RCA MODEL 327-A

FREQUENCY RESPONSE

Vertical Amplifier 0 cps to 100 kc
Horizontal Amplifier 0 cps to 100 kc
Sweep Circuit 1 cps to 30 kc
Blanking Amplifier 30 cps to 100 kc

DEFLECTION SENSITIVITY

Vertical Amplifier 0.025 rms volts/inch
Vertical-Deflection Plates 52 rms volts/inch
Horizontal Amplifier 0.03 rms volts/inch
Horizontal-Deflection Plates 52 rms volts/inch

LINE RATING 105-115/115-125/ and 210-230/230-250 volts, 50/60 cps

TUBE COMPLEMENT

Type	*Function*
914	Cathode-Ray Tube
6SF5 (twelve)	Voltage Amplifiers
6J5 (two)	Voltage Amplifier (Phase Inverter)
6SN7GT (four)	Sync Amplifier, Keying, Rectifier, Blanking Amplifier
6N7	Timing-Axis (Sweep) Oscillator
879	High-Voltage Rectifier
5V4G	Low-Voltage Rectifier
6X5GT (two)	Voltage-Doubler Rectifiers
VR150-30 (two)	Voltage Regulators

The schematic circuit diagram for Model 327-A is shown in Fig. 22-58.

Timing Oscillator

The timing oscillator circuit uses a special circuit which functions as a one shot multivibrator, or multiple-sweep operation. A 6N7 *(V3)* is used in the timing oscillator circuit. The 6N7 is also a part of the single-sweep circuit. The output of the timing-axis oscillator is fed to a 6SN7 cathode-follower tube *V4,* whose output in turn is delivered to the 6SF5 *(V6)* horizontal amplifier. The single-sweep rate corresponds in frequency to that obtained in the normal multi-sweep operation. The single-sweep circuit uses three double-triode tubes: the timing axis tube *V3,* a double triode as a keying tube *V2,* and the cathode-follower-triode section of a third tube *V4* that has its other section connected as a biased diode. The biased-diode section of *V4* is the first tube in the circuit and permits signals of but one polarity to be applied to the keying tube *V2.*

The action of the single-sweep circuit is as follows: When a signal is applied to the vertical amplifier, a voltage appears at pin 4 of the 6SN7GT synchronizing amplifier *V1.* This voltage is taken from the output of *V15,* at the junction of *R83.* The voltage appearing at the plate of *V1* is coupled through capacitator *C4* to pin 1 of the second-triode section of this tube. This section of the tube is used as phase inverter for the purpose of reversing the phase of the signal applied to the biased diode section of *V4* which has pins 1-4, grid and plate, tied together for single-sweep operation, and for normal synchronizing phase when using multisweep.

In the starting condition for sweep, the first-triode section of the keying tube *V2* (pins 1, 2, 3) is conducting, and the second-triode section is cut off. The rectified current passed by the diode section of *V4* is of such polarity as to apply a negative voltage to pin 1 of *V2.* The application of this negative voltage causes the first-triode section to become nonconducting. With the second triode conducting, a high positive d-c voltage appears across *R16,* the grid resistor for the first-triode section of the sweep oscillator *V3.*

Since both triode sections of *V3* have a common cathode resistance, the operation potential of the diode plate (formed by connecting the plate and grid together by switch *S2C*) is controlled by the drop in this resistance *(R19* and *R20).* Changes of bias on the input grid of *V3,* pin 4, then causes the diode section to be conducting when the cathode potential rises, and nonconducting when it falls. Since a capacitator is connected in the diode circuit, the rate of change in voltage is controlled by the resistance and capacitance in the circuit *(R22, R23* and any of the range capacitors, *C6, C7, C8,* or *C10,* depending on which range button is pressed). In multiple sweep, these same components are used, the single-sweep time corresponding to a single across-the-screen movement of the multiple sweep. This sweep output is impressed on pin 4 of the cathode-follower tube *V4,* where the output taken from its cathode circuit is impressed on the input of the horizontal amplifier (grid of *V6*). Movement of the spot on the screen of the cathode-ray tube then results. To prevent a spot from appearing before the start of the sweep, the blanking amplifier *V5* is connected to the keying tube *V2.*

