### AKAI AT-93 TUNER

**Manufacturer's Specifications**

**FM Section**

**Usable Sensitivity:** Mono, 11.2 dBf.  
**50-dB Quieting Sensitivity:** Mono, 17.2 dBf; stereo, 38.2 dBf.

**S/N:** Mono, 90 dB; stereo, 80 dB.  
**THD (at 1 kHz):** Mono, 0.02% in wide mode and 0.08% in narrow mode; stereo, 0.07% in wide mode and 0.3% in narrow mode.

**Alternate-Channel Selectivity:** Wide, 60 dB; narrow, 90 dB.  
**Capture Ratio:** Wide, 1.3 dB.  
**Frequency Response:** 30 Hz to 15 kHz, ±0.5 dB.  
**AM Suppression:** 65 dB.  
**I.f. Rejection:** 100 dB.  
**Image Rejection:** 90 dB.  
**Spurious-Response Rejection:** 100 dB.  
**Subcarrier Rejection:** 70 dB.  
**Output Level:** 770 mV at 100% modulation.  
**Separation (at 1 kHz):** Wide, 62 dB; narrow, 55 dB; blend 1, 20 dB; blend 2, 10 dB.

**AM Section**

**Sensitivity (Loop Antenna):** 300 µV/m.

**Selectivity:** 50 dB.  
**Image Rejection:** 40 dB.  
**I.f. Rejection:** 60 dB.  
**S/N:** 45 dB.  
**THD:** 0.6%.  
**Output Level:** 250 mV, at 30% modulation.  
**High-Cut Filter:** –6 dB at 10 kHz.

**General Specifications**

**Power Requirements:** 120 V, 60 Hz.  
**Dimensions:** 18¼ in. W × 37/8 in. H × 13½ in. D (46.1 cm × 8.7 cm × 34.4 cm).  
**Weight:** 13.9 lbs. (6.3 kg).  
**Price:** $599.

**Company Address:** Akai Div. of Mitsubishi, 225 Old New Brunswick Rd., Suite 101, Piscataway, N.J. 08854.

For literature, circle No. 92.
As I began to examine the features of the attractively styled AT-93 AM/FM tuner from Akai, my first reaction was one of moderate resentment. I resent equipment that tries to think for me instead of letting me do things myself. The Akai AT-93 is one of those tuners that decides which of its two antenna inputs provides the best signal, whether it should be in wide or narrow i.f. mode, whether to employ one of its two levels of stereo blend circuitry to reduce noise for weak-signal stereo, and whether to activate its high-cut filter to further reduce noise or other interference. Upon closer examination, and a brief reading of the owner’s manual, my resentment quickly turned to admiration. Akai had the good sense to allow a user to defeat those decisions by simply touching any one of several manual-override buttons. Here, at last, was a tuner that offered the best of both worlds: Optimum automatic operating modes for those who simply want to sit back and listen to the best FM reception available, even during rapid DX-ing, and manual selection of all modes for inveterate experimenters and button-pushers.

The Akai tuner has a pair of antenna inputs, each of which can be connected to a separate antenna. For example, you could have two outdoor antennas facing in different directions. The AT-93 employs a comparator circuit that samples the incoming signals and routes the stronger signal to the tuner circuitry when the station is first tuned in.

As mentioned, the microprocessor-equipped AT-93 judges signal quality to determine the best setting for i.f. bandwidth, stereo blend (two levels plus mono), and high-frequency cut. These settings (or your own overriding ones) can be stored in any one of the tuner’s 20 memory presets. There’s an unusual feature associated with these presets: The Akai has a sequential station-call function for automatic selection of up to three different stations. The desired stations are memorized and then recalled when the tuner is turned on via a timer. This function is extremely useful for absentee recording. If you set the external timer to switch on and off as many as three times, the unit will be tuned to preset 20 the first time, preset 19 the second, and preset 18 the third. In addition to the sequential station-call tuning just described, there are several other ways to tune the AT-93. You can manually select presets, auto-scan through the presets, auto-scan to the next station up or down, or tune up or down in 0.1-MHz increments.

As for the AT-93’s circuitry, it employs a dual-gate MOSFET in the r.f. stage and a phase-locked-loop, quartz-synthesized tuning system. Separate power-supply circuits are used for the digital and audio sections.

Control Layout

At the left end of the slim, black front panel is the power on/off button. Operating-mode buttons for antenna selection, i.f. bandwidth, blend selection, and high-cut filtering come next. An “FM Auto” button selects automatic or manual FM-reception mode, while touching any of the other four operating buttons restores manual control of the previously automated function. The display area at the upper right of the panel shows tuning information as well as the various modes currently in effect. Pressing a “Preset Scan” button at the far right initiates scanning; pressing the same button a second time locks in the chosen station. Additional buttons along the lower left edge of the panel select muting, band, and the scanning mode. Next come the up and down manual tuning switches and 10 preset buttons. No “shift” key is needed to make these handle the 20 preset station frequencies; pushing any button twice switches it from the first decade (1 to 10) to the second (11 to 20). Above the preset buttons, appropriate green or red LEDs illuminate to show which decade has been chosen. A “Memory” button at the lower right corner completes the front-panel layout.

The rear panel is equipped with two 75-ohm coaxial antenna connectors, spring-loaded terminals for hooking up
The AT-93’s automatically optimized operation allows you to just sit back and listen or to do all the button-pushing you want.

