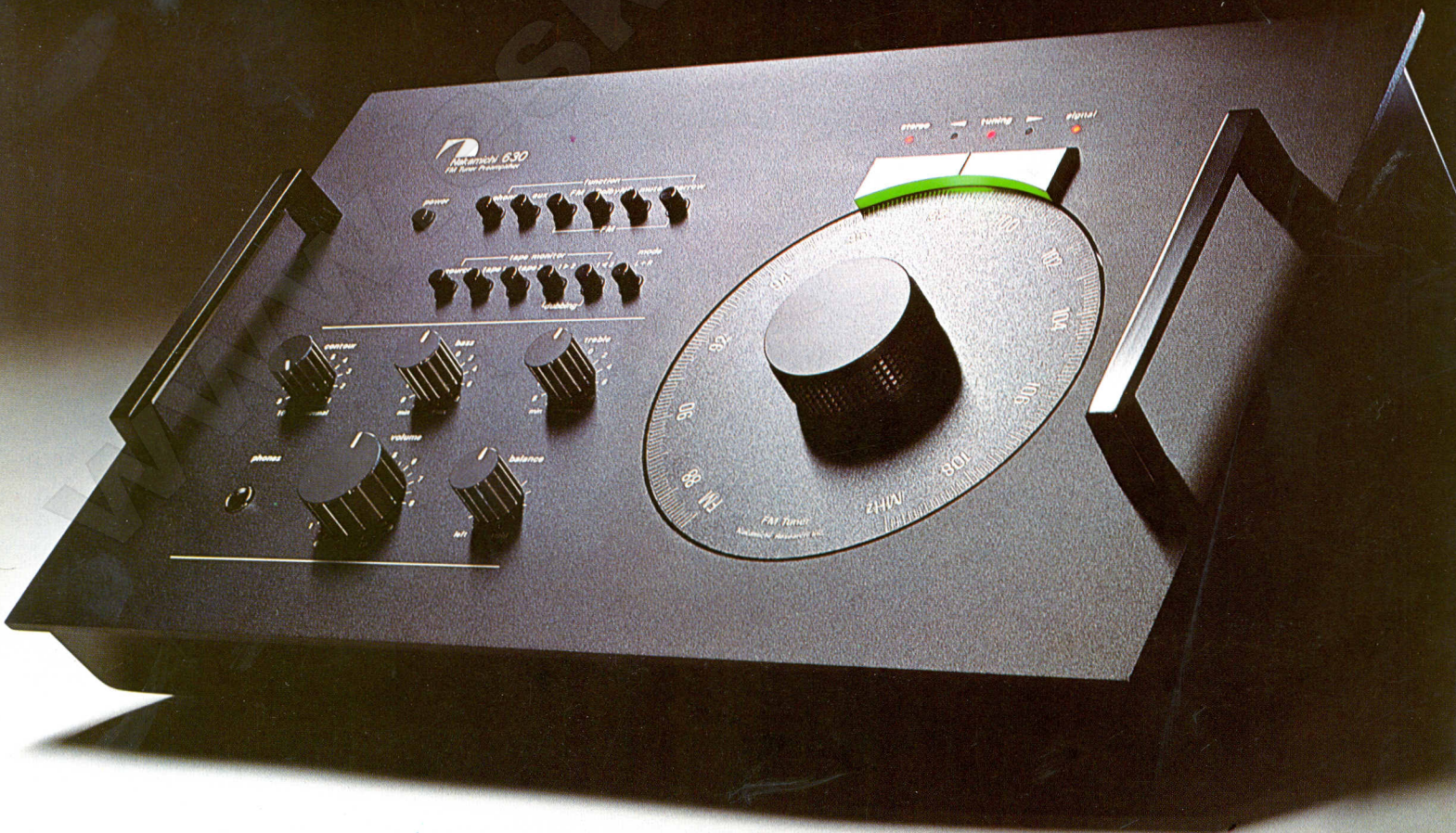




Nakamichi 630

FM Tuner Preamplifier





Nakamichi **630**
FM Tuner Preamp

AN UNUSUAL AND VERSATILE COMBINATION

Nakamichi has combined proven state-of-the-art preamplifier circuitry with an exceptional FM tuner to create yet another fine component for the now famous 600 Series. The 630 is a versatile FM Tuner Preamp which offers outstanding performance and quality at a price one would normally expect to pay for such a fine tuner or preamp alone.

