THE DATASHEET OF

DC344A

DC344 LTC2420 Demonstration Board

Quick Start Guide

Simple, Small, Accurate

This demonstration board features the LTC2420, a 20-bit high-performance analog-to-digital converter (ADC). The LTC2420 combines exemplary DC accuracy (INL 4PPM, RMS noise 1.2PPM) with an easy-to-use SO8 package. Operating from a single 2.7 to 5.5v supply, the LTC2420 draws less than 250uA. Using an internal oscillator requiring no external components, the LTC2420 rejects line frequency noise (50Hz or 60 Hz +/-2%) at least 120dB.

The LTC2420 also offers a Fast Mode. Output rates up to 100sps are possible with 16-bit noise and 12-bits total unadjusted error.

The combination of a standard serial interface (SPI, Microwire compatible) and flexible analog input and reference ranges make this part simple to use. The input reference voltage range is 0v to Vcc, while the analog input range can go below ground and above Vref by 12.5%*Vref within the range of to -0.3V to Vcc+0.3V. User transparent zero and fullscale calibration result in offset errors below 2PPM and temperature drifts below 0.04PPM/degree C. Single conversion settling time results in latency-free results enabling multiplexed applications.

The demo board allows the user to quickly confirm the accuracy of the LTC2420 while demonstrating its ease-of-use. The board connects directly to the serial port of any IBM compatible PC. The demonstration board derives its power from the computer's serial port. The LT1460, used as a precision 5V regulator, drives the reference input to the LTC2420. The reference input to the converter is tied to Vcc, resulting in a -0.3 to +5.3 input range. The combination of the LTC1460 and two bypass capacitors are the only components required by the LTC2420.

This manual shows how to use the LTC2420 demonstration board. Included are timing diagrams, schematics, and suggested experiments that allow the user to confirm the accuracy of the LTC2420.

KEY FEATURES

*Fast Mode enables switching between 7.5 readings per second and 100 readings per second. The demonstration board contains an oscillator tuned to 2.048MHz which may drive the F0 pin of the LTC2420 under software control.

*Noise histogram and RMS noise calculations updated real time.

*Single-shot output graph shows non-averaged output for determining peak-to-peak noise.

*On-board LTC1460 reference can be replaced by an external reference

*The reference is output is available for ratiometric measurements.

*Power derived from computer serial port.

*Scalable output for ratio-metric or absolute measurements.

OPERATION

The demonstration board and software were designed to allow the user quick and easy evaluation of the LTC2420. The operation is described in five sections: I hardware setup, II software setup, III acquiring data, IV Fast Mode, and V suggested experiments.

I. HARDWARE SETUP

STEP 1:Serial port connection

Connect the demonstration board DB9 socket J5 to the serial port (COM1 or COM2) directly or through a male-to-female 9-pin extender cable (not provided).

STEP 2:Rejection Frequency

The internal oscillator on the LTC2420 can be configured to reject line frequencies of 50Hz or 60Hz by tying pin 8 (F0) to Vcc or Ground, respectively. This is achieved through jumper JP1 (defaulted for 60Hz rejection). While in the fast mode (to be described later) the LTC2420 outputs data at 100Hz with a corresponding 800Hz rejection.

STEP 3: Select Reference

The demonstration board contains an LTC1460 (5v) voltage reference. Jumper JP1 selects the LTC1460 as the reference for the LTC2420, or allows the user to apply an external reference (0.1v to 5V) through connector J1. Vcc remains 5V for the LTC2420 regardless of which reference voltage is selected. Additionally, the reference is output to connector J2 for ratiometric measurements.

STEP 4: Apply Input signal

The input to the ADC is applied through Banana connector J3.

II. SOFTWARE SETUP

Install the software on an IBM compatible Windows 98 or 95 computer using the diskette provided. The included diskette contains a file LTC2420.zip. Once this file is unzipped, two files will be created: LTC2420.exe and SERPDRV. Both files must remain in the same directory. Type LTC2420.exe to run the demonstration software.

Once LTC2420.exe is executed the screen is filled with a graphic. This graphic contains:

1. Noise Histogram graph

2. RMS Noise displayed in PPM

3. Real-time ADC output graph

4. Conversion Rate Switch for fast mode (100sps) or normal mode (50/60Hz Rejection)

5. Display resolution switch (16 or 20-bits display)

6. Switch to Write Data to a file

7. Data Abort indicator

8. Serial Port selector

9. Start/Stop switch

Setup (Do these prior to acquiring data)

STEP 1: Select Serial Port

Toggle the serial port switch to COM1 (default) or COM2 depending on the port to which the demonstration board is connected.

STEP 2: RUN

Click on the Start switch to begin acquiring data.

III. ACQUIRING DATA

1. HISTOGRAM

The acquired ADC data is plotted real time on a histogram graph. The RMS noise is displayed below the histogram graph in 16/20-bit resolution.

2. TRANSIENT DATA

The raw ADC output data vs. time is plotted on the transient graph. Each data point on this graph is a non-averaged single shot conversion result. This display can be set to 20-bit scale or 16-scale by toggling the display resolution switch.

3. PROBLEMS

If there is a problem acquiring input data, the "Data Abort" indicator will turn on (change color from yellow to red). The most likely causes are either the wrong COM port is selected or the board is not plugged into the computer.

IV. FAST MODE

The DC334 demonstration board contains an on board oscillator. This oscillator has been factory set to 2.048Mhz using trim pot R9. With 2.048MHz applied to the F0 pin of the LTC2420, the device will output data at 100 samples per second. In order to enable the fast mode, a toggle switch is contained in the software which will switch between the normal mode (50/60 Hz rejection) and the fast mode (800Hz rejection).

Jumper JP3 must be removed (default) in order to enable the 2.048MHz oscillator. If this jumper is in place, the device will not work when the software is switched to fast mode. Pot R9 can be adjusted for variable output rates above and below 100sps.

V. SUGGESTED EXPERIMENTS

1. Measure Offset

To determine the actual offset of the LTC2420, tie the input (J3) to GND (J4) on the board. The offset can be obtained by reading the Raw ADC output Graph. By toggling the fast mode switch between 100sps (red) and 7.5sps (white) comparisons can be made between normal and fast mode.

2. Measure Fullscale

Similar to the offset measurement, the LTC2420 fullscale error can be determined by tying Vref out (J2) to input (J3). The fullscale can be determined by reading the Raw ADC output Graph. The ideal value is 65,536 if the display resolution is set to 16-bits and 1,048,576 if the display resolution is set to 20-bits. Again, this test may be made in both normal and fast mode.

3. Measure RMS Noise

The RMS noise is determined by applying any stable DC voltage to the input (J3) of the ADC. The histogram will accumulate data. The actual RMS noise is displayed below the noise histogram window in 16/20-bits.

4. Measure Linearity

There are several methods for determining the linearity of the LTC2420. In order to determine the actual linearity of the LTC2420, either an accurate source (24-bit DAC, kelvin-varley divider, voltage standard) and/or an accurate DVM (6.5 digits) is required. The fullscale errors do to the reference output voltage must be compensated prior to calculating the linearity.

5. Post Processing Data

The user may post process raw data from the LTC2420, by changing the “Write Data to a File?” switch to “yes” prior to running. This will generate a text file containing the raw output of the ADC. This can be easily imported into a spreadsheet for further processing. While the ADC is running, this switch can be asserted and data will be written to a file from that point on.