



# Evaluation Board For PLL Frequency Synthesizer

EVAL-ADF4213EB1

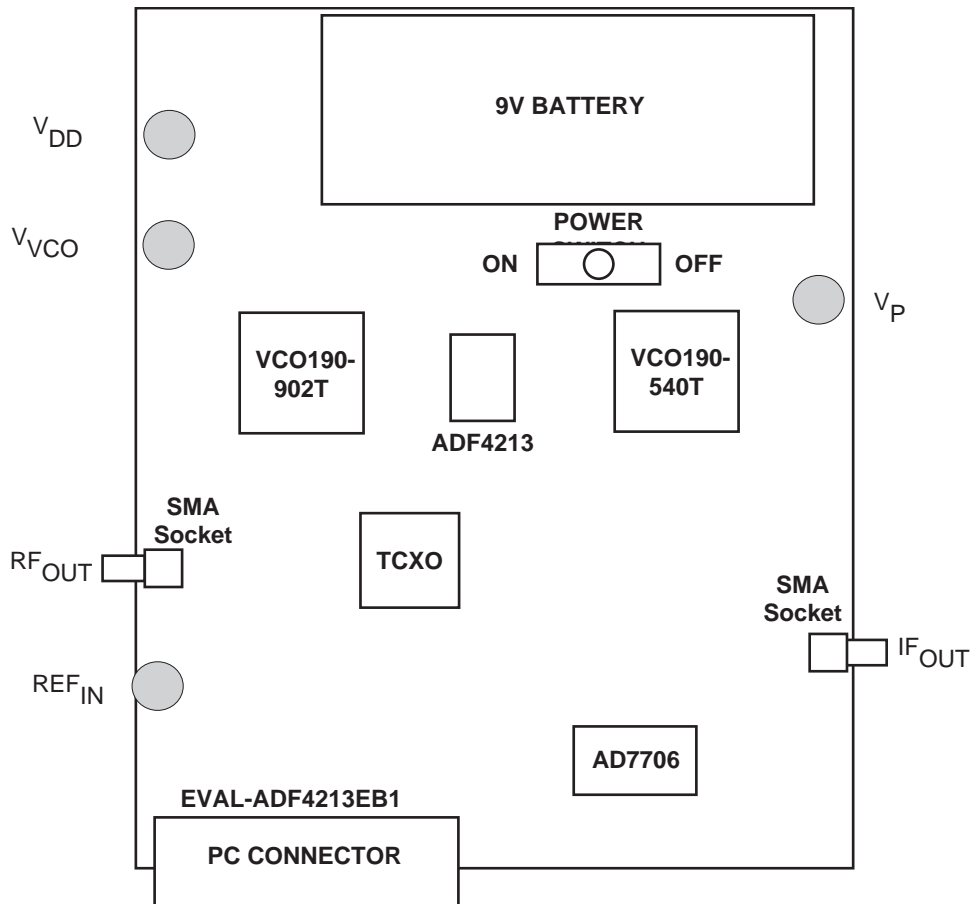
## FEATURES

- Self-Contained Board including Synthesizer, VCO,s and Loop Filter
- Channel Spacing: 200kHz
- RF Output: 900MHz
- IF Output: 540MHz
- Designed for 20kHz loop bandwidth on both IF and RF
- Accompanying Software allows complete control of synthesizer functions from PC
- Battery Operated: Choice of 3V or 5V supplies
- Typical Phase Noise Performance of -91dBc/Hz @ 1kHz offset for RF (900MHz)
- Typical Spurious Performance of better than -90dBc at 200kHz offset from carrier

## GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4213 Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the ADF4213 synthesizer, a pc connector, TCXO reference input, power supplies and IF/RF outputs. Both output channels have a 20kHz loop filter. The IF channel has a 540MHz VCO while the RF channel has a 900MHz VCO. A cable is included with the board to connect to a pc printer port. The package also contains windows software to allow easy programming of the synthesizer.

