FC1
Flow Cell Controller

Customize Your Own Controller Now!

- *Gas or liquid flow speed control*
- *Flow on/off control*
- *Temperature control*
- *External humidifier control (gas flowing on/off, dry/wet gas selection etc.)*
- *Rotator control*
- *External potentiostat/galvanostat or electronic load control*
- *Customized design avaliable*

Flow Cell Controller
for control and monitoring 3rd party devices

The FC1 Flow Cell Cntroller is a basic controller from SMART2 fuel cell test system controller family and it is specially designed for process control purposes. It is suitable for operating parameters for other devices such as MFC, heating device, solution supply pump, rotator, etc. For example, user can build his/her own system for monitoring flow cell performance by connecting relevant components and equipments.

Main Board

Digital Input(DI)
- for emergency button
- for level sensing

Digital Output(DO)
- for SSR control
- for valve control

Analog Input(AI)
- for temperature measurement
- for flow rate measurement
- 2x universal analog input port (10V DC)

Analog Output(AO)
- for flow rate control
- 2x universal analog output port (10V DC)

Additional Modules

- MFC Module, GM1
- Temperature Module, TM1
- Humidifier Module, HM1

It contains two general purpose AI(analog input)/AO(analog output) in the range of 0 ~ 10V, which are located on the front panel and other signal in/out ports on the back panel. And it communicates with a computer by the way of a Local Area Network(LAN).

The FC1 supports various safety features including watchdog, emergency button, limit values, etc. for both personal safety and instrument protection. A GUI(graphical user interface) provides an easy-to-use powerful interface for novice and adavanced users.

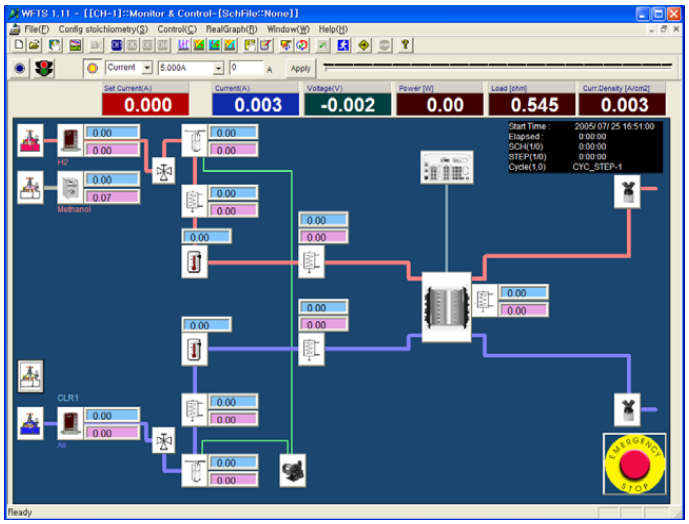
Flow Cell Controller, FC1

Features

- Compact design
- Allows user to easily customize a truly unique controller for a flow cell system.
- A flow cell controller with 2ea analog inputs and 2ea analog outputs
- A software with powerful graphical user interface.
- The various safety functions are provided to protect the cell and system from being damaged.
- LAN communication

WFTS™ Software

The WFTS™ software consists of server program to communicate with system, main program to control & data acquisition and data managing program for analysis. Automatic control and data acquisition is conducted through pre-programmed single or group schedules in the software.



- Quick and easy test configuration
- Real-time graphic data output
- User friendly graphical user interface
- Continuous data logging
- Background server program
- Independent data managing software
- Button click & play mode
- VOI (Value of Interest) displaying selection
- Colorful display of each module status
- Setting/reading value display

Flow Cell Controller Usage Examples

Fuel Cell Test Application

System Configuration

- *MFC(Mass Flow Controller)*
- *Methanol pump*
- *Humidifier*
- *Electronic load*
- *Back pressure regulator*
- *Temperature measurement*
- *Pressure measurement etc.*

