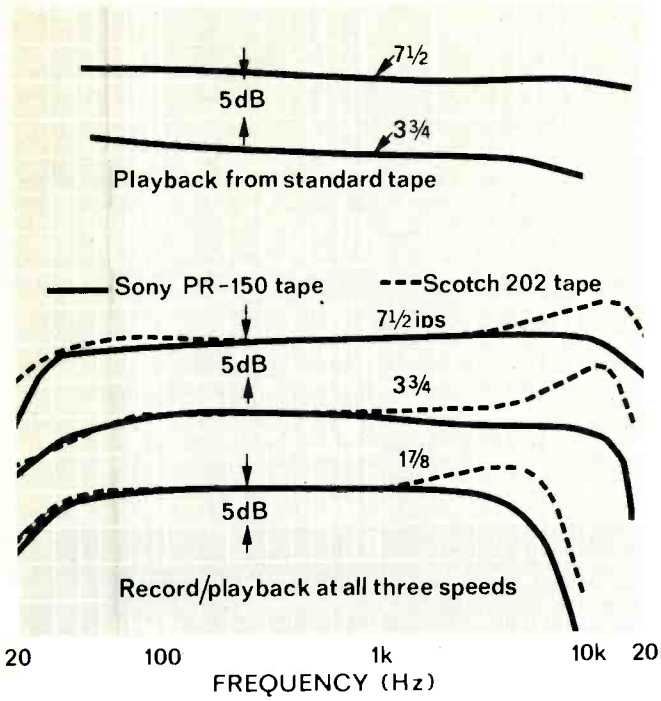


Fig. 4. Performance curves: Upper pair show responses to standard-frequency tapes. Lower curves show record/play responses with Sony PR-150 tape (for which the machine was biased) in solid lines, and with Scotch 202 tape in dotted lines.

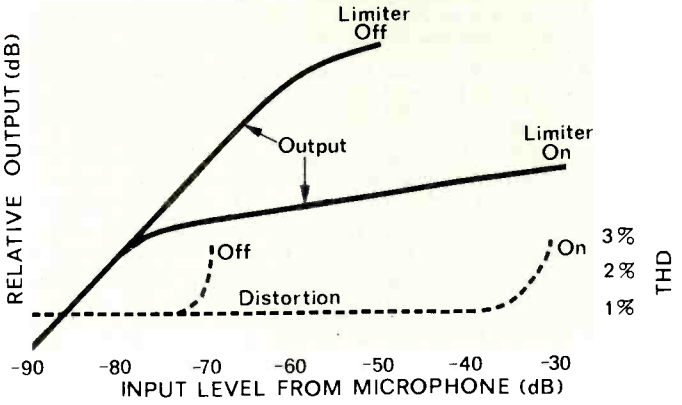


Fig. 5. Limiter-compressor characteristics: Solid lines show relative outputs for the wide range of microphone input signals with the limiter on and off. The dotted curves show the distortions under both conditions.

selves. They are completely exposed with the cover off, and the usual grease-pencil markings can be applied exactly at the head gap—making sure to use the correct head for the track configuration you are using. The remote control previously mentioned will start the transport at a distance, leaving the mode—recording or playback—undisturbed. It will not permit remote rewinding or fast forward winding, but that is rarely needed from a remote location anyhow.

The machine's speed accuracy holds well until the battery voltages are below the limits marked on the meters, which ensures that recordings made in the field will be compatible with those made in the studio.

In evaluating the total Sony/Superscope Model 770, one must concede that it is not a machine you would carry around as you would a cassette recorder. It weighs too much for that application. Since it is a professional machine with important extra features and 7-in. tape reel capacity, it should be viewed in that light. As such, its 25 lbs. appears to be amazingly light. In fact, we would view the Sony/Superscope Model 770 as a superb tape deck even if it were an a.c.-only machine. With a built-in battery power supply and a stereo system that maintains accurate speed, Sony has surely developed an exceptional unit that fills a niche sorely needed by professionals and other serious recordists. And if $750 sounds like a lot of money, remember that you're getting a portable that can also be used as a no-compromise a.c. tape deck. An added fillip is a marvelous instruction book that includes a complete schematic.

Check No. 45 on Reader Service Card

H. H. Scott Model LR-88 Stereo FM/AM Receiver Kit

Fig. 1—Front view of the H. H. Scott LR-88 receiver kit, after assembly.

