INSTRUCTION MANUAL

8-Channel Data Recorder

DA-40

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Organization of this manual

This manual describes the features, operation and other aspects of the 8-Channel Data Recorder DA-40. If the unit is used together with other equipment to configure a measurement system, consult the documentation of all other components as well. The section starting on page iii contains important information and precautions about safety. Be sure to read and observe these in full.

This manual contains the following sections.

Outline

Gives basic information on the unit.

Parts and Functions

Explains the indicators, connectors, and all other parts on the panels of the unit.

Power On/Off

Explains how to turn the unit on and off.

Display Explanation

Explains the various items that are shown on the display panel.

Menu Operations and Setting Items

Lists the basic steps that are common to all menus, and explains the individual setting items.

Preparations

Explains checks and other steps to take before starting to record. Sensor connection and setup as well as other functions are also explained here.

Recording

Explains the recording process as well the voice memo and marker functions.

Recall/Playback of Recorded Data

Explains how to recall and delete recorded data.

Messages

Explains the description of messages that appear on the display and countermeasure to take in response to such messages.

Filter Characteristics

Shows the high-pass filter and low-pass filter characteristics.

Settings and Other Information

For convenient reference, this section lists all menu settings, data recording operation types, and other relevant information.

WAVE File Format

Provides information about the WAVE file format used by the unit for recording data.

Specifications

Lists the technical specifications of the unit.

* Company names and product names mentioned in this manual are usually trademarks or registered trademarks of their respective owners.

CE

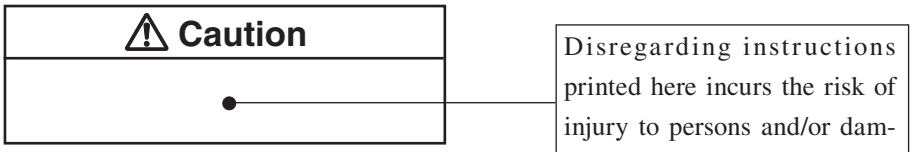
The product described in this manual is in conformity with the following European standards;

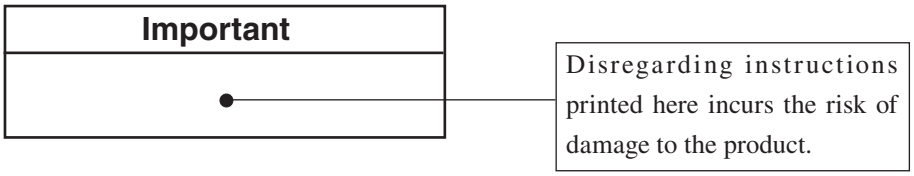
EN61326-1:2006

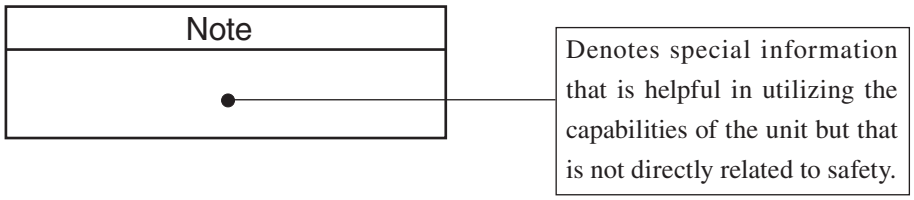
To conform to the EU requirement of the Directive 2002/96/EC on Waste Electrical and Electronic Equipment, the symbol mark on the right is shown on the instrument.

FOR SAFETY

In this manual, important safety instructions are specially marked as shown below. To prevent the risk of death or injury to persons and severe damage to the unit or peripheral equipment, make sure that all instructions are fully understood and observed.







⚠ Caution

When using earphones, beware of excessive volume levels

When connecting earphones to the Monitor Out connector of this unit, use only earphones with a volume adjustment function, because there is a risk of excessive volume levels.

Do not play the supplied disc in a CD player

The supplied DA-40 Viewer software installation disc is not a music CD. Inserting this disc in a CD player poses the risk of excessive volume levels than can cause hearing damage and damage to the CD player.

Be careful around rotating machinery

When using the unit near rotating machinery, take care that cables cannot be caught in the machinery.

Avoid excessive force and abrupt operation

Applying strong force to the keys or card slot cover of the unit can lead to damage and injury. When connecting or disconnecting cables and opening or closing the card slot cover, take care not to pinch your fingers.

Important

Disconnect sensors when playing back recorded data

During recording, the Input/Output connectors are used to supply the sensor signals, but the connectors become output connectors during playback of recorded data. If a sensor remains connected, there is a risk of damage to the sensor by the playback signal.

Check the install CD before installation

Before inserting the supplied DA-40 Viewer software install CD in the CD-ROM drive of a computer, be sure to visually check the disc. If there are any cracks or scratches or if the disc is deformed, do not insert the disc in the CD-ROM drive. Otherwise there is a risk of damage to the CD-ROM drive.

Handle batteries correctly

If batteries are inserted with wrong polarity or otherwise mishandled, battery fluid may leak and overheating may occur.

Do not apply excessive voltage

Make sure that voltage applied to the power supply connector (DC-IN), to the Input/Output connectors, and to the external trigger (Ext. Trig.) connector does not exceed the specified values. Otherwise there is a risk of damage to the unit.

Usage Precautions

- Operate the unit only as described in this manual.
- Observe the following conditions with regard to locations for use and storage of the unit:
  - Do not use or store the unit in locations where the specified permissible range for temperature and humidity may be exceeded (-10ºC to +50ºC, max. 90% RH).
  - Do not use or store the unit in locations where there are rapid and drastic changes in temperature or where there is a possibility of condensation.
  - Do not use or store the unit in locations that may be subject to splashes of water or other liquids.
  - Do not use or store the unit for an extended time in locations that may be exposed to direct sunlight.
  - Do not use or store the unit in locations that may be subject to air with high salt or sulphur content, or subject to the influence of gases and other chemicals.
  - Do not use or store the unit in slanted or instable locations.
  - Do not use or store the unit in locations that may be subject to vibrations or shock.
- If batteries are inserted with wrong polarity or otherwise mishandled, battery fluid may leak and overheating may occur.
- Make sure that voltage applied to the power supply connector (DC-IN) and to the signal Input/Output connectors does not exceed the specified values.
- Take care that cables and other parts cannot be caught in rotating machinery.
- Do not apply strong force to the keys or card slot cover of the unit. Otherwise there is a risk of damage to the unit or injury to fingers etc. When connecting or disconnecting cables and opening or closing the card slot cover, take care not to pinch your fingers.

- Use only earphones with volume control function at the Monitor Out connector of this unit, and beware of excessive volume levels.
- Use only CompactFlash cards supplied by Rion. Other commercially available cards may not operate properly with the unit.
- Verify before use that all cables are correctly and safely connected. Do not bend cables sharply or subject them to pressure. When removing cables, always grasp the plug or connector and do not pull the cable.
- Do not disassemble the unit or attempt internal alterations. In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact your supplier.
- When returning the unit for maintenance or servicing, use the original packing to protect it from shocks and vibration.
- When disposing of the unit, be sure to observe all applicable legal regurations and guidelines in your country and community.

Contents

Outline

The DA-40 is a compact, lightweight data recorder designed for waveform recording. The unit can be powered from batteries, for convenient use in the field.

To record sound or vibration waveforms, microphones or accelerometers can be connected easily. The capability for sensor drive power supply (CCLD) is also provided. Unlike with conventional units having only general-purpose connectors, the design of the DA-40 eliminates the need to set up additional connection equipment, allowing quick and uncomplicated recording start.

Features

The unit has the following features.

- Simultaneous recording of electrical signals in up to 8 channels. Compact and lightweight body ensures easy portability. A set of six IEC LR14 (size C) alkaline batteries will power the unit for about 8 hours of continuous use (at 23ºC, frequency range setting 100 Hz, 8-channel input, no CCLD, backlight off).
- CCLD support allows easy hookup of sensors including microphones and accelerometers.
- A wide range of sensors for converting sound pressure, vibrations, rotation, temperature or other measurement quantities into an electrical signal (AC or DC) is supported. Direct input range display to match the sensor measurement quantity (value, unit) is possible.
- Frequency range from DC to 20 kHz allows recording of a wide range of phenomena.
- Recorded data are stored on CompactFlash card in WAVE format. For example, when using a 4 GB card, available recording time with the 20 kHz frequency range setting and continuous recording in 8 input channels is about 80 minutes.
- Voice memo and marker information can also be recorded, to facilitate later data management.

- Accurate playback of data is possible, making it easy for example to check the reliability of data in the field. The playback signal can also be output to an analyzer or similar equipment.
- Supplied viewer software (DA-40 Viewer) for use on a computer provides the required features for checking and storing the recorded waveform data (including voice memo and marker), as well as frequency weighting and time weighting functions. The software runs on Windows computers.

System configuration

Target

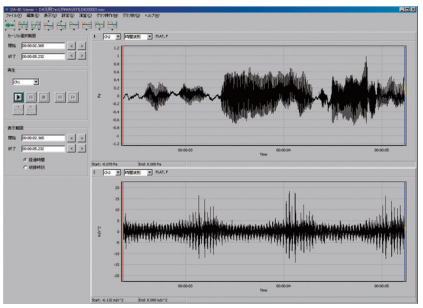
Automobile running test
(sound and vibration data)

Road traffic noise
(sound pressure waveform data)

Product inspection data

Other data

Analysis



Sensor/Measuring instrument

Tachometer　Sound level meter

Temperature meter　Vibration level meter

Microphone　Accelerometer

Other sensor

Application software

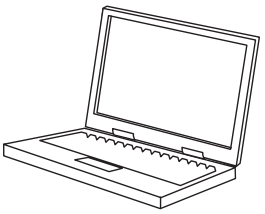
Supplied: Viewer software (DA-40 Viewer)

Waveform analysis software (CAT-WAVE)

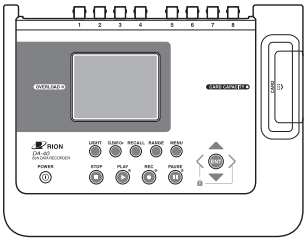
Generic waveform processing software
(up to 2 channels)

(NOTE) WAVE files created by the DA-40 are not supported by the DA-20PA1 or CAT-78WR application software.

CompactFlash Card



Windows Computer
(generic)



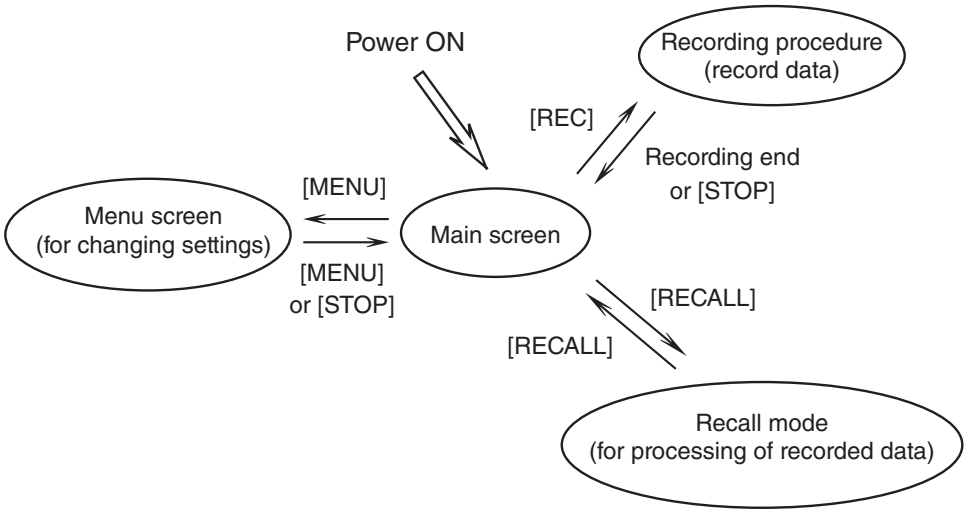
8-channel Data Recorder
DA-40

Playback signal
monitoring output

Waveform monitoring equipment
Voltmeter
FFT analyzer
Other equipment

Operation environment

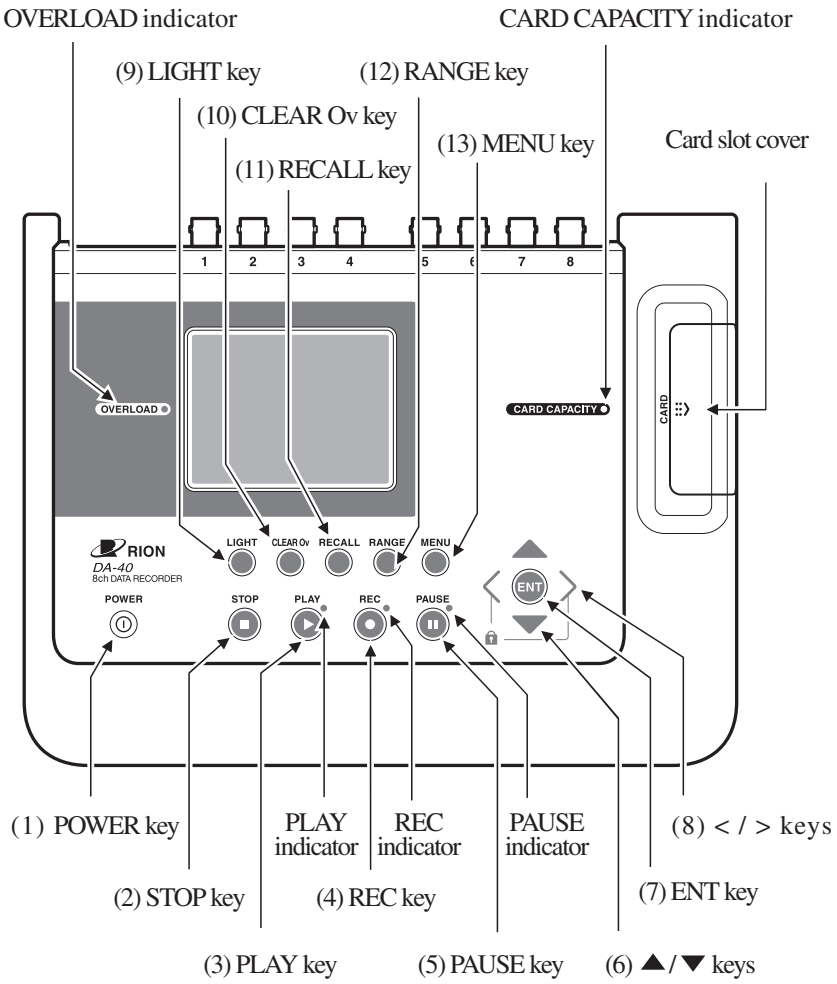
The DA-40 allows various operations for recording data. The general concept of the basic functions is as shown in the diagram below.



Main screen	This screen appears as the first screen, a short while after power to the unit is turned on. The menu screens, recording procedure, and recall mode are all accessed from the main screen. Input range selection is also possible from this screen.
Menu screen	Pressing the [MENU] key at the main screen brings up a menu screen. There are a number of menu screens that give access to recording parameters, input settings, and various other settings (see page 26).
Recording procedure	Pressing the [REC] key at the main screen initiates the recording procedure. This encompasses all steps required to record data (see page 79).
Recall mode	Pressing the [RECALL] key at the main screen activates the recall mode. In this mode, you can check, playback and delete recorded data (see page 93).

Parts and Functions

Top panel



Display panel

Shows input data, recorded data, menus for changing settings, etc.

Key names and functions

The DA-40 has some dedicated keys that perform only a specific function, and some keys that perform various functions depending on the current operating state.

(1) [POWER] key

Serves to turn the unit on and off. The key must be kept depressed for about 2 seconds.

(2) [STOP] key

Serves to stop data recording or data playback. The key is also used for menu operations and other functions.

(3) [PLAY] key

Serves to start data playback.

(4) [REC] key

Serves to start data recording.

(5) [PAUSE] key

Serves to pause and resume data recording or playback.

(6) [▲]/[▼] keys

These keys serve to switch the input range, select a monitor channel, and perform menu operations.

(7) [ENT] key

This key serves to confirm an item to be changed and accept a setting that has been made. It is used when setting the input range, performing menu operations, etc.

(8) [<]/[>] keys

These keys serve to change the data display format, change the file number, perform fast reverse/forward during playback, and perform menu operations.

(9) [LIGHT] key

Serves to control backlighting of the LCD screen. The backlight is turned on or off depending on the key press timing. When the LCD backlight has been activated, it will automatically turn itself off if there has been no key activity for a certain period. (The duration of this period can be changed with a menu setting.)

Note
When the remaining battery capacity is low and the battery icon (page 20) is flashing, the backlight does not operate.

(10) [CLEAR Ov] key

Serves to clear the overload history display. This display indicates if there has been any overload condition between the point when the key was last pressed and the current time (see page 22).

(11) [RECALL] key

Serves to activate the recall mode and to cancel the recall mode and return to the main screen.

(12) [RANGE] key

Serves to activate and cancel the input range setting condition.

In recall mode, the key serves to delete the most recently recorded data.

(13) [MENU] key

Serves to bring up a menu screen or return to the main screen.

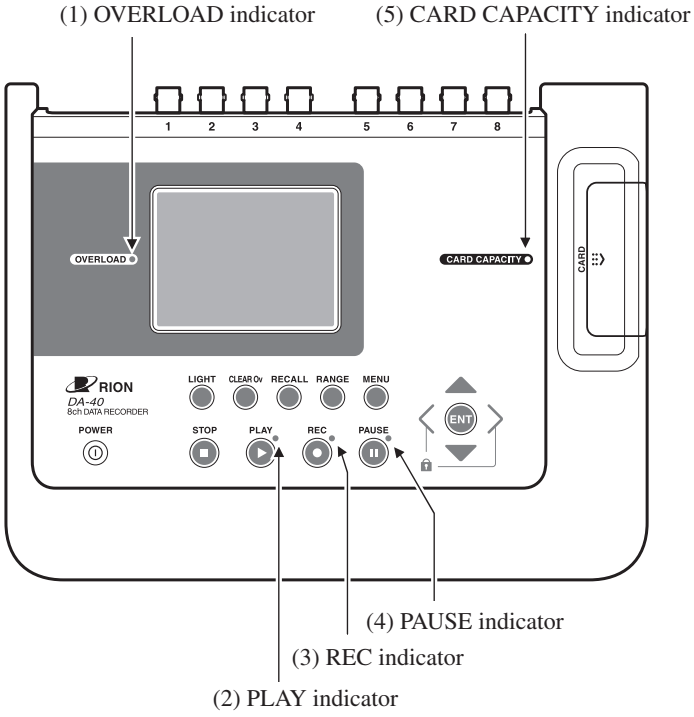
There are a number of menu screens which allow changing the settings of the unit. Menu screens are organized by function category, such as input settings, recording parameters, etc.

Key lock

Pressing and holding the [<] and [>] keys together for a few seconds activates the key lock condition. In this condition, all keys except the [<]/[>] keys and the [LIGHT] key are inactive. The condition is indicated by a key lock icon that appears on the display (page 76).

To cancel the key lock condition, press and hold the [<] and [>] keys together once more.

Indicator names and functions



(1) OVERLOAD indicator

Indicates that the input signal level in a channel is excessive. While the indicator is lit, correct recording is not possible for that channel.

Lit in red: While the input signal is causing overload and for 1 second after the overload condition ceases, the indicator is lit.

(2) PLAY indicator

Indicates that recorded data are being played back.

Flashing in green: Recorded data are being played back.

(3) REC indicator

Indicates the operating condition during data recording.

Flashing in red: Data are being recorded.

Flashing in green: Unit is in trigger standby condition.

(4) PAUSE indicator

Indicates that data recording/playback is being paused.

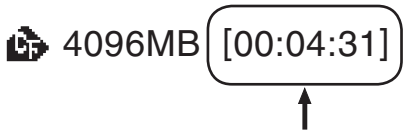
Flashing in blue: Data recording or playback is being paused.

(5) CARD CAPACITY indicator

Indicates that the remaining data recording time on the CompactFlash card is less than 10 minutes.

Flashing in red: Data recording will stop within 10 minutes.

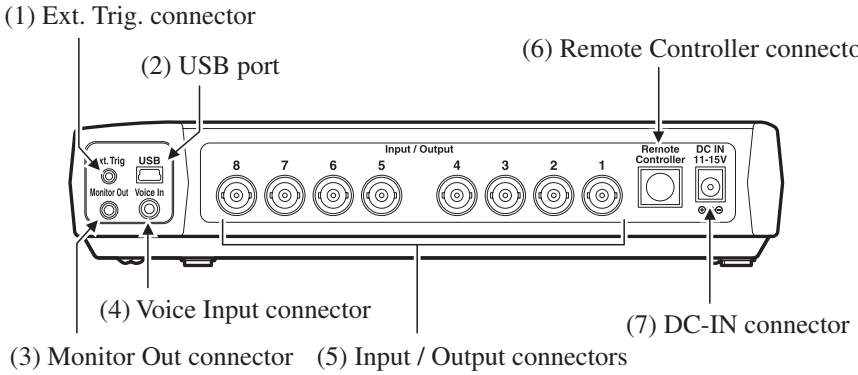
Also while the indicator is not flashing, the currently available recording time is shown on the display in the format "XX:XX:XX". Before starting to record, you should check this indication to make sure that the intended data can be recorded.



Display example for available recording time shown on bottom line of LCD screen

Hours : Minutes : Seconds

Rear panel



(1) External trigger connector (Ext. Trig.)

Accepts an external trigger signal.

(2) USB port (USB)

For future expansion (currently not used).

(3) Monitor output connector (Monitor Out)

The monitor channel input signal or playback signal is output from this connector.

(4) Voice input connector (Voice Input)

Serves to connect the supplied microphone for the voice memo function.

(5) Input/output connectors (Input/Output)

In modes other than recall mode, these connectors are used to supply the input signal for recording.

While recorded data are being played back in recall mode, the playback signal is available at these connectors.

Each connector therefore fulfills two functions. In this manual, the connector is referred to as a "signal input connector" when functioning as an input and as a "playback output connector" when functioning as an output.

(6) Remote controller connector (Remote Controller)

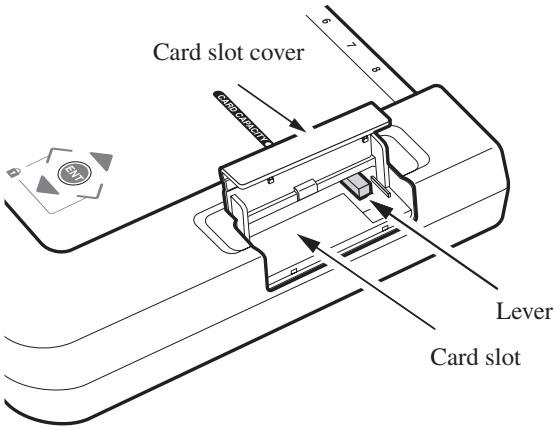
Serves to connect the Remote Controller (option).

(7) Power supply connector (DC-IN)

An AC adapter (option) or the cigarette lighter adapter CC-82 (option) can be connected here. For information on suitable AC adapters, see the section "Optional Accessories" (page 141).

Important
Do not connect any AC adapter or cigarette lighter adapter except for the specified models. Otherwise the unit may be damaged.
The cigarette lighter adapter (option) is only for use in cars with a 12-V electrical system. If the adapter is used in a car with a 24-V electrical system to supply power to the DC-IN connector of the DA-40, the unit will be damaged.
When connecting an external DC source to the DC-IN connector, pay close attention to voltage rating and polarity. The allowable voltage range is 11 to 15 V. The shut-down voltage is set to 10.5 V.

Front side panel



Lever

Push this lever in to remove the CompactFlash card.

Card slot cover

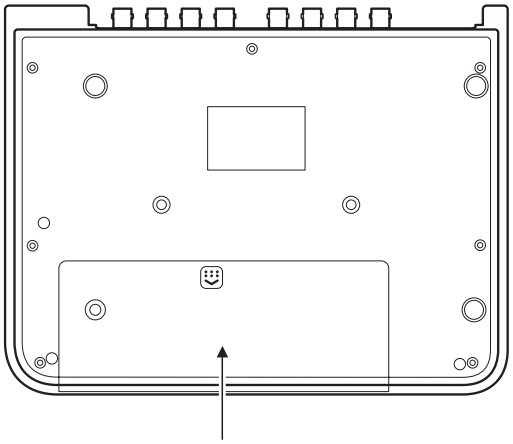
Open this cover to access the CompactFlash card slot.

Card slot

The CompactFlash card is inserted here.

Note
Use only RION supplied CompactFlash cards certified for operation in the DA-40. 4 GB CompactFlash cards must be formatted with the FAT32 file system. 2 GB cards should be formatted with the FAT16 file system.
CompactFlash cards that contain other data files cannot be used in the DA-40. (The indication "Card Error" appears.) To use such a card in the DA-40, it must be formatted in a Windows computer first. When removing the card from the computer after formatting, be sure to follow the correct procedure for safely removing hardware (such as clicking on the icon in the task tray).
When a CompactFlash card with a large number of files is inserted in the DA-40, the unit may take some time to recognize the card. The time required will be longer with a 4 GB card (FAT32) than with a 2 GB card (FAT16).

Bottom panel



Battery compartment

Accepts six alkaline batteries (IEC LR14 (size C)).

Menu lock mode (see page 77):

When the [MENU] switch inside the battery compartment is set to "LOCK", changing settings and deleting data via the menus is not possible.

Wake-up-on-power mode (see page 50):

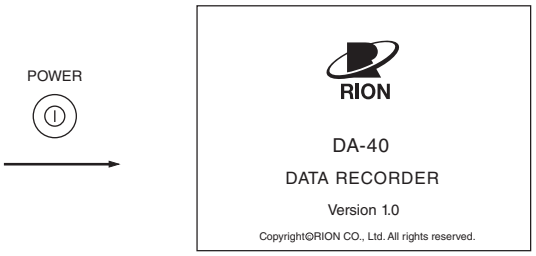
When the [WAKE UP ON POWER] switch inside the battery compartment is set to "ON", the unit is switched on and off in conjunction with the power supplied to the DC-IN connector on the DA-40. In this case, the [POWER] key has no effect.

Note
Before changing the position of this switch, disconnect any external power that is being supplied to the DC-IN connector and remove all batteries from the battery compartment. Otherwise operation of the unit will become unstable. If this has happened (not a defect of the unit), disconnect the external power, remove all batteries, after a few seconds, reconnect the power and turn the unit on.
When using the wake-up-on-power mode, there should be no batteries inserted in the unit.

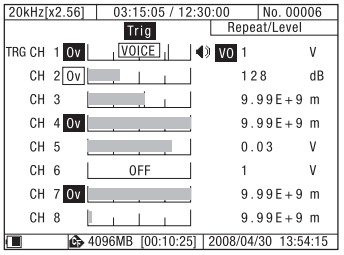
Power On/Off

Turning the power on

When you keep the [POWER] key depressed, the startup screen as shown below appears on the display. After a while, the main screen will be shown.



Startup screen immediately after power-on



Main screen

Note
The input range and menu settings etc. at power-on will be the same as the settings that were active before the unit was last turned off.
After turning the power on, it takes about 20 seconds for the main screen to appear.

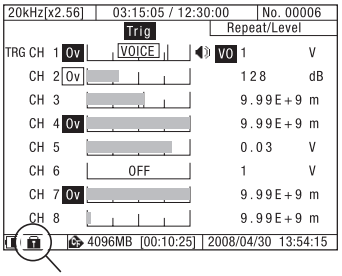
Important
At power-on, the unit performs various self-checking and adjustment routines. The indication "Adjustment executing" is shown during this interval, which may take up to about one minute. If adjustment could not be completed normally, the indication "Adjustment failed" appears and all LED indicators are flashing. In such a case, press the [ENT] key to cancel the display. Then turn the unit off, wait a few seconds, and turn power on again.

Turning the power off

When you keep the [POWER] key depressed, the shutdown screen as shown below appears on the display, and the unit is turned off.

Shutdown screen

Note that if a icon is shown at the bottom of the display, the operation keys including the [POWER] key are locked. The power cannot be turned off in this condition. (For information on the key lock feature, see page 76.)

