

SECTION I

GENERAL

1-1 INTRODUCTION

This Instruction manual is composed of the following sections:

(1) Section I GENERAL

This section outlines VP-7723A Audio Analyzer.

(2) Section II SPECIFICATIONS

This section shows the specifications of this instrument in a list form.

(3) Section III INSTALLATION

This section describes electrical and mechanical preparations to be made to use the VP-7723A and safety precautions. Be sure to read this section before operating the instrument.

(4) Section IV OPERATION

This section describes in detail the functions and operating procedures of this instrument.

(5) Section V GP-IB OVERVIEW

This section describes the GP-IB standard.

(6) Section VI GP-IB INTERFACE

This section describes in detail the operating procedures of this instrument using the GP-IB interface.

(7) Section VII EXT CONTROL I/O INTERFACE

This section describes in detail the functions and operating procedures of the external control I/O interface specific to this instrument.

(8) Section VIII OPTIONAL FUNCTIONS

This section provides information about options. Included are specifications, installing procedures, and operation procedures of the optional accessories to be installed in this instrument.

(9) Section IX MAINTENANCE

This section describes the usual maintenance procedures.

1-2 ID NUMBER

This instrument has a ten-character ID number. The first seven characters are assigned

uniquely for each product. The last three figures comprise the ID suffix which is the same for all identical products and changes only when a change is made. All correspondence with the factory or representatives concerning this instrument should include the complete ten-character ID number.

The contents of this manual apply directly to products numbered with the same ID number suffix(es) as noted under the title of ID NUMBERS on the first page of this manual.

1-3 DESCRIPTION

The VP-7723A Audio Analyzer is a measuring instrument with functions to measure seven items including AC level, DC level, distortion, and S/N ratio, and has a measuring signal source as shown in Figure 1-1. An audio measuring system featuring low noise, a high accuracy, and an excellent measuring efficiency can be built by combining the signal source and the various measuring functions. As Figure 1-1 shows, this instrument extensively incorporates digital control technique. The VP-7723A is designed for fully-automatic measurement such as automatic ranging, automatic tuning, and output of measured data.

The audio analyzer has versatile functions as follows: a preset function to preset up to 100 sets of measuring conditions, a limit judgment function for PASS/FAIL judgment of measured results, an auto-sequence function to automatically recall preset memory in sequence, a printer output function to output measured results to a printer. It also equips the GP-IB, and EXT CONTROL I/O interfaces as standard facilities.

Therefore, the VP-7723A Audio Analyzer is used in research and development, as well as in production and inspection lines of audio equipment, and also widely applied as a component in automatic measuring system.

