TU-X1

Sansui Super Integrated FM/AM Stereo Tuner

Sansui Only hi-fi, everything hi-fi.

This Sansui Supertuner is Strictly Hi-Fi

Sansui TU tuners have always stressed accurate *reception* of radio signals and their proper *reproduction* of sound waves as well. One way of looking at a hi-fi tuner—our way—is to see it as much, much more than a mere radio receiver. Since our latest DC hi-fi amps have the ability to reproduce a frequency range of from *zero* Hz (DC) to as high as 500,000Hz without straining, we feel it only fitting that the new TU-X1 provide comparable improvements in hi-fi behavior.

We call the TU-X1 the "Supertuner" with justification. It delivers accurate reception and superior amplification specifications on a level with our best AU integrated amplifiers. Such factors as slew rate, rise time and TIM (factors only recently discussed in relation to our amplifiers and *never* before mentioned in any tuners) have been improved for better transient response. Steady-state response, too, is more impressive in the TU-X1. Examples: The slew rate of the FM stereo MPX driver amps is a fantastic 200V/μSec. Total harmonic distortion is a mere 0.02%, and the signal-to-noise ratio an excellent 86dB.

Much of the circuitry in the TU-X1 is so new and so effective we've applied for patents on it. Also new and effective is the fact that the FM and AM sections are *independent* from input to output, integrated into one sturdy chassis for convenience.

If you have been impressed with the widened dynamic range, lower noise and virtually unlimited frequency response now available from direct-to-disc recordings and the best of the latest digital tape systems, wait till you hear what our TU-X1 has to offer in strictly high fidelity performance. It joins the ranks of our very finest products from Sansui, where it's *all* hi-fi.

Independent FM Stereo Section

We set the same high standards of transient and steady-state response for the FM section of the TU-X1 as applied to the best of our Sansui AU integrated amps. THD or total harmonic distortion of 0.02% or better is not an unreasonable spec to ask of an expensive, state-of-the-art DC amp. But to provide that kind of performance from the amp-out terminals of a tuner has been—until now—unheard of! This ought to whet your appetite for still more amazing data about the remarkable Sansui TU-X1. So, here are some of the highlights:

FM Frontend with 7-Gang Variable Capacitor.

The frontend in an FM tuner is like the phono equalizer of a preamp. In both, a tiny input singal must be brought into a form acceptable by the later stages of the hi-fi chain for reproduction through your speaker systems, and accuracy is *the* prime consideration.

If overload and saturation occur in the frontend, if crossmodulation is allowed to rise above certain levels, if group delay characteristics are less than ideal, no number of add-on circuits or tone controls, filters, etc. can restore the received signal to its original purity.

Maintaining frontend accuracy is a delicate matter, since a large number of variables are involved. Signals reach the tuner, after all, through a decidedly impure medium—the air. Distant or weak stations are subject to many kinds of distortion and interference, while close-by or strong stations can themselves be sources of saturation and other problems.

Thus, the role of the frontend is to maintain accuracy under any reception conditions. In the Sansui TU-X1, that role is admirably played by a combination of a 2-stage RF amp with a dual-gate MOS FET, a dual-gate MOS FET mixer, a local oscillator with a 2-stage buffer amp, and a trustworthy IF buffer amp.

The dual-gate MOS FETs feature ideal linearity and high signal-to-noise ratios. We've taken advantage of these factors by developing a Linearity Optimizing Circuit to constantly detect the level of interference signal(s) and, when strong interference threatens, to instantly reduce the gain in the frontend. In this way, the MOS FET RF amp is never clipped, thus the generation of crossmodulation and intermodulation distortion is entirely avoided.

The tuning circuit in the frontend is an advanced double-tuned type. It has a high "Q" interstage, "M" coupled with a precision-built 7-gang variable capacitor.

For the first time in tuner technology, a flat group-delay response has been achieved in the RF tuning circuit. This is not to be confused with flat response in the IF section, something relatively "easy" to achieve. As a result, the overall group-delay response is flat from the frontend down to the detector.

FM IF Features 3-Stage Darlington-Connected Differential Amps.

Variations in the signal *level* of a broadcast are converted into phase or *frequency modulations* (thus the name "FM") before they leave the transmitter. Therefore, inaccurate phase response ends up as distortion in any tuner unable to offer particularly good group-delay or phase response in its frontend, IF and detector circuits.

In designing the IF section of the TU-X1, Sansui engineers introduced a new transient-response parameter: Transient Group-Delay Response.

Field tests of tuners have shown an interdependence of circuit quality with reception conditions. That is, the strength (or weakness) of incoming signals, the local climatic and atmospheric conditions and other constantly-changing factors found in one area rarely ever exactly match those in another, and circuitry effective at point X may be totally ineffective at point Y.

We weren't surprised by these findings, only more convinced by them that Sansui *must* find a way to assure better reception under any circumstances in every location. That way, we have determined, is by achieving a flat response in tuner circuitry *from input to output*.

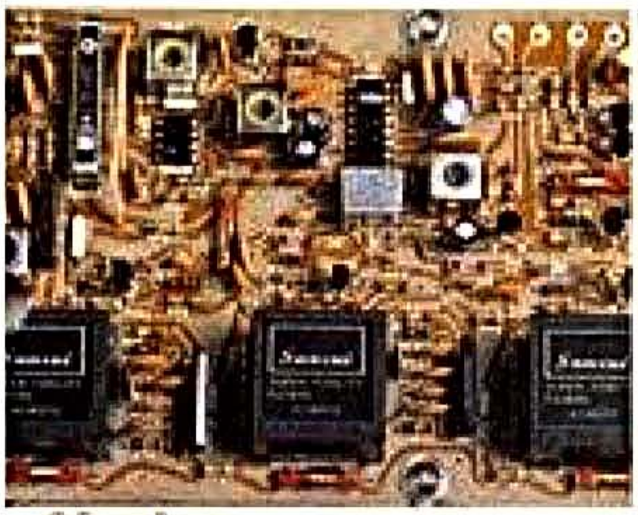
How this is achieved in the TU-X1 is with a custom-designed IC combining a triple-base Darlington-connected differential in the IF section. Then, a constant-current circuit, which stabilizes bias and permits high current driving, improves phase response.

GROUP DELAY RESPONSE OF CONVENTIONAL TUNER

Note that the responses are modified according to the strengths of the incoming signals.

GROUP DELAY RESPONSE OF TU-X1

These traces show the group delay responses at two input levels, one strong (65dBf) and the other rather weak (45dBf). You'll notice there's not much difference in the two. Performance is always constant irrespective of the strengths of incoming signals, thanks to the newly-developed Darlington-connected differential IC in the TU-X1.



IF Circuit Board

Darlington-Connected Differential FM IF ICs

Flat-Response LC Block Filter.

Maintaining linear phase response in the IF when filters are introduced was the next challenge. We met it by using two different types of filters, one a linear-phase LC type and the other a very special Sansui development, the Equivalent Variable Group-Delay Equalizer (Pat. Pend.).

The latter permits the independent adjustment of the equivalent amount of frequency response of the IF signal within the bandwidth. This, in turn, helps eliminate any deviation, however minute, in group-delay response within the bandwidth. Higher signal-to-noise ratio and lower distortion are also achieved.

Linear-Phase SAW Filter.