## BLOCK DIAGRAM



REV.PrA 12/00

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One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
Tel: 781-329-4700 Fax: 781-326-8703

## Hardware Description

The evaluation board comes with a cable for connecting to the printer port of a PC. The silk screen and cable diagram for the evaluation board are shown below. The board schematic is shown on pages 3 and 4.

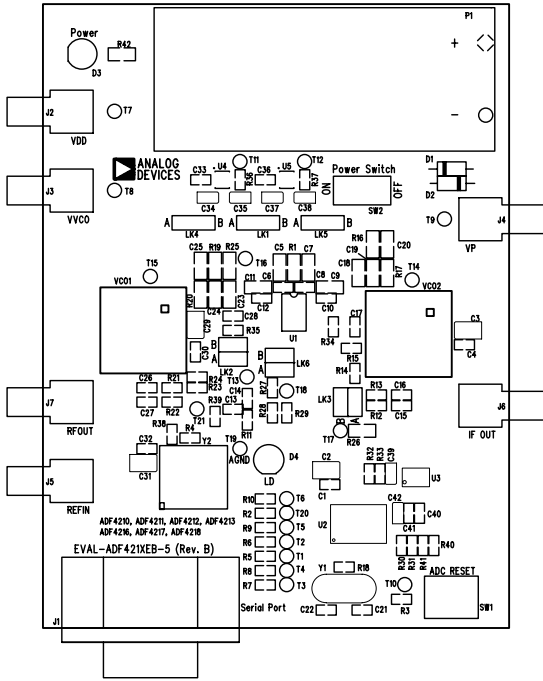
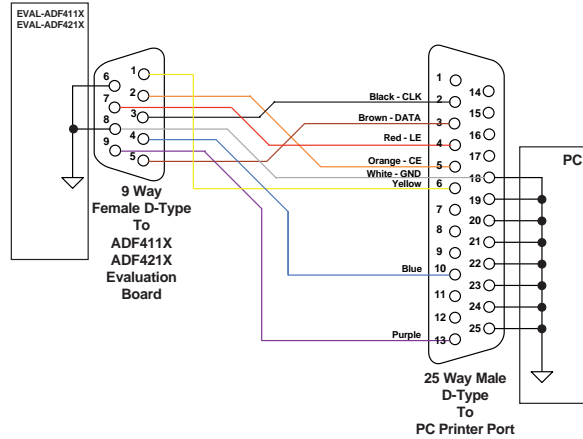


Figure 1. Evaluation Board Silkscreen



ADF411X/ADF421X CABLE CONNECTIONS Rev 2 (15/3/99)

Figure 2. PC Cable Diagram

The AD7706 A/D converter is used to monitor the power supply voltage and current consumption of the ADF4213. This helps the user pick the optimum synthesizer settings for power consumption and also provides an alert if the battery voltage is too low to sustain the required 3V or 5V for the board supply.

RF loop component values shown in the circuit diagram are for 900MHz RF output, 5mA CP current, VCO190-902T, 200kHz channel spacing and 20kHz loop bandwidth. IF loop component values are for 540MHz IF output, 5mA CP current, VCO190-540T, 200kHz channel spacing and 20kHz loop bandwidth.

The board is powered from a single 9V battery. The power supply circuitry allows the user to choose either 3V or 5V for the ADF4213  $V_{DD}$  and  $V_P$ , and for the VCO supplies. The default settings are 3V for the ADF4213  $V_{DD}$  and 5V for the ADF4213  $V_P$  and for the VCO supplies. **It is very important to note that the ADF4213  $V_{DD}$  should never exceed the ADF4213  $V_P$ . This can damage the device.**

All components necessary for LO generation are on-board. The 13MHz TCXO from Vectron provides the necessary Reference Input. There are two channels controlled by the ADF4213.

The RF PLL is made up of one half of the ADF4213, a passive loop filter (20kHz bandwidth) and the VCO 190-902T from Vari-L. The output is available at RFOUT through a standard SMA connector.