Redox Flow Batteries Application

System Configuration

- *Liquid flow control*
- *Temperature control*
- *Potentiostat/Galvanostat*

RDE(Rotating Disk Electrode) Test Application

- *Rotating System(RPM Control)*

Chlor-Alkali Process

- *Pump control*
- *Temperature control etc.*

Flow Cell for Electrochemical Synthesis

- *Pump control*
- *Temperature control etc.*

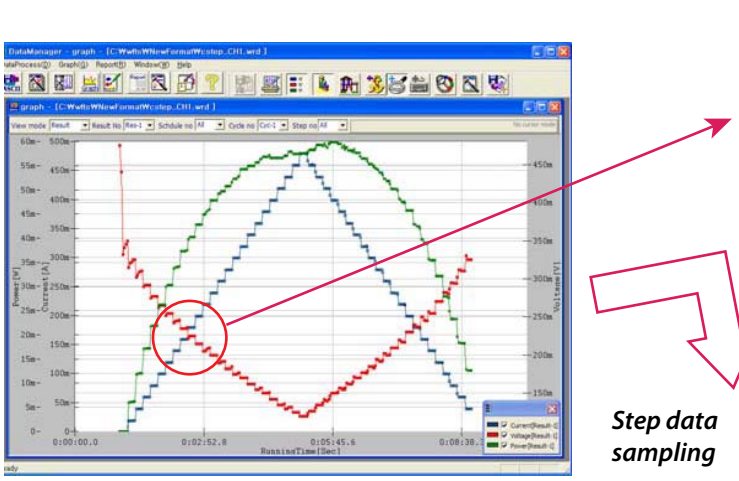
Solid State Battery Application

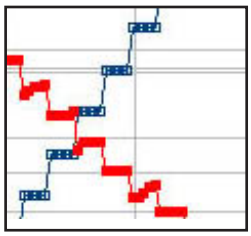
Data Manager

Independent data analysis program for WFTS software.

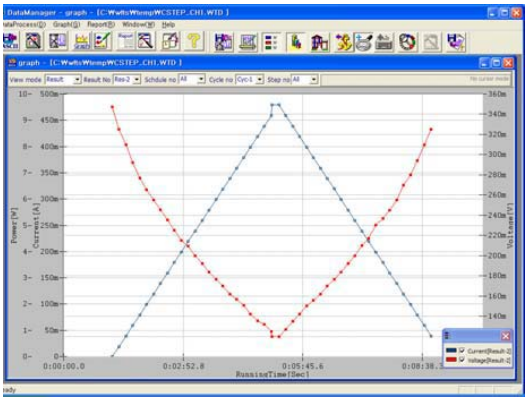
Multi Y Axis Graph

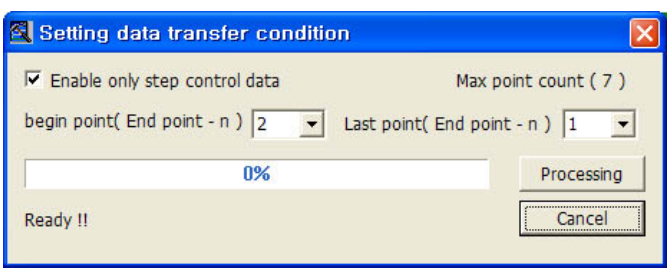
User selectable time base 4 Y axis graph.
Any of measured parameters can be selected for each axis.





