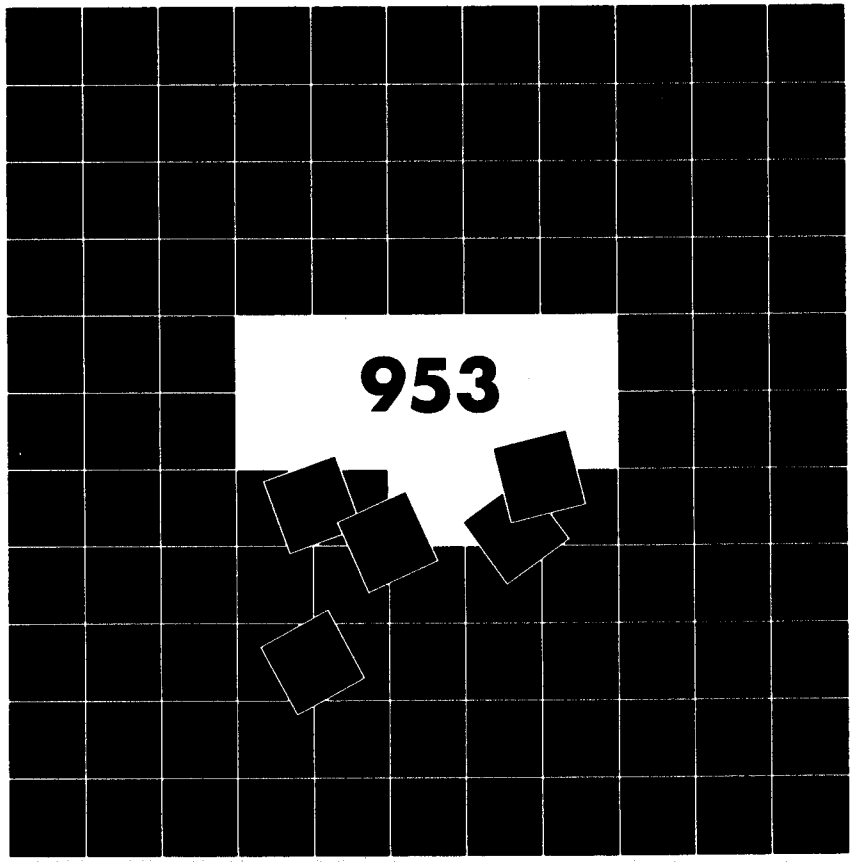
LEADER

1 GHz SIGNAL LEVEL METER

INSTRUCTION MANUAL



LEADER ELECTRONICS CORP.

OPERATING SAFETY PRECAUTIONS

Thank you for your purchase of the 953. To ensure safe operation of this measuring instrument, be sure to follow the warnings and precautions provided below.
The conventions for presenting warning and cautions in this manual are as follows. Please observe them to ensure safe operation of the 953.

⚠ **Warning .....** When warnings labeled as such are not observed, there is a risk of bodily harm, including a risk to human life.

⚠ **Caution .....** When cautions are not observed, there is a risk of bodily harm, and of damage to this product or equipment connected to this product.

⚠ **Warning**

- Do not use this product or equipment connected to it in an explosive, ignitable, or flammable atmosphere, as this will result in the risk of explosion.
- Use C size (IEC type R14) batteries, as the use of other types can cause failures of the 953 and fire.
- Do not connect this product to a piece of equipment or cable having a voltage with respect to ground on its chassis, as such connection can result in the risk of electrical shock.
- Use the dedicated AC Adapter. Otherwise, you run the risk of fire or instrument damage.

⚠ **Caution**

- Do not remove the case cover, as this can risk failures or loss of performance.
- Do not allow water to enter the 953. The 953 is not waterproof.
- If condensation forms on the 953 due to a sudden change in temperature, use the 953 only after allowing it to dry sufficiently.

TABLE OF CONTENTS

■ OPERATING PRECAUTIONS

■ Installation

⚠ Caution

Do not use the instrument in the following environments.

1. High temperature environments
   Do not place the instrument under direct sunlight, in a closed automobile, or near a heater (e.g., stove).
   Do not move the instrument from cold to warm environment abruptly, it may cause condensation.
   Operating temperature range: 0 to 40˚C
   Storage temperature range: -10 to 50˚C

2. High humidity environments
   Do not place the instrument in the high humidity environment (e.g., bathroom, near a humidor).

3. Dusty or sooty conditions

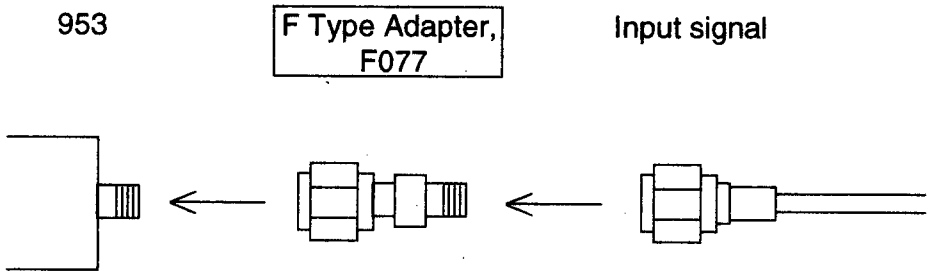
■ Cautions On Connector

⚠ Caution

Use one of the connectors listed in the table below for signal input to the INPUT connector of this instrument. Using a connector other than those specified may cause trouble (e.g., contact failure, damage).

Nominal Name	Model	Remarks
F Type	————	Conforms to EIAJ RC-6012A standards, addendum The coaxial cable with center conductor 0.8-mm in diameter can only be used when using the conductor as a center contact. Example: 5C-2V, TVEFCX, BSCX, etc.
NF Type	C12 Type	High-frequency coaxial connector Conforms to EIAJ RC-5220 standards
C15 Type	C15 Type	High-frequency coaxial connector Conforms to EIAJ RC-5223 standards

To protect the INPUT connector, the F Type Adapter F077 (see the figure below, sold separately) should be used.



1. SPECIFICATIONS

1.1 Description

The Model 953 1GHz Signal Level Meter with an LCD-display spectrum analysis function covers the VHF, UHF, and CATV channels in the world. Up to 128 channel levels can be displayed simultaneously.
The multi-channel preset system and automatic scaling functions based on frequency synthesizer technology enables a single-key operation for accurate measurements.
Since the RS-232C interface is provided as standard, this instrument allows data output to a printer or personal computer, and remote control capability.
Various functions and capabilities: C/N, hum, and AC/DC superimposed voltage measurements, 512 screen memories, automatic power-off function, and LCD backlight are provided.
These features also enable receiving level of TV signals, FM broadcasts, wireless microphones, and CATV installations to be measured, and the measurement data to be printed.

1.2 Features

[Level Measurement Mode (CHANNEL)]

(1) Frequency range of 5 - 1030 MHz.
(2) Frequency synthesizer ensures accurate frequency setting and stable display.
(3) Large LCD panel displays up to 128 channel measurement level for VHF and UHF.
(4) Average-value detection (peak-value detection for video and NICAM carriers).
(5) Simultaneous level display with bar-graph for all channels and digital for selected channel.
(6) MAX HOLD function holds the maximum level measured.
(7) To ensure accurate measurement, influence caused by frequency response and ambient temperature is automatically compensated.
(8) Four units can be selected: dBµV, dBµVEMF, dBmV, and dBmW.

[Spectrum Measurement Mode]

(1) 5 - 1030 MHz spectrum analysis function.
(2) Three resolution bandwidths of 110 kHz, 330 kHz, and 1 MHz.
(3) Level specified by frequency marker is displayed in numerical value.
(4) Frequency synthesizer ensures accurate frequency setting and stable display.
(5) For accurate measurement, influences caused by frequency response and ambient temperature is automatically compensated.

[Simple Operation]

(1) VHF, UHF, and CATV channel frequency tables (video, sound, and NICAM) are stored for easy presetting.
(2) Automatic channel setting with search function.
(3) Automatic scaling eliminates attenuator operation.
(4) Channel setting with program selection (50 maximum, depending on number of channels).
(5) Channel edit function for easy channel setting.
(6) Data transfer to the other 953.

[Measurement Data Recording and Storage]

(1) Single-key operation to print measurement data (use 712 Printer).
(2) Data output to a personal computer via the RS-232C interface.
(3) Large-capacity memory (512 maximum, depending on number of channels).

[Various Functions]

(1) Remote control via the RS-232C interface.
(2) AC/DC superimposed voltage measurement function.
(3) C/N measurement function.
(4) Hum measurement function.
(5) Data logger function.

(6) Stability measurement function.
(7) Built-in speaker for demodulated sound monitor, buzz check, and beeper.
(8) Battery check function displays battery voltage.
(9) Automatic power-off function saves power consumption.
(10) Automatic LCD contrast control with temperature sensor.
(11) The backlight is useful when operating the instrument in dark locations.
(12) AC adapter LPS-1950 or LPS-1911J enables continuous operation.
(13) Six hour continuous operation with LP 2114 lead-acid battery (optionally available), 10 hour continuous operation with BP-95S Ni-Cd battery (optionally available).
(14) Timer and calendar function.

1.3 Specifications

1.3.1 Reception Range

Frequency Range	5 to 1030 MHz
Frequency Setting	12.5 kHz steps
Frequency Accuracy	±10 kHz
Stored Channel Table	
CATV	Japan, Japan SUB BAND A, Japan SUB BAND B, USA<STD HIS>, USA<STD EIA>, USA<HRC EIA>, USA<IRC EIA>, JERROLD STD, JERROLD HRC, CCIR, China, Ireland, France, Holland, Philips, Semens
VHF	Japan, USA, CCIR, china, Angora, Australia, Indonesia, Ireland, Italy, Cote d'Ivoire, Morocco, New France, New Zealand, OIRT, South Africa, UK
UHF	Japan, USA, CCIR, China, Australia, OIRT, UK/Hong Kong
VHF + UHF	Japan, USA, CCIR, China, Australia, Indonesia, Ireland, Italy, New France, OIRT, South Africa, UK
RADIO MIC	AL BAND, AH BAND, B BAND, C BAND

1.3.2 Level Measurement

Input Connector	F type (replaceable)
Impedance	75 Ω
	50 Ω (using LC 1587 50 Ω - 75 Ω Matching Pad)

Range (Unit Selectable)	[Bandwidth: 110 kHz, Video filter: 0.1 kHz] 15 to 120 dBμV (1 μV = 0 dBμ into 75 Ω termination) 21 to 126 dBμVEMF (1 μV = 0 dBμVEMF 75 Ω open circuit) -45 to 60 dBmV (1 mV = 0 dBmV into 75 Ω termination) -94 to 11 dBmW (1 mW = 0 dBmW into 75 Ω termination)
Resolution	0.1 dB
Accuracy	±2 dB (≥40 dBμV) ±3 dB (<40 dBμV)
Bandwidth	
Level Measurement (CHANNEL)	Video carrier (:v attached): 330 kHz Sound carrier (:s attached), etc.: 110 kHz NICAM carrier (:n attached): 330 kHz
SPECTRUM Measurement	Ganged with span (110 kHz, 330 kHz, 1 MHz)
Detection Method	
Level Measurement (CHANNEL)	Average-value detection for video carrier (:v attached) Peak-value detection NICAM carrier (:n attached)
SPECTRUM Measurement	Average-value detection
Video Filter	
Level Measurement (CHANNEL)	Video carrier (:v attached): 100 kHz Sound carrier (:s attached), etc.: 1 kHz NICAM carrier (:n attached): 100 kHz
SPECTRUM Measurement	Ganged with span (0.1 kHz, 1 kHz, 100 kHz, selectable)
Scale	
Level Measurement (CHANNEL)	Automatic, manual, selectable
SPECTRUM Measurement	Manual only
Reference Level	20 to 120 dBμV
Scale Division	2, 5, 10 dB/div

1.3.3 Display Method

Level Measurement (CHANNEL)	
MULTI	Bar-graph for 1 to 128 channels Numerical display for cursored channel
SINGLE	Bar-graph and numerical display for single channel
SPECTRUM Measurement	
Frequency Range	5 to 1030 MHz, 12.5 kHz steps
Span	0 to 1025 MHz, 1 MHz steps
Reference Level	20 to 120 dBµV
dB/DIV	2, 5, 10 dB
Resolution bandwidth	Ganged with span (110 kHz, 330 kHz, 1 MHz)
Video Filter	0.1 kHz, 1 kHz, 100 kHz
Marker	5 to 1030 MHz, 12.5 kHz steps Numerical display for marked frequency's level
Display Area	6 div (V) x 10 div (H)

1.3.4 Additional Measurement Modes

a. V-S Measurement	-9 to 25 dB
b. V-N Measurement	-9 to 25 dB (S - N < 20 dB)
c. C/N Ratio Measurement	
Range	20 to 50 dB (equivalent bandwidth: 4 MHz) (Signal level: ≥ 85 dBµV, below 85 dBµV reduces upper limit)
Accuracy	±4 dB

d. Hum Modulation Measurement

Range	0.5 to 5 %
Accuracy	±1 %
Modulation Bandwidth	2 to 200 Hz

e. Stability Measurement

Settable Time	1 to 300 sec, 1 sec steps

f. AC/DC Voltage Measurement

AC Voltage	1 to 100 Vrms, 50/60 Hz sine wave (Peak-to-peak value measurement, rms indication)
DC Voltage	1 to 50 V
AC/DC Selection	Automatic
Resolution	0.1 V
Accuracy	±(5 % + 1 V)

g. Data Logger

Time Interval	1 to 999 minutes, 1 minute steps
Output Destination	Printer, memory
Number of Outputs	Printer: 1 to 999, endless Memory: 512 max

1.3.5 Memory

a. Number of Programs	50 max
Level Measurement	16 programs for 128 channels
	50 programs for 40 channels
SPECTRUM Measurement	20 programs
b. Number of Data Memories	512 max
Level Measurement	109 memories for 128 channels
	512 memories for 27 channels
SPECTRUM Measurement	138 memories

1.3.6 RS-232C Interface

	Serial interface, (9-pin D-sub connector)
Communication System	Full duplex
Synchronous System	Asynchronous
Parameter	
X Parameter	Enable, disable
Data Bit Length	7 bits, 8 bits
Parity	None, even, odd
Start Bit	1 bit,
Stop Bit	1 bit, 2 bits
Baud Rate	300, 600, 1200, 2400, 4800, 9600 bps
Printer Output	For Model 712 (optional accessory)
Output Type	Measurement data
	Graph
	Measurement data and graph
Remote Control	All functions except power on/off and RS-232C setup can be remotely controlled with a personal computer.

1.3.7 Display Section

Display	128 dots (V) x 160 dots (H)
Dot Size	0.56 mm (V) x 0.56 mm (H)
SPECTRUM Display Area	60 dots (V) x 100 dots (H)
CHANNEL Display Area	60 dots (V) x 128 dots (H)

1.3.8 Others

a. Reference Offset	±30 dB, 0.1 dB steps
b. Calibration Offset	±2 dB, 0.1 dB steps
c. Sound Output	Speaker
d. Automatic Power-Off	
Operating Time	Approx. 5 minutes after last key operation
Continuous Operation	By turning off the automatic power-off function

1.3.9 Environmental Conditions

Operating temperature range	0 to 40°C
Operating humidity range	30 to 85% RH
Storage temperature range	-10 to 50°C

1.3.10 Dimensions & Weight

213 (W) x 120 (H) x 200 (D) mm
Approx. 3.6 kg (including battery)

1.3.11 Accessories

Type D cell	8
DC Plug (w/45 cm cable)	1
Carrying Case	1
Instruction Manual	1
Instruction Manual (RS-232C/Frequency Table)	1

1.4 Optional Accessories

712	Printer (AC Adapter, Cable provided)
LC-083	Roll Paper
LC-2239	Accessory Bag (same as printer bag)
LC-2093	C15-P-P,BSCX Cable, 1.5 m
LJ-09	Coaxial Clip
LBN-14	300 Ω - 75 Ω Balun
LC 1587	50 Ω - 75 Ω Matching Pad
LC 1589	F(C12) - JJ F Adapter (3 pieces)
LC 1590	F•J - BNC75•J BNC Adapter
LC-2096	Printer Cable, 1 m (for 712)
LC-2097	RS-232C Cable, 1m (for PC-98)
LC-2098	RS-232C Cable, 1m (for IBM-PC)
LC-2099	RS-232C Transfer Cable, 1m
LP 2113	Cover/Charger for Lead-Acid Battery (use AC Adapter to recharge)
LP 2114	Lead-Acid Battery Pack 12 V, 3.2 Ah
LPS-1911J	AC Adapter, 100 VAC (for LP 2113)
LPS-1950	AC Adapter, 100 to 240 VAC, install to main frame
LC-2091	Battery Cover for BP-90A
BP-95S	Battery (equivalent to BP-90A 12 V, 5 Ah) *
DBC-220a	2-Channel Charger/Discharger *
FX-1	2-Channel Charger *

*: Manufactured by I•D•X Co., Ltd.

Note 1: When installing the BP-95S (equivalent to BP-90A) to the 953, the LC-2091 Battery Cover is required.

Note 2: The DBC-220a Charger/Discharger and FX-1 Charger are used for the BP-95S (equivalent to BP-90A). They cannot be used for the 953.

Note 3: The LC-2239 Accessory Bag can be used for both the 712 and 953. Attach the bag on the carrying case for later use.

Note 4: When using the LP 2114 Lead-Acid Battery Pack, LP 2113 and LPS-1911J are required.

Note 5: One LC-083 Roll Paper is supplied to the 712.

2. PANEL DESCRIPTION

2.1 Front Panel

Figure 2-1 shows front panel.

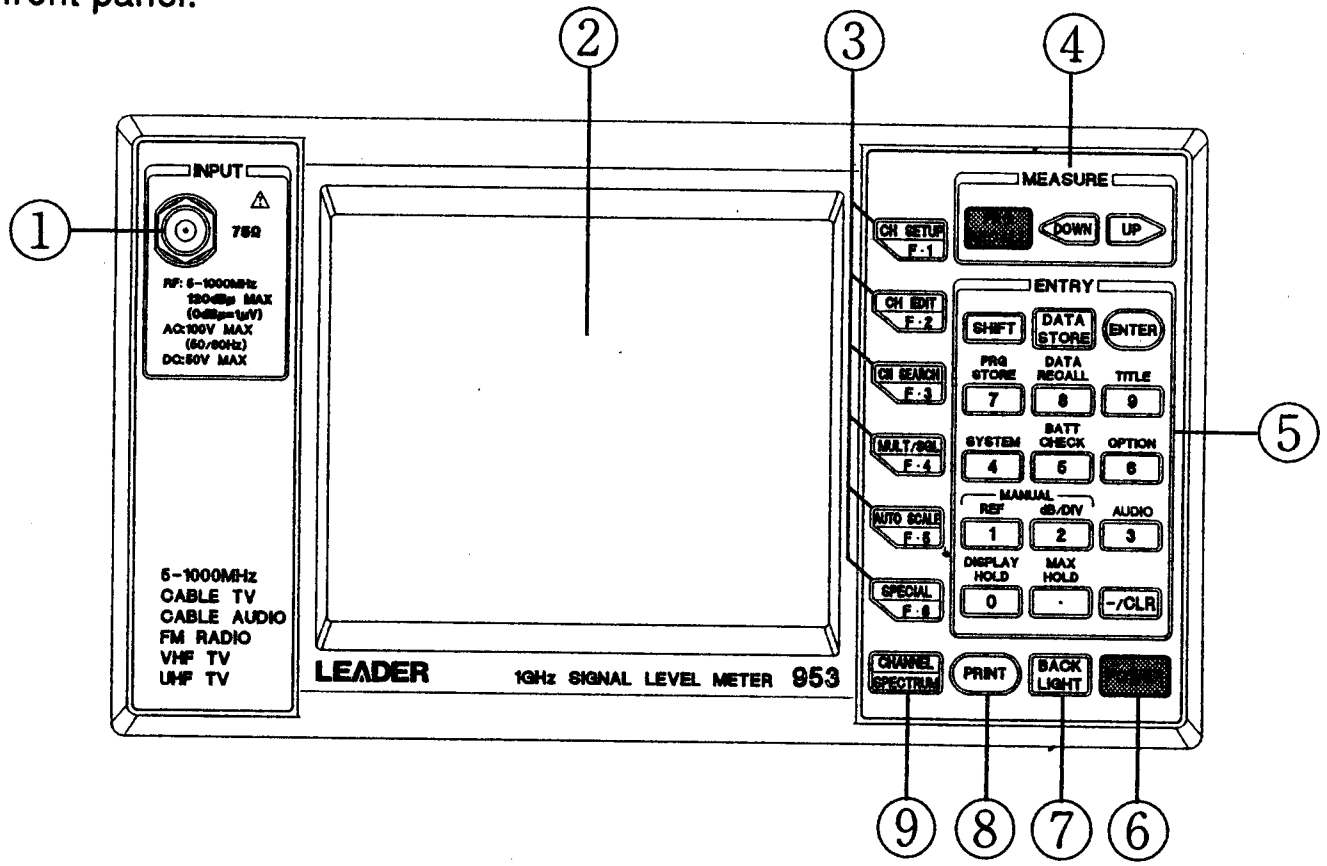


Figure 2-1 Front Panel

① INPUT connector

Signal input connector.
AC and DC voltages superimposed on the cable can also be measured. The maximum input voltage is 100 Vrms or 50 VDC.
F-type adapter is installed as standard. The adapter is replaceable.
The F - BNC Adapter and 50 Ω - 75 Ω Matching Pad are optionally available.

② LCD panel

Displays channel, frequency, input signal level, spectrum, setting conditions, and measurement results.
The backlight is useful when operating the instrument in dark locations.

③ Function key group

• When the menu is displayed on the screen, these keys are used as the function keys, F•1 to F•6.

CH SETUP	This key is used to display selection screen for band, country, or area to be measured.
CH EDIT	This key is used to edit or store the channel data.
CH SEARCH	This key is used to measure all channel signal levels. The signal with approximately 50 dBμV or higher level is displayed. This function only works in the MULTI-channel measurement mode.
MULTI/SGL	This key is used to select MULTI- or SINGLE-channel measurement mode.
AUTO SCALE	In the MULTI-channel measurement mode, this key is used to select automatic or manual scaling.
SPECIAL	This key is used to display SPECIAL measurement screens: V-S,V-N, C/N, HUM, and AC/DC measurement.

④ MEASURE key group

PRG RECALL	This key is used to recall programmed channel group.
DOWN, UP	When the level measurement mode (CHANNEL) is selected, these keys are used to move the channel cursor in the MULTI-channel measurement mode, or to select channel in the SINGLE-channel measurement mode. When the spectrum mode is selected, these keys are used to set numerical value.

⑤ ENTRY key group

DATA STORE	Press this key to store measurement data.
ENTER	Press this key after numerical value is input. To store measurement data into memory, press this key after pressing the DATA STORE key.
0 - 9 .	Numerical key. The value is displayed at the second line of the upper-left corner of the screen. Press the ENTER key to enter data.
-/CLR	This key is used to input "-" sign for numerical value. Pressing twice this key clears numerical value.
SHIFT	By pressing this key activates blue function printed above numerical keys. The SHIFT is displayed at the upper part of the screen in reverse video. To cancel the SHIFT, press this key again. The **blue** functions are described below.

PRG STORE	Displays screen to program the level measurement channels or spectrum measurement settings.
DATA RECALL	Displays screen to recall stored measurement data.
TITLE	Displays screen to name or revise program and measurement data. The title is displayed at the upper part of the screen in reverse video.

SYSTEM	Displays the SYSTEM setting screen. The contrast, date, beeper, automatic power-off, print, program transfer, RS-232C, measurement unit, and calibration offset can be set.
BATT CHECK	Displays screen to measure loaded voltage of battery or power supply.
OPTION	Displays screen to set additional functions (i.e., data logger, stability measurement, impedance selection).
MANUAL REF	In the MULTI-channel measurement mode, REF level can be changed manually. Value at the top of the scale is displayed in reverse video (REF level).
MANUAL dB/DIV	In the MULTI-channel measurement mode, level scale division can be changed manually. Values at the upper two the scales are displayed in reverse video.
AUDIO	FM demodulation is performed at the cursored frequency. The speaker outputs demodulated sound. The <SOUND ON> is displayed at the upper part of the screen.
DISPLAY HOLD	Holds measurement screen temporary. The <DISPLAY HOLD> is displayed at the upper part of the screen.
MAX HOLD	Displays maximum value of each measurement point. The <MAX HOLD> is displayed at the upper part of the screen.

⑥ POWER key

Press to turn power on, and press again to turn power off.
The automatic power-off function turns power off 5 minutes after last key operation. To this function, use AUTO POWER OFF in the system setting screen.

OFF: Cancels automatic power-off function temporary when it is being set. The automatic power-off function will be set when power is turned on again.

<OFF>: The automatic power-off function is canceled completely.

⑦ BACKLIGHT key

Turns LCD backlight on/off.

⑧ PRINT key

This key is used to print the screen and measurement data to the 712 Printer via the RS-232C interface. If no printer is connected, the RS-232C error screen is displayed approximately 10 seconds later.

⑨ CHANNEL/SPECTRUM key

Selects either level measurement mode (CHANNEL) or SPECTRUM measurement mode.

2.2 Rear Panel

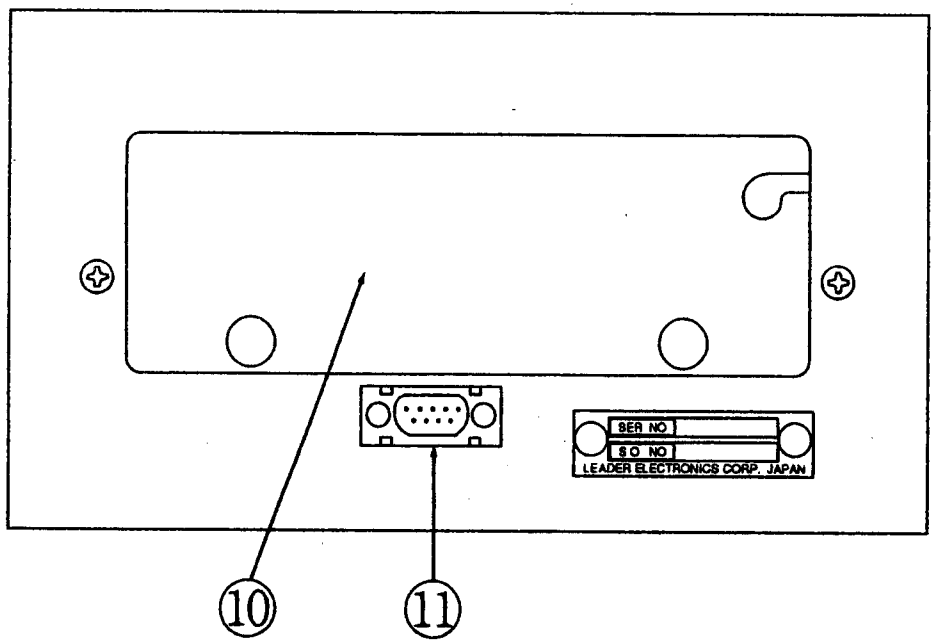


Figure 2-2 Rear Panel

⑩ Battery compartment, cover
Install 8 type D cells. The battery pack or AC adapter (optional accessory) can also be installed.

⑪ 9-pin D-sub connector (RS-232C)
To output data to the 712 Printer, personal computer, or conventional printer.
In the remote control mode, this connector is used to communicate with a personal computer.

3. INITIAL USE

3.1 Cautions

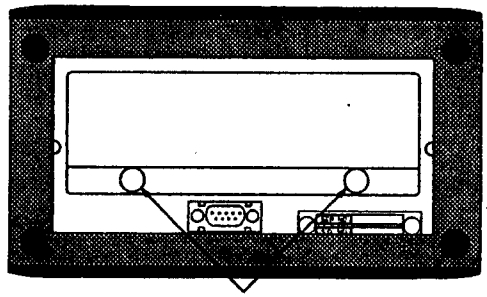
(1) When the instrument is left for long time without supplying power, remove the battery to prevent depletion and leakage.
(2) The battery supplied is only to be used to check operation. Because this battery may be depleted, replace it with a new battery. Install the new battery according to the correct polarity. Otherwise, trouble may result.
(3) Do not apply severe mechanical shock.
(4) Do not apply excessive force on the LCD panel.
(5) Do not press the keys with a sharp object. This can cause trouble.
(6) When putting the 953 in the carrying case, tighten the screw on the bottom of cabinet to prevent the 953 from falling.
(7) Do not expose the instrument to large amounts of water (e.g., rain water). This can cause trouble.
(8) Store the instrument in a temperature range of (-10 to 50°C) to prevent LCD damage. The instrument should be operated in a temperature range of (0 to 40°C) and humidity range of (30 to 85%).
(9) Do not apply excessive voltage (i.e., 120 dBμV, 100 VAC, 50 VDC) to the input connector. It can cause trouble.

3.2 Battery Operation

3.2.1 Battery Installation

When battery voltage drops under 8.5 V, the low battery sign ([+ −][LOW!]) appears at the upper-left corner of the screen and flashes. Prepare a new battery in this case.
When battery voltage drops under 8 V, <<LOW BATTERY>> screen is displayed. Turn power off and replace the battery as follows.

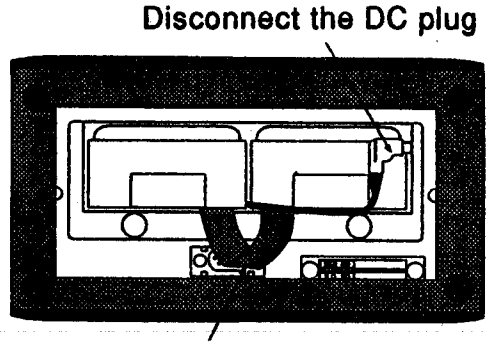
(1) Pull the latches on the battery compartment cover on the rear panel, then remove the cover.



Pull the latches and remove the cover

Figure 3-1

(2) Remove the DC plug.
Pull the ribbon and remove the battery case.
Never drop the case to prevent damaging.



Pull the ribbon and remove the battery case

Figure 3-2

(3) Install 8 type D cells or equivalent into the case with correct polarity.

(4) Install the case into the battery compartment and connect the DC plug.
The power supply may be turned on.

(5) Place the battery cover and press the latches.

(6) Press the POWER key to turn power on. Confirm that the measurement screen appears.

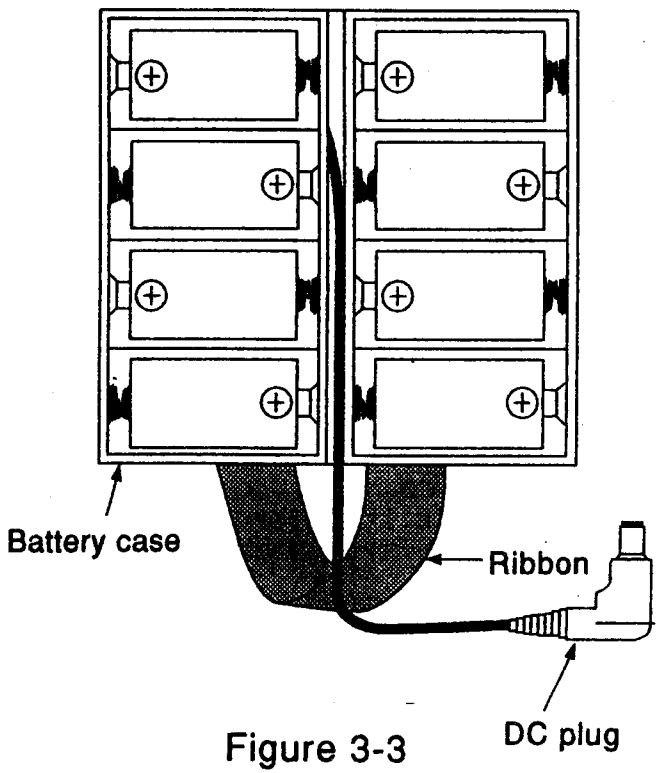


Figure 3-3

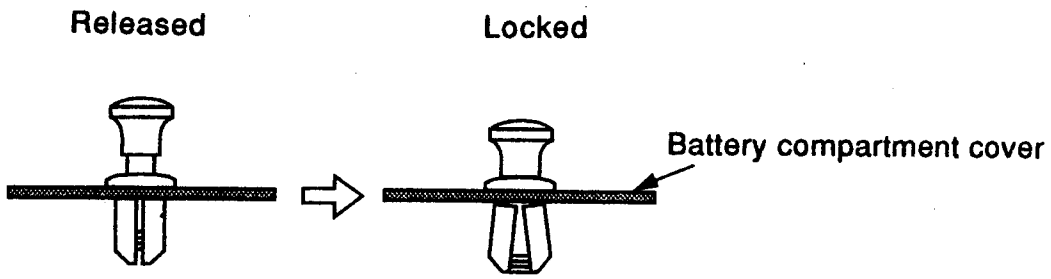


Figure 3-4 Latches

3.2.2 Battery Check

Follow procedure below to check loaded voltage of power supply.
Time is also displayed.

• Operating Procedure

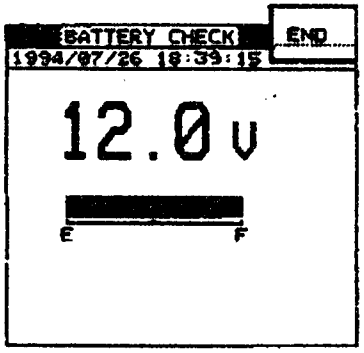
1. Press the SHIFT key.

2. Press the BATT CHECK (5) key.
   Power supply voltage is displayed.
   Time is also displayed.

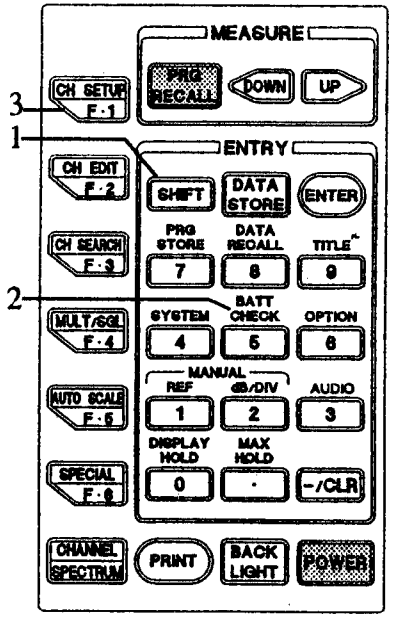
3. To return to the measurement screen,
   press the F•1 (END) key.

