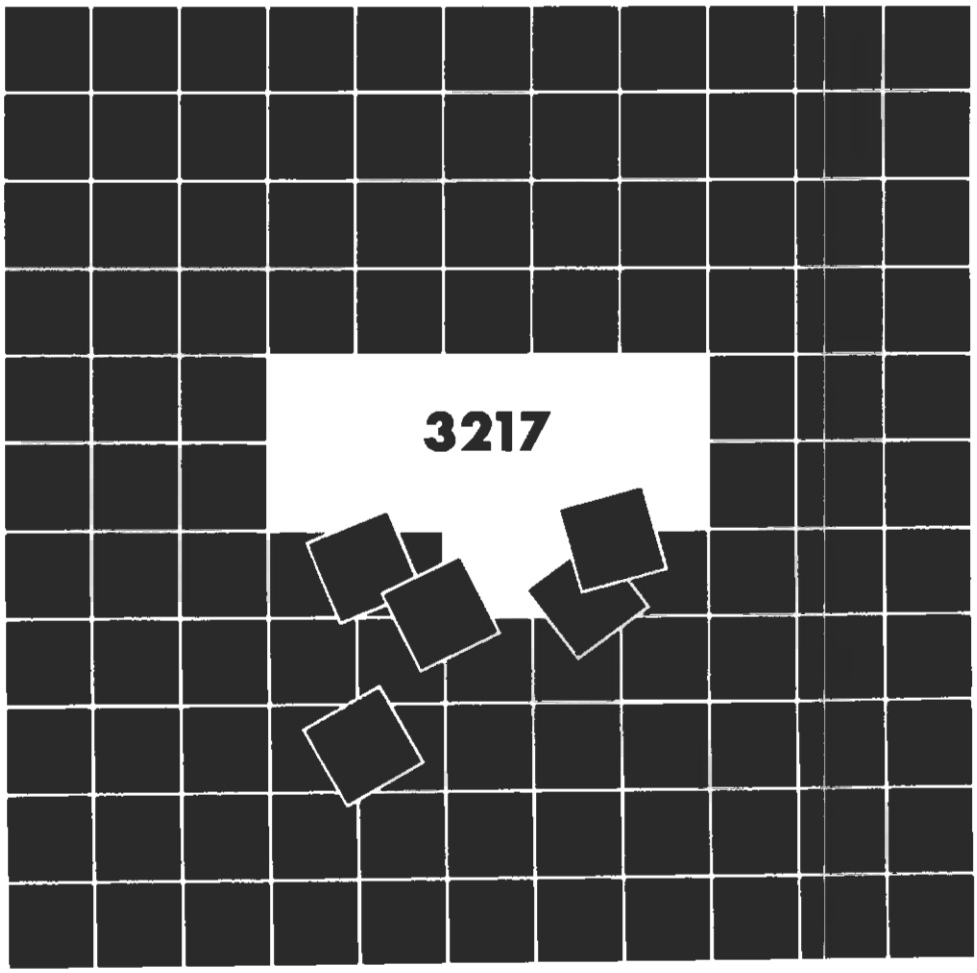
LEADER

RDS STANDARD SIGNAL GENERATOR

INSTRUCTION MANUAL



LEADER ELECTRONICS CORP.

TABLE OF CONTENTS

1. SPECIFICATIONS

1.1 Introduction

The Model 3217 is a synthesizer-type Standard Signal Generator which generates CW, and FM/AM modulated signals over the frequency range 100 kHz to 140 MHz.

It includes a full-feature FM stereo modulator and RDS/TRI* signal generator that generates FM multiplex signals.

*RDS: Radio Data System

TRI: Traffic Radio Information

1.2 Features

1.2.1 Standard Signal Generator

- The oscillation frequency is locked to a reference frequency oscillator to ensure high-stability signal output.
- The output level can be set in the range –20 dBμ to 126 dBμ (0 dBμ = 1μV, 50-Ω open circuit), in 0.1-dB steps.
- The frequency, level, and level of modulation can be set numerically by key input.

1.2.2 FM/AM Modulation

- The ability to use AM and FM simultaneously is ideal for use in AM suppression measurements of FM receivers.
- An FM multiplex RDS/TRI signal generator is provided as standard.

1.2.3 FM Multiplex

- The TRI signal can be generated to conform it either EBU-established standards or USA-established standards.
- The RDS signal accommodates EON (EBU publication Tech 3244 and EN50067).
- By using the special EON function, it is possible to configure a network with other Model 3217s, without the need of a computer.
- Up to 1536 groups (512 as standards) of RDS signal group data can be stored internally in the standard Model 3217, and it possible to incorporate up to 47 patterns (16 as standard) of a pattern data length up of to 255 groups.

1.2.4 Others

- Up to 100 sets of frequencies, output levels, and modulation levels can be preset into internal memory.
- A 24-pin connector is provided on the rear panel to enable all panel switches (with the exception of the power switch and LOCAL key) to be remotely controlled.
- A GPIB interface (conforming to the IEEE 488.2 standard) is provided as standard, enabling incorporation of the Model 3217 in to GPIB-controlled measurement systems.
- Using the optional RDS EDITING SOFT (FS 3005), RDS data can be made easily by connecting with IBM-PC (mfd. by IBM) or PC-9801 series (mfd. by NEC) computer.

1.3 Specifications

1.3.1 Frequency

Range	100 kHz to 140 MHz
Resolution	100 Hz (frequency < 30 MHz) 1 kHz (frequency ≧ 30 MHz)
Settings	Made by numeric keys, digit-selector keys and rotary knob, and increment/decrement keys.
Accuracy	$\pm 5 \times 10^{-5}$ (≧ 500 kHz) $\pm (5 \times 10^{-5} + 1$ digit) (< 500 kHz)
Display	6 digits

1.3.2 Output

Range	−20 dBμ to 126 dBμ (0 dBμ = 1 μV, 50-Ω open circuit)
Resolution	0.1 dB
Settings	Made by numeric keys, digit-selector keys and rotary knob, and increment/decrement keys.
Reference level accuracy	± 1 dB (at 126 dBμ output)
Attenuator accuracy	± 1.5 dB (at output ≧ 0 dBμ) ± 2 dB (at output < 0 dBμ)
Impedance	50 Ω, VSWR 1.3 max.
Spurious components	Harmonic : −30 dBc or less Non-Harmonic : −50 dBc or less
Display	4 digits

1.3.3 Modulation

(a) FM Modulation (Monaural/Stereo)

Frequency deviation	0 to 99.9 kHz (at 1 MHz or higher) 0 to 1/10 of carrier frequency (at below 1 MHz)
Display	3 digits
Resolution	0.1 kHz
Modulation accuracy	± (set value × 0.1 + 1) 1 kHz
Distortion	0.05% max. (10.7 MHz ± 1 MHz, 76 to 108 MHz) 0.1% max. (other frequencies) (1 kHz, 75 kHz deviation, demodulation bandwidth 50 Hz to 15 kHz, de-emphasis of 50 μs)

Residual FM	73 dB or greater S/N with respect to 75 kHz deviation. (frequency ≤ 110 MHz) (demodulated bandwidth: 50 Hz to 15 kHz, de-emphasis of 50μs) Except the frequencies which are 80 MHz ± n ± 20 kHz (n: integer) under 30 MHz.
Pre-emphasis	Off, 25, 50, 75 μs
Composite output	1 Vrms max. (75-Ω, open circuit)
• FM stereo	
Separation	55 dB or better (1 kHz, 75-kHz deviation, 76 to 108 MHz)
Modes	MAIN, SUB, L, R
• Pilot signal	
Frequency	19 kHz ± 1 Hz
Frequency deviation	0 to 10.0 kHz
Display	3 digits
Resolution	0.1 kHz
Modulation accuracy	± (set value × 0.1 + 0.5) kHz
Pilot output	1 Vrms (600-Ω, open circuit)

(b) AM Modulation

Modulation percentage	0 to 80.0% (500 to 1799 kHz) 0 to 60.0% (other frequencies)
Display	3 digits
Resolution	0.1%
Modulation accuracy	± (set value × 0.1 + 1)%
Distortion	0.5% max. (150 kHz to 2 MHz) 1.5% max. (other frequencies) (1 kHz, 30% modulation, demodulated bandwidth 50 Hz to 15 kHz)
Residual AM	55 dB or greater S/N with respect to 30% modulation (150 kHz to 2 MHz) (demodulated bandwidth 50 Hz to 15 kHz)

(c) Internal Modulation Frequency

Frequency	Any 1 of 7 internal frequencies (30 Hz, 100 Hz, 400 Hz, 1 kHz, 6.3 kHz, 10 kHz, 15 kHz)
Accuracy	± 3%

(d) External Modulation

Input impedance	10 kΩ
Reference input voltage	1.0 Vrms
Frequency range	FM: 20 kHz to 100 kHz
	AM: 20 Hz to 10 kHz
Frequency response	±1 dB (with respect to 1-kHz reference)
Pre-emphasis	Off, 25, 50, 75 μs (FM only)

(e) RDS (Radio Data System)

- Subcarrier

Frequency	57 kHz ± 3 Hz
Phase	0° or 90° (with respect to the triple harmonic of pilot signal)
FM deviation	0 to 7.5 kHz (preset 2.0 kHz, RDS only) (preset 1.2 kHz, when used with TR1)
Resolution	0.1 kHz
Modulation accuracy	±(set value × 0.1 + 0.5) kHz
Display	2 digits

- Modulation method

Modulation	Biphase encoding
Coding	Differential

- Message

Content	EON, PI, PIN, PS, PTY, RT, TA, TP, AF, CT, DI, M/S, etc.

- Standard internal data

Number of patterns	16 patterns (0 to F)
Maximum number of groups	512 groups
Maximum pattern length	255 groups

- RDS data input/output

Data input	TTL level (rear-panel connector)
Clock output	1187.5 bits/s, TTL level (rear-panel connector)

- User-defined internal data 1 (ROM type)

  Number of patterns 16 patterns (U0 to UF)

  Maximum number of groups 512 groups

  Maximum pattern length 255 groups

- User-defined internal data 2 (RAM type: accessed via GPIB)

  Number of patterns 15 patterns (G0 to GE)

  Maximum number of groups 512 groups

  Maximum pattern length 255 groups

(f) TRI (Traffic Radio Information)

- EBU system

  SK (Transmitter identification code)

  Frequency 57 kHz±3 Hz,

  Phase 0° (with respect to the 3rd harmonic of the 19-kHz pilot-tone)

  FM deviation 0 to 7.5 kHz (preset 4.0 kHz, TRI only)
  (preset 3.5 kHz, when used with RDS)

  Resolution 0.1 kHz

  Modulation accuracy ±(set value × 0.1 + 0.5) kHz

  Display 2 digits

  DK (Announcement identification code)

  Modulation signal DK: 125 kHz (1/456 of 57 kHz)

  AM modulation level 0 to 40% (preset 30%)

  Resolution 1%

  Modulation accuracy ±(set value × 0.1 + 1)%

  Display 2 digits

  BK (Area identification code)

  Modulation signal
  A: 23.75 Hz (1/2400 of 57 kHz)
  B: 28.27 Hz (1/2016 of 57 kHz)
  C: 34.93 Hz (1/1632 of 57 kHz)
  D: 39.58 Hz (1/1440 of 57 kHz)
  E: 45.67 Hz (1/1248 of 57 kHz)
  F: 53.98 Hz (1/1056 of 57 kHz)

  AM modulation level 0 to 80% (preset 60%)

  Resolution 1%

Modulation accuracy	±(set value × 0.1 + 1)%
Display	2 digits

- USA System

57-kHz pilot

Frequency	57 kHz ± 3 Hz
Phase	0° (with respect to the 3rd harmonic of the 19-kHz pilot-tone)
FM deviation	0 to 7.5 kHz (preset 4.0 kHz, TRI only) (preset 3.5 kHz, RDS only)
Resolution	0.1 kHz
Modulation accuracy	±(set value × 0.1 + 0.5) kHz
Display	2 digits

ME (message signal)

Modulation signal	ME1: 142.5 Hz (1/400 of 57 kHz) ME2: 154.9 Hz (1/368 of 57 kHz)
AM modulation level	0 to 80% (preset 60%)
Resolution	1%
Modulation accuracy	±(set value × 0.1 + 1)%
Display	2 digits

ZO (zone signal)

Modulation signal	1: 23.75 Hz (1/2400 of 57 kHz) 2: 28.27 Hz (1/2016 of 57 kHz) 3: 34.93 Hz (1/1632 of 57 kHz) 4: 39.58 Hz (1/1440 of 57 kHz) 5: 45.67 Hz (1/1248 of 57 kHz) 6: 53.98 Hz (1/1056 of 57 kHz) 7: 63.62 Hz (1/896 of 57 kHz) 8: 75.79 Hz (1/752 of 57 kHz) 9: 98.96 Hz (1/576 of 57 kHz) 10: 122.84 Hz (1/464 of 57 kHz)
AM modulation level	0 to 80% (preset 60%, but approx. 1/2 for simultaneous ME1 and ME2 modulation)
Resolution	1%
Modulation accuracy	±(set value × 0.1 + 1)%
Display	2 digits

1.3.4 Presets

Up to 100 sets of frequency, modulation, and output level values can be stored as presets in internal memory except the POWER switch and LOCAL key.

1.3.5 Leakage Field Strength

Below the level that would affect a measurement of 0 dBμ (1 μV)

1.3.6 Remote Control

All panel switches (except the power switch and LOCAL key) are remotely controllable.

1.3.7 GPIB

Standardly provided interface	Conforms to ANSI/IEEE Std. 488.1/488.2-1987 standards.

1.3.8 General Specifications

Environmental conditions	Operating temperature: 0 to 40°C Operating humidity: 85% max. Conditions for guaranteed accuracy Temperature: 10 to 35°C Humidity: 85% max.
Power requirements	100, 120, 220, 240 VAC ± 10% (250 V max.)
Power consumption	Approx. 55 VA
Line frequency	50/60 Hz
Dimensions	426 (W) × 99 (H) × 400 (D) mm
Weight	Approx. 11 kg
Accessories	
Supplied accessories	BNC-to-BNC cable (3D-2V, 50-Ω, 1 meter) Power cord Spare fuse
Optional accessoriers	Remote Controller : 3216-01 RDS Editing Soft : FS 3005-PC (for IBM-PC) FS 3005-98 (for PC-9801)

2. OPERATING PRECAUTIONS

2.1 Line Voltage

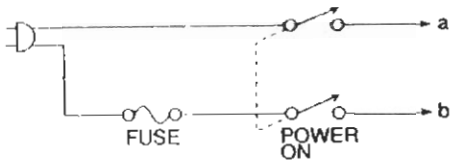
The Model 3217 should be operated from a power line having a voltage within ±10% of the nominal value.

Normal operation may not be possible at lower than 90% of the nominal voltage, and operation at a voltage exceeding 110% of the nominal value can cause internal damage.

The four nominal line voltages shown in Table 2-1 are possible by opening the cover of the Model 3217 and changing the taps as shown in Fig 2-1. Be sure to observe the proper fuse rating as shown in the table.

Table 2-1 Line Voltage and Fuse Data

Nominal Voltage	Line Voltage (±10%)	Fuse Rating	Leader Part Number
100 V	90 to 110 V	1A Time-lag	436 3765 006
120 V	108 to 132 V		
220 V	198 to 242 V	0.5 A Time-lag	436 3750 003
240 V	216 to 250 V		



When the time-lag fuse is required, contact your local Leader agent.

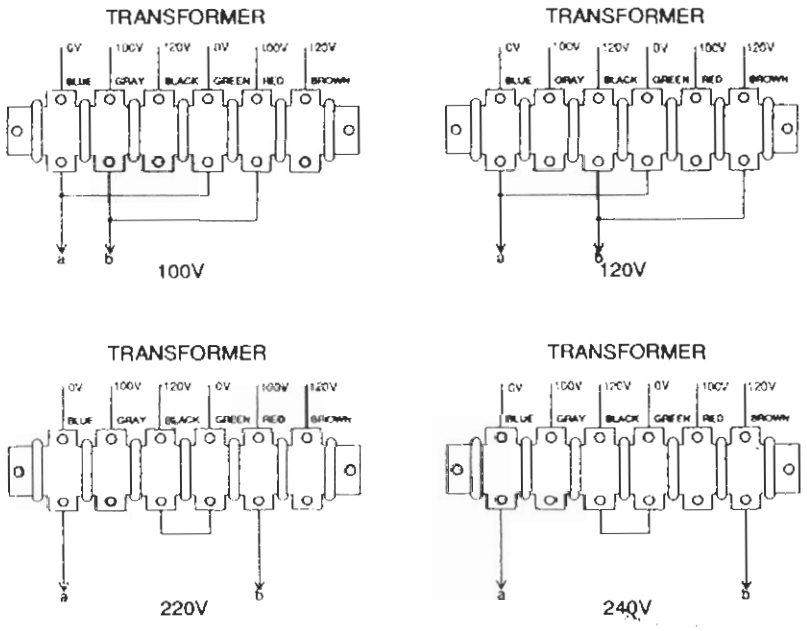


Fig. 2-1 Taps for Various Line Voltages

2.2 Memory Backup

Data which has been written into the internal memory of the Model 3217 is held for approximately 1 month, even if the Model 3217 is not used for that period. Extended periods, however, risk the danger of lost data.

When the Model 3217 is first powered up after purchase, and when it has been left unused for a long period of time, power it for at least 8 hours to allow the internal memory backup battery to charge.

2.3 Voltages Applied to Outputs and Excessive Input Voltages

Take sufficient care that voltages are not applied to the outputs of the Model 3217.

If a cable comes into contact with a source of DC voltage, there is a danger of damaging the internal attenuator of the Model 3217.

The external modulation input should not be subjected to input voltages exceeding 5 Vp-p.

If superimposed DC voltages exceeding ± 2 V are present, use a capacitor to block this DC component.

2.4 Care in Installing the GPIB Unit

The GPIB unit refers to the unit onto the rear panel of which are located the GPIB control connector ㉟ and the GPIB ADDRESS switches ㊱ (refer to Section 3.7, which describes the rear panel).

The ROM devices in this unit include IC201, the control ROM, and IC202, the pattern data ROM. When the pattern data ROM is being programmed, be sure that this is not inserted mistakenly into the wrong socket.

3. PANEL DESCRIPTIONS

Fig. 3-1 shows the front panel layout of the Model 3217. In the panel descriptions that follow, panel feature will be referred to by the circled numbers shown in this and other figures

3.1 Display Section

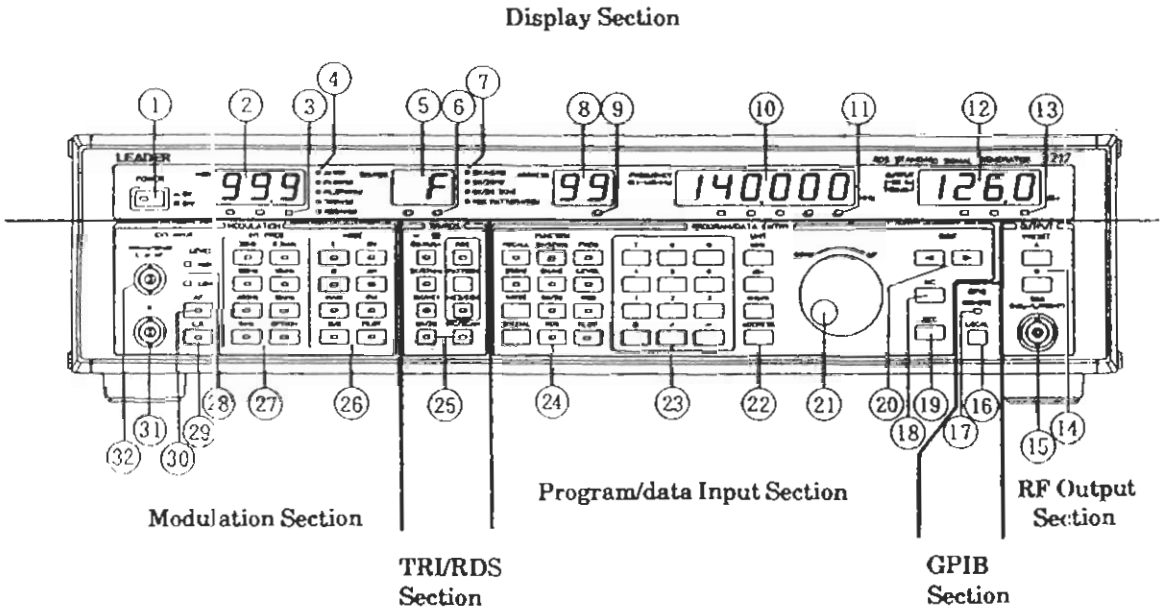


Fig. 3-1 Model 3217 Front Panel

① POWER switch

Push this power switch in to apply power to the Model 3217, and push in once more to release the switch and switch power off.

When power is applied to the Model 3217, the panel conditions that were in effect immediately before power was last switched off are restored automatically, these being loaded from the "last memory" of the Model 3217. Note, however, that if the power is switched off in the RECALL mode, the setting conditions in the address set just before power was switched off will be recalled. (Refer to Section 5.2, which describes the RECALL mode.)

② MOD modulation display

This 3-digit display indicates the modulation level. The maximum indicated FM deviation is 99.9 kHz (RF frequency ≥ 1 MHz). The maximum AM modulation percentage is 80.0% (500 to 1799 kHz) or 60.0% (other frequencies).

The currently displayed modulation is that of the last set mode (e.g., AM or FM). This mode is indicated by the LED of the modulation mode indicator LEDs ④ which is lighted.

③ Modulation cursor

This cursor lights when the MOD, PILOT, SK/57kHz, or RDS key of the FUNCTION key group ㉓ is selected.

The DIGIT keys (◁ and ▷) ⑳ move the lighted position, and the lighted position value can be changed by using the rotary knob ㉑, the INC key ⑱, and the DEC key ⑲.

④ Modulation mode indicator LEDs

The LED corresponding to the current modulation mode for the MOD modulation display ② lights.

⑤ TRI/RDS display

This display indicates the TRI DK/ME, the BK/ZO AM modulation percentage, and the BK/ZO area/zone, and RDS pattern. The modulation percentage is indicated to 2 digits.

⑥ TRI/RDS cursor

This cursor lights when the DK/ME or BK/ZO key of the FUNCTION key group ㉓ is selected.

The the lighted position value can be changed by using the rotary knob ㉑, the INC key ⑱, and the DEC key ⑲.

⑦ TRI/RDS mode indicator LEDs

The LED corresponding to the current mode (e.g., modulation or pattern) of the TRI/RDS display ⑤.

⑧ ADDRESS display

For the RECALL and STORE modes, this display indicates the internal memory address (0 to 99).

⑨ Address cursor

This cursor lights when the RECALL or STORE key of the FUNCTION key group ㉓ is selected to enable the RECALL or STORE mode.

The the lighted position value can be changed by using the INC key ⑱, and the DEC key ⑲. Note that the rotary knob ㉑ cannot be used to change this value.

⑩ FREQUENCY RF frequency display

This 6-digit display indicates the RF frequency. The frequency resolution is 100 Hz below 30 MHz and 1 kHz at 30 MHz or higher.

⑪ Frequency cursor

This cursor lights when the FREQ key of the FUNCTION key group ㉔ is selected.

The DIGIT keys (◁ and ▷) ⑳ move the lighted position, and the lighted position value can be changed by using the rotary knob ㉑, the INC key ⑱, and the DEC key ⑲.

⑫ OUTPUT RF output level display

This 4-digit display indicates the RF output level.

The RF output level can be set over the range −20 dBμ to 126 dBμ (0 dBμ = 1 μV, 50-Ω, open circuit), in 0.1-dB steps.

⑬ RF output level cursor

The DIGIT keys (◁ and ▷) ⑳ move the lighted position, and the lighted position value can be changed by using the rotary knob ㉑, the INC key ⑱, and the DEC key ⑲.

3.2 OUTPUT (RF Output) Section

⑭ A and B RF output PRESET keys

It is possible to establish 2 values (A and B) of frequently used RF level. For details, refer to Section 5.3 (Output Level Presets).

⑮ OUTPUT RF output connector

This is the BNC-type RF output connector. The output impedance is 50 Ω.

3.3 GPIB Section

⑯ LOCAL key

When in the GPIB mode, pressing this keys switches from REMOTE mode to LOCAL mode.

⑰ REMOTE indicator

This LED lights when the Model 3217 is in the REMOTE mode.

3.4 PROGRAM/DATA ENTRY Section

⑱ INC key

This key has the same effect as UP of the rotary knob ㉑. (Note that it cannot be used to set the RDS frequency deviation.)

⑲ DEC key

This key has the same effect as DOWN of the rotary knob ㉑. (Note that it cannot be used to set the RDS frequency deviation.)

⑳ DIGIT (◁ and ▷) keys

These keys are used to increment and decrement the selected digit of the frequency, output level, modulation level, or address.

㉑ Rotary knob

This knob can be used to change the digit indicated by the frequency, output level, modulation level, or BK/ZO area/zone cursor. The cursor of the item to be changed is lighted by selecting the appropriate key of the FUNCTION group ㉔. (Note that the rotary knob cannot be used in RDS pattern settings.)

㉒ UNIT keys

These keys select the units to be used in setting data values for the function selected by the FUNCTION group ㉔ (with he exception of the WRITE function). Pressing one of these keys completes the data input, just as one would add the units after a number in normal written form.

(Writing into memory in the STORE mode is done by the WRITE key.)

㉓ DATA keys

This numeric key pad includes keys for the input of numerals 0 to 9, decimal point, and negative sign (−). If an error is made in a setting, press the same FUNCTION group key and make the setting once again.

㉔ FUNCTION keys

- FREQ key

  This key is used to set the frequency.

  The frequency setting is made in the following manner.

  ㉔ FREQ ㉓ 1 → 0 → 0 → ㉒ MHz

  (for a setting of 100 MHz)

- LEVEL key

  This key is used to set the output level.

  The output level is set in the following manner.

  ㉔ LEVEL ㉓ 1 → 2 → 6 → ㉒ dBμ

  (for a setting of 126 dBμ)

- MOD key

  This key is used to set either the FM frequency deviation or the AM modulator index.

  The FM deviation is set in the following manner.

  ㉔ MOD ㉓ 2 → 2 → . → 5 ㉒ kHz/%

  (for a setting of 22.5 kHz)

  The AM modulation percentage is set in the following manner.

  ㉔ MOD ㉓ 3 → 0 ㉒ kHz/%

  (for a setting of 30%)

- PILOT key

  This key is used to set the pilot deviation.

  The pilot deviation is set in the following manner.

  ㉔ PILOT ㉓ 7 → . → 5 → ㉒ kHz/%

  (for a setting of 7.5 kHz)

- SK/57kHz key

  This key is used to set the TRI deviation.

  The TRI deviation is set in the following manner.

  ㉔ SK/57kHz ㉓ 3 → . → 5 → ㉒ kHz/%

  (for a setting of 3.5 kHz)

- DK/ME key

  This key is used to set the DK/ME AM modulationpercentage.

  The DK/ME AM modulation percentage is set in the following manner.

  ㉔ DK/ME ㉓ 3 → 0 → ㉒ kHz/%

  (for a setting of 30%)

- BK/ZO key

  This key is used to set the BK/ZO AM modulation percentage.

  The BK/ZO AM modulation percentage is set in the following manner.

  ㉔ BK/ZO ㉓ 3 → 0 → ㉒ kHz/%

  (for a setting of 30%)

- RDS key

  This key is used to set the RDS deviation and RDS pattern.

  The RDS deviation is set in the following manner.

  ㉔ RDS ㉓ 1 → . → 2 → ㉒ kHz/%

  (for a setting of 1.2 kHz)

  The RDS pattern is set using the INC key ⑱ and DEC key ⑲ only.

- RECALL key

  The LED of this key lights when the Model 3217 is in the RECALL mode.

  When it is lighted, it is possible to recall data directly from the memory address specified by the DATA keys ㉓.

  ㉔ RECALL ㉓ 5 → 6 → ㉒ ADDRESS

  (for recall of data from address 56)

- STORE

  The LED of this key lights when the Model 3217 is in the STORE mode.

  When it is lighted, it is possible to store data directly into the memory address specified by the DATA keys ㉓.

  After making panel settings, the store operation is performed as follows.

  ㉔ STORE ㉓ 3 → 2 → ㉒ ADDRESS → WRITE

  (for store panel conditions into address 32)

  Each time the WRITE key is pressed the address is incremented by 1.

- SPECIAL key

  This key is used for such settings as begin address and end address. For details refer to Section 6.1 (SPECIAL Key).

3.5 TRI/RDS Section

㉕ TRI/RDS key group

- RDS on key

  This key is used to switch the RDS signal on and off.

  The LED of this key lights when the RDS signal is on.

  Because the RDS signal cannot be used simultaneously with the USA-system TRI signal, the RDS signal is switched off automatically when the the SK/57kHz TRI signal key is pressed.

- PATTERN key

  This key is used to sequentially select the RDS signal patterns (16 patterns from 0 to F).

- EBU/USA key

  This key is used to select either the EBU-system or USA-system TRI signal. The associated LED lights when the USA system is selected, and is extinguished when the EBU system is selected. Switching between EBU and USA systems is done in toggle (alternate) fashion.

- SK/57kHz key

  This key is used to switch the TRI signal on and off.

  The LED of this key lights when the TRI signal is on.

  For the USA system, this is automatically switched off when the RDS key is pressed.

- DK/ME1 key

  This key is used to switch the DK/ME1 signal of the TRI signal on and off.

  The LED of this key lights when the ME1 signal is on.

- ME2/EON key

  When the RDS key is in the on condition, this key is used to send an EON interrupt signal. In addition, when the TRI USA-system SK/57kHz key is on, this key switches the ME2 signal on and off, in which case the associated LED lights for when the signal is in the on condition.

- BK/ZO key

  This key is used to switch the BK/ZO signal of the TRI signal on and off.

  The LED of this key lights when the signal is on.

- INC/SCAN key

  This key is used to switch the frequency (A to F or 1 to 10) of the BK/ZO signal of the TRI signal. Each time the key is pressed the modulation signal is incremented by one.

  If the key is held down for longer than approximately 1 second, the key's LED will light, the automatic scan mode will be enabled, and the modulation signal will be switched automatically.

  If the key is pressed again, the automatic scan is stopped and the automatic scan mode is disabled.

3.6 MODULATION Section

㉙ MODE keys

- ON key

  This key is used to switch the modulation signal on and off.

  The on condition is indicated by the lighting of the modulation display ② and the lighting of the LED of this key. When modulation is off, CW output (carrier only) occurs.

- AM key

  This key is used to select amplitude modulation.

  The associated LED lights when AM modulation is on.

  This key operates in toggle fashion with the FM key.

- FM key

  This key is used to select amplitude modulation.

  The associated LED lights when internal FM modulation is on.

  This key operates in toggle fashion with the AM key.

- PILOT key

  This key is used to switch the pilot signal on and off.

  The associated LED lights when the pilot signal is on.

  This key is only operative when FM modulation is selected.

- L, R, MAIN, and SUB keys

  These keys are used to select the various stereo modes.

  The LED of the key corresponding to the selected mode lights.

  Monaural modulation is selected by press the MAIN key and setting the PILOT key to off.

㉗ INT FREQ keys

- 30Hz, 100Hz, 400Hz, 1kHz, 6.3kHz, 10kHz, and 15kHz keys

  These keys are used to select the internal modulation frequency and mode.

  Only one frequency can be selected of the 7 available. The LED of the key for the selected frequency lights to indicate the selected internal modulation frequency.

- OPTION key

  This key is not used in the standard Model 3217, and is reserved for additional options.

㉘ EXT LEVEL monitor indicators

These LEDs indicate the external modulation input level. When the input is lower than a reference 1-Vrms level, the LOW LED lights, and when the input is higher than this level the HIGH LED lights. When the level is correct, both LEDs are extinguished.

The level monitored by these LEDs is the external input applied at the L or AF connector ㉜.

To monitor the R input ㉛, switch the input from the L or AF connector ㉜, monitor the input, and then switch the input back to the R input connector ㉛.

㉙ EXT L, R key

This key is used to select the stereo dual tone in the external modulation mode.

Apply the L and R audio signals to the L or AF input connector ㉜ and R input connector ㉛, respectively. If the L and R signals are in phase and have a level of 1 Vrms, the MAIN modulation index (deviation) will be 75.0 kHz (including the 7.5-kHz pilot component).

㉚ EXT AF key

This key is used to select the external modulation mode.

Apply the external audio signal at the L or AF input connector ㉜.

㉛ EXT R input connector

This connector accepts the R signal input for the external modulation mode stereo dual tone signal. Press the EXT L, R key ㉙ to light its LED, thereby selecting this mode. The input impedance is 10 kΩ.

㉜ EXT L or AF input connector

For stereo dual-tone input in the external modulation mode, this connector serves as the L signal input. (This mode is enabled by pressing the EXT L, R key to light the associated LED.) In the external modulation mode, for either stereo dual-tone or AM, this connector serves as the input connector for the selected type of audio signal.

If the EXT AF key is pressed to light its LED, this mode is selected. The input impedance is 10 kΩ.

3.7 Rear Panel

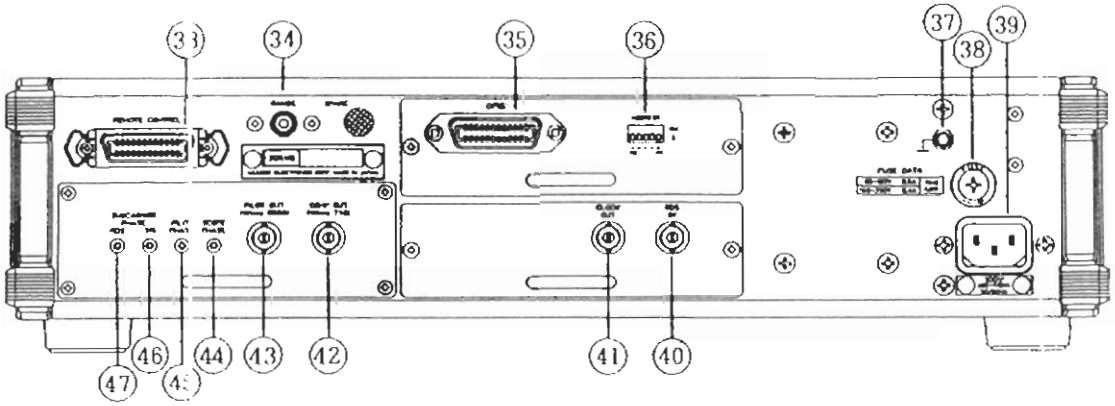


Fig. 3-2 Model 3217 Rear Panel

㉝ REMOTE CONTROL connector

This 24-pin connector is used for remote control of the Model 3217. (Refer to Section 10, REMOTE CONTROL.)

㉞ RANGE output connector

This connector is used for controlling such devices as dummy antennas.

Frequency < 30 MHz ..... 0 V

Frequency ≥ 30 MHz ..... 5 V

When using this for other applications, care should be taken with regard to ratings. Not that the output rating is 5 V/50 mA (source output).

㉟ GPIB connector

This 24-pin connector is used to connect the Model 3217 as part of a GPIB system.

㊱ GPIB address switches

These switches are used to set the address of the Model 3217 on a GPIB bus.

㊲ Ground terminal

This ground terminal is connected to the chassis of the Model 3217. It is used in providing a ground connection to the Model 3217.

㊳ Fuse holder

This holder holds the power line fuse of the Model 3217. To remove the fuse, turn the head of the fuse holder counterclockwise using a Phillips screwdriver. When replacing the fuse, be sure to observe the fuse rating for the line voltage being used, as indicated the FUSE DATA table located to the left of the fuse holder.

㊴ Power inlet

This is the inlet at which the power cord is connected. Be sure that the line voltage is within the specified limits (± 10% with respect to nominal value, except never exceeding 250 V).

㊵ RDS IN data input connector

This is the external RDS data input connector.

㊶ CLOCK OUT clock output connector

This is the syncing clock output when applying an external RDS data input.

㊷ COMP OUT composite signal output connector

This is the STEREO/RDS/TRI composite signal output connector.

㊸ PILOT OUT pilot signal output connector

This is the stereo pilot signal output connector. It is used for such operations as phase calibration.

㊹ SCOPE PHASE adjustment trimmer

This is an additional adjustment of the stereo pilot signal before phase calibration. (Refer to Section 12.1, Pilot Signal Phase Calibration.)

㊺ PILOT PHASE calibration adjustment

This is the adjustment for stereo pilot signal phase calibration. (Refer to Section 12.1, Pilot Signal Phase Calibration.)

㊻ SUBCARRIER PHASE TRI calibration adjustment

This is the adjustment for TRI signal subcarrier phase calibration. (Refer to Section 12.1, Pilot Signal Phase Calibration.)

㊼ SUBCARRIER PHASE RDS calibration adjustment

This is the adjustment for RDS signal subcarrier phase calibration. (Refer to Section 12.1, Pilot Signal Phase Calibration.)

4. OPERATION

There are two modes of controlling the operation of the Model 3217: the manual operating mode and the memory operating mode.

In the manual operating mode, setting values are directly input via panel keys.

In the memory operating mode, setting values are first written into memory, and these are recalled from memory as needed.

In this section, the manual operating mode will be described.

If the RECALL key or STORE key of the FUNCTION section is lighted, the Model 3217 is in the memory operating mode. Press the lighted key to extinguish its LED and place the Model 3217 in the manual operating mode.

4.1 Frequency Setting

4.1.1 Basic Operation

The frequency setting can be either by using the numeric keys of the DATA key ㉓, or by using the rotary knob ㉑ in combination with the INC key ⑱ and DEC key ⑲.

The frequency setting range is 100 kHz to 140 MHz.

Note that for FM modulation there are cases in which settings lower than 1 MHz are not possible. (Refer to Section 4.4, FM Modulation.)

Minimum resolution:

Frequencies lower than 30 MHz: 100 Hz

Frequencies of 30 MHz or higher: 1 kHz

(a) Setting Using the DATA keys

Fig. 4-1 shows the section of the front panel used in this setting method.

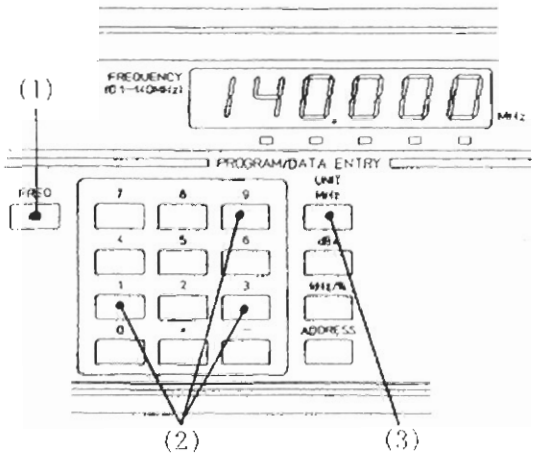


Fig. 4-1 Frequency Setting Using the Numeric Keys

Make the following key operations.

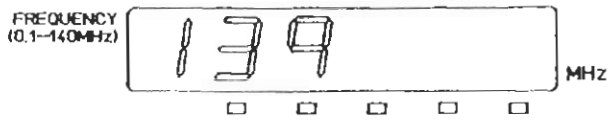
FREQ → DATA → MHz or kHz/%

Let us take the example of setting the frequency to 139 MHz.

(1) Press the FREQ key.

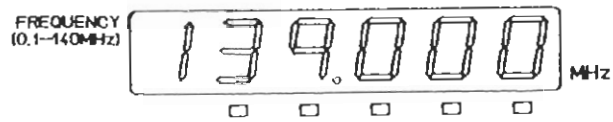
(2) Press the DATA keys in the following sequence.

1 → 3 → 9



If there are trailing zeros on the value to be set, it is not necessary to press the 0 key.

(3) Press the MHz key.



(b) Setting Using the Rotary Knob in Combination With the INC and DEC keys

Fig. 4-2 shows the section of the front panel used in this setting method.

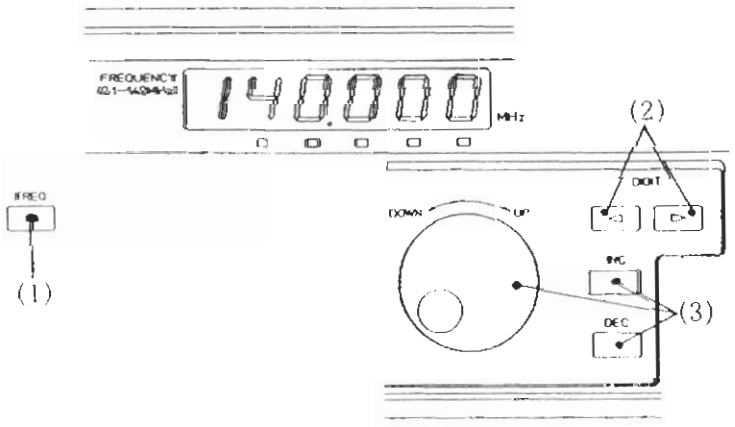


Fig. 4-2 Frequency Setting Using the Rotary Knob and the INC and DEC keys

(1) Use the FREQ key to light the frequency cursor LED

(2) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed. Note that it is not possible to specify the most significant digit.

The ◁ and ▷ keys move the position of the lighted frequency cursor to the left and right, respectively. (Refer to Fig. 4-3.)

(3) Use the rotary knob or the INC or DEC keys to set the desired frequency. Note that carrying and borrowing between digits is performed automatically.

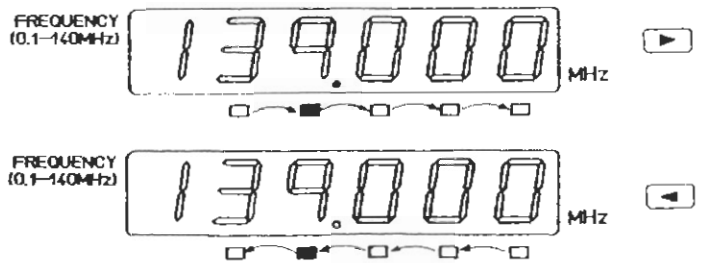


Fig. 4-3 Operation of the Frequency Display When Using the DIGIT keys

4.1.2 Using the ΔF Mode

(a) ΔF Mode Setting (SPECIAL 11)

The ΔF mode is used to establish a given RF frequency as the reference frequency, treating this frequency as 0.000 MHz, with respect to which the frequency is varied.

The RF frequency to be established as the reference is the value immediately before entering the ΔF mode, and when the ΔF mode is enabled, the frequency is thus displayed as 0.000 MHz.

It is also possible to specify the size of the step by which the frequency is to be varied. The basic specifications are as follows.

Step size:	100 Hz to 19.9999 MHz (< 30 MHz)
	1 kHz to 19.999 MHz (≥ 30 MHz)
Maximum frequency variable range:	± 19.9999 MHz (< 30 MHz)
	± 19.999 MHz (≥ 30 MHz)

Fig. 4-4 shows the section of the front panel used in this setting method.

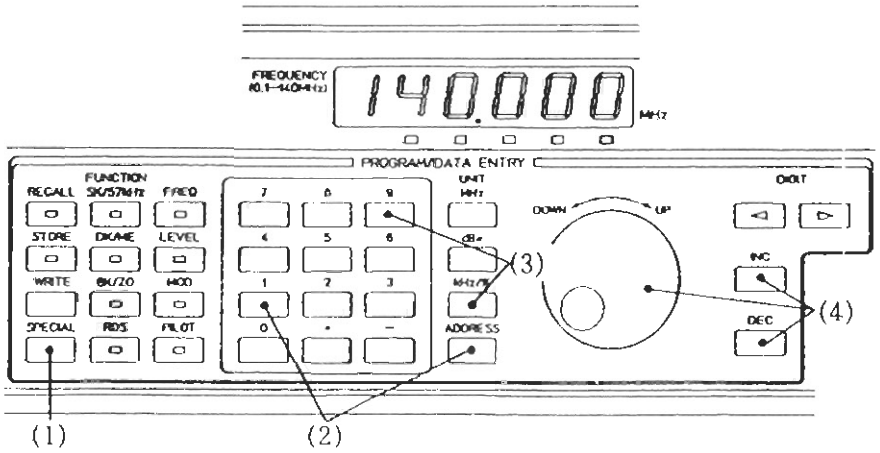


Fig. 4-4 ΔF Mode Operation

Make the following key operations.

