

SECTION I GENERAL INFORMATION

I-1 Introduction

This instruction manual is composed of the following sections:

(1) Section I GENERAL

This section outlines the VP-7722A 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-7722A and safety precautions. **IMPORTANT: BE SURE TO READ THIS SECTION BEFORE OPERATING THE INSTRUMENT.**

(4) Section IV PANEL FEATURES

This section describes the operational functions of the switches and controls installed on the front and rear panels.

(5) Section V OSCILLATOR OPERATION

This section describes the operating procedures of the signal generator section of this instrument.

(6) Section VI MEASURING SECTION OPERATION

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

(7) Section VII ADDITIONAL FUNCTIONS

This section describes in detail the preset and limit operations, as well as the plotter output operating procedures, of this instrument.

(8) Section VIII OVERVIEW OF THE GP-IB

This section describes the GP-IB standard.

(9) Section IX GP-IB INTERFACE

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

(10) Section K MEMORY CONTROL

This instrument can remote control the recall function of the preset data. Detailed descriptions of the functions, operating procedures, interfaces, and other items will follow.

(11) Section XI OPTIONAL FUNCTIONS

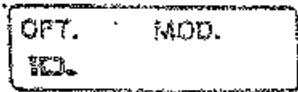
This section describes the specifications of the 8-bit parallel interface and weighting filters to be installed in this instrument as optional provisions.

(12) Section XII MAINTENANCE

1-2 ID number

This instrument is numbered with a ten-character ID number. The first seven digits and letter(s) assigned uniquely for each product. The last three digits 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 the manual.



1-3 Description

The VP-7722A Audio Analyzer is a measuring instrument with functions to measure ten items including the frequency, level, distortion, S/N ratio, and signal average and has a measuring signal source as shown in Fig. 1-3, VP-7722A Configuration. An audio measuring system featuring low noise, a high accuracy, and an excellent measuring efficiency can be built by combining the signal source and various measuring functions.

One feature of this instrument is the measurement of distortion factor. The true distortion below the noise level which cannot be measured by conventional distortion meters can be measured using the digital signal processing techniques. This instrument can also perform a harmonic analysis for making it easy to measure extremely low distortion factors.

As Fig. 1-2 shows, this instrument extensively incorporates digital control and signal processing techniques. The VP-7722A 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 measuring conditions, a limit function for PASS/FAIL judgment of measured results, a plotter output function to graph measured results by combining this instrument and a digital plotter, a remote control function through the memory control or GP-IB for remote setting and sending of measured data.

The microprocessors contained in the audio analyzer simplify various operations of the instrument, which features high performance and multi-functions, and miniaturize it to 15, 42, and 40 cm in height, width, and depth. The VP-7722A Audio Analyzer is a labor-saving automation component for use in research and development, as well as in production and inspection lines of audio equipment.

