



# WCDMA Evaluation Board For PLL Frequency Synthesizer

EVAL-ADF4118EB1

## FEATURES

**Self-Contained Board including Synthesizer, VCO and Loop Filter for generating WCDMA frequencies (1.93GHz to 1.99GHz)**

**Designed for 20kHz Loop Bandwidth**

**Accompanying Software allows complete control of synthesizer functions from PC**

**Battery Operated: Choice of 3V or 5V supplies**

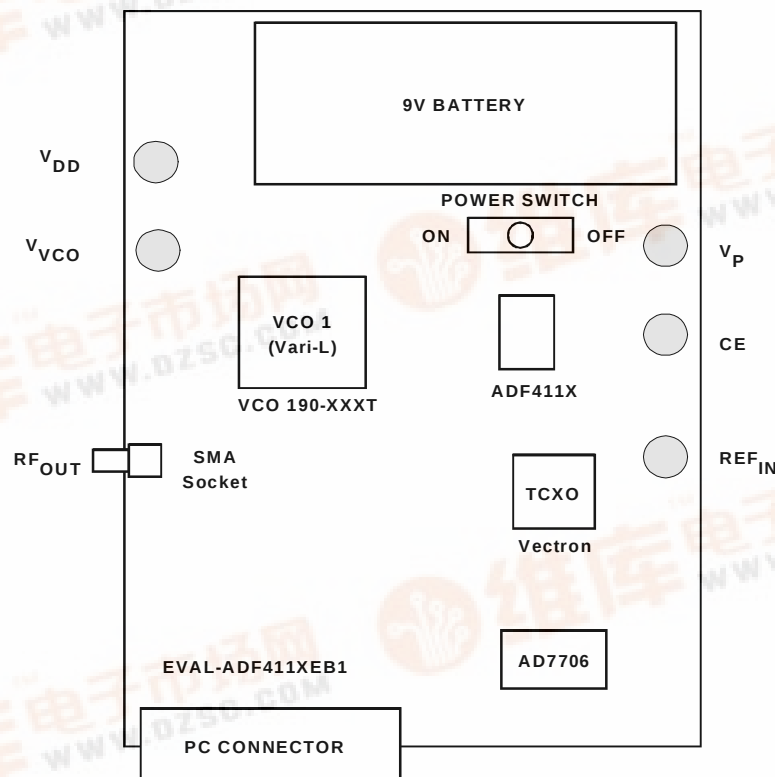
**Typical Phase Noise Performance of -85dBc/Hz @ 1kHz offset**

## GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4118 Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the ADF4118 synthesizer, a pc connector, TCXO for the reference input, SMA connectors for the power supplies and RF output. There is also a low pass loop filter (20kHz) and a VCO (Vari-L VCO190-1960T) 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



