SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR JANUARY, 1935

THE ALL-STAR JUNIOR

A five-tube, all-wave superheterodyne, engineered and sponsored by a group of manufacturers, that has electrical band-spreading, a signal beacon, and plenty of gain. Can be assembled and wired in no time. A good "side-line" for the Service Man.

THE All-Star Super Six fabricated receiver introduced last fall was received so well that the same group of manufacturers are now sponsoring a second design—the All-Star Junior—lower in cost than the Super Six, but in some ways superior to the former set.

Possible Profits

The All-Star Junior looks like a good bet for the Service Man interested in constructing the latest in all-wave receivers for people with thin pocket-books. The actual assembling and wiring job is a cinch as the panel and sub-base are completely drilled and punched to take the standard parts specified. These parts are available on any jobber's shelves and in many cases the Service Man will have a good stock of many of the parts on his own shelves. Moreover, a special cabinet may be obtained for this receiver that it may have the appearance of a finished factory job. The cabinet has a detachable ebony-finished wood cover, has a base length of 18 inches, a height of 9½ inches and a depth of 8 inches.

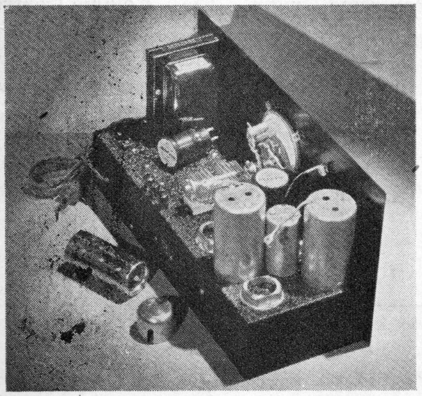

Fig. 3. A rear view of the receiver. The speaker plugs into the socket mounted on the rear wall of the sub-base.

Features of Set

One of the principal features of the set is the beat-frequency oscillator—not included in the standard All-Star Super Six Receiver—which may be used for the reception of cw signals or used as a signal beacon. This beat-frequency oscillator will indicate the presence of a station by producing a high-pitched note in the speaker when the set is tuned to the station carrier. With this arrangement, and moderately careful tuning, it is next to impossible for one to pass over an unmodulated carrier. A switch is provided so that the beat-frequency oscillator may be made inoperative after a phone station is tuned in.

The next important feature in the All-Star Junior is the electrical band-spread system. There is provided in both the first detector circuit and the oscillator circuit a band-setting tank condenser and a lower capacity tuning condenser. The low-capacity first detector and oscillator variable condensers are ganged together and mechanically coupled to the main tuning control on the front panel. The high-capacity band-setters or tank condensers are in shunt with the respective low-capacity condensers, but are not ganged. They are controlled by small knobs, with scales, on the front panel and permit large shifts in wavelength or frequency. At the same time—since they are not mechanically coupled—they permit the tuning to exact resonance of both the

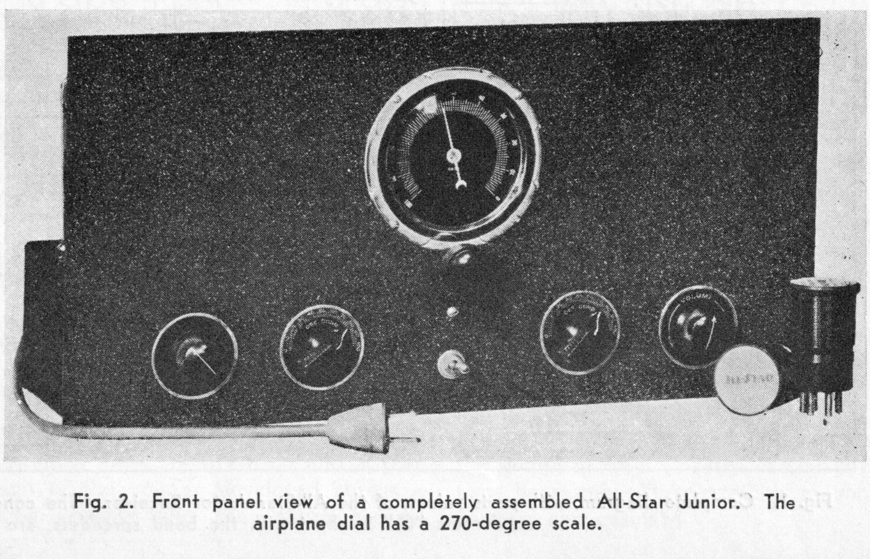

Fig. 2. Front panel view of a completely assembled All-Star Junior. The airplane dial has a 270-degree scale.