FM STEREO DISTORTION: LESS THAN 0.08% (40 dB SELECTIVITY, 1 kHz)

SELECTIVITY:

BETTER THAN 40 dB (NORMAL)

BETTER THAN 80 dB (NARROW)

Why not a receiver?

Despite tremendous advances in circuit miniaturization, the fact remains that the most critical components of an FM tuner (the front end and IF strip) take up space. Although "the bigger, the better" does not always apply, it can be said that larger tuners generally offer superior performance. Since a power amplifier also requires a finite amount of space, a receiver is always a compromise in performance, unless, of course, it is of gigantic proportions. Even then, it is difficult to keep spurious radiations from the power amplifier circuits from adversely affecting FM performance. The tuner/preamp format of the 630 further offers freedom of choice in the type and size of power amplifier. A user with medium power requirements, for example, can place the 630 atop a Nakamichi 420 Power Amplifier to form a compact system with performance unavailable in a receiver and rarely found in "separates." The audiophile with considerably higher power requirements can utilize the 630 with two Nakamichi 620 Power Amplifiers (either free-standing or in the System One Rack) bridged for monaural operation — no receiver in the world offers 350 watts per channel into 8 ohms.

High Precision FM Tuner Section

The 630's FM tuner section is decidedly one of the most advanced ever designed. The unusual tuning dial is only one of numerous innovations found throughout the tuner section. Each stage of the FM circuit contains the most advanced features to be found on the market today.

— an expensive and elaborate front end

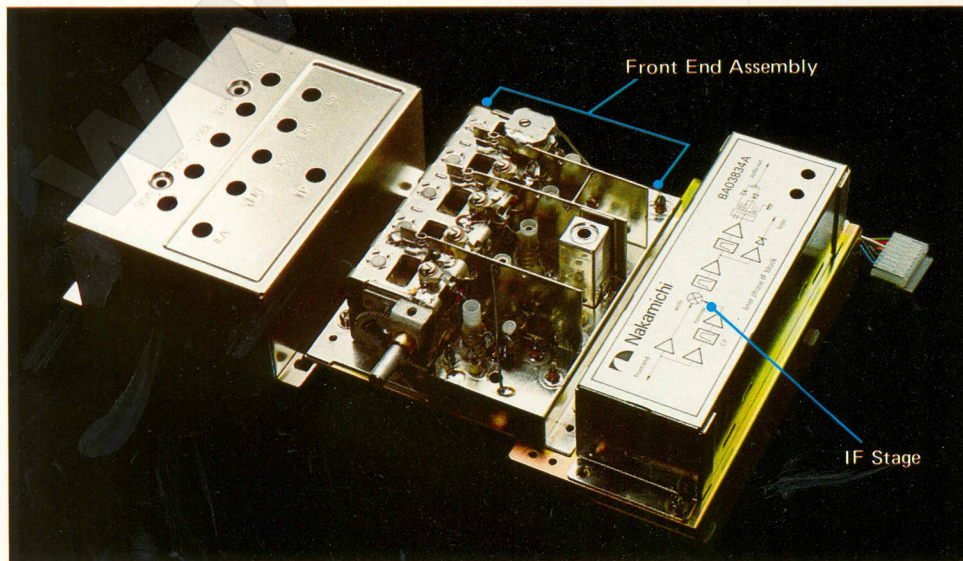
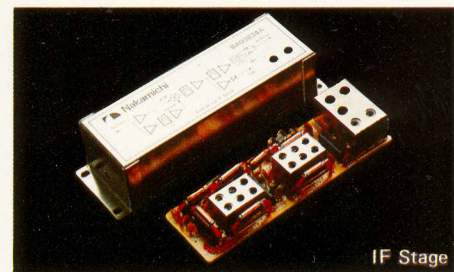
The front end of the 630's FM section employs a specially designed ganged 5-section linear variable tuning capacitor. Although the components of a conventional FM front end are mounted on a printed circuit board, the 630 features hand-wiring of critical components directly onto the front end chassis. Although costly, this method ensures near-zero local oscillator leakage and low drift thanks to the higher heat conductivity of the metal chassis. The sophisticated RF stage employs low-noise dual-gate MOSFET devices which effectively minimize harmonic distortion, intermodulation products and other undesirable inter-

