Build Your Own VIDEO-AUDIO SET

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With the kit described, the building of a television receiver is easy.

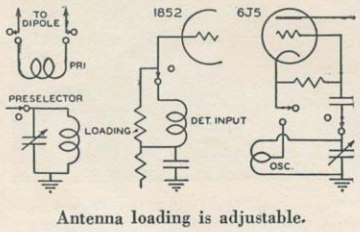
With the power circuits completely enclosed, the safety factor is greatly raised.

THE receiver to be described was built from a kit designed to provide amateurs and experimenters with parts for a complete sound and picture receiver for the RMA Standard Television Signal. It is a superheterodyne covering the 44 to 50 and 50 to 56 megacycle channels with provision made for adding coils to a switch assembly as additional frequency assignments are put to use. Both sound and picture channels are tuned simultaneously by means of this selector switch and a small vernier condenser. There are six controls on the front of the panel.

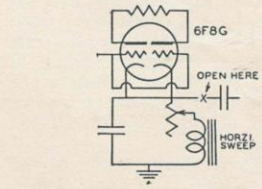
Four additional, seldom used, knobs are brought out on the left hand side of the chassis. All of these knobs are grouped in a manner that facilitates understanding their use and makes them convenient to use. It is intended that a half wave dipole antennae be used for reception, using a transmission line with a characteristic impedance of approximately 110 ohms to connect the antennae to the receiver. A conventional antennae with a single wire lead-in *is not* recommended because such an antennae and lead-in pick up reflected signals from several directions and may cause multiple images on the cathode ray tube.

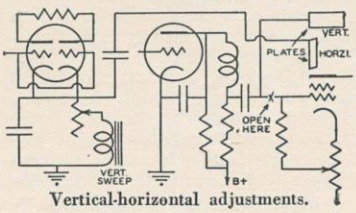
High Frequency Coil Assembly

The radio frequency and oscillator coil assembly consists of a rotary channel switch assembly upon which is mounted a four-section coil for each of the two low frequency television channels. Each of these four-section coils consists of an antenna primary, a preselector, the detector input, and oscillator as shown. This arrangement permits the coupling between windings to be adjusted to optimum conditions for each television band without the compromises involved in covering a larger tuning range with one set of coils. The channel switch has four positions with two, four-section coils mounted on the switch, prewired and tested. The coil-mounting plate has provision for two additional coil assemblies which will be ample for a given locality for some time to come. Later, this can be changed.



Antenna loading is adjustable.





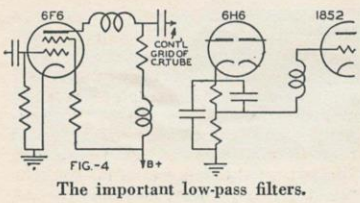
Vertical-horizontal adjustments.

Picture I.F. Amplifier

The picture i.f. amplifier makes use of capacitative coupling to facilitate adjustment of band width. Small iron cores, which tune the coils, are adjusted from the top of the can, while the degree of overcoupling is adjusted with a two-plate trimmer connected between the high potential ends of the coils. A cut-away view of such a coil, shows the simplicity of this arrangement. Plate and grid leads to the tubes are taken from the lower end of the coils and are about one and one-half inches in length. Loading resistors to obtain uniform amplification over the pass-band are connected externally to the coil assembly. A portion of the cathode resistor is not bypassed. This minimizes variation of input resistance and capacity with variation of bias. A trap for the 8.25 meg. sound i.f. frequency is connected to the grid of the first i.f. tube. This trap is also adjusted from the top of the coil can, being tuned by a small iron core.

Picture I.F. Alignment

One way to adjust the i.f. is to apply a voltage from an oscillator with frequency sweep to the amplifier, stage by stage, observing the shape of the selectivity curve on a cathode ray oscillograph connected to the video detector. If the experimenter has access to such a "wobbulator" but has not a cathode ray oscillograph, the cathode ray tube of the receiver will do very well. It is only necessary to apply the vertical sawtooth voltage of

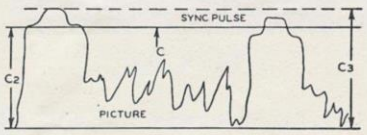


The important low-pass filters.

the sweep circuit to the horizontal deflecting plates, (allowing the horizontal sweep to go unused) and capacity-couple the plate of the video amplifier to the vertical deflecting plate. The trace will "lock-in" well enough to observe the selectivity curve.