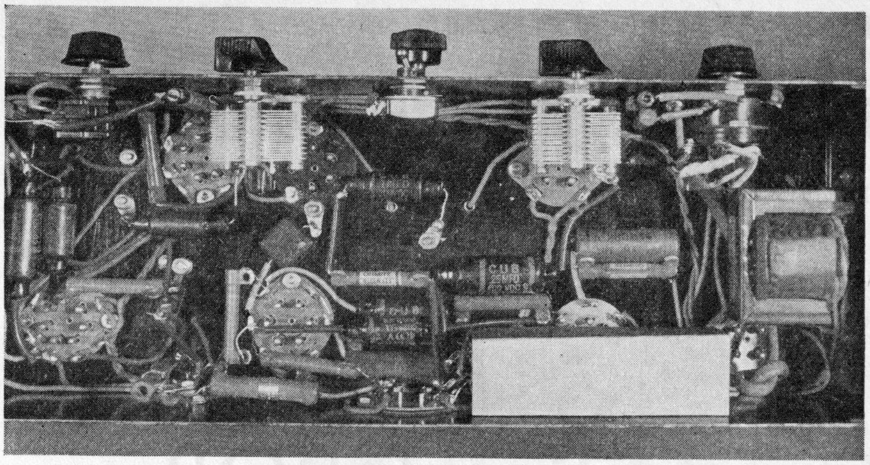

Fig. 4. Bottom view of the receiver chassis, showing wiring and location of parts.

first detector and oscillator circuits for any band of frequencies.

Once the tank condensers have been set to the bottom of some specific frequency band—say, the 49-meter broadcast band—all actual tuning is done with the main airplane-type tuning dial. Since this dial controls variable condensers having very low maximum capacity, the entire 49-meter band is spread out or opened up so as to occupy almost the entire tuning scale rather than just a few degrees on the scale. The band-spread feature is continuous over the entire wavelength range of the receiver. Stations may be accurately logged.

High efficiency is obtained through the use of plug-in coils, which provide low contact resistance and are free from the effects of mutual inductance or dead-end effects. Six pairs of coils are used to cover the range from 10 to 550 meters.

The Circuit

The complete circuit, with parts values, is shown in Fig. 1. A 6A7 tube is used as first detector and oscillator. The output of the first detector or mixer is fed to a pre-tuned i-f transformer peaked at 370 kc, an intermediate frequency sufficiently high to steer clear of the effects of image frequency.

The input i-f transformer is coupled to the pentode section of a 6F7 tube. The triode section of this tube is used as the beat-frequency oscillator in connection with the shielded coil unit marked "BFO." The "BFO Switch" shorts the oscillator plate to ground when closed, thus making the oscillator inoperative.

The 6F7 i-f pentode is coupled to a second i-f transformer which in turn feeds a high-gain second detector. The output of this tube—a type 77—is resistance coupled to a type 42 power pentode. An i-f filter, consisting of a choke, RFC, and two condensers, C-7, is included in the plate circuit of the second detector tube to prevent any stray i-f signal voltage from reaching the power tube control grid.

A type 80 rectifier is used in the power supply. The power-supply filter has two sections, the first section being a standard filter choke and the second section being the 1,000-ohm field of the dynamic speaker.

It should be noted that there are three antenna input connections which permit the use of an ordinary aerial or an antenna of the doublet type with transposed feeders.

Volume is controlled by varying the bias on the i-f pentode only. A sensitivity control, or "Local-Distance" switch, is included in the cathode circuit of the mixer tube. When the switch is closed, the resistor R-2 is shorted with the result that the bias on the mixer tube is reduced and the gain consequently increased.

