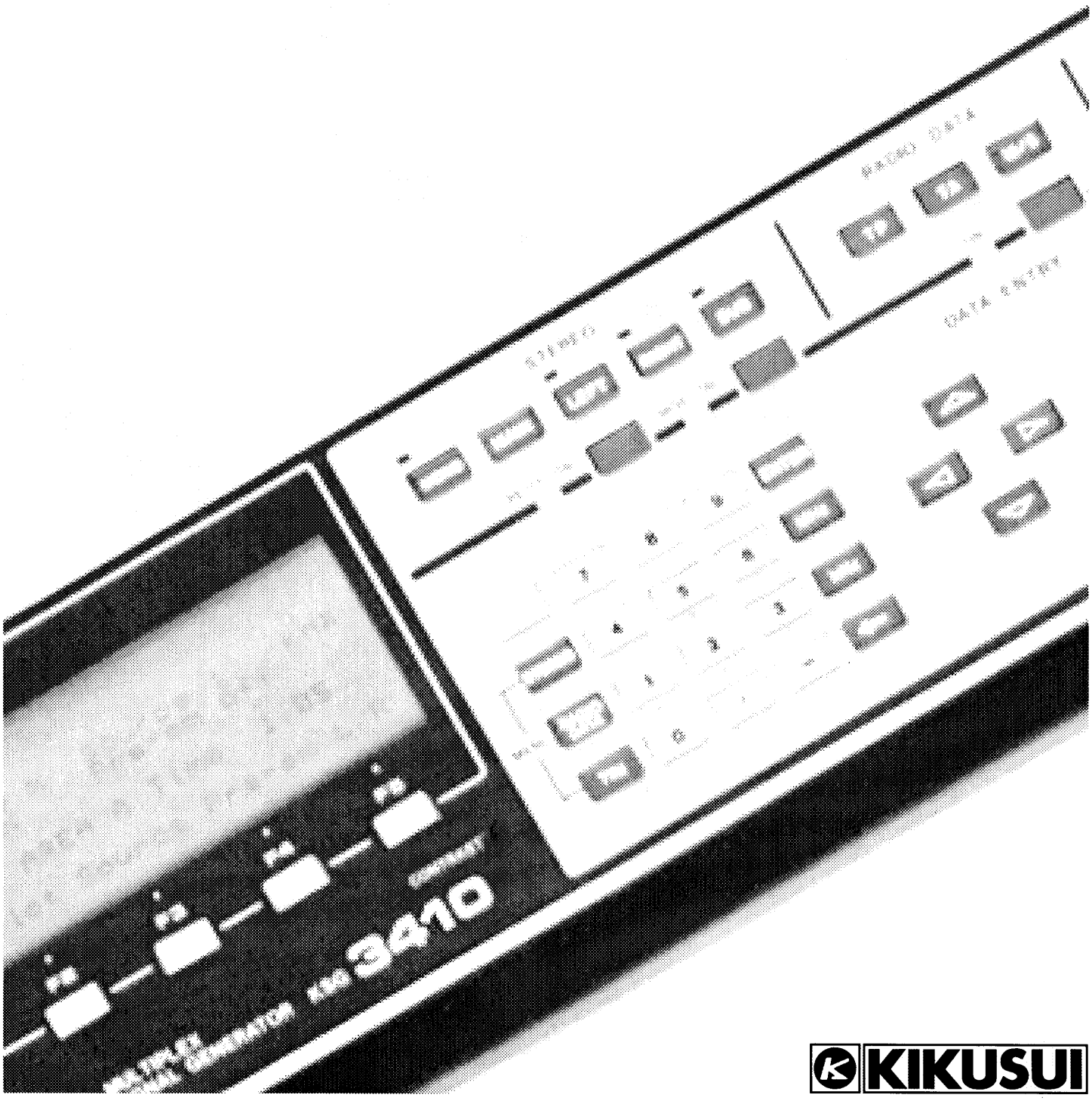
Electronic Test
Instruments &
Power Supplies

KSG Series

RDS/RBDS Radio Data Signal Generator

KSG3410

Operation Manual



KIKUSUI

■About this manual

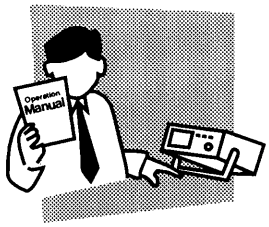
Please read this manual thoroughly beforehand to ensure correct operation of the product. Be sure to retain the manual so that you can use it whenever necessary. When the product is relocated, be sure the manual be included.

The contents of this manual, including the specifications of the instrument, are subject to change without notice.

Kikusui Part No. Z1-000-822 IB000332
Printed in Japan

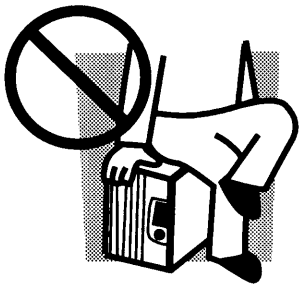
⚠ Safety Precautions

The following safety precautions must be observed to avoid fire hazard, electrical shock, accidents, and other failures. Keep them in mind and make sure that all of them are observed properly. Kikusui assumes no liability against any damages or problems resulting from negligence of the precautions.



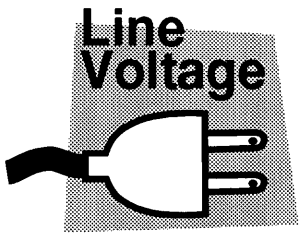
Users

- This product must be used only by qualified personnel who understand the contents of this operation manual.
- If it is handled by disqualified personnel, personal injury may result. Be sure to handle it under supervision of qualified personnel (those who have electrical knowledge.)



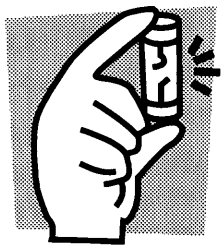
Purposes of use

- If the product is to be used for purposes not described in this manual, contact your Kikusui agent in advance.



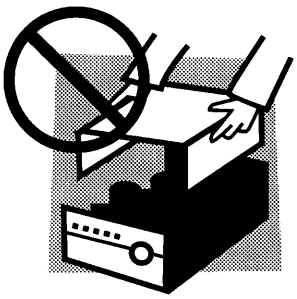
Input power

- Use the product with the specified input power voltage.
- For applying power, use the AC power cable provided. The shape of the plug differs according to the power voltage and areas. Use the cable which is suitable for the line voltage used.



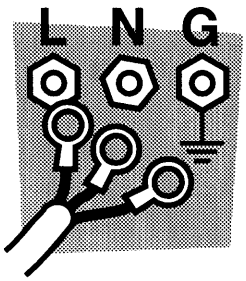
Fuse

- With products with a fuse holder on the exterior surface, the fuse can be replaced with a new one. When replacing a fuse, use the one which has appropriate shape, ratings, and specifications.



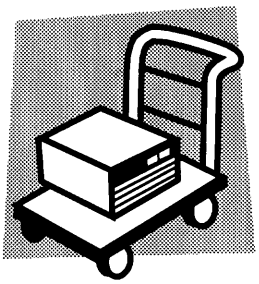
Cover

- There are parts inside the product which may cause physical hazards. Do not remove the external cover. If the cover must be removed, contact your Kikusui agent in advance.



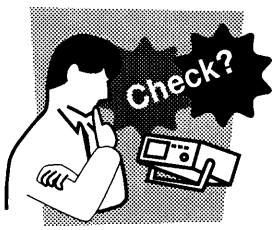
Installation

- When installing products be sure to observe "Precautions for Installation" described in this manual.
- To avoid electrical shock, connect the protective ground terminal to electrical ground (safety ground).
- When applying power to the products from a switchboard, be sure work is performed by a qualified and licensed electrician or is conducted under the direction of such a person.
- Be sure to use the AC power cable provided. Consult your Kikusui agent if other cable than included is to be used for some reason.
- When installing products with casters, be sure to lock the casters.



Relocation

- Turn off the power switch and then disconnect all cables when relocating the product.
- Use two or more persons when relocating the product which weights more than 20 kg. The weight of the products can be found on the rear panel of the product and/or in this operation manual.
- Use extra precautions such as using more people when relocating into or out of present locations including inclines or steps. Also handle carefully when relocating tall products as they can fall over easily.
- Be sure the operation manual be included when the product is relocated.



Operations

- Check that the AC input voltage setting and the fuse rating are satisfied and that there is no abnormality on the surface of the AC power cable. Be sure to unplug the AC power cable or stop applying power before checking.
- If any abnormality or failure is detected in the products, stop using it

immediately. Unplug the AC power cable or disconnect the AC power cable from the switchboard. Be careful not to allow the product to be used before it is completely repaired.

- For output wiring or load cables, use connection cables with larger current capacity.
- Do not disassemble or modify the product. If it must be modified, contact your Kikusui agent.

Maintenance and checking

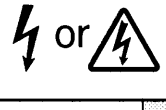
- To avoid electrical shock, be absolutely sure to unplug the AC power cable or stop applying power before performing maintenance or checking.
- Do not remove the cover when performing maintenance or checking. If the cover must be removed, contact your Kikusui agent in advance.
- To maintain performance and safe operation of the product, it is recommended that periodic maintenance, checking, cleaning, and calibration be performed.

Service

- Internal service is to be done by Kikusui service engineers. If the product must be adjusted or repaired, contact your Kikusui agent.

Safety Symbols

This operation manual and this product use the following safety symbols. Note the meaning of each of the symbols to ensure safe use of the product. (As using symbols depend on the product, all of symbols may not be used.)

	Indicates the presence of 1000V or higher. Never attempt to touch this part when the power switch of the product is turned on.
WARNING	Indicates the possibility of personal injury or death. Never fail to follow the operating procedure. Do not proceed beyond a WARNING sign until the noted conditions are fully understood and met.
CAUTION	Indicates the existence of damage to the product or connected equipment. Always follow the operating procedure. Do not proceed beyond a CAUTION sign until the indicted conditions are fully understood and met.
NOTE	Indicates additional information such as operating procedure.
Description	Describes technical terms used in this manual.
	Indicates action prohibited.
	Indicates general warning, caution, risk of danger. When this mark is indicated on the product, refer the relevant section of the Operation Manual.
	Indicates a grounding (earth) terminal.
	Indicates a chassis grounding terminal.

CONTENTS

Preface

Overview

The KSG3410 is a signal generator mounting Enhanced Other Networks (EON) conforming to EBU report "Tech 3244-E & Supplement No.4", which generates radio data system (RDS) signal, radio broadcast data system (RBDS) signal partly conforming to "UNITED STATES RBDS STANDARD" prescribed by National Radio System Committee (NRSC), and stereo signal superposed by traffic radio information (TRI or ARI) signal. In addition to the use as a modulator for RDS and RBDS IC chips and FM broadcast equipment, the KSG3410 can be used for adjustment, inspection, and characteristic measurement in prototype research divisions, e.g., for stereo demodulation (including RDS/RBDS) IC and adapters and high-grade FM stereo receivers or tuners with RDS/RBDS.

By connecting the output signal of the KSG3410 to the KSG4000 series FM-AM standard signal generator, stereo signal, RDS/RBDS signal, composite signal superposed by TRI signal can be supplied from high-frequency output to stereo receivers, RDS/RBDS receivers, and TRI receivers.

RDS/RBDS data and clock (1187.5 Hz) with TTL level are output from the rear panel of the KSG3410, and therefore it can be used to test the logic section of RDS/RBDS receivers.

Necessary data are created or edited directly on the LCD screen of the KSG3410, or on a personal computer connected to the KSG3410 via the GPIB or RS-232C interface. The output data are modified in real time.

In addition, up to 100 different data sets can be stored in the memory of the KSG3410. Using optional support software, data can be stored on disks for personal computers in the form of files.

The following shows an example system configuration.

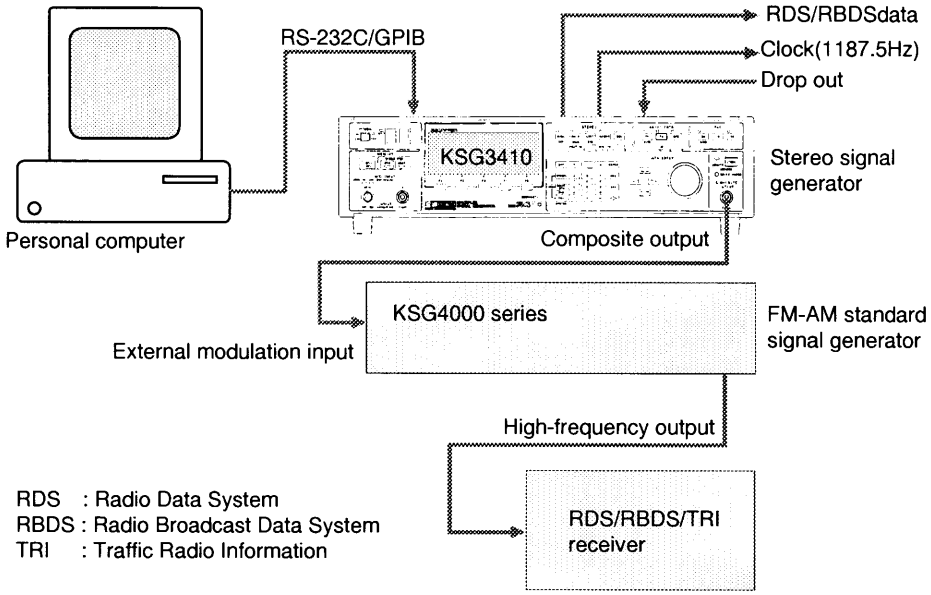


Fig.P-1 KSG3410 System Configuration

Features

■ Stereo signal section

- Separation of right and left channels is 72 dB or higher in mid-band (measured value)
- Excellent pilot phase stability eliminates the need for calibration
- Provided with seven internal modulation oscillator waveforms, realizing extremely low distortion of 0.005% or less (measured value)

  The internal modulation oscillator signals can be output, allowing the KSG3410 to be used as a spot oscillator with low distortion

■ RDS/RBDS signal

- Data can be created and edited on the LCD screen of the KSG3410

  Enhanced Other Networks (EON) data can be created and edited on the LCD screen
- Optional support software makes it possible to create and edit data on a personal computer
- Data includes a data set consisting of PI, PS, and AF and a group type sequence sending the data set, each of which can be created and edited

- Extracts necessary codes from data set based on the input data, configures group data, and then output it in real time (RBDS-specific codes are set from the panel)
- Check word and offset word are created automatically
- Data and group-type sequences can be inserted and deleted easily
- Makes it possible to set the phase of 57 kHz sub-carrier to 0° or 90° (with respect to the 3rd harmonics of the 19 kHz pilot signal) and to vary it from -10° to +10° in 1° steps
- Provided with excellent suppression ratio of the 57 kHz sub-carrier
- RDS/RBDS data and 1187.5 Hz synchronization clock signal can be output from the rear panel, and the clock output can be inverted

■ Operation

- Various data can be set and modified easily on the LCD screen using the numeric keypads and the rotary knob

■ Memory function

- All panel settings and RDS/RBDS data can be stored in memory, allowing store and recall of 100 different points

■ External control

- Provided with the GPIB and RS-232C interfaces as standard
- Almost panel operations can be controlled remotely

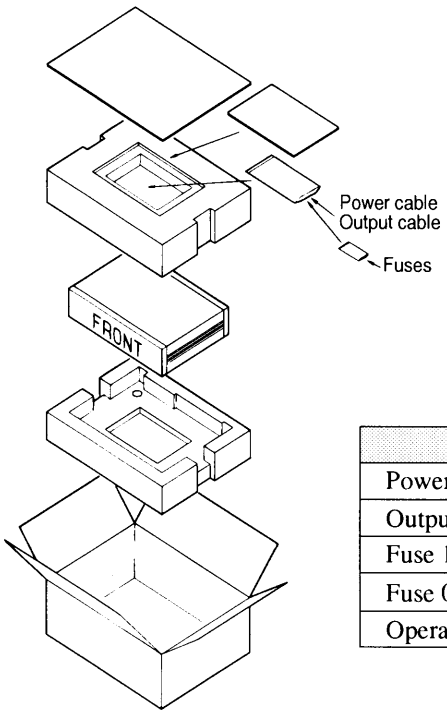
Chapter 1 Setup

This chapter provides basic information before actual operations such as unpacking, installation, etc.

Contents

1.1 Checking at Unpacking

When you unpack the product, make sure that you have all the parts and that none have been damaged during transportation. If any parts is damaged or missing, contact your Kikusui agent.



Accessory	Qty.	Check
Power cable	1	
Output cable (SA550)	1	
Fuse 1.0 A	1	
Fuse 0.5 A	1	
Operation manual	1	

Fig.1-1 Packing/Unpacking the Parts

CAUTION

- When transporting the product, be sure to use the original packing materials. If they are missing, contact your Kikusui agent.
- When packing the product, remove the power cable and all other connection cables.

1.2 Precautions for Installation

The following are the precautions for installation which must be observed.

■ Do not use in explosive atmosphere

To avoid explosion or fire hazard, do not use the product in any areas exposed to inflammable materials such as alcohol or thinner.

■ Do not place the product in high-temperature areas or areas exposed to direct sunlight

Do not place the product near heating element, or heater, or in areas exposed to rapid temperature changes.

Operating temperature range: 5℃ to 35℃

Maximum allowable temperature range: 0℃ to 40℃

■ Do not place the product in humid areas

Do not place the product in any humid areas such as near a water heater, humidifier, or water tap.

Operating humidity range: 10% to 80%

■ Do not place the product in any areas exposed to corrosive gases or sulfuric mist

■ Do not place the product in dusty areas

■ Do not use in any areas which are poorly ventilated

Leave an open space around the product to obtain air flow.

■ Do not place the product in any places where the surface tilted or vibrated

■ Do not use the product in any areas exposed to strong magnetic or electric fields.

1.3 Checking the Input Fuse

When replacing a fuse with a new one, use a fuse conforming to the input current ratings. (See the LINE VOLTAGE table on the rear panel.)

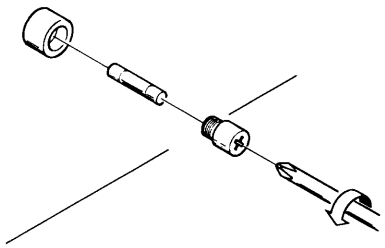


Fig.1-2 Checking the Input Fuse

1.4 Checking the AC Input Power

Make sure that the VOLTAGE SELECTOR is set to the power voltage to be used. (See the LINE VOLTAGE table on the rear panel.)

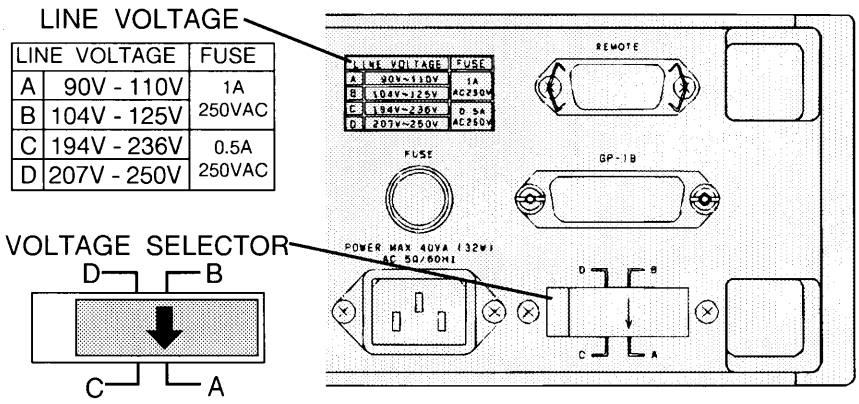


Fig.1-3 Checking the Power Requirements (Rear Panel)

Chapter 2 Operations

This chapter describes the power-on sequence, basic operations common to all operation modes, each of the STEREO, RDS/RBDS, and TRI modes, and then memory functions.

Contents

2.1 Turning the Power On

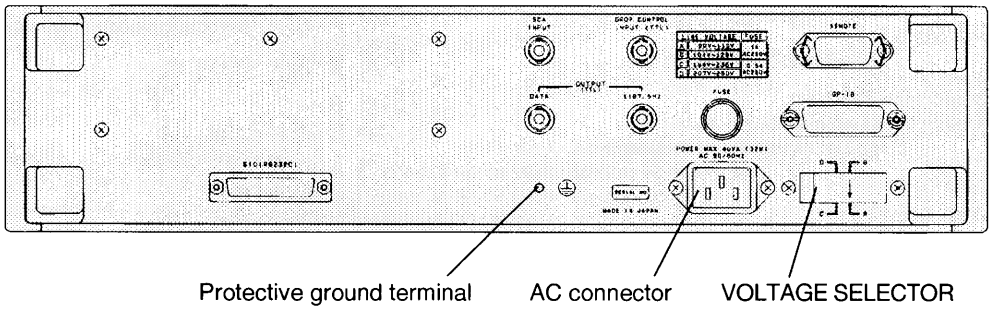


Fig.2-1 Rear Panel

① Make sure that the 【POWER】 switch is turned off.

② Connect the protective ground terminal to a good ground.

③ Make sure that VOLTAGE SELECTOR on the rear panel is set to the power voltage to be used. (If the setting is wrong, make correct setting.)

④ Connect the power cable to the AC connector on the rear panel.

⑤ Plug the power cable into the correct power line.

CAUTION

- If VOLTAGE SELECTOR setting is wrong, the fuse may be damaged.

⑥ Make sure that nothing is connected to the 【AF/L】 and 【R】 connectors on the front panel. (Connection will be made upon completion of panel setting.)

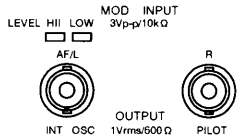


Fig.2-2 【AF/L】 and 【R】 Connectors

CAUTION

- Each of the 【AF/L】 and 【R】 connectors is in the output or input mode depending on the panel settings. If the panel settings do not agree with the usage, signals may be in conflict with each other and the KSG3410 be damaged.

⑦ Turn on the 【POWER】 switch.

All indicators on the front panel once go on. Then the KSG3410 is put in the condition existed before the power is turned off, except the 【LEVEL HI/LO】 indicator.

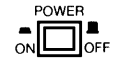


Fig.2-3 【POWER】 Switch

Initial Settings

At the time of shipment, the following contents are stored in memory (00 to 99).

- Stereo modulation : Mod 85%
- Pilot level : 10%
- Internal modulation oscillator : 1kHz
- Pre-emphasis : off
- RDS/RBDS data : all 0
- Traffic information : SK 4.7%
- DK : 30%
- BK : 60%
- Area : A
- Scan : off
- Time : 1.0s
- Tone : off

In this case, the contents of the RDS/RBDS data output from the KSG3410 are as follows:

- Group type : 15B
- PI : 0000
- TP : 0
- TA : 0
- PTY : 0
- M/S : 0
- DI : 0

2.2 Basic Operations

The KSG3410 is provided with three major operating modes: STEREO, RADIO DATA, and TRI. The RADIO DATA mode has three modes: RDS/RBDS, EON, and RDS SYS.

Each of above operating modes can directly be entered from any mode by the following key operations:

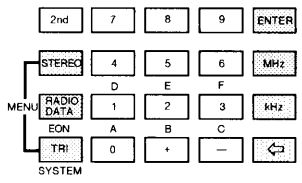


Fig.2-4 Mode Switching

Mode	Key operation
STEREO	【STEREO】
RADIO DATA	【RADIO DATA】
TRI	【TRI】
EON	【2nd】 【EON (RADIO DATA)】
RDS SYS	【2nd】 【SYSTEM (TRI)】

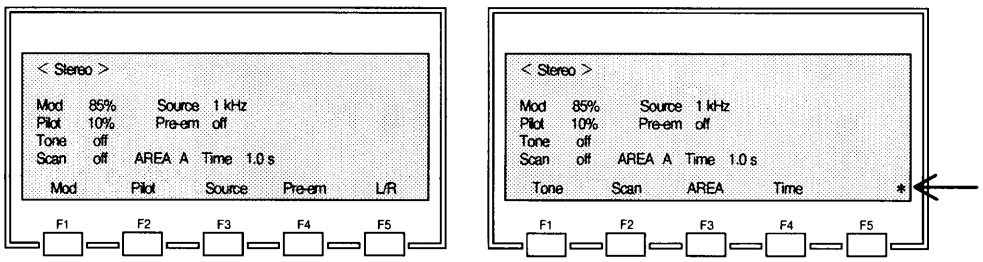
2.2.1 Common Items for the LCD Screen

- The "<" and ">" marks in the selection menu above the function keys (F1 to F5) indicates that screen switching is to be performed when the function is selected.

  With functions without the < or > mark, cursor movement to the corresponding setting item or on/off switching is performed.

  Cursor movement to setting items can also be performed with the 【△】, 【▽】, 【▷】, and 【◁】 keys.
- When the 【2nd】 key is pressed, the "＊" mark appears at the lower right corner of the screen, entering the execution mode of the functions displayed in yellow or the second function operation mode. When the 【2nd】 key is pressed again, these modes are canceled.

  To switch between STEREO, RADIO DATA, and TRI in the shift function mode, press the 【2nd】 key to exit the shift function mode or press the key twice.
- The screen display may be disturbed by, for instance, rotating the rotary knob rapidly. In such a case, press the 【⇦】 key to update the screen.



When the 【2nd】 key is pressed

Fig.2-5 LCD Screen

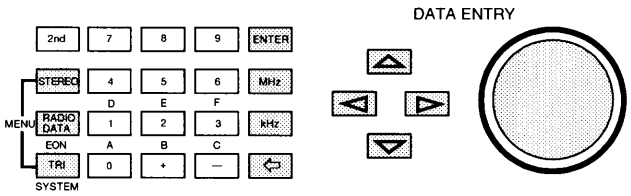


Fig.2-6 Data Entry

2.2.2 Output Level Setting

The following describes the procedure for setting the output level of the KSG3410 when a standard FM signal generator (referred to as SG hereafter) is connected to it.

NOTE

- The modulation input level of the KSG4000 series is about 3Vp-p; however, the value differs from model to model. Adjustment on each model is necessary to obtain an appropriate level.

① When the monaural/stereo modulation level display is on, press the 【2nd】 and 【TRI(SYSTEM)】 keys to turn on the output level display.

NOTE

- When the monaural modulation level is other than 100%, the modulation input level of the SG cannot be set correctly.

