Block IV Receiver-Exciter Control and Monitoring

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The Block IV Receiver–Exciter Subsystem has the capability of being configured and controlled either by a computer or manually. This report contains a brief discussion on the computer mode of control and a technical description of the manual controls and system monitor.

I. Introduction

Basic to the Block IV Receiver–Exciter (RE) Subsystem is its capability of being controlled by computer in the primary mode of operation, or manually in the secondary mode. Computer control provides complete receiver and exciter configuration, adjusts system operating frequencies, performs doppler tracking, and automatically acquires the receiver. It also performs pre- and post-calibrations on the receiver, and monitors and stores system performance test points, operating frequencies, and analog monitoring voltages in the computer. When being controlled manually, configuration data are stored within the RE Subsystem and are processed for distribution to the station monitors.

II. Computer Control

A block diagram of the overall Block IV Receiver–Exciter control and monitor is shown in Fig. 1. The Receiver–Exciter Subsystem will contain a minicomputer which will be controlled by a station computer when full station automation occurs. The interface between computers occurs in the computer distribution module. This computer distribution module also couples three separate control distribution modules to the receiver–exciter minicomputer for control of the receiver and exciter configuration, control of the receiver and exciter frequencies (programmed oscillators), and control of performance monitoring of the receiver–exciter. Two instruments are used for monitoring: a digital voltmeter to monitor analog signals and a counter to monitor frequencies. Each instrument is time-shared through the appropriate multiplexer. These instruments have been selected to provide output compatible with computer control.

The control lines from the computer distribution module to the station computer and the computer control distribution modules are the Network Control System standard 14-line interface. These control lines are bidirectional to allow system data to be stored within the computer.

III. Manual Control

Putting the receiver–exciter on manual control is accomplished by actuation of individual switches located on the front panel of the control assembly. The receiver manual control panel is shown in Fig. 2; the exciter manual control panel is similar. As shown in Fig. 1, the receiver and the exciter manual controls are essentially in parallel with the control lines to and from the computer.

The manual controls duplicate the computer functions in that they must be capable of addressing the individual control and configuration (C/C) registers, transmit control data to these registers, and then receive and compare the register data with transmitted data for confirmation. Also, the manual control stores the data received from the C/C registers in binary level format to make this information available for monitoring.

Figure 3 is a simplified block diagram of a receiver or exciter manual control. Binary voltage levels from the front panel switches are applied to the input of a data multiplexer. When the load switch is pressed, the sequencing counter generates a *new data ready* pulse causing the address/read counter to address the first C/C register. The C/C register generates and transmits, back to the manual control, a *respond* pulse. The manual control then transmits the first set of configuration data to the C/C register and puts the transmitted data into temporary storage. The C/C register again responds and retransmits the configuration data back to the manual control where they are compared with the stored data in the control. Also the data received back from the C/C register are stored in latches located within the manual control. This process continues until all of the C/C registers have been addressed and configured and then automatically stops.

Each successful comparison between the transmitted and received data causes the comparison counter to advance one count. After the configuration cycle is complete, a front panel light driven by the comparison counter output verifies that the system has been correctly configured.

The manual control also reads and stores the RF subassembly test point (power monitors) voltages, and these are applied to front panel indicators.

Loading the configuration data into the receiver or exciter C/C registers can also be done automatically. The automatic loading uses the station 1-s time tick to start the counters (in the manual control) through their address, read, and sequencing cycle. This feature assures that the configuration has not changed during a tracking period.

IV. Receiver and Exciter Monitors

Receiver and exciter monitors are used for distributing the configuration status to the station monitors. A typical monitor drawer block diagram is shown in Fig. 4. The data, stored within the manual control, are coupled to the input of the monitor drawer through a multiconductor cable. Each datum bit is applied to the input of a relay driver which controls several relay closures for external distribution. The C/C functions are also displayed on front panel lights.

V. Conclusion

A Block IV Receiver–Exciter Subsystem will be installed at DSS 14 to support the Mariner Venus/Mercury 1973 S–X-band experiment. A Block IV RE Subsystem will also be installed in each of the 64-m subnet stations as one of the primary radio subsystems for Viking 1975. Through the Viking 1975 period, computers will not be available and the RE Subsystem will be controlled manually. Present plans are to install computers after Viking 1975 to allow computer control of the RE Subsystems.

