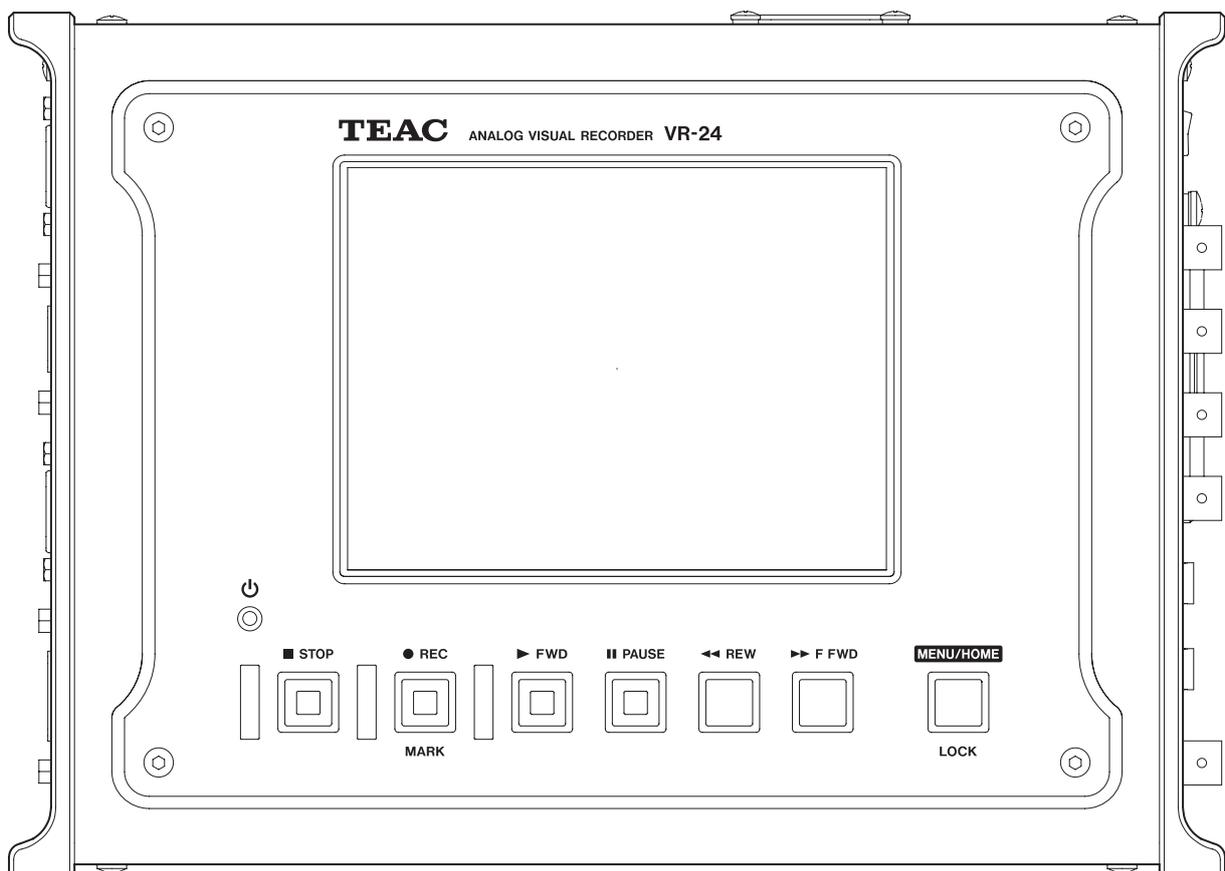


# TEAC

# VR-24

## Analog Visual Recorder Instructions for Use



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# 1. Introduction

Thank you for purchasing the VR-24.

Please read this document in its entirety before using the product to get the best performance and ensure safe and proper operation.

## 1-1. Disclaimers

Information is given about products in this manual only for the purpose of example and does not indicate any guarantees against infringements of third-party intellectual property rights and other rights related to them. TEAC Corporation will bear no responsibility for infringements on third-party intellectual property rights or their occurrence because of the use of these products.

## 1-2. Included accessories

If anything is missing or damaged, contact us.  
(For contact information, see the last page.)

AC adapter × 1  
AC power cords (for Japan, North America and Europe)  
× 1 each  
Microphone × 1  
Earphone × 1  
CD-ROM × 1  
Product overview (Japanese/English) × 1

## 1-3. Features

This data recorder assures the synchronization of video and analog signals and allows their recording.

This standalone data recorder has been designed to be compact and lightweight in consideration of field use. (An optional battery unit designed for this recorder is also available.)

- One-channel recording is possible when the video input is HD resolution at 30 fps, and two-channel high-quality recording is possible when it is VGA resolution at 30 fps.
- Video signals are input using a gigabit Ethernet interface.  
Cameras can be easily connected to the main unit using dedicated camera cables for control signals and power supply.  
We have published a list of cameras that have been connected and tested for operation on our website (<https://datarecorder.jp/en/>).
- Recording is supported for up to four channels of 24-bit analog input in the DC 0 Hz – 40 kHz frequency range.  
A wide dynamic range is realized using 24-bit analog to digital conversion.
- Analog input using DC, AC and ICP sensors is supported.
- For convenience at measurement sites, CAN, GPS and pulse signal input are supported as standard.
- CFast cards enable high-capacity data recording at high transfer rates. Recorded data is easy to use and multiple cards can be prepared, allowing easy creation of separate files according to recording purposes, for example.  
SD cards can be used for recording when inputting only analog signals, making possible the use of recording media that is easy to obtain.
- For operation, the unit includes a 5.7-inch color TFT display with excellent visibility. The graphical interface design enables intuitive operation using the touchscreen. This also makes it easy to check video and analog signal recording at measurement sites.  
A panel lock function is also included, however, to prevent misoperation.
- Numerous and convenient additional functions include trigger recording starting/stopping.

- Synchronized connection of two units is supported, allowing the number of recording channels to be increased.  
In addition, synchronized connection with our more advanced products (WX/LX series) is supported, allowing the number of recording channels for analog signals to be increased greatly.
- A wide DC power input range (DC 11 V – 17 V) is supported.
- The AC adapter, which is an included accessory, supports universal power supplies. (AC 100 V – 240 V)

### 1-4. Recording media

The CFast and SDHC card slots are accessed by opening the black cover in the center on the side of the unit.

#### ATTENTION

Format media with this unit before using them with the unit (page 61).

#### 1-4-1. CFast card

One CFast card slot

##### Compatible media

32 GB – 128 GB

#### 1-4-2. SDHC card

One SDHC card slot

##### Compatible media

SDHC cards (SDXC cards not supported)

##### Recording capacity

4 GB – 32 GB

##### Recommended speed class

Class 10

#### 1-4-3. Media that has been verified to operate with this system

This unit uses CFast and SDHC cards for recording and playback.

We provide a list of CFast and SDHC cards that we have verified for operation with this unit on our Information Products Division data recorders website.

<https://datarecorder.jp/en/>

You can also contact us. (For contact information, see the last page.)

- Prepare media for use only with the VR-24.
- To ensure stable recording, you should try to keep the the total number of files to 1000 or less. Moreover, before recording, confirm that the recording medium has enough open space.
- Use a CFast card in fixed disk mode. Do not use a CFast card in removable mode.

## 1. Introduction

### 1-5. TAFFmat format

#### 1-5-1. Type of files

The VR-24 makes a binary-format data file and ASCII-format header file each time recording stops or pauses.

Data file:	Contains data converted from analog to digital, etc. (binary format with a “dat” file extension)
Header file:	Contains recording conditions and other information Text (ASCII) format with “hdr” file extension
Voice memo file*:	Contains voice memo data WAV format with “wav” file extension
Video file*:	Contains camera video data AVI format with “avi” extension

\*Files are created when recorded.

- Two video files are created if two cameras are used.

#### 1-5-2. File name

The file name is common to the data file and header file. An ID number is added to the end of the specified file name. When you specify a new file name, the ID number starts from 1. After recording is stopped or paused, the ID number is automatically incremented each time the recording restarts. If a data file with the same name or same ID number already exists when recording to the media, the next ID number is used.

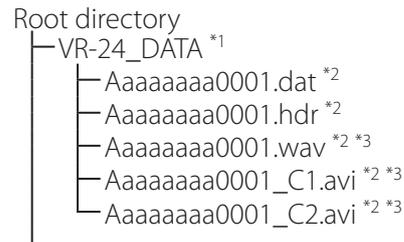
Set the “File name” type on the RecFile page of the FILE settings. For the file name, use up to 8 half-width alphanumeric characters. A 4-digit ID number (starting from 0001) is attached to these file names for a maximum of 12 characters.

At the ends of the names of video files, “C1” is added for camera 1 and “C2” is added for camera 2.

- If the ID number exceeds 1000, recording will stop.

#### 1-5-3. Media directory structures

The directory structure of each medium is as follows.



- 1 VR-24\_DATA  
This directory is made automatically when the medium is formatted. When the medium is inserted in an VR-24, this directory is made automatically if it does not already exist.
- 2 These files are created for each ID.
- 3 These are created when recorded.

#### 1-5-4. Data file

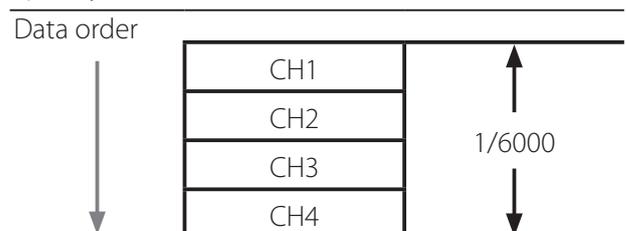
16-bit data converted from analog to digital is recorded as 2-byte integer values from  $-32768$  to  $+32767$  while 24-bit converted data is recorded as 4-byte integer values from  $-8388608$  to  $+8388607$ . Negative numbers are shown using two’s-complement notation.

The byte order is from the lowest to the highest (Intel format).

The data order is from the first sampling channel to the second sampling channel and so on until the last sampling channel. This order is called the INTERLACED format, and the format name is recorded in STORAGE\_MODE in the header file.

The structure of a data file is as follows. In this document, a collection of data as shown in the example is called a “scan”. A data file is made of repeated scans.

Example of data for one scan recorded at 6 kHz sampling frequency



### 1-5-5. Converting data to physical quantities

16-bit data converted from analog to digital is recorded as integer values from  $-32768$  to  $+32767$  and the value would be  $\pm 25000$  when the input is  $\pm 100\%$  in the input range settings. 24-bit converted data is recorded as integer values from  $-8388608$  to  $+8388607$  and the value would be  $\pm 6400000$  when the input is  $\pm 100\%$  in the input range settings. The input value is obtained from the following formula:

Input value = (A/D conversion value of the data file)  $\times$  SLOPE + Y\_OFFSET

- See “Explanations of header file” on page 10 for information about SLOPE and Y\_OFFSET.

### 1-5-6. Header file

Header files are ASCII-format text files containing information such as recording conditions.

In a header file, each recording-condition entry is written on 1 line, with parameters separated by a comma (.). An example of a header file is shown as follows.