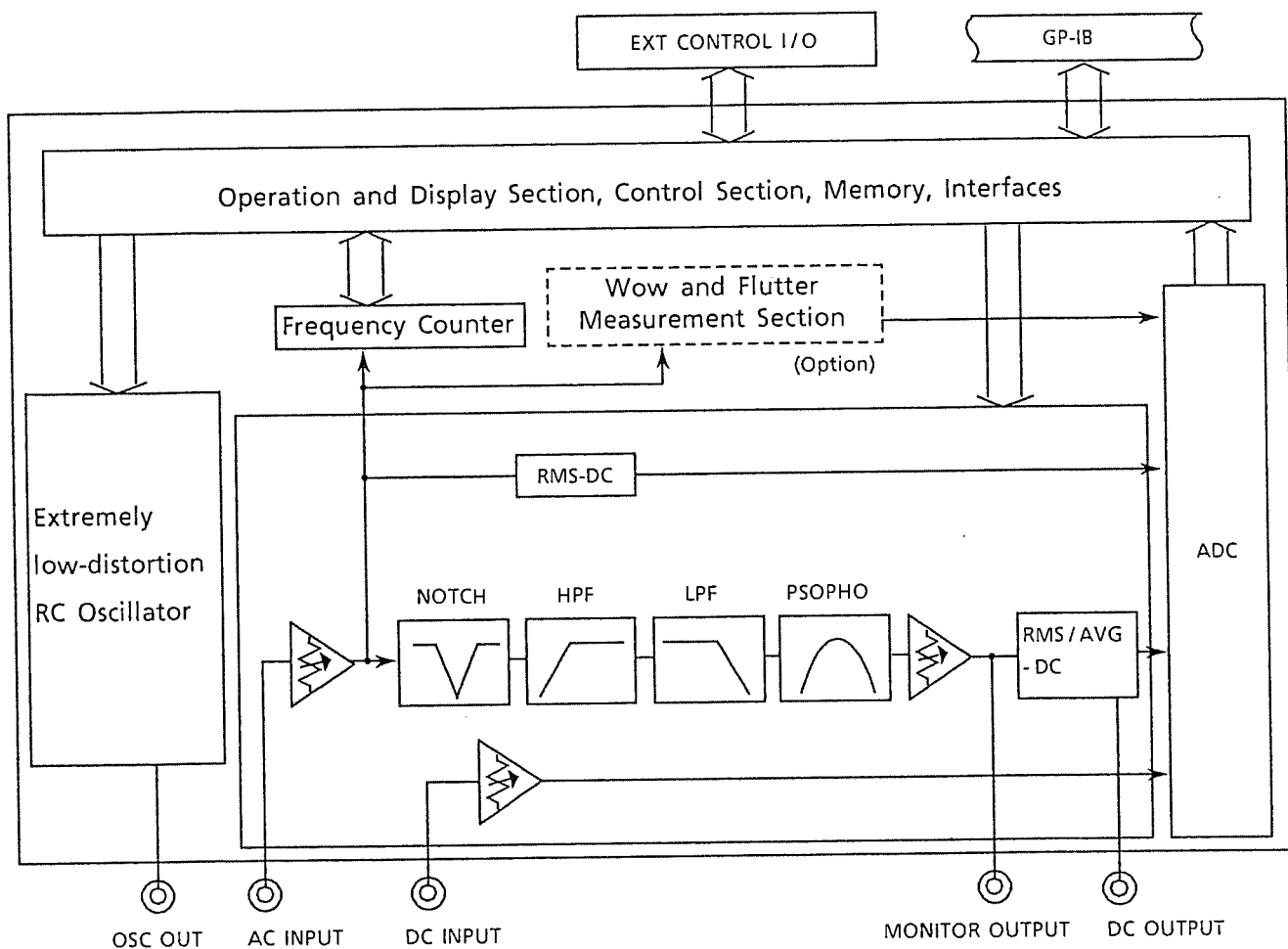


Figure 1-1 Configuration of VP-7723A

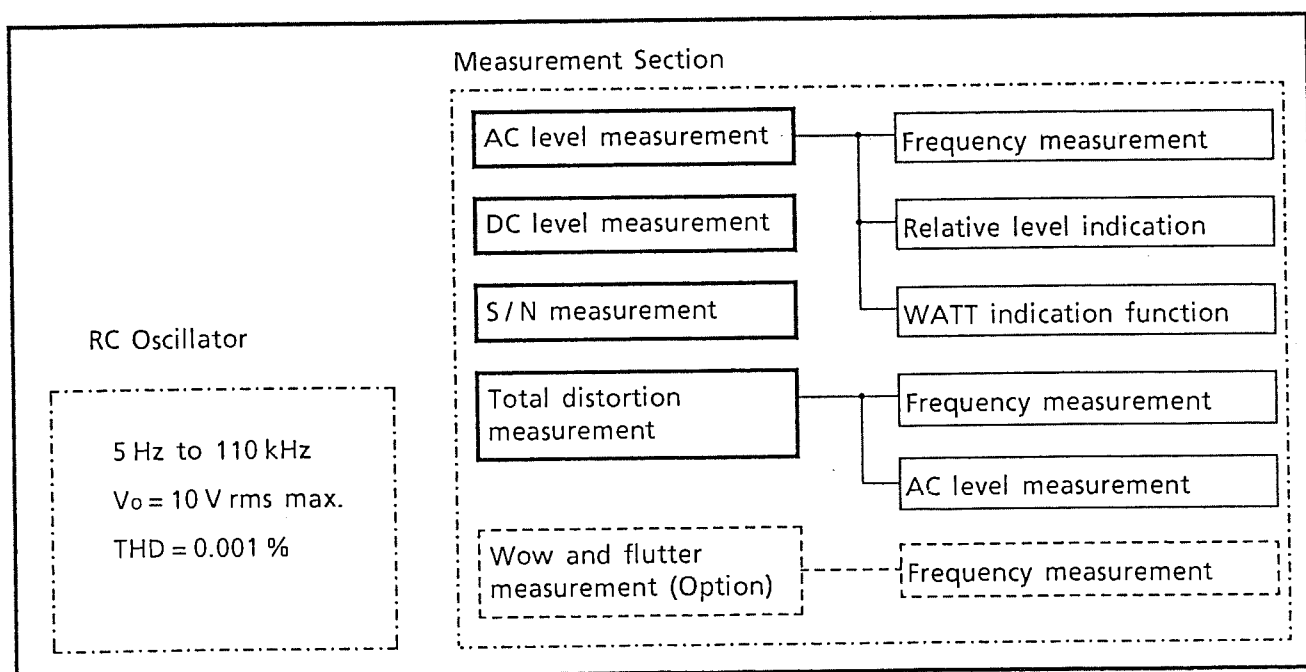


Figure 1-2 Configuration of measurement functions of VP-7723A

1-4 SIGNAL GENERATOR SECTION

The instrument provides a built-in extremely low-distortion programmable RC oscillator as signal source for measurement. The oscillator adopts a bridged-T type oscillation system with a frequency range from 5 Hz to 110 kHz.

The maximum output of this signal generator is 5 V rms across a 600 Ω load (10 V rms at an open end). The output is adjustable in 0.1-dB steps by an output attenuator of total 99.9 dB. The output can be set in dBV *1 or dBm *2. Either of these output units can be selected. The distortion ratio is 0.001 % or less (80 kHz BW) in the range of 20 Hz to 15 kHz.

1-5 MEASUREMENT SECTION

The measurement section of this instrument has the following basic measurement functions :

- 1) Frequency measurement
- 2) AC level measurement
- 3) Total distortion measurement
- 4) Signal-to-noise ratio (S/N) measurement
- 5) DC level measurement
- 6) Wow & flutter measurement (option)

The following paragraphs 1-6 to 1-11 describe the general features of each measurement function.

1-6 FREQUENCY MEASUREMENT

This instrument contains a reciprocal frequency counter for high-speed and high-

resolution measurement of low frequency signals. Input signal periods are measured with an accuracy of 5×10^{-5} using the reference time base of 8 MHz (125 ns), and are displayed in frequency after performing division calculation by a microprocessor.

Frequencies ranging from 5 Hz to 110 kHz can be measured in all the measurement modes except the DC level measurement.

1-7 AC LEVEL MEASUREMENT

The instrument is used as a high-sensitivity AC voltmeter that permits a selection of average-responding or rms-responding characteristics *3.

The measurement range is divided into seven sub-ranges as follows : 0.316 mV, 3.16 mV, 31.6 mV, 316 mV, 3.16 V, 31.6 V, and 100 V f.r.d. (f.r.d. = full range display). At least 10 % of over-range is provided for each range except the 100.0 V range.

The measurement indication units that can be selected are V(mV), dBV, and dBm.

Since internal residual noise is 10 μ V or less, the measurable range of this instrument is approximately 30 μ V to 100 V rms (–90 to 40 dBV or –88 to 42 dBm) *4.

The range selection can be made automatically or manually.

*1 0 dBV = 1 V rms across 600 Ω load.

"dBV" is read merely as "dB" on the front panel marking of the instrument.

*2 0 dBm = 1 mW into 600 Ω load.

The units of "dBV" and "dBm" are used to distinguish the voltage and power level from the generally used "dB" unit to express relative ratio such as S/N and distortion.

*3 The response characteristics can be selected in AC level, distortion, and S/N measurement functions. The response characteristics of input signal level measurement in distortion and wow & flutter measurements are fixed to rms-responding. Response characteristics of wow & flutter measurement are quasi-peak-responding for option 01 and rms-responding for option 02.

*4 The specification of internal residual noise is 10 μ V or less with 500 kHz BW or 4 μ V with 80 kHz BW. Thus, if the 80 kHz LPF contained in this instrument is turned on, the AC level measurable range will be extended down to 10 μ V.

