

# Equipment Profiles

- EICO Model 3200 Stereo FM Tuner
- EICO Model 3150 Stereo Control Amplifier
- Thorens TD-125 Manual Turntable
- NordMende Model 8001/T Stereo Tape Recorder
- Harman-Kardon Model HK-50 Speaker System

## EICO Model 3200 "Cortina" Stereo FM Tuner

### MANUFACTURER'S SPECIFICATIONS:

IHF Useable Sensitivity: 2.4  $\mu\text{V}$ . S/N: 60 dB. Capture Ratio: Under 4.5 dB. IHF Selectivity: 45 dB. Frequency Response: 20 Hz to 15 kHz  $\pm 1$  dB. Image Rejection: 45 dB. I.F. Rejection: 80 dB. Spurious Response Rejection: 80 dB. Total Harmonic Distortion: (Mono) Less than 0.75%. FM Stereo Separation: 40 dB at 1 kHz. Hum and Noise: 70 dB below output. Output Impedance: 5000 ohms. Dimensions: 12" W x 3 $\frac{1}{8}$ " H x 7 $\frac{3}{4}$ " D. Price: \$99.95 (Kit); \$139.95 (Wired).

"The easiest kit I ever built," said the kit builder who assembled the EICO Model 3200 "Cortina" stereo FM tuner. Never having tackled a tuner kit before (he constructed audio amplifier kits and instruments previously), he spent only five hours on assembly and one hour reading the manual and laying out parts. He found the instruction manual's parenthetical notes a great help, and construction time was speeded up by preassembled and prealigned sections.

The kit builder encountered very few problems, noting that construction was "amazingly simple." Except for a tuning dial that "turned harder in the middle than at the other ends," the tuner worked like a charm when completed, he observed.

In our investigation of this unit, we

had an opportunity to compare the "factory wired" product with the kit, wired by a relatively inexperienced "do-it-yourselfer." Aside from a few mis-dressed and overlong lead lengths (in the power supply section, where lengths are not critical), the two units were very nearly identical.

A photo of the completed tuner, housed in its metal "cage" (included in the price of the kit or wired unit) is shown in Fig. 1, while the "insides" are displayed in Fig. 2. From this latter photo, you can observe the three basic components which make up the tuner: starting from the left, the multiplex stereo decoder board, the FM-i.f. strip and the r.f. front end, obscured by the dial-drive drum.

The simple, gold-finished, one-piece front panel has three slim "rocker" switches along its lower edge. The first of these is a mono/auto-stereo switch. This is followed by an AFC on/off switch and a power on/off switch. Illumination of the dial scale is adequate, if not startling, and frequency calibration

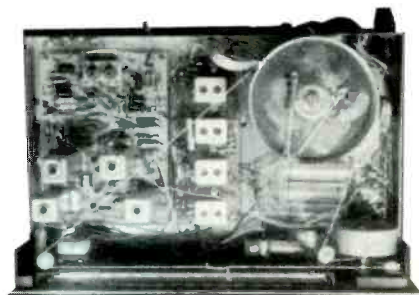


Fig. 2—Open-chassis view of the EICO Model 3200 stereo tuner, showing layout of three major modules.

was accurate within approximately one channel width (200 kHz). The megahertz spread from low end to high end is about the most linear we have seen. That is, there is no "bunching" of frequencies at either end of the band. A "logging" scale, calibrated from 0 to 100, and sub-divided into 100 divisions, is also provided. The dial glass area also contains a peak-reading tuning meter as well as a stereo indicator light which denotes the presence of a stereo FM transmission.

The circuitry employed in the Model

3200 is quite basic. Only bi-polar types of transistors are used (no FET's). There are three in the r.f. section, four in the i.f. strip and six in the multiplex decoder circuitry. Eight diodes, two silicon rectifiers and a varactor diode (for the AFC circuit) complete the solid-state count.

As disclosed in Fig. 3, IHF sensitivity measured 4  $\mu\text{V}$ , falling short of the claimed 2.4  $\mu\text{V}$ . No attempt at realignment was made. S/N ratio, on the other hand, was 62 dB, a bit better than claimed by the manufacturer. One-dB limiting was achieved at 4  $\mu\text{V}$ . Total Harmonic Distortion (in both mono and stereo) measured 1.2% at full 75-kHz modulation. I.F. and Spurious Response rejection were excellent, measuring 80 dB, as claimed, while selectivity met its published claim.

