INSTRUCTION MANUAL

4-Channel Data Recorder

DA-20

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Organization of this manual

This manual describes the features, operation and other aspects of the 4-Channel Data Recorder DA-20. If the unit is used together with other equipment to configure a measurement system, consult the documentation of all other components as well. The following pages contain important information 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 LCD panel.

Menu Operations and Setting Items

Lists the basic steps that are common to all menus, and briefly 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 causes for messages that appear on the display and steps to take in response to such messages.

Filter Characteristics

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

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

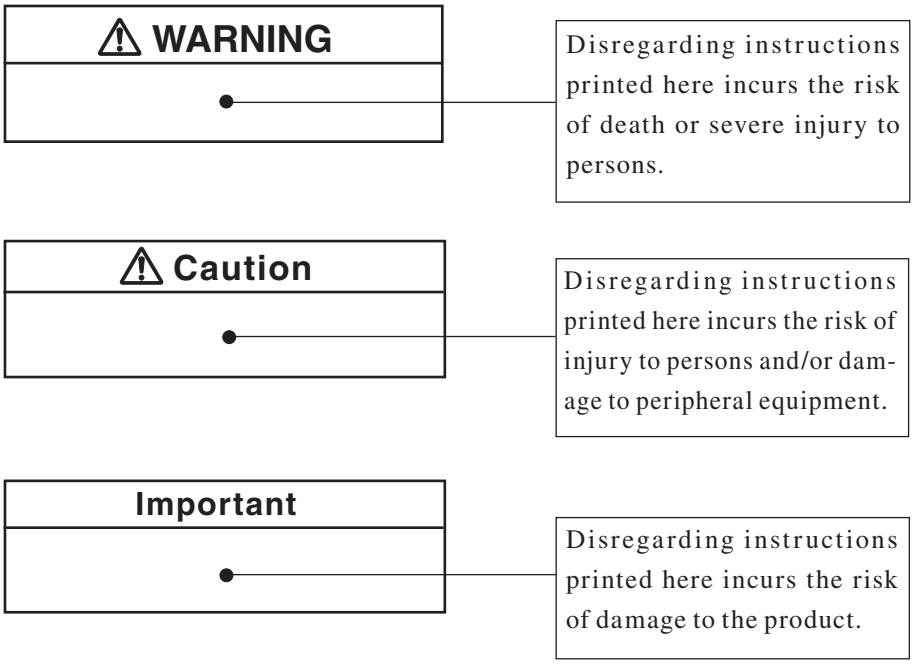
The product described in this manual is in conformity with the following European standards;

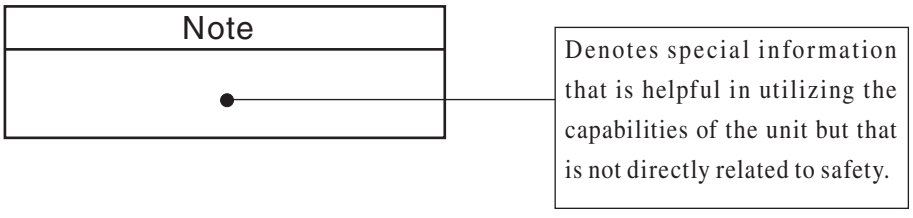
EN61326:1997 + A1:1998 + A2:2001 + A3:2003

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, check for compatibility with this unit

You should use only the supplied earphones at the Monitor Out connector of this unit. If other earphones are used, there is a risk of excessive volume levels causing hearing damage.

Do not play the supplied CD-ROM disc in a CD player

The DA-20 Viewer software is supplied on a CD-ROM included in the package. This 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 or the strap of the supplied soft carrying case 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

Input connectors used during data recording may 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-ROM

Before inserting the supplied DA-20 Viewer software install CD-ROM 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) and to the signal input/output connectors does not exceed the specified values. Otherwise there is a risk of damage to the unit.

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 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 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 in locations that may be exposed to direct sunlight.
  - Do not 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 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 or the strap of the supplied soft case 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 the supplied earphones at the Monitor Out connector of this unit. If other earphones are used, there is a risk of excessive volume levels causing hearing damage.
- Use only CompactFlash cards supplied by Rion. When other commercially available cards are used, the unit may not operate properly.
- 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 attempt to disassemble or modify the unit. In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
- When sending the unit in for servicing, please use the original packing material to protect the unit from vibrations and shocks.
- When disposing of the unit, be sure to observe all applicable legal regulations and guidelines in your country and community.

Contents

Outline

The DA-20 is a compact, lightweight data recorder designed for waveform recording. The unit can be powered from batteries, for ease of 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. The useful array of dedicated connectors eliminates the need to set up additional connection equipment, allowing quick and uncomplicated recording start.

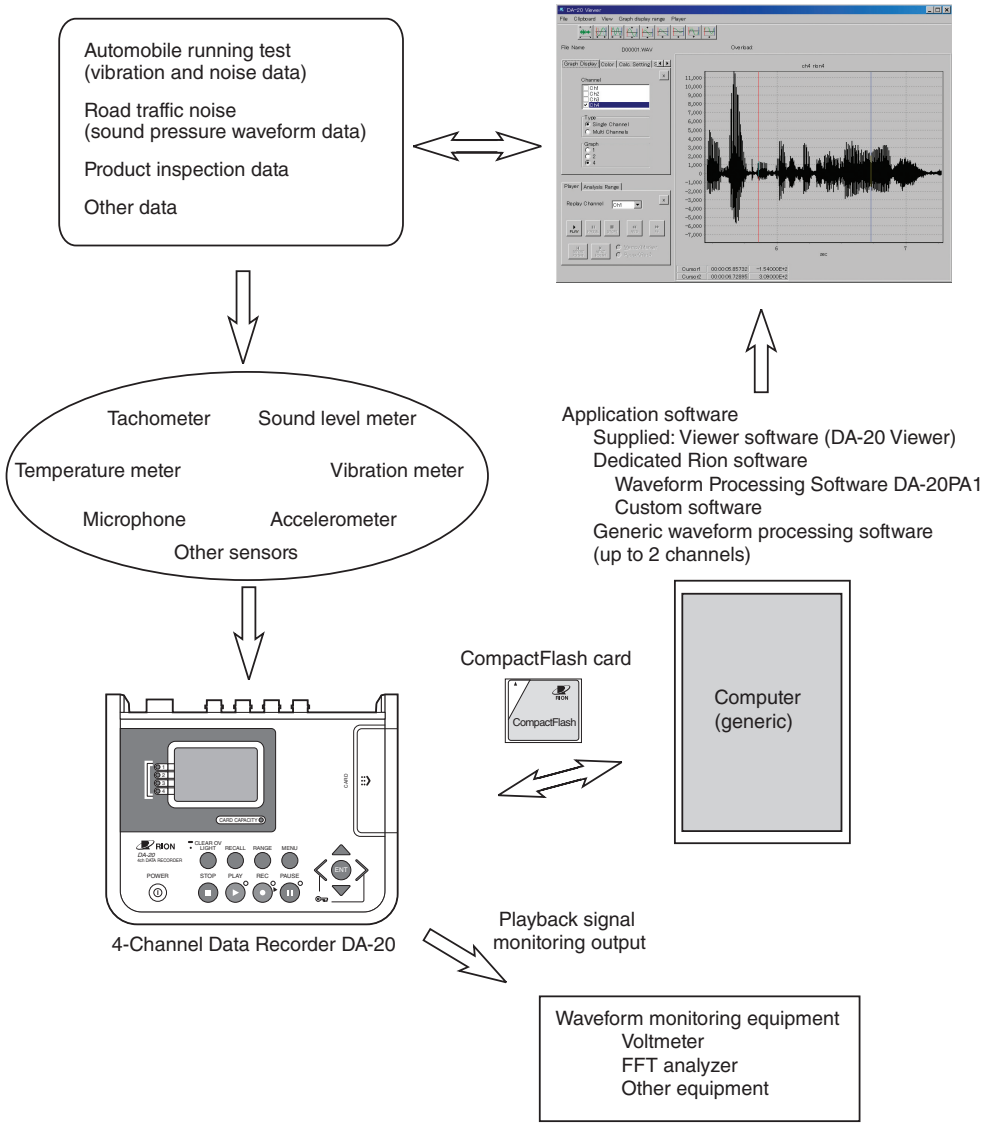
Features

The unit has the following features.

- Simultaneous recording of electrical signals in up to 4 channels. Compact and lightweight body ensures easy portability. A set of four IEC LR6 (size AA) alkaline batteries will power the unit for about 8 hours of continuous use (at 23°C, frequency range setting 20 kHz, 4-channel input, no CCLD, backlight off).
- Dedicated connectors allow easy hookup of sensors such as microphones and accelerometers. CCLD is also supported.
- 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 for specific sensors 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 256 MB card, available recording time with the 5 kHz frequency range setting and continuous recording in 4 input channels is 44 minutes.

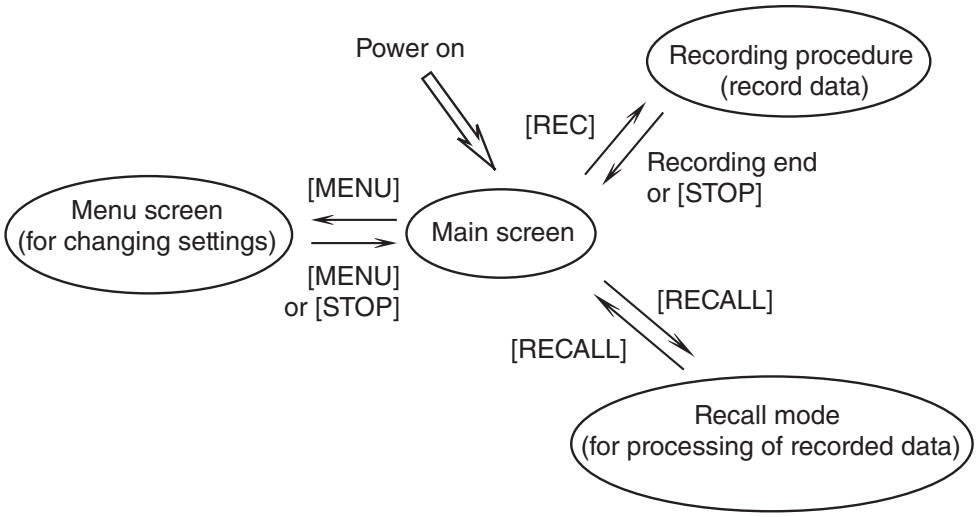
- Voice memo and marker information can also be recorded, to facilitate later data management.
- Playback of data is possible, making it easy for example to check the reliability of data in the field.
- Supplied viewer software (DA-20 Viewer) for use on a computer provides the minimum features required for checking and storing the recorded waveform data (including voice memo and marker).

System configuration



Operation environment

The DA-20 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.

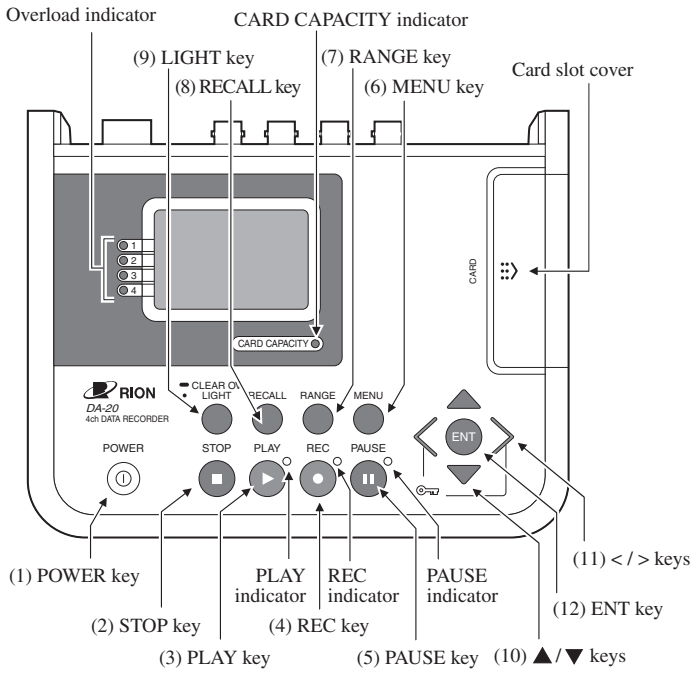
Menu screen — Pressing the [MENU] key at the main screen brings up a menu screen. There are a number of menu screens that give access to recording parameters, input settings, and various other settings (see page 25).

Recording procedure — Pressing the [REC] key at the main screen initiates the recording procedure. This encompasses all steps required to record data (see page 80).

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 94).

Parts and Functions

Front panel



Display panel

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

Key names and functions

The DA-20 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) [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.

(7) [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.

(8) [RECALL] key

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

(9) [LIGHT] ([CLEAR Ov]) key

Serves to control the LCD backlight. The backlight is turned on or off at the point where the key is released. 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.)

The key is also used to clear the overload history display. To do this, keep the key depressed for several seconds. The overload history display indicates if there has been any overload condition between the point when the key was last pressed and the current time.

(10) [▲]/[▼] keys

These keys serve to switch the input range, select a monitor channel, change the index number, and perform menu operations. In a given condition (together with the [LIGHT] key), the keys also serve to adjust the LCD contrast.

(11) [<]/[>] keys

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

(12) [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.

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 [LIGHT] key and the [<]/[>] keys that are necessary for canceling the condition are inactive. (The [POWER] key is also locked.)

Indicator names and functions

(1) Overload indicators

Indicate that the input signal level is excessive. There is one indicator for each 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 (including paused playback).

(3) REC indicator

Indicates the operating condition during data recording.

Flashing in red: Data are being recorded (including paused recording).

Flashing in green: Unit is in trigger standby condition.

(4) PAUSE indicator

Indicates that data recording/playback is being paused.

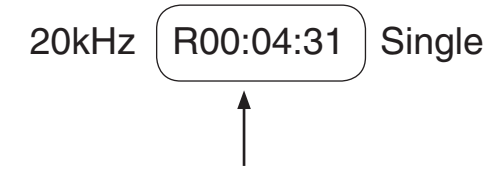
Flashing in blue: Data recording or playback is being paused.

(5) CARD CAPACITY indicator

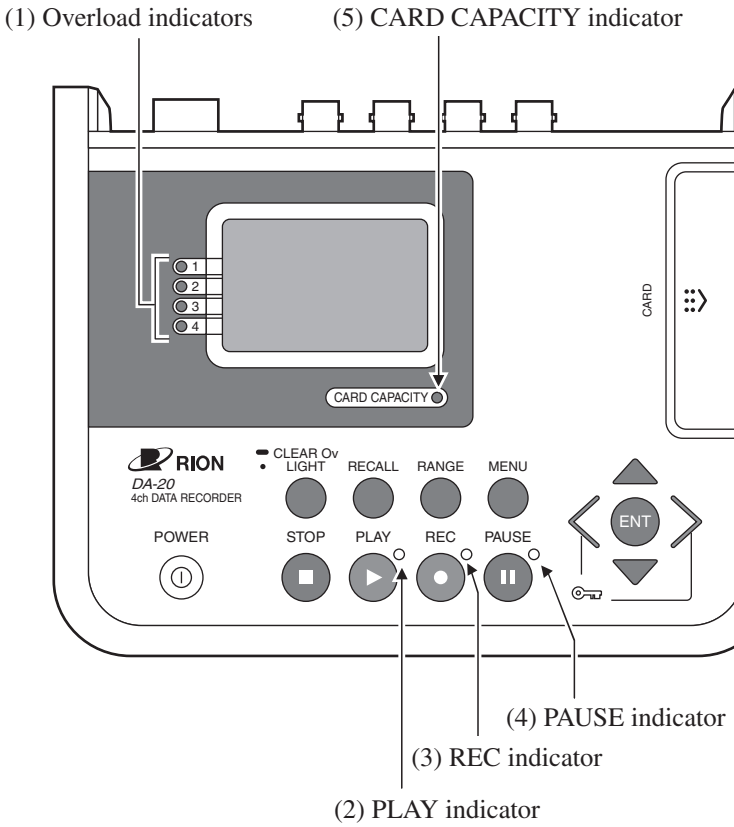
Indicates that the remaining data recording time on the CompactFlash card is less than 10 minutes, or that no CompactFlash card is inserted.

Flashing in red: Data recording will stop within 10 minutes.
No CompactFlash card is inserted.

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

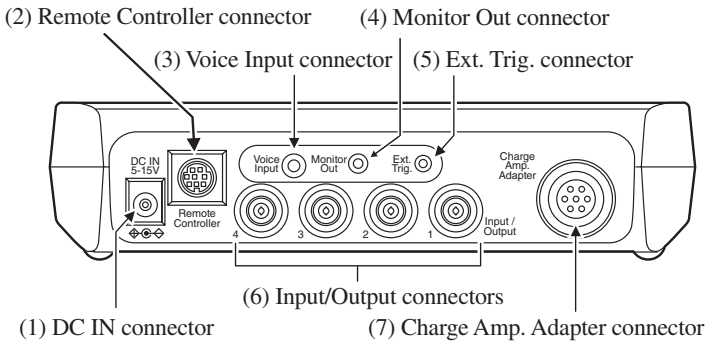


Display example for available recording time shown on bottom line of LCD screen
Hours : Minutes : Seconds



Note
Protective film The unit is shipped with a protective film covering the operation panel. When using the unit, please remove this film.

Rear panel



(1) DC IN connector

The AC adapter NC-98 series or the cigarette lighter adapter CC-82 can be connected here.

Important
Do not connect any other adapter besides the NC-98 series. Otherwise the unit may be damaged.
The cigarette lighter adapter CC-82 is only for use in cars with a 12-V electrical system. If the CC-82 is used in a car with a 24-V electrical system to supply power to the DC IN connector of the DA-20, the unit will be damaged.

(2) Remote Controller connector

Serves to connect the Remote Controller (option).

(3) Voice Input connector

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

(4) Monitor Out connector

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

(5) Ext. Trig. connector

Serves to supply the external trigger signal.

(6) Input/Output connectors

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.

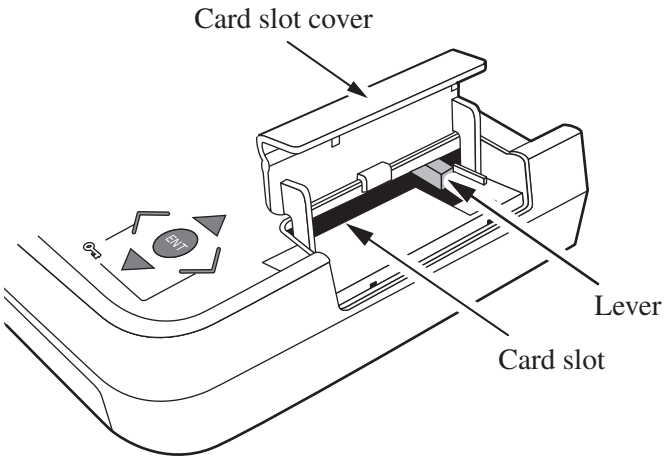
Each connector therefore fulfills two functions. In this manual, the connector is referred to as a "signal input connector" when functioning as an input and as a "signal output connector" when functioning as an output.

(7) Charge Amp. Adapter connector

Serves for connection of the 3ch preamplifier VP-80. The X/Y/Z channels of the VP-80 correspond to the channels 1, 2, 3 of the connector. For information on connection of the 3ch preamplifier VP-80, see page 60.

Note
Do not connect a microphone to the Charge Amp. Adapter connector.

Front side panel



Lever

Push this lever in to remove the CompactFlash card.

Card slot cover

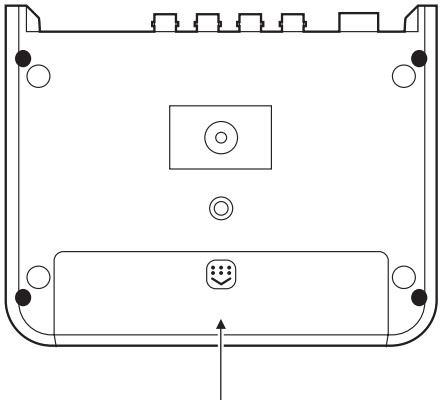
Open this cover to access the CompactFlash card slot.

Card slot

The CompactFlash card is inserted here.

Note
CompactFlash cards that contain other data files cannot be used in the DA-20. (The indication "Card Error" appears.) To use such a card in the DA-20, it must be formatted in the DA-20 first. CompactFlash cards that use the FAT32 file format cannot be used in the DA-20. Such cards can also not be formatted in the DA-20.

Bottom panel



Battery compartment

Accepts four IEC R6 (size AA) alkaline batteries.

Take care not to reverse the (+) and (-) polarity when inserting the batteries (see page 47).

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.

Power-on mode: (see page 49)

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-20. In this case, the [POWER] key has no effect.

