SS1101EB
User's Manual

V 1.1A

Siliconians, Inc.
4701 Patrick Henry Drive, Suite 501, Santa Clara, CA 95054
Tel: 408-748-8600 Fax: 408-748-8687
www.siliconians.com or info@siliconians.com

1. Introduction

The SS1101EB consists of a set of hardware and software tools for rapid evaluation and development of applications based on the SS1101C chip. These tools are designed to test the use of the SS1101C chip in both voice and data modes in the conditions under which the SS1101C is intended to operate.

The kit allows for communication between two identical boards, either directly using a baseband connection or through an RF link. The user can connect a PC to each board and send data or use a pair of telephone handsets for voice communication.

The kit consists of:

- Two evaluation boards (SS1101EB)
- SS1101EB Embedded MCU software
- User Interface PC software
- Two telephone handsets
- Connection cables
- Optionally two 900 Mhz RF Modules

The evaluation can be carried out using the kit as-is or the user can develop its own software and hardware and implement them using the SS1101EB. To that effect, a large prototype area is provided for the user's hardware. Sockets for MCU and external memory devices are also provided to incorporate the user's software.

1.1 Tool Kit Overview

The SS1101EB supports the two following configurations:

- PC interface
- Stand-alone.

A board can be in any of these two configurations. In the PC Interface configuration an interface with the SS1101EB is provided from the PCs through a com port of the PC.

In the stand-alone mode a board is controlled by the on-board software. In the stand-alone mode, through the handsets, the users could talk to each other when the signal is locked. Signal could be locked by pressing the reset button.

The SS1101EB supports two kinds of connection:

- Directly baseband to baseband.

- Through RF Modules.

The direct baseband to baseband connection is implemented using optocouplers, thus the boards provide electrically isolated baseband communications. The optional Panasonic CLU04S RF Module is used for wireless communications.

Furthermore, the SS1101EB Kit supports two modes of communication:

- Voice
- Data

Two handsets are provided for establishing the voice mode communications. Data mode provide communications between two boards in full duplex and half duplex modes.

A signaling channel is supported in voice and full duplex data modes. In the voice mode the signaling channel can be used for data chat between two PCs.

Summary of the SS1101EB hardware functions:

- RS232 PC interface
- RF interface
- Voice interfaces: ADPCM and PCM
- Handset connector
- Easy clip-on access to key signals
- Signal detect and power-on LEDs
- Parallel Bus Interface status LEDs
- Prototype Area

Summary of the SS1101EB software functions:

- MCU resident monitor
- Stand-alone or resident operations
- Serial port interface
- Control of the SS1101C
- Chat between PCs using the Signaling Channel
- Automatic Bit Error Rate calculation
- Bi-directional data transmission between PCs

2. Manual Topics

This manual includes the following topics:

- Hardware description and configuration (Chapter 3)
- Software installation and operation on your PC (Chapter 4)

The manual should be used along with the SS1101C Data Sheet

3. SS1101EB Hardware Description

This chapter discusses in detail the hardware components and software features provided by the resident monitor of the SS1101EB Kit

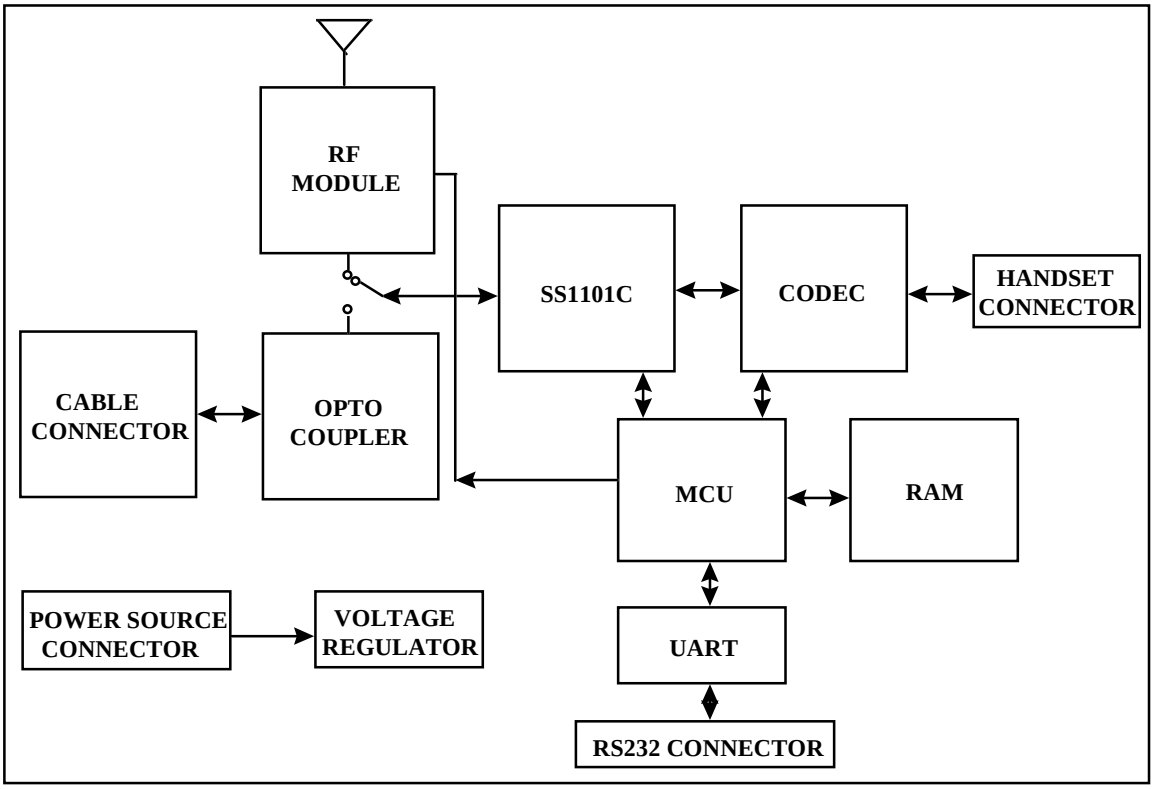


Figure 1.The block diagram of evaluation board SS1101EB

The SS1101EB layout of the board are presented in Exhibit A.

3.1 RS232 Interface

These circuits provide data exchange between the PBI and any external device with an RS232 interface. The data exchanges are carried out through the on-board UART. Five RS232 interface signals are available on the SS1101EB: TX, RX, CTS, RTS, and GND. The signals are terminated by a J1 connector. The pinout of the connector is as follows:

Table 1: J1 pinout

DB9 pin No	Function
2	RX
3	TX
5	GND
7	RTS
8	CTS

3.2 Data Rate

The data rate is defined by the MCU software and the external clock. Two clock sources are provided:

- A crystal connected to the UART
- The master clock of the SS1101C divided by four (labeled OSCUP). This circuit is hardwired on the board.

Circuits for the first option are on the board on the wire side but are not populated. In order to use this option, you must disconnect the OSCUP circuit by soldering out the R1 (1.5K) resistor of the OSCUP circuit.