Stereo FM separation, as plotted in Fig. 4, falls somewhat short of the 40 dB claimed. Again, no attempt at realignment was made.

Both the measured THD and the failure to meet IHF Sensitivity claims prompted us to investigate the state of alignment of this particular unit. Using sweep alignment techniques, we checked the detector "S" curve at signal input levels of 5  $\mu\text{V}$  and 100  $\mu\text{V}$ . Results are shown in the photos of Fig. 5A and 5B, respectively. As we suspected, the failure to meet the 2.4  $\mu\text{V}$  sensitivity spec was caused by a constricted overall bandwidth at the lower signal-strength level. In both photos, total sweep width is 300 kHz ( $\pm 150$  kHz). At the lower signal level, however, there is curvature within the required 150-kHz central portion of the sweep. Thus, the "least usable sensitivity" limitation does not arise due to the presence of noise, but from excessive distortion at low signal levels. This is confirmed in Fig. 3 by the fact that if one were to consider *only* noise (as was the case before the IHF spec was devised) in determining "quieting sensitivity," the Model 3200 is capable of 30 dB of quieting at a mere 1.6  $\mu\text{V}$  input! It is possible that realignment of the i.f. system might have "broadened" the response sufficiently to enable the tuner to meet its published IHF sensitivity spec, but, again, this was not attempted.

Listening to the tuner in operation, the 1.2% THD was not as objectionable as we might have supposed. This is largely due to the fact that most stations seldom permit full deviation (75 kHz) to occur. If one backs down on modulation to, say, 50 or 60 kHz, THD quickly settles back to a very acceptable 0.5 or 0.6%. The moderate sensitivity was in evidence, however. We were able to receive about 35 acceptable stations, some eleven of these in ac-



EICO Model 3200 stereo FM tuner, available as a kit or factory-assembled unit.

## Equipment Profiles (continued)

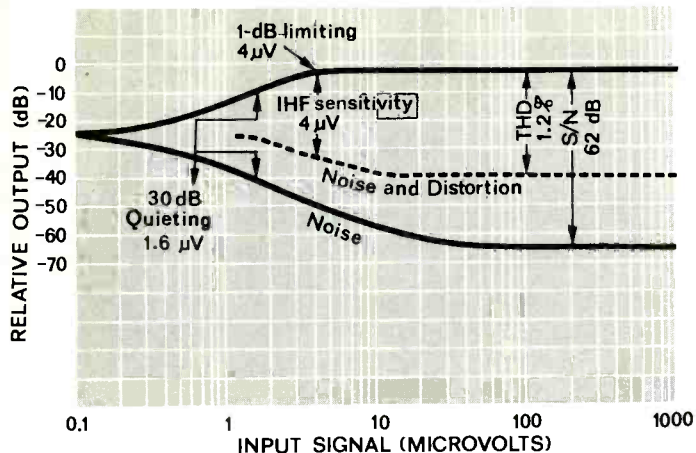


Fig. 3—FM characteristics of the Model 3200 Cortina tuner.

Fig. 4—Stereo separation characteristics.

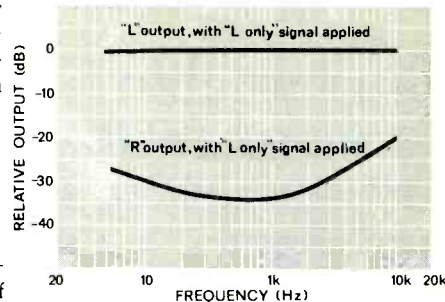
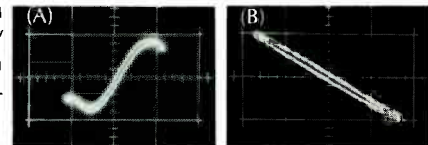


Fig. 5—Overall bandwidth response of the EICO stereo FM tuner for (A) a 5- $\mu$ V input signal and (B) a 100- $\mu$ V input signal.



ceptable stereo. (For reference, the best we've ever done at this site is 49 usable signals, with 15 of them in stereo.)