Here's a stereo FM/AM receiver *kit* with a real hot front end, fairly high power output, low distortion, and excellent operating flexibility. Besides that, it's a good-looking unit when assembled; no "kit look" to this one. And assembling it yourself saves money.

Most of the kit-building consists of mechanical assembly of parts, and wiring output transistor circuitry, selector-switch, and all of the interconnecting cables between the various p.c. boards. A view of the underside of the chassis, after completion, is shown in Fig. 2. All but one of the p.c. assemblies can be seen in mounted position. The H. H. Scott silver-plated, FET front end comes completely wired and aligned. In all, the Model LR-88 has a total of 34 silicon transistors, 24 diodes, 4 integrated circuits and 2 stabistors.

Our kit builder was asked about con-

MANUFACTURER'S SPECIFICATIONS: **FM Tuner Section.** IHF Usable Sensitivity: 2.5 μV. S/N Ratio: 65 dB. Capture Ratio: 2.5 dB. IHF Selectivity: 45 dB. Frequency Response: 50 to 15,000 Hz ±2 dB. Cross-Modulation Rejection: 80 dB. Total Harmonic Distortion (Mono): 0.6%. FM Stereo Separation: 35 dB @ 400 Hz. **AM Tuner Section.** Sensitivity: 200 μV (built-in antenna; 9 μV (ext. antenna). **Amplifier Section.** Dynamic (IHF) Power Output: 80 watts total at 8 ohms. RMS Power Output: 30 watts per channel at 8 ohms. THD: 0.6% at rated output; 0.4% at 15 watts rms/channel. IM: 0.8% at rated output; 0.6% at 15 watts rms/channel. Frequency Response: Tape, Extra: 20 to 20,000 Hz ±1.5 dB. S/N Ratio: Tape, Extra: 80 dB; Phono: 65 dB; Tone-Control Range: Bass: ±10 dB @ 50 Hz; Treble: ±10 dB @ 10 kHz. Power Bandwidth: 20 to 20,000 Hz. Damping Factor: 30. Dimensions: (completed unit) 17½" W x 15" D x 5½" H. Price: $334.95.

struction of the kit, so before we deal with the "finished product," here are his comments:

"Instructions were excellent . . . This kit displayed exceptional design and packaging concepts . . . color diagrams were easy to follow. Parts were delineated by construction number and beautifully packed in foam separators. Solderless connectors helped considerably where used."

Minor difficulties encountered were: ". . . some screws had stub ends instead of pointed (self-tapping type) and were hard to start in self-tapping holes. One wire length was missing."

Pre-cut and pre-stripped wire, with critical sections being pre-wired and pre-aligned, plus liberal use of printed-circuit boards, simplifies construction. And Scott's use of built-in meters for alignment purposes, makes it all so easy for the non-pro. It took our builder, who was admittedly meticulous about everything, a total of 45 hours to finish the stereo FM/AM receiver kit.

The instruction booklet, by the way, is far more than just an assembly and wiring manual. Pages 28 through 67 in this 152-page book are actual step-by-step instructions. Other sections include general kit construction tips, a detailed parts list, test procedures and alignment (without the need for any test equipment), installation and operating instructions, a section on AM/FM receiver theory (fully twelve pages), technical service instructions, and a station log and custom-mounting template (full size).

The Completed Receiver

The photo in Fig. 1 shows the front panel of the LR-88. The upper half of the panel is black, disclosing a well-lighted dial scale only when the unit is turned on. Two tuning meters are at the left, one for center-of-channel tuning of FM stations, the other for peak signal indication while tuning in FM and AM stations. The expanded FM scale has marks for every MHz, and they are extremely accurate, deviating from true frequency by less than a "pointer width" at all points on the dial. An equally well-calibrated AM and logging scale are provided. To the right of the dial scale is a tiny red spot of light, illuminated in the presence of a stereo FM signal; to the right of that is a nicely balanced flywheel tuning knob.

The lower half of the panel is in anodized gold color and contains all the other controls. A pair of microphone jacks are at the extreme left. These are followed by a five-position selector switch (mic., phono, FM, AM and Extra), the usual balance control, clutch-type dual bass and treble controls (each channel's tonal response can be individually adjusted) and a loudness control which, in its counterclockwise position, turns off power to the entire unit. We wish power on-off had been accomplished in some other manner, say by means of one of the push-push buttons at the lower right of the panel. As it is, there are seven of these button switches for such secondary functions as loudness on/off, tape monitor, mono/stereo, noise (high-frequency) filter, FM muting, remote speakers on/off and main speakers on/off. A stereo headphone jack completes the front-panel layout.