Vertical Output Amplifier

A study of the circuit of the output stage, *V17, V18, V19,* and *V20,* shows that this is a push-pull type. It is, however, distinctly unusual because d-c potentials are applied to the grids and because series operation is used for each half of the stage. This can be seen by tracing from *R95* to *R97, V17, R99, V19, R103* and *B+,* so that it is apparent that *V17-V19* form a series circuit; and from *R96* to *R98, V18, R100, V20, R104,* and *B+. V18* and *V20* also form a series circuit. The two series circuits, considered together form a push-pull amplifier stage.

The power-output stage or deflection-stage circuit is quite complicated and cannot be discussed in detail here. It is really a differential d-c push-pull amplifier, consisting basically of a bridge circuit formed by arms R101, R102, and R103, R104. The amount of unbalanced current flow, which is coupled to the deflection plates, depends on the relative input signal.

RCA MODEL 715-B

FREQUENCY RESPONSE

Vertical Amplifier 5 cps to 11 Mc, flat within ± 1 db
Horizontal Amplifier 3 cps to 500 kc, flat within ± 2 db
Sweep Circuit Sawtooth Range, 5 cps to 100 kc, Sync Range, 5 cps to 2 Mc

DEFLECTION FACTORS

Vertical Amplifier 0.1 rms volts/inch, (2nd anode 2,600 V)
Vertical-Deflection Plates 35 rms volts/inch, (2nd anode, 2,600 V)
Horizontal Amplifier 0.5 rms volts/inch, (2nd anode 2,600 V)
Horizontal-Deflection Plates 29 rms volts/inch, (2nd anode 2,600 V)

LINE RATING 105-125/210-250 volts, 50-60 cps

The schematic circuit diagram including tube complement and functions is shown in Figs. 22-59A (Power Supply) and 22-59B (Oscilloscope). This oscilloscope possesses a number of unusual features, which will be discussed.

Vertical Amplifier

The input to the vertical amplifier is fed through a five-step attenuator unit. The input amplifier uses high-frequency compensation in form of *L101* which is in series with its plate circuit. The 6V6 push-pull vertical-driver stage *V105* is unusual because of the frequency compensation network arrangement. Series inductance *L105* tends to attenuate high-frequency signals, serving as a low-pass filter, while *L107A* in series with the plate-load resistor *R150,* tends to boost the voltage output at the higher frequencies. A similar action occurs with respect to the other half of the 6V6 vertical-driver stage *V106.* The net effect involves differential action between the various components, the shape of the response curve for this stage being alterable by means of the variable inductances *L105, L107A, L107B,* and *L106.* The over-all curve for the entire vertical amplifier is a summation of the response characteristics of the individual stages. The push-pull 6V6 driven stage excites the push-pull 807 vertical-output stage, *V107* and *V108.* The 807 plate circuits are also frequency compensated to give a flat over-all, equalized response curve.

Horizontal Amplifier

The output stage provides low-frequency boost by means of *L119* and *L120* in the plate circuit of *V114* and *V115,* respectively. In addition to this low-frequency compensation, there is a high-frequency boost provided by *L117* and *L118* to compensate for high-frequency attenuation. The spot positioning control circuit is driven by the push-pull 6AG7 horizontal-output.

