

**REVIEW:**

# **AKAI AT-V04 AM/FM TUNER**

**by PETER SAWATZKY, VE3IXQ**

While numerous 'synthesized' receivers and tuners are currently available on the market, none to date have offered features useful to the serious FM DXer. While digital frequency readout is a significant improvement over analog dial readout on conventional tuners, it should be noted that most such units are of the phase locked loop (PLL) variety.

While this type of circuitry offers some interesting features such as random access 'preset station' capability, and has the advantage of precise tuning, it must be remembered that the tuner cannot be detuned from any of the 100 allocated frequencies. This is a considerable disadvantage to the DXer, especially in an area where many locals are present, as it is frequently necessary to receive a weaker station on an adjacent frequency by tuning further away from the stronger station, but certainly not by a full allocated frequency as would be dictated by a PLL synthesized tuner. Consider also the case where a foreign station not on an American allocated frequency were to be received. The PLL tuner could not be detuned to a 'split' frequency. This might also be a consideration in the event the FCC were to begin allocating split frequencies or adding allocated frequencies above or below the present 88.1-107.9 MHz range. Any re-allocation of the present FM broadcast band would effectively render the PLL synthesized FM tuner obsolete.

Also, it has been noted that FM tuners consisting of varactor-type front ends tend to, on the average, have lower sensitivities at signal levels below those used to establish IHF sensitivity ratings. This is presumably due to differences in the quieting curves. This phenomenon is evidenced by Pioneer's 'Supertuner' line. Both the KP500 and the KE3000 models are acclaimed by Pioneer as consisting of their 'Supertuner' design and both have identical sensitivity specifications (according to Pioneer's own manuals), but the analog KP500 model was noted to have considerably greater sensitivity at the low signal end than its KE3000 PLL-type counterpart.

The only other commonly available type of FM tuner with digital frequency readout consists basically of a conventional analog tuner with circuitry (commonly a dedicated IC) which converts the local oscillator to a digital signal, which, when driven into the display, shows the frequency to which one is tuned.. Frequently the digital display in this type of design is complemented with a conventional analog dial for those who are squeamish about converting to a full digital design all at once. The prime disadvantage in this type of design is that the 'preset station' recall capability and the 'auto-scan' and 'search' capabilities cannot be incorporated, because essentially the tuner is not digital and hence cannot be digitally controlled to produce these features.

While these latter features may initially not appear to be of great interest to the FM DXer, it should be noted that most DXers are at many non-DX times also listeners and/or may tape music, which makes both a much simpler and more pleasurable experience. Having had experience with such features renders them almost indispensable. Most of these latter non-PLL type tuners also offer only 0.2 MHz display increments, or, at best, 0.1 MHz increments. This offers only marginal usefulness towards frequency readability when detuning from strong signals to receive weaker adjacent channel stations.

Now comes the Akai model AT-V04, offering the best of both worlds and incorporating additional features which many of either of the previous types do not have.

Firstly, the AT-V04 features a 'fluorescent' digital readout with display increments of 0.05 MHz. This aids significantly in true frequency readout when detuning, as previously mentioned, is required.

While the unit is billed as a 'digital synthesizer' tuner by Akai, it is obviously not of the PLL variety. This is evidenced by the fact that in spite of its full complement of auto-scan, search and preset station capabilities, it is capable of full manual override--not incremental as in the case of conventional analog tuners.

Hence, the AT-V04 is basically a dual-mode tuner, capable of PLL-type scan, search and preset station capabilities, but converting at the touch of a tuning knob (literally--the tuning knob is touch sensitive) to fully analog operation.

First, let us examine the non-manual tuning mode. 'Auto' tuning incorporated a two-position momentary contact switch, one position for down-tuning and the other for up. By depressing the switch momentarily on either side, the tuner tunes in the corresponding direction on the band until a station of at least a preset signal level is found. The audio is muted until the station has been found and locked onto. If, however, one wishes to bypass several stations, one simply maintains the 'auto' tune switch in the depressed position until the frequency readout indicates that area of the band just prior to which the station of interest is located. At this point, release of the switch will cause the tuner to lock onto the next available station which produces at least a certain signal strength (internally adjusted). The tuner is not of the PLL variety in spite of the fact that it uses a varactor-type front

end. Auto-tuning is accomplished by means of a digitally controlled analog voltage ramp inserted into the varactor tuner. This scheme necessitates a frequency readout circuit based on the local oscillator frequency, as in the case of the common non-PLL type analog tuners with digital frequency readout. Of particular interest in the auto tuning mode is that 'scrolling' is possible-- i.e. the voltage ramp is controlled in such a manner that once one tunes to the top of the band and continues to up-tune, it automatically resumes up-scanning from the bottom of the band, and of course, the converse is true for down-tuning. Unlike PLL-type tuners, the full tuning range goes well beyond the allocated band of 88.1 through 107.9 MHz, extending from 87.40 to 108.20 MHz. This is quite useful in that it enables reception of channel 6 TV audio which is a good indicator for FM sporadic E-skip in areas with no strong channel 6 locally.