When you switch the IF bandwidth for FM to NARROW, a SAW (Surface Acoustic Wave) filter is put on line with the above-mentioned LC filter. Thanks to the sharp response of the filters, a high 80dB selectivity is achieved, *without* compromising hi-fi parameters. In the WIDE position, three stages of LC filters are circuited to improve hi-fi parameters and still retain a comfortably high 55dB selectivity. This is evidence of our "super-tuner's" superiority as a radio receiver *and* a hi-fi instrument.

FM 4 Pole LC Block Filters

SAW Filter

Wide-Range Power Ratio Detector.

The bandwidth of a radio signal has, theoretically, an infinite number of progressively attenuating sidebands. This necessitates the use of a detector of wide range/linear response capabilities, such as the one in the TU-X1. Ours we call the High-Power Drive Ratio Detector and it has a wide bandwidth of 4MHz p-p and a flat response of 1MHz for 0.5% differential gain range. It teams up with the aforementioned differential IC and our newly-developed detector coil for the widest dynamic range ever achieved.

Adjacent Channel Filter.

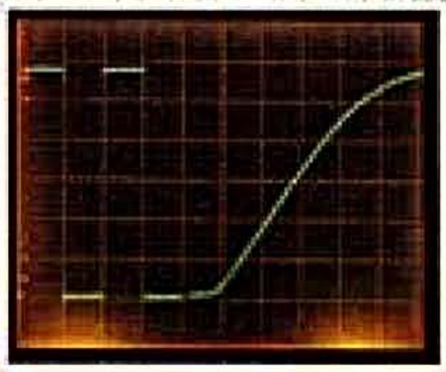
Metropolitan and urban areas today are "crowded" with FM signals, some as close as 400kHz or even 200kHz to their neighbors on the dial. Conventional IF filters can usually handle the elimination of undesired stations if the margin is 400kHz or better, but permit "birdie" beat noise if the margin is less. Sansui has innovated a special Adjacent Channel Filter at the output of the detector to end this problem. It is a phase-linear type, equipped with a group-dealy equalizer.

DC Composite Signal Amp.

Three different signals are contained in composite at the detector output: the main L+R signal, the 38kHz subcarrier signal amplitude-modulated by L minus R, and the 19kHz pilot carrier. Therefore, the bandwidth of a composite signal amplifier should range at least from zero Hz to as high as 53kHz. Also, since this is the first *audio* amp the signal encounters in the tuner circuitry, this amp should have hi-fi specifications as high as any hi-fi amp, in order to assure a high signal-to-noise ratio in the following MPX demodulator.

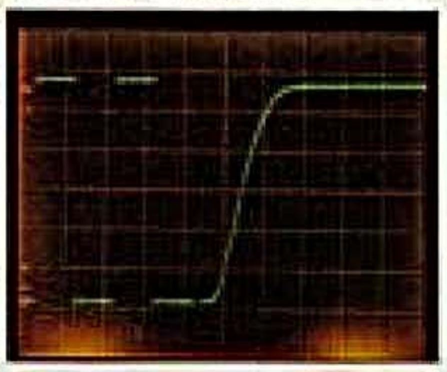
Sansui has developed highly sophisticated, exclusive circuitry for the composite signal amp in the TU-X1. It features an FET input and a push-pull drive in DC configuration. Not incidentally, this is a near replica of the circuitry in one of our best DC power amplifiers. And it's the reason the composite signal amp in the TU-X1 offers a slew rate of a high 200V/μSec!

SLEW RATE OF CONVENTIONAL TUNER'S COMPOSITE AMP (f=10kHz, slew rate=60V/μSec.)



V=5V/div. H=0.1μV/div.

SLEW RATE OF TU-X1'S COMPOSITE AMP
(Slew rate=200V/μSec.)



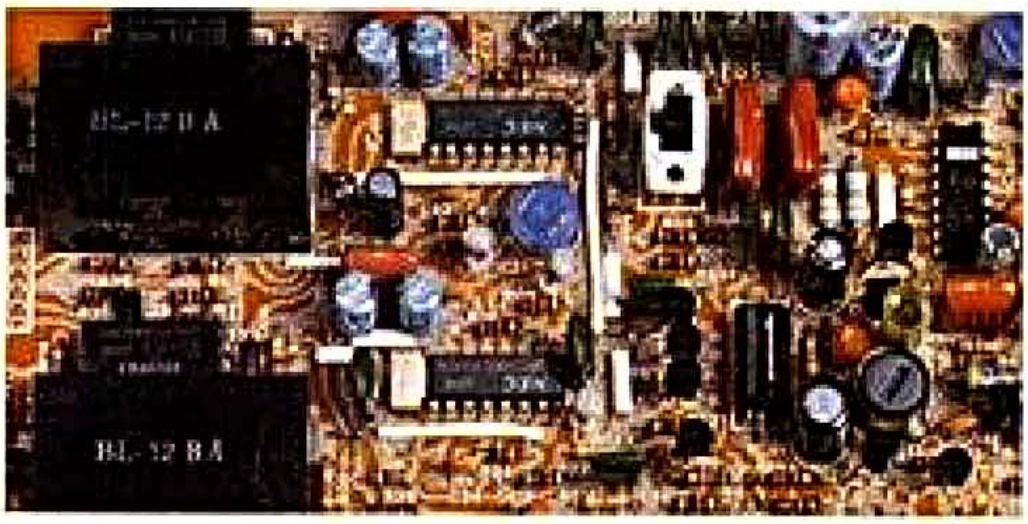
V=5V/div. H=0.1μV/div.

Each trace is of slew rate of the composite amp that drives the MPX demodulator, located after the FM detector.

PLL MPX Demodulator with Pilot Canceller.

The composite signal leaves the DC amp described above to enter and be demodulated or separated into Left and Right channel signals by the MPX demodulator. The subcarrier signal to trigger demodulation is generated by the 19kHz pilot carrier in the PLL (Phase-Locked Loop) circuit. Demodulation is then undertaken by the switching circuit.

There's a catch: that 19kHz pilot-signal carrier, once its mission has been completed, must be *entirely* eliminated. If it is allowed to mingle with the demodulated audio signal, reproduction becomes muddy and hi-fi parameters are severely compromised.



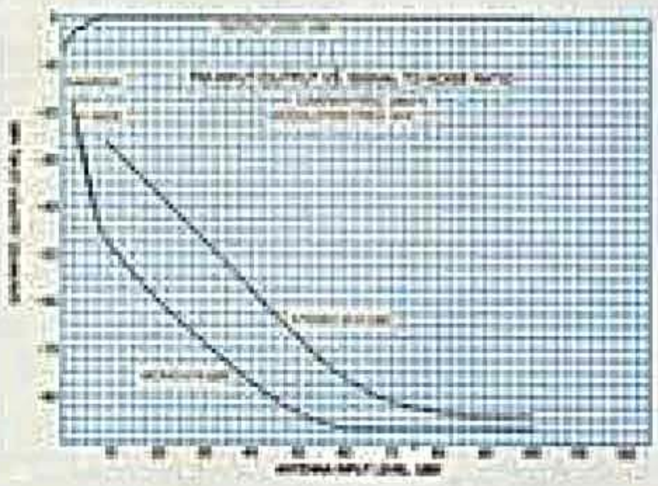
Conventional tuner designs use a low-pass 19kHz filter at the output of the demodulator to remove the pilot-carrier. More often than not, such a filter itself causes still more degradation of hi-fi performance, since it cuts out not only the 19kHz pilot but the musical content in the high frequencies as well, and causes phase irregularities in the demodulated signal.

