Wireless Demo Board Checklist

Introduction

This paper discusses some of the common problems that people often have operating National's demo boards, as well as how to diagnose them and get a demo board up and working. This is intended as a step by step guide of things to check. First, the board is diagnosed, and then cures are implemented.

Before You Start

1. Get the evaluation instructions. If you don't have them
   Go to http://www.national.com/design
   choose "models and software"
   choose "wireless web page"
   choose "evaluation software" link
   The direct URL is: http://www.national.com/sw/Wireless (this is case sensitive)

If the instructions are there, great. If not, type in the part number at the bottom and search for it. There are a lot of instructions on the web not listed there. Be sure to try both with and without the "lmx" suffix. ie. For the lmx2350 instructions, try "2350" and "lmx2350".

2. Be sure that your instructions match those of the customer.

Steps to Diagnosis

These are the basic steps to check. It may not be necessary to do all of these.

1. Confirm proper setup
2. Confirm communication between PC and demo board
3. Confirm proper frequency range operation
4. Confirm proper voltage range operation/VCO operation
5. Confirm proper charge pump current and comparison frequency

1. Confirm proper setup

a. Reference Signal – a reference signal needs to be provided to the connector labeled sma. This is often labeled OSCin
b. VCC – the proper voltage needs to be provided. Check step 4 to make sure the proper VCO voltage is provided.
c. jumpers – make sure that all of the jumpers are on the board
d. output signal - The RF_out or IF out should be connected to a signal generator
e. cable – make sure the cable is connected to the PC and the demo board. Also make sure the cable is correct. Refer to appendix A.

2. Confirm communication between the PC and the demo board.

Any of these steps can confirm communication. Repeat these steps several times to make sure that the communication is consistent.

a. PowerDown/PowerUp test -- Any PLL which has a softwire powerdown function can be tested with this. Monitor the voltage at the fin pin. In the power up state, this should have a DC component of about 1.6 volts (2 diode drops), in the power down state, this should have 0 volts. Another way is to monitor the current and see if it changes. Note an Ammeter accurate to the mA is necessary for this.
b. Phase detector polarity test -- If the part allows this through software. Toggle the phase detector from positive to negative and back. This should cause the carrier to jump around.

c. For parts that do not have a software way of changing the phase detector polarity, or powering down/up, Try these

1. High/Low frequency test -- program the synthesizer to a high frequency well above it's tuning range, the carrier should go to the upper rail. The same can be done while programming to a very low frequency.
2. fout test - monitor the frequency of the fout pin. This should be the crystal reference frequency divided by R. Change this frequency and see if this frequency changes.

3. Confirm proper frequency of operation.

Look at the VCO on the board and look up the tuning range in the table. Also, if programming is verified, program the synthesizer way high. This should cause the VCO to go to it's upper rail. This is the upper tuning range (note that the spec on tuning range will always be less than the actual tuning range, since this will be very noisy). Next, program the VCO to a very low frequency. This should cause the VCO to go to the lower rail. Thus the tuning range can be determined in this way. We changed varactor diode manufacturers, so some of the IF VCO ranges given in the instructions are off.

4. Confirm proper voltage range operation.

Make sure that you are giving the proper VCO operating voltage. If unsure of this, look at the pins for the microwire. If you see a voltage divider there (do not be deceived however, sometimes 0 ohm resistors are used), then this is a good clue that the board is not intended to run at 5 volts. The output of most computer ports is 5 volts, so this divider is necessary, if the PLL is to run at a lower voltage.

5. Confirm proper charge pump operation and comparison frequency.

Loop filters are designed for a particular N value and a particular comparison frequency. Make sure that you are running the PLL in the correct way. If the PLL is locked and tunes, then look at the loop bandwidth and see if it matches the one in the picture. Usually, these are run in the highest current modes. If you are using too low of a charge pump current, then the loop bandwidth will be less. The loop bandwidth is approximately proportional to the square root of the charge pump current. Also check if the loop bandwidth is peaking. This is a clue that the filter is not optimized for the parameters you are using.

Treatment

Once a problem is diagnosed, then a cure needs to be implemented.

1. Programming problem

a. Confirm proper cable. The lmx2350/52 has a new and different cable
b. If using a laptop, this only puts out 3 volts which causes problems when 5 volts is expected. You can remove the resistive dividers on the microwire pins.
c. Try switching computers -- one may be just putting out a dirty signal
d. Confirm proper cable connection. The cable should hang off of the lower corner and the left edge should be flush with the pins.
e. If the code loader program is being used, confirm the port setup is correct. Check the code loader instructions.

