



XE1201EVK Evaluation kit User's Guide

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Introduction

Firstly, many thanks for using XEMICS products. The XE1201 Evaluation kit is a flexible support tool that allows you to extract and evaluate the XE1201 electrical performances with your application environment parameters. Influences and interactions between components and system conditions can be easily evaluated thanks to the tuning elements that have been especially inserted in the RF board (final applications can be built without any tuning component). All the XE1201 modes and functions behaviors are controlled via user-friendly-menu-driven software installed on a WINDOWS based PC. Configuration data and results are entered and read directly via the keyboard/mouse and the PC screen.

For customers who wish to start application designs based on this evaluation kit, detailed descriptions on PCB, components characteristics and layout implementation are also given.

In a typical utilization of the XE1201 Evaluation kit, minimum measurement tools are recommended as follows :

- WINDOWS based PC (to program the XE1201 behaviors)
- Spectrum analyzer (if one needs to visualize RF signals spectrum i.e. LO, RFOUT,...)
- Oscilloscope to visualize the demodulated data and synchronized clock
- RF generator
- Pattern generator

Kit Contents

- RF board with XE1201 circuit soldered with components and connectors; the XE1201 EVAL board.
- Interface board ; the PC-XE1201 INTERFACE board
- Inter-board connector
- XEMICS CD ROM including Application Example and CoolRIDE development tools
- This user guide

Software installation

The application **XE1201_V3** is an executable program. It has been created with the software Labview, which works under Windows 3.x. It enables the configuration of the main characteristics for the XE1201 Low-Power UHF transceiver, via the 3-wire bus.

Click on Setup.exe and then follow the installation instructions on the screen.

Note : it is necessary to have PC screen set with 1024*768 pixels minimum and with small characters, in order to get the software working properly. In addition, <xel201v2.exe> needs the file <lvdevice.dll>; this file is automatically copied during the unzip operations.

Hardware Setup

Connection of the RF board and PC-XE1201 interface board:

The interface board is connected to the parallel port of the PC. The cable (not included in the kit) used for connection between the interface and the PC is a 25 pin RS-232-C, as described in the schematic. The 2 boards are interconnected via the 10 flat wires cable; one can either choose the K1 or K2 connection on the RF side.

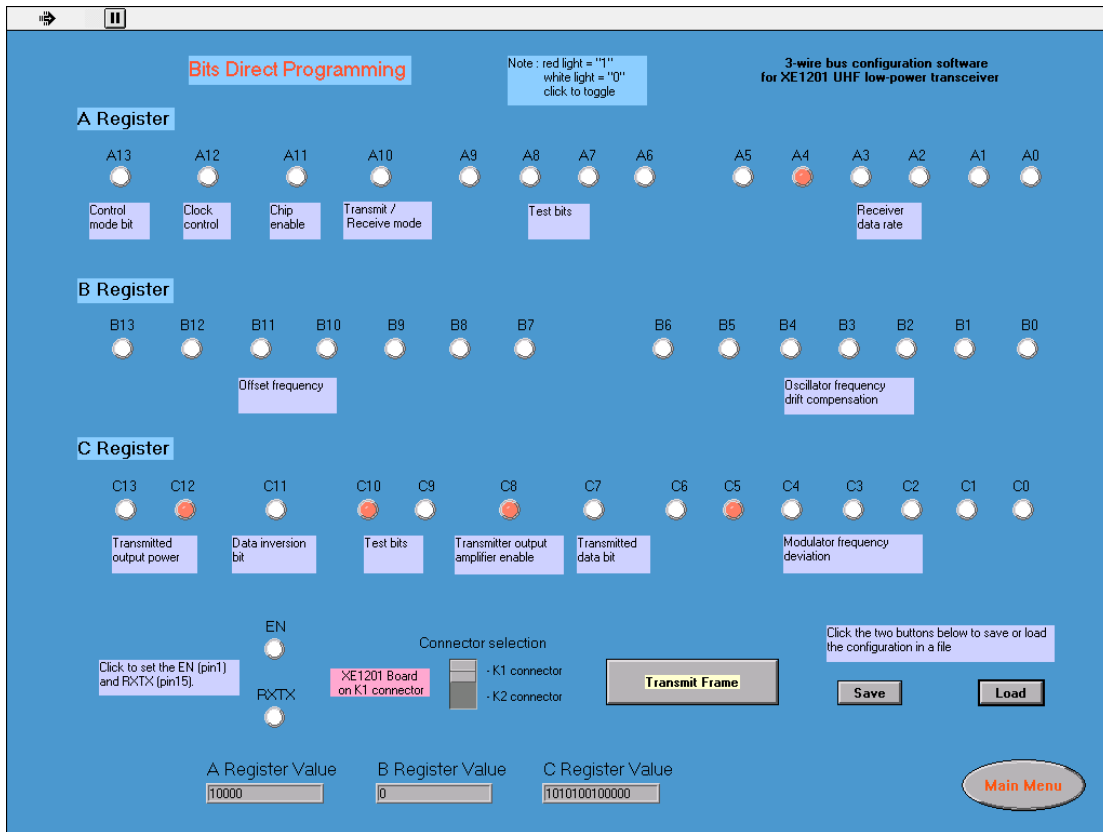
The 2 boards (RF board and the PC-XE1201 interface board) must be both power-supplied by a VCC between 2.4 and 3.6 volts (same values for both boards). Power connections are made via pins (VDD_in, VSS_in on the RF board and D_VDD, D_GND on the interface board).