② Press the 【2nd】 and 【MONO(SET)】 keys to make the following output level setting (the fingertip setting function):
  - Monaural modulation level : 100%
  - Internal modulation oscillator : 1 kHz
  - Output level : 3.00 Vp-p

③ Connect the 【COMPOSITE OUTPUT】 connector and the external modulation input terminal of the SG.

④ Using the rotary knob, adjust the output level so that an appropriate level of SG's external modulation input be obtained.

2.2.3 Fingertip Setting Function

The KSG3410 allows the following five types of setting operations by means of panel key combinations.

1) When the 【2nd】 and 【MONO (SET)】 keys are pressed, the following output level setting is made, allowing the external modulation input level of the SG to be set.

   However, this is valid only when pre-emphasis is off. See subsection 2.3.5, "Using Pre-Emphasis".
   - Monaural modulation level : 100%
   - 【MOD ON】 indicator : On
   - Internal modulation signal : 1 kHz
   - Output level : 3.00 Vp-p

   Change the output level to 3.00 Vp-p with the rotary knob and then set the external modulation input level of the SG to an appropriate level, or set 100%=75kHz deviation.

2) When the 【2nd】 and 【MAIN (100%)】 keys are pressed, the following output level setting is made. A signal consisting of the sum of the stereo modulation level and the pilot level is output.
   - Stereo modulation level : 90%
   - Pilot level : 10%
   - 【MAIN】 indicator : On
   - 【PILOT ON】 indicator : On
   - 【MOD ON】 indicator : On

NOTE

- Each time switching between MAIN, LEFT, RIGHT, and

SUB is made, 【LEVEL HI/LO】 and 【LEVEL HI/LO】 may go on alternately because the range between HI and LO is very small. This does not generate any major errors and no problem occurs on the use of the KSG3410. However, when the 【MONO】 key is selected, monaural 90% modulation results and therefore 【LEVEL LO】 goes on.

3) When the 【2nd】 and 【LEFT (30%)】 keys are pressed, the following output level setting is made. A 37% signal consisting of the sum of 27% stereo modulation level and 10% pilot level is output.
   - Stereo modulation level : 27%
   - Pilot level : 10%
   - 【MAIN】 indicator : On
   - 【PILOT ON】 indicator : On
   - 【MOD ON】 indicator : On

4) When the 【2nd】 and 【TP(100%)】 keys are pressed, the following output level setting is made. A 99.7% composite signal is output from the 【COMPOSITE OUTPUT】 connector.
   - Stereo modulation level : 85%
   - Pilot level : 10%
   - RDS/RBDS modulation level : 1.6%
   - SK modulation level : 4.7%
   - DK modulation level : 30%
   - BK modulation level : 60%
   - 【MAIN】 indicator : On
   - 【PILOT ON】 indicator : On
   - 【MOD ON】 indicator : On
   - 【RDS/RBDS】 indicator : On
   - 【SK】 indicator : On
   - 【DK】 indicator : On
   - 【BK】 indicator : On

5) When the 【2nd】 and 【SK(100%)】 keys are pressed, the following output level setting is made. A 100.3% composite signal is output from the 【COMPOSITE OUTPUT】 connector.
   - Stereo modulation level : 85%
   - Pilot level : 10%
   - SK modulation level : 5.3%
   - DK modulation level : 30%
   - BK modulation level : 60%
   - 【MAIN】 indicator : On
   - 【PILOT ON】 indicator : On
   - 【MOD ON】 indicator : On
   - 【SK】 indicator : On
   - 【DK】 indicator : On
   - 【BK】 indicator : On

When the 【BK】 indicator goes off, the DK signal alone results; when only the 【BK】 indicator goes on, the BK signal alone results.

2.3 STEREO Mode Setting

When the 【STEREO】 key is pressed, the <Stereo> screen is displayed. Fig.2-8 shows the key operation flow for the screen.

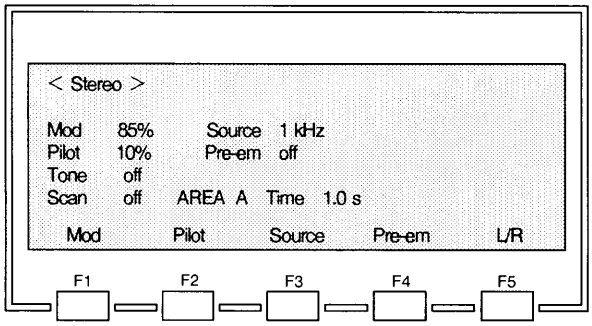


Fig.2-7 <Stereo> Screen

<Stereo>

Mod	【F1】	Modulation level 0 to100%
Pilot	【F2】	Pilot level 0 to15%
Source	【F3】	EXT, 30Hz to 15kHz
Pre-em	【F4】	off, 25 μ s, 50 μ s, 75 μ s
L/R	【F5】	EXT L/R
*Tone	【F1】	on/off
*Scan	【F2】	on/off
*AREA	【F3】	Areas A to F
*Time	【F4】	pass, 0.1 to 12.0s

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-8 Key Operation Flow for the <Stereo> Screen

2.3.1 <Stereo> Screen

■ Mod

Sets the monaural/stereo modulation level to 0 to 100% in 0.5% steps. When pre-emphasis is on, sets it to 0 to 10%.

The numeric keypad or rotary knob is used for setting. For details, see subsection 2.3.2, "Monaural/Stereo Modulation Level Setting".

■ Pilot

Sets the pilot level to 0 to 15% in 1% steps.

The numeric keypad or rotary knob is used for setting. For details, see subsection 2.3.3, "Pilot Level Setting".

■ Source

Sets external modulation (EXT) or the internal modulation frequency as follows with rotary knob operation:

EXT, 30Hz, 100Hz, 400Hz, 1kHz, 6.3kHz, 10kHz, 15kHz

When the [L/R](【F5】) key is pressed, the 【LEFT】 and 【RIGHT】 keys go on at the same time and stereo modulation input is enabled which uses the two external modulation signals supplied to the 【AF/L】 and 【R】 input connectors.

Check the appropriate input level (about 3Vp-p) by means of the 【LEVEL HI-LO】 indicator.

When no signal is supplied to the 【AF/L】 and 【R】 input connectors, 【LO】 of 【LEVEL HI-LO】 goes on.

For details, see subsection 2.3.4, "Modulation Setting".

■ Pre-em

Sets pre-emphasis as follows with rotary knob operation:

off, 25 μ s, 50 μ s, 75 μ s

When pre-emphasis is used, the monaural/stereo modulation level decreases by 20 dB and therefore the Mod display becomes "1/10".

For details, see subsection 2.3.5, "Using Pre-Emphasis".

■ L/R

Enables stereo modulation input which uses the two external modulation signals supplied to the 【AF/L】 and 【R】 input connectors.

■ Tone

Turns on or off single output of the announce signal and area signal of the TRI signal. In this case, modulation level setting is possible but the stereo modulator function does not work.

For details, see subsection 2.5.3, "Output of the DK or BK Signal Only (Tone Output)".

■ Scan

Turns on or off scan of the area signal.

■ AREA

Switches the area identification signal (frequency) from A to F by means of the 【2nd】 and 【A】 to 【F】 keys or rotary knob.

■ Time

Sets the scan time for the area signal in the range from 0.1s to 12.0s in 0.1s steps by means of the numeric keypad or rotary knob.

NOTE

- 0.1s corresponds to approx. 87.5 ms. Therefore 12.0s corresponds to 87.5 ms×120 = 10500 ms (approx.10.5 s). Note that the value does not indicate an accurate time.

2.3.2 Setting the Monaural/Stereo Modulation Level

■ Setting by the rotary knob

Press the 【STEREO】 key to display the <Stereo> screen. If the cursor is not located on the monaural/stereo modulation level setting, move it to the modulation level setting using the [Mod](【F1】), 【◁】 , 【▷】 , 【△】 , or 【▽】 key. The digit at the cursor position or higher digits of the modulation level can be increased or decreased.

■ Setting by the numeric keypad

Move the cursor to the monaural/stereo modulation level setting and set the value using the numeric keypad and the 【ENTER】 key. For example, to set it to 80%, press 【8】 【0】 , and then 【ENTER】 . The monaural/stereo modulation level can be set within the range from 0 to 100%.

■ Switching the monaural/stereo modulation mode

To switch the monaural/stereo modulation mode, press the 【MONO】 , 【MAIN】 , 【LEFT】 , 【RIGHT】 , or 【SUB】 key. In this case the 【MOD ON】 indicator goes on. When the 【MOD ON】 key is on, the 【PILOT ON】 key cannot be turned on.

2.3.3 Setting the Pilot Level

In the stereo modulation mode, the pilot signal can be turned on or off by pressing the 【PILOT ON】 key.

When the cursor is located on the pilot level setting, the pilot level can be set using the rotary knob or numeric keypad even if the 【PILOT ON】 key is off. The pilot level can be set within the range from 0 to 15%.

■ Setting by the rotary knob

Press the 【STEREO】 key to display the <Stereo> screen. If the cursor is not located on the pilot level setting, move it to the pilot level setting using the [Pilot](【F2】), 【◁】 , 【▷】 , 【△】 , or 【▽】 key. The digit at the cursor

position or higher digits of the pilot level can be increased or decreased.

■ Setting by the numeric keypad

Move the cursor to the pilot level setting and set the value using the numeric keypad and the 【ENTER】 key.

2.3.4 Modulation Setting

2.3.4.1 Modulation Source

Press the 【STEREO】 key to display the <Stereo> screen. Press the [Source] (【F3】) key to move the cursor to the modulation source setting.

■ Setting the internal modulation oscillation frequency

Using the rotary knob, select 30Hz, 100Hz, 400Hz, 1kHz, 6.3kHz, 10kHz, or 15kHz.

■ Setting external modulation

1) External modulation by a single signal

Set [Source] to "EXT" using the rotary knob. Enter an appropriate level to the 【AF/L】 input connector and then set the external signal source input level in the location where both 【LEVEL HI】 and 【LEVEL LO】 go off.

2) External modulation by two signals

When the [L/R](【F5】) key is pressed, the 【LEFT】 and 【RIGHT】 keys go on at the same time, allowing the L side stereo modulation signal of the external signal source to be supplied to the [AF/L] connector and the R side stereo modulation signal to be supplied to the 【R】 connector.

In the same manner as 1), set the external signal source input level in the location where both 【LEVEL HI】 and 【LEVEL LO】 go off.

To check the input level of the 【R】 connector, connect the signal to the 【AF/L】 connector and then set an appropriate level using 【LEVEL HI】 and 【LEVEL LO】 .

2.3.4.2 Connecting the External Modulation Signal Source

■ Connection and setting

The external modulation signal source with a single signal is connected to the 【AF/L】 input connector on the panel. The input impedance is approx. 10k Ω and the appropriate input level is about 3 Vp-p.

Set the external signal source input level in the location where both 【LEVEL HI】 and 【LEVEL LO】 go off. The desired modulation level can be set simply by changing the setting level of the LCD display. Therefore, it is not necessary to adjust the external modulation signal source level each time the modulation level or modulation mode is changed.

If the external modulation signal source level is too low, the 【LEVEL LO】 indicator goes on; if it is too high, the 【LEVEL HI】 indicator goes on.

The above descriptions apply to the external stereo modulation signal source with two signals connected to the 【R】 input connector.

■ Setting range

When the external modulation input level is adjusted to a value between LO and HI, both the 【LEVEL LO】 and 【LEVEL HI】 indicators go off and the error of the set value falls within ±2%. With reference to the HI and LO levels, the modulation level is set to a digital set value internally. Once the input level of the external modulation signal source is set, it is set, without the need of adjustment, to a desired modulation level by means of the digital setting function of the KSG3410.

The relationship between the input level and the monaural/stereo modulation level is shown in Fig.2-9. As shown in this figure, the input level range operates linearly with respect to the input level.

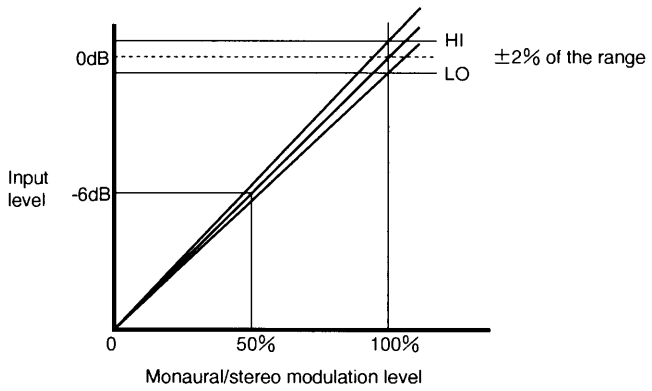


Fig.2-9 Set Input Level and Monaural/Stereo Modulation Level

For example, when the input level is set to a value between LO and HI and the display set to 100%, and then the input level attenuated by -6 dB, a modulation level of 50% with 100% display results. In this case, the 【LO】 indicator goes on and a normal 50% modulation level is obtained.

In addition, the same relationship as above applies to the external modulation input level of the SG. When the output level is set, the range between LO and HI performs peak operation both for composite signals and single signals. When the input level is set within an appropriate range between LO and HI, the 【LO】 and 【HI】 indicators go off. Each time switching between the 【MAIN】, 【LEFT】, 【RIGHT】, and 【SUB】 keys is made, the 【LO】 and 【HI】 indicators may go on alternately because of the very narrow range

between LO and HI. In this case, no major error results and no problem occurs on the use of the KSG3410.

NOTE

- As for the peak level of the composite signal output (MAIN signal + SUB signal + pilot signal), two periods of 38 kHz and one period of 19 kHz are added. Therefore the peak level of <LEFT signal + RIGHT signal + SUB signal + pilot signal> is 97% with respect to that of <MAIN signal + pilot signal>, resulting in 0.26 dB reduction in amplitude level ratio. For this reason, the 【LO】 indicator goes on more frequently through 【LEFT】, 【RIGHT】, and 【SUB】 key operation.

2.3.5 Using Pre-Emphasis

Pre-emphasis operates in either of the monaural, stereo, internal modulation, and external modulation modes.

Press the 【STEREO】 key to display the <Stereo> screen. Then press the [Pre-em](【F4】) key to move the cursor to the pre-emphasis setting. Using the rotary knob, select the value from off, 25 μ s, 50 μ s, and 75 μ s.

The standard pre-emphasis characteristic is shown in Fig.2-10. The 20 dB line in the figure stands for the condition under which pre-emphasis is off. When pre-emphasis is set, 20 dB reduction results at the flat portion in lower bands (400 Hz or lower).

For example, pre-emphasis is set to 10% with respect to 100% monaural modulation level. In addition, the overall modulation level after pre-emphasis setting is 19% (= 9% stereo modulation level + 10% pilot level) with respect to 90% stereo modulation level and 10% pilot level.

The RDS/RBDS and TRI modulation levels are, in the same manner as the pilot level above, added to the overall modulation level.

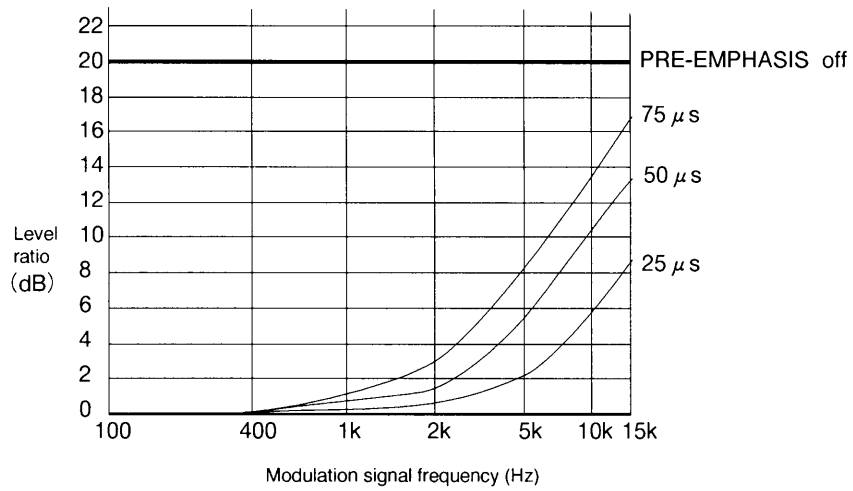


Fig.2-10 Standard Pre-Emphasis Characteristic

2.4 RDS/RBDS Mode Setting

The menu configuration for the RDS/RBDS mode is shown in Fig.2-11.

When the 【RADIO DATA】 key is pressed, the <Radio Data System main> screen appears.

When the 【2nd】 and 【EON(RADIO DATA)】 keys are pressed, the <Enhanced Other Net.XX XXX> screen can directly be displayed.

When the 【2nd】 and 【SYSTEM(TRI)】 keys are pressed, the <Radio Data System SYS> screen can be displayed.

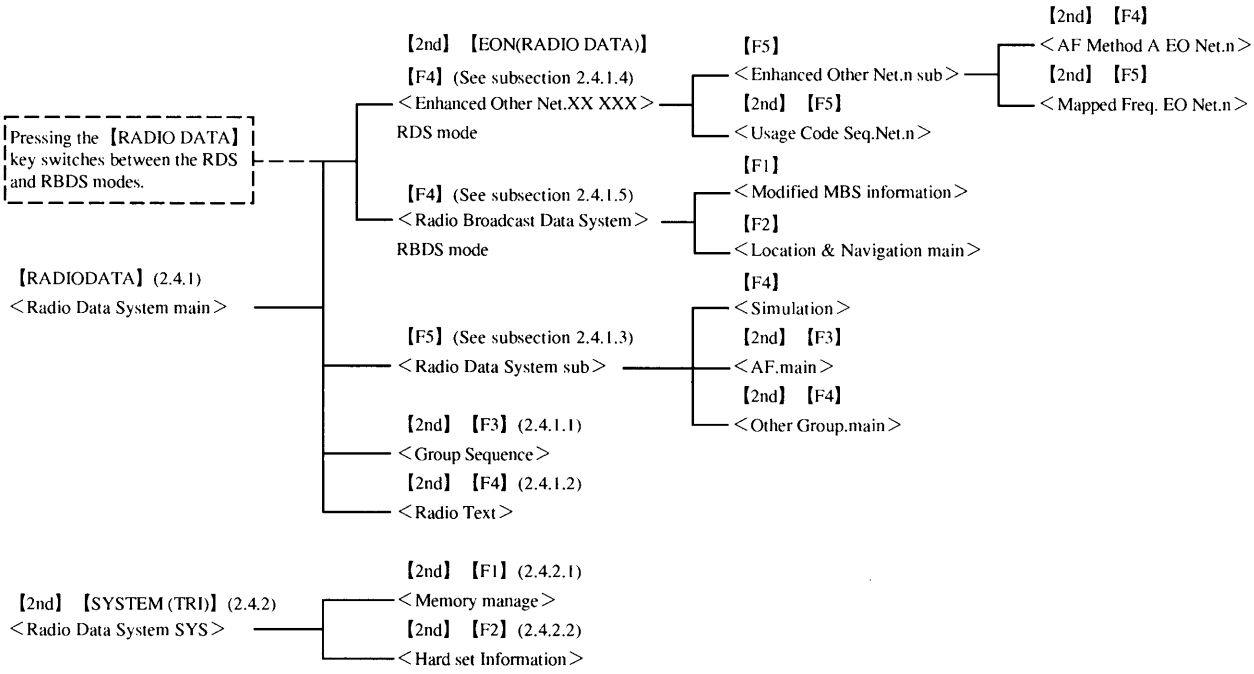


Fig.2-11 Menu Configuration for the RDS/RBDS Modes

2.4.1 <Radio Data System main> Screen

Pressing the 【RADIO DATA】 key displays the <Radio Data System main> screen. From this screen, pressing the same key switches between the RDS and RBDS modes, as shown in Figs.2-12 and 2-13.

The key operation flowchart of the <Radio Data System main> screen is shown in Fig.2-14.

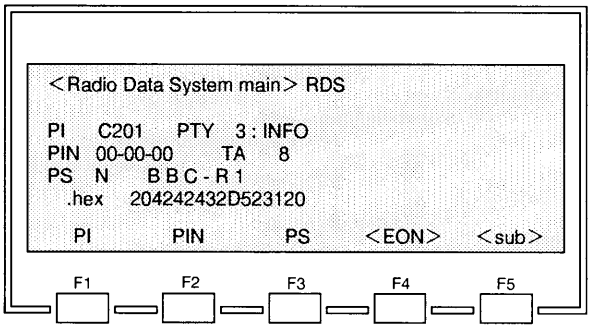


Fig.2-12 <Radio Data System main> Screen (RDS Mode)

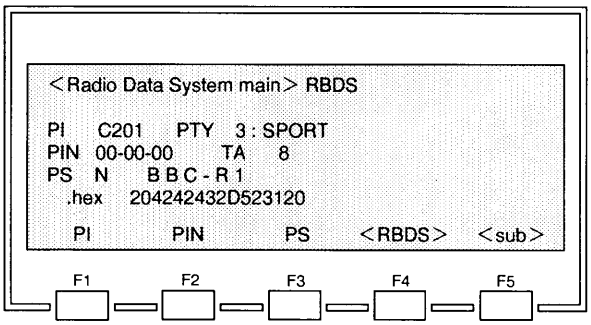


Fig.2-13 <Radio Data System main> Screen (RBDS Mode)

<Radio Data System main>

PI	【F1】	0000 to FFFF
PIN	【F2】	dd-hh-mm
PS	【F3】	N, 0, 1, 2
<EON/RBDS>	【F4】	
<sub>	【F5】	
*PTY	【F1】	0 to 31
*TA	【F2】	0 to 9
*<GRP>	【F3】	
*<RT>	【F4】	
*<SYS>	【F5】	= 【2nd】 【SYSTEM (TRI)】

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-14 Key Operation Flow for the <Radio Data System main> Screen

■ PI

Indicates the program identification (ID) code.

Enter a 4-digit hexadecimal number from 0000 to FFFF. The highest digit specifies the nation ID, the 2nd highest digit the area ID, and the lower two digits the program service ID. Do not omit any digit. If any digit is missing, "0" is assumed for the missing and subsequent digits.

■ PIN

Indicates the program item number.

The scheduled broadcast start time is sent. It is used for program reception reservation.

Date Consists of 5 bits. Enter a 2-digit decimal number from 00 to 31.

Hour Consists of 5 bits. Enter a 2-digit decimal number from 00 to 31. The actual hour is specified with a number from 00 to 23. A number from 00 to 31 can be specified for program check and other purposes.

Minute Consists of 6 bits. Enter a 2-digit decimal number from 00 to 63. The actual minute is specified with a number from 0 to 59. A number from 00 to 63 can be specified for program check and other purposes.

Upon data entry, delimit each item with a minus sign (-) as follows using the 【−】 key: 20-10-15. The rotary knob can also be used for data entry.

■ PS N

Indicates the program service name.

The abbreviation of the broadcast station and program name are sent.

N specifies the code table as follows:

0 : Specifies the code table in EBU Tech.3244-E Fig.21.
1 : Specifies the code table in EBU Tech.3244-E Fig.22.
2 : Specifies the code table in EBU Tech.3244-E Fig.23.
N : Specifies no code table.

To enter a data item to PS, move the cursor from the N position to the [.hex] display section with the 【▷】 key, and then use the rotary knob or the numeric keypad. Enter a number from 20 to FF. For 7F or larger numbers, "." is displayed. For PS, enter eight ASCII characters. The characters entered are converted into an address from left to right in units of two characters.

■ <EON>

As is the case with the 【2nd】 and 【EON(RADIO DATA)】 key operations, the <Enhanced other Net.xxxxx> screen in subsection 2.4.1.4 is displayed.

■ <RBDS>

The <Radio Broadcast Data System> screen in subsection 2.4.1.5 is displayed.

■ <sub>

The <Radio Data System sub> screen in subsection 2.4.1.3 is displayed.

■ PTY

Indicates the program type which is used to identify program contents. Enter a 2-digit decimal number from 00 to 31 (consisting of 5 bits).

■ TA n

Indicates the announce ID for traffic information.

One bit is used as a traffic information broadcasting ID signal.

For n, specify a number from 0 to 9 representing the number of insertions of type-15B groups at the time of TA change. "0" indicates that there is no automatic insertion.

NOTE

- TA setting is turned on or off by means of the 【TA】 key on the panel. When on, the "TA" bit is set to "1".

■ <GRP>

The <Group Sequence> screen in subsection 2.4.1.1 is displayed.

■ <RT>

The <Radio Text> screen in subsection 2.4.1.2 is displayed.

■ <SYS>

As is the case with the 【2nd】 and 【SYSTEM(TRI)】 key operations, the <Radio Data System SYS> screen in subsection 2.4.2 is displayed.

2.4.1.1 <Group Sequence> Screen

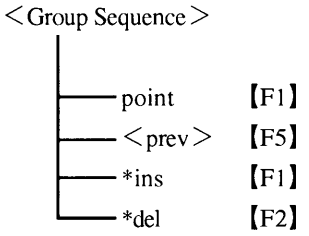
When the 【2nd】 key is pressed from the <Radio Data System main> screen and then the [<GRP>] key is pressed, the <Group Sequence> screen is displayed. The key operation flow for this screen is shown in Fig.2-15.

The following describes the procedure for editing the sequence of the group type which must be followed to transfer data from the KSG3410.

To change the group type, the numeric keypad or rotary knob is used.

To specify user-defined group types UD1 and UD2, enter D1 and D2 respectively from the numeric keypad.

To specify "MBS", the group type of MMBS (offset word E = 0), enter E0 from the numeric keypad.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-15 Key Operation Flow for the <Group Sequence> Screen

■ point

Indicates the location number in all group types at which the group type displayed at the upper left corner of the data edit area is positioned.

If there is no data on the screen, 0 is displayed at the "point" position as shown in the following screen.

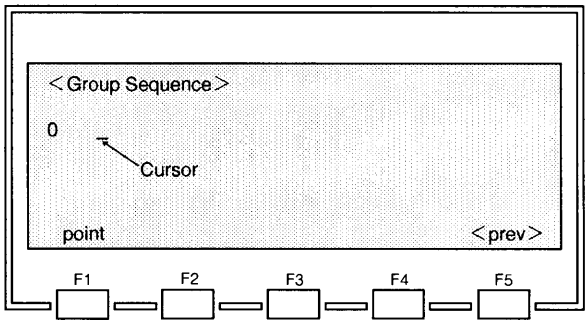


Fig.2-16 <Group Sequence> Screen 1

To enter group type 1A in the screen in Fig.2-16, press the 【1】, 【2nd】, 【A(1)】, and then 【ENTER】 key from the numeric keypad.