3.3 RS232 Test Pins

Nine test pins connected to the RS232 circuits are provided on the board. These are:

Table 2: RS232 CIRCUITS TEST PINS

Label	DESCRIPTION
OSCUP	Clock for UART
2	RX data from the RS232 driver to the DB9
8	CTS signal from the RS232 driver to the DB9
7	RTS signal from the DB9 to the RS232 receiver
3	TX data from the DB9 to the RS232 Receiver
SOUT	Serial output of the UART connected to the RS232 driver of RX data
SIN	Serial input of the UART connected to the RS232 receiver of TX data
RTS	RTS input to the UART from the RS232 receiver
CTS	CTS output of the UART to the RS232 driver

3.4 Direct Board to Board Interface

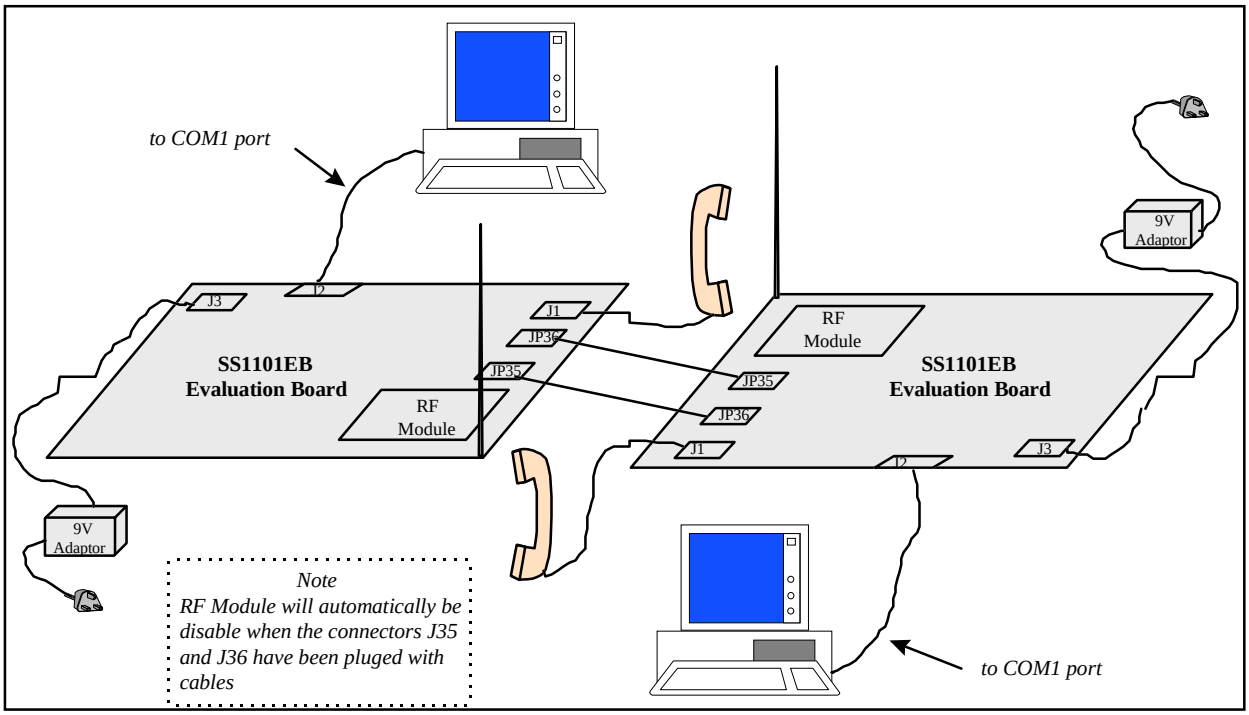


Figure 2.Direct Board to Board Interface

The direct board to board interface is an interface which provides a baseband connection between two boards without the use of RF Modules. This interface provides direct connection of respectively the MODOUT output and DI input of one SS1101C to the DI input and MODOUT output of the another SS1101C. These circuits are connected through optocouplers to eliminate electrical coupling of the spread signals.

You can test your software and hardware without any noise or signal attenuation inserted by the RF Modules when using this interface.

The cables supplied and the optocouplers are only tested for the 16.384MHz clock of the SS1101C.

Two RJ11 connectors are used for the connections - J35 and J36, MODOUT output and DI input, accordingly. The pinout of the jumpers are as follows:

Table 3: JP35, JP36 connectors

Pin No.	JP35	JP36
1	VCC from another board	VCC to another board
2	MODOUT output	DI input
3	NC	NC
4	GND from another board	GND to another board

3.5 RF Interface

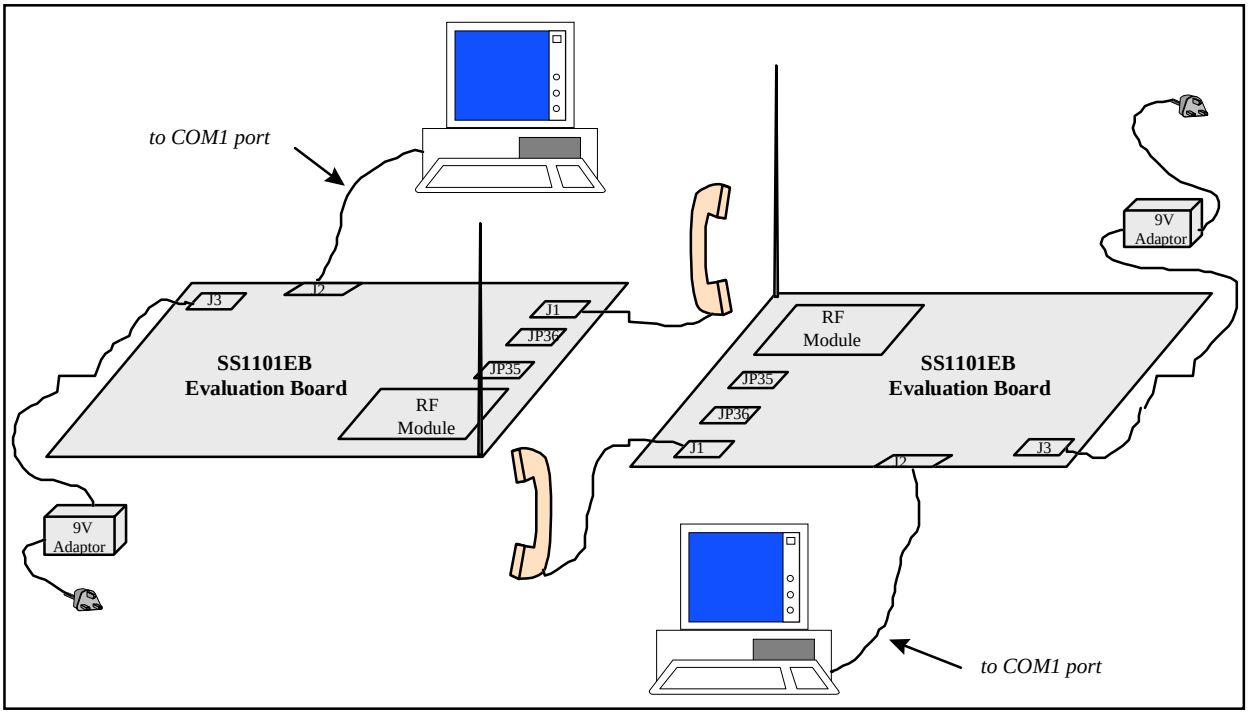


Figure 3.RF Interface

The SS1101EB comes optionally with an RF Module from PANASONIC installed on the board. The pin description of the connector is shown below:

Table 4: RF Interface Connector Pins

Pin No.	Name	Description
1	TX-MOD	MODOUT signal from SS1101C
2,12,16,18, 19,20,21,22	RF GND	RF Ground
3	PCH	TX Power Control (3.6VDC)
4	NC	
5	TX-VCC	TX Circuit Control
6	DVCC	Power Supply

Table 4: RF Interface Connector Pins

Pin No.	Name	Description
7	TXRX-SW	TX/RX Switch Control. PLLSW output of SS1101C
8	PLL-CLK	Clock input control from MCU
9	PLL-DATA	PLL data from MCU
10	PLL-STB	Strobe input from MCU
11	LOCK	PLL lock detection output to MCU
13	REF-IN	PLL reference input frequency from the SS1101C Master Clock (16,384MHz)
14	RSSII	Carrier signal level output
15	DET-OUT	Demodulated signal output

3.6 SS1101EB Clock Subsystems

A set of crystals and oscillators are provided on the SS1101EB board. These crystals and oscillators supply clocks to the SS1101C, UART, MCU, and Codec. You can choose your own crystals for your specific application and replace the existing crystals with appropriate regards to the specifications of the components as defined in this section.

