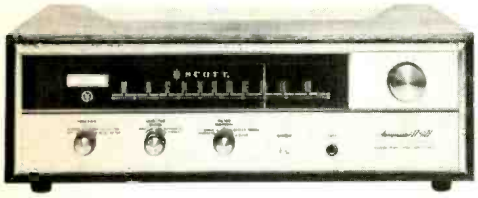
H. H. Scott LT-112B-1 FM Stereo Tuner Kit



MANUFACTURER'S SPECIFICATIONS—Usable Sensitivity (IHF): 1.8 μV. Cross-Modulation Rejection: 90 dB. Signal-to-Noise Ratio: 65 dB. Total Harmonic Distortion: 0.8%. Frequency Response: 50-15,000 Hz ±1 dB. Capture Ratio: 2-5 dB. Selectivity: 45 dB. Stereo Separation (1 kHz): 40 dB. Audio Output Level: 1.2 V rms. Dimensions: 15 in. x 12½ in. x 4⅛ in. high. Price: $199.95.

Years ago the prospective kit builder was warned against attempting construction of a *tuner* until he had attempted less-critical construction projects, such as an amplifier or a preamplifier. A number of important advances have enabled H. H. Scott to develop a tuner *kit* that can be assembled with such ease that even the neophyte kit-builder need not be afraid to tackle it:

(1) Prealigned, modular printed-circuit sections (six, in all) reduce the amount of actual wiring to an absolute minimum. Most of the wiring is confined to interconnections between the modules and the power supply and selector switch sections. (2) The critical front end is completely wired and aligned. (3) Alignment of other tuned circuits can be accomplished quickly and easily without using a single instrument. (4) The 78-page construction manual is written and illustrated in a manner that fairly invites the kit-builder to dive in and "build" without the usual fears associated with kit building. Full color diagrams show actual placement of wires and parts, and assembly and wiring instructions are grouped in easy-to-follow sections. In addition, the manual serves as a well-written primer for anyone interested in the theory of FM and stereo FM.

The kit was assembled by a person who had never made such an attempt before. Except for a slight bending of a dial pointer to eliminate contact with the dial face, and a rather sloppy job of dressing some long wire lengths (which did not affect performance), he did a perfect job in about 10 hours. Precut, pre-stripped and pre-tinned wires assisted greatly.

Features

The finished appearance of the LT-112B rivals that of many quality, factory-assembled units. It does not have a "home-built" look! A rich-looking gold and charcoal-brown dress panel is offset by a subdued dial-glass area that employs soft-blue numerals to indicate frequency, as well as a 0-100 logging scale. The multi-function tuning meter is also contained in the dial glass area. The lower half of the panel contains three selector switches, a stereo indicator light, a standard stereo jack from which an output can be obtained for making tape recordings. (The stereo indicator lamp lights up blue, which doesn't make for good contrast. A red reflector would have been preferable.) The first of the selector switches turns on power to the unit and, in its alternate positions, introduces sub-channel and noise filters for the elimination of noise in less-than-optimum stereo reception situations. The second switch, labelled "selector," enables the listener to choose mono or automatic stereo listening, with or without interstation muting. The third switch selects the various functions of the meter. Its positions include "signal strength" (in which the meter is a "peak reading" one), "multipath" (in which the meter indicates presence or absence of signal reflections detrimental to good stereo FM reception), "center tuning" (in which the meter becomes a "center of channel" indicator, for optimum station tuning) and finally, "align" (in which the sensitivity of the meter circuit is altered to permit its use during initial r.f. and i.f. alignment upon completion of the kit). A close-up view of the meter face is shown in Fig. 2, illustrating its dual scale calibration.

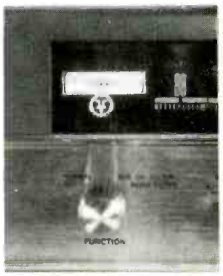


Fig. 2—Closeup of multi-function tuning meter that is also used during final alignment of the Scott LT-112B FM stereo tuner kit.

The tuning knob is located at the upper right of the panel, and its action is fairly smooth and precise, good use having been made of a heavy flywheel assembly.