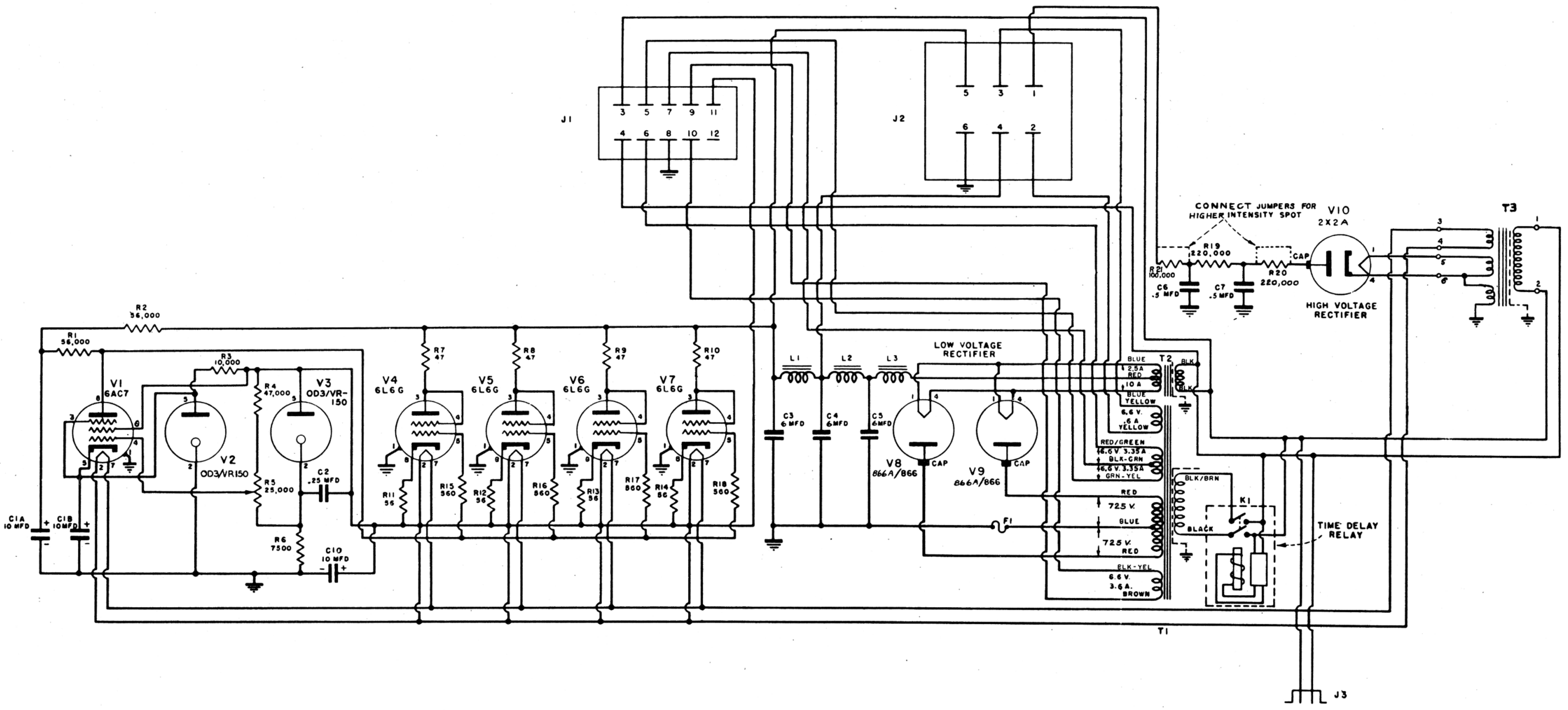


Fig. 22-59A.—Power supply of RCA Model 715-B.