ferences. Use of the finest quality components and careful design have resulted in the highest possible usable sensitivity.

— linear phase IF filter for flat group delay and maximum selectivity

An FM tuner's IF stage can largely determine overall performance because it controls two of the most important parameters: distortion and selectivity. Ironically, good distortion and good selectivity are almost mutually exclusive because one is generally improved at the expense of the other.

The reason is that an FM signal consists of not only a single frequency but also various modulation sidebands on both sides of the center frequency (tuning frequency). The amount of overall distortion is dependent on how accurately these sidebands are transmitted to the demodulator network (next stage). The main purpose of the IF filter, however, is to pass through only a certain portion of the signal by suppressing unwanted frequencies. Tuners with high selectivity, therefore, usually employ many stages of filters. All filters, unfortunately, have the undesirable side effect of causing frequency dependent group delay. Put simply, this means that some frequencies of the signal are delayed more than others, and this caused distortion. The 630's IF stage



achieves excellent group delay characteristics while maintaining high selectivity by applying technology originally developed for the integrated circuit. Close grouping of the LC filter networks have resulted in the selectivity of a 12-stage filter but with the group delay characteristics of a 2-stage filter. In the "narrow" filter position, the IF stage utilizes a special "uni-wafer" with four ceramic filters, together with a 2-stage linear-phase LC filter, for even better selectivity at very little sacrifice in distortion. The entire IF section, furthermore, is shielded (a very uncommon practice) to minimize spurious emissions that can adversely affect other sections of the tuner.

— choice of “narrow” or “wide” filter response

In areas where the stations are crowded together, the 630 user may select “narrow” filter response to increase selectivity to an amazing 80 dB while maintaining superb distortion and separation figures.

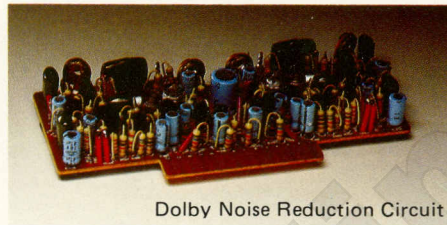
— phase-locked loop (PLL) demodulator

The multiplex demodulator of the FM stereo section utilizes phase-locked loop circuitry which assures high temperature stability and drift-free performance.

— built-in Dolby Noise Reduction circuitry

Depressing the Dolby FM switch on the 630

activates B-type Dolby decoding circuitry as well as the 25 microsecond de-emphasis required for proper reception of Dolby FM broadcasts.



Dolby Noise Reduction Circuit

— a truly effective 19 kHz filter

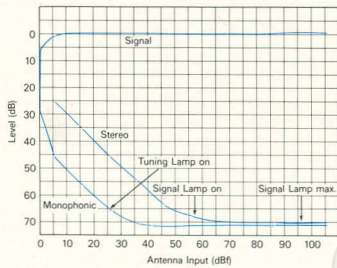
The 630 incorporates a filter which reduces the 19 kHz FM Stereo carrier signal by 70 dB, thus preventing it from interfering with Dolby and other circuitry.

— noise-free muting circuit

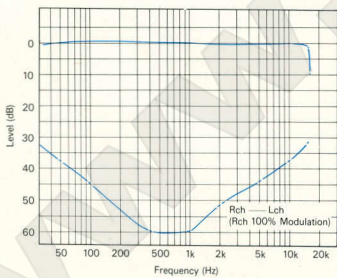
The muting circuit suppresses interstation noise completely and without the “thumping” noise characteristic of most muting circuits as one tunes through a station.

