

EPICS based remote control system for ECR-IS & LEBT in SCL Demo at RISP

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EPICS Collaboration meeting at SNS in Oak Ridge, Tennessee





SCL Demo overview

- SCL Demo has 7 sections, ECR-IS, LEBT, RFQ, MEBT, QWR cryomodule, RF and diagnostics sections.
- ECR-IS, LEBT and RFQ sections were installed.
- 9 RFQs aligned and SSPA for RFQ is installing.
- Utilities are running.



Project schedule (ECR-IS & LEBT control)

- The date of ECRIS beam extraction experiment was July 1st.
- ECR-IS & LEBT control system project launched at end of March.
- ECR-IS remote control system is running for beam extraction experiment at SCL Demo.



Remote control system scheme and strategy

- Local control system is based on EPICS, and PLC control DI/DO and 4 analog signal.
- We use RS232 protocol in local control system.
- Local control system used serial server and PLC, and it is integrated to EPICS.



ECR-IS & LEBT Section

- ECR-IS and LEBT section has three different high voltage levels.
- It shows devices at each high voltage sections.



ECR-IS & LEBT Local Control Structure

- ECR-IS & LEBT remote control system is composed by 3 different high voltage levels.
- 70kV : Vacuum devices, HVPS, Step motor system for gas feeding.
- 50kV : Vacuum devices, Superconducting magnet PS, HVPS, Level monitors, Temperature monitors, Pair solenoid PS.
- Ground : PC, PLC, Volt meters, Dipole magnet PS, Steering magnet PS, Vacuum devices, HVPS for EQT, HVPS for EQD.



Control Racks for ECRIS & LEBT section

• The date of ECR-IS beam extraction experiment was decided to July 1st.



ECR-IS & LEBT section devices and protocols

• 21 kinds of devices are integrated to local remote control system. Total number devices are 61.

Devices	# of device	protocol	Interface terminal
Glassman HVPS	12	RS232	DB9
DLM4015 PS(Steering Mag)	2	RS232	RJ11(6pin)
Sorenson PS(Dipole Mag)	3	RS232	RJ11(6pin)
AMI430 PS(SC Mag)	5	RS232	DB9
AMI150 He level Mon	2	RS232	DB9
LakeShore218	2	RS232	DB9
LakeShore224	1	TCP/IP	RJ45
ISEG HVPS(EQD)	8	RS232	USB B passive
LakeShore121	4	RS232	USB B passive
ОЅАКА ТМР	2	RS232	DB9
Keithley 6514(FC)	2	RS232	DB9
Keithley 3706A(Hole sensor)	1	TCP/IP	RJ11
Leybold TD20 TMP	1	RS232	DB9
Step Motor Controller	1	Analog	
XGS600(Gauge Con)	3	RS232	DB9
S7-319 PLC	1	TCP/IP	RJ45
Diagnostics Vac PLC(LSIS PLC)	1	Modbus TCP	RJ45
Gyrotron	1	CA	RJ45
Klystron	1	TCP/IP	RJ45
RF Switch	1	RS232	DB9
Eletrometer	1	RS232	DB9



-RS232 USB B passive typedevices are on 50kV platform- Used Optical USB cable fromCoring to electrical isolation



ECR-IS & LEBT Interfaces

- RS232 connections by DB9/DB15
- RS232 connections by USB B passive
- TCP/IP connections by LAN



ECR-IS and LEBT control system is connected 5 kinds of interface. All interfaces are isolated through optical fiber.



