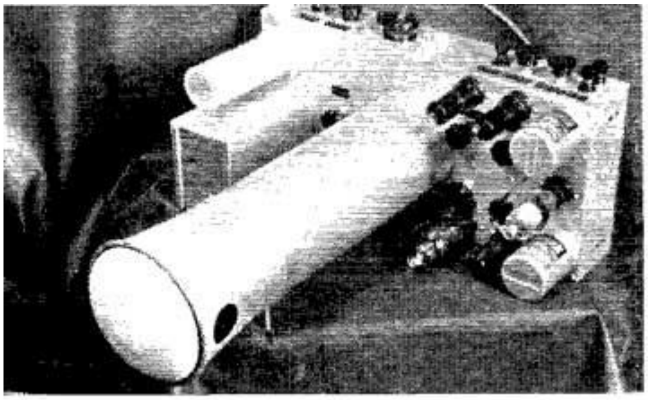

Fig. 2 — Scanning, synchronizing and power-supply circuits are assembled on one chassis with the 1802 cathode-ray tube. This unit may be connected to the receiver described in a previous issue, replacing the electromagnetic-deflection circuits shown in February *QST*.

An Electrostatic-Deflection Kinescope Unit for the Television Receiver

Scanning, Synchronizing and Power Supply Circuits for the New Five-Inch Tubes

BY J. B. SHERMAN*

LAST month's article [1] described Kinescope outfits for electromagnetic deflection, for use with the video receiver described in Mr. C. C. Shumard's articles.[2] A new 5-inch tube for electrostatic deflection, the Type 1802,[3] also lends itself well to use in this receiver. A single, compact unit has been built for the 1802, containing high-voltage supply and synchronizing and scanning equipment.

Fig. 1 shows the circuit of this unit. The composite horizontal and vertical synchronizing signal from the receiver is supplied from the receiver to the post marked "sync input," and the horizontal and vertical impulses are separated and delivered to the respective scanning oscillators in much the same manner as shown previously. Blocking oscillators and discharge circuits are used for generating the sawtooth waves. These are modified somewhat from the form shown for magnetic deflection, in order to suit the electrostatic-deflection requirements. The output circuits, however, are entirely different, since it is necessary in the electrostatic case to supply large voltages rather than the large currents required for magnetic deflection.

It will be observed that push-pull deflection is used for the Kinescope. This makes it possible to obtain sufficient deflecting voltage with a "B" supply of only 300 volts for operation of the Kinescope at 2000 volts on the second anode. Furthermore, focus and linearity of deflection with this arrangement are much better than can be obtained with the single-ended connection.

A Type 6N7 tube is used for vertical deflection output, push-pull operation being obtained by feeding one grid from the opposite plate circuit. A lower value of plate load resistance is necessary for the horizontal output than for the vertical, in order to maintain an adequate frequency-response characteristic for the high-frequency sawtooth. A Type 6F8G tube is used for horizontal output because it permits a greater plate voltage swing than the 6N7 at the lower load resistance. The push-pull operation is obtained again by driving one grid from the opposite plate.

Fig. 2 shows the appearance of the complete unit. A standard 8″ × 17″ × 3″ chassis is used, turned on its side, with the Kinescope socket mounted in the center. This makes possible

The new electrostatic-deflection tubes are not only appreciably less expensive than the magnetic tubes of equivalent size, but are probably more adaptable to amateur use as well. The circuits for television reception resemble those made familiar by oscilloscope practice; no special deflecting coils are required. And, as proved by the sample photograph in this article, the picture has good detail. An excellent moderate-cost unit for "looking-in" on the transmissions soon to be regularly scheduled.

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[1] J. B. Sherman, "Using Electromagnetic-Deflection Cathode-Ray Tubes in the Television Receiver," *QST*, February, 1939.

[2] C. C. Shumard, "A Practical Television Receiver for the Amateur," *QST*, December, 1938; "Construction and Alignment of the Television Receiver," *QST*, January, 1939.