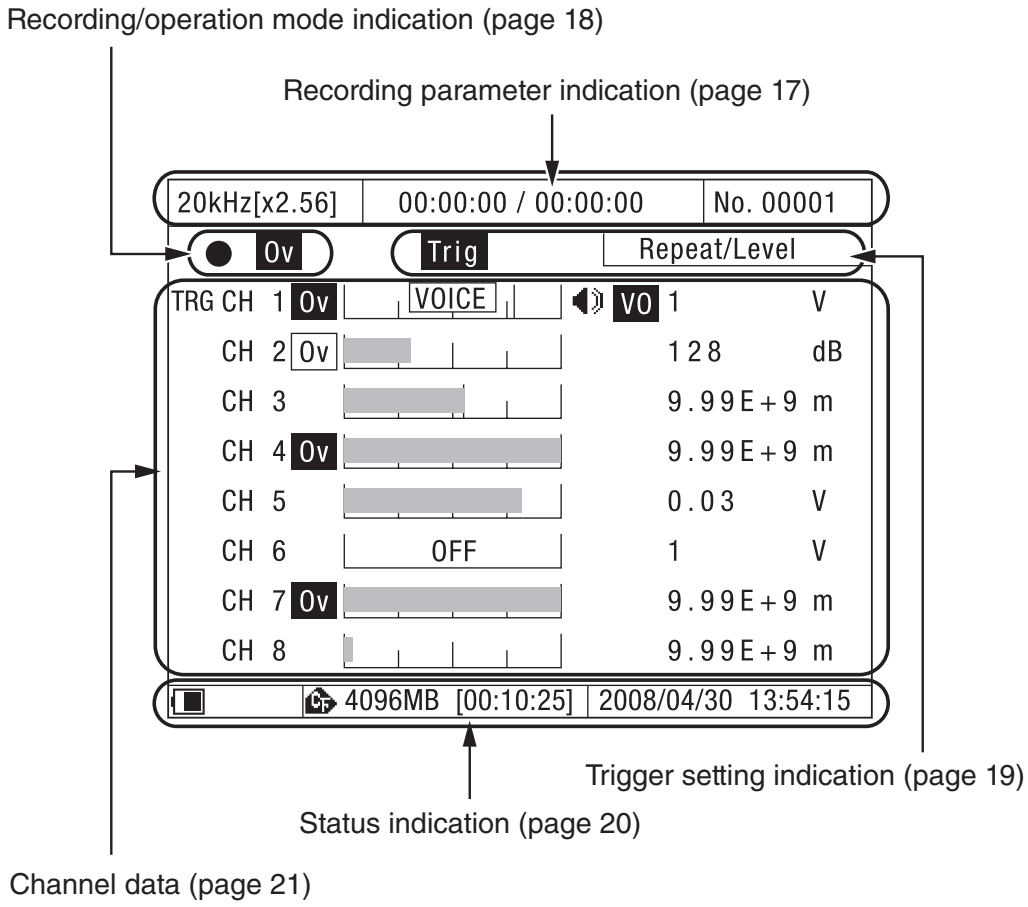


Indicates the key lock condition

Note
After turning the unit off, do not turn the unit on again immediately. Wait at least a few seconds.

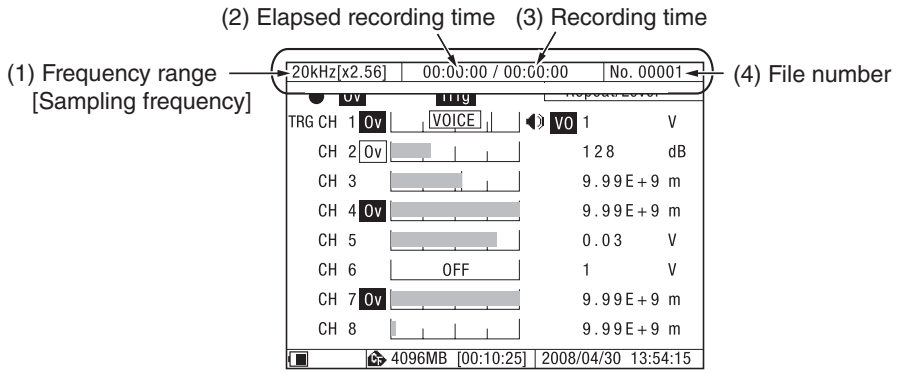
Display Explanation

Display screen



Recording parameter indication

From left, the display shows the frequency range [sampling frequency], elapsed recording time, recording time, and file number.



(1) Frequency range [Sampling frequency]

Shows the setting made with Menu 2 "Rec.Parameters", items "Frequency Range" and "Sampling Freq.". The relationship between frequency range and sampling frequency is as shown in the table below.

Frequency range	Sampling frequency	
	[× 2.56]	[× 2.4]
100 Hz	256 Hz	240 Hz
500 Hz	1.28 kHz	1.2 kHz
1 kHz	2.56 kHz	2.4 kHz
5 kHz	12.8 kHz	12 kHz
10 kHz	25.6 kHz	24 kHz
20 kHz	51.2 kHz	48 kHz

(2) Elapsed recording time (Format: "00:00:00" or "??d 00:00:00")

In recording mode, the elapsed time since the start of recording (including pre-recording time but excluding pause time) is displayed in 24-hour format. When the time is 24 hours or longer, the format changes to "??d 00:00:00". The "??" indicates the number of days, up to 31. The recording time indication is retained until a new recording is started.

(3) Recording time (Format: "/ 00:00:00" or "/ (Manual)")

Shows the setting made with Menu 2 "Rec.Parameters", item "Recording Time". When the manual setting has been selected, the indication shows "/ (Manual)".

When the [STOP] key is pressed or the CompactFlash card runs out of space, recording stops. In this case, the actual recorded data time will be shorter than the recording time setting. (The recording time also includes the pre-recording time of 1 second or 5 seconds.)

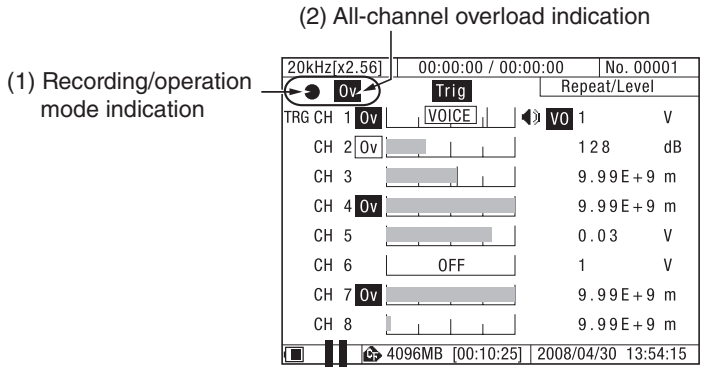
(4) File number (Format: "No. ?????")

Files of recorded data are numbered (00001 to 65533) for easier identification. Whenever a new file is created, the number is incremented by +1. During recording, the number of the file currently being written to is shown. In the stop and trigger standby mode, the number of the next file to be created is shown.

When you insert an empty CompactFlash card, file numbering restarts from 00001.

Recording/operation mode indication

This field shows recording and operation status information as well as all-channel overload information.



(1) Recording/operation mode indication

An icon indicates the current recording condition.

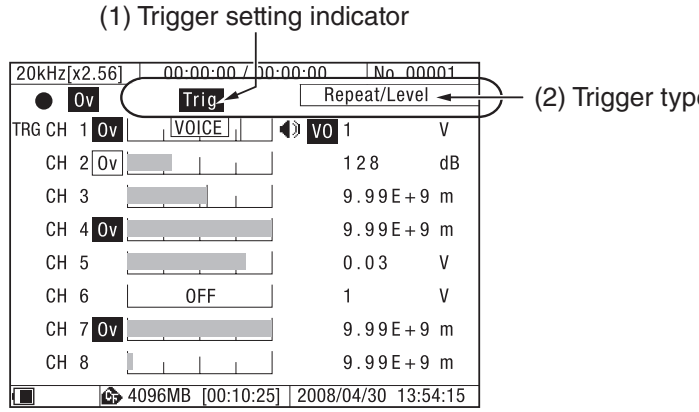
	Normal condition
▶	Playback in progress (recall mode only), flashing
●	Recording in progress, flashing Trigger standby, permanently on
❚❚	Recording/playback paused, permanently on
◀◀	Rewind (recall mode only), flashing
▶▶	Fast-forward (recall mode only), flashing

(2) All-channel overload indication

This indication appears if there has been an overload condition in any channel. There are two types of indications, for instantaneous overload and overload history. The display method is the same as explained in the section on overload information (page 22).

Trigger setting indication

The trigger setting and type are shown here. When the trigger is set to OFF (Free), nothing is shown.



(1) Trigger setting indicator

This indicator appears if any trigger (except Free) has been set.

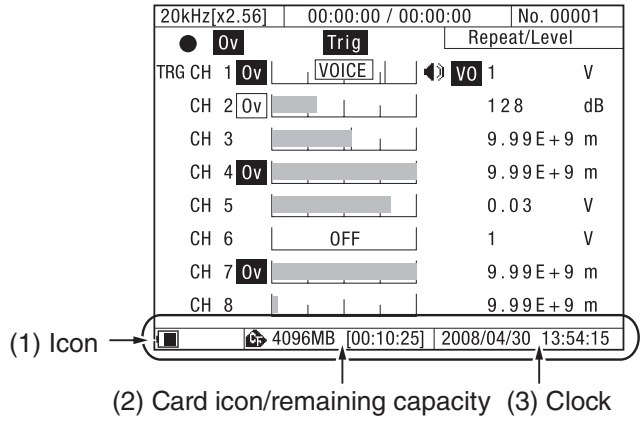
(2) Trigger type

None	Free trigger (no trigger setting)
"Single Level"	Single level trigger
"Repeat Level"	Repeat level trigger
"Single Time"	Single time trigger
"Repeat Time"	Repeat time trigger
"Single Ext"	Single external trigger
"Repeat Ext"	Repeat external trigger
"Single Ext-Gate"	Single external gate trigger
"Repeat Ext-Gate"	Repeat external gate trigger

When a level trigger has been set, information about the trigger channel and trigger level is shown in the channel data area. For details on the channel data area, see the section starting on page 21.

Status indication

From left, the display shows the indication icon, card capacity (size/available recording time), and clock (date/time).

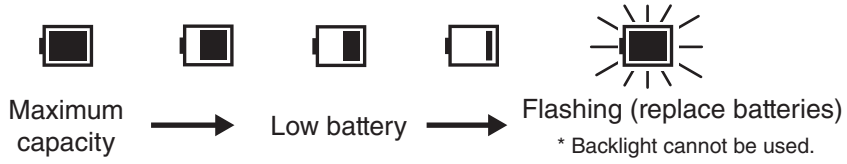


(1) Icon

A graphic symbol representing the power supply status, key lock status, or menu lock status is shown here.

: Shown when unit is being powered from an external source.

: Shows the approximate remaining battery capacity when the unit is being powered from batteries. The number of blue segments decreases as the batteries get depleted. When the indication starts to flash, replace the batteries with a fresh set.



: Indicates the key lock condition where the operation keys except for [LIGHT], [<], and [>] are disabled. (For details on the key lock function, see page 76.)

The condition is activated by pressing and holding the [<] and [>] keys together for a few seconds. Repeating the procedure cancels key lock and causes the icon to disappear.

The keys on the Remote Controller are not affected by the key lock function.

: Indicates the menu lock condition where the menus cannot be used. (For details on the menu lock function, see page 77.)

(2) Card icon/remaining capacity

The remaining card capacity is shown here in MB units, along with the remaining recording time as calculated from the currently selected sampling frequency and number of active channels.

When no card is inserted, the icon and MB indication are not shown, and the remaining recording time indication shows "--:--:--".

Note
When calculating remaining capacity of a CompactFlash card, the DA-40 uses 1 GB = 1024 MB, 1 MB = 1024 KB, and 1 KB = 1024 bytes.

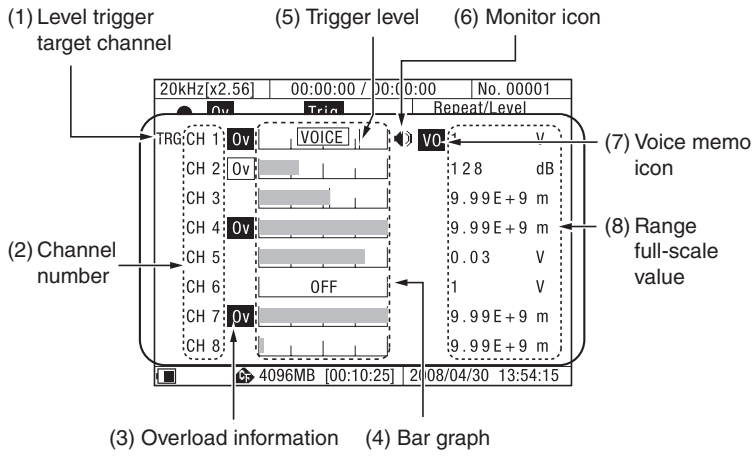
(3) Clock

Shows the current date and time, using 24-hour format.

Channel data

From left, the display shows the level trigger target channel, channel number, overload information, bar graph, trigger level, monitor icon, voice memo icon, and range full-scale value.

The data for eight channels are shown simultaneously on the display.



(1) Level trigger target channel

When the level trigger function is used, the indication "TRG" is shown to the left of the channel indication.

(2) Channel number

The channel number (CH1 to CH8) is shown here.

(3) Overload information

There are two types of overload indications: instantaneous overload and overload history.

Ov	Shown when instantaneous overload has occurred.
Ov	Shown when overload has occurred at least once during recording (overload history).

The overload history indication is cleared in the following cases:

- Power-on
- [CLEAR Ov] key pressed
- Recording settings changed:
  - Frequency range
  - Sampling frequency
  - Input range
  - Channel setting (type, HPF, LPF, sensor type, scaling)
- Recording start (during trigger standby, previous history is shown)
- When recall mode is canceled

(4) Bar graph

Shows the magnitude of the input signal, using one of the following three methods:

- Linear value display

  This is used when "LINEAR" has been selected for the "Bar Graph" item in the menu (see page 43). If the sensor type for the channel has been set to "SLM/VM/MIC" in the "INPUT" menu (see page 34), this mode cannot be selected.

- Logarithmic value display (bar graph covers about 75 dB)

  This is used when "LOG" has been selected for the "Bar Graph" item in the menu. If the sensor type for the channel has been set to "SLM/VM/MIC", this mode cannot be selected.

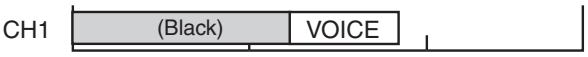
- dB value display (bar graph covers about 60 dB)
  When the sensor type for the channel has been set to "SLM/VM/MIC", this mode is always used, regardless of the "Bar Graph" menu setting.

The color and pattern of the bar graph changes, depending on the channel setting and status, as shown below.

Normal condition — Bar graph color: Blue

Overload has occurred — Bar graph color: Red

Voice memo operation (CH1 only) — Bar graph color: Black (Blue when marker is used)



When the voice memo mode is "Voice/Input" and the microphone switch is ON, the indication VOICE appears, as shown above. When the microphone switch is OFF, normal recording is carried out.

When the voice memo mode is "Voice Only", the indication VOICE Only appears, regardless of the microphone switch setting. The display is the same when the unit is idle and when it is recording.

When the voice memo mode is "OFF (Marker)", the indication MARKER appears for one second at the point where the microphone switch is set to ON.
The marker function is available only during recording, not in the idle state.

Channel OFF

This indication is shown when the respective channel is set to OFF.

(5) Trigger level

When level trigger is used, a vertical line on the bar graph for the respective channel shows the level trigger position.

(6) Monitor icon

The icon is shown to the right of the bar graph for the channel selected for monitor output.

The monitor channel can be changed using the [▲]/[▼] keys.

(7) Voice memo icon

When voice memo has been selected for channel 1, the following icon indication appears.

Vo	"Voice/Input" selected as voice memo setting
Vo	"Voice Only" selected as voice memo setting

(8) Range full-scale value

Depending on the "Sensor" and "Sensitivity" settings in the <Input> menu, the value corresponding to the bar graph full range point is shown here. A list of the menu settings and values/units is shown in the table below.

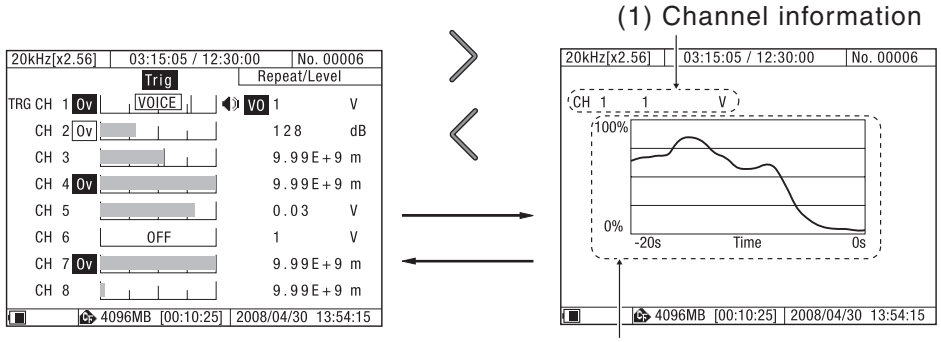
<Input> menu Sensor setting	Numric range (number of digits)	Unit
V	0.01, 0.03, 0.1, 0.3, 1, 3, 10	"V"
EU	9.99E ± 99	"EU"
MIC	0.0 to 999.9 (5 digits, 0.1 dB step)	"dB"
PICK	9.99E ± 99 (8 digits)	"m/s^2"
SLM	30 to 130 (3 digits, 10 dB step)	"dB"
VM	30 to 130 (3 digits, 10 dB step)	"dB"

For information on changing the input range setting, see page 59.

History display

Besides the bar graph format, the data display can also show a history graph of waveform data absolute values. (This is not available in recall mode.) To switch between the bar graph and history display, use the [>] or [<] key.

The data shown on the history display are the data of the monitor channel. The horizontal axis is the time (up to 20 seconds before), and the vertical axis is the level. Also during history display, you can switch the monitor channel with the [▲]/[▼] keys.



Bar graph display

Maximum value history display

(1) Channel information

From left, the display shows the channel number, overload information, range full-scale, and voice memo icon.

(2) Time-level graph

The time-level graph shows a history graph for waveform data of the last 20 seconds in the monitor channel.

The graph is based on the approximate absolute (not the root mean square) values of the input waveform.

Menu Operations and Setting Items

General menu operation steps

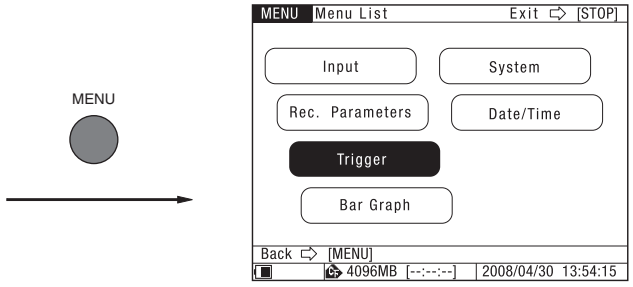
Almost all settings of the DA-40 except for the input range setting are made via menus.

To make a setting, you call up the menu from the menu list page. When a menu has been selected, the screen with the individual settings of that menu appears.

There are a total of six menu pages, divided by category such as input related settings, recording settings etc. A detailed description of menu operation steps follows.

1. Call up the menu list

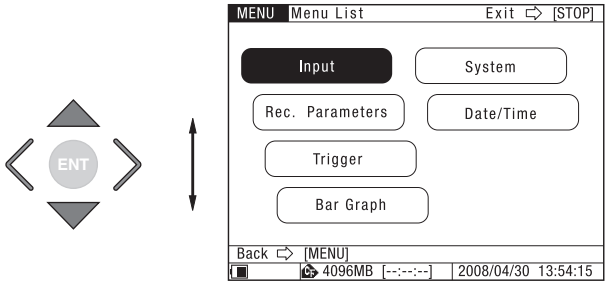
   Press the [MENU] key. The menu list appears.



Menu list

2. Select a menu page

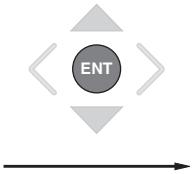
   Use the [▲]/[▼]/[<]/[>] keys to move the cursor to the desired menu page.

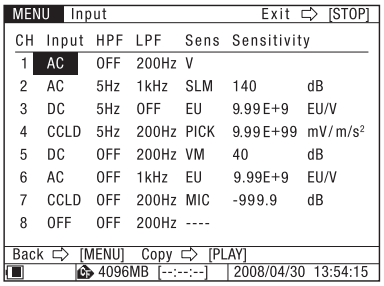


Menu list

3. Open the menu page

Press the [ENT] key. The items on the selected menu page appear.

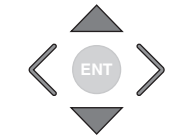


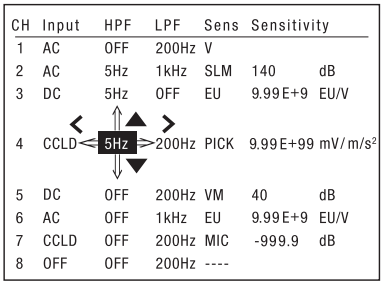


Menu 1

4. Select an item

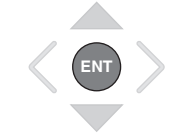
Use the [▲]/[▼]/[<]/[>] keys to move the cursor to the desired setting item.





5. Initiate the change

Press the [ENT] key to start changing the selected item.



There are three ways of changing a setting, as follows.

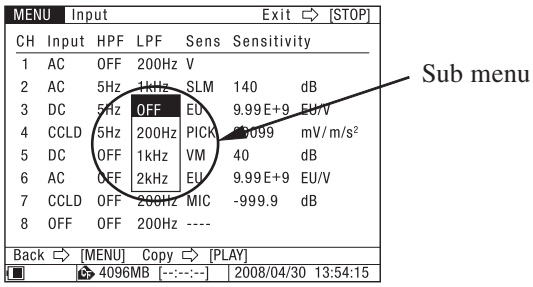
A : Change setting on sub menu

B : Change setting with sub cursor

C : Execute (process) selected item

6. Detailed explanation of methods A, B, C

A: Change setting on sub menu



Sub menu example

The sub menu appears when the [ENT] key is pressed. Select the setting from the sub menu. The following setting items have sub menus.

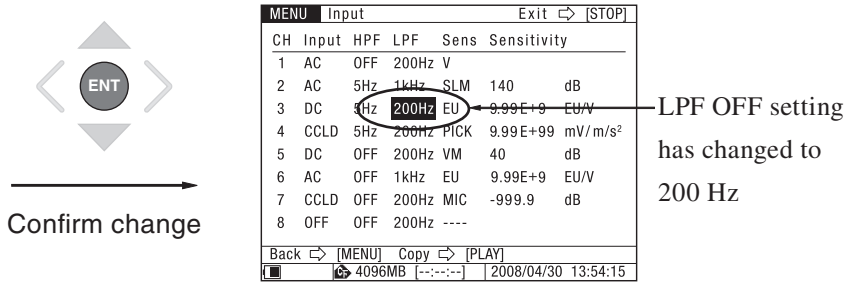
< Input >	(Input, HPF, LPF, Sensor)
< Rec.Parameters >	(Frequency Range, Sampling Frequency, etc.)
< Trigger >	(Trigger Mode, Trigger Type, etc.)
< Bar Graph >	Bar Graph Display Type
< System >	(Play Signal Output, Backlight Brightness, etc.)

The explanation below uses the channel 3 LPF setting on the < Input > page as an example. The procedure is the same for other items.

A-1 Use the [▲]/[▼] keys to move the cursor in the sub menu to the desired setting.

Select setting

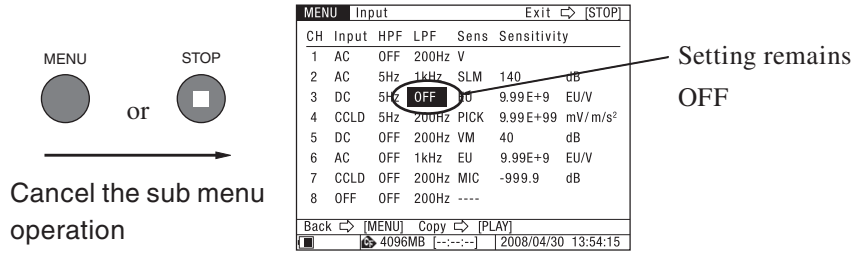
A-2 Press the [ENT] key. The change is accepted and the sub menu disappears.



Confirm change

Menu 1

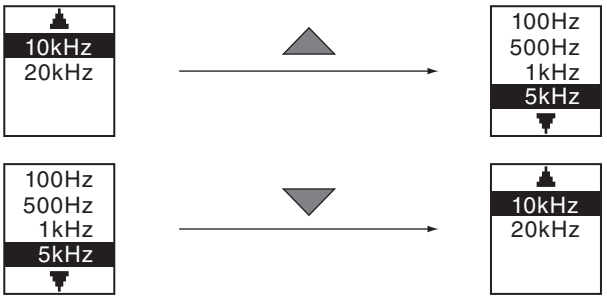
A-2’ By pressing the [MENU] key or [STOP] key instead of the [ENT] key, you can cancel the sub menu without changing the setting. In this case, the indication is as shown below.



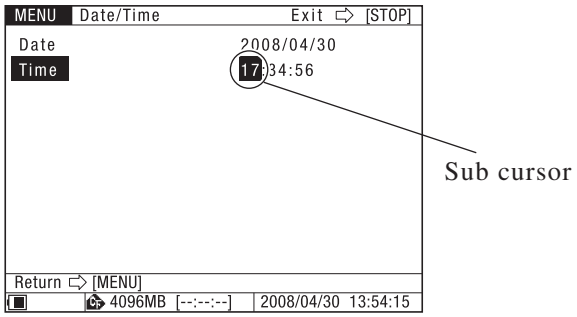
Menu 1

< If the desired setting does not appear on the sub menu >

Some sub menus have more settings than fit into the sub menu frame. In such a case, a "▲" or "▼" is shown at the top or bottom of the sub menu, indicating that you can bring up more settings by pressing the [▲] or [▼] key. When you press the respective key, the indication scrolls up or down to show more settings.



B: Change setting with sub cursor



Sub cursor example

The sub cursor appears when the [ENT] key is pressed. Move the cursor and change the setting with the arrow keys. The following setting items have sub cursors.

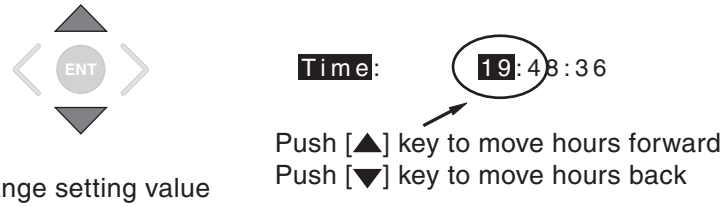
< Input >	(Sensitivity)
< Rec.Parameters >	(Recording time, Pre-recording time)
< Trigger >	(Level, Start Time, Stop Time)
< System >	(Device index number)
< Date Time >	(Date, Time)

The explanation below uses the Time setting on the < Date Time > page as an example. The procedure is the same for other items.

B-1 Use the [<]/[>] keys to move the sub cursor to the item you want to set (hours, minutes, or seconds in this example).

Select setting item

B-2 Use the [▲]/[▼] keys to change the value or unit of the item under the sub cursor (value for hours, minutes, or seconds in this example). Holding down a key causes a faster change.

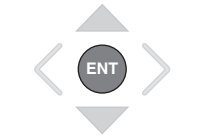


Change setting value

B-3 Change other items (for example minutes or seconds) in the same way, using the [▲]/[▼] /[<]/[>] keys. (Repeat steps B-1 to B-2.)
(The illustration below shows changes for all three items: hours, minutes, and seconds.)

Time: 19:03:00

B-4 Press the [ENT] key. The change is accepted and the sub menu disappears.

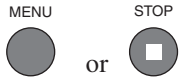


Confirm change

Time: 19:03:00

Time is changed

B-4' By pressing the [MENU] key or [STOP] key instead of the [ENT] key, you can cancel the sub cursor operation without changing the setting. In this case, the indication is as shown below.



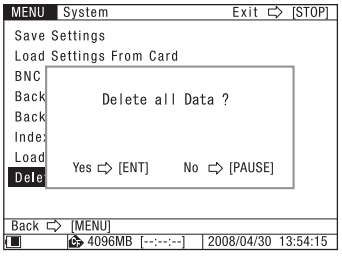
Cancel the sub cursor operation

Time: 15:48:36

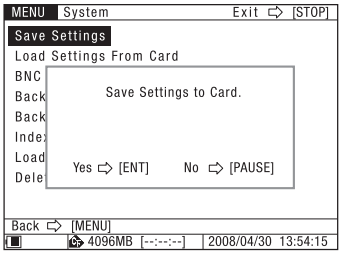
Time setting remains as before

C: Execute (process) selected item

This type of setting procedure applies to items such as "Delete all files" (for deleting data from the CompactFlash card), "Save Settings", and "Load Default Settings" on the < System > page. To execute the process, press the key corresponding to "OK". To cancel the process, press the key corresponding to "Cancel". When the process is completed, the original menu page appears again.



Execution choice, example 1

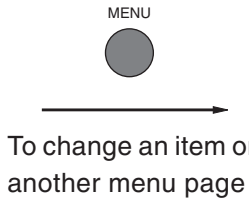


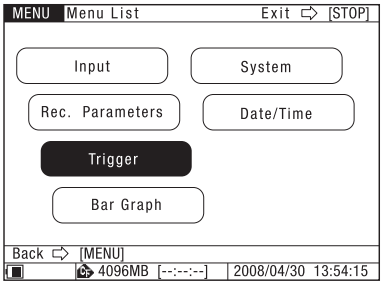
Execution choice, example 2

This concludes the description of the three ways of changing a menu setting.

7. Changing an item on another menu page

Press the [MENU] key to bring up the menu list.