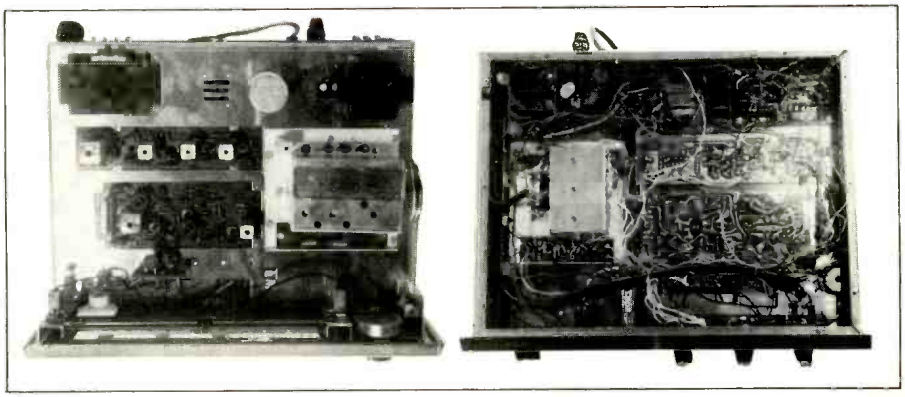
In addition to the usual left and right outputs and antenna terminals, the rear apron of the LT-112B has a pair of jacks for connection to the vertical and horizontal inputs of an oscilloscope. This can provide more meaningful indications of multipath than can be obtained by means of an internal meter. With a 'scope connected, it is also possible to judge centered-tuning, as well as modulation pattern of any given station. For example, Fig. 7 shows a mis-tuned condition with relatively high modulation from an FM station. In Fig. 8 we deliberately modulated a signal generator ±300 kHz (more than would ever be encountered in broadcast practice) in order to display the perfectly symmetrical, wideband response of the i.f. system. The rear of the tuner also contains right and left level adjustments, so that tuner output levels may be adjusted to match other program source levels associated with the user's overall music system.

Top and bottom views of the completed chassis are shown in Figs. 3 and 4. Careful examination of the underside of the chassis discloses that no effort was made to "dress" wires neatly —we deliberately wanted to check performance of a set that might be built by a rank amateur, as this one was.

Circuitry

The circuit of the Model LT-112B tuner, as previously mentioned, consists of several modules. The FM front end contains four solid-state amplifying devices, three of which are FET's. Five NPN devices are used in the 10.7-MHz i.f. and limiter strip (which also

Figs. 3 and 4—Top and bottom views of completely assembled kit. Lead wires were not routed as neatly as one would wish, but the tuner operated perfectly after assembly by a kit-assembly "beginner."



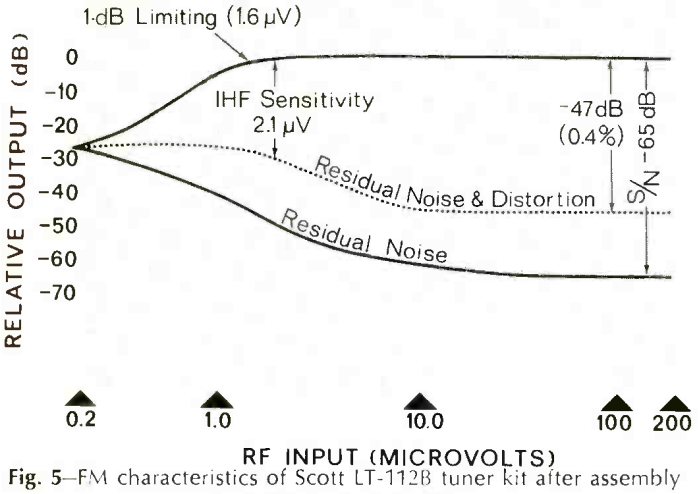


Fig. 5—FM characteristics of Scott LT-112B tuner kit after assembly by a neophyte kit builder.

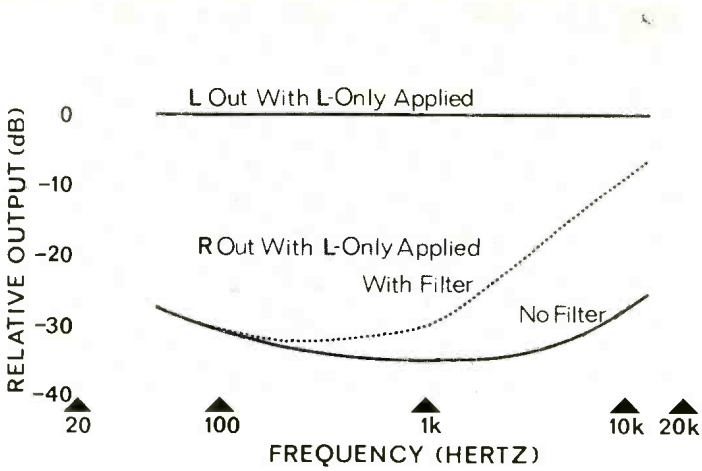


Fig. 6—Stereo FM separation with and without sub-channel filter introduced.