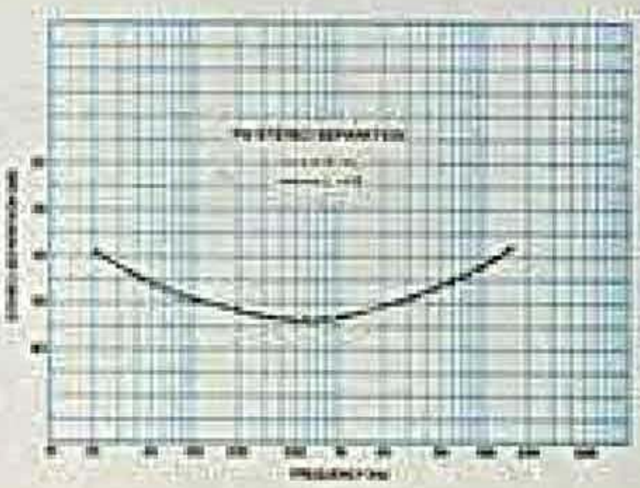
Sansui avoids this in the TU-X1 with a special Pilot Canceller Circuit. It removes the pilot-carrier signal *before* the composite signal enters the switching circuit. No filter, then, is required. Reproduction is pure and clean with frequencies extending well into the highest range of the spectrum.

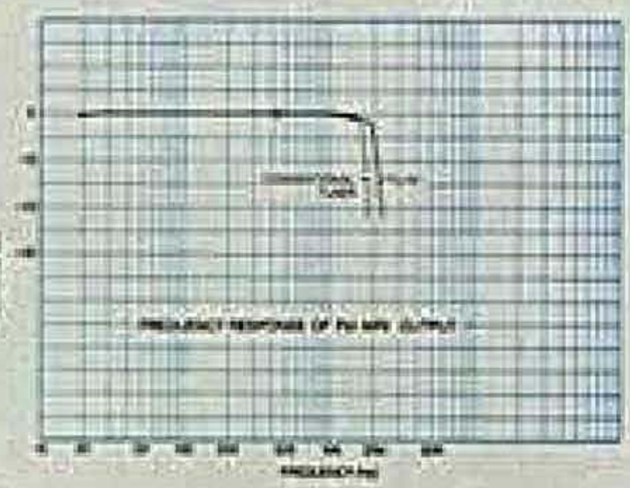
Incidentally, our elaborate PLL MPX with Pilot Canceller is contained in a one-chip IC for long-term stability. Reliability is high and costs, not incidentally, are trimmed.

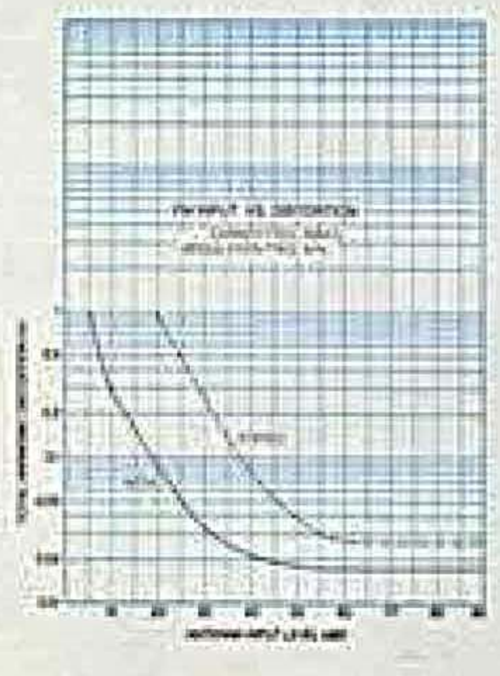
DC Audio Amplifier.

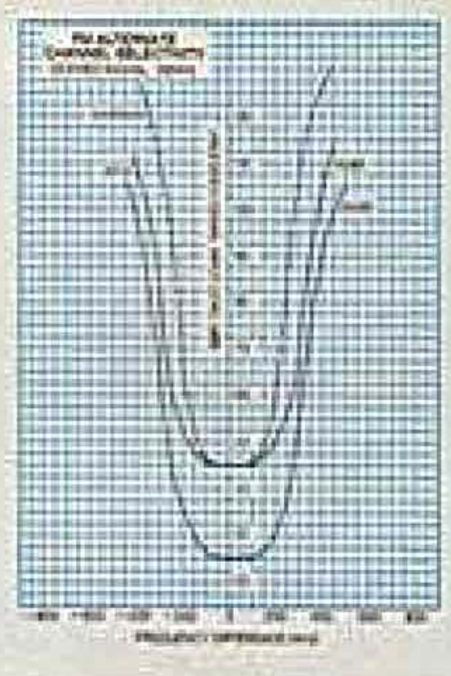
Another Sansui custom-made IC is found at the tuner's output. The one-chip unit has a push-pull output design and – of particular importance – it, too, is DC. Gain is sufficient to feed your power amp *directly* without the extra boost of a preamp. It's another Sansui exclusive.











The two lines above represent the spectra of beating with the adjacent-channel station, the lower one processed by Sansui's Adjacent-Channel Filter and the upper one not. A relatively low level of beating for the former means reduction of swishing noise across the entire audio range.

Integrated Tuner Concept
Meters, muting switches, even the dial scales for FM and AM are completely independent in this unique INTEGRATED FM/AM supertuner. In fact, just about the only things the independent sections have in common is single-chassis mounting.

Green for FM/RED for AM
All FM controls are identified in green, AM in red. Note, too, that all AM controls are on the left side, FM on the right.

Double-Output Facilities
There are two sets of output terminals on the rear panel. You may select FM or AM function for either set and make connections direct to amplifier(s).

FM Automatic Noise Filter (Pat. Pend.)
FM signals too weak for respectable hi-fi reproduction in stereo over the full frequency range are processed automatically when this switch is engaged.

FM Muting Switch
Low-quality signals are eliminated entirely when Muting is on.

400Hz Calibration Switch
Use it to send a "test signal" to the outputs as you calibrate recording levels on connected decks, etc.

FM Multipath Meter
Because of the detector's wide dynamic range, multipath reflections are accurately indicated for absolutely correct antenna orientation.

Four Meters for FM/AM
As mentioned above, the TU-X1 has two meters for FM tuning – and two for AM tuning.

AM Muting Switch
It eliminates *beat* as well as inter-station noise as you tune AM stations.

Beat Canceller for AM
When interference is present near the carrier frequency of the station you want, use the USB/LSB SELECTOR switch, trying both positions until that interference is eliminated. The BEAT CANCELLER SWITCH should be ON if interference is perceived. In the one-in-a-thousand instance when interference is present both above and below the carrier, switch the AM BANDWIDTH SELECTOR to NARROW.

AM Bar Antenna
A new design was perfected for this built-in bar antenna to shield it from static and ensure ideal performance.

Multiple FM/AM Antenna Connections
The rear panel of the TU-X1 has facilities for both 300-ohm and 75-ohm FM antennas and AM leads. An "F" type connector is provided exclusively for use with the optional Sansui FA-7.

