COMMISSIONING STATUS OF NSLS-II VACUUM CONTROL SYSTEM

MOPPC120

H. Xu, H. Hseuh, S. Leng, D. T. Zigrosser,
Photon Science Directorate, BNL, Upton, NY 11973, U.S.A.

BROOKHAVEN NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY Office of Science

ABSTRACT

The National Synchrotron Light Source II (NSLS-II) is a state-of-the-art 3 GeV third generation light source currently under integrated testing and commissioning at Brookhaven National Laboratory. The vacuum systems are monitored by vacuum gauges and ion pump current. The gate valves are controlled by programmable logic controllers (PLC) using voting scheme. EPICS application codes provide the high level monitoring and control through the input-output controllers. This paper will discuss the commissioning status of the various aspects of vacuum control system.

INTRODUCTION

The NSLS-II accelerator complex comprises a 200 MeV linac, linac-to-booster transport line (LTB), a 3 GeV booster ring (BR), booster-to-storage ring transport line (BTS), and the 3 GeV storage ring (SR). There are also front end and beam line vacuum systems which are not included in this paper.

NSLS-II VACUUM COMPONENT

Major components used in NSLS-II vacuum system are listed in Table 1.

Table 1: Major Vacuum Components in NSLS-II

	IP	CCG	TCG	GV	TSP	RGA	FV
Linac	23	6	6	6	-	-	-
LTB	13	6	4	4	-	-	-
BR	78	17	9	9	-	4	-
BTS	15	8	5	5	-	-	1
SR	225	120	60	60	225	38	-

These components are controlled by corresponding controllers installed in mezzanine racks, which are listed in Table 2.

Table 2: Vacuum Controllers in NSLS-II

	IPC	VGC	PLC	TSPC	RGAC	FVC
Linac	12	3	1	-	-	-
LTB	7	3	1	-	-	-
BR	40	9	4	-	2	-
BTS	8	4	1	-	-	1
SR	120	60	30	225	38	-

NSLS-II VACUUM CONTROL SYSTEM

Figure 1 shows the architecture of NSLS-II vacuum control system.

