OPERATION MANUAL

FM-AM SIGNAL GENERATOR

KSG4100
KSG4110

Fourth Edition

KIKUSUI ELECTRONICS CORPORATION

(KIKUSUI PART NO. Z1-477-020)

M-94074

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.

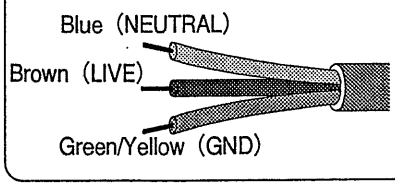
☐ AC power cable

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.

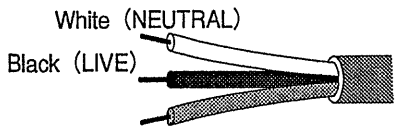
WARNING

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

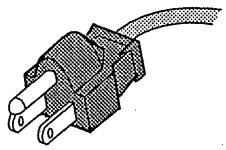
☐ Without a power plug



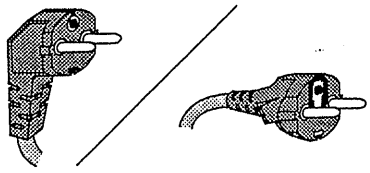
☐ Without a power plug



☐ 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

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1 . INTRODUCTION

1.1 General Description

The KSG4100 and KSG4110 are highly stable FM-AM signal generators using a Phase-Locked-Loop system which is locked to a standard crystal oscillator. The KSG4110 features a built-in high performance stereo modulator.

The output frequency range is 100kHz - 110MHz, covering both the FM and AM broadcast bands. The output level covers the range from −19dBμ to 99dBμ, making these multi-purpose signal generators suitable for use on production lines, for quality control and on the service bench for FM-AM radios, FM stereo receivers, FM type interphones, cordless telephones.

The carrier frequency, output level and type of modulation can be stored into the internal 100 points memory in free combination. The memory consists of 10 blocks, each of which has 10 memory (10×10=100) and data can be stored and recall from 100 points memory continually or in blocks. Up to 4 output points can be stored in independent memory and recalled. A remote control function is also provided for control of all operations possible from the panel.

1.2 Features

(1) Digital setting of the carrier frequency is possible in up to 6 digits. Continuous variation is possible using the rotary knob with cursor indication. A frequency difference display and [redacted] function are also providedfor checking the selectivity.

(2) Carrier frequency and output level can also be set in steps.

(3) The output levels cover the wide range from -19dBμ to 99dBμ (open-circuit) and 2-digit digital setting is possible in 1dB steps. An independent 4-point memory function is also provided.

(4) Pre-set keys are provided for modulation: FM 3.5kHz, 22.5kHz, 75kHz and AM 30%. The KSG4110 also has one-touch 30% and 100% settings for stereo modulation.

(5) Modulation distortion, S/N ratio and stereo characteristics are outstanding.

(6) All panel indicators can be memorized. It can be used separated into 10 blocks with 10 points each, or 100 continuous points and 4 output level points may be stored and recalled.

(7) Memory data can be copied to identical machines by using the DUMP key.

(8) All operations are controlled by a built in microprocessor. And all values keyed in can be digitally displayed for easier reading.

(9) Input data can be quickly revised using the ← back space key.

(10) All panel operations can be remote controlled.

2. SPECIFICATIONS

○ Frequency (RF)

Range	:	100kHz to 110MHz	
Resolution	:	100Hz	RF < 35MHz
		1kHz	RF ≧ 35MHz
Display	:	6-digit display, △FREQ display, and ±frequency inversion function	
Accuracy	:	$\pm 5 \times 10^{-5} \pm 1$ digit	

○ Output

Range	:	−19dBμ to 99dBμ	open-circuit (0dBμ = 1μV)
Resolution	:	1dB	
Display	:	2-digit display	
Memory	:	Four mutually independent point (A/B/C/D), with STORE/RECALL key	
Reference level accuracy	:	At output level 99dB	
		±1dB	RF > 400kHz
		±1.5dB	RF ≦ 400kHz
Attenuator accuracy	:	±1dB	Output ≧ 20dB
		±1.5dB	Output < 20dB
Signal source impedance	:	50Ω	BNC type connector
VSWR	:	≦ 1.2	

Spurious	:	At ratio to fundamental frequency signal = 0dBc
2nd harmonic		≦ −30dBc

Residual modulation (S/N)

FM component	:	Demodulation frequency range = 50Hz to 15kHz RF: 10.7MHz, and 75MHz to 110MHz 75kHz deviation ratio ≧ 73dB (≦ 17Hz) Other RF values ≧ 66dB (≦ 38Hz)
AM component	:	Demodulation frequency range = 50Hz to 15kHz 30% depth ratio (except subharmonic of 80MHz) ≧ 60dB (≦ 0.03%)

o Modulation

1) KSG4100	FM or AM with internal or external modulating signal
2) KSG4110	FM/FM stereo or AM with internal or external modulating signal (No compound FM/AM modulation)
Internal modulation frequency	400Hz/1kHz/3kHz, ±3% (KSG4110 Except 3kHz)

External modulation

1) input impedance	Approx. 10kΩ (unbalance)
2) Input voltage requirement for external modulation	Approx. 3Vp-p

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

<Frequency Modulation>

Deviation	:	0 to 99.5kHz RF > 1MHz RF×10% RF ≦ 1MHz
Resolution	:	0.5kHz
Display	:	3-digit numeral display
Accuracy	:	≦ (Display value±10) kHz
External modulation frequency characteristics	:	20Hz to 100kHz (1kHz reference) ±1dB
Separation	:	Modulation frequency 1kHz ≧ 50dB
Distortion	:	Demodulation range: 50Hz to 15kHz RF: 10.7MHz/75MHz to 110MHz Modulation frequency=1kHz, 75kHz deviation ≦ 0.05% ≦ 0.1% (Other RF values)

<Amplitude Modulation>

Depth	:	0 to 60%
Resolution	:	0.5%
Display	:	3-digit numeral display
Accuracy	:	≦ (Setting value ±5) % RF ≦ 30MHz
External modulation frequency characteristics	:	50Hz to 10kHz (1kHz reference) ±1dB

Distortion : Demodulation range: 50Hz to 15kHz
RF: 200kHz to 30MHz
Modulation frequency = 1kHz, Depth 30%
≦ 0.5% (RF: 200kHz to 30MHz)
≦ 3.0% (Other RF values)
(except 30MHz to 35MHz and subharmonic of 80MHz)

<Stereo Modulation> KSG4110 only

Separation : ≧ 55dB (400Hz to 1kHz)
≧ 40dB (100Hz to 10kHz)
≧ 30dB (50Hz to 15kHz)

Pilot frequency : 19kHz±2Hz

External modulation frequency characteristics : 50Hz to 15kHz (1kHz reference)
±1dB

○ Setting functions :

1) Numeric keys and rotary knob
(with cursor desgination)
Carrier frequency, output level, modulation and memory

2) Step keys
Carrier frequency and output level

3) Preset keys
Frequency modulation: 3.5kHz/22.5kHz/75kHz
Amplitude modulation: 30%
Stereo modulation : 30%, 100%
(KSG4110 only)

○ Memory function :

1) 100 points (carrier frequency, output level, modulation level, modulation mode, etc.)

2) 10 blocks×10, or 100 continuous points

3) 4 independent output level points

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

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

- Range output (Dummy antenna control output):

  RF≧35MHz: "1" (5V, 50mA max.)
  RF<35MHz: "0" (0V)

- Leakage : No detectable interference onto output.

- Backup battery : Provided

- Power requirements

  Line voltage : AC 100V, 115V, 215V, 230V; ±10% allowance (selectable by voltage selector plug on rear panel)

  Line frequency : 50Hz/60Hz

  Power dissipation : Approx. 30VA

- Mechanical specifications

  Dimensions of main frame : 430 W × 99 H × 250 D mm (16.93 W × 3.90 H × 9.84 D in.)

  Maximum dimensions : 445 W × 119 H × 300 D mm (17.52 W × 4.69 H × 11.81 D in.)

  Weight : Approx. 6kg (13 lb)

○ Operation environment (temperature and humidity)

To satisfy specifications	:	5 to 35°C (41 to 95°F), 85% RH or less
Maximum operating range	:	0 to 40°C (32 to 104°F), 90% RH or less

○ Accessories

Output cable (SA550)	1
Power cable	1
Fuse 1.0A	1
Fuse 0.5A	1
Operation manual	1

○ Others (option) KSG4110 only

SCA

1) Input voltage	:	Approx. 1Vrms (at depth 10%)
2) Input impedance	:	Approx. 10kΩ (unbalance)

PILOT

1) Output voltage	:	Approx. 1Vrms
2) Output impedance	:	Approx. 600Ω

3. PREPARATION FOR USE

3.1 Receiving Inspection

Before these machines are shipped from the factory, they receive stringent mechanical and electrical tests and inspections to ensure that operation is normal.
When your machine is delivered, inspect it immediately to make sure there is no shipping damage. If a problem is found, immediately contact your dealer.

3.2 Power Supply Voltage Check

These machines can be used with any of the oprating voltages shown in the chart below by changing the voltage selector plug on the rear panel.
Before plugging in the power cable, be sure to check the power supply voltage and the voltage selector plug.
When changing the voltage used, the fusemay also have to be replaced, as shown in the chart below.
Using these machines at other than the set voltages can cause faulty operation or damage to the circuitry.

Setting	Center Voltage	Voltage Range	Fuse
A	100V	90 - 110V	1.0A
B	115V	104 - 126V	
C	215V	194 - 236V	0.5A
D	230V	207 - 235V	

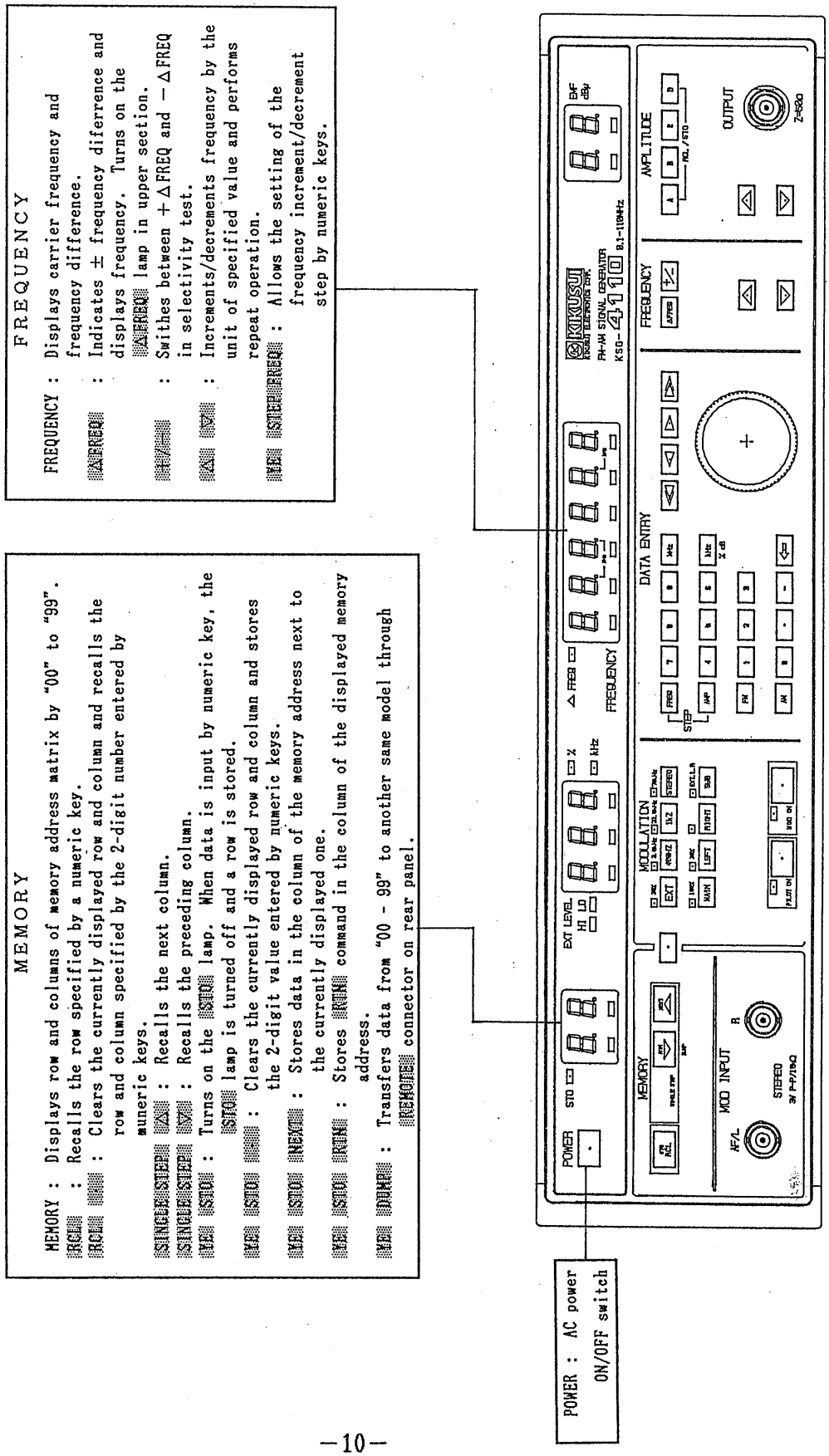
3.3 Installation Location, Ambient Temperature and Warm-up Time

