

FREQUENCY RESPONSE TESTER

MODEL 8510

OPERATION MANUAL

KIKUSUI ELECTRONICS CORP.

# Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark )

Input voltage

The input voltage of this product is \_\_\_\_\_ VAC,  
and the voltage range is \_\_\_\_\_ to \_\_\_\_\_ VAC. Use the product within this range only.

Input fuse

The rating of this product's input fuse is \_\_\_\_\_ A, \_\_\_\_\_ VAC, and \_\_\_\_\_.

### WARNING

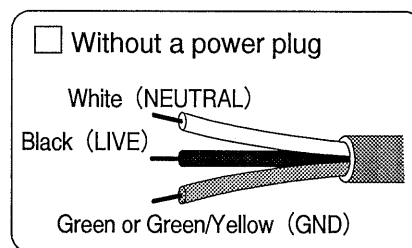
- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

### WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.



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## 1. DESCRIPTION:

This model of 8510 can measure Frequency Response Characteristics between frequency ranges from 20Hz to 200kHz at Input Levels from +20dBm to -100dBm at Dynamic Range of 30dB(+5 — -25)/60dB(+10 — -50)/6dB(+1 — -5) and use 12 inch long persistence C.R.T. as Direct Display Unit.

This 8510 has additionally functions:

- 1) 2 Line Level Marker on Vertical Axis
- 2) 3 Points Adjustable Brightness Marker on Horizontal Axis Piled on Level Marker
- 3) Level Marker and Brightness Marker freely adjustable
- 4) Auto Level Function to adjust the automatically to Set Level provided synchronization with external circuit
- 5) Automatic Synchronizing Sweep Function(F-V Conversion), that is, Sweep Signal is given from measured Signal in a case of measurement of no supply of Sweep Signal

From the above mentioned functions, the Instrument is well suitable for measurement of Frequency Response Characteristics of Amplifiers, Filters, Networks, Taperecorders, Speakers, Microphones, and other sound apparatus.

## 2. SPECIFICATIONS:

NAME:	Frequency Response Tester (Tracer)
MODEL NO.:	8510
INPUT IMPEADANCE:	About 1Mohm
MEASURING INPUT LEVEL:	-100dBm — +20dBm
MEASURABLE FREQUENCY RANGE:	20 — 20kHz/20 — 200kHz
DYNAMIC RANGE:	30/60dB and 6dB
INPUT FINE KNOB:	about 0 — -10dB
6dB OFF SET RANGE:	+10/0/-10/-20/-30/-40
CONTINUOUS VARIABLE RANGE:	about 0 — -10dB

## MEASURING RANGE &amp; FREQUENCY RESPONSE CHARACTERISTICS:

As per following table:

(FINE KNOB POSITION is placed to CAL'D)

RANGE (dBm)	FREQUENCY RESPONSE at 1kHz	DYNAMIC RANGE		LINEARITY at 1kHz
		30dB	60dB	
+10	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
0	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
-10	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
-20	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
-30	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
-40	20Hz-200kHz 1dB	+5 - -25	+10 - -50	1dB
	50Hz-100kHz 0.6dB		+10 - -40	
-50	20Hz-100kHz 1dB	+5 - -25	+10 - -50	1.5dB
	50Hz-100kHz 0.6dB		+10 - -40	
-60	20Hz-50kHz 2dB	+5 - -25		1.5dB
	50Hz-20kHz 1dB		+10 - -40	

6dB Range is of a part of expansion of 60dB Range.

AUTO LEVEL: ON/OFF by Switch

LEVEL PRESETTING: Within Graduation on C.R.T.

TRIGGER: EXT/INT

EXT: TTL Level

INT: Switch Push ON

EFFECTIVE SCALE AREA: In a case of calibration to lower Level than indicated.

Value: -50 - (+10 - calibration value)

In a case of calibration to higher Level than indicated.

