# OPERATION MANUAL

# FM/AM SIGNAL GENERATOR

# KSG4300

Third Edition

KIKUSUI ELECTRONICS CORPORATION

(KIKUSUI PART NO. Z1-477-320)

M-94072

On Power Supply Source, it is requested to replace the related places in the operation manual with the following items:

(Please apply the item of mark.)

☐ Power Supply Voltage: to _____ V AC

☐ Line Fuse: to _____ A

☐ Powre Cable: to 3-core cable (See Fig.1 for the colors.)

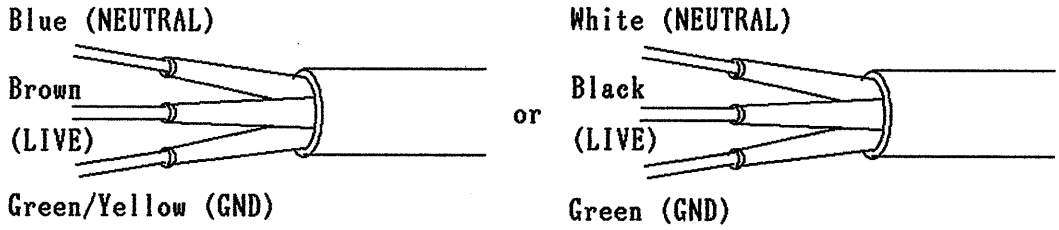



Fig. 1

Please be advised beforehand that the above matter may cause some alteration against explanation or circuit diagram in the operation manual.

*AC Plug: In case of Line Voltage 125V AC or more, AC Plug is in principle taken off and delivered, in view of the safety.
(AC Plug on 3-core cables is taken off in regardless of input voltage.)
TO connect the AC plug to the AC power cord, connect the respective pins of the AC plug to the respective core-wires (LIVE, NEUTRAL, and GND) of the AC power cord by referring to the color codes shown in Fig. 1.

Before using the instrument, it is requested to fix a suitable plug for the voltage used.

# 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.

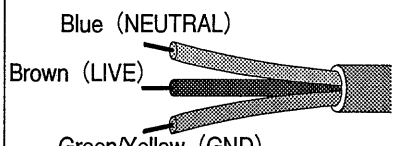
☐ AC power cable

The product is porvided 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.

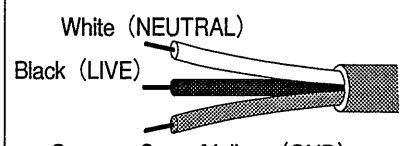
**WARNING**

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

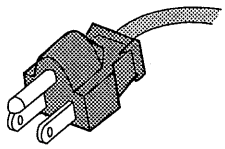
☐ Without a power plug



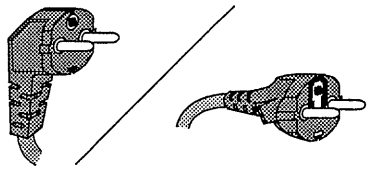

☐ Without a power plug




☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

☐ Another Cable _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

# CONTENTS

# CONTENTS

(Cont'd)

# CONTENS

(Cont'd)

# 1. INTRODUCTION

## 1.1 General Description

The KSG4300 is an FM/AM signal generator that covers the frequency of 10kHz to 280MHz. Since it generates highly stable signals ($2 \times 10^{-7}$/week) with the resolution of 100Hz by the use of Phase Lock Loop (PLL), it is suitable for measuring various functions of the receivers for FM and/or AM broadcasting. It can be operated easily as it adopts recall and numeric data entry methods.

The output level at open circuit ranges from —20.0dBμ to 132.0dBμ (0.1μV to 4Vrms), and the resolution of output signal is 0.1dB.
As to the unit of output signal level, dBμ at loaded, EMF dBμ at open circuit, or dBm can be selected by a unit key. Further, the loss caused by an additional item, such as a dummy antenna, can be offset.

Three modulation modes, namely, FM, AM, and FM—AM modes, are available. The FM peak frequency deviation is 300kHz, and the maximum AM depth is 99.9%. Both internal and external modulation is possible.
Since the KSG4300 gives a very low FM distortion rate of 0.01% or less (for 1kHz modulation frequency and 75kHz deviation), it is suitable for the development of FM tuners and their adjustment on production line.
The AM external modulation range is from 20Hz to 20kHz with very little incidental FM; so the AM suppression ratio of an FM tuner can be measured accurately.

A recall method (100 memory points) is used for operation, and numeric data entry, increment key, Rotary Knob, and Δ key increase operationality.

Simple pressing of numeric data entry keys can store any frequencies, output levels, and modulation rates in memory, the Rotary Knob makes the operator feel no difference from the same type of dial on conventional signal generator, and the Δ display for frequency and output level is very useful for difference measurement.

A remote control function is also provided for control of all operations possible from the panel.

## 1.2 Features

(1) The carrier frequency can be specified with a 7-digit number, and the value of a desired digit (designated by cursor) can be changed continuously by a rotary knob. Also, the KSG4300 has the ΔFREQ (frequency difference) display function and the ±Δf function to check selectivity.

(2) The output level can be selected from a wide range of −20dBμ to 132dBμ (open-circuit), and it can be specified with a 4-digit number in units of 0.1dB. Also, an output level ON/OFF function is provided.

(3) The carrier frequency, output level, and modulation rate can be incremented/decremented by the unit of a specified value.

(4) Modulation preset keys are provided for AM 30%, FM 3.5kHz, 22.5kHz, and 75kHz to facilitate operation. ON/OFF of modulation can be specified for AM and FM independently of each other.

(5) The KSG4300 gives small modulation distortion, high S/N ratio, and good stereo characteristic.

(6) The KSG4300 is useful for S/N measurement because it has a built-in crystal oscillator in addition to the oscillator that generates the carrier frequency specified in digital mode.

(7) All the information displayed on panel can be memorized; 100 points of data can be stored in memory and recalled from it.

(8) The KSG4300 can be operated easily because all the operations are controlled by a microprocessor and specified values are displayed in digital mode.

(9) Input data can be corrected immediately by the use of back space (←) key.

(10) Data can be copied from the memory of one KSG4300 to that of another KSG4300 by the pressing of DUMP key.

(11) The panel operation can be done in remote control mode.

(12) The KSG4300 has a GP-IB interface.

# 2. SPECIFICATIONS

o Frequency (RF)

(1) RF variable frequency

Range : 10kHz to 280MHz

Resolution : 10Hz for 10kHz to 3MHz
100Hz for 3MHz to 130MHz
200Hz for 130MHz to 280MHz

Display : 7-digit readout, ΔFREQ dislay, and
± frequency inversion function

Accuracy : ± $2 \times 10^{-6}$

Stability : ± $2 \times 10^{-7}$/week (48 hours after power-on)

(2) Fixed frequency (crystal oscillator)

Frequency : 89.9MHz

Accuracy : ± $3 \times 10^{-5}$

o Output level

Range : Maximum output

| Unit | For CW.FM | For 99.9% AM |
|---|---|---|
| EMF dBμ | 132dBμ | 126dBμ |
| dBμ | 126dBμ | 120dBμ |
| 50Ω dBm | 19dBm | 13dBm |
| 75Ω dBm | 17dBm | 11dBm |

Minimum output

| Unit | 10k – 30MHz | 30 – 280MHz |
|---|---|---|
| EMF dBμ | —20dBμ | —10dBμ |
| dBμ | —26dBμ | —16dBμ |
| 50Ω dBm | —133dBm | —123dBm |
| 75Ω dBm | —135dBm | —125dBm |

Note: CW = Carrier wave

Unit: Four types of units, namely, EMF dBμ for open-circuit at 0dB = 1μV, dBμ for loaded-terminal voltage, dBm for 50Ω output impedance, and dBm for 75Ω output impedance.

Resolution : 0.1dB

Display : 4-digit readout that can be read directly in each one of the four unit types Δ dB display and any desired offset value display

The unit of EMF dBμ, abbreviated as dB, is applied to all the following description:

Standard level accuracy : At the output level of 126dB
1) ± 1dB (RF ≧ 400kHz)
2) ± 2dB (RF > 400kHz)

Attenuator accuracy :
1) ± 1dB (Output ≧ 20dB)
2) ± 1.5dB (Output ≧ 0dB)
3) ± 2dB (Output > 0dB)

RF.ON/OFF : Output level can be turned on/off by RF-OFF key.

Output impedance: 50Ω or 75Ω BNE type connector

VSWR :
≦ 1.2 (Output impedance = 50Ω ; Output level = 60dB)
≦ 1.2 (Output impedance = 75Ω ; FR ≦ 130MHz; Output level = 60dB)
≦ 1.5 (Other RF values and output levels)

Spurious singals (Fundamental wave = 0dBc)

Harmonics : ≦ -30dBc (Output level ≦ 126dB)

Non-harmonics :
≦ -60dBc (RF ≦ 32.5MHz; Measurement range ≦ 90MHz)
≦ -50dBc (RF > 32.5MHz; Measurement range ≦ 300MHz)
≦ -80dBc (Fixed crystal oscillation)

Sub-harmonics :
≦ -80dBc (RF ≦ 130MHz)
≦ -50dBc (RF > 130MHz)

Residual modulation (S/N)

FM component : Demodulation band width = 300Hz to 15kHz;
De-emphasis = 50μs; 75kHz deviation
1) ≧ 93dB
(Fixed frequency (Modulation is not allowed))
2) ≧ 87dB (RF = 75MHz to 110MHz)
3) ≧ 80dB (RF = 32.5MHz to 240MHz)
4) ≧ 70dB (Other RF values)

AM component : Demodulation band width = 50Hz to 15kHz;
30% depth ratio

1) ≧ 60dB (RF = 400kHz to 1.7MHz)
2) ≧ 55dB (Other RF values)

o Modulation (for RF variable frequency)

FM/AM simultaneous modulation : Selection can be made from the following signal sources for FM and AM simultaneously:

1) External
2) Internal 400Hz
3) Internal 1kHz

*Note: Only for AM, either AM terminal or FM/AF terminal can be used as external modulation terminal.*

Internal modulation frequency : 400Hz and 1kHz; ± 3%
(Two frequencies are available)

External modulation input impedance : 10kΩ approx. (unbalance)

Input voltage requirement for external modulation : 3Vp-p approx.

*Note: For the above input voltage, an error of ±2% is allowed by HI-LO moniter.*

[FM]

Maximum frequency deviation range and resolution

| RF variable frequency | 300k-3MHz | 3-32.5, 65-280MHz | | 32.5-65MHz | |
|---|---|---|---|---|---|
| Maximum frequency deviation range | 0-30kHz | 0-99.9kHz | 100-300kHz | 0-49.9kHz | 50-150kHz |
| Resolution | 100Hz | 100Hz | 1kHz | 100Hz | 1kHz |

*Note: When the value of RF is smaller than or equal to 300kHz, the maximum frequency deviation is 10% of the RF value.*

Display : 3-digit readout

Accuracy : 1) ± 5% of maximum frequency deviation (RF > 3MHz)
2) ± 10% of maximum frequency deviation (RF ≦ 3MHz)

External modulation frequency characteristics : 20Hz to 100kHz, 1kHz reference
± 1dB
(RF = 75MHz to 110MHz)
± 1.5dB
(RF = Other than above values)

Separation : For Modulation frequency = 1kHz and Deviation=75kHz.

1) ≧ 60dB (RF 10.7 ± 1MHz, 83 ± 1MHz, 98 ± 1MHz)
2) ≧ 50dB (RF 75MHz to 110MHz)

Distortion : For Demodulation band width = 300Hz to 15kHz, De-emphasis = 50μs, Modulation frequency = 1kHz, and Deviation = 75kHz

1) ≦ 0.01% (RF 10.7 ± 1MHz, 75 to 110MHz)
2) ≦ 0.1% (Other RF values)

Incidental AM : For Modulation frequency = 1kHz and Deviation = 75kHz
≦ 0.5% (RF 10.7 ± 1MHz, 75 to 110MHz)

[AM]

| | | |
|---|---|---|
| Settable | : | 0 to 99.9% |
| Depth | : | 0 to 80% (Output level ≦ 126dB) |
| Resolution | : | 0.1% |
| Display | : | 3-digit readout |
| Accuracy | : | For 0 to 80% modulation<br>1) ≦ (Displayed value ± 5)% (RF 400kHz to 1.7MHz)<br>2) ≦ (Displayed value ± 10)% (Other RF values) |
| External modulation frequency characteristics | : | 50Hz to 20kHz ± 1dB<br>(1kHz reference; RF = 400kHz to 1.7MHz)<br>50Hz to 10kHz ± 1dB<br>(1kHz reference; Other RF values) |
| Distortion | : | For Demodulation band width = 50Hz to 15kHz, Modulation frequency = 1kHz, and Depth = 30%<br>1) ≦ 0.2% (RF = 400kHz to 1.7MHz)<br>2) ≦ 1% (Other RF values) |
| Incidental FM | : | For Modulation frequency = 1kHz, Depth = 30%, and Output level ≦ 126dB<br>≦ 75Hz (RF ≦ 130MHz) |

o Setting Functions : 1) Ten numeric keys and rotary knob (with cursor designation) for specifying carrier frequency, modulation mode, memory, and output level
2) Step keys for specifying carrier frequency, output level, and modulation level
3) Preset keys for specifying 3.5kHz, 22.5kHz, and 75kHz (for FM) and 30% (for AM)

o Memory Function : 1) 100 points for carrier frequency, output level, modulation level, modulation mode, etc.
2) The memory can be used in blocks of 10 points or as a continuous space of 100 points

o DUMP Function : The contents of the 100-point memory can be transferred to the memory of the same model signal generator by DUMP key.

o Remote Control : The frequency, output level, and modulation mode can be stored/recalled, the frequency and output level can be incremented/decremented by steps or continuously by rotary knob, modulation can be turned on/off, etc.

o GP-IB Interface : SH0, AH1, T0, L1, SR0, RL1, PP0, DC1, DT0, C0

o Range Out (dummy antenna switching output):

"1" (5V MAX 50mA) for RF $\geqq$ 35MHz
"0" (0V) for RF $<$ 35MHz

o Leakage Field Strength : The measurement of 0dB (1μV) is not affected.

o Backup Battery is provided.

o Power Source : AC 100, 115, 215, 230V ± 10%
(selected by a switch on real panel)

Frequency : 50Hz/60Hz

Power dissipation: Approx. 60VA

o Size and Weight

Dimensions : 430(W) × 99(H) × 300(D) mm
445(W) × 119(H) × 355(D) mm (Full envelope)

Weight : Approx. 10kg

o Environmental Conditions (temperature and humidity)

| | | |
|---|---|---|
| Range to satisfy specifications | : | 5°C to 35°C; 85% or less |
| Allowable range for operation | : | 0°C to 40°C; 90% or less |

| | | | |
|---|---|---|---|
| o Accessories | : | Output cable (SA550) | 1 |
| | | Power supply cord | 1 |
| | | Fuse (1.5A) | 1 |
| | | Fuse (0.8A) | 1 |
| | | Operation manual | 1 |

o Parallel Interface : Factory-installed option

*Note: GP-IB interface is not used together with Parallel interface.*

# 3. PREPARATION FOR USE

## 3.1 Unpacking and Inspection

Before being shipped from the factory, the KSG4300 goes through thorough mechanical and electrical examinations and inspections, and its correct operation is confirmed and guaranteed.

On receiving the instrument, inspect it for any damage that may have been caused during transportation. Should a damage be found, notify the Sales Office immediately.

## 3.2 Line Voltage and Fuse Selection

Select a voltage range from the table below by the voltage selection plug on the rear panel of KSG4300, and the instrument can be used in the selected voltage range.

Before connecting the power supply cord to the instrument, verify that the voltage selection is matched to the power source. When the voltage range is changed, change the fuse also according to the table below.