SPECIAL → 1 → 1 → ADDRESS → DATA → MHz or kHz

The example of setting the ΔF mode frequency step to 9 kHz is described below.

(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

1 → 1 → ADDRESS

This will place the Model 3217 into the ΔF mode.

After displaying the current step frequency for approximately 0.5 second, the RF frequency display will appear as shown in Fig. 4-5.

(3) Next, enter the frequency step size by pressing 9 and then the kHz key of the UNIT section of keys.

The RF frequency display will indicate the input data for approximately 0.5 second. This completes the input of the frequency step.

(4) It is possible to step the frequency up or down by using either the rotary key or the INC and DEC keys.

Note, however, that in the RECALL mode, only the rotary knob can be used.

(a) <30 MHz

(b) ≥30 MHz

Fig. 4-5 Frequency Display Section (ΔF Mode)

(b) ΔF Mode Precautions

If at below 30 MHz the frequency step is set to less than 1 kHz and then the frequency is changed to 30 MHz or higher, even though the minimum resolution is 1 kHz, the step frequency will be less than 1 kHz, and so stepping will not be possible.

If this occurs, set the frequency to 30 MHz or higher and then set the frequency step again to a value of 1 kHz or higher.

Also, for use at frequencies of below 30 MHz, if the variable range is greater than 30 MHz, there will also be a range over which stepping will not be possible. Care should be taken in stepping to assure that this does not occur.

(c) ΔOFF (Canceling the ΔF Mode: SPECIAL 10)

This is used to escape from the ΔF mode.

Make the following key operations.

SPECIAL → 1 → 0 → ADDRESS

4.2 Output Level Setting

4.2.1 Basic Operation

The output level setting can be made by using the DATA keys, the rotary knob or the INC key and DEC key.

The output level setting range is –20 dBμ to 126 dBμ.

(a) Setting Using the DATA keys

Fig. 4-6 shows the section of the front panel used in this setting method.

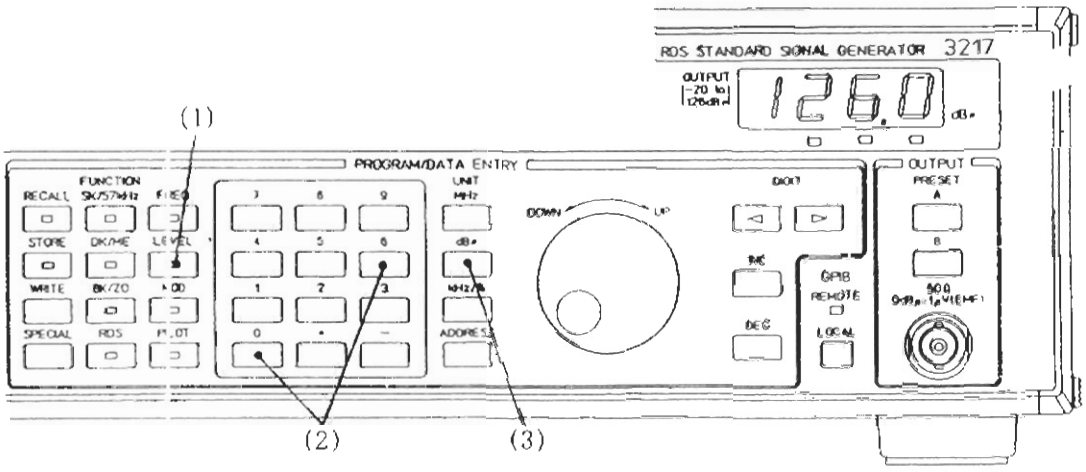


Fig. 4-6 Output Level Setting

Make the following key operations.

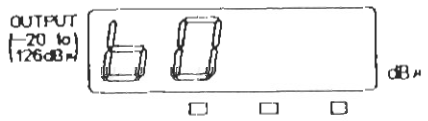
LEVEL → level setting → dBμ

Let us take the example of setting the output level to 60 dBμ.

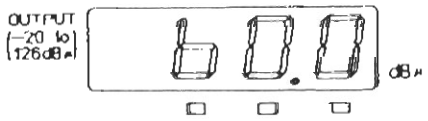
(1) Press the LEVEL key.

(2) Press the DATA keys in the following sequence.

6 → 0



(3) Press the dBμ key.



(b) Setting Using the Rotary Knob

(1) Use the LEVEL key to light the output cursor LED.

(2) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed. Note that it is not possible to specify the most significant digit.

The ▷ and ◁ keys move the position of the lighted output cursor to the left and right, respectively.

(3) Use the rotary knob to set the desired output level. Note that carrying and borrowing between digits is performed automatically.

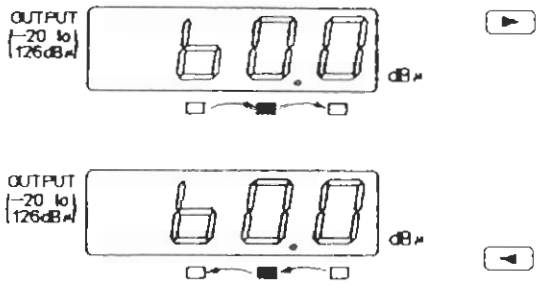


Fig. 4-7 Output Level Display

(c) Setting Using the INC and DEC Keys

Refer to Fig. 4-6.

(1) Use the LEVEL key to light the output cursor LED.

(2) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed. Note that it is not possible to specify the most significant digit.

The ▷ and ◁ keys move the position of the lighted output cursor to the left and right, respectively. Refer to Fig. 4-7.

(3) Use the INC and DEC keys to set the desired output level.

Note that carrying and borrowing between digits is performed automatically.

4.2.2 Using the ΔL Mode

(a) ΔL Mode Setting (SPECIAL 12)

The ΔL mode is used to establish a given RF level as the reference level, treating this level as 0.0 dB, with respect to which the level is varied.

The RF level to be established as the reference is the value immediately before entering the ΔL mode, and when the ΔL mode is enabled, the level is thus displayed as 0.0 dB.

It is also possible to specify the size of the step by which the level is to be varied. The basic specifications are as follows.

Step size:	0.1 to 9.9 dB
Resolution:	0.1 dB
Maximum offset level:	146.0 dB

Fig. 4-8 shows the section of the front panel used in this setting method.

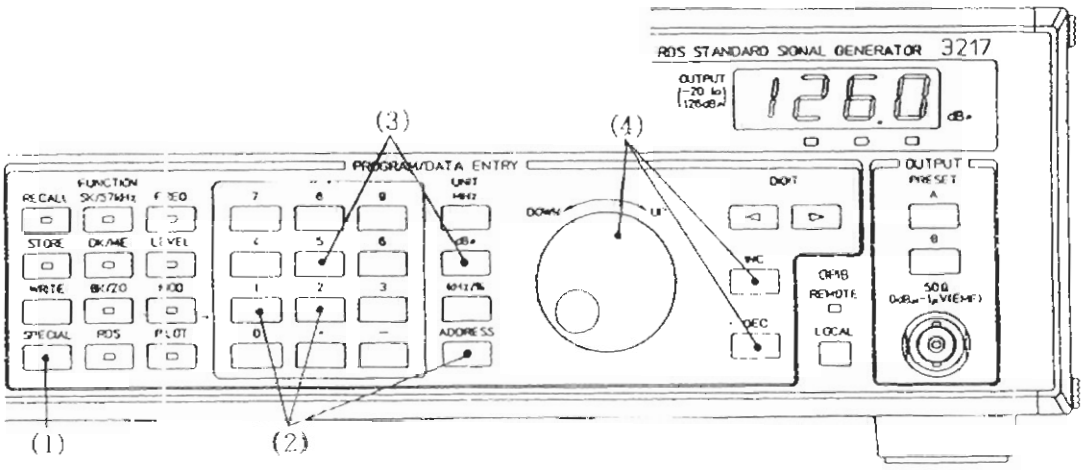


Fig. 4-8 ΔL (Level Stepping) Setting

Make the following key operations.

SPECIAL → 1 → 2 → ADDRESS → step level → dBμ

The example of setting the ΔL mode level step to 5 dB is described below.

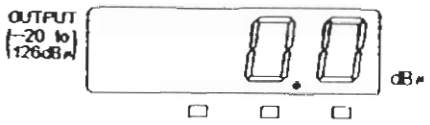
(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

1 → 2 → ADDRESS

This will place the Model 3217 into the ΔL mode.

After displaying the current step level for approximately 0.5 second, the RF frequency display will appear as shown below.



(3) Next, enter the level step size by pressing 5 and then the dBμ key of the UNIT section of keys.

The RF level display will indicate the input data for approximately 0.5 second. This completes the input of the level step.

(4) It is possible to step the level up or down by using either the rotary knob or the INC and DEC keys.

Note, however, that in the RECALL mode, only the rotary knob can be used.

(b) ΔOFF (Canceling the ΔL Mode: SPECIAL 10)

This is used to escape from the ΔL mode.

Make the following key operations.

SPECIAL → 1 → 0 → ADDRESS

4.3 AM Modulation

Table 4-1 shows the AM modulation setting ranges.

Fig. 4-1 AM Modulation Setting Ranges

Frequency	Modulation Percentage
500 to 1,799 kHz	0 to 80%
Other frequencies	0 to 60%

The AM modulation setting can be either by using the DATA keys, by using the rotary knob, or by using the INC key and DEC key.

(a) Setting Using the DATA keys

Fig. 4-9 shows the section of the front panel used in this setting method.

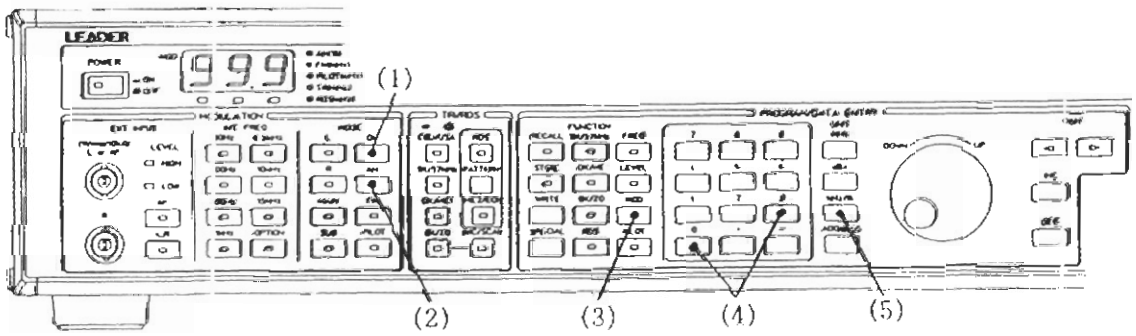


Fig. 4-9 AM Modulation Setting

The following example is that of setting the modulation percentage to 30%.

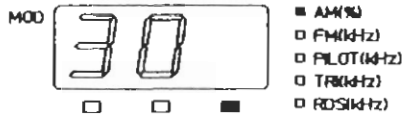
(1) Press the ON key of the MODE section.

(2) Press the AM key of the MODE section.

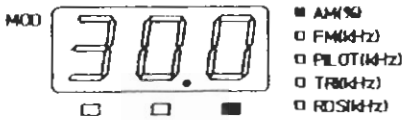
(3) Press the MOD key of the PROGRAM/DATA ENTRY section.

(4) Press the DATA keys in the following sequence.

3 → 0



(5) Press the kHz/% key.



(b) Setting Using the Rotary Knob

(1) Press the ON key of the MODE section.

(2) Press the AM key of the MODE section.

(3) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed.

(4) Use the rotary knob to set the desired value.

(c) Setting Using the INC and DEC keys

(1) Press the ON key of the MODE section.

(2) Press the AM key of the MODE section.

(3) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed.

(4) Use the INC and DEC keys to set the desired value.

4.4 FM Modulation

4.4.1 FM Modulation Setting

The FM modulation setting can be either by using the DATA keys, by using the rotary knob, or by using the INC key and DEC key.

If the carrier frequency is 1 MHz or lower, the maximum frequency deviation is limited to 1/10 of the carrier frequency.

(a) Setting Using the DATA keys

Fig. 4-10 shows the section of the front panel used in this setting method.

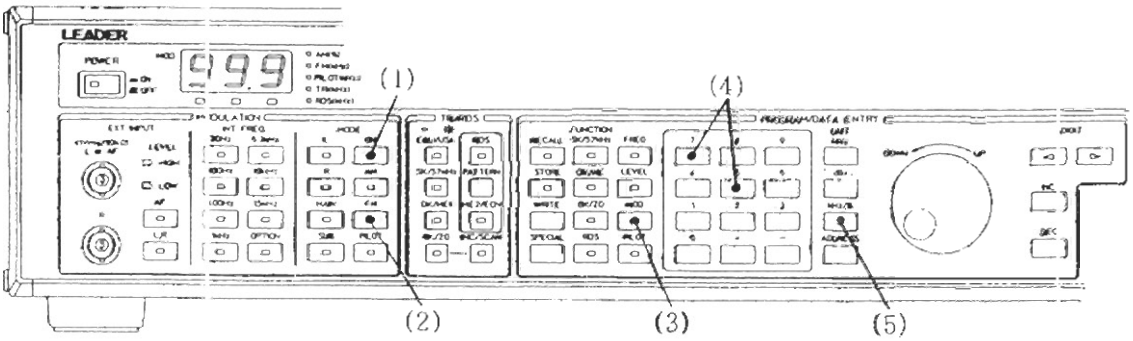


Fig. 4-10 FM Modulation Setting

The following example is that of setting the modulation (frequency deviation) to 75 kHz.

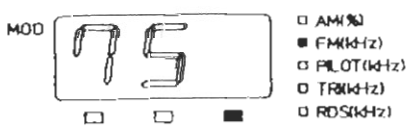
(1) Press the ON key of the MODE section.

(2) Press the FM key of the MODE section.

(3) Press the MOD key of the PROGRAM/DATA ENTRY section.

(4) Press the DATA keys in the following sequence.

7 → 5



(5) Press the kHz/% key.

(b) Setting Using the Rotary Knob

(1) Press the ON key of the MODE section.

(2) Press the FM key of the MODE section.

(3) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed.

(4) Use the rotary knob to set the desired value.

(c) Setting Using the INC and DEC Keys

(1) Press the ON key of the MODE section.

(2) Press the FM key of the MODE section.

(2) Use the ◁ and ▷ DIGIT keys to specify the digit to be changed.

(3) Use the INC and DEC keys to set the desired value.

4.4.2 Pre-e nphasis (SPECIAL 30 to 33)

(a) Pre-emphasis Off (SPECIAL 30)

This is used to escape from the pre-emphasis mode.

Press keys in the following sequence.

SPECIAL → 3 → 0 → ADDRESS

(b) Pre-emphasis 25 μs (SPECIAL 31)

This is used to apply 25 μs of pre-emphasis to the main and sub channels.

Press keys in the following sequence.

SPECIAL → 3 → 1 → ADDRESS

(c) Pre-emphasis 50 μs (SPECIAL 32)

This is used to apply 50 μs of pre-emphasis to the main and sub channels.

Press keys in the following sequence.

SPECIAL → 3 → 2 → ADDRESS

(d) Pre-emphasis 75 μs (SPECIAL 33)

This is used to apply 75 μs of pre-emphasis to the main and sub channels.

Press keys in the following sequence.

SPECIAL → 3 → 3 → ADDRESS

4.5 FM Stereo Modulation

4.5.1 Modulation Source Setting

In the Model 3217, the baseband modulation audio signal (AF) source can be selected as one of 3 sources (1 internal and 2 external). This source selection is described below.

(a) Internal Modulation

Press an INT FREQ key to select this modulation mode.

It is possible in this mode to select the desired stereo signal (L, R, SUB, or MAIN) or MONO signal.

(b) External Modulation (AF key)

Press the AF key to select this modulation mode.

Input an external modulation signal of the appropriate level at the L or AF input connector of the EXT INT section. Other aspects of this mode are the same as for internal modulation.

(c) External Modulation (L, R key)

Press the L, R key to select this modulation mode.

By inputting the L signal at the L or AF external modulation input connector, and the R signal at the R input connector the stereo mode is set.

In the case of this mode, therefore, it is not possible to switch the stereo mode from the front panel.

This mode enables measurements at frequencies not possible using the available internal modulation frequencies.

4.5.2 FM Stereo Modulation Operation

The portions of the front panel used in these operations are shown in Fig. 4-11.

The following operations will be described.

- Internal modulation
- External modulation using the AF key
- External modulation using the L, R key

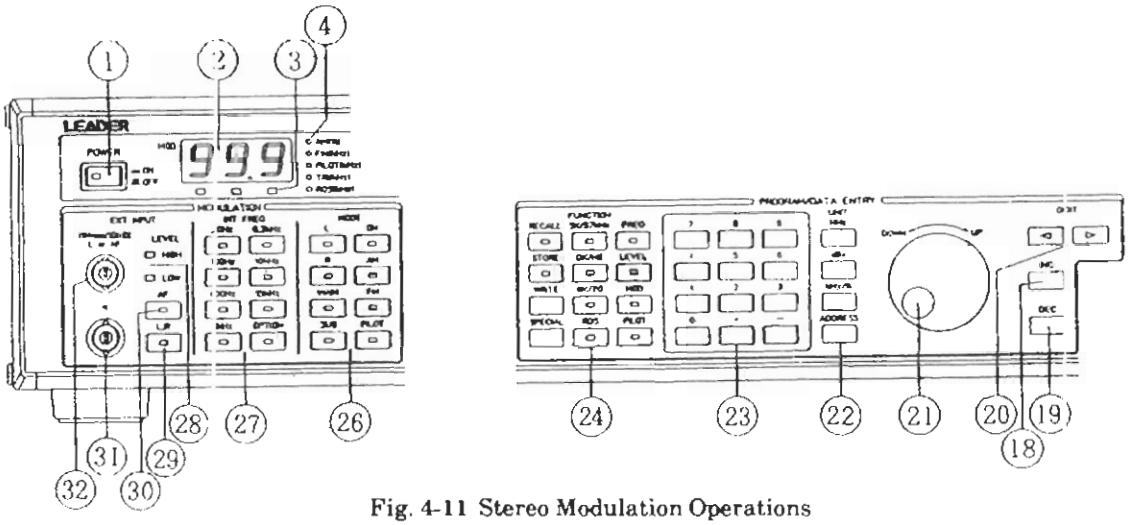


Fig. 4-11 Stereo Modulation Operations

(a) Internal Modulation

(1) Press the INT FREQ key of the desired internal modulation frequency.

(2) Press the MODE key of the desired mode (L, R, MAIN, SUB, MONO).

(3) Set the MOD ON key to the on condition to light its LED.

(4) Press the PILOT key to light it LED (for stereo).

(5) Press the MOD key of the FUNCTION section to obtain a modulation indication on the modulation display.

(6) Use the rotary knob to adjust to the desired deviation.

(7) Press the PILOT key of the FUNCTION section to obtain a pilot indication on the modulation display.

(8) Use the rotary knob to adjust to the desired deviation.

It is also possible to use the INC and DEC keys to set the deviation.

(b) External Modulation Using EXT AF

(1) Press the AF key to select external modulation.

(2) Press the MODE key of the desired mode (L, R, MAIN, SUB, MONO).

(3) Set the MOD ON key to the on condition to light its LED.

(4) Press the PILOT key to light it LED (for stereo).

(5) Press the MOD key of the FUNCTION section to obtain a modulation indication on the modulation display.

(6) Use the rotary knob to adjust to the desired deviation.

(7) Press the PILOT key of the FUNCTION section to obtain a pilot indication on the modulation display.

(8) Use the rotary knob to adjust to the desired deviation.

(9) Apply an external modulation signal to the L or AF input connector.

Adjust the signal while monitoring its level on the LEVEL (EXT LEVEL) monitor LEDs.

(c) External Modulation Using EXT L, R

(1) Press the L, R key to select external modulation.

When doing this, all the LEDs indicating the stereo mode will be extinguished.

(2) Set the MOD ON key to the on condition to light its LED.

(3) Press the PILOT key to light it LED (for stereo).

(4) Press the PILOT key of the FUNCTION section to obtain a pilot indication on the modulation display.

(5) Use the rotary knob to adjust to the desired deviation.

(6) Apply a stereo signal to the L or AF input and the R input connectors.

With the left and right channels in phase, and 1-Vrms signals applied, in the MAIN stereo mode, the deviation will be 67.5 kHz (not including the pilot signal).

4.6 TRI

4.6.1 TRI Modulation Index Setting

The TRI modulation index (frequency deviation) setting can be made by using the rotary knob or by using the INC and DEC keys.

The TRI modulation index setting range is 0 to 7.5 kHz.

(a) Setting Using the DATA keys

Fig. 4-12 shows the section of the front panel used in this setting method.

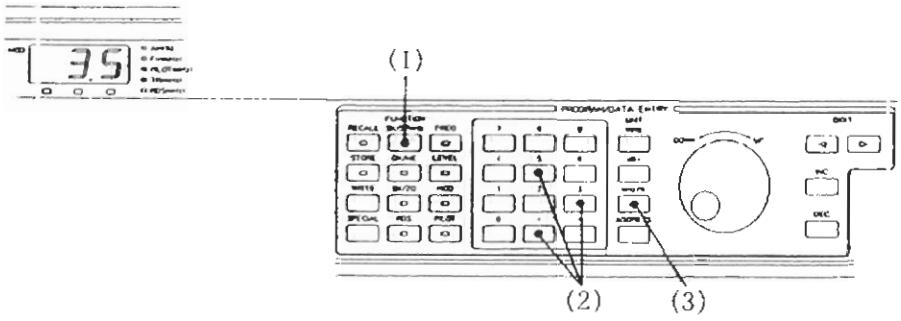


Fig. 4-12 TRI Modulation Setting

Press keys in the following sequence.

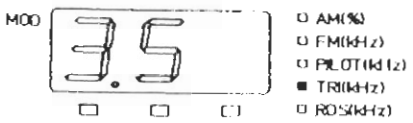
SK/57kHz → DATA → kHz/%

The following is the example of setting the modulation index to 3.5 kHz.

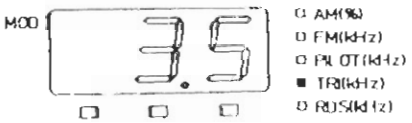
(1) Press the SK/57kHz key.

(2) Press the DATA keys in the following sequence.

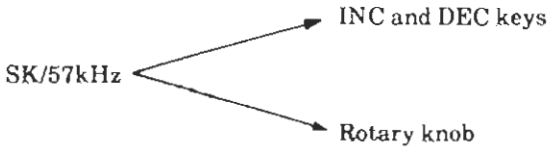
3 → . → 5



(3) Press the kHz/% key.



(b) Method Using the DIGIT keys



(1) Press the SK/57kHz key.

(2) Press the DIGIT keys to specify the digit to be changed.

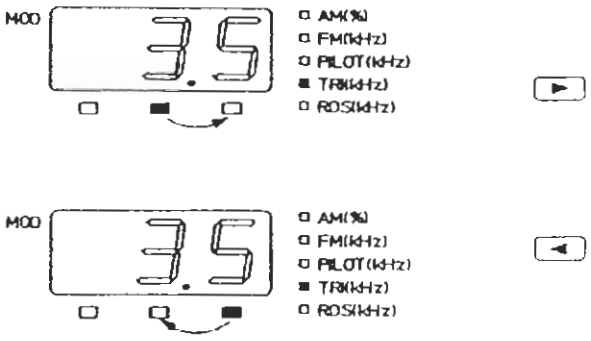


Fig. 4-13 Modulation Display Section (Setting Using DIGIT Keys)

(3) Use the INC and DEC keys or the rotary knob to set the desired value of modulation index. Note that carrying and borrowing between digits is performed automatically.

4.6.2 DK/ME Modulation Percentage Setting

The DK/ME modulation percentage setting can be made by using the rotary knob or by using the INC and DEC keys.

The DK modulation percentage setting range is 0 to 40%.

The ME1 and ME2 modulation percentage setting range is 0 to 80%.

If FM is switched off, it is not possible to set the DK/ME modulation percentage.

(a) Setting Using the Numeric Keys

Fig. 4-14 shows the section of the front panel used in this setting method.

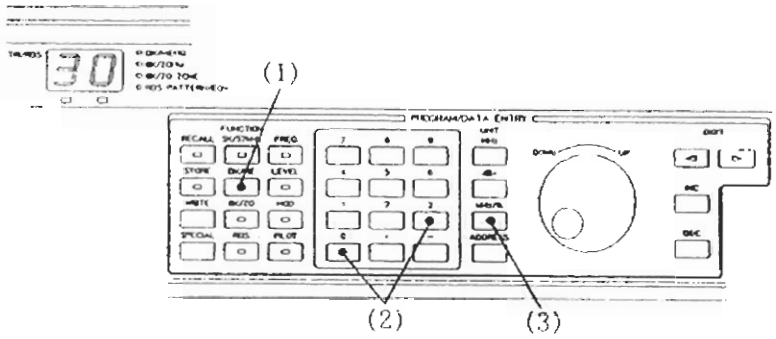


Fig. 4-14 DK/ME Modulation Percentage Setting

Press keys in the following sequence.

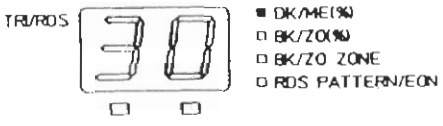
DK/ME → DATA → kHz/%

The following is the example of setting the modulation percentage to 30%.

(1) Press the DK/ME key.

(2) Press keys in the following sequence.

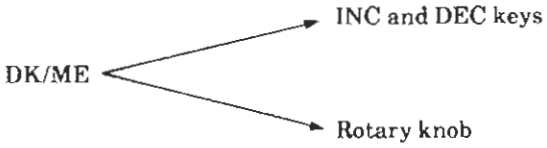
3 → 0



(3) Press the kHz/% key.

(b) Method Using the DIGIT keys

To change DK/ME modulation percentage by using DIGIT key, FM, SK/57kHz, and DK/ME keys must be switched on.



(1) Press the DK/ME key.

(2) Press the DIGIT keys to specify the digit to be changed.

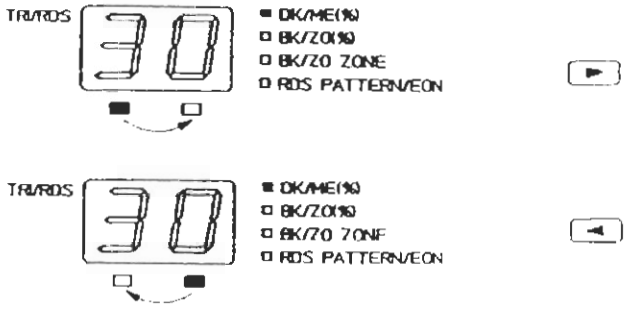


Fig. 4-15 TRI/RDS Modulation Display Section (Setting Using DIGIT Keys)

(3) Use the INC and DEC keys or the rotary knob to set the desired value of modulation index. Note that carrying and borrowing between digits is performed automatically.

4.6.3 BK/ZO Modulation Percentage Setting

The BK/ZO modulation percentage setting can be made by using the rotary knob or by using the INC and DEC keys.

The BK modulation percentage setting range is 0 to 80%.

The ZO modulation percentage setting range is 0 to 40% when ME is on, and 0 to 80% when ME is off.

If FM is switched off, it is not possible to set the BK/ZO modulation percentage.

(a) Setting Using the DATA keys

Fig. 4-16 shows the section of the front panel used in this setting method.

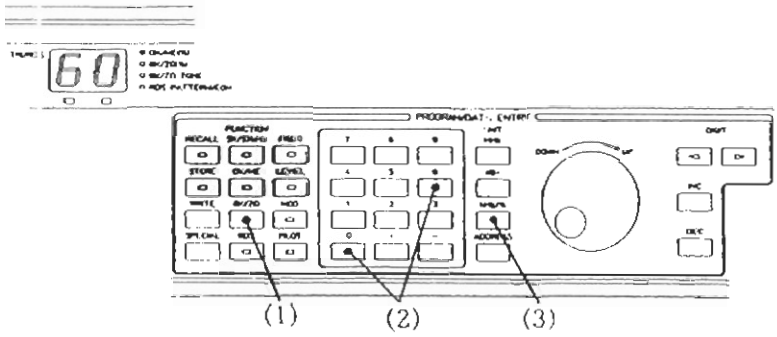


Fig. 4-16 BK/ZO Modulation Percentage Setting

Press keys in the following sequence.

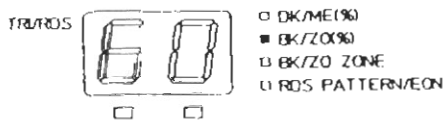
BK/ZO → DATA → kHz/%

The following is the example of setting the modulation percentage to 60%.

(1) Press the BK/ZO key.

(2) Press the DATA keys in the following sequence.

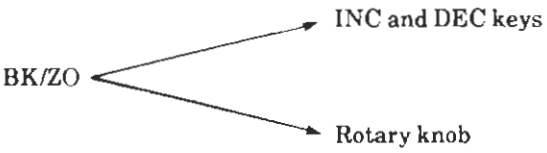
6 → 0



(3) Press the kHz/% key.

(b) Method Using the DIGIT keys

To change BK/ZO modulation percentage by using DIGIT key, FM, SK/57kHz, and BK/ZO keys must be switched on.



(1) Press the BK/ZO key.

(2) Press the DIGIT keys to specify the digit to be changed.

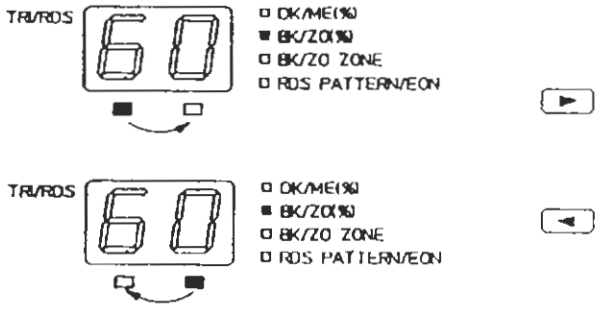


Fig. 4-17 TRI/RDS Modulation Display Section
(Setting of DK/ZO Modulation Percentage Using DIGIT Keys)

(3) Use the INC and DEC keys or the rotary knob to set the desired value of modulation index. Note that carrying and borrowing between digits is performed automatically.

4.6.4 Modulation Source Setting

Fig. 4-18 shows the section of the front panel used in this setting method.

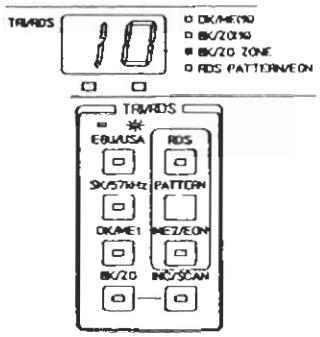


Fig. 4-18 TRI/RDS Setting Section

- Selection of the EBU or USA System (EBU/USA key)

  It is possible to select two TRI signal types, the EBU system and the USA system, using the EBU/USA key, with the on/off conditions of the SK/57kHz, DK/ME1, BK/ZO, and ME2/EON keys preset for each of these. This key operates in alternate (toggle) fashion.

  Extinguishing the EBU/USA selects the EBU system, and lighting the LED selects the USA system.

- Switching the TRI signal on and off (SK/57kHz key)

  The TRI signal can be switched on and off using the SK/57kHz key. This key operates in toggle fashion.

  Extinguishing the SK/57kHz key LED selects switches the TRI signal off, and lighting the LED switches the TRI signal on. When the TRI signal is switched off, even if one of the DK/ME1, ME2/EON, and BK/ZO key LEDs was lighted, it will be extinguished, with the associated signals being switched off.

- Switching the DK signal on and off (EBU system only: DK/ME1 key)

  The DK signal can be switched on and off using the DK/ME1 key. This key operates in toggle fashion. Extinguish the DK/ME1 LED switches the DK signal off, and lighting the LED switches the DK signal on.

- Switching the ME1 and ME2 signals on and off (USA system, DK/ME1 and ME2/EON keys)

  To select the USA system for the TRI signal, the RDS key must be off. If the RDS key is on, set it to off.

  The ME1 signal can be switched either on or off using the DK/ME1 key. Extinguishing the LED of this key switches the ME1 signal off, and lighting the LED switches the ME1 signal on. This key operates in toggle fashion.

  In the same manner, the ME2 signal can be switched on and off using the ME2/EON key. Extinguishing the LED of the ME2/EON key switches the ME2 signal off, and lighting the LED of this key switches the ME2 signal on.

  With the ME1 signal on, if the ME2/EON key is pressed the ME1 signal is switched off, and the ME2 signal is switched on.

  In converse, if the ME2 signal on, if the DK/ME1 key is pressed the ME2 signal is switched off, and the ME1 signal is switched on.

- Switching the BK signal on and off (EBU system, BK/ZO key)

  The BK signal can be switched either on or off using the BK/ZO key. This key operates in toggle fashion. Extinguishing the LED of this key switches the BK signal off, and lighting the LED switches the BK signal on.

- Switching the ZO signal on and off (USA system, BK/ZO key)

  The ZO signal can be switched either on or off using the BK/ZO key. This key operates in toggle fashion. Extinguishing the LED of this key switches the ZO signal off, and lighting the LED switches the ZO signal on.

- Switching the BK/ZO signal modulation frequency (INC/SCAN key)

  The modulation frequency can be switched using the INC/SCAN key of the TRI/RDS section. Note that this key is only operative if the BK signal or ZO signal is on.

  If the EBU system BK signal is on, each time the INC/SCAN key is pressed, the modulation frequency switches one step in the following sequence.

  → A → B → C → D → E → F →

  This is the increment mode.

  If the INC/SCAN key is held down for longer than approximately 1 second, the LED of the key lights, and incrementing is performed automatically in the auto-scan mode. If the INC/SCAN key is press once again, the LED of the key is extinguished, and return in made to the increment mode.

  The BK/ZO ZONE LED of the TRI/RDS mode indicators above the TRI/RDS section of keys will light, and the TRI/RDS display will appear as shown in Fig. 4-19.

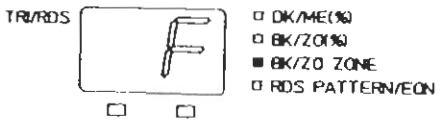


Fig. 4-19 TRI/RDS Display (BK Signal Modulation Frequency Switching)

In the USA system, if the ZO signal is on, each time the INC/SCAN key is pressed, the modulation frequency switches one step in the following sequence.

→ 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 10 →

This is the increment mode.

If the INC/SCAN key is held down for longer than approximately 1 second, the LED of the key lights, and incrementing is performed automatically in the auto-scan mode. If the INC/SCAN key is press once again, the LED of the key is extinguished, and return in made to the increment mode.

The BK/ZO ZONE LED of the TRI/RDS mode indicators above the TRI/RDS section of keys will light, and the TRI/RDS display will appear as shown in Fig. 4-20.

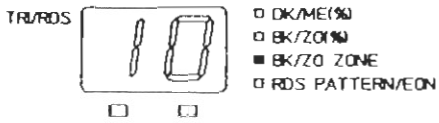


Fig. 4-20 TRI/RDS Display (ZO Signal Modulation Frequency Switching)

- Setting the BK/ZO modulation frequency switching speed (scan time) (SPECIAL 51)

  By using SPECIAL 51, it is possible to to set the scan time for scanning the modulation frequencies.

  The scan time can be set in the range 1 to 9 seconds, in 1-second steps.

  Fig. 4-21 shows the section of the front panel used in this setting method.

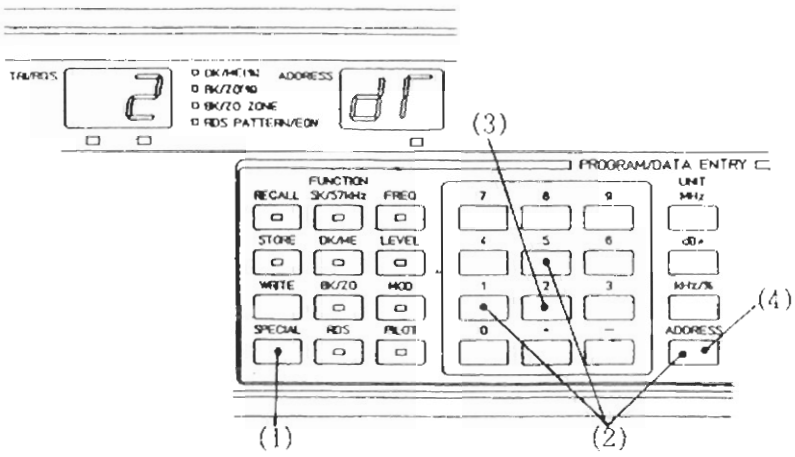


Fig. 4-21 BK/ZO Scan Time Setting

Press keys in the following sequence.

SPECIAL → 5 → 1 → ADDRESS → scan time → ADDRESS

The example of setting the scan time to 2 seconds is described below.

(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

5 → 1 → ADDRESS

(3) Next, input the scan time of 2. The TRI/RDS display will input the input data.

(4) Press the ADDRESS key. This completes the setting of the BK/ZO scan time.

- Initializing the setting of the BK/ZO scan time (SPECIAL 50)

  Initializing the BK/ZO scan time sets the scan time to 1 second.

  Press keys in the following sequence.

SPECIAL → 5 → 0 → ADDRESS

4.7 RDS

4.7.1 RDS Modulation Index Setting

The RDS modulation index (frequency deviation) setting can be made by using the rotary knob or by using the INC and DEC keys.

The RDS modulation index setting range is 0 to 7.5 kHz.

(a) Setting Using the DATA keys

Fig. 4-22 shows the section of the front panel used in this setting method.

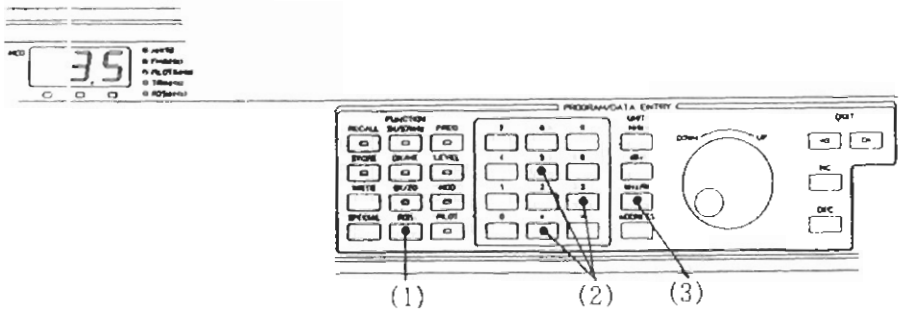


Fig. 4-22 RDS Modulation Setting

Press keys in the following sequence.

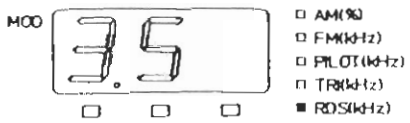
RDS → DATA → kHz/%

The following is the example of setting the modulation index to 3.5 kHz.

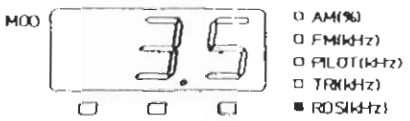
(1) Press the RDS key.

(2) Press keys in the following sequence.

3 → . → 5

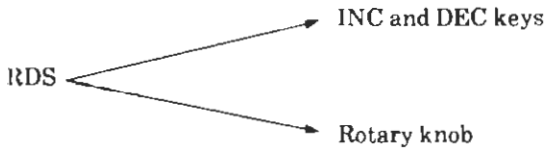


(3) Press the kHz/% key.



The RDS (kHz) LED of the modulation mode indicator LEDs will light.

(b) Method Using the DIGIT keys



(1) Press the RDS key.

(2) Press the DIGIT keys to specify the digit to be changed.

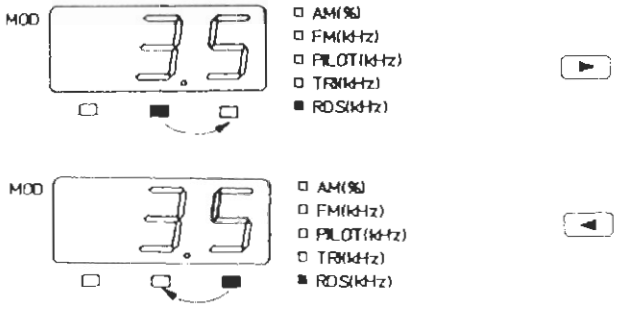


Fig. 4-23 Modulation Display Section (RDS Setting Using DIGIT Keys)

(3) Use the INC and DEC keys or the rotary knob to set the desired value of modulation index. Note that carrying and borrowing between digits is performed automatically.

4.7.2 RDS Related Operations

Fig. 4-24 shows the section of the front panel related to the settings described in this section.

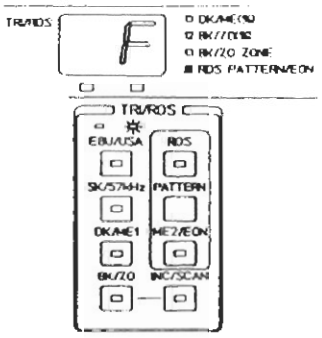


Fig. 4-24 RDS-Related Panel Section

- Switching the RDS signal on and off (RDS key, see Note 1)

  The RDS key can be switched either on or off using the RDS key.

  The RDS signal cannot be switched on unless the modulation mode is FM.

  Extinguishing the RDS key LED switches the RDS signal off, and lighting the LED switches the signal on.

- Incrementing the pattern number (PATTERN key)

  With the RDS signal switched on, each time the PATTERN key of the TRI/RDS section is pressed, the RDS pattern data is incremented by 1.

  There are up to 16 patterns, with pattern numbers ranging from 0 to F (in hexadecimal).

  Pattern numbers which do contain data are skipped.

- Sending EON group data (group type 14B) (ME2/EON key, see Note 2)

  With the RDS signal switched on, only case in which pattern data includes EON data (group type 14A), the following functions operate.

  - In this condition, when the ME2/EON key is pressed, 8 groups (see Note 3) of group data (group type 14B) is sent at one time as a continuous interruption of the RDS pattern data being sent to give notice of the start of broadcast traffic information of another station.

  - This operation occurs only 1 time immediately after the ME2/EON key is pressed, after which return is made to sending the original patter data.

  Fig. 4-25 illustrates the concept of this operation.

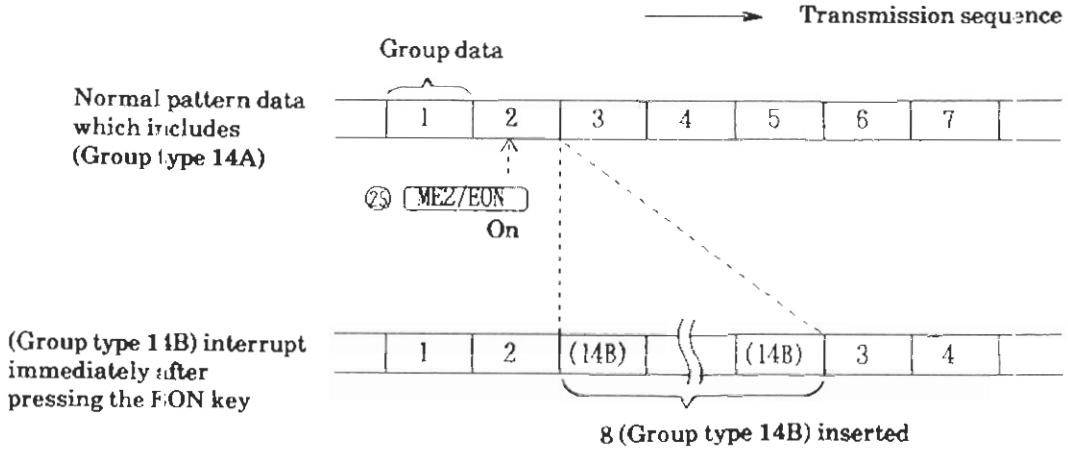


Fig. 4-25 EON Group Data (Group Type 14B) Transmission

In addition, when the ME2/EON key is pressed, the TRI/RDS display indicates TA for approximately 1 second to provide notice of a traffic announcement (see Fig. 4-26).