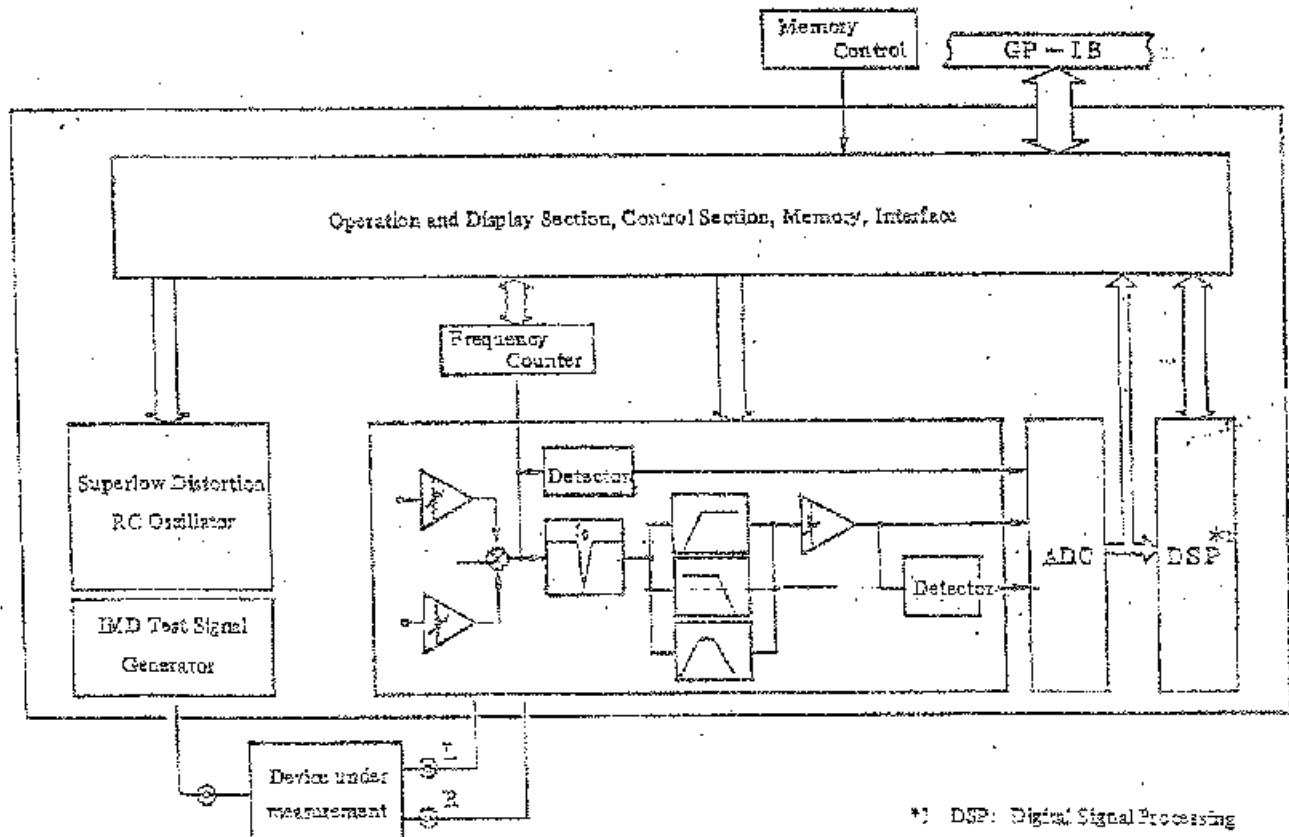


Fig. 1-2 (a) Configuration of VP-7722A

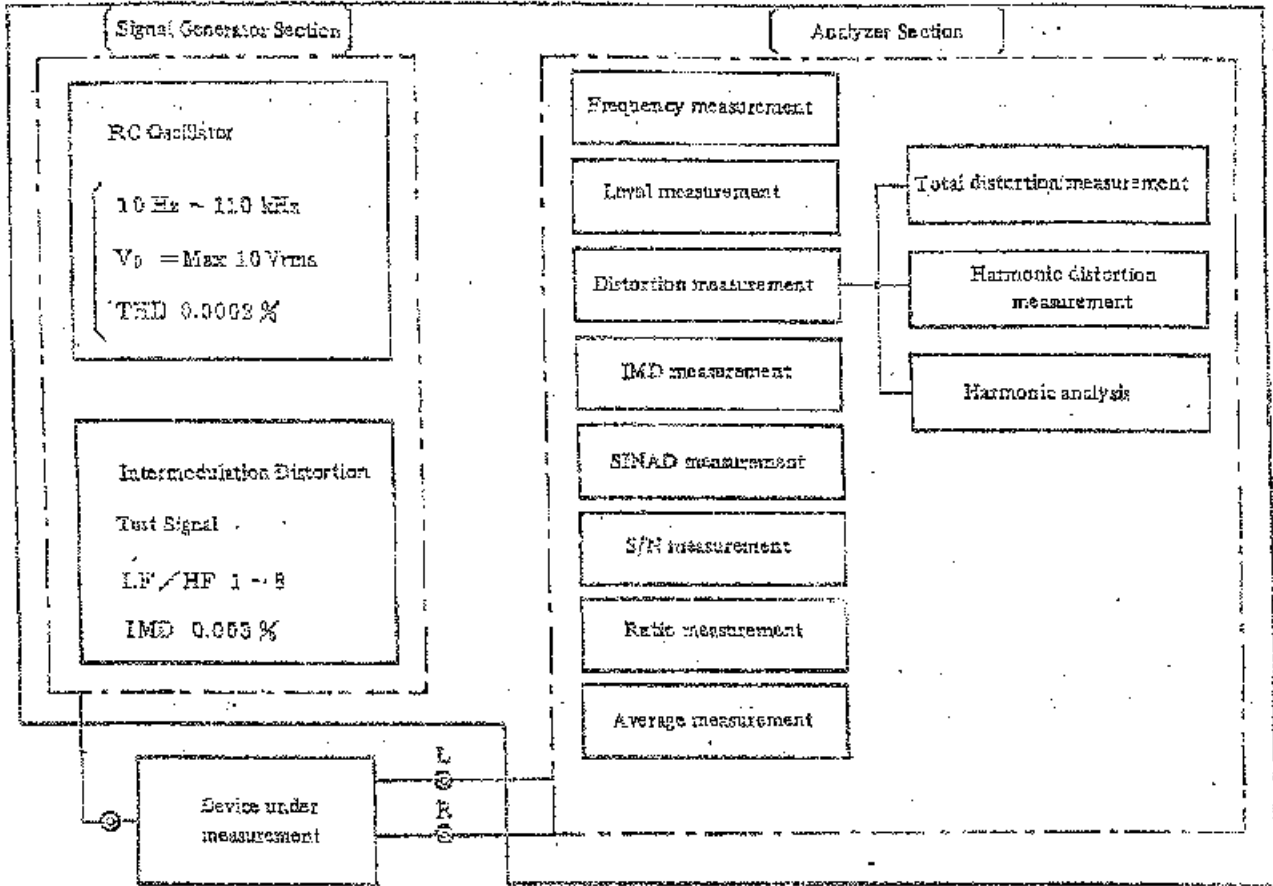


Fig. 1-2 (b) Configuration of VP-7722A

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 = 1V rms) is described as dBV throughout this instruction manual.

Table 2-1 Specifications

SOURCE			
Designation	Performance		Conditions or remarks
* NORMAL MODE <u>FREQUENCY</u> Display Frequency range and resolution	4 digits		Sine signal source mode
10 Hz to 110 kHz in 4 ranges			
10.0 to 159.9 Hz	0.160 to 1.599 kHz	1.60 to 15.99 kHz	16.0 to 110.0 kHz
0.1 Hz resolution	1 Hz resolution	10 Hz resolution	100 Hz resolution
Accuracy <u>OUTPUT AMPLITUDE</u> Display Units Range and resolution Accuracy	±3% of reading ±2% of reading 2 digits and a minus sign dBm (0 dBm = 1mW into 600Ω) dBV (0 dBV = 1Vrms)		10 Hz to 110 kHz 0.160 to 15.99 kHz The voltage in dBV is defined as the matched output (terminated by a 600Ω load). > -37.1 dBV < -37.2 dBV