Mechanical Details

A front-panel view of the All-Star Junior is shown in Fig. 2. The knob to the extreme left controls the Local-Distance Switch, the next knob controls the Oscillator Tank Condenser. The toggle switch in the center is the Beat-Frequency Oscillator control. To the right of this switch is the knob for the Mixer Tank Condenser and to the extreme right, the Volume-Control knob.

A rear view of the receiver is shown in Fig. 3. This clearly shows the two i-f transformers, with the beat-frequency oscillator unit mounted between them. The mixer and oscillator coils plug in to sockets mounted each side of the band-spread gang condenser.

(*Continued on page* 11)

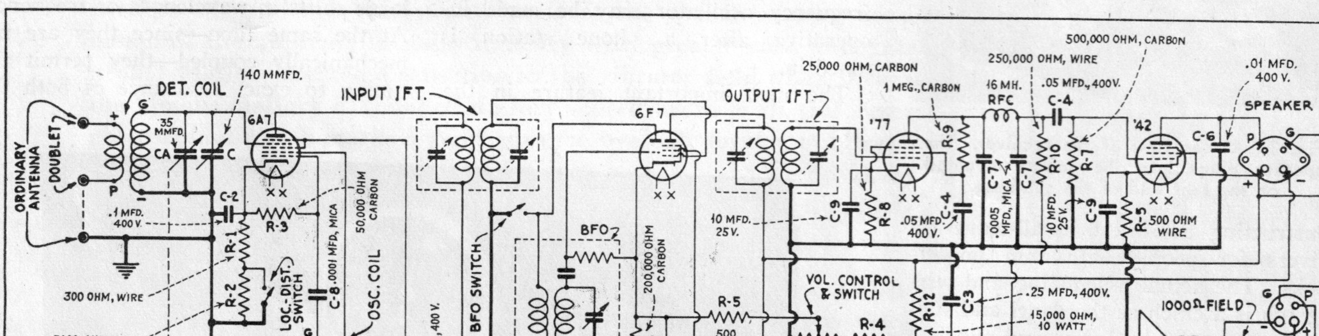

Fig. 1. Complete diagram, with parts values, of the All-Star Junior Receiver. The condensers "CA" are the band spreaders and the condensers "C," in shunt with the band spreaders, are the band setters.

INCREASING B-BATTERY SERVICE

By L. S. Fox*

In battery receivers, the grid-bias voltages are usually obtained from a C battery, and these bias voltages are correct for the corresponding plate voltages obtained from new B batteries. As the B batteries are used up, the plate voltages are reduced, but because no current is taken from the C battery, its voltage remains practically constant. Therefore, while the grid bias will be correct for new B batteries, it will become increasingly excessive as the plate voltages fall. As a result, the performance of the receiver will not be as satisfactory as it would if grid bias could be reduced to a suitable value for the lower plate voltages. When the grid bias is so reduced, it will be found that usually the B batteries are serviceable to lower voltages than without the reduction. In many cases, with receivers having constant grid-bias voltages, where the B batteries had to be replaced when down to 34 volts, the reduction of the grid-bias voltages made it possible to use the B batteries down to 30 volts and in some instances to 24 volts, adding as much as 50 per cent to B-battery life.

C-Battery Bleeder

This grid-bias reduction is accomplished in many modern battery receivers by bleeding the C battery through a shunt resistor which is connected across the battery only when the receiver is in operation.

When short B battery life is reported, the receiver should be examined to see if a C-battery bleeder resistor is used. If not, this battery saving feature can easily be added to most sets. All that is required is a new off-on switch having an additional pair of contacts and the resistor itself. The resistor and switch contacts are connected in series across the entire C battery so that current from the C battery will flow through the resistor only when the receiver is turned on.

Resistance Calculation

To calculate the resistance required, measure the total B-battery current of the receiver with B batteries down to 37 volts per 45-volt battery, and divide by 200,000. The result will be the correct value in ohms for a 22.5-volt C battery. For a C battery of less than 22.5 volts, the resistance should be proportionately less. An actual value to the nearest 500 ohms will be satisfactory.