REV.PrB 04/00

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# EVAL-ADF4118EB1

## 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.

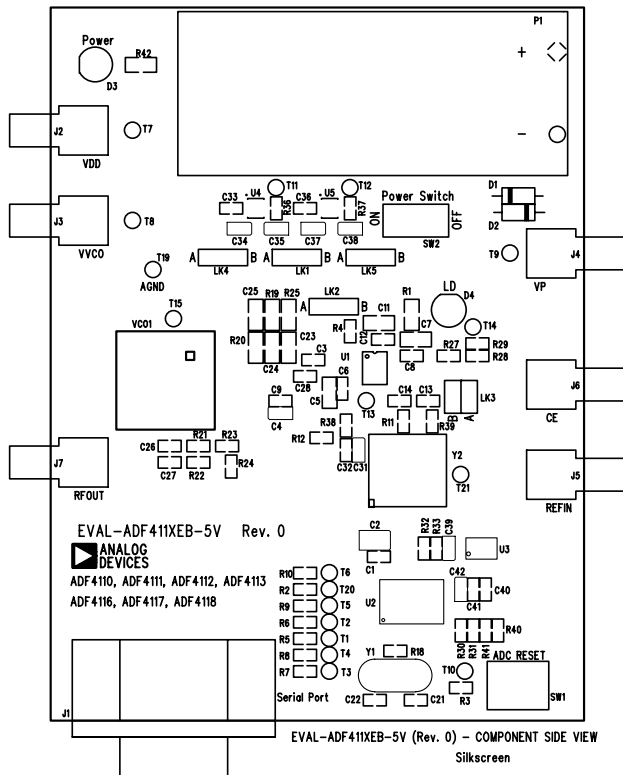


Figure 1. Evaluation Board Silkscreen

The board is powered from a single 9V battery. The power supply circuitry allows the user to choose either 3V or 5V for the ADF4118  $V_{DD}$  and  $V_P$ , and for the VCO supply. The default settings are 3V for the ADF4118  $V_{DD}$  and 5V for the ADF4118  $V_P$  and for the VCO supply. **It is very important to note that the ADF4118  $V_{DD}$  should never exceed the ADF4118  $V_P$ . This can damage the device.**

