

901217 - Chemical Sensors

Week 51

1. Irene Hu
 - a. Finished tuning snubber circuit for revD baseboard
 - b. Tested inrush current and startup times. Removing inrush circuit for revD baseboard
 - c. Measuring hibernation current for Tiva1290

Week 50

1. Irene Hu
 - a. Hibernation problem with TM4C129 solved by contractor, tested his solution
 - b. Troubleshoot and checked out three new 129 modules
 - c. Rehabilitated remaining two revC baseboards
 - d. Measuring hibernation current using revC baseboard. Unfortunately layout did not solve issue with current spikes when module's hib power is connected to baseboard
 - e. Trying to tune snubber circuit on revC baseboard; two scales of oscillation
 - f. Changes made to revD baseboard, awaiting snubber circuit results
2. Thom Maughan
 - a. Migrating to Tiva 1290 from 123g is in progress. Working through merge issues. Switching between projects is affecting progress. I2C is working, hibernate appears to be working. Irene has tested Jacobs fix but there is work remaining to integrate and test. pH driver is working on 1290 but ISUS driver is not yet working on 1290. Planning Thurs/Fri to work with Jacob (modulo LRAUV project) as his next availability is January.
 - b. 'Dev / Test Box' build quantity has been bumped to six. Provided bill of materials and ordered most of the parts. Ben Davis is taking care of the box build.
 - c. Was pushing to get UW a box on Dec 17 with a preview of the software. Reset the delivery to second week of January and am planning to fly up and meet the UW team.
 - d. In progress on Serial command implementation and test. Working on test plan and command status spreadsheet.

Week 49

1. Irene Hu
 - a. Testing and troubleshooting Tiva129 module; fixed some assembly errors, working on TM4C129 failure to hibernate
 - b. Troubleshooting mcaps with Jess (some 0ohm capacitors)

- c. Troubleshooting and testing MSC3 baseboard revC. 12V regulator seems to work well, some assembly errors
- 2. Thom Maughan
 - a. Working on serial protocol functions. Development on Tiva 123g is getting very tight.
 - b. Transitioning from Tiva 123g to 1290. Line by line code merge / review produced a build that did not communicate on console, suspecting something with the pll or clock setup. Second merge is line by line, but module at a time and now have the interrupt i2c code merged and working on 1290 rapido board.
 - c. Sent Jacob Schloss a RevA Tiva 1290 and an additional Tiva 1290 Rapido v1.2 along with a RevB Baseboard. Emphasis is on getting the hibernate function working and assist on code merge.
 - d. Built up a 2nd 'test box' for use by Jess in calibration. Jess is working on a python version for calibration.
 - e. Used the ESP environmental chamber to characterize the Fiberlite UV lamp from 15C to -15C. Also tested with dew and changing the guard shield distance to the high voltage. Prelim result is Fiberlite can handle the temperature range and frost/dew with little change in output intensity.

Week 48

- 1. Thom Maughan
 - a. Contractor
 - b. Cold testing in ESP environmental chamber
 - c. Serial protocol
 - d. Transition to Tiva 1290

Week 47

- 1. Irene Hu
 - a. Troubleshooting Tiva129 failure to hibernate
 - b. Bug testing for MSC3; look through code
 - c. MSC3 rC baseboard sent out
 - d. Working w/ Jess to set up mcap checkout process for Johnson lab
- 2. Thom Maughan
 - a. Working with contractor and testing code drop on 123g and 1290 hardware.
 - b. I2c low level driver is working on rapid proto 1290 boards. Hibernate / sleep is not yet functioning. Irene is working on revA 1290 and launchpad and has opened support case at TI. Progress is being made
 - c. Software is coming along. Working to get the serial protocol for all commands finished. Irene, Ben and Jess are setup to file bugs
 - d. Working with Ben on 3x builds with pH and Nitrate. One for Dev, One for Test and one for Irene and contractor.
 - e. Thanks to Jim Birch and Nadia for granting access to the big environmental chamber for low temperature testing the deuterium UV lamp.