Two additional functions for AC level measurement are the relative level measurement and the WATT indication functions. The relative level measurement function indicates a relative level to a reference level in dB. The measurable range of this function is ± 130 dB *1. This function is useful for measurement of frequency characteristics, level ratio, and S / N ratio. The WATT indication function calculates wattage with the following expression using AC level measured value and an assumptive load resistance R_L *2.

$$\text{WATT} = (\text{AC level measured value})^2 / R_L \quad (1-1)$$

1-8 TOTAL DISTORTION MEASUREMENT

This instrument measures distortion with the fundamental frequency range of 5 Hz to 110 kHz as defined in the following :

DISTN =

$$\sqrt{e_2^2 + e_3^2 + \dots + e_N^2 + e_n^2} / e_{in} \times 100 [\%] \quad (1-2)$$

or

DISTN =

$$20 \log (\sqrt{e_2^2 + e_3^2 + \dots + e_N^2 + e_n^2} / e_{in}) [\text{dB}] \quad (1-3)$$

Where e_{in} : rms value of input signal level

e_N : rms value of the Nth harmonic,

$N = 2, 3, \dots$

e_n : rms value of noise contained in the signal

This instrument measures frequencies of input signals and automatically tunes the center frequency of the fundamental-rejection filter. Wide and sharp characteristics are obtained due to a multi-stage filter circuit with low noise and low distortion. It enables to measure signals with some frequency fluctuations while providing the measurement capability of distortion factors of 0.001 % (- 100 dB, 80 kHz BW) or less.

The measurement is made in five ranges from 0.01 % to 31.6 % f. r. d., where the automatic ranging is performed. Though the input signal level range in normal distortion measurement is 0.1 to 100 V rms, the high-sensitive input range of 3.16 mV f. r. d. is also provided to measure the dynamic range of digital audio equipment.

For distortion measurement, both input signal level and noise / distortion signal level are converted into DC voltage by each detection circuit, and then into digital data by an A / D converter. These two data are ratio-calculated by a microprocessor, to obtain a distortion factor. The reference level setting operation often used in conventional distortion meters is not required. The input signal level obtained in the detection circuit is read on the display together with the measurement result of the distortion.

The detection circuit of the input signal level has rms-responding characteristics while the detection circuit of the noise and distortion components can select either rms- or average-responding characteristics. The bandwidth of the measuring system is 5 Hz to 500 kHz.

In distortion measurements, input signals containing a large amount of noise are sometimes handled, disabling frequency measurement and making automatic ranging operation unstable. The tuning frequency of the fundamental-rejection filter, input signal level range, and distortion factor measurement range can be fixed independently to avoid these effects.

Figure 1-3 shows typical distortion characteristics when the signal generator and distortion measuring section of this instrument are directly connected.

*1 The input voltage range that can be handled in the relative level measurement function is also approximately 30 μ V to 100 V rms (- 90 to 40 dBV or - 88 to 42 dBm). The measurement range of the relative level depends on the specified value of the reference level. For example, if the reference level is 10 V rms (+ 20 dBV), the measurable range of the relative level is varied between + 20 and - 110 dB.

*2 The assumptive load resistance R_L does not mean that a load resistor is actually contained within this instrument. The R_L value is specified merely for calculation.

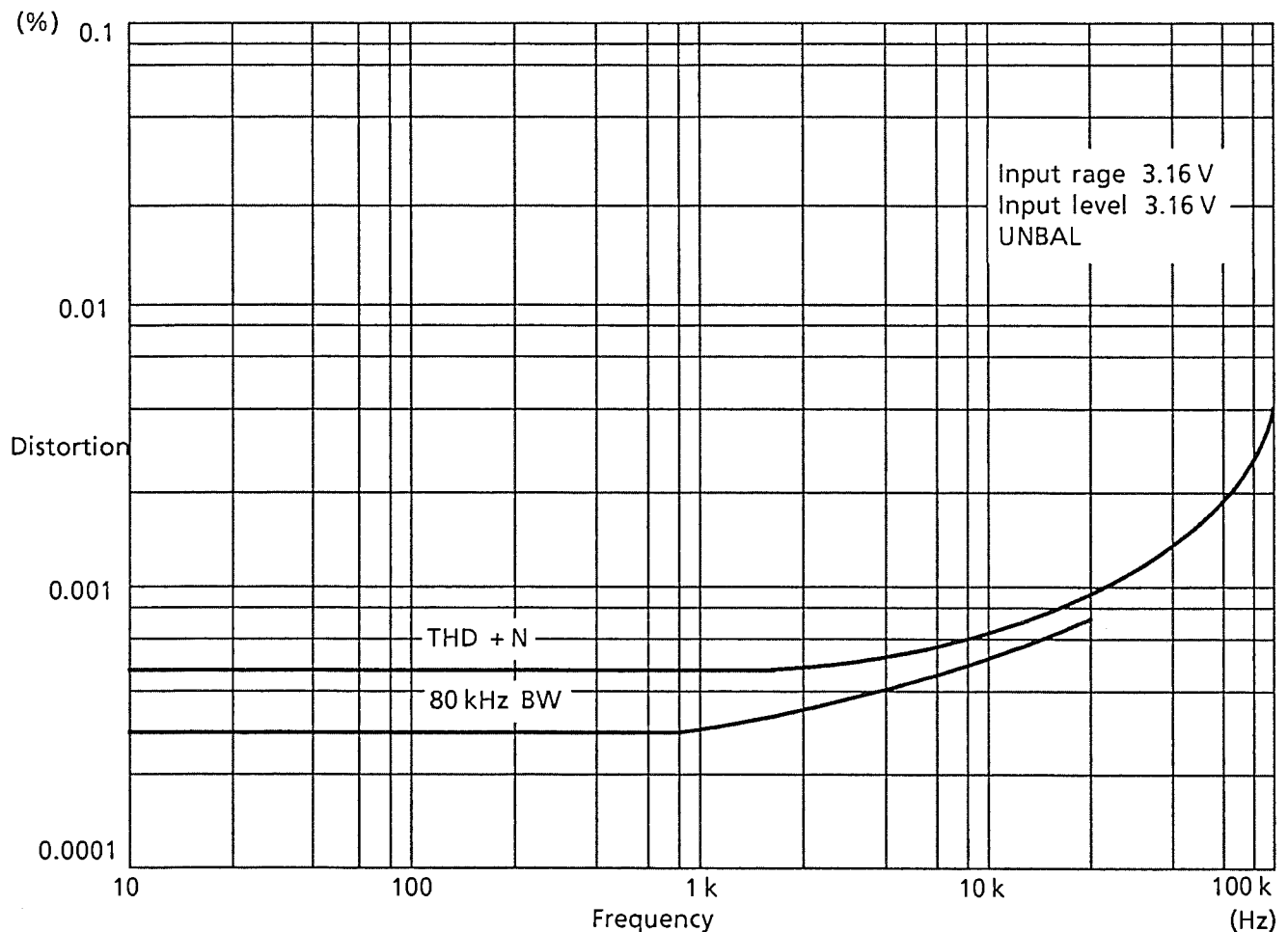


Figure 1-3 Typical overall distortion characteristics

1-9 S/N MEASUREMENT

The S/N ratio can be obtained by calculating the ratio between the signal (S) and noise (N) components: The S component is obtained by applying a signal to the object to be measured to measure its output level, and the N component is measured by disconnecting the applied signal and terminating the input terminal of the object to be measured by a characteristic impedance.

