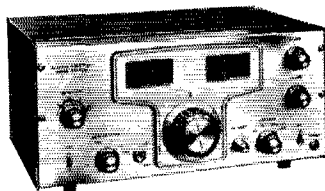


• Recent Equipment —

Lafayette HA-350 Receiver

THE HA-350, an import from Japan, appears to be the first serious attempt to crush the amateur receiver market with Japanese-manufactured gear. In the HA-350 the JA's have done an attention-getting job. Here is a five-band (3.5 through 29.7 Mc.) amateur-band receiver featuring double conversion, tunable i.f. for identical bandspread on all bands, 455-kc. mechanical filter, crystal-controlled front ends from 7 Mc. up, crystal-controlled b.f.o. for selectable sideband reception, 100-kc. crystal calibrator, and the usual "fixings" such as an S meter, automatic noise limiter, and a.g.c. that works on c.w. and s.s.b. as well as a.m. All this in a package measuring 15 inches wide, 7¾ inches high, and less than 12 inches deep. The tuning range is 600 kilocycles, giving full 10-meter coverage (28 to 29.7 Mc.) in three steps, along with good bandspread on the lower-frequency bands.

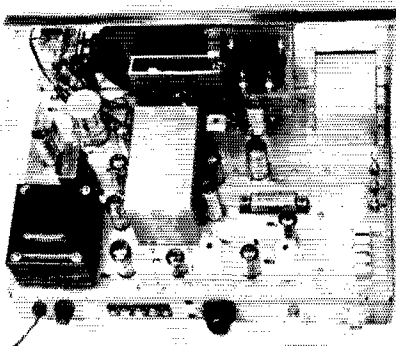
The receiver has some interesting circuit features which, while not exactly innovations, are more representative of home-built than commercial designs. For example, the tunable i.f. covers the 3.5-4-Mc. band directly; the set is basically an 80-meter receiver to which crystal-controlled front ends have been added for covering the higher frequencies. The general scheme is given in the block diagram, Fig. 1. V_3 converts 80-meter signals to 455 kc., V_4 being the variable oscillator that provides the beating frequency. V_1 is a straight r.f. amplifier, used as such on all bands, and on 3.5 Mc. V_{2A} likewise is an r.f. amplifier. These two stages have gang-tuned grid



circuits, but a 3.5-4-Mc. bandpass circuit is used for coupling V_{2A} to V_3 . On 80, therefore, there is only one frequency conversion.

For 7-Mc. reception the h.f. crystal oscillator, V_{2B} , is switched on, having been inoperative on 3.5 Mc. This is the only change made in shifting V_{2A} from straight r.f. amplification to frequency conversion. On this and the higher bands V_1 is the only r.f. stage, V_2 serving as an oscillator-mixer for these bands. Only two sets of coils are used, as the tuning capacitor has enough range to cover a 2-to-1 frequency ratio. One set of coils is used for 3.5-7 Mc. and the other takes care of 14-29.7 Mc. — reminiscent of some of the homemade converters that have been described in *QST*. The r.f. tuning has to be separately adjusted on each band, an operating feature that has crept into more than one domestically-manufactured receiver in recent years (there once was a day when a single tuning control was the only acceptable method, but times do change!). One result of using a 2-to-1 range in the front-end tuning is that the gain tends to be leveled off on each coil set, since the band that falls at the high- C end of the scale (the lower-frequency band) generally gets amplified less than the one at the low- C end. This helps to overcome, comparatively, the general reduction in amplification that occurs as one goes higher in frequency.

Although there are actually only two front-end tuning ranges, there is a separate position for each band on the band switch because it is necessary to switch the converter crystals. There is a little doubling-up on crystals, five of them being made to provide seven bandspread segments. The crystal for 7-Mc. reception, for example, is on 11 Mc., which conveniently offers WWV reception on 15 Mc. as an "image"; thus there is a special WWV position on the bandswitch. The crystal for 21-Mc. reception (24.5 Mc.) likewise is used for "image" reception of the 28.5-29-Mc. segment of the 10-meter band. As a result of this and the position of the v.f.o. in the spectrum, the tuning is in one direction for one set of bands — 80 and 10 meters — and in the opposite direction for the rest. This, too, is a feature that is not unknown in current commercial receivers.



Rear view of the HA-350 out of its cabinet. The box in the center houses the variable oscillator and 3.5-Mc. mixer tuned circuits. The oscillator and mixer tubes are alongside. The preselector tuning capacitors are in the shield box against the panel at the right. The mechanical filter is the horizontal object on the chassis to the right of the oscillator-mixer box. Crystals for the h.f. oscillators for various bands are in the right corner in the foreground.

