Post-Detection Subcarrier Recording Subsystem

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The Post-Detection Subcarrier Recording Subsystem for the 64-meter stations will be revised from the present configuration at DSS 14. The reasons for the change are to provide for future computer control of the pre/post-calibration process at the new 64-meter stations and to reduce the number of cabinets required to perform the essential functions of the Analog Instrumentation/Recording (AIS/REC) Subsystems. Changes from the present configuration are described, including patching functions, test equipment, and semi-automatic and automatic computer control.

I. Introduction

The Post-Detection Subcarrier Recording Subsystem is being implemented for the 64-meter stations and extends the analog recording capability previously provided by the Analog Instrumentation Subsystem and the Recording Subsystem. The new configuration provides for future computer control for pre-track calibration of the recording equipment. It also provides a semi-automatic calibration mode and an improved coaxial patch panel for signal routing. The revised configuration will also substantially reduce the number of cabinets required to contain the equipment.

A block diagram of the Post-Detection Subcarrier Recording Equipment (PPR) is shown in Fig. 1. A discussion of the modes of operation was contained in Ref. 1. The PPR for the 64-meter stations is being modified in this effort. The primary changes are concerned with the block labeled PPR Signal Conditioning and Testing.

The present AIS and REC Subsystems at the DSIF 64-meter site are being combined and the resultant eight cabinets are being reduced to four. Two of these cabinets contain FR1400 tape recorders and two contain PPR patching, signal conditioning, and test equipment. In addition, these cabinets contain interface and control circuitry enabling semi-automatic and automatic computer control of signal path, setup of test equipment, and calibration and checkout of signal conditioning equipment.

It is planned to delete the previously available wideband FM capability from the PPR, substituting instead the use of VCOs and mixers combined with direct recording techniques which were successfully used in *Mariner* Mars 1971. The advantages of this are increased flexibility, wider deviation (greater accuracy) and compatibility with the playback facility at CTA 21. In short, the function of the PPR is to record incoming signals, through patching either directly to the tape recorder or through preconditioning equipment such as VCOs and mixers. Upon

demand, pre-recorded signals can be supplied to the Subcarrier Demodulator Assembly (SDA) or Symbol Synchronizer Assembly (SSA) through the PPR's discriminators (refer to Fig. 1).

II. New Features of the PPR

In the automatic computer-controlled mode, when implemented, the PPR will be checked and calibrated by a test program loaded into the subsystem computer. The program provides commands, which are stored in the Digital Electronics Subassembly (DES) of the PPR, to configure the subsystem and measure its performance. The PPR test equipment includes a programmable voltage source, a programmable digital voltmeter, a programmable frequency synthesizer, a frequency counter, and a programmable discriminator. The subsystem is configured by a programmable switching relay matrix. The DES transmits the data from the test equipment back to the computer for evaluation. Anomalies, determined by the results of the test program, are printed out on the subsystem input/output typewriter for operator evaluation.

Normally closed contacts of the switching matrix are inserted in the signal path to the tape recorder at various places such as VCO input and output, mixer amplifier input and output, and tape recorder input and output. Switch contacts are also placed in the input/output of the test equipment. Through suitable selection of the switches, test equipment may be applied either to signal conditioning equipment, recording equipment or other test equipment for calibration checkout. The switching matrix is programmed by the computer in the automatic mode.

In the semi-automatic mode the Calibration Test Programming Panel (CTPP) and the Matrix Calibration Panel (MCP) of the PPR are used to operate the PPR. This mode is used when the subsystem computer is not available. The control of the programmable test equipment is performed through the CTPP, and the matrix is configured through the MCP. The operator reads the test equipment front panel displays, in this mode, to determine subsystem anomalies.

A new system of coaxial patch panels will be used in this PPR. The panels utilize a normal-through configuration where the normal (record) mode of operation is prepatched by means of permanent cables at the rear of the panels. Should it be desired to re-route these under unusual circumstances, a patch cord is inserted breaking the normal path and establishing a new path. Thus, under normal circumstances, no patch cord is visible on any of the panels. In reproduce mode (nonreal-time playback) patch cords are required because of the large number of combinations of paths possible. The normal routing of the signals is interruptible by the programmable switching matrix.