[3] Type 1802-P1 has the familiar green screen; Type 1802-P4 uses the more recent white screen.

simple, compact construction. With adequate shielding of the Kinescope no effect on either focus or deflection can be observed due to the proximity of the power transformer. The outside shield which serves also to support the Kinescope is ¼-inch aluminum tubing, 12 inches long and 4 inches inside diameter. It is fastened to the chassis by four 6-32 bolts tapped into the

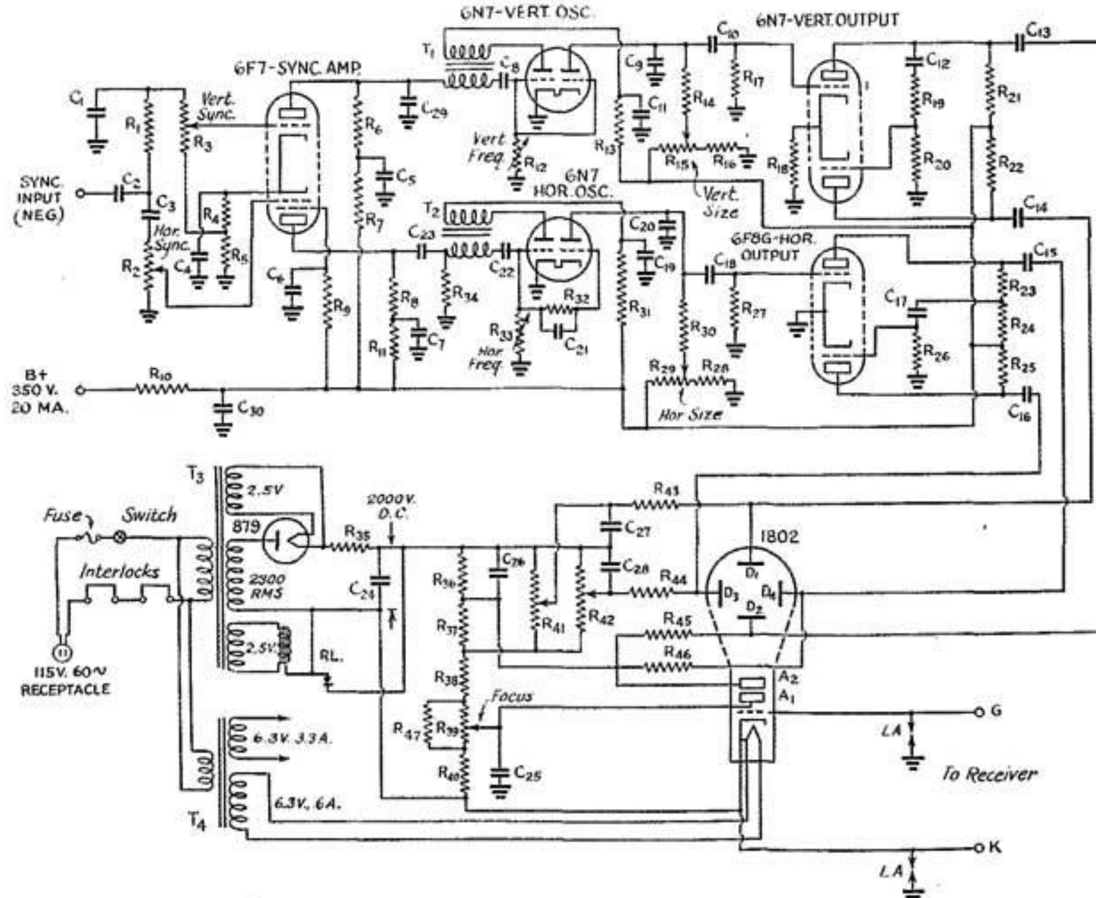

Fig. 1 — Scanning, synchronizing and power supply circuits for the 1802.

