LEADER TEST INSTRUMENTS

MODEL LFG-1300

FUNCTION GENERATOR

INSTRUCTION MANUAL

LEADER ELECTRONICS CORP.

ADDENDUM to the Instruction Manual of LFG-1300 Function Generator

This is inserted as an addendum to the Instruction Manual of LFG-1300 Function Generator in which a fuse is newly added to protect circuitry. Please read same with the following corrections:

P.5 Accessories

Circuit Protection Fuse . . . . . 1 pce.

P.24 7.3 Fuse

A. **Fuse for Power Supply**

Fuses for this generator are rated as shown in Table 7-1. If a fuse has blown out, find its cause then replace the fuse after confirming safety.

Power voltage	Fuse rating
110, 117V	0.3A
200, 234V	0.125A

(SLOW BLOW)

Table 7-1

B. **Circuit protection fuse (inside)**

This fuse protects internal circuitry against excessive voltages that may enter the OUTPUT connector from an external source.

Output is suppressed when the fuse has blown out. To replace the fuse, open the cabinet and it will be found on the PC board (T-2004) on the right side. Pull it out for replacement.

This instrument is supplied with one spare fuse. If a spare fuse is not available, please check with our Service Section.

After replacing the fuse, use maximum care to protect the OUTPUT connector against application of excessive voltages.

TABLE OF CONTENTS

1. GENERAL

LFG-1300 is designed as a function generator to produce five types of waveforms, i.e. sine, triangle, square, pulse, and saw tooth waves in a wide frequency range of 0.002Hz to 2MHz.

The equipment has many applications in adjustment services of audio filters and BC band radios, since the sweep and AM modulation functions are provided.

The TTL output terminal provided on the rear panel is available as a signal source for digital circuits.

2. FEATURES

(1) Wide frequency range, 0.002Hz to 2MHz.
LFG-1300 has many applications as a signal source for ranging from measurements of response signals with a few seconds intervals to services of BC band radios.

(2) Five types of output waveforms (with TTL output).
Sine, triangle, square, pulse, and saw tooth waveforms as well as various levels of DC voltages are available. The offset function is provided to superpose DC voltages on these waveforms. The TTL output is particularly useful as a signal source for digital circuits.

(3) Low distortion factor, 0.5% (10Hz to 20kHz).

(4) Built-in sweep function.
Linear and logarithmic sweepings are available with variable sweep rate and width.

(5) External sweep control (with VCG terminal).
External control of oscillation frequency is available. (FM modulation is also possible.)

(6) Built-in AM modulation.
This is useful as a signal source for testings of BC band radios. DSB (double side band) signal is available by the carrier suppress function.

(7) Attenuators.
Three attenuators are provided, i.e. 10dB, 20dB, and 40dB. Maximum attenuation of 70dB is available by the combination.

3. SPECIFICATIONS

Frequency Range	0.002Hz to 2MHz in 8 decade ranges.
Dial Accuracy	± (3% set value + 3% full scale) for 0.02Hz to 200kHz. ± (5% set value + 5% full scale) for 200kHz to 2MHz.
Output Signals	Sine, Triangle, Square, Pulse, Saw tooth, DC, TTL output
Sine Wave	
Output voltage	$20V_{p\text{-}p}$ (approx. 7Vrms) at no termination.
Distortion	Less than 0.5% for 10Hz to 20kHz. Less than 1% for 20kHz to 100kHz. Less than 3% for 100kHz to 2MHz.
Output flatness	Within ±0.3dB for 0.02Hz to 2MHz.
Triangle Wave	
Output voltage	$20V_{p\text{-}p}$ at no termination.
Symmetry	Less than 1% for 0.02Hz to 100kHz.
Square Wave	
Output voltage	$20V_{p\text{-}p}$ at no termination
Symmetry	Less than 1% for 0.02Hz to 100kHz.
Rise time	Less than 100ns.
Pulse/Saw tooth Wave	Symmetry is continuously variable 1:1 to 40:1 by the symmetry ajdustment knob (with polarity inversion switch).
TTL Output	
Fanout	20TTL
Output level	2.4V to 5V for H. 0V to 0.4V for L.
DC	Any level within ±10V by DC OFFSET.
DC OFFSET	-10V to +10V Clipping level for superposed waveform: ±10V.
Sweep	
Sweep mode	LOG. or LINEAR is selectable.
Sweep rate	Continuously variable, 20ms (50Hz) to 5s (0.2Hz).
Sweep width	Continuously variable, 10:1 to 1000:1 of frequency ratio.
External sweep control (VCG)	0V to +10V (max. sweep width).
Sweep output (H. OUT)	This is connected to X-axis of an oscilloscope.

AM Modulation	
Modulation	Continuously variable, 0% to 95% or more.
Modulation signal	External input. Carrier suppress function is available.
Output Terminal	
Output impedance	50Ω ±5%.
Attenuators	10dB, 20dB, and 40dB.
Accuracy	±1% of set value for less than 200kHz. ±2% of set value for 200kHz and above.
Rear Panel Terminals	
VCG IN	External frequency control input, maximum control at 0V to +10V, approx. 10kΩ of input impedance.
GCV OUT	Frequency control voltage output, approx. 0V to +5V for a dial tuning, approx. 1.5kΩ of output impedance.
MOD IN	AM modulation input, optimum input voltage 0.3Vrms, approx. 10kΩ of input impedance.
H.OUT	X-axis signal for oscilloscope in sweep operation, 0V to +1V saw tooth wave, approx. 1kΩ of output impedance.
TTL OUT	TTL level output. Fanout: 20TTL.
Size and Weight	125mm (H) X 250mm (W) X 250mm (D), 4kg. approx.
Power Supply	100V, 117V, 220V, or 240V is available by the voltage selector on the rear panel. 20VA
Accessories	A connection cable LC-2048 (BNC 50Ω). Circuit protection fuse. Instruction manual.
Optional accessory	Terminator LT-2049 50Ω (Separately available).

4. PANEL DESCRIPTION

Front Panel

① Power switch:
When the switch is turned on, the pilot lamp ⑰ goes on.

② Frequency dial:
The output frequency is determined by the product of the dial set value and selected frequency range ⑯.

③ Sweep ON-OFF switch:
The equipment becomes a sweep generator at ON, and a CW oscillator at OFF.

④ RATE:
Sets the repeat intervals of sweep generator.

⑤ LINEAR and LOG. selection switches:
Linear mode or logarithmic mode of sweeping is selectable by depressing one of these switches.

⑥ MOD:
is used for variable control of modulation in AM (amplitude modulation).

⑦ A.M. ON/OFF switch:
Amplitude modulation is available by turning on the switch. Input modulation signal is applied to the MOD IN terminal on the rear panel.

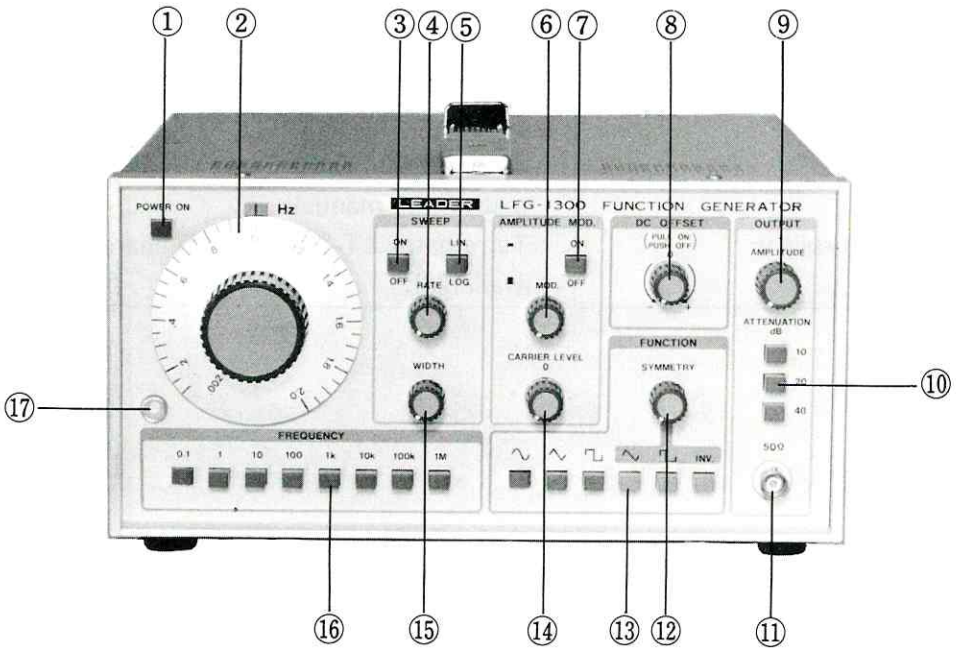
⑧ DC OFFSET:
is used to superpose the output waveform on a DC voltage. Pull the knob to activate the function. Turning to the right results in producing positive voltages, and turning to the left results in producing negative voltages. When all the FUNCTION keys ⑬ are released, only DC voltages are obtained.

⑨ AMPLITUDE:
makes output voltage variable.

⑩ Output attenuators:
Calibrated attenuation is available when the output terminal ⑪ is terminated by 50Ω. Using 10dB, 20dB, and 40dB attenuators, various values of attenuation are available upto 70 dB in increments of 10dB.

⑪ Output terminal:
All the output signals are obtained from this terminal with 50 ohms of impedance.

⑫ SYMMETRY:
makes variable control of symmetry to produce pulse and saw tooth waveforms. Full scale left turn results in producing symmetrical square and triangle waveforms. Turning to the right results in changing of symmetry.



⑬ FUNCTION:
There are five keys to select sine, triangle, square, pulse, or saw tooth waveform.

⑭ CARRIER LEVEL:
makes variable control of carrier level for amplitude modulation. When the carrier level suppressed, DSB (double side band) is available.

⑮ WIDTH:
sets the upper sweep frequency in sweep generator operation. The lower sweep frequency is determined by the frequency dial ②. Maximum 1000:1 of frequency ratio is available.