In this case, the cursor moves to the next data entry position and the following screen results.

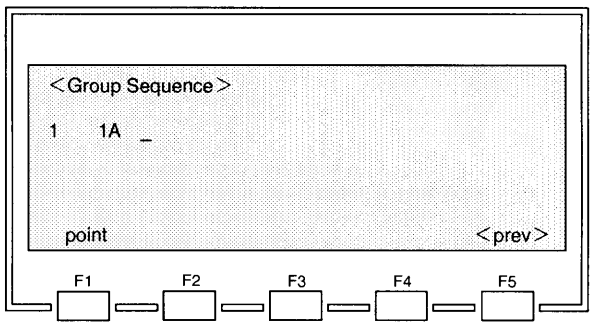


Fig.2-17 <Group Sequence> Screen 2

The group type once entered can be modified using the rotary knob.

If the cursor is out of the data edit area, press the 【▷】 key to move it to the right.

Enter data items in succession. When the following screen appears, press the [point] key to move the cursor to the "point" position.

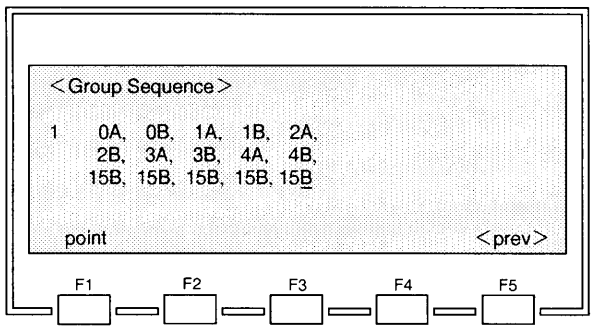


Fig.2-18 <Group Sequence> Screen 3

Turn the rotary knob clockwise all the way, the following screen results.

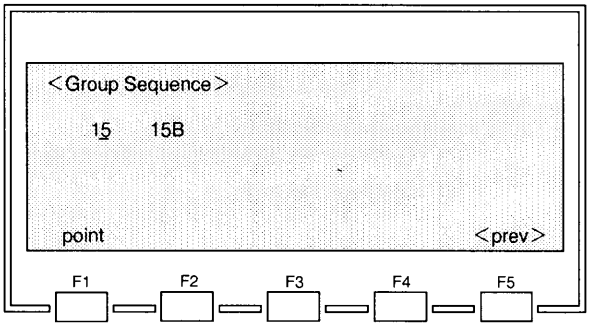


Fig.2-19 <Group Sequence> Screen 4

The number at the cursor position indicates that there are 15 data items and the last one is "15B".

When the rotary knob is turned counterclockwise by five steps, six data items appear, indicating that the 10th data items is "4B" as shown in the following screen.

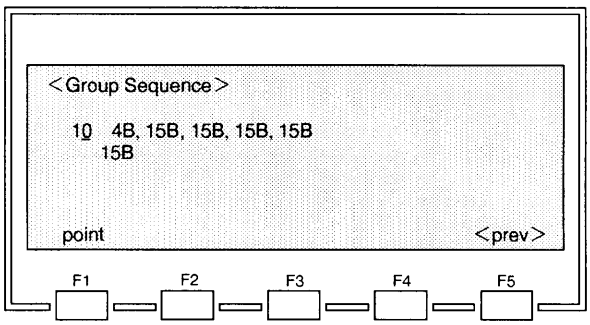


Fig.2-20 <Group Sequence> Screen 5

■ <prev>

Goes back to the <Radio Data System main> screen.

■ ins

Inserts a data item.

Pressing the [ins] key inserts "15B" at the current cursor position and control returns to the previous screen. Then replace "15B" with the desired data.

To add data items, move the cursor next to the last item and then enter a data item directly. The rotary knob cannot be used for data insertion.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

NOTE

- When deleting variable-length data such as GRP from the edit screen, data items are handled as several pages because of convenience of processing and one data item is left undeleted for each page.

About User-Defined Groups UD1 and UD2

UD1

With this user-defined group, each of group types A, B, C, C', D, E, and F applies to any block (1 to 4) as an offset word. There are no limitations on the information word of each block. For each of blocks 1 to 4, enter a 4-digit information word (hexadecimal code) and a 3-digit offset word (hexadecimal code). To specify the offset word for A, B, C, C', D, E, and F, enter a 3-digit hexadecimal code according to the following table.

Table 2-1 Offset Word Code Table

Offset word	Hexadecimal code
A	0FC
B	198
C	168
C'	350
D	1B4
E	0
F	194

When a data item in UD1 is output from the KSG3410, a specified check word is calculated for the information word and then the set offset word is appended.

UD2

With this user-defined group, there are no limitations on definition of the information word, check word+offset word. Enter it with a 7-digit hexadecimal.

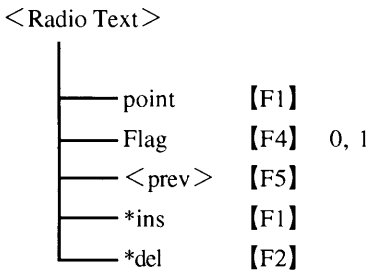
When a data item in UD2 is output from the KSG3410, the data is not subject to any processing.

For editing of UD1 and UD2, see "<Other Group. main> Screen".

2.4.1.2 <Radio Text> Screen

The <Radio Text> screen can be displayed by pressing the 【2nd】 key and then the [<RT>] key from the <Radio Data System main> screen in subsection 2.4.1. The key operation flow for this screen is shown in Fig.2-21.

From this screen, radio text data consisting of up to 64 characters can be edited. Use the numeric keypad or the [ins] key to enter hexadecimal codes of radio test data and the rotary knob to edit it.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-21 Key Operation Flow for the <Radio Data System main> Screen

■ point

Indicates the location number in all characters at which the character displayed at the upper left corner of the data edit area is positioned.

■ Flag

Switches the Text A/Text B flag between 0 and 1.

■ <prev>

Goes back to the <Radio Data System main> screen.

■ Data entry

In the same manner as the <Group Sequence> screen in subsection 2.4.1.1, data can be entered using the numeric keypad or the 【2nd】 and [ins] keys, in units of two digits of hexadecimal codes. Up to 64 characters can be entered.

Enter a number from 00 to FF. For 1F or smaller numbers and 80 or larger numbers, "." is displayed.

■ ins

Pressing the [ins] key inserts "space" at the current cursor position. Then replace the space with the desired data.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

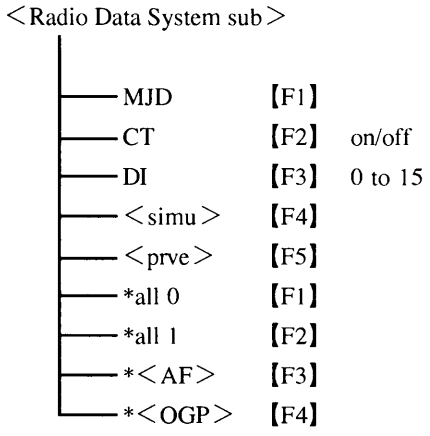
■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

2.4.1.3 <Radio Data System sub> Screen

The <Radio Data System sub> screen can be displayed by pressing the [<sub>] key from the <Radio Data System main> screen in subsection 2.4.1. The key operation flow for this screen is shown in Fig.2-22.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-22 Key Operation Flow for the <Radio Data System sub> Screen

■ MJD

Enter the initial set value. When the initial set value is entered, the initial CT value is also set. The "hh:mm±nn.n" format represents hour, minute, and the local offset time.

With entry operation using the rotary knob, the 8-digit date data (year, month, and day) changes automatically.

For the date data, 17 bits are used for the range from March 1st 1900 to February 28th 2100. For the time data, 5 bits are used for hour (hh: 0 to 31) and 6 bits for minute (mm: 0 to 63). Although the actual time representation requires up to 23 for hour and 59 for minute, hh can be set to 0 to 31 and mm to 0 to 63. The local offset time (±nn.n) can be set to ±0 to 15.5.

Enter data using the following format by means of the numeric keypad:

1989-1-20-12-30--15.5

Press the 【−】 key between items. To enter a minus sign (-), press the 【−】 key twice. The data can be changed using the rotary knob.

■ CT on/off

Indicates the time information in minute. Turns on or off the automatic

addition function for minute and the 4A interrupt output function.

Each time the [CT] key pressed, these functions are turned on or off alternately. This operation can also be performed using the rotary knob.

When CT is on, the CT value is increased every minute based on the initial set value of MJD and 4A is output to the group sequence. In addition, when CT is changed from off to on, minute is increased and 4A is output to the group sequence.

When CT is off, the automatic increment and interrupt functions mentioned above do not operate. The automatic increment is disabled for GPIB and RS-232C control. The automatic increment changes minute, hour and date.

■ DI

Indicates the decoder ID.

Used to turn on or off transmission condition ID, monaural, stereo, and decoder. Enter a 2-digit decimal number from 00 to 15 (consisting of 4 bits).

■ <Simu>

Calls the <Simulation> screen at the subordinate level.

■ <prev>

Goes back to the <Radio Data System main> screen.

■ all 0

Outputs "continuous 0" data as RDS/RBDS data. In this case, the following line appears on the 2nd line.

Output data is all 0.

To cancel, press the 【2nd】 key again and then press the [all 0] key.

■ all 1

Outputs continuous 1" data as RDS/RBDS data. In this case, the following line appears on the 2nd line.

Output data is all 1.

To cancel, press the 【2nd】 key again and then press the [all 1] key.

■ <AF>

Calls the <AF.main> screen at the subordinate level.

■ <OGP>

Calls the <Other Group.main> screen at the subordinate level.

<Simulation> Screen

The <Simulation> screen can be displayed by pressing the [<simu>] key from the <Radio Data System sub> screen in subsection 2.4.1.3. The key operation flow for this screen is shown in Fig.2-23.

Based on the group type sequence set in subsection 2.4.1.1, data output from the KSG3410 is represented by hexadecimal numbers.

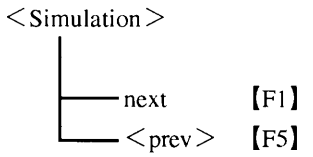


Fig.2-23 Key Operation Flow for the <Simulation> Screen

■ next

Displays the data of the next group type.

■ <prev>

Goes back to the <Radio Data System sub> screen.

The following describes each screen title.

■ Group

Displays the group type. Displays the contents of the group type code and version code in the information word in the 2nd block.

■ e

Displays "*" when the error bit is set. See subsection 2.4.2, <Radio Data System SYS> Screen".

■ i

Displays the contents of the information word with 4-digit hexadecimal numbers. With i1/3, the 1st line displays one block and 2nd line 3 blocks. With i2/4, the 1st line displays 2 blocks and the 2nd line 4 blocks.

■ c+o

Displays the contents of check word + offset with 3-digit hexadecimal numbers.

NOTE

- When data is modified, it is displayed in the <Simulation> screen being delayed by about 8 groups (equal to the number of output buffers).
- When the screen is updated using the 【⇦】 key, data for one group is displayed.

<AF.main> Screen

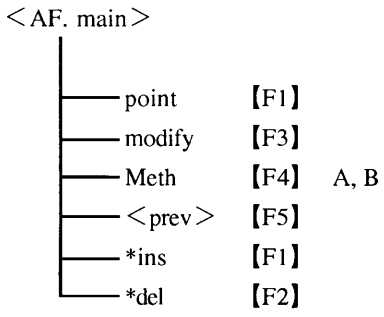
The <AF.main> screen can be displayed by pressing the 【2nd】 key and then the [<AF>] key from the <Radio Data System sub> screen in subsection 2.4.1.3. The key operation flow for this screen is shown in Fig.2-24.

This screen is used to edit the frequency list (alternative frequency) for the same program.

Filler codes can be entered by entering "F" from the numeric keypad. In this case, "FL" is displayed on the screen.

When Method A is selected, the FM band frequency represented by nn.n: is specified as the main transmitter frequency to be output together with "Number of freq code".

When Method B is selected, the FM band frequency represented by nn.n: is specified as the header frequency.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-24 Key Operation Flow for the <AF.main> Screen

■ point

Indicates the location number in all frequencies at which the frequency displayed at the upper left corner of the data edit area is positioned.

■ modify

Switches between the FM band frequency for Adjacent-Region (marked with "*"), the main transmitter frequency for Method A (marked with ":"), the header frequency for Method B (marked with ":"), AF frequency, and the FM band frequency with offset (+25k, +50k, +75k), in circulating manner.

■ Meth

Switches between Method A and Method B.

■ <prev>

Goes back to the <Radio Data System sub> screen.

■ Data entry

Data can be entered in the same manner as the <Group Sequence> screen in subsection 2.4.1.1. The frequency range is as follows:

FM : 87.5 to 107.9 MHz, in 0.1 MHz steps
MF : 531 to 1602 kHz, in 9 kHz steps
LF : 155 to 281 kHz, in 9 kHz steps

The MF and LF frequencies can be entered from the numeric keypad and varied using the rotary knob.

For entry of the FM band frequency, the 【ENTER】 or 【MHz】 key is used as a terminator; for entry of the MF and LF band frequency, the 【kHz】 key is used as a terminator.

■ ins

Pressing the [ins] key inserts "FL" at the current cursor position. Then replace the space with the desired data.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

<Other Group.main> Screen

The <Other Group.main> screen can be displayed by pressing the 【2nd】 key and then the [<OGP>] key from the <Radio Data System sub> screen in subsection 2.4.1.3. The key operation flow for this screen is shown in Fig.2-25.

This screen is used to edit the spare bit of Other Group (group types other than 0A, 0B, 2A, 2B, 14A, 14B, and 15B, and user-defined group types UD1 and UD2). The KSG3410 handles the spare bit of group types 1A, 1B, and 4A as Other Group.

NOTE

- The lowest 3 (unused) bits of information block 2 of group type 14B are not handled as a spare bit. Instead, they are set to "0" and they cannot be set to any other value.

<Other Group.main>

- point 【F1】
- Typ 【F4】 0A, ···
- <prev> 【F5】
- *ins 【F1】
- *del 【F2】

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-25 Key Operation Flow for the <Other Group.main> Screen

■ point

Indicates the location number in all Other Groups at which the Other Group displayed at the upper left corner of the data edit area is positioned.

■ Typ

Move the cursor to the Other Group type and then enter the group type with a hexadecimal number from the numeric keypad, or select an Other Group type with the rotary knob.

■ <prev>

Goes back to the <Radio Data System sub> screen.

■ Data entry

The number of digits to be entered can be set automatically depending on the group type. The insertion position of the spare bit for each group type is shown in Fig.2-26.

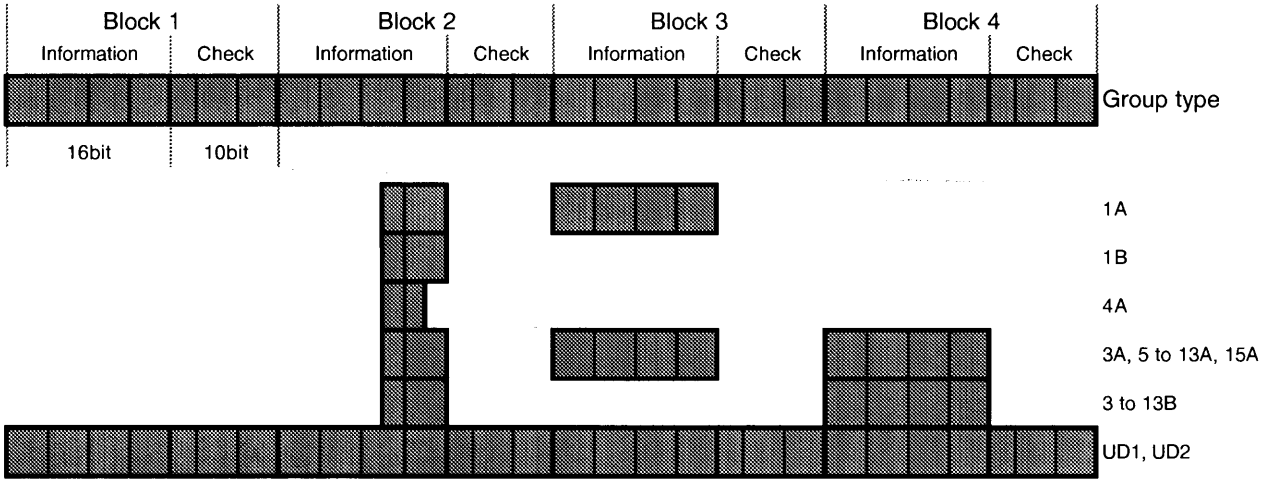


Fig.2-26 Insertion Position of Spare Bit for Each Group Type

NOTE

- As for Other Groups, data for each group type is handled as continuous data.

Example 1)

As for group type 1A above, the lower 5 bits of the information word of block 2 and 16 bits of that of block 3 are handled as a continuous data shown below:

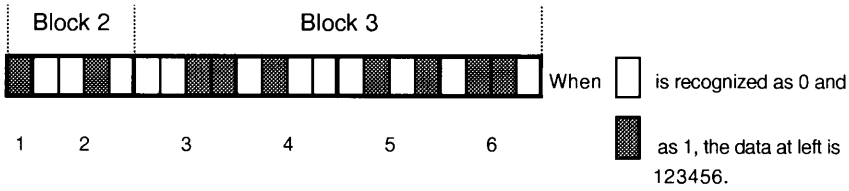


Fig.2-27 Information Word for Block 2 and Block 3

With the following screen, data for group type 1A is not entered and therefore "0" is displayed at the "point" position.

For "hh-hhhh-xxxx", enter a data item such as "12-3456". The "xxxx" part is set automatically inside the KSG3410.

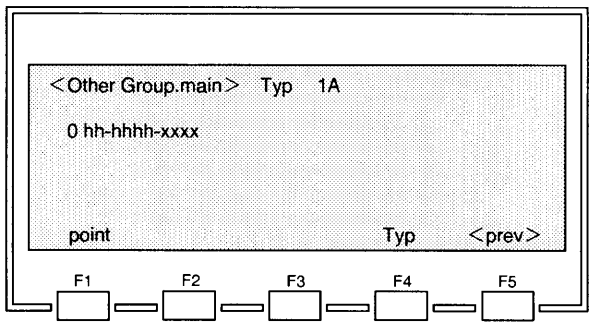


Fig.2-28 <Other Group.main> Screen

■ ins

Pressing the [ins] key inserts "FL" at the current cursor position. Then replace the space with the desired data.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

2.4.1.4 <Enhanced Other Net.XX XXX> Screen

The <Enhanced Other Net.XX XXX> screen can be displayed by pressing the 【RADIO DATA】 key to set the RDS mode and then selecting <EON> from the <Radio Data System main> screen in subsection 2.4.1. It can also be displayed by pressing the 【2nd】 key and then the 【EON(RADIO DATA)】 key.

On this screen, <Enhanced Other Net...> or <Enhanced Other Net.01 on/off> is displayed. The key operation flow for this screen is shown in Fig.2-33.

<Enhanced Other Net... ...>

Indicates that no data area is allocated on the Other Network. Data cannot be entered.

<Enhanced Other Net.01 on/off>

Indicates Other Network No.01 is entered.

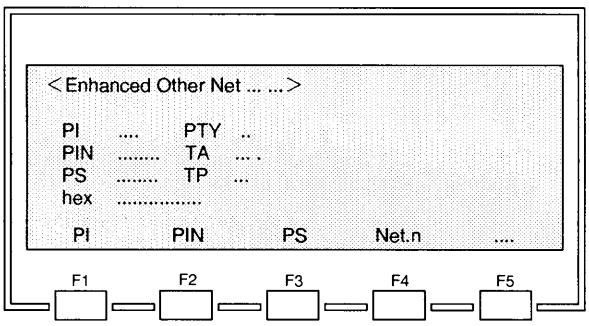


Fig.2-29 <Enhanced Other Net...> Screen

■ Increasing the number of Other Networks

Pressing the 【2nd】 key and the [ins] key allocates the data area for Other Network No.01 as shown in Fig.3-30.

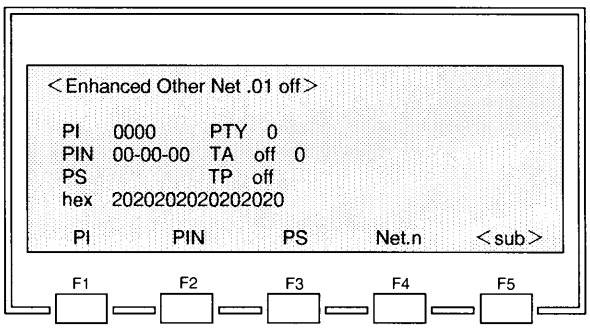


Fig.2-30 <Enhanced Other Net.01 off> Screen

To add the data area for Other Network No.02, press the [Net.n] key to move the cursor to Net.01. Then turn the rotary knob clockwise to display the <Enhanced Other Net...> screen.

Pressing the 【2nd】 key and the [ins] key allocates the data area for Other

Network No.02 as shown in Fig.3-31.

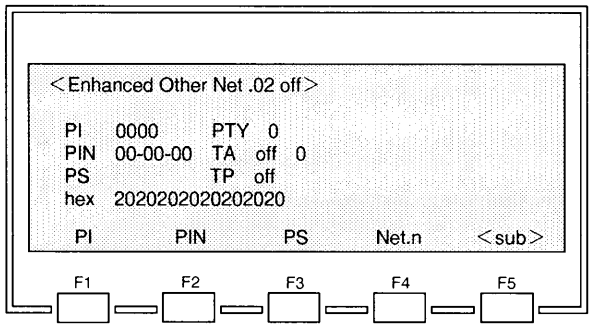


Fig.2-31 <Enhanced Other Net.02 off> Screen

To increase the number of Other Networks, repeat the same operation as above the necessary number of times. Each time the [ins] key is pressed from the <Enhanced Other Net.01 off> screen, a data area is inserted. Fig.2-32 shows the sequence of data area allocation for Other Networks.

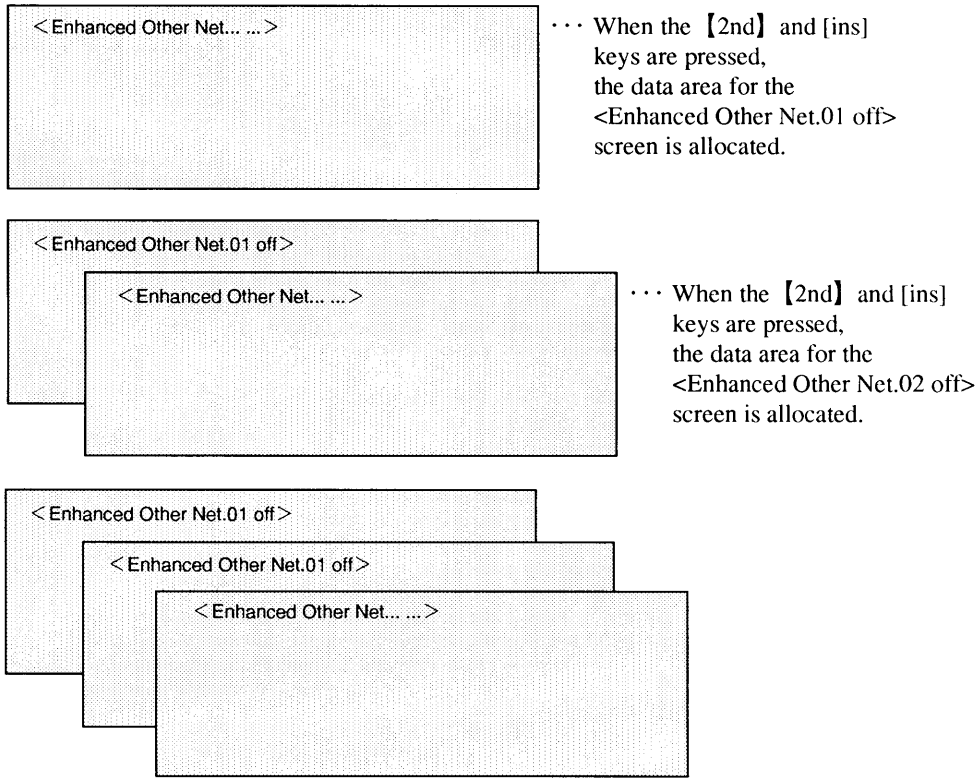


Fig.2-32 Successive Data Area Allocation for Other Network

NOTE

· The number of Other Networks can be set to 01 to 99.

<Enhanced Other Net.n>

PI	【F1】	0000 to FFFF
PIN	【F2】	dd-hh-mm
PS	【F3】	
Net.n	【F4】	
<sub>	【F5】	
*ins	【F1】	
*del	【F2】	
*PTY	【F3】	0 to 31
*TA	【F4】	on/off, 0 to 9
*<UCS>	【F5】	

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-33 Key Operation Flow for the <Enhanced Other Net.... ...> Screen

■ PI

Indicates the program identification (ID) code.

Enter a 4-digit hexadecimal number from 0000 to FFFF. The highest digit specifies the nation ID, the 2nd highest digit the area ID, and the lower two digits the program service ID. Do not omit any digit. If any digit is missing, "0" is assumed for the missing and subsequent digits.

■ PIN

Indicates the program item number.

The scheduled broadcast start time is sent. It is used for program reception reservation.

Date Consists of 5 bits. Enter a 2-digit decimal number from 00 to 31.

Hour Consists of 5 bits. Enter a 2-digit decimal number from 00 to 31.

The actual hour is specified with a number from 00 to 23. A number from 00 to 31 can be specified for program check and other purposes.

Minute Consists of 6 bits. Enter a 2-digit decimal number from 00 to 63.

The actual minute is specified with a number from 0 to 59. A number from 00 to 63 can be specified for program check and other purposes.

Upon data entry, delimit each item with a minus sign (-) as follows using the 【−】 key: 20-10-15

The rotary knob can also be used for data entry.

■ PS

Indicates the program service name.

The abbreviation of the broadcast station and program name are sent.

PS can be entered using the rotary knob or the numeric keypad. Enter a number from 20 to FF. For 80 or larger numbers, "." is displayed. Enter eight ASCII characters.