The diagram shows how the output of the 6F6 can be applied to the vertical deflecting plate by changing the .05 mfd. 2000 volt blocking condenser from the control grid of the cathode ray tube to the vertical deflecting plate. The grid resistor to the bias supply must, of course, be left connected to the control grid.

Another method of alignment of the

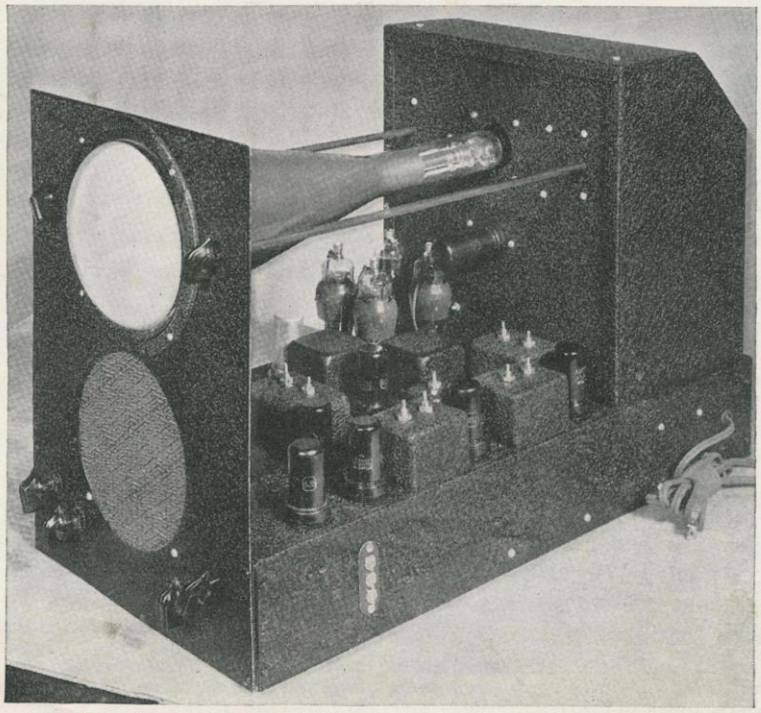


Sync.-pulse and picture graph.

picture i.f. is to use a test oscillator and output meter, adjusting the transformers in order, starting with the output transformer. It may be helpful to first plot a selectivity curve for this stage alone, adjusting the capacity coupling so that two peaks will appear at approximately 10.5 and 11.5 MC respectively. Upon going to the next stage, a second curve may be made to have its two points of maximum response at about the same two frequencies. When the signal is applied to the grid of the 1852 converter, this stage is adjusted to "fill-in" the valley between the two peaks and a third curve plotted to show the overall i.f. selectivity. The trap for the *sound* i.f. frequency may be adjusted *before* tuning the input picture transformer, but should be "touched up" *after* the input stage has been aligned.

This alignment procedure will give an overall i.f. sensitivity on the order of 500 microvolts for optimum contrast on the cathode ray screen. For amateurs living outside the "service area" of a television transmitter it is possible, because of the flexibility of the i.f. amplifier, to adjust the band pass characteristic to any reasonable combination of selectivity and gain. Thus, a distance handicap can be compensated for, to some extent, though naturally at sacrifice of picture detail. Similarly, those who are fortunate enough to have a signal input of 4000 or 5000 microvolts may reduce the sensitivity and improve detail, as dictated by their particular locations.

The second detector consists of one diode of a 6H6. The low pass filter which comprises the load of this tube is mounted in the high voltage compartment directly below the horizontally placed 6F6. An inspection of the illustration of the complete receiver will show the advantage of this particular arrangement. It will be noted that the placement of the 6H6 and the 6F6 permit short, direct leads for both the video frequencies and the synchro-



What the completed sound and sight television receiver will look like.

nizing pulses, which are taken from the same (6H6) tube.

Video Amplifier

The video amplifier consists of a 6F6 tube in a circuit which is a combination of series and shunt compensation to give a flat frequency response up to 3 mc. In the video amplifier the experimenter may raise or lower the gain, if so inclined. This flexibility is desirable since the frequency response of the video amplifier should be comparable to the band pass characteristic of the picture i.f. amplifier system.