Value: +10 - (-50 + calibration value)

RESPONSE SPEED: Ripple & Noise

	20Hz	70Hz	200Hz
SLOW	4dB	2dB	0.5dB
MID	10dB	4dB	1dB
FAST	16dB	8dB	2dB

VERTICAL AXIS SCALE: +5 - 0 - -25/+10 - 0 - -50/+1 - 0 - -5

HORIZONTAL AXIS SWEEP MODE: EXT 1, 2/ INT

EXT 1: SWEEP WAVE( ) 0 - 8V/-4 - +4V by SWITCHING OF MODE

2: OSCILLATING WAVE( ) Input Level: 500mVp-p Min.  
F. Max.: 50kHz

INT: SWEEPING POSSIBLE LEVEL Effective Scale on C.R.T. or  
100  $\mu$ Vrms Min.

SETTING ACCURACY: EXT 1 6% + 5Hz  
EXT 2/INT 6% + 5Hz

HORIZONTAL RANGE: 20 - 20kHz/20 - 200kHz

BLANKING: ON/OFF

BRIGHTNESS MODULATION: Horizontal sweep mode EXT 1 TTL Level  
EXT 2/INT Automatically

LEVEL MARKER: 2 Fly Back Lines (Setting Freely available)

HORIZONTAL MARKER: 3 Bright Points (Setting Freely available only  
on Level Marker)

ILLUMINATION: Continous Variable

POSITION: H and V (a little bit adjustment available)

X-Y RECORDER TERMINALS: Output Impeadance: 2Kohm Max.  
Y Level: +1 - -5V  
X Level: 0 - 8V/ -4 - +4V  
by MODE Switching

LENGTH OF SCALE: 120mm (V) x 186mm (H)

CATHODE RAY TUBE: 12 inch long persistance

INPUT POWER SUPPLY: VAC  $\pm$ 10% 50/60Hz abt. 35VA

WEIGHT: About 17kg.

DIMENSIONS: 430 (W) x 250 (H) x 370 (D)mm  
MAX. DIMENSIONS: 430 (W) x 260 (H) x 430 (D)mm

OPERATING TEMPERATURE RANGE: 5° to 45°C

ACCESSORIES:

Operational Manual	-----	1
BW-1 (Lead Wire)	-----	1
Scale (20Hz - 20kHz) Log.	-----	1
" (20Hz - 200kHz) Log.	-----	1
" (20Hz - 20kHz) Linear	-----	1
Cable (Input and Output)	-----	1
Shelter for Light (Food)	-----	1

## 3. OPERATION METHOD:

3-1 DETAILS OF FRONT PANEL: Refer to Fig. 3-1

- (1) INTEN: Brightness Control and Power ON/OFF Switch Knob

Power OFF situation is given if this switch is locked at the counterclockwise direction.

If this switch is rotated toward clockwise direction, Brightness is lighter. And then, Signal Use Fly Back Bright Point appear on the surface of C.R.T. and by further rotation of this Knob, Level Marker Line and Horizontal Marker is appear on the surface in turn.

To protect break-down of C.R.T., Bright Line is chopped. Accordingly, in a case of fast Sweeping, Bright Line will be in dotted line. But this phenomenon is not of any trouble.

Please note that it is not possible to adjust the Brightness of Level Marker.

When Horizontal Sweep Mode is adjusted to EXT 2/INT, Brightness will be darker than usual situation's by Brightness modulation if Sweep Time is delayed from about 1 decade(20Hz - 200kHz)/10 seconds.