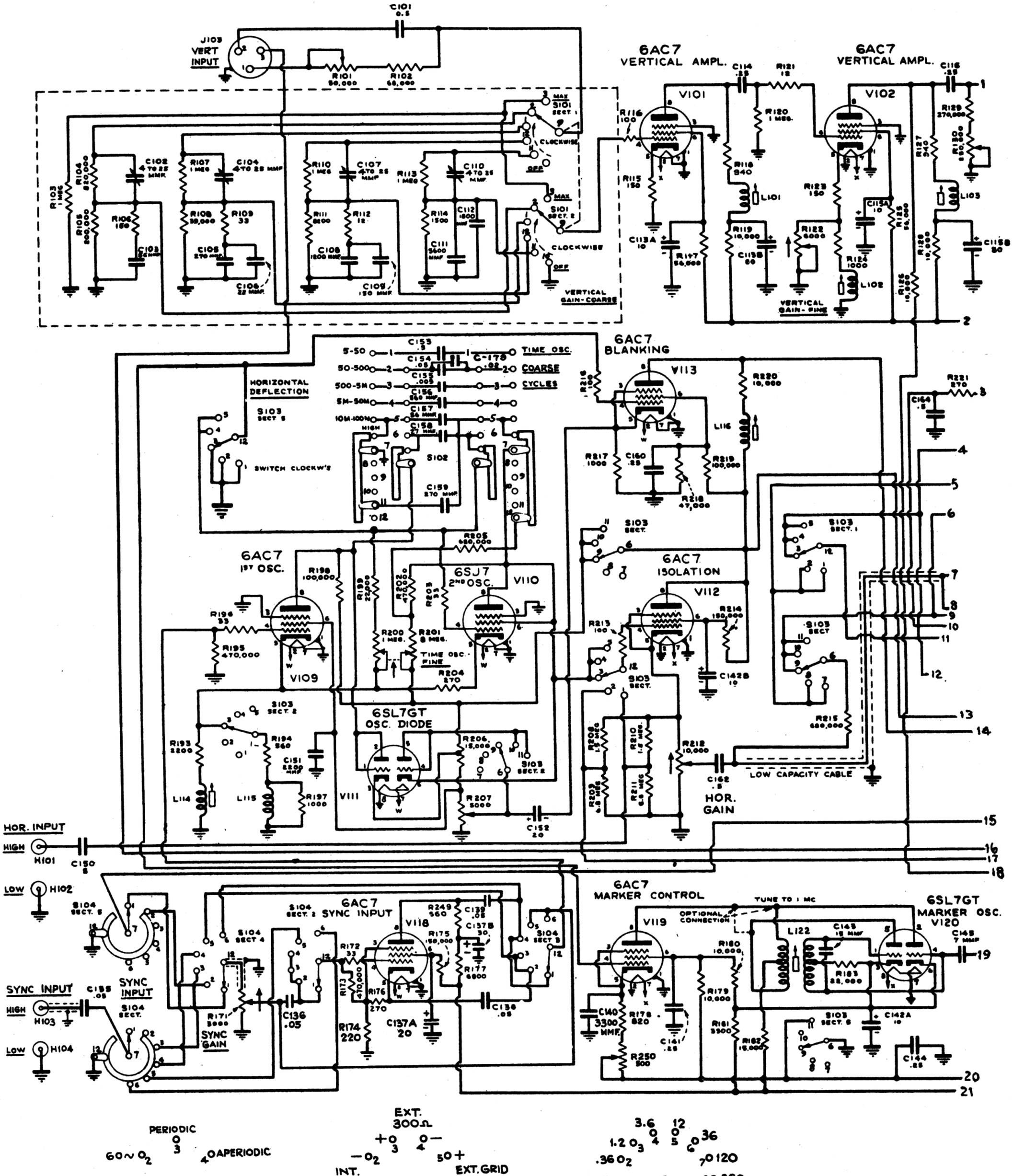
Courtesy RCA

Marker Control

The marker control tube *V119* receives its excitation from the grid circuit of the blanking amplifier *V113*. When *S103*, the horizontal-deflection switch is in the fifth, or APERIODIC AND MARKER, position, timing marker pulses are superimposed on the signal voltage. This produces a visible indication on the signal trace at selected time intervals. In the type 715-B oscilloscopes, the intervals have been set at one microsecond. The use of the marker-control tube, which is keyed by the sweep-oscillator voltage, insures that the timing markers will appear stationary on the screen of the cathode-ray tube.

Oscillator Diode

In the fourth, or APERIODIC, position of the HOR DEFLECTION control, the Potter Oscillator circuit is converted from a repetitive oscillator to an aperiodic or "one-shot" type for examination of waveforms that do not recur at regular intervals. The change is accomplished by increasing the grid bias on both of the oscillator tubes. When the oscillator is triggered by a sync pulse, a single cycle of oscillation occurs, causing the spot to sweep across the screen of the cathode-ray tube and return to its starting position. It remains there until the oscillator is triggered by the next sync pulse.



