There is a typo in Figure caption 8-30. Capacitance is shown in pF NOT in uF as it should be.

the dc grid bias, either in the grid or cathode circuit. If the gain control is automatic, as in the case of agc, the bias is controlled in the grid circuit. Manual control of rf gain is generally done in the cathode circuit. A typical rf amplifier stage with the two types of gain control is shown in schematic form in Fig. 8-28A. The agc control voltage (negative) is derived from rectified carrier or signal at the detector before the audio amplifier, or in the case of a cw or ssb receiver it can be derived from rectified audio. The manual-gain control voltage (positive with respect to chassis) is usually derived from a potentiometer across the B+ supply, since the bias can be changed even though little plate current is being drawn.

Tracking

Tracking refers to the ability of a receiver to have all of its front-end stages – usually the rf amplifier, the mixer, and the oscillator – tune over a given range while each stage remains tuned to its proper frequency at any specified point in the tuning range. This arrangement provides a single tuning control for bandset and bandspread adjustments. To achieve proper tracking, it is usually necessary to have variable inductors and variable trimmer and padder capacitors for each of the tuned circuits. A two- or three-section variable capacitor is used for the tuning control.

Most modern receivers use a separate tuning control for the local oscillator and this is called the "main tuning." The rf and mixer stages are tracked and use a two-section variable for front-end peaking adjustments. This control is frequently called "preselector tuning." If the main tuning control is moved, the preselector is readjusted for a peak signal response at the new frequency.

REDUCING BROADCAST STATION INTERFERENCE

Some receivers, particularly those that are lacking in front-end selectivity, are subject to cross talk and overload from adjacent-frequency ham or commercial stations. This condition is particularly common with simple receivers that use bipolar transistors in the rf and mixer stages. With the latter, the range of linear operation is small compared to that of vacuum tubes. Large signals send the transistors into the nonlinear operating region, causing severe crosstalk.

The most common cross-talk problem in ham radio is that which is caused by the presence of nearby broadcast stations in the 550- to 1600-kHz range. In some regions, the ham bands – when tuned in on even the best receivers – are a mass of distorted "pop" music, garbled voices, and splatter. It should be pointed out at this juncture that the broadcast stations themselves seldom are at fault, (although in isolated instances they are capable of generating spurious output if operating in a faulty manner).

The most direct approach to the problem of broadcast-station interference is to install a rejection filter between the antenna feed line and

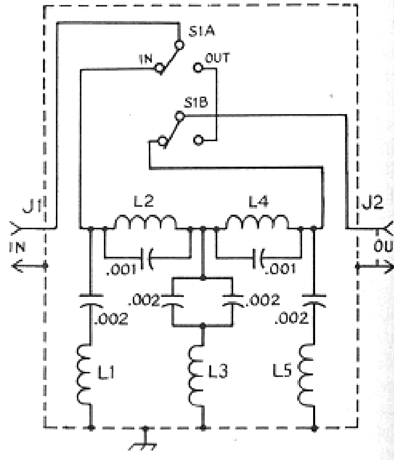
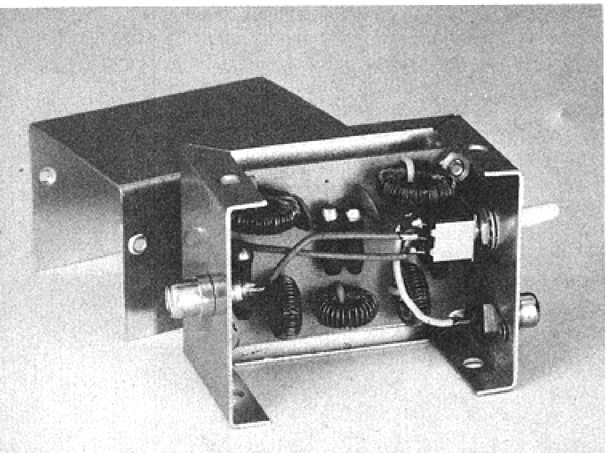


Fig. 8-30 – Capacitance is in pF. Capacitors are disk or tubular ceramic.
J1, J2 – Phono jack.
L1, L5 – 10-μH inductor, 43 turns, No. 26 enam. wire on Amidon T-50-2 toroid core (available from Amidon Associates, 12033 Ostego St., North Hollywood, CA 91607).
L2, L4 – 33-μH inductor, 75 turns, No. 30 enam. wire on Amidon T-68-2 toroid core.
L3 – 4.7-μH inductor, 30 turns, No. 26 enam. wire on Amidon T-50-2 toroid core.
S1 – Spst toggle.

