LTM9003
12-Bit Digital Predistortion Receiver Subsystem

DESCRIPTION

Demonstration circuit DC1642A is an evaluation board featuring Linear Technology Corporation's LTM®9003 12-Bit predistortion receiver subsystem. DC1642A demonstrates good circuit layout techniques and recommended external circuitry for optimal system performance.

DC1642A comes with Linear Technology's 12-bit LTM9003 receiver subsystem installed. The board includes output LVDS buffers. DC1642A plugs into the DC890 data acquisition demo board using an FT149 adapter card and the output can be easily analyzed with Linear Technology's PScope™ data processing software, which is available for no charge on our website at http://www.linear.com.

Design files for this circuit board are available at http://www.linear.com/demo

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QUICK START PROCEDURE

Validating the performance of the LTM9003 is simple with DC1642A, and requires only two input sources, a clock source, a computer, and a lab power supply. Refer to Figure 1 for proper board evaluation equipment setup and follow the procedure below:

1. Connect the power supply as shown in Figure 1. There are on-board low-noise voltage regulators that provide the supply voltage for the DC1642A. The entire board and all components share a common ground. The power supply should still be a low-noise lab power supply capable of supplying at least 1A.
2. Provide an encode clock to the ADC via SMA connector J7. Use a low-phase-noise clock source such as a filtered RF signal generator or a high-quality clock oscillator.

Note: Similar to having a noisy input, a high-jitter (phase noise) encode clock will degrade the signal-to-noise ratio (SNR) of the system.

3. Apply an RF input signal to the board. For best results, use a low distortion, low noise signal generator with sufficient filtering to avoid degrading the performance of the receiver.
4. Apply an LO input signal to the board. Note that the difference in frequency between this signal and the RF signal will be the IF frequency resulting at the IF filter and ADC input.
5. Observe the ADC output with the FT149 adapter card connected to the DC890, a USB cable, a Windows computer, and Linear Technology's PScope data processing software. Note that the DC890 will also require an external 6V/1A power supply when receiving LVDS outputs.

ORDER OPTIONS

Table 1. DC1642A Variants

DC1624 VARIANTS	PART NUMBER	SFDR	SUPPLY VOLTAGE	BANDPASS FILTER
1624A-AA	LTM9003A-AA	58.8dB	2.5V ADC, 3.3V Amplifier, 3.3V Mixer	184MHz Center, 125MHz Bandwidth
1624A-AB	LTM9003A-AB	62.4dB	2.5V ADC, 3.3V Amplifier, 5V Mixer	184MHz Center, 125MHz Bandwidth

