LG 3802 (S1)

ISDB-T SIGNAL GENERATOR

INSTRUCTION MANUAL

LEADER ELECTRONICS CORP.

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GENERAL SAFETY SUMMARY

■ To Avoid Personal Injury

It is recommended that only qualified personnel with technical knowledge use this instrument only after reading and fully understanding all functions of the instrument described this instruction manual.
This instrument is not designed and manufactured for consumers.
If you do not have enough knowledge on electricity, to avoid personal injury and prevent damage to this product, please be sure to use this product only under the supervision of an engineer who has sufficient knowledge about electronics.

■ Precautions on Contents

Should you find the contents in this manual and any of its technical terms confusing, please feel free to contact your local LEADER agent.

■ Symbols and Terms

Following terms and symbols indicate necessary warnings and cautions used in this manual and on the product are there for safe operation.

＜**Symbol**＞ 	The sections where this symbol is marked in this manual or instrument, if not correctly performed or practiced, could result in personal injury or cause serious danger to the instrument. Misuse could also produce unintentional movement to create an operational impediment on the instrument or other products that might be connected to it. Be sure to refer to the safety precautions in this manual to safely use the part of the instrument where the symbol is marked.
＜**Term**＞  **WARNING**	Warning statements identify warning conditions that if disregarded or not correctly performed or adhered to, could result in serious personal injury or even loss of life.
＜**Term**＞  **CAUTION**	Caution statements identify caution conditions that if disregarded or not correctly performed or adhered to, could result in personal injury or damage to the instrument.

GENERAL SAFETY SUMMARY

Review the following safety precautions to avoid operator's injury and loss of life and prevent damage and deterioration to this instrument. To avoid potential hazards, use this product as specified.

WARNING

■ Warnings on the Cases and Panels of the Instrument

Operator should not remove any cases or panel for any reasons. If you touch inside the instrument it could result personal shock or fire hazard. Refrain from spilling any liquid on or inserting anything flammables or piece of metal into the ventilation of the instrument. Such actions could cause fire, shock, malfunction and be an accident hazard while the power is on.

■ Warnings on Power Line

- **Make sure to connect only to the rated power line voltage. Excess voltage may cause fire.**
  Confirm the voltage of the commercial power line before connecting the AC power cord. The power frequency of the power line should be 50/60 Hz.

- **Warning on the Power Cord**
  Use only the optional power cord that is attached to this instrument. The use of the power cord other than that attached could cause fire hazard.
  If the attached cord is damaged stop using it and contact your local LEADER agent. Should you use a damaged cord, it could cause a shock or create a fire hazard. When you pull out the cord be sure to hold it by plug and pull from the socket not by holding the cord wire.

■ Warning on Fuse

When the fuse is melted the instrument stops operation. If the fuse melted, turn off the power switch and disconnect the power plug from the socket. If you change the fuse while the cord is connected to the socket, it could cause a shock hazard. Only use the specified type and rated current and voltage fuses.
If the cause for melting fuse is unclear or if you suspect there is damage to the instrument or if you have no proper fuse at hand please contact your local LEADER agent.

GENERAL SAFETY SUMMARY

WARNING

■ Warning on Installation Environments

● About the Operating Temperature Range

Operate the instrument between the temperature range of 0 to 40 °C. When option 71 is installed, the operating temperature must be between 5 to 40 °C. Operating the instrument at higher temperatures could cause a fire hazard.

Rapid changes of temperatures from cold to warm can create internal moisture or condensation and could damage the instrument. If there is a possibility of moisture condensation allow the instrument to sit for 30 minutes without the power on.

● About the Operating Humidity Range

Operating humidity range is ≤ 85 % RH.

Do not operate the instrument with wet hands. This could cause a shock and fire hazard.

● About the Operation in the Presence of Gasses

Operating the instrument in and near the presence or storage locations of flammable, explosive gasses or fumes could create an explosion and fire hazard. Do not operate the instrument anywhere near such environments.

● Avoid Insertions

Do not insert metals or flammable objects or drop liquid on or into the instrument. To do so could cause fire, shock, malfunction and create a dangerous accident hazard.

■ Warning while Operating

While operating the instrument if smoke, fire, or a bad smell occurs, turn off the instrument at once for it could cause a fire hazard. When such a case occurs, turn off the power switch and pull the plug of the cord from the plug socket. Contact your local LEADER agent after confirming there is no fire.

■ Warning about Ground

The instrument has a ground terminal to avoid electric shock hazard and to protect the instrument from damage. Ensure that the product is properly grounded for safe operation.

GENERAL SAFETY SUMMARY

CAUTION

■ Caution on Input/Output Terminals

Input Terminals are rated with a maximum input. Do not supply an input over the specified rating in the standard section of the instruction manual. Also, do not supply external power to Output terminal, this could cause the instrument to malfunction.

■ Caution when Not Using the Instrument for a Long Time

Make sure to disconnect the power cord from the socket when you do not use the instrument for a long time.

Please conform to the above warnings and cautions for safe operation. There are cautions in each area of this instruction manual, so please conform to each caution. If you have any questions about this manual, please feel free to contact your local LEADER agent.

■ Calibration

This instrument is produced under the strictest quality controls at the factory, but accuracy may gradually deteriorate due to worn components.
Therefore, periodic calibration should be performed.
When service or calibration is required, contact your local LEADER agent.

■ Routine Maintenance

Remove the power cord plug from the socket when cleaning the instrument.
Avoid the use of thinner or benzene solvents for cleaning cases, panels and knobs since this might remove the paint or damage plastic surfaces.
Wipe cases, panels, and knobs lightly with a soft cloth damped with neutral detergent.
Do not allow water, detergent, or other foreign objects to enter the instrument while cleaning.
If a liquid or metal object enters the instrument, it can cause electric shock or fire.

GENERAL SAFETY SUMMARY

CAUTION

■ Cautions on using hard disk drive (HDD: OP71) [IMPORTANT]

The HDD (Hard Disc Drive) is installed in this option. To prevent damage to the HDD or losing stored data, be careful not to expose this option to other forms of severe mechanical hock. Read the cautions below carefully to ensure correct operation.

- Do not apply severe mechanical shock when power is turned on.
- Do not turn power off when data is being written (OP71: copying data from USB STORAGE, copying data via LAN).
- Do not turn power off in the remote control mode when the HDD write mode is in enable status.
- Do not move this instrument when power is turned on or immediately after power is turned off.
- Do not turn power on when the option is in condensation.

Data will not be lost even if power is turned off in playback operation, however, power should be turned off after the HDD stops to avoid shorten its service life.

Internal HDD service life may become several years depending on the environmental and operating conditions. Approaching its full service life may cause noisy picture or sound, or data may not be played back.

Valuable data should be backed up (such as media of DVD recorded with DVD drive of connection via USB STORAGE) and stored separately from the instrument as a master file.

Turn power off when the instrument is left for long time without supplying power. HDD service life may be shortened when leaving the HDD in power on conditions.

Note that the operating temperature varies as follows:

Main unit only: 0 to 40 °C
With this option: 5 to 40 °C

1. INTRODUCTION

Thank you for purchasing LEADER's measuring instruments.
Please read this instruction manual carefully to ensure correct and safe operation.
If you have any difficulties or questions on how to use the instrument after you have read this manual, please feel free to contact your local LEADER agent.
After you have read the manual, keep the manual in a safe place for quick reference.

1.1 Scope of Warranty

This LEADER instrument has been manufactured under the strictest quality control guidelines. LEADER shall not be obligated to furnish free service during the warranty period under the following conditions.

1. Repair of malfunction or damages resulting from fire, natural calamity, or improper voltage applied by the user.
2. Repair of an instrument that has been improperly repaired, adjusted, or modified by personnel other than a factory-trained LEADER representative.
3. Repair of malfunctions or damages resulting from improper use.
4. Repair of malfunctions caused by devices other than this instrument.
5. Repair of malfunctions or damages without the presentation of a proof of purchase or receipt bill for the instrument.

1.2 Operating Precautions

WARNING

1.2.1 Line Voltage and Fuse

Confirm that the power line voltage is correct before connecting the power cord.
The voltage range and fuse rating are indicated on the rear panel.
The instrument must be connected to the rated line voltage and line frequency of 50 Hz to 60 Hz.
When replacing the fuse, turn the power switch off and disconnect the power cord from the outlet.

When replacing the fuse, use the correct fuse that matches the line voltage.

Voltage Range	Fuse Rating	LEADER Parts Number
90 to 250 V	2.0A, time-lag	436 3580 013

CAUTION

1.2.2 Maximum Input Voltage

There is restriction when applying input signals.
Applying excessive voltage to the connector may result instrument damage.

Connector	Allowable Input Voltage
REMOTE CONTROL	
INC, DEC, RESET Pins	-0.5 V/+5.5 V
FREQ STD 10 MHz INPUT	2.5 Vp-p

CAUTION

1.2.3 Reverse Voltage, Excessive Voltage

Do not apply external voltage to the output connectors.
If the cable touches such as DC power source, internal attenuator may be burned-out.
Do not apply 5 Vp-p or greater signal to the output connector.
If ±2V or greater DC component is superimposed, block it using a capacitor.

1.2.4 Backup of Control Settings

This instrument retains the panel settings even when the power is turned off. The setting can be recalled when the power is turned on.
When the instrument is left for five years without supplying power, the stored data may be lost.

Notes on Backup Data
Data must be backed up properly since stored data may be lost or changed caused by incorrect operation, malfunction, or maintenance. A notepad may be helpful in some cases.

1.2.5 Installation

Do not use the instrument in the following environments.

- High temperature environments
  Do not place the instrument under direct sunlight 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
  Operating temperature range: 5 to 40˚C (When Option 71 is installed.)
- High humidity environments
  Do not place the instrument in the high humidity environment (e.g., bathroom, near a humidor).
  Operating humidity range: ≤85% RH (without condensation)
- Dusty environments

1.2.6 Mechanical Shock

To prevent damage to the precise components used in this instrument, be careful not to expose the instrument to other forms of severe mechanical shock.

1.2.7 About Network

The remote control capability operation via the Ethernet is confirmed only under the local network environments; it is not guaranteed under other environments.

1.2.8 About the Mark by Directive of WEEE in Europe

This product and accessories are object products of European WEEE directive. When you discard this product and accessories, please process according to the regulation system of each country and various places.
(WEEE Directive: Waste Electrical and Electronic Equipment)

2. SPECIFICATIONS

2.1 General

The LG 3802 (S1) ISDB-T Signal Generator with the OFDM capability conforms to Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) standards for digital terrestrial TV system in Japan. This instrument features a channel coding/modulation, C/N generator, and up converter in a single package. Consequently, the modulated signal covering VHF and UHF channels can be output.
In addition to the internal MPEG-2 Transport Stream (TS), the MPEG-2 TS can be externally applied. Therefore, the receiver can be checked visually and acoustically by using the existing TS. Combining with the BER measurement capability, overall functions of the reception system can be tested.

2.2 Features

- All-in-one
  This instrument features the signal generator capability and BER measurement capability in a single package.
  The BER function is used to measure the front-end, the broadcasting MPEG-2 TS function is used to visually check entire system.
  In addition to the digital terrestrial TV broadcasting, this instrument can also be used for the connected segment transmission of 1, 3, and 8 segments in digital terrestrial sound broadcasting.
- Arbitrary transmission parameter settings
  The transmission parameter can be arbitrary set via the front panel controls. The QVGA LCD graphically displays the setting conditions.
- Encoding/modulation MPEG-2 TS in realtime
  The MPEG-2 TS applied from the DVB-ASI or DVB-SPI connector can be encoded/modulated in realtime. In addition to the MPEG-2 TS, broadcasting TS prescribed by the ARIB standards can also be used.
- 100 preset conditions
  Up to 100 preset conditions can be stored in the memory.
  Since the stored contents can be categorized into 10 groups, the preset mode is convenient for inspection applications.
- Various factory options
  The following factory options are available:
  - OP71 USB STORAGE Option (Factory Option)
    Internal HDD and USB2.0 interface is provided.
    With the internal HDD and USB STORAGE (i.e., external HDD or DVD-ROM) installed, a stream including HDTV content (i.e., requires large storage area) and long-time TS can be played back from those devices.
  - OP72A Fading Option (Factory Option)
    The fading noise (e.g., ghost, multipath) can be added when testing a mobile object and portable terminals.

2.3 Specifications

2.3.1 Channel Coding Section

2.3.1.1 Broadcasting system

Digital Terrestrial TV (ARIB STD-B31)
Digital Terrestrial Sound (ARIB STD-B29) (＊1) (＊2)

2.3.1.2 Transmission Parameter (＊3)

Hierarchical layers	
TV:	3 max.
Audio 3 Segments:	2 max. (＊1)
Audio 1 Segment:	1 (＊2)
Mode	MODE 1, MODE 2, MODE 3
Guard Interval	1/4, 1/8, 1/16, 1/32
Carrier Modulation	DQPSK, QPSK, 16QAM, 64QAM
Convolution Coding Rate	1/2, 2/3, 3/4, 5/6, 7/8
Length of Time Interleaving	0 to 32 (depends on broadcasting system and MODE)
Number of Segments	
TV:	13, each hierarchical layer can arbitrary be set.
Audio 3 segments:	3, each hierarchical layer can arbitrary be set. (＊1)
Audio 1 segment:	1 (＊2)
Connected Segment Transmission	Settable
Partial Reception	Settable (＊4)
Reed-Solomon Code	ON/OFF, selectable

＊1: Combination of the modulations (16 through 60) described to the appendix of ARIB TR-B13 volume 7 has been confirmed.
About the combination of MODE, GI, and career modulations other than the above, it has not verified at present.

＊2: Combination of the modulations (1 through 15) described to the appendix of ARIB TR-B13 volume 7 has been confirmed.

MODE	2, 3
G. I.	1/4, 1/8, 1/16 (MODE3 only)
Modulation	QPSK1/2, QPSK2/3, 16QAM1/2, 16QAM2/3 (hierarchy layer B only)

About the combination of MODE, GI, and career modulations other than the above, it has not verified at present.

＊3: When the TS input is set to external (i. e., SPI, ASI), MPEG-2 TS stored in OP71, or PN, this function is enabled. The internal ROM becomes fixed parameter.
In addition, when broadcasting TS is used, the transmission parameter setting with this instrument becomes invalid.

＊4: For the TS not independent of PCR packet, the PCR of partial reception section cannot be updated.

2.3.2 RF Signal Generator

(1) Frequency

Range	50 to 860 MHz	
Resolution	1 kHz, set in frequency	
Channel	VHF, UHF	1 to 62ch
	CATV	C13 to C63ch
	Subchannels	3 to 40ch (for Sound 1 segment)
		6 to 37ch (for Sound 3 segments)
		Refer to Table 2-1 (for Sound 8-1 segment) (＊5)
		Refer to Table 2-1 (for Sound 8-3 segments) (＊5)
Accuracy	±0.2 x 10^{-6}	

Table 2-1 Occupied subchannel and subchannel

Occupied subchannel	Settable subchannel	
	Sound (8-1seg)	Sound (8-3seg)
2 to 25	3, 6, 9,12,15,18,21,24	6, 9,12,15,18,21
3 to 26	4, 7,10,13,16,19,22,25	7,10,13,16,19,22
4 to 27	5, 8,11,14,17,20,23,26	8,11,14,17,20,23
5 to 28	6, 9,12,15,18,21,24,27	9,12,15,18,21,24
6 to 29	7,10,13,16,19,22,25,28	10,13,16,19,22,25
7 to 30	8,11,14,17,20,23,26,29	11,14,17,20,23,26
8 to 31	9,12,15,18,21,24,27,30	12,15,18,21,24,27
9 to 32	10,13,16,19,22,25,28,31	13,16,19,22,25,28
10 to 33	11,14,17,20,23,26,29,32	14,17,20,23,26,29
11 to 34	12,15,18,21,24,27,30,33	15,18,21,24,27,30
12 to 35	13,16,19,22,25,28,31,34	16,19,22,25,28,31
13 to 36	14,17,20,23,26,29,32,35	17,20,23,26,29,32
14 to 37	15,18,21,24,27,30,33,36	18,21,24,27,30,33
15 to 38	16,19,22,25,28,31,34,37	19,22,25,28,31,34
16 to 39	17,20,23,26,29,32,35,38	20,23,26,29,32,35
17 to 40	18,21,24,27,30,33,36,39	21,24,27,30,33,36
18 to 41	19,22,25,28,31,34,37,40	22,25,28,31,34,37

(2) Output

Range

-100.0 to +13.0 dBm (into 50 Ω)
-53.0 to +60.0 dBmV (into 50 Ω)
+7.0 to +120.0 dBμV (into 50 Ω)
(for television, Sound 8-3 seg, Sound 8-1 seg)

-105.0 to +8.0 dBm (into 50 Ω)
-58.0 to +55.0 dBmV (into 50 Ω)
+2.0 to +115.0 dBμV (into 50 Ω)
(for Sound 3 seg)

-110.0 to +3.0 dBm (into 50 Ω)
-63.0 to +50.0 dBmV (into 50 Ω)
-3.0 to +110.0 dBμV (into 50 Ω)
(for Sound 1 seg)

Resolution	0.1 dB
Impedance	50 Ω
Level Accuracy	±1 dB (digital terrestrial TV, Level: 0 dBm, C/N off)
Output control	ON/OFF selectable (＊6)
Output offset	-20.0 to +20.0dB (＊7) (Relative value compensation for eight specified points of frequency, and linearly compensation between each specified points of frequency)
Output Connector	N type
Harmonics	-30 dBc
Spurious	-50 dBc

＊5: Connected segment transmission mode can only be set.

＊6: The system to turn on/off at the final output stage is adopted.
This function is applied to all signals when the C/N has been added or the OP72A Fading Option has been installed.

＊7: When the offset output level exceeds the level described in Step (2), the actual output level is set to the uppermost limit (or lowermost limit).
When the OP72A Fading Option is installed, the settable level depends on the Option.

2.3.3 Input/Output Signal Sources

2.3.3.1 Internal Signal

(1) Pseudo Random Signal PN23

Short:	8 OFDM Frame period	
Long:	Continuation	Normal/Inverted selectable

(2) ROM (Television only)

Pattern (Common)	Color Bar, Ramp, Monoscope (＊8)
<12seg>	
Screen size	1920×1080i, 1440×1080i, 720×480i (16:9) 720×480i (4:3)
Sound (Tone)	1kHz (LR), 400Hz (LR), 1kHz (L)＋400Hz (R)
<1seg>	
Screen size	320×180(16:9)
Sound (Tone)	1kHz (LR), 400Hz (LR), 1kHz (L)＋400Hz (R)

＊8: 1440 x 1080 monoscope pattern is not provided.
Moreover, the monoscope screen for 1 seg becomes the subsize of 720×480(16:9).

2.3.3.2 DVB-ASI Input

Input Connector	BNC connector
Input Impedance	75 Ω
Input Level	0.8 Vp-p
Baud Rate	270 Mbps

2.3.3.3 DVB-SPI Input

Input Connector	25-pin D-sub
Input Impedance	100 Ω differential input
Input Level	LVDS
Input Format	MPEG-2 TS or BER count input, automatic selection

2.3.3.4 ASI, SPI Input Specifications

Input Packet Format	188, 204 bytes	
Applicable Stream	MPEG-2 TS (ISO/IEC 13818-1)	
	Broadcasting TS (ARIB STD-B31) (＊9)	
Input Data Rate	TV	23.2347 Mbps max. (＊10)
	Sound 3 segments	5.3618 Mbps max. (＊10)
	Sound 1 segment	1.7872 Mbps max. (＊10)
PCR Update Functions	PCR (8 max.) (＊11)	

＊9: The TS should be synchronized with this instrument.

＊10: <Example>
Guard interval: 1/32, carrier modulation: 64QAM, coding rate: 7/8, maximum number of segments
The Maximum input data rate depends on the modulation parameter.

＊11: It conforms to PCR multiplex regulations of the partial reception layer of ARIB STD-B29 and STD-B31.

2.3.3.5 External REF Input

Input Connector	BNC connector
Input Impedance	50 Ω
Input Level	0.8 Vp-p
Input Frequency	10 MHz

2.3.3.6 REF Output

Output Connector	BNC connector
Output Impedance	50 Ω
Output Level	0 dBm
Output Frequency	10 MHz

2.3.4 C/N Generator Section

C/N Variable Range	0 to 30 dB
Setting Resolution	0.1 dB
On/Off	Selectable

2.3.5 BER Counter Section

Packet Length	204 bytes (including 16-byte Reed-Solomon code)
	Parallel: LVDS (25-pin D-sub)
	∗ This function is not a conventional BER counter.
Input Connector	Use DVB-SPI connector

2.3.6 GO/NO-GO Function

Threshold Settings	Upper and lower limits of BER
GO/NO-GO Indication	Displays GO/NO-GO on the screen.
	Outputs judgement result to REMOTE CONTROL connector in TTL level.

2.3.7 Remote Control

Connector	24-pin rectangular connector
	57LE-30240 (Amphenol)
Controllable Mode	Recalling preset data from memory (INC/DEC/RESET)
Input Level	TTL

2.3.8 External Interface

(1) Memory Card Interface

Memory Card	Compact flash card (CFA TYPE-I)
Function	Updating firmware, changing internal TS

(2) ETHERNET Interface

Specifications	10BASE-T or 100BASE-TX
Function	Setting this instrument, reading status

(3) GPIB

Specifications	ANSI/IEEE Std 488.1-1987.
Connector	24-pin rectangular connector

(4) USB Interface

Specifications	USB1.1 (Front panel..... A Type connector)

2.3.9 Display Panel

LCD	5.7” QVGA (320 x 240) TFT color

2.4 General Specifications

Environmental Conditions	
Operating Temperature	0 to 40°C
	5 to 40°C (OP71 installed)
Operating Humidity	≤85% RH (without condensation)
Spec-Guaranteed Temperature	10 to 35°C
Spec-Guaranteed Humidity	≤85% RH (without condensation)
Operating Environment	Indoor use
Operating Altitude	Up to 2000 m
Overvoltage Category	Ⅱ
Pollution Degree	2
Power Requirements	
Voltage	90 to 250 VAC, 50/60 Hz
Power Consumption	140 W max.
Dimensions and Weight	
Dimensions	426 (W) x 150 (H) x 450 (D) mm
Weight	14 kg approx.
Accessories	
	Power cord.....1
	Instruction Manual 1

3. PANEL DESCRIPTIONS

3.1 Front Panel

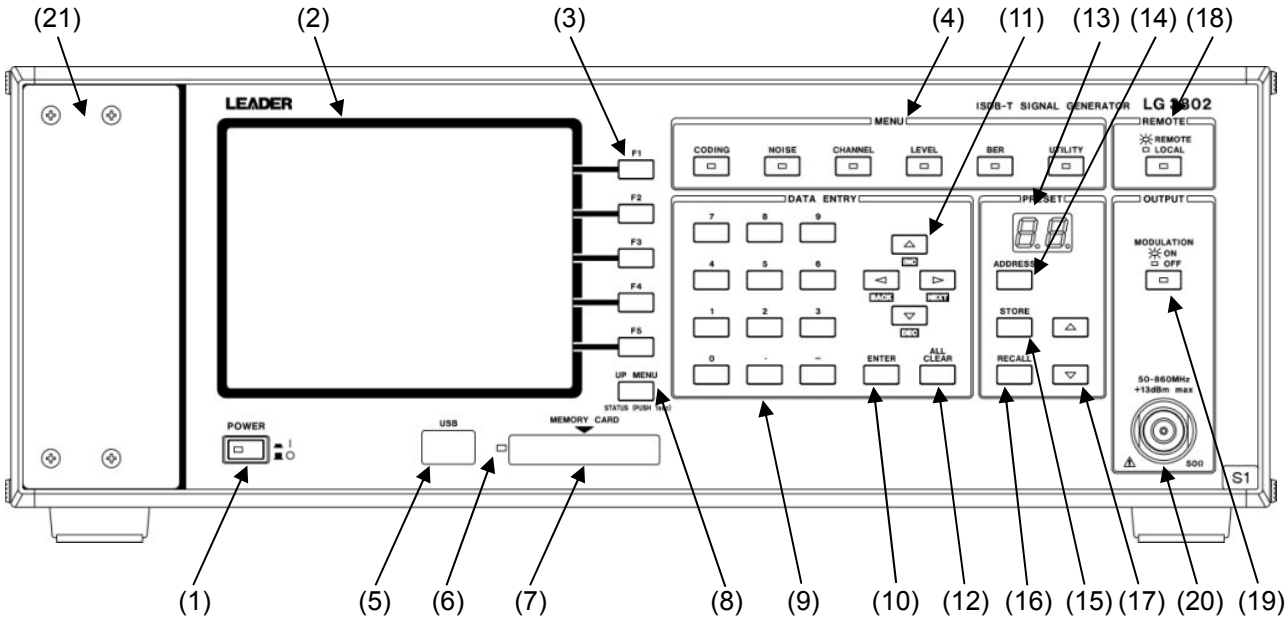


Figure 3-1 LG 3802 (S1) front panel

(1) POWER switch
Push this switch in to apply power. Release this switch for turning power off. The setting conditions immediately before turning power off can be recalled.

(2) LCD panel
Indicates the setting conditions in Graphical User Interface (GUI).

(3) Function keys (F1 to F5)
Set functions. The functions are displayed on the LCD panel.

(4) MENU keys
Set functions. Six keys are provided.

CODING	Selects broadcasting system, input source, modulation parameter, etc.
NOISE	Selects noise signal on/off. Sets the CN value. Sets the fading parameter when Fading Option (OP72A) is installed.
CHANNEL	Sets the RF output channel. Sets the offset mode on/off. The channel can also be set in frequency.
LEVEL	Sets the output level.
BER	Controls and sets the Bit Error Rate (BER).
UTILITY	Sets the group, GPIB address, network, etc.

(5) USB connector
USB 1.1 connector

(6) Access lamp
Lights when this instrument is accessing the memory card (7).
Do not turn the power off or remove memory card while the lamp lights to prevent data and instrument damage.

(7) MEMORY CARD slot
Use only for saving/loading preset data, upgrading firmware or updating internal data.

(8) UP MENU key
While displaying the setting screen, pressing this key enters the current data, then returns to the upper level by one.
Holding down this key for at least one second enters the current setting, then returns to the top screen.

(9) Ten key (0 to 9 . -)
Directly enter such numeric data as level, channel (frequency), CN. Press ENTER (10) key to enter data.

(10) ENTER key
Enters numeric data set.

(11) Arrow keys { ↑ (INC), ↓ (DEC), ← (BACK), → (NEXT)}
< ↑ , ↓ keys>
- Increments and decrements numeric data {i.e., level, channel (frequency), CN}.
- Moves the arrow to the PID number to be selected in external input mode.
- Increments and decrements the PID value between 0 and F when data is input in hexadecimal numbers.

Difference between Up (F2)/Down (F4) keys and ↑ / ↓ keys

F2, F4 keys	Increments and decrements the value by preset step size. Becomes only single operation.
↑ , ↓ keys	Increments and decrements the value by preset step size. Holding down this key continuously changes the value.

< ←, → keys>
- Moves the arrow to the PID number to be selected in external input mode.
- When entering PID value (hexadecimal numbers):
  pressing the → key enters the value at the current digit, then moves to the next digit.
  pressing the ← key cancels the value at the current digit, then returns to the previous digit.

(12) ALL CLEAR key
Clears input data (i.e., numeric data, hexadecimal data).

(13) PRESET display
Displays the last selected preset number.

(14) ADDRESS key
Specifies the address to be stored or recalled.

(15) STORE key
Stores the current setting in the specified address.

(16) RECALL key
Recalls the setting conditions in the specified address.

(17) ↑, ↓ key
Increments and decrements the address.

(18) REMOTE key
Switches the remote control mode to local control mode. This key is disabled in local control mode.

(19) MODULATION key
Pressing this key alternately output the modulation signal (indicator lights) or carrier signal (indicator goes off).

(20) RF OUTPUT connector  CAUTION
Outputs RF signal. Refer to Section 2.3.2, "RF Signal Generator" for specifications.

(21) Option compartment
Compartment to install the USB STORAGE Option (OP71).

3.2 Rear Panel

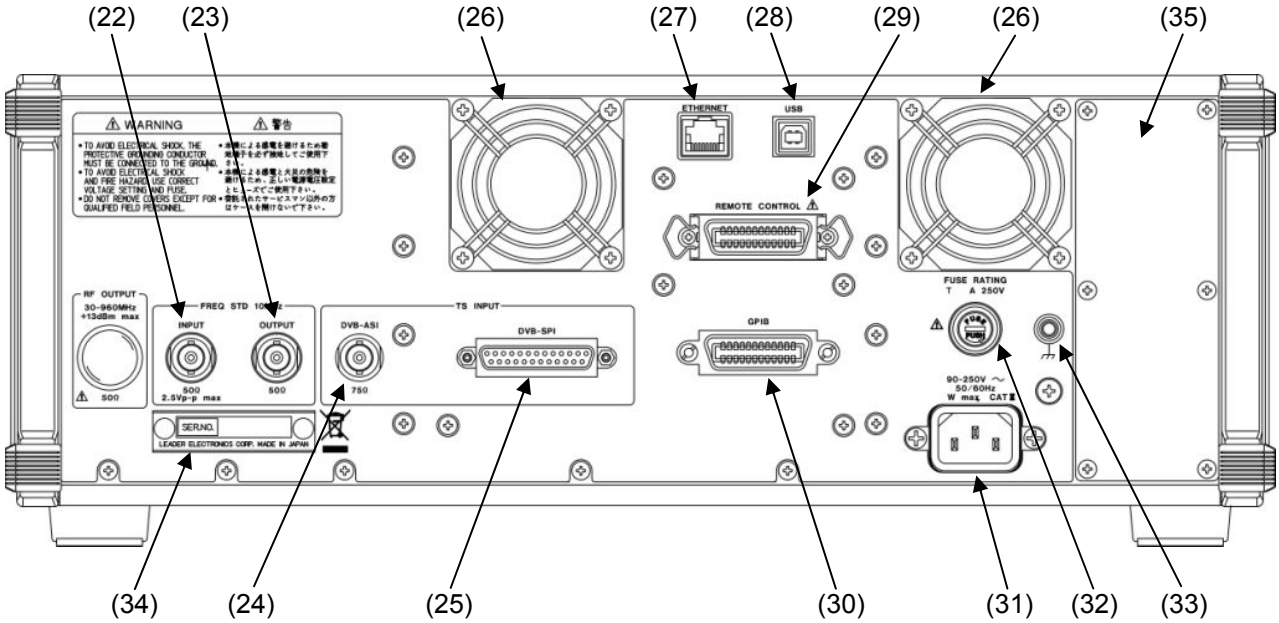


Figure 3-2 LG 3802 (S1) rear panel

(22) FREQ STD 10 MHz INPUT connector
Accepts the external reference signal. Apply 10 MHz reference signal when operating this instrument in synchronized with the equipment connected.

(23) FREQ STD 10 MHz OUTPUT connector
Synchronizes other equipment.

(24) TS INPUT DVB-ASI connector
Accepts the external TS signal. Apply the TS in DVB-ASI format.

(25) TS INPUT DVB-SPI connector
Accepts the external TS signal. Apply the TS in DVB-SPI format.

(26) Cooling fans
To prevent instrument damage due to overheating, do not block airflow through the ventilation holes.
If the fan stops, the LCD panel displays alarm message.
Turn the instrument power off immediately, then contact your local LEADER agent in this case.

(27) Network connector (ETHERNET)
Control connector for 10BASE-T or 100BASE-TX.

(28) USB connector
Factory use only. Leave this connector open.

(29) REMOTE CONTROL connector ⚠CAUTION
Used to up/down and return operations for the preset value.
Refer to Section 7 "REMOTE CONTROL."

(30) GPIB connector
GPIB interface connector.

(31) AC INPUT
AC power inlet. The accessory power coed should be used. The AC voltage range is 90 to 250 V.
Refer to Section 1.2.1, "Line Voltage and Fuse" for details.

(32) FUSE ⚠CAUTION
The mains fuse is installed. Use only the fuse of correct type and rating for replacement.
Refer to Section 1.2.1, "Line Voltage and Fuse" for details.

(33) GND terminal
Grounding terminal connected to the chassis of this instrument

(34) Serial number plate
Instrument serial number. Provide this number when contacting us.

(35) Option compartment
Compartment to install the USB STORAGE Option (OP71).

4. LCD PANEL DESCRIPTION

4.1 Turning Power On and Starting Instrument

Connect the accessory power cord between the AC inlet on the rear panel and the mains. Press the POWER switch to turn power on for starting the system. Whit for about 45 seconds until the top screen (Status screen) is displayed. The setting conditions immediately before turning power off will be recalled.

4.2 Screen Description

The screen display consists of the top screen and various setting screens. The followings describe the typical screens.

<Top Screen>

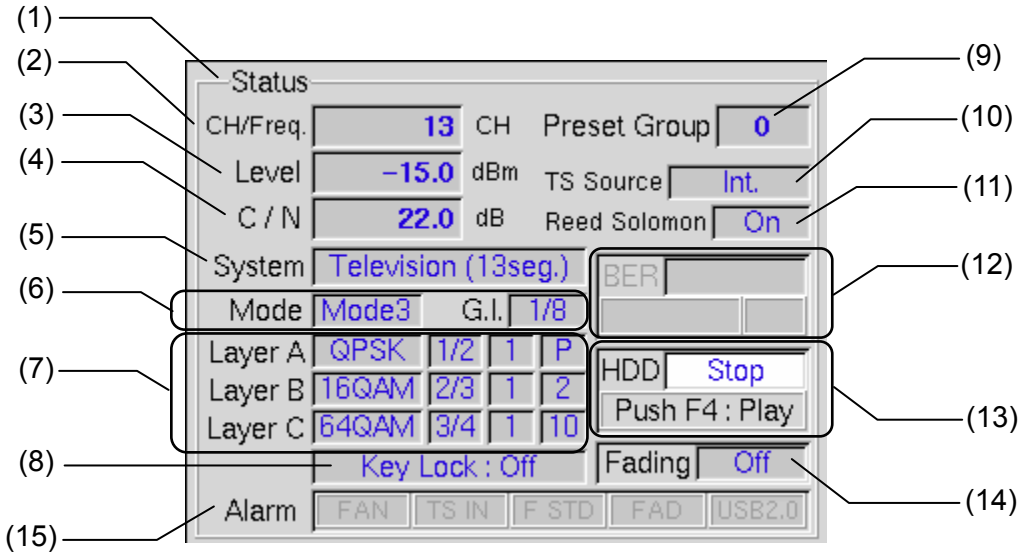


Figure 4-1 Top screen

(1)	Screen title	Indicates the top (Status) screen.
(2)	Channel, Frequency	Displays the channel number when the RF signal is set in channel. Displays the frequency in unit of MHz when the RF signal is set in frequency. (Refer to Section 5.3.)
(3)	Output level	Displays the output level (Refer to Section 5.4.)
(4)	C/N level	Displays the C/N level. "--" is displayed when the C/N is set off. (Refer to Section 5.2.)
(5)	Broadcasting system	Displays the broadcasting system. (Refer to Section 5.1.1.)
(6)	Mode, Guard Interval (Current)	Displays the Mode being selected, and Guard Interval setting conditions. The Current in the TMCC information is only displayed.

(7) Carrier modulation (Current)

Displays the carrier modulation setting status. The Current in the TMCC information is only displayed. Display is as follows from the leftmost column:

Modulation (Carrier modulation)
Code Rate
Time IL (Time interleaving)
Segments (Number of segments)

When the partial reception hierarchical layer is set, the number of segments is displayed in "P." (Refer to Section 5.1.3.)