Accuracy		±0.5 dB of reading at 400Hz ±0.8 dB of reading at 400Hz	

SOURCE (Cont'd)		
Designation	Performance	Conditions or remarks
Flatness	With reference to 400 Hz; $\pm 0.3\text{dB}$ $\pm 0.05\text{dB}$	With a load resistor of 600 Ω 10 Hz to 110 kHz 20 Hz to 20 kHz
Output resistance	600 Ω $\pm 2\%$	
<u>DISTORTION</u>	<0.003% (-90 dB) <0.0002% (-114 dB)	10 Hz to 110 kHz 50 Hz to 10 kHz; 2 fo-10 fo harmonic distortion
⊗ IMD TEST SOURCE		Dual-tone signal
<u>FREQUENCY</u>		
Display	4 digits	Displays the HF frequency.
Frequencies	LF 50 or 60 Hz HF 2.00 to 10.00 kHz 1 range	
Accuracies	LF $\pm 3\%$ HF $\pm 2\%$ of reading	
<u>OUTPUT AMPLITUDE</u>		
Display	3 digits and a minus sign	Displays the rms value of the dual-tone signal.
Units	dBm dBV	
Range and resolution	Variable from 6.2 to -83.7 dBm (4.0 to -85.2 dBV) in 0.1 dB steps	
Accuracy	± 1 dB of reading	LF 50 Hz, HF 7 kHz LF/HF=4/1
LF/HF Ratio	Variable from 1/1 to 8/1 in fractional steps	
<u>IM DISTORTION</u>	<0.002% (-94 dB)	LF/HF=4/1, HF 7kHz