QUICK START PROCEDURE

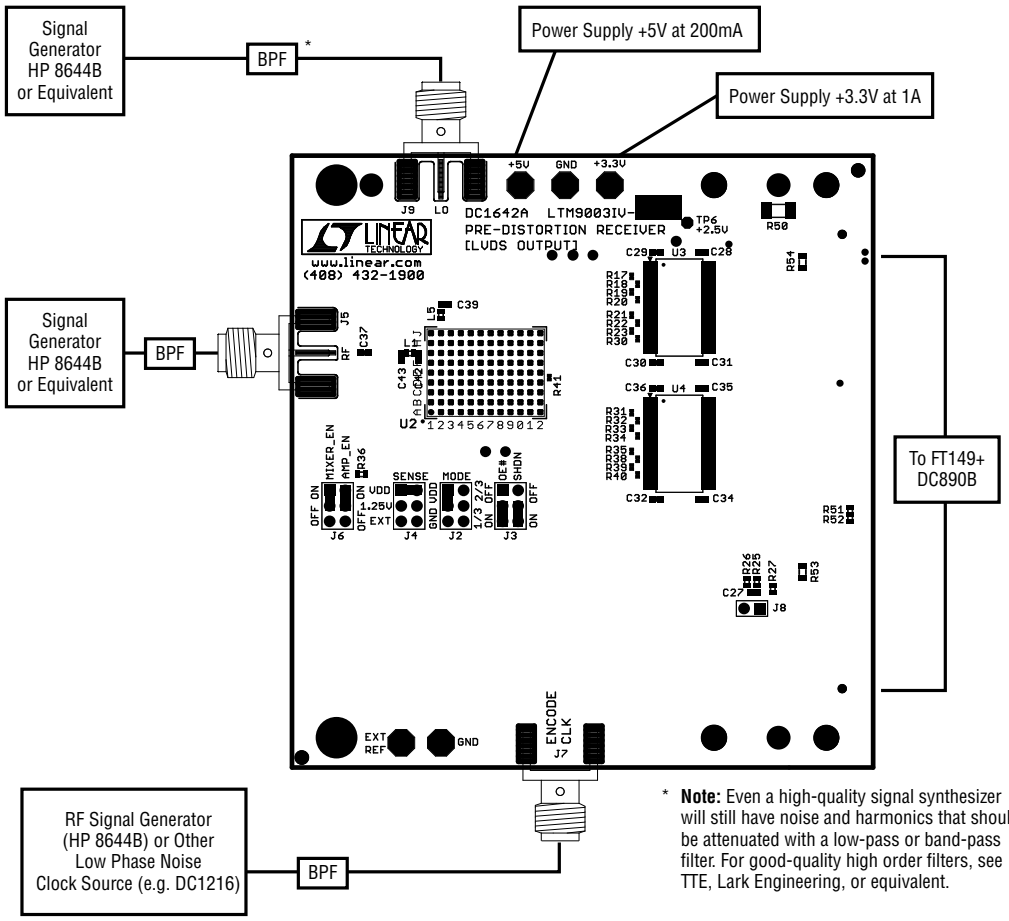


Figure 1. Proper Measurement Equipment Setup

Table 2. DC1642A Connectors and Jumpers

REFERENCE	FUNCTION
J2 (Mode)	Output Format and Clock Duty Stabilizer Pin. Default is V_{DD}.
J3 ($\overline{SHDN}$/OE)	Enables/Disables the ADC. Default is ON.
J4 (Sense)	Reference Input to Adjust the Full-Scale Range of the DC1642A. Default is V_{DD}.
J5 (RF)	Board RF Signal Input. Impedance-matched to 50Ω for use with lab signal generators.
J6 (Mixer/Amplifier Enable)	Enables/Disables the RF Mixer and Amplifier. Default is ON.
J7 (CLK)	Board Clock Input. Impedance-matched to 50Ω. Drive with a low-phase-noise clock oscil-lator or filtered sine wave signal source.
J9 (LO)	Board LO Signal Input. Impedance-matched to 50Ω for use with lab signal generators.
TP1 (External Reference)	Reference Input to Adjust the Full-Scale Range of the LTM9003. Connects to the SENSE pin; by default, tied to V_{DD} for internal reference.
TP2 (GND)	DC Ground.
TP3 (3.3V)	DC Supply Input (3.3VDC).
TP4 (GND)	DC Ground.
TP5 (5V)	DC Supply Input (5VDC).

QUICK START PROCEDURE

Other Board Circuitry

Device U1 is an EEPROM device that is used by the PScope software to identify the board and apply the correct settings for the data collection.

Using PScope Software

PScope, downloadable from Linear Technology's website at http://www.linear.com/software, processes data from the DC890 QuikEval II data acquisition board and displays FFT and signal analysis information on the computer screen.

The on-board EEPROM U1 should enable automatic board detection and auto-configuration of the software.

From the Configure menu in the toolbar, uncheck "Autodetect Device." The default settings for DC1642A are shown in Figure 2.