- f. RevC baseboards should be in by first week in December and we'll begin integration tests soon after.
- g. Working a plan to build more RevA 1290 processor modules.

Week 46

1. Irene Hu
 - a. Checked out and set up all MSC3 Tiva123 modules received from Indtec
 - b. Tiva129 modules received, configured code and uploaded; mostly works. Had to troubleshoot one board (broken oscillator)
 - c. MSC3 revC layout (Jose) almost finished
 - d. Helping set up and troubleshoot the first MSC3 QC box

Week 45

1. Irene Hu
 - a. MSC3 Baseboard rC is in layout
 - b. Parts inventory for MMS Digital Boards next build
 - c. Working w/ Ben on preprogramming chips before sending to Indtec

Week 44

1. Irene Hu
 - a. Tiva129 module sent off for fab
 - b. 12V regulator on MSC3 baseboard received feedback from E2E of "very poor layout". Working on rC of baseboard that cleans up vestigial upstream components. Removing ferrite bead from rB board seemed to get regulator working, but it broke again during probing before could verify
 - c. Concluded tests of ideal diodes / hib power supplies, wrote a writeup, changes made for rC
 - d. Discussed mcap inventory procedure with Jess
 - e. Got Xeltek programmer to work again for MMS digital boards AT17 and PIC programming; working on a writeup for Ben

Week 43

1. Irene Hu
 - a. Tiva1290 module: finished schematic, working with Jose on layout
 - b. Mini ISUS baseboard: mostly done with schematic
 - c. MSC3 baseboard: Troubleshooting 12V regulator continues with help of E2E
 - d. MSC3 baseboard: current measurements for testing ideal diodes for hib power were influenced by noise of nearby PSU... need to redo
2. Thom Maughan
 - a. Major milestone achieved. Both Nitrate and pH drivers are working and an MSC3 is available that can run tests and calibrations. We still have a ways to go on many small details and are changing to the Tiva 1290 processor.

- b. Working with the contractor who is improving the robustness of the i2c driver on Tiva 1290 and working on the NAND flash driver. Shipped a 123g module and baseboard.

Week 42

1. Irene Hu
 - a. MSC3 Tiva 1290 module draft, sent to Thom for checking, negotiating details
 - b. Troubleshooting 12V convertor on MSC3 Baseboard revB. Fails with combo of low Vin (eg 8V) and higher load (~750 mA is where problems appear)
2. Thom Maughan
 - a. Working with Jessica on calibration setup and test harness. Jessica has created a python based MSC test framework. Connected MSC3 and ran pH. Minor fix needed and we'll be calibrating and noise analyzing pH.
 - b. Nitrate driver is coming along
 - c. Contractor Jacob Schloss has reworked i2c for the 1290 Tiva. Next step is NAND flash driver with FRAM caching.

Week 41

1. Irene Hu
 - a. Tiva TM4C1290 module- pinout done, finalizing some things
 - b. Jim is building Baseboard revB. Tiva modules revB built in house were delivered to Thom and work; Indtec is making 20 more
2. Thom Maughan
 - a. pHFETSOS was made open source on 26 Sep 2024 by Ken Johnson and Yui Takeshita
 - b. Working with Jacob Schloss, contractor from Suburban Marine on Tiva1290 and I2C peripheral drivers
 - c. ISUS driver appears to be functioning though it has different timing than the CF2 running the continuous sample menu item. Captured timing and scrutinizing the ported code. Almost 8 months of hard push to get this milestone.
 - d. Approval to make the 3rd rev of rapid proto hardware. This time when JLCPCB handles all the part stuffing with order delays for parts not in stock.
 - e. Still developing for both Tiva 123g and 1290. Will cut to 1290 after getting the HIB working provided all the other drivers work also. pH driver is working on the 1290.

Week 39

1. Thom Maughan
 - a. Nitrate (ISUS) driver is getting close. Finished the init routines and coefficient file loading. Ran out of internal RAM on one set of coefficients that can be removed per Yui. Debugging with print statements is slow, but working.