MEASUREMENT		
Designation	Performance	Conditions or remarks
Measurement Functions	Frequency measurement AC level measurement S/N measurement Distortion measurements 1) Total harmonic distortion 2) harmonic distortion 3) harmonic analysis SINAD measurement IM distortion measurement Ratio measurements Averaged signal level measurement	Includes the relative level measurement function. 2fo to 10fo BW Selectable harmonic: 2fo to 5fo Conforming to the SMPTE method. L/R and R/L level ratios Includes the relative level measurement function.
FREQUENCY MEASUREMENT		
Measurement range	10 Hz to 110 kHz	
Display resolution	5 digits 0.01 Hz	Frequency ≥ 100 Hz Frequency < 100 Hz
Input level range	0.1 to 100V rms	
Accuracy	$\pm 5 \times 10^{-5} \pm 1$ digit	
Measuring system	Reciprocal counter	

LEVEL MEASUREMENT			
Designation	Performance	Conditions and remarks	
Full range display	7 ranges		
	Unit: (m)V	Unit: dBV	Unit: dBm
	100.0 V	40.0 dBV	42.2 dBm
	31.60 V	30.0 dBV	32.2 dBm
	3.160 V	10.0 dBV	12.2 dBm
	316.0 mV	-10.0 dBV	-7.8 dBm
	31.60 mV	-30.0 dBV	-27.8 dBm
	3.160 mV	-50.0 dBV	-47.8 dBm
	0.3160 mV	-70.0 dBV	-67.8 dBm
Accuracy	±2% of full range display ±10% of full range display	400 Hz 400 Hz, 0.316 mV range	
Flatness	With reference to 400 Hz; ±10% ±5%	10 Hz to 110 kHz 20 Hz to 20 kHz	
Residual noise	<10 μVrms		
Relative level measurement range	±130 dB	The range will be limited depending on the reference value selected.	
Detection response	RMS or average responding		
S/N MEASUREMENT			
S/N measurement range	0 to 130 dB	Table 2-2 shows the limitation for S/N measurement range depending on the S component level.	
S and N component level range	30 μVrms to 100 Vrms	S ≥ N	

S/N MEASUREMENT (Cont'd)

Designation	Performance	Conditions or remarks
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Table 2-2 S/N measurement limits

S component level freq ≤10 kHz		Unfloated input	Floated input
≥31.6V	≥ 30 dBV	>130 dB	>124 dB
≥3.16V	≥ 10 dBV	>110 dB	>104 dB
≥316mV	≥-10 dBV	> 90 dB	> 84 dB
≥31.6mV	≥-30 dBV	> 70 dB	> 64 dB
≥3.16mV	≥-50 dBV	> 50 dB	> 44 dB
≥0.316mV	≥-70 dBV	> 30 dB	> 24 dB

Accuracy

±1 dB

S component level accuracy

Same as LEVEL measurement

S/N delay time

1.5 to 99.9s

DISTORTION MEASUREMENT

Distortion measuring functions

DISTN

$$= \frac{\sqrt{e_2^2 + e_3^2 + \dots + e_n^2}}{e_{in}} \times 100\%$$

THD1

$$= \frac{\sqrt{e_2^2 + e_3^2 + \dots + e_{10}^2}}{e_{in}} \times 100\%$$

THD2

$$= \frac{\sqrt{e_2^2 + e_3^2 + \dots + e_{10}^2 + e_{DN}^2}}{e_{in}} \times 100\%$$

2fc, 3fc, ... 5fc

$$= \frac{e_{2-5}}{e_{in}} \times 100\%$$

e_{in} : Input signal level
 e_n : Nth harmonic level
 e_n : Noise included in the input signal
 e_{DN} : Noise introduced by the distortion measurement system