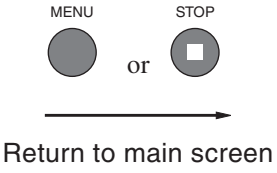


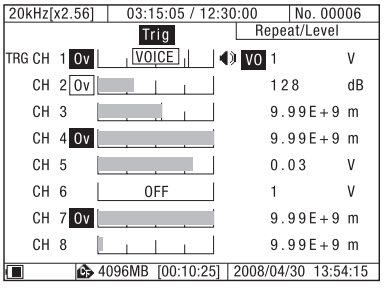


Menu list

8. Return to main screen

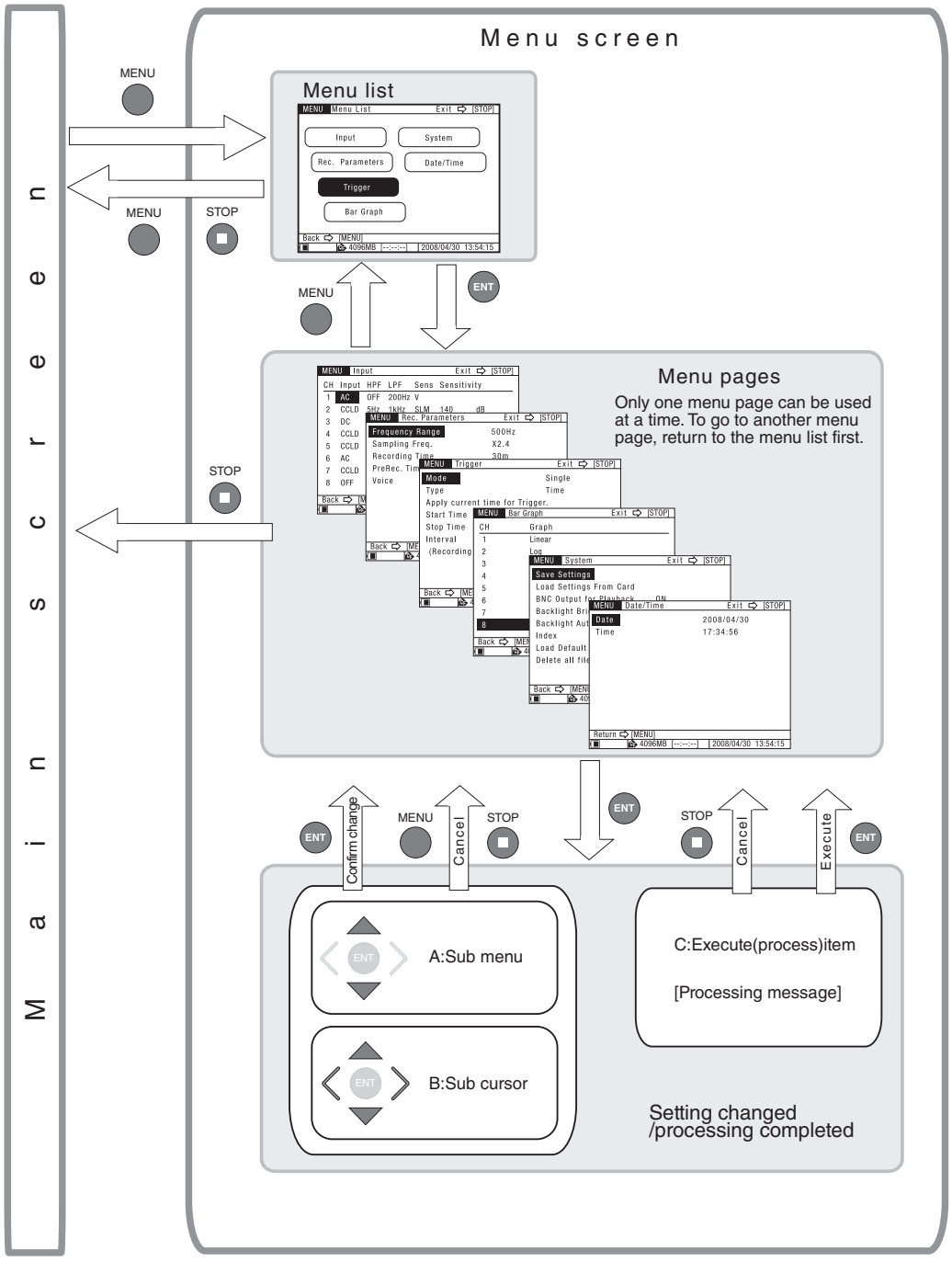
Press the [MENU] key or [STOP] key to return to the main screen.





Menu flow diagram

The organization of all menu operations is shown in the diagram below. Note that you always have to use the menu list to go to a menu page.

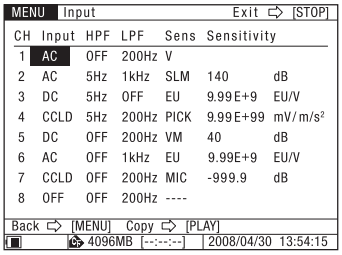


Menu Items

Setting items are organized in six pages, with related items appearing together on one page. The menus are numbered from 1 to 6.
The contents of each menu page are described below.

Menu 1 < Input >

Allows you to select the sensor (signal) type, input signal filtering, sensor sensitivity level and units for each channel.



Menu 1

Input Sensor (signal) type setting (A: sub menu)

Controls the input on/off setting and sensor (signal) type.

OFF Select this setting when the input is not to be used.

DC This setting is for input of an electrical signal, with the recording to include DC components. This is suitable for environment sensors (temperature, wind speed, pressure, etc.) and sound level meters that output the measurement value as a DC signal. The setting should also be used when recording a signal (such as from a vibration level meter) that comprises frequency components below 1 Hz.

AC This setting is for input of a normal electrical signal, with the recording to exclude DC components. This is suitable for sound level meters, vibration meters and similar equipment that outputs the measurement value as an AC signal. The cutoff frequency is about 0.3 Hz.

Note
When Input is set to AC, a high-pass filter with a cutoff frequency of 0.3 Hz is applied. However, if the input signal contains high-level DC components that exceed the input range, overload may occur in the DA-40.

CCLD This setting is for microphones, accelerometers and other sensors that require a sensor drive power supply. (See the section starting on page 53.)
(CCLD: Constant Current Line Drive)

Note
If the unit is operated on battery power, take the following points into account when setting the Input to CCLD. When quitting the menu, if battery capacity is too low for supporting CCLD operation, the unit will switch itself off automatically. In such a case, replace all batteries with fresh ones, or connect an AC adapter or other external power supply.

HPF High-pass filter frequency setting (A: sub menu)

Enables a high-pass filter for the input signal. The HPF frequency indicates the cutoff frequency.

Available settings are OFF and 5 Hz.

When the Input setting is DC, only the OFF setting is available for the high-pass filter. During voice memo recording (see pages 39, 73, 87), the high-pass filter is disabled for channel 1.

OFF / 5 Hz

LPF Low-pass filter frequency setting (A: sub menu)

Enables a low-pass filter for the input signal. The LPF frequency indicates the cutoff frequency.

Available settings are OFF, 200 Hz, 1 kHz, and 2 kHz, but only selections that are within the frequency range setting are allowed. During voice memo recording (see pages 39, 73, 87), the low-pass filter is disabled for channel 1.

OFF / 200 Hz / 1 kHz / 2 kHz

Sens Sensor type setting (A: sub menu)

Lets you select the sensor type and make other sensor related settings. Available options depend on the Input setting.

Input setting	Available Sensor settings (depending on Input) and description	
	Sensor	Description
OFF	- - - -	No setting available
AC/DC	V	Record input voltage from sensor or measuring instrument as is.
	EU	Convert input voltage from sensor or measuring instrument into EU for recording.
	SLM	Sound level meter (with AC or DC output) is connected.
	VM	Vibration level meter (with AC or DC output) is connected.
CCLD	V	Constant Current Line Drive compatible sensor is connected. Record input voltage from sensor as is.
	EU	Constant Current Line Drive compatible sensor is connected. Convert input voltage from sensor into EU for recording.
	MIC	Constant Current Line Drive compatible microphone is connected.
	PICK	Accelerometer with built-in preamplifier is connected.

EU (Engineering Units) is a unit symbol for expressing various physical quantities detected by a sensor.

Sensitivity Unit conversion value setting (B: sub cursor)

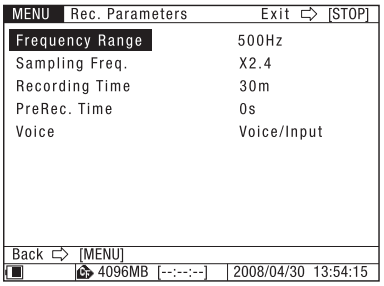
Specifies the relationship between input signal voltage and measurement value, according to the preceding Sensor setting.

Sensor setting	Sensitivity setting (depending on Sensor)
V	No setting
EU	Voltage per EU (V/EU) (Note that the EU setting value is the inverse of that used in the DA-20.)
MIC	Constant Current Line Drive compatible microphone sensitivity level (dB)
PICK	Voltage sensitivity of accelerometer with built-in preamplifier ($mV/(m/s^2)$)
SLM	Sound level meter level range (dB)
VM	Vibration level meter level range (dB)

For additional information on the Input, Sens, and Sensitivity settings, see also pages 54 to 58.

Menu 2 < Rec.Parameters >

This menu comprises settings for recording and auxiliary functions.



Menu 2

Frequency Range Frequency range setting (A: sub menu)

The value selected as the frequency range setting represents the highest effective frequency that can be included in the recorded data.

Available settings are 100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, and 20 kHz. When a setting lower than 1 kHz (500 Hz or 100 Hz) is selected, the voice memo function (see pages 39, 73, 87) cannot be used during data recording.

100 Hz / 500 Hz / 1 kHz / 5 kHz / 10 kHz / 20 kHz

Sampling Freq. Sampling frequency setting (A: sub menu)

The DA-40 provides a choice of two sampling frequency settings commonly used for frequency analyzers and voice processing: 2.4 times or 2.56 times the frequency range.

×2.4 Results in slightly longer recording time than with the "×2.56" setting

×2.56 Commonly used by FFT analyzers

Recording Time Recording time setting (B: sub cursor)

The recording time can be set in hours, minutes, or seconds, and a Manual setting is also available. When Manual is selected, the recording time is not preset, allowing the operator to press the [STOP] key whenever required. With the Manual setting, recording will automatically stop after 31 days have elapsed. A recording time that is longer than is possible with the CompactFlash card that is inserted cannot be set.

The sub cursor moves in the following order for the recording time (1 to 59 / 1 to 24 / Manual) and the unit (s, m, h).

When data for the preset recording time have been collected, recording stops automatically. However, if the [STOP] key is pressed before that, or if the CompactFlash card becomes full, recording stops at that point.

1 to 59 s (seconds) / 1 to 59 m (minutes) / 1 to 24 h (hours) / Manual

PreRec.Time Pre-recording time setting (A: sub menu)

When recording is started by pressing the [REC] key or by a trigger event, the pre-recording function allows data from a range before the actual start point to be included in the recording. The PreRec. Time value determines the duration of the range for such data. Available settings are 0, 1, and 5 s (seconds). To disable the function, select the "0" setting. For more information, refer also to page 64.

0 s / 1 s / 5 s

Note
After changing the frequency range or channel setting, the [REC] key will be inactive for the PreRec. Time interval, and recording cannot be started during this interval.

Voice — Voice memo function setting (A: sub menu)

This setting determines how the voice memo function can be used during recording.

The DA-40 is capable of recording the time when the microphone switch was pressed (marker) or of recording comments or similar via the microphone (voice memo). When voice memo is used, the audio is recorded instead of the channel 1 input.

When channel 1 is set to OFF, or when the frequency setting is 100 Hz or 500 Hz, the "Voice" setting can only be OFF (Marker). When voice memo is used during recording, channel 1 cannot be used as a trigger channel (see page 41).

Voice Only	The sound from the microphone is recorded while the microphone switch is being pushed. When the switch is released, no signal (zero) is recorded.
Voice/Input	The sound from the microphone is recorded while the microphone switch is being pushed. When the switch is released, the input signal of channel 1 is recorded.
OFF (Marker)	Voice memo cannot be used, but marker information can be recorded. The input signal to channel 1 is not affected.

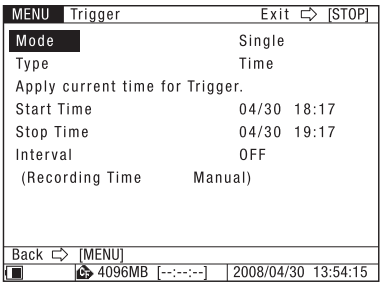
The voice memo setting has no effect when the DA-40 is not in recording mode. (When the microphone switch is pushed, the input from the microphone will be recorded.)

For details about the voice memo and marker function, see the section about auxiliary function setup (pages 73 to 75) and the section about using the voice memo/marker (pages 87 to 89).

Note
When intending to use the voice memo function during data recording, a frequency range setting of 5 kHz or higher is recommended.
When the microphone switch is operated during recording, noise may be recorded in channel 1 (overload may also occur). This will not happen if the voice memo setting is "OFF (Marker)".

Menu 3 < Trigger >

Comprises trigger related items (see pages 66 to 71).



Menu 3

Mode Trigger operation mode setting (A: sub menu)

Determines the basic operation when a trigger event occurs. If trigger operation is not required, choose the "Free" setting.

Free	Trigger is not active. Recording starts immediately when the [REC] key is pressed.
Single	The unit goes into trigger standby mode when the [REC] key is pressed. When a trigger event occurs, recording starts. When the amount of data corresponding to the recording time has been recorded, recording stops.
Repeat	The unit goes into trigger standby mode when the [REC] key is pressed. When a trigger event occurs, recording starts. When the amount of data corresponding to the recording time has been recorded, the unit again goes into trigger standby mode. This is repeated with every trigger event until the [STOP] key is pressed or the CompactFlash card becomes full.

Type Trigger signal type setting (A: sub menu)

Determines the type of trigger signal. When the "Mode" item is set to "Free", this item does not appear.

Level	A trigger event occurs and recording is started when the level of the input signal in the specified channel (trigger channel) becomes a preset value (trigger level) or higher.
Ext	A trigger event occurs and recording is started when the external trigger connector is shorted.
Ext-Gate	Recording is carried out only while the external trigger connector is shorted (gate trigger operation). When the external trigger connector goes open, recording will stop after a delay of 5 seconds (post-recording).
Time	Recording is carried out from the specified Start Time to the specified Stop Time, at intervals as specified by the Interval setting.

Level Trigger level setting (B: sub cursor)

When the trigger signal type is "Level", a trigger event occurs when the absolute value of the input signal waveform exceeds the trigger level. The trigger level is a threshold set as a relative percentage [%] correlated to the full-scale value of the input range setting that is active at the time of recording.

Consequently, the actual trigger level (input signal waveform value) will change when the input range setting is changed.

The trigger level is indicated on the bar graph for the trigger channel (see page 24).

Ch Trigger channel setting (B: sub cursor)

When the trigger signal type is "Level", a channel (1 to 8) must be specified for monitoring. This is called the trigger channel.

When the voice memo function (see pages 39, 73, 87) is used during recording, channel 1 cannot be specified as trigger channel because it is used for recording the voice memo signal.

Start Time/Stop Time Recording start time/stop time setting (B: sub cursor)

Lets you specify a start time and stop time for recording. The maximum setting is one year, which can span two different calendar years.

Apply current Time for Trigger (C: Execute)

Uses the current time for the Start Time or Stop Time setting.

Interval Recording interval setting (A: sub menu)

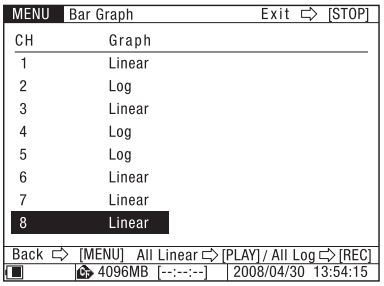
When the trigger type has been set to "Time" and the trigger mode to "Repeat", the recording interval can be set here. The following settings are available.

5 m / 10 m / 15 m / 30 m / 1 h / 8 h / 24 h

Note
The interval setting must be longer than the "Recording Time" as set in Menu 2 < Rec.Parameters >. When "Recording Time" is set to "Manual", the interval setting is not available.

Menu 4 < Bar Graph >

This menu serves for making bar graph display settings.



Menu 4

Graph Bar graph display method (A: sub menu)

Lets you select linear value display (Linear) or logarithmic value display (Log) for each channel.

Pressing the [PLAY] key sets all channels to "Linear", and pressing the [REC] key sets all channels to "Log".

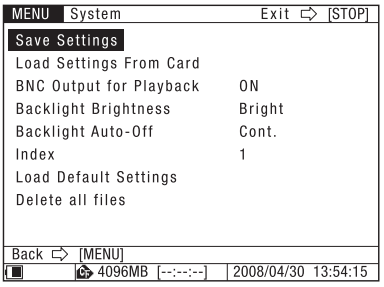
For details on the bar graph display method, see page 22.

Linear/Log

Note
The Graph menu will be blank for channels whose "Sensitivity" has been set to MIC, SLM, or VM with Menu 1 < Input >. The bar graph indication for such channels is fixed to dB.

Menu 5 < System >

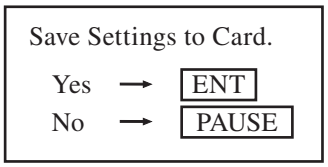
This menu comprises general items such as display backlight brightness and CompactFlash card data deleting.



Menu 5

Save Settings — Save current settings on CompactFlash card (C: Execute)

The input range and other settings made with the menus can be saved on a CompactFlash card for later use. Only one set of settings can be saved.



[ENT] key: Perform setting file update
[PAUSE] key: Cancel setting file update

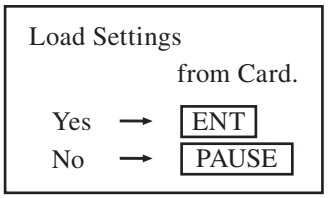
If the message "Remove CF Card" appears when you press the [ENT] key to update the setting file, the CompactFlash card may be defective.

Important

Changes to settings made with the menus will be saved on the CompactFlash card by the "Save Settings" function, but for the unit, the settings will only be activated at the point where you return to the main screen.
If you turn the power off before returning to the main screen, the changed settings will not be active the next time you turn the unit on.

Load Settings From Card　Load settings saved on CompactFlash card (C: Execute)

Settings saved on a CompactFlash card can be loaded back into the unit.



[ENT] key: Load settings saved on CompactFlash card into DA-40

[PAUSE] key: Cancel loading of settings

Note

When a setting file is loaded which contains a CCLD setting for the Input item of Menu 1 < Input >, the channels for which CCLD is selected will be supplied with a constant current. Before loading a setting file, it is recommended to disconnect the sensors. (Quitting recall mode: see page 101)

If the unit is operated on battery power and the remaining capacity of the batteries is low, a forced power-down will occur when a CCLD setting is selected (see page 35).

BNC output for Playback　Set playback signal output mode (A: sub menu)

Specifies whether the playback signal from recorded data is supplied at the playback output connectors (BNC connectors). (Regardless of the setting, the playback signal for the monitor channel will be output from the monitor output.)

For details on playback, see page 97 in the section "Recall/Playback of Recorded Data".

- OFF　Playback signal is not supplied at playback output connectors. However, monitor channel playback signal is supplied at monitor output connector.
- ON　Playback signal is supplied at playback output connectors. Monitor channel playback signal is also supplied at monitor output connector. If playback is carried out with a sensor connected, the signal may cause the sensor to be damaged or destroyed. When activating recall mode with this setting enabled, follow the message that appears and disconnect the sensor(s).

Backlight Brightness — Set backlight brightness (A: sub menu)

Lets you select backlight Brightness in two steps: Bright or Dark.

Backlight Auto-Off — Set backlight auto-off timer (A: sub menu)

When no key is operated for the period set here, the backlight will be automatically turned off. Available settings are 10 s, 1 min, 3 min, and CONT. To have the backlight continuously on, select CONT.

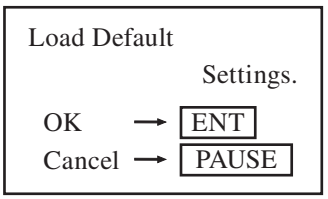
Index — Set device index number (B: sub cursor)

Using this setting, you can assign a unique number to each DA-40 device. The setting range is 1 to 255. Because the index number information is recorded along with the data, it can be used to identify multiple DA-40 units or data recording conditions.

The index number setting has no influence on performance or functions of the unit.

Load Default Settings — Return all settings to the default values (C: Execute)

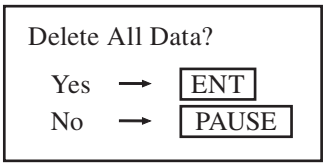
This lets you return all settings to the factory default condition.



[ENT] key: Load default settings
[PAUSE] key: Cancel loading of settings

Delete All Files — Delete all data from the CompactFlash card (C: Execute)

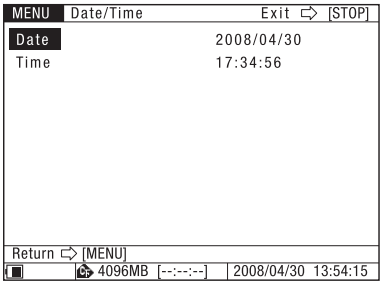
This lets you delete all data files from a CompactFlash card (the setting file will not be deleted).



[ENT] key: Delete files
[PAUSE] key: Cancel deletion of files

Menu 6 < Date Time >

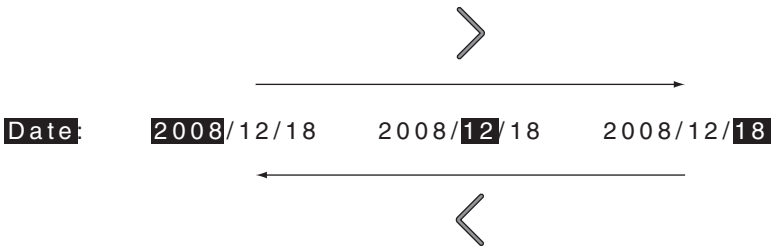
This menu serves for setting the current date and time.



Menu 6

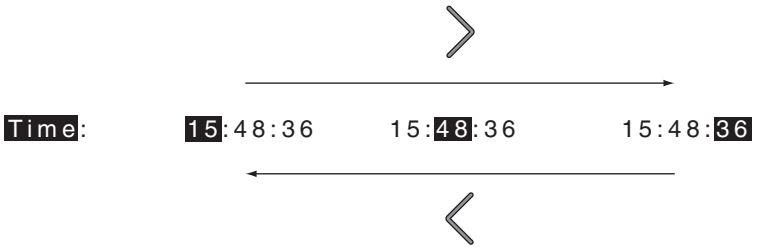
Date Set current date (B: sub cursor)

Lets you set the year (to 2099), month, and day separately.



Time Set current time (B: sub cursor)

Lets you set the hours, minutes, and seconds separately.



Preparations

This chapter describes the settings and steps to take before starting to record data.

Preparations and checks before recording

1. Power supply (inserting batteries, AC adapter, power-on mode)
2. CompactFlash card preparations (insertion and removal, formatting)
3. Connection of external devices (sensors etc.)
4. Sensitivity setting

Recording parameter settings

1. Input range, overload
2. Frequency range, sampling frequency
3. Recording time, trigger

Auxiliary function setup

1. Device index number
2. Voice memo/marker
3. Preventing inadvertent operation
4. Remote control operation

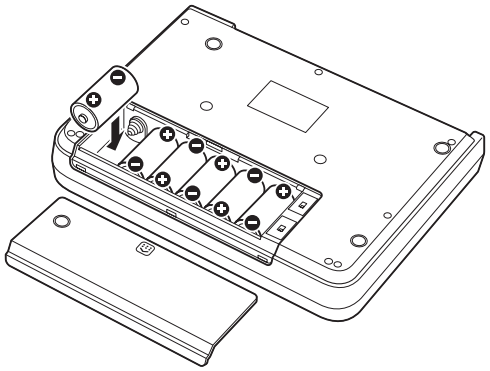
Preparations and checks before recording

Power supply

The DA-40 can be powered from six alkaline batteries (IEC LR14 (size C)) or from the optional AC adapter.

Inserting the batteries

1. Open the battery compartment cover.
2. Insert six alkaline batteries (IEC LR14 (size C)) with correct polarity, as shown inside the compartment.
3. Replace the battery compartment cover.

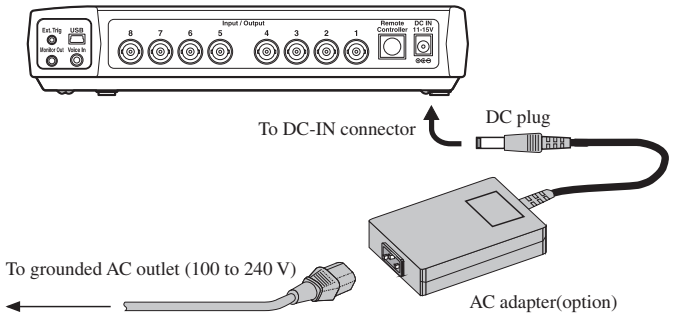


Important
Take care not to reverse the (+) and (-) polarity when inserting the batteries. Always replace all six batteries together. Do not mix old and new batteries or batteries of different type. Remove the batteries from the unit if the unit is not to be used for an extended period.

Note
If the unit is operated on battery power, take the following points into account when using a CCLD type sensor. When quitting the menu after setting the Input item of Menu 1 < Input > to CCLD, the unit may switch itself off automatically. In such a case, replace all batteries with fresh ones.

AC adapter (option)

Connect the AC adapter as shown below.

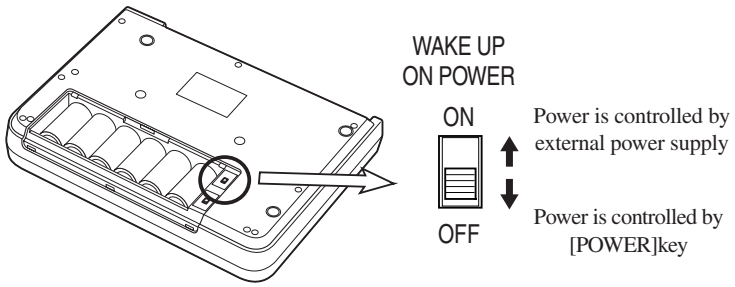


Important

Use only the specified AC adapter available as an option for the DA-40. Using another kind of AC adapter may lead to damage and malfunction. When connecting a battery or purpose-built cable to the DC-IN connector, take great care to ensure correct polarity.

Power-on mode

When you open the battery compartment cover as shown below, the [WAKE UP ON POWER] switch becomes accessible. By setting this switch to ON, you can have the on/off status of the unit controlled by the power supplied to the DC-IN connector. In such a case, the [POWER] key on the panel has no effect.



Important

When setting the [WAKE UP ON POWER] switch to ON, remove all batteries from the battery compartment. Otherwise the power-on mode will not operate normally.

CompactFlash card preparations

Recorded data are saved on CompactFlash cards in WAVE file format. To enable storing of recorded data files on a CompactFlash card, a special data management file and directory structure particular to the DA-40 is required on the card. When you insert a blank CompactFlash card formatted in a Windows computer into the DA-40 for the first time, this directory structure and data management file are automatically created.

Important
Use only RION supplied CompactFlash cards certified for operation in the DA-40. Operation with other cards is not assured.
If folders or files on the CompactFlash card have been altered by other equipment except the DA-40, do not continue to use the card for recording in the DA-40. Data may not be recorded correctly.

Formatting a CompactFlash card

Format the CompactFlash card in a Windows computer.

Format 2 GB cards with the FAT16 file system, and 4 GB cards with the FAT32 file system.

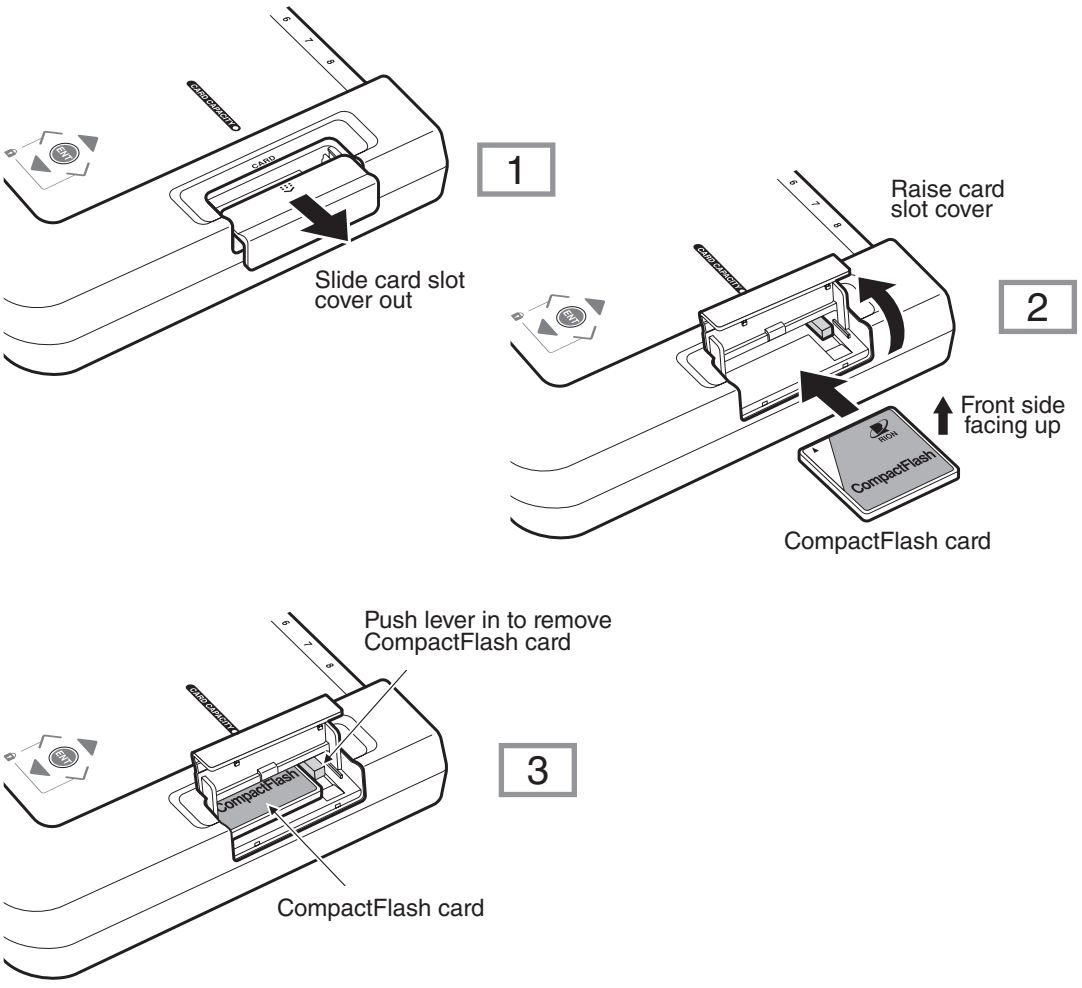
Important
When removing the card from the computer, be sure to follow the correct procedure for safely removing hardware (such as clicking on the icon in the task tray). Otherwise the file system may be damaged, preventing correct operation in the DA-40.