The peak-reading tuning meter helped in tuning for center of channel. It cannot do double duty as a signal-strength indicator, however, because it is highly non-linear. In tuning from

one station to another, we observed that interstation noise was rather loud, often "triggering" the stereo indicator lamp. Once "on station," there was no difficulty here.

In sum, the EICO Model 3200 stereo tuner, while not a great performer as separate tuners go, should do very

nically in non-fringe reception areas as part of a modest stereo hi-fi setup (especially when an adequate antenna is used). The tuner kit, in particular, impresses one with its relatively low cost, ease of assembly, and small size.

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## EICO Model 3150 "Cortina" Stereo Control Amplifier

### MANUFACTURER'S SPECIFICATIONS:

IHF Music Power: 100 watts (total), 8 ohms. Continuous Power Output: 40 watts per channel (8 ohms). THD: Under 0.15% at 40 watts rms/channel, both channels driven. IM: Under 1% at rated output. Frequency Response: 10 Hz to 30 kHz  $\pm 1.5$  dB. Hum and Noise: 80 dB below rated output. Power Bandwidth: 10 Hz to 20 kHz at 0.5% THD. Damping Factor: 35 or greater with 8-ohm load. Tone Control Range: Bass:  $\pm 15$  dB at 50 Hz; Treble:  $\pm 15$  dB at 10 kHz. Dimensions: 14 $\frac{3}{8}$ " W x 3 $\frac{3}{8}$ " H x 8 $\frac{3}{16}$ " D. Price: \$149.95 (Kit); \$225.00 (wired).

The Model 3150 "Cortina" is a high-powered, well designed, moderately priced unit. We examined a factory-assembled unit.

The front panel of the 3150 model consists of a gold-finished heavy extrusion with six equally spaced rotary control knobs in the upper section and six evenly spaced rocker-switches in the lower section for secondary functions. An on/off indicator light and phone jack (for stereo headphones) at the extreme right end of the panel completes the layout, as shown in Fig. 1. Starting at the left, the rotary knobs consist of a three-position selector (phono, tuner, aux), a volume control, a balance control, bass and treble controls, and a speaker selector switch (for main, remote, both, and phones). The secondary rocker switches include a tape monitor switch, loudness-contour, on/off, mono-stereo, low-frequency filter on/off, high-frequency filter on/off and power on/off.

The rear panel (shown pictorially in Fig. 2A) contains a line fuse, switched and unswitched convenience a.c. outlets, speaker terminals for main and

remote speakers (of the non-barrier type, offering less protection against speaker leads shorting), a ground terminal post, and input jacks corresponding to the three positions of the selector switch. In addition, there are tape-in and tape-out pairs of jacks. The tape-out jacks are used for making tape recordings of any of the other program sources, while the tape-in jacks serve a dual purpose. They enable listening to recordings from a tape deck equipped with its own preamplifier, and also permit tape monitoring from "three-headed" tape recorders. For either of these uses, the tape monitor rocker on the front panel must be placed in the "tape" position since the main selector switch has only three positions, neither of which is for tape, per se.

If ever a stereo amplifier could be thought of as two amplifiers, the EICO 3150 falls into that category. Unlike other compact designs we have seen, EICO has chosen to supply p.c. boards for each channel for magnetic preamplifier, voltage amplifier stages, and driver sections. Thus, the three boards of one channel are mounted on top of the chassis, while three identical boards of the other channel are similarly mounted below the chassis surface. It is this packaging technique which results in the 3 $\frac{3}{8}$  in. overall height of the amplifier, belying the high wattage capability contained inside.

About the only thing common to both channels is the rugged power supply, of

EICO Model 3150 stereo preamplifier/power amplifier features 100 watts of total IHF Music Power with 8-ohm loads.