In the S/N measurement function of this instrument, ON and OFF of the signal generator output and measurements of the S and N component signal levels are automatically synchronized so that the measurement can be performed by merely pressing the S/N measurement key. As measurement results, the S component signal level and the S signal frequency are displayed together with S/N ratio simultaneously.

The S/N measurement is a measurement of both S and N components in AC level measure-

ment and a calculation of the S/N ratio. Thus the S and N components that can be measured are approximately 30 μ V to 100 V rms as in AC level measurement. (However, S component \geq N component.)

Residual noise is 10 μ V or less as in AC level measurement. The range of the S/N ratio that can be measured depends on the S component signal level. For example, S/N ratio of 130 dB or greater can be measured for the S component signal level of 31.6 V rms. The S/N measurement range decreases 10 dB for every 10 dB reduced in this S component signal level. The range constructions of S and N component signal level measurements are the same as that of AC level measurement. The automatic and manual ranging can be performed for both S and N component measurements.

The S/N measurement is conducted as shown in Figure 1-4.

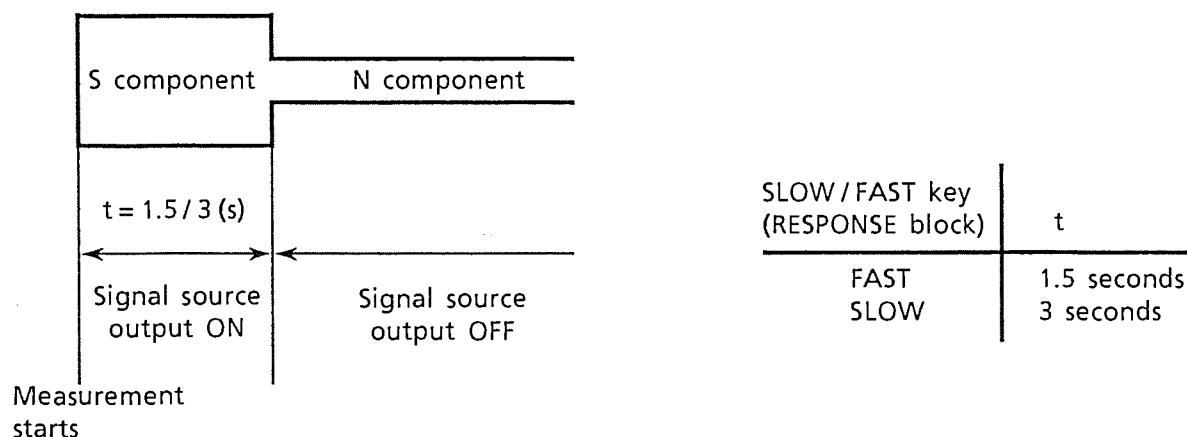


Figure 1-4 S / N measurement

1-10 DC LEVEL MEASUREMENT

This instrument allows to measure the DC voltage. The measurement range is divided into four ranges as follows: 316.0 mV, 3.160 V, 31.60 V, and 100.0 V f. r. d. At least 10 % of over-range is provided for each range except the 100.0 V range. The range selection can be made automatically or manually.

1-11 WOW & FLUTTER MEASUREMENT (OPTION 01, 02)

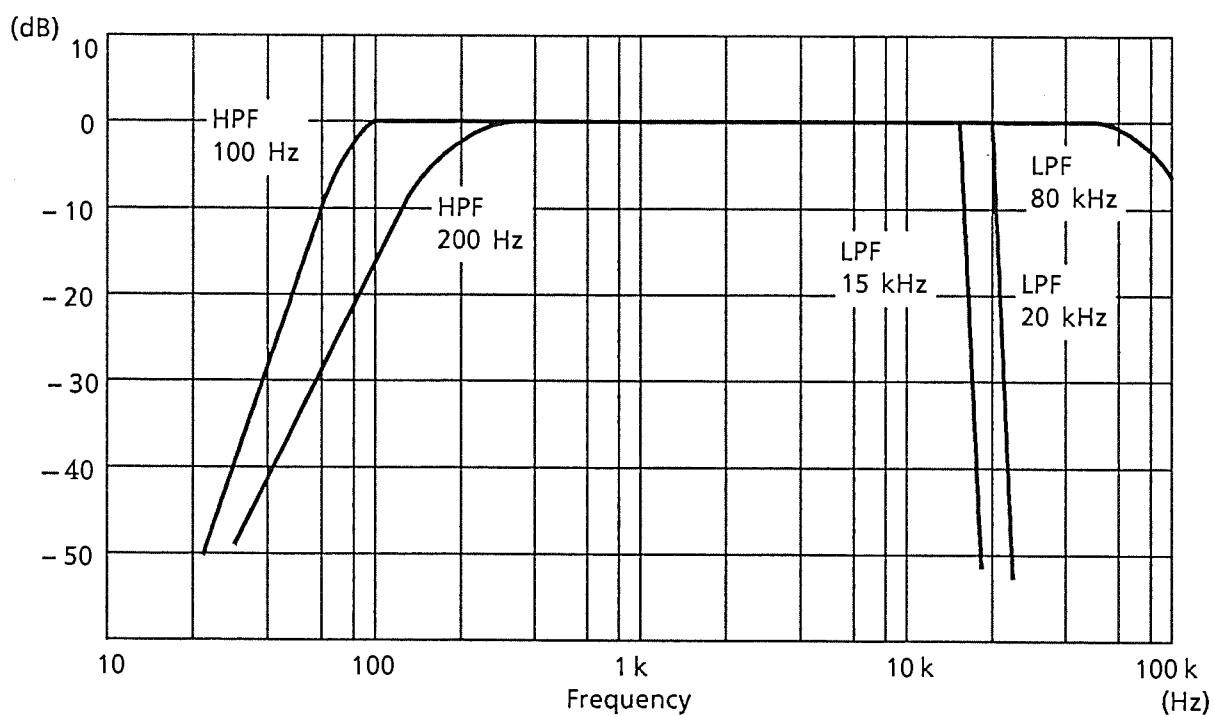
Option 01 has the wow & flutter measurement function with the quasi-peak responding characteristics conforming to the IEC, DIN, and EIAJ standards. Option 02 has the function with the rms-responding characteristics conforming to JIS. Two measurement center frequencies of both option 1 and option 2 are available at 3 and 3.15 kHz. Turning on or off psycho-metric weighting is selectable.