Fig. 7 (left)—With an oscilloscope connected to a pair of jack receptacles provided at the rear of the LT-112B, a mis-tuned condition can be easily detected. Fig. 8—Excellent i.f. bandpass response is displayed with a sweep generator's ±300 kHz applied.

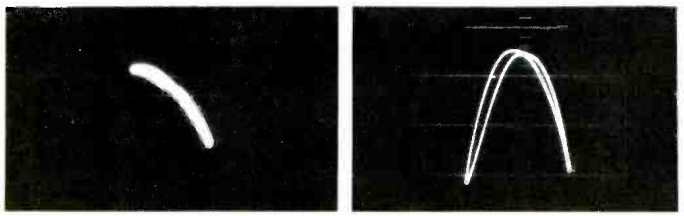
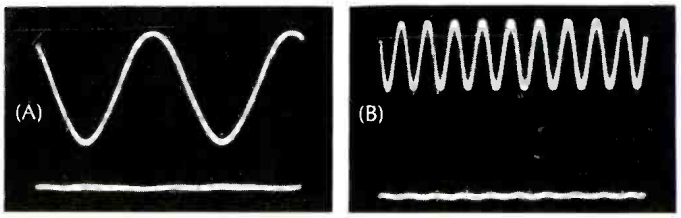


Fig. 9—Visual display of FM stereo separation (graphic plot may be seen above) of the Model LT-112B stereo tuner at (A) 1000 Hz and (B) 10,000 Hz.



employs a ratio detector as the FM demodulator circuit). The multiplex printed-circuit module employs the popular "switching" circuit for demodulation and includes the automatic switching circuits developed by Scott. In these circuits, switching will only occur (to stereo) if there is sufficient pilot signal to insure good synchronization with the locally generated 38-kHz signal. Additionally, the switching circuit requires a greater signal-to-noise ratio for it to switch to stereo than for it to switch back to mono. This prevents a marginally acceptable signal from intermittently switching back and forth from mono to stereo. Seven transistors are used in this carefully designed circuit. A small muting-circuit module consisting of two transistors, a "multipath indicator" module consisting of a transistor and two diodes, and an audio-output amplifier module complete the complement of p.c. boards. The latter includes four more transistors as well as the 38-kHz and 19-kHz rejection filter components and level adjustments for left and right output signals.

Performance

In evaluating the specifications and measurements which follow, the reader is reminded once more that this unit was built per the instruction manual and aligned without the use of any professional test equipment. While it is remarkable that most of the specifications of the completed kit were met or exceeded, further alignment using instruments might, we felt, yield even better results. Amazingly, the IHF sensitivity could not be improved upon using standard alignment procedures. This speaks very well indeed for the factory alignment of the front end, as well as for the techniques developed by Scott for home alignment without the aid of instruments. Much of the FM performance story can be gleaned from Fig. 5. IHF sensitivity at 98 MHz was 2.1 μV, while at 108 MHz (not shown) it measured 1.9 μV, which is right on the specification nose, allowing for normal production tolerances. Ultimate signal-to-noise ratio was exactly 65 dB, as rated, and total harmonic distortion was only 0.4% as against the published figure of 0.8%. Full limiting was achieved with a mere input of 1.6μV!

Stereo FM separation was 35 dB at 1 kHz, a very fine figure, though slightly less than the spec's. Separation at other frequencies is shown in the plot of Fig. 6. Also shown here is the effect on separation when the sub-channel filter is introduced. Note that at the very-high audio frequencies separation is seriously degraded by the filter, as admitted by Scott. Therefore, the filter is really intended for situations in which reduced separation is preferred to very noisy, weak-signal stereo reception. A dual plot of stereo separation is shown in Fig. 9 for 1 kHz and 10 kHz signals.

In use, the Model LT-112B confirmed its measured specifications. At a distance of some 25 miles from the center of the Metropolitan New York area, we were able to receive 38 stations clearly, 12 of which were transmitting stereo FM. None of the twelve required the use of the sub-channel filter. Any evidence of distortion was clearly a case of multi-path problems (as confirmed by the self-contained meter, as well as by scope readings) which were almost completely cleared up by a slight reorientation of our antenna.

If you lean towards kit construction, and have steered clear of FM tuners until now, the Scott LT-112B may well serve as your introduction to this fine program source. You might remove the bottom cover every so often, though, or they'll never believe you built it yourself. More importantly, the stereo FM tuner works beautifully. And there's nothing on the market that is factory-assembled to match its performance, features, and appearance at its price.