The rear connection panel, shown in Fig. 2, has two a.c. convenience receptacles (one switched, one unswitched); a line fuse, as well as individual channel speaker fuses; antenna terminals for FM, as well as a terminal for external AM antenna; speaker terminal strips (barrier type, to prevent accidental shorts); a phono sensitivity switch (either 4-mV or 7-mV sensitivity for full output); tape input and tape output jacks; an access hole for the muting threshold adjust (variable from 3- to 30-μV sensitivity. And there's a new feature we haven't seen on a complete receiver before: a small slide switch alters the remote-speaker output terminals from stereo channels to a monophonic mix of left and right channels. This strikes us as a very good idea, in that it permits the mounting of a *single* remote speaker in another room (or even one in each of two secondary locations) and, when thrown to the "mono" position, affords a compatible mono mix of program material while the main speakers continue to provide full stereo. Another suggested use (by Scott) is the possibility of using a single remote speaker as a fill-in center channel for overly separated program material or two widely spaced main speakers (because of decor necessity). In such cases, a single remote speaker is connected to either set of remote speaker terminals, the mono-stereo remote speaker switch is set to "mono," and this single speaker then can be placed mid-way between the two main speakers to provide the needed third-channel fill.

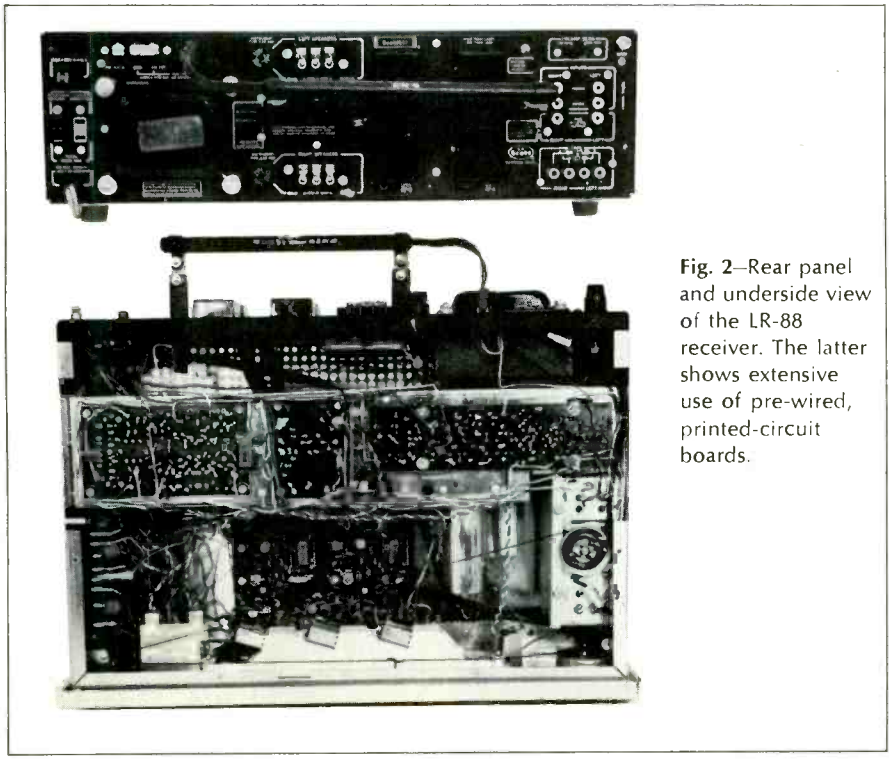


Fig. 2—Rear panel and underside view of the LR-88 receiver. The latter shows extensive use of pre-wired, printed-circuit boards.

The AM loopstick antenna is plugged into an appropriate socket at the rear, so that it can be disconnected (and even removed entirely together with its protruding brackets) in the event that an external antenna is used for AM. The output transistors are mounted on the rear surface, too, as is common. Suitable protective covers are used to prevent access to these devices, which carry voltage on their cases.