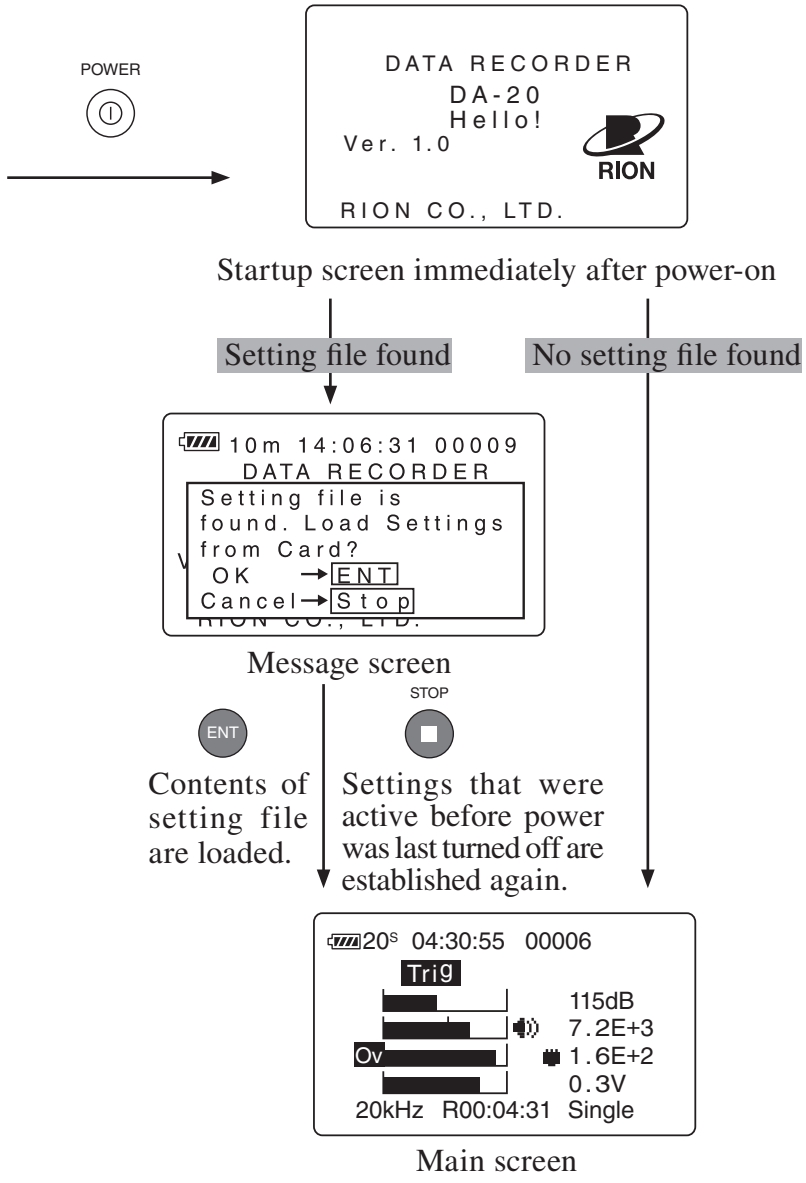
Note
Before changing the position of this switch, disconnect any external power that is being supplied to the DC IN connector and remove all batteries from the battery compartment. Otherwise operation of the unit will become unstable. If this has happened (not a defect of the unit), disconnect the external power, remove all batteries, and then 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 few seconds, the main screen will be shown.

If there is a setting file on the CompactFlash card, the main screen does not appear straight away. Instead, a message is shown asking whether you want to load the settings from the card, or use the settings that were established before power was last turned off.

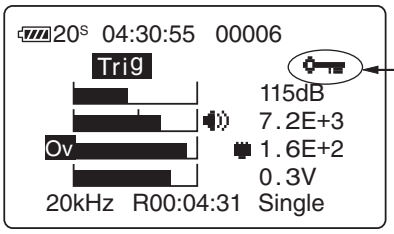


Turning the power off

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 symbol is shown at the top right of the display, the operation keys including the [POWER] key are locked. The power cannot be turned off in this condition.



Indicates the key lock condition

See page 77 (Preventing inadvertent operation)

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

About the setting file

You can store all setting values and parameters of the unit on the CompactFlash card as a setting file (DA20.INI).

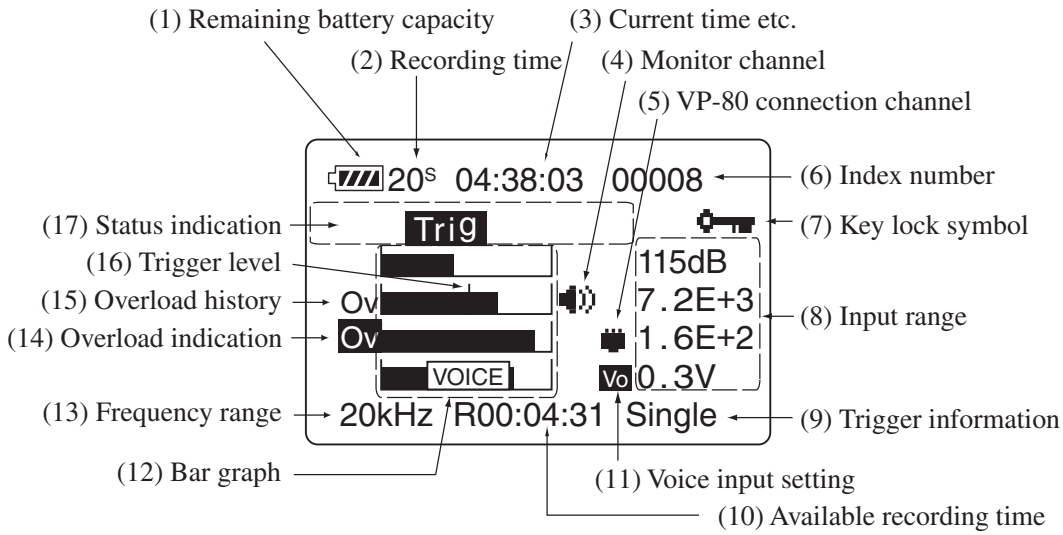
This capability allows you for example to store the optimum settings for a certain recording task and then quickly re-establish these settings at power-on. This reduces the time required for startup and the risk of making setup errors.

To create a setting file, use the "Save Settings" item on Menu 5 < System >. (see page 43)

Note
When the contents of a setting file are loaded at power-on, a channel selected for CCLD will be supplied with constant current. To prevent problems due to unsuitable connections, it is recommended to disconnect sensors before loading a setting file. (See information about canceling recall mode on page 103.)

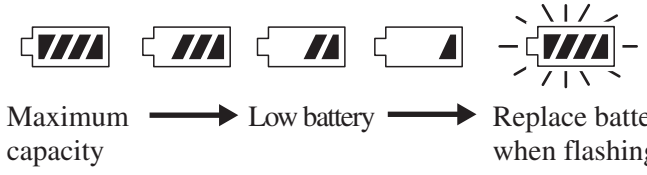
Display Explanation

Display screen



(1) Remaining battery capacity

Shows the approximate remaining charge of the batteries. The number of black segments decreases as the batteries get depleted. When the indication starts to flash, replace the batteries with a fresh set.



(2) Recording time

Shows the setting of the "Rec. Time" item on Menu 2 < Rec.Parameters >. Unless recording was stopped beforehand or the CompactFlash card has run out of space, recording will continue until the recorded data amount corresponds to the recording time setting. This is the basic operation mode of the unit.

This indication is not shown when the recording time setting is "Manual" or when the unit is in recall mode.

(3) Current time/Elapsed time/Actual recording time

On the main screen, the current time is shown in 24-hour notation. The current time setting can be changed with Menu 6 < Date Time >.

In recording mode, the elapsed time since the start of recording is displayed, as calculated from the amount of recorded data.

In recall mode, the actual recording time is displayed, as calculated from the total amount of recorded data. During playback, the elapsed time from the start of the data to the present point is displayed.

(4) Monitor channel

Indicates which channel signal is being supplied at the Monitor Out connector of the DA-20. The monitor channel can be changed with the [▲]/[▼] keys.

(5) VP-80 connection channel

Indicates which channel handles a signal supplied via the VP-80. The sensor signal for this channel should be connected to the input of the VP-80, not to the DA-20 (see pages 53, 55, 60).

(6) Index number

This is a number (1 to 65533) used to identify recorded data. When recorded data are saved in a file, the index number is incremented by 1, so that index number + 1 becomes the next index number. The files are stored on the CompactFlash card, using the index number as file name.

(7) Key lock symbol

This symbol indicates the key lock condition in which all keys except the [LIGHT] key and the [<]/[>] keys are inactive.

When you press and hold the [<] key and [>] key together, the key lock symbol appears in the top right of the display and key lock is activated. To cancel the key lock state, repeating the procedure (press and hold the [<] key and [>] key together). The key lock symbol goes out.

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

(8) Input range

Shows the input range setting for each channel.

The input range setting can be changed by using the [RANGE] key and other keys. (This is not possible during recording and in recall mode.)

(9) Trigger information

Indicates the setting of the "Trigger Mode" item in Menu 4 < Trigger >. (In recall mode, the "recording start time" is shown instead.)

The display changes as follows, depending on the setting.

Free:	Nothing is shown
Single:	"Single" is shown
Repeat:	In recording mode, the number of trigger events is shown. On the main screen, "00000" is shown.

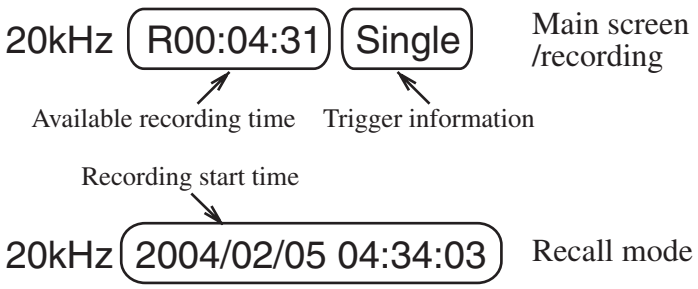
(10) Available recording time

Based on the latest settings, the approximate remaining capacity of the CompactFlash card is shown in terms of recording time. When the time is less than 10 minutes, the indication flashes.

The approximate amount of data recorded under the current settings is shown as a time value. (In recall mode, the "recording start time" is shown instead.)

Recording start time (recall mode only)

In recall mode, the recording start time for the currently displayed data is shown. The relationship to trigger information and available recording time is as indicated below.



(11) Voice input setting Vo / Vo only

Indicates the setting of the "Voice" item on Menu 2 < Rec.Parameters >.

The "Voice" setting determines how the voice memo or marker function during recording is used.

When the indication is "Vo" ("Voice/Input" setting), channel 4 is switched between signal recording and voice memo recording.

When the indication is "Vo only" ("Voice Only" setting), channel 4 is used exclusively for voice memo recording.

When no indication is shown ("OFF (Marker" setting), a marker is recorded instead of the voice memo.

(12) Bar graph

Shows the absolute value of the input signal on a logarithmic scale. The bar graph range is about 60 dB. The monitor channel data can also be shown as maximum data history for 0.5-second intervals.

To switch between the bar graph and maximum data history display, use the [>] or [<] key. To switch the monitor channel, use the [▲]/[▼] keys (see page 24).

(13) Frequency range

Shows the selected frequency range (see pages 36 and 65).

The frequency range setting is made with the "Freq.Range" item in Menu 2 < Rec.Parameters >.

(14) Overload indication Ov

This indication is shown when the input signal level is causing overload. The overload indicator also lights up. The indication is shown for at least 1 second.

(15) Overload history Ov

This indication is shown when there has been an overload condition between the current point and a point in the past.

To clear the overload history indication, hold down the [CLEAR Ov] key. (This key only affects the display. Any overload history information in recorded data is not deleted when the [CLEAR Ov] key is pressed.)

The overload history is cleared in the following cases:

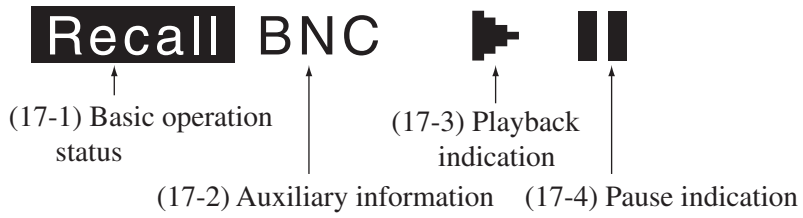
- Input or sampling setting has been changed (input range, frequency range, sampling frequency, AC/DC, sensor type, filter)
- Channel was set to off (cleared for respective channel)
- Power was turned off (cleared for all channels)
- Recording was started (cleared for all channels)
- Trigger event has occurred and recording was started (cleared for all channels)
- Recall condition was terminated (cleared for all channels)

(16) Trigger level

When a level trigger is used for data recording, a mark indicating the trigger level is shown on the bar graph for the trigger channel. (For information on the trigger function, see pages 40 and 66.)

(17) Status indication

Shows which operation status the unit is currently in. The status indication consists of the following 4 parts.



(17-1) Basic operation status

Shows the basic mode, such as recording, recall etc.

No indication

This is the condition when the main screen is shown. The menu screens, recording procedure, and recall mode are all accessed from this screen.

Rec

This indicates the condition from the point where the recording operation is started (by pressing the [REC] key) to the end of the entire operation. The overall term for this condition is "recording procedure" which also includes pause and trigger standby where data are not actually recorded. By contrast, the condition where data are actually being recorded is referred to as "recording in progress".

Recall

This indicates the recall mode (where recorded data can be checked, played back, and deleted). As an exception, when recorded data are shown in list format, the indication is off.

(17-2) Auxiliary information

Indicates auxiliary information about the basic operation condition.

No indication

Indicates that the trigger function is not being used.

Trig

Indicates that the trigger function is being used. In recall mode, this indication is not shown.

BNC

Indicates that the playback signal is set to be supplied at the signal output connectors (recall mode only).

The monitor channel signal is always supplied at the Monitor Out connector.

(17-3) Playback indication

Shows the recorded data playback status in recall mode.

Indicates that recorded data are being played back.
The PLAY indicator next to the [PLAY] key also flashes.

Indicates that playback (processing) is carried out in fast-forward.
When the [>] key is pressed during playback, fast-forward occurs while the key is being held. If the key is pressed for more than 1.5 seconds during pause, high-speed fast-forward occurs while the key is being held. (Pressing the key for less than 1.5 seconds in pause will move the playback position forwards to the next voice memo or marker position, if available.)

Indicates that playback (processing) is carried out in fast-reverse.
When the [<] key is pressed during playback, fast-reverse occurs while the key is being held. If the key is pressed for more than 1.5 seconds during pause, high-speed reverse occurs while the key is being held. (Pressing the key for less than 1.5 seconds in pause will move the playback position backwards to the next voice memo or marker position, if available.)

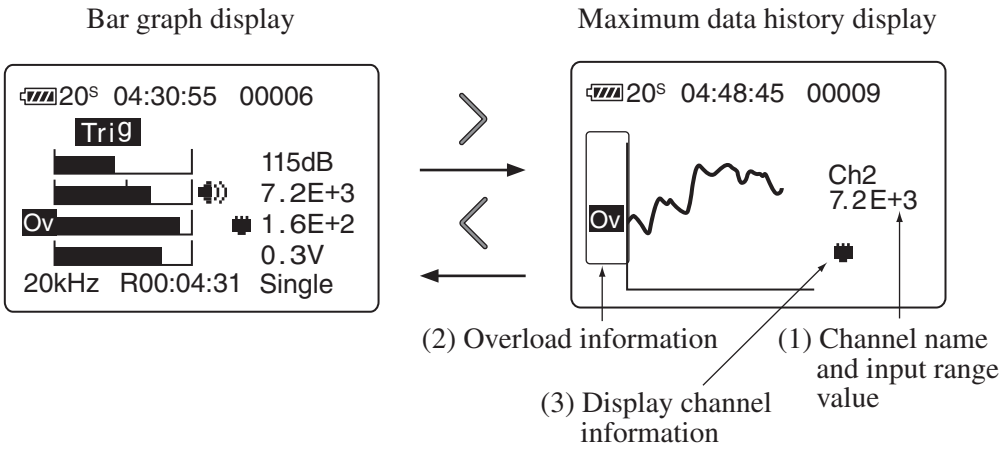
(17-4) Pause indication

Shows that recording or playback is paused. The PAUSE indicator next to the [PAUSE] key also flashes.

Data display formats

The data display can be switched from bar graph mode to maximum data history for 0.5-second intervals. (In recall mode, this is not possible.) To switch between the bar graph and maximum data history display, use the [>] or [<] key.

The data shown on the maximum data history display are the data of the monitor channel. The horizontal axis is the time and the vertical axis is the maximum value in 0.5-second intervals. Also during maximum data history display, you can switch the monitor channel with the [▲]/[▼] keys.



(1) Channel name and input range value

Shows the channel number (1 to 4) and the input range setting for the channel.

(2) Overload information

Shows overload information not only for the monitored channel but also for the other channels. The indication is the same as on the bar graph display.

(3) Display channel information

This symbol is shown when the input signal for the display channel 1 to 3 is derived from the VP-80.

Vo This symbol appears when channel 4 is shown and the "Voice/Input" setting for the voice memo function is selected.

Menu Operations and Setting Items

General menu operation steps

Almost all settings of the DA-20 except for the input range setting are made via menus.

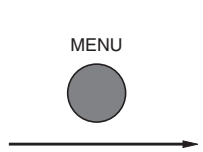
To make a setting, you call up the menu from the menu list page. When a menu has been selected, the screen with the individual settings of that menu appears.

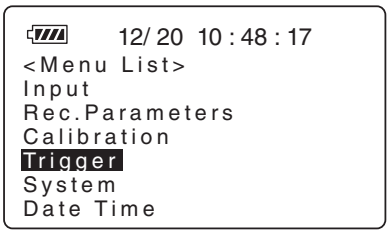
It is not possible to move directly from one menu page to another. You must return to the menu list page first.

There are a total of six menu pages. A detailed description of menu operation steps follows.

1. Call up the menu list

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

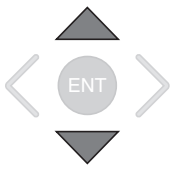


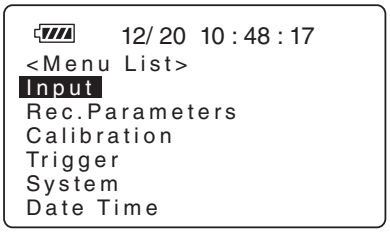


Menu list

2. Select a menu page

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

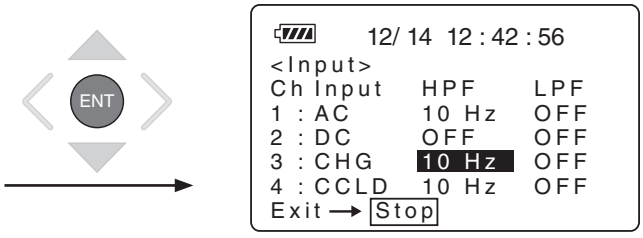




Menu list

3. Open the menu page

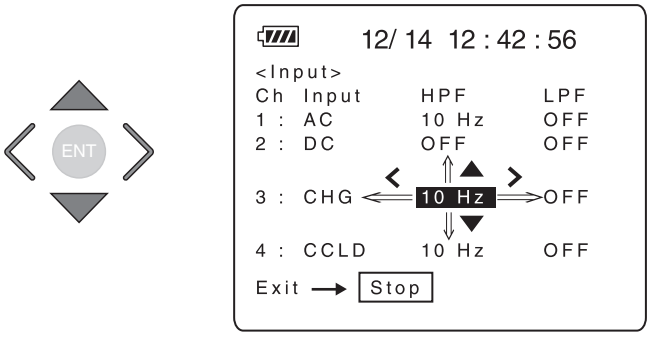
Press the [ENT] key. The items on the selected menu page appear.



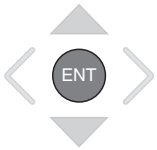
Menu 1

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.

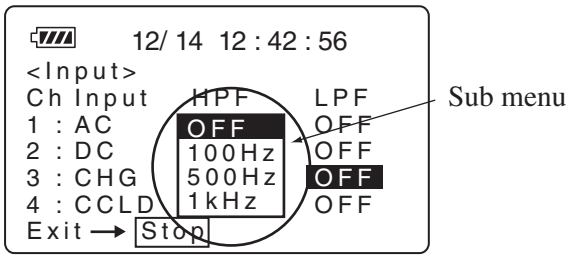
A: Change setting on sub menu

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)

< Rec.Parameters >
(Frequency range, sampling frequency, Pre-time)

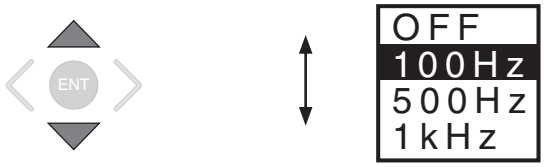
< Calibration >
(Sensor)

< Trigger > (Mode, Type, Channel)

< System > (Play, Light Auto Off)

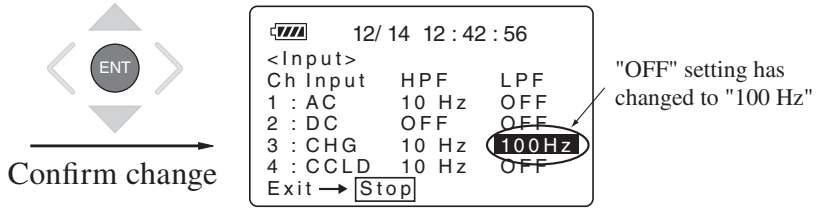
The explanation below uses the channel 3 LPF setting on the < Input > page as an example. The procedure is the same for other items.