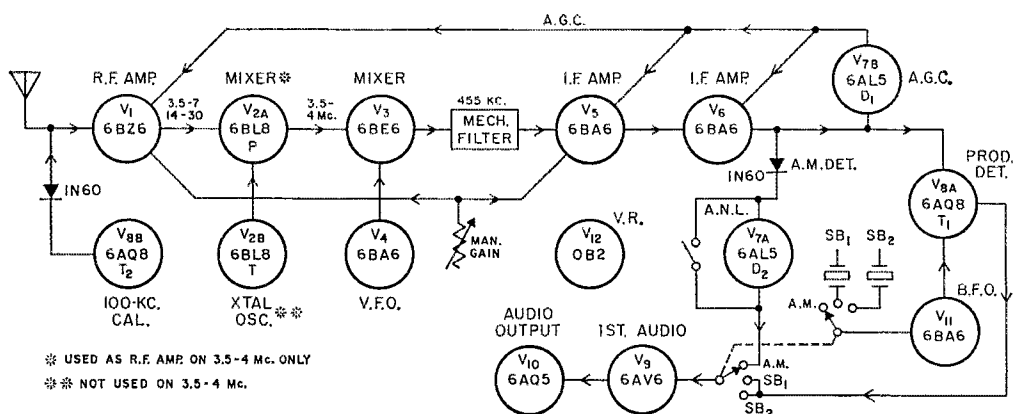


Fig. 1—Block diagram of the Lafayette HA-300 receiver.

Other Features

The i.f. amplifier after the mechanical filter follows standard practice, with transformer coupling. The a.m. detector is a semiconductor diode; the audio output goes through the well-known series-type noise limiter (which can be switched out) using one section of a 6AL5. For c.w. and s.s.b. reception the detector is one triode section of a 6AQ8 with the b.f.o. voltage introduced across its cathode resistor. Upper or lower sideband reception is selectable by a switch which cuts in one or the other of two crystals placed at the edges of the mechanical-filter pass-band. C.w. can of course be received on either of these.

The remaining section, V7B, of the 6AL5 is used as an automatic gain control rectifier. A.g.c. voltage is applied to the r.f. amplifier and the two i.f. stages, as shown in Fig. 1. On c.w.-s.s.b. the release time of this circuit is quite long, with the result that the audio output is held quite constant as you tune across a band. One consequence is that the receiver blocks up when the station transmitter goes on, and is reluctant to come back within a reasonable time when sending stops. However, there is an octal "auxiliary" socket on the back to which the a.g.c. lead is brought out, so it would be no great problem to circumvent the a.g.c. by shorting it out while transmitting. The same socket has a lead to the antenna terminal so it, too, can be grounded while transmitting. It also has a pair of leads, paralleling the send-receive switch, for relay- or switch-operated standby. In the "receive" position the send-receive switch disconnects the screen voltage to V2A, the plate and screen voltage to V3, the plate and screen voltage to V5; the remaining tubes stay in operation.

The audio system uses a voltage-amplifier stage followed by a 6AQ5 for power output. The input is switched, along with the b.f.o. crystals, to the proper detector for a.m. or c.w.-s.s.b. reception.

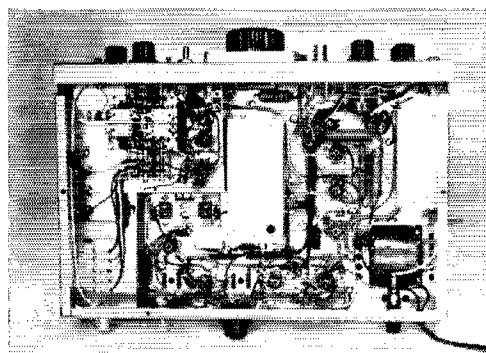
The 100-kc. calibrator is crystal controlled (the crystal is sold as an accessory), using a

triode in the well-known Pierce circuit. It is connected to the antenna lead through a crystal diode for building up the harmonic output.

The power supply uses a full-wave transformer at rather low voltage (140 volts r.m.s. each side of the center tap) rectified by a pair of semiconductor diodes. These are bypassed to prevent damage by transient "spikes". The filter has three 40- μ f. capacitors with resistors between, and is quite effective since the hum in headphones is lower than average for commercial receivers. A voltage regulator tube holds the plate voltage on the various oscillator tubes (except the 100-kc. oscillator) at 105 volts. The regulated voltage is also applied to the screen of the last i.f. stage, which incorporates a bridge circuit for the S meter.