III. Procurement Status

The conceptual design for the new PPR Subsystem has been completed. Vendor proposals for design and fabrication of three Post-Detection Recording Subsystems for the 64-meter sites has been received, reviewed, and evaluated. Award and negotiations of the contract will take place during the latter part of June 1972. The delivery schedule for the three subsystems is mid-December 1972, mid-January 1973, and mid-February 1973.

Reference

1. Hamilton, G., "Post-Detection Subcarrier Recording Equipment Implementation for Analog Recording Playback," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. VII, pp. 182–184. Jet Propulsion Laboratory, Pasadena, Calif., Feb. 15, 1972.

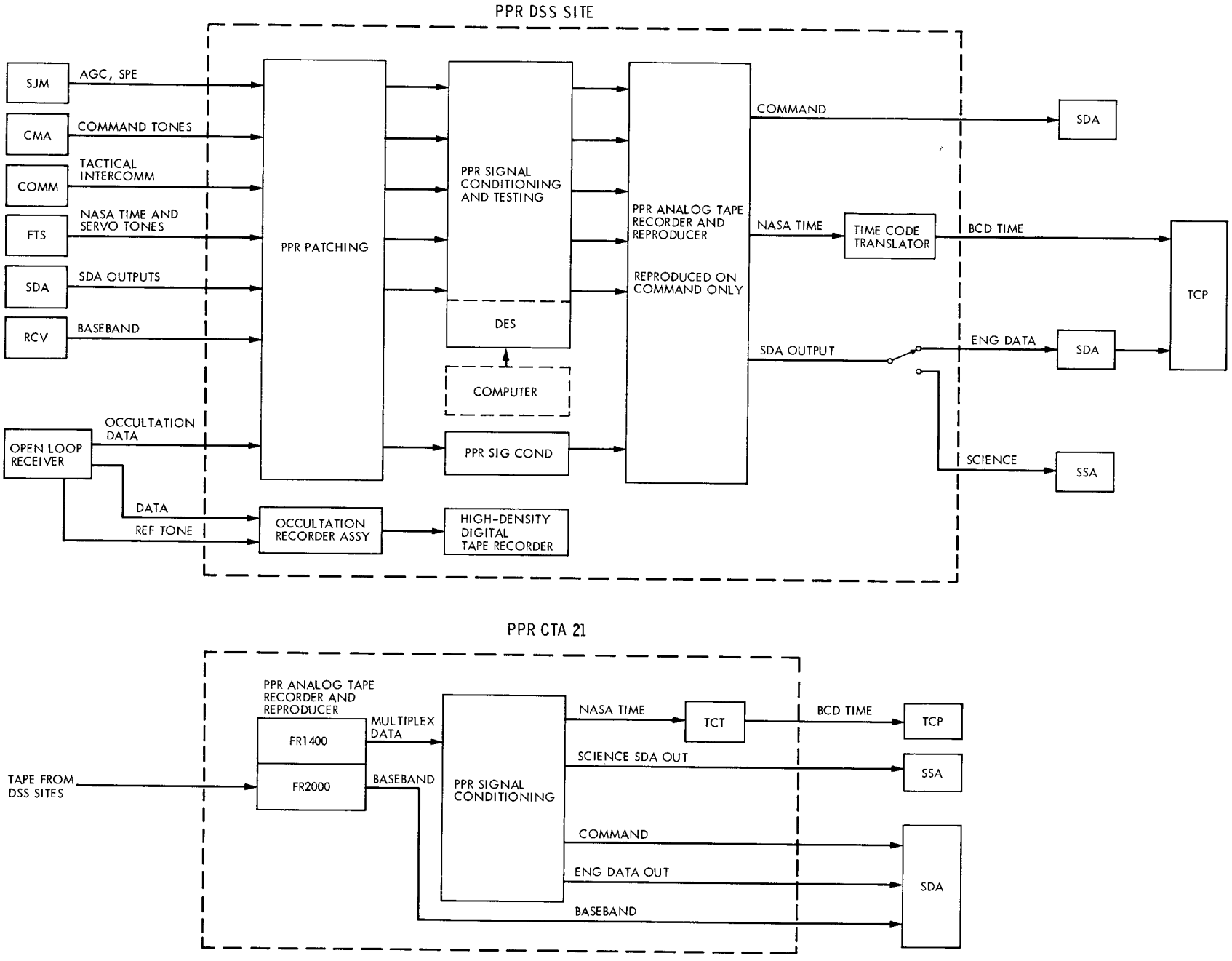

Fig. 1. Block diagram of PPR Subsystem