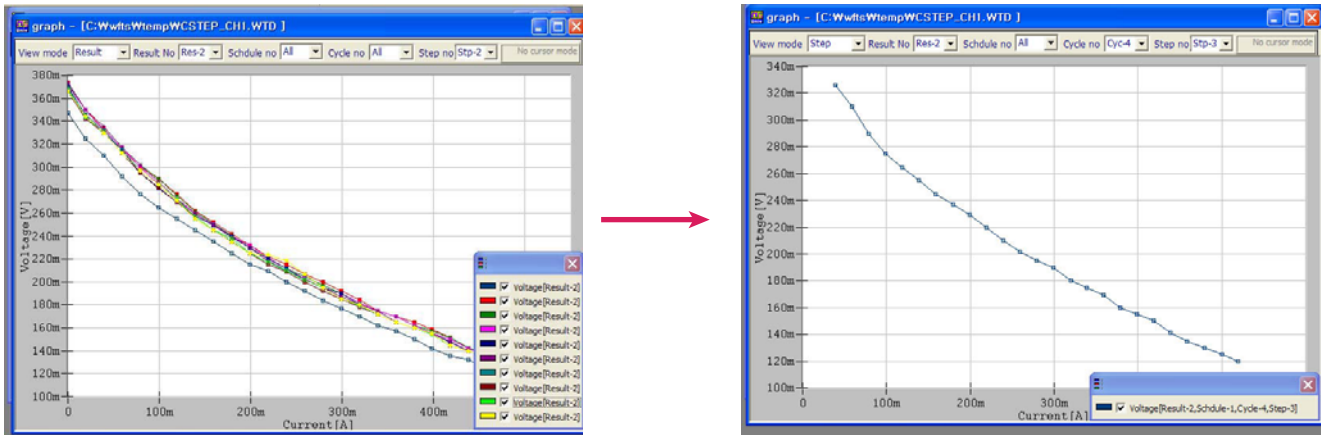
Step data sampling





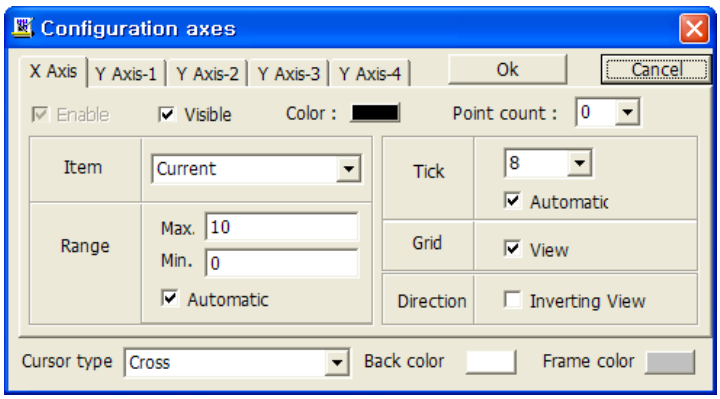
Graph Parameter Selection

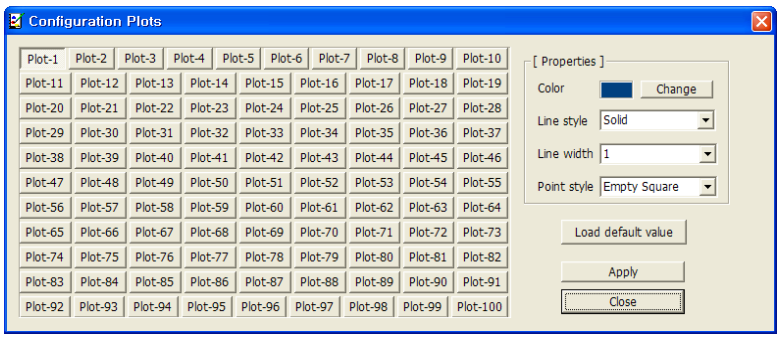
- View mode selection : result/schedule/cycle/step
- Result number selection
- Schedule number selection
- Cycle number selection
- Step number selection



4th cycle, 3rd step selection

- Axis & plot configuration





Flow Cell Controller, FC1

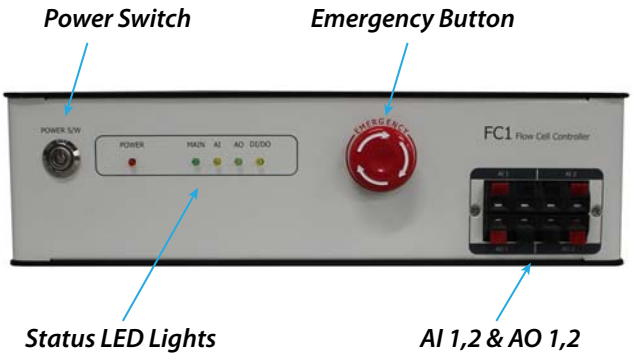
General Specifications

Analog to Digital Converter(ADC)	
Resolution	16 bit
Input voltage range	10V
Digital to Analog Converter(DAC)	
Resolution	12 bit
Output voltage range	10V
Data Sampling	
Max. sampling interval	1 sec
Interface	
Communication	TCP/IP (LAN) communication

Front Panel

Analog In(AI) Port, 2ea	
Connection	2 speaker terminal blocks
Input voltage range	0 ~ 10V
Input impedance	10 GOhms
Analog Out(AO) Port, 2ea	
Connection	2 speaker terminal blocks
Output voltage range	0 ~ 10V

