting down the IT9500.

```
back to boot code successful
```

0. Enable PID filter

This command is used to control hardware PID filter. The user can use this command to control hardware PID filter enable, disable and setting PID filter to pass or filter the packets with the PID's specified. All entries in the PID filter will be set to 0 after the PID filter is reset.

```
control PidFilter 0:pass the specified PID's(Pass mode) 1:filter the specified P
ID's(Block mode)
0
enable PidFilter 0:disable 1:enable
1
```

1. IT9507_resetPidFilter

This command is used to reset the hardware PID filter. All entries in the PID filter will be set to 0 after the PID filter is reset.

```
IT9507_resetPidFilter successful
```

2. IT9507_addPidToFilter

This command is used for adding a PID entry to the hardware PID filter. At most 31 PID entries are supported in IT9500.

The valid index range is 1~31.

The PID is specified in decimal from 0~8191(0x1FFF).

```
IT9507_addPidToFilter index ?
1
IT9507_addPidToFilter PID(DEC)
1001
add Pid successful

==========================================
```

3. Send custom SI/PSI packet-One-shot IT9507_sendHwPSITable()

This command is a test command for IT9507_sendHwPSITable(). After press this command, the packet (0x47 0x01 0x02 0x03 …) is inserted in IT9500 stream output buffer and transmitted. The packet is transmitted by IT9500 once and only once.

```
188:IT9507_sendHwPSITable successful (fake data is 0x47 0x06 0x07 0x08 ... )
```

8. Periodical custom packet transmission IT9507_accessFwPSITable()/IT9507_setFwPSITableTimer()

The user can set up to 5 custom packets (each at 188 Bytes) and specify the repetition rate (interval) to transmitting the packets periodically. The five buffers are indexed from 1~5.

The user can use IT9507_accessFwPSITable () to set the custom packets and use IT9507_setFwPSITableTimer () to set repetition interval in units of ms. Setting the interval timer to zero, will disable the corresponding custom packet.

```
PSI table index ?
1
IT9507_accessFwPSITable successful index = 1
fake data is 0x47, index, index+1, index+2...
```

```
PSI table index ?
1
Timer = ? (ms)
50
IT9507_getDeviceType successful index = 1 Timer = 50(ms)
```