• PLC handles relays through DI/DO/AI/AO modules

Port setup parameters

- 8 USB B type serial communication ports using ttyUSB_{ID_serial number}.
- 35 serial communication ports using ttyr{Identifier}.
- Port parameters set up at system booting.

local@ecris: ~/control/epics ×		
SUBSYSTEMS="ttv"		
ATTRS{idVendor}=="0403", ATTRS{idProduct}=="6001", ENV{ID_SERIAL_SHORT}=="?*", SYMLINK+="ttyUSB_%E{ID_SERIAL_SHORT}"		
ATTRS{idVendor}=="1fb9", ATTRS{idProduct}=="0100", ENV{ID_SERIAL_SHORT}=="?*", SYMLINK+="ttyUSB_%E{ID_SERIAL_SHORT}"		
ATTRS{idVendor}=="1fb9", ATTRS{idProduct}=="0204", ENV{ID_SERIAL_SHORT}=="?*", SYMLINK+="ttyUSB_%E{ID_SERIAL_SHORT}"		
# BOIREN REINEL="ttyr05", RUN+="/bin/stty -F /dev/ttyr04 speed 19200 cs0 -parenb -crtscts raw -echo" #ECRISComServer1 Ground Glassman ET50420 (HV) beam acceleration" # Broken>chenged 0b KERNEL=="ttyr06", RUN+="/bin/stty -F /dev/ttyr06 speed 19200 cs8 -parenb -crtscts raw -echo" #ECRISComServer1 Ground Glassman ET50420 (HV) beam acceleration" KERNEL=="ttyr07" RUN="/bin/stty -F /dev/ttyr06 speed 19200 cs8 -parenb -crtscts raw -echo" #ECRISComServer1 Ground Glassman ET50420 (LV) beam acceleration" KERNEL=="ttyr07" RUN="/bin/stty -F /dev/ttyr06 speed 19200 cs8 -parenb -crtscts raw -echo" #ECRISComServer1 Ground Sorensen SG140-125 dipole magnet"		
KERNEL=="ttyr20", RUN+="/bin/stty -F /dev/ttyr20 speed 96 <u>00</u> cs8 -parenb crtscts raw -echo"		
KERNEL=="ttyr21", RUN+="/bin/stty -F /dev/ttyr21 speed 19		
#KERNEL=="ttyr22", RUN+="/bin/stty_F/dev/ttyr22 speed 1 Serial ports were named to ttyr##.		
KERNEL=="ttyr23", RUN+="/bin/stty -F /dev/ttyr23 speed 9600 csg -pareno -criscis raw -echo KERNEL=="ttyr23", RUN+="/bin/stty -F /dev/ttyr23 speed 9600 csg -pareno -criscis raw -echo		
KERNEL=="ttyr24", RUN+="/bin/stty -F /dev/ttyr24 speed 9600 cs8 -parenb -crtscts raw -echo" KERNEL=="ttyr24", RUN+="/bin/stty -F /dev/ttyr24 speed 9600 cs8 -parenb -crtscts raw -echo"		
KERNEL=="ttyr25", RUN+="/bin/stty -F /dev/ttyr25 speed 19200 cs8 -parenb -crtscts raw -echo" KERNEL=="ttyr25", RUN+="/bin/stty -F /dev/ttyr25 speed 19200 cs8 -parenb -crtscts raw -echo"		
KERNEL=="ttyr26", RUN+="/bin/stty -F /dev/ttyr26 speed 9600 cs8 -parenb -crtscts raw -ecno" KERNEL "ttyr27", RUN- "/bin/stty -F /dev/ttyr27 speed 9600 cs8 -parenb -crtscts raw -ecno"		
KERNEL=="ttyr2/", RUN+="/bin/stty -F /dev/ttyr2/ speed 9600 cs8 -parenb -crtscts raw -ecno" KERNEL "ttyr20", RUN+ "/bin/stty -F /dev/ttyr20 speed 40000 cs8 -parenb -crtscts raw -ecno"		
KERNEL== llyr28 , RUN+= /bin/stly -F /dev/llyr28 speed 19200 cs8 -parend -criscis raw -echo KERNEL=="ttyr20"		
KERNEL== ltyr29 , RUN+= /bin/stty = /dev/ttyr29 speed 9600 cs/ parodd parenb -criscis raw -echo KERNEL=="ttyr2a" _ PUN_="/bin/stty = /dev/ttyr2a speed 9600 cs/ parodd parenb _criscis raw _echo"		
KERNEL (LY)Za, KUN+- /DIH/SULY - /dev/LUYZa speed 9000 CS/ parodu parend -Cruscus raw -echo		
KEHNEL=="ttyr2a", RUM+="/bin/stty -F /dev/ttyr2a speed 9600 cs7 parodd pareno -crtscts raw -echo" #ECRISComServer3 50kV High Voltage Lavkshore218 Temperature monitor ch8" KERNEL=="ttyr30", RUM+="/bin/stty -F /dev/ttyr30 speed 19200 cs8 -parodd parenb -crtscts raw -echo" #ECRISComServer3 70kV XGS Voltage Lavkshore218 Temperature monitor ch8" KERNEL=="ttyr31", RUM+="/bin/stty -F /dev/ttyr31 speed 19200 cs8 -parenb -crtscts raw -echo" #ECRISComServer3 70kV XGS 600 Vacuum gauge controller"		
KERNEL=="ttyUSB_A70449SI", RUN+="/bin/stty -F /dev/ttyUSB_A70449SI speed 9600 cs8 -parenb -crtscts -echo" #F		
KERNEL=="ttyUSB_A70449SP", RUN+="/bin/stty_F_/dev/ttyUSB_A70449SP_USB_serial ports were named to		
$KERNEL == [tyusb_A/044912], RUN+= /bin/stty = F /dev/ttyUSB_A/044912] = 0000 serial perce were named to KERNEL == "ttyUSB_A7044952", RUN+= "/bin/stty = F /dev/ttyUSB_A7044952", RUN+= R$		
#KERNEL=="ttyUSB_LSA12I0", RUN+="/bin/stty -F /dev/ttyUSB_LSA12I0 s ttyUSB_{device ID & serial number}.		
KERNEL=="ttyÜSB_121A0CU", RUN+="/bin/sttyF /dev/ttyÜSB_121A0CU speed 57600 cs/ parodo pareno -criscis raw -ecno		
KERNEL=="ttyUSB_121A0E0", RUN+="/bin/stty -F /dev/ttyUSB_121A0E0 speed 57600 cs7 parodd parenb -crtscts raw -echo"		
KERNEL=="ttyUSB_121A0E4", RUN+="/bin/stty -F /dev/ttyUSB_121A0E4 speed 57600 cs7 parodd parenb -crtscts raw -echo"		
RERNEL== llyUSB_12TAUEF , RUN+="/DIN/Stty -F /dev/ttyUSB_12TAUEF speed 5/600 cs/ parodd parenb -crtscts raw -echo"		

