electronics-lis

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Services, products and expertise in: Concept, design and manufacturing of electronics and mechatronic systems

Control Driver (PIC32MK)

In development

CD control driver-PIC32MK (top and bottom sides)

Emergency loops configuration:
1. Isolated Enable input
2. Isolated State output

CAB 2.0B bus isolated interface (non populated):
1. High Speed (1MHz),
2. Separated supply (internal DC/DC converter)
3. Manual or Software termination resistor switching

High Speed isolated RS485/422 (non populated):
1. Bidirectional: can be applied as Modbus interface, synchronisation for CAN bus or SPI (Clock and Mosi/Miso).
2. Master/slave configuration by SW.
3. Termination resistor switched by SW

Supply configuration: USB or external:

High Speed isolated USB to UART (Rx/Tx):
High Speed USB interface to PIC32MK

Enable, State, CAN bus, RS485/422, PIC32MK's USB, Microchip debugger and Programming, USB-to-UART, 4 digital I/O:
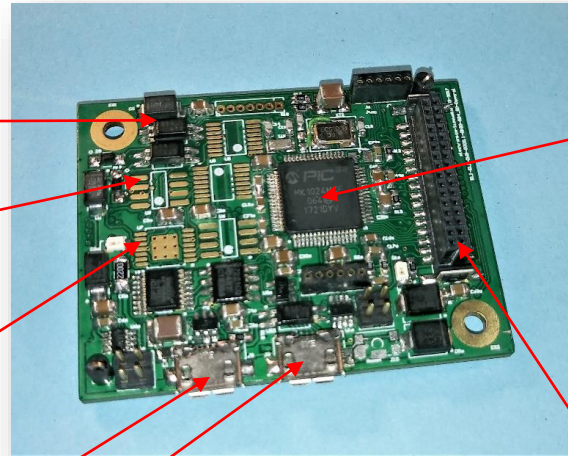
CPU: PIC32MK1024MCF/GP064

1. 32 bits floating-point, DSP, 120 MIPS
2. single-Cycle MAC, MPY and Mixed-sign MUL
3. Hardware divide and 32 bits Multiply support
4. 4kb EE, 1024kb program and 256 kb RAM memories
5. USB module
6. High precision PWM (8.32 [ns] resolution)
7. 4 x CAN bus module
8. 6 x 32-bits Quadrature Encoder Interface
9. 6 x high speed (50 [MHz]) SPI, I2S
10. 7 x 12-bits ADC and 3x 12-bits DAC
11. Large DMA possibilities including separated RAM memory
12. AEC-Q100 revision
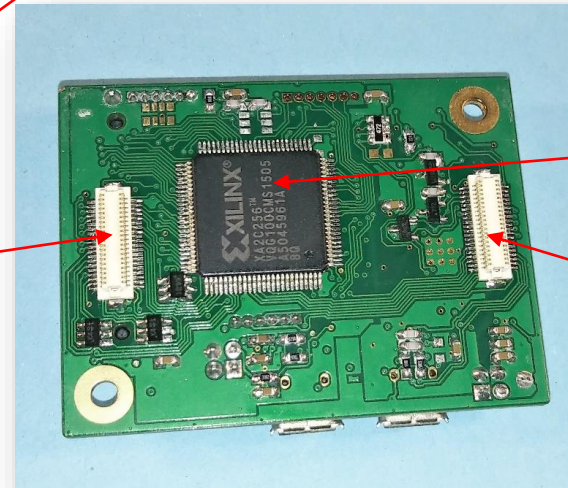
18 x ADC, 2 x DAC, I2C, 16 programmable (CPLD) digital I/O