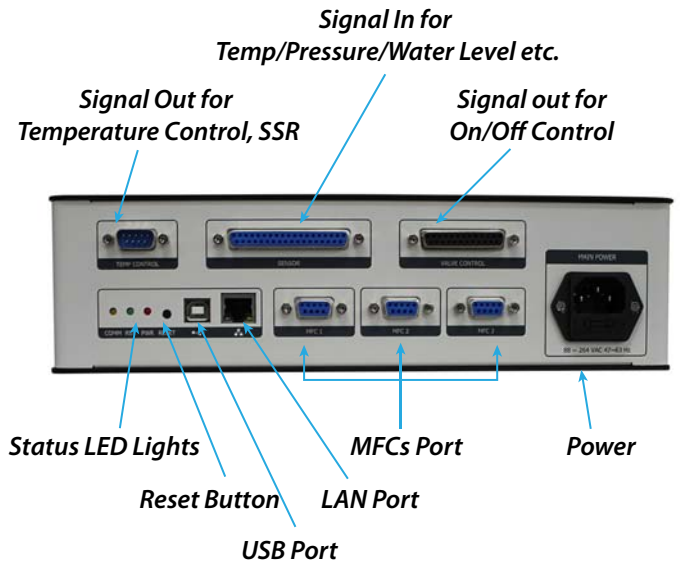
Front View



Rear Panel

MFC Port, 3ea	
Connection	D-sub 9 pin(female)
Flow control by AO	0 ~ 5V analog signal out
Flow monitoring by AI	0 ~ 5V analog signal in
MFC control power	+15V, -15V
Temperature Control Port	
Connection	D-sub 9 pin(female)
Temperature control by DO	signal relay & SSR, temp. module required
Temperature control	PID control
Sensing Port	
Connection	D-sub 37 pin(female)
Analog input	11ea
Analog input range	0 ~ 10V
Digital input	2ea
Default setup, AI	
For temperature sensing, 7ea	amplifier for thermocouple signal (temp. option) required
For pressure sensing, 4ea	pressure sensor(4~20mA output) required
Default setup, DI	
For level sensing	humidifier required for water level monitoring
Valve Control Port, 12ea	
Connection	D-sub 25 pin(female)
Valve control by DO	solenoid valve required
Control voltage	AC220V(default), DC 12V or 24V(option)

Rear View



System configuration can be customized upon request.

MFC Module GM1, Option

Connection	D-sub 9p(female), 3 ports
Component	MFC, valves, tubings
Max. number of MFCs	3ea
Max. flow rate	within range of 100 ~ 5000 SCCM user selectable
Control range	2% to 100% of full scale
Accuracy	± 1% full scale
Gas supply pressure requirement	3 bar(43.51psi)
Tubing material	SUS 316
Fitting	DK-LOK, 1/4"

Temperature Module TM1, Option

Temperature Control & Monitoring	
No. of ports	7ea
Temperature control	by SSR (PID control by FC1 controller)
Temperature sensing	
Sensor	K-type thermocouple
Signal amplication	0 ~ 10V output(10mV/℃)
Temperature range	0 ~ 1000℃
Accuracy	±1℃
Temp Monitoring Only	
No. of ports	7ea
Temperature sensing	
Sensor	K-type thermocouple
Signal amplication	0 ~ 10V output(10mV/℃)
Temperature range	0 ~ 1000℃
Accuracy	±1℃

Humidifier Module HM1, Option

Temperature Module TM1 is included.	
Type	membrane type (Nafion tube used)
Bottle size	2x 1L(anode & cathode)
Base material	stainless steel pipes, KS D 3576
Top material	SUS 304
Sealing	silicon gasket
Insulation material	urethane foam
Temperature control by DO	signal relay & SSR, temp. option required
Temperature control	PID control
Heater	band heater, 500Watt
Tubing material	SUS 316
Fitting	DK-LOK, 1/4"
Water supply	automatic control with a level sensor
Temperature control	by SSR(PID Control by FC1 controller)
Temperature sensing	
Sensor	K-type thermocouple
Signal amplication	0 ~ 10V output(10mV/℃)
Temperature range	0 ~ 1000℃
Accuracy	±1℃
Line heating available	

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