3.6.1 SS1101C Clock

Both a 16.384Mhz oscillator and a 32.768MHz crystal are connected to the SS1101C. These clock sources support 32Kbps and 64Kbps data rates, respectively, in both voice and data full duplex modes. In half duplex mode they support 85.66Kbps and 171.33Kbps data rates, respectively.

The communications circuits of the RF Module support communications with the 16.384MHz clock enabled on the SS1101C. The 16.384Mhz oscillator is used instead of a crystal to provide a buffered clock to the RF Module.

When the SS1101EB is set to communicate with a 32.768MHz crystal enabled, only the direct connection can be used. In this mode you should only use the

direct connection by soldering jumper wires from MODOUT pin of one SS1101C to DI pin of the other SS1101C and vice versa.

The SS1101C was tested to support a master clock frequency of up to 50MHz in the mode described above.

The optocoupler circuits support a crystal up to 24MHz.

Table 5: Type of connection versus SS1101C clock

SS1101EB Clock	Connection to Use
16.384 Mhz	RF Module
< 24 Mhz	Baseband by optocouplers
< 50 Mhz	Baseband by direct connection

3.6.2 UART Clock

The SS1101EB Kit uses the UART for communications with a PC through the RS232 interface. The software supplied with the Kit supports a 19.200 baud rate for communications with the PC. The UART is programmed to accommodate only this baud rate. If you want to use another rate, new embedded software and PC software should be written.

As it was described in paragraph 3.1, two sources provide clocks to the UART - the master clock of the SS1101C divided by four and an external oscillator circuit. If you do not use the MCU as provided, you can connect the external crystal by populating the external oscillator circuits. A crystal with a 4 MHz frequency will support the SS1101EB without changes in the embedded software (resident monitor).

3.6.3 MCU Clock

A 12MHz crystal circuit is connected to the MCU to support its operations. The MCU can work with a maximum clock value of 24MHz.

3.6.4 Codec Clock

One 10.368MHz crystal supports the codec operations in both PCM and ADPCM modes.

3.7 Voice Circuits

The SS1101EB Kit demonstrates the high quality of voice transmission using the spread spectrum technology as implemented into the SS1101C chip.

The single channel ADPCM CODEC IC MSM7560 from OKI Semiconductor performs coding between analog voice signal and digital serial data.

Two formats of voice compression are supported: ADPCM (32 Kbps) and PCM (64 Kbps). These formats are selectable on the board by changing the jumpers settings.

The following drawing shows the jumper settings:

Figure 4.Voice coding selection

Figure 5.Source selection

3.8 Parallel Bus Interface

The SS1101C, UART, RAM, ROM, DIP switch, and LEDs are connected to the MCU through a parallel bus. The MCU controls access to these peripherals.

You can choose an external or internal ROM configuration by setting the jumper as follows:

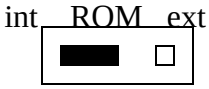


Figure 6.ROM configuration

3.9 Power Supply

The SS1101EB is powered by a single 9VDC power supply which is generated from the AC to DC adaptor.

3.10Power on indication

The red LED is lit when 9VDC is supplied to the board.

3.11Prototype area and user's access points

A wide prototype area is available for the user. The user can put its own components in this area and connect them to the existing SS1101EB components using a number of access points labeled TPxx (refer to the hardware schematics for their layout and functions). The RS232 test point are an example of the access points functions.

The port pin 3, 4 and 5 of the Port1 and the port pin 2 and 3 of the Port4 of the MCU SM8203 are the spare I/O pins. When the user writes its own software, these pins can be used to connect new devices from the prototype area to the MCU, if the existing on-board MCU is to be used.

The port4 pins AN4 through AN7 can also be used as spare I/O pins of the MCU.

A 16 pins header is connected to the Parallel Bus to provide access to the bus. The pins of the header are designated A8 through A15 for the address and D0 through D7 for the address and data.

3.12Summary of the Jumper Settings

Table 6: Summary of the Jumper settings

Jumper	Description
J1	Phone Jack for Handset
J2	RS232 connector
J3	Power Supply Inlet.
JP35, JP36	Cable connector for Direct Board to Board Interface
JP37, JP38	Voice Code Selection (i.e ADPCM or PCM)
X	Selection for external ROM or internal ROM

3.13Summary of LED indicators

Table 7: Sumarry of LED Indicators

LED	Description
The red LED on the power supply side	Indicate whether the power is on
The green LED close on the RF Module side	Indicate whether the signal is locked

3.14Summary of Switches

Table 8: Summary of Switches

Name of the Switch	Description
Dip Switch	Position 1 off is for Master board, on is for Slave board. All other position should be off.
Reset Button	Reset the communication port

4. SS1101EB PC Software User's Guide

4.1 Introduction

The SS1101EB PC software is developed for serial communication between the SS1101EB evaluation board and any PC with Windows 3.1, Windows 95 or Windows NT operating system. Voice and Data can be transmitted between two evaluation boards through direct wire coupling or RF transmission.

The PC software was developed using Visual Basic programming language. In order to run the PC software, the user must first run the setup utility to install the PC software. The setup program will automatically copy all the required DLL (Dynamic Link Library) files from the setup diskettes to the windows system directory. The PC software consists of three main functions:

- Control register values selection
- Chat windows
- Data window

For all the names and functions of the control registers, please refer to the SS1101C Integrated Spread-Spectrum Transceiver External Specification Manual.

4.2 Running the Setup Program

There are a total of three 1.44MB floppy disks containing the setup program and all the required DLLs. To run the setup program, first insert Disk 1 of the setup program in Drive "A" of the user system. If you are using Windows 3.1, from the "File" drop-down menu of the "Program Manager" window, select "Run". Then type in "A:\setup" in "Run" window. After that, follow the on screen procedure. For Windows 95 and Windows NT, from "Start" button, select "Run" and type in "A:\setup" to run the setup utility. To finish setup, just follow the on screen procedure.

The resolution of the monitor should be at 1024 by 768 pixels and 16-bit (64K) or higher color palette.

4.3 Control Register Values Selection

For any combo box with green color background, user can select any pre-defined values from the drop down menu. With the yellow background in the combo box, user has to type in the register a value in hexadecimal format. The Control Registers window is shown in Figure 7.