• Screen Display

2.



• Keys Used



3.2.3 Battery Life

Battery life depends on the battery type, ambient temperature, storage time, operating conditions, etc. Refer to Figure 3-5 for approximate battery life in continuous operation (25°C, new battery).

Battery Type \ Voltage	<8.5 V LOW!! Flashes	<8.0 V <<LOW BATT>>	Total
① High-Grade Manganese Battery	100 min.	20 min.	120 min.
② Alkaline Battery	360 min.	140 min.	500 min.
③ Lead-Acid Battery (LP 2114)	430 min.	3 min.	430 min.
④ Ni-Cd Battery (BP-95S)	590 min.	1 min.	590 min.

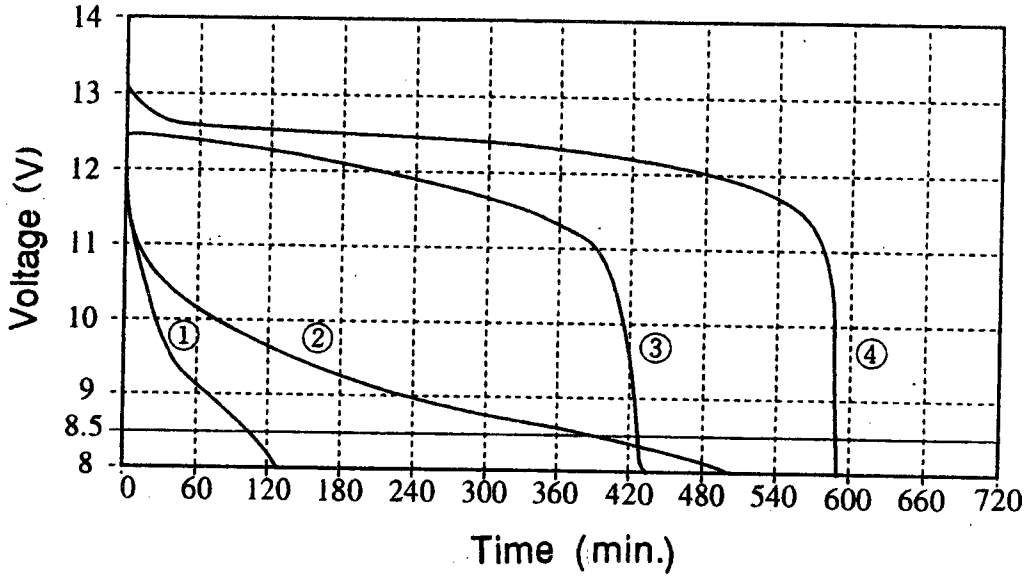


Figure 3-5 Battery life (25°C)

- The battery supplied is only to be used to check operation. Replace it with a new battery.
- The battery is depleted more quickly under continuous operation and low ambient temperature.
- When battery voltage drops under 8.5 V, the low battery sign (+ − LOW!!) appears at the upper-left corner of the screen and flashes. Prepare a new battery in this case.
- When battery voltage drops under 8 V, <<LOW BATTERY>> screen is displayed and beeper sounds three times. Turn power off and replace the battery.

3.3 Operating Precautions

(1) Press the POWER key to turn power on.
The power is automatically turned off by the automatic power-off function 5 minutes after last key operation. Turn power on again in this case.

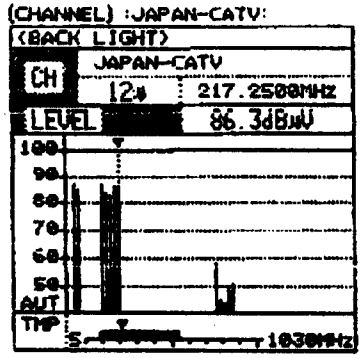
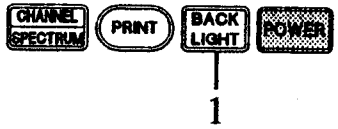
(2) When the beeper sounds three times, the previous key operation was not accepted (This key is not used for the screen on display).

(3) When the function keys are displayed at the right margin in the level measurement (CHANNEL) mode, use following keys to cancel the display.
- F•1 "END" is only displayed. → Press the CH SETUP-F•1 key.
- F•1 to F•6 are displayed. → Press the SPECIAL-F•6 key. (1 to 3 times)

(4) When power is turned on, the 953 retains the key settings in effect before power was turned off.
- Measurement data recall screen setting → Returns to previous measurement screen
- Automatic power-off, OFF → Returns to ON (except <OFF> setting)
- Backlight, ON → Returns to OFF
- All measurement modes and functions. except data logger, impedance selection, and reference setting → Returns to previous measurement screen

3.4 Backlight On/Off

The backlight is useful when operating the instrument in dark locations. Turn it only when necessary to save battery power. When power is turned off, the backlight is also turned off. Turn it on as required when power is turned on.

• Operating Procedure	• Screen Display	• Keys Used
1. Press the BACKLIGHT key to turn on or off the backlight. The <BACKLIGHT> is displayed at the upper-left corner of the screen while the backlight is on. The screen becomes brighter.		

3.5 SYSTEM Setting

- The following nine basic systems are available.

- The factory setting is shown below. Set the system as required.

1. CONTRAST	Midrange (MID<0>)	
2. DATE	Japan Standard Time	
3. BEEP	ON	
4. AUTO POWER OFF	ON	
5. PRINT TYPE	GRAPH + DATA	
6. PRG COPY	RECEIVE	
7. RS-232C	<X>	Enable
	<DATA>	8 bits
	<PARITY>	None
	<STOP>	1 bit
	<BAUD>	9600 bps
8. UNIT	dBμV	
9. CAL OFFSET	0.0 dB	

• Operating Procedure • Screen Display • Keys Used

1. Press the SHIFT key.

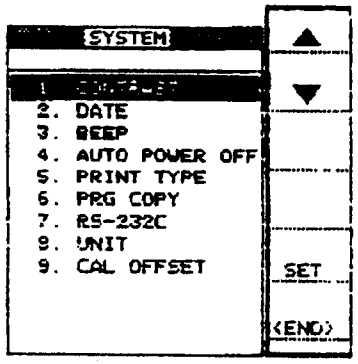
2. Press the SYSTEM (4) key to display SYSTEM setting screen.

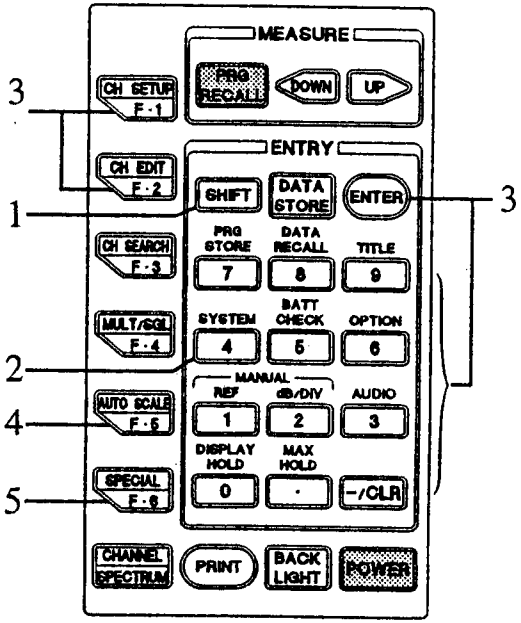
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

4. Press the F•5 (SET) key. The selected screen is displayed.

5. To escape from the SYSTEM setting screen, press the F•6 (<END>) key. The previous measurement screen is displayed.
   This operation is applied for Steps 3.5.1 through 3.5.9 except 3.5.6.

2.





3.5.1 Contrast

Screen contrast can be changed, set as required.

• Operating Procedure • Screen Display • Keys Used

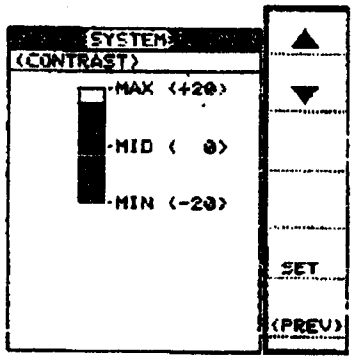
1. Display the SYSTEM setting screen. Position the cursor to "1. CONTRAST" and press the F•5 (SET) key to display CONTRAST setting screen.

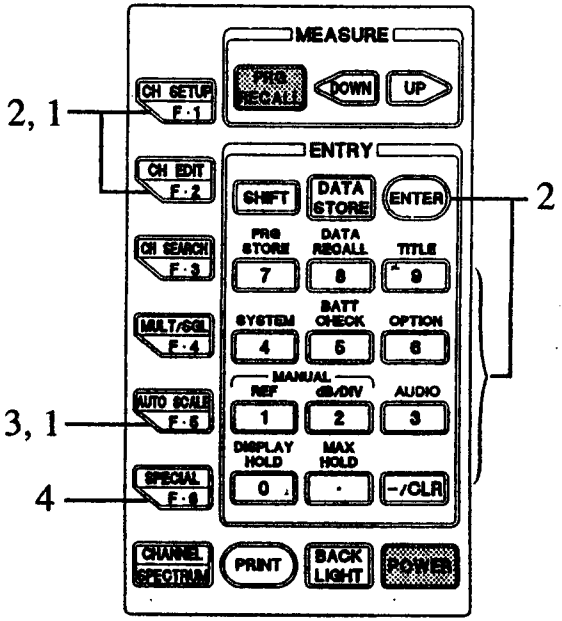
2. Press the F•1 (▲) or F•2 (▼) key, or input data (-20 to 20) using the numerical key, then press the ENTER key. The bar-graph indicates the contrast.

3. Press the F•5 (SET) key to set the selected item. The screen returns to the SYSTEM screen.

4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

2.





3.5.2 Date

The date can be added to the program, measurement data to be stored, AC/DC measurement screen, and hardcopy.

• Operating Procedure • Screen Display • Keys Used

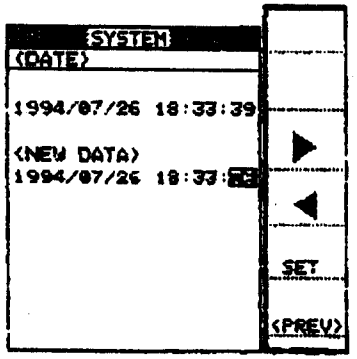
---

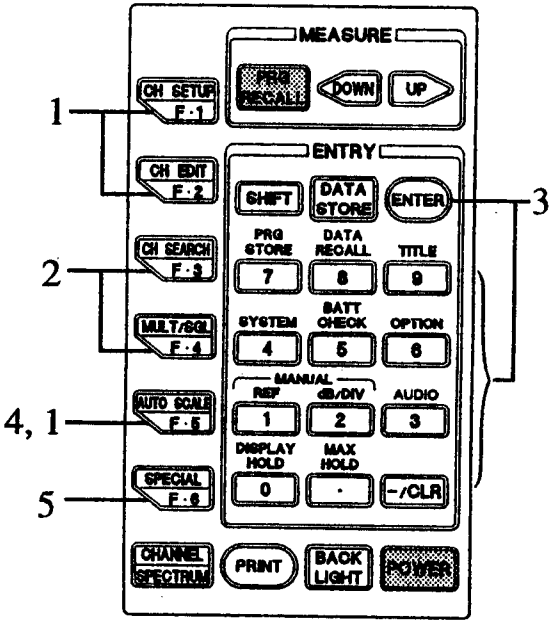
1. Display the SYSTEM setting screen. Position the cursor to "2. DATE" and press the F•5 (SET) key to display DATE setting screen.

2. Press the F•3 (▶) or F•4 (◀) key to position the cursor to year, month, date, hour, minute, or second of <NEW DATA>.

3. Input data using the numerical key, then press the ENTER key. The input data is displayed at the <NEW DATA>.

2.





4. For accurate time setting, enter a time value slightly before the correct time, then press the F•5 (SET) key at the precise time. The newly set time is displayed above <NEW DATA>.

5. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

3.5.3 Beeper

Beeper can be on or off. The beeper sounds in the following conditions even it is turned off: power on/off, error screen (RS-232C, REMOTE, and EEPROM) and <LOW BATTERY> screen.

• Operating Procedure

1. Display the SYSTEM setting screen. Position the cursor to "3. BEEP" and press the F•5 (SET) key to display BEEP setting screen.

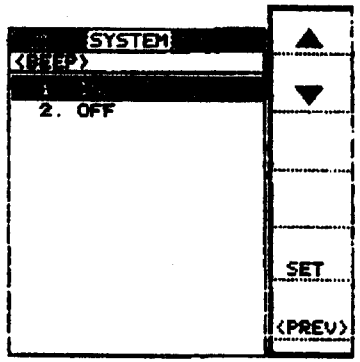
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

3. Press the F•5 (SET) key to set the beeper. The screen returns to the SYSTEM screen.

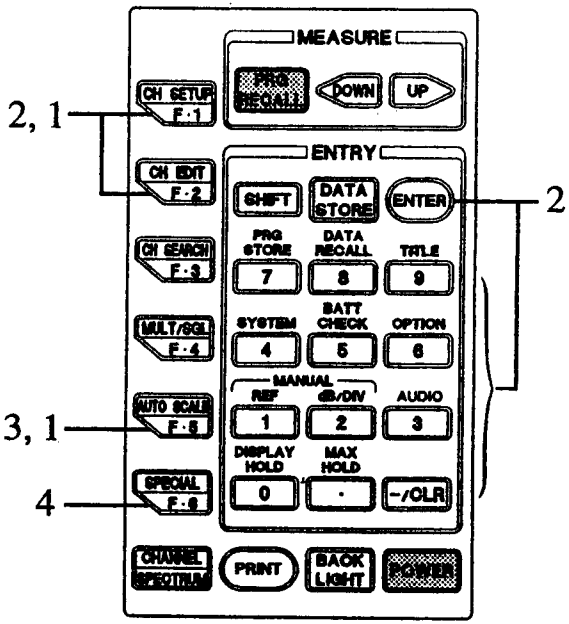
4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

• Screen Display

2.



• Keys Used



3.5.4 Automatic Power-Off

This function activates 5 minutes after last key operation. Followings describe turning on/off this function.

1. ON Activates automatic power-off function. Power is turned off 5 minutes after last key operation.
2. OFF The automatic power-off function is canceled temporary. Turning power on again enables this function.
3. <OFF> The automatic power-off function is canceled completely. Use this mode for continuous operation (e.g., continuous level monitoring, communication via the RS-232C interface).

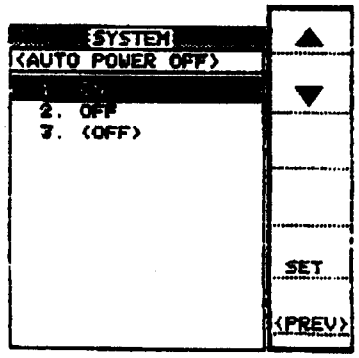
• Operating Procedure • Screen Display • Keys Used

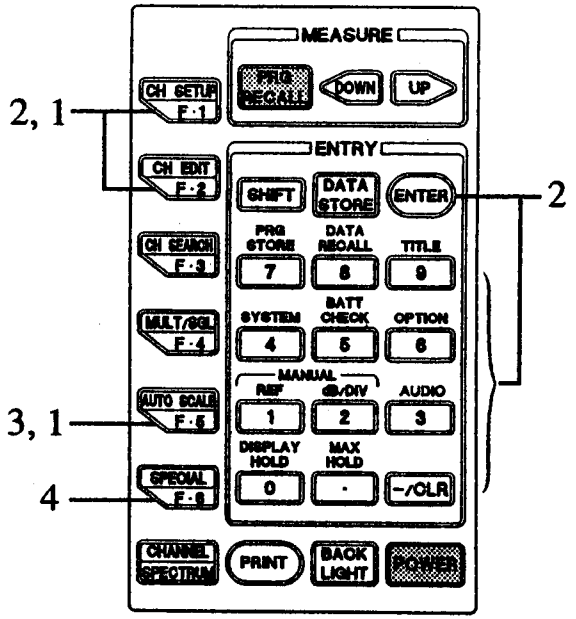
---

1. Display the SYSTEM setting screen. Position the cursor to "4. AUTO POWER OFF" and press the F•5 (SET) key to display AUTO POWER OFF setting screen.

2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

2.





3. Press the F•5 (SET) key to set the selected item. The screen returns to the SYSTEM screen.

4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

3.5.5 Printout Type

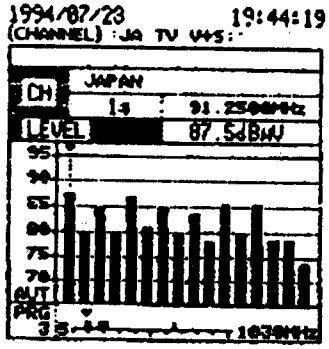
The following printout types are available for the 712 Printer.

1. GRAPH ONLY Outputs displayed screen.
2. DATA ONLY Outputs measurement data.
3. GRAPH + DATA Outputs displayed screen and measurement data.

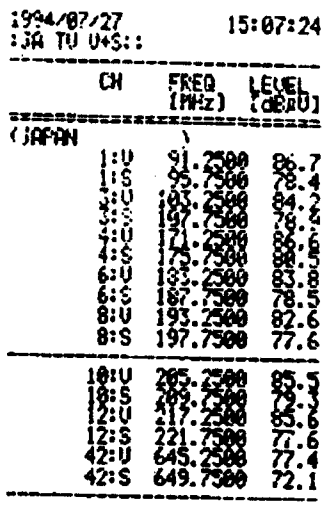
In the SPECTRUM mode, displayed screen is only output even 2. DATA ONLY or 3. GRAPH + DATA is selected.

- Example of Printout Type

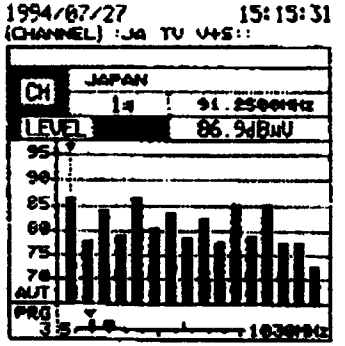
1. GRAPH ONLY

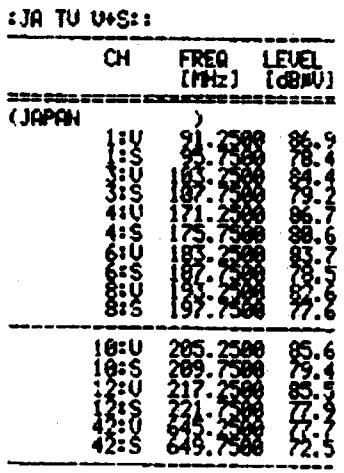


2. DATA ONLY

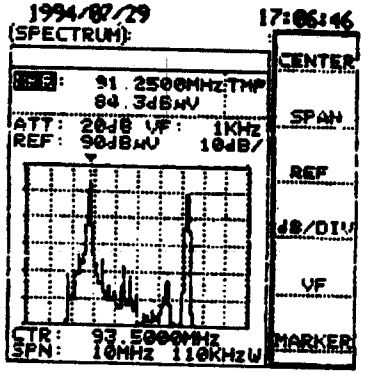


3. GRAPH + DATA





* Spectrum measurement mode



• Operating Procedure • Screen Display • Keys Used

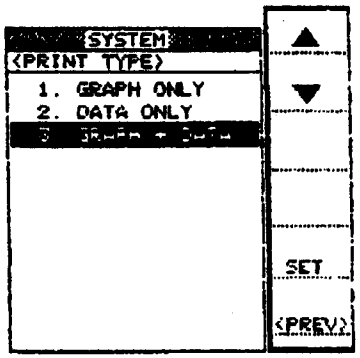
1. Display the SYSTEM setting screen. Position the cursor to "5. PRINT TYPE" and press the F•5 (SET) key to display PRINT TYPE setting screen.

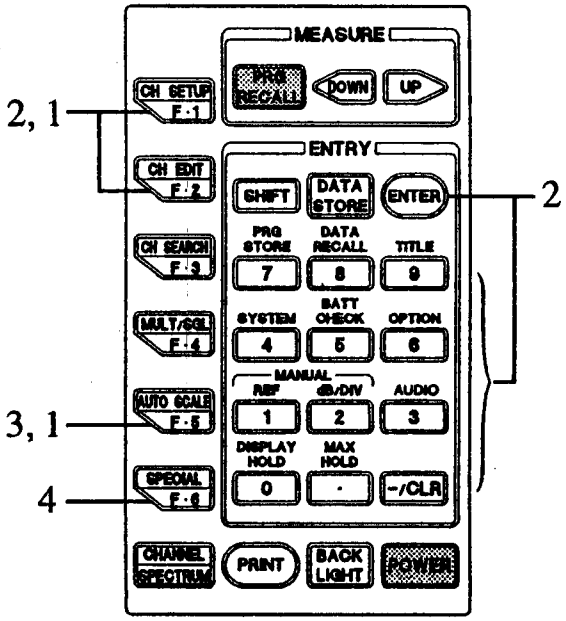
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

3. Press the F•5 (SET) key to set the selected item. The screen returns to the SYSTEM screen.

4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

2.





3.5.6 Program Transfer

The stored program can be transferred to the other 953 via the RS-232C interface. Refer to Section 10.4, "Program Transfer" for detail.

3.5.7 RS-232C Interface

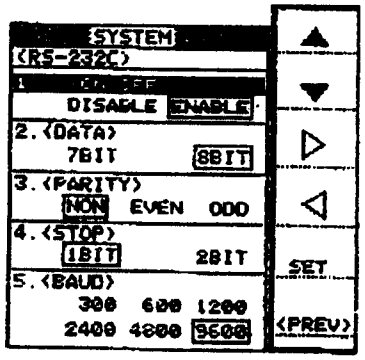
When using a conventional printer or communicating with a personal computer, the parameters should be the same. If the parameters are different, communication cannot be made. Set five parameters.

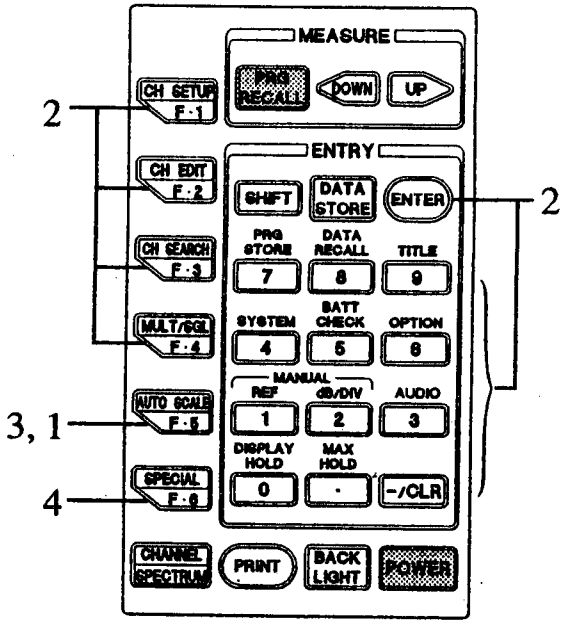
• Operating Procedure • Screen Display • Keys Used

1. Display the SYSTEM setting screen. Position the cursor to "7. RS-232C" and press the F•5 (SET) key to display RS-232C setting screen.

2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key to select the item. Press the F•3 (▷) or F•4 (◁) key to select the same parameter as a personal computer or printer. The selected parameter is displayed in a box.

2.





3. Press the F•5 (SET) key to set the selected item. The screen returns to the SYSTEM screen.

4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

3.5.8 Measurement Unit

Four units, and conversion formula with respect to dBμV are shown below.

Display		Conversion Formula
dBμV	(1 μV = 0 dBμ into 75 Ω termination)	Reference
dBμE	(1 μV = 0 dBμVEMF 75 Ω open circuit)	dBμV + 6 dB
dBmV	(1 mV = 0 dBmV into 75 Ω termination)	dBμV - 60 dB
dBmW	(1 mW = 0 dBmW into 75 Ω termination)	dBμV - 108.8 dB

• Operating Procedure • Screen Display • Keys Used

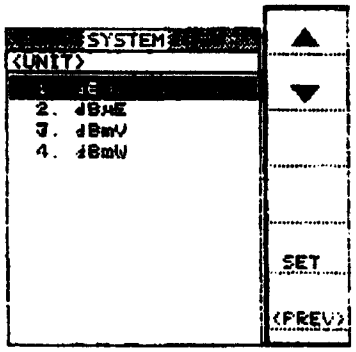
1. Display the SYSTEM setting screen. Position the cursor to "8. UNIT" and press the F•5 (SET) key to display UNIT setting screen.

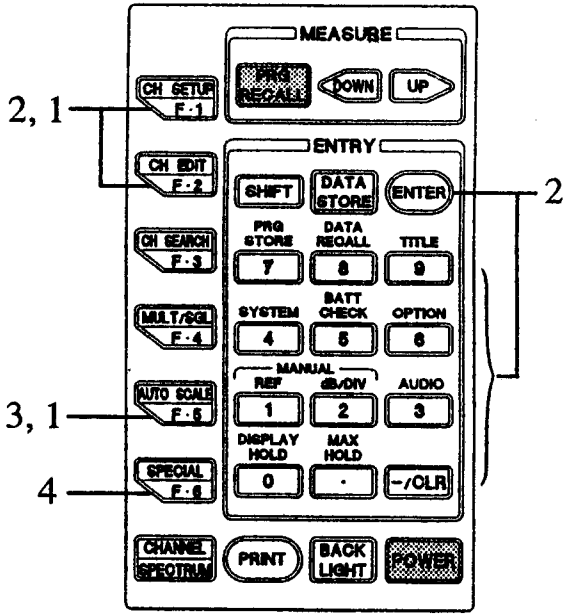
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

3. Press the F•5 (SET) key to set the selected item. The screen returns to the SYSTEM screen.

4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

2.





3.5.9 Calibration Offset

This function is used to match the measurement values between two or more 953s, or to calibrate the specified point (frequency, level). The settable range is up to ±2 dB. The set value is summed or detracted to the measurement value, and displayed with asterisk at the right side of the unit.

• Operating Procedure

1. Display the SYSTEM setting screen. Position the cursor to "9. CAL OFFSET" and press the F•5 (SET) key to display CAL OFFSET setting screen.

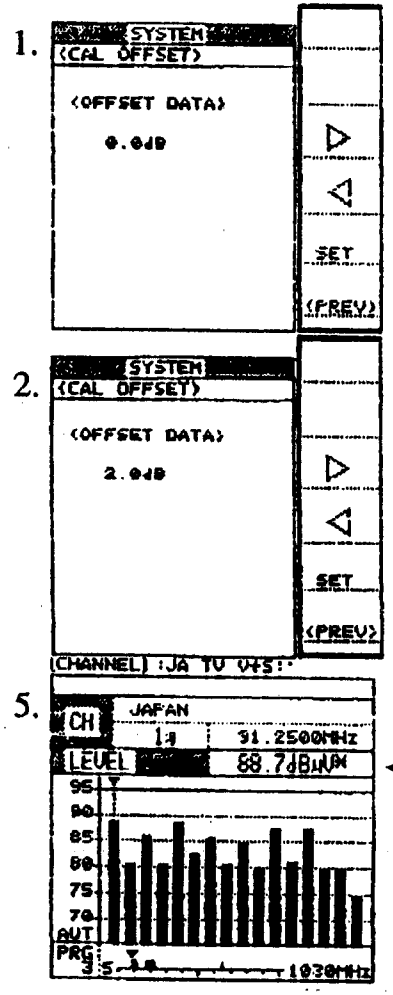
2. Press the F•3 (▷) or F•4 (◁), or input data (-2.0 to 2.0) using the numerical key, then press the ENTER key.

3. Press the F•5 (SET) key to set the offset value. The screen returns to the SYSTEM screen.

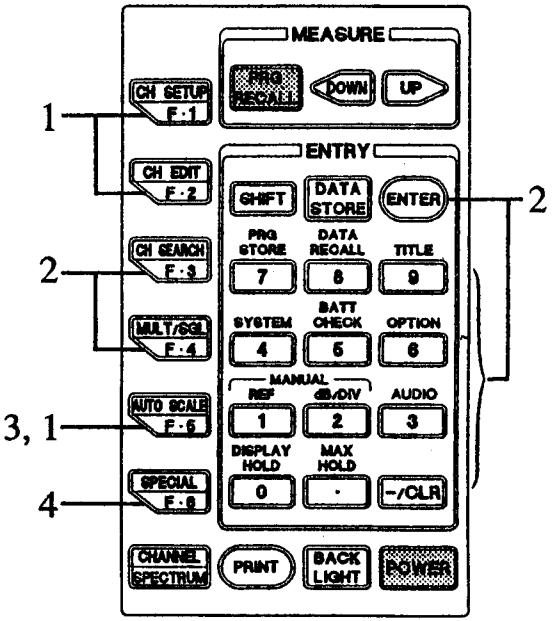
4. To cancel this setting, press the F•6 (<PREV>) key. The screen returns to the SYSTEM setting screen.

5. When the CAL OFFSET is set, asterisk is displayed at the right side of the unit.

• Screen Display



• Keys Used



4. OPTIONAL POWER SUPPLIES

4.1 LP 2114 Lead-Acid Battery Pack

(1) Use the LP 2114 Lead-Acid Battery Pack when using a high-grade manganese battery is insufficient for the required operating time. Continuous operation time is approximately 6 hours.

(2) When using the LP 2114 Lead-Acid Battery Pack, LP 2113 Battery Charger/Cover and LPS-1911J AC Adapter (for charging, 100 V area) are required.

(3) To charge the LP 2114 Lead-Acid Battery Pack, LP 2113 Battery Charger/Cover and LPS-1911J AC Adapter are required. Normal charging time between the fully discharged state and the fully charged state are approximately 12 hours.

(4) Refer to LP 2113 instruction manual for detail.

(5) The LPS-1911J can also be connected to the jack in the battery compartment.

(6) The LPS-1911J should be connected to the power line voltage between 90 V and 110 V. Exceeding voltage can cause trouble.

4.2 BP-95S Ni-Cd Battery Pack

(1) Use BP-95S Ni-Cd Battery Pack when using a high-grade manganese or alkaline battery is insufficient for the required operating time. Continuous operation time is approximately 10 hours.

(2) When using the BP-95S, LC-2091 Battery Cover for BP-90A (equivalent to BP-95S) is required.

(3) Refer to LC-2091 instruction manual for detail.

(4) The DBC-220a 2-Channel Charger/Discharger and FX-1 2-Channel Charger for the BP-95S are optionally available. These model can discharge or charge two BP-95S simultaneously. Normal charging times between the fully discharged state and the fully charged state are approximately 6 hours.

4.3 LPS-1950 AC Adapter

(1) When mains outlet is available, use LPS-1950 AC Adapter (installable in the main frame).

(2) For continuous operation, set AUTO POWER OFF in the SYSTEM screen to <OFF>.

(3) The line voltage is 100 to 240 VAC, 50/60 Hz.

(4) Refer to LPS-1950 instruction manual for detail.

4.4 Using External DC Power Supply

(1) Use supplied DC plug to connect external DC power supply.

(2) The power supply specifications should be the voltage of 12 V, and current capacity of at least 1 A. The voltage range is 8 to 13.5 V, however, low voltage increases the current.

(3) Pay attention to the polarity when using the DC plug. Incorrect polarity can cause trouble.

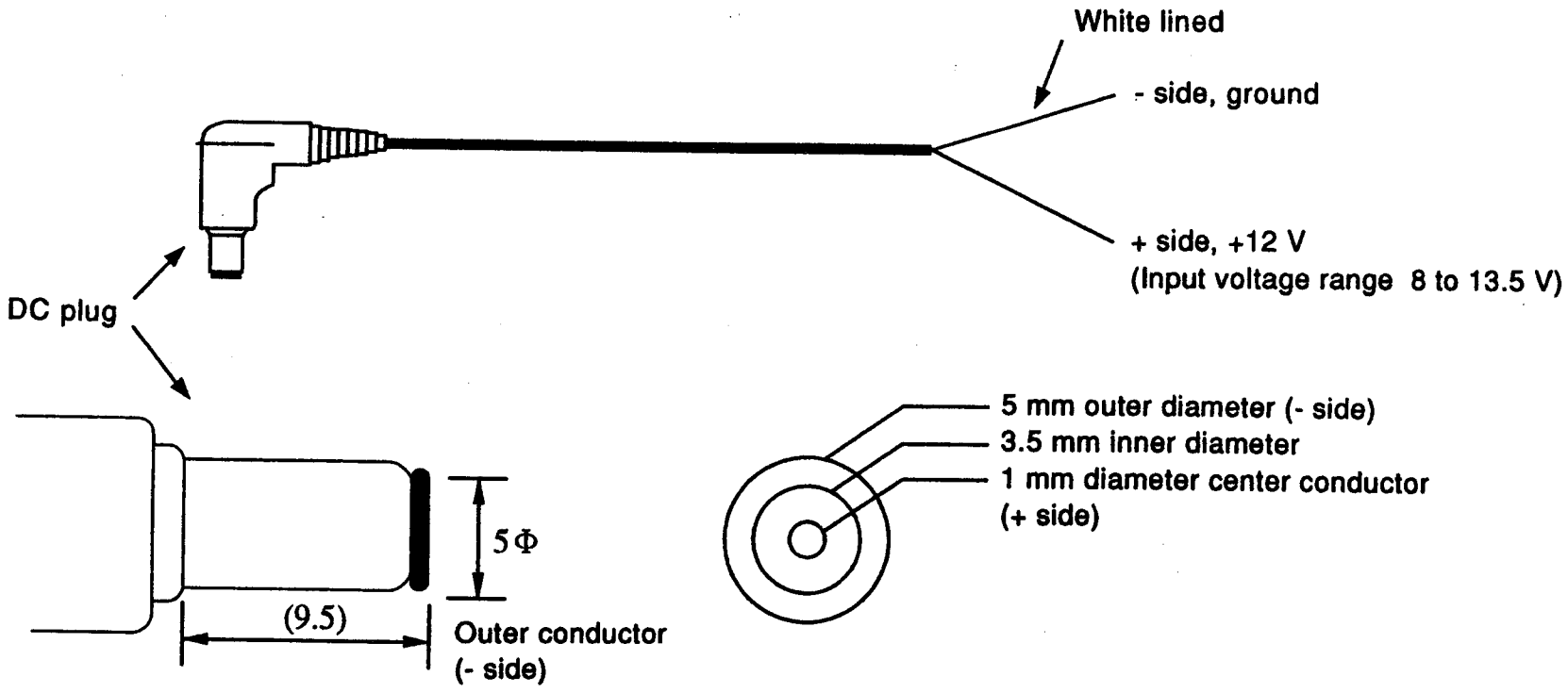


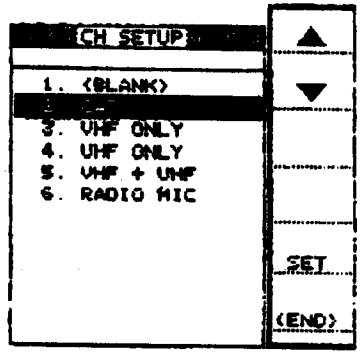
Figure 4-1

5. LEVEL MEASUREMENT

The level measurement is performed when the CHANNEL/SPECTRUM key is set to CHANNEL. The level of the selected channel is measured, and result is displayed with bar-graph and numerical value.
The multi-channel and single channel measurement modes are provided. The factory setting is JAPAN-CATV and multi-channel measurement mode.
Connect the antenna or CATV cable to the INPUT connector. The cable can be connected if 100 VAC or 50 VDC or lower voltage is superimposed.
Input impedance is 75 Ω. Other impedance system may cause incorrect measurement.