How to use the program for the configuration of the XE1201:

Once the program is executed, the main screen shows five different menus that user has then to select. These are :

- Bits Direct Programming menu
- Features Programming menu
- Frames sequence menu
- Parallel Port Configuration menu
- Parallel Port Control

The 5 menus are shown and described on the following page

Bits Direct Programming menu:


Bits Direct Programming

Note : red light = "1"
white light = "0"
click to toggle

**3-wire bus configuration software
for XE1201 UHF low-power transceiver**

A Register

A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1 A0

Control mode bit Clock control Chip enable Transmit / Receive mode Test bits Receiver data rate

B Register

B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1 B0

Offset frequency Oscillator frequency drift compensation

C Register

C13 C12 C11 C10 C9 C8 C7 C6 C5 C4 C3 C2 C1 C0

Transmitted output power Data inversion bit Test bits Transmitter output amplifier enable Transmitted data bit Modulator frequency deviation

Click to set the EN (pin1) and RXTX (pin15).

EN

RXTX

Connector selection

- K1 connector
- K2 connector

Click the two buttons below to save or load the configuration in a file

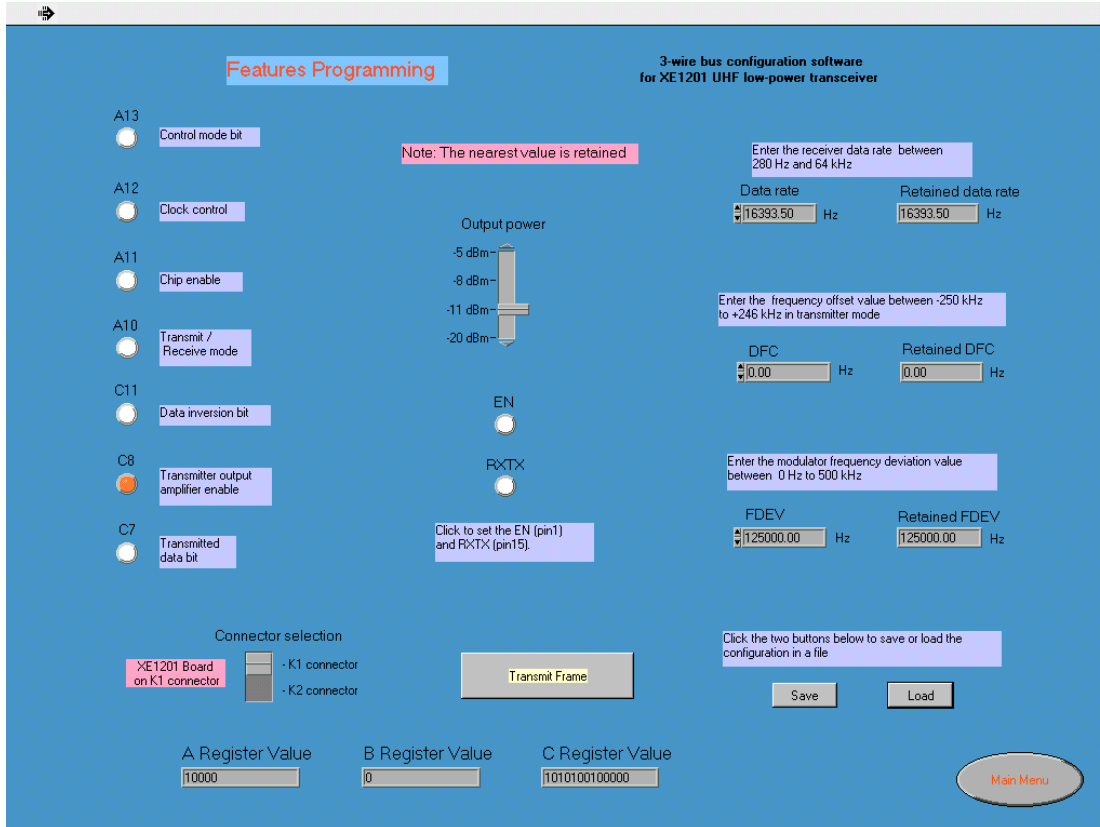
Transmit Frame **Save** **Load**

A Register Value 10000 B Register Value 0 C Register Value 1010100100000

Main Menu