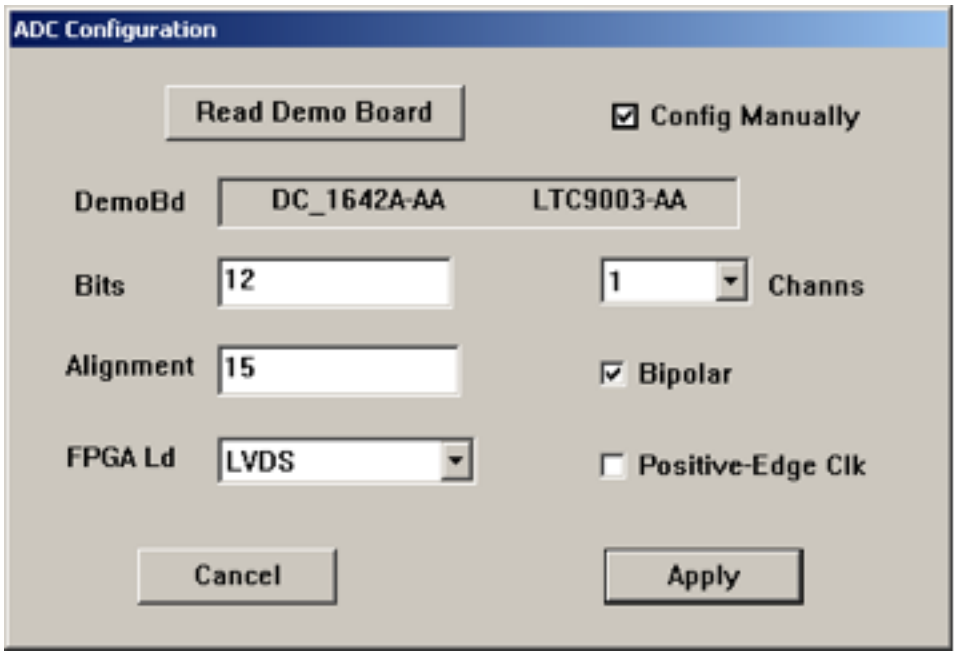