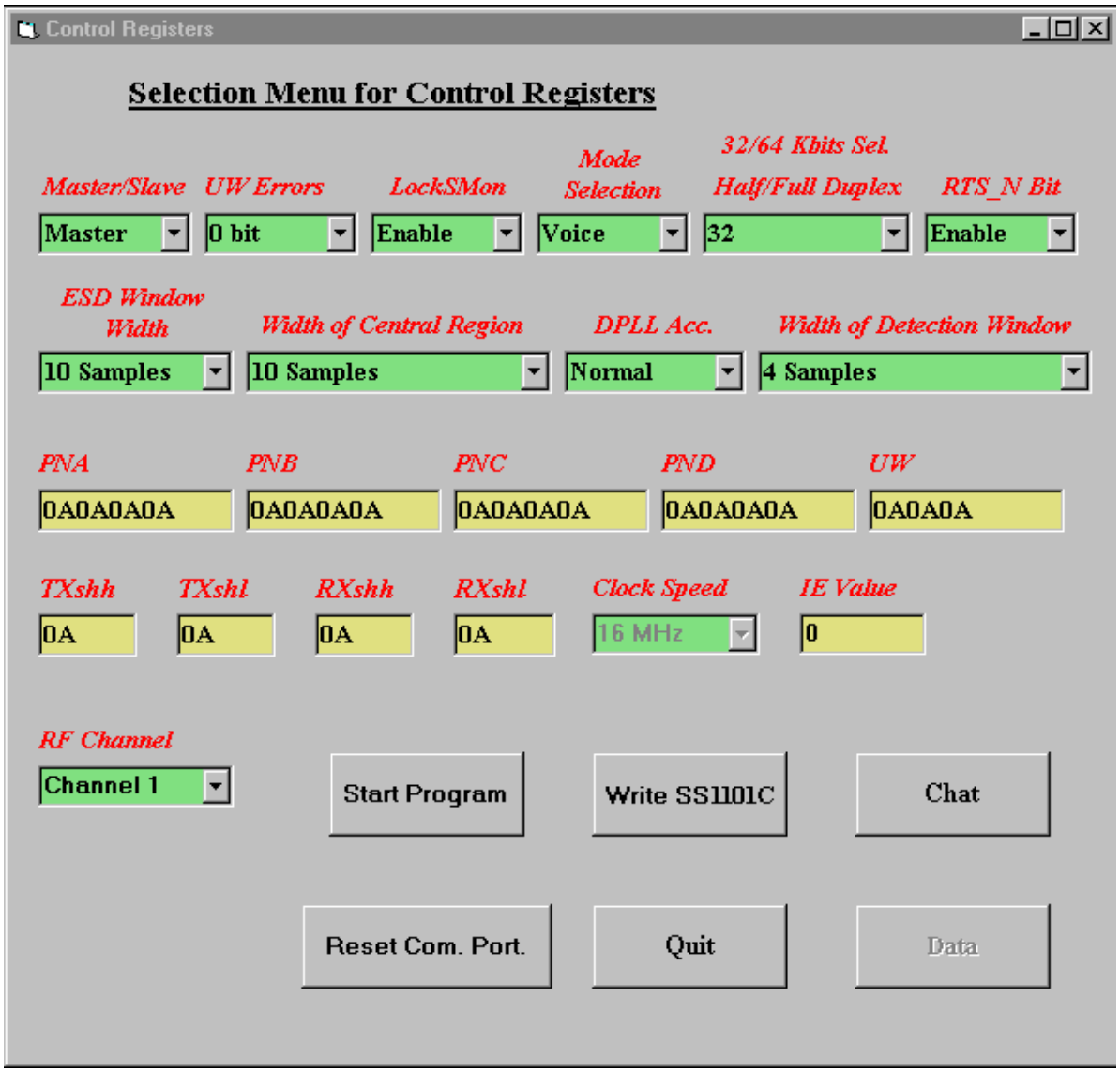


Figure 7.Control Registers Window

4.3.1 Master/Slave Mode

Select either Master or Slave mode for the evaluation board. If one of the evaluation boards is in Master mode, the other board has to be in Slave mode. See Figure 8.

Figure 8. Master / Slave selection

4.3.2 UW Errors

The selection is used to set up the number of allowable UW errors in bits from 0 bit to 4 bits max. See Figure 9. The number of allowable errors in UW depends on the application. For example, applications that can tolerate a larger BER can usually allow more UW errors while still maintaining a reasonable communication link as in the case of voice application.

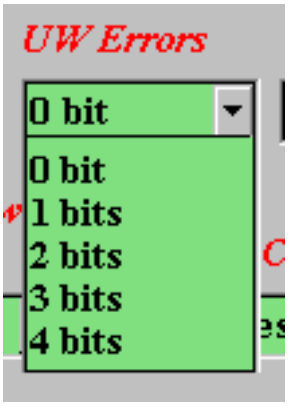


Figure 9.Selection of UW errors

4.3.3 LockSMon

The selection is used to enable or disable the Locking State Machine. See Figure 10. The locking state machine when used in conjunction with the programmable allowable UW errors gives the system designer the flexibility to tailor the SS1101C for a particular operating environment. Typically, by enabling the Locking State Machine and by allowing more UW errors, the SS1101C will continue to operate normally even in a marginal communication link channel without repeatedly loosing lock and going into acquisition. The disadvantage is the corresponding increase in the data errors; for some critical

applications, this might not be tolerable. In this case, the number of allowable UW errors can be reduced and the locking state machine turned off.

Figure 10.Mode of Locking State Machine

4.3.4 Mode Selection

Voice or Data mode selection. In Voice mode, the "Data" button and Clock speed selection are disabled. See Figure 11. left. In Data Mode, the Clock speed selection is enabled. With Half Duplex mode, the "Chat" button is disabled; otherwise the "Chat" and "Data" buttons are enabled. See Figure 11. right.

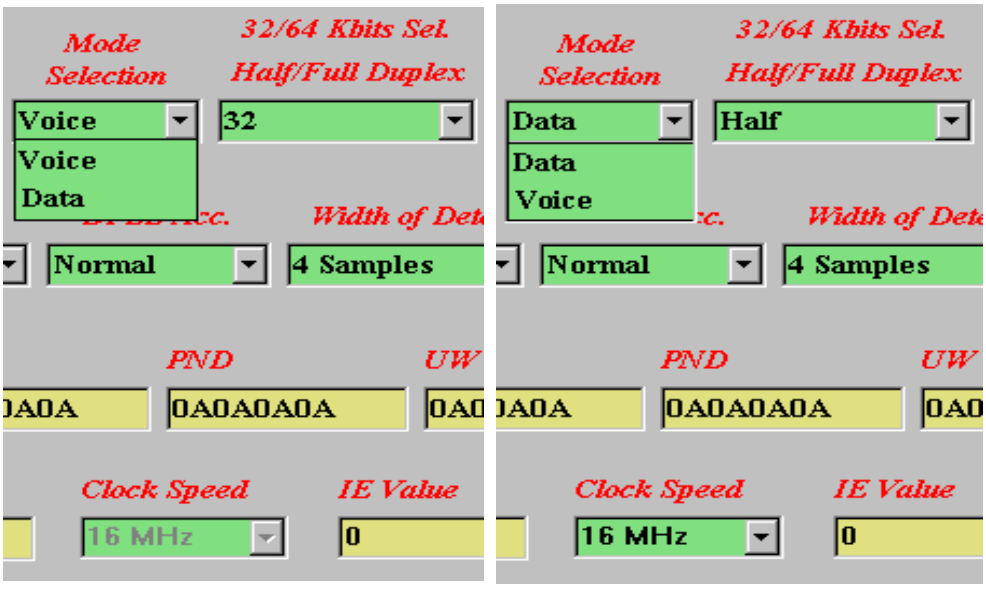


Figure 11. Voice or Data mode selection

4.3.5 Bit Rate and Half or Full Duplex Mode Selection

In Voice Mode, users could choose to use either ADPCM (32Kbps) or PCM (64Kbps). See Figure 12. left.

