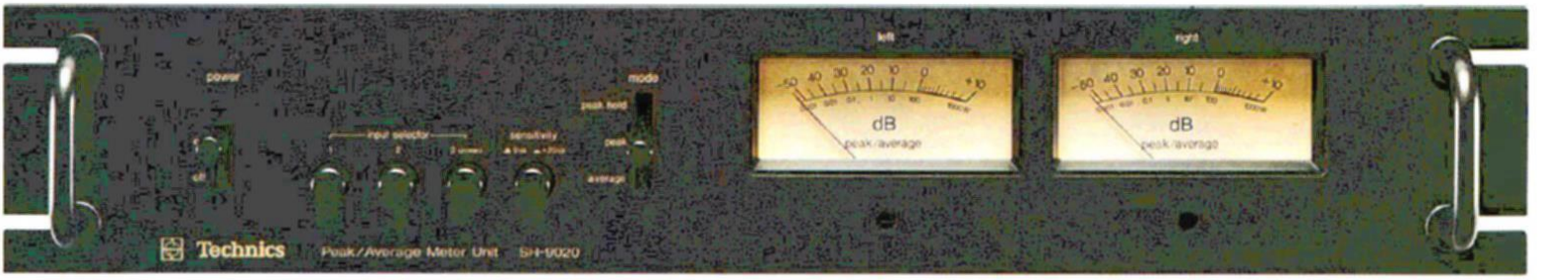
National

Technics SH-9020

Peak/Average Meter Unit

SH-9020 Peak/Average Meter Unit



The Laboratory Grade Meter Unit with Astounding Capabilities Such As 0dB Response to a Single 10kHz Wave.

Peak/Average Meter Unit With Three Mode Function Capability: Peak, Peak Hold, and Average

Technics developed the SH-9020 Peak/Average Meter Unit to give you the signal and output information you need to make absolutely sure your components are delivering the high fidelity performance that you demand. The SH-9020 functions in three modes: Peak, with an unheard of attack time of 100μsec, Peak Hold, and Average at a level of performance way above VU meter industry standards. With this capability, you can expect to realize a degree of high fidelity sound reproduction that until now existed mostly in theory.

VU and Peak: Two Approaches to Audio Metering

Broadcasting facilities in the United States have long used a type of meter known as the VU. A VU meter measures sound level in volume units where OVU = +4dBm = 1.228V. In a circuit of 600 ohms impedance, a continuous reference power of 1mW will give a 0dBm=−4VU reading on the meter. The range of a standard VU meter is 25dB. The standard rise time in response to an OVU sine wave, is 300msec (for the meter to reach 99% of its indication).

In contrast to the VU type, or averaging meter that gives correlated readings of rapidly fluctuating signal levels, there is the peak meter. As its name suggests, the peak meter indicates transient peaks in the signal. DIN standards have been established for such meters and the BBC uses a variety it calls the "Peak Program Meter" or PPM with typical fast rise, slow decay characteristics. The West German DIN specifies dynamic and response characteristics as follows: A sine wave voltage indicating 0dB will give a reading of −2dB ±0.5dB at a 10msec duration. When a continuous signal is cut, it will take 1.5sec ±0.25sec for the indication to fall from 0dB to −20dB. The range of the peak meter is set at 45dB.

Though peak meters are designed to give peak signal readings, transients are inevitably integrated to a greater or lesser degree as a function of transient duration. For example, the BBC's PPM, given a 4msec pulse, will show a reading 80% of that obtained were the pulse continuous. When the signal is stopped, the meter takes 3sec to fall 24dB. The SH-9020 combines the capabilities of the VU and peak meters described above to provide the serious high fidelity component owner with the means to check a variety of functions and interfaces and so verify performance.