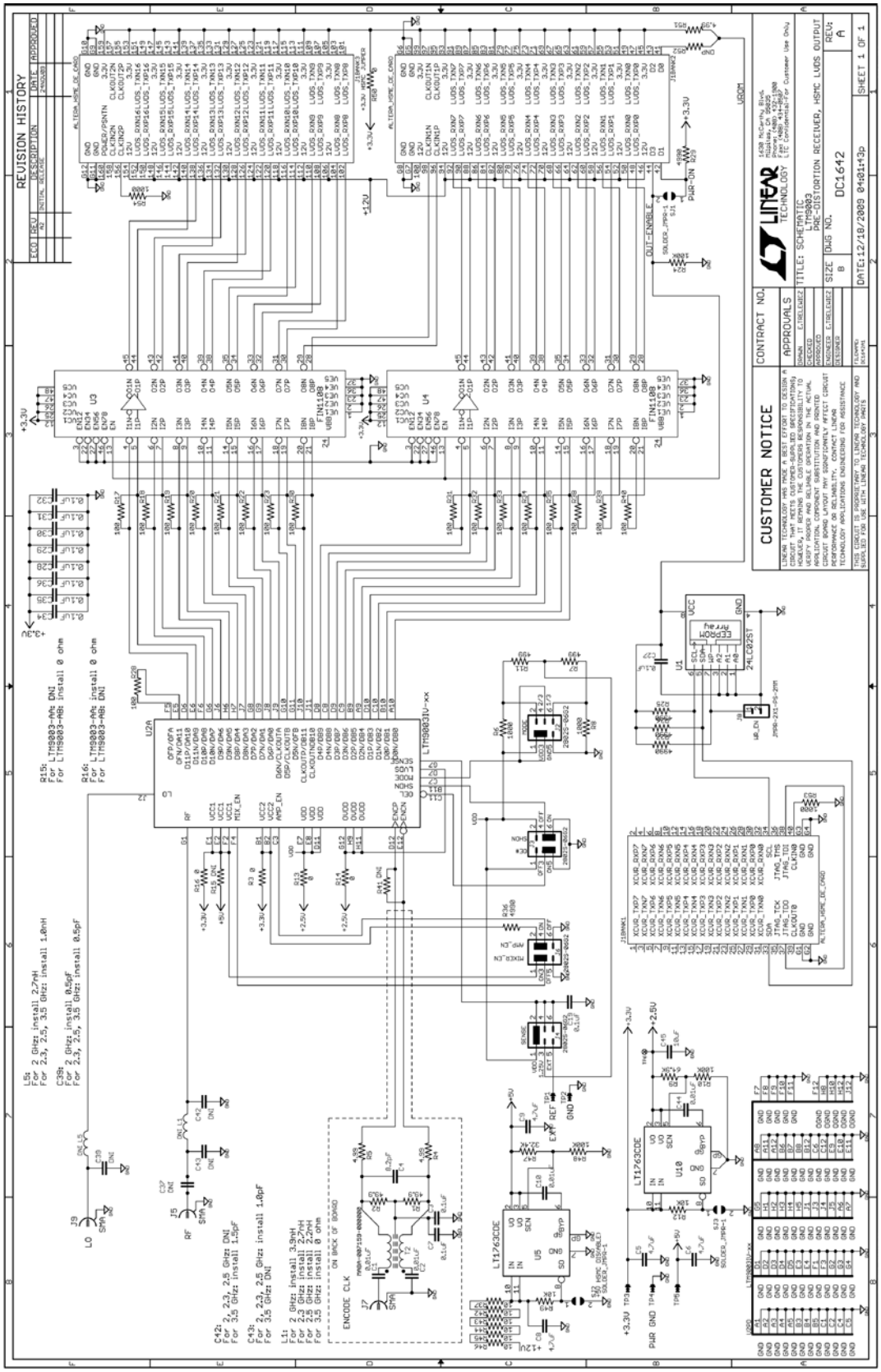