In Data Mode, it can only be either Half or Full Duplex. See Figure 12. right.

Figure 12. ADPCM / PCM and half / full duplex selection

4.3.6 RTS_N Bit

The selection is used to enable or disable the RTS_N Bit. See Figure 13. In Full Duplex Mode, chips communicating with each other should have RTS_N enabled.

In Half-Duplex Operation, if the RTS_N is disable, then the chip is in the Receive Mode. If the RTS_N is enable, then the chip is in the Transmit Mode.

For more about the usage of RTS_N, please read the Section 3.3, Data Mode Timing information of the SS1101C External Specification (from p12 to p15).

Figure 13.Selection of RTS_N bit

4.3.7 ESD Window Width

Set the width of the ESD Window in either 10, 12 or 14 samples wide. See Figure 14. Windowing algorithm is employed by SS1101C in Digital Signal Processing. ESD window is mainly used on the detection of the phase error signal in tracking mode. In general, if smaller window size is used, the PLL will behave as if it has a smaller loop bandwidth with higher noise filtering but at the expense of slower dynamic response. If larger window size is used, the PLL will respond quicker dynamically but its performance will be degraded because more noise is allowed to enter the system.

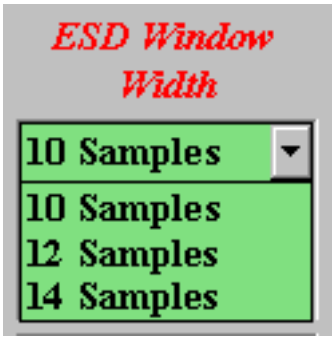


Figure 14.ESD window width

4.3.8 Width of Central Region

Set the width of the "Central Region" in either 10 or 12 samples wide. See Figure 15. The Central Region is used to adjust the window of Peak Search which is used in acquisition mode to produce the peak index and good peak indicator. In general, if smaller window size is used, the PLL will behave as if it has a smaller loop bandwidth with higher noise filtering but at the expense of slower dynamic response. If larger window size is used, the PLL will respond quicker dynamically but its performance will be degraded because more noise is allowed to enter the system.

(Note: the width of the ESD Windows must be $\geq$ the width of the Central Region.)

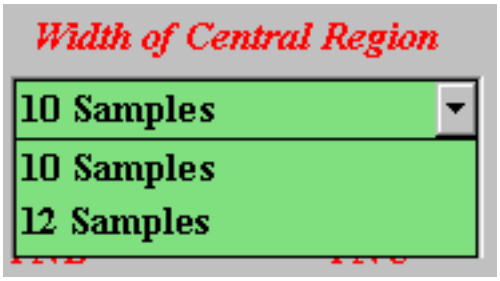


Figure 15. Width of Central Region selection

4.3.9 DPLL Accumulator

Reset or not of the DPLL Accumulator. See Figure 16.

In the Full-Duplex or TDD mode, the DPLL Accumulator should normally be set to "0" for no DPLL Accumulator reset during each "freeze DPLL" period. The only instance where DPLL Accumulator should be set "1" to reset DPLL Accumulator is if the frequency offset between the transmitter and receiver is known to be very small. In this case, the performance of the DPLL will be slightly enhanced if DPLL Accumulator is reset during each "freeze DPLL" period. In half-duplex operation, DPLL Accumlator should be set to "1" to always reset the DPLL Accumulator.

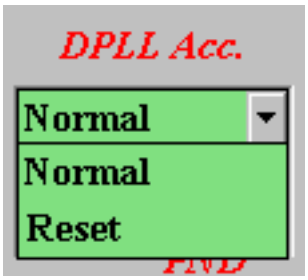


Figure 16. DPLL Accumulator

4.3.10 Width of Detection Window

Set the width of the Detection Window in either 4, 6, 8 or 10 samples wide. See Fig. 1.10. Similarly, the width of the detection window should be large enough to take advantage of multipath combining but should not be so large that excessive noise is allowed into the receiver causing receiver sensitivity degradation. In general, these parameters can be experimentally optimized for a particular environment. Otherwise, it is recommended that these parameters be programmed to values in the middle of the programmable range (for example,

set PLSL to 12 samples wide, CNTLR to 10 samples wide, and WSL to 8 samples wide).

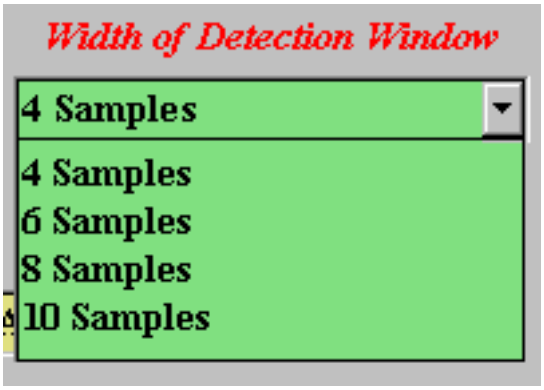


Figure 17.Width of the Detection Window

4.3.11 PNA Value

Type in the 32-bit PN sequence value in hexadecimal format. See Figure 18.

For the design of the PN sequence, please refer to the Section 13.4 PN Sequence and UW Selection, on the page of 35 of SS1101C External Specification.

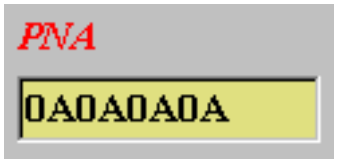


Figure 18.PNA Value

4.3.12 PNB Value

Type in the 32-bit PN sequence value in hexadecimal format. See Fig. 1.12.

For the design of the PN sequence, please refer to the Section 13.4 PN Sequence and UW Selection, on the page of 35 of SS1101C External Specification.

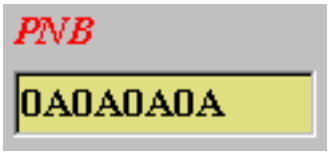


Figure 19. PNB Value

4.3.13 PNC Value

Type in the 32-bit PN sequence value in hexadecimal format. See Figure 20.

For the design of the PN sequence, please refer to the Section 13.4 PN Sequence and UW Selection, on the page of 35 of SS1101C External Specification.

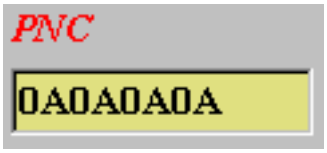


Figure 20. PNC Value

4.3.14 PND Value

Type in the 32-bit PN sequence value in hexadecimal format. See Figure 21.

For the design of the PN sequence, please refer to the Section 13.4 PN Sequence and UW Selection, on the page of 35 of SS1101C External Specification.

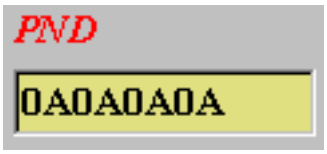


Figure 21.PND Value

4.3.15 Unique Word Value

Type in the 24-bit Unique Word Value in hexadecimal format. See Figure 22.

For the design of the UW sequence, please refer to the Section 13.4 PN Sequence and UW Selection, on the page of 35 of SS1101C External Specification.

