SERVO CONTROL

AND

DATA SYNCHRONIZATION STUDY

REPORT NO. 70-007-Q2

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TECHNICAL CONTENT

This report contains information prepared by Borg-Warner Controls under JPL subcontract. Its content is not necessarily endorsed by the Jet Propulsion Laboratory, California Institute of Technology, or the National Aeronautics and Space Administration.

NEW TECHNOLOGY

No new technology has been discovered to date of this report as a result of this study.

SYNOPSIS

Reducing the theory contained in Report No. 70-007-Q1 to hardware has resulted in a breadboard recorder. This report contains photographs of this breadboard, and describes testing of the breadboard to date.

SERVO CONTROL AND DATA SYNCHRONIZATION STUDY

INTRODUCTION

Investigating the feasibility of a magnetic tape recorder-reproducer capable of (1) accepting data pulses at varying rates, (2) making maximum usage of storage space by recording data at a constant rate, and (3) retrieving the recorded data at a rate synchronized to an external clock is the objective of the study. The first quarterly report gave a theoretical description of such a "recorder". Now, that theory is being reduced to hardware. This report will describe the hardware completed and tested.

GENERAL

Reducing the theory to hardware results in a breadboard recorder. Individual circuits are built on Vector cards. A typical circuit breadboard is shown in figure 1.

Building circuits on separate cards allows them to be tested individually. Test equipment providing ideal signals and voltages is connected to the card. When the circuit is operating properly, test equipment is disconnected, and the card is installed in the recorder. Figure 2 shows the recorder breadboard.

Each function of the recorder is tested as cards are completed and installed. Adjustments are made to individual cards to trim them into the total circuit.

TESTING

Circuits completed to date are being tested in the record mode. See figure 3 for a block diagram of the recorder. The velocity servo loop has

been closed and tested with clock input signals ranging from 300 Hz to 9 kHz. Motor speed responds to changes in clock input rate. The tachometer wheel used for motor speed pickup is shown in figure 4. Figure 5 shows the position of the tachometer in relation to the tape transport.

Buffer register and digital to analog converter circuits have been tested, both individually and interconnected to each other. The next step is to connect these circuits to the servo loop. When this is accomplished, the majority of the recorder electronics will have been tested functionally. See figure 3 for circuits used in both record and playback modes (these circuits are outlined with a double-weight line).