Inserting and removing a CompactFlash card

Turn power OFF and then proceed as shown below to insert or remove a CompactFlash card.

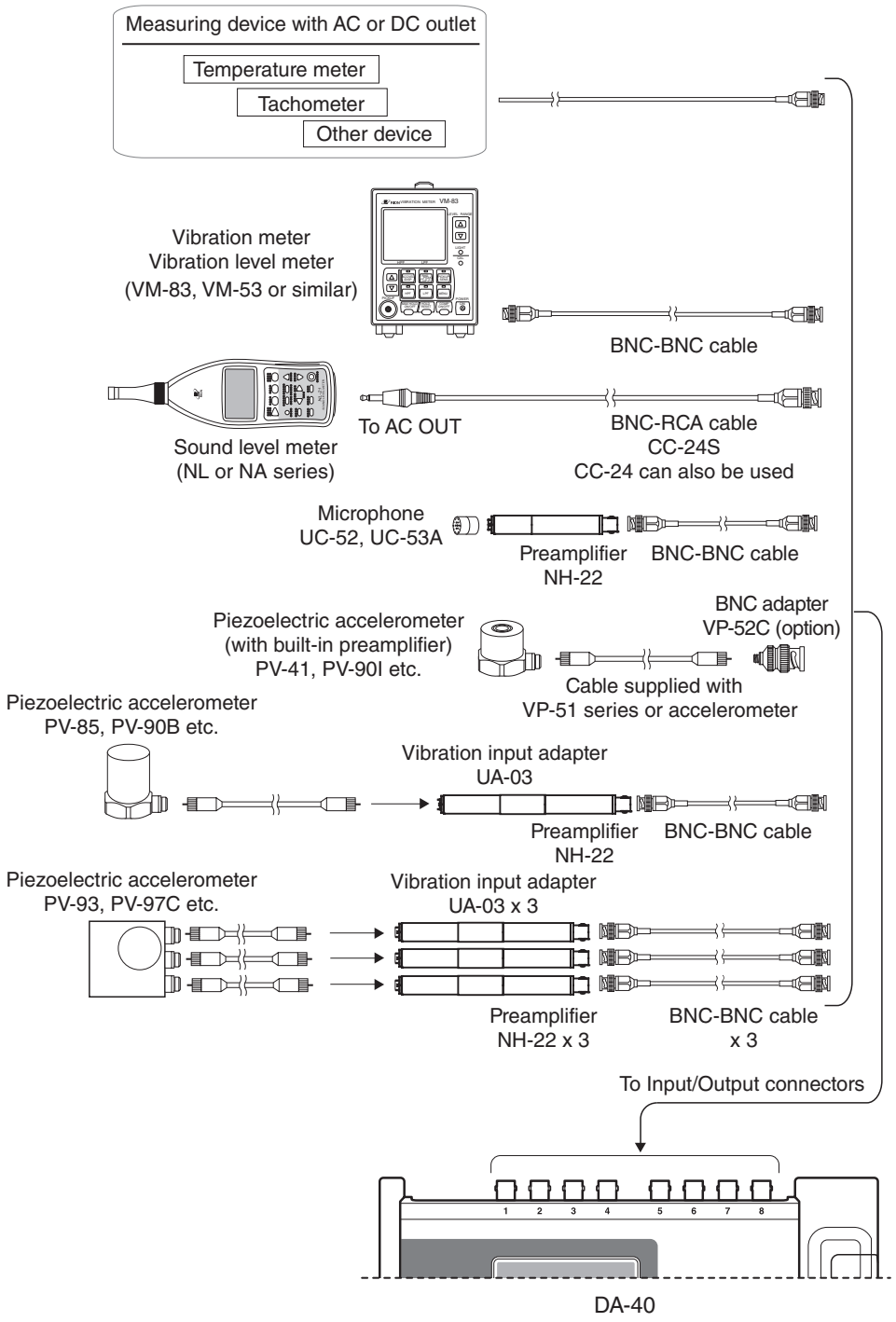
Important
CompactFlash cards with data recorded in the DA-20 cannot be used in the DA-40. Conversely, CompactFlash cards with data recorded in the DA-40 cannot be used in the DA-20.

Note
Do not insert or remove a CompactFlash card while power to the unit is on.
The time required for a 4 GB card to be recognized by the unit will be longer than with a 2 GB card.



Sensor (external equipment) connections

As shown below, the DA-40 is designed to handle the output of various sensors or measuring instruments. Correct input settings must be made, depending on the sensor and signal type and whether the sensor requires a constant current power supply. Some possible combinations are shown below.



Input settings

The eight signal input connectors (BNC connectors) can not only accept a signal, they also allow output of a constant current to a CCLD (Constant Current Line Drive) type sensor. Some CCLD sensors use a basic preamplifier + accelerometer or microphone configuration. The DA-40 can record up to eight input signals. The input connectors 1 to 8 are assigned to channels 1 to 8.

Input setting (Menu 1 < Input >: Input)

The setting is made for each channel separately, with the "Input" item on Menu 1 < Input >.

AC — For sensors that output an electrical signal without DC components

DC components and components below 0.3 Hz are blocked.

Example: AC output of sound level meter or vibration meter

DC — For sensors that output an electrical signal including DC

Example: Temperature meter or tachometer output, DC output of sound level meter

CCLD — For sensors requiring a constant current source

For such sensors, a constant current is supplied via the input connectors of the DA-40.

Example 1: Combination of microphone UC-52 or UC-53A or similar with preamplifier NH-22 (CCLD: 2 mA / 4 mA) or similar

Example 2: Combination of piezoelectric accelerometer PV-85 or PV-90B or similar with vibration input adapter UA-03 and preamplifier NH-22 (CCLD: 2 mA / 4 mA) or similar

Example 3: Piezoelectric accelerometer with built-in preamplifier PV-41, PV-90I, PV-97I (3-axis) or similar

Sensitivity setting (Menu 1 < Input >: Sens, Sensitivity)

Sensor setting

Depending on the Input setting described on the preceding page (AC, DC, CCLD), set the "Sensor" item for the combinations marked with a "○" in the table below. EU (Engineering Units) is a unit symbol for expressing various physical quantities detected by a sensor.

Input	Sensor					
	V	EU	MIC	PICK	SLM	VM
AC	○	○	×	×	○	○
DC	○	○	×	×	○	○
CCLD	○	○	○	○	×	×

When the "Sensor" item is set, the sensor signal units are determined automatically, as shown in the table below.

Indication for Sensor item in menu	Unit as shown on main screen	Scaled unit set for Sensitivity item in menu	Value input for Sensitivity
—	V	—	—
EU	EU	V/EU	Set voltage corresponding to 1 EU
MIC	dB	dB	Set microphone sensitivity level (dB re. 1 V/Pa)
PICK	m/s^2	$mV/(m/s^2)$	Set sensitivity of accelerometer (with built-in preamplifier)
SLM	dB	dB	Set sound level meter level range (full-scale value)
VM	dB	dB	Set vibration level meter (VM-53 or similar) level range (full-scale value)

Sensitivity setting

This setting determines the correlation between input signal voltage and signal units. How the values are to be set for each signal unit is explained below.

mV/(m/s²) Set the voltage sensitivity of the accelerometer.

Example: For PV-90I rated for 0.44 mV/(m/s²), the setting should be "0.44".

Example: For PV-85 [rated for 6.42 pC/(m/s²) sensitivity, 720 pF static capacitance], connected to NH-22 (transmission loss -0.3 dB) via UA-03 and a cable with a static capacitance of 180 pF, the voltage sensitivity should be set to "6.89", calculated as follows:

$6.42/(720+180)\times10^{(-0.3/20)}=6.89\times10^{-3}$

→ "6.89"mV/(m/s²) → "6.89"

dB Set the microphone sensitivity level (dB re. 1 V/Pa), or level range (full-scale value) of sound level meter or vibration level meter.

Microphone

Example: For UC-53A rated for -28 dB and used together with NH-22, the transmission loss is taken as -0.8 dB and the setting should therefore be "-28.8".

Sound level meter

Set to full-scale value of level range Example: 80 dB

Vibration level meter

Set to full-scale value of level range Example: 80 dB

EU Set how many volts of the sensor signal voltage correspond to one unit of the physical quantity.

Example: For a tachometer rated for 1 V/1000 rpm, the setting should be "1.00E-03".

The table below shows the correlation formula for the original input range *X* [V] and the condition after the sensitivity setting.

Unit	Sensitivity value	Input (Sens) type	Input range value after conversion
[V]	None	DC/AC(---)	*X*[V]
[EU]	*K*[V/EU]	DC/AC(EU)	*X*/*K*
[dB]	*S*[dBV/Pa]	MIC(CCLD)	94-S-3+20 $\log_{10}(X)$
[m/s^2]	*V*[mV/(m/s^2)]	PICK(CCLD)	$1/(V/1000)\times X$
[dB]	*R*[dB]	SLM/VM	20 $\log_{10}(X)$+*R*-10

Some practical examples for applying the respective formula to actual sensitivity values are shown below. These values are shown as input range. (When the exponent is two digits, the mantissa is shown as one digit. The effective number of digits for dB is three. In 3-V systems, $\sqrt{10}$ is used instead of 3 for calculation. This is because the 3-V range actually is 3.16 V = $\sqrt{10}$.)

Sensor	Sensitivity	Unit	Actually displayed input range value						
General	1	V	10 V	3 V	1 V	0.3 V	0.1 V	0.03 V	0.01 V
Tachometer	*K*=1.0E-03	EU	1.0E+4	3.2E+3	1.0E+3	3.2E+2	1.0E+2	3.2E+1	1.0E+1
UC-53A	*S*=-28.8	dB	140 dB	130 dB	120 dB	110 dB	100 dB	90.0 dB	80.0 dB
PV-90I	*V*=0.44	m/s^2	2.3E+4	7.2E+3	2.3E+3	7.2E+2	2.3E+2	7.2E+1	2.3E+1
SLM	*R*=80 dB	dB	90	80	70	60	50	40	30

Input settings and sensitivity settings for some representative sensors are shown below for reference. The sensitivity value differs for each sensor.

Sensor example	Input	Sensor	Sensitivity	Sensor sensitivity unit
DC output of general measuring device or sensor, or AC output of vibration level meter	DC	-----	No setting	1
		EU	X.XXE+XX	V/EU
AC output of general measuring device, sensor, vibration meter, sound level meter	AC	-----	No setting	1
		EU	X.XXE+XX	V/EU
Microphone: UC-52 + Preamplifier: NH-22	CCLD	MIC	Sensitivity level (-0.1 to -99.9)	dB (0 dB=1 V/Pa)
Piezoelectric accelerometer (with built-in amplifier):PV-90I	CCLD	PICK	Voltage sensitivity (0.01 to 99.99)	mV/(m/s^2)
Piezoelectric accelerometer: PV-85 + Vibration input adapter: UA-03A + Preamplifier: NH-22	CCLD	PICK	Voltage sensitivity (0.01 to 99.99)	mV/(m/s^2)
Sound level meter NL series	AC	SLM	Voltage sensitivity (40 to 140)	dB
Vibration level meter:VM-53	AC/DC	VM	Voltage sensitivity (40 to 140)	dB

Note

When Input is set to AC, a high-pass filter with a cutoff frequency of 0.3 Hz is applied. However, if the input signal contains high-level DC components that exceed the input range, overload may occur in the DA-40.

Recording parameter settings

This section describes how to set the parameters for recording data. Input range, frequency range, sampling frequency, and recording time are required items. If necessary, you should also set the PreRec. Time, trigger, and other related items.

Input range setting

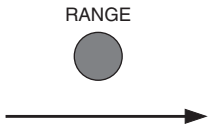
The input range can be set to seven levels in 10 dB steps (0.01, 0.03, 0.1, 0.3, 1, 3, 10 V). Select an appropriate setting according to the input signal level and the operation method of the DA-40.

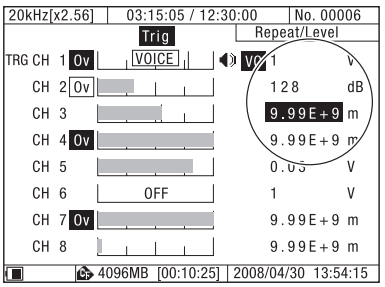
For improved S/N ratio, setting the input range as low as possible without causing overload is generally preferred. For inspection of products and other kinds of periodic measurements, it may be necessary to keep the input range setting the same, in order to allow product comparisons and to detect deterioration over time.

To set the input range, proceed as follows from the main screen.
(The setting cannot be changed in recording or recall mode.)

1. Activate cursor in input range display section

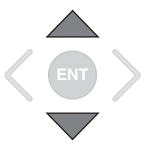
   Press the [RANGE] key to cause the input range display section to be shown in reverse (cursor active).

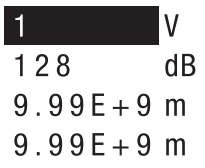




2. Select the channel for which to change the input range

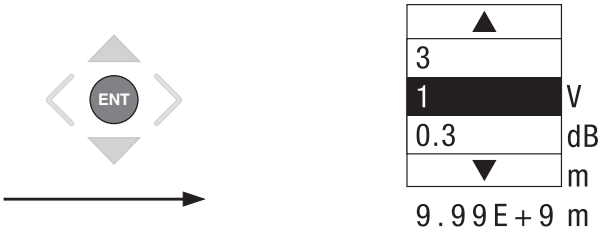
   Use the [▲]/[▼] keys to move the cursor to the channel whose input range setting you want to change.





3. Activate the range change mode

   Press the [ENT] key to bring up the sub menu.



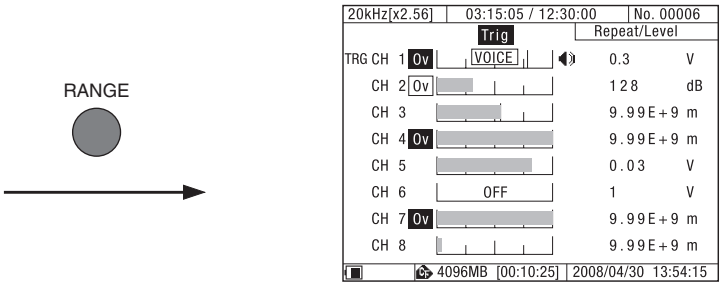
4. Select the new input range setting.

   Use the [▲]/[▼] keys to change the input range.

5. Confirm the new input range setting.

   Press the [ENT] key to return to the condition of step 2.

6. If you want to change the input range for another channel, repeat the procedure from step 2. Otherwise press the [RANGE] key to complete the range setting procedure.

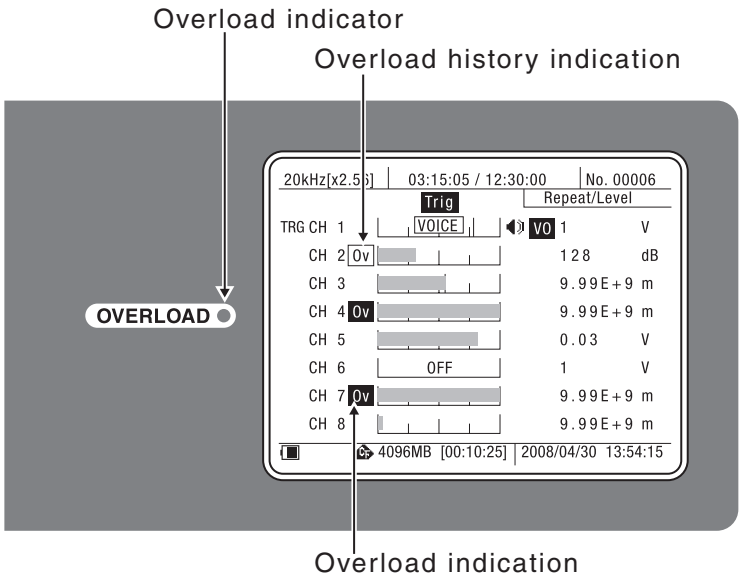


Input range setting and overload

When setting the input range, check whether overload occurs. When this happens, the overload indicator shown in the illustration below lights up in red, and the indication Ov appears on the display.

To improve reliability and ensure that overload does not occur for an extended period, the overload history indication is convenient. This indication comes on when there has been an overload event at any time within a given period. To reset the indication, hold down the [CLEAR Ov] key. When the key is released, overload history monitoring Ov begins, allowing the operator to determine later whether there has been overload without having to constantly check the overload indicator.

The overload history is also cleared when you make a recording parameter setting. For details on clearing the overload history, see page 22 (Overload Information).



Sampling

The sampling action of the DA-40 is controlled by the frequency range and sampling frequency setting. The sampling frequency can be set to 2.4 times or 2.56 times the frequency range.

Setting the frequency range

The frequency range can be set in six steps (100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 20 kHz). Make the setting using the "Frequency Range" item in Menu 2 < Rec.Parameters >.

The frequency range value represents the highest effective frequency that will be included in the recorded waveform. Higher components will be cut off. When making the setting, choose a value that is higher than the highest frequency of components that need to be included in the recorded data.

Setting the sampling frequency

Waveform sampling is carried out at a frequency that is 2.4 times or 2.56 times the frequency range value. Make the setting using the "Sampling Freq." item in Menu 2 < Rec.Parameters >.

To perform FFT analysis after recording, using the ×2.56 setting is recommended.

Recording process

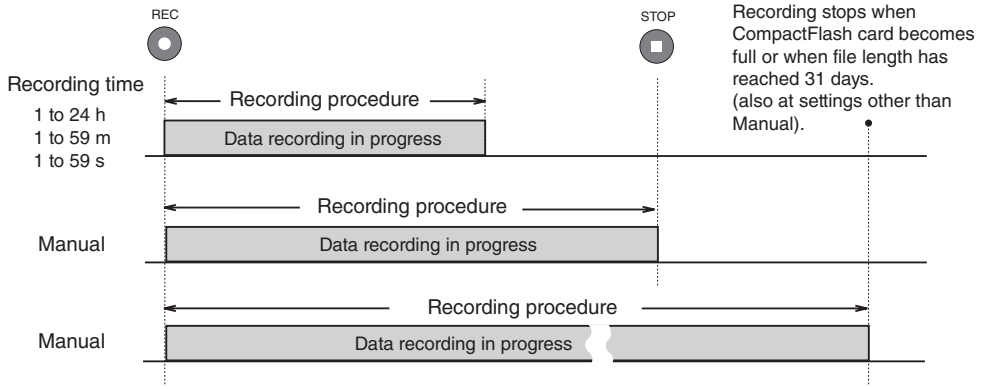
When you press the [REC] key, the data recording operation starts. However, if the trigger function (described later) is used, recording may not begin right away. In such a case, actual recording will only start when the trigger conditions are met, or in other words when a trigger event occurs.

Recording stops when the amount of data corresponding to the recording time has been recorded. If repeat trigger is selected, the recording condition is not terminated at this point. Rather, the unit goes into trigger standby mode and recording begins again at the next trigger event.

Even before the amount of data corresponding to the recording time has been recorded, recording can be stopped by pressing the [STOP] key. It will also stop when the CompactFlash card becomes full. Data recorded up to that point will be stored.

Setting the recording time

The recording time can be set to 1 to 59 s (seconds), 1 to 59 m (minutes), 1 to 24 h (hours), and a "Manual" setting is also available. When "Manual" is selected, recording continues until the [STOP] key is pressed. Regardless of the recording time setting, when there is no more room on the CompactFlash card to store data, recording stops. Recording to one file is also limited to a maximum of 31 days. When this limit is reached, the file is closed.



Make the recording time setting using the "Recording Time" item in Menu 2 < Rec.Parameters >.

When the PreRec. Time has been set to 1 second, the recording time can be set to a value of 2 seconds or higher. When the PreRec. Time has been set to 5 seconds, the recording time can be set to a value of 6 seconds or higher.

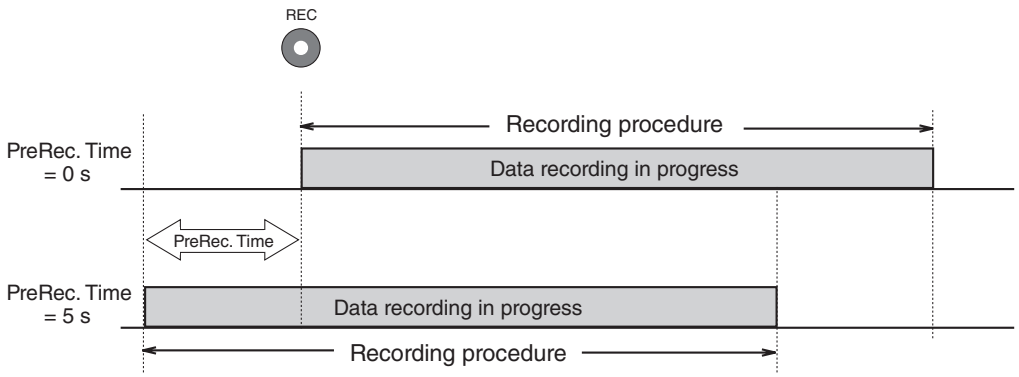
The recording time setting cannot exceed the remaining available capacity of the CompactFlash card inserted in the DA-40. If this applies, the recording time will automatically be changed to the maximum available time at the point where the [ENT] key is pressed.

Setting the PreRec. Time

If you wish to include data from a point slightly before the [REC] key was pressed or before the trigger event, use the PreRec. Time function. Available pre-recording settings are 0, 1, and 5 seconds.

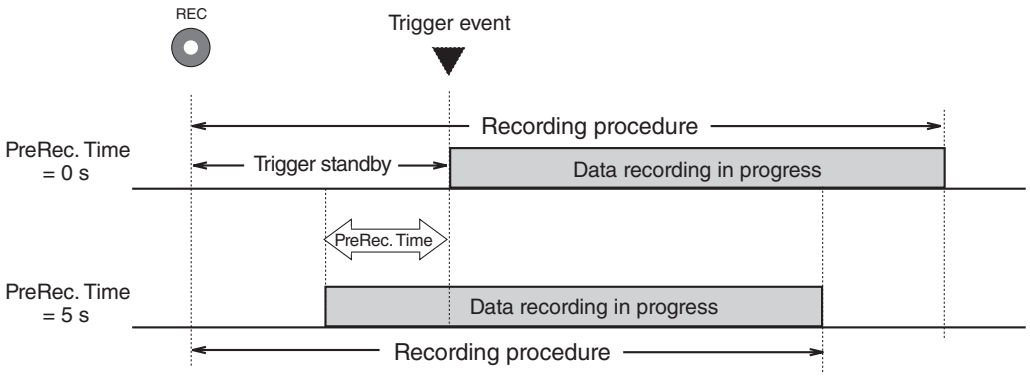
The overall recorded data length will correspond to the recording time. The PreRec. Time is not added to the recording time, rather it is included in the total.

Make the PreRec. Time setting using the "PreRec. Time" item in Menu 2 < Rec.Parameters > (page 38).



Difference in recording procedure with PreRec. Time

(PreRec. Time: 5 s, Recording Time: other than Manual, Trigger Mode: Free)



Difference in trigger operation depending on PreRec. Time setting
(PreRec. Time: 5 s, Recording Time: other than Manual, Trigger Mode: Single)

When the "Type" item of Menu 3 < Trigger > is set to "Time", the PreRec. Time setting has no effect.

Trigger conditions

The trigger operation is determined by the trigger mode and trigger type. When the trigger type is set to "Level", the trigger level and trigger channel must be set. For the "Time" trigger the start/stop time and interval must be set. Only trigger events that occur while the DA-40 is in the trigger standby condition are valid. Any trigger events that occur while data recording is in progress (including pause) are disregarded.

Setting the trigger mode

This setting determines the basic trigger operation.

Make the trigger mode setting using the "Mode" item in Menu 3 < Trigger >.

If the trigger function is not required, select the "Free" setting.

Free (trigger off)

Recording starts immediately when the [REC] key is pressed and ends when the amount of data corresponding to the recording time has been recorded.

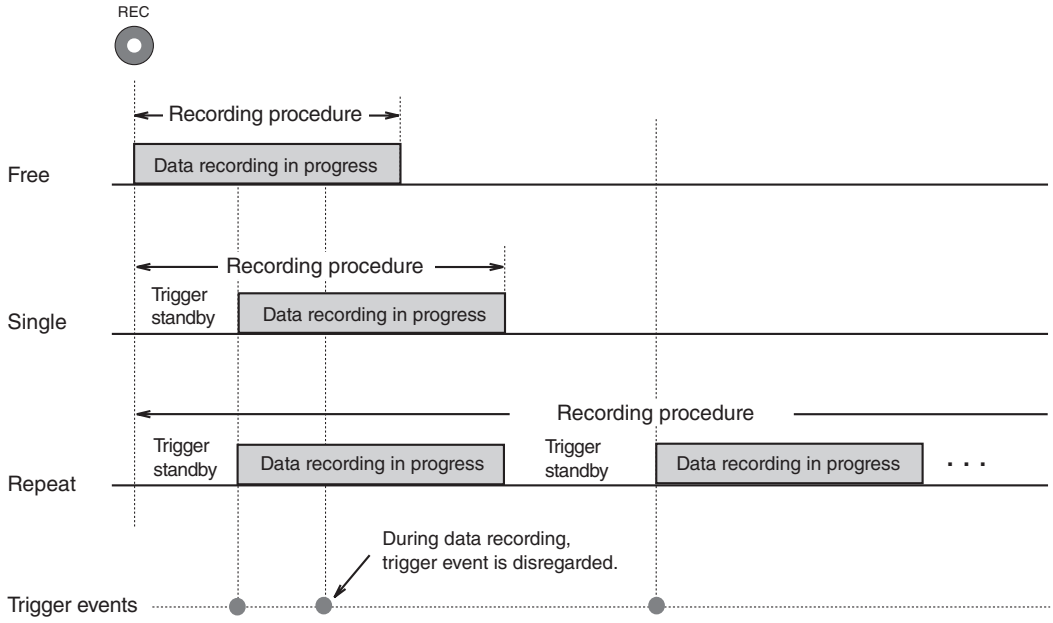
Single (single trigger)

The unit goes into trigger standby mode when the [REC] key is pressed. When a trigger event occurs, recording starts. When the amount of data corresponding to the recording time has been recorded, recording stops.

Repeat (repeat trigger)

The unit goes into trigger standby mode when the [REC] key is pressed. When a trigger event occurs, recording starts. When the amount of data corresponding to the recording time has been recorded, the unit again goes into trigger standby mode and the operation is repeated.

Note
Repeat operation is possible also when the Recording Time is set to Manual. But because recording will be carried out once only, operation is the same as in Single mode.



Difference in recording procedure according to trigger mode
(PreRec. Time: 0, Recording Time: other than Manual, Trigger Type: Level or External)

Setting the trigger type

This setting determines the type of event that serves as a trigger.

Make the setting using the "Type" item in Menu 3 < Trigger >.

Level (level trigger)

A trigger event occurs when the level of the input signal in the specified trigger channel becomes a preset threshold value (trigger level) or higher.

External (external trigger)

A trigger event occurs when the state of the external trigger connector changes from H (open) to L (shorted). Detection is carried out on the falling edge.