- Change in the display in the case of pattern F (only when pattern F includes group type 14B)

Pattern F display

TA display immediately after press the ME2/EON key

Original condition

Fig. 4-26 TRI/RDS Display (TA Display)

Notes

1. It is not possible to combine the USA system TRI with RDS.

   If the USA system TRI signal is switched on, switching the RDS signal on will cause the TRI signal to be switched off automatically.

2. For details with regard to the EON function, refer to Section 9.2, RDS Transmission Messages.

3. The number of insertions of group type 14B when the EON key is pressed can be changed as part of SPECIAL mode settings.

4.7.3 RDS DATA Setting (SPECIAL 40 to 49)

- RDS internal data (phase 90°) (SPECIAL 40)

  This mode uses the internal RDS data of the Model 3217.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 90°.

  Press keys in the following sequence.

  SPECIAL → 4 → 0 → ADDRESS

- RDS external data (phase 90°) (SPECIAL 41)

  This mode uses RDS data input at the rear-panel RDS IN connector.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 90°.

  Press keys in the following sequence.

  SPECIAL → 4 → 1 → ADDRESS

- RDS user data (phase 90°) (SPECIAL 42)

  This mode uses RDS data which has been added to internal ROM memory of the Model 3217. To use this mode, therefore, is is necessary to first write RDS pattern data into internal ROM memory.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 90°.

  Press keys in the following sequence.

  SPECIAL → 4 → 2 → ADDRESS

- RDS GPIB data (phase 90°) (SPECIAL 43)

  This mode uses RDS data written in RAM memory via the GPIB interface. To use this mode, therefore, it is necessary to first write RDS pattern data into RAM memory via the GPIB interface.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 90°.

  Press keys in the following sequence.

  SPECIAL → 4 → 3 → ADDRESS

- RDS null data (phase 90°) (SPECIAL 44)

  This mode uses RDS null data (continuous zeros).

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 90°.

  Press keys in the following sequence.

  SPECIAL → 4 → 4 → ADDRESS

- RDS internal data (phase 0°) (SPECIAL 45)

  This mode uses the internal RDS data of the Model 3217.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 0°.

  Press keys in the following sequence.

  SPECIAL → 4 → 5 → ADDRESS

- RDS external data (phase 0°) (SPECIAL 46)

  This mode uses RDS data input at the rear-panel RDS IN connector.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 0°.

  Press keys in the following sequence.

  SPECIAL → 4 → 6 → ADDRESS

- RDS user data (phase 0°) (SPECIAL 47)

  This mode uses RDS data which has been added to internal ROM memory of the Model 3217. To use this mode, therefore, is is necessary to first write RD pattern data into internal ROM memory.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 0°.

  Press keys in the following sequence.

  SPECIAL → 4 → 7 → ADDRESS

- RDS GPIB data (phase 0°) (SPECIAL 48)

  This mode uses RDS data written in RAM memory via the GPIB interface. To use this mode, therefore, it is necessary to first write RDS pattern data into RAM memory via the GPIB interface.

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 0°.

  Press keys in the following sequence.

  SPECIAL → 4 → 8 → ADDRESS

- RDS null data (phase 0°) (SPECIAL 49)

  This mode uses RDS null data (continuous zeros).

  The phase difference between the pilot signal (19 kHz) and the RDS subcarrier signal (57 kHz) is 0°.

  Press keys in the following sequence.

  SPECIAL → 4 → 9 → ADDRESS

4.7.4 EON Mode Setting (SPECIAL 80 to 82)

Press the ME2/EON key of the TRI/RDS key group to set the mode in which the EON interrupt signal is sent.

- EON initial setting (SPECIAL 80)

  This sets the interrupt sending operation to the basic operating mode.

  Press keys in the following sequence.

  SPECIAL → 8 → 0 → ADDRESS

- EON remote linked mode (SPECIAL 81, 82)

  In this mode, a simple setting is made which simulates an EON traffic information network, using two or more Model 3217s.

  By simply mutually connecting the GPIB connectors of each of the Model 3217s, the need for an addition controller or control program is eliminated.

  The settings described below cause an EON interrupt signal to be generated at one of the Model 3217s, which sends the traffic information start signal of the other station to the Model 3217 currently receiving, while simultaneously switching the other Model 3217s to the traffic information start condition.

  The setting procedure using two Model 3217s is described below. In this description, the Model 3217 which is set for no traffic information broadcast and which is currently receiving is called the *master*, while the other station in the network (i.e., the station which is set to shortly receive broadcast traffic information) is called the *slave*.

(1) Setting at the master Model 3217 (SPECIAL 81)

SPECIAL → 8 → 1 → ADDRESS

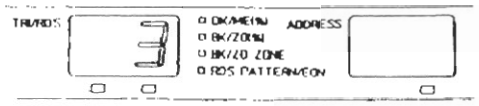
(2) Setting at the slave Model 3217 (SPECIAL 82)

SPECIAL → 8 → 2 → ADDRESS

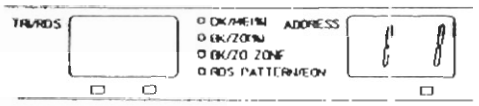
Press the RECALL key to switch it on, thereby lighting its LED.

Next, we will described how the display changes when the RDS pattern number 3 (including EON information) is currently being sent by the master, the memory recall address of the slave is 11 (before start of traffic information), with the currently being sent RDS in the next address 12. (For an actual example of how data is set, refer to Section 13.2, EON Remote Linked Example.)

(1) The TRI/RDS display of the master and the ADDRESS display of the slave will appear as follows.



Master RDS pattern display

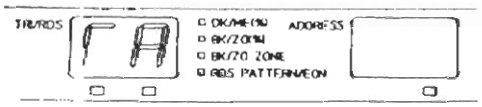


Slave address display

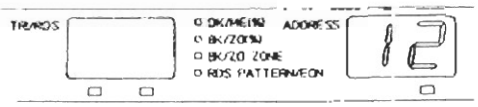
(2) Press the ME2/EON key of the TRI/RDS key group of the master.

Simultaneous with the start of sending the EON interrupt signal, the slave Model 3217's address is automatically incremented by 1.

When this occurs, the displays of the master and the slave will appear as follows.

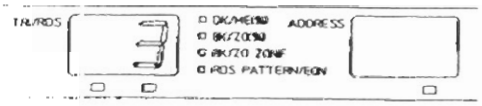


Master display

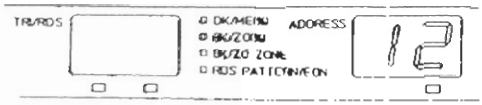


Slave display

(3) After completion of the sending of the EON interrupt signal, the master and slave displays will appear as follows.



Master display



Slave display

4.7.5 Setting the Number of Times EON Group Data is Sent (SPECIAL 90 and 91)

- EON data initial setting (SPECIAL 90)

  After executing this function, the number of EON data groups (refer to section 4.7.2, RDS-Related Operation) is initialized to the standard setting of 8.

  Press keys in the following sequence.

  SPECIAL → 9 → 0 → ADDRESS

- Number of EON data setting (SPECIAL 91)

  This is the mode used to set the number of EON data groups (refer to section 4.7.2, RDS-Related Operation) in the range 0 to 99.

  Fig. 4-27 shows the section of the front panel used in this setting.

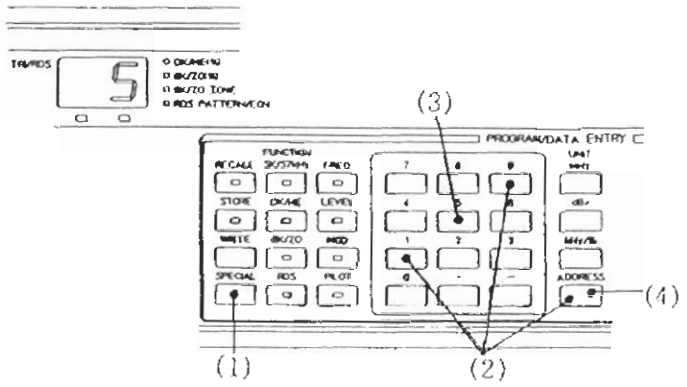


Fig. 4-27

Press keys in the following sequence.

SPECIAL → 9 → 1 → ADDRESS → no. of groups → ADDRESS

The example of setting the number of groups sent to 5 is described below.

(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

9 → 1 → ADDRESS

(3) Next, input the number of groups sent as 5.

The TRI/RDS display will indicate the input data.

(4) Press the ADDRESS key.

This completes the setting of the number of times the EON group data is sent.

4.7.6 EON Delay Time Setting (SPECIAL 100, 101)

The EON delay time is the time in the EON remote linked mode from the point at which ME2/EON key ㉟ of the TRI/RDS group is pressed until the address of the slave unit is switched. This timing is shown in Fig. 4-7-7.
For details regarding the EON remote linked mode, refer to Section 4.7.4, which describes the EON mode settings (SPECIAL 80 to 82).

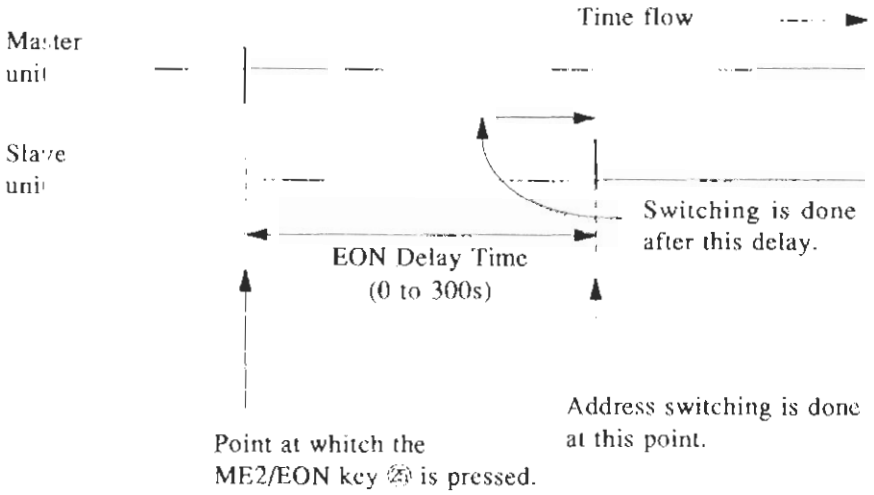


Fig. 4-7-7 EON Delay Time Explanation

EON Delay Time Initialization (SPECIAL 100)

After executing this function, the EON delay time is initialized to 0 second setting.

Press keys in the following sequence.

SPECIAL → 1 → 0 → 0 → ADDRESS

EON Delay Time Setting (SPECIAL 101)

The settable time is as follows.

Setting range : 0 to 300 s (5 minutes)
Resolution : 1 s

Fig. 4-7-8 shows a part of the front panel used in this setting method.

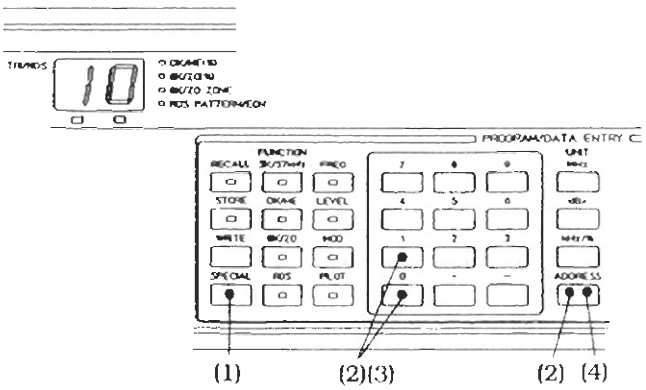


Fig. 4-7-8 EON Delay Time Setting

Press keys in the following sequence.

SPECIAL → 1 → 0 → 1 → ADDRESS → Delay Time → ADDRESS

The example of setting the delay time to 10 seconds is described below.

(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

1 → 0 → 1 → ADDRESS

(3) Next, press keys in the following sequence.

1 → 0

(4) Press the ADDRESS key.

This completes the setting of the EON delay time.

4.8 Special Modulation Modes (SPECIAL 20 to 26)

Using the Model 3217, it is possible to set the following variety of modulation modes that are not covered by dedicated front panel keys.

- Leaving the special modulation mode (SPECIAL 20)

  This function escapes from the special modulation mode.

  Press keys in the following sequence.

  SPECIAL → 2 → 0 → ADDRESS

- Internal AM and FM modulation (SPECIAL 21)

  This mode applies both AM and FM modulation by internal signals simultaneously.

  Press keys in the following sequence.

  SPECIAL → 2 → 1 → ADDRESS

  When this key input is made, both AM and FM keys of the MODE key group light.

  The modulation level display will indicate the last set modulation mode.

  To change the modulation level, first display the modulation for which the level is to be changed.

  Press the AM key to switch AM modulation on and off.

  Press the FM key to switch FM modulation on and off.

  Press the ON key to switch AM and FM on or off simultaneously.

- Internal AM, external FM modulation (SPECIAL 22)

  This mode applies AM modulation using an internal signal, and FM modulation by means of the signal applied to the L or AF input connector.

  Press keys in the following sequence.

  SPECIAL → 2 → 2 → ADDRESS

  The AM and FM keys of the MODE key group and the AF key of the EXT INT group will all light when this setting is made.

  The modulation level display will indicate the last set modulation (either AM or FM).

  To change the modulation level, first display the modulation for which the level is to be changed.

  Press the AM key to switch AM modulation on and off.

  Press the FM key to switch FM modulation on and off.

  Press the ON key to switch AM and FM on or off simultaneously.

- Internal AM and (EXT-L, R) FM modulation (SPECIAL 23) (*Note)

  This mode applies AM modulation using an internal signal, and external 2-signal stereo FM modulation using the signals applied to the L or AF and R input connectors.

  Press keys in the following sequence.

  SPECIAL → 2 → 3 → ADDRESS

  The AM and FM keys of the MODE key group and the L, R key of the EXT INPUT group will light when this setting is made.

  The modulation level display will indicate the last set modulation (either AM or FM). Note that in this mode it is not possible to change the FM deviation, which is fixed at 67.5 kHz.

  To change the percentage of AM modulation, first display the AM modulation mode.

  Press the AM key to switch AM modulation on and off.

  Press the FM key to switch FM modulation on and off.

  Press the ON key to switch AM and FM on or off simultaneously.

- (INT-L) FM and (EXT-R) FM modulation (SPECIAL 24) (*Note)

  This mode applies stereo FM modulation, with the L channel modulated by an internal signal and the R channel modulated by the external signal applied to the R input connector.

  Press keys in the following sequence.

  SPECIAL → 2 → 4 → ADDRESS

  The FM key of the MODE key group and the L, R key of the EXT INPUT key group will light when this setting is made. In this mode, it is not possible to change the FM deviation, which is fixed at 67.5 kHz.

  Press the IN FREQ key to switch the L channel on and off.

  Press the L, R key to switch the R channel on and off.

  Press the ON key to switch the L and R channels on and off simultaneously.

- External AM, internal FM modulation (SPECIAL 25)

  This mode applies AM modulation using the signal applied to the L or AF input connector, and FM modulation using an internal signal.

  Press keys in the following sequence.

  SPECIAL → 2 → 5 → ADDRESS

  The AM and FM keys of the MODE key group and the L, R key of the EXT INPUT key group will light when this setting is made. The modulation level display will indicate the last set modulation (either AM or FM).

To change the modulation level, first display the modulation for which the level is to be changed.

Press the AM key to switch AM modulation on and off.

Press the FM key to switch FM modulation on and off.

Press the ON key to switch AM and FM on or off simultaneously.

- External AM, external FM modulation (SPECIAL 26)

This mode applies AM modulation using the signal applied at the L or AF input connector, and FM modulation using the signal applied at the R input connector.

Press keys in the following sequence.

SPECIAL → 2 → 6 → ADDRESS

The AM and FM keys of the MODE key group and the AF and L, R keys of the EXT INPUT key group will light when this setting is made. The modulation level display will indicate the last set modulation (either AM or FM).

To change the modulation level, first display the modulation for which the level is to be changed.

Press the AM key to switch AM modulation on and off.

Press the FM key to switch FM modulation on and off.

Press the ON key to switch AM and FM on or off simultaneously.

Note

When SPECIAL 23 and SPECIAL 24 are set, the FM deviation is automatically fixed so that L component +R component = 67.5 kHz. However, if the RF frequency is 1 MHz or lower, the following limitations must be observed.

(L component + R component =) 67.5 kHz + PILOT deviation + RDS deviation + TRI deviation = less than 1/10 of RF frequency

If this limitation is exceeded, the frequency display will flash, after which the setting conditions will be made as follows.

SPECIAL 23	FM set to off
SPECIAL 24	MOD set to off

In such cases, make the RF frequency setting so that the above condition is satisfied, and then turn the modulation on.

4.9 Modulation Presets (SPECIAL 70 to 77)

- All modulation off (SPECIAL 70)

  This mode sets all modulation (AM, FM, pilot, TRI, and RDS) to off.

  Press keys in the following sequence.

  SPECIAL → 7 → 0 → ADDRESS

- Preset 30% (SPECIAL 71)

  This mode sets the modulation percentage for AM, FM, pilot, TRI, and RDS to 30%. Note that it is not possible to use this mode in combination with special modulation modes.

  The actual modulation levels set are shown in Table 4-2.

  Press keys in the following sequence.

  SPECIAL → 7 → 1 → ADDRESS

Table 4-2 Preset 30% Modulation Levels

	AM	Mono FM	Mono TRI	Mono RDS	Mono TRI&RDS	Stereo FM	Stereo TRI	Stereo RDS	Stereo TRI&RDS
VOD	30.0%	22.5kHz (30%)	22.5kHz (30%)	22.5kHz (30%)	22.5kHz (30%)	20.3kHz (27%)	20.3kHz (27%)	20.3kHz (27%)	20.3kHz (27%)
PILOT						7.5kHz (10%)	7.5kHz (10%)	7.5kHz (10%)	7.5kHz (10%)
TRI			4.0kHz (5.3%)		3.5kHz (4.7%)		4.0kHz (5.3%)		3.5kHz (4.7%)
RDS				2.0kHz (2.7%)	1.2kHz (1.6%)			2.0kHz (2.7%)	1.2kHz (1.6%)
TOTAL	30.0%	22.5kHz	26.5kHz	24.5kHz	27.2kHz	27.8kHz	31.8kHz	29.8kHz	32.5kHz

- Preset 100% (SPECIAL 72)

This mode sets the modulation percentage for FM, pilot, TRI, and RDS to 100%. The AM modulation cannot be set.

Note that it is not possible to use this mode in combination with special modulation modes.

The actual modulation levels set are shown in Table 4-3.

Press keys in the following sequence.

SPECIAL → 7 → 2 → ADDRESS

Table 4-3 Preset 100% Modulation Levels

	Mono FM	Stereo FM	Mono TRI	Mono RDS	Mono TRI&RDS	Stereo TRI	Stereo RDS	Stereo TRI&RDS
MOD	75.0kHz (100%)	67.5kHz (90%)	71.0kHz (94.7%)	73.0kHz (97.3%)	70.3kHz (93.7%)	63.5kHz (84.7%)	65.5kHz (87.3%)	62.8kHz (83.7%)
PILOT		7.5kHz (10%)				7.5kHz (10%)	7.5kHz (10%)	7.5kHz (10%)
TRI			4.0kHz (5.3%)		3.5kHz (4.7%)	4.0kHz (5.3%)		3.5kHz (4.7%)
RDS				2.0kHz (2.7%)	1.2kHz (1.6%)		2.0kHz (2.7%)	1.2kHz (1.6%)
TOTAL	75.0kHz	75.0kHz	75.0kHz	75.0kHz	75.0kHz	75.0kHz	75.0kHz	75.0kHz

- Preset scope phase adjustment (SPECIAL 73)

This mode is used to perform pilot signal phase calibration.

For details of the calibration procedure, refer to Section 12.1.1, Pilot Signal Phase Calibration.

Table 4-4 shows the settings made.

Press keys in the following sequence.

SPECIAL → 7 → 3 → ADDRESS

Table 4-4 Preset Scope Phase Adjustment Settings

Internal frequency	1 kHz
Mode	MOD off FM-SUB Pilot on
Pilot level	7.5 kHz
TRI	Off
RDS	Off
Function	Pilot

- Preset pilot phase adjustment (SPECIAL 74)

  This mode is used to perform phase calibration of the pilot signal and subcarrier.

  For details of the calibration procedure, refer to Section 12.1.2, Pilot Signal and Subcarrier Phase Calibration.

  Table 4-5 shows the settings made.

  Press keys in the following sequence.

  SPECIAL → 7 → 4 → ADDRESS

Table 4-5 Preset Pilot Phase Adjustment Settings

Internal frequency	1 kHz
Mode	MOD off FM-SUB Pilot off
Modulation level	7.5 kHz
TRI	Off
RDS	Off
Function	Mod

- Preset TRI subcarrier phase adjustment (SPECIAL 75)

  This mode is used to perform phase calibration of the pilot signal and TRI subcarrier signal.

  For details of the calibration procedure, refer to Section 12.1.3, Pilot Signal and TRI Subcarrier Phase Calibration.

  Table 4-6 shows the settings made.

  Press keys in the following sequence.

  SPECIAL → 7 → 5 → ADDRESS

Table 4-6 Preset TRI Subcarrier Phase Adjustment Settings

Internal frequency	1 kHz
Mode	MOD off FM-SUB Pilot off
TRI	EBU
SK/57kHz	7.5 kHz
DK/ME	Off
BK/ZO	Off
RDS	Off
Function	SK/57kHz

- Preset RDS subcarrier phase adjustment (phase 90°) (SPECIAL 76)

  This mode is used to perform phase calibration of the pilot signal and RDS subcarrier signal.

  The phase difference between the pilot signal and the RDS subcarrier is 90°

  For details of the calibration procedure, refer to Section 12.1.4, Pilot Signal and RDS Subcarrier Phase Calibration (Phase of 90°).

  Table 4-7 shows the settings made.

  Press keys in the following sequence.

  SPECIAL → 7 → 6 → ADDRESS

Table 4-7 Preset RDS Subcarrier Phase Adjustment Settings (Phase 90°)

Internal frequency	1 kHz
Mode	MOD off FM-SUB Pilot off
TRI	Off
RDS	7.5 kHz
RDS data	RDS null data (phase 90°)
Function	RDS

- Preset RDS subcarrier phase adjustment (phase 0°) (SPECIAL 77)

This mode is used to perform phase calibration of the pilot signal and RDS subcarrier signal.

The phase difference between the pilot signal and the RDS subcarrier is 0°.

For details of the calibration procedure, refer to Section 12.1.5, Pilot Signal and RDS Subcarrier Phase Calibration (Phase of 0°).

Table 4-8 shows the settings made.

Press keys in the following sequence.

SPECIAL → 7 → 7 → ADDRESS

Table 4-8 Preset RDS Subcarrier Phase Adjustment Settings (Phase 0°)

Internal frequency	1 kHz
Mode	MOD off FM-SUB Pilot off
TRI	Off
RDS	7.5 kHz
RDS data	RDS null data (phase 0°)
Function	RDS

5. MEMORY OPERATION

The Model 3217 has a store mode and a recall mode.

Memory addresses range from 0 to 99.

It is possible to store all setting into memory, with the exception of the SPECIAL 80, 81, and 82.

Store mode: Setting data is stored into internal memory at the specified address.

Recall mode: Setting data is recalled from the specified address in internal memory.

Note that the settings in effect when power is switched off are automatically restored when the power is switched on once again.

5.1 Store Mode

Fig. 5-1 shows the part of the front panel used in these settings.

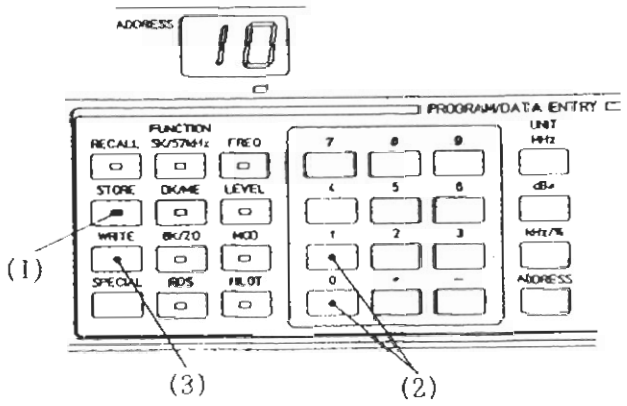


Fig. 5-1 Store Mode Operation

First, set the frequency, output level, and modulation data in the manual mode.

Then press keys in the following sequence.

STORE → address setting → WRITE

To change to the store mode from either the recall mode or the manual mode, press the STORE key of the FUNCTION key group to light its LED.

For example, to store data into address 10, following the procedure described below.

In the manual mode, set the frequency, output level,and modulation data.

(1) Place the Model 3217 in the store mode.

(2) Press the DATA keys in the following sequence.

1 → 0

This is the starting address for storage of data.

(3) Press the WRITE key to store the input data at address 10.

When this is done, the address is automatically incremented by 1. When storing in successive addresses continuously, therefore, it is only necessary to repeat the sequence of data input and pressing the WRITE key.

5.2 Recall Mode

Fig. 5-2 shows the part of the front panel used in these settings.

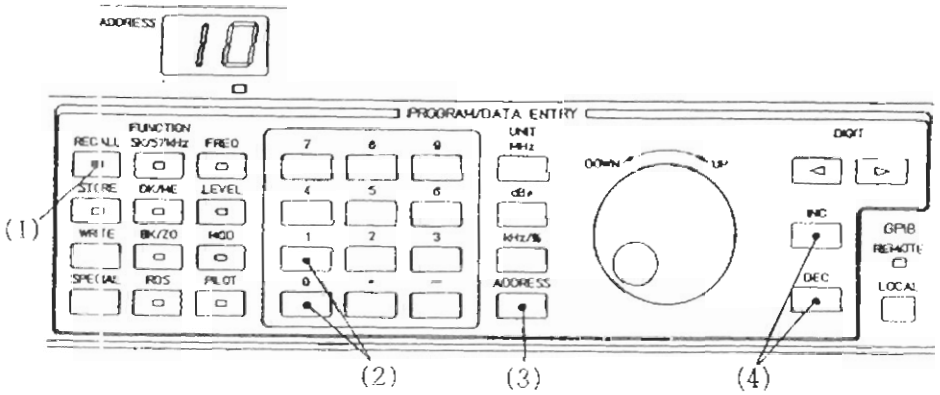


Fig. 5-2 Recall Mode Operation

Press keys in the following sequence.

RECALL → address setting → ADDRESS

To change to the recall mode from either the store mode or the manual mode, press the RECALL key of the FUNCTION key group to light its LED.

For example, to recall data from memory address 10 follow the procedure described below.

(1) Place the Model 3217 in the recall mode.

(2) Press the DATA keys in the following sequence.

1 → 0

(3) Press the ADDRESS key to recall the data that had been written at address 10.

(4) The INC and DEC keys can be used to sequence through memory addresses to recall data sequentially.

5.3 Establishing Output Level Presets

In addition to the memory address range 0 to 99, the Model 3217 has two memory areas (A and B) which can be used to store output level presets.

These memory locations are provided as a convenience in storing *frequently used values of output level.*

Presets are established (written) in the store mode and recalled in either the recall mode or the manual mode.

Fig. 5-3 shows the part of the front panel used in these settings.

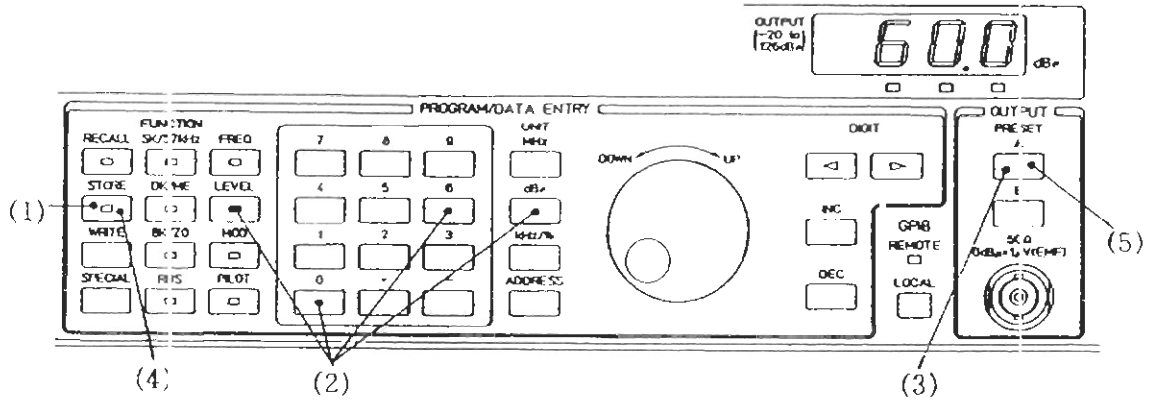


Fig. 5-3 Output Level Presets

As an example, let us look at the procedure for establishing the preset of 60 dBμ at location A.

(1) Place the Model 3217 in the store mode (verifying that the STORE LED is lighted).

(2) Set the output level to 60 dBμ.

(3) Press the PRESET A key of the OUTPUT section.

(4) Press the STORE key, and then enable the manual mode.

(5) Press the PRESET A key to verify the preset.

5.4 Begin Address and End Address Settings

5.4.1 Begin Address and End Address Initial Settings (SPECIAL 00)

This operation clears the settings of the begin and end addresses, setting the begin address to 0 and the end address to 99. It is made by pressing keys in the following sequence.

SPECIAL → 0 → 0 → ADDRESS

5.4.2 Begin Address Setting (SPECIAL 01)

Fig 5-4 shows the part of the front panel used in this setting.

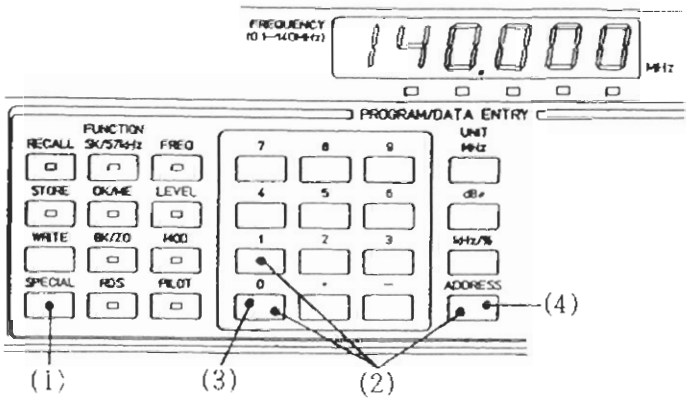


Fig. 5-4 Begin Address Setting

Press keys in the following sequence.

SPECIAL → 0 → 1 → ADDRESS → begin address → ADDRESS

The procedure for setting the begin address to 0 is described below.

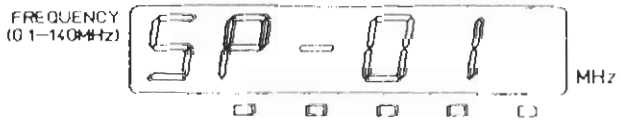
(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

0 → 1 → ADDRESS.

This places the Model 3217 in the begin address setting mode.

When this is done, the frequency display will appear as follows.



(3) Next, input the begin address as 0.

The address display will indicate the input data.

(4) Press the ADDRESS key.

This competes the setting of the begin address.

If step (3) above is skipped, jumping from (2) to (4), it is possible to check the currently set begin address. When doing this, the current begin address is indicated by the address display for approximately 0.5 second.

5.4.3 End Address Setting (SPECIAL 02)

Press keys in the following sequence.

SPECIAL → 0 → 2 → ADDRESS → end address → ADDRESS

The procedure for setting the end address to 99 is described below.

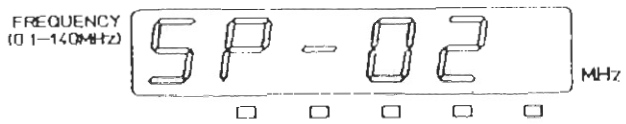
(1) Press the SPECIAL key.

(2) Press the DATA keys in the following sequence.

0 → 2 → ADDRESS.

This places the Model 3217 in the end address setting mode.

When this is done, the frequency display will appear as follows.



(3) Next input the end address with the following key sequence.

9 → 9

(4) Press the ADDRESS key.

This completes the setting of the end address.

As was the case for the begin address, if step (3) above is skipped, jumping from (2) to (4), it is possible to check the currently set end address.

5.4.4 Changing the Begin and End Addresses

When setting the current addresses to new values, it is necessary to satisfy the following relationship.

Begin address < end address

Fig. 5-5 shows the three possible relationships between the begin and end addresses, and the procedure for changing the addresses.

Case A: Either the begin or end address can be set.

Case B: The begin address must be set only after first setting the end address.

Case C: The end address must be set only after first setting the begin address.

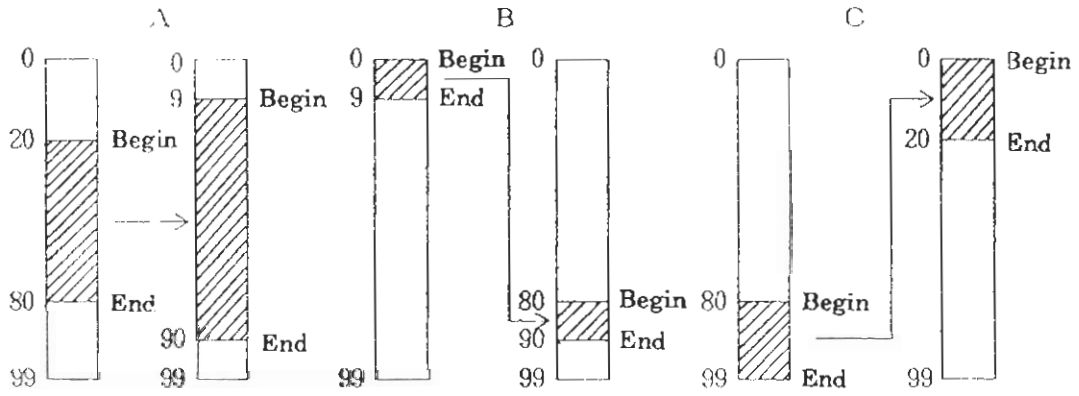
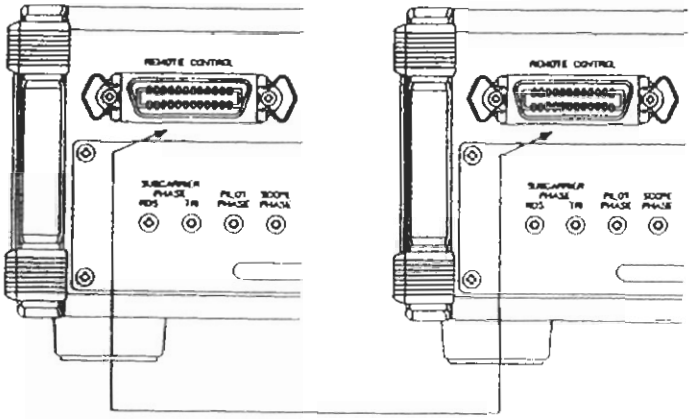


Fig. 5-5 Changing the Begin and End Addresses

5.5 Sending and Receiving Memory Data (SPECIAL 03, 04)

It is possible to transfer data between Model 3217s.

Mutually connect the REMOTE CONTROL connectors of the Model 3217s between which data is to be transferred, as shown in Fig. 5-6



Receive (RX) Send (TX)

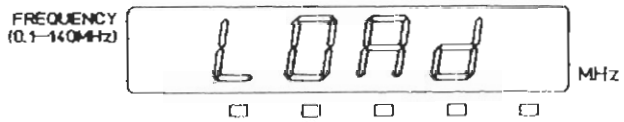
Fig. 5-6 Remote Control Connector Mutual Connection

Following the procedure described below.

<Reception>

SPECIAL → 0 → 3 → ADDRESS

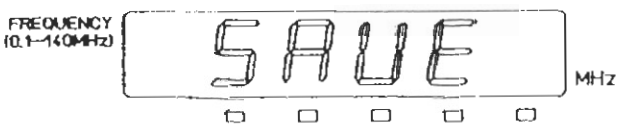
The frequency display will appear as follows.



<Transmission>

SPECIAL → 0 → 4 → ADDRESS

The frequency display will appear as follows.



The following is an example of transmission and reception.

Receiving Side (RX)	Transmitting Side (TX)
(1) Press the SPECIAL key.	
(2) Press the DATA keys in the following sequence. 0 → 3 → ADDRESS	
	(3) Press the SPECIAL key.
	(4) Press the DATA keys in the following sequence. 0 → 4 → ADDRESS

The data reception is completed in approximately 10 seconds.

The displays are restored to the states they were in before entering this mode.

In the receiving condition (0 → 3 → ADDRESS), if no data is received from the transmitting side, press any panel key to escape from this condition.

6. SPECIAL KEYS OPERATIONS

6.1 SPECIAL Function List

The Model 3217 has a special variety of functions in addition to those which can be invoked directly by specific keys on the front panel.

These special functions are summarized in Table 6-1.

Table 6-1 Special Function List

SPECIAL No.	Settings Made	Page
000	Clear all special functions (except begin and end addresses)	6-4
00	Begin address and end address initialization (00,99)	5-4
01	Begin address setting	5-4
02	End address setting	5-5
03	Memory data reception	5-7
04	Memory data transmission	5-7
10	Δ off	4-5, 4-9
11	ΔF (RF frequency)	4-3
12	ΔL (RF level)	4-8
20	Special modulation off	4-39
21	Internal AM, internal FM	4-39
22	Internal AM, external FM	4-39
23	Internal AM, (EXT-L, R) FM	4-40
24	(INT-L) FM, (EXT-R) FM	4-40
25	External AM, internal FM	4-40
26	External AM, external FM	4-41
30	Pre-emphasis off	4-14
31	Pre-emphasis 25 μs	4-14
32	Pre-emphasis 50 μs	4-14
33	Pre-emphasis 75 μs	4-14

TABLE 6-1 Special Function List (continued)

SPECIAL No.	Settings Made	Page
40	RDS internal data (phase 90°)	4-32
41	RDS external data (phase 90°)	4-32
42	RDS user data (phase 90°)	4-32
43	RDS GRIB data (phase 90°)	4-32
44	RDS null data (phase 90°)	4-32
45	RDS internal data (phase 0°)	4-33
46	RDS external data (phase 0°)	4-33
47	RDS user data (phase 0°)	4-33
48	RDS GRIB data (phase 0°)	4-33
49	RDS null data (phase 0°)	4-33
50	BK/ZO scan time initialization (1 s)	4-27
51	BK/ZO scan time setting	4-27
70	All modulation off	4-42
71	Preset 30%	4-42
72	Preset 100%	4-43
73	Preset scope phase adjustment	4-43
74	Preset pilot phase adjustment	4-44
75	Preset TRI subcarrier phase adjustment	4-45
76	Preset RDS subcarrier phase adjustment (phase 90°)	4-45
77	Preset RDS subcarrier phase adjustment (phase 0°)	4-46
80	EON mode initialization	4-34
81	EON mode remote link (transmission side)	4-34
82	EON mode remote link (receiving side)	4-34
90	Number of EON group data initialization	4-36
91	Number of EON group data setting	4-36
100	EON delay time initialization	4-37
101	EON delay time setting	4-37

6.2 Checkir g SPECIAL Function Settings

The following method can be used to check the current special function settings.

Press kc ys in either of the following sequence.

To check numbers from 0 through the 90s :

SPECIAL → SPECIAL

or

SPECIAL → 0 → ADDRESS

To check numbers above 100 :

SPECIAL → 1 → ADDRESS

The settings (last digit of each SPECIAL setting) will appear on the modulation level display, the TRI/RDS display, the programmable address display, the RF frequency display, and the RF level display.

Fig. 6-1 shows an example of the display for numbers from 0 through the 90s, while Fig. 6-2 shows an example of the display for numbers above 100.

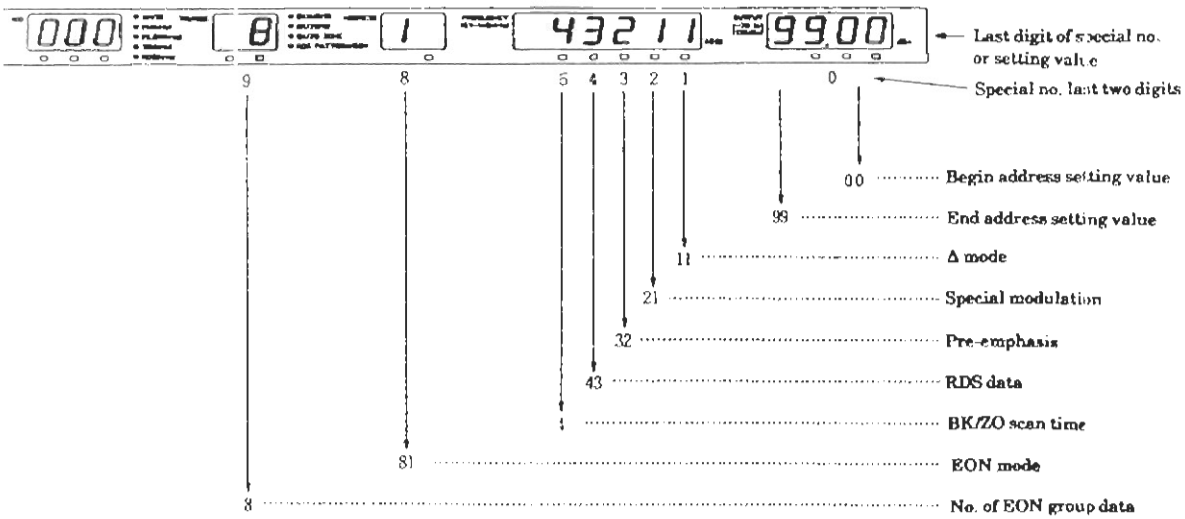


Fig. 6-1 Display Example for SPECIAL Functions From 0 Through the 90s

To escape from t ie SPECIAL function display condition, press any other key.

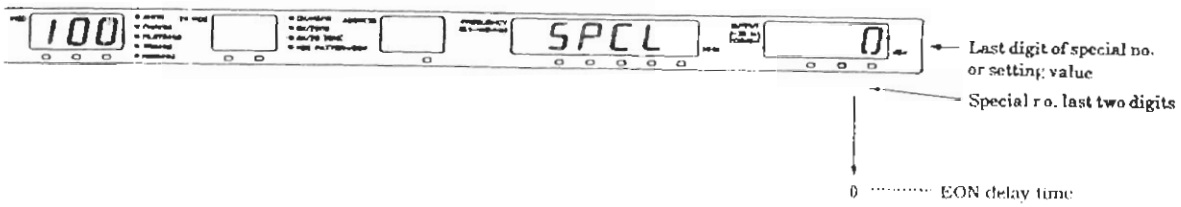


Fig. 6-2 Display Example for SPECIAL Functions above 100

To escape from the SPECIAL function display condition, press any other key.

6.3 Clearing ALL SPECIAL Functions (SPECIAL 000)

It is possible to set all set SPECIAL functions except the begin and end addresses to off or the initialized conditions as follows.

Press keys in the following sequence.

SPECIAL → 0 → 0 → 0 → ADDRESS

When this key sequence is input, the SPECIAL functions are set as follows.

- Δ off (SPECIAL 10)
- Special modulation off (SPECIAL 20)
- Pre-emphasis off (SPECIAL 30)
- RDS internal data (phase 90°) (SPECIAL 40)
- BK/ZO scan time initialized (1 s) (SPECIAL 50)
- All modulation off (SPECIAL 70)
- EON mode initialized (SPECIAL 80)
- Number of EON group data initialized (SPECIAL 90)
- EON delay time initialized (SPECIAL 100)

7. DESCRIPTION OF FM STEREO MODULATION

7.1 FM Stereo Modulation

FM stereo broadcasts are made using a modulation method known as *suppressed AM carrier*, with the spectrum of the resulting composite signal (modulated signal) appearing as shown in Fig. 7-1. This composite signal is broadcast as a frequency-modulated RF carrier signal.