The IF PLL is made up of one half of the ADF4213, a passive loop filter (20kHz bandwidth) and the VCO 190-540T from Vari-L. The output is available at IFOUT through a standard SMA connector.

If the user wishes, they may use their own power supplies and reference input. In this case, they need to insert SMA connectors as shown on the silkscreen and block diagram.

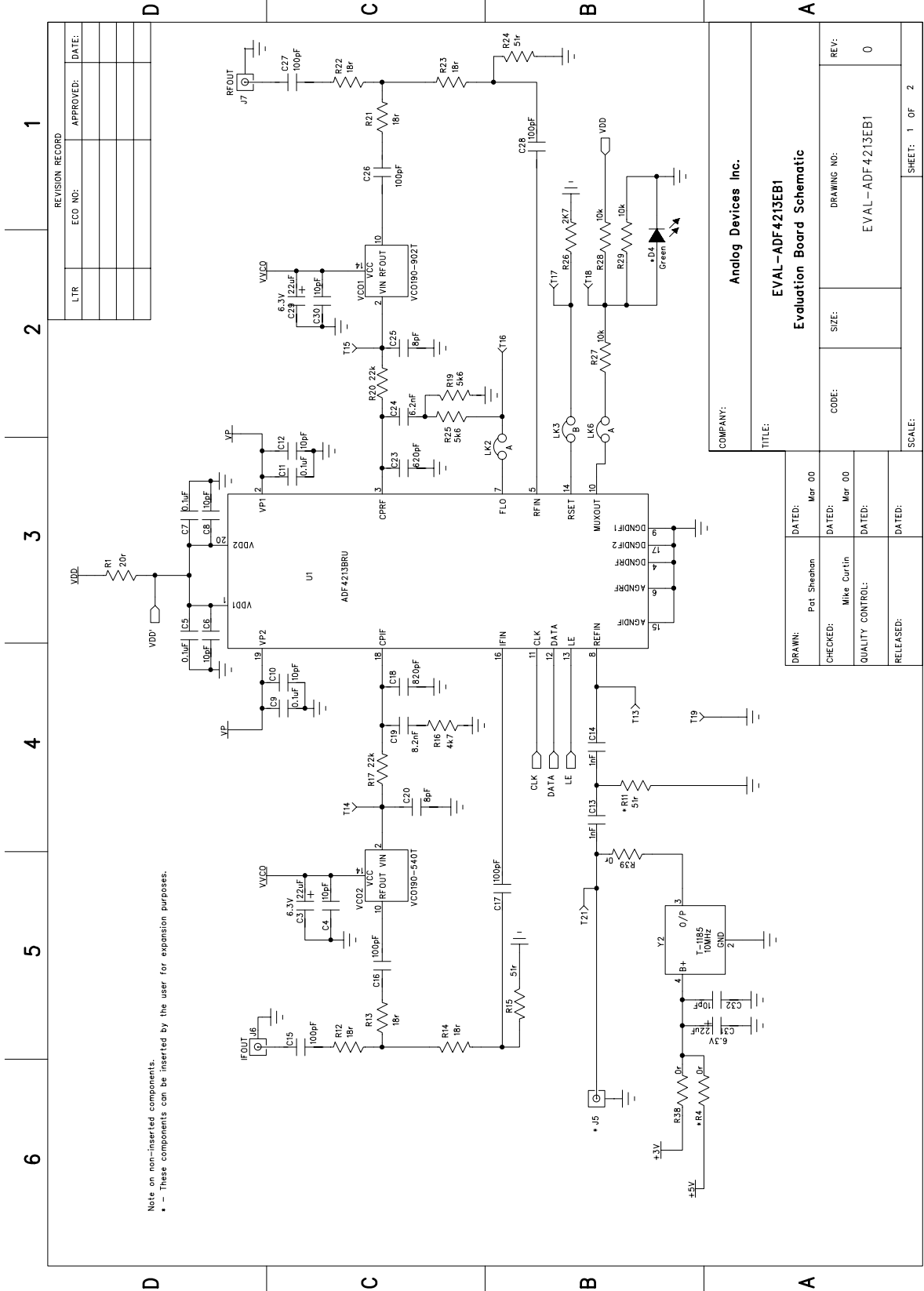


Figure 3. Evaluation Board Circuit Diagram (Page 1)