— unique tuning indicators

Instead of tuning meters, which are often difficult to read, the 630 utilizes a series of tuning lights that indicate center tuning, tuning direction, stereo station and signal strength. Combined with the 630’s “human-engineered” large tuning dial, they make precise station selection a breeze.

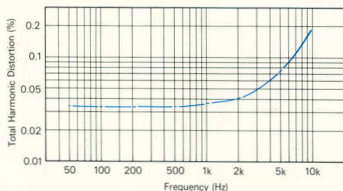


Input vs. Noise Level



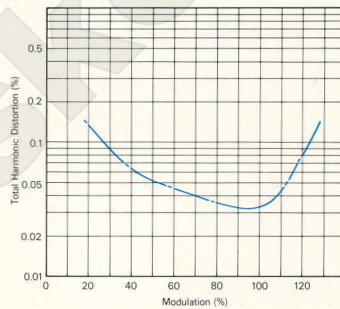
Stereo Separation

Antenna Input: 98MHz, 65dBf, 1mV, 300ohm
IF: Normal



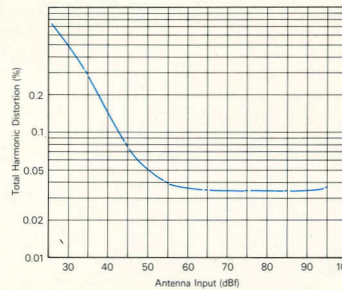
Frequency vs. Total Harmonic Distortion (Stereo)

Antenna Input: 98MHz, 65dBf, 1mV, 300ohm
Modulation: main 45.5%
sub-carrier 45.5%
pilot 9%



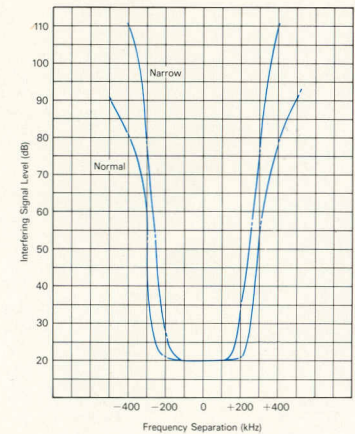
Modulation vs. Total Harmonic Distortion

Modulation: main 45.5%
sub-carrier 45.5%
pilot 9%
Frequency: 1kHz
Antenna Input: 98MHz, 65dBf, 1mV, 300ohm



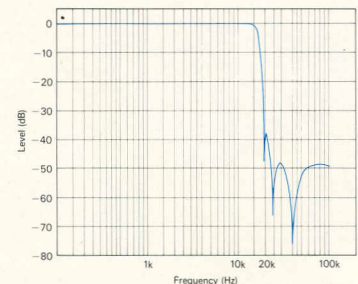
input vs. Total Harmonic Distortion (Stereo)

Modulation: main 45.5%
sub-carrier 45.5%
pilot 9%

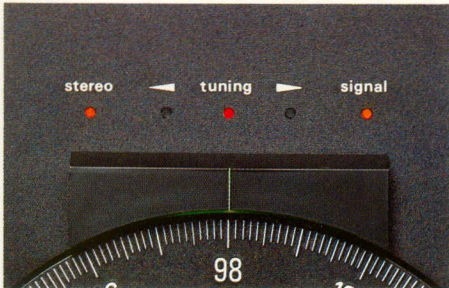


Selectivity

Impedance: 300ohm
Interfering Signal: 1kHz, 100% Modulation
Interference Output Level: -30dB
Desired Signal: unmodulated