Here, one can program all the different bits of the three registers, via the data line SD. Click on the corresponding small circular buttons to select the desired option (activation at value 1; visible through a red dot). Once all the choices are validated, click on the Save button to store these settings. To activate the operations, the « Transmit Frame » button must be « pushed ».

Features Programming menu:



Features Programming

3-wire bus configuration software
for XE1201 UHF low-power transceiver

Left Sidebar (Feature Selection):

- A13: Control mode bit
- A12: Clock control
- A11: Chip enable
- A10: Transmit / Receive mode
- C11: Data inversion bit
- C8: Transmitter output amplifier enable
- C7: Transmitted data bit

Central Area:

Note: The nearest value is retained

Output power: -5 dBm, -8 dBm, -11 dBm, -20 dBm

EN: ☐

RXTX: ☐

Click to set the EN (pin1) and RXTX (pin15).

Right Area (Configuration):

Data rate: Enter the receiver data rate between 280 Hz and 64 kHz. Data rate: 16393.50 Hz. Retained data rate: 16393.50 Hz.

Frequency offset: Enter the frequency offset value between -250 kHz to +246 kHz in transmitter mode. DFC: 0.00 Hz. Retained DFC: 0.00 Hz.

Frequency deviation: Enter the modulator frequency deviation value between 0 Hz to 500 kHz. FDEV: 125000.00 Hz. Retained FDEV: 125000.00 Hz.

Connector selection: XE1201 Board on K1 connector, K1 connector, K2 connector.

Buttons: Transmit Frame, Save, Load.

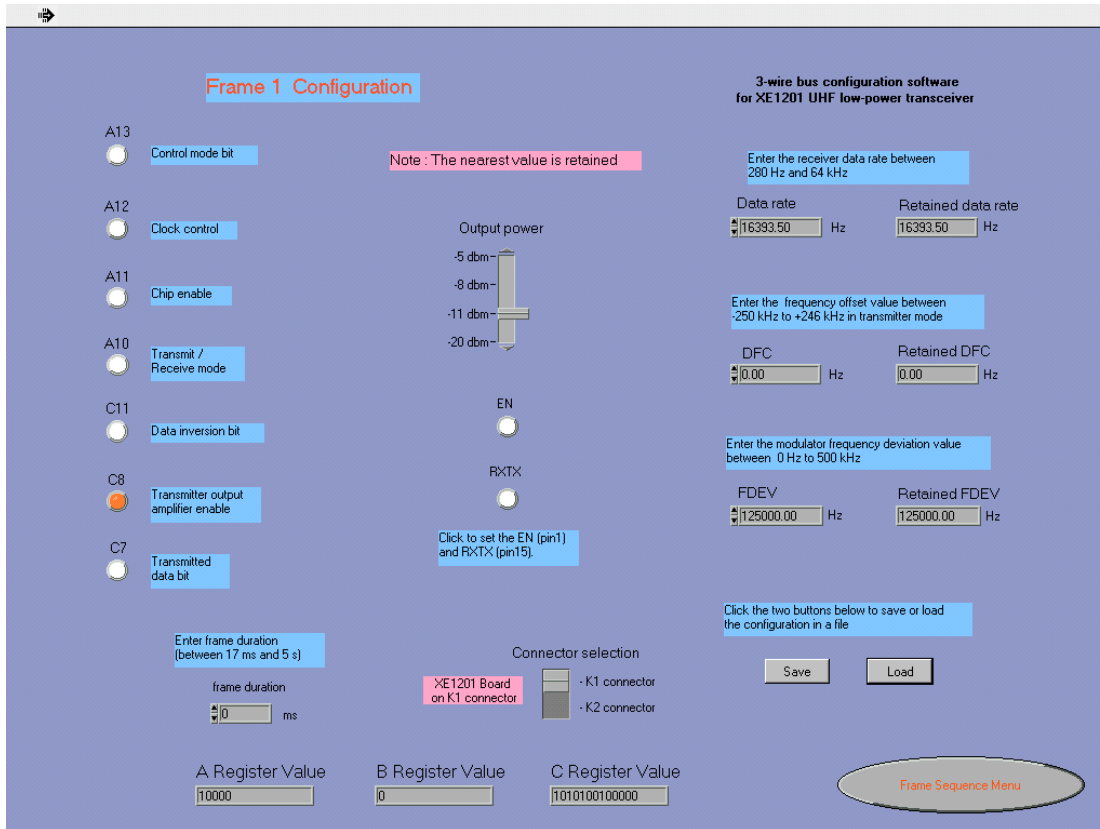
Registers: A Register Value: 10000, B Register Value: 0, C Register Value: 1010100100000.