#### Example of header file

```

DATASET TEST0001
VERSION 1
SERIES VR24_CH1,VR24_CH2,VR24_CH3,VR24_CH4
DATE 01-01-2015
TIME 12:00:00.00
RATE 48000
VERT_UNITS V,V,V,V
HORZ_UNITS Sec
COMMENT VR-24
NUM_SERIES 4
STORAGE_MODE INTERLACED
FILE_TYPE INTEGER
SLOPE 8.000000e-005,8.000000e-005,8.000000e-005,8.000000e-005
X_OFFSET -1.0
Y_OFFSET 0.000000e+000,0.000000e+000,0.000000e+000,0.000000e+000
NUM_SAMPS 2928000
DATA
DEVICE VR-24
CH1 VR-24_CH1,RANGE=1V,ICP,OFF,OFF
CH2 VR-24_CH2,RANGE=1V,ICP,OFF,OFF
CH3 VR-24_CH3,RANGE=1V,ICP,OFF,OFF
CH4 VR-24_CH4,RANGE=1V,DC,OFF,OFF
REC_MODE CFast
END_TIME 01-01-2015 12:01:00
START_TRIGGER COMMAND,PRE
STOP_CONDITION COMMAND,POST
START_PRE_COUNT 48000
STOP_POST_COUNT 48000
MARK 403200,595200,787200
VOICE_MEMO 8BITS
CAMERA_USE HD_1Ch
IMAGE_OFFSET 0
CAN_OFFSET 0
GPS_OFFSET 0
CAN_BLOCK_SIZE 2
GPS_BLOCK_SIZE 32
ANALOG_CH 1,2,3,4
PULSE_CH 5
CAN_CH 6,7
GPS_CH 8
VR-24_VERSION APP:V1.0.0, AD:V1.00, VR10000

```

# 1. Introduction

## Explanations of header file

DATASET	File name
VERSION	1 (This is a fixed value.)
SERIES	Name of each channel
DATE	Date when recording started (month-day-year)
TIME	Time when recording started (hour: minute: second)
RATE	Sampling frequency (Unit: Hz)
VERT_UNITS	Physical/engineering units of each channel
HORZ_UNITS	Time axis units (Sec: This is a fixed value)
COMMENT	Comment entered using FILE and RecFile settings.
NUM_SERIES	Number of recording channels
STORAGE_MODE	Data order. Fixed as INTERLACED because this is the scan order.
FILE_TYPE	In 16 bits A/D, INTEGER (1data, 2-byte integers) In 24 bits A/D, LONG (1data, 4-byte integers)
SLOPE	Coefficient used when converting data to physical/engineering units
X_OFFSET	Location of the first data on the time axis; normally 0 The setting value (number of seconds to three decimal places) is written in minus for the pre-trigger time. Even if you set the number of scans for Pre-trigger, this will be in seconds.
Y_OFFSET	Offset used for converting data to physical/engineering units
NUM_SAMPS	Number of data items recorded per channel
DATA	The data that follows this entry is specific to this unit, and it might differ from the formats of other models.
DEVICE	VR-24
CH1_	The channel name and amplifier settings (range, mode, HPF and LPF settings) appear after the underscore
REC_MODE	Recording destination device (CFast, SD)
END_TIME	Recording end time
START_TRIGGER	Recording starting conditions: PANEL: Transport buttons LEVEL: Level trigger DATE: Starting time designation if interval operation EXT: External trigger TIME_OUT: Timeout SYNC: Synchronized recording PRE: Added for a pre-trigger
STOP_CONDITION	Recording stopping conditions: PANEL: Transport buttons LEVEL: Level trigger TIMER: Specified recording time EXT: External trigger MEDIA_FULL: When medium becomes full SYNC: Synchronized recording POST: Added for a post-trigger
START_PRE_COUNT	Number of scans recorded by a pre-trigger
STOP_POST_COUNT	Number of scans recorded by a post-trigger
MARK	Number of scans at the instant an event mark was attached.
VOICE_MEMO	The number of bits per sample for voice-memo data
CAMERA_USE	Camera use setting      OFF HD_1Ch VGA_1Ch QVGA_1Ch VGA_2Ch QVGA_2Ch
IMAGE_OFFSET	Number of camera video offset scans

CAN_OFFSET	Number of CAN data offset scans
GPS_OFFSET	Number of GPS data offset scans
CAN_BLOCK_SIZE	CAN data block size
GPS_BLOCK_SIZE	GPS data block size
ANALOG_CH	Analog channel recorded
PULSE_CH	Pulse data channel recorded
CAN_CH	CAN data channel recorded
GPS_CH	GPS data channel recorded
VR-24_VERSION	VR-24 APP and AD versions and serial number

- In synchronized recording, the VR-24 attaches the following information after DEVICE.
  - SYNC MASTER      In the case of a master unit in synchronized recording
  - (SYNC SLAVE)      In the case of a slave unit in synchronized recording

## 2. IMPORTANT SAFETY INSTRUCTIONS

### Model for USA

#### Declaration of Conformity

Model number: VR-24

Trade name: TEAC

Responsible party: TEAC AMERICA, INC.

Address: 10410 Pioneer Blvd. Unit #1, Santa Fe Springs, California 90670, U.S.A.

Telephone number: 1-323-726-0303

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

#### Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



### Model for Canada

Innovation, Science and Economic Development Canada's Compliance Statement:

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### Model for UK

This product complies with the applicable UK regulations.



### Model for Europe

#### DECLARATION OF CONFORMITY

This product complies with the European Directives request, and the other Commission Regulations.



#### DECLARACIÓN DE CONFORMIDAD

Este producto cumple con las exigencias de las directivas europeas y con los reglamentos de la Comisión Europea.

#### DÉCLARATION DE CONFORMITÉ

Ce produit est conforme aux directives européennes et aux autres réglementations de la Commission européenne.

#### KONFORMITÄTSERKLÄRUNG

Dieses Produkt entspricht den Anforderungen europäischer Richtlinien sowie anderen Verordnungen der Kommission.

### Disposal of electrical and electronic equipment

- All electrical/electronic equipment should be disposed of separately from the municipal waste stream via collection facilities designated by the government or local authorities.
- By disposing of electrical/electronic equipment correctly, you will help save valuable resources and prevent any potential negative effects on human health and the environment.
- Improper disposal of waste electrical/electronic equipment can have serious effects on the environment and human health because of the presence of hazardous substances in the equipment.
- The Waste Electrical and Electronic Equipment (WEEE) symbols, which show  wheeled bins that have been crossed out, indicate that electrical/electronic equipment must be collected and disposed of separately from household waste.
- Return and collection systems are available to end users. For more detailed information about the disposal of old electrical/electronic equipment and waste batteries/accumulators, please contact your city office, waste disposal service or the shop where you purchased the equipment.

### **WARNING**

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

### **ATENCIÓN**

Este es un producto de clase A. En un entorno no profesional, este aparato puede producir interferencias de radio, en cuyo caso el usuario será el responsable de tomar las medidas necesarias para solucionarlo.

### **AVERTISSEMENT**

Il s'agit d'un produit de Classe A. Dans un environnement domestique, cet appareil peut provoquer des interférences radio, dans ce cas l'utilisateur peut être amené à prendre des mesures appropriées.

### **Warnung**

Dies ist eine Einrichtung, welche die Funk-Entstörung nach Klasse A besitzt. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.

### **DISCLAIMER**

TEAC disclaims all warranty, either expressed or implied, with respect to this product and the accompanying written materials. In no event shall TEAC be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information or other loss) arising out of the use of or inability to use this product.

## 3. Connections

### 3-1. Powering the unit

The VR-24 operates with DC 12V power.

The included AC adapter can be attached to the DC IN connector on the right side panel to supply power.

To supply power using equipment other than the included AC adapter, correctly follow the pin number assignments in “5-1. DC IN power connector” on page 20.

Equipment could be damaged if connections are made with incorrect pin numbers or voltage that exceeds the guaranteed voltage operating range is supplied.

#### **ATTENTION**

- The guaranteed DC power supply operating range is DC 11 V – DC 17 V. Never use a voltage outside this range. Doing so could damage equipment or cause unexpected system shutdowns.
- Do not supply power to AC adapters or DC INs until after securely connecting all connection cables between units.
- Before disconnecting connection cables, turn off the power to the AC adapters and DC INs.
- When using within Japan, use the included AC cord that has a PSE mark on the plug.
- When using in the North American region, use the included AC cord that has a CSA mark on the plug.

### 3-2. Connecting cameras

The circular connector of a dedicated camera cable sends control signals and supplies power for one camera. When connected to the main unit, the LAN connector sends video signals.

When connecting cameras to the main unit, always connect the circular and LAN connectors for one camera in pairs to the same camera number connectors.

Connect camera cables before turning the unit on.

When only connecting one camera, connect it to CAMERA-1.

Connected cameras will automatically have IP addresses set when the unit is turned on.

The unit might require some time after putting it into standby and changing the connection number of the camera, so we do not recommend doing this when making measurements.

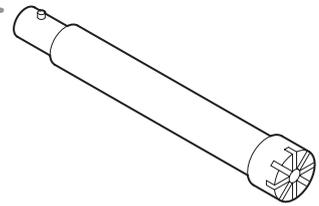
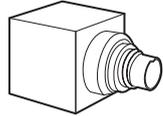
### 3-3. TEDS

A Transducer Electronic Data Sheet (TEDS) is a standard format defined in IEEE 1451.4 for recording information specific to a measurement sensor that is stored within the sensor itself. By connecting a TEDS sensor with a TEDS-compatible VR-24, sensor calibration is made unnecessary, reducing the time required for measurement preparations.

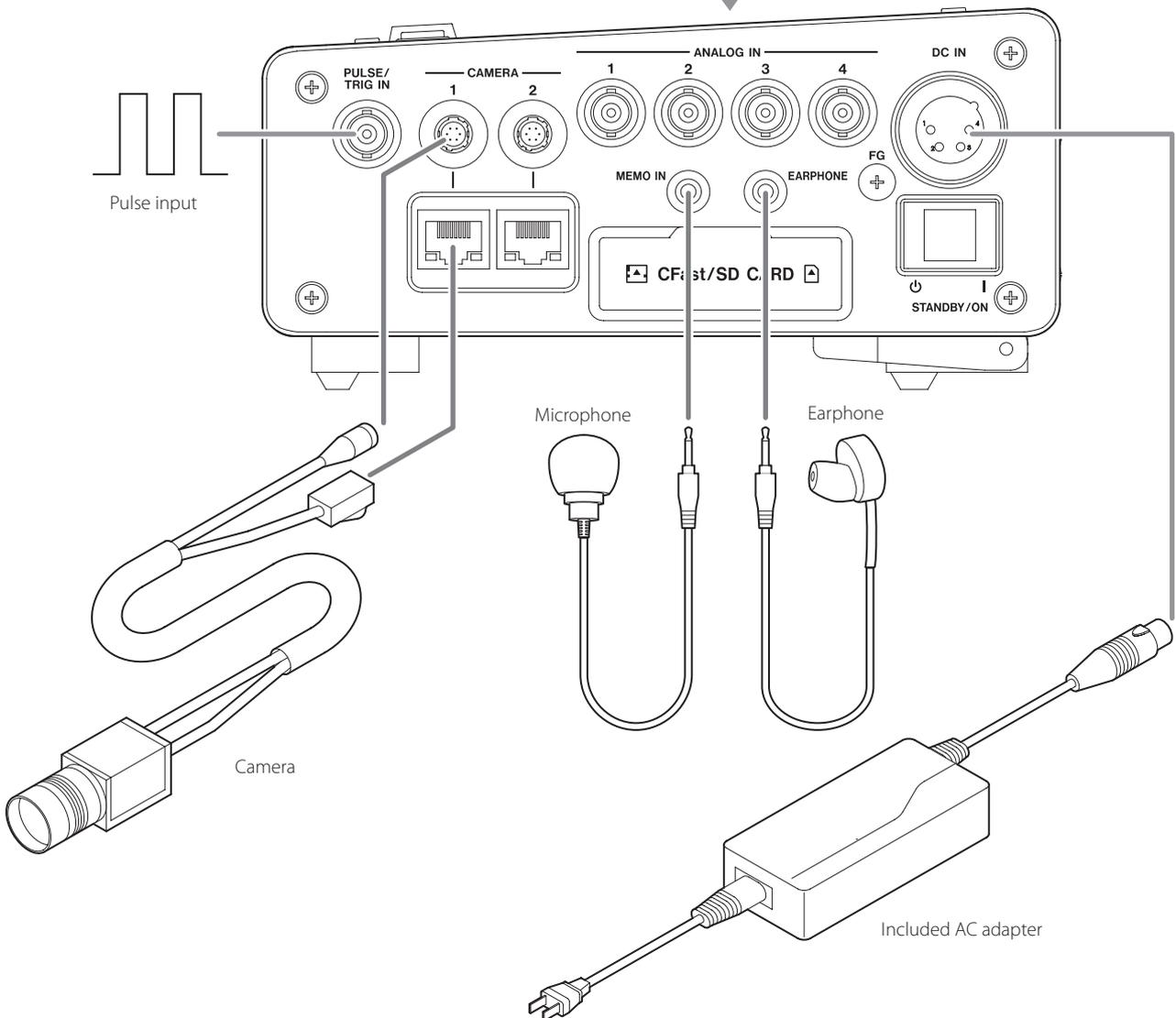
- If transducer information is not compliant with the TEDS IEEE standard, correct information cannot be loaded and displayed.
- Supports TEDS Ver. 1.0.

