A7121 Configuration Utility User's Guide

Document Title

A7121 Configuration Utility User's Guide

Revision History

Rev. No.	History	Issue Date	Remark
1.0	Initial issue	Feb 1, 2005	Preliminary

Table of contents

I. Introduction

This document describes how to use the A7121 Configuration Utility software. The software is used to program the A7121 device on the evaluation board. By using this software the designer of the radio system can easily evaluate the performance of RF IC in the early stage of the design process. It is further a useful tool during the generation of the configuration data and for finding optimized external component values.

II. Install/Uninstall

The software is written to run under Windows 98, Windows 2000 or Windows XP operating system. There should be a parallel port in the target PC for the device control.

To install A7121 Configuration Utility:

1 Start Windows, if you have not already done so.
2 Place the CD-ROM disk into the CD-ROM drive.
3 Select "Install A7121 Configuration Utility" item to setup program.

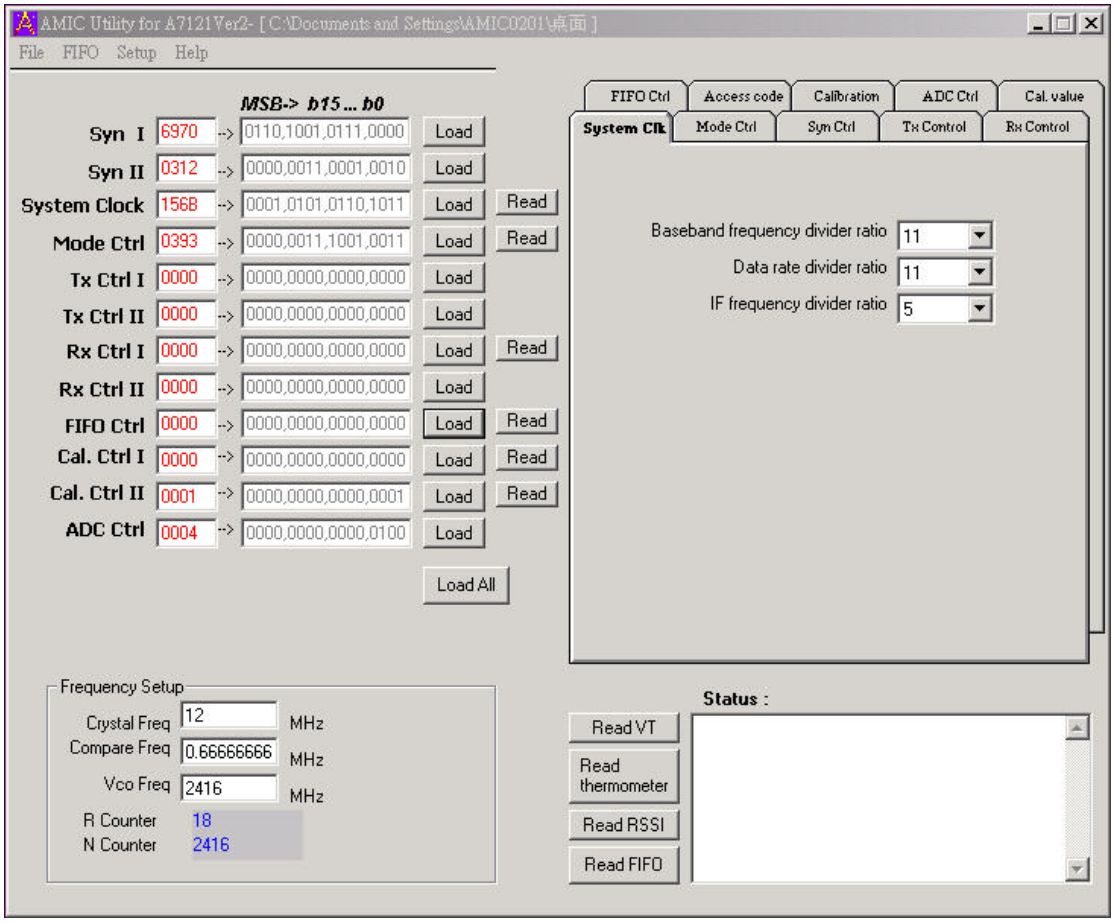
Notes: Administrator privilege is required for installing the A7121 configuration utility on Windows 2000/XP. If the user doesn't have the administrative right, this program may be not work while controlling the device with the parallel port.

To uninstall A7121 Configuration Utility:

1 Click the [Start] button under Windows.
2 Select "Control Panel" in Setup.
3 Double-click Add/Remove Programs.
4 Click Install/Uninstall. Then select A7121 configuration Utility from the list of programs that can be automatically removed.
5 Click the [Remove...] button to uninstall A7121 Configuration Utility.

III. Using the A7121 configuration utility software

The A7121 configuration utility program Main Screen appears whenever you execute the program. The screen is shown below. Refer to the A7121 datasheet for detailed information on the register settings.



