Short Course

TEXAS INSTRUMENTS

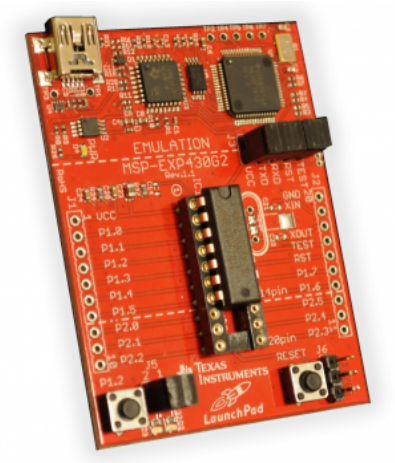
LaunchPad Data Logging

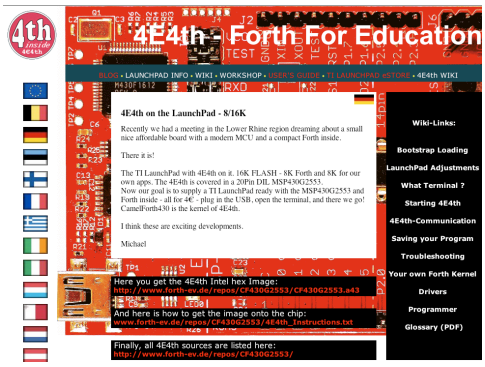
with

Immediate Fast programming

Using

Free Onboard 4E4th Language





Code

Investigations

Involving Digital I/O,

Analog to Digital Conversion & Temperature

by Andrew Reid

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Imaging Associates International

Preface.

Investigating Electronic Sensor Measurement, Data Logging and Process Control, becomes with micro-computers interesting and fun, particularly when we look at some products such as Air conditioners . Most of us have found short comings in these products as we strive to gain thermal comfort at a reasonable cost. In some instances poor programming accounts for poor performance which is not good enough!.

Most modern products have micro computers in them.--------- so somebody had to programmed them ----- maybe you should have their job!.

Now it's Amazing!

To benefit from what you have read so far consider taking the following "Discovery Action".

* Visit Texas Instruments site www.ti.com and consider buying a Launchpad US $4.30

* Now visit the 4E4th site www.4E4th.eu you will find you can.

Download the free 4E4th Language software.

Download the free 4E4th Terminal software.

Download the free MSP430 Flash programmer.

* Or visit Imaging Associates International for Flashed 4E4th LaunchPads.

---------- www.sustainabilitymeasurement.com ----------

This book is about the **TEXAS INSTRUMENTS LaunchPad which has an MSP430G2553** Flashed with **Free 4E4th Onboard.**

With no fuss we measure the chips internal temperature using its ADC

Other free products like free **TeamViewer** - www.teamviewer.com allow two users to control in real time each others 4E4th Launchpad -- no compiling!.

Perhaps in applying , sharing with your friends, this book will help you master or appreciate the many factors in achieving a better life style through the knowledge gained by using the Texas Instruments LaunchPad populated with the 16-bit MCP430G2553 you enhance your chance to get a better job, make more money while having fun learning whilst interacting with other people.

Andrew Reid --- 8th April 2012

Texas Instruments 4E4th LaunchPad Data Logging & Control

Contents.

1.0 Overview.

1.1 What's it About?.

1.2 How is it Implemented?.

1.3 Course Structure.

1.4 our System.

1.5 On Going Support TeamViewer.

2.0 Organizing your Hardware and Software.

2.1 The Hardware Involved.

2.1.1 The launchPad Kit.

2.2 The Hardware Interconnections.

2.3 The Software Involved.

2.4 Bootstrap Loading.

2.5 Serial Terminal Emulation programs for 4E4th & MSP430.

2.5.1 Configuring Tera Term.

3.0 The Keyboard & 4E4th.

3.1 Using 4E4th.

3.1.1 Using some Core Words.

3.2 Data Logging Aspects of KeyBoard Entry.

3.2.1 The Word Key & Single Character Input.

3.2.2 4E4th Website Resources.