Some General Observations

The tuning uses pinch drive from the tuning knob to the calibrated dial, followed by gears from the dial to the tuning capacitor. The action is light, but there was a slight amount of backlash



The shielding along the right-hand side of the chassis near the panel covers the v.f.o. circuit. The preselector coils are in a shield compartment between the bottom of the v.f.o.-mixer box (center) and the band switch at the upper left. The i.f. section is at bottom center in this view.

in the one we tried out. We understand that this receiver was one of a few flown over for initial inspection, so it is not known whether this is characteristic of the mechanism or not. On more certain ground, the tuning rate varies from 100 kc. per knob rotation at one end of the scale to about 150 kc. at the other; many operators would find this a little fast for easy tuning. There is one feature of the dial mechanism that may be confusing — at least, it proved so to the writer: The dial rotates in the opposite direction to that in which the knob is being turned. It would be hard to find an instance of this “oppositeness” in American equipment, and it takes a little getting used to.

Having a tunable i.f. that covers 80 meters can be disconcerting if there is any feed-through. Measurement of the i.f. rejection showed it to be about 50 db. with the receiver tuned to 7 Mc., and approximately 60 db. on all the higher bands. This is adequate under ordinary conditions. However, if you're using the traditional “hunk of wire” for a receiving antenna and are looking over a band — such as 21 or 28 Mc. — which is usually dead in the evening in this part of the sun-spot cycle, you'll hear weak amateur signals that may inspire you to fire up the transmitter — until you catch on. With a tuned antenna system this should not be a problem, and even with the hunk of wire it isn't one when the band you're listening on is actually open.

The receiver has plenty of gain — so much so that with a speaker or headphones of ordinary sensitivity the audio volume is hard to control; your eardrums are likely to be rattled with the audio control barely opened. Some like it that way, and those that don't will have little trouble in finding ways — a resistive voltage divider in the audio input circuit, for example — to knock it down. The manual r.f. gain control also has a rather limited range; signals are still coming through at good strength with the control all the way off. Since the a.g.c. takes over when the r.f. signal level gets high, this may not be too much of a disadvantage provided the audio gain can be controlled more smoothly.

With crystal control everywhere but in the tunable i.f., and the latter operating at a relatively low frequency, the stability can hardly help but be good. It sounds that way, both electrically and mechanically.

Like any equipment that has several oscillators and conversions, this receiver has birdies. Some of these are quite prominent when you

tune across a band without the antenna connected. In most cases, though, they go down into the mud when the antenna is on and the front end is properly tuned. With one or two exceptions they should not be particularly bothersome.

The mechanical filter is rated at a bandwidth of 2 kc. at 6 db. down and 6 kc. at 60 db. down. We did not attempt to measure this, but in c.w. reception the other side of zero beat is practically nonexistent, which is a good indication of skirt selectivity. The selectivity is strictly s.s.b.; off-set tuning is necessary for good a.m. reception, and the phone bandwidth may be too wide to satisfy c.w. men who are used to sharper i.f.'s. Adding audio selectivity would seem to be the only answer to this last, since there is no provision in the receiver for anything other than the 2-kc. bandwidth.

The construction is quite solid, with rather more attention paid to shielding than one ordinarily expects in receivers of this price class. The v.f.o./mixer circuits are completely boxed in, for example, with the power leads brought out through feed-through bypasses. The b.f.o. circuit is likewise separately shielded. There is also a good deal of shielding around the front-end circuits, the tuning capacitor being completely boxed.

The panel layout is simple, with ample room between controls. The tuning knob is the most prominent one, as it should be, and is large enough for a good grip. The hardware you have to remove to get the chassis out of the case is all machine screws; the Japanese do not seem to go for sheet-metal screws the way domestic manufacturers do.

— G.G.

Lafayette HA-350 Receiver

Height: 7 ¾ inches.

Width: 15 inches.

Depth: 12 inches including controls and terminals.

Weight: App. 19 lb.

Power Requirements: 115 volts a.c., 50/60 cycles.

Price Class: \$190.

Distributor: Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L. I., New York.

Strays

Adman Bill Shakespeare wrote slogans long ago. It was only recently ARRL Advertising Manager WIVG came up with products to fit them:

“O, understand my drift” — The Windsor Crystal Co.

“When we have shuffled off this mortal coil” — Hamlet Inductances

“Screw your courage to the sticking place” — Macbeth Small Tools

“I have them at my fingers' ends” — Twelfth Night Dials

“Let me tell the world!” — Henry IV Transmitter Co.

“These blessed candles of the night” — Merchant of Venice Pilot Lights

“Out, damned spot! Out, I say!” — Macbeth Contact Cleaner

(Adapted from “After Hours,” August 23, 1963 Printers' Ink.)