■ Net.n

The cursor moves to the EON network number. Switch the network number using the numeric keypad or rotary knob.

■ on/off

Turns on or off Other Networks. Only other networks with the "on" condition are output.

■ <sub>

The <Enhanced Other Net.n sub> screen is displayed.

■ ins

When the cursor is positioned at the EON network number, pressing the [ins] key inserts a data area for Other Networks.

■ del

When the cursor is positioned at the EON network number, pressing the [del] key deletes a data area for Other Networks.

■ PTY

Indicates the EON program type. Enter a 2-digit decimal number from 00 to 31 (consisting of 5 bits).

■ TA

Turns on or off the EON TA. When on, "1" is set; when off, "0" is set. It can also be changed using the rotary knob.

■ TA n

Parameter n specifies, when TP of EON is on, the number of insertions with which group type 14B is output to the normal group sequence when TA changes (from on to off or off to on).

Specify n with a number from 0 to 9. When 0 is specified, automatic insertion is inhibited.

Example 1)

As for the following group sequence, when TA n=2 of EON is inserted, group type 14B is output twice as shown in Fig.2-34 when TA changes.

TP on/off: Turns on or off the EON TP by means of the rotary knob.

When on, "1" is set; when off, "0" is set.

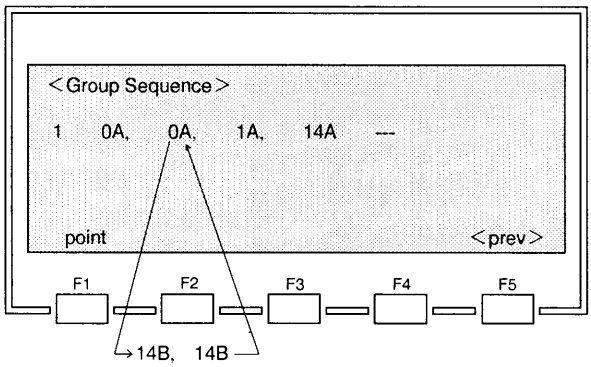


Fig.2-34 Insertion of TA n=2

■ <UCS>

The <Usage Code Seq.Net.n> screen is displayed.

<Enhanced Other Net.n sub> Screen

The <Enhanced Other Net.n sub> screen can be displayed by pressing the [<sub>] key to set the RDS mode and then selecting <EON> from the <Enhanced Other Net.n on/off> screen. The key operation flow for this screen is shown in Fig.2-35.

<Enhanced Other Net.n sub>

Uc12	【F1】	0000 to FFFF
Uc13	【F2】	000 to 7FF
Uc15	【F3】	0000 to FFFF
<prev>	【F5】	
*<AF>	【F4】	
*<MAP>	【F5】	

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-35 Key Operation Flow for the <Enhanced Other Net.n sub> Screen

■ Uc12

Enter a 4-digit hexadecimal number from 0000 to FFFF to specify 16-bit data of information block 3 which corresponds to usage code 12 of type 14A.

■ Uc13

Enter a 3-digit hexadecimal number from 000 to 7FE to specify 10-bit data (reserved portion in Fig.2-36) of information block 3 which corresponds to usage code 13 of type 14A.

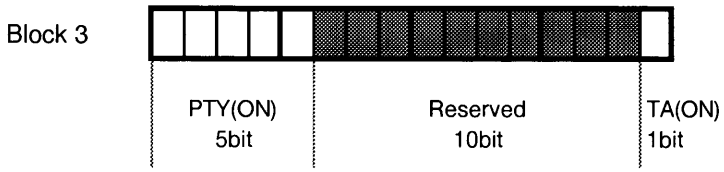


Fig.2-36 Information Block 3

■ Uc15

Enter a 4-digit hexadecimal number from 0000 to FFFF to specify 16-bit data of information block 3 which corresponds to usage code 15 of type 14A.

■ <AF>

Calls the <AF Method A.EO Net.n> screen at the subordinate level.

■ <MAP>

Calls the <Mapped Freq. EO Net.n> screen at the subordinate level.

<AF Method A.EO Net.n> Screen

This screen is used to enter the EON AF frequency by means of Method A.

The <AF Method A.EO Net.n> screen can be displayed by pressing the 【2nd】 key and then the [<AF>] key from the <Enhanced Other Net.n sub> screen. The key operation flow for this screen is shown in Fig.2-37.

The frequency range is as follows:

FM: 87.5 to 107.9 MHz, in 0.1 MHz steps

MF: 531 to 1602 kHz, in 9 kHz steps

LF: 153 to 279 kHz, in 9 kHz steps

For entry of the FM band frequency, the 【ENTER】 or 【MHz】 key is used as a terminator; for entry of the MF and LF band frequency, the 【kHz】 key is used as a terminator.

NOTE

- In EBU EN 50067 specifications, FM band carrier frequency 87.5 MHz specified in EBU Tech.3244-E are not used. However, the KSG3410 allows entry of the frequency for the purpose of receiver program checking.

<AF Method A EO Net.n>

- point 【F1】
- modify 【F3】
- <prev> 【F5】
- *ins 【F1】
- *del 【F2】

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-37 Key Operation Flow for the <AF Method A.EO Net.n> Screen

■ point

Indicates the location number in all AF band frequencies at which the AF frequency displayed at the upper left corner of the data edit area is positioned.

With the screen in Fig.2-38, "0" is displayed at the "point" position because AF frequency data for Other Network No.01 is not entered.

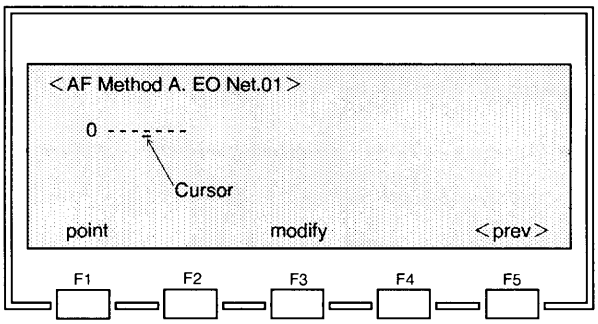


Fig.2-38 <AF Method A.EO Net.01> Screen 1

If the cursor is out of the data edit area, press the cursor control keys to move it to the data edit area.

To enter 90 MHz of AF band, press 【9】, 【0】, and then 【ENTER】 (or 【MHz】). The cursor moves to the next data entry position as shown in Fig.2-39.

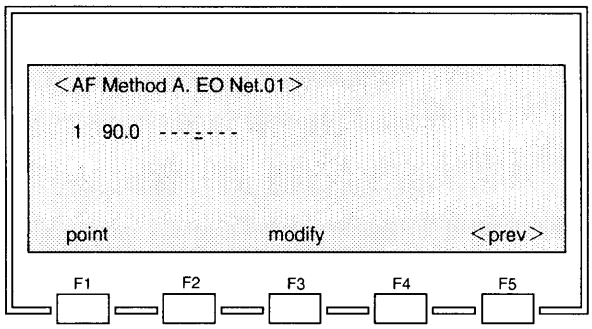


Fig.2-39 <AF Method A.EO Net.01> Screen 2

The AF frequency once entered can be changed using the rotary knob. To add

a data item, move the cursor to the data entry position ("---") and then enter a data item directly from the numeric keypad.

■ modify

Switches between the FM band AF frequency without offset and the FM band AF frequency with offset (+25k, +50k, +75k), in circulating manner.

NOTE

- In EBU EN 50067 specifications, the frequency offset specified in EBU Tech.3244-E is deleted. The KSG3410 allows addition of the frequency offset using the modify function. However, because of limitations on AF data transmission, entry of the FM band AF frequency must be limited to the 2nd and subsequent positions.

■ ins

Inserts a data item.

Pressing the [ins] key inserts "FL" at the current cursor position. Then replace the space with the desired data.

The rotary knob cannot be used for data insertion. To change the frequency, use the numeric keypad or the rotary knob.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

<Mapped Freq. EO Net.n> Screen

This screen is used to enter the EON AF frequency by means of Mapped Frequency.

The <Mapped Freq.EO Net.n> screen can be displayed by pressing the 【2nd】 key and then the [<MAP>] key from the <Enhanced Other Net.n sub> screen. The key operation flow for this screen is shown in Fig.2-40.

The frequency range is as follows:

FM : 87.5 to 107.9 MHz, in 0.1 MHz steps

MF : 531 to 1602 kHz, in 9 kHz steps

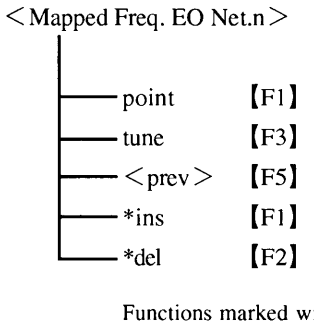
LF : 153 to 279 kHz, in 9 kHz steps

For entry of the FM band frequency, the 【ENTER】 or 【MHz】 key is used as a terminator; for entry of the MF and LF band frequency, the 【kHz】 key is

used as a terminator.

NOTE

- In EBU EN 50067 specifications, FM band carrier frequency 87.5 MHz specified in EBU Tech.3244-E are not used. However, the KSG3410 allows entry of the frequency for the purpose of receiver program checking.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-40 Key Operation Flow for the <Mapped Freq.EO Net.n> Screen

■ point

Indicates the location number in all AF band frequencies at which the AF frequency displayed at the upper left corner of the data edit area is positioned.

With the screen in Fig.2-41, "0" is displayed at the "point" position because map data for Other Network No.01 is not entered.

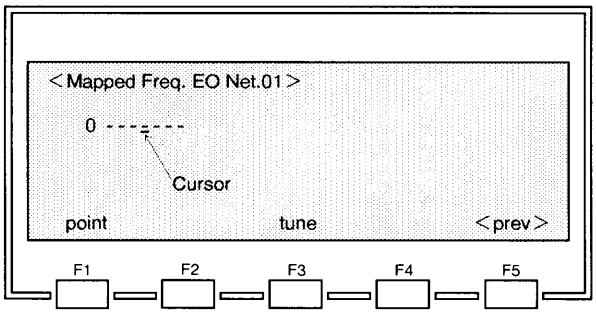


Fig.2-41 <Mapped Freq.EO Net.01> Screen 1

If the cursor is out of the data edit area, press the cursor control keys to move it to the data edit area.

First, enter Tuning Frequency. To enter 95 MHz of Tuning Frequency, press 【9】, 【5】, and then 【ENTER】 (or 【MHz】). Move the cursor back to 95.0 and then press the [tune] key to specify Tuning Frequency.

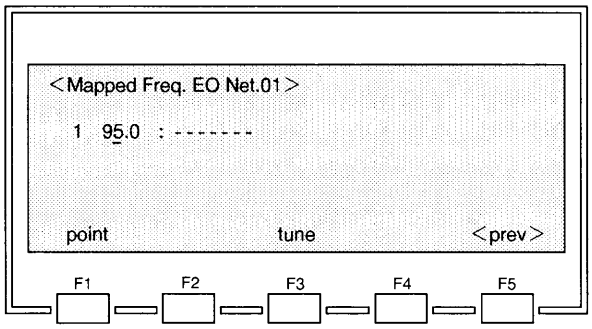


Fig.2-42 <Mapped Freq.EO Net.01> Screen 2

The frequency once entered can be changed using the rotary knob. To add a data item, move the cursor to the data entry position ("---") and then enter a data item directly from the numeric keypad.

■ tune

Enables or disables Tuning Frequency specification alternately.

■ ins

Inserts a data item.

Pressing the [ins] key inserts "FL" at the current cursor position. Then replace the space with the desired data.

The rotary knob cannot be used for data insertion. To change the frequency, use the numeric keypad or the rotary knob.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

Example 1)

Map data:

Map data group 1

Tuning Freq.1	95MHz	89MHz	Mapped Freq.1
↑	95MHz	91MHz	Mapped Freq.2
↑	95MHz	92MHz	Mapped Freq.3
↑	95MHz	101MHz	Mapped Freq.4
↑	95MHz	153kHz	Mapped LF Freq.

Map data group 2

Tuning Freq.2	88MHz	96MHz	Mapped Freq.1

Map data group 3

Tuning Freq.3	102MHz	90MHz	Mapped Freq.1
↑	102MHz	100MHz	Mapped Freq.2
↑	102MHz	531kHz	Mapped MF Freq.

When the above map data groups are set in the KSG3410, the following screen is displayed. The Tuning Frequency for each map data group can be specified using the [tune] key.

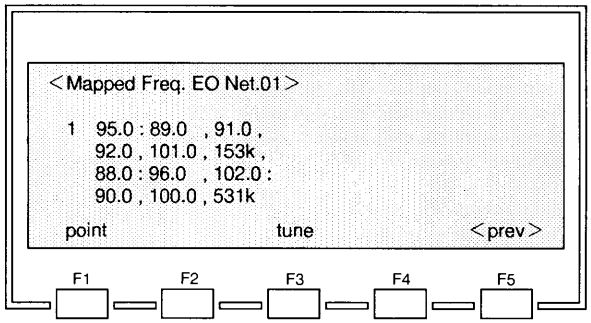


Fig.2-43 <Mapped Freq.EO Net.01> Screen 3

<Usage Code Seq. Net.n>Screen

The <Usage Code Seq.Net.n> screen can be displayed by pressing the 【2nd】 key and then the [<UCS>] key from the <Enhanced Other Net.n on/off> screen.

■ Usage code and usage code sequence

Data of block 3 of type 14A is output according to the usage code sequence (UCS). Therefore, when type 14A is set in the group sequence and EON information is sent, UCS must be entered for each of Other Networks. Enter the usage code (UC) with a number from 0 to 15.

Usage code and corresponding EON data are shown in Table 2-2.

Table 2-2 Usage Code and Corresponding EON Data

Usage Code	EON data	Remarks
0 to 3	Eight PS (ON) characters	1
4	AF (ON) - Method A	2
5	Tuning freq. (TN) and Mapped FM freq.1 (ON)	
6	Tuning freq. (TN) and Mapped FM freq.2 (ON)	
7	Tuning freq. (TN) and Mapped FM freq.3 (ON)	
8	Tuning freq. (TN) and Mapped FM freq.4 (ON)	
9	Tuning freq. (TN) and Mapped LF/MF freq. (ON)	
*10	unallocated	3
*11	unallocated	4
12	Linking information	
13	PTY (ON) ,TA (ON) , etc.	
14	PIN (ON)	5
15	Reserved for broadcasters use	

"TN" stands for "This Network" and "ON" "Other Network".

NOTE

1. To output eight PS (ON) characters, enter usage codes 0, 1, 2, and 3.
2. According to the conventions, either Method A or Mapped Frequency can be selected for the EON AF frequency. Therefore, usage codes 4 and 5 to 9 cannot be specified at the same time. However, when these usage codes are specified intentionally for receiver program checking, data both for Method A and Mapped Frequency are output.
3. Unlike normal data, usage code 10 is unallocated and basically it should not be output. For this reason, it is displayed "*10" for notification on entry. When *10 is set, the KSG3410 outputs fixed data 0000 (hexadecimal).
4. As is the case with usage code 10, unlike normal data, usage code 11 is unallocated and basically it should not be output. For this reason, it is displayed "*11" for notification on entry. When *11 is set, the KSG3410 outputs fixed data 0000 (hexadecimal).
5. If usage code is not specified in the usage code sequence, the KSG3410 assumes usage code 0 and outputs two PS (ON) characters.

1) Output of eight PS (ON), PTY (ON), TA (ON), and PIN (ON)

To output eight PS (ON) characters, enter usage codes 0, 1, 2, and 3 in the UCS in succession.

To output PTY (ON) and TA (ON), enter usage code 13 in the UCS. To output

PIN (ON), enter usage code 14 in the UCS.

2) Output of the AF list with Method A

To output the AF list with Method A, enter usage code 4 in the UCS. However, the number of entries is determined by the number of AF and the AF frequency attribute (FM band frequency without offset, FM band frequency with offset, or LF-MF frequency).

When usage code 4 is entered, two FM band frequencies without offset and an FM band frequency with offset, and an LF-MF frequency are output.

In addition, since the frequency at the top of the AF list forms a pair with the code indicating the total number of AF frequencies, it is limited to the FM band frequency without offset or filler code.

Usage code	AF list (contents of block 3 of type 14A)	
4	Total number of AF	FM band frequency without offset
4	FM band frequency without offset	FM band frequency without offset
4	FM band frequency with offset	
4	LF·MF frequency	

Example 1)

When 90 MHz, 91 MHz, 92 MHz, 93 MHz, and 153 MHz are set in the AF list

Usage code	AF list	
4	Total number of AF : 5	90MHz
4	91MHz	92MHz
4	93MHz	Filler Code
4	153kHz	

To output enter four usage code 4 into the UCS in succession.

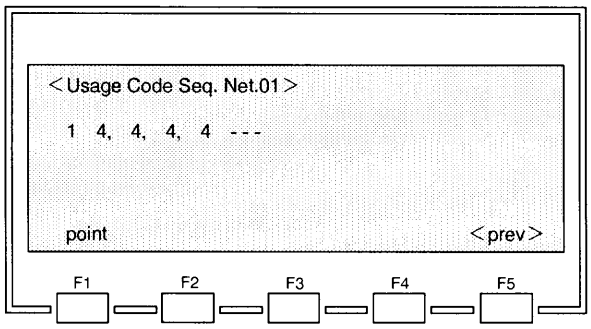


Fig.2-44 <Usage Code Seq.Net.01> Screen 1

NOTE

- The support software has the function to have a reference to the AF list set in the UCS "Ins" mode and

expand usage code 4 in the UCS.

3) Output of the AF frequency with Mapped Frequency

To output AF frequencies with Mapped Frequency, enter usage code 5 in the UCS. However, the number of entries is determined by the number of Mapped Frequencies contained in the AF list.

Example 2)

Usage code		Map data group 1		
5	Tuning Freq.1	95MHz	89MHz	Mapped Freq.1
6	↑	95MHz	91MHz	Mapped Freq.2
7	↑	95MHz	92MHz	Mapped Freq.3
8	↑	95MHz	101MHz	Mapped Freq.4
9	↑	95MHz	153kHz	Mapped LF Freq.
		Map data group 2		
5	Tuning Freq.2	88MHz	96MHz	Mapped Freq.1
		Map data group 3		
5	Tuning Freq.3	102MHz	90MHz	Mapped Freq.1
6	↑	102MHz	100MHz	Mapped Freq.2
9	↑	102MHz	531kHz	Mapped MF Freq.

When map data groups 1 to 3 have already been input to the KSG3410, enter the corresponding UCS. The total number of map data items for each Tuning Frequency is nine. Enter nine usage code 5 in the UCS.

NOTE

- Usage code 5 is used as a representative of the map data group (usage codes 5 to 9).

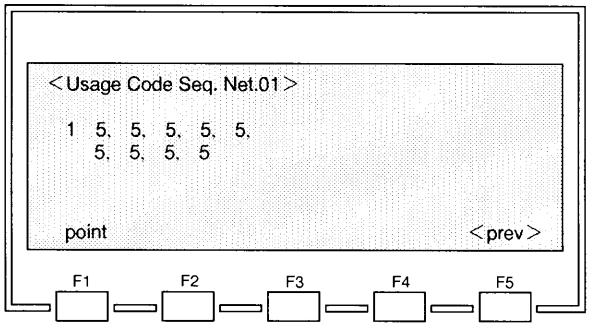


Fig.2-45 <Usage Code Seq.Net.01> Screen 2

When usage codes 5 to 9 matching the map data are entered, the same output results. (The KSG3410 outputs map data in the same order as usage codes 5 to 9 appear in the UCS.)

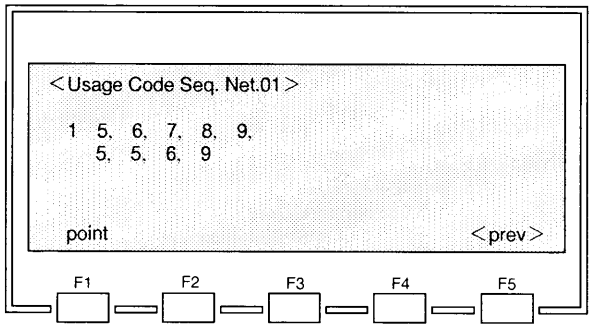


Fig.2-46 <Usage Code Seq.Net.01> Screen 3

NOTE

- The support software has the function to have a reference to the map data set in the UCS "Ins" mode and expand usage codes 5 to 9 in the UCS.

■ Synchronized output of usage code sequence and AF data

Normally, usage code sequence and AF data are out of synchronization. However, AF data can be output in sequence by storing it in memory address of the KSG3410 and then recalling it.

The following shows examples for PS (ON) data and map data setting. Example 3) shows output data when they are out of synchronization and example 4) output data when they are synchronized with each other.

PS (ON) data: K I K U S U I

Map data:

Map data group 1

Tuning Freq.1	88MHz	90MHz	Mapped Freq.1
↑	88MHz	91MHz	Mapped Freq.2

Map data group 2

Tuning Freq.2	92MHz	89MHz	Mapped Freq.1
↑	92MHz	95MHz	Mapped Freq.2
↑	92MHz	162kHz	Mapped LF Freq.

Map data group 3

Tuning Freq.3	103MHz	97MHz	Mapped Freq.1

Example 3)

Output data (out of synchronization)

Usage code	Output data		
0	K	I	
1	K	U	
2	S	U	
3	I		
9	92MHz	162MHz	Map data group 2
5	103MHz	97MHz	Map data group 3
5	88MHz	90MHz	Map data group 1
6	88MHz	91MHz	Map data group 1
5	92MHz	89kHz	Map data group 2
6	92MHz	95MHz	Map data group 2

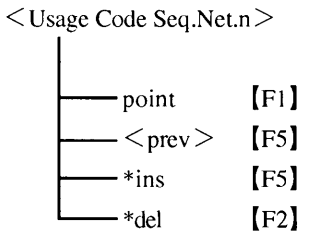
Example 4)

Output data (synchronized with each other)

Usage code	Output data		
0	K	I	
1	K	U	
2	S	U	
3	I		
5	88MHz	90MHz	Map data group 1
6	88MHz	91MHz	Map data group 1
5	92MHz	89MHz	Map data group 2
6	92MHz	95MHz	Map data group 2
9	92MHz	162kHz	Map data group 2
5	103MHz	97MHz	Map data group 3

■ <Usage Code Seq. Net.n> Screen

The key operation flow for this screen is shown in Fig.2-47.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-47 Key Operation Flow for the <Usage Code Seq. Net.n> Screen

■ point

Indicates the location number in all usage codes at which the usage code displayed at the upper left corner of the data edit area is positioned.

With the screen in Fig.2-48, "0" is displayed at the "point" position because map data for Other Network No.01 is not entered.

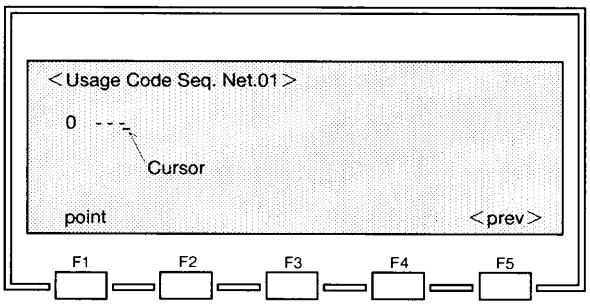


Fig.2-48 <Usage Code Seq. Net.01> Screen 1

If the cursor is out of the data edit area, press the cursor control keys to move it to the data edit area.

To enter usage code 0, press 【0】 and then 【ENTER】. Alternatively, press the 【2nd】 key and then the [ins] key to insert "14", and then modify it using the rotary knob. The cursor moves to the next entry position and the following screen results.

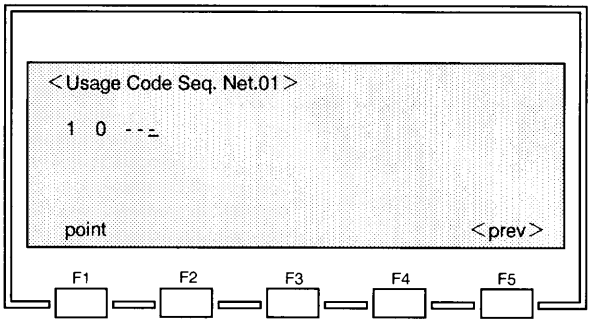


Fig.2-49 <Usage Code Seq. Net.01> Screen 2

The usage code once entered can be changed using the rotary knob. To add a data item, move the cursor to the data entry position ("---") and then enter a data item directly from the numeric keypad.

■ <prev>

Goes back to the <Enhanced Other Net.n on/off> screen.

■ ins

Inserts a data item.

Pressing the [ins] key inserts "14" at the current cursor position. The rotary knob cannot be used for data insertion. To change the usage code, use the numeric keypad or the rotary knob.

NOTE

- For data insertion (ins), processing is performed in the above manner in order for data area allocation.

■ del

Deletes a data item.

Pressing the [del] key deletes the data item at the current cursor position.

Example 5)

When eight PS characters, AF (Method A: 88 MHz, 90 MHz, and 103 MHz) , and usage code sequence for PTY, TA, and PIN are set in Other Network No.01 and output

When usage codes have been entered, the following screen results.

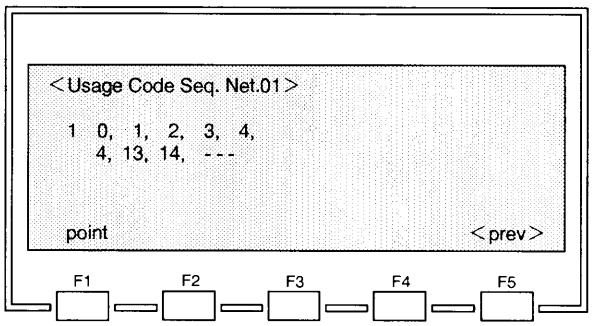


Fig.2-50 <Usage Code Seq. Net.01> Screen 3

Example 6)

When eight PS characters, AF (Tuning Freq: 88 MHz, Mapped Freq.1: 90 MHz, and Mapped Freq.2: 103 MHz), and usage code sequence for PTY, TA, and PIN are set in Other Network No.02 and output.

Go back to the <Enhanced Other Net.01 off> screen and allocate a data area for Other Network No.02. When usage codes have been entered, the following screen results.