DISTORTION MEASUREMENT (Cont'd)																		
Designation	Performance	Conditions or remarks																
<u>TOTAL HARMONIC DISTORTION MEASUREMENT</u>																		
(DISTOR)																		
Fundamental frequency range	10 Hz to 110 kHz																	
Full range display	0.01% (-80dB) to 100% (0dB)	5 ranges																
Display of measurement units	<table border="1"> <tr> <td>Selection of unit key</td> <td>V, %</td> <td>dB</td> </tr> <tr> <td>Input signal level</td> <td>mV, V</td> <td>dBV, dBm</td> </tr> <tr> <td>Distortion</td> <td>%</td> <td>dB</td> </tr> </table>		Selection of unit key	V, %	dB	Input signal level	mV, V	dBV, dBm	Distortion	%	dB							
Selection of unit key	V, %	dB																
Input signal level	mV, V	dBV, dBm																
Distortion	%	dB																
Detection response	Input signal level: average responding Distortion: RMS or average responding																	
Fundamental rejection	>100 dB >110 dB	10 Hz to 110 kHz 20 Hz to 20 kHz																
Second harmonic accuracy	±1 dB ±3 dB	10 Hz to 15.99 kHz 16.0 to 110 kHz																
Residual noise and distortion	Depend on input frequency range and level as listed in Table 2-3 and 2-4.																	
Table 2-3 Residual noise and distortion for unfloated input																		
<table border="1"> <thead> <tr> <th>Input signal level</th> <th>≥ 1V</th> <th>≥0.3V</th> <th>≥0.1V</th> </tr> </thead> <tbody> <tr> <td>10Hz - 20kHz</td> <td><-95 dB</td> <td><-90 dB</td> <td><-80 dB</td> </tr> <tr> <td>20kHz- 50kHz</td> <td><-90 dB</td> <td><-85 dB</td> <td><-80 dB</td> </tr> <tr> <td>50kHz-110kHz</td> <td><-85 dB</td> <td><-80 dB</td> <td><-75 dB</td> </tr> </tbody> </table>			Input signal level	≥ 1V	≥0.3V	≥0.1V	10Hz - 20kHz	<-95 dB	<-90 dB	<-80 dB	20kHz- 50kHz	<-90 dB	<-85 dB	<-80 dB	50kHz-110kHz	<-85 dB	<-80 dB	<-75 dB
Input signal level	≥ 1V	≥0.3V	≥0.1V															
10Hz - 20kHz	<-95 dB	<-90 dB	<-80 dB															
20kHz- 50kHz	<-90 dB	<-85 dB	<-80 dB															
50kHz-110kHz	<-85 dB	<-80 dB	<-75 dB															

DISTORTION MEASUREMENT (Cont'd)			
Designation	Performance		Conditions or remarks
	Table 2-4 Residual noise and distortion for floated input		
	Input signal level	>1V	>0.3V >0.1V
	10Hz - 20kHz	<-80 dB	<-75 dB <-75 dB
	20kHz - 50kHz	<-80 dB	<-75 dB <-75 dB
	50kHz - 110kHz	<-80 dB	<-75 dB <-75 dB
Input level measurement			
Range	0.05 to 100 Vrms		Table 2-3 and 2-4 also show the limitation for the distortion measurement range.
Full range display	100V 10.0V 1.00V 75.0V 7.50V 750mV 36.2V 5.62V 562mV 42.2V 4.22V 422mV 31.6V 3.16V 316mV 23.7V 2.37V 237mV 17.8V 1.78V 178mV 13.3V 1.33V 133mV		100V =40dBV =42.2dBm 133mV =-17.5dBV =-15.3dBm 24 ranges in 2.5dB steps About 10% of overrange is provided for each range except on the 100V range.
Accuracy	±2% of full range display		At 400Hz
Flatness	With reference to 400Hz at a full range display; ±5% from 10Hz to 110kHz		Excluding the ranges above 42.2V.