Main Menu

Here, one can program all the different characteristics of the transceiver, as described in the XE1201 data sheet.

The user enters the desired features; when all the data have been entered, selections are validated by a click on the Save button. Again, operations are executed after having pressed the « Transmit Frame » button.

Frames Sequence menu:



Frame 1 Configuration

3-wire bus configuration software for XE1201 UHF low-power transceiver

Note: The nearest value is retained

Enter the receiver data rate between 280 Hz and 64 kHz

Data rate: 16393.50 Hz Retained data rate: 16393.50 Hz

Enter the frequency offset value between -250 kHz to +246 kHz in transmitter mode

DFC: 0.00 Hz Retained DFC: 0.00 Hz

Enter the modulator frequency deviation value between 0 Hz to 500 kHz

FDEV: 25000.00 Hz Retained FDEV: 25000.00 Hz

Click the two buttons below to save or load the configuration in a file

Save Load

Enter frame duration (between 17 ms and 5 s)

frame duration: 0 ms

Connector selection

XE1201 Board on K1 connector

K1 connector K2 connector

Click to set the EN (pin1) and RXTX (pin15).

EN RXTX

A Register Value: 10000 B Register Value: 0 C Register Value: 1010100100000

Frame Sequence Menu

- One can send four Lift sequences to the transceiver one after the other. The duration between sequences can be changed and set by the user. The figure shows the possible set-up of one of the Frame Configurations. Use the small circular buttons to activate the Clock Control, Chip Enable, Transmit/Receive Mode, Data inversion bit, Transmitter output amplifier enable and the Transfer data bit. On this screen, one can also set the EN (pin 1) and RXTX (pin 15). The output power is set using the sliding buttons.

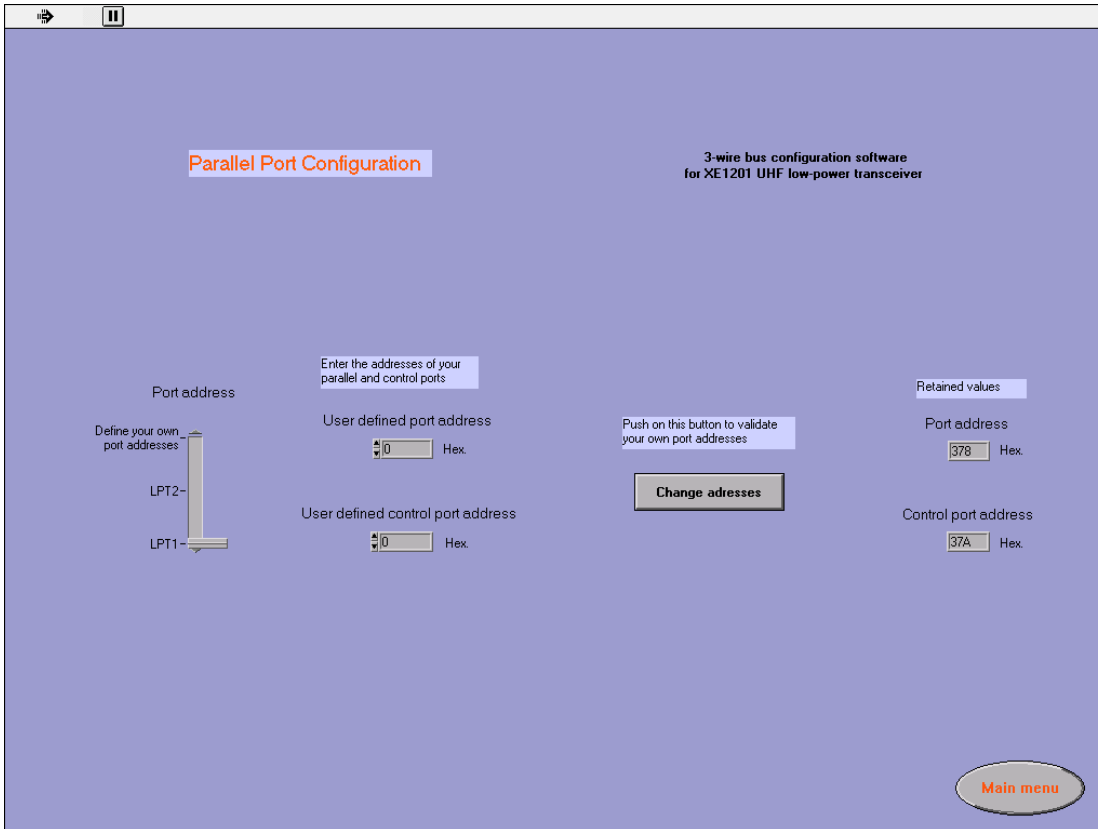
Also enter the receiver data rate and the modulator frequency deviation here.