Independent AM Section

How often have you heard "AM is lo-fi, and always will be!" or similar statements? Limitations said to be "inherent" in AM broadcasting include susceptibility to noise, a lack of dynamic range, a tendency toward distortion and a relatively restricted frequency range.

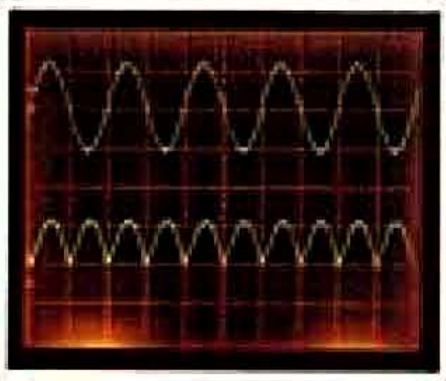
Sansui questions the "inherentness" of these common AM problems, however. Is AM forever doomed to low fidelity? We think not.

In the TU-X1 you will find that we've put up a good argument for *high* fidelity AM, and packed the AM section with innovative circuitry that backs it up. One unusual and important development is the Sansui PLL Synchronized Product Detector, the first of its kind in the world. What it does and how it works will be detailed in the following paragraphs.

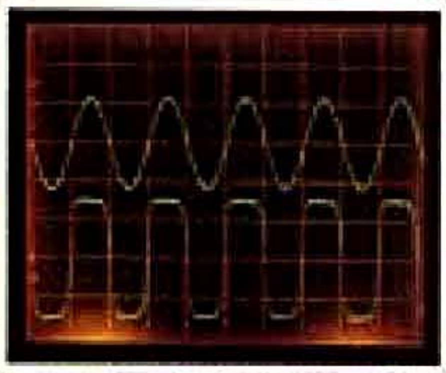
Other elaborate AM circuitry in the TU-X1 does its part, too, for significant improvements in reception and reproduction of amplitude-modulated radio signals. A high signal-to-noise ratio, a flat response over a wide frequency range and very low distortion are some of the very real results.

Sansui PLL Synchronized Product Detector for AM.

Our new circuit for synchronized product detection works just like an MPX demodulator in FM stereo. Very simply stated, audio signals are extracted by modulating the AM IF signal with a switching signal of the same frequency and phase as the IF signal. That explanation, however, is hardly adequate to satisfy audiophiles, much less the Sansui engineers who perfected the device. Therefore it is first necessary to explain how a conventional AM "envelope-type" detector works.



WAVEFORM OF AM PLL SYNCHRONIZED PRODUCT DETECTOR
Upper Trace: 450kHz IF Signal
Lower Trace: Detector Output (before it's sent to low-pass filter)



WAVEFORM OF AM PLL SYNCHRONIZED PRODUCT DETECTOR
Upper Trace: 450kHz IF Signal
Lower Trace: Switching Signal

The switching signal (lower trace) is in the same phase and of the same frequency as the IF signal.

Fig. 1 shows the construction of the ordinary detector. AM signals from the IFT (Intermediate Frequency Tran- former) output (Fig. 1a) are sent to the diode ("D" in Fig. 1) to b- rectified (Fig. 1b) and then detected (Fig. 1c). If the AM signals contain interference, that interference is also contained at the output of the detector as the result of beating with audio signals.

Such interference or beat may be eliminated by limiting the bandwidth of the IF filter so that they do not enter the detector at all. But like a baby thrown out with the bath water, the usable bandwidth, too, is sacrificed. The AM sound thus detected is far from hi-fi, suffering limited frequency range and poor signal-to-noise ratio.

Accentuating the Positive.

Our new PLL Synchronized Product Detector for AM takes advantage of the way the AM carrier is spectrally composed. That is, the carrier has sidebands both above and below it – USB for the Upper Sidebands, LSB for the Lower Sidebands. Those sidebands are often found to contain interference. The following will explain how, by using some of the principles of MPX demodulation in FM stereo, we have eliminated that interference.

Fig. 2 shows how the AM IF signal is switched with a signal of the same frequency and phase as the IF signal, and how better quality AM audio signals can be obtained. Fig. 3 shows the main elements of the Synchronized Product Detector – the PLL circuit is composed of the Phase Detector (PD), Low Pass Filter (LPF) and the Voltage-Controlled Oscillator (VCO). It generates signals of the same frequency as the input IF signal with phase locked.

The circuit needs still another device to generate a signal 90 degrees out of phase; otherwise, no signal wou- appear at the output of the detector. The input is thus first phase-shifted by 90 degrees before it is applied to the PD and the following Product Detector. This is accomplished by phase shifters (0 + 45° and 0 − 45°) for a total 90° shift. The PD-1 and PD-2 then work in complementary fashion, with the sum of the upper and lower sidebands (USB + LSB) appearing at the output of the PD-2.

If no interference is present, no signal appears at the output of 0° PLL, since the output of the PD-1 is zero (USB

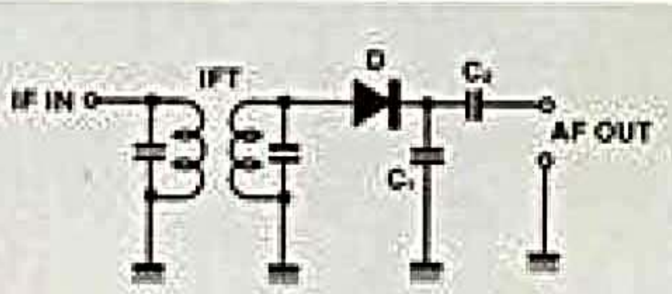


Fig. 1 ENVELOPE AM DETECTOR

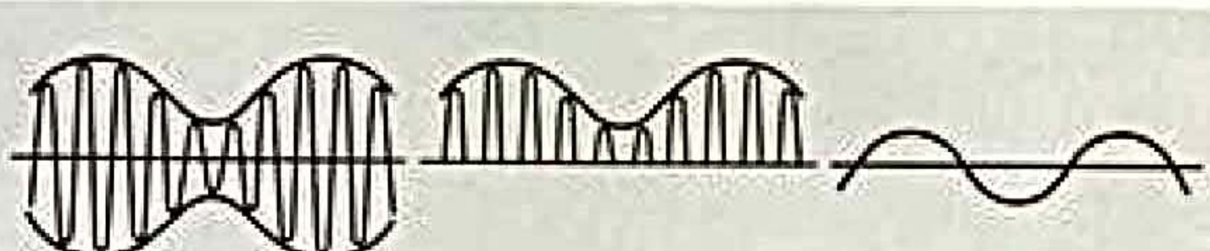


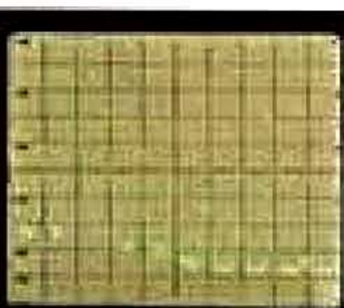
Fig. 1 (a) Fig. 1 (b) Fig. 1 (c)

ENVELOPE WAVEFORM DETECTION

−LSB components = 0). But if there's interference, its components appear at the PD-1, and the desired signal *plus* interference components at the PD-2. When operated (PD-1 minus PD-2, or PD-1 + PD-2), these composite outputs yield interference-free audio signal on either the USB or LSB. Interference is rarely totally absent, and it typically appears either in the USB or LSB, seldom in both. Thus selecting and detecting the interference-free sideband results in noise-free reception *never* before achieved in AM tuners. Here is an example:

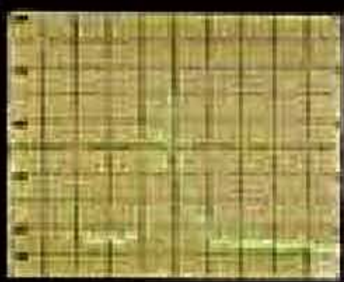
Assume that interference is in the USB or upper sideband. A difference then exists between the outputs of the PDs. When the PD-1 output is subtracted from the PD-2 output, interference is stipped off and a pure-as-possible audio signal is derived ... a positive improvement in AM sound. Incidentally, the switch for selecting USB or LSB is on the front panel for maximum convenience.