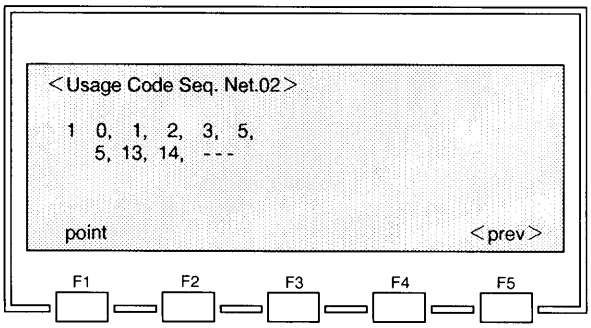


Fig.2-51 <Usage Code Seq. Net.02> Screen

2.4.1.5 <Radio Broadcast Data System>Screen

The <Radio Broadcast Data System> screen can be displayed by pressing the 【RADIO DATA】 key from the <Radio Data System main> screen in subsection 2.4.1.

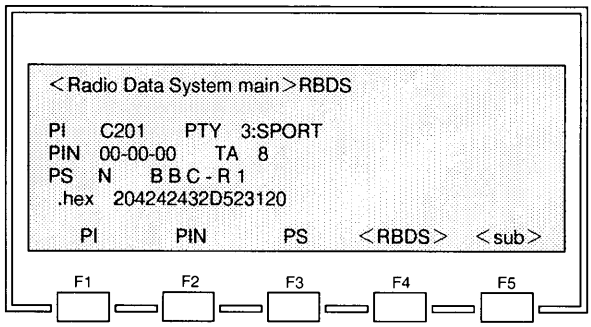


Fig.2-52 <Radio Data System main> Screen (RBDS Mode)

When <RBDS> is selected in the RBDS mode, the <Radio Broadcast Data System> screen is displayed. The key operation flow for this screen is shown in Fig.2-54.

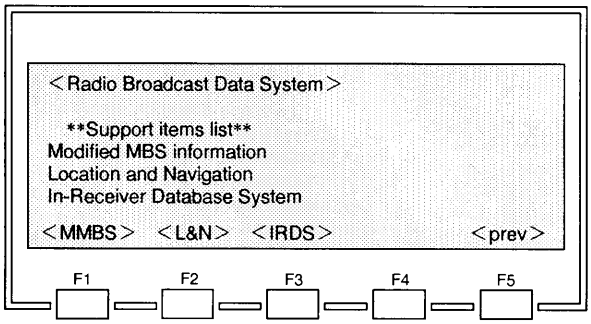


Fig.2-53 <Radio Broadcast Data System> Screen

<Radio Broadcast Data System>

- <MMBS> 【F1】
- <L&N> 【F2】
- <IRDS> 【F3】 Not supported
- <prve> 【F5】

Fig.2-54 Key Operation Flow for the <Radio Broadcast Data System> Screen

■ <MMBS>

The <Modified MBS information> screen displays the environment setting for the MMBS mode as shown in Fig.2-55. The key operation flow for this screen is shown in Fig.2-56.

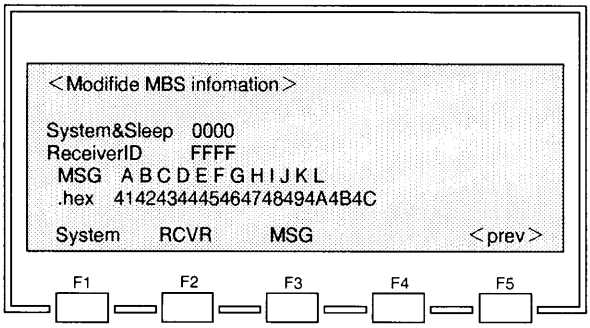


Fig.2-55 <Modified MBS information> Screen

<Modified MBS information>

System	【F1】	System & sleep code	hex : 0000 to FFFF
RCVR	【F2】	Reciver ID	hex : 0000 to FFFF
MSG	【F3】	Message	hex : 20 to FF, 12 characters
<prve>	【F4】		

Fig.2-56 Key Operation Flow for the <Modified MBS information> Screen

■ <L&N>

The <Location & Navigation main> screen displays the environment setting for the MMBS mode as shown in Fig.2-57. The key operation flow for this screen is shown in Fig.2-58.

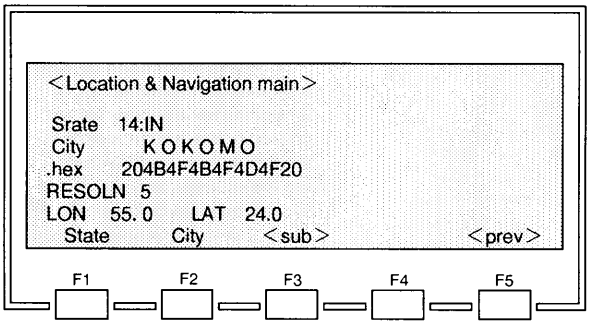


Fig.2-57 <Location & Navigation main> Screen

<Location & Navigation main>

State	【F1】	State code	dec : 0 to 63
City	【F2】	City name	hex : 20 to FF, 8 characters
<sub>	【F3】		
<prve>	【F5】		
*RESOLT	【F1】	Resolution	dec : 0 to 5
*LON	【F2】	Longitude	dec : 55 to 131, .2step
*LAT	【F3】	Latitude	dec : 24 to 90, .2step

Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-58 Key Operation Flow for the <Location & Navigation main> Screen

■ <IRDS>

<In-Receiver Data System> is not supported.

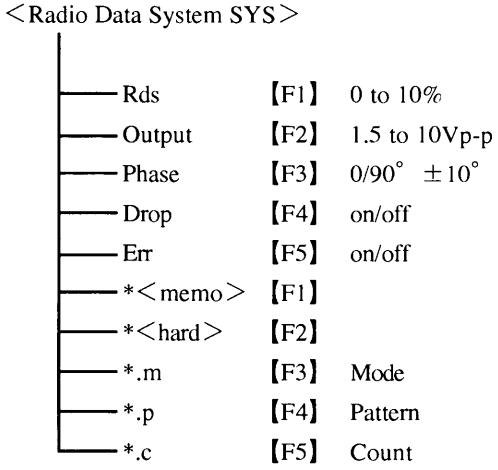
■ <prev>

Goes back to the <Radio Data System main> screen.

2.4.2 <Radio Data System SYS> Screen

The <Radio Data System SYS> screen can be displayed by pressing the 【2nd】 key and then the [<SYS>] key (or the 【TRI】 key) from the <Radio Data System main> screen in subsection 2.4.1.

The key operation flow for this screen is shown in Fig.2-59.



Functions marked with "*" are enabled after the 【2nd】 key is pressed.

Fig.2-59 Key Operation Flow for the <Radio Data System SYS> Screen

■ Rds

Sets the RDS/RBDS modulation level (0 to 10%) with respect to 100% composite signal.

The output level of the RDS/RBDS signal is the one when "continuous 0" data is output. When the modulation level is 10%, the level which is 1/10 times the specified output level is output. For example, when the modulation level is set to 3% and the output level 3 Vp-p, 3% x 3 Vp-p/100% = 0.09 Vp-p is output.

■ Output

Indicates the output level (peak to peak) from the KSG3410 when the monaural/ stereo modulation level is 100%. Set a voltage value which is equal to the input voltage sensitivity necessary for the external modulation input of the SG to be used together with the KSG3410. See subsection 2.2.2, "Output Level".

The output level by simultaneous modulation of the stereo signal, the RDS

(Radio Data System) signal, and the TRI signal is equal to the vector sum of the stereo modulation level, the RDS/RBDS modulation level, and the TRI (=SK) modulation level.

In addition, the output level by simultaneous modulation depends on the setting of the phase difference between the RDS/RBDS signal and the TRI signal (for example, 0° , 90° , ±10°).

■ Phase

See subsection 2.4.3, "Phase Variation Method for the 57 kHz Sub-Carrier".

■ Drop on/off

Turns on or off drop with the toggle operation of the drop key. This operation can also be performed using the rotary knob. See subsection 2.4.4, "Using Dropout".

■ Err on/off

Turns on or off error with the toggle operation of the error key. This operation can also be performed using the rotary knob.

The error function is used to simulate effects of a bit error in RDS data on receiver operation, which was caused by multi-path.

When error pattern (.p) for one block is set and then the type of the logical operation using this error pattern and normal RDS/RBDS data is specified by means of error mode (.m), the result is output as RDS/RBDS data in Err on (error on) condition. In the Err off (error off) condition, the error pattern and error mode specified are disabled and they are not reflected in RDS/RBDS data.

The following shows an example bit train for one block of the RDS/RBDS data which is output by error mode and error pattern setting.

Example 1)

Normal RDS/RBDS data FE00 3CD

Error mode (.m) AND

Error pattern (.p) 1234 167

RDS/RBDS data output (Error on) 1200 145

RDS/RBDS data output (Error off) FE00 3CD

■ <memo>

Calls the <Memory manage> screen in subsection 2.4.2.1.

■ <hard>

Calls the <Hard set Information> screen in subsection 2.4.2.2.

■ .m

Selects the error mode from "XOR", "OR", and "AND" using the rotary knob.

■ .p

Makes error pattern setting by entering a hexadecimal number from the numeric keypad or using the rotary knob. When Err is on, the specified error pattern is enabled.

■ .c

Makes error count setting to specify the interval of blocks in the output data with which an error block is generated. When "0" is set, an error block is generated on all blocks. The blocks with error block can be checked from the <Simulation> screen.

Specify this parameter with a decimal number from 0 to 255 using the numeric keypad or rotary knob.

2.4.2.1 <Memory manage> Screen

The <Memory manage> screen can be displayed by pressing the [<memo>] key from the <Radio Data System SYS> screen in subsection 2.4.2.

The key operation flow for this screen is shown in Fig.2-60.

This screen is used to display memory usage and release unnecessary memory space. The recall or store operation, except the RTN instruction, cannot be performed from this screen.

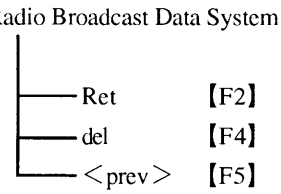


Fig.2-60 Key Operation Flow for the <Memory manage> Screen

■ Ret

Inserts RTN in the specified memory address. To cancel the current RTN, set RTN in another memory address. In this case, RTN within 10 blocks is canceled.

■ del

Clears the contents of the data stored in the displayed memory address.

■ <prev>

Goes back to the <Radio Data System SYS> screen.

The following describes each screen title.

■ Memory

Displays memory addresses to display memory usage. When the screen

changes, "00" is displayed.

For memory operation, see subsection 2.7, "Storing and Recalling Data to/ from Memory".

■ Return

Displays "**" at the entry position of RTN.

■ data

Displays the usage of the displayed memory address.

■ max

Indicates the maximum amount of memory available.

■ free

Indicates the amount of memory available.

■ active

Indicates the amount of active memory.

2.4.2.2 <Hard set Information> Screen

The <Hard set Information> screen can be displayed by pressing the [<hard>] key from the <Radio Data System SYS> screen in subsection 2.4.2.

The key operation flow for this screen is shown in Fig.2-61.

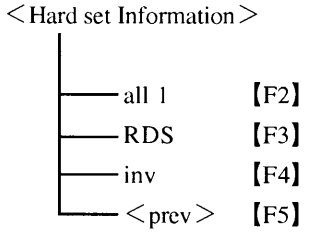


Fig.2-61 Key Operation Flow for the <Hard set Information> Screen

■ all 0

Outputs "continuous 0" data as RDS/RBDS data. In this case, the following line appears at the top of the screen.

Output data is all 0.

To cancel, press the [all 0] key again or press the [RDS] key.

■ all 1

Outputs "continuous 1" data as RDS/RBDS data. In this case, the following line appears at the top of the screen.

Output data is all 1.

To cancel, press the [all 1] key again or press the [RDS] key.

■ RDS (Radio Data System)

The KSG3410 outputs the contents of the created or edited active memory.

■ inv

See "OUT (TTL) 1187.5 Hz" below.

■ <prev>

Goes back to the <Radio Data System SYS> screen.

The following describes each screen title.

■ OUT (TTL) 1187.5Hz

"inv" specifies whether the output data from 【OUTPUT DATA】 on the rear panel is sampled at the positive edge or negative edge of 【1187.5Hz】 output. "normal" specifies the negative edge and "inverse" the positive edge.

■ Output data

Selects the source of the RDS/RBDS data using the [all 0], [all 1], and [RDS] keys.

2.4.3 Phase Variation Method for the 57 kHz Sub-Carrier

The phase variation function for the RDS/RBDS 57 kHz sub-carrier is used to evaluate the operation margin of RDS/RBDS receivers with respect to the phase difference of the 57 kHz sub-carrier, which was caused by multi-path.

In the <Radio Data System SYS> screen in subsection 2.4.2, the toggle operation for Phase makes it possible to set the phase of the 57 kHz sub-carrier to 0° (in phase) or 90° with respect to the SK 57 kHz sub-carrier.

In addition, the 0° or 90° phase setting can be varied within a range from -10° to +10° in 1° steps by moving the cursor to the right of S (Shift) using the 【▷】 key.

NOTE

- In normal operating condition, set the phase of the 57 kHz sub-carrier to 90° ± 0° .

2.4.4 Using Drop Out

The drop out function is used to evaluate RDS/RBDS receiver operation when variation in the RDS/RBDS signal level fed to it occurs.

Connect the signal with TTL level to the 【DROP CONTROL INPUT (TTL)】 connector on the rear panel.

When the signal output from the 【COMPOSITE OUTPUT】 connector, which is the summation of the RDS/RBDS and TRI signals, is Low of the TTL level, the drop out level set in the <Radio Data System SYS> screen in subsection 2.4.2 is output.

The drop out function can be turned on or off by means of the toggle operation of Drop in the <Radio Data System SYS> screen or the rotary knob.

When drop out level is set to 100%, 100% of the set RDS/RBDS modulation level and the TRI modulation level is output. The drop out level can be set to 0 to 100% in 1% steps.

CAUTION

- When the drop out function is not used, disconnect the signal from the 【DROP CONTROL INPUT(TTL)】 connector on the rear panel and turn off the drop out setting.

2.5 TRI Mode Setting

2.5.1 <Traffic Radio Information> Screen

Pressing the 【TRI】 key displays the <Traffic Radio Information> screen. The key operation flow for this screen is shown in Fig.2-62.

<Traffic Radio Information>

SK	【F1】	Modulation level 0 to 10%
DK	【F2】	Modulation level 0 to 40%
BK	【F3】	Modulation level 0 to 80%
AREA	【F4】	Areas A to F

Fig.2-62 Key Operation Flow for the <Traffic Radio Information> Screen

■ SK

Sets the SK modulation level with respect to 100% composite signal, within a range from 0 to 10%.

The output level of the TRI signal is based on the SK signal level (DK and BK on the panel set to off). Therefore, when DK and BK on the panel are set to on, the output level increases. When the modulation level is set to 10%, an output level which is 1/10 times the set output level is output. For example, when the modulation level is set to 5% and the output level 3Vp-p, 0.15 Vp-p (= 5% × 3 Vp-p/100%) is output.

■ DK

Sets the AM modulation factor by DK, within a range from 0 to 40%. The prescribed value is 30%.

■ BK

Sets the AM modulation factor by areas A to F, within a range from 0 to 80%. The prescribed value is 60%.

■ AREA

Makes setting for areas A to F.

2.5.2 TRI BK Area and Scan Time Setting

■ Setting the scan time

1) Press the 【STEREO】 key to display the <Stereo> screen.

Press the 【2nd】 and [Time] (【F4】 keys to move the cursor to the scan time setting. Then set the scan time using the rotary knob or numeric keypad. Set the scan time between the currently displayed AREA and the next AREA. The scan time can be set with "pass", within a range from 0.1 s to 12.0 s in 0.1 s steps. Because of the internal clock time specification, 0.1 s corresponds to approx. 87.5 ms and 12.0 s approx. 10.5 s.

2) To skip a certain area, set "pass". To cancel area skipping, select the area with the rotary knob and then set other than "pass".

■ Starting scanning

1) To start scanning, press the 【2nd】 and [Scan] (【F2】) keys. The rotary knob can also be used for this purpose.

During scanning, "A" to "F" display for [AREA] in the <Stereo> and <Traffic Radio Information> screens is highlighted.

2) The relationship between the area display and scan mode is shown below.

Scan mode

Display	Area	Frequency
→	A	23.75Hz
	B	28.27Hz
	C	34.93Hz
	D	39.58Hz
	E	45.67Hz
	F	53.98Hz

NOTE

- When "pass" is specified for all the scan time between A to F, scan operation is not possible.

■ Stopping scanning

To stop scanning, press the 【2nd】 and [Scan] (【F2】) keys during scanning. The rotary knob can also be used for this purpose.

2.5.3 Output of Only the DK or BK Signal (Tone Output)

1) Press the 【STEREO】 key to display the <Stereo> screen.

To turn on tone output, press the 【2nd】 and [Tone] (【F1】) keys. All the panel indicators other than 【DK】 and 【BK】 go off, entering the tone output mode. In this case, SK modulation does not operate and only the DK and BK signals are output.

2) Select 【DK】 and/or 【BK】 keys. The tone output level is proportional to the set DK and BK modulation levels. For example, the tone output level is approx. 0.3 Vrms for 30% modulation level.

3) To turn off tone output, press the 【2nd】 and [Tone] (【F1】) keys. The normal output mode including the stereo modulation mode resumes. The rotary knob can also be used for the same purpose.

2.6 SCA Level Setting

CAUTION

- The KSG3410 is provided with the 【SCA INPUT】 input connector on the rear panel. The signal supplied to this connector is output from the 【COMPOSITE OUTPUT】 connector regardless of the operating condition (internal oscillator or external signal source input). Therefore, only the SCA signal can be connected to the 【SCA INPUT】 connector on the rear panel.
- When using the traffic information signal, leave the 【SCA INPUT】 connector unconnected.

The modulation level of the Subsidiary Communication Authorization (SCA) signal is specified to 10%.

The SCA signal level is set by turning off the monaural/stereo modulation level, RDS/RBDS modulation level, SK modulation level, and pilot level. When the 【SCA INPUT】 input level is set to approx. 0.1 Vrms, a modulation level of about 10% results.

When 10% SCA signal is added, limit the modulation level of the main and sub channel to 80% to prevent the FM deviation from exceeding 75 kHz at the time of SG modulation.

2.7 Storing and Recalling Data to/from Memory

The memory of the KSG3410 consists of a 10 x 10 matrix, allowing a total of 100 different settings to be stored.

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	·	·			
20	21	22	·	·	·				
30	31	·	·	·					
40	·	·	·						
50	·	·							
60	·								
70									
80									
90									99

Fig.2-63 Memory Matrix

CAUTION

- Data is to be stored in the address which is specified first after store operation is specified. Make sure that the address specification is correct.

2.7.1 Address Specification

Direct Specification (by Numeric Keypad)

■ Store

Press 【2nd】, 【STO】, 【 · 】, row number (block), and then column number. To store data in address 25, press 【2nd】, 【STO】, 【 · 】, 【2】 and 【5】.

■ Recall

Press 【RCL】, 【 · 】 row number (block), and then column number. To recall data from address 25, press 【RCL】, 【 · 】, 【2】 and 【5】.

NOTE

- The 【—】 key can be used as a wild card of the row number (block). When address 25 is recalled, pressing 【RCL】, 【 · 】, 【—】, 【8】 recalls address 28.

Specification with 【△】 and 【▽】 Keys

The 【△】 and 【▽】 keys can be used to specify the column number.

■ Store

Press 【RCL】 , row number (block), and 【△】 / 【▽】 to specify the column number prior or next to the target one, and then press 【2nd】 , 【STO】 , and 【△】 / 【▽】 to select the column number to store data.

To store data in address 25, press 【RCL】 , 【2】 , and 【△】 / 【▽】 to specify address 24 or 26, and then press 【2nd】 , 【STO】 , and 【△】 / 【▽】 to select address 25.

■ Recall

Press [RCL], row number (block), and 【△】 / 【▽】 to specify the column number.

To specify address 25, press 【RCL】 , 【2】 , and then 【△】 five times.

Cycle Specification of the Column Number

This method is used to limit the 【△】 and 【▽】 cycle for the column number in a block. Specify the block and column number for which cycle is to be limited by direct specification and then press 【2nd】 , 【STO】 and 【RTN】 The column number is displayed in cyclic manner.

Example 1)

To cycle two blocks with column numbers 0 to 6, press 【2nd】 , 【STO】 , 【 · 】 , 【2】 , 【6】 or 【RCL】 , 【 · 】 , 【2】 , 【6】 by direct specification. Then press 【2nd】 , 【STO】 and 【RTN】 to allow column numbers 0 to 6 to be selected by the 【△】 and 【▽】 keys.

20→21→22→23→24→25→26→RETURN→20→21→ · · · ·

NOTE

- If cycle specification of column number is made when column number is 0, only the top column can be selected.

To cancel cycle specification, set the limited column number of the specified block as cycle 0 to 9 again. In the above example, press 【RCL】 , 【 · 】 , 【2】 , 【9】 by direct specification, and then press 【2nd】 , 【STO】 and 【RTN】 .

Consecutive Address Setting

Normally, the address is specified in cyclic manner within a block. Consecutive address setting allows address specification in two or more consecutive blocks.

① Recall column 9 in the first block of the blocks to be consecutive.

② Press 【2nd】, 【STO】, and 【NEXT】 to allow subsequent blocks to be selected or displayed in succession.

Example 2)

To make blocks 3 and 4 consecutive, press 【RCL】, 【 · 】, 【3】, 【9】, and then press 【2nd】 【STO】 【NEXT】.

Addresses 30 to 49 can be selected by the 【△】 and 【▽】 keys.

· · · · →38→39→NEXT→40→41→ · · · ·

To cancel consecutive address specification, replace NEXT with RETURN.

Recall the last address of the address to be canceled, by pressing 【RCL】, 【 · 】, row number (block), column number, and then press 【2nd】, 【STO】, and 【RTN】.

In the above example, press 【RCL】, 【 · 】, 【3】, 【9】 with direct specification, and then press 【2nd】, 【STO】, and 【RTN】.

2.7.2 Basic Store Operation

CAUTION

- When the <REMOTE Setup> screen is displayed, avoid performing memory store operation.
- Data is to be stored in the address which is specified first after store operation is specified. Make sure that the address specification is correct. When the address has not yet been specified, the [STO] indicator goes on; when it has been specified, the indicator goes off.

The basic store operation includes the following steps:

- Level, data, and clock setting
- Store specification
- Address specification

Successive Store within a Block

① Press 【2nd】, 【STO】, and row number (block) to store data in the first column of the specified block.

② Press 【2nd】, 【STO】, and 【△】 to store data in the next column.

Example 1) Storing data in addresses 20 and 21

Make level, data, and clock polarity setting, and then press 【2nd】, 【STO】, and 【2】 to store data in address 20. Then make another setting and press 【2nd】, 【STO】, and 【△】 to increment the column number. Data is stored in address 21.

■ Direct Store

① Press 【2nd】, 【STO】, row number (block), and column number to store data in the specified address directly.

Example 2) Storing data in address 25

Make level, data, and clock polarity setting, and then press 【2nd】, 【STO】, 【·】, 【2】, 【5】 to store data in address 25.

NOTE

- After direct store, pressing 【2nd】, 【STO】, 【△】 (or 【▽】) stores data in the address prior or next to the current one.

2.7.3 Basic Recall Operation

Successive Recall within a Block

① Press 【RCL】 and row number (block) to recall a block, and then press 【△】 / 【▽】 to select the column number.

Example 1) Recalling block 2

Press 【RCL】 and 【2】 to recall address 20. Then press 【△】 / 【▽】 to select the column number.

Direct Recall

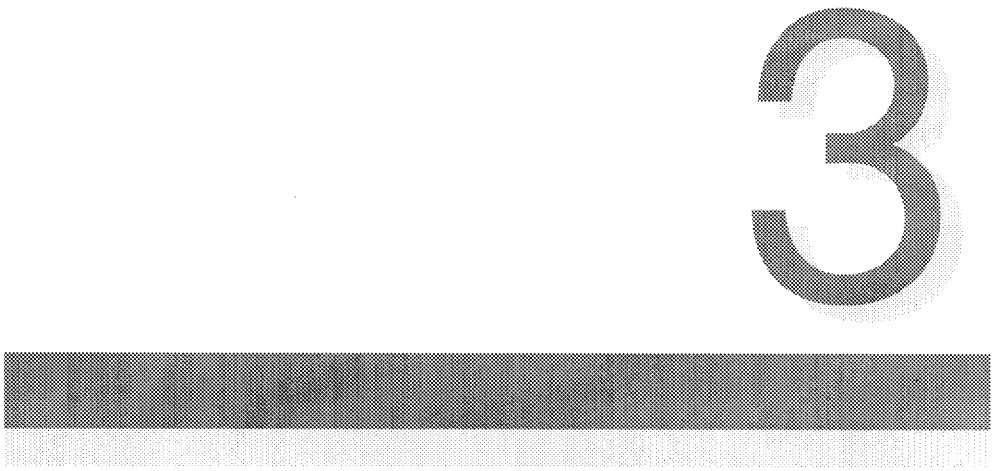
① Press 【RCL】, 【·】, row number (block), and column number to recall the specified address directly.

Example 2) Recalling address 25

Press 【RCL】 → 【 · 】 → 【2】 → 【5】 to recall address 25.

NOTE

· After direct recall, pressing 【△】 / 【▽】 selects the address prior or next to the current one.



Chapter 3 Remote Control

This chapter describes remote control using the GPIB, RS-232C, and other interfaces.

Contents

3.1 Remote Control Using the Remote Connector

3.1.1 Overview

The KSG3410 is provided with a remote connector on the rear panel, which are used to control front panel key operations remotely.

NOTE

- "1" and "0" used in the following description correspond to "High" and "Low" of the TTL level, respectively.