5.1 Recalling Channel Table

Since the CATV and TV channel tables are stored, it can be recalled as required. The table consists of hierarchical structure; top for band, and second for country.

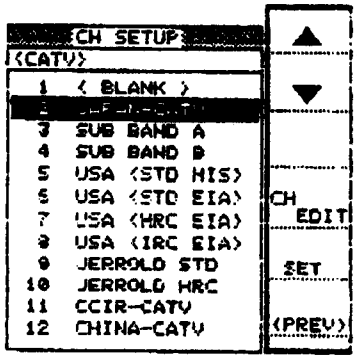
• Operating Procedure	• Screen Display	• Keys Used
1. Press the CH SETUP-F•1 key. The band selection screen of the CH SETUP screen is displayed.	1.	
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the band to be selected.	2. 	

3. Press the F•5 (SET) key to display the table selection screen in CH SETUP screen.

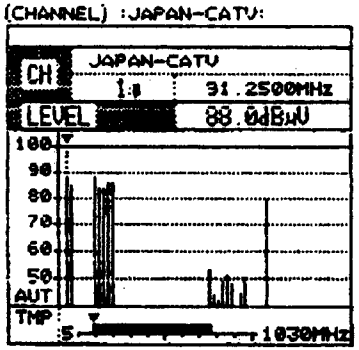
4. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the table to be selected.

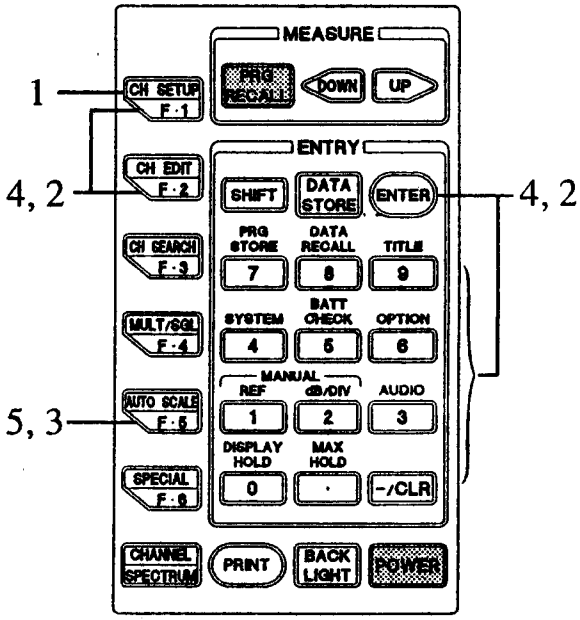
5. Press the F•5 (SET) key. The level measurement (CHANNEL) screen of the selected table is displayed.
   When signal is applied to the INPUT connector, the measurement result is displayed.

3.
4.



5.

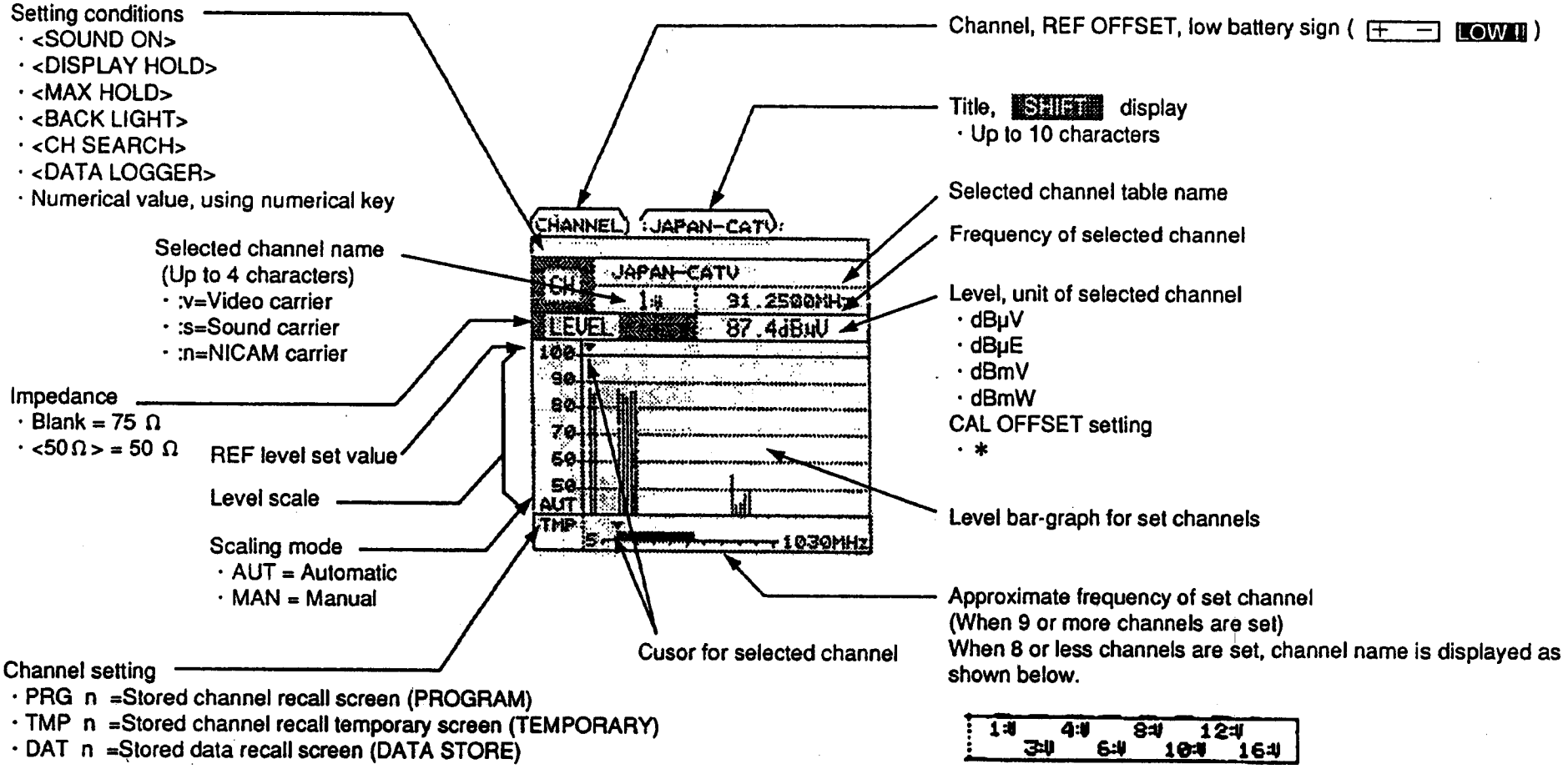




5.2 Multi-Channel Measurement

This mode measures and displays levels for two or more channels simultaneously.
Press the MULTI/SGL-F•4 key to select MULTI.
The following informations are displayed in the multi-channel measurement screen.

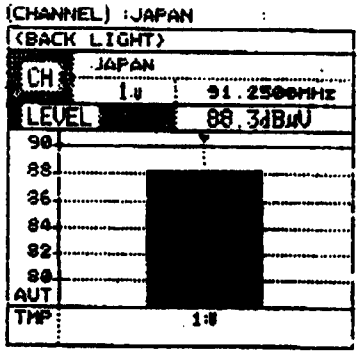
- Description of Multi-Channel Measurement Screen



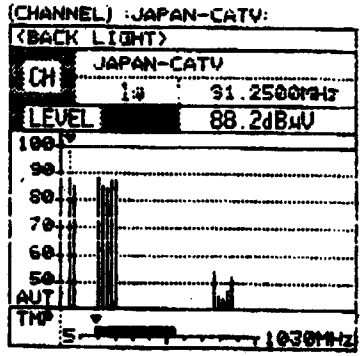
• Bar-graph of the multi-channel measurement mode

The display method of the bar-graph width and channel name depends on number of channels set.

Number of Channels	Channel Name Display	Width
1	Channel name	Wide
2		.
3 to 4		.
5 to 8		.
9 to 16	Approx channel frequency	.
17 to 32		.
33 to 64		.
65 to 128		Narrow



Example 1 Number of set channels: 1



Example 2 Number of set channels: 64

5.3 Channel Selection using Cursor

In the multi-channel measurement mode, a selected channel name, frequency, and measurement result can be numerically displayed.
The selected channel in the gar-graphs is indicated with the cursor.

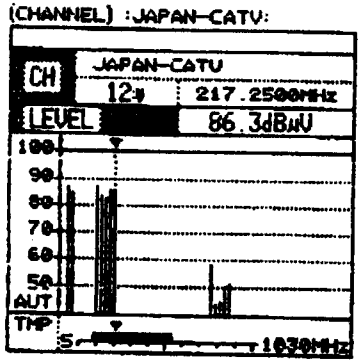
• Operating Procedure • Screen Display • Keys Used

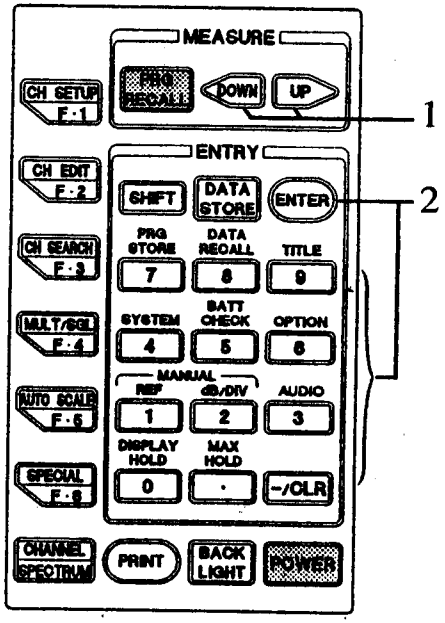
---

1. To select the channel, press the DOWN or UP key. Hold down the keys for continual selection. When 32 or more channels are displayed, the cursor skips.

2. The numerical key and ENTER key can also be used to set the channel number directly.

1.





5.4 Single-Channel Measurement

This mode measures and displays the level single channel.
The level is automatically displayed in numerical value and horizontal bar.
The full scale of upper bar is 12 dB, and lower bar is 100 dB.

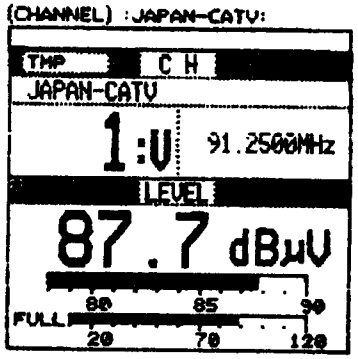
• Operating Procedure • Screen Display • Keys Used

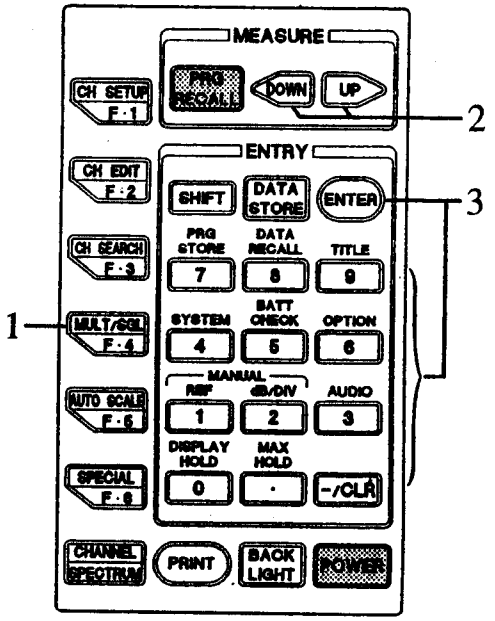
1. Press the MULTI/SGL-F•4 key to select SGL mode.
   When the multi-channel measurement mode is used, the cursored channel is displayed.

2. To select the channel, press the DOWN or UP key. Hold down the key for continual selection.

3. The numerical key and ENTER key can also be used to set the channel number directly.

1.



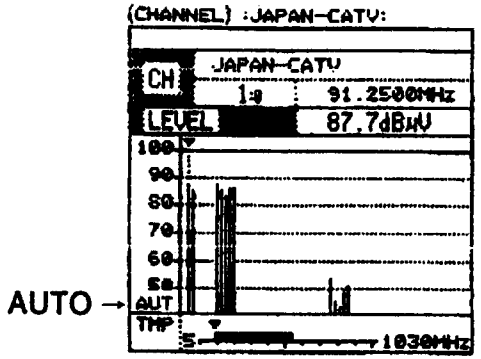


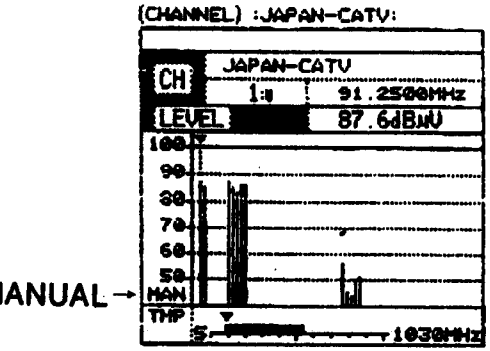
5.5 Automatic Scaling

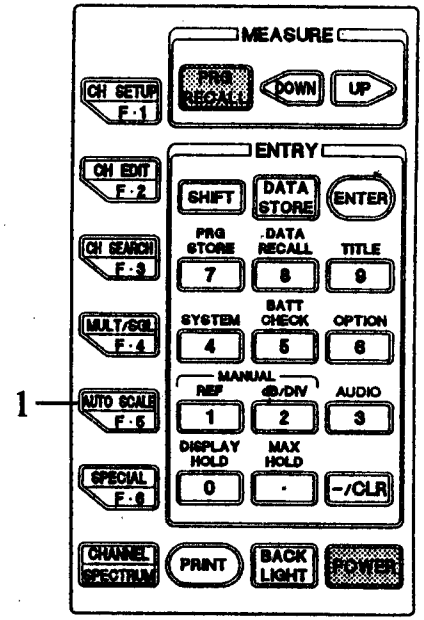
In the multi-channel measurement mode, no manual scaling is required for easier observation since the reference level and scale are automatically set.

• Operating Procedure • Screen Display • Keys Used

1. Press the AUTO SCALE-F•5 key to select automatic scaling function.







5.6 Manual Scaling

When the signal level is unstable or when making measurement at the specified level in the multi-channel measurement mode, manual scaling is used to set the reference level and scale.

• Operating Procedure

1. Press the SHIFT key.
   Press the MANUAL REF (1) key to display MANUAL screen. The reference level is displayed in reverse video.

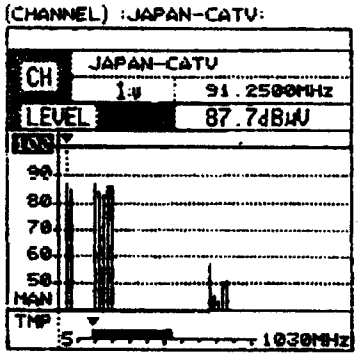
2. Input data using the numerical key.

3. Press the ENTER key. The reference level is set.

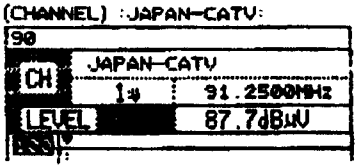
4. By pressing the DOWN or UP key, the reference level up and down in 1 division steps.

• Screen Display

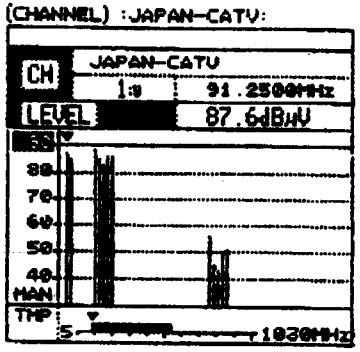
1.



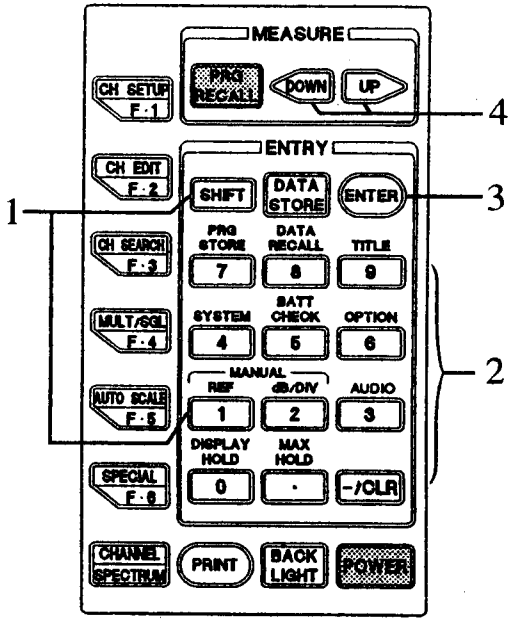
2.



3.



• Keys Used



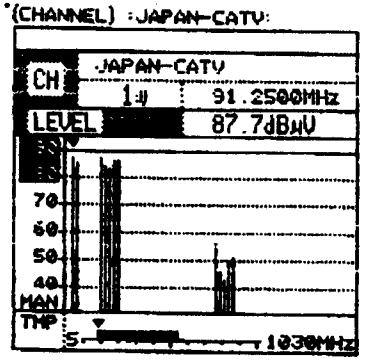
• Operating Procedure • Screen Display • Keys Used

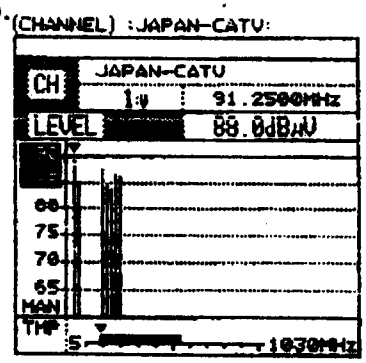
5. Press the SHIFT key..
   Press the MANUAL dB/DIV (2) key. The scale division is displayed in reverse video.

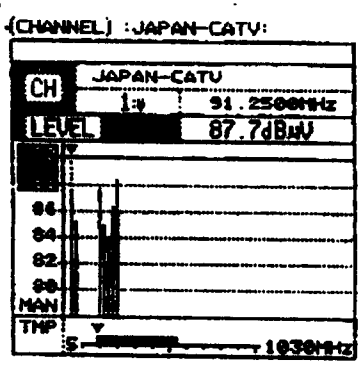
6. Select 2 dB/DIV, 5 dB/DIV or 10 dB/DIV as required by pressing the DOWN or UP key.

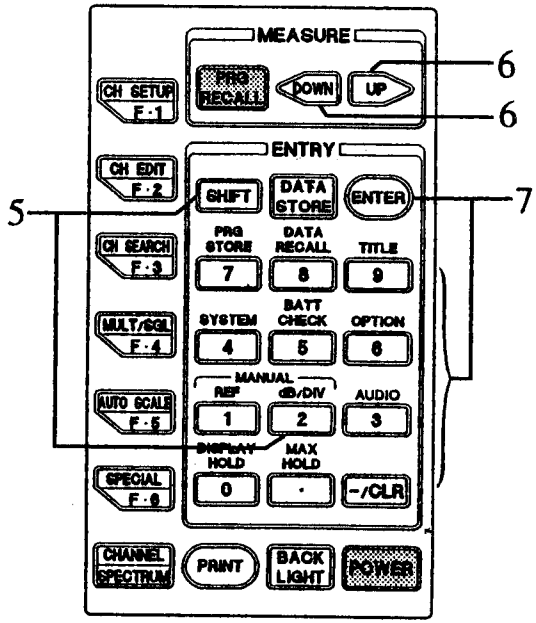
7. The scale division (i.e., 2 dB/DIV, 5 dB/DIV or 10 dB/DIV) can be also selected as follows by using the numerical key and ENTER key.

Numerical Key	Scale Division
0 - 3	2 dB/DIV
4 - 7	5 dB/DIV
8 - 10	10 dB/DIV

5.


6.


7.




6. SPECTRUM MEASUREMENT

Press the CHANNEL/SPECTRUM key to select the SPECTRUM.

(1) The RF ATT is selected by setting the reference level.

Reference Level	RF ATT
120 to 106 dBμV	40 dB
105 to 86 dBμV	20 dB
85 to 20 dBμV	0 dB

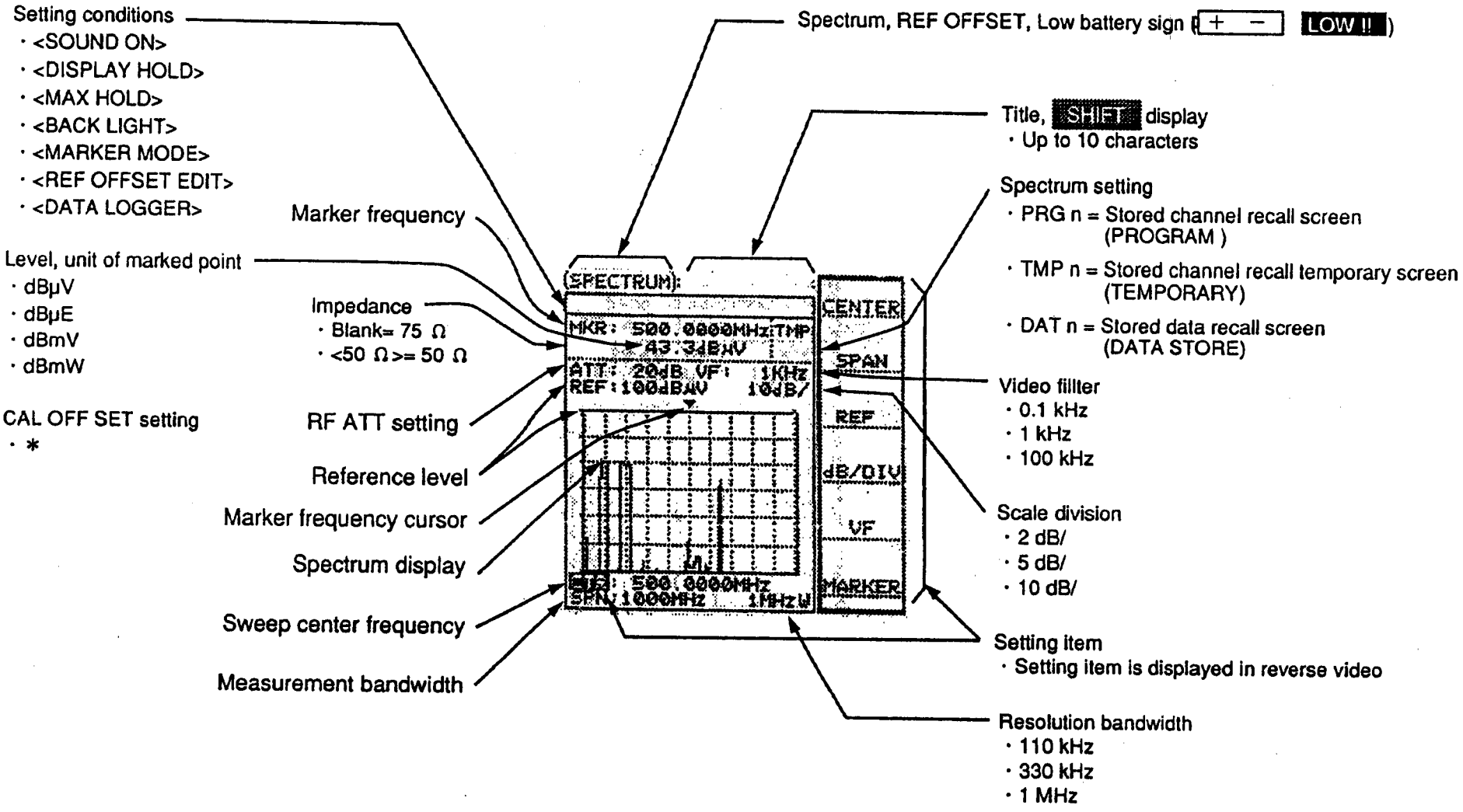
(2) The resolution bandwidth is selected by setting the span.

Span	Resolution Bandwidth
1025 MHz to 100 MHz	1 MHz
99 MHz to 20 MHz	330 kHz
19 MHz to 0 MHz	110 kHz

(3) The factory setting is as follows.

Center frequency	500 MHz
Span	1000 MHz
Reference level	100 dBμV
Scale division	10 dB/DIV
Video filter	1 kHz
Marker	500 MHz

(4) Description of Spectrum Screen



6.1 Function Settings

The functions shown in Table below are available.
Press the function key (F•1 to F•6) to select the function, then input data using the numerical key, or DOWN or UP key for optimum display.

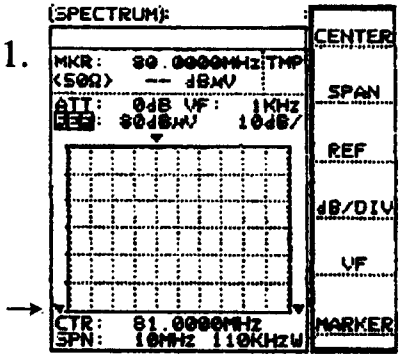
Function	Numerical Key	DOWN/UP Key
CENTER	Up to 9 digits including decimal point, 0.0125 MHz steps	1 DIV steps (1/10 of span)
SPAN	0 to 1025 MHz, 1 MHz steps	1, 2, 5, 10, 20, 50, 100, 500, 1000 MHz
REF	20 to 120 dB, 1 dB steps	1 DIV steps (dB/DIV steps)
dB/DIV	0 to 3 for 2 dB/DIV 4 to 7 for 5 dB/DIV 8 to 10 for 10 dB/DIV	2, 5, 10 dB/DIV
VF	0.05 to 0.44 for 0.1 kHz 0.45 to 49 for 1 kHz 50 to 100 for 100 kHz	0.1, 1, 100 kHz
MARKER	Same as CENTER	1/10 DIV steps (1/10 of span)

- The sweep returns to the start point when the setting value is changed.

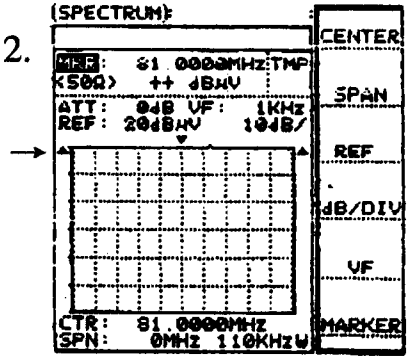
- When the measurement level goes beyond specifications, the waveform will be erased.
  1. If ▼ is displayed below the scale, reduce the REF value.

  2. If ▲ is displayed above the scale, increase the REF value.

1.



2.



6.2 Using Marker

The convenient MARKER MODE is provided.
Refer to Section 8.6, "Setting Reference Offset" for reference offset.

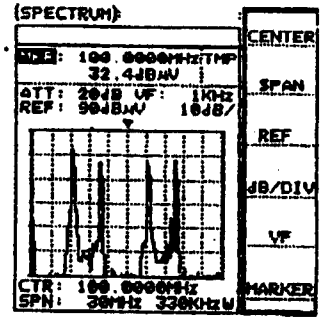
• Operating Procedure

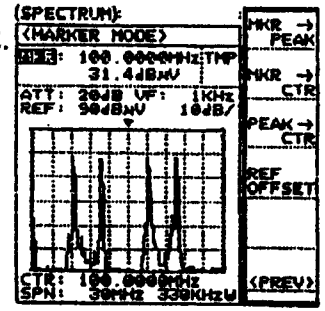
1. If the MKR is displayed in normal video, press the F•6 (MARKER) key for reverse video.

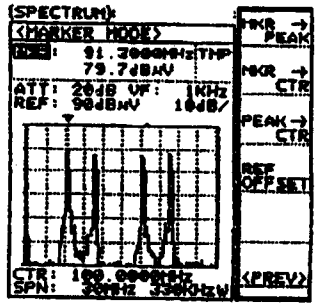
2. Press the F•6 (MARKER) key again to display MARKER MODE screen.

3. By pressing the F•1 (MKR → PEAK) key, the cursor moves to the largest spectrum.

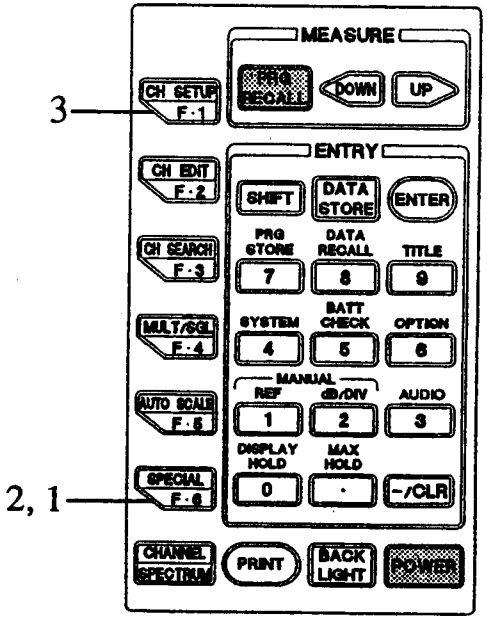
• Screen Display

1.


2.


3.


• Keys Used

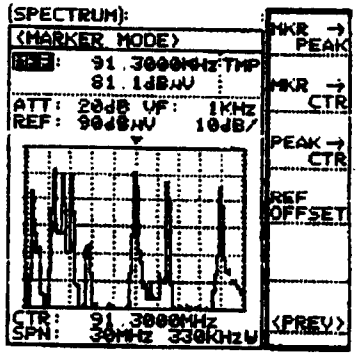


4. By pressing the F•2 (MKR → CTR) key, the center frequency is displayed.

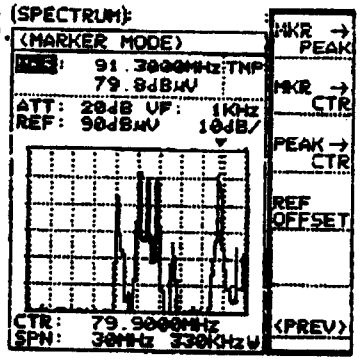
5. By pressing the F•3 (MKR → PEAK) key, the center frequency becomes the largest spectrum.

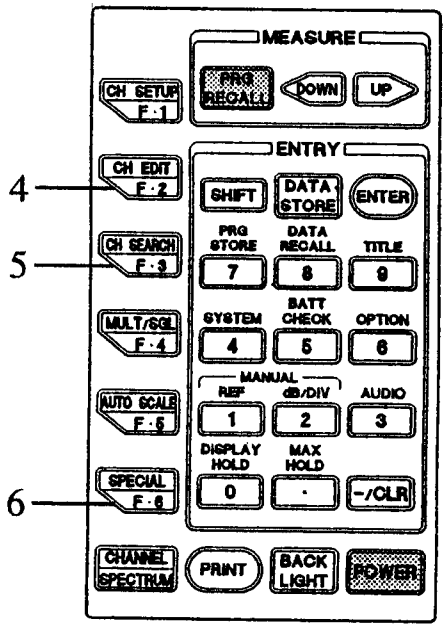
6. By pressing the F•6 (<PREV>) key, the screen returns to the spectrum measurement screen.

4.



5.





7. ADDITIONAL MEASUREMENT MODES

In the level measurement (CHANNEL) mode, six functions (i.e., V-S, V-N, C/N, HUM, AC/DC, and stability) can be selected. In the multi-channel measurement mode, the measurement screen switched to the single mode, and cursored channel will be measured.
In the MAX HOLD mode, cancel it before entering measurement. Set MAX HOLD again after measurement is completed.

• Operating Procedure

1. Press the SPECIAL-F•6 key to display SPECIAL screen.

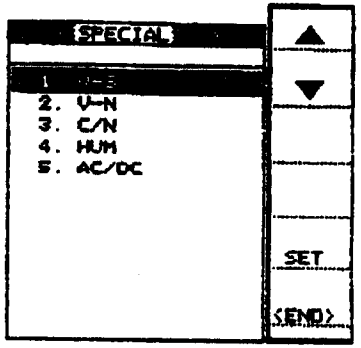
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the item to be selected.

