AEROQUIP MODEL 10,000

FREQUENCY RESPONSE
Vertical Amplifier Flat, d.c. to 10,000 cps, 1 db down at 20,000 cps
Sweep Circuit 15, 3, 1, 0.3, 0.1, 0.03, 0.01, 0.003, 0.001 seconds

LINE RATING 105-125 volts, 50-1,800 cps

TUBE COMPLEMENT

Type	*Function*
12AH7-GT (V1A)	Y-Amplifier Input
12AH7-GT (V1B)	X-Amplifier
12SL7-GT (V2A)	2nd Y-Amplifier
12SL7-GT (V2B)	Y-Amplifier Output
2050 (V3A)	Single-Trace Control Tube
2050 (V3B)	X-Axis Sweep Generator
OD3 (V4)	Voltage Regulator
OC3 (V5)	Voltage Regulator
OA3 (V6)	Low-Voltage Regulator
12SJ7 (V7A)	Timing-Wave Generator
12SJ7 (V7B)	Low-Voltage Regulator
6AS7 (V8)	Low-Voltage Regulator
5U4-G (V9A)	Medium-Voltage Rectifier
5U4-G (V9B)	Low-Voltage Rectifier
2X2/879 (V10)	High-Voltage Rectifier
6V6-GT (V11)	High-Voltage Regulator
5BP1 or 5LP7 (V12)	Cathode-Ray Tube

The schematic circuit diagram of the Aeroquip Hydrauliscope is shown in Fig. 22-1. This is not an ordinary oscilloscope such as might be used in an electronic laboratory or in radio servicing, but it was designed specifically for hydraulic pressure measurements. It provides visual presentation of the variation in pressure in a hydraulic system with respect to time or motion. It will respond faithfully to static or transient phenomena up to a frequency of 20,000 cps. The input circuit may be modified, externally or internally, to accept the output of practically all the pressure pickup elements which convert changes in some variable to changes in electrical potential.

Pressure Pickup Element

This element includes two arms of the Wheatstone bridge circuit. One of these arms consists of a winding of one mil diameter wire-wound under tension on an especially prepared metal tube. Pressure inside the tube causes an increase in its diameter, thereby stretching the wire and increasing its resistance. Different operating pressure ranges are obtained by varying the wall thickness of the tube. The second arm of the bridge is a winding identical to the first, but not subject to pressure changes. This winding is used for temperature compensation.

Time Bases

The horizontal or X-axis time-base circuit consists of a 2050 thyratron *V3B* and an *R-C* charging circuit. Nine fixed time bases are provided, and are selected by a switch. The rates range from 15 seconds to 1 millisecond per sweep of 3.5 inches. This time-base generator is connected directly to the X-TIME amplifier which uses a 12AH7-GT tube *V1B* feeding the horizontal-deflection plates of the cathode-ray tube. The starting position of the trace is controlled by the X-POSITION control *R19*.

X-Selector

The generator *V3B* may be triggered in different ways, as selected by the X-SELECTOR switch *S4*. In the CONTINUOUS position, the grid bias of *V3B* is adjusted by *R31* to the point where the thyratron acts as a relaxation oscillator. These oscillations may be synchronized, if desired, by the application of a signal between terminals *A* and *B* of the EXTERNAL receptacle *J2*.

In the INTERNAL REPEAT position, sufficient bias is supplied to *V3B* so that it will not ionize until it receives a signal from the Y amplifier through *C3A*. This signal must be positive and must correspond to an upward deflection greater than one-quarter inch.

In the EXTERNAL REPEAT position, *V3B* may be triggered by simply shorting terminals *A* and *B* of the EXTERNAL receptacle *J2*. This is usually done by means of a suitable contactor operated from some element in the hydraulic system. Each time the contactor closes, *V3B* will receive a trigger pulse. The EXTERNAL SINGLE position of the X-SELECTOR switch connects the second thyratron *V3A* between the EXTERNAL receptacle *J2* and the grid of *V3B*.

When the contactor closes, *V3A* conducts and sends a signal to *V3B*. Since there is no capacitor in the anode circuit of *V3A*, this thyratron will remain conductive regardless of the opening and closing of the external contactor until the anode circuit is broken by pressing the reset button *S1*.

Since *V3B* can receive a signal only at the instant *V3A* begins to carry current, it is apparent that only one trace will be drawn unless the reset button is operated. In the INTERNAL-SINGLE position, operation is the same as the EXTERNAL-SINGLE position except that the trace is initiated by a positive signal from the Y-axis amplifier. A sweep of the beam may also be initiated in the EXTERNAL position by a pulse of positive voltage (six volts minimum) applied to terminal *A*.

