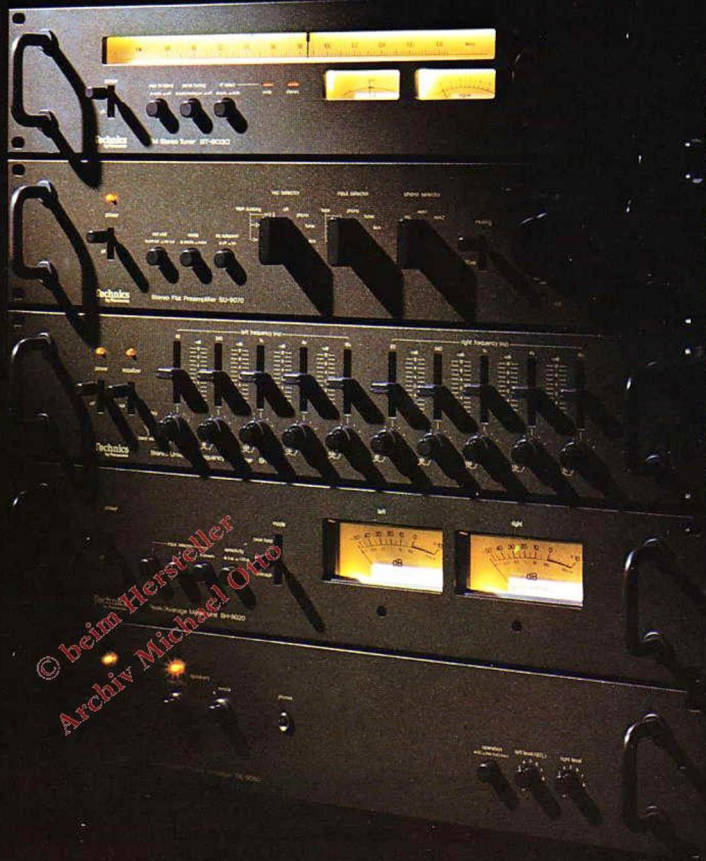
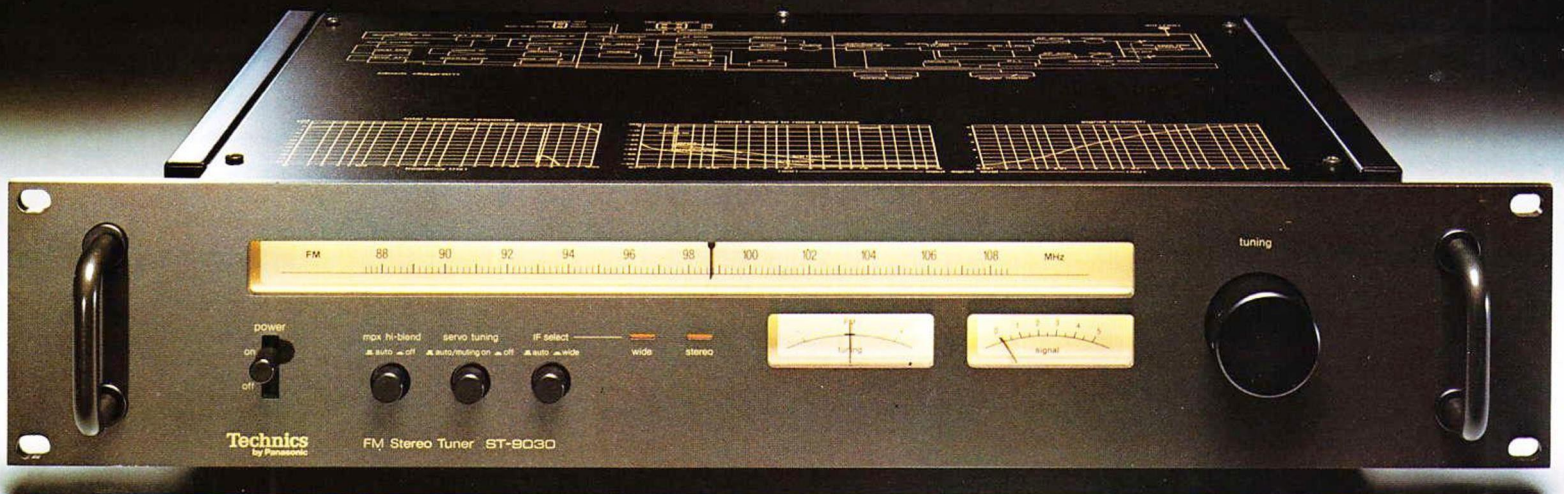


Technics ST-9030

FM Stereo Tuner

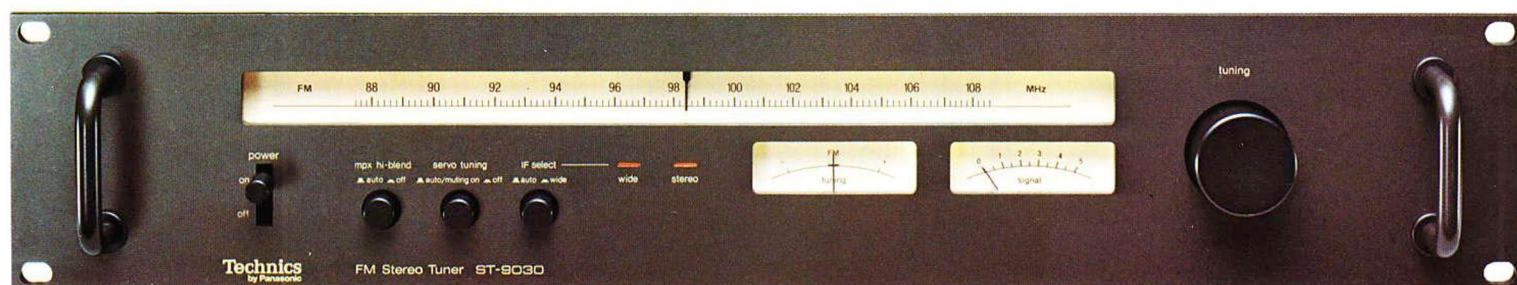


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Archiv Michael Otto



Professional Series

ST-9030 FM Stereo Tuner



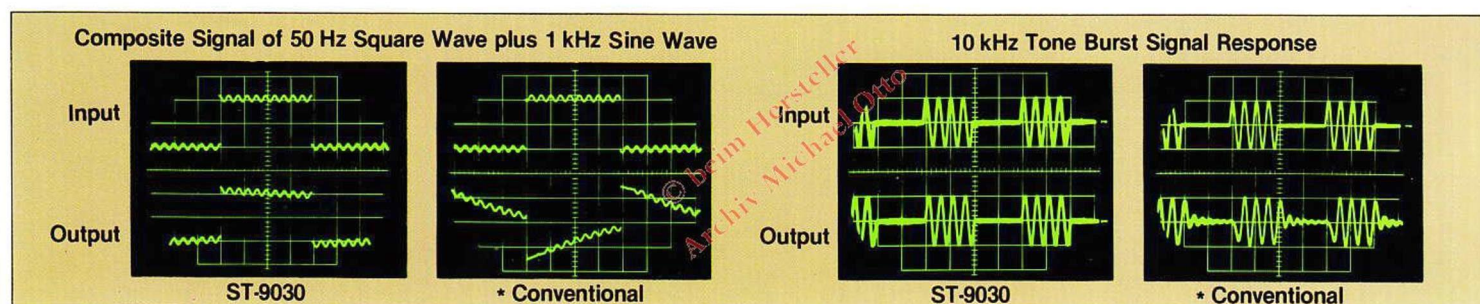
Waveform Fidelity — a True Measure of Tuner Performance

Staggering as the ST-9030 technical specifications may seem, the real test of true high quality performance lies in waveform fidelity. Although the waveforms of all signals in music programs are usually extremely complex, there are two relatively simple forms—the square wave, and the tone burst signals that will clearly show how well the tuner performs.

The comparison here between Technics ST-9030 (where design considerations were all aimed at waveform fidelity) and a conventional tuner (where waveform fidelity has not been of prime importance) clearly illustrates the logical conclusion resulting from a

critical difference in approach to this means of testing quality and performance.

The very steep "sag" in the square wave output signal in the conventional tuner indicates poor amplification phase characteristics in the low frequency region (thus introducing distortion), while the suppressed sections at the start of the 1kHz sine wave signals signify a contracted dynamic range in the low frequency region. The ST-9030 shows clear superiority over the conventional tuner. Although the time lag is not so critical if it is consistent, the unstable response patterns, the shortened leading edge amplitudes and the ringing during the off times will introduce audible distortion.



* Representative performance of high-quality tuners which use a conventional low-pass filter. The difference in performance between these and the ST-9030 is largely attributable to Technics' use of the more advanced pilot signal canceller.