C_1, C_{20}, C_{22}, C_{29} — 0.001-μfd., 400-volt.
C_2, C_5, C_9, C_{10}, C_{11}, C_{12} — 0.25-μfd., 400-volt.
C_3 — 50-μμfd., 400-volt.
C_4 — 25-μfd., 25-volt.
C_6, C_{19} — 0.05-μfd., 400-volt.
C_7, C_8 — 0.1-μfd., 400-volt.
C_{13}, C_{14} — 0.1-μfd., 2000-volt.
C_{15}, C_{16} — 0.005-μfd., 2000-volt.
C_{17}, C_{18} — 0.01-μfd., 400-volt.
C_{21} — 800-μμfd., 200-volt.
C_{23} — 0.004-μfd., 400-volt.
C_{24} — 1-μfd., 2000-volt (Aerovox Type 2005).
C_{25} — 0.1-μfd., 1000-volt.
C_{26}, C_{27}, C_{28} — 0.25-μfd., 200-volt.
C_{30} — 16-μfd., 450-volt.
R_1, R_7, R_{11}, R_{13}, R_{31} — 0.1-megohm, ½-watt.
R_2 — 10,000-ohm potentiometer.
R_3, R_{12}, R_{39}, R_{41}, R_{42} — 0.25-megohm potentiometer.
R_4 — 900 ohms, ½-watt.
R_5 — 1100 ohms, ½-watt.
R_6, R_8 — 10,000 ohms, ½-watt.
R_9 — 0.4-megohm, ½-watt.
R_{10} — 2000 ohms, 2-watt.
R_{14} — 1-megohm, ½-watt.
R_{15}, R_{29}, R_{33} — 0.1-megohm potentiometer.
R_{16}, R_{28} — 1000 ohms, ½-watt.
R_{17}, R_{19}, R_{26}, R_{27}, R_{44}, R_{46} — 2 megohms, ½-watt.
R_{18} — 2500 ohms, ½-watt.
R_{20} — 60,000 ohms, ½-watt.
R_{21}, R_{22} — 0.2-megohm, ½-watt.
R_{23}, R_{25} — 50,000 ohms, 1-watt.
R_{24} — 3000 ohms, ½-watt.
R_{30} — 0.5-megohm, ½-watt.
R_{32} — 5000 ohms, ½-watt.
R_{34} — 500 ohms, ½-watt.
R_{35} — 50,000 ohms, 2-watt.
R_{36}, R_{37} — 30,000 ohms, ½-watt.
R_{38} — 0.6-megohm, 3-watt (3–0.2 meg., 1 watt).
R_{40} — 0.15-megohm, 1-watt.
R_{43}, R_{45} — 3 megohms, ½-watt.
R_{47} — 0.5-megohm, 1-watt.
T_1 — Vertical oscillation transformer (RCA No. 9834)
T_2 — Horizontal oscillation transformer (RCA No. 9835).
T_3 — Power transformer (see text) (RCA No. 9839).
T_4 — Filament transformer.
LA — Lightning arrestors (Brach No. 27A, dismounted).
RL — Discharge relay — Dunco No. RA-1 (modified as described).

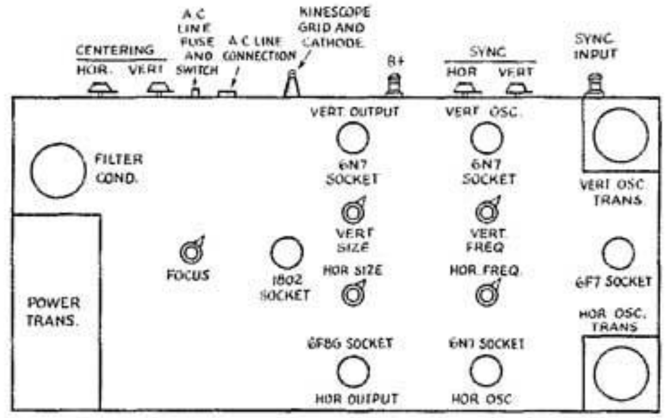

Fig. 3 — Layout drawing of the 1802 unit.

tubing wall. In order to house the tube completely a cone, 4½ inches long and 5½ inches in diameter at the mouth, is cut from No. 20 sheet aluminum and fastened to the end by bolts tapped into the tubing. The inside shield consists of a loosely-wound spiral of 3 layers of No. 22 sheet iron, 11 inches long, which fits inside the aluminum tube. If it is necessary to demagnetize the iron, this can be done in the same manner as described in last month's article.