3-4. Connecting sensors

Piezoelectric accelerometer  
 Example  
 Voltage output type with built-in preamp  
 724ZT: triaxial ICP that supports TEDS

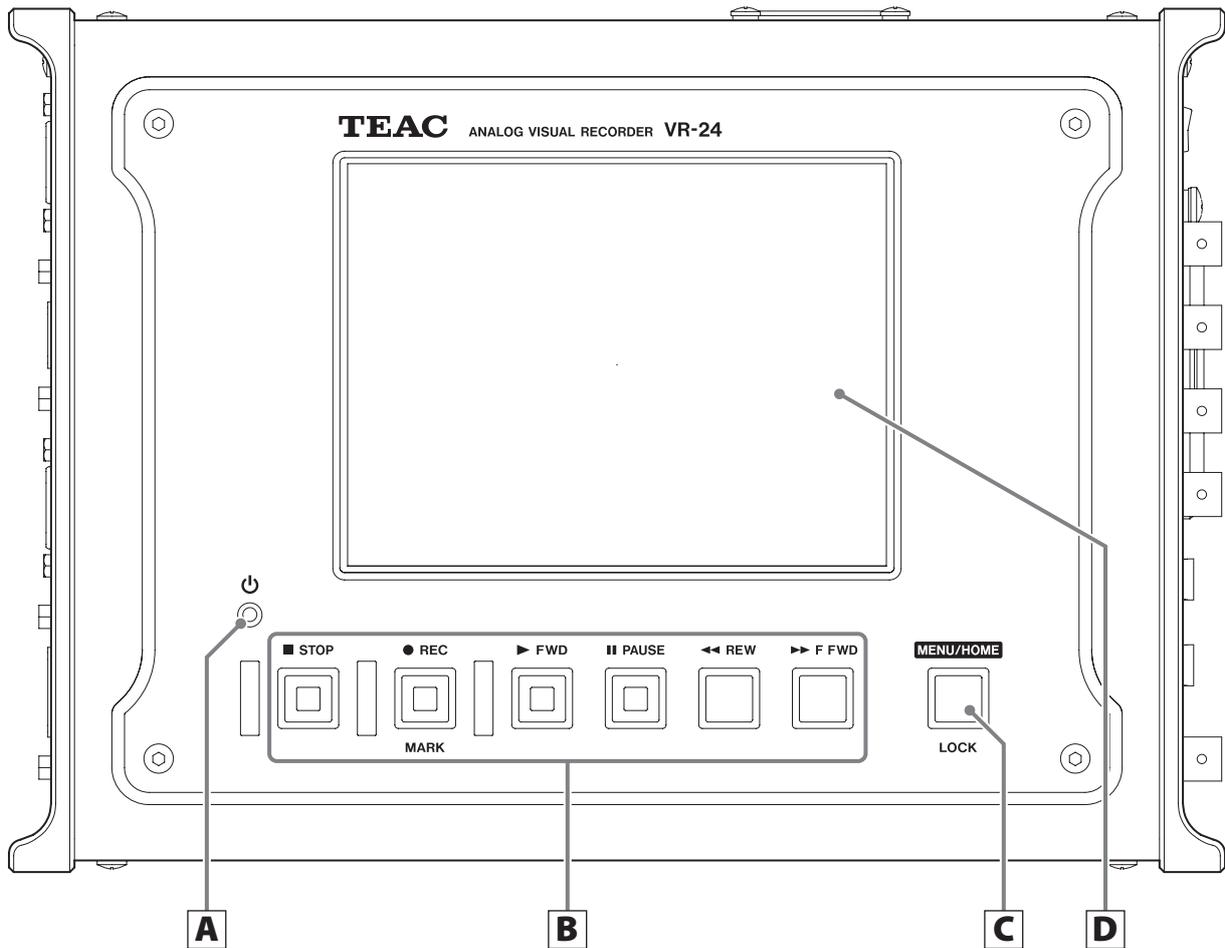


To ANALOG IN



## 4. Names and functions of parts

### 4-1. Top



#### **A** Power indicator (⏻)

This lights green when the unit is on.  
This blinks green when the system is starting up.  
After pressing the switch toward O, it blinks orange until the unit enters standby.

- This blinks red if an irregularity is detected from the power supply input through the DC IN.
- This also blinks red if low battery voltage is detected when using an optional battery unit.

#### **B** Transport buttons

##### **STOP (■ STOP) button**

Press to stop recording and playback.

##### **Record (● REC) button**

Press when the system is stopped to make it record ready.

Press during recording to add an event mark that can be searched for during playback.

- A maximum of 200 event marks can be added to a single data file.

##### **Play (▶ FWD) button**

Press when the system is stopped or playback ready to start playback.

Press when the unit is record ready to start recording.

#### **Pause (|| PAUSE) button**

Press when the system is stopped or playing back to make it playback ready.

Press when recording to make it record ready.

#### **Search (◀◀ REW/▶▶ F FWD) buttons**

Use to search playback files.

#### **C** MENU/HOME button

Use to change the display and for setting value input operations.

If you want to prevent misoperation of this unit when it is on, press and hold this button when the HOME screen is open to lock the panel controls.

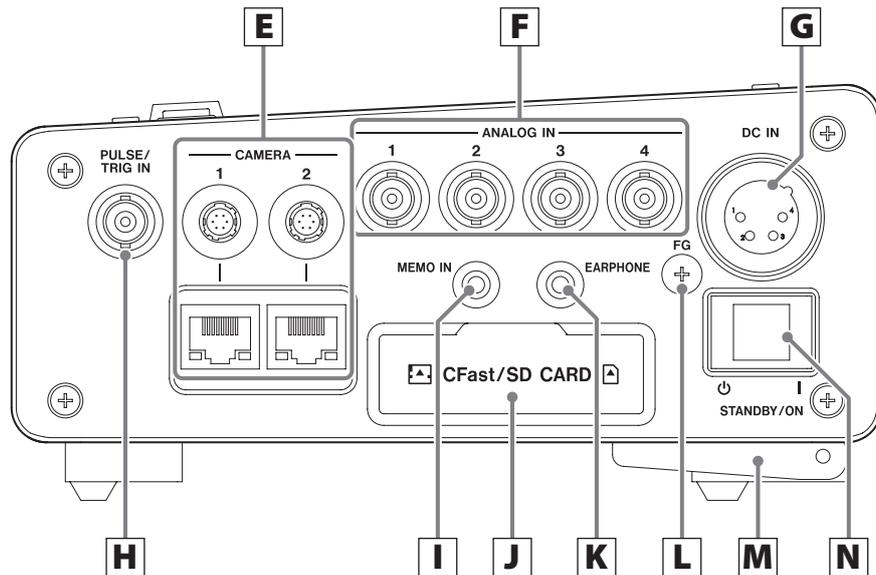
#### **D** Display

This 5.7-inch color TFT display features 640x480 resolution, 262 thousand colors and pressure-sensitive touchscreen functionality. In addition to showing various information, it can also be used for various setting value input operations.

#### **NOTE**

The display is produced with extremely high-precision manufacturing technologies. At least 99.99% of the pixels operate as specified. On rare occasions, a pixel might misfire or appear as a red or black dot, but this is not a malfunction.

## 4-2. Right side

**E CAMERA input connectors**

Connect the dedicated camera cables here.  
Always connect the circular and LAN connectors of one dedicated camera cable in pairs to the same camera number connectors.  
When only connecting one camera, connect it to CAMERA-1.

**F ANALOG IN connectors**

Use these to input analog measurement signals.  
Starting with channel 1, connect them in order without skipping channels.

**G DC IN power connector**

Connect the included AC adapter here.  
Use the optional DC power cable designed for this unit to supply DC 11V–17V power.

**H PULSE/TRIG IN connector**

Use this to input pulse signals.  
External trigger signals can also be input here.  
Only one of these two functions can be used at a time.

**I MEMO IN (mic input) jack**

Connect the included mic here to record voice memos.

**J Recording media slot cover (CFast/SD CARD)**

The CFast (upper) and SDHC (lower) card slots are located under the cover.  
Always keep the recording media slot cover closed when not loading or unloading recording media.

Do not open the recording media slot cover when the system is operating.

**K EARPHONE jack**

Connect the included earphone here when you want to listen to voice memos.

- You can change the signal output using the “Monitor channel” setting.

**L FG (frame grounding) connector**

Connect a grounding wire here.  
When connecting a grounding wire, always use the screw that is temporarily tightened to the unit.

**M Feet with angled stand function**

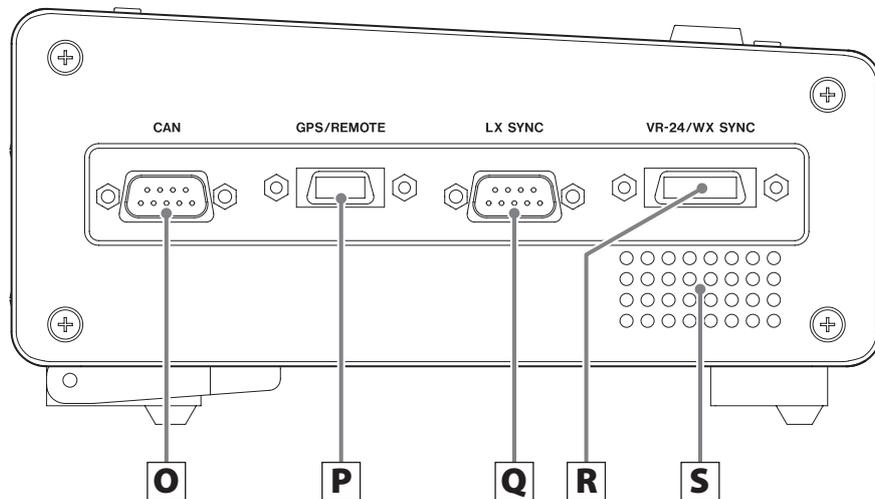
Pull out the angled stand when you want to adjust the unit's installation angle to make the display easier to view. When raising the angled stand, turn it firmly until it seems to click into place. Always set both right and left feet equally.  
Using the unit when the feet are not properly set causes instability and is dangerous.  
Moreover, you should always confirm that the place of installation is flat beforehand.

**N STANDBY/ON switch**

Press to turn the power on or put the unit into standby. Press the switch toward I to turn the unit on. Press the switch toward O to put the unit in standby.

## 4. Names and functions of parts

### 4-3. Left side



#### **O** CAN input connector

Input automobile status signals, control signals and other information from a CAN interface here.

#### **P** GPS/remote control signal input connector (GPS/REMOTE)

Input GPS information, including time, location and elevation, here.

The optional remote control unit designed for this product can also be connected here.

These two functions can be used separately.

#### **Q** LX recording synchronization connector (LX SYNC)

Use this to synchronize recording with a data recorder from our more advanced LX series.

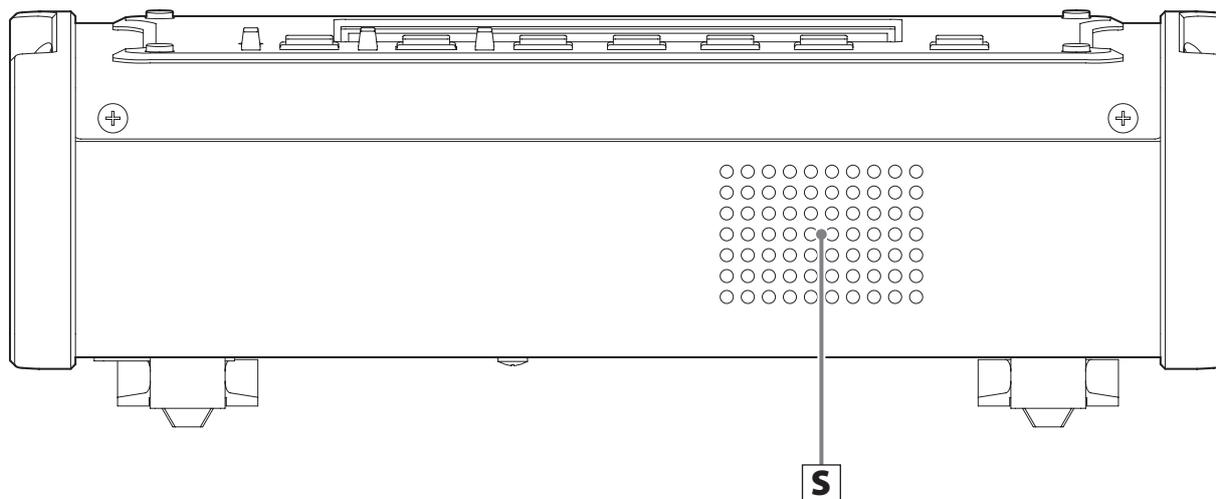
Do not connect anything when not conducting synchronized recording.

#### **R** VR-24/WX recording synchronization connector (VR-24/WX SYNC)

Use this to synchronize recording with a data recorder from our more advanced WX series or another VR-24.

Do not connect anything when not conducting synchronized recording.

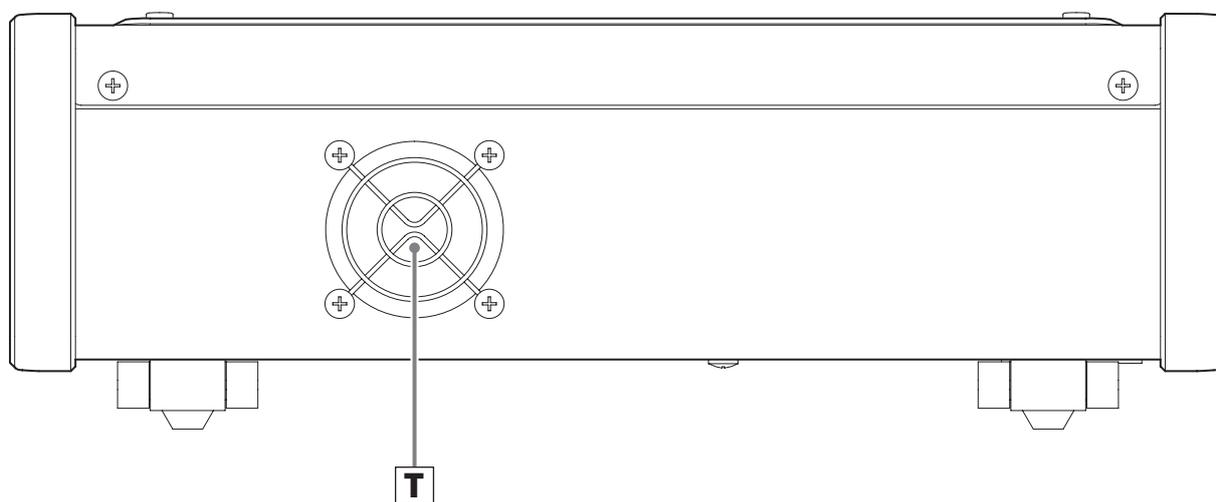
### 4-4. Front



#### **S** Cooling ports

These are ventilation holes to cool the unit. Do not block these holes.

### 4-5. Rear



#### **T** Cooling fan

This is an exhaust fan to cool the unit. Do not block its output.

## 5. Connector specifications

### 5-1. DC IN power connector

#### Function

Input a power supply between DC 11 V and 17 V.

- These voltage values are the guaranteed operating range.

#### Connector

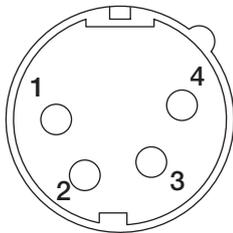
XLR (Neutrik NC4MPR-HD)

#### Pin assignments

Pin	Function
1	0V DC power supply
2	Unused
3	Unused
4	11V–17V DC power supply

#### CAUTION

Do not connect anything to the unused pins.



### 5-2. PULSE/TRIG IN connector

#### Function

Use to input pulse signals or external trigger signals.

- When using as a pulse input connector, refer to “10-5. Pulse” on page 57.
- When using as an external trigger input connector, set this to OFF, as explained in “10-5. Pulse” on page 57.  
See “7-4. Setting triggers” on page 34 and “12. TRIGGER settings” on page 62 also.

#### Pulse input

Input format

Input voltage range: 0–12 V

Threshold level: 2.3 V ( $\pm 10\%$ )

#### External trigger input

Input format

Input voltage range: 0–12 V

L level: 0.6 V or less

H level: open or 3 V or more

- Changing from H to L starts recording.  
Changing from L to H stops recording.

#### Connector

BNC connector

### 5-3. CAN input connector

#### Function

Use to input a CAN signal.

#### CAN signal

Function names

CAN Low, CAN High

- The CAN ground is insulated from the unit's FG.
- Connect the CAN cable shield to the unit's FG.

#### Ignition input

Function name

Ignition input

Input format

Input voltage range: 0–12 V  
L level: 3.0 V or less  
H level: 4.5 V or more

#### Connector on unit

9-pin D-sub rectangular connector  
(Hirose RDED-9P-LNA (4-40))

#### Pin assignments

Pin	Function
1	Unused
2	CAN Low
3	CAN ground
4	Unused
5	CAN cable shield
6	Unused
7	CAN High
8	Unused
9	Ignition input

#### CAUTION

Do not connect anything to the unused pins.

### 5-4. GPS/remote control signal input connector (GPS/REMOTE)

#### Function

Use to connect an optional GPS receiver (sold separately), to control recording with contact signals or to connect an optional remote control unit (sold separately).

#### Contact input

Function names

STOP, REC, FWD, PAUSE input

Input format

Input voltage range: 0–5 V  
L level: 0.4 V or less  
H level: open or 2.4 V or more  
Pulse width: 100 msec or more

#### Status output

Function names

STOP, REC, FWD, PAUSE status

Output format

Open collector  
Maximum sync current: 8 mA  
Maximum applied voltage: +5 V

#### DC power supply output

Output voltage: +5 V  
Maximum output current: 500 mA

#### Connector on unit

Angled, half-pitch, 20-pin connector  
(Hirose DX10A-20S)

## 5. Connector specifications

---

### Pin assignments

Pin	Function
1	DC power supply output
2	DC power supply output
3	GPS serial input
4	GPS serial output
5	Ground (GND)
6	Unused
7	Unused
8	Unused
9	Ground (GND)
10	STOP status
11	REC status
12	FWD status
13	PAUSE status
14	Ground (GND)
15	PPS input for GPS
16	STOP input
17	REC input
18	FWD input
19	PAUSE input
20	Ground (GND)

### CAUTION

- Do not connect anything to the unused pins.
- Pins 1 and 2 are for an option that is sold separately. Do not use them for any other purpose.

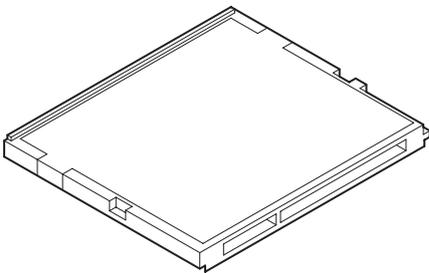
### 6-1. Handling recording media

This unit uses CFast cards as recording media.  
This unit cannot record video data to SDHC cards.

#### 6-1-1. CFast cards

CFast is a new specification created by the CompactFlash Association. This compact storage format uses a serial ATA interface to achieve I/O speeds that surpass previous products, including CompactFlash cards.

Retaining the small size and convenience of CompactFlash cards, this medium boasts much higher transmission speeds and power when transmitting large volumes of data. In addition, precise power control reduces energy consumption.



#### 6-1-2. Handling

CFast cards are designed to be tough, but you should take care to avoid allowing them to be dropped. In order to assure the accuracy and security of data, please observe the following precautions.

- Format CFast cards with the VR-24 before using them with this system.
- When not using a CFast card, store it in a protective case.
- Avoid dusty or humid environments.
- Avoid direct sunlight, high and extremely cold temperatures, as well as extreme temperature changes.
- Do not force a CFast card into the card slot. If you are having trouble inserting the CFast card, confirm the notch location and that it is oriented correctly.
- Read the CFast card operation manual.
- Always remove the CFast card before transportation.

#### 6-1-3. CFast card insertion and removal

The recording media slot cover is at the bottom center of the side of the unit. Open the black cover to access the CFast card slot.

The CFast card has a front end that must be inserted first. Insert the card with the correct orientation. Forcing a card into the card slot is dangerous and could even damage the device.

Always put the unit into standby before inserting or removing a CFast card.

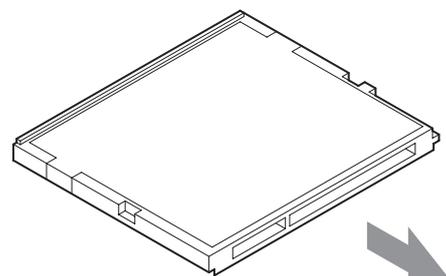
#### **WARNING**

Never remove a CFast card when the unit is on. Removing a card could cause recording to fail or recorded data to be lost, for example. Moreover, doing so could also damage the unit.

#### CFast card insertion

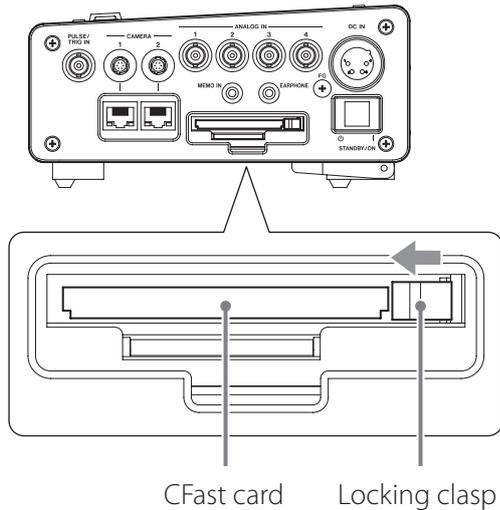
- 1** Open the recording media slot cover on the bottom center of the side of the unit.
- 2** Insert the CFast card into the card slot with the orientation as shown in the following illustration.

Push the CFast card in gently until it reaches the stopper, which will cause the lock lever to the right of the CFast card to project forward. Pull out the locking clasp and fix it to the front of the CFast card. This is a measure to prevent the CFast card from falling out unexpectedly.



Into CFast card slot

## 6. Basic operation



### 3 Close the recording media slot cover.

#### Removing CFast cards

- 1 Open the recording media slot cover on the bottom center of the side of the unit.
- 2 Slide the locking clasp to the right of the CFast card front to unlock the CFast card lock.
- 3 Press the front of the locking clasp into the unit.  
The CFast card will project forward.
- 4 Grasp the CFast card with fingers and pull it out.

### 6-1-4. Handling SDHC cards

Avoid using SD cards that have adapters for microSD cards or miniSD cards.

#### ATTENTION

- This unit cannot record video data to SDHC cards.
- When recording to an SDHC card, recording will stop if the size of an analog data file reaches 4 GB.

### 6-1-5. Insertion and removal

Always put the unit into standby before inserting or removing an SDHC card.

Never remove an SDHC card when the unit is in use (including when recording or playing back). Removing a card could cause recording to fail or recorded data to be lost, for example. Moreover, doing so could also damage the unit.

#### SDHC card insertion

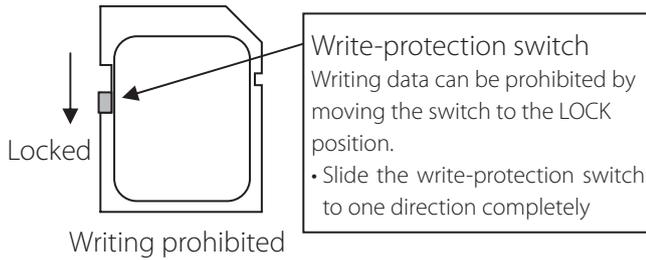
- 1 Open the recording media slot cover on the bottom center of the side of the unit.
- 2 Push the SDHC card all the way into the SDHC card slot at the bottom of the opening.
  - The SDHC card has a front end that must be inserted first. Insert the card with the correct orientation. Forcing a card into the card slot could damage this unit.
  - A clicking sound can be heard when the card is pushed all the way in.
- 3 Close the recording media slot cover.

#### Removing SDHC cards

- 1 Open the recording media slot cover.
- 2 Push SDHC card in gently.  
The SDHC card will come out part way.
- 3 Pull the SDHC card out by hand.
- 4 Close the recording media slot cover.

### SDHC card write-protection switches

SDHC cards have write-protection switches.



- To use an SDHC card for recording or to erase recording data on it or format it, unlock the write-protection.

### 6-2. Turning the unit on

Confirm that the included AC adapter or the DC power cable (sold separately) is connected and turn the STANDBY/ON switch on.

When the Home Screen appears on the display, the system is ready for use.

### 6-3. Putting the unit into standby

Confirm that the unit is stopped (not recording, playing back or record/playback ready), and put the unit into standby.

Putting the unit into standby when the unit is not stopped could damage system data. If the unit is put into standby while data is being written, the recorded data might become unreadable.

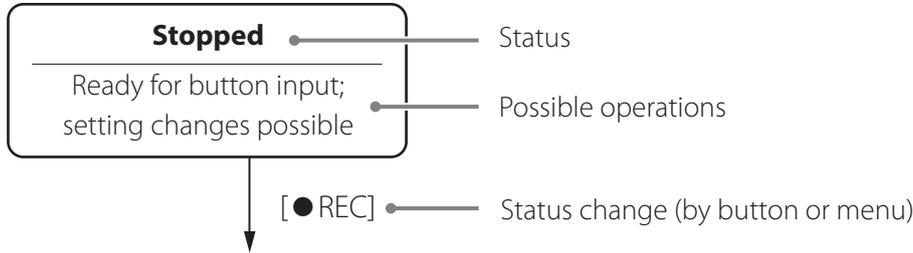
Put the unit into standby before moving it.

## 6. Basic operation

### 6-4. Status changes

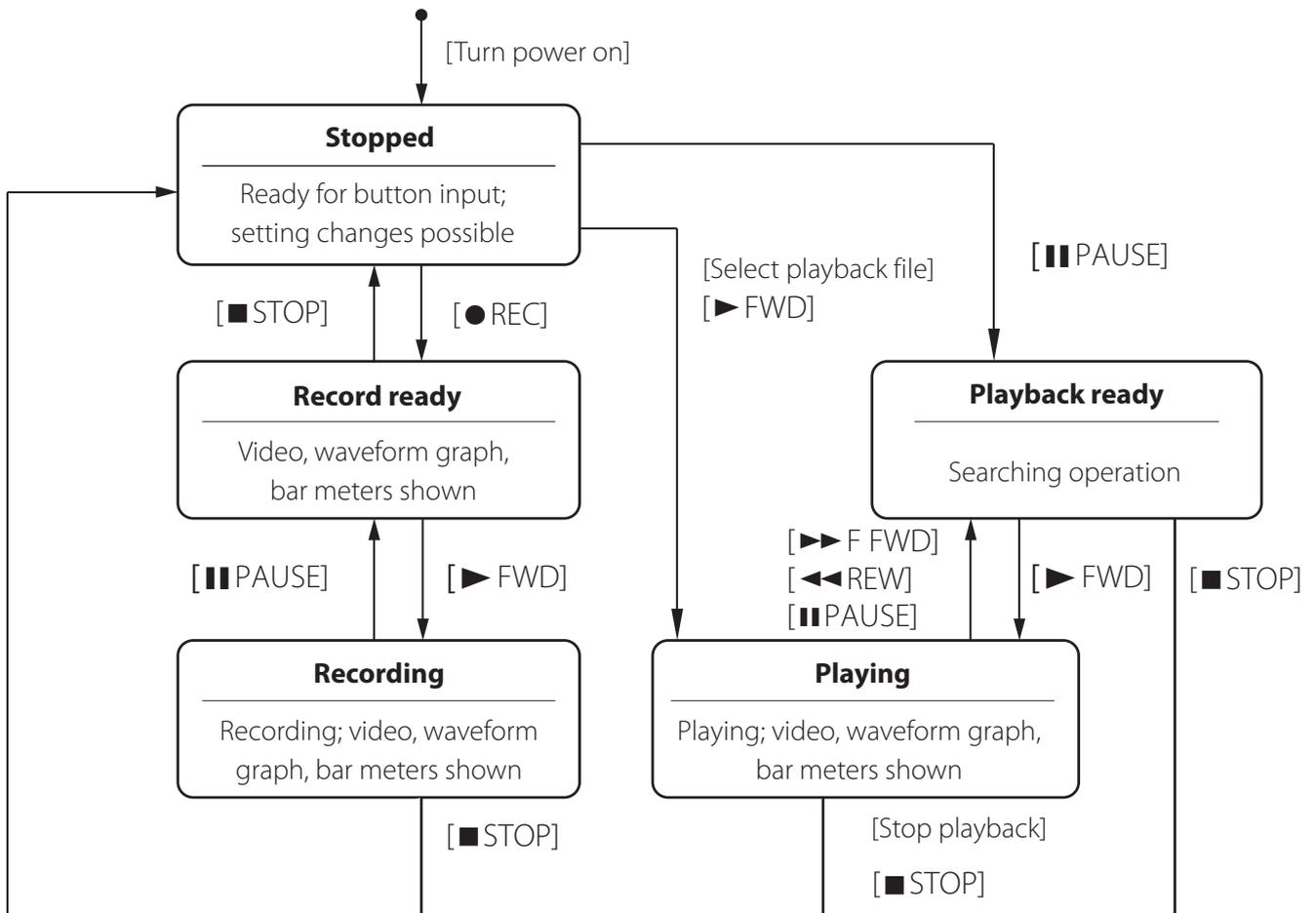
#### 6-4-1. Explanation of status change diagram entry

Entries appear on the status change diagram in the following manner.

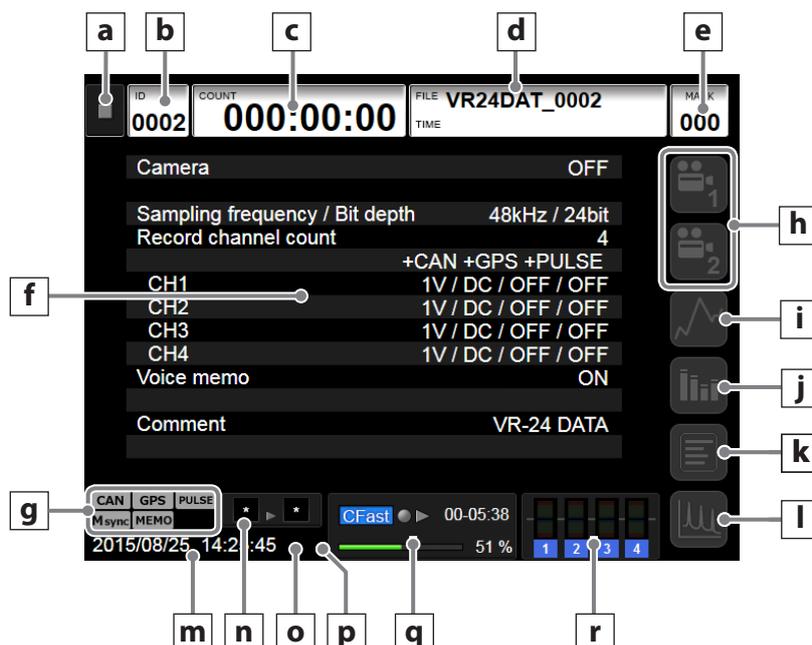


#### 6-4-2. Status change diagram

The status of the system can be changed in the following manner.



## 6-5. Home screen

**a** Status icon

This icon shows the current status of the recording unit.

The meanings of the icons are as follows.

- : Stopped (ready for use)
- ▶ II : Playback ready
- ▶ : Playing back
- II : Record ready
- : Recording

**b** ID number (ID)

This shows the ID number.

ID numbers with up to 4 digits from 0001 to 1000 can be shown.

Touch when in a stopped state to conduct an ID search (page 38).

**c** Counter (COUNT)

This appears as HHH:MM:SS (hours: minutes: seconds). The appearance changes according to the status of the unit.

**When recording,**

this shows the elapsed time since recording started.

**When playing back or ready for playback,**

this shows the elapsed time from the beginning of the file.

Touch when playback ready to conduct a COUNT search (page 39).

**d** Recording file information (FILE/TIME)**Recording file name (FILE)**

The appearance changes according to the status of the unit.

**When playing back or ready for playback,**

this shows the name of the file that is being played or is ready for playback.

**At all other times,**

This shows the name of the file that will be recorded. Only the first eight characters of file names can be set. The last four numbers are automatically added when recording starts.

**TIME display (TIME)**

By default, this shows the year, month and day in that order (YYYY/MM/DD), but it can be set to show them in MM/DD/YYYY or DD/MM/YYYY format. (YYYY: year, MM: month, DD: day)

When playing back and when playback ready, this shows when the recording was made.

Touch when playback ready to conduct a TIME search (page 39).

## 6. Basic operation

### e Number of event marks (MARK)

This shows the number of event marks.

The information shown changes according to the status of the unit.

#### When recording, playing back or ready for playback,

this shows the total number of event marks made from the beginning of the measured data to the current position.

Touch when playback ready to conduct a MARK search (page 39).

### f Recording settings

This shows recording setting values.

#### Camera use

Camera use settings

#### Sampling frequency/bit depth

Sampling frequency and recording quantization bit depth settings

#### Voice memo

Voice memo function setting

When playing back, this shows playback data.

#### Record channel count

Recording channel count settings

#### CH1 CH2 CH3 CH4

Individual channel settings

#### Comment

Recording setting comment

### g Status indicators

#### CAN

 : OFF

 : ON

 : ON and transmitting  
(not shown when standing by)

#### GPS

 : OFF

 : ON

 : ON and receiving  
(not shown when standing by)

#### Pulse

 : OFF

 : ON

 : ON and receiving pulse  
(not shown when standing by)

### Synchronization

 : OFF

 : waiting for synchronization (VR sync master)

 : waiting for synchronization (VR sync slave)

 : waiting for synchronization (WX sync)

 : waiting for synchronization (LX sync)

 : synchronized (VR sync master)

 : synchronized (VR sync slave)

 : synchronized (WX sync)

 : synchronized (LX sync)

### Voice memo

 : OFF

 : ON

 : audio input detected

### h Camera input switching buttons

### i Graphed waveform display button

### j Bar meter display button

### k GPS/CAN/Pulse display button

Touch to show GPS/CAN/Pulse data.

### l FFT display button

### m Date and time

This shows the current date and time.

If the information shown is incorrect, set the date and time on the setting screen.

### n Trigger setting

### o Panel lock status

 : panel unlocked

 : panel locked

### p Battery indicator

This appears when a BU-VR24 battery unit (option sold separately) is connected and a working battery pack is loaded in it.

 : No battery pack

 : Battery pack loaded

### q Recording media information

#### When playing back or ready for playback,

this shows the elapsed time from the beginning of the file.

**At all other times,**

this shows the amount of space used on the current media.

**r Bar meters**

**6-6. Data display**

When this unit is record ready, recording or playing back, you can choose whether its display shows video, graphed waveforms of analog data or bar meters.

**6-6-1. Video display**

Use the camera input switching buttons to select the video you want to show on the display. The display will show the selected data from CAMERA-1 or CAMERA-2. The display cannot show both images at the same time.

Camera button

White balance button



Exposure adjustment buttons

- The buttons shown depend on the settings made in SYSTEM → Camera.

**Camera button**

When record ready or recording, readjusts the exposure.

**White balance button**

When record ready or recording, readjusts the white balance.

**Exposure adjustment buttons**

Usually the brightness will be adjusted so that it is optimal, but you can touch the + button to intentionally make it brighter.

You can touch the – button to intentionally make it darker.

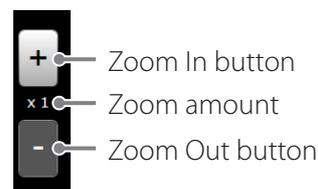
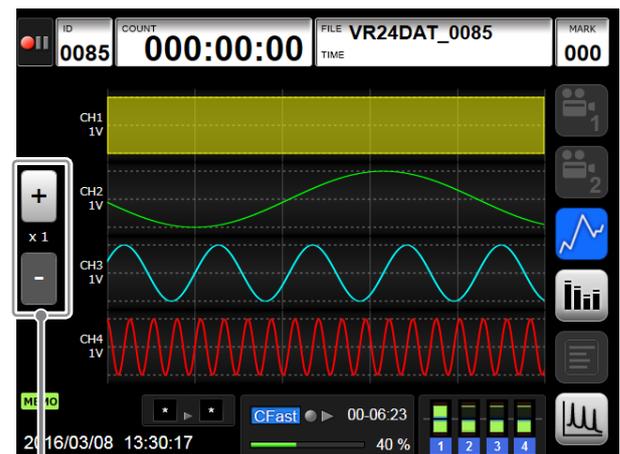
The adjustment range is  $\pm 2$ .

- Since the range of adjustment is limited, using the exposure adjustment buttons might not change the brightness.

**6-6-2. Graphed analog data waveform display**

Touch the graphed waveform display button to show graphed waveforms of analog data on the display. Waveforms will not be shown for channels that have their input settings OFF. Moreover, their data, including channel numbers on the left side, will not be shown.

Graphed waveforms can be shown for a maximum of four channels at the same time. Moreover, it is not possible to designate which channels are shown.



The time axis in graphed waveform display can be zoomed.

The zoom amounts are  $\times 1$ ,  $\times 2$ ,  $\times 4$  or  $\times 8$ .

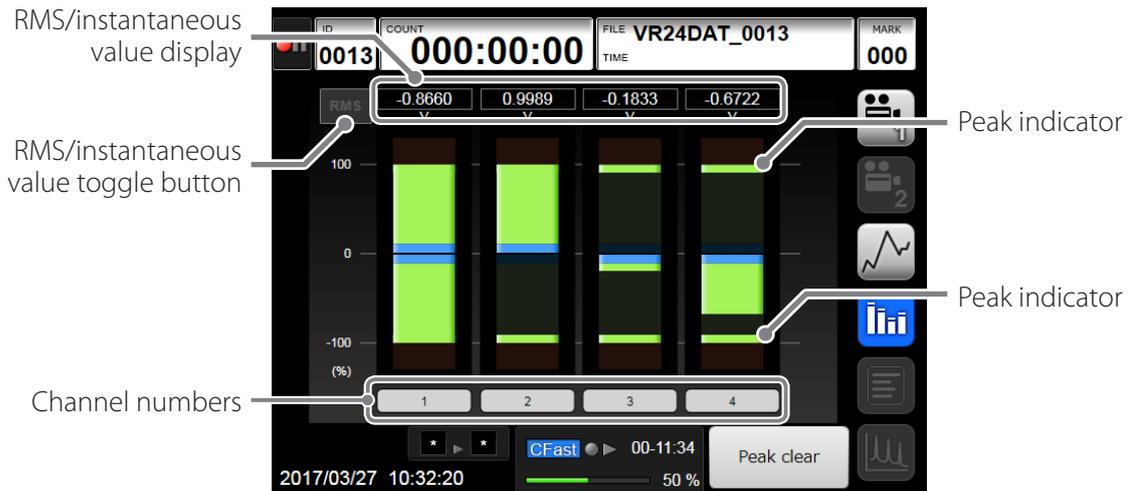
Use the Zoom In/Out buttons to change the zoom amount.

**NOTE**

If the Camera Use setting is set to "1CH (HD 30fps)", zoom will be fixed at  $\times 1$  when recording.

## 6. Basic operation

### 6-6-3. Analog data bar meter display



Touch the bar meter display button to show bar meters of the analog data on the display. Bar meters will not be shown for channels that have their input settings OFF, and their channel numbers will appear gray.

A small version of these bar meters appear at the bottom right of the home screen and graphed waveform display screens.

#### Bar meters

The bar meters are colored by level as follows.

Level (%)	Color
100 to 127	Red
10 to 100	Green
0 to 10	Blue
0 to -10	Blue
-10 to -100	Green
-100 to -127	Red

#### Channel numbers

The colors of the channel numbers depend on their analog input status as follows.

- These are examples of CH1.

**1 Usual**

The analog data level is greater than -100% and less than 100%.

**1 Over range**

The analog data level is greater than 100% or less than -100%.

**1 ICP sensor interruption detection**

An ICP sensor is being used and an interruption is detected

#### Channels shown

Bar meters can be shown for a maximum of four channels at the same time, and it is not possible to designate which channels are shown.

#### Peak indicators

Peak indicators begin to be shown when the unit becomes record ready and when recording starts.

- Peak indicators are reset whenever recording starts from a record ready state.
- When recording stops, the bar meters disappear, but the peak indicators remain.
- Touch the Peak clear button to clear peak indicators.

#### Peak clear button

This resets the peak indicators.

#### RMS/instantaneous value display

These show the analog data levels as RMS or instantaneous values.

Touch the RMS/instantaneous value toggle button to switch which is shown.

### 6-6-4. GPS/CAN/Pulse data display



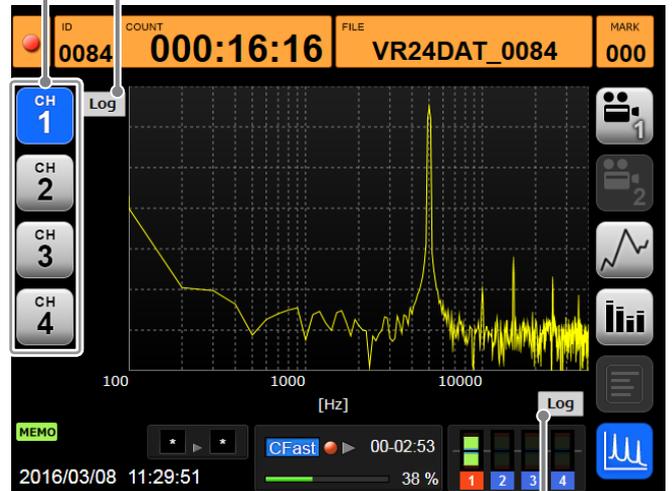
When GPS, CAN or Pulse is active, you can select it. Unused functions are shown as OFF.

#### ATTENTION

When the sampling frequency is set to 96 kHz or 102.4 kHz, CAN data cannot be shown.

### 6-6-5. Analog data FFT display

Channel selection button  
Vertical scale button



Horizontal scale button

Touch the FFT display button to show FFT conversion of the analog data on the display.

#### Channel selection buttons

Use these buttons to select the channel to show.

#### Vertical scale button

#### Horizontal scale button

Switch between log and linear scales for display of the axes.

Example with vertical axis shown using linear scale



#### ATTENTION

If the Camera Use setting is set to "1CH (HD 30fps)", FFT display of analog data is not possible when record ready or recording.

## 6. Basic operation

### 6-7. Trigger settings display



Stop trigger

Start trigger

The start and stop trigger settings are shown by icons.

- ★: No trigger
- 🔌: External trigger
- 📏: Level trigger
- 🕒: Recording time
- ⌚: Timeout

Triggers set modes. If multiple conditions are set, they are shown in the following order of priority.

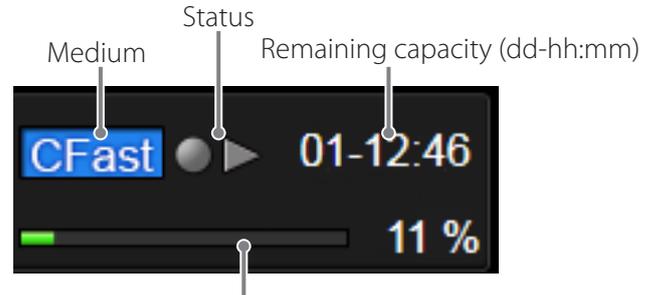
Start conditions

Priority	Condition
1	📏: Level trigger
2	🔌: External trigger
3	⌚: Timeout

Stop conditions

Priority	Condition
1	📏: Level trigger
2	🔌: External trigger
3	🕒: Recording time

### 6-8. Recording media information



Media capacity use and playback position display

#### Media, status and remaining capacity

This shows the type of recording media and amount of available recording time (days-hours: minutes).

- No media is loaded.
- Media is loaded.
- Something is wrong with the media, the media is not supported or the format is not supported.



▶ blinks green during playback.



● blinks red during recording.



The icons appear gray when no media is being accessed.

**01-04:56**

This shows the amount of available recording time (days-hours: minutes). In this example, the amount of available recording time is 1 day, 4 hours and 56 minutes.

The available recording time shown is an estimate.

- CFAST cards cannot be used when unformatted (for example, immediately after purchase). Format them with the VR-24 before use.
- SDHC cards smaller than 2 GB are not supported.

#### Media capacity use and playback position display

The information shown changes according to the status of this unit.

##### When playing back or ready for playback,

the elapsed time from the beginning of the file is shown as a blue bar meter and as a %.

##### At all other times,

the amount of the current media space used is shown as a green bar meter and as a %.

### 6-9. Panel locking

Press and hold the MENU/HOME button to lock or unlock the panel.

When the panel is locked, only the STANDBY/ON switch and the MENU/HOME button function.

## 7. Recording

### 7-1. Order of procedures



### 7-2. Setting recording conditions

Make settings for the sampling frequency, analog-digital conversion bit depth, number of recording channels, voice memo activation and input amplification.

- In order to record measurements with greater precision, however, we recommend letting the system warm-up for at least 10 minutes and then manually calibrating it before beginning measurement.

MISC → Etc → Calibration → Amp calibration

### 7-3. Setting recording destination

Set the media and file name for recording.

FILE → RecFile → Recording device

FILE → RecFile → File name

FILE → RecFile → Comment

- If the recording destination media does not have open space, format it.

FILE → Media → Format

### 7-4. Setting triggers

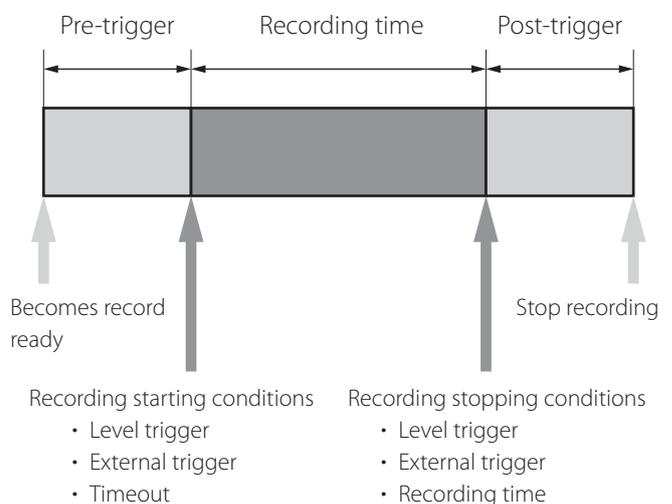
In addition to manually starting and stopping recording, you can also set the system to start and stop recording using triggers and intervals. See “7-4-2. Interval recording” on page 35 and “12. TRIGGER settings” on page 65 for details about settings.

#### ATTENTION

When using triggers and intervals to start recording automatically, put the unit into a record ready state. The unit will not detect triggers if just in a stopped state.

#### 7-4-1. Trigger recording

Example of one trigger recording repetition



For trigger recording, you can set a combination of recording starting conditions (level trigger, external trigger or timeout) and recording stopping conditions (level trigger, external trigger or recording time).

#### Recording starting conditions

##### Level trigger

Use a level change for the set channel as a trigger.

##### External trigger

Recording starts when the input through the external trigger input connector (TRIG IN) becomes the L level (0.6V or less).

##### Timeout

If the conditions set to start recording are not met within a specified time, recording will be forced to start automatically.

##### Pre-trigger

By default, the system saves data from the time between when a recording starting condition occurs and when a recording stopping condition occurs.

When a pre-trigger interval is set, data is recorded before a recording starting condition occurs, but only after the system is made record ready.

- You cannot record voice memos during this time.

### Recording stopping conditions

#### Level trigger

Use a level change for the set channel as a trigger.

#### External trigger

Recording stops when the input through the external trigger input connector (TRIG IN) becomes the H level (open or 3 V or more).

#### Recording time

Recording continues only for the set amount of time.

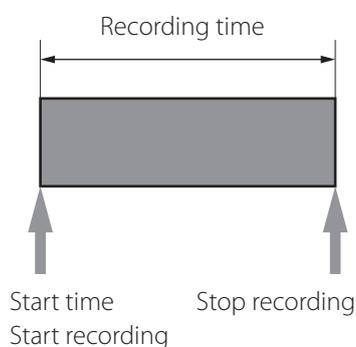
#### Post-trigger

Even after the above recording stopping conditions are met, recording will continue for the set amount of time.

- When recording is stopped manually, however, post-trigger recording will not occur.

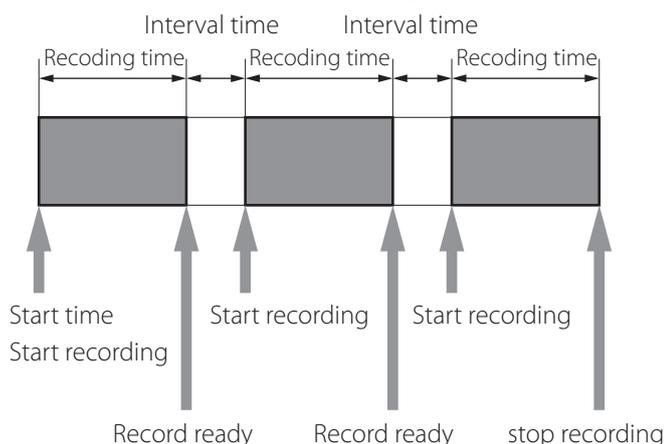
## 7-4-2. Interval recording

Example of one interval recording repetition



With interval recording, when the number of repetitions is set to 1, recording will start at the set time and stop after the set recording time has elapsed.

Example of three interval recording repetitions



When the number of repetitions is set to 2 or more, recording will start at the set time and stop after the set recording time has elapsed. Then, the system will become record ready and start recording again after the set interval. After this process has repeated to record the set number of repetitions, recording will stop.

If the number of repetitions is set to 0, interval recording will repeat until the recording media is full, or recording is stopped manually.

#### Start time

Recording starts at the set time.

#### ATTENTION

If the set time has already passed when the unit is made record ready, recording will not start.

The unit might take some time to become record ready if, for example, there are already many recorded files. Considering this, set the start time with sufficient spare time.

#### Recording time

Recording continues for the set amount of time.

#### Interval time

If the number of repetitions is set to 2 or more recordings, this is the amount of time that the system stays in a record ready state from the time one recording ends until the next recording starts.

#### Repetitions

Sets the number of repetitions. When set to 0, interval recording will repeat until the recording media is full or recording is stopped manually.

- When set to 0, if recording is repeated until the recording media becomes full, the recorded data for the last recording might not be as long as the recording time setting.

## 7. Recording

### 7-5. Calibration

Set the value used to convert sensor output to physical quantities.

#### 7-5-1. Equivalent input calibration

Set the rated output and rated capacity indicated in the sensor test results table ("Unit substitution" on page 52).

#### 7-5-2. Actual load calibration

Calibrate by applying an actual load to the sensor.

- For details about how to use the calibrator used for calibration, refer to the operation manual that came with it.

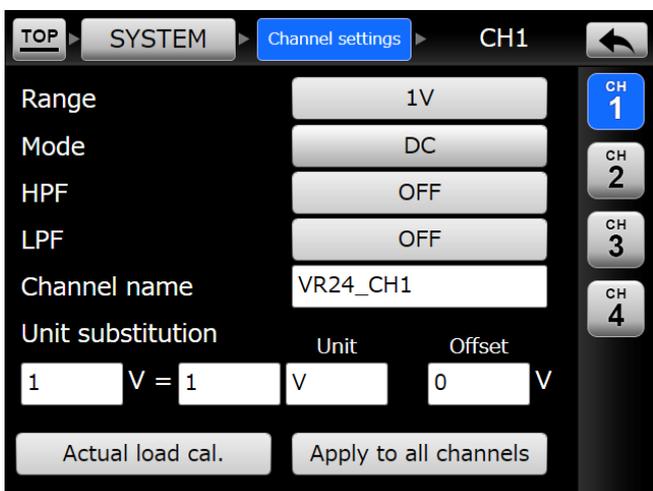
#### Actual load calibration procedures

##### 1 Connect the sensor to the calibrator.

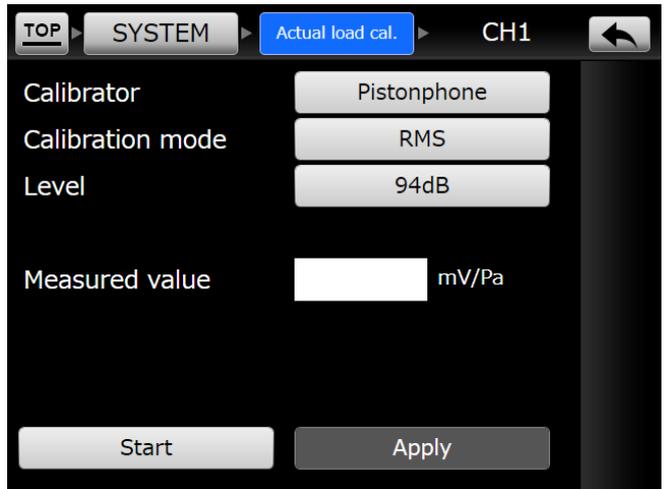
To calibrate a microphone, connect it to a pistonphone.  
To calibrate an accelerometer, connect it to an exciter.

##### 2 Press the MENU/HOME button on the top panel, and then touch the "SYSTEM" → "Analog" → "Channel settings" buttons in order.

##### 3 Set the sensor for actual load calibration, and touch the "Actual load cal." button.



##### 4 Select the actual load value applied to the sensor by the calibrator.



#### Calibrator

Pistonphone: Select when calibrating a microphone.  
Exciter: Select when calibrating an accelerometer.

#### Calibration mode

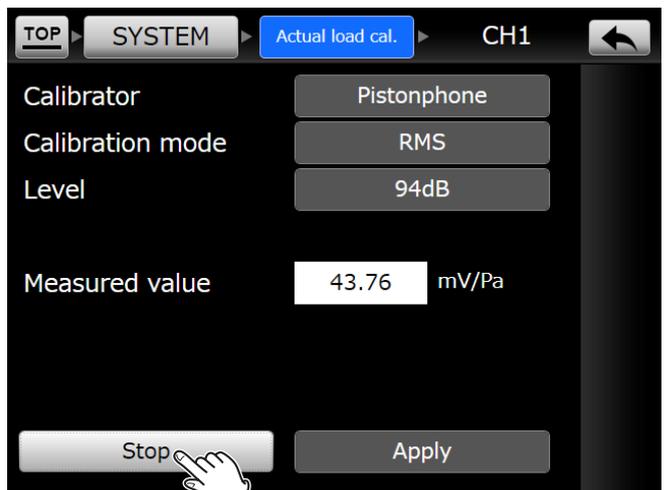
RMS: Calibration is conducted with an RMS value (effective value).  
Peak: Calibration is conducted with a peak value.

#### Level

When the calibrator is a pistonphone  
74 dB, 94 dB, 114 dB  
When the calibrator is an exciter  
4.9 m/s<sup>2</sup>, 9.8 m/s<sup>2</sup>, 10.0 m/s<sup>2</sup>

##### 5 After the actual load is applied to the sensor by the calibrator, touch the "Start" button to start measurement.

##### 6 When the measured value shown in the "Measured value" field becomes stable, touch the "Stop" button.



## 8. Recording

- 7 Touch the “Apply” button to reflect the measured value in the physical quantity conversion value.

### 7-5-3. TEDS calibration

When a TEDS sensor is connected to this unit, the unit will read TEDS data when it is turned on, and automatically set the physical quantity conversion value if it has not been set.

- When the TEDS sensor is changed or the “Update TEDS info” button is touched, the physical quantity conversion value will be reset.

### 7-6. Starting recording

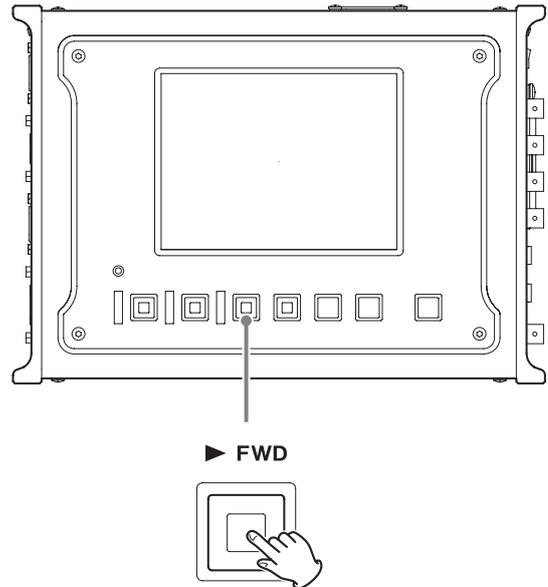
Press the REC button to make the unit ready to record. If a starting trigger has been set, recording will start when a trigger condition is met. If no starting trigger has been set, press the FWD button to start recording.

## 8. Playback

### 8-1. Playback

If a medium that already has a recording is inserted into the unit, press the play (▶ FWD) button when the unit is stopped or playback ready to start playback of the last file made after the system started or the last file that was recorded.

After playback, the file that last played back will start playing again from the beginning.



Press the ◀◀ REW search button when the system is playing back to skip to the beginning of the current file and make it playback ready.

Press the ◀◀ REW search button when the system is playback ready to skip to the beginning of the file recorded before it and make it playback ready.

Press the ▶▶ F FWD search button when the system is playback ready to skip to the beginning of the file recorded after it and make it playback ready.

## 8. Playback

### 8-2. Changing the playback speed



#### NOTE

Touch the middle of the screen to hide the slider and operation buttons, and touch it again to show them.

#### Slider

The ● on the slider shows the file playback position. Move ● to change the playback position.

#### High-speed reverse playback button (<<)

This increases the playback speed.

#### Low-speed reverse playback button (<)

This decreases the playback speed.

#### Playback speed indicator

The playback speed is shown in the center.

When playing forward, ► appears.

When playing backward, ◀ appears.

Touch it to play at normal (x1) speed.

#### Low-speed playback button (>)

This decreases the playback speed.

#### High-speed playback button (>>)

This increases the playback speed.

#### NOTE

- The playback direction will change in response to the button touched.
- During reverse playback and when the playback speed has been changed, the display cannot be changed from video display.

### 8-3. File search

You can open the file list and use it to select and play files.

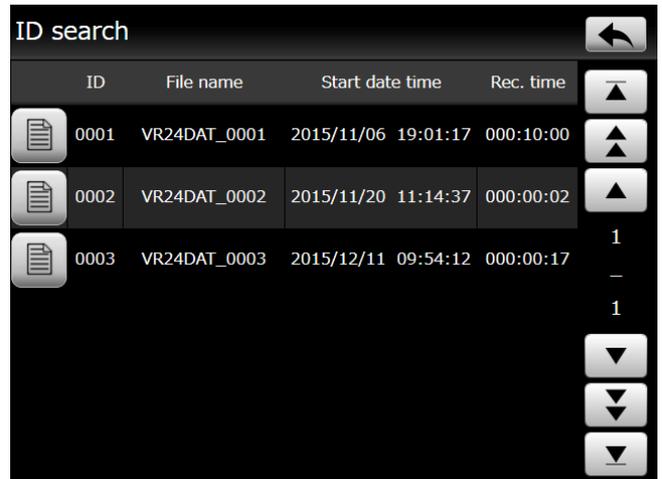
FILE → PlayFile → File search

See "11-2. PlayFile (playback settings)" on page 60 for details.

### 8-4. ID search

Touch ID on the Home Screen when in a stopped state to open the ID search screen.

Select a file in the list to start playing it.



Touch the ▢ buttons at the left side of the list to show details.

### 8-5. COUNT search

Touch COUNT on the Home Screen when playback ready to open the COUNT search screen.

Set the hour, minute and second, and press the OK button to start playback from that time.

The hour, minute and second set here is the elapsed time of the recording.

### 8-6. TIME search

Touch FILE/TIME on the Home Screen when playback ready to open the TIME search screen.

Set the year, month, day, hour, minute and second, and press the OK button to start playback from that time.

The searchable range is between the starting and ending dates and times of the current file.

### 8-7. MARK search

Touch MARK on the Home Screen when playback ready to open the MARK search screen.

Set the event mark number, and press the OK button to start playback from that event mark position.

# 9. Settings

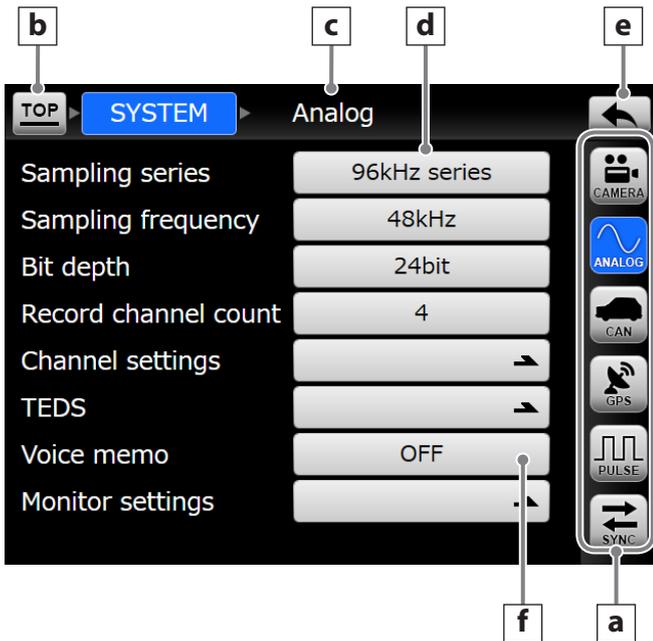
## 9-1. Settings screens

### TOP screen



- a Settings screen buttons**  
Touch a button to open that settings screen.
- b TOP button**  
Return to the TOP menu.
- c Settings screen name**  
This shows the current settings category.
- d Setting value selection buttons**  
Touch a button to show the options.
- e Back button (←)**  
Return to the higher-level menu screen.
- f Setting button (→)**  
Touch to open a lower-level menu screen.

### Settings screens



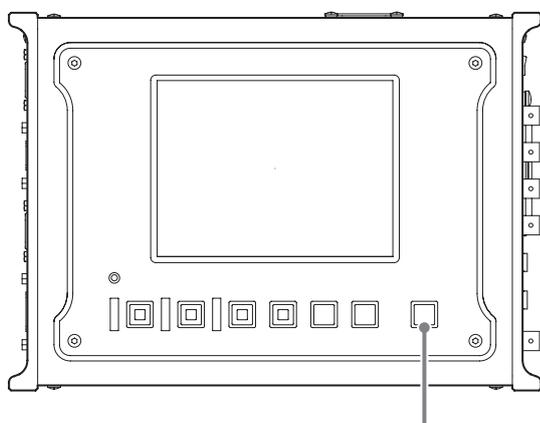
## 9-2. Basic operation

Set this unit's various settings by touching buttons and other icons shown on the touch panel display.

- See "9-7. Menu screen item list" on page 44 for the settings menu structure.
- See "9-8. Setting values list" on page 45 for the default values and options of each setting.

### 1 Press the MENU/HOME button on the top panel to open the TOP menu screen.

- If you press the MENU/HOME button when recording, setting values can be shown but they cannot be changed.



MENU/HOME



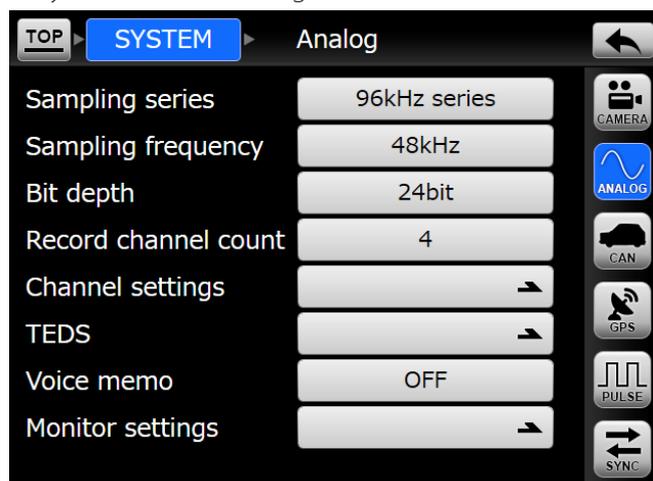
LOCK

### 2 Touch the button for the type of setting that you want to change.

When you touch a setting button, a screen where you can change multiple related settings will open.

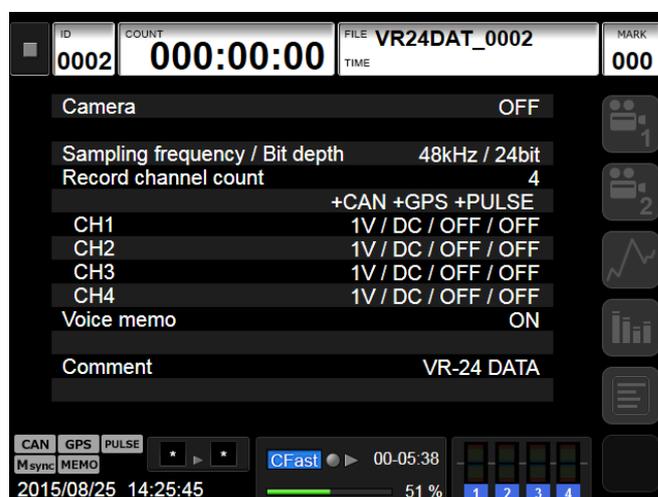


The following screen is the one that will open when you touch the Analog button.



- Press the back (←) button to return to the higher-level menu screen.
- Press a setting button on the right edge of the screen to open a different settings screen without returning to the higher-level menu screen.

### 3 When you are done changing settings, press the MENU/HOME button to return to the HOME screen.



### ATTENTION

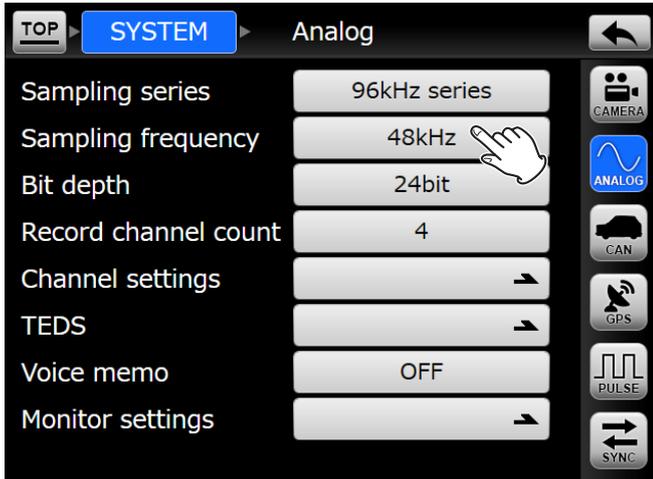
Settings are applied when the Home Screen is reopened.

## 9. Settings

### 9-3. Selecting values from setting options

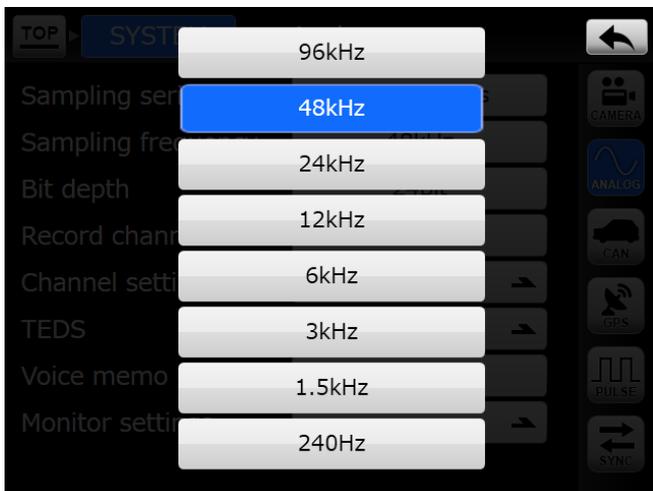
Follow these procedures to select a different value option for a setting such as the sampling frequency.

#### 1 Touch the button showing the set value.

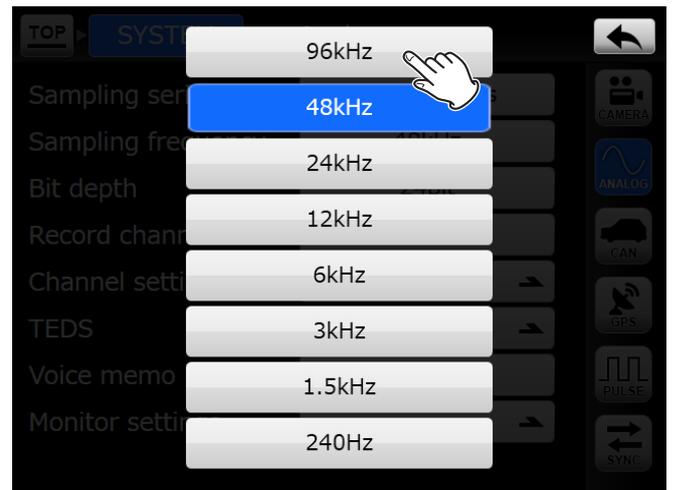


A list of setting options will appear.

For example, press the 48kHz sampling frequency button to open the following screen.

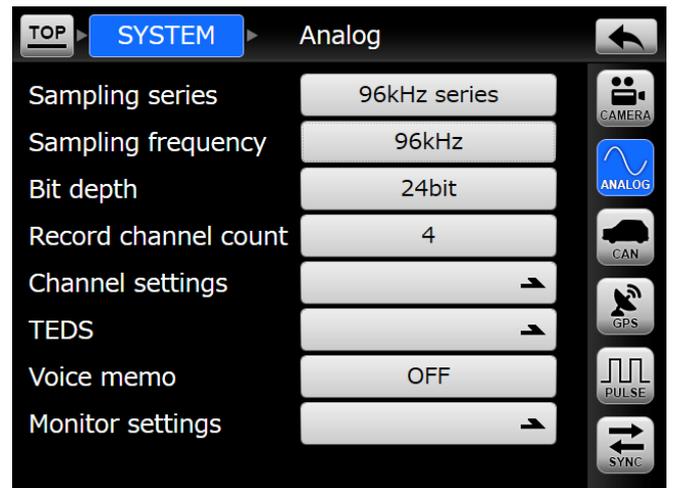


#### 2 Touch a button to set that value.



The list of setting options will disappear, and the set value will change.

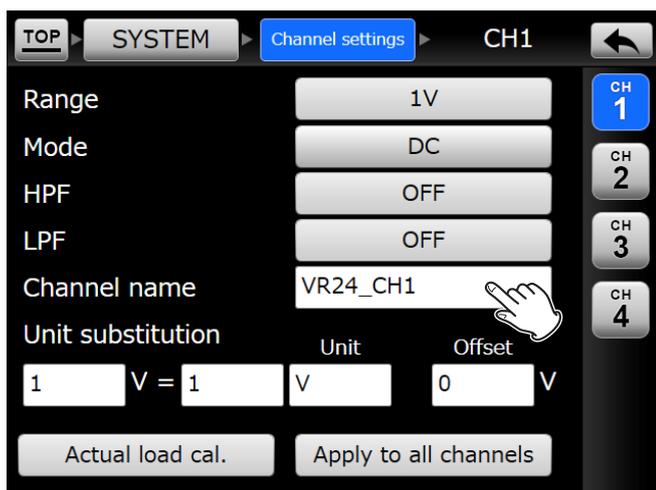
- Press the back button at the top right of the screen to return to the higher-level menu screen without changing the setting.



## 9-4. Inputting characters as setting values

To input characters as the value for a setting such as “Channel name” and “Unit substitution”, touch the setting value to open the character input screen.

- 1 Touch a setting value to open the character input screen.



The currently set characters are shown in the window near the top of this screen.



- 2 Input the characters and touch the OK button.

Return to the settings screen.

The functions of the buttons other than the characters are as follows.

BS: Delete the character to the left of the cursor

OK: Confirm the input characters

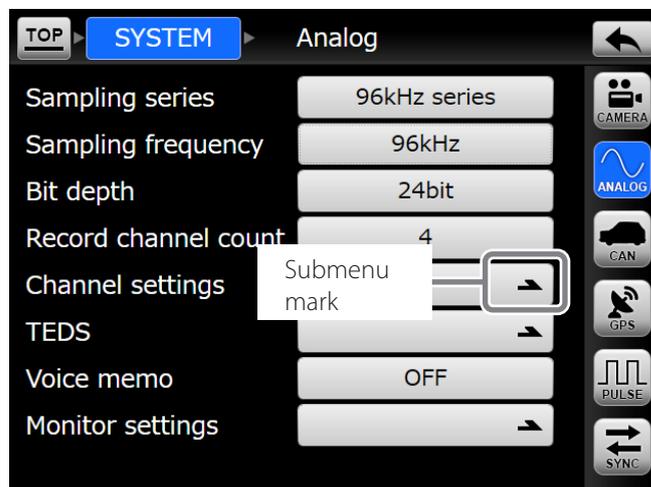
Cancel: Cancel the input

◀▶: Move the cursor in the direction of the arrow

SHIFT: Touch to change input to lowercase letters and symbols.

## 9-5. Opening submenu screens

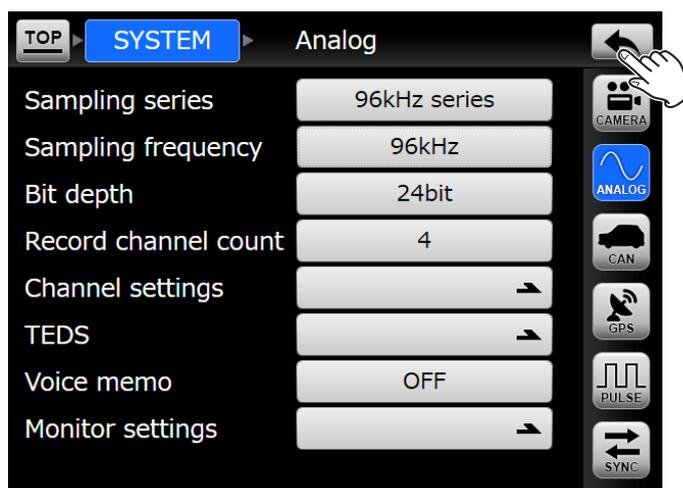
The menu screen has a multilevel structure. A setting item with a submenu has a ▶ on the right side of its button. Touch the button to open its submenu screen.



- The structure of the menus is shown in “9-7. Menu screen item list” on page 44.

## 9-6. Opening higher-level menu screens

Press the button at the top right of the screen to return to the previous screen.



## 9. Settings

### 9-7. Menu screen item list

#### SYSTEM

- Camera
  - Camera use
  - Resolutions
  - Frame rate
  - Gain
  - Shutter speed
  - White balance
  - Contrast
  - Saturation
  - Camera status
- Analog
  - Sampling series
  - Sampling frequency
  - Bit depth
  - Record channel count
  - Channel settings
    - Actual load calibration
  - TEDS
  - Voice memo
  - Monitor settings
- CAN
  - Use
  - Port settings
  - Signal settings
  - IGNI trigger
- GPS
  - Data recording
  - Time zone
  - Status
  - Adjust time
- Pulse
  - Use
  - Mode
  - Edge
  - Pulses per revolution
  - Unit substitution
- Sync
  - Synchronization type
  - Connection check
  - Adjust time

#### FILE

- RecFile
  - Recording device
  - File name
  - Comment
- PlayFile
  - File search
- Media
  - Format

#### TRIGGER

- Mode
  - OFF
  - Trigger
    - Start conditions
      - Level trigger
      - External trigger
      - Timeout
    - Pre-trigger
    - Stop conditions
      - Level trigger
      - External trigger
      - Recording time
    - Post-trigger
    - Repetitions
- Interval
  - Start time
  - Recording time
  - Interval time
  - Repetitions

#### MISC

- LCD
  - Backlight dimming
  - Brightness
- Date time
  - Set date and time
  - Display
- Parameters
  - Load parameters
  - Save parameters
  - Initialize settings
- Etc
  - Sampling display
  - Language (言語)
  - Beep settings
  - Fan
  - Calibration
    - Amp calibration
  - Version

## 9-8. Setting values list

### 9-8-1. SYSTEM - Camera

Parameter	Default value	Setting values	Note
Camera use	2CH	OFF, 1CH, 2CH	
Resolutions	VGA	HD (1280x720), VGA (640x480), QVGA (320x240)	
Frame rate	30fps	100fps, 30fps, 1fps	
Gain	Standard	Standard, Increased, Continuous	
Shutter speed	Once	Continuous, Once, Fixed Max, Fixed 1/500, Fixed 1/1000, Fixed 1/5000, Fixed 1/10000	
White balance	Once	Once, Tungsten (3100K), Fluorescent (4200K), Daylight (5000K), Cloudy (6500K)	
Contrast	Standard	Weakest, Weak, Standard, Strong, Strongest	
Saturation	Standard	Low, Standard, High	

### 9-8-2. SYSTEM - Analog

Parameter	Default value	Setting values	Note	
Sampling series	96kHz series	96kHz series 102.4kHz series		
Sampling frequency	48kHz	96kHz, 48kHz, 24kHz, 12kHz, 6kHz, 3kHz, 1.5kHz, 240Hz 102.4kHz, 51.2kHz, 25.6kHz, 12.8kHz, 5.12kHz, 2.56kHz, 1.28kHz, 256Hz		
Bit depth	24bit	24bit, 16bit		
Record channel count	4	1, 2, 3, 4		
Channel settings	Range	1 V	10, 3.16, 2, 1, 0.316, 0.1, 0.0316, 0.01V	
	Mode	DC	DC, AC, ICP	
	HPF	OFF	OFF, 5Hz	
	LPF	OFF	OFF, 200Hz, 500Hz, 1kHz, 2kHz	
	Channel name	VR24_xxx		20 ASCII characters maximum
	Unit substitution	a = 1.000000 b = 1.000000 c = V d = 0.000000		[a] V = [b] [c] [d] a: Coefficient 1 b: Coefficient 2 c: Unit d: Offset (V)
	Actual load calibration			
TEDS				
Voice memo	OFF	OFF, ON		

## 9. Settings

Parameter	Default value	Setting values	Note
Monitor settings	Monitor channel	Voice memo	Voice