MPX Filter Characteristics



A Brief Explanation of Dolby FM*

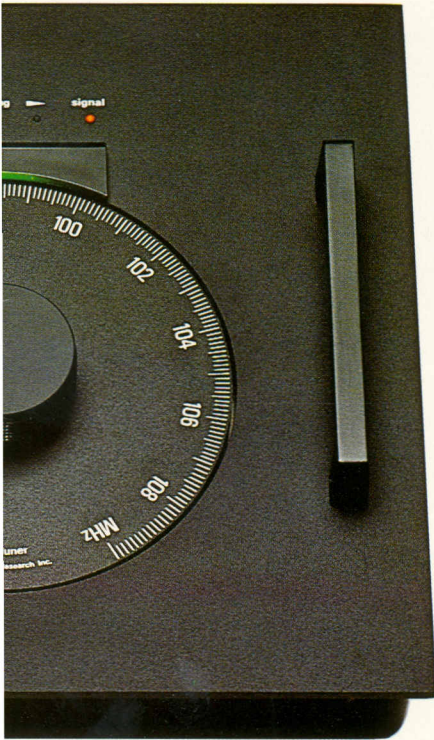
The Nakamichi 630 incorporates B-type Dolby Noise Reduction decoding circuitry to take advantage of the fact that there are now many stations (in the United States) broadcasting Dolby FM. FM stereo has always been a relatively noisy medium, requiring a rather sharp pre-emphasis (boosting of high frequencies) at the transmitter and a complementary de-emphasis (restoration of pre-boostered highs) at the tuner or receiver to achieve a reasonable semblance of noise-free performance. The 75 microsecond time constant (50 microseconds in most European countries) defines the standard pre-emphasis curve currently being used by non-Dolbyized FM stations. The drawback of so much pre-emphasis is that stations must utilize large amounts of high frequency limiting to prevent over-modulation, or else modulate at an overall lower level and end up with what the pre-emphasis was supposed to counter in the first place: poor signal-to-noise ratio. This is why even the best of FM broadcasts have lacked the dynamic range of today's better quality LP discs, especially at the higher frequencies. Dolby FM improves the quality of reception in two basic ways (assuming the station is broadcasting Dolby FM):

- better signal-to-noise ratio, especially in weak signal areas;
- full recovery of high frequency dynamic range in any reception area.

The increase in signal-to-noise is the result of the well-known properties of the Dolby Noise Reduction System. Dolby FM utilizes the same B-type Dolby circuitry found today on numerous cassette tape recorders. The increase in high frequency dynamic range can be attributed to a new FM time constant, 25 microseconds. FM stations broadcasting Dolby FM utilize this new time constant which reduces pre-emphasis to an optimum level. High frequency over-modulation and the need for drastic limiting are eliminated. Depressing the Dolby FM switch on the Nakamichi 630 changes the de-emphasis time constant from 75 microseconds (50 microseconds in Europe) to 25 microseconds and activates the built-in Dolby Noise Reduction System.



EXTREMELY LOW-NOISE, LOW-DISTORTION PREAMPLIFIER CIRCUITRY —



The preamplifier section of the Nakamichi 630 has many circuits and features in common with the Nakamichi 610 Control Preamplifier and the 410 Preamplifier, units which have proven themselves to be of the highest order among electronic components. The 630's preamplifier features the following:

— an unexcelled phono section

Utilizing a unique "triple-transistor" first stage and class A push-pull current drive circuitry, the 630's phono preamplifier achieves new lows in noise and distortion. The wide dynamic range and switch selectable input sensitivity (1, 2 or 5 mV) permits the use of a wide range of phono cartridges including several moving-coil devices without the normally required intermediate signal boosting devices.

— bass, treble and contour controls

In addition to precision bass and treble tone controls, the 630 features a contour control which acts independently of the volume control to compensate for the human ear's de-sensitization to the extreme low and high frequencies at low listening levels. Unlike the "loudness" compensation switches found on many units, the 630's contour control provides a realistic level of low and high frequency boosting at soft listening levels regardless of the actual volume control setting.

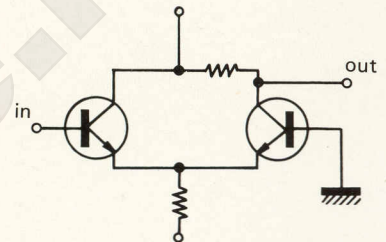
— tape deck monitoring and dubbing facilities

Up to two tape decks may be monitored independently without affecting recordings in progress. Tape copying does not require re-connection of the decks because front panel switches on the 630 provide copy capability.