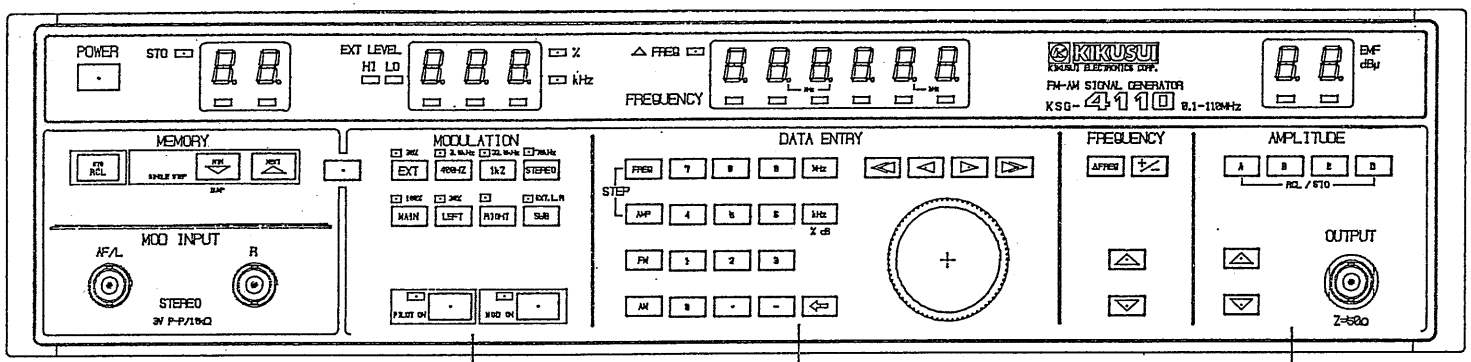
The temperature range for normal operation of these machines is 0 to 40°C (32 to 104°F). Long-term usage or storage in places where temperature and humidity are high can cause damage and shorten the service life of the machine.

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 Explanation of the Front Panel





MODULATION

MODULATION : Displays FM, stereo, AM modulation rate by three digits

MOD INPUT AF/L : External modulation input connector for FM, stereo and AM single signal.

R : External modulation input connector for right signal of stereo modulation.

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

% : Indicates AM and stereo depth by the unit of 0.5%.

kHz : Indicates FM frequency deviation by the unit of 0.5kHz

STEREO : Sets stereo mode. When on, modulation mode can be switched alternately.

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

MAIN, LEFT, RIGHT, SUB : Selects signal mode for internal and external modulation.

MODULATION ON : Turns ON/OFF modulation.

PILOT ON : Turns ON/OFF pilot signal.

YE EXT 30%, 3.5kHz, 22.5kHz, 75kHz : Presets AM depth at 30% or FM deviation at 3.5kHz, 22.5kHz, 75kHz.

YE MAIN 100%, LEFT 30%, EXT L/R : Presets stereo modulation 100%, 30% and external modulation input.

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.

BS : Back space (BS) key. Correct data input error or displays center frequency when △FREQ 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 two digits.

A B C D : Recall keys for the independent 4-point memory.

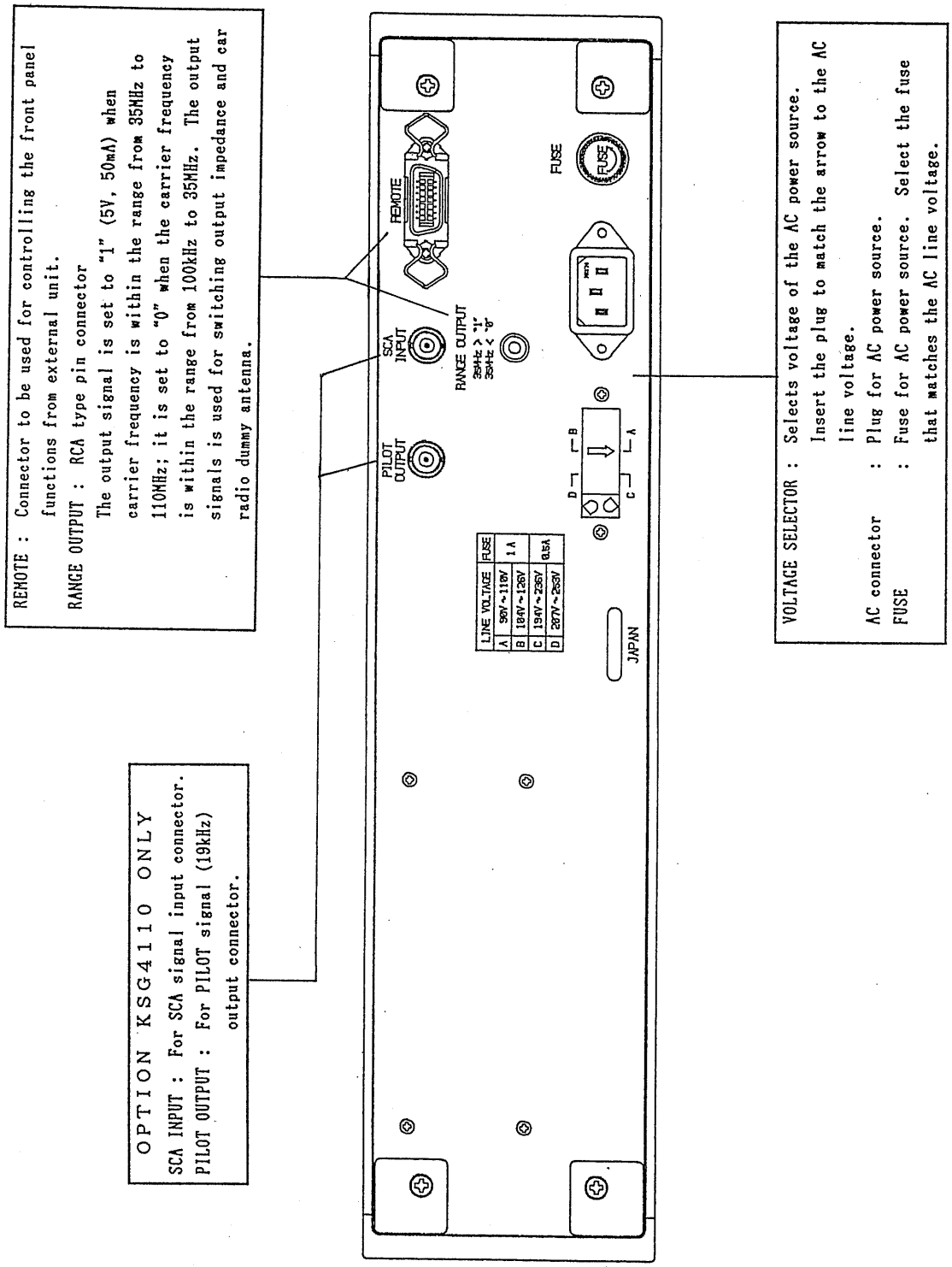
△ ▽ : Increments/decriments amplitude by the unit of specified value and performs repeat operation.

OUTPUT : BNC connector for RF output. −19dBμ to 99dBμ at open circuit. The signal source impedance is 50Ω.

YE A B C D : The store keys for the independent 4-point memory.

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

4.2 Explanation of the Rear Panel

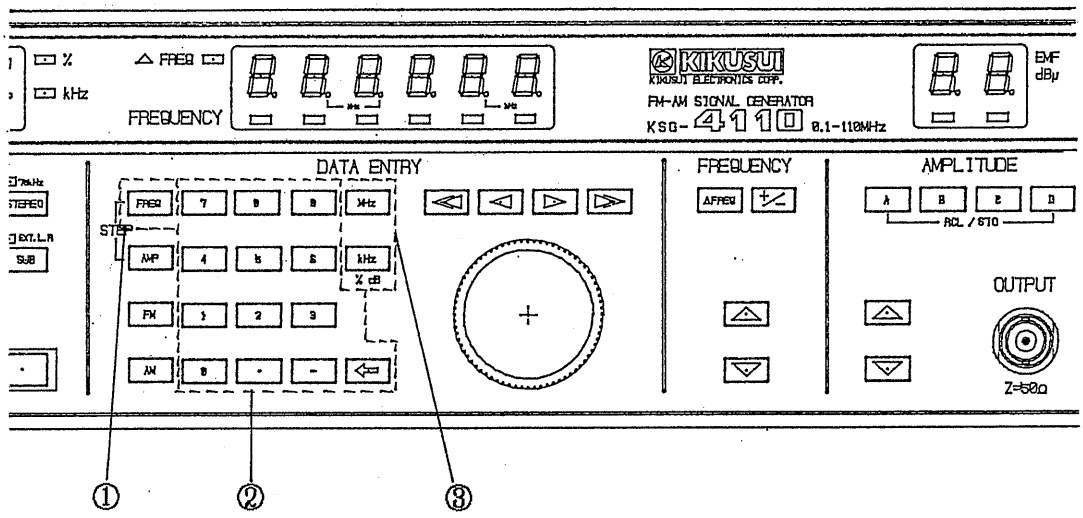


4.3 Turning on the Power Supply.

Connect the power cable to the power source of the correct voltage and press the POWER switch. When the power is turned on, the status found before the power was turned off is displayed (Except HI·LO indicators).

4.4 Setting Frequency

4.4.1 Using the Numeric Keys



Press the FREQ key and input the desired values using the Numeric Keys. Operate in the sequence indicated by the numerals ①, ② and ③ in the diagram above.

If a key other than those enclosed by the dotted lines is pressed, the values from before the FREQ key was pressed will again be displayed.

When input is completed using the numeric keys, pressing the MHz, kHz keys will display the correct values on the Frequency Display. Only 6-digit can be input. Values larger than this will be ignored.

If an error is made inputting with the numeric keys, press the FREQ key again and again make the input with the numeric keys or correct the input using the ← back space key. After pressing the MHz or kHz unit key, there is no need to press the FREQ key until the AMP, FM, AM or STEREO (KSG4100) key is pressed. Settings can be made using only the numeric keys and MHz or kHz key.

(a) Example: Inputting 12.3456MHz

×: ··· undefined

␣: ··· does not light

Operating the keys as shown adjusts the display as shown in the column on the right.

Key Operation	Frequency Display
① FREQ	×××.×××···Previous value
② 1	1␣␣ ␣␣␣
③ 2	12␣ ␣␣␣
④ .	12.␣␣␣␣
⑤ 3	12.3␣␣␣
⑥ 4	12.34␣␣
⑦ 5	12.345␣
⑧ 6	12.3456
⑨ MHz	12.345.6

(b) Example: Inputting 455kHz

Key Operation	Frequency Display
FREQ	12.345.6
4	4␣␣ ␣␣␣
5	45␣ ␣␣␣
5	455 ␣␣␣
kHz	␣␣ 455.0

(c) Example: Intended to input 11MHz but instead input 12MHz.

Key Operation		Frequency Display
FREQ		␣␣ 455.0
1		1␣␣ ␣␣␣
2	Pressed 2 instead of 1.	12␣ ␣␣␣
⇐		1␣␣ ␣␣␣
1		11␣ ␣␣␣
MHz		11.000.0

As shown above, when an error is made, one character can be erased by pressing the ⇐ key. If the ⇐ key is pressed continuously, displayed characters are erased and the previous value is displayed.

(d) Example: An error was made while inputting 85.7MHz.

Key Operation		Frequency Display
FREQ		11.000.0
8		8␣␣ ␣␣␣
6	Pressed 6 instead of 5 .	86␣ ␣␣␣
.		86. ␣␣␣
7		86.7␣␣␣
⇦	Press twice.	86␣ ␣␣␣
⇦	Press twice.	11.000.0

If the MHz or kHz unit key is not pressed, the display will remain as before.

8	8␣␣ ␣␣␣
5	85␣ ␣␣␣
.	85. ␣␣␣
7	85.7␣␣␣
MHz	␣85.700

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

Key Operation	Frequency Display
FREQ	␣85.700
1	1␣␣ ␣␣␣
1	11␣ ␣␣␣
MHz	11.000.0
1	1␣␣ ␣␣␣
MHz	␣1.000.0

As shown above, the FREQ key need not be pressed for the next input after an erroneous input has been made as far as the unit.