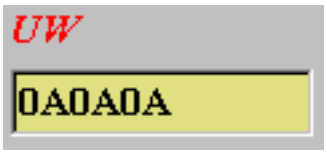


Figure 22.Unique Word Value

4.3.16 Transmitting FIFO Interrupt Threshold High Value

Type in the 5-bit Transmitting FIFO Interrupt Threshold High Value in hexadecimal format. See Figure 23. An interrupt will be generated if the FIFO has been filled up to the Threshold High Value (unit in Threshold value is byte).

Figure 23. Transmitting FIFO Interrupt Threshold High

4.3.17 Transmitting FIFO Interrupt Threshold Low Value

Type in the 5-bit Transmitting FIFO Interrupt Threshold Low Value in hexadecimal format. See Figure 24. An interrupt will be genrated if the data inside the FIFO has been sent and the number of the data has been reach the Threshold Low Value.

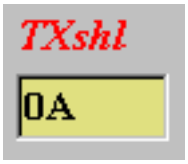


Figure 24.Transmitting FIFO Interrupt Threshold Low

4.3.18 Receiving FIFO Interrupt Threshold High Value

Type in the 5-bit Receiving FIFO Interrupt Threshold High Value in hexadecimal format. See Figure 25. An interrupt will be generated if the FIFO has been filled to the Threshold High Value during data receiving.

Figure 25.Receiving FIFO Interrupt Threshold High

4.3.19 Receiving FIFO Interrupt Threshold Low Value

Type in the 5-bit Receiving FIFO Interrupt Threshold Low Value in hexadecimal format. See Figure 26. An interrupt will be generated if the data inside the FIFO has been read by the system and down to the Threshold Low Value.

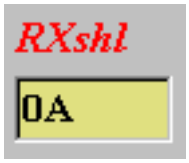


Figure 26.Receiving FIFO Interrupt Threshold Low

4.3.20 Clock Speed

In Data Mode, select the Clock speed to either 16 or 32 MHz for data transmission. See Figure 27.

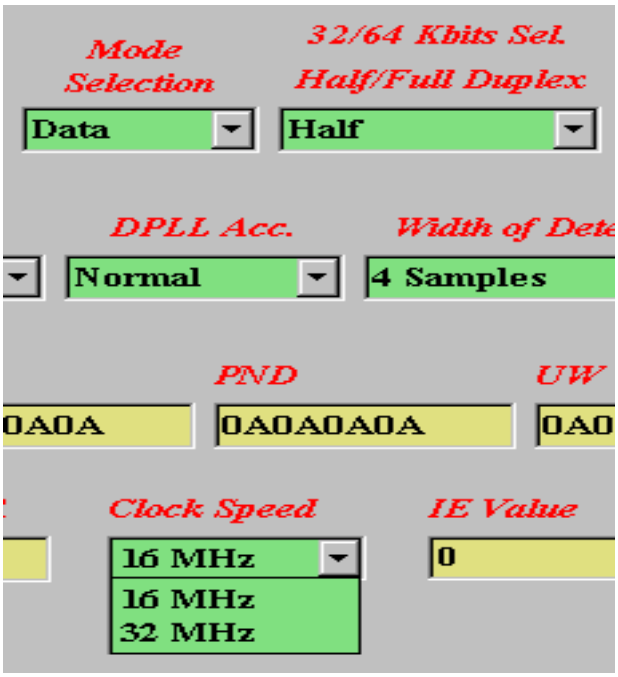


Figure 27.Data mode clock speed

4.3.21 Interrupt Enable Value (IE)

- Type in (hexadecimal) the 4-bit value of IE register which is used to control the four interrupts (see Figure 28.):
- RXSW (Signaling Word Received) received interrupt
- S/N (Signal/Noise Indicator) interrupt
- TXFIFO (Transmitting FIFO) interrupt
- RXFIFO (Receiving FIFO) interrupt

Figure 28. Interrupt Enable Value

4.3.22 RF Channel

Select the RF Channel number from 1 to 12. See Figure 29.

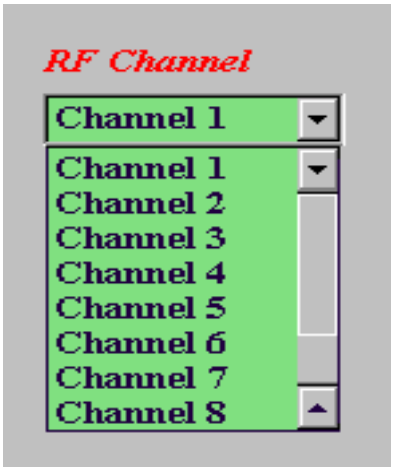


Figure 29. RF Channel selection

4.3.23 Start Program Button

After starting the PC software program, the user has to click the "Start Program" button to try to establish the communication between the PC and the evaluation board. First the PC will send 5 bytes of "1" to the evaluation board. After receiving the data, the evaluation board will send back 5 bytes of "01" back to the PC to establish the communication. If the PC doesn't receive the correct data back from the board, a warning message will be displayed on the screen to ask the user either to "retry" or to "abort" the operation. If the communication is established, the evaluation board will then send all the control registers' default values to the PC. Then, the PC will update and show all the values of the control registers on the screen. After finishing the process, it will show the user that "all default parameters have been updated" on the screen. See Figure 30.

Figure 30. Start Program Button

4.3.24 Write SS1101C Button

After selecting and typing in all the values of the control registers, the user has to click the "Write SS1101C" button in order to write all the values to the

SS1101C chip. After writing all the values, the program will automatically read back all the control register values from the SS1101C and display these back on the screen. Then, it will ask the user to re-check all the control register values. If all the values are correct, the user can then start another procedure. See Figure 31.

Figure 31. Write SS1101C Button

4.3.25 Reset Com. Port Button

If there is any communication problem during the send and receiving process, the user can reset the serial port communication by clicking the "Reset Com. Port." button. See Figure 32.

Figure 32. Reset Com. Port Button

4.3.26 Chat Windows Button

The Chat Windows button is enabled only in the "Voice" mode and in the Data "Full Duplex" mode. After selecting either one of the above modes, the user can click on the button to go to the Chat Windows. The functions of the Chat Windows will be discussed in the section 4.4 . See Figure 33.

.

Figure 33. Chat Button

4.3.27 Data Window

The Data Window button is enabled only in the "Data" mode. It can be either "Half" or "Full" Duplex mode. To go to the Data Window, just click the "Data" button after selecting either one of the modes just mentioned above. See Figure 34.