DISTORTION MEASUREMENT (Cont'd)																						
Designation	Performance	Conditions and remarks																				
<u>HARMONIC DISTORTION MEASUREMENT (THD)</u>																						
Detection bandwidth Full range display	2nd to 10th harmonics 0.001% (-100dB) to 100% (0dB)	6 ranges The 100% (0dB) range is not available for automatic operation.																				
Fundamental rejection Second harmonic	>140dB																					
accuracy	Same as DISTN measurement																					
Residual distortion	Depends on input frequency range and level as listed in table 2-5 and 2-6.																					
<p>Table 2-5 Residual distortion for unfloated input</p> <table border="1"> <thead> <tr> <th>Input signal level</th> <th>≥1V</th> <th>≥0.3V</th> <th>≥0.1V</th> </tr> </thead> <tbody> <tr> <td>20Hz-10kHz</td> <td><-110dB</td> <td><-107dB</td> <td><-104dB</td> </tr> <tr> <td>10Hz-20kHz</td> <td><-105dB</td> <td><-102dB</td> <td><-98dB</td> </tr> <tr> <td>20kHz-50kHz</td> <td><-98dB</td> <td><-95dB</td> <td><-90dB</td> </tr> <tr> <td>50kHz-110kHz</td> <td><-85dB</td> <td><-80dB</td> <td><-75dB</td> </tr> </tbody> </table>			Input signal level	≥1V	≥0.3V	≥0.1V	20Hz-10kHz	<-110dB	<-107dB	<-104dB	10Hz-20kHz	<-105dB	<-102dB	<-98dB	20kHz-50kHz	<-98dB	<-95dB	<-90dB	50kHz-110kHz	<-85dB	<-80dB	<-75dB
Input signal level	≥1V	≥0.3V	≥0.1V																			
20Hz-10kHz	<-110dB	<-107dB	<-104dB																			
10Hz-20kHz	<-105dB	<-102dB	<-98dB																			
20kHz-50kHz	<-98dB	<-95dB	<-90dB																			
50kHz-110kHz	<-85dB	<-80dB	<-75dB																			

DISTORTION MEASUREMENT (Cont'd)			
Designation	Performance	Conditions and remarks	
	Table 2-5 Residual distortion for floated input		
	Input signal level	≥1V	≥0.3V
	20Hz-10kHz	<-105dB	<-100dB
	10Hz-20kHz	<-100dB	<-100dB
	20kHz-50kHz	<-98dB	<-95dB
	50kHz-110kHz	<-85dB	<-80dB
DSP MONITOR output	2nd to 10th harmonic components with the fundamental (1kHz) component rejected. Provided only in single channel measurement. Voltage: 0.5Vrms approx. Output resistance: 1kΩ approx.	The converted 1kHz is always the fundamental frequency as a result of DSP (digital signal processing). With both input signal level and measured distortion are at each full range display.	
SYNC output	TTL level output with frequency identical to the fundamental frequency of the DSP MONITOR output.		
<u>HARMONIC DISTORTION MEASUREMENT (THD₂)</u>			
Detection bandwidth	2nd to 10th harmonics		
Full range display	1% (-40dB) and 100% (0dB)	2 ranges	
Fundamental rejection Second harmonic	≥100dB		
accuracy	Same as DISTN measurement		
Residual noise and distortion	<-20dB <-55dB	Input signal level ≥1V Input signal level ≥0.1V	

DISTORTION MEASUREMENT (Cont'd)		
Designation	Performance	Conditions and remarks
DSP MONITOR output	None	
<u>HARMONIC ANALYSIS</u> (2fo to 5fo)		
Detection bandwidth	Harmonic components selected out of 2fo, 3fo, 4fo and 5fo are detected. Adjacent harmonic attenuation: >25dB	
Distortion measurement range	Same as THD1 measurement	
Fundamental rejection Second harmonic accuracy	Same as THD1 measurement	
Residual distortion	Same as THD1 measurement	
DSP MONITOR output	Selected harmonic components	
SYNC output	Same as THD1 measurement	
<u>SINAD MEASUREMENT</u>		
Full range display	0, 20, 40dB 0, 20, 40, 60, 80, 100dB	3 ranges for auto ranging operation 6 ranges for manual setting
Display of measurement units	Input signal level: dBV, dBm SINAD: dB	
Fundamental rejection	>50dB	
Residual SINAD	>50dB >65dB	Input signal level ≥ 1V Input signal level ≥ 0.1V
Other characteristics	Same as DISTN measurement	