The videotron is operated with the cathode and control grid about 2000 volts negative with respect to chassis. For this reason, a rated 2000 volt blocking condenser *must* be used between the cathode ray control grid

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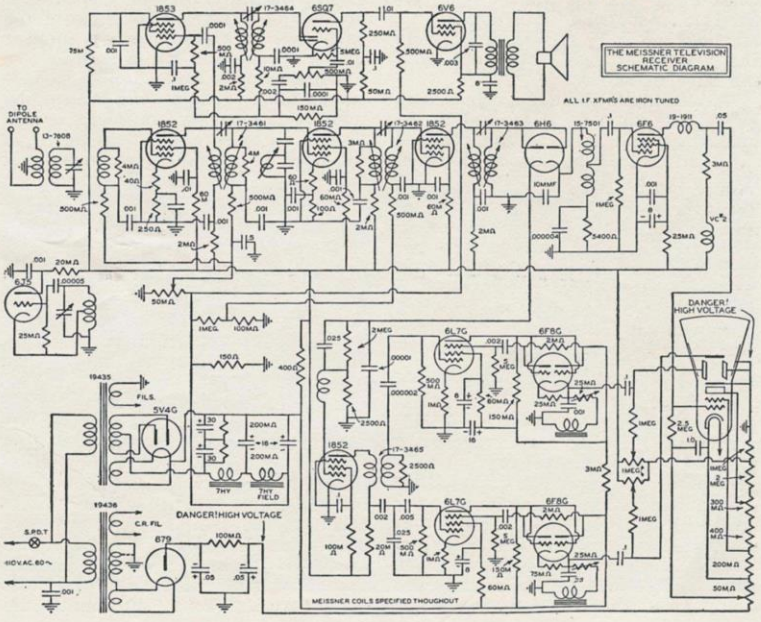
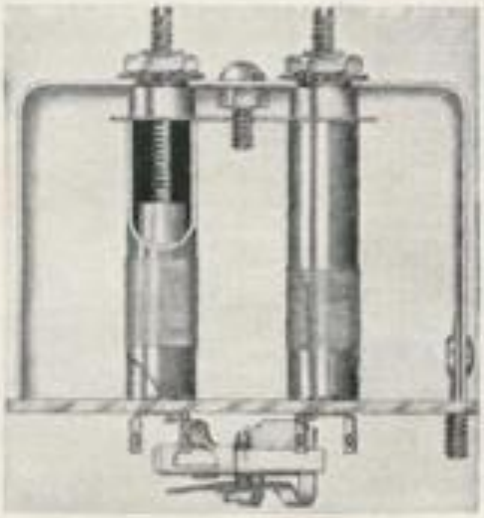


Build a Tele-Receiver

(Continued from page 13)

and the plate of the 6F6 video amplifier. Also, the condenser from the cathode ray control grid to its cathode must be insulated for 2000 volts to ground. The focusing and bias potentiometers are part of the high voltage bleeder and are mounted on bakelite sub-panels and supplied with insulated extension shafts. The videotron tube socket is mounted in a manner that



Internal I.F. construction.

permits a few degrees rotation about its long axis so that the edges of the picture may be made truly vertical and horizontal. Provision is also made at the tube socket to accommodate the commercial variation in the overall length of the tubes.

Synchronizing Pulse Clipper

Returning to the 6H6, the synchronizing circuit begins with the other diode plate, the cathode of which is connected to a resistance capacity network.

Synchronizing pulses are separated from each other in the "synchronizing separator coils" in the plate circuit of the 1852 synchronizing separator tube. Horizontal synchronizing pulses appear at the secondary coil while vertical synchronizing pulses appear across a condenser in the plate circuit of the 1852 tube.

The sweep circuits are of the multivibrator type and are easily adjusted for sweep amplitude and frequency. The separated synchronizing pulses are applied to the control grids of the 6L7G's through suitable coupling condensers.

The sound channel consists of an 1853 i.f. amplifier, a 6SQ7 second detector, first audio and A.V.C., a 6V6 output tube, and a 6-inch electrodynamic speaker, the field of which is a part of the low voltage filter. The same type of tuning and capacity coupling system used in the picture i.f. transformers is employed, although, of course, the pass band of this stage is far sharper and the amplification higher than in a picture i.f. stage. The sound i.f. should, however, be broad enough so that some adjustment of the oscillator frequency may be made (for best picture) without noticeably affecting the sound reproduction. The frequency to which the sound i.f. is tuned is 8.25 mc. –30–