4.4.2 Using the Rotary Knob

The Rotary Knob varies the frequency above the digit indicated by the lighted cursor on the FREQUENCY Display. When the FREQUENCY Display does not have a cursor, the ⧏◁ and ▷⧐ keys are used. The ◁ and ▷ keys are used when there is a cursor. There is no need to set the MHz or kHz unit keys.

(a) Example: Changing from 100MHz to 100.02MHz

"_" shows the cursor position

Key Operation		Frequency Display
		1 0 0 . 0 0 0
◁	Press once.	1 0 0 . 0 0 0
↻	Rotate the Rotary Knob 2 steps clockwise.	1 0 0 . 0 2 0

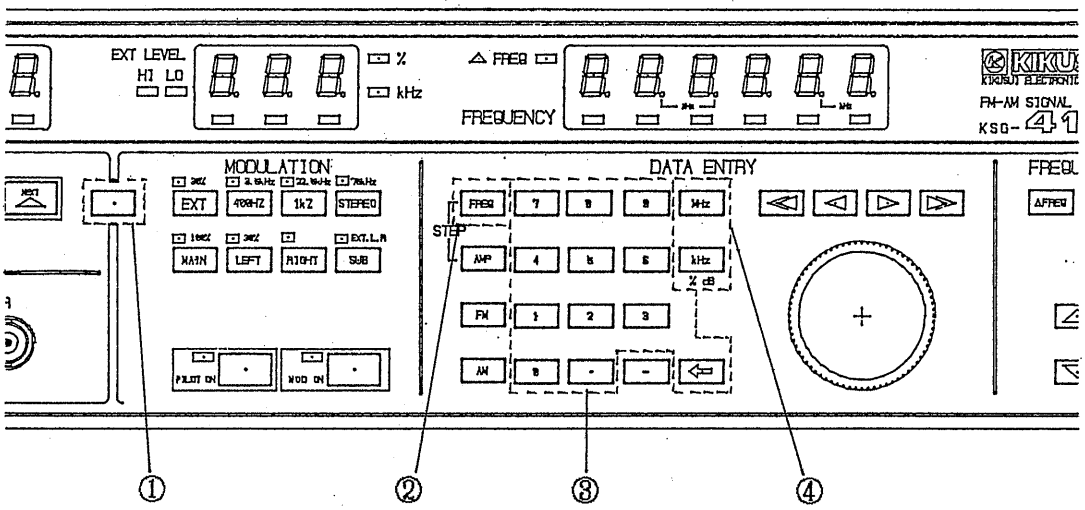
(b) Example: Changing from 100.02MHz to 98.02MHz.

Key Operation		Frequency Display
		1 0 0 . 0 2 0
◁	Press twice.	1 0 0 . 0 2 0
↺	Rotate the Rotary Knob 2 steps counterclockwise.	␣ 9 8 . 0 2 0

4.4.3 Setting frequency step for △ and ▽ Keys

Any desired step value (100Hz minimum) can be freely set to increase or decrease the frequency using the Frequency △ and ▽ keys.

In this case, the position of the Frequency Display cursor is irrelevant.



Input is set in the sequence ①, ②, ③, ④ shown in the diagram above.

In the following explanation, YE indicates the yellow key ①.

(a) Example: Setting 9kHz using the Frequency △, ▽ keys.

Key Operation		Frequency Display
YE		␣1.000.0
STEP FREQ		␣1.000.0
9		9␣ ␣␣␣ ␣
kHz		␣1.000.0
△	Press once.	␣1.009.0

For continuous shift in 9kHz steps, the repeat function operates when the Frequency △, ▽ keys are pressed continuously.

4.4.4 Setting Frequency Difference Using the ΔFREQ and +/− Keys

This function is for checking the amount of frequency difference and is extremely useful for measuring the bandwidths of receivers. When the ΔFREQ key is pressed, the ΔFREQ display of the Frequency Display lights, displaying the frequency difference FREQ.

(a) Example: With a center frequency of 100MHz, ΔFREQ is varied in 100kHz steps using the △, ▽ keys.

Key Operation		Frequency Display	
YE STEP FREQ		××× ×××	
1		1␣␣ ␣␣␣	
0		10␣ ␣␣␣	
0		100 ␣␣␣	
kHz		××× ×××	
FREQ		××× ×××	
1		1␣␣ ␣␣␣	
0		10␣ ␣␣␣	
0		100 ␣␣␣	
MHz		100.000	
ΔFREQ		␣␣␣ ␣␣0	ΔFREQ display lights.
Frequency ▽		−␣␣ 100	Carrier frequency 99.9MHz.
⇦		␣␣␣ ␣␣0	

The repeat function operates when the Frequency △, ▽ keys are pressed continuously for continuous shift in 100kHz steps. In this example, the carrier frequency returns to center 0 when the ⇐ key is pressed.

(b) Example: When the present setting is 100MHz.

Key Operation	Frequency Display	
	100.000	
△FREQ	␣␣␣ ␣␣0	△FREQ display lights.
◁ Press 3 times.	␣␣␣ ␣␣0	
Rotate the rotary knob 5 steps counterclockwise.	−␣5.000	Carrier frequency 95MHz
△FREQ	␣95.000	

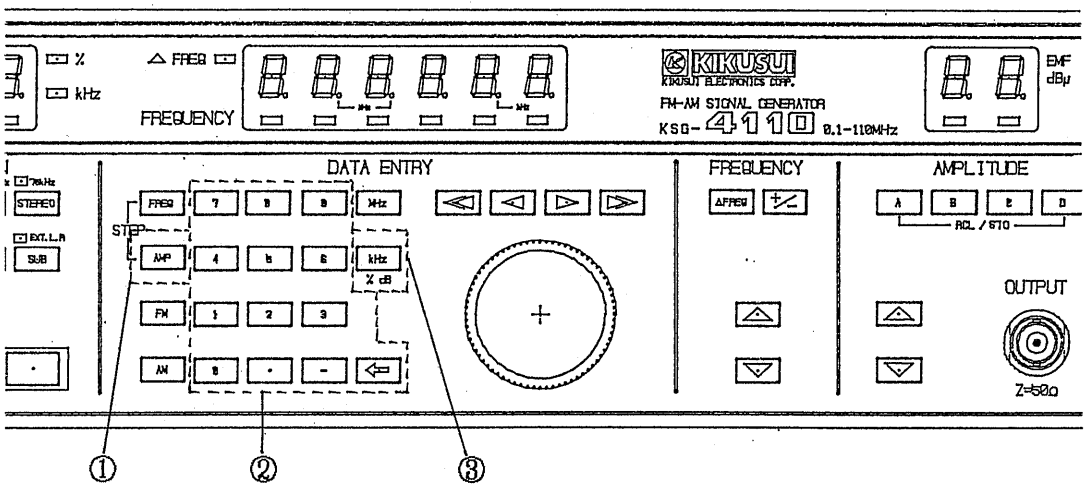
Press the △FREQ again to release the △FREQ function.
In this case, the varied carrier frequency becomes 95MHz.

(c) Example: +/− key used when the frequncy has been changed to 100MHz with △FREQ.

Key Operation	Frequency Display	
	100.000	
FREQ	100.000	
△FREQ	␣␣␣ ␣␣0	FREQ display lights.
2	2␣␣ ␣␣␣	
0	20␣ ␣␣␣	
0	200 ␣␣␣	
kHz	␣␣␣ 200	Carrier frequency 100.2MHz
+/−	−␣␣ 200	Carrier frequency 99.8MHz
△FREQ or FREQ	␣99.800	

4.5 Setting the Output Level

4.5.1 Using the Numeric Keys



Press the AMP key and continuously input desired values using the numeric keys. Operation is in the sequence ①, ②, ③ shown in the diagram above. If a key other than those shown inside the dotted lines is pressed, the value displayed before the AMP key was pressed will again be displayed.

When input is completed using the numeric keys, the correct display will appear on the Amplitude Display when the dB (kHz) key is pressed.

(a) Example: Setting 79dB.

Key Operation	Amplitude Display
AMP	×× ----- Previous value
7	7␣
9	7 9
dB	7 9

(b) Example: Setting −5dB.

Key Operation	Amplitude Display
AMP	7 9
+/−	−␣
5	− 5
dB	− 5

It is not necessary to press this key for continuous setting.

(c) Example: A key-in error is made while setting 46dB.

Key Operation		Amplitude Display
AMP		−5
4		4␣
9	9 pressed instead of 6.	49
⇦		4␣
6		46
dB		46

When a key-in error is made using the numeric keys, use the ⇦ key to make the correction. If the dB key has already been pressed before the error is discovered, input again from the beginning.

4.5.2 Using the Rotary Knob

The Rotary Knob varies the output level for the digits above the position of the cursor of the Amplitude display.
When there is no cursor in the Amplitude Display, use the ◁◁ and ▷▷ keys. Use the ◁ and ▷ keys for moving the cursor in the display.
The output level increases when the Rotary Knob is turned clockwise and decreases when the Rotary Knob is turned counterclockwise.

(a) Example: Changing from 46dB to 66dB.

"_" is the cursor position.

Key Operation		Amplitude Display
		4<u>6</u>
◁	Press once.	<u>4</u>6
	Rotate the Rotary 2 steps clockwise.	<u>6</u>6

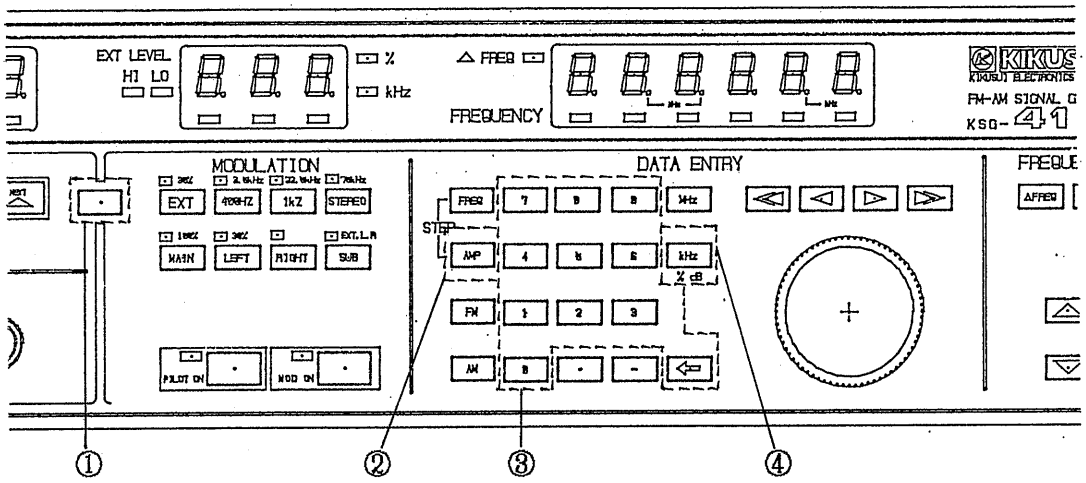
(b) Example: Changing from 66dB to 60dB.

Key Operation		Amplitude Display
		66
▷	Press once.	66
↺	Rotate Rotary Knob 6 steps counter-clockwise.	60

There is no need to press the dB (kHz) key when making settings with the Rotary Knob.

4.5.3 Setting output level steps for △ and ▽ Keys.

The output level can be varied freely in steps (1dB minimum) using the Amplitude △, ▽ keys.



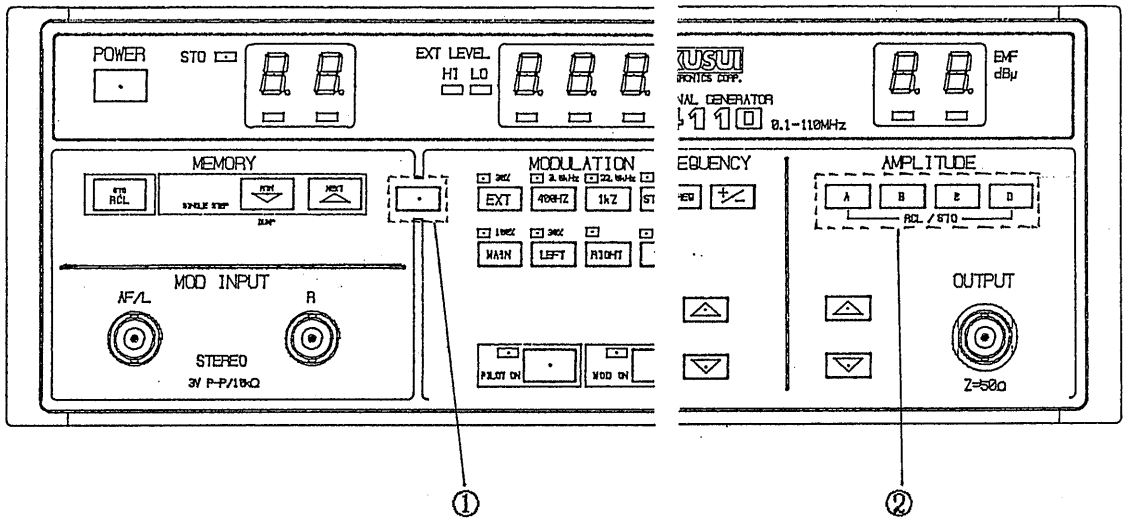
Input is set in the sequence ①, ②, ③, ④ shown in the diagram above.