## Equipment Profiles (continued)

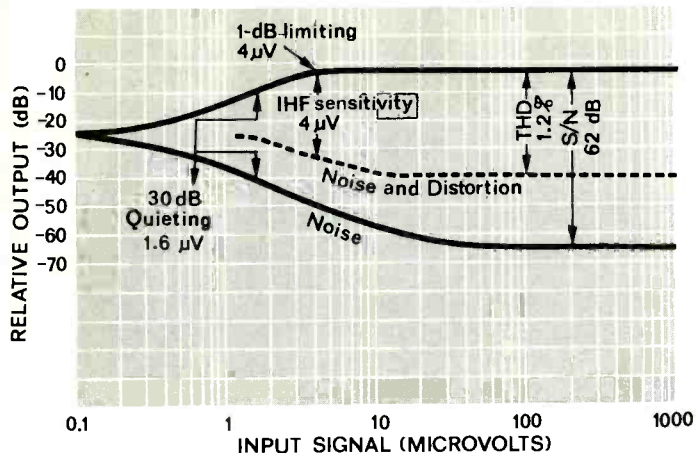


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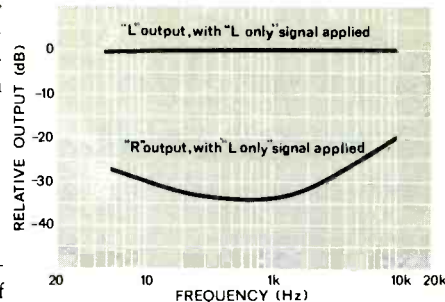
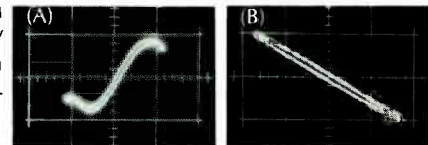


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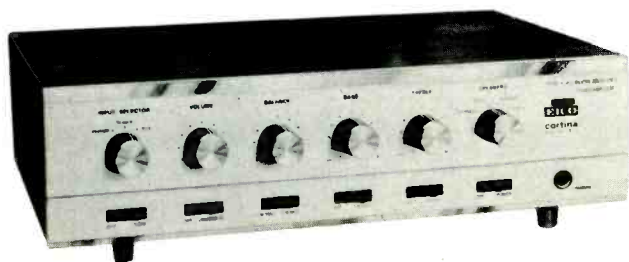
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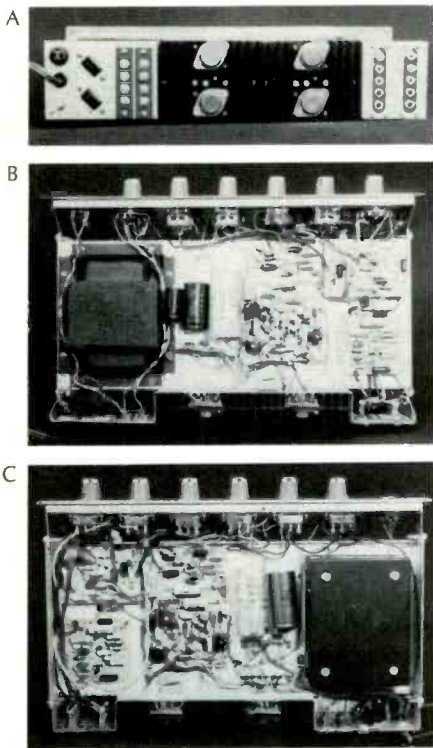


Fig. 2—The rear panel layout of EICO's Model 3150 stereo amplifier is shown in (A). Figures 2B and C show top and bottom views of the chassis, illustrating how duplicate printed-circuit boards are mounted for each channel. Twenty-six silicon transistors, six silicon rectifiers and twelve biasing and protective-circuit diodes are used in this design.

which the massive power transformer (shown in the views of Figs. 2B and 2C) is particularly impressive. As can be seen in the photos, it occupies about a third of the entire cubic volume of this amplifier. Other power supply components (such as electrolytics) are also conservatively rated for long life and cool operation. In protracted tests in which full power was extracted from both channels, the heat-sink area at the rear of the amplifier was warm to

the touch, but not "hot," and even this moderate amount of heat would seldom result from normal musical listening, however high the level.