All components necessary for LO generation are catered for on-board. The 10MHz TCXO from Vectron provides the necessary Reference Input. The PLL is made up of the ADF4118, passive loop filter (20kHz) and the VCO 190-1960T 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 ADF4118. This helps the user pick the optimum synthesizer settings for power consumption and also provides an alert if the battery

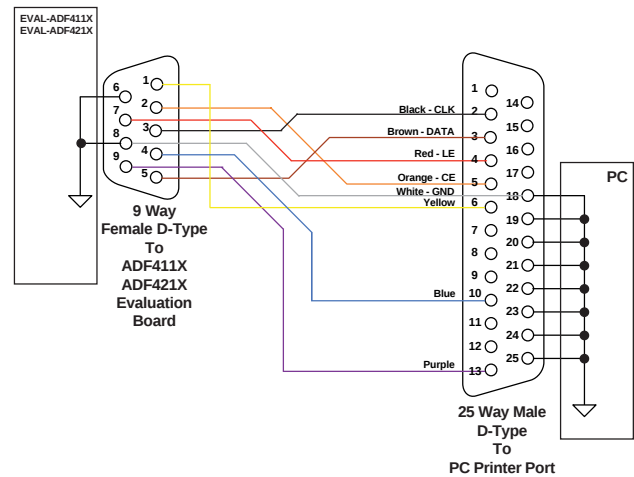
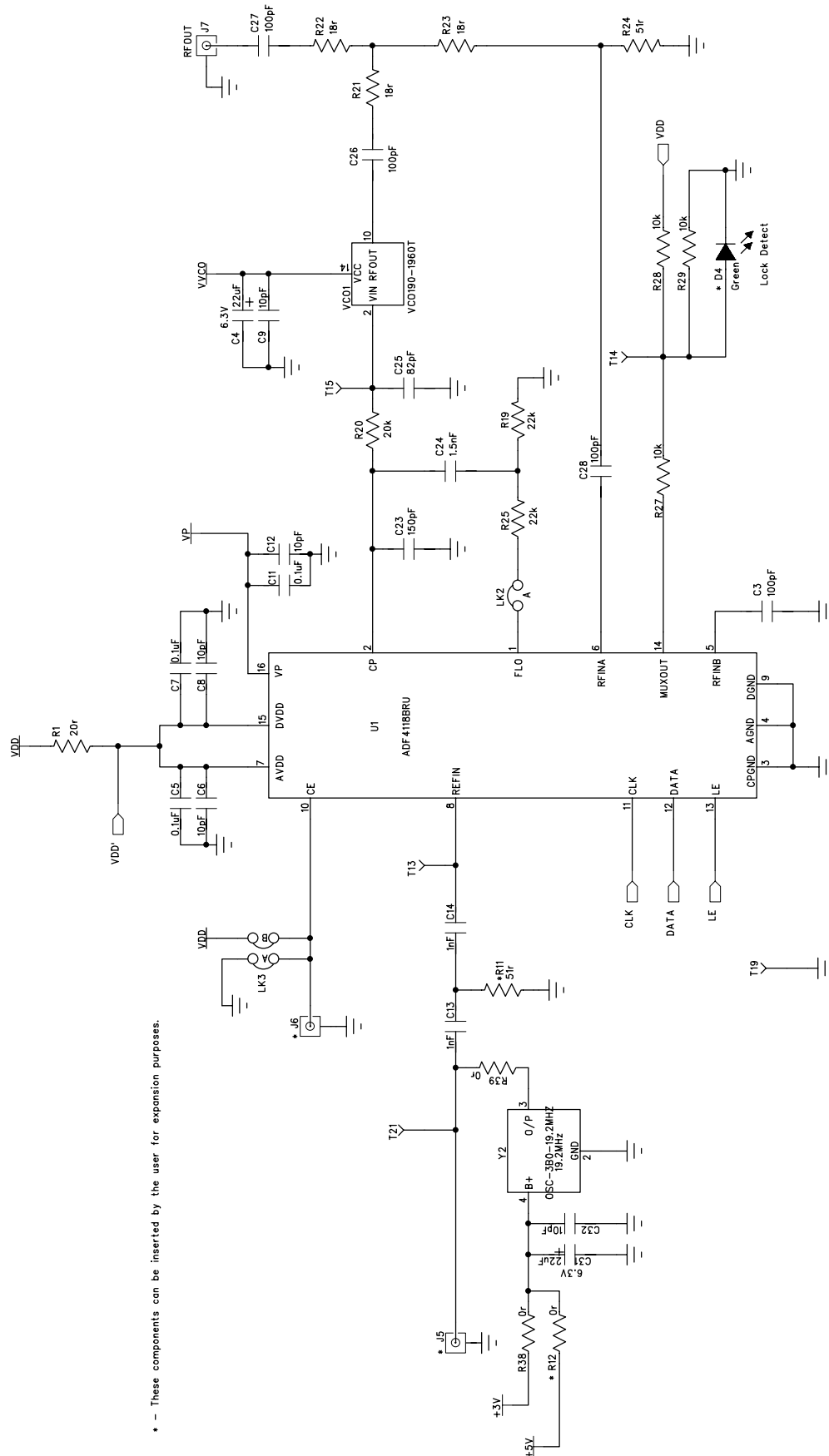