(a) Example: Setting 2dB using the Amplitude △, ▽ keys.

Key Operation		Amplitude Display
60 STEP AMP		60
2		2␣
dB		60
△	Press once.	62

The repeat function operates when the Amplitude △, ▽ keys are pressed continuously for continuous increase or decrease in 2dB steps.

4.5.4 Setting the Independent 4-Point Memory



The four keys ② A to D shown in the diagram above can store output levels without using the main memory.

To store output levels, use the YE A to D keys in the sequence ①, ②. The presently displayed output level can be stored in any optional locationusing the four A to D keys. In other words, A to D are memory addresses and output levels can be recalled by again pressing the keys.

These four memories have absolutely no influence on the main memory.

4.6 Setting the Modulation

4.6.1 Setting With the YE Key

(a) Set the AM depth to 30% using the YE and 30% keys.

(b) Set the FM deviation to 3.5kHz using the YE and 3.5kHz keys.

(c) Set the FM deviation to 22.5kHz using the YE and 22.5kHz keys.

(d) Set the FM deviation to 75kHz using the YE and 75kHz keys.

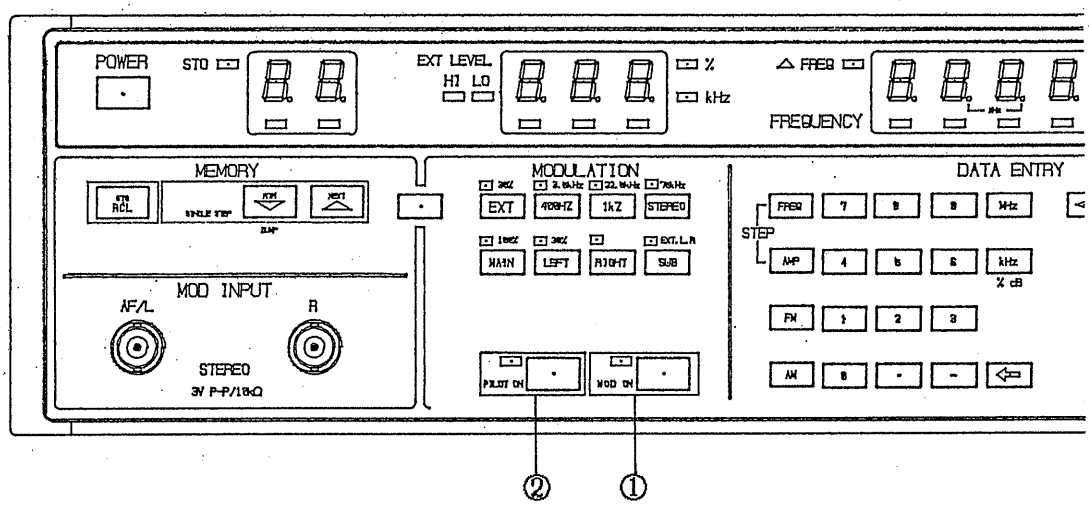
(e) Set the KSG4110 stereo modulation to 100% using the YE and 100% keys. (Modulation level 67.5kHz = 90%; pilot level 7.5kHz = 10%; total = 100%.)

(f) Set the KSG4110 stereo modulation to 30% using the YE and 30% (left) keys. The display will be 37%. (Modulation level 20.25kHz = 27%; pilot level 7.5kHz = 10%; total = 37%.)

(g) Set the KSG4110 left and right external stereo modulation input connectors using the YE and EXT LR keys. (Operates when the STEREO key is pressed.)

4.6.2 Setting the Modulation Source

The corresponding display lights when the modulation source selection keys are pressed. Key ① turns modulation on and off, key ② turns the pilot level (KSG4110) on and off.



(a) Example: Setting FM internal modulation of 400Hz for 75kHz deviation.

Key Operation	Modulation Display
400Hz	400Hz lights.
FM	××.× Previous value kHz lights.
7	7␣␣
5	75␣
kHz	75.0

(b) Example: Turning modulation off.

Press key ①. When the display goes out, the modulation is turned off.The display at this time is 0.0kHz.

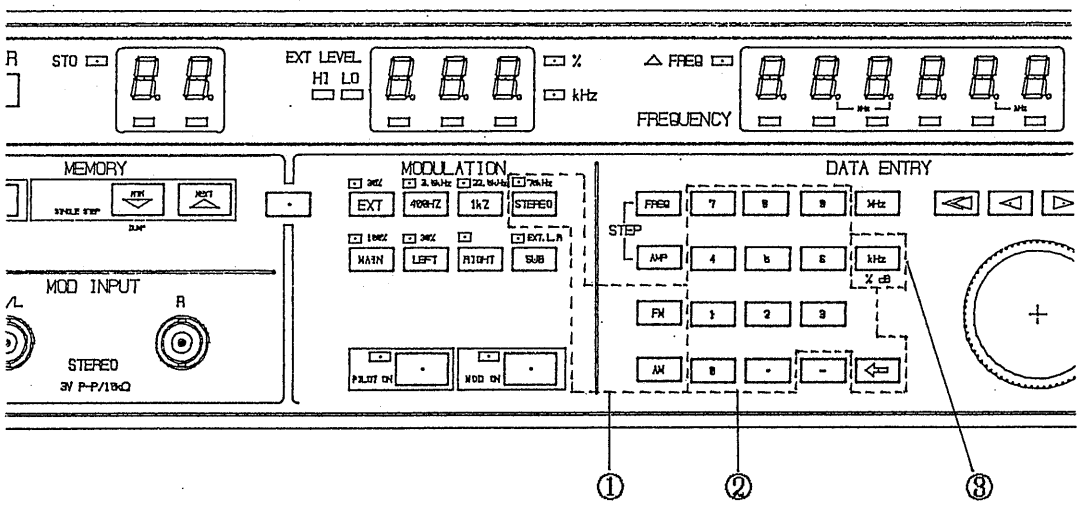
(c) Example: Setting the KSG4110 stereo modulation to 100% at 1kHz.

Key Operation	Modulation Display
1kHz	1kHz lights.
STEREO	××.× ···· Previous value % lights.
1	1␣␣
0	10␣
0	100
%	100

Measurements are now possible in the stereo mode using the MAIN, LEFT, RIGHT and SUB keys.

(d) Example: Turning the KSG4110 modulation off.
Press key ①. When the display goes out, the modulation is off. The display at this time is 10% (pilot level). The pilot level is off when key ② is pressed and the display goes out. The display at this time is 0.0%.

4.6.3 Using the Numeric Keys



Input is set in the sequence ①, ②, ③ shown in the diagram above. First, modulation is turned on by pressing the Modulation STEREO (KSG4110 only), Data Entry FM, AM keys. The previously set modulation is displayed together with the unit on the Modulation display. Next, input the desired values using the numeric keys. When input is completed, the input is displayed together with the unit on the Modulation display when the kHz key is pressed for FM modulation, the % (kHz) key is pressed for stereo modulation (KSG4110) or pilot level or the % (kHz) key is pressed for AM modulation. Any desired values can be input using the numeric keys but the maximums are 99.5kHz for FM modulation, 105% for stereo modulation (KSG4110), 15% for the pilot level (KSG4110) and 60% for AM modulation. The minimum step is 0.5%; consequently, when the kHz / % key is pressed, inputs between ××.0 and ××.4 are changed to ××.0 and inputs between ××.5 and ××.9 are changed to ××.5. The minimum step for the pilot level (KSG4110) is 1%.

(a) Example: Setting FM 25kHz.

Key Operation	Modulation Display
FM	××.× ····· Previous value
	kHz display
2	2␣␣
5	25␣
kHz	25.0

(b) Example: Setting the KSG4110 for 100% stereo modulation. The stereo modulation set value changes to 90 to 105% in accordance with the pilot level.

Key Operation	Modulation Display	
STEREO	××.×	····· Previous value
		% display
1	1␣ ␣	
0	10 ␣	
0	100	
%	100	

When the pilot level is set to 10% with Modulation off, the modulation level is 0 but the 10% pilot level is displayed.

(c) Example: Setting the KSG4110 for a 10% pilot level (in stereo display mode).

Key Operation	Modulation Display	
YE PILOT	␣××	····· Previous value
		% display
1	1␣ ␣	
0	10 ␣	
%	␣10	
YE PILOT	××.×	This operation returns to the pilot level 10% stereo mode.

(d) Example: Continuous setting to 30% AM modulation.

Key Operation	Modulation Display	
AM	××.×	····· Previous value
		% display
3	3␣ ␣	
0	30 ␣	
%	30.0	

4.6.4 Using the Rotary Knob

FM deviation, stereo modulation (KSG4110), pilot level (KSG4110) and AM modulation can be increased and decreased using the Rotary Knob. Use the [<<] and [>>] keys when there is no cursor in the Modulation Display, and the [<] and [>] keys when there is a cursor.

(a) Example: Changing FM deviation from 25kHz to 35kHz.

"_" is the cursor position.

Key Operation		Modulation Display
[FM]		25.0
[<]	Press once.	25.0
	Rotate the Rotary Knob 1 step clockwise.	35.0

(b) Example: Changing the KSG4110 stereo modulation from 100% to 95%.

Key Operation		Modulation Display
[STEREO]		100
[>]	Press twice.	100
	Rotate the Rotary Knob 2 steps counterclockwise.	99.0
[<]	Press once.	99.0
	Rotate the Rotary Knob 4 steps counterclockwise.	95.0

(c) Example: Changing the KSG4110 pilot level from 15% to 10%.

Key Operation		Modulation Display
[AM] [PILOT]		␣15
[>]	Press once.	␣15
	Rotate the Rotary Knob 5 steps counterclockwise.	␣10

(d) Example: Changing AM depth from 30% to 25%.

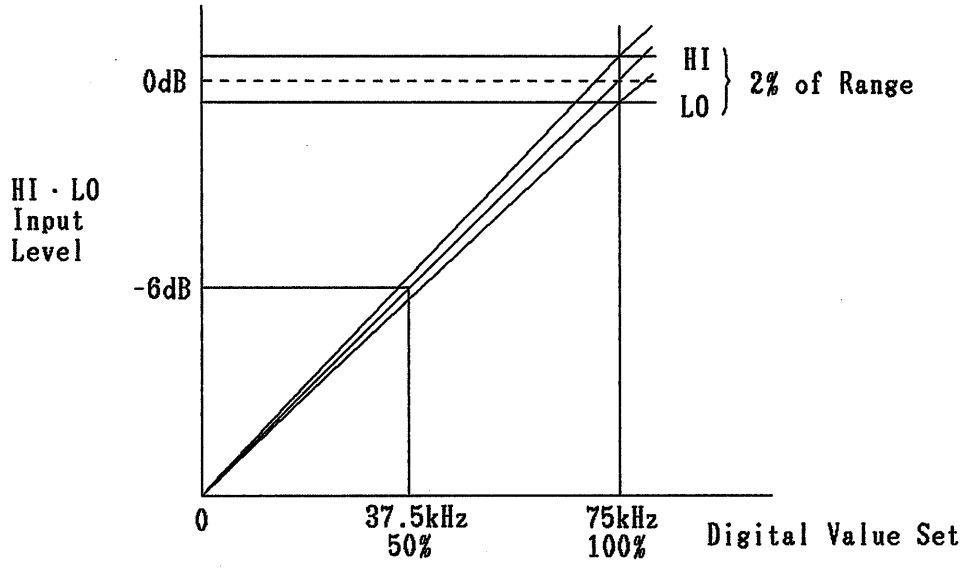
Key Operation		Modulation Display
AM		30.0
▷	Press once.	30.0
	Rotate the Rotary Knob 5 steps counterclockwise.	25.0

4.6.5 Connection and Setting of External Modulation Signals

(1) Connection and setting method

The external modulation signal input connectors connect to MOD INPUT, AF/L R (KSG4110) on the front panel.
Input impedance is approximately 10kΩ, and the appropriate input level is approximately 3Vp-p. The appropriate input level disappears in EXT LEVEL HI LO.
The EXT LEVEL HI LO display of the Modulation Display adjusts the modulation signal source level to within the range where both disappear. When the modulation signal source level is low, LO
lights. When the level is high, HI lights. There is no need to adjust this modulation signal source level even if the modulation is changed. The AF/L connector (KSG4110) is the single signal input for FM modulation, AM modulation and stereo modulation or the left signal input for stereo modulation.
The R connector (KSG4110) is the right signal input for stereo modulation.