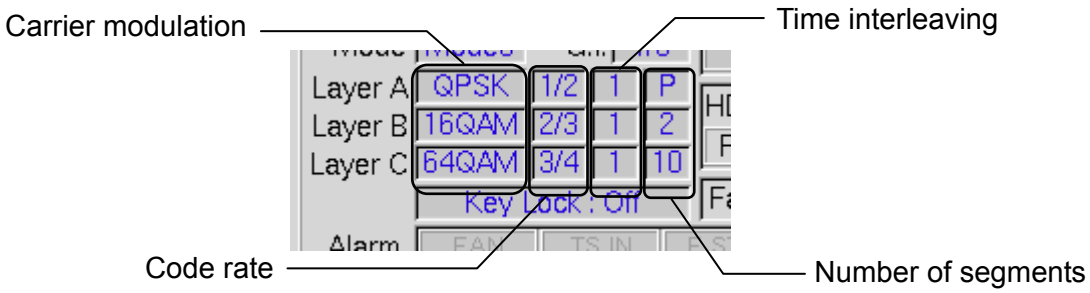


Figure 4-2 Carrier modulation display section

(8) Key lock

Displays the panel key lock status. (Refer to Section 5.6.)

(9) Group

Displays the preset group number. (Refer to Section 5.6.1.)

(10) TS signal selection

Selects the TS to be used. (Refer to Section 5.1.2.)

(11) Reed-Solomon code

Displays the Reed-Solomon code on/off. (Refer to Section 5.1.4.)

(12) BER result display

Displays the Bit Error Rate (BER) measurement value and GO/NO-GO results based on the threshold values. (Refer to Section 5.5.)

(13) Playback/Stop display

Displays the playback or stop status when the USB STORAGE Option (OP71) is installed.
When the option is not installed, it is not displayed.

(14) Fading status display

Displays the fading on/off when the Fading Option (OP72A) is installed.
When the option is not installed, it is not displayed.

(15) Alarm display

Displays alarm status for cooling fan, TS input, and reference signal. Refer to <<Alarm display on the top screen>> on the following page.

<<About top screen>>

- The top screen displays the titles.
  See each setting screen for detail.
- The top screen is displayed when one of the following operations is performed:
  (1) Immediately after the power is turned on.
  (2) UP MENU key is held down for at least one second.
  (3) ADDRESS key is pressed.
  (4) Preset status is recalled by using the RECALL key, or ↑ or ↓ key in the PRESET group.

<<Settable/controllable items on the top screen>>

- When the USB STORAGE Option (OP71) is installed, the TS can be played back or stopped by using the F4 key.
  To set other items, press the MENU key to display the appropriate screen, then set the item as required.

<<Alarm display on the top screen>>

- The following alarm message is displayed on the top screen. Message is displayed in red.

[FAN] Indicates cooling fan trouble. If this alarm is displayed, turn the instrument power off, then contact your local LEADER agent.

[TS IN] Monitors each input signal when SPI/ASI is selected as TS input. The SPI input in BER measurement mode is also monitored.
The alarm is displayed in the following status:
(1) No signal is input.
(2) When the signal other than transport stream (MPEG-2 TS or broadcasting TS) is input.
(3) When the TS signal other than packet size of 188 bytes or 204 bytes is input.
(4) When five packets or more packets except 0x47 are continuously received at the header byte position.

[F STD] Monitors the reference signal. The alarm is displayed in the following status:
(1) No signal is applied.
(2) Input signal frequency exceeds the PLL lock range.
(3) Input signal level is lower than the acceptable level.

[FAD] Enabled when the Fading Option (OP72A) is installed.
For details, refer to Chapter 11 in this manual.

[USB 2.0] When USB STORAGE Option (OP71) is installed, a setting alarm is displayed. For details, refer to Chapter 10 in this manual.

<Setting screen example "CODING">

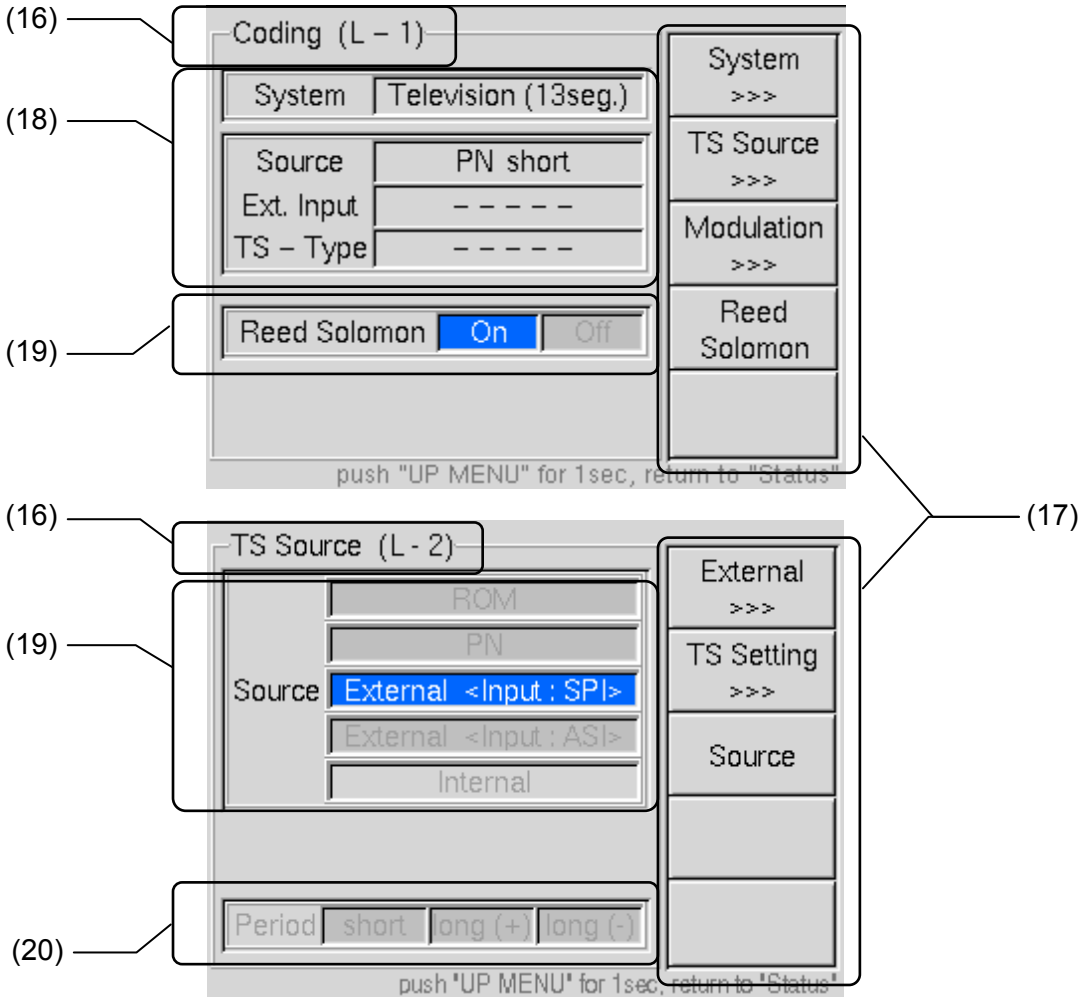


Figure 4-3 Setting screen example (1)

(16) Screen title, hierarchical layer display — Displays the screen title and hierarchical layer from the top menu.

(17) Function — Displays the functions assigned to the F1 to F5 keys. When ">>>" is displayed on the side or bottom of the function display, use the next hierarchical layer for settings.

(18) Setting status — Displays the setting status related to the screen being displayed.

(19) Selection status — Use the corresponding F key when changing the settings. The selected item is displayed in white character on the blue background. Pressing the key sequentially selects the item.

(20) Disabled function — Items displayed in gray title is currently disabled or optional functions.

<Setting screen example "LEVEL">

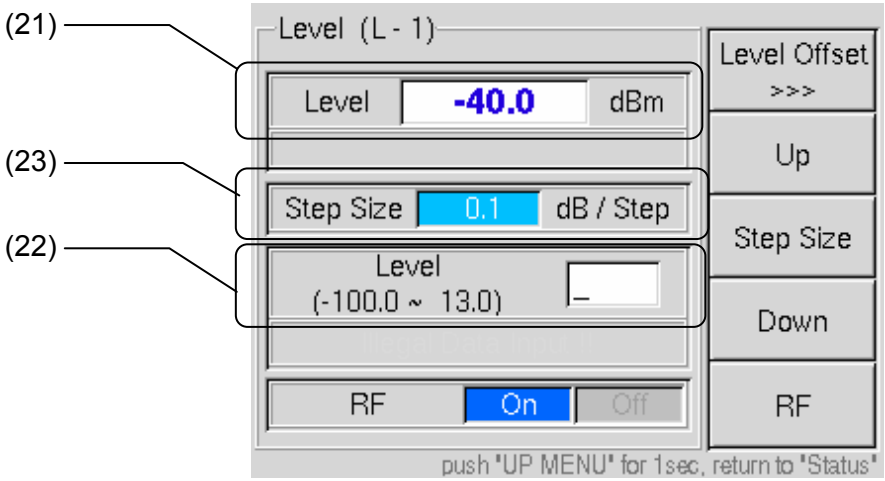


Figure 4-4 Setting screen example (2)

(21) Numeric value display column — Displays the numeric value entered. The value is displayed on the white background.

(22) Numeric value setting column — Displays data set by using the numeric keypad. When the ENTER key is pressed, the value is displayed in the Numeric value column.
After data is entered, "-" is displayed for wait status.

(23) Step display — The numeric value can be sequentially updated in preset steps displayed in the step size column.
Pressing the F2 (Up) or F4 (Down) key increments/decrements the value preset by using the F3 key. The ↑ or ↓ key in the DATA ENTRY can also be used as well.

(1) Pressing either key in the MENU group enters the setting screen.
(2) To return to the upper hierarchical layer, press the UP MENU key. Press this key repeatedly to return to the uppermost hierarchical layer.
(3) Holding down the UP MENU key for at least one second any hierarchical layer returns to the top menu.
(4) There are two setting methods:
- For the items set on the CODING menu, data is entered when the UP MENU key is pressed to return to upper hierarchical layer or to the top menu.
- For other items {level, channel (frequency), C/N, etc.}, data is directly entered when the value or settings are changed.

4.3 Menu

The top screen only displays the current setting status; there is no setting items.
When changing the setting status, press the MENU key to display the setting screen.
The MENU key function is listed below:

CODING	Selects the broadcasting system. Selects the TS input source. Selects the modulation parameter. Selects the Reed-Solomon code on/off. (Refer to Section 5.1.)
NOISE	Sets the CN level value. Sets the CN addition on/off. (Refer to Section 5.2.)
CHANNEL	Sets the RF output channel (or RF frequency). (Refer to Section 5.3.)
LEVEL	Sets the output level. Sets the output offset. Sets the RF output on/off. (Refer to Section 5.4.)
BER	Controls the BER measurement function. Sets the threshold level for GO/NO-GO judgement. Selects the measurement layer. (Refer to Section 5.5.)
UTILITY	Sets the PRESET group. Save/load the preset data. Sets the TCP/IP. Sets the GPIB address. Sets the LCD backlight brightness. Selects the REF signal. Sets the calendar. (Refer to Section 5.6.) Selects the output level display.

* To return to the top menu, hold down the UP MENU key for at least one second.

5. USING MENU

5.1 CODING

Pressing the CODING key in the MENU group enters setting screen.

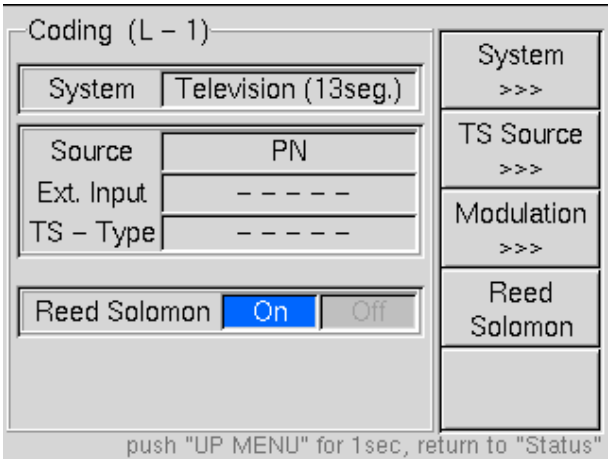


Figure 5-1 Coding screen

This screen is used for the items related to the channel coding (e.g., selecting broadcasting system, selecting TS signal, setting modulation for each hierarchical layer corresponding to TS source).
Read the instructions below carefully to ensure correct operation when setting the items since they are interact with each other.

Item on the Coding screen can be changed when the UP MENU key is pressed, or the UP MENU key is held down for at least one second for returning to the top screen.

After setting is completed, press any key in the MENU or hold down the UP MENU key for at least one second to return to the top screen.

- System (F1) Sets the broadcasting system (Refer to Section 5.1.1.)
- TS Source (F2) Selects the TS signal source (Refer to Section 5.1.2.)
- Modulation (F3) Sets the modulation mode. This function is enabled when the TS Source is PN, and when the External/Internal (when OP71 is installed) is MPEG-2 TS. (Refer to Section 5.1.3.)
- Reed-Solomon (F4) Sets Reed-Solomon code on/off. (Refer to Section 5.1.4.)

5.1.1 System

The broadcasting system can be selected by pressing the System (F1) key on the Coding (L-1) screen.

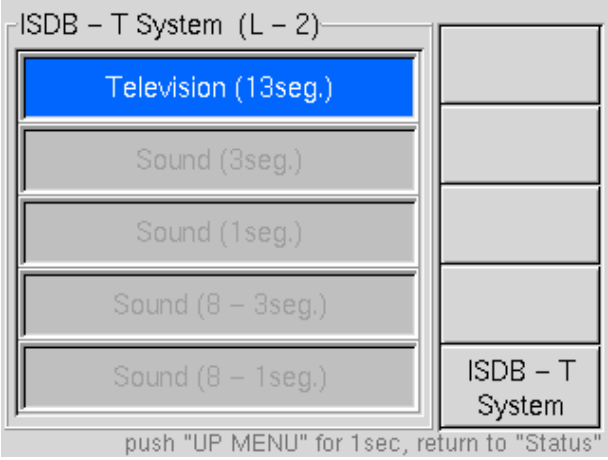


Figure 5-2 Broadcasting system selection screen

- ISDB-T System (F5)

Television (13 segments)	Outputs the RF signal for digital terrestrial TV broadcasting prescribed by ARIB STD-B31.
Sound (3 segments)	Outputs the RF signal independently for digital terrestrial sound broadcasting (3 segments) prescribed by ARIB STD-B29.
Sound (1 segment)	Outputs the RF signal independently for digital terrestrial sound broadcasting (1 segment) prescribed by ARIB STD-B29.
Sound (8-3 segments)	Outputs the RF signal assigned to the segment center in connected segment transmission mode for digital terrestrial sound broadcasting (3 segments) prescribed by ARIB STD-B29.
Sound (8-1 segments)	Outputs the RF signal assigned to the segment center in connected segment transmission mode for digital terrestrial sound broadcasting (1 segment) prescribed by ARIB STD-B29.

Notes on selecting broadcasting system

There are restrictions when the broadcasting system is selected.

- When the Sound (3 Segments, 1 Segment, 8-3 Segments, 8-1 segments) is selected, the ROM cannot be selected for the input source.
- When the Sound (3 Segments, 8-3 Segments) is selected, the number of hierarchy is 2, number of segments for each hierarchical layer is "1 + 2 segments" in Modulation mode. The partial reception is fixed to on.
- When the Sound (1 Segment, 8-1 segments) is selected, the number of hierarchy is 1, number of segments for a hierarchical layer is "1 segment" in Modulation mode.

In the LG 3802 (S1), the subchannel can be set when the connected segment transmission mode is used. Refer to Section 5.3.2.

5.1.2 TS Source

The TS source can be selected by pressing the Source (F2) key on the Coding (L-1) screen.

Notes on selecting TS source

- The receiver is temporary unlocked when TS source (each pattern stored in the ROM, PN, SPI, ASI, Internal) is switched since the coding circuit is reset.
- When the external TS (SPI, ASI) is selected, reception capability is disabled if TS INPUT alarm lights on the top screen or TS exceeding allowable rate is input.

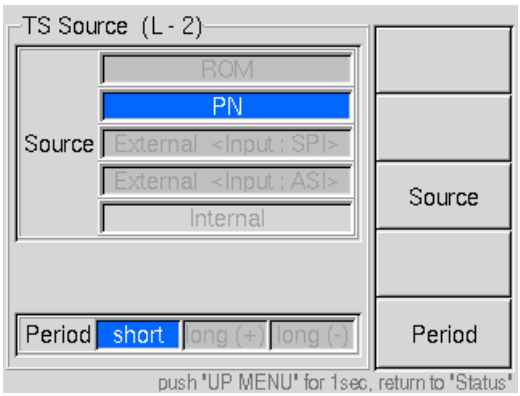


Figure 5-3 TS input selection (for PN)

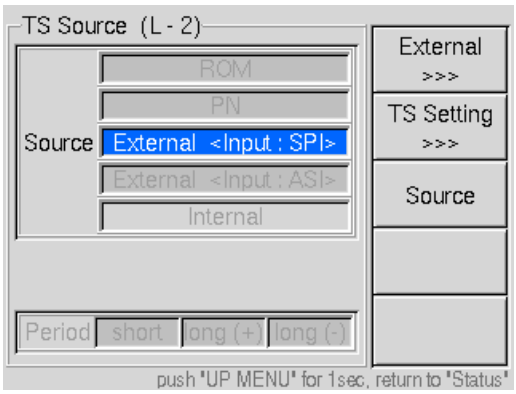


Figure 5-4 TS input selection (for SPI)

- TS Setting (F2)

  Set the TS input. The settable items are as follows:

  Null Packet Filter
  PCR Update
  PSI Modify
  TOT Overwrite

  No setting screen is displayed when the PN is selected. Refer to Sections 5.1.2.1 and 5.1.2.2 for details.

- Source (F3)

  Selects the TS input to be used.

ROM	Modulates and outputs the video and sound signals stored in the ROM. This function is only enabled when the broadcasting system is set to Television.
PN	Pseudo random signal in PN23 (Refer to Section 5.1.2.4)
External <SPI>	TS input to the SPI connector on the rear panel is used.
External <ASI>	TS input to the ASI connector on the rear panel is used.
Internal	When the option (OP71) is installed, TS of the internal HDD or TS of the external storage via USB connection is used.

• Period (F5)

This function is only enabled when the PN is selected.

Short Random signal repeated in 8 OFDM frame period.

Long (+) Random signal by using PRBS 23. An error can be measured with a conventional BER measuring instrument.

Long (-) Inverse of Long (+)

5.1.2.1 TS Setting

Pressing the TS Setting (F2) key on the TS Source screen can set various signal required for the TS input.

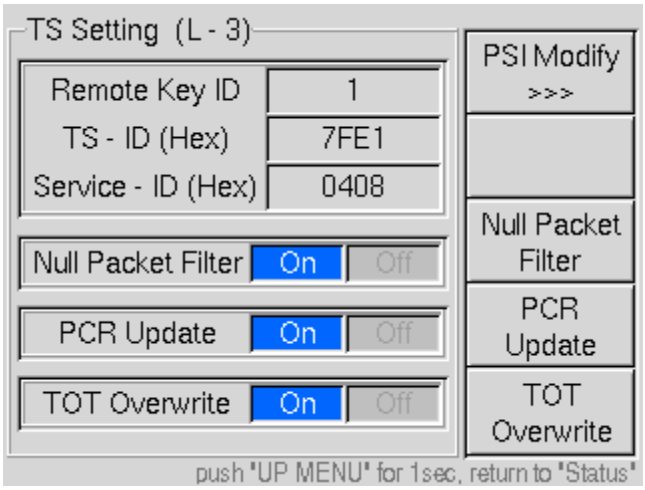


Figure 5.5 TS setting screen

• PSI Modify (F1)

Parameters written on the PAT, PMT, and NIT are rewritable.

Remote Key ID

TS-ID

Service ID

Refer to Section 5.1.2.2 for details.

• Null Packet Filter (F3)

This key is only enabled when the External (i.e., SPI, ASI) is selected. The packet with 0x1FFF PID is filtered off from the TS applied to the input connector.

Various carrier modulation capabilities can be increased by removing surplus null packet.

This key cannot be used for broadcasting TS.

• PCR Update (F4)

External TS applied is converted into broadcasting TS to perform channel coding. Since converting operations (e.g., ordering packets, inserting disabled packet) are required, the PCR should be rewritten.

Set this function on in general.

Up to eight PCRs are rewritable for the external TS.

This key cannot be used for broadcasting TS.

• TOT Overwrite (F5)

Selecting On can rewrite the Time Offset Table (TOT) based on the time preset to this instrument. Selecting Off outputs the TOT on the TS input as is.

This setting is only enabled when the ASI or SPI is applied, or when the Internal (when the OP71 is installed) is selected.

When the ROM is selected, the time based on the time preset to this instrument is set. Refer to Section 5.6.2.5, "System Time" for setting the timer of this instrument.

Notes on rewriting TOT

This function is disabled when there is no TOT in the TS input.
MPEG-2 TS and broadcasting TS are supported.

5.1.2.2 PSI Modify

Other channels can be received by changing the specified parameter in the PSI.

When constructing the centralized signal source using multiple LG 3802 (S1)s, transmission channels corresponding to the number of the LG 3802 (S1)s can be obtained by setting different channels.

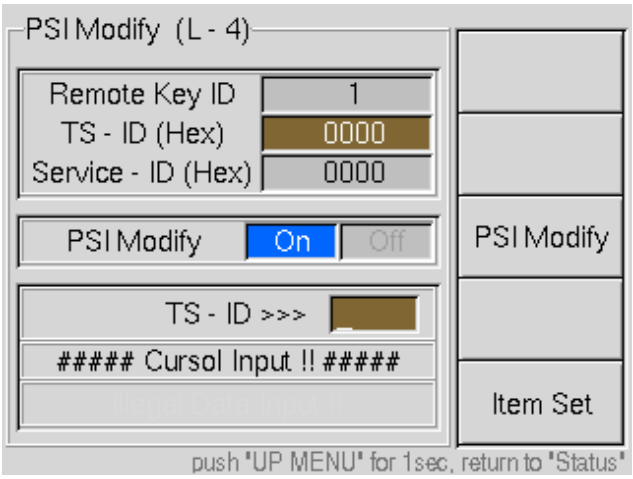


Figure 5-6 PSI update screen

• PSI Modify (F3)

Controls update functions.

Selecting Off outputs the signal as is.

Selecting On enables the F5 key; the parameter can be edited.

• Item Set (F5)

Selects the item to be edited. Pressing the key selects Remote Key ID, TS-ID, and Service ID sequentially.

Remote Key ID	Enter data by using the numeric keypad. The settable range is 1 to 12.
TS-ID	Enter data by using the ↑, ↓, ←, and → keys. Refer to Section 5.1.2.6, "PID Hierarchical Layer Setting" for details. The settable range is 0x0000 to 0xFFFF.
Service ID	Enter data by using the ↑, ↓, ←, and → keys. Refer to Section 5.1.2.6, "PID Hierarchical Layer Setting" for details. The settable range is 0x0000 to 0xFFFF.

Notes on rewriting PSI

- This function is confirmed by using the ROM pattern and moving picture file supplied with the OP71. Other streams are not guaranteed.
- The modifiable table of the parameter described above are PAT, NIT, and PMT. Other tables (e.g., EIT, SDT, BIT) are output as is.
- Table with the selection length of 183 byte or larger (extending to multiple packets) cannot be updated correctly. Set this function Off in this case.
- When other than 0 is input to the pointer field of the table, it cannot be updated correctly. Set this function Off in this case.
- If the TS contains multiple services, it may be not able to receive normally according to the contents of PAT or NIT. In this case, do not use this function.
- The part for rewriting PAT: ServiceID of the first program loop except TS-ID or NIT description.
- The part for rewriting PMT: ServiceID of PMT with PID which rewrote Service ID by PAT.
- The part for rewriting of NIT: NetworkID, TS-ID, OriginalNetworkID, ServiceID described in the beginning of service list descriptor, RemoteKeyID of TS information descriptor, or ServiceID described in the beginning of TS information descriptor.
- In the actual broadcasting operation, the broadcasting station name and program name may be changed when data is entered to the scanned receiver.

5.1.2.3 Selecting ROM Pattern

TS signal of ROM in this instrument supports 1seg and 12seg (1+12seg).
The pattern stored in the ROM (called ROM pattern) can be selected by setting the Source to ROM on the TS Source (L-2) screen, then press the Pattern (F1) key to select video pattern, screen size, or sound pattern.

∗ The ROM pattern can only be used when the Television (13 segments) is selected.

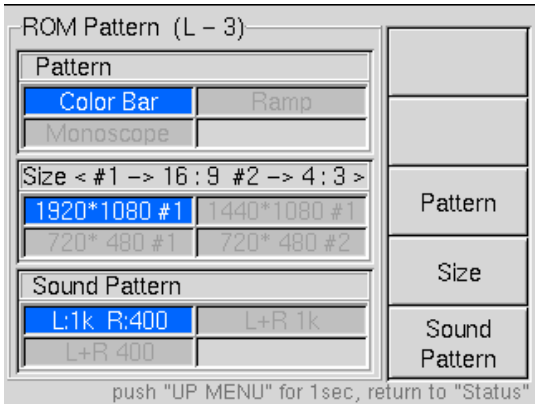


Figure 5-7 ROM pattern selection screen

- Pattern (F3)
  Selects the video pattern. (Common 1seg, 12seg)

Color Bar	Eight-color full field color bar pattern
Ramp	Full field ramp pattern
Monoscope	Monoscope pattern

- Size (F4)
  About 12seg, selects the screen size.
  1seg section is set to 320×180 (16:9) fixation regardless of the selection of the screen size.

12seg Section	1920 x 1080#1	(16:9)
	1440 x 1080#1	(16:9)
	720 x 480#1	(16:9)
	720 x 480#2	(4:3)
1seg Section	320 x 180	(16:9)

- Sound Pattern (F5)
  Selects the sound pattern. (Common 1seg, 12seg)

L: 1k R: 400	Tone signal (1 kHz for left, 400 Hz for right)
L+R 1k	Tone signal (1 kHz for both left and right)
L+R 400	Tone signal (400 Hz for both left and right)

The pattern, pattern size, and sound can arbitrary be combined. Picture of the monoscope pattern depends on the pattern size. However, monoscope pattern of 1440 size is not installed. (This combination cannot be selected via the front panel.)

About the monoscope pattern of a 1seg section

The monoscope of the 1seg section reduces the picture of 720x480 (16:9) size. Since neither a scale nor a chart is made properly to the screen size of 320x180, it cannot be used for the confirmation of original resolution. Use only for the purpose confirming a pattern.

The modulation parameter is fixed as follows when ROM is selected regardless of Section 5.1.3, "Modulation."

Mode	3	
Guard Interval	1/8	
Partial Reception	On	
	Layer-A	Layer-B
Modulation	QPSK	64QAM
Code Rate	2/3	3/4
Time IL	4	2
Segments	1	12

5.1.2.4 Selecting PN

The random signal (PN23) can be output by setting the Source to PN on the TS Source (L-2) screen.

When multiple hierarchical layers are set in MODULATION mode, PN in each hierarchical layer is independently output.

Refer to Section 5.1.3, "Modulation."

PN signal can also be selected. Refer to Section 5.1.2 for details.

5.1.2.5 Selecting External <ASI or SPI>

The TS applied to the ASI or SPI connector is used by setting the Source to External on the TS Source (L-2) screen.

Use the External (F1) key for detail settings. The item settable in detail are described below.

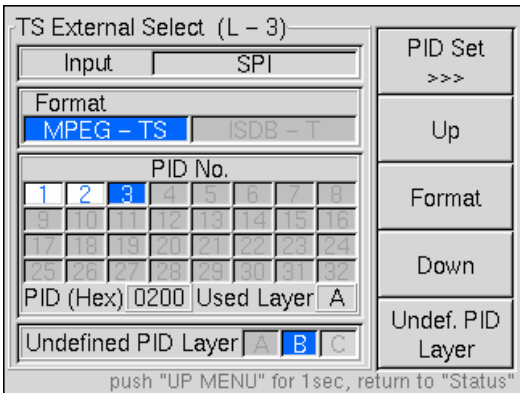


Figure 5-8 External TS setting (for MPEG-2 TS)

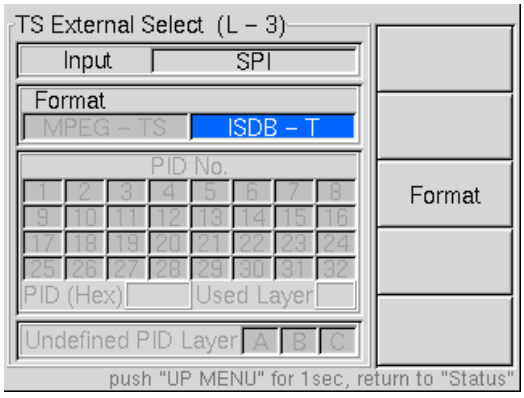


Figure 5-9 External TS setting (for ISDB-T)

• PID Set (F1)

The TS packet can be assigned to each PID hierarchical layer when multiple hierarchical layers are set in modulation parameter setting mode, and also TS input is set to MPEG-2 TS.

Up to 32 types of PID can be set.

The setting contents can be confirmed in the PID No. column.

Refer to Section 5.1.2.6 for details.

<Blue character on white background>

PID value and hierarchical layer to be assigned are already set. The contents are displayed in the PID (HEX) column (bottom) and Used layer column.

<Dark gray character on gray background>

Undefined.

<White character on blue background>

Indicates the PID number being selected.

When all PID numbers are undefined, the TS packet is assigned to the hierarchical layer specified by Undefined PID Layer (F5).

Refer to Section 5.1.2.6 for details.

• Format (F3)
Selects the TS format to be input.

MPEG-TS This item is used for conventional TS signal (MPEG-2 TS). The upper limit of the TS rate to be input depends on the carrier modulation setting conditions. Prepare the TS corresponding to settings required.
For the MPEG-2 TS, asynchronous signal can be input since TS conversion (according to coding operation) and data rate conversion are simultaneously performed.

∗ Set Null Packet Filter and PCR Update for the MPEG-2 TS. Refer to Section 5.1.2.1 for settings

ISDB-T This item is used to input the broadcasting TS prescribed by ARIB STD-B31. There are following restrictions for the broadcasting TS.
(a) Modulation setting depends on the IIP packet in the TS.
(b) The TS synchronized with this instrument (i.e., for Television: 2048÷63≒32.507937 Mbps) should be input. Asynchronized status outputs incorrect signal.
(c) PID setting is ignored.

• Up (F2)
Selects the PID number in the PID No. column. Pressing the key increments the number.

• Down (F4)
Selects the PID number in the PID No. column. Pressing the key decrements the number.

∗ The PID number can be selected by pressing the ↑, ↓, ←, and → keys in the DATA ENTRY group. The highlight cursor moves on the display area of 8 columns by 4 rows.

• Undefined PID (F5)
Selects the PID packet with a value specified other than the PID mode for distributing to the desired hierarchical layer.
This setting interacts with modulation settings described in Section 5.1.3, "Modulation."
In case of the number of hierarchical modulation layers is:
1 : A only (not selectable)
2 : Selectable A and B
3 : Selectable A, B, and C

∗ In case of the hierarchical layer C is selected (in 3 hierarchical modulation modes), changing the hierarchical modulation mode to 2 or 1 forcibly sets the Undefined PID to the hierarchical layer A.
When the hierarchical layer B is selected (in 2 or 3 hierarchical modulation modes), changing the hierarchical layer to 1 sets the Undefined PID to hierarchical layer A.

5.1.2.6 PID Hierarchical Layer Setting

The PID can be assigned to each hierarchical layer by pressing the PID Set (F1) on the TS External Select (L-3) screen.

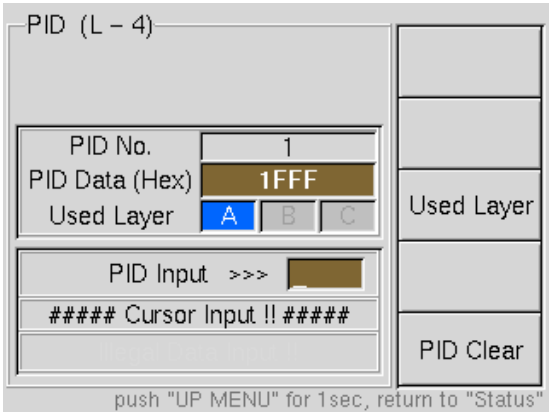


Figure 5-10 PID input and hierarchical layer setting

- Used Layer (F3)
  Specifies the hierarchical layer to assign the packet with PID value.
- PID Clear (F5)
  Clears PID value and hierarchical layer set to this PID number.
  ∗ The capability of F key is only displayed when the PID value is entered.

<Setting Procedure>

(1) Display the TS External Select (L-3) screen (Figure 5-8). Select the PID number by pressing the Up or Down key.
(2) Press the PID_Set (F1) key to display the setting screen (Figure 5-10).
(3) Pressing the ↑ or ↓ key sequentially selects 0 to 9, A to F. Select the digit by pressing the → key, then enter data to each digit.
To cancel a character, press the ← key. To cancel data on all digits, press the ALL CLEAR key.
(4) When setting 1FFF as shown in Figure 5-10, for example, proceed as follows:
  (i) Press the ↑ key in the DATA ENTRY group twice. "1" is displayed in the PID Input column.
  (ii) Press → key to enter data; the cursor "_" is displayed on the next digit.
  (iii) Press the ↓ key. "1F" is displayed.
  (iv) Press → key to enter data; the cursor "_" is displayed on the next digit.
  (v) After four digits are set, then press the ENTER key.
  PID is now entered. "1FFF" is displayed in the PID Data column.
  (vi) To cancel all data, press the ALL CLEAR key.
  (vii) Specify the hierarchical layer to assign PID by pressing the Used Layer (F3) key.
  (viii) Pressing the PID Clear (F5) key clears PID value in the PID Data (Hex) and hierarchical layer settings.

Notes on setting PID

The numeric keypad cannot be used to enter PID data. Apply the setting procedure described above even when entering the PID value other than "A to F."

5.1.2.7 Hierarchying Example

Example to output TS of external SPI in hierarchical modulation format.