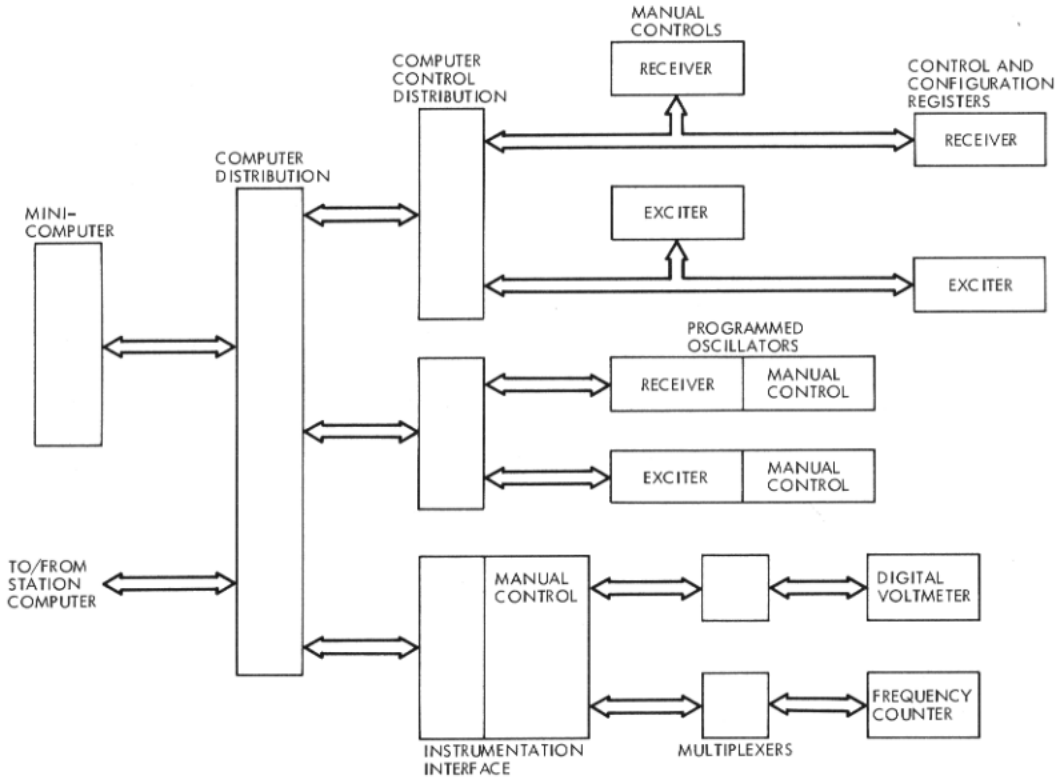

Fig. 1. Block IV Receiver–Exciter control

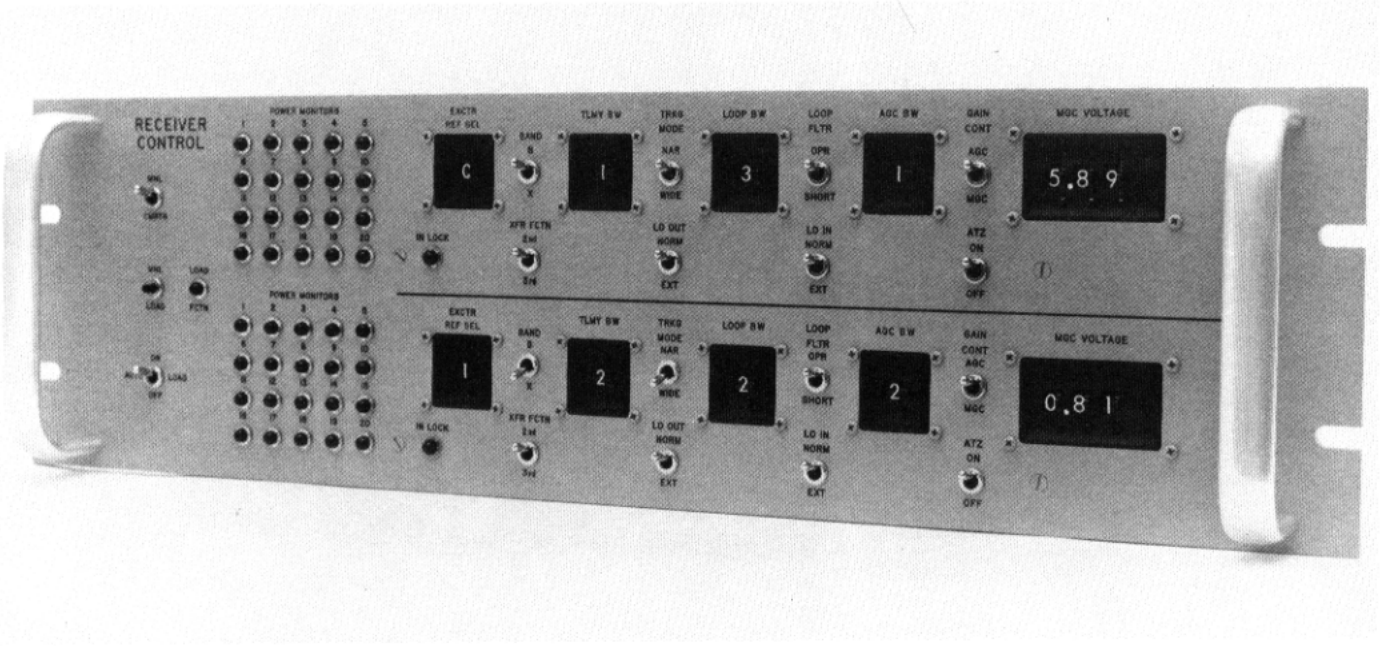

Fig. 2. Block IV receiver manual control panel