2. Frequency Range or Voltage problem.

Check the VCO on the board in appendix B.

Appendix A – Proper Cable Connection

Cable Types

Type A — This has 5 wires that lead to a 2X5 header. Note that at the db25 connector, there are 5 pins that plug into the computer. Consult the blank evaluation board instructions for a more detailed drawing of this. The header is wider than the wires, and the wires are flush left with the header. Left is defined from a frame of reference such that the holes on the connector are on the bottom side. This is the older type of header, used with the following eval boards: lmx2301/2305,lmx2306/16/26,lmx233x family ,lmx1501/1511. Of the 5 wires, only 4 are actually necessary. Looking at the plastic header, going left to right they are as follows:

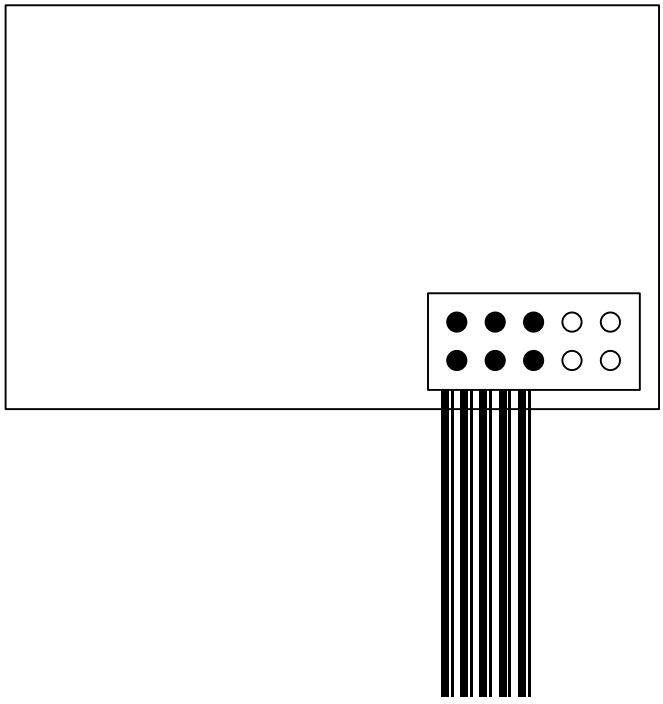
Far Left	--	Clock
2nd	--	Data
3rd	--	GND
4th	--	LE
5th	--	Not used

Type B — This also has a 2 X 5 header. It has 10 wires leading to this header. There are also 10 pins on the back of the db25 connector. This is used for the following evaluation boards: lmx160x family, lmx2350/52

Proper Cable Connection

Regardless of cable type, the connection procedure is the same. Find the pin connector and turn the board such that the wide side of the pin connector is on the side of the board closest to you. Connect the cable such that the left side of the cable header lines up with the left side of the cable connector. Therefore, the cable wires should run off the edge of the board and not across the board. See the Figure 1. Note that the location of this header can change for different eval boards.

Figure 1Typical Connection Diagram



Appendix B: VCO TABLE

Manufacturer	Model	Min. Freq. (MHz)	Max. Freq. (MHz)	Operating Voltage	Gain (MHz/Volt)
ALPS	514B	1880	1900	3	
ALPS	529A	1770	1900	3	
ALPS	531A	914	915	3	
ALPS	553A	884.7	948.7	3	38
ALPS	919B	1770	1790	3	
ALPS	926A	2350	2470	3	
ALPS	926B	2330	2490	5	
ALPS	934A	857	915	5	20
ALPS	985A	1805	1880	3	44.6
ALPS	941A	994	1099	3	
muRata	MQE-001-836	824	849	4.2	11
muRata	MQE-001-926	914	939	4.2	12
muRata	MQE-001-964	952	977	4.2	10
muRata	MQE-001-836	806	866	5.0	20
muRata	MQE-003-730	720	740	4.3	6.7
muRata	MQE-030-1780	1750	1810	3	17
muRata	MQE-520-1667	1648	1686	3	
muRata	MQE-530-1619A	1607	1631	3.9	
muRata	MQE-531-1653	1653	1670		
muRata	MQE-570-0820	810	830	2.3	
muRata	MQE 744-243	235.5	250.5	3	7.5
Varil	2549	889	915	3	