Figure 34.Data Window Button

4.3.28 Quit the program

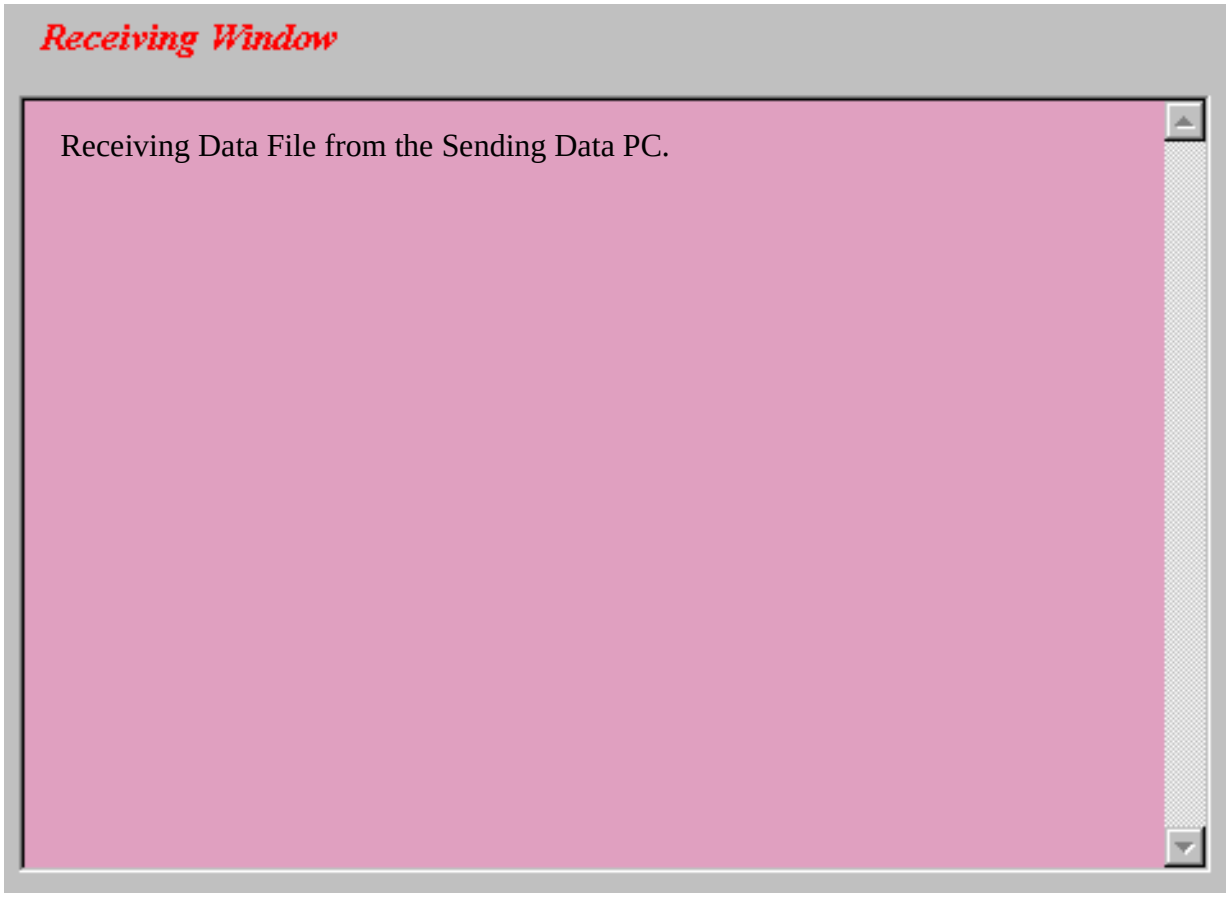
To quit the program just click the "Quit" button. This is the only way to quit the SS1101EB software program. See Figure 35.

Figure 35.Quit Button

4.4 Chat Window

The user can either select "Voice" mode or "Full Duplex" mode in the Control Registers Selection Menu before going into Chat Window. The color of the "Transmitting Window" is yellow which means the user has to type in the text. For the "Receiving Window", the color is pink which means that only that PC can print the text on such a window.

In "Voice" mode, the user can be talking on the phone and typing on either side of the "Transmitting Window" of the two PCs. The PC will then transmit all the data from the "Transmitting Window" to the other side's PC. On the other side's PC, the text will be displayed on the "Receiving Window" as soon as it is received. Communications are actually happening in "real time". After each packet of data is received, the program will automatically update the S/N ratio value on the S/N Ratio window.


Receiving Window
Receiving Data File from the Sending Data PC.

In "Full Duplex" mode, the user can only type in text in the "Transmitting Window" on either side's PC and the other side's PC will receive the data and display it in the "Receiving Window". To return to the selection menu for control registers, just click the "Return" button. See Figure 36. for the Chat Windows Diagram.

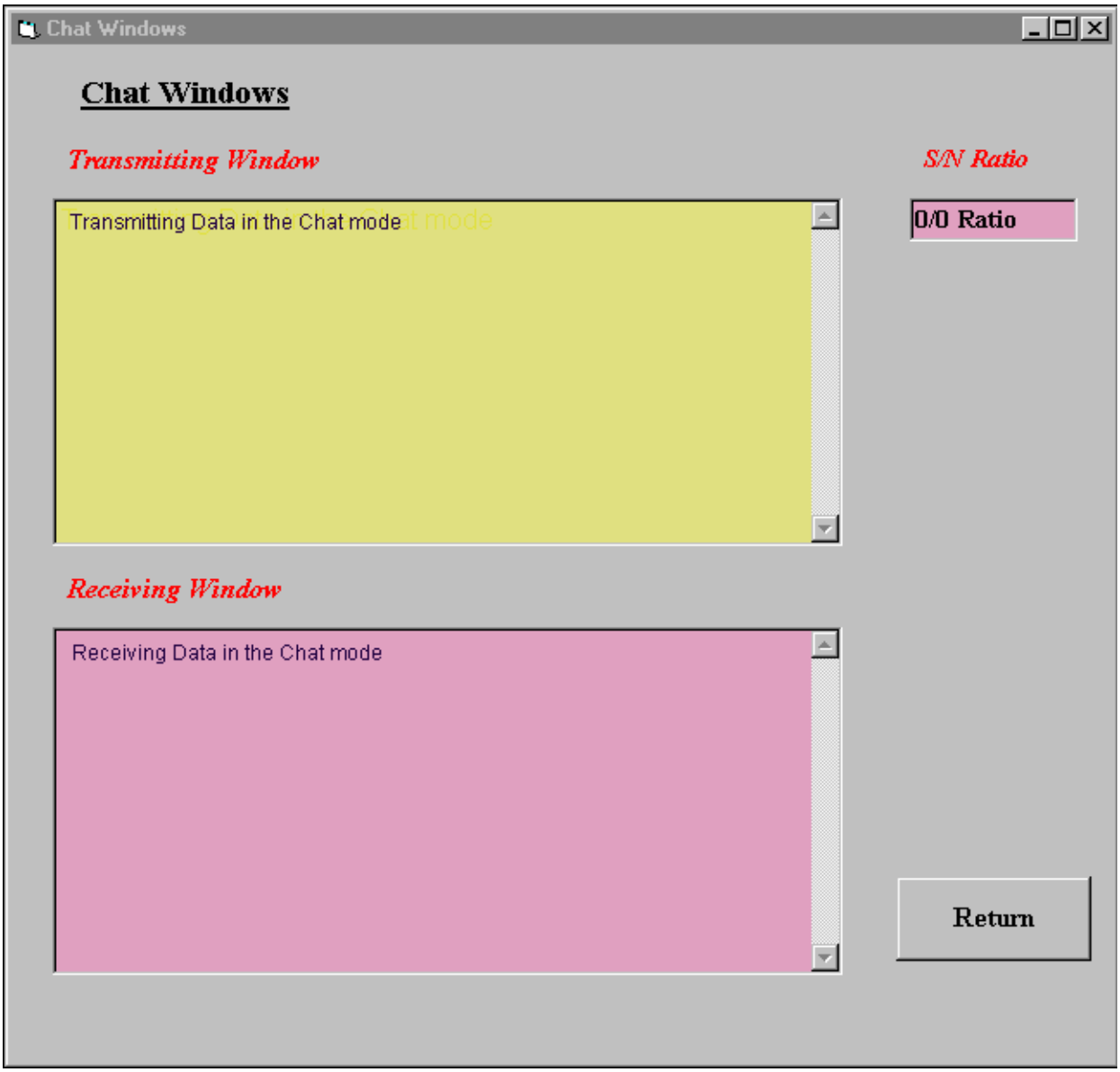


Figure 36.Chat Window

4.5 Data Window

The user can only go to the Data Window by selecting Data Mode in the Control Register Menu. If the current mode is "Half Duplex", the "File Transfer" and "File Receive" buttons will be disabled. Also, in "Half Duplex" mode, in order to calculate the BER value for the Slave side, the Master side of the PC should enable the RTS_N Bit.