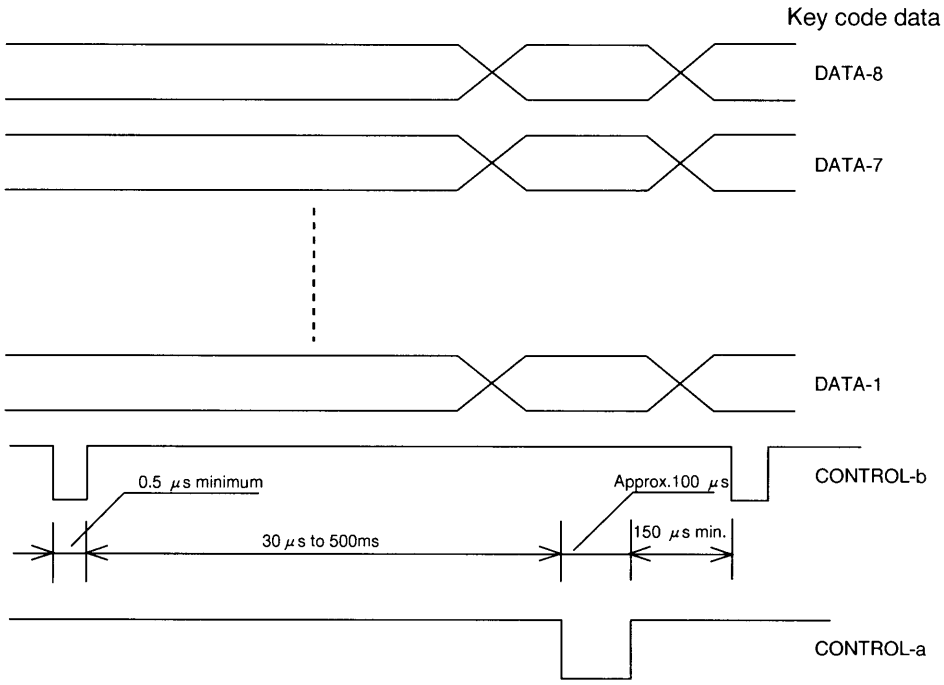


Fig.3-1 Timing Chart

CONTROL-b : This signal requests data read by outputting "0" for 0.5 μ s or more.

CONTROL-a : Outputs "0" for about 100 μ s, 30 μ s to 500 ms after reception of the signal CONTROL-b. In this duration, data is read.

For 150 μ s after the level is set back to "1", the signal CONTROL-b cannot be received.

DATA-1 to 8 : This key code data must be retained while the signal CONTROL-a is "0".

3.1.2 Descriptions on the Remote Connector Terminal

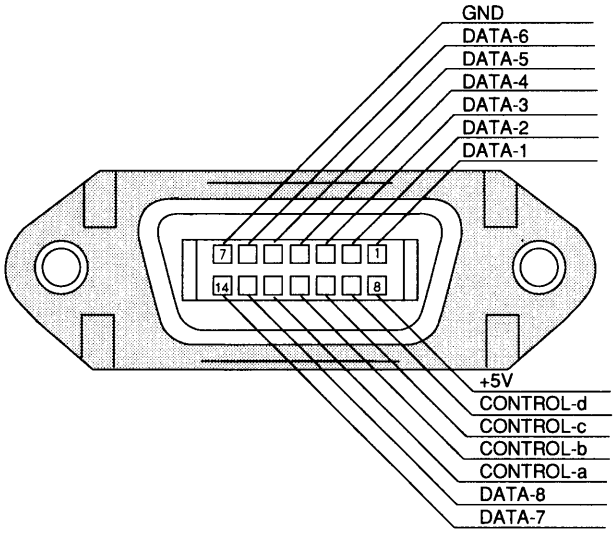


Fig.3-2 Pin Assignment of the Remote Connector

DATA-1 to -8 (Pin Nos.1 to 6, 13, and 14)

The DATA lines form a bi-directional data bus which can be used for input and output. Because the data bus is bi-directional, if "0" or "1" is applied to DATA-1 to -8 directly, the KSG3410 does not operate.

CONTROL (Pin Nos.9 to 12)

- CONTROL-a: DATA STROBE output terminal (pin No.12)
  Outputs "1" normally or "0" to read data.
- CONTROL-b: REQUEST TO READ input terminal (pin No.11)
  Outputs "1" normally or "0" to request data read.
- CONTROL-c: Display control output terminal (pin No.10)
  When "1", data processing is performed.
- CONTROL-d: Display control output terminal (pin No.9)
  When "1", data processing is performed.
  Outputs a square wave with a width of about 13 ms and a period of about 87.6 ms continuously.

+5V terminal : Remote control power terminal (pin No.8)

Maximum current output: 100 mA

CAUTION

- Avoid using the remote connector for other than remote control.

GND terminal: Ground terminal (pin No.7)

Connected to the chassis.

3.1.3 Panel Key Code Table

Every key on the panel is assigned a code.

When a key code shown in Table 3-1 below is specified, setting the signal CONTROL-b to "0" is equivalent to pressing the corresponding key on the panel.

Table 3-1 Key Code Table

Key name	DATA input pin No. 6	5	4	3	2	1
	MSB ← Key Code → LSB					
RCL/STO	0	0	0	1	0	0
▽/RTN	0	0	0	1	1	1
△/NEXT	0	0	0	1	1	0
F1	0	0	1	0	0	1
F2	0	0	1	0	1	1
F3	0	0	1	1	0	0
F4	0	1	0	0	0	0
F5	0	1	0	0	0	1
MONO(SET)	1	0	1	0	1	0
MAIN(100%)	0	1	1	1	0	0
LEFT(30%)	0	1	1	1	0	1
RIGHT	0	1	1	1	1	0
SUB	0	1	1	1	1	1
MOD ON	0	0	1	1	1	1
PILOT ON	0	0	1	1	1	0
TP(100%)	1	0	0	1	1	0
TA	1	0	0	1	1	1
M/S	1	0	1	0	0	0
ON	1	0	0	1	0	0
SK(100%)	1	0	0	0	0	1
DK	1	0	0	0	1	0
BK	1	0	0	0	1	1
2nd	0	1	1	0	1	1
STEREO	0	1	0	0	1	0
RADIO DATA(EON)	0	1	0	0	1	1
TRI(SYSTEM)	0	1	0	1	0	0
ENTER	0	0	1	0	1	0
MHz	0	1	0	1	1	0
kHz	1	0	0	1	0	1
0	1	1	0	0	0	0
1	1	1	0	0	0	1
2	1	1	0	0	1	0
3	1	1	0	0	1	1
4	1	1	0	1	0	0
5	1	1	0	1	0	1
6	1	1	0	1	1	0
7	1	1	0	1	1	1
8	1	1	1	0	0	0
9	1	1	1	0	0	1
·	1	0	1	1	1	0
—	1	0	1	1	0	1
⇦	0	0	1	0	0	0
△	0	1	0	1	1	1
▽	0	1	1	0	0	0
◁	1	1	1	1	0	0
▷	1	1	1	1	0	1
Rotary knob (right)	0	0	0	0	0	0
Rotary knob (left)	0	0	0	0	0	1
LOCAL	1	0	1	1	1	1

NOTE

- The DATA lines form a 8-bit data bus and therefore set DATA8 (pin No.13) and DATA7 (pin No.14) to "1".

3.1.4 Performing Recall Using Remote Control

■ Recalling memory 57

① Set "000100" which corresponds to 【RCL】 key.

② While the signal CONTROL-a is "0", data is read.

③ Set the key code of the 【 · 】 key ("101110") and then set the signal CONTROL-b to "0".

④ Set the key code of the 【5】 key ("110101") and then set the signal CONTROL-b to "0".

⑤ Set the key code of the 【7】 key ("110111") and then set the signal CONTROL-b to "0".

When the signal CONTROL-a becomes "0", recall processing is started.

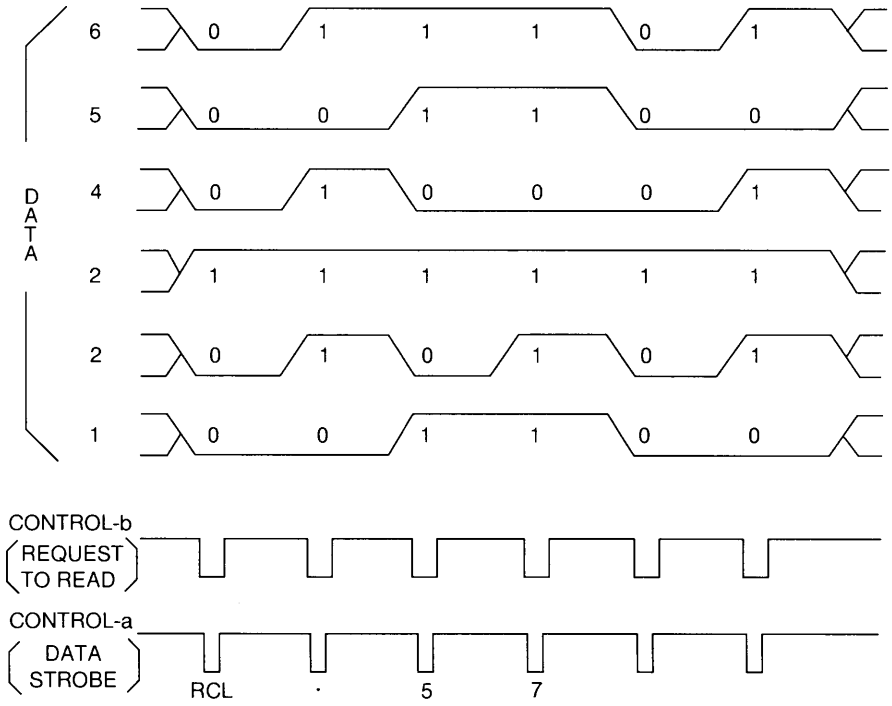


Fig.3-3 Time Chart for Recall "57"

■ Example remote control circuit and operation

Since the data line of the remote control connector is a bi-directional bus, the circuit shown below is recommended for remote control of the KSG3410.

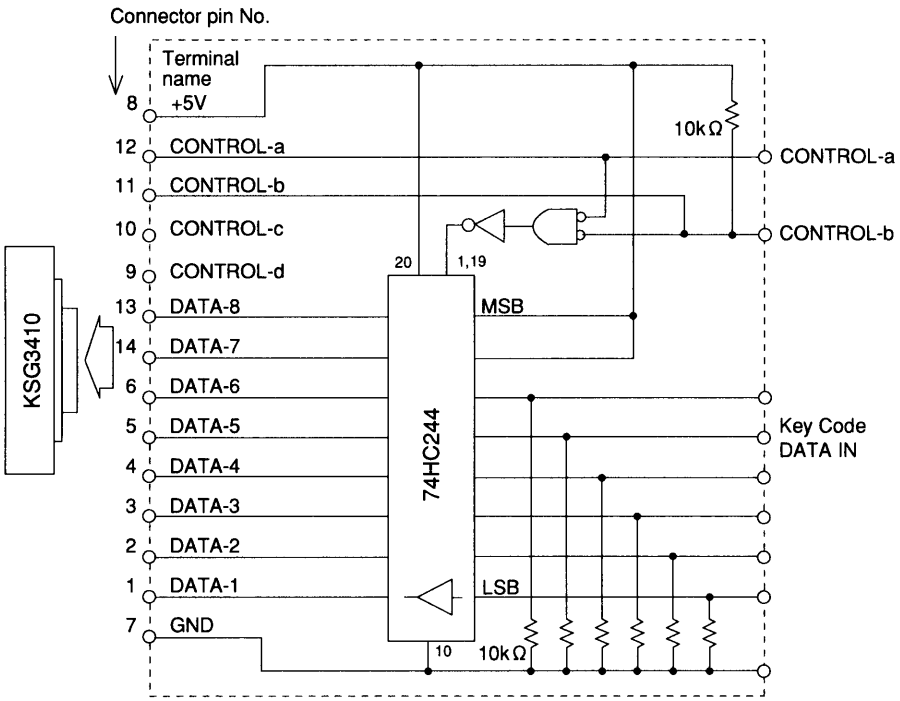


Fig.3-4 Example Remote Circuit

① When the signal CONTROL-b is "1", set DATA-1 to -6.

② Wait for 10 μ s or more, set the signal CONTROL-b to "0".

③ The signal CONTROL-a becomes "0" within 30 μ s to 500 ms.

Set Enable A and B (pin Nos.1 and 19) to "0" and then perform key code capture processing while the signal CONTROL-a is "0" (for about 100 μ s).

④ Upon completion of capture processing, the signal CONTROL-a becomes "1". Confirm this signal and then set the next key code.

Key code data can be input in succession by repeating the above procedure.

NOTE

- When inputting key code data in succession, if the signal CONTROL-b is set to "0" before key code data processing is completed, it takes up to approx. 500 ms till the signal CONTROL-a is output.
- The DATA line consists of eight bits. Send "1" to DATA-8 (pin 13) and DATA-7 (pin 14) via the 74HC244.

The timing chart of the example remote control circuit is shown in Fig.3-5.

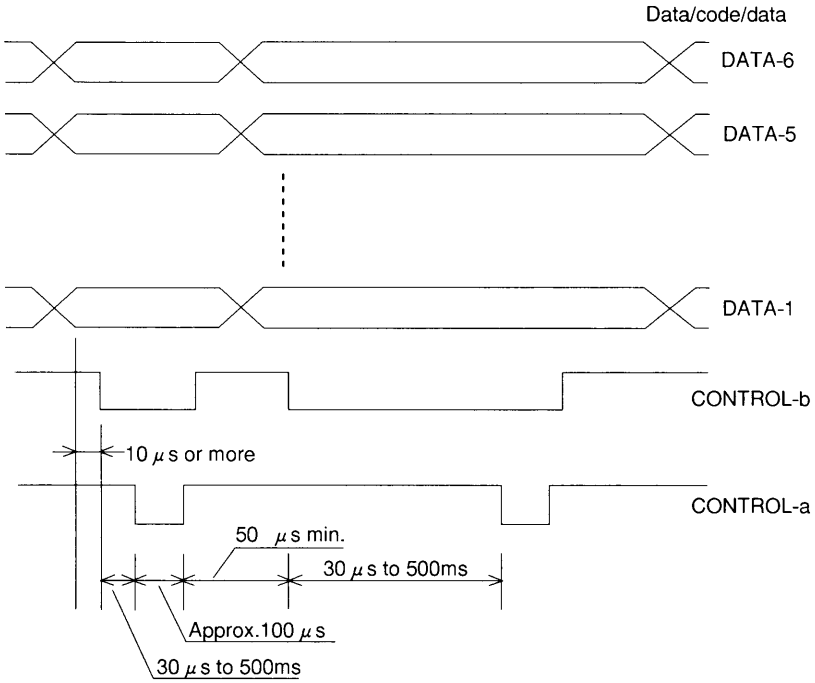


Fig.3-5 Timing Chart of the Example Remote Circuit

■ Example output circuit of the MEMORY display unit

Since the remote control terminal has a bi-directional bus configuration, data can be output in the same manner as the MEMORY display unit on the panel. In addition, when a latch is used instead of the CMOS4511, MEMORY display unit data can be used.

When the circuits in Figs.3-4 and 3-6 are connected in parallel at the connector, remote control of the KSG3410 as well as internal MEMORY display and data check are allowed.

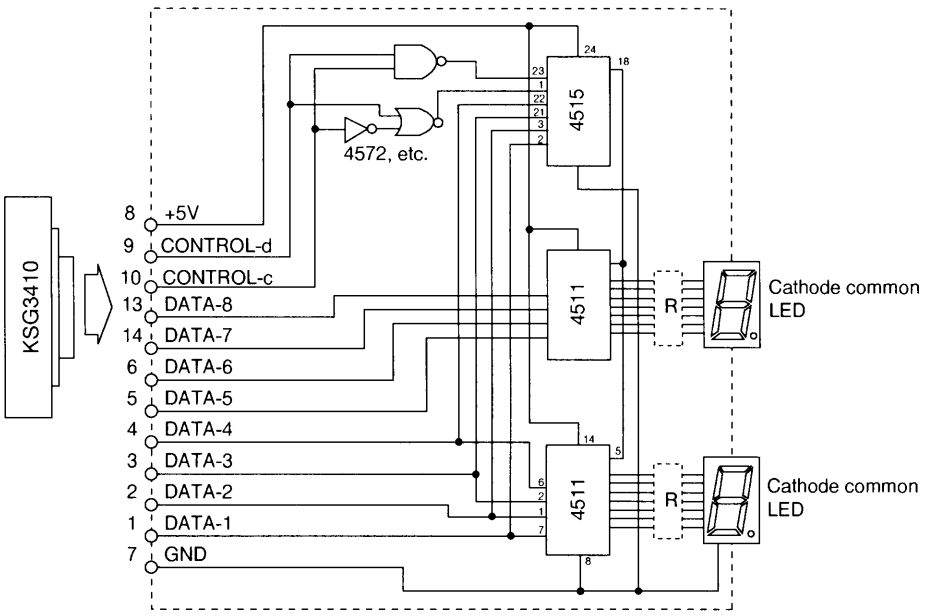


Fig.3-6 Example Output Circuit of the MEMORY Display Unit

3.2 GPIB Control

3.2.1 Overview

The GPIB interface of the KSG3410 is controlled by means of the IEEE488 standard interface bus. The electrical and mechanical specifications of the interface conform to IEEE std 488.1-1987.

3.2.2 Setup

① When the power is off, connect the GPIB cable.
② Turn on the 【POWER】 switch.
③ Press the 【2nd】 and 【LOCAL】 keys to display the <REMOTE Setup> screen.
④ Check the device address of the GPIB interface. [Addr] indicates the device address which is set to "11" at the time of shipment.

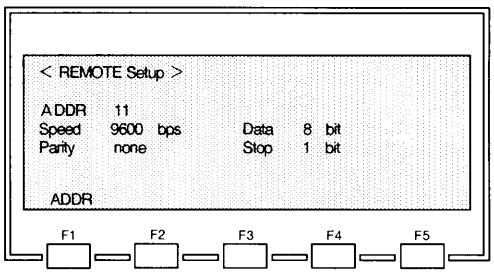


Fig.3-7 <REMOTE Setup> Screen

Device address setting

A number from 0 to 30 can be set as a device address.

① Press the 【2nd】 and 【LOCAL】 keys to display the <REMOTE Setup> screen.
The device address is displayed at [Addr].

② If the cursor is not located on [Addr], move it to [Addr] using the [Addr] (【F1】) key or the 【△】 , 【▽】 , 【▷】 , and 【◁】 keys.

③ [Addr] setting is made using the rotary knob or numeric keypad.

Rotary knob : Increments and decrements the digit at the cursor position.

Numeric keypad : Allows direct address setting by entering a number. For example, to set address 20, press 【2】 , 【0】 , and 【ENTER】 .

CAUTION

- When the device address has been set, turn off the power and then turn it back on.

  The device address is backed up till memory is initialized.

3.2.3 Control Commands and Bus Line Commands

NOTE

- Control commands and bus line commands differ according to the computer to be used. See each individual manual.

Table 3-2 Control Commands and Bus Line Commands

Control command and bus line command		Description
HP9816	PC9801	
OUTPUT	PRINT@	Specifies the listener address and sends program data.
ENTER	INPUT@	Specifies the talker address and receives data from the interface.
REMOTE	ISET REN	When a listener address is specified, the 【REMOTE】 indicator (red) on the panel goes on indicating that the KSG3410 is ready to receive data. In this case, if the 【LOCAL】 key on the panel is pressed, the indicator goes off and the local mode is re-entered, allowing manual operation on the panel.
LOCAL LOCKOUT	LOCAL LOCKOUT	When a universal command is used to send LOCAL LOCKOUT to all devices on the GPIB bus, manual operation on the panel is disabled.
LOCAL	IRESET REN	The 【REMOTE】 indicator goes off and the local mode is re-entered, allowing manual operation on the panel.
CLEAR	ISET IFC	The same as status after turning off the power of the KSG3410 and then turn it back on.

3.2.4 Program Codes

The program codes of the KSG3410 are shown in Table 3-3 (by function) and Table 3-4 (in alphabetical order).

In developing control programs, write the program code so that commands be sent in the same order as panel operation.

Table 3-3 Program Code List (by Function)

Function	Command	Query	Data	Unit	Remarks
Modulation level	MOD		○○○ ○○.○	%	
		MOD?	s ddd.d% s dd.dd%	%	s indicates ON or OF. ddd.d indicates set value. When ddd.d≦10%, d at the 1st digit is blank (when pre-emphasis is on).
Modulation off	MODOF		---	---	
Modulation on	MODON		---	---	
MAIN signal	M1		---	---	
LEFT signal	M2		---	---	
RIGHT signal	M3		---	---	
SUB signal	M4		---	---	
EXT L/R signal	M5		---	---	
MONO signal	M6		---	---	
Modulation off	M7 (MO)		---	---	
External modulation EXT	S1		---	---	
Internal modulation 30Hz	S2		---	---	
Internal modulation 100Hz	S3		---	---	
Internal modulation 400Hz	S4		---	---	
Internal modulation 1kHz	S5		---	---	
Internal modulation 6.3kHz	S6		---	---	
Internal modulation 10kHz	S7		---	---	
Internal modulation 15kHz	S8		---	---	
Pilot level	PL		○○	%	
Pilot off	PLOF		---	---	
Pilot on	PLON		---	---	
Pre-emphasis off	PRE0		---	---	
Pre-emphasis 25μs	PRE1		---	---	
Pre-emphasis 50μs	PRE2		---	---	
Pre-emphasis 75μs	PRE3		---	---	
Output level	AP		○○.○○	V	
		AP?	dd.ddV	V	dd.dd indicates set value.
SRDS/RBDS modulation level	AF		○○.○○	%	
		AF?	dd.dd%	%	dd.dd indicates set value.
		OT?	s	---	s indicates ON or OF.
RDS/RBDSmodulation level off	OTOF		---	---	
RDS/RBDSmodulation level on	OTON		---	---	
Outputs RDS/RBDS data.	RDSN		○	---	
		RDS?	c	---	c indicates N, 0, or 1.
Outputs all 0.	RDS0		○	---	
Outputs all 1.	RDS1		○	---	
Phase 0°	PH0		○○	---	
Phase 90°	PH90		○○	---	
Phase shift (-10° to +10°)	PHS		±○○	---	
		PH?	n Sn'	---	n indicates 0 or 90. Sn' indicates -10 to +10.
Group interval to add error pattern	ER		○○○	---	
Error pattern		ER?	s s1 Phhhhhhh n	---	s indicates ON or OF. s1 indicates OR, XOR, or AND. hhhhhhh indicates a 7-digit hexadecimal number. n indicates a 3-digit number.

Table 3-3 Program Code List (by Function) (Continued)

Function	Command	Query	Data	Unit	Remarks
Error off	EROF		---	---	
Error on	ERON		---	---	
Error pattern setting	ERP		○○○○ ○○○	---	
Error pattern XOR	ERXOR		---	---	
Error pattern OR	EROR		---	---	
Error pattern AND	ERAND		---	---	
Drop level	DROP		○○	%	
		DROP?	s n%	%	s indicates ON or OF. n indicates 1- to 3-digit set value.
Drop off	DROPOF		---	---	
Drop on	DROPON		---	---	
SK modulation level	SK		○○.○	%	
		SK?	s dd.d%	%	s indicates ON or OF. dd.d indicates set value.
SK modulation off	SKOF		---	---	
SK modulation on	SKON		---	---	
DK modulation level	DK		○○	%	
		DK?	s n%	%	s indicates ON or OF. n indicates 1- to 2-digit set value.
	TDK		○○	%	Effective only at tone output
DK modulation level off	DKOF		---	---	
DK modulation level off	TDKOF		---	---	Effective only at tone output
DK modulation level on	DKON		---	---	
DK modulation level on	TDKON		---	---	Effective only at tone output
BK modulation level	BK		○○	%	
		BK?	s n%	%	s indicates ON or OF. n indicates 1- to 2-digit set value.
Area identification signal modulcation level	TBK		○○	%	Effective only at tone output
BK modulation level off	BKOF		---	---	
BK modulation level off	TBKOF		---	---	Effective only at tone output
BK modulation level on	BKON		---	---	
BK modulation level on	TBKON		---	---	Effective only at tone output
BK area A	AREAA		○	---	
Area identification signal A	TAREAA		○	---	Effective only at tone output
BK area B	AREAB		○	---	
Area identification signal B	TAREAB		○	---	Effective only at tone output
BK area C	AREAC		○	---	
Area identification signal C	TAREAC		○	---	Effective only at tone output
BK area D	AREAD		○	---	
Area identification signal D	TAREAD		○	---	Effective only at tone output
BK area E	AREAE		○	---	
Area identification signal E	TAREAE		○	---	Effective only at tone output
BK area F	AREAF		○	---	
Area identification signal F	TAREAF		○	---	Effective only at tone output
BK area		AREA?	c	---	c indicates a character from A to F.
Tone output signal off	TOF		---	---	Effective only at tone output
Tone output signal on	TON		---	---	Effective only at tone output
Memory recall	RC		○○	---	
Memory store	ST		○○	---	

1. Data marked with "---" is optional.
2. With data ○○, digit 1 to the most significant digit are effective.
3. Data is an integer or real number. The E format cannot be used.
4. Lowercase letters can be used.