3. Press the F•5 (SET) key to display the selected measurement screen.

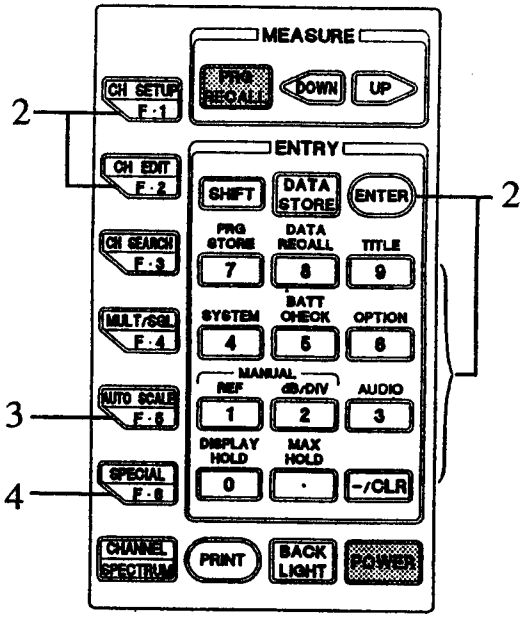
4. To return to the previous measurement screen, press the F•6 (END) key.

• Screen Display

1.



• Keys Used



7.1 V-S Measurement

This function is used to measure level difference between video (V) and sound (S) carriers in the same channel of the CATV or TV.

• Operating Procedure

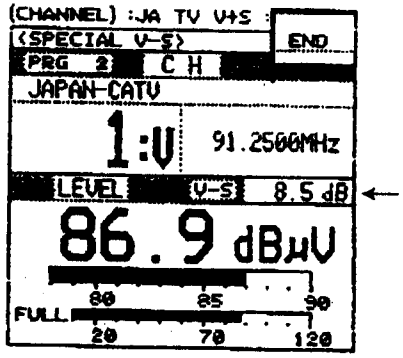
1. Display the SPECIAL screen.
   Position the cursor to "1. V-S" and press the F•5 (SET) key to display <SPECIAL V-S> setting screen.
   The V-S difference is displayed at the LEVEL column.

2. To select the channel to be measured, press the DOWN or UP key.

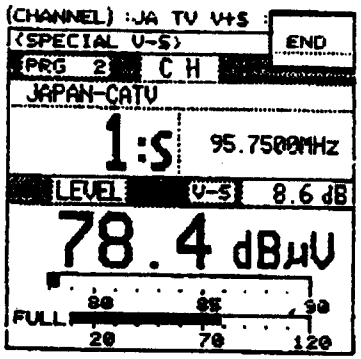
3. To return to the measurement screen, press the F•1 (END) key.

• Screen Display

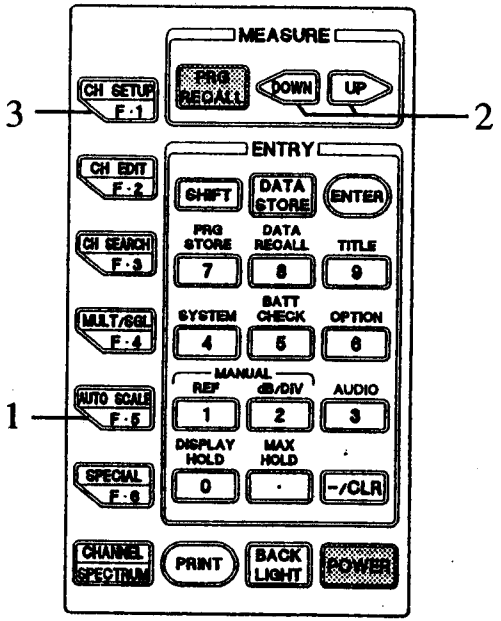
1.



2.



• Keys Used



7.2 V-N Measurement

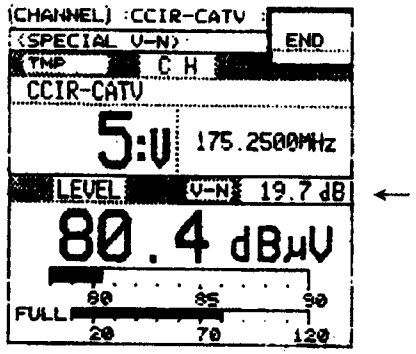
This function is used to measure level difference between video (V) and NICAM (N) carriers in the same channel of the CATV or TV.
When the channel without NICAM carrier, the measurement cannot be made even "V-N" is displayed.

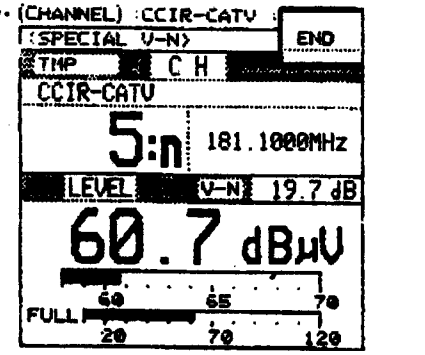
• Operating Procedure • Screen Display • Keys Used

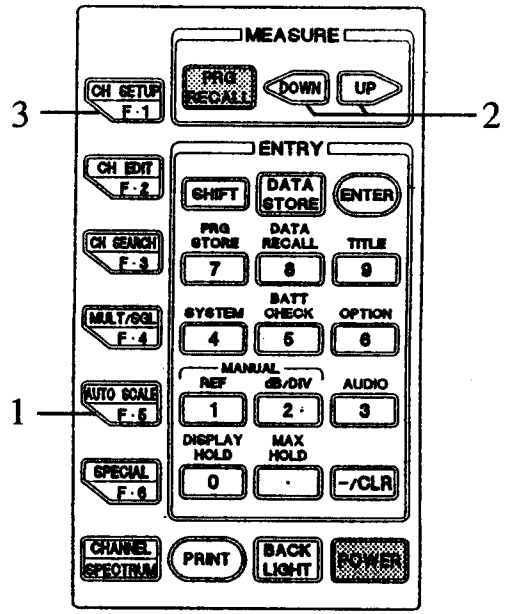
1. Display the SPECIAL screen.
   Position the cursor to "2. V-N" and press the F•5 (SET) key to display <SPECIAL V-N> setting screen.
   The V-N difference is displayed at the LEVEL column.

2. To select the channel to be measured, press the DOWN or UP key.

3. To return to the measurement screen, press the F•1 (END) key.

1.


2.




7.3 C/N Measurement

This function is used to measure signal to noise ratio. The noise level is indicated in equivalent bandwidth of 4 MHz. The noise is measured within ±8 MHz of the signal to be measured.
If signal is existed at upper or lower adjacent channel, measurement may be impossible or error is increased.
The C/N ratio measurement range is 20 to 50 dB for 85 dBµV or higher signal level. Upper limit reduces for 85 dBµV or lower signal level as shown Figure 7-1.
When signal or noise level is out of measurement range, the ">" sign is displayed at the left side of the measurement value.

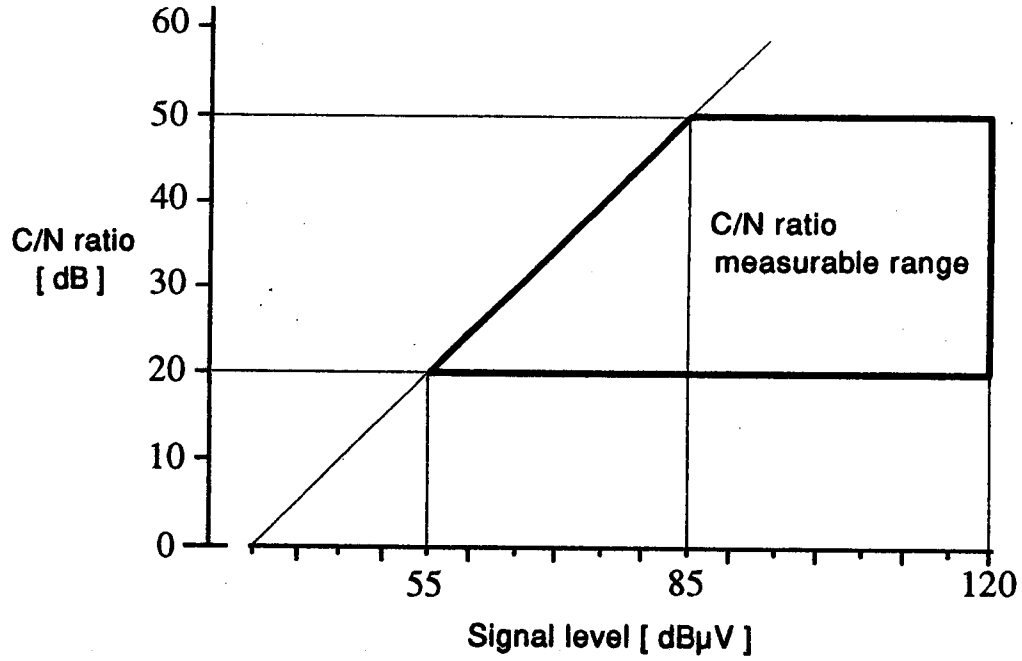


Figure 7-1 C/N ratio measurement range

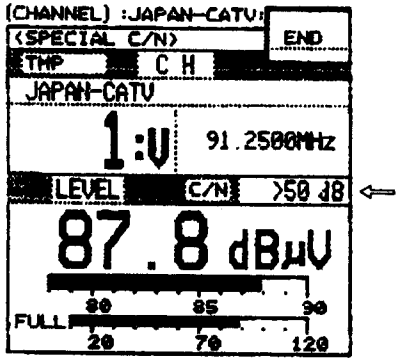
• Operating Procedure • Screen Display • Keys Used

1. Display the SPECIAL screen.
   Position the cursor to "3. C/N" and press the F•5 (SET) key to display <SPECIAL C/N> setting screen.
   The C/N ratio is displayed at the LEVEL column.

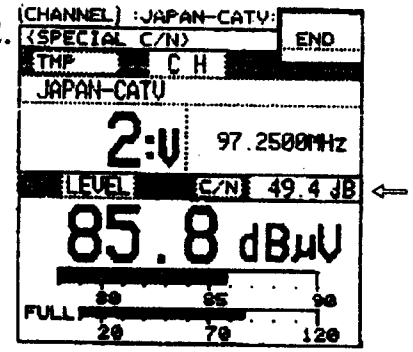
2. To select the channel to be measured, press the DOWN or UP key.

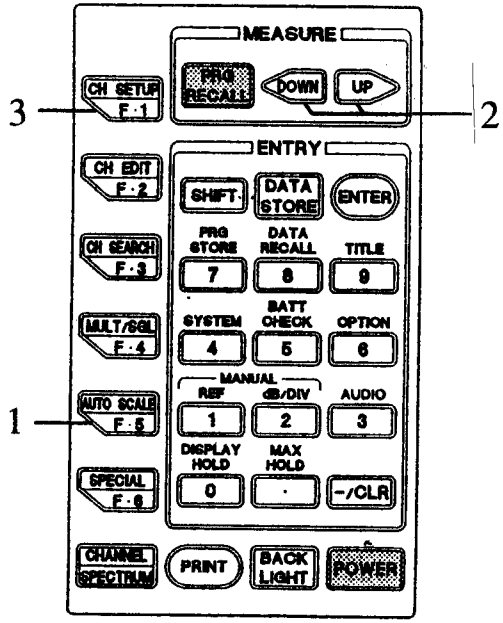
3. To return to the measurement screen, press the F•1 (END) key.

1.



2.





7.4 Hum Modulation Measurement

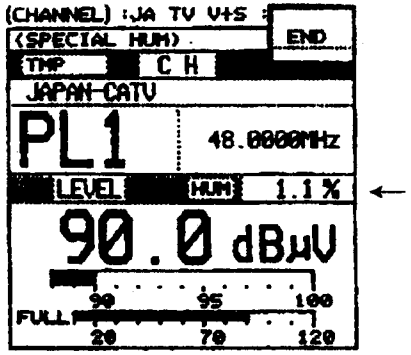
This function is used to measure hum modulation produced by line frequency (50/60 Hz) in the CATV system. The frequency difference between vertical sync and power line may cause flicker. The hum modulation is indicated in %. Measurement is made by using unmodulated signal (e.g., pilot signal).

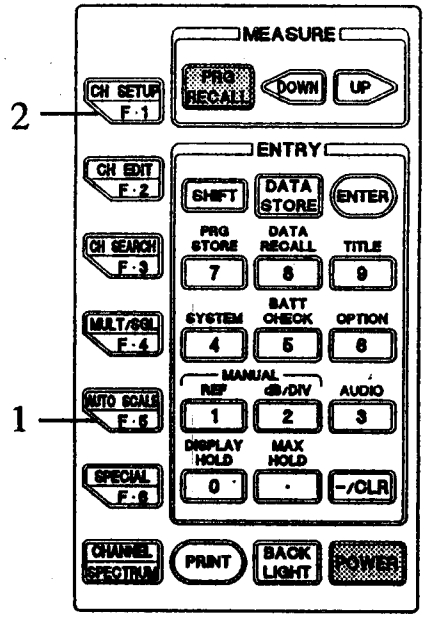
• Operating Procedure • Screen Display • Keys Used

---

1. Display the SPECIAL screen. Position the cursor to "4. HUM" and press the F•5 (SET) key to display <SPECIAL HUM> setting screen. The hum modulation value is displayed at the LEVEL column.

2. To return to the measurement screen, press the F•1 (END) key.





7.5 AC/DC Voltage Measurement

In the CATV system, AC and DC voltages superimposed on the cable is applied to a trunk amplifier. To measure the voltage, connect the cable to the INPUT connector. The outer conductor is the reference. The maximum measurable voltage is as follows.

AC voltage: 100V, 50/60 Hz
DC voltage: ±50 V

AC or DC, and DC polarity are automatically selected.

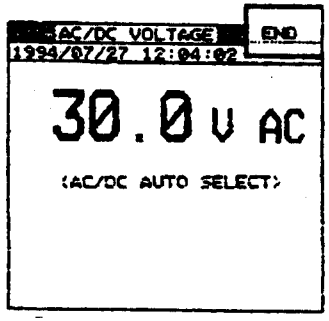
• Operating Procedure

1. Display the SPECIAL screen. Position the cursor to "5. AC/DC" and press the F•5 (SET) key to display <AC/DC VOLTAGE> setting screen. The voltage is displayed on the screen

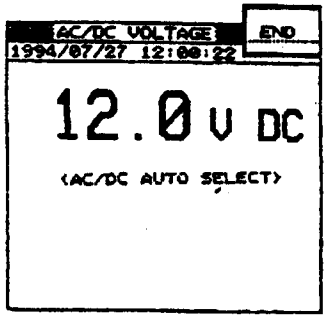
2. To return to the measurement screen, press the F•1 (END) key.

• Screen Display

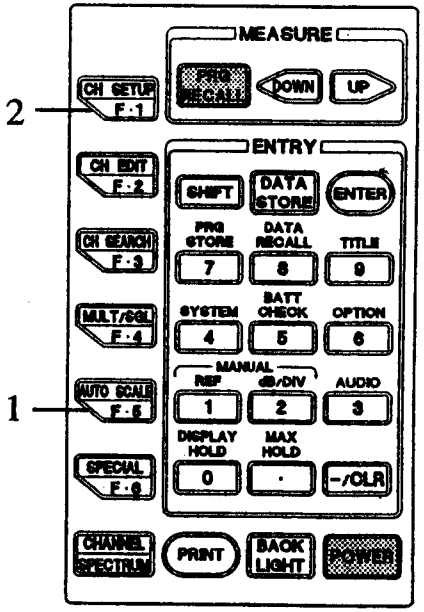
1.



1.



• Keys Used



7.6 Stability Measurement

This function measures short term level stability (i.e., level difference between maximum and minimum) at time interval of 5 minutes.

• Operating Procedure

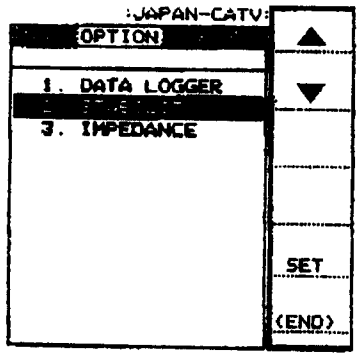
1. Press the SHIFT key.

2. Press the OPTION (6) key.
   The OPTION screen is displayed.

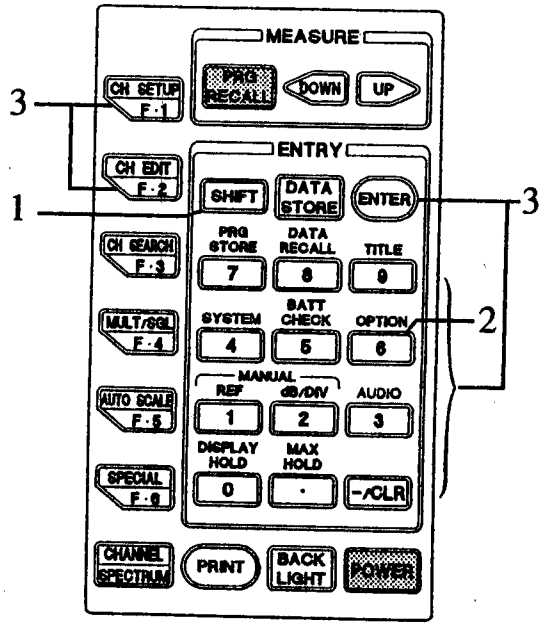
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "2. STABILITY".

• Screen Display

3.



• Keys Used



• Operating Procedure • Screen Display • Keys Used

4. Press the F•5 (SET) key.
   The OPTION <STABILITY> setting screen is displayed.

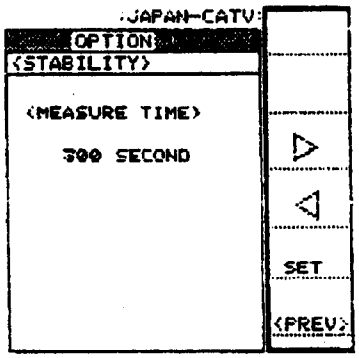
5. Press the F•3 (▷) or F•4 (◁) key, or input data (1 to 300) using the numerical key, then press the ENTER key. The measurement interval (1 to 300 seconds) is set.

6. Press the F•5 (SET) key to display <OPTION STABILITY> setting screen. The measurement time "WAITXXXSEC" is displayed.

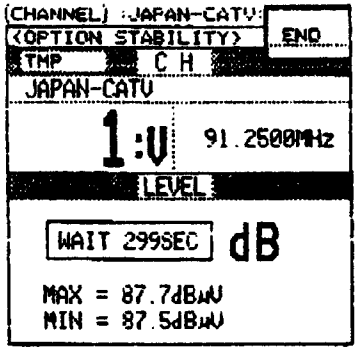
7. The level difference between maximum and minimum is displayed.

8. To return to the measurement screen while measurement or after completing measurement, press the F•1 (END) key.

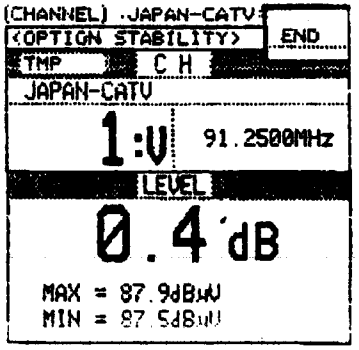
5.

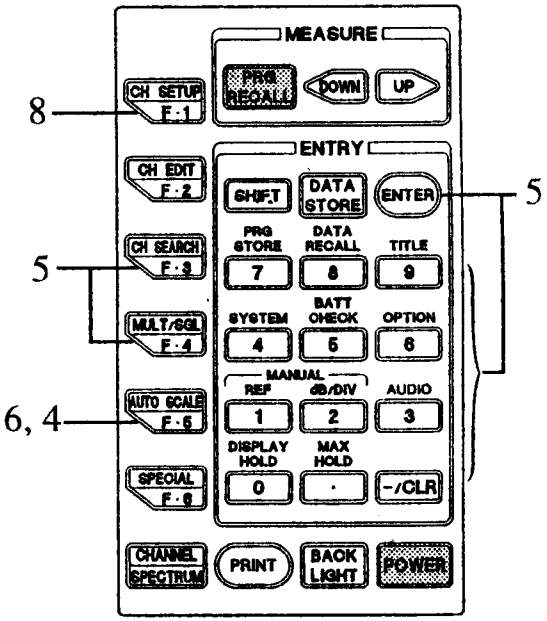


6.



7.





8. ADDITIONAL FUNCTIONS

The following six functions shown in Table below are available.
Operating conditions are also shown in Table.

Function \ Condition	Key Operation	Programmable	Power On/Off	CHANNEL/SPECTRUM Selection
FM Sound Demodulation	SHIFT, AUDIO SET	No	Canceled	Chancel this function once to select the mode again.
Display Hold	SHIFT, DISPLAY HOLD	No	Canceled	Canceled
Maximum Hold	SHIFT, MAX HOLD	No	Canceled	Held
Data Logger	SHIFT, OPTION, ▲ or ▼, SET	No	Held	Chancel this function once to select the mode again.
75 Ω/50 Ω Selection	SHIFT, OPTION, ▲ or ▼, SET	No	Held	Held
Ref Offset CHANNEL SPECTRUM	CH EDIT-F•2, REF OFFSET (F•4) MARKER (F•6) twice, REF OFFSET (F•4)	Yes Yes	Held Held	Held Held

8.1 FM Sound Demodulation

The FM sound of CATV, cable broadcasting, FM broadcasting, TV, wireless microphone can be demodulated. While demodulating FM sound, level measurement is performed for selected channel or marked frequency. This function is automatically canceled by turning off the power. By tuning the frequency to the TV video carrier, buzz is output.

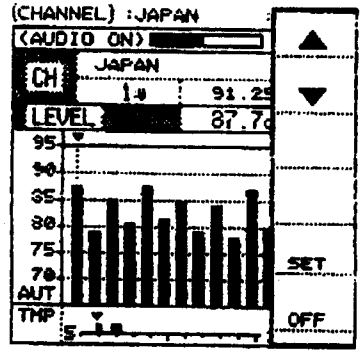
8.1.1 Level Measurement (CHANNEL) Mode

• Operating Procedure

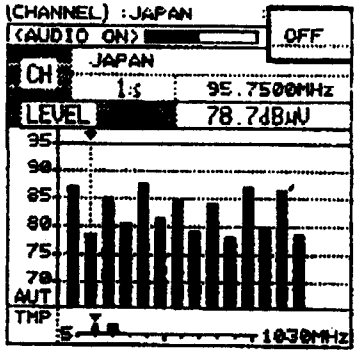
1. Press the SHIFT key.
2. Press the AUDIO (3) key.
   The AUDIO ON screen is displayed and speaker sounds.
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key to set sound level.
4. Press the F•5 (SET) key.
   The AUDIO ON screen is displayed.
5. Press the DOWN or UP key to select the channel to output sound.
6. To cancel the AUDIO ON screen and return to the measurement screen, press the F•6 (END) key.

• Screen Display

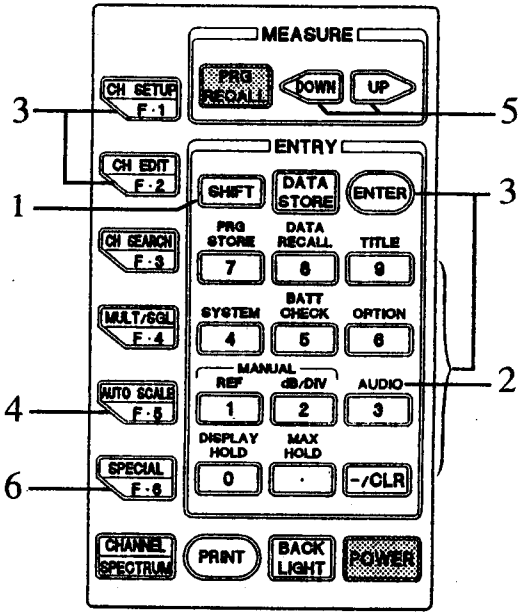
2. / 6.



4. / 5.



• Keys Used



8.1.2 Spectrum Measurement Mode

• Operating Procedure

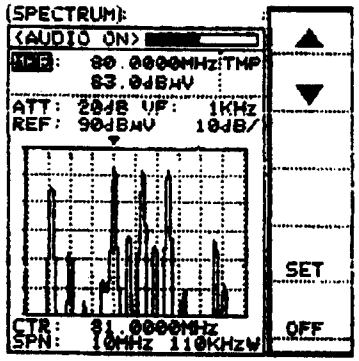
1. Apply the procedure (8.1.1, 1 through 4) to display AUDIO ON screen.

2. Press the DOWN or UP key, or input data (5 to 1030, in 0.0125 step) using the numerical key, then press the ENTER key. The cursor moves to the spectrum to be selected and speaker sounds.

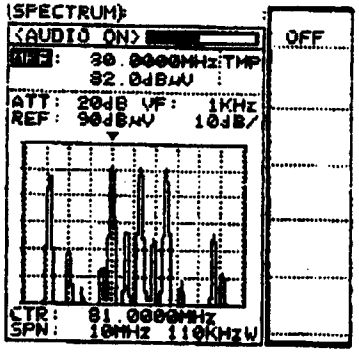
3. To cancel the AUDIO ON screen and return to the measurement screen, press the F•6 (END) key.

• Screen Display

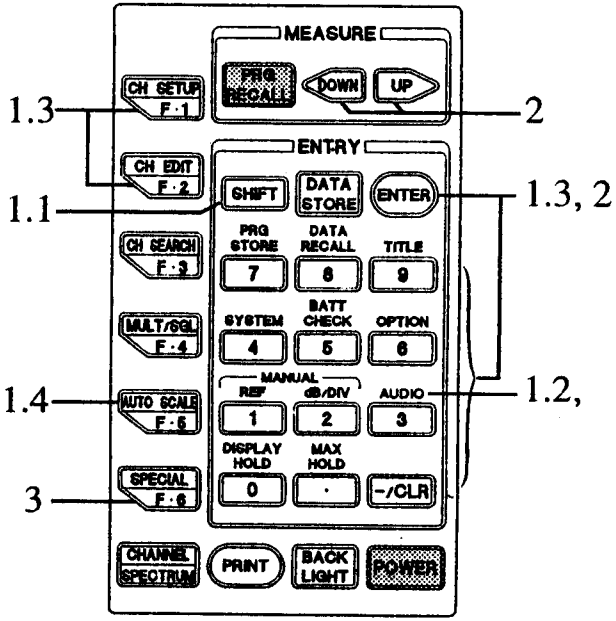
1.



2.



• Keys Used



8.1.3 Cancelling FM Sound Demodulation

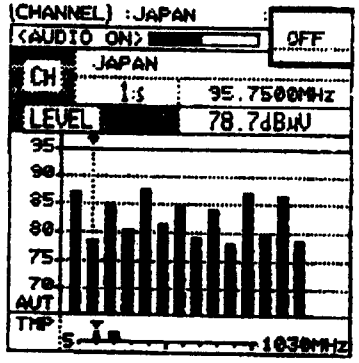
• Operating Procedure

1. Press the F•1 (OFF) key. The screen returns to the previous measurement screen.

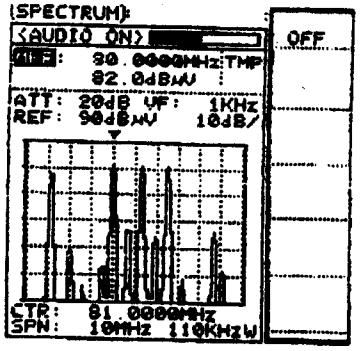
2. Turning power off can also cancel this function.

• Screen Display

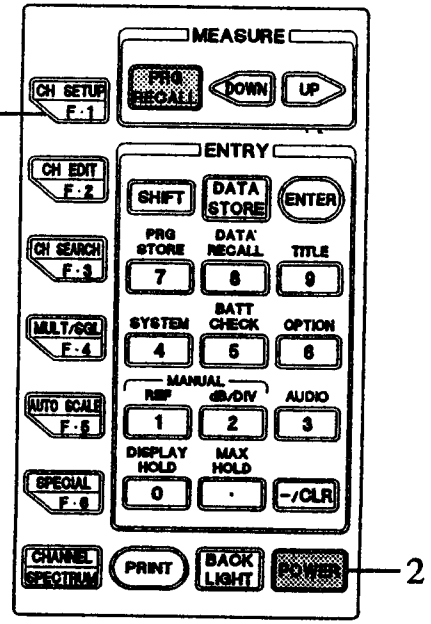
1.



1.



• Keys Used



8.2 Display Hold Function

The displayed screen can be held temporary before printing.
To chancel this function, press any key.

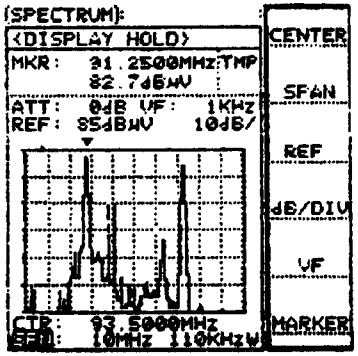
• Operating Procedure

1. Press the SHIFT key.

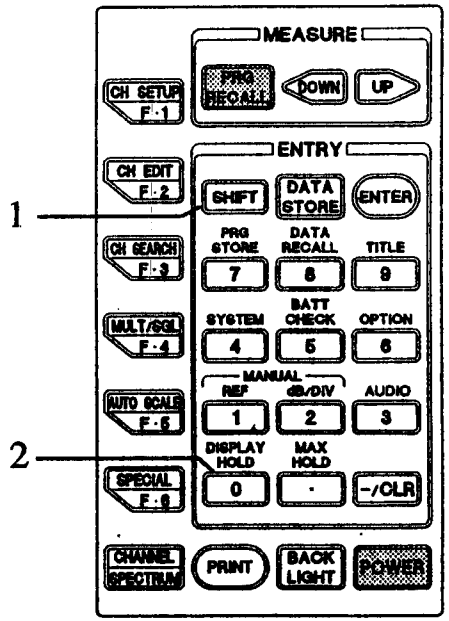
2. Press the DISPLAY HOLD (0) key.
   The DISPLAY HOLD screen is displayed and the screen is held.

• Screen Display

2.



• Keys Used



8.3 Maximum Hold Function

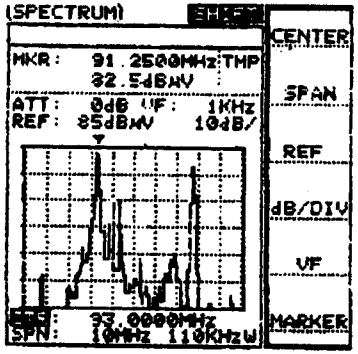
The maximum input signal level is displayed during measurement. The level is held even the signal is removed. This function is ideal to observe or measure maximum level of intermittent or unstable signal.

• Operating Procedure

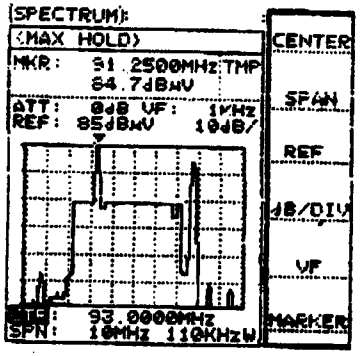
1. Press the SHIFT key.
2. Press the MAX HOLD (.) key.
   The <MAX HOLD> screen is displayed and the maximum input signal level is held and displayed
3. To cancel this function, press the SHIFT key.
4. Press the MAX HOLD (.) key. This function is canceled. The screen returns to the measurement screen.
5. Turning power off can also cancel this function.

• Screen Display

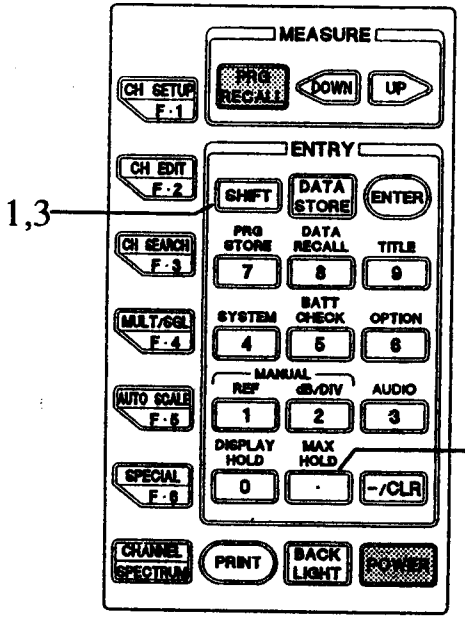
1.



2.



• Keys Used



8.4 Data Logger

The data logger function enables measurement of input signal at a constant time interval. The measured data can be printed out or stored into the memory.
Set output destination, storing data, time interval, and number of data.

Output Destination	Printer	Memory	
Storing Data	-	Overwrite	Insertion
Number of Data	0 to 999 (0: Endless)	1 to 512 (0: Unacceptable) Maximum value depends on number of channels and memory capacity.	
Time Interval	0 to 999 minutes, 1 minute steps		

When time interval is set to 2 minutes or longer, the instrument enters sleep condition. The instrument activates up to 70 seconds before starting measurement. Set the measurement screen to collect data, then proceed as follows.

8.4.1 Data Output to a Printer

• Operating Procedure　　• Screen Display　　• Keys Used

1. Press the SHIFT key.

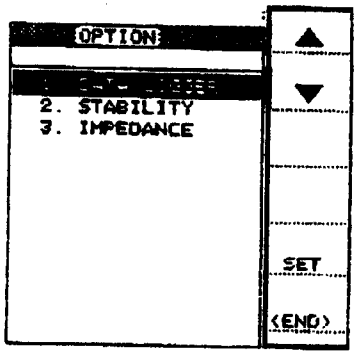
2. Press the OPTION (6) key.
   The OPTION screen is displayed.

3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "1. DATA LOGGER".

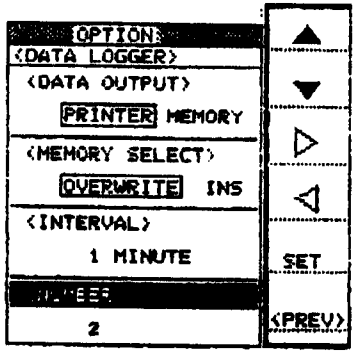
4. Press the F•5 (SET) key.
   The OPTION <DATA LOGGER> setting screen is displayed.