The Ultimate in FM Performance, Featuring Fully Automatic IF Band Selection for Optimum Reception Condition

Frequency Response 20Hz—18kHz (+ 0.1dB, -0.5dB) **Alternate channel selectivity** 90dB (narrow band)
Sensitivity 1.2μV (75Ω) and T.H.D. 0.08% (stereo, wide band)

Superb FM Tuner for Superb FM Reception

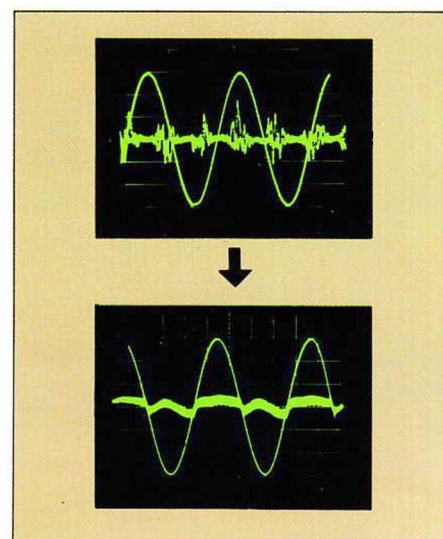
The ST-9030 tuner, designed exclusively for high quality FM reception, achieves an incredibly high level of performance which would have been considered almost impossible only a few years ago. This welcome situation has been brought about by a profusion of very significant electronic and technological advances. For example, the 19kHz FM pilot signal is removed in the ST-9030 by a very imaginative pilot cancel circuit, instead of the less efficient low-pass filter. An extremely linear frequency response extending right up past 18kHz is the exciting result. Another example is revealed in the IF

stage, which has been divided into independent "narrow" and "wide" bands, selected automatically in the ST-9030 according to transmission conditions. Even in very congested regions, the astronomical alternate channel selectivity of 90dB completely eliminates even the slightest trace of interference from adjacent stations, while in less crowded areas the wide band elevates reception quality to a super grade, with sensitivity of 1.2μV, and a distortionless THD of only 0.08% for both stereo and mono. Other outstanding features include servo tuning, automatic hi-blend, a PLL MPX IC, and an FM linear frequency 8-ganged variable tuning capacitor in the front-end. When it comes to high quality reception of FM programs, the ST-9030 is the right kind of FM tuner where only the best will do.

Two Completely Independent NARROW and WIDE Band IF Stages with Automatic Selection of Optimum Conditions

One of the more exciting advances featured in the ST-9030 is the independent, dual, narrow/wide band IF stage. For many years, tuner designers had been searching for ways

of getting around the problem posed by the effects of mutually antagonistic high selectivity and low distortion. It was very difficult to improve one without resulting in



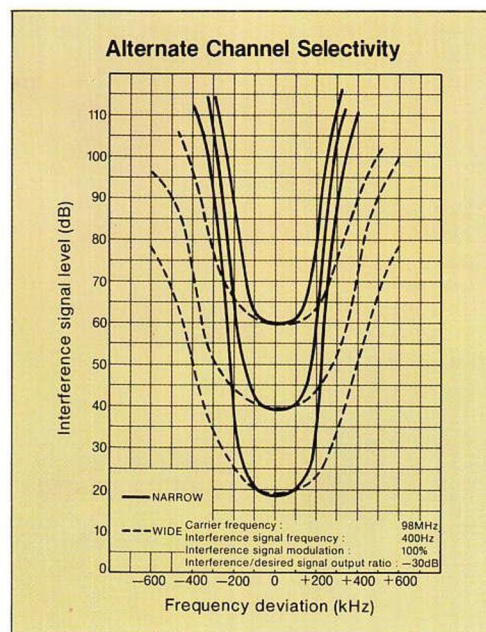
Effect of Automatic Bandwidth Switching

When distortion exceeds 0.3% due to adjacent station interference or other causes (top signal trace), bandwidth is automatically switched to narrow to restore low-distortion reception (bottom trace).

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Wide Band IF

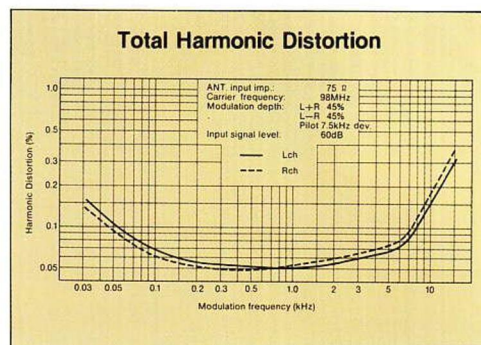
Since this band will normally be used in situations where selectivity is not of such critical importance, distortion, stereo separation, and capture ratio have all been pushed to the very limits of measuring capabilities. Employing compact 6-pole LC filter of outstanding group delay characteristics, plus 6-stage differential amplification, total harmonic distortion (stereo and mono) is reduced to an almost unprecedented 0.08%. Superb stereo separation ratings of 50dB (1kHz) and 40dB (10kHz), and a capture ratio as low as 0.8dB have also been achieved.



Narrow Band IF

By employing 4 separate 4-resonator ceramic filters (a total of 16 resonators) which exhibit very good group delay characteristics, a buffer amplifier, and 6-stage differential amplification, the ST-9030 attains the exceptionally high alternate channel selectivity of 90dB (400kHz) while still maintaining very good stereo separation (40dB at 1kHz, and 30dB at 10kHz), and very low distortion levels (mono 0.15%, stereo 0.3%).

Signals from the mixer circuit pass through both IF circuits, and feed into the detector circuit where selection of the appropriate IF band occurs. When the IF Selector is set to the "Auto" position, the tuner will initially switch over to the narrow band. If the input signal level exceeds 32.6dBf, or if the frequency difference (Δf) between the tuned station and the closest adjacent station is greater than 400kHz, the tuner automatically

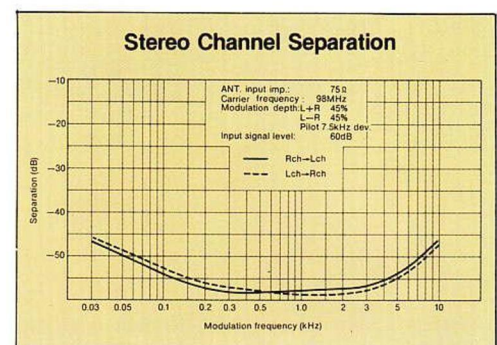


switches over to the wide band. But if the input signal is too weak, or if adjacent station signals are too close to the desired signal, causing spurious and/or crossmodulation interference, the tuner will remain switched to the narrow band.

Although detection of input signal level is quite a simple task, detection of adjacent station interference requires a very complex circuitry. The ST-9030 is designed to switch over to the narrow band if interference noise causes the S/N ratio (during stereo) to drop below 50dB (0.3% distortion).

PLL MPX IC with Pilot and Subcarrier Cancel Circuits

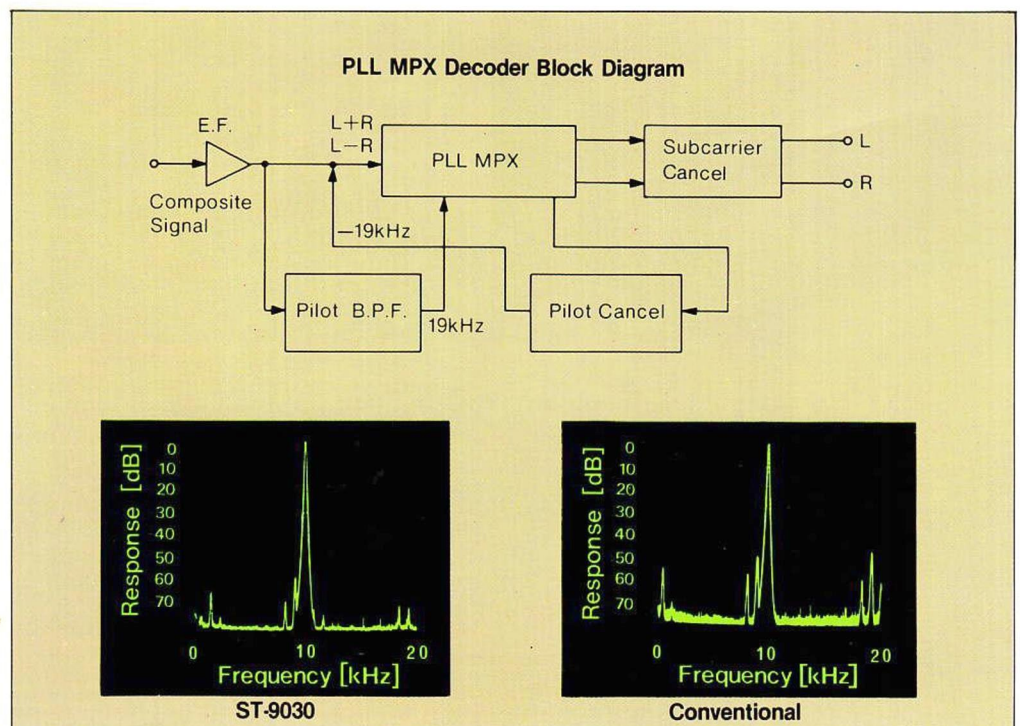
The recent development of an IC for the PLL type MPX stereo decoder circuit has resulted in far reaching improvements, such as lower distortion level, higher stereo separation, and capacity to cope with the "shock noise" occurring in conventional systems. But one of the major features of this circuit is the pilot cancel circuit. Although now appearing in many other tuners, this imaginative



signal remover which avoids cutting out any of the high end portions of the program, is an original Technics invention, first introduced in the Technics ST-9700 several years ago. Besides contributing to greater waveform fidelity, it is also very instrumental in reducing distortion in the very high frequency regions of the program.