⑯ FREQUENCY:
There are ⑧ frequency range selection buttons.

⑰ Pilot lamp:
indicates green light when the power is on.

Rear Panel

⑱ VCG IN:
stands for Voltage Controlled Generator, and controls externally the output frequency with input voltage of 0V to 10V.

⑲ GCV OUT:
stands for Generator Control Voltage, and outputs a voltage which is proportional to output frequency. A dial tuning produces voltages of 0V to +5V.

⑳ TTL OUT:
This is the output terminal as a signal source used for experiments of digital circuits, for example. TTL level square wave of the frequency set by the oscillator frequency dial ② is available, however, frequency may be changed by turning the SYMMETRY knob.

㉑ MOD IN:
This is the modulation signal input terminal used for amplitude modulation. Optimum voltage is approximately 0.3Vrms. Excess voltage results in a signal distortion due to saturation. A too small voltage deteriorates modulation linearity.

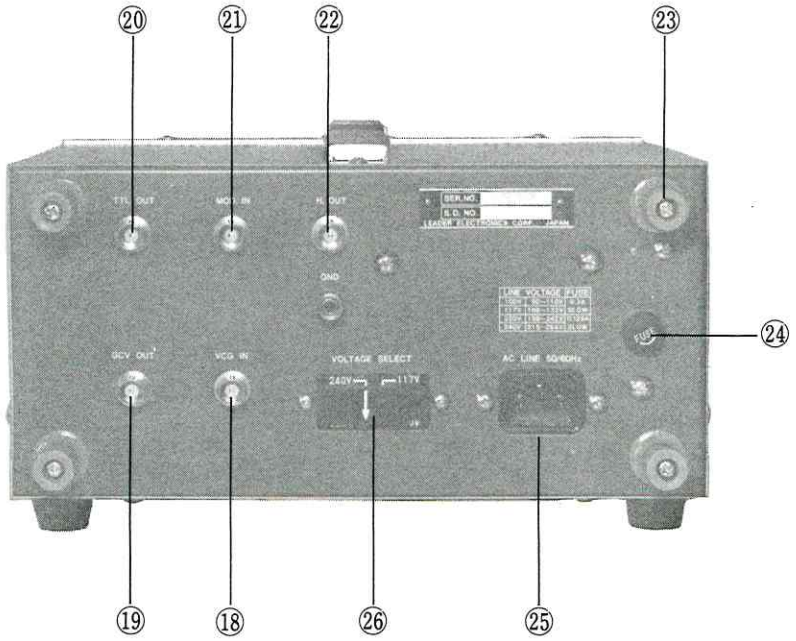
㉒ H OUT:
outputs X-axis (horizontal) signal for sweep generation. Saw tooth waves of 0V to +1V with repeat intervals set by the RATE knob ④ are available.

㉓ Cord winder

㉔ Fuse: 0.3A for 100V to 117V
0.2A for 200V to 234V.

㉕ AC inlet

㉖ Power voltage selection switch



5. USE

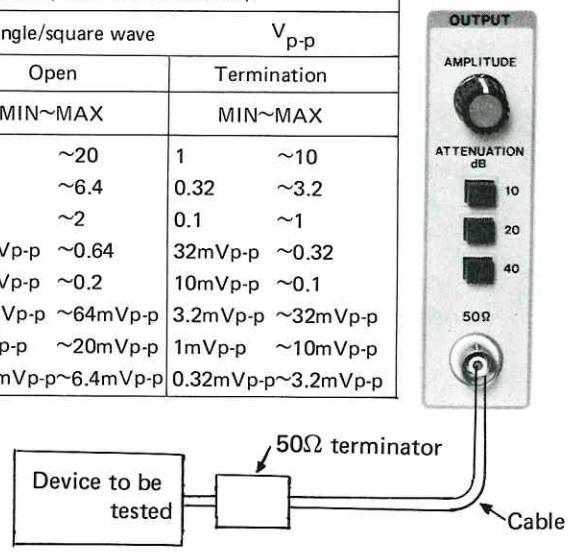
The LFG-1300 can be used for a wide range of applications as a generator of various waveforms, sweep generator, and/or AM/FM oscillator.

5.1 Cautions on Use

(1) Power voltage applied should be within ±10% of the rating.
(2) Do not apply an external DC voltage to the output terminal.
(3) Output attenuators:
There are five attenuators, i.e., 10dB, 20dB, and 40dB. Use a 50Ω terminator (LT-2049, separately available) to get correct attenuation at more than 200kHz. Maximum 70dB is available by the combination of three attenuators. Table 5-1 shows the relationship between attenuation and output voltage. When the output is opened, the output voltage is 6dB higher than the case terminated.

Attenuation dB	Setting of attenuators dB	Output voltage range (variation by AMPLITUDE knob)			
		Sine wave Vrms		Triangle/square wave V_{p-p}	
		Open	Termination	Open	Termination
	10 20 40	MIN~MAX	MIN~MAX	MIN~MAX	MIN~MAX
0		0.7 ~7.0	0.35 ~3.5	2 ~20	1 ~10
10	10	0.22 ~2.2	0.11 ~1.1	0.64 ~6.4	0.32 ~3.2
20	20	10mV ~0.7	35mV ~0.35	0.2 ~2	0.1 ~1
30	10 20	22mV ~0.22	11mV ~0.11	64mVp-p ~0.64	32mVp-p ~0.32
40	40	7mV ~70mV	3.5mV ~35mV	20mVp-p ~0.2	10mVp-p ~0.1
50	10 40	2.2mV ~22mV	1.1mV ~11mV	6.4mVp-p ~64mVp-p	3.2mVp-p ~32mVp-p
60	20 40	0.7mV ~7mV	0.35mV~3.5mV	2mVp-p ~20mVp-p	1mVp-p ~10mVp-p
70	10 20 40	0.22mV~2.2mV	0.11mV~1.1mV	0.64mVp-p~6.4mVp-p	0.32mVp-p~3.2mVp-p

Table 5-1



5.2 Signal Generator Operation

A. Sine wave
(1) Panel setting
Set the front panel functions as shown in Fig. 5-1.
Remarks: The equipment generates a sine wave by the shaping network circuits which use a plurarity of diodes. The distortion factor is lower than a conventional function generator, however, the output waveform may contain small pulses which are quite normal.

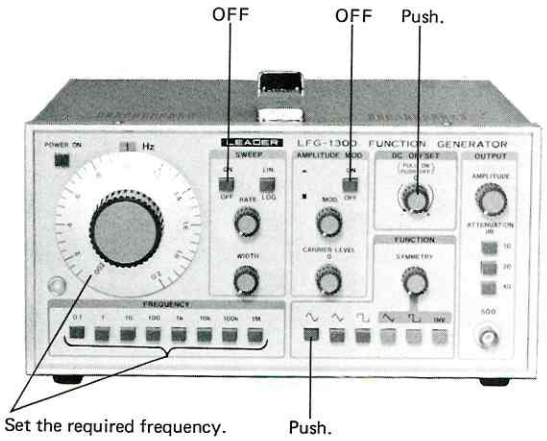


Fig. 5-1

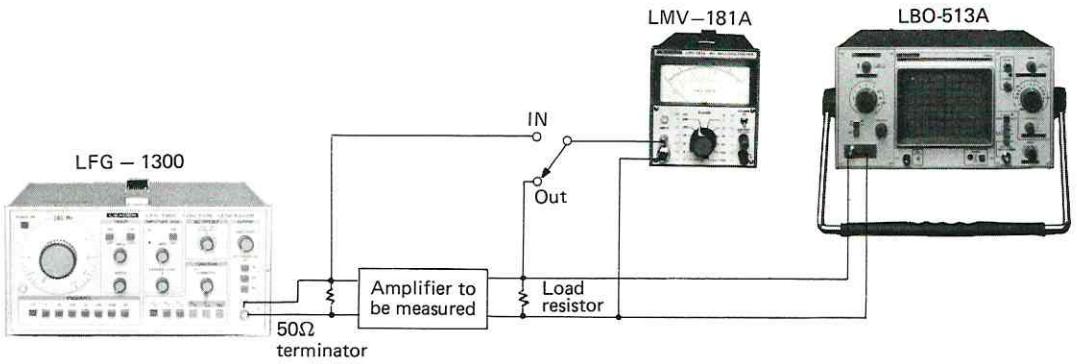


Fig. 5-2

(2) Measurement example (audio amplifier)
Required instruments:

AC volt meter	LEADER LMV–181A or the equivalent
Oscilloscope	LEADER LBO–513A or the equivalent
Load resistor	LEADER LD-21

(a) Input/output characteristics measurement

Set the LFG-1300 as follows:
FUNCTION ~ Sine wave
FREQ. RANGE X 1k } Oscillation
Dial scale 1.0 } 1kHz

AMPLITUDE Left turn
Output attenuation 70dB (max.)

Connect the instruments as shown in Fig. 5-2. As the input voltage to the amplifier is increased by turning the AMPLITUDE knob to the right, the output voltage of the amplifier is increased. When the amplifier saturates, the output voltage does not increase, and the waveform on the oscilloscope starts a distortion. The input/output characteristics of the amplifier are obtained by recording the output voltages. The data is useful to know the range of no saturation amplification. Voltage gain of the amplifier is calculated by the following formula:

$$\text{Voltage gain (dB)} = 20 \log \frac{\text{output voltage (V)}}{\text{input voltage (V)}}$$

(b) Max. output power

No-distortion maximum output voltage is obtained from the input/output characteristics data of section a) above, and the max. output power is calculated by the following formula:

$$\text{Output power (W)} = \frac{\text{output voltage (V)}^2}{\text{load resistance } (\Omega)}$$

(c) Frequency response measurement

Set the AMPLITUDE to a range where no distortion of the amplifier is caused. Fix the input voltage at a certain level during the measurement.

Then, change the frequency by the FREQUENCY range selectors and dial to obtain the relationship between frequency and output voltage of the amplifier. The frequency response curve of the amplifier is available by plotting the data on a log-linear paper.

It is recommended that the amplifier to be tested is connected by a 50Ω coaxial cable with the equipment, and a termination is made at the input side of the amplifier.

