LX7730 EVB Rev. B Get-Started Guide

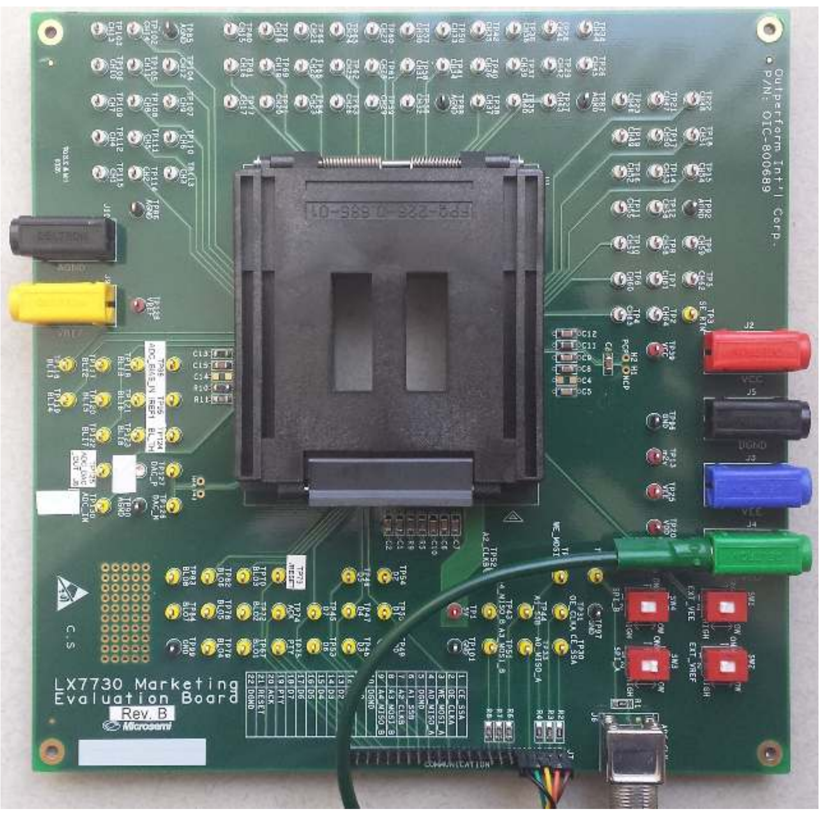
1 Description

This document complements the downloadable user guide lx7730_evaluation_board_user_guide_rev_0.6.pdf, and provides the following:

- The GUI software and USB drivers are embedded in this PDF
- A detailed walk-through of the LX7730's fundamental features (ADC, comparators, current source, and DAC) as a demo or tutorial, or as a guide to quickly test a suspect part.

1.1 Equipment Needed

- A bench power supply set between 12V and 15V DC for the LX7730's VCC supply (13.5V is a good choice), rated at (or current limit set to) at least 250mA. The power supply should have a built in ammeter to monitor VCC current
- A bench signal generator configured to provide a 500kHz square wave with unloaded amplitude 0V to 3.3V
- An LX7730 EVB and LX7730-ES part (either installed or provided in a separate protective container)
- An FTDI C232HM-DDHSL-0 USB interface dongle. This also provides the VDD logic supply to the EVB
- A PC to operate the GUI
- Optionally a DVM or multimeter (the cheapest one will be fine) to check voltages and for basic functional testing
- Optionally three short (200mm or more) test leads with a spring clip at each end for basic functional testing
- Optionally two 1kΩ leaded resistors for basic functional testing of the 10-bit DAC and ADC

