ANALOG DEVICES

1750MHz Evaluation Board For PLL Frequency Synthesizer

EVAL-ADF4113EB2

FEATURES

Self-Contained Board including Synthesizer, VCO, Loop Filter for generating frequencies of 1700MHz to 1800MHz

Designed for 20kHz Loop Bandwidth

Accompanying Software allows complete control of synthesizer functions from PC

Battery Operated: Choice of 3V or 5V supplies

Typical Phase Noise Performance of -86dBc/Hz @ 1kHz offset

GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4113 Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the ADF4113 synthesizer, a pc connector, SMA connector for the reference input, power supplies and RF output. There is also a loop filter (20kHz bandwidth) and a VCO on board. 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
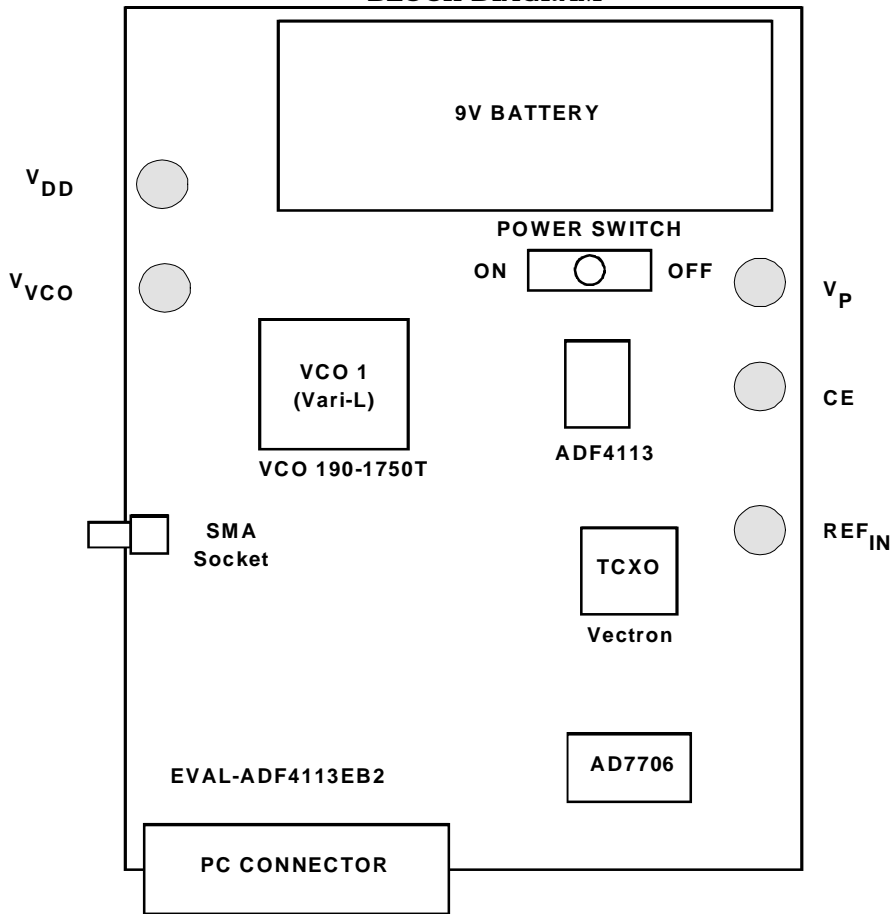
Hardware Description