Performance Measurements

We have long maintained that IHF sensitivity alone does not tell the complete story concerning a product's performance as an FM receiver. Here is another case in point. Although the

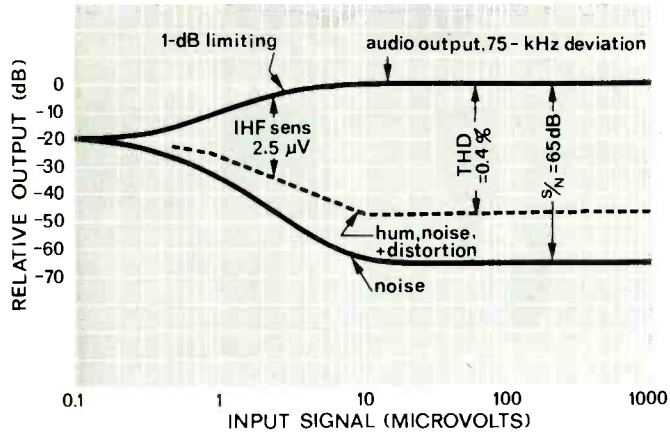


Fig. 3—FM (monophonic) characteristics of the LR-88.

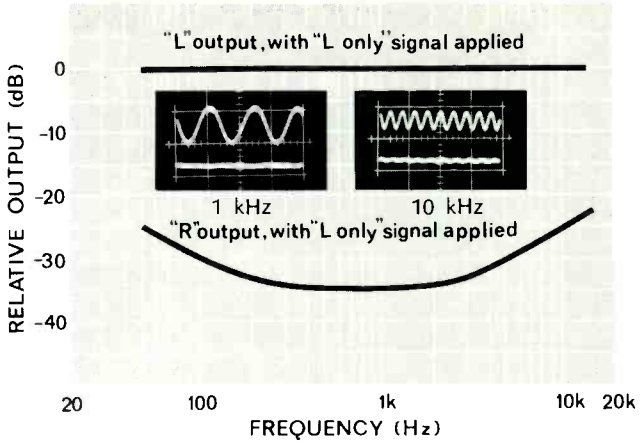


Fig. 4—Stereo FM separation, with 1 kHz and 10 kHz dual-trace photos.

Fig. 5—Total harmonic distortion and intermodulation distortion of the LR-88 receiver vs. power output (rms watts).

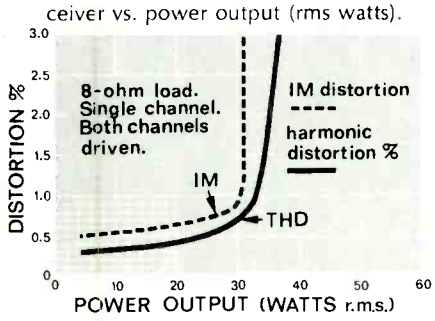


Fig. 6 — Power bandwidth (½ power) stretches from 18 Hz to 23 kHz. Square-wave response at (A) 100 Hz and (B) 10 kHz is also shown.

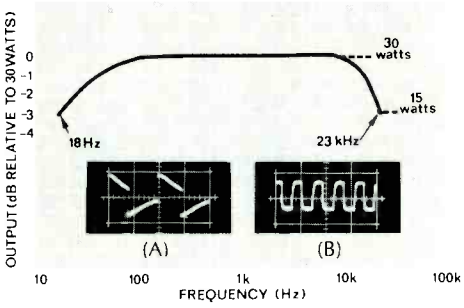
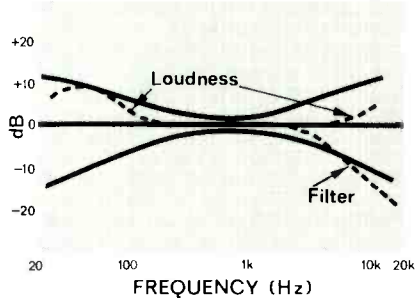


Fig. 7—Tone control, loudness, and high-frequency filter action.



Scott people claim a sensitivity of 2.5 μV, and our sample come close to it as shown in Fig. 3, actual FM performance seems better than that. For example, we logged no fewer than 43 FM stations with adequate quieting, using only an indoor dipole antenna. Of these, 15 were in "listenable" FM stereo. When we switched to an outdoor Yagi antenna, with the aid of a rotator, we were able to pick up a grand total of 51 usable stations (at least 30-dB rejection of noise and distortion) and the stereo number increased to 17. All this in a suburban New York location. Now, 2.5 μV IHF sensitivity is not the lowest ever measured in our labs, but this is a new record for number of stations received.