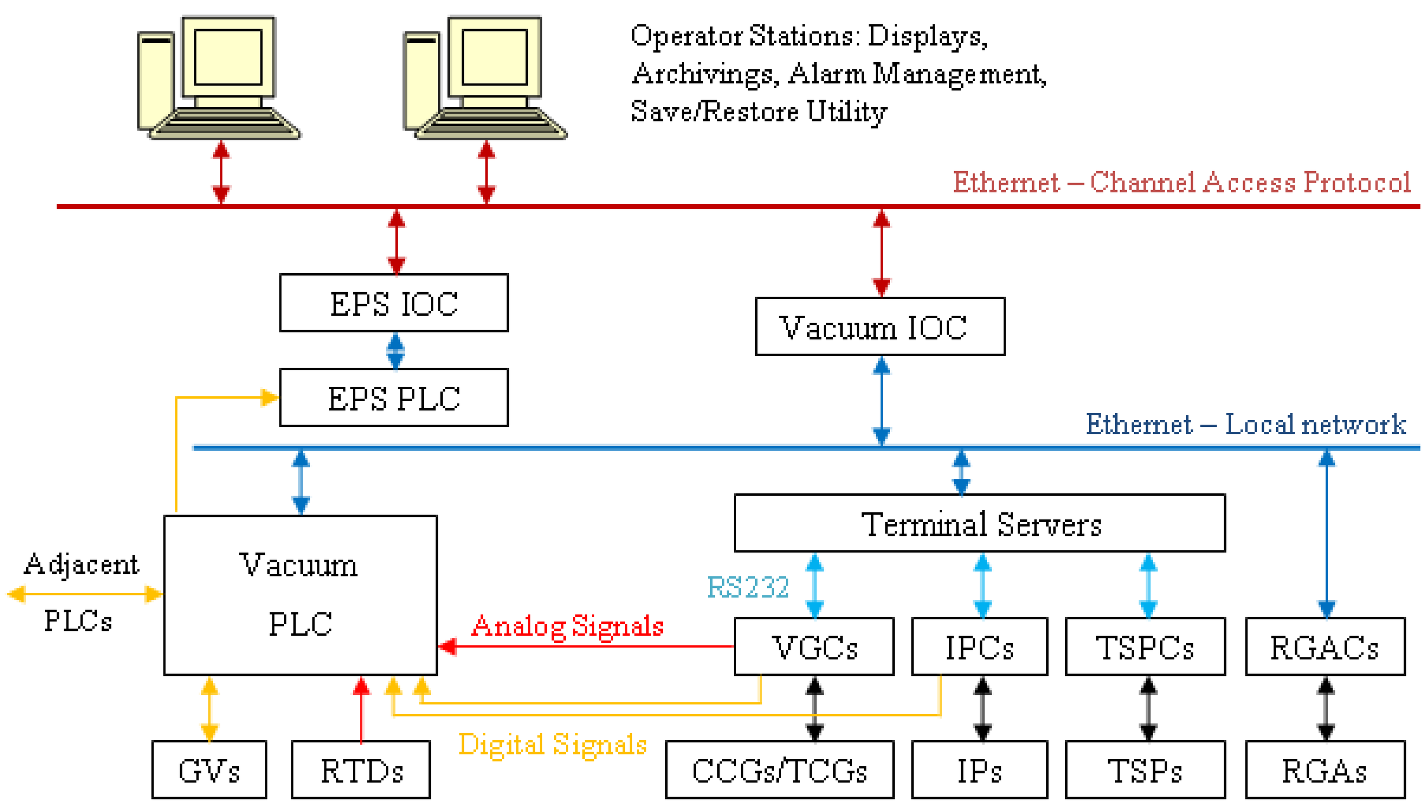

Figure 1: NSLS-II vacuum control system architecture.

Operator Interface

NSLS-II uses Control System Studio (CSS) as the main operator application.
Channel Archiver is used as the data logging system to log all important parameters, such as pressure readings, RTD temperature readings, GV status, and so on.
Integrated Relational Model of Installed Systems (IRMIS) will be used to describe all components and wiring data.

Input/Output Controller

6 IBM servers are dedicated for vacuum system, one for injector system, and one for each storage ring pentant. All 6 servers are placed in ring building control room. These IOCs communicate with vacuum devices through local network, and communicate with other systems via the control network.

Vacuum Devices Control

The vacuum control system interfaces directly with each vacuum device as seen in Figure 1, and as part of the storage ring machine protection systems (EPS). These vacuum devices can be operated via front-panel display and with the machine control system through RS-232 or Ethernet for high-level monitoring and control. The terminal servers, MOXA CN2650I-16 are used to integrate various vacuum devices. 37 terminal servers will be used for initial operation, 1 for each injector area and each storage ring cell.
The PLCs use a voting scheme, with inputs from the set point contacts of several gauges and ion pumps, to initiate valve interlock and closure. The fast response analogue CCG signal from the gauge controller is used for machine protection system. Each PLC is equipped with a Panel View for local diagnostic and troubleshooting.

CURRENT COMMISSIONING STATUS

Linac

A Simens PLC is used to interface with all vacuum devices and provide interlock signals to the vacuum system and EPS. The PLC system monitors IPs HV status, CCG relay status, CCG analogue readings, and controls the GVs. A terminal server was added later to interface with all vacuum controllers through serial ports.