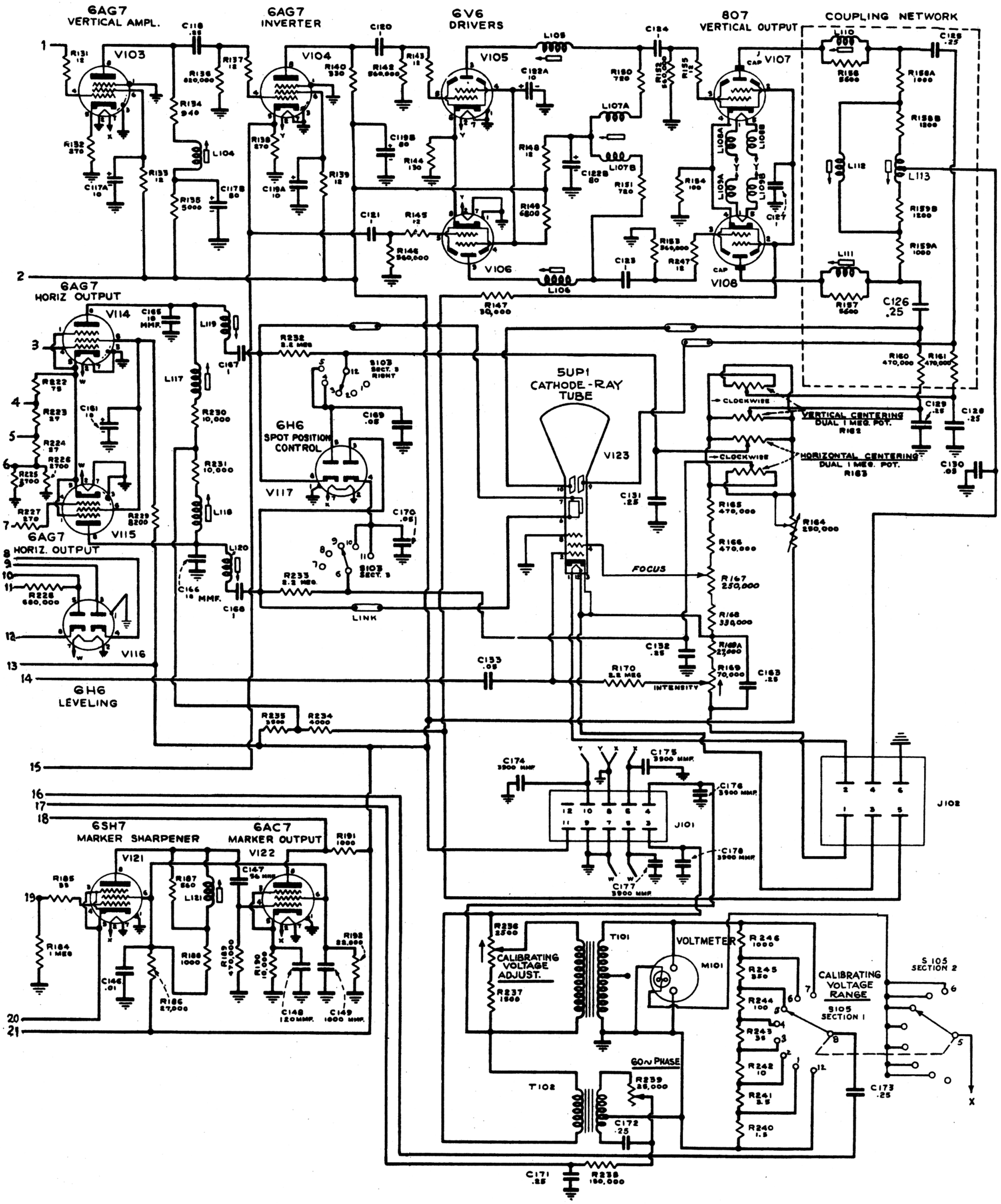


Fig. 22-59B.—Schematic of RCA Model 715-B.

Courtesy RCA