As measurement results, the frequency and the input level are displayed with the measured value simultaneously.

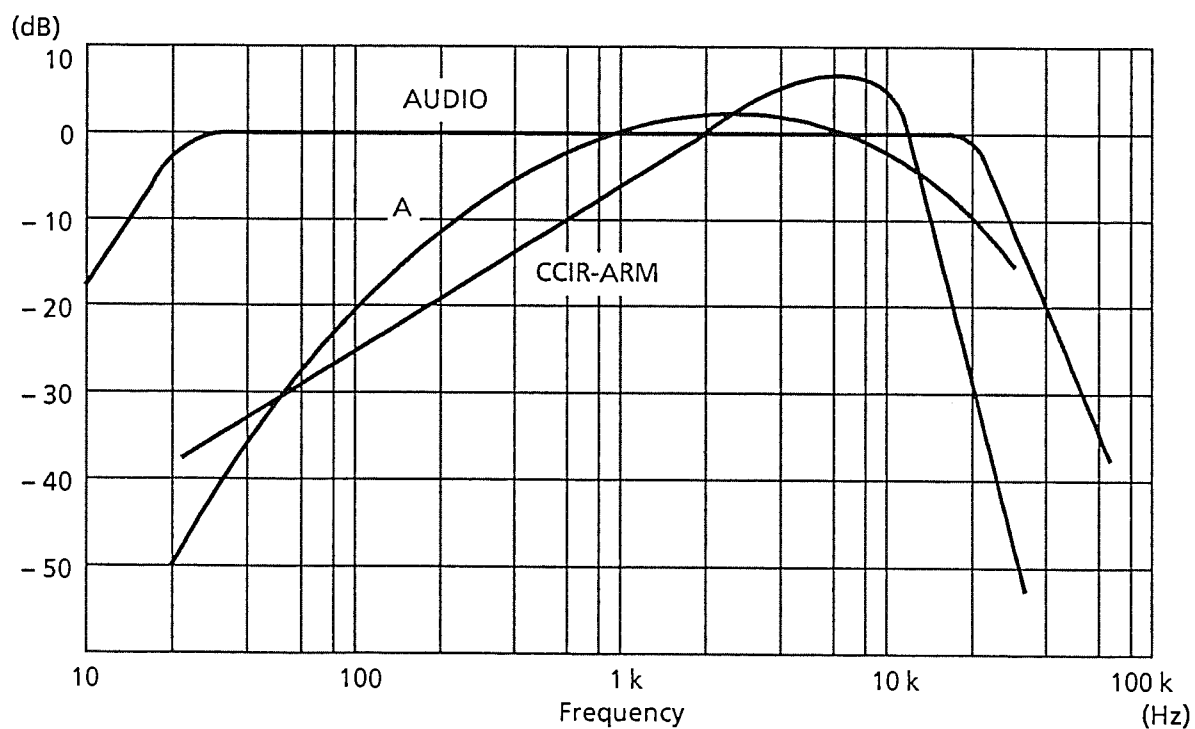
The input signal level is 0.1 to 100 V rms, and the measurement range is divided into three: 10.00 %, 1.000 %, and 0.1000 %.

1-12 MEASUREMENT FILTERS

The eight types of measurement filters are internally provided to insert into the measurement system in the AC level, distortion, and S / N ratio measurements. They are two types of high-pass filters, three types of low-pass filters, and three types of noise evaluation filters. In addition to them, one type of each low-pass filter and noise evaluation filter are available as optional accessories. Figure 1-5 shows the characteristics of the internally provided filters.



(a) Low-pass and high-pass filters



(b) Noise evaluation filters

Figure 1-5 Characteristics of internally provided filters

1-13 ADDITIVE FUNCTIONS

The following three functions are provided for more convenient use of this instrument in addition to the basic measuring functions:

- 1) Preset function
- 2) Limit judgment function
- 3) EXT CONTROL I/O function

Each of these functions is outlined below.

1-14 PRESET FUNCTION

This function will be useful if measurement setups have been determined. Oscillator frequency, output amplitude, measuring function selection, filter selection, and other setups of this instrument can be stored in registers as one set of data. By recalling these registers as required, the setups can be reproduced at a time. One hundred setups can be stored in total.

The auto sequence function is also provided to automatically recall the memory in sequence at any desired time interval.

1-15 LIMIT JUDGMENT FUNCTION

In some applications such as production processes, it is often required to perform PASS / FAIL judgment for certain limit range. Limit judgment function sets upper and lower limit values for each measuring function, and gives warning by turning on "OVER" or "UNDER" LED when measured values exceed the specified limit values. This function can be used more effectively when combined with the preset function.

1-16 EXT CONTROL I/O FUNCTION

The EXT CONTROL I/O connector on the rear panel of this instrument offers the following functions.

- 1) Remote sequence recall
Remote controls the memory sequence recall function externally.
- 2) Remote modify
Remote controls the modifications of signal source frequency and the signal source output amplitude by an external rotary encoder.

- 3) Remote direct recall

Remote controls the memory direct recall function externally.

- 4) Limit judgment output

Gives external LED lighting output to represent the limit judgment result.

- 5) Control output

Gives the TTL output signal of 8 bits x 2 ports to control external equipment.

- 6) Printing output for memory (list output)

Outputs the contents of preset memory to a printer.

- 7) Data read

Reads externally applied 8-bit TTL input signal with the GP-IB controller.

- 8) Data print

Outputs measured values to a printer.

1-17 MEMORY SYNC AND





MEMORY COPY FUNCTIONS

The memory sync function is provided to recall preset memory contents of several instruments simultaneously in the talk-only / listen-only mode of the GP-IB interface.

