Implementation of the control system and the data processing logic for the mass flow controller of the MWIS

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The control system for the DMFC of the MWIS

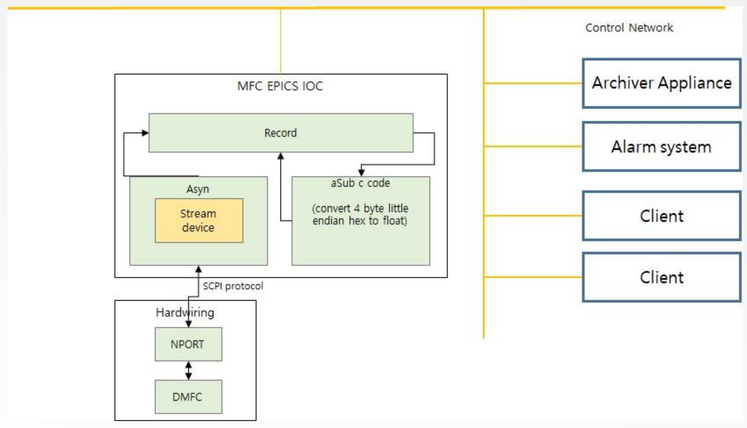
The specification of the DMFC and the KOMAC

- 100MeV, 20mA (Peak current) proton linac accelerator
- The injector is a microwave ion source with the extraction voltage of 50kV
- The MFC can control and read the hydrogen gas flow rate

Hardware spec.	
Max flow	10
unit	SCCM
Gas	H2
Pressure range	1~3 (kg/cm^2)
Supply voltage	+15V or +24V
Communication setting	
Baud rate	9600 bps
Data bits	8
Stop bits	1
Parity	None
Interface	Rs-485 2-Wire

The KOMAC control system

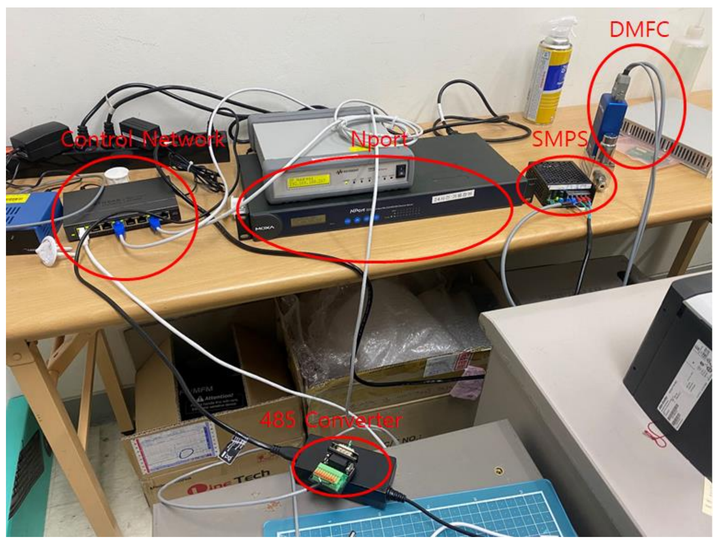
- Based on Experimental Physics and Industrial Control System (EPICS) framework
- The Input Output Controller (IOC) is a distributed system based on EPICS
- Process variable : about 18500 ea
- Timing system provides pulse until 60Hz repetition that's maximum repetition
- The communication protocol is configured using SCPI commands based on EPICS IOC



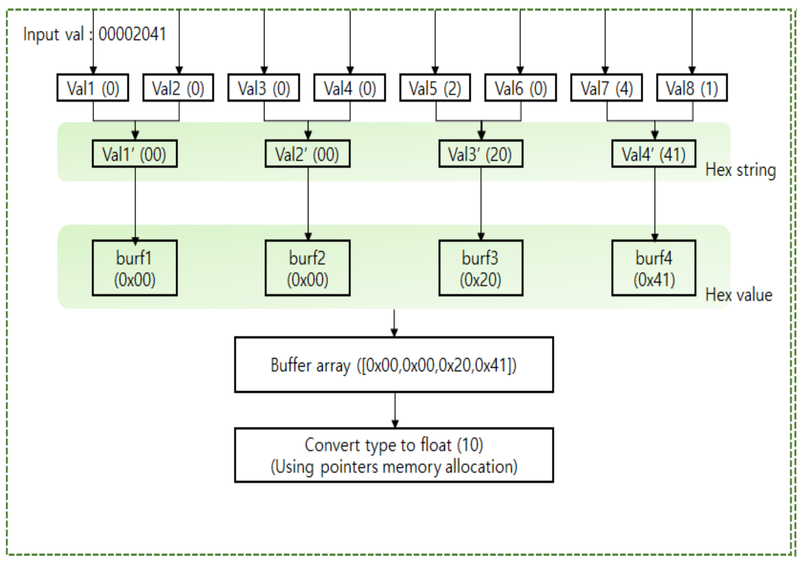
The DMFC control system and the data processing logic