Fig. 8-29 – Inside view of the broadcast trap.



the input terminals of the receiver. Such a filter, if capable of providing sufficient attenuation, prevents the broadcast-station signals from reaching the ham receiver's front end, thus solving the cross-talk problem.

An effective band-rejection filter, containing two constant-*k* sections in cascade, is shown in Fig. 8-30. It offers sharp rejection to signals in the 500- to 1600-kHz range but does not impair reception above or below the broadcast band. It is designed for use in low-impedance lines, particularly those that are 50 to 75 ohms.

The band-rejection filter is housed in a 3 1/2 X 2 1/8 X 1 5/8-inch Minibox. Phono connections are used for J1 and J2 – an aid to cost reduction. Different-style fittings can be used if the builder wishes. Standard-value components are used throughout the filter and the values specified must be used if good results are to be had.

In situations where a *single* broadcast station is involved in the cross-talk problem, a simple series- or parallel-tuned wave trap, tuned to the frequency of the interfering station, may prove adequate in solving the problem. (Such a trap can be installed as shown in Fig. 8-31.) The trap inductors can be made from ferrite-bar broadcast radio loop antennas and tuned to resonance by means of a 365-pF variable capacitor. Traps of this type should be enclosed in a metal box, as is true of the band-rejection filter.

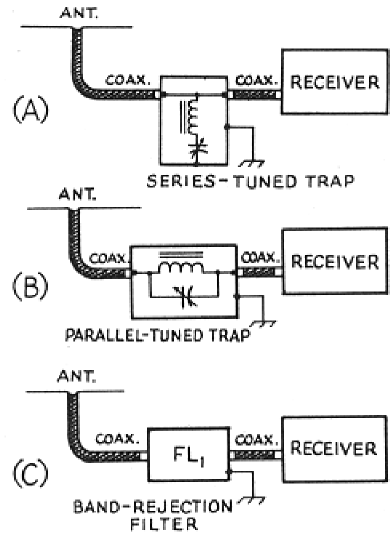


Fig. 8-31 – Examples of series- and parallel-tuned single-frequency traps (installed) are shown at A and B. At C, FL1 represents the band-rejection filter described in the text. If possible, the filter used should be bolted to the chassis or case of the receiver. The receiver should have a good earth ground connected to it.

FRONT-END OVERLOAD PROTECTION FOR THE RECEIVER

It is not uncommon to experience front-end overloading when the station receiver is subjected to an extremely strong signal. Frequently, it becomes necessary to install some type of external attenuator between the antenna and the input of the receiver to minimize the bad effects caused by the strong signal, or signals. Ideally, such an attenuator should be designed to match the impedance of the antenna feed line and the input impedance of the receiver. Also, the attenuator should be variable, enabling the user to have some control over the amount of attenuation used. Manufacturers of some modern receiving equipment build attenuators into the front end of their receivers, offering benefits that are not available from the normal rf gain-control circuit.

Examples of two such attenuators are given in Figs. 8-34 and 8-35. In Fig. 8-35 a ladder-type attenuator gives a 0- to 40-decibel range of control in five steps. A precision step attenuator is illustrated in Fig. 8-34. The latter offers an attenuation range of 3 to 61 decibels in 3-dB steps by closing one or more of five toggle switches. Both units are designed for use in low-impedance lines. The one in Fig. 8-35 is designed for a midrange impedance of 60 ohms, making it satisfactory for use with receivers having a 50- or 75-ohm input. Although designed for an impedance of 50 ohms, the attenuator of Fig. 8-34 will work satisfactorily with 75-ohm receiver inputs if accurate attenuation steps are not required.

Standard-value 1/2-watt resistors are used in the simple attenuator, which will give good results from the broadcast band to 30 MHz. Isolation between sections is not good enough to make this unit particularly effective above 30 MHz. The

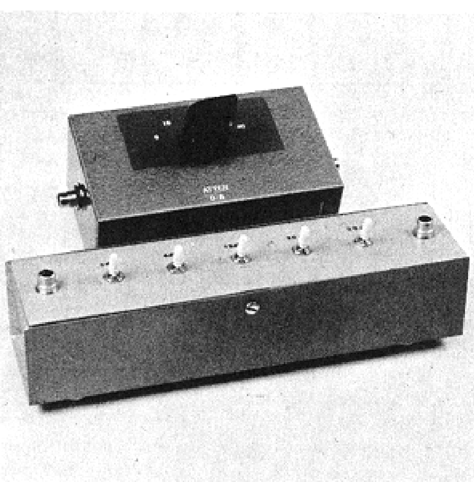


Fig. 8-32 – Two attenuators for receiver front-end protection.