Figure 2. Entering the Correct Device Information for Your ADC. Select the Correct Parameters for the DC1642A. Under Normal Conditions, PScope Should Automatically Recognize the Board and Adjust the Software Settings Accordingly

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
LTM9003CV, Demo Board #1642A				
1	1	C4	Capacitor, NPO, 8.2pF, 50V, 0.25pF, 0402	AVX/04025A8R2CAT2A
2	4	C1, C2, C10, C44	Capacitor, X5R, 0.01µF, 16V, 0.1, 0402	AVX/0402YC103KAT
3	10	C19, C27-C32, C34, C35, C36	Capacitor, X5R, 0.1µF, 10V, 0.1, 0402	AVX/0402ZD104KAT
4	1	C45	Capacitor, X5R, 10µF, 6.3V, 0.2, 0805	AVX/08056D106MAT
5	4	C5, C6, C8, C9	Capacitor, X5R, 4.7µF, 10V, 0.2, 0805	AVX/0805ZD475MAT
6	2	C3, C7	Capacitor, X7R, 0.1µF, 16V, 0.1, 0603	AVX/0603YC104KAT
7	0	C37, C42	Capacitor, DNI	
8	1	C39	Capacitor, NPO, 0.5pF, 50V, 0.25pF, 0402	AVX/04025A0R5CAT2A
9	1	C43	Capacitor, NPO, 1pF, 50V, 0.25pF, 0402	AVX/04025A1R0CAT2A
10	1	J1	Connector, HSMC, Mezzanine	Samtec/ASP-122952-01
11	4	J2, J3, J4, J6	Header, 3×2, 2mm	Samtec/TMM-103-02-L-D
12	3	J5, J7, J9	Connector, SMA Female Edge Mount	E.FJOHNSON/142-0701-851
13	1	J8	Header, 2×1, 2mm	Samtec/TMM-102-02-L-S
14	1	L1	Inductor, 3.9nH, 5%, 0402	Coilcraft/0402CS-3N9XJLW
15	1	L5	Inductor, 2.7nH, 5%, 0402	Coilcraft/0402CS-2N7XJLW
16	0	R41	Resistor, DNI	
17	0	R52	Resistor, 0.01, 1/16W, 0603	Vishay, CRCW0603XXXX
18	3	R3, R13, R14	Resistor, 0Ω Jumper, 0805	Vishay, CRCW08050000ZOEA
19	1	R50	Resistor, 0Ω Jumper, 1206	NIC, NRC12ZOTR
20	6	R37, R42-R46	Resistor, 10Ω, 0.01, 1/4W, 1206	Vishay, CRCW120610R0FNEA
21	17	R17-R23, R28, R30-R35, R38-R40	Resistor, 100Ω, 0.01, 39833, 0201	Vishay, CRCW0201100RFNED
22	4	R6, R8, R53, R54	Resistor, 1000Ω, 0.01, 1/10W, 0603	Vishay, CRCW06031K00FKEA
23	3	R10, R24, R48	Resistor, 100k, 0.01, 39829, 0402	Vishay, CRCW0402100KFKED
24	2	R12, R49	Resistor, 10k, 0.01, 39829, 0402	Vishay, CRCW040210K0FKED
25	1	R47	Resistor, 32.4k, 0.01, 39829, 0402	Vishay, CRCW040232K4FKED
26	3	R4, R5, R51	Resistor, 4.99Ω, 0.01, 39829, 0402	Vishay, CRCW04024R99FKED
27	2	R1, R2	Resistor, 49.9Ω, 0.01, 39829, 0402	Vishay, CRCW040249R9FKED
28	2	R7, R11	Resistor, 499Ω, 0.01, 1/10W, 0603	Vishay, CRCW0603499RFKEA
29	5	R25, R26, R27, R29, R36	Resistor, 4990Ω, 0.01, 39829, 0402	Vishay, CRCW04024K99FKED
30	1	R9	Resistor, 64.9k, 0.01, 39829, 0402	Vishay, CRCW040264K9FKED
31	1	T2	XFRMR, 1:1, SMT, SM-22	Macom/MABA-007159-000000
32	5	TP1-TP5	Turret	Mill_Max/2308-2
33	1	U1	IC, Serial_EEPROM, TSSOP8	Microchip/24LC025-I_ST
34	2	U3, U4	IC, RPTR, LVDS, OCTAL, SMT, TSSOP	Fairchild/FIN1108
35	2	U5, U10	IC, VREG, ADJ, 500MA, DFN	Linear Technology/LT1763CDE
36	6	XJP2, XJP3, XJP4, XJP6 (See Drawing)	SHUNT	Samtec 2SN-BK-G
37	3	(Stand-Off)	Stand-Off, Nylon, 0.25"	Keystone/ 8831(Snap On)
38	2		Stencil, Component & Solder Sides	
LTM9003CV-AA, Demo Board #1642A-AA				
1	1	DC1642AA	General BOM	
2	0	R15	Resistor, DNI	
3	1	R16	Resistor, 0Ω Jumper, 0805	Vishay CRCW08050000Z0EA
4	1	U2	I.C., µModule	Linear Tech. Corp. LTM9003CV-AA
5	1		Printed Circuit Board	Demo Circuit 1642A
LTM9003CV-AB, Demo Board #1642A-AB				
1	1	DC1642AA	General BOM	
2	1	R15	Resistor, 0Ω Jumper, 0805	Vishay CRCW08050000Z0EA
3	0	R16	Resistor, DNI	
4	1	U2	I.C., µModule	Linear Tech. Corp. LTM9003CV-AB
5	1		Printed Circuit Board	Demo Circuit 1642A

SCHEMATIC DIAGRAM



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