3.2.3 Delay a Point of Interest.

4.0 . Familiarization

4.1 The LaunchPad Board Layout

4.2 Physical Picture IC MSP430G2553

4.3 -MSP430G2553 Functional Block Diagram.-

4.4 Digital I/O of the MSP430G2553

4.4.1 Digital I/O Overview.

4.4.2 Device Pin out & Description.

4.4.3 Digital I/O Registers

4.4 4 Digital I/O Operation Register Description.

4.5 Functional Block Diagram of the MSP430G2553-- Port 1 Selected.

4.6 Schematic of Hardware J Connector I/0.

4.6.1 Port 1 & 2 Registers and their Function.

4.6.2 On-Board Port 1 & 2

4.7 LaunchPad Physical Components of Interest.

4.7.2 Switches/Push Buttons.

4.7.2 LEDs.

5.0 LaunchPad Keyboard LED Output Control.

5.1 Overview.

5.2 Word Review.

5.21 Variable and Constant Difference.

5.3 Short Programs Controlling the red & green LED's.

5.3.1 Using keyboard Keys only.

6.0 Switches S1 and S2.

6.1 Core Word S?.

6.2 Some 4E4th Words Bytes using S?.

6.3 Switches and LEDs.

6.4 Use of Switch & KeyBoard and LEDs.

7.0 Analog to Digital Conversion.

Overview.

7.1 ADC10 Functional Elements.

7.2 Main ADC10 Block Diagram.

7.3 Working ADC Registry Diagram.

7.4 Identifying Registers For Coding.

7.4.1 Input Register & Physical Voltage Input Connections.

7.4.2 Registers Selected from Texas Instruments MSP430G2553.h

8.0 Comparison of C and 4E4th Forth Bit Fiddling Operators.

8.1 Some C Bit Operators.

8.2 4E4th Bit Operators

8.3 Some Conversion Examples.

9.0 Measuring the MSP430G2553 Internal Temperature.

Objective

9.1 Developing the 4E4th program.

9.2 Our 4E4th Code.

9.3 Code Organization.

9.4 Some words using iReadtemp.

10 Measuring Voltage and External Temperature.

Overview.

10.1 External Device Connections.

10.1.1 Battery Connections.

10.1.2 Temperature Sensor Connections.

10.2 Single Channel Voltage Measurement Code.

11 Counting Pulses.

Overview

11.1 Additional Digital I/O Data

11.1.1 Summary

11.1.2 Programmable pin Functions.

11.2 Review of Port 1 Registers.

11.3 Code Testing using the 4E4th Terminal.

11.4 What is to Be Counted?.

Section Z -Appendices.

A 1 Useful URL's.

A2 Some Extra Hardware Considerations.

.

1.0 Overview .

1.1 What's it About?

This book is concerned with applying the **TEXAS INSTRUMENTS MSP-EXP430G2** experimenter board called the **LaunchPad** to sensor based practical Data logging and Process Control applications **using an "on-board" programming language** called **4E4th.**

Background information concerning this free on-board language is covered for the **Windows, Linux**, and **Mac** Operating Systems in the Appendices along with suggested support and various download websites.

As this language is **"on-board"** it means that **"Applications"** may be shared with no modification between users with different operating systems using a **free program** called **TeamViewer.**

In fact a two user of **TeamViewer** could **Control in Real Time** each others Launchpad and at the same time, have audio and visual communication whilst investigating their Data logging and Control MSP430G2553 experiments. Appendices provide the details with the download website information.

1.2 How is it Implemented

The early part of the course concerns the Texas Instruments MSP430G2553 MCU itself. The information presented has been kept to a "Bare Minimum " and is focused on laying the foundation so as to be able to make easy practical measurements using the 4E4th program language in scientific and engineering application areas . This information is a concise resource of data required for the short application programs we will explore.

As we progress the course will combine straight forward applications with source code which use directly connected low cost sensor transducers for measuring temperature, light, etc . These will be coupled with the LaunchPads integrated switches and leds.