The feat is all the more remarkable when you remember that the kit builder did not have access to a single piece of professional test or alignment equipment. Whatever alignment was needed was done simply by following the EZ-A-LIGN® procedure given in the Scott manual. Essentially, the tuning meters of the finished receiver serve as the necessary indicators during this ingenious alignment procedures. Other relevant FM characteristics are also shown in the composite graphs of Fig. 3. It should be noted that while THD in mono was actually better than claimed (0.4% instead of 0.6%), it did reach 1.0% in the stereo (no manufacturer's spec given). Signal-to-noise was exactly 65 dB, as stated and full limiting occurred at an input of only 3 microvolts.

As for amplifier performance, the manufacturer's specifications were easily met or exceeded. For example, rated distortion was reached at 32 watts r.m.s. per channel, as compared with 30 watts claimed. THD with an eight-ohm load, as well as IM distortion, are shown in Fig. 5. Power bandwidth, shown graphically in Fig. 6, is seen to extend from 18 to 23,000 Hz; again, better than manufacturer's claims if one bases the measurements upon 30 watts rms per channel of full output. Tone-control action is illustrated in Fig. 7, in which the loudness compensation characteristic as well as the high-frequency filter action is indicated. It must be pointed out that this filter is not very effecive because of its limited slope (6 dB per octave), which acts like little more than an auxiliary treble control with a slightly shifted cross-over point. Square-wave response at 100 Hz and 10,000 Hz, shown in Fig. 6, is typical of most all-in-one receivers, and is deemed to be adequate.

Scott multiplex decoder circuits are noted for their sophisticated and excellent design, and the one built into the LR-88 is no exception. Particularly noteworthy is the fact that separation of at least 25 dB between channels is maintained from 50 Hz to 10,000 Hz, with fully 35 dB of separation measured at mid-band frequencies, as shown in Fig. 4. Accompanying photos taken of a dual trace 'scope screen visually confirm the meter measurements. Threshold of switching from mono to stereo FM is positive, and occurs at about 4 microvolts of r.f. input signal. At this minimal signal level, stereo performance is fairly noisy, of course, but the mono-stereo pushbutton switch enables the user to defeat the automatic switching feature and listen to such marginal stations in a mono mode. When the switch is depressed to mono, the stereo indicator light is extinguished, to remind the user that he is *not* listening in stereo, station announcements notwithstanding.

All in all, if kit building is your forte (or even if you've never tried it for fear of possible complexity), the Scott LR-88 offers a most competent design at a price well below that for an equivalent factory-assembled unit.

Check No. 84 on Reader Service Card

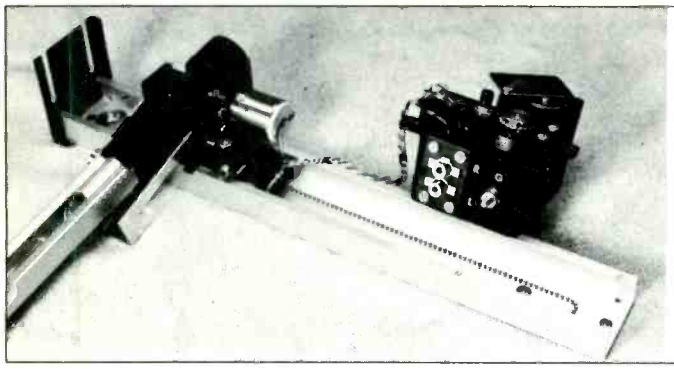


Fig. 2. The working parts of the arm inverted to show the construction, together with a close-up of the amplifier/servo motor housing.

of the track. The motor is fitted with a pulley which is grooved to fit the ball chain, and the other end of the chain loop feeds over a nylon pulley at the right end of the track. Most of these details can be seen in the accompanying figures.

At the end of the record, the arm moves more rapidly because of the run-out groove, and the gold wire contacts a second platinum alloy wire which energizes a second motor on the carriage to release the lift bracket, thus raising the cartridge from the record. If the user wishes to lift the arm before the end of the record, he depresses the release latch lever on the carriage which mechanically lifts the arm, or he depresses a red button on the top of the motor housing which energizes the lift motor. The "C" cell fits into the casting and is held in place by a cover which also serves to make contact with the positive pole of the battery.

