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1. Introduction

A7121 is a 2.4G FSK RF transceiver. The DK7121A is a development kit that helps engineers to design and develop the kernel (transmission control) of 2.4G wireless applications such as keyboards, mice, remote controls, gamepads, headsets and so on. The equipments you should prepare yourself are one PC and two power supplies. After the system setup and run, the result of wireless transmission will display on the screen as a format of PER. The detailed information of this development kit is available in the document later. About the detailed control of A7121, please reference the source code and A7121 application note and datasheet in the CD-ROM.

2. Kit Components

The DK7121A contains the following items:

- Two A7121 RF modules
- Two DK boards
- One RS232 cables
- CD ROM containing:
  - DK7121A User Manual
  - DK7121A quick start guide
  - A7121 PER test program
  - A7121 Datasheet
  - Application note A7121
  - Development Kit Source code

3. Definitions

PER (Packet Error Rate or Packet Error Ratio)

A PER is a procedure or device that measures the BER for a given transmission. This Development Kit is a PERT that helps engineers learning how to control the RF chips through the providing firmware.

BER (Bit Error Rate or Bit Error Ratio)

BER is a measure of the accuracy of transmission for digital information in a telecommunication system. It is the percentage of bits that are error relative to the total number of bits received in a transmission, usually expressed as ten to a negative power. For example, a transmission might have a BER of 10 to the minus 9, meaning that one bit was in error out of 1,000,000,000 transmitted bits. The BER indicates how often a packet or other data unit has to be retransmitted because of an error. It means the packets had to be resent would increase in a transmission if the BER is too high. Hence the QoS became worse.

QoS (Quality of Service)

QoS implies the performance of a communication system. It may relate to some factors such as BER (Bit Error Ratio), SNR (Signal to Noise Ratio), maximum and mean throughput rate, priority and reliably, depending upon the communication system. BER is typically employed when expressing the QoS in a transmission.

4. Getting started

We prepare a Quick Start Guide as a paper in the box of the package beyond the pdf file in the CD-ROM. The user can follow the simple software installation guide and step-by-step procedure to run the one-way or two-way test very easily. Detailed descriptions about software installation and each step will be given in the S/W part of this document. H/W part includes PCB board description, Pin definition and schematic. F/W part includes the flowchart. The complete source code is allocated in the CD-ROM.

5. H/W Description

5.1 Voltage supply

User can apply power to Jack J9 of the Board from a 5 ~ 10VDC supply. The on-board voltage regulator generates a regulated +3.3VDC for the Board circuitry. The red Led shows whether the board has power applied.

5.2 RS232 connection

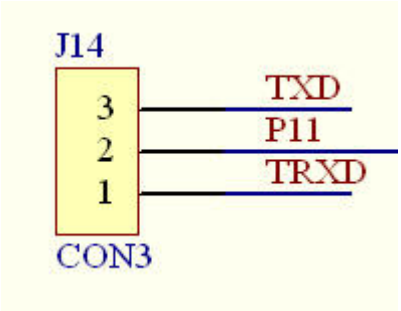
The DK Board provides a DB-9 connection for a simply RS232 port. User uses the supplied RS232 cable to connect the DK Board to the PC's serial port (COM1 or COM2). The DK board is connected to a PC to be programmed by the software.

5.3 RF module expansion connection

The Board provides RF module expansion connectors for A7121 module. You should plug in RF module on connector J8.

5.4 Jumper setting

5.4.1 J14 jumper setting: The TX data is sent to Pin TRXD of A7121 when Pin 1 & 2 is short. The TX data is sent to Pin TXD of A7121 when Pin 2 & 3 is short.



J14 circuit

5.5 Push Button

The following table shows the push button function.

Push button	Description
SW1 (MCU RESET)	Reset MCU

5.6 LEDs

The Board provides three Leds. Refer to the table below for different Leds.

