The Rare Isotope Science Project at the Institute for Basic Science constructs a heavy ion accelerator (RAON) facility in South Korea. The stable ion beam for the RAON accelerator could be generated by ECR ion source system. Therefore, it is necessary to build an ECR ion source control system that could be integrated into an accelerator control system easily. The vacuum control system is divided several parts because of one vacuum chamber among three different voltage stages (ground, 50 kV, and 80 kV). In this report, we will present the preliminary design and implementation of vacuum control system for the ECR ion source. We plan to use a Programmable Logic Controller (PLC) in order to control the vacuum system through interlock logic program. The PLC system has two major components: a digital I/O module that provides power to each component and standard RS-232 modules to connect the gauge and pump controllers. In addition, we will discuss its extension plan to integrate the vacuum control system into the RAON accelerator control system based on the EPICS framework.

Requirements
- Connecting related equipment (Gauge Controller & TMP controller etc.)
- Development of AB PLC Ladder Program (Vacuum control & Interlock)
- Make Human-Machine Interface (HMI) program
- Develop the EPICS IOC
- Serial communication for Gauge Controller & TMP controller

PLC control
- PLC chassis installed at each rack.
- OSAKA turbo pump controller (TD353) & Vacuum gauge controller (XGS600) are connected with ASCII modules of AB PLC.
- Optical communication module (1734-ETAP2F) is installed to configure network system between ground and high voltage platform.

Preliminary test for Networking & Installation
- Preliminary test set up for confirming the network and I/O wiring.
- We configured demo vacuum control system like the vacuum system of the ECR ion source to test serial communication for turbo pump controller and vacuum gauge controller.
- The vacuum system controlled by PLC will be integrated with EPICS framework.

Summary
The system will be integrated with EPICS framework through Modbus TCP/IP module or Ether-IP module of the AB PLC. We are developing the EPICS IOC to control the vacuum system in real-time using EPICS drivers. The User Interface (UI) for monitoring and operating the system will be developed by the Control System Studio (CSS) software to provide easy control environment for users. The vacuum control system of the ECR ion source is finally designed by the ladder logic program to perform the interlock checks continuously without data from the EPICS IOC so that the PLC can perform its protection functions even when the IOC is shut down [2].

Acknowledgement
This work is supported by the Rare Isotope Science Project funded by Ministry of Science, ICT and Future Planning(MISP) and National Research Foundation(NRF) of Korea(Project No. 2011-0032011).

References