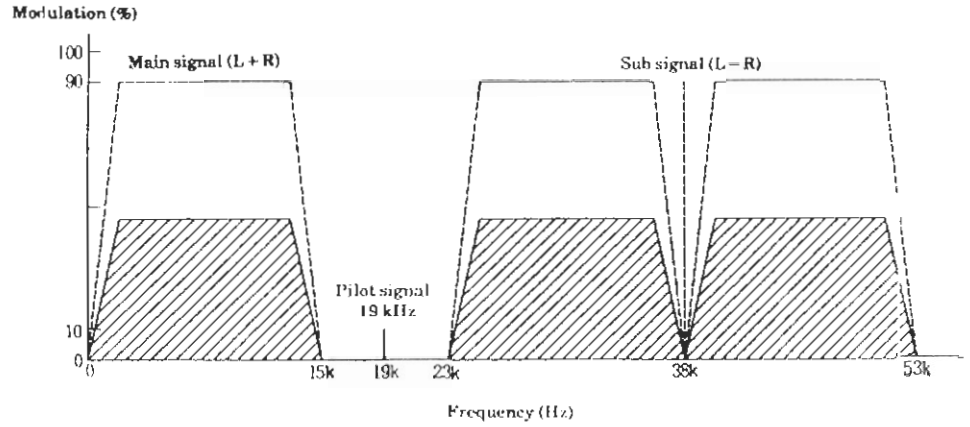


Fig. 7-1 Composite Stereo Signal Frequency Spectrum

With a (main + sub signal) = 90% and pilot signal = 10%, a signal having maximum modulation (100% or 75 kHz deviation) results. The sub signal is a doubles-sideband (DSB) signal with a suppressed 38-kHz carrier, with the 19-Hz pilot signal serving as the reference in restoring the carrier of the sub signal being restored at the receiver. In a monaural broadcast, the main signal is 100%, and the sub signal and pilot are not present. In addition, the composite output of the Model 3217 is proportional to the FM deviation, and is 750 mVrms for a modulation of 100%.

The composite stereo signal has the components shown in Fig. 7-2.

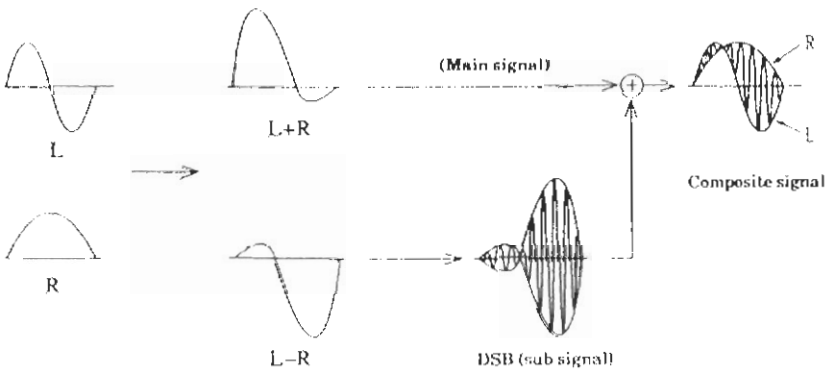


Fig. 7-2 Components of the Composite Stereo Signal

7.2 Pre-emphasis

In an FM broadcast, because of the intrinsic nature of the FM system, the higher the demodulated bandwidth is made the more noise occurs, and there is a tendency for the spectrum to fall off starting at the mid-range and going into the high-frequency range for voice and music sources. For this reason, to reduce noise, the high-frequency is pre-emphasized at the transmission side, with exactly the opposite characteristics applied at the receiving side. The process of applying attenuation when demodulating is known as *de-emphasis*.

Fig. 7-3 shows the standard response curves used to pre-emphasis.

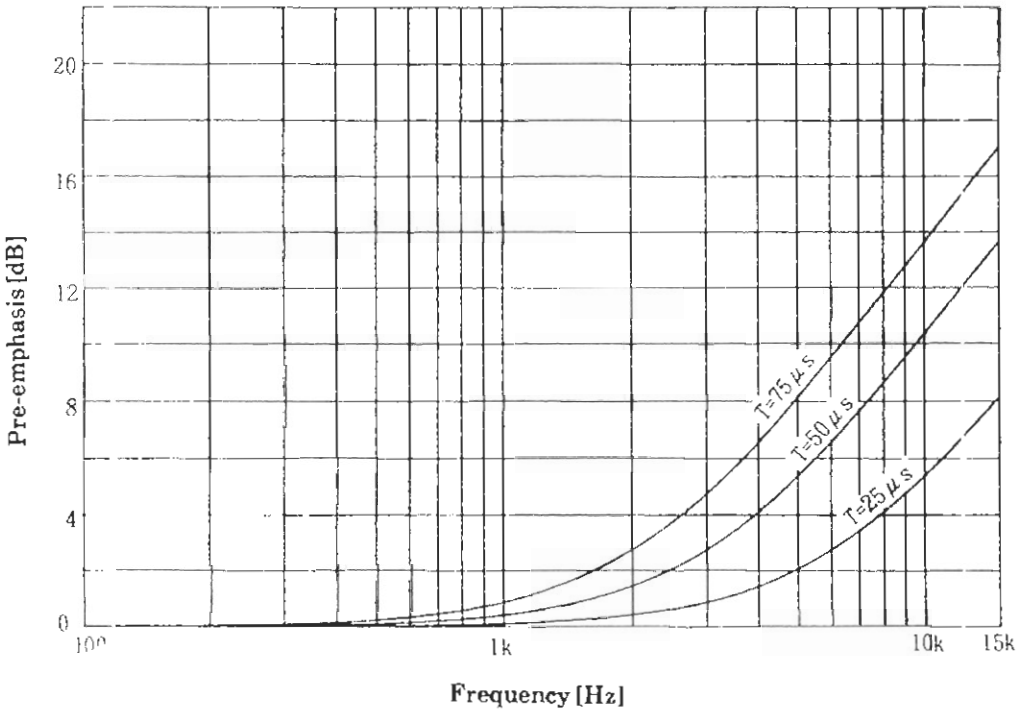


Fig. 7-3 Standard Pre-emphasis Curves

In Japan and Europe, the 50-μs curve is used. In the USA, however, the 75-μs curve is applied. The de-emphasis curves are the opposite of the curves shown in Fig. 7-3

8. THE TRI SIGNAL

The TRI (Traffic Radio Information) signal is a signal which is used to convey road traffic information. The AM modulated TRI signal on the 57-kHz subcarrier is FM modulated onto the main carrier signal.

There are two systems of such signals: the EBU system signal known as the ARI signal, and the USA system.

In the Model 3217, the capability of generating both types of TRI signals is provided as standard.

When using this signal, the system to be used is selected, and the signal is multiplexed onto the stereo modulated signal.

While it is also possible to multiplex simultaneously with the RDS signal, in the Model 3217, it is not possible to do this simultaneous with the USA system signal, but it is possible with the EBU system signal.

The specifications of the TRI signals are shown in Table 8-1.

Table 8-1 TRI Signal Specifications

Item	EBU System	USA System
Carrier signal		
Name	SK (Note) (trans. ID code)	57 kHz pilot
Frequency	57 kHz	57 kHz
Main carrier freq. deviation	±4.0 kHz (TRI alone) ±3.0 kHz (with RDS)	±4.0 kHz (TRI alone)
Announcement/message signal		
Name	DK (see Note) (announcement ID code)	ME1/ME2 (See Note) (message signal)
Modulation signal	DK: 125 kHz (57 kHz/456)	ME1: 142.5 Hz (57 kHz/400) ME2: 154.9 Hz (57 kHz/368)
Modulation method	AM	AM
Modulation level	30%	60%
Area/zone signal		
Name	BK (area ID code)	ZO (see Note) (zone signal)
Modulation signal	A: 23.75 kHz (57 kHz/2400) B: 28.27 kHz (57 kHz/2016) C: 34.93 kHz (57 kHz/1632) D: 39.58 kHz (57 kHz/1440) E: 45.67 kHz (57 kHz/1248) F: 53.98 kHz (57 kHz/1056)	1: 23.75 Hz (57 kHz/2400) 2: 28.27 Hz (57 kHz/2016) 3: 34.93 Hz (57 kHz/1632) 4: 39.58 Hz (57 kHz/1440) 5: 45.67 Hz (57 kHz/1248) 6: 53.98 Hz (57 kHz/1056) 7: 63.62 Hz (57 kHz/896) 8: 75.79 Hz (57 kHz/752) 9: 98.95 Hz (57 kHz/576) 10: 122.84 Hz (57 kHz/464)
Modulation method	AM	AM
Modulation level	60%	60% (ZO only) 30% (when combined with ME1 or ME2)

Note:
SK: Senderkennung Transmitter Identification Code
DK: Durchsagekennung Announcement Identification Code
ME: Message Signal 1, 2
BK: Bereichskennung Area Identification Code
ZO: Zone Signal

The frequency spectra of the TRI signal and the stereo modulated (composite) signal are shown in Fig. 8-1. An example of a TRI signal is shown in Fig. 8-2.

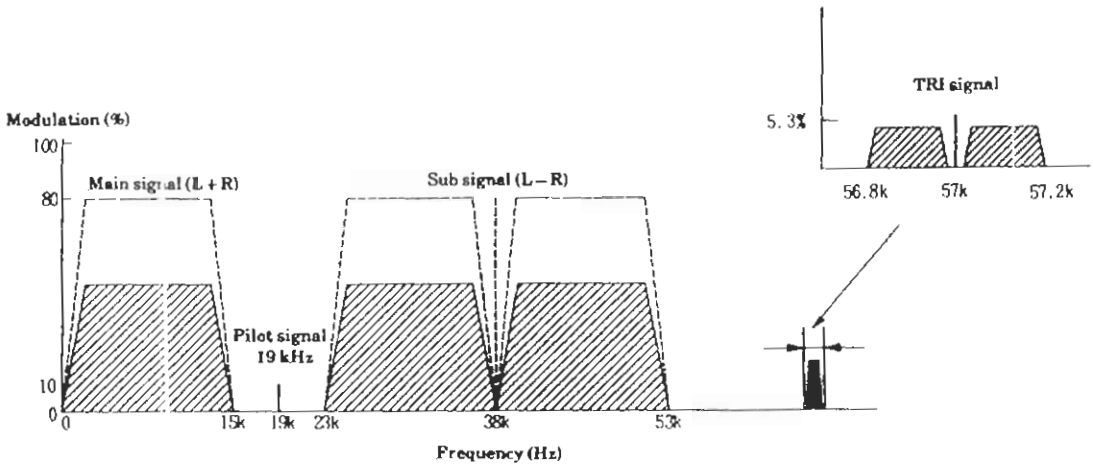


Fig. 8-1 TRI Signal and Stereo Signal Frequency Spectra

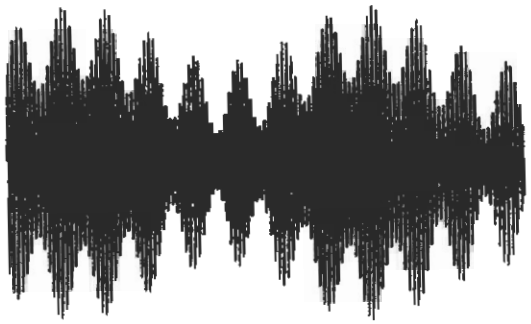


Fig. 8-2 TRI Signal Waveform Example

9. THE RDS SIGNAL

9.1 RDS Concept

RDS, standing for Radio Data System, is a system in which station selection frequency information and road traffic information control signals are transmitted. The RDS signal is DSB modulated with a subcarrier frequency of 57 kHz, this being frequency modulated onto the main carrier signal.

In the Model 3217, a built-in RDS signal generator is provided, which generates a signal conforming to the European Broadcast Union (EBU) standards set down in EBU publication Tech. 3244.

In addition, the Model 3217 also accommodates the EON (Enhanced Other Networks) which were recommended in 1989. EON is an ehancement of the ON (other networks).

While it is possible multiplex simultaneously with the TRI signal, in the Model 3217 it is not possible to multiplex the RDS signal with the USA system TRI signal, but is with the EBU TRI signal.

The RDS signal specifications are shown in Table 9-1

Table 9-1 RDS Signal Specifications

Item	Specifications
Subcarrier frequency	57 kHz
Subcarrier modulation method	DSB, carrier-suppressed AM
Frequency deviation	RDS alone: ±2 kHz With TRI (EBU only): ±1.2 kHz
Data modulation method	2-phase PSK
Data coding method	Differential coding
Occupied bandwidth	57 kHz ±2.4 kHz (square root of 100% cosine rolloff characteristics)
Bit rate	1187.5 bits/s
Error correction code	(26, 16) compressed cyclic code
Generation polynomial used	$G(x) = X^{10} + X^8 + X^7 + X^5 + X^4 + X^3 + 1$
1 block	26 bits
1 group	104 bits (4 blocks)
Syncing method	Syncing by means of an offset word

The spectra of the RDS signal and the stereo modulation (composite) signal are shown in Fig. 9-1. An example of an RDS signal waveform is shown in Fig. 9-2

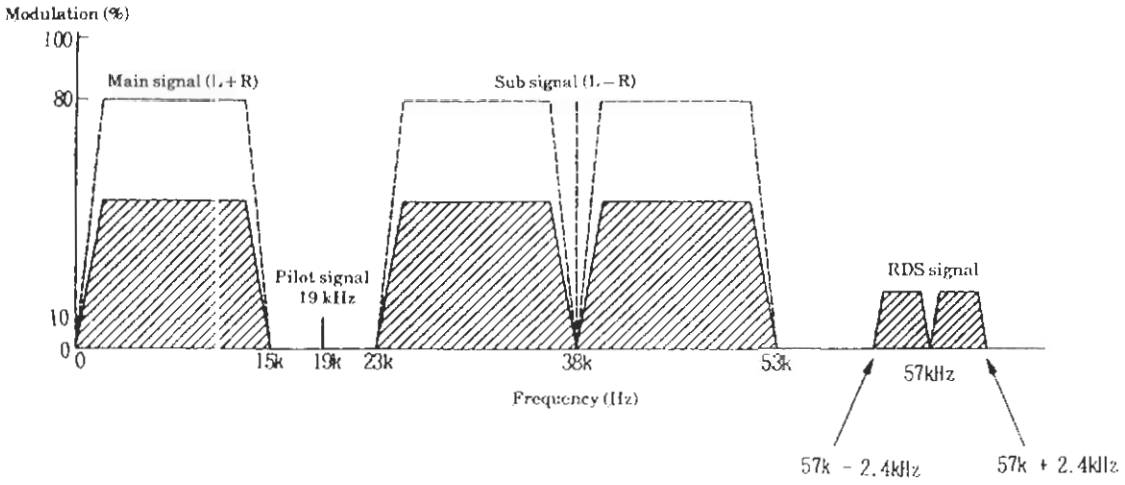


Fig. 9-1 RDS Signal and Stereo Signal Frequency Spectra

Fig. 9-2 RDS Signal Waveform Example

9.2 RDS Transmitted Messages

RDS provides the service of sending the messages listed in Table 9-2.

Table 9-2 Basic Messages Provided by the RDS Signal

Transmitted Message	Contents
PI (Program Identification Code)	Program and country ID codes, etc.
PS (Program Service name)	Station name
AF (Alternative Frequencies)	List of frequencies of stations broadcasting the same program
TP (Traffic Program Identification)	Traffic program ID signal
TA (Traffic Announcement Identification)	Traffic program start signal or on-air ID signal
PTY (Program Type)	ID code for news, music, sports, etc.
ON (Other Network)	Information about networks other than the one currently broadcasting (When EON starts being used, this will no longer be used.)
EON (Enhanced Other Network)	Information about received network and networks other than the one received. (When EON starts being used, ON will no longer be used.)
PIN (Program Item Number)	Broadcast scheduled starting time code
DI (Decode Identification)	Broadcast status ID code: monaural/stereo
M/S (Music/Speech switch)	Music/speech ID code
RT (Radio Text)	Radio text information
TDS (Transparent Data Channel)	Arbitrary data
IH (In House applications)	For use by the broadcast station
CT (Clock Time)	Date and time information
RP (Radio Paging)	Paging information

9.3 Baseband Structure

The baseband structure of the RDS data is shown in Fig. 9-3.

As can be seen from Table 9-1 also, RDS data is structured with the minimum unit of a *group*, which consists of 104 bits.

One group in turn consists of 4 blocks of 26 bits each.

One block consists of a (26, 16) compressed cyclic code and an offset word using for establishing synchronization.

The RDS data is decoded by detecting the 4 offset words that are part of the group.

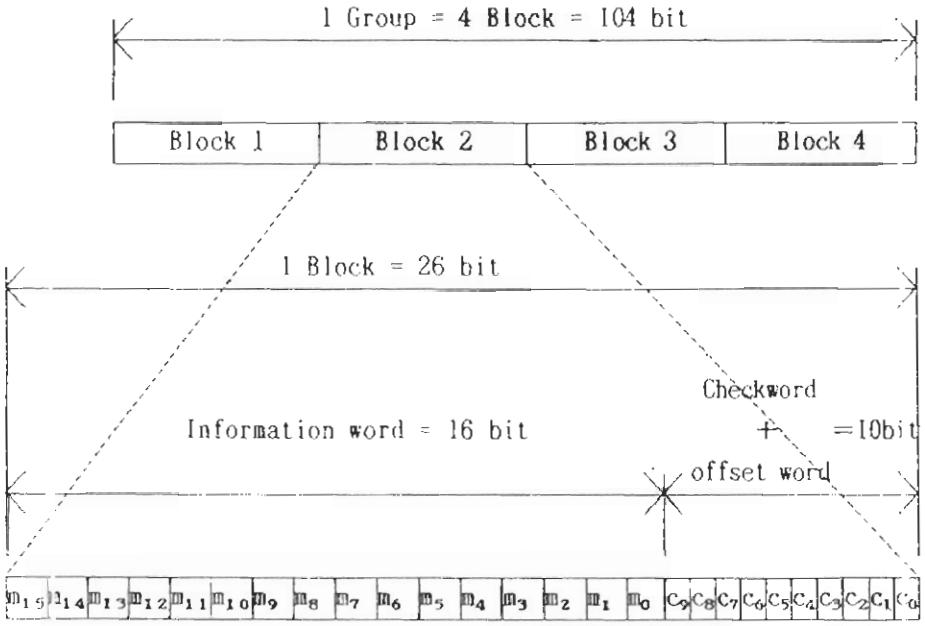


Fig. 9-3 RDS Data Baseband Structure

9.4 Data ROM Specifications

9.4.1 Data ROM Address Map

The address map of the pattern data ROM (IC202) used in the Model 3217's GPIB unit is shown in Fig. 9-4

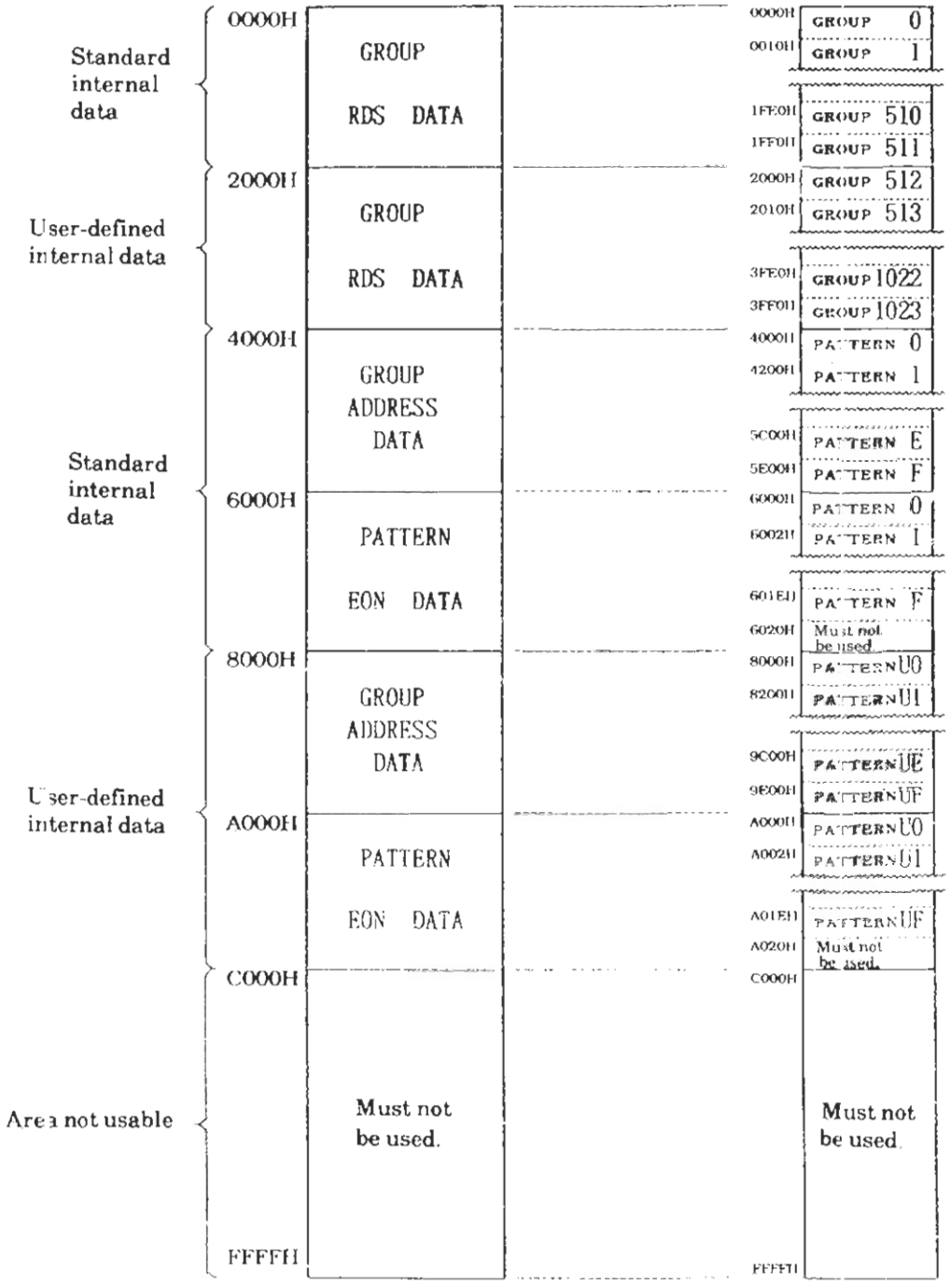


Fig. 9-4 Pattern Data ROM (IC202) Address Map

Address Map Description

The IC202 pattern data ROM has two kinds of data stored in it: standard internal data, and user-defined data. (When shipped, it has only standard internal data written into it.)

Referring to the address map, GROUP RDS DATA is an area in which 512 groups of data is stored. For standard internal data the locations GROUP 0 to GROUP 511 are assigned, and for user-defined internal data, the locations GROUP 512 to GROUP 1023 are assigned. Storage of 1 group of data requires 16 bytes.

For example, GROUP 1 of GROUP RDS DATA occupies ROM addresses 0010H to 001FH.

GROUP ADDRESS DATA is the area into which are stored, in transmission sequence, the group numbers which are used for each pattern.

For standard internal data, there are 16 patterns from PATTERN 0 to PATTERN 15, the data for each pattern of which can be stored up to 255 groups.

For user-defined internal data also, there are 16 patterns, running from PATTERN U0 to UF, the data for each pattern of which can be stored up to 255 groups.

To store a single group number, 2 bytes are required, and to store the data for 1 pattern, a maximum of 510 bytes (2 bytes × 255 groups) are required.

For example, PATTERN 1 of GROUP ADDRESS DATA is stored in ROM addresses 4200H to 43FFH, and the group number for the second group is stored in ROM addresses 4202H and 4203H.

PATTERN EON DATA is the area into which are stored the group numbers used by the EON interrupt signal.

A group is assigned to each pattern.

For standard internal data, it is possible to store 16 patterns from PATTERN 0 to PATTERN 15, and for user-defined internal data, it is possible to store 16 patterns from PATTERN U0 to PATTERN UF.

To store data of a group number for one pattern, 2 bytes are required, so to stored data for 16 patterns, 32 bytes are required.

For example, the EON interrupt data for PATTERN 1 is stored at ROM addresses 6002H and 6003H.

In addition to the above, the GPIB unit has a RAM used for GPIB access, and this can be used to store data for the 15 patterns from PATTERN G0 to PATTERN GE.

When using this RAM memory, GROUP RDS DATA can be used to store 512 groups of data, the address area assigned to this being GROUP 1024 to GROUP 1535.

For details, refer to Section 11.6, RDS Data Format.

9.5 Data Generation Method

9.5.1 GROUP RDS DATA Generation

The GROUP RDS DATA generation flowchart is shown in Fig. 9-5.

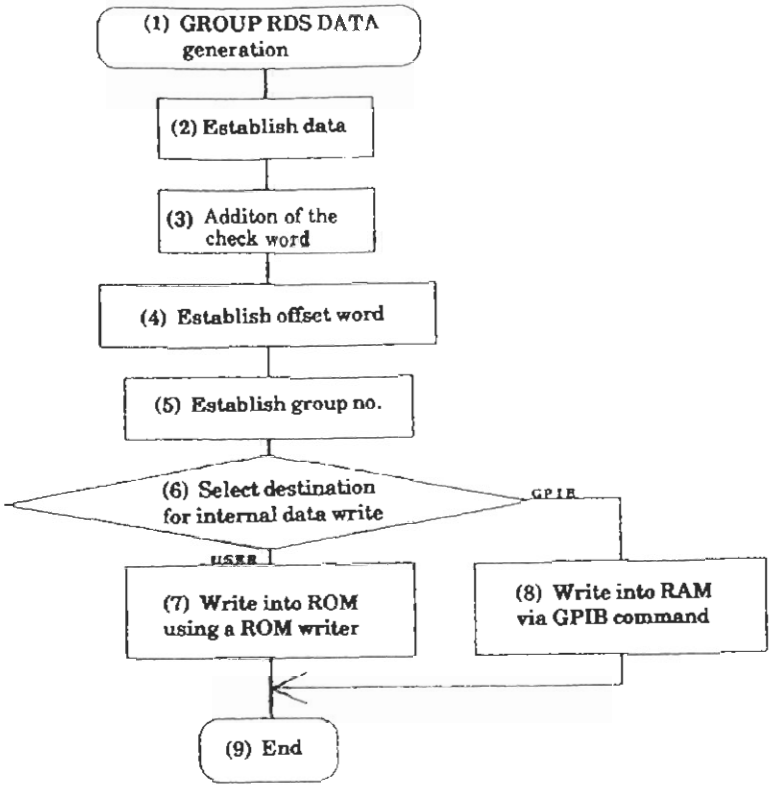


Fig. 9-5 GROUP RDS DATA Generation Flowchart

(1) GROUP RDS DATA generation

(2) Establishment of data: The data required by RDS engineering documentation should be established.

(3) Additon of the check word: Use the generation polynomial given in Table 9-1 to add the check word.

(4) Establish the offset word: Refer to RDS engineering documentation in establishing the offset word, adding this to the error detection and correction code.

(5) Establish the group number: Establish to which group the assignment is to be made.

(6) Selection of internal data writing destination: Select either user-defined internal data (directly written into ROM) or GPIB data (written into RAM by a GPIB command).

(7) Program the ROM using a ROM writer: Write into the ROM address established at step (5) which corresponds to the group number. (Example: For GROUP 512, writing starts at address $512 \times 16 = 8192$ (2000H).) Also, when writing data add 6 bits to the low order 16 bits (block) to convert this to 32-bit (4-byte) hex data

(8) Write data into RAM by GPIB commands: Write into the RAM address established at step (5) which corresponds to the group number, using GPIB commands. (Use the GPIB command GP to specify GROUP 1024 to GROUP 1535.) Also, when writing data add 6 bits to the low order 16 bits (block) to convert this to 32-bit (4-byte) hex data

(9) End

9.5.2 GROUP ADDRESS DATA Generation

The GROUP ADDRESS DATA generation flowchart is shown in Fig. 9-6.

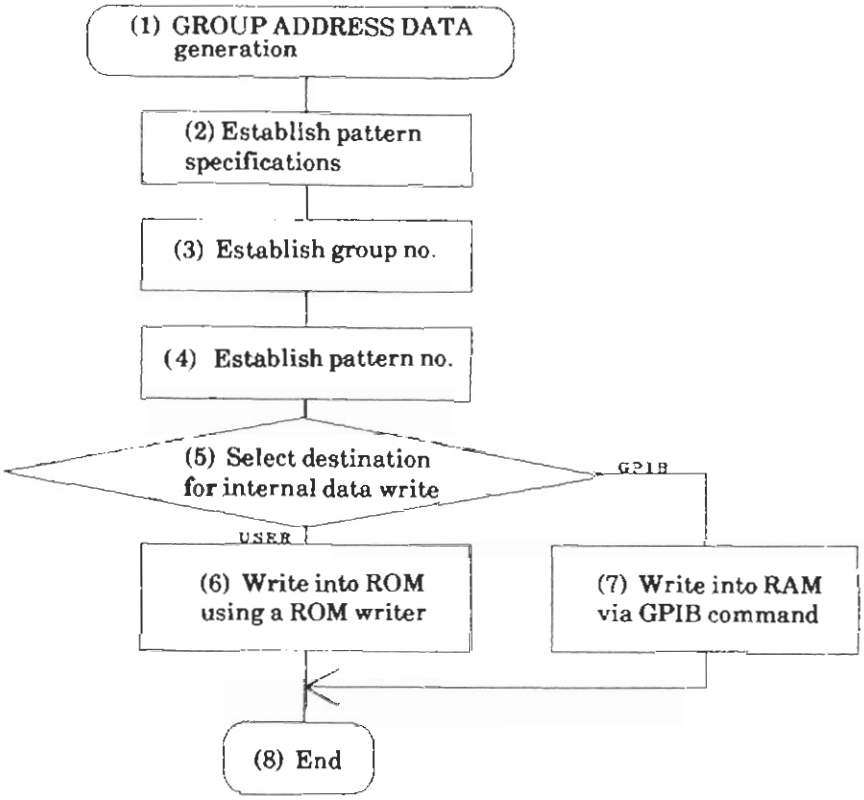


Fig. 9-6 GROUP ADDRESS DATA Generation Flowchart

(1) GROUP ADDRESS DATA generation

(2) Establishment of pattern specifications: Establish the pattern specifications of Section 13.2.

(3) Establish the group number: Select the group number corresponding to the contents established at (2) from the group data generated as described in Section 9.5.1.

(4) Establish the pattern number: Establish to what pattern assignment is to be done.

(5) Selection of internal data writing destination: Select either user-defined internal data (directly written into ROM) or GPIB data (written into RAM by a GPIB command).

(6) Program the ROM using a ROM writer: Write into the ROM address which corresponds to the pattern number established at step (4) the group number established at step (3). Also, if there are fewer than 255 patterns, append FFH two times after the last group number.

(7) Write data into RAM by GPIB commands: Write into the RAM address corresponding to the pattern number establish in step (4) the group number established at step (3). Also, if there are fewer than 255 patterns, append FFFFH two times after the last group number.

(8) End

9.5.3 PATTERN EON DATA Generation

The PATTERN EON DATA generation flowchart is shown in Fig. 9-7.

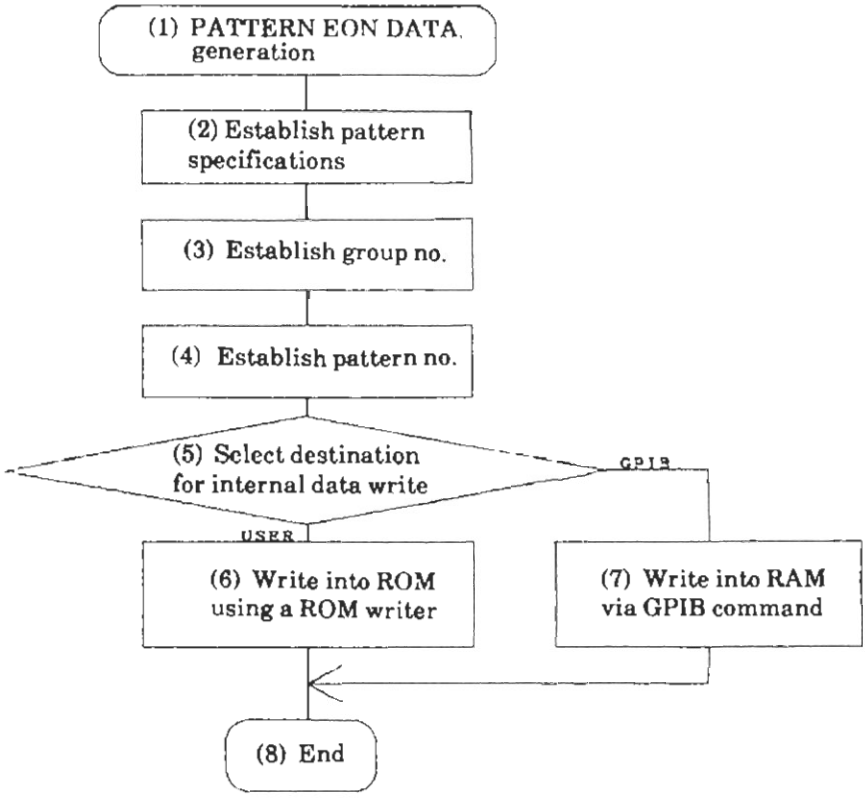


Fig. 9-7 PATTERN EON DATA Generation Flowchart

(1) PATTERN EON DATA generation

(2) Establishment of pattern specifications: Establish the EON interrupt specifications.

(3) Establish the group number: Select the group number corresponding to the contents established at (2) from the group data generated as described in Section 9.5.1.

(4) Establish the pattern number: Establish to what pattern assignment is to be done.

(5) Selection of internal data writing destination: Select either user-defined internal data (directly written into ROM) or GPIB data (written into RAM by a GPIB command).

(6) Program the ROM using a ROM writer: Write into the ROM address which corresponds to the pattern number established at step (4) the group number established at step (3). Convert the decimal group numbers to hex data. If the EON interrupt signal is not required, write FFFFH.

(7) Write data into RAM by GPIB commands: Write into the RAM address corresponding to the pattern number establish in step (4) the group number established at step (3). Also, if there are fewer than 255 patterns, append FFFFH two times after the last group number.

(8) End

10. REMOTE CONTROL

The front-panel controls of the Model 3217, with the exception of power switch and the LOCAL key, can be remotely controlled.

The mating connector type is an Amphenol type 57-30240 plug. The Model 3216-01 Remote Controller can be used for remote control of the Model 3217.

The key codes (hexadecimal) are shown in Table 10-1, while the remote control pin assignments are given in Table 10-2. The D0 through D6 data lines of Table 10-2 are set to the code hexadecimal values given in Table 10-1 to control the Model 3217.

Table 10-1 Key Codes

HEX	Key	HEX	Key	HEX	Key	HEX	Key	HEX	Key
00	*	10	L	20	57k/SK(%)	30	<9>	40	BEGIN+0
01	EXT AF	11	R	21	ME/DK(%)	31	<6>	41	BEGIN+1
02	EXT IR	12	MAIN	22	ZO/BK(%)	32	<3>	42	BEGIN+2
03	RECALL	13	SUB	23	RDS(%)	33	<->	43	BEGIN+3
04	STORE	14	ON	24	FREQ (F)	34	MHz	44	BEGIN+4
05	WRITE	15	AM	25	LEVEL(F)	35	dBμ	45	BEGIN+5
06	SPECIAL	16	FM	26	MOD (F)	36	kHz/%	46	BEGIN+6
07	*	17	PILOT ON	27	PILOT(F)	37	ADDRESS	47	BEGIN+7
08	30Hz	18	USA/EBU	28	<7>	38	UP/DN	48	BEGIN+8
09	100Hz	19	57k/SK	29	<4>	39	←	49	BEGIN+9
0A	400Hz	1A	ME1/DK	2A	<1>	3A	→	4A	PST C
0B	1kHz	1B	ZO/BK	2B	<0>	3B	INC	4B	PST D
0C	6.3kHz	1C	RDS	2C	<8>	3C	DEC	4C	*
0D	10kHz	1D	PATTERN	2D	<5>	3D	*	4D	*
0E	15kHz	1E	ME2	2E	<2>	3E	PST A	4E	*
0F	(OPTION)	1F	INC/SCAN	2F	<.>	3F	PST B	4F	*

Hex: hexadecimal, (F): function key, *: must not be used.

Table 10-2 Remote Control Pin Assignments

Pin No.	Signal Name	Pin No.	Signal Name
1	D0 (LSB)	13	NC
2	D1	14	NC
3	D2	15	NC
4	D3	16	NC
5	D4	17	NC
6	D5	18	NC
7	D6 (MSB)	19	NC
8	Strobe	20	GND
9	Data transfer	21	$\overline{3216}$/3217
10	Data transfer	22	UP
11	+5 V	23	DOWN
12	$\overline{\text{RMT}}$/LCL	24	GND

The inputs accept CMOS level signals.

Drive the data inputs (D0 to D6) with tri-state drivers (74HC244 or equivalent), and set pin 12 low so that contention does not occur with internal data.

If pin 12 is driven high, the front panel of the Model 3217 becomes operative.

Notes

1. When performing remote control, always keep pin 12 low.

2. To ensure +5 V high levels, take care that the loads are not allowed to exceed 10 mA.

3. The strobe is the signal which causes input data to be read.

   When the key code (D0 to D6) changes, the strobe must be kept low. After the key code (D0 to D6) change has been completed, drive the strobe high to read the new key code on the rising edge of the strobe line.

   For details, refer to Section 10.1, Timing of Key Code Reading.

4. Pins which are marked NC (no connection) must be kept open.

5. When using the key codes of Table 10-1, always keep pin 21 high. If this pin is allowed to go low, the Model 3215/3216 key codes will be used instead of those for the Model 3217.

10.1 Timing of Key Code Reading

The timing of reading the key codes is shown in Fig. 10-1.

The key code (D0 to D6) is read on the rising edge of the strobe signal.

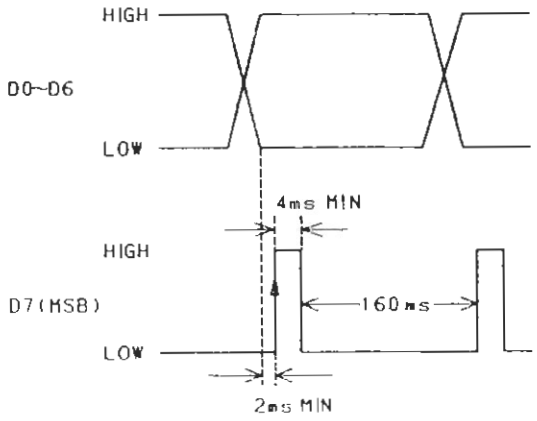


Fig. 10-1 Key Code Reading Timing

10.2 Other Notes on Remote Control

10.2.1 UP/DOWN Remote Control

Pin 22 (UP) and pin 23 (DOWN) of the remote control connector have functions which correspond to those of the rotary knob.

If the desired pin (direction) is kept low while the strobe is allowed to go from low to high, control is affected on the rising edge.

When these pins are kept low, the key code (D0 to D6) is ignored (i.e, D0 to D6 become DON'T CARE).

Use open-collector lines to drive these remote control lines.

The timing is as shown in Fig. 10-2.

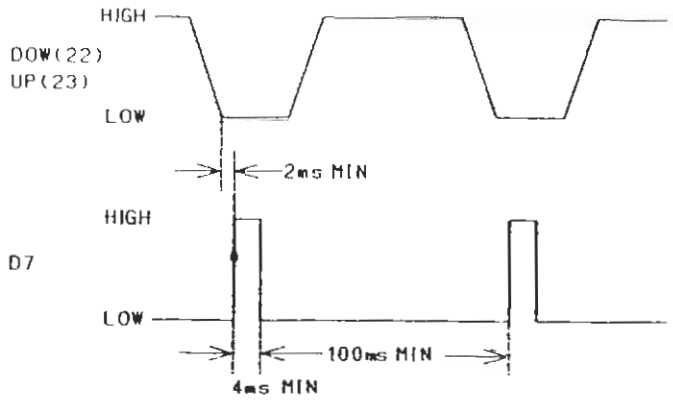


Fig. 10-2 Timing of the UP/DOWN Remote Control Inputs

10.2.2 Special Remote Control Key Codes

(a) Direct Recall

The key code 10 can be used in the recall mode (refer to Section 5, Memory Operation) to set 10 memory addresses after a preset begin address (refer to Section 5.4.2, Begin Address Setting) using only a single key code, enabling random readout.

This is done in the recall mode by using 0 to 9, which are the low 4 bits of the key codes 40 to 49 as the BCD code offset word to read out specific memory addresses as follows.

The address of the low 4 bits (0 to 7) is added to the begin offset.

Note, however, addresses which exceed the end address are ignored.

For example, in the recall mode:

Begin address = 5

End address = 99

With these settings, if the key code C1 (hexadecimal) is input, the address read out is 5 + 1 = 6.

In the same manner, the key codes C0 to C9 can be used to read out the addresses 5 to 12.

(b) Output Level Presets C and D

Four remote control output level offsets (A, B, C, and D) are available, which includes C and D added to the normal front panel presets, A and B.

By using the key codes 4A and 4B, it is possible to remotely control output level offsets C and D which cannot be controlled from the front panel.

For details on preset sequence, refer to Section 5.3, Output Level Presets.

11. GPIB

11.1 Introduction

Using the GPIB interface, it is possible to make such settings as frequency, output level, and modulation level by means of program codes.

11.2 Interface Specifications

Standards	ANSI/IEEE Std. 488.1-1987 ANSI/IEEE Std. 488.2-1987
LSI device used	TMS9914A
Code used	ASCII
Interface functions	See Table 11-1

Table 11-1 Interface Functions

Function	Function Code	Description
Source handshake	SH1	All functions
Acceptor handshake	AH1	All functions
Talker	T5	Basic talker functions, serial poll, talk only Talker canceled by MLA MSA ∧ LPAS.
Listener	L3	Basic listener functions, listen only Listener canceled by MTA MSA ∧ TPAS.
Service request	SR1	All functions
Remote/local	RL1	All functions
Parallel poll	PP0	No functions
Device clear	DC1	All functions
Device trigger	DT0	No functions
Controller	C0	No functions
Bus buffer	E2	Three states (75160 B)

Command data is data that is output from the controller when the ATN signal is low, the codes assigned to this data being shown in Table 11-2.

Table 11-2 Interface Messages and ASCII Codes

B i t s ② \ b7 b6 b5				0	0	0	0	0	0	1	1	1	1	1	1
				0	MSG	0	MSG	0	MSG	1	MSG	0	MSG	1	MSG
					0		1		0		1		0		1
b4	b3	b2	b1	Row / Column	0	1	2	3	4	5	6	7			
0	0	0	0	0	NUL		SP	0	@	P	`	p			
0	0	0	1	1		GTL	!	1	A	Q	a	q			
0	0	1	0	2			"	2	B	R	b	r			
0	0	1	1	3			#	3	C	S	c	s			
0	1	0	0	4		SDC	DCL	$	4	D	T	d	t		
0	1	0	1	5				%	5	E	U	e	u		
0	1	1	0	6				&	6	F	V	f	v		
0	1	1	1	7				'	7	G	W	g	w		
1	0	0	0	8			SPE	(	8	H	X	h	x		
1	0	0	1	9			SPD	)	9	I	Y	i	y		
1	0	1	0	10	LF			*	:	J	Z	j	z		
1	0	1	1	11				+	;	K	[	k	{		
1	1	0	0	12				,	<	L	\	l	|		
1	1	0	1	13	CR			-	=	M	]	m	}		
1	1	1	0	14				.	>	N	^	n	~		
1	1	1	1	15				/	?	UNL O	-	UNT o		DEL	

Address command group (ACG) — Universal command group (UCG) — Listener address group (LAG) — Talker address group (TAG)

Primary command group (PCG) — Secondary command group (SCG)

Notes: 1. MSG is the interface message.