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.
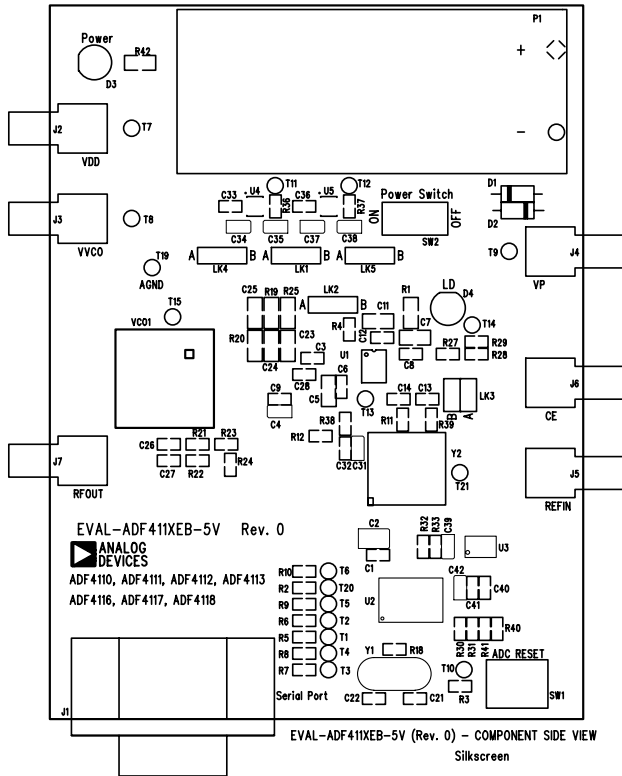

Figure 1. Evaluation Board Silkscreen

Figure 2. PC Cable Diagram

Loop component values shown in the circuit diagram are for 1750MHz RF output, 5mA CP current, VCO190-1750T, 200kHz channel spacing and 20kHz loop bandwidth.

The board is powered from a single 9V battery. The power supply ciruitry allows the user to choose either 3V or 5V for the ADF4113 V_{DD} and V_P, and for the VCO supply. The default settings are 3V for the ADF4113 V_{DD} and 5V for the ADF4113 V_P and for the VCO supply. **It is very important to note that the ADF4113 V_{DD} should never exceed the ADF4113 V_P. This can damage the device.**

All components necessary for LO generation are onboard. The 10 MHz TCXO from Vectron provides the necessary Reference Input. The PLL is made up of the ADF4113, passive loop filter (20kHz bandwidth) and the VCO 190-1750 from Vari-L. The output is available at RFOUT 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 to as shown on the silkscreen and block diagram.

