MICROPROCESSOR CONTROLLED TESTING OF MIXED SIGNAL ASICs

Project by:

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Challenges of the mixed signal ASIC Control

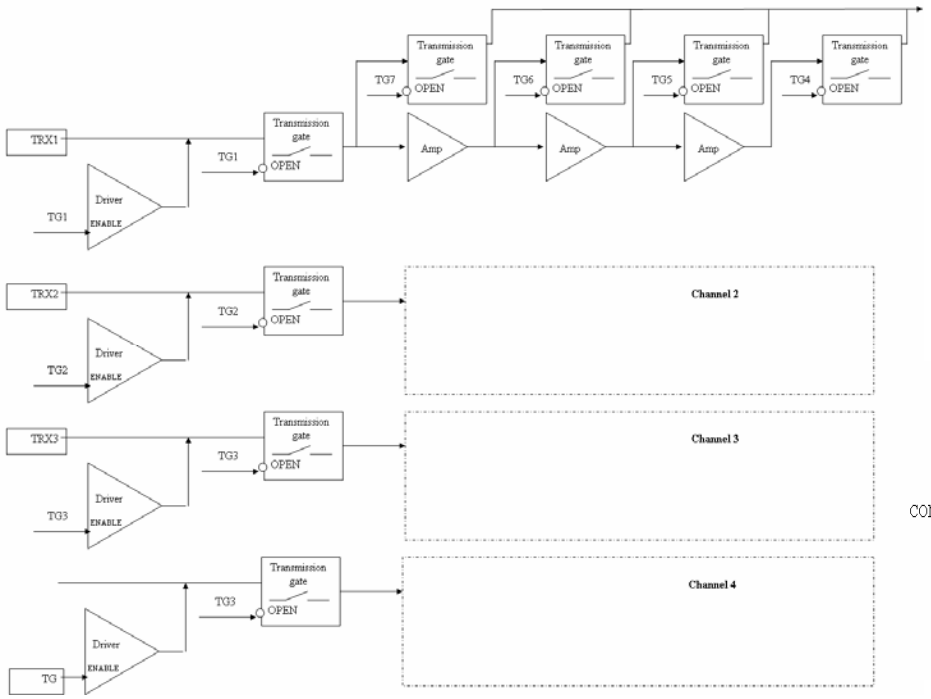
- *Old ASICs – only Analogue*
- *Old ASICs – easy to test*

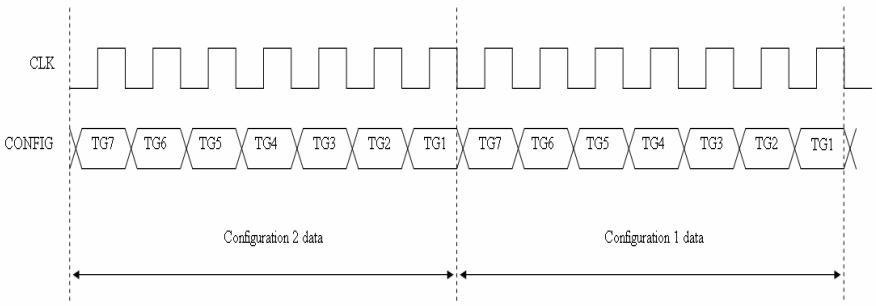
- *This ASIC – designed for Ultrasonic Instrumentation*
- *It's a mixed signal ASIC – integrates both Digital & Analogue parts*
- *Requirement of a special separate board for its testing*

- *We Have To Manufacture The TESTER*

Specific Objectives

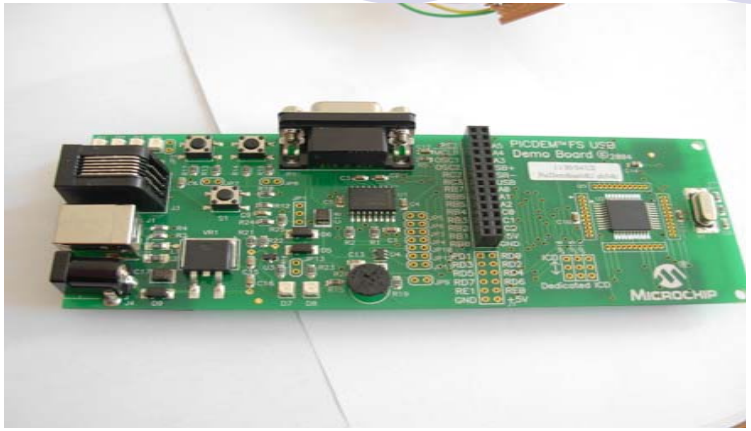
- Study the structure of the ASIC
- Find safe sequences
- Communicate them