Modulation settings

Hierarchical layer A: QPSK 1/2	1 segment
Hierarchical layer B: 16QAM 1/2	2 segments
Hierarchical layer C: 64QAM 3/4	10 segments

Hierarchical layer assignments

PAT (0x0000)	: Hierarchical layer B
NIT (0x0010)	: Hierarchical layer B
Program 1 (Service 1)	: Hierarchical layer C
Program 2 (Service 2)	: Hierarchical layer B
Program 3 (Service 3)	: Hierarchical layer A
Others (e.g., SDT, TOT, CAT)	: Hierarchical layer B

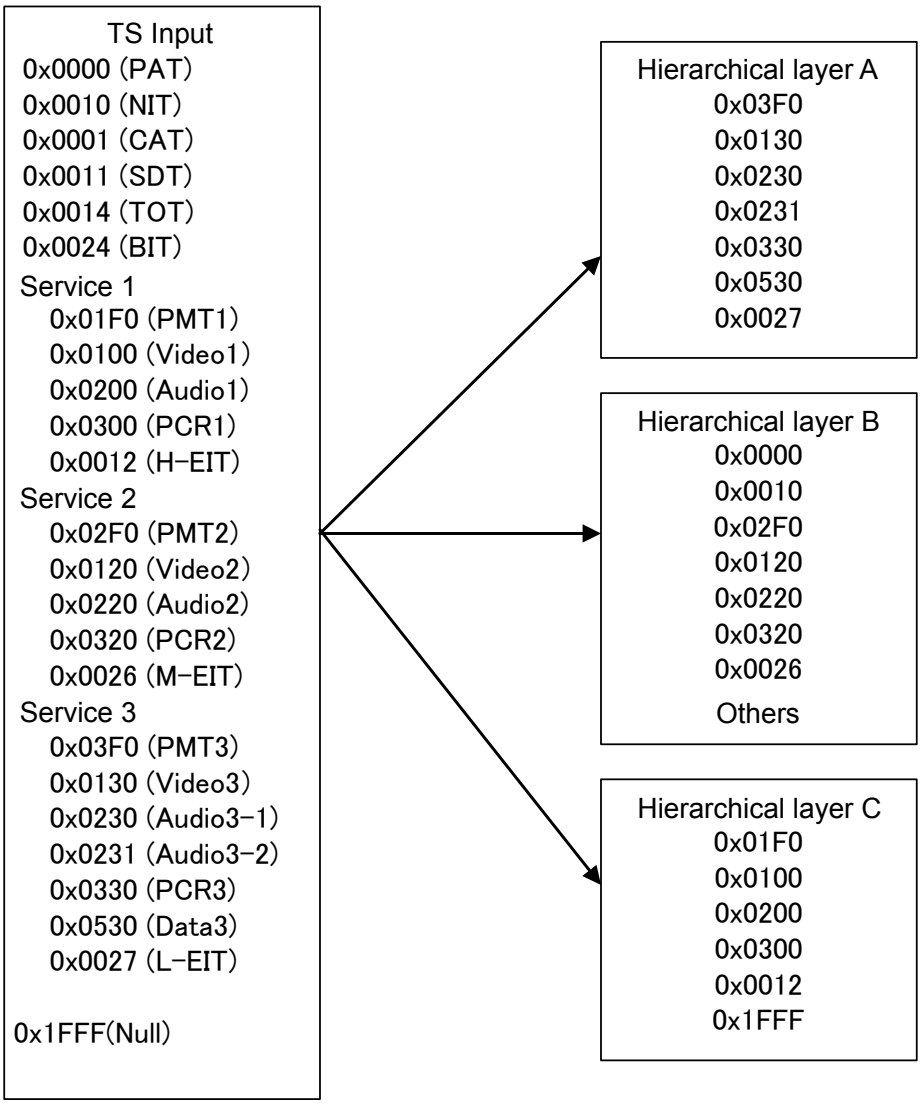


Figure 5-11 Hierarchical layer example

(1) Press the TS Source (F2) key to set External. Press External (F1) and Format (F3) keys sequentially for MPEG-TS.
(2) Press the Modulation (F3) key to set the modulation. Refer to Section 5.1.3.
(3) Press the TS Source (F2) key and External (F1) keys sequentially to enter External Select (L-3) screen.
Press the Up (F2), Down (F4), or arrow key to set the PID number to "1."
(4) Press the PID Set (F1) key to enter PID (L-4) screen. Enter PID value. Refer to Section 5.1.2.6.
Enter 0x3F0, here, as shown in Figure 5-11.
(5) Press the Used Layer (F3) key to select the hierarchical layer A to assign the PID 1. The PID No. 1 is now set.
Press the UP MENU key to return to the L-3 screen.
(6) Specify the PID No. 2, then assign 0x130 to the hierarchical layer A.
(7) Apply the same procedure described above, set the PID to assign to hierarchical layer A, and the PID to assign to hierarchical layer C (11 types).
(8) Since all packets other than the packets set in Steps (1) through (7) are assigned to the hierarchical layer B, press the Undefined PID layer (F5) key on the TS External Select (L-3) screen to select "B."
(9) To enter settings, press the UP MENU key to return to upper hierarchical layer (L-2) or hold down the UP MENU key for at least one second to return to the top screen to enter settings.

Notes on hierarchical layer settings

- When performing the procedure described above, use TS with known PID tree structure. This instrument cannot analyze or display the TS tree.
- The applicable information rate to input each hierarchical layer depends on the modulation settings (i.e., guard ratio, modulation system, coding rate, number of segments). If excessive information rate is input, this instrument cannot output the correct signal since the buffer overflows.
- Up to 32 types of PID can be assigned.
- When assigning PID to the hierarchical layer, a descriptor cannot be inserted, and PSI cannot be edited.

5.1.2.8 Multiplexing PCR Packet

Conforms to PCR multiplex specifications of partial reception system prescribed by ARIB STD-B29 and ARIB STD-B31 standards.
Use in the following conditions.

Applicable Hierarchical Layers	Partial reception hierarchical layer (for Television, 3 segments) Hierarchy A (for 1 segment)
PCR Multiplex Positions	First packet on the hierarchical layer A of the top of 1 OFDM frame
Number of PCRs Multiplexed	1 per 1 OFDM frame (Mode 1) 2 per 1 OFDM frame (Mode 2) 4 per 1 OFDM frame (Mode 3)

Notes on multiplexing PCR

- Can only be supported at the time of partial reception hierarchical layer.
- In the modulation mode, this function multiplexes the PCR packet on the partial reception hierarchical layer when the partial reception mode has been selected, and PCR Update has been set on besides.
- The Adaptation field control should not use anything other than "10" (only Adaptation field) for the PCR packet. The data of the payload section is missed.
- PCR of the partial reception hierarchical layer superimposed to TS is annulled.
- Gives PCR assigned to the partial reception layer only as one kind. Multiple PCRs are not supported.
- The Multiplex position of PCR cannot be changed.
- Since the number of PCR packets of hierarchical layer A will increase by this function when an insertion interval exceeds the above-mentioned multiplexing interval (58ms or more in MODE3 and GI1/8), be careful of overflow.

5.1.3 Modulation

This menu is used to set the modulation parameter. This item is also effective under the following conditions:
MPEG-2 TS is selected in External <SPI, ASI>, PN is selected, and MPEG-2 TS is selected in Internal when the USB STORAGE Option (OP71) is installed.

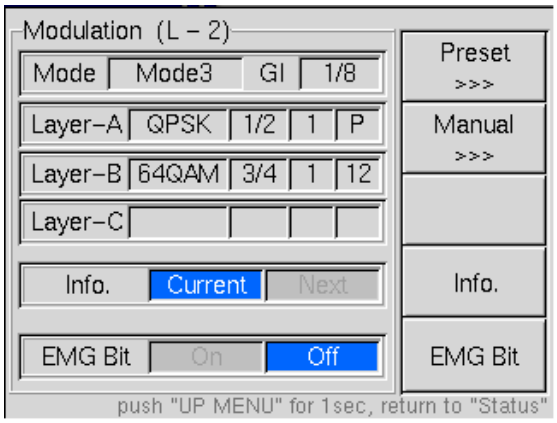


Figure 5-12 Modulation setting screen

- Info. (F4)
  Selects the modulation information to be displayed.
  Current Current information
  Next Next Information

- EMG Bit (F5)
  Sets "start flag for emergency-alarm broadcasting" on/off.

- Preset (F1)
  Five types of modulation patterns are provided. Press the Preset No. key to select the pattern. (The preset patterns cannot be rewritten.)
  Tables 5-1 through 5-3 list the preset patterns.

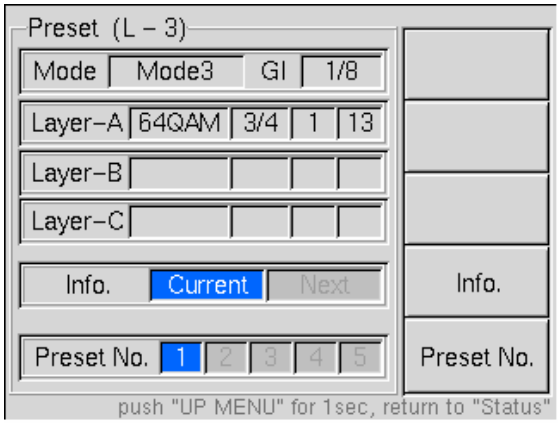


Figure 5-13 Preset selection screen

Table 5-1 Modulation preset (For Television)

Preset No.		No1	No2	No3	No4	No5
Current	Mode	3	3	2	3	3
	GI	1/8	1/8	1/8	1/4	1/8
	Partial Reception	OFF	ON	OFF	OFF	ON
	LA Modulation	64QAM	QPSK	16QAM	64QAM	QPSK
	LA Code Rate	3/4	1/2	2/3	3/4	1/2
	LA Time IL	1	1	4	1	1
	LA Segments	13	1	13	13	1
	LB Modulation		64QAM			16QAM
	LB Code Rate		3/4			2/3
	LB Time IL		1			1
	LB Segments		12			2
	LC Modulation					64QAM
	LC Code Rate					3/4
	LC Time IL					1
	LC Segments					10
Next	Mode	3	2	3	3	3
	GI	1/8	1/8	1/4	1/8	1/8
	Partial Reception	ON	OFF	OFF	ON	OFF
	LA Modulation	QPSK	16QAM	64QAM	QPSK	64QAM
	LA Code Rate	1/2	2/3	3/4	1/2	3/4
	LA Time IL	1	4	1	1	1
	LA Segments	1	13	13	1	13
	LB Modulation	64QAM			16QAM	
	LB Code Rate	3/4			2/3	
	LB Time IL	1			1	
	LB Segments	12			2	
	LC Modulation				64QAM	
	LC Code Rate				3/4	
	LC Time IL				1	
	LC Segments				10	

Table 5-2 Modulation preset {For Sound (3 segments), Sound (8-3 segments)}

Preset No.		No1	No2	No3	No4	No5
Current	Mode	3	3	2	3	3
	GI	1/8	1/4	1/4	1/8	1/8
	Partial Reception	ON	ON	ON	ON	ON
	LA Modulation	QPSK	QPSK	QPSK	QPSK	QPSK
	LA Code Rate	1/2	1/2	1/2	1/2	2/3
	LA Time IL	1	1	2	1	1
	LA Segments	1	1	1	1	1
	LB Modulation	16QAM	16QAM	16QAM	16QAM	16QAM
	LB Code Rate	1/2	1/2	1/2	2/3	2/3
	LB Time IL	1	1	2	1	1
	LB Segments	2	2	2	2	2
Next	Mode	3	2	3	3	3
	GI	1/4	1/4	1/8	1/8	1/8
	Partial Reception	ON	ON	ON	ON	ON
	LA Mod	QPSK	QPSK	QPSK	QPSK	QPSK
	LA Code Rate	1/2	1/2	1/2	2/3	1/2
	LA Time IL	1	2	1	1	1
	LA Segments	1	1	1	1	1
	LB Modulation	16QAM	16QAM	16QAM	16QAM	16QAM
	LB Code Rate	1/2	1/2	2/3	2/3	1/2
	LB Time IL	1	2	1	1	1
	LB Segments	2	2	2	2	2

∗ Phase-shift-correction value for connected segment transmission is "0" (zero).

Table 5-3 Modulation preset {For Sound (1 segment), Sound (8-1 segments)}

Preset No.		No1	No2	No3	No4	No5
Current	Mode	3	3	2	3	3
	GI	1/8	1/4	1/4	1/8	1/8
	LA Modulation	QPSK	QPSK	QPSK	QPSK	QPSK
	LA Code Rate	1/2	1/2	1/2	1/2	2/3
	LA Time IL	1	1	2	1	1
	LA Segments	1	1	1	1	1
Next	Mode	3	3	3	2	3
	GI	1/8	1/8	1/4	1/4	1/8
	LA Modulation	QPSK	QPSK	QPSK	QPSK	QPSK
	LA Code Rate	2/3	1/2	1/2	1/2	1/2
	LA Time IL	1	1	1	2	1
	LA Segments	1	1	1	1	1

∗ Phase-shift-correction value for connected segment transmission is "0" (zero).

• Manual (F2)
Changes parameter on the following screens.

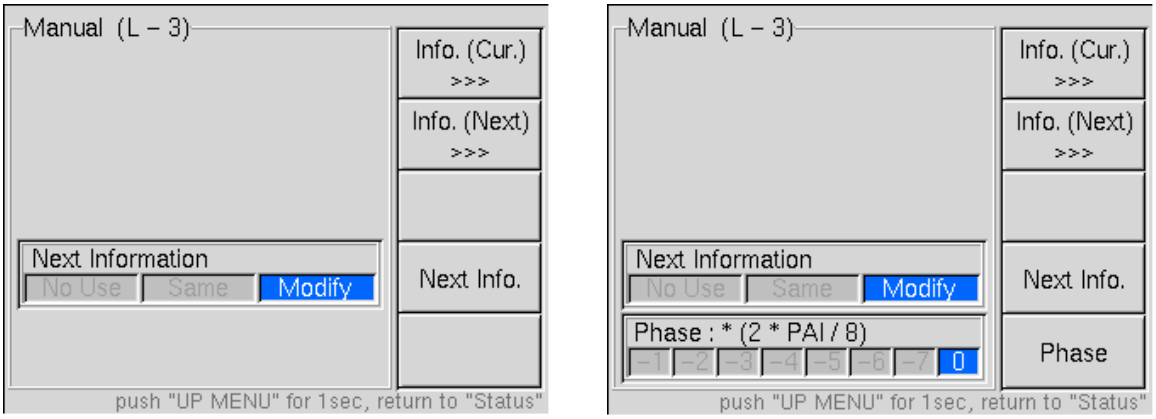


Figure 5-14 Manual setting screen

Next Info. (F4) Selects the next information setting method.
No Use Selects this item when the next information is not required.
Same Sets the same parameter as the current parameter.
Modify Used for manual settings. The setting function is added to the F2 key.
Phase (F5) Sets Phase-shift-correction value for connected segment transmission. (In case of Sound connected segment transmission mode is selected.)

Notes on Phase settings

• The phase setting is only effective for the TMCC; not effective for the RF signal output.

Info (Cur) (F1) Sets the current information after the hierarchical layers (i.e., L-4, L-5).
Info (Next) (F2) Sets the next information after the hierarchical layers (i.e., L-4, L-5).
∗ This section only describes the Current setting procedure since setting items of the Current and Next are the same.

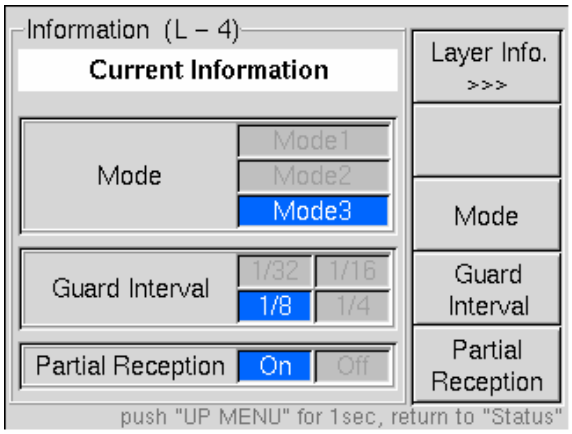


Figure 5-15 Modulation setting (1)

Mode (F3)	Selects the mode.
Guard Interval (F4)	Selects the guard interval.
Partial Reception (F5)	Sets the partial reception flag on/off. (Television only)

- Layer Info. (F1)
  Moves to the modulation setting screen (L-5) for each hierarchical layer.

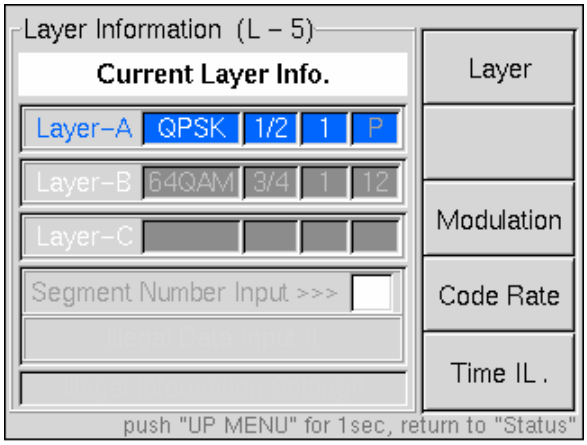


Figure 5-16 Modulation setting (2)

Layer (F1)	Selects the hierarchical layer to be set.
Modulation (F3)	Selects the carrier modulation system.
Code Rate (F4)	Selects the code rate.
Time IL (F5)	Selects the time interleaving.
Segment	Enter the number of segments by using the numeric keypad. When the broadcasting system is in Television: hierarchical layer A can only be set when the number of segments is set to 13. When the number of segments is set to 12 or low, hierarchical layer B can be set, and when the partial reception is enabled, "P" is displayed on the hierarchical layer A. The number of segments are fixed to 1.

Notes on modulation setting

- When ROM is selected for the TS Source, the parameter is fixed as described in Section 5.1.2.3 regardless of setting in this section.
- When the Time IL is set to other than 0, it takes about five to 15 seconds until the signal is output since internal processing takes long time.

5.1.4 Reed-Solomon

When coding operation is in progress, Reed-Solomon code (204, 188) added to every packet can be set on/off. Select on/off as required when measuring BER. When receiving the signal with a tuner for consumer, set it on.

5.2 NOISE

This instrument can add a noise (C/N) to the RF output. When OP72A is installed, it is also possible to add the fading noise. Refer to Chapter 11 for details of OP72A.

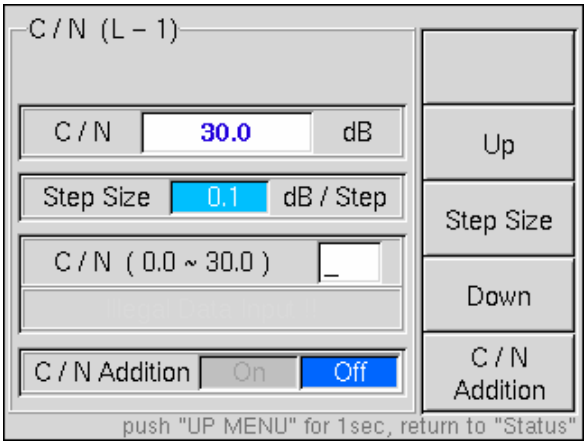


Figure 5-17 C/N setting screen

- Step Size (F3) Sets the step size for Up and Down operations.
- C/N Addition (F5) Sets C/N on/off.
  The C/N value can be directly entered by using the numeric keypad, or changed by using the Up (F2) and Down (F4) keys.

5.3 CHANNEL

The frequency and RF channels can be set when the broadcasting system is set to Television.
The subchannels can be set as well as the RF channels when other than the broadcasting system is set to Television.
The subchannel setting mode is enabled in the following conditions:

- Other than the Television is selected in the broadcasting system.
- The channel is set to VHF, UHF, or CATV.

When the subchannel setting mode is enabled, both RF channel and subchannel are displayed in the channel display area on the top screen.

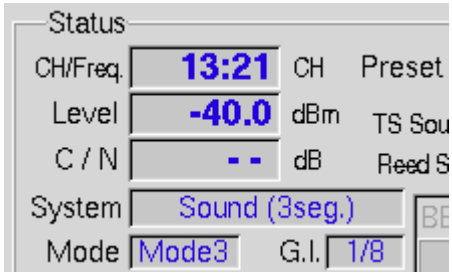


Figure 5-18 Subchannel display on the top screen

5.3.1 Setting Channel

When broadcasting system is set to Television.

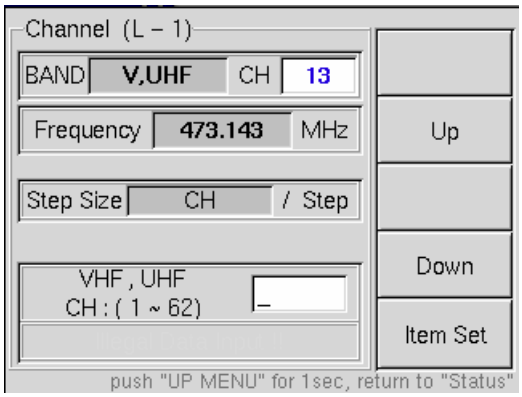


Figure 5-19 Channel setting

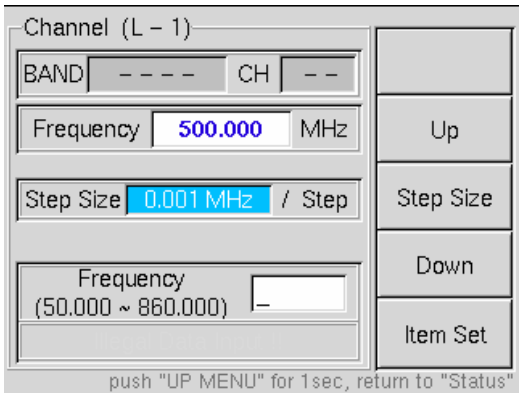


Figure 5-20 Frequency setting

- Item Set (F5) Selects setting range and method of the RF frequency.
  - VHF, UHF VHF and UHF channels Channel 1 to 62
  - CATV CATV channel Channel C13 to C63
  - Frequency Sets the CHANNEL in frequency.
    When the CHANNEL is set in channel, top screen displays the channel. When the CHANNEL is set in frequency, top screen displays the frequency.

- Step Size (F3) Sets the steps for Up and Down operations.
  The CHANNEL can be directly entered by using the numeric keypad, or changed by using the Up (F2) and Down (F4) keys.

5.3.2 Setting Subchannel

When other than broadcasting system is set to Television.

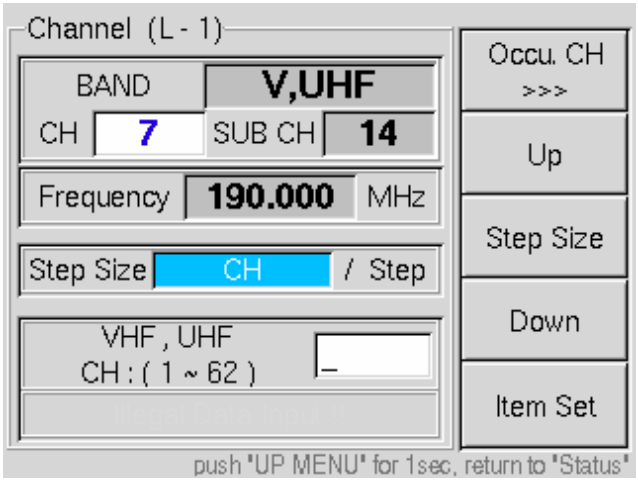


Figure 5-21 Channel setting screen

- Occu. CH (F1)
  The subchannel occupied in connected segment transmission can be set.
  This setting is enabled in the following conditions:
  - The Sound (8-1 seg) or Sound (8-3 seg) mode is selected in the broadcasting system.
  - The channel is set to VHF, UHF, or CATV.

  The Occu. CH (F1) key on the Channel (L-1) screen can be used to set the Begin subchannel number occupied in connected segment transmission.
  The settable range is 2 to 18. When the Begin number is entered, the settable subchannels are displayed at the center of Channel (L-1) screen.
  Enter the subchannel number by using the numeric keypad, then press the ENTER key.

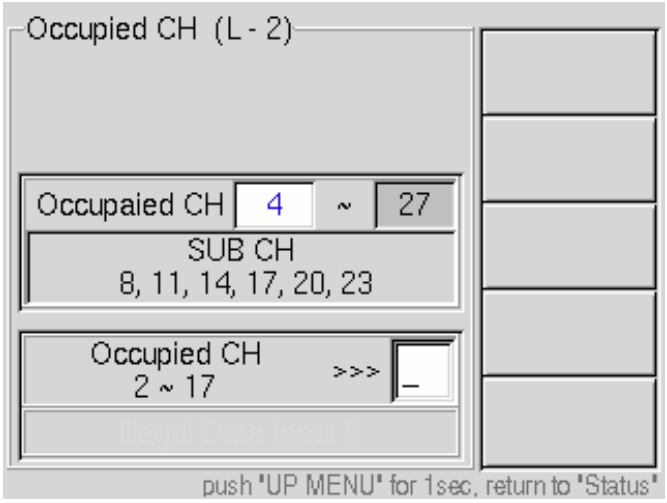


Figure 5-22 Occupied subchannel setting screen in connected segment transmission mode

- Step Size (F3)
  Selects the channel or subchannel in the channel setting mode.

- Item Set (F5)
  Selects the setting range and setting method of the RF frequency.

VHF, UHF	VHF and UHF channels	1 to 62
CATV	CATV channel	C13 to C63
SUB CH	Subchannel	3 to 40 (for Sound 1 seg)
		6 to 37 (for Sound 3 seg)
		See Table 5-4 (for Sound 8-1 seg)
		See Table 5-4 (for Sound 8-3 seg)
Frequency	Direct setting in frequency	50 to 860 MHz

Table 5-4 Settable subchannel

Occupied subchannel	Settable subchannel	
	Sound (8-1seg)	Sound (8-3seg)
2 to 25	3, 6, 9,12,15,18,21,24	6, 9,12,15,18,21
3 to 26	4, 7,10,13,16,19,22,25	7,10,13,16,19,22
4 to 27	5, 8,11,14,17,20,23,26	8,11,14,17,20,23
5 to 28	6, 9,12,15,18,21,24,27	9,12,15,18,21,24
6 to 29	7,10,13,16,19,22,25,28	10,13,16,19,22,25
7 to 30	8,11,14,17,20,23,26,29	11,14,17,20,23,26
8 to 31	9,12,15,18,21,24,27,30	12,15,18,21,24,27
9 to 32	10,13,16,19,22,25,28,31	13,16,19,22,25,28
10 to 33	11,14,17,20,23,26,29,32	14,17,20,23,26,29
11 to 34	12,15,18,21,24,27,30,33	15,18,21,24,27,30
12 to 35	13,16,19,22,25,28,31,34	16,19,22,25,28,31
13 to 36	14,17,20,23,26,29,32,35	17,20,23,26,29,32
14 to 37	15,18,21,24,27,30,33,36	18,21,24,27,30,33
15 to 38	16,19,22,25,28,31,34,37	19,22,25,28,31,34
16 to 39	17,20,23,26,29,32,35,38	20,23,26,29,32,35
17 to 40	18,21,24,27,30,33,36,39	21,24,27,30,33,36
18 to 41	19,22,25,28,31,34,37,40	22,25,28,31,34,37

Other segments in connected segment transmission

In the connected segment transmission mode, other than the segments listed above (i.e., seven segments for Sound 8-1 seg, five segments for Sound 8-3 seg) may not be received correctly since the modulation signal is output by dummy data.
Even if the signal is received, it cannot be used for BER measurement due to the random TS data.

5.4 LEVEL

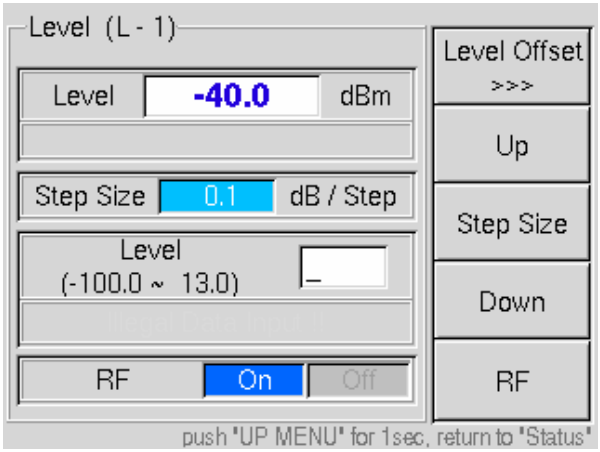


Figure 5-23 Level setting

- Level Offset (F1)
  Displays the offset setting screen.
  Refer to Section 5.4.1.

- RF (F5)
  Sets RF signal on/off. This capability is applied to on all, such as the OFDM modulation signal, Fading (when OP72A is installed) and CN.

- Step Size (F3) Sets the steps for Up and Down operations.
  The LEVEL can be directly entered by using the numeric keypad, or changed by using the Up (F2) and Down (F4) keys.

5.4.1 Level Offset

This function can be set eight points of frequency to compensate. Compensates linearly between the points. Refer to the following examples.

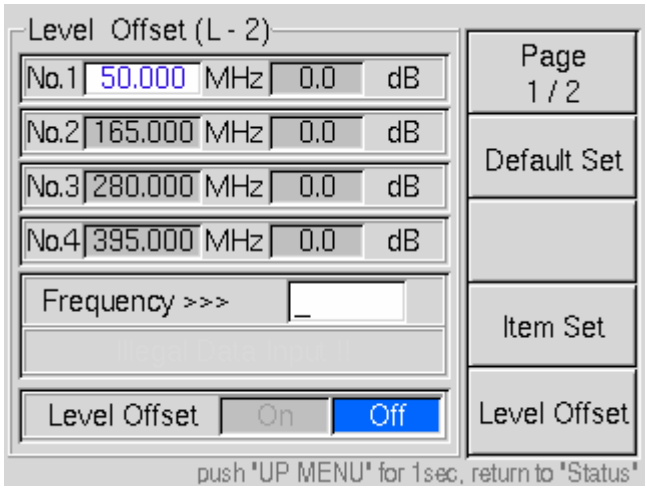


Figure 5-24 Offset setting screen

- Page (F1)
  Switches the offset setting screen (1/2, 2/2).
  The points of frequency from 1 to 4 are set with Page1/2, and the points of frequency from 5 to 8 are set with page2/2.

- Default Set (F2)
  All points of frequency values are set to the default value (Frequency 50.000MHz and level offset 0 dB).

- Item Set (F4)
  Select the points of frequency or level offset.

- Level Offset (F5)
  ON/OFF of the offset addition is switched. The screen is displayed as follows when the output level offset is on.

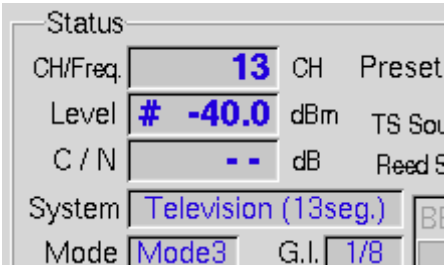


Figure 5-25 Top screen

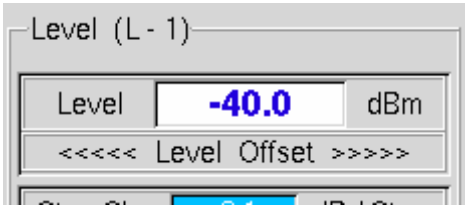


Figure 5-26 Level setting screen

<Setting Example>

Output level: -20dBm

Table 5-5 Example of setting offset

Points of Frequency	No 1	No 2	No 3	No 4	No 5	No 6	No 7	No 8
Frequency (MHz)	50	150	250	400	450	600	650	700
Offset (dB)	-5.0	+2.5	+20.0	+15.0	-20.0	-15.0	-2.0	-5.0

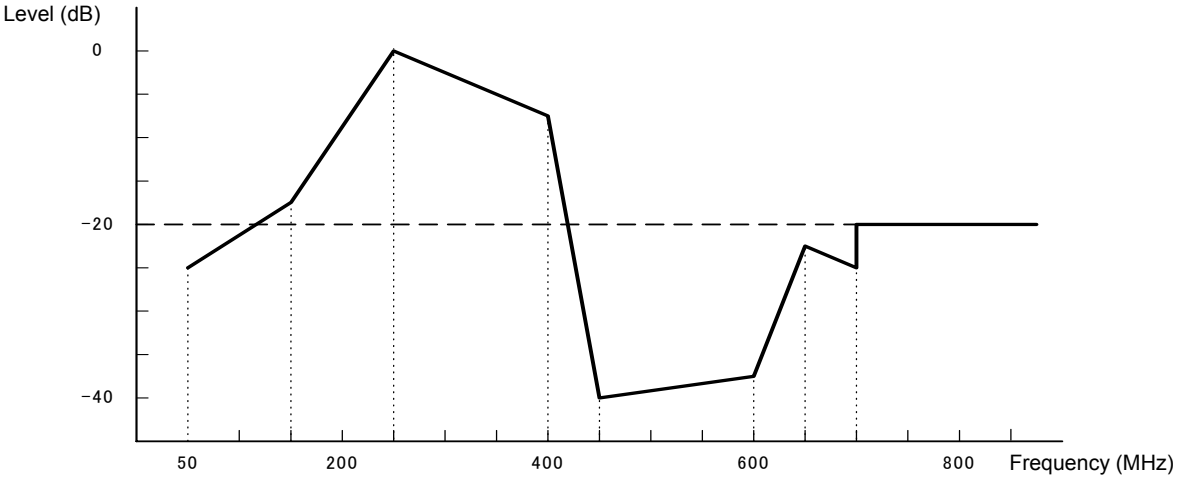


Figure 5-27 Graph Example of Setting Result

Notes on Settings

- Each frequency should be set as follows:
  No. 1 < No. 2 < ・・・ < No. 7 < No. 8
- The settable range of each point is ±20 dB.
- Since the eighth point is 700 MHz in above case, the higher band (700 to 860 MHz) is handled as an unset band. The unset band will not be offset; there is no compensation value.
- At least two frequencies should be set since the offset value is derived from the interpolation between two frequencies.

5.5 BER

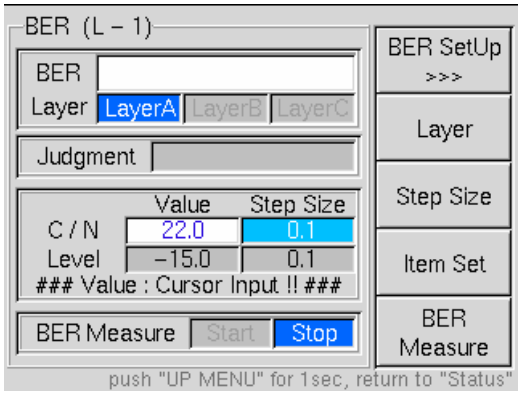


Figure 5-28 BER setting and measurement

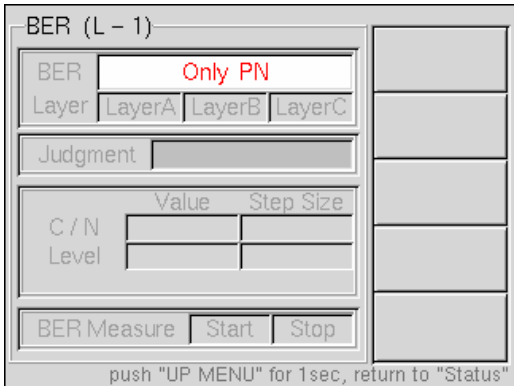


Figure 5-29 Impossible to set

- BER Setup (F1) Sets the BER measurement conditions. Refer to Section 5.5.1.
- Layer (F2) Selects hierarchical layer to be measured. When the modulation is only set to the hierarchical layer A, this key is disabled.
- Step Size (F3) Selects the variable range of C/N or output level.
- Item Set (F4) Selects the item by pressing the ↑ or ↓ key in the DATA ENTRY group. The C/N or level can be selected when the C/N is set on. This key is disabled when the C/N is set off.
- BER (F5) Controls BER measurement.

Notes on using BER function

∗ The BER measurement mode is enabled when the TS Select is set to PN.
BER cannot be measured when other than TS Select is set to PN, and message as shown in Figure 5-29 is displayed.

5.5.1 BER Setup

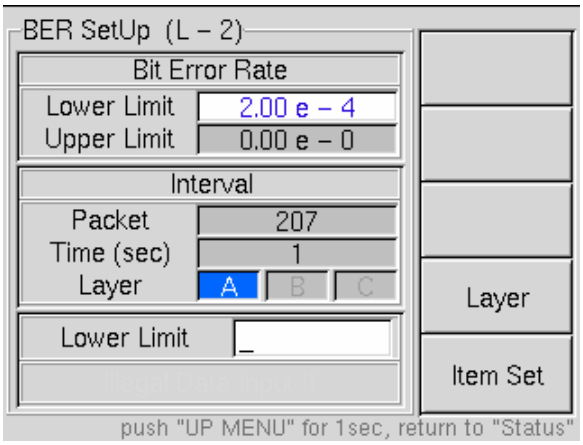


Figure 5-30 BER setting screen

- Layer (F4)
  Selects the hierarchical layer to set the upper limit, lower limit, and measurement interval. This key is enabled when multiple hierarchical layers are set in Modulation.

- Item Set (F5)
  Sets the item to be set.

  Upper Limit — Sets the upper threshold value (close to 0) in GO/NO-GO judgement mode.

  Lower Limit — Sets the lower threshold value (close to 1) in GO/NO-GO judgement mode.
  (Settable range: 0.00E-0, 1.00E-9 to 9.99E-1)

  Packet — Sets the measurement interval in number of packets. The time is automatically displayed by converting the number of packets.

  Time (Sec) — Sets the measurement interval in time. The number of packets is automatically displayed by converting the number of packets.

  ∗ The values can be directly entered by using the numeric keypad.