Timing-Wave Oscillator

In order to provide accurate indication of time intervals on the X-axis, a stable resistance-capacitance coupled oscillator is included. This circuit uses a type 12SJ7 tube *V7A* and is arranged so the frequency of oscillation changes with the X-TIME switch *S5*. On the 15-, 3-, and 1-second positions, the timing wave has a frequency of 5 cps. In the next three positions, 0.3, 0.1, and 0.03, the frequency of the timing-wave oscillator is 100 cps, and in the remaining three positions the frequency is 3,000 cps. The timing wave is fed to the Y-amplifier by means of the TIMING switch *S2*. When this switch is pressed, the cathode-ray beam moves down approximately one-quarter inch so that the timing wave, as it appears on the viewing screen, will be below the normal zero axis. The timing wave is intended primarily for use in connection with the camera attachment since no provision is made for synchronization with the continuous sweep.

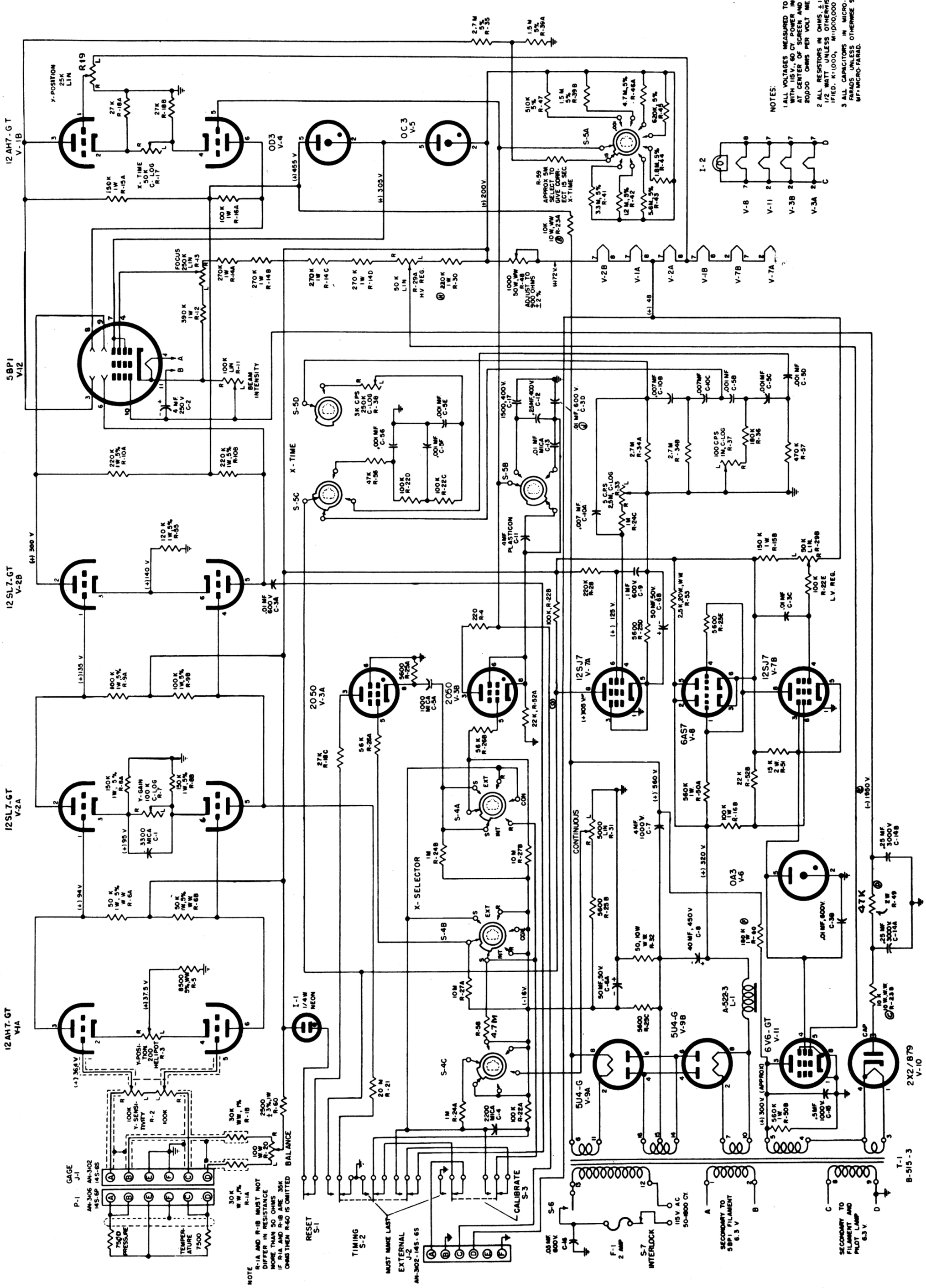

Fig. 22-1.—Schematic of Aeroquip Model 10,000.

Courtesy Aeroquip Corp.