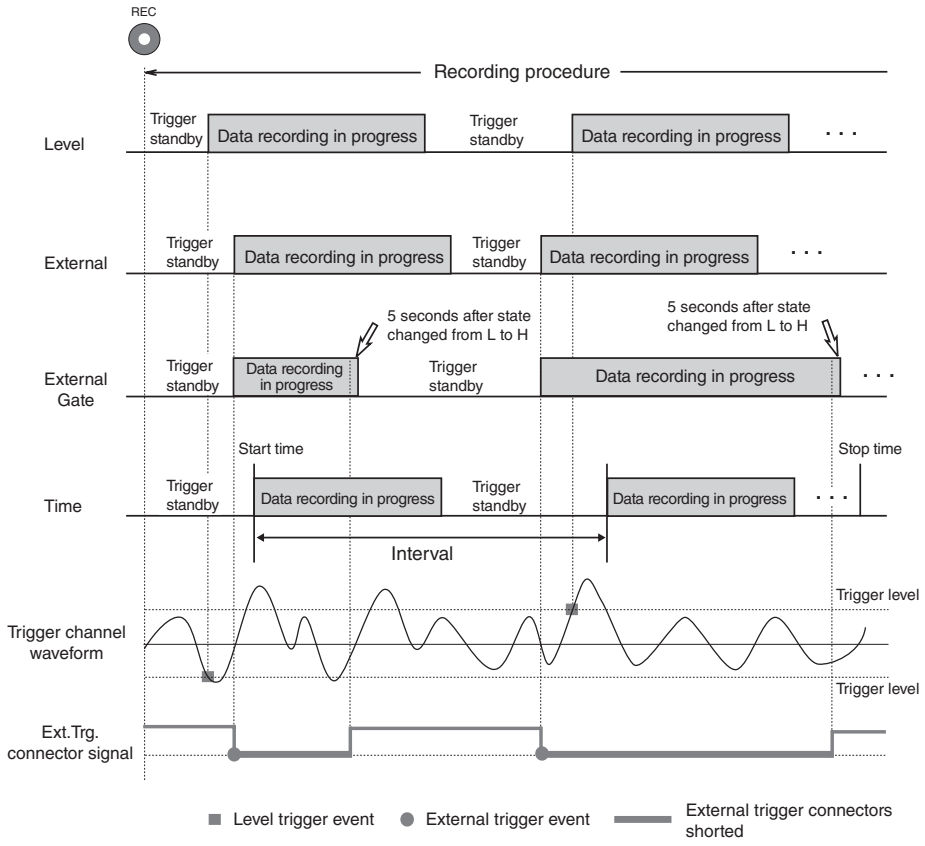
External Gate (external gate trigger)

Data recording is carried out while the state of the external trigger connector is L (shorted). Also after the state changes to H (open), recording continues for five seconds (post-recording). If the state of the external trigger connector is already L (shorted) when the [REC] key is pressed, recording starts straight away because the trigger conditions are met. With this trigger type, the recording time setting has no effect.

Time

Recording is carried out from the specified Start Time to the specified Stop Time, at intervals as specified by the Interval setting.

Note
When the trigger type is set to "Time", pausing the recording is not possible ([PAUSE] key does not work). Also, the "PreRec. Time" setting in menu 2 < Rec. Parameters > has no effect. When the Stop Time is reached, recording will stop, also if the Recording Time is not yet completed.
For trigger types other than "Time", pausing the recording is possible (except during trigger standby).



Difference in recording procedure according to trigger type
(PreRec. Time: 0, Recording Time: other than Manual, Trigger Mode: Repeat)

Setting the trigger level

When the trigger type is set to "Level" (level of signal at input connector), the actual level to be used as a trigger level must be set as a percentage [%] of the full-scale value of the current input range.

Make the setting using the "Level" item in Menu 3 < Trigger >. The actual trigger level is indicated on the bar graph for the trigger channel (see page 24).

Setting the trigger channel

When the trigger type is set to "Level", the channel to be used as trigger channel must be set.

Make the setting using the "Ch" item in Menu 3 < Trigger >.

When using the voice memo function, channel 1 is not available as a trigger channel.

The indication "TRG" is shown at the left of the trigger channel. (For information on level trigger target channel indication, see page 21).

Setting the start and stop time

When the trigger type is set to "Time", set the start time and stop time as follows.

Make the setting using the "Start Time" and "Stop Time" items in Menu 3 < Trigger >.

Note
Set the start time and stop time to a time later than the current date/time. If an earlier setting is used, this will be taken as a setting for one year later.

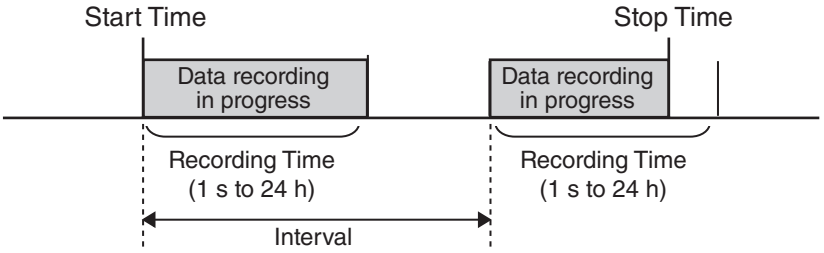
Setting the recording interval

When the trigger type is set to "Time", set the interval as follows.

The interval setting cannot be shorter than the Recording Time setting.

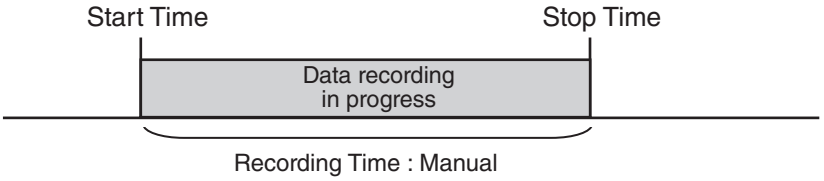
Make the setting using the "Interval" item in Menu 3 < Trigger >.

When Stop Time is reached before Recording Time is up



Recording stops (Stop Time has priority)

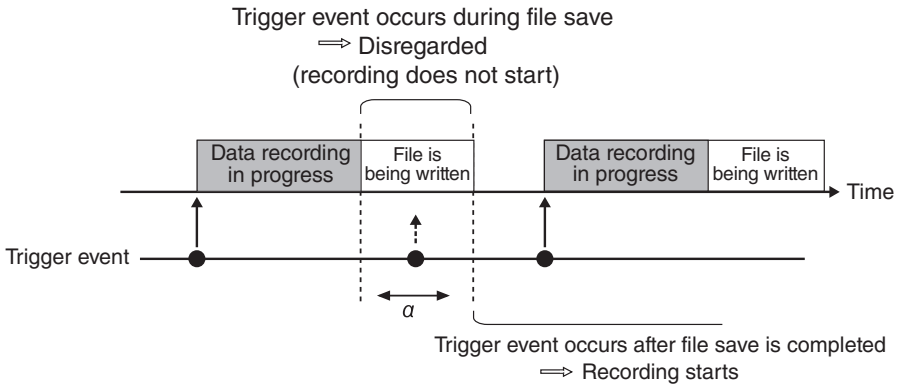
When Recording Time is set to Manual, recording stops at the Stop Time.



Recording begins at the specified start date/time and ends at the specified stop date/time.

Repeat trigger precaution

If trigger conditions are met while a file is being closed, the next recording will not start.



"α" is the time required to write previous data to CompactFlash card as a file.

File write time

When a 4 GB CompactFlash card is used, and 8 channel data were recorded for one hour using a frequency range setting of 20 kHz, the file write process will take about 90 seconds.

Recorded data are also written sequentially to a file during the recording process, but at the point where recording stops, there will be a certain amount of data that still need to be written. In addition, file management information to allow later retrieval of the file also need to be created.

The "File is being written" above refers to this process of writing remaining data and file management information.

Auxiliary function setup

Device index number (Menu 5 < System >: Index)

The index number setting has no influence on performance or functions of the unit. Setting an index number is optional. The setting range is 1 to 255. Some possible uses for the index number capability are listed below.

1. Temporary management (classification) of recorded data
   - Example 1 In a system where several DA-40 units are used, the index number can serve to manage data according to the unit on which the data were recorded.
   - Example 2 Manage recorded data according to measurement purpose, measurement location, or similar.
   - Example 3 Manage recorded data according to measurement parameters.
2. Using the index number as input range information
   When using a system where a calibration signal is recorded in order to calibrate recorded data, sensor range information will be required. Using an input range value as the index number will facilitate data management.

Voice memo/marker

The voice memo function allows the operator to add comments before and after the recording procedure or during recording. The marker function can be used to mark a certain position, for example when a particular phenomenon occurred during recording. This makes it easy to later locate the data for that point. For example, if noise was encountered at a certain point, the marker can serve to locate and isolate the corresponding data.

Voice memo

During voice memo recording, the microphone input signal will be recorded instead of the channel 1 signal. The audio level is indicated by the bar graph for channel 1, and the indication VOICE Only (dedicated to voice memo microphone, regardless of microphone switch status) or VOICE (voice memo or signal, only while microphone switch is pressed) is shown in the center. The actual operation of the voice memo function differs, depending on whether data are currently being recorded or not.

Before starting to record data

Voice memo recording is carried out simply by pressing the microphone switch. When the microphone switch is released, voice memo recording stops. The voice memo is handled in the same way as other recording data and saved as a file. (The number is incremented by 1.) This operation is not affected by the Voice setting (page 39).

While data are being recorded

Select the desired setting with the "Voice" item of Menu 2 < Rec.Parameters >.

Voice Only

The channel 1 signal is not recorded. While the microphone switch is being pushed, the sound from the microphone is recorded. When the switch is released, no signal (zero) is recorded.

Voice/Input

The sound from the microphone is recorded while the microphone switch is being pushed. When the switch is released, the input signal of channel 1 is recorded.

OFF (Marker)

The voice memo function is not used. Marker information can be recorded.

(Note) The "Voice Only" or "Voice/Input" setting can only be selected when the frequency range setting is 1 kHz or higher.

The voice memo is recorded as channel 1 information in the file currently being recorded.

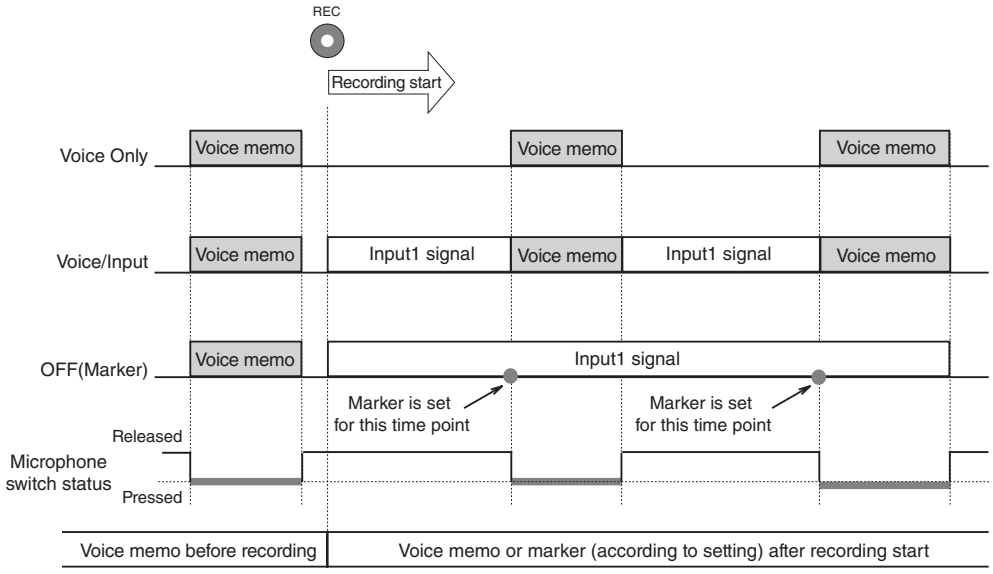
Marker

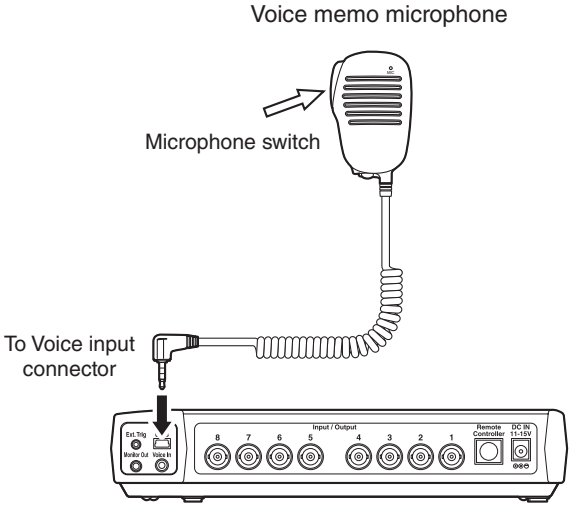
The marker function is only available during data recording. Marker recording does not affect the operation of channel 1. The maximum number of marker points that can be set between the beginning and the end of data recording is about 3,000. When the microphone switch is pressed, the indication MARKER appears for one second in the center of the bar graph for channel 1. When not using the marker function, you should disconnect the voice memo microphone.

The marker precision is about 1 second.

Comparison of voice memo and marker operation

The diagram below illustrates the operation principle of the voice memo and marker function. The functions differ in the action that occurs when the microphone switch is pressed.



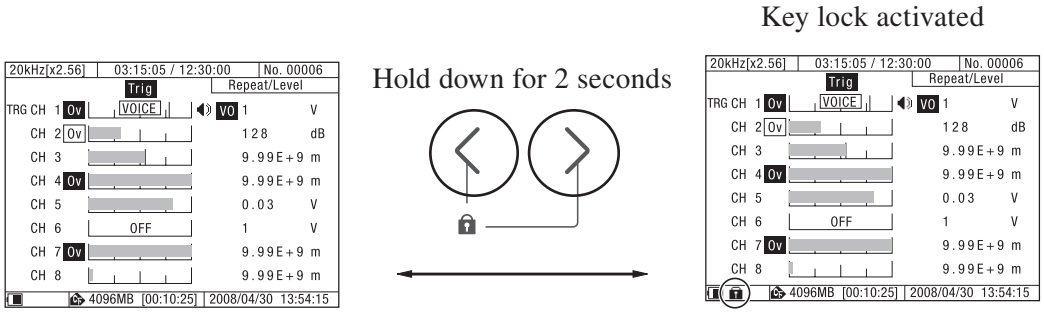


Preventing inadvertent operation (key lock and menu lock)

This section explains the key lock and menu lock functions that serve to prevent operation errors when performing data recording in the field.

Key lock Makes almost all keys inactive

Pressing and holding the [<] and [>] keys together for a few seconds activates the key lock condition. In this condition, all keys except the [LIGHT] key and the [<]/[>] keys are locked. Remote control operation remains possible. To cancel the key lock state, press and hold the [<] and [>] keys once more. During key lock, a key lock icon [🔒] appears in the bottom left of the display.



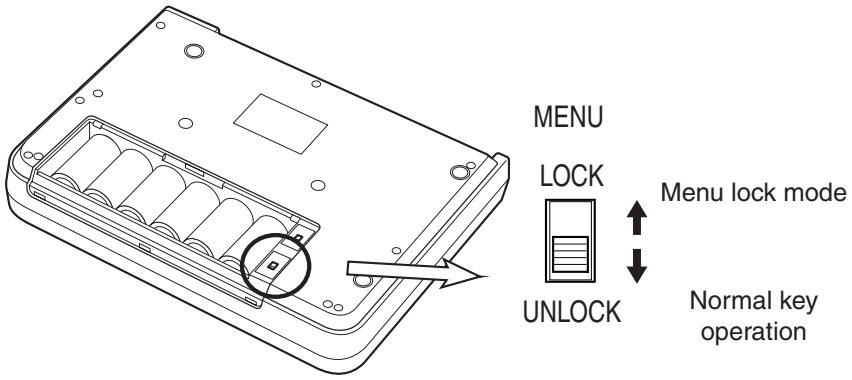
Menu lock

Changing menu settings and deleting data are disabled

Opening the battery compartment cover gives access to a slide switch in the lower left section, as shown in the illustration below. When you set this switch to the LOCK position, menu settings cannot be changed, and data in recall mode cannot be deleted. Only the input range setting can still be changed. This condition is called the menu lock mode.

When menu lock is active, the indication MENU LOCKED appears if you call up a menu and attempt to make a setting, or if you attempt to delete data in recall mode.

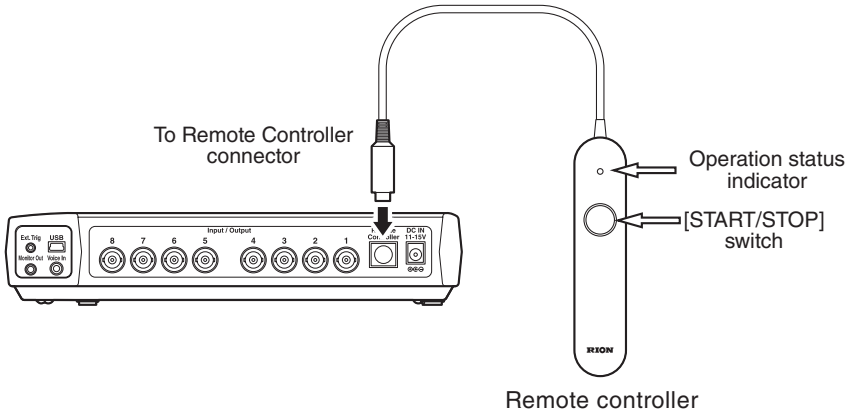
During menu lock, a menu lock icon [🔒] appears in the bottom left of the display.



Note
Operate the menu lock switch only while power to the unit is switched off.

Remote control operation

The optional Remote Controller (DA-20RC1) allows recording start/stop control from a remote location. The controller features simple construction with only a start/stop switch and an operation status indicator. The cable is to be connected to the Remote Controller connector on the DA-40.
The Remote Controller allows for example centralized control of measurement system including other devices, with the DA-40 used to record data under a given set of conditions. Because the Remote Controller is designed to be operative also when the key lock feature is enabled, the DA-40 can be protected from inadvertent operation.



The first push of the [START/STOP] switch on the Remote Controller starts recording. When the switch is pushed while recording is in progress, recording stops. The operation status indicator provides the information listed in the following table.

Status indicator	Operation
Flashing red	Recording
Flashing green	Trigger standby
Lit in red (1 second or more)	Overload has occurred
Off	Other condition

When an overload condition continues, no distinction is made with regard to whether it is before or after recording start. However, recording under permanent overload conditions is a problem. Adjust the input range setting to prevent overload.

Recording

This section explains the recording process, including pre-recording checks and general steps for recording.

Recording steps

1. Checks before recording

Check the power supply, sensor readiness, and all settings.

2. Adjust input range. Record calibration signal as required.

Adjust the input range setting so that no overload occurs. To ensure that the recorded data correspond to correct measurement values, record a calibration signal before recording. When there has been no change in sensors and recording parameters, this step may be omitted from the second time onwards. If the sensitivity setting of the DA-40 can be considered to provide sufficient accuracy, recording a calibration signal is not necessary.

3. Recording

Use the [REC] key to perform the recording procedure, and repeat as necessary. If any of the items that are to be checked before recording has changed (connection of external equipment, input settings, etc.), return to step 1.

After data recording has started, use the voice memo/marker function, pause function, and trigger processing as necessary.

1. Checks before recording

Before starting to record, check that all sensors are connected correctly and that all settings are made properly. Items to be checked are listed below.

1. Power supply

- □ Are inserted batteries in good condition? Are spare batteries available? (See pages 20, 49.) Is an AC adapter or other suitable external power source available?
- □ Are power-on settings appropriate? (See page 50.)

2. Auxiliary functions

- ☐ Are voice memo and marker settings appropriate? ("Voice" item of Menu 2 < Rec.Parameters >) (See pages 39, 73.)
- ☐ Has key operation been restricted as required by the usage environment? (Key lock, menu lock mode) (See page 76.)
- ☐ Has Remote Controller been made available (as required)? Normally, key lock should be enabled when using Remote Controller.
- ☐ Is device index number setting appropriate? (See page 72.)

3. CompactFlash card

- ☐ Is CompactFlash card appropriate for use in DA-40? (Insert card and check for messages.) (See pages 12, 51, 106)
- ☐ Is enough free capacity available? Is spare CompactFlash card available? (Set number of channels and recording parameters as required, and then check remaining recording time on main screen.) (See pages 9, 21, 115)

4. External equipment connection

- ☐ Is sensor configuration appropriate? Have sensor been connected correctly? (See pages 10, 53)

5. Input settings

- ☐ Are input and sensitivity settings matched to sensor? (If calibration signal is to be recorded for sensitivity calibration, the sensitivity setting check can be omitted.) (See pages 54 to 58)
- ☐ Are unused input channels set to OFF? (Otherwise noise from unused inputs may be recorded as data, unnecessarily using up CompactFlash card capacity.)
- ☐ Are low-pass filter and high-pass filter settings appropriate? (See page 35)

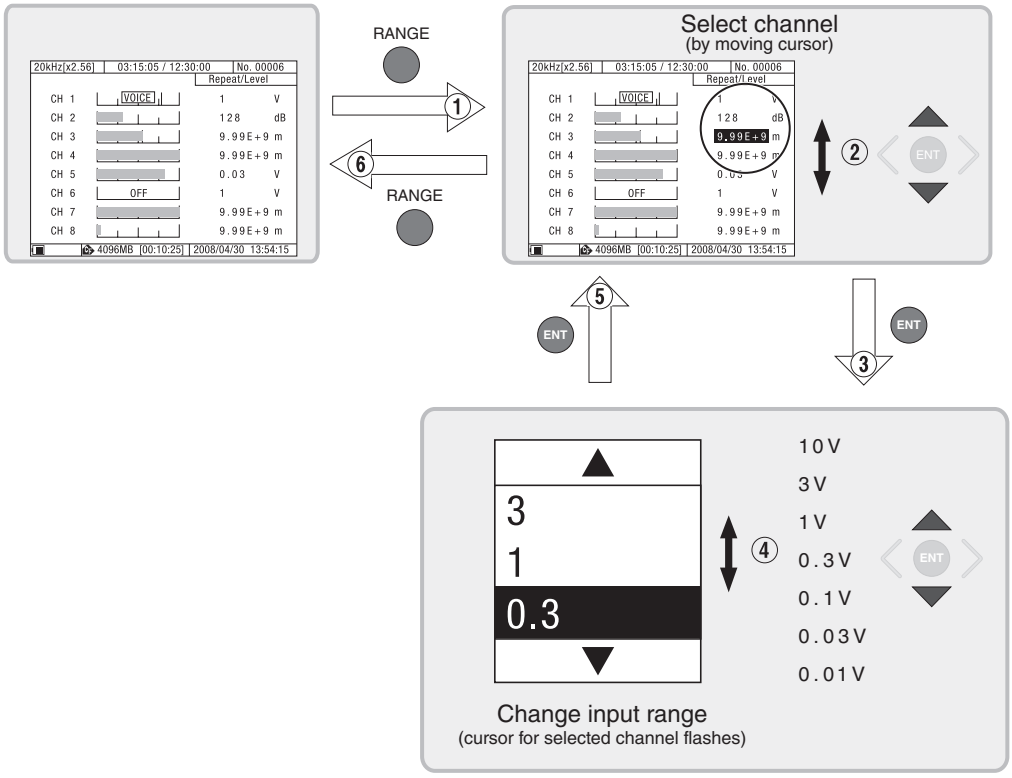
6. Recording parameters

- ☐ Trigger (See pages 66 to 71)
- ☐ Frequency range, sampling frequency (See page 62)
- ☐ Recording time (See page 63)
- ☐ Sensitivity setting (See pages 55 to 58)
- ☐ Input range (See pages 59 to 61)

2. Input range setting / Calibration signal recording

Changing the input range setting

1. Press the [RANGE] key to cause the input range display section to be shown in reverse (cursor active).
2. Use the [▲]/[▼] keys to move the cursor to the channel whose input range setting you want to change.
3. Press the [ENT] key to allow changing the current input range setting.
4. Use the [▲]/[▼] keys to change the input range.
5. Press the [ENT] key.
6. If you want to change the input range for another channel, repeat steps 2 to 5. Otherwise press the [RANGE] key to complete the range setting procedure.



Recording a calibration signal

Calibration for recorded data is normally performed by recording the sensor calibration signal before or after the data recording procedure and by correlating the result to the recorded data.
This method allows correct calibration even if the effect of the configuration elements of the sensor (extension cable, preamplifier, etc.) is unknown.
In principle, it will be necessary to record the calibration signal again when the configuration elements have been changed. Input range information of measuring device will also be required (if range switching is possible).

In the representative examples listed below, recording the calibration signal may be necessary. In actual use, the operator should decide whether calibration is necessary, based on information given in this manual and other data.

1. Input range setting of the measuring instrument (not DA-40) was changed.
   The instrument may change output signal being supplied to DA-40 when input range setting is changed even at the same input signal.
2. Extension cable was changed (length, cable gauge, etc.)
   A change in electrical impedance may result in a different output signal being supplied to the DA-40.

3. Recording

Starting to record

Press the [REC] key.

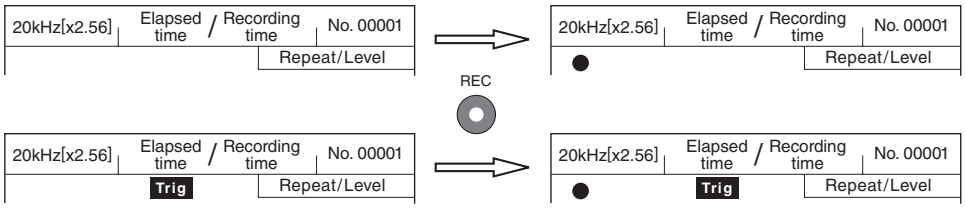
REC

The recording procedure begins.

The REC indicator at the top right above the [REC] key flashes, and the REC icon appears on the display.

While recording is in progress, the REC icon flashes, and the elapsed time count based on the recorded data volume is updated. When the elapsed time equals the preset recording time, recording stops.

During pause or trigger standby, the elapsed time count is not updated. If the PreRec. Time function is used, the elapsed time count does not start from zero but from the PreRec. Time value.



< If one of the following messages appears and recording does not start >

- [NO CARD!]
  ⇒ Insert a CompactFlash card and press any key to clear the message. Any [REC] key operation is disregarded.
- [Card Error. Remove Card or Format Card.]
  ⇒ A CompactFlash card that cannot be used in the DA-40 was inserted. Press any key to clear the message. Any [REC] key operation is disregarded. Format the card in a computer or insert another CompactFlash card.

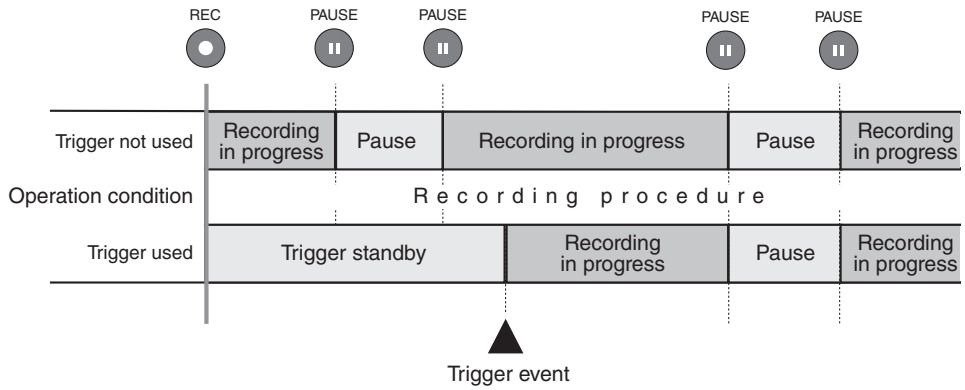
< When does the recording procedure stop? >

The recording procedure stops in the following cases.

1. The amount of data corresponding to the recording time setting has been recorded.
2. There is no more remaining space on the CompactFlash card.
3. The [STOP] key was pressed.
4. The number of days in one data file has reached 31.
5. The stop time set for the time trigger has been reached.

< "Recording procedure" and "recording in progress" >

The entire process between initiating the recording and the completion of all steps is called the "recording procedure". This also includes the pause or trigger standby conditions during which no actual data are being recorded. The condition where actual data are being recorded (i.e. where the unit is not in the pause or trigger standby condition) is called "recording in progress".



< Overload history and display >

The overload history display Ov can be turned off during recording by pressing the [CLEAR Ov] key. However, only the display is turned off. The information about any overload that occurred is recorded along with the data.

This capability can be used when overload has occurred and been noted, but the operator then wants to monitor any further overload occurrences. The voice memo or marker function can also be used in addition to overload monitoring, which can be helpful when analyzing data later.

The overload history does not comprise information about any overload that occurred during pause, trigger standby, or during voice memo recording.

Terminating a recording partway

Press the [STOP] key.

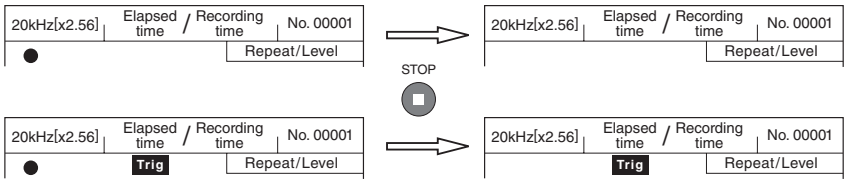
The REC indicator and the REC icon go out and recording stops.

Now Closing file.
Do not remove Card.

While the above message is shown, do not remove the CompactFlash card, because data are being written to it.

After a long-term recording or when there is a large number of files on the CompactFlash card, this process may take some time.

When the writing process is completed, the file number is incremented by 1.

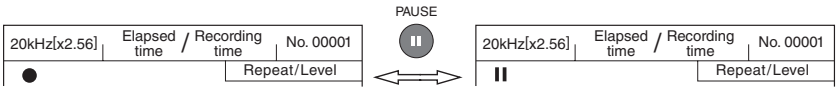


Pausing/restarting the recording

Press the [PAUSE] key.

The recording is paused. The ❚❚ icon appears on the display.

When you press the [PAUSE] key again, the ❚❚ icon disappears and recording resumes.