The 1802 socket is the new standard 11-pin magnal type.

Fig. 3 shows the layout of the panel and Fig. 4 is an inside view of the chassis. Focus, size, and frequency controls are located on the panel so that their shafts can be extended to a cabinet front panel. Centering and sync controls are not often used and are therefore placed on the upper edge of the chassis, where they can be conveniently reached in a cabinet with hinged top.

The usual high-voltage precautions have been taken. Neon lightning arrestors are connected from Kinescope grid and cathode to ground to prevent any possible external appearance of high voltage at these points. Pin jacks fastened to the cover of the rear of the chassis open the 110-volt circuit when the cover is removed, and a relay discharges the high-voltage condenser when the 110-volt circuit is broken, whether by removal of the cover or by operation of the line switch. By promptly removing the high voltage, the discharge relay also prevents the appearance of a stationary spot on the screen after the entire receiver is turned off, for since the Kinescope bias is obtained from the low-voltage receiver supply which has a shorter time constant than the high-voltage supply, the Kinescope anode voltage would otherwise persist after the scanning and bias voltages have been removed. The discharge relay is a modified Dunco type RA-1, shown in the photograph of Fig. 5. It is mounted upside down in order to obtain gravity operation in the event of failure of the spring, and has an extension contact arm fastened to the armature. This is the low side of the circuit, and the high-voltage connection is made to a contact on a small porcelain standoff insulator mounted directly on the chassis. This relay has a 2.5-volt winding which is conveniently connected to the unused 2.5-volt secondary of the power transformer.

In connection with the power transformer, it should be mentioned that the high-voltage secondary potential actually required is only about 1700 volts r.m.s. However, high-voltage low-current transformers designed for Kinescope operation are at present difficult to obtain, and it was necessary to use a standard transformer of higher voltage with a series resistor.

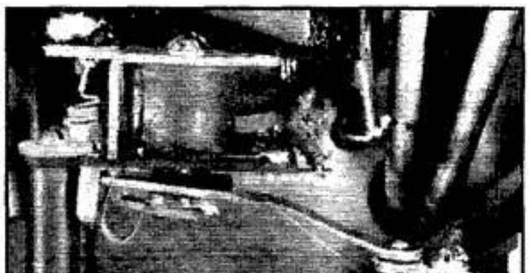

Fig. 5 — The gravity-operated relay is a simple adaptation of an ordinary inexpensive a.c. relay. The extension arm is connected to the low-potential end of the high-voltage supply, thus no special insulation is needed.

The Kinescope operates at heater voltage of 6.3, as do the rest of the tubes in the unit. However, since the Kinescope cathode and heater are operated above ground, a separate transformer winding is required. The small trans-

Fig. 4 — Most of the components are below the chassis. The rectifier tube is at the right, filament transformer in the lower left corner.

Fig. 6 — This photograph shows the detail that the five-inch electrostatic tube is capable of giving. The picture originated in an r.f. signal generator and was passed through the entire receiver, not just the video circuits alone.

former mounted inside the chassis near the 6F7 tube has two 6.3-volt windings for supplying all of the heaters. It is perfectly satisfactory, however, to run all but the Kinescope from the same transformer winding which supplies the rest of the tubes in the receiver.