(2) Explanation of the setting range



The diagram above shows the relationship between modulation input levels. When the input level is adjusted and is within the HI, LO range, the error in the setting will be ±2%. The modulation is set internally to the digital set value based on the HI, LO levels.
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, if the input level is attenuated to −6dB after the input level is set in the HI, LO range and the display is set to 75kHz deviation, the display will be 75kHz = 100% and deviation becomes 37.5kHz = 50%. At this time, the LO lamp will light but normal 37.5kHz deviation will be obtained.

Also, when the input level is set in the appropriate HI, LO range, the HI, LO lamps will go out but may light alternately in some cases when switching to MAIN, LEFT, RIGHT or SUB of the KSG4110 stereo modulator.
The HI, LO range is very narrow so there will be very little error even if the HI, LO lamps do light.

4.7 Using the Memory

4.7.1 Memory Recall

The memory is arranged in a matrix. In other words, it is arranged in 10 lines horizontally and 10 columns vertically for a total of 100 points.
The memory layout is shown in the diagram below.

Memory addresses: 2-digit, 7-segment display.

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

The basic recall operation is to call out the lines with the RCL and numeric keys, and to call out the columns with the Memory △ key, in thatorder. Also, the Memory Display can be turned off with the RCL and . keys. And memory addresses can be called directly by entering the line and column in succession using the numeric keys.
The following examples show how to store the carrier frequency, output, modulation mode, etc., set in items 4.4 to 4.6 using the operation described in item 4.7.2.

(a) Example: Recalling memory address "10".

	Memory display
Press the RCL and 1 keys.	"10"

(b) Example: Recalling memory addresses "43".

Press the RCL and 4 keys.	
Press the Memory △ key 3 times.	"43"

(c) Example: Recalling memory address "85".
Press the RCL and 8 keys
Press the Memory △ key 5 times. "85" is displayed.

When repeating the recall operation continuously, it is only necessary to press the RCL key the first time.

(d) Example: Direct recalling of memory address "56".
Press the RCL and . keys The Memory display goes out.
Input "56" using the numeric keys 5 6 to recall "78" in succession:
When the Memory display gose out by the . key, press the numeric keys 7 8. Then, "78" is displayed.

4.7.2 Memory Storage

As explained in Item 4.7.1 Memory Recall Method, the memory addresses are laid out in a matrix and almost all functions controlled from the operation panel can be stored but the carrier frequency steps, amplitude steps and ΔFREQ function cannot be stored. The basic store operation is performed by setting the carrier frequency, output level, modulation mode, etc., and pressing the YE key, STO key, numeric keys and Memory △ key in sequence. The Memory display can also be turned off using the YE key and . key, a 2-digit value can then be input using the numeric keys for direct storage at the indicated line and column numbers.

(a) Example: Storing the carrier frequency of 84MHz, output level of 66dB, internal modulation of 1kHz and stereo modulation of 100% inmemory address "10" with the KSG4110.

①	FREQ	×××.×××
	8	8␣␣ ␣␣␣
	4	84␣ ␣␣␣
		← Cursor
	MHz	␣84.000

The carrier frequency can also be set using the Rotary Knob, Frequency △ ▽ keys.

②	AMP	×× 6␣ 6 6 6 6
	6	
	6	
	dB	

The output level can also be set using the Rotary Knob, Amplitude △ ▽ keys or independent 4-point memory A to D keys.

③	kHz	××.×
	YE 100%	1 0 0 %

The modulation level and mode can also be set using the numeric keys and modulation mode key. When the above settings have be made, they can be stored in memory address "10" using the YE key, STO key and the numeral 1.

(b) Example: Storing a separate item in memory address "13".

		Memory display
①	RCL 1 △ Press twice.	"12"
②	Set the carrier frequency, output level and modulation.	
③	Press the YE STO △ keys.	"13"

The data set in ② is stored in memory address "13".

(c) Example: When storing in memory address "45".

① Set the carrier frequency, output level, modulation, etc.
② Turn off the Memory display using the YE, STO, . keys.
③ Input "45" using the numeric keys to store the data set in ①.

Note 1: The YE, STO, . keys cannot be omitted for continuous storing.

Note 2: The RTN key used in Item 4.7.3 cannot be used with this direct storage method.

4.7.3 When Not Using All Memory Columns (Setting RTN key)

(a) Example: Changing the memory address from "10" → "11" → "12" → "13" → "10" → "11".

key Operation	Memory Display
RCL 1 △ Press 3 times.	"13"
YE STO RTN	"13" Return command is input.

[How to Use]

RCL 1	"10" First address.
△	"11" Second address.
△	"12" Third address.
△	"13" Fourth address.
△	"10" Returns to first address.

4.7.4 How to release the RTN key

There are two method.

(1) Press the RCL . 1 9 keys for "19"
Press the YE STO RTN keys "19"
The return command is set to the 10 steps of the previous state.

(2) Press the RCL 1 △ keys 3 times. "13"
Press the YE STO △ keys. "14" RTN stored here.

..
..
..
..
..

Pressing the YE STO △ key 5 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 RTN key was pressed.

4.7.5 Using the Memory Recall for More Than 10 Continuous Steps (Setting NEXT key)

Normally, the memory steps which can be recalled are the 10 steps 00 to 09, 10 to 19,..., 90 to 99 but it is also possible to increase in 10-step unitsby means of the following operations. With the Memory display showing column number 9, the next 10 steps can be continuously recalled using the YE STO NEXT keys.

(a) Example: To continuously recall memory addresses "30" to "49".

Key Operation	Memory Display
×	"39" Previous display.
YE	"39"
STO	"39" STO LED lights.
NEXT	"40" STO LED goes out.

The recall operation is as follows:

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

4.7.6 How to release NEXT key

Set any memory address ("09", "19"..."89") you wish to release from the Memory display and press the YE, STO and RTN (▽) keys in that order.

(a) Example: To return the memory address "30" to "49" continuous recall operation to "30" to "39", "40" to "49" opration.

Key Operation	Memory Display
×	"39" Previous value.
YE	"39"
STO	"39" STO LED lights.
RTN (▽)	"39" STO LED goes out.

4.7.7 Memory Copy Between Identical Machines

1) The 100-point and the output level 4-point memory data can be copied to another same model.

2) Memory data copying method

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

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 KSG4100/4110 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.

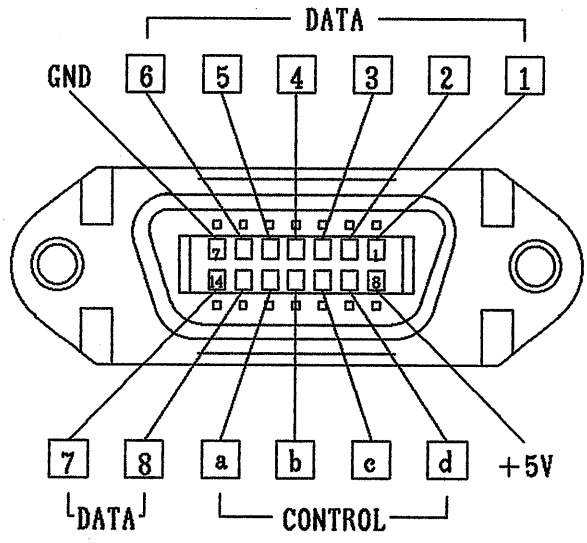


Figure 5-1

[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 KSG4100/4110. 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

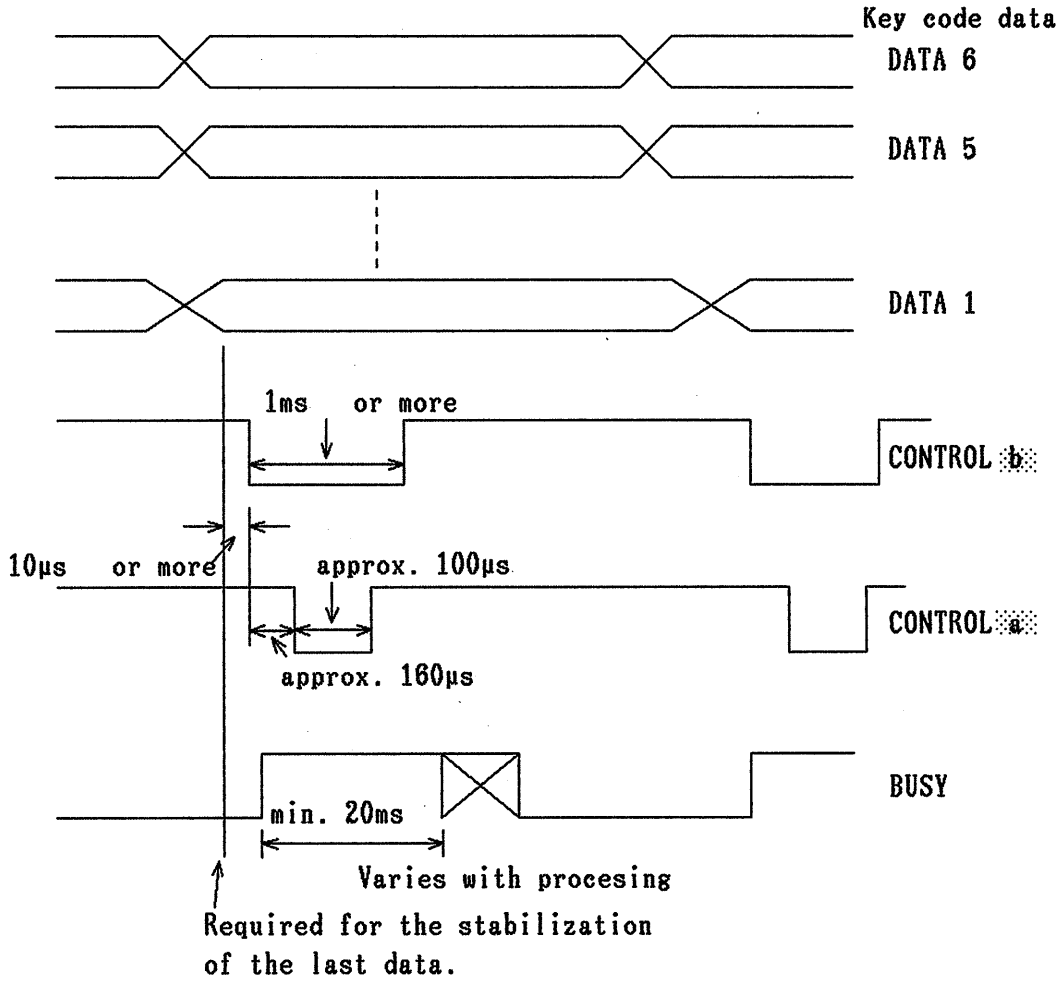


Figure 5-2

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 Code Input Pin Number						
	6	5	4	3	2	1	
Key Name	MSB	← Key Code →				LSB	
[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	
[MODULATION] [EXT]	0	0	1	0	0	1	
[MODULATION] [400Hz]	0	0	1	0	1	1	
[MODULATION] [1kHz]	0	0	1	1	0	0	
[MODULATION] [3kHz]	1	0	1	0	1	0	KSG4100 only
[STEREO]	1	0	1	0	1	0	KSG4110 only
[STEREO] [MAIN]	0	1	1	1	0	0	KSG4110 only
[STEREO] [LEFT]	0	1	1	1	0	1	KSG4110 only
[STEREO] [RIGHT]	0	1	1	1	1	0	KSG4110 only
[STEREO] [SUB]	0	1	1	1	1	1	KSG4110 only
[MODLATION ON]	0	0	1	1	1	1	
[PILOT ON]	0	0	1	1	1	0	KSG4110 only

(cont'd)

Table 5-2

Key Name	MSB	← Key Code →				LSB
DATA ENTRY FREQ / STEP FREQ	0	1	0	0	1	0
DATA ENTRY AMP / STEP AMP	0	1	0	0	1	1
DATA ENTRY FM	0	1	0	1	0	0
DATA ENTRY AM	0	1	0	1	0	1
DATA ENTRY 0	1	1	0	0	0	0
DATA ENTRY 1	1	1	0	0	0	1
DATA ENTRY 2	1	1	0	0	1	0
DATA ENTRY 3	1	1	0	0	1	1
DATA ENTRY 4	1	1	0	1	0	0
DATA ENTRY 5	1	1	0	1	0	1
DATA ENTRY 6	1	1	0	1	1	0
DATA ENTRY 7	1	1	0	1	1	1
DATA ENTRY 8	1	1	1	0	0	0
DATA ENTRY 9	1	1	1	0	0	1
DATA ENTRY .	1	0	1	1	1	0
DATA ENTRY (-)	1	0	1	1	0	1
DATA ENTRY ⇦	0	0	1	0	0	0
DATA ENTRY MHz	0	1	0	1	1	0
DATA ENTRY kHz, %, dB	1	0	0	1	0	1
DATA ENTRY ◁◁	0	1	0	1	1	1
DATA ENTRY ◁	1	1	1	1	0	0
DATA ENTRY ▷	1	1	1	1	1	0
DATA ENTRY ▷▷	0	1	1	0	0	0
DATA ENTRY Rotary knob UP	0	0	0	0	0	0
DATA ENTRY Rotary knob DOWN	0	0	0	0	0	1
FREQUENCY △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 RCL A / STO A	1	0	0	0	0	1
AMPLITUDE RCL B / STO B	1	0	0	0	1	0
AMPLITUDE RCL C / STO C	1	0	0	0	1	1
AMPLITUDE RCL D / STO D	1	0	0	1	0	0
AMPLITUDE △	1	0	0	1	1	0
AMPLITUDE ▽	1	0	0	1	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 b which is set to "0" for 1ms 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 b signal as shown in Figure 5-3.