An Attack Time of 100μsec Means a 0dB Reading for Even One Full Wave of a 10kHz Signal

In the Peak Meter mode of operation, the SH-9020 will reach peak indication with the incredible rise time of 100μsec. This means that a 0dB indication is obtained with even a single 10kHz wave. The recovery time, 0dB to −20dB, for the same transient is 750msec. Until now, linearity of this magnitude has seldom been pursued, much less realized. Faced with the same single wave of a 10kHz signal, meters in the past gave readings of from −20dB to −40dB. There was also an inherent tendency toward rapid deterioration of accuracy with weak inputs. By means of ingenious compensation circuit design, Technics SH-9020 Meter Unit approaches the limits of linearity over an impressively wide range of signal strength. A linear rectifier incorporating an operational amplifier and logarithmic compression circuit are the design components behind the 100μsec attack time and superb frequency response characteristics.

Peak Hold Capability of More Than 25 Minutes

One of the functions of a peak meter is to provide an indication of the highest signal level reached within a specific program. In the Peak Hold mode, the SH-9020 holds onto the highest peak transient indication without falling back to lower signal levels. With this capability, you can check the highest actual peak level of a recorded or live program without having to constantly watch every jump of the indicator needle. In fact, when a signal giving a reading of 0dB is cut off, more than 25 minutes elapse before the indication falls to −3dB. Signal loss in the Peak Hold circuit is reduced by using a combination of polyester film capacitors, reed relay and FETs.

Peak Mode Response to Tone Bursts of Varing Frequency

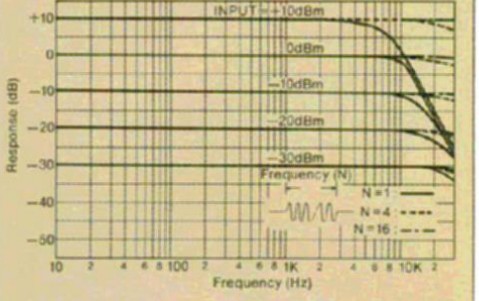


Fig. 1

Tone Burst Response

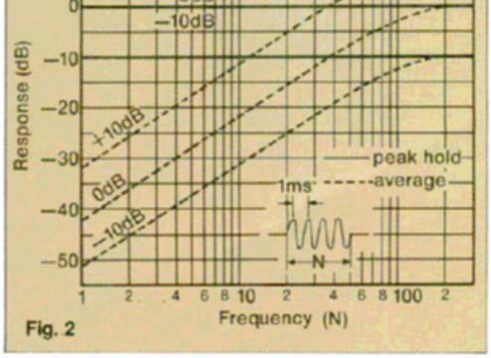


Fig. 2

Peak Hold Decay Time

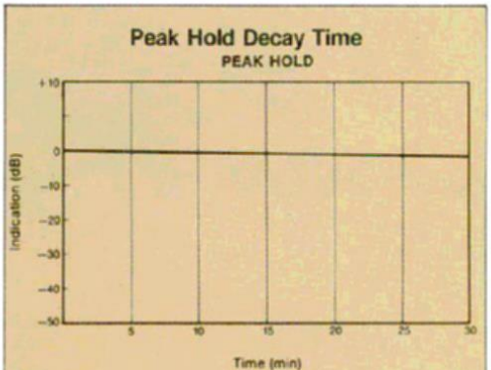


Fig. 3

Average Mode Corresponds to VU Meter

In the Average Mode, the attack time is 330msec and the recovery time 250msec, 0dB to −20dB, to give a capability corresponding to VU meter standards. Therefore, volume checks of the same type possible with a VU meter may be obtained. As stated above, 0VU on a VU meter expresses a signal level of 1.228V in a circuit of 600 ohms impedance. By employing a sensitivity switch on the SH-9020, the 0dB position becomes −16dB while at +20dB sensitivity, the +4dB level obtained corresponds precisely with the 0VU level on a VU meter scale. By comparing the readings obtained in the Average Mode with the peak indication given by the Peak Hold Mode, you can find the peak margin of any program.