Fig. A



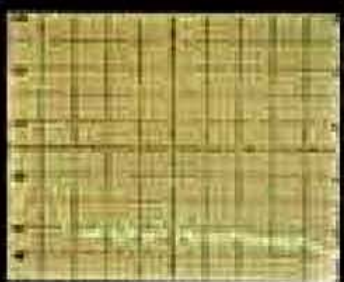
SPECTRUM ANALYZED WAVEFORM OF CONVENTIONAL AM TUNER WITH ENVELOPE DETECTOR
Desired Signal: 1,000kHz, 1kHz Modulation
Undesired Signal: 1,004kHz, 400Hz Modulation

Fig. B



SPECTRUM ANALYZED WAVEFORM OF TU-X1 WITH AM PLL SYNCHRONIZED PRODUCT DETECTOR
(Beat Canceller: OFF)
Measured in same conditions as the conventional tuner.

Fig. C



SPECTRUM ANALYZED WAVEFORM OF TU-X1 WITH AM PLL SYNCHRONIZED PRODUCT DETECTOR
(Beat Canceller: ON)
Measured in same conditions as the conventional tuner.

These traces are made on the supposition that a 1,000kHz signal, modulated by 1kHz signal, is interfered with by an undesired 1,004kHz signal, modulated by 400Hz. Measurements are made on the output of each tuner.

In Fig. A you see a beat frequency and a number of spurious frequencies as the result of beating between the two signal frequencies. But in Fig. B you see a little beat but no spurious frequencies at all, because the AM PLL synchronized product detector theoretically does not produce the latter. When the Beat Canceller is on line, there are still fewer beat frequencies as you see in Fig. C. Reproduced sound is cleaner and clearer.

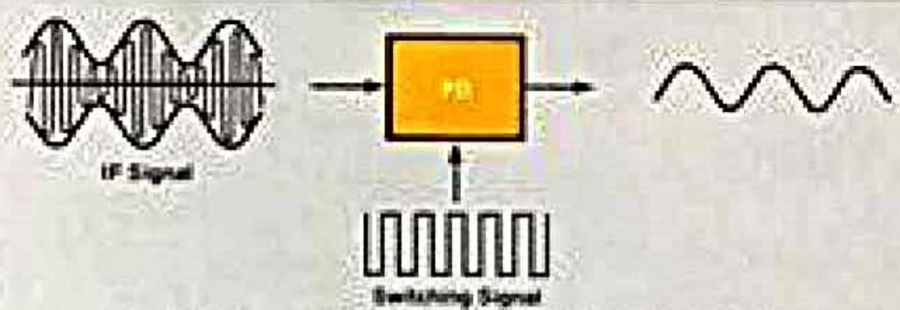


Fig. 2 CONCEPTUAL OPERATION OF SYNCHRONIZED PRODUCT DETECTOR

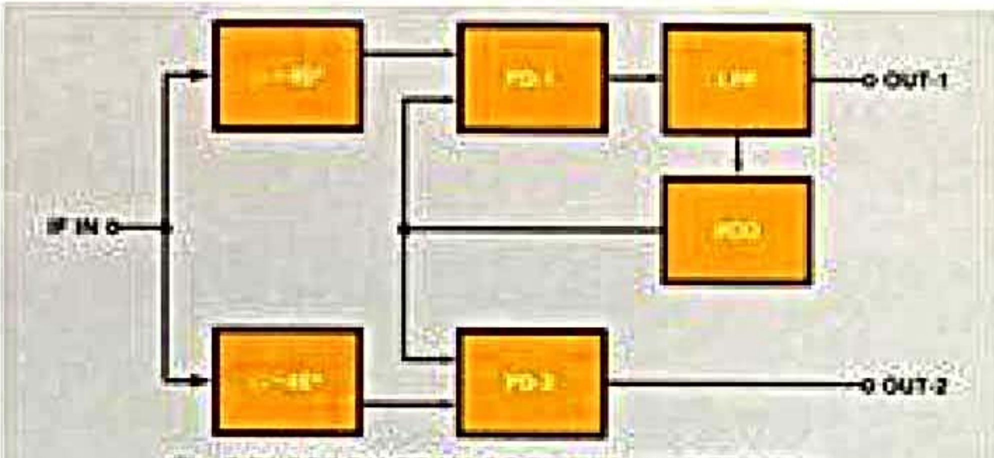


Fig. 3 BLOCK DIAGRAM OF TU-X1'S AM DETECTOR

AM Antenna Circuit.

To maximize the benefits of the new Sansui PLL Synchronized Product Detector in the AM section, top-quality components were used throughout. To provide the best possible input signal, too, we chose the best system known for antennas.

Low-Distortion AM IF Amplifier.

A wide-range, 3-pole IF transformer in the IF filter circuit assures a wide AM bandwidth for improved tonal quality. The following IF amp itself is a differential plus two 2-stage direct-coupled sections, each of NPN and PNP transistors. A variable NF AGC (Nagative Feedback Automatic Gain Control) circuit, formed of a photocoupler (LED and CdS), teams up with the amps in the IF so that you'll never be annoyed by excessive distortion from too-weak or too-strong signals.

AM Antenna CB

AM IF Filter

Dual-MOS FET RF Amp in AM Frontend.

Here is perhaps the most elaborate configuration yet devised for an AM frontend (RF amp, local oscillator and mixer amp combined). It features a dual-gate MOS FET in the RF amp and the double-balanced mixer in IC. The low-noise, highly linear performance of the MOS FET ensures high sensitivity. The double-balanced mixer electrically isolates the input and output stages to suppress the RF and oscillator signals effectively. As a result, rejection performance (eliminating spurious response) is superb so that interference is drastically reduced.

Detector in IC Format.

The aforementioned Sansui PLL Synchronized Product Detector for AM is formed of two balanced mixer ICs and transistor 3-stage differential amplifiers. High linearity is just one advantage.