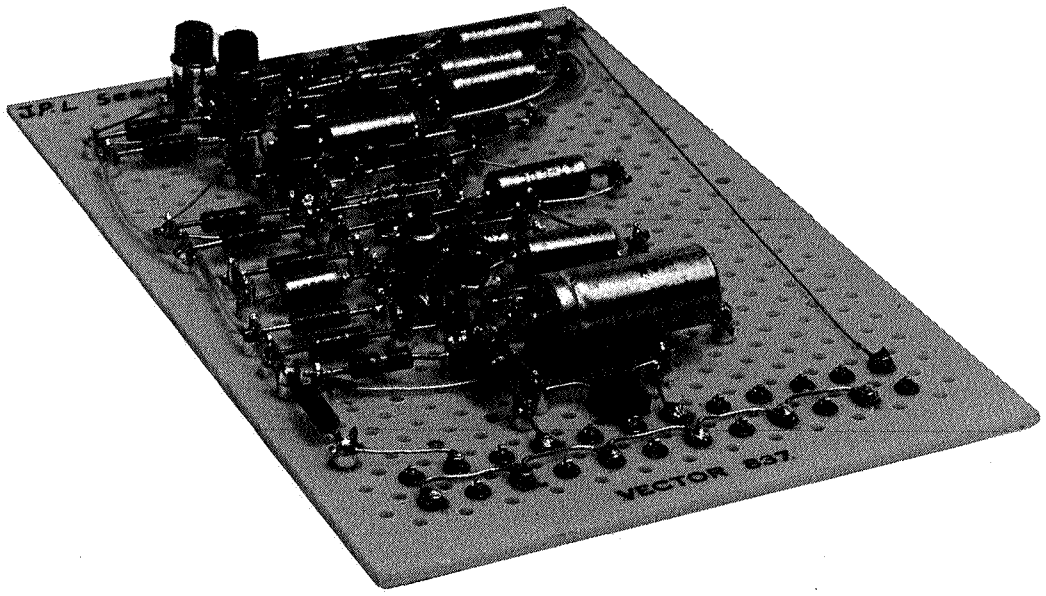

Figure 1. Breadboard Circuit Card

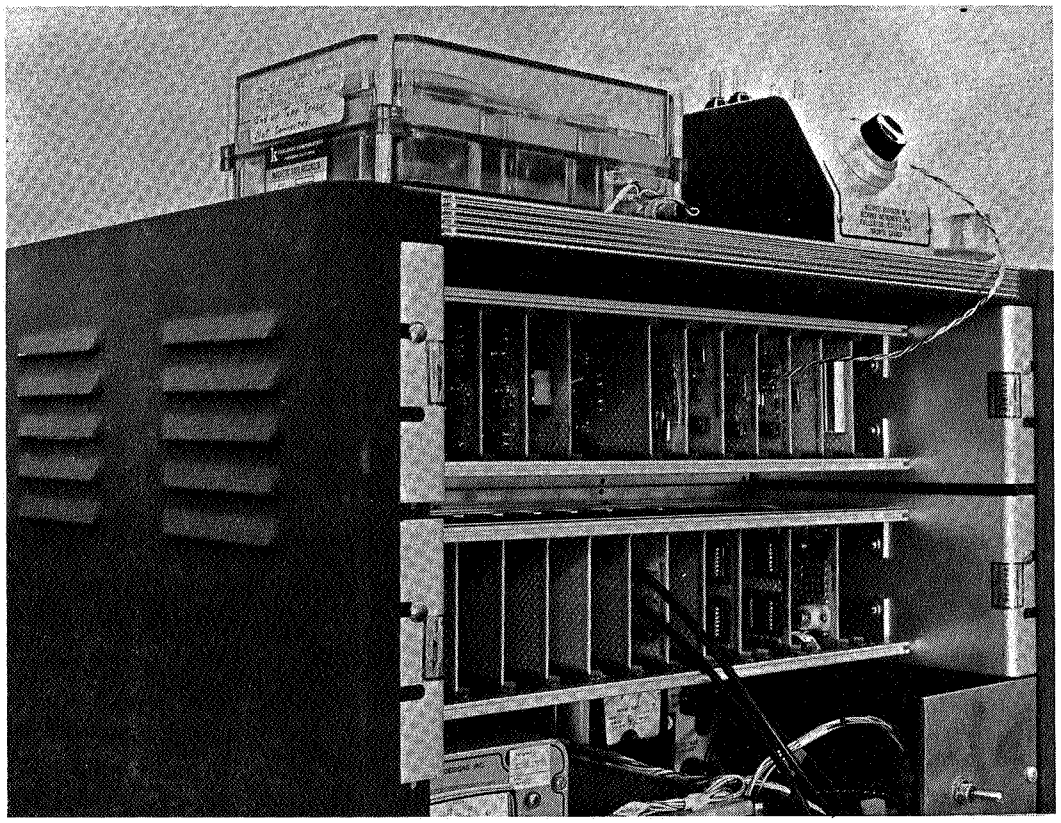