Figure 2. PC Cable Diagram

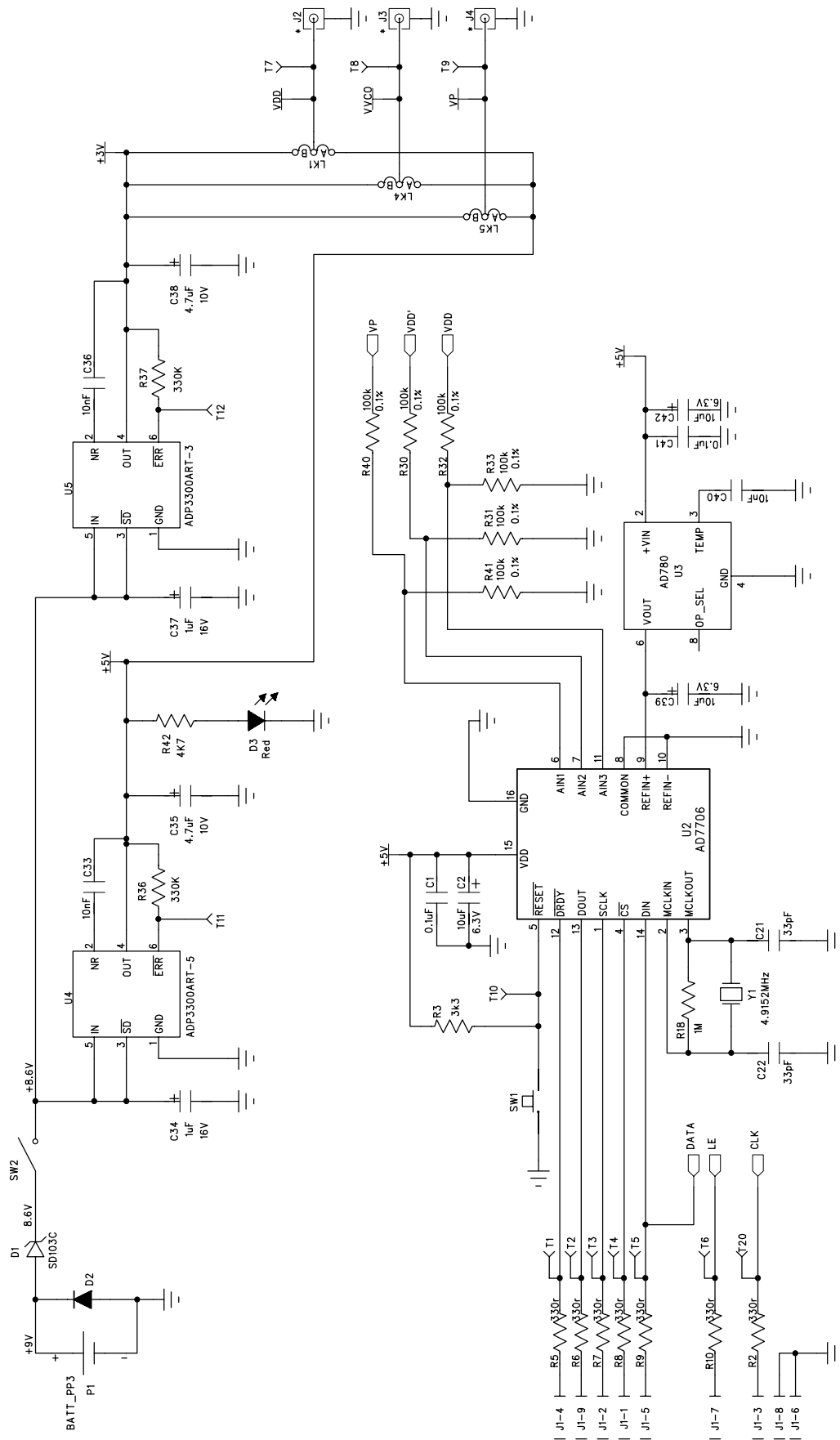
voltage is too low to sustain the required 3V or 5V for the board supply.

Loop component values shown in the circuit diagram are for 1.96GHz RF output, 1mA CP current, VCO190-1960T, 200kHz channel spacing and 20kHz loop bandwidth.



\* - These components can be inserted by the user for expansion purposes.

Figure 3. Evaluation Board Circuit Diagram (Page 1)



### Software Description

The software comes on a CD. If the user double clicks 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/ADF4XXX/ADF4XXX\_rev0”. To run the software, simply double-click on “adf4XXX\_rev0.exe”.

Before the main software screen appears, the Device window appears, which will ask the user to choose which device is being evaluated. Choose the ADF4118 and click OK.

The Main Interface window will now appear. (See Figure 5)

Click on the Eval Board frame near the top right corner of the Main Interface window.

The Eval Board window will appear. Choose the Eval-ADF4118EB1. Click OK.

The data is now set up, and other features can now be examined by the user.