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



Select setting

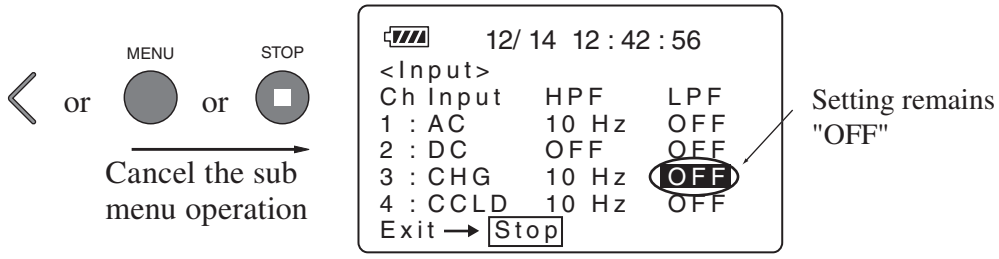
A-2 Press the [ENT] key. The change is accepted and the sub menu disappears.



Confirm change

Menu 1

A-2' By pressing the [<] or [MENU] 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.

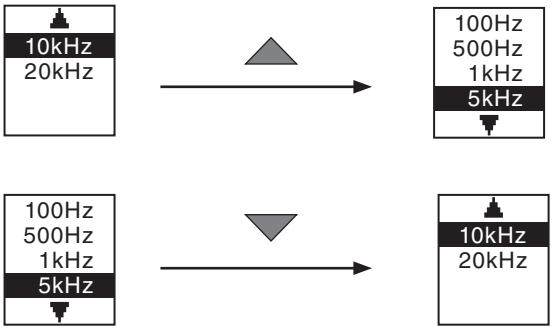


Cancel the sub menu operation

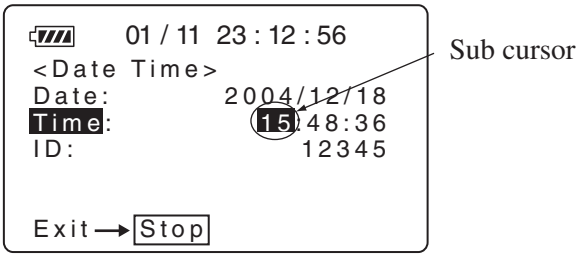
Menu 1

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, indicating that you can bring up more settings by pressing the [▲] or [▼] key. When you press the respective key, the indication slides to show more settings.



B: Change setting with sub cursor



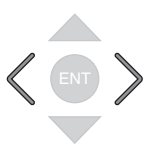
Sub cursor example

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.

< Rec.Parameters >	(Recording time)
< Calibration >	(Sensitivity)
< Trigger >	(Level)
< System >	(LCD Contrast)
< Date Time >	(Date, Time, ID)

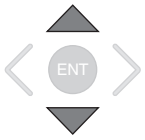
The explanation below uses the Time setting on the < Date Time > page as an example. The procedure is the same for other items.

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

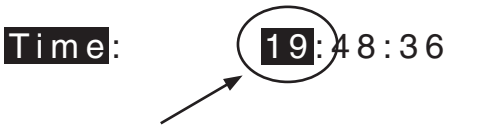


Select setting item

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.



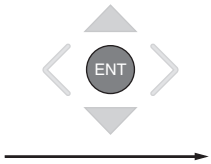
Change setting value



Push [▲] key to move hours forward
Push [▼] key to move hours back

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

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



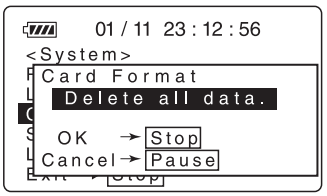
Confirm change

Time is changed

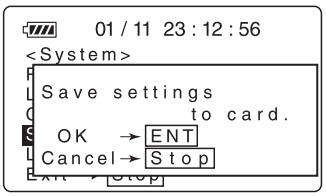
B-4' By pressing the [<] or [MENU] or [STOP] key instead of the [ENT] key, you can cancel the sub cursor operation without changing the setting. In this case, the indication is as shown below.

C: Execute (process) selected item

This type of setting procedure applies only to two items: "Card Format" and "Save 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.



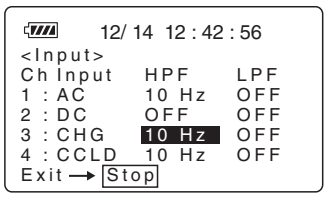
Execution choice, example 1



Execution choice, example 2

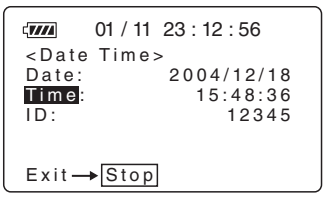
This concludes the description of the three ways of changing a setting.

At this stage, one of menu pages 1 to 6 should be shown.



Menu 1

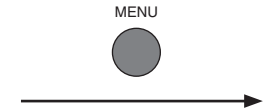
to



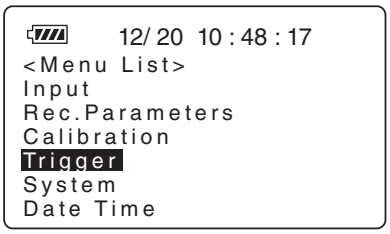
Menu 6

7. Changing an item on another menu page

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



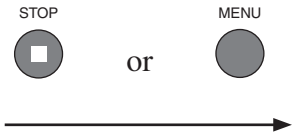
To change an item on another menu page



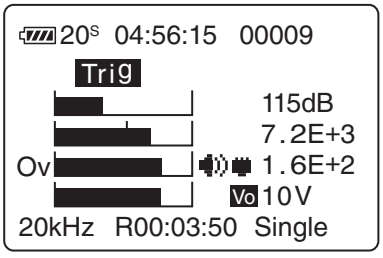
Menu list

8. Return to main screen

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

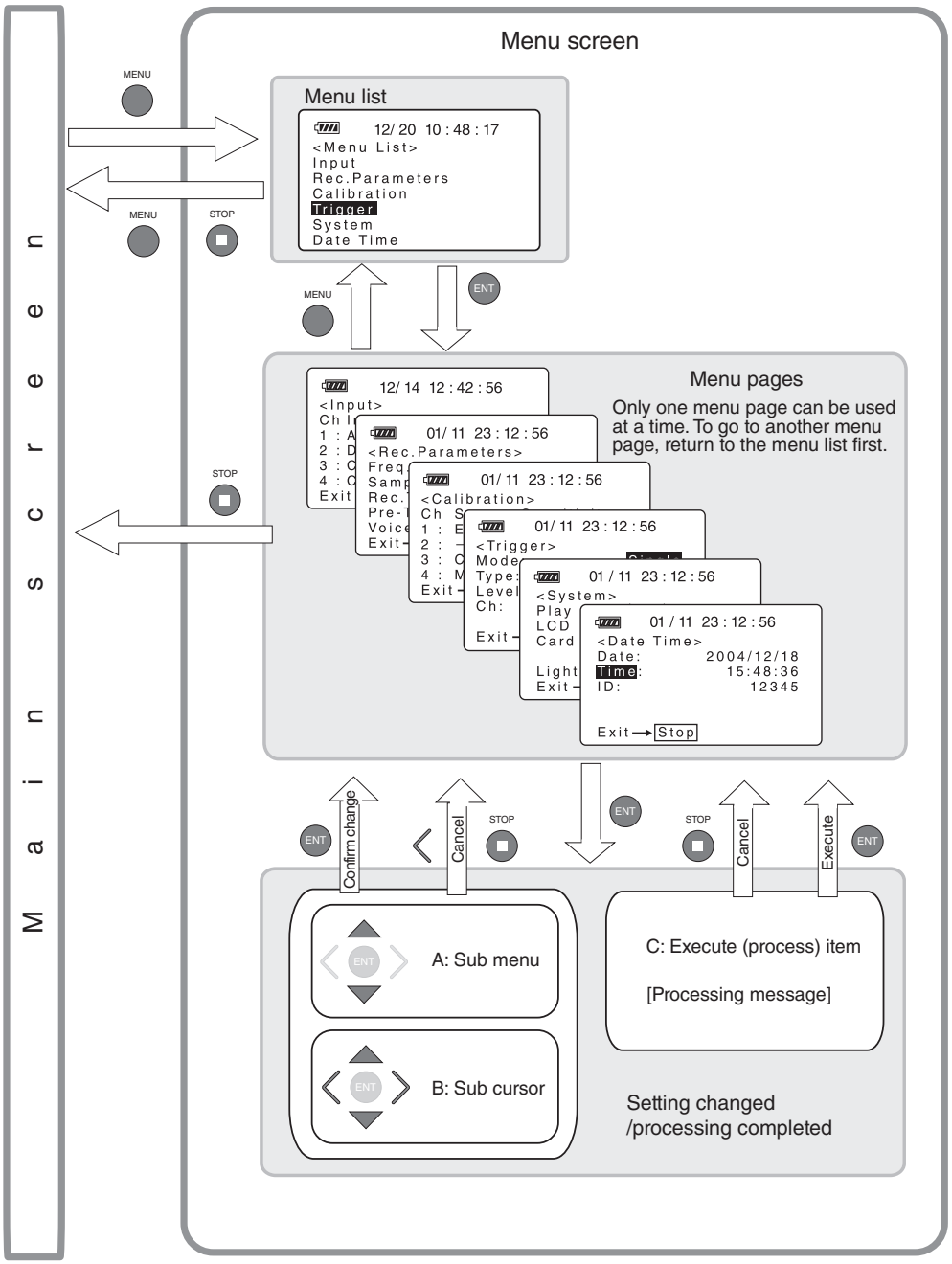


Return to main screen



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.

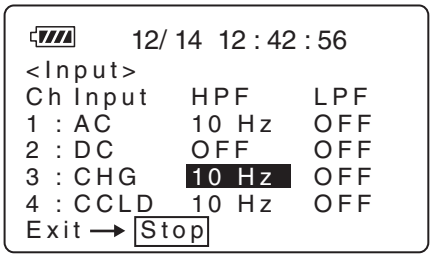


Menu Items

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 control input on/off, signal type, and filter settings for each channel.



Menu 1

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

Controls the input on/off setting and sensor (signal) type. The actual relationship between sensor connection and input signal is determined by this setting together with the menu 3 < Calibration > setting.

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

DC — This setting is for input of a normal electrical signal, with the recording to include DC components. This is suitable for environment sensors (temperature, wind speed, pressure, etc.) that output the measurement value as a DC signal.

When the "DC" setting is selected for a channel, input range settings lower than 1 V are not available for that channel.

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.

CCLD This setting is for microphones, accelerometers and other sensors that require a sensor drive power supply.

CHG Select this setting when the input signal is supplied via the VP-80. This setting is available only for channels 1 to 3. A channel for which the CHG setting is selected is indicated by the  icon.

For information on how to connect channels set to CHG, see the section on connection of the 3-ch preamplifier VP-80 on page 60.

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

Selects which high-pass filter is applied to the input signal. Only the signal components above the high-pass filter frequency are recorded.

Available settings are OFF and 10 Hz.

When the input setting is "DC", only the "OFF" setting is available for the high-pass filter.

OFF / 10 Hz

When voice memo information is recorded (see pages 38, 74, 88), the high-pass filter is defeated.

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

Selects which low-pass filter is applied to the input signal. Only the signal components below the low-pass filter frequency are recorded.

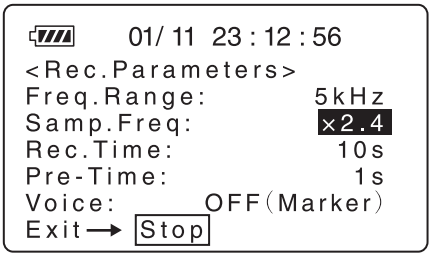
Available settings are OFF, 1 kHz, 500 Hz, and 100 Hz, but only selections that are within the frequency range setting are allowed.

100 Hz / 500 Hz / 1 kHz / OFF

When voice memo information is recorded (see pages 38, 74, 88), the low-pass filter is defeated.

Menu 2 < Rec.Parameters >

This menu comprises items related to the quality of recorded data and auxiliary functions.



Menu 2

Freq.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. When performing frequency analysis on recorded data, it is recommended to discard any components that are higher than this value.

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 38, 74, 88) cannot be used during data recording.

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

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

By principle, the sampling frequency should be at least twice as high as the Freq.Range. The DA-20 provides a choice of two settings commonly used for frequency analyzers and voice processing: 2.4 times or 2.56 times the frequency range.

× 2.4 Used mainly for voice signal processing

× 2.56 Commonly used by FFT analyzers

Rec.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 predetermined, allowing the operator to press the [STOP] key whenever required. 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 the end of the preset recording time is reached, 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 / 1 to 59 m / 1 to 24 h / Manual

Pre-Time ■ Pre-recording time setting (B: sub cursor)

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 Pre-Time value determines the duration of the range for such data. Available settings are 0, 1, and 5 seconds. To disable the function, select the "0" setting.

0 s / 1 s / 5 s

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

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

The DA-20 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 4 input.

When channel 4 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 4 cannot be used as a trigger channel (see page 41).

- OFF (Marker) Voice memo cannot be used, but marker information can be recorded. The input signal to channel 4 is not affected.
- 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 4 is recorded.
- 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.

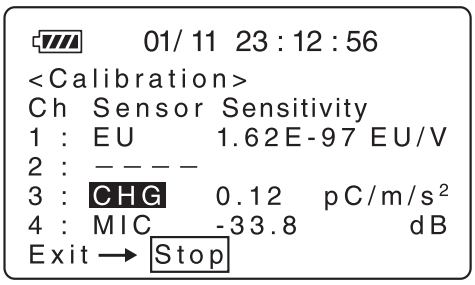
The voice memo setting has no effect when the DA-20 is not in recording mode.

For details about the voice memo and marker function, see the section about auxiliary function setup (page 74) and the section about using the voice memo/marker (page 88).

Note
When intending to use the voice memo function during data recording, a frequency range setting of 5 kHz or higher is recommended.

Menu 3 < Calibration >

This menu comprises items related to the sensor type, sensitivity, units, etc.



Menu 3

Sensor ■ Sensor type setting (A: sub menu)

Related to the "Input" item on Menu 1 < Input >, this item serves to select the actual sensor type.

"Input" setting	Available sensor type setting
AC or DC	EU or --- (Do not use EU)
CCLD	MIC or PICK
CHG	CHG (fixed according to "Input" setting)
OFF	OFF (fixed according to "Input" setting)

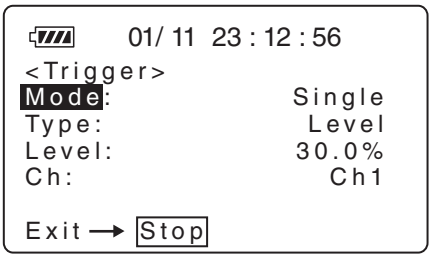
Sensitivity ■ Sensitivity and unit conversion setting (B: sub cursor)

According to the preceding "Sensor" item, this setting determines the correlation between input signal voltage and measurement value.

"Sensor" setting	Sensitivity setting
EU	Enter measurement value corresponding to 1 V
---	No entry required
MIC	Enter microphone sensitivity level (dB)
PICK	Enter voltage sensitivity (mV/(m/s^2))
CHG	Enter charge sensitivity (pC/(m/s^2))
OFF	No entry required

Menu 4 < Trigger >

Comprises trigger related items (see pages 66 to 72).



Menu 4

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 higher than a preset value (trigger level).
- External — A trigger event occurs and recording is started when the Ext. Trig. connector is shorted. This allows the use of an external timing signal supplied to the trigger input.
- External Gate — Recording is carried out only while the Ext. Trig. connector is shorted.

Level ■ Trigger level setting (B: sub cursor)

When the trigger signal type is "Level", the trigger state is controlled by the level of the input signal. The trigger level is a threshold set as a relative percentage [%] correlated to the input range setting that is active at the time of recording.

Consequently, the actual trigger level will change when the input range setting is changed.

The trigger level is indicated on the bar graph for the trigger channel (see page 17).

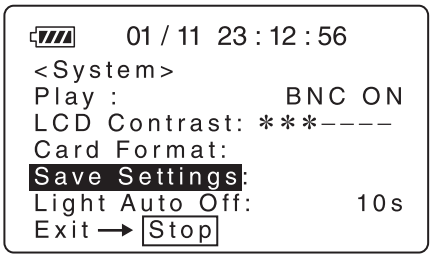
Ch ■ Trigger channel setting (B: sub cursor)

When the trigger signal type is "Level", a channel (1 to 4) must be specified for monitoring. This is called the trigger channel.

When the voice memo function (see pages 38, 74, 88) is used during recording, channel 4 cannot be specified as trigger channel because it is used for recording the voice memo signal.

Menu 5 < System >

This menu comprises general items such as display contrast and CompactFlash card formatting.



Menu 5

Play ■ Playback mode setting (A: sub menu)

Determines whether the recorded data signal is supplied as a playback signal at the signal output connectors. (With any setting, the playback signal of the monitor channel is available at the Monitor Out connector.)

For details on making this setting, see the section "Recall/Playback of Recorded Data" on page 94.

BNC OFF — The playback signal is not supplied at the signal output connectors. However, the playback signal of the monitor channel is supplied at the Monitor Out connector.

BNC ON — The playback signal is supplied at the signal output connectors. The playback signal of the monitor channel is supplied at the Monitor Out connector.

If this setting is selected and a sensor remains connected in recall mode, the sensor may be destroyed by the playback signal. When recall mode is activated in this condition, a warning message appears, reminding the operator to disconnect the sensors.

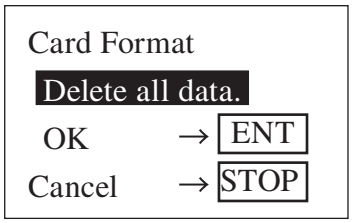
LCD Contrast ■ LCD contrast setting (B: sub cursor)

Serves to adjust the display contrast. The number of asterisks corresponds to the setting. For this item only, simply operating the [▲]/[▼] keys determines the setting (pressing the [ENT] key is not required).

The display contrast can also be adjusted by holding down the [LIGHT] key and pressing the [▲]/[▼] keys at the main screen or during recording.

Card Format ■ Format a CompactFlash card (C: Execute)

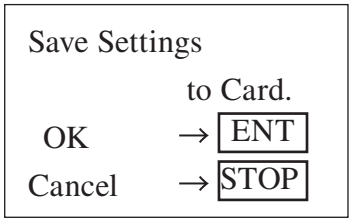
This item serves for formatting (initializing) a CompactFlash card for use with the DA-20. A CompactFlash card that has been formatted in a computer does not have the file and directory structure required by the DA-20. Be sure to use this menu item to format any card that you intend to use with the DA-20. When a format is performed in this way, a setting file created or updated with the "Save Settings" item (DA20.INI) will not be deleted.



[ENT] key: Proceed with format
[STOP] key: Cancel format

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

After you have made various settings to use the unit for a specific purpose, you can save the settings on a CompactFlash card for later use. Only one set of settings can be saved. The file created by this function (DA20.INI) will not be deleted by the "Card Format" procedure (see above).



[ENT] key: Proceed with setting file creation/update
[STOP] key: Cancel setting file creation/update

If the message "Could not format" appears when you press the [ENT] key to create/update the setting file, the CompactFlash card is defective or was formatted using a file system other than FAT16. Use a different card or format the card with the FAT16 file system and then try again.

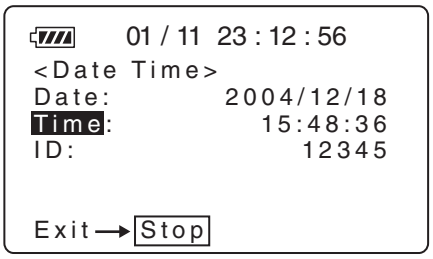
Important
The condition of the unit saved by the "Save Settings" function is the condition that is established when you return to the main screen after making settings. If you use the function after changing settings but without having returned to the main screen, the most recent settings may not be saved.

Light Auto Off ■ LCD backlight timer setting (B: sub cursor)

The LCD backlight is automatically turned off when there is no key activity for a certain period. Available settings for this period are 10 seconds, 1 minute, 3 minutes, and CONT. The "CONT" setting means that the backlight stays on continuously. Choose this setting if you want to defeat the automatic turn-off function.