< Setting >

(1) Select the broadcasting system to be measured.
(2) Set the TS Source to PN, then select the Period: Short, Long (+), or Long (-). Refer to Section 5.1.2 for details.
(3) The measurable layers are as follows:
  Television (13 seg): Hierarchical layers A, B, or C (depending on modulation setting)
  Sound (1 seg), Sound (8-1 seg): Hierarchical layers A only
  Sound (3 seg), Sound (8-3 seg): Hierarchical layers A or B
(4) Use the SPI connector to input the TS when measuring the BER. Set the front end to output the hierarchical layer corresponding to the broadcasting TS rate (32.507937 Mbps).
(5) When no signal is input to the SPI connector or there is asynchronous error on the TS, the alarm lights on the top screen and BER column display "BER Error."

(6) When measurement starts, the top screen and BER screen display the measurement value. "GO" is displayed when measurement value is with the threshold value; "NO-GO" is displayed for outside the threshold.

(7) When the TS signal to be measured is serial signal, the BER measurement can be enabled using the LG 3802-01 (Serial Parallel Converter) that is sold separately.

5.6 UTILITY

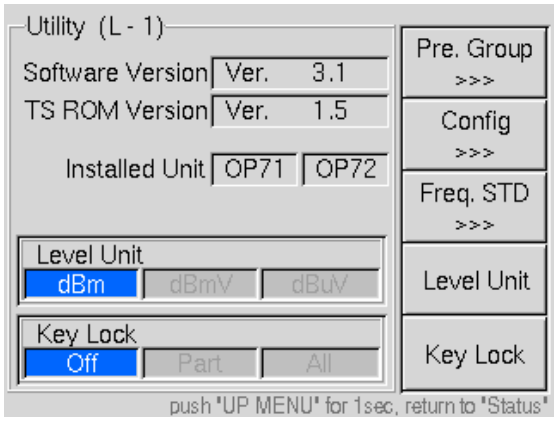


Figure 5-31 Utility screen

Software Version — Displays the control software version. Provide the serial number indicated on the rear panel and software number when contacting us.

TS ROM Version — Displays the ROM pattern version.

Installed Unit — Displays the option installed.

- Pre. Group (F1)
  There are 100 preset conditions (i.e., consisting of 10 groups, 10 conditions per group). The range for the increment or decrement can be set independently by each group.

- Config (F2)
  Sets this instrument.

- Freq. STD (F3)
  Selects the reference signal.

- Level Unit (F4)
  Three types of the level units can be selected.
  The level is displayed on the screen with the selected unit.

  dBm Indicates the output level into 50 Ω load. 0 dBm=1 mW
  The settable range is: -100 to +13 dBm.

  dBmV Indicates the output level into 50 Ω load. 0 dBmV=1 mV
  The settable range is: -53 to +60 dBmV.

  dBμV Indicates the output level into 50 Ω load. 0 dBμV=1 μV
  The settable range is: +7 to +120 dBμV.

- Key Lock (F5)
  Restricts the front panel key operations.
  Off Enables all keys.
  Part Disables all keys except the Address, ↑ / ↓ (PRESET), and RECALL keys.
  All Disables all keys.
  The Utility, F5, and UP MENU keys can always be used for canceling the Key Lock mode.

5.6.1 Preset Group

This instrument provides 100 preset memories. The memories can be divided into 10 groups.

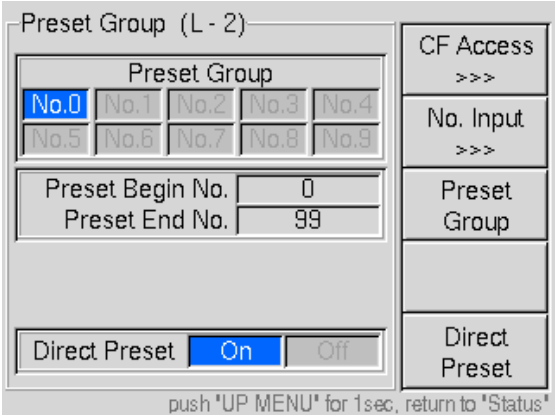


Figure 5-32 Group setting screen

- CF Access (F1)
  The preset data can be saved on a Compact Flash card (CF), and can be loaded from it. Refer to Section 5.6.1.1.

- No. Input (F2)
  Moves to the group setting screen. Refer to Section 5.6.1.2.

- Preset Group (F3)
  Selects the group number.

- Direct Preset (F5)
  Selecting the Off disables the direct preset number recall mode set with the ↑ or ↓ key in the PRESET column (refer to Section 3.1, “Front Panel”).
  This setting prevents the incorrect operation by accidentally pressing the ↑ or ↓ key.

5.6.1.1 CF Access

Procure a CF card. At least 400 kB is required for storing data.

<Storing control settings>

(1) Insert the CF card into the memory card slot on the front panel.

(2) To enter the CF access screen, press the following key sequentially:
UTILITY → Pre. Group (F1) (Figure 5-31) → CF Access (F1) (Figure 5-32)

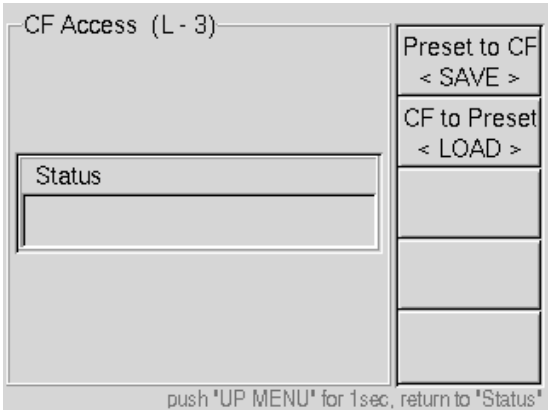


Figure 5-33 CF Access (1)

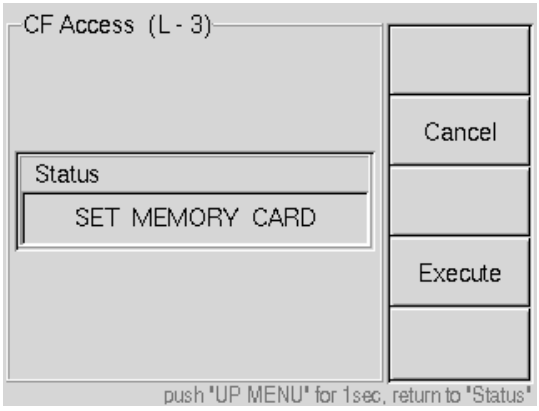


Figure 5-34 CF Access (2)

(3) When storing the LG 3802 (S1) settings, press the "Preset to CF" (F1) key.
When loading the LG 3802 (S1) settings, press the "CF to Preset" (F2) key (see Figure 5-33).

(4) The screen as shown in Figure 5-34 is displayed.
Press the Execute (F4) or Cancel (F2) key as required.

(5) When storing data, "LG3802_PRESET" folder is automatically created in the CF card, then preset data is written in this folder.
When loading data, contents in the "LG3802_PRESET" folder is read for presetting purpose.

(6) The access lamp by the connector lights while ACCESS is in progress (see Figure 5-35).
After data is written, Message is displayed in the Status column, then returns to the screen as shown in Figure 5-33.

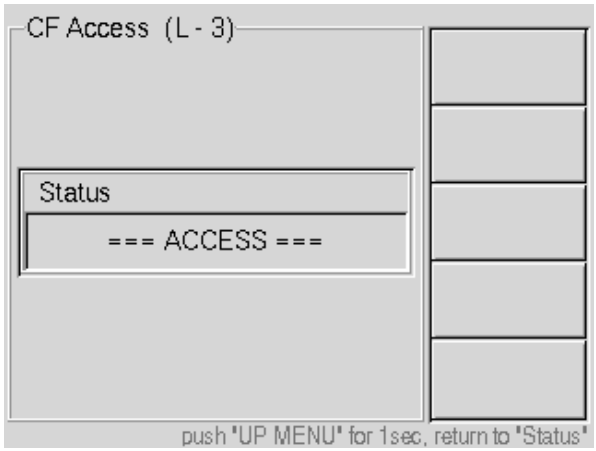


Figure 5-35 CF Access (3)

(7) Remove the CF card.

CF Access

- Messages after Access is completed:

Data is written on the CF.	Preset Data to CF: Success
Data is not written on the CF.	Preset Data to CF: Fail
Data is read from the CF.	CF to Preset Data: Success
Data is not read from the CF.	CF to Preset Data: Fail

- When the "LG3802_PRESET" folder is already provided, the folder contents are overwritten. Therefore, important data must be backed up properly on the computer or change the file name.
- When loading the CF contents, the current preset data stored in the LG 3802 (S1) is deleted. Therefore, important data must be backed up properly before loading the contents.
- When reading CF data is failed, confirm that the conditions below to perform correct operation:
  (1) The memory space is available on the CF card.
  (2) The file format should be set to FAT.

5.6.1.2 No Input

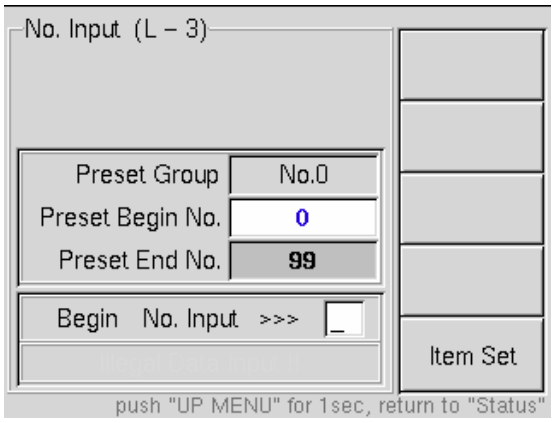


Figure 5-36 Begin/end address screen

- Item Set (F5)
  Selects the Begin or End address.
  Begin No. Sets the Begin address.
  End No. Sets the End address.

5.6.2 Config

This screen is used to set this instrument.

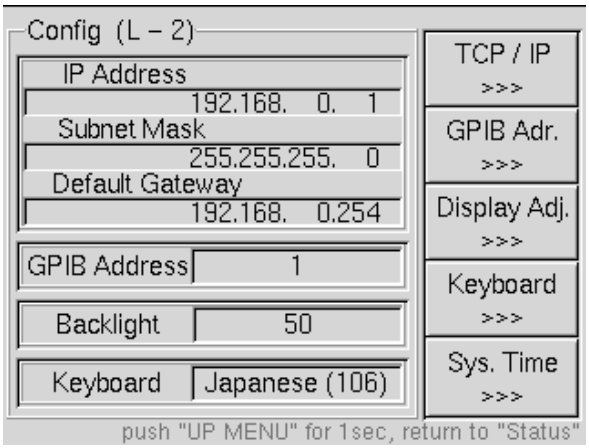


Figure 5-37 Config. screen

- TCP/IP (F1)
  Sets such as IP address when connecting the ETHERNET connector via Local Area Network (LAN).

- GPIB Adr. (F2)
  Sets the GPIB address for the equipment to be controlled.

- Display Adj. (F3)
  Adjusts LCD backlight brightness.

- Keyboard (F4)
  Selects the keyboard type to connect the USB connector on the front panel.

- Sys. Time (F5)
  Sets the calendar of this instrument.

5.6.2.1 TCP/IP

Sets the TCP/IP of this instrument.

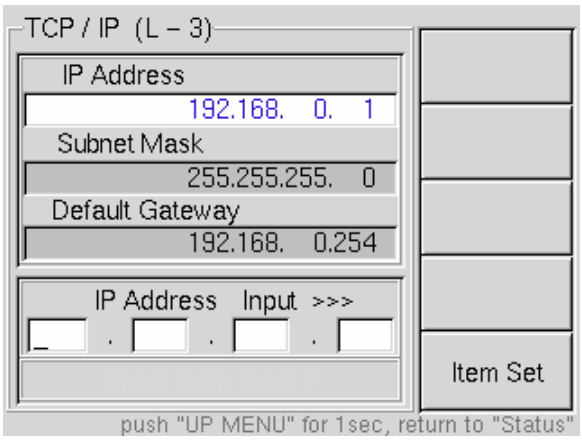


Figure 5-38 TCP/IP setting screen

- Item Set (F5)
  Select the following items.

IP Address	Sets the IP address. Use the numeric keypad.
Subnet Mask	Sets the subnet mask. Use the numeric keypad.
Default Gateway	Sets the default gateway. Use the numeric keypad.

∗ The setting conditions will be recalled when the power is turned on.

5.6.2.2 GPIB Address

This screen is used to set the GPIB address. Use the numeric keypad, or Up (F2) or Down (F4) key.

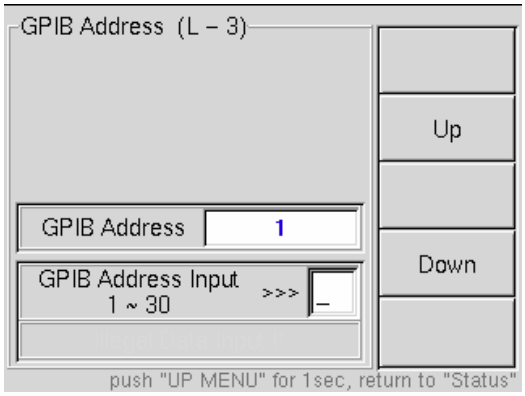


Figure 5-39 GPIB setting screen

∗ The setting conditions will be recalled when the power is turned on.

5.6.2.3 Display Adjust

Provides 10-step LCD backlight brightness control. Use the Up (F2) or Down (F4) key.

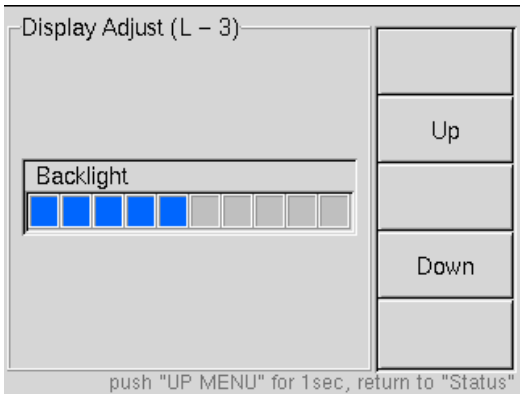


Figure 5-40 Backlight adjustment screen

5.6.2.4 Keyboard

This screen is used to select the keyboard type to connect the USB connector on the front panel.

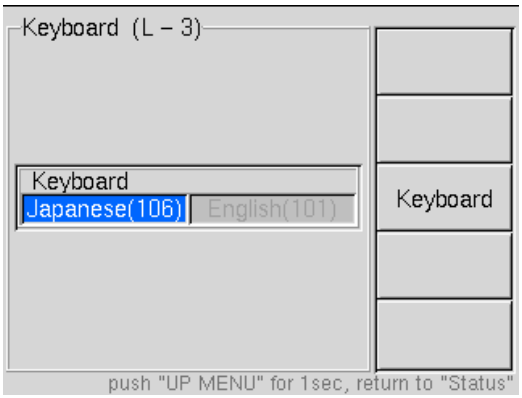


Figure 5-41 Keyboard selection screen

∗ There is no function currently. This screen will be enabled when new function is established in the future.

5.6.2.5 System Time

This screen is used to set the calendar of this instrument.

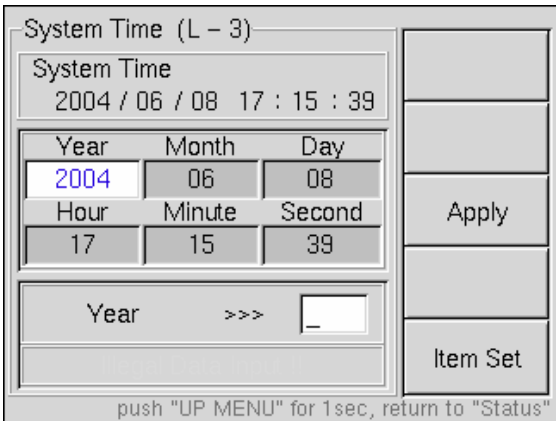


Figure 5-42 Calendar setting screen

- Item Set (F5)
  Sets the calendar.

Year	Sets the year.	Use the numeric keypad.
Month	Sets the month.	Use the numeric keypad.
Date	Sets the date.	Use the numeric keypad.
Hour	Sets the hour.	Use the numeric keypad.
Minute	Sets the minute.	Use the numeric keypad.
Second	Sets the second.	Use the numeric keypad.

- Apply (F3)
  Enters data to the System Time. A time lag may exist until data is fetched.

5.6.3 Freq. STD

This screen is used to select the reference signal.

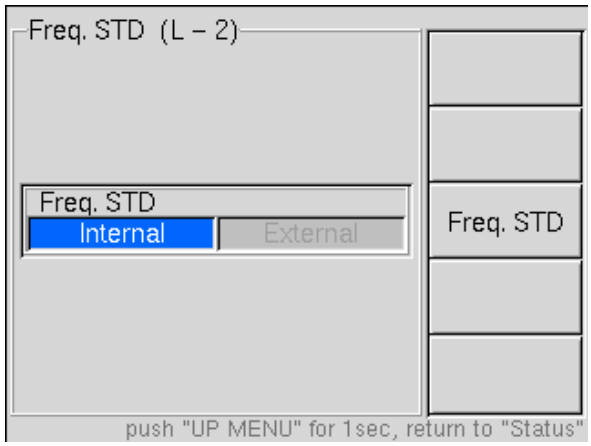


Figure 5-43 Reference frequency selection

- Freq.STD (F3)
  Selects the reference signal.
  - Internal — Internal OCXO is used for the reference signal.
  - External — The instrument synchronizes with the signal applied to the input connector on the rear panel.

Notes on selecting external REF

- When the reference signal is switched, the signal goes off temporarily since the hardware is reset.

Notes on using external REF

- Since all clock signals are generated from this reference signal, signal purity (phase noise characteristics) and tolerance will affect to coding operation and modulation.
- ARIB STD-B29 and B31 prescribe the allowable tolerance of the IFFT sample frequency is ±0.3 ppm. Therefore, the TV signal may not be received depending the reference signal characteristics; the high signal purity, stability, and accuracy should be required for the external reference.
  The Freq STD alarm on the top screen goes off even if the input signal tolerance is about 50 ppm. However, the alarm is activated with the 10 MHz PLL signal, it does not guarantee the RF output signal characteristics.

6. PRESET, GROUP

6.1 Preset

Up to 100 setting conditions can be stored and recalled by using the front panel key.

- Storing Data
  (1) Set the CODING, CHANNEL, LEVEL, etc.
  (2) Press the ADDRESS key. The PRESET number LED brinks.
  (3) Specify the address to store data by pressing the ↑ or ↓ key in the PRESET column, or enter address by using the numeric keypad.
  (4) When the address is directly set by using the numeric keypad, press the ENTER key.
  (5) Pressing the STORE key stores data.

There are two methods to recall the setting conditions:

- Direct recall
  To recall the desired memory number, press the ↑ or ↓ key in the PRESET column.
- Specifying address
  (1) Press the ADDRESS key. The PRESET number indicator LED brinks.
  (2) Specify the address to recall data by pressing the ↑ or ↓ key in the PRESET column, or enter address by using the numeric keypad.
  (3) Press the ENTER key to enter data.
  (4) Pressing the RECALL key recalls data.

6.2 GROUP

Up to ten groups can be set. Preset data can easily be used by incrementing or decrementing the preset range for each group.

- Setting group to be used
  (1) Press the Pre. Group (F1) key on the UTILITY screen to enter group setting screen.
  (2) Press the Preset Group (F5) key to select the desired group number.

- Setting preset range
  (1) Select the group number on the group setting screen.
  (2) Press the No. Input (F2) key to enter preset number setting screen, then set the Begin and End numbers.
  ∗ The End number must be larger than the Begin number.

- Recalling preset data
  (1) Press the ↑ or ↓ key, or the numeric keypad to specify the number to recall data. Refer to Section 5.6.1.
  ∗ Use the preset number within the specified range in the group being set. Otherwise, the preset number is canceled.

7. REMOTE CONTROL

This instrument can be remotely controlled (e.g., increments or decrements preset data) via the REMOTE CONTROL connector.

(1) Major Function — Increment, decrement, returning group top
(2) Connector — 57LE-40240-7700 (DDK Ltd.) or equivalent
(3) Input Level — TTL (Pull up to +3.3 V)
(4) Input Logic — Negative logic
(5) Output Level — TTL (GO/NO-GO), open collector (Alarm)
(6) Fan Out — 1 each
(7) Output Voltage — +12 V (Alarm)
(8) Output Logic — Positive logic/negative logic (GO/NO-GO), negative logic (Alarm)
(9) Pin Assignments — See Table 7-1

Table 7-1 Pin assignments

No.	Name	Input/Output	No.	Name	Input/Output
1	INC	Input	13	GO (Positive logic)	Output
2	DEC	Input	14	GO (Negative logic)	Output
3	RETURN	Input	15	NO-GO (Positive logic)	Output
4	Reserve		16	NO-GO (Negative logic)	Output
5	Reserve		17	Alarm	Output
6	Reserve		18	N. C.	
7	Reserve		19	N. C.	
8	Reserve		20	N. C.	
9	N. C.		21	N. C.	
10	N. C.		22	N. C.	
11	GND	GND	23	GND	GND
12	GND	GND	24	GND	GND

∗ About REMOTE CONTROL connector
- Do not apply external voltage to the output pins except Alarm pin.
- All pins are pulled up to +3.3 V. When externally control this instrument, do not apply voltage exceeding +5.0 V or negative voltages.

∗ Recalling preset conditions via the REMOTE CONTROL connector
- The preset conditions between the Begin and End address can be recalled by using the INC/DEC pins. The INC, DEC, and RETURN pins are Low active. Assert for at least one second.
- After setting is performed, wait for at least one second for the next setting.

∗ GO/NO-GO output pins
- Outputs TTL High or Low for GO/NO-GO judgement.

∗ Alarm output pin
- Outputs OR of three types of alarms displayed on the top screen in negative logic. Since the open collector output is used, pull up the circuit for connection.

∗ Operation while using GPIB and Ethernet
- The REMOTE CONTROL connector is enabled even when operating the instrument via the GPIB (in remote control mode) and Ethernet. When the REMOTE CONTROL connector is not used, disconnect any equipment from the connector.

8. GPIB

Since this instrument provides the GPIB (IEEE 488) connector as standard, major functions can be remotely controlled via the GPIB interface.

Note

The GPIB capability of this instrument is confirmed by using the GPIB board (PCI-GPIB, PCMCIA-GPIB) manufactured by National Instruments Corporation (NI). If other than the board mentioned above is used, operation may differ from the instructions in this manual. Therefore, the board mentioned above should be used when controlling this instrument.

8.1 Specifications

Standard	Conforms to ANSI/IEEE Std 488.1-1978
LSI Used	TMS9914A or equivalent
Code	ASCII

8.2 Interface Function

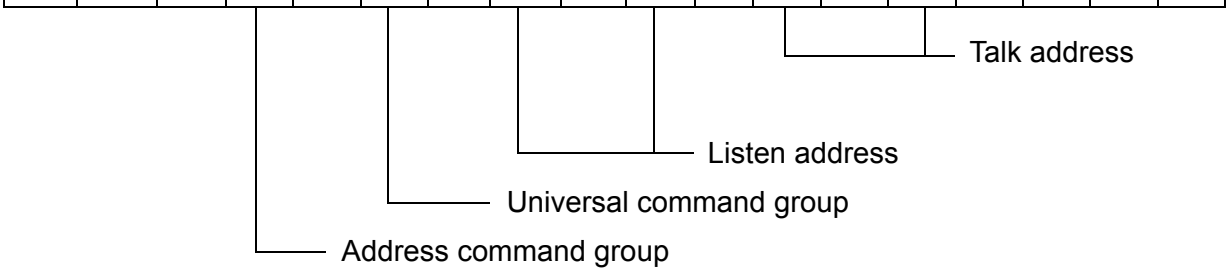
Table 8-1 Interface function

Function	Subset	Description
Source Handshake	SH1	All functions
Acceptor Handshake	AH1	All functions
Talker	T8	Basic talker function, canceling talker specified by listener
Listener	L4	Basic listener function, canceling listener specified by MTA
Service Request	SR0	No function
Remote/Local	RL2	No LLO function
Parallel Poll	PP0	No function
Device clear	DC1	All function
Device trigger	DT0	No function
Control	C0	No function
	E1	Open collector driver is used. State driver is used for EOI and DAV, however.

8.3 Interface Message Function

Table 8-2 Interface message and ASCII code

	Upper 4 bits	0		1		2		3		4		5		6		7	
Lower 4 bits		ASC	MSG	ASC	MSG	ASC	MSG	ASC	MSG	ASC	MSG	ASC	MSG	ASC	MSG	ASC	MSG
0		NUL				SPC		0		@		P		`		p	
1			GTL			!		1		A		Q		a		q	
2						"		2		B		R		b		r	
3						#		3		C		S		c		s	
4			SDC		DCL	$		4		D		T		d		t	
5						%		5		E		U		e		u	
6						&		6		F		V		f		v	
7						'		7		G		W		g		w	
8						(		8		H		X		h		x	
9						)		9		I		Y		i		y	
A		LF				*		:		J		Z		j		z	
B						+		;		K		[		k		{	
C						,		<		L		¥		l		|	
D		CR				-		=		M		]		m		}	
E						.		>		N		^		n		~	
F						/		?	UNL	O		_	UNT	o			



8.4 GPIB Address

Settable Range 1 to 30

Setting Procedure (Refer to Section 5.6.2.2.)

(1) Press the UTILITY key in the MENU group.
(2) Press the Config (F2) and GPIB Adr. (F2) keys sequentially to enter GPIB screen.
(3) Set the address.
(4) Turn power off, then turn power on. The address is now set.

8.5 Clear, Reset

The Clear and Reset modes can be controlled by using the commands.
The followings describe the reply for the clear and reset operations.

(1) IFC (Interface clear)
Reply of the universal command (IFC) is listed below.
- Cancels specified talker and listener.
- GPIB buffer and waiting command remain as is.
- Remote control conditions remain as is.
- Front panel control settings remain as is.

(2) DCL, SDC (Device clear)
Reply of the universal command (DCL) and address command (SDC) are listed below.
- Clears the GPIB buffer and waiting command.
- Interface conditions (specified talker and listener conditions) are remained.
- Enables the remote control mode.
- Front panel control settings remain as is.

(3) Returning power on
When the power is turned on again, the following operation is performed.
- Cancels specified talker and listener.
- Clears the GPIB buffer and waiting command.
- Enables the local control mode.
- Displays the top screen regardless of the display before turning power off.

8.6 REMOTE/LOCAL

The remote or local control mode can be selected by using the system controller and REMOTE key. Either remote or local control mode is always selected. Each status is described below.

(1) Local control mode
The local control mode is selected under the following conditions:
(a) Power is turned on. (Immediately after the instrument starts.)
(b) The REMOTE LED is turned off by pressing the REMOTE key.
(c) When GTL command is received.
(d) Remote control mode is canceled.

(2) Remote control mode
The remote control mode is enabled when the REN is in the truth state and this instrument is set to the listener. The REMOTE LED lights. In remote control mode, all front panel keys except the POWER switch and REMOTE key are disabled.
The instrument can be controlled via the ETHER connector. The REMOTE CONTROL connector can also be used to control this instrument. When the GPIB capability is enabled, do not connect the equipment (e.g., personal computer) to the ETHER or REMOTE CONTROL connector.

8.7 Multiline Message Command

Table 8-3 lists the multiline message command types and a reply to each command.

Table 8-3 Reply of multiline message command

Type	Name	Description	Reply
Universal Command	DCL	Clearing GPIB buffer	Yes
	SPE	Setting serial polling to State	No
	SPD	Clearing serial polling	No
	PPU	Clearing parallel polling	No
	LLO	Setting all devices to local lockout status to inhibit manual operation	No
Address Command	UNL	Canceling specified listener	Yes
	UNT	Canceling specified talker	Yes
	SDC	Clearing GPIB buffer	Yes
	PPC	Enabling line assignments of parallel poll to specified listener in parallel polling	No
	GTL	Setting specified device to local	Yes
	GET	Triggering specified device	No
	TCT	When there are two controllers in the system, the controller specified to the talker operates as a master	No

8.8 Program Message Format

When controlling this instrument via the GPIB interface, send the program codes from the controller to this instrument.

The program message consists of a single or multiple program codes.

The program code consisting of up to 255 bytes (including delimiter) per each program message in ASCII code can be received.

If the program code contains unspecified header or parameter outside the settable specified range, this program code is ignored even when the operation is performed.

8.9 Program Message Terminator

The terminator is used to delimit a program message. The following terminators can be used even if CR is attached.

(1) LF
(2) LF+EOI
(3) EOI

Separator for reply message ・・・";" (3Bh in ASCII code)
Terminator for reply message ・・・CR+LF+EOI

8.10 Program Code Format

The program code consists of header, and data in accordance with requirements.

(1) Character
Use uppercase letters should be used for header and data.

(2) Delimiter between header and data
Insert a space (20h in ASCII code) between header and data.
Also insert a space before "?" for query.

(3) Program message unit separator
Use a semicolon ";" (3Bh in ASCII code) when transfers multiple messages simultaneously.

(4) Program data separator
Use a comma "," (2Ch in ASCII code) to delimit multiple parameters.

8.11 Program Code List

Table 8-4 Setting code list

	Header	Data		Description	Unit
1	SY	n	0 to 4	Selecting broadcasting system	
2	TS	n	0 to 6	Selecting TS input	
		p	0 to 2	Type of TS input, or ROM video pattern	
		q	0 to 3	ROM screen size	
		r	0 to 2	ROM sound pattern	
3	PD	n	1 to 32	Assigning PID to hierarchical layer	
		p	0 to 3	Hierarchical layer assigned	
		q	0 to 1FFF	PID value	Converted into hexadecimal number
4	UD	n	1 to 3	Assigning undefined PID to hierarchical layer	
5	TR	n	1 to 5	Setting TMCC preset pattern	
6	EM	n	0 to 1	Setting EMG bit	
7	MD	n	0 to 1	Selecting Current/Next	
		p	1 to 3	Setting mode	
8	GI	n	0 to 1	Selecting Current/Next	
		p	0 to 3	Setting guard Interval (C, N)	
9	PH	n	0 to 7	Setting phase-shift-correction value (Tsb) (C, N)	
13	CO	n	0 to 1	CN on (1), off (0)	
14	CN	i	0.0 to 30.0	Setting C/N value	dB
15	CU			CN value UP	
16	CD			CN value DOWN	
17	CL	n	0 to 2	Selecting digit to be set	
18	BO	n	0 to 1	Setting BER measurement on (1), off (0)	
21	BU	ne	0.00E-0 to 9.99E-1	Setting upper limit of BER threshold value	
22	BL	ne	0.00E-0 to 9.99E-1	Setting lower limit of BER threshold value	
23	BI	n	1 to 3	Specifying hierarchical layer to be set	
		p	1 to 43200	Setting BER measurement interval	sec
24	BM	n	1 to 3	Setting measurement layer	
25	CH	n	1 to 62 C13 to C63	Setting channel	
26	RF	i	50.000 to 860.000	Setting RF frequency	MHz
27	FU			Frequency UP	
28	FD			Frequency DOWN	
29	DF	n	0 to 5	Selecting digit to be set	
30	LM	i	-100.0 to 13.0, OFF (＊1) -105.0 to 8.0, OFF (＊2) -110.0 to 3.0, OFF (＊3)	Output level	dBm
31	DU			Output level UP	
32	DD			Output level DOWN	
33	DL	n	0 to 2	Selecting digit to be set	
34	CK	n	0 to 1	Selecting reference signal	
35	ST	n	0 to 99	Setting address to store data	
36	RC	n	0 to 99	Setting address to recall data	
37	RU			Address increment	
38	RD			Address decrement	
39	RR			Returning to begin address	
40	GR	n	0 to 9	Selecting group	
41	GS	n	0 to 9	Setting begin and end addresses in each group	
		p	0 to 98	Setting begin address	
		q	1 to 99	Setting end address	
42	CW	n	0 to 1	Setting modulation on (0), off (1)	

	Header	Data		Description	Unit
43	LV	i	7.0 to 120.0, OFF (＊1) 2.0 to 115.0, OFF (＊2) -3.0 to 110.0, OFF (＊3)	Output level	dBμV
44	LW	i	-53.0 to 60.0, OFF (＊1) -58.0 to 55.0, OFF (＊2) -63.0 to 50.0, OFF (＊3)	Output level	dBmV
45	TT	n	0 to 1	Rewriting TOT	
46	PI	n	0 to 1	Rewriting parameter	
		p	0000 to FFFF	TS-ID	
		q	0000 to FFFF	Service ID	
		r	1 to 12	Remote Key ID	
47	CC	i	13 to 63	Setting CATV channel	
48	LO	n	0 to 1	Setting level offset	
49	LS	n	1 to 8	Points of Frequency	
		i	50.000 to 860.000	RF frequency	
		j	-20.0 to 20.0	Output level offset	
50	SC	n	3 to 40(＊3) 6 to 37(＊2) See Table 5-4 (＊4)	Subchannel number	
51	OC	n	2 to 18	Begin subchannel number occupied in connected segment transmission	
		p	1 to 18 (＊5) 2 to 7 (＊6)	Segment number transmitted	
52	AL	n	0 to 1	Updating of status display screen on (1), off (0)	

(＊1) For Television, Sound 8-3, Sound 8-1
(＊2) For Sound 3 seg
(＊3) For Sound 1 seg
(＊4) For Sound 8-1 or Sound 8-3
(＊5) For Sound 8-1
(＊6) For Sound 8-3

Table 8-5 Query code list

	Header	Data		Description	Reply
1	SY		?	Reading selection status of broadcasting system	n
2	TS		?	Reading signal selected to TS input	n, p, q, r
3	PD	n	?	Reading to assign PID to hierarchical layer	n, p, q
4	UD		?	Reading assignment destination status for undefined PID	n
6	EM		?	Reading setting status of EMG bit	n
7	MD	n	?	Reading setting status of mode (C, N)	n, p
8	GI	n	?	Reading setting status of guard Interval (C, N)	n, p
9	PH		?	Reading setting status of (C, N) of phase-shift-correction value (Tsb)	n, p
10	LA	n	?	Reading setting status of modulation parameter (C, N) (Para) of hierarchical layer A	n, p, q, r, s
11	LB	n	?	Reading setting status of modulation parameter (C, N) (Para) of hierarchical layer B	n, p, q, r, s
12	LC	n	?	Reading setting status of modulation parameter (C, N) (Para) of hierarchical layer C	n, p, q, r, s
13	CO		?	Reading setting status of CN on (1), off (0)	n
14	CN		?	Reading setting status of C/N value	i
17	CL		?	Reading setting status of step to be set	n
18	BO		?	Reading setting status of BER measurement on (1), off (0)	n
19	BR		?	Reading BER value	ne
20	BJ		?	Reading judgement results	ne, n
21	BU		?	Reading setting status of upper limit for BER threshold value	ne
22	BL		?	Reading setting status of lower limit for BER threshold value	ne
23	BI	n	?	Reading setting status of BER measurement interval	n, p
24	BM		?	Reading setting status of BER measurement hierarchical layer	n
25	CH		?	Reading setting status of channel	n
26	RF		?	Reading setting status of RF frequency	i
29	DF		?	Reading setting status of digit to be set	n
30	LM		?	Reading output level in unit of dBm	i
33	DL		?	Reading setting status of digit to be set	n
34	CK		?	Reading selection status of reference signal	n
40	GR		?	Reading selection status of group	n
41	GS	n	?	Reading setting status of begin and end addresses in each group	n, p
42	CW		?	Reading setting status of modulation	n
43	LV		?	Reading output level in unit of dBμV	i
44	LW		?	Reading output level in unit of dBmV	i
45	TT		?	Reading TOT rewriting settings	n
46	PI		?	Reading parameter settings	n, p, q, r
47	CC		?	Reading CATV channel settings	n
48	LO		?	Reading setting status of level offset	n
49	LS	n	?	Reading setting status of offset	n, i, j
50	SC		?	Reading subchannel settings	n
51	OC		?	Reading occupied subchannel settings	n, p
52	AL		?	Reading the settings for updating of status display screen	n

For dedicated option program codes, refer to the Chapter of each option.

8.12 Detail Program Code

This section describes the detail program codes listed in Section 8.11.
Definition:

n, p, q, r, s	0 and natural number
i, j	Integer including decimal point
ne	Real number including exponential number
a	Character in ASCII code
c	Character code reserved
_	Space (20h in ASCII code)

- Terminator is omitted for a syntax. Add the terminator at the end of the code (refer to Section 8.9).
- Header is not added for reply; the reply code consists of data only.