When all these fields have been filled in, click on the SAVE button. This will save all data for Frame 1.

To load a previously saved configuration, click on the load button and select the desired settings.

Now click on the Frame Sequence Menu button to return and set up the other Frames.

Parallel Port Configuration menu:

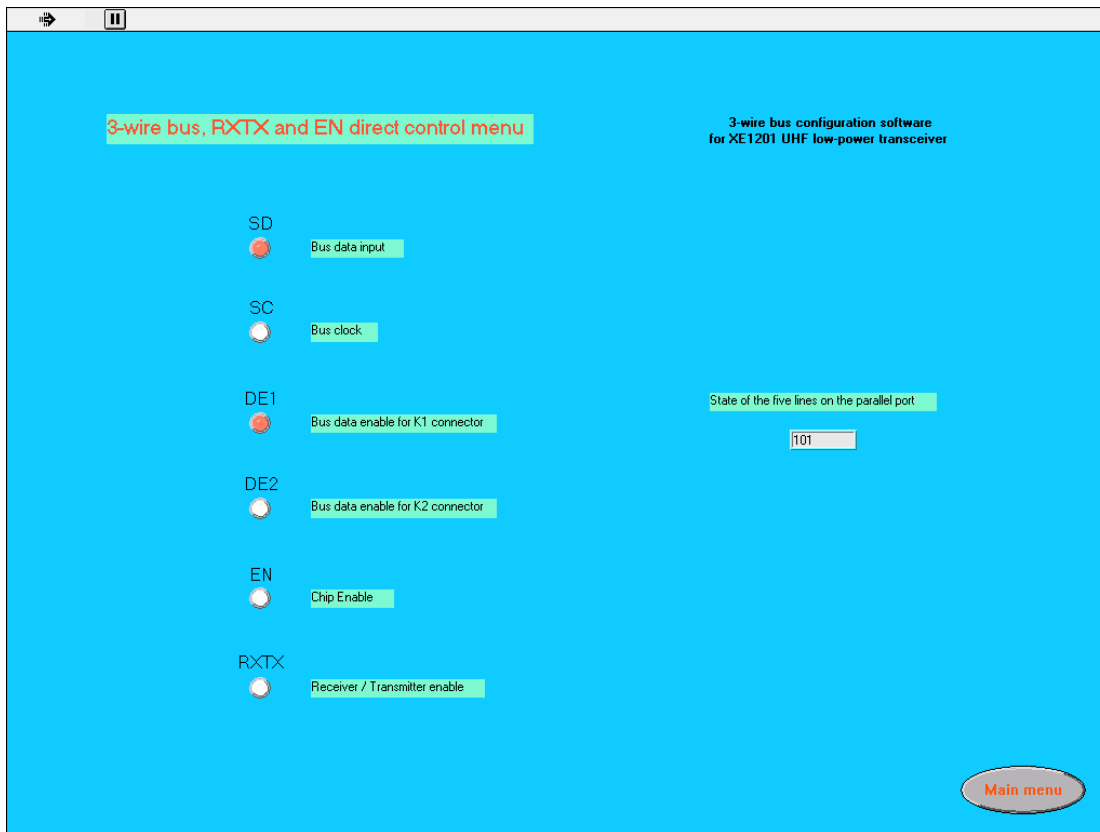


The screenshot shows the 'Parallel Port Configuration' menu of the '3-wire bus configuration software for XE1201 UHF low-power transceiver'. The interface is set against a light blue background. At the top left, there is a title bar with a back arrow and a pause icon. The main area contains several sections:

- Port address**: A section on the left with a vertical slider labeled 'Define your own port addresses' and two options, 'LPT2-' and 'LPT1-'. The 'LPT1-' option is currently selected.
- Enter the addresses of your parallel and control ports**: A central instruction box.
- User defined port address**: A text input field showing '0' followed by 'Hex.'.
- User defined control port address**: A text input field showing '0' followed by 'Hex.'.
- Push on this button to validate your own port addresses**: A text instruction above a 'Change addresses' button.
- Retained values**: A section on the right showing 'Port address' as '378 Hex.' and 'Control port address' as '37A Hex.'.
- Main menu**: A button in the bottom right corner.

One can choose the parallel port of the PC, send data LPT1 or LPT2, or define own Port Address (in HEX). Click on the Validate button to activate the new address.

Parallel Port Control Menu:



One can control the static levels of the 3-wire bus, as well as the lines EN and RXTX. Click on the radio buttons to activate the following parameters:

- Bus data Input
- Bus Clock
- Bus Data Enable for K1 Connector
- Bus Data Enable for K2 Connector
- Chip enable
- Receiver / Transmitter Enable

Note: The screen refresh is performed when one clicks on the "enter" button (localized on the upper left corner of the screen), or when you send the data.

Parallel port address selection:

Every parallel port has an address identified in the PC. Correct address selection is required prior to sending data on the right parallel port. This address must be known in advance; it can be found in the PC documentation or through the BIOS program during any PC initialization phase.

Once known, the parallel port address can be entered from the Labview program via the menu

< Parallel Port Configuration >.

There are three different practical cases (linked to the user PC hardware):

1. The PC has only one parallel port named LPT1 and is addressed by :

0378 Hex

and the control port is defined by :

037A Hex. ("default mode" in the program)

2. The PC has two parallel ports and LPT1 is already used (usually a printer). One can use the second parallel port named LPT2 and it is addressed by:

0278 Hex

and its control port is defined by :

027A Hex

3. The PC has a special address for its parallel port. In this case, enter just its corresponding address in the program.

Choice of the 3-wire bus connector on the PC-XE1201 interface

The PC-XE1201 interface allows you to program two XE1201 evaluation RF boards via their connectors K1 and K2. The only thing to note is that you must program the different modes on one board with the CONTROL MODE BIT (A13) set to 1. This is because you can address only one of the two connectors via the pin 15 (RXTX) and pin 1 (EN).

More detailed description of the configuration bits and pins can be found in the XEMICS XE1201 Datasheet ref D88-011 on pages 5 to 7.

Annexes: hardware descriptions:

A1 : Layout of XE1201 Evaluation board V2.0 :