Where a C-battery bleeder is used, the C battery should always be replaced with the B batteries, so that the B and C voltages will always be in proper proportion. If new B batteries are used with on old, run-down C battery, the grid bias will be too low and, therefore, the plate current will be too high, so that the B batteries will have short life. Where short B-battery service is the complaint, always check to see if new B batteries were used together with an old C battery.

*National Carbon Company, Inc.

•

BEAT OSCILLATOR CIRCUIT

(*See Front Cover*)

The new RCA Victor Model ACR-136 Amateur Communications Receiver utilizes an interesting arrangement of coupling between the i-f beat oscillator and the second detector. The beat oscillator is used principally for the reception of cw signals in this receiver, but also proves of value as a station finder or signal beacon for modulated or unmodulated carriers of phone or broadcast stations.

Beat Oscillator Circuit

The beat-oscillator, second-detector circuit, of the ACR-136 is shown on the front cover. The beat oscillator uses a 6D6 tube in an electron-coupled circuit, the cathode of the tube connecting to a tap on the oscillator coil. The coil, with its shunt capacity, normally oscillates at the same frequency to which the i-f amplifier of the receiver is tuned. A small vernier condenser, C-2, is shunted across the main oscillator-coil capacity. This condenser may be varied for the purpose of altering slightly the beat-oscillator frequency when certain forms of beat-note interference are encountered. The pitch of the received cw signals may also be varied in this manner.

A switch, S, in the plate circuit of the beat oscillator tube is used for cutting off the plate voltage when the beat oscillator is not in use.

The grid of the beat-oscillator tube is biased by the condenser-leak combination, C-1, R-1.

Coupling System

The 6B7 tube functions as second detector, avc and first a-f. Diode A provides linear rectification and a portion of the voltage developed across a load resistor and the volume-control potentiometer, is used to bias back the r-f, mixer and i-f tubes. Diode B is used as the coupling medium between the beat oscillator and second detector. It will be seen that the plate of the beat-oscillator tube is connected to this diode through a small coupling condenser, C. The coupling lead is shielded to prevent the i-f voltage from being induced in adjacent circuits.

The diode B is grounded through the load resistor, R. This resistor provides the return connection to the cathode of the 6B7 tube, but it is a question if any current flows in this circuit. Since diode B is at ground potential it assumes a negative bias equal to the voltage drop in the cathode bias resistor. If the beat-oscillator voltage is sufficient to overcome this bias, then current will flow in the circuit of diode B. If the beat-oscillator voltage is maintained at a value lower than the diode bias voltage, no current will be created in the diode circuit from the beat-oscillator voltage. In any event, diode B is coupled to the cathode of the tube and will induce the beat-oscillator voltage in this common circuit. The i-f oscillator voltage therefore beats with the incoming signal voltage.

•

THE ALL-STAR JUNIOR

(*Continued from page* 10)

The power transformer is mounted at the far end of the chassis, with the type 80 rectifier socket next to it.

A bottom view of the chassis is shown in Fig. 4. This indicates the relative positions of the mixer and oscillator tank condensers, the volume control, the filter chokes, etc.

The Manufacturers

The Foundation Unit, together with diagrams and construction details, is being supplied by Thordarson. This company is also supplying the power transformer and filter choke. The fixed resistors are by Ohmite, the tapered volume control by Electrad, fixed condensers by Cornell-Dubilier, variable condensers by Hammarlund, and all r-f and i-f coils by Meissner.

The Crowe Name Plate Mfg. Co. is supplying the airplane dial, the four nameplate dials and the receiver cabinet. The 6-inch dynamic speaker, with 1,000-ohm field, was designed by Oxford. The tube shields are products of the Erie Can Company, and the eight wafer sockets are supplied by the Oak Mfg. Co.

A special wiring kit is being supplied by the Belden Mfg. Co. and the same concern can supply as optional equipment an all-wave aerial kit.

The Service Man need not purchase the complete kit . . . any of the parts may be purchased separately, as most of them are standard.