The manual mode of tuning is engaged by touching the manual tuning knob which is electronically touch sensitive. When changing from the auto-tuning to the manual tuning mode (and vice versa), muting is automatically engaged for a period of a second or so. Manual tuning is equivalent to that on a conventional tuner, with infinite resolution. Scrolling is not possible, however, in the manual mode and manual tuning, when selected, returns the frequency to that last selected in the manual tuning mode, not that last obtained in the auto-tuning mode. The reason for this is, that since the manual tuning mode utilizes the same varactor tuner, a multi-turn potentiometer (very smooth in operation) is used as a voltage divider to vary a DC voltage into the varactor tuner stage. When returning to the auto-tune mode, however, up/down scanning resumes from that frequency to which the manual mode was used to adjust the frequency.

A total of 14 stations can be programmed into memory--7 on FM and 7 on AM. These can be programmed into memory while in either manual or auto tuning mode. It is interesting to note that in order to recall a station on a frequency, a station must be present on that frequency with a certain minimum signal strength, since the principle on which the tuner operates is that it searches for signal strength on or about the pre-programmed frequency, and then locks onto it. If, for example, the tuner were programmed for a strong station on 92.7 MHz, and that station were off the air when reselected in the preset mode, the tuner would look slightly on either side of that frequency. If it were to find a strong signal on either 92.5 or 92.9 MHz, for example, under these circumstances, it would lock onto one of these. If nothing was found, it would 'float' in an undefined state around 92.7 MHz without anything to lock onto. Up or down auto-tuning can also be resumed originating from any of the preset frequencies. Since the 'preset station' feature necessitates locking onto a station with a certain minimum signal strength, it is of minimal use to the DXer who wishes repeatedly to call up various good DX frequencies which would normally be vacant. In order to keep the memory intact while the tuner is not powered, the unit contains three standard 'AA' penlight batteries which need replacement approximately once a year. These are readily accessible in the rear of the unit.

The frequency readout is extremely visible, even under high ambient light conditions, due to the bright 'fluorescent' display technology used. The fluorescent display also includes an "AM" and "FM" display and a "MHz" and "kHz" display. The digits are about ½" high and are clearly visible across a large room.

In addition to the attractive blue frequency readout, the AT-V04 is endowed with a full complement of rather impressive LED indicators. Each of the 7 preset station switches has above it a green LED to indicate which preset station has been selected, when in that mode. An 8th switch which enables preset station programming into memory also has above it a green LED to indicate when the tuner is in the programming mode. A five-segment red LED array indicates signal strength. While this type of display cannot be as definitively read as an analog meter, it has found to be adequate except when weak stations are selected. A center-tuning display comprises three LED'S, two red and the center one green to indicate when the station of interest has been tuned in correctly. The stereo indicator LED is red. Also, a green LED above the manual tuning knob is turned on when that mode is selected. It is impressive and pleasurable to view the signal strength, center-tuning and stereo LED's change continually while tuning, especially in the auto-tuning mode.

Other front panel features and controls include three levels of muting (one off, one internally preset and the last user-adjustable via a rear panel control), a stereo/mono mode switch, AM/FM selector switch and power switch.

Rear panel controls include the previously mentioned muting level control, an audio level control to control the audio output level to your amplifier, and separate local/distant switches for both AM and FM to reduce signal levels in areas with overload problems. Overload, incidentally, has not been noted to be a problem with this tuner.

Antenna inputs include three separate sets of FM connections, one 75-ohm screw-terminal type, one 300-ohm screw-terminal type and the other a coaxial 75-ohm connector type (although not F59 connector compatible). AM antenna input consists of a built-in adjustable ferrite bar antenna as well as an external input (for which, it would appear, a European style of connector may be required). Only a single set of phono output connectors is provided--i.e. if taping capability is desired, it must be done directly from the amplifier. Also, unfortunately, the AT-V04 does not have a separate 8-ohm headphone output.

Performance-wise, the AT-V04 is state-of-the-art. Its 1.6 uV IHF sensitivity rating and greater than 75 dB alternate channel selectivity rating can almost be believed, as when it was compared A-B with the classic Sony ST-5130, negligible differences were noted on either parameter. It is conceivable that the AT-V04 might even outperform that unit if more scientific measuring techniques were utilized. As already noted, the AT-V04 has no problem with overload, at least certainly no more so than the ST-5130. In A-B tests, the full quieting stereo audio signal to noise ratio was as good as, if not better than, that of the ST-5130 and in overall terms sounded better than the ST-5130 due to much higher treble response. Even with full treble on the amplifier, the ST-5130 does not have nearly enough high-frequency output to produce the clean

clear sound of the AT-V04. No significant difference in bass response was noticed.

