open-time and arrives at a time t_2 and a corresponding voltage v_2. This is the point on the pressure signal where shutter action should be initiated. Since the discharge of the flashlamp is a relatively instantaneous event, triggering of that circuit should occur at the peak of the pressure pulse during the spectrograph slit open-time as shown at t_3 in trace A.

To set up synchronization, the voltage level measured at v_2 is used as the reference voltage level on a second voltage comparator referred to as the High Level Comparator (HL Comp). When the pressure signal voltage rises above the reference level, the comparator changes output logic states as shown in trace D. Again, the comparator will revert to its initial state when the signal voltage falls below this reference level at t_4.

When the HL Comp changes states at t_2, the level transition fires the spectrograph shutter high voltage circuit by the pulse shown as trace E. At that same moment, the HL Comp signal also starts a time-delay circuit set to the interval between t_2 and t_3. At the end of the time delay period, a trigger pulse is sent to the flashlamp high voltage firing circuit as shown in trace F.

Figure 5, the more complete timing diagram for the pressure transducer system, contains all the information shown on Figure 4. Figure 5 also shows the steps taken to cope with the timing problems already discussed.

The magnetic pickup transducer system also uses a gated oscillator to synchronize its oscilloscope triggering time. Triggered by the first positive magnetic pickup signal, the oscillator will remain on for a fixed, pre-set interval. Once triggered, the oscillator will operate for one interval only and must be manually reset before it can be triggered again.

Signals from the motion transducer do not need synchronization; they are simply recorded along with the pressure pulse.

Display

Two methods have been used to display the pressure transducer signal on oscilloscopes. First is the straightforward single sweep of the oscilloscope trace showing one complete pressure pulse as shown in Figure 2. This technique requires only one trigger pulse to the oscilloscope sweep circuit. The second technique is to operate the oscilloscope sweep rate at a faster speed and cause the oscilloscope to sweep several times during the pressure pulse. Each trace then covers only a portion of the total signal so that, in effect, a time expansion of the signal is displayed. Triggering the oscilloscope for this type of display is accomplished by using the continuous oscillator signal as shown in Figure 4, trace C. Each time the oscilloscope retraces after a sweep, the oscillator signal will retrigger the sweep as long as the oscillator is gated on.

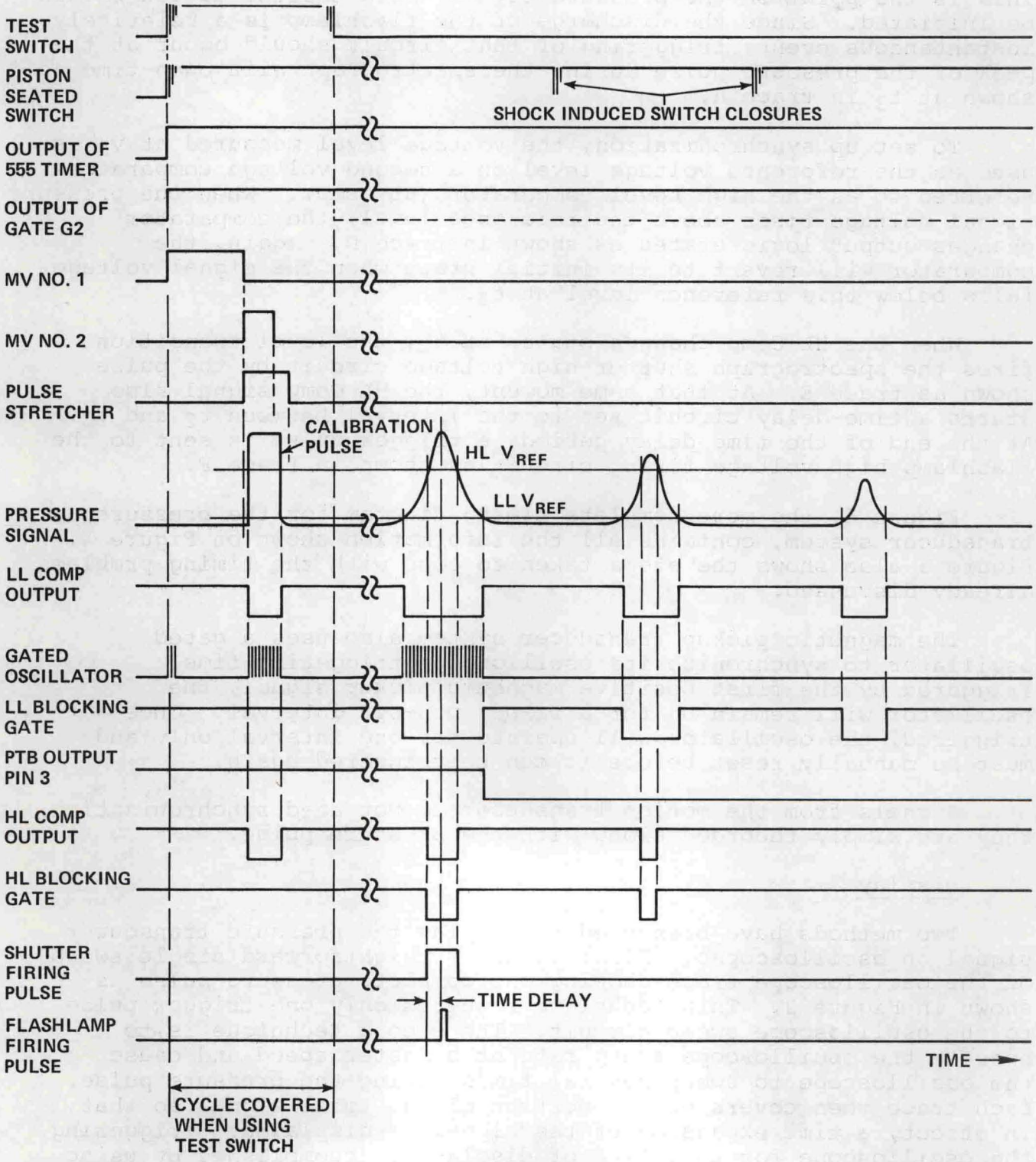

FIG. 5 PRESSURE TRANSDUCER SYSTEM TIMING DIAGRAM