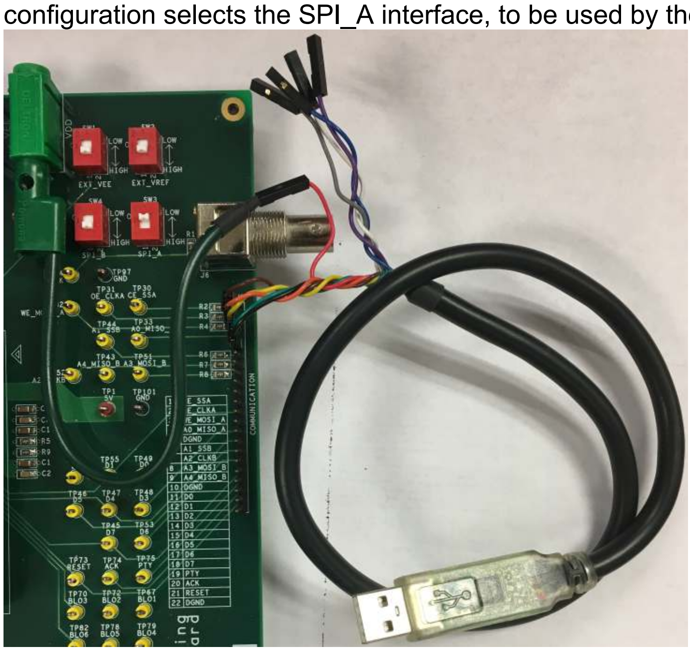


1.2 Extracting the Embedded Software

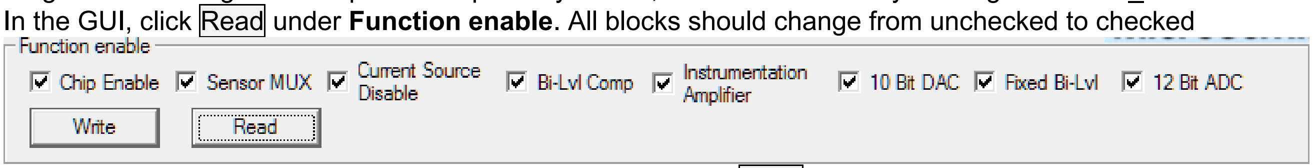
- The PDF contains the embedded file LX7730.txt stored as an attachment. Drag LX7730.txt with the left mouse button to your desktop, or right-click it and select a different destination
- Rename LX7730.txt to LX7730.zip which is an encrypted zip file
- Open LX7730.zip, and extract the two files to your desktop or a different destination if preferred. This is an encrypted zip using **microchiptechnology** as the password
- The two files extracted from the zip file need to be renamed:
  - Rename **CDM21228_Setup.txt** to **CDM21228_Setup.exe**
  - Rename **LX7730 v0_2a.txt** to **LX7730 v0_2a.exe**

1.3 Starting Up From Scratch Instructions (skip what you don't need to do again)

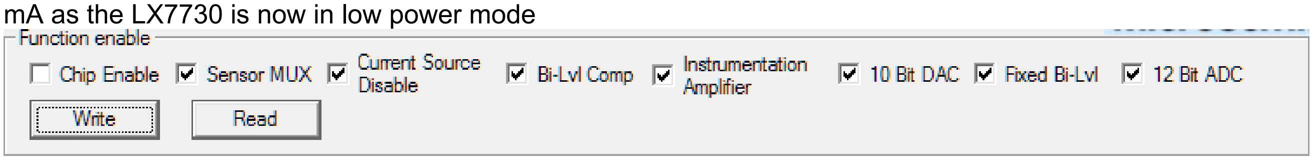
- Run CDM21228_Setup.exe to set up drivers for the FTDI C232HM-DDHSL-0 USB interface dongle. These drivers were obtained from https://www.ftdichip.com/Drivers/D2XX.htm. If you're not sure whether you have the drivers installed already, then try running LX7730 v0_2a.exe. If an error message appears, then you don't have the drivers installed and need to do so
- An LX7730-ES part should be already installed in the socket on the EVB. If it isn't installed, follow the attached user guide's detailed installation instructions. There are eight possible orientations of the LX7730-ES part in the socket, and only one is correct, so please double check. The LX7730-ES can be safely left installed between uses if the EVB is stored/shipped in an antistatic bag
- EVBs are normally shipped with the FTDI dongle already connected, and the correct connections are shown below. The pin order for the J7 connector is brown (top by BNC plug, pin 1), orange, yellow, green, black. The red lead connects to the green 4mm socket via an adapter cable. The grey, white, blue, and purple leads are unused
- Check that the red slide switch SW3 (bottom right) is down, and the remaining three switches down, as below. This configuration selects the SPI_A interface, to be used by the FTDI dongle, internal 5V VREF, internal VEE supply