Specifications

FM SECTION

TUNING RANGE	88 to 108MHz
50dB QUIETING SENSITIVITY	
MONO	12.5dBf
STEREO	34dBf
SENSITIVITY	
MONO	8.6dBf (1.47μV IHF T-100)
STEREO	14.5dBf
SIGNAL TO NOISE RATIO	
MONO	86dB (at 85dBf)
	86dB (at 65dBf)
STEREO	83dB (at 85dBf)
	80dB (at 65dBf)
FREQUENCY RESPONSE	
MONO	20 to 15,000Hz +0.2dB, −0.5dB
STEREO	20 to 18,000Hz +0.2dB, −1.5dB
	20 to 15,000Hz +0.2dB, −0.8dB
TOTAL HARMONIC DISTORTION	
MONO	less than 0.03% at 100Hz
	less than 0.02% at 1,000Hz
	less than 0.04% at 6,000Hz
STEREO	less than 0.04% at 100Hz
	less than 0.03% at 1,000Hz
	less than 0.05% at 6,000Hz
CAPTURE RATIO	0.8dB
ADJACENT CHANNEL SELECTIVITY	
NARROW	15dB at 200kHz
ALTERNATE CHANNEL SELECTIVITY	
WIDE	55dB at 400kHz
NARROW	80dB at 400kHz
SPURIOUS RESPONSE RATIO	130dB at 98MHz
IMAGE RESPONSE RATIO	130dB at 98MHz
IF RESPONSE RATIO	
Balanced	130dB at 98MHz
Unbalanced	130dB at 98MHz
RF INTERMODULATION	70dB at 98MHz
AM SUPPRESSION RATIO	65dB at 98MHz
STEREO SEPARATION	45dB at 100Hz
	50dB at 1,000Hz
	45dB at 10,000Hz
ANTENNA INPUT IMPEDANCE	300 ohms balanced
	75 ohms unbalanced
OUTPUT VOLTAGE AND IMPEDANCE	
Variable	1.5V, 2.5k ohms
Dolby FM	200mV

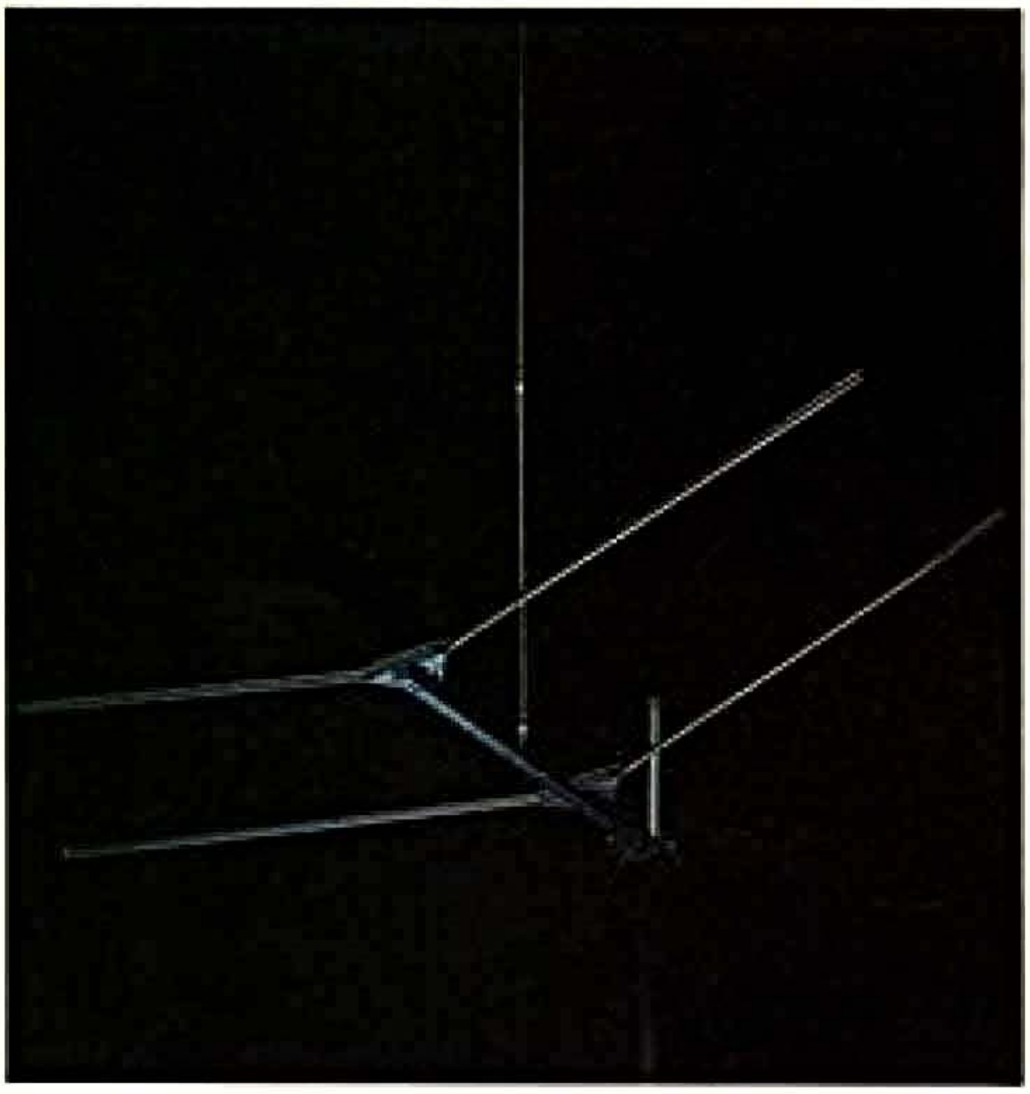
AM SECTION

TUNING RANGE	530 to 1,600kHz
SENSITIVITY (BAR ANTENNA)	50dB/m
SELECTIVITY	35dB at 1,000kHz (NARROW)
SIGNAL TO NOISE RATIO	65dB
TOTAL HARMONIC DISTORTION	less than 0.2% at 30% Mod. 90dB/m
IMAGE RESPONSE RATIO	70dB at 1,000kHz
IF RESPONSE RATIO	70dB at 1,000kHz

GENERAL

AC OUTLET	unswitched total 100 watts
POWER REQUIREMENTS	
POWER VOLTAGE	100, 120, 220, 240V 50/60Hz
POWER CONSUMPTION	30 watts
SEMICONDUCTORS	81 Transistors, 47 Diodes; 6 FETs, 19 ICs
DIMENSIONS	480mm (18-29/32")W
	197mm (7-3/4")H
	450mm (17¾")D
WEIGHT	16.2kg (35.7lbs.) Net
	18.7kg (41.2lbs.) Packed

- The FM performance of this model is measured pursuant to the new Institute of High Fidelity standard, IHF-T-200, except specifications with the legend IHF-T-100.
- For European models, some specifications might change to comply with local safety regulations and standards.
- Design and specifications subject to change without notice for improvements.



