Control System Upgrade

F.P. Abegglen, R.H. Burch, and T. Cowden

The upgrade of the K500 Control System is underway. The control system has been divided into subsystems and some portions have been tested offline and some parts on the machine as time permitted. The ECR II ion source has been operating on the new control system and is being used as a testing platform for the control system. Some control algorithm tests have been performed for speed and reliability. Other subsystems are switched between the old and the new control system for testing as time allows. To date the vacuum and extraction systems have been tested in this manner. The trimcoil, main magnet, ECR I, and rf system have not been tested. The consolidation of the STD bus crates for the trimcoil power supplies is being implemented at this time. In the current arrangement, one small crate is used for each power supply. In the new system two full size STD bus crates will suffice for all eighteen power supplies.

The new CPU cards in the STD bus crates have a common set of programs and derive their identity from the network node number. If a CPU fails it is simply replaced with a spare CPU card and then loading node specific information from a server.

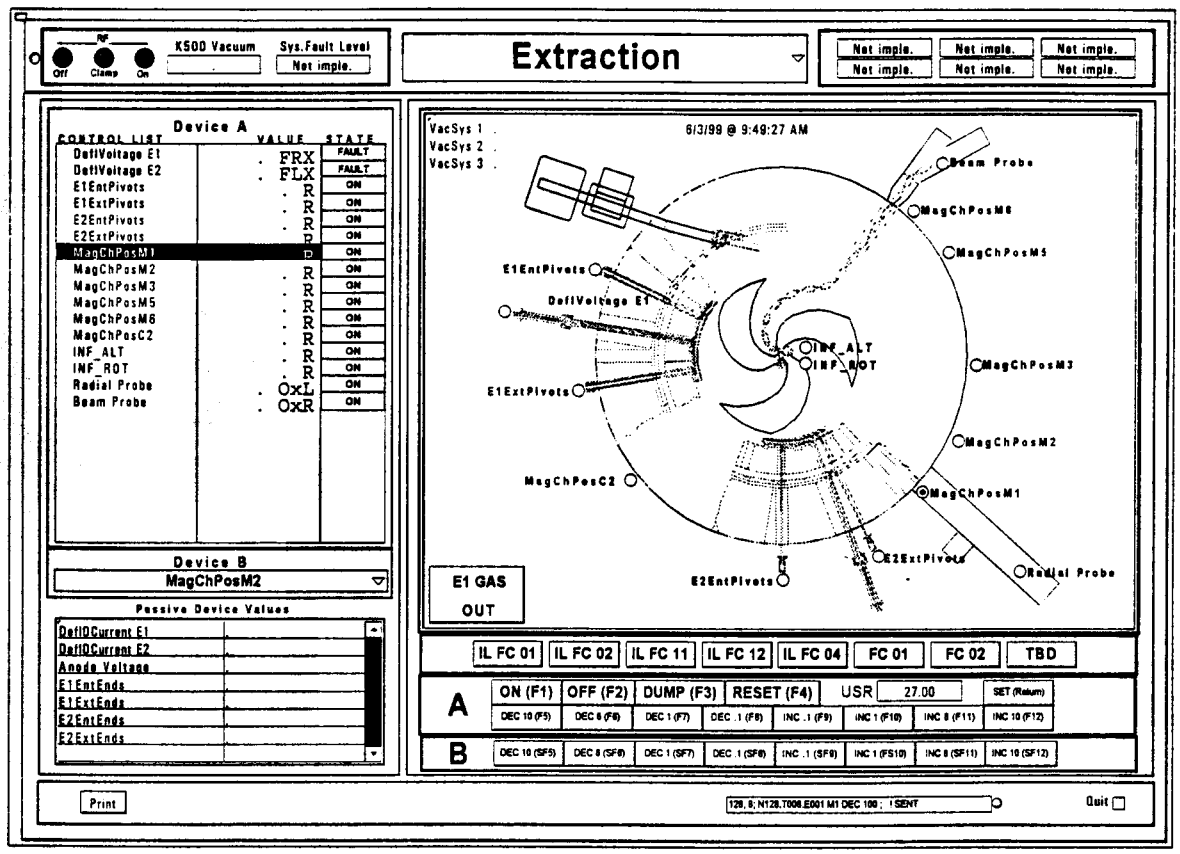

Figure 1. The "Extraction" screen is one of four K500 cyclotron control screens. The user, using these screens, can visualize and modify the state of the cyclotron through a simple graphical user interface. The extraction parameters are "tuned" through this screen. The Cyclotron Control System upgrade control screens display the current state of the physical devices, their current value, and their general location.