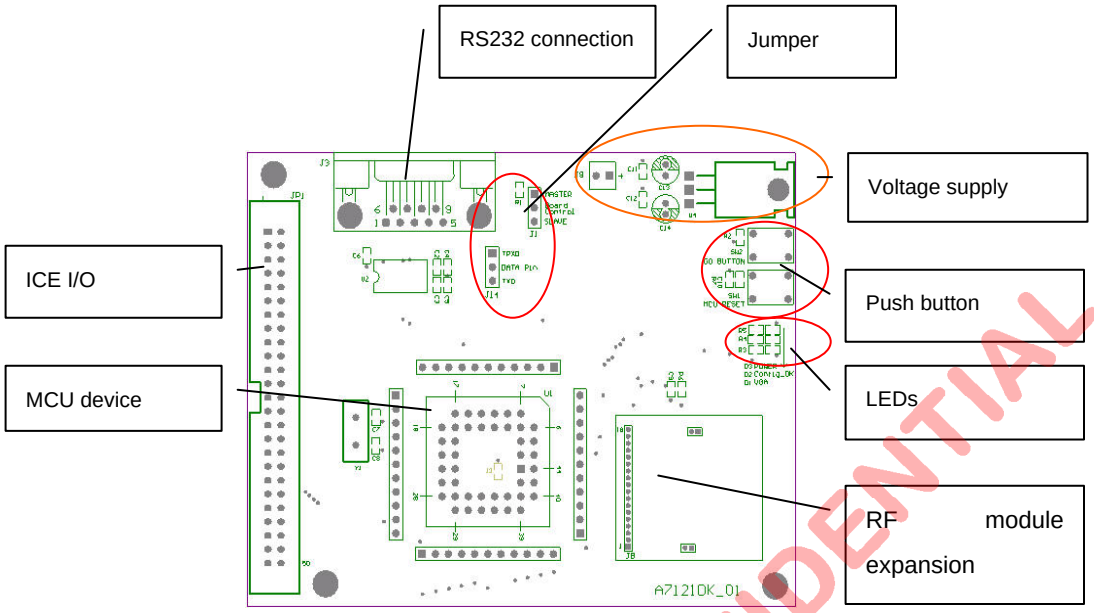
LED	Description
D1 (Green)	Config ok indirect
D2 (Yellow)	VGA gain indirect, On- 20dB,Off- 0dB
D3 (Red)	Power on indirect

5.7 ICE I/O connections

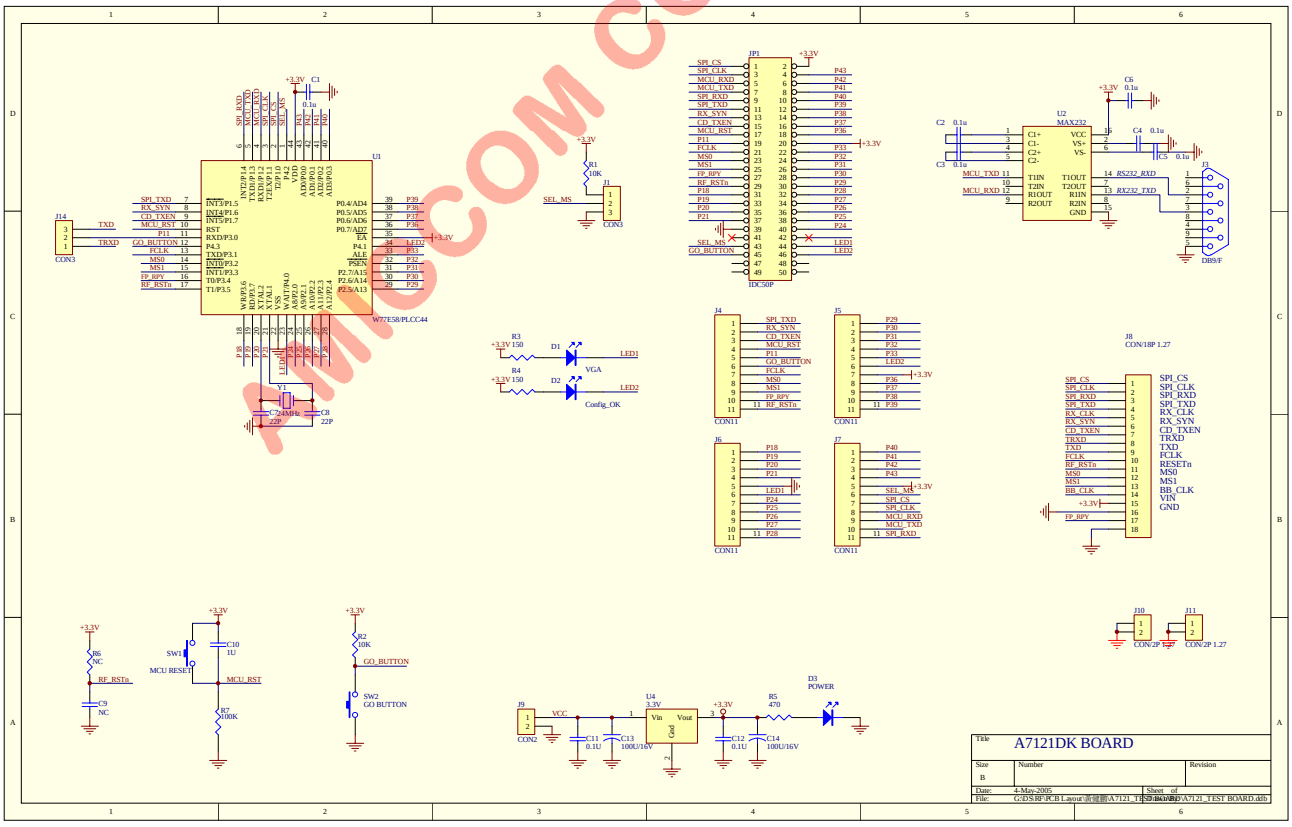
The following tables show the MCU pin assignments to I/O connections (JP1)