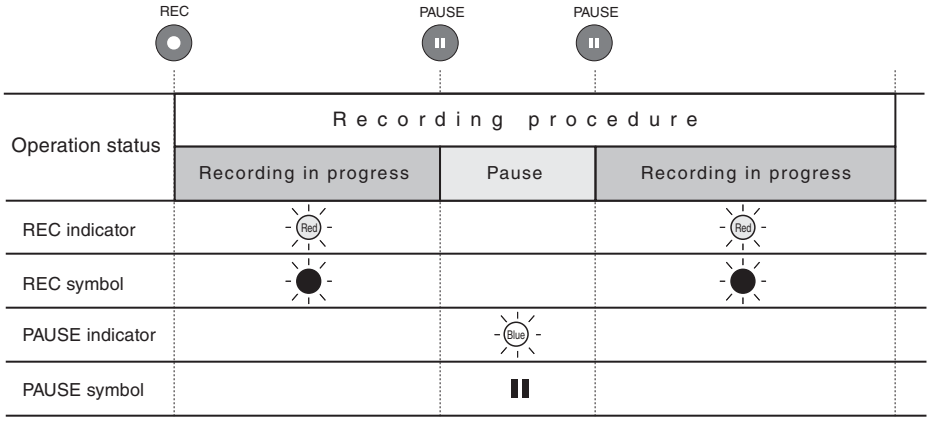


In the pause condition, the elapsed time count stops. The voice memo and marker function can also not be used.

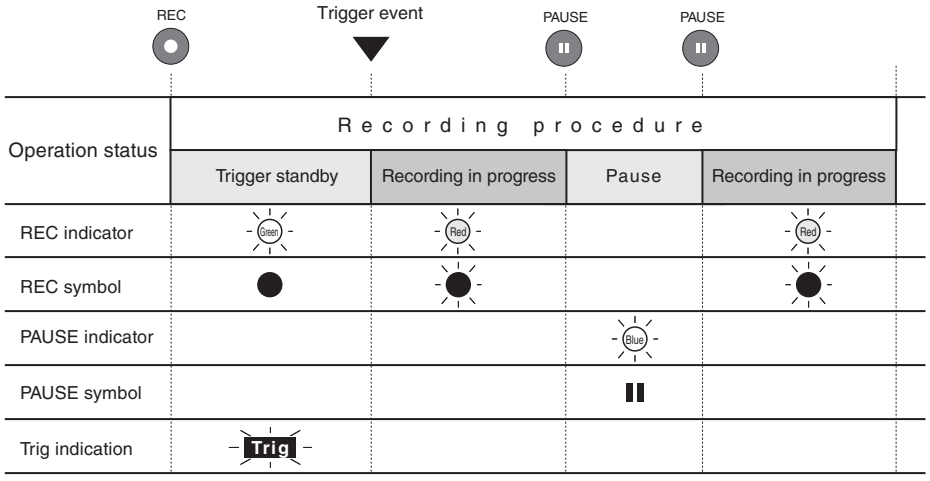
Note
The minimum interval between pauses is 5 seconds when the frequency range is 100 Hz and 1 second when the frequency range is 500 Hz or higher.

Recording procedure conditions and indicator/display status

The various conditions of the unit during the recording procedure can be checked using the indicators and the display panel.
The two illustrations below show the various conditions, with and without the use of the trigger function. (Flashing of an indicator or symbol is indicated in the illustration as ☼.)



Basic recording

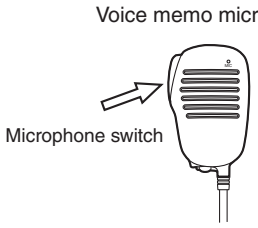


Recording with trigger function

Using the voice memo/marker function

Voice memo

Voice memo recording on the CompactFlash card starts when the microphone switch is pushed and stops when the switch is released. While recording a voice memo, the indication VOICE or VOICE Only is shown on the bar graph for channel 1.



VOICE Vo 0.3V

Voice/Input setting : Shown during voice memo recording

VOICE Only Vo

Voice Only setting : Shown during voice memo recording

When the unit is currently not performing the recording procedure, voice memo recording is possible at any time. When voice memo recording was stopped but the voice memo file is still being written to the CompactFlash card, the [REC] key is not accepted.

When the unit is currently performing recording, voice memo recording can be started only while recording is in progress (not during pause or trigger standby).

When channel 1 is set to OFF or the frequency range setting is less than 1 kHz, or when the "Voice" item of Menu 2 < Rec.Parameters > is set to "OFF (Marker)", voice memo recording while recording is in progress is not possible.

When the microphone switch is operated, noise (overload) may occur (see page 39).

Marker

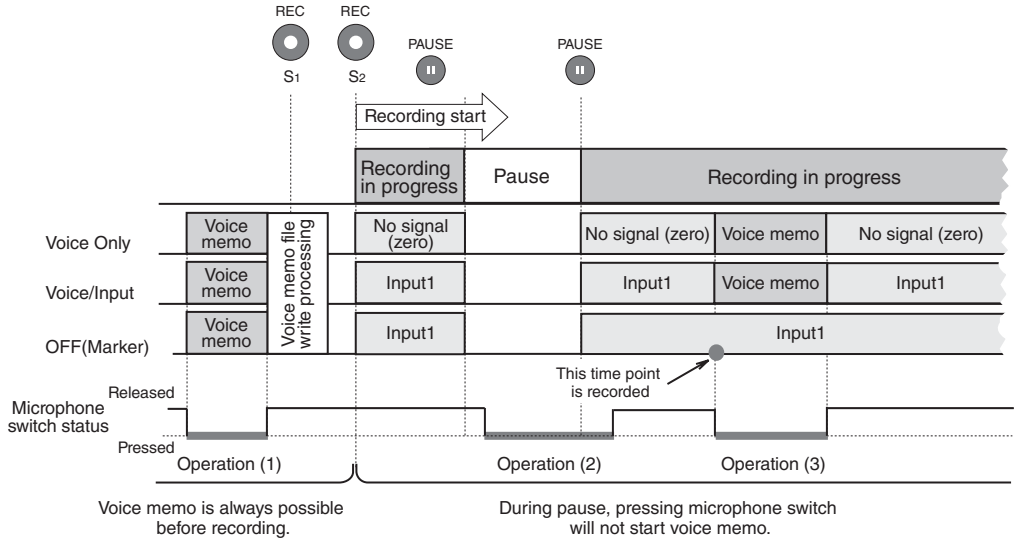
To use the marker function, set the "Voice" item of Menu 2 < Rec.Parameters > to "OFF (Marker)".

When the microphone switch is pressed while data are being recorded, the current time is recorded as a marker. Pressing the switch also causes the indication MARKER to appear on the bar graph for channel 1 for about one second.

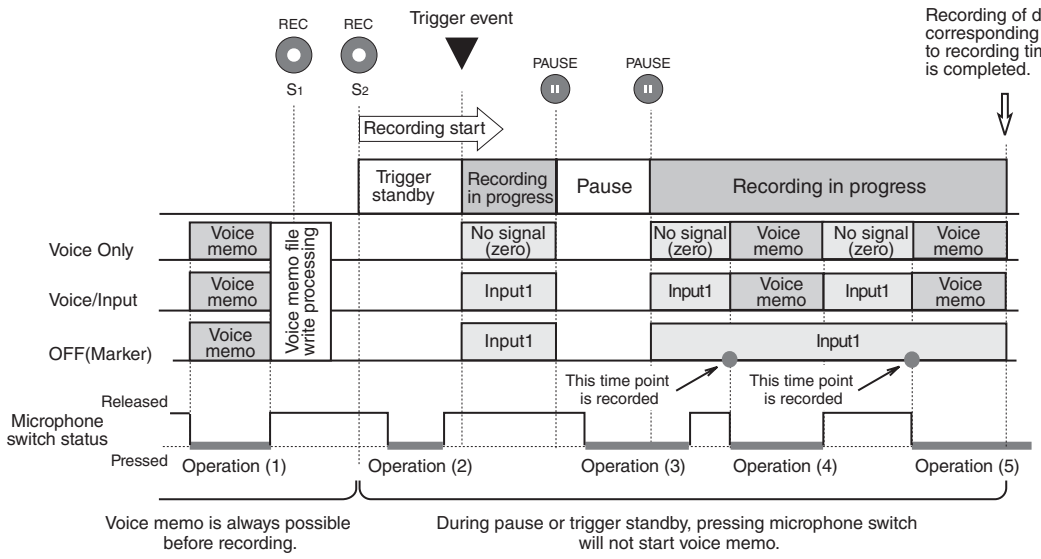
The marker function is not limited by the frequency range setting, but it can only be used while recording is in progress.

MARKER 1V

Marker (OFF) setting : indication just after marker



The above illustration shows the voice memo/marker operation in detail when the trigger function is not used. During the operation (1) interval, recording is not in progress and voice memo recording is possible at any time, regardless of the "Voice" setting. However, while a voice memo file is being written to the CompactFlash card, [REC] S_1 is not accepted, and at [REC] S_2, recording is already in progress. Voice memo operations during the pause interval (2) are disregarded. The marker information is recorded only when the switch is pressed while recording is in progress, as in operation (3).



The above illustration shows the voice memo/marker operation in detail when the trigger function is used.

Except for the fact that voice memo operation is disregarded during trigger standby as well as during pause, operation is the same as when the trigger function is not used. During the voice memo operation interval (5), the voice memo recording will be interrupted at the point where data recording is complete, even if the microphone switch is kept depressed. (The same applies for recording end when the trigger function is not used.)

Data recording example

Monitor road noise and record sound pressure waveform when a given level is exceeded

The sound level meter NL-21 is used to measure noise levels. The comparator output and AC output of the NL-21 are used for recording the waveform on the DA-40.

Connect the comparator output of the sound level meter to the Ext. Trig. connector of the DA-40, using the cable CC-94A. For voice memo recording, connect the supplied voice memo microphone to the voice input connector. Connect the AC output of the sound level meter to the channel 8 connector of the DA-40.

Make the DA-40 settings as follows.

Input settings (using < Input > menu)

CH	Input	HPF	LPF	Sens	Sensitivity
1	AC	OFF	OFF	V	
2	OFF	OFF	OFF		
3	OFF	OFF	OFF		
4	OFF	OFF	OFF		
5	OFF	OFF	OFF		
6	OFF	OFF	OFF		
7	OFF	OFF	OFF		
8	AC	OFF	OFF	SLM	Level range value dB

(Channel 8 is to be used for waveform recording. Channel 1 is to be used exclusively for voice memo recording.)

Auxiliary functions

- Set device index number to level range value of sound level meter (for calibration signal recording)
- Set comparator level of NL-21 to level of signal to record.
- Set key lock to ON and voice memo setting to Voice Only.

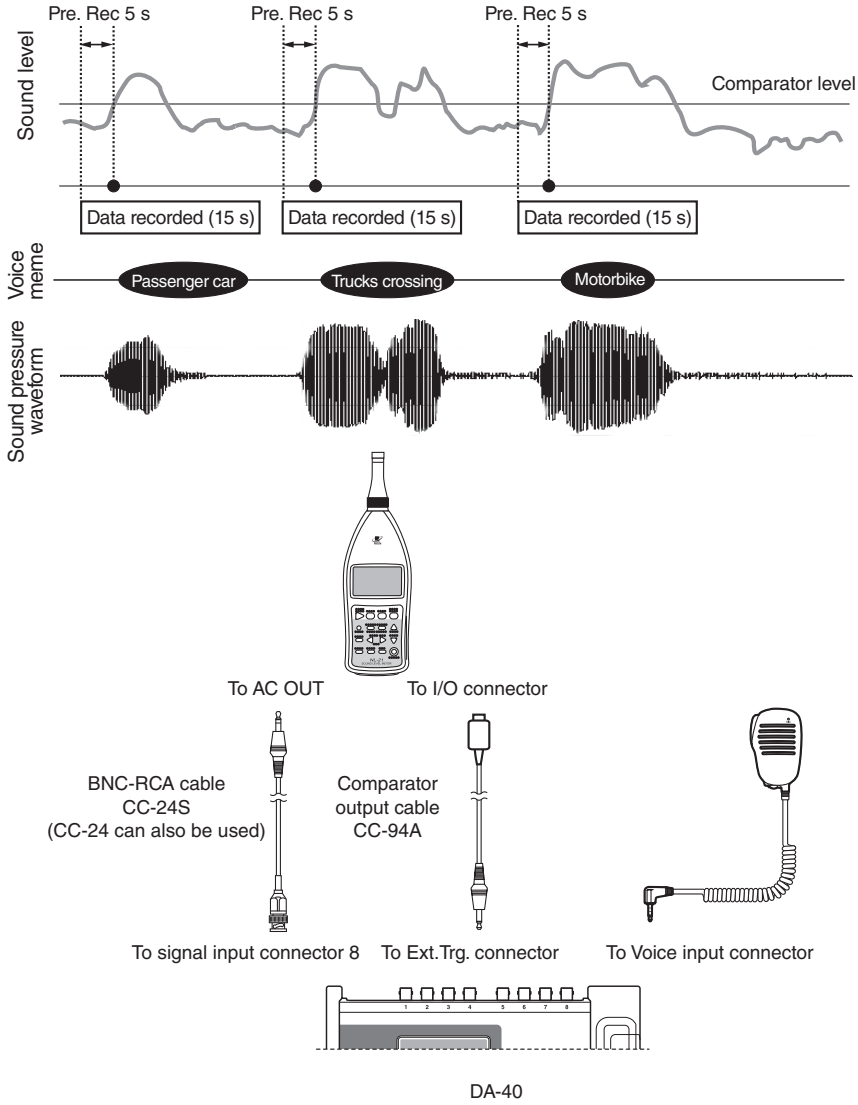
Recording parameters

Recording parameters		Recording parameters	
Item	Setting	Item	Setting
Trigger mode	Repeat	Trigger type	External
Recording time	15 s	PreRec. Time	5 s
Frequency range	20 kHz	Sampling frequency	×2.56
Input range	Suitable value		

Procedure

1. Record calibration signal of sound level meter (at this time, trigger mode should be set to "Free").
2. Cancel calibration mode at sound level meter. Set trigger mode back to "Repeat" and recording time to "15 s".
3. Press the [REC] key to enable trigger standby.
4. Record voice memo as necessary.
5. Press the [STOP] key to terminate recording.

Note
It is also possible to select "SLM" for the "Sens" item and set the sensitivity to the level range (full-scale value) of the sound level meter, without recording the calibration signal. However, for optimum measurement accuracy, recording the calibration signal of the sound level meter is preferable.



Generated file name	D00005 (Trigger1)	D00005 (Trigger2)	D00005 (Trigger3)
Recorded sound pressure waveform (channel 8)			
Voice memo (channel 1)			

In this example, it is assumed there are already four recorded data (including the calibration signal) on the CompactFlash card. The file name therefore starts from D00005.

Recall/Playback of Recorded Data

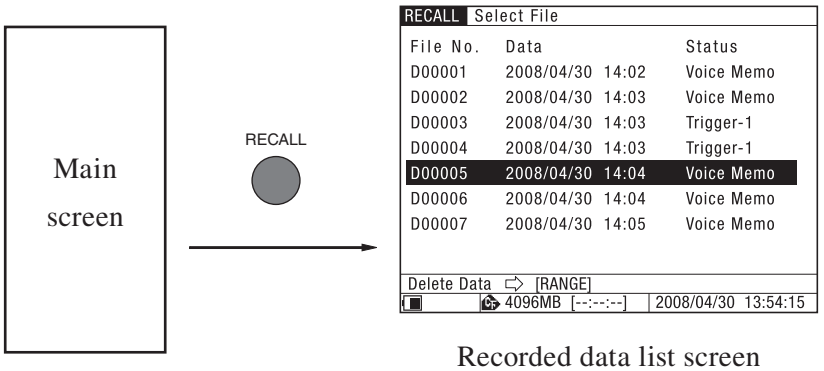
You can call up a list of recorded data and select data for playback and for checking. You can also delete unwanted data or determine whether data have to be recorded again.

(For a flow chart of the overall operations described in this section, see page 104.)

Activating recall mode

Press the [RECALL] key. A screen listing recorded data appears, and the unit switches to recall mode.

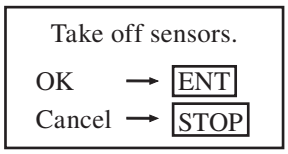
Note
When there are a lot of data on the CompactFlash card, entering recall mode may take some time.
The recorded data list screen can show up to 1,000 files. (The maximum number of recorded data files is 65,533.) When there are more than 1,000 files, the message "Cannot display more than 1000 files" appears (see next page).



Recorded data list screen

When activating the recall mode, one of the following messages may appear.

- If playback signal is output from playback output connectors



[ENT] key: Enter recall mode.
[STOP] key: Cancel entering recall mode.

⚠ Caution

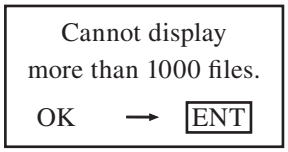
When a playback signal is output to a sensor, the sensor may be destroyed. When the unit is set up to output the playback signal, you should disconnect any sensors before starting playback.

To use recall mode without disconnecting the sensors, press the [STOP] key to return to the main screen, open the < System > menu, and set "BNC Output for Playback" to OFF. Then press the [RECALL] key to enter recall mode.

- If no CompactFlash card is inserted

  The recall mode cannot be activated. In this case, the indication No Card appears on the display for a few seconds, and then the main screen appears again.

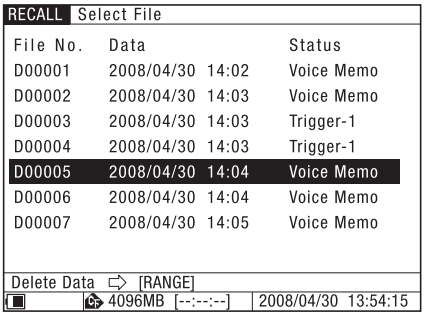
- If the number of recorded data files is more than 1000



Press the [ENT] key to return to the recorded data list screen.

Viewing recorded data

The recorded data list screen shows the file number, recording start time, and status of the data selected by the cursor. The "XXXXX" of DXXXXX is the file number. The Status field shows "Voice Memo" if this was recorded at the main screen. For data recorded with the repeat trigger function, the number of the trigger event is shown. (For example, Trigger-3 indicates data recorded at the third trigger event.) Use the [▲]/[▼] keys to move the cursor.

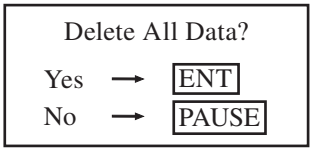


Recorded data list screen

Deleting recorded data

The recorded data list screen also lets you delete the most recently recorded data (with the highest file number).

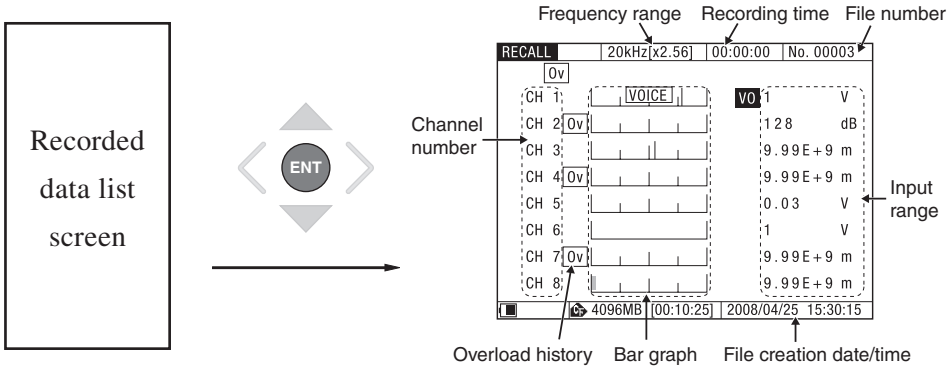
1. Move the cursor to the recorded data with the highest file number and press the [RANGE] key.
2. Verify that the message below is shown, and press the [ENT] key or [PAUSE] key.



By repeating this procedure, you can delete multiple data, always with the highest file number.
It is not possible to specify recorded data with a lower file number for deletion.

Selecting recorded data for playback

Move the cursor to the recorded data you want to play back, and press the [ENT] key. The recall screen appears, and the recorded data can be played back.



Recall screen example

The recall screen provides information about frequency range, recording time, input range, overload history, etc. The recording time is the time corresponding to the actual recorded data. For data where recording was stopped partway, this will be shorter than the recording time specified via the menu.
Playback of recorded data can also be started from this screen. The [<]/[>] keys can be used to select recorded data (change file numbers).

< Playback signal output destination --- Double-check! >

When a sensor remains connected to the playback output connectors (which function as signal input connectors during data recording), the playback signal will be applied to the sensor, which may cause permanent damage. For safety, you should disconnect all sensors during playback.

Playback of recorded data

The recall screen gives access to various operations related to playback of recorded data.

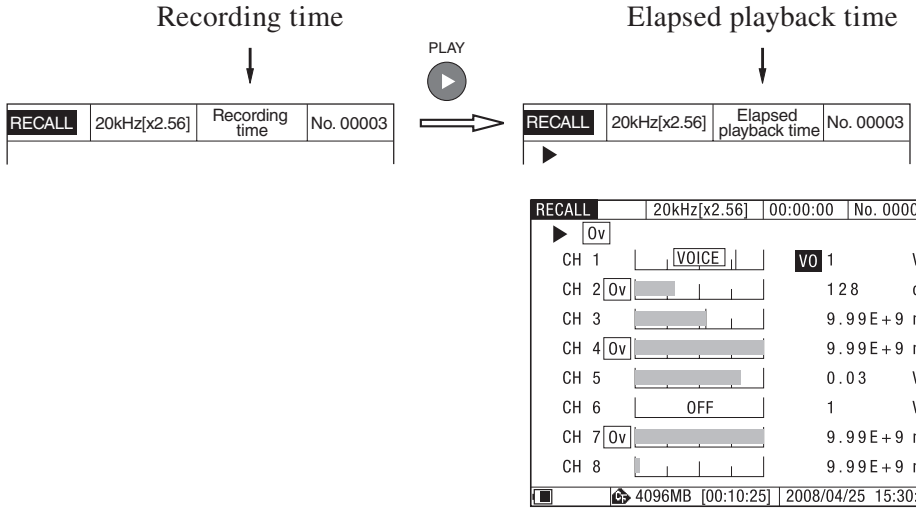
Playing recorded data

Press the [PLAY] key.

Playback of recorded data starts.

During playback, the PLAY indicator at the top right of the [PLAY] key flashes, and the playback icon ▶ flashes on the display. When all recorded data have been played, playback stops. During playback, the bar graphs are linked to the playback signal. The recording time indication changes to elapsed playback time indication.

The playback signal of the monitor channel is output at the Monitor Out connector. When the "BNC Output for Playback" item on Menu 5 < System > is set to ON, the playback signal of each channel is also output at the playback signal output (BNC) connectors. The recorded data can be checked by supplying these signals to earphones, monitoring devices, or similar.



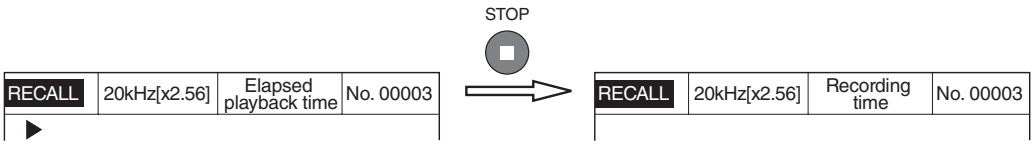
Playback screen example

Stopping playback partway

Press the [STOP] key.

STOP

The PLAY indicator and playback symbol ▶ go out, and the unit returns to the recall screen.



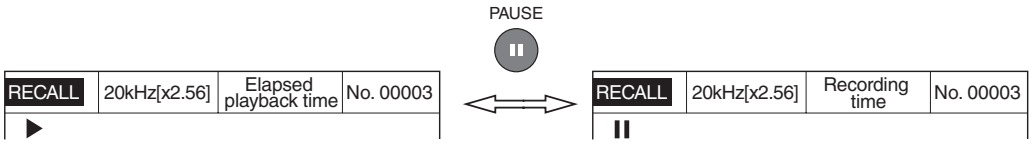
Pausing and restarting playback

Press the [PAUSE] key.

Playback is halted temporarily. In this condition, the pause symbol ▌▌ flashes on the display.

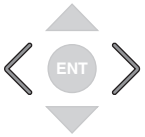
PAUSE

When you press the [PAUSE] key once more, the pause symbol ▌▌ goes out and playback resumes.



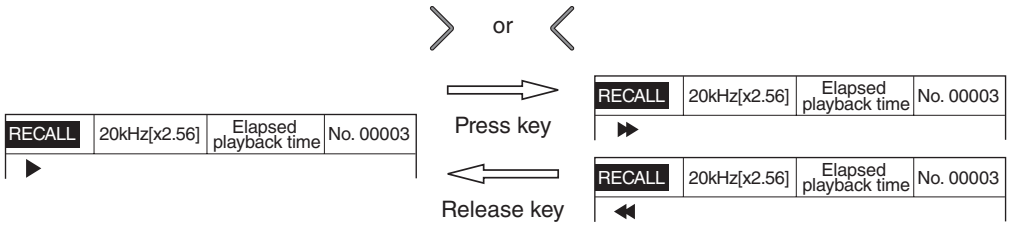
Performing fast forward or reverse during playback

Press the [>]/[<] keys.



While you press the [>] or [<] key, the playback position is moved quickly forwards or backwards. During this time, no playback signal is output. If the playback position was moved all the way to the end of the recorded data, playback will stop when you release the [>] key. If the playback position was moved all the way to the beginning of the recorded data, playback will start when you release the [<] key.

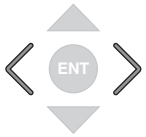
The speed of fast forward or reverse is about 4 times higher than regular playback.



Fast forward or reverse occurs while [>] or [<] key is pressed

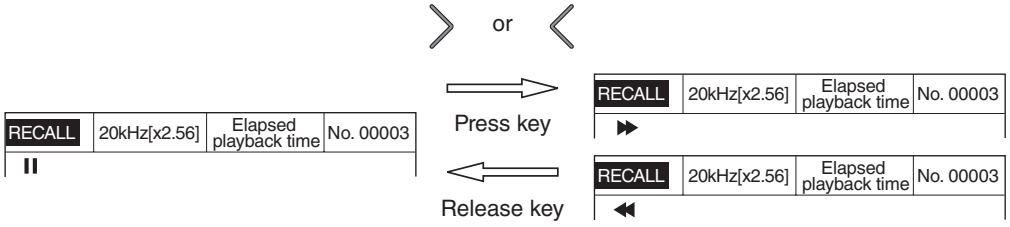
Performing high-speed forward or reverse during playback

While playback is paused, press and hold the [>] or [<] key.



When you hold down the [>] or [<] key for about one second, high-speed forward or reverse starts and the playback position is moved quickly forwards or backwards. When you release the key, the unit returns to the playback pause condition at that point. The speed of fast forward or reverse is about 60 times higher than regular playback.

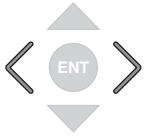
If you press the [>] or [<] key and release it within less than a second, the unit jumps to the voice memo start position or marker position.



High-speed forward or reverse occurs while [>] or [<] key is held down

Jumping to the voice memo start position or marker position

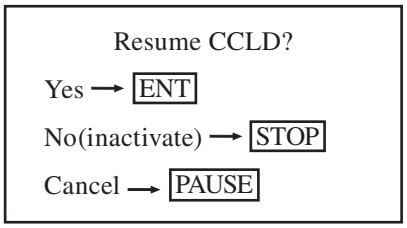
While playback is paused, press the [>] or [<] key.



When you press the [>] or [<] key, the playback position jumps forwards or backwards to the next (closest) voice memo start position or marker position. If there is no voice memo start position or marker position in that direction, the position jumps to the end or the beginning of the recorded data. The elapsed playback time indication changes when the position changes, letting you check the movement.

Canceling recall mode

When you press the [RECALL] key at the recorded data list screen, the recall mode is terminated and the unit returns to the main screen.
If a recall screen is currently shown, press the [RECALL] key once to return to the recorded data list screen, and then press it again to cancel the recall mode.
When the unit returns to the main screen, a constant current may be output from a channel for which CCLD is selected. Because a different type of sensor may have been connected in the meantime, the following warning message appears first.



[ENT] key:	CCLD setting that was active before entering recall mode is established again.
[STOP] key:	CCLD setting is changed to AC.
[PAUSE] key:	Recall mode shutdown is canceled.

When the CCLD setting is reestablished by pressing the [ENT] key, the power supply condition is checked, and the unit may be shut down if battery capacity is insufficient.
In such a case, replace the batteries with a fresh set, or use an AC adapter or other suitable external power source.

Other information

When CompactFlash card was removed in recall mode

While the unit is in recall mode, you should not remove the CompactFlash card. If the CompactFlash card is removed, the recall mode will be canceled and the unit returns to the main screen.

Important
If you remove the CompactFlash card while the card is being accessed, damage may occur.

About the supplied viewer software (DA-40 Viewer)

The supplied viewer software (DA-40 Viewer) can be used to read waveform information of recorded data from the CompactFlash card and display it on a computer.
The file structure on the CompactFlash card is as follows.

DA40.INI		Setting file
[WAVEFILE]	D00001.WAV	Recorded data with file number 00001
	D00002.WAV	Recorded data with file number 00002
	:	Etc.

To observe the waveform of recorded data with the viewer software, select the "Dxxxxx.WAV" file in the [WAVEFILE] folder. The "Dxxxxx" part corresponds to the indication shown on the recorded data list screen in recall mode. The DA40.INI file contains information about all settings of the DA-40 (see page 44). The supplied viewer software allows you to read this file. You can also store the file with a suitable file name on the computer, and use different files to manage various settings.