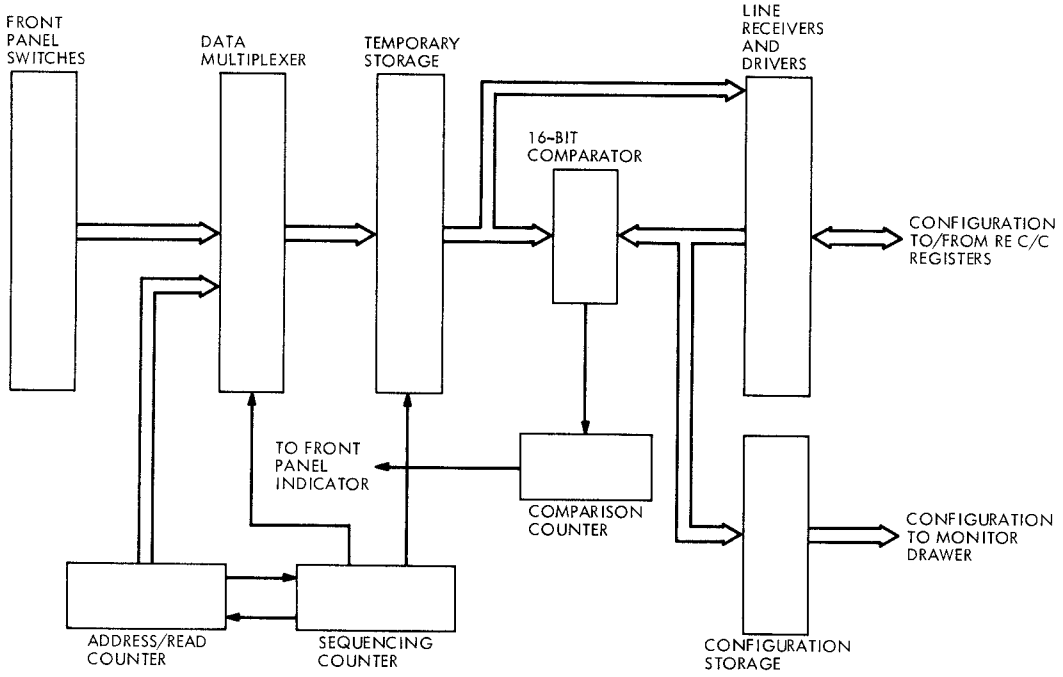

Fig. 3. Block IV Receiver–Exciter manual control block diagram

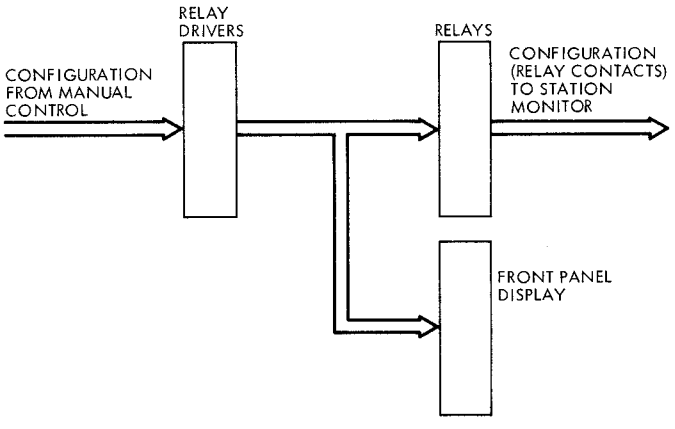

Fig. 4. Block IV configuration monitor drawer