2. b1 = DIO1 ..... b7 = DIO7, with DIO8 unused.

Interface message functions are as follows.

GTL:	Go to Local
SDC:	Selected Device Clear
LLO:	Local Lock Out
DCL:	Device CLear
SPE:	Serial Poll Enable
SPD:	Serial Poll Disable
UNL:	UNListen
UNT:	UNTalk

Operation of SDC and DCL

These perform a clear of the output buffer (queue).

11.3 Address Setting

The address of the Model 3217 as part of the GPIB system is set by means of DIP switches located on the GPIB unit panel at the rear of the Model 3217 (refer to Fig. 11-1)

There are 5 bit positions (switches A1 to A5). Setting a switch to ON or OFF selects the logic state 1 or 0, respectively.

The address setting must be made before power to the Model 3217 is switched on, as the address is read only at the time power is switched on.

Note that the address settings in Table do not include the setting of address 31. The setting of all switches A1 to A5 to 1 (ON) has a special function (UNL, UNT) and should not be used as an address setting.

Table 11-3 Address Setting

Address	A5	A4	A3	A2	A1
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0

≪Example≫ To set the address 5, make the DIP switch settings as shown in Fig. 11-1.

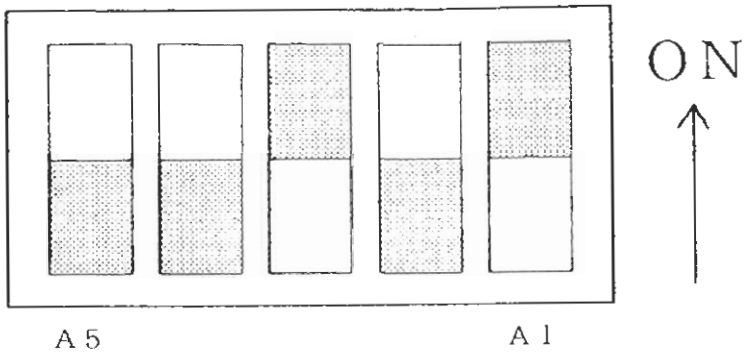


Fig. 11-1

11.4 GPIB Functions

The GPIB can be used for the following functions.

① Panel control
② Reading of panel settings
③ Reading and writing of RDS data

① Panel control

The panel settings of the Model 3217 are normally made manually from the front panel keys directly but can also be made remotely. In the remote mode equivalent or even additional settings are possible from an external controller via the GPIB interface.

For example, to set the RF frequency to 100 MHz, the following character string is sent to the Model 3217.

FR100MHZ

When this string is sent, it is interpreted by the Model 3217, and the RF frequency is set to 100 MHz, just as it would be done by normal key operations.

② Reading of panel settings

It is possible to send the panel settings of the Model 3217 to an external computer.

For example, to determine the current output level setting, the character string "LU?" is sent to the Model 3217.

If the Model 3217 is specified as a talker, it is possible to read the output level.

Readout example: LU 123.4 (123.4 dBμ)

③ Reading and writing of RDS data

It is possible to read the RDS data set at the Model 3217.

It is also possible to sent externally generated RDS data to the Model 3217 via the GPIB interface, this data being written into internal memory of the Model 3217.

11.5 Program Format

11.5.1 Program Message Format

In setting various data using the GPIB interface, it is necessary to send program codes to the Model 3217 from a controller.

The Model 3217 can send and receive up to 4 kilobytes as a single ASCII code program message.

≪Example≫ To set the frequency to 100 MHz, output level to 90 dBμ, internal modulation frequency to 1 kHz, stereo mode to MAIN, and FM deviation to 75 kHz, the following two methods can be used.

① Direct settings using direct codes

FR 110MHZ;LU 60DBU;IN 1KHZ;SM3;FM 75KHZ

Frequency — Output level — 1 kHz — MAIN — 75 kHz

② Setting using a hierarchal structure (refer to Section 11.10, GPIB Hierarchal Structure)

FR 110MHZ;LEV 60DBU;INT;FR 1KHZ;MOD DEV;ST 0;MOD;DEV 75KHZ

Frequency — Output level — 1 kHz — MAIN — 75 kHz

11.5.2 Input Format

Program codes consist of a header, followed by data codes.

□ □ _ □ □ □ (LF)

① ② ③ ④

①: Header
②: Header separator
③: Data
④: Delimiter 0AH (LF) or message unit separator

- Header code
  - ① Command program header

    This is the message that sets equipment operation.

    ≪Ex.≫ FR 110MHZ
  - ② Query program header

    This is the message that asks for the current equipment status.

    ≪Ex.≫ FR ?
- Data code
  - ① Data consisting of a value and a unit

    ≪Ex.≫ FR 110MHZ
  - ② Data with no units appended

    ≪Ex.≫ MD 1 (AF modulation on)

③ Data with neither a value nor units (header code only)

≪Ex.≫ FU (frequency shifted up)

The header and units are interpreted the same, whether they are in upper-case or lower-case characters.

- Header separator

  As a rule, a space is inserted between the header and data as the header separator, with a semicolon (;) inserted between each program as the program message separator.

- Delimiter

  The delimiter is a linefeed characters (0AH).

11.5.3 Using Model 3215/3216 Control Programs

The Model 3217 is provided with a GPIB interface (IEEE 488.2) as standard.

To maintain compatibility with Model 3215/3216 control programs, however, the following command formats variations are accepted.

(1) When using direct codes, formats in which there is absolutely no space code separating the command header and message data as the header separator. This format will not cause an error (if hierarchal commands are not used).

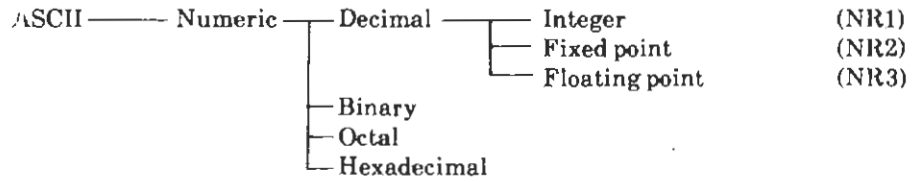
(2) It is possible to substitute the suffix "S" for the data units.

(3) When the suffix "S" is used, no error results when a number of commands are concatenated without an intervening ";" as the program message unit separator.

11.5.4 Interpretation of Numeric Data

According to the IEEE 488.2 specifications, the Model 3217 can recognize the following types of numeric data.

(a) Received Data Types



(b) Decimal Data

① Coding formats

≪Examples≫

• Integer (NR1)	123	+123	−123
• Fixed point (NR2)	123.4	+123.4	−123.4
• Floating point (NR3)	1.234E+3	+12.34E−6	−123E3
	1.234e+3		

② Units and coefficients

It is possible to add units and coefficients to NRf format data

≪Examples≫ For an RF frequency of 123.456 MHz

- 123.456MHZ
- 123456/KHZ
- 1.23456E+5K
- 1.23456E+8

③ Number of significant digits in received data

When the number of significant digits in the received data exceeds the number of internal digits in the hardware, the following processing is performed.

≪Example 1≫ Overflow

Frequency data 1234.567MHZ

Because the maximum frequency is 140.000 MHz, overflow results

≪Example 2≫ Rounding off

- 123.4567MHZ → 123.457 MHz

  Because the last digit at 30 MHz or higher is 1 kHz, rounding is done based on the 0.1 kHz digit value.

- 12.345678MHZ → 12.3457 MHz

  Because the last digit at lower than 30 MHz is 0.1 kHz, rounding is done based on the 0.01 kHz digit value.

(c) Numeric Data Other Than Decimal Format

Numeric data with a leading character string of "#B", "#Q" or "#H" is interpreted as binary, octal, or hexadecimal format, respectively.

① Binary values

≪Examples≫ #B1010 → Interpreted as 10 (decimal)

#b10101010 → Interpreted as 170 (decimal)

0 or 1

② Octal values

≪Example≫ #Q2045 → Interpreted as 1061 (decimal)

Value in range 0 to 7

③ Hexadecimal values

≪Example≫ #H12AF → Interpreted as 4783 (decimal)

ASCII:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Decimal:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

11.5.5 Command Program Input Format

Table 11-4 (a)

Item	Header	Data Code	Meaning	Units
RF frequency	FR	0.1 to 140.000M	0 to 140.000 MHz frequency setting	(Hz)
Output level	LU	−20.0 to 126.0	−20.0 to 126.0 dBμ output level setting	(dBμ)
FM deviation	FM	0 to 99.9K	0 to 99.9 kHz FM deviation setting	(Hz)
Pilot deviation	PM	0 to 10.0K	0 to 10.0 kHz pilot deviation setting	(Hz)
EBU/USA system	TR	0, 1	0 = USA, 1 = EBU	None
TRI modulation level	UT DT BT KT ET ZT	0 to 7.5K 0 to 40 0 to 80 0 to 7.5K 0 to 80 0 to 80 (Note 1)	0 to 7.5 kHz SK deviation setting 0 to 40% DK modulation setting 0 to 80% BK modulation setting 0 to 7.5 kHz 57-kHz pilot modulation setting 0 to 80% ME modulation setting 0 to 80% ZO modulation setting	(Hz) (%) (%) (Hz) (%) (%)
RDS deviation	RM	0 to 7.5K	0 to 7.5 kHz RDS deviation setting	(Hz)
BK area ID code	BC	A to F	BK code setting	None
ZO zone signal	ZC	1 to 10	ZO code setting	None
RDS pattern	RP	0 to 15 or #H0 to #HF	RDS pattern setting (Note 2)	None
EON transmission	EB		EON is transmitted when RDS is on.	None
AM modulation	AM	0 to 80.0 (Note 3)	0 to 80.0% AM modulation setting	(%)
FM modulation on/off	FO	0, 1	0 = Off, 1 = On	None
AM modulation on/off	AO	0, 1	0 = Off, 1 = On	None
AF modulation on/off	MD	0, 1	0 = Off, 1 = On	None
Pilot modulation on/off	PT	0, 1	0 = Off, 1 = On	None
SK modulation on/off	SK	0, 1	0 = Off, 1 = On	None
DK modulation on/off	DK	0, 1	0 = Off, 1 = On	None
BK modulation on/off	BK	0, 1	0 = Off, 1 = On	None

Notes: 1. 0 to 40% when either ME1 or ME2 is on.

2. 0 to 15 (user ROM data) when special 42 or 47 is selected.
   Can be set to 0 to 14 when special 43 or special 48 is selected.

3. 0 to 80.0% (500 kHz to 1799 kHz)
   0 to 60.0% (other frequencies)

Table 11-4 (b)

Item	Header	Data Code	Meaning	Units
57 kHz modulation on/off	KD	0, 1	0 = Off, 1 = On	None
ME modulation on/off	ME	0, 1, 2	0 = Off, 1 = ME1, 2 = ME2	None
ZO modulation on/off	ZO	0, 1	0 = Off, 1 = On	None
RDS modulation on/off	RD	0, 1	0 = Off, 1 = On	None
SCA modulation on/off	SC	0, 1 (option)	0 = Off, 1 = On	None
INT on/off EXT AF on/off EXT L, R on/off	IM EA EL	0, 1 0, 1 0,1	0 = Off, 1 = On 0 = Off, 1 = On 0 = Off, 1 = On	None None None
BK/ZO code scan	SO	0, 1	0 = Off, 1 = On	None
Internal modulation frequency	IN	30, 100, 400, 1K, 6.3K, 10K, 15K	30 = 30 Hz, 100 = 100 Hz, 400 = 400 Hz, 1K = 1 kHz, 6.3K = 6.3 kHz, 10K = 10 kHz, 15K = 15 kHz	(Hz)
Stereo mode	SM	0, 1, 2, 3	0 = Off, 1 = R, 2 = MAIN, 3 = SUB	None
Pre-emphasis	PR	0, 1, 2, 3	0 = Off, 1 = 25 μs, 2 = 50 μs, 3 = 75 μs	None
Preset	ST RC	0 to 99 0 to 99	Storage into memory address Recall from memory address	None None
Begin address End address	BE EN	0 to 99 0 to 99	Begin address setting End address setting	None None
RF frequency	FU FD		Frequency shift up Frequency shift down	None None
(including ΔF)	DF	0 to 4	Setting of digit to be changed 0 = 100 kHz digit - - - 4 = 1 MHz digit (< 30 MHz) 0 = 1 kHz digit 2 = 10 kHz digit - - - 4 = 10 MHz (≧ 30 MHz)	None
Output level	DU DD		Output level shift up Output level shift down	None None
(including ΔL)	DL	0 to 2	Setting of digit to be changed 0 = 0.1 dB, 1 = 1.0 dB, 2 = 10 dB	None
AM modulation	AU AN		Modulation level shift up Modulation level shift down	None None
FM modulation	MU MN		Modulation level shift up Modulation level shift down	None None
Pilot modulation	PU PN		Modulation level shift up Modulation level shift down	None None

Table 11-4 (c)

Item	Header	Data Code	Meaning	Units
SK modulation	UU UN		Output level shift up Output level shift down	None None
57 kHz modulation	KU KN		Output level shift up Output level shift down	None None
RDS modulation	RU RN		Output level shift up Output level shift down	None None
	DM	0 to 2	Setting of digit to be changed 0 = 0.1 kHz, 1 = 1.0 kHz, 2 = 10.0 kHz	None
DK modulation	TU TN		Output level shift up Output level shift down	None None
BK modulation	BU BN		Output level shift up Output level shift down	None None
ME modulation	EU ED		Output level shift up Output level shift down	None None
ZO modulation	ZU ZN		Output level shift up Output level shift down	None None
	DR	0 to 1	Setting of digit to be changed 0 = 1%, 1 = 10%	None
RDS pattern	NU NN		RDS pattern shift up RDS pattern shift down	None None
Number of response data	WI	1 to 64 ?	Sets the number of response data in the response string with respect to a [DI?] or [AD?] query command. Sends the currently set number of response data.	None None
Group RDS address	GR	0 to 1535	Sets the GROUP RDS DATA address for ε. [DATA] command setting or query.	None
RDS data length	LN	0 to 255 ?	Sets the GPIB RDS rate (valid only in the GPIB mode). Sends the currently set RDS data length.	None None
RDS data	DA	XXXX, XXXX ..... XXXX, XXXX ?	Only when the GROUP ADDRESS is larger than 1024, the GROUP RDS ADDRESS for the GPIB specifications is set. The contents of GROUP RDS DATA at the GROUP ADDRESS is sent (hex. data).	None None
RDS data no.	AD	XXXX, XXXX ..... XXXX, XXXX ?	Sets the GROUP ADDRESS DATA at the GPIB EON ADDRESS (NR1). (Valid only in the GPIB mode.) Sends the address pattern.	None None

Table 11-4 (d)

Item	Header	Data Code	Meaning	Units
EON address	ES	XXXX	Sets the EON ADDRESS DATA into the GPIB EON ADDRESS area.	None
		?	Sends the currently set EON ADDRESS DATA.	None
Direct RDS data	DI	XXXX, XXXX ..... XXXX, XXXX, NL	Data is set directly into the GPIB RDS data area. (Valid only in the GPIB mode and only for pattern 0.)	None
		..... XXXX, XXXX ..... XXXX, XXXX, NL	The GPIB mode GROUP RDS DATA no. 1280 to 1534 data are changed.	
		?	The currently set RDS data is sent (hex. data).	None
Direct EON data	DE	XXXX, XXXX ..... XXXX, XXXX	EON data is written into the GPIB RDS data area and the EON ADDRESS area. (Valid only in the GPIB mode and only for pattern 0.) The GPIB mode GROUP RDS DATA no. 1535 data is changed.	None
		?	The currently set EON data is sent (hex. data)	None

Table 11-4 (e)

Item	Header	Data Code	Meaning	Units
Special	SP000	XXXX	Clear all special settings.	None
	SP00		Initializes begin and end addresses to begin address = 0, end address = 99.	None
	SP01	0 to 99	Sets begin address.	None
	SP02		Sets end address.	None
	SP03		Loads.	None
	SP04		Saves.	None
	SP10		Sets Δ mode to off.	None
	SP11	0.1K to 19.9999M	ΔF	Hz
	SP12	0.1 to 9.9	ΔL	dBμ
	SP20		Sets special modulation to off.	None
	SP21		Internal AM, internal FM	None
	SP22		Internal AM, external FM	None
	SP23		Internal AM, (EXT-L, R) FM	None
	SP24		(INT-L) FM, (EXT-R) FM	None
	SP25		External AM, internal FM	None
	SP26		External AM, external FM	None
	SP30		Sets pre-emphasis to off.	None
	SP31		Sets pre-emphasis to 25 μs.	None
	SP32		Sets pre-emphasis to 50 μs.	None
	SP33		Sets pre-emphasis to 75 μs.	None
	SP40		RDS internal data 90°	None
	SP41		RDS external data 90°	None
	SP42		RDS user data 90°	None
	SP43		RDS GPIB data 90°	None
	SP44		RDS null data 90°	None
	SP45		RDS internal data 0°	None
	SP46		RDS external data 0°	None
	SP47		RDS user data 0°	None
	SP48		RDS GPIB data 0°	None
	SP49		RDS null data 0°	None
	SP50		Initializes ΔT (1 s)	None
	SP51	1 to 9	Sets ΔT (1 to 9 s)	None
	SP60		Sets SCA to off.	None
	SP61		Sets SCA to on/	None
	SP70		All MOD off	None
	SP71		Preset 30%	None
	SP72		Preset 100%	None
	SP73		Preset scope	None
	SP74		Preset pilot	None
	SP75		Preset TRI	None
	SP76		Preset RDS 90°	None
	SP77		Preset RDS 0°	None
	SP80		Initializes EON mode.	None
	SP90		Initializes umber of EON data (8 times)	None
	SP91	1 to 99	Sets number of EON data (1 to 99 times)	None

11.5.6 Individual Command Program Input Formats

(1) RF Frequency Setting ("FR" Header)

The frequency can be set in the range 0.1 to 140 MHz. In units of megahertz, the places after the decimal point can be left off. Resolution is 100 Hz from 0.1 to 29.9999 MHz and 1 kHz from 30 to 140 MHz.

≪Example 3≫ Setting of 120.56 MHz

"FR 120.56MHZ"

≪Example 4≫ Setting of 1 MHz

"FR 1MHZ"

(2) Output Level Setting ('LU" Header)

The output level can be set in the range −20 to 126 dBμ, in 0.1-dB steps.

≪Example 5≫ Setting of 120.5 dBμ

"LE 120.5DBU"

≪Example 6≫ Setting of −10 dBμ

"LE −10DBU"

(3) FM Modulation Deviation Setting ("FM" Header)

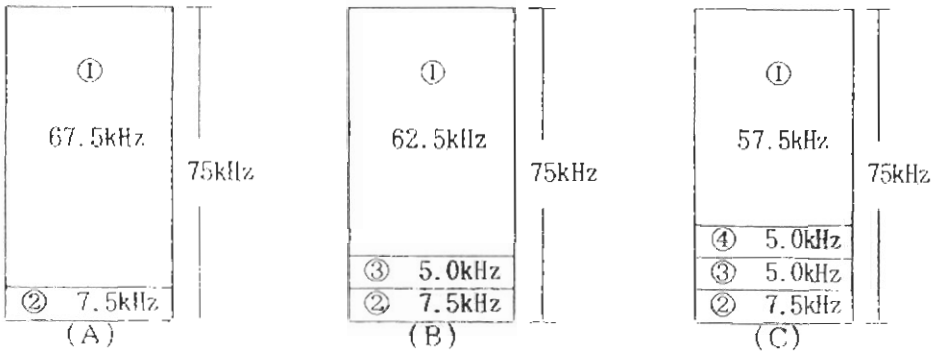
The maximum settable FM deviation is 99.9 kHz, this setting being made in 0.1-kHz steps.

≪Example 7≫ Setting of 75-kHz FM deviation

"FM 75KHZ"

Note

When pilot modulation, TRI (SK, 57 kHz) modulation, and RDS modulation are on, the FM modulation is as shown in Fig. 11-2.



①: Audio signal deviation
②: Pilot deviation
③: TRI (SK, 57 kHz) deviation
④: RDS deviation

Fig. 11-2

(A) With an FM deviation setting of 75 kHz and a pilot deviation setting of 7.5 kHz, the deviation caused by the audio signal is 75.0 – 7.5 = 67.5 kHz.

(B) With and FM deviation setting of 75 kHz, a pilot deviation setting of 7.5 kHz, and a TRI deviation setting of 5.0 kHz, the deviation caused by the audio signal is 75.0 – 7.5 – 5.0 = 62.5 kHz.

(C) With an FM deviation setting of 75 kHz, a pilot deviation setting of 7.5 kHz, a TRI deviation setting of 5.0 kHz, and an RDS deviation setting of 5.0 kHz, the deviation caused by the audio signal is 75.0 – 7.5 – 5.0 – 5.0 = 57.5 kHz.

(4) Pilot Deviation Setting ("PM" Header)

The pilot deviation can be set in the range 0 to 10.0 kHz.

≪Example 8≫ Setting of 5 kHz

"PM 5KHZ"

≪Example 9≫ Setting of FM deviation of 75 kHz, which includes a pilot deviation of 5 kHz

"PM 5KHZ;FM 75KHZ"

Note

The setting sequence for FM deviation which includes a pilot signal (or, similarly, TRI or RDS) shown in ≪Example 9≫ must be observed. If, in order to achieve the same setting results as ≪Example 9≫ an attempt is made to use the setting

"FM 75KHZ;PM 5KHZ" ①

or

"FM 70KHZ;PM 5KHZ' ②

the overall FM deviation in either case will depend upon the immediately previous setting of the pilot deviation in kHz. In order to achieve the same overall FM deviation as ≪Example 9≫, the immediately previous pilot deviation setting would have to have been 5 kHz in the case of ① and 0 kHz in the case of ②.

(5) TRI Signal EBU/USA Selection ("TR"Header)

Data is either "1" (EBU) of "0" (USA).

≪Example 10≫ Selection of the US system TRI signal.

"TR 0"

(6) TRI Modulation Setting

- (EBU System)
  - SK modulation ("UT" header)

    SK modulation (deviation) can be set in the range 0 to 7.5 kHz.

    ≪Example 11≫ Setting of 3.4 kHz

    "UT 3.4KHZ"
  - DK modulation ("DT" header)

    DK modulation (%) can be set in the range 0 to 40%.

    ≪Example 12≫ Setting of 40%

    "DT 40PCT"

- BK modulation ("BT" header)

  BK modulation (%) can be set in the range 0 to 80%.

  ≪Example 13≫ Setting of 56%

  "BT 56PCT"

- (USA System)

  - 57-kHz pilot modulation ("KT" header)

    The 57-kHz pilot modulation (deviation) can be set in the range 0 to 7.5 kHz.

    ≪Example 14≫ Setting of 7.4 kHz

    "KT 7.4KHZ"

  - ME modulation ("ET" header)

    ME modulation (%) can be set in the range 0 to 80%.

    ≪Example 15≫ Setting of 69%

    "ET 69PCT"

  - ZO modulation ("ZT" header)

    ZO modulation (%) can be set in the range 0 to 80%.

    ≪Example 16≫ Setting of 56%

    "ZT 56PCT"

Note

When used simultaneously with ME1 or ME2, ZO modulation is approximately halved. Therefore, with simultaneous modulation, the maximum modulation level is 40%. Note that setting ME1 or ME2 to on after setting the ZO modulation will result in halving the ZO setting.

(7) RDS Modulation Setting ("RM" Heading)

RDS modulation (deviation) can be set in the range 0 to 7.5 kHz.

≪Example 17≫ Setting of 2.3 kHz

"RM 2.3KHZ"

(8) BK Area Identification Code Setting ("BC" Heading)

The BK area identification code (BK code) can be set in the range A to F.

≪Example 18≫ Setting of area identification code to D

"BC D"

(9) ZO Zone Signal Code (ZO Code) ("ZC" Heading)

The zone signal code (ZO code) can be set in the range 1 to 10.

≪Example 19≫ Setting of the zone signal code to 4

"ZC 4"

(10 RDS Pattern Setting ("RP" Header)

The RDS pattern can be set in the range 0 to FH.

≪Example 20≫ Setting of the RDS pattern to "A"

"RP #AH or RP 10"

(11 AM Modulation Setting ("AM" Header)

The AM modulation can be set up to 80.0% from 500 to 1799 kHz, and up to 60.0% at other frequencies, in 0.1% steps.

≪Example 21≫ Setting of 45.6% AM modulation

"AM 45.6PCT"

(12 On/Off Settings of Various Types of Modulation

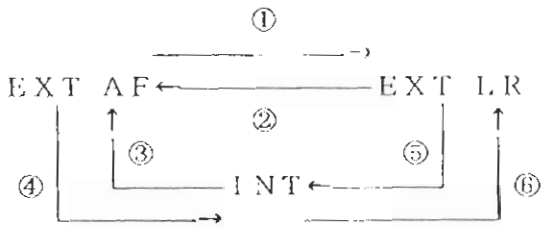
Data is either "1" (on) or "0" (off).

FM modulation on/off	"FO 1" or "FO 0"
AM modulation on/off	"AO 1" or "AO 0"
AF modulation on/off	"MD 1" or "MD 0"
Pilot modulation on/off	"PT 1" or "PT 0"
SK modulation on/off	"SK 1" or "SK 0"
DK modulation on/off	"DK 1" or "DK 0"
BK modulation on/off	"BK 1" or "BK 0"
57-kHz pilot modulation on/off	"KD 1" or "KD 0"
ME modulation on/off	"ME 1", "ME 2", or "ME0" (Note 1)
ZO modulation on/off	"ZO 1" or "ZO 0"
RDS modulation on/off	"RD 1" or "RD 0"
SCA modulation on/off	"SC 1" or "SC 0"
Internal modulation on/off	"IM 1" or "IM 0" (Note 2)
External modulation (EXT AF) on/off	"EA 1" or "EA 0" (Note 2)
External modulation (EXT L, R) on/off	"EL 1" or "EL 0" (Note 2)
BK/ZO code scan on/off	"SO 1" or "SO 0"
EON code transmission	"EB"

Notes

1. With ME modulation only, since there are both ME1 and ME2 types of modulation, "0" selects ME off, "1" selects ME1 on, and "2" data selects ME2 on.
2. With regard to on/off switching of internal modulation (IM) and external modulation (EA, EL), refer to Fig. 11-3 for state transitions between internal and external modulation.

Fig. 11-3 State Transitions Between Internal and External Modulation



			①	②	③	④	⑤	⑥
SP20	Special modulation off	FM	EL1	EA1	EA1	IM1	IM1	EL1
		AM	—	—	EA1	IM1, EA0	—	—
SP21	INT AM , INT FM		—	—		—	—	—
SP22	INT AM , EXT FM		—	—	—	—	—	—
SP23	INT AM , (EXT-L, R FM)		—	—	—	—	—	—
SP24	(INT-L FM), (EXT-R FM)		—	—	—	—	IM , EL	
SP25	EXT AM , INT FM		—	—	—	—	—	—
SP26	EXT AM , EXT FM		—	—	—	—	—	—

Note that setting commands corresponding to the "—" locations in the table above are invalid and will result in an error condition. Use the AM and FM modulation on/off commands "AO" and "FO" commands to switch the modulation corresponding to these table locations on and off.

Also, for SP24, use "IM 1/0" to switch INT FM(L) on and off, and "EL 1/0" to switch EXT FM(R) on and off.

(13) Internal Modulation Frequency Setting ("IN" Header)

There are 7 internal modulation frequencies: 30 Hz, 100 Hz, 400 Hz, 1 kHz, 6.3 kHz, 10 kHz, and 15 kHz.

≪Example 22≫ Setting of the internal modulation frequency to 400 Hz

"IN 400HZ"

≪Example 23≫ Setting of the internal modulation frequency to 6.3 kHz

"IN 6.3KHZ"

(14) Stereo Mode Setting ("SM"Header)

Switching is possible between 4 stereo modes: L, R, MAIN, and SUB. The relationship of setting data to these modes is as follows.

Stereo Mode	Data
L	0
R	1
MAIN	2
SUB	3

≪Example 24≫ Setting of the R stereo mode

"SM 1"

(15) Pre-emphasis Setting ("PR" Header)

Switching is possible between 4 pre-emphasis settings: off, 25 μs, 50 μs, and 75 μs. The relationship of setting data to the pre-emphasis setting is as follows.

Pre-emphasis	Data
Off	0
25 μs	1
50 μs	2
75 μs	3

≪Example 25≫ Setting of pre-emphasis to 50 μs.

"PR 2"

(16) Preset ("ST" and "RC" Headers)

The Model 3217 has memory addresses ranging from 0 to 99. Panel setting data can be written into memory by *store* operations, and recalled from memory by *recall* operations.

The "ST" is used for storing, and the "RC" header is used for recalling data.

Data is made up of the numerals 0 to 9.

≪Example 26≫ Recalling from address 73

"RC 73"

≪Example 27≫ Storing into address 88

"ST 88"

(17) Begin Address Setting ("BE" Header)

The begin address can be set to any value in the range 0 to 99 for which the condition (begin address) < (end address) is satisfied.

≪Example 28≫ Setting the begin address to 10

"BE 10"

(18) End Address Setting ("EN" Header)

The end address can be set to any value in the range 0 to 99 for which the condition (begin address) < (end address) is satisfied.

≪Example 29≫ Setting the begin address to 85

"EN 85"

(19) RF Frequency Up/Down ("DF", "FU", and "FD" Headers)

① "DF" sets the digit to be changed.

Data is in the range 0 to 4, with the following meanings.

0 ..... 100 Hz (1 kHz)

1 ..... 1 kHz (10 kHz)

2 ..... 10 kHz (100 kHz)

3 ..... 100 kHz (1 MHz)

4 ..... 1 MHz (10 MHz)

(In the above, values in ( ) apply for frequencies of 30 MHz and higher.)

② "FU" shifts the frequency upward, and "FD" shifts the frequency downward.

≪Example 30≫ Increase the 10-kHz digit (RF frequency of 10 MHz)

"DF 2" ; FU"

10-kHz digit Shift frequency upward

≪Example 31≫ Decrease the 1-MHz digit (RF frequency of 100 MHz)

"DF 3" ; FD"

1-MHz digit Shift frequency downward

(20) Output Level Up/Down ("DL", "DU", and "DD" Headers)

① "DL" sets the digit to be changed.

Data is in the range 0 to 2, with the following meanings.

0 ..... 0.1 dB

1 ..... 1.0 dB

2 ..... 10.0 dB

② "DU" shifts the output level upward, and "DD" shifts the output level downward.

≪Example 32≫ Decrease the 1-dB digit

"DL 1 ; DD"

1-dB digit Shift output level downward

(21) Setting of Modulation Digit to Be Changed ("DM" Header)

Data is in the range 0 to 2, with the following meanings

0 ..... 0.1 kHz (or %)

1 ..... 1.0 kHz (or %)

2 ..... 10.0 kHz (or %)

① AM modulation up/down ("AU" and "AN" headers)

"AU" shifts the AM modulation level upward, and "AN" shifts the AM modulation level downward.

≪Example 33≫ Increase the 0.1% digit

"DM 0 ; AU"

0.1% digit Shift AM modulation level upward

② FM modulation up/down ("MU" and "MN" headers)

"MU" shifts the FM modulation level upward, and "MN" shifts the FM modulation level downward.

≪Example 34≫ Decrease the 10.0-kHz digit

"DM 2 ; MN"

10.0-kHz digit Shift FM modulation level downward

③ Pilot modulation up/down ("PU" and "PN" headers)

"PU" shifts the pilot modulation level upward, and "PN" shifts the pilot modulation level downward.

≪Example 35≫ Increase the 1.0-kHz digit

"DM 1 ; PU"

1.0-kHz digit Shift pilot modulation level upward

④ SK modulation up/down ("UU" and "UN" headers)

"UU" shifts the SK modulation level upward, and "UN" shifts the SK modulation level downward.

≪Example 36≫ Decrease the 0.1-kHz digit

"DM 0 ; UN"

0.1-kHz digit Shift SK modulation level downward

⑤ 57-kHz pilot modulation up/down ("KU" and "KN" headers)

"KU" shifts the 57-kHz pilot modulation level upward, and "KN" shifts the 57-kHz pilot modulation level downward.

≪Example 37≫ Decrease the 1.0-kHz digit

"DM 1 ; KU"

1.0-kHz digit — Shift 57-kHz pilot modulation level upward

⑥ RDS modulation up/down ("RU" and "RN" headers)

"RU" shifts the RDS modulation level upward, and "RN" shifts the RDS modulation level downward.

≪Example 38≫ Decrease the 0.1-kHz digit

"DM 0 ; RU"

0.1-kHz digit — Shift RDS modulation level upward

(22) Setting of the TRI Modulation Digit to Be Changed ("DR" Header)

Data is in the range 0 to 1, with the following meanings

0 ..... 1%

1 ..... 10%

① DK modulation up/down ("TU" and "TN" headers)

"TU" shifts the DK modulation level upward, and "TN" shifts the DK modulation level downward.

≪Example 39≫ Increase the 1% digit

"DR 0 ; TU"

1% digit — Shift DK modulation level upward

② BK modulation up/down ("BU" and "BN" headers)

"BU" shifts the BK modulation level upward, and "BN" shifts the BK modulation level downward.

≪Example 40≫ Decrease the 10% digit

"DR 1 ; BU"

10% digit — Shift BK modulation level downward

③ ME modulation up/down ("EU" and "ED" headers)

"EU" shifts the ME modulation level upward, and "ED" shifts the ME modulation level downward.

≪Example 41≫ Decrease the 1% digit

"DR 0 ; ED"

1% digit — Shift ME modulation level downward

④ ZO modulation up/down ("ZU" and "ZN" headers)

"ZU" shifts the ZO modulation level upward, and "ZN" shifts the ZO modulation level downward.

≪Example 42≫ Decrease the 10% digit

"DR 1 ; ZU"

10% digit — Shift ZO modulation level upward

Note

In (19) to (22), the digit to be changed need only be specified one time before a series a up/down operations, i.e., the digit need not be specified each time such an operation is performed.

(23) Special Settings ("SP" Headers)

The Model 3217 enables the special settings listed in Table 11-4 (e).

① Clear all special settings (SP000)

≪Example 43≫ Clear all special settings

"SP000"

② Initialize begin and end addresses (SP00)

≪Example 44≫ Initialize begin and end addresses

"SP00"

③ Set begin and end addresses (SP01 and SP02)

≪Example 45≫ Set begin and end addresses to 0

"SP01 0"

Set end address to 99

"SP02 99"

④ Load/save (SP03 and SP04)

≪Example 46≫ Load

"SP03"

Save

"SP04"

⑤ ΔF mode setting (SP11)

≪Example 47≫ Set ΔF mode

"SP11"

In this mode, the frequency can be increased or decreased using the "FU" and "FD" headers, respectively. To leave this mode, use "SP10".

To set the frequency step size, append the frequency step size.

"SP11 1.2KHZ" (Frequency step size: 1.2 kHz)

⑥ ΔL mode setting (SP12)

≪Example 48≫ Set ΔL mode

"SP12"

In this mode, the output level can be increased or decreased using the "DU" and "DD" headers, respectively. To leave this mode, use "SP10".

To set the output level step size, append the output level step size.

"SP12 0.3DBU" (Output level step size: 0.3 dB)

⑦ Special modulation setting (SP20 to SP26)

≪Example 49≫ Setting SP23 (internal AM, external FM)

"SP23"

⑧ Pre-emphasis setting (SP30 to 33)

≪Example 50≫ Setting the pre-emphasis to 50 μs

"SP32"

⑨ RDS special data setting (SP40 to 49)

≪Example 51≫ Setting SP44 (RDS null data, 90°)

"SP44"

⑩ ΔT Initialization (SP50)

≪Example 52≫ Initializing the BK/ZO code scan time to 1 second

"SP50"

⑪ ΔT setting (SP51)

≪Example 53≫ Setting the BK/ZO code scan time to a value in the range 1 to 9 seconds (5 s in this example)

"SP51 5"

⑫ Preset setting (SP70 to SP77)

≪Example 54≫ Setting the preset to 100% (SP72)

"SP72"

⑬ EON mode initialization (SP80)

≪Example 55≫ Initialization of the EON mode

"SP80"

⑭ Number of EON data initialization (SP90)

≪Example 56≫ Initialization of the number of EON data (thereby setting it to 8 times)

"SP90"

⑮ Number of EON data setting (SP91)

≪Example 57≫ Setting of the number of EON data to (1 to 99)

Setting of the number of EON data to 12 times

"SP91 12"

For details on these special functions, refer to Section 6.1, SPECIAL Keys.

11.5.7 Query Program Input Formats and Response

Table 11-5 (a)

Item	Query Program Message	Response Message	Response	(Note 1)
RF frequency	FR ?	FR 123.456E+6	123.456 MHz	NR3
Output level	LU ?	LU 12.3DBI	12.3 dBμ	NR2
FM modulation level	FM ?	FM 76.5E+3	76.5 MHz	NR3
EBU/USA system	TR ?	TR 0	US system	NR1
Pilot modulation level	PM ?	PM 4.3E+3	4.3 kHz	NR3
SK modulation level	UT ?	UT 2.5E+3	2.5 kHz	NR3
DK modulation level	DT ?	DT 45	45%	NR1
BK modulation level	BT ?	BT 56	56%	NR1
57-kHz pilot mod. level	KT ?	KT 7.4E+3	7.4 kHz	NR3
ME modulation level	ET ?	ET 69	69%	NR1
ZO modulation level	ZT ?	ZT 56	56%	NR1
RDS modulation level	RM ?	RM 2.3E+3	2.3 kHz	NR3
BK area identification code	BC ?	BC D	D	ASCII
ZO zone signal	ZC ?	ZC 5	5	NR1
RDS pattern	RP ?	RP 4	4	NR1
AM modulation level	AM ?	AM 45.6	45.6%	NR2
FM modulation on/off	FO ?	FO 1	On	NR1
AM modulation on/off	AO ?	AO 0	Off	NR1
AF modulation on/off	MD ?	MD 1	On	NR1
Pilot modulation on/off	PT ?	PT 0	Off	NR1
SK modulation on/off	SK ?	SK 1	On	NR1
DK modulation on/off	DK ?	DK 0	Off	NR1
BK modulation on/off	BK ?	BK 1	On	NR1
57-kHz modulation on/off	KD ?	KD 0	Off	NR1
ME modulation on/off	ME ?	ME 2	ME2 on	NR1
ZO modulation on/off	ZO ?	ZO 1	On	NR1
RDS modulation on/off	RD ?	RD 0	Off	NR1
SCA modulation on/off	SC ?	SC 1	On	NR1
INT on/off	IM ?	IM 0	Off	NR1
EXT A, F on/off	EA ?	EA 1	On	NR1
EXT L, R on/off	EL ?	EL 0	Off	NR1
Internal modulation frequency	IN ?	IN 1.0E+3	1 kHz	NR3

Table 11-5 (a) (continued)

Item	Query Program Message	Response Message	Response	(Note 1)
Stereo mode	SM ?	SM 3	SUB	NR1
Pre-emphasis	PR ?	PR 1	25 µs	NR1
Recall address	RC ?	RC 15	15	NR1
Store address	ST ?	ST 18	18	NR1
Begin address	BE ?	BE 6	6	NR1
End address	EN ?	EN 73	73	NR1
RF frequency varied digit	DF ?	DF 3	1 MHz (≧30 MHz 100 kHz (<30 MHz)	NR1 NR1
Output level varied digit	DL ?	DL 1	1.0 dB	NR1
Modulation level varied digit	DM ?	DM 2	10 kHz (%)	NR1
TRI modulation varied digit	DR ?	DR 0	1%	NR1

Table 11-5 (b)

Item	Query Program Message	Response Message	Response	(Note 1)
All special codes	SP ?	SP15, 73, 1, 3, 2, 4, 6, 1, 1, 18	(Note 2)	NR1
ΔF, L mode	SP1 ?	SP11	ΔF mode	NR1
Special modulation	SP2 ?	SP25	EXT AM, INT FM	NR1
Pre-emphasis	SP3 ?	SP33	75 µs	NR1
RDS special data	SP4 ?	SP40	RDS internal data, 90°	NR1
Begin address	SP01 ?	SP 01 6	6	NR1
End address	SP02 ?	SP 02 73	73	NR1
BK/ZO scan time	SP51 ?	SP51 7	7 s	NR1
Number of EON data	SP91 ?	SP91 11	11	NR1

Note: 1. Refer to Section 11.5.4 (a), Received Data Types

2. Refer to subsection (5) below, All Special Code Query.

The query commands enable you to determined the current setting conditions by appending a "?" onto the commands given in Table 11-4.

Several examples of queries and responses are given below.

(1) Determining the current RF frequency (NR3)

≪Example 58≫ "FR?"

Response: FR 123.456E+6 (123.456 MHz)

(2) Determining the current output level (NR2)

≪Example 59≫ "LU?"

Response: LU 12.3 (12.3 dBμ)

(3) Determining the current BK area identification code (ASCII)

≪Example 60≫ "BC?"

Response: BC D

(4) Determining the current AF modulation on/off status (NR1)

≪Example 61≫ "MD?"

Response: MD 1 (AF modulation on)

(5) Determining all the current special codes

≪Example 62≫ "SP ?"

Response: SP15, 73, 1, 3, 2, 4, 6, 1, 1, 18

①: Begin address (15)

②: End address (73)

③: Δ mode (ΔF mode)

④: Special modulation (INT AM + EXT FM)

⑤: Pre-emphasis (50 μs)

⑥: RDS special data (RDS null data, 90°)

⑦: BK/ZO code scan time (6 s)

⑧: SCAN on (option)

⑨: EON mode address link

⑩: Number of EON data (18 times)

11.6 RDS Data Format

The Model 3217 can read or write RDS data in response to RDS commands.

11.6.1 RDS Related Commands

(1) RDS Pattern Up/Down ("NU" and "NN" Headers)

The "NU" header increments the RDS pattern, and the "NU" header decrements the RDS pattern.

≪Example 63≫ Incrementing of the RDS pattern

"NU"

≪Example 64≫ Decrementing of the RDS pattern

"NN"

(2) Setting of the Number of RDS Response Data ("WI" Header)

This is the setting of how many RDS data are included in a single response to the "AD?" and "DI?" commands.

≪Example 65≫ With a setting of "WI 1" the responses are as follows.

① Response to "AD?"

```
AD 0 DLM
AD 1 DLM
AD 2 DLM
AD 3 DLM
```

"DLM" indicates the delimiter.

② Response to "DI?"

```
DI #C201,#026D,#H0000,#H0198,#HE700,#H0243,#H5244,#H028A DLM
#C201,#026D,#H0001,#H0021,#H2244,#H0015,#H5320,#H03FB DLM
#C201,#026D,#H0002,#H02EA,#H6688,#H0105,#H5445,#H01FB DLM
#C201,#026D,#H0003,#H0353,#HAACC,#H0056,#H5354,#H01E9 DLM
#FFFF,#FFFF DLM
```

≪Example 66≫ With a setting of "WI 3" the responses are as follows.

① Response to "AD?"

```
AD  0, 1, 2  DLM
    3, 65535 DLM
```

"DLM" indicates the delimiter.

② Response to "DI?"

```
DI #C201,#026D,#H0000,#H0198,#HE700,#H0243,#H5244,#H028A
,#C201,#026D,#H0001,#H0021,#H2244,#H0015,#H5320,#H03FB
,#C201,#026D,#H0002,#H02EA,#H6688,#H0105,#H5445,#H01FB DLM

#C201,#026D,#H0003,#H0353,#HAACC,#H0056,#H5354,#H01E9
,#FFFF,#FFFF DLM
```

(3) RDS Data Group Number Setting ("GR" Header)

This is the setting of the RDS group number for group RDS data setting and querying for "DA" or "DA?".