Fig. 3—THD + N vs. frequency for wide (A) and narrow (B) i.f. modes.

Fig. 4—THD + N vs. signal strength for wide (A) and narrow (B) i.f. modes.

the separately supplied AM loop antenna, and a pair of audio output jacks. The 75-ohm coaxial receptacles are not quite the standard F-type used in the U.S. for video and other r.f. applications, but fortunately Akai provides the necessary adaptor so you can connect a standard coaxial transmission line.

Measurements

Figure 1 shows the overall FM frequency response of both channels; the two channels were so closely matched that no difference is visible between them. Response was close to ruler-flat from 20 Hz to 13 kHz and was down a mere 0.2 dB at 15 kHz. Usable sensitivity in mono measured just over 12 dB. The stereo indicator light goes off at about 20 dB, but stereo reception continues down to about 6 dB, as shown in Fig. 2, though with diminished separation. Of greater significance was the tuner’s excellent quieting characteristics: 50-dB quieting in mono was reached with a signal level of only 16.5 dB, while for stereo, the signal level required for 50 dB of S/N was 35 dB. Both figures are better than those claimed by Akai. A full plot of mono and stereo noise characteristics, as a function of signal strength, is shown in Fig. 2. Because results were substantially the same whether I used the narrow or wide i.f. mode, only one set of curves is shown. With strong signals, mono S/N reached 63 dB. At 65 dB, stereo S/N was 77 dB, but with an even stronger signal of 80 dB, stereo S/N surpassed the 80-dB mark.

Figures 3A and 3B show how THD + N varied with frequency for the wide and narrow i.f. modes. The IHF/EIA Standard for tuner measurement requires that THD be quoted for three frequencies: 100 Hz, 1 kHz, and 6 kHz. Whenever I make these tests, I use a recommended band-pass filter with −3 dB cutoff points at 200 Hz and 15 kHz. This filter explains the apparent "dip" in THD at the extreme low end of the audio spectrum and the seeming reversal of the curve direction between about 7 and 10 kHz. In any event, at 1 kHz, actual mono THD + N in wide i.f. mode was about the lowest I have ever recorded for any FM tuner.
In its narrow i.f. mode, the AT-93 has lower distortion than several highly regarded tuners do in wide mode.

Fig. 5A—Frequency response (top curves) and separation (bottom curves), with and without blend, for wide i.f. mode at 65-dBf signal level. Response curves are (top to bottom) without blend, with blend 1, and with blend 2.

Fig. 5B—Same as Fig. 5A but using narrow i.f. mode.

Fig. 5C—Frequency response (top curves) and separation (bottom curves), without blend, for four low signal levels in wide i.f. mode.
Some designers go overboard in deciding on narrow-band parameters, but engineers made just the right choices on the Akai AT-93.

Fig. 6—Separation for a 5-kHz modulating signal (top curve) and crosstalk components plus subcarrier and sideband components (bottom curve) for wide (A) and narrow (B) modes.

Fig. 7—AM frequency response for signal with NRSC pre-emphasis.
engineers who care about AM response will yield a reasonably flat response curve with this test setup. Such was the case with the Akai AT-93’s AM section—at least at the high-frequency end of the spectrum. As shown in Fig. 7, response extended out to just above 5 kHz for the −6 dB cutoff point. I’m not quite sure why response rolled off so rapidly at the low end (down 6 dB at around 70 Hz), but that’s the curve that it plotted.

As for other AM characteristics, selectivity measured 48 dB (very good for AM), i.f. rejection was 62 dB, and image rejection was 41 dB. Distortion, using a 1-kHz signal at 30% modulation, was 0.5%, while S/N for a 1-mV input signal was 47 dB. Aside from the absence of ultra-low bass response, listening tests conducted for the AM section revealed that it sounded better than most of the AM tuner sections in many name-brand “high-fidelity” tuners and receivers.

Use and Listening Tests

I started auditioning the Akai AT-93 with the unit set to its automatic tuning mode—the one in which the tuner’s own microcomputer decides which antenna, i.f. setting, blend mode, and high-frequency cut to use for each received signal. The two antennas employed were my outdoor multielement antenna and an amplified indoor antenna. For each of the 53 usable signals I was able to pick up, I deliberately reset all of the parameters that the tuner had decided to use, one by one, to see if I could improve on the AT-93’s choices. Of the 53 signals received, the tuner switched to mono on five of them because of weak signal strength. I decided that I could tolerate two of those five signals in stereo after all. In every other respect and for every other signal received, I could not outsmart or second-guess this tuner! It always chose the optimum operating parameters. Although this may have wounded my ego a bit, it sure speaks well for the way the built-in microcomputer decides to program this amazing unit.

Setting up my 20 presets was easy—a lot easier than on some tuners and receivers I’ve tested. I also tried out the absentee recording capability. While the AT-93 was in my listening room, I had to be away for two days. On both days, two different stations were broadcasting programs I wanted to record. I only had one event-timer, so I got someone in the lab to manually turn on the tuner for the second event. Sure enough, the second preset frequency appeared, just as promised. As an FM tuner fan from way back, I was truly astonished by the performance this Akai component delivered—especially since its price is about half that of several tuners I recently tested and listened to that didn’t perform as well. If you are looking for the right FM tuner for your system and care about good FM reception, I can recommend the Akai AT-93 without any qualifications or reservations.

Leonard Feldman

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