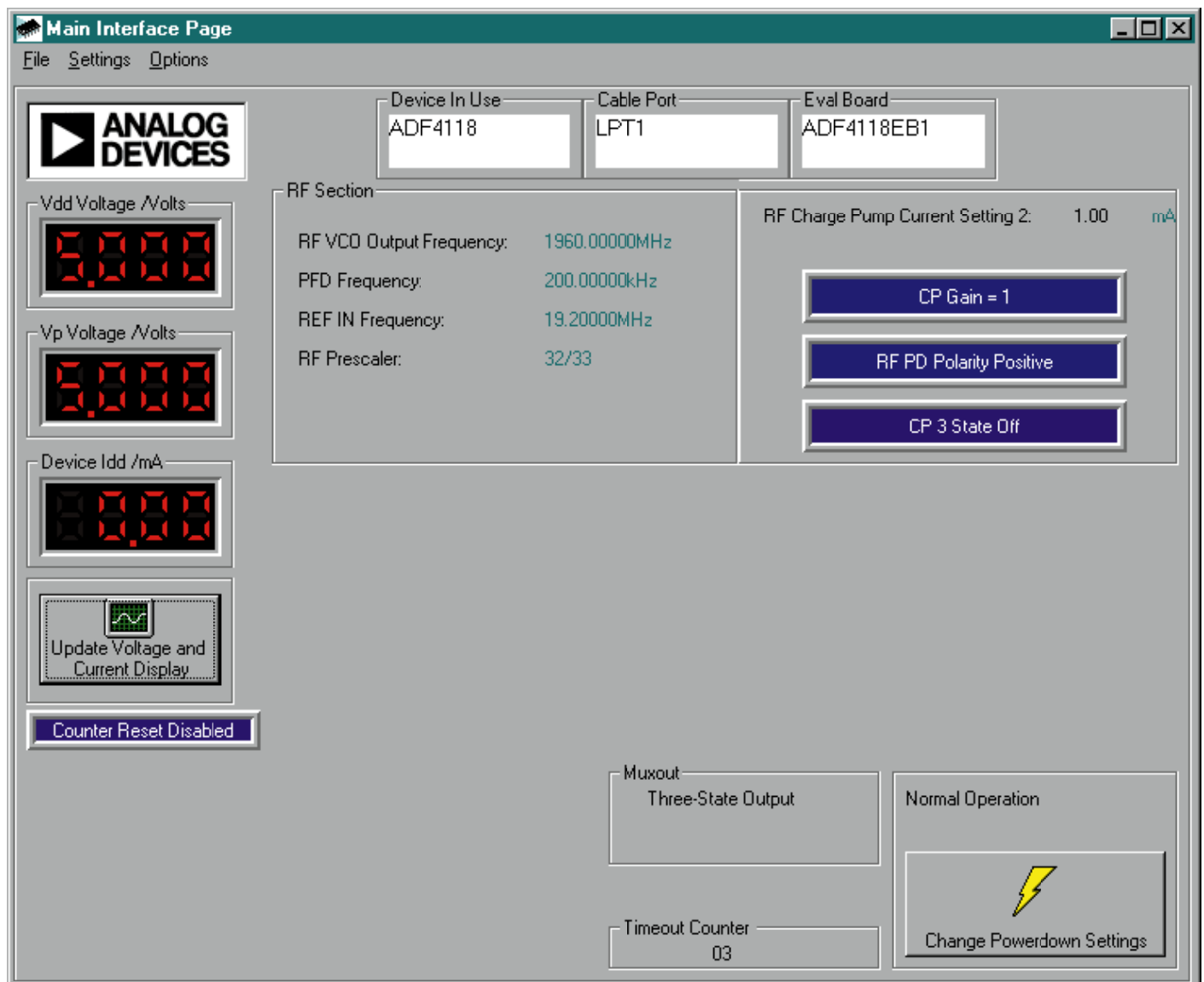


Figure 5. Software Front Panel

## EVAL-ADF4118EB1

Table 1. Bill of Materials for the EVAL-ADF4118EB1

| Qty | Reference Designator                  | Description                         | Manufacturer                | PCB DECAL       | VALUE           |
|-----|---------------------------------------|-------------------------------------|-----------------------------|-----------------|-----------------|
| 1   | U1                                    | ADF4118BRU                          | ADI                         | TSSOP-16        | ADF4118BRU      |
| 1   | U2                                    | AD7706BR                            | ADI                         | SO16WB          | AD7706BR        |
| 1   | U3                                    | AD780AR                             | ADI                         | SO8NB           | AD780AR         |
| 1   | U4                                    | ADP3300ART-5                        | ADI                         | SOT23-6         | ADP3300ART-5    |
| 1   | U5                                    | ADP3300ART-3                        | ADI                         | SOT23-6         | ADP3300ART-3    |
| 1   | VCO1                                  | VCO190-1960T                        | Vari-L (Acal Elect. = Dist) |                 | VCO190-1960T    |
| 1   | Y1                                    | 4.9152MHz Crystal                   | Vectron International       | HC49 low profil | VXA1-1011       |
| 1   | Y2                                    | 19.2 MHz TCXO                       | Vectron International       |                 | OSC-3B0-19.2MHZ |
| 1   | D1                                    | SD103C Schottky Di                  | General Semiconductor       | DO35            | SD103C          |
| 1   | D2                                    | 1N4001                              |                             | DO35            | FEC 365-117     |
| 1   | D3                                    | Red Low Power LE                    | Vishay                      | LED             | FEC 657-130     |
| 1   | D4                                    | Green Low Power LED (Do Not Insert  | Vishay                      | LED             | FEC 657-141     |
| 2   | C1 C41                                | 0.1uF Multi Layer Ceramic Capacitor | Murata                      | Case 0603       | FEC 499-675     |
| 1   | C2                                    | 10uF 6.3V Tantalum Capacitor        | AVX                         | CAP1TAJ_B       | FEC 197-014     |
| 4   | C3 C26 C27 C28                        | 100pF Multi Layer Ceramic Capacitor | Murata                      | Case 0603       | FEC 499-122     |
| 2   | C4 C31                                | 22uF 6.3V Tantalum Capacitor        | AVX                         | CAP1TAJ_A       | FEC 197-038     |
| 3   | C5 C7 C11                             | 0.1uF Multi Layer Ceramic Capacitor | Murata                      | Case 0805       | FEC 317-627     |
| 5   | C6 C8 C9 C12 C32                      | 10pF Multi Layer Ceramic Capacitor  | Murata                      | Case 0603       | FEC 499-110     |