CPLD: 256 Macrocells, 6000 gates (reprogrammable digital interface to given application)
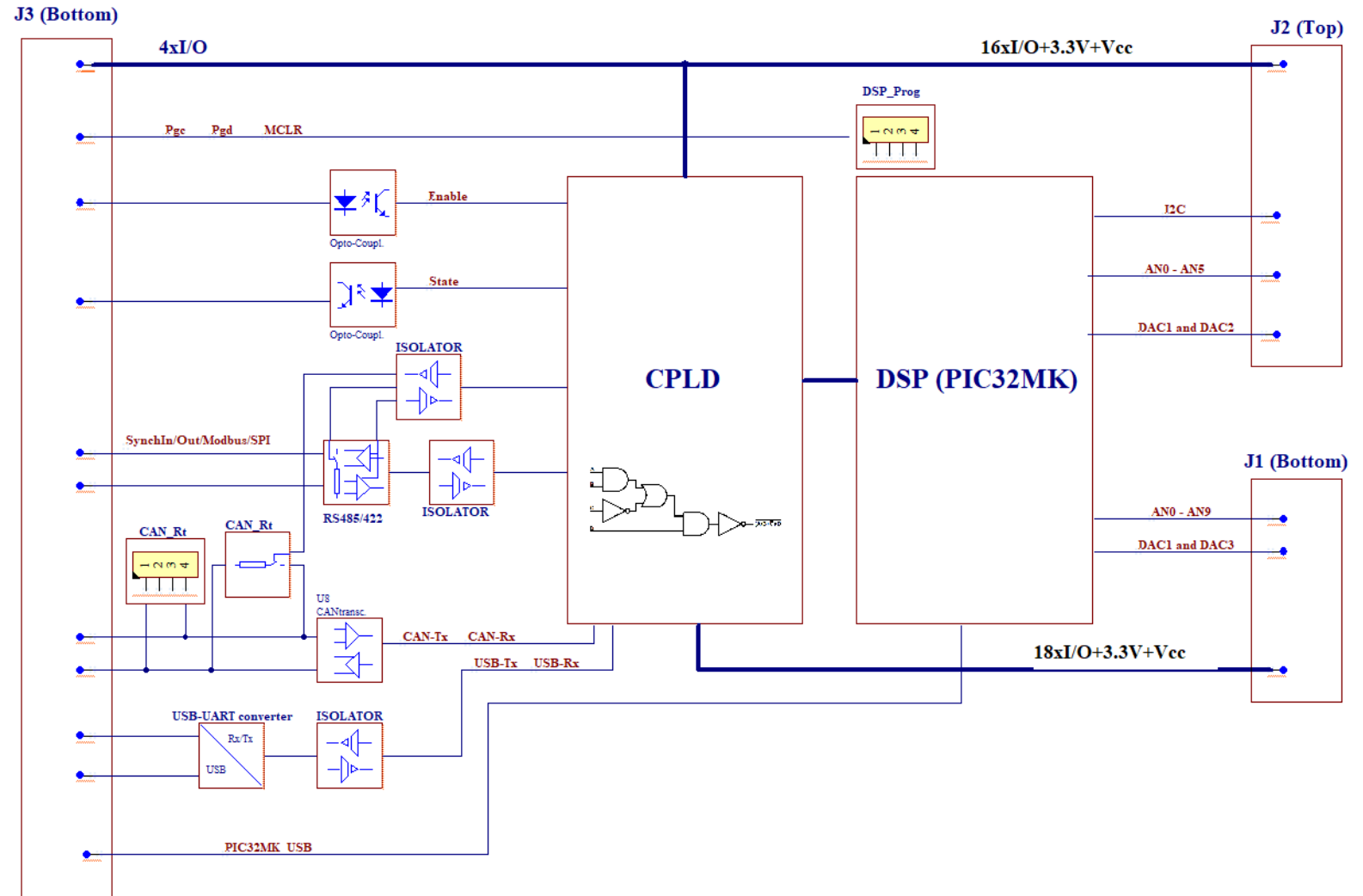