Menu 6 < Date Time >

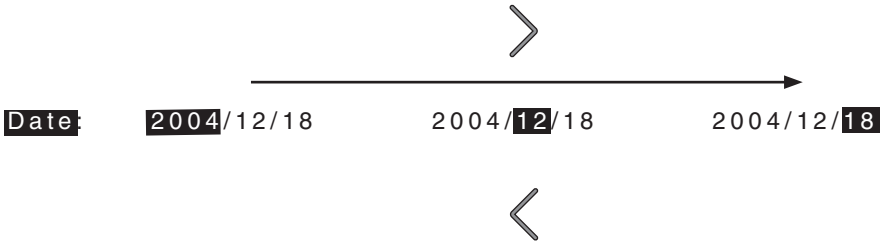
This menu serves for setting the current date and time and the ID number.



Menu 6

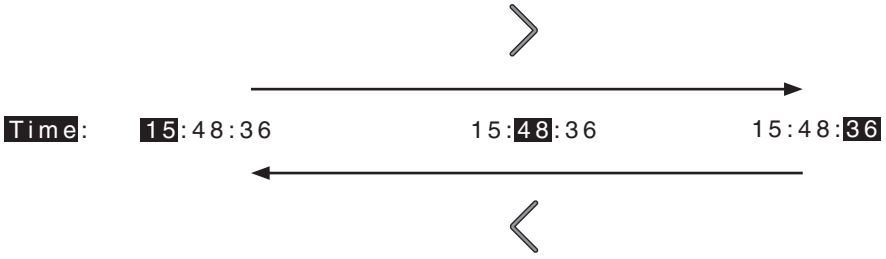
Date ■ Set current date (B: sub cursor)

Lets you set the year, month, and day separately.



Time Set current time (B: sub cursor)

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



ID ■ Set ID number (B: sub cursor)

The ID number can be set according to the system requirements. The setting range is 1 to 255. Because the ID number information is recorded along with the data, it can be used to identify multiple DA-20 units or data recording conditions.

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

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
5. Calendar
6. Display contrast

Recording parameter settings

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

Auxiliary function setup

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

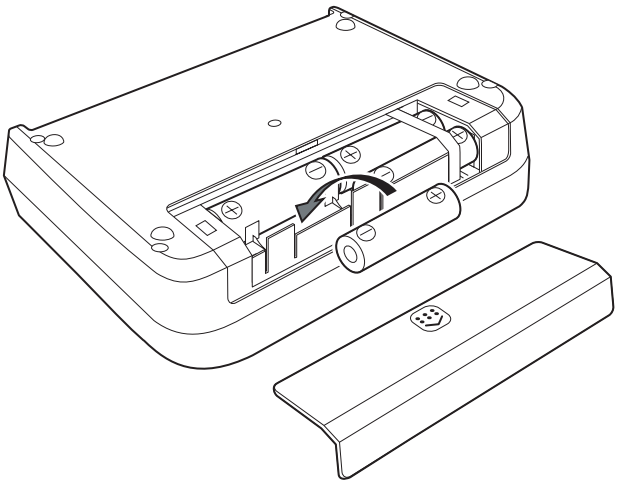
Preparations and checks before recording

Power supply

The DA-20 can be powered from four IEC R6 (size AA) alkaline batteries or from the optional AC adapter (NC-98 series).

Inserting the batteries

1. Open the battery compartment cover.
2. Insert four IEC R6 (size AA) alkaline batteries 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 four 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.

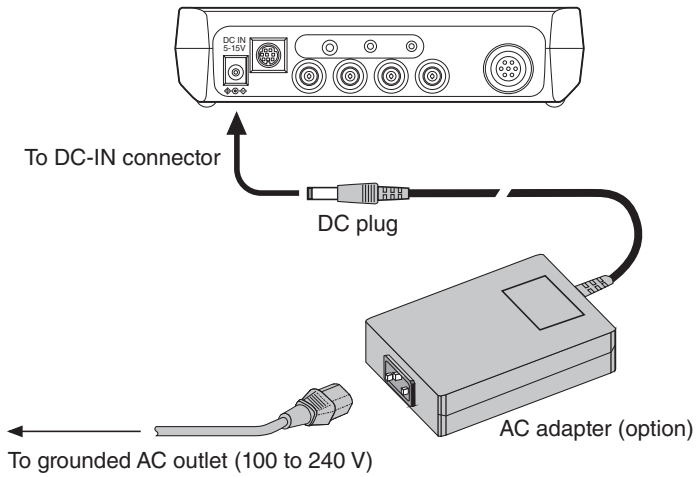
Note

When the unit is powered from batteries and a CCLD sensor is used, set the "CCLD" item on Menu 1 < Input > and then quit the menu screen. At this time, the message shown below may appear. In such a case, replace the batteries with a fresh set.

Low Battery.
Can’t turn on CCLD

AC adapter (option)

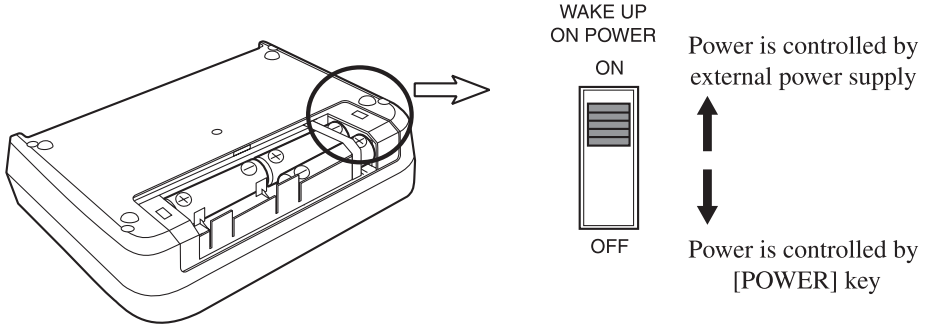
Connect the AC adapter as shown below.



Important
Use only the AC adapter NC-98 series. Using any other kind of adapter may damage the unit.

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 formatted in the DA-20, using the 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-20 is required on the card.

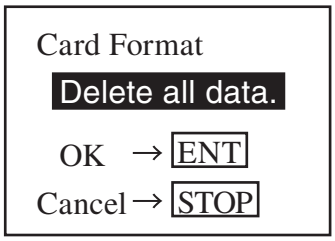
Note
Before using the unit for the first time, or when wanting to use a CompactFlash card formatted in another device or a CompactFlash card whose file/folder structure was changed, be sure to format the CompactFlash card in the DA-20. However, note that CompactFlash cards that have been formatted in another device using the FAT32 files system cannot be formatted or used in the DA-20. To enable the use of such a card, reformat it in a computer with the FAT16 file system, and then format it in the DA-20.

Formatting a CompactFlash card

Follow the steps below to format a CompactFlash card.

1. Terminate any recording operation or the recall mode and return to the main screen.
2. Insert the CompactFlash card as shown on page 52. If the card is already inserted in the unit, proceed to the next step.
3. Press the [MENU] key to bring up the menu list screen, and select Menu 5 < System >. Then press the [ENT] key.
4. On the Menu 5 < System > screen, move the cursor to "Card Format" and press the [ENT] key.

5. Verify that the following message is shown, and press the [ENT] key to proceed.
   To cancel the formatting process, press the [STOP] key.

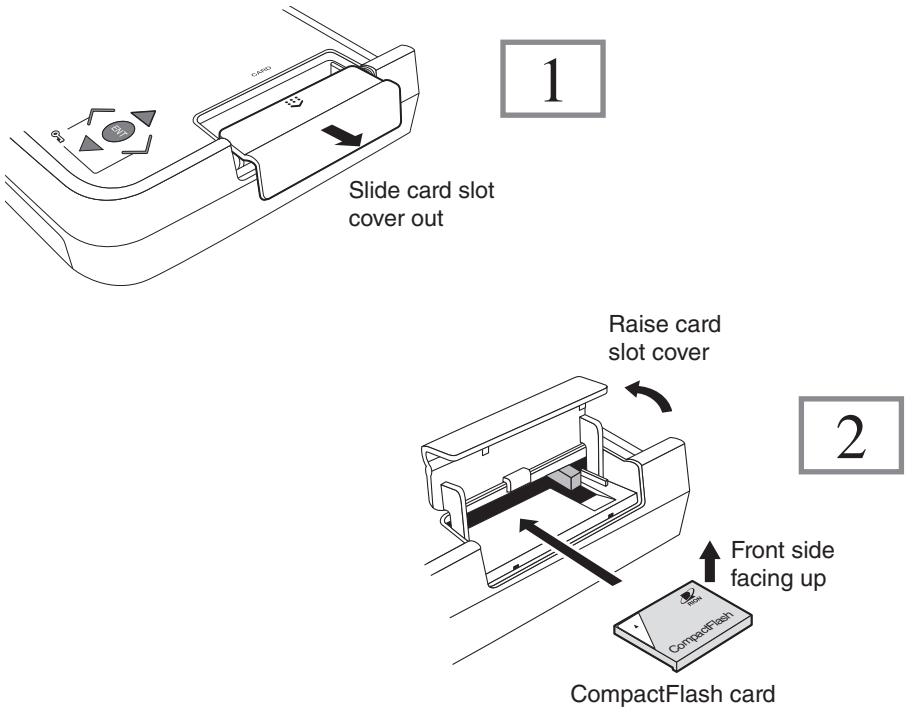


6. When the Menu 5 < System > screen is shown again, press the [STOP] key to return to the main screen.

Inserting and removing a CompactFlash card

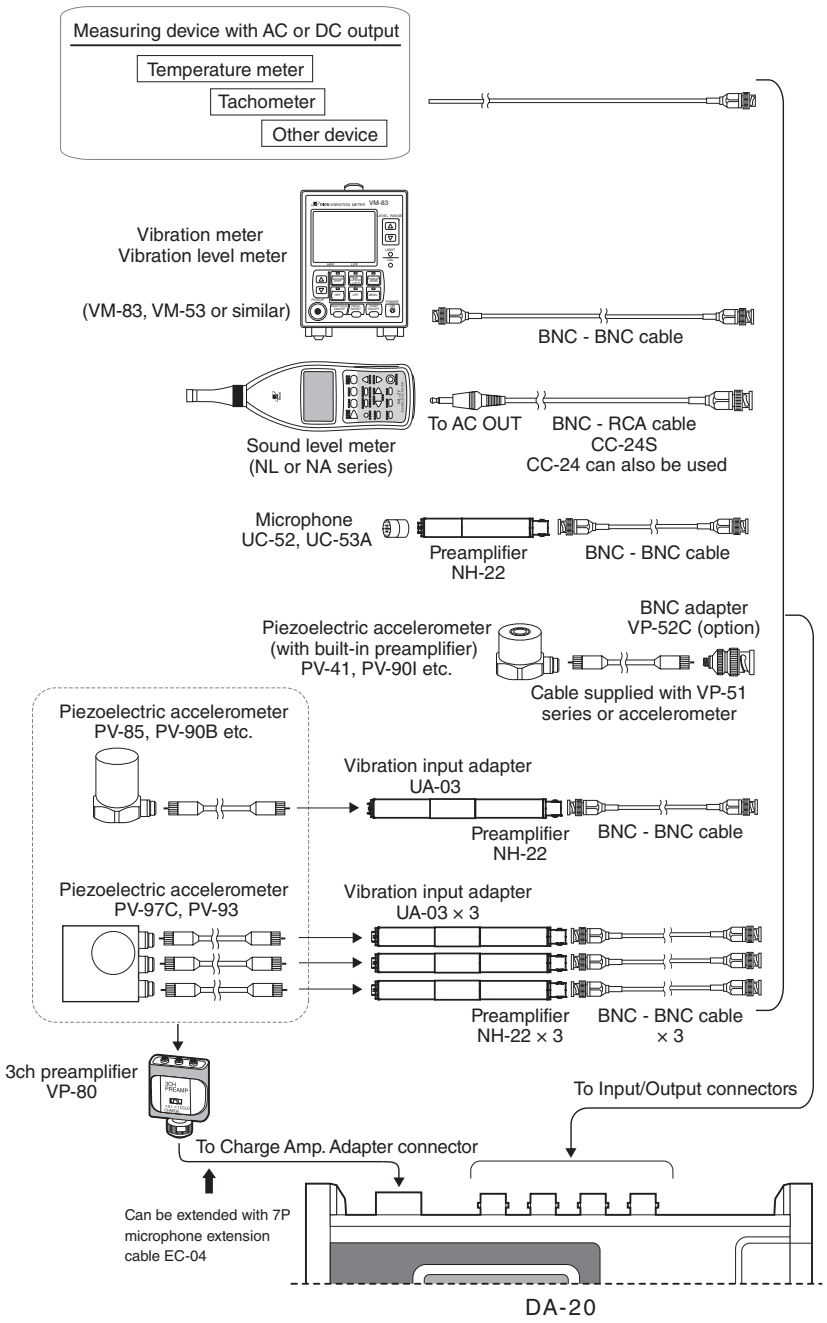
Turn power OFF and then proceed as shown below.

Note
Avoid inserting or removing a CompactFlash card while power is on.



Sensor (external equipment) connections

The DA-20 is designed to handle the output of various sensors (including devices that use a sensor element to convert a physical quantity into an electrical signal). 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 four signal input connectors (BNC connectors) can not only accept a signal, they also allow output of a constant current to a CCLD type sensor. In this case, the sensor configuration has to be a basic preamplifier + accelerometer setup or a microphone. The Charge Amp. Adapter connector (7P connector) is a dedicated connector for the Rion 3ch preamplifier VP-80.
The DA-20 can record up to four input signals simultaneously. These are handled by channels 1 to 4, each with its own input signal connector (1 to 4). In the Charge Amp. Adapter connector, the X, Y, Z channels of the VP-80 are assigned to channels 1, 2, 3.

Input setting (Menu 1 < Input >: Input)

This setting serves to identify the sensor type (AC/DC/CCLD/CHG).
The setting is made for each channel separately, with the "Input" item on Menu 1/6 < Input >.

AC For sensors that output an electrical signal without DC components

Example: AC output of sound level meter or vibration meter

DC For sensors that output an electrical signal including DC components (input range setting must be 1 V or higher)

Example: Temperature meter, tachometer, 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-20. The physical quantity sensor in this case is limited to a microphone or accelerometer.

Example 1: Combination of microphone UC-52 or UC-53A or similar with preamplifier NH-22 or similar

Example 2: Combination of piezoelectric accelerometer PV-85 or PV-90B or similar with input adapter UA-03 and preamplifier NH-22 or similar

Example 3: Piezoelectric accelerometer with built-in preamplifier PV-41 or PV-90I or similar

CHG Piezoelectric accelerometer (using VP-80)

The sensor signal is supplied to the VP-80, and the VP-80 is connected to the Charge Amp. Adapter connector of the DA-20. (In this case, the signal input connectors are not used. For details on this connection, see page 60.)

Example: Piezoelectric accelerometer PV-85 or PV-97C or similar

Sensitivity setting (Menu 3 < Calibration >: Sensor, Sensitivity)

Sensor setting

For AC or DC type sensors, the use of EU (Engineering Units) can be specified. For CCLD type sensors, the physical quantity detection element can be specified as being a microphone or accelerometer. When the Input setting and the Sensor setting have been made, the sensor signal unit will automatically be set. EU can be thought of as a unit symbol for expressing various physical quantities detected by a sensor.

Sensor type	Sensor setting	Signal unit (set automatically)
DC/AC	EU or V	EU or V
CCLD	MIC or PICK	dB or m/s^2
CHG	Fixed to CHG	m/s^2

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/s^2) Set the voltage sensitivity of the accelerometer.

Example: For PV-90I rated for 0.44 mV/(m/s^2), the setting should be "0.44".

Example: For PV-85 rated for 6.42 pC/(m/s^2), capacitance 720 pF, connected with a cable (capacitance 180 pF) to the UA-03 and then to the preamplifier NH-22 (gain -0.3 dB), the voltage sensitivity should be set as shown below.

Compensated sensitivity value = $6.42/(720+180)\times10^{(-0.3/20)} = 6.89 \times10^{-3}$ → "6.89" mV/ (m/s^2)

pC/(m/s^2) Set the charge sensitivity of the accelerometer (using VP-80). When VP-80 is set to "× 0.1", charge sensitivity must be multiplied by 0.1.

Example: For PV-85 rated for 6.42 pC/(m/s^2), the setting should be "6.42". When the VP-80 is set to "× 0.1", the setting should be "0.64".

dB Set the microphone sensitivity level.

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".

EU Set the physical quantity corresponding to a sensor signal voltage of 1 V.

Example: For a tachometer rated for 10 kHz/V, the setting should be "1.00E+04".

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

Input range value after conversion	Unit	Sensitivity value	Sensor type
X [V]	[V]	None	DC/AC (---)
K × X	[EU]	K[EU/V]	DC/AC (EU)
94-S+20log(X) [dB]	[dB]	S[dBV/Pa]	MIC (CCLD)
1/(V/1000) × X	[m/s^2]	V[$mV/m/s^2$)]	PICK (CCLD)
1/(C/1000) × X	[m/s^2]	C[$pC/(m/s^2$)]	CHG (VP-80)

Some practical examples for applying the respective formula to actual sensitivity values are shown below. These values are shown as input range. (For the PV-85, the VP-80 is used.)
(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.)

Sensor	Sensitivity	Unit	Actually displayed input range value						
General	1	V	10V	3V	1V	0.3V	0.1V	0.03V	0.01V
Tachometer	K=1.0E+04	EU	1.0E+5	3.2E+4	1.0E+4	3.2E+3	1.0E+3	3.2E+2	1.0E+2
UC-53A	S=-28.8	dB	143dB	133dB	123dB	113dB	103dB	92.8dB	82.8dB
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
PV-85	C=6.42	m/s^2	1.6E+3	4.9E+2	1.6E+2	4.9E+1	1.6E+1	4.9E+0	1.6E+0

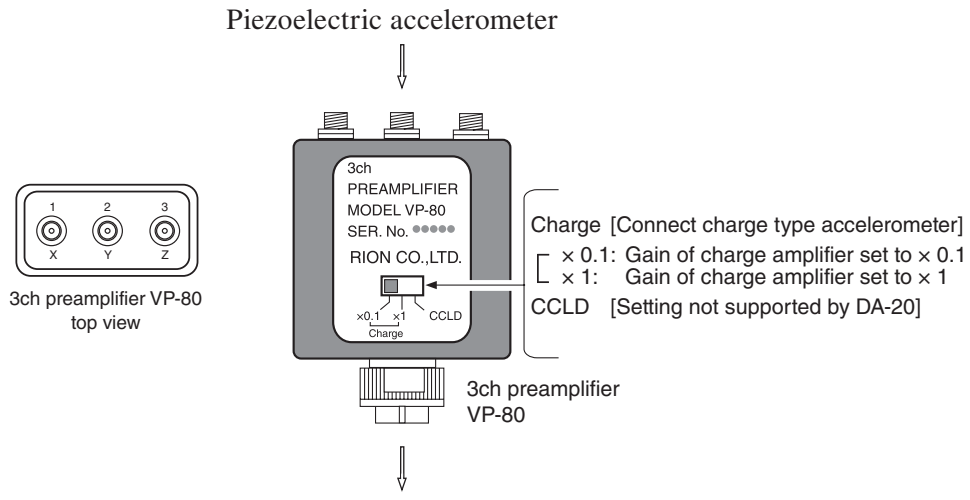
Input settings and sensitivity settings for some representative sensors are shown below for reference. The sensitivity value differs for each sensor.
(For channels where "Input" is set to "DC", the input range cannot be lower than 1 V.)

Sensor example	Input	Sensor	Sensitivity	Sensor sensitivity unit
DC output of general measuring device or sensor	DC	-----	No setting	1
		EU	X.XXE+XX	EU/V
AC output of general measuring device, sensor, vibration meter, sound level meter	AC	-----	No setting	1
		EU	X.XXE+XX	EU/V
Microphone: UC-52 + Preamplifier: NH-22	CCLD	MIC	Sensitivity level (-0.1 to -99.9)	dB dB (re.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-03 + Preamplifier: NH-22	CCLD	PICK	Voltage sensitivity (0.01 to 99.99)	mV/(m/s^2)
Piezoelectric accelerometer: PV-85 + 3-ch preamplifier: VP-80	CHG	CHG	Charge sensitivity (0.01 to 99.99)	pC/(m/s^2)

Connection of 3ch preamplifier VP-80

To make connections for a VP-80 and piezoelectric accelerometer, turn power to the DA-20 off and then perform the following steps.