Figure 2. Breadboard Recorder

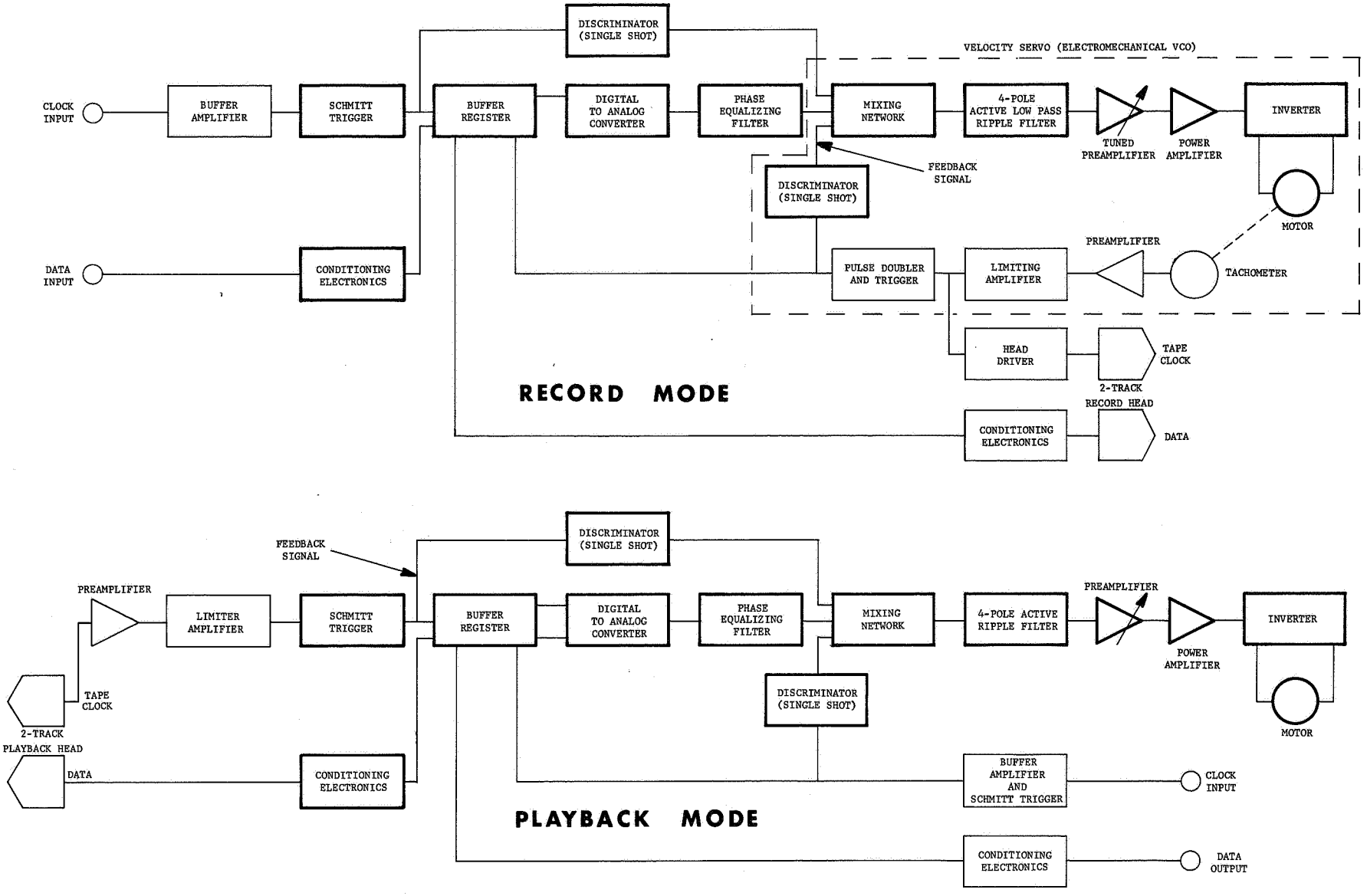

Figure 3. Block Diagram, Recorder

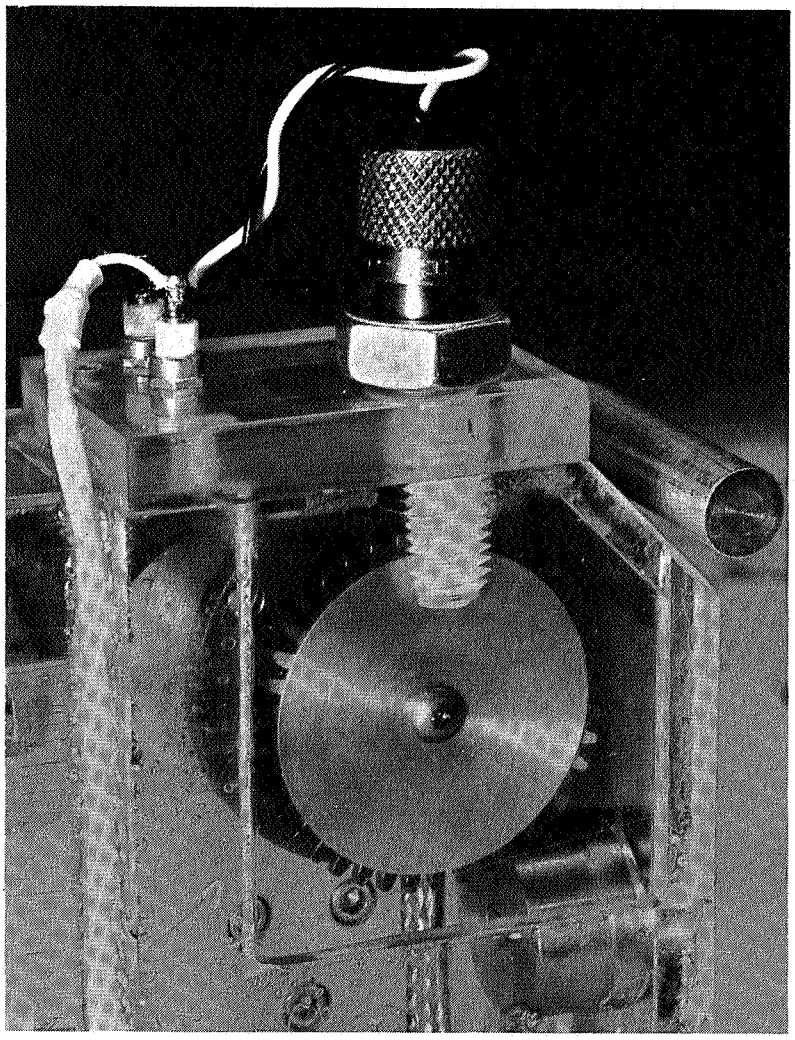