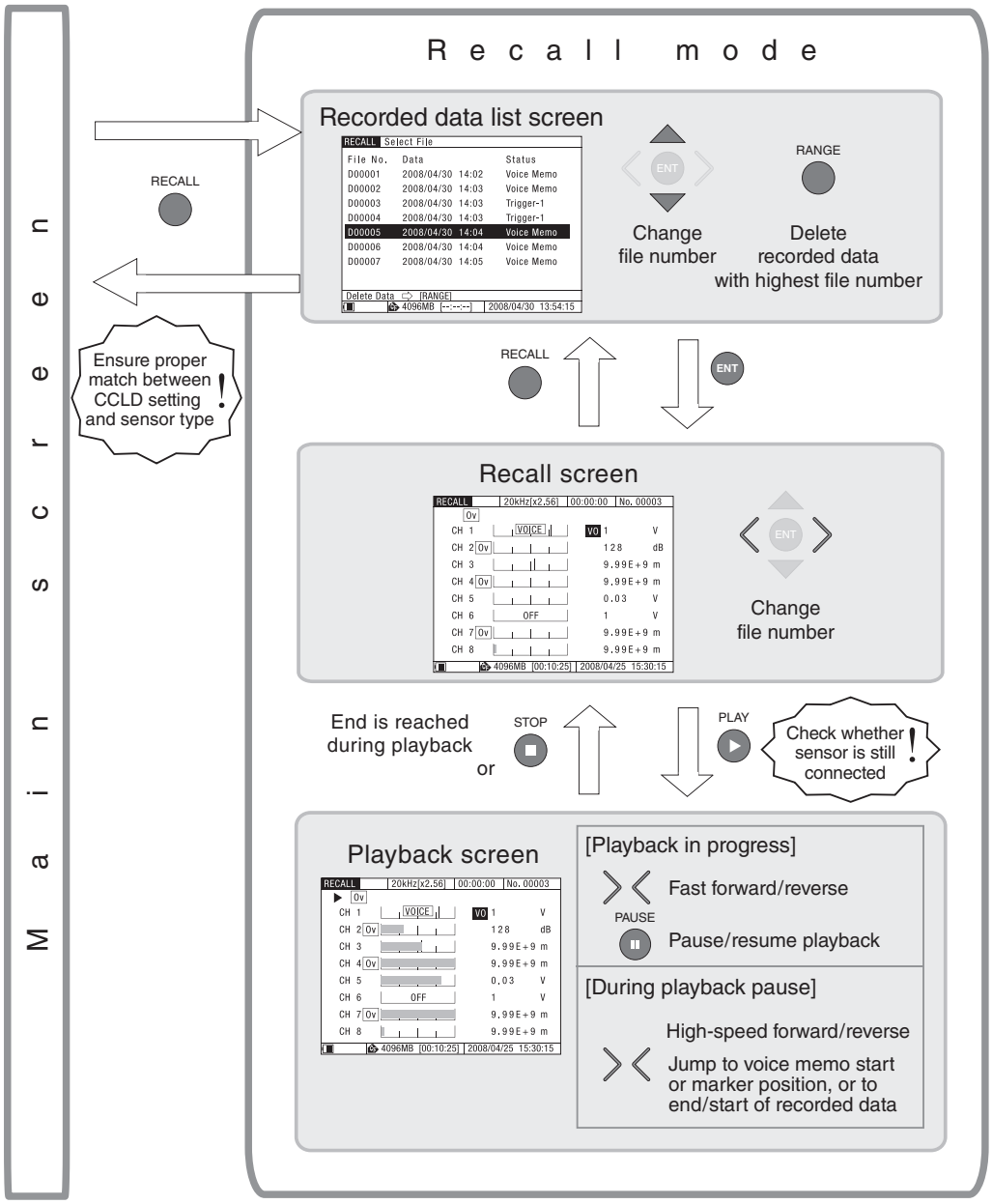
Playing WAVE files on a Windows computer using the DA-40

1. Format the CompactFlash card on the Windows computer.
2. Remove the card from the computer, following the correct procedure for safely removing hardware (such as clicking on the icon in the task tray). Then insert the CompactFlash card into card reader connected to the computer.
3. Create a folder named "WAVEFILE" on the computer and copy the WAVE files into that folder. The WAVE files should be given names in the format "Dxxxxx.wav" where xxxxx is a number from 00001 to 65533. Then copy the entire WAVEFILE folder to the CompactFlash card.
4. Remove the CompactFlash card from the computer, using the correct procedure.
5. Insert the CompactFlash card into the DA-40, and use the recall screen to play the files.

Important
Use only RION supplied CompactFlash cards. Operation with other cards is not assured.
If files on the CompactFlash card created by the above procedure have been partially deleted, edited, or other files have been added, playback in the DA-40 will no longer be possible.
Do not use the CompactFlash card created by the above procedure for recording data, because data may not be recorded correctly. To record data, use only CompactFlash cards formatted in the computer and then removed using the correct procedure.

Note
Only WAVE files that were recorded with the DA-40 or edited with the supplied DA-40 Viewer software can be played using the DA-40.

Recall Mode Operation Flow Chart



Messages

During operation of this unit, various messages giving warnings and providing procedure information will appear. The most important messages are listed and described in this section.
(The actual font and placement of the message on the display may differ from the examples shown here.)
Messages are listed below. A representative display state where the message may appear is given in parentheses. The message explanations in this section are also in the same order.

Adjustment Failed. ---------- (Power-on)
Card Error. ----------(Power-on etc.)
Cannot Display... ----------(Recall mode)
Cannot Record. ---------- (Menu setting)
Cannot Record. Card ... ---------- (Voice memo, recording)
Cannot Record. Index ...---------- (Voice memo, recording)
Delete the Last Data? ---(When deleting data in recall mode)
Delete All Data?---------- (Menu setting)
Low Battery. ---------- (Constantly monitored)
MENU LOCKED ---------- (Menu display, data deletion)
No Card ----------(Recall mode)
Now Closing File. ---------- (Voice memo, recording)
Resume CCLD? ----------(Recall cancel)
Save Settings to Card. ---------- (Menu setting)
Take off sensors. ----------(Recall mode)
All settings are cleared. ---------- (Power-on)

The message explanation uses the following pattern.

Message string	
Description	Explains the meaning of the message or the condition it refers to.
Countermeasure	Describes steps to take when the message is shown.
Condition	Describes the operation steps or unit condition that can lead to the message being shown. (Omitted where not necessary.)

Adjustment failed.
Please reboot.
OK → ENT

Description — At power-on, the unit performs various adjustment routines. If these cannot be completed within a certain period, this message appears.

Countermeasure — Press the [ENT] key to clear the message, and then perform a power-down, power-on cycle.

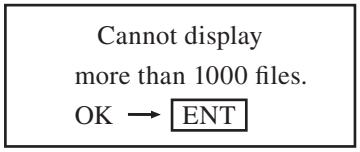
Condition
- Indication "Adjustment Executing" was displayed for about 1 minute during the power-on phase.

Card Error.
Remove Card or Delete Card.
OK → ENT

Description — The inserted CompactFlash card cannot be read/written in the DA-40.
- Folder/file structure as required by the DA-40 is not present, or another folder/file structure exists.
- There has been an error managing a file required by the DA-40.
- The card was formatted using a file system other than FAT16 or FAT32, or the card is defective.

Countermeasure — Press the [ENT] key to clear the message.
Format the card in a computer. If the message is still shown, try a different CompactFlash card.
Formatting a card will permanently delete all data present on the card. Copy any data that are still required to another location on the computer before starting the formatting process.

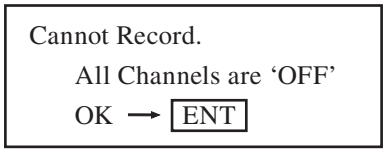
Condition
- At power-on, or when a CompactFlash card is inserted/removed
- Recording procedure or recall mode was activated
- Attempted to write unit settings via a menu item



Description The number of recorded data files exceeds 1,000.

Countermeasure Press the [ENT] key to clear the message and return to the recorded data list screen.

Condition
- Trying to activate recall mode by pressing [RECALL] key



Description All channels are set to OFF.

Countermeasure Press the [ENT] key to clear the message. The unit is functioning normally, but data cannot be recorded. To record data, set at least one channel to a setting other than OFF.

Condition
- Quitting a menu screen and returning the main screen
- Trying to activate recording by pressing [REC]

Cannot Record.
Card Capacity is Full.
OK → ENT

Description — There is not enough space on the CompactFlash card to write data.

Countermeasure — Press the [ENT] key to clear the message. (Data recorded up to that point will be saved on the CompactFlash card.)
Copy the existing files on the CompactFlash card to a suitable location on the computer, and then format the CompactFlash card. Alternatively, provide another CompactFlash card.

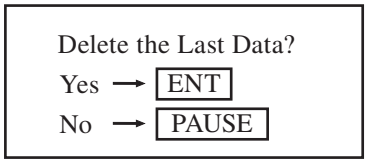
Condition
- Card became full during recording
- Attempted to start recording while no space was available on card

Cannot Record.
Index Number is
Maximum (65533).
OK → ENT

Description — The maximum number of data that can be recorded with the DA-40 has been reached. (The current file number is at the maximum of 65533.)

Countermeasure — Press any key to clear the message.
Copy the existing files on the CompactFlash card to a suitable location on the computer, and then format the CompactFlash card. Alternatively, provide another CompactFlash card.

Condition
- Attempted to start recording procedure
- Attempted to record voice memo from main screen



Description Confirms deletion of recorded data.

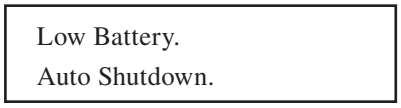
Countermeasure To continue, press the [ENT] key. To cancel, press the [PAUSE] key.

Condition In recall mode at the recorded data list screen, the most recently recorded data was specified for deletion.

Description Confirms deletion of all data on the CompactFlash card.

Countermeasure To continue, press the [ENT] key. To cancel, press the [PAUSE] key.
When you press the [ENT] key, the message at right will be shown until the end of the deletion process.

Condition When executing "Delete All Data" item on Menu 5 < System >.



Description Battery voltage has fallen below required level. The unit will automatically turn itself off after about one minute.

Countermeasure Supply external power before the countdown finishes. (If the countdown finishes and the unit shuts down while recording was in progress, the data up to that point will be saved on the CompactFlash card.)

MENU LOCKED
Turn Switch to "UNLOCK" in the Battery Box.
OK → ENT

Description — One of the following actions was attempted in menu lock mode.
- Tried to change a setting in a menu
- Tried to delete data (recall mode)

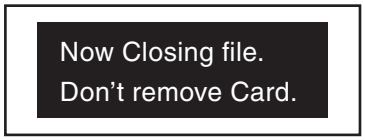
Countermeasure — Press the [ENT] key to clear the message.
If you want to proceed with the menu setting or data deletion, cancel the menu lock mode (see page 77).

No Card
OK → ENT

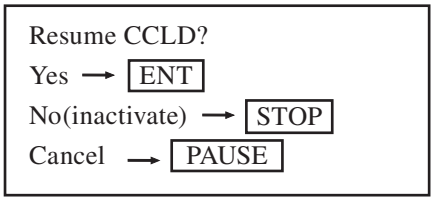
Description — No CompactFlash card is inserted in the DA-40.

Countermeasure — Insert a CompactFlash card. After a few seconds, the recorded data list screen should appear.
When you press the [ENT] key, the recall mode is automatically canceled and the main screen appears again. Turn power to the unit off and insert a CompactFlash card.

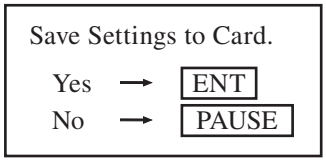
Condition
- CompactFlash card was removed in recall mode
- Tried to enter recall mode



Description	Data recording was completed, and information necessary for data management is currently being written to the CompactFlash card.
Countermeasure	Never remove the CompactFlash card in this condition. Be sure to wait until the message has disappeared. Otherwise the card may become unusable until formatted in a computer (at this time, previously recorded data will also be destroyed). While the message is being shown, the [REC] key is inactive and any trigger event is disregarded.
Condition	● Data recording is completed ● Voice memo recording from main screen was stopped



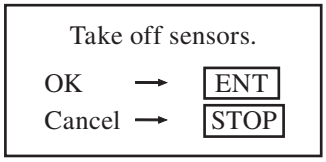
Description	This is a confirmation whether it is adequate to supply a constant current to a signal input connector set to CCLD. The confirmation is intended to guard against inadvertent output that could damage a sensor.
Countermeasure	To maintain the CCLD setting, press the [ENT] key. To change the CCLD setting to AC, press the [STOP] key (when not wishing to provide a constant current to a connected sensor). To cancel returning to the main screen, press the [PAUSE] key.
Condition	Returning from recall mode to main screen (when a channel set to CCLD exists) When the CCLD setting is reestablished by pressing the [ENT] key, the power supply condition is checked, and the unit may be shut down if battery capacity is insufficient. In such a case, replace the batteries with a fresh set, or use an AC adapter or other suitable external power source.



Description — Select whether to save the current settings of the unit.

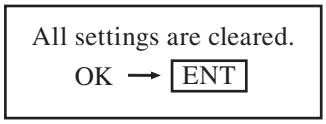
Countermeasure — Press the [ENT] key to save, [PAUSE] key to cancel. When you press the [ENT] key, the settings of the DA-40 are saved as a setting file on the CompactFlash card. (The file name is fixed to DA40.INI.)

Condition — When executing "Save Settings" item of Menu 5 < System >



Description — When recall mode is entered and the playback signal is set to be output to the playback output connectors (BNC), this warning message appears, for sensor protection.

Countermeasure — If there is no problem with supplying the playback signal to the sensors, you can disregard the message. Otherwise, disconnect any sensors.
Press the [ENT] key to activate the recall mode.
Press the [STOP] key to cancel.



Description — This message appears at power-on if the input range and menu settings from the last use could not be saved properly. All settings will return to the factory default condition.

Countermeasure — Make the required settings again before starting to record.

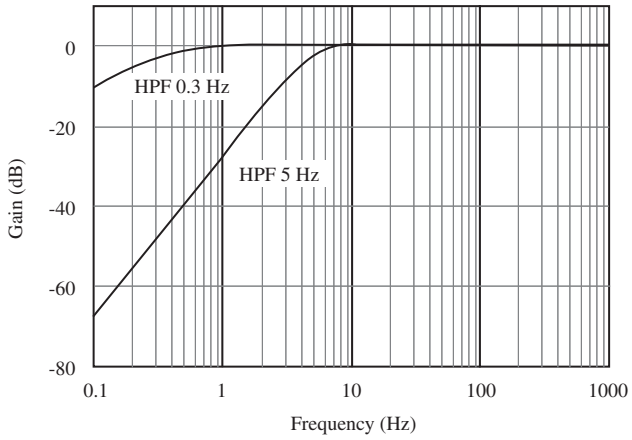
Filter Characteristics

Representative low-pass filter and high-pass filter characteristics are shown below.

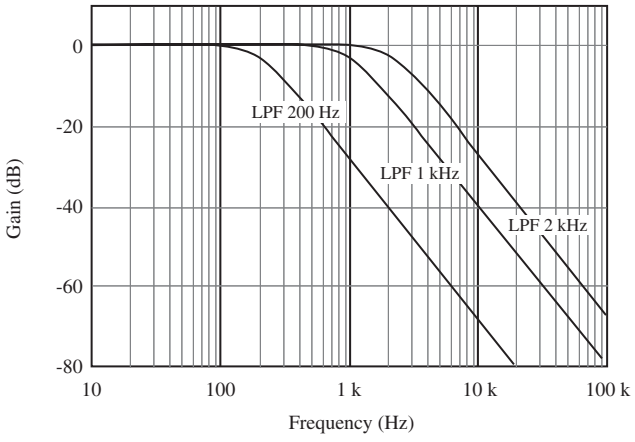
The available low-pass filter settings are OFF, 200 Hz, 1 kHz, and 2 kHz, but the setting must be the frequency range setting or lower. When the OFF setting is selected, the low-pass filter is set to the cutoff frequency of the frequency range.

The available high-pass filter settings are OFF and 5 Hz. For DC channels, the only available setting is OFF. For AC and CCLD channels, a 0.3 Hz high-pass filter will apply even if the OFF setting is selected.

High-pass filter characteristics



Low-pass filter characteristics



Settings and Other Information

This section lists all menu settings, data recording operation types, and other relevant information.

Approximate recording times

2 GB CompactFlash card (Sampling frequency: ×2.56)						
Number of channels	Frequency range					
	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
1	1066 h 40 m	213 h 20 m	106 h 40 m	21 h 20 m	10 h 40 m	5 h 20 m
2	533 h 20 m	106 h 40 m	53 h 20 m	10 h 40 m	5 h 20 m	2 h 40 m
4	266 h 40 m	53 h 20 m	26 h 40 m	5 h 20 m	2 h 40 m	1 h 20 m
8	133 h 20 m	26 h 40 m	13 h 20 m	2 h 40 m	1 h 20 m	40 m

4 GB CompactFlash card (Sampling frequency: ×2.56)						
Number of channels	Frequency range					
	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
1	2133 h 20 m	426 h 40 m	213 h 20 m	42 h 40 m	21 h 20 m	10 h 40 m
2	1066 h 40 m	213 h 20 m	106 h 40 m	21 h 20 m	10 h 40 m	5 h 20 m
4	533 h 20 m	106 h 40 m	53 h 20 m	10 h 40 m	5 h 20 m	2 h 40 m
8	266 h 40 m	53 h 20 m	26 h 40 m	5 h 20 m	2 h 40 m	1 h 20 m

Menu Items

< Input > menu (page 34)

Item	Description	Settings
Input	Sensor signal type	[OFF] / [DC] / [AC] / [CCLD]
HPF	High-pass filter frequency	[OFF] / [5 Hz]
LPF	Low-pass filter frequency	[OFF] / [200 Hz] / [1 kHz] / [2 kHZ]
Sens	Sensor type	[V] / [EU] / [MIC] / [PICK] / [SLM] / [VM]
Sensitivity	Sensor sensitivity/unit conversion	[EU/V] / [dB] / [mV/(m/s^2)]

< Rec.Parameters > menu (page 37)

Item	Description	Settings
Frequency Range	Frequency range	[100 Hz] / [500 Hz] / [1 kHz] / [5 kHz] / [10 kHz] / [20 kHz]
Sampling Freq.	Sampling frequency	[×2.4] / [×2.56]
Recording Time	Recording time	[1 to 59 s] / [1 to 59 m] / [1 to 24 h] / (Manual)
PreRec. Time	Pre-recording time	[0 s] / [1 s] / [5 s]
Voice	Voice memo function	[OFF(Marker)] / [Voice/Input] / [Voice Only]

< Trigger > menu (page 40)

Item	Description	Settings
Mode	Trigger mode	[Free] / [Single] / [Repeat]*3
Type	Trigger type	[Level] / [Ext] / [Time] / [Ext-Gate]
Level	Trigger level *1	[0.1 to 0.9%] / [1 to 99%]
Ch	Trigger channel *1	[Ch1] to [Ch8]
Start Time	Start time *2	[01/01 00:00] to [12/31 23:59]
Stop Time	Stop time *2	[01/01 00:00] to [12/31 23:59]
Interval	Recording interval *2	[5 m] / [10 m] / [15 m] / [30 m] / [1 h] / [8 h] / [24 h]

*1 Trigger level and trigger channel to be set when trigger signal type is "Level".
*2 Start time, stop time, and interval to be set when trigger signal type is "Time". When recording time is set to "Manual", "Interval" cannot be set.
*3 When recording time is set to "Manual", trigger "Repeat" and "Single" have the same effect.

< Bar Graph > menu (page 43)

Item	Description	Settings
Graph	Bar graph display mode	[Linear] / [Log]
Note	For channels where the sensor type is [MIC], [SLM], or [VM], the graph display mode cannot be set. The bar graph is always in dB.	

< System > menu (page 44)

Item	Description/Operation	Settings
Save Settings	Save settings of unit on CompactFlash card	
Load Settings from Card	Load settings from CompactFlash card into unit	
BNC Output for Playback	Playback mode	[OFF] / [ON]
Backlight Brightness	Display backlight brightness	[Bright] / [Dark]
Backlight Auto-Off	Display backlight auto-off timer	[10 s] / [1 m] / [3 m] / [CONT]
Index	Device index number	[1] to [255]
Load Default Settings	Return all settings to factory default	
Delete All Files	Delete all data from CompactFlash card (except for settings)	

< Date Time > menu (page 47)

Item	Description	Settings
Date	Date	[2000/01/01] to [2063/12/31]
Time	Time	[00:00:00] to [23:59:59]

Data Recording

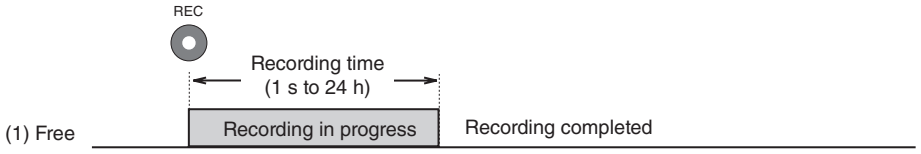
The unit offers 16 different (13 practical) combinations of recording time and trigger settings. The tables below list combinations that are useful from a practical point of view.

Data recording operation type						
	Recording time setting	Type	Mode	Parameter	Parameter	Parameter
(1)	Recording Time 1 s to 24 h	–	Free	–	–	–
(2)		Level	Single	Level (Trigger level)	Ch (Trigger channel)	–
(3)			Repeat			
(4)		External	Single	–	–	–
(5)			Repeat			
(6)		Time	Single	Start-Time	Stop-Time	Interval (Recording interval)
(7)			Repeat			
(8)	Manual	–	Free	–	–	–
(9)		Level	Single	Level (Trigger level)	Ch (Trigger channel)	–
(10)			Repeat*			
(11)		External	Single	–	–	–
(12)			Repeat*			
(13)		Time	Single	Start-Time	Stop-Time	–
(14)			Repeat*			
(15)	–	Ext-Gate	Single	–	–	–
(16)			Repeat			
"–": No setting item, "Repeat *" indicates that operation is essentially the same as for "Single"						

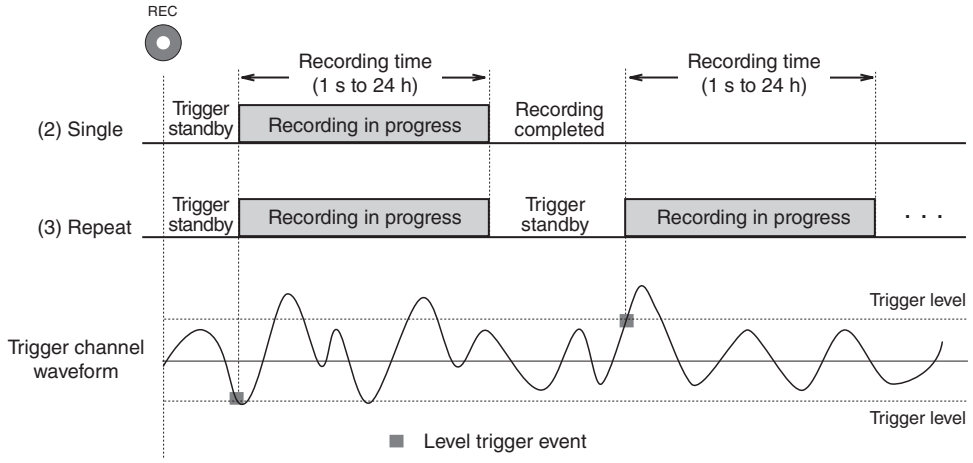
Validity of pause and pre-recording settings etc. depending on trigger conditions						
Trigger	Combination (previous table)	Trigger standby [PAUSE]	Recording [PAUSE]	Pre-recording (PreRec. Time)	Post-recording	Recording stop due to [STOP] key operation or insufficient CF card capacity
Mode Free	(1)(8)	Not applicable	○	○	×	○
Level	(2)(3)(9)(10)	×	○	○	×	○
External	(4)(5)(11)(12)	×	○	○	×	○
Time	(6)(7)(13)(14)	×	×	×	×	○
Ext-Gate	(15)(16)	×	×	○	○	○

○: Function is valid ×: Function is not available
Recording during "Recording [PAUSE]" does not include trigger standby.
Post-recording (5 seconds) functions only for Ext-Gate.

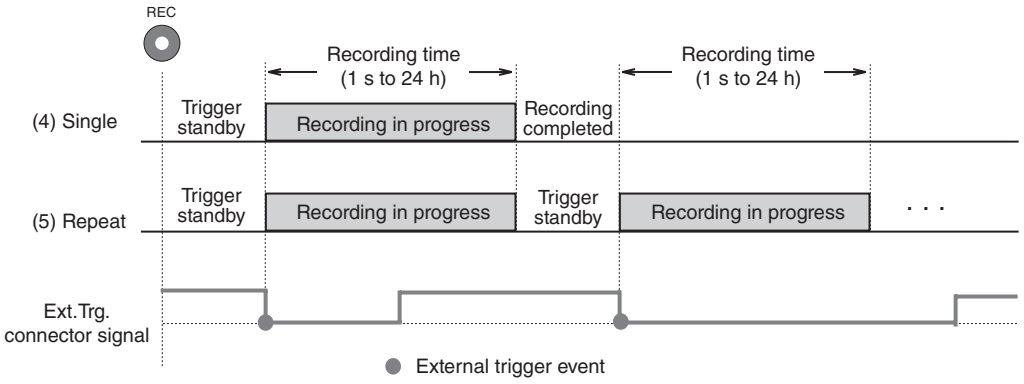
Data recording: Recording time (1 s to 24 h), no trigger (1)



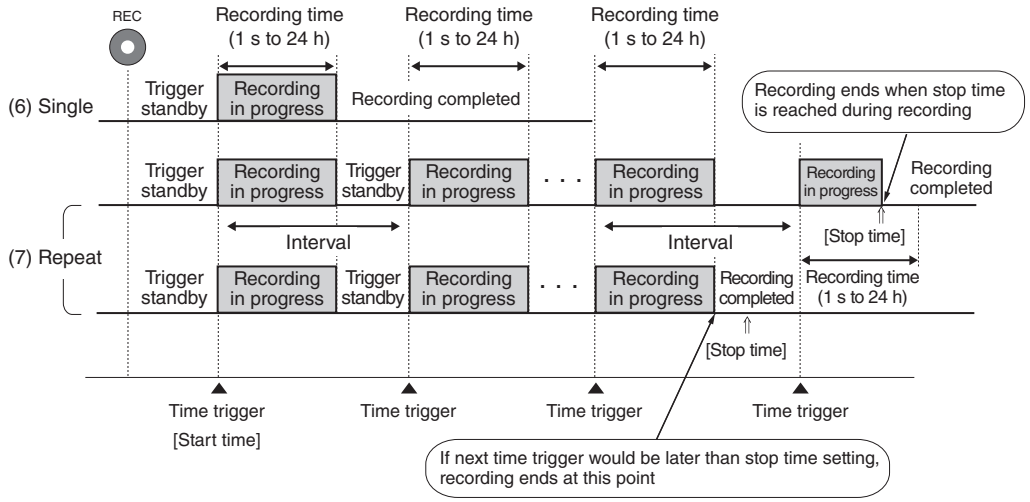
Data recording: Recording time (1 s to 24 h), Level trigger (2), (3)



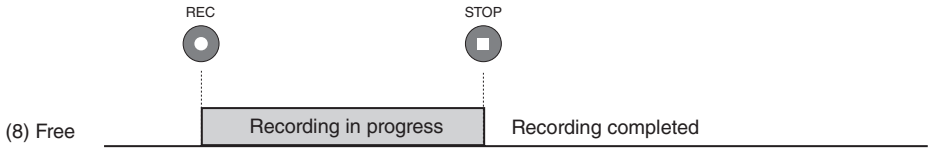
Data recording: Recording time (1 s to 24 h), External trigger (4), (5)



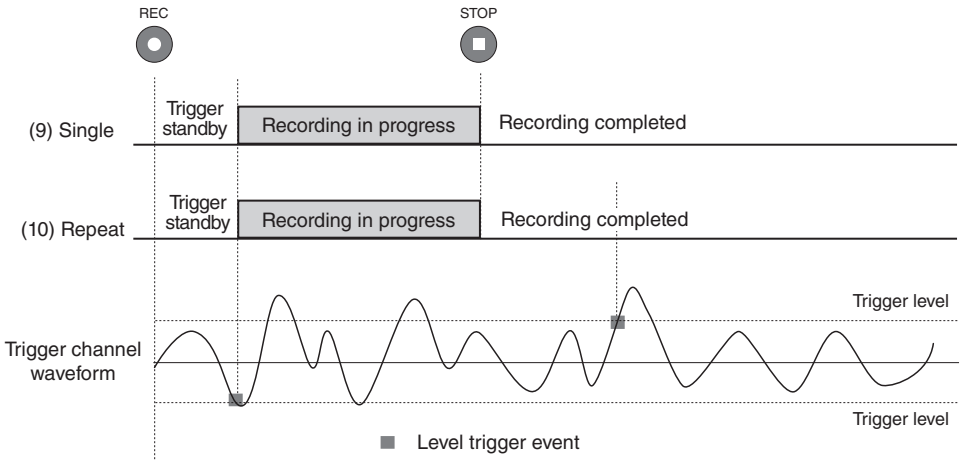
Data recording: Recording time (1 s to 24 h), Time trigger (6), (7)