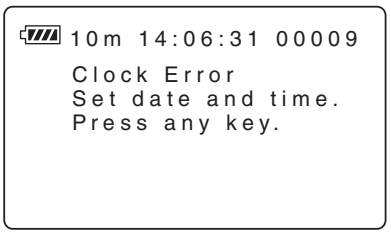
1. Attach the 3ch preamplifier VP-80 to the DA-20. If an extension is required, the extension cable EC-04 or similar can be used.
2. Connect up to three piezoelectric accelerometers to the 3ch preamplifier VP-80. Do not use CCLD type sensors such as an accelerometer with built-in preamplifier.
   The 1, 2, 3 (or X, Y, Z) connection will correspond to the signal input connectors 1, 2, 3 of the DA-20.
3. Set the slide switch on the name plate of the 3ch preamplifier VP-80 to "× 0.1" or "× 1".
   The DA-20 does not support the CCLD setting of the VP-80.
4. Turn power to the DA-20 on and make the following settings for channels to which a piezoelectric accelerometer is connected.
   - To enable the connection, set the "Input" item of Menu 1 < Input > to "CHG".
   - When the 3ch preamplifier VP-80 has been set to "Charge × 0.1", set the "Sensitivity" item of Menu 3 < Calibration > to 1/10 of the charge sensitivity.



Calendar (Menu 6 < Date Time >: Date, Time)

The DA-20 has a built-in clock and calendar. Before starting to use the unit, check the date/time setting and correct it as necessary. (On screens other than Menu 6, the year or the month/day are not shown.)

The DA-20 will operate even if the date and time have not been set, but the following message will appear at startup and every time when starting to record. You can cancel the message by pressing any key.



Calendar not set message

Display contrast (Menu 5 < System >: LCD Contrast etc.)

You can adjust the display contrast for best readability. There are two ways of doing this.

(1) Call up Menu 5 < System > and adjust the "LCD Contrast" item.

(2) Hold down the [LIGHT] key and use the [▲]/[▼] keys. The [▲] key makes the display darker and the [▼] key makes the display lighter. This is not possible when a menu screen is displayed or when the unit is in the recall mode.

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 pre-time and trigger related items.

Input range setting

The input range can be set in 7 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-20.

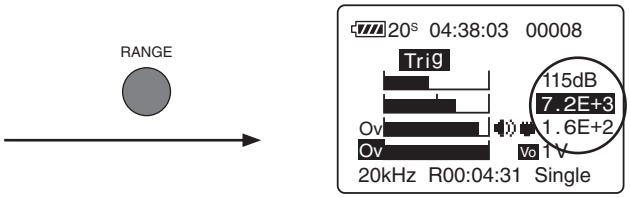
For improved S/N ratio, setting the input range as low as possible without causing overload is generally preferred. For inspection of products and other kinds of periodic measurements, it may be necessary to keep the input range setting the same, in order to allow product comparisons and to detect deterioration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

To set the input range, proceed as follows.

(The setting cannot be changed in recording or recall mode. For DC channels, the input range cannot be lower than 1 V.)

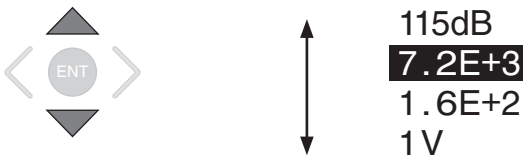
1. Activate cursor in input range display section

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



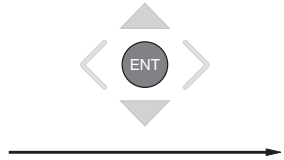
2. Select the channel for which to change the input range

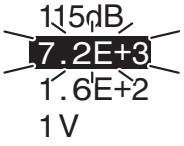
   Use the [▲]/[▼] keys to move the cursor to the channel whose input range setting you want to change.



3. Activate the range change mode

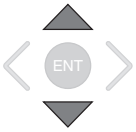
   Press the [ENT] key to allow changing the current input range setting. Verify that the cursor flashes.

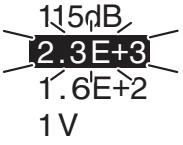




4. Select the new input range setting.

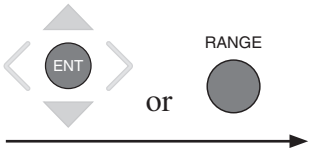
   Use the [▲]/[▼] keys to change the input range. The new value becomes effective immediately. (If no other channel needs to be changed, you can press the [STOP] key to complete the range setting procedure.)

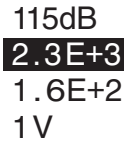




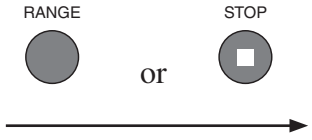
5. Confirm the new input range setting.

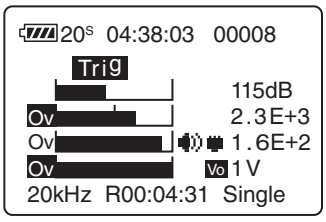
   Press the [ENT] key or [RANGE] key to return to the condition of step 2.





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

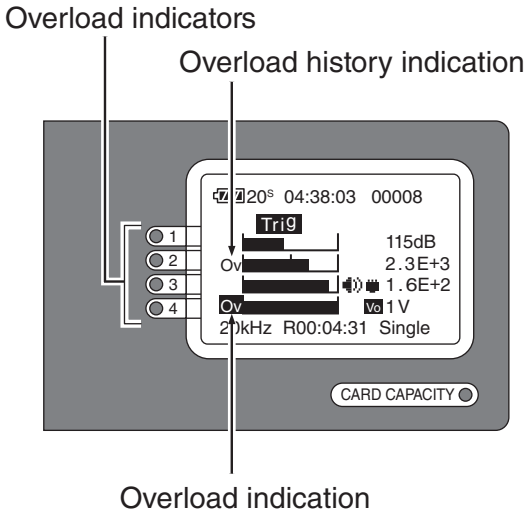




Input range setting and overload

In step 4, set the input range while checking whether overload occurs. When this happens, the overload indicator 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 Ov 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 begins, allowing the operator to determine later whether there has been overload without having to constantly check the overload indicator.



Sampling

The sampling action of the DA-20 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 6 steps (100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 20 kHz). Make the setting using the "Freq.Range" item in Menu 2 < Rec.Parameters >.

The frequency range value represents the highest effective frequency that will be included in the recorded waveform. When analyzing a waveform recorded with the DA-20, consider only components that are below the frequency range setting value.

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 "Samp.Freq" item in Menu 2 < Rec.Parameters >.

Recording process

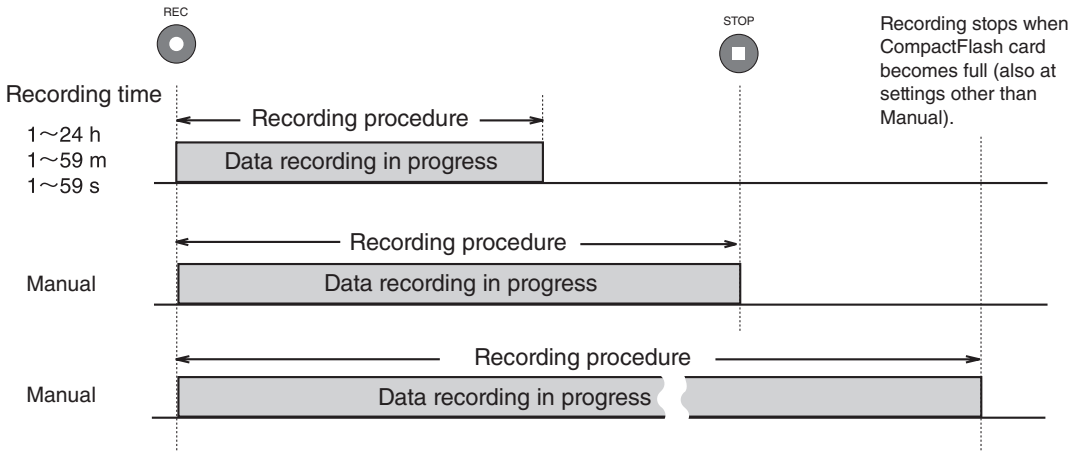
When you press the [REC] key, the data recording operation starts. However, if the trigger function (described later) is used, recording may not begin right away. In such a case, actual recording will only start when the trigger conditions are met, or in other words when a trigger event occurs.

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.



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

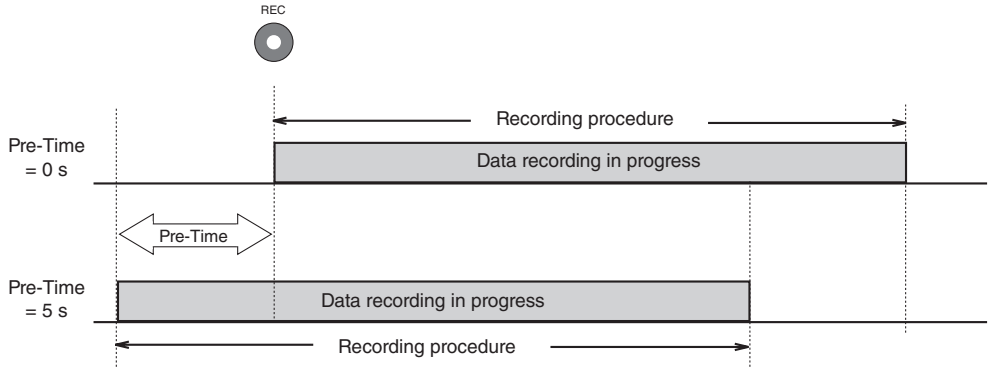
The recording time setting cannot exceed the remaining available capacity of the CompactFlash card inserted in the DA-20. If this applies, the recording time will automatically be changed to the maximum available time at the point where the [ENT] key is pressed.

Setting the pre-time

If you wish to include data from a point slightly before the [REC] key was pressed, use the pre-time function. The three available pre-time settings are 0, 1, and 5 seconds. The pre-time function also works in conjunction with the trigger function (described later).

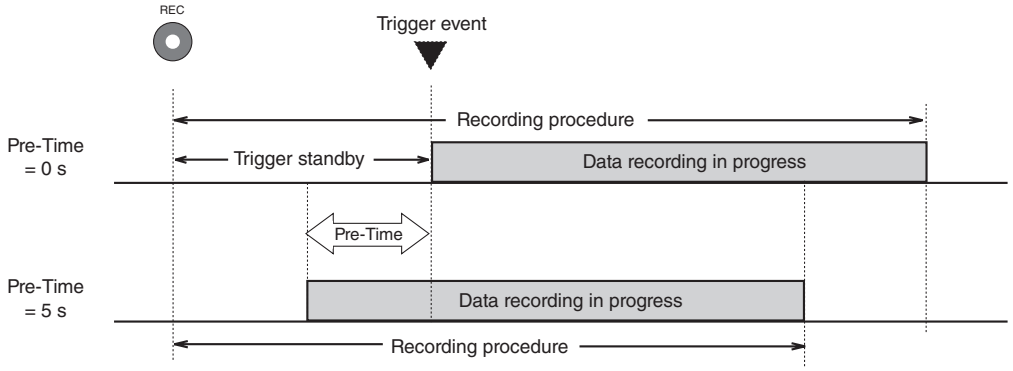
The overall recorded data length corresponds to the recording time. (The pre-time data do not represent added data, they are included in the total.)

Make the pre-time setting using the "Pre-Time" item in Menu 2 < Rec.Parameters >.



Difference in recording procedure with pre-time

(Pre-time setting 5 s, recording time setting not Manual, trigger mode Free)



Difference in pre-time recording procedure with trigger

(Pre-time setting 5 s, recording time setting not Manual, trigger mode Single)

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. Only trigger events that occur while the DA-20 is in the trigger standby condition are valid. Any trigger events that occur while data recording is in progress are disregarded.

Setting the trigger mode

This setting determines the basic trigger operation.

Make the trigger mode setting using the "Mode" item in Menu 4 < Trigger >.

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

Free (trigger off)

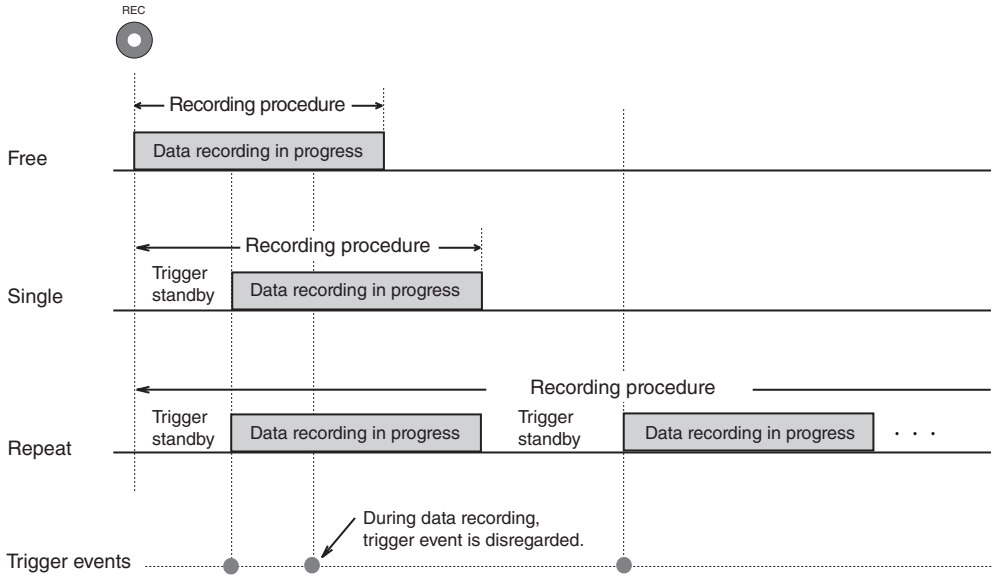
Recording starts immediately when the [REC] key is pressed and ends when the amount of data corresponding to the recording time has been recorded.

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.



Difference in recording procedure according to trigger mode

(Pre-time setting 0, recording time setting not Manual, trigger type not External Gate)

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 4 < Trigger >.

Level (level trigger)

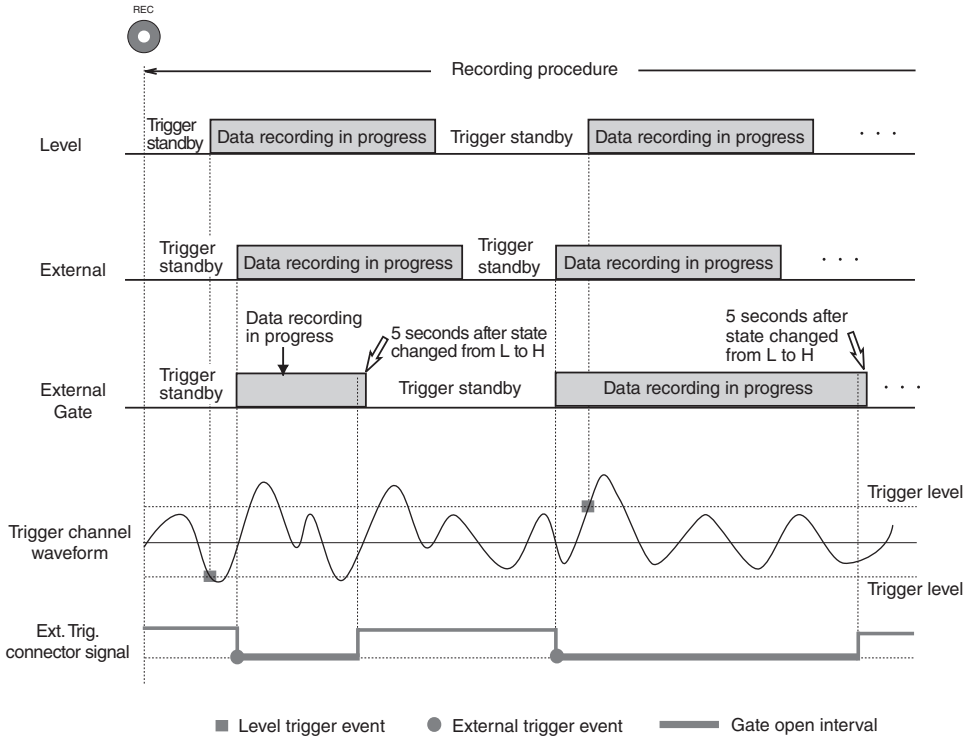
A trigger event occurs when the level of the input signal in the specified channel (trigger channel) becomes higher than a preset value (trigger level).

External (external trigger)

A trigger event occurs when the state of the Ext. Trig. connector changes from H to L.

External Gate (external gate trigger)

Data recording is carried out while the state of the Ext. Trig. connector is L. Also after the state changes to H, recording continues for five seconds. With this trigger type, the recording time setting has no effect.



Difference in recording procedure according to trigger type

(Pre-time setting 0, recording time setting not 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 4 < Trigger >.

The actual trigger level is indicated on the bar graph for the trigger channel (see page 17).

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 4 < Trigger >.

Auxiliary function setup

ID number (Menu 6 < Date Time >: ID)

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

1. Temporary management (classification) of recorded data
   - Example 1 In a system where several DA-20 units are used, the ID 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.

   In the above cases, it is recommended to ultimately save recorded data in dedicated folders on a computer, or use commercially available data management software.
2. Using ID number as sensor range information

   When using a system where a calibration signal is recorded in order to calibrate recorded data, sensor range information will be required.

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 4 signal. The audio level is indicated by the bar graph for channel 4, and the indication VOICE 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. (This operation is not affected by the setting for operation during data recording, as described below.)

While data are being recorded

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

Voice Only

The channel 4 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 4 is recorded.

OFF (Marker)

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

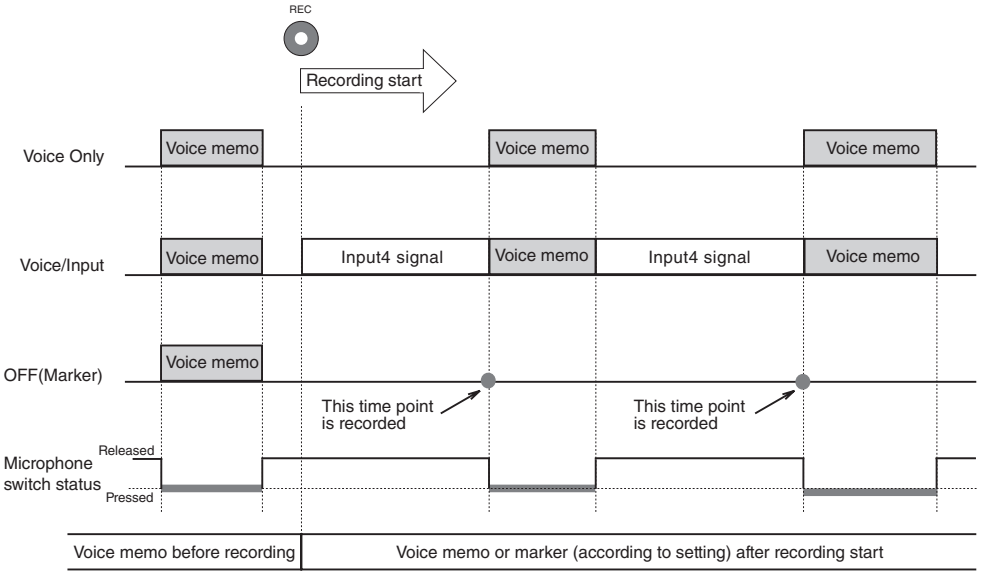
The "Voice Only" or "Voice/Input" setting can only be selected when the frequency range setting is 1 kHz or higher.

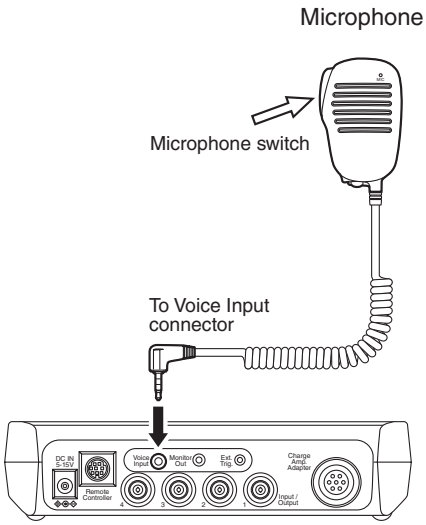
Marker

The marker function is only available during data recording. Marker recording does not affect the operation of channel 4. The maximum number of marker points that can be set between the beginning and the end of data recording is about 3,000. When not using the marker function, you should disconnect the microphone.

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.