- (2) ILLUM: Illuminating Knob for Scale. By clockwise direction operation, the lightness is brighter.
- (3) POSITION:
- H  $\leftrightarrow$  This is Horizontal Direction Position Adjustment Resistor. By clockwise rotation, the position is transferred toward right direction. By opposite operation, left transfer is given.  
(Transfer Width: about 1 decade/(20Hz - 200kHz))
- V  $\updownarrow$  Vertical Direction Position Adjustment Resistor By Clockwise rotation, the position is transferred toward upper side and by the opposite operation, reverse transfer is obtained.  
(Transfer Width: about 20dB/(+10 - -50))
- (4) ROTATE: This is Semi-Fixed Knob for calibration of Bright Line's slopiness. About  $\pm 5^\circ$  slopiness calibration is possible by this Knob.
- (5) LEVEL MARKER: Bright Line Marker against Vertical Axis has 2 Lines, and that each Line can move independently in effective area of C.R.T.  
By these Markers, comparison Level against measuring standard is provided, and also, smaller distortion of surface of C.R.T. and error of parallax is given.
- (6) HORIZONTAL MARKER: This Bright Marker is placed on Level Marker. 3 Markers are freely settled. And this Marker is used to settlement of standard Frequency Points.

- (7) DYNAMIC RANGE: 30/60/6dB (3 ranges) selectable by Push Button Switches.  
6dB range is used to a part of expansion of 60dB Range.
- (8) OFFSET: Offset Knob on 6dB Range.  
6dB Range measure a part of expansion of 60dB Range. Therefore, Level Shift is settled by this Knob if necessary.  
This Range covers +10dB - -40dB with 10dB step variation. Upper Knob of this double Knob give continuous variation.  
Shift Point is adjusted to be 0dB within effective area of C.R.T. on each Range.  
After reading of Level on 60dB Range, the value shall be settled by Offset Knob. After then, please switch to 6dB range, so that the Point is positioned to 0dB though it's accuracy is not so much high.
- (9) RESPONSE: SLOW, MID & FAST (3 Range) selectable by measuring condition for Response Speed Switch.  
Easy reading on surface of C.R.T. is given by suitable selection of this Switch considering the correspondence with Sweep Response Speed.
- Recommendable Switch Selection:
- |      |         |
|------|---------|
| SLOW | 20Hz -  |
| MID  | 70Hz -  |
| FAST | 200Hz - |
- (10) AUTO: AUTO LEVEL ON/OFF Switch which is actuated by Switch Push and Locking.  
In this condition, Trigger Signal calibrates Signal Level to become the value settled by LEVEL PRESET Knob.  
Trigger Method depends on TRIG Switch "11" on Panel or on External Input Signal.
- (11) TRIG.: Manual Operation Trigger Switch of AUTO LEVEL, which Switch connection is externally "OR".  
Gate is opened while depressed.
- (12) LEVEL PRESET: Level Setting Knob for AUTO LEVEL. The Level is moved within effective area of C.R.T.  
(Setting Operation is easily made while "11" TRIGGER Switch is depressed.
- (13) RANGE: Input Voltage Selectable Range within +10 - -60dB with 10dB step in 8 Ranges.  
This Knob is constructed by 2 double Knobs: Upper Knob is for CH1 and another lower Knob is for CH2.  
This Knob can give independent operation or continuous operation (Red Button Operation).



- (14) FINE: Continuous Variable Knob within ranges about variable range from 0 to -10dB. Each range is calibrated in the position of CAL'D. In a case of adjustment by this Knob, effective DYNAMIC RANGE on the surface of C.R.T. shall decrease the value adjusted by the Knob. (Dynamic Range Value - FINE Knob adjusted value)
- (15) INPUT: Input Terminal of 20Hz - 200kHz and +20dB - -100dBm Signals.
- 3-2: DETAILS OF REAR PANEL: Refer to Fig. 3-2
- (16) BLANKING ON/OFF: Blanking ON/OFF Switch  
In a case of Sweep Mode of EXT 1, External TTL Level of "L" give Blanking Action.  
For Sweep Mode of EXT 2/INT, Bright erasion is made in internal circuit.
- (17) VERTICAL POLARITY: Polarity Exchanging Switch for Vertical Axis.  
"+" Upper Side: +5/+10/+1 dB scale  
"-" Lower Side: " scale
- (18) HORIZONTAL RANGE: Selectable Switch for 20 - 20 kHz/20 - 200 kHz
- (19) HORIZONTAL MODE: Sweep Mode Selectable Switch for INT/EXT 1/EXT 2 in accordance with application.
- INT: Without Sweep Signal, Automatic Sweep is done by synchronization with Measuring Signal Frequency.
- EXT 1: Sweep is done by Sweep Signal Wave from Oscillator.
- EXT 2: Sweep is made by Input of same Frequency to measuring Signal Frequency.  
(This Mode is used to take Sweep in a case that Sweep is not done by INT Mode in the point of Level or that Signal Frequency include much distortion and Noise).  
Input is taken from BNC connector.
- (20) RECORDER: For Output Terminals for X-Y Recorders.