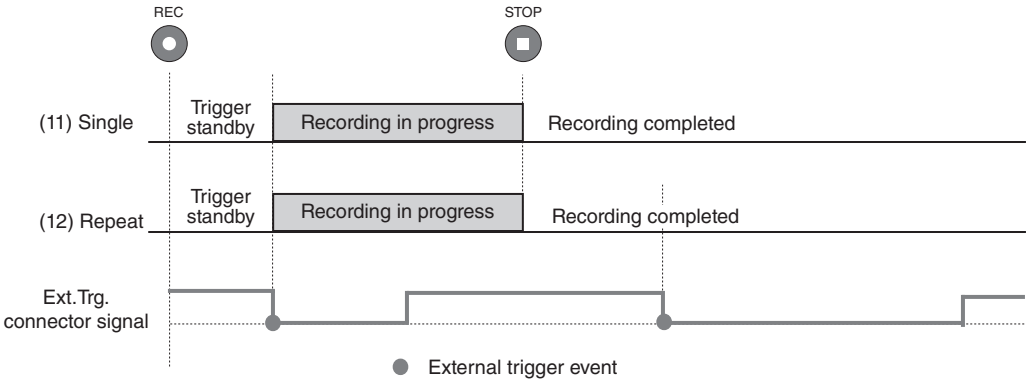
Data recording: Manual (controlled with [STOP] key), no trigger (8)



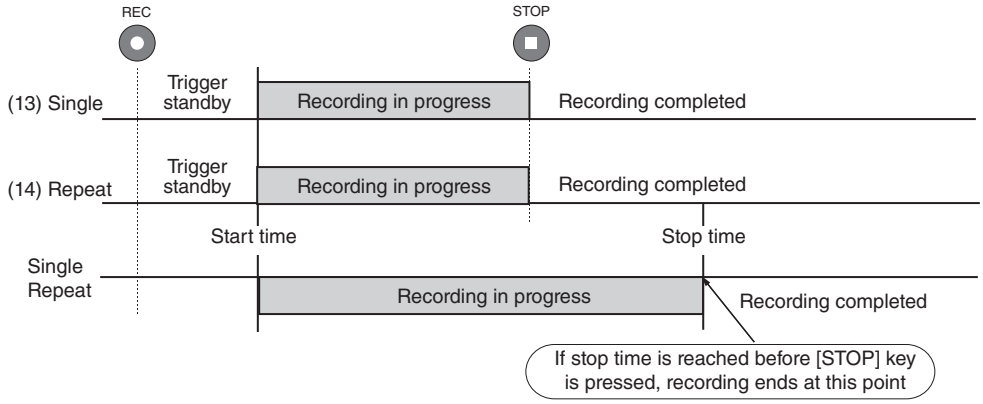
Data recording: Manual (controlled with [STOP] key), Level trigger (9), (10)



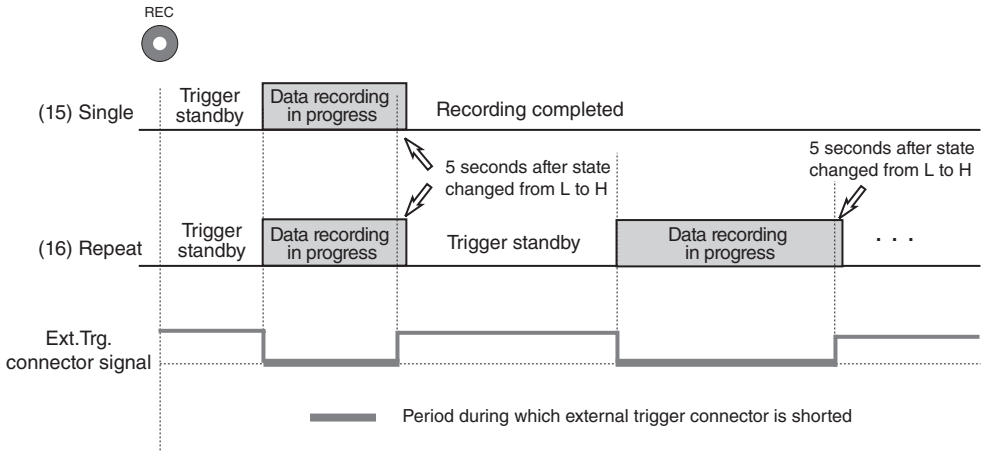
Data recording: Manual (controlled with [STOP] key), External trigger (11), (12)



Data recording: Manual (controlled with [STOP] key), Time trigger (13), (14)



Data recording: Using gate signal (15), (16)

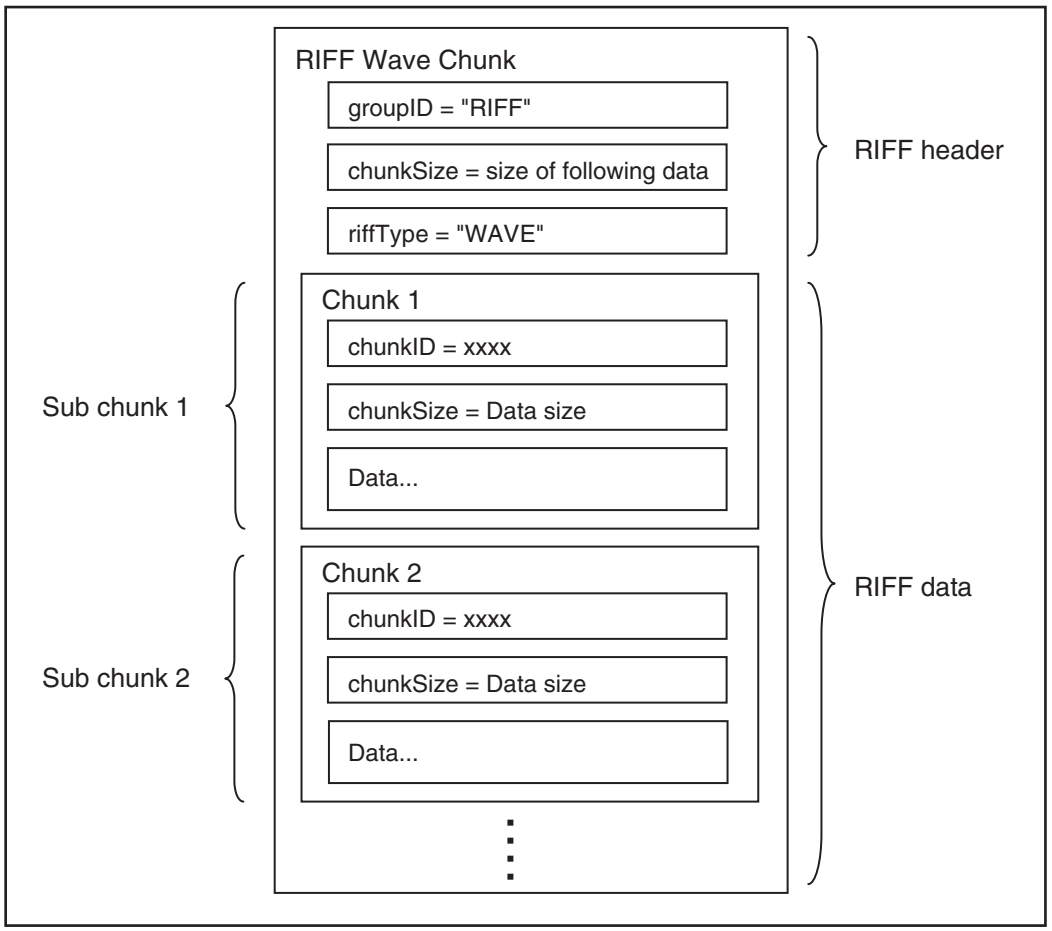


WAVE File Format

This section provides details about the WAVE file format used by the unit.

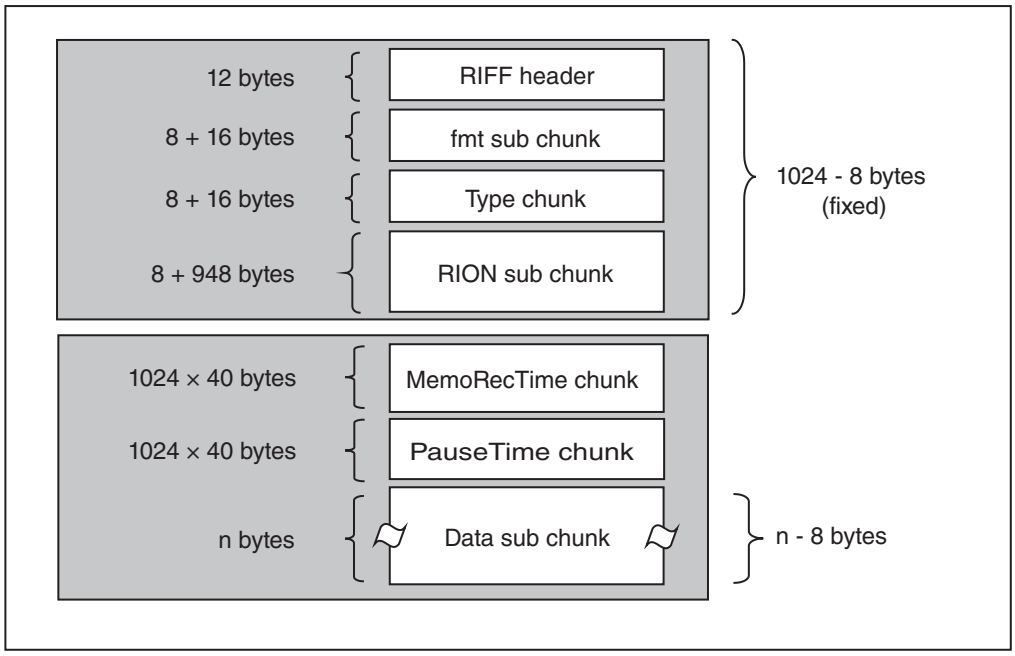
Basic structure

The WAVE file is made up of variable-length blocks called "chunks". The basic structure is as follows.



Basic WAVE file structure

The chunks and file structure used by the DA-40 are shown below.



File structure and size

Data Types

The DA-40 uses the following specially defined data types.

```
typedef char      ID[ 4 ];          /* < Chunk ID type consisting of 4 ASCII characters      */
typedef char      ARY[ 8 ];         /* < General string type consisting of 8 ASCII characters */
typedef char      TIMESTAMP[ 16 ];  /* < Time type consisting of 16 ASCII characters        */
typedef struct {
  DWORD           dwDataAddress;    /* < Address as counted from start of data chunk        */
  DATETIMEM       dwDateTimeM;      /* < Same as dwFatDateTime                              */
  } PAUSETIMEFORMAT;

  dwFatDateTime
      The date is a packed value with the following format.
      Bits        Values      Meaning
      0 to 5      0 to 59     Second
      6 to 11     0 to 59     Minutes (0 to 59)
      12 to 16    0 to 23     Hours (0 to 23, 24-hour format)
      17 to 21    0 to 31     Day of the month (1 to 31)
      22 to 25    1 to 12     Month (1 = January, 2 = February etc.)
      26 to 31    0 to 63     Year offset from 2000 (add 2000 to get actual year)

typedef struct {
            year    :6;       /* < Year (offset from 2000)   */
            mon     :4;       /* < Month (1 to 12)           */
            day     :5;       /* < Day (1 to 31)             */
            hour    :5;       /* < Hours (0 to 23)           */
            min     :6;       /* < Minutes (0 to 59)         */
            sec     :6;       /* < Seconds (0 to 59)         */
} FATDATETIME;
```

Chunks

The following tables provide details about the structure of the RIFF header (RIFF chunk) and the various sub chunks listed in the section "File structure and size".

RIFF chunk

Table 1 RIFF chunk

Type	Variable name	Size	Description	Value
ID	groupID	4	Indicates RIFF	"RIFF"
DWORD	chunkSize	4	Total size of following data (not including this item)	
ID	riffType	4	Indicates RIFF type	"WAVE"

fmt sub chunk

Table 2 fmt sub chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"fmt "
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	16
PCMWAVEFORMAT		16		
WORD	wFormatTag	(2)	Format type	0x0001
WORD	nChannels	(2)	Number of channels	1 to 8
DWORD	nSamplesPerSec	(4)	Number of samples per second	See Table 3
DWORD	nAvgBytesPerSec	(4)	Number of bytes per second	See Fig. 1
WORD	nBlockAlidn	(2)	Block size	8
WORD	wBitsPerSample	(2)	Number of bits per sample	16

Table 3 nSamplesPerSec

Range / Rate	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
2.4	240	1200	2400	12000	24000	48000
2.56	256	1280	2560	12800	25600	51200

$$nAvgBytesPerSec = nSamplesPerSec \times nChannels \times \frac{wBitsPerSample}{8}$$

Fig. 1 nAvgBytesPerSec

Type chunk

Table 4 Type chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"TYPE"
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	
ARY	ProductType	8	Product designation (always 4 bytes + 4 space bytes)	"DA40____"
dummy		8		

"DA40MEMO" is used as ProductType for voice memo data recorded in idle state.

RION sub chunk

Stores setting information of the unit, including trigger settings and settings for each channel.

Size is fixed to 8 + 948 bytes = 956 bytes.

Table 5 RION sub chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"DA40"
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	948
RIONFORMAT		948		
ID	maker	(4)	Company name	"RION"
ARY	prod_type	(8)	Product designation	"DA-40___"
DWORD	nFileVersion	(4)	File version	0 (not used)
ARY	nCpuVersion	(8)	CPU Version"X.Y.ZZ__"	"0.0.01__"
ARY	nDspVersion	(8)	DSP Version"X.Y.ZZ__"	"0.0.01__"
DWORD	serial	(4)	Serial number	
DWORD	index	(4)	Device index number	
DWORD	edit_flag	(4)	Viewer editing flag For DA-40, numeric 0 is entered	0: No edits
DWORD	cnt_pause	(4)	Pause count during WAVE file recording	0: None, 1 and up : Count
DWORD	cnt_voice	(4)	Voice memo or marker count	0: None, 1 and up : Count
DWORD	cnt_trig	(4)	Repeat trigger sequential number	
WORD	pre_time	(2)	Pre-trigger time [s]	
WORD	memo_mode	(2)	Voice memo mode	0: OFF (Marker) 1: Voice Only 2: Voice/Input If there was no voice memo recording for the respective file, this will always be "0" regardless of the setting at the DA-40.

Type	Variable name	Size	Description	Value
T_FATDATETIME	rec_start_time	(4)	Recording start time When trigger function is used, start time is defined as including the PreRec. time.	
DWORD (bit field)	year	((6bit))	Year bit 31 to 26	0 to 63 (offset from 2000)
	mon	((4bit))	Month bit 25 to 22	1 to 12
	day	((5bit))	Day bit 21 to 17	1 to 31
	hour	((5bit))	Hours bit 16 to 12	0 to 24
	min	((6bit))	Minutes bit 11 to 6	0 to 59
	sec	((6bit))	Seconds bit 5 to 0	0 to 59
T_TRG_INFO		(18)	Trigger information	
WORD	trig_mode	((2))	Trigger mode	10: Free 20: Single 30: Repeat
WORD	trig_type	((2))	Trigger type	00: Free 10: Level 20: Time 30: Ext. 50: Ext.Gate
WORD	trig_level	((2))	Trigger level	1 to 990 (×10 of percent value)
WORD	trig_ch	((2))	Trigger channel	1 to 16
T_FATDATETIME	start_time	((4))	Trigger start time	
DWORD (bit field)	year	(((6bit)))	Year bit 31 to 26	Not used
	mon	(((4bit)))	Month bit 25 to 22	1 to 12
	day	(((5bit)))	Day bit 21 to 17	1 to 31
	hour	(((5bit)))	Hours bit 16 to 12	0 to 24
	min	(((6bit)))	Minutes bit 11 to 6	0 to 59
	sec	(((6bit)))	Seconds bit 5 to 0	0 to 59
T_FATDATETIME	stop_time	((4))	Trigger stop time	
DWORD (bit field)	year	(((6bit)))	Year bit 31 to 26	Not used
	mon	(((4bit)))	Month bit 25 to 22	1 to 12
	day	(((5bit)))	Day bit 21 to 17	1 to 31
	hour	(((5bit)))	Hours bit 16 to 12	0 to 24
	min	(((6bit)))	Minutes bit 11 to 6	0 to 59
	sec	(((6bit)))	Seconds bit 5 to 0	0 to 59

Type	Variable name	Size	Description	Value
WORD	interval_time	((2))	Interval time	0 : OFF 1 : 5 minutes 2 : 10 minutes 3 : 15 minutes 4 : 30 minutes 5 : 1 hour 6 : 8 hours 7 : 24 hours
T_R_CH_INFO	ch_info[16]	(800)	Channel information (for 16 channels)	
double	val_per_bit	((8))	Calibration value per bit	
double	val_per_volt	((8))	Relation between voltage and scaling value. If scaling in data recorder is off, the value is 1.	
double	db_reference	((8))	0: dB scaling conversion is off. >0: Value for dB scaling conversion. Negative value not allowed. (Enter value for MIC, SLM, VM)	
ARY	unit	((8))	Left-aligned string indicating scaling target unit for channel. Padded with spaces.	Examples: "V_____" "EU_____" "dB_____" "m/s^2___"
ARY	range	((8))	Input (voltage) range [V] Not value after scaling. 0.01 V to 10 V	Examples: "1 V_____" "0.01 V___"
WORD	input_type	((2))	Channel setting	0 : OFF 1 : CCLD 2 : AC 3 : DC
WORD	hpf	((2))	HPF setting When Input Type is AC or CCLD, 0.3 Hz filter is active also when HPF setting is OFF.	0 : Not used. 10 : 0.3 Hz 15 : 5 Hz 20 : 20 Hz 30 : 100 Hz

Type	Variable name	Size	Description	Value
WORD	lpf	((2))	LPF setting	0 : Not used. 5 : 100 Hz 6 : 200 Hz 7 : 1 kHz 10 : 2 kHz 12 : 5 kHz 20 : 20 kHz
WORD	over	((2))	Overload information for the channel. If overload has occurred at least once, this is "1", otherwise "0".	
WORD	sensor	((2))	Sensor type selection	0 : V 1 : EU 2 : MIC 3 : PICKUP 4 : SLM 5 : VM
BYTE	padding[98]	(66)	Padding bytes to place the header on a 512 byte boundary	

Memo Rec Time chunk

This chunk contains information about the start position and date/time of voice memo events during recording. Regardless of whether the WAVE file comprises memo data, the Memo Rec Time chunk is always added.
Also appended to voice memo data recorded in idle state.
Size is fixed to 12 bytes × 3412 + 8 + 8 = 40960 bytes.
Upper limit is 3412 positions.
Dummy 8 bytes at the end are not used.

Table 6 Memo Rec Time chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"memo"
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	40944
MEMORECTIMEFORMAT [3412]		40944		
DWORD	dwDataAddress	(4)	Address from data top	
DWORD	dwDataSize	(4)	Voice memo size (bytes)	
DATETIME	dwDateTimeM	(4)	Date/time	
dummy		8		

Pause Time chunk

This chunk contains information about the position of pause events during recording and date/time when pause was canceled and recording resumed.
Pause Time chunk is added to the WAVE file also when the [PAUSE] key has not been pressed during recording.
Also appended to voice memo data recorded in idle state.
Size is fixed to 8 bytes × 5119 + 8 = 40960 bytes.
Upper limit is 5119 positions.

Table 7 Pause Time chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"paus"
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	40952
PAUSETIMEFORMAT[5119]		40952		
DWORD	dwDataAddress	(4)	Address from data top	
DATETIME	dwDateTimeM	(4)	Date/time	

Data sub chunk

Raw waveform data obtained from the DSP are stored here.

Table 8 Data sub chunk

Type	Variable name	Size	Description	Value
ID	chunkID	4	Indicates chunk type	"data"
DWORD	chunkSize	4	Total size of following chunk data (not including this item)	
WAVEDATA			Raw waveform data obtained from DSP	

WAVEDATA follows the data conventions for regular WAVE files (16-bit, short, little endian, range full-scale value 25400).

Specifications

Input section

Input connectors

Signal input	× 8 channels (BNC)
Voice memo input	× 1 channel (voice memo microphone: 3.5 dia. 4-pole mini jack)
External trigger input	× 1 (2.5 dia. stereo mini jack)
Remote control	× 1 (8-pin MINI DIN connector for optional Remote Controller (DA-20RC1))
USB port	× 1 (Mini-B connector)
Input range	0.01, 0.03, 0.1, 0.3, 1, 3, 10 V
	Note: The 0.03 V, 0.3 V, 3 V input range settings stand for 0.0316 V, 0.316 V, and 3.16 V actual values.
Input impedance	100 kΩ or more
Maximum input voltage	±13.0 V
Overload point	Range full-scale +2.0 dB, tolerance ±1.0 dB
Input coupling	AC/DC (AC coupling (primary): -3.0 dB ±1.0 dB at 0.315 Hz)
Sensor drive power (CCLD)	2 mA, 18 V (change to 4 mA available as factory option)
Analog filters	Cutoff slope: 12 dB/oct, at filter frequency -3.0 dB ±1.0 dB High-pass filter: OFF, 5 Hz Low-pass filter: OFF, 200 Hz, 1 kHz, 2 kHz

Frequency response	DC coupling	DC to 1 Hz:	±1.0 dB
		1 Hz to 12.5 kHz:	±0.5 dB
		12.5 kHz to 20 kHz:	±1.0 dB
	AC coupling	1 Hz:	±1.0 dB
		1 Hz to 12.5 kHz:	±0.5 dB
		12.5 kHz to 20 kHz:	±1.0 dB

Inter-channel phase lag

AC coupling, HPF OFF (same frequency range, filter OFF, 20 kHz range)

10 Hz to 10 kHz: 1.7 deg max.

10 kHz to 20 kHz: 3.41 deg max.

Crosstalk: (within frequency band)

max. -100 dB (1 kHz) (Input range: 10, 3, 1, 0.3 V)

max. -95 dB (1 kHz) (Input range: 0.1 V)

max. -68 dB (1 kHz) (Input range: 0.03 V)

max. -58 dB (1 kHz) (Input range: 0.01 V)

S/N ratio: (within frequency band, including overload)

80 dB or better (Input range: 10, 3, 1, 0.3 V)

75 dB or better (Input range: 0.1 V)

70 dB or better (Input range: 0.03 V)

60 dB or better (Input range: 0.01 V)

Offset

AC coupling

max. 2.0% of range full-scale

DC coupling (input shorted):

max. 2.0% of range full-scale (10, 3, 1 V)

max. 2.5% of range full-scale (0.3, 0.1 V)

max. 5.0% of range full-scale (0.03 V)

max. 10% of range full-scale (0.01 V)

Distortion

±0.1% (within frequency band)

Voice memo function

3 operation modes (B and C only available when frequency range is 1 kHz or higher)

A: Recording in idle state

B: During recording, use channel 1 to record voice memo data only

C: During recording, switch channel 1 between recording voice memo data and recording normal data

Output section

Output connectors

Playback output × 8 channels (BNC, same as signal input)

Output impedance

600 Ω

Frequency response

DC to 1 Hz: ±1.0 dB

1 Hz to 12.5 kHz: ±0.5 dB

12.5 kHz to 20 kHz: ±1.0 dB

Output voltage ±3.16 V (corresponding voltage at range full scale)

Maximum output voltage

±4.0 V

Offset 1.5% or less of maximum output

S/N ratio 72 dB or better (within frequency band, including overload)

Inter-channel phase lag (20 kHz range)

DC to 10 kHz: 1.7 deg max.

10 kHz to 20 kHz: 3.41 deg max.

Crosstalk max. -90 dB (1 kHz)

Monitor output × 1 channel (3.5 dia. stereo mini jack)

During recording: analog signal output of one selected channel

During playback: playback output of one selected channel

Output impedance

100 Ω

Output voltage ±3.16 V (corresponding voltage at range full scale)

Maximum output voltage

±5.5 V

Offset 2.0% or less of range full-scale (input range 1 V or higher)

Other specifications

Same as for input (frequency response, linearity, distortion)

Playback output selection

A:	Output only from monitor output connector
B:	Output both from BNC and monitor output connectors

Recording section

Recording media	CompactFlash™ card (Type I) (Operation assured only with RION supplied CompactFlash cards certified for operation in DA-40) 2 GB, 4 GB
File system	FAT16, FAT32
A/D converter	16-bit quantization (quantization dynamic range 96 dB)
File format	WAVE (16-bit linear, no compression) (Corresponding to 25,400 digits at range full-scale)
Frequency range settings	100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 20 kHz
Sampling frequency settings	Frequency range ×2.4 or ×2.56
Maximum recording time	Approx. 80 minutes (20 kHz range × 8 channels, using 4 GB CompactFlash card)
Pre-recording	Data recorded 0, 1, or 5 seconds prior to pressing record key or trigger event

Trigger section

Trigger source	External: Open collector supported (internal 3.3 V, 50 kΩ) (Compatible with comparator output of Sound Level Meter NL-21, NL-31, NL-22, NL-32) • Ext • Ext-Gate Internal • Level trigger: 0.1% to 9.9%, 10 to 99% of input range full-scale, linear peak • Time trigger: recording is carried out repeatedly between preset start time and stop time, at specified intervals)
Trigger mode	Free, Single, Repeat
Pre-trigger	0, 1, or 5 seconds (pre-recording time before trigger event)

Calibration

Scaling according to sensor sensitivity, individual settings for each channel
Settings support directly connected microphone sensitivity, vibration accelerometer sensitivity, sound level meter, vibration level meter

Display

LCD screen	Backlit color TFT, 320 (H) × 240 (V) dots (QVGA)
Display contents	Level bar graph (linear, logarithmic scale), level history, channel-specific overload, setting screen, playback screen
LED indicators	Overload indication, remaining card capacity warning Status indicator for recording, playback, trigger standby, etc.

Power supply section

Power supply — Batteries or AC adapter (NC-99)
Cigarette lighter adapter (CC-82)

Batteries — Alkaline batteries (IEC LR14 (size C)) × 6

External DC — 11 to 15 V

Battery life — Representative values for alkaline batteries, continuous use at 23ºC (backlight off)

Frequency range	Number of channels	CCLD ON	CCLD OFF
20 kHz	8ch	4.5 hours	6.5 hours
20 kHz	1ch	5.5 hours	9.0 hours
100 Hz	8ch	6.5 hours	10.5 hours
20 kHz	8ch	2 hours (4 mA)	–

Other Specifications

Dimensions — Approx. 210 (H) × 270 (W) × 50 (D) mm

Mass — 1.2 kg (not including batteries)

Fastening holes — 1/4-20UNC (inch) screw holes on rear panel (2)

Ambient conditions for use
-10°C to +50°C, max. 90% RH (no condensation)

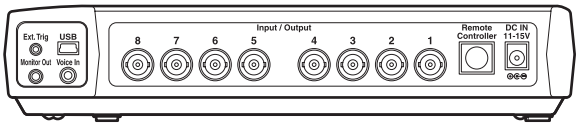
Ambient conditions for storage
-10°C to +50°C, max. 90% RH (no condensation)

Supplied accessories

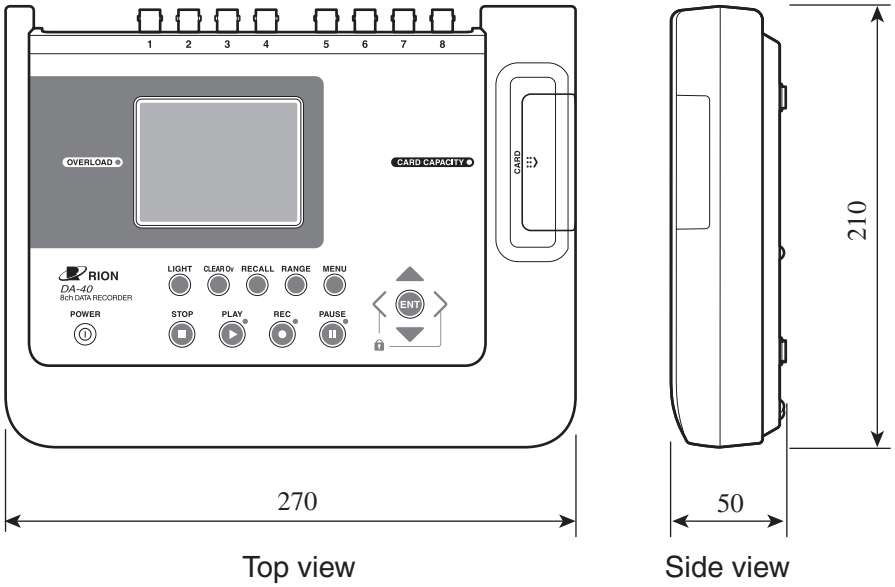
Carrying case (CF-28)	1
Viewer software (DA-40 Viewer, CD-ROM)	1
IEC LR14 (size C) alkaline battery	6
Voice memo microphone	1
Monitor earphone	1
Instruction manual	1
Inspection certificate	1

Optional accessories

- AC adapter (NC-99)
- 4-channel data recorder remote control unit (DA-20RC1)
- CompactFlash card (for DA-40)
  - MC-20HS2 2 GB
  - MC-40HS2 4 GB
- Comparator output cable
  (CC-94A, for connection to NL-21, NL-31, NL-22, NL-32)
- BNC - BNC cable (NC-39A)
- Cigarette lighter adapter (CC-82)
- CCLD: 4 mA modification (factory option)
- Condenser microphones (UC series: only electret type)
- Preamplifier (NH-22)
- Piezoelectric accelerometers (PV series)
- Waveform analysis software (CAT-WAVE)



Rear view



Top view

Side view

Unit: mm

Dimensional drawing of 8-Channel Data Recorder DA-40

No. 53040 08-10