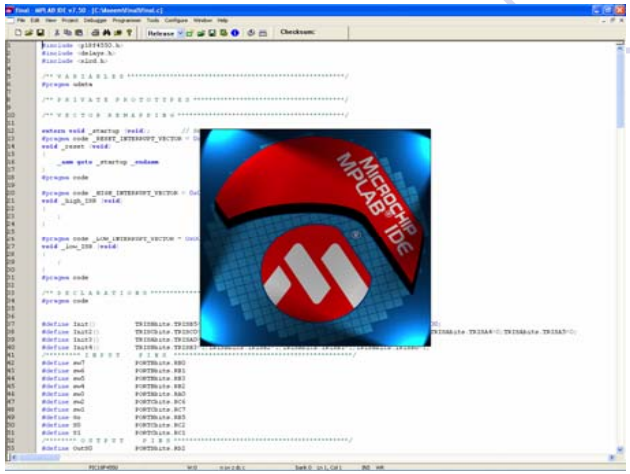




A Solution : Microcontroller Based

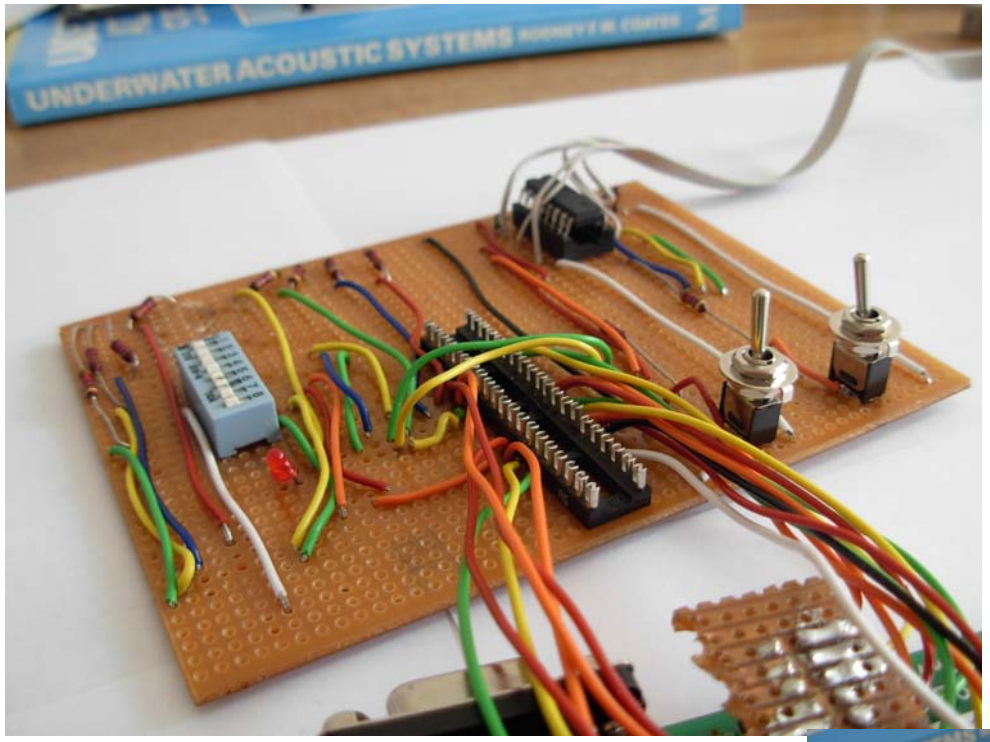
- Custom Board – not a speedy option
- PIC Microcontroller – flexible with many functions
- Free compiler , experience in programming
- Hence decided to use FS USB (hardware) and
- MPLAB (software platform for development)