FA-7 FM/AM Compatible Antenna System
- World's first FM/AM compatible antenna system (Pat. Pend.): Both FM and AM reception is possible with one antenna and one cable, connected to receiver/tuner's FM/AM terminals.
- FM antenna with sharp directionality for reduced multipath interference.
- Non-directional AM antenna

Sansui

SANSUI ELECTRIC CO., LTD.
14-1 IZUMI 2-CHOME, SUGINAMI-KU, TOKYO 168 JAPAN/TELEPHONE: 323-1111/TELEX 232-2076
SANSUI ELECTRONICS CORPORATION
1250 VALLEY BROOK AVENUE, LYNDHURST, NEW JERSEY 07071, U.S.A./TELEX: NEW JERSEY 422633 SEC UI
SANSUI AUDIO EUROPE N.V.
NORTH TRADE BUILDING, NOORDERLAAN 133-BUS 1, 2030 ANTWERP, BELGIUM/TELEX: 33538

Printed in Japan (9M002K2)

SPECIFICATIONS TUNERS

TYPE	TU-217	TU-317	TU-417	TU-X1	TU-719	TU-919
FM-SECTION						
Tuning range	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz
50 dB Quieting sensitivity						
mono	13.8 dBf	13.5 dBf	13.5 dBf	12.5 dBf	13.0 dBf	12.5 dBf
stereo	37 dBf	36.5 dBf	36.5 dBf	34 dBf	35 dBf	34 dBf
Sensitivity						
mono	10.5 dBf (1.8 uV IHF T-100) (1 uV DIN)	10.3 dBf (1.8 uV IHF T-100) (1 uV DIN)	10.1 dBf (1.75 uV IHF T-100)	8.7 dBf (1.49 uV IHF T-100)	9.6 dBf (1.65 uV IHF T-100) (0.95 uV DIN)	9.0 dBf (1.5 uV IHF T-100) (0.95 uV DIN)
stereo	20 dBf	19 dBf	19 dBf	14.5 dBf	16.0 dBf	15.0 dBf
Signal-to-noise ratio						
mono	78 dB (at 65 dBf) —	79 dB (at 65 dBf) —	79 dB (at 65 dBf) —	86 dB (at 65 dBf) 86 dB (at 85 dBf)	81 dB (at 65 dBf) 81 dB (at 80 dBf)	82 dB (at 65 dBf) 83 dB (at 80 dBf)
stereo	72 dB (at 65 dBf) 75 dB (at 80 dBf)	73 dB (at 65 dBf) 76 dB (at 80 dBf)	73 dB (at 65 dBf) 76 dB (at 80 dBf)	80 dB (at 65 dBf) 83 dB (at 85 dBf)	76 dB (at 65 dBf) 78 dB (at 80 dBf)	76 dB (at 65 dBf) 80 dB (at 80 dBf)
Frequency response						
mono	30 to 15,000 Hz (+0.5 dB, −1 dB)	30 to 15,000 Hz (+0.5 dB, −1 dB)	20 to 15,000 Hz (+0.5 dB, −1 dB)	20 to 15,000 Hz (+0.2 dB, −0.5 dB)	30 to 15,000 Hz (+0.2 dB, −0.5 dB)	30 to 15,000 Hz (+0.2 dB, −0.5 dB)
stereo	30 to 15,000 Hz (+0.5 dB, −1 dB) —	30 to 15,000 Hz (+0.5 dB, −1 dB) —	20 to 15,000 Hz (+0.5 dB, −1 dB) —	20 to 18,000 Hz (+0.2 dB, −1.5 dB) 20 to 15,000 Hz (+0.2 dB, −0.8 dB)	30 to 15,000 Hz (+0.2 dB, −0.5 dB) —	30 to 15,000 Hz (+0.2 dB, −0.5 dB) —
Total harmonic distortion						
mono at 100 Hz	less than 0.1%	less than 0.1%	less than 0.12%	less than 0.03%	less than 0.1%	less than 0.06%
at 1000 Hz	less than 0.1%	less than 0.07%	less than 0.07%	less than 0.02%	less than 0.07%	less than 0.04%
at 6000 Hz	less than 0.25%	less than 0.23%	less than 0.27%	less than 0.04%	less than 0.1%	less than 0.06%
stereo at 100 Hz	less than 0.15%	less than 0.15%	less than 0.22%	less than 0.04%	less than 0.1%	less than 0.09%
at 1000 Hz	less than 0.13%	less than 0.09%	less than 0.09%	less than 0.03%	less than 0.07%	less than 0.06%
at 6000 Hz	less than 0.25%	less than 0.25%	less than 0.29%	less than 0.05%	less than 0.1%	less than 0.15%
Capture ratio	1.0 dB	1.0 dB	1.0 dB	0.8 dB	1.0 dB	0.9 dB
Adjacent channel selectivity						
narrow (200 kHz)	—	—	—	15 dB	—	18 dB
Alternate channel selectivity						
wide (400 kHz)	—	—	—	55 dB	60 dB	50 dB
narrow (400 kHz)	50 dB	50 dB	50 dB	80 dB	80 dB	80 dB
Spurious response ratio (98 MHz)	80 dB	83 dB	83 dB	130 dB	85 dB	110 dB
Image response ratio (98 MHz)	50 dB	55 dB	55 dB	130 dB	80 dB	110 dB
IF response ratio (98 MHz)						
balanced	90 dB	95 dB	95 dB	130 dB	90 dB	110 dB
unbalanced	—	—	—	130 dB	—	—
RF intermodulation	—	—	55 dB	70 dB	65 dB	75 dB
AM suppression ratio (98 MHz)	50 dB	50 dB	50 dB	65 dB	50 dB	60 dB
stereo separation at 100 Hz	35 dB	35 dB	35 dB	45 dB	35 dB	40 dB
at 1000 Hz	40 dB	40 dB	40 dB	50 dB	50 dB	50 dB
at 10,000 Hz	30 dB	30 dB	30 dB	40 dB	35 dB	35 dB
Antenna input impedance balanced	300 Ohm	300 Ohm	300 Ohm	300 Ohm	300 Ohm	300 Ohm
unbalanced	75 Ohm	75 Ohm	75 Ohm	75 Ohm	75 Ohm	75 Ohm
Output voltage and impedance	0.775 V/1 kOhm	0.775 V/1 kOhm	—	—	—	—
variable	—	—	0.775 V/1 kOhm	1.5 V/2.5 kOhm	0.775 V/2.5 kOhm	1 V/2.5 kOhm
DOLBY FM	—	—	—	0.2 V	—	0.2 V
AM SECTION						
Tuning range	530 - 1,600 kHz	530 - 1,600 kHz	530 - 1,600 kHz	530 - 1,600 kHz	530 - 1,600 kHz	530 - 1,600 kHz
Sensitivity (bar antenna)	47 dB/m (220 uV/m)	47 dB/m (220 uV/m)	47 dB/m (220 uV/m)	50 dB/m	47 dB/m (220 uV/m)	47 dB/m (220 uV/m)
Selectivity (± 10 kHz at 1,000 kHz)	35 dB	35 dB	35 dB	35 dB	35 dB	35 dB
Signal-to-noise ratio	48 dB	48 dB	48 dB	65 dB	50 dB	50 dB
Total harmonic distortion (30% mod.)	less than 0.4%	less than 0.4%	less than 0.4%	less than 0.2%	less than 0.35%	less than 0.35%
Image response ratio (1000 kHz)	55 dB	55 dB	55 dB	70 dB	50 dB	70 dB
IF response ratio (1000 kHz)	40 dB	40 dB	40 dB	70 dB	35 dB	70 dB
GENERAL						
AC outlet	—	—	—	unswitched 100 Watts	—	—
Power requirements · voltage	100, 120, 220, 240V 50-60 Hz	100, 120, 220, 240V 50-60 Hz	100, 120, 220, 240V 50-60 Hz	100, 120, 220, 240V 50-60 Hz	100, 120, 220, 240V 50-60 Hz	100, 120, 220, 240V 50-60 H
· consumption	5 Watts	15 Watts	17 Watts	30 Watts	23 Watts	22 Watts
Semiconductors	8 transistors, 6 diodes, 1 FET, 4 IC's	8 transistors, 6 diodes, 1 FET, 4 IC's	9 transistors, 7 diodes, 1 FET, 3 IC's	81 transistors, 47 diodes, 6 FET, 19 IC's	43 transistors, 29 diodes, 3 FET, 10 IC's	73 transistors, 57 diodes, 6 FET, 18 IC's
Dimensions (W x H x D) mm	430 x 110 x 310	430 x 110 x 310	430 x 168 x 405	480 x 197 x 450	430 x 168 x 405	430 x 168 x 402
with rack mounting handles	482 x 110 x 316	482 x 110 x 316	482 x 168 x 417	—	482 x 168 x 417	482 x 168 x 419
Weight (with handles) net	4.7 kg	5.3 kg	8.3 kg	16.2 kg (no handles)	9.2 kg	9.8 kg
packed	5.8 kg	6.4 kg	9.8 kg	18.7 kg	11.0 kg	11.8 kg