Application of a voltage beyond the selected range will cause in complete operation or failure.

| Setting Position | Center Voltage | Line Voltage Range | Fuse |
|---|---|---|---|
| A | 100V | 90 ~ 110V | 1.5A |
| B | 115V | 104 ~ 126V | |
| C | 215V | 194 ~ 236V | 0.8A |
| D | 230V | 207 ~ 253V | |

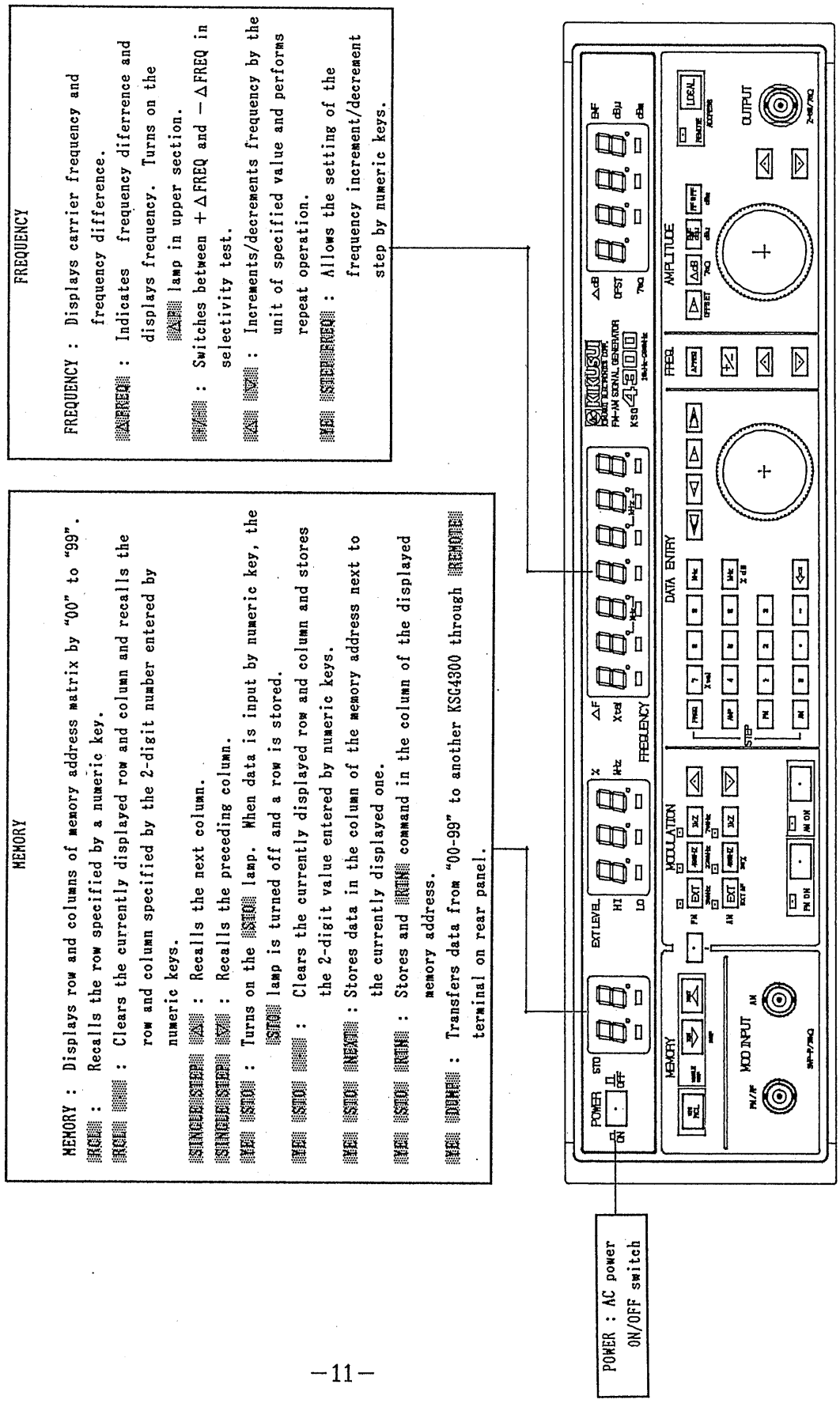
## 3.3 Surrounding Temperature/Humidity, Warm-up Time, and Installation Place

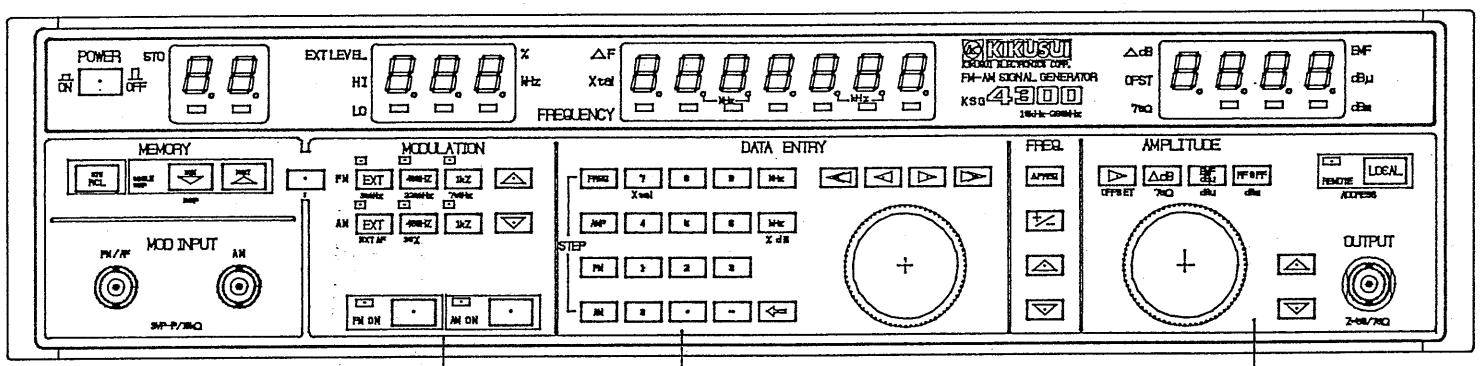
The KSG4300 operates correctly in temperatures from 0°C to 40°C (32 to 104°F). If the instrument is used or placed under high temperature and humidity for a long time, failures will occur and the life of the instrument will be shortened.

The instrument requires the warm-up time of 30 minutes. Do not use the instrument near a strong magnetic field or electromagnetic waves.

# 4. OPERATION

## 4.1 Front Panel Features






## MODULATION

MODULATION : Displays FM/AM modulation rate by three digits.

MOD INPUT : External modulation input terminal for FM or AM single signal.

EXT LEVEL HI LO : Indicates external modulation input level range. The range is normal when HI LO is off.

% : Indicates AM depth by the unit of 0.1%.

kHz : Indicates FM frequency deviation by the unit of 0.1kHz.

EXT,400Hz,1kHz : Switches between external and internal modulation for FM and AM.

△ ▽ : Increments/decrements modulation by the unit of specified value and performs repeat operation.

FM ON : Turns ON/OFF FM modulation.

AM ON : Turns ON/OFF AM modulation.

FM 3.5kHz,22.5kHz,75kHz : Presets FM deviation at 3.5kHz, 22.5kHz, or 75kHz.

AM 30% : Presets AM depth at 30%.

## DATA ENTRY

DATA ENTRY : Keys to input numeric values directly and move cursor and rotary knob to modify displayed value.

FREQ : Allows the setting of frequency by numeric keys.

AMP : Allows the setting of output level by numeric keys.

FM : Allows the setting of FM deviation by numeric keys.

AM : Allows the setting of AM depth by numeric keys.

Numeric keys (0～9, ・, −): Enter numeric values.

MHz kHz %/dB : Enter units.

← : Back space (BS) key. Correct data input error or displays center frequency when ΔFREQ function is used.

◁◁ ▷▷ : Move cursor into block.

◁ ▷ : Move cursor within block.

Rotary knob : Modifies the value at cursor position.

## AMPLITUDE

AMPLITUDE : Displays RF output level by four digits.

▷ : Moves cursor.

ΔdB : Displays deviation of output level.

EMF dB : Sets a unit.

RF OFF : Turns ON/OFF output level.

LOCAL : Releases the instrument from remote control by GP-IB.

Rotary knob : Modifies the value at cursor position.

△ ▽ : Increments/decrements amplitude by the unit of specified value and performs repeat operation.

OUTPUT : BNC terminal for RF output. −20.0dBμ to 132.0dBμ at open circuit. The signal source impedance is 50Ω.

SET STEP AMP : Allows the setting of the output level increment/decrement step by numeric keys.

OFFSET : Displays the offset for dummy antenna, etc.

dB dBm : Sets a unit.

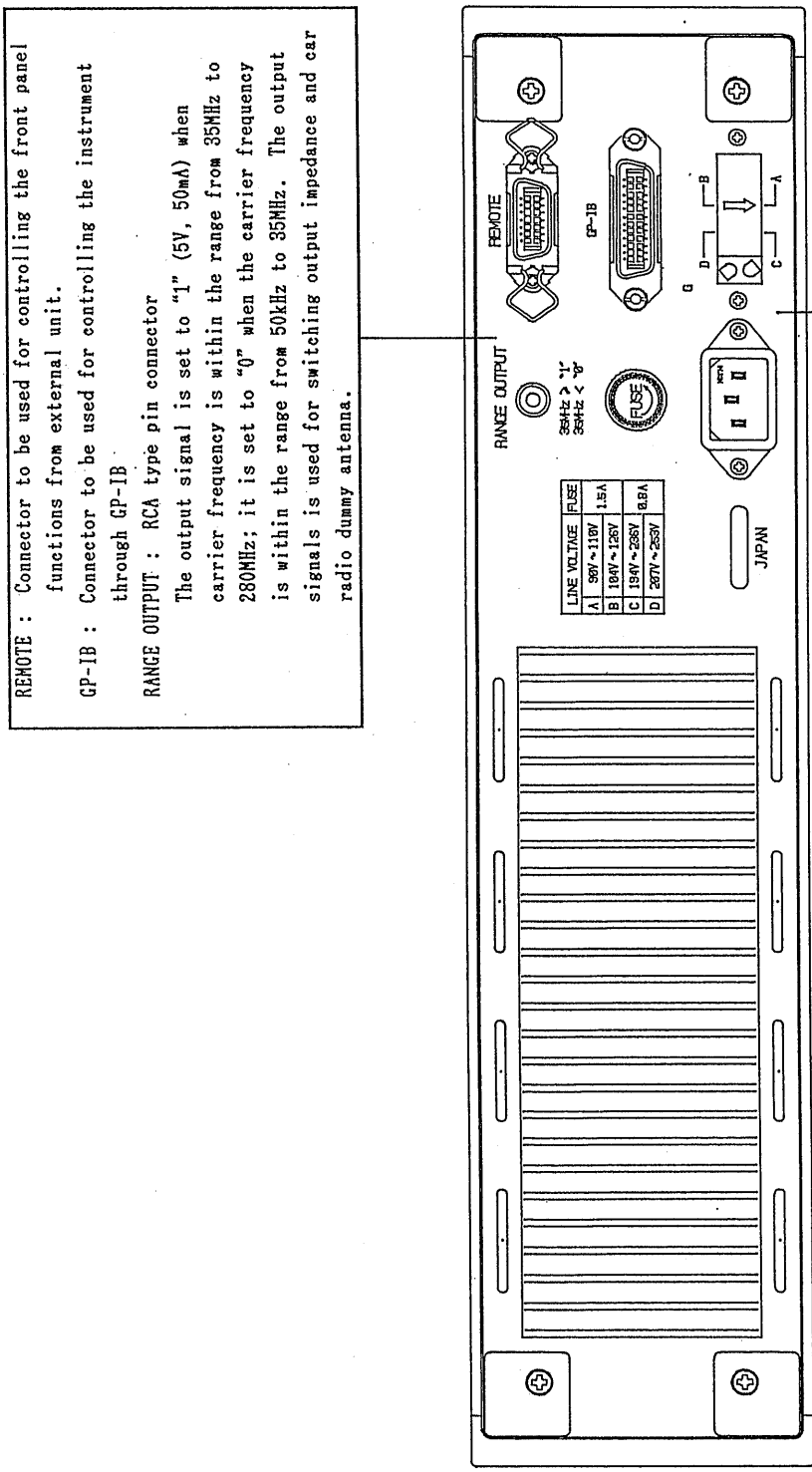
ADDRESS : Displays GP-IB address.

## 4.2 Rear Pamel Features

REMOTE : Connector to be used for controlling the front panel functions from external unit.

GP-IB : Connector to be used for controlling the instrument through GP-IB

RANGE OUTPUT : RCA type pin connector
The output signal is set to "1" (5V, 50mA) when carrier frequency is within the range from 35MHz to 280MHz; it is set to "0" when the carrier frequency is within the range from 50kHz to 35MHz. The output signals is used for switching output impedance and car radio dummy antenna.




VOLTAGE SELECTOR: Selects voltage of the AC power source. Insert the plug to match the arrow to the AC line voltage.

AC connector : Plug for AC power source.

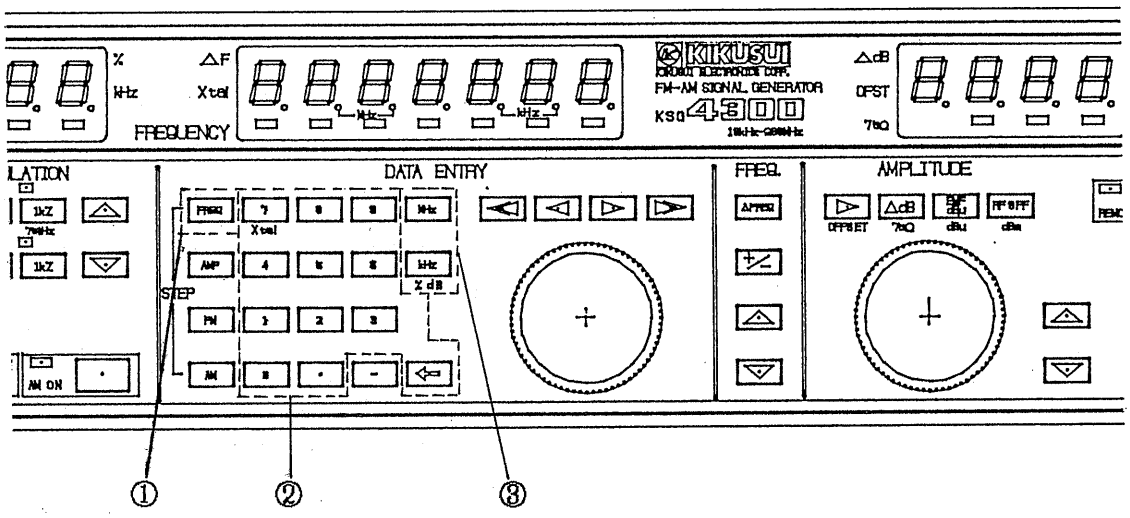
FUSE : Fuse for AC power source. Select the fuse that matches the AC line voltage.

## 4.3 Turning on the Power Supply

Connect the power supply cord to the power source of the selected voltage and press the POWER switch. All the LEDs on front panel come on and then the status found before the power was turned off is displayed.

## 4.4 Setting Frequency

### 4.4.1 Setting frequency by numeric keys




Press the FREQ key and enter a desired value by numeric keys (0～9, ·). Press keys in the order of ①, ②, and ③ in the above chart. If a key outside of the frame [ ] is pressed, the value found before the FREQ key was pressed is displayed.

Press the MHz or kHz key on completion of the numeric key entry, and the specified value is displayed in the FREQUENCY section correctly. The maximum number of digits for the input value is 7; a value of more than seven digits is not accepted.

When pressing a numeric key by mistake, press the FREQ key again and enter the desired value by numeric keys or correct the value of the particular digit by the ← (back space) key.
If the AMP, FM, or AM key has not been pressed after the unit key ( MHz or kHz ) is pressed, a different frequency can be set only by the numeric keys and unit key without the necessity of pressing the FREQ key.

(a) Example: 123.4567MHz is input.

×..... Undefined
␣..... Turned off

| Key operation | FREQUENCY display | |
|---|---|---|
| FREQ | ××× . ×××. × | Previous value |
| 1 | 1␣␣ ␣␣␣ ␣ | |
| 2 | 12␣ ␣␣␣ ␣ | |
| 3 | 123. ␣␣␣ ␣ | |
| . | 123. ␣␣␣ ␣ | |
| 4 | 123. 4␣␣ ␣ | |
| 5 | 123. 45␣ ␣ | |
| 6 | 123. 456 ␣ | |
| 7 | 123. 456 7 | |
| MHz | 123. 456. 7 | |

(b) Example: 455kHz is input.

| Key operation | FREQUENCY display |
|---|---|
| | 123. 456. 7 |
| FREQ | 123. 456. 7 |
| 4 | 4␣␣ ␣␣␣ ␣ |
| 5 | 45␣ ␣␣␣ ␣ |
| 5 | 455 ␣␣␣ ␣ |
| kHz | ␣␣4 55. 00 |

(c) Example: 11MHz was to be input, but 12MHz was input by mistake.

| Key operation | | FREQUENCY display |
|---|---|---|
| FREQ | | ␣␣4 55. 00 |
| 1 | | 1␣␣ ␣␣␣ ␣ |
| 2 | "2" was pressed for "1" by mistake | 12␣ ␣␣␣ ␣ |
| ⇦ | | 1␣␣ ␣␣␣ ␣ |
| 1 | | 11␣ ␣␣␣ ␣ |
| MHz | | ␣11. 000. 0 |

If a numeric key is pressed by mistake as in the above example, the character of the pressed key can be deleted by the pressing of ⇦ key.
If the ⇦ key is pressed continuously, all the displayed characters are deleted and the previous value is displayed.

(d) Example: 85.7MHz was to be input, but an error was made during the input.

| Key operation | | FREQUENCY display |
|---|---|---|
| FREQ | | ␣11.000.0 |
| 8 | | 8␣␣ ␣␣␣ ␣ |
| 6 | "6" was pressed for "5" by mistake | 86␣ ␣␣␣ ␣ |
| . | | 86␣. ␣␣␣ ␣ |
| 7 | | 86.7␣␣␣ ␣ |
| ⇦ | Press twice | 86␣ ␣␣␣ ␣ |
| ⇦ | Press twice | ␣11.000.0 |

If the ⇦ key is pressed before the key ( MHz or kHz ), the previous frequency is displayed.

| | |
|---|---|
| 8 | 8␣␣ ␣␣␣ ␣ |
| 5 | 85␣ ␣␣␣ ␣ |
| . | 85. ␣␣␣ ␣ |
| 7 | 85.7␣␣␣ ␣ |
| MHz | ␣85.700.0 |

(e) Example: 11MHz was input for 1MHz by mistake.

| Key operation | FREQUENCY display |
|---|---|
| FREQ | ␣85.700.0 |
| 1 | 1␣␣ ␣␣␣ ␣ |
| 1 | 11␣ ␣␣␣ ␣ |
| MHz | ␣11.000.0 |
| 1 | 1␣␣ ␣␣␣ ␣ |
| MHz | ␣1.000.00 |

If an error is found after the unit key is pressed as in the above example, the correct frequency can be input without pressing the FREQ key again.

### 4.4.2 Rotary knob

The rotary knob increases or decreases the value of the digits at and above the cursor position in the FREQUENCY display section.
If the cursor is not found in the FREQUENCY display section, bring it into the section by the ◁◁ or ▷▷ key; to move the cursor within the section, use the ◁ or ▷ key.

After changing frequency by the rotary knob, the unit key ( MHz or kHz ) need not be pressed.