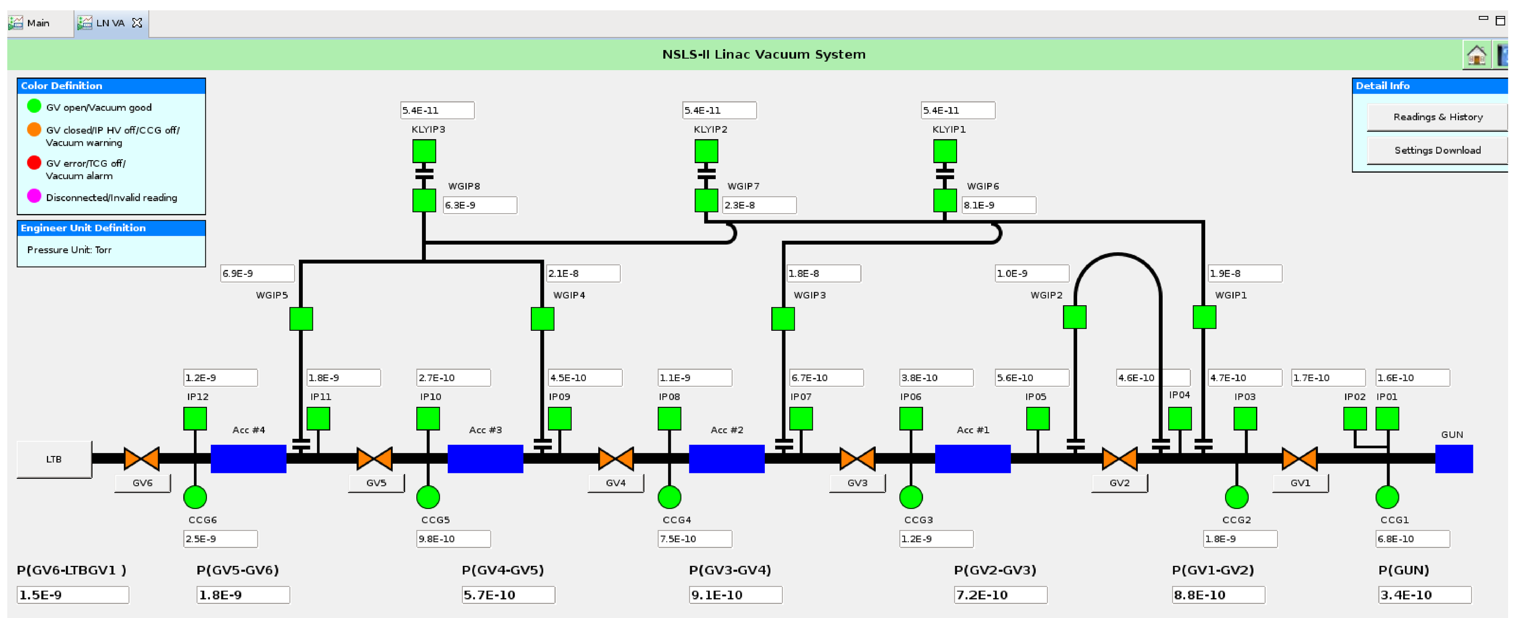

Figure 2: NSLS-II Linac vacuum control system main panel.

LTB, Booster, BTS

The terminal servers are used to integrate various vacuum devices through serial ports. The Allen Bradley PLCs are used to interlock the vacuum system and EPS. The PLC system provides monitor on IPs relay status, CCGs relay status, CCG analogue readings, and control to GVs. The PLCs use a voting scheme, with setpoint relay inputs from 2 IPs and 1 CCG. TCGs are used to interlock IPs from turning on through EPICS. One IBM computer running Debian is installed in injector vacuum rack for local diagnostic and troubleshooting. CCG, IP pressure readings, RTD temperature readings, GV status, section average pressure values are logged in dedicated archive server.

Storage Ring

The configuration for vacuum control related devices have been completed for all cells in storage ring. These devices including CCGs, TCGs, IPs, and RGAs, have been turned on for monitored and controlled through EPICS, following the commissioning of the vacuum sectors. The PLCs use a similar voting scheme as Booster Ring, with set point relay inputs from 2 CCGs and 1 IP. If pressure readings of two out of three devices in the logic exceed the set point value $2*10^{-7}$ Torr, the GVs at both sides of the concerning section are closed immediately, as well as the gate valves at adjacent cells. The relay signals from TCG are used for GV interlock as well as IP protection.
Ten IBM servers, one out of every three cells, have been installed at vacuum rack to provide local diagnostic and troubleshooting.
CCG, IP pressure readings, GV status, section average pressure values are logged. Important parameters affecting the operation of RGA are constantly monitored and archived.

