

II. TRANSDUCER SIGNAL CONDITIONING AND LOGIC CONTROL CIRCUITS

Block Diagram

Figure 3 is a diagram of the compressor with the transducer signal recording systems. All voltage analog signals from the transducers are processed, displayed on oscilloscopes and photographed with Polaroid cameras. As shown, the pressure transducer signal is displayed on three oscilloscopes along with the motion transducer signal, the raw magnetic pickup signal, and a processed form of the magnetic pickup signal. Signals from the pressure transducer are also sent to the control system that fires the spectrograph shutter and flashlamp high voltage circuits. All oscilloscope sweeps are triggered by external signal sources located in the control systems.

Both the pressure transducer system and the magnetic pickup system have a test switch for operational testing of the circuits and for adjusting the oscilloscope displays. The switch labeled PISTON SEATED serves two purposes. In preparing the compressor for firing, it is used to verify that the piston is properly seated at the reservoir end of the tube. Just before firing the compressor, the switch is connected into the pressure transducer system where it serves as an ON-OFF control switch.

System Timing Considerations

The time required for the piston to travel from the reservoir end of the tube to the test section is variable depending on the mass of the piston and the initial gas pressure ratio across the piston. Because of the variable time, oscilloscope display recording is synchronized to the occurrence of the first pressure pulse generated in the test section rather than to some starting point event such as the release of the piston.

Since the compressor is operated in the free piston mode, several compression cycles occur during each firing resulting in several pressure pulses of diminishing amplitude being sent to the recording system. At the same time, if the piston passes by the magnetic pickup, signals from that transducer would also be sent to its recording system. As it is only the first compression cycle that is of interest, these unwanted transducer signals are prevented from being recorded by the oscilloscope cameras. To do that, the circuits that trigger the oscilloscope sweeps are disabled at the completion of the first compression cycle. Resetting the control systems is done automatically for the pressure transducer

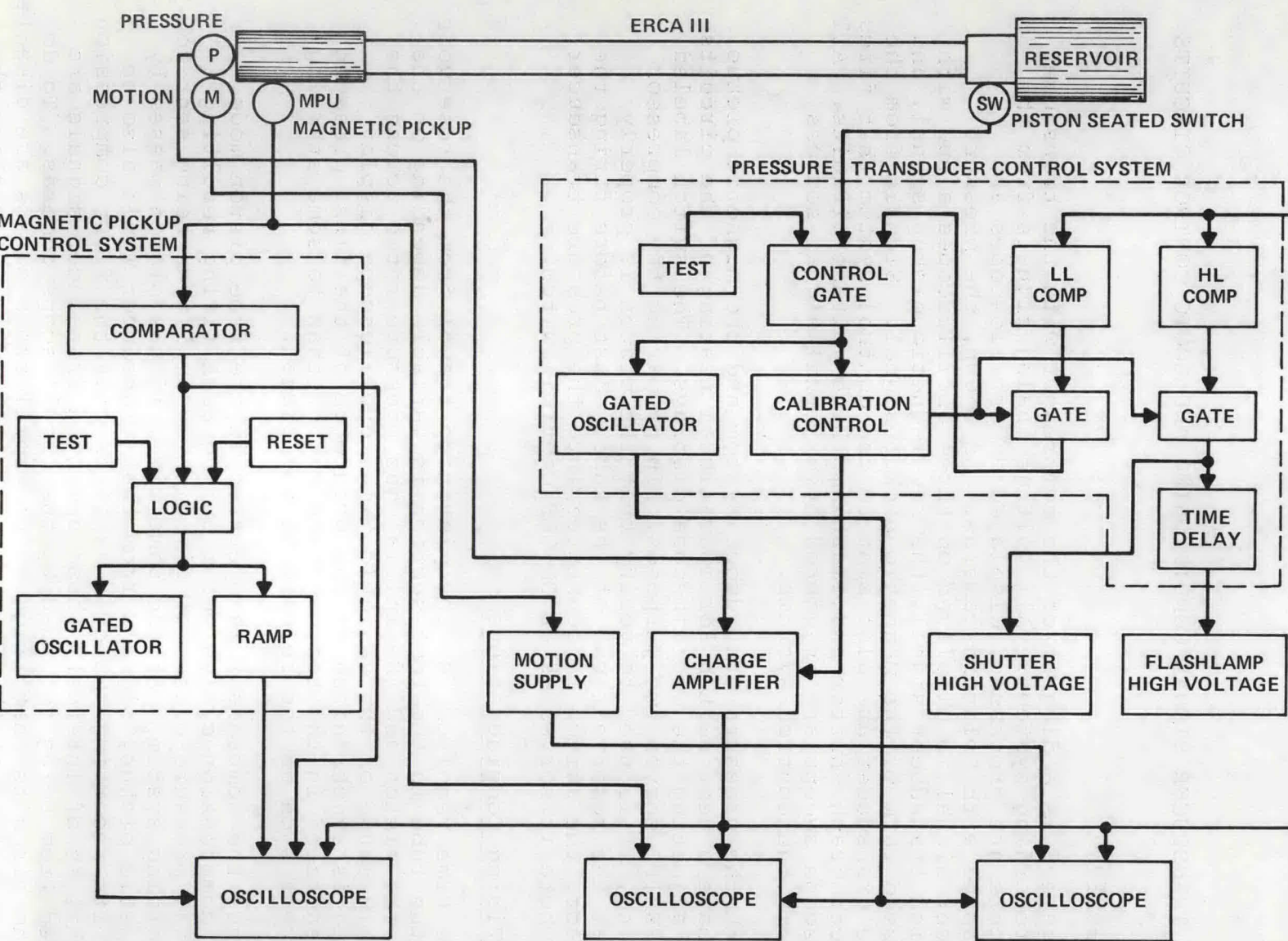


FIG. 3 TRANSDUCER SIGNAL RECORDING SYSTEMS