- b. pH driver is now working with the Jensenian analog sim. Thanks to Irene for troubleshooting a reversed diode on the baseboard.
- c. Tiva 123 revB support. New pinmux scheme is implemented with prelim test. Received two handbuild Tiva 123 RevB on Sep 25 - working! Many thanks to the EETechs for fast turnaround.
- d. Tiva 1290 v1.0 board bringup. Uarts, I2c, microSD are working. Using the 1290 to resolve some of the code porting on the 123 when the single step debugger is needed.
- e. Interviewed a contractor from Suburban Marine. Wrote a PO and working with Ken on details.

Week 38

- 1. Irene Hu
 - a. Tiva module sent out, baseboard in final stages
 - b. Started pinmapping for TM4C1290 replacement
- 2. Thom Maughan
 - a. Isus driver is now scanning spectra, working on timing, formatting output. Working towards calibration in ChemSensors lab. Working on data formatting and serial protocol.
 - b. pH driver is working, output format is close.
 - c. Workstation isus calibration program c source files from Ken.
 - d. Tested two more baseboards, Irene fixed one of them
 - e. Review MSC3 Tiva revB and baseboard revB
 - f. Received TM4c1290 rapid proto Tiva Module. EE-tech assembly and rework for swapped MISO/MOSI. Started porting, board bringup
 - g. Second rev of Tiva 1290 board updated to add development features and fix SPI, sent out for fab 5pm.
 - h. Captured nitrate and pH serial between calibration workstations and MSC1.
 - i. Listened in on GO-BGC Argo float meeting

Week 37

- 1. Irene Hu
 - a. Tiva module and baseboard are almost done with layout
 - b. Working on Tiva module version using TM4C129 alternative, as code for ISUS driver is running into RAM issues
- 2. Thom Maughan
 - a. Conditionally compiled the code to fit in the Tiva TM4c123g code space. Did a bit of buffer shuffling to keep under the 32K limit. Meet with Yui and Ken regarding options.
 - b. Designed and laid out a rapid proto TM4C1290 based processor module. If all goes well, the assembled boards should be at MBARI around Sep 17.
 - c. MSC3 RevA board checkout is complete after getting to the bottom of RTS (PD7) problem. Special GPIO that required an unlock procedure.

- d. Chris B and Jim M helped build a number of sniffer cables and the Saleae proved invaluable (thanks Kent for the tip on use with rs232).
- e. Clocked the first 256 samples from the MMS_Digital (spec board), a big step to the ISUS driver milestone. wahoo!

Week 36

- 1. Irene Hu
 - a. Aadu's visit from UW
 - b. MSC3 design review and ensuing changes to baseboard and Tiva module - now in layout
- 2. Thom Maughan
 - a. Inrush measurements, finalizing revA board bringup
 - b. Inputs to MSC3 revB hardware. Attended Irene's design review
 - c. Meetings with Aadu from UW. Setup and running of float test suite, etc.
 - d. Line termination config for cr vs cr-lf
 - e. Pushing to get ISUS driver running on RevA. Ran out of code space and ram in debug build config which had been identified as a risk using tm4c123g processor. Tm4c129 code compatible variant strongly suggested.

Week 35

- 1. Irene Hu
 - a. Modifications to MSC3 Tiva module and baseboard; new regulator circuit
 - b. MSC3 design review prep
 - c. Inrush current testing - somewhat concerning
- 2. Thom Maughan
 - a. Reworked codebase to add newline config parm for cr vs cr-lf
 - b. Mms spec driver

Week 34

- 1. Irene Hu
 - a. Timing measurements on MSC3 startup and shutdown
 - b. Convo w/ Dana Swift at UW, subsequent circuit mods
- 2. Thom Maughan
 - a. Review of MSC3 tiva module and baseboard schematics. Inrush current measurement, Fiberlite testing for inrush and current usage. Working to understand the large cap.
 - b. Meeting with UW to review system design differences between Persistor CF2 sleep and Tiva hibernate. Learned that the large cap was likely added to prevent power glitches from corrupting the PCMCIA card. Also learned there may be humidity in the float housing.
 - c. UW is ok with the consequences of low power hibernate on RTS from MSC3.
 - d. Auto-sleep feature of pHFET-SOS will need to be disabled.