- Connect the black 4mm socket to the bench power supply's 0V output, usually black
- Connect the red 4mm socket to the bench power supply's positive output, usually red, after double checking that the power supply is set between 12V and 15V (13.5V is a good choice)
  - This is the VIN supply to the LX7730
  - The EVB is now powered up, and will draw about 60mA because the LX7730 powers up in operating mode
- Optionally use the DVM to:
  - check that the 5V test point TP1 and the VREF output TP25 are both close to 5V
  - check that the VEE output at TP25 is about -(VIN - 2)V, so about -11.5V if VIN was set to about 13.5V
  - check that the m2v ouput at TP13 is about -2V
- Plug the FTDI dongle into a spare USB port of your PC, and start the GUI by running LX7730v0_2a.exe
- In the GUI, click Read under **Function enable**. All blocks should change from unchecked to checked



- Now uncheck **Chip Enable** under **Function enable**, and click Write. The current consumption should drop to a few mA as the LX7730 is now in low power mode



- If the ADC is going to be used, connect a bench signal generator configured to provide a 500kHz square wave with unloaded amplitude 0V to 3.3V. The EVB does not use a 50Ω termination resistor. If the signal generator expects a 50Ω termination resistor (load), then the output voltage doubles when unloaded, so set the amplitude to 0V to 1.65V
- The EVB is now set up

2 Basic Functional Testing and Demonstration

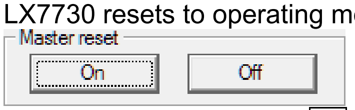
The functional testing uses a DVM, two 1kΩ resistors, and three short (200mm or more) test leads with a spring clip at each end. The test leads are use to connect resistors and test points together on the EVB.

The 500kHz signal generator isn't required for checking out the BLI/BLO comparators (Section 2.2) or the 10-bit DAC (Section 2.3).

2.1 Reset the LX7730

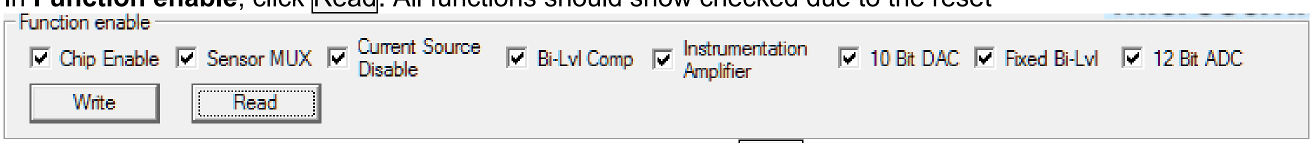
First of all we reset the LX7730 to clear all registers to the default settings.

- In **Master reset**, click the On button. The current consumption should be about 60mA as the LX7730 because the LX7730 resets to operating mode, same as on power up

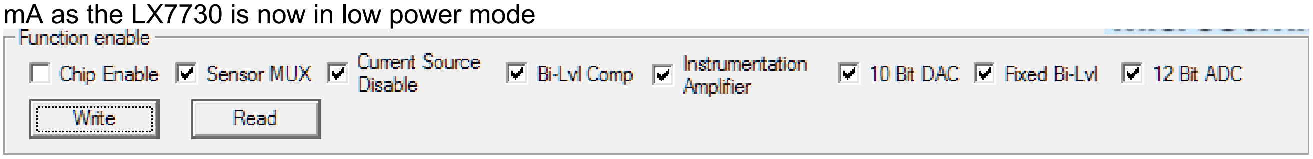


- In **Master reset**, click the Off button

- In **Function enable**, click Read. All functions should show checked due to the reset



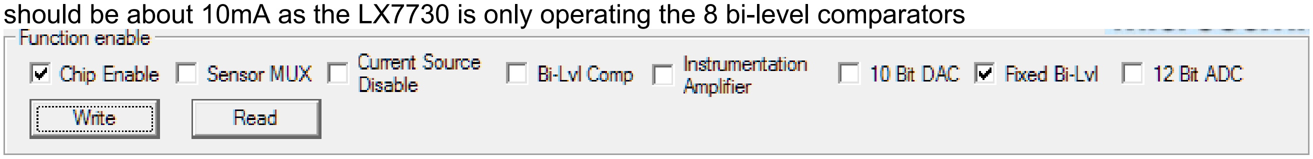
- Now uncheck **Chip Enable** under **Function enable**, and click Write. The current consumption should drop to a few mA as the LX7730 is now in low power mode



2.2 BLI/BLO Comparators

These 8 comparators have input pins and output pins, so the internal registers are only used to configure them.