16 bits I/O bus: configurable (CPLD) 0-3.3 [V], **I2C bus, 6 x ADC** and **2 x DAC**
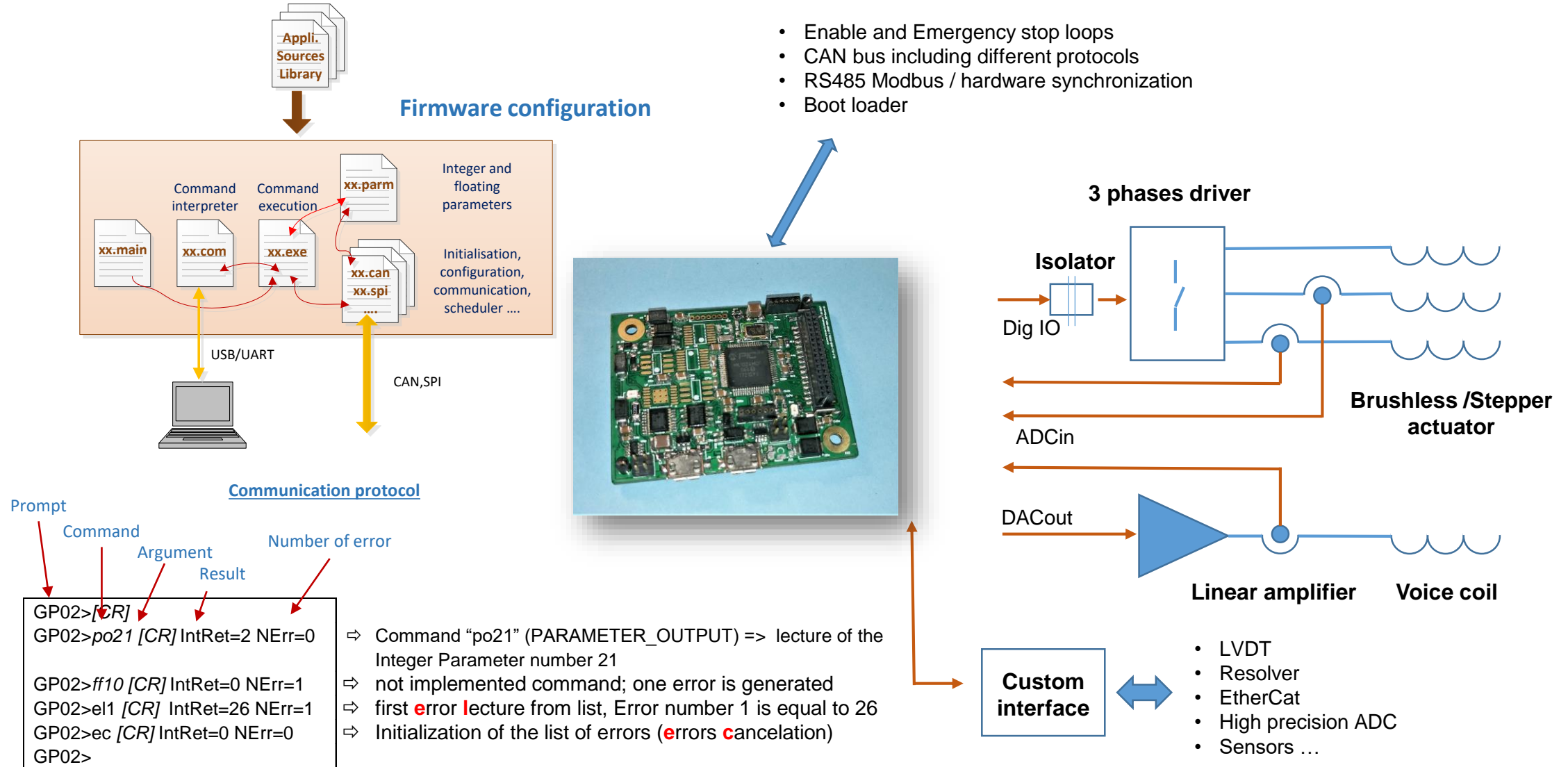
CD control driver-PIC32MK(block diagram)