IMD MEASUREMENT		
Designation	Performance	Conditions and remarks
IMD measurement method	SMPTE method	
Input frequency range	LF: 560Hz HF: 2 to 20 KHz	
Measurable mixing range	1:1 to 8:1	
Full range display	0.01% (-80dB) to 100% (0dB)	5 ranges in 20dB steps
Measurement unit	% or dB	
Detection response	RMS or average responding	
Residual IMD	<0.002% (-94dB) <0.003% (-90dB)	LF60Hz, HF7kHz, LF/HF=1/1 LF60Hz, HF7kHz, LF/HF=4/1 Input signal level 1 Vrms
Input signal level range	Same as DISTN measurement	
RATIO MEASUREMENT		
Denominator measurement Input range	0.05V to 100V rms	
Full range display	Same as DISTN input level measurement	24 ranges
Accuracy	±2% of full range display	
Ratio measurement Range	Table 2-7 shows the limitation for ratio measurement range depending on the denominator level.	

RATIO MEASUREMENT (Cont'd)		
Designation	Performance	Conditions and remarks
Table 2-7 Ratio measurement range		
	Denominator level	Range (unit dB) Range (unit %)
	100V (40dBV)	0 to -130 dB 100 to 0.00003%
	31.6V (30dBV)	10 to -120 dB 100 to 0.0001%
	3.16V (10dBV)	30 to -100 dB 100 to 0.001%
	316mV (-10dBV)	50 to -80 dB 100 to 0.31%
	100mV (-20dBV)	60 to -70 dB 100 to 0.03%
Accuracy	±1dB	At 400Hz, with both denominator and numerator levels are at each full range display.
Flatness	With reference to 400Hz; ±2dB from 10Hz to 110kHz	
Detection response Denominator Numerator	Average responding Average or RMS responding	
AVERAGED SIGNAL LEVEL MEASUREMENT		
Full range display	Same as LEVEL measurement	7 ranges
Accuracy	±10% of full range display	At 400Hz
Flatness	With reference to 400Hz at a full range display: ±10% from 10Hz to 110kHz	
Residual noise	<10µV rms	16 times averaged
Detection response Required input reference	RMS or average responding	
Signal level for averaging	0.1V to 100V rms	
Number of averaging times	16, 32, 64, 128, 256	

COMMON FOR ALL MEASUREMENT

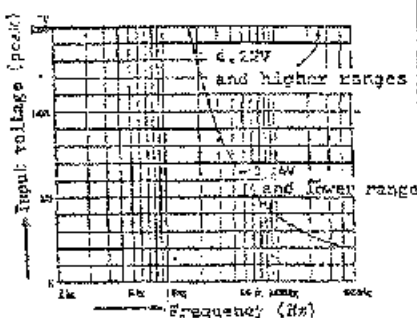
Designation	Performance	Conditions and remarks															
Input impedance Maximum allowable input voltage	100 kΩ shunted by <math><200\text{pF}</math> Maximum allowable input voltage between A (or B) terminal and common connection. 4, 22V to 100V ranges: 150V (DC+AC peak) 3, 16V or lower ranges: 150V (DC+AC peak) for AC component of 17kHz or lower. See Fig. 2-1 for higher frequencies.	Each input to common connection 															
Filters	<table border="1"> <thead> <tr> <th></th> <th>-3dB cutoff frequency</th> <th>Rolloff</th> </tr> </thead> <tbody> <tr> <td>30 kHz LPF</td> <td>20 ± 5 kHz</td> <td>-60dB/decade</td> </tr> <tr> <td>80 kHz LPF</td> <td>80 ± 10 kHz</td> <td>-60dB/decade</td> </tr> <tr> <td>400 Hz HPF</td> <td>400 ± 50 Hz</td> <td>-60dB/decade</td> </tr> <tr> <td>PSCPO-A</td> <td colspan="2">"A" characteristic of the IHP standard</td> </tr> </tbody> </table>			-3dB cutoff frequency	Rolloff	30 kHz LPF	20 ± 5 kHz	-60dB/decade	80 kHz LPF	80 ± 10 kHz	-60dB/decade	400 Hz HPF	400 ± 50 Hz	-60dB/decade	PSCPO-A	"A" characteristic of the IHP standard	
	-3dB cutoff frequency	Rolloff															
30 kHz LPF	20 ± 5 kHz	-60dB/decade															
80 kHz LPF	80 ± 10 kHz	-60dB/decade															
400 Hz HPF	400 ± 50 Hz	-60dB/decade															
PSCPO-A	"A" characteristic of the IHP standard																