- In **Function enable**, set only **Chip Enable** and **Fixed Bi-Lvl** checked, and click Write. The current consumption should be about 10mA as the LX7730 is only operating the 8 bi-level comparators

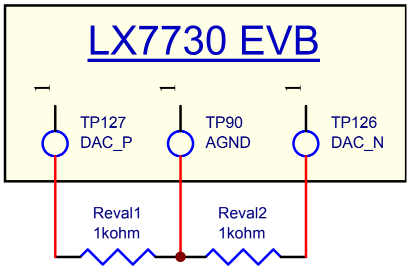


- Connect the DVM between the comparator output BLO1 test point TP67 and one of the GND or AGND test points. The DVM should read 0V (logic low), as all the BLI comparator inputs have weak internal pulldowns caused by normal leakage to GND (under 1.5µA) in the input protection circuits
- Connect a test lead between the comparator input BLI1 test point TP116 and the +5V test point TP1. The DVM should read about 3.3V (logic high), as the comparator input is higher than it's +2.5V trip threshold
- Move the test lead from the +5V test point TP1 to one of the GND or AGND test points. The DVM should now read 0V (logic low), as the comparator input is lower than the +2.5V trip threshold
- Repeat the procedure for the remaining 7 comparators at input BLI2-8, outputs BLO2-8 if desired

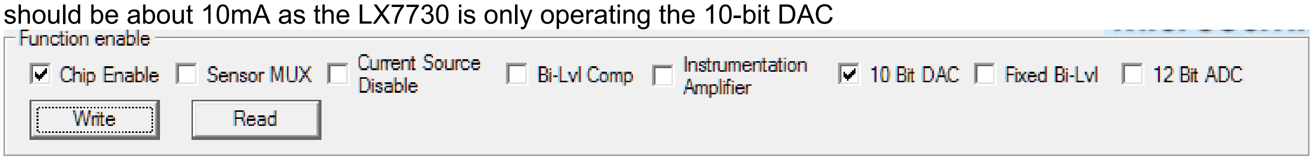
2.3 10-Bit DAC Outputs DAC_P and DAC_N

The 10-bit DAC is checked out by configuring it's outputs to be complementary current sources to the DAC_P and DAC_N pins. These currents are converted to voltages using two 1kΩ resistors, so that the outputs can be observed using the DVM. The complementary DAC outputs source 0-2mA and 2-0mA respectively, so the full scale output voltages with 1kΩ resistor output loads will be 0-2V and 2-0V respectively

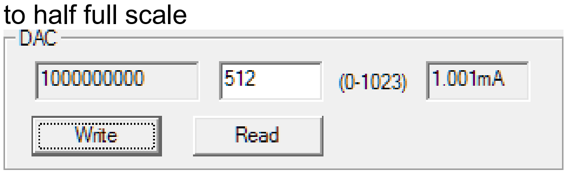
- Connect a test lead between an AGND test point and one side of both 1kΩ resistors. Connect a test lead between the other end of one resistor to the DAC_P test point TP127. Connect a test lead between the other end of the other resistor to the DAC_N test point TP126. Both DAC outputs now have a load resistor to AGND



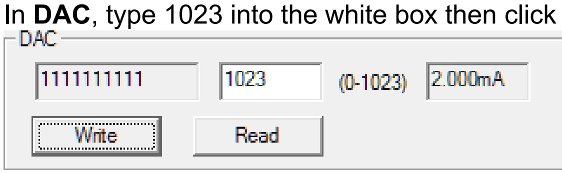
- Connect the DVM from the DAC_N test point TP126 and AGND. It should read 0V, because the 10-bit DAC was disabled in the setup for the previous test
- In **Function enable**, set only **Chip Enable** and **10 Bit DAC** checked, and click Write. The current consumption should be about 10mA as the LX7730 is only operating the 10-bit DAC