The AD7706 A/D converter is used to monitor the power supply voltage and current consumption of the ADF4113. 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.
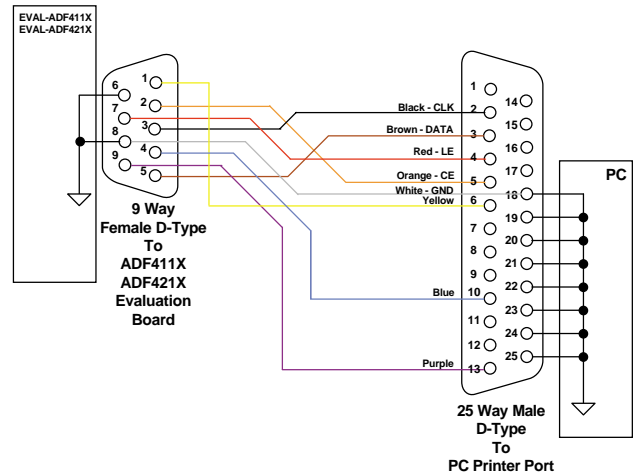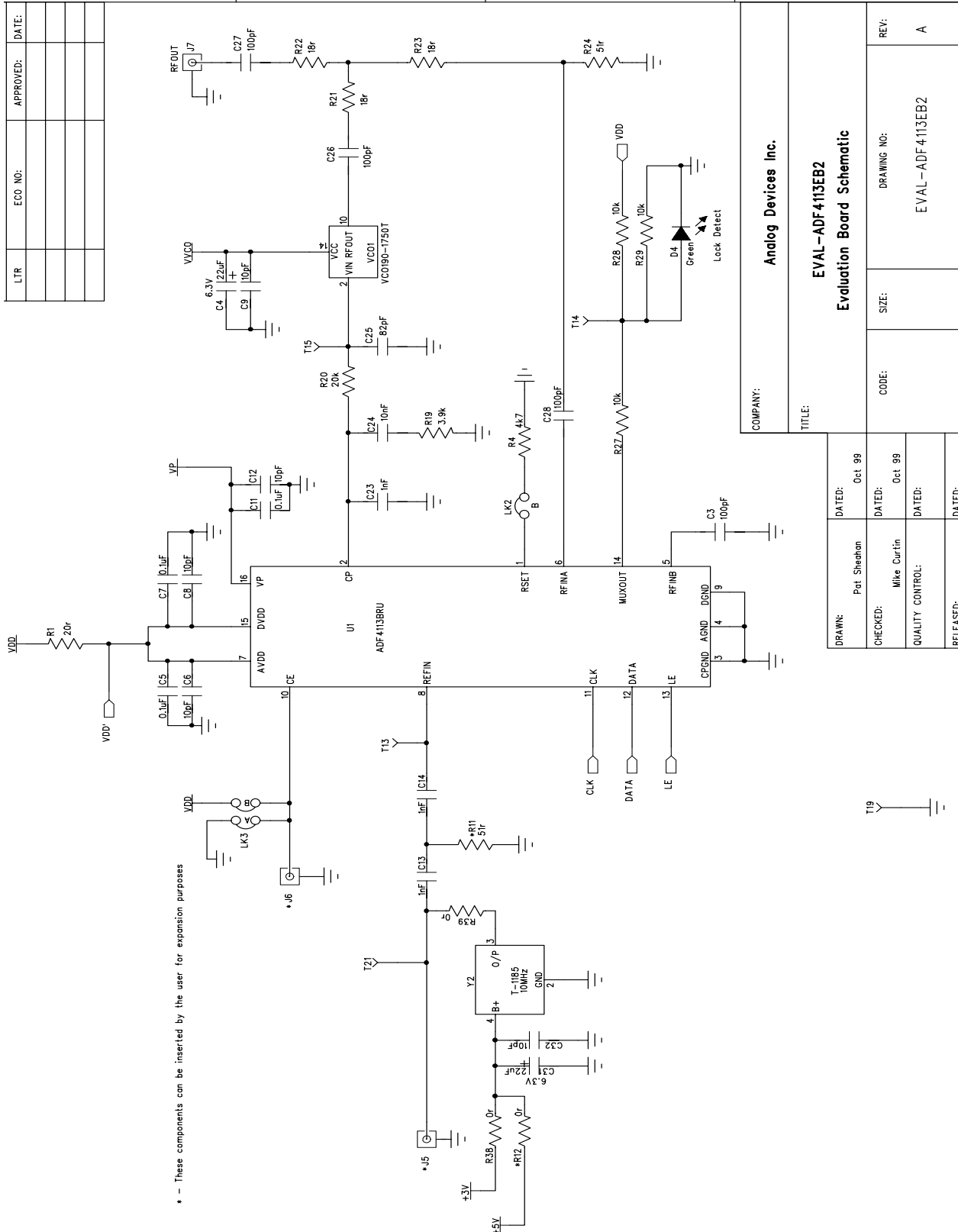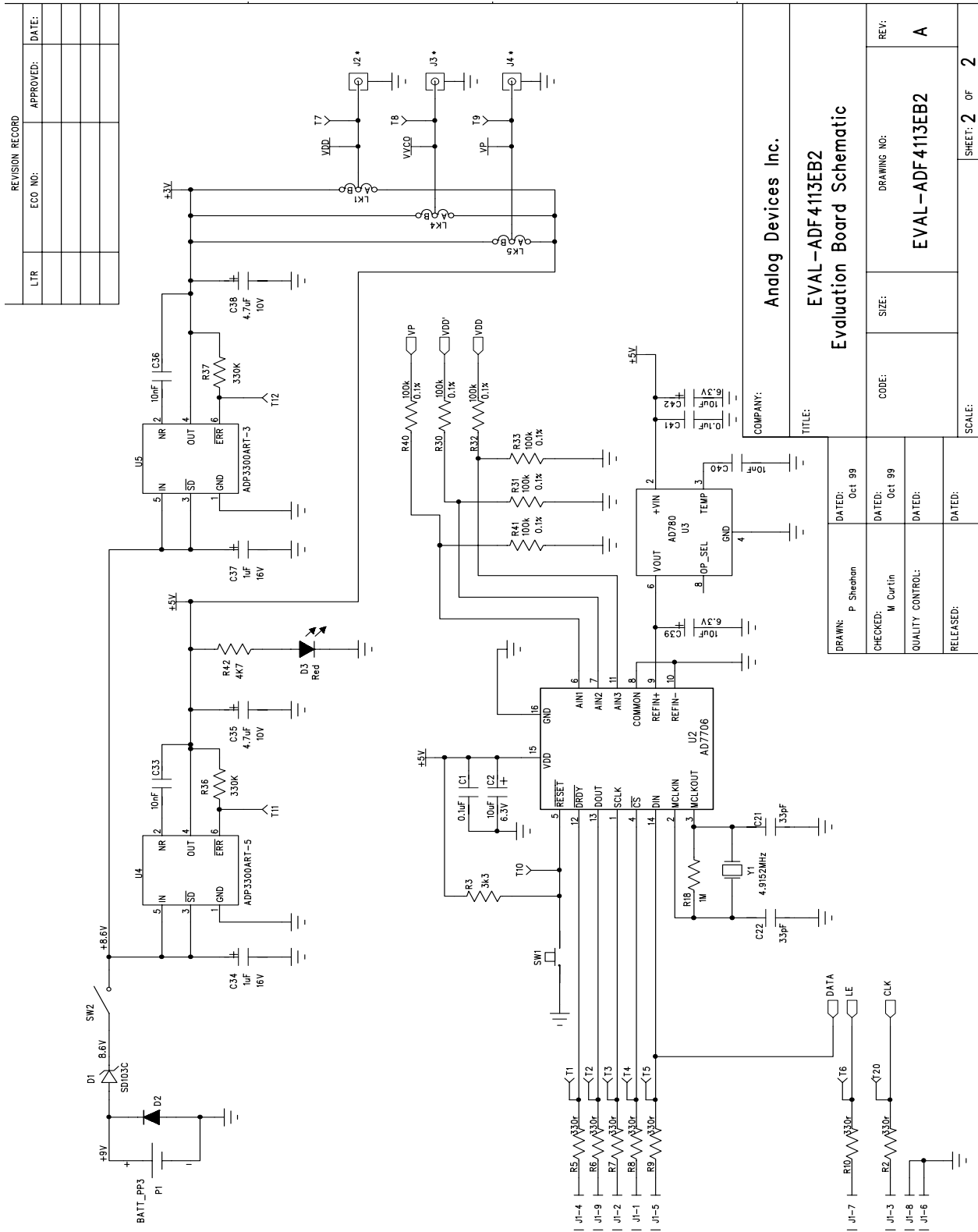
Figure 3. Evaluation Board Circuit Diagram (Page 1)