Naming Convention

- We want to test of RAON naming convention in SCL Demo.
- ECR-IS and LEBT control system PVs named under RAON naming convention.

SYS – SUB : DEV## : CMD . Field

Description

- SYS : System Name
- SUB : Sub System Name
- DEV : Device Name
- ## : Identifier
- CMD : Command
- Field : Record field

Examples

ECRIS-Mag:Str01:Off ECRIS-Mag:Str01:On ECRIS-Mag:Str01:RampStart ECRIS-Mag:Str01:RampZero ECRIS-Mag:Str01:Reset ECRIS-Mag:Str02:Off ECRIS-Mag:Str02:On ECRIS-Mag:Str02:RampStart ECRIS-Mag:Str02:RampZero ECRIS-Mag:Str02:Reset ECRIS-Mag:Str01:CurrentStatus ECRIS-Mag:Str02:CurrentStatus

Operator Interfaces & Alarm



Archive appliance



Mass scan results from the ECR-IS & LEBT

- It is a mass scan result from ECR-IS.
- ECR-IS is conditioning to improve beam current to 10μA.



Plans

- Gyrotron EPICS Integration
- Klystron EPICS Integration

- Diagnostics Vacuum system EPICS Integration
- Diagnostic PC & devices EPICS Integration



Plans

- Yokogawa eRT3 plus PLC test on RT-linux
- Embedded vacuum control module
- Embedded power supplier control module

- Embedded temperature monitor module
- Embedded digital IO module
- Embedded multi channel vacuum gauge module



Thank you.

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