By comparing the demodulation spectral distributions of 10kHz modulated signals in the ST-9030 and a conventional tuner, the vast improvement achieved by the cancel circuits becomes very clear indeed. The ST-9030 shows much less generation of higher harmonics and other unwanted components caused by beat phenomena.

A 19kHz signal supplied by the IC, and which has been synchronized perfectly with the pilot signal, undergoes waveform shaping into a pure 19kHz signal, and is amplified in the stereo muting circuit (which passes the 19kHz signal only during stereo). This is then fed back to the input side of the MPX to cancel out the unwanted pilot signal, thus avoiding any problems in subsequent non-linear circuits.



Effect of Pilot Cancel Circuit

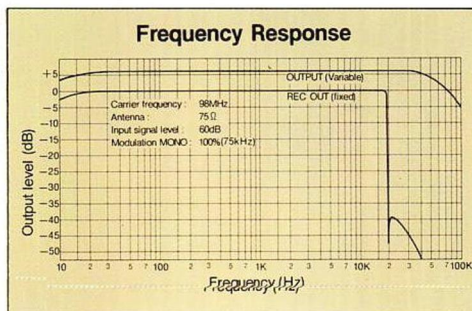
Output spectrum when f. mod. 10kHz input is applied. Left: ST-9030—note almost complete absence

of 19kHz and other unwanted components. Right: Conventional tuner without pilot cancel circuit.

Extended Frequency Response of 20Hz~18kHz (+0.1~0.5dB)

Because the stereo decoding pilot signal is now eliminated by the electronic pilot cancel circuit, rather than a low-pass filter (which unavoidably removes some of the wanted program as well), frequency response in the ST-9030 is improved by a very significant margin. In addition, a cancel circuit for removal of the 38kHz sub-carrier has also been included. The resultant flat frequency response all the way from 20Hz to 18kHz with only +0.1, -0.5dB deviation gives an exceptionally high degree of high fidelity that is still very rare in tuners today.

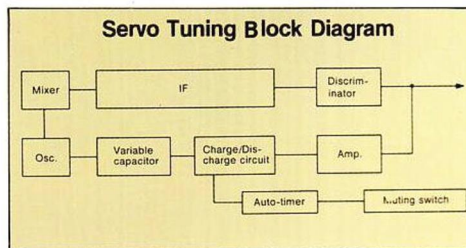
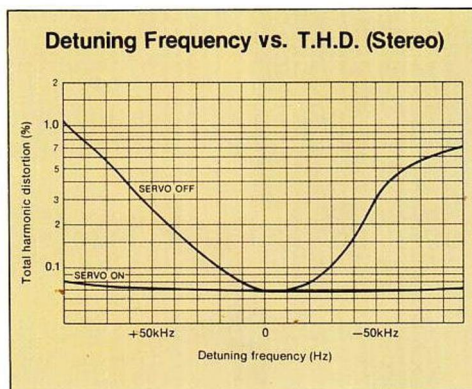
The ST-9030 has also eliminated the cause of the "jitter" problem caused by mixing modulated input signals in the MPX. Deterioration of stereo separation, and distortion in the high frequency region is thus suppressed even further.



Servo Tuning Circuit for Stable and Accurate Tuning

Practically invincible stability in station tuning is assured by this advanced electronic device which locks onto the tuned frequency, and stays there despite any minor fluctuations in carrier frequency, local oscillator frequency, or IF center frequency. This means greater reliability due to the complete absence of drift which could lead to distortion and loss of stereo separation.

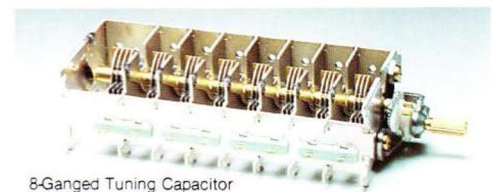
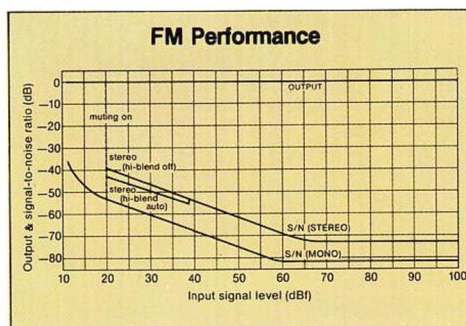
When retuning to another station, servo tuning is temporarily switched off. The muting width (the degree of detuning before muting sets in) is also readjusted, contracting from $\pm 100\text{kHz}$ when servo tuning is on, to $\pm 50\text{kHz}$ when switched off. Furthermore, the center tuning meter is locked to within $\pm 10\text{kHz}$ of the center position when servo tuning is on.



High Sensitivity Front-End Equipped with FM Linear Frequency 8-Ganged Variable Tuning Capacitor

The ST-9030 tuner's front-end, one of the most critical stages in any tuner, is equipped with an advanced linear frequency 8-ganged variable tuning capacitor. The improvement in sensitivity and reduction of noise levels is also due in part to the adoption of 3 double-tuned circuits, plus dual gate MOS FETs in the 2-stage RF amplifier and the balanced mixer circuit. The use of special low-noise transistors in the local oscillator, and a tuned buffer circuit inserted prior to the mixer, also contribute to the very high stability in this tuner. The tuned buffer circuit employed here is a combination of tuning circuit and junction FET, including a 2-ganged variable capacitor. It is very effective in maintaining waveform fidelity and preventing any reverse effect of RF signals.

These innovations have made the ST-9030 extremely robust, being capable of handling even exceptionally strong signals without overload. Spurious response and other basic characteristics have also been improved by very significant degrees. Furthermore, "hot" portions of the circuitry have been elevated above the glass epoxy coated circuit board, eliminating yet another potential degradation of the ST-9030's waveform fidelity.



Automatic Hi-Blend Switch Improves Weak-Area S/N

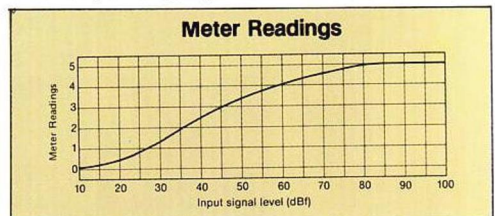
To further improve the quality of rather distant or weak FM stations, the hi-blend feature in the ST-9030 is operated automatically (although switch-over to manual operation is also naturally provided). When the input stereo signal drops below a level of 34.7dBf, the hi-blend mechanism is activated automatically to suppress noise at the slight expense of some stereo separation.

Positive Muting in Narrow and Wide Band Operation Made Possible by NAND Muting

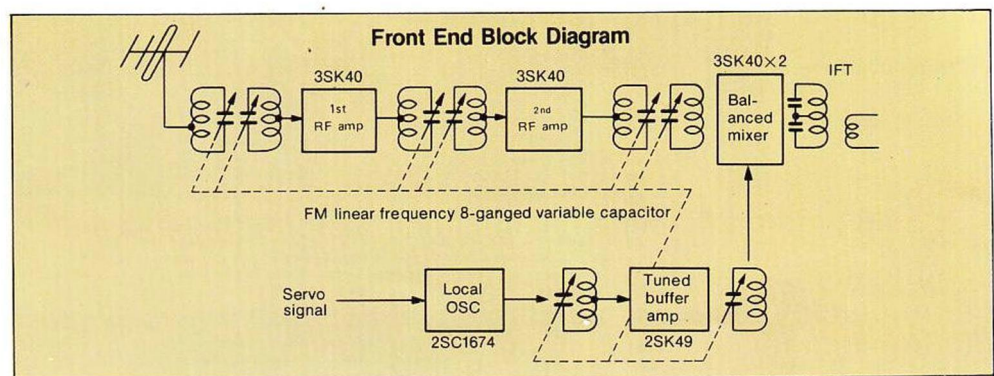
Complete muting of inter-station noise has now been made possible by the NAND muting switching system which automatically sets the muting width and level in accordance with signal level and whether narrow ($\pm 50\text{kHz}$) or wide ($\pm 120\text{kHz}$) bandwidth is being used at any given moment. This has been made possible by the independent regulation of muting level and muting width by the signal level and DC signal.

Other Important Features

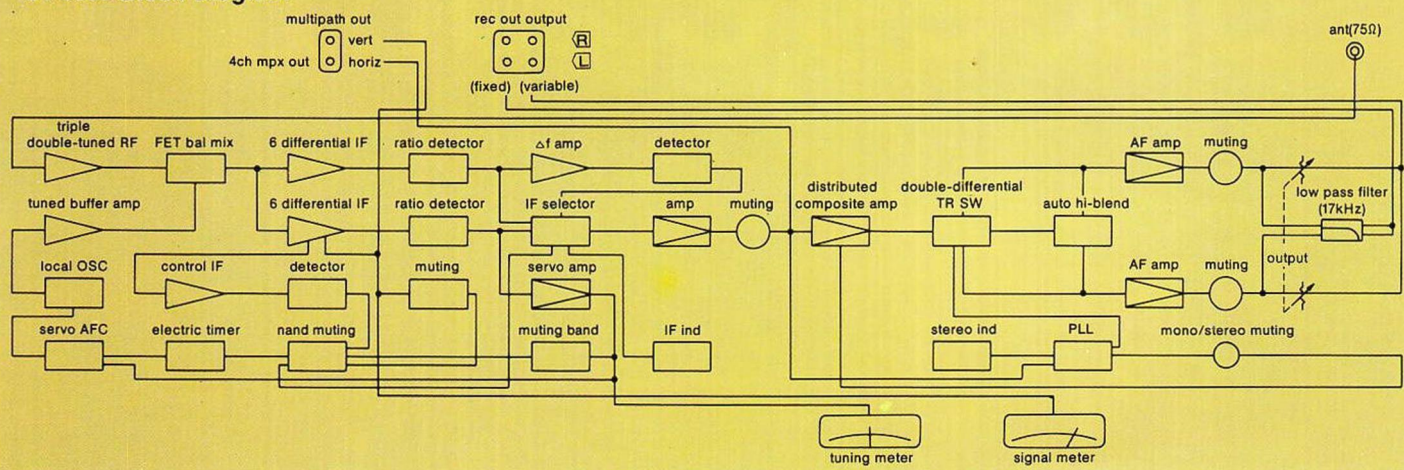
- Precision signal meter linear to as high as 81dBf, thus providing accuracy in measuring even very strong signals.