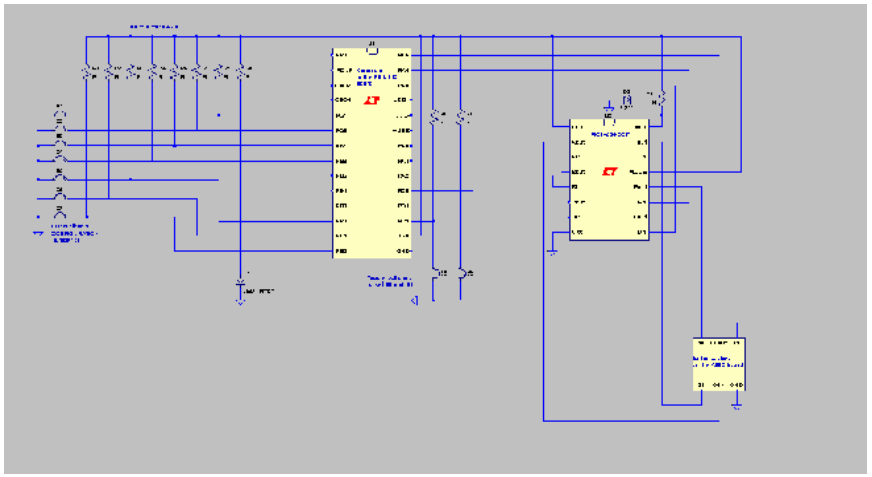


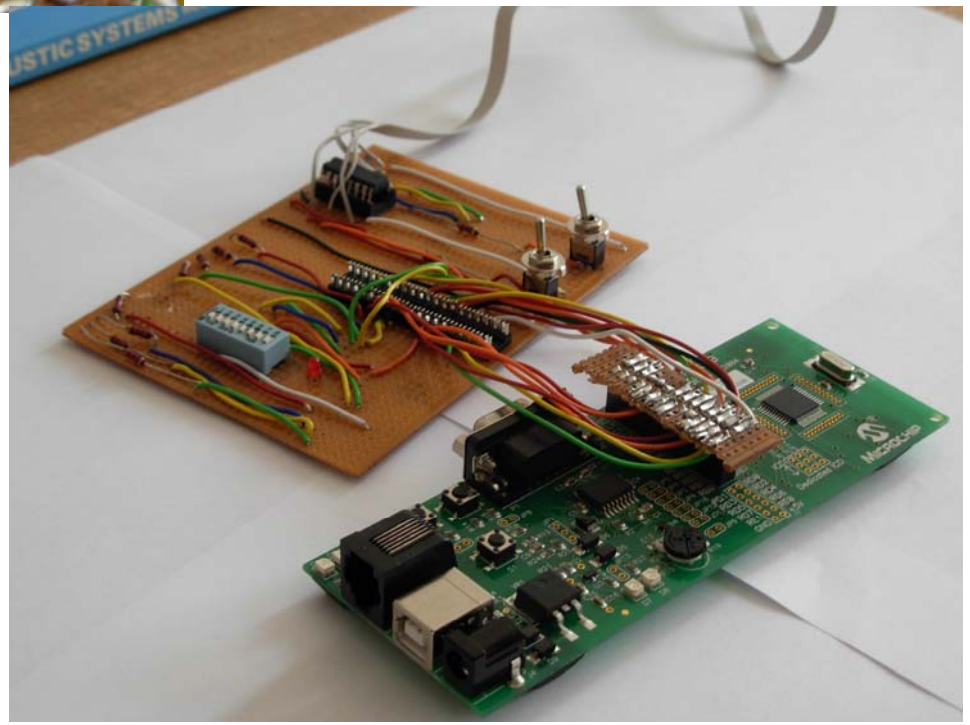


Hardware Development

- *Use of Vero board for quick assembly*
- *Balancing no. of output & input pins : what was required and what was available*
- *Deciding User interface & providing all the necessary support for it*
- *Partition functions between the custom & on board Hardware*