B. Triangle wave

(1) Panel setting
Set the front panel functions as shown in Fig. 5-3.

(2) Measurement example (linearity of audio amplifier)
Connect the instruments as shown in Fig. 5-2. It is difficult to check clipping and distortion of an audio amplifier by sine waves. However, triangle waves are useful in such a case, since round summits are observed as shown in Fig. 5-4 when clipping and distortion exist.

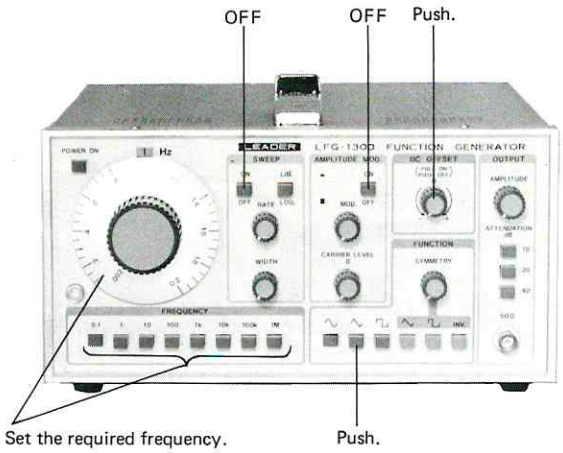


Fig. 5-3

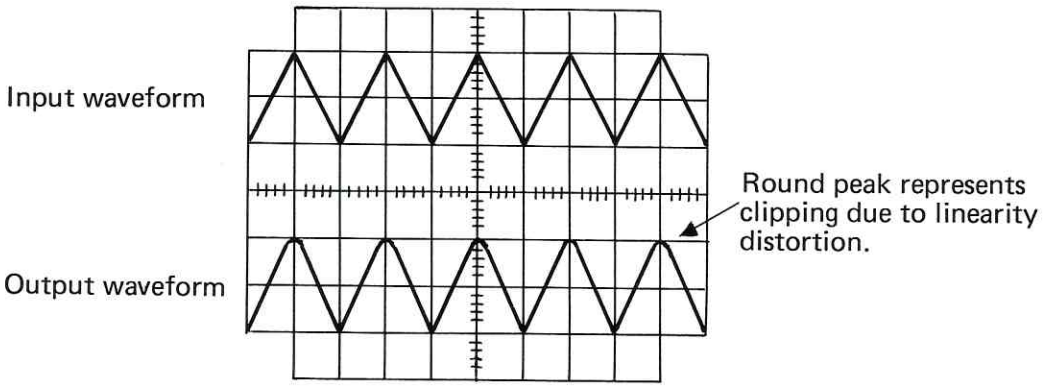


Fig. 5-4

C. Square wave

(1) Panel setting
Set the front panel functions as shown in Fig. 5-5.

(2) Measurement example (frequency response)
Connect the instruments as shown in Fig. 5-6.

The frequency response of an amplifier can be judged by the output waveforms as follows:

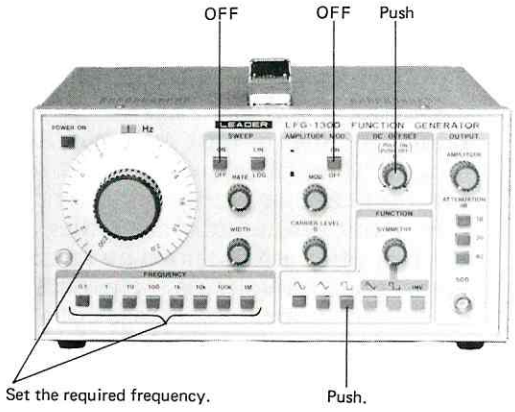


Fig. 5-5

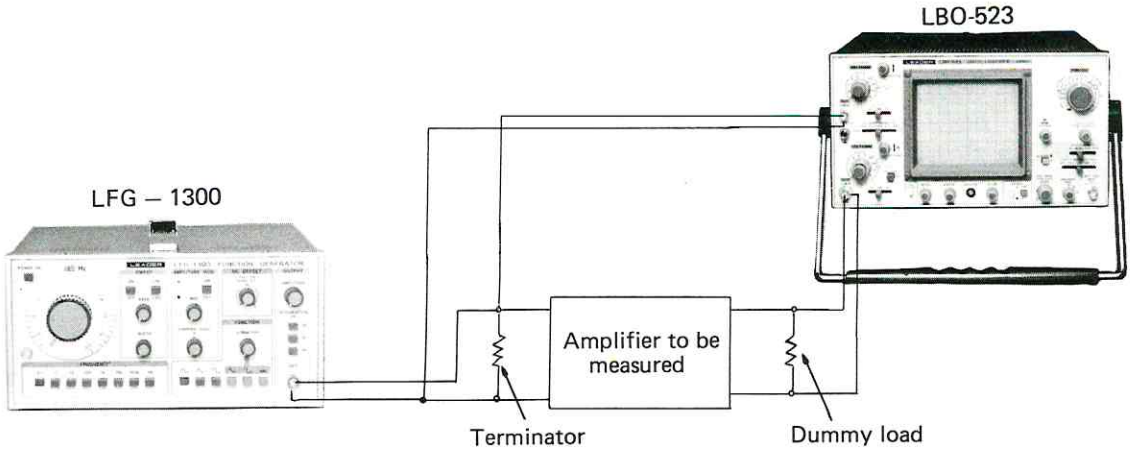


Fig. 5-6

Output waveform	Response of the amplifier	
	Flat level upto about 10 times of input frequency.	V, f
	High frequency is cutoff at around 10 times of input frequency.	
	Low frequency is cutoff at around 1/10 of input frequency.	
	High pass frequency is increased at around 10 times of input frequency.	
	A sharp peak at around 10 times of input frequency.	

Fig. 5-7

D. Pulse wave and saw tooth wave

(1) Panel setting
Set the front panel functions as shown in Fig. 5-8. Select the ⎍ (pulse) or ◺ (saw tooth) button as required on the FUNCTION panel (gray color).

(2) Variable symmetry
This function is available by changing the symmetry of a square or triangle wave. Turning the SYMMETRY knob to the right results in changing the symmetry. When it is changed, the oscillation frequency goes lower than the set value of the frequency dial. The maximum change ratio is 1:40. When the knob is fully turned to the left, a symmetrical pulse wave (equivalent to square

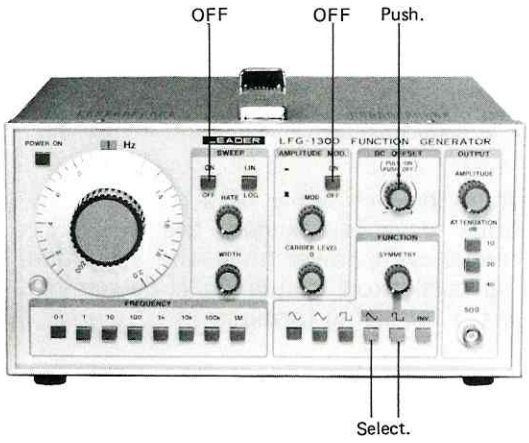


Fig. 5-8

wave) or saw tooth wave (equivalent to triangle wave) is generated. The INV switch on the FUNCTION panel is used to invert the polarity of a waveform. Figure 5-9 shows the relationship between normal and inverted waveforms.

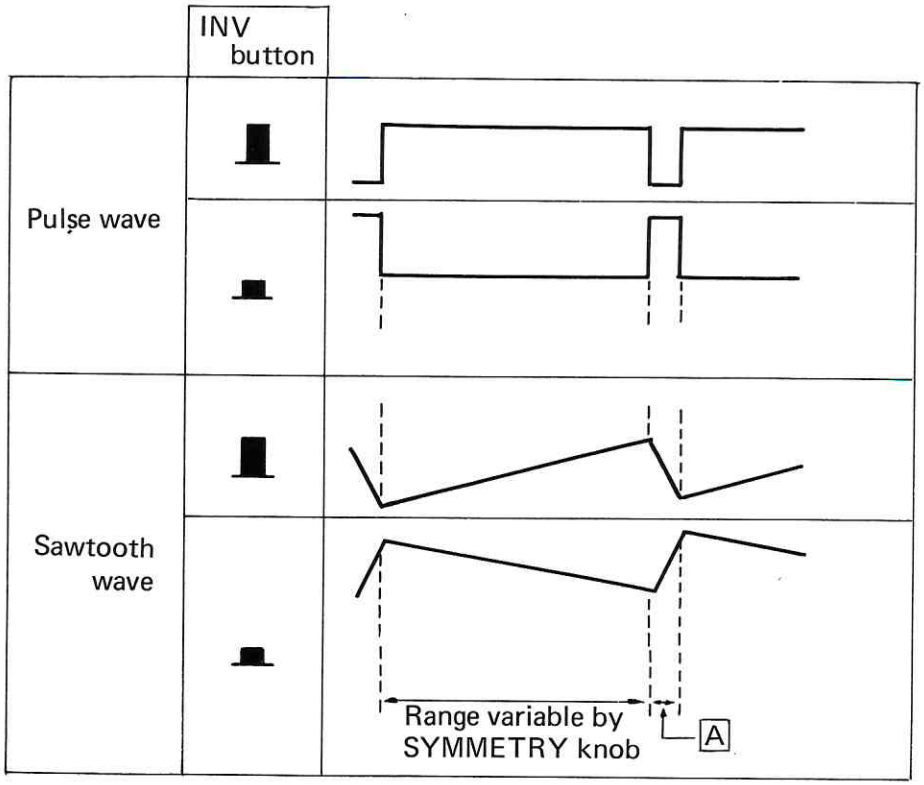


Fig. 5-9

The interval [A] is constant regardless of symmetry control. [A] is determined by the frequency range and dial setting according to the following formula:

$$[A] = \frac{1}{2\ (\text{dial indication} \times \text{frequency range})}$$

When the symmetry of a pulse or saw tooth wave is changed, the oscillation frequency is lower than the set value. The oscillation frequency is determined by the following formula:

f (oscillation frequency) =

$$\frac{2}{1 + \frac{B}{A}} \text{ dial indication} \times \text{frequency range}$$

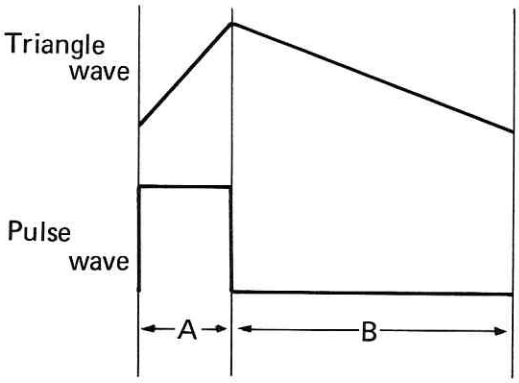


Figure 5-11 shows a graph indicating the relationship between the symmetry ratio and magnification factor.