≪Example 67≫ Response to "GR 0;DA?"

DA #C201, #026D, #H0000, #H0198, #HE700, #H0243, #H5244, #H028A D.M

* The group RDS data No. 0 data is returned.

≪Example 68≫ Data setting by the "DA" command

"GR 1024;DA #C201, #026D, #H0000, #H0198, #HE700, #H0243, #H5244, #H028A"

* The group RDS data No. 1024 (GPIB mode) is set.

- Commands related to setting and changing of RDS data

(4) through (9) described below are commands related to setting and changing RDS data.

Setting and changing of RDS data is not valid for *standard internal data* and *user-defined data* because the data is from internal ROM.

(4) RDS Pattern Setting ("LN" Header)

This command changes the current selected pattern data length (GPIB mode only).

≪Example 69≫ "LN 3"

① When the group address data is longer than the set value

Memory contents before executing the command:

#H0000, #H0001, #H0002, #H0003, #H0004, #H0005, #HFFFF
└── Address data end mark

Memory contents after executing the command:

#H0000, #H0001, #H0002, #HFFFF
└── Address data end mark

- #HFFFF (address data end mark) is written after the number of data specified by the "LN" command.

② When the group address data is shorter than the set value

Memory contents before executing the command:

#H0001, #HFFFF
└──────Address data end mark

Memory contents after executing the command:

#H0001, #H0000, #H0000, #HFFFF
└Address data end mark

- #H0000 is written at the address data which is the number of data specified by the "LN" command from the currently set address end mark, after which #HFFFF (address end mark) is written.

(5) RDS Data Setting ("DA" Header)

This command sets the RDS data of the currently set group RDS data number (for GR1024 to 1535 only).

Group RDS Data Number				
0	to	511	Standard internal data	← Valid for "DA?" only
512	to	1023	User-defined internal data	← Valid for "DA?" only
1024	to	1535	GPIB data	← Valid for "DA" and "DA?"

Refer to setting ≪Example 68≫.

(6) RDS Data Number Setting ("AD" Header)

This command sets the group address data of the currently selected pattern (GPIB mode only).

≪Example 70≫ "AD 0, 1, 2, 3"

"4, 5, 9999"
└──── Address data end mark

The data is set after the command header, separated from the group RDS data number to be set by either a comma (,) or a delimiter (LF). At the end, if a value greater than 1535 (the maximum value, #H5FF, of the GPIB mode group RDS data number), this will be interpreted as the address data end mark.

(7) EON Address Data Setting ("ES" Header)

This command sets the EON address data of the currently selected pattern (GPIB only).

≪Example 71≫ Setting of the group RDS data number 1050 as the EON data.

"ES 1050"

(8) Direct RDS Data Setting ("DI" Header)

The data to be actually sent as RDS data is set directly (only usable for the GPIB mode pattern 0).

There is not guarantee as to the group RDS data contents of the currently set group numbers 1280 to 1534 when this command is used.

≪Example 72≫

```
" DI #C201,#026D,#H0000,#H0198,#HE700,#H0243,#H5244,#H028A
 ,#C201,#026D,#H0001,#H0021,#H2244,#H0015,#H5320,#H03FB
 ,#C201,#026D,#H0002,#H02EA,#H6688,#H0105,#H5445,#H01FB "

" #C201,#026D,#H0003,#H0353,#HAACC,#H0056,#H5354,#H01E9
 ,#C201,#026D,#H4001,#H02C6,#H7402,#H0329,#HC880,#H0013
 ,#FFFF,#FFFF "
```

Direct RDS data end mark

- Data is received in groups of 8 data.
- At the end of data, if the first data a group is **#HFFFF, #HFFFF**, this is taken as the data end mark.
- The above setting writes the set data into group RDS data numbers 1534 to 1530.
- As a result of the above setting, the GPIB mode pattern 0 address data is as follows.

#H05FE, #H05FD, #H05FC, #H05FB, #H05FA, #HFFFF

(9) EON Data Setting ("DE" Header)

The data to be actually sent as EON data is set directly (only usable for the GPIB mode pattern 0).

≪Example 73≫

```
" DE #C201,#026D,#H0000,#H0198,#HE700,#H0243,#H5244,#H028A"
```

- Data is received in groups of 8 data.
- The above setting writes the set data into group RDS data number 1535.
- As a result of the above setting, the GPIB mode pattern 0 EON address data is as follows.

#H05FF (1535)

11.6.2 RDS Related Query Commands

(1) Querying the Number of RDS Response Data (NR1)

≪Example 74≫ "WI?"

Response: WI 3

(2) Querying the Group RDS Data Address (NR1)

≪Example 75≫ "GR?"

Response: GR 1030

(3) Querying the RDS Data Length (NR1)

≪Example 76≫ "LN?"

Response: LN 12

(4) Querying the Group Address Data (NR1)

≪Example 77≫ "AD?"

Response: AD 0, 1, 2, 3, 4, 5, 65535

Address end mark

(5) Querying the Group RDS Data (ASCII, hexadecimal data)

≪Example 78≫ "DA?"

Response:

DA #C201, #026D, #H0000, #H0198, #HE700, #H0243, #H5244, #H028A

(6) Querying the EON Address Data (NR1)

≪Example 79≫ "ES?"

Response: ES 511

(7) Querying the Direct RDS Data (ASCII, hexadecimal data)

≪Example 80≫ "WI3;DI?"

Response: " DI #C201, #026D, #H0000, #H0198, #HE700, #H0243, #H5244, #H028A
, #C201, #026D, #H0001, #H0021, #H2244, #H0015, #H5320, #H03FB
, #C201, #026D, #H0002, #H02EA, #H6688, #H0105, #H5445, #H01FB "

" #C201, #026D, #H0003, #H0353, #HAACC, #H0056, #H5354, #H01E9
, #C201, #026D, #H4001, #H02C6, #H7402, #H0329, #HC880, #H0013
, #FFFF, #FFFF "

Direct RDS data end mark

- Data is received in groups of 8 data.
- At the end of data, if the first data a group is #HFFFF, #HFFFF, this is taken as the data end mark.
- The number of data included in one statement will depend upor the "WI" command. (For example, for "WI3" 3 group RDS data are sent.)

(8) Querying the Direct EON data (NR1)

≪Example 81≫ "DE?"

Response:

" DE #C201, #026D, #H0000, #H0198, #HE700, #H0243, #H5244, #H028A"

11.6.3 GPIB and RDS Data Query Commands

- There are two methods available of querying RDS data via the GPIB.

  (a) Separate querying of group address data and group RDS data as stored in ROM memory.

  (b) Querying of the actually sent data.

(a) Method of Separately Querying the Group Address Data and Group RDS Data

(1) Group Address Data Query

GPIB command: ADdress?

Example: Using the PC-9801 with N88BASIC

Program:

```
10  ADDR=1
20  DIM  DT$ (256)
30  PRINT  @ADDR;"RP  1;WI  10;LN?"
40  LINE  INPUT  @ADDR;MAX$
50  MAX=VAL (MAX$)
60  *RDS. LOOP
70  PRINT  @ADDR;"AD?"
80  FOR  I  =  1  TO  INT ((MAX+1) /10)
90  LINE  INPUT  @ADDR;DT$ (I)
100  PRINT  DT$ (I)
110  NEXT  I
120  END
```

RP 1 — Selects RDS pattern 1

WI 10 — Number of data in one statement

LN? — Check of no. of data

AD? — GROUP ADDRESS DATA request

Results of execution:

```
DT$ (1) =XXXX, XXXX, XXXX ·····, XXXX
DT$ (2) =XXXX, XXXX, XXXX, ·····, XXXX
DT$ (X) =XXXX, XXXX, 65535
```

DT$ (1) — GROUP RDS DATA number

XXXX, XXXX, XXXX ····· — 10 data

XXXX, XXXX, 65535 — MAX-th data

65535 — Data end mark (#HFFFF)

(2) Group RDS Data Query

GPIB command: DA?

Example: Using the PC-9801 with N88BASIC

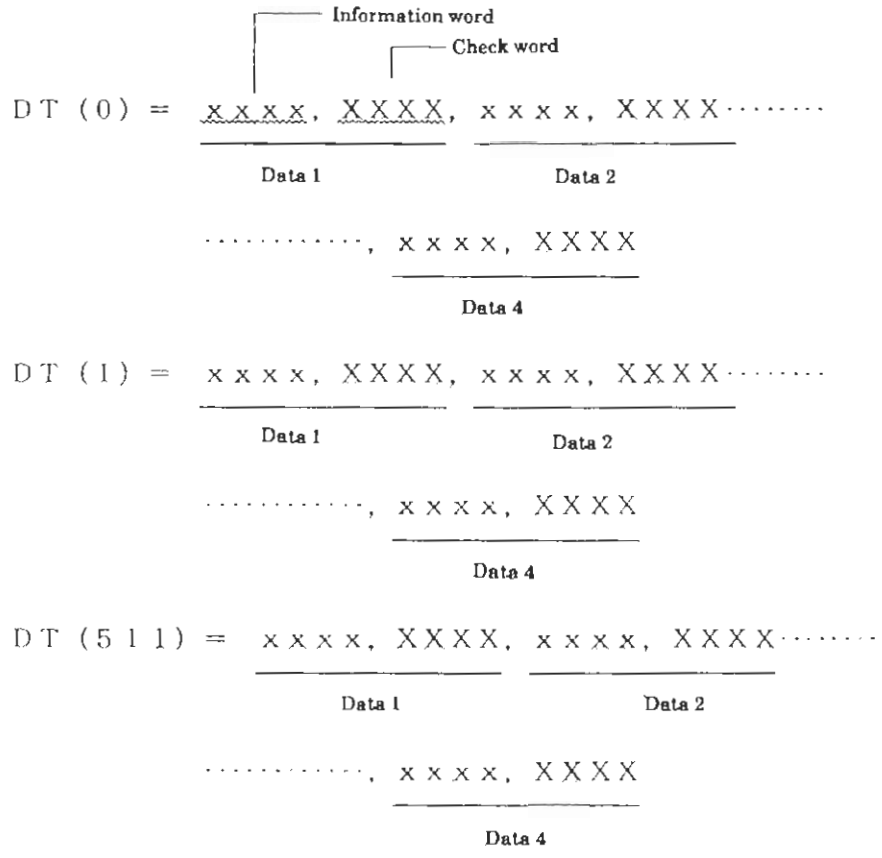
Program:

```
10  ADDR=1
20  DIM DT$(512)
30  FOR I=0 TO 511
40  PRINT @ADDR;"GR"+STR$(I)+";DA?"
50  LINE INPUT @ADDR;DT$(I)
60  PRINT DT$
70  NEXT I
```

GROUP RDS DATA request

RDS data number setting

Results of execution:



(b) Query of Actually Sent RDS Data

GPIB command: DI?

Example: Using the PC-9801 with N88BASIC

Program:

```
10  ADDR=1
20  DIM DT$(256)
30  PRINT @ADDR;"RP 1;WD 2;LN?"
40  LINE INPUT @ADDR;MAX$
50  MAX=VAL(MAX$)
60  *RDS.LOOP
70  PRINT @ADDR;"DI?"
80  FOR I = 1 TO INT((MAX+1)/2)
90  LINE INPUT @ADDR:DT$(I)
100 PRINT DT$(I)
110 NEXT I
120 END
```

RP 1 — RDS pattern setting

WD 2 — Number of data in one statement

LN? — Check of data length

DI? — Direct data request

Results of execution:

DT(1) = xxxx, XXXX, xxxx, XXXX·····xxxx, XXXX
1st data

xxxx, XXXX, xxxx, XXXX·····xxxx, XXXX
2nd data

DT(2) = xxxx, XXXX, xxxx, XXXX·····xxxx, XXXX
3rd data

xxxx, XXXX, xxxx, XXXX·····xxxx, XXXX
4th data

.
.
.
.
.
.
.

DT(X) = #HFFFF, #HFFFF
Data end mark

11.7 Status Byte Register

11.7.1 Status Byte Register Contents

To read the contents of the status byte register, either use the IEEE 488.2 common command "*STB?" or perform a serial poll.

Table 11-6

Bit	Name	Meaning
7		Not used.
6	RQS or MSS	IEEE 488.2 master status summary bit
5	ESB	IEEE 488.2 standard event status register summary bit
4	MAV	IEEE 488.2 output queue summary bit
3 2 1		Not used.
0	ESB	Error status summary bit

- RQS/MSS summary bit

  Bit 6 of the status register has two meanings, which depend upon the method of access.

  (1) RQS bit

  When access is performed by means of a serial poll, this bit indicates to the controller that the Model 3217 has driven the service request control line *true*. This bit is cleared when the controller completes the serial poll.

  (2) MSS bit

  When access is performed by means of the common IEEE 488.2 "*STB?" command, this bit indicates that the Model 3217 has a reason to issue a service request.

  In contrast to the RQS bit, the MSS bit is not cleared at the completion of the serial poll, and therefor always indicates the latest status.

- MAV summary bit

  This bit indicates that there is character string data in the output waiting buffer of the Model 3217 which can be output. By specifying the Model 3217 as a talker, it is possible to read out the character string data from the output wait buffer.

- Error status summary bit

  This indicates that a unique Model 3217 error has occurred.

11.7.2 Service Request Enable Register

This is an 16-bit register which sets the summary bit corresponding to the status byte register, as specified in IEEE 488.2.

When the service request enable bit is "1", a service request is issued by the Model 3217 to the controller when the bits of the status byte register indicate that an SRQ factor has occurred.

The service request enable register is set by the common IEEE 488.2 "*SRE" command, and can be read out by the common "*SRE?" command.

Note that bit 6 is not used.

This register is cleared when the power to the Model 3217 is switched on, and when the common IEEE 488.2 command "*CLS" is issued.

11.7.3 Standard Event Status Register

Table 11-7

Bit	Name	Meaning
15 to 8		Not used.
7	PON (power on)	Set to 1 when power is switched on.
6	URQ (user request)	(Does not occur with the Model 3217.)
5	CME (command error)	Header could not be interpreted. IEEE 488.2 syntax error (e.g., numerical expression format)
4	EXE (execution error)	Range or mode error.
3	DDE (device dependent error)	(Does not occur with the Model 3217.)
2	QYE (query error)	Output queue is empty or a queue overflow has occurred.
1	RQC (request control)	(Does not occur with the Model 3217.)
0	OPC (operation complete)	Set to 1 when command execution is completed.

These are read out by the common IEEE 488.2 command "*ESR?".

11.7.4 Standard Event Status Enable Register

The ESB summary bit is set (made true) by the logic sum of the standard event status register bits 16 bits).

This is set by the common IEEE 488.2 "*ESE" command, and can be read out by the common "*ESE?" query command.

11.7.5 Error Status Register

This is a register that is unique to the Model 3217, and is used to indicate an error condition which could occur, for example, when improper GPIB command data is encountered.

It is read out either by the "*ERR?" query command, and is cleared simultaneously with this query operation.

Table 11-8 Error Status Register

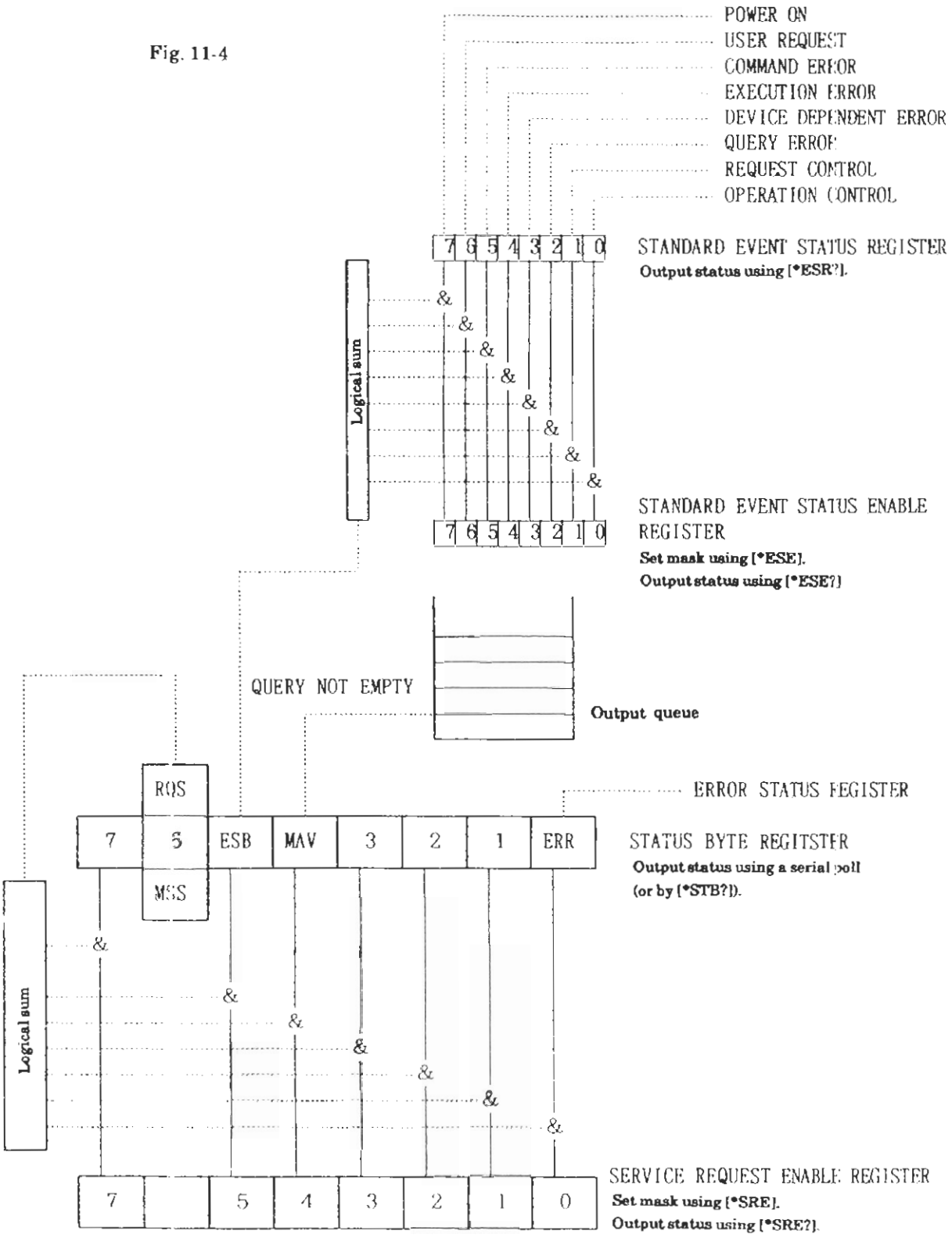
Bit	Name	Meaning and Examples of Errors
15 to 11		Not used.
10	Other data error	Error than types listed below.
9	(FM) total data error	• MU (FM = 99.9 kHz) Attempt to increase FM deviation from 99.9 kHz.
8	(FM) RDS data error	• RM 11KHz (RDS maximum modulation: 7.5 kHz)
7	(FM) TRI data error	• KT8.8KHz (TRI maximum modulation: 7.5 kHz)
6	(FM) Pilot data error	• PM10.1KHz (Pilot maximum modulation: 10.0 kHz)
5	(FM) MAIN data error	• FM100KHz (FM maximum modulation: 99.9 kHz)
4	AM modulation error	• AM61PCT (Frequency: 100 MHz) (Maximum AM modulation = 80% for 500 kHz to 1799 kHz only)
3	SPECIAL data error	• SP35 (Special 30s commands up to 33 only)
2	Preset data error	• ST5 (begin address: 10) (Storage outside range bounded by begin and end addresses)
1	Output data error	• LU150DBU (Maximum output range: −20 to 126 dBμ)
0	Frequency data error	• FR1000MHz • FU (when frequency = 140 MHz)

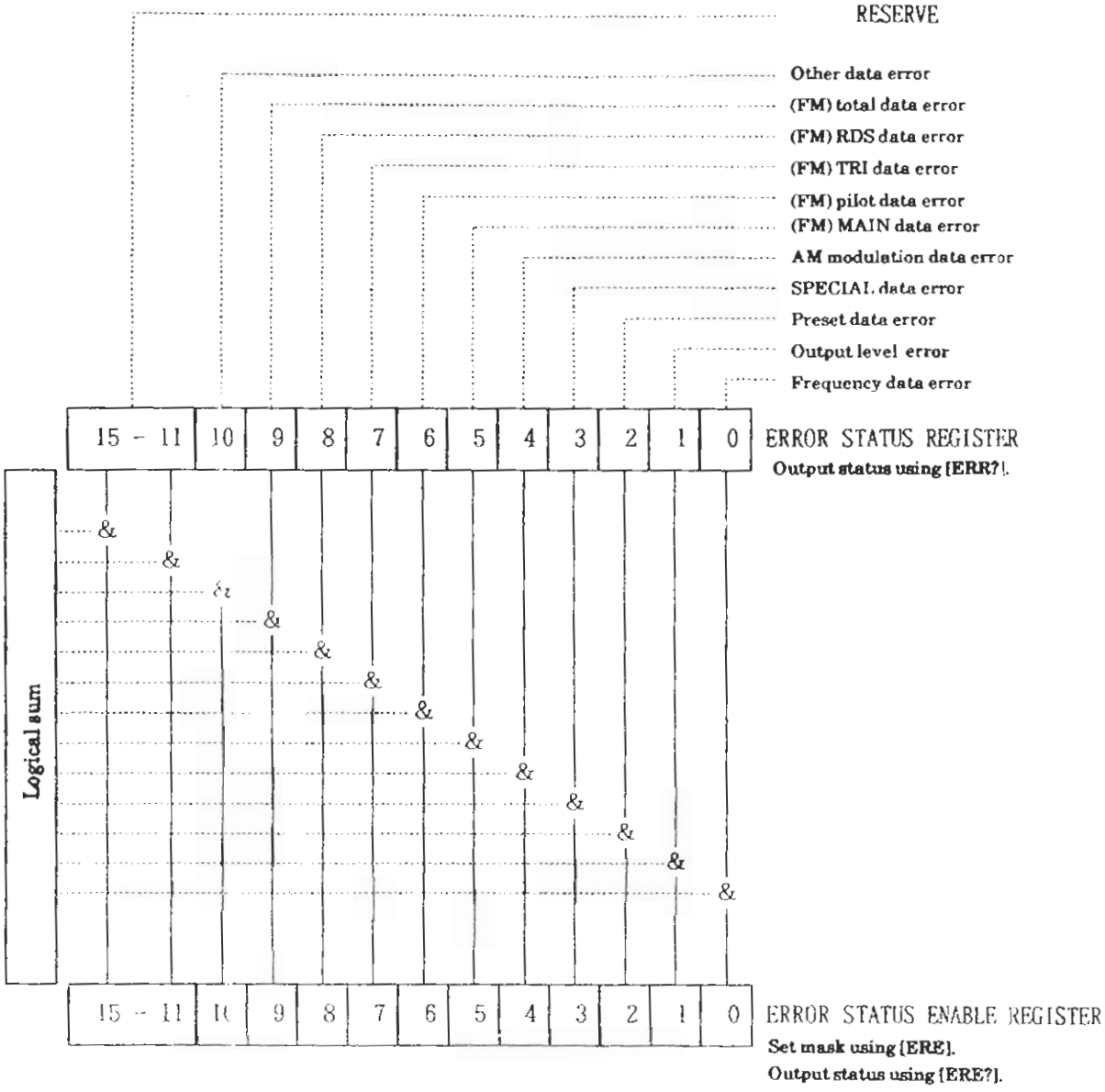
11.7.6 Error Status Enable Register

The ESB summary bit is set (made true) by the logical sum of the bits of the error status register. This can be set by the "ERE" command and queried by the "ERE?" query command.

11.7.7 Status Register Architecture

Fig. 11-4




RESERVE
Other data error
(FM) total data error
(FM) RDS data error
(FM) TRI data error
(FM) pilot data error
(FM) MAIN data error
AM modulation data error
SPECIAL data error
Preset data error
Output level error
Frequency data error
15 - 11
10
9
8
7
6
5
4
3
2
1
0
ERROR STATUS REGISTER
Output status using [ERR?].
Logical sum
&
ERROR STATUS ENABLE REGISTER
Set mask using [ERE].
Output status using [ERE?].

11.8 IEEE 488.2 Common Commands and Queries

Of the control and query commands (e.g., checking for the existence of data) sent from the controller to various equipment, there are a group of commands, known as *common commands*, which are not equipment specific. These are shown in Table 11-9.

Table 11-9 Common Commands and Queries

System Data Commands and Queries	
*IDN?	Equipment ID e.g., (manufacturer, model)
Internal Operation Commands and Queries	
*RST	Equipment initialization
*TST?	Query of self test results
Syncing Commands and Queries	
*OPC	Set the LSB of SESR (bit 0) after all currently executing operations are completed.
*OPC?	Respond with an ASCII "1" after all currently executing operations are completed.
*WAI	Execute the command following *WAI after all currently executing operations are completed.
Status and Event Control Commands and Queries	
*CLS	Clear status byte and related queues (with the exception of the output queue).
*ESE	Write into the standard event status enable register.
*ESE?	Read out the standard event status enable register.
*ESR?	Read out the standard event status register.
*SRE	Write into the service request enable register.
*SRE?	Read out the service request enable register.
*STB?	Read out the status byte and MSS bit without executing a serial poll.
*RCL	Recall panel conditions from memory address.
*SAV	Save panel conditions to memory address.

1. *IDN? (Identification Query)

This reads out the manufacturer and model of the equipment.

Response: "LEADER_CORP, MODEL_3217, 0, V1.0"

①: Manufacturer's name

②: Model number

③: 0

④: Software version

2 *RST (Reset Command)

This command resets the equipment to the condition it is when power is applied, with frequency, output level and other data being cleared to the initialized values. The GPIB status remains unchanged, however.

- RF frequency: 90.000 MHz
- Output level: +80.0 dBμ
- FM deviation: 65.5 kHz
- FM modulation: On
- Pilot deviation: 7.5 kHz
- Pilot modulation: On
- AM modulation: 30%
- AM modulation: ON
- AF modulation: On
- Internal modulation: On (internal modulation frequency: 30 Hz)
- Stereo mode MAIN
- TRI
  - EBU system
  - (EBU)
    - SK modulation off
    - SK deviation: 3.5 kHz
    - DK modulation on
    - DK modulation: 30%
    - BK modulation on
    - BK modulation: 60%
    - BK code: A
  - (USA)
    - 57-kHz modulation off
    - 57-kHz deviation: 3.5 kHz
    - ME modulation on
    - ME modulation: 60%
    - ZO modulation on
    - ZO modulation: 30%
    - ZO code: 1
- RDS modulation: On
- RDS deviation: 2.0 kHz
- RDS pattern: 0
- Special modulation: Off (SP20)
- SCA modulation: Off (SP60) (Option)
- Pre-emphasis: Off (SP30)
- Recall: Off
- Store: Off
- Begin address: 0
- End address: 99
- Current address: 0
- Function mode: FREQ (kHz)
- MOD display: FM (kHz)

- TRI/RDS display: RDS pattern
- Digit cursor: Lowest digit of frequency
- Preset: A: 30 dBμ, B: −20 dBμ

3. *TST? (Self-Test Query) (NR1)

   This outputs the results of the self test (RAM write test).

   0: OK

   1: Problem detected

4. *OPC (Operation Complete Command)

   This command sets bit 0 (OPC) of the standard event status register to 1 each time an operation such as frequency setting is completed (0, 1).

5. *OPC? (Operation Complete Query) (NR1)

   This command outputs the status of bit 0 of the standard event status register.

6. *WAI (Wait-to-Continue Command)

   This command causes execution of the command following the *WAI command after the currently executing operation is completed.

7. *CLS (Clear Status Command)

   This command clears all bits of the status byte, the event status register, and the event status enable register.

8. *ESE (Standard Event Status Enable Command)

   This command enables the standard event status register (0 to 0FFH).

   0: Masked (initialized value)

9. *ESE? (Standard Event Status Enable Query) (NR1)

   This command outputs the contents of the standard event status register.

10 *ESR? (Standard Event Status Register Query) (NR1)

   This command outputs the contents of the standard event status register, clearing the contents as output is performed.

11 *SRE (Service Request Enable Command)

   This command enables a service request (0 to 0FFH).

   (Initialized value: 0)

12. *SRE? (Service Request Enable Query) (NR1)

   This command outputs the contents of the service request enable register.

13. *STB? (Read Status Byte Query) (NR1)

   This command outputs the contents of the status byte register.

14. *RCL (Recall)

   This command recalls panel conditions from a memory address (0 to 99).

15. *SAV (Save)

   This command saves panel conditions to a memory address (0 to 99).

11.9 General Model 3217 Commands and Queries

Of the control and query commands (e.g., checking for the existence of data) sent from the controller to various equipment, there are a group of commands, known as *general Model 3217 commands and queries*, which are specific to the functions of the Model 3217. These are shown in Table 11-10.

Table 11-10 Model 3217 General Commands and Queries

ERE	Write into the error status enable register.
ERE?	Read from the error status enable register.
ERR?	Read from the error status register.
ND	Clear the output queue.
HEADER	Set the header to on or off.

1. ERE (Error Status Enable Command)

   This command enables the error status.

2. ERE? (Error Status Enable Query) (NR1)

   This command outputs the contents of the error status enable register, clearing the contents as output is performed.

3. ERR? (Error Status Register Query) (NR1)

   This command outputs the contents of the error status register.

4. ND (New Data)

   This command clears the output queue, enabling the newest data to be output after the next query command.

5. HEader

   This command establishes whether or not a header is to be added to the response to a query command.

   "HE 0": Header off

   "HE 1": Header on

11.10 GPIB Command Hierarchal Structure

The Model 3217 can be set via the GPIB using either of the following two methods.

① Settings by means of direct command codes (commands enclosed in square brackets, [ ], in the GPIB hierarchal diagrams).

Settings made by means of direct commands enable a small number of characters making up the commands enclosed in square brackets and data values to be used in making settings.

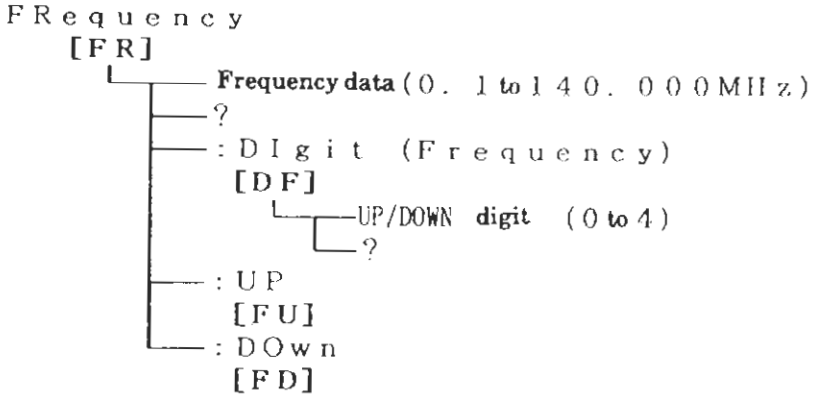
② Settings using the hierarchal structure (commands above the square brackets, [ ], in the GPIB hierarchal diagrams).

Settings made using the hierarchal structure use commands that are made up of characters contained in the meaning of the commands, thus aiding in achieving a structured understanding of command groups.

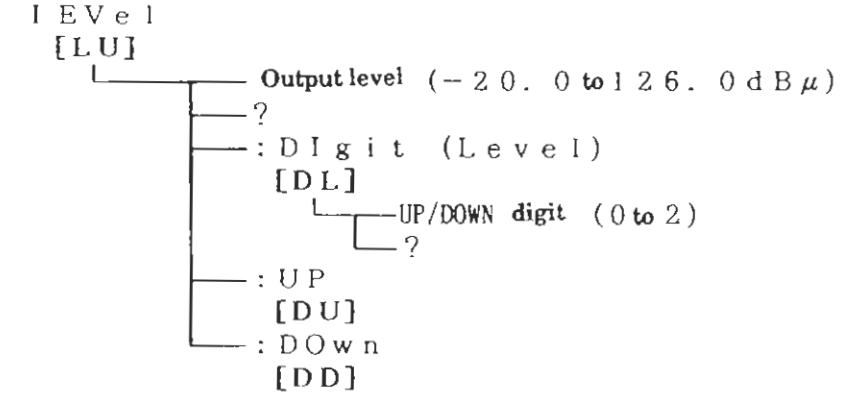
≪Example≫	Direct commands	Hierarchal commands
① RF frequency shift up	FU	FREQ:UP
② AM modulation level up	AU	MOD:AM:UP
③ SK modulation level setting	UT 4.5KHZ	MOD:DEV:TRI:SK:DEV 4.5KHZ
④ DK modulation level setting	DK 20PCT	MOD:DEV:TRI:DK:DEP 20PCT

Hierarchal commands are set by the character strings shown in the following sections, in which the upper-case portion of the commands indicate the shorten forms of commands, which is the minimum usable length of the command.