(a) Example: To change frequency from 100MHz to 100.02MHz

The mark "_" denotes the cursor position

| Key operation | | FREQUENCY display |
|---|---|---|
| | | 1 0 0 . 0 0 0 . 0 |
| ◁ | Press once | 1 0 0 . 0 0 0 . 0 |
|  | Turn the rotary knob clockwise by two steps | 1 0 0 . 0 2 0 . 0 |

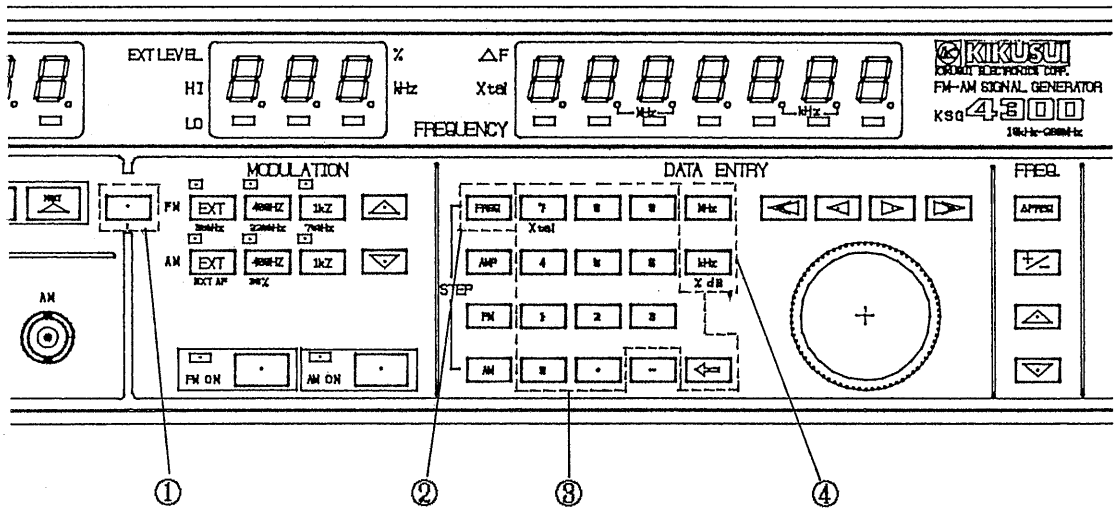
(b) Example: To change frequency from 100.02MHz to 98.02MHz

| Key operation | | FREQUENCY display |
|---|---|---|
| | | 1 0 0 . 0 2 0 . 0 |
| ◁ | Press twice | 1 0 0 . 0 2 0 . 0 |
|  | Turn the rotary knob counterclockwise by two steps | ␣ 9 8 . 0 2 0 . 0 |

### 4.4.3 Setting frequency step for △ and ▽ keys

Set a desired step value (minimum 10Hz) for the [FREQUENCY] △ and ▽ keys, and the frequency can be incremented or decremented by the unit of that value.

In setting the value, the cursor position in the [FREQUENCY] display section may be ignored.




Input the step value in the order of ①, ②, ③, and ④ shown in the above chart.

The YE key in the explanation below means the yellow key of number 1 . This key functions as a shift key; the function of an orange key on the panel pressed after the YE key is different from that of the same key pressed without YE key.

(a) Example: To set 9kHz for △ and ▽ keys when carrier frequency is 1MHz

| Key operation | FREQUENCY display |
|---|---|
| YE | ␣1.000.00 |
| STEP FREQ | ␣1.000.00 |
| 9 | 9␣␣ ␣␣␣ ␣ |
| kHz | ␣1.000.00 |
| △ Press once | ␣1.009.00 |

keep pressing the △ or ▽ key in the FREQ section, and the repeat function is applied to keep increasing or decreasing the frequency by the unit of 9kHz.

4.4.4 Frequency difference [ΔFREQ] and [+/−] keys

The [ΔFREQ] function, to check the value of change in frequency, is useful for measuring the band width of a receiver.

When the [ΔFREQ] key is pressed, the [Δ] indicator in the [FREQUENCY] display section is turned on and the frequency difference (ΔFREQ) is displayed.

(a) Example: 100MHz is set currently.

| Key operation | FREQUENCY display | |
|---|---|---|
| [YE] | | |
| [STEP FREQ] | ××× ××× × | |
| [1] | 1␣␣ ␣␣␣ ␣ | |
| [0] | 10␣ ␣␣␣ ␣ | |
| [0] | 100 ␣␣␣ ␣ | |
| [kHz] | ××× ××× × | |
| [FREQ] | ××× ××× × | |
| [1] | 1␣␣ ␣␣␣ ␣ | |
| [0] | 10␣ ␣␣␣ ␣ | |
| [0] | 100 ␣␣␣ ␣ | |
| [MHz] | 100. 000. 0 | |
| [ΔFREQ] | ␣␣␣ ␣␣0. 0 | ΔF indicator comes on |
| [FREQUENCY] [▽] | −␣␣ 100. 0 | Carrier frequency 99.9MHz |
| [⇐] | ␣␣␣ ␣␣0. 0 | |

If the operator keeps pressing the [△] or [▽] key in the [FREQ] section, the repeat function is applied and the frequency keeps increasing or decreasing by the unit of 100kHz. If the [⇐] key ispressed in the above example, the carrier frequency returns to the initial value (center value).

(b) Example: 100MHz is set currently.

| Key operation | | FREQUENCY display | |
|---|---|---|---|
| | | 100.000.0 | |
| ΔFREQ | | ␣␣␣ ␣␣0.0 | ΔF indicator comes on |
| ◁ | Press three times | ␣␣␣ ␣␣0.0 | |
|  | Turn the rotary knob counterclockwise by five steps | −␣5.000.0 | Carrier frequency 95MHz |
| ΔFREQ | | ␣95.000.0 | |

To release the ΔFREQ function, press the ΔFREQ key again. In the above example, the carrier frequency effective after the release is 95MHz.

(c) Example: Using +/− key after modification of 100MHz by ΔFREQ

| Key operation | FREQUENCY display | |
|---|---|---|
| | 100.000.0 | |
| ΔFREQ | ␣␣␣ ␣␣0.0 | ΔF indicator comes on |
| 2 | 2␣␣ ␣␣␣ ␣ | |
| 0 | 20␣ ␣␣␣ ␣ | |
| 0 | 200 ␣␣␣ ␣ | |
| kHz | ␣␣␣ 200.0 | Carrier frequency 100.2MHz |
| +/− | −␣␣ 200.0 | Carrier frequency 99.8MHz |
| ΔFREQ or FREQ | ␣99.800.0 | |

### 4.4.5 Using crystal oscillator

The KSG4300 has a built-in crystal oscillator of 89.9MHz. Use the crystal oscillator for measuring the S/N ratio of an FM receiver. Neither FM nor AM modulation is allowed.

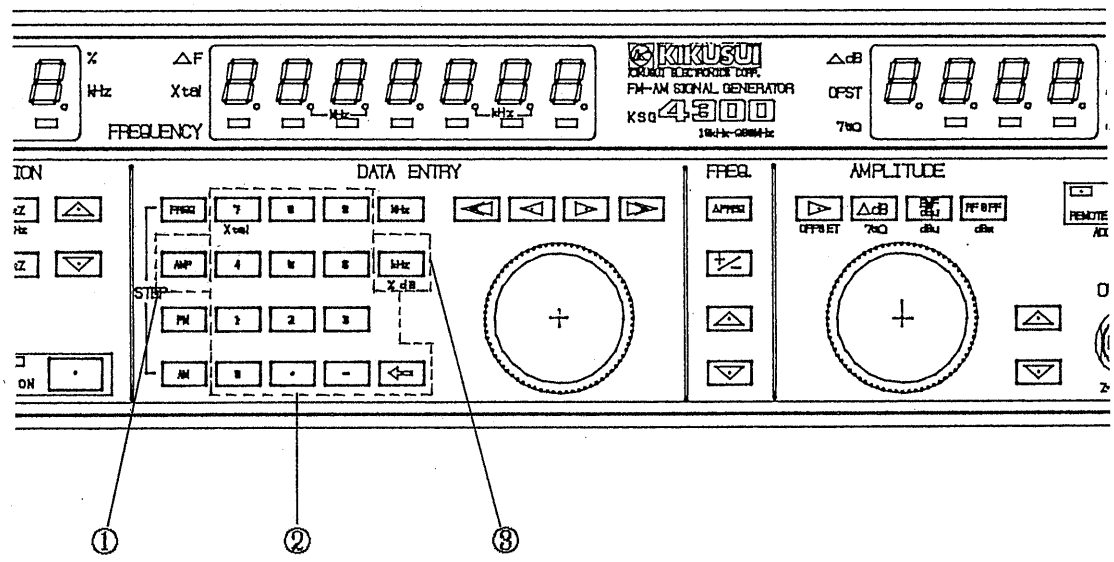
To call the crystal oscillat or, press [YE], [X tal].
When these keys are pressed, the X tal indicator is turned on and the following value is displayed in the FREQUENCY section:

␣89.9␣␣␣

The display of the above value means that the 89.9MHz crystal oscillator is active.

## 4.5 Setting Output Level

### 4.5.1 Setting output level by numeric keys




Press the AMP key and enter a desired value by numeric keys ( 0~9 , . , - ).

Press keys in the order of ①, ②, and ③ in the above chart.
If a key outside of the frame [ ] is pressed, the value displayed before the AMP key was pressed is displayed again.

After entering a value by numeric keys, press the dB ( kHz ) key. Then, the value is displayed in the [AMPLITUDE] section correctly.

(a) Example: To set 10dB

| Key opreation | AMPLITUDE display |
|---|---|
| AMP | ×××.× ..... Previous value |
| 1 | 1␣␣ ␣ |
| 0 | 10␣ ␣ |
| dB | ␣10.0 |

(b) Example: To set —5dB

| Key opreation | AMPLITUDE display |
|---|---|
| AMP | ␣10.0 |
| — | —␣␣ ␣ |
| 5 | —5␣ ␣ |
| dB | —␣5.0 |

The AMP key need not be pressed if an output level is to be set immediately after another output level.

(c) Example: 120dB was to be set, but an error was made during the setting (Unit = EMF dBμ)

| Key oepration | | AMPLITUDE display |
|---|---|---|
| AMP | | —␣5.0 |
| 1 | | 1␣␣ ␣ |
| 3 | "3" was pressed for "2" by mistake | 13␣ ␣ |
| ← | | 1␣␣ ␣ |
| 2 | | 12␣ ␣ |
| 0 | | 120 ␣ |
| dB | | 120.0 |

If an error is made during the setting by numeric keys, correct the error by the ← key.
If an error is found after the dB key is pressed, enter the correct value by numeric keys again.
If an output level higher or lower than the maximum or minimum value allowed for the specified unit is set, the [AMPLITUDE] section displays the previous value.

### 4.5.2 Rotary knob

The rotary knob increases or decreases the value of the digits at and above the cursor position in the [AMPLITUDE] section.
Use the [▷] key for moving the cursor.
Turn the rotary knob clockwise, and the output level will increase; turn it counterclockwise, and the output level will decrease.

After changing the output level by rotary knob, the [dB] ( [kHz] ) unit key need not be pressed.

(a) Example: To change output level from 46dB to 66dB
(Unit = EMF dBμ)

The mark "_" denotes the cursor position

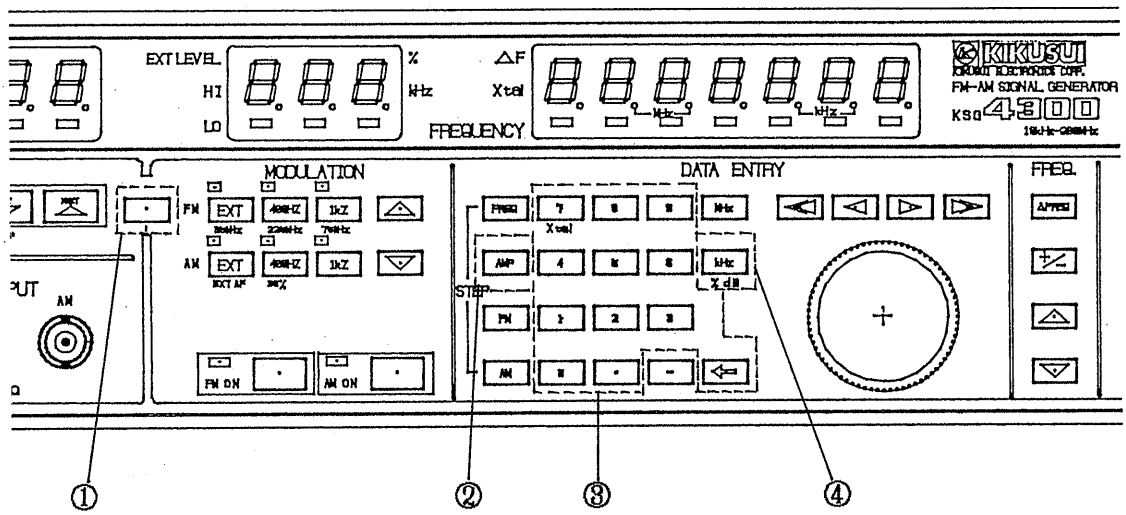
| Key operation | | AMPLITUDE display |
|---|---|---|
| | | ␣46.0 |
| [▷] | Press twice | ␣46.0 |
|  | Turn the rotary knob clockwise by two steps | ␣66.0 |

(b) Example: To change output level from 66dB to 60dB

| Key operation | | AMPLITUDE display |
|---|---|---|
| | | ␣66.0 |
| [▷] | Press once | ␣66.0 |
|  | Turn the rotary knob counterclockwise by six steps | ␣60.0 |

4.5.3 Setting output level step for [△] and [▽] keys

Set a desired step value (minimum 0.1dB) for the [AMPLITUDE] [△] and [▽] keys, and the output level can be incremented or decremented by the unit of that value.




Press keys in the order of ①, ②, ③, and ④ in the above chart.

(a) Example: To set 2dB for [△] [▽] keys when the output level is 46dB

| Key operation | | AMPLITUDE display |
|---|---|---|
| [YE] [STEP] [AMP] | | ␣46.0 |
| [2] | | 2␣␣ ␣ |
| [dB] | | ␣46.0 |
| [△] | Press once | ␣48.0 |

To change the output level continuously by the step of 2dB, keep pressing the [AMPLITUDE] [△] or [▽] key. When the key remains pressed, a repeat function is applied.

### 4.5.4 Setting offset value

The offset function is used for compensating the gain in amplifier and loss in dummy antenna and cable.

To set an offset value for the output level, press the AMP key, numeric keys ( 0~9 , . , (-) ) and YE OFFSET.
When YE OFFSET is pressed, the offset output level is displayed.

(a) Example: To give —6dB offset to 100 EMF dBμ

| Key operation | AMPLITUDE display | |
|---|---|---|
| AMP | 100.0 | |
| (-) | —␣␣␣ | |
| 6 | —6␣␣ | |
| YE OFFSET | 100.0 | |
| YE OFFSET | ␣94.0 | OFST indicator is turned on |
| To release offset | | |
| YE OFFSET | 100.0 | OFST indicator is turned off |

### 4.5.5 Output level difference Δ dB key

The Δ dB function, to check the value of change in output level, is useful for measuring the band width of a receiver and attenuation characteristic of a filter.

Note that the Δ dB indicator in the [AMPLITUDE] section is turned on when the Δ dB key is pressed.

To release the Δ dB function, press Δ dB again.

(a) Example: The current output level is 54 EMF dBμ.

| Key operation | | AMPLITUDE display | |
|---|---|---|---|
| | | ␣54.0 | |
| Δ dB | | ␣␣0.0 | dB indicator is turned on |
|  | Turn the rotary knob counterclockwise by 16 steps | −16.0 | |
| Δ dB | | ␣38.0 | |

4.5.6 Switching output impedance

The standard output impedance of the KSG4300 is 50Ω, but it may be switched to 75Ω.

The 75Ω output impedance satisfies the specifications of the instrument when the carrier frequency is within the range from 10kHz to 130MHz.

To switch the output impedance to 75Ω, press the 75Ω key. The 75Ω indicator is turned on when the key is pressed.

To switch the output impedance from 75Ω to 50Ω, press the 75Ω key again; the 75Ω indicator is turned off and the output impedance is set to 50Ω.

4.5.7 RF OFF key

When the RF OFF key is pressed, the RF output signal is turned off and "OFF" is displayed in the [AMPLITUDE] section.

4.5.8 Setting unit key

(a) EMF dBμ: Open circuit voltage —20dBμ to 132dBμ

Press the EMF dBμ key, and the EMF dBμ indicator in the [AMPLITUDE] section is turned on.

(b) dBμ: Loaded voltage —26dBμ to 126dBμ

Press the [YE dBμ] key, and the dBμ indicator in the [AMPLITUDE] section is turned on.

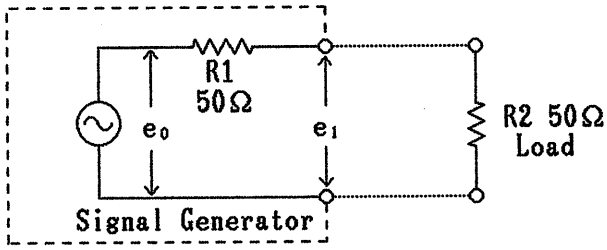
(c) 50Ω dBm: Power indication —133dBm to 19dBm

Press the [YE dBm] key, and the dBm indicator in the [AMPLITUDE] section is turned on.

(d) 75Ω dBm: Power indication —135dBm to 17dBm

4.5.9 Unit of output level

The units of output level used for the KSG4300 are as follows:




(a) EMF dBμ (open circuit voltage)

The voltage $e_0$ in the above chart is normalized by "0dBμ = 1μV rms".

(b) dBμ (loaded voltage)

The voltage $e_1$ in the above chart is normalized by "0dBμ = 1μV rms".

(c) dBm (power indication)
The power consumed by R2 in the above chart is normalized by

"0dBm = $\sqrt{1\ \text{mW} \times 50\Omega}$ = 0.2236V rms".

(d) When R2 is 75Ω, the power consumed by R2 is normalized by

"0dBm = $\sqrt{1\ \text{mW} \times 75\Omega}$ = 0.27386V rms".

## 4.6 Setting the Modulation

### 4.6.1 YE key

(a) Press YE 30%, and the AM depth is set to 30%.

(b) Press YE 3.5kHz, and the FM peak frequency deviation is set to 3.5kHz.

(c) Press YE 22.5kHz, and the FM peak frequency deviation is set to 22.5kHz.

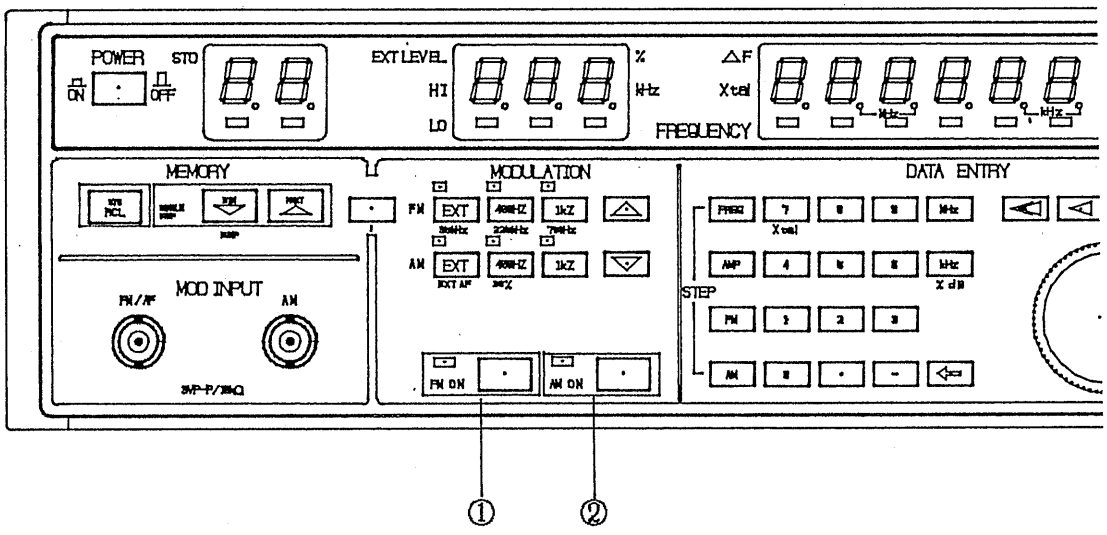
(d) Press YE 75kHz, and the FM peak frequency deviation is set to 75kHz.

(e) Press YE EXT AF, and the FM input terminal can be used as AM input terminal.

### 4.6.2 Setting modulation source

Press a modulation source switching key, and the corresponding indicator is turned on.

Keys ① and ② turn on/off FM and AM respectively. Each time the key is pressed, the relevant modulation is turned on and off alternately.



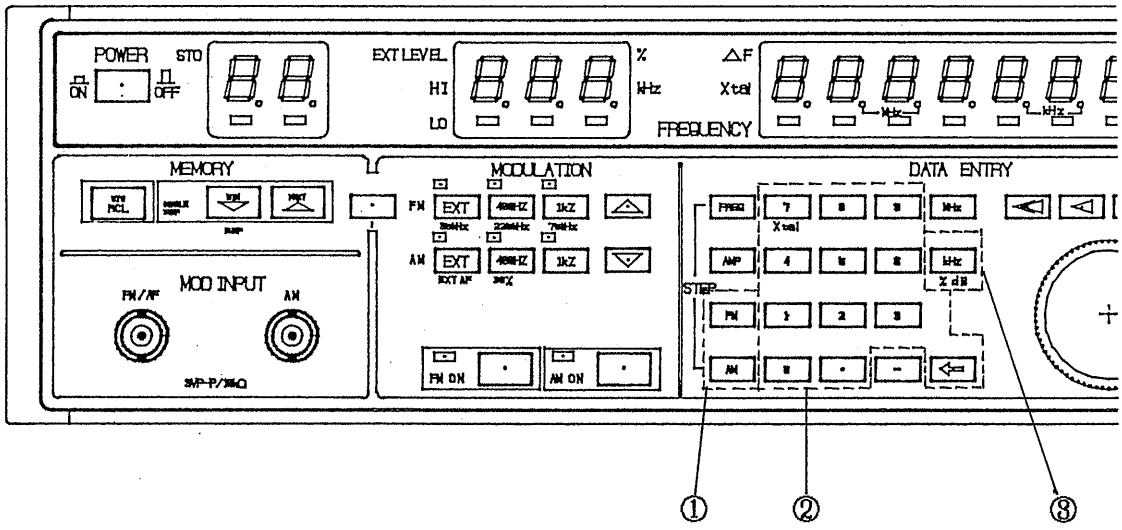
(a) Example: 75kHz deviation is to be set for 400Hz internal FM source

| Key operation | MODULATION display | |
|---|---|---|
| FM 400 Hz | | 400Hz indicator is on |
| | ××.× ... | Previously set value |
| | | kHz indicator is on |
| FM | | |
| 7 | 7␣␣ | |
| 5 | 75␣ | |
| kHz | 75.0 | |

(b) Example: The modulation is to be turned off

The modulation is terminated when key ① or ② is pressed and the FM ON indicator is turned off. At this time, 0.0kHz is displayed in the [MODULATION] section.

4.6.3 Setting modulation by numeric keys




Press keys in the order of ①, ②, and ③ in the above chart.

First, press the FM or AM key in [DATA ENTRY] section, and the previously set modulation factor is displayed with unit in the [MODULATION] section.

Enter a desired value with numeric keys ( 0~9 , . ).
After entering the value, press kHz for FM and % ( kHz ) for AM. Then, the value is displayed in the [MODULATION] section with the specified unit.

Any value may be input by the numeric keys, but the following relation-ship between carrier frequency and minimum/maximum FM deviation must be observed:

| Carrier frequency | Maximum deviation | Minimum deviation |
|---|---|---|
| 10kHz ~ 2.99999MHz | 0~30kHz | 0.1kHz |
| 3.0MHz ~ 32.4999MHz | 0~99.9kHz | 0.1kHz |
| | 100~300kHz | 1kHz |
| 32.5MHz ~ 64.9999MHz | 0~49.9kHz | 0.1kHz |
| | 50~150kHz | 1kHz |
| 65.0MHz ~ 280MHz | 0~99.9kHz | 0.1kHz |
| | 100~300kHz | 1kHz |

The maximum AM depth is 99.9% and minimum depth is 0.1%.

(a) Example: To set FM 25kHz

| Key operation | MODULATION display |
|---|---|
| FM | ××.× ...Previously set value |
| | kHz is displayed as unit |
| 2 | 2␣␣ |
| 5 | 25␣ |
| kHz | 25.0 |

(b) Example: To set AM 30% after the above operation

| Key operation | MODULATION display |
|---|---|
| AM | ××.× ...Previously set value |
| | % is displayed as unit |
| 3 | 3␣␣ |
| 0 | 30␣ |
| % | 30.0 |

### 4.6.4 Flashing in [MODULATION] section

If the FM deviation specified by the user is not within the range determined by carrier frequency, an error is reported in one of the three ways described below and the modulation cannot be executed. When this happens, set the deviation again within the allowable range.

(1) The frequency deviation value cannot be entered when it is changed to a value beyond the allowable range.

(2) The value displayed in the [MODULATION] section flashes when it is not within the allowable range because the carrier frequency has been changed.

(3) The kHz unit indicator flashes when the AM indicator in the MODULATION section is on for (2).

For example, when the carrier frequency is 4.5MHz and FM deviation is 50kHz, the value "50" is displayed in the [MODULATION] section. If the carrier frequency is reduced to 2.99999MHz or lower, the value "50" flashes in the [MODULATION] section and the output signal is not modulated.

### 4.6.5 Rotary knob

The rotary knob can modify the FM deviation and AM depth by increasing or decreasing the value of the digit at the cursor position in [MODULATION] section. When the cursor is not found in the [MODULATION] section, bring it into the section by the ◁ or ▷ key; when it is found in the section, move it by the ◁◁ or ▷▷ key.

After changing the modulation factor by the rotary knob, the unit key ( kHz or % ) need not be pressed.

(a) Example: To change FM deviation from 25kHz to 35kHz
(when carrier frequency is 3MHz or higher)

The mark "_" denotes cursor position

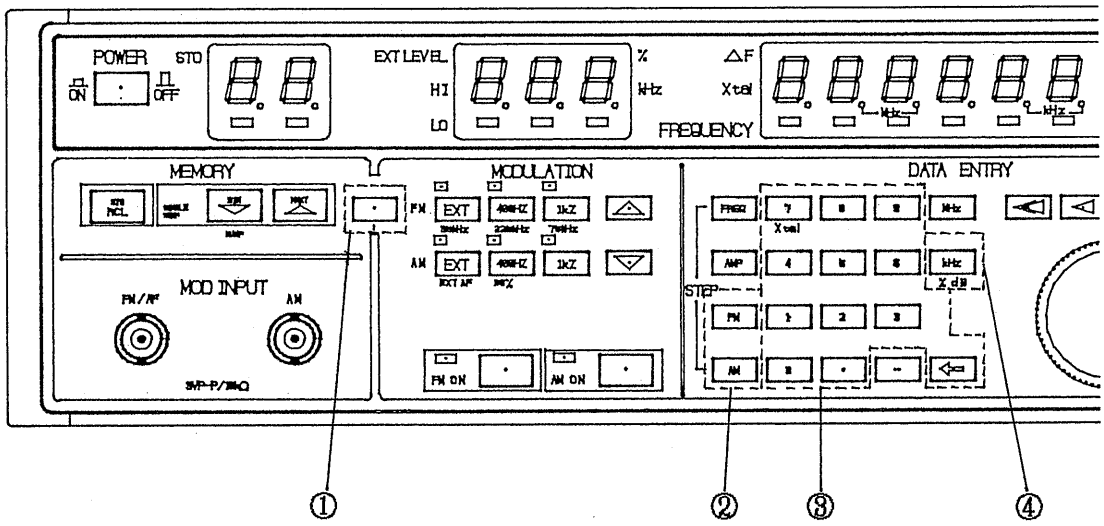
| Key operation | | MODULATION display |
|---|---|---|
| FM | | 25.0 |
| ◁ | | 25.0 |
|  | Turn the rotary knob clockwise by one step | 35.0 |

(b) Example: To change AM depth from 30% to 25%

| Key operation | | MODULATION display |
|---|---|---|
| AM | | 30.0 |
| ▷ | | 30.0 |
|  | Turn the rotary knob counter-clockwise by five step | 25.0 |

### 4.6.6 Setting modulation step for △ and ▽ keys

Set a desired step value (minimum 0.1kHz or 0.1%) for the [MODULATION] △ and ▽ keys, and the modulation can be incremented or decremented by the unit of that value.




Press keys in the order of ①, ②, ③ and ④ in the above chart.

(a) Example: To set 2.5kHz as FM step

| Key operation | MODULATION display |
|---|---|
| [MODULATION] [STEP] [FM] | 75.0 kHz |
| [2] | 2␣␣ |
| [.] | 2.␣␣ |
| [5] | 2.5␣ |
| [kHz] | 75.0 |
| [△] Press onece | 77.5 |

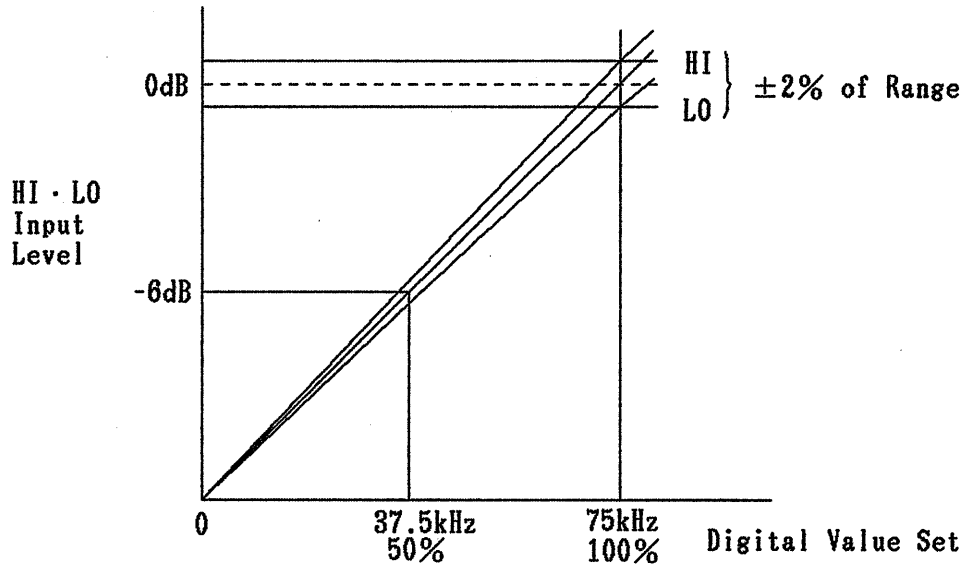
To increment or decrement the FM deviation continuously by the unit of the specified value, keep pressing the [MODULATION] △ or ▽ key. When the key remains pressed, a repeat function is applied. The AM depth can be incremented/decremented in the same way as FM deviation.

### 4.6.7 External modulation signal connection and setting

#### (1) Connection and setting method

Connect the external modulation signal input terminal to MOD INPUT ( FM/AF , AM ) on the front panel.
The input impedance is approximately 10kΩ, and appropriate input level is about 3Vp-p.
The appropriate input level range is obtained when both HI and LO of EXT LEVEL are turned off. Adjust the level of external modulation signal source to the range that turns off both HI and LO. When the level of external modulation signal source is too low, LO is turned on; when it is too high, HI is turned on. The external modulation signal source level need not be adjusted each time the modulation is modified.

#### (2) Setting range




The above chart shows the relationship between modulation and input level.
When the input level is adjusted to the range of HI and LO, it is set within the error range of ±2%. The modulation is converted into a digital value internally on the basis of this input level.

Whether the input signal is a composite wave signal or single wave signal, the instrument checks if the peak of the signal is within the range of HI and LO and the modulation is proportioned to the input level as shown in the above chart. For example, after setting the input level within the range of HI and LO and the FM peak frequency deviation to 75kHz, attenuate the input level by —6dB. Then, 75kHz remains displayed but the actual peak frequency deviation is reduced to 37.5kHz. At this time, the LO lamp is turned on, but modulation is done correctly at the peak frequency deviationof 37.5kHz.

When the input level is set within the range of HI and LO, the HI and LO lamps are turned off, but when the MAIN, LEFT, RIGHT, and SUB switches of the stereo signal generator are manipulated, the HI and LO lamps may be turned on alternately. Since the range of HI and LO is very narrow, the HI and LO lamps maybe turned on alternately but that does not mean a serious error.

## 4.7 Memory

### 4.7.1 Memory recall method

Memory addresses are allocated in a matrix of 10 raws and 10 columns (100 points in total).

The following is the memory address allocation diagram:

MEMORY address 2-beams 7-segment display

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 10 | | | | | | | | | . |
| 20 | | | | | | | | | . |
| 30 | | | | | | | | | . |
| 40 | | | | | | | | | . |
| 50 | | | | | | | | | . |
| 60 | | | | | | | | | . |
| 70 | | | | | | | | | . |
| 80 | | | | | | | | | . |
| 90 | . | . | . | . | . | . | . | . | . 99 |

Basically, the recall operation means to call the row number by the RCL key and numeric key ( 0~9 ) and to call the column number by the [MEMORY] △ key.
Also, a memory row and column can be called directly by the entry of a 2-digit number by numeric keys ( 0~9 ) after clearing the MEMORY display by the RCL and * keys.
In the following examples, it is assumed that the carrier frequency, output level, modulation mode, etc. are set as explained in Sections 4.4 to 4.6 and that they are stored in memory by the operation explained in Section 4.7.2:

(a) Example: To recall memory address "10"

| | MEMORY display |
|---|---|
| RCL key, 1 key | "10" |

(b) Example: To recall memory address "43"

| | |
|---|---|
| RCL key, 4 key | |
| Press MEMORY △ key three times | "43" |

(c) Example: To recall memory address "85"

RCL key, 8 key
Press MEMORY △ key five times "85"

When two or more addresses are to be recalled continuously, the RCL key need not be pressed for the second and subsequent addresses.

(d) Example: To recall memory address "56" directly

Press the RCL and · keys, and the [MEMORY] display is cleared. Press the numeric keys 5 and 6 , and "56" is displayed.
When the address "78" is to be called subsequently, omit pressing the RCL key and simply press the · key. When the [MEMORY] display is cleared by the · key, press the numeric keys 7 and 8. Then,"78" is displayed.

4.7.2 Memory store method

Most of the functions specified on front panel can be stored in the memory addresses allocated in the form of a matrix as described in Section 4.7.1, but the step values of carrier frequency, output level, and modulation factor, ΔFREQ function, and RF OFF function cannot be stored.
The basic store operation is to set data such as carrier frequency, output level, and modulation type and press YE , STO , numeric key, and [MEMORY] △ in this order. Also, the data can be stored directly into a row and column by entering a 2-digit number by numeric keys after clearing the [MEMORY] display by YE and ·.

(a) Example: To store 1MHz carrier frequency, 76 EMF dBμ output level, 1kHz internal modulation source, and 30% AM depth into memory address "10"

| | |
|---|---|
| ① FREQ | ×××. ×××. × |
| 1 | 1␣␣ ␣␣␣ ␣ |
| MHz | ␣␣1. 000. 0 |

Basides the above method, the carrier frequency may be set by the rotary knob or [FREQUENCY] △ or ▽ key.

② AMP ×××　×
　7 7␣␣　␣
　6 7 6␣　␣
　dB ␣7 6 . 0

Besides the above method, the output level may be set by the rotary knob or [AMPLITUDE] △ or ▽ key.

③ AM 1kHz ××. ×
　YE 30% 3 0 . 0 %

Besides the above method, the modulation level and mode may be set by numeric keys ( 0~9 ) and modulation mode key.
After setting the above data, press YE, STO, and 1.
Then, the data is stored into memory address "10".

(b) Example: To store different data into memory address "12"

| | MEMORY display |
|---|---|
| ① RCL 1 △ (Press △ twice) | "12" is displayed |
| ② Set carrier frequency, output level, modulation mode, etc. | |
| ③ Press YE STO △ | "13" is displayed |

The data set by step 2 is stored into memory address "13".

(c) Example: To store data into memory address "45"

① Set carrier frequency, output level, modulation mode, etc.
② Clear MEMORY display by YE, STO, and ·.
③ Press numeric keys 4 and 5 , and the data set by step ① is stored.

*Note 1: When data is to be stored continuously, the YE, STO, and · key must not be omitted.*

*Note 2: The RTN key explained in Section 4.7.3 cannot be used in the direct store method.*

### 4.7.3 Storing data into a part of memory row (Setting RTN key)

(a) Example: To shift memory addresses as "10" → "11" → "12"
"13" → "10" → "11"

| Key operation | MEMORY display |
|---|---|
| RCL 1 △ Press three times | "13" |
| YE STO RTN | "14" RTN command is stored |

[How to use the function]

| | |
|---|---|
| RCL 1 | "10" (First memory address) |
| △ | "11" (Second memory address) |
| △ | "12" (Third memory address) |
| △ | "13" (Fourth memory address) |
| △ | "10" (Returns to first memory address) |

### 4.7.4 How to release RTN key

The following two methods are available:

(1) Display "19" by RCL "19"
RCL - 1 9
Press YE STO ▽ "19"
By the above operation, all the ten columns become available as they were before the RTN key was pressed.

(2) Display "13" by RCL , "13"
RCL 1, and △ keys
Press YE STO △ "14" RTN command is stored at "14"

..
..

YE STO △ (Press five times) "19"

Each time the △ key is pressed, the RTN command is sent to the next column, and finally, all the ten columns become available as they were before the RTN key was pressed.

### 4.7.5 Recalling more than ten columns continuously (Setting NEXT key)

Normally, up to ten memory columns (00 - 09, 10 - 19, ... , 90 - 99) can be recalled at a time, but more than ten columns can be recalled continuously by the following operation:

Display column number "9" in [MEMORY] section and press YE, STO, and NEXT keys; then, another ten columns can be recalled without specifying the next row number.

(a) Example: To recall memory addresses 30 - 49 continuously

| Key operation | MEMORY display | |
|---|---|---|
| × | "39" | Previous value |
| YE | "39" | |
| STO | "39" | STO LED comes on |
| NEXT | "40" | STO LED comes off |

The memory addresses are recalled as follows:

→ "30" → "31" → . . . → "39" → "40" → "41" → . . . → "49"

### 4.7.6 How to release NEXT key

Display the memory address ("09", "19", ... , or "89") at which the function is to be released, and press the YE, STO, and RTN keys in this order.

(a) Example: To reset the continous recall of memory addresses 30 - 49 (to recall 30 - 39 and 40 - 49 separately)

| Key operation | MEMORY display | |
|---|---|---|
| × | "39" | Previous value |
| YE | "39" | |
| STO | "39" | STO LED comes on |
| RTN (▽) | "39" | STO LED comes off |

### 4.7.7 Copying memory data to another KSG4300

1) The 100-point memory data can be copied to another unit of KSG4300.

2) Memory data copying method

① Turn on the power for the local and remote signal generators.

② Connect the remote control terminals on rear panel of the local signal generator to those of remote signal generator, using DUMP cable.

③ Press [YE], [DUMP] (▽), and the copying is started.

*Note: The DUMP cable uses an amphenol-type 14-pin connector. Among the 14 pins, numbers 8 - 10 are unconnected, but all other are connected.*

*Optional DUMP cable Model SA510*

# 5. REMOTE CONTROL

## 5.1 General Discription

### 5.1.1 Outline

The KSG4300 has a 14-pin connector for remote control.

## 5.2 Operation Procedure

### 5.2.1 Explanation of Remote Control Connector

Figure 5-1 shows the connector pin allocation on the rear panel.

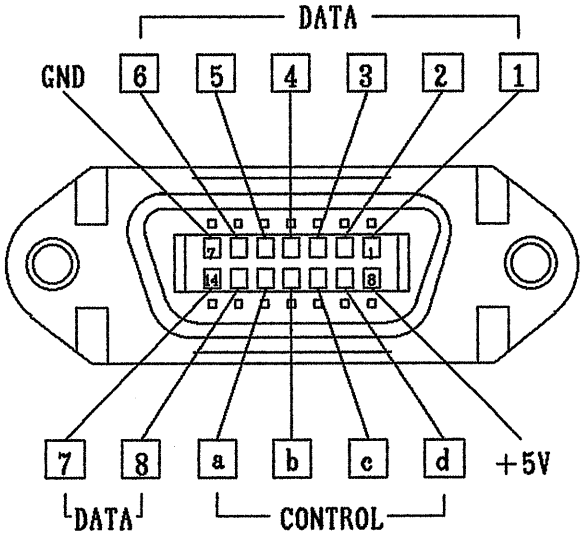



Figure 5-1

[Explanation of terminals]

In the following explanation, "1" and "0" correspond to the high and low levels of TTL respectively.

1) DATA terminals [illegible] - [illegible] (Pins 1 - 6, 13, and 14)

The DATA terminals are used for connecting a bus to the rear panel of the KSG4300. Since the bus is bidirectional, it can be used for both input and output.

*Note: Since the DATA terminals are bidirectional bus, the signal generator does not function if data "0" or "1" is applied to the lines of DATA [illegible] - [illegible] directly.*

2) CONTROL terminals [a] and [b] (Pins 11 and 12)

[a] DATA STROBE output terminals (Pin 12)
Normally, "1" is output from this terminal. When data is read, "0" is output from it.

[b] REQUEST TO READ input terminals (Pin 11)
Normally, "1" is input to this terminals. When data read is requested, "0" is input to it.

3) CONTROL terminals [c] and [d] (Pins 9 and 10)

[c] and [d] Display control output terminals
When "1" is output from either of these terminals ([c] or [d]), data is being processed.

That is, the logical sum of the signals output from [c] and [d] is the BUSY signal to external instrument.

4) +5V (Pin 8)

Power source for remote control (max. 100mA; equivalent to the power for turning on 2-digit LEDs)

5) GND (Pin 7)

5.2.2 Input data timing

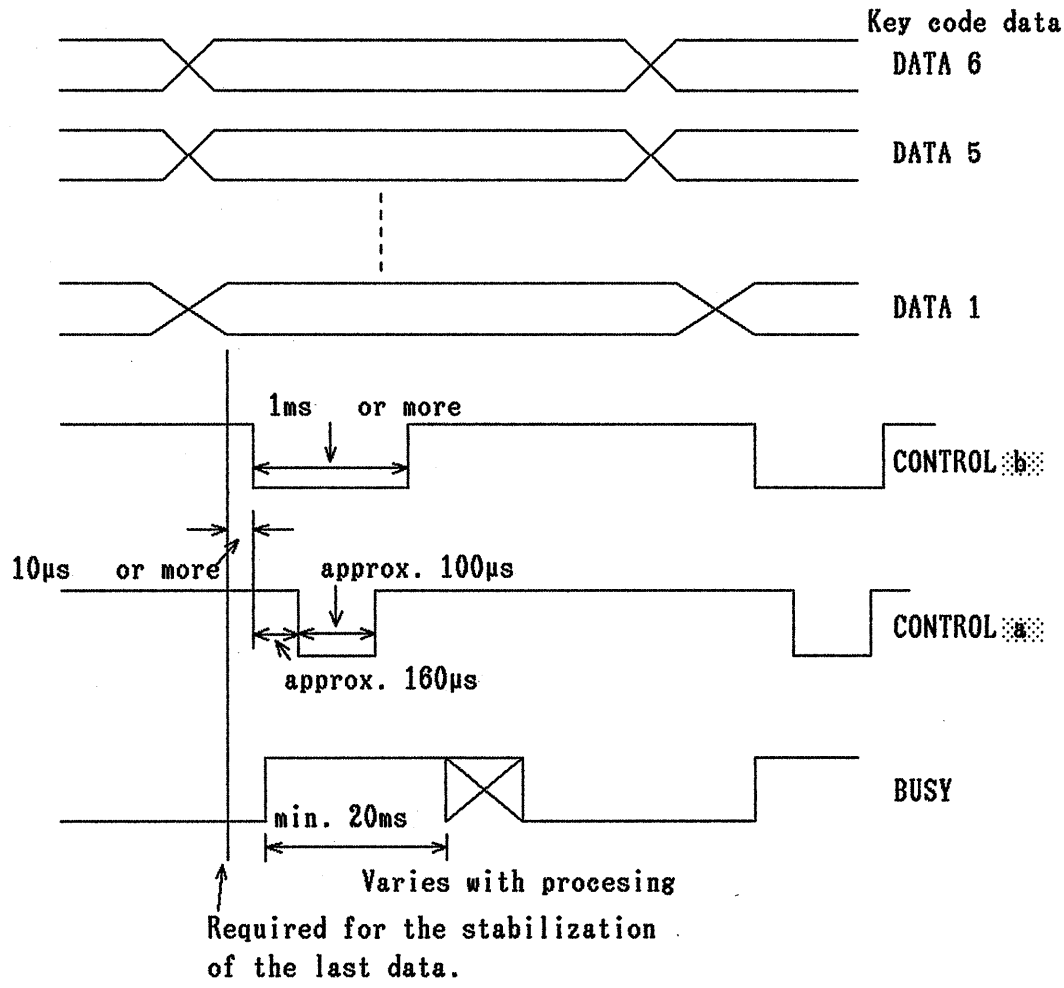



Figure 5-2

When the BUSY signal is "0", set the key code data (DATA1-6), and after the last data of DATA1-6 is established, wait for 10μs or longer.
Then, set CONTROL b to "0" for 1ms or longer as shown in Figure 5-2.
Approximately 160μs after CONTROL b falls, CONTROL a is set to "0" for approximately 100μs.
During this period of approximately 100μs , the key code data that have been set are read processed.

After CONTROL b falls and before CONTROL a falls (that is, during the period of approximately 160μs ), the BUSY signal rises to "1" to indicate that the key code data are being processed.
Enter the next key code data after the BUSY signal is set to "0".

### 5.2.3 Panel key code table

All the panel keys are expressed in codes. So, setting one of the key codes listed below (table 5-1) and sending it with CONTROL [b] is equivalent to pressing the panel key corresponding to the code.

Table 5-1

| Key name | Key code input pin number 6 (MSB) | 5 | 4 | 3 | 2 | 1 (LSB) |
|---|---|---|---|---|---|---|
| LOCAL | 1 | 0 | 1 | 1 | 1 | 1 |
| MEMORY RCL / STO | 0 | 0 | 0 | 1 | 0 | 0 |
| MEMORY ▽ / RTN | 0 | 0 | 0 | 1 | 1 | 1 |
| MEMORY △ / NEXT | 0 | 0 | 0 | 1 | 1 | 0 |
| YE (Yellow Key) | 0 | 1 | 1 | 0 | 1 | 1 |
| FM EXT | 0 | 0 | 1 | 0 | 0 | 1 |
| FM 400Hz | 0 | 0 | 1 | 0 | 1 | 1 |
| FM 1kHz | 0 | 0 | 1 | 1 | 0 | 0 |
| AM EXT | 0 | 1 | 1 | 1 | 0 | 0 |
| AM 400Hz | 0 | 1 | 1 | 1 | 0 | 1 |
| AM 1kHz | 0 | 1 | 1 | 1 | 1 | 0 |
| MODULATION △ | 1 | 0 | 1 | 0 | 1 | 0 |
| MODULATION ▽ | 0 | 1 | 1 | 1 | 1 | 1 |
| FM ON | 0 | 0 | 1 | 1 | 1 | 0 |
| AM ON | 0 | 0 | 1 | 1 | 1 | 1 |
| DATA ENTRY FREQ / STEP FREQ | 0 | 1 | 0 | 0 | 1 | 0 |
| DATA AMP / STEP AMP | 0 | 1 | 0 | 0 | 1 | 1 |
| DATA FM / STEP FM | 0 | 1 | 0 | 1 | 0 | 0 |
| DATA AM / STEP AM | 0 | 1 | 0 | 1 | 0 | 1 |
| DATA 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| DATA 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| DATA 2 | 1 | 1 | 0 | 0 | 1 | 0 |
| DATA 3 | 1 | 1 | 0 | 0 | 1 | 1 |
| DATA 4 | 1 | 1 | 0 | 1 | 0 | 0 |
| DATA 5 | 1 | 1 | 0 | 1 | 0 | 1 |
| DATA 6 | 1 | 1 | 0 | 1 | 1 | 0 |

(cont'd)

Table 5-1

| Key name | MSB | | ← Key Code → | | | LSB |
|---|---|---|---|---|---|---|
| DATA 7 | 1 | 1 | 0 | 1 | 1 | 1 |
| DATA 8 | 1 | 1 | 1 | 0 | 0 | 0 |
| DATA 9 | 1 | 1 | 1 | 0 | 0 | 1 |
| DATA . | 1 | 0 | 1 | 1 | 1 | 0 |
| DATA - | 1 | 0 | 1 | 1 | 0 | 1 |
| DATA ⇦ | 0 | 0 | 1 | 0 | 0 | 0 |
| DATA MHz | 0 | 1 | 0 | 1 | 1 | 0 |
| DATA kHz , % , dB | 1 | 0 | 0 | 1 | 0 | 1 |
| DATA ≪ | 0 | 1 | 0 | 1 | 1 | 1 |
| DATA ≪ | 1 | 1 | 1 | 1 | 0 | 0 |
| DATA ≫ | 1 | 1 | 1 | 1 | 1 | 0 |
| DATA ▷≫ | 0 | 1 | 1 | 0 | 0 | 0 |
| DATA Rotary knob UP | 0 | 0 | 0 | 0 | 0 | 0 |
| DATA Rotary knob DOWN | 0 | 0 | 0 | 0 | 0 | 1 |
| FREQUENCY Δ FREQ | 1 | 1 | 1 | 1 | 0 | 1 |
| FREQUENCY ＋/－ | 1 | 0 | 1 | 0 | 0 | 1 |
| FREQUENCY △ | 0 | 1 | 1 | 0 | 0 | 1 |
| FREQUENCY ▽ | 0 | 1 | 1 | 0 | 1 | 0 |
| AMPLITUDE CURSOR ▷ | 1 | 0 | 0 | 0 | 0 | 1 |
| AMPLITUDE Δ dB | 1 | 0 | 0 | 0 | 1 | 0 |
| AMPLITUDE EMF dBμ | 1 | 0 | 0 | 0 | 1 | 1 |
| AMPLITUDE RF.OFF | 1 | 0 | 0 | 1 | 0 | 0 |
| AMPLITUDE △ | 1 | 0 | 0 | 1 | 1 | 0 |
| AMPLITUDE ▽ | 1 | 0 | 0 | 1 | 1 | 1 |
| AMPLITUDE Rotary knob UP | 0 | 0 | 0 | 1 | 0 | 0 |
| AMPLITUDE Rotary knob DOWN | 0 | 0 | 0 | 0 | 1 | 1 |

### 5.2.4 Setting frequency by remote control (example)

The frequency of 82.5MHz is to be set.

1) Set the FREQ code "010010" according to the panel key code table (Table 5-1).
2) Send CONTROL [illegible] which is set to "0" for 1 ms or longer as shown in Figure 5-2 (input data timing).
3) Set the data "82.5" according to the code table and send CONTROL [illegible] signal as shown in Figure 5-3.

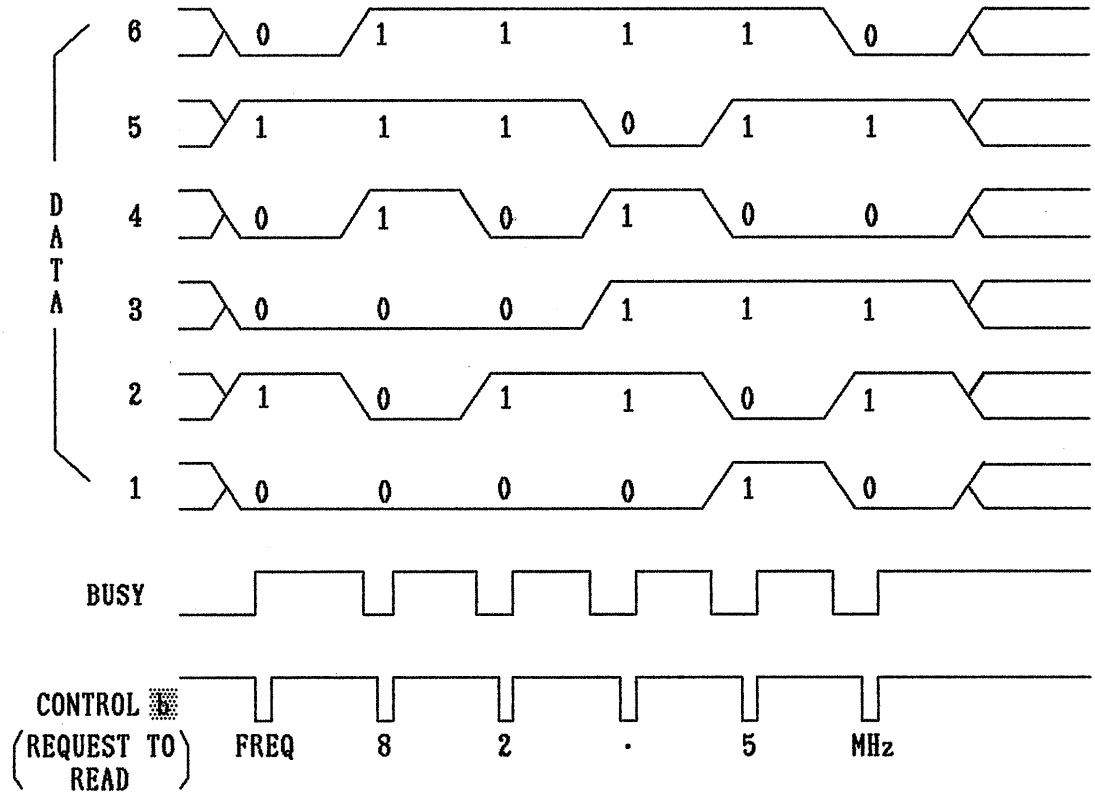



Figure 5-3

4) Finally, send "010110" for "MHz" with CONTROL [illegible] signal, and the data transmission is completed.
5) When the signal generator receives the last data, namely, "010110" for "MHz" and CONTROL [illegible], it starts processing the specified frequency.

5.2.5 Remote Control circuit diagram example and operation.

Since the data lines of the remote control connector are bidirectional bus lines, it is recommended to use the circuit shown in Figure 5-4 when controlling the signal generator from a remote unit.

Figure 5-4 shows the remote control circuit that increments the memory address by one each time the switch is pressed.

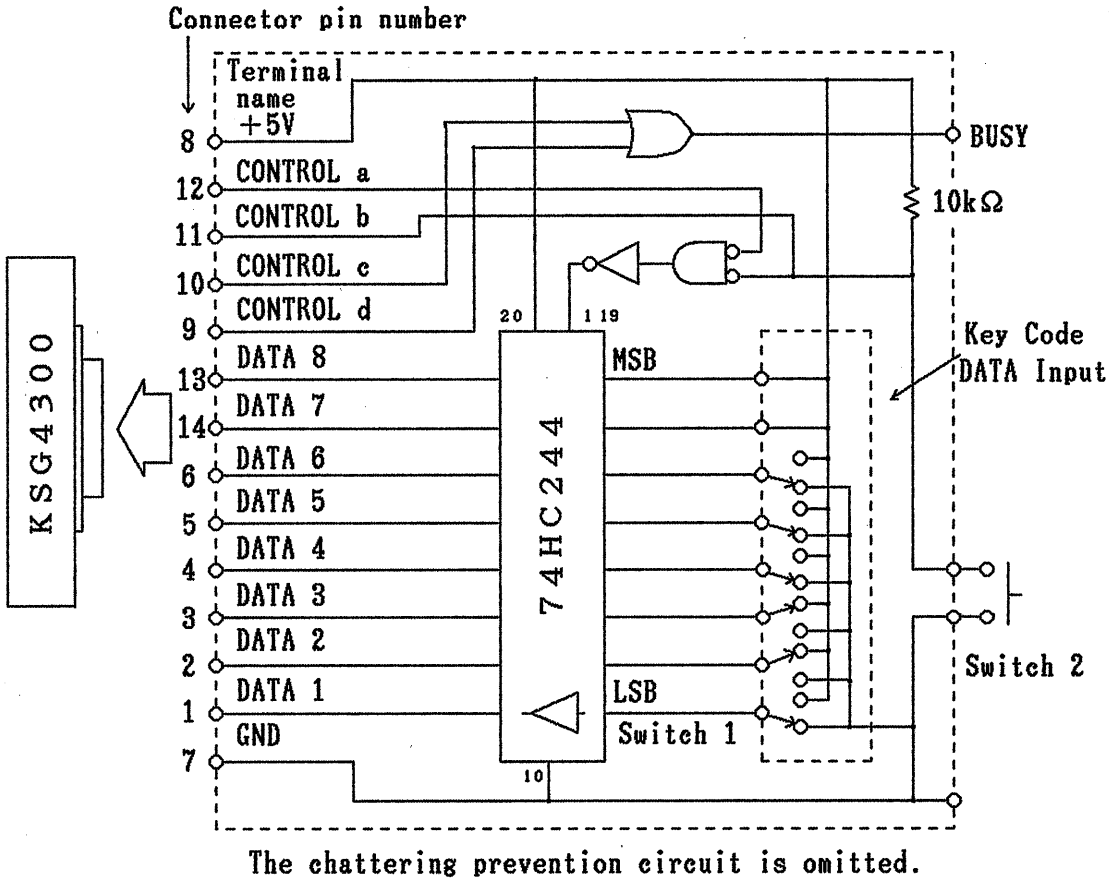



Figure 5-4

Set the data of MEMORY RCL △ on Key Code Data Input Switch 1 according to the key code table (Table 5-1) and set CONTROL [illegible] to "0" (Press Switch 2). Then, approximately 160μs later, CONTROL [illegible] is set to "0" and Enable A and B (pins 1 and 19) of 74HC244 are set to "0". The data is sent to the KSG4300 during the period of approximately 100μs when CONTROL [illegible] is "0"

If other key code data of the key code table is set on Switch 1, the function of the corresponding key on the front panel can be controlled in remote mode.

When using a computer for the external remote control on the basis of function shown in Figure 5-4, be sure to confirm that the BUSY signal is set to "0" before setting CONTROL [illegible] to "0" for more than 1ms.

*Note: Since the control terminals (DATA terminals) are assigned to eight bits, the fixed data "1" is sent for the 7th and 8th bits (pins 14 and 13) through 74HC244.*

### 5.2.6 Memory Display output circuit example

Figure 5-5 shows an example circuit.

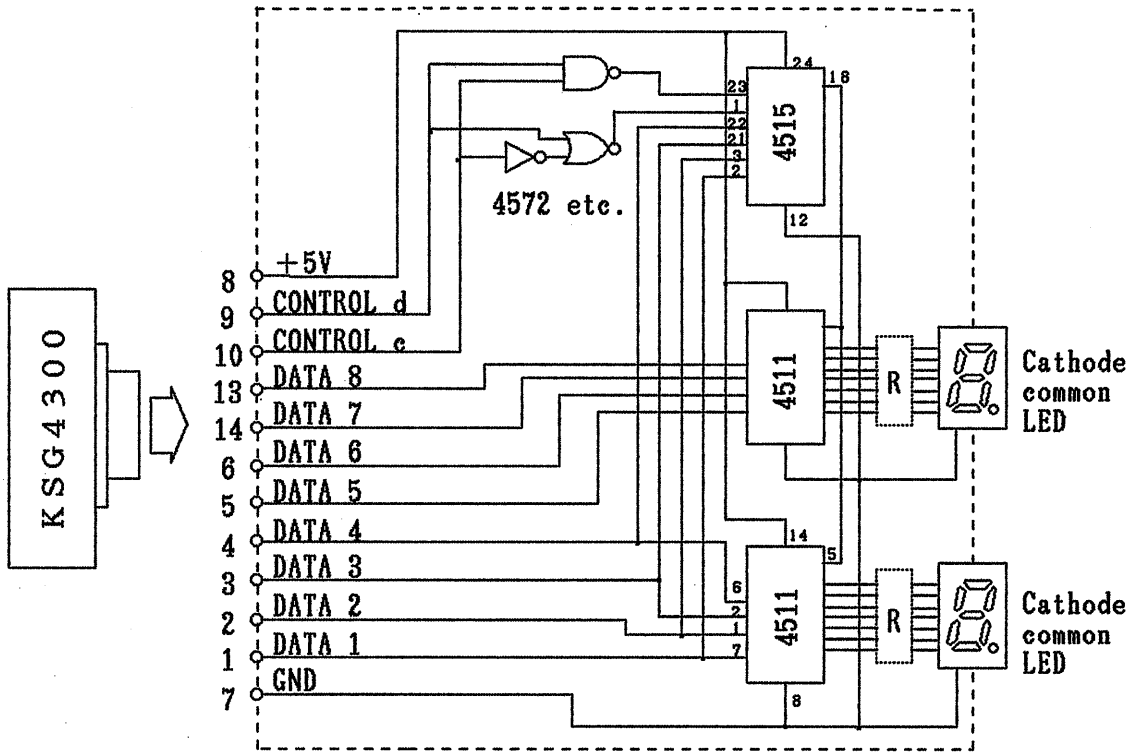



Figure 5-5

Since the remote control terminal has a bidirectional bus structure, it can output the same data displayed in the [MEMORY] section of the signal generator through the circuit shown in Figure 5-5. In addition to being displayed on a remote device, the data in the [MEMORY] section can be used for a process if the CMOS 4511 is replaced by a latch circuit.

If the circuit in Figure 5-4 is connected to that in Figure 5-5 by the connector section in parallel, the user can not only control the signal generator from a remote unit but also display the data in [MEMORY] section on a remote unit or check the data on the signal generator by a remote unit.

# 6. OUTPUT IMPEDANCE AND DUMMY ANTENNA SWITCHING SIGNAL

6.1 "RANGE OUTPUT" RCA Pin Connector

When the carrier frequency is within the range from 35.0000MHz to 280MHz, the output signal is set to "1" (5V, 50mA); when it is within the range from 10kHz to 34.9999MHz, the output signal is set to "0".

The output signal can be used as the control signal of an output impedance switch, dummy antenna for car radio, etc.

The current of 50mA is used for driving two reed relays.

# 7. BACKUP BATTERY AND INTIALIZING CPU

The KSG4300 uses a memory backup battery, and the battery may discharge all its electricity when the signal generator is not used for a long time.

Turn on the power for the signal generator having a charging circuit, and fully charge the battery.

The memory backup battery is greatly affected by the surrounding temperature, humidity, and storage conditions. After about five years, the discharge capability of the battery is reduced to approximately 90% of the initial capability.
The battery is fully usable in this state, but when it becomes unusable, replace it with CADNIC BACKUP N-SB3 of Sanyo Electric Co. or GB 50H-3X of Japan Storage Battery Co., Ltd.
[Battery position and replacement method]
Remove the top panel of the instrument, and five aluminum sash cases are found. Among these cases, the one attached to the left side of the instrument contains the CPU printed circuit board, and the battery is mounted on this board.
Remove two screws from the left side, take out the aluminum sash case, pull out the PC board, and replace the battery with a new one.

After replacing the battery, insert the PC board into the aluminum sash caseand fasten the two screws. Then, turn on the power switch and initialize the CPU by pressing the initial set button.

# 8. GP—IB

(General Purpose Interface Bus)

## 8.1 Introduction

### 8.1.1 General description

The KSG4300 has a GP-IB interface, and it can be controlled by the IEEE 488 standard interface bus.

### 8.1.2 Features

(1) The functions of the signal generator can be controlled by the IEEE 488 standard interface bus.
(2) The remote mode can be verified by the [REMOTE] indicator.
(3) The signal generator can be set in local mode at any time by thepressing of [LOCAL] key. In the local mode, manual operation onthe front panel is allowed. (In local lockout mode, however, the manual operation is not allowed.)
(4) The device address assigned to the signal generator can be displayed in the [AMPLITUDE] section.

## 8.2 Performance

### 8.2.1 Interface functions

SH0: No source handshake
AH1: Complete acceptor handshake
T0 : No Talker function
L1 : Basic listener, listen only mode
LE0: No extnded listener capability
SR0: No service request capability
RL1: Complete remote/local capability
Local lockout capability
PP0: No parallel poll capability
DC1: Complete device clear capability
Select device clear capability
DT0: No device trigger capability
C0 : No controller capability

### 8.2.2 Electrical specifications related to interface system

Compiles to IEEE Std 488-1975.

## 8.3 Operation procedure

### 8.3.1 Preparation for use

Turn on the power and check the device address of the signal generator on GP-IB.

1) Press [LOCAL] key after [YE] key, and device address "07" is displayed in the [AMPLITUDE] section.
2) To change the device address, turn off the power and set a new address according to the address setting method explained in Section 8.3.2.
3) Connect the GP-IB cable when the power is off.

### 8.3.2 Address setting method

The address of the KSG4300 is set at "07" when the instrument isdelivered from the factory.

The address switch is mounted on the CPU board in the signal generator. To set a new address, remove the top panel and shield board and manipulate the address switch S2 on the PC board 90-SIG-90101 found in the left aluminum sash case viewed from the front panel.

The address "07" can be changed to a desired address.

Remove the two screws on the left side and the angle for fixing RF connector, and the aluminum sash case can be taken out. Liftthe case and pull out the PC board toward the rear panel.

Aftersetting the address, put the board back to its original position.

① Table 8-1 lists the values of S2 and corresponding addresses.
② When a switch of S2 is set to ON, the corresponding bit is set to the level of "0".
③ Figure 8-1 shows how S2 is set for address "07".

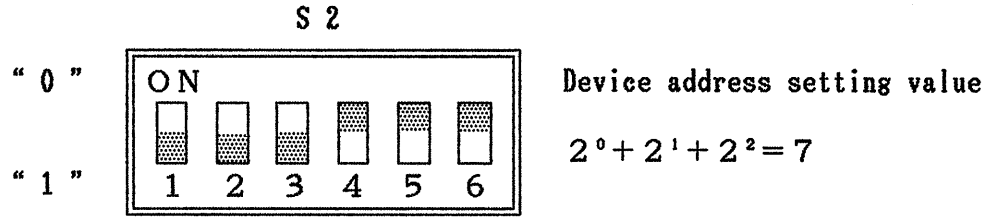



Figure 8-1

Table 8-1

| Listener address | Address switch | | | | | |
|---|---|---|---|---|---|---|
| Device number | 1 | 2 | 3 | 4 | 5 | 6 |
| 0 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 3 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 4 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 5 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 6 | 0 | 1 | 1 | 0 | 0 | 0 |
| 0 7 | 1 | 1 | 1 | 0 | 0 | 0 |
| 0 8 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 9 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 2 | 0 | 0 | 1 | 1 | 0 | 0 |
| 1 3 | 1 | 0 | 1 | 1 | 0 | 0 |
| 1 4 | 0 | 1 | 1 | 1 | 0 | 0 |
| 1 5 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 6 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 7 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 8 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 9 | 1 | 1 | 0 | 0 | 1 | 0 |
| 2 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 2 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 2 2 | 0 | 1 | 1 | 0 | 1 | 0 |
| 2 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 2 4 | 0 | 0 | 0 | 1 | 1 | 0 |
| 2 5 | 1 | 0 | 0 | 1 | 1 | 0 |
| 2 6 | 0 | 1 | 0 | 1 | 1 | 0 |
| 2 7 | 1 | 1 | 0 | 1 | 1 | 0 |
| 2 8 | 0 | 0 | 1 | 1 | 1 | 0 |
| 2 9 | 1 | 0 | 1 | 1 | 1 | 0 |
| 3 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| Listen only | * | * | * | * | * | 1 |

The DIP-SW is set to "07" at the factory.

DIP SW

1 = OFF 0 = ON

### 8.3.3 Available control command and bus line commands

Table 8-2

| control command and bus line command (for hp BASIC) | Explanation |
|---|---|
| OUTPUT<br>REMOTE | Specifies the listener address and sends program data. Turns on the [REMOTE] indicator (red) and prepares for receiving data when the listener address is specified.If the LOCAL key on the front panel is pressed in this state, the [REMOTE] indicator is turned off an the signal generator is set in local mode to enable manual operation on the front panel. |
| LOCAL<br>LOCKOUT | Disables manual operation on all the devices on GP-IB. The LOCAL LOCKOUT command is a universal command. |
| LOCAL | Turns off the [REMOTE] indicator and sets the signal generator in local mode to allow manual operation on the front panel. |
| CLEAR | Sets the signal generator in the same state as the initial power-on state. |

*Note: Since the bus line commands vary with the computer to be used, refer to the instruction manual of the specific computer to be used.*

### 8.3.4 Program code table

Set the measuring conditions for KSG4300 with the codes listed in Table 8-3.
Table 8-4 list the codes in alphabetical order, and Table 8-5 gives the function setting methods. See these tables also.
When creating a control program, arrange the program codes in the same order as the corresponding functions that would be specified on the panel.

Table 8-3 GP-IB Function Setting Method

| Item | Program code | Data | Unit |
|---|---|---|---|
| Carrier frequency | | | |
| Carrier frequency | FR | OO.O | HZ, KZ, MZ |
| Crystal oscillator OFF | XO | — | — |
| Crustal oscillator ON | X1 | — | — |
| Output | | | |
| EMF dBμ | EM | — | — |
| dBμ | DU | — | — |
| dBm | DM | — | — |
| Output level | AP | OO.O | DB |
| Output OFF | RO | — | — |
| Output ON | R1 | — | — |
| Output impedance | | | |
| Output impedance 50Ω | Z50 | — | — |
| Output impedance 75Ω | Z75 | — | — |
| Modulation | | | |
| AM depth | AM | OO.O | PC |
| AM depth | AM | OO.O | % |
| Amplitude modulation OFF | AMS5 | — | — |
| FM peak frequency deviation | FM | OO.O | KZ |
| Frequency modulation OFF | FMS5 | — | — |
| External modulation signal source | S1AM, S1FM | — | — |
| Modulation signal source 400Hz | S2AM, S2FM | — | — |
| Modulation signal source 1kHz | S3AM, S3FM | — | — |
| Modulation signal source EXT AF | S4AM | — | — |
| Memory control | | | |
| Memory recall | RC | OO | — |
| Memory store | ST | OO | — |

*Notes 1: The mark "——" means an optional item.*

*2: The mark "OO" means that the data may be specified with one digit up to the maximum number of digits.*

*3: Data must be expressed in integers or real numbers; it must not be expressed in E format.*

*4: Alphabetic characters may be expressed in small letters.*

Table 8-4 GP-IB Program Codes

Alphabetical order

| Program code | Explanation | Remarks |
|---|---|---|
| AM | Amplitude modulation | Function mode |
| AP | Output level | Function mode |
| DB | Unit | Unit |
| DU | Output dBμ | Function mode |
| DM | Output dBm | Function mode |
| EM | Output EMF dBμ | Function mode |
| FM | Frequency modulation | Function mode |
| FR | Carrier frequency | Function mode |
| HZ | Hz | Unit |
| KZ | kHz | Unit |
| MZ | MHz | Unit |
| PC | Modulation in percent | Unit |
| RC | Memory recall | Function mode |
| R0 | Output OFF | Function mode |
| R1 | Output ON | Function mode |
| S1 | External modulation ON | Modulation signal source switching |
| S2 | Internal modulation 400Hz | Modulation signal source switching |
| S3 | Internal modulation 1kHz | Modulation signal source switching |
| S4 | EXT AF (AM) | Modulation signal source switching |
| S5 | Modulation OFF | Modulation signal source switching |
| ST | Memory store | Function mode |
| X0 | Crystal oscillator OFF | Function mode |
| X1 | Crystal oscillator ON | Function mode |
| Z50 | Output impedance 50Ω | Function mode |
| Z75 | Output impedance 75Ω | Function mode |
| 0～9 | Numeric value | Data |
| − | Minus sign | Data |
| . | Decimal point | Data |
| % | Modulation in percent | Unit |

Table 8-5 GP-IB Program Code

Classified by function

| Function | Program code |
|---|---|
| Carrier frequency | FR |
| Crystal oscillator OFF | XO |
| Crystall oscillator ON | X1 |
| Output | AP |
| EMF dBμ | EM |
| dBμ | DU |
| dBm | DM |
| Output impedance 50Ω | Z50 |
| Output impedance 75Ω | Z75 |
| Output OFF | RO |
| Output ON | R1 |
| Modulation | |
| Amplitude modulation | AM |
| Frequency modulation | FM |
| EXT | S1 |
| 400Hz | S2 |
| 1kHz | S3 |
| EXT AF (AM) | S4 |
| Modulation OFF | S5 |
| Data | |
| Numeric value | 0～9 |
| Minus sign | − |
| Decimal point | . |
| Unit | |
| MHz | MZ |
| kHz | KZ |
| Hz | HZ |
| dB | DB |
| % | PC or % |
| Memory | |
| Memory recall | RC |
| Memory store | ST |

### 8.3.5 Basic data setting method

100MHz carrier frequency, EMF 120 dBμ output level, 1kHz internal modulation frequency, and 75kHz FM peak frequency deviation are to be set.

In the following examples, HP9816 is used:

Example 1: `OUTPUT 707;"FR100MZ,EMAP120DB,S3FM75KZ"`

| Output command | Frequency data | Output level data | FM deviation data |
|---|---|---|---|

Normally, CRLF or EOI is sent.

Example 2: To send the above data items one by one

```
OUTPUT 707;"FR100MZ"
OUTPUT 707;"EMAP120DB"
OUTPUT 707;"S3FM75KZ"
```

Example 3: To set the carrier frequency at 88.2MHz

a) "FR88.2MZ"

Example 4: To set the output level at 120 EMF dBμ

a) "EM,AP120DB" b) "EM" , "AP120DB"

Example 5: To set the output level at 100dBμ

a) "DU,AP100DB" b) "DU" , "AP100DB"

Example 6: To set the output level at —3.5dBm

a) "DM,AP-3.5DB" b) "DM" , "AP-3.5DB"

Example 7: To set the internal modulation frequency at 400Hz and AM depth at 30%

a) "S2AM30%" b) "S2AM30PC"

Example 8: To set external FM deviation 75kHz

a) "S1FM75KZ" b) "S1FM", "FM75KZ"

Note: S1 only is invalid.

Example 9: To turn off modulation

a) "AMS5" b) "FMS5"

Example 10: To recall memory address "36"

a) "RC36"

Example 11: To store data at memory address "36"

a) "ST36"

### 8.3.6 Connector pin allocation diagram

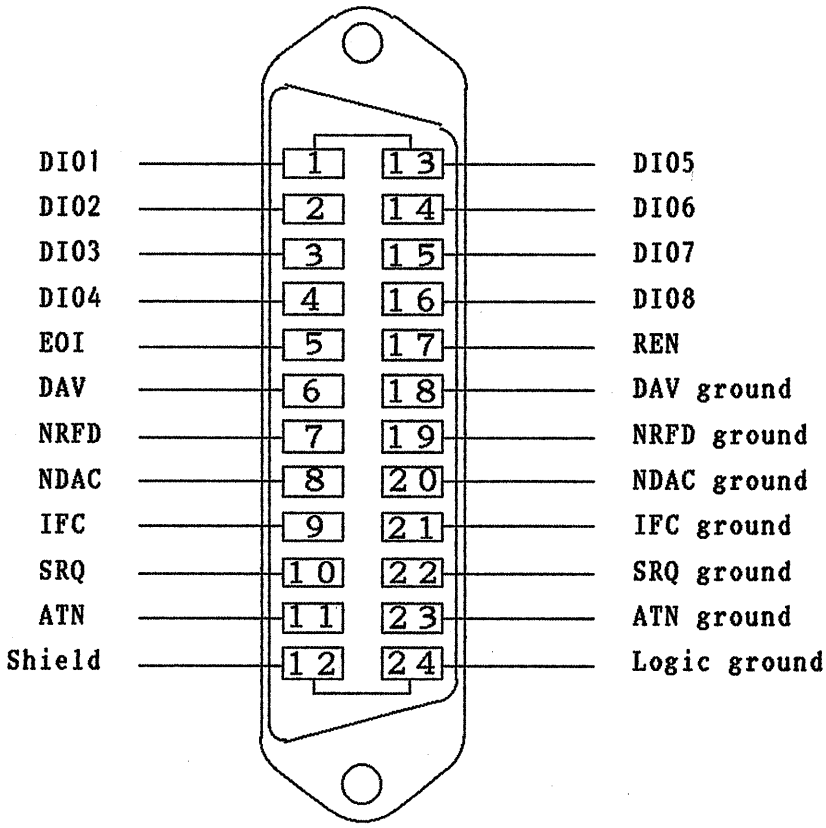



Figure 8-2

### 8.3.7 Reference (program example)

An example of a program for HP 9816 is given below. This program is to set the data of frequency, output level, and modulation factor, to store the data into the signal generator, and to recall the data from it. This program is just for reference, and it may not be the best one. Since the program description method varies with the system to control the signal generator, code the program in the most suitable way for the system.

```
10    Dev=707                          Interface select code
      * 100 + Device address
20    Frequency=100*1.E+6              100000000Hz
30    Freqstep=10*1.E+6                10000000Hz
40    Level=120                        120dB
50    Levelstep=-10                    -10dB
60    Fm=75                            75kHz
70    Fmstep=-5                        -5kHz
80    CLEAR Dev                        Clear selected device
90    WAIT 2
100   OUTPUT Dev;"R1"                  Output ON
110   FOR N=0 TO 9
120     Freq=Frequency+Freqstep*N
130     Lev=Level+Levelstep*N
140     Fmlev=Fm+Fmstep*N
150     OUTPUT Dev;"FR";Freq/1.E+6;"Mz"    Set frequency
160     OUTPUT Dev;"EMAP";Lev;"dB"         Set output level
170     OUTPUT Dev;"AMS5"                  Turn off AM modulation
180     OUTPUT Dev;"S2FM";Fmlev;"kz"       Set 400 Hz internal
                                           modulation frequency and
                                           FM deviation
190     OUTPUT Dev:"ST";N                  Store data into memory
200   NEXT N
210   FOR N=0 TO 9                         Recall data from memory
220     OUTPUT Dev;"RC";N
230     WAIT 2
240   NEXT N
250   END
```

# 9. ACCESSORIES

(Optional)

## 9.1 SA100 Test Loop

1) Performance

| | |
|---|---|
| Frequency range | 100kHz to 30MHz |
| Migration length | Vertical Approx. 250mm, Horizontal 360° |
| Input coaxial cable | 50Ω |
| Test Loop | Diameter 250mm, 0.8$\phi$ 1 Turn |

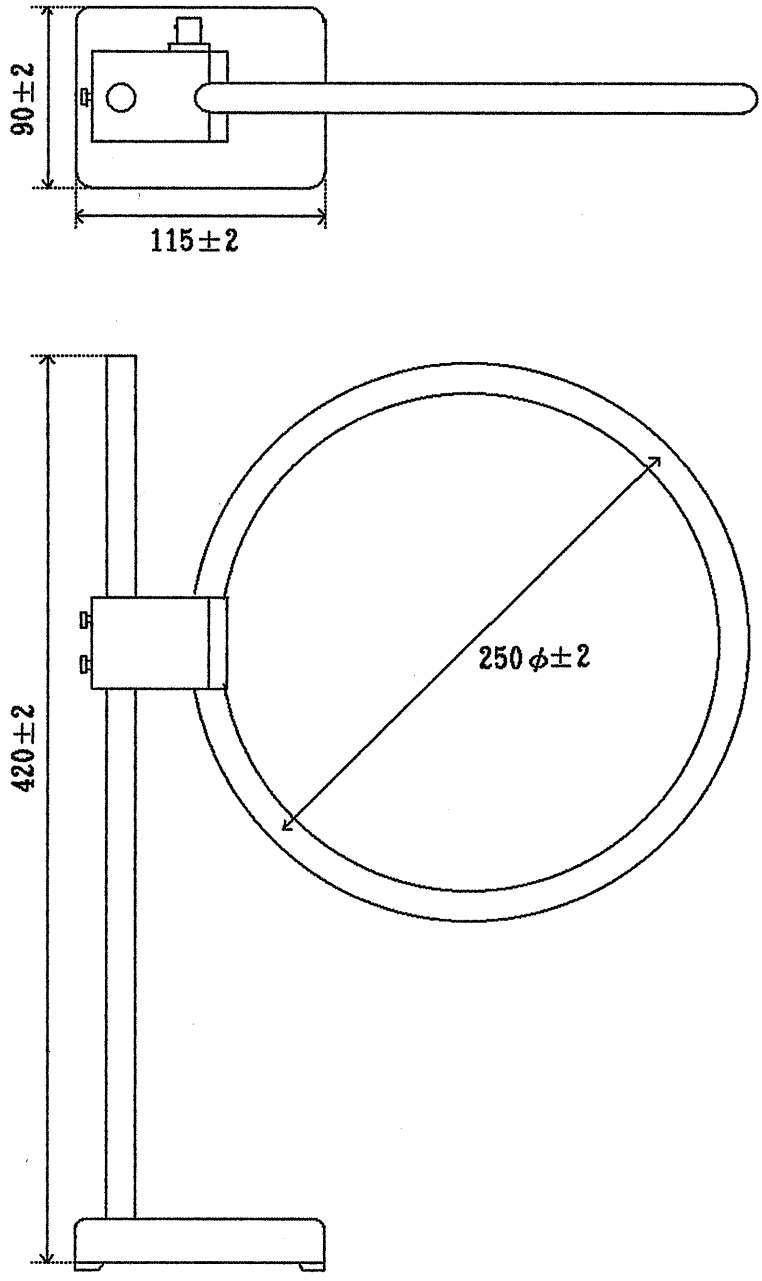



Figure 9-1. Outline drawing

## 9.2 SA150 Band Splitting Filter

1) Performance

| | |
|---|---|
| Input frequency range | DC to 130MHz |
| Input/output impedance | 50Ω (BNC-J type connector) |
| VSWR input/output | 1.2 or less |
| Output frequency range | AM: DC to 30MHz |
| | FM: 75MHz to 130MHz |
| Insertion loss | 0.5dB or less |

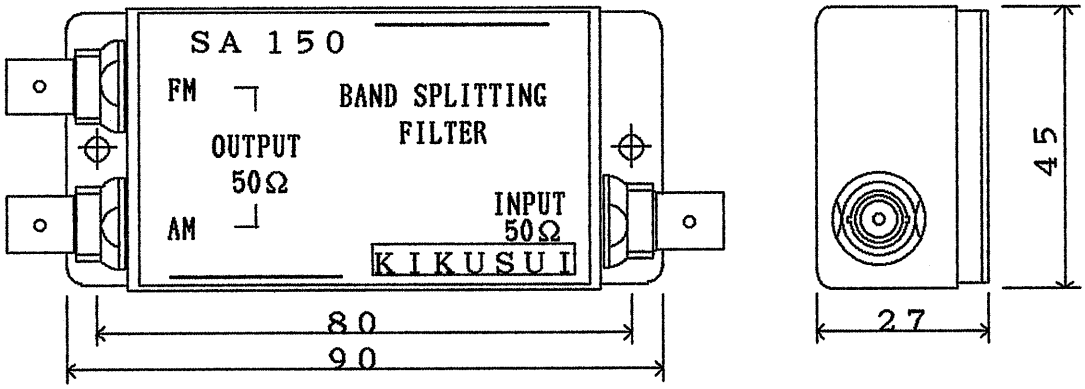
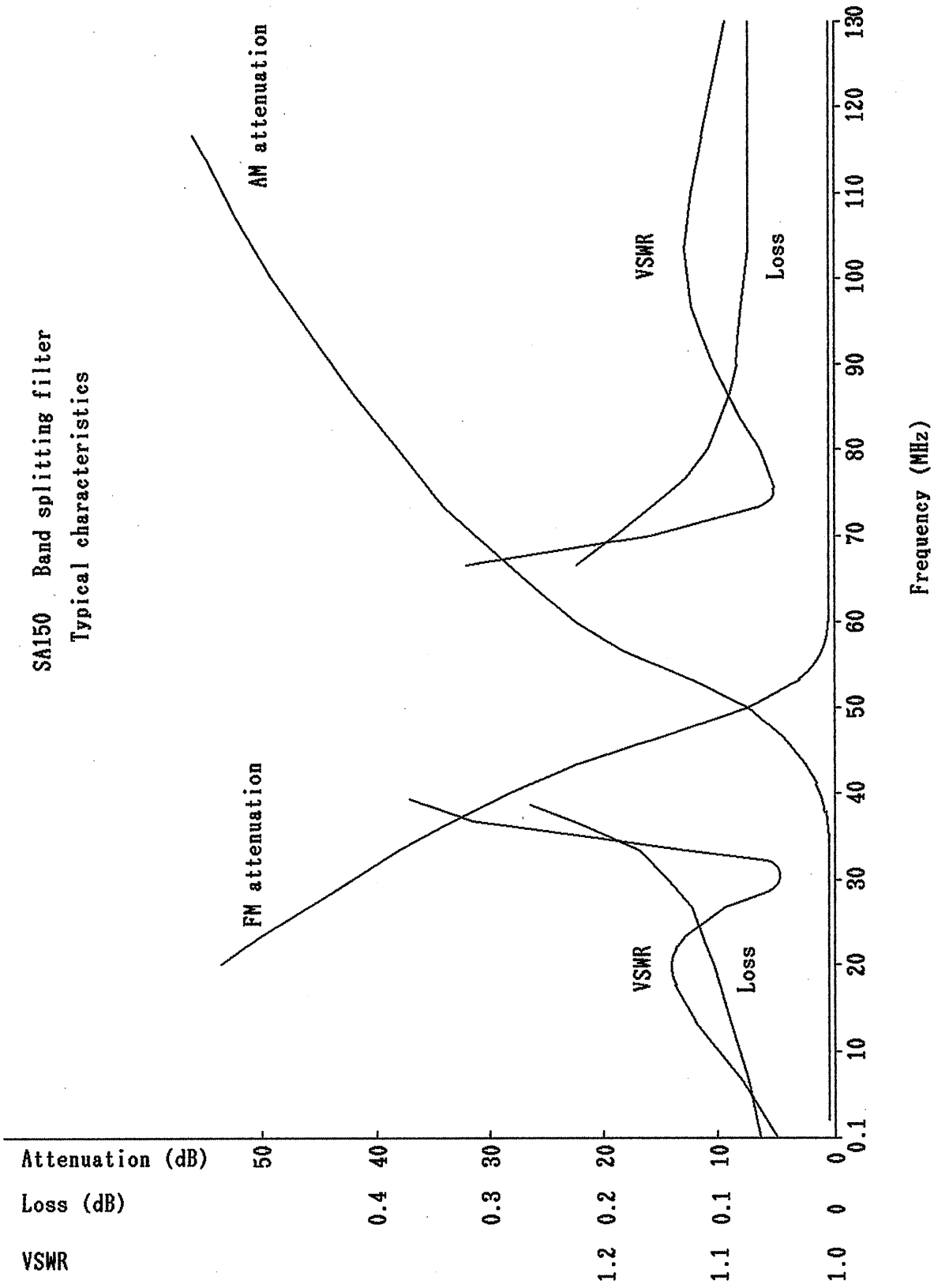



Figure 9-2

Figure 9-3


SA150 Band splitting filter
Typical characteristics
AM attenuation
FM attenuation
VSWR
Loss
VSWR
Loss
Attenuation (dB)
Loss (dB)
VSWR
50
40
30
20
10
0
0.4
0.3
0.2
0.1
0
1.2
1.1
1.0
0.1
10
20
30
40
50
60
70
80
90
100
110
120
130
Frequency (MHz)

2) SA150 application example

The SA150 outputs separate signals by the combination of HPF and LPF.

The RANGE OUTPUT control signal output from the rear panel of KGS4300 need not be used.

Figure 9-4 shows an example application of the SA150.

The SA150 can be used with little error when the input signal frequencyis less than 30MHz or between 75MHz and 110MHz; the error increases in other ranges. (See Figure 9-2 for the external appearance and Figure 9-3 for typical characteristics.)

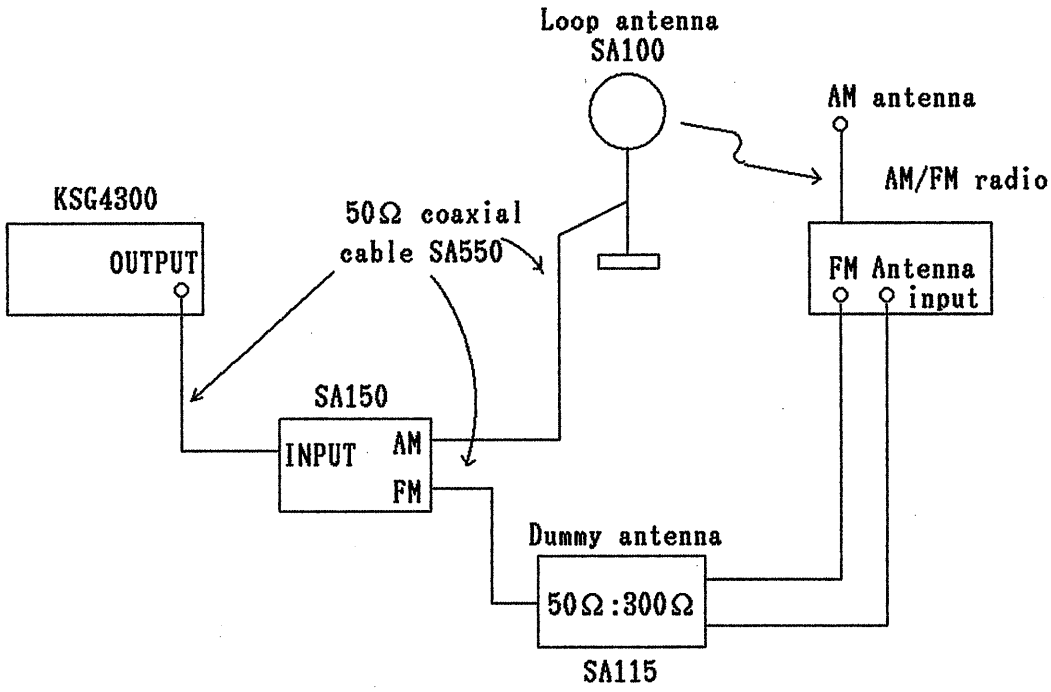



Figure 9-4

## 9.3 SA151 and SA152 Dummy Antennas for Car Radios

The SA151 and SA152 dummy antennas comply with JIS C6102-1988, and they are used for testing car radios.

Switching between AM and FM dummy antennas is done automatically by the RANGE OUTPUT control signal from the rear panel of KSG4300.

SA151: AM output impedance = 80Ω
FM output impedance = 75Ω
(Loaded type)

SA152: AM output impedance = 80Ω
FM output impedance = 75Ω
(Open-circuit type)

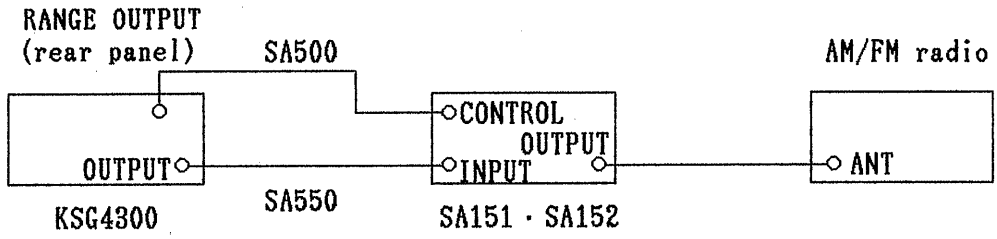



Figure 9-5. Connection Example

### 9.3.1 SA151 dummy antenna for car radio (loaded type)

1) Performance

| | |
|---|---|
| Input frequency range | 50kHz to 200MHz |
| Input impedance | 50Ω (BNC-J type connector) |
| VSWR | 1.2 or less |
| Output impedance | AM: 80Ω |
| | FM: 75Ω |
| Control signal | AM: 0V |
| | FM: 5V, 50mA or less |
| Control terminal | Audio pin connector (RCA type) |
| Accessory | SA500 (Single-core shielded cable with RCA type pin plugs at both ends. Length = 0.8m) |

2) Dummy antenna circuit diagram

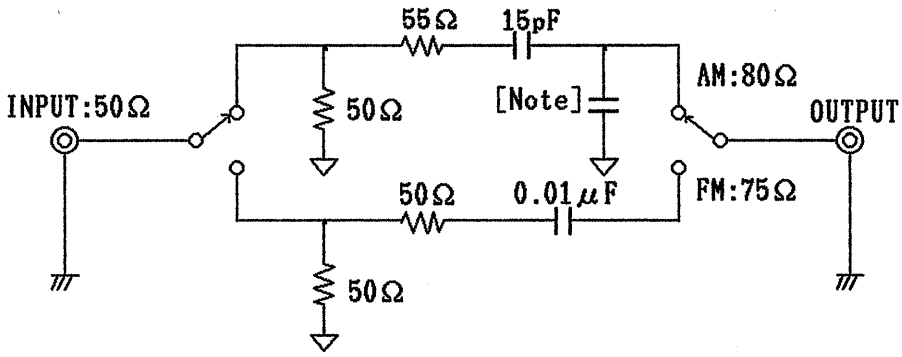



Figure 9-6

*Note: Adjust the load capacitance to 60pF including the antenna cable capacitance for car radio. (Actually, a 30pF capacitor is mounted.)*

3) Outline drawing

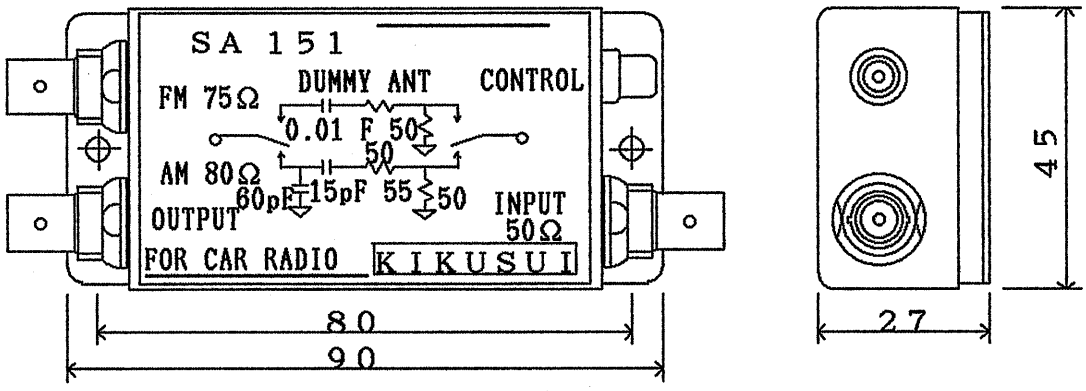



Figure 9-7

9.3.2 SA152 dummy antenna for car radio (open-circuit type)

1) Performance

| | |
|---|---|
| Input frequency range | 50kHz to 200MHz |
| Input impedance | 50Ω (BNC-J type connector) |
| VSWR | 1.2 or less |
| Output impedance | AM: 80Ω |
| | FM: 75Ω |
| Control signal | AM: 0V |
| | FM: 5V, 50mA or less |
| Control terminal | Audio pin connector (RCA type) |
| Accessory | SA500 (Single-core shielded cable with RCA type in plugs at both ends. Length = 0.8m) |

2) Dummy antenna circuit diagram

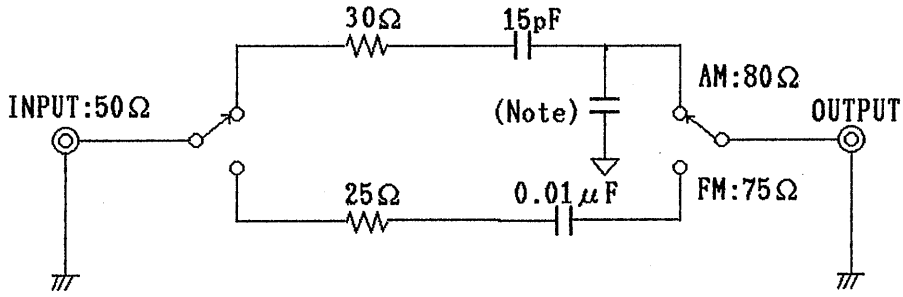



Figure 9-8

*Note: Adjust the load capacitance to 60pF including the antenna cable capacitance for car radio. (Actually, a 30pF capacitor is mounted.)*

3) Outline drawing

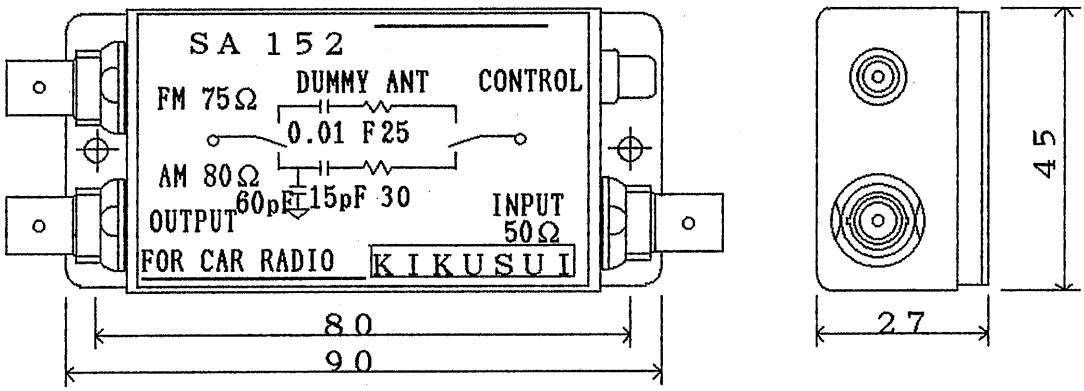



Figure 9-9

## 9.4 SA153 Output Switch and SA154 Output Impedance Switch

The SA153 is used for a test loop antenna in AM band and for a 50Ω : 300Ω dummy antenna in FM band. The SA154 is used for a test loop antenna in AM band and for a 75Ω : 300Ω dummy antenna in FM band.

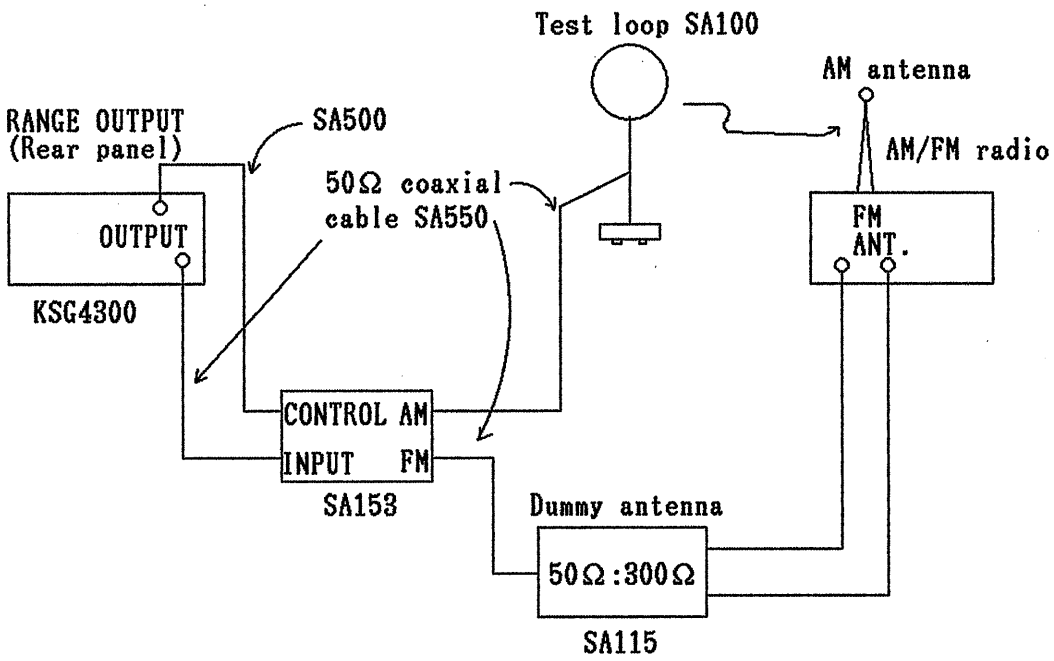



Figure 9-10. SA153 connection diagram

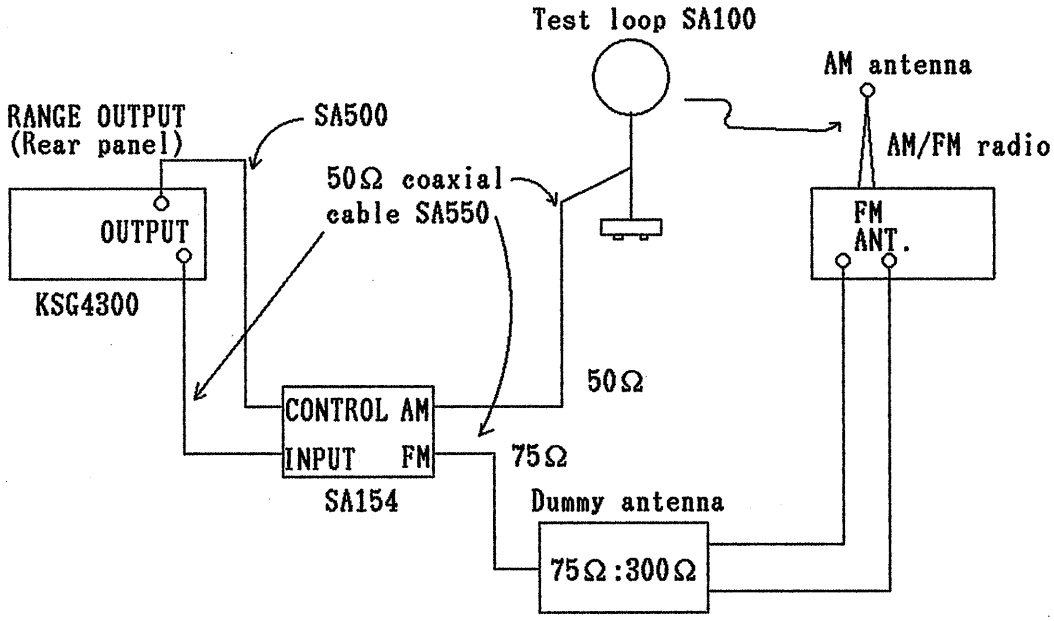



Figure 9-11. SA154 connection diagram

1) Performance (SA153 Output Switch and SA154 Output Impedance Switch)

| | |
|---|---|
| Input frequency range | DC to 200MHz |
| Input impedance | 50Ω (BNC-J type connector) |
| VSWR | 1.2 or less |
| Output impedance | |
| SA153 | AM: 50Ω (for test loop) |
| | FM: 50Ω (for 50Ω : 300Ω dummy antenna) |
| SA154 | AM: 50Ω (for test loop) |
| | FM: 75Ω (for 75Ω : 300Ω dummy antenna) |
| Control signal | AM: 0V |
| | FM: 5V, 50mA or less |
| Control terminal | Audio pin connector (RCA type) |
| Accessory | SA500 (single-core shielded cable with RCA type in plugs at both ends. Length = 0.8m) |

2) Output switch and impedance switch circuit diagrams

SA153

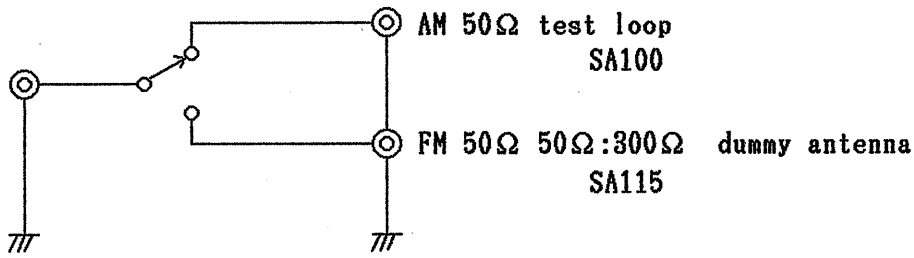



Figure 9-12

SA154

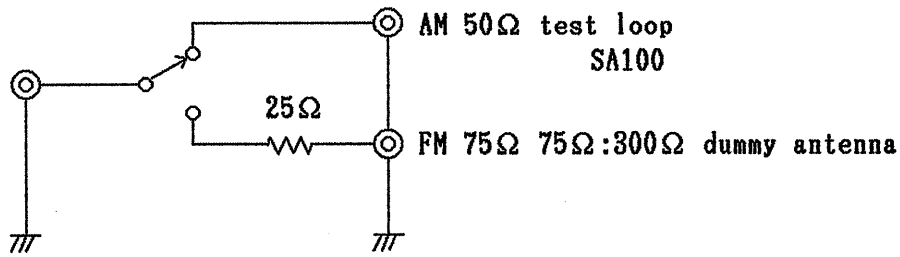



Figure 9-13

3) Outline drawing

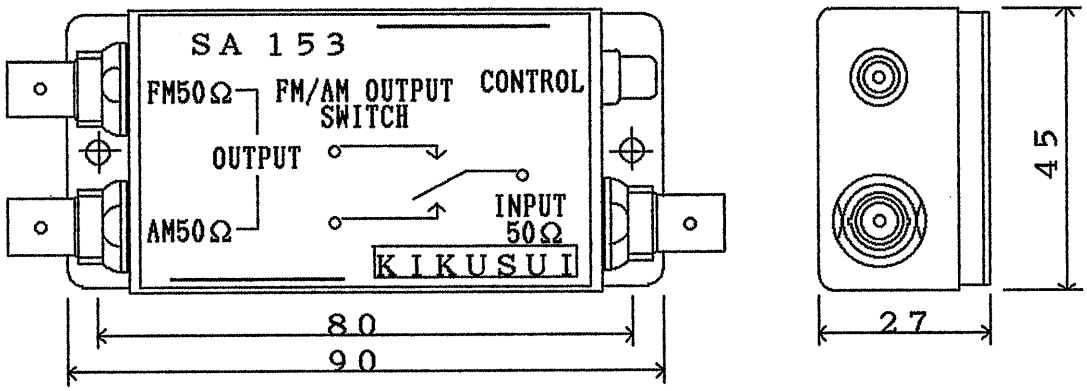



Figure 9-14. Outline drawing

*Note: When using the SA150, SA153, or SA154, do not connect the 50Ω : 75Ω dummy antenna for AM band and 50Ω : 300Ω balanced dummy antenna for FM band to an AM/FM radio as shown in Figure 9-15 because the balance of the dummy antenna for FM band is lost at point "a".*

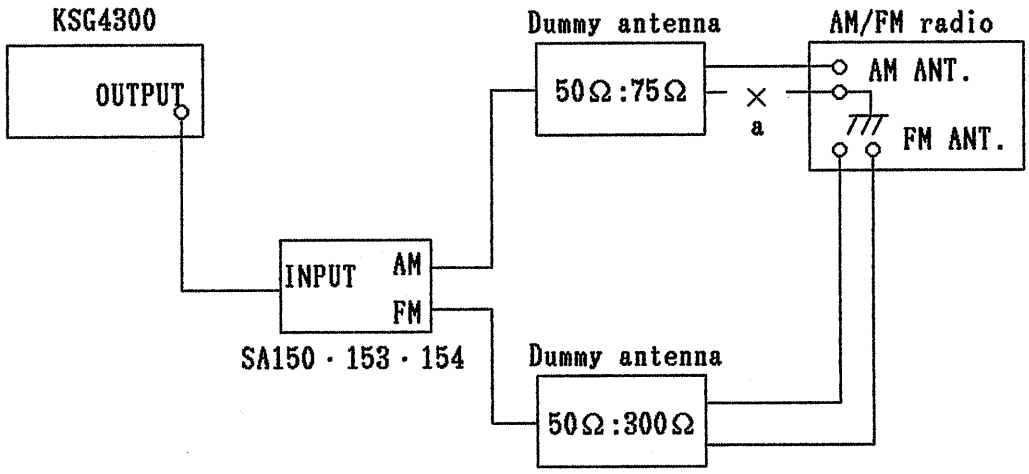



Figure 9-15