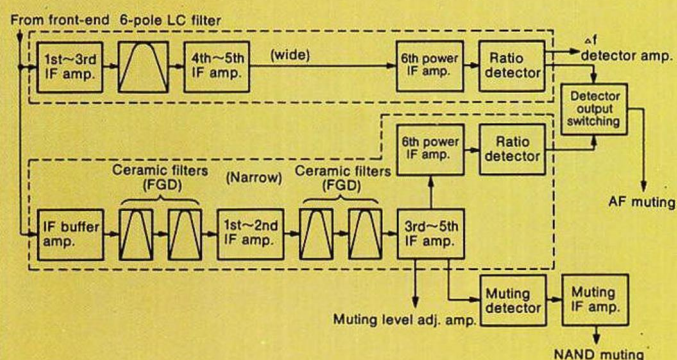
- Special 75 ohm F-type antenna connector for co-axial cable. 75 ohm cable is strongly recommended in the interest of noise-free reception.
- AC power supply line-filter to eliminate ripples and other interference signals induced via the AC power cord.
- High performance monolithic operation amplifier IC for audio frequency amplification, and independent constant voltage supplies for both radio and audio frequency amplification circuits.



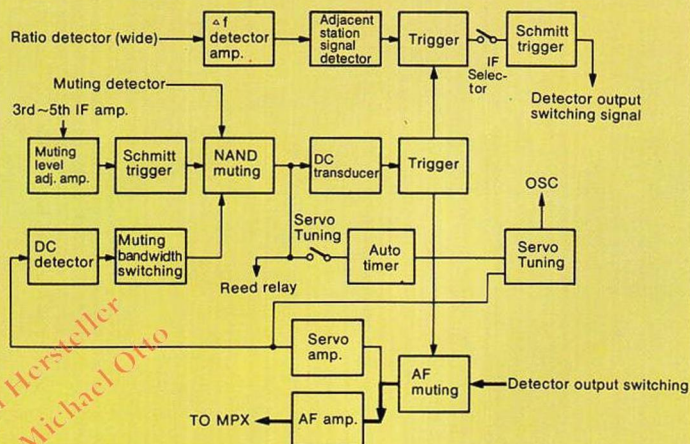
ST-9030 Block Diagram



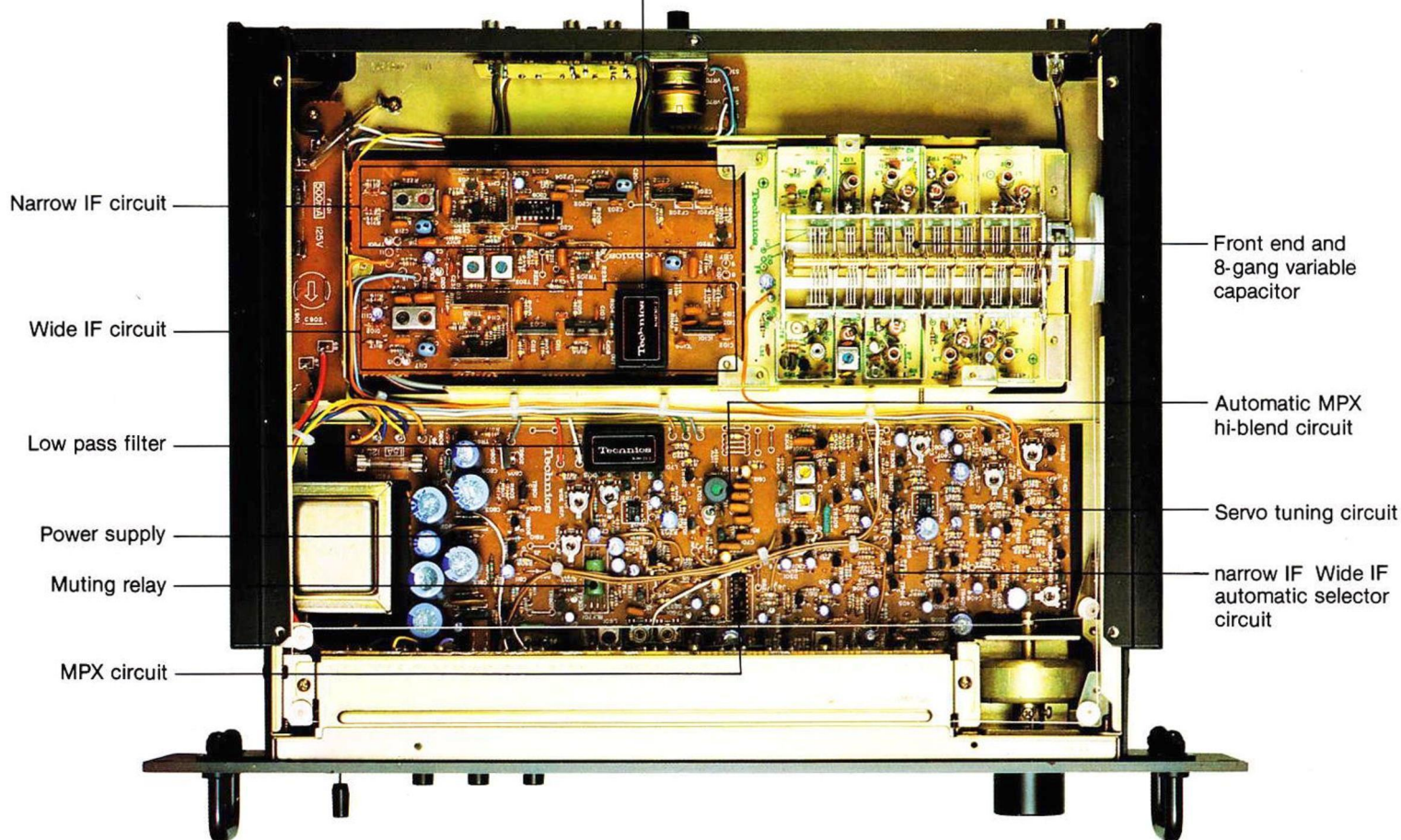
IF Stage Block Diagram



Block Diagram of IF Control Functions



Flat group delay block filter

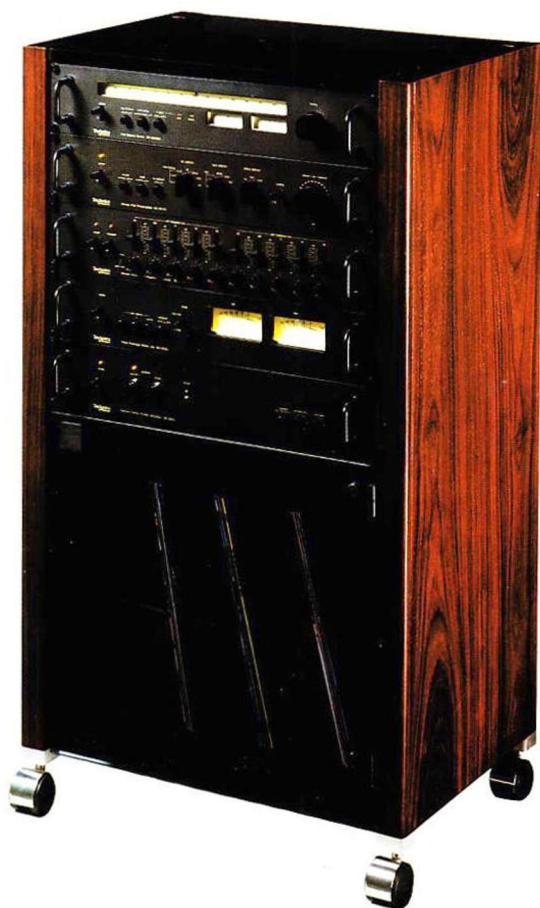


Rear Panel Facilities



1. Terminal for FM antenna 75Ω coaxial cable
2. Output level control
3. Output terminals (Variable)
4. Output terminals (Fixed)
5. 4-channel MPX output & FM multipath outputs

The "Flat" Component System is dedicated to ultimate performance at an affordable price.



Ultimate performance. Because in creating the "flat" system Technics engineers separated the basic amplifier/tuner into five components. Researched and developed each component to state-of-the-art perfection. Then recombined the components into a system that provides a magnitude of performance once thought to be purely theoretical. Affordable price. Because each component is priced far lower than what you'd expect, considering its extraordinary quality. And because the five-way breakup lets you buy just the equipment that you need—or can afford—right now. With the possibility of adding the rest of the system in the future.