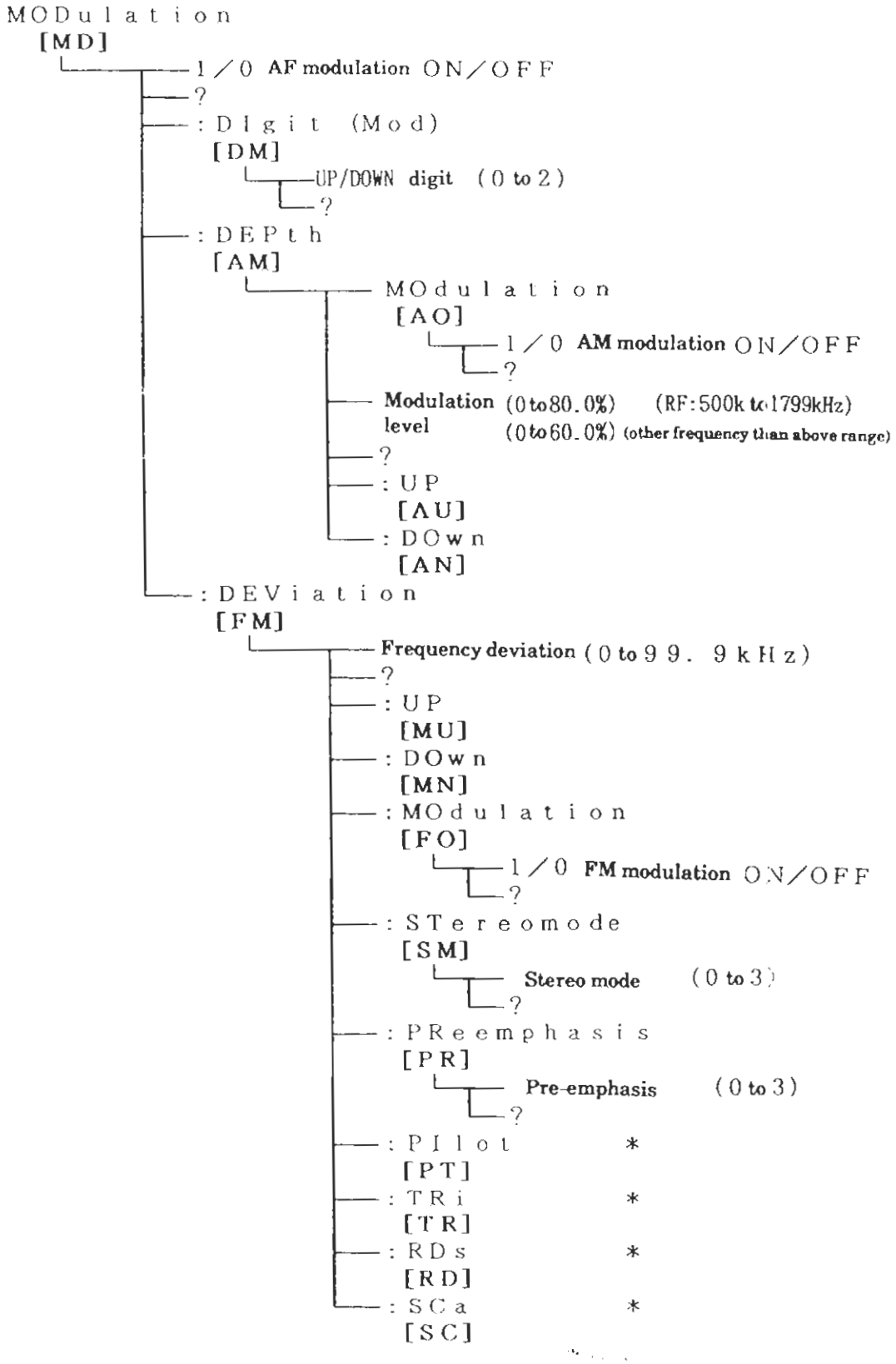
11.10.1 RF Frequency



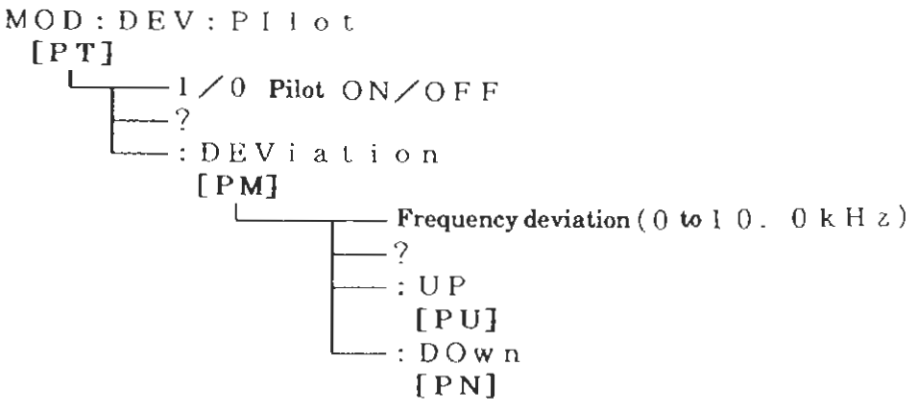
11.10.2 Output Level



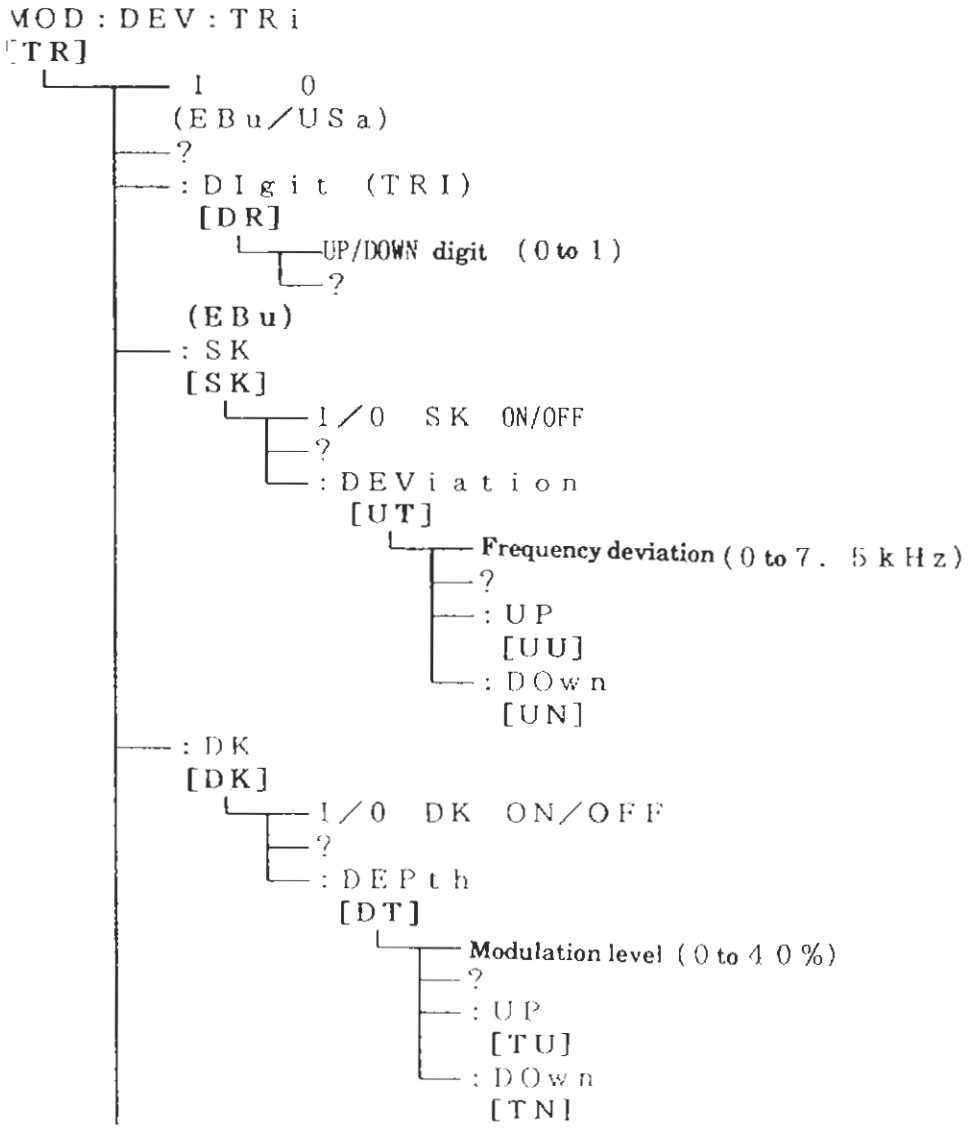
11.10.3 Modulation

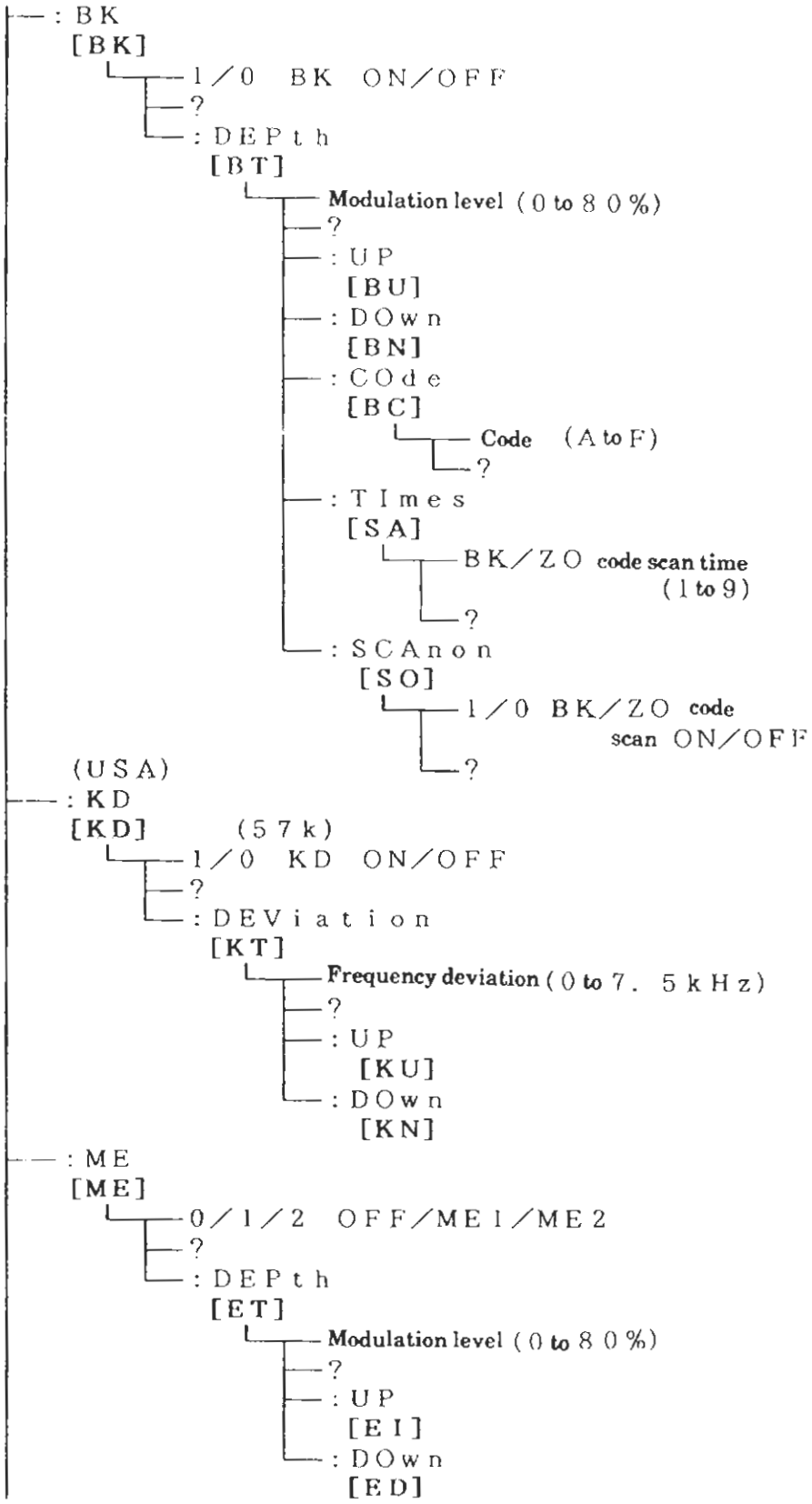


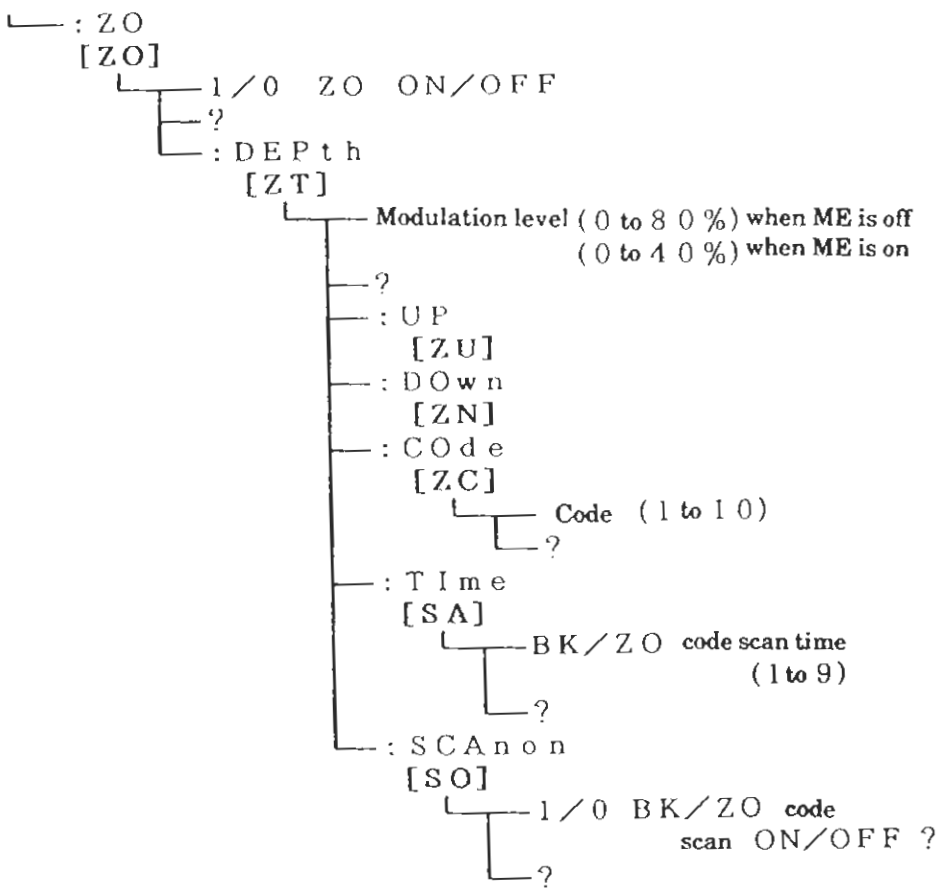
11.10.4 Pilot Modulation



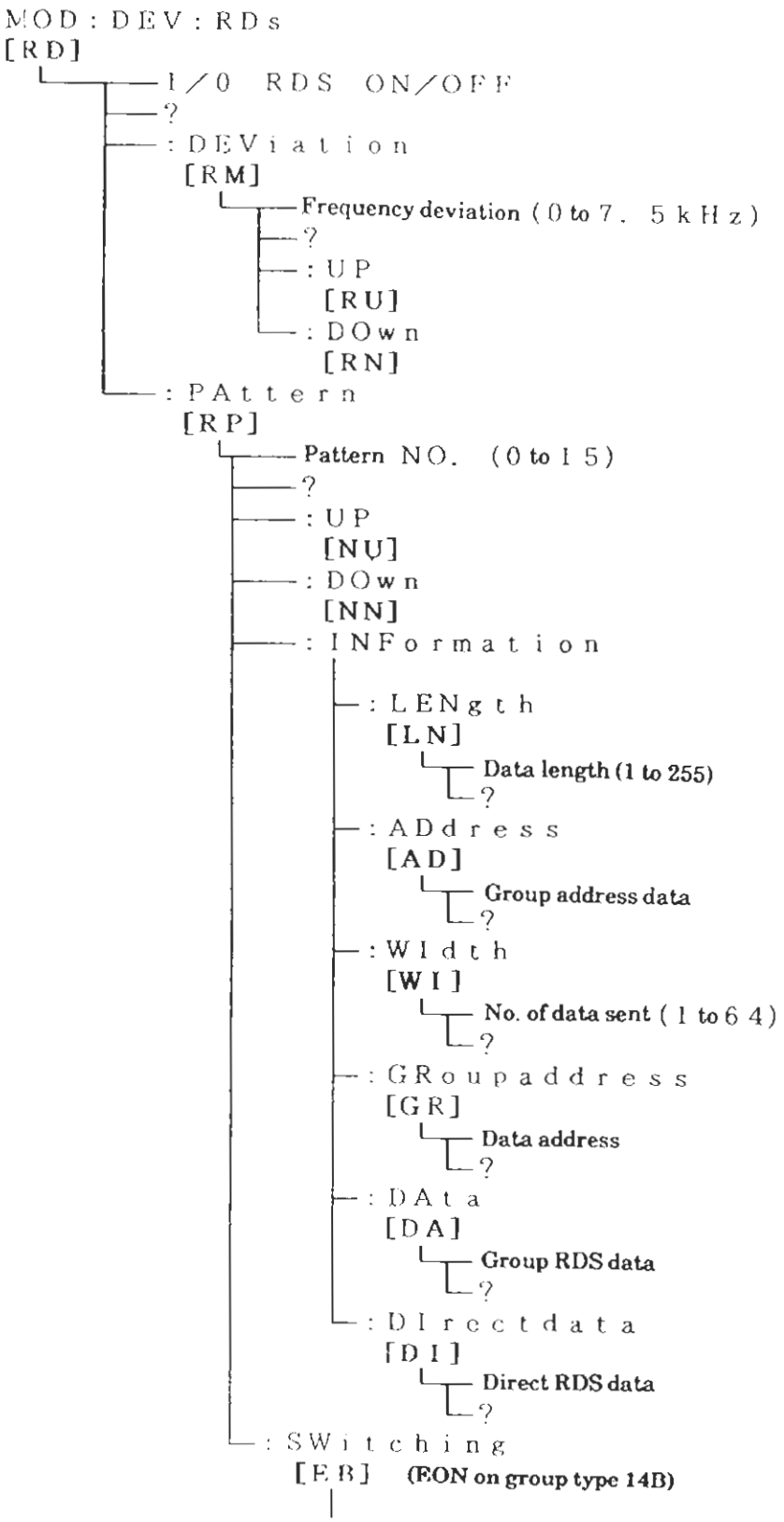
11.10.5 TFI

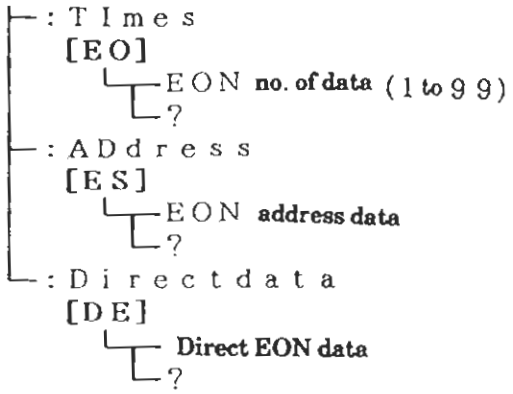



:BK
[BK]
1/0 BK ON/OFF
?
:DEPth
[BT]
Modulation level (0 to 80%)
?
:UP
[BU]
:DOwn
[BN]
:COde
[BC]
Code (A to F)
?
:TImes
[SA]
BK/ZO code scan time
(1 to 9)
?
:SCAnon
[SO]
1/0 BK/ZO code
scan ON/OFF
?
(USA)
:KD
[KD] (57k)
1/0 KD ON/OFF
?
:DEViation
[KT]
Frequency deviation (0 to 7.5kHz)
?
:UP
[KU]
:DOwn
[KN]
:ME
[ME]
0/1/2 OFF/ME1/ME2
?
:DEPth
[ET]
Modulation level (0 to 80%)
?
:UP
[EI]
:DOwn
[ED]


: ZO
[ZO]
1/0 ZO ON/OFF
?
: DEPth
[ZT]
Modulation level (0 to 80%) when ME is off
(0 to 40%) when ME is on
?
: UP
[ZU]
: DOwn
[ZN]
: COde
[ZC]
Code (1 to 10)
?
: TIme
[SA]
BK/ZO code scan time
(1 to 9)
?
: SCAnon
[SO]
1/0 BK/ZO code
scan ON/OFF ?
?

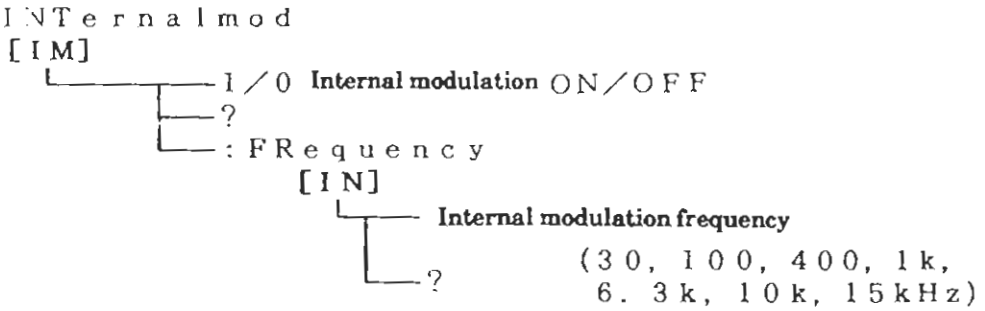
11.10.6 RDS


MOD:DEV:RDs
[RD]
I/O RDS ON/OFF
?
:DEViation
[RM]
Frequency deviation (0 to 7.5kHz)
?
:UP
[RU]
:DOwn
[RN]
:PAttern
[RP]
Pattern NO. (0 to 15)
?
:UP
[NU]
:DOwn
[NN]
:INFormation
:LENgth
[LN]
Data length (1 to 255)
?
:ADdress
[AD]
Group address data
?
:WIdth
[WI]
No. of data sent (1 to 64)
?
:GRoupaddress
[GR]
Data address
?
:DAta
[DA]
Group RDS data
?
:DIrectdata
[DI]
Direct RDS data
?
:SWitching
[EB] (EON on group type 14B)

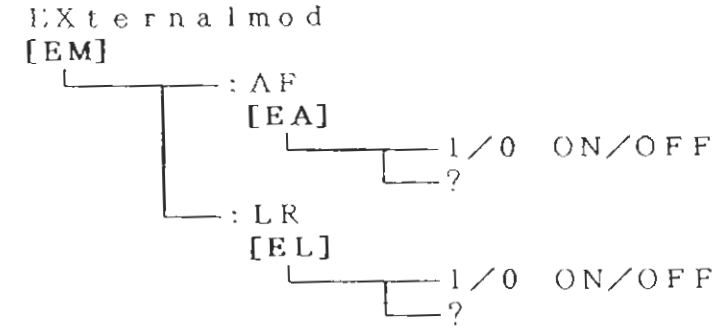


11.10.7 SCA Modulation (Option)

11.10.8 Internal Modulation



11.10.9 External Modulation



11.10.10 SPECIAL

SPecial
[SP]

- Special codes
  - ? (All data)
  - 01? (Begin address)
  - 02? (End address)
  - 1? (0 = Δ off, 1 = ΔF, 2 = ΔL)
  - 11? (ΔF frequency step size)
  - 12? (ΔL level step size)
  - 2? (Special modulation) 20 to 26
  - 3? (Pre-emphasis) 30 to 33
  - 4? (RDS special data) 40 to 49
  - 51? (BK/ZO code scan time)
  - 6? (SCA 0 = Off, 1 = On) (Option)
  - 8? (EON link mode)
  - 91? (Number of EON data)

11.10.11 Preset

STore
[ST]

- Store address (0 to 99)
  - ?

RECall
[RC]

- Recall address (0 to 99)
  - ?
  - UP
    [LI] Address UP & RECALL
  - DOwn
    [LD] Address DOWN & RECALL

BEginaddress
[BE]

- Begin address (0 to 99)
  - ?

ENdaddress
[EN]

- End address (0 to 99)
  - ?

11.11 Sample Programs

11.11.1 Sample Program 1

- Direct mode ("DI" command) RDS data setting
- Personal computer: NEC PC-9801 with N88BASIC + PC-9801-29N (GPIB board)

```
10  '
20  '*************************************
30  '*                                   *
40  '*     Model 3217 GPIB Sample Program *
50  '*                                   *
60  '*          No. 1 RDS Data Set       *
70  '*                                   *
80  '*************************************
90  '
100 '----------  INITIAL SET ----------
110 CONSOLE 0,24:CLS
120 DIM RDSDI$(512,8)
130 SG=1                                    'Model 3217 GPIB address (Note 1)
140 ISET IFC                                'Interface clear
150 ISET REN                                'Remote enable
160 WBYTE &H14;                             'Device clear (Note 2)
170 '
180 '
190 '-----------  MAIN ROUTINE  -----------
200 '
210 PRINT @SG;"SP000;FR 95.8MHZ;LU 70DBU;MD 1;FO 1;PT 1;IN 1KHZ;SP72;TR 1;RD1;SP43;RP 0"
220 '                  SP000          Clear all special functions ( Note 3 )
230 '                  FR 95.8MHZ     Frequency: 95.8 MHz
240 '                  LU 70DBU       Output level: 70 dBμ
250 '                  MD 1           Modulation on
260 '                  FO 1           FM modulation selected
270 '                  PT 1           Pilot on
280 '                  IN 1KHZ        Internal modulation: 1 kHz
290 '                  SP72           SP72 preset
300 '                  TR 1           EBU system TRI selected
310 '                  RD 0           RDS off (until data is set)
320 '                  SP43           RDS GPIB mode selected
330 '                  RP 0           RDS pattern 0
340 '
350 GOSUB *RDSDI                            'Send RDS data (Note 4)
360 '
370 GOSUB *RDSEON                           Send EON data (Note 5)
380 '
390 PRINT @SG;"RD 1"                        RDS on (Note 6)
400 '
410 CLS
420 PRINT "Press Q to send EON data"
430 PRINT "Press E to end program"
440 '
450 *KINP.WAIT
460       K$=INKEY$                                                    Note 7
470       IF K$ = "Q" THEN PRINT @SG;"EB"   'Pressing Q sends EON data.
480       IF K$ <> "E" THEN *KINP.WAIT      'Pressing E ends the program.
490 END
500 '
```

```
510 '
520 '-------------------------------------------------------
530 ' * *     D I R E C T   G R O U P   R D S   D A T A     * *
540 ' * *          RDS Data Setting Using the Direct Mode          * *
550 '-------------------------------------------------------
560 '
570 '-------------  GROUP RDS DATA SEND  -------------
580 *RDSDI
590 '
600 ' * * *   Read sample data.                                          Note 8
610 '
620 RESTORE *GROUPRDS
630 IMAX=0
640 *RDSDILOOP
650 FOR I=0 TO 7
660     READ RDSDI$(IMAX,I)
670 NEXT I
680 IMAX=IMAX+1
690 IF RDSDI$(IMAX-1,1) <> "#HFFFF" THEN *RDSDILOOP
700 '
710 IMAX=IMAX-1                 'Number of data to be sent                Note 9
720 '
730 ' * *   Send 1st data
740 '                                                                     Note 10
750 RDSDT$ ="DI "+RDSDI$(0,0)                        'Header + 1st data
760    FOR J=1 TO 7
770         RDSDT$ = RDSDT$+","+RDSDI$(0,J)    '
780    NEXT J
790 PRINT @SG;RDSDT$
800 PRINT RDSDT$
810 '
810 ' * *   Send n-th data.                                              Note 11
820 '
830    FOR I=1 TO IMAX-1
840         RDSDT$=RDSDI$(I,0)
850              FOR J=1 TO 7
860                   RDSDT$=RDSDT$+RDSDI$(I,J)
870              NEXT J
880        PRINT @SG;RDSDT$
890        PRINT RDSDT$
900    NEXT I
910 '
920 ' * *     Send RDS data end mark.                                    Note 12
930 '
940 PRINT @SG;"#HFFFF,#HFFFF"
950 PRINT "#HFFFF,#HFFFF"
960 RETURN
970 '
```

```
980 '-------------------------------------------------
990 '**       EON  GROUP  RDS  DATA       **
1000 '**       Sending EON Data Using the Direct Mode     **
1010 '-------------------------------------------------
1020 '
1030 '----------  DIRECT EON DATA SEND ----------
1040 *RDSEON
1050 '
1060 '**    Read sample data.
1070 '
1080 RESTORE *GROUPEONDATA                                          Note 13
1090 FOR I=0 TO 7
1100     READ RDSDT$(I)
1110 NEXT I
1120 '
1130 '**    Send EON data.                                          Note 14
1140 '
1150   RDSDT$="0E "+RDSDT$(0)
1160       FOR J=1 TO 7
1170           RDSDT$=RDSDT$+RDSDT$(J)        'Generate character string to be sent.
1180       NEXT J
1190 '
1200   PRINT @SC;RDSDT$                        'Send data.
1210   PRINT RDSDT$                            'Send data.
1220 RETURN
1230 '
5000 '*************************
5010 '**          Group RDS Data Table          **
5020 '*************************
5030 *GROUPRDS                                                      Note 15
5040 DATA #HC201,#H26D,#H0030,#H0E0,#HE705,#H0A7,#H2052,#H2E1
5050 DATA #HC201,#H26D,#H0031,#H159,#H0710,#H0C3,#H6164,#H18D
5060 DATA #HC201,#H26D,#H0032,#H392,#H4653,#H004,#H696F,#H31C
5070 DATA #HC201,#H26D,#H0033,#H22B,#HB8AD,#H06C,#H3120,#H308
5080 DATA #HC201,#H26D,#HE030,#H1DF,#H2052,#H23D,#HC202,#H1EE
5090 DATA #HC201,#H26D,#HE031,#H066,#H6164,#H151,#HC202,#H1EE
5100 DATA #HC201,#H26D,#HE032,#H2AD,#H696F,#H3C0,#HC202,#H1EE
5110 DATA #HC201,#H26D,#HE033,#H314,#H3220,#H2B3,#HC202,#H1EE
5120 DATA #HC201,#H26D,#HE034,#H282,#HE4CD,#H299,#HC202,#H1EE
5130 DATA #HC201,#H26D,#HE035,#H33B,#H5330,#H268,#HC202,#H1EE
5140 '
5150 DATA #HC201,#H26D,#HE036,#H1F0,#H5316,#H270,#HC202,#H1EE
5160 DATA #HC201,#H26D,#HE037,#H049,#H533B,#H150,#HC202,#H1EE
5170 DATA #HC201,#H26D,#HE038,#H2DC,#H5398,#H132,#HC202,#H1EE
5180 DATA #HC201,#H26D,#HE039,#H365,#H53CD,#H05E,#HC202,#H1EE
5190 DATA #HC201,#H26D,#HE03A,#H1AE,#H0C00,#H168,#HC202,#H1EE
5200 DATA #HC201,#H26D,#HE03B,#H017,#H0C00,#H168,#HC202,#H1EE
5210 DATA #HC201,#H26D,#HE03C,#H181,#HCCE0,#H14F,#HC202,#H1EE
5220 DATA #HC201,#H26D,#HE03D,#H038,#H0800,#H231,#HC202,#H1EE
5230 DATA #HC201,#H26D,#HE03E,#H2F3,#H0800,#H231,#HC202,#H1EE
5240 DATA #HC201,#H26D,#HE03F,#H34A,#H0C00,#H168,#HC202,#H1EE
5250 DATA #HFFFF,#HFFFF,#HFFFF,#HFFFF,#HFFFF,#HFFFF,#HFFFF,#HFFFF
5260 '
5270 '
5280 '*************************
5290 '**          EON Group RDS Data Table          **
5300 '*************************
5310 *GROUPEONDATA
5320 DATA #HC201,#H26D,#HE838,#H185,#HC201,#H1C1,#HC202,#H1EE       Note 16
```

- Program Notes

Note 1 Line 130
Set the Model 3217 GPIB address to 1 (settable range 0 to 30).

Note 2 Line 160
Clear the output queue buffer by means of the device clear.

Note 3 Line 210
Make parameter settings necessary for RDS operation.
In GPIB mode RDS operation, because the RDS data before settings are made are uncertain, data is set using"RD 0" (RDS off).
Because the data setting by means of the "DI" command can only be used for the GPIB mode pattern 0, the "SP43" command (RDS GPIB mode selection) and "PA 0" command (pattern 0 selection) are sent.

Note 4 Line 350
Call the RDS data sending subroutine.

Note 5 Line 370
Call the EON data sending subroutine.

Note 6 Line 390
Because the RDS/EON data sending is completed, RDS is set to on.

Note 7 Lines 450 to 490
When the Q key of the personal computer keyboard is pressed, the EON output command is sent. When the "E" key is pressed, the program is stopped.

Note 8 Lines 600 to 690
Read the RDS data of lines 5000 to 5250 is read into the RDSDI$(I, J) array variable. When this is done, the number of sent data is established by the value of IMAX.

Note 9 Line 710
Set the number of data to be sent.

Note 10 Lines 730 to 800
Send one group of RDS data with a direct data command, appending a header to the data.

Note 11 Lines 810 to 900
Send RDS data from the 2nd group on a group at a time in sequence. (In N88BASIC, because the maximum length of a character string is 255 characters, data is sent in groups.)

Note 12 Lines 920 to 950
Send the direct RDS data end mark.

Note 13 Lines 1080 to 1110
Read in the EON send data at line 5320.

Note 14 Lines 1130 to 1210
Use the "DE" command to send direct EON data.

Note 15 Lines 5030 to 5250
RDS data to be sent.

Note 16 Line 5320
EON data to be sent.

11.11.2 Sample Program 2

- RDS data setting of group address data ("AD" command), EON address data ("ES" command), and group RDS data ("DA" command)
- Personal computer: NEC PC-9801 with N88BASIC + PC-9801-29N (GPIB board)

```
10  '*************************************
20  '*                                   *
30  '*      Model 3217 GPIB Sample Program *
40  '*                                   *
50  '*        No. 2 RDS Data Set         *
60  '*                                   *
70  '*  Setting Group Address Data and Group RDS Data *
80  '*************************************
90  '
100 '----------  INITIAL SET  ----------
110 CONSOLE 0,24:CLS
120 DIM RDSDT$(512,8),RDSAD(15,256),EONAD(15),IMAX(16)
130 SG=2                                    'Model 3217 GPIB address
140 ISET IFC                                'Interface clear
150 ISET REN                                'Remote enable
160 WBYTE &H14;                             'Device clear
170 '
180 '
190 '----------  MAIN ROUTINE  ----------
200 '
210 PRINT @SG;"SP000;FR 95.8MHZ;LU 70DBU;MD 1;FO 1;PT 1;IN 1KHZ;SP72;TR 1;RD1;SP43"
220 '                 SP000       Clear all special functions                    Note 1
230 '                 FR 95.8MHZ  Frequency: 95.8 MHz
240 '                 LU 70DBU    Output level: 70 dBμ
250 '                 MD 1        Modulation on
260 '                 FO 1        FM modulation selected
270 '                 PT 1        Pilot on
280 '                 IN 1KHZ     Internal modulation: 1 kHz
290 '                 SP72        SP72 preset
300 '                 TR 1        EBU system TRI selected
310 '                 RD 0        RDS off (until data is set)
320 '                 SP43        RDS GPIB mode selected
330 '
340 GOSUB *RDS.DATA                         'Send RDS data (Note 2)
350 '
360 GOSUB *RDS.ADDRESS                      'Send address data (Note 3)
370 '
380 GOSUB *RDSEON.ADDRESS                   'Send EON address data (Note 4)
390 '
400 PRINT @SG;"RD 1"                                                       Note 5
410 '
420 CLS
430 PRINT "Press Q to send EON data."
440 PRINT "Press E to end program."
450 '
460 *KINP.WAIT                                                             Note 6
470       K$=INKEY$
480       IF K$ = "Q" THEN PRINT @SG;"EB"       'Pressing Q sends EON data.
490       IF K$ <> "E" THEN *KINP.WAIT
500 END
510 '
```

```
520 '
530 '-------------------------------------------------------------------
540 '*                    GROUP  RDS  DATA                              *
550 '*                Send Group RDS Data No.1024 to 1059.              *
560 '*                                                                  *
570 '-------------------------------------------------------------------
580 '
590 '----------  GROUP RDS DATA SEND ----------
600 *RDS.DATA
610 '
620 '***  Read Sample Data          NO. 1024 to 1059                    Note 7
630 '
640 RESTORE *GROUPRDS
650   FOR I= 0 TO 36
660       FOR J=0 TO 7
670           READ RDSDT$(I,J)
680       NEXT J
690  NEXT I
700 '
710 '***  Send group RDS data                                          Note 8
720  FOR I= 0 TO 36
730      RDSDT$="GR "+STR$(I+1024)+";DA "+RDSDT$(I,0)
740          FOR J=1 TO 7
750              RDSDT$=RDSDT$+","+RDSDT$(I,J)
760          NEXT J
770      PRINT @SG;RDSDT$
780      PRINT RDSDT$
790 NEXT I
800 RETURN
810 '
820 '-------------------------------------------------------------------
830 '*                  GROUP  ADDRESS  DATA                            *
840 '*              Send Group Address Data of Patterns 0 to 14         *
850 '-------------------------------------------------------------------
860 '
870 '----------  GROUP ADDRESS DATA SEND ----------
880 *RDS.ADDRESS
890 '
900 '***  Read sample data                                             Note 9
910 '
920 RESTORE *GROUPADDRESS
930   I=0:J=0
940      *RDSADLOOP0
950      J=0
960      *RDSADLOOP
970               READ RDSAD(I,J)
980               J=J+1
990           IF RDSAD(I,J-1) < 9999      THEN *RDSADLOOP
1000           IMAX(I)=J-1
1010              PRINT
1020      IF I < 14 THEN I=I+1:GOTO *RDSADLOOP0
1030 '
1040 '***  Send group address data                                      Note 10
1050 '
1060   FOR I=0 TO 14
1070       RDSDT$="PA "+STR$(I)+";AD "+STR$(RDSAD(I,0))
1080           FOR J=1 TO IMAX(I)
1090               RDSDT$=RDSDT$+","+STR$(RDSAD(I,J))
1100           NEXT J
```

```
1110       PRINT @SG;RDSDT$
1120       PRINT RDSDT$
1130    NEXT I
1140 RETURN
1150 '
1160 '-------------------------------------------------------------------
1170 '*                  EON  ADDRESS  DATA                             *
1180 '*              Send EON Address Data for Patterns 0 to 14         *
1190 '-------------------------------------------------------------------
1200 '
1210 '-----------  EON ADDRESS DATA SEND ------------
1220 *RDSEON.ADDRESS
1230 '
1240 '* * *   Read sample data                                          Note 11
1250 '
1260 RESTORE *EONADDRESSDATA
1270    FOR I=0 TO 14
1280         READ EONAD(I)
1290    NEXT
1300 '
1400 '* * *   Send EON address data                                     Note 12
1410 '
1420    FOR I=0 TO 14
1430        RDSDT$ "PA "+STR$(I)+";ES "+STR$(EONAD(I))
1440        PRINT @SG;RDSDT$
1450        PRINT @SG;RDSDT$
1460    NEXT I
1470 RETURN
1480 '
1490 '
5000 '* * * * * * * * * * * * * * * * * * * * * * * * * *
5010 '* *              Group Address Data Table              * *
5020 '* * * * * * * * * * * * * * * * * * * * * * * * * *
5030 *GROUPADDRESS                                                    Note 13
5040 '>>>PATTERN 0
5050 DATA 1024,1025,1026,1027,,1028,1029,1030,1031,1032,1033
5060 DATA 1034,1035,1036,1037,,1038,1039,1040,1041,1042,1043,9999
5070 '>>>PATTERN 1
5080 DATA 1045,1046,1047,1048,1049,9999
5090 '>>>PATTERN 2
5100 DATA 1050,1051,1052,1053,1054,9999
5110 '>>>PATTERN 3
5120 DATA 1055,1056,1057,1058,1059,9999
5130 '>>>PATTERN 4
5140 DATA 0,1,2,3,4,9999                                              Note 14
5150 '>>>PATTERN 5
5160 DATA 21,10,3,100,9999
5170 '>>>PATTERN 6
5180 DATA 1033,1034,1035,1036,9999
5190 '>>>PATTERN 7
5200 DATA 1037,1038,1039,1040,9999
5210 '>>>PATTERN 8
5220 DATA 1041,1042,1043,1044,9999
5230 '>>>PATTERN 9
5240 DATA 1045,1046,1047,1048,9999
5250 '>>>PATTERN A
5260 DATA 1049,1050,1051,1052,9999
5270 '>>>PATTERN B
5280 DATA 9999                                                        Note 15
```

```
5290 '>>>PATTERN C
5300 DATA 9999
5310 '>>>PATTERN D
5320 DATA 9999
5330 '>>>PATTERN E
5340 DATA 9999
5350 '
6000 '*********************************
6010 '**          EON Address Data Table          **
6020 '*********************************
6020 *EONADDRESSDATA                                          Note 16
6030 DATA 1044
6040 DATA 9999                                               Note 17
6050 DATA 9999
6060 DATA 120
6070 DATA 120
6080 DATA 9999
6090 DATA 9999
6100 DATA 9999
6110 DATA 9999
6120 DATA 9999
6130 DATA 9999
6140 DATA 9999
6150 DATA 9999
6160 DATA 9999
6170 DATA 9999
6180 '
7000 '*********************************
7010 '**          Group RDS Data Table          **
7020 '*********************************
7030 *GROUPRDS                                               Note 18
7040 '>>> GROUP RDS DATA NO.1024
7050 DATA #HC201,#H26D,#H0030,#H0E0,#HE705,#H0A7,#H2052,#H2E1
7060 '>>> GROUP RDS DATA NO.1025
7070 DATA #HC201,#H26D,#H0031,#H159,#H0710,#H0C3,#H6164,#H18D
7080 '>>> GROUP RDS DATA NO.1026
7090 DATA #HC201,#H26D,#H0032,#H392,#H4653,#H004,#H696F,#H31C
7100 '>>> GROUP RDS DATA NO.1027
7110 DATA #HC201,#H26D,#H0033,#H22B,#HB8AD,#H06C,#H3120,#H308
7120 '>>> GROUP RDS DATA NO.1028
7130 DATA #HC201,#H26D,#HE030,#H1DF,#H2052,#H23D,#HC202,#H1EE
7140 '>>> GROUP RDS DATA NO.1029
7150 DATA #HC201,#H26D,#HE031,#H066,#H6164,#H151,#HC202,#H1EE
7160 '>>> GROUP RDS DATA NO.1030
7170 DATA #HC201,#H26D,#HE032,#H2AD,#H696F,#H3C0,#HC202,#H1EE
7180 '>>> GROUP RDS DATA NO.1031
7190 DATA #HC201,#H26D,#HE033,#H314,#H3220,#H2B3,#HC202,#H1EE
7200 '>>> GROUP RDS DATA NO.1032
7210 DATA #HC201,#H26D,#HE034,#H282,#HE4CD,#H299,#HC202,#H1EE
7220 '>>> GROUP RDS DATA NO.1033
7230 DATA #HC201,#H26D,#HE035,#H33B,#H5330,#H268,#HC202,#H1EE
7240 '
7260 DATA #HC201,#H26D,#HE036,#H1F0,#H5316,#H270,#HC202,#H1EE
7270 '>>> GROUP RDS DATA NO.1035
7280 DATA #HC201,#H26D,#HE037,#H049,#H533B,#H150,#HC202,#H1EE
7290 '>>> GROUP RDS DATA NO.1036
7300 DATA #HC201,#H26D,#HE038,#H2DC,#H5398,#H132,#HC202,#H1EE
7310 '>>> GROUP RDS DATA NO.1037
7320 DATA #HC201,#H26D,#HE039,#H365,#H53CD,#H05E,#HC202,#H1EE
```

```
7330 '>>> GROUP RDS DATA NO.1038
7340 DATA #HC201,#H26D,#HE03A,#H1AE,#H0000,#H168,#HC202,#H1EE
7350 '>>> GROUP RDS DATA NO.1039
7360 DATA #HC201,#H26D,#HE03B,#H017,#H0000,#H168,#HC202,#H1EE
7370 '>>> GROUP RDS DATA NO.1040
7380 DATA #HC201,#H26D,#HE03C,#H181,#HCCE0,#H14F,#HC202,#H1EE
7390 '>>> GROUP RDS DATA NO.1041
7400 DATA #HC201,#H26D,#HE03D,#H038,#H0800,#H231,#HC202,#H1EE
7410 '>>> GROUP RDS DATA NO.1042
7420 DATA #HC201,#H26D,#HE03E,#H2F3,#H0800,#H231,#HC202,#H1EE
7430 '>>> GROUP RDS DATA NO.1043
7440 DATA #HC201,#H26D,#HE03F,#H34A,#H0000,#H168,#HC202,#H1EE
7450 '
7460 '>>> GROUP RDS DATA NO.1044
7470 DATA #HC201,#H26D,#HE838,#H185,#HC201,#H1C1,#HC202,#H1EE
7480 '
7490 '
7500 '>>> GROUP RDS DATA NO.1045
7510 DATA #HC201,#H26D,#H0000,#H198,#HE700,#H243,#H5244,#H28A
7520 '>>> GROUP RDS DATA NO.1046
7530 DATA #HC201,#H26D,#H0001,#H021,#H2244,#H015,#H5320,#H3FB
7540 '>>> GROUP RDS DATA NO.1047
7550 DATA #HC201,#H26D,#H0002,#H2EA,#H6688,#H185,#H5445,#H1FB
7560 '>>> GROUP RDS DATA NO.1048
7570 DATA #HC201,#H26D,#H0003,#H353,#HAACC,#H056,#H5354,#H1E9
7580 '>>> GROUP RDS DATA NO.1049
7590 DATA #HC201,#H26D,#H4001,#H2C6,#H7402,#H329,#HC880,#H013
7600 '
7610 '>>> GROUP RDS DATA NO.1050
7620 DATA #HC201,#H26D,#H0400,#H2E8,#HE700,#H243,#H5244,#H28A
7630 '>>> GROUP RDS DATA NO.1051
7640 DATA #HC201,#H26D,#H0401,#H351,#H2244,#H015,#H5320,#H3FB
7650 '>>> GROUP RDS DATA NO.1052
7660 DATA #HC201,#H26D,#H0402,#H19A,#H6688,#H185,#H5445,#H1FB
7670 '>>> GROUP RDS DATA NO.1053
7680 DATA #HC201,#H26D,#H0403,#H023,#HAACC,#H056,#H5354,#H1E9
7690 '>>> GROUP RDS DATA NO.1054
7700 DATA #HC201,#H26D,#H4401,#H1B6,#H7402,#H329,#HC882,#H361
7710 '
7720 '>>> GROUP RDS DATA NO.1055
7730 DATA #HC201,#H26D,#H0410,#H157,#HE700,#H243,#H5244,#H28A
7740 '>>> GROUP RDS DATA NO.1056
7750 DATA #HC201,#H26D,#H0411,#H0EE,#H2244,#H015,#H5320,#H3FB
7760 '>>> GROUP RDS DATA NO.1057
7770 DATA #HC201,#H26D,#H0412,#H225,#H6688,#H185,#H5445,#H1FB
7780 '>>> GROUP RDS DATA NO.1058
7790 DATA #HC201,#H26D,#H0413,#H39C,#HAACC,#H056,#H5354,#H1E9
7800 '>>> GROUP RDS DATA NO.1059
7810 DATA #HC201,#H26D,#H4401,#H1B6,#H7402,#H329,#HC8A2,#H1A6
```

Note 19

- Program Notes

Note 1 Line 210

Make parameter settings necessary for RDS operation.
In GPIB mode RDS operation, because the RDS data before settings are made are uncertain, data is set using"RD 0" (RDS off).

Note 2 Line 340
Call the group RDS data sending subroutine.

Note 3 Line 360
Call the group address data sending subroutine.

Note 4 Line 380
Call the EON address data sending subroutine.

Note 5 Line 400
Because the RDS/EON data sending is completed, RDS is set to on.

Note 6 Lines 460 to 500
When the Q key of the personal computer keyboard is pressed, the EON output command is sent. When the "E" key is pressed, the program is stopped.

Note 7 Lines 640 to 690
Read the RDS data of lines 7000 to 7810 is read into the RDSDT$(I, J) array variable.

Note 8 Lines 710 to 790
Each time a group of RDS data is sent, use the "GR" command to send data while sequencing through the data numbers 1024 to 1059.

Note 9 Lines 920 to 1020
Read 14 patterns of data from the send group address data 5000 to 5340.

Note 10 Lines 1060 to 1130
Use the "PA" command to sequence through patterns 0 to 14 while sending group address data.

Note 11 Lines 1260 to 1290
Read 14 patterns of EON send data of lines 6000 to 6170.

Note 12 Lines 1420 to 1470
Use the "PA" command to sequence through patterns 0 to 14 while using the "ES" command to send EON address data.

Note 13 Lines 5000 to 5350
Group address data to be sent (patterns 0 to 14).

Note 14 Line 5140
This is GPIB mode address data; it is possible to use original mode or user mode group RDS data (No. 0 to 1023).

Note 15 Line 5280
Only in the case in which address data is 9999 (>1535), the data of that pattern is invalid, and taken as null data.

Note 16 Lines 6000 to 6170
EON address data to be sent.

Note 17 Line 6040
Only in the case in which EON address data is 9999 (>1535), no EON operation is made for that pattern.

Note 18 Lines 7000 to 7810
RDS data to be sent.

Note 19 As is the case with other RDS data, data used for EON is recalled by EON address data after being set as group RDS data.

11.11.3 Sample Program 3

- **Basic IEEE 488.2 operation**
- **Personal computer: Compaq QuickBASIC 4.5 + NI-488.2, and MS-DOS™**

```
10 '  QuickBAS C 4.5 Example Program - 488.2 calls
20 '
30 '  This sample program is for reference only. It can only be expected to
40 '  function with a MODEL 3217 RDS Standard signal Generator.
50 '
60    REM $INCLUDE: 'qbdecl.bas'
70
80    DECLARE SUB gpiberr (msg$)
90
100    DIM instruments%(31)
110    DIM result%(30)
120    DIM Reading AS STRING * 30
130
140    CLS
150
160 '  Our board needs to be the Controller-In-Charge in order to
170 '  perform the Find All Listeners protocol.
180
190    CALL SendIFC(0)
200    IF ibsta% AND EERR THEN
210     CALL gpiberr("SendIFC Error")
220     STOP
230    END IF
240
250 '  Create an array with all of the valid GPIB primary addresses.  This
260 '  array will be given to the Find All Listeners protocol.
270
280    FOR k% = 0 TO 30                                              Note 1
290     instruments%(k%) = k%
300    NEXT k%
310    instruments%(31) = NOADDR
320
330 '  Find all of the listeners on the bus.
340
350    PRINT "Finding all listeners on the bus..."
360
370    CALL FindLstn(0, instruments%(), result%(), 31)
380    IF ibsta% AND EERR THEN
390     CALL gpiberr("FindLstn Error")
400     STOP
410    END IF
420
430    num.listeners% = ibcnt% - 1
440
450    PRINT "No. of instruments found =", num.listeners%
460
470 '  Now send the *IDN? command to each of the devices that we found.
480 '
490 '  Our AT GPIB board is at address 0 by default.  Our board does not
500 '  respond to *IDN?, so skip it.
510
520    CALL DevClear(0, m3217%)                                      Note 2
530    IF ibsta% AND EERR THEN
```

```
540     CALL gpiberr("DevClear Error")
550     STOP
560    END IF
570
580
590    FOR k% = 1 TO num.listeners%                                          Note 3
600
610     CALL Send(0, result%(k%), "*CLS;*IDN?", NLend)                       Note 4
620     IF ibsta% AND EERR THEN
630         CALL gpiberr("Send Error")
640         STOP
650     END IF
660
670     CALL Receive(0, result%(k%), Reading$, STOPend)                      Note 5
680     IF ibsta% AND EERR THEN
690         CALL gpiberr("Receive Error")
700         STOP
710     END IF
720
730     pad% = result%(k%) AND &HFF
740     PRINT "The instrument at address "; pad%; " is: ", LEFT$(Reading$, iben:%)
750
760     IF LEFT$(Reading$, 22) = "LEADER CORP,MODEL 3217" THEN               Note 6
770             m3217% = result%(k%)
780             PRINT "**** We found the Model_3217 ****"
790             GOTO found
800     END IF
810    NEXT k%
820    PRINT "I did not find the Model_3217!"                                Note 7
830    STOP
840
850 found:
860     '  Reset the Model_3217.
870
880    CALL DevClear(0, m3217%)
890    IF ibsta% AND EERR THEN
900     CALL gpiberr("DevClear Error")
910     STOP
920    END IF
930
940    CALL Send(0, m3217%, "*RST", NLend)                                   Note 8
950    IF ibsta% AND EERR THEN
960     CALL gpiberr("Send *RST Error")
970     STOP
980    END IF
990
1000 '  Setup for a test.  Allow the 3217 to assert
1010 '  SRQ when it has a message to send.
1020
1030    CALL Send(0, m3217%, "FREQ 10MHZ;FREQ:DIGIT 4;LEVEL 1.1DBU;*SRE 16", NLend) Note 9
1040    IF ibsta% < 0 THEN
1050    CALL gpiberr("Send Setup Error")
1060    STOP
1070    END IF
1080
1090    sum = 0
1100    FOR m% = 1 TO 100
1110
1120    ' Trigger the Model_3217.
```

```
1130
1140        CALL Send(0, m3217%, "FREQ:UP;FREQ?", NLend)                    Note 10
1150        IF ibsta% AND EERR THEN
1160             CALL gpiberr("Send Command Error")
1170             STOP
1180        END IF
1190
1200    '   Wait for the Model 3217 to assert SRQ, meaning it is ready with the
1210    '   measurement.
1220
1230        CALL WaitSRQ(0, SRQasserted%)                                   Note 11
1240        IF SRQasserted% = 0 THEN
1250             CALL gpiberr("WaitSRQ Error")
1260             STOP
1270        END IF
1280
1290
1300    '   Read its status byte.  Be sure that the MAV (Message Available)
1310    '   bit is set.
1320
1330        CALL ReadStatusByte(0, m3217%, status%)                         Note 12
1340        IF ibsta% AND EERR THEN
1350             CALL gpiberr("ReadStatusByte Error")
1360             STOP
1370        END IF
1380
1390        IF (status% AND &H10) <> &H10 THEN
1400             CALL gpiberr("Improper Status Byte")
1410             PRINT "Status Byte: "; status%
1420             STOP
1430        END IF
1440
1450    '   Read the measurement.
1460
1470        CALL Receive(0, m3217%, Reading$, STOPend)                      Note 13
1480        IF ibsta% AND EERR THEN
1490             CALL gpiberr("Receive Error")
1500             STOP
1510        END IF
1520
1530       Reading$ = LEFT$(Reading$, ibcnt%)
1540       PRINT "Frequency Set: "; Reading$;
1550
1560       '*********************************************                  Note 14
1570       '***  This position Measurement Routine insert ***
1580       PRINT "Measurement !!"
1590       '*********************************************
1600
1610       NEXT m%
1620
1630       PRINT "The Measurement Complete the 100 times"
1640 END
```

- **Program Notes**

Note 1 **Lines 250 to 450**
Search for the addresses of devices connected to the personal computer.

Note 2 Line 520
Use the device clear to clear the GPIB output buffer of the Model 3217.

Note 3 Lines 590 to 840
Send the "IDN?" command to the addresses encountered in the search described in Note 1, searching for the GPIB address of the Model 3217.

Note 4 Line 610
Clear the status byte register with "*CLS".
Access the manufacturer and model number with "*IDN?".

Note 5 Line 670
Receive the response to the "*IDN?".

Note 6 Lines 760 to 800
If the beginning of the character string response to "*IDN?" is "LEADER_MODEL 3217", this indicates that the Model 3217 is connected at that GPIB address. If so, display "**** We found the Model 3217 ****" and move to the next processing.

Note 7 Lines 820 to 830
If the above string is not found, display "Did not find the Model 3217" and stop the program.

Note 8 Line 940
Output the "*RST" command to the Model 3217 to initialize it.

Note 9 Line 1030
Send commands to the Model 3217.
FREQ 10MHZ = RF frequency set to 10 MHz.
FREQ:DIGIT 4 = 1-MHz digit selected for increment and decrement.
LEVEL 1.1DBU = Output level set to 1.1 dBμ.
*SRE 16 = Generate an SQR when there is data in the output queue.

Note 10 Line 1140
Send commands to the Model 3217.
FREQ:UP = Increase the frequency.
FREQ? = Query the currently set frequency.

Note 11 Line 1230
Wait for the Model 3217 SRQ to determine whether or not there was a response message ready with respect to the "FREQ?".

Note 12 Lines 1330 to 1430
After receiving an SRQ, read the contents of the status byte by performing a serial poll.
If the contents of the SRQ is "queue not empty", proceed to data reception.

Note 13 Lines 1470 to 1540
Receive the frequency data from the Model 3217 and display this data.

Note 14 When measuring instruments or other devices are used in combination, insert the measurement sequence in this position.

12. CALIBRATION AND SERVICE

12.1 Pilot Signal Phase Calibration

To achieve a high degree of stereo separation between main and sub signals, it is necessary to maintain the correct phase relationship between the pilot signal (19 kHz) and the subcarrier (38 kHz).

In addition, to ensure correct recognition of the TRI and RDS signals, it is necessary that the correct phase relationships be maintained between the pilot signal (19 kHz), the TRI subcarrier (57 kHz), and the RDS subcarrier (57 kHz).

In normal use, it is not necessary to perform recalibration. However, if especially high performed is required, fine adjustment trimmers ㊹, ㊺, ㊻, and ㊼ are provided for making these adjustments.

The calibration method is as follows.

There are 4 calibration points:

(1) ㊹ SCOPE PHASE

(2) ㊺ PILOT PHASE

(3) ㊻ TRI SUBCARRIER PHASE

(4) ㊼ RDS SUBCARRIER PHASE

The oscilloscope you use for calibration must be one that has an X-Y display mode, and that has at least several megahertz bandwidth on both X axis and Y axis. When performing highly accurate calibration, a scope with good saturation characteristics is also required, so that excess amplitude does not result in off-screen displays.

Connection Method

(1) Connect the output from he PILOT OUT connector on the rear pane to the X axis of the scope, using a coaxial cable.

(2) Connect the output of the COMP OUT connect on the rear panel to the Y axis of the scope. Set the oscilloscope X-axis sensitivity to 0.5 V/div and the Y-axis sensitivity to 50 mV/div.

When performing a precise calibration, set the X-axis sensitivity to 0.2 V/div and the Y-axis sensitivity to 20 mV/div.

Maintain the same oscilloscope sensitivity settings for all calibration locations.

12.1.1 Pilot Signal Phase Calibration

Set the Model 3217 up for calibration as follows.

(1) Press the SPECIAL key.

(2) Press keys in the following sequence.

7 → 3

Adjustment Method

Adjust SCOPE PHASE ㊺ to change the display from Fig. 12-1 (a) to that of (b).

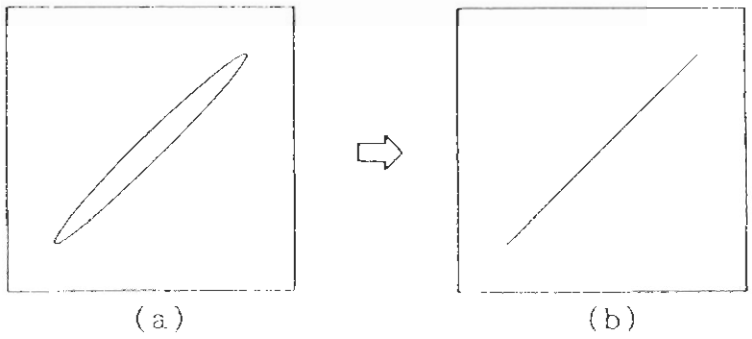


Fig. 12-1 Pilot Signal Phase Calibration

12.1.2 Pilot Signal and Subcarrier Phase Calibration

Set the Model 3217 up for calibration as follows.

(1) Press the SPECIAL key.

(2) Press keys in the following sequence.

7 → 4

Adjustment Method

Adjust PILOT PHASE ㊺ to change the display from Fig. 12-2 (a) to that of (b).

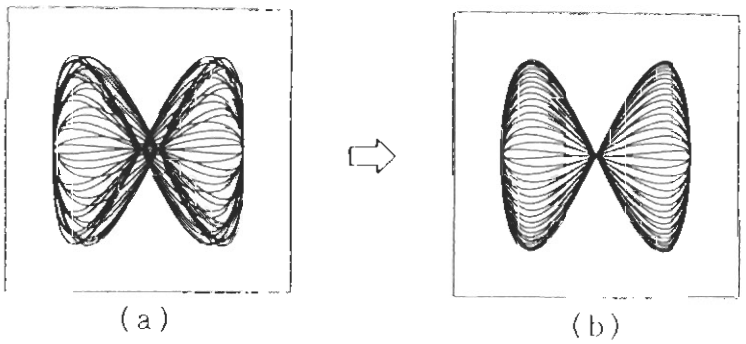


Fig. 12-2 Pilot Signal and Subcarrier Phase Calibration

12.1.3 Pilot Signal and TRI Subcarrier Phase Calibration

Set the Model 3217 up for calibration as follows.

(1) Press the SPECIAL key.

(2) Press keys in the following sequence.

7 → 5

Adjustment Method

Adjust TRI SUBCARRIER PHASE ㊻ to change the display from Fig. 12-3 (a) to that of (b).

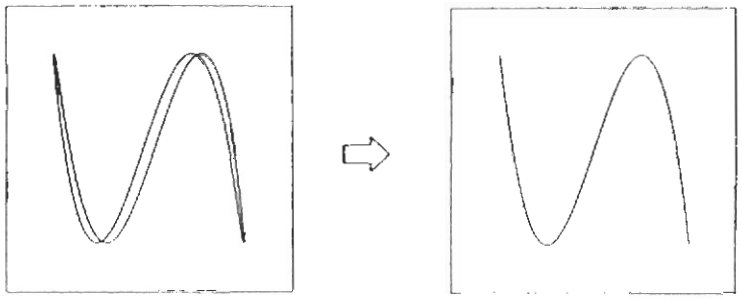


Fig. 12-3 Pilot Signal and TRI Subcarrier Phase Calibration

12.1.4 Pilot Signal and RDS Subcarrier Phase Calibration (with phase 90°)

Set the Model 3217 up for calibration as follows.

(1) Press the SPECIAL key.

(2) Press keys in the following sequence.

7 → 6

Adjustment Method

Adjust RDS SUBCARRIER PHASE ㊺ to change the display from Fig. 12-4 (a) to that of (b).

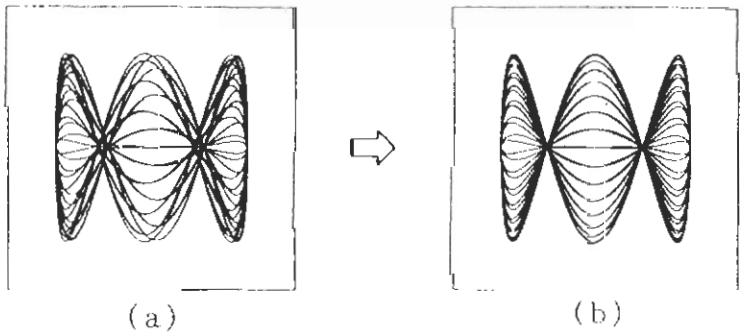


Fig. 12-4 Pilot Signal and RDS Subcarrier Phase Calibration

12.1.5 Pilot Signal and RDS Subcarrier Phase Calibration (with phase 0°)

Set the Model 3217 up for calibration as follows.

(1) Press the SPECIAL key.

(2) Press keys in the following sequence.

7 → 7

Adjustment Method

Adjust RDS SUBCARRIER PHASE ㊺ to change the display from Fig. 12-5 (a) to that of (b).

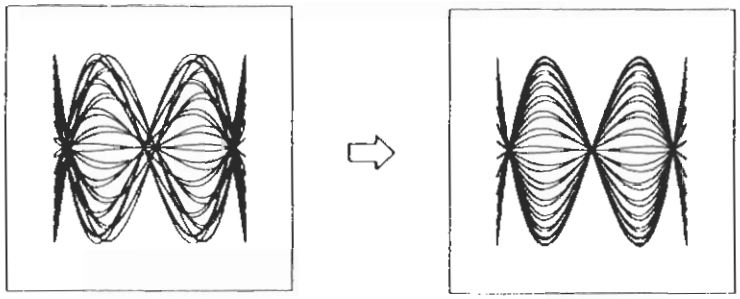


Fig. 12-5 Pilot Signal and RDS Subcarrier Phase Calibration

12.2 Calibration and Servicing

If you wish to have your Model 3217 inspected or calibrated to improve its performance, or if you have problems with operation, or with a failure of the Model 3217, contact you nearest sales representative.

13. APPENDIX

13.1 Remote Control of the Model 3215/3216

It is not necessary to read this section, unless you plan to use a Model 3215/3216 remote controller to control the Model 3217.

Remote control of the Model 3217 can be performed with a Model 3215/3216 controller (e.i., using Model 3215/3216 key codes) by setting pin 21 of the remote control connector to low. With a Model 3216-01 Remote Controller (intended for use with the Model 3215/3216) connected, this pin is automatically held at a low level.

The key codes used in this condition are shown in Table 13-1.

For details on the method of remote control, refer to Section 10, REMOTE CONTROL.

Note however, that there are some functions of the Model 3217 that cannot be controlled by key codes intended for the Model 3215/3216. Also, care is required as there are some key codes that must not be used.

Table 13-1 Model 3215/3216 Key Codes

HEX	Key	HEX	Key	HEX	Key	HEX	Key	HEX	Key
00	*	10	EXT AF	20	<7>	30	<1>	40	BEGIN+0
01	MOD (D)	11	L	21	<8>	31	<2>	41	BEGIN+1
02	PILOT (D)	12	R	22	<9>	32	<3>	42	BEGIN+2
03	1.0 ↑	13	1.0 ↓	23	*	33	→	43	BEGIN+3
04	MOD ON	14	FM	24	FREQ<E>	34	MHz	44	BEGIN+4
05	INC	15	*	25	PST A	35	kHz(%)	45	BEGIN+5
06	RECALL	16	WRITE	26	PST B	36	*	46	BEGIN+6
07	FREQ(F)	17	MOD (F)	27	*	37	*	47	BEGIN+7
08	INT	18	EXT LR	28	<4>	38	<0>	48	BEGIN+8
09	*	19	MAIN	29	<5>	39	<.>	49	BEGIN+9
0A	OPTION	1A	SUB	2A	<6>	3A	<->	4A	*
0B	0.1 ↑	1B	0.1 ↓	2B	←	3B	*	4B	*
0C	AM	1C	PILOT ON	2C	LEVEL<E>	3C	dBμ	4C	*
0D	*	1D	DEG	2D	PST C	3D	ADDRESS	4D	*
0E	STORE	1E	SPECIAL	2E	PST D	3E	*	4E	*
0F	LEVEL(F)	1F	PILOT (F)	2F	*	3F	*	4F	*

Hex: hexadecimal, (D): display key, (E): edit key, (F): function key

areas: Functions for only Model 3216.

areas: Functions for only the Model 3215/3216. Care is required as these functions differ from those of the Model 3217. For details of the functions, refer to the instruction manual for the Model 3215/3216.

13.2 RDS Pattern Data List

PATTERN No.	RDS Function	PI code	Program service	Date & Time	GROUP Type	TP	TA	GROUP NUMBER	EON No.
0	Basic tuning	C201	Testing1	92/6/25 8:12	0B, 0A, 4A	0	0	125, 0-3, 0-3, 0-3, 0-3, 0-3, 240, 0-3, 0-3, 0-3, 0-3, 0-3, 240	
1	Traffic program	C202	Testing2	92/6/25 17:23	0A, 4A	1	0	10-13, 241	
2	Traffic announcement	C202	Testing2	92/6/25 9:04	0A, 4A	1	1	15-18, 242	
3	EON(Network-1) TN=88.0. ON=90.1 TN=88.2. ON=91.9	C201	Radio 1	92/6/25 8:12	0A, 4A, 14A, 14B	0	1	5-8, 240, 400-403, 435, 436, 443, 444, 480, 487	496
4	EON(Network-2) TN=90.1. ON=88.0 TN=91.9. ON=88.2	C202	Radio 2	92/6/25 9:04	0A, 4A, 14A	1	1	25-28, 242, 415-418, 450, 451, 458, 459, 483, 488	
5	EON(Network-2) TN=90.1. ON=88.0 TN=91.9. ON=88.2	C202	Radio 2	92/6/25 17:23	0A, 4A, 14A	1	0	20-23, 241, 415-418, 450, 451, 458, 459, 483, 488	
6	EON(Network-1) TN=88.0. ON=87.6 TN=88.2. ON=89.7	C201	Radio_1	92/6/25 8:12	0A, 4A, 14A, 14B	0	1	5-8, 240, 405-408, 435, 436, 443, 444, 480, 487	497
7	EON(Network-3) TN=87.6. ON=88.0 TN=89.7. ON=88.2	C203	Radio_3	92/6/25 16:42	0A, 4A, 14A	1	1	35-38, 245, 420-423, 466, 467, 473, 474, 485, 490	
8	EON(Network-3) TN=87.6. ON=88.0 TN=89.7. ON=88.2	C203	Radio_3	92/6/25 8:56	0A, 4A, 14A	1	0	30-33, 244, 420-423, 466, 467, 473, 474, 485, 490	
9	PS Character repertoires	C525	!"#%&'()		0A	0	0	50-53	
A	PS Character repertoires	C625	*+,-./@[		0A	0	0	55-58	
B	PS Character repertoires	C056	01234567		0A	0	0	60-63	
C	PS Character repertoires	E201	89:;<=>?		0A	0	0	65-68	
D	PS Character repertoires	E203	ABCDEFGH		0A	0	0	70-73	
E	PS Character repertoires	EF24	IJKLMNOP		0A	0	0	75-78	
F	PS, RT Character repertoires	C201	01234567, ABCDEFGH	92/6/25 8:12	0A, 0B, 2A, 4A	0	0	125, 240, 60-63, 60-63, 60-63, 60-63, 60-63, 200-214, 60-63, 60-63, 60-63, 60-63, 126, 70-73, 70-73, 70-73, 70-73, 70-73, 216-231, 70-73, 70-73, 70-73, 70-73, 70-73	

□ ··· Blank

13.3 RDS Group Data List

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc	□ ···Blank
0	0A	C201	00000	0	TA=0 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 7 , 88.0	PS=T,e
1	0A	C201	00000	0	TA=0 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 88.2, 89.1	PS=s,t
2	0A	C201	00000	0	TA=0 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 94.5, 95.8	PS=i,n
3	0A	C201	00000	0	TA=0 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=101.4,104.8	PS=g,l
4						
5	0A	C201	00001	0	TA=1 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 7 , 88.0	PS=R,a
6	0A	C201	00001	0	TA=1 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 88.2, 89.1	PS=d,i
7	0A	C201	00001	0	TA=1 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 94.5, 95.8	PS=o,_
8	0A	C201	00001	0	TA=1 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=101.4,104.8	PS=1,□
9						
10	0A	C202	01010	1	TA=0 M/S=M $DI(d_3)$=0 C_1C_0=00 AF= 7 , 90.1	PS=T,e
11	0A	C202	01010	1	TA=0 M/S=M $DI(d_2)$=0 C_1C_0=01 AF= 91.9, 92.3	PS=s,t
12	0A	C202	01010	1	TA=0 M/S=M $DI(d_1)$=0 C_1C_0=10 AF= 95.2, 96.2	PS=i,n
13	0A	C202	01010	1	TA=0 M/S=M $DI(d_0)$=1 C_1C_0=11 AF= 97.6,101.9	PS=g,2
14						
15	0A	C202	01010	1	TA=1 M/S=M $DI(d_3)$=0 C_1C_0=00 AF= 7 , 90.1	PS=T,e
16	0A	C202	01010	1	TA=1 M/S=M $DI(d_2)$=0 C_1C_0=01 AF= 91.9, 92.3	PS=s,t
17	0A	C202	01010	1	TA=1 M/S=M $DI(d_1)$=0 C_1C_0=10 AF= 95.2, 96.2	PS=i,n
18	0A	C202	01010	1	TA=1 M/S=M $DI(d_0)$=1 C_1C_0=11 AF= 97.6,101.9	PS=g,2
19						
20	0A	C202	00001	1	TA=0 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 7 , 90.1	PS=R,a
21	0A	C202	00001	1	TA=0 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 91.9, 92.3	PS=d,i
22	0A	C202	00001	1	TA=0 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 95.2, 96.2	PS=o,_
23	0A	C202	00001	1	TA=0 M/S=S $DI(d_0)$=0 C_1C_0=11 AF= 97.6,101.9	PS=2,□
24						
25	0A	C202	00001	1	TA=1 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 7 , 90.1	PS=R,a
26	0A	C202	00001	1	TA=1 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 91.9, 92.3	PS=d,i
27	0A	C202	00001	1	TA=1 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 95.2, 96.2	PS=o,_
28	0A	C202	00001	1	TA=1 M/S=S $DI(d_0)$=0 C_1C_0=11 AF= 97.6,101.9	PS=2,□
29						
30	0A	C203	00001	1	TA=0 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 6 , 87.6	PS=R,a
31	0A	C203	00001	1	TA=0 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 89.7, 91.3	PS=d,i
32	0A	C203	00001	1	TA=0 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 99.6,102.2	PS=o,_
33	0A	C203	00001	1	TA=0 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=104.0,-----	PS=3,□
34						
35	0A	C203	00001	1	TA=1 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 6 , 87.6	PS=R,a
36	0A	C203	00001	1	TA=1 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 89.7, 91.3	PS=d,i
37	0A	C203	00001	1	TA=1 M/S=S $DI(d_1)$=0 C_1C_0=10 AF= 99.6,102.2	PS=o,_
38	0A	C203	00001	1	TA=1 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=104.0,-----	PS=3,□
39						
40	0A	C026	00001	1	TA=0 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 2 ,(250)	PS=R,a
41	0A	C026	00001	1	TA=0 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 252 , 261	PS=d,i
42	0A	C026	00001	1	TA=0 M/S=S $DI(d_1)$=0 C_1C_0=10 AF=-----,-----	PS=o,_
43	0A	C026	00001	1	TA=0 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=-----,-----	PS=4,□
44						
45	0A	C026	00001	1	TA=1 M/S=S $DI(d_3)$=0 C_1C_0=00 AF= 2 ,(250)	PS=R,a
46	0A	C026	00001	1	TA=1 M/S=S $DI(d_2)$=0 C_1C_0=01 AF= 252 , 261	PS=d,i
47	0A	C026	00001	1	TA=1 M/S=S $DI(d_1)$=0 C_1C_0=10 AF=-----,-----	PS=o,_
48	0A	C026	00001	1	TA=1 M/S=S $DI(d_0)$=0 C_1C_0=11 AF=-----,-----	PS=4,□
49						

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc					□ …Blank
50	0A	C525	00000	0	TA=0	M/S=M	DI(d_2)=0	C_1C_0=01	AF= 2 , 91.7	PS=!,”
51	0A	C525	00000	0	TA=0	M/S=M	DI(d_2)=0	C_1C_0=01	AF= 93.4,-----	PS=#,%
52	0A	C525	00000	0	TA=0	M/S=M	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=&,’
53	0A	C525	00000	0	TA=0	M/S=M	DI(d_0)=0	C_1C_0=11	AF=-----,-----	PS=(,)
54										
55	0A	C625	00001	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 2 ,102.7	PS=*,+
56	0A	C625	00001	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF=103.5,-----	PS=,,-
57	0A	C625	00001	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=.,/
58	0A	C625	00001	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS=@,□
59										
60	0A	C056	00010	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 4 , 90.0	PS=0,1
61	0A	C056	00010	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 91.0, 92.0	PS=2,3
62	0A	C056	00010	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF= 93.0,-----	PS=4,5
63	0A	C056	00010	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS=6,7
64										
65	0A	E201	00011	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 5 , 88.8	PS=8,9
66	0A	E201	00011	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 87.6, 95.1	PS=:,;
67	0A	E201	00011	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF= 92.2, 99.3	PS=<,=
68	0A	E201	00011	0	TA=0	M/S=S	DI(d_0)=0	C_1C_0=11	AF= 92.6,-----	PS=>,?
69										
70	0A	E203	00100	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 3 , 97.0	PS=A,B
71	0A	E203	00100	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 98.0, 98.4	PS=C,D
72	0A	E203	00100	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=E,F
73	0A	E203	00100	0	TA=0	M/S=S	DI(d_0)=0	C_1C_0=11	AF=-----,-----	PS=G,H
74										
75	0A	EF24	00101	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 3 , 89.5	PS=I,J
76	0A	EF24	00101	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF=102.0,103.0	PS=K,L
77	0A	EF24	00101	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=M,N
78	0A	EF24	00101	0	TA=0	M/S=S	DI(d_0)=0	C_1C_0=11	AF=-----,-----	PS=O,P
79										
80	0A	C201	00110	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 4 , 89.7	PS=Q,R
81	0A	C201	00110	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 88.1, 88.8	PS=S,T
82	0A	C201	00110	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF= 88.7,-----	PS=U,V
83	0A	C201	00110	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS=W,X
84										
85	0A	C202	00111	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 3 , 90.3	PS=Y,Z
86	0A	C202	00111	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 91.0, 91.9	PS=[,\
87	0A	C202	00111	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=],-
88	0A	C202	00111	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS= ,|
89										
90	0A	C203	01000	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 3 , 92.5	PS=a,b
91	0A	C203	01000	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 93.2, 94.1	PS=c,d
92	0A	C203	01000	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=e,f
93	0A	C203	01000	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS=g,h
94										
95	0A	C204	01001	0	TA=0	M/S=S	DI(d_3)=0	C_1C_0=00	AF= 2 , 93.5	PS=i,j
96	0A	C204	01001	0	TA=0	M/S=S	DI(d_2)=0	C_1C_0=01	AF= 94.9,-----	PS=k,l
97	0A	C204	01001	0	TA=0	M/S=S	DI(d_1)=0	C_1C_0=10	AF=-----,-----	PS=m,n
98	0A	C204	01001	0	TA=0	M/S=S	DI(d_0)=1	C_1C_0=11	AF=-----,-----	PS=o,p
99										

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc	□ ···Blank
100	0A	C425	01010	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 AF= 2 , 94.5	PS=q, r
101	0A	C425	01010	0	TA=0 M/S=S DI(d_2)=0 C_1C_0=01 AF= 95.8,-----	PS=s, t
102	0A	C425	01010	0	TA=0 M/S=S DI(d_1)=0 C_1C_0=10 AF=-----,-----	PS=u, v
103	0A	C425	01010	0	TA=0 M/S=S DI(d_0)=1 C_1C_0=11 AF=-----,-----	PS=w, x
104						
105	0A	CA25	01011	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 AF= 2 ,104.6	PS=y, z
106	0A	CA25	01011	0	TA=0 M/S=S DI(d_2)=0 C_1C_0=01 AF=103.8,-----	PS={, |
107	0A	CA25	01011	0	TA=0 M/S=S DI(d_1)=0 C_1C_0=10 AF=-----,-----	PS=}, ~
108	0A	CA25	01011	0	TA=0 M/S=S DI(d_0)=1 C_1C_0=11 AF=-----,-----	PS=□,□
109						
110	0A	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 AF= 7 , 88.0	PS=Ⅱ, α
111	0A	C201	00000	0	TA=0 M/S=S DI(d_2)=0 C_1C_0=01 AF= 88.2, 89.1	PS=β, φ
112	0A	C201	00000	0	TA=0 M/S=S DI(d_1)=0 C_1C_0=10 AF= 94.5, 95.8	PS=δ, ε
113	0A	C201	00000	0	TA=0 M/S=S DI(d_0)=0 C_1C_0=11 AF=101.4,104.8	PS=φ, γ
114						
115	0A	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 AF= 7 , 88.0	PS=η, ι
116	0A	C201	00000	0	TA=0 M/S=S DI(d_2)=0 C_1C_0=01 AF= 88.2, 89.1	PS=Σ, χ
117	0A	C201	00000	0	TA=0 M/S=S DI(d_1)=0 C_1C_0=10 AF= 94.5, 95.8	PS=λ, μ
118	0A	C201	00000	0	TA=0 M/S=S DI(d_0)=0 C_1C_0=11 AF=101.4,104.8	PS=ν, ω
119						
120	0A	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 AF= 7 , 88.0	PS=π, Ω
121	0A	C201	00000	0	TA=0 M/S=S DI(d_2)=0 C_1C_0=01 AF= 88.2, 89.1	PS=ρ, σ
122	0A	C201	00000	0	TA=0 M/S=S DI(d_1)=0 C_1C_0=10 AF= 94.5, 95.8	PS=τ, ξ
123	0A	C201	00000	0	TA=0 M/S=S DI(d_0)=0 C_1C_0=11 AF=101.4,104.8	PS=θ, Γ
124						
125	0B	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 PS=0/15,0/15 (E.1)	
126	0B	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 PS=0/14,0/14 (E.2)	
127	0B	C201	00000	0	TA=0 M/S=S DI(d_3)=0 C_1C_0=00 PS=1/11,6/14 (E.3)	
128						
129						
130						
131						
132						
133						
134						
135						
136						
137						
138						
139						
140						
141						
142						
143						
144						
145						
146						
147						
148						
149						

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc ▯ ··Blank
150					
151					
152					
153					
154					
155					
156					
157					
158					
159					
160					
161					
162					
163					
164					
165					
166					
167					
168					
169					
170					
171					
172					
173					
174					
175					
176					
177					
178					
179					
180					
181					
182					
183					
184					
185					
186					
187					
188					
189					
190					
191					
192					
193					
194					
195					
196					
197					
198					
199					

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc	□ …Blank
200	2A	C201	00000	0	TextA/B=0	segment address=0000 character= L,E,A,D
201	2A	C201	00000	0	TextA/B=0	segment address=0001 character= E,R,□,E
202	2A	C201	00000	0	TextA/B=0	segment address=0010 character= L,E,C,T
203	2A	C201	00000	0	TextA/B=0	segment address=0011 character= R,O,N,I
204	2A	C201	00000	0	TextA/B=0	segment address=0100 character= C,S,□,C
205	2A	C201	00000	0	TextA/B=0	segment address=0101 character= O,R,P,.
206	2A	C201	00000	0	TextA/B=0	segment address=0110 character= □,□,□,M
207	2A	C201	00000	0	TextA/B=0	segment address=0111 character= O,D,E,L
208	2A	C201	00000	0	TextA/B=0	segment address=1000 character= □,3,2,1
209	2A	C201	00000	0	TextA/B=0	segment address=1001 character= 7,□,□,□
210	2A	C201	00000	0	TextA/B=0	segment address=1010 character= R,D,S,□
211	2A	C201	00000	0	TextA/B=0	segment address=1011 character= S,I,G,N
212	2A	C201	00000	0	TextA/B=0	segment address=1100 character= A,L,□,G
213	2A	C201	00000	0	TextA/B=0	segment address=1101 character= E,N,E,R
214	2A	C201	00000	0	TextA/B=0	segment address=1110 character= A,T,O,R
215						
216	2A	C201	00000	0	TextA/B=1	segment address=0000 character= !,",#,%
217	2A	C201	00000	0	TextA/B=1	segment address=0001 character= &,',(,)
218	2A	C201	00000	0	TextA/B=1	segment address=0010 character= *,+,,,-
219	2A	C201	00000	0	TextA/B=1	segment address=0011 character= .,/,@,□
220	2A	C201	00000	0	TextA/B=1	segment address=0100 character= 0,1,2,3
221	2A	C201	00000	0	TextA/B=1	segment address=0101 character= 4,5,6,7
222	2A	C201	00000	0	TextA/B=1	segment address=0110 character= 8,9,:,;
223	2A	C201	00000	0	TextA/B=1	segment address=0111 character= <,=,>,?
224	2A	C201	00000	0	TextA/B=1	segment address=1000 character= A,B,C,D
225	2A	C201	00000	0	TextA/B=1	segment address=1001 character= E,F,G,H
226	2A	C201	00000	0	TextA/B=1	segment address=1010 character= I,J,K,L
227	2A	C201	00000	0	TextA/B=1	segment address=1011 character= M,N,O,P
228	2A	C201	00000	0	TextA/B=1	segment address=1100 character= Q,R,S,T
229	2A	C201	00000	0	TextA/B=1	segment address=1101 character= U,V,W,X
230	2A	C201	00000	0	TextA/B=1	segment address=1110 character= Y,Z,[,\
231	2A	C201	00000	0	TextA/B=1	segment address=1111 character=],-,_,
232						
233						
234						
235						
236						
237						
238						
239						
240	4A	C201	00000	0	Year=1992 Month=6 Day=25 Hour=8 Minute=12 offset=0	
241	4A	C201	00000	1	Year=1992 Month=6 Day=25 Hour=17 Minute=23 offset=0	
242	4A	C201	00000	1	Year=1992 Month=6 Day=25 Hour=8 Minute=34 offset=+1	
243	4A	C201	00000	1	Year=1992 Month=6 Day=25 Hour=17 Minute=45 offset=+2	
244	4A	C201	00000	1	Year=1992 Month=6 Day=25 Hour=8 Minute=56 offset=0	
245	4A	C201	00000	1	Year=1992 Month=6 Day=25 Hour=17 Minute=12 offset=-1	
246	4A	C026	00000	1	Year=1992 Month=6 Day=25 Hour=8 Minute=34 offset=-2	
247	4A	C026	00000	1	Year=1992 Month=6 Day=25 Hour=17 Minute=56 offset=0	
248						
249						

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc [···Blank
250					
251					
252					
253					
254					
255					
256					
257					
258					
259					
260					
261					
262					
263					
264					
265					
266					
267					
268					
269					
270					
271					
272					
273					
274					
275					
276					
277					
278					
279					
280					
281					
282					
283					
284					
285					
286					
287					
288					
289					
290					
291					
292					
293					
294					
295					
296					
297					
298					
299					

GROUP No.	GROUP type	PI (TV)	PTY	TP (TN)	etc ▯ ... Blank
300					
301					
302					
303					
304					
305					
306					
307					
308					
309					
310					
311					
312					
313					
314					
315					
316					
317					
318					
319					
320					
321					
322					
323					
324					
325					
326					
327					
328					
329					
330					
331					
332					
333					
334					
335					
336					
337					
338					
339					
340					
341					
342					
343					
344					
345					
346					
347					
348					
349					

GROUP No.	GROUP type	PT (TN)	PTY	TP (TN)	etc [] ···Blank
350					
351					
352					
353					
354					
355					
356					
357					
358					
359					
360					
361					
362					
363					
364					
365					
366					
367					
368					
369					
370					
371					
372					
373					
374					
375					
376					
377					
378					
379					
380					
381					
382					
383					
384					
385					
386					
387					
388					
389					
390					
391					
392					
393					
394					
395					
396					
397					
398					
399					

GROUP No.	GROUP type	PI (TN)	PTY (TN)	TP (TN)	etc					[] …Blank
400	14A	C201	00001	0	TP(ON)=1	U.code=0000	char=R,a	PI(ON)=C202		
401	14A	C201	00001	0	TP(ON)=1	U.code=0001	char=d,i	PI(ON)=C202		
402	14A	C201	00001	0	TP(ON)=1	U.code=0010	char=o,_	PI(ON)=C202		
403	14A	C201	00001	0	TP(ON)=1	U.code=0011	char=2,[]	PI(ON)=C202		
404										
405	14A	C201	00001	0	TP(ON)=1	U.code=0000	char=R,a	PI(ON)=C203		
406	14A	C201	00001	0	TP(ON)=1	U.code=0001	char=d,i	PI(ON)=C203		
407	14A	C201	00001	0	TP(ON)=1	U.code=0010	char=o,_	PI(ON)=C203		
408	14A	C201	00001	0	TP(ON)=1	U.code=0011	char=3,[]	PI(ON)=C203		
409										
410	14A	C201	00001	0	TP(ON)=1	U.code=0000	char=R,a	PI(ON)=C026		
411	14A	C201	00001	0	TP(ON)=1	U.code=0001	char=d,i	PI(ON)=C026		
412	14A	C201	00001	0	TP(ON)=1	U.code=0010	char=o,_	PI(ON)=C026		
413	14A	C201	00001	0	TP(ON)=1	U.code=0011	char=4,[]	PI(ON)=C026		
414										
415	14A	C202	00001	1	TP(ON)=0	U.code=0000	char=R,a	PI(ON)=C201		
416	14A	C202	00001	1	TP(ON)=0	U.code=0001	char=d,i	PI(ON)=C201		
417	14A	C202	00001	1	TP(ON)=0	U.code=0010	char=o,_	PI(ON)=C201		
418	14A	C202	00001	1	TP(ON)=0	U.code=0011	char=1,[]	PI(ON)=C201		
419										
420	14A	C203	00001	1	TP(ON)=0	U.code=0000	char=R,a	PI(ON)=C201		
421	14A	C203	00001	1	TP(ON)=0	U.code=0001	char=d,i	PI(ON)=C201		
422	14A	C203	00001	1	TP(ON)=0	U.code=0010	char=o,_	PI(ON)=C201		
423	14A	C203	00001	1	TP(ON)=0	U.code=0011	char=1,[]	PI(ON)=C201		
424										
425	14A	C026	00001	1	TP(ON)=0	U.code=0000	char=R,a	PI(ON)=C201		
426	14A	C026	00001	1	TP(ON)=0	U.code=0001	char=d,i	PI(ON)=C201		
427	14A	C026	00001	1	TP(ON)=0	U.code=0010	char=o,_	PI(ON)=C201		
428	14A	C026	00001	1	TP(ON)=0	U.code=0011	char=1,[]	PI(ON)=C201		
429										
430										
431										
432										
433										
434										
435	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN= 88.0	Map.1= 90.1	PI(ON)=C202	
436	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN= 88.2	Map.1= 91.9	PI(ON)=C202	
437	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN= 89.1	Map.1= 92.3	PI(ON)=C202	
438	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN= 94.5	Map.1= 95.4	PI(ON)=C202	
439	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN= 95.8	Map.1= 96.2	PI(ON)=C202	
440	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN=101.4	Map.1= 97.6	PI(ON)=C202	
441	14A	C201	00001	0	TP(ON)=1	U.code=0101	TN=104.8	Map.1=101.9	PI(ON)=C202	
442										
443	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN= 88.0	Map.2= 87.6	PI(ON)=C203	
444	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN= 88.2	Map.2= 89.7	PI(ON)=C203	
445	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN= 89.1	Map.2= 91.3	PI(ON)=C203	
446	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN= 94.5	Map.2= 99.6	PI(ON)=C203	
447	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN= 95.8	Map.2=102.2	PI(ON)=C203	
448	14A	C201	00001	0	TP(ON)=1	U.code=0110	TN=101.4	Map.2=104.0	PI(ON)=C203	
449										

GROUP No.	GROU type	PI (TN)	PTY	TP (TN)	etc	[] ...Blank
450	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 90.1 Map.1= 88.0	PI(ON)=C201
451	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 91.9 Map.1= 88.2	PI(ON)=C201
452	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 92.3 Map.1= 89.1	PI(ON)=C201
453	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 95.4 Map.1= 94.5	PI(ON)=C201
454	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 96.2 Map.1= 95.8	PI(ON)=C201
455	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN= 97.6 Map.1=101.4	PI(ON)=C201
456	14A	C202	00001	1	TP(ON)=0 U.code=0101 TN=101.9 Map.1=104.8	PI(ON)=C201
457						
458	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 90.1 Map.2= 87.6	PI(ON)=C201
459	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 91.9 Map.2= 89.7	PI(ON)=C201
460	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 92.3 Map.2= 91.3	PI(ON)=C201
461	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 95.4 Map.2= 99.6	PI(ON)=C201
462	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 96.2 Map.2=102.2	PI(ON)=C201
463	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN= 97.6 Map.2=104.0	PI(ON)=C201
464	14A	C202	00001	1	TP(ON)=0 U.code=0110 TN=101.9 Map.2=-----	PI(ON)=C201
465						
466	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN= 87.6 Map.1= 90.1	PI(ON)=C201
467	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN= 89.7 Map.1= 91.9	PI(ON)=C201
468	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN= 91.3 Map.1= 92.3	PI(ON)=C201
469	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN= 99.6 Map.1= 95.4	PI(ON)=C201
470	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN=102.2 Map.1= 96.2	PI(ON)=C201
471	14A	C203	00001	1	TP(ON)=0 U.code=0101 TN=104.0 Map.1= 97.6	PI(ON)=C201
472						
473	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN= 87.6 Map.2= 88.0	PI(ON)=C201
474	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN= 89.7 Map.2= 88.2	PI(ON)=C201
475	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN= 91.3 Map.2= 89.1	PI(ON)=C201
476	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN= 99.6 Map.2= 94.5	PI(ON)=C201
477	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN=102.2 Map.2= 95.8	PI(ON)=C201
478	14A	C203	00001	1	TP(ON)=0 U.code=0110 TN=104.0 Map.2=101.4	PI(ON)=C201
479						
480	14A	C201	00001	0	TP(ON)=1 U.code=1101 PTY=00001 Rsv=N TA(ON)=0	PI(ON)=C202
481	14A	C201	00001	0	TP(ON)=1 U.code=1101 PTY=00001 Rsv=N TA(ON)=0	PI(ON)=C203
482	14A	C201	00001	0	TP(ON)=1 U.code=1101 PTY=00001 Rsv=N TA(ON)=1	PI(ON)=C202
483						
484	14A	C202	00001	1	TP(ON)=0 U.code=1101 PTY=00001 Rsv=N TA(ON)=1	PI(ON)=C201
485	14A	C203	00001	1	TP(ON)=0 U.code=1101 PTY=00001 Rsv=N TA(ON)=1	PI(ON)=C201
486						
487	14A	C201	00001	0	TP(ON)=1 U.code=1110 PIN(ON)=25/8:12	PI(ON)=C202
488	14A	C201	00001	0	TP(ON)=1 U.code=1110 PIN(ON)=25/8:12	PI(ON)=C203
489	14A	C202	00001	1	TP(ON)=0 U.code=1110 PIN(ON)=25/8:34	PI(ON)=C201
490	14A	C203	00001	1	TP(ON)=0 U.code=1110 PIN(ON)=25/8:56	PI(ON)=C201
491						
492						
493						
494						
495	14B	C201	00001	0	TP(ON)=1 TA(ON)=0 PI(TN)=C201	PI(ON)=C202
496	14B	C201	00001	0	TP(ON)=1 TA(ON)=1 PI(TN)=C201	PI(ON)=C202
497	14B	C201	00001	0	TP(ON)=1 TA(ON)=1 PI(TN)=C201	PI(ON)=C203
498						
499						

GROUP No.	GROUP type	PI (TN)	PTY	TP (TN)	etc	□ ···Blank
500						
501						
502						
503						
504						
505						
506						
507						
508						
509						
510						
511						

13.4 Example of EON Remote Linking (SPECIAL 81 and 82)

13.4.1 Preset Memory Setting Example

Model 3217 (master) settings (this network)

* Settings made after SPECIAL 000 (special all clear)

PRESET ADDRESS	FREQUENCY (MHz)	LEVEL (dBμ)	FUNCTION				RDS PATTERN	INT FREQ	Remarks
			MOD	PILOT	TRI	RDS			
0	88.0	70.0	75.0	7.5	0.0	2.0	3	1 kHz	Other station program

SPECIAL 72: Preset 100%

SPECIAL 81: EON mode remote link (transmit)

Model 3217 (slave) settings (this network)

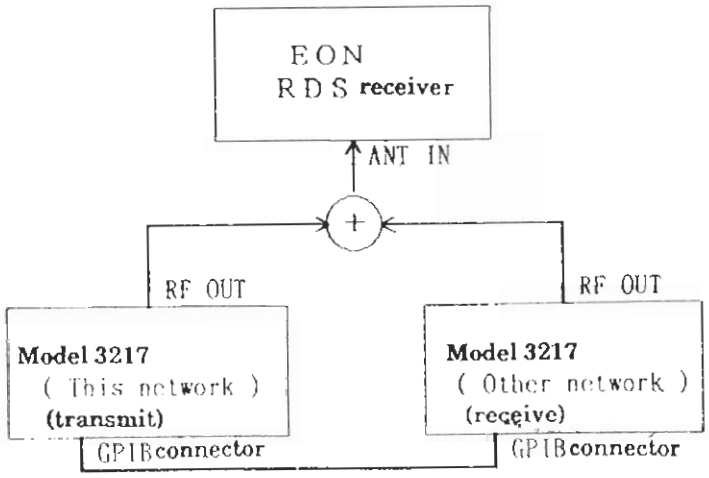
* Settings made after SPECIAL 000 (special all clear)

PRESET ADDRESS	FREQUENCY (MHz)	LEVEL (dBμ)	FUNCTION				RDS PATTERN	INT FREQ	Remarks
			MOD	PILOT	TRI	RDS			
1 1	90.1	70.0	75.0	7.5	0.0	2.0	5	400Hz	Traffic program start
1 2	90.1	70.0	75.0	7.5	0.0	2.0	4	6.3kHz	Traffic Program on-air
1 3	90.1	70.0	75.0	7.5	0.0	2.0	5	400Hz	Traffic program end

SPECIAL 72: Preset 100%

SPECIAL 82: EON mode remote link (receive)

13.4.2 Connection Example



LEADER ELECTRONICS CORP.

2-6-33 Tsunashima-higashi, Kohoku-ku, Yokohama, JAPAN
PHONE:81-45-541-2123
FAX:81-45-544-1280 TELEX:J47780 JPLEADER

LEADER INSTRUMENTS CORP.

380 Oser Avenue, Hauppauge, New York 11788 U. S. A.
PHONE:1-561-231-6900
FAX:1-561-231-5295 TELEX:510-227-9669 LEADER HAUP

LEADER INSTRUMENTS (EUROPE) LTD.

Raglan House, 8-24 Stoke Road,
Slough, Berkshire SL2 5AG, ENGLAND
PHONE:44-753-538022
FAX:44-753-538528

LEADER INSTRUMENTS (H.K.) LTD.

Room 303-304 New East Ocean Centre,
9 Science Museum Road, Tsimshatsui East,
Kowloon, HONG KONG
PHONE:852-2-7212503
FAX:852-2-7237573 TELEX:39025 LDR HK HX

LEADER INSTRUMENTS ASIA PTE., LTD.

300 Beach Road, #25-01/02,
The Concourse, SINGAPORE 0719
PHONE:65-295-4822
FAX:65-295-4833