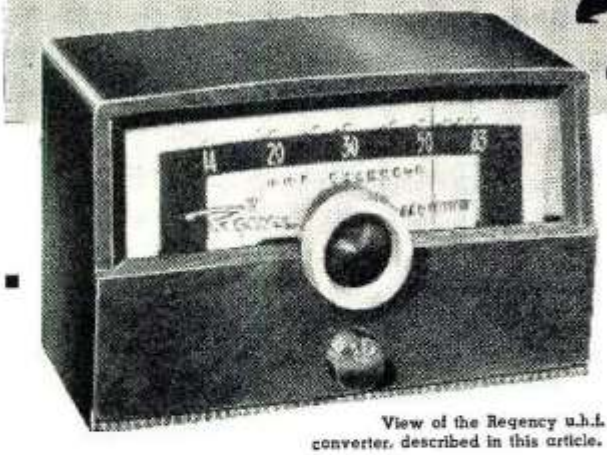
The Regency U.H.F. CONVERTER



View of the Regency u.h.f. converter, described in this article.

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Here is a popular converter widely used in u.h.f. areas. Read how it works and how to service it.

AT THE TIME u.h.f. stations were allocated, in the summer of 1952, there were approximately 16 million v.h.f. television receivers in operation. Since then the number has increased to over 22 million, and most of these receivers have no way of receiving u.h.f. signals except through the use of new tuning strips or converters. Of the two, converters are by far the more flexible. A completely self-contained converter can be used with any television receiver, irrespective of the type of tuner it possesses. Furthermore, a converter will, in general, tune over the entire u.h.f. band while a strip is designed essentially for single-channel reception. Last, but not least, converters can be installed by a layman, while a technician is needed to install any unit that must be internally combined with a television receiver.

There are a number of approaches to converter design, but if these are examined with a view toward keeping the final product simple in construction, easy to operate and service, and simple to align, then the field narrows down considerably. Major emphasis is on the tuner and the one finally evolved for the *Regency* converter is only 4 inches in diameter and 3 inches in depth. The unit tunes continuously with a dial drive shaft covering the 70 channels in 340° of rotation, permitting the use of a small direct drive scale. Included in the tuner are two stages of i.f. amplification.

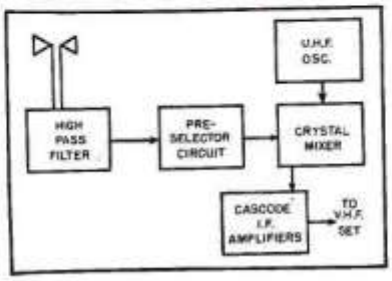
A block diagram of the circuits in this tuner is shown in Fig. 1; the schematic diagram is given in Fig. 2. The input circuit from the u.h.f. antenna is balanced and designed to match a 300-ohm line. This circuit consists of a high-pass filter which serves to reduce oscillator radiation from the converter, response of the unit to image signals, and the reception of spurious responses, especially those produced by high-powered v.h.f. TV or FM broadcast stations.

Beyond the high-pass filter is the preselector circuit. This consists of a balanced transmission line antenna coupling loop which is inductively coupled to a tunable transmission line. The function of the preselector circuit is the same as that of the r.f. circuit in any receiver, namely, to permit one station to be received, and to reject all others.

A shorting slider varies the frequency of the parallel-wire tuning elements. In covering the u.h.f. band from 470 to 890 mc., the line shorting slider has a 4-inch travel. The slider is noiseless during operation.

Due to the fact that the antenna coupling loop and the crystal mixer (which follows the preselector) are placed at opposite ends of the tuning line, direct coupling between the antenna and mixer circuits is avoided. The tracking problem between preselector and oscillator tuning circuits is simplified by the employment of two trimmer condensers on the preselector lines. One trimmer condenser is used for setting the high-frequency end and the other is used for setting the low-frequency end of the range. This arrangement allows the electrical tracking of the oscillator and preselector circuits to be a simple and positive alignment operation. The trimmers are a special u.h.f. balanced type which were developed for this tuner.

Fig. 1. Block diagram of the basic circuit of the Regency u.h.f. converter.



Once the desired signal has been chosen by the preselector, it is next fed to a crystal mixer. Also reaching the mixer is the oscillator signal.

The oscillator circuit is of the ultraudion type widely used in present v.h.f. receivers. A 6AF4 miniature triode is capacity-coupled to a quarter-wave, short-circuited transmission line. The oscillator operates at a lower frequency than the signal, in order that the relative position of the sound and video carriers in the incoming signal is not reversed. Coming into the v.h.f. receiver, the video carrier frequency must be below the sound carrier frequency as in a v.h.f. signal.

In order to receive u.h.f. stations between 470 and 890 mc., the local oscillator tunes from 275 to 695 mc. The v.h.f. set is tuned to channel 10. The oscillator generates adequate injection voltage over the entire frequency range (275 to 695 mc.) without any frequency skips. Oscillator tuning is accomplished by a sliding silver contact which varies the active portion of the line. A trimmer condenser across the oscillator plate tank circuit allows the frequency range to be set to the desired frequency at the low end of the range. Oscillator tuning is mechanically ganged with preselector tuning.