Logarithmic Compression And Flat Frequency Response

The logarithmic compression circuit uses an IC operation amplifier and dual transistors to ensure accurate meter indication. On the meter, the scale from −50dB to 0dB is compressed while the 0dB to +10dB portion is finely graduated for accurate reading over a wide range. Peak indicator circuits characteristically deteriorate in accuracy of response at low input levels. However, the SH-9020 incorporates remarkably precise compensation circuits with the result that at +10dB to −40dB, the frequency response is 10Hz to 20kHz ±1.5dB. Up to −40dB, the incredible frequency response of 10Hz to 10kHz ±3dB is still obtained.

Three Inputs Plus Sensitivity Switch Equals Versatility

Sources 1 and 2 allow you to check recording output and other line levels. The third input allows direct readings of your power amplifier's output to 1000W. With the sensitivity switch on 0dB, the meter range is 1000W to 0.001W (1mW). By switching to 20dB, the range is changed to cover from 10W to 0.00001W (0.01mW). With this broad range capability, reproduction output level checks are greatly facilitated.

When using sources 1 and 2, the sensitivity switch makes possible an incredible indicator range of 80dB. Readings from 2.45mV to 24.5V may be obtained by appropriate selection of the 0dB or +20dB sensitivity switch position.

Relay Muting Circuit, Temperature Compensation

A relay operated muting circuit operates when the unit is turned on or off. With the very fast attack time exhibited by the SH-9020, this safety mechanism is incorporated to protect the meters from sudden shock that might otherwise have a cumulative deleterious effect on performance. The meter's circuits are designed in such a way that temperature changes are automatically compensated for. Meter units without temperature compensation may give widely differing indications with variations in temperature.

Impedance Adjustment Switch

The 8 ohm-6 ohm-4 ohm adjustment switch enables corrections to be made for differences in amplifier output caused by speaker impedance variations.

Circuit Operation:

Source

Note that two groups of pin jacks are provided below the source terminals so connections may be made without having to occupy the Rec Out jack of the amplifier and thus negate the possibility of normal component hook-up. In the case of source 3, since there is a danger of reversed plus/minus connections causing blown fuses, a protective resistance has been inserted between the circuit and ground. In the sensitivity switching circuit, a 1% tolerance resistance is employed to obtain a high level of meter accuracy.

Fullwave Linear Rectifier

Accurate metering of very low signal levels cannot be reliably performed with a simple diode rectifier, as diodes cease to operate in linear fashion below certain levels. The SH-9020 therefore employs an elaborate circuit combining operation amplifier and diode functions to achieve linear indication over a very wide range of signal levels. From this rectifier, the signal then enters the logarithmic converter.

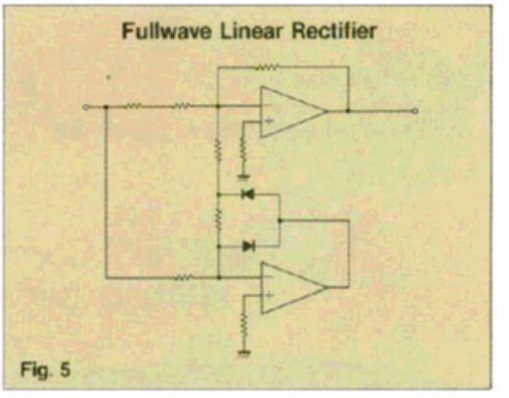


Fig. 5

Logarithmic Converter Circuit

To cover the extremely wide range of levels with linear scale reading would have required a multitude of switchable meter ranges and would have made the unit difficult to operate. Technics engineers therefore chose to install a linear-to-logarithmic converter which "compresses" the range logarithmically and permits the entire scope of levels to be covered with just two meter sensitivity settings.

The converter circuit is not a simple diode-equipped "curve approximation" type but rather a true logarithmic compressor using dual transistors and equipped with operation amplification and temperature compensation. It permits meter read-out of good linearity with a dynamic range of fully 65dB.

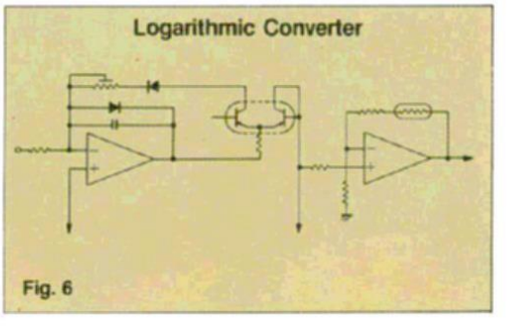


Fig. 6

Level Shift Circuit

Located between logarithmic converter and peak hold circuit, this circuit was designed to improve the decay time characteristics of the meter. If recovery time is merely a function of CR discharge, the needle's speed will tend to slow down. To overcome this problem, reverse voltage is used to average the speed so that the indicator falls at a constant rate.

Peak Hold Circuit

The Peak Hold function is one of the Unit's strongest points. Since the indicator maintains its positions for more than 25min. (before falling to −3dB), the capacitors must store a charge for an unusually long time. A resistance of 40GΩ is therefore required. Plus,

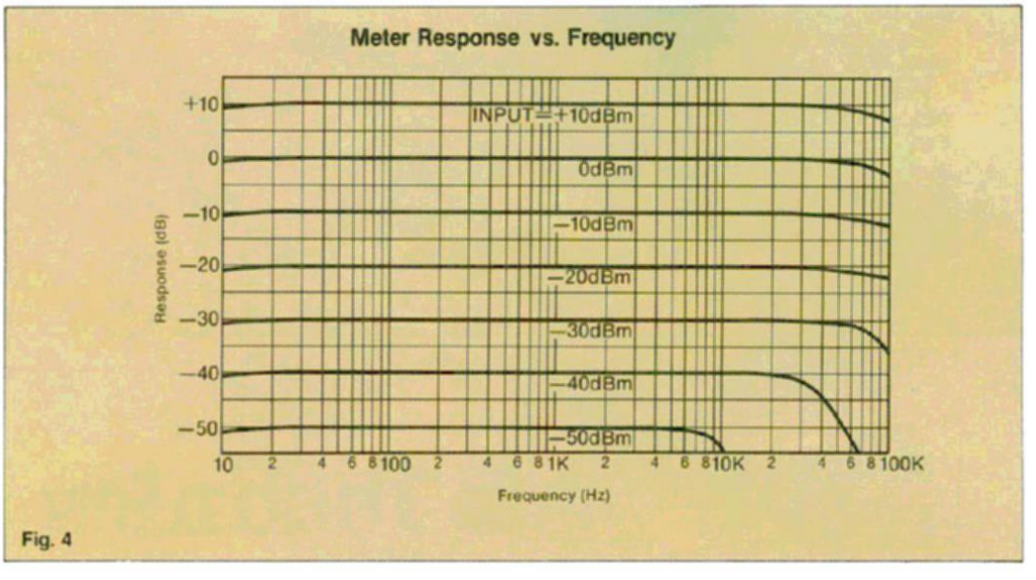
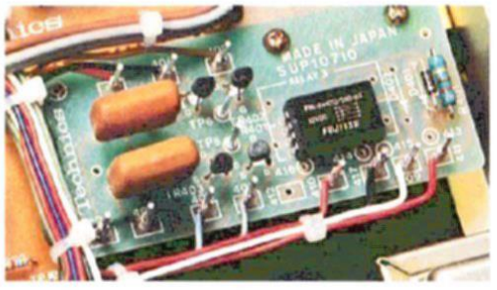


Fig. 4

metalized polyester film capacitors, FETs, a reed relay sealed with glass, and a glass/epoxy printed circuit board, ensure that the circuit keeps its "hold" characteristics through such extreme conditions as 40°C temperature and 95% humidity. Compensation circuits even protect the meter from fluctuations in primary power supply.



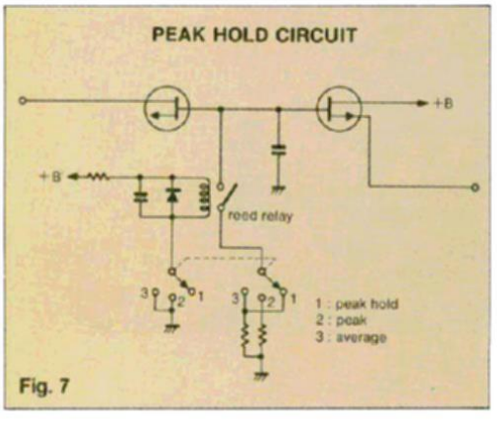


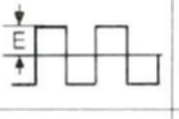
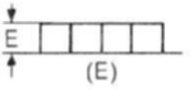
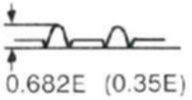
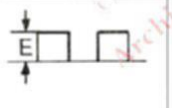
Fig. 7

Response Characteristics

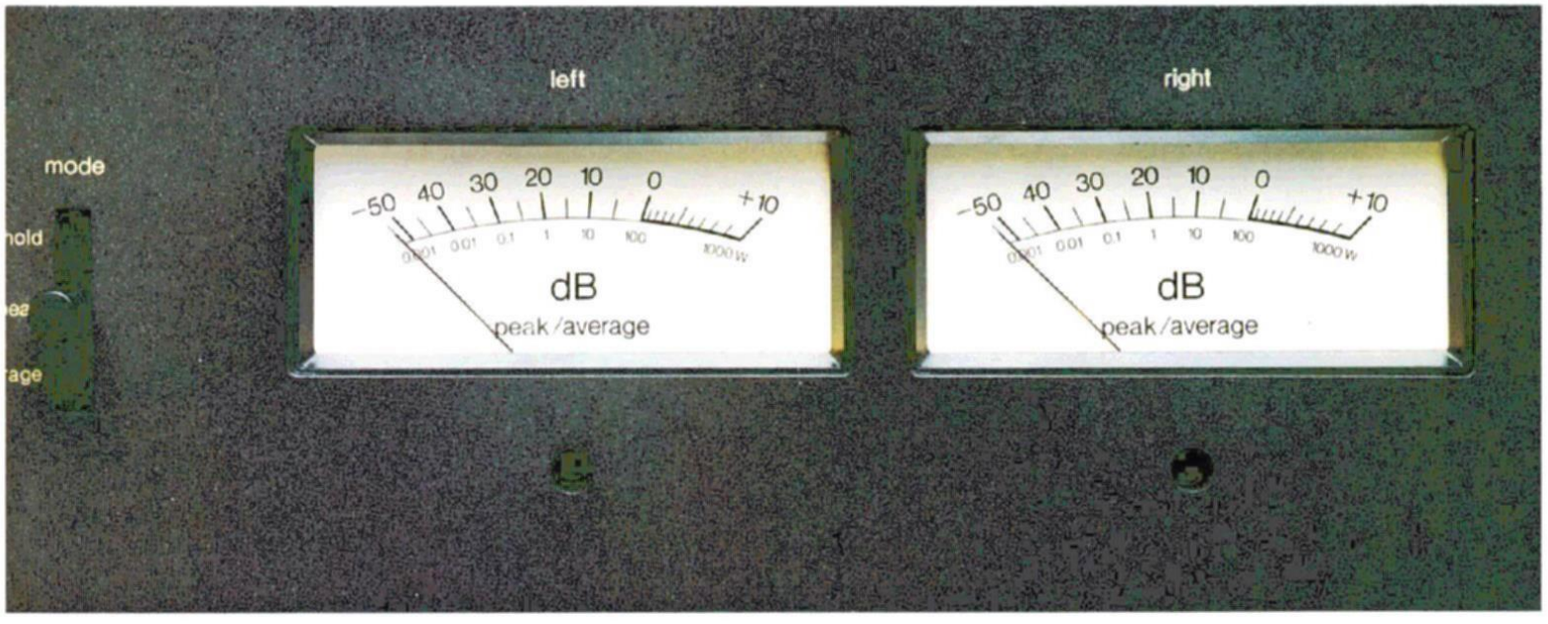
Figure 4 shows indicator levels in response to input frequency from 20Hz to 20kHz. Since the response is completely flat, it is possible to check the frequency response characteristics of a listening space by using an oscillator with microphone and speaker. Furthermore, if the decibel level, mic sensitivity, and mic amp gain are known, a direct reading may be taken.

Figure 2 shows meter indication in response to 1kHz sine wave bursts with varying numbers of waves per burst. The response characteristics exhibited in the Average mode are identical to VU meter standards. Figure 1 shows indicator characteristics in response to sine wave frequency and with different number of waves per burst. Results show excellent response in the Peak mode to a pulse as short as one full wave of a 10kHz signal. Figure 8 shows indicator response to continuous sine and other wave forms. As can be seen from the chart, response is in line with the theoretical ideals of linearity.

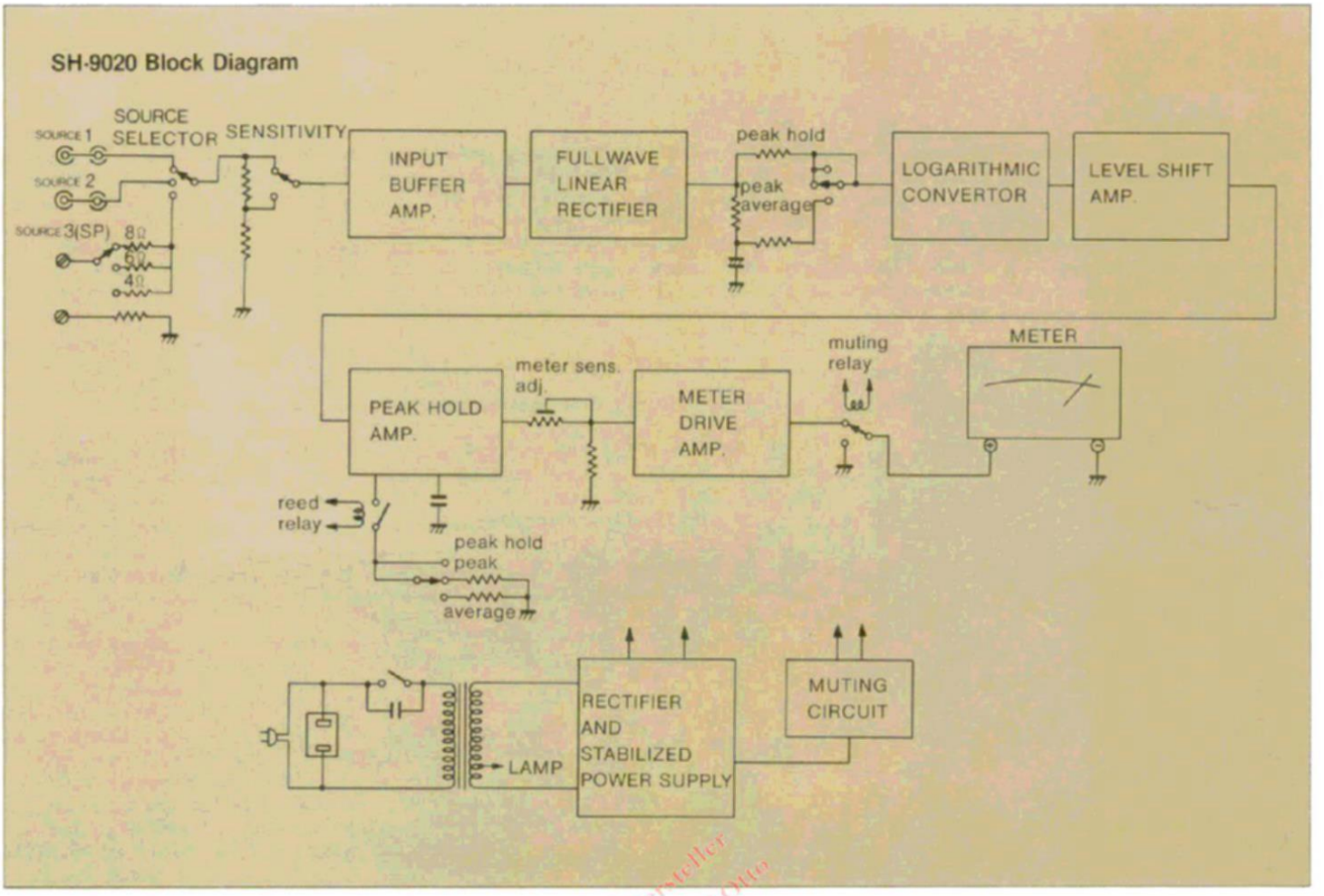
Fig. 8 **Theoretical/Actual Response to Various Waveforms**

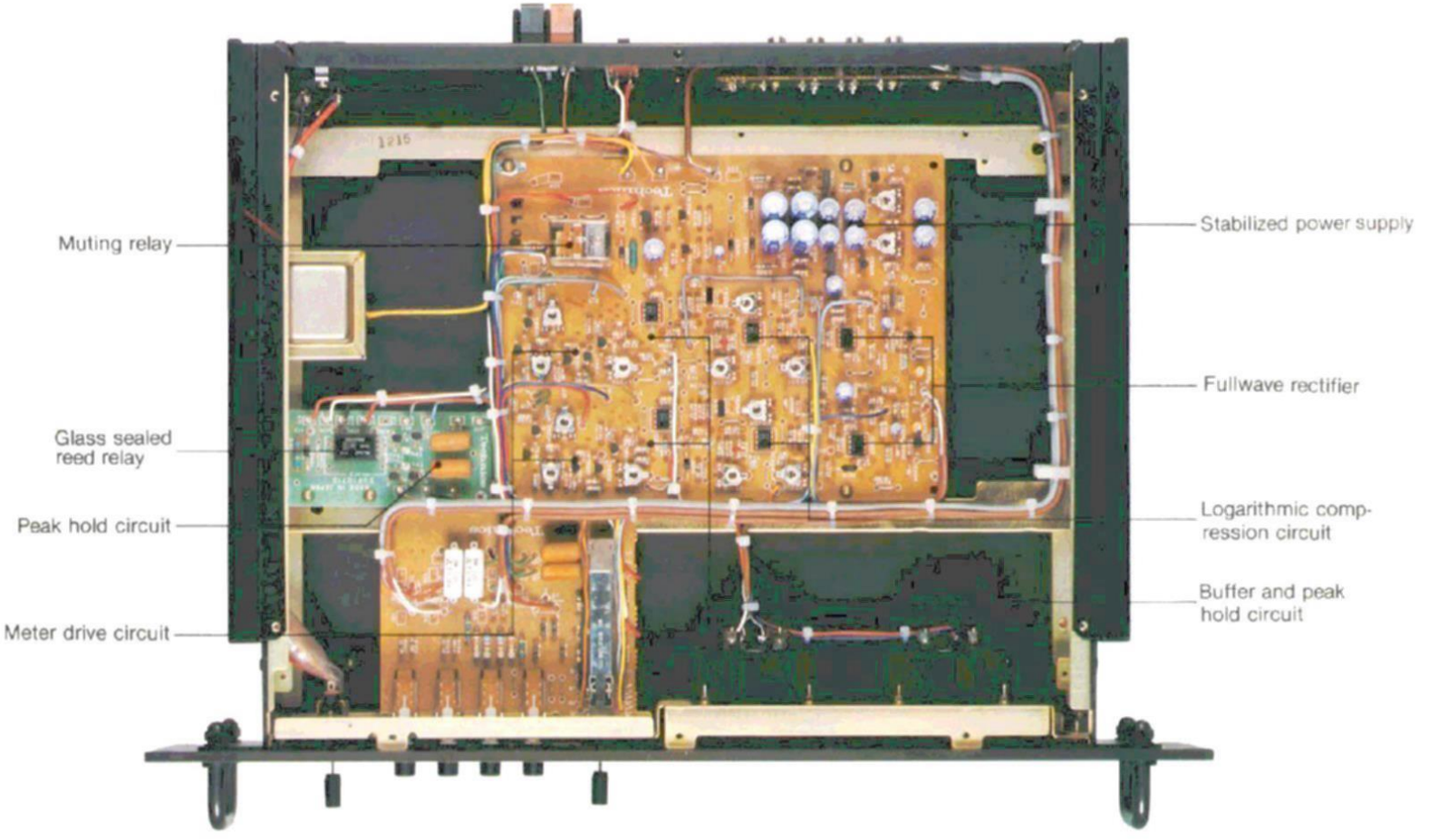
input waveform	AC circuit output	fullwave rectifier output	theoretical meter level	actual indication of SH-9020
		 (0.637E)	peak 0 dB average 0	0 dB 0
		 (E)	peak 0 average +3.92	0 4
		 (0.5E)	peak 0 average −2.1	0 −2
	 0.318E	 0.682E (0.35E)	peak −3.32 average −5.19	−3.5 −5
	 0.25E	 0.75E (0.28E)	peak −2.49 average −7.1	−2.5 −7
	 0.5E	 0.5E (0.5E)	peak −6.0 average −2.1	−6 −2

fullwave rectifier output: peak level (average level)

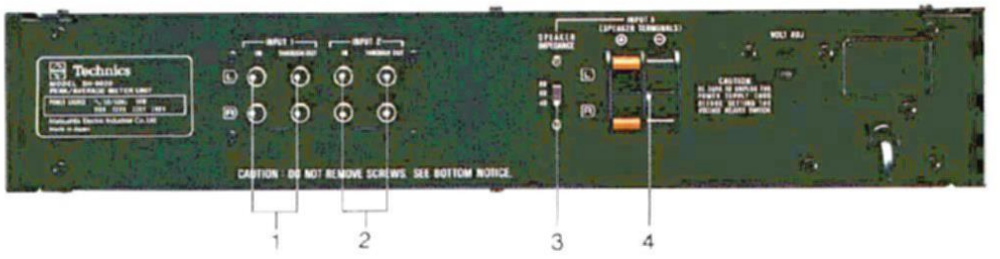


SH-9020 Block Diagram





Rear Panel Facilities



1. Source terminals 1
2. Source terminals 2
3. Speaker impedance selector (4Ω, 6Ω, 8Ω)
4. Source terminals 3 (speaker)

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 (W×H×D) 540×969×400 mm

Technical Specifications

Input sensitivity/ impedance	
source 1, 2	20 dBm (7.75 V)/ 47 kilohms (sens. 0 dB) 0 dBm (0.775 V)/ 47 kilohms (sens. +20 dB)
source 3	100W (8 Ω, 6 Ω, 4 Ω)/ 10 kilohms (sens. 0 dB) 1W (8 Ω, 6 Ω, 4 Ω)/ 10 kilohms (sens. +20 dB)
Sensitivity selector	0 dB, +20 dB
Frequency response	10 Hz ~ 20 kHz ±1.5 dB (+10 dB ~ −40 dB) 10 Hz ~ 10 kHz ±3 dB (less than −40 dB)
Attack time	330 msec. (average) 100 μsec. (peak, peak hold)
Recovery time	250 msec. (average, 0 dB→ −20 dB) 750 msec. (peak, 0 dB→ −20 dB) more than 25 min. (peak hold, 0 dB→ −3 dB)
Meter range	+10 dB ~ −50 dB
Indication accuracy	0 dB ±1.5 dB (source 1, 2 0 dB indication) 0 dB ±2 dB (source 3 0 dB indication)

GENERAL

Power consumption	12 W
Power supply	110/120/220/240 V
Dimensions (W×H×D)	450×92×378 mm
Weight	5.5 kg

Technics
Matsushita Electric

Specifications subject to change without notice Printed in Japan SD7D020E