- The DVM on DAC_N should now read about 2V. Move the DVM to the DAC_P test point, which should read 0V. This represents the default DAC setting of 0
- Select **Page2** in the top left corner of the GUI. In **DAC**, type 512 into the white box, and click Write. This sets the DAC to half full scale



- Use the DVM to read the DAC_P and DAC_N outputs. They should both be about 1V, representing half full scale
- In **DAC**, type 1023 into the white box then click Write. This sets the DAC to full scale

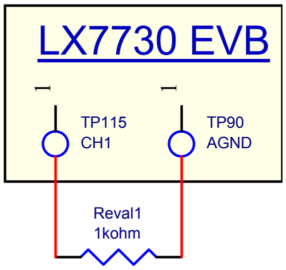


- Use the DVM to read the DAC_P and DAC_N outputs. DAC_P should be about 2V, and DAC_N at 0V, representing full scale
- Select **Page1** in the top left corner of the GUI
- Remove the test leads from the test points

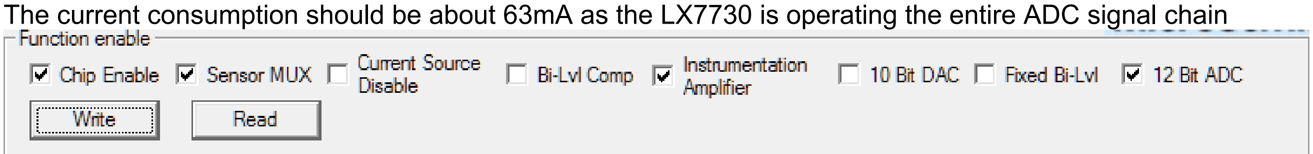
2.4 ADC and Sensor Current Source

The ADC is configurable to measure differential and single-ended inputs with a range of sensitivities, and can additionally force a programmable current into an external resistive sensor, such as a thermistor. In this section, we use one of the 1kΩ resistors as a dummy external resistive sensor, drive it from an internal current source.

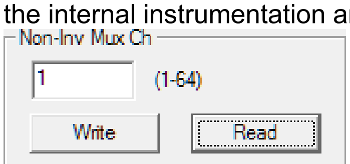
- Use two test leads to connect a 1kΩ resistor between the CH1 analog input TP15 and an AGND test point



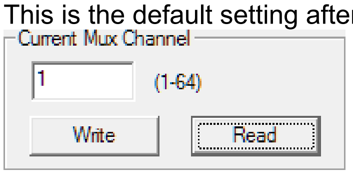
- Connect the DVM between the ADC_IN test point TP130 and AGND. This will be measuring the voltage at the end of the analog input signal chain and the input to the ADC itself
- In **Function enable**, check **Chip Enable**, **Sensor Mux**, **Instrumentation Amplifier**, and **12 Bit ADC,** and click Write. The current consumption should be about 63mA as the LX7730 is operating the entire ADC signal chain



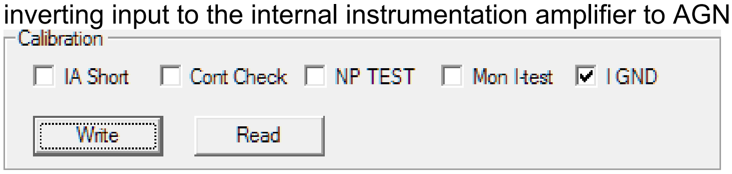
- Click Read under **Non-Inv Mux Ch** to check that CH1 is selected. This is the default setting of the inverting input to the internal instrumentation amplifier after reset



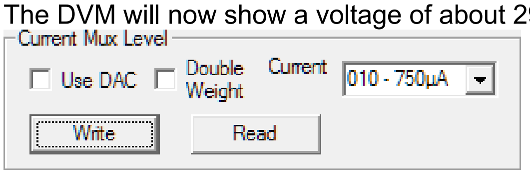
- Click Read under **Current Mux Ch** to check that CH1 is selected as the destination for the internal current source. This is the default setting after reset