The AM section, although very selective, has rather poor audio in terms of frequency response, sounding much like a juke-box. The frequency readout for the AM band consists of 1 kHz increments which makes the tuner potentially very useful for foreign broadcast band DX. Unfortunately, the frequency readout for the AM band is frequently off by one or two kHz, but these minor shortcomings on AM should be of little consequence to the FM DXer.

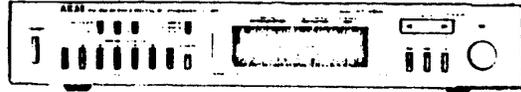
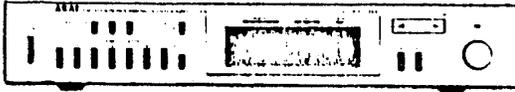
The most outstanding physical feature of the AT-V04 is its extremely low profile (only 3.1" high) which enables placement into very compact environments. Both black and silver panel models are available. The unit is fully enclosed with no air vents (the unit dissipates very little power in terms of heat) and has no wooden cabinet. In all, extremely attractive styling for an otherwise exquisite tuner.

At \$420 (MSL in Canada; Canadian dollars), the AT-V04 is a bargain. If anything bad can be said about this tuner, it may be its availability, or lack of it. Toronto Akai sources claim a considerable log of back-orders, indicating either a production problem at Akai and/or an overwhelming response by the consumer. The latter seems unlikely in view of the minimal promotion Akai appears to have made. While several vague references have been seen in audio magazines, no major commercial promotion campaign has been noted. Remarkably, however, the AT-V04 can, along with several other new Akai components, be viewed on posters on the rear of Guelph, Ontario city buses. It is not known what the delivery situation in the U.S. is at this time. A long-awaited AT-V04 did finally come through for an audiophile friend though, so presumably the delivery situation is not hopeless.

The only other possible complaint might be that, although much sophisticated large scale integration (LSI) technology is used throughout the tuner, many of the functions should have been achievable with the use of a single general-purpose microprocessor chip. This might have reduced parts count which, as can be seen in the schematics, is quite high and eliminated the need for some of what may be custom LSI (which might prove difficult if not impossible to find in the distant future in case of parts failure).

Let us hope that the AT-V04 is a sign of technology to come, although this may be a somewhat optimistic outlook. The dual-mode non-PLL tuning feature, while ideal for the FM DXer, may not necessarily be appreciated for what it is by the average consumer or even audiophile, and hence may not set a trend in tuner technology. It would be in the best interests of any serious FM DXers, therefore, to seek out all available AT-V04's, lest they should soon become much sought-after but discontinued models, as was the case with the Sony ST-5130 in its heyday. That tuner was discovered by the majority of DXers only well after it was out of production.

U.S. headquarters for Akai America, Ltd. are located at 2139 E. Del Amo Blvd., Compton, California 90220. Manufacturer's specifications, illustrations and schematics (on this month's VUD cover) follow:

**AT-V04****AT-V04/L**MODEL **AT-V04**

DATE MARCH, 1980

## I. TECHNICAL DATA

## FM TUNER SECTION

Frequency Range	87.5 MHz to 108 MHz
Sensitivity (IHF)	1.6 $\mu$ V
Capture Ratio	1.2 dB
Selectivity (IHF)	More than 75 dB
Image Rejection	More than 80 dB (98 MHz)
IF Rejection	More than 95 dB (98 MHz)
Spurious Rejection	More than 95 dB (98 MHz)
AM Suppression	65 dB
Signal to Noise Ratio	75 dB
Harmonic Distortion	
MONO	Less than 0.08 % (100 % modulation)
STEREO	Less than 0.1 % (100 % modulation)
Muting	OFF
	1. 30 $\mu$ V
	2. 10 $\mu$ V to 100 $\mu$ V
Stereo Separation	More than 54 dB (1 kHz)
Sub Carrier Suppression	More than 80 dB
Output Voltage	Controllable from 0 to 1.5 V (100 % modulation)
Antenna Input Impedance	300 ohms balanced, 75 ohms unbalanced

## AM TUNER SECTION

Frequency Range	520 kHz to 1,605 kHz
Sensitivity (IHF)	150 $\mu$ V/m (bar antenna), 10 $\mu$ V (external antenna)
Selectivity (IHF)	More than 30 dB
Image Rejection	More than 55 dB (1,000 kHz)
IF Rejection	More than 40 dB
Signal to Noise Ratio	More than 55 dB
Output Voltage	Controllable from 0 mV to 500 mV (30 % modulation)
Antenna	Built-in ferrite bar antenna
Power Requirements	120 V, 60 Hz for USA and Canada 220 V, 50 Hz for Europe except UK 240 V, 50 Hz for UK and Australia 110 V/220 V/240 V, 50/60 Hz internally switchable for others.
Dimensions	440(W) $\times$ 78(H) $\times$ 332(D) mm (17.3 $\times$ 3.1 $\times$ 13.1) inches
Weight	5.5 kg (12.1 lbs)

AKAI ELECTRIC CO., LTD.  
(P.O. BOX 21, Tokyo International Airport, Japan)