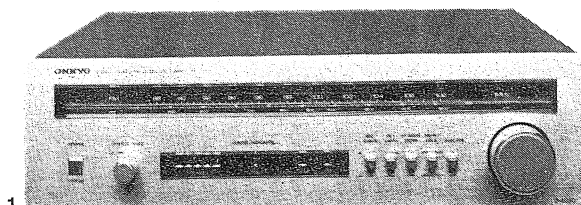


R.E.A.L. SOUND



CIRCLE 107 ON FREE INFORMATION CARD

ONKYO T-4090 AM/FM Tuner

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CONTRIBUTING HI-FI EDITOR

ONKYO (42-07 20th AVE., LONG ISLAND CITY, NY 11105) was one of the first companies to incorporate an advanced form of AFC (Automatic Frequency Control) circuitry that is based upon a quartz crystal reference oscillator into many of their receiver and tuner products. The elegance and accuracy of that tuning system along with the panel layout and the measured performance of the T-4090 suggest that the tuner is worth a good deal more than its moderate suggested retail price.

There are no conventional tuning meters on the T-4090's front panel. Instead, mounted behind an opening along the lower section of the front panel, are five LED's that illuminate, one by one, as the strength of incoming signals increases. In that same window area are LED's that illuminate next to the words TUNED and LOCKED. When the tuning knob is touched, the quartz-lock tuning feature is deactivated. As the dial pointer approaches perfect tuning, the LED above the word TUNED illuminates. Releasing the tuning knob activates the quartz-lock AFC feature, which then completes the center-of-channel tuning job, causing the LOCKED light to come on. If the user releases the tuning knob when it is either slightly higher or lower in frequency than it should be, an appropriate green arrow to either side of the TUNED light flashes the direction the tuning knob should be turned.

Other controls along the lower portion of the panel include a POWER on/off pushbutton; a continuously variable audio OUTPUT LEVEL control; a RECORD CHECK pushbutton switch (that turns on a built-in 440 Hz tone set to the equivalent of 50% FM modulation and which is useful for presetting tape deck recording levels); a DE-EMPHASIS switch with 25 or 75 microsecond positions; a STEREO NOISE or "blend" filter switch; a MUTE/LOCK switch; an

AM/FM SELECTOR switch, and a large fly-wheel-coupled tuning knob.

The low, long profile of the front panel of the Onkyo T-4090, pictured in Fig. 1, is visually enhanced by a relatively thin dial-glass area that extends almost the full length of the panel. Behind that clear glass are linearly inscribed FM and AM frequency notations that are clearly illuminated when power is applied to the tuner.

The rear panel of the Onkyo T-4090 has antenna terminals for connection of 75-ohm, 300-ohm FM or external AM transmission lines. A pivotable ferrite bar antenna is provided for local AM reception. A three-position slide switch, located near the pair of audio output jacks determines the sensitivity of the sensing switch associated with the tuning knob. That switch helps to compensate for differences in "hand capacitance" of different people using the control and is adjusted so that when the knob is released, "locking" action of the quartz-lock tuning system takes place without undue delay. In our tests, the switch was left in its mid setting.

Circuit highlights

An internal view of the T-4090 chassis is pictured in Fig. 2. While no schematic diagram is supplied with the tuner, the owner's manual sheds some light on circuit design. The first stage of the FM front end employs a dual-gate metal oxide field effect transistor. FM local oscillator circuitry is hermetically sealed to insure against drift caused by changes in humidity or temperature. A phase-lock-loop IC circuit is used in the multiplex decoder section of the tuner. All of the components of the tuner are contained on a single large circuit board, with the exception of the separate shielded front-end visible in Fig. 2.

RADIO-ELECTRONICS AUDIO LAB

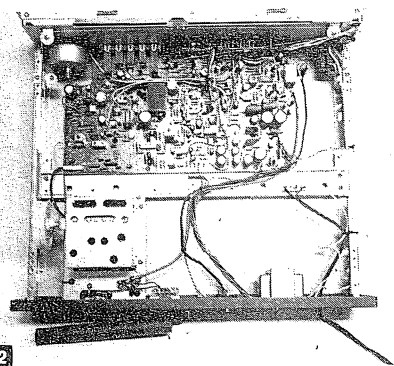
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RATES

ONKYO T-4090

EXCELLENT

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FM Performance measurements

A summary of our test measurements of the FM section of the Onkyo T-4090 will be found in Table I. Comparing our results with those claimed by the manufacturer, it is immediately apparent that the tuner did better than claimed for most of the important specifications. 50 dB quieting and maximum signal-to-noise were particularly impressive, both in mono and stereo, for a tuner in this price category; and distortion figures exceeded published claims by at least a factor of two-to-one.