Fig. 2-1 Maximum allowable input voltage for AC component only

COMMON FOR ALL MEASUREMENTS (Cont'd)				
Designation		Performance		Conditions and remarks
Monitor output				
Measurement	Monitor output	Output voltage	Output resistance	Note
LEVEL	Provides scaled presentation of input signal.	Approx. 1Vrms, open circuit, level indicator at a full range display.	1kΩ±5%	Provides I and R signals alternately in L&R measurement
S/N	Provides scaled presentation of noise component only.	Approx. 1Vrms, open circuit, when N level corresponds to a full range display.		
DISTN TDL1,2 SIGNAL	Provides scaled presentation of noise and distortion components.	Approx. 1Vrms, open circuit, both input level and distortion indicators at each full range display.		
IMD	Provides scaled presentation of noise and IM components.	Not specified.		
RATIO	Provides scaled presentation of numerator input component only.	Approx. 1Vrms, open circuit, when numerator level corresponds to a full range display.		
AVERAGE	Same as LEVEL measurement.	Same as LEVEL measurement.		

OTHERS	
Designation	Performance
<p><u>PRESET</u> function</p> <p>Number of memory registers</p> <p>Items to be stored at a time</p>	<p>100</p> <ol style="list-style-type: none"> 1) Frequency of the source 2) Amplitude unit of the source 3) Output amplitude of the source 4) Mixing ratio of the IMD test source 5) Assignment of a source function 6) Assignment of a measurement function 7) Filter assignment 8) Response assignment 9) Units for two measurement displays 10) Operation mode, automatic or manual 11) Parameters for manual operation <ul style="list-style-type: none"> . Fundamental frequency of distortion measurement . Input level range . Measurement range . Reference level for relative level measurement . Delay time for S/N measurement . Number of averaging times 12) Upper and/or lower limits for the LIMIT function 13) Input channel assignment

OTHERS (Cont'd)		
Designation	Performance	Conditions and remarks
<u>LIMIT function</u>	OVER and UNDER lights indicate the comparison result of the measured value to the predetermined upper and/or lower limits.	
<u>PLOTTER OUTPUT function</u>	Plots up to 32 acquired measurement data on the predetermined X and Y coordinates. X-axis is assigned for frequency or level axis. The grid lines are edited to include the assigned X-axis measurement points and Y-axis upper and lower limits.	
Interface	GP-IB talk only mode	8-bit parallel interface optionally available.
Command system	L1, L2	See Section 7 of this manual
<u>Built-in interface</u>	GP-IB and memory control	
<u>Remote control</u>	GP-IB: SH1, AH1, T7, L4, SR0, RM1, PFC, DC1, DT0, CO	Ref. Section 9 of this manual
	Memory control: Recall operation of PRESET memory registers, and modification of measurement parameters.	Ref. Section 10 of this manual
<u>Others</u>		
Ambient conditions	0°C to 43°C, RH20-90% 10°C to 35°C, RH20-85% -20°C to 70°C, RH20-90%	Limit range of operation Limit range for guaranteed performances Storage and transportation

OTHERS (Cont'd)		
Designation	Performance	Conditions and remarks
Power requirements		
Voltage	100V: 90V to 112V 120V: 106V to 132V 220V: 196V to 244V 240V: 214V to 250V	
Frequency	50 or 60KHz	
Power consumption	120VA or less	
Dimensions	426mm wide, 150mm high and 400mm deep	
Mass	Approx. 3.7 kg	
Accessories furnished	1 ... Power cable 1 ... GF-IP connector cap 1 ... Spare fuse 1 ... Instruction manual	