The memory copy function allows this instrument to transfer the contents of memory to another VP-7723A.

1-18 FLOATING CONNECTION AND

BALANCED INPUT

The common lines of the signal source and the measuring section can be separately floated from the frame of this instrument to avoid the problem of ground-loop caused by interconnection of devices during measurement of low level signals or low distortion. These common lines are marked as  and  on the panel to distinguish from the frame ground (). The common line  of the measuring section can be connected directly to the frame ground with a switch.

The balanced input is also available to match objects to be measured with floating output terminals such as BTL amplifiers.

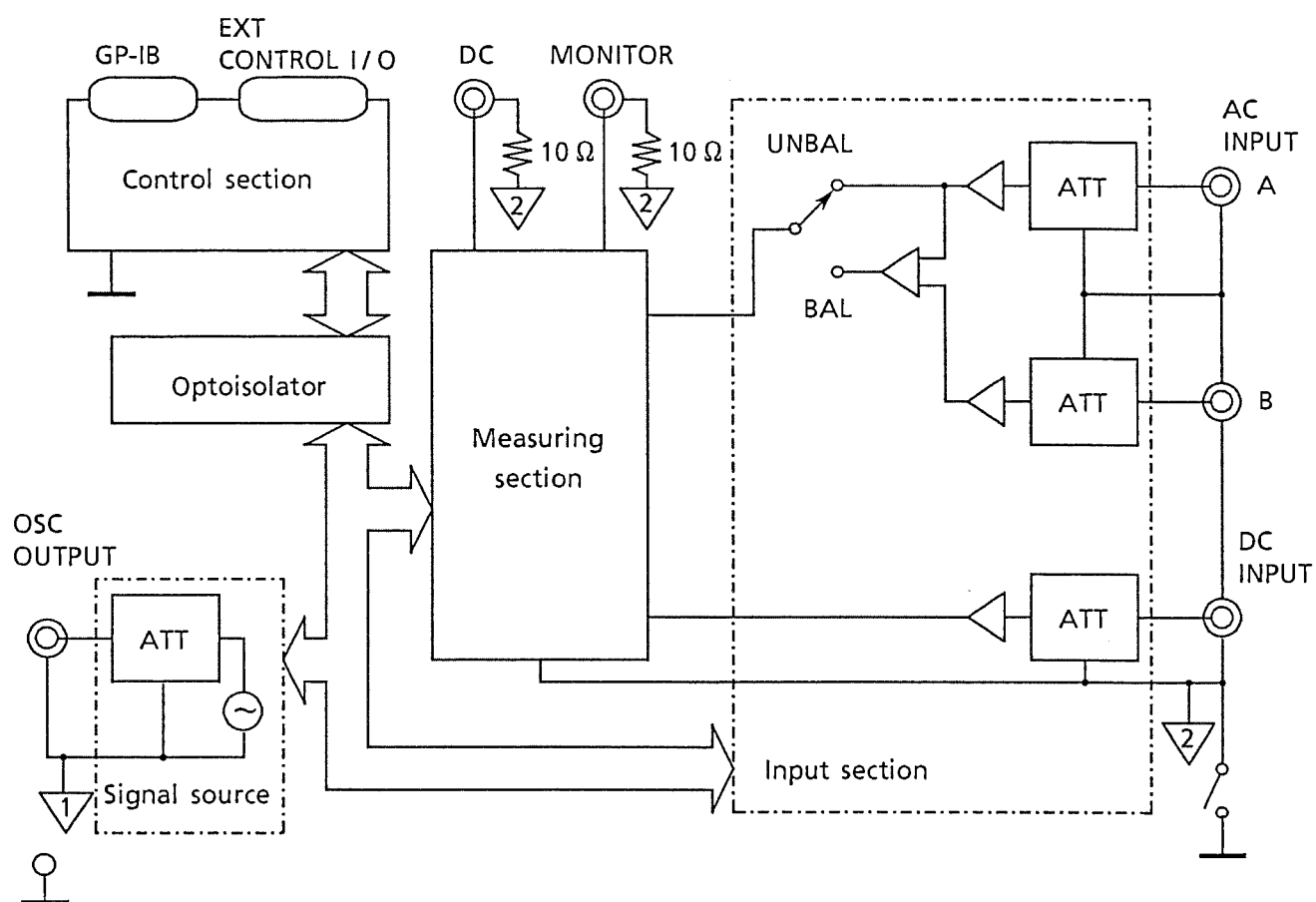


Figure 1-6 Common line configuration of the VP-7723A

SECTION II

SPECIFICATIONS

- NOTE 1) The specifications have been given in the condition of the automatic operation or properly set manual operation.
- NOTE 2) The dB unit to express a voltage level (0 dB = 1 V rms) is described dBV throughout this instruction manual.

2-1 ELECTRICAL PERFORMANCE

SIGNAL SOURCE					
Designation		Performance		Conditions or remarks	
<u>FREQUENCY</u>		4 digits			
Display					
Frequency range and resolution					
		5 Hz to 110 kHz in 4 ranges			
		5.0 to 200.9 Hz	0.201 to 2.009 Hz	2.01 to 20.09 kHz	20.1 to 110.0 kHz
		0.1 Hz resolution	1 Hz resolution	10 Hz resolution	100 Hz resolution
Accuracy		3 % of reading 2 % of reading		5 Hz to 110 kHz 0.201 to 20.09 kHz	
<u>OUTPUT AMPLITUDE</u>		3 digits and a minus sign dBm (0 dBm : 1 mW into 600 Ω) dBV (0 dBV : 1 V rms) Variable from 16.2 dBm to −83.7 dBm (14.0 dBV to −85.9 dBV) in 0.1 dB steps. ±0.5 dB of reading at 1 kHz ±0.8 dB of reading at 1 kHz With reference to 1 kHz ; ±0.3 dB ±0.05 dB ≤ 10 μV rms		The voltage in dBV is defined as the matched output (terminated by a 600 Ω load). > −37.1 dBV ≤ −37.2 dBV With a load resistor of 600 Ω 5 Hz to 110 kHz 20.0 Hz to 20.09 kHz	
Display					
Units					
Range and resolution					
Accuracy					
Flatness					
Noise voltage with OSC switch OFF					
<u>DISTORTION</u>		≤ 0.01 % (−80 dB) ≤ 0.001 % (−100 dB)		5 Hz to 110 kHz 20 Hz to 15 kHz, 80 kHz BW	