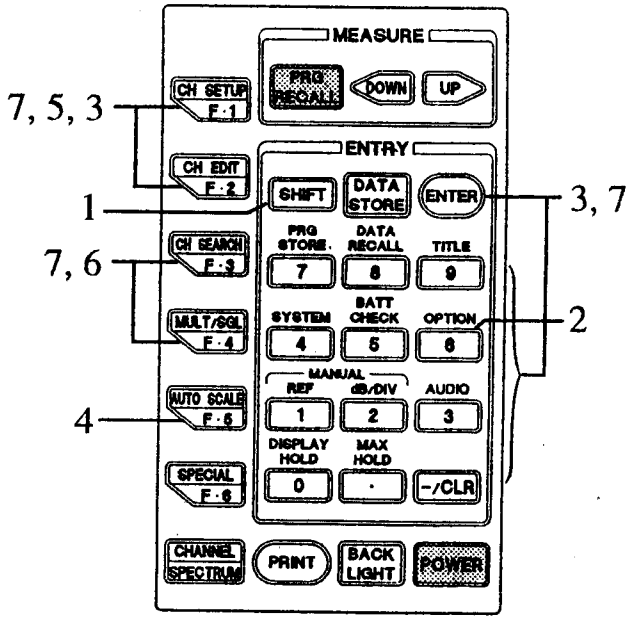
5. Press the F•1 (▲) or F•2 (▼) key to select the <DATA OUTPUT>.

2.
3.



4.~7.





6. Press the F•3 (▷) or F•4 (◁) key to move the box to the "PRINTER".

7. Press the F•2 (▼) key to select the <INTERVAL>. Press the F•3 (▷) or F•4 (◁) key, or input data, then press the ENTER key to set value.
   Press the F•2 (▼) key to select the <NUMBER>. Press the F•3 (▷) or F•4 (◁) key, or input data, then press the ENTER key to set value.

• Operating Procedure

8. Press the F•5 (SET) key. The DATA LOGGER screen is displayed.
   Data is collected and output according to the settings.
   Data collecting order is displayed at the upper-right corner of the screen.
   The measurement time is also output to the printer.

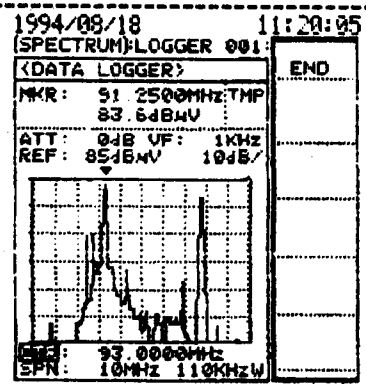
9. When measurement is completed, The screen returns to the previous measurement screen.

10. To quit measurement in progress, press the F•1 (END) key to return to the previous measurement screen.

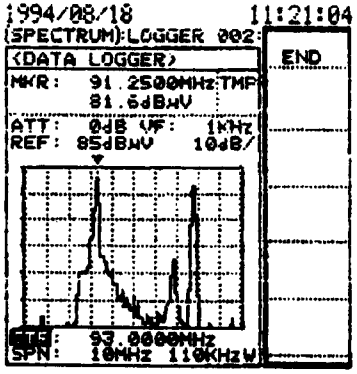
11. When the instrument in the sleep condition, press the POWER key to turn power on, then press the F•1 (END) key to return to previous screen.

• Screen Display

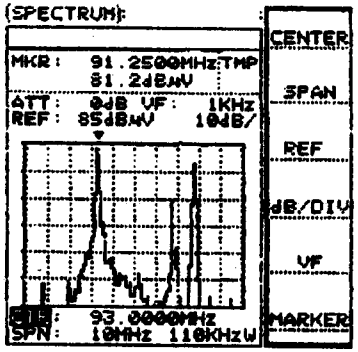
8. No.1



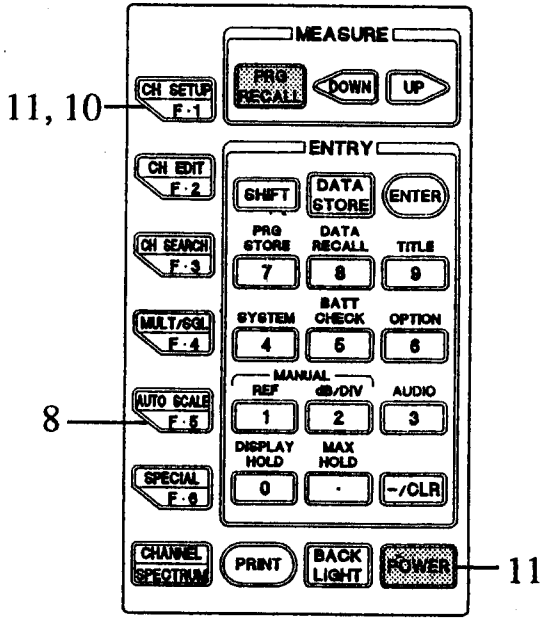
8. No.2
10.
11.



9.



• Keys Used



8.4.2 Data Store into Memory

• Operating Procedure

1. Apply the procedure (8.4.1, 1 through 4) to display OPTION <DATA LOGGER> screen.

2. Press the F•1 (▲) or F•2 (▼) key to select the <DATA OUTPUT>.

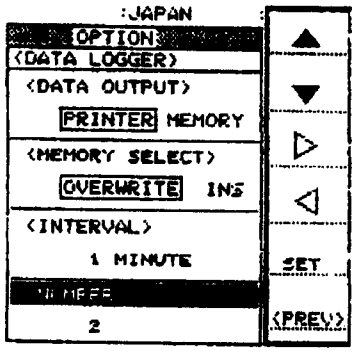
3. Press the F•3 (▷) or F•4 (◁) key to move the box to the "MEMORY".

4. Press the F•2 (▼) key to select the <MEMORY SELECT>.

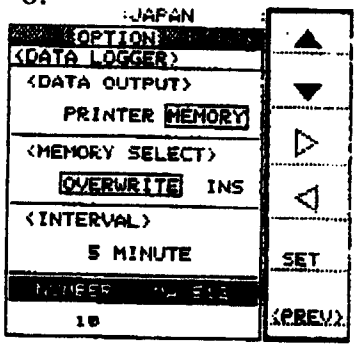
5. Press the F•3 (▷) or F•4 (◁) key to move the box to the OVER WRITE or INS.

• Screen Display

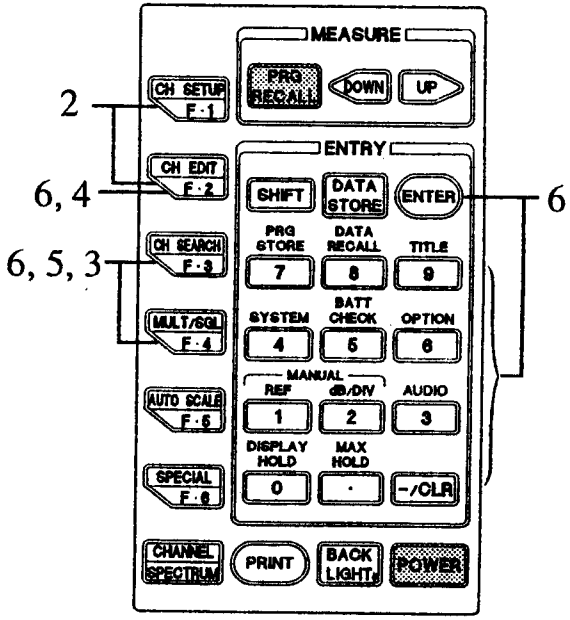
1.



2.~6.



• Keys Used



6. Press the F•2 (▼) key to select the <INTERVAL>. Press the F•3 (▷) or F•4 (◁) key, or input data, then press the ENTER key to set value.
   Press the F•2 (▼) key to select the <NUMBER>. Press the F•3 (▷) or F•4 (◁) key, or input data, then press the ENTER key to set value.
   Maximum number of collectable data is displayed (<NUMBER MAX XXX>). Use below this number of data.

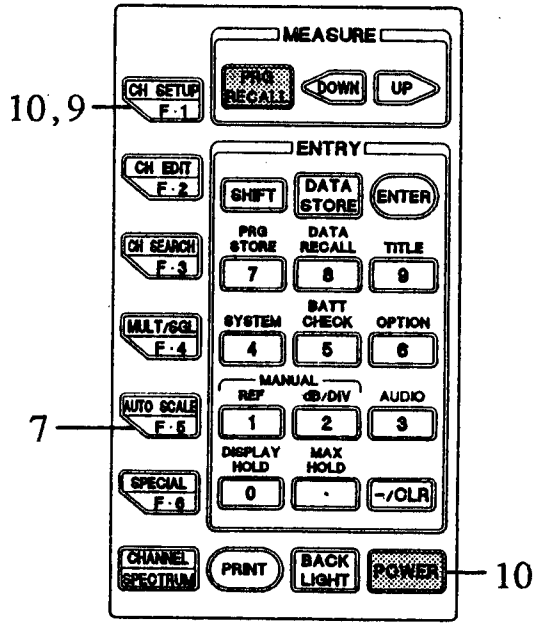
7. Press the F•5 (SET) key. The DATA LOGGER screen is displayed. Data is collected and stored into memory according to the settings. Data collecting order is displayed at the upper-right corner of the screen.

8. When measurement is completed, The screen returns to the previous measurement screen.

9. To quit measurement in progress, press the F•1 (END) key to return to the previous measurement screen.

10. When the instrument in the sleep condition, press the POWER key to turn power on, then press the F•1 (END) key to return to previous screen.

11. To recall stored data, refer to Section 11.2, "Recalling Stored Data" for detail.



8.5 Impedance Selection

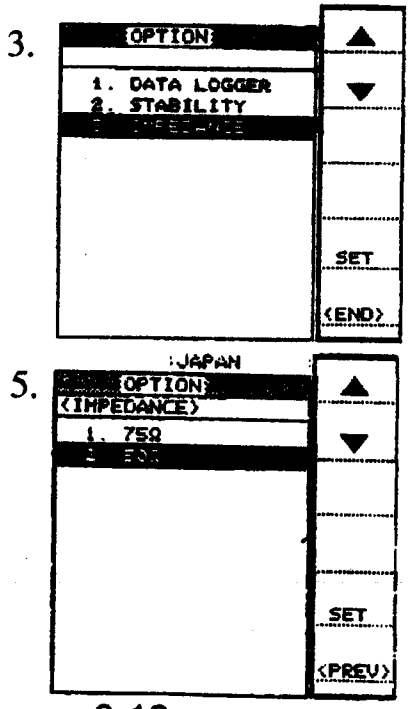
The input impedance of the 953 is 75 Ω. When using the 953 in the 50 Ω system, replace the INPUT connector with the LC 1587 50 Ω to 75 Ω Matching Pad (optionally available).
Select "50 Ω" in the menu when LC 1587 is connected, and select "75 Ω" when LC 1587 is disconnected.
The level measurement range reduces approximately 5 dB by insertion loss. (20 to 120 dBμV at measurement bandwidth of 110 kHz, video filter of 0.1 kHz)
When LC 1587 is connected, AC/DC measurement cannot be made. Do not apply 6 V or higher voltage to the LC 1587 to prevent trouble.

8.5.1 75 Ω to 50 Ω

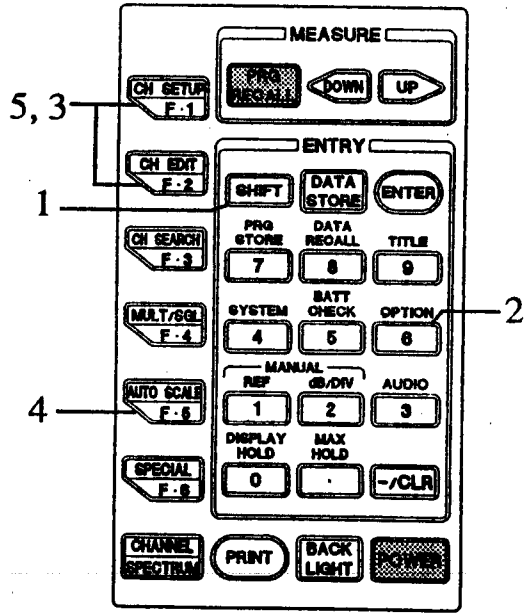
• Operating Procedure

1. Press the SHIFT key.
2. Press the OPTION (6) key.
   The OPTION screen is displayed.
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "3. IMPEDANCE".
4. Press the F•5 (SET) key.
   The OPTION <IMPEDANCE> setting screen is displayed.
5. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key to position the cursor to the "2. 50 Ω".

• Screen Display



• Keys Used

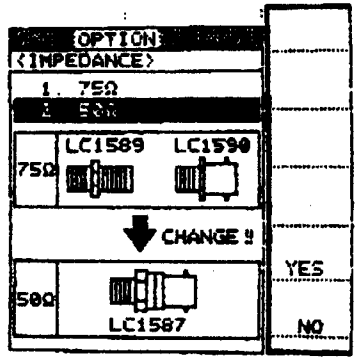


6. Press the F•5 (SET) key to display the connector replacement screen.

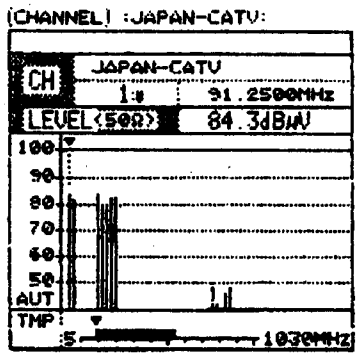
7. Replace the INPUT connector with the LC 1587. Press the F•5 (YES) key. The 50-Ω measurement screen is displayed.
   In the level measurement (CHANNEL) mode, <50 Ω> is displayed at the right side of the LEVEL.
   In the SPECTRUM mode, <50 Ω> is displayed at the left side of the marker level display.

8. To cancel the 50 Ω setting, press the F•6 (NO) key. The screen returns to the OPTION <IMPEDANCE> and cursor moves to the "1. 75 Ω".

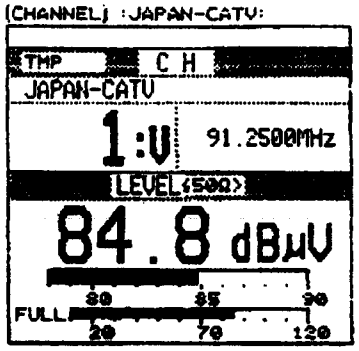
6.

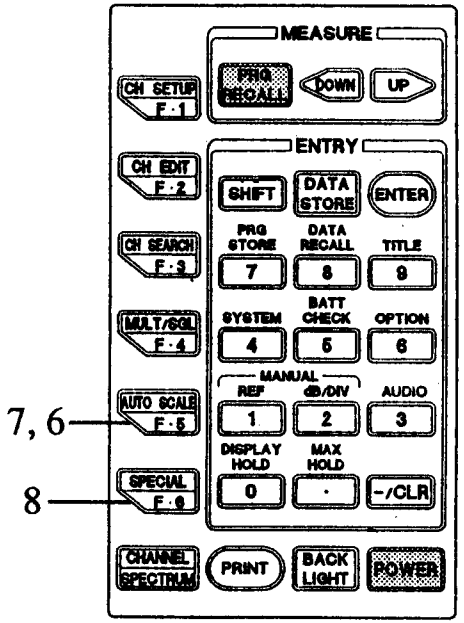


7.



7.

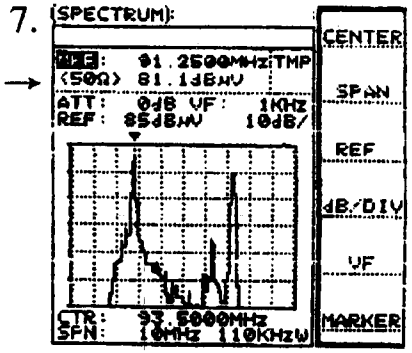




7, 6

8

7.



8.5.2 50 Ω to 75 Ω

• Operating Procedure • Screen Display • Keys Used

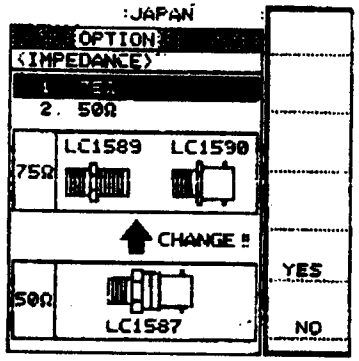
1. Apply the procedure (8.5.1, 1 through 4) to display OPTION <IMPEDANCE> screen.

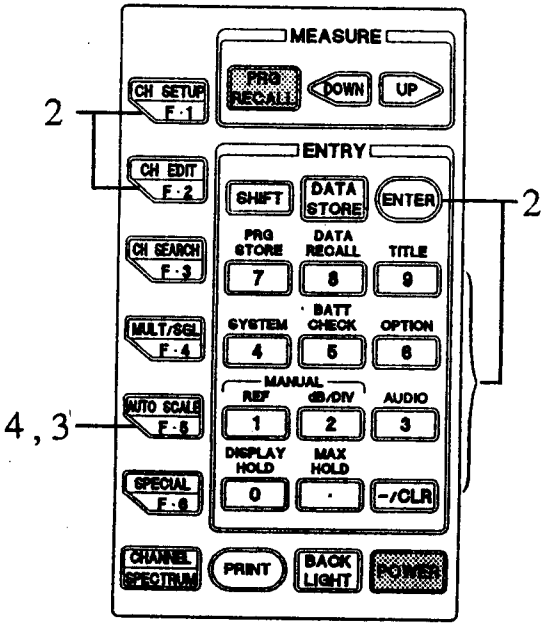
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key to position the cursor to the "1. 75 Ω".

3. Press the F•5 (SET) key to display the connector replacement screen.

4. Replace the LC 1587 with the LC 1589 F Adapter or LC 1590 BNC Adapter.
   Press the F•5 (YES) key.
   The instrument is set 75 Ω system. The "75 Ω" is not displayed on the screen.

3.





8.6 Setting Reference Offset

This instrument compensates known gain or less of the CATV system (e.g., trunk amplifier) to read measurement value directly.

The reference offset value for level measurement (CHANNEL) or spectrum measurement mode can be set or programmed individually. To store data into the program, refer to Section 10, "STORING AND RECALLING PROGRAM" for detail.

Setting procedure for the level measurement (CHANNEL) mode or spectrum measurement mode is difference.
The reference offset value is displayed at the upper-left corner of the screen.
No value is displayed when the reference is set to 0. Note that the value displayed when making measurement.
Settable reference offset range is ±30 dB in 0.1 dB steps.

8.6.1 Level Measurement (CHANNEL) Mode

• Operating Procedure

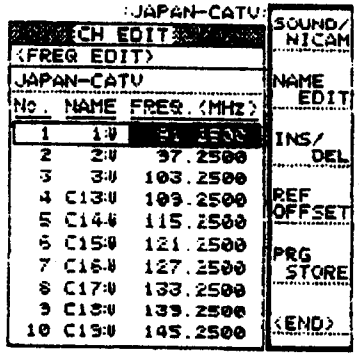
1. Press the CH EDIT-F•2 key.
   The CH EDIT <FREQ EDIT> screen is displayed.

2. Press the F•4 (REF OFFSET) key. The CH EDIT <REF OFFSET EDIT> screen is displayed.
   The reference offset value at the upper-left of the screen is displayed in reverse video.

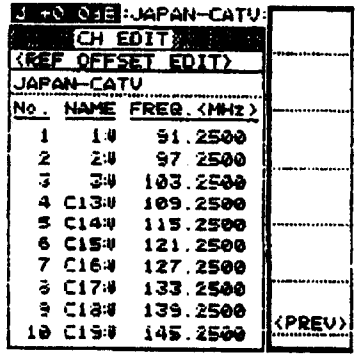
3. Input data (-30.0 to 30.0, no input is required if below decimal point is 0) using the numerical key, then press the ENTER key. The reference offset value is set.
   Check value at the upper-left corner of the screen for correct.

• Screen Display

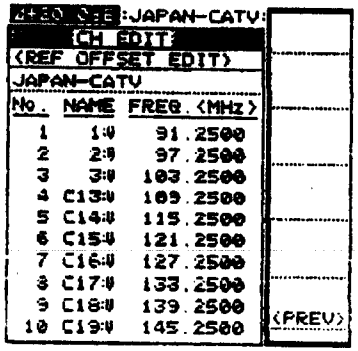
1.



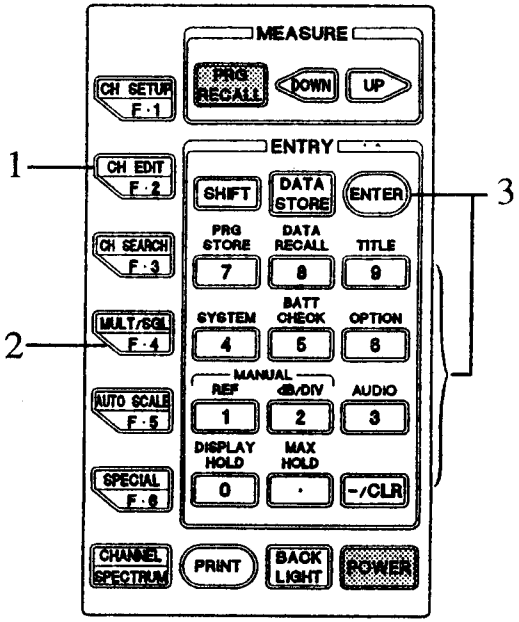
2.



3.



• Keys Used

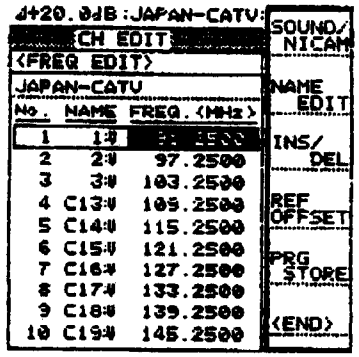


4. Press the F•6 (<PREV>) key. The screen returns to the CH EDIT <FREQ EDIT> screen.

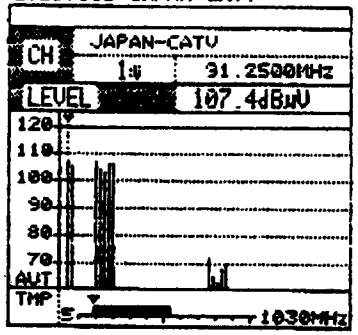
5. By pressing the F•6 (END) key, measurement screen with reference offset is displayed.

6. To reset the reference offset value to 0, apply the procedure (Steps 1 through 5 mentioned above) and input 0 at Step 3. The reference offset value at the upper-left corner is deleted, and [CHANNEL] is displayed.

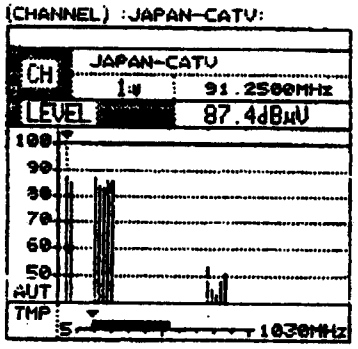
4.

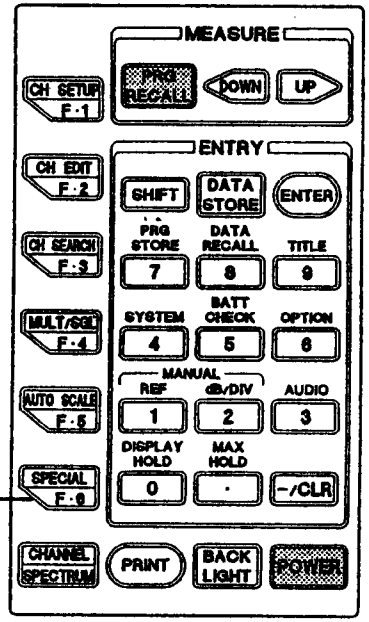


5.



6.





4, 5

8.6.2 Spectrum Mode

• Operating Procedure

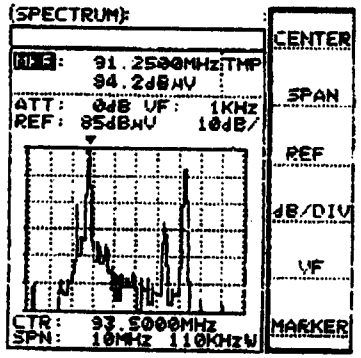
1. Press the F•6 (MARKER) key to display MKR: in reverse video.

2. Press the F•6 (MARKER) again. The <MARKER MODE> screen is displayed.

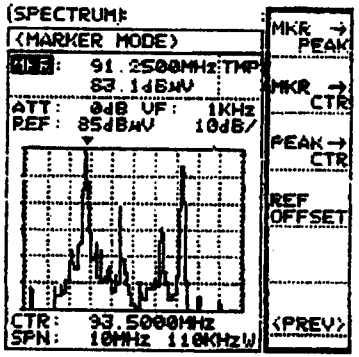
3. Press the F•4 (REF OFFSET) key. The <REF OFFSET EDIT> screen is displayed. The reference offset is displayed in reverse video.

• Screen Display

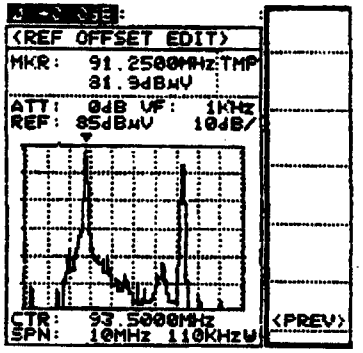
1.



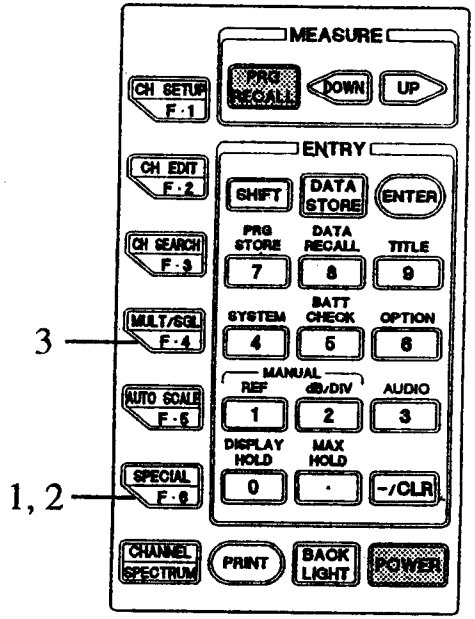
2.



3.



• Keys Used

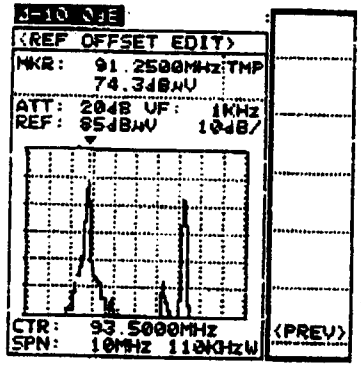


4. Input data (-30.0 to 30.0, no input is required if below decimal point is 0) using the numerical key, then press the ENTER key. The reference offset value is set.
   Check value at the upper-left corner of the screen for correct.

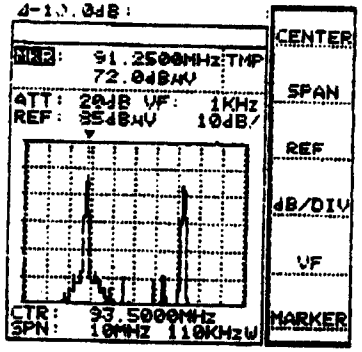
5. Press the F•6 (<PREV>) key twice. The spectrum screen with reference offset is displayed.

6. To reset the reference offset value to 0, apply the procedure (Steps 1 through 5 mentioned above) and input 0 at Step 4. The reference offset value at the upper-left corner is deleted, and [SPECTRUM] is displayed.

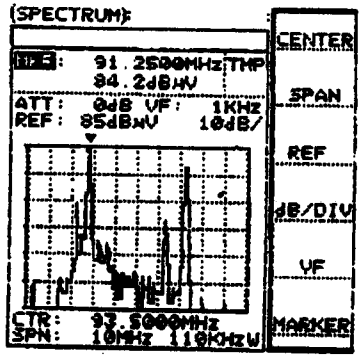
4.

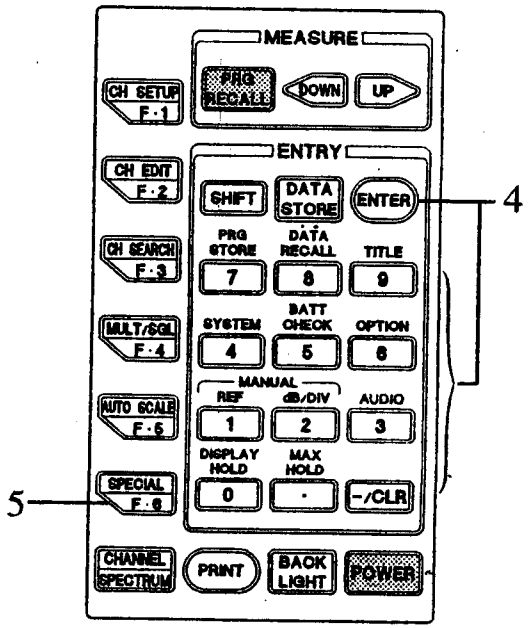


5.



6.





9. CHANNEL FREQUENCY SETTING

When making level measurement, channel frequency should be set.
Various setting methods are mentioned in this section.
For effective measurement, desired channels can be gathered by using stored channel table.
The channel set is retained even power is turned off.
Followings describe setting procedure.

9.1 Search Function

The search function displays the channels of 50 dBµV level or higher. This function reduces the number of channels displayed for easier observation, and enables faster measurement.

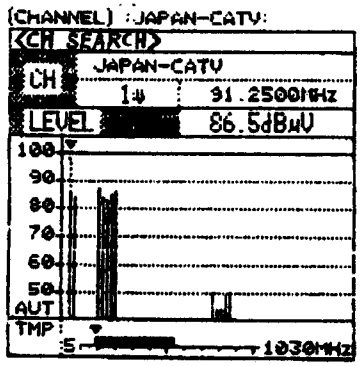
• Operating Procedure • Screen Display • Keys Used

1. Connect the antenna or CATV cable to the INPUT connector.

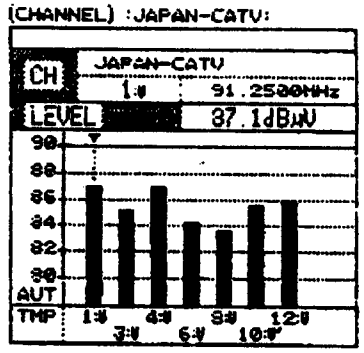
2. Refer to Section 5.1, "Recalling Channel Table" to recall the channel table. Press the CH SEARCH-F•3 key. The <CH SEARCH> is displayed at the second line, and signal search will be started.

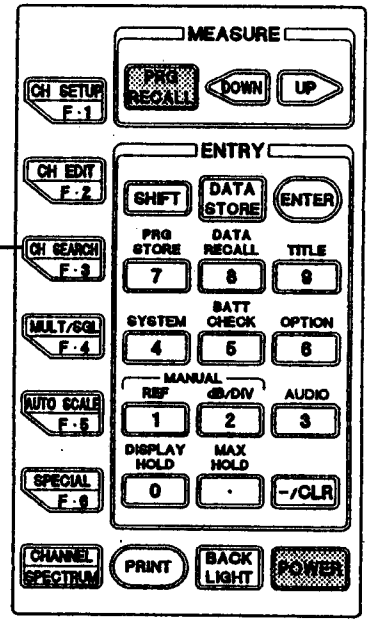
3. The signals with 50 dBµV level or higher are displayed.

2.



3.





9.2 Delete Function

This function deletes unnecessary items (e.g., a channel in the recalled channel table, program edited by search function, program recalled by program recall mode).

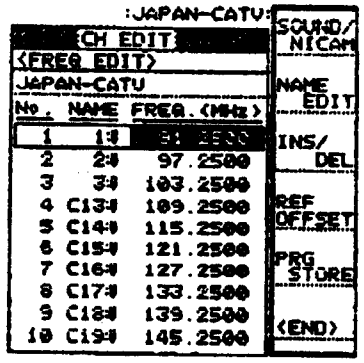
• Operating Procedure

1. Press the CH EDIT-F•2 key. The CH EDIT <FREQ EDIT> screen is displayed.

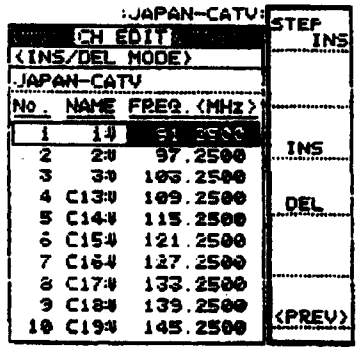
2. Press the F•3 (INS/DEL) key. The CH EDIT <INS/DEL MODE> screen is displayed.

• Screen Display

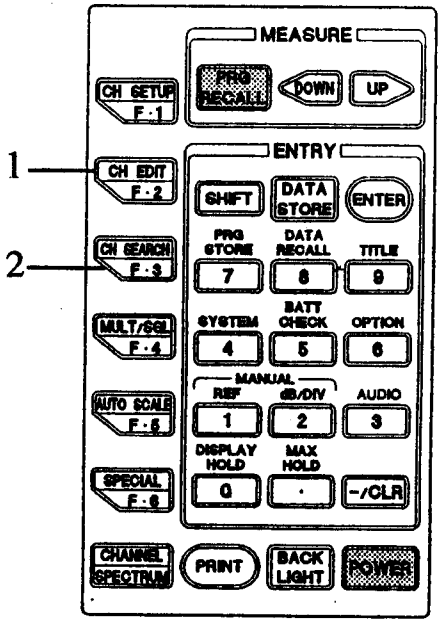
1.



2.



• Keys Used



• Operating Procedure

3. Press the DOWN or UP key to position the cursor to channel to be deleted.

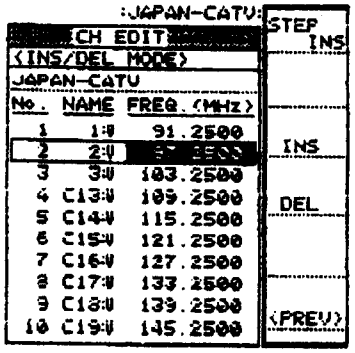
4. Press the F•4 (DEL) key. The cursored channel is deleted.
   The next channel is moved to the cursored position. Press the F•4 (DEL) key again for continual deleting.