Table 3-4 Program Code List (in Alphabetical Order)

Command	Query	Function	Data	Unit	Remarks
AF		RDS/RBDS modulation level	○○.○○	%	
	AF?	RDS/RBDS modulation level	dd.dd%	%	dd.d indicates set value.
AP		Output level	○○.○○	V	
	AP?	Output level	dd.ddV	V	dd.d indicates set value.
AREAA		BK eara A	○	—	
AREAB		BK eara B	○	—	
AREAC		BK eara C	○	—	
AREAD		BK eara D	○	—	
AREAE		BK eara E	○	—	
AREAF		BK eara F	○	—	
	AREA?	BK eara	c	—	c indicates a character from A to F.
BK		BK modulation level	○○	%	
	BK?	BK modulation level	s n%	%	s indicates ON or OF. n indicates 1- to 2-digit set value.
BKOF		BK modulation level off	—	—	
BKON		BK modulation level on	—	—	
DK		DK modulation level	○○	%	
	DK?	DK modulation level	s n%	%	s indicates ON or OF. n indicates 1- to 2-digit set value.
DKOF		DK modulation level off	—	—	
DKON		DK modulation level on	—	—	
DROP		Drop level	○○	%	
	DROP?	Drop level	s n%	%	s indicates ON or OF. n indicates 1- to 3-digit set value.
DROPOF		Drop off	—	—	
DROPON		Drop on	—	—	
ER		Group interval to add error pattern	○○○	—	
	ER?	Error pattern	s s1 Phhhhhhh n	—	s indicates ON or OF. s1 indicates OR, XOR, or AND. hhhhhhh indicates a 7-digit hexadecimal number. n indicates a 3-digit number.
ERAND		Error pattern AND	—	—	
EROF		Error off	—	—	
ERON		Error on	—	—	
EROR		Error pattern OR	—	—	
ERP		Error pattern setting	○○○○ ○○○	—	
ERXOR		Error pattern XOR	—	—	
M1		MAIN signal	—	—	
M2		LEFT signal	—	—	
M3		RIGHT signal	—	—	
M4		SUB signal	—	—	
M5		EXT L/R signal	—	—	
M6		MONO signal	—	—	
M7 (MO)		Modulation off	—	—	
MOD		Modulation level	○○○ ○○.○	%	
	MOD?	Modulation level	s ddd.d% s dd.dd%	%	s indicates ON or OF. ddd.d indicates set value. When ddd.d≦10%, d at the 1st digit is blank (when pre-emphasis is on).
MODOF		Modulation off	—	—	
MODON		Modulation on	—	—	

Table 3-4 Program Code List (in Alphabetical Order) Continued

Command	Query	Function	Data	Unit	Remarks
OTOF		RDS/RBDS modulation level off	---	---	
OTON		RDS/RBDS modulation level on	---	---	
	OT?	RDS/RBDS modulation level	s	---	s indicates ON or OF.
PH0		Phase 0°	○○	---	
PH90		Phase 90°	○○	---	
PHS		Phase shift (-10 to +10)	±○○	---	
	PH?	Phase shift (-10 to +10)	n Sn'	---	n indicates 0 or 90. Sn' indicates -10 to +10.
PL		Pilot level	○○	%	
PLOF		Pilot off	---	---	
PLON		Pilot on	---	---	
PRE0		Pre-emphasis off	---	---	
PRE1		Pre-emphasis 25 μs	---	---	
PRE2		Pre-emphasis 50 μs	---	---	
PRE3		Pre-emphasis 75 μs	---	---	
RC		Memory recall	○○	---	
RDS0		Outputs all 0.	○	---	
RDS1		Outputs all 1.	○	---	
RDSN		RDS/RBDS data output	○	---	
	RDS?	RDS/RBDS data output	c	---	c indicates N, 0, or 1.
S1		External modulation EXT	---	---	
S2		Internal modulation 30Hz	---	---	
S3		Internal modulation 100Hz	---	---	
S4		Internal modulation 400Hz	---	---	
S5		Internal modulation 1kHz	---	---	
S6		Internal modulation 6.3kHz	---	---	
S7		Internal modulation 10kHz	---	---	
S8		Internal modulation 15kHz	---	---	
SK		SK modulation level	○○.○	%	
	SK?	SK modulation level	s dd.d%	%	s indicates ON or OF. dd.d indicates set value.
SKOF		SK modulation level off	---	---	
SKON		SK modulation level on	---	---	
ST		Memory store	○○	---	
TAREAA		Area identification signal A	○	---	Effective only at tone output
TAREAB		Area identification signal B	○	---	Effective only at tone output
TAREAC		Area identification signal C	○	---	Effective only at tone output
TAREAD		Area identification signal D	○	---	Effective only at tone output
TAREAE		Area identification signal E	○	---	Effective only at tone output
TAREAF		Area identification signal F	○	---	Effective only at tone output
TBK		Area identification signal modulation level	○○	%	Effective only at tone output
TBKOF		BK modulation level off	---	---	Effective only at tone output
TBKON		BK modulation level on	---	---	Effective only at tone output
TDK		DK modulation level	○○	%	Effective only at tone output
TDKOF		DK modulation level off	---	---	Effective only at tone output
TDKON		DK modulation level on	---	---	Effective only at tone output
TOF		Tone output signal off	---	---	Effective only at tone output
TON		Tone output signal on	---	---	Effective only at tone output

1. Data marked with "---" is optional.
2. With data ○○ digit 1 to the most significant digit are effective.
3. Data is an integer or real number. The E format cannot be used.
4. Lowercase letters can be used.

3.2.5 Example of Basic Data Setting

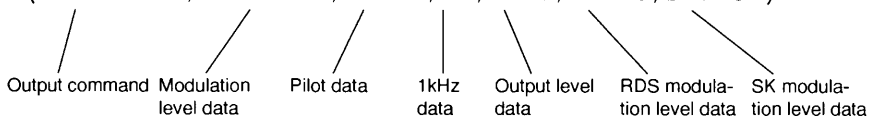
NOTE

- The following example applies to the HP9816 and example in ( ) applies to the PC9801.

Example 1) When the following is setting is made

Modulation level	90%
Pilot level	10%
Internal modulation	1 kHz
Output level	3 Vp-p
RDS/RBDS data output	5%
SK modulation level	7%

```
OUTPUT 711;"MOD90PC,PL10%,S5,AP3V,AF5PC,SK7PC"
(PRINT@ 11;"MOD90PC,PL10%,S5,AP3V,AF5PC,SK7PC")
```



Normally, CRLF or EOI is sent last.

In the above example, data are sent at one time. However, data can be sent one by one.

```
OUTPUT 711;"MOD90PC"      (PRINT@ 11;"MOD90PC")
OUTPUT 711;"PL10%"        (PRINT@ 11;"PL10%")
OUTPUT 711;"S5"           (PRINT@ 11;"S5")
OUTPUT 711;"AP3V"         (PRINT@ 11;"AP3V")
OUTPUT 711;"AF5PC"        (PRINT@ 11;"AF5PC")
OUTPUT 711;"SK7PC"        (PRINT@ 11;"SK7PC")
```

Example 2) Inputting the TRI traffic information area in A$

```
OUTPUT 711;"AREA?"        (PRINT@ 11;"AREA?")
ENTER 711;A$              (INPUT@ 11;A$)
```

Example 3) Setting the stereo modulation level to 30% and the pilot level to 8%

```
"MOD30PC","PL8%"
```

Example 4) Setting the modulation function to the LEFT signal

```
"M2"
```

Example 5) Setting the modulation source to 400 Hz

```
"S4"
```

Example 6) Setting the modulation level to OFF

There are the following three commands:

(1) "MODOF"

(2) "M7"

(3) "M0"

Example 7) Setting the pilot level to OFF

```
"POF"
```

Example 8) Setting the output level to 2.83 Vp-p

```
"AP2.83V"
```

Example 9) Setting the RDS/RBDS modulation level to 1.6%

```
"AF1.6PC"
```

Example 10) Setting the BK area to A

```
"AREAA"
```

Example 11) Setting the RDS/RBDS output level to OFF

```
"OTOF"
```

Example 12) Memory recall

Recalling memory address 36

```
"RC36"
```

Example 13) Memory store

Same as Memory recall.

```
"ST36"
```

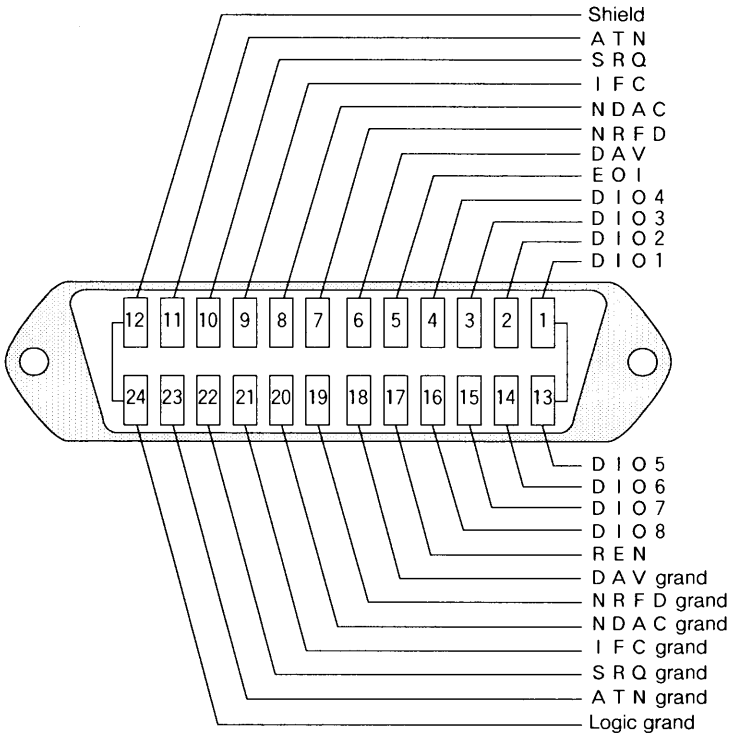


Fig.3-8 Pin Assignment of the GPIB Connector

3.3 SIO Control (RS-232C)

3.3.1 Overview

The serial interface function of the KSG3410 conforms to EIA RS-232C standard.

1) Communication protocol including transmission rate can be set in arbitrary manner.
2) GPIB remote/local functions can be realized by the serial interface.

3.3.2 Usage

Setup

① When the power is off, connect the RS-232C cable (straight cable).
② Turn on the 【POWER】 switch.
③ Press the 【2nd】 and then 【LOCAL】 keys to display the <REMOTE Setup> screen.

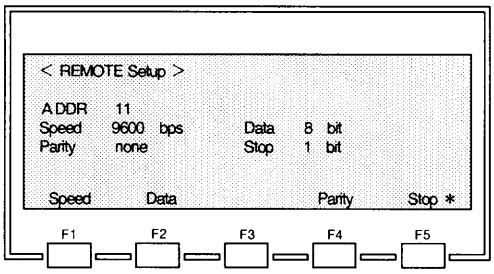


Fig.3-9 <REMOTE Setup> Screen

Protocol Setting

CAUTION

- Upon completion of protocol, turn the power back on.
  Protocol setting is backed up until memory is initialized.

Press the 【2nd】 and then 【LOCAL】 keys to display the <REMOTE Setup> screen. Protocol settings include [Speed], [Data], [Stop], and [Parity].

■ Speed setting

Speed settings include [300], [600], [1200], [2400], [4800], and [9600] (bps). [9600] is set at the time of shipment.

① If the cursor is not at [Speed], move the cursor to it using the [Speed] (【F2】) key or the 【△】 , 【▽】 , 【▷】 , and 【◁】 keys.

② Speed setting is made using the rotary knob.

■ Data bit setting

Data bit settings include [7] and [8] (bits). [8] is set at the time of shipment.

① If the cursor is not at [Data], move the cursor to it using the [Data] (【F3】) key or the 【△】 , 【▽】 , 【▷】 , and 【◁】 keys.

② Data bit setting is made using the rotary knob.

■ Stop bit setting

Stop bit settings include [1] and [2] (bits). [1] is set at the time of shipment.

① If the cursor is not at [Stop], move the cursor to it using the [Stop] (【F4】) key or the 【△】 , 【▽】 , 【▷】 , and 【◁】 keys.

② Stop bit setting is made using the rotary knob.

■ Parity bit setting

Parity bit settings include [None], [Odd], and [Even]. [None] is set at the time of shipment.

① If the cursor is not at [Parity], move the cursor to it using the [Parity] (【F5】) key or the 【△】 , 【▽】 , 【▷】 , and 【◁】 keys.

② Parity bit setting is made using the rotary knob.

NOTE

- The following combinations cannot be specified:
  1) [Data] : 8BIT, [Stop] : 2BIT, [Parity] : Odd
  2) [Data] : 8BIT, [Stop] : 2BIT, [Parity] : Even
  3) [Data] : 7BIT, [Parity] : None

3.3.3 Control Method

The connector of the KSG3410 is designed as data circuit termination equipment (DCE) of the RS-232C.

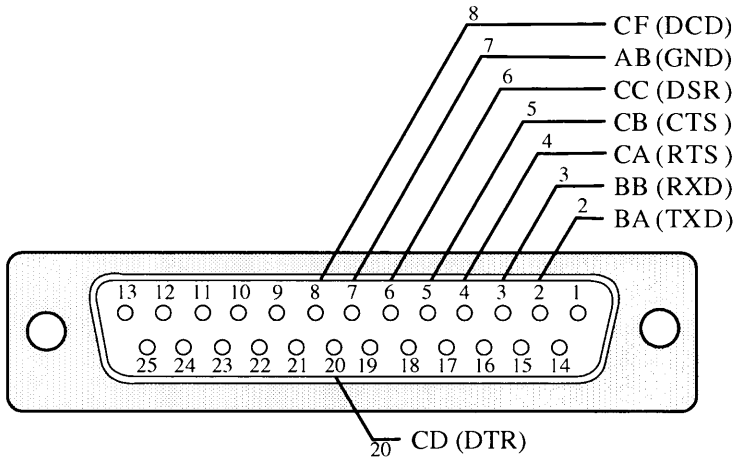
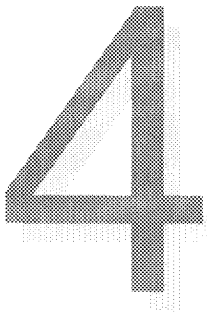


Fig.3-10 Pin Assignment of the RS-232C Connector

When sending the program code to the KSG3410, set CA (RTS) to ON, wait until CB (CTS) is set to ON, and send the program code to BA (TXD). Set CB (CTS) to ON and OFF for each character.

The program code consists of ASCII characters, carriage return (CR), and line feed (LF). The number of characters must be 80 or less. To receive return data from RS-232C, CD must be set to ON.

When the program code for return data creation is sent and then ACK (CTRL-F) is sent with the above procedure, return data is sent to BB. The return data is terminated by CR and LF. CC and CF are set to ON when the KSG3410 is operating.



Chapter 4
Name and Function of Controls

This chapter describes the name and function of the switches, indicators, and connectors on the front and rear panels of the KSG3410.

Contents

4.1 Front Panel

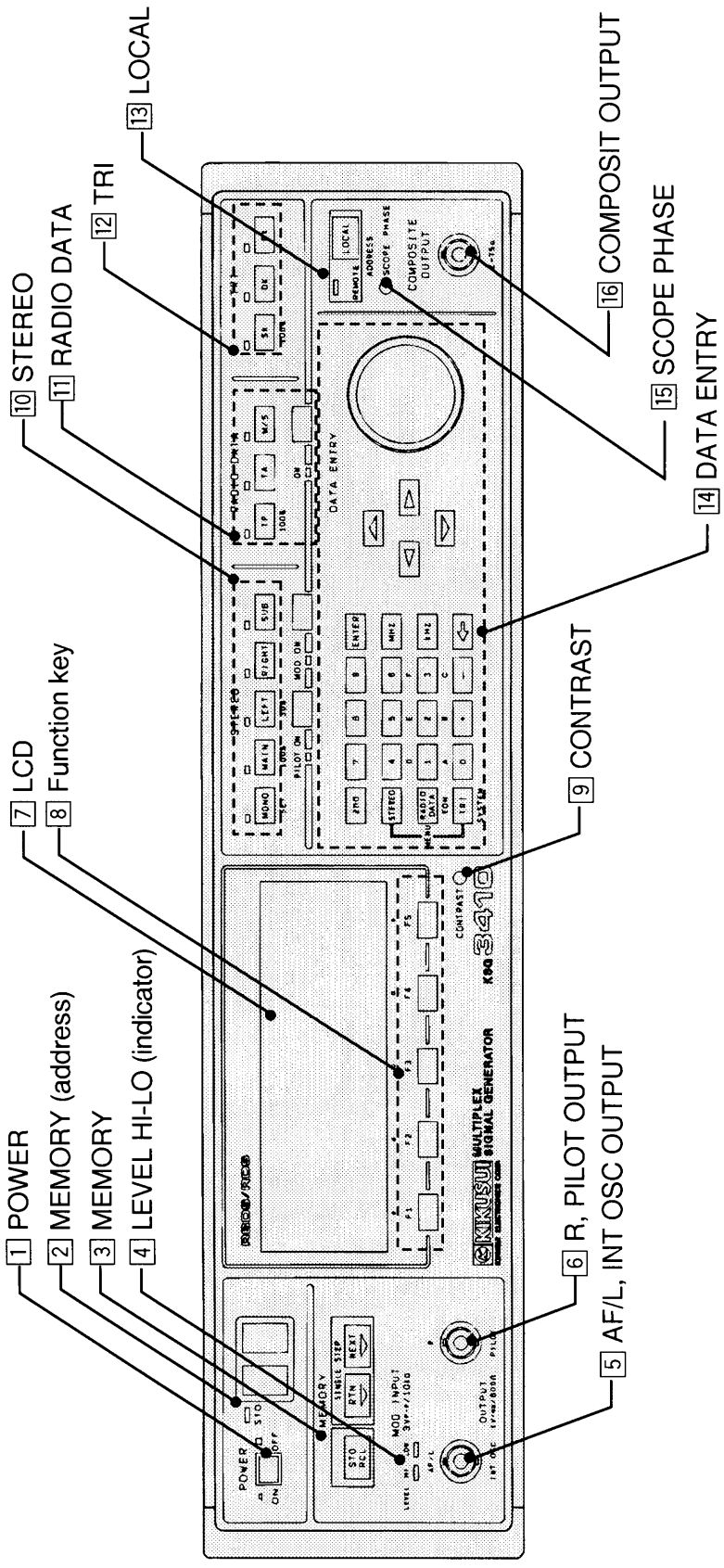


Fig.4-1 Front Panel of the KSG3410

[1] POWER switch

This switch is used to turn on or off the power of the KSG3410. Press this switch to turn on the power and press it again to turn off the power.

When the power is turned on, all indicator on the panel go on and then the condition existed before the power is turned off resumes, except for the 【LEVEL HI/LO】 indicator.

[2] MEMORY indicator

Displays the row and column numbers of memory address which is allocated in matrix format. The left indicator displays the row number and the right indicator the column number.

Data can be stored in continuous 100 points (00 to 99) of memory or ten blocks each of which consists of 10 points of memory. Each LCD screen and panel key setting, except for the 【 LEVEL HI/LO】 indicator, can be stored in memory.

[3] MEMORY key

- The single-step 【▽(RTN)】 and 【△(NEXT)】 keys can be used to specify the column number of memory address.
- Press the 【▽(RTN)】 key to return to the previous step and press the 【△(NEXT)】 key to proceed with the next step.
- Pressing the 【RCL(STO)】 key and numeric keypad recalls the first row of each block.
- Pressing the 【RCL(STO)】 and 【 · 】 keys clears the row and column display and entering a 2-digit number from the numeric keypad recalls the specified row and column.
- Pressing the 【RCL(STO)】 and 【−】 keys clears the column display and entering a 1-digit number from the numeric keypad recalls the specified column.
- Pressing the 【2nd】 and 【RCL(STO)】 keys and entering a 1-digit number from the numeric keypad allow data to be stored in the first row of the specified block.
- Pressing the 【2nd】 , 【RCL(STO)】 , and 【△(NEXT)】 keys allows the panel settings to be stored in the menu address next to the one currently displayed.
- Pressing the 【2nd】 , 【RCL(STO)】 , and 【 · 】 keys clears the row and column display and entering a 2-digit number from the numeric keypad allows data to be stored in the specified row and column.
- Pressing the 【2nd】 , 【RCL(STO)】 , and 【−】 keys clears the column display and entering a 1-digit number from the numeric keypad allows data to be stored in the specified column.

[4] LEVEL HI/LO indicator

Checks the appropriate input level (approx.3 Vp-p) of the external modulation signal connected to the AF/L connector ([5]).

If the level of the external modulation signal source is too low, the 【LO】 indicator goes on; if it is too high, the 【HI】 indicator goes on.

[5] AF/L, INT OSC OUTPUT (1Vrms/600Ω)

This connector can be used for the following three purposes:

1. External modulation signal input connector (AF)

   When [source] of the <STEREO> screen is set to EXT, this connector functions as an input connector for modulation with a single external modulation signal.

2. External stereo modulation signal input connector

   When [source] of the <STEREO> screen is set to EXT L/R, this connector functions as a left side stereo modulation signal input connector for modulation with two external modulation signals. (For the right side, this connector functions as the 【R】 connector.)

3. Internal signal oscillator output connector

   When [source] of the <STEREO> screen is set to [30Hz], [100Hz], [400Hz], [1kHz], [6.3kHz], [10kHz] or [15kHz], this connector functions as an internal signal oscillator output connector, allowing the KSG3410 to be used as a spot oscillator or synchronization signal source with low distortion.

[6] R, PILOT OUTPUT (1Vrms/600Ω)

This connector can be used for the following two purposes:

1. External stereo modulation signal input connector

   When [source] of the <STEREO> screen is set to EXT L/R, this connector functions as a right side stereo modulation signal input connector for modulation with two external modulation signals. (For the left side, this connector functions as the 【AF/L】 connector.)

   To check the R side level, connect the signal to the 【AF/L】 connector and then set the appropriate level using the 【LEVEL HI/LO】 indicator.

2. Stereo phase monitoring pilot signal output connector

   When [source] of the <STEREO> screen is set to other than EXT L/R, this connector outputs a stereo phase monitoring pilot signal with 1 Vrms output level and 600-ohm impedance.

[7] LCD

Displays various levels including the monaural/stereo modulation level, the pilot level, the RDS/RBDS signal modulation level, and the TRI signal modulation level.

[8] Function keys (F1 to F5)

Used to move the cursor in the LCD screen and to switch between screens.

[9] CONTRAST

Used to adjust the contrast of the LCD screen.

[10] STEREO key

1. 【MONO】, 【MAIN】, 【LEFT】, 【RIGHT】, and 【SUB】 keys
   Used to switch the modulation mode. The mode corresponding to the lit indicator is on.
2. 【PILOT ON】 key
   Used to turn on or off the pilot signal. When the indicator is on, the pilot signal is turned on.
3. 【MOD ON】 key
   Used to turn on or off monaural/stereo modulation. When the indicator is on, monaural/stereo modulation is turned on.
4. 【2nd】 and 【MONO(SET)】 keys
   Sets the following operation mode:

Monaural modulation level	: 100%
Pilot level	: off
RDS/RBDS modulation	: off
TRI modulation	: off
Internal modulation signal	: 1 kHz
Output level	: 3 Vp-p

5. 【2nd】 and 【MAIN(100%)】 keys
   Sets the following operation mode:

Stereo modulation level	: 90%
Pilot level	: 10%
RDS/RBDS modulation	: off
TRI modulation	: off

6. 【2nd】 and 【LEFT(30%)】 keys
   Sets the following operation mode:

Stereo modulation level	: 27%
Pilot level	: 10%
RDS/RBDS modulation	: off
TRI modulation	: off

11 RADIO DATA key

1. 【TP】, 【TA】, and 【M/S】 keys

   Used to change the "TP", "TA", and "M/S" bits in the RDS/RBDS signal group data.

2. 【ON】 key

   Used to turn on or off the RDS/RBDS signal (57 kHz carrier suppression DSB signal). When the indicator is on, the signal is turned on.

3. 【2nd】 and 【100%(TP)】 keys

   Sets the following operation mode:

Stereo modulation level	: 85%
Pilot level	: 10%
RDS/RBDS modulation	: 1.6%
SK modulation level	: 4.7%
DK modulation level	: 30%
BK modulation level	: 60%
Area	: A

12 TRI key

1. 【SK】, 【DK】, and 【BK】 keys

   Used to turn on or off traffic information signals SK, DK, and BK. When the indicator is on, the signal is turned on.

2. 【2nd】 and 【100%(SK)】 keys

   Sets the following operation mode:

Stereo modulation level	: 85%
Pilot level	: 10%
RDS/RBDS modulation	: 1.6%
SK modulation level	: 5.3%
DK modulation level	: 30%
BK modulation level	: 60%
Area	: A

13 LOCAL key

1. 【LOCAL】 key

   In the remote control mode (【REMOTE】 indicator goes on), the panel control resumes by pressing the 【LOCAL】 key. However, the key does not operate in the local lockout condition.

2. [REMOTE] indicator

   Goes on in the remote control mode and goes off in the local mode.

3. 【2nd】 and 【LOCAL】 keys

   Pressing the 【2nd】 and 【LOCAL】 keys displays the <REMOTE

Setup> screen, allowing GPIB and RS-232C settings to be made.

[14] DATA ENTRY

1. 【2nd】 key

   Press the 【2nd 】 key and then any key with a yellow indication executes the corresponding function.

2. 【STEREO】 , 【RADIO DATA】 , 【TRI】 , 【EON】 (【2nd】 and 【RADIO DATA】), 【SYSTEM】 (【2nd】 and 【TRI】) keys

   Calls the <Stereo=STEREO>, <Radio Data system main=RADIO DATA>, <Traffic Radio Information=TRI>, <Enhanced Other Net.XX XXX=EON>, and <Radio Data System SYS=SYSTEM> screens.

3. Numeric keypad

   Used to enter numbers 0 to 9 and symbols "." and "-".

4. 【2nd】 【A(1)】 to 【F(6)】 keys

   Used to enter alphabet characters A to F.

5. 【ENTER】 key

   Used as a terminator for data entry. The terminator is not necessary at the time of MEMORY setting and setting with the rotary knob.

6. 【MHz】 and 【kHz】 keys

7. 【⇦】 key

   The BS (backspace) key is used to modify numeric data during entry. This key can also be used to update the screen.

8. 【△】 , 【▽】 , 【◁】 , and 【▷】 keys

   Used to move the cursor in the LCD screen.

9. Rotary knob

   Used to change the cursor position setting.

[15] SCOPE PHASE

Used to make fine adjustment of the phase of the oscilloscope which monitors the phase of 32 kHz sub-carrier and pilot signal.

[16] COMPOSITE OUTPUT (Z=75Ω)

This BNC connector is used as an output connector for the composite signal consisting of the stereo signal, RDS/RBDS signal, and TRI signal.

Since the output impedance is approx. 75 Ω, the signal can be supplied to standard FM signal generators and transmitters with high or low input impedance. The output level ranges from 1.5 Vp-p to 10 Vp-p.