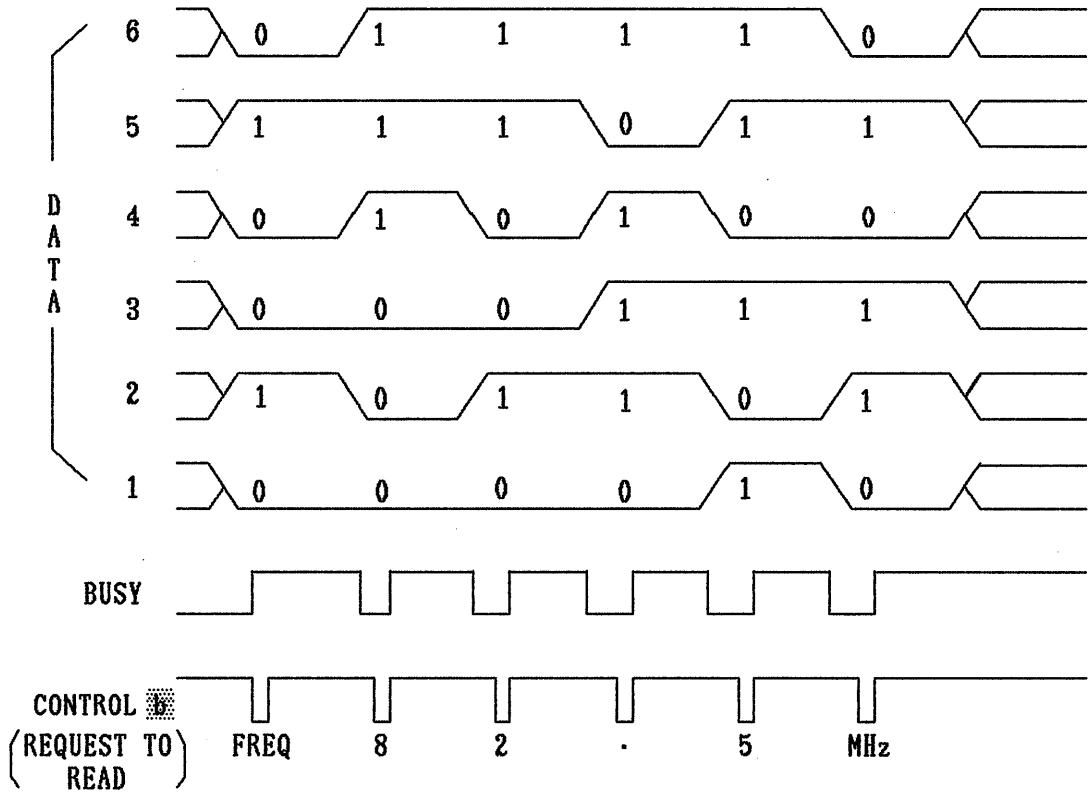


Figure 5-3

4) Finally, send "010110" for "MHz" with CONTROL b signal, and the data transmission is completed.
5) When the signal generator receives the last data, namely, "010110" for "MHz" and CONTROL b, 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.

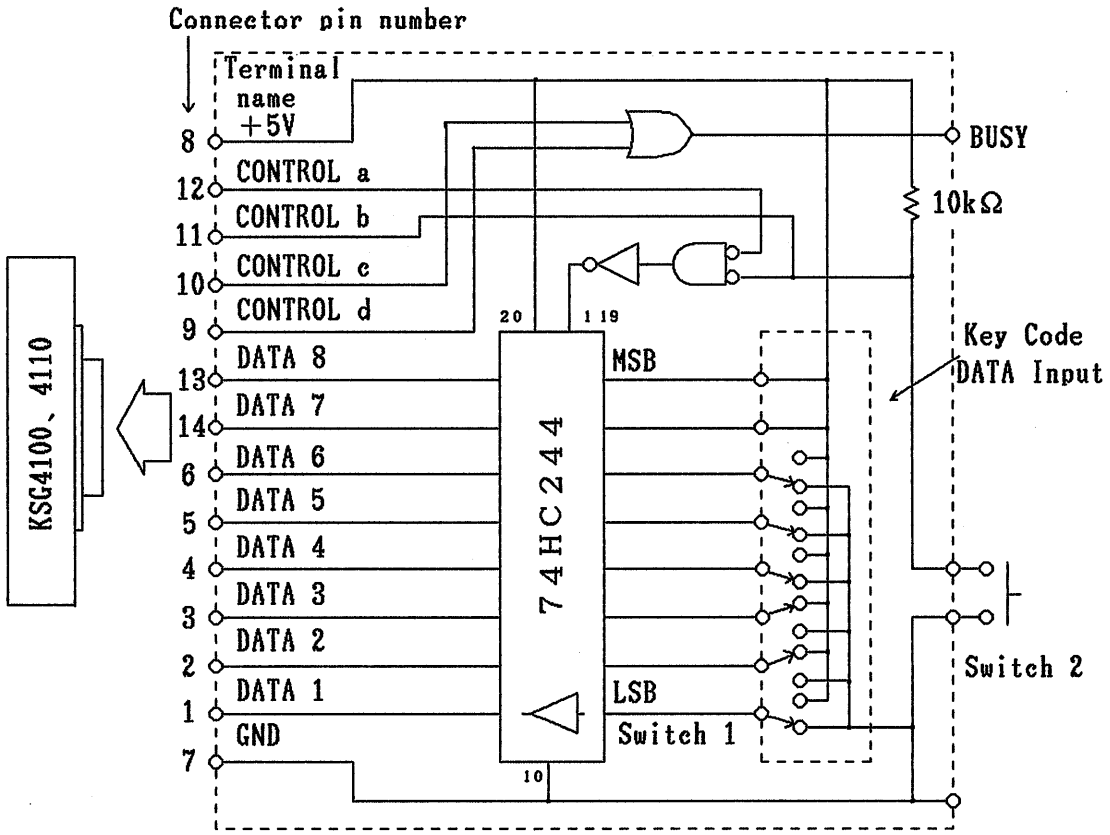


Figure 5-4

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 KSG4100/4110 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.

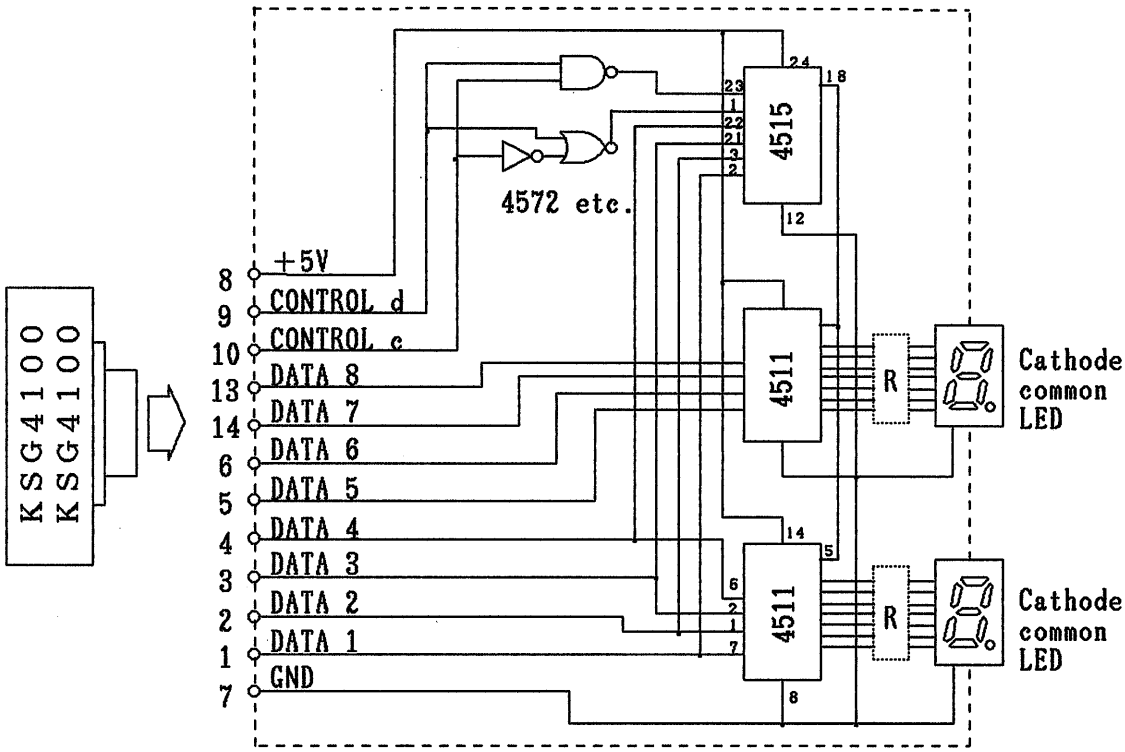


Figure 5-5

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. SWITCHING SIGNALS FOR OUTPUT IMPEDANCE, DUMMY ANTENNA, ETC.

6.1 RANGE OUTPUT RCA pin connector

When the carrier frequency is 35.000MHz to 110MHz, operation becomes "1", and a 5V, 50mA output is obtained. When the carrier frequency is 100kHz to 34.9999MHz, operation is "0".
Use is possible as an output impedance selector or to provide a control signal for a dummy antenna for a car radio, etc.
The 50mA current is used to drive the 2 reed relays.

7. BATTERY BACKUP AND INITIALZING CPU

This machine uses a battery backup for the memory. This battery may become discharge if the machine is not used for a long period of time. This machine is equipped with a charging circuit so the battery can be charged by merely turning on the power.
The memory backup battery is also greatly affected by ambient temperature and humidity and storage conditions.
The battery will maintain a 90% charge even after being used for 5 years. This is sufficient for use but if the battery should fail, replace it with a Sanyo Electric CADNIC BAKUP N-SB3.

[Battery Location and Replacement Method]
When the top cover of this machine is removed, four aluminum cases can be seen. The CPU printed circuit board is in the aluminum case mounted closestto the rear panel. The battery is held to the top of this circuit board by a band.
When replacing the battery, remove the single screw on the right side holding the aluminum case and the four screws on the left side of the case. Next, remove the case and replace the batteries.
When the battery replacement is completed, close the aluminum case, replace four screws on the left and the single screw on the right, turn the power switch on and press the initial set push-button switch once by inserting a screwdriver through the hole in the side of the aluminum case to initialize the CPU.