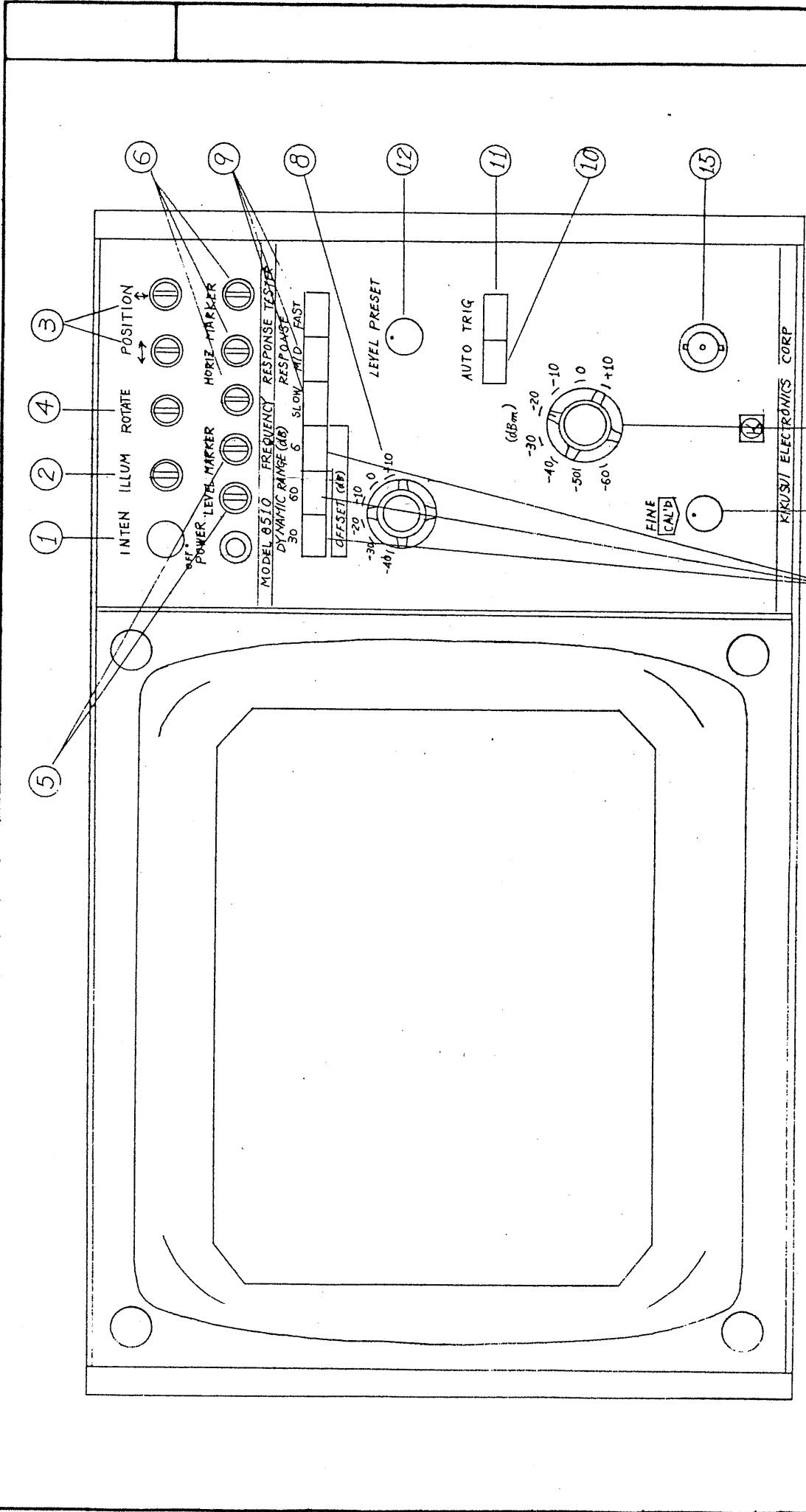


Fig. 3-1 Front Panel Arrangement

承認 校正 取扱説明書書式

NP-32635 B

72111000・30SK13

作成 年月日 仕様 番号

S-781952

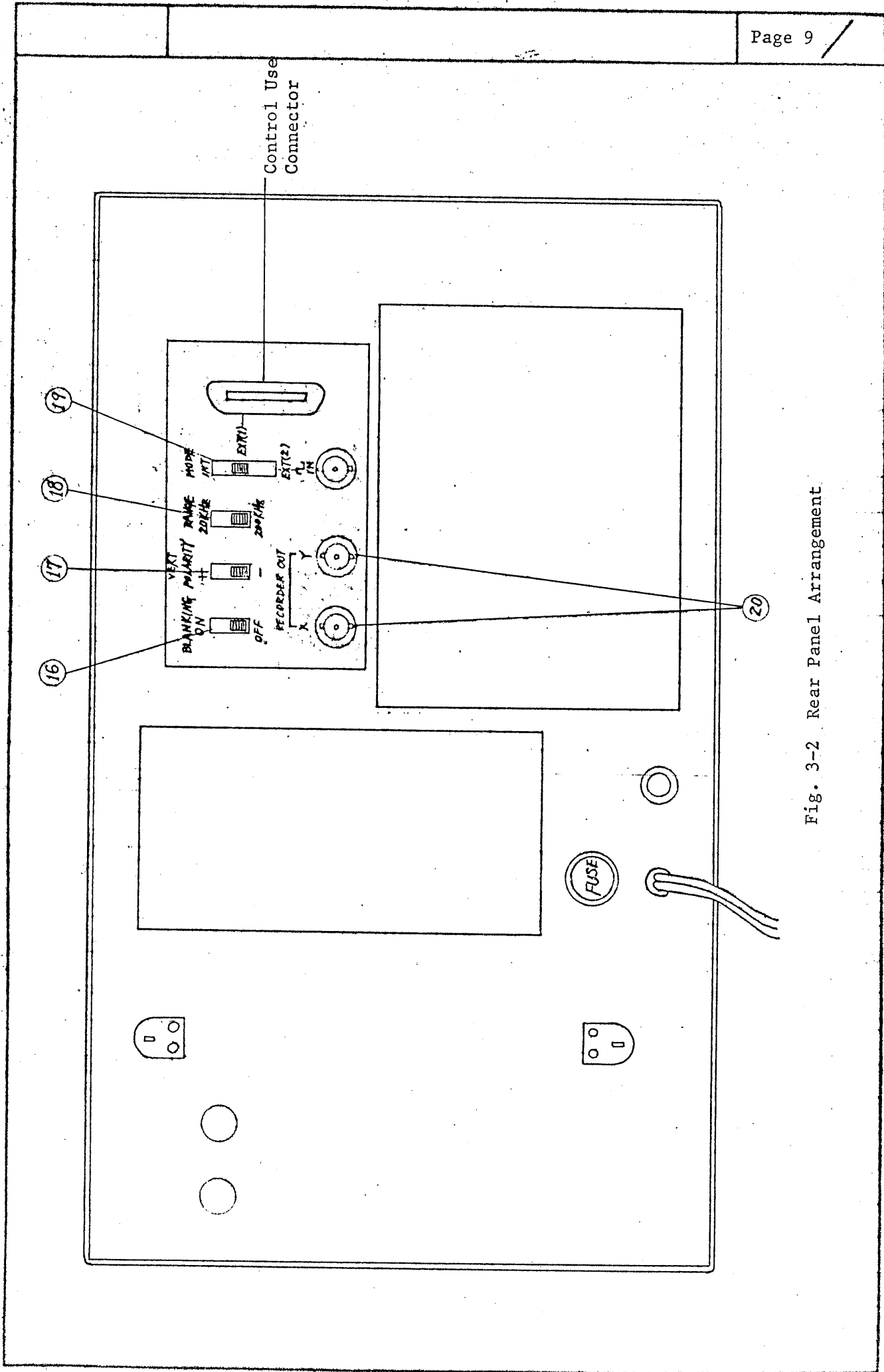


Fig. 3-2 Rear Panel Arrangement

NP-2845 B 5545 K13

## 3-3 PIN DISTRIBUTION (ARRANGEMENT) OF CONTROL INPUT USE

	13	1	
	14	2	
	15	3	
	16	4	
BLANKING	17	5	
BRIGHTNESS	18	6	WIDE/DEVI
	19	7	
TIME BASE (H)	20	8	TIME BASE (L)
	21	9	
AUTO LEVEL TRIGGER	22	10	
F-V CONVERSION	23	11	
CONTROL USE GROUND	24	12	AUTO LEVEL SIGNAL OUT

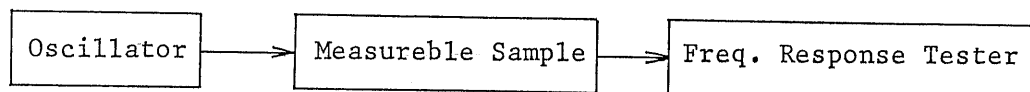