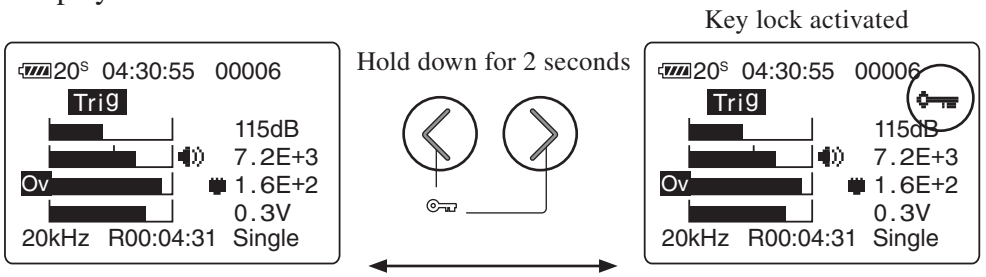


Preventing inadvertent operation

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

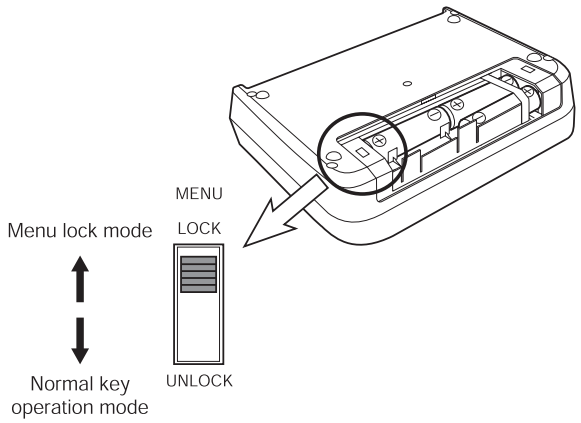
Pressing and holding the [<] and [>] keys together for a few seconds activates the key lock condition. In this condition, all keys except the [LIGHT] key and the [<]/[>] keys are locked. Remote control operation remains possible. To cancel the key lock state, press and hold the [<] and [>] keys once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

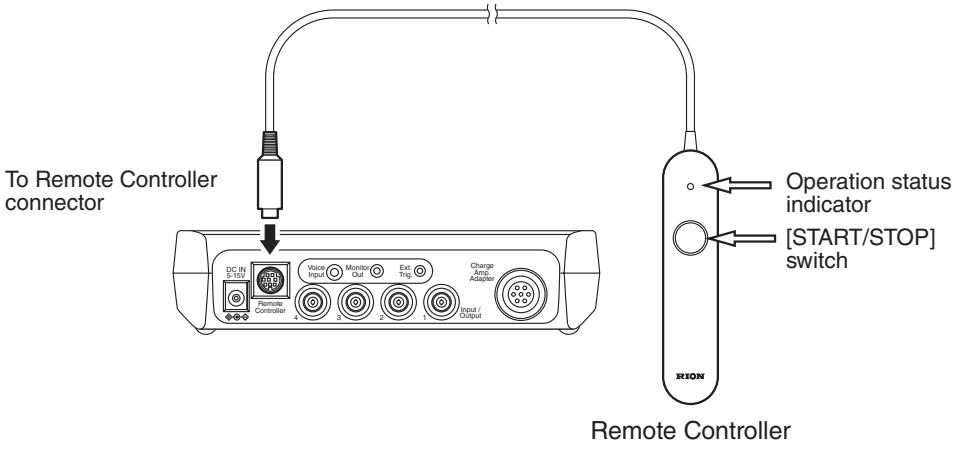
If you call up a menu and attempt to make a setting, or if you attempt to delete data in recall mode, the indication MENU LOCKED appears.



Remote control operation

The optional Remote Controller 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-20.

The Remote Controller allows for example centralized control of measurement system including other devices, with the DA-20 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-20 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	Data recording in progress
Flashing green	Trigger standby
Lit red/flashing green	Overload occurred during trigger standby
Lit red (1 second or more)	Overload occurred (before or after recording start)
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 level range setting to prevent overload.

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-20 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. (The pages given for reference are not necessarily the only ones where related information is found.)

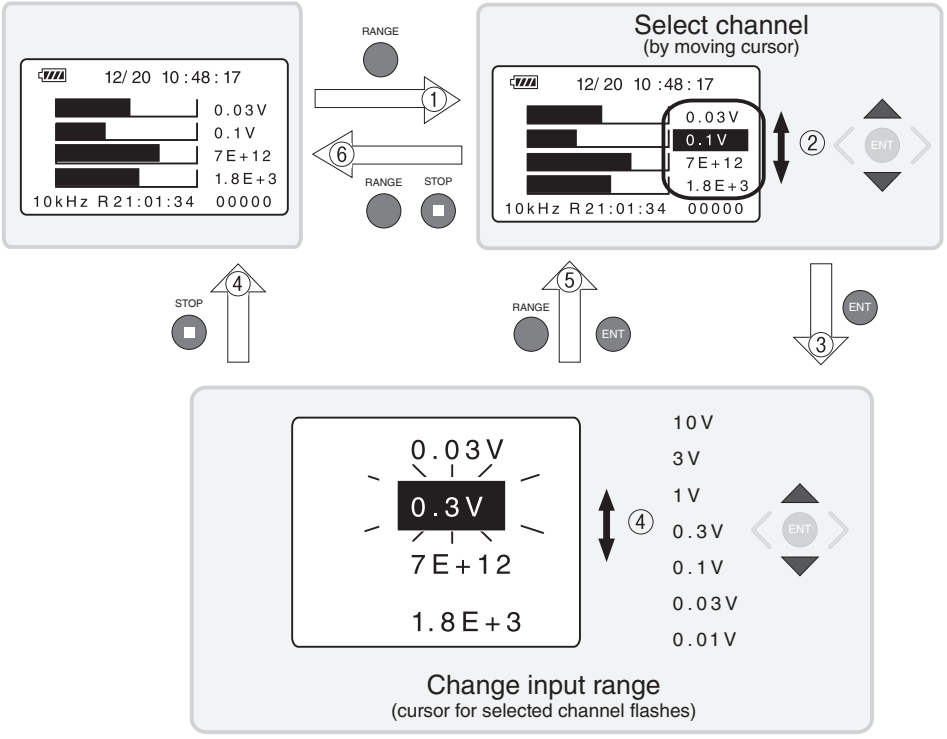
1. Power supply
   - ☐ Are inserted batteries in good condition? Are spare batteries available? (See pages 17, 47)
   - ☐ Are AC adapter and power cord available?
   - ☐ Are power-on mode settings appropriate? (See page 49)

2. Auxiliary functions
   - ☐ Are voice memo and marker settings appropriate? ("Voice" item of Menu 2 < Rec.Parameters >) (See pages 38, 74)
   - ☐ Has key operation been restricted as required by the usage environment? (Key lock, menu lock mode) (See page 77)
   - ☐ Has Remote Controller been made available (as required)? Normally, key lock should be enabled when using Remote Controller.
   - ☐ Is ID number setting appropriate? (See page 73)
3. CompactFlash card
   - ☐ Is CompactFlash card appropriate for use in DA-20? (Insert card and check for messages.) (See page 109, 111)
   - ☐ 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 page 8)
4. External equipment connection
   - ☐ Is sensor configuration appropriate? Have sensor been connected correctly? (See page 53, 54, 60)
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 page 56 to 59)
   - ☐ 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 page 66 to 72)
   - ☐ Frequency range, sampling frequency (See page 65)
   - ☐ Recording time (See page 66)
   - ☐ Sensitivity setting (See page 56 to 59)
   - ☐ Input range (See page 62 to 64)

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. Verify that the cursor flashes.
4. Use the [▲]/[▼] keys to change the input range. The new value becomes effective immediately. At this point, you can press the [STOP] key to complete the range setting procedure.
   For DC channels, the input range cannot be lower than 1 V.
5. Press the [ENT] key or the [RANGE] key.
6. If you want to change the input range for another channel, repeat steps 2 to 5. Otherwise press the [RANGE] key or the [STOP] 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 will also be required (if range switching is possible).

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

1. Sensor input range setting (not input range setting of DA-20) was changed. In this case, the same measurement quantity input may result in a different output signal being supplied to the DA-20.
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-20.
3. Other cases

3. Recording

Starting to record

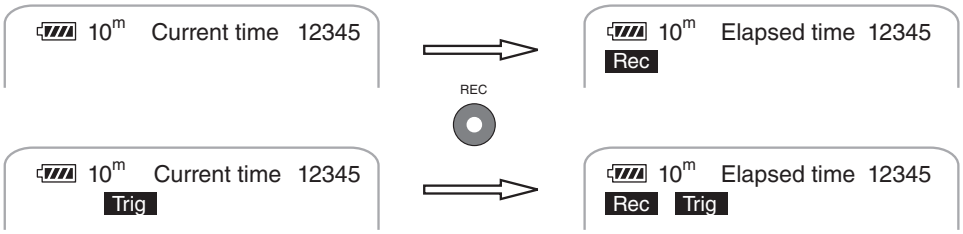
Press the [REC] key.

The recording procedure begins.

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

While recording is in progress, the Rec indication 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 pre-time function is used, the elapsed time count does not start from zero but from the pre-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 cancel the message. Any [REC] key operation is disregarded.
- [Clock Error. Set date and time. Press any key.]
  ⇒ Calendar information has not been set. Press any key to cancel the message. Recording can be started in this condition.
- [Card Error. Remove or format card.]
  ⇒ A CompactFlash card that cannot be used in the DA-20 was inserted. Press any key to cancel the message. Any [REC] key operation is disregarded.
  Format the card in the DA-20 or insert another CompactFlash card.

When does the recording procedure stop?

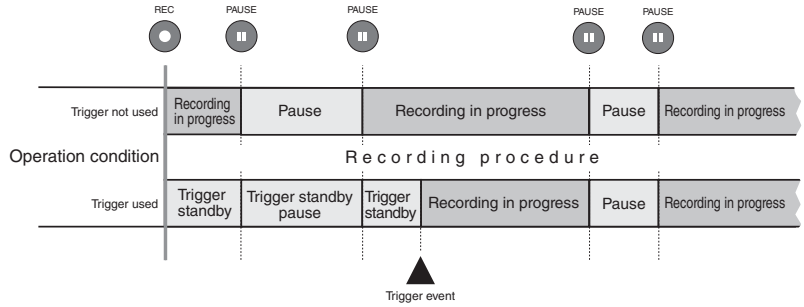
The recording procedure stops in the following cases.

When the recording time setting is "Manual" or when the trigger mode setting is "Repeat", the recording procedure stops only in cases 2 and 3.

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.

"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. 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.

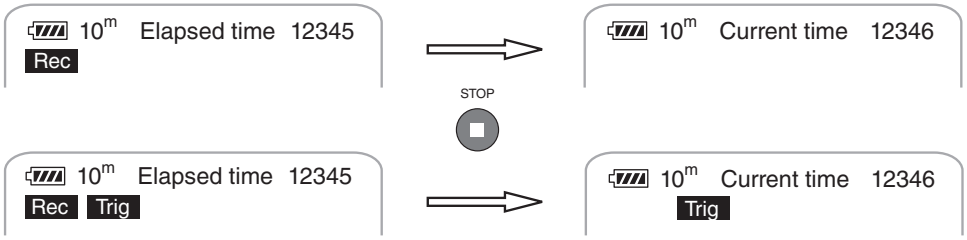
Terminating a recording partway

Press the [STOP] key.

The REC indicator and the Rec indication go out and recording stops.

> Now Closing file.
> Do not remove Card.

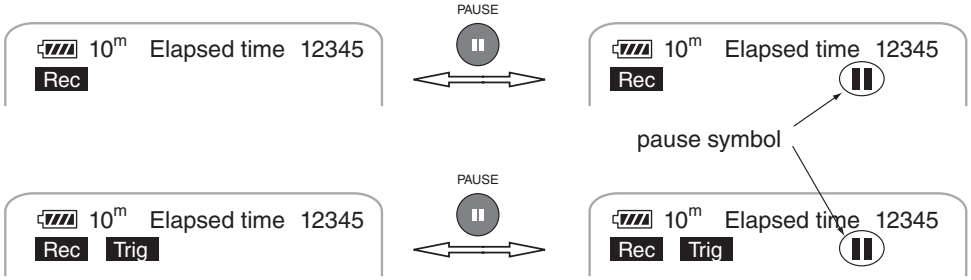
While the above message is shown, do not remove the CompactFlash card, because data are being written to it. When the writing process is completed, the index number is incremented by 1.



Pausing/restarting recording or trigger standby

Press the [PAUSE] key.

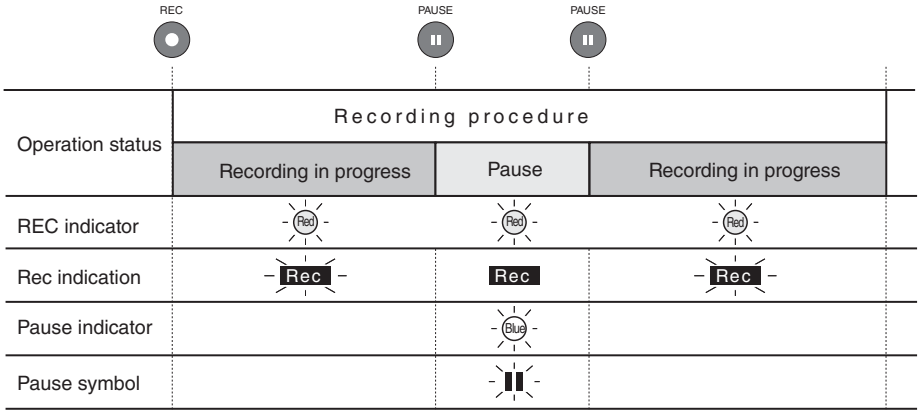
The recording or trigger standby condition is paused. The ❚❚ symbol on the display flashes.
When you press the [PAUSE] key again, the ❚❚ symbol disappears and recording or trigger standby resumes.



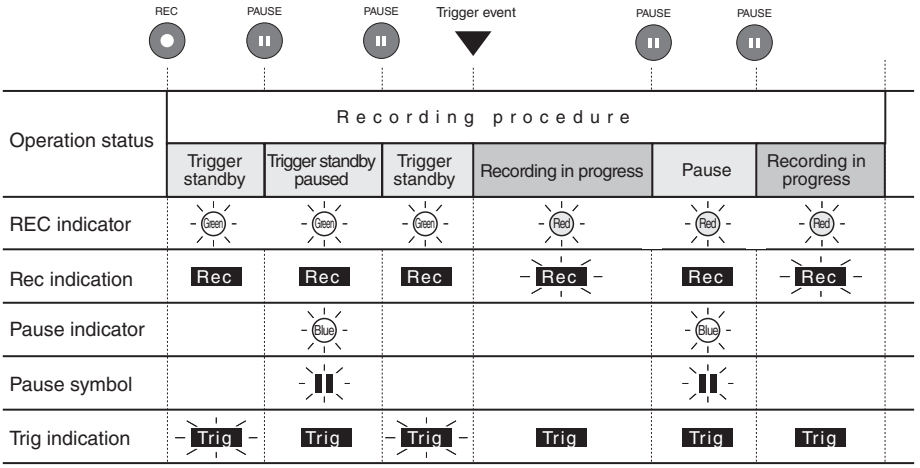
In the pause or trigger standby condition, the elapsed time count stops. The voice memo and marker function can also not be used.

Recording procedure conditions and indicator/display status

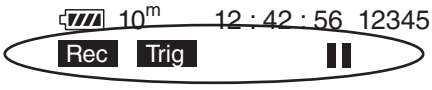
The various conditions of the unit during the recording procedure can be checked using the indicators and the LCD panel.
The two illustrations below show the various conditions, with and without the use of the trigger function. (Flashing of an indicator or symbol is indicated in the illustration as -☼-.)



Basic recording



Recording with trigger function

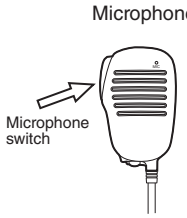


Position of Rec indication, Trig indication, and Pause symbol

Using the voice memo/marker function

Voice memo

Voice memo recording starts when the microphone switch is pushed and stops when the switch is released. While recording a voice memo, the indication VOICE is shown on the bar graph for channel 4.



VOICE Vo 0.3V

Voice/Input setting: Shown during voice memo recording

VOICE Vo ONLY

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 cannot be pressed.

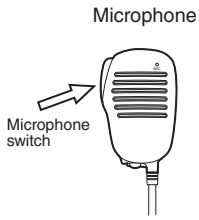
When the unit is currently performing the recording procedure, voice memo recording can be started only while recording is in progress (not during pause or trigger standby).

When channel 4 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.

Marker

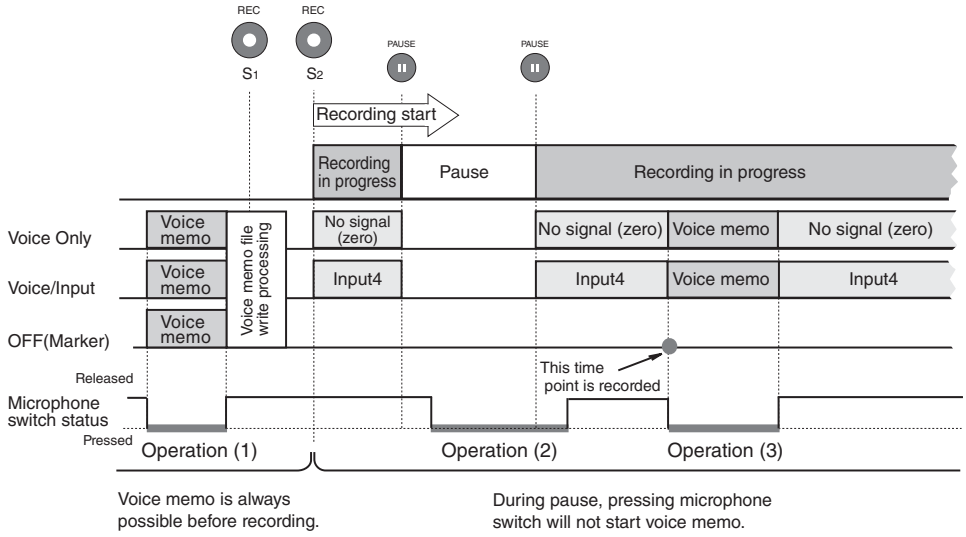
When the microphone switch is pressed while data are being recorded, the current time is recorded as a marker. Pressing the switch also causes the indication MARKER to appear on the bar graph for channel 4 for about one second.

The marker function is not limited by the frequency range setting, but it can only be used while recording is in progress. To use the function, the "Voice" item of Menu 2 < Rec.Parameters > must be set to "OFF (Marker)".

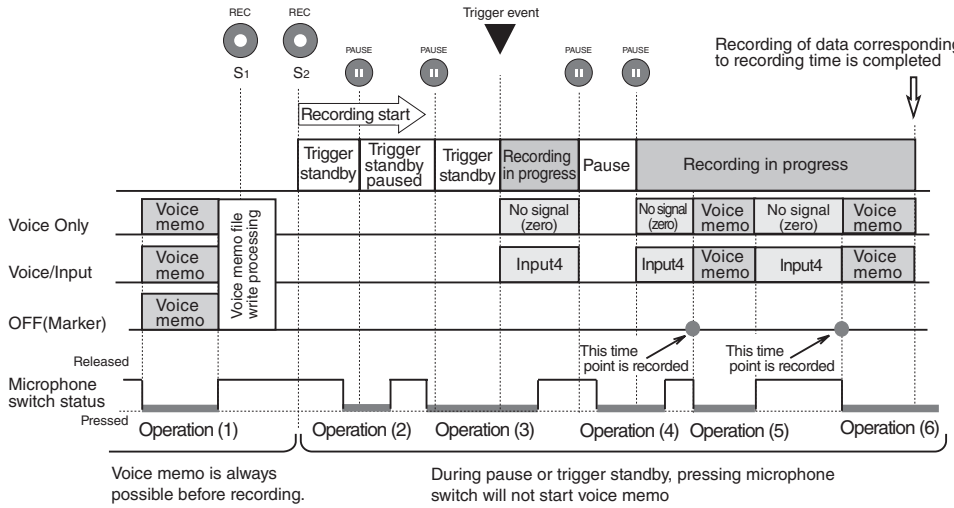


1 V

Marker (OFF) setting: Shown immediately after marker operation



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 CompactFlash card, [REC]S_1 is not accepted, and at the time of [REC]S_2, recording may already be in progress. Voice memo operations during the pause interval (2) are disregarded (the unit returns to the recording in progress condition while the microphone switch is pressed, but voice memo does not start). During the voice memo interval (3), voice memo recording is carried out when the microphone switch is pressed. 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. When the interval from [REC]S_2 until the trigger event is considered as pause, the operation is the same as when the trigger function is not used. During the voice memo operation interval (6), 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 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-20.

Connect the comparator output of the sound level meter to the Ext. Trig. connector of the DA-20, using the cable CC-94A. Connect the AC output of the sound level meter to the signal input connector 1 of the DA-20.

Make the DA-20 settings as follows.

Input settings

(Channel 1 is to be used for waveform recording. Channel 4 is to be used exclusively for voice memo recording.)

Channel 1	AC	LPF/HPF both OFF	No EU
Channel 2	OFF		
Channel 3	OFF		
Channel 4	DC	LPF/HPF both OFF	No EU

Auxiliary functions

Set ID number to level range value of sound level meter (to be used together with calibration signal recording)

Key lock ON Voice memo setting: Voice Only

Recording parameters

Trigger mode: Repeat Trigger type: External

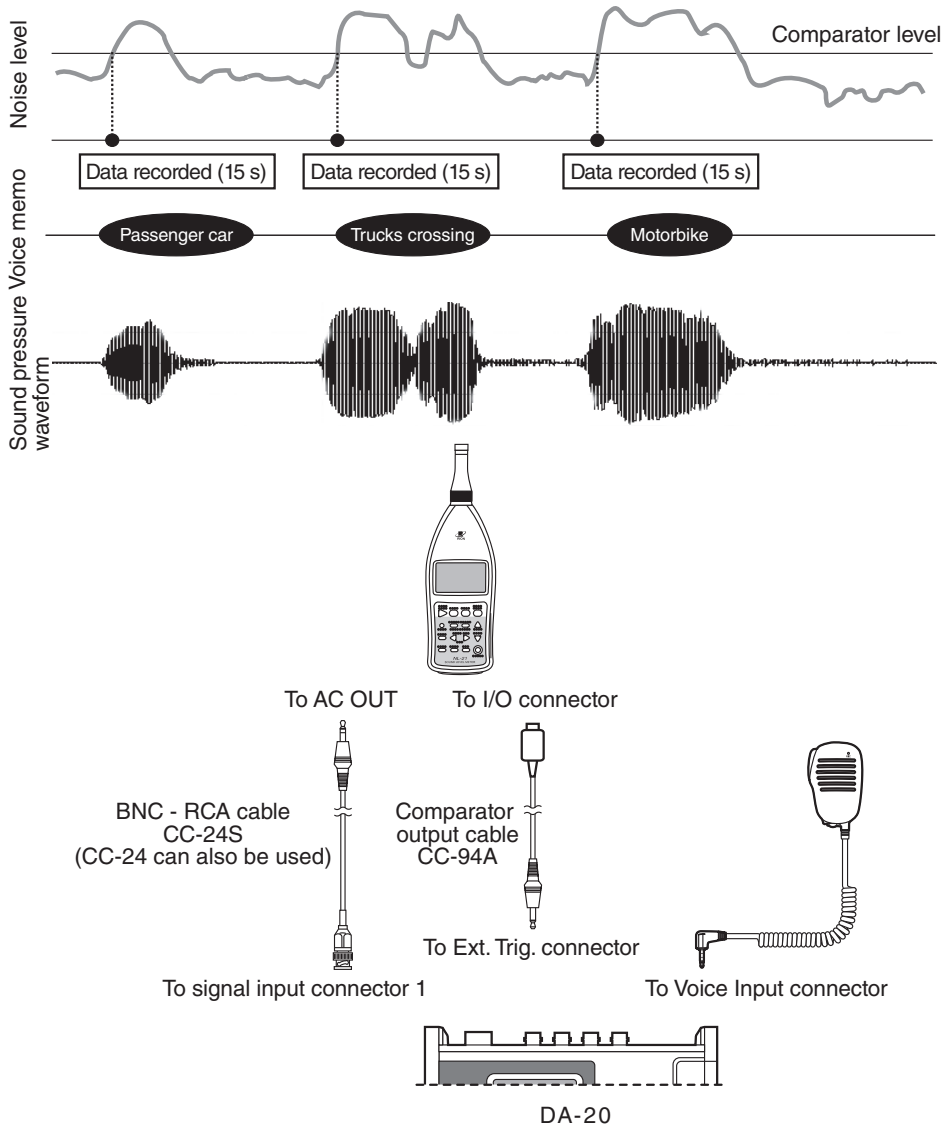
Recording time: 15s Pre-time: 5s

Frequency range: 20 kHz Sampling frequency: × 2.56

Input range: suitable setting

Procedure

1. Record calibration signal of sound level meter (at this time, trigger mode should be set to "Free" and recording time should be "10s").
2. Cancel calibration mode at sound level meter and set trigger mode back to "Repeat" and recording time to "15s".
3. Press the [REC] key to start recording.
4. Record voice memo as necessary.



Generated file name	D00005 (Trigger1)	D00006 (Trigger2)	D00007 (Trigger3)
Recorded sound pressure waveform (channel 1)			
Voice memo (channel 4)	Passenger car	Trucks crossing	Motorbike

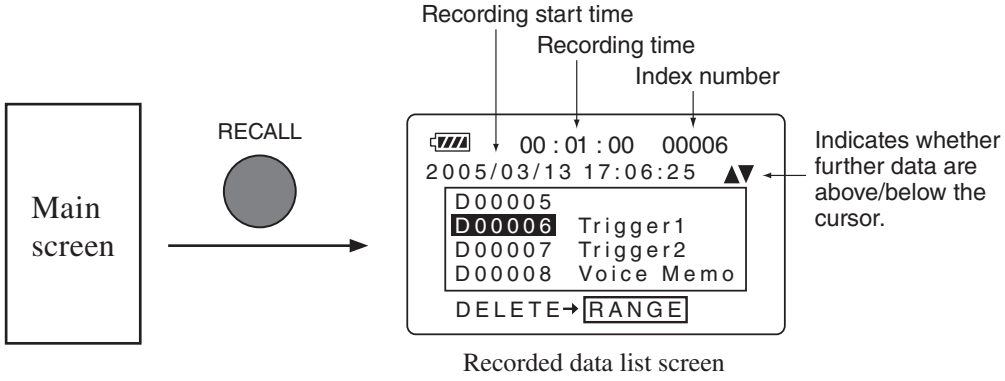
In this example, it is assumed there are already four recorded data on the CompactFlash card. The file name therefore starts from D00005.

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.

Activating recall mode

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



Recorded data list screen

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

1. If playback signal of recorded data is also output from signal output connectors ("Play" item of Menu 5 < System > set to "BNC ON")
   Depending on the type of signal that is output in recall mode, a connected sensor may be destroyed by the playback signal. To use this setting effectively, you should disconnect any sensors.
   When you press the [ENT] key, the message disappears and the recall mode is activated.

   Take off sensors.
   OK → ENT

2. If no CompactFlash card is inserted

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

3. If there are no recorded data

   The recall mode cannot be activated. Press any key to return to the main screen.

   No recall data!
   Press any key.

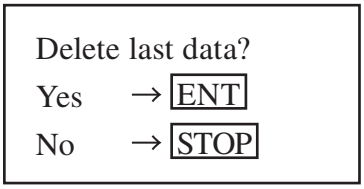
Making a rough check of recorded data

On the recorded data list screen, the recording start time, recording time, and index number for the data selected by the cursor are shown. The "XXXXX" of "DXXXXX" corresponds to the index number. The recording time shown is the actual recording time of the data. This may be shorter than the recording time set with the menu, for example if recording was stopped partway. If voice memo information was recorded from the main screen, the indication "Voice Memo" is shown. For data recorded with the repeat trigger function, a comment such as "Trigger n" (where n denotes the trigger count) is shown. Use the [▲]/[▼] keys to move the cursor. The ▲, ▼, or ▲ ▼ indication to the right of the recording start time shows that there are more data in the indicated direction.

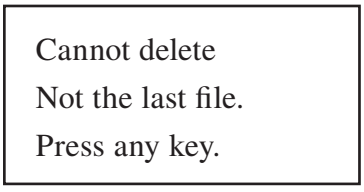
Deleting recorded data

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

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

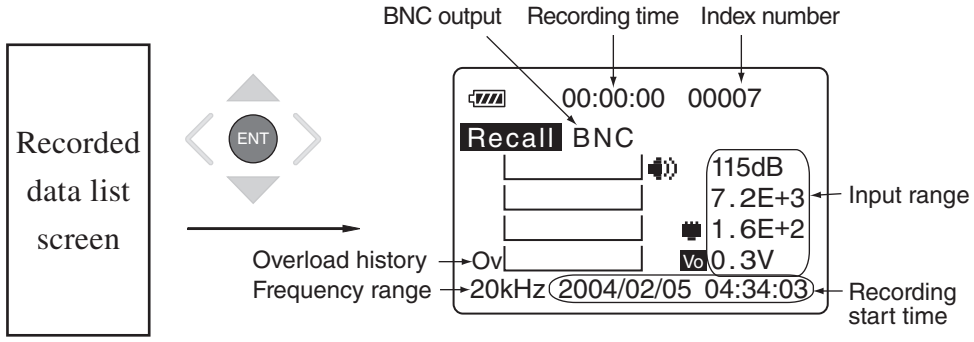


By repeating this procedure, you can delete multiple data, always with the highest index number.
It is not possible to specify recorded data with a lower index number for deletion. In such a case, the message shown below appears. Press any key to cancel the message, or wait until the message disappears automatically.



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, input range, overload history, and whether the playback signal is being supplied to the signal output connectors.

Playback of recorded data can also be started from this screen. The [<]/[>] keys can be used to select recorded data (change index numbers).

BNC output — When this indication is displayed, the playback signal is being supplied to the signal output connectors. If not, nothing is shown here.

Recording time — This is the actual recording time of the data. Unless the [STOP] key was pressed during recording or the recording was terminated partway for another reason, the value should be the same as the preset recording time.

Playback signal output destination --- check again

When a sensor remains connected to the signal 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.

Important
If the playback signal is applied to a sensor, the sensor may be destroyed. When the output setting for the playback signal is "**BNC**", disconnect all sensors before starting playback.

Playback of recorded data

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

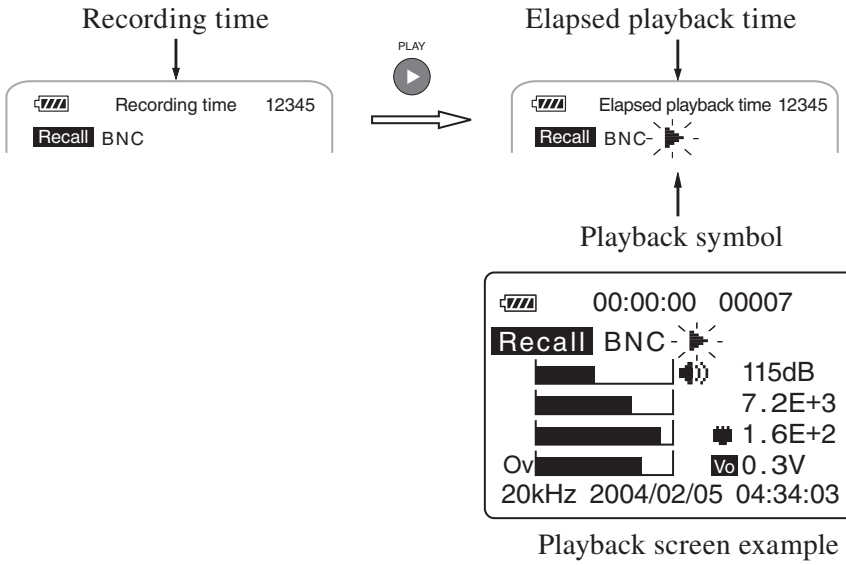
Playing recorded data

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 symbol appears 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 "Play" item on Menu 5 < System > is set to "BNC ON", the playback signal of each channel is also output at the signal output (BNC) connectors. (In this case, the indication "BNC" is shown to the right of Recall .) The recorded data can be checked by supplying these signals to earphones, monitoring devices, or similar.

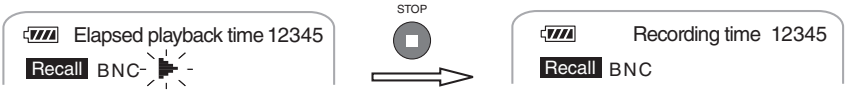


Playback screen example

Stopping playback partway

Press the [STOP] key.

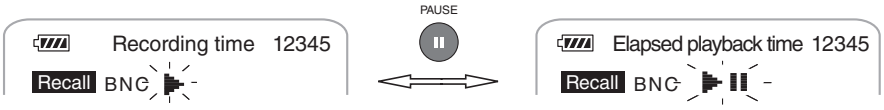
The PLAY indicator and playback symbol go out, and the unit returns to the recall screen.



Pausing and restarting playback

Press the [PAUSE] key.

Playback is halted temporarily. In this condition, the pause symbol flashes on the display.
When you press the [PAUSE] key once more, the pause symbol goes out and playback resumes.

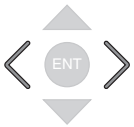


Playback in progress

Playback paused

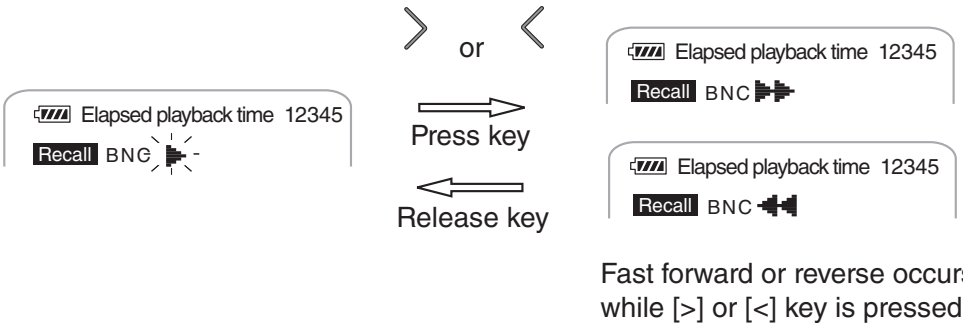
Performing fast forward or reverse during playback

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.

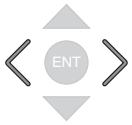
The speed of fast forward or reverse is about 4 times higher than regular playback.



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

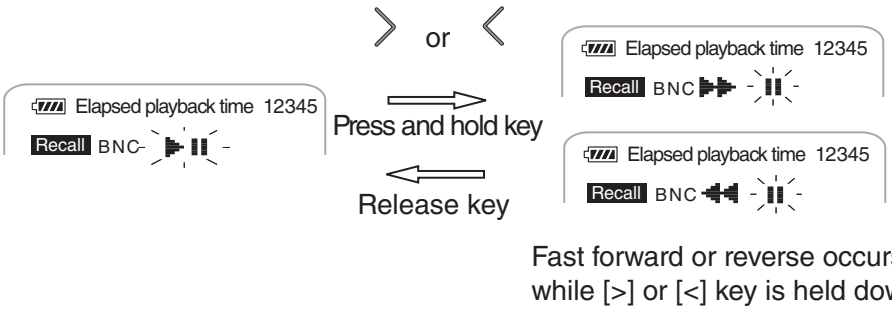
High-speed forward or reverse

Press and hold the [>]/[<] keys during playback pause.



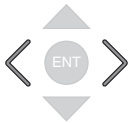
When you press and hold the [>] or [<] key for more than 1 second, the playback position is moved at high speed forwards or backwards. When you release the key, the unit again goes into the playback pause condition. The speed of fast forward or reverse in this case is about 60 times higher than regular playback.

If you press the [>] or [<] key and release it within 1 second, the playback position jumps to the voice memo start position or marker position.



Jumping to the voice memo start position or marker position

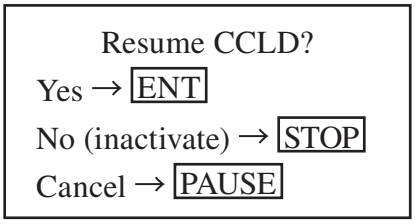
Press the [>]/[<] keys during playback pause.



When you press the [>] or [<] key, the playback position jumps forwards or backwards to the next 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.

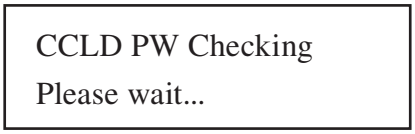
Canceling recall mode

When you press the [RECALL] key at the 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 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.

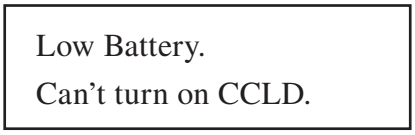


[ENT] key: CCLD setting that was active before entering recall mode is established again.
[STOP] key: CCLD setting is changed to AC.
[PAUSE] key: Recall mode shutdown is canceled (unit stays in recall mode).

When the CCLD setting is reestablished by pressing the [ENT] key, the power supply condition is checked first, before returning to the main screen.



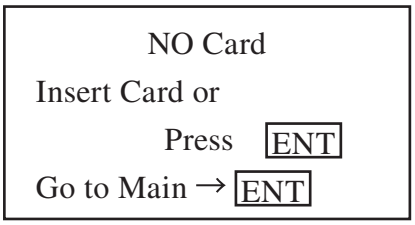
If the power supply (battery capacity) is too low for CCLD, the message shown below appears. Replace the batteries with a fresh set, or use the dedicated AC adapter NC-98 series.



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 following message appears.



Case 1

When you reinsert the CompactFlash card, the recorded data list screen appears again after a few seconds. However, the index number is automatically reset to 00001.

Case 2

When you press the [ENT] key, the main screen appears. In this case, no recording or data recall is possible until a suitable CompactFlash card has been inserted.

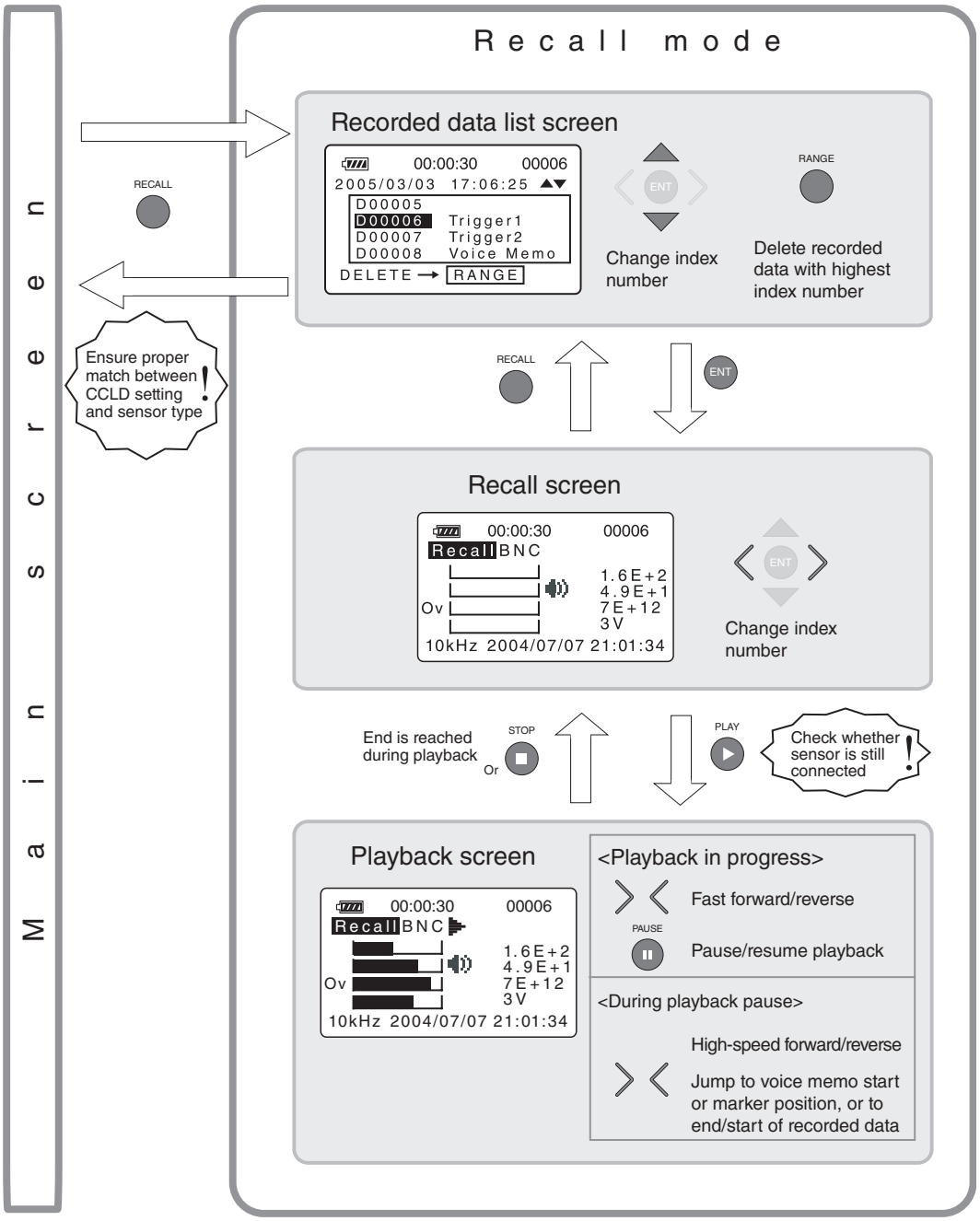
About the supplied viewer software (DA-20 Viewer)

The supplied viewer software (DA-20 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.

```
DA20.INI                    Setting file
[WAVEFILE] D00001.WAV       Recorded data with index number 00001
           D00002.WAV       Recorded data with index 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 DA20.INI file contains information about all settings of the DA-20. The supplied viewer software allows you to read this file, edit the settings, and write the file to the CompactFlash card for use in the DA-20. You can also store the file on a different location in the computer, and use suitable file names for example to manage various settings.


Main screen
Recall mode
Recorded data list screen
00:00:30 00006
2005/03/03 17:06:25
D00005
D00006 Trigger1
D00007 Trigger2
D00008 Voice Memo
DELETE → RANGE
ENT
Change index number
RANGE
Delete recorded data with highest index number
RECALL
Ensure proper match between CCLD setting and sensor type !
RECALL
ENT
Recall screen
00:00:30 00006
RecallBNC
1.6E+2
4.9E+1
Ov
7E+12
3V
10kHz 2004/07/07 21:01:34
ENT
Change index number
End is reached during playback
Or
STOP
PLAY
Check whether sensor is still connected !
Playback screen
00:00:30 00006
RecallBNC
1.6E+2
4.9E+1
Ov
7E+12
3V
10kHz 2004/07/07 21:01:34
<Playback in progress>
Fast forward/reverse
PAUSE
Pause/resume playback
<During playback pause>
High-speed forward/reverse
Jump to voice memo start or marker position, or to end/start of recorded data

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 in alphabetical order. A representative display state where the message may appear is given in parentheses.

All channels are 'OFF' ---------- (Menu setting)
Card Error ---------- (At power-on etc.)
Cannot delete.----------(When deleting data in recall mode)
Cannot load settings ---------- (At power-on)
Cannot Record. Card · · · ---------- (Voice memo, recording)
Cannot Record. Index · · · ---------- (Voice memo, recording)
Card Format.---------- (Menu setting)
CCLD PW Checking ----------(Menu setting, recall cancel)
Low Battery. Can't · · · ---------- (After previous message)
Clock Error ---------- (At power-on, recording start)
Delete last data? ----------(When deleting data in recall mode)
Low Battery ---------- (Constantly monitored)
Menu Lock! ---------- (Menu display, deletion)
No Card ----------(Recall mode)
Now Closing file ---------- (Voice memo, recording)
Resume CCLD? ----------(Recall cancel)
Save settings to card.---------- (Menu setting)
Setting file is found.---------- (At power-on)
Take off sensors.----------(Recall mode)

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.)

All channels are ‘OFF’. Cannot Record. Press any key.

Description

All channels are set to OFF.

Countermeasure

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]

Card Error.
Remove or format Card.
Close → ENT

Description

The inserted CompactFlash card cannot be read/written in the DA-20.

- Folder/file structure as required by the DA-20 is not present, or another folder/file structure exists.
- There has been an error managing a file required by the DA-20.
- The card was formatted using a file system other than FAT16, or the card is defective.

Countermeasure

Press the [ENT] key to cancel the message.

Format the CompactFlash card in the DA-20. If the message appears again, format the card in a computer using the FAT16 file system. Then format the card again in the DA-20. If the message still appears, use a different CompactFlash card.

Formatting a CompactFlash card will delete all recorded data stored on the card. Copy any required files to a computer first.

Condition

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

Cannot delete.
Not the last file.
Press any key.

Description

In recall mode at the recorded data list screen, recorded data with an index number other than the highest number was specified for deletion.

Countermeasure

Press any key to cancel the message.

Only the most recently recorded data (with the highest index number) can be deleted. Move the cursor to this entry.

Cannot load settings
Change cards or format card.
OK → ENT

Description

At power-on, the unit attempted to load settings from a setting file, but an error or setting problem was detected. The problem could be setting values that are out of range for the DA-20 or contradictory settings.

Countermeasure

Press the [ENT] key. The setting file is disregarded, and the last settings before power was turned off are established again.

The setting file can be overwritten using the "Save setting" item of Menu 5 < System >. This will not correct the error but update the file with the current settings. Because the "Card Format" item of Menu 5 < System > will not delete or overwrite the setting file, this also does not correct the error.

Cannot Record.
Card capacity full.
Press any key.

Description

There is not enough space on the CompactFlash card for writing data.

Countermeasure

Press any key to cancel the message. (Recorded data that have been stored up to that point on the CompactFlash card will be retained.)
Copy the existing data (files) from the CompactFlash card to a computer or similar and then format the card in the DA-20 again. Alternatively, use a different CompactFlash card.

Condition

- Ran out of space while recording data
- Attempted to start recording procedure while no space was available on card

Cannot Record.
Index number maximum.
Press any key.

Description

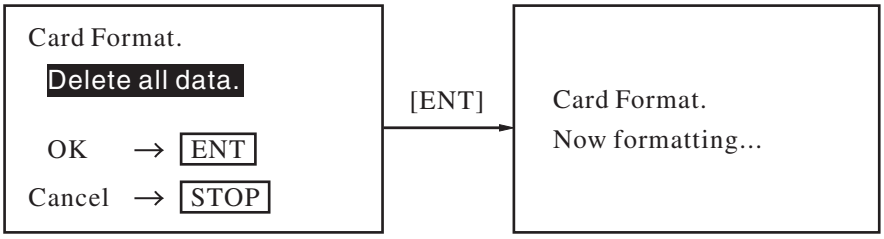
The maximum number of data that can be recorded with the DA-20 has been reached. (The current index number is at the maximum of 65533.)

Countermeasure

Press any key to cancel the message.
Copy the existing data (files) from the CompactFlash card to a computer or similar and then format the card in the DA-20 again. Alternatively, use a different CompactFlash card.

Condition

- Attempted to start recording procedure
- Attempted to record voice memo from menu screen



Description

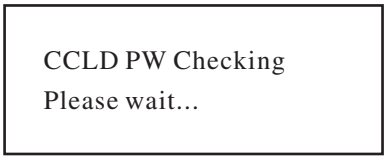
Confirmation of CompactFlash card formatting process

Countermeasure

Press the [ENT] key to format, [STOP] key to cancel.

Condition

Executing "Card Format" item of Menu 5 < System >

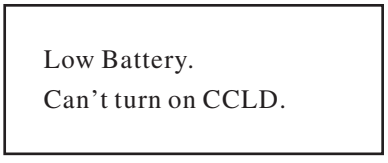


Description

Power supply condition is being checked when a channel set to CCLD exists.

Countermeasure

Message disappears automatically when power supply check does not return any problems. If power supply condition is insufficient, the following message appears. In this case, replace the batteries.



Condition

- When exiting menu (channel set to CCLD is present)
- Quitting recall mode with selection for retaining CCLD

Clock Error.
Set date and time.
Press any key.

Description

The internal clock has not been set.

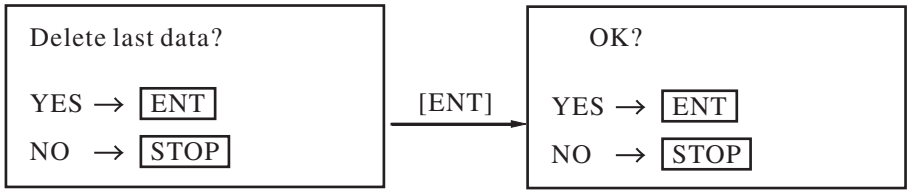
Countermeasure

Press any key to cancel the message.

The DA-20 can be used in this condition. If the recording start time as used by the unit does not need to match the actual time, no setting is required. Otherwise make the setting with Menu 6 < Date Time >.

Condition

- At power-on
- Attempted to start recording procedure



Description

Recorded data deletion was initiated. When pressing the [ENT] key, a second confirmation message appears.

Countermeasure

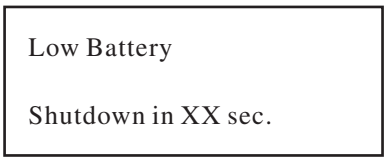
Press the [ENT] key to delete, [STOP] key to cancel.

When the deletion process is complete, the following message appears. Press any key to cancel the message.

Index XXXXX Data
Deleted.
Press any key.

Condition

In recall mode at the recorded data list screen, recorded data with highest index number was specified for deletion.



Description

Battery voltage has fallen below required level. The unit will automatically turn itself off after a countdown of 60 seconds.

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.)

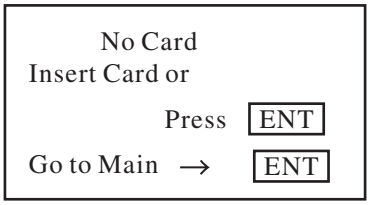
Description

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 any key to cancel the message.
If you want to proceed with the attempted action, cancel the menu lock mode (see the section "Preparations" on page 77.)



Cause

No CompactFlash card is inserted in the DA-20.

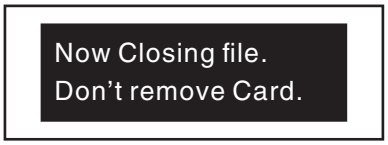
Countermeasure

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. Insert a CompactFlash card without delay.

Condition

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



Description

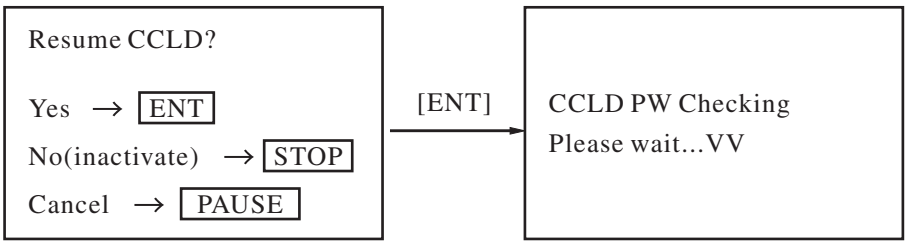
Data recording was completed, and information necessary for data management is currently being written to the CompactFlash card.

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 the DA-20 again (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

- When data amount for recording time setting has been collected
- When voice memo recording from main screen was completed



Description

This is a confirmation whether it is alright to supply a constant current to a signal input connector set to CCLD (for sensor protection).

Countermeasure

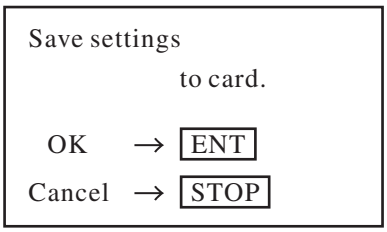
To maintain the CCLD setting, press the [ENT] key.

To change the CCLD setting to AC, press the [STOP] key (when not wishing to provide a constant current to a connected sensor).

To return to the main screen, press the [PAUSE] key.

Condition

Returning from recall mode to main screen (when channel set to CCLD exists)



Description

Select whether to save the current settings of the unit.

Countermeasure

Press the [ENT] key to save, [STOP] key to cancel.

When you press the [ENT] key, the settings are saved as a setting file on the CompactFlash card. (The file name is fixed to DA20.INI.)

Condition

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

Setting file is
found. Load settings
from Card?
OK → [ENT]
Cancel → [STOP]

Description

Select whether to set up the DA-20 according to the setting file content. If no setting file is found, this message does not appear.

Countermeasure

Press the [ENT] key to set up the DA-20 according to the setting file content. Press the [STOP] key to use the settings that were active before power was last switched off.

Condition

At power-on

Take off sensors.

OK → [ENT]

Cause

When recall mode is entered and the playback signal is set to be output to the signal 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.

In either case, pressing the [ENT] key activates the recall mode.

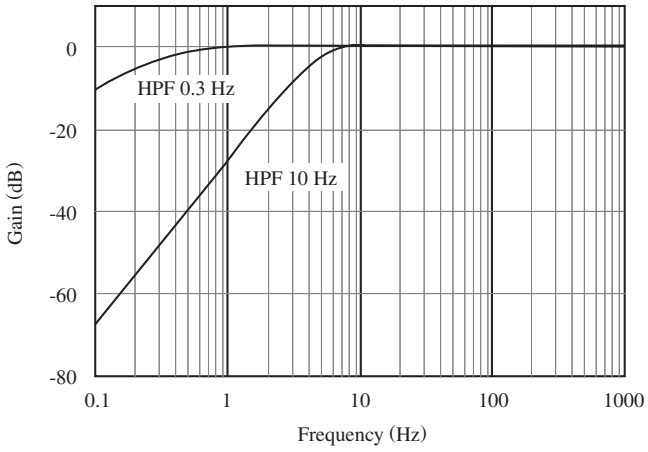
Filter Characteristics

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

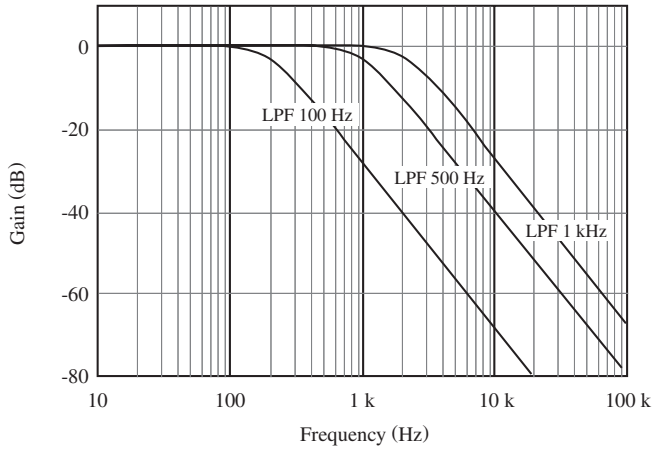
The available low-pass filter settings are OFF, 100 Hz, 500 Hz, and 1 kHz, but the setting must be lower than the frequency range setting. When the OFF setting is selected, the low-pass filter is set to the cutoff frequency of the frequency range (anti-aliasing filter).

The available high-pass filter settings are OFF and 10 Hz. For DC channels, the only available setting is OFF. For AC 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



Backup Battery

The DA-20 incorporates a backup battery (rechargeable) for clock data backup.

The battery is recharged automatically while power to the DA-20 is on. It takes about 12 hours to reach a full charge.

With a full charge, data will be retained for about 1.5 months. If this period is exceeded, clock data will be lost. It is therefore recommended to ensure that the battery is charged.

The service life of the backup battery is limited. You should have the battery replaced about once every five years. Please contact your supplier.

Note
When the backup battery is old, the data retention period will be shorter.

Important
A full charge is achieved by leaving power to the DA-20 on for 12 hours.

Specifications

Input section

Number of channels

4

Input connectors

Signal input BNC × 4

Voice memo input

ϕ3.5 4-pole mini jack × 1

External trigger input

ϕ2.5 stereo mini jack × 1

(used in monaural configuration)

3ch preamplifier (VP-80) input

7-pin connector × 1

Remote control

8-pin MINI DIN connector for optional Remote Controller

Input impedance 100 kΩ or more

Maximum input voltage

±13.0 V

Overload +2.0 dB of range full-scale value tolerance ±1.0 dB

Overload warning indication on display

Input coupling AC/DC (AC coupling: -3.0 dB tolerance ±1.0 dB at 0.315 Hz)

Sensor drive power (CCLD)

2 mA, 18 V

Frequency range DC to 20 kHz

Input range 0.01, 0.03, 0.1, 0.3, 1, 3, 10 V

(Range settings under 1 V available only with AC coupling)

Analog filters Cutoff slope -12 dB/oct,

at cutoff frequency -3.0 dB ±1.0 dB

High-pass OFF, 10 Hz (Cutoff frequency 5 Hz)

Low-pass OFF, 100 Hz, 500 Hz, 1 kHz (Cutoff frequency correspond to 200 Hz, 1 kHz, 2 kHz respectively)

Inter-channel phase lag

4 deg max. (same range, AC coupling, HPF OFF, frequency range 1 Hz to 20 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

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)

Voice memo

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

A. Record in condition other than data recording

B. Use channel 4 constantly for voice memo during data recording

C. Switch to channel 4 for voice memo during data recording

Output section

Connectors

Playback output

BNC × 4 (same as signal input)

Monitor output

ϕ3.5 stereo mini jack × 1

During recording

analog signal of one selected channel

During playback

Playback output of one selected channel

Playback output

Playback output connectors

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

Monitor output connector

Output impedance

100 Ω

Output voltage

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

Maximum output voltage

±5.5 V

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 with Rion-supplied cards only (128 MB, 256 MB, 1 GB, 2 GB)
File system	FAT 16
A/D converter	16-bit quantization
File format	WAVE (16-bit linear, non-compression)
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. 90 minutes (at sampling frequency 48 kHz [20 kHz × 2.4], 4 channels, using 2 GB CompactFlash card) Maximum file size 2 GB (FAT16 limitation)
Pre-recording	Data recorded 0, 1 or 5 seconds prior to pressing record key or trigger event.

Trigger section

Trigger type	
External	Open collector supported (External, External Gate) (compatible sound level meters: NL-21, NL-22, NL-31, NL-32) Start when external gate goes from High to Low Stop 5 seconds after gate goes from Low to High
Internal	0.1% to 9.9% of input range full-scale, 10 to 99% of linear peak
Trigger mode	Free, single, repeat (separate files created by repeat trigger)
Pre-trigger	0, 1 or 5 seconds (pre-time before trigger event)

Calibration

Readings	Linear (EU), Log (dB), can be set for each channel Main screen reading is linear only

Display

LCD panel 128 × 64 dots, 121 segments (with backlight)

Display contents Setting screen, recording screen, level bar graph, level history.

LED indicators Overload indication for each channel, remaining card capacity warning.
Status indicator for recording, playback, trigger standby, etc.

Power supply section

Power supply Batteries or AC adapter (NC-98 series)
Cigarette lighter adapter (CC-82)

Batteries IEC LR6 (size AA) × 4, alkaline type

External DC 5 to 15 V

Battery life

Frequency range	Number of channels	CCLD ON	CCLD OFF
20 kHz	4 ch	4.5 hours	8 hours
20 kHz	1 ch	7.5 hours	10 hours
100 Hz	4 ch	5 hours	9.5 hours
100 Hz	1 ch	8.5 hours	10 hours

Time is approximately

Dimensions Approx. 140 (H) × 175 (W) × 45 (D) mm

Mass Approx. 480 g (not including batteries)

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

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

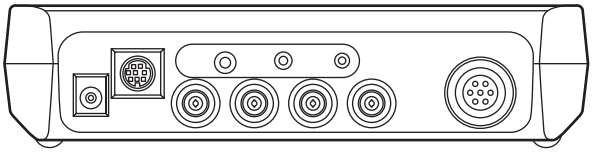
Ambient conditions for storage
-10ºC to +50ºC, max. 90% RH (no condensation)

Supplied accessories

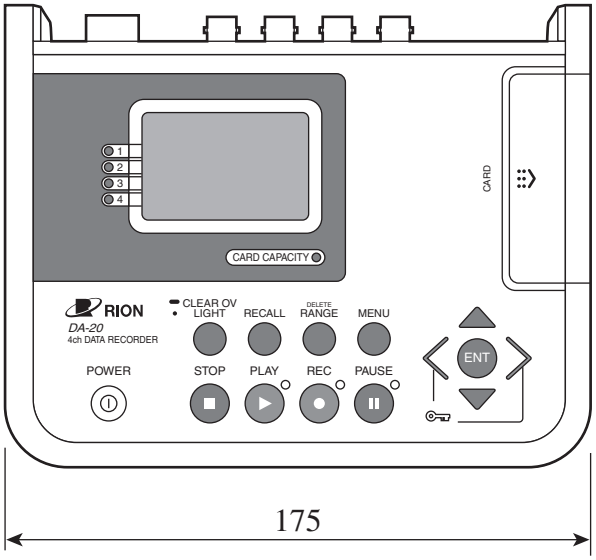
IEC R6 (size AA) battery (alkaline) (LR6)	4
Viewer software (DA-20 Viewer CD-ROM)	1
Soft carrying case (DA-20-007)	1
Shoulder strap (VX-54-003) (included in the soft carrying case)	(1)
Voice memo microphone	1
Monitor earphone	1
Instruction manual	1
Inspection certificate	1

Optional accessories

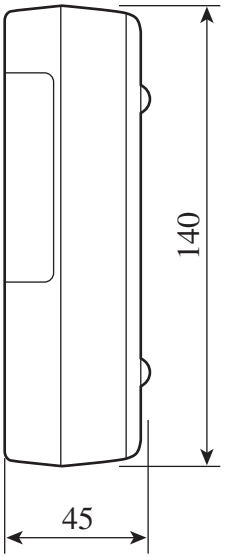
Waveform processing software	(DA-20PA1)
AC adapter	(NC-98 series)
Battery pack	(BP-21)
4-channel data recorder remote control unit	(DA-20RC1)
3-channel preamplifier	(VP-80) (3-channel microdot connector)
CompactFlash card (Type I)	(128 MB, 256 MB, 1 GB, 2 GB)
Comparator output cable	(CC-94A, for connection to NL-21, NL-22, NL-31, NL-32)
BNC to BNC cable	(NC-39A)
Cigarette lighter adapter	(CC-82)
Waveform analysis software	(CAT-WAVE)
Condenser microphones	(UC series: only electret type)
Preamplifier	(NH-22)
Piezoelectric accelerometers	(PV series)



Top view



Front view



Side view

Unit: mm

Dimensional drawing of 4-Channel Data Recorder DA-20

No. 40752 08-12