8. ACCESSORIES

(Optional)

8.1 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, 0.8φ 1 Turn

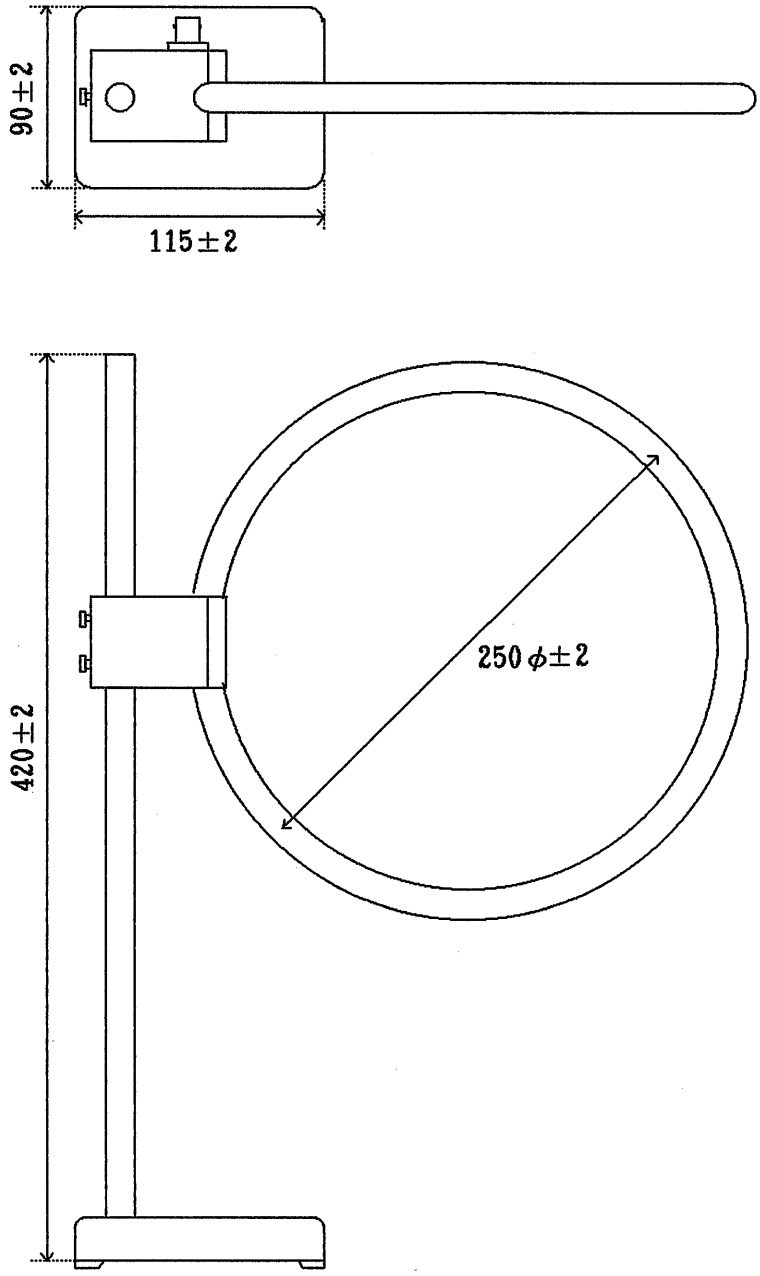


Figure 8-1 Outline drawing

8.2 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

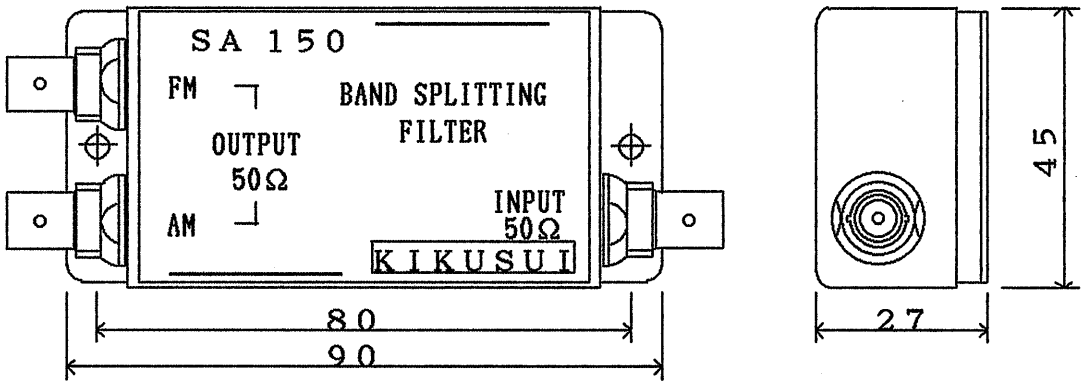
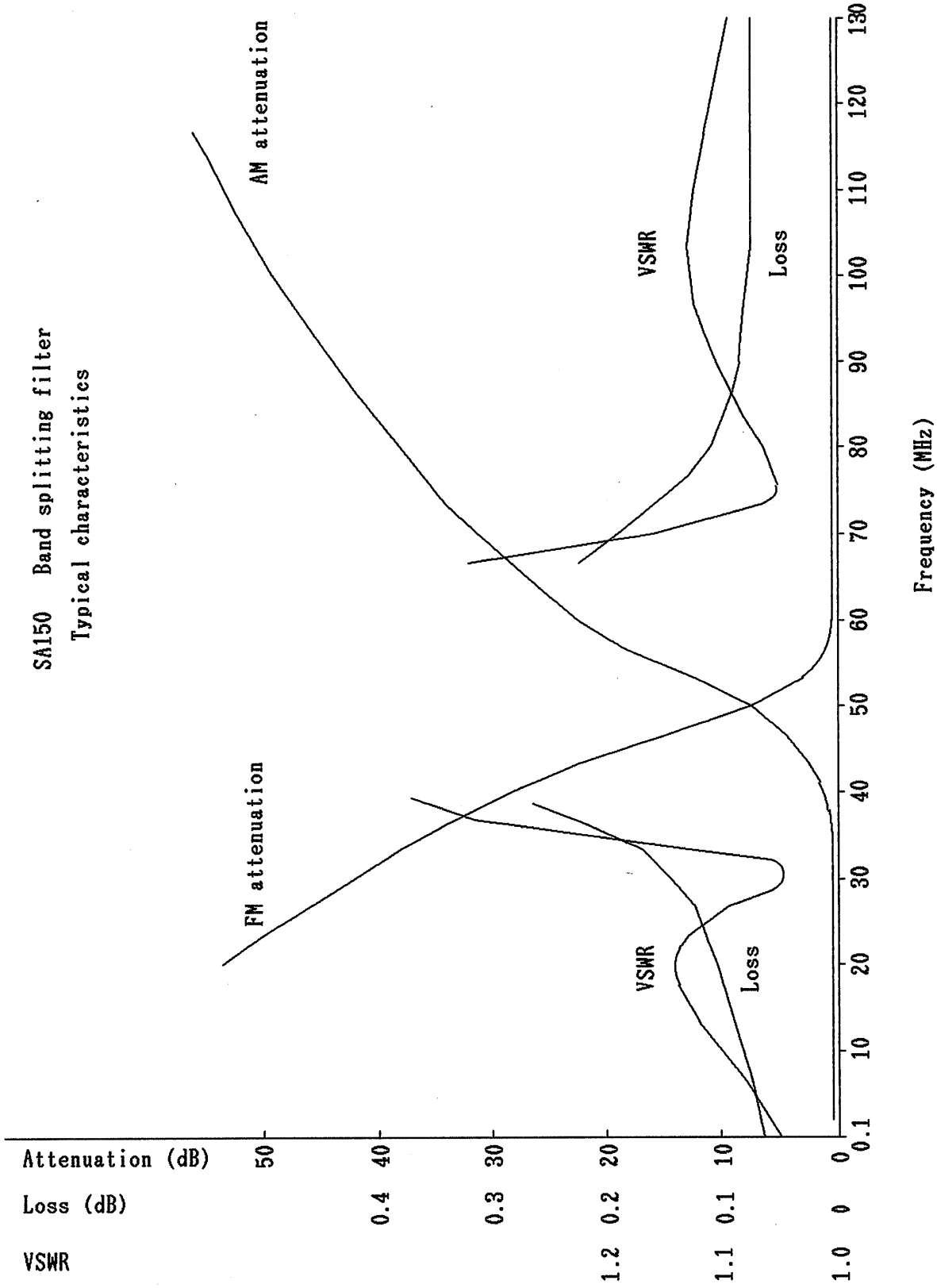


Figure 8-2

Figure 8-3


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 KGS4100 or KSG4100 need not be used.
Figure 8-4 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 8-2 for the external appearance and Figure 8-3 for typical characteristics.)

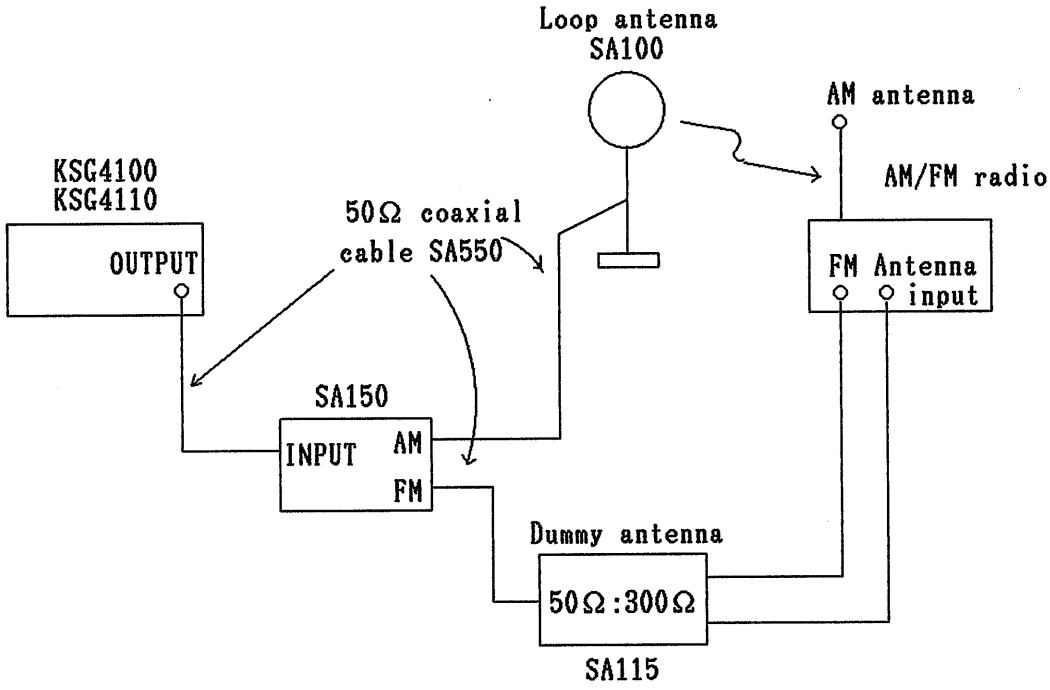


Figure 8-4

8.3 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 KSG4100 or KSG4110.

SA151: AM output impedance = 80Ω
FM output impedance = 75Ω
(Loaded type)
SA152: AM output impedance = 80Ω
FM output impedance = 75Ω
(Open-circuit type)