Figure 4. Evaluation Board Circuit Diagram (Page 2)

Software Description

The software comes on a CD marked "ADF4xxx evaluation software". If the user double clicks on "setup.exe" on the CD, then the install wizard installs the software. Follow the on-screen directions. The software will be installed in a default directory called "C:\ProgramFiles\Analog Devices\ADF4XXX_rev0".

The installation will create a shortcut under Analog Devices by default. The program can be run by clicking on ADF4XXX_rev0.

On running the software a panel appears which asks the user to choose the device to progam. Select the ADF4113. The front panel will appear with some arbitrary values.

The evaluation board can be setup exactly by clicking "Eval Board" near the top right corner of the panel. From the following menu select ADF4113EB2.

This will program the device to the recommended settings for the setup (i.e. charge pump current, prescaler, polarity etc.) The user can adjust any of the settings by clicking with the left mouse button on that feature and adjusting it accordingly. The drop-down menus contain options to examine the various test-modes or to set the configuration options.

There is also a facility to monitor the Supply and Charge Pump Voltage as well as the Device Current. To get the most up to date reading just click on the "UpdateVoltage and Current Display Button".
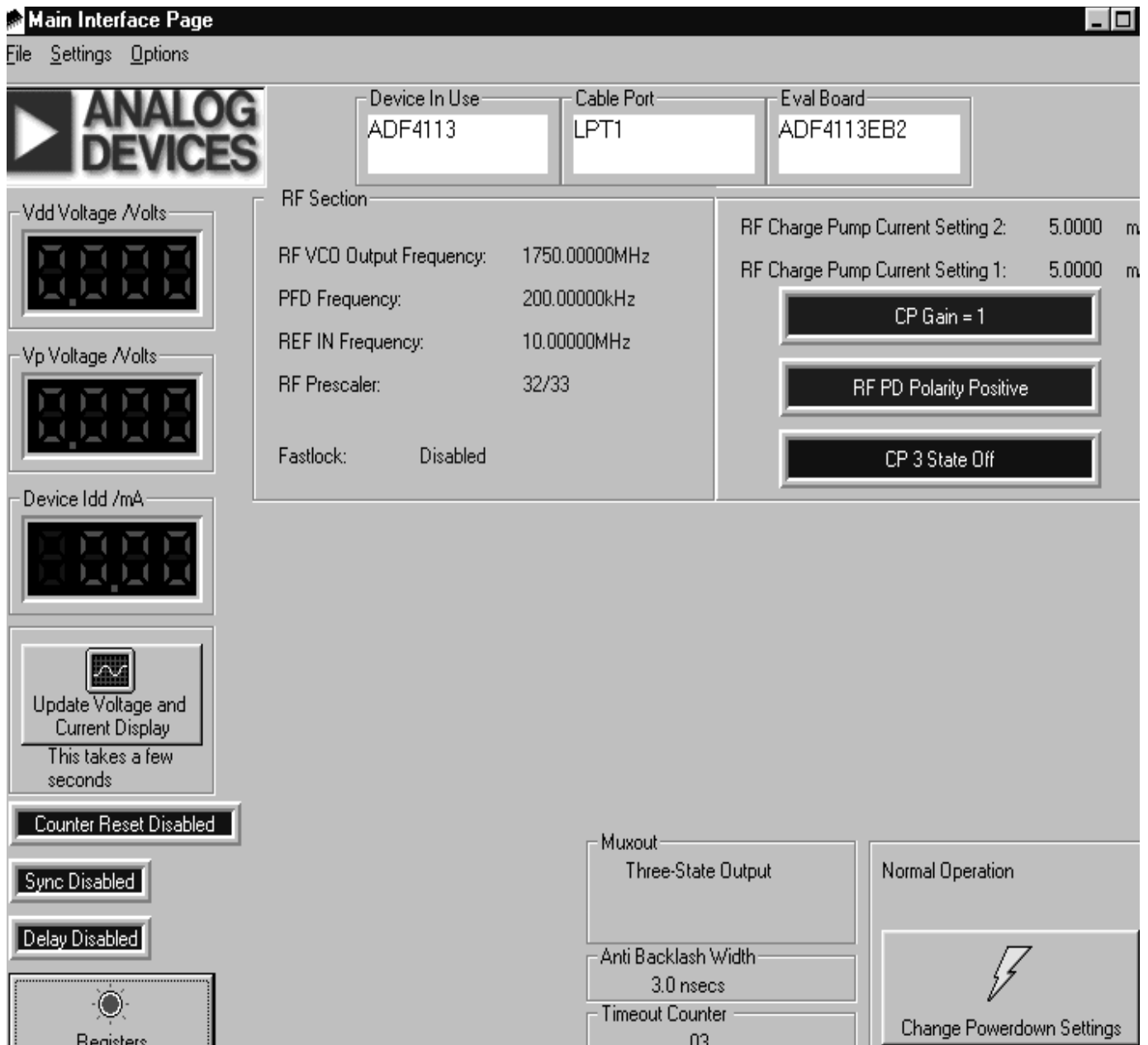