The Rabco arm must be mounted directly on the motor plate, or on some part of the turntable structure that moves as the platter does. Thus it is suited for use with the Thorens TD-150 table, on which the test sample was installed. This turntable provides the needed spring mounting from the base, yet provides a place for mounting an arm so it will be rigid with the turntable, for no relative movement between the arm and the center of the platter can ever be permitted. Several Thorens models should accommodate the Rabco arm nicely, and the ingenious experimenter could undoubtedly figure out some way to mount it on other turntables.

Performance

Without question, the Rabco arm does what it is supposed to do, and does it nicely. There is sufficient latitude for the arm to sway slightly enough to accommodate minor eccentricities of the record movement without energizing the servo motor, but even if it did, the arm would only move slightly in the proper direction and then stop and let the cartridge "catch up." Then the cycle would start all over again.

Obviously, there is no skating—since skating is the result of the geometry of angled arms and their overhang positions—so no anti-skating provision is necessary. And because the only work the stylus has to do—other than track the groove and wiggle its magnet or its armature so as to produce the signal—is to move the arm against the fine platinum alloy spring wire, the cartridge is able to track at usually well under the cartridge-manufacturer's specification. The Shure V15-II, which was fitted on our test sample, would track anything we gave it at ½ gram, and if we sat still and didn't walk around on the not-too-solid floor, it would track at ¼ gram on most material. Some heavy modulations would not come through as they should, so we would recommend ½ gram as the minimum for this cartridge, assuming a solid flooring.

The driving motor can barely be heard by placing the ear close to the track, but could not be heard through the reproduction at all. At first we thought that some form of dashpot would be desirable to slow the dropping of the stylus to the record, which seemed to be rather abrupt, but dropping a half-gram a quarter of an inch (at most) couldn't possibly hit very hard, so we quit worrying about that.

The track is readily adjustable to any platter height, and stylus force is adjusted by turning the counterweight one full turn for each gram of force desired, after balancing the arm completely. The counterweight has a marker on its back so as to permit accurate adjustment.

Our only suggestion for a change, after rejecting the few other ideas we first had, would be to color the release latch lever red instead of the yellow now used. The electrical release button is red, and the yellow is jarring, in our opinion. We know the principle is right, and we must admit that the embodiment of the finished product works perfectly, as far as we can see. It is a delightful device.

As mentioned, our test sample was fitted with a Shure V15-II cartridge, and it was mounted on a Thorens TD-150. Factory fitted, the cartridge is an additional $67.50, and the table is an additional $85.00. The base, in oiled walnut, is another $12.00, making a total of $314.00 for the complete assembly. Additional plug-in cartridge holders are $7.50 each, for those who must have a number of cartridges ready to use.

This is not inexpensive, but you get a lot for your money: minimized record and stylus wear, superb reproduction, and perfect anti-skating compensation (since none is required).

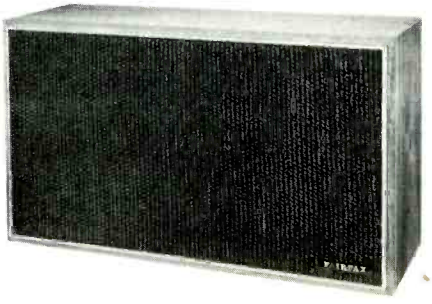
Check No. 134 on Reader Service Card

Fairfax Bookshelf Loudspeaker System, Model FX-100

MANUFACTURER'S SPECIFICATIONS:
Two-way system. Woofer—8 in. dia. ducted port; Tweeter, 3½-in. cone. Crossover frequency: 5500 Hz. Frequency range: 30-20,000 Hz. Power Handling Capacity: 30 watts. Impedance: 8 ohms. Dimensions: 21″ x 12″ x 8″ deep. Weight: 24 lbs. Price: $89.50.

This new compact bookshelf model employs two speakers in a ported reflex cabinet which differs from most other ported cabinets in that the port tube is cut off at an angle of about 45 deg., rather than perpendicular to its length. The tube itself is 2½ in. in diameter, 4½ in. long at its longer dimension, and 2 in. long in its shorter. This form of port should tend to smooth out the lower end of the spectrum, much in the same manner as an exponential horn does if it is large enough to reproduce lows. The speaker puts out a good level at 60 Hz, without doubling, and a measurable output up to 22,000 Hz, although it is down considerably at that frequency, as one would expect.

Fig. 1—Fairfax FX-100 Loudspeaker system.



Check No. 51 on Reader Service Card →