Stereo separation was particularly good at the high end of the spectrum, as can be seen by examining Fig. 3, which shows the frequency response (upper trace), maximum separation (lower trace) and separation when the MPX blend circuit is employed (middle trace).

Figure 4 is a spectrum analysis of the cross-talk components that appear in the "non modulated" output channel of the tuner when the opposite channel is modulated with a 5-kHz

MANUFACTURER'S PUBLISHED SPECIFICATIONS:

FM TUNER SECTION:

Usable Sensitivity: mono, 9.8 dBf (1.7 μ V); stereo, 17.2 dBf (4 μ V). **50 dB Quieting Sensitivity:** mono 14.7 dBf (3 μ V); stereo, 36 dBf (35 μ V). **Signal-to-noise Ratio:** mono, 76 dB; stereo, 68 dB. **Capture Ratio:** 1.3 dB. **Image Rejection:** 90 dB. **IF Rejection:** 100 dB. **Spurious Rejection:** 95 dB. **Alternate Channel Selectivity:** 70 dB. **AM Suppression:** 55 dB. **Harmonic Distortion:** 1 kHz mono, 0.1%; stereo, 0.25%. **Stereo Separation:** 40 dB at 1 kHz; 35 dB at 70 Hz to 10 kHz. **Muting Threshold:** 17.2 dBf (4.0 μ V). **Stereo Threshold:** 17.2 dBf (4 μ V). **Frequency Response:** 30 Hz to 15 kHz, +0.5, -1.5 dB.

AM TUNER SECTION:

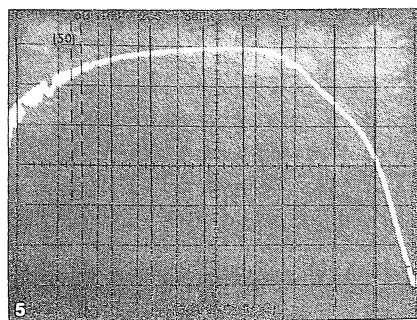
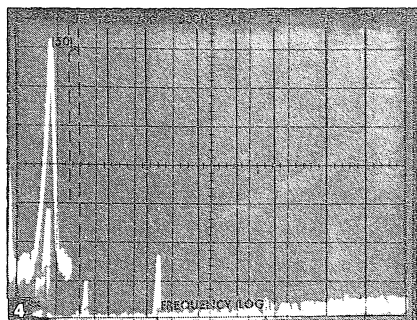
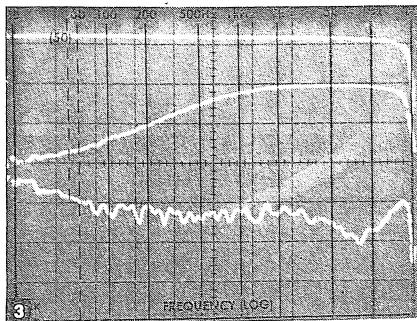
Usable Sensitivity: 25 μ V. **Image Rejection:** 50 dB. **IF Rejection:** 40 dB. **S/N Ratio:** 45 dB. **Harmonic Distortion:** 0.7%.

GENERAL SPECIFICATIONS:

Power Requirements: 120 volts 60 Hz. **Output Level:** FM, 0 to 1.5 volts; AM, 0 to 0.5 volts. **Dimensions:** 16 1/2" W x 5" H x 15 1/4" inches deep. **Weight:** 13 lbs. **Suggested Retail Price:** \$339.95.

tone, in stereo, at full modulation. In Fig. 4, the frequency sweep is *linear* (rather than logarithmic, as in Fig. 3) from 0 Hz to 50 kHz, while vertical sensitivity of the display remains at 10 dB-per-division. The tall spike at the left is the reference or desired 5-kHz output. The lower spike, contained within the taller one, is the amount of 5 kHz coming out of the opposite channel and, as can be seen, is some 44 dB lower (an excellent separation value at 5 kHz). The only additional components from the unmodulated channel output are a bit of second harmonic of the 5-kHz signal and a somewhat greater-amplitude 19-kHz pilot signal component.

The frequency response of the AM tuner was essentially no better or worse than that obtained from most high-fidelity tuners and receivers, with a -6 dB roll-off occurring at around 3 kHz. Dial calibration was extremely accurate for both the FM and AM frequency scales. Results of our AM frequency response measurements are shown in Fig. 5.



Summary

Our overall product evaluation of the Onkyo T-4090 will be found in Table II. Perhaps the most outstanding point about this tuner is that it is extremely easy to use and tune correctly. Considering that the tuner has only one degree of selectivity, we feel that the designers have come up with a good choice in IF bandwidth characteristics to provide lowest distortion reception and a minimum of interference problems.