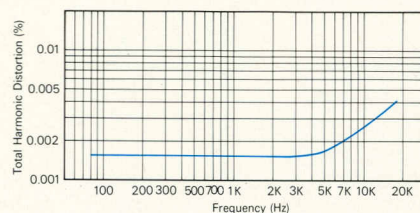
— high output headphone amplifier

The headphone amplifier in the 630 provides a maximum of 300 mW per channel into 8 ohm stereo headphones.

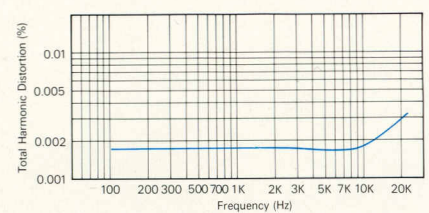
Why there are no differential amplifiers at critical stages in Nakamichi preamplifiers ...



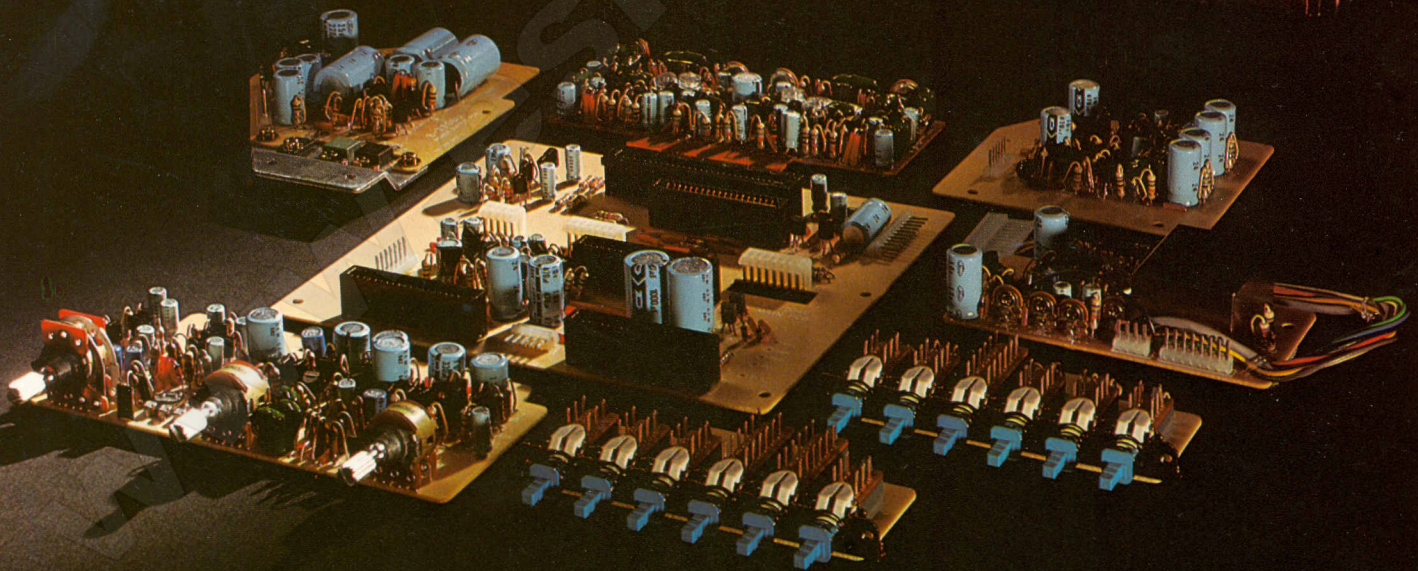
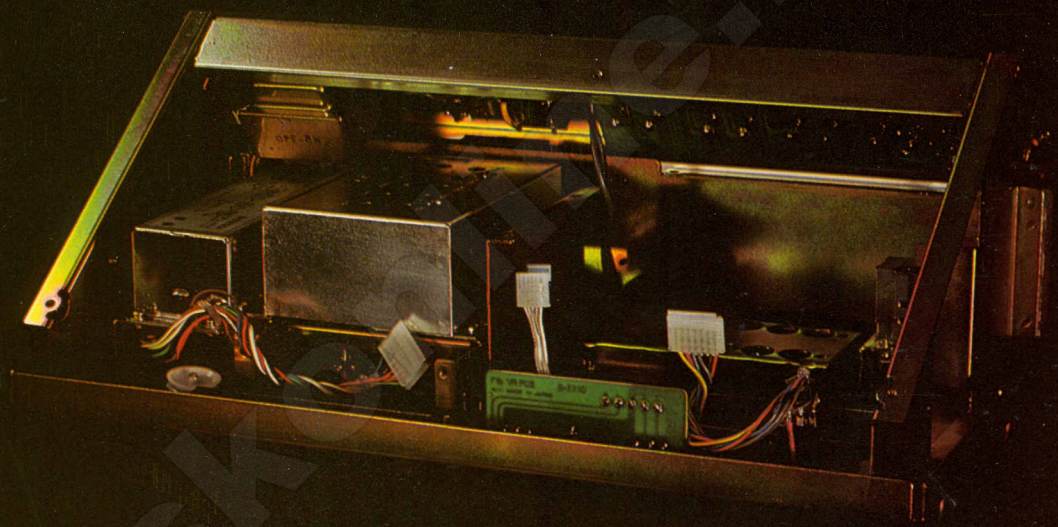
Virtually all electronics manufacturers employ differential amplifiers in their preamplifier circuitry. The differential amplifier (see schematic representation), when used as a first stage, offers the circuit designer relatively high input impedance and a convenient method for applying negative feedback. Our ongoing research into "initial linearity," however, has proven that differential amplifiers are highly non-linear at near-zero signal values. Nakamichi believes small signal linearity to be extremely critical, especially in terms of a device's tonal quality. Most manufacturers have ignored this aspect in favor of impressive distortion specifications at high signal levels. A quick glance at the specifications will confirm that Nakamichi has not made any sacrifices in conventional dynamic range and distortion measurements, but only detailed narrow-band spectral analysis and careful listening will reveal that much attention has been paid to initial linearity. The phono sections of Nakamichi preamplifiers, therefore, use no differential amplifiers. Instead, single collector-follower transistor configurations with constant current loading are employed at the critical initial stages where sound coloration can most easily occur. The lack of differential amplifiers is only one of the ways in which Nakamichi products are able to deliver clean and accurate sound. High initial linearity is an underlying design consideration for all individual Nakamichi components, from magnetic heads and phono preamps, to power amplifiers and loudspeakers.