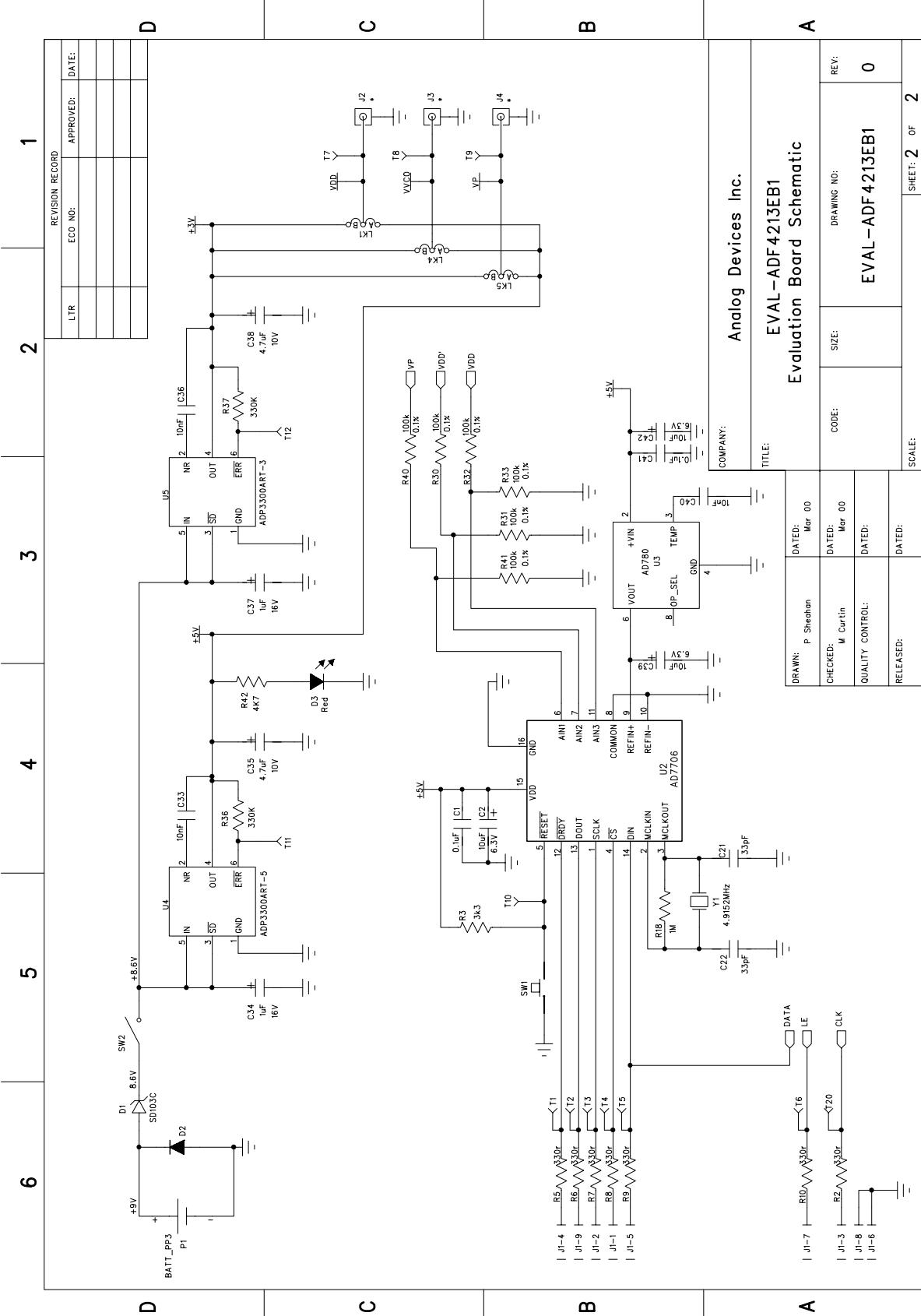


Figure 4. Evaluation Board Circuit Diagram (Page 2)