## 4. PRINCIPLES OF OPERATION:

## 4-1 OPERATION METHOD OF AUTO LEVEL:

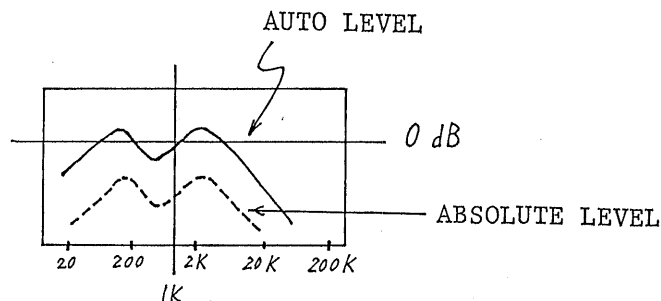
In a case of measurement of characteristics for reference frequency, it is necessary to meet each Level between on reference frequency and measurable sample or to make approximate calculation for reading the everytime when each Level has different ones. AUTO LEVEL function provide automatic Level Shift to meet each Level difference on the reference frequency and measurable sample. This function is suitable for measuring of relative Levels.

Example:

In a case of measurement of characteristics on reference Level of 0dB at 1kHz.



- 1) Set the Oscillator to 1kHz.
- 2) AUTO LEVEL Switch should be turned to ON position.
- 3) By PRESET Knob, adjust the Level to 0dB in the condition of the TRIGGER Switch being depressed. After the Level is set to 0dB, the TRIGGER Switch should be released.
- 4) Oscillator Sweep Operation.
- 5) Trace the Level to get cross on 0dB at 1kHz.



4-2 OPERATION METHOD OF 6dB RANGE:

This 6dB Range is applied to partial expansion of Characteristics on WIDE RANGE.

- 1) Read the Calibration on C.R.T. about what dB point should be partly expanded:

Example:  $\longrightarrow$  -10dB

- 2) Set the OFFSET Switch to -10dB.