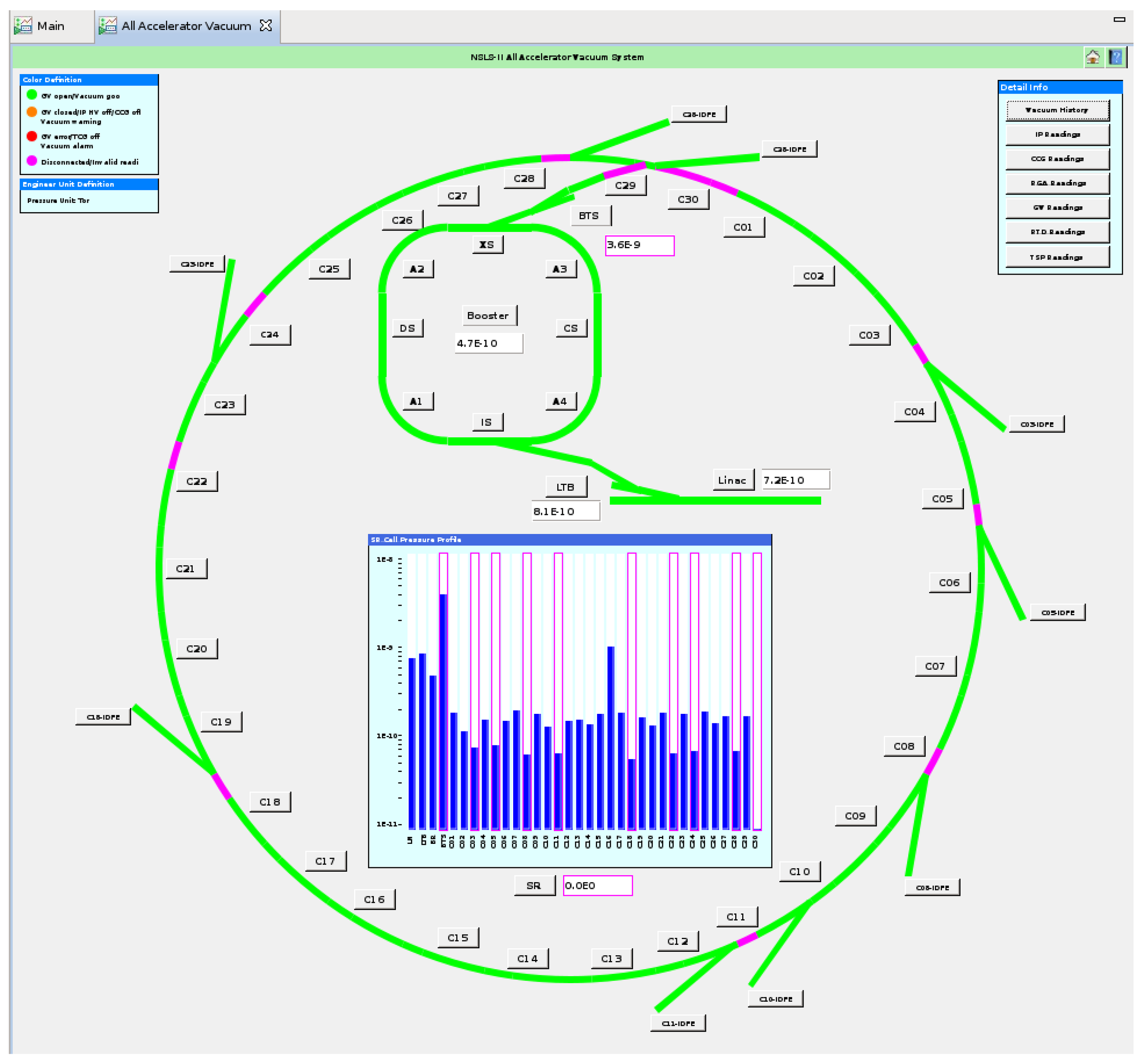

Figure 3: NSLS-II Accelerator vacuum control system main panel.