**Software Description**

The evaluation board software is contained on a CD-ROM which comes in the package. To load the software the user should click on "setup.exe", then the install wizard installs the software. Follow the on-screen directions. The software will be installed in a default directory called "C:/Program Files/Analog Devices". To run the software, simply go to the Start Menu and choose Program/ADF4XXX/ ADF4XXX\_rev2. This will open the software for the evaluation board. The user will be asked to choose which device is being evaluated. Click on the ADF4213 button. Hit OK. The window shown below will now appear.

In this panel, click on the "Eval Board" button. Choose ADF4213EB1 from the list on offer. Hit OK. The synthesizer will now be programmed with the correct settings for a GSM system working at 900MHz RF and 540MHz IF. 200kHz PFD frequency is set up, 32/33 prescaler is chosen and charge pump current of 5mA is programmed.

If the user wishes to change any of the settings then place the cursor over the desired parameter (RF VCO Output Frequency, for example) and click once. This brings up a screen where it is possible to either type in a new value of output frequency or else increment and decrement by the channel spacing.

The software also allows monitoring of the device supply voltage, supply current and the charge pump voltage. Simply hit the "Update Voltage and Current Display" button to get an up-to-date reading.

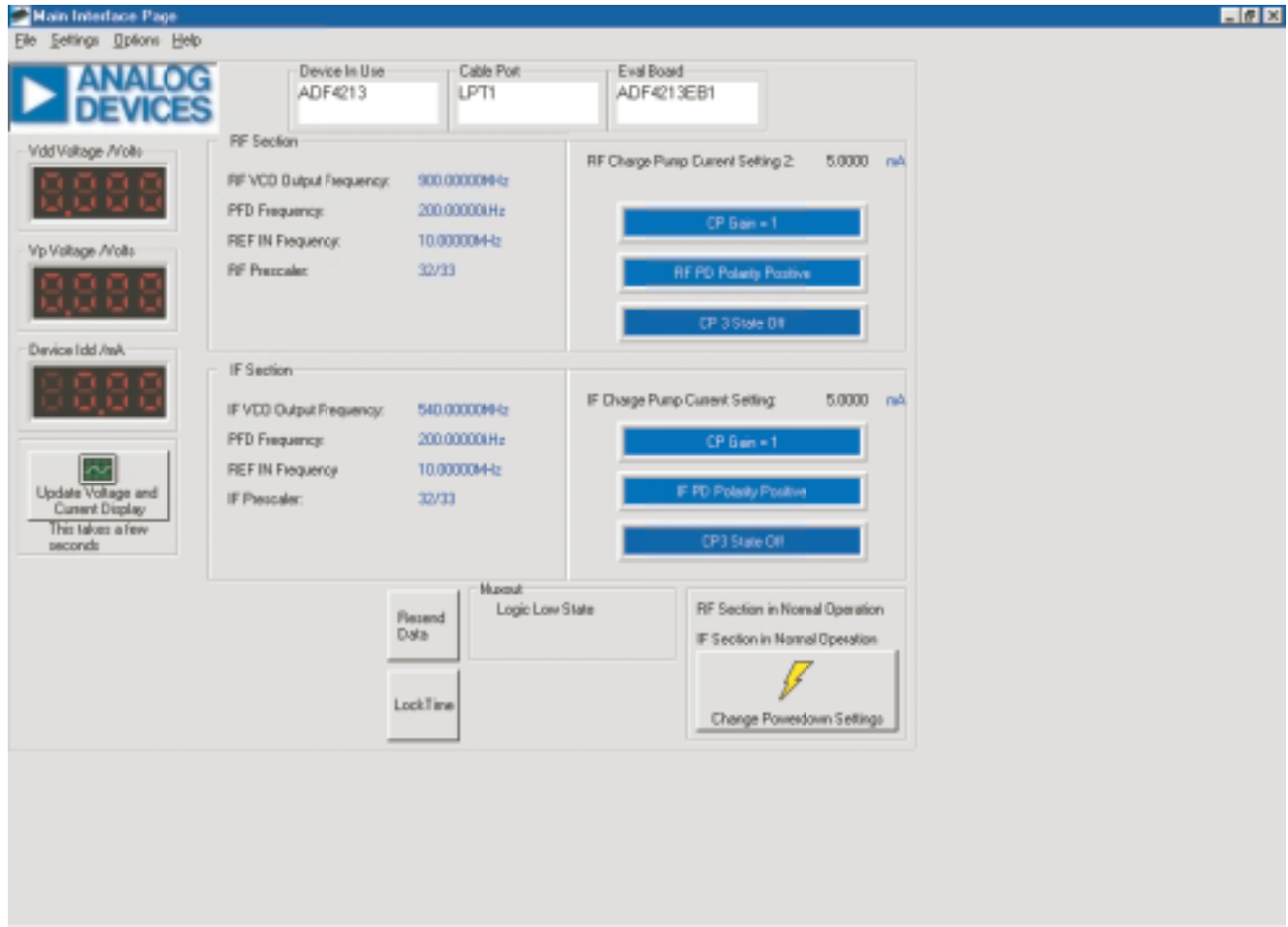


Figure 5. Software Front Panel

Table 1. Bill of Materials for the EVAL-ADF4113EB1

Qty	Reference	Description	Manufacturer	PCB DECAL	VALUE
1	U1	ADF4213BRU	ADI	TSSOP-20	ADF4213BRU