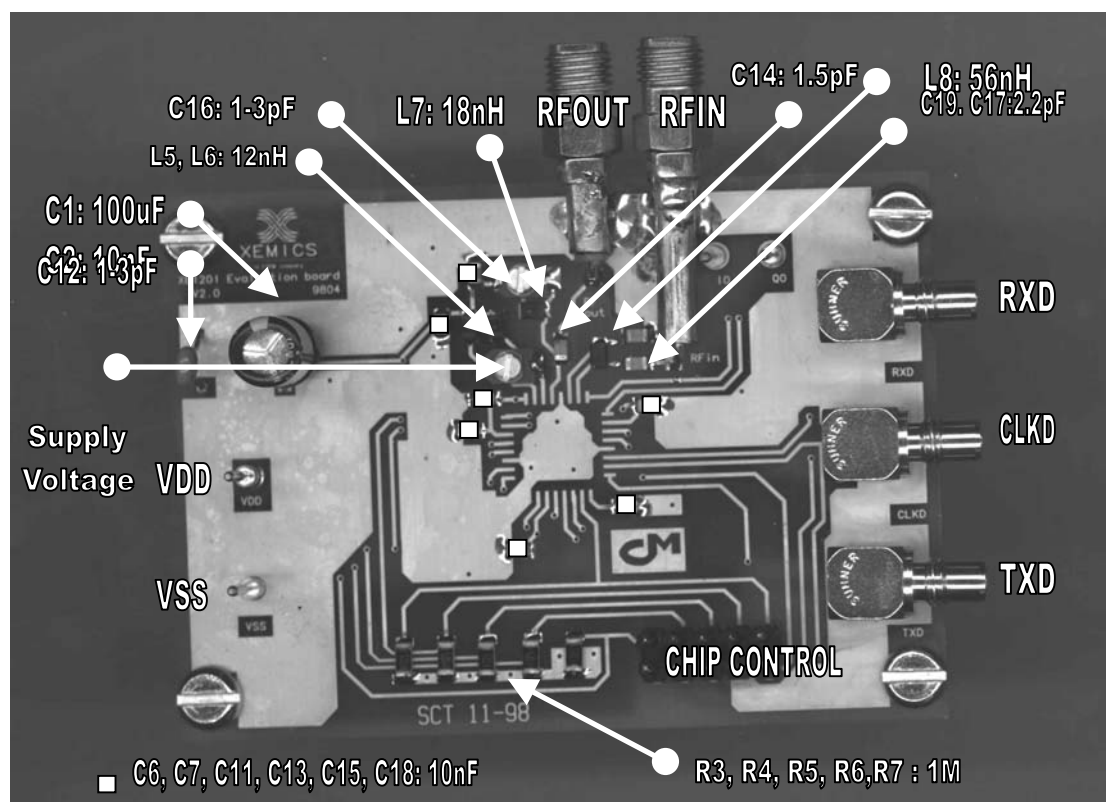


Figure 1 : Top view of XE1201 evaluation board



Figure 2: bottom view of XE1201 evaluation board

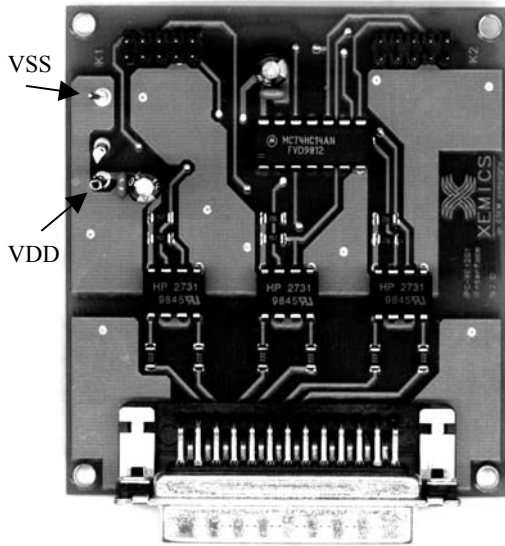
Board adjustment:

Measurements on this board are performed with the Local frequency set to 433.92 MHz with the C10 trimmer capacitor (see figure 2). The Local Oscillator frequency can be seen in the RFOUT port, with a spectrum analyser or a high frequency meter.

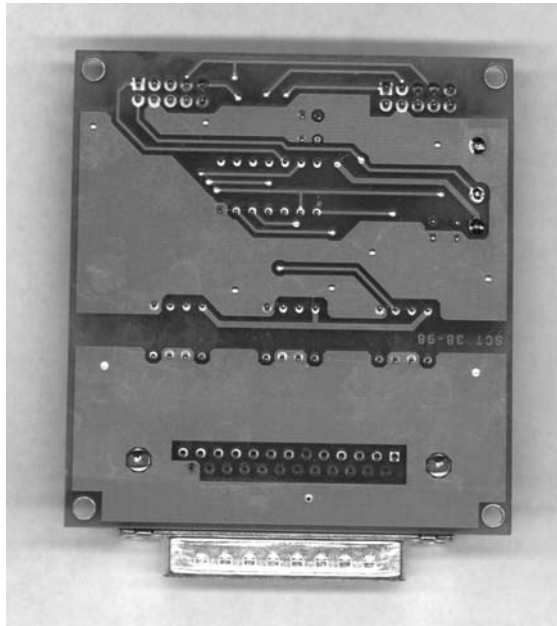
Then the C5 trimmer capacitor (see figure 2) is set to obtain the maximum power level on RFOUT port (Typically with a new board $P_{out} \approx -12$ dBm). This adjustment is very important, because it has an influence on receiver and transmitter functionary mode.

In transmitter mode, the C16 trimmer capacitor (see figure 1) is set to obtain the maximum power performance (Typically -4 dBm) and a 50 Ω output load.