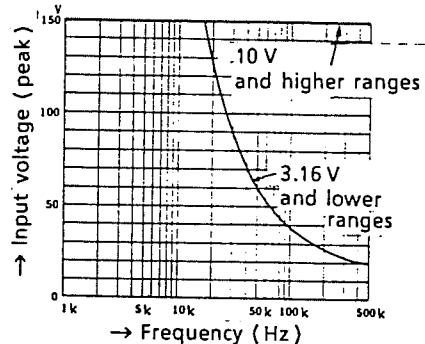
MEASUREMENT				
Designation	Performance		Conditions or remarks	
Measurement Functions	Frequency measurement AC level measurement including : Relative level measurement function, and WATT indication function DC level measurement S/N measurement Total distortion measurement Wow & flutter measurement		Option 01	
FREQUENCY MEASUREMENT				
Designation	Performance		Conditions or remarks	
Measurement range	5 Hz to 110 kHz		Operates in AC level, distortion and wow & flutter measurement modes. At the input range of 3.16 mV in distortion measurement	
Display resolution	Frequency ≥ 100 Hz : 5-digit display Frequency <100 Hz : 			

Note :
At least 10 % of over-range is provided for each range except the 100.0 V range.

AC LEVEL MEASUREMENT (Cont'd)		
Designation	Performance	Conditions or remarks
Residual noise	$< 10 \mu\text{V rms}$ $< 4 \mu\text{V rms}$	500 kHz BW 80 kHz BW
Relative level measurement range	$\pm 130 \text{ dB}$ or more	The range will be limited depending on the reference value selected.
Response	Average or RMS responding	
WATT indication function		
Measuring method	Calculates wattage with measured AC level and specified assumptive load resistance value (R_L).	No actual load is contained.
Display resolution	5 digits at most, 0.01 W	XXX.XX watts
DC LEVEL MEASUREMENT		
Designation	Performance	Conditions or remarks
Full range display	4 ranges 100.0 V 31.60 V 3.160 V 316.0 mV	At least 10 % of over-range is provided for each range except the 100.0 V range.
Accuracy	$\pm (0.3 \% \text{ of full range display} + 0.75 \% \text{ of reading})$	
S / N MEASUREMENT		
Designation	Performance	Conditions or remarks
S and N levels	30 μV to 100 V rms for either S or N	$S > N$ S : signal, N : Noise
S / N measurement range	0 to 130 dB	
The following table shows the limitation for S / N measurement range depending on the S component level.		
S component level (frequency $\leq 10 \text{ kHz}$)		Limitation for S / N measurement
$\geq 31.6 \text{ V (30 dBV)}$		130 dB
$\geq 3.16 \text{ V (10 dBV)}$		110 dB
$\geq 316 \text{ mV (} - 10 \text{ dBV)}$		90 dB
$\geq 31.6 \text{ mV (} - 30 \text{ dBV)}$		70 dB
$\geq 3.16 \text{ mV (} - 50 \text{ dBV)}$		50 dB
$\geq 0.316 \text{ mV (} - 70 \text{ dBV)}$		30 dB

S / N MEASUREMENT (Cont'd)						
Designation		Performance			Conditions or remarks	
Unit		(m)V, dB, dBm dB ± 2 % of full range display ± 1 dB Average- or RMS-responding Approximately 1.5 s for fast response or 3 s for slow response			1 kHz Range composition is the same as that in AC level measurement function.	
S component level						
S / N ratio						
S component level accuracy						
S / N accuracy						
Response						
S / N delay time						
TOTAL DISTORTION MEASUREMENT						
Designation		Performance			Conditions or remarks	
Fundamental frequency range		5.0 Hz to 110.0 kHz 5 ranges 31.60 % (– 10.00 dB) 10.00 % (– 20.00 dB) 1.000 % (– 40.00 dB) 0.1000 % (– 60.00 dB) 0.01000 % (– 80.00 dB)				
Full range display and Display resolution						
Display of measurement units						
		Selection of unit key	V, %	dB	* dB : 0 dB = 1 V rms ** dB : Distortion (ratio)	
		Input signal level	mV, V	dB*, dBm		
		Distortion	%	dB**		
Response		Input signal level : RMS-responding Distortion signal level : RMS- or average-responding			5 Hz to 110 kHz 20 Hz to 20.09 kHz	
Second harmonic accuracy		± 3 dB ± 1 dB				
Residual noise and distortion						
Input range	100, 31.6, 10, 3.16, 1 V		0.316 V		Detection bandwidth	
Input level	Full range display input	1/3 of full range display input	Full range display input	1/3 of full range display input		
5 Hz to 20 kHz	≤ – 100 dB, 0.001 %	≤ – 90 dB, 0.0032 %	≤ – 9	3, 0.002 %	≤ – 85 dB, 0.0056 %	80 kHz BW
5 Hz to 110 kHz	≤ – 80 dB, 0.01 %	≤ – 80 dB, 0.01 %	≤ – 7	3, 0.016 %	≤ – 74 dB, 0.02 %	500 kHz BW

TOTAL DISTORTION MEASUREMENT (Cont'd)		
Designation	Performance	Conditions or remarks
Input signal level Range	Input range 3.16 mV : ≤ -45 dB, 0.56 % for 2 mV rms input 0.1 to 100 V rms 1 to 3.16 V rms	Fundamental frequency range : 20 Hz to 10 kHz Detection bandwidth : 20 kHz BW As shown in residual noise and distortion specifications, the distortion measurement range will be limited depending on the input signal level.
Full range display	7 ranges 100.0 V (40.0 dBV, 42.2 dBm) 31.6 V (30.0 dBV, 32.2 dBm) 10.0 V (20.0 dBV, 22.2 dBm) 3.16 V (10.0 dBV, 12.2 dBm) 1.00 V (0 dBV, 2.2 dBm) 0.316 V (– 10.0 dBV, – 7.8 dBm) 3.16 mV (– 50.0 dBV, – 47.8 dBm)	Bandwidth of 3.16 mV range is 20 kHz BW. It is not available for automatic ranging function.
Accuracy Flatness	± 2 % of full range display With reference to 1 kHz and with full range display input ; ± 5 % from 5 Hz to 110 kHz ± 10 % from 10 Hz to 20 kHz	1 kHz Excluding 3.16 mV and 100 V ranges At 3.16 mV range
WOW & FLUTTER MEASUREMENT (OPTION)		
Designation	Performance	Conditions or remarks
Measurement center frequencies	3 kHz, 3.15 kHz ± 200 Hz	
Full range display and Display resolution	3 ranges 10.00 %, 1.000 %, 0.1000 %	
Response	Quasi-peak responding (OPT 01), Rms-responding (OPT 02)	
Flatness WTD	Psophometric weighting characteristics in accordance with DIN 45507	
UNWTD	0.5 Hz to 300 Hz	
Accuracy	± 5 % of full range display	
Input signal level range	Same as input signal level range of distortion measurement	