Figure 5. Software Front Panel

Table 1. Bill of Materials for the EVAL-ADF4113EB2

Reference Designator	Description	Manufacturer	PCB DECAL	VALUE
U1	ADF4113BRU	ADI	TSSOP-16	ADF4113BRU
U2	AD7706BR	ADI	SO16WB	AD7706BR
U3	AD780AR	ADI	SO8NB	AD780AR
U4	ADP3300ART-5	ADI	SOT23-6	ADP3300ART-5
U5	ADP3300ART-3	ADI	SOT23-6	ADP3300ART-3
VCO1	VCO190-1750	Vari-L (Acal Elect. = Disti)		VCO190-1750
Y1	4.9152MHz Crystal	Vectron International	HC49 low profile	VXA1-1011
Y2	10 MHz TCXO	Vectron International	T-118	
D1	SD103C Schottky Diode	General Semiconductor	DO35	SD103C
D2	IN4001		D035	FEC 365-117
D3	Red Low Power LED	Visha	LED	FEC 657-130
D4	Green Low Power LED (Do Not Insert)	Visha	LED	FEC 657-141
C1 C41	0.1uF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-675
C2	10uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_B	FEC 197-014
C3 C26 C27 C28	100pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-122
C4 C31	22uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 197-038
C5 C7 C11	0.1uF Multi Layer Ceramic Capacitor	Murata	Case 0805	FEC 317-627
C6 C8 C9 C12 C3	10pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-110
C13 C14	1nF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 317-202
C21 C22	33pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 498-555
C23	1nF Multi Layer Ceramic Capacitor	Murata	Case 0805	
C24	10nF Multi Layer Ceramic Capacitor	Murata	Case 0805	
C25	82pF Multi Layer Ceramic Capacitor	Murata	Case 0805	
C33 C36 C40	10nF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-146
C34 C37	1uF 16V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 498-701
C35 C38	4.7uF 10V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 498-658
C39 C42	10uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 197-014
R1	20r 5% Resistor (Surface Mount)	Multicomp	Case 0805	FEC 771-132
R2 R5 R6 R7 R8 R9 R10	330r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-143
R3	3k3 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-290
R4	4k7 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-318
R11 R25	Do Not Insert		Case 0805	
R18	1M 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-598
R19	3k9 1% Resistor (Surface Mount)		Case 0805	
R20	20k 1% Resistor (Surface Mount)		Case 0805	
R21 R22 R23	18r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-021
R24	51r 1% Resistor (Surface Mount)	Multicomp	Case 0603	
R27 R28 R29	10k 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-355
R30 R31 R32 R33 R40 R41	100k 0.1% Resistor (Surface Mount)	Meggitt	Case 0603	FEC 911-471
R36 R37	330K 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-537
R38 R39	0r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 772-227
R12	0r 1% Resistor - Do Not Insert	Multicomp	Case 0603	FEC 772-227
R42	4k7 1% Resistor (Surface Mount)	Multicomp	Case 0805	FEC 911-938
SW1	Push Button Switch	Omron	SW\PB-SMALL	FEC 176-986
SW2	SPDT Switch - (Washable)	Apem	SW_SIP-3P	FEC 150-559
T1-15T19-21	Red Testpoint	W Hughes	TESTPOINT	FEC-240-345
J1	9 PIN D-TYPE MALE (HORIZ)	McMurdo	DCON9M	FEC 150-750
J2 J3 J4 J5 J6	Do Not Insert		SMA	
J7	GOLD 50Ω SMA SOCKET	Pasterna	SMA	PE4118
LK1 LK4 LK5	3 pin header	Harwin	SIP-3P	FEC 512-047
LK2-B	Wire Lin			
LK3	2 pin header	Harwin	SIP-2P	FEC 512-035
LK1 LK3-5	Shorting Shunt	Harwin		FEC 150-410
P1	Pair PCB snap-on battery connector	Keystone	BATT_PP3	FEC 723-988
P1	9V PP3 Batter	Duracell		FEC 908-526
Each Corner	Rubber Stick-On Feet	3M		FEC 148-922
EVAL-ADF411XEB1	PCB	ADI		
Parts Free issued by ADI.				
Leave position blank - Do not insert.				