| 2   | C13 C14                               | 1nF Multi Layer Ceramic Capacitor   | Murata                      | Case 0603       | FEC 317-202     |
| 2   | C21 C22                               | 33pF Multi Layer Ceramic Capacitor  | Murata                      | Case 0603       | FEC 498-555     |
| 1   | C23                                   | 150pF Multi Layer Ceramic Capacitor | Murata                      | Case 0805       |                 |
| 1   | C24                                   | 1.5nF Multi Layer Ceramic Capacitor | Murata                      | Case 0805       |                 |
| 1   | C25                                   | 82pF Multi Layer Ceramic Capacitor  | Murata                      | Case 0805       |                 |
| 3   | C33 C36 C40                           | 10nF Multi Layer Ceramic Capacitor  | Murata                      | Case 0603       | FEC 499-146     |
| 2   | C34 C37                               | 1uF 16V Tantalum Capacitor          | AVX                         | CAP1TAJ_A       | FEC 498-701     |
| 2   | C35 C38                               | 4.7uF 10V Tantalum Capacitor        | AVX                         | CAP1TAJ_A       | FEC 498-658     |
| 2   | C39 C42                               | 10uF 6.3V Tantalum Capacitor        | AVX                         | CAP1TAJ_A       | FEC 197-014     |
| 1   | R1                                    | 20r 5% Resistor (Surface Mount      | Multicomp                   | Case 0805       | FEC 771-132     |
| 7   | R2 R5 R6 R7 R8 R9 R10                 | 330r 1% Resistor (Surface Mount     | Multicomp                   | Case 0603       | FEC 911-143     |
| 1   | R3                                    | 3k3 1% Resistor (Surface Mount      | Multicomp                   | Case 0603       | FEC 911-290     |
| 1   | R4                                    | 4k7 1% Resistor (Surface Mount      | Multicomp                   | Case 0603       | FEC 911-318     |
| 1   | R11                                   | Do Not Insert                       |                             | Case 0603       |                 |
| 1   | R18                                   | 1M 1% Resistor (Surface Mount)      | Multicomp                   | Case 0603       | FEC 911-598     |
| 1   | R19                                   | 22k 1% Resistor (Surface Mount      | Multicomp                   | Case 0805       |                 |
| 1   | R20                                   | 20k 1% Resistor (Surface Mount      | Multicomp                   | Case 0805       |                 |
| 3   | R21 R22 R23                           | 18r 1% Resistor (Surface Mount      | Multicomp                   | Case 0603       | FEC 911-021     |
| 1   | R24                                   | 51r 1% Resistor (Surface Mount      | Multicomp                   | Case 0603       |                 |
| 1   | R25                                   | 22k 1% Resistor (Surface Mount      | Multicomp                   | Case 0805       |                 |
| 3   | R27 R28 R29                           | 10k 1% Resistor (Surface Mount      | Multicomp                   | Case 0603       | FEC 911-355     |