SPECIFICATIONS AX 7

SOUND SOURCE MIXING SECTION

MIXING FACILITY Mixing between inputs 1, 2, 3 & 4 : Reverb, Panpot, Level Control, −20 dB Attenuator (4-in/2-out Facility)
Mixing between inputs 1 through 4 and Stereo Source : Mixing Level Control (6-in/2-out Facility)
INPUT 1, 2 (MIC) SENSITIVITY/IMPEDANCE (at 1,000 Hz) · 1 mV (10 mV Attenuator in)/47 kOhms
INPUT 3, 4 (MIC/GUITAR/LINE)
SENSITIVITY/IMPEDANCE (at 1,000 Hz)
1 mV/47 kOhms (MIC), 20 mV/47 kOhms (GUITAR), 150 mV/47 kOhms (LINE)
MAXIMUM INPUT CAPABILITY
(at 1,000 Hz 0.1% THD)
MIC 40 mV RMS (290 mV RMS Attenuator in)
PANPOTS inputs 1 through 4
ATTENUATOR −20 dB (INPUT 1, 2, 3, 4)
FILTER
LOW −3 dB at 200 Hz (6 dB/oct.)
REVERBERATION SELECTOR INPUT 1, 1+2, 1+2+3, 1+2+3+4
REVERBERATION TIME 0 to 3.2 seconds (1kHz)

TAPE AND OUTPUT SECTION

INPUT SENSITIVITY AND IMPEDANCE (at 1,000 Hz)
LINE, SOURCE, TAPE 150 mV/47 kOhms
OUTPUT VOLTAGE AND IMPEDANCE (at 1,000 Hz)
MIXING OUT TO REC OUT 1 V into 47 kOhm load/less than 1.8 kOhms
MIXING OUT TO OUTPUT 1 V into 47 kOhm load/less than 1.8 kOhms

MAXIMUM OUTPUT (at 0.1% THD)
5 V into 47 kOhm load
CHANNEL SEPARATION (at 1,000 Hz)
SOURCE 70 dB
TAPE 70 dB
HUM AND NOISE (IHF)
MIC 61 dB
GUITAR 58 dB
LINE 69 dB
SOURCE 78 dB
FREQUENCY RESPONSE
SOURCE/TAPE 20 to 20,000 Hz +0 dB, −0.5 dB
MIC/GUITAR/LINE 20 to 20,000 Hz +0 dB, −1 dB
TOTAL HARMONIC DISTORTION (20 to 20,000 Hz)
less than 0.1% at or below 2 V RMS output voltage
AC OUTLETS switched max. 450 watts
unswitched total 500 watts
POWER REQUIREMENTS
VOLTAGE 100, 120, 220, 240 V 50/60 Hz
CONSUMPTION 3 watts
SEMICONDUCTORS 6 Transistors; 6 Diodes; 6 IC's
DIMENSIONS (W x H x D) mm 430 x 110 x 285
with Rack-mounting handles 482 x 110 x 299
WEIGHT (with handles) Net 5.1 kg
Packed 6.3 kg

SPECIFICATIONS MA 7

METER AMPLIFIER UNIT

INPUT SENSITIVITY AND IMPEDANCE
INPUT 1, 2, 3 −20 dB (7.75 V/47 kOhms)
0 dB (0.775 V/47 kOhms) Variable, max. +20 dB (0.0775 V/47 kOhms)
POWER −20 dB (10,000 W/8 Ohms)
0 dB (100 W/8 Ohms) Variable, max. +20 dB (1 W/8 Ohms)
SENSITIVITY SELECTOR 0 dB, −20 dB
Variable (max. +20 dB)
FREQUENCY RESPONSE
+5 dB to −40 dB
10 to 20,000 Hz +1.5 dB, −1.5 dB
under −40 dB
10 to 20,000 Hz +2.5 dB, −2.5 dB
ATTACK TIME
Peak, Peak Hold within 100 usec.
VU within 330 msec.
RECOVERY TIME
Peak : more than 1,000 msec. (0 dB to −20 dB)
Peak Hold : more than 5 min. (0 dB to −3 dB)
VU : more than 250 msec. (0 dB to −20 dB)
INDICATION ACCURACY 0 dB, ±1.5 dB
(Input sens. 0 dB, −20 dB)
OSCILLATOR FREQUENCY 400 Hz, 10 kHz
MONITOR OUTPUT 1.5 watts +1.5 watts (1 kHz)
POWER REQUIREMENTS
VOLTAGE 100, 120, 220, 240V 50/60 Hz
CONSUMPTION 15 Watts
SEMICONDUCTORS 15 Transistors; 17 Diodes; 1 FET; 7 IC's

DIMENSIONS (W x H x D) mm 430 x 110 x 332
with Rack mounting handles 482 x 110 x 347
WEIGHT (with handles) Net 5.8 kg

CUE MONITOR SPEAKER UNIT

SPEAKER 80 mm (3 3/16") x 2 (L, R) cone type
MAXIMUM INPUT POWER 2 watts
FREQUENCY RANGE 80 to 18,000 Hz
SENSITIVITY 86 dB/W (JIS at 1 m)
IMPEDANCE 8 Ohms
DIMENSIONS (W x H x D) mm 430 x 110 x 257
with Rack-mounting handles 482 x 110 x 287
WEIGHT (with handles) Net 3.1 kg
WEIGHT (MA-7+Speak. unit) Packed 11.2 kg

Sansui

SANSUI AUDIO EUROPE N.V.
UNIT 10A, LYON INDUSTRIAL ESTATE ROCKWARE AVENUE GB-GREENFORD, MIDDX UB6 OAA ENGLAND / TEL. (01) 575 11 33 / TELEX 89 52103

SANSUI AUDIO EUROPE N.V.
NORTH TRADE BUILDING, NOORDERLAAN 133-BUS 1, 2030 ANTWERP, BELGIUM / TEL. (031) 42 31 40 / TELEX 33538

SANSUI ELECTRIC CO. LTD
14-1 IZUMI 2-CHOME, SUGINAMI-KU TOKYO 168 JAPAN / TEL. 323-1111 / TELEX 232-2076

Printed in Belgium