1	U2	AD7706BR	ADI	SO16WB	AD7706BR
1	U3	AD780A	ADI	SO8NB	AD780A
1	U4	ADP3300ART-5	ADI	SOT23-6	ADP3300ART-5
1	U5	ADP3300ART-3	ADI	SOT23-6	ADP3300ART-3
1	VCO1	902MHz VCO	Vari-L		VCO190-902T
1	VCO2	540MHz VCO	Vari-L		VCO190-540T
1	Y1	4.9152MHz Crystal	Vectron International	HC49 low profile	VXA4-1011
1	Y2	10 MHz TCXO	Vectron International		T-1185
1	D1	SD103C Schottky Diode	General Semiconductor	DO35	SD103
1	D2	1N4001		D03	FEC 365-117
1	D3	Red Low Power LE	Visha	LED	FEC 657-130
1	D4	Green Low Power LED (Do Not Insert)	Visha	LED	FEC 657-141
6	C1 C5 C7 C9 C11 C41	Multi Layer Ceramic Capacitor	Murata	Case 0603	0.1uF
1	C2	Tantalum Capacitor	AVX	CAPITAJ B	10uF 6.3V
3	C3 C29 C31	Tantalum Capacitor	AVX	CAPITAJ A	22uF 6.3V
7	C4 C6 C8 C10 C12 C30 C32	Multi Layer Ceramic Capacitor	Murata	Case 0603	10pF
2	C13-14	Multi Layer Ceramic Capacitor	Murata	Case 0603	1nF
6	C15-17 C26-28	Multi Layer Ceramic Capacitor	Murata	Case 0603	100pF
1	C18	Multi Layer Ceramic Capacitor	Murata	Case 0805	820pF
1	C19	Multi Layer Ceramic Capacitor	Murata	Case 0805	8.2nF
1	C20	Multi Layer Ceramic Capacitor	Murata	Case 0805	8pF
2	C21-22	Multi Layer Ceramic Capacitor	Murata	Case 0603	33pF
1	C23	Multi Layer Ceramic Capacitor	Murata	Case 0805	620pF
1	C24	Multi Layer Ceramic Capacitor	Murata	Case 0805	6.2nF
1	C25	Multi Layer Ceramic Capacitor	Murata	Case 0805	8pF
3	C33 C36 C40	Multi Layer Ceramic Capacitor	Murata	Case 0603	10nF
2	C34 C37	Tantalum Capacitor	AVX	CAPITAJ A	1uF 16V
2	C35 C38	Tantalum Capacitor	AVX	CAPITAJ A	4.7uF 10V
2	C39 C42	Tantalum Capacitor	AVX	CAPITAJ A	10uF 6.3V
1	R1	Resistor (Surface Mount)	Boums	Case 0805	20r 1.0%
7	R2 R5-10	Resistor (Surface Mount)	Boums	Case 0603	330r 1.0%