| 6   | R30 R31 R32 R33 R40 R41               | 100k 0.1% Resistor (Surface Mount   | Meggitt                     | Case 0603       | FEC 911-471     |
| 2   | R36 R37                               | 330K 1% Resistor (Surface Mount     | Multicomp                   | Case 0603       | FEC 911-537     |
| 2   | R38 R39                               | 0r 1% Resistor (Surface Mount       | Multicomp                   | Case 0603       | FEC 772-227     |
| 1   | R12                                   | 0r 1% Resistor - Do Not Insert      | Multicomp                   | Case 0603       | FEC 772-227     |
| 1   | R42                                   | 4k7 1% Resistor (Surface Mount      | Multicomp                   | Case 0805       | FEC 911-938     |
| 1   | SW1                                   | Push Button Switc                   | Omron                       | SW1PB-SMALL     | FEC 176-986     |
| 1   | SW2                                   | SPDT Switch - (Washable)            | Apem                        | SW_SIP-3P       | FEC 150-559     |
| 18  | T1-15 T19-21                          | Red Testpoint                       | W Hughes                    | TESTPOINT       | FEC-240-345     |
| 1   | J1                                    | 9 PIN D-TYPE MALE (HORIZ)           | McMurdo                     | DCON9M          | FEC 150-750     |
| 5   | J2 J3 J4 J5 J6                        | Do Not Insert                       |                             | SMA             |                 |
| 1   | J7                                    | GOLD 50Ω SMA SOCKET                 | Pasternack                  | SMA             | PE4118          |
| 3   | LK1 LK4 LK5                           | 3 pin header                        | Harwin                      | SIP-3P          | FEC 512-047     |
| 1   | LK2-A                                 | Wire Link                           |                             |                 |                 |
| 1   | LK3                                   | 2 pin header                        | Harwin                      | SIP-2P          | FEC 512-035     |
| 4   | LK1 LK3-5                             | Shorting Shunt                      | Harwin                      |                 | FEC 150-410     |
| 2   | P1                                    | Pair PCB snap-on battery connector  | Keystone                    | BATT_PP3        | FEC 723-988     |
| 1   | P1                                    | 9V PP3 Battery                      | Duracell                    |                 | FEC 908-526     |
| 4   | Each Corner                           | Rubber Stick-On Feet                | 3M                          |                 | FEC 148-922     |
| 1   | EVAL-ADF411XEB1                       | PCB                                 | ADI                         |                 |                 |
|     | Parts Free issued by ADI.             |                                     |                             |                 |                 |
|     | Leave position blank - Do not insert. |                                     |                             |                 |                 |