J2(Top)

J1 and J3
(Bottom)

J3 (Bottom)

4xI/O

16xI/O+3.3V+Vcc

J2 (Top)

Pgc   Pgd   MCLR

DSP_Prog

Enable

Opto-Coupl.

I2C

State

AN0 - AN5

Opto-Coupl.

DAC1 and DAC2

ISOLATOR

CPLD

DSP (PIC32MK)

SynchIn/Out/Modbus/SPI

ISOLATOR

RS485/422

J1 (Bottom)

CAN_Rt   CAN_Rt

AN0 - AN9

DAC1 and DAC3

U8
CANtransc.

CAN-Tx   CAN-Rx

USB-Tx   USB-Rx

18xI/O+3.3V+Vcc

USB-UART converter   ISOLATOR

Rx/Tx

USB

PIC32MK USB

CD control driver-PIC32MK (motion control applications)

Appli. Sources Library

Firmware configuration

- Command interpreter
- Command execution
- **xx.parm** — Integer and floating parameters
- **xx.main**
- **xx.com**
- **xx.exe**
- **xx.can**
- **xx.spi**
- .... — Initialisation, configuration, communication, scheduler ....

USB/UART

CAN,SPI

- Enable and Emergency stop loops
- CAN bus including different protocols
- RS485 Modbus / hardware synchronization
- Boot loader

3 phases driver

Isolator

Dig IO

ADCin

DACout

Brushless /Stepper actuator

Linear amplifier   **Voice coil**

Communication protocol

- Prompt
- Command
- Argument
- Result
- Number of error

```
GP02>[CR]
GP02>po21 [CR] IntRet=2 NErr=0

GP02>ff10 [CR] IntRet=0 NErr=1
GP02>el1 [CR]  IntRet=26 NErr=1
GP02>ec [CR] IntRet=0 NErr=0
GP02>
```

⇨ Command "po21" (PARAMETER_OUTPUT) => lecture of the Integer Parameter number 21
⇨ not implemented command; one error is generated
⇨ first **e**rror **l**ecture from list, Error number 1 is equal to 26
⇨ Initialization of the list of errors (**e**rrors **c**ancelation)

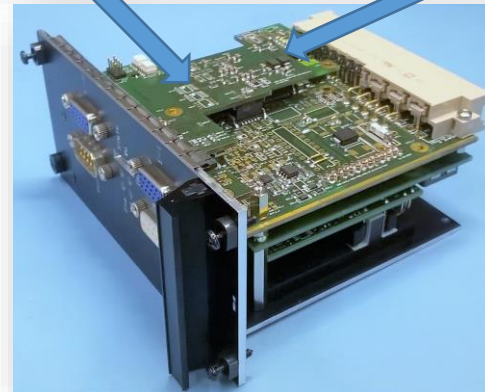**Custom interface**

- LVDT
- Resolver
- EtherCat
- High precision ADC
- Sensors …

The Intelligent Motion Control System (**IMCS**) is a cost and time effective solution to implement simple or complex and high-performance motion control/test systems or prototypes.

Customized:
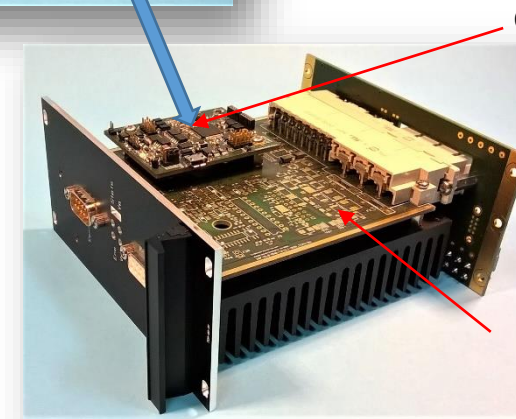- **Short time development, test and verification applications**
  - **Specific implementation**

The Control Driver (CD) is an autonomous controller DSP-CPLD based which combine all the functions necessary to control one actuator or custom applications

The Intelligent Motion Control Unit (IMCU) is a DSP and CPLD based controller suitable for a large spectrum of control applications. Its modular design includes:
- common for all applications main board (**MAIN**),
- designed for each specific application mezzanine (**MEZZ**)
- range of power amplifier(s) (**PA**)

Control (active) extension

Customized for given application (passive) amplifier

Versatile:
- **Research, development and test platforms**
- **Singular industrial, robotics and mechatronic applications**
  - **Educational platforms (student and PhD works)**