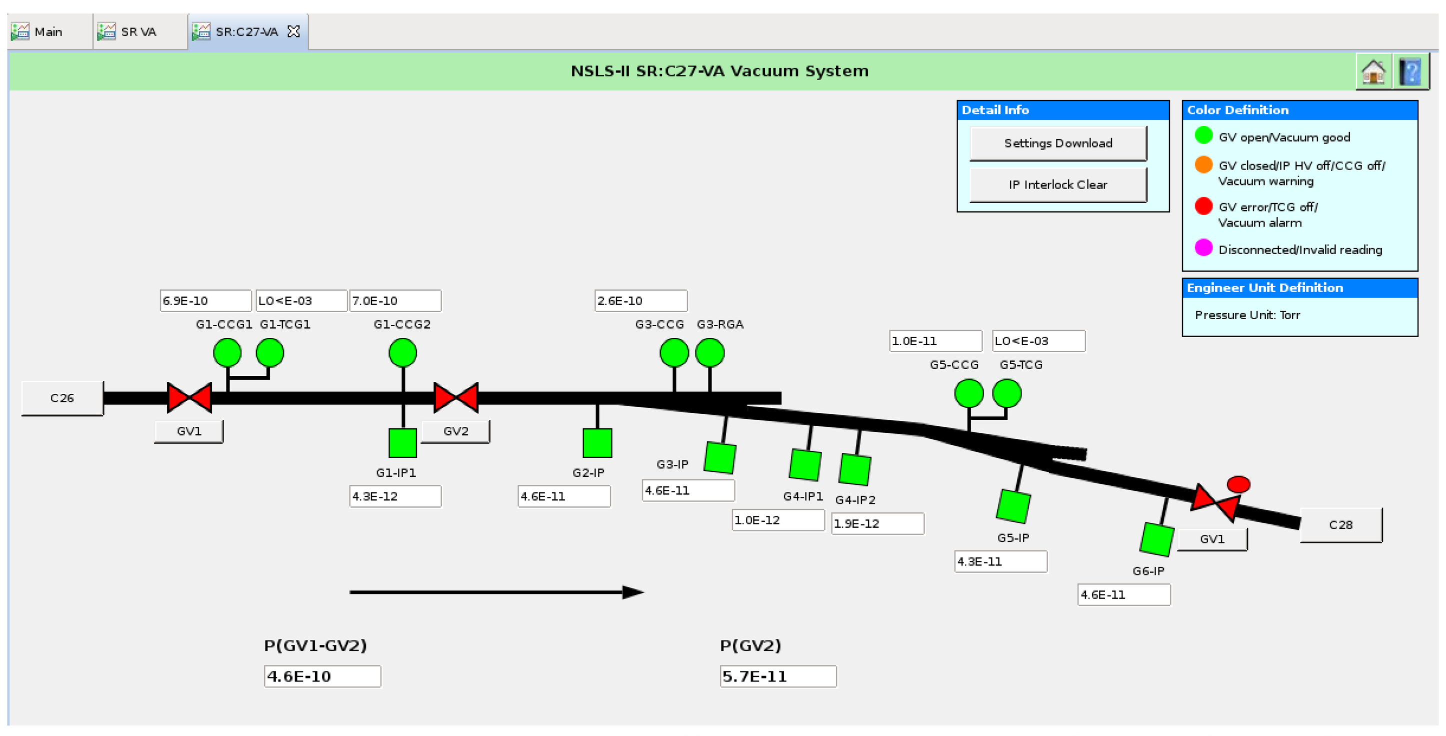

Figure 4: NSLS-II storage ring cell vacuum monitor and control panel.

SUMMARY

So far, commissioning of the NSLS-II vacuum control system is progressing well and is providing useful information for vacuum group during the commissioning process. The control group and vacuum group continue to work closely to develop a reliable, user friendly control system.