(1) Selecting broadcasting system ....."SY"

Function Selecting and querying broadcasting system.
Syntax SY_n (Setting, reply)
SY_? (Query)

n	Broadcasting system Selection
0	Television (13 seg)
1	Sound (1 seg)
2	Sound (3 seg)
3	Sound (Connected segment transmission, 1 segment)
4	Sound (Connected segment transmission, 3 segments)

(2) Selecting TS input....."TS"

Function Selecting and querying TS for channel coding.
Syntax TS_n (, p, q, r) (Setting, reply)
TS_? (Query)

∗ In this program code, the amount of consequent data depends on "n" selected.

n	TS Input Selection
0	PN (Short)
1	External ASI
2	External SPI
3	Internal (OP71)
4	Reserve (Not used)
5	ROM
6	PN (Long)

∗ "3" is only enabled when the USB STORAGE Option (OP71) is installed.

For external ASI or external SPI

p	TS Type Selection
0	MPEG-2 TS
1	ISDB-T TS

For Internal (OP71 installed. Reply only; no setting is required.)

p	Drive Used
0	Internal HDD
1	USB STORAGE

For ROM

p	Pattern Selection
0	Color Bar
1	Ramp
2	Monoscope

q	Screen Size Selection
0	1920 x 1080 (16:9)
1	1440 x 1080 (16:9)
2	720 x 480 (16:9)
3	720 x 480 (4:3)

r	Sound Pattern
0	L: 1 kHz, R: 400 Hz
1	L, R: 1 kHz
2	L, R: 400 Hz

For PN (Long)

p	PN Long Selection
0	Inverted (-)
1	Normal (+)

(1) For PN (Short)	TS_0	(PN-short)
(2) For ASI, SPI	TS_1, 0	(ASI, MPEG-2 TS)
(3) For ROM	TS_5, 1, 0, 2	(Ramp, 1920x1080, 400 Hz)
(4) For Internal	TS_3 (at setting)	
	Reply for TS_?	3, 0
(5) For PN (Long)	TS_6, 1 (at setting)	(PN-long (+))

∗ For ROM, refer to Section 5.1.2.3 for selecting the pattern.
∗ Combination of the monoscope pattern and 1440 x 1080 cannot be set. (Setting is ignored.)
∗ Setting is ignored when "n" and following data are not matched.
∗ When playing back the TS from internal HDD or USB STORAGE, setting the TS command forcibly stops playback operation.

(3) Setting PID hierarchical layer ..... "PD"

Function Setting and querying PID by each hierarchical layer when ASI or SPI is specified for external input.

Syntax PD_n, p (, q) (Setting, reply)
PD_n_? (Query)

n	PID Number Selection
1 to 32	Internal control number for instrument

p	Hierarchical layer Setting
0	Not specified (Deleting PID)
1	Hierarchical layer A
2	Hierarchical layer B
3	Hierarchical layer C

q PID value: 0 to 1FFF Enter data in hexadecimal notation

∗ When deleting PID value numbered in "n", transfer data with "n" and "p" (enter 0).

∗ This command is enabled when ASI or SPI, and MPEG-2 TS are selected.

(4) Assigning undefined PID to hierarchical layer ..... "UD"

Function Setting and querying destination to assign PID other than the PID specified in Step (3).

Syntax UD_n (Setting, reply)
UD_? (Query)

n	Undefined PID Hierarchical layer Setting
1	Hierarchical layer A
2	Hierarchical layer B
3	Hierarchical layer C

∗ The following conditions should be satisfied, otherwise, this program code is ignored.
ASI or PSI is selected.
MPEG-2 TS is selected.
The hierarchical layer corresponding to the Modulation should be set to specify hierarchical layers B and C.

(5) Selecting TMCC preset pattern ..... "TR"

Function Selecting TMCC preset pattern.

Syntax TR_n (Setting)

n	TMCC Pattern
1	Preset 1
2	Preset 2
3	Preset 3
4	Preset 4
5	Preset 5

(6) Setting EMG bit......"EM"

Function Setting and querying EMG bit in the TMCC.

Syntax EM_n (Setting, reply)

EM_? (Query)

n	EMG Bit
0	Off
1	On

(7) Setting mode....."MD"

Function Setting and querying coding mode.

Syntax MD_n, p (Setting, reply)

MD_n_? (Query)

n	Current/Next
0	Current
1	Next

p	Mode
1	MODE 1
2	MODE 2
3	MODE 3
4	Not used

∗ "Not used" can only be used for Next. If the Current is selected, improper operation may result.

∗ Do not use this program code when broadcasting TS in ASI or SPI, and ROM are selected.

∗ Do not use this program code when broadcasting TS is selected in internal mode.

(8) Setting guard interval....."GI"

Function Setting and querying guard interval in coding mode.

Syntax GI_n, p (Setting, reply)

GI_n_? (Query)

n	Current/Next
0	Current
1	Next

p	Mode
0	1/4 or not used
1	1/8
2	1/16
3	1/32

∗ Do not use this program code when broadcasting TS in ASI or SPI, and ROM are selected.

∗ Do not use this program code when broadcasting TS is selected in internal mode.

(9) Setting phase-shift-correction value ....."PH"

Function Setting and querying Phase-shift-correction value in coding mode.

Syntax PH_n (Setting, reply)

PH_? (Query)

n	Phase-shift-correction value
0	0
1	1/8
2	2/8
3	3/8
4	4/8
5	5/8
6	6/8
7	7/8

∗ This program code is only applied to the connected segment transmission in the broadcasting system. When other mode is selected, this code will be ignored.

(10) Modulation parameter ....."LA"

Function Querying current modulation parameter for hierarchical layer A.

Syntax n, p, q, r, s (Reply)

LA_n_? (Query)

n	Current/Next
0	Current
1	Next

p	Carrier Modulation
0	QPSK
1	DQPSK
2	16QAM
3	64QAM
4	Not used

q	Code Rate
0	1/2
1	2/3
2	3/4
3	5/6
4	7/8
5	Not used

r	Length of Time Interleaving		
	MODE 3	MODE 2	MODE 1
0	0	0	0
1	1	2	4
2	2	4	8
3	4	8	16
4 (*)	8	16	32
5	Not used	Not used	Not used

* Sound broadcasting only

s	Number of Segments
0 to 13	Number of segments (for Television)
P, 2	Number of segments (for Sound 3 segments)
1	Number of segments (for Sound 1 segment)
P	Partial reception (for 1 segment)
14	Not used

* This program code cannot set the modulation parameter. Query is only performed.

(11) Querying modulation parameter......"LB"

Function Querying current modulation parameter for hierarchical layer B.

Syntax n, p, q, r, s (Reply)

LB_n_? (Query)

Data "n," "p," "q," "r," and "s" are the same as the Step (10) "LA."

* This program code cannot set the modulation parameter. Query is only performed.

(12) Querying modulation parameter....."LC"

Function Querying current modulation parameter for hierarchical layer C.

Syntax n, p, q, r, s (Reply)

LC_n_? (Query)

Data "n," "p," "q," "r," and "s" are the same as the Step (10) "LA."

* This program code cannot set the modulation parameter. Query is only performed.

(13) Setting C/N on/off ..... "CO"

Function Setting and querying C/N set in Step (14) on/off.

Syntax CO_n (Setting, reply)

CO_? (Query)

n	C/N On/Off
0	Off
1	On

(14) Setting C/N value ..... "CN"

Function Setting and querying C/N value added.

Syntax CN_i (Setting, reply)

CN_? (Query)

i C/N value: 0 to 30.0 (dB) Effective down to one digit after the decimal point

(15) Incrementing C/N value ..... "CU"

Function Incrementing C/N value in current steps.

Syntax CU (Setting)

(16) Decrementing C/N value ..... "CD"

Function Decrementing C/N value in current steps.

Syntax CD (Setting)

(17) Setting preset steps for C/N value ..... "CL"

Function Setting preset steps for incrementing and decrementing C/N value.

Syntax CL_n (Setting, reply)

CL_? (Query)

n	C/N Value Steps
0	0.1
1	1.0
2	10.0

(18) Setting BER measurement ..... "BO"

Function Setting and querying BER measurement.

Syntax BO_n (Setting, reply)

BO_? (Query)

n	BER Measurement
0	Off
1	On

∗ This program code can only be used when the Source is set to PN.

(19) Reading BER measurement value ..... "BR"

Function Reading BER measurement value.

Syntax ne (Reply)

BR_? (Query)

BER measurement value ne: Replied in exponential format of 0.00E-0

∗ This program code can only be used when the Source is set to PN.

(20) Reading BER judgement results ..... "BJ"

Function Reading BER GO/NO-GO judgement results in accordance with measurement value.

Syntax ne_n (Reply)

BJ_? (Query)

BER measurement value ne: Replied in exponential format of 0.00E-0

n	BER Measurement
0	NO-GO
1	GO

∗ This program code can only be used when the Source is set to PN.

(21) Setting upper limit of BER ..... "BU"

Function Setting and querying upper limit for GO/NO-GO judgement.

Syntax BU_ne (Setting, reply)

BU_? (Query)

BER upper value ne: Exponential format of 0.00E-0

∗ This program code can only be used when the Source is set to PN.

∗ When the value set is below the current lower limit, the value is ignored due to handled as an error.

(22) Setting lower limit of BER..... "BL"

Function Setting and querying lower limit for GO/NO-GO judgement.

Syntax BL_ne (Setting, reply)

BL_? (Query)

BER lower value ne: Exponential format of 0.00E-0

∗ This program code can only be used when the Source is set to PN.

∗ When the value set is above the current upper limit, the value is ignored due to handled as an error.

(23) Setting BER measurement interval ...."BI"

Function Setting and querying BER measurement interval.

Syntax BI_n, p (Setting, reply)

BI_n_? (Query)

n	Specifying Hierarchical Layer
1	Hierarchical layer A
2	Hierarchical layer B
3	Hierarchical layer C

BER measurement interval p: 1 to 43200 sec.

∗ The value set in second is converted into the number of packets ; it cannot be set in number of packets.

(24) Setting BER measurement layer....."BM"

Function Setting and querying BER measurement layer.

Syntax BM_n (Setting, reply)

BM_? (Query)

n	Layer Setting
1	Hierarchical layer A
2	Hierarchical layer B
3	Hierarchical layer C

∗ This program code can be used when the corresponding hierarchical layer is set in Modulation mode.

Notes on program code for (18) to (24)

When TS input is set other then the PN, both setting and querying operations are disabled.

(25) Setting RF channel....."CH"

Function Setting and querying RF channel (VHF, UHF, CATV).

Syntax CH_n (Setting, reply)

CH_? (Query)

n RF channel: 1 to 62 for VHF and UHF
C13 to C63 for CATV

∗ This program code is ignored when querying channel set in frequency.

(26) Setting RF frequency....."RF"

Function Setting and querying RF frequency.

Syntax RF_i (Setting, reply)

RF_? (Query)

i RF frequency: 50.000 to 860.000 (MHz), effective down to three digits after decimal point

∗ This program code is ignored when querying frequency set in channel.

(27) Incrementing frequency or channel ...."FU"

Function Incrementing frequency in current steps when RF is set in frequency.
Incrementing channel by one when RF is set in channel.

Syntax FU (Setting)

(28) Decrementing frequency or channel .."FD"

Function Decrementing frequency in current steps when RF is set in frequency.
Decrementing channel by one when RF is set in channel.

Syntax FD (Setting)

(29) Setting frequency in current steps....."DF"

Function Setting and querying increment/decrement of frequency in current steps.

Syntax DF_n (Setting, reply)
DF_? (Query)

n	Frequency Steps
0	0.001
1	0.01
2	0.1
3	0.143
4	1.0
5	10.0

∗ This program code is ignored when frequency is set in channel.

(30) Setting output level....."LM"

Function Setting and querying output level.

Syntax LM_i (Setting, reply)
LM_? (Query)

i Output level: -100.0 to +13.0 (dBm) For Television, Sound (8-3seg), and Sound (8-1seg)
-105.0 to +8.0 (dBm) For Sound (3seg)
-110.0 to +3.0 (dBm) For Sound (1seg)
OFF

(Effective down to one digit after the decimal point)

(31) Incrementing output level ....."DU"

Function Incrementing output level in current steps.

Syntax DU (Setting)

(32) Decrementing output level....."DD"

Function Decrementing output level in current steps.

Syntax DD (Setting)

(33) Setting output level steps ..... "DL"

Function Setting and querying increment/decrement of output level steps.

Syntax DL_n (Setting, reply)

DL_? (Query)

n	Output Level Steps
0	0.1
1	1.0
2	10.0

(34) Selecting reference clock ..... "CK"

Function Setting and querying reference clock.

Syntax CK_n (Setting, reply)

CK_? (Query)

n	Reference Clock
0	Internal
1	External input

(35) Writing preset memory ..... "ST"

Function Storing current setting conditions to specified number.

Syntax ST_n (Setting)

n Preset number 0 to 99

(36) Reading preset memory ..... "RC"

Function Reading preset values of specified number.

Syntax RC_n (Setting)

n Preset number 0 to 99

(37) Incrementing preset number ..... "RU"

Function Incrementing preset number.

Syntax RU (Setting)

(38) Decrementing preset number ..... "RD"

Function Decrementing preset number.

Syntax RD (Setting)

(39) Preset return ..... "RR"

Function Returning preset number to top.

Syntax RR (Setting)

(40) Selecting group ..... "GR"

Function Setting and querying group.

Syntax GR_n (Setting, reply)

GR_? (Query)

n Group number 0 to 9

(41) Setting group ..... "GS"

Function Setting and querying group.

Syntax GS_n, p, q (Setting, reply)

GS_n_? (Query)

n Group number 0 to 9

p Begin address 0 to 98

q End address 1 to 99

∗ The address numbers should be: begin address < end address.

(42) Setting modulation..... "CW"

Function Setting and querying modulation.

Syntax CW_n (Setting, reply)

CW_? (Query)

n	Modulation
0	Modulation output
1	CW (carrier) output

(43) Output level (dBμV) ..... "LV"

Function Setting and querying output level in unit of dBμV

Syntax LV_i (Setting, reply)

LV_? (Query)

i Output level: +7.0 to +120.0 dBμV (for Television, Sound 8-3 seg, Sound 8-1seg)

+2.0 to +115.0 dBμV (for Sound 3 seg)

-3.0 to +110.0 dBμV (for Sound 1 seg)

OFF

(Effective down to one digit after the decimal point)

(44) Output level (dBmV) ..... "LW"

Function Setting and querying output level in unit of dBmV

Syntax LW_i (Setting, reply)

LW_? (Query)

i Output level: -53.0 to +60.0 dBmV (for Television, Sound 8-3 seg Sound 8-1seg)

-58.0 to +55.0 dBmV (for Sound 3 seg)

-63.0 to +50.0 dBmV (for Sound 1 seg)

OFF

(Effective down to one digit after the decimal point)

(45) Rewriting TOT ..... "TT"

Function Setting and querying rewriting function for TOT

Syntax TT_n (Setting, reply)

TT_? (Query)

n	Rewriting TOT
0	Off
1	On

(46) Setting reception parameter ..... "PI"

Function Setting and querying reception parameter

Syntax PI_n, p, q, r (Setting, reply)

PI_? (Query)

n	Rewriting Parameter
0	Off
1	On

p TS-ID : 0000 to FFFF (hexadecimal number)

q Service ID : 0000 to FFFF (hexadecimal number)

r Remote Key ID : 1 to 12 (natural number)

∗ When the parameter rewriting mode is set off, TS-ID, Service ID, and Remote Key ID settings are ignored.

(47) Setting RF channel (CATV) ..... "CC"

Function Setting and querying CATV channel

Syntax CC_n (Setting, reply)

CC_? (Query)

n CATV channel : 13 to 63

∗ Use "CH" for setting the VHF and UHF channels. (Refer to Step (25) in the Section 8.12, "Detail Program Code" for detail.)

∗ The query operation is ignored when the channel is set in frequency, or VHF or UHF mode is selected.

(48) Setting offset on/off ..... "LO"

Function Setting and querying output level offset mode on/off

Syntax LO_n (Setting, reply)

LO_? (Query)

n	Setting offset on/off
0	Off
1	On

(49) Setting level offset ..... "LS"

Function Setting and querying the receiving parameter

Syntax LS_n, i, j (Setting, reply)

LS_n_? (Query)

n	Frequency point
1	Frequency point No. 1
2	Frequency point No. 2
3	Frequency point No. 3
4	Frequency point No. 4
5	Frequency point No. 5
6	Frequency point No. 6
7	Frequency point No. 7
8	Frequency point No. 8

i RF frequency: 50.000 to 860.000 (MHz)

j Offset value: -20.0 to 20.0 (dB)

∗ Each frequency should be set as follows:

No.1 < No.2 < ・・・< No.8

The setting that violates this relation is ignored.

(50) Setting subchannel ..... "SC"

Function Setting and querying subchannel

Syntax SC_n (Setting, reply)

SC_? (Query)

n Subchannel: 3 to 40 (for Sound 1 seg)
6 to 37 (for Sound 3 seg)
See Table 5-4 (for Sound 8-1 seg or Sound 8-3 seg)

∗ For setting subchannel, refer to Section 5.3.2 for details.

∗ This setting is only enabled when other than the Television is selected in the broadcasting system, and channel is set in VHF/UHF or CATV mode. Other cases are ignored.

∗ Setting and querying are disabled when the channel is set in frequency.

(51) Setting Begin subchannel number occupied in connected segment transmission ..... "OC"

Function Selecting and querying Begin subchannel number occupied in connected segment transmission

Syntax OC_n, p (Setting, reply)

OC_? (Query)

n Begin subchannel number occupied in connected segment transmission:
2 to 18 (for Sound 8-1 seg or Sound 8-3 seg)

p Segment number transmitted: 1 to 8 (for Sound 8-1 seg)
2 to 7 (for Sound 8-3 seg)

∗ This setting is only enabled when the sound (8-1 seg) or Sound (8-3 seg) is selected, and channel is set in VHF/UHF or CATV mode. Other cases are ignored.

∗ Setting and querying are disabled when the channel is set in frequency.

Table 8-6 Settable subchannel list

Begin subchannel number occupied in connected Segment Transmission	Segment number transmitted															
	Sound(8-1seg)								Sound(8-3seg)							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
2	3	6	9	12	15	18	21	24	-	6	9	12	15	18	21	-
3	4	7	10	13	16	19	22	25	-	7	10	13	16	19	22	-
4	5	8	11	14	17	20	23	26	-	8	11	14	17	20	23	-
5	6	9	12	15	18	21	24	27	-	9	12	15	18	21	24	-
6	7	10	13	16	19	22	25	28	-	10	13	16	19	22	25	-
7	8	11	14	17	20	23	26	29	-	11	14	17	20	23	26	-
8	9	12	15	18	21	24	27	30	-	12	15	18	21	24	27	-
9	10	13	16	19	22	25	28	31	-	13	16	19	22	25	28	-
10	11	14	17	20	23	26	29	32	-	14	17	20	23	26	29	-
11	12	15	18	21	24	27	30	33	-	15	18	21	24	27	30	-
12	13	16	19	22	25	28	31	34	-	16	19	22	25	28	31	-
13	14	17	20	23	26	29	32	35	-	17	20	23	26	29	32	-
14	15	18	21	24	27	30	33	36	-	18	21	24	27	30	33	-
15	16	19	22	25	28	31	34	37	-	19	22	25	28	31	34	-
16	17	20	23	26	29	32	35	38	-	20	23	26	29	32	35	-
17	18	21	24	27	30	33	36	39	-	21	24	27	30	33	36	-
18	19	22	25	28	31	34	37	40	-	22	25	28	31	34	37	-

∗ When Sound8-3 mode is selected, 1 and 8 of the segment numbers transmitted cannot be set.

(52) Setting the updating of status display screen .....”AL”

Function Setting and querying the updating of Status Window display

Syntax AL_n (Setting, reply)

AL_? (Query)

n	Updating of status display screen
0	Off
1	On

When the updating of status display screen is set to Off, the screen shown in the figure below is displayed.

Figure 8-1 Screen that sets Off setting of updating of the status display screen

＊When you want to control remotely at high speed and continuation, please set this setting to Off.

9. ETHERNET

9.1 Connection

When constructing the network system via the ETHERNET connector, use a STP cable conforming to 100BASE-TX standards.
Use a straight cable when connecting the network via a hub. Use a cross cable when connecting a personal computer.
Network manager should set the TCP/IP of this instrument according to your local network environments.

9.2 Operating with Personal Computer

Use the TELNET when remotely controlling the LG 3802 (S1) by using a commuter. To startup the TELNET, refer to the personal computer instruction manual.

∗ Starting TELNET with the Windows 2000

① Select TELNET from the START menu.
② When IP address assigned to the LG 3802 (S1) is "192.168.0.1," enter "telnet 192.168.0.1."
③ The LG 3802 (S1) and TELNET is now connected.

When TELNET is started, "login:" is displayed. Enter "lg3802."
When "Password" is displayed, enter "lg3802."
The login name and password cannot be changed.
Prefix "rem" to the command listed in Tables 8-4 and 8-5 for run the system. Attach "?" after the command to read setting value.

Example 1: When setting the frequency to 500 MHz, output level to -60 dBm, proceed as follows:
rem ☐ RF ☐ 500 ENTER
rem ☐ LM ☐ -60 ENTER
∗ ☐ is a space. Enter a space between header and data code.

Example 2: When reading the channel being set, proceed as follows:
rem ☐ CH ☐ ? ENTER
∗ Enter a space between header, data code, and "?."

Notes on using Ethernet

This instrument can be controlled via the Ethernet even when operating via the GPIB interface, or REMOTE CONTROL mode is in operation. When Ethernet is only used, disconnect other cables.

∗ Windows is a registered trademark of Microsoft Corporation.
Operation of this instrument is confirmed by using Windows 2000 (SP2), however, the system may operate incorrectly depending on the personal computer environments.

10. OP71 USB STORAGE OPTION (Factory Option)

10.1 specifications

10.1.1 General

The OP71 USB STORAGE Option is designed to install to the LG 3802 (S1) main frame. This option provides the internal 80-GB 2.5" HDD and the USB2.0 connector to which either an external HDD or a DVD-ROM drive users both may possess could be connect. Therefore, the TS can be played back from those devices, and it enables all-in-one system including the TS generator.

10.1.2 Features

- MPEG-2 TS or the broadcasting TS can be played back from the internal HDD.
- Since internal flash memory is used to start OS and applications, no problem will occur even if power is accidentally turned off.
  Entire capacity of internal HDD can be used for storing and playing back data.
- Description of the stream (e.g., packet size, bit rate) is analyzed and automatically set. In addition, for the broadcasting TS, the modulation setting is carried out automatically.
- MPEG-2 TS can be played back directly from an external connection HDD via USB2.0 (＊1)
- TS data stored on the USB STORAGE can be fetched to the internal HDD.
- Up to 419 MB data can be stored in the RAM and played back.
- The played back range (i.e., start to end) can be set by time length or in number of packets.
- It can be replaced from the front panel, however, contact your local LEADER agent when replacing the Internal HDD.

＊1 Depending on the performance of the connected device, there may be the case that can not play back.

10.1.3 Specifications

10.1.3.1 Internal HDD

Type, Format	2.5 “ IDE interface
Disk Format	EXT3
Rotational Speed	5400rpm
Speed	Up to 100 MB/s (U-DMA5)
Capacity	80GB
Installable Number	1
Maintenance	Installing and detaching are possible from the front panel

10.1.3.2 USB Interface

Specifications	USB2.0
Function	Connects the external HDD or DVD drive applicable to USB2.0

- ∗ Power source supply from the USB terminal is not possible. When you connect the device of the bus power drive, please use an external power supply.
- ∗ Depending on the affinity of the device connected and this instrument, there may be the case that does not operate normally.
- ∗ Even the device which does not support USB2.0 can be connected. However, a noise might enter the video and sound which are played back by the relation with a transfer rate.
- ∗ As for a front terminal and the rear terminal, the device that can be connected is one respectively.
- ∗ The connection via a USB hub may not operate normally.

10.1.3.3 Applicable External HDD

Interface	USB2.0
Disk Format	VFAT,NTFS (Read Only)
Rotational Speed	5400 rpm or more
Baud Rate	100MB/s or more

- ∗ This option does not provide the function that writes the data to USB STORAGE.
- ∗ There is no function of defragmentation in this option.
- ∗ Please use partition of HDD by one partition. When there are two or more partition, only first partition is recognized.

10.1.3.4 Applicable external DVD-ROM Drive

Interface	USB2.0
Applicable Media	CD-ROM, CD-R, CD-RW, DVD-ROM, DVD±R, DVD±RW

- ∗ This option does not provide the function that writes the data to USB STORAGE.
- ∗ The data written by the Packet Write is not supported.
- ∗ This option can directly playback the TS from the USB STORAGE (DVD), however, such operation is not guaranteed since operation depends on disc type, data store conditions, and playback bit rate of TS.

10.1.3.5 Applicable Stream

Disk Format	MPEG-2 TS (ISO/IEC13818-1), Broadcasting TS (ARIB STD-B31)
Packet Length	188, 204byte
File Size	Up to disc capacity

- ∗ Since this option does not support a program stream, the contents cannot be taken from the commercial DVD software and from the file recorded by similar DVD recording.

10.1.3.6 Playback

Playback Bit Rate	200 Kbps to 40 Mbps (MPEG-2 TS) 32.507937 Mbps (Broadcasting TS)
Loop Playback	Possible (not applicable to seamless)
Playback Range	Begin to end specified by the time or in number of packets.
RAM Playback	Possible

* The range cannot be specified for within five seconds.
* The TS file of less than five seconds cannot be played back.
* In RAM playback mode, larger than 419-MB file cannot be used.
* When the playback range is specified by the packet, 858993460 or more cannot be set in the number of packets.

10.1.4 General Specifications

Environmental Conditions

Operating Temperature	5 to 40°C

Accessory

DVD-R	1

Other specifications apply to standard model of LG 3802 (S1).

10.2 Panel Descriptions

10.2.1 Panel

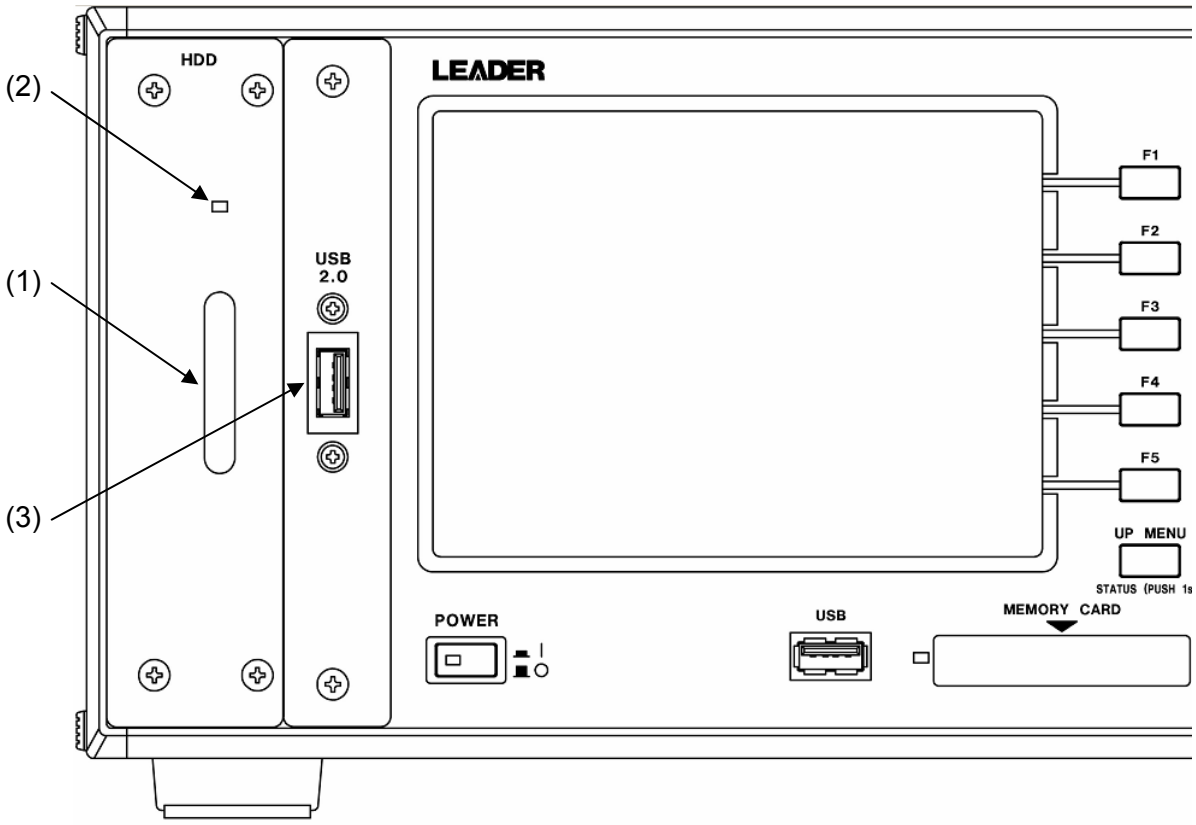


Figure 10-1 OP71 Front panel

(1) Internal HDD drive
2.5" Internal HDD. It can be replaced from the front panel, however, contact your local LEADER agent when replacing the Internal HDD.

(2) Internal HDD access lamp.
Lights when the internal HDD is in operation. Do not turn power off when the lamp lights.

(3) USB2.0 Interface (on front panel)
USB2.0 connector
Connects the external HDD or DVD drive applicable to USB2.0
Even the device which does not support USB2.0 can be connected. However, a noise might enter the video and sound which are played back by the relation with a transfer rate.

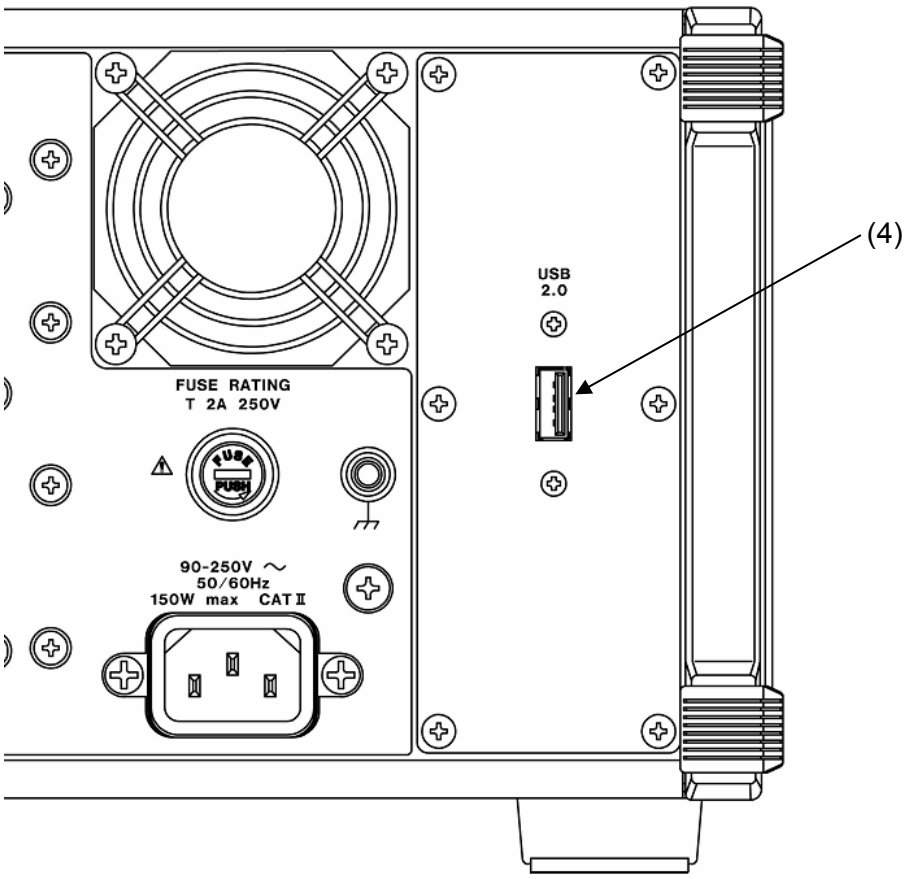


Figure 10-2 OP71 rear panel

(4) USB2.0 Interface (on rear panel)
USB2.0 connector
Connects the external HDD or DVD drive applicable to USB2.0
Even the device which does not support USB2.0 can be connected. However, a noise might enter the video and sound which are played back by the relation with a transfer rate.

10.2.2 LCD Screen

When TS is playing back from this option, the STATUS screen (top screen) is displayed below.

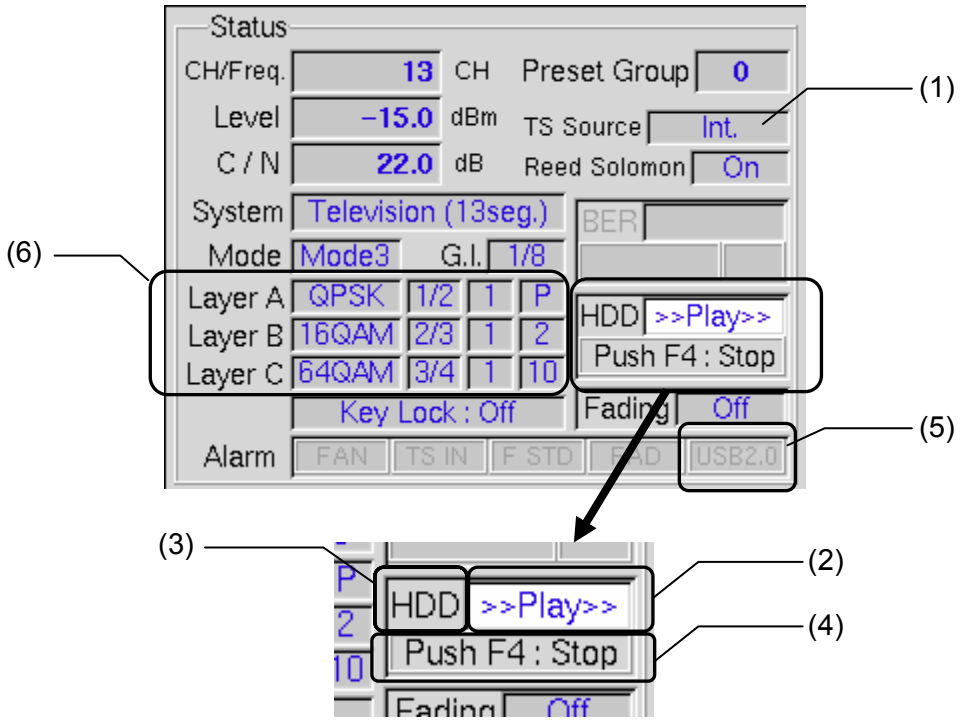


Figure 10-3 STATUS screen

(1) TS signal selection
Displays "Int." when the internal HDD or USB STORAGE is used.

(2) Playback/stop display
Indicates TS playback status. "Play" is scrolled during playback operation.
"Stop" is displayed when having stopped.

(3) Drive display
"HDD" is displayed when the file on the internal HDD is playing back.
"USB" is displayed when the file on the USB STORAGE is playing back.

(4) Using F4 key
The F4 key function is as follows:
"Stop" is displayed when play back operation is performed; pressing the F4 key stops the playback operation.
"Play" is displayed when no play back operation is performed; pressing the F4 key starts the playback operation.

(5) Alarm display “USB2.0”
When USB STORAGE is mounted, it is displayed as "USB2.0" in a blue character. It is displayed as an alarm, if a cable is pull out when the device is mounted state.

(6) Carrier modulation (Current)
Indicates the current carrier modulation status that displayed by selecting the MPEG-2 TS file. Analyzed results of IIP information is displayed when the broadcasting TS file is selected.

10.3 Operation Procedure

OP71 can playback the large capacity TS stream from the internal HDD or USB STORAGE.
The receiver performance can be confirmed with this model by using the moving natural picture; the ROM pattern and PN pattern are not applicable to this purpose.