Since the 300-volt current demand of the unit is small (approximately 20 ma.), it is most convenient to use the same "B" supply as shown in Fig. 2 of Mr. Shumard's December article. The negative "B" connection of the scanning unit is ground. The positive "B" lead is run to the output side of the second filter choke. It may be necessary to reduce R_{57} in the "B" supply slightly to maintain the specified 3 volts across it. If necessary, the filter output can be increased by using a small condenser (say 1 μfd.) across the rectifier output before the first choke. The other connections to the receiver are sync input, Kinescope grid, and Kinescope cathode. These are made directly to the terminals thus marked.

After the unit has been built, the linearity of scanning can be checked by the bar-pattern method described previously. It will be noted that the circuit shows no scanning distribution adjustments, nor should any be necessary. If greater deflection is desired, R_{10} may be reduced, which will increase the "B" supply voltage. However, 300 volts is adequate for rated 2000-volt operation of the 1802.

Fig. 6 is a photograph of a received Monoscope picture, using the 1802 unit connected to the receiver described in Mr. Shumard's articles. The Monoscope signal was used to modulate a signal generator tuned to 45 Mc. and connected to the antenna posts of the receiver, and the photograph thus indicates the overall performance of the complete outfit.

Affiliated Clubs

(*Continued from p. 41*)

Actually a mobilization of emergency facilities, the test was also witnessed by officials of telephone, telegraph and power companies, the American Legion and various public officials. Contact was established with some fifteen cities in Washington, Idaho and Montana on 3.9- and 1.75-Mc. 'phone. Several stations operated on emergency power, one actually having a power failure and handling replacement orders for the power company. Amateurs coöperating in the test included W7BFI (Spokane control station), W7AAN, W7AQK, W7ABK, W7ABT, W7FGZ, W7BOZ, W7CCR, W7BTJ, W7EPS, W7DZX, W7FIJ, W7CRL, W7EPS, W7BYT, W7FON, W7BXN, W7HR, W7EQV, W7EDU, W7ADK, W7DOZ, W7DTJ, W7DYT, W7ASA, W7FOV, W7FOM, W7FVO.

VISIT YOUR LOCAL CLUB

ADDRESS the Communications Manager, A.R.R.L. (enclosing 3¢ stamp, please), for data on affiliated clubs in your vicinity. Clubs are excellent places to get acquainted with radio amateurs and to participate in interesting discussions on our hobby. At A.R.R.L. headquarters there are recorded the addresses of several hundred amateur radio clubs affiliated with the League, their places and times of meeting. Why not drop in at your local club and "meet the gang"?

GENERAL CLUB NEWS

THE Mike and Key Club of Baltimore, Md. held a Party and Dance on January 21st to help pay for the complete, emergency-powered station now under construction by the club. A worthy objective! . . . The Iowa-Illinois Amateur Radio Club has adopted a new By-Law whereby every member in good standing receives with payment of his dues a year's membership in the A.R.R.L. This was done to stimulate club membership and insure 100% membership in the League. . . . The Worcester (Mass.) Radio Association is planning a banquet commemorating its 20th anniversary to be held some time in the early spring. A new transmitter is being completed for the club station, W1BKQ, and it is hoped that many contacts will be possible with other affiliated club stations. . . . An enthusiastic code class under the tutorship of Nate Heaton, W9UVU, is a regular feature of the Hamfesters Radio Club (Chicago). In addition to teaching code the need for good operating practices is also stressed in an effort to start out the beginner in the right way. The club's theory class is under the direction of Wynne H. Davies, W9YKJ. . . . W2JIQ, Tu-Boro Radio Club, is operating on 7 Mc. with a 6L6 oscillator-6L6 doubler combination. . . . The Albuquerque Communications Club (New Mexico) is sponsor of a weekly newspaper column, "Picked Up By The Antenna," written by Ted Douglass, club activities manager. . . . The Mid-Hudson Amateur Radio Club (Poughkeepsie, N. Y.) held a very successful Fourth Annual Banquet and Get-Together on December 10, 1938. M.-H.A.R.A. recently conducted a raffle, the proceeds of which are to be used to build a portable emergency-powered transmitter. . . .

— *E. L. B.*