The "Flat" Component System consists of:

- ST-9030: FM Stereo Tuner
- SU-9070: Stereo DC Preamplifier
- SH-9010: Stereo Universal Frequency Equalizer
- SH-9020: Peak/Average Meter Unit
- SE-9060: Stereo/Mono DC Power Amplifier

Movable Custom Rack, Model SH-999

Elegant custom rack for Technics "Flat" components or other 19-inch units. Side panels rosewood grain veneer, glass top and front door. Record compartment holds several dozen LP's. Four sturdy casters for mobility and easy access to back panel connections.

Technical Specifications

Frequency range	88 ~ 108 MHz
Antenna terminal	75 ohms (unbalanced)
Sensitivity	12.8 dBf
	1.2 μV (75 ohms)
50 dB quieting sensitivity	
MONO	18.1 dBf
	2.2 μV (75 ohms)
STEREO	38.1 dBf
	22 μV (75 ohms)
Total harmonic distortion	
wide	
MONO	0.08% (1 kHz)
STEREO	0.08% (1 kHz)
narrow	
MONO	0.15% (1 kHz)
STEREO	0.3% (1 kHz)
S/N	
MONO	80 dB
Frequency response	
variable	20 Hz ~ 18 kHz
	+0.1, -0.5 dB
fixed	20 Hz ~ 15 kHz
	+0.2, -0.8 dB
Alternate channel selectivity	
wide	25 dB
narrow	90 dB
Capture ratio	
wide	0.8 dB
narrow	2.0 dB
Image rejection at	
98 MHz	135 dB
IF rejection at	
98 MHz	135 dB
Spurious response rejection at	
98 MHz	135 dB
AM suppression	
(wide)	58 dB
Stereo separation	
wide	
1 kHz	50 dB
10 kHz	40 dB
narrow	
1 kHz	40 dB
10 kHz	30 dB
Carrier leak	
variable	-65 dB (19 kHz)
fixed	-70 dB (19, 38 kHz)
GENERAL	
Output voltage	
variable	0 ~ 1.5 V
fixed	0.7 V
Power consumption	27 W
Power supply	AC 120 V 60 Hz
Dimensions	
(H × W × D)	3-31/32" × 19" × 14-9/16"
	(101 × 482 × 370 mm)
Weight	15.9 lb (7.2 kg)

Technics

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Division of Matsushita Electric Corporation of America
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PANASONIC NEW JERSEY: 50 Meadowlands Parkway, Secaucus, New Jersey 07094 (201) 348-7000
PANASONIC BOSTON: 75 University Avenue (P.O. Box 487, Norwood, Mass.), Westwood, Massachusetts 02090 (617) 326-4000
PANASONIC BALTIMORE: 11 Azar Court, Baltimore, Md. 21227 (301) 247-4300
PANASONIC CHICAGO: 425 East Algonquin Road, Arlington Heights, Ill. 60005 (312) 364-7900
PANASONIC ATLANTA: 1 Meca Way, Duluth, Georgia 30136 (404) 448-1100
PANASONIC DALLAS: 1825 Walnut Hill Lane, Irving, Texas 75062 (214) 258-2828
PANASONIC WEST, INC.: 8383 Wilshire Blvd., Beverly Hills, Calif. 90211 (213) 655-1111
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PANASONIC HAWAII, INC.: 320 Waiakamilo Road, Honolulu, Hawaii 96817 (808) 847-5361

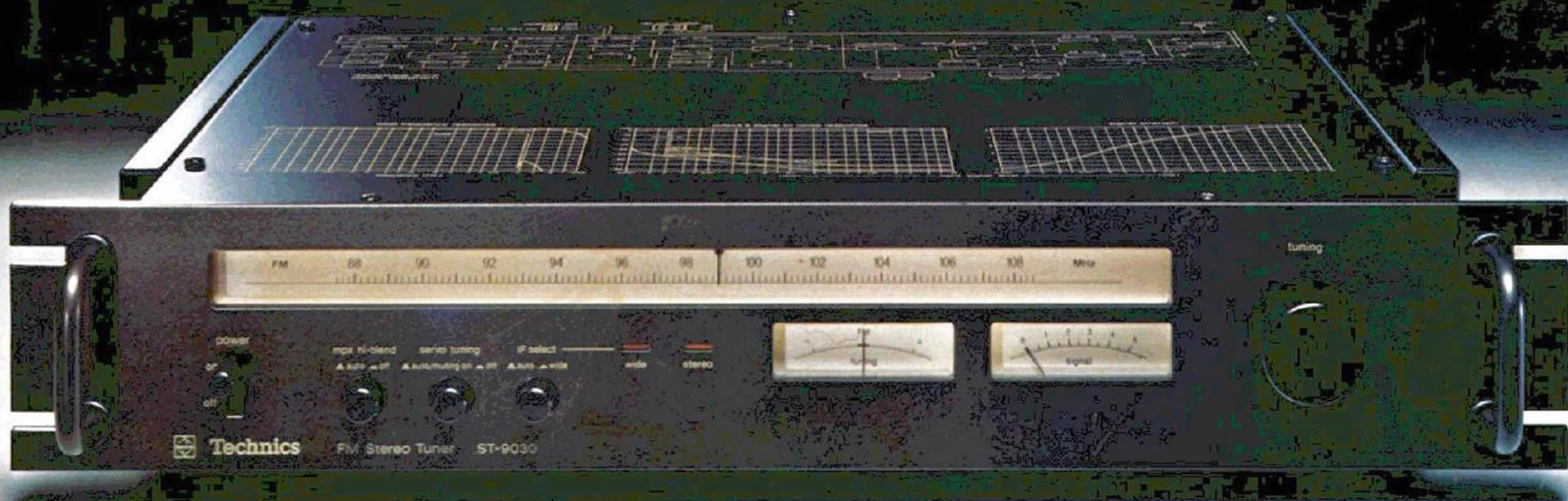


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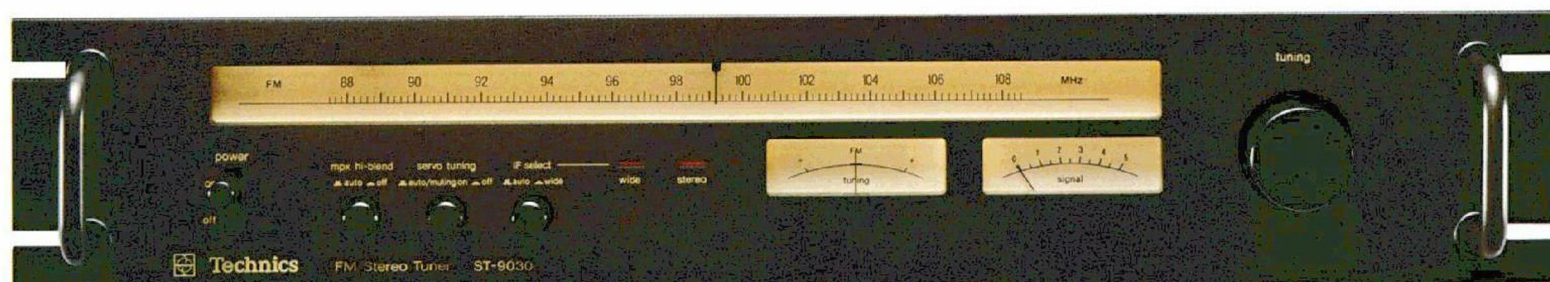
FM Stereo Tuner



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ST-9030 FM Stereo Tuner



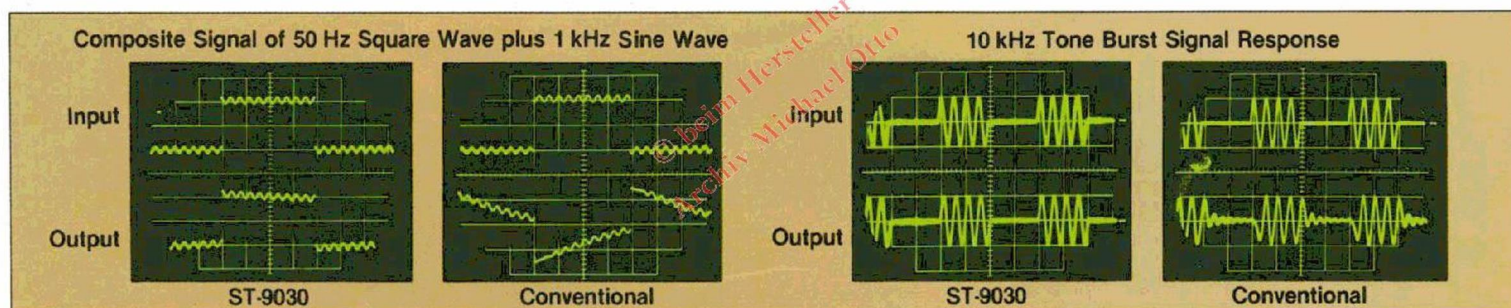
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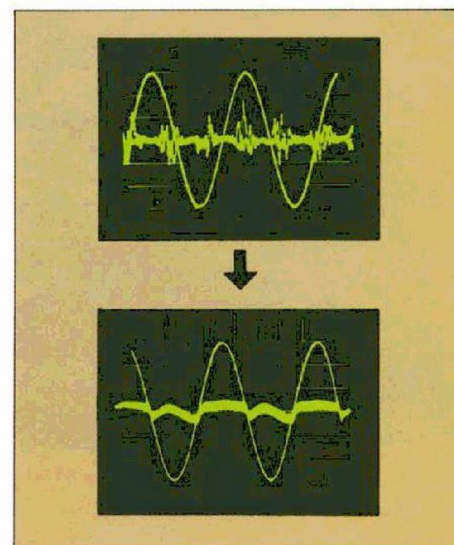
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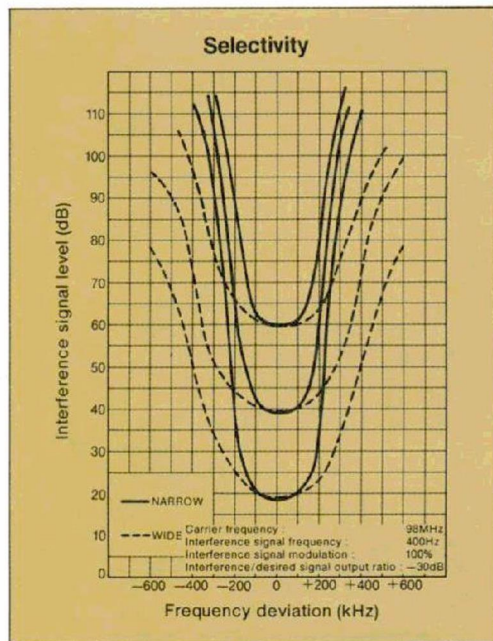