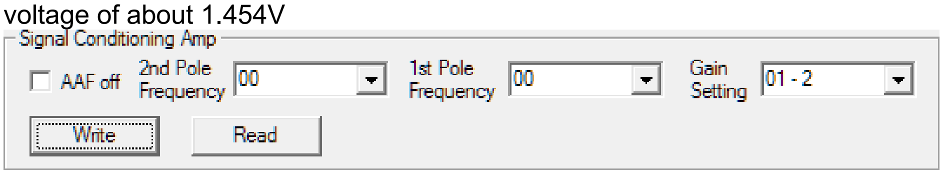
- Select **Page2** in the top left corner of the GUI. In **Calibration**, check **IGND**, and click Write. This sets the non-inverting input to the internal instrumentation amplifier to AGND internally



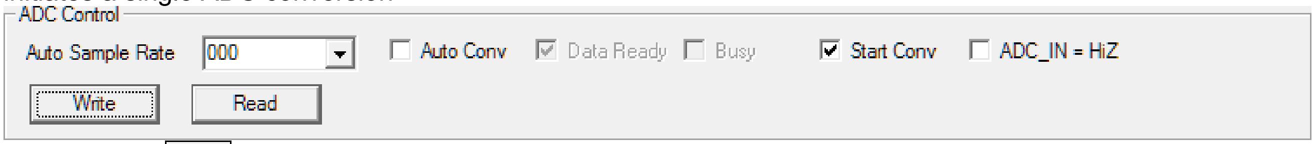
- Select **Page1** in the top left corner of the GUI
- In **Current Mux Level**, select **010 - 750µA** current, and click Write. This selects a current source of actually 727µA out of the CH1 pin from the LX7730. This will pass through the 1kΩ resistor that fitted earlier from CH1 to AGND, and the voltage at CH1 will be nominally 0.727V, plus or minus due to tolerances
- The DVM will now show a voltage of about 290mV, which is 727mV times the default input amplifier gain of 0.4



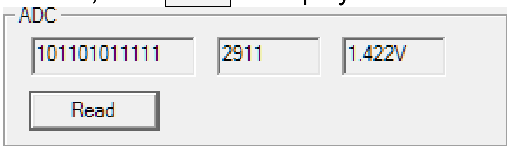
- In **Signal Conditioning Amp**, select **01 - 2** gain setting, and click Write. This selects a voltage gain of 2, so the 0.727V nominal at CH1 will become 1.454V at the ADC input, which has a full scale of 2V. The DVM will now show a voltage of about 1.454V



- Now we can take ADC measurements. In **ADC Control**, ensure that only **Start Conv** is checked, and click Write. This initiates a single ADC conversion



- In **ADC**, click Read to display the ADC conversion result

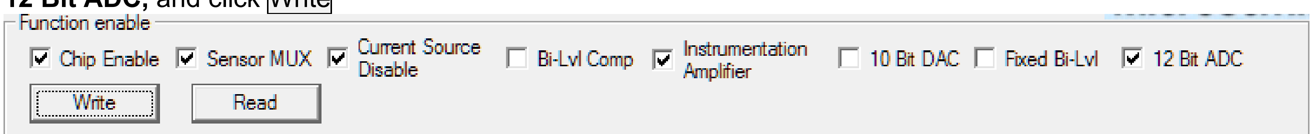


- Repeat clicking Write under **ADC Control** followed by Read under **ADC** to take more readings. Change the current source value in the **Current Mux Level** setting and see how the ADC readings change. If the **Current Mux Level** setting is changed to **100 - 1250µA**, then the input voltage at the ADC will be about 2.4V, as shown by the DVM. However, this exceeds the ADC's 2V full scale, so the ADC will simply return a value of full scale
- Remove the two test leads with the 1kΩ resistor from the test points, but leave the DVM in place for the next section

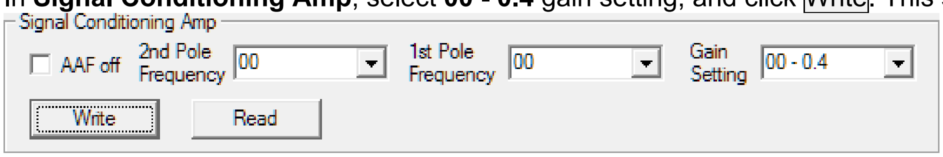
2.5 Using the ADC for Internal Diagnostics

The ADC multiplexor can be switched to monitor the reference and power supplies for diagnostics. In this section we configure the ADC to measure the VCC supply.