UNDERWATER ACOUSTIC SYSTEMS





Software Development

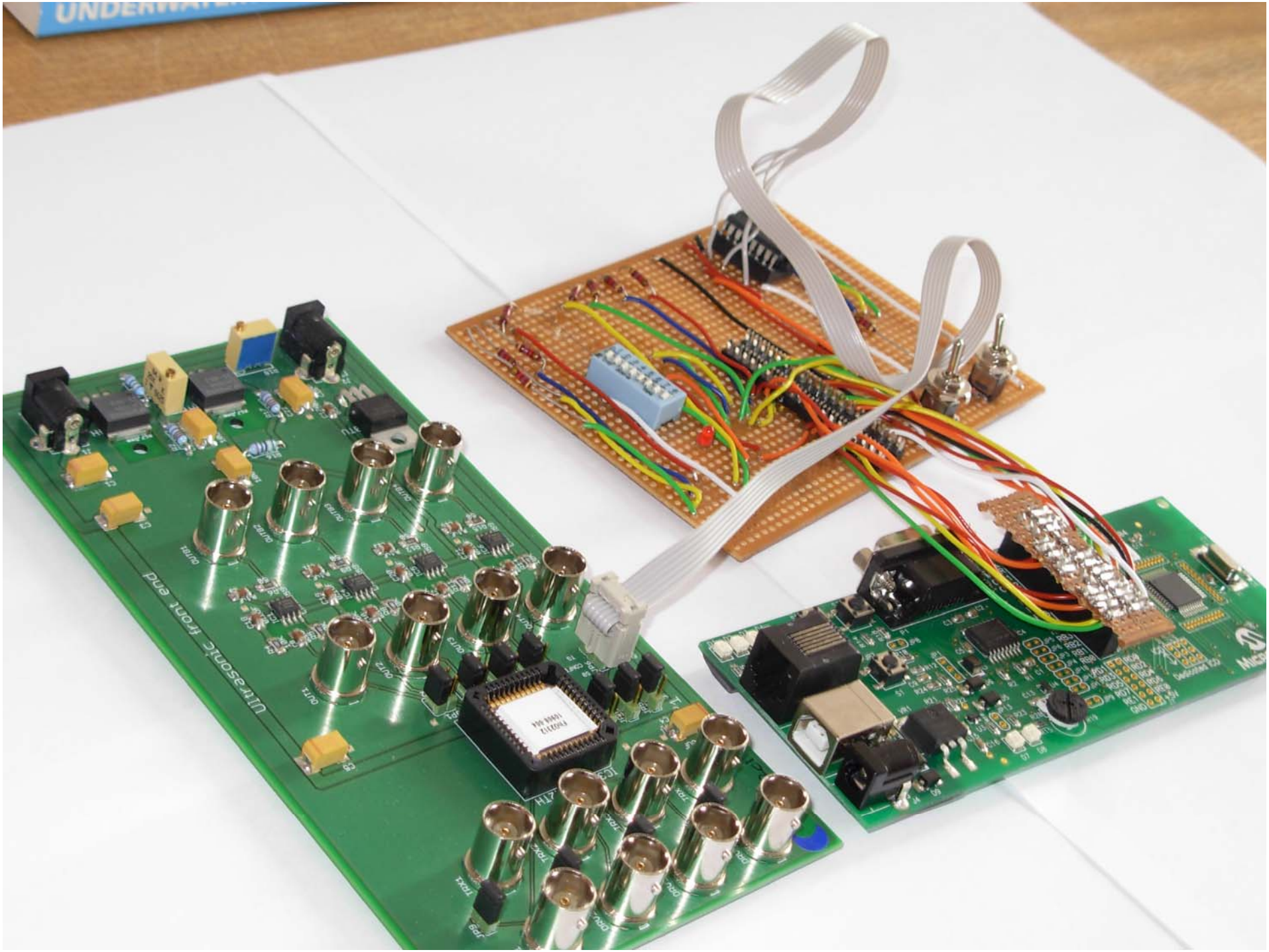
- *Programming in C and use of boot loader*
- *200 lines of code overall*
- *Use of library subroutines for delay and custom subroutines for error checking and communication (bit bunging)*
- *Use of ICD 2 for debugging*
- *Provisions of monitoring the bit sequence using the board*

Problems Encountered

- *Familiarization with programming the FS USB board (boot loader/ICD 2)*
- *Releasing additional input/outputs by modifying the board (cutting traces)*
- *Interfacing TTL to CMOS logic level (dedicated IC)*
- *Debugging Communications: use of measurement equipment first, then software solution*
- *Impossibility to apply a standard keyboard solution for coding configuration bits (they support one switch at a time only)*

The Result

- *A user-friendly interface circuit*
- *Indication of :*
  - *Error conditions*
  - *Sequences*
  - *Configuration bits*
- *A simple to use "Tester" to test the highly advanced ASIC*


Ultrasonic front end

What did I learn

- *Programming and debugging embedded systems*
- *Interfacing and debugging custom additions to embedded systems*

- ***To Sum up, a technique for quick development of one-off devices***