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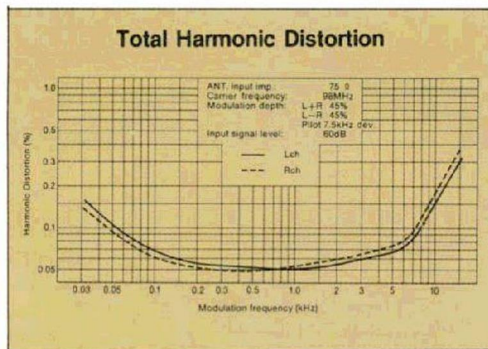
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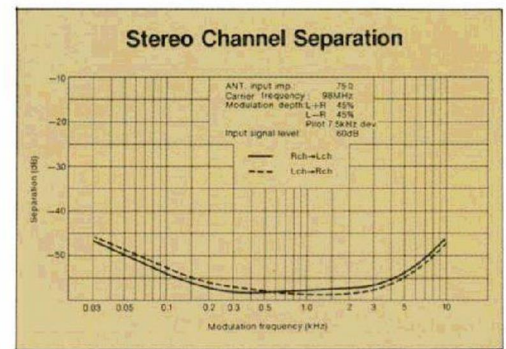


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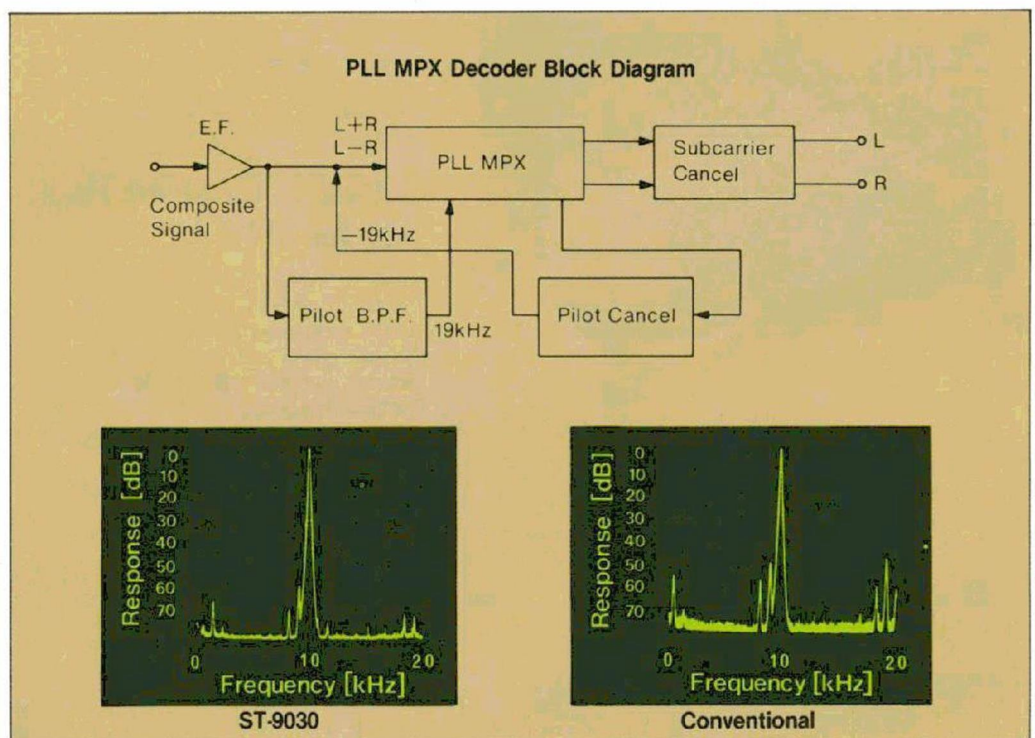
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By comparing the demodulation spectral distributions of 10kHz modulated signals in the ST-9030 and a conventional tuner, the vast improvement achieved by the cancel circuits becomes very clear indeed. The ST-9030 shows much less generation of higher harmonics and other unwanted components caused by beat phenomena.

A 19kHz signal supplied by the IC, and which has been synchronized perfectly with the pilot signal, undergoes waveform shaping into a pure 19kHz signal, and is amplified in the stereo muting circuit (which passes the 19kHz signal only during stereo). This is then fed back to the input side of the MPX to cancel out the unwanted pilot signal, thus avoiding any problems in subsequent non-linear circuits.



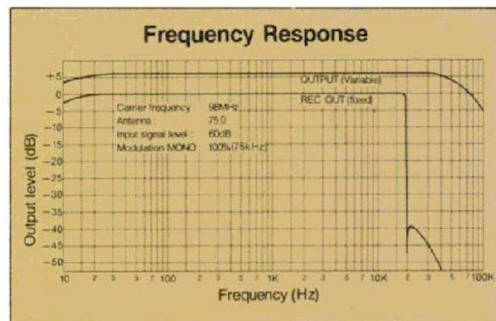
Effect of Pilot Cancel Circuit

Output spectrum when f. mod. 10kHz input is applied. Left: ST-9030—note almost complete absence

of 19kHz and other unwanted components. Right: Conventional tuner without pilot cancel circuit.

Extended Frequency Response of 20Hz~18kHz (+0.1~0.5dB)

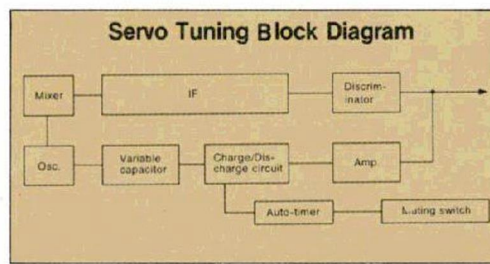
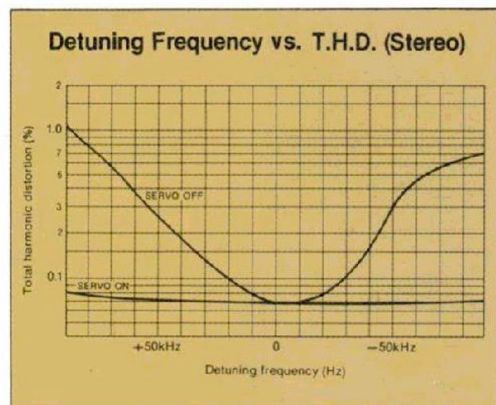
Because the stereo decoding pilot signal is now eliminated by the electronic pilot cancel circuit, rather than a low-pass filter (which unavoidably removes some of the wanted program as well), frequency response in the ST-9030 is improved by a very significant margin. In addition, a cancel circuit for removal of the 38kHz sub-carrier has also been included. The resultant flat frequency response all the way from 20Hz to 18kHz with only +0.1, -0.5dB deviation gives an exceptionally high degree of high fidelity that is still very rare in tuners today. The ST-9030 has also eliminated the cause of the "jitter" problem caused by mixing modulated input signals in the MPX. Deterioration of stereo separation, and distortion in the high frequency region is thus suppressed even further.



Servo Tuning Circuit for Stable and Accurate Tuning

Practically invincible stability in station tuning is assured by this advanced electronic device which locks onto the tuned frequency, and stays there despite any minor fluctuations in carrier frequency, local oscillator frequency, or IF center frequency. This means greater reliability due to the complete absence of drift which could lead to distortion and loss of stereo separation.