Figure 4. Low-Inertia Tachometer Wheel

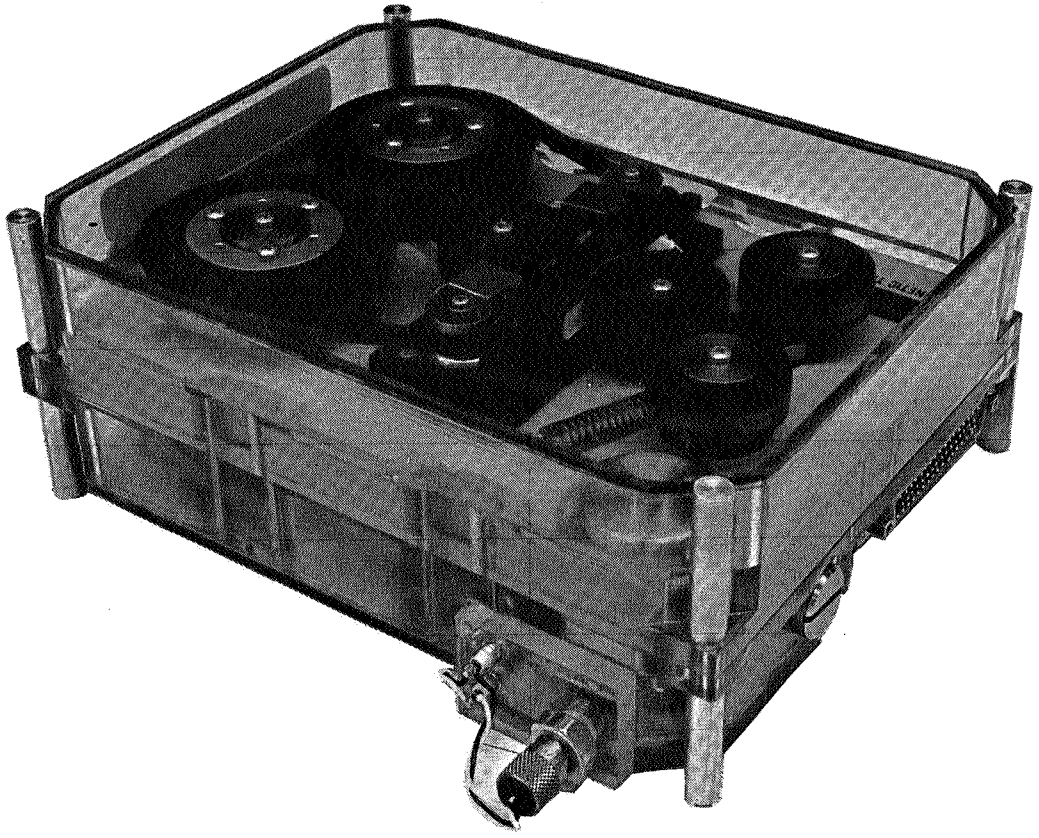

Figure 5. Modified Tape Transport