RANGE 0dB Variable Knob C.C.W. Maximum Position  
 or  
 RANGE -10dB Variable Knob C.W. Maximum Position

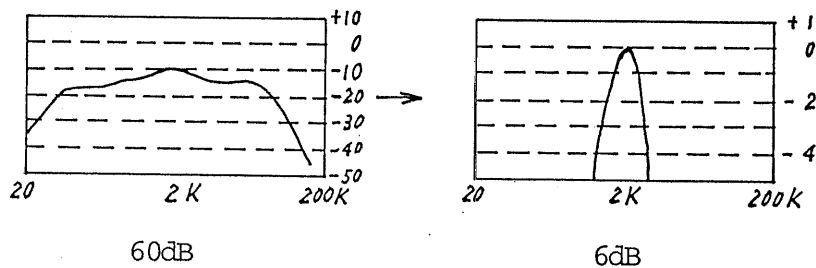
- 3) Exchange the RANGE to 6dB.

- 4) The point of -10dB is shifted to position of 0dB on 6dB Range.

\* If the requesting expansion point is indicated by LEVEL MARKER or HORIZONTAL MARKER, it is very convenience for this measurement.

C.C.W.: Counterclockwise Direction

C.W.: Clockwise Direction



## 5. PREPARATION FOR OPERATION:

## 5-1 PREPARATION:

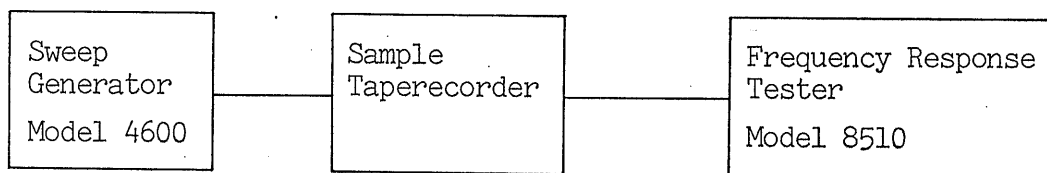
- 1) Check the position of INTEN Knob to be POWER OFF position.
- 2) Set the Input Range to +10dBm.
- 3) Dynamic Range should be settled to 60dB.
- 4) Connect AC Plug to Input Power Supply Line(        V, 50/60Hz)
- 5) Rotate the INTEN Knob to C.W. direction to release the Locking. Then, Power Supply is provided.
- 6) In a case of necessity of accuracy, aging of 30 - 60 minutes is required in the condition of low brightness.
- 7) Select the RANGE according to measurable Frequency on the Rear Panel. For 20Hz - 20kHz measurement, change the calibration Scale.
- 8) In a case of Black-out effect, switch BLANKING Switch to ON.
- 9) Select the Polarity of Vertical Axis to " + " in a case of usage of Fixed (Set-in) Scale.
- 10) Select the Sweep Mode on Horizontal Axis. In a case that Time Base Signal can be available by combination of Sweep Oscillator, use this Equipment in the condition of "EXT 1" Mode.
- 11) Select the Mode on Vertical Axis.
- 12) Select the Input Range.
- 13) Dynamic Range Selection.
- 14) RESPONSE Setting.  
Response is decided by measuring Frequency but can be selected by value of Ripple.
- 15) To increase the brightness, INTEN Knob should be rotated toward C.W. direction.
- 16) In accordance with necessity, settle the Level Marker or Frequency Marker.
- 17) Input Measuring Signal to Input Terminal.