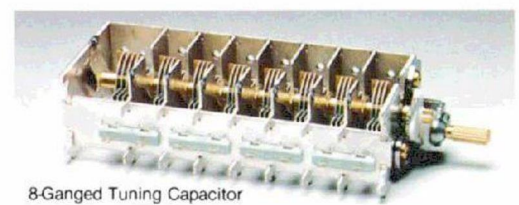
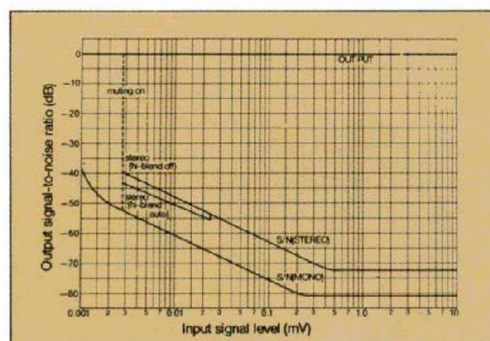
When retuning to another station, servo tuning is temporarily switched off. The muting width (the degree of detuning before muting sets in) is also readjusted, contracting from $\pm 100\text{kHz}$ when servo tuning is on, to $\pm 50\text{kHz}$ when switched off. Furthermore, the center tuning meter is locked to within $\pm 10\text{kHz}$ of the center position when servo tuning is on.



High Sensitivity Front-End Equipped with FM Linear Frequency 8-Ganged Variable Tuning Capacitor

The ST-9030 tuner's front-end, one of the most critical stages in any tuner, is equipped with an advanced linear frequency 8-ganged variable tuning capacitor. The improvement in sensitivity and reduction of noise levels is also due in part to the adoption of 3 double-tuned circuits, plus dual gate MOS FETs in the 2-stage RF amplifier and the balanced mixer circuit. The use of special low-noise transistors in the local oscillator, and a tuned buffer circuit inserted prior to the mixer, also contribute to the very high stability in this tuner. The tuned buffer circuit employed here is a combination of tuning circuit and junction FET, including a 2-ganged variable capacitor. It is very effective in maintaining waveform fidelity and preventing any reverse effect of RF signals.

These innovations have made the ST-9030 extremely robust, being capable of handling even exceptionally strong signals without overload. Spurious response and other basic characteristics have also been improved by very significant degrees. Furthermore, "hot" portions of the circuitry have been elevated above the glass epoxy coated circuit board, eliminating yet another potential degradation of the ST-9030's waveform fidelity.



Automatic Hi-Blend Switch Improves Weak-Area S/N

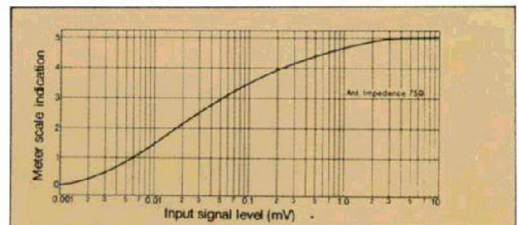
To further improve the quality of rather distant or weak FM stations, the hi-blend feature in the ST-9030 is operated automatically (although switch-over to manual operation is also naturally provided). When the input stereo signal drops below a level of 34.7dBf, the hi-blend mechanism is activated automatically to suppress noise at the slight expense of some stereo separation.

Positive Muting in Narrow and Wide Band Operation Made Possible by NAND Muting

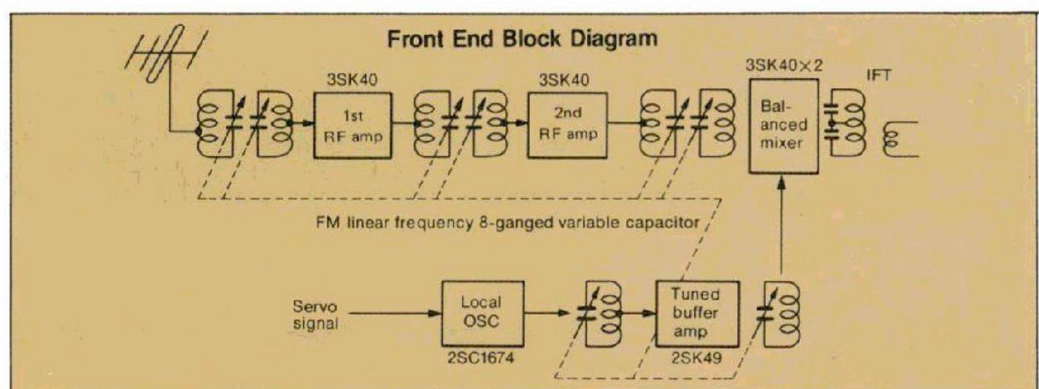
Complete muting of inter-station noise has now been made possible by the NAND muting switching system which automatically sets the muting width and level in accordance with signal level and whether narrow ($\pm 50\text{kHz}$) or wide ($\pm 120\text{kHz}$) bandwidth is being used at any given moment. This has been made possible by the independent regulation of muting level and muting width by the signal level and DC signal.

Other Important Features

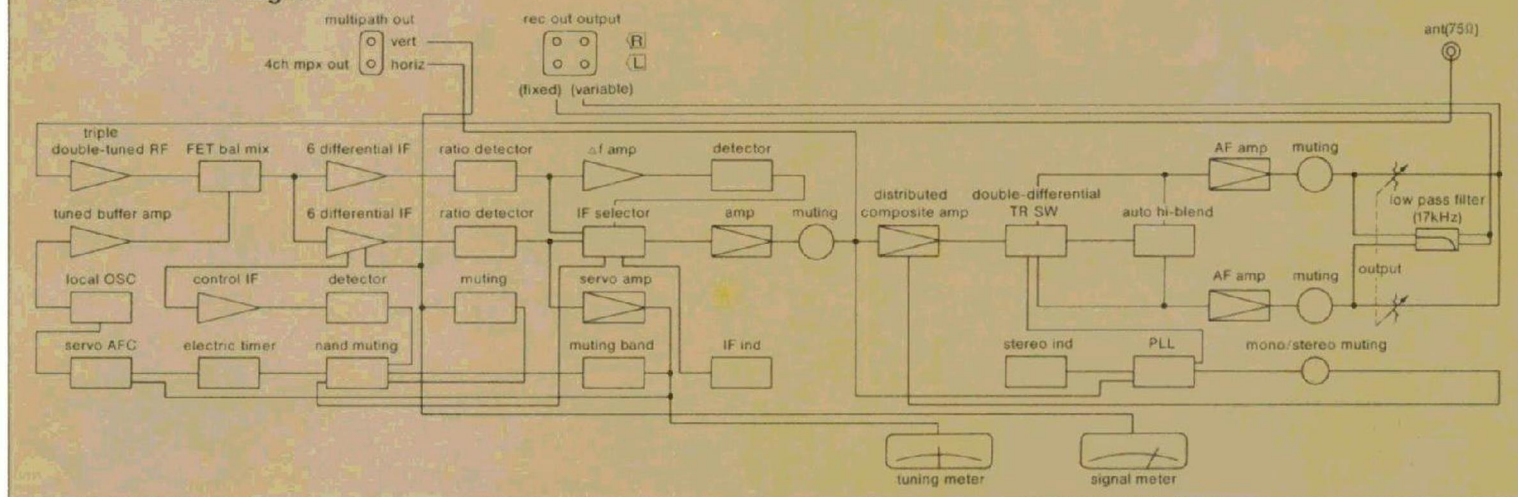
- Precision signal meter linear to as high as 81dBf, thus providing accuracy in measuring even very strong signals.



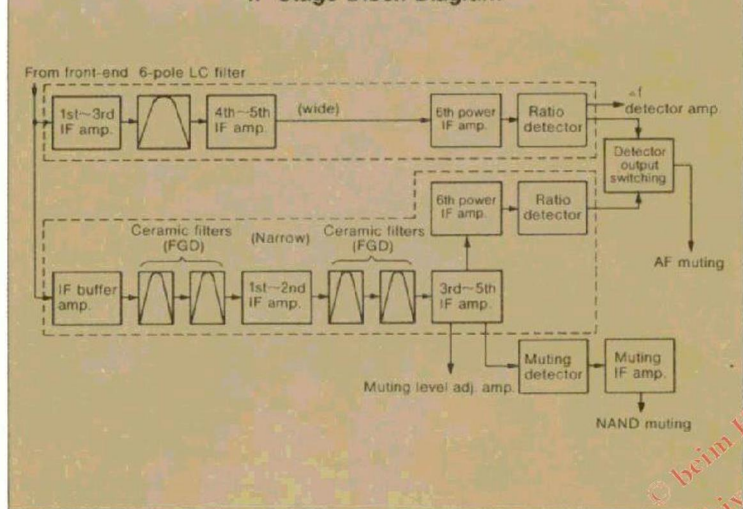
- Special 75 ohm F-type antenna connector for co-axial cable. 75 ohm cable is strongly recommended in the interest of noise-free reception.
- AC power supply line-filter to eliminate ripples and other interference signals induced via the AC power cord.
- High performance monolithic operation amplifier IC for audio frequency amplification, and independent constant voltage supplies for both radio and audio frequency amplification circuits.