5. Repeat Steps 3 and 4 to delete unnecessary channel.

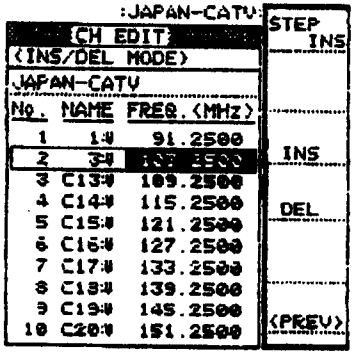
6. Press the F•6 (<PREV>) key. The screen returns to the CH EDIT <FREQ EDIT> screen. Pressing the F•6 (END) key again displays TMP measurement screen after edited.

• Screen Display

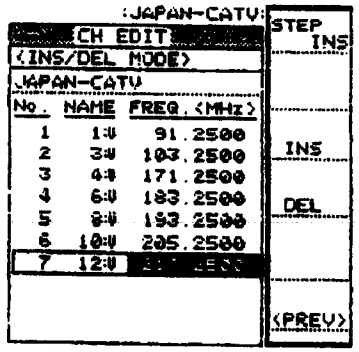
3.



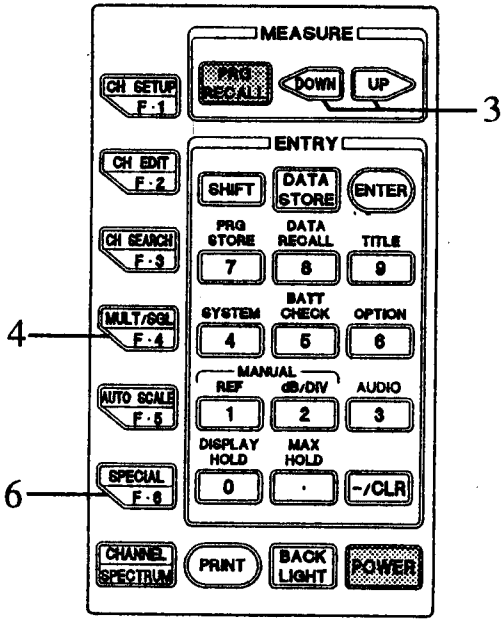
4.



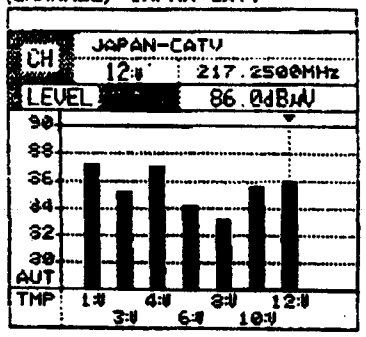
5.



• Keys Used



6.



9.3 Adding Sound and NICAM Carriers

The sound and NICAM carriers can be added to the recalled channel table or edited program. If number of added channels go beyond 128 channels, adding cannot be made. Set the number of channel to 64 or less to add either sound or NICAM carrier, or set it to 42 or less to add both sound and NICAM carriers. The channel with ":v" can only be used.

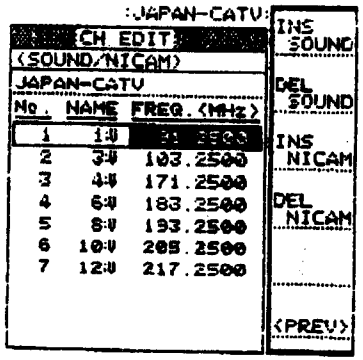
• Operating Procedure • Screen Display • Keys Used

1. Press the CH EDIT-F•2 key.
   The CH EDIT <FREQ EDIT> screen is displayed.

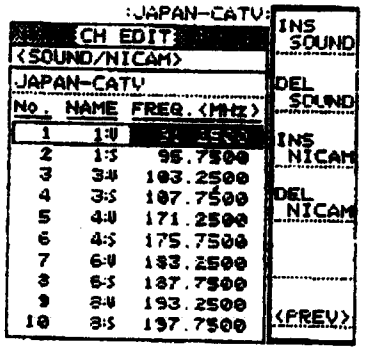
2. Press the F•1 (SOUND/NICAM) key. The CH EDIT <SOUND/NICAM> screen is displayed.

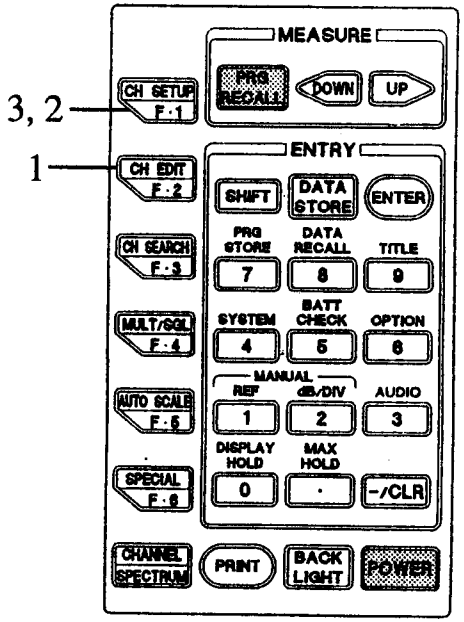
3. Press the F•1 (INS SOUND) key. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the sound carrier (named XXX:s) is added.

2.



3.





• Operating Procedure

• Screen Display

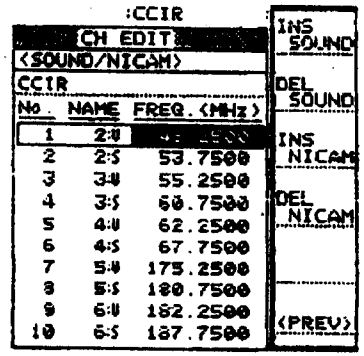
• Keys Used

4. Press the F•3 (INS NICAM) key.
   When the channel table has the NICAM, the "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the NICAM carrier (named XXX:n) is added.
   When the channel table has no NICAM, the beeper sounds three times.

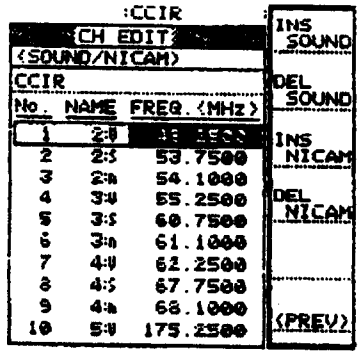
5. To delete the carrier after added, press the F•2 (DEL SOUND) and F•4 (DEL NICAM) keys. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the carriers are deleted.

6. Press the F•6 (<PREV>) key. The screen returns to the CH EDIT <FREQ EDIT> screen. Pressing the F•6 (END) key again displays TMP measurement screen with sound and NICAM carriers.

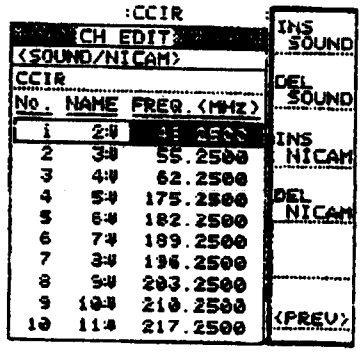
3.

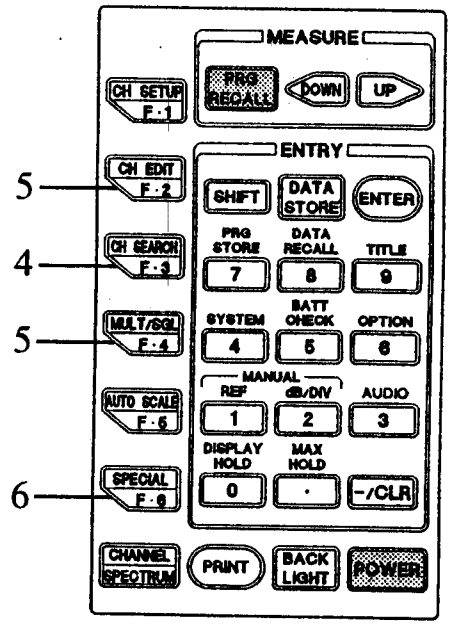


4.

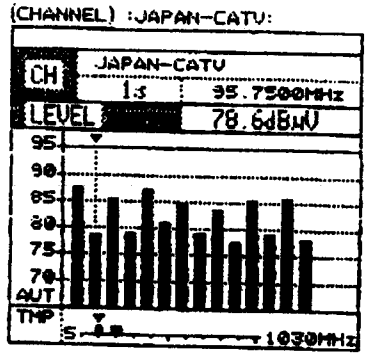


5.





6.



9.4 Setting Arbitrary Frequency

When the frequency is not listed in the channel table, set frequency and name using the CH EDIT screen. Frequency of 5 to 1030 MHz can be set in 0.0125 MHz (12.5 kHz) steps. If no decimal point is input, XXXX.0000 is displayed. When a step frequency other than 0.0125 MHz is set, the frequency is rounded to 0.0125 MHz steps.

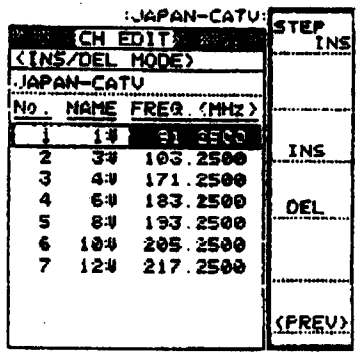
9.4.1 Programming

• Operating Procedure

1. Press the CH EDIT-F•2 key. The CH EDIT <FREQ EDIT> screen is displayed.
2. Press the F•3 (INS/DEL) key. The CH EDIT <INS/DEL MODE>.
3. Press the DOWN or UP key to position the cursor to the next line of the channel to be added.
4. Press the F•3 (INS) key. The channels are dropped, and cursored spot is blanked.

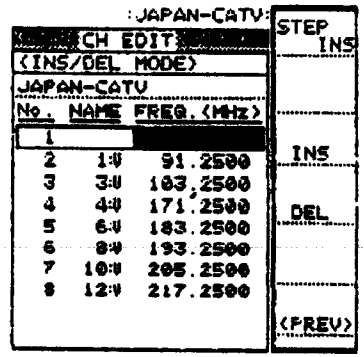
• Screen Display

2.

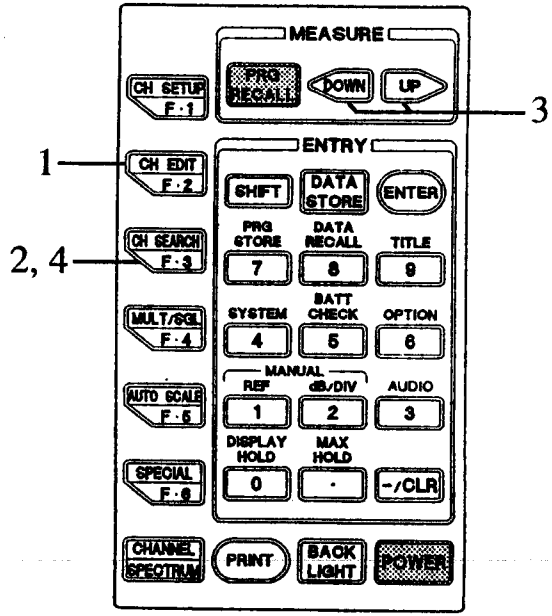


3.

4.



• Keys Used



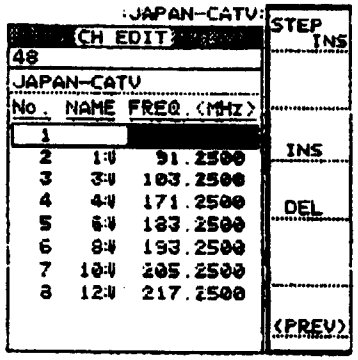
5. Press the numerical key to set the frequency.
   The frequency is displayed in the blanked column at the upper part of the screen.

6. By pressing the ENTER key, the frequency is set.

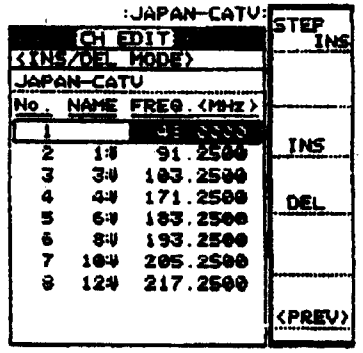
7. To input the frequency, apply Steps 3 through 6.
   For channel naming, refer to Section 9.6, "Setting Channel Name" for detail.

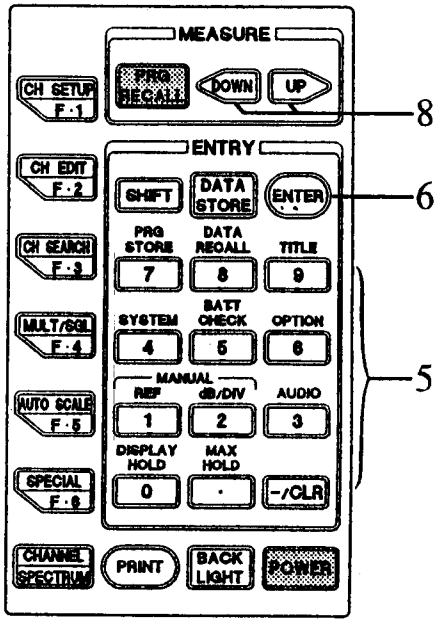
8. To change the frequency being set, press the DOWN or UP key to position the cursor to the channel to be changed, then repeat Steps 5 through 6 to input frequency.

5.



6.





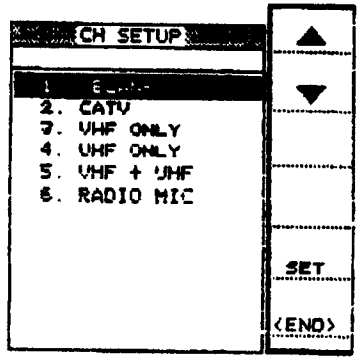
9.4.2 BLANK of Channel Table

• Operating Procedure

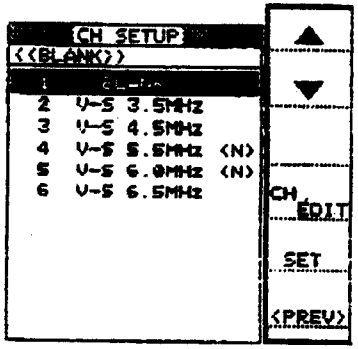
1. Press the CH SETUP key.
   The band selection screen in the CH SETUP screen is displayed.
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "1. BLANK".
3. Press the F•5 (SET) key to display the CH SETUP <BLANK> screen.
4. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "1. BLANK".
5. Press the F•4 (CH EDIT) key. The CH EDIT <FREQ EDIT> screen is displayed.
6. Follow the Section 9.4.1 to set the frequency.
7. To set the channel name, refer to Section 9.6, "Setting Channel Name" for detail.

• Screen Display

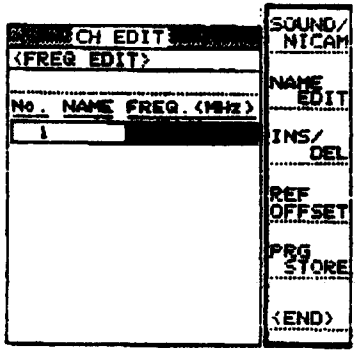
2.



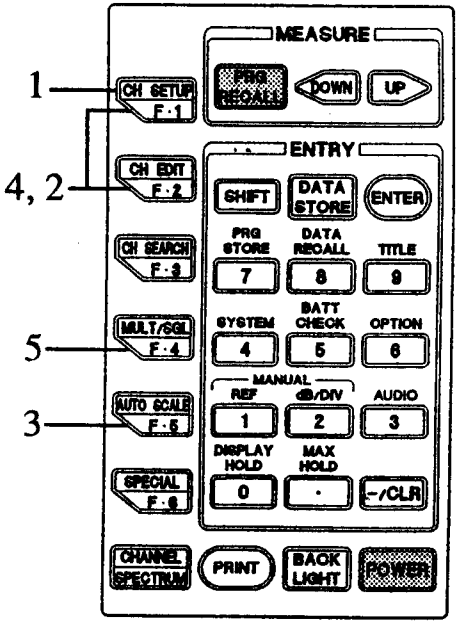
4.



5.



• Keys Used

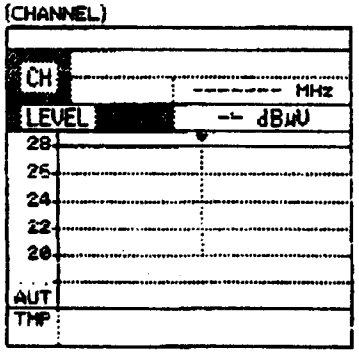


8. To add the sound and NICAM carriers, position the cursor to the sound carrier in the Step 4 mentioned above. Apply the procedure (Steps 5 and 6 mentioned above) to set the frequency.
   Add the ":v" to the end of channel name.
   Refer to Section 9.6, "Setting Channel Name" for detail.
   Refer to Section 9.3, "Adding Sound and NICAM Carriers" to add the sound and NICAM carriers.

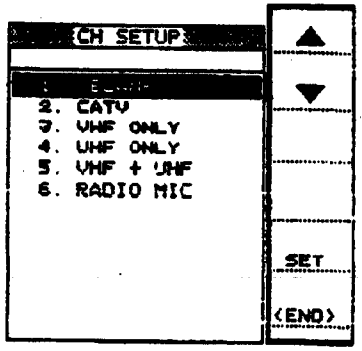
9. By pressing the F•5 (SET) key in the CH SETUP <BLANK> screen (set at Step 4.), the level measurement (CHANNEL) screen without frequency is displayed.

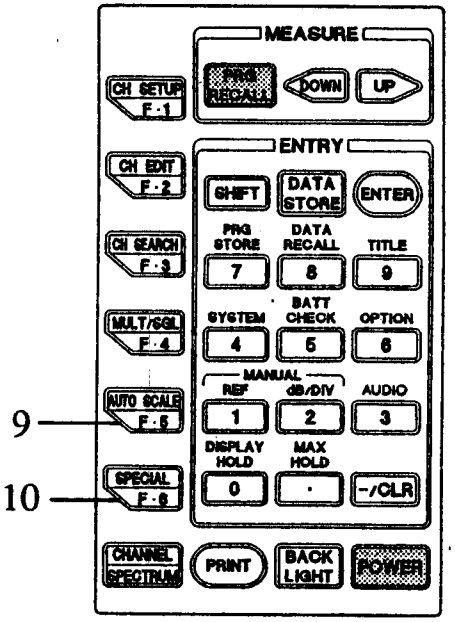
10. Press the F•6 (<PREV>) key. The screen returns to the band selection screen of the CH SETUP screen.

9.



10.





9.5 Setting Frequency in Equal Steps

To set the frequency in equal steps, set the start, stop, and step frequencies.
The step can be set in 0.0125 MHz and multiple.
No channel name is added in this setting. Refer to Section 9.6, "Setting Channel Name" for naming.

• Operating Procedure • Screen Display • Keys Used

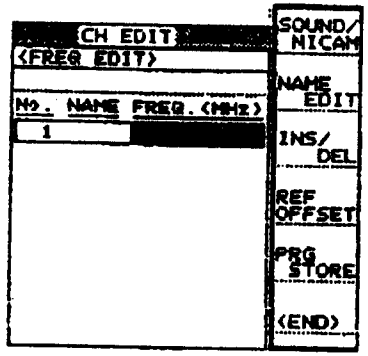
---

1. Press the CH EDIT-F•2 key.
   The CH EDIT <FREQ EDIT> screen is displayed.

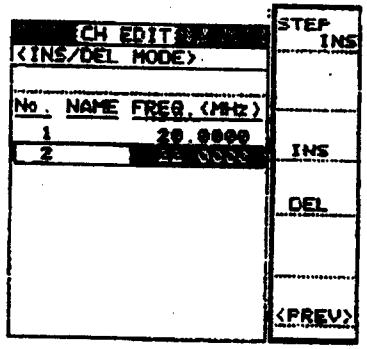
2. Press the F•3 (INS/DEL) key. The CH EDIT <INS/DEL MODE> screen is displayed.

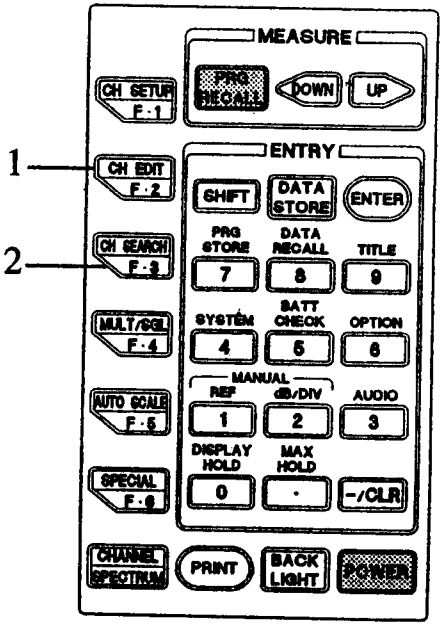
3. Refer to Section 9.4, "Setting Arbitrary Frequency" to set the start and stop frequencies.

1.



3.





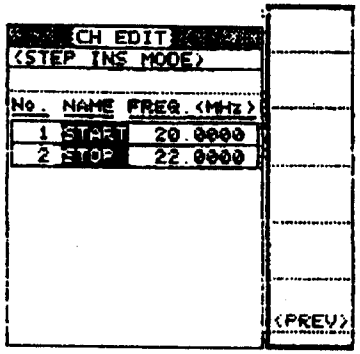
4. Press the F•1 (STEP INS) key. The CH EDIT <STEP INS MODE> screen is displayed. The STOP cursor is positioned at the cursored position, and the START cursor is positioned at the above channel.
   By pressing the DOWN or UP key, the cursors move simultaneously.

5. Press the numerical key to input step frequency in MHz.

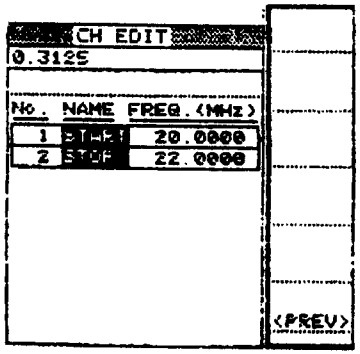
6. Press the ENTER key. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the step frequency is set.

7. To delete unnecessary frequency, press the DOWN or UP key to position the cursor to the frequency, then press the F•4 (DEL) key.

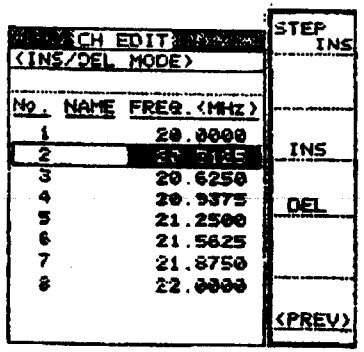
4.

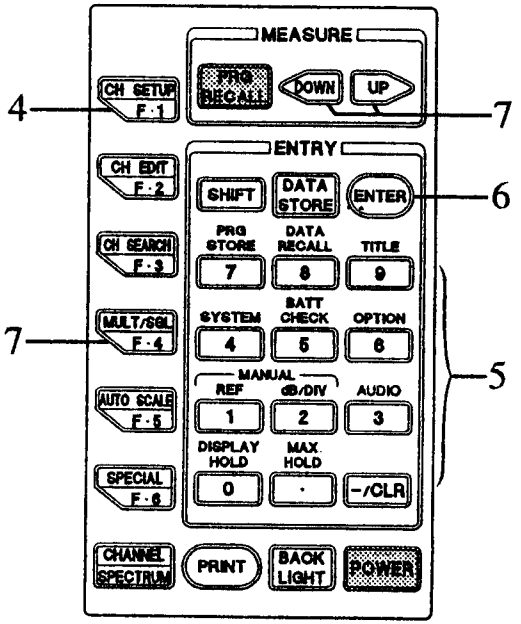


5.



6.

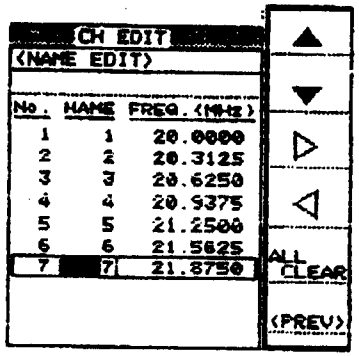




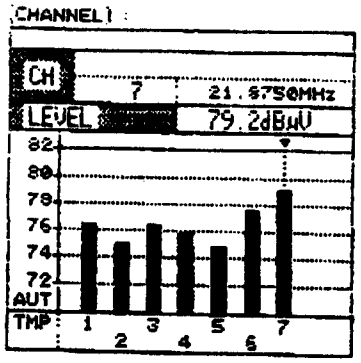
8. To set the channel name, refer to Section 9.6, "Setting Channel Name" for detail.

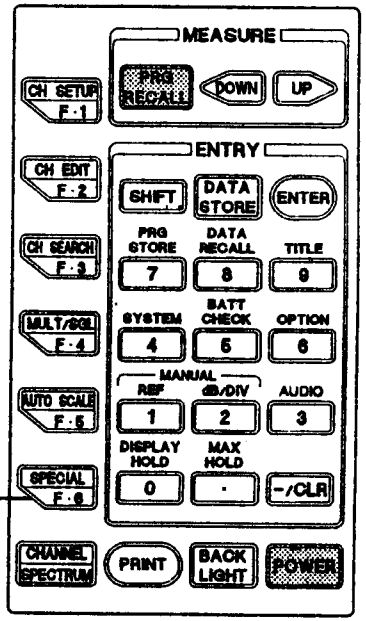
9. Press the F•6 (<PREV>) key. The screen returns to the CH EDIT <FREQ EDIT> screen. Pressing the F•6 (END) key again displays measurement screen after edited.

8.



9.

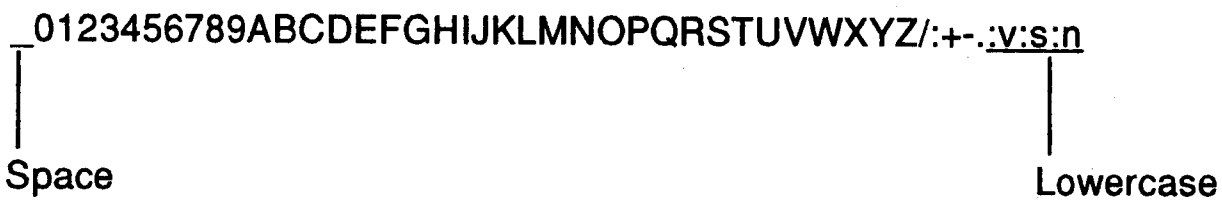




9

9.6 Setting Channel Name

Up to four characters below can be used for naming.



In the <NAME EDIT> screen:
the F•1 (▲) key selects character shown above from the left to right, and
the F•2 (▼) key selects character shown above from the right to left.

The :v, :s, and :n can be added at the right end of the name.

- :v Indicates TV video carrier. Peak detection is made at the bandwidth of 330 kHz. The sound (:s) and NICAM (:n) carriers can be added when editing the channel.
- :s Indicates TV sound carrier. Average detection is made at the bandwidth of 110 kHz. The DEL SOUND can be used to cancel when editing the channel.
- :n Indicates TV NICAM carrier. Peak detection is made at the bandwidth of 330 kHz. The DEL NICAM can be used to cancel when editing the channel.

• Operating Procedure

1. Press the CH EDIT-F•2 key.
   The CH EDIT <FREQ EDIT> screen is displayed.

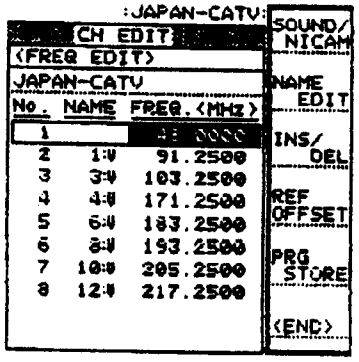
2. Press the F•2 (NAME EDIT) key.
   The CH EDIT <NAME EDIT> screen is displayed.

3. The cursor is displayed in normal video to indicate one character area out of four characters at the NAME column.
   Press the F•1 (▲) or F•2 (▼) key to recall the character.

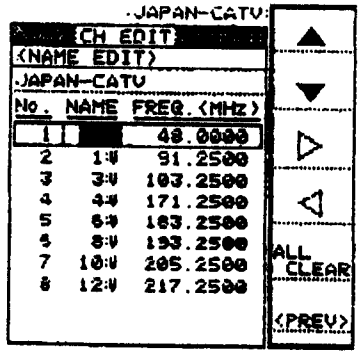
4. Press the F•3 (▷) or F•4 (◁) key to move the cursor to the right to input name.

• Screen Display

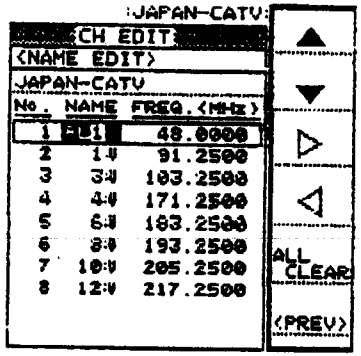
1.



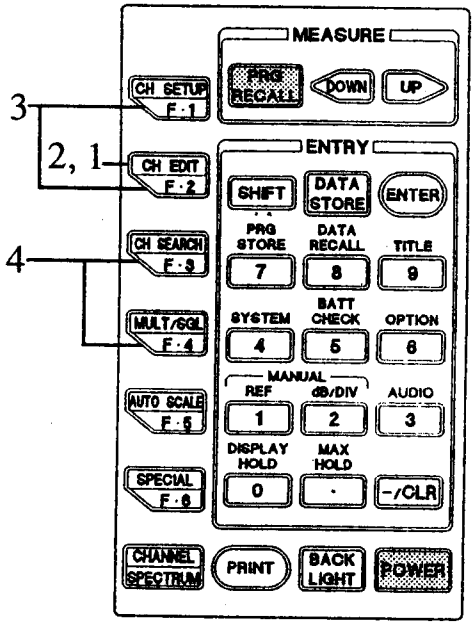
2.



3.
4.



• Keys Used



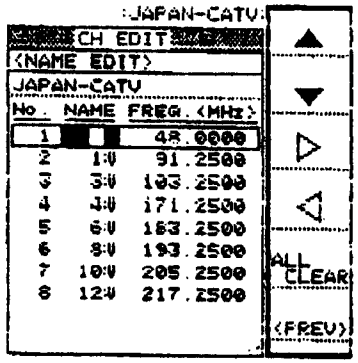
5. Apply the procedure (Steps 3 and 4 mentioned above) to input the name. Up to four characters can be input.

6. To clear the name, press the F•5 (ALL CLEAR) key. To clear one character, apply the procedure (Step 3 mentioned above) and input the space.

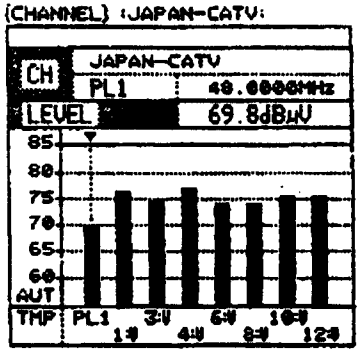
7. To change the name, press the DOWN or UP key to position the cursor to the character to be changed, then apply the procedure (Step 6 mentioned above) and input the character.

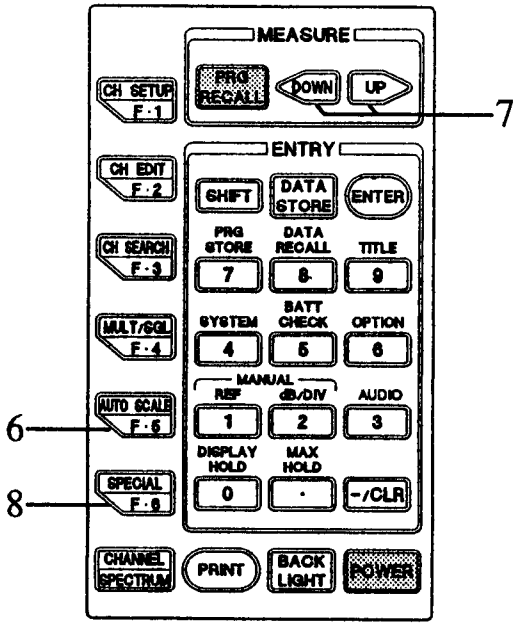
8. Press the F•6 (<PREV>) key. The screen returns to the CH EDIT <FREQ EDIT> screen. Pressing the F•6 (END) key again displays TMP measurement screen after edited.

6.



8.





10. STORING AND RECALLING PROGRAM

- Up to 50 programs of the level measurement (CHANNEL) and spectrum measurement modes can be stored.

Setting		Number of Storable Programs
Level Measurement (CHANNEL)	128 channels	16
	64 channels	32
	≤40 channels	50
Spectrum Measurement		20

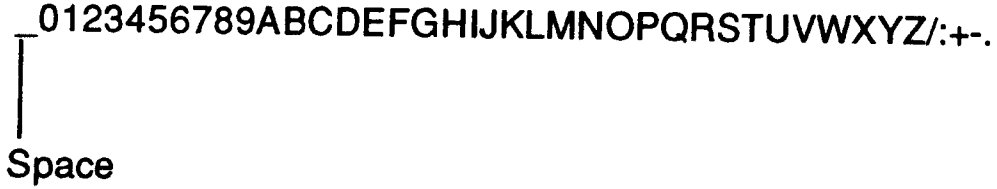
The level measurement (CHANNEL) mode and spectrum measurement can be mixed when programing. Remaining memory capacity is displayed at the lower part of the PRG STORE screen. (FREE MEMORY=XX)

- The storable settings into program and screens (TMP and PRG) are shown below.
  - Level Measurement (CHANNEL):
    When following settings is changed after recalled, the TMP screen is displayed.
    1. CH NAME, 2. CH FREQ, 3. REF LEVEL, 4. dB/DIV, 5. TITLE, 6. REF OFFSET
    When following settings is changed after recalled, the PRG screen is displayed.
    1. MULTI/SGL, 2. CHANNEL selection
  - Spectrum Measurement:
    When following settings is changed after recalled, the TMP screen is displayed.
    1. CENTER, 2. SPAN, 3. REF, 4. dB/DIV, 5. TITLE, 6. REF OFFSET
    When following settings is changed after recalling, the PRG screen is displayed.
    1. VF, 2. MARKER

- The stored program can be recalled any time. You can reduce setup time by programming frequently used measuring conditions. When using the same program, the measurement is made only pressing the POWER key and applying signal to be measured.
- When changing the set or recalling channel table after program is recalled, the TMP (TEMPORARY) screen is appeared. The screen retains until other program is recalled.
  When TMP screen is displayed after changing setting for the recalled program, this screen retains even the previous setting is recalled.
  When power is turned on, the 953 retains the key settings in effect before power or CHANNEL/SPECTRUM was switched.

10.1 Titling

Titling to the program helps designation of program contents when storing or recalling data.
Up to 10 characters can be set for titling in measurement (level and spectrum) modes, CH EDIT, PRG STORE, and DATA STORE screens. The title is displayed uppermost of the screen.
When channel table is recalled in the level measurement (CHANNEL) mode, name in the channel table is displayed up to 10 characters.
Usable characters are shown below.



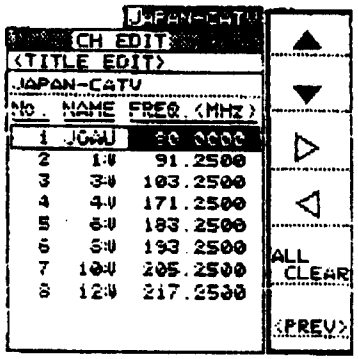
In the <TITLE EDIT> screen:
the F•1 (▲) key selects character shown above from the left to right, and
the F•2 (▼) key selects character shown above from the right to left.

• Operating Procedure

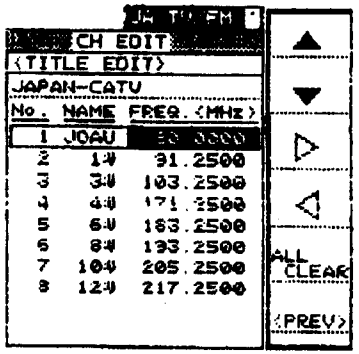
1. Display measurement screen (i.e., level measurement (CHANNEL) mode, spectrum, CH EDIT, PRG STORE, or DATA STORE), then press the SHIFT key.
2. Press the TITLE (9) key. The <TITLE EDIT> screen is displayed. The title display column is displayed uppermost of the screen center.
3. The cursor is displayed in normal video to indicate one character area out of four characters at the TITLE column in normal video. Press the F•1 (▲) or F•2 (▼) key to recall the character.
4. Press the F•3 (▷) or F•4 (◁) key to move the cursor to the right to input character.
5. Apply the procedure (Steps 3 and 4 mentioned above) to input the title. Up to 10 characters can be used.
6. Press the F•6 (END or PREV) key. The screen returns to the screen displayed before the <TITLE EDIT> was pressed.

• Screen Display

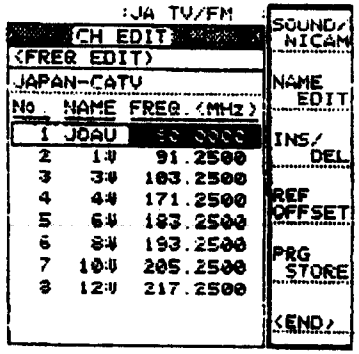
2.



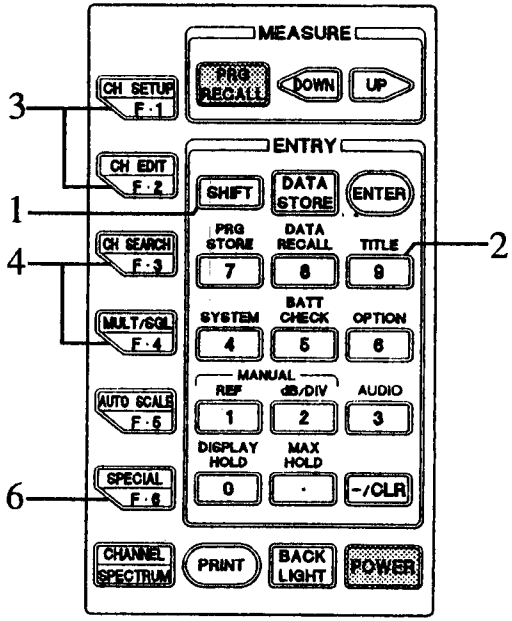
5.



6.



• Keys Used



10.2 Storing Program

Up to 50 programs edited in the Section 9, "CHANNEL FREQUENCY SETTING" or obtained by the spectrum measurement mode can be stored. The number of storable programs depend on number of channels set. The remaining memory capacity is displayed at the lower part of PRG STORE screen.
If program has no title, NO TITLE is displayed.
For the program obtained by the spectrum measurement mode, "S" is displayed top of the program list.

• Operating Procedure • Screen Display • Keys Used

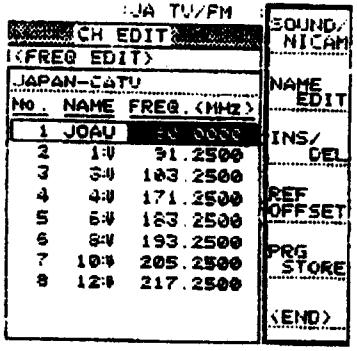
1. When the CH EDIT <FREQ EDIT> screen is displayed, press the F•5 (PRG STORE) key.
   The PRG STORE screen is displayed.

2. When the measurement screen is displayed, press the SHIFT key.

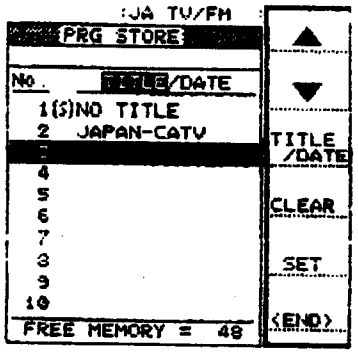
3. Press the PRG STORE (7) key. The PRG STORE screen is displayed.

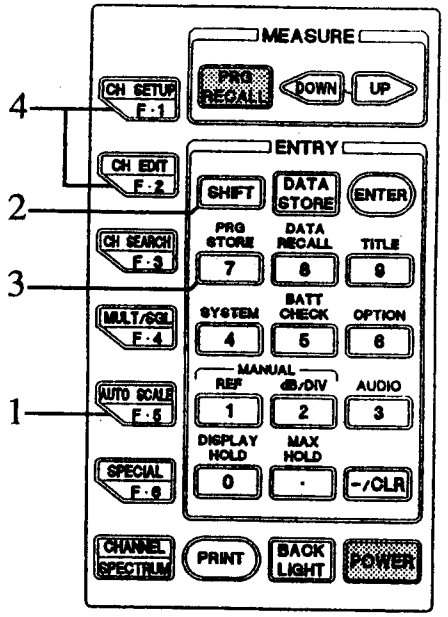
4. Press the F•1 (▲) or F•2 (▼) key to position the cursor to the number to be stored.

1.



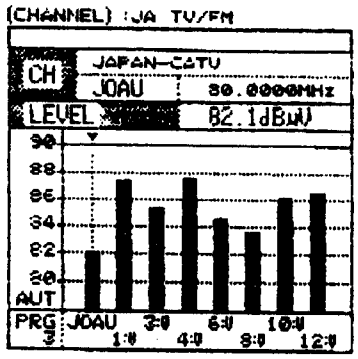
1.
3.
4.



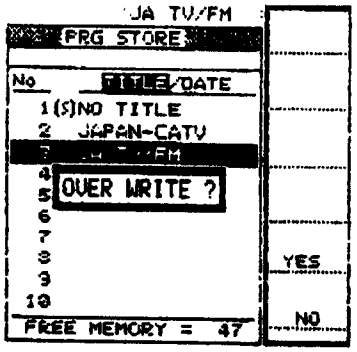


5. By pressing the F•5 (SET) key, the title is displayed at the cursor. After store is completed, previous screen is displayed.
6. When positioning the cursor to the stored item in the PRG STORE screen, "OVER WRITE?" is displayed at the center of the screen.
7. If overwrite is acceptable, press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary. After this sign is erased, the title is changed.
   After store is completed, previous screen is displayed.
8. If overwrite is not acceptable, press the F•6 (NO) key. The screen returns to the PRG STORE screen. Apply the procedure (Steps 4 and 5 mentioned above).
9. To escape from the PRG STORE screen without store data, press the F•6 (NO) key. The screen returns to the previous measurement screen.

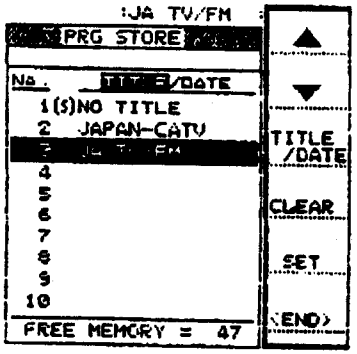
5.
7.
9.



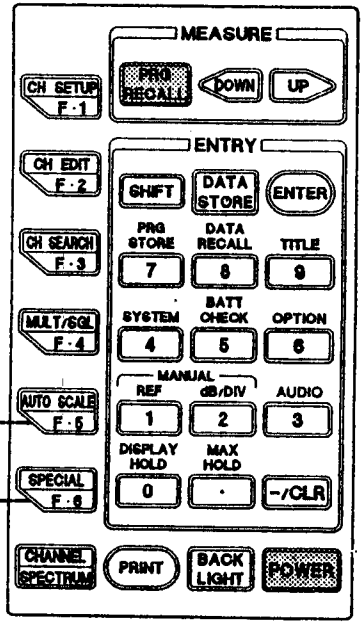
6.



8.



5, 6, 7 —
8, 9 —



10.3 Recalling Program

The stored program can easily be recalled.
Year, month, date, hour, minute, and second are added when storing program.

10.3.1 Recalling Program

• Operating Procedure

1. Press the PRG RECALL key. The PRG RECALL screen is displayed.

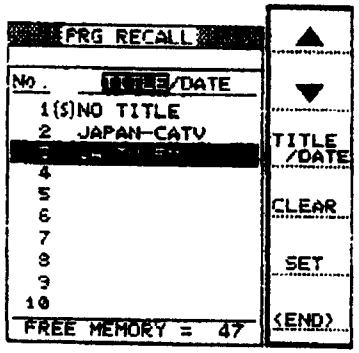
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the program to be selected.

3. Press the F•5 (SET) key. the selected PRG measurement screen is recalled.

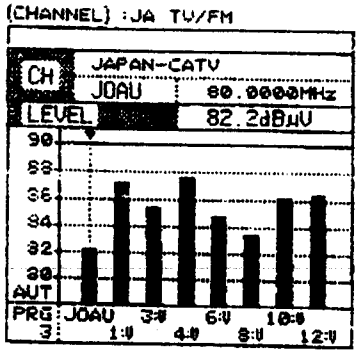
4. To return to previous screen without recalling the program, press the F•6 (END) key. Previous screen before recalling the PRG RECALL screen is displayed.

• Screen Display

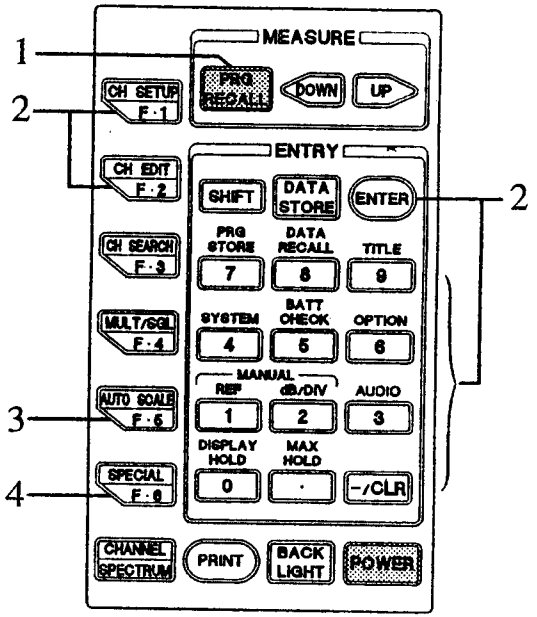
1.
2.



3.



• Keys Used



10.3.2 Checking Programmed Date

• Operating Procedure

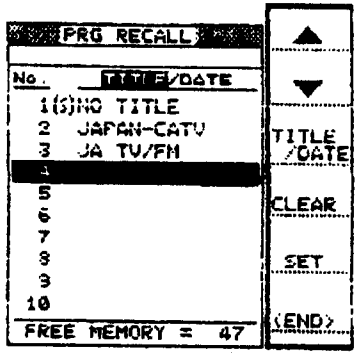
1. Press the PRG RECALL key. The PRG RECALL screen is displayed.

2. Press the F•3 (TITLE/DATE) key to display DATE 1 screen.
   Programmed date (year, month, date, hour, and minute) are displayed.

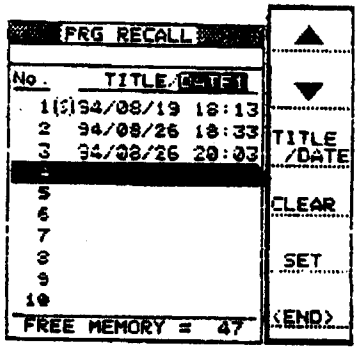
3. Press the F•3 (TITLE/DATE) key again to display DATE 2 screen.
   Programmed date (month, date, hour, minute, and second) are displayed.

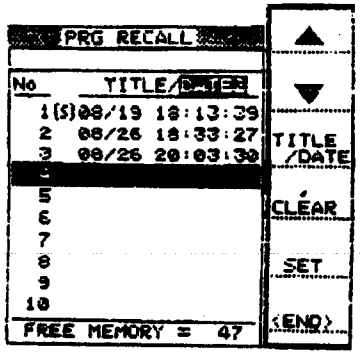
4. By pressing the F•3 (TITLE/DATE) key, the screen returns to the previous TITLE screen.

• Screen Display

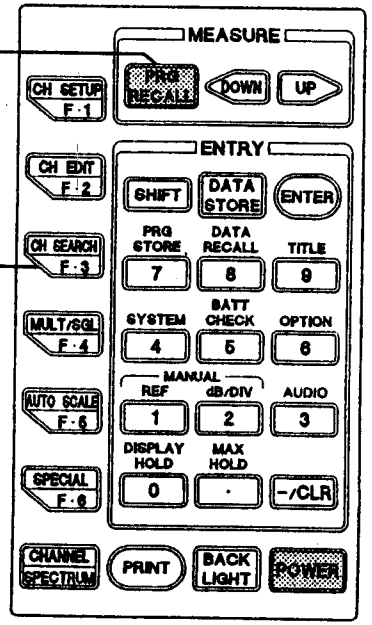
1.


4.

2.


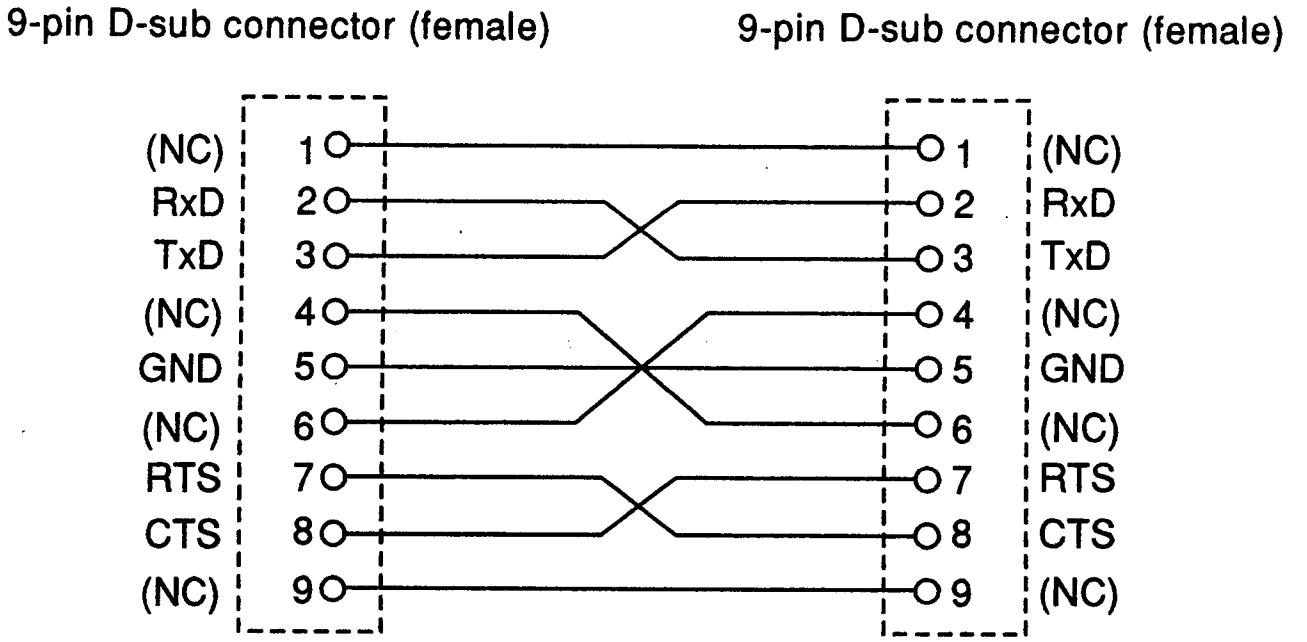
3.


• Keys Used



10.4 Program Transfer

The stored program contents can be transferred to the other 953 via the RS-232C interface.
Use optional LC-2099 RS-232C Transfer Cable.
A cable without connection of pins 1, 4, 6, and 9 can also be used.



LC-2099 RS-232C Transfer Cable

10.4.1 Program Transfer

• Operating Procedure

1. Set both 953s as follows.
   Press the SHIFT key.

2. Press the SYSTEM (4) key to display SYSTEM screen.

3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the "6. PRG COPY".

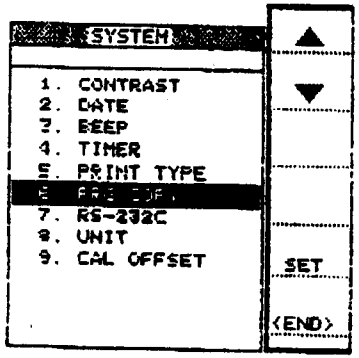
4. Press the F•5 (SET) key to display SYSTEM <PRG COPY> screen.

5. Press the F•1 (▲) or F•2 (▼) key of the Receiving 953 and position the cursor to the "2. RECEIVE".

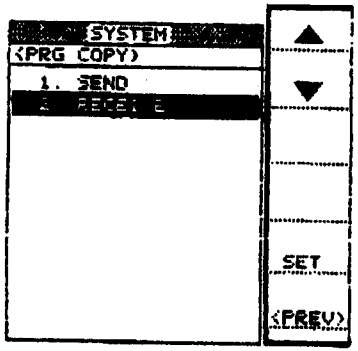
6. Press the F•5 (SET) key. The scale is displayed at the center of the screen. The Receiving 953 enters waiting condition.

• Screen Display

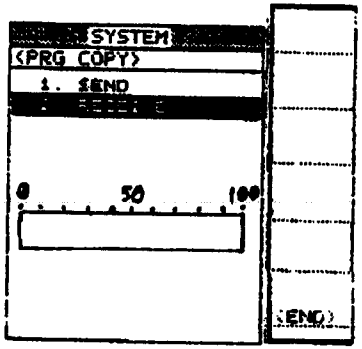
2.
3.



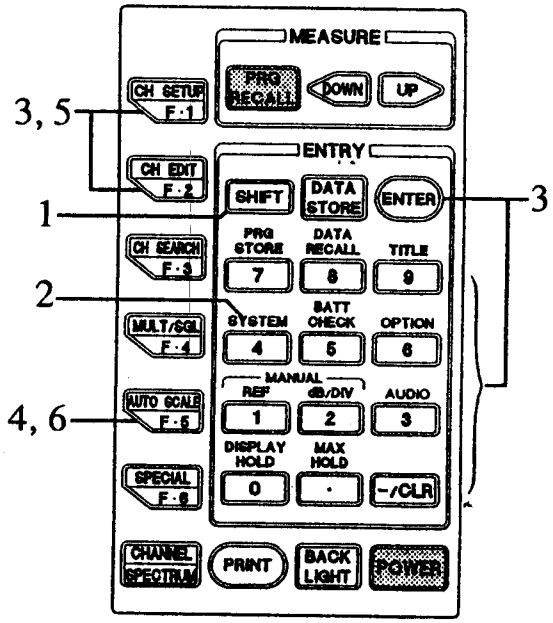
4.
5.



6.



• Keys Used



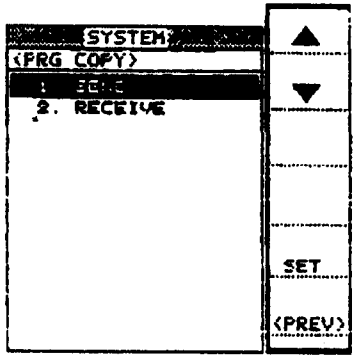
7. Press the F•1 (▲) or F•2 (▼) key of the Sending 953 and position the cursor to the "1. SEND".

8. Press the F•5 (SET) key. The scale is displayed at the center of the screen. The program transfer is started.

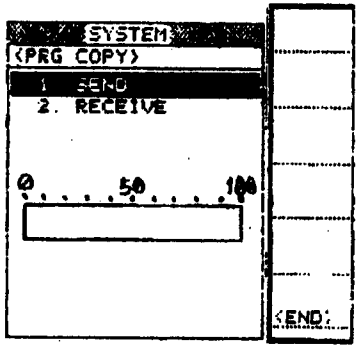
9. The black bar indicates transfer progress. It take about 45 seconds to transfer data. The beeper sounds after transfer is completed and screen returns to the previous measurement screen.

10. To quit the program transfer in progress, press the F•6 (END) key. The SYSTEM <PRG COPY> screen is displayed.
Quitting the transfer in progress may cause trouble due to program contents failure. Delete the program using Section 10.5.2, "Deleting All Programs" and set again.

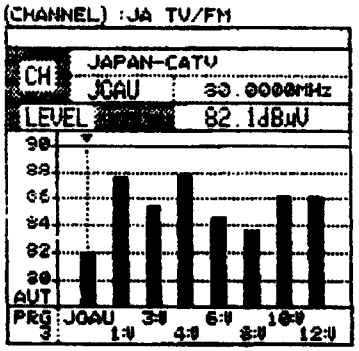
7.

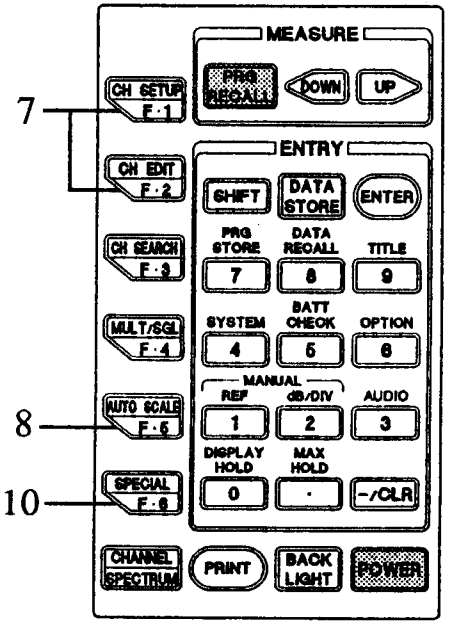


8.



9.





10.4.2 RS-232C Interface Communication Error

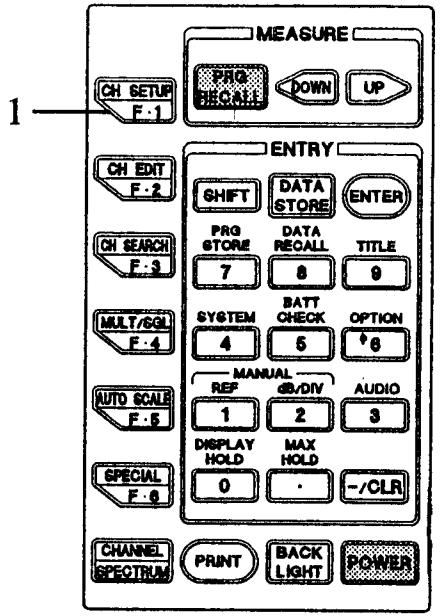
When communication error caused by cable broken or poor contact occurs, the "ERROR <RS-232C>" is displayed at the center of the screen and beeper sounds three times. When error occurs, check the cable and contact for correct and proceed again.

• Operating Procedure	• Screen Display	• Keys Used

1. Press the F•1 (END) key. The SYSTEM <PRG COPY> screen is displayed.

2. Connect the cable correctly.

3. Apply procedure (10.4.1, 6 through 8).



10.5 Deleting Program

Three methods are available to delete unnecessary program: overwrite (refer to Section 10.2, "Recalling Program"), one by one, and all. The followings describe deletion procedure in the PRG RECALL screen, however, the same procedure can also be used for the PRG STORE screen without recalling the screen.

10.5.1 Deleting Programs One By One

• Operating Procedure

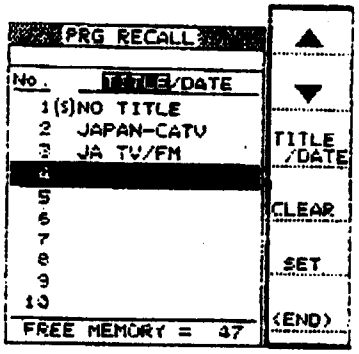
1. Press the PRG RECALL key. The PRG RECALL screen is displayed.

2. Press the F•4 (CLEAR) key. The PRG RECALL <CLEAR MODE> screen is displayed.

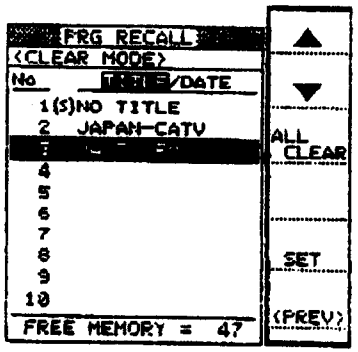
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the program to be deleted.

• Screen Display

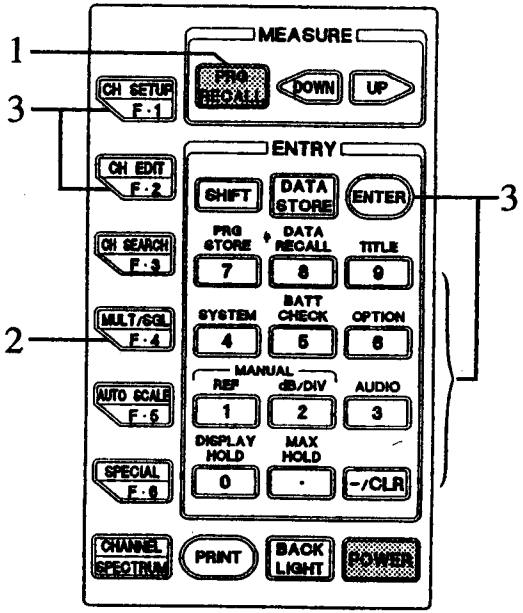
1. 7.



2. 3. 6.



• Keys Used



• Operating Procedure

4. Press the F•5 (SET) key. The "CLEAR?" is displayed at the center of the screen.

5. Press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the cursored program is cleared.

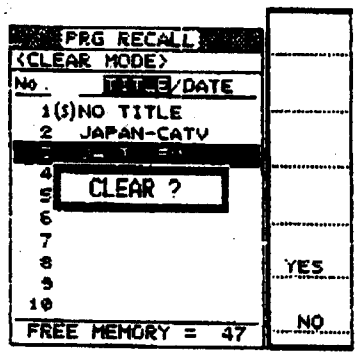
6. By pressing the F•6 (NO) key at the Step 4 mentioned above, the screen returns to the PRG RECALL <CLEAR MODE> screen without clear operation.

7. Press the F•6 (<PREV>) key. The screen returns to the PRG RECALL screen.

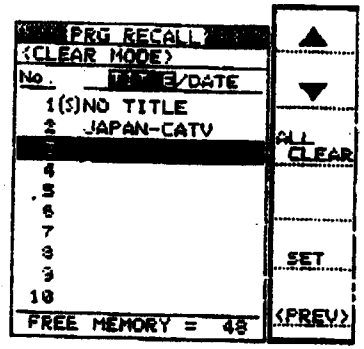
8. Pressing the F•6 (END) key again displays measurement screen.

• Screen Display

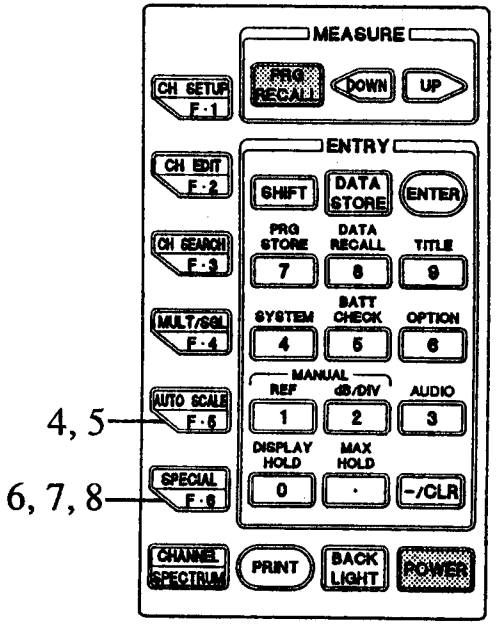
4.



5.



• Keys Used



4, 5

6, 7, 8

10.5.2 Deleting All Programs

• Operating Procedure

1. Press the PRG RECALL key. The PRG RECALL screen is displayed.

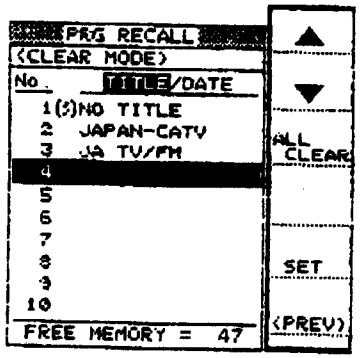
2. Press the F•4 (CLEAR) key. The PRG RECALL <CLEAR MODE> screen is displayed.

3. Press the F•3 (ALL CLEAR) key. The "ALL CLEAR?" is displayed at the center of the screen.

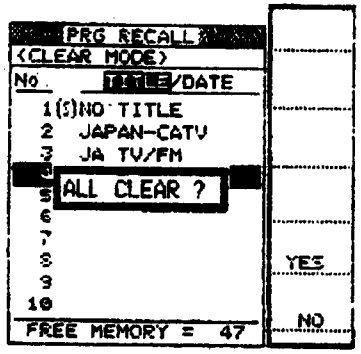
4. To clear all programs, press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary. After this sign is erased, the all programs are cleared.

• Screen Display

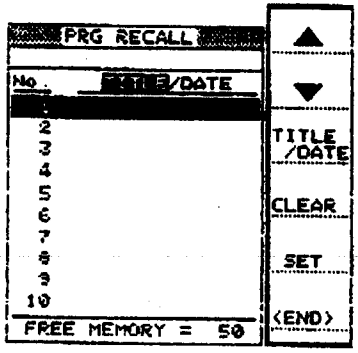
2. 5.



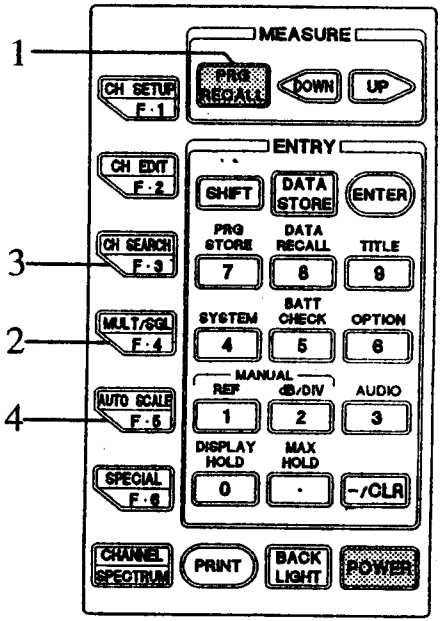
3.



4.



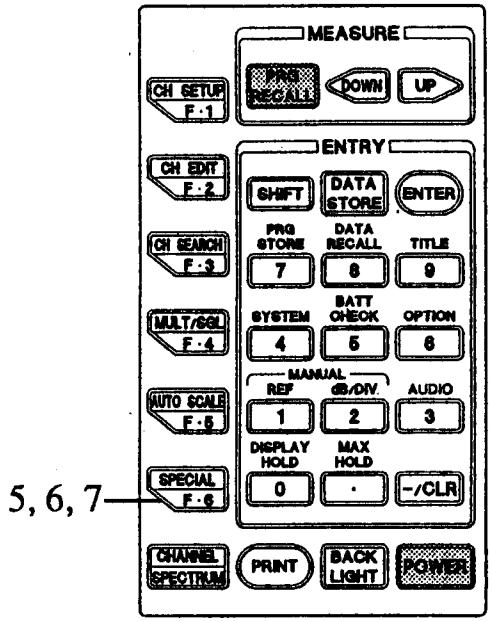
• Keys Used



5. By pressing the F•6 (NO) key when the screen (set at the Step 3 mentioned above) is displayed, the screen returns to the PRG RECALL <CLEAR MODE> screen without clear operation.

6. Press the F•6 (<PREV>) key. The screen returns to the PRG RECALL screen.

7. Pressing the F•6 (END) key again displays measurement screen.



5, 6, 7

11. STORING AND RECALLING MEASUREMENT DATA

- Up to 512 screens of the measurement data can be stored.

Setting		Number of Storable Programs
Level Measurement (CHANNEL)	128 channels	109
	70 channels	199
	50 channels	279
	≤27 channels	512
Spectrum Measurement		138

The level measurement (CHANNEL) and spectrum measurement modes can be mixed when storing data.
Remaining memory capacity is displayed lower part of the DATA STORE screen. (FREE MEMORY=XXX)

- AC/DC voltage data cannot be stored.
- The title and stored date are automatically added to data.
- For simple operation, the cursor moves up one by one when storing data continually.

11.1 Storing Measurement Data

In the DATA STORE screen, "S" at the head of the title indicates spectrum measurement data.
When storing measurement data without title, NO TITLE is written automatically, however, it is not displayed when stored data is recalled.

11.1.1 Storing Individual Data

• Operating Procedure

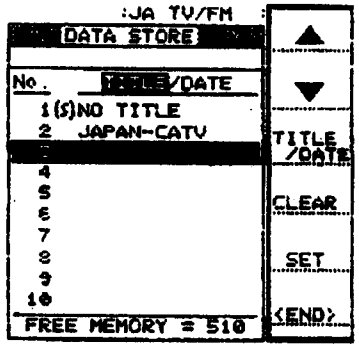
1. Press the DATA STORE key when displaying any measurement screen. The DATA STORE screen is displayed.

2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the number to be stored.

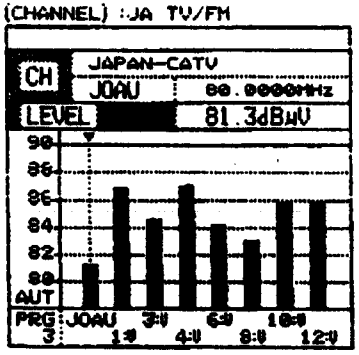
3. Press the F•5 (SET) key or ENTER key. The title is displayed at the cursored point.
   After store is completed, the measurement screen is displayed.

• Screen Display

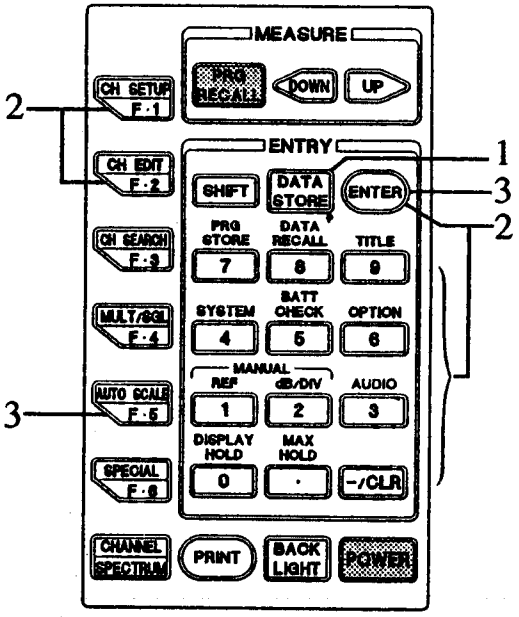
1.
2.



3.



• Keys Used



11.1.2 Storing Data Continually

• Operating Procedure

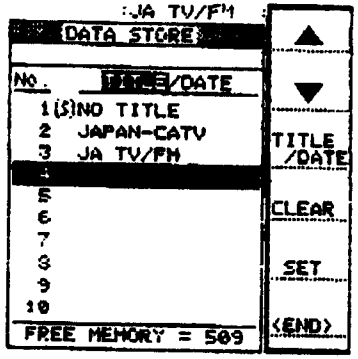
1. Press the DATA STORE key when displaying any measurement screen. The DATA STORE screen is displayed.

2. Press the ENTER key. The title is displayed at the cursored point. After storage is completed, the measurement screen is displayed.

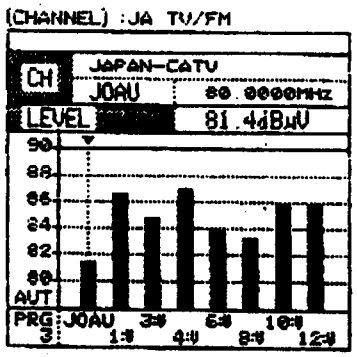
3. The cursor moves to the next number when store is completed, repeat Steps 1 and 2 to store data.

• Screen Display

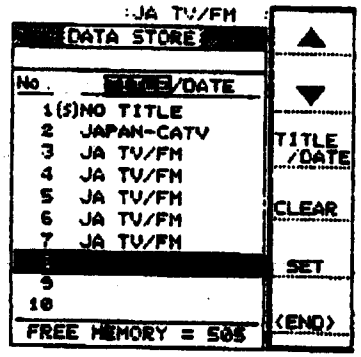
1.



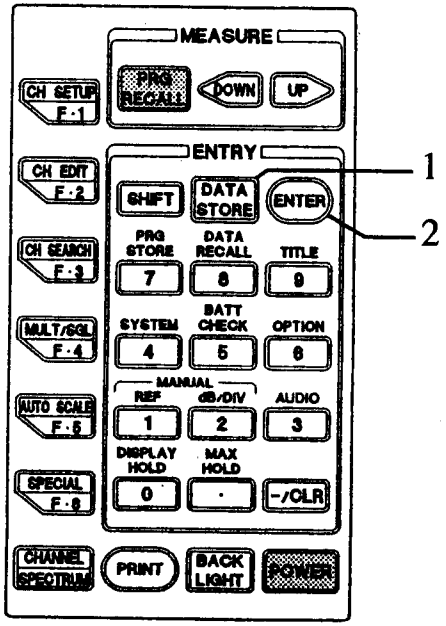
2.



3.



• Keys Used



11.1.3 Overwriting Measurement Data

• Operating Procedure

1. Press the DATA STORE key when displaying any measurement screen. The DATA STORE screen is displayed.

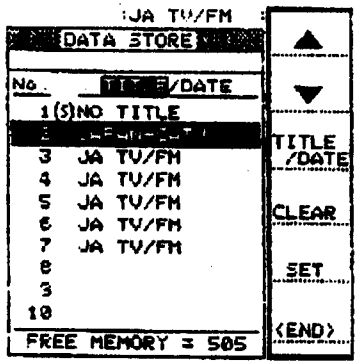
2. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the number to be stored.

3. Press the F•5 (SET) key. The "OVER WRITE?" is displayed at the center of the screen.

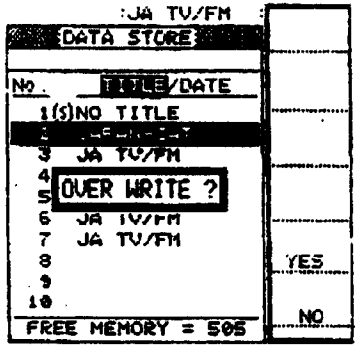
4. To overwrite data, press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the cursored title is changed.
   After store is completed, the measurement screen is displayed.

• Screen Display

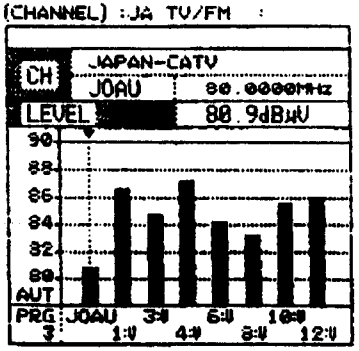
1.
2.
5.



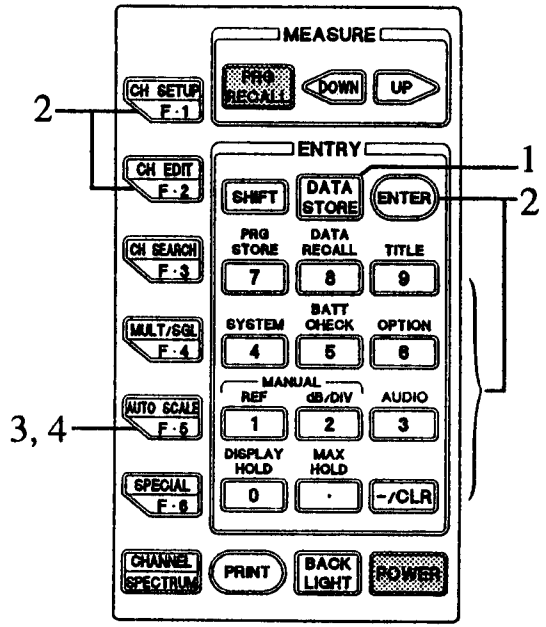
3.



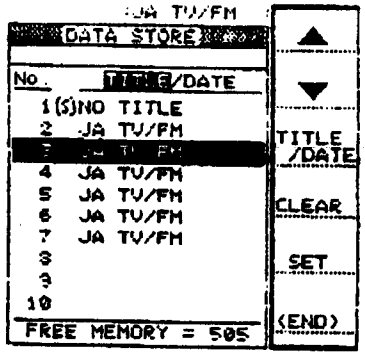
4.



• Keys Used

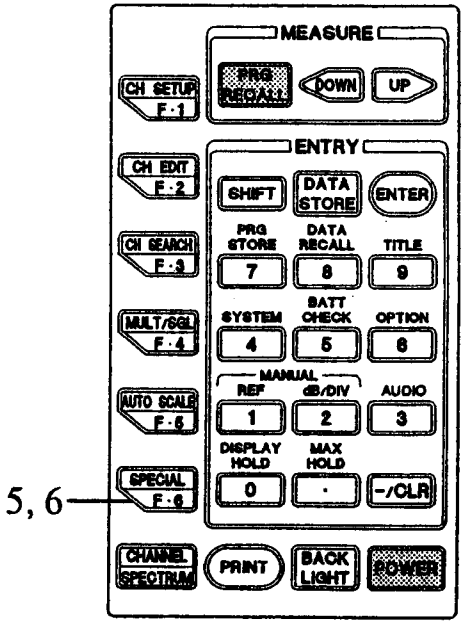


1.



5. If overwrite is not acceptable at the Step 3 mentioned above, press the F•6 (NO) key. The screen returns to the DATA STORE screen.

6. To escape from the DATA STORE screen, press the F•6 (END) key. The screen returns to the previous measurement screen.



11.1.4 Storing Data With Title

• Operating Procedure

1. Press the DATA STORE key when displaying any measurement screen. The DATA STORE screen is displayed.

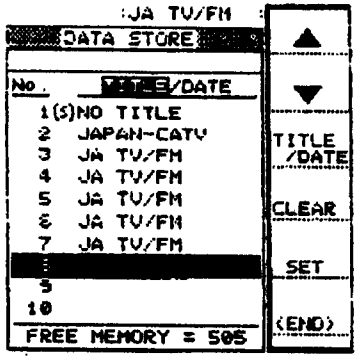
2. Refer to Section 10.1, "Titling" for titling. [Key operation: SHIFT, TITLE (9), F•3 (▷) or F•4 (◁), F•1 (▲) or F•2 (▼)]

3. Press the F•6 (<PREV>) key. The DATA STORE screen is displayed.

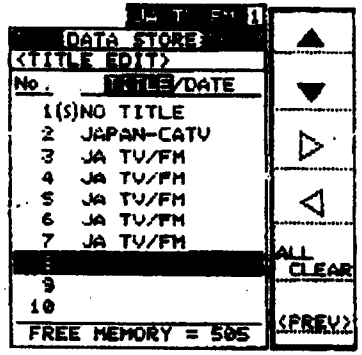
4. Press the F•5 (SET) key or ENTER key. The title is displayed. After store is completed, the measurement screen (TMP screen set at Step 2) is displayed.

• Screen Display

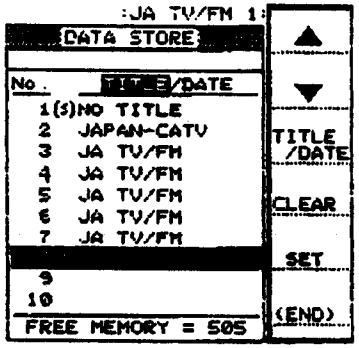
1.



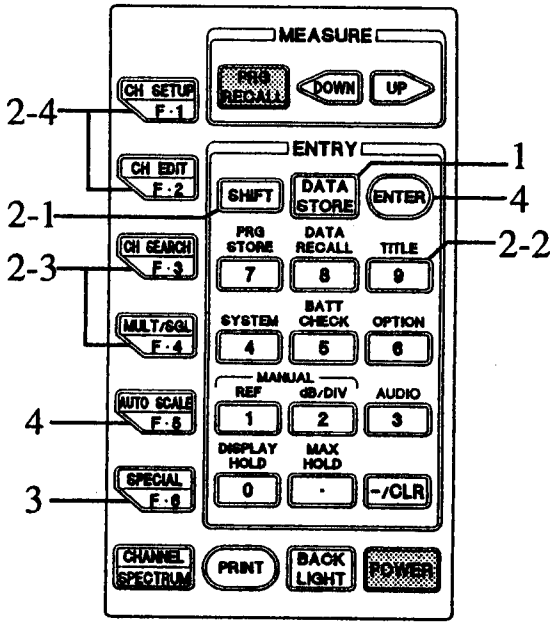
2.



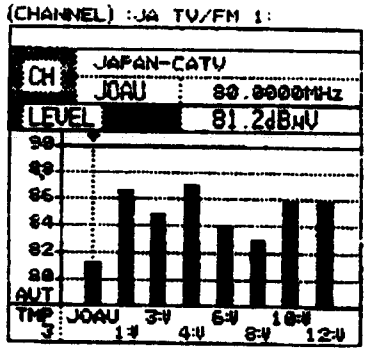
3.



• Keys Used



4.



11.2 Recalling Stored Data

The stored program can easily be recalled.
Year, month, date, hour, minute, and second are added when storing program.

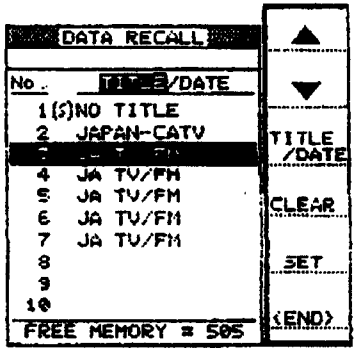
11.2.1 Recalling Stored Data

• Operating Procedure

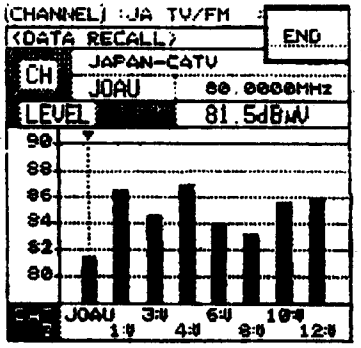
1. Press the SHIFT key.
2. Press the DATA RECALL (8) key. The DATA RECALL screen is displayed.
3. Press the F•1 (▲) or F•2 (▼) key, or input data using the numerical key, then press the ENTER key. The cursor moves to the data to be recalled.
4. Press the F•5 (SET) key. The recalled screen is displayed.

• Screen Display

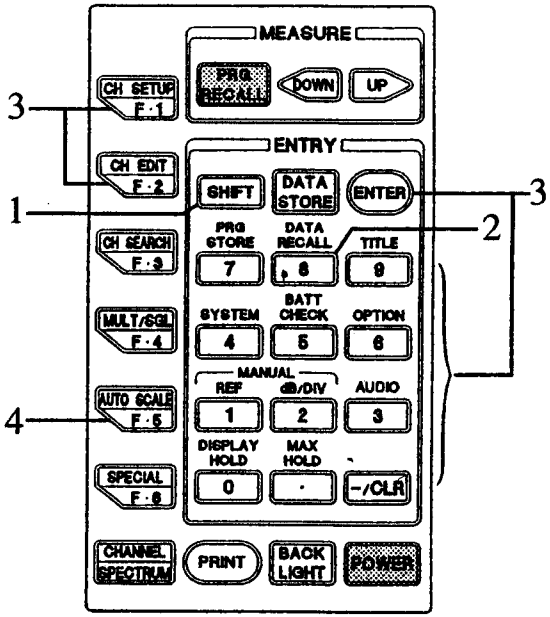
2.
3.



4.



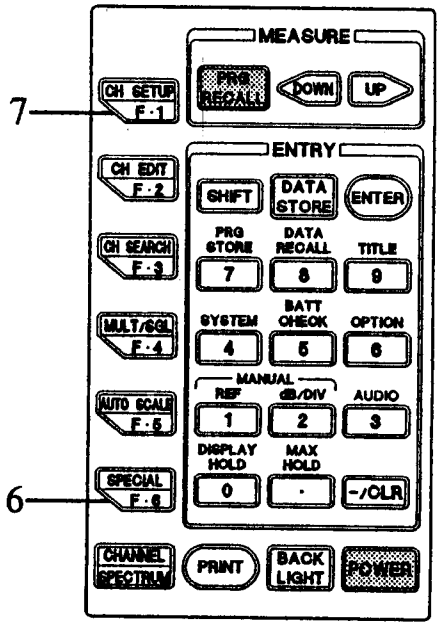
• Keys Used



5. Repeat Steps 1 through 4 to recall stored data continually.

6. To return to the previous screen without recalling data, press the F•6 (END) key. The previous screen is displayed.

7. To escape from the recalled screen, press the F•1 (END) key. The screen returns to the previous measurement screen.



11.2.2 Checking Stored Date

• Operating Procedure

1. Press the SHIFT key.

2. Press the DATA RECALL (8) key. The DATA RECALL screen is displayed.

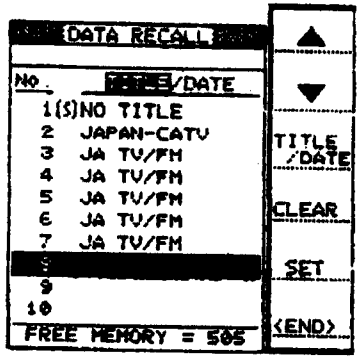
3. Press the F•3 (TITLE/DATE) key to display DATE 1 screen.
   Stored date (year, month, date, hour, and minute) are displayed.

4. Press the F•3 (TITLE/DATE) key again to display DATE 2 screen.
   Stored date (month, date, hour, minute, and second) are displayed.

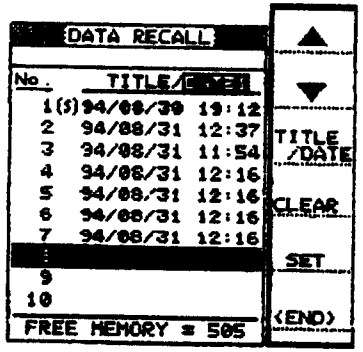
5. By pressing the F•3 (TITLE/DATE) key once again, the screen returns to the previous TITLE screen.

• Screen Display

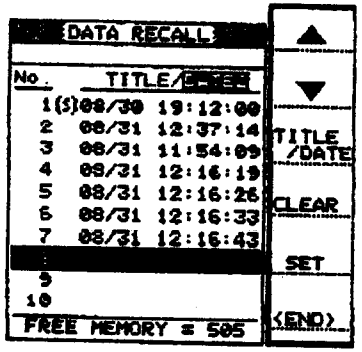
2.
5.



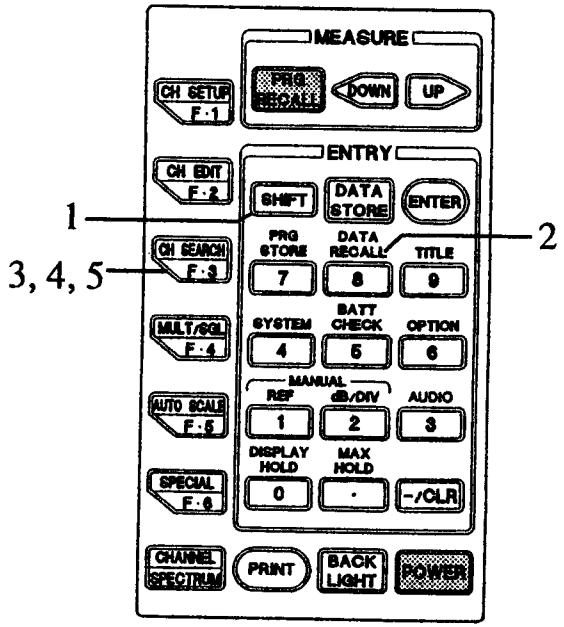
3.



4.



• Keys Used



11.3 Deleting Stored Data

Three methods are available to delete unnecessary stored data: overwrite (refer to Section 11.1.3, "Overwriting Measurement Data"), one by one, and all. The following procedure describes the method in the DATA STORE screen, however, the same method can also be used for the DATA RECALL screen without recalling the screen.

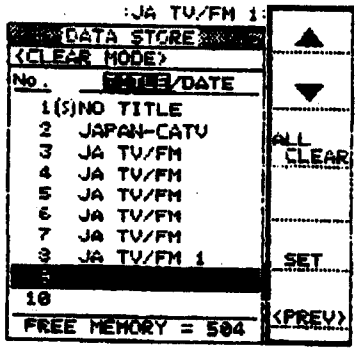
11.3.1 Deleting Stored Data One By One

• Operating Procedure

1. Press the DATA STORE key. The DATA STORE screen is displayed.
2. Press the F•4 (CLEAR) key. The DATA STORE <CLEAR MODE> screen is displayed.
3. Press the F•1 (▲) or F•2 (▼) key to position the cursor to data to be deleted.

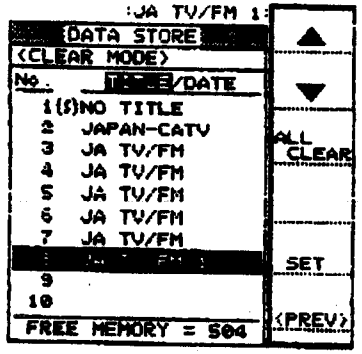
• Screen Display

2.

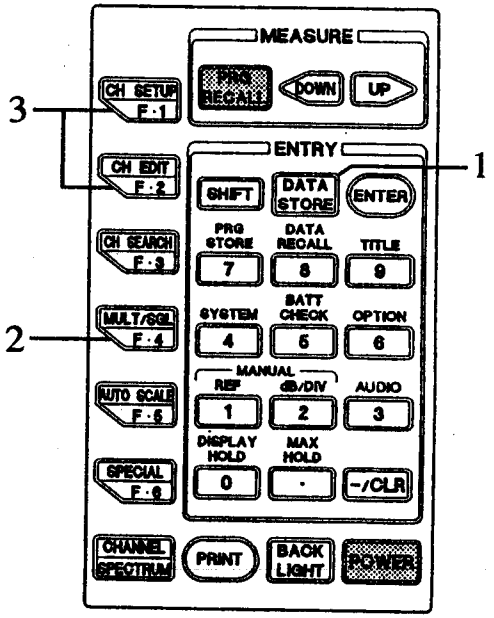


3.

6.



• Keys Used



4. Press the F•5 (SET) key. The "CLEAR?" is displayed at the center of the screen.

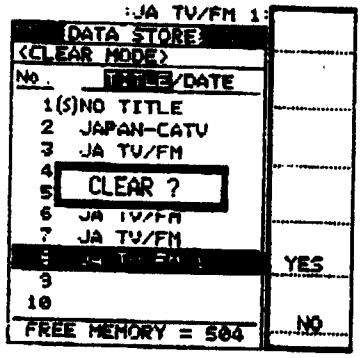
5. Press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary.
   After this sign is erased, the cursored stored data is cleared.

6. By pressing the F•6 (NO) key at the Step 4 mentioned above, the screen returns to the DATA STORE <CLEAR MODE> screen without clear operation.

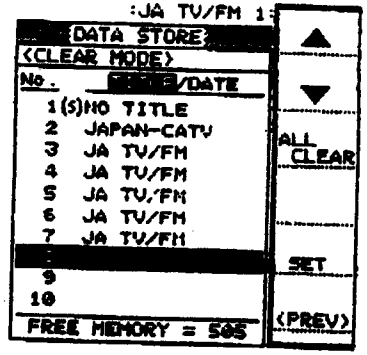
7. Press the F•6 (<PREV>) key. The screen returns to the DATA STORE screen.

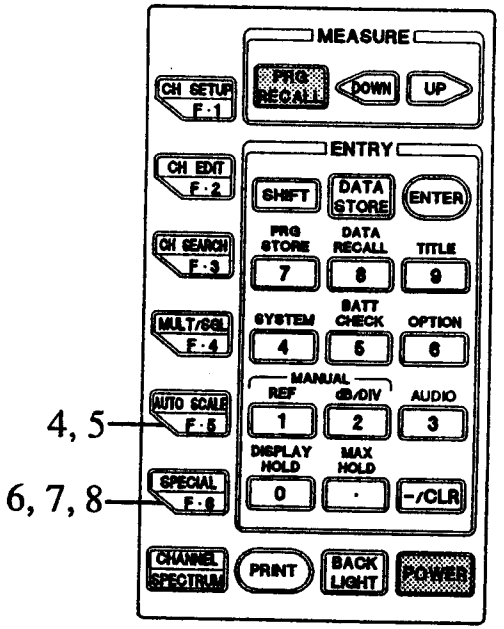
8. Pressing the F•6 (END) key again displays measurement screen.

4.



5.





11.3.2 Deleting All Stored Data

• Operating Procedure

1. Press the DATA STORE key. The DATA STORE screen is displayed.

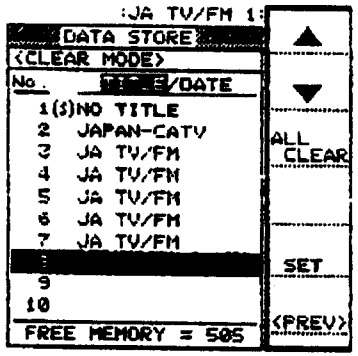
2. Press the F•4 (CLEAR) key. The DATA STORE <CLEAR MODE> screen is displayed.

3. Press the F•3 (ALL CLEAR) key. The "ALL CLEAR?" is displayed at the center of the screen.

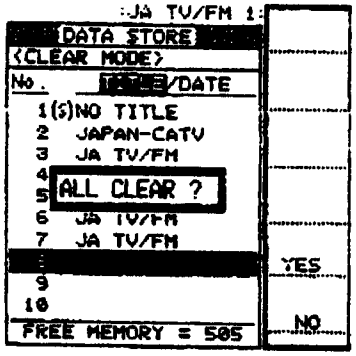
4. To clear all stored data, press the F•5 (YES) key. The "WAIT•••" is displayed at the center of the screen temporary. After this sign is erased, the all stored data are cleared.

• Screen Display

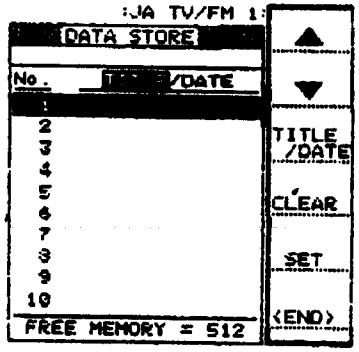
2. 5.



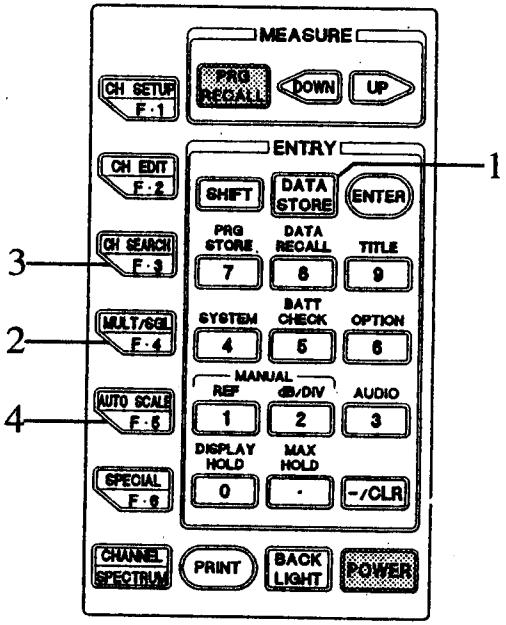
3.



4.



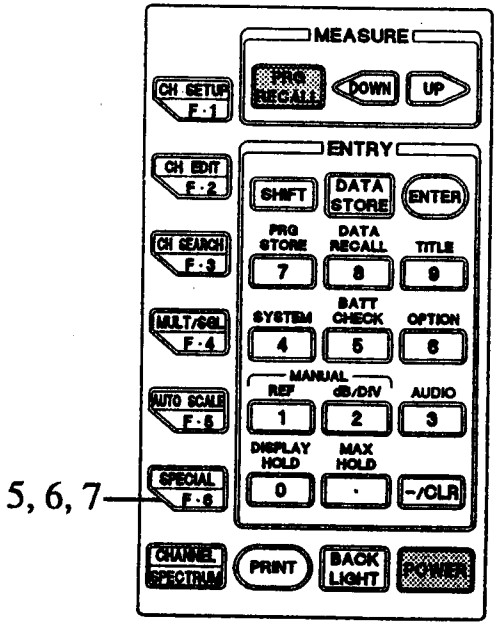
• Keys Used



5. By pressing the F•6 (NO) key at the Step 3 mentioned above, the screen returns to the DATA STORE <CLEAR MODE> screen without clear operation.

6. Press the F•6 (<PREV>) key. The screen returns to the DATA STORE screen.

7. Pressing the F•6 (END) key again displays measurement screen.



12. DATA OUTPUT TO THE 712 PRINTER

- Measurement data, stored data, and displayed screen can be output to the 712 Printer (optional accessory).

- Three output types are available in the level measurement (CHANNEL) mode: graph only, data only, and graph and data.
  Refer to Section 3.5.5, "Printout Type" for detail.

- In the spectrum measurement mode, data output type is graph only.

- Printed date is added to a hardcopy. For stored data, stored date is added.

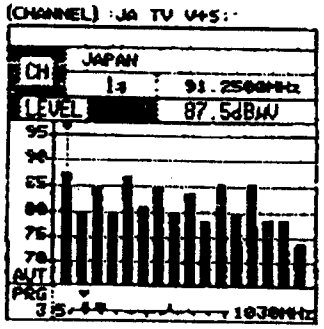
- Titling is convenient for sorting data. Refer to Section 10.1, "Titling" for detail.

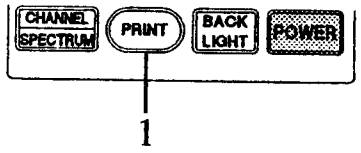
12.1 Data Output to the Printer

• Operating Procedure	• Screen Display	• Keys Used

1. Press the PRINT key. Data is output to the printer.
   No measurement is made while printing.

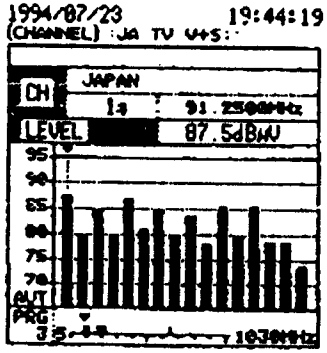
1.





- Example of Printout Type

1. GRAPH ONLY

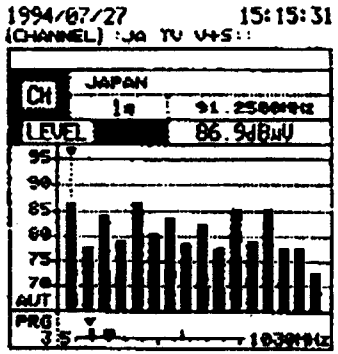


2. DATA ONLY

:1994/07/27 15:07:24
:JA TV U+S::

	CH	FREQ [MHz]	LEVEL [dBμV]
(JAPAN			
	1:U	91.2500	86.7
	1:S	95.7500	78.4
	4:U	183.2500	84.2
	3:S	187.7500	78.9
	4:U	171.2500	86.6
	4:S	175.7500	80.5
	6:U	183.2500	83.8
	6:S	187.7500	78.5
	8:U	193.2500	82.6
	8:S	197.7500	77.6
	10:U	205.2500	85.5
	10:S	209.7500	79.3
	12:U	217.2500	85.6
	12:S	221.7500	77.6
	42:U	645.2500	77.4
	42:S	649.7500	72.1

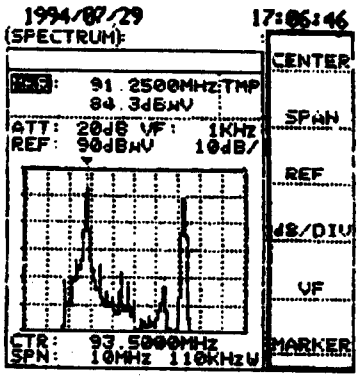
3. GRAPH + DATA



:JA TV U+S::

	CH	FREQ [MHz]	LEVEL [dBμV]
(JAPAN			
	1:U	91.2500	86.9
	1:S	95.7500	78.4
	4:U	183.2500	84.4
	3:S	187.7500	79.2
	4:U	171.2500	86.7
	4:S	175.7500	80.6
	6:U	183.2500	83.7
	6:S	187.7500	78.5
	8:U	193.2500	82.6
	8:S	197.7500	77.6
	10:U	205.2500	85.6
	10:S	209.7500	79.4
	12:U	217.2500	85.5
	12:S	221.7500	77.6
	42:U	645.2500	77.7
	42:S	649.7500	72.5

* Spectrum measurement mode



12.2 Output Error

When no data is output to the printer, "ERROR <RS-232C>" is displayed at the center of the screen and beeper sounds approximately 10 seconds later.

Press the F•1 (END) key to display previous screen and check following items for correct, then press the PRINT key again.

- POWER lamp of the 712 lights.
- ON LINE lamp of the 712 lights.
- RS-232C cable is connected correctly.

When failure is corrected within approximately 10 seconds, data will be output to the printer.

13. MAINTENANCE

13.1 Daily Check

(1) When the instrument is left for long time without supplying power, remove the battery to prevent depletion and leakage.
(2) If the LCD surface becomes dirty, wipe it off using a cloth damped with water. Do not use detergent or solvents (e.g., alcohol, thinner).

13.2 In Case of Trouble

(1) No power is supplied.
Check battery voltage.
Replace battery with new one.
Check battery case for any broken wires.
(2) Operation failure
Refer to the instruction manual for correct operation.
(3) If the instrument still has trouble, contact your local Leader agent.
(4) If "ERROR <EEPROM>" is displayed on the screen, the EEPROM may be broken. Contact your local Leader agent.
(5) To return the instrument, please describe the trouble.

LEADER ELECTRONICS CORP.

2-6-33 Tsunashima-Higashi, Kohoku-ku, Yokohama 223-8505, Japan
PHONE: 81-45-541-2123 FAX: 81-45-541-2823

Jan.9 , 1998 98010.3K TS 4 Printed in Japan