- e. Aadu from UW will be traveling to MBARI next week. He's bringing the computer I sent with the UW test suite installed. Focus will be on MSC1 testing.
- f. Making interrupted progress on the ISUS driver development. No blocking issues in the hardware and nearly complete on board bringup.
- g. Designed a buck-boost converter with TI Webench tool. Used the design for intern bakeoff. Boards received and tested 21 Aug 2024.

Week 33

- 1. Irene Hu
 - a. Various circuit fixes and modifications to MSC3 Tiva module and baseboard
 - b. Kicked off 40 mcaps and 2 baseboards

Week 32

- 1. Irene Hu
 - a. pH measurements with MSC3 are working after various code fixes
 - b. Coin cell and main battery power consumption tests
- 2. Thom Maughan
 - a. Note: Backlog of missed weeklies.
 - b. Moved from MSC2 (MphOx based) to new MSC3 hardware in 3rd week of June.
 - c. Worked with Irene on board bringup and sorting out RevA issues.
 - d. Designed a small board to add FRAM to the RevA Tiva module.
 - e. Designed a Tiva launchpad daughterboard to open the possibility of outside contractor development of peripheral drivers. Planning to use upwork and/or fiverr. Hoping to invest 6 to 10 hours and save 6 to 10 days development. EETechs have assembled 5 boards.
 - f. Stripped down version of pHFETSOS to remove IP for outside development. Pushed to public bitbucket. Thanks Kent for the bitbucket project support.
 - g. I2C port expander driver working. Testing of MMS Spec and Fiberlite UV source.
 - h. Irene tested the MCAP pH after finding and fixing some software porting issues.
 - i. In progress on ISUS driver
 - j. Inrush current testing of MSC3. Inrush of Fiberlite on MSC3 is less than 0.5 amps. MSC1 has reported inrush of 3 amps, in progress on measurement.
 - k. Software dev resumed on July 31.

Week 31

- 1. Irene Hu
 - a. Troubleshooting on MSC3. Issue with comms while plugged into baseboard traced to strange behavior of reset, disappeared after various troubleshooting measures
 - b. Testing pH comms with MSC3. Hardware is built, need to update code

Week 30

1. Irene Hu
 - a. Taking over TIVA module from Thom while he's gone. Thom fixed I2C problem in code. Next hangup in init traced to bad grounding of oscillator (schematic copy-paste error). Next to tackle is hangup during hibernation

Week 29

1. Irene Hu
 - a. Troubleshooting MSC3 Tiva module. Previous connector was mirrored. Inability to load code traced to watchdog, fixed with some jumpers
 - b. Soldered FRAM boards for Thom and worked out connections, but board is having I2C issues

Week 28

1. Irene Hu
 - a. Troubleshooting MSC3 baseboard - faulty connections on load switches
2. Thom Maughan
 - a. Working on Tiva processor module
 - b. USB power supply and portable dev environment to enable round the globe/clock dev.
 - c. Working on tracking milestones for Ken/Yui/Kent.

Week 27

1. Irene Hu
 - a. Minor assistance for Thom in setting up MSC3
2. Thom Maughan
 - a. MSC3 processor and baseboard were delivered on Thursday 27 June 2024.
 - b. Moving from MSC2 hack board to MSC3.
 - c. Schedule pressure is high and balance between proposal efforts and MSC3 efforts.
 - d. Working on MSC3 hardware bringup with Irene and hopefully Irene can help with some of the software tasks. Pushed pHFETSOS to bitbucket. Built up a portable dev setup for remote work.
 - e. Mooring ISUS is functioning and returning data.