10.3.1 Displaying and setting the TS File

To enter the TS File (L-3) screen, proceed as follows:
CODING (L-1) → TS Source (L-2): Internal → TS File (F1)

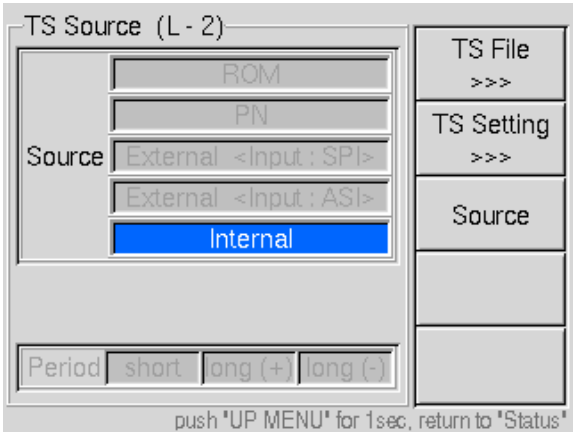


Figure 10-4 Selecting TS input

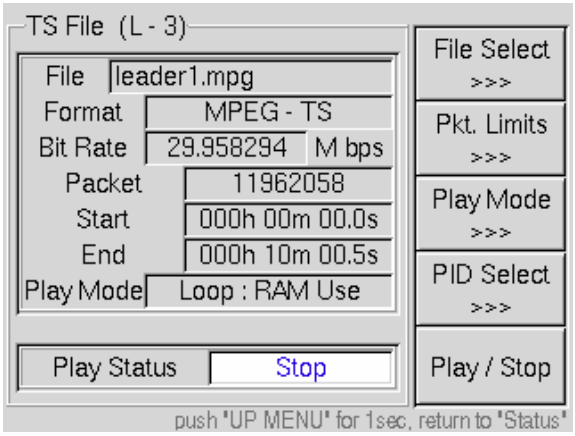


Figure 10-5 TS FILE screen

< Display description >

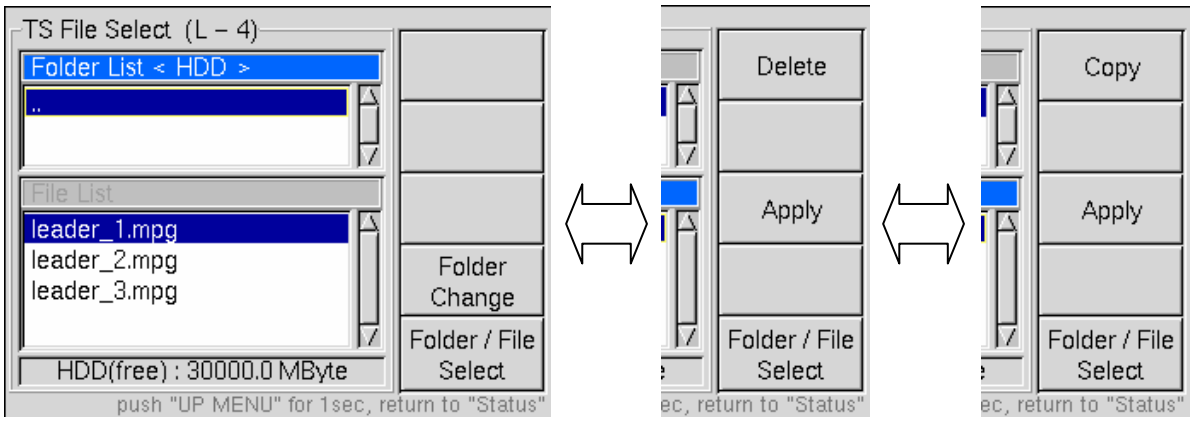
File	File name being selected
Format	TS format (MPEG-2 TS/ ISDB-T TS)
Bit Rate	TS bit rate.
Packet	Number of packets converted from file size.
Start	To start playback operation
End	To stop playback operation
Play Mode	Displays the playback method and status of RAM data playback.
Play Status	Displays the status of playback/stop.

< Setting item >

File Select	Selects the TS to be used. (Refer to Section 10.3.2)
Pkt. Limit	Determines the playback range of file selected. (Refer to Section 10.3.3)
Play Mode	Selects the playback method and RAM data playback function on/off. (Refer to Section 10.3.4)
PID Select	Sets the hierarchical layer according to PID. (Refer to Section 10.3.5)
Play/Stop	Controls the playback /stop operation. “Play” in the text box scrolls during playback operation. (Refer to Section 10.3.6)

10.3.2 Selecting File

First, it is necessary to select the file before the TS file is played back.
To enter the TS File Select (L-4) screen, proceed as follows:
CODING (L-1) → TS Source (L-2): Internal → TS File (L-3) → File Select (F1)



(a) For internal HDD (b) For USB STORAGE

Figure 10-6 Selecting file (Folder)

Figure 10-7 Selecting file (internal HDD, USB STORAGE)

< Key description >

Folder Change — This key can only be used when the Folder List is highlighted. Select the folder from the list. Position the highlight (in white character on the blue background) to the folder to be moved by pressing the ↑ or ↓ key, then press this key.The specified file is displayed in the file list column. To return to upper folder, highlight "..", then press the F4 key. In addition, move to upper folder by pressing ← key, or to lower folder by pressing → key.

Folder/ File Select — Selects the item to be selected. Pressing this key alternately selects Folder List (top) and File List (bottom). The selected item is highlighted (in white character on the blue background).

Apply — This key can only be used when the File List is highlighted. To play back the file, highlight the file to be selected by pressing the ↑ or ↓ key, then press this key.

Delete — This key is enabled when the file is selected in the internal HDD during stop and the File List is highlighted. To delete the file, highlight the file to be selected by pressing the ↑ or ↓ key, then press this key. Refer to Section 10.3.7.3
(The file has not deleted yet, here.)

Copy — This key is enabled when the file is selected in the USB STORAGE during stop and the File List is highlighted. To copy the file, highlight the file to be selected by pressing the ↑ or ↓ key, then press this key. Refer to Section 10.3.7.2
(The file has not copied yet, here.)

Execute	Displayed after the F1 (Delete or Copy) key is pressed. To execute the delete or copy operation, press this key.
Cancel	Displayed after the F1 (Delete or Copy) key is pressed. To cancel the delete or copy operation, press this key.
Mount	When the USB STORAGE is not recognized by this instrument and Folder List is highlighted and the uppermost file is displayed, this key can be used. Press this key to enter the USB STORAGE contents display mode. Refer to Section 10.3.7.1.
Unmount	When the USB STORAGE is recognized by this instrument and Folder List is highlighted and the uppermost file is displayed, this key can be used. Press this key to enter the USB STORAGE removable mode. Refer to Section 10.3.7.1.
Benchmark	When the USB STORAGE is recognized by this instrument and "front" of USB at Folder List is highlighted, this key can be used. Can be confirmed the transfer rate of USB STORAGE. Refer to Section 10.3.8.1.

To select the TS File to be played back, proceed as follows:
To copy/play back the file in the USB STORAGE, you must mount the USB STORAGE. Refer to Section 10.3.7.

< Operating procedure >

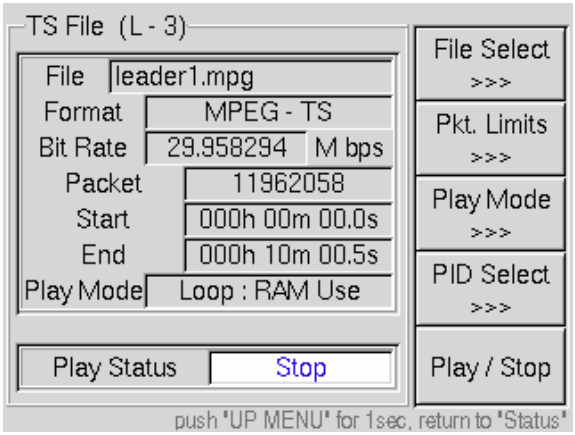


Figure 10-8 TS file screen

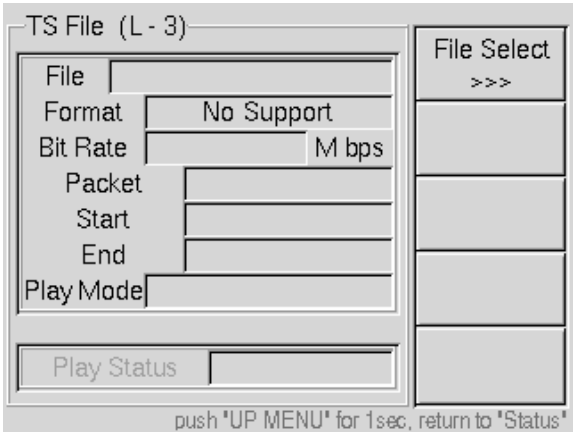


Figure 10-9 TS file screen (No Support)

(1) Display the TS File screen (Figure 10-8), then press the F1 (File Select) key to enter the TS File Select.

(2) The folder list is displayed on the upper part of the screen. The file list in the folder is displayed on the lower part of the screen. First, there is a highlight in the folder.

(3) Specify the folder containing the file to be played back by pressing the ↑ or ↓ key, and F4 (Folder Change) key.

(4) After the folder is moved, press the F5 (Folder/File Select) key to highlight the file list.

(5) Specify the file to be played back by pressing the ↑ or ↓ key, then press the F3 (Apply) key The specified file will be analyzed.

(6) If the file is not in TS format, or TS is not supported by this instrument, the Format column displays “No Support” as shown in Figure 10-9 and playback operation cannot be performed. Functions other than the file selection (e.g., playback, specifying range) are disabled.

(7) For the TS that can be played back, TS information is displayed on the TS File screen (figure 10-8) after data is analyzed. The functions described in Section 10.3.1 are assigned to the F keys to enable the playback operation.

If you press the F3 (Apply) key after specifying the file, the selected file is judged whether playback operation can be performed according to the following items analyzed in Step (1) through (4). For the recallable file, function is assigned to the key to enable the control mode. If the file is not in TS format, or TS is not supported by this instrument, the Format column displays “No Support” and playback operation cannot be performed. (Functions other than the file selection are disabled.)

< Analyzing File >

(1) Header byte periodicity
Judges the periodicity of header byte (0x47) in 188 or 204.

(2) Analyzing PCR
Observes the PCR flag, then compares PCR values of same PID two or more points and calculate bit rate.

(3) Judging Possibility of Playback Operation
When the bit rate calculated in Step (2) exceeds the specified range. (i.e., 200kbps to 100Mbps), or when the bit rate cannot be calculated, the TS cannot be played back; “No Support” is displayed.

(4) Analyzing IIP
When the number of packets is 204, finds a packet with PID of 0x1FF0 (IIP packet).
If there is no packet, it is judged as MPEG-2 TS. When IIP is found, it sets an input signal as broadcasting TS, and will be analyzed to reflect parameter settings.

10.3.3 Specifying playback range

The playback range of the selected TS file can be set in packet or time.
To enter the Pkt.Limits (L-4) screen, proceed as follows:
CODING(L-1) → TS Source(L-2): Internal → TS File(L-3) → Pkt.Limits(F2)

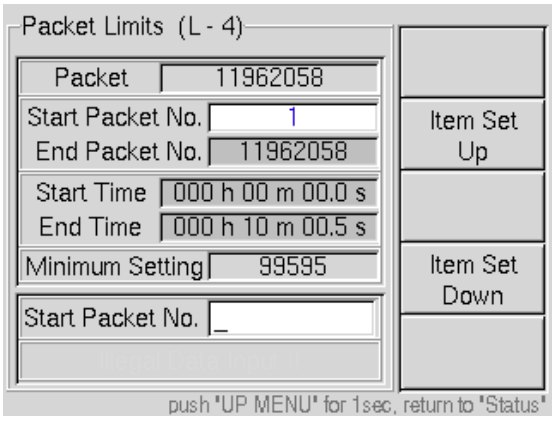


Figure 10-10 Playback range setting screen (no range specified)

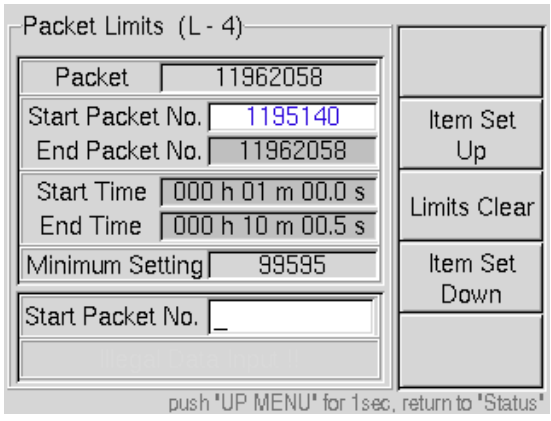


Figure 10-11 Playback range setting screen (range specified)

< Display description >

- Packet (Time) — When the portion (selected portion) of blue characters on white ground is in Start/End Packet No., the total number of packets of selected TS file is displayed. When the selected portion is in Start/ End Time, the playback time of TS file is displayed.
- Start Packet No. — The packet that starts playback is displayed.
  The Start Packet No. cannot specify the value more than the End Packet No. In addition, the interval between the Start Packet No. and the End Packet No. cannot specify the value that becomes Minimum Setting or less.
- End Packet No. — The packet that ends playback is displayed.
  The End Packet No. cannot specify the value more than the Start Packet No. In addition, the interval between the End Packet No. and the Start Packet No. cannot specify the value that becomes Minimum Setting or less.
- Start Time — The time that starts playback is displayed.
  The Start Time cannot specify the value more than the End Time. In addition, the interval between the Start Time and the End Time cannot specify the value that becomes Minimum Setting or less.
- End Time — The time that ends playback is displayed.
  The End Time cannot specify the value more than the Start Time. In addition, the interval between the End Time and the Start Time cannot specify the value that becomes Minimum Setting or less.
- Minimum Setting — The minimum packets and the minimum time of the TS file selected that can be played back by this instrument can be displayed. (The value of approximately five seconds is displayed by time conversion.)

• Input Column　　It is the numerical input column. The value that can be input varies depending on the position of the selected portion.
Enter data by using the numeric keypad.

< Key description >

• Item Set UP (F2)
Selected portion moves upward.

• Limits Clear (F3)
When the playback range is specified, it can be displayed.
Press the F3 (Limits Clear) key when you want to return the playback range.
As for both setting ranges in the packet and the setting ranges in the time, the value is cleared.

• Item Set Down (F4)
Selected portion moves downward.

Pressing the F2 (Item Set Up) or F4 (Item Set Down) key, you select the item that you want to change from among a Start Packet (Start Packet No.), an End Packet (End Packet No.), a Start Time, or an End Time.
The value of Minimum Setting becomes the packet display if the selected portion is in the packet area, and it becomes the time display if the selected portion is in the time area.
The number of packets in difference between start and end should set larger than the value displayed in the Minimum Setting column when entering the number of packets.
The value less than it becomes an error, and is canceled.

＊ In selection of Pkt. Limits and Play Mode, it cannot change setup during playback. When you change the setup, stop playback operation once.

Time data input

When the cursor key (→) is pressed while inputting the numeric data to set the time;
・If no numeric data has been input,「000h」is inserted in the character display area.
・If「x」had been input,「00xh」is inserted following the character being input.
(「x」can take the value of 0 to 9. It is the same as follows.)
・If「000h」had been input,「00m」is inserted following the「000h」being input.
・If「000hx」had been input,「0xm」is inserted following the「000h」being input.
・If「000h00m」had been input,「00.0s」is inserted following the「000h00m」being input.
・If「000h00mx」had been input,「0x.0s」is inserted following the「000h00m」being input.
When the cursor key (←) is pressed while inputting the numeric data to set the time; delete one digit.

About TS playback range

- The time conversion is calculated from detected bit rate and the file size. Some errors may occur depending on data.
- The packet is calculated automatically when specifying it by the time.
  The minimum unit in the time setting becomes 0.1 seconds.
- When there are the fractional data bytes at the start and end packets, the fractional data bytes are ignored; data is output in each packet.
- In broadcasting TS, the number of packets played back is the integer multiplied by the number of packets of the ISDB-T frame. In case of the range is specified with Pkt. Limits, fraction is automatically removed if the specified number of packets is not a multiply of number of frame packets.
- Settings in the time and the packet should be both larger than 5 seconds.
  Obtaining minimum number of packets is described as follows.
  Minimum number of packets = bit rate/ (8 x packet format) x 5
  * Bit rate is in units of bps.
  * Fractions after the decimal point are removed.
  * Packet format is 188 or 204.
- When the playback range is specified in the packet, it cannot set up 858993460 or more in the number of packets, and when it specifies in the time, 100h or more cannot be set up.

10.3.4 Playing Back RAM Data Function and Loop Playback

The method of playing back the TS file can be set up.
To enter the Play Mode (L-4) screen, proceed as follows:
CODING (L-1) → TS Source (L-2): Internal → TS File (L-3) → Play Mode (F3)

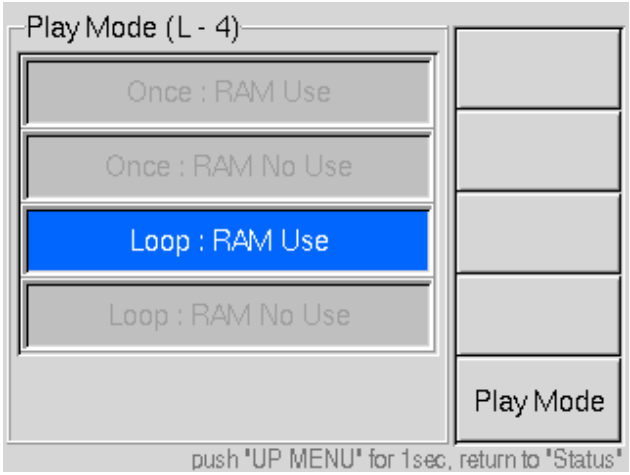


Figure 10-12 Playback method/ RAM data playback setting screen

- Play Mode (F5)
  In Play Mode, select the repetition playback (Loop) or one-time playback (once).
  Once: RAM Use Playback operation is performed once, RAM data is played back.

Once: RAM No Use	Playback operation is performed once, no RAM data is played back.
Loop: RAM Use	Playback operation is performed repeatedly, RAM data is played back. (default)
Loop: RAM No Use	Playback operation is performed repeatedly, no RAM data is played back.

This option reads data from the internal HDD or USB STORAGE to internal RAM and playback the data by specifying data size of 419MB or low, or sets data size to 419MB in the playback range described in Section 10.3.3.
When playing back TS in the internal HDD or USB STORAGE for a long time, data should be set within a size possible to playback.

"RAM Use" • "RAM No Use"

• "RAM Use" ⇒ When the file size is 419MB or less, modulation is performed after the TS data is transferred to the internal RAM.
The load to internal HDD or USB STORAGE can be reduced especially in loop playback mode since the internal HDD or USB STORAGE is accessed only when the first reading operation.
However, some time delay exists until signal is output after the playback key is pressed due to no modulation signal output since data is first transferred from internal HDD or USB STORAGE to RAM.

• "RAM No Use" ⇒ When the file size is 419MB or less, modulation is performed immediately after the TS data is transferred to the internal RAM.
Data is always read from the internal HDD or USB STORAGE.
It takes several seconds until the modulation signal is output after the recall key is pressed since data is immediately read from the internal HDD or USB STORAGE.

∗ When played back data is larger than 419MB, no RAM data is played back regardless of the RAM setting.

10.3.5 Hierarchying PID

When the selected TS is MPEG-2 TS, the TS packet of each PID can be assigned to each hierarchical layer when multiple hierarchical layers are set in Modulation.
The basic operation procedure is the same when the MPEG-2 TS is selected in the External. Refer to Sections 5.1.2.3 through 5.1.2.5 in this instruction manual.

(1) Set the TS Source to the Internal, then recall the signal to be played back. (Refer to Section 10.3.2.) When the selected TS is MPEG-2 TS, PID Select function is added to the F3 key. (In broadcasting TS, it is not displayed.)
(2) Set the modulation status as follows: Coding (L-1) → Modulation (L-2).
(3) Follow the procedure below to enter PID Select (L-4) screen.
Coding (L-1) → TS source (L-2): Internal → TS File (L-3): F3 (PID Select).

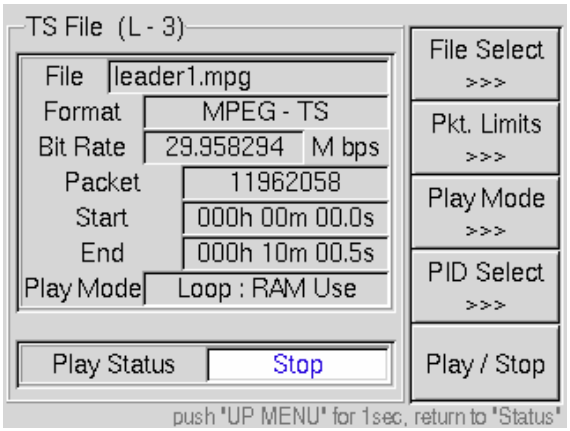


Figure 10-13 TS file selection screen

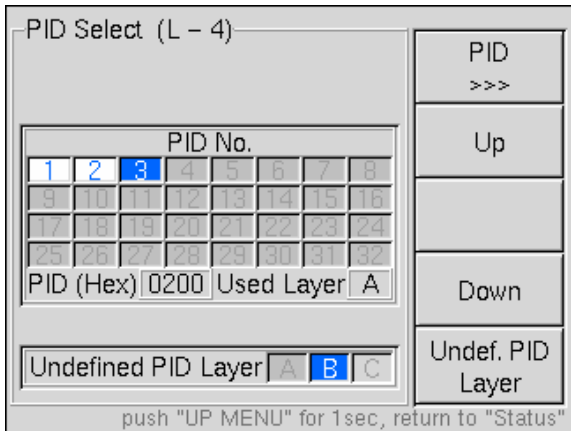


Figure 10-14 PID selection screen

Select the PID number to be set by pressing the F2 (Up) and F4 (Down), or Arrow (↑ ↓ ← →) key.
Highlight No. 1, then press the F1 (PID) key.

(4) Select the PID number, then press the F1 (PID) key to enter PID setting screen.

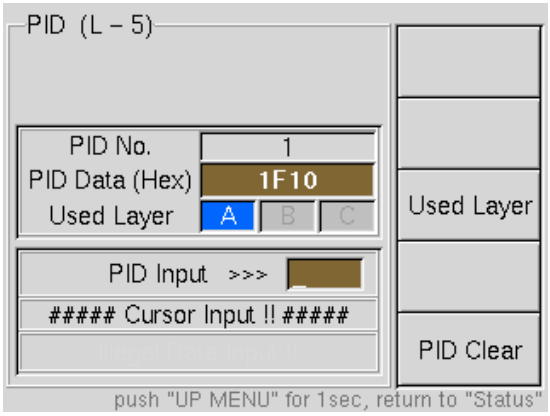


Figure 10-15 PID setting screen

(5) Set the hierarchical layer to assign PID value.
Pressing the ↑ or ↓ key sequentially selects 0 to 9, A to F. Select the digit by pressing the → key, then enter data to each digit.
To cancel a character, press the ← key. To cancel data on all digits, press the ALL CLEAR key.
When the PID is entered, select the hierarchical layer to assign the PID by pressing the F3 (Used Layer).
To clear PID settings, press the F5 (PID Clear) key.

(6) To set further PID, press the UP MENU key to return to the PID selection screen, select No. 2, then apply the same procedure described above.
The same procedure is applicable to No. 3 and later PID.

(7) On the PID screen, specify the assignment destination of undefined PID by pressing the F5 (Undef. PID Layer) key.

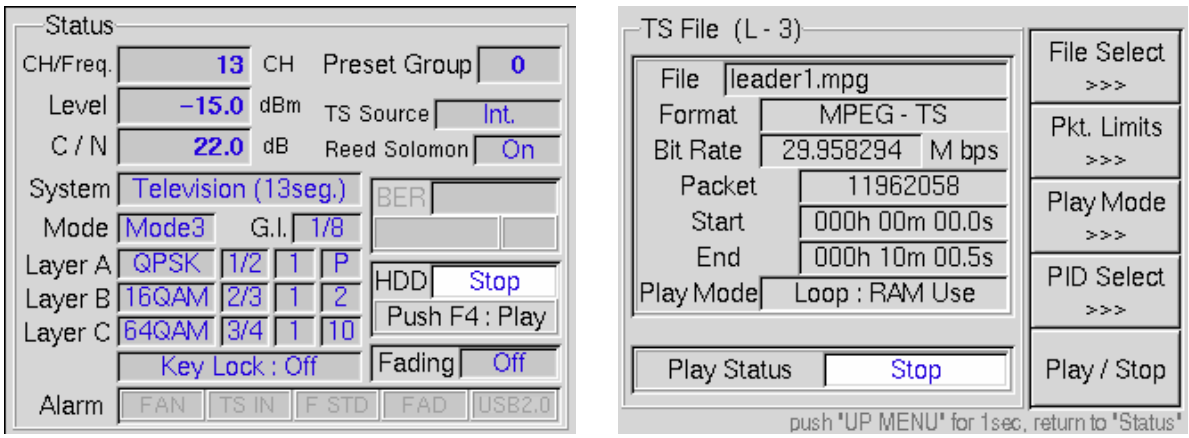
(8) Return to the top screen or TS file screen.

Notes on setting PID

Note that the following instructions when hierarchying the PID.

- The applicable information rate to input each hierarchical layer depends on the modulation settings (i.e., guard ratio, modulation system, coding rate, number of segments).
  If excessive information rate is input, incorrect signal is output since the buffer overflows.
  Confirm that the contents and structure of the TS to be used before hierarchying.
- Up to 32 types of PID can be assigned.
- When assigning PID to the hierarchical layer, a descriptor cannot be inserted, and PSI cannot be edited.
- The partial reception hierarchical layer of PCR packet position cannot be fixed. If the partial reception mode is set, and partial reception hierarchical layer is picked up by using the receiver, PCR jitter may occur.

10.3.6 Playback/ Stop of TS File



(a) Top screen (b) TS File (L-3) screen

Figure 10-16 Playback/ Stop of TS File screen (during stopping playback)

The selected TS file can be played back on a top screen or the TS File (L-3) screen

< When Playing back >

When playback of TS file has stopped (Figure 10-16), it can be played back by pressing F4 key in the case of a top screen, or by pressing F5 key in the case of a TS File (L-3) screen.

During playback operation, “Play” is scrolled.

(a) Top screen (b) TS File (L-3) screen

Figure 10-17 Playback/ Stop of TS File screen (during playback)

< When stopping playback >

When the TS file is playing back (Figure 10-17), it can be stopped by pressing F4 key in the case of a top screen, or by pressing F5 key in the case of a TS File (L-3) screen.

When playback is being stopped, “Stop” is displayed.

Refer to pertinent section of Chapter 5 in this manual for other settings (e.g., modulation, output level, frequency, CN on/off).

These settings can be changed while being playing back or even stopping.

However, when the broadcasting TS is selected, coding and modulation are performed according to the IIP modulation settings; as a result the coding, modulation conditions, or PID Select settings cannot set by using this instrument.

When the preset number is recalled, if the state under playback has been preset, playback will be started automatically.

(Playback operation is played back from the head of the file, when there is no range specified. When the range is specified, playback is started from the specified head.)

Internal HDD is being used the commercial item, however, the system structure is not in the Windows environment. Therefore, read the instructions below carefully to ensure correct operation.

Notes on playback operation

The following conditions should be satisfied when playing back the TS file.

* The TS file should be in MPEG-2 TS format confirming to ISO/IEC 13818-1 MPEG-2 TS, or the broadcasting TS prescribed by ARIB STD-B31.
* The packet size of 188 or 204 bytes can be used. The size of 204 bytes can only be used for the broadcasting TS.
* At least one PCR possible to analyze the bit rate should be superimposed.
  The bit rate calculated from the PCR should be in the range of 200 kbps to 40 Mbps.
  When the PCR is not superimposed on the TS, or the bit rate exceeds the specified range, "No Support" is displayed; no playback operation is performed.
* When the TS of playback time that is calculated from the analyzed bit rate and file size is less than 5 seconds, “No Support” is displayed; no playback operation is performed.

The following conditions should be satisfied even when the TS is recognized and is possible to playback.

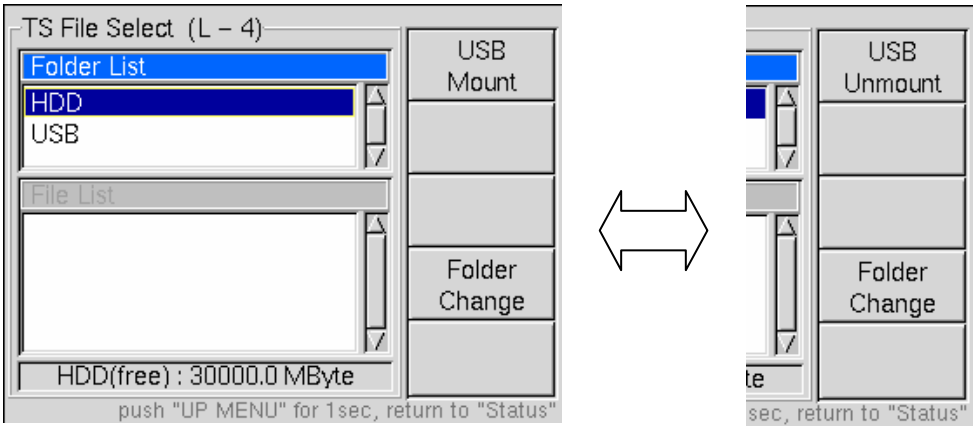
* TS rate is fixed. The TS is played back at first detected bit rate when there is an excessive level variation of the TS, or multiple TS with different bit rate.
* Playback operation may not be performed correctly caused by the status of multiple packet data in the TS. If a fractional size of packet exists on the TS, the signal may be intermittent since resynchronization is performed in the coding section.
* Up to eight PCR values can be updated. PCR value of the converted broadcasting TS is compensated when the PCR Update is set on. The initial value is obtained, then compensation is performed again when the PCR decrements in loop playback mode.
* For broadcasting TS, the modulation parameter (TMCC) cannot be counted down. Modulated signal is intermitted by resetting the coding section when the parameter is changed.
  Note that the followings when playing back the file of 1 Mbps or lower bit rate.
  - It takes several seconds to about one minute until the TS starts after the playback key is pressed.
  - This instrument handles data every 520 KB. When the file size is less than 520 KB, the number of loops exceeding 520 KB is automatically set.
    Therefore, multiple loop operation is performed even when the playback operation is performed in "Once" mode.
  - The time delay may exists between "Play" or "Stop" displayed on the screen and the signal output.
* The seamless cannot be used. PTS/DTS and continuity counter are not updated.
* Be sure to use the device corresponding to USB2.0 when playing back from USB STORAGE.
* When being RAM playback, even if the USB cable comes off during playing back, playback is continued as is. When not being RAM playback, it stops after the file has been played back until point from which the cable has come off. (Even if Loop playback being ON, it stops.)

* This option can directly playback the TS from USB STORAGE (DVD), however, such operation is not guaranteed since operation depends on disc type, data store conditions, and playback bit rate of TS.
* In the playback from USB STORAGE (HDD), there is a possibility that a noise might get on the video and the sound during playing back according to the data store conditions of the TS. When such a symptom occurs, perform playback operation again after carrying out defragmentation of it by the personal computer that can connect USB STORAGE.
* Defragmentation of VFAT and NTFS formats of USB STORAGE (HDD) cannot be performed in this instrument.
* The TS file of less than five seconds cannot be played back.

10.3.7 Operating File

10.3.7.1 Mounting or Unmounting of USB STORAGE

USB STORAGE in this option is started in unmounted conditions (the condition which is not mounted in the internal system).
When playing back or copying the data from the USB STORAGE, it is necessary to make the mounted conditions to the main frame of LG 3802 (S1).
In addition, when you remove the USB STORAGE, unmount it.



(a) Display in Unmounted conditions (b) Display in Mounted conditions

Figure 10-18 USB STORAGE conditions

When using the USB STORAGE, proceed as follows:
< Mount >
(1) Connect the USB STORAGE to the USB terminal of the rear and the front (neighbor of internal HDD).
(2) To enter the selection screen, proceed as follows:
CODING → TS Source: Internal → TS File → File Select
(3) Press the F4 (Folder Change) key until HDD or USB is displayed.
(4) Press the F1 (USB Mount) key. The Mount will be completed after several seconds. (The F1 shows "USB Unmount.")

When you remove the USB STORAGE, proceed as follows:

< Unmount >

(1) To enter the selection screen, proceed as follows:
CODING → TS Source: Internal → TS File → File Select

(2) Press the F4 (Folder Change) key until HDD or USB is displayed.

(3) Press the F1 (USB Unmount) key. The Unmount will be completed after several seconds. (The F1 shows "USB Mount.")

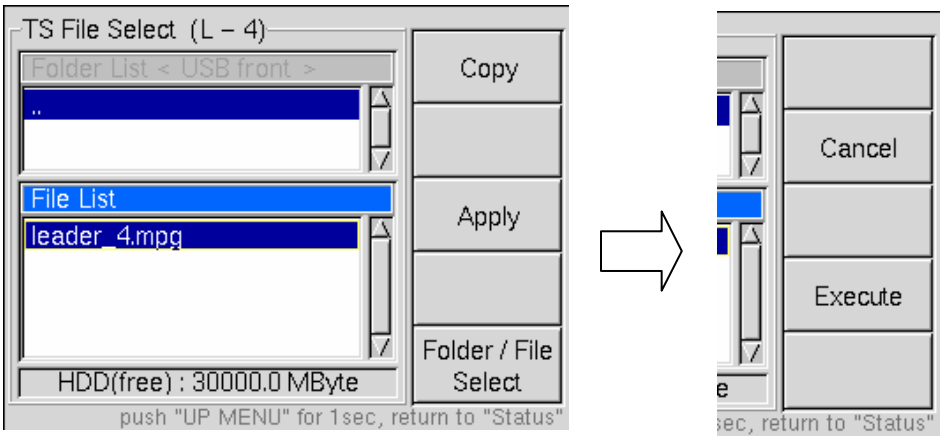
(4) Remove the USB STORAGE from the USB terminal of the rear and the front (neighbor of internal HDD).

Mounting/Unmounting of USB STORAGE

- If power is turned on when the USB STORAGE is mounted, operation starts as it conditions.
- When the USB STORAGE (DVD-ROM drive) is mounted in the conditions where the disc has been contained, the eject button of the DVD-ROM drive is disabled. When you want to change the disc, please unmount once.
- If you want to mount one more set when one USB STORAGE has been already mounted, please once unmount USB STORAGE already mounted, and mount again after changing into the conditions where two sets connected.
- If the USB cable comes off during playing back, playback stops. When you connect it again, please once unmount it in the conditions where the cable has come off, and mount again.

10.3.7.2 Copying File

When USB STORAGE of this instrument is in mounted conditions, file can copy to internal HDD. When copying the file, proceed as follows:



(a) File selection screen (b) Execution confirmed

Figure 10-19 USB STORAGE file selection

(1) Highlight the file to be copied by pressing the F4 (Folder Change), F5 (Folder/File Select), and ↑ or ↓ keys sequentially.

(2) Pressing the F1 (Copy) key changes F key assignments as shown in Figure 10-19 (b). Press the F4 (Execute) key or F2 (Cancel) key as required.
- ∗ The copy destination cannot be set. When copying data from the USB STORAGE, data is copied to the root of HDD.

(3) Data is now copying when "Under a copy" is displayed on the lower part of the LCD panel. When copying data, F key assignments are canceled and other key operations are disabled. The USB STORAGE and HDD access lamps light.
- ∗ Do not turn power off when data is being copied. Serious damage or trouble may occur on the HDD and abnormal playback operations may be performed. When copy is in progress, it cannot be canceled.
- ∗ Note that the same file name is overwritten.
- ∗ The rest of HDD capacity is displayed on the bottom of the File List. If file size is larger than the rest of capacity, it cannot be copied.