The software is separated into two parts: one is the human-to-machine interface written in Labview under Microsoft NT4 operating system, and the other is the control interface written in C under QNX4.24 operating system. The human-to-machine interface includes graphical displays (see Fig. 1 and 2) of the hardware and allows the user to adjust the machine parameters, while the control interface executes the user instructions at the hardware level. The two interfaces communicate through Arcnet, where text messages are passed between the monitor/database server and the Ziatech STD bus process cards. The communications level receives Arcnet packets from Labview, validates the address header, and then dispatches the message to the hardware management level. In turn it receives hardware management level messages for routing, and sends them over Arcnet to Labview.

The human interface control system is implemented on four Microsoft NT computers: they are (1) the monitor/database server, (2) ECR A server, (3) K500 server and (4) ECR B server. The ECR A, K500 and ECR B servers can run on any NT computer with an Ethernet card, while the monitor/database server requires an additional Arcnet card.

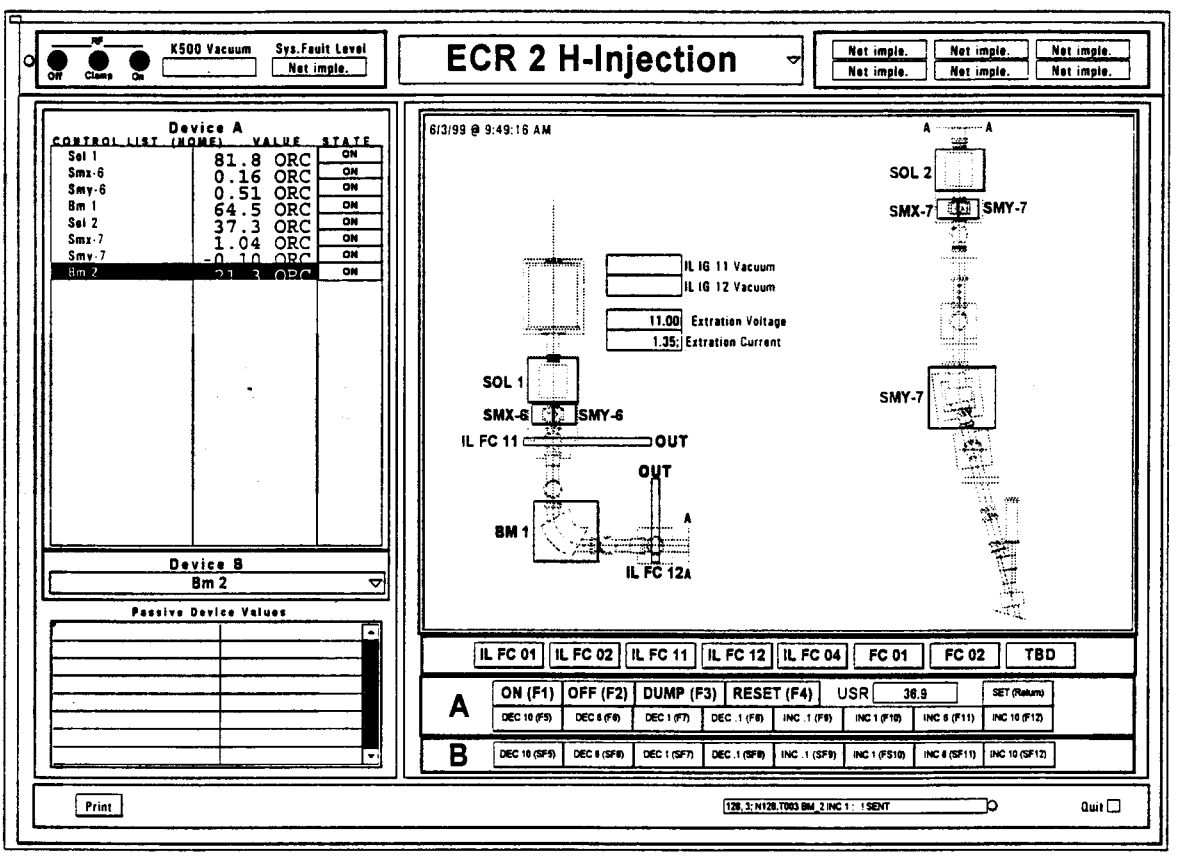

Figure 2. The "ECR 2 H-Injection" screen is one of three ECR 2 screens. The purpose of this screen is to tune the beam, extracted from the ECR 2, to the K500 vertical injection line. The physical devices in the Cyclotron Control System upgrade can be selected and modified with the control panel in one of three ways: point-n-click with the mouse, select-n-execute via function keys, and select-n-execute via the special keyboard.