In receiver mode, the C12 trimmer capacitor (see figure 1) is adjusted to obtain the maximum voltage amplitude on IO and QO ports (Typically 1.5Vpp).

A2 : Layout of PC-XE1201 Interface board V2.0 :


PC-XE1201 Interface board –
Top view



PC-XE1201 Interface board –
Bottom view



KCC - DEC 98	BOM - XEMICS Evaluation kit XE1201 : "XE1201 EVAL"					Qty
	Components	References	value	Form	Origin	
RF board						
U1	Transceiver circuit	XE1201	NAP	TQFP32	Xemics	1
Q1	XTAL Quartz	S0409745	4.00 MHz	-	Sarnix	1
SAW1	SAW resonator	RO-2101A	433.92 MHz	SM-2	RFM	1
C1	Decoupling capacitor VDD chemical	Any one (not critical)	100 uF	-	Philips or eq	1
C2	Decoupling capacitor ceramic	Any one (not critical)	100 nF	-	Any one	1
C3,C4,C6,C7,C11	Decoupling capacitors	0805 X7R Ni +/-10%, 50v	10 nF	SMD 0805	Philips or eq	9
C5	Adjustment tank PA trim-capacitor	TZC03Z030A110	1.4 to 3 pF	SMD	Murata or eq	1
C10	Adjustment tank LO trim-capacitor	TZC03Z060A110	2 to 6 pF	SMD	Murata or eq	1
C12	Adjustment tank LNA trim-capacitor	TZC03Z030A110	1.4 to 3 pF	SMD	Murata or eq	1
C14	Adaptation matching RF-out cap	0805 NPO Ni, +/-0.25pF, 50 v	1.5 pF	SMD 0805	Philips or eq	1
C16	Adjustment matching RF-out cap	TZC03Z030A110	1.4 to 3 pF	SMD	Philips or eq	1
C17	Adaptation matching RF-in cap	0805 NPO Ni, +/-0.25pF, 50 v	2.2 pF	SMD 0805	Philips or eq	1
C19	Coupling RF-in capacitor	0805 NPO Ni, +/-0.25pF, 50 v	2.2 pF	SMD 0805	Philips or eq	1
R3,R4,R5,R6,R7,R8	Pull-down resistors digital inputs	Any one (not critical)	1 MOhm	SMD 1206	Philips or eq	6
L1,L2,L3,L4,L5,L6	Inductors for tanks	0805 CS-120-X JBC 5%	12 nH	SMD 0805	Coilcraft or eq	6
L7	Matching RF-out inductor	0805 CS-180-X JBC 5%	18 nH	SMD 0805	Coilcraft ou eq	1
L8	Matching RF-in inductor	0805 CS-560-XJBC 5%	56 nH	SMD 0805	Coilcraft ou eq	1
L9	SAW resonator tuning inductor	0805 CS-220-XJBC 5%	22 nH	SMD 0805	Coilcraft ou eq	1
Conn_10p	Connector 10 pins male double sides	SUBD barette double	0.1 inch			1
RF_in, RF_out	RF SMA connectors	21 SMA-50-3-15/111	-			2
	Semi-rigid coax cable for SMA connection	E2 141	20.5 mm		Huber&Shuhner	1
	Semi-rigid coax cable for SMA connection	E2 141	12.5 mm		Huber&Shuhner	1
VDD-in, VSS-in, IO, QO	Test pins					4
TXD, RXD, CLKD	SMC connectors (digital data)	85 SMC-50-0-1/111	-			3
	Interboards flat cable					1
	Connector 10 pins dipole female	DIN 41651 dipole female			3M, Arting or eq	2
PCB board	Double sides		70 mm x 50 mm			

Interface board						
U1, U2, U3	Opto-coupler		HP2731	-	DIP8	HP
U4	Schmitt trigger inverter and buffers		MM74HC14N	-	DIP14	Motorola
R1,R3,R5,R,R9,R11	Serial port interface resistors		Not critical	2.2 kOhms	1206	Philips or eq
R2,R4,R6,R8,R10,R12	Pull-up resistors		Not critical	1 kOhms	1206	Philips or eq
C1, C3	Decoupling capacitor supplies, chemical		-	10 uF	Ref+10k	Philips ou eq
C2,C4	Decoupling capacitor supplies, ceramic		1206 X7R 10	100 nF	K5K	Philips ou eq
K1, K2	Connector 10 pins male double sides		SUBD barette double	0.1 inch		3M, Arting or eq
PCB board	Double sides			75mm x 70 mm		

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