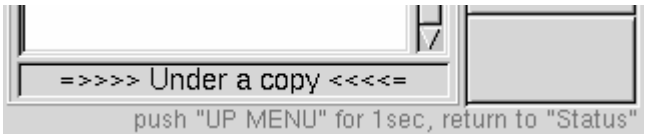
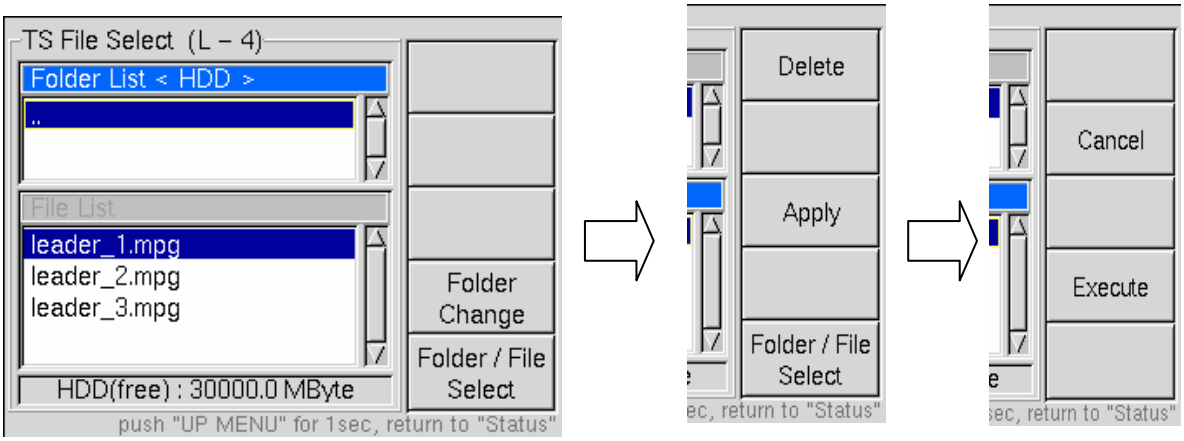


Figure 10-20 Copy in progress

After data is copied, screen returns as shown in Figure 10-19 (a).

10.3.7.3 Deleting File

Unnecessary file on the internal HDD can be deleted. Proceed as follows:



(a) Folder selection screen (b) Selecting file (c) Execution confirmed

Figure 10-21 Deleting file

(1) Highlight the file to be deleted by pressing the F4 (Folder Change), F5 (Folder/File Select), and ↑ or ↓ keys sequentially.

(2) Press the F1 (Delete) key to change F key assignments as shown in Figure 10-21 (c). Press the F4 (Execute) key or F2 (Cancel) key as required.
∗ Be extremely careful when deleting the file, the deleted file cannot be recovered.

(3) "Under deletion" displays at the lower part of the screen. This instrument enters the deleting mode. When deleting the file, the function key assignments are canceled; no other key operations can be performed. The internal HDD access lamp lights.
∗ Do not turn power off when data is being deleted. Serious damage or trouble may occur on the internal HDD and abnormal playback operations may be performed.

Figure 10-22 Deleting file

The Internal is selected when the file stored in the last memory or preset memory is deleted; no file is selected in this case. Perform input selection and file selection again.

10.3.7.4 Operating File via LAN

The file server is installed for controlling the internal HDD. By using this capability, files on the internal HDD can be controlled with a personal computer via the LAN.
(In this operation, use remote command. Refer to Section 10.4 for details.)

The personal computer should satisfy the following conditions:

OS：	Microsoft Windows98SE,NT,2000,XP
CPU：	Intel Pentium, Celeron, or equivalent
LAN：	10BASE-T or 100BASE-TX is installed.
Application：	MS-DOS or DOS window, or command prompt is installed.

Follow the procedure for setting up and operation.

(1) Setting TCP/IP

The TCP/IP of this instrument and network to be connected should be matched. Follow an example below. Preconsultation may be required with network manager when setting up the network system (e.g., TCP/IP, server name, work group).

IP address：	192.168.0.1
Subnet mask：	255.255.255.0
Default gateway：	192.168.0.254
Server name of this instrument：	LG3802_OP71
Work group name：	WORKGROUP

- Display the "Utility" screen, then press the F2 (Config) key and F1 (TCP/IP) keys sequentially to enter TCP/IP screen.
- Set the IP address, subnet mask, and default gateway.
- After setting is completed, turn power off, then power on again.

＊The IP address "192.168.254.XXX" cannot be set since it is used in this instrument. Setting conditions of the equipment connected should be changed as well.

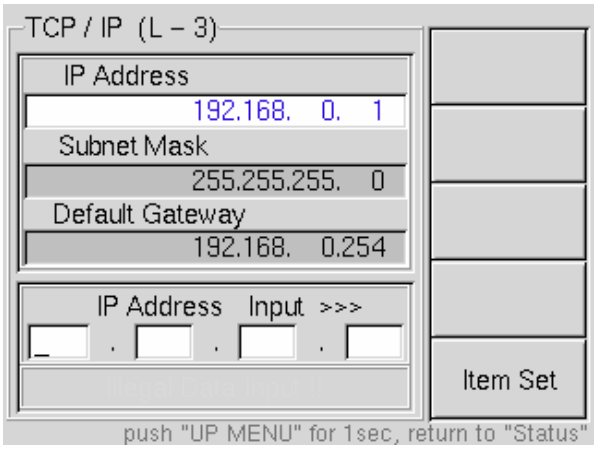


Figure 10-23 TCP/IP setting

(2) Connecting LAN cable

Use a cross cable when connecting a personal computer. Use a straight cable when connecting the local network via a hub.

(3) Connecting telnet

Start DOS window or command prompt on the personal computer, then enter:

C:＼> telnet 192.168.0.1 <Enter>

LG3802 login: lg3802 <Enter>

Password: lg3802 <Enter>

The following message is displayed, then login operation will be completed.

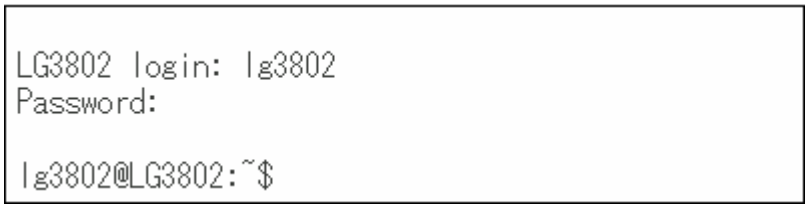


Figure 10-24 Login status

(4) Setting file server name

When using the system for the first time, set the server name by using "NAM" code.

Example: Setting LG3802_OP71

$ rem NAM LG3802_OP71 <Enter>

(5) Setting work group

When using the system for the first time, set the work group by using "WGP" code.

Example: Setting WORKGROUP

$ rem WGP WORKGROUP <Enter>

(6) Enabling file server

Enables the file server.

$ rem FSV ENABLE <Enter>

(7) HDD write mode

When writing data on the internal HDD, enable the write mode by using " HDW" code.

$ rem HDW ENABLE <Enter>

Cautions on writing internal HDD [IMPORTANT]

∗ Set the file server name and work group name when the file server is disabled.

∗ After data is written on the internal HDD, send the “HDW” code to disable the write mode.
(Refer to Step (9) Completion.) If power is turned off when this function is enabled, it takes for several minutes since instrument enters file system recovery operation for the next start up operation.

∗ When the “HDW” is set to ENABLE, other operations should be paused to concentrate the internal processor on internal HDD writing operation.
When the “HDW” is enabled, the following operations cannot be guaranteed.
- Up dating the LCD panel display (e.g., alarms, BER measurement, GO/NO-GO).
- Output of RF signal when TS is playing back from the internal HDD or USB STORAGE.

∗ All operations cannot be guaranteed when data is being written.

∗ The “HDW” command does not accept during being played back.
Be sure to set up after stopping playback operation temporarily.

```
lg3802@LG3802:~$ rem NAM LG3802_OP71
lg3802@LG3802:~$ rem NAM ?
LG3802_OP70
lg3802@LG3802:~$ rem WGP WORKGROUP
lg3802@LG3802:~$ rem WGP ?
WORKGROUP
lg3802@LG3802:~$ rem FSV ENABLE
lg3802@LG3802:~$ rem HDW ENABLE
*** CAUTION!! *** Please Set <<rem HDW DISABLE>> Before Power Off.
lg3802@LG3802:~$
```

Figure 10-25　DOS window in remote control mode

(8) Finding file with the personal computer

To find the file, start up the Explorer of personal computer, then enter file server name to address bar.

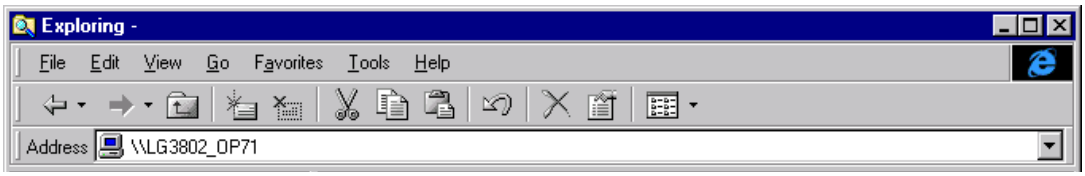


Figure 10-26　File server name

After find operation is completed, the internal HDD contents are displayed on the Explorer. Various operations (e.g., writing internal HDD data, fetching internal HDD data to the personal computer, changing file name) can be performed with such operations as drag/drop and copy/paste. (The baud rate is about 6 Mbps.)

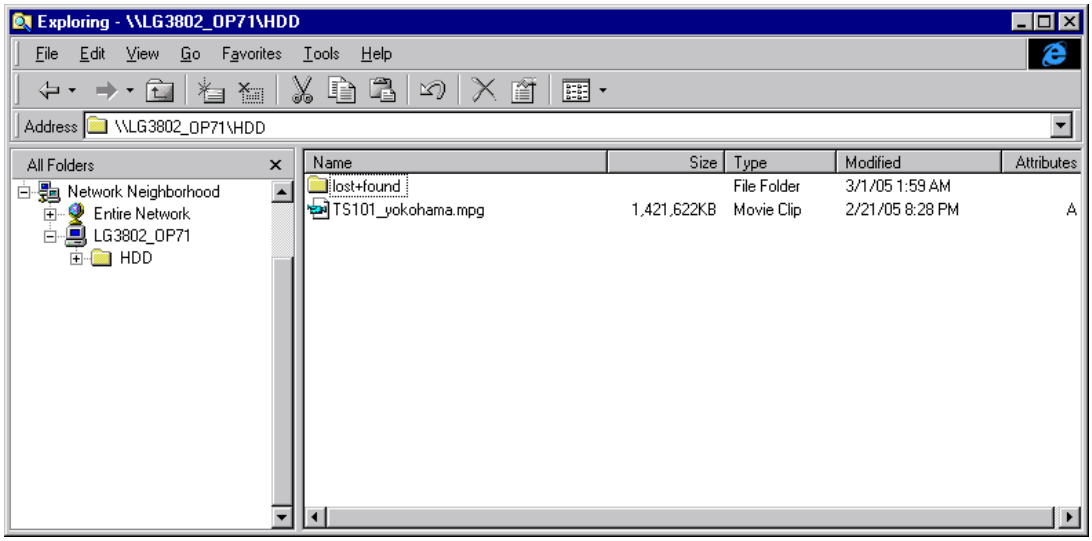


Figure 10-27　Explorer display example

Notes on file operation

- 2-byte characters cannot be used for the file system and LCD panel. If 2-byte character file is written, the file cannot be deleted and used since 2-byte character is not displayed on the LCD panel. Delete the file via LAN.
- The following characters can be used for the file name.
  A to Z, a to z, 0 to 9
  # $ % + , . = [ ] ^ _ { } ~ -
- The following characters cannot be used for the file name.
  ! " & ' ( ) * / : ; < > ? \ | ` ☐ (Space)
- The file containing 240 or more characters in full path cannot be recalled or played back. When you make the hierarchical folder, please make within limitation of the number of characters.
- Up to 64 files can be stored in a folder. When copying more than 64 files, add a folder, then divide the file via LAN.
- Up to 20 characters can be used for the file name including expansion.
- The file exceeding the rest of capacity cannot copied via LAN.
  If such file is copied, the size between the written file and file information are not the same.
- The copied file remains on the HDD when you cancel the copy operation in progress. Therefore, deletes it using Explorer.
- The same file name is overwritten.
- Files arranged on the personal computer cannot be reflected on this instrument.

(9) Completion.
After data is written on the internal HDD, send the "HDW" code below to disable the write function.
$ rem HDW DISABLE <Enter>

Cautions on internal HDD [IMPORTANT]

The internal HDD write mode must be set to DISABLE before turning power off.

(10) Renew of parameter (Network)
The timing to change parameters via the network (Includes setup via the remote.) is shown below.

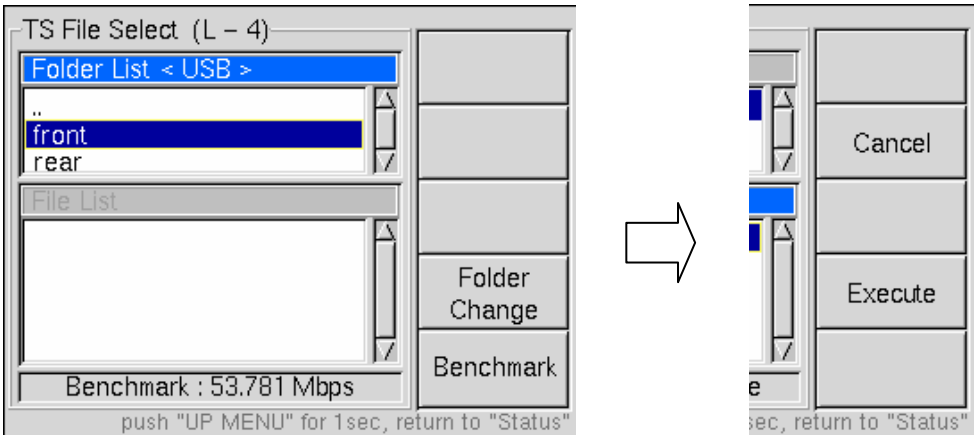
1. IP address: After power is returned on.
2. Subnet mask: After power is returned on.
3. Default gateway: After power is returned on.
4. File server name: Send "rem FSV ENABLE".
5. Work group name: Send "rem FSV ENABLE".
6. Enabling file server: Send "rem FSV ENABLE".
7. Setting HDD write mode: Immediately after setting is completed.

10.3.8 Others

10.3.8.1 Benchmark

The Benchmark of the equipment connected via the USB can be measured when the cursor is positioned at ”front” on the file selection screen.
The baud rate of STORAGE connected via the USB can be measured by executing the Benchmark. Proceed as follows:

(1) Copy the TS data (TS002_yokohama.trp) immediately below the USB STORAGE.
(2) Mount the USB STORAGE to the main frame.
(3) Position the cursor to "front" The "Benchmark" is displayed at the F5 key as shown in Figure 10-28 (a).
(4) Pressing the F5 key displays the screen as shown in Figure 10-28 (b). Press the F4 key for execution.
(5) Wait for about one minute. The USB STORAGE rate is displayed on the lower part of the screen.



(a) Benchmark (b) Execution confirmed

Figure 10-28 Benchmark measurement

∗ The approximate rate is displayed, here.
∗ The internal HDD should have at least 520 MB of free space for measuring the Benchmark.
∗ The Benchmark cannot be measured when there is no "TS002_yokohama.trp" immediately below the “front”.

10.3.8.2 Confirming version

The information related to installation of this option can be confirmed on the Utility screen.

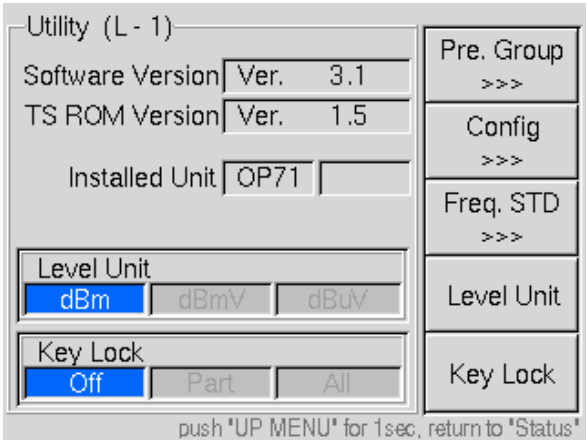


Figure 10-29 UTILITY screen

10.4 GPIB, Remote

Additional items regarding the option (OP71) are described in the section. Refer from Chapter 8 for other details.

10.4.1 Added Program Code List

Table 10-1 Setting code list

	Header	Data		Description
70	HDW	c	ENABLE,DISABLE	Setting HDD write mode
71	FSV	c	ENABLE,DISABLE	Setting file server
72	NAM	a	ASCII	Setting file serve name
73	WGP	a	ASCII	Setting work group
74	IP	n	0 to 1	TS playback
77	IS	n	1 to 858993459	Setting Start packet for playback
78	IE	n	1 to 858993459	Setting End packet for playback
79	IL	n	0 to 1	Controlling loop playing back operation
80	HS	c	000h00m00.0s to 999h59h59.9s	Setting Start time for playback
81	HE	c	000h00m00.0s to 999h59h59.9s	Setting End time for playback
82	IM	n	0 to 1	Setting playing back RAM Data

Table 10-2 Query code list

	Header	Data	Description	Reply
70	HDW	?	Querying HDD write mode	c
71	FSV	?	Querying file server status	c
72	NAM	?	Querying file server name	a
73	WGP	?	Querying work group name	a
74	IP	?	Querying TS playback setting conditions	n
75	II	?	Reading file information	n, p, q
76	IR	?	Reading bit rate	i
77	IS	?	Reading start packet for playback	n
78	IE	?	Reading end packet for playback	n
79	IL	?	Reading loop playback control status	n
80	HS	?	Reading start time for playback	c
81	HE	?	Reading End time for playback	c
82	IM	?	Reading playing back RAM Data setting	n

∗ Use codes 70 to 73 for remote controlling via the LAN.

10.4.2 Detail Program Code

This section describes the detail program codes listed in Section 10.4.1.
The codes used in this section are defined as follows.

n, p, q	0 and natural number
i	Integer including decimal point
a	Character in ASCII code
c	Character code reserved
-	Space (20h in ASCII code)

- Terminator is omitted for a syntax. Add the terminator at the end of the code. Refer to Section 8.9 for details
- Header is not added for reply; the reply code consists of data only.

(70) HDD write mode ..... "HDW"

Function Setting and querying HDD write mode
Syntax HDW_c (Setting, reply)
HDW_? (Query)

c	TS Playback Setting
ENABLE	Writable
DISABLE	Not writable

[IMPORTANT]
∗ This mode must be set to DISABLE before turning power off.

(71) Setting file server.....”FSV”

Function Setting and querying file server

Syntax FSV_c (Setting, reply)

FSV_? (Query)

c	TS Playback Setting
ENABLE	Server enable
DISABLE	Server disable

∗ This mode returns to DISABLE every time when power is turned off.

(72) Setting and querying file server name.....”NAM”

Function Setting and querying file server name

Syntax NAM_a (Setting, reply)

NAM_? (Query)

a (Name): Up to 16 characters in ASCII code (uppercase letters only)

(73) Setting work group .....”WGP”

Function Setting and querying work group

Syntax WGP_a (Setting, reply)

WGP_? (Query)

a (Name): Up to 16 characters in ASCII code (uppercase letters only)

Notes on program code (70 to 73)

- This function is mainly used for Ethernet function. Refer to section 10.3.7.4 for details.
  Setting and querying can be performed via the GPIB interface, however, file operation cannot be performed via the GPIB interface.
- When the function is enabled with “HDW” command via the GPIB interface, note that the same character set via the Ethernet will be returned.
  The 67 characters consisting of "*** CAUTION!! *** Please Set <<rem HDW DISABLE>> Before Power Off," CR, and LF

(74) Setting TS playback .....”IP”

Function Setting and querying TS playback

Syntax IP_n (Setting, reply)

IP_? (Query)

n	TS Playback Setting
0	Stop
1	Play

(75) Setting file information .....”II”

Function Querying TS file information

Syntax n, p, q (Reply)

II_? (Query)

n	TS Playback Setting
0	MPEG-2 TS
1	ISDB-T TS

p	Packet Size
0	188 bytes
1	204 bytes

q Total packet: 1 to 4294967295.

(76) Setting TS bit rate.....”IR”

Function Querying TS bit rate to be played back

Syntax i (Reply)

IR_? (Query)

i Bit rate: 00.200000 to 60.000000 (Mbps)
Displays up to 6 digits below decimal point.

(77) Setting Start packet for playback.....”IS”

Function Querying Start packet for playback

Syntax IS_n (Setting, reply)

IS_? (Query)

n Start packet for playback: 0, and 1 to 858993459

* Setting status cannot be changed when the TS playback operation is in progress.
* Setting “0” clears both playback start end values.
* When values are cleared, playback operation is performed from the start to end.
* The value exceeding the number of file information packets cannot be set.
* The playback end packet should be smaller than the minimum number of packets.

(78) Setting End packet for playback.....”IE”

Function Querying End time for playback

Syntax IE_n (Setting, reply)

IE_? (Query)

n End packet for playback: 0, and 1 to 858993459

* Setting status cannot be changed when the TS playback operation is in progress.
* Setting “0” clears both playback start end values.
* When values are cleared, playback operation is performed from the start to end.
* The value exceeding the number of file information packets cannot be set.
* The playback start packet should be larger than the minimum number of packets.

Obtaining minimum number of packets

Minimum number of packets = bit rate/ (8 x packet format) x 5

* Bit rate is in units of bps.
* Fractions after the decimal point is removed.
* Packet format is 188 or 204.

(79) Controlling loop Playback operation....."IL"

Function Setting and querying loop playback mode

Syntax IL_n (Setting, reply)

IL_? (Query)

n	Loop Playback Control
0	Once
1	Loop

* Setting status cannot be changed when TS playback operation is in progress.

(80) Playback Start time.....”HS”

Function Setting and querying the playback start section that is set in the time

Syntax HS_c (Setting, reply)

HS_? (Query)

c Playback start time: 000h00m00.0s to 999h59m59.9s
or CLR (When the setting numerical value is cleared)

(81) Playback End time.....”HE”

Function Setting and querying the playback end section that is set in the time

Syntax HE_c (Setting, reply)

HE_? (Query)

c Playback end time 000h00m00.0s to 999h59m59.9s
or CLR (When the setting numerical value is cleared)

* The range that can be set depends on the file size and the time calculated from the bit rate of TS.
* The setting of interval between the start and end should be larger than 5 seconds.
* The playback end time should be larger than the start time.
* Setting status cannot be changed when the TS playback operation is in progress.
* Setting “CLR” clears both playback start and end values. Moreover, the setting values in the packet are cleared simultaneously.
* When the setting values are cleared in the packet setting (IS and IE), also the time setting is cleared simultaneously.
* When values are cleared, playback operation is performed from the start to end.
* The setting and query operations are only enabled when the TS input is set to internal.
* When the file selected at the end is deleted, the setting and query operations are disabled even when a file not supported by this instrument is selected.

(82) Setting RAM playback .....”IM”

Function Setting and querying RAM playback

Syntax IM_n (Setting, reply)

IM_? (Query)

n	RAM Playback
0	Off
1	On

* TS Source: This setting is only enabled when the format possible to playback in the internal is selected. Other cases are ignored.
* Setting status cannot be changed when the TS playback operation is in progress.

Notes on program code (74 to 82)

- The setting and query operations are only enabled when the TS input is set to Internal.
- When the file selected at the end is deleted, the setting and query operations are disabled even when a file not supported by this instrument is selected.

10.5 Sample TS

The dedicated sample TS is provided to check performance of this instrument. If the sample is deleted from the internal HDD, copy the sample TS from DVD-R supplied as an accessory.

File Name	TS002_yokohama.trp
File Size	2, 441, 263, 104 (Bytes): 600.7 sec. (10 min.)
Number of Packets	11, 966, 976 (Packets)
Packet Format	204 (Bytes)
TS Type	ISDB-T
Bit Rate	32.507937 Mbps
Number of Programs	2
Program Contents	HDTV video + AAC stereo sound, 1 seg video + AAC stereo sound
TS-ID	0x7FE1
Network ID	0x7FE1
Service ID	0x0408
Remote ID	2
TS Name	TestStream
Network Name	Network

PID Used and Multi hierarchical layer

PAT	0x0000	(Hierarchical layer B)
NIT	0x0010	(Hierarchical layer A)
SDT	0x0011	(Hierarchical layer A)
TOT	0x0014	(Hierarchical layer A)
BIT	0x0024	(Hierarchical layer A)
PMT(12seg)	0x0050	(Hierarchical layer B)
Video(12seg)	0x0100	(Hierarchical layer B)
Audio(12seg)	0x0200	(Hierarchical layer B)
PCR(12seg)	0x0300	(Hierarchical layer B)
Video(1seg)	0x0400	(Hierarchical layer A)
Audio(1seg)	0x0500	(Hierarchical layer A)
PCR(1seg)	0x0600	(Hierarchical layer A)
PMT(1seg)	0x1FC8	(Hierarchical layer A)
IIP	0x1FF0	(Invalid hierarchical layer)

Descriptor

Network Name Descriptor, System Management Descriptor, Service List Descriptor, Terrestrial Delivery System Descriptor, TS Information Descriptor (NIT)
Stream Identifier Descriptor, Video Decode Control Descriptor (PMT)
("Mode 3, GI1/8,Frequency26ch" is set to the terrestrial distribution system in the NIT.)

Setting contents of Modulation Parameter of 11P

MODE	3
GI	1/8
Partial Reception	ON
Modulation(A)	QPSK
Code Rate(A)	2/3
Time IL（A）	4
Segments(A)	1
Modulation(B)	64QAM
Code Rate(B)	3/4
Time IL（B）	2
Segments(B)	12

Notes on sample TS

Copyrights related to the video in this stream are owned by LEADER ELECTRONICS CORPORATION.
The following actions by using this stream are prohibited.

- Performing copy, modify, or edit this software for any reason without our permission.
- Converting into PES and elementary stream.
- Open and broadcasting on a commercial basis
- Open and broadcasting to public.
- Transfer to others.
- Applying the video to the products not manufactured by LEADER ELECTRONICS CORPORATION.

This TS stream is only used for the performance check in the factory. Therefore, this stream cannot be used for the reference to evaluate such as decoder, video, and sound quality.
The performance is confirmed by using a conventional receiver, it cannot be guaranteed for any receivers, however.

11. OP 72A FADING OPTION (Factory Option)

11.1 Specifications

11.1.1 General

The LG 3802 (S1) OP72A Fading Option, installable to the LG 3802 (S1) main frame, is designed to simply simulate the multipath fading when mobile objects receive the digital terrestrial TV signal (ISDB-T).

Since this instrument generates a pseudo fading component on the digital baseband signal, such interference as multipath fading and propagation delay prescribed by International Standardization Group can easily be simulated.

11.1.2 Features

- By installing this option to the LG 3802 (S1) main frame, the multipath fading and propagation delay simulation system can easily be constructed at lower cost.
- Various fading parameters can be set via the front panel or remote controller.
- Fading components can be applied to such modulation signals as patterns stored in the ROM, pseudo random signal, external TS, and TS played back from HDD (USB STORAGE Option installed). The fading components can also be applied to the carrier wave (CW).
- Up to 12 propagation paths can be created. (∗A)
- Four modulated fading types (i.e., Rician, Rayleigh, frequency shift, and phase shift) can be set.
- Since the measurement profiles (∗B) for testing interference area recommended by GSM and ATSC are provided, various multipath fading can easily be simulated.
- Up to 100 preset conditions can be stored in the preset memory.
  Combining various parameters can construct the propagation path to test mobile object reception status under the similar conditions as the actual broadcasting systems.

∗A The settable number of paths depends on the combination of fading types.

∗B • Equivalent to ETSI EN 300 910 (GSM 05. 05)
• Equivalent to A/74 ATSC Recommended Practice: Receiver Performance Guidelines.

11.1.3 Specifications

11.1.3.1 Fading Generator

Settable Fading Mode (Fading Mode)

Normal mode (Off), 6 Path mode (6 Path), 12 Path mode (12 Path)

Maximum Doppler Frequency (Doppler)

0.1 to 200 Hz (＊1), in 0.1 Hz resolution (common to each path)

Speed of Mobile Object (Speed)

Settable in the range converted from output frequency and maximum Doppler frequency (＊1). In 0.01km/h steps (common to each path)

Path State (Path State)

Each path can be respectively set on/off.

Modulated Fading Type (Fading Type)

Rayleigh:	Rayleigh fading (settable for all paths)
Rician:	Rician fading (settable for path 1) (＊2)
Freq_Shift:	Frequency shift (Settable for one out of arbitrary paths, or arbitrary two out of path1 path2 and path3)
Settable range	-1.0 to 1.0 (ratio to the maximum Doppler frequency), in 0.1 steps
Phase_Shift:	Phase shift (settable for all paths)
Settable range	0° to 360°, in 0.1° steps
Through:	Path through

Relative Delay Time (Delay)

0 to 800.0 μs, in ≈ 0.1 μs (＊3) steps

Relative Path Loss (Loss)

-30.0 to 0 dB,	in 0.1 dB steps for -10 to 0 dB
	in 0.5 dB steps for -20 to -10 dB
	in 1.0 dB steps for -30 to -20 dB

＊1 There are setting restrictions when the Doppler frequency (derived from the speed of mobile object) exceeds the minimum or maximum frequency.

＊2 There are three Rician patterns categorized according to K factor and angle of arrival.

＊3 The second digit after the decimal point is rounded off for display.

11.1.3.2 RF Signal Generator

(1) Frequency

Range	50 to 860 MHz
Resolution	1 kHz, set in frequency
Accuracy	$\pm 0.2 \times 10^{-6}$

(2) Output

Range	-100 to +13 dBm (Normal mode) -53 to +60 dBmV +7 to +120 dBμV
	-100 to +8 dBm (6 Path mode) -53 to +55 dBmV +7 to +115 dBμV
	-100 to +3 dBm (12 Path mode) -53 to +50 dBmV +7 to +110 dBμV
Resolution	0.1 dB
Accuracy	±2.5 dB

11.1.3.3 C/N Generator Section

C/N Variable Range	0 to 30 dB (Normal mode) 0 to 25 dB (6 Path mode) 0 to 20 dB (12 Path mode)
Resolution	0.1 dB
C/N Addition	Settable C/N addition on/off

Other specifications apply to standard model of LG 3802 (S1).

11.1.4 Maximum Doppler Frequency

In mobile communication services, the carrier frequency received by the moving object is changed caused by a Doppler effect. The maximum frequency shift (called maximum Doppler frequency) depends on the speed of mobile object and carrier frequency. The maximum Doppler frequency can be derived from the formula below.

Maximum Doppler frequency (Fd) = V/λ= Fc x V/c .....Formula (1)

where, V: speed of mobile object (m/s)
Fc: carrier frequency (Hz)
c: speed of light (≈ $3x10^8$ m/s)

The settable maximum Doppler frequency is 0.1 Hz to 200 Hz, carrier frequency is 50 to 860 MHz. Table 11-1 lists the settable maximum Doppler frequency. Note that settable maximum Doppler frequency is restricted by the carrier frequency and speed of mobile object.

Table 11-1 Settable example of the maximum Doppler frequency relationship with typical output frequency and the speed of mobile object.

Channel	Carrier Frequency (MHz)	Speed of mobile object (km/h)
—	50.000	1.1 to 4320.0
1 to 3 (VHF)	93.143 to 105.143	0.6 to value based on formula (1)
C13 to C16	111.143 to 129.143	0.5 to value based on formula (1)
C17 to C22 4, 5 (VHF)	167.143 to 179.143	0.4 to value based on formula (1)
6 to 12 (VHF) C23 to C30	185.143 to 267.143	0.3 to value based on formula (1)
C31 to C63 13 to 24 (UHF)	273.143 to 539.143	0.2 to value based on formula (1)
25 to 62 (UHF)	545.143 to 767.143	0.1 to value based on formula (1)
—	860.000	0.1 to 251.2

11.1.5 Modulated Fading Types

11.1.5.1 Rayleigh Fading (Rayleigh)

In radio wave communication systems, the Rayleigh fading is expressed as the sum of multiple components received over the separate paths (e.g., reflected, diffracted) other than the direct wave.

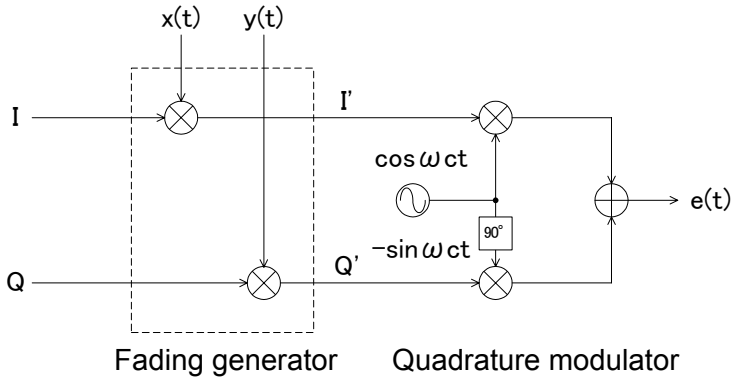


Figure 11-1 Architecture

The "x (t)" and "y (t)" are constant Gaussian noises having the average value of 0 and the same distribution. A complex multiplication is performed to the baseband, then applied to the quadrature modulator to produce IF signal "e(t)."

Spectrum of Rayleigh-fading carrier (CW) is illustrated below. (Fc: carrier frequency, Fd: Maximum Doppler frequency [Doppler])

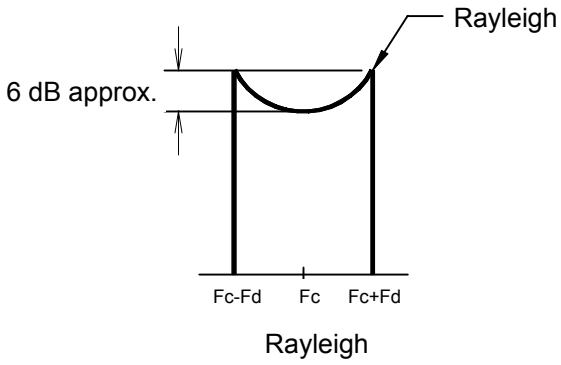


Figure 11-2 Spectrum of Rayleigh-fading carrier (CW)

Figure 11-2 shows the averaged spectrum of Rayleigh-fading carrier (CW).
This option provides the fading generator with 12 Paths and outputs the sum of signals in each path.

11.1.5.2 Rician Fading (Rician)

The Rician fading is expressed as the sum of the direct wave and fading components produced with Rayleigh distribution.
Three Rician fading patterns (∗ 4) can be set.

Rician 1: K factor = 0 dB, AOA = 45°
Rician 2: K factor = 6.8 dB, AOA = 45°
Rician 3: K factor = 0 dB, AOA = 0°

The K factor indicates the ratio of direct wave power components (LOS) and Rayleigh distribution power components. See formula below:

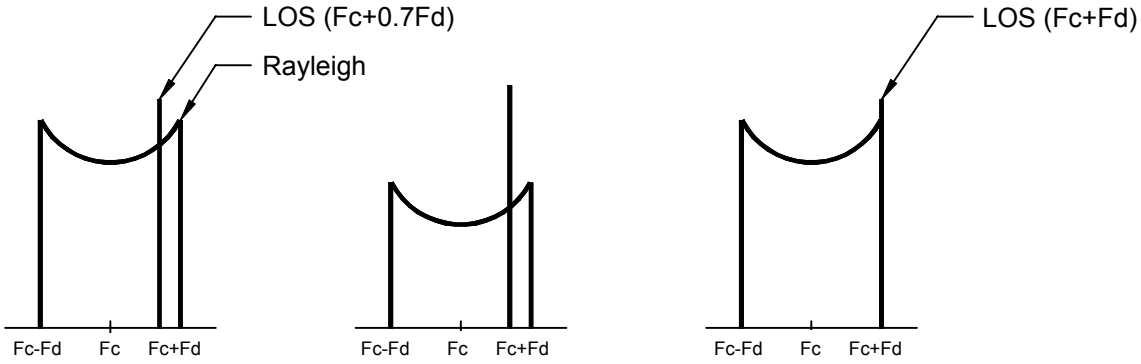
K factor [dB] = 20 x log 10 (LOS/Rayleigh)

Magnitude of the frequency shift of direct wave power components (LOS) is determined by the Angle-Of-Arrival (AOA).