Use of the Graph

The X-curve is used to determine the frequency dial set value for the required frequency when the symmetry ratio B/A of a waveform is known.

Example 1:

When a 1kHz oscillation frequency is required at B/A = 3, the multiplication factor of 2.0 is obtained from the intersection of the X-curve and B/A = 3 scale. Thus, the frequency dial is set to 2kHz. (1kHz X 2 = 2kHz) The Y-curve is used to determine the oscillation frequency, when the symmetry ratio B/A of a qaveform and frequency dial set value are known.

Example 2:

When the frequency dial set value is 1kHz at B/A = 3, the multiplication factor of 0.5 is obtained from the intersection of Y-curve and 1kHz scale, and the oscillation frequency of 1kHz X 0.5 = 500Hz is known.

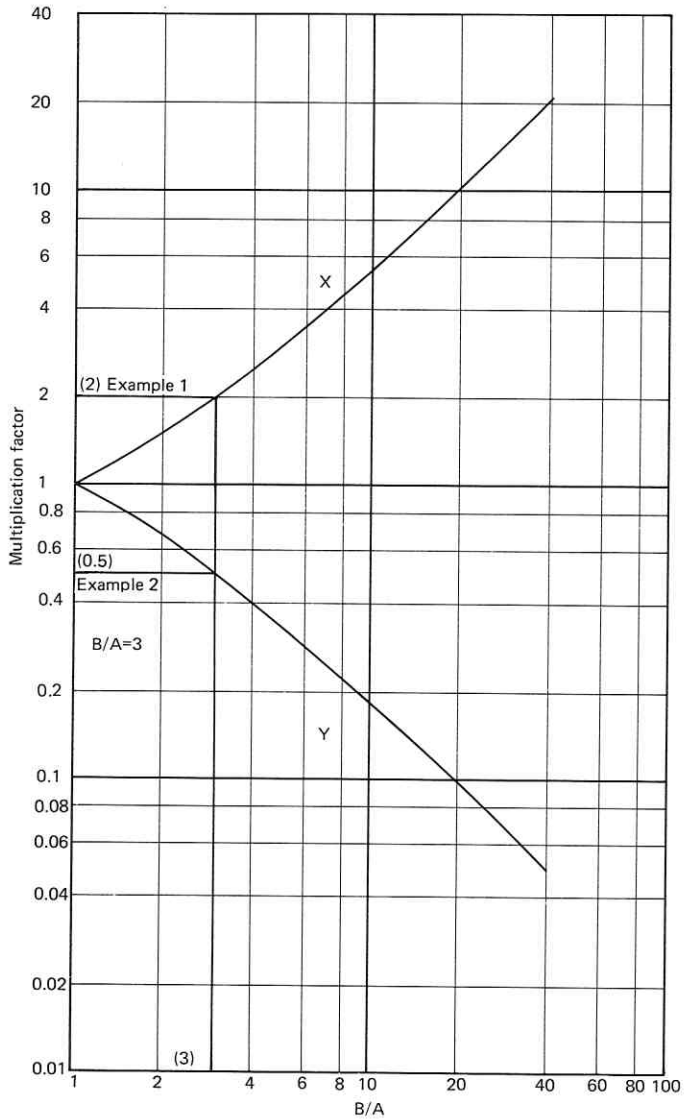


Fig. 5-10

E. DC output

(1) Panel setting

Set the front panel functions as shown in Fig. 5-11.

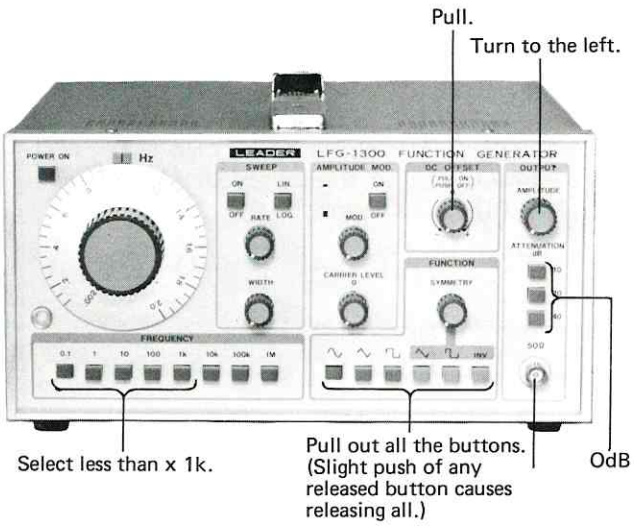


Fig. 5-11

(2) Output voltage

Adjust the output voltage by the DC OFFSET. Turning to the right results in producing positive voltages, and turning to the left results in producing negative voltages. The maximum output voltage is ±10V (at open output), and the maximum load current is 100mA.

The relationship between the load current and output voltage is as shown in Fig. 5-12, because the output impedance is 50Ω (at maximum output of 10V).

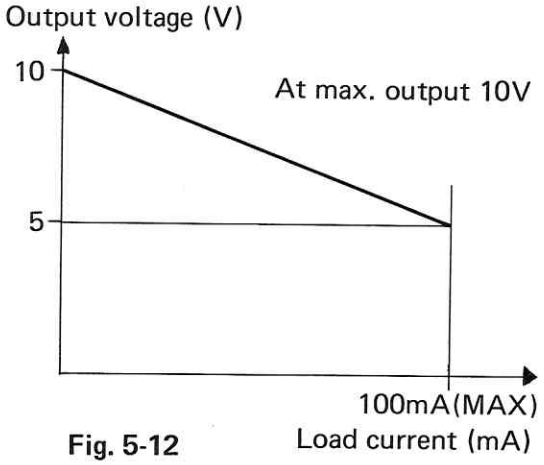


Fig. 5-12

F. TTL output

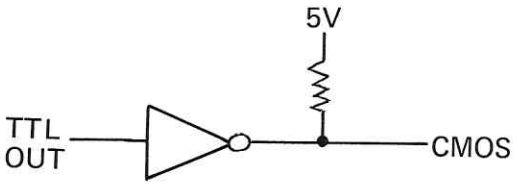
(1) Maximum loads of 20 TTL gates are available.

(2) The output levels are:

2.4V to 5V as H level

0V to 0.4V as L level

A level conversion is required when a CMOS is used since its threshold voltage is different. Use of an open collector TTL such as SN7406 is recommended.



(The output may be used with a TTL-MOS interface IC, SN75367.)

(3) Use a coaxial cable of less than 50cm in length for a connection with the instrument to be measured.

If a cable is too long, it may cause a waveform distortion and/or malfunction by linking.

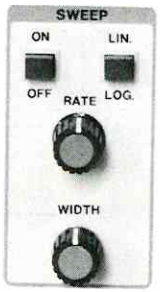
(4) The oscillation frequency is lower than the frequency dial set value when the SYMMETRY knob is operated for a pulse or saw tooth waveform.

5.3 Sweep Generator Operation

A. Operation procedure

(1) Set the front panel functions as described in Section 5.2 Signal Generator Operation.

(2) Turn on the ON/OFF switch of the sweeper.



(3) Set the LIN/LOG switch as required.
(4) Within the required sweep frequency range, select one of the FREQUENCY range switches that includes the upper limit frequency.
(5) Set the lower limit frequency by the frequency dial.
(6) Set the upper limit frequency by the WIDTH knob.
(7) Set a sweep time in a range of 20ms to 5s by the RATE knob.

B. Measurement example (equalizer characteristics of a preamplifier)

(1) Measurement condition

Input terminal	PHONO IN (MAG) small adjustment
Input voltage	7mV (depends on the specification of an amplifier)
Output terminal	PREAMP OUTPUT adjustment
Output voltage	100mV (depends on the specification of an amplifier)

(2) Interconnection

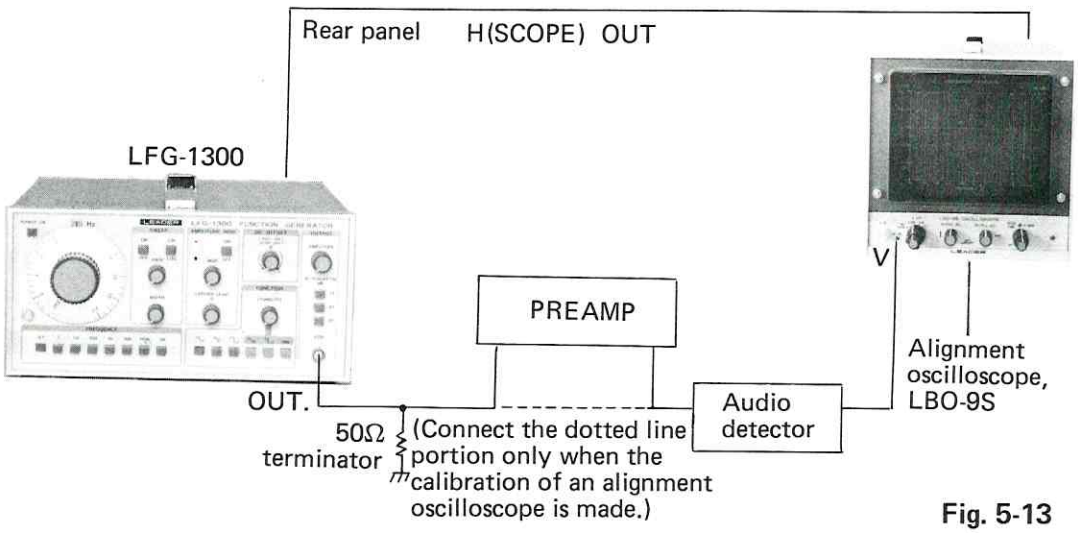


Fig. 5-13

(3) Calibration of alignment oscilloscope
(A frequency scale is required.)
a. Obtain a 1kHz output in accordance with the procedure described in Section 5.2, A. Sine wave.
b. Connect the output from LFG-1300 to the input of the audio detector.
c. Adjust the V-axis sensitivity so that +10dB is obtained on the oscilloscope scale when the LFG-1300 output is 0dB, and −40dB is obtained when the output is −50dB.
d. Adjust the H-axis sensitivity so that the horizontal alignment is at the 20Hz/20kHz scale on the scope.
e. Eliminate the direct connection between the LFG-1300 output and audio detector input, then, interconnect the preamplifier.