4.2 Rear Panel

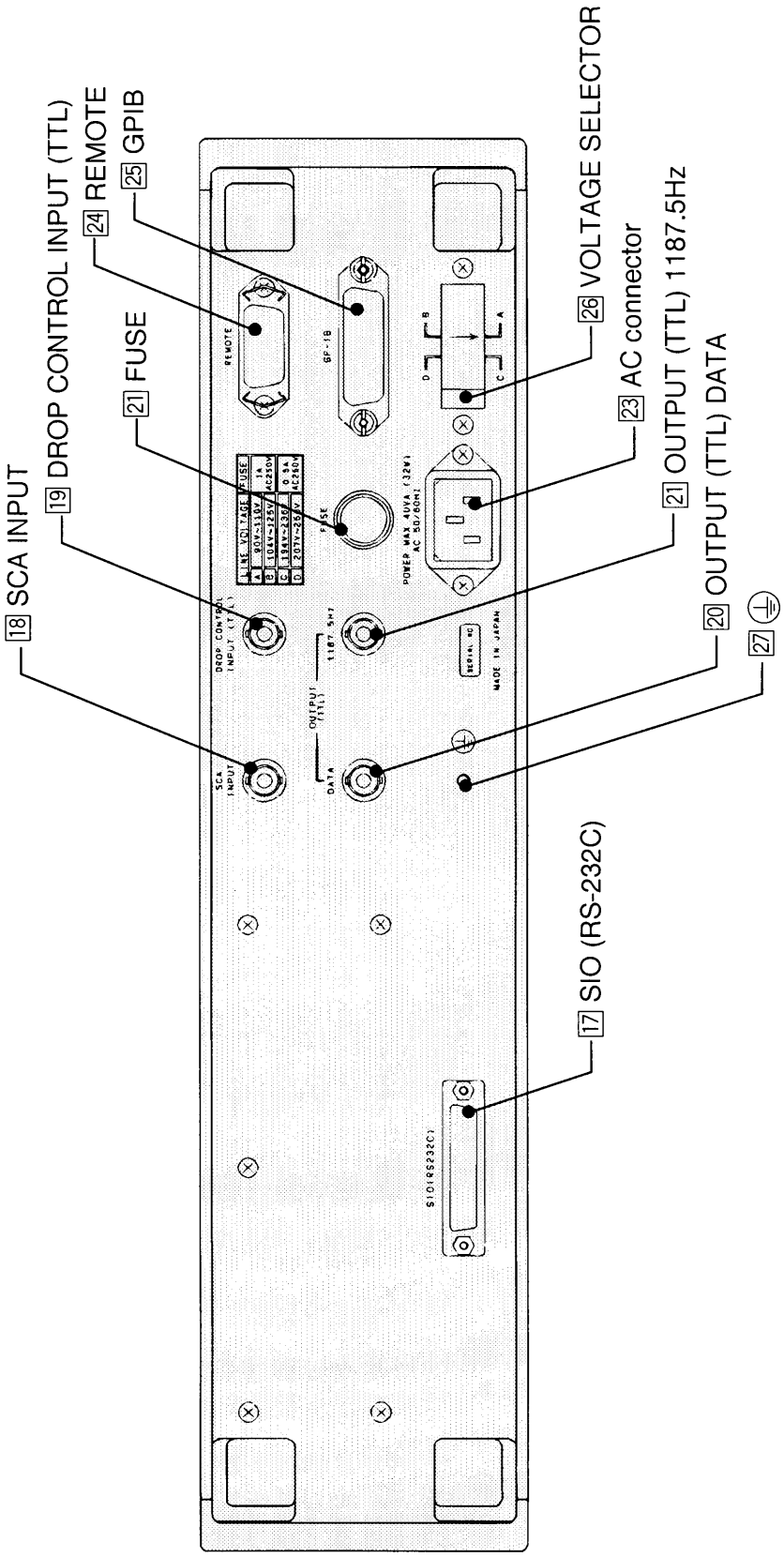


Fig.4-2 Rear Panel of the KSG3410

17 SIO connector

Used to control the KSG3410 by means of the serial interface (RS-232C).

18 SCA INPUT connector

This BNC connector is used as an SCA signal input connector.
The input impedance is about 5kΩ and the input level necessary for 10% modulation is about 0.1 Vrms. When this connector is not used, leave it unconnected.

19 DROP CONTROL INPUT (TTL) connector

At the TTL Low level, the output level (RDS/RBDS signal + TRI signal) is equal to the drop out level set from the panel.

20 OUTPUT (TTL) DATA connector

This BNC connector outputs RDS/RBDS data with the TTL level. The data timing is as follows:

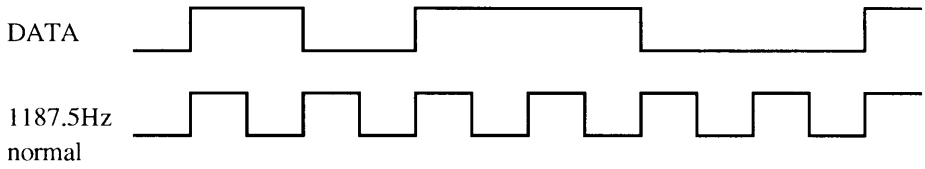


Fig.4-3 RDS/RBDS Data Output Timing

Whether data is sampled at the rising or falling edge of the clock is set from the <Hard set Information> screen.

21 OUTPUT (TTL) 1187.5 Hz connector

This BNC connector outputs RDS/RBDS data clock with the TTL level.

22 FUSE

Used for the input power fuse.
Use a fuse which conforms to the input power voltage. Specifications of applicable fuses are inscribed on the LINE VOLTAGE table on the rear panel.

23 50/60 Hz AC connector

Used to connect the input power cable.

24 REMOTE connector

Used for remote control of panel operation.

25 GPIB connector

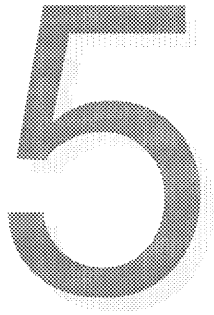
Used for GPIB control.

26 VOLTAGE SELECTOR

Used select the power voltage. Set this selector so that the arrow on the plug points to the voltage used.

27 ⏚

Protective ground terminal



Chapter 5
Maintenance and Calibration

This chapter covers maintenance and calibration of the KSG3410. To ensure a long operating life, perform maintenance, inspection, and calibration periodically.

Contents

5.1 Cleaning

If the panel is dirty, clean it with a soft cloth dampened with mild detergent dissolved in water.

CAUTION

- Be sure to turn the [POWER] switch off and remove the AC power cable.
- Do not use volatile substances such as thinner or benzene. Otherwise, the panel surface may become discolored, printed letters erased, or the LCD may turn whitish.

5.2 Checking

Check that there is no scratch on the coating of the AC power cable and that the power plug is not dislocated or cracked.

WARNING

- Scratch on the coating of the AC power cable may cause electrical shock. Stop using it immediately.

For purchase of accessories, contact your Kikusui agent.

5.3 Calibration

Calibrating the pilot phase

Prepare an oscilloscope with the X-Y function.
Prior to calibration or adjustment, warm up the KSG3410 for 30 minutes or more.

① Connect the KSG3410 and the oscilloscope as shown in Fig.5-1.

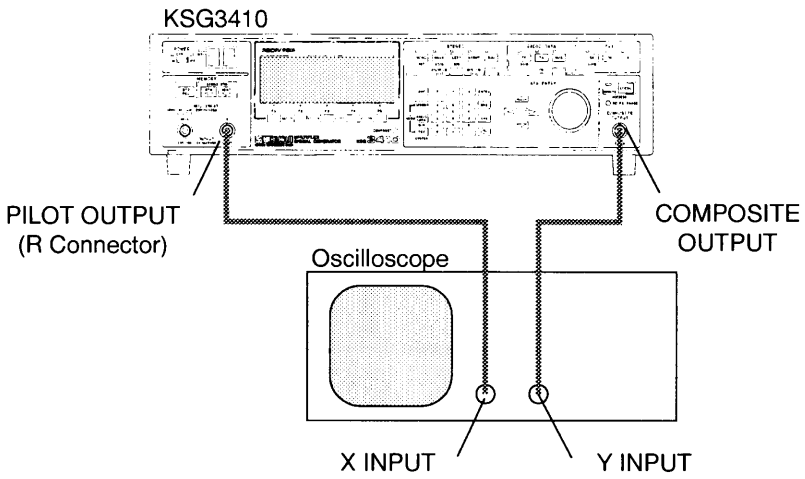


Fig.5-1 Oscilloscope Connection

② Press the 【2nd】 and 【MONO(SET)】 keys.
(The output level is set to 3.00 Vp-p, monaural modulation level to 100%, and internal modulation signal to 1 kHz.)

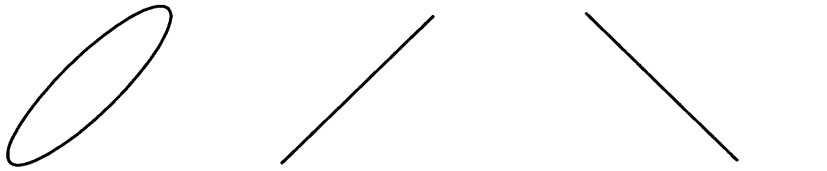
③ Press the 【2nd】 and 【MAIN(100%)】 keys.
(The stereo modulation level is set to 90% and pilot level to 10%.)

④ Press the 【STEREO】 key to display the <STEREO> screen.

⑤ Press the STEREO 【MOD ON】 key to turn off the 【MOD ON】 indicator and stereo modulation.

⑥ Set the input sensitivity of the oscilloscope (X INPUT to 0.2 V/DIV and Y INPUT to 0.1 V/DIV).

Make sure that the oscilloscope displays the waveform shown in Fig.5-2(b). If the waveform is out of phase, adjust it by turning the 【SCOPE PHASE】.



(a) Out of phase (b) In phase (c) 180° out of phase

Fig.5-2 Pilot Phase Calibration

⑦ Make the following settings of the KSG3410.

- Turn off the 【PILOT ON】 key. (The 【PILOT ON】 indicator goes off.)
- Press the STEREO 【SUB】 key. (The 【SUB】 indicator goes on.)

Make sure that the oscilloscope displays the waveform shown in Fig.5-3(b). If it displays the waveform shown in Fig.5-3(a), the waveform is still out of phase. Make adjustment in ⑤ again.

(a) Out of phase (b) In phase

Fig.5-3 Pilot Phase Checking

5.4 Backup Battery and CPU Reset

Backup Battery

The KSG3410 mounts a backup battery for memory storage. When the power of the KSG3410 is supplied, the battery is charged. If the KSG3410 is not used for a long period, the battery may discharge.

The operating life of the battery largely depends on the ambient temperature, humidity, and maintenance conditions. Normally, the discharge capacity is 90% after 5 year operation.

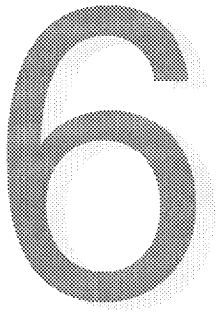
If the battery is defective, consult your Kikusui agent.

CPU Reset

When the 【2nd】 key is pressed and held and then the power switch is turned on, CPU reset is performed. In CPU reset, memory contents, modulation levels, and GPIB address are initialized.

NOTE

- When soft reset is performed, the KSG3410 waits for entry of panel key. In this case, press any key; otherwise, GPIB control may not operate normally.



Chapter 6 Specifications

This chapter explains electrical and mechanical specifications and accessories.

Contents

6.1 Specifications

RDS/RBDS Signal

Frequency, accuracy	57 kHz±3 Hz
Modulation range	0 to 10%
Resolution	0.01%
Frequency phase	0° or 90° (with respect to the 3rd harmonic of 19 kHz pilot signal)
Variable range	±10°
Resolution	1°
Sub-carrier suppression ratio	50 dB or more
Switching function	Mode switching between RDS and RBDS
	ON(=1)/OFF(=0) switching of TP, TA, and M/S
	ON/OFF data set for RDS/RBDS: PI, PS, F-PS, PTY, PTYN, TP, TA, M/S, DI, AF, PIN, EON, RT, CT, MMBS, and LOC/NAVI
Group type	OA to FB (15 B)
	User-defined groups "UD1", "UD2", and "MBS"
Data source	all 0 and all 1
Data output	TTL level (rear panel)
1187.5 Hz clock output	TTL level (rear panel)
Drop out input	TTL level (rear panel)

TRI (ARI) Signal (Traffic Information Transmission Signal)

SSK (Transmitter identification signal)	
Frequency, accuracy	57 kHz ±3 Hz
Modulation range	0 to 10% Specified level
	4.7% (with 100% RDS/RBDS)
	5.3% (with 100% TRI)
Resolution	0.1%
Accuracy	(Displayed value±2) %
DK (Announce identification signal)	
Modulation frequency	125 Hz (57 kHz×1/456)
Modulation level	0 to 40% 30% specified level

Resolution	1 %
Accuracy	(Displayed value±5) %
Distortion	≦0.8% for demodulation bandwidth of 15 Hz to 15 kHz
BK (area identification signal)	
Modulation frequency	A 23.75 Hz (57 kHz×1/2400)
	B 28.27 Hz (57 kHz×1/2016)
	C 34.93 Hz (57 kHz×1/1632)
	D 39.58 Hz (57 kHz×1/1440)
	E 45.67 Hz (57 kHz×1/1248)
	F 53.98 Hz (57 kHz×1/1056)
Modulation level	0 to 80% 60% specified level
Resolution	1%
Accuracy	(Displayed value±5) %
Distortion	≦0.8% for demodulation bandwidth of 15 Hz to 15 kHz
Area selection	With the numeric keypad and rotary knob
Alias scan function	
Scan interval	0.1 s to 12.0 s (10.5 sec.)
Resolution	0.1 s (0.0875 sec.)
Skip function	Possible between areas (set to "pass")
DK, BK signal output	SK: Output when OFF
	DK: Approx. 0.3 Vrms (for 30% modulation)
	BK: Approx. 0.6 Vrms (for 60% modulation)

Stereo/Monaural Signal

Frequency characteristic	
Stereo	±0.3 dB 30 Hz to 15 kHz, with reference to 1 kHz
Monaural	±0.5 dB 30 Hz to 80 kHz, with reference to 1 kHz
Modulation range	
Stereo	0 to 100%
Monaural	0 to 100%
Resolution	0.5%
Accuracy	(Displayed value±5) %
Distortion	For demodulation bandwith of 30 Hz to 15 kHz
	≦0.01% 200 Hz to 10 kHz
	≦0.05% 30 Hz to 15 kHz

S/N	≧86 dB for demodulation bandwidth of 30 Hz to 15 kHz)
Separation	≧66 dB 30 Hz to 15 kHz
Composite output range	1.5 Vp-p to 10 Vp-p open-circuit voltage
Resolution	10 mVp-p
Accuracy	(Displayed value±5) %
Impedance	Approx. 75 Ω (unbalanced)
Pilot signal	
Frequency, accuracy	19 kHz±1 Hz
Modulation range	0 to 15% 10% specified level
Resolution	1%
Accuracy	(Displayed value±2) %
Pre-emphasis	off, 25 μ s, 50 μ s, and 75 μ s
Internal modulation oscillator	
Frequency, accuracy	(30 Hz, 100 Hz, 400 Hz, 1 kHz, 6.3 kHz, 10 kHz, and 15 kHz)±5%

External Modulation Input

a) AF/L	
Frequency range	
Stereo	30 Hz to 15 kHz
Monaural	30 Hz to 80 kHz
Input voltage	HI-LO monitor with ±2% width for 3 Vp-p input voltage
Input impedance	Approx. 10 kΩ (unbalanced)
b) R	
Frequency range	
Stereo	30 Hz to 15 kHz
Input voltage	HI-LO monitor with ±2% width for 3 Vp-p input voltage (Checked by connecting signal to AF/L input)
Impedance	Approx. 10 kΩ (unbalanced)
Internal modulation oscillator output	
Frequency	Conforms to internal modulation oscillator frequency
Output voltage	Approx. 1 Vrms open-circuit voltage
Impedance	Approx. 600Ω (unbalanced)
Distortion	≦0.01% for demodulation bandwidth of 30 Hz to 15 kHz)

Pilot output	
Voltage	Approx. 1 Vrms open-circuit voltage
Impedance	Approx. 600 Ω (unbalanced)
SCA input	
Voltage	Approx. 0.1 Vrms with 10% modulation
Impedance	5 kΩ (unbalanced)
Display function	Screen switching by the MENU key and F1 to F5 keys Displays data creation/editing, modulation level, output level, and function settings

Setting Mode

Monaural/stereo signal	MONO, MAIN, LEFT, RIGHT, SUB
Modulation	MOD ON/OFF
Pilot signal	PILOT ON/OFF
RDS/RBDS signal	TP, TA, M/S, RDS ON/OFF
TRI signal	SK, DK, BK
Setting function	1) Monaural/stereo modulation level, pilot level, output level, RDS/RBDS modulation level, data, TRI modulation level, memory settings can be made with the numeric keypad and rotary knob 2) Preset keys Monaural 100% (output level set) Stereo 100%, 30% RDS/RBDS 100% TRI 100%
Memory function	1) 10 points × 10, or consecutive 100 points can be used (in monaural/stereo modulation level, pilot level, RDS/RBDS modulation level, data, TRI modulation level setting modes) 2) Store (with store indicator) 3) Recall 4) Memory address increment/decrement 5) Memory address return
Remote control	Operations equivalent to front panel operations are possible

GPIB Interface Functions

Function	Category	Function
Transmit handshake	SH1	Function provided
Receive handshake	AH1	All functions provided
Talker	T6	Function provided
Listener	L3	Basic listener function only
Service request	SR1	Function provided
Remote local	RL1	All functions provided
Parallel port	PP0	Function not provided
Device clear	DC1	All functions provided
Device trigger	DT0	Function not provided
Controller	C0	Function not provided

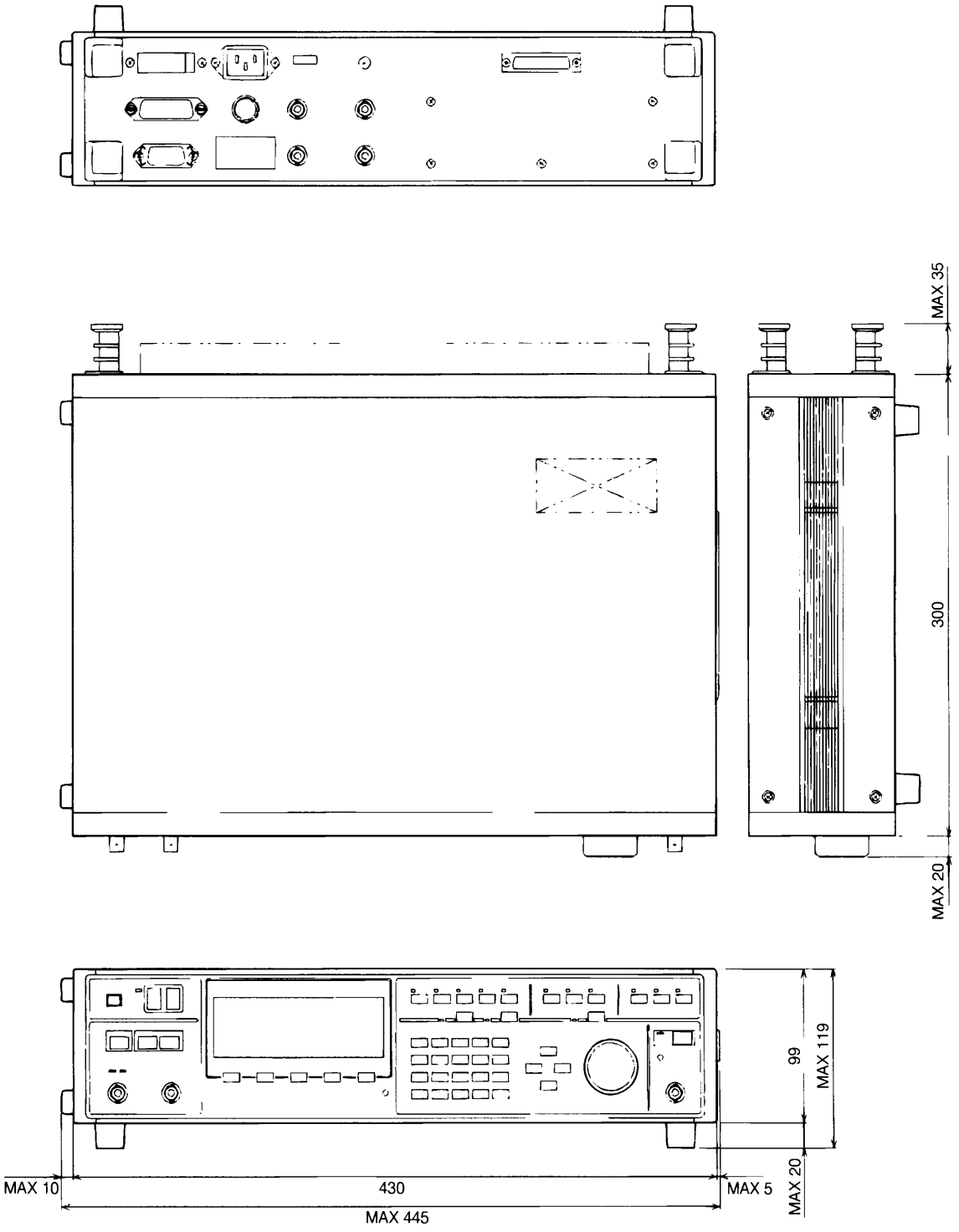
SIO Interface (RS-232C)

Baud rate	300, 600, 1200, 2400, 4800, 9600
Data bit	7 or 8 bits
Stop bit	1 or 2 bits
Parity check	Even, odd, none
Other	Asynchronous

General Specifications

Backup battery	Provided
Power supply	
Operating voltage	100, 115, 215, 230 V±10%, 250 V maximum (selected by VOLTAGE SELECTOR on the rear panel)
Frequency	50 Hz/60 Hz
Power consumption	Approx. 33 VA
Mechanical	
External dimensions	430 W×99 H×250 D (mm) (chassis) 445 W×119 H×305 D (mm) (maximum)
Weight	Approx. 7 kg
Environmental condition (temperature and humidity)	
Specified operating range	5 to 35℃, 85% or less
Maximum operating range	0 to 40℃, 90% or less
Accessories	
Output cable (SA570)	×1
Power cable	×1
Operation manual	×1
Fuse	1.0 A×1 0.5 A×1
Option	Support software for the PC-9801 series

6.2 External Dimensions



Unit: mm

Fig.6-1 External Dimensions of the KSG3410

Appendices

Appendices provide sample programs for RS-232C and GPIB control and messages displayed on the LCD screen.

Contents

Appendix 1 RS-232C Sample Program

The following sample program sends a program code to the PC-9801 and receives a return data.

```
100       ACK$=CHR$(6):LF$=CHR$(10)
110       OPEN "COM:N81NNNLL" AS #1                    Opens RS-232C as #1
120       ON COM GOSUB *REC                            Defines processing for RS-
                                                       232C interrupt from *REC
130       COM ON                                       Enables RS-232C interrupt
140  *LOOP:
150       KEY 1,"return"+CHR$(13):KEY 6,""             Defines "return+CHR$(13)"
                                                       for function key 1 and null
                                                       character for other keys
160       KEY 2,"":KEY 7,""
170       KEY 3,"":KEY 8,""
180       KEY 4,"":KEY 9,""
190       KEY 5,"":KEY 10,""
200       LINE INPUT ">",PROG-CORD$                    Uses ">" for prompt to wait
                                                       for entry of program code
210       IF PROG-CORD$="return" THEN *RETDATA
220       B$=""
230       PRINT #1,PROG-CORD$+LF$                      Outputs program code
240       IF LEN(B$)><0 THEN PRINT B$
250       GOTO *LOOP
260  ,
270  *REC:
280       IF LOC(1)><0 THEN B$=B$+INPUT$(LOC(1),#1)    RS-232C interrupt routine
290       RETURN
300  ,
310  *RETDATA:
320       B$=""
```

```
330       PRINT #1,ACK$;                                  Sends ACK$ to send return
                                                          code
340       IF LEN(B$)=0 THEN 340
350       IF MID$(B$,LEN(B$),1)><LF$ THEN 350             Waits until LF is received
360       PRINT B$;                                       Prints return code and
                                                          returns to loop
370       GOTO *LOOP
380  ,
390       END
```

The following shows the result of the above program.
Data is set in and read from PI and PIN.

```
RUN
>PIABCD(CR)                    Sets "ABCD" in PI
>PI?(CR)
>Return(CR)                    F1 pressed
ABCD                           Return code

>PIN12-23-34(CR)               Sets "12-23-34" in PIN
>PIN?(CR)
>Return(CR)                    F1 pressed
12-23-34                       Return code
>
```

Appendix 2 GPIB Sample Program

The following sample program sets the stereo modulation level, pilot level, and modulation source, stores them in the KSG3410, and then recalls them.

```
10   Dev=709                                    Interface select code
                                                *100+device address
20   Mod_level=10                               10%
30   Mod_level_step=10                          10%
40   Pilot_level=10                             10%
50   Pilot_step=-1                              -1%
60   CLEAR Dev                                  Clears select device
70   WAIT 2
80     FOR N=0 TO 9
90       Mod=Mod_level+Mod_level_step*N
100      Pilot=Pilot_level+Pilot_step*N
110      OUTPUT Dev;"MOD";Mod"PC"                Sets stereo modulation level
120      OUTPUT Dev;"PL";Pilot;"PC"              Sets pilot level
130      OUTPUT Dev;"S5"                         Sets internal 1kHz
140      OUTPUT Dev;"ST";N                       Stores it in memory
150    NEXT N
160    FOR N=0 TO 9
170      OUTPUT Dev;"RC";N                       Recalls it from memory
180      WAIT 2
190    NEXT N
200  END
```

Appendix 3 Message List

Messages are displayed on the second line of the LCD screen.

Message	Meaning
-- Output data is all 0 --	"continuous 0 data" is set as RDS/RBDS data. When this message is displayed, changes in RDS/ RBDS data with the numeric keypad or rotary knob are not reflected in the output. Select "RDS (Radio Data System)" in the <Hard set Information> screen to cancel "continuous 0 data".
-- Output data is all 1 --	"continuous 1 data" is set as RDS/RBDS data. When this message is displayed, changes in RDS/ RBDS data with the numeric keypad or rotary knob are not reflected in the output. Select "RDS (Radio Data System)" in the <Hard set Information> screen to cancel "continuous 1 data".
ERROR <memory full>	Store operation cannot be performed because it requires more than the maximum capacity of available memory (45k bytes) inside the KSG3410.
ERROR <number full>	An attempt was made to enter 100 or more EON networks.
ERROR <not exist data>	An attempt was made to delete data when there is no data.

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