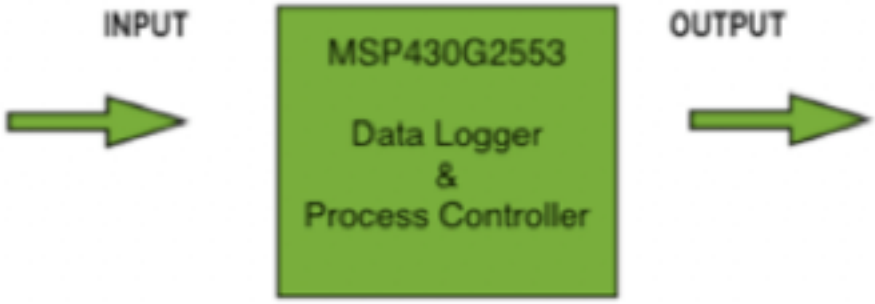
These applications with your code changes will enable you to modify and see results rapidly without going through lengthy and often irritating compiling procedures as you wait for Action! .

The order of the day is " Lets Do it Now!'

In that context the 4E4th programming language will be learnt by "Problem Solving" as we go with your guided independent study using the recommended Websites as a resource.

1.3 Course Structure.

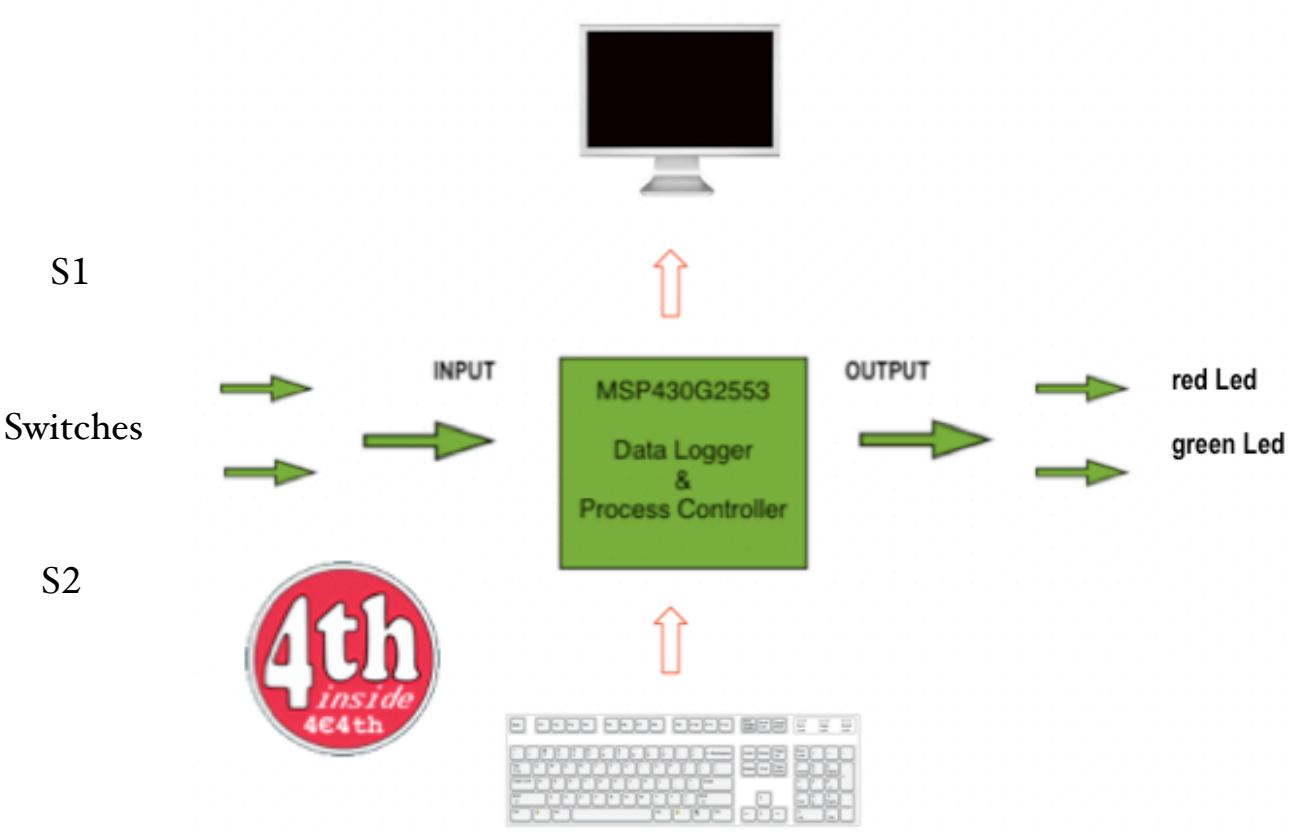
Any course about Data logging and the introduction to straight forward Process Control will be concerned with Inputs and Outputs. Ours is no exception so here is our first diagram.