In "Full Duplex" mode, the "File Transfer" button will be enabled for the "Master" mode side. On the other PC, in "Slave" mode, the "File Receive" button will be enabled.

4.5.1 Number of Minutes for BER Calculation Window

Type in the number of minutes for calculating the BER value in a decimal number format. The minimum and maximum values for the number of minute(s) are 1 and 120 respectively. See Figure 37.

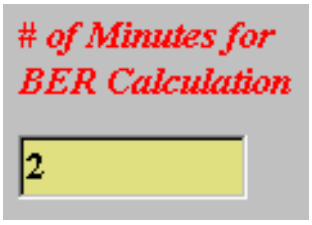


Figure 37. Number of minutes for BER calculation

4.5.2 BER Calculation Button

In "Half Duplex" Mode: the user has to click the BER Calculation button, first on the PC with "RTS_N Bit" enabled, then the BER Calculation button on the other side's PC.

In "Full Duplex" Mode: the user has to click the BER Calculation button first on the PC with "Master" mode selected then the BER Calculation button on the other side's PC with "Slave" mode selected. See Figure 38. for the button.

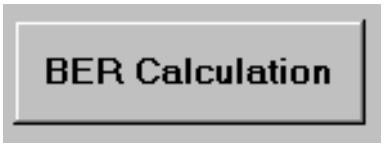


Figure 38. BER Calculation Button

4.5.3 Current BER Value in (Bits/Second) Window

The PC will display the result of the BER value in the window after finishing the calculation for the number of minutes entered for BER calculation. See Figure 39.

In "Half Duplex" Mode: the PC will display the BER value only if it is in the "Slave" mode.

In "Full Duplex" Mode: both PCs will display the BER value.

Figure 39.Current BER Value

4.5.4 S/N Ratio Window

After each BER calculation, the software will automatically display the S/N Ratio on the S/N Ratio Window. See Figure 40. The value with a perfect transmission is H58. Then the value decreases when the link becomes bad down to H40.

Figure 40.S/N Ratio Value

4.5.5 File Transfer Button

To start the file transfer operation, in Full Duplex mode, the user has to click the "File Transfer" button from the Master side PC after the "File Receive" button has been clicked on the Slave side PC. See Figure 41.

Figure 41.File Transfer Button

4.5.6 File Receive Button

First click the "File Receive" button in the Slave side PC before clicking the "File Transfer" button in the Master side PC to start the file transfer operation. See Figure 42.

Figure 42.File Receive Button

4.5.7 Receiving window

The data transmitted by the sending PC will be displayed on the receiving side PC in the "Receiving Window". See Figure 41.

5. Operation procedure

5.1 Chat Mode

Users could follow the below procedure to make the kit operating with PCs in Chat Mode

i. Install the Set-up Disk into two different PCs.

ii. Run the “Project 3” to get the “Selection Menu for Control Registers”.

iii. Keep the default settings of the evaluation boards unchange.

iv. Connect the RS232 with PC’s COM1 port and the evaluation boards. (It is better to use PS/2 mouse or you need to set your Microsoft mouse in COM2).

v. Connect the power supply to the evaluation boads, then turn them on.

vi. Set one board as MASTER and the other as SLAVE by:

a. MASTER BOARD: turn the first dip of the Dip switch off.

b. SLAVE Board: turn the first dip of the Dip switch on.

vii. Hit the reset button to reset the evaluation board. Both master and slave evaluatin board need to be reset.

viii. In screen of MASTER BOARD, press the “Reset Com Port” once, and then press the “Start Program” once (only once, twice will generate an error), the system will respond by

“Handshaking OK”

then press “OK”.

And then the system will respond by

“All default parameters has been updated”

then press “OK”

Press the “Chat” button from the “Selection Menu”, the system will then go to the “Chat Windows”.

ix. In the screen of Slave Board, do the same procedure of Step (viii), so the Slave Board could also go into the “Chat Windows”.

x. Any characters that type from one computer will transmit to another computer and voice can be transferred simultaneously.

5.2 Data Mode

Users could follow the below procedure to make the kit operating with PCs in Chat Mode:

i. Install the Set-up Disk into two different PCs.

ii. Run the “Project 3” to get the “Selection Menu for Control Registers”.

iii. Keep the default settings of the evaluation boards unchange.

“All selected parameter has been sent and updated.”

iv. Connect the RS232 with PC’s COM1 port and the evaluation boards. (It is better to use PS/2 mouse or you need to set your Microsoft mouse in COM2.)

v. Connect the power supply to the evaluation boads, then turn them on.

vi. Set one board as MASTER and the other as SLAVE by:

a. MASTER BOARD: turn the first dip of the Dip switch off.

b. SLAVE Board: turn the first dip of the Dip switch on.

vii. Hit the reset button to reset the evaluation board. Both master and slave evaluatin board need to be reset.

viii. In screen of MASTER BOARD, press the “Reset Com Port” once, and then press the “Start Program” once (only once, twice will generate an error), the system will respond by

“Handshaking OK”

then press “OK”.

And then the system will respond by

“All default parameters has been updated”

then press “OK”

Then go to the “Mode Selection” to select “Data” mode.

And then go to “32/64 bits Sel. Half/Full Duplex” to select “ Full” mode.

After doing that, go to press the “Write SS1101c”, the system will then respond

“Start Receiving PNA now”

then press “OK”. The system will then respond

“Please checked the value again.”,

then press OK

Press the “Data” button from the “ Selection Menu”, the system will then go to the “Data Window”.

xi. In the screen of Slave Board, do the same procedure of step 8, so the Slave Board could also go into the “Data Window”.

x. To start the file transfer, go to the screen of slave board then press the “File receive” as request to send . And then, in the screen of master board, press the “File Transfer” to start transfer. You will then find a small file appear on the screen of Slave Board.

“Testing for sending and receiving the file from PC1 to PC2 in Full Duplex mode. PC with RTS_Enable can send the text file to the Receiving PC only.

SST101 - Text File Transferring Test.”

5.3 Note on the operation

Some PCs may have compatibility issue on their I/O chips. The issue will make the data not to be transferred in the Chap Mode. Under such phenonemon, users should set the buffer size of the COM port of their PC to 4. This may generate a handshaking error message during pressing the “Start Program” button. However, the error message will be gone when the “try again” button inside the error message dialogue is pressed.

5.4 Conclusion

The SS1101EB PC software is developed as a bridge between two PCs and two evaluation boards. By using serial communications, a PC will send and receive data from the evaluation board through the serial port of the PC. The PC software supports any 486 -33 MHz PC or above with three different operating

systems -- Windows 3.1, Windows 95 and Windows NT. The video display should be set at 1024 x 768 pixels and 16-bit (64K) color palette or higher for better looking purpose.

The PC software can also demonstrate the functions and features of the Spread-Spectrum Chip (SS1101C) both in voice and data modes.

For more detail on all the functions and features of the SS1101C product, please refer to our SS1101C Integrated Spread-Spectrum Transceiver External Specification Manual.