## 5-2 NOTEWORTHY POINTS:

- 1) Avoid the operation in the ambient condition of bad ventiration or under direct Sun Light.
- 2) This Equipment is influenced by Inductive or Magnetic field. Please be careful to do operation under such Inductive or Magnetic field.
- 3) INTEN Knob should be positioned to lower brightness when this Equipment is not used, because the Dot on higher brightness will provide bad influence to C.R.T. if the brighter Dot is positioned in a same place for a long time.
- 4) Maximum Input Signal Level is designed by 20dBm on this Equipment. Please avoid to input more higher Input Signal Level to this Frequency Response Tester.
- 5) Drastical higher Sweep Speed will give measuring error. Therefore, please take care to take suitable Sweep Speed in measurement.
- 6) And also, there may happen measuring error in INT Mode Sweep Operation if Noise or Distortion is largely included in Input Signal Level. application on EXT 1 Mode is recommendable.
- 7) AUTO LEVEL Switch ON is for relative Level measurement. For absolute Level measurement, check the following points:
  - (1) AUTO LEVEL Switch must be to OFF.
  - (2) Input FINE Knob should be positioned to place of CAL'D.

## 6. APPLICATION EXAMPLES:

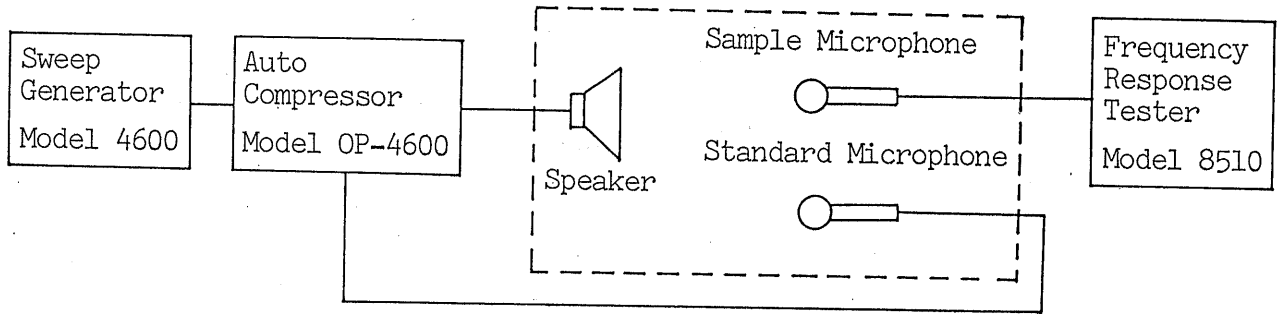
- 1) Frequency Characteristic Test for Taperecorders:



Please supply suitable Recording Level Sweep Signal to the sample Taperecorder to view the Output Level at Recording and Playing Operation by this Frequency Response Tester. The Recording Level Sweep Signal is influenced by applied Tapes but should be adjusted to be Sweep Signal that is decreased by 10 - 20dB from the Taperecorder's requested Recording Level. In this case, HORIZONTAL SWEEP MODE should be selected to INT.

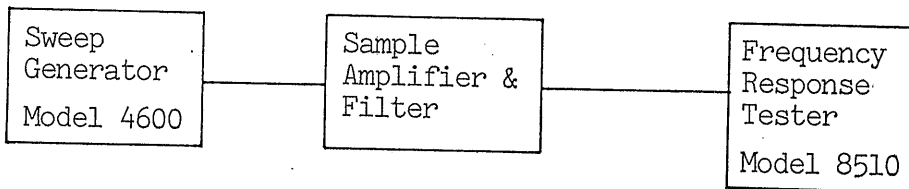


2) Front Sensitivity Frequency Response Characteristics for Microphones:



Above block diagram is for Microphone Front Frequency Response Characteristic Test. But the relative Speaker have not constant Sound Pressure for necessity for this measurement. Therefore, to compensate the Frequency Characteristic of Speaker, the Frequency Characteristic of Speaker is fed back to Auto Compressor by Standard Microphone like a kinds of closed looped circuit. Accordingly, compensated constant Sound Pressure is given to the Sample Microphone for this Test.

3) Frequency Response Test for Amplifier & Filters:



Measurement of Frequency Response Characteristics for Amplifiers or Filters by supply of suitable Sweep Signal.

4) Frequency Response Characteristics for pick-up on Record Players:

