

# ION SOURCE CONTROL SYSTEM WITH AN OPTICAL FIBER LINK

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## Abstract

An ion source control system has been developed. Standard RS-232C serial communication and an optical fiber link are adopted to interface the ion source and its console. A low cost microcomputer is connected. Some modification has been given to protect the system from noises or surges.

## 1. Introduction

In Kyoto Univ. Tandem Van de Graaff Laboratory, a polarized ion source has been improved and it has become necessary to extend its control system. The new system is required to satisfy some conditions, that is, reliability, extensibility, easy manipulation, cost performance etc. The outline of the system is as follows: The system consists of two parts, the Ground Potential Station (GPS) and the High Voltage Terminal (HVT), and a serial communication line connects them. The GPS consists of a low cost microcomputer, some peripherals and serial communication ports. The HVT is isolated from the ground by an optical fiber link which bears 80 kilovolts of potential difference. Both the GPS and the HVT have common bus structures so we can extend the system set-up without any alterations. A plain BASIC language offers us easy programming.

## 2. Hardware

The system construction is described in Fig.1. The microcomputer TRS-80 has 12 kB BASIC interpreter and 16kB RAM. A program is loaded from a cassette tape. Some additional I/O devices are furnished for man-machine communication. The serial data transfer is adapted to the RS-232C standard. Optical fibers with BNC connectors allowed us to design an isolated system easily.

The HVT is constructed by wired logic circuitry which is shielded twice. There are slots acceptable of 8 interface cards on the backplane. At present up to 32 ADC's and relays can be controlled. Each datum is stored in two registers and when a difference between the contents of them is once detected, an interrupt action takes place. Time out interrupt warns break down of the serial link.

## 3. Software

The communication data are 8 bits in length and their format is described in Fig.2. Data to the HVT contain 5 address bits and 3 instruction bits. Though there are only 8 commands, they are enough to manipulate ADC's and relays. Data from the HVT have two modes, i.e. a "response" mode and an "interrupt" mode. Usually when the HVT receives an instruction, it always returns appropriate data to the GPS (response mode), and if once

an interrupt action occurs, the HVT sends the interrupt status to the GPS (interrupt mode).

A BASIC interpreter is available and some modification concerns the UART interrupt service is added to the system monitor.

#### 4. Test of the System

The system is now undergoing several tests. Most efforts have been concentrated on protecting the system from surges or noises, for example, induced by the terminal voltage break down. Noise filters and surge absorbers are employed. A clean AC line is also necessary. Including these improvements, stable operations have been achieved under rather severe circumstances.

#### Acknowledgement

The authors represent thanks to Oki Electric Industry Co. Ltd. for their valuable technical advices and supports about the optical fiber link.

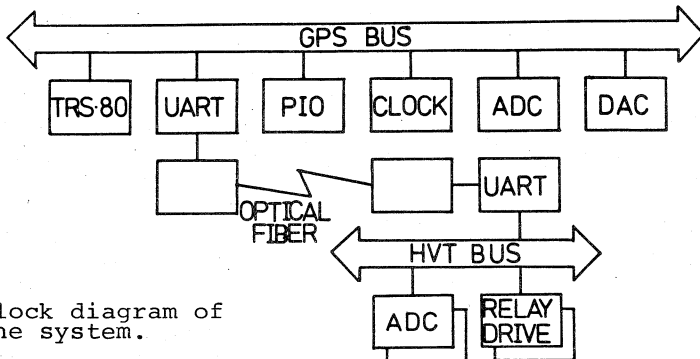


Fig.1. Block diagram of the system.

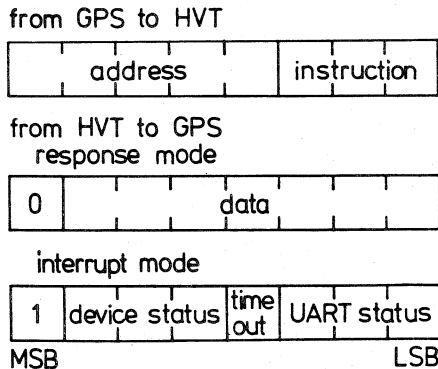


Fig.2. Communication data format.