Frequency vs. Total Harmonic Distortion
Phono Input Output: 2V Constant
Input: 2mV



Frequency vs. Total Harmonic Distortion
Aux Input Output: 2V constant



Nakamichi 630 Specifications

Power Requirements... 100-120/220-240 VAC,
50/60 Hz
Power Consumption... 20 VA

Preamplifier Section

Input Sensitivity/Impedance
phono 1 mV, 2 mV, 5 mV/100k ohms
aux 100 mV/150k ohms
tape monitor 1, 2 100 mV/150k ohms
Maximum Input Levels
phono 250 mV (1 kHz, 5 mV position)
Output Levels/Output Impedance/Load Impedance
Preamplifier output 1 V/500 ohms/10k ohms
rec out 200 mV/1k ohms/50k ohms
headphone 40 mW/4.5 ohms/8 ohms
Maximum Output at Clipping
preamplifier output 5 V into 50k ohms
rec out 4 V into 50k ohms
headphone 300 mW into 8 ohms
Frequency Response
phono RIAA
deviation within ± 0.3 dB
aux 20-50,000 Hz +0, -1.5 dB
tape monitor 20-50,000 Hz +0, -1.5 dB
Signal-to-Noise Ratio
(IHF-A)/Equivalent Input Noise
phono Better than 80 dB (ref. 1 mV)/
-140 dB
aux, tape monitor Better than 102 dB/-122 dB
Residual Noise Level (IHF-A)
headphone 8 microvolts or less (8 ohms)
preamplifier output 4 microvolts or less
(VR @ min.)
Distortion
phono Less than 0.003%
(all freq. up to 10 kHz)
aux, tape monitor Less than 0.004%
Tone Control
bass ± 9 dB at 20 Hz
treble ± 9 dB at 20 kHz
Contour (control @ "B")
-30 dB @ 3 kHz
-15 dB @ 20 Hz
-24 dB @ 20 kHz