Signal name	MCU pin #	JP1 pin #		MCU pin #	Signal name
SPI_CS	2	1	2	44	+3.3V
SPI_CLK	3	3	4	43	P43
MCU_RXD	4	5	6	42	P42
MCU_TXD	5	7	8	41	P41
SPI_RXD	6	9	10	40	P40
SPI_TXD	7	11	12	39	P39
RX_SYN_	8	13	14	38	P38
CD_TXEN	9	15	16	37	P37
MCU_RST	10	17	18	36	P36
P11	11	19	20	35	+3.3V
FCLK	13	21	22	33	P33
MS0	14	23	24	32	P32
MS!	15	25	26	31	P31
NC	16	27	28	30	P30
RF_RSTn	17	29	30	29	P29
P18	18	31	32	28	P28
P19	19	33	34	27	P27
P20	20	35	36	26	P26
P21	21	37	38	25	P25
GND	22	39	40	24	P24
NC		41	42		NC
SEL_MS	1	43	44	23	LED1
GO_BUTTON	12	45	46	34	LED2
NC		47	48		NC
NC		49	50		NC

5.8 Development Board Placement



5.9 Development Board Schematic



6. S/W Description

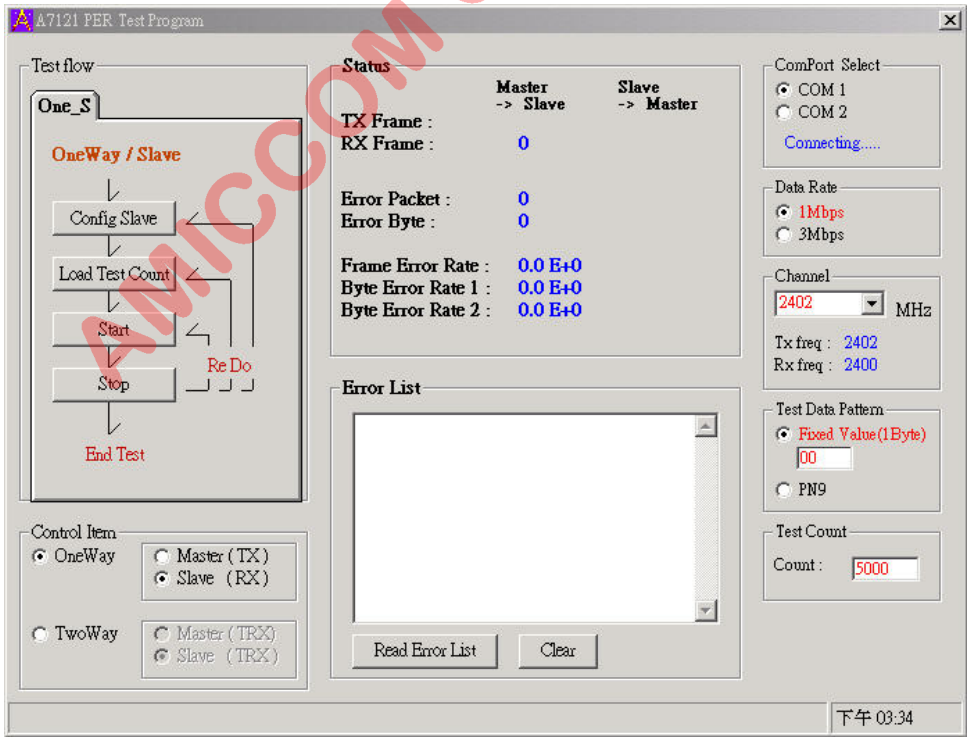
The "A7121 PER (Packet Error Rate) test program" software run on window 98,window 2000 or window XP operating system, and is used for controlling the DK board. The software communicates with the DK board through the PC's serial port.

- **To install A7121 PER test program**
  1) Insert the software into your CD-ROM drive.
  2) Select "A7121 PER test program setup" item.
  3) Follow the instructions given by the setup wizard for correct installation of the program.

- **To uninstall A7121 PER test program**

  Click the [Start] button under Windows.
  Select "Control Panel" in Setup.
  Double-click Add/Remove Programs.
  Click Install/Uninstall. Then select "A7121 PER test program" from the list of programs that can be automatically removed.
  Click the [Remove...] button to uninstall "A7121 PER test program".

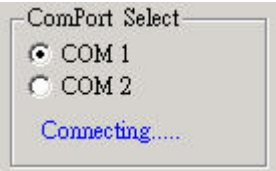
- **To use A7121 PER test program**: The A7121 PER test program Main Screen appears whenever you execute the program. The screen is shown below.



Control panel

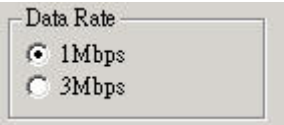
ComPort select

You can choose comport 1 or 2 to config the DK board. The default setting is COM 1.



Data rate

The data rate can be set 1Mbps or 3Mbps. The default setting is 1Mbps.

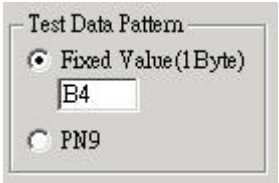


Channel

The channel can be set frequency from 2402 to 2480 MHz at data rate 1Mbps mode or frequency from 2403 to 2479.5 MHz at data rate 3Mbps mode. The label Tx freq" and "Rx freq" is shown frequency setting currently.

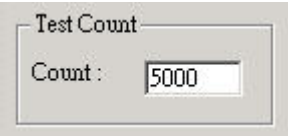
Test Data Pattern

The test data pattern can be set in one of two modes. Choosing "Fixed value (1 byte)", you need enter 1 byte value (hex value) in text field. The fixed value used on the channel being testing. Choosing "PN9", the data PN sequence used on the channel being testing.



Test Count

You can enter a value between 1 and 65535 for testing frame count.

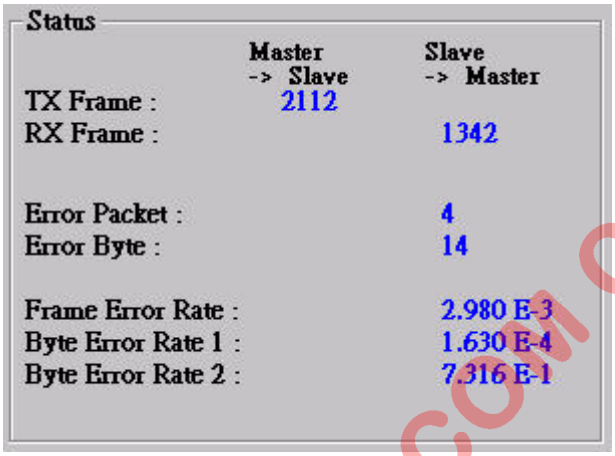


Please note that the parameter on the control panel will become red color when it is modified.

B. Status list

Status

This status frame is shown PER information currently.



TX Frame: This value indicates transmitted packet.

RX Frame: This value indicates received packet

Frame Error Rate = Error Frame / RX Frame

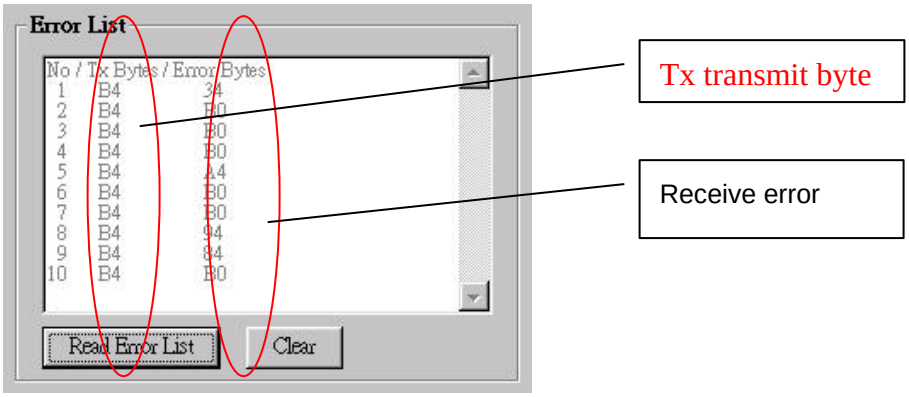
Byte Error Rate 1 (w/o frame loss)= Error Byte / (RX Frame *64)

Byte Error Rate 2 (with frame loss)= (Error Byte + (Total Test Frame –RX Frame)*64) / (Total Test Frame * 64).

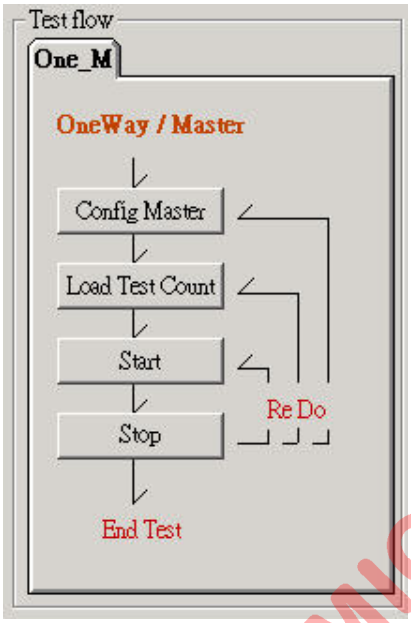
Error list

After user pressed this “Read Error List” button while testing error occurred, the program will display first 10 error bytes on ErrList frame.

Press ‘Clear” push button, the software will clear error list.



C. One-way or Two-way control page



"Config Master" or "Config Slave" push button

Press button "Config Master" or "Config Slave", the software will send all parameters (one-way or two-way mode, data rate, channel, data pattern) to MCU. If configuration data is valid, the button back color becomes green. The green LED (LED2) on the DK board turn on indicates that the A7121's configuration is ok. If "Config Master" or "Config Slave" failed, error message is shown.

"Load Test Count" push button

Press button "Load Test Count", the software will send test count value to MCU.

"Start" push button

Press button "Start" on master, the software will show a message to prompt whether the slave board is ready or not. If yes, press "Ok" button to start PER testing and the back color of "Start" button becomes to green.

"Stop" push button

Press 'Stop" push button, the software will be stop testing.

D. Control Item

User can choose "OneWay" or "TwoWay" to do uni-directional or bi-directional PER testing. In the "OneWay" mode, the master board is set as transmitted side and slave board is set as received side.

1. Setup procedure

The following steps show users how to run the development kit test program example of One-Way mode

1) Connect PC#1 RS232 com1 port to master board with RS232 cable, and connect another PC#2 RS232 com1 port to slave board with RS232 cable (or connect PC#1 RS232 com2 port to slave board).

2) PC#2 setup procedures for slave board
   (1) Select **comport select** > **COM 1**.
   (2) Select **data rate**> **1Mbps**.
   (3) Select **Channel> 2402MHz.**
   (4) Select test **data pattern**> **Fixed value,** and enter "**B4**" on text field (hex value).
   (5) Test count enter "**5000**" on the text field (Decimal value).
   (6) Select **Control Item > OneWay > Slave(RX)**.
   (7) Press **Config Slave** push button.
   (8) Press **Load Test Count** push button.
   (9) Press **Start** push button, and the A7121 on the slave board will be into RX mode.
3) PC#1 setup procedures for master board
   (1) Select **comport select** > **COM 1**
   (2) Select **data rate**> **1Mbps**.
   (3) Select **Channel> 2402MHz.**
   (4) Select test **data pattern**> **Fixed value,** and enter "**B4**" on text field (hex value).
   (5) Test count enter "**5000**" on the text field (Decimal value).
   (6) Select **Control Item > OneWay > Master(TX)**.
   (7) Press **Config Master** push button.
   (8) Press **Load Test Count** push button.
   (9) Press **Start** push button, and then bring up a message "Please check Slave Board is ready!!". If the slave board is ready (i.e. A7121 is in RX mode), press "**Ok**" button to start PER testing.
4) If the setup is correct, user can observe transmitted/received status on status list.
5) User can press "**Stop**" button to stop testing on master or slave board at any time. After stop program, user can redo the PER testing program by following any step.
   5.1 Press "Start" button to restart testing.
   5.2 Modify "**Test Count**" value, and press "**Load Test Count** " and "Start" button to restart testing.
   5.3 Modify any parameter on control panel, and redo above item 2) or 3) setup procedures

7. F/W Flowchart