(4) Panel setting
Set the front panel functions as shown in Fig. 5-14.

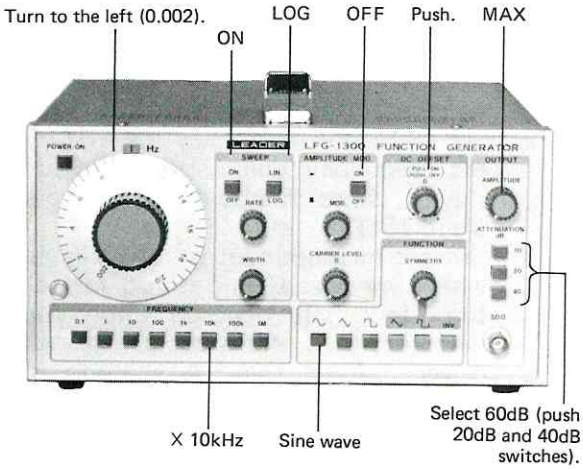


Fig. 5-14

(5) Measurement procedure

a. Set the sweep time by the RATE knob.

b. Set the alignment scope frequency dial to the sweep frequency. Get the 20Hz alignment by the frequency dial, and the 20kHz alignment by the WIDTH knob. Ensure correct measurements by the readjustment of sweep time after the sweep frequency is changed.

c. Figure 5-15 shows an example of measurement.

RIAA Frequency response

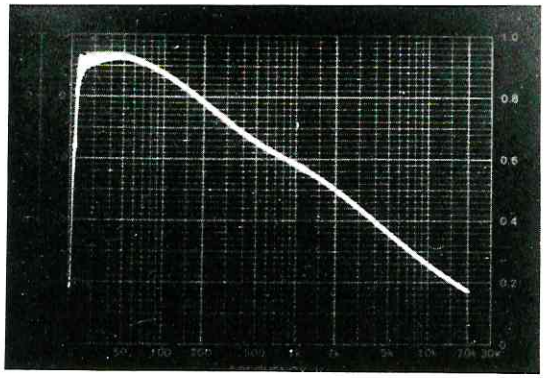


Fig. 5-15

C. Measurement example (IF response of AM radio)

(1) Interconnection

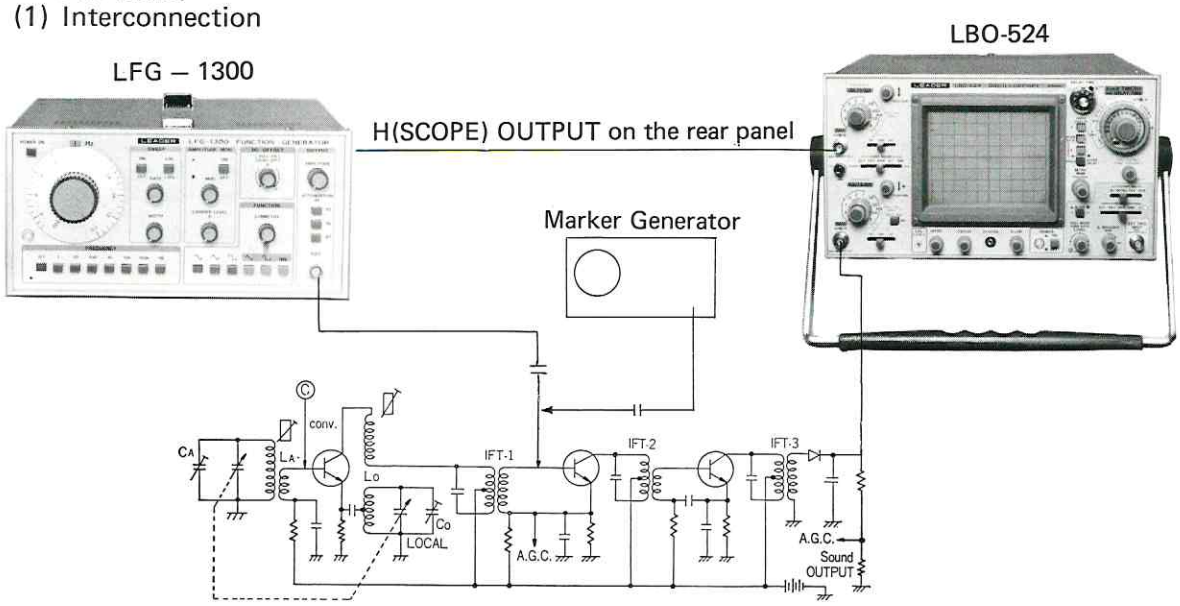


Fig. 5-16

(2) Panel setting

Set the front panel functions as shown in Fig. 5-17.

(3) Measurement procedure

a. Set the center frequency 455kHz by the frequency dial. Turn the dial slowly, since the width is narrow (min. 10:1).

b. Correct measurement is not available when the sweep time is too fast or too slow. It depends upon the detector time constant of the receiver. Ajust the RATE knob to obtain a correct measurement.

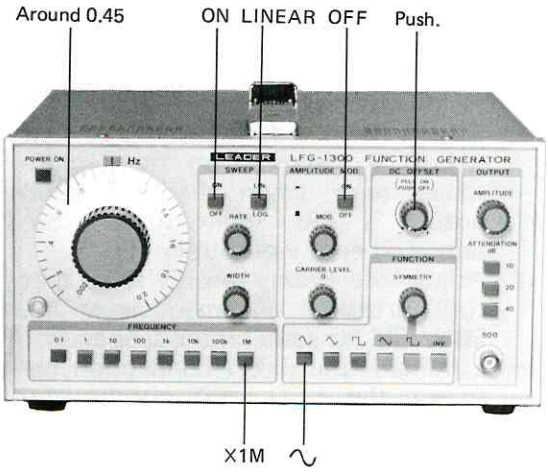


Fig. 5-17

c. Figure 5-16 shows an example of measurement.
Note: The return of a sweep is adjusted to the minimum. If a little longer time is required, adjust the RETURN VR 301 located inside the chassis cover.

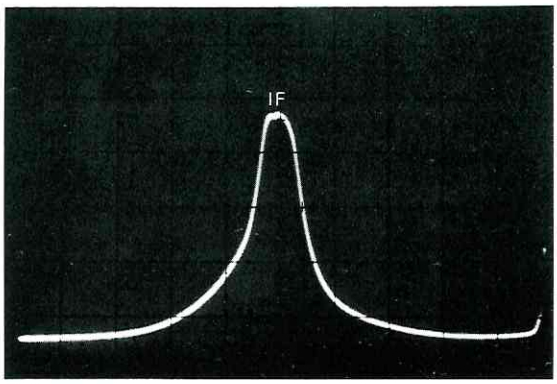


Fig. 5-18

D. Measurement example (tracking adjustment of AM radio)
(1) Make the interconnection as shown in Fig. 5-14.
Connect the output of this equipment to the input of the AM radio.
(2) Set the control functions as shown in Fig. 5-15.
(3) Set the marker generator at 600kHz.
(4) Adjust the frequency dial to get 600kHz beat marker signals.
(5) Set the marker generator at 1400kHz. Adjust the WIDTH knob to get 1400kHz marker signals.
(6) Set the marker generator to 600kHz again, and ensure the beat marker signals are displayed on the scope.
(7) Set the receiver dial to 1400kHz while the marker generator frequency is 1400kHz. Adjust the oscillation frequency by variable control of the local oscillator capacity, so that the maximum detection output is obtained. Repeat the adjustments several times at 1400kHz and 600kHz.
(8) Adjust the antenna side inductance and capacitance in the same manner.

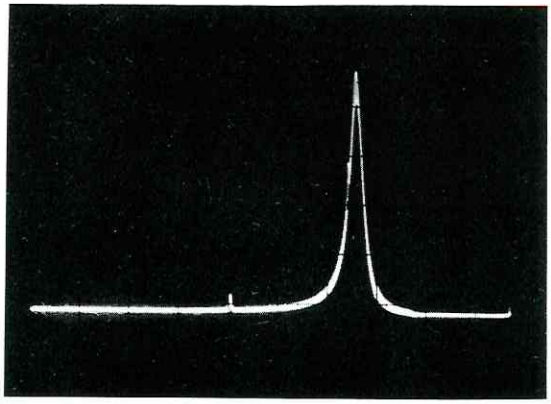
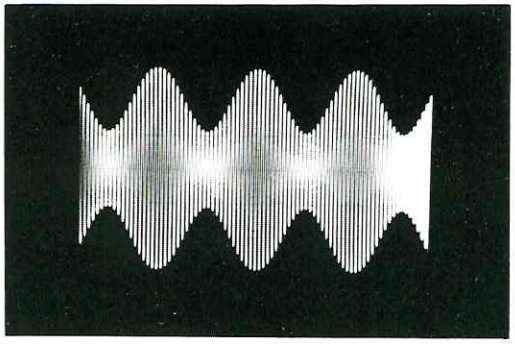


Fig. 5-19 Tracking adjustment

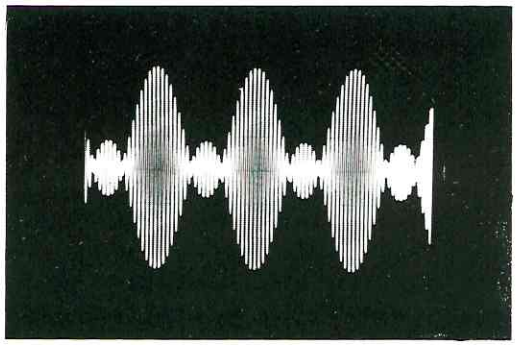
(9) Set the radio dial at 1400kHz while the marker generator is in 1400kHz. Adjust the oscillation frequency by a variable control of the local oscillator capacitor, so that the maximum detection output is obtained.

5.4 Amplitude modulator operation

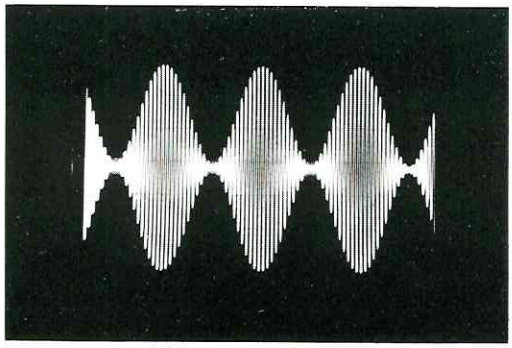
A. Operating procedure
(1) Set the control functions as described in Section 5.2 "Signal generator operation" to generate the desired waveform.
(2) Turn on the amplitude modulator ON/OFF switch.
(3) Apply the modulation signal to the MOD IN terminal on the rear panel. Appropriate input level of the modulation signal is 0.3Vrms. Higher level inputs will cause distortion due to saturation. On the other hand, lower level inputs will cause deterioration of the modulation linearity.
(4) Turn the MOD knob of the amplitude modulator fully to the right.
(5) Turn the CARRIER LEVEL knob of the amplitude modulator slowly to the right to get 100% of the modulation.
(6) The desired modulation can be obtained by a readjustment of the MOD knob.
(7) The DSB (double side band) is available, when the carrier level is made small by turning the CARRIER LEVEL knob to the left in the case of Item 5) above.



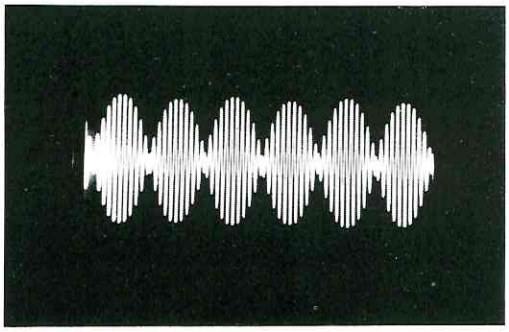
50% modulation



Over 100% modulation



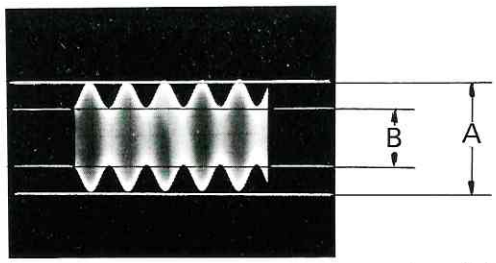
100% modulation



DSB (double side band)

Fig. 5-20

B. Measurement of modulation
The modulation is generally measured by an oscilloscope. The interconnection of the instruments is as shown in Fig. 5-2.



$$M(\text{modulation}) = \frac{A - B}{A + B} \times 100\%$$

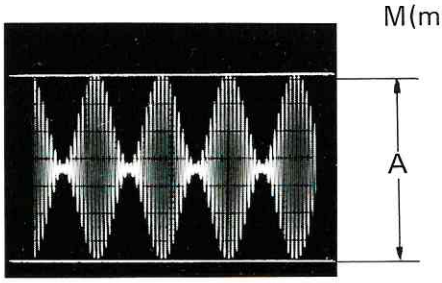


Fig. 5-21

5.5 Use of DC offset

This function is used to superpose the output waveform on a DC voltage. The function is effective when the DC OFFSET knob is at the released position. Turning to the right results in superposing a positive voltage, and turning to the left results in superposing a negative voltage. The range of variable voltage is ±10V when the output terminal is open (±5V when terminated).

However, when the function is used while AMPLITUDE knob is set to produce a large output, clipping of the waveform occurs. In such a case, reduce the output level by the AMPLITUDE knob. The DC offset voltage is not changed when the AMPLITUDE knob is turned.

The clipping level of a waveform is ±10V when the output terminal is open (±5V when terminated). The offset function is illustrated in Fig. 5-2.

Note: When the DC OFFSET knob is pushed, the function is in the OFF condition, however, a few hundreds mV of DC voltage remains at the output terminal.
For eliminating this voltage, pull the DC OFFSET knob to enable the function and make a measurement operation after adjusting the DC level to zero.

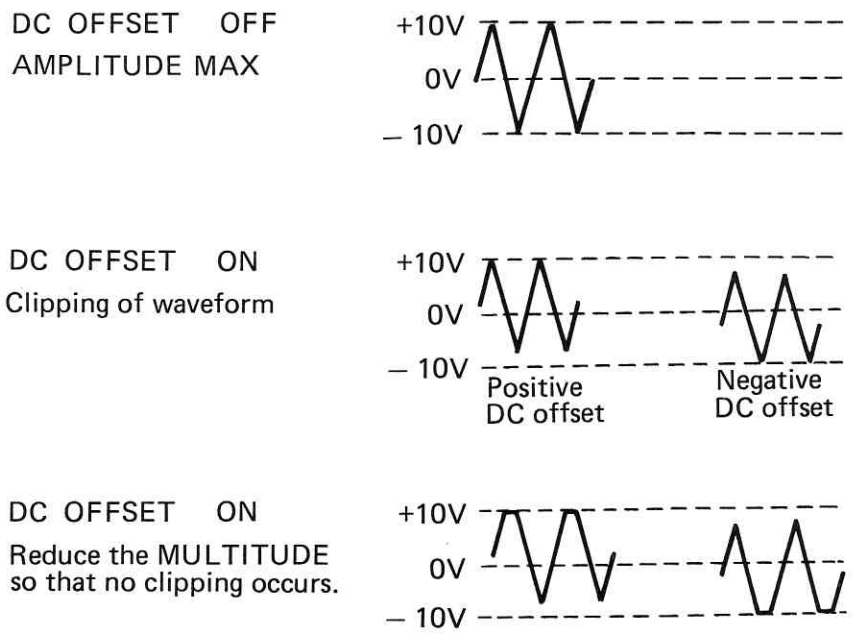


Fig. 5-22

5.6 Operation of external frequency control and frequency modulation

Applying a voltage to the VCG terminal on the rear panel results in controlling the oscillation frequency.

A. External frequency control
This function is enabled by applying DC voltages to the VCG (Voltage Controlled Generator) terminal. When the frequency dial is turned to the right to the condition of (0.002) and the applied voltage is changed, the oscillation frequency is increased in proportion to the input voltage. At the input voltage of +10V, the oscillation frequency at double the indicated frequency range is available.
An example:
When the range is X1k: 2 X 1k = 2kHz
When the frequency dial is set to 2.0 and a negative voltage is applied, a lower oscillation frequency is obtained.
Thus, the oscillation frequency is determined by the voltage applied to the VCG terminal and setting of the frequency dial. This relationship is shown in Fig. 5-19 (for the X 1kHz range).
The ratio between the upper and lower limits of the controlled frequency is maximum 1000:1.

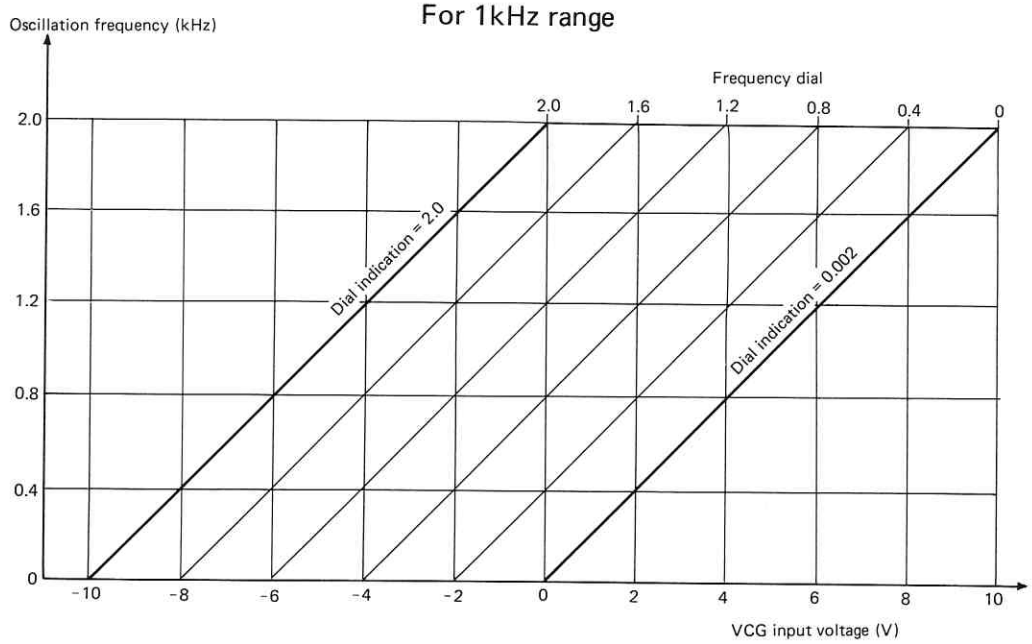


Fig. 5-23

B. Use of frequency modulation
The frequency modulation function is available when the modulation signals are applied to the VCG terminal. The relationship between the frequency range and frequency shifting per a single volt is shown in Table 5-2. The input impedance of the terminal is 10kΩ.

Frequency range	X0.1	X1	X10	X100	X1k	X10k	X100k	X1M
Frequency shifting per 1V	0.02Hz	0.2Hz	2Hz	20Hz	200Hz	2k	20k	200k

Table 5-2

An example:
The frequency modulation of 10kHz shifting is required with the oscillation frequency of 500kHz.
Since the X 1M range is used for 500kHz, the frequency shifting per 1V is 200kHz from Table 5-2.

$$\text{Input voltage} = 1\text{V} \times \frac{10\text{kHz}}{200\text{kHz}}$$

$$= 0.05\text{V (50mV)}$$

Accordingly, the modulation signal of 50mVp-p is applied to the VCG terminal.

6. Block Diagram

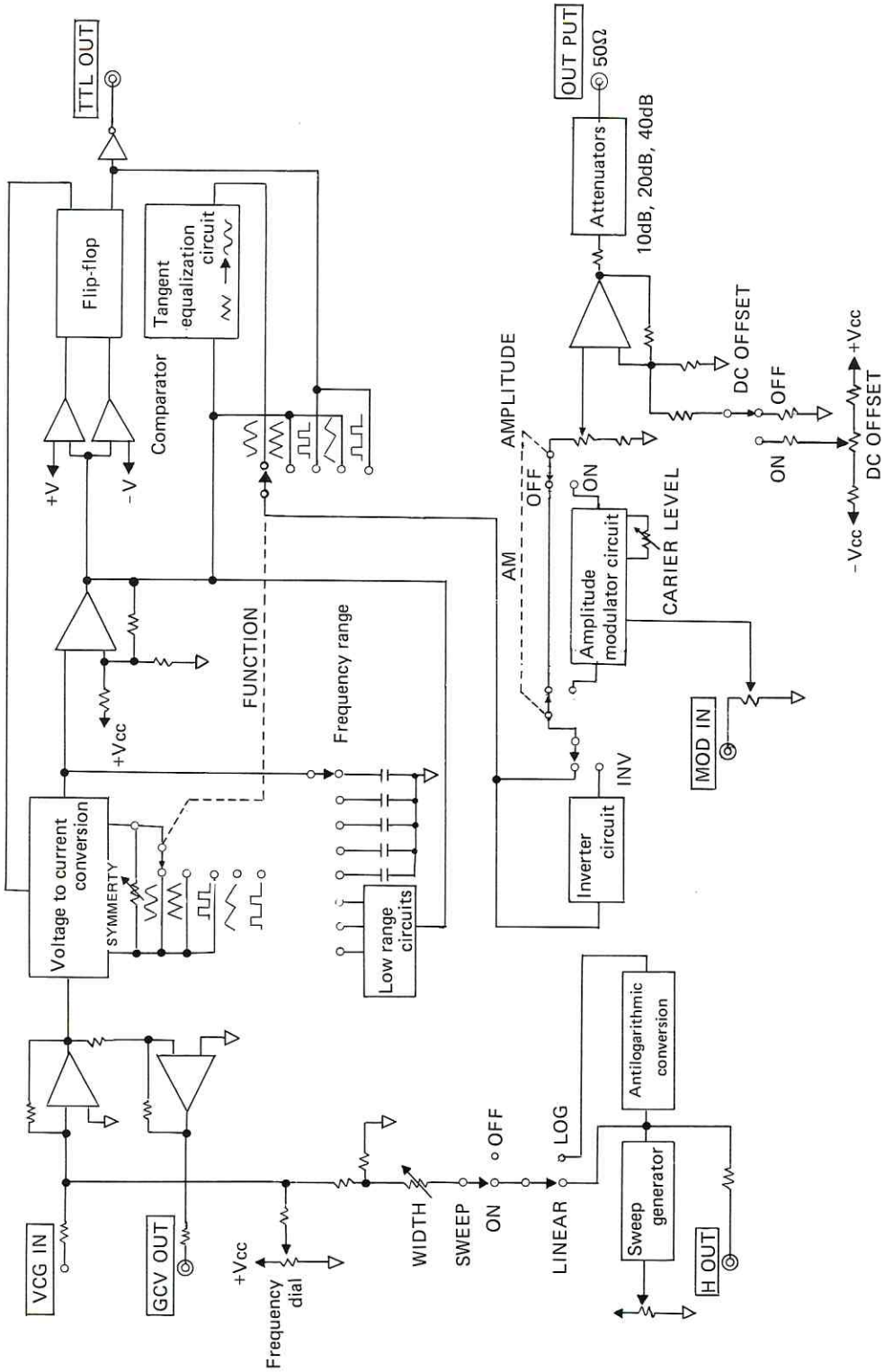


Fig. 6-1

7. Maintenance

7.1 Exposing the chassis

Remove 10 screws as shown in Fig. 7-1.

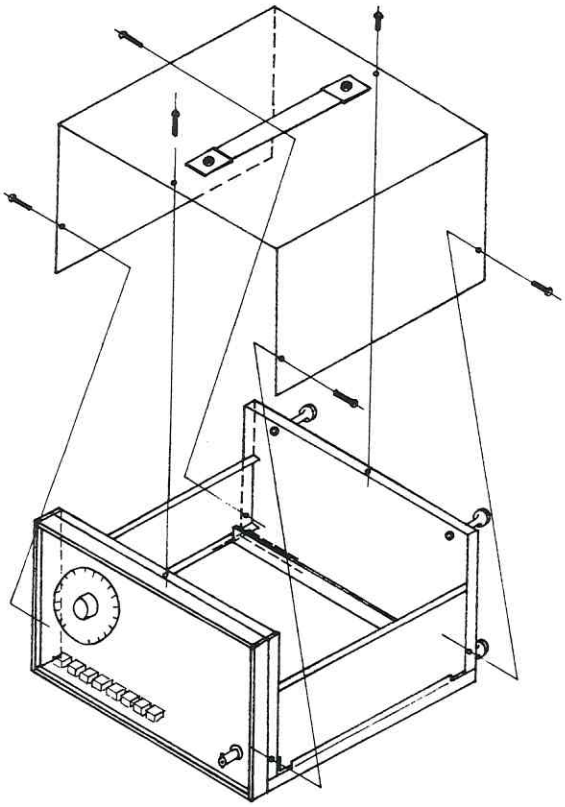


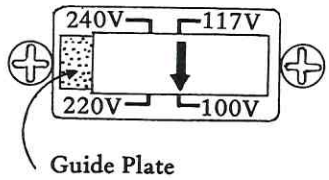
Fig. 7-1

7.2 Power voltage

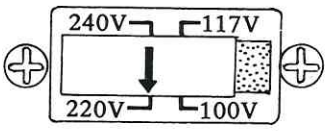
In use, a power source voltage must be applied within ±10% of the rated value. Operation with a voltage less than 10% of rated value may result in improper performance, and a voltage more than +10% of rated value may damage power supply circuitry. Before use, check a voltage range and a fuse rating, both being indicated on the rear panel.

Way on setting indicated power source voltages

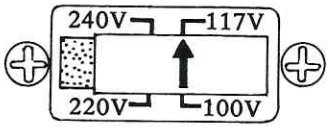
For setting an indicated power source voltage, insert a voltage switch plug into a socket so that an arrowhead marked on the plug may be directed to one of power source voltages marked on the socket along with a guide plate, as shown in the following drawings.



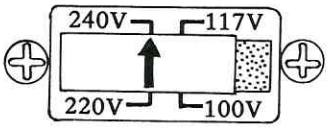
For 100V



For 220V



For 117V



For 240V

NOTE:

For sets delivered for specific countries, the AC cord is fixed with a single voltage preset.

Fig. 7-2

7.3 Fuse

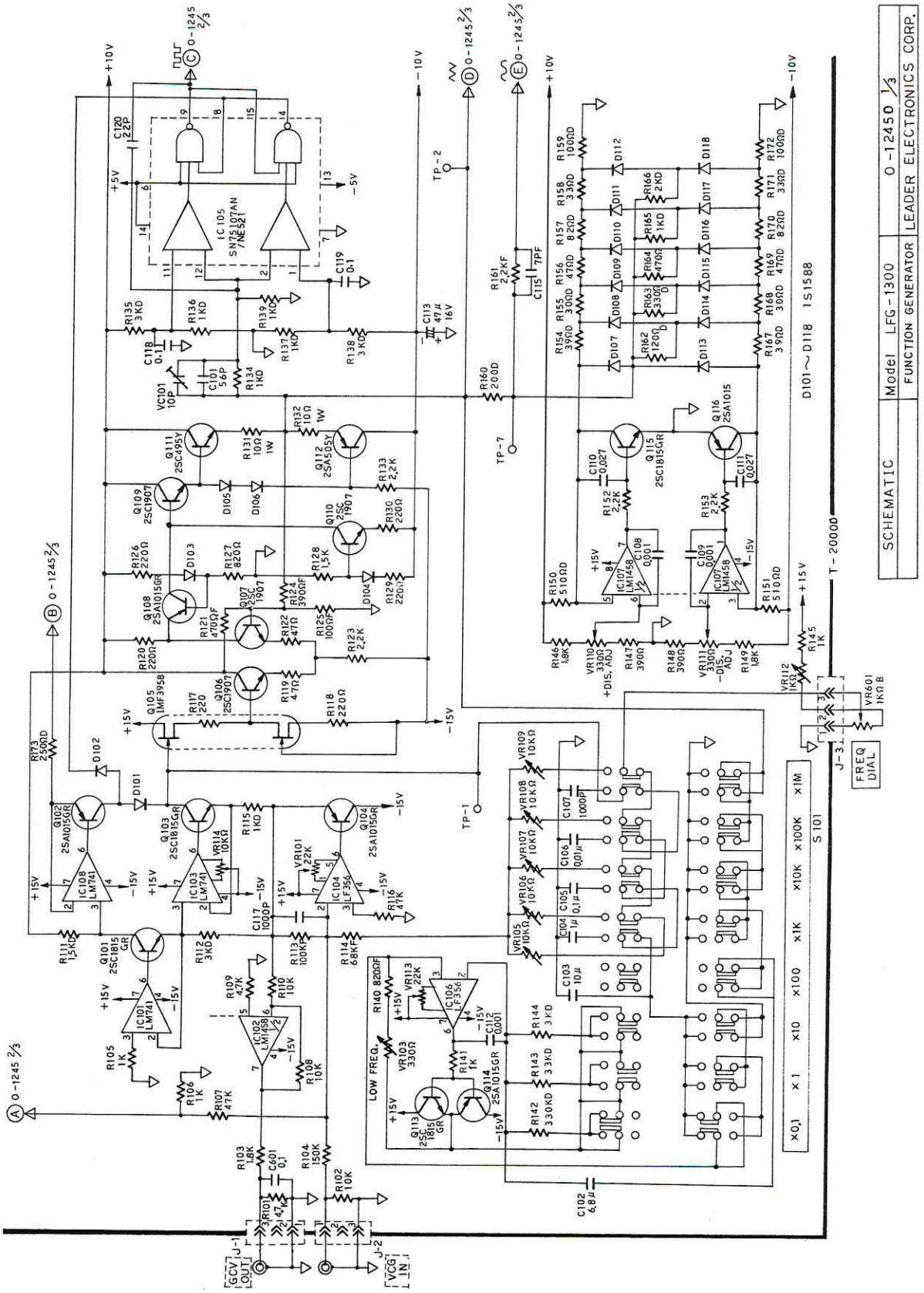
Fuses of this Generator are rated as shown in Table 7-1. If a fuse is broken off, find its cause. Replace the fuse after safety was confirmed.