1	R3	Resistor (Surface Mount)	Boums	Case 0603	3k3 1.0%
1	R4	Do Not Insert	Boums	Case 0603	
1	R11	Do Not Insert	Boums	Case 0603	
6	R12-14 R21-23	Resistor (Surface Mount)	Boums	Case 0603	18r 1.0%
2	R15 R24	Resistor (Surface Mount)	Boums	Case 0603	51r 1.0%
1	R16	Resistor (Surface Mount)	Boums	Case 0805	4k7 1.0%
1	R17	Resistor (Surface Mount)	Boums	Case 0805	22k 1.0%
1	R18	Resistor (Surface Mount)	Boums	Case 0603	1M 1.0%
1	R19	Resistor (Surface Mount)	Boums	Case 0805	5k6 1.0%
1	R20	Resistor (Surface Mount)	Boums	Case 0805	22k 1.0%
1	R25	Resistor (Surface Mount)	Boums	Case 0805	5k6 1.0%
1	R26	Resistor (Surface Mount)	Boums	Case 0603	2k7 1.0%
3	R27-29	Resistor (Surface Mount)	Boums	Case 0603	10k 1.0%
6	R30-33 R40-41	Resistor (Surface Mount)	Meggitt	Case 0603	100k 0.1%
2	R34-35	Resistor (Surface Mount)	Boums	Case 0603	0r 1.0%
2	R36 R37	Resistor (Surface Mount)	Boums	Case 0603	330k 1.0%
2	R38 R39	Resistor (Surface Mount)	Boums	Case 0603	0r 1.0%
1	R42	Resistor (Surface Mount)	Boums	Case 0603	4k7 1.0%
1	SW1	Push Button Switch	Omron	SW\PB-SMALL	FEC 176-986
1	SW2	SPDT Switch - (Washable)	Apem	SW SIP-3P	FEC 150-559
21	T1-21	Red Testpoint	W Hughes	TESTPOINT	FEC-240-345
1	J1	9 PIN D-TYPE MALE (HORIZ)	McMurdo	DCON9M	FEC 150-750
4	J2 J3 J4 J5 J6	Do Not Insert		SMA	
2	J6 J7	GOLD 50Ω SMA SOCKET	Pasternack	SMA	PE4118
3	LK1 LK4 LK	3 pin header	Harwin	SIP-3P	FEC 512-047
3	LK2-A LK3-B LK6-A	Wire link			
3	LK1 LK4 LK	Shorting Shunt	Harwin		FEC 150-410
4	Each Corner	Rubber Stick-On Feet	3M		FEC 148-922
2	P1	Pair PCB snap-on battery connector	Keystone	BATT_PP3	FEC 723-988
1	P1	9V PP3 Battery	Duracell		FEC 908-526
1	PCB	EVAL-ADF421XEB-5 (Rev. A)			
		Parts Free issued by ADI.			