Customized:
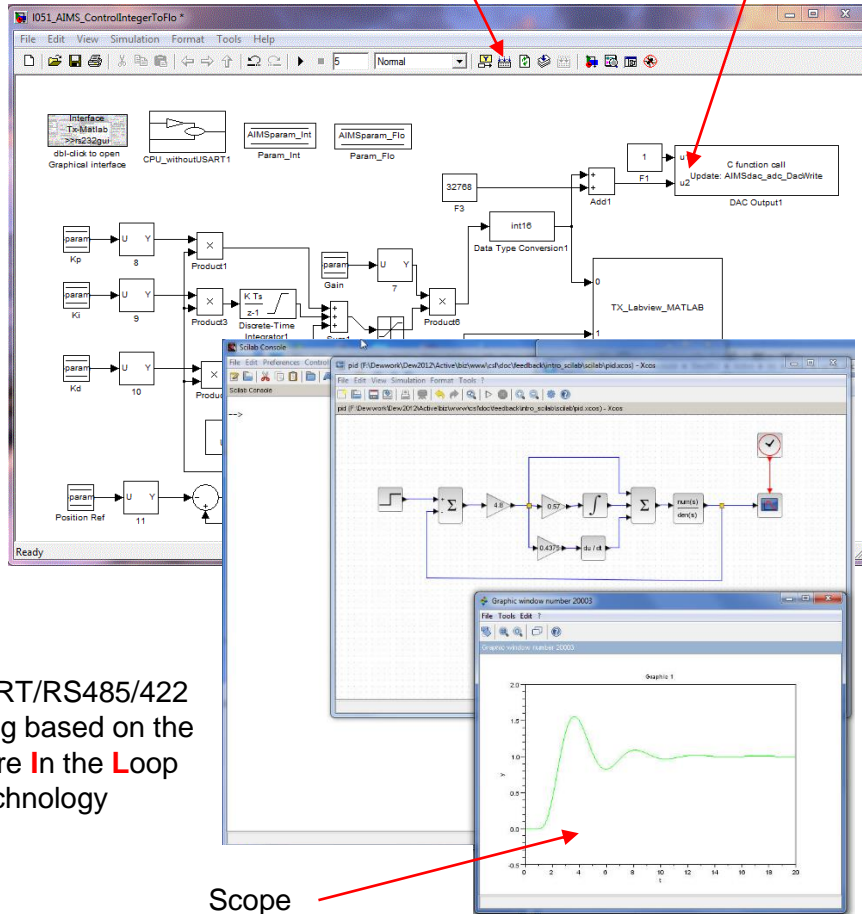- **Short serial manufacturing**
  - **Cost optimization**

SW development (RealTime and application)

Real Time

Simulation model

OneClick direct programming

Application function call

USB/UART/RS485/422 monitoring based on the **H**ardware **I**n the **L**oop technology

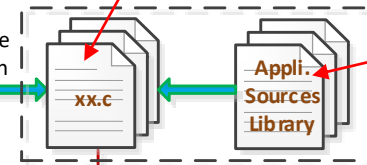Scope

Application

User's application

Provided firmware including all necessary drivers and initialization procedures
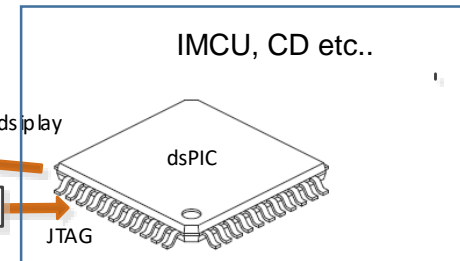
Direct code generation

xx.c

Appli. Sources Library

Assembler Compiler

Linker

xx.hex

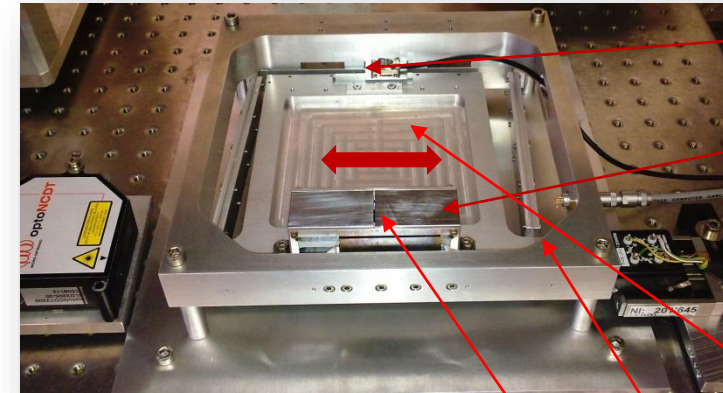UART for dsiplay

Tool

JTAG

IMCU, CD etc..

dsPIC

Main feathers:

1. Microchip's development (MPLAB), compiler (XC16), JTAG and boot loader programming tools
2. Large application libraries and demos
3. Windows and Linux platforms
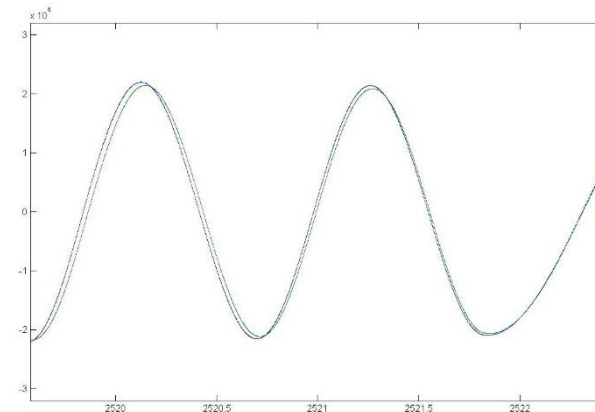4. Possibility of the Ethernet and e-Cloud configurations.
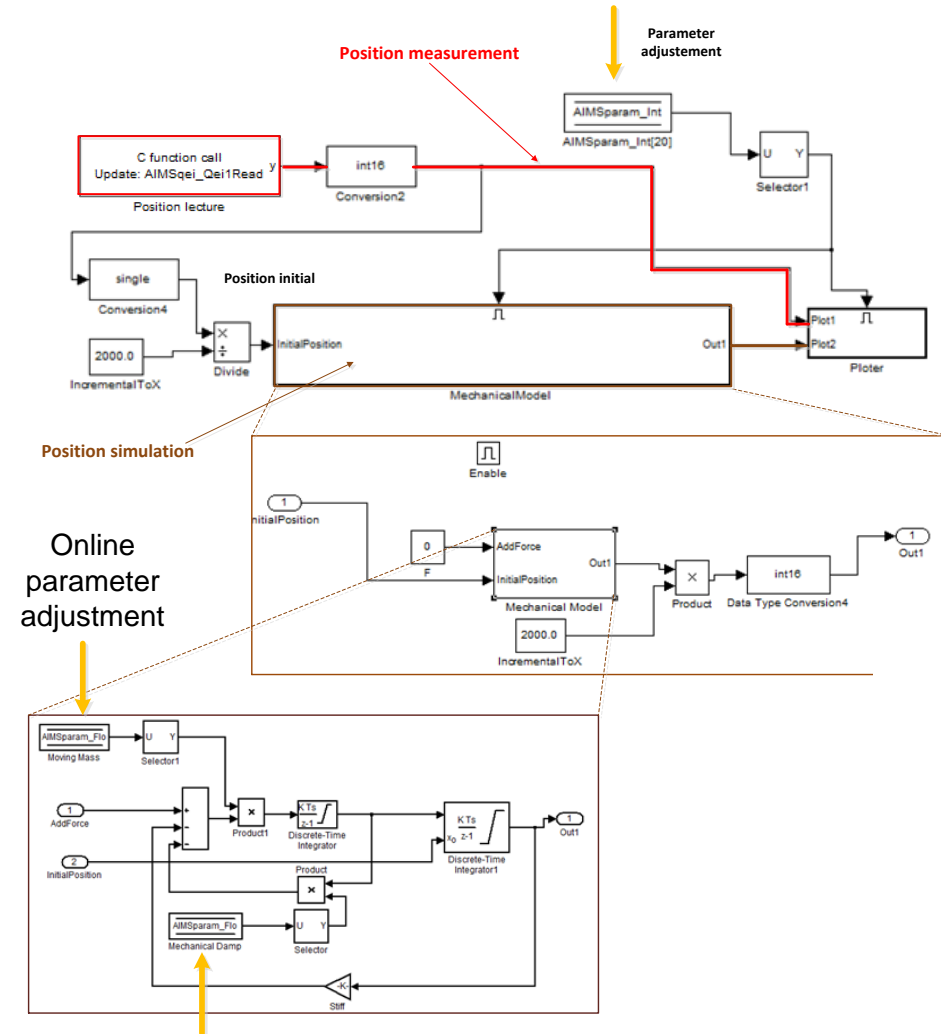
Flex mechanic (very low friction and stickiness)

Position sensor

Linear actuator

k

m

Actuator (k_i)

Simulated on the DSP and measured by DSP position comparison (free oscillation)

3 phases driver

Isolator

Dig IO

ADCin

Brushless /Stepper actuator