### Measured Performance

EICO's engineers were conservative, too, in deciding upon the specifications for this amplifier. For example, we were able to drive both channels to 42 watts each before reaching a total harmonic distortion (THD) of 0.15%. But more significantly, we continued driving until an output of 55 watts per channel was attained, where the THD was then only 0.3%. Really objectionable THD did not occur until an output of about 60 watts was obtained, as shown in Fig. 3. Equally outstanding is the IM characteristic, plotted in Fig. 3. The 1% IM figure was not reached until an output power of 56 watts per channel was produced. And at rated output, the total IM per channel was only 0.5%. Power bandwidth, shown in Fig. 4, conformed very closely to published specifications, as did the tone control range, plotted in Fig. 5. Figure 5 also shows the filter action and the loudness contour compensation at  $\frac{1}{4}$  and  $\frac{1}{2}$  volume settings. As for the high- and low-frequency filters, while they conform to published specs, they have a slope of only 6 dB/octave, limiting their usefulness as "scratch" and "rumble" filters.

A published specification given by EICO (but not summarized above, since it is not a specification required by the Institute of High Fidelity) is the rise time, stated to be 3.5 microseconds. While we did not measure this rise time directly, the photos of Fig. 4 show square-wave response at 100 Hz and 10 kHz. The 10-kHz square-wave response is about the best we have seen in an integrated amplifier (or even in a basic amplifier, for that matter).

Further proof of excellence in transient response was evident when we subjected the Model 3150 to extensive listening tests. A Cambridge recording of Bartok's *Sonata for Two Pianos and Percussion* (CRS-1803) served as a musical audition for this amplifier. The various shadings of the different percussive instruments were clearly discernible with this amplifier. Often, certain notes on a piano and the same-pitched tones of a xylophone are indistinguishable from each other when heard through "muddy" (low damping factor and poor transient response) amplifiers. Such was definitely NOT the case here—the "woody" sound of the xylophone was distinctly heard and well defined, as were all the other percussive instruments.

Residual hum and noise were quite acceptable, though the published specification might mislead one. The 80-dB S/N refers to full amplifier output with the volume control turned all the way down. Since hardly anybody listens to amplifiers in that condition, a more realistic figure for the high-level inputs is 75 dB; still more than enough dynamic range for any purpose. In phono settings, the S/N ratio was a respectable 62 dB below a 5-mV input reference, at full output.

For the prospective kit builder, this integrated amplifier is certainly an outstanding value at \$149.95. For those seeking an amplifier that's factory wired, and packed solidly with honestly performing circuitry, the EICO 3150, at \$225.00, is right up there with similarly priced and even more expensive competition. We believe it to be so good, that it outclasses the Cortina 3200 stereo FM tuner (see preceding profile), which is probably better paired to the 70-watt music power Cortina 3070 integrated amplifier. The latter is priced the same as the tuner, too.

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Fig. 3—Total harmonic and IM distortion of EICO 3150. From 1 watt to 50 watts, THD consisted primarily of second harmonic distortion. Above 50 watts, 3rd and higher-order harmonics were evident.

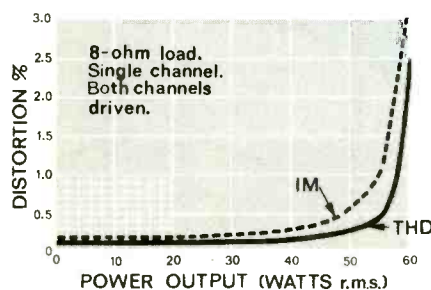


Fig. 4—Power bandwidth for 0.5% THD. Zero dB equals 50 watts into an 8-ohm load. Square-wave response at (A) 100 Hz and (B) 10 kHz are pictured here.

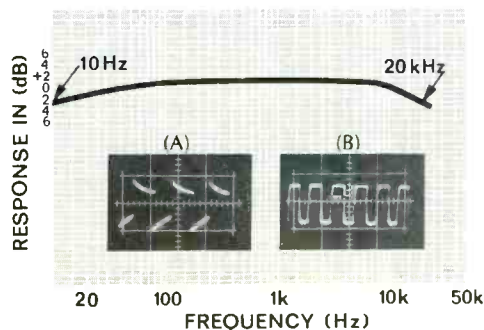


Fig. 5—Tone-control range, loudness contour, and filter response of the EICO 3150 stereo control amplifier.