LOS Doppler [Hz] = Doppler [Hz] x cos (AOA)

where, LOS Doppler [Hz] ≈ 0.7 x Doppler [Hz] for AOA = 45°
LOS Doppler [Hz] = Doppler [Hz] for AOA = 0°

Figure 11-3 shows the spectrum when Rician fading (Rician 1, Rician 2, Rician 3) are applied to the carrier (CW). (Fc: carrier frequency, Fd: Maximum Doppler frequency)



Rician 1
K = 0 [dB]
A0A = 45°

Rician 2
K = 6.8 [dB]
A0A = 45°

Rician 3
K = 0 [dB]
A0A = 0°

Figure 11-3 Carrier (CW) spectrum with Rician fading

A single Rician fading can only be added to the Path 1.

∗ 4 These patterns refer to the Rician fading profile prescribed by the standards below.
Rician 1, 2: Draft GSM 05,05 V8.0.0 (1999-07)
Rician 3: ETSI Terrestrial Trunked Radio standards (TETRA)

11.1.5.3 Frequency Shift (Freq. Shift)

The Frequency Shift (called Doppler shift) shifts the baseband signal frequency with the maximum Doppler frequency (Fd).

See formula and Figure 11-1 below.

$I = I \times \cos\omega f \cdot t - Q \times \sin\omega f \cdot t$

$Q = I \times \sin\omega f \cdot t + Q \times \cos\omega f \cdot t$

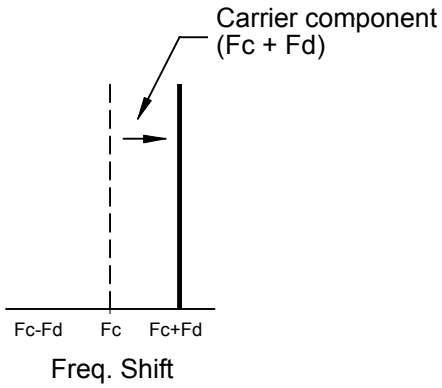


Figure 11-4 Spectrum of carrier wave shifted

The RF frequency can be shifted in ratio of -1.0 to +1.0 to the maximum Doppler frequency.
For example, when the maximum Doppler frequency is 100 Hz, the RF frequency shifts +100 Hz by setting the shift to +1.0.

11.1.5.4 Phase Shift (Phase Shift)

The Phase Shift shifts the baseband signal phase with the preset phase angle.

See Figure 11-1. The frequency shift can be derived from the following formula.

$I = I \times \cos\theta - Q \times \sin\theta$

$Q = I \times \sin\theta + Q \times \cos\theta$

The settable phase angle is 0° to 360°. This mode cannot display the frequency shift in spectrum format.

11.1.5.5 Path Through (Through)

When each path is set to Path Through, the output signal is delayed or attenuated regardless of the Doppler frequency. The multipath propagation system is thus constructed.

11.1.6 Relative Delay Time

This function is used to delay the path signal with the preset delay time set in each path with respect to the reference signal (∗ 5).

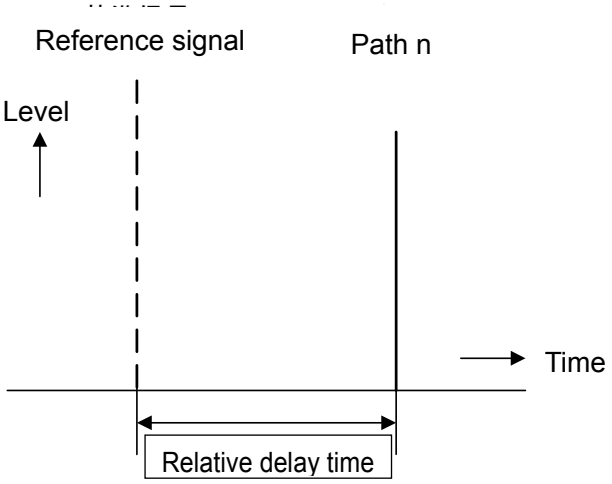


Figure 11-5 Relative delay time

11.1.7 Relative Path Loss

This function is used to attenuate the path signal corresponding to the preset loss set in each path with respect to the reference signal (∗ 5)

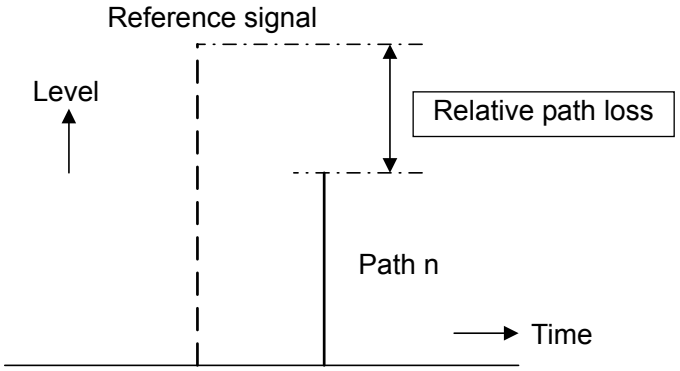


Figure 11-6 Relative path loss

∗ 5 Reference signal can be obtain by setting the relative delay time and relative path loss to 0.

11.2 LCD Panel Description

11.2.1 LCD Display

The screen display consists of the top screen and various setting screens. The followings describe the typical screens.

<Top screen>

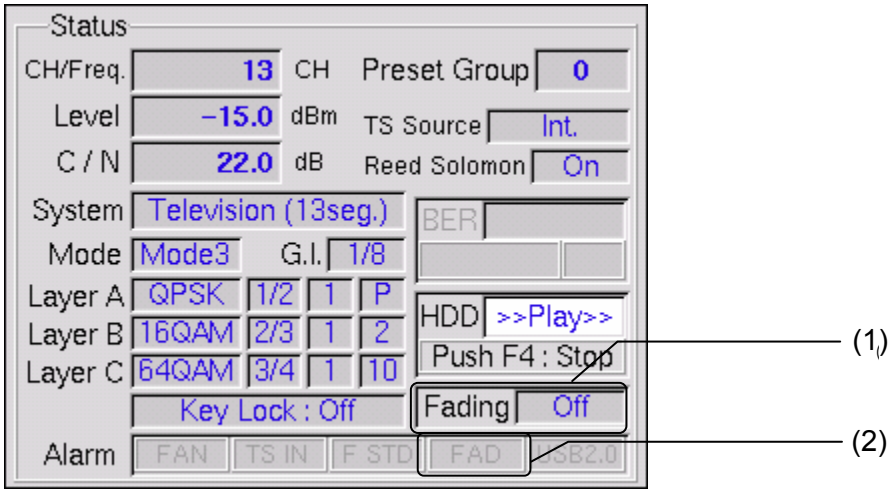


Figure 11-7 Top screen

(1) Selecting fading mode — When the fading mode is enabled, "6 Path" or "12 Path" is displayed. "Off" indicates the normal mode.

(2) Fading output alarm — Displays the output status. When fading mode is selected, error is displayed if the internally generated signal is distorted due to excessive signal level.

About output alarm

In fading mode, overflow may occur since the internal signal level raises momentary when summing the multipath modulation waves. The output alarm indicator lights in this case. Lower the internal signal level (e.g., reducing relative path loss in detail path setting).

11.3 Operating Procedure

Various fading parameters can be set.

11.3.1 Setting/Displaying Fading Mode

Pressing the NOISE key enters Noise selection screen.

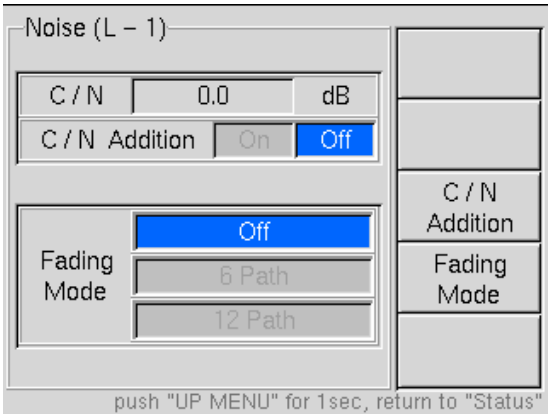


Figure 11-8 Noise selection screen

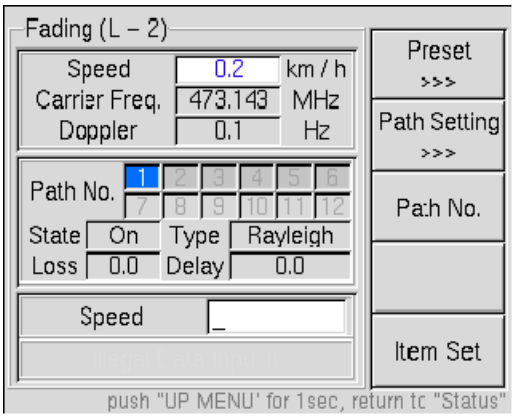


Figure 11-9 Detail setting screen

Pressing the Fading Mode key alternately selects the 6 Path, 12 Path, and Off. Select as required.
When 6 Path or 12 Path is selected, "Fading>>>" is displayed on the F2 key. Pressing the F2 key enters detail setting screen.

<Display description>

Speed	Speed of mobile object
Carrier Freq.	RF output frequency
Doppler	Maximum Doppler frequency
Path No.	Selectable number of paths, selected path number
State	Selected path conditions
Type	Modulated fading type of selected path
Loss	Relative path loss of selected path
Delay	Relative delay time of selected path

To set the Speed, use the numeric keypad in units of km/h.
To set the Carrier Freq., use the numeric keypad in units of MHz.
To set the Doppler, use the numeric keypad in units of Hz.
Pressing the Item Set switches the items to be set numeric data.
Pressing the Path No. key increments the path number by one from "1."

Pressing the Preset key can select five types of fading profiles for 6 Path or 12 Path mode respectively.
Pressing the Preset No. key switches the preset number. In 12 Path mode, Page is assigned to the F4 key. Pressing this key displays page 2.

Refer to Section 11.6 for detail profile setting conditions.

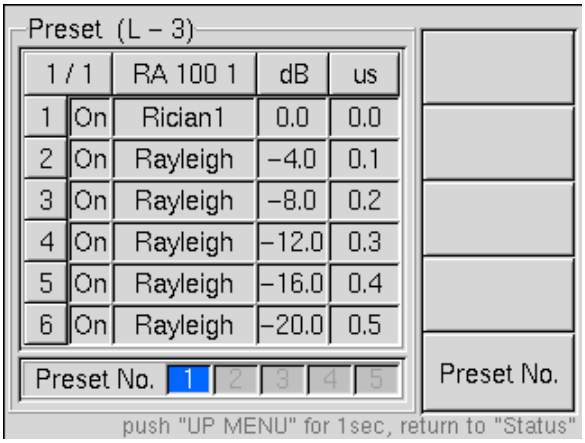


Figure 11-10 Preset No. selection screen

11.3.2 Detail Setting/Displaying Each Path

When the path number is selected, pressing the Path Setting key displays its detail setting screen.

Pressing the Item Set key sequentially selects the items to set numeric data.

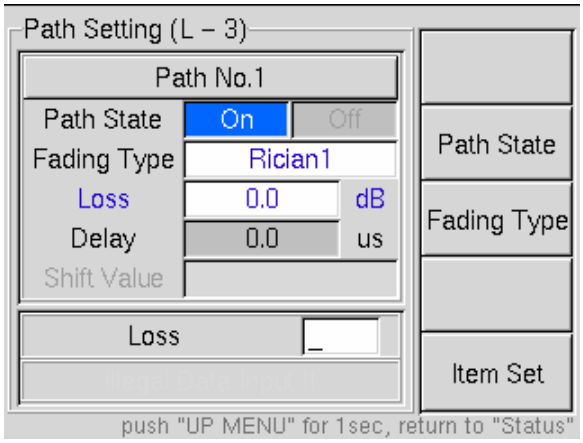


Figure 11-11 Detail path number setting screen

<Setting item>

Path State	Selects the path signal on/off.
Fading Type	Determines the modulated fading type.
Loss	Sets the relative path loss. Use the numeric keypad to directly enter the value in units of dB.
Delay	Sets the relative delay time. Use the numeric keypad to directly enter the value in units of μs.
Shift Value	Sets the magnitude of shift when the fading type is Freq. Shift or Phase Shift by using the numeric keypad. For the Freq. Shift, enter the ratio to the maximum Doppler frequency. When the Phase Shift is selected, enter the angle by using the numeric keypad.

11.3.3 Restriction of Settings

There are following restrictions on this Option.

11.3.3.1 Speed of Mobile Object and Maximum Doppler Frequency

The settable maximum Doppler frequency is 0.1 Hz to 200 Hz, carrier frequency is 50 to 860 MHz. The setting of the Doppler frequency cannot be set the maximum Doppler frequency becoming the range outside, since the relation between the output frequency and the speed of the mobile object. Therefore, the settable maximum Doppler frequency is restricted by the RF frequency and the speed of the mobile object.
Refer to section 11.1.4 for details.

11.3.3.2 Modulated Fading Type

The settable combination of the modulated fading type is listed below.

Table 11.2 Settable combination of modulated fading

	Path1	Path2	Path3	Path4 and later	Remarks
Pattern1	Rayleigh	Rayleigh	Rayleigh	Rayleigh	All are the Rayleigh.
Pattern2	Rician	Rayleigh	Rayleigh	Rayleigh	Only Path1 is the Rician.
Pattern3	Freq.Shift	Rayleigh	Rayleigh	Rayleigh	Settable the Freq. Shift for only one out of arbitrary paths.
	Rayleigh	Freq.Shift	Rayleigh	Rayleigh	
	Rayleigh	Rayleigh	Freq.Shift	Rayleigh	
	Rayleigh	Rayleigh	Rayleigh	Rayleigh/Freq.Shift	
Pattern4	Freq.Shift	Freq.Shift	Rayleigh	Off	Settable the Freq. Shift for arbitrary two out of path1, path2 and path3.
	Rayleigh	Freq.Shift	Freq.Shift	Off	
	Freq.Shift	Rayleigh	Freq.Shift	Off	

Rayleigh: [Rayleigh] or [Phase Shift] or [Through]
Rician: [Rician1] or [Rician2] or [Rician3]

Remarks

- The Rician can only be set to Path1 (pattern2).
  The Rayleigh or Phase Shift or Through can only be set to the Path2 and later.
  When the Freq. Shift is selected for Path2 and later, the Path1 cannot be set to Rician.
- The Freq. Shift can be set only one out of arbitrary paths (Pattern3).
  When the Freq. Shift is set as any one path, the Freq. Shift cannot be set to other paths. However, the Freq. Shift can be set for arbitrary two out of path1, path2 and path3 (Pattern4).
  For example, when the both Path1 and Path2 have been set to the Freq. Shift, only Path3 can be set to Rayleigh or Phase Shift or Through.
  The Path4 and later cannot be set on.
  When the Path4 and later are set on, Path4 and later is automatically set off by selecting the Freq. Shift to Path1 and Path2.

11.3.3.3 Relative Path Loss

The settable range of the relative path loss is -30.0 to 0 dB. The settable steps are listed below.

-10 to 0 dB: 0.1 dB steps
-20 to -10 dB: 0.5 dB steps
-30 to -20 dB: 1.0 dB steps

If the step value other than the specified step range is entered, the value after decimal point is set as follows:

-20 to -10 dB: Approximated to settable value
-30 to -20 dB: Rounded off.

11.3.3.4 RF Output Level

In fading mode, overflow may occur since the internal signal level raises momentary when summing the multipath modulation waves. Therefore, the output level depends on the fading mode as follows since the internal signal level is lowered and compensated at the RF signal generator:

Normal mode	-100 to +13 dBm,	-53 to +60 dBmV,	+7 to +120 dBμV
6 Path mode	-100 to +8 dBm,	-53 to +55 dBmV,	+7 to +115 dBμV
12 Path mode	-100 to +3 dBm,	-53 to +50 dBmV,	+7 to +110 dBμV

About RF output level

When summing the modulation signals of multiple paths in the fading mode, the internal signal level is reduced 5 dB for the 6 Path mode, 10 dB for the 12 Path mode since the internal signal level raises momentary. The level is compensated in the RF generator.
Therefore, the upper limit of the RF signal level is lowered 5 dB for 6 Path mode, 10 dB for 12 Path mode with respect to the normal mode.

11.3.3.5 Setting C/N

In the fading mode, since the ratio of the noise is different according to the correction of the level of internal signal, the setting range of C/N is also different.

Normal mode	0 to 30 dB
6 Path mode	0 to 25 dB
12 Path mode	0 to 20 dB

The C/N adds the amount of energies of the Noise to the amount of energies of the Reference signal. Although the amount of energies of the signal changes by combining the number of Paths or the Fading types, the amount of energies of the noise does not change.
The following figures show the case where C/N is added to the carrier (CW).

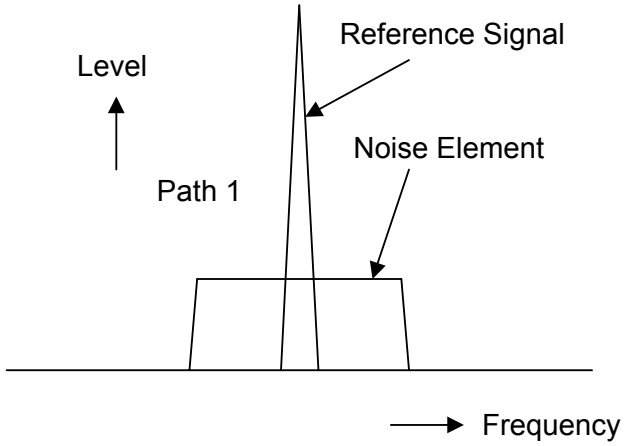


Figure 11-12 When the Fading is set to OFF or Path1 only and when the Loss is 0dB (Reference Signal).

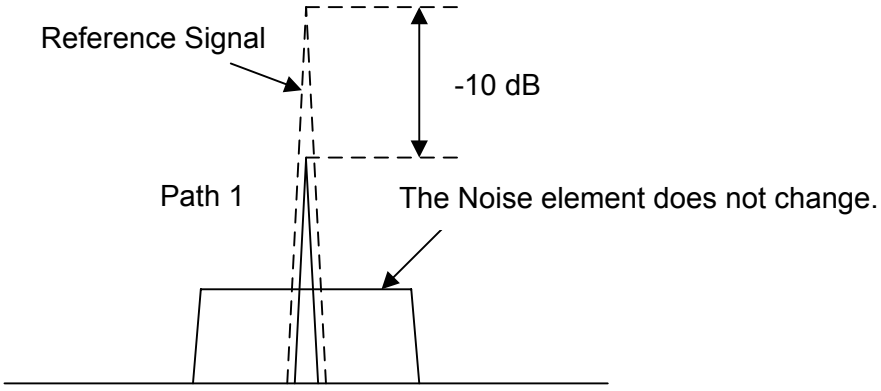


Figure 11-13 When the Fading is set to Path1 only and when the Loss is -10dB.

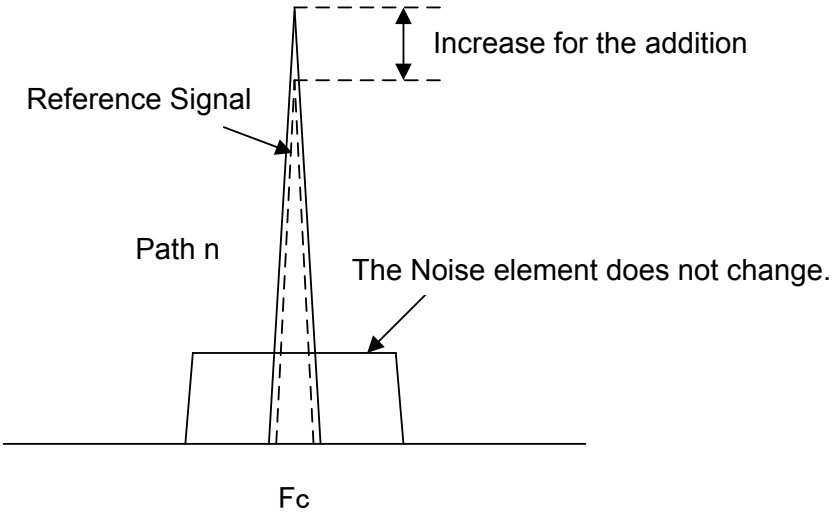


Figure 11-14　When multiple Paths are added

Although the output level is changed, this C/N does not change, but the amount of entire energies are changed.

11.4 Others

<Confirming version>

The information related to this option can be confirmed on the "UTILITY" screen.

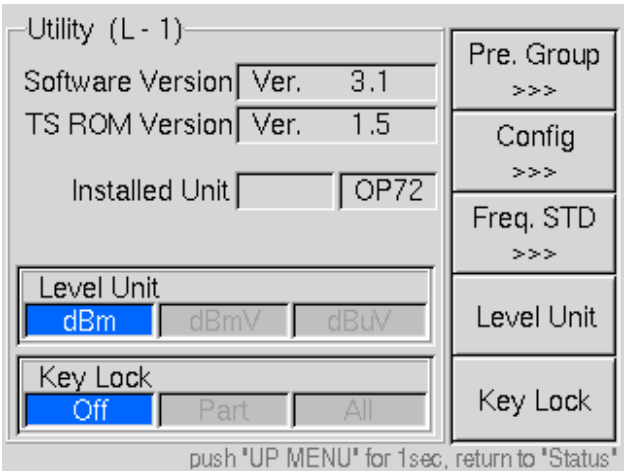


Figure 11-15　UTILITY screen

11.5 GPIB

This section only describes the information related to the OP72A. Refer to Chapter 8 in this manual for other informations.

11.5.1 Program Code List Added to OP72A

Table 11-3 Setting code list

	Header	Data	Description
90	FO	n 0 to 2	Setting fading on/off
91	FR	n 0 to 2	Selecting preset group
		p 1 to 5	Selecting preset number
92	FS	i 0.1 to 4320.0	Setting speed of mobile object
93	FP	n 1 to 12	Setting path number
		p 0 to 1	Path control
		q 0 to 6	Setting fading type
		r -30.0 to 0	Setting relative loss
		s 0 to 800.0	Setting relative delay time
		t -1.0 to 1.0	Setting magnitude of frequency shift
		t 0 to 360.0	Setting magnitude of phase shift
94	DP	i 0.1 to 200.0	Setting Doppler frequency

Table 11-4 Query code list

	Header	Data	Description	Reply
90	FO	?	Querying fading on or off	n
92	FS	?	Querying speed of mobile object settings	i
93	FP	?	Querying detail path settings	n, p, q, r, s, t
94	DP	?	Querying Doppler frequency	i

11.5.2 Detail Program Code

This section describes detail program codes listed in Section 11.5.1.
The codes used in this section are defined as follows.

n, p, q	0 and natural number
i, r, s, t	Integer including decimal point
_	Space (20h in ASCII code)

- Terminator is omitted for a syntax. Refer to Section 8.9, “Program Message Terminator” for the added terminator at the end of the code.
- Header is not added for reply; the reply code consists of data only.

(90) Setting fading on/off ..... "FO"

Function Setting and querying fading on/off

Syntax FO_n (Setting, reply)

FO_? (Query)

n	Fading On/Off
0	Off
1	6 Path
2	12 Path

(91) Presetting fading ..... "FR"

Function Presetting fading

Syntax FR_n, p (Setting)

n	Group Settings
0	Group 0
1	Group 1
2	Group 2

p	Pattern Settings
1	Pattern 1
2	Pattern 2
3	Pattern 3
4	Pattern 4
5	Pattern 5

(92) Setting speed of mobile object ..... "FS"

Function Setting and querying speed of mobile object

Syntax FS_i (Setting, reply)

FS_? (Query)

i Speed: 0.1 to 4320.0 (km/h), effective down to one digit after decimal point

∗ The settable speed of mobile object depends on the RF frequency. Refer to Section 11.3.3.1 for details.

(93) Setting path in detail ..... "FP"

Function Setting and querying path in detail

Syntax FP_n, p (, q, r, s, t) (Setting, reply)

FP_n_? (Query)

∗ In this program code, the amount of consequent data depends on "p" or "q" selected. This code cannot be set when the fading mode is set off.

n	Path No
1 to 12	Path No

∗ Path numbers 1 to 6 are effective in the 6 Path mode when the fading mode is set on.

p	Path Control
0	Off
1	On

∗ When the path control is set off, no later setting is required.
Example:
Path 2 = off FP 2, 0

q	Fading Type
0	Rayleigh
1	Rician 1
2	Rician 2
3	Rician 3
4	Freq. Shift
5	Phase Shift
6	Through

∗ Refer to Section 11.3.3.2 for the settable fading type since there is restriction.

r Relative path loss: -30.0 to 0 (dB), effective down to one digit after decimal point

∗ Refer to Section 11.3.3.3 for the settable step of the relative path loss since the step depends on the setting range.

s Relative delay time: 0 to 800.0 (μs), effective down to one digit after decimal point

t	Magnitude of Shift
-1.0 to 1.0	Magnitude of shift (for frequency shift)
0 to 360.0	Magnitude of shift (for phase shift)
None	Except frequency and phase shift

∗ The magnitude of shift can only be set when the frequency shift or phase shift mode is selected.

(94) Setting Doppler frequency..... "DP"

Function Setting and querying maximum Doppler frequency

Syntax DP_i (Setting, reply)

DP_? (Query)

i Maximum Doppler frequency: 0.1 to 200.0 Hz, effective down to one digit after decimal point

∗ The setting of the Doppler frequency cannot be set the maximum Doppler frequency becoming the range outside, since the relation between the RF output frequency and the speed of the mobile object. Refer to Section 11.1.4 for details.

11.6 Fading Profile

This option equips five patterns for each measurement profile respectively in three groups. The patterns are the model*6 recommended by ATSC and GSM standard.
Also these patterns refer to the model to evaluate “Advanced Television Technology Center (ATTC)” and “Mobile Television and Innovative Receivers (MOTIVATE) projects.”

*6 GSM: ETSI EN 300 910 (GSM 05. 05) equivalent
ATSC: A/74 ATSC Recommended Practice: Receiver Performance Guidelines equivalent

The contents of each group are listed below:

1: GSM
2: ATSC
3: BRAZIL Ensemble

Abbreviations for the patterns of GMS listed below:

RA: Typical case for Rural Area
TU: Typical case for Urban Area
HT: Typical case for Hilly Terrain
EQ: Profile for Equalization Test

* In this instrument composition, the output alarm might light even if the pattern has been preset.
Refer to Section 11.2.1 (2), “Fading output alarm.”

Table 11-5 Preset 1-1 GSM-RA100-1 (6 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	100.0	On	0.0	0.0	Rician1	
2		On	0.1	-4.0	Rayleigh	
3		On	0.2	-8.0	Rayleigh	
4		On	0.3	-12.0	Rayleigh	
5		On	0.4	-16.0	Rayleigh	
6		On	0.5	-20.0	Rayleigh	

Table 11-6 Preset 1-2 GSM-RA100-2 (6 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	100.0	On	0.0	0.0	Rician1	
2		On	0.2	-2.0	Rayleigh	
3		On	0.4	-10.0	Rayleigh	
4		On	0.6	-20.0	Rayleigh	
5		Off				
6		Off				

Table 11-7 Preset 1-3 GSM-TU50 (6 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	50.0	On	0.0	-3.0	Rayleigh	
2		On	0.2	0.0	Rayleigh	
3		On	0.5	-2.0	Rayleigh	
4		On	1.6	-6.0	Rayleigh	
5		On	2.3	-8.0	Rayleigh	
6		On	5.0	-10.0	Rayleigh	

Table 11-8 Preset 1-4 GSM-HT100 (6 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	100.0	On	0.0	0.0	Rayleigh	
2		On	0.1	-1.5	Rayleigh	
3		On	0.3	-4.5	Rayleigh	
4		On	0.5	-7.5	Rayleigh	
5		On	15.0	-8.0	Rayleigh	
6		On	17.2	-17.5	Rayleigh	

Table 11-9 Preset 1-5 GSM-EQ50 (6 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	50.0	On	0.0	0.0	Rayleigh	
2		On	3.2	0.0	Rayleigh	
3		On	6.4	0.0	Rayleigh	
4		On	9.6	0.0	Rayleigh	
5		On	12.8	0.0	Rayleigh	
6		On	16.0	0.0	Rayleigh	

Table 11-10 Preset 2-1 ATSC-R2.1 #1

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.5	On	1.8	0.0	Phase Shift	0
2		On	0.0	-20.0	Phase Shift	125
3		On	2.0	-20.0	Phase Shift	80
4		On	3.6	-10.0	Phase Shift	45
5		On	7.5	-18.0	Freq.Shift	1.0
6		On	36.8	-18.0	Phase Shift	90

Table 11-11 Preset 2-2 ATSC-R2.1 #2

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.5	On	1.8	0.0	Phase Shift	0
2		On	0.0	-17.0	Phase Shift	125
3		On	2.0	-17.0	Phase Shift	80
4		On	3.6	-7.0	Phase Shift	45
5		On	7.5	-15.0	Freq.Shift	1.0
6		On	36.8	-15.0	Phase Shift	90

Table 11-12 Preset 2-3 ATSC-R2.1 #3

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.5	On	1.8	0.0	Phase Shift	0
2		On	0.0	-14.0	Phase Shift	125
3		On	2.0	-14.0	Phase Shift	80
4		On	3.6	-4.0	Phase Shift	45
5		On	7.5	-12.0	Freq.Shift	1.0
6		On	36.8	-12.0	Phase Shift	90

Table 11-13 Preset 2-4 ATSC-R2.1 #4

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.5	On	1.8	0.0	Phase Shift	0
2		On	0.0	-11.0	Phase Shift	125
3		On	2.0	-11.0	Phase Shift	80
4		On	3.6	-1.0	Phase Shift	45
5		On	7.5	-9.0	Freq.Shift	1.0
6		On	36.8	-9.0	Phase Shift	90

Table 11-14 Preset 2-5 ATSC-R2.2 #1

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.5	On	1.8	0.0	Phase Shift	0
2		On	0.0	-15.0	Phase Shift	125
3		On	2.0	-15.0	Phase Shift	80
4		On	3.6	-7.0	Phase Shift	45
5		On	7.5	-15.0	Freq.Shift	1.0
6		On	41.6	-15.0	Phase Shift	90

Table 11-15 Preset 3-1 BRAZIL ENSEMBLE A

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.2	On	0.0	0.0	Phase Shift	0
2		On	0.2	-14.0	Phase Shift	0
3		On	2.2	-16.0	Phase Shift	0
4		On	3.1	-15.0	Phase Shift	0
5		On	5.9	-13.5	Phase Shift	0
6		On	5.9	-16.5	Phase Shift	0

Table 11-16 Preset 3-2 BRAZIL ENSEMBLE B

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.2	On	0.0	0.0	Phase Shift	0
2		On	0.3	-12.0	Phase Shift	0
3		On	3.5	-4.0	Phase Shift	0
4		On	4.4	-7.0	Phase Shift	0
5		On	9.5	-15.0	Phase Shift	0
6		On	12.7	-22.0	Phase Shift	0

Table 11-17 Preset 3-3 BRAZIL ENSEMBLE C

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.2	On	0.0	-2.8	Phase Shift	0
2		On	0.1	0.0	Phase Shift	0
3		On	0.4	-3.8	Phase Shift	0
4		On	1.5	-0.1	Phase Shift	0
5		On	2.3	-2.5	Phase Shift	0
6		On	2.8	-1.3	Phase Shift	0

Table 11-18 Preset 3-4 BRAZIL ENSEMBLE D

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.2	On	0.2	-0.1	Phase Shift	0
2		On	0.6	-3.8	Phase Shift	0
3		On	2.2	-2.6	Phase Shift	0
4		On	3.1	-1.3	Phase Shift	0
5		On	5.9	0.0	Phase Shift	0
6		On	5.9	-2.8	Phase Shift	0

Table 11-19 Preset 3-5 BRAZIL ENSEMBLE E

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	0.2	On	0.0	0.0	Phase Shift	0
2		On	1.0	0.0	Phase Shift	0
3		On	2.0	0.0	Phase Shift	0
4		Off				
5		Off				
6		Off				

Table 11-20 Preset 1-1 GSM-TU50-1 (12 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	50.0	On	0.0	-4.0	Rayleigh	
2		On	0.1	-3.0	Rayleigh	
3		On	0.3	0.0	Rayleigh	
4		On	0.5	-2.6	Rayleigh	
5		On	0.8	-3.0	Rayleigh	
6		On	1.1	-5.0	Rayleigh	
7		On	1.3	-7.0	Rayleigh	
8		On	1.7	-5.0	Rayleigh	
9		On	2.3	-6.5	Rayleigh	
10		On	3.1	-8.6	Rayleigh	
11		On	3.2	-11.0	Rayleigh	
12		On	5.0	-10.0	Rayleigh	

Table 11-21 Preset 1-2 GSM-TU50-2 (12 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	50.0	On	0.0	-4.0	Rayleigh	
2		On	0.2	-3.0	Rayleigh	
3		On	0.4	0.0	Rayleigh	
4		On	0.6	-2.0	Rayleigh	
5		On	0.8	-3.0	Rayleigh	
6		On	1.2	-5.0	Rayleigh	
7		On	1.4	-7.0	Rayleigh	
8		On	1.8	-5.0	Rayleigh	
9		On	2.4	-6.0	Rayleigh	
10		On	3.0	-9.0	Rayleigh	
11		On	3.2	-11.0	Rayleigh	
12		On	5.0	-10.0	Rayleigh	

Table 11-22 Preset 1-3 GSM-HT100-1 (12 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	100.0	On	0.0	-10.0	Rayleigh	
2		On	0.1	-8.0	Rayleigh	
3		On	0.3	-6.0	Rayleigh	
4		On	0.5	-4.0	Rayleigh	
5		On	0.7	0.0	Rayleigh	
6		On	1.0	0.0	Rayleigh	
7		On	1.3	-4.0	Rayleigh	
8		On	15.0	-8.0	Rayleigh	
9		On	15.2	-9.0	Rayleigh	
10		On	15.7	-10.0	Rayleigh	
11		On	17.2	-12.0	Rayleigh	
12		On	20.0	-14.0	Rayleigh	

Table 11-23 Preset 1-4 GSM-HT100-2 (12 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	100.0	On	0.0	-10.0	Rayleigh	
2		On	0.2	-8.0	Rayleigh	
3		On	0.4	-6.0	Rayleigh	
4		On	0.6	-4.0	Rayleigh	
5		On	0.8	0.0	Rayleigh	
6		On	2.0	0.0	Rayleigh	
7		On	2.4	-4.0	Rayleigh	
8		On	15.0	-8.0	Rayleigh	
9		On	15.2	-9.0	Rayleigh	
10		On	15.8	-10.0	Rayleigh	
11		On	17.2	-12.0	Rayleigh	
12		On	20.0	-14.0	Rayleigh	

Table 11-24 Preset 1-5 GSM-EQ50 (12 Path)

Path	Speed (km/h)	Path State	Delay (us)	Loss (dB)	Type	Shift
1	50.0	On	0.0	0.0	Rayleigh	
2		On	1.6	0.0	Rayleigh	
3		On	3.2	0.0	Rayleigh	
4		On	4.8	0.0	Rayleigh	
5		On	6.4	0.0	Rayleigh	
6		On	8.0	0.0	Rayleigh	
7		On	9.6	0.0	Rayleigh	
8		On	11.2	0.0	Rayleigh	
9		On	12.8	0.0	Rayleigh	
10		On	14.4	0.0	Rayleigh	
11		On	16.0	0.0	Rayleigh	
12		On	17.6	0.0	Rayleigh	

12. MAINTENANCE

The LG 3802 (S1) is designed to operate stably under normal handling. If you have questions regarding calibration and service, contact your local LEADER agent.

■ Open Source

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When the source code is required, contact your local LEADER agent.

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