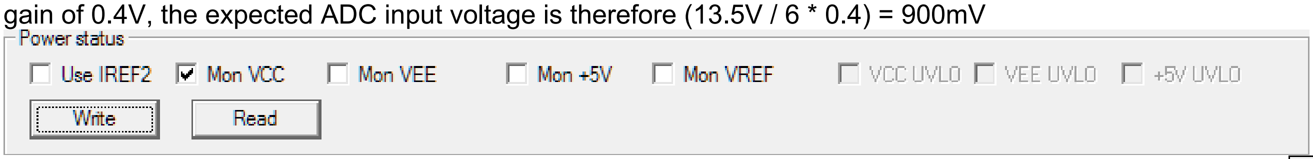
- In **Function enable**, check **Chip Enable**, **Sensor Mux**, **Current Source Disable**, **Instrumentation Amplifier**, and **12 Bit ADC,** and click Write



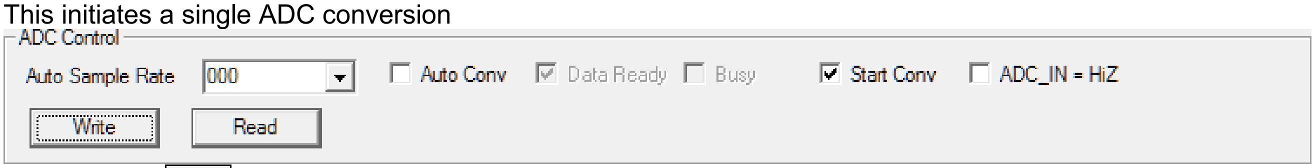
- In **Signal Conditioning Amp**, select **00 - 0.4** gain setting, and click Write. This selects a voltage gain of 0.4



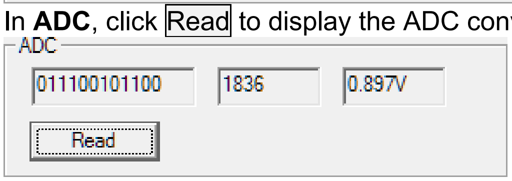
- In **Power status**, check **Mon Vcc**, ensure the other boxes are unchecked, and click Write. The input multiplexor now selects the VCC supply divided by 6, which will be 2.25V when VCC is set to 13.5V. As we have set the amplifier to a gain of 0.4V, the expected ADC input voltage is therefore (13.5V / 6 * 0.4) = 900mV



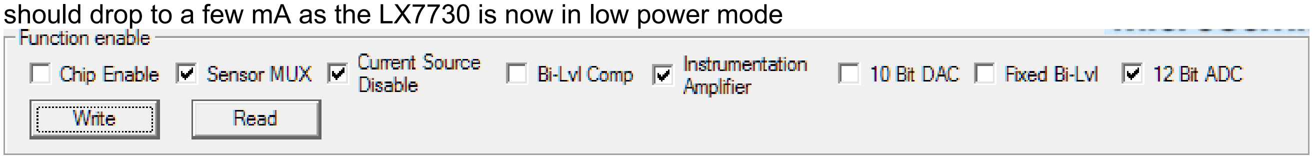
- Now we can take an ADC measurement. In **ADC Control**, ensure that only **Start Conv** is checked, and click Write. This initiates a single ADC conversion



- In **ADC**, click Read to display the ADC conversion result



- When finished testing, uncheck **Chip Enable** under **Function enable**, and click Write. The current consumption should drop to a few mA as the LX7730 is now in low power mode



3 Change Log

Date	Issue	Part Type
2020-1-10	1	First release

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