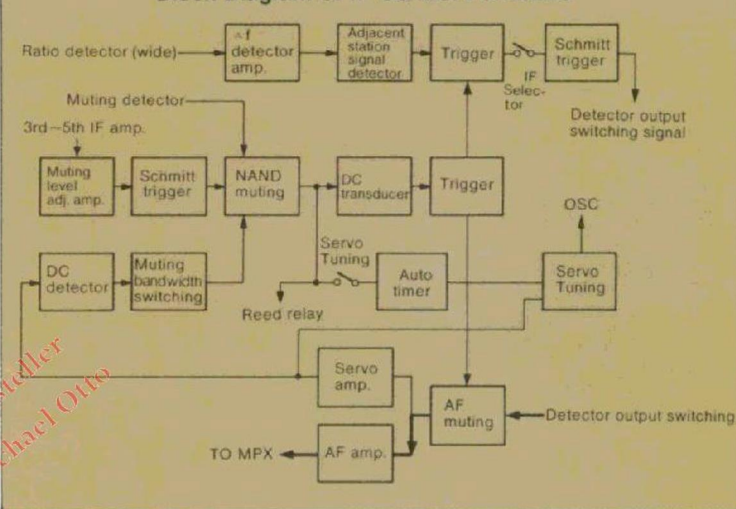
ST-9030 Block Diagram



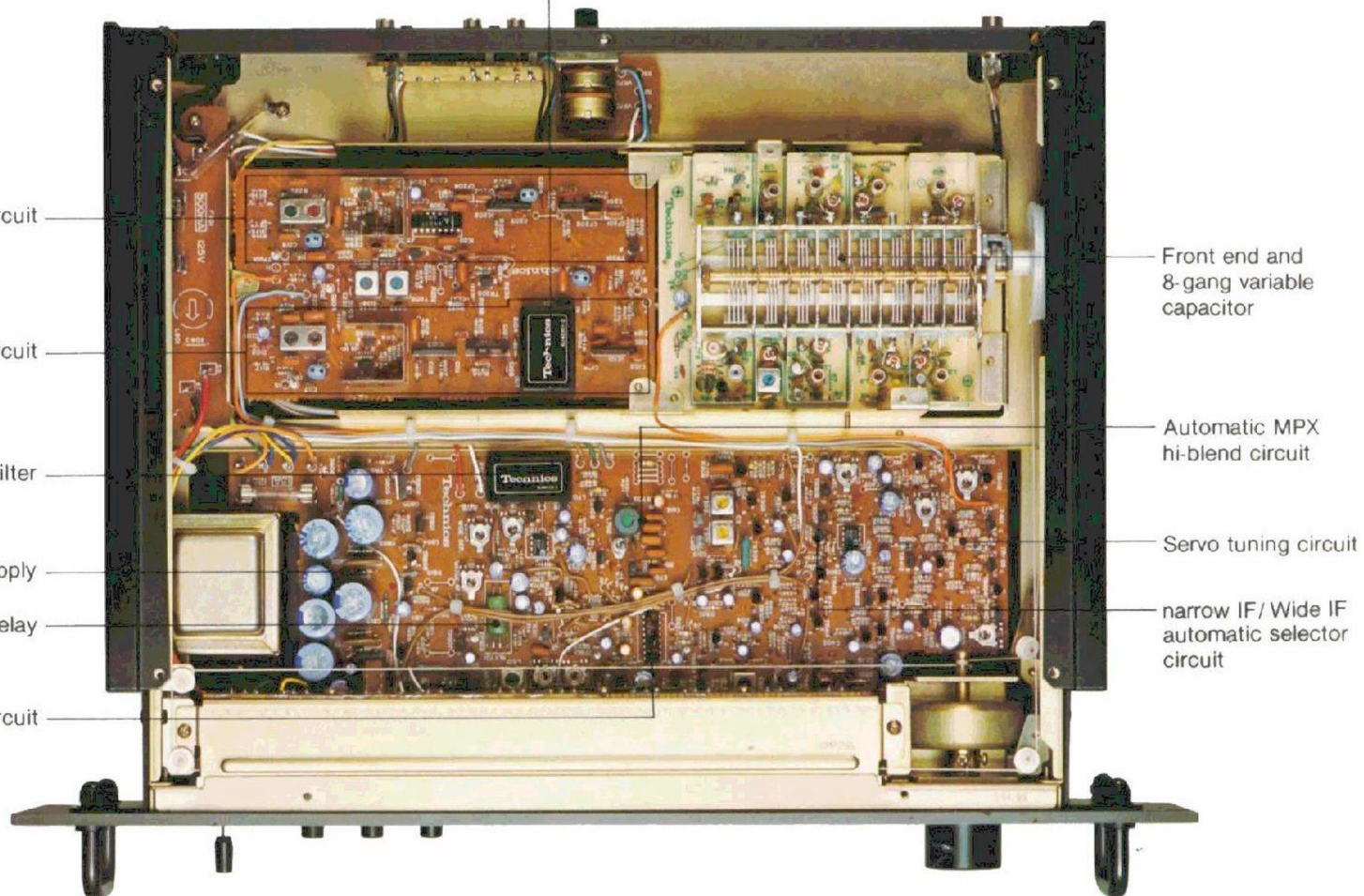
IF Stage Block Diagram



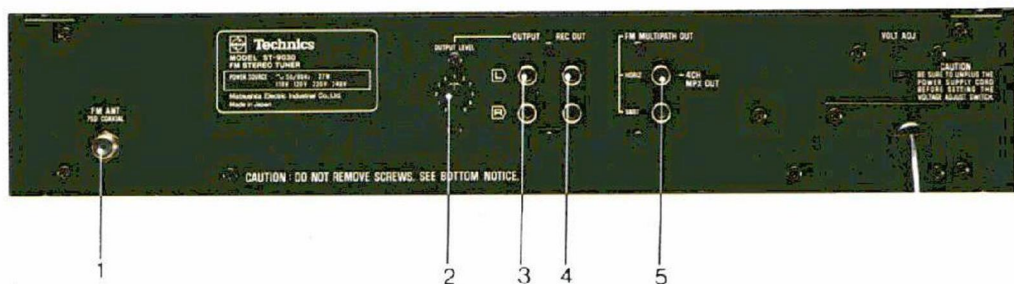
Block Diagram of IF Control Functions



Flat group delay block filter



Rear Panel Facilities



1. Terminal for FM antenna 75Ω coaxial cable
2. Output level control
3. Output terminals (Variable)
4. Output terminals (Fixed)
5. 4-channel MPX output & FM multipath outputs

The "Flat" Component System is dedicated to ultimate performance at an affordable price.



Ultimate performance. Because in creating the "flat" system Technics engineers separated the basic amplifier/tuner into five components. Researched and developed each component to state-of-the-art perfection. Then recombined the components into a system that provides a magnitude of performance once thought to be purely theoretical. Affordable price. Because each component is priced far lower than what you'd expect, considering its 'extraordinary quality. And because the five-way breakup lets you buy just the equipment that you need—or can afford—right now. With the possibility of adding the rest of the system in the future.

The "Flat" Component System consists of:

- ST-9030: FM Stereo Tuner
- SU-9070: Stereo DC Preamplifier
- SH-9010: Stereo Universal Frequency Equalizer
- SH-9020: Peak/Average Meter Unit
- SE-9060: Stereo/Mono DC Power Amplifier

Movable Custom Rack, Model SH-999K

Elegant custom rack for Technics "Flat" components or other 45cm units. Side panels black grain veneer, glass top and front door. Record compartment holds several dozen LP's. Four sturdy casters for mobility and easy access to back panel connections.

Dimensions 540×969×400 mm (W×H×D)

Technical Specifications

Frequency range	88~108 MHz
Antenna terminal	75 Ω (unbalanced)
Sensitivity	12.8 dBf, 1.2 μV (75 Ω, IHF '58) S/N 30 dB, 1.2 μV (75 Ω) S/N 26 dB, 1.1 μV (75 Ω) S/N 20 dB, 1.0 μV (75 Ω)
50 dB quieting sensitivity	
MONO	18.1 dBf, 2.2 μV (75 Ω, IHF '58)
STEREO	38.1 dBf, 22 μV (75 Ω, IHF '58)
Total harmonic distortion	
wide MONO	0.08% (1 kHz)
STEREO	0.08% (1 kHz)
narrow MONO	0.15% (1 kHz)
STEREO	0.3% (1 kHz)
S/N	80 dB (MONO), 75 dB (MONO, DIN)
Frequency response	
variable	20 Hz~18 kHz +0.1, -0.5 dB
fixed	20 Hz~15 kHz +0.2, -0.8 dB 20 Hz~18 kHz ±1.5 dB (DIN)
Alternate channel selectivity	
wide	25 dB
narrow	90 dB
Capture ratio	
wide	0.8 dB
narrow	2.0 dB
Image rejection at 98 MHz	135 dB
IF rejection at 98 MHz	135 dB
Spurious response rejection at 98 MHz	135 dB
AM suppression	58 dB (wide)
Stereo separation	
wide	50 dB (1 kHz), 40 dB (10 kHz)
narrow	40 dB (1 kHz), 30 dB (10 kHz)
Carrier leak	
variable	-65 dB (19 kHz), -60 dB (19 kHz, DIN)
fixed	-70 dB (19 kHz, 38 kHz), -65 dB (19 kHz, DIN)
Channel balance	0 dB
Limiting point	1.0 μV (75 Ω)
Bandwidth (wide/narrow)	
IF amplifier	300 kHz/200 kHz
FM demodulator	1.5 MHz/1.5 MHz

GENERAL

Output voltage	
variable	0~1.5 V
fixed	0.7 V
Power consumption	27 W
Power supply	110/120/220/240 V
Dimensions (W×H×D)	450×92×370 mm
Weight	7.4 kg

 **Technics**
Matsushita Electric