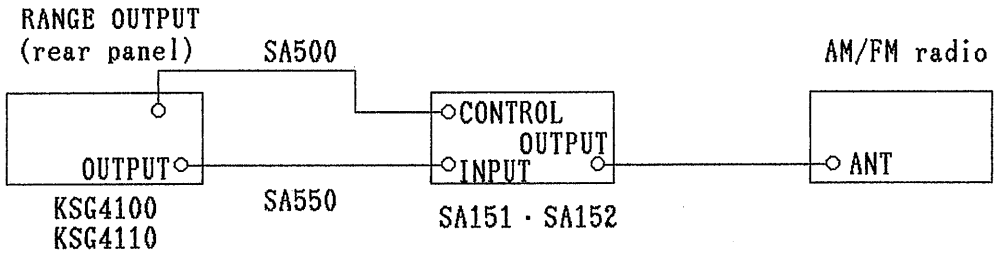


Figure 8-5 Connection Example

8.3.1 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

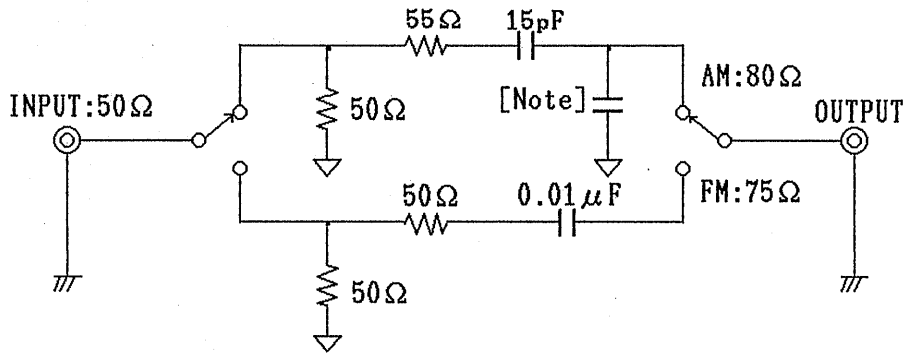


Figure 8-6

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

(3) Outline drawing

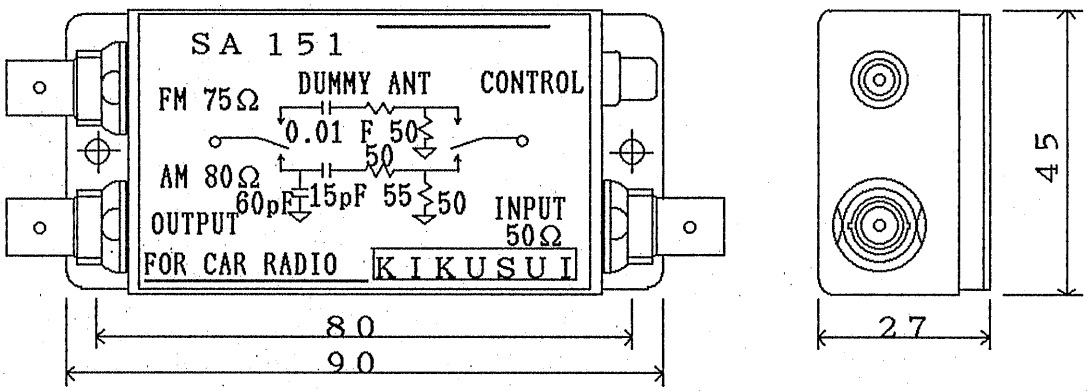


Figure 8-7

8.3.2 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

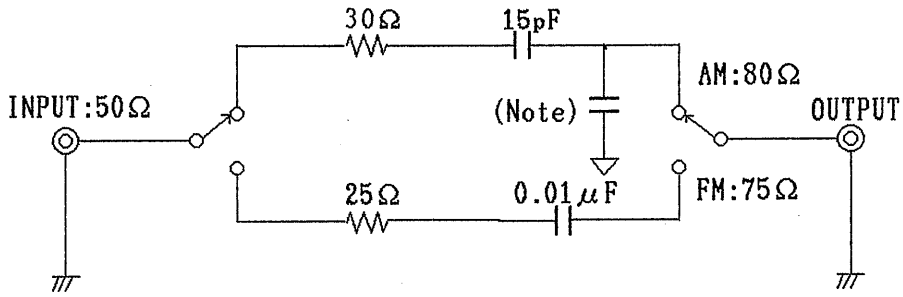


Figure 8-8

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

(3) Outline drawing

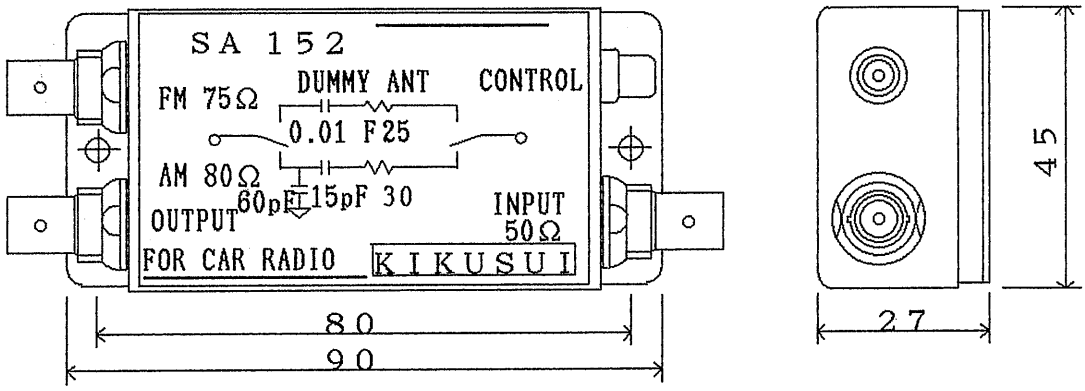


Figure 8-9

8.4 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.

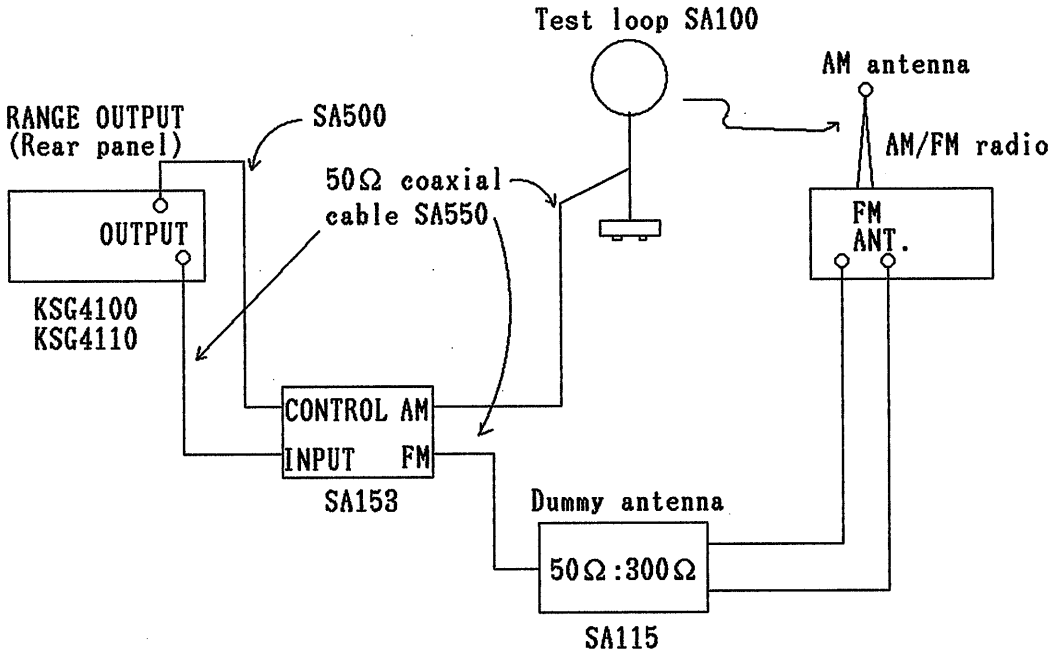


Figure 8-10 SA153 connection diagram

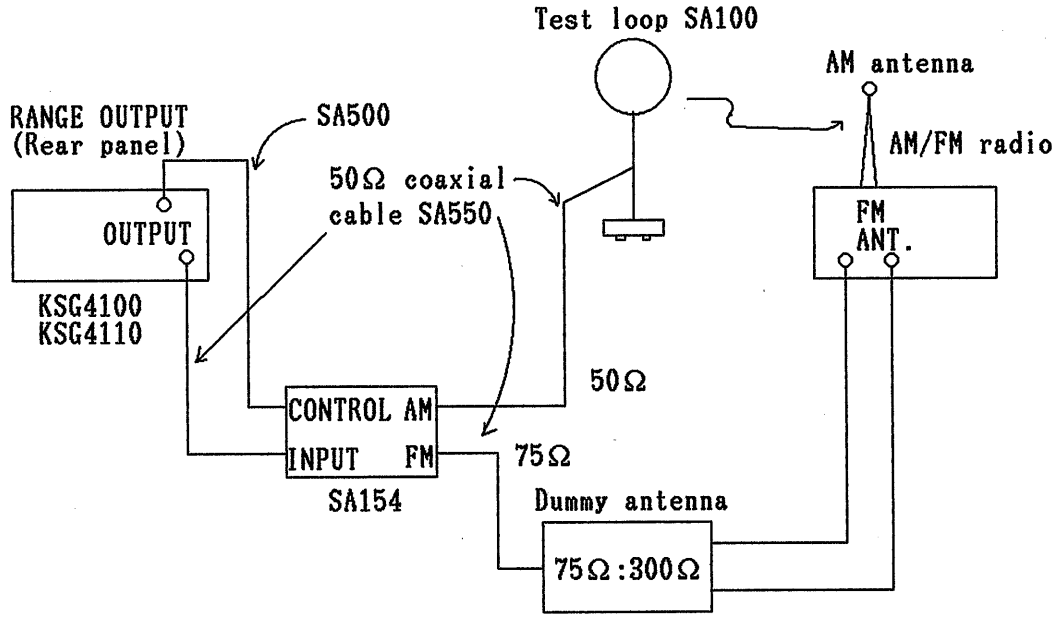


Figure 8-11 SA154 connection diagram

(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

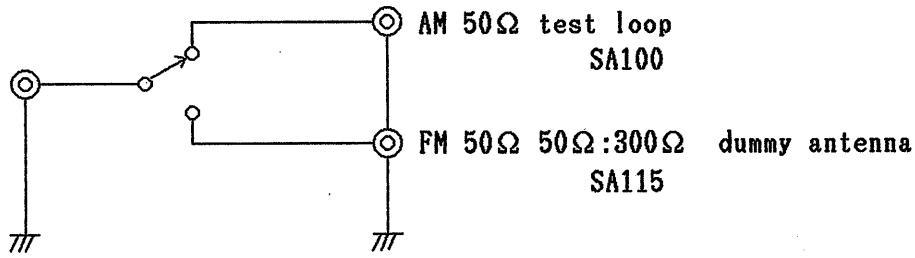


Figure 8-12

SA154

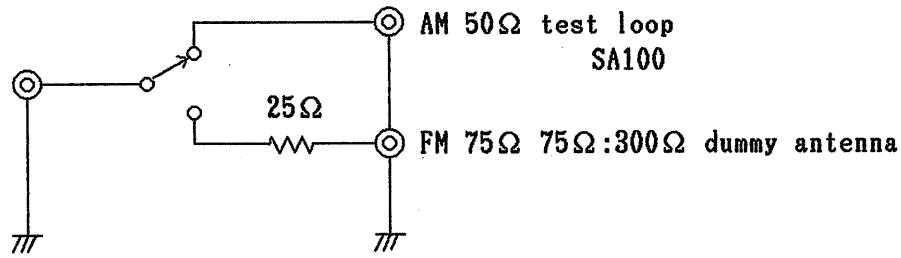


Figure 8-13

(3) Outline drawing

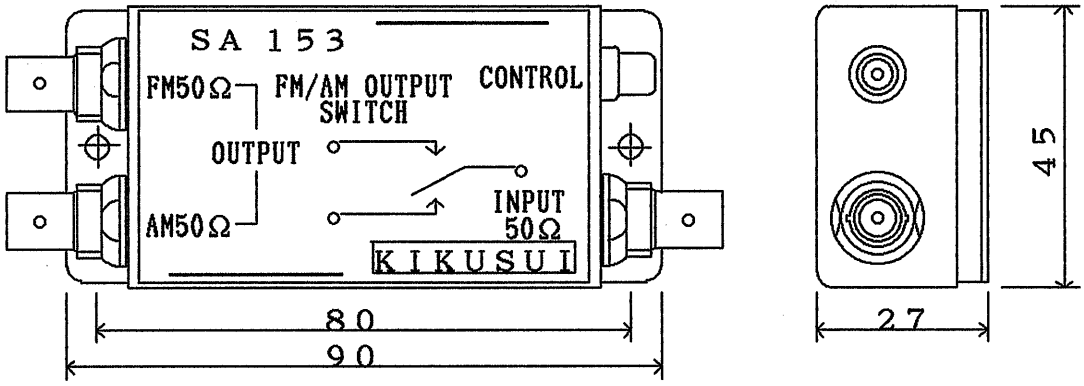


Figure 8-14 Outline drawing

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 8-15 because the balance of the dummy antenna for FM band is lost at point "a".

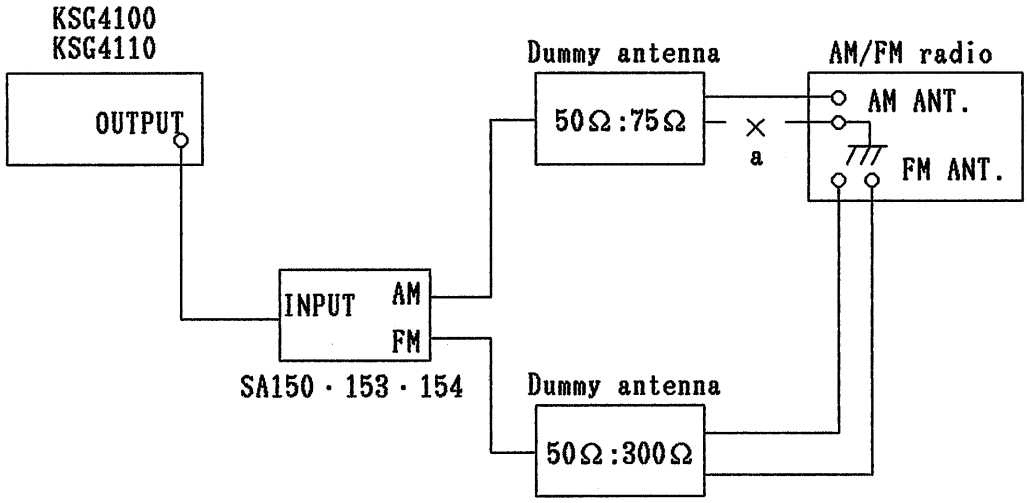


Figure 8-15