The frequency of the local oscillator stabilizes after approximately five minutes' operation. The maximum deviation due to line voltage drift (within the range of 95 to 125 volts), is approximately 70 kc.

The signal at the output of the crystal mixer is fed to a cascode i.f. amplifier. This i.f. amplifier operates

over the frequency range of the r.f. amplifier in the v.h.f. television receiver when the latter is set for channel 10. Actually, any of the v.h.f. channels, 8, 9, 10, 11, or 12 can be chosen, permitting the set owner to use the channel which, in his location, is interference-free.

Little need be said about the cascode amplifier other than that it was chosen because of its high gain and low-noise qualities. The output of this stage is balanced, presenting an impedance of 300 ohms to match the v.h.f. receiver unit.

Three views of the tuner are shown in Figs. 3, 4, and 5. In Fig. 3, the tuner is shown as a complete unit with all the covers and shields in place. Fig. 5 is a top view of the tuner with the outer shields removed. The preselector tuning line with its slider and trimmer condensers can be seen at the top of the unit. Back of the line is the antenna coupling loop. In the center of the assembly is the double-triode i.f. amplifier tube.

The bottom side of the tuner, shown in Fig. 4, contains the oscillator circuitry. The oscillator tube rests on its side at the left-hand side of the illustration.

Service Hints

In general, alignment will rarely have to be performed on this converter if it receives normal care in use. When servicing is required, the stage at fault can be detected quickly by following the procedures to be outlined:

Oscillator tube: The oscillator tube can be checked for oscillation by several methods. One means consists of checking the cathode current and, at the same time, touching the oscillator lines with a screwdriver. The current should rise, indicating that the tube was oscillating and the screwdriver stopped the oscillations.

Another method of checking for oscillation consists of using a vacuum-tube voltmeter with a 1-megohm resistor probe and very short leads to read d.c. voltage on the grid of the 6AF4. This reading should be approximately −3 to −10 volts d.c.

In order to gain access to the oscillator tube, remove the perforated cover on the side of the tuner. In removing the 6AF4, reasonable care should be exercised not to disturb any of the components. It may be necessary to try several tubes in the oscillator circuit, inasmuch as certain tubes will operate better than others for optimum alignment and injection. Usually, changing of the oscillator tube does not require realignment.

Amplifier tube: Changing the 6BK7 i.f. amplifier tube should not require any change, other than a touch-up of the converter output adjustment, which extends through the tuner case and can be turned conveniently with the fingers for maximum performance. This adjustment is also made when different v.h.f. channels are selected for the double conversion.

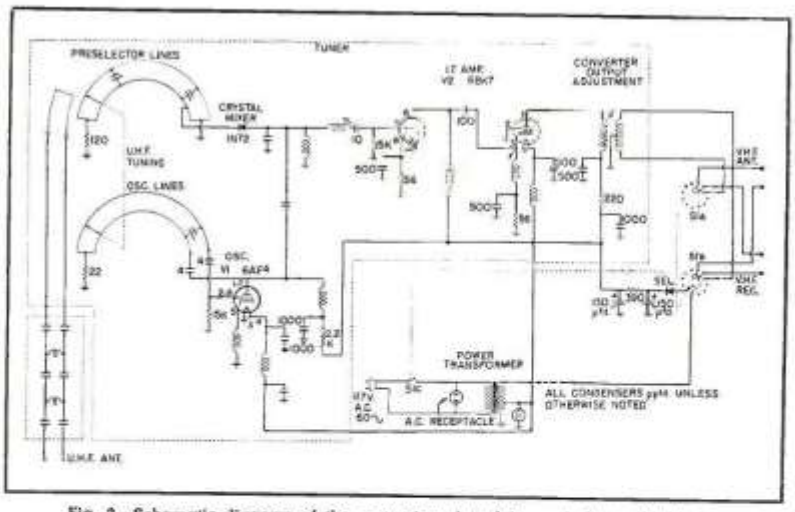


Fig. 2. Schematic diagram of the converter; dotted boxes indicate shielding.

Fig. 3. The completely shielded tuner assembly of the Regency converter.

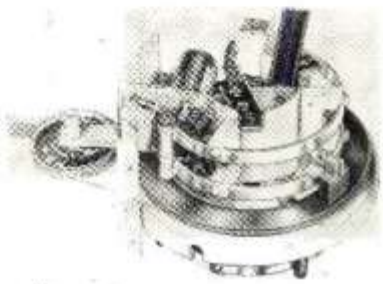


Fig. 4. The bottom view of the tuner showing oscillator tube on its side.

Crystal diode 1N72: A defective crystal can be established by the lack of rectified injection voltage, providing the oscillator tube is definitely working. Should a crystal require changing, it is important that the leads be kept the same length and that the position of the new crystal is identical to the defective crystal. Care should be taken not to overheat the crystal with the soldering iron, and it is advisable to hold the crystal with a pair of pliers back of the soldering point.

All components replaced should be wired into the circuit as near to the original physical placement as possible, with the same size leads. —30—

Fig. 5. Top view of the tuner showing preselector and antenna coupling lines.