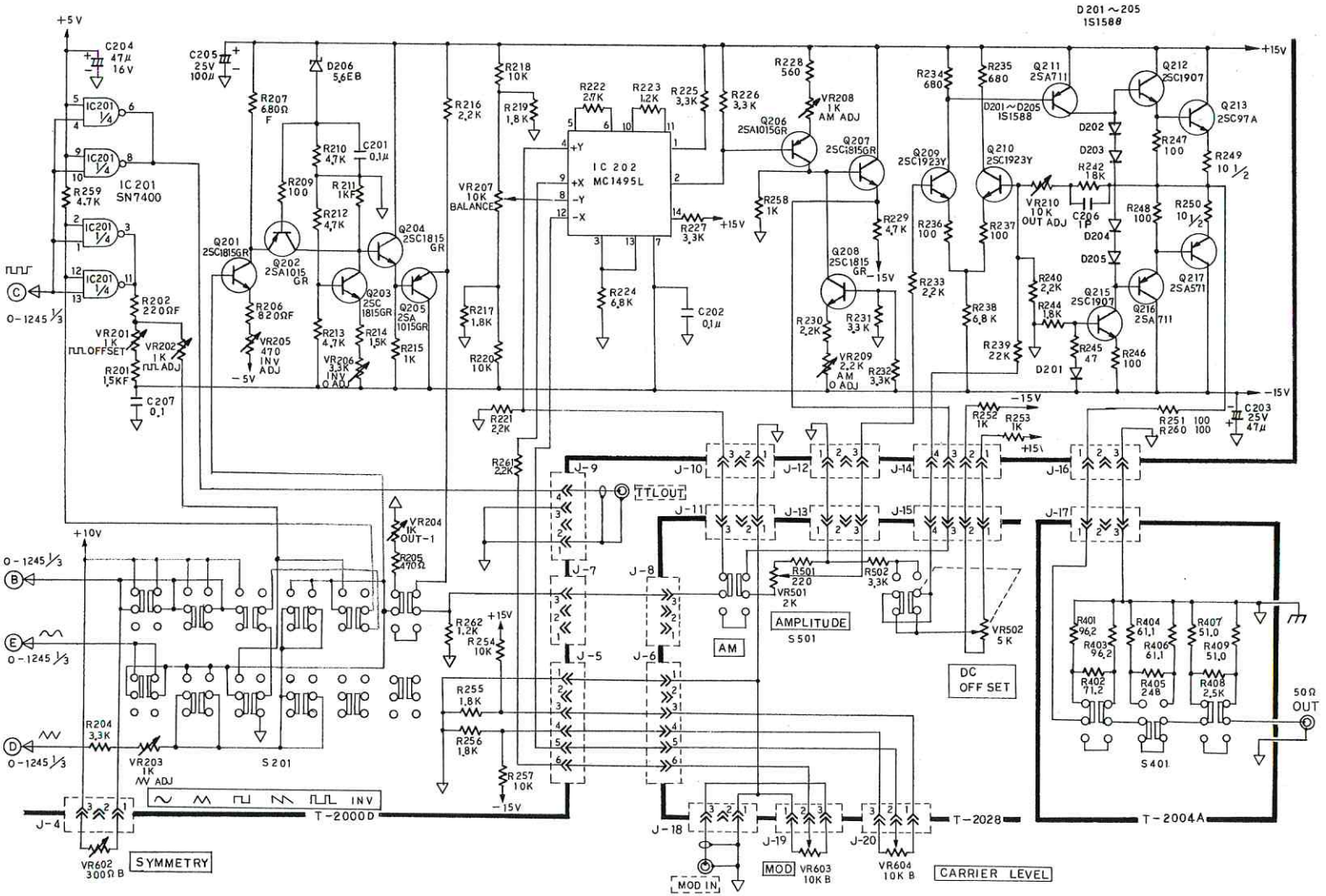
Power voltage	Fuse rating
100, 117V	0.3A
200, 234V	0.125A

(SLOW BLOW)

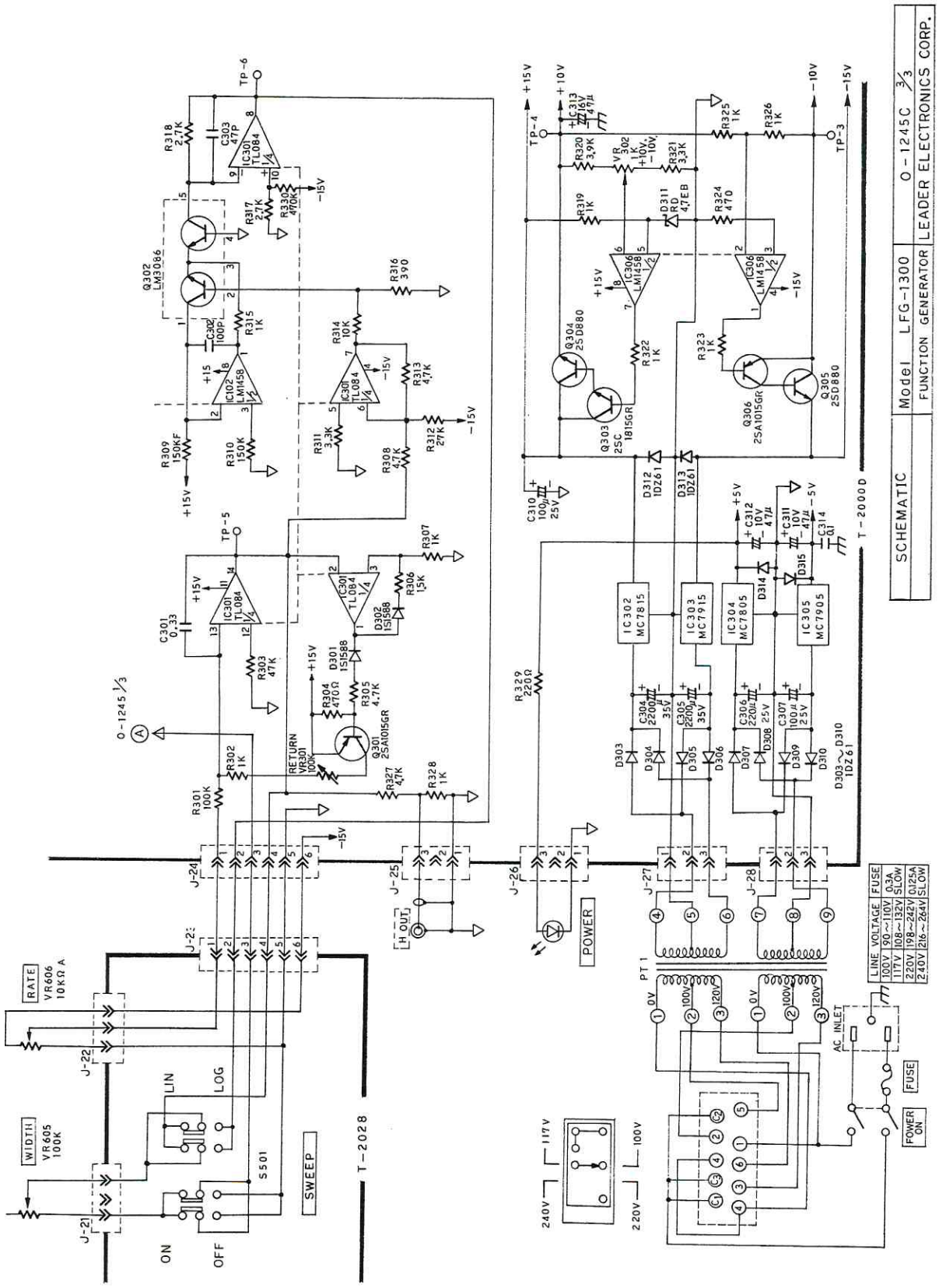
Table 7-1

8. SCHEMATIC DIAGRAM





SCHEMATIC	Model LFG-1300	0-1245C 2/3
	FUNCTION GENERATOR	LEADER ELECTRONICS CORP.


SCHEMATIC
Model LFG-1300
0-1245C 3/3
FUNCTION GENERATOR
LEADER ELECTRONICS CORP.
T-2028
T-2000D
POWER
SWEEP
RATE
WIDTH
LIN
LOG
ON
OFF
AC INLET
FUSE
POWER ON
PT1
LINE VOLTAGE
FUSE
100V 90~110V 0.3A SLOW
117V 108~132V SLOW
220V 198~242V 0.125A
240V 216~264V SLOW

MEMO