COMMON FOR ALL MEASUREMENT FUNCTIONS		
Designation	Performance	Conditions or remarks
Input impedance	100 k Ω shunted by 200 pF or less 1 M Ω	A or B terminal to common line DC terminal to common line
Maximum allowable input voltage	Fig. 2-1 shows the maximum allowable input voltage for AC component only. 10 V to 100 V ranges : 150 V (DC + AC peak) 3.16 V or lower ranges : 150 V (DC + AC peak) for AC component below 17 kHz. See Fig. 2-1 for higher frequencies.	 <p>Fig. 2-1 Maximum allowable input voltage for AC component only</p>
Filters		
100 Hz HPF	- 3 dB cutoff frequency 75 \pm 15 Hz Rolloff > 40 dB at 25 Hz	For rejection of pilot component in measuring AM stereo.
200 Hz HPF	- 3 dB cutoff frequency 180 \pm 25 Hz Rolloff 60 dB / decade	
15 kHz LPF	Pass band \pm 1 dB in \leq 15 kHz Attenuation > 30 dB at \geq 19 kHz	Ninth Chebyshev filter
20 kHz LPF	Pass band \pm 1 dB in \leq 20 kHz Attenuation > 30 dB at \geq 24.1 kHz	Ninth Chebyshev filter
80 kHz LPF	- 3 dB cutoff frequency 80 \pm 10 kHz Rolloff 60 dB / decade	
PSOPHO A	A characteristics of IEC recommendation	
PSOPHO CCIR ARM	ARM characteristics of CCIR	
PSOPHO AUDIO	AUDIO characteristics of DIN 45405	See Fig. 1-6.

COMMON FOR ALL MEASUREMENT FUNCTIONS (Cont'd)				
Designation		Performance		Conditions or remarks
Monitor output and DC output				
Measurement	Monitor output	Monitor output voltage (open end)	DC output voltage (open end)	Output resistance
AC LEVEL	Provides scaled presentation of input signal.	Approx. 0.2 V rms, level indicator at a full range display.	Approx. - 2.5 V, level indicator at a full range display.	1kΩ ± 5 %
S / N	Noise component only.	Approx. 0.2 V rms, N level at a full range display.	Approx. - 2.5 V, N level at a full range display.	
DISTN	Noise and distortion components.	Approx. 0.2 V rms, both input level and distortion signal level at each full range display.	Approx. - 2.5 V, both input level and distortion signal level at each full range display.	
DC LEVEL	None	_____	Approx. ±2.5 V, level indicator at a full range display.	
WOW & FLUTTER	None	_____	Approx. 2.5 V, level indicator at a full range display.	
OTHERS				
Designation		Performance		Conditions or remarks
<u>PRESET function</u>				
Number of memory registers		100		
Items to be stored at a time		1) Frequency of the signal source 2) Output amplitude of the signal source (including OFF) 3) Measurement mode 4) Input range 5) Measurement range 6) Frequency of fundamental rejection filter 7) Selection of filter 8) Indication response assignment 9) Units for two measurement displays, % or V / dB 10) Operation mode, automatic or manual 11) Upper and / or lower limits for the LIMIT judgment function		

OTHERS (Cont'd)		
Designation	Performance	Conditions or remarks
<u>MODIFY function</u> <u>LIMIT function</u> <u>INTERFACE</u> <u>Remote control</u>	12) BAL or UNBAL input selection 13) Data of output ports P1 and P2 in EXT CONTROL I/O 14) Reference data in relative level measurement 15) Load resistance (R_L) data in WATT indication function. 16) Wow & flutter measurement center frequency 1) Modifies signal source frequency and output amplitude. 2) In manual operation <ul style="list-style-type: none"> • Modifies input level range • Modifies measurement range OVER and UNDER lights indicate the comparison result of the measured value to the predetermined upper and/or lower limits. GP-IB, EXT CONTROL I/O GP-IB : SH1, AH1, T7, L3, SR0, RL1, PP0, DC1, DT1, C0 <ul style="list-style-type: none"> • Copy function of preset data in talk only or listen only mode. • Memory sync function in talk only or listen only mode. EXT CONTROL I/O : <ul style="list-style-type: none"> • Sequence memory recall operation • Direct memory recall operation • Remote control of modify function • External control output 8 bits x 2 ports • Reading of external data 8 bits x 1 ports • Printing out of preset memory contents and measured value. 	

OTHERS (Cont'd)		
Designation	Performance	Conditions or remarks
<u>Power requirements</u>		
Voltage	100 V: 90 V to 112 V 120 V: 106 V to 132 V 220 V: 196 V to 244 V 240 V: 214 V to 250 V	
Frequency	50 or 60 Hz	
Power consumption	60 VA or less	

2-2 ENVIRONMENTAL CONDITIONS

Designation	Performance	Conditions or remarks
Ambient temperature and humidity	0° to 40 °C, RH 20 to 90 % 10° to 35 °C, RH 20 to 85 % – 20° to 70 °C, RH 20 to 90 %	Limit range of operation Limit range for guaranteed performance Storage and transportation

2-3 MECHANICAL PERFORMANCE

Designation	Performance	Conditions or remarks
Dimensions	426 mm wide, 132 mm high, and 400 mm deep	Excluding knob, connectors, handle and feet
Mass	Approx. 13 kg	

2-4 ACCESSORIES

Designation	Performance	Conditions or remarks
	Power cable 1 Spare fuse 1 GP-IB connector cap ... 1 Instruction manual 1	

2-5 OPTION

Designation	Performance	Conditions or remarks
Option 01	Wow & flutter measurement function (quasi-peak-responding)	Ordering model number : VP-7723A01
Option 02	Wow & flutter measurement function (rms-responding)	
Optional accessories	Measurement filters CCITT P53 TEL C-MESSAGE 1 kHz BPF 3 kHz BPF IEC-C	See Section VIII for details.