Tuner Section

Frequency Band 88 MHz - 108 MHz
Usable Sensitivity (for 30 dB quieting)
mono 2.5 μ V (300 ohms), 13 dBf
stereo 25 μ V (300 ohms), 33 dBf
Sensitivity for 50 dB quieting
mono 5 μ V (300 ohms), 19 dBf
stereo 50 μ V (300 ohms), 39 dBf
Sensitivity for 3% Total Noise and Distortion (Stereo)
..... 35 dBf
Signal-to-Noise Ratio (@ 65 dBf)
Dolby NR out mono better than 70 dB
stereo better than 68 dB
Dolby NR in mono better than 75 dB
stereo better than 73 dB
Muting Threshold 17 μ V (300 ohms), 30 dBf
(tuning lamp "on")
Frequency Response... 30-15,000 Hz +0.3 dB, -1.5 dB
Distortion (@ 65 dBf, 100% modulation)
100 Hz and 1 kHz
wide mono less than 0.05%
stereo less than 0.08%
narrow mono less than 0.15%
stereo less than 0.5%
6 kHz
wide mono less than 0.1%
stereo less than 0.15%
narrow mono less than 0.3%
stereo less than 0.8%
Capture Ratio 1 dB (wide)
Alternate Channel Selectivity
wide better than 40 dB
narrow better than 80 dB
Stereo Separation
wide 100 Hz ... better than 40 dB
1 kHz better than 50 dB
10 kHz ... better than 35 dB
narrow 100 Hz ... better than 30 dB
1 kHz better than 30 dB
10 kHz ... better than 30 dB
Spurious Response
Rejection better than 100 dB
Image Rejection better than 100 dB @ 98 MHz
IF Rejection better than 100 dB
AM Suppression better than 60 dB
SCA Rejection better than 75 dB

Frequency Drift less than 30 kHz, -10° to 60°C
MPX Filter -70 dB @ 19 kHz
Antenna 300 ohms balanced
75 ohms unbalanced
Tuner Output 290 mV (50% modulation)
Dimensions 16(W) x 6-11/16(H) x 9-5/16(D)
inches
400(W) x 170(H) x 237(D) m/m
Weight 15-1/2 lb. (approx.)
7 kg.

- Specifications and appearance design are subject to change for further improvement without notice.
- Dolby NR under license from Dolby Laboratories Inc.
- The word "Dolby" is a trademarks of Dolby Laboratories Inc.

Nakamichi SYSTEM ONE

The Nakamichi 600 Series was originally envisioned as a group of components that would allow the creative audiophile a degree of flexibility and control in the recording and reproduction of music never before available on consumer high fidelity equipment. SYSTEM ONE is a custom rack with built-in multi-function digital program timer, which offers a slim and compact method for stacking the 600 Series components. Differing in basic concept from the professional 19-inch standard rack, SYSTEM ONE is decidedly non-industrial in appearance and complements any decor. Its mobility allows it to become the nucleus of a high accuracy music system just about anywhere in the home or studio.

Shown here are two of the many possible combinations for SYSTEM ONE. At right is the basic combination consisting of the Nakamichi 600 Cassette Console, the 610 Control Preamplifier, the 630 FM Tuner Preamplifier and the 620 Power Amplifier. To its left is a combination for higher power requirements, consisting of the 600, 630, and two 620 Power Amplifiers bridged for monaural operation using the BA-100 Bridging Adaptor (not shown). Each 620 thus bridged delivers a minimum of 350 watts continuous sine wave into an 8 ohm loudspeaker (5-20,000 Hz with less than 0.05% THD)



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