We will concentrate on Short Action Code always using inexpensive sensor hardware. Often in the context of Input & Output sensor situations time in the form of a response is important. Delays and periods of time to allow for settling of an input magnitude before measurement may be essential if an accurate value is to be obtained before on going processing. These requirements could be made more complex if this situation requires compensations and the implementation of safeguards compensate for an unexpected time required for recovery from an overload. These points are mentioned now so that the deceptively simple examples used throughout this course are not treated as robust or regarded in anyway optimized to task.

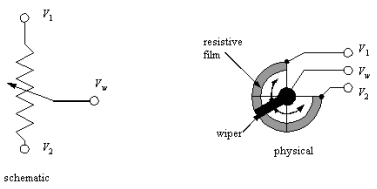
1.4 Our System.

The picture below illustrates our initial system without external sensors.



Our inputs and outputs will have to be calibrated and scaled into engineering units. For example when temperature is measured we need degrees Centigrade for Australia and degrees Fahrenheit for the USA.

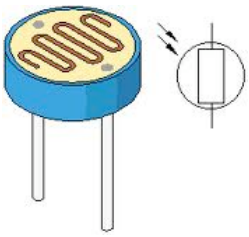
Aspects of calibration and scaling using 4E4th are addressed in those parts of the course where we are using external transducers in addition to the two switches and the red & green leds.

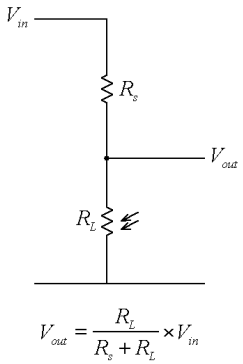


Our system will be broken down into component parts which relate directly to those elements being programmed. These elements can be interchanged physically and their individual software components reused as more involved systems are investigated.

For instance a single light sensor when used as part of the course along with an LCD digital display needs the program code associated with the internal analog to digital convertor ADC10 of the MSP430G2553 which is used in this instance to measure the sensor output voltage . All code used forms part of the course.

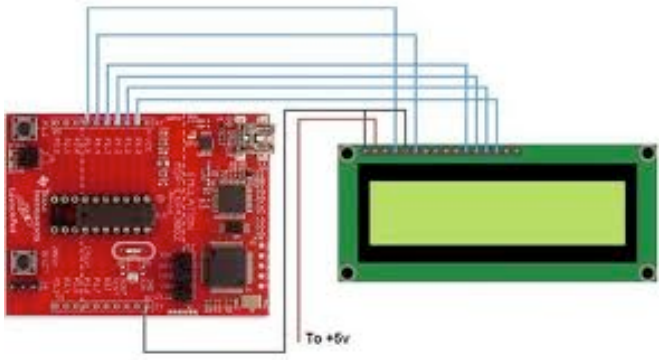
Light Sensor.





Light Sensor Circuit.

LaunchPad and Display.



1.5 On Going Support TeamViewer.

At any stage TeamViewer will be used when required to support the learning process .