R-E

TABLE 1
RADIO-ELECTRONICS PRODUCT TEST REPORT

Manufacturer: Onkyo

Model: T-4090

FM PERFORMANCE MEASUREMENTS

SENSITIVITY, NOISE AND FREEDOM FROM INTERFERENCE	R-E Measurement	R-E Evaluation
IHF Sensitivity, Mono: (μ V)(dBf).....	1.7 (9.8)	Excellent
Sensitivity, Stereo (μ V) (dBf).....	4.0 (17.2)	Excellent
50 dB quieting signal, mono (μ V)(dBf).....	2.2 (12.0)	Superb
50 dB quieting signal, stereo (μ V)(dBf).....	30.0 (34.7)	Very good
Maximum S/N ratio, mono (dB).....	79	Excellent
Maximum S/N ratio, stereo (dB).....	71.5	Excellent
Capture Ratio (dB).....	1.4	Very good
AM suppression (dB).....	55	Good
Image rejection (dB).....	95	Excellent
IF rejection (dB).....	96	Excellent
Spurious rejection (dB).....	95	Excellent
Alternate channel selectivity (dB).....	72	Very good

FIDELITY AND DISTORTION MEASUREMENTS

Frequency response, 50Hz to 15 kHz (\pm dB).....	1.0	Very good
Harmonic distortion, 1kHz, mono (%).....	0.047	Superb
Harmonic distortion, 1kHz, stereo (%).....	0.10	Excellent
Harmonic distortion, 100 Hz, mono (%).....	0.08	Superb
Harmonic distortion, 100 Hz, stereo (%).....	0.11	Excellent
Harmonic distortion, 6 kHz, mono (%).....	0.12	Very good
Harmonic distortion, 6 kHz, stereo (%).....	0.28	Very good
Distortion at 50 dB quieting, mono (%).....	1.0	Good
Distortion at 50 dB quieting, stereo (%).....	0.35	Very good

STEREO PERFORMANCE MEASUREMENTS

Stereo threshold (μ V) (dBf).....	4.0 (17.2)	Excellent
Separation, 1 kHz (dB).....	46	Excellent
Separation, 100 Hz (dB).....	39	Very good
Separation, 10 kHz (dB).....	40	Superb

MISCELLANEOUS MEASUREMENTS

Muting threshold (μ V) (dBf).....	4.0 (17.2)	Excellent
Dial calibration accuracy (\pm kHz @ MHz).....	100	Excellent

EVALUATION OF CONTROLS, DESIGN, CONSTRUCTION

Control layout.....	Very good
Ease of tuning.....	Excellent
Accuracy of meters or other tuning aids.....	Excellent
Usefulness of other controls.....	Very good
Construction and internal layout.....	Very good
Ease of servicing.....	Excellent
Evaluation of extra features, if any.....	Very good

OVERALL FM PERFORMANCE RATING.....	Excellent
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TABLE 2
OVERALL PRODUCT ANALYSIS

Retail price.....	\$339.95
Price category.....	Medium
Price/performance ratio.....	Excellent
Styling and appearance.....	Excellent
Sound quality.....	Excellent
Mechanical performance.....	Very good

Comments: Frequency synthesized tuners (which the Onkyo T-4090 is not) offer perfect center-of-channel tuning that, in turn, results in lowest-distortion reception of FM stations. Many of these costly tuners tend to sacrifice ultimate signal-to-noise and selectivity as a trade-off for the frequency synthesis. In that regard, the Onkyo T-4090 tends to provide the best of both worlds. While not a true frequency synthesis tuning device, its quartz-lock tuning system proves to be fully as accurate in being able to zero in on exact center-of-channel tuning as are the crystal-controlled frequency synthesis units now available.

To be sure, the T-4090 lacks such features as selectable IF bandwidth, which is sometimes of benefit when you are trying to single out relatively weak signals that are close in frequency to stronger nearby stations. In our listening tests, such problems of this sort that we did encounter were easily overcome through the use of a reasonably directional outdoor antenna.

We found the tuning indicators and LED signal strength indicators to be fully as effective, and perhaps more so, than conventional meters. While many tuners equipped with such sophisticated tune-lock schemes as Onkyo's "quartz lock" (those schemes are often given other names) often end up tuning into signals at anything but the optimum lowest-distortion point, such was not the case with the Onkyo T-4090. When we tuned for lowest distortion (with the aid of lab equipment) with the lock feature temporarily defeated and then activated the lock circuit, the distortion readings remained exactly the same.

All of the factory-set levels, such as stereo threshold and muting threshold, were ideally set for the sensitivity and quieting characteristics of this tuner which, in themselves are excellent. In short, here is a mid-priced tuner devoid of many frills and fancy digital readouts, but one that delivers FM reproduction that is limited only by the quality of the program source and broadcasting station's practices.