Development Environment

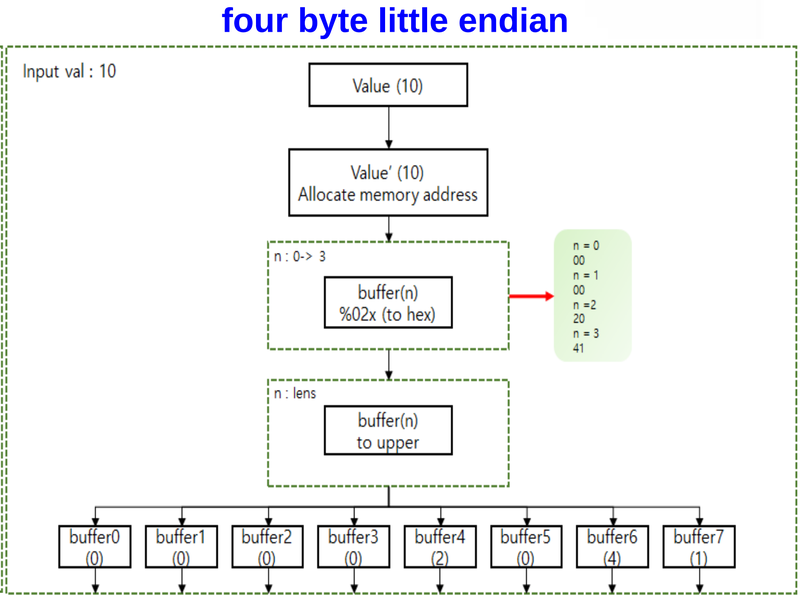
- Centos7 64bit
- Epics base 3.15.6, Asyn 4.34 streamdevice master, seq 2.0.2
- The devices were installed on the test bench for communication test



The type is changed to float

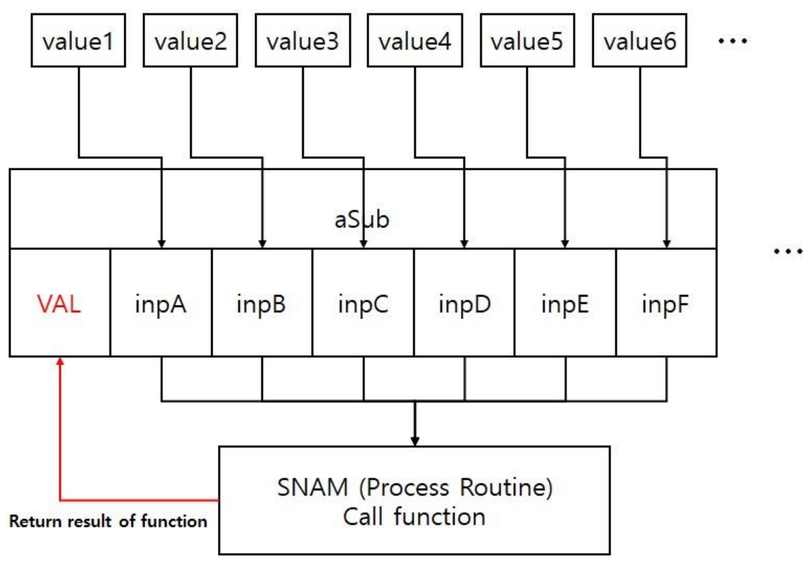


The format is changed to four byte little endian



The method of the data processing

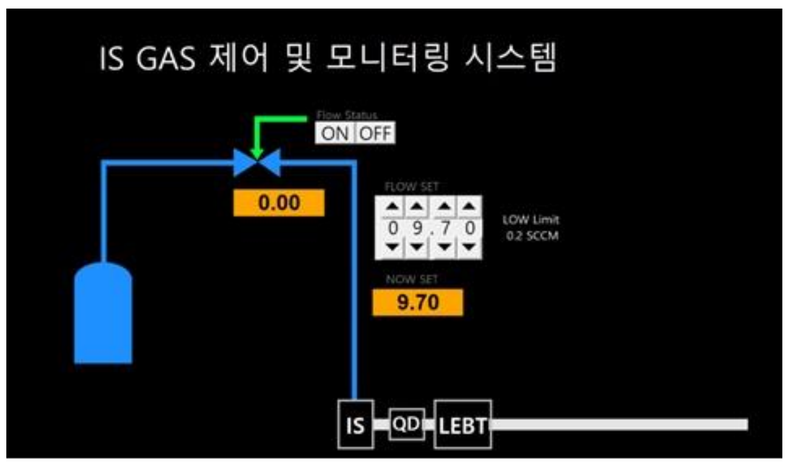
- Protocols were written as a command frame generated in hexdecimal
- When the device sends the data about the flow rate and set value, the data is formatted to 4 byte little endian hex value. The value is changed to ASCII format under the sending and receiving. So each place value needs to be understood to a string value. Each string sends from the protocol to the string record. And each string record sends the value to aSubroutine record. This record works conversion function that is built by c language.



The integrated interface and the interlock system

The integrated interface

- The interface is designed using the Control System Studio (CSS) tool based on Java eclipse]
- The functions are displayed which are the control on/off, digital mode, flow rate value, and set flow value



The interlock system

- If the ion source trip breaks out when the MWIS was operated, the gas flow must have been blocked immediately
- The interlock system is configured based on a Sequencer module that is built c language
- The interlock system monitors the degree of ion source vacuum at all times
- If the value is reached to limit, the block command sends to the IOC