A. Pull-down menu

1. File menu options

The File menu offers the following commands:

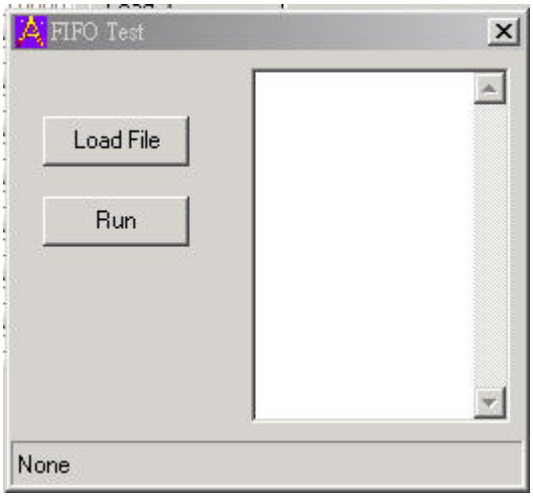
Open Opens an existing CFG file.

Save As Displays a file selection dialog box that asks you for the name of an CFG-file in which to save the entered system parameters.

Exit Exits A7121 Configuration Utility program

2.FIFO menu option

This is a FIFO test function. Bring up a sub-box; load a txt file for FIFO data with hex value. Pressing "Run" button to load into RF chip



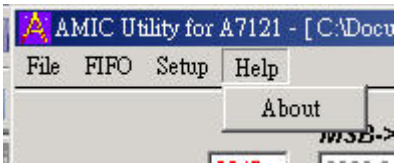
3.Setup menu option

The Port setup menu offers the following commands.

Port setup

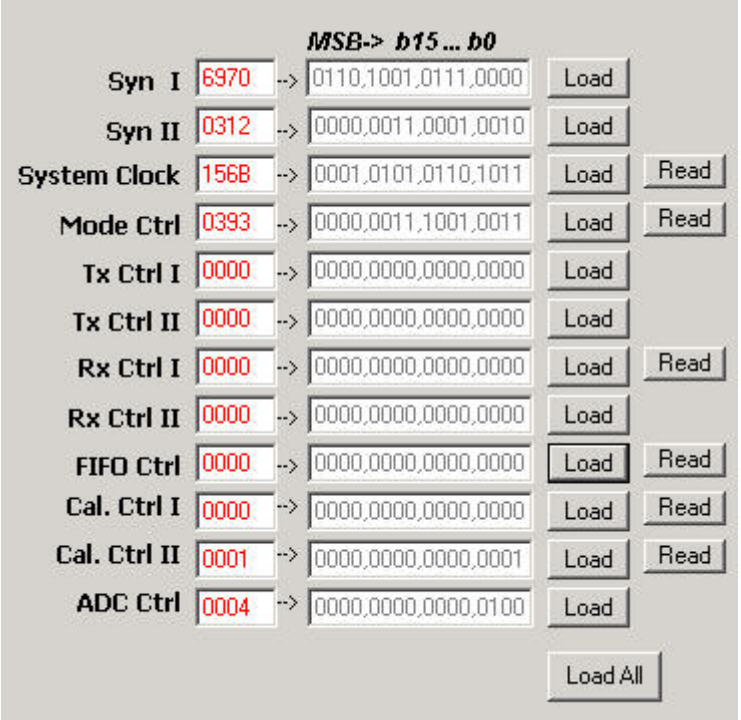
Displays a window in which you can choose between different I/O addresses for the parallel port ('0x278', '0x378'). The default address is '0x378'.

4.Help menu options



The help menu provides access to useful information about the product. **About** brings up a message box with the software revision and copyright information.

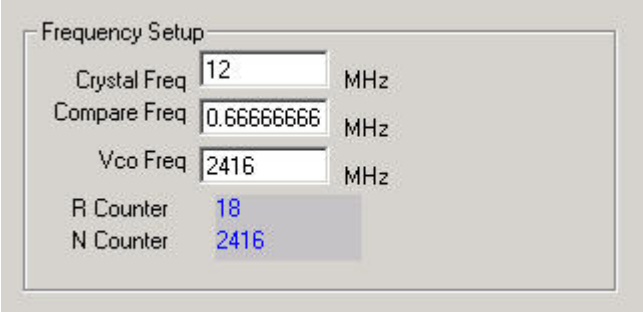
B. Registers Tab



The registers tab shows the bits that the A7121 configuration utility is sending to the device. The names part of the data registers is displayed. For each register, the bit on the left hand side is the MSB and is sent first, while the bit on the right hand side is the LSB and is sent last. You can change the different parameter value in you need configure register, the specified register in register Tab will change automatically. When the Load command is used, the selected data register is sent. After this step is done once, it is necessary to do it again whenever data register is to be changed. When the Read command is used, you can readout the register value which display in status message box

Pressing "Load all" button, the program can send out the register values one by one. It contains synthesizer register I, II, system clock register, mode control register, Tx control register I, II, Rx control register I, II, FIFO control register, Access code register, calibration control register I, II, ADC sampling clock register.

C. Frequency Setup



The user needs to enter the crystal frequency, the VCO frequency, and the compare frequency. When you have changed the values, MA, MB and R counter value are calculated and Syn Reg I, Syn Reg II register will change automatically.

The crystal frequency The crystal frequency of your module board is 12.000000 MHz.

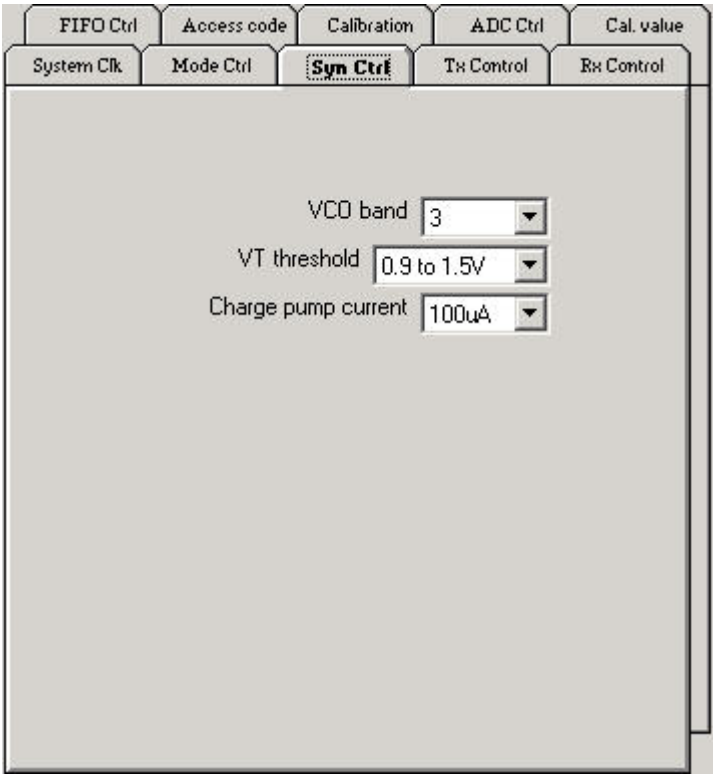
Do not change the crystal frequency parameter when using this module unless the crystal is being replaced.

The VCO frequency The a7121 can operate at frequencies between 2400 and 2500 MHz ISM band. Enter the desired RF frequency

The compare frequency The compare frequency is depending on you need data rate setting. If you use data rate1Mbps to transmit data, enter value "0.66666666666…" (2/3) until N counter value is integer. If 3Mbps is selected, enter value "0.75".

Note that the N counter and R counter value are integers, not floating numbers.

D. Synthesizer Control Register Tab



VCO band You can choose between 0 and 7 from a pull down menu.

VT threshold This is a VT low threshold (VTHL) and high threshold (VTHH) setting for VCO calibration. You can chose between 0 and 7 from a pull down menu:

0:VTHL=0.5V VTHH=2V

1:VTHL=0.6V VTHH=1.9V

2:VTHL=0.7V VTHH=1.8V

3:VTHL=0.8V VTHH=1.7V

4:VTHL=0.8V VTHH=1.6V

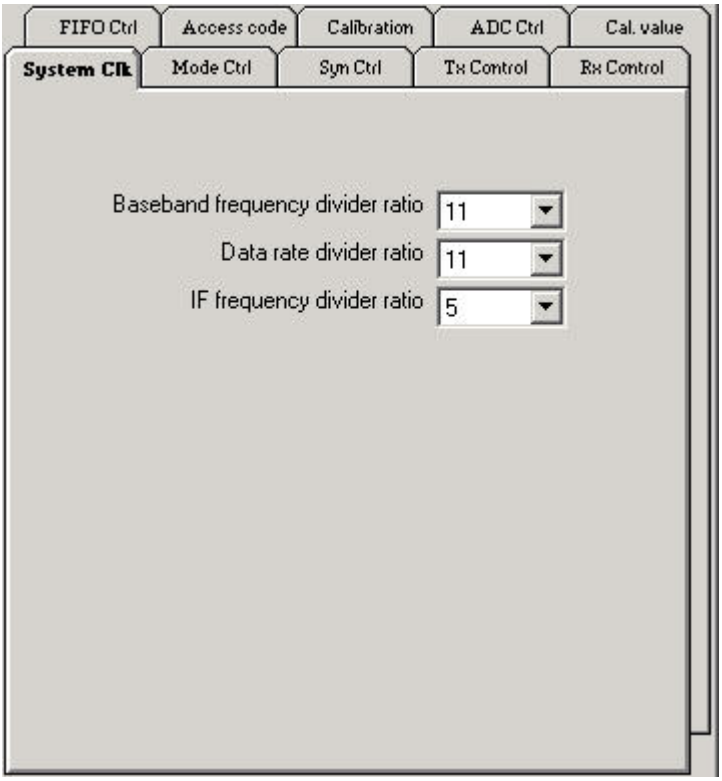
5:VTHL=0.9V VTHH=1.6V

6:VTHL=0.9V VTHH=1.5V

7:VTHL=1.0V VTHH=1.5V

Charge pump current You can choose between four possible choices of charge pump current: 100uA, 300uA, 500uA, 700uA.the different current are selected from a pull down menu.

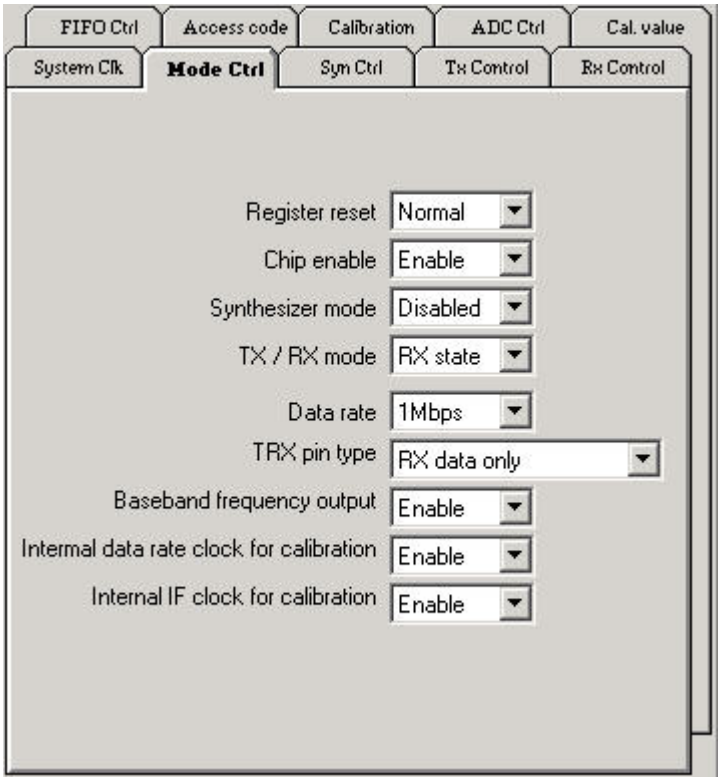
E. System Clock Control Register Tab



The A7121 has three synchronous programmable frequency divider for internal clock source. Ratio of baseband frequency divider, data rate divider and IF frequency divider can be independently set. There are frequency divider generates frequency signal of baseband, data rate and IF frequency respectively by dividing the same crystal frequency input.

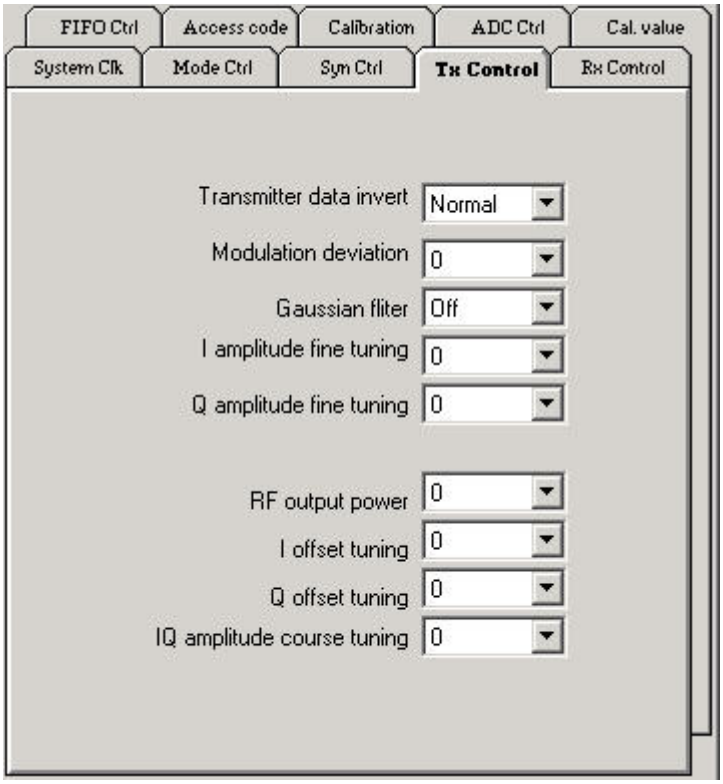
Baseband frequency divider ratio You can chose between 0 and 31 from a pull down menu. Baseband frequency = crystal frequency / (chosen value +1)
Data rate divider ratio You can choose between 0 and 31 from a pull down menu. Data rate = crystal frequency / (chosen value+1)
IF frequency divider ratio You can choose between 0 and 31 from a pull down menu. IF frequency = crystal frequency / (chosen value+1)

F. Mode control Register Tab



Register reset You can choose normal or reset option for RF chip register reset
Chip enable You can choose enable to set RF chip to be active or disable to set RF chip in disable state.
Synthesizer mode You can choose enable or disable option for RF chip into synthesizer mode
TX / RX mode You can set RF chip in Tx mode or Rx mode from a pull down menu.
Data rate The data rate can be set 1Mbps or 3Mbps
TRX pin type You can choose between two possible choices of TRXD pin as: Rx data or bi-directional TRX data.
Baseband frequency out You can choose enable or disable option for RF chip BB_CLK pin (pin 15) output.
Internal data rate clock for calibration You can choose enable or disable option for internal data rate clock.
Internal IF clock for calibration You can choose enable or disable option for internal IF clock.

G. Tx Control Register Tab



Transmit data invert You can choose normal or invert option for transmitter data polarity.

Frequency deviation You can set between 0 and 7 from a pull down menu.

Gaussian filter You can choose enable or disable option for Gaussian filter available

I amplitude fine-tuning You can set between 0 and 31 to adjust the I signal amplitude.

Q amplitude fine-tuning You can set between 0 and 31 to adjust the Q signal amplitude.

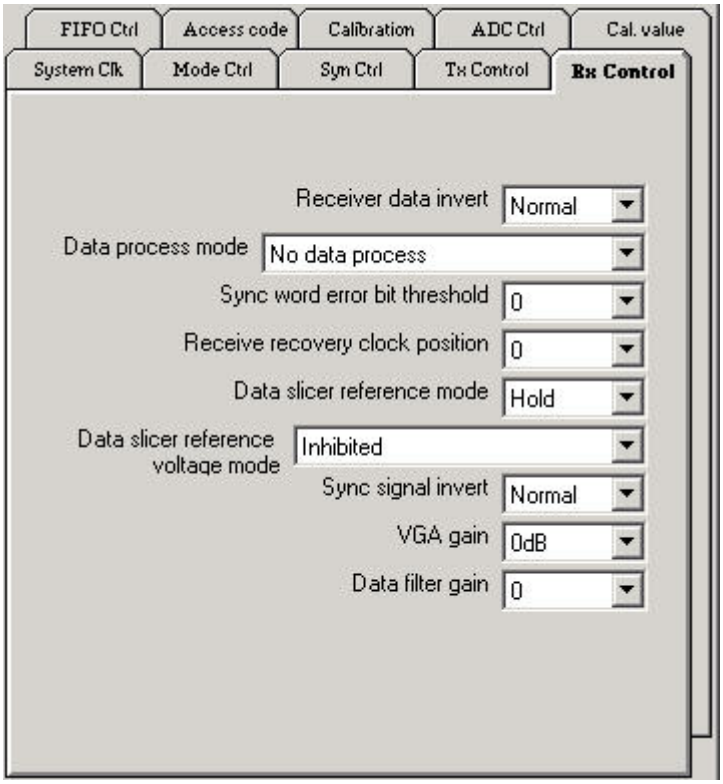
RF output power You can choose between four possible choices of RF power: 3dBm, 0dBm, -3dBm, -6dBm. The different RF output are selected from a pull-down menu

I offset tuning You can set between 0 and 15 to adjust the I offset value.

Q offset tuning You can set between 0 and 15 to adjust the I offset value.

IQ amplitude course tuning You can set between 0 and 3 to adjust the IQ amplitude value.

H. Rx Control Register Tab



Receive data invert You can choose normal or invert option for receive data polarity.

Data process mode You can chose between 0 and 3 from a pull down menu. For A7121 RF chip, data process mode can be set 4 modes

0:disable frame sync and FIFO mode (no data process)

1:Enable frame sync. Rx output data is inactive (high) before sync.

2.Enable frame sync. No data process.

3:Enable frame sync and FIFO mode

Error bit threshold You can set between 0 and 7 to set sync word error bit number threshold value.

Receive recovery clock position You can set between 0 and 7 to set Rx data recovery clock position

Data slicer reference mode You can choose enable or disable option for internal reference voltage connection state

Data slicer reference voltage mode You can choose between four possible choices of reference voltage mode

1.Inhibited

2.Average mode before Rx sync, off after Rx sync

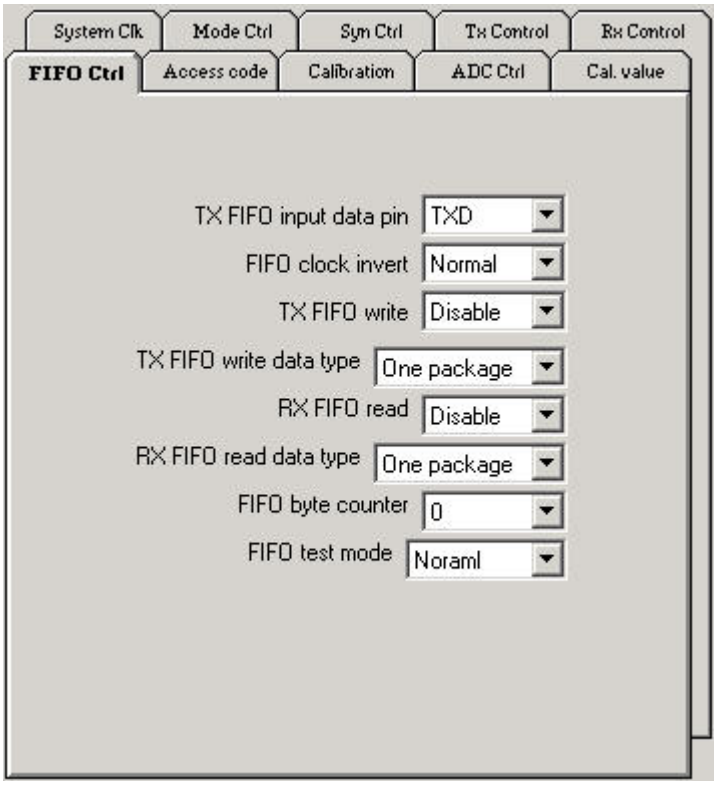
3.Average mode

4.Fixed reference voltage mode

Sync signal invert You can choose normal or invert option for sync signal polarity.

VGA gain You can choose between four possible choices of gain: 0dB, 5 dB, 15 dB, and 20 dB. The different VGA gains are selected from a pull down menu.
Data filter gain You can set between 0 and 7 from a pull down menu

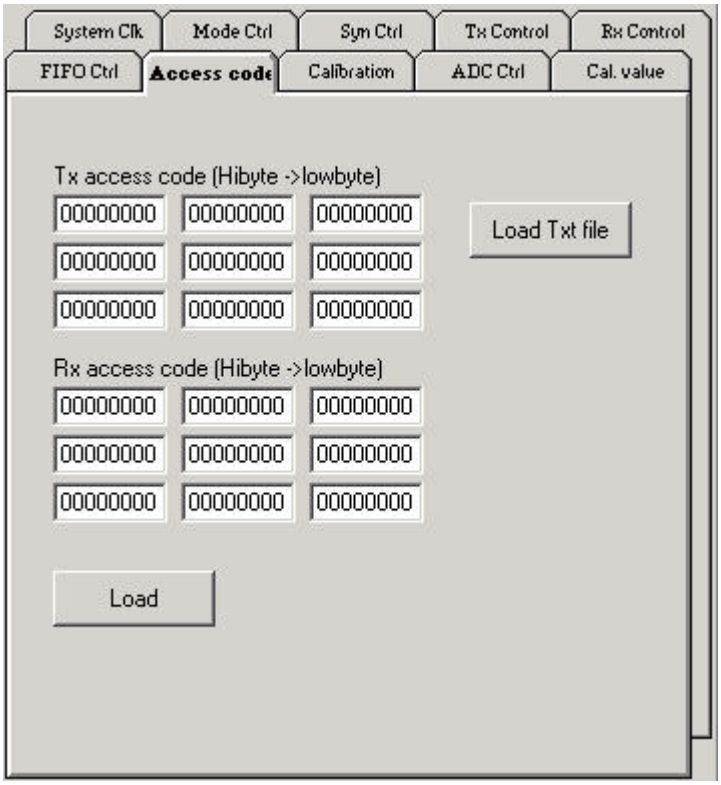
I.FIFO Control Register Tab



Tx FIFO input data pin You can choose between two possible choices of data input pin: TXD pin, SPI_RXD pin
FIFO clock invert You can choose normal or invert option for FIFO clock signal polarity.
Tx FIFO write Tx FIFO write mode can be selected from a pull down menu. Choosing "Enabled", transmit data with FIFO mode. If "Disable" is selected, transmit data without FIFO mode
Tx FIFO write data type
You can chose one packet data write to FIFO or write data to FIFO continuously
Rx FIFO read The RX FIFO read mode could be selected from a pull down menu. Choosing "Enable", receive data with FIFO mode. If "disable" is selected, receive data without FIFO mode
Rx FIFO read data type You can choose one packet data read from FIFO or read data continuously from

FIFO byte count You can set between 0 and 63 from a pull down menu to select 1 ~ 64 bytes you want to transmit data byte

J. Access Code Control Register Tab



Tx access code

You can enter the 9 bytes access code binary values directly.

Rx access code

You can enter the 9 bytes access code binary values directly.

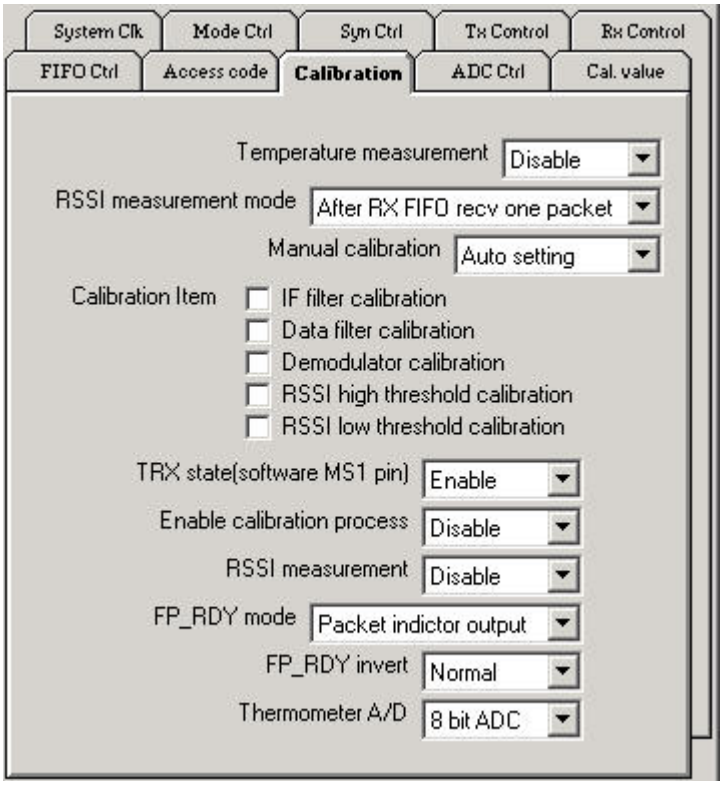
Load txt file button

You can write a txt file with hex value, then import txt file.

Load button

After the access code value is written to the control box, you can press "Load" button to configure RF chip for the specific register.

K. Calibration Control Register Tab



Temperature measurement You can set enable or disable option for temperature measurement

RSSI measurement mode You can choose between three possible choices of different period of RSSI measurement: After Rx FIFO receives one packet data, after Rx sync is active and after calibration control register set are selected from a pull down menu.

Manual Calibration You can set enable or disable option for manual calibration

IF calibration If checked, then before starting calibration action will be executed.

Data filter calibration If checked, then before starting calibration action will be executed.

Demodulator calibration If checked, then before starting calibration action will be executed.

RSSI high threshold calibration If checked, then before starting calibration action will be executed.

RSSI low threshold calibration If checked, then before starting calibration action will be executed.

TRX state This is software MS1 instant hardware MS1 pin under MS1 pin is pull high state. You can choose enable or disable option for TRX state

Enable Calibration process You can choose enable or disable option for process of IF filter calibration, data filter calibration, demodulator calibration, RSSI high

threshold calibration, RSSI low threshold calibration.

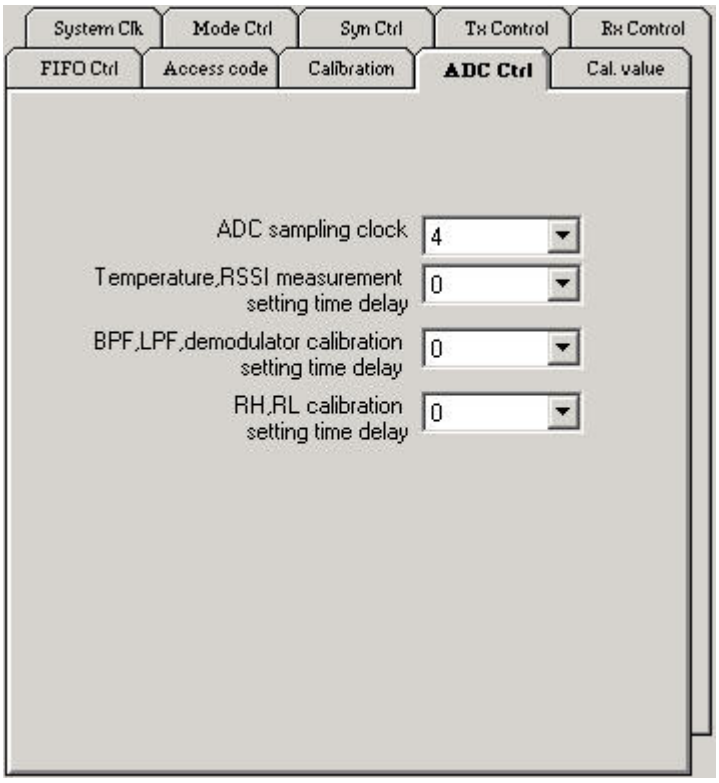
RSSI measurement You can choose enable or disable option for RSSI measurement.

FP_RDY mode You can choose between two possible choices of FP_RDY output pin as: FIFO packet ready output or calibration ready output

FP_RDY invert You can set normal or invert for FP_RDY signal polarity.

Thermometer A/D You can choose 8-bit ADC or 3-bit ADC for thermometer

L. ADC Sampling Clock Control Register Tab



ADC sampling clock setting You can choose between 0 and 7 from a pull down menu to setting ADC sampling clock. ADC sampling clock depending on the following formula:

Fs=IF frequency / 2^(ADC [3:0])

Temperature, RSSI measurement setting time delay You can choose between 0 and 7 from a pull down menu.

Delay time=4us*2^(chosen value)

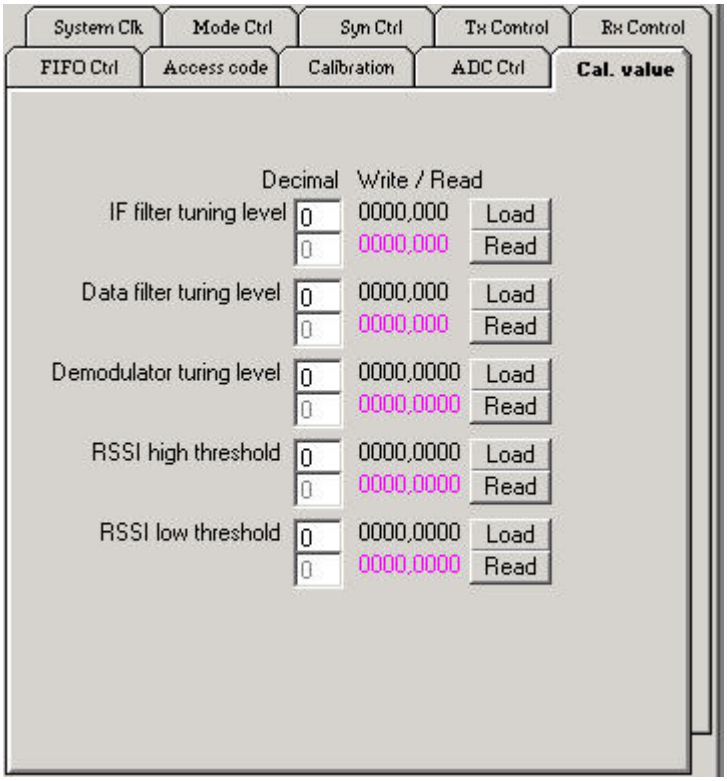
BPF, LPF, Demodulator calibration setting time delay You can choose between 0 and 7 from a pull down menu.

Delay time=30us*2^(chosen value)

RH, RL calibration setting time delay You can choose between 0 and 7 from a pull

down menu.
Delay time=32us*2^(chosen value)

M. Cal. Control Register Tab



When manual calibration is chosen (MCAL bit in calibration register), user needs to enter the IF filter tuning value, data filter tuning value, demodulator tuning value, RSSI high threshold value, RSSI low threshold value for setting of manual calibration value.

IF filter tuning level You can set between 0 and 127 to adjust the IF filter voltage-tuning value. Pressing "Load" button, the tuning value load into RF chip. Pressing "Read" button, Readout tuning value from RF chip.

Data filter tuning level You can set between 0 and 127 to adjust the data filter voltage tuning value. Pressing "Load" button, the tuning value load into RF chip. Pressing "Read" button, Readout tuning value from RF chip.

Demodulator tuning level you can set between 0 and 255 to adjust the demodulator voltage tuning value. Pressing "Load" button, the tuning value load into RF chip. Pressing "Read" button, Readout tuning value from RF chip.

RSSI high threshold you can set between 0 and 255 to adjust the RH threshold voltage tuning value. Pressing "Load" button, the tuning value load into RF chip.

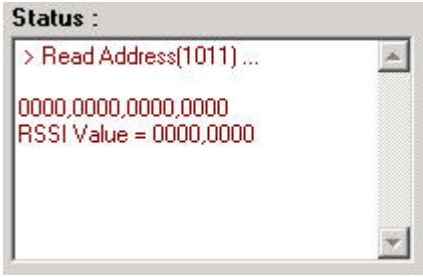
Pressing "Read" button, Readout tuning value from RF chip.
RSSI low threshold you can set between 0 and 255 to adjust the RL threshold voltage tuning value. Pressing "Load" button, the tuning value load into RF chip. Pressing "Read" button, Readout tuning value from RF chip.

N. Read Button

The read button offers the following commands. After pressing button you need, you can read back the value for the specific register on RF chip. The information is given in a status message box.

Read VT Readout digital VT value in the synthesizer register II
Read thermometer Readout thermometer value in the thermometer register
Read RSSI Readout RSSI value in the RSSI register

O. Status Message Box



This is Info about Read back / write to register value information.

IV. Connector Configuration

To ease the testing of the RF module the A7121 configuration utility software could be used. The program operates through the PC parallel port. By connecting the parallel port control lines to the device under test, the module could be controlled very easily and changes in the configuration could be done very fast. The PC parallel port operates at 5V, so a voltage translator is needed between the PC and the RF module.

The configuration table below gives the pin numbering for the 25-pin PC parallel port to 9-pin RS232 serial port connector. The user needs to refer table to modify connector (DB25 (male) to DB 9(female)) one by one. If the port setup or connector setup is incorrect, then it will not program correctly.

The configuration table

DB25 Connector Pin	DB9 Connector Pin	Signal name
2	2	SPI_CLK
3	3	SPI_RXD
4	4	SPI_CS
6	6	FIFO_CLK
10	7	FIFO_RXD
15	1	SPI_TXD
22	9	GND

Before executing the A7121 Configuration Utility, please ensure that a test or evaluation Board is powered up and connected to your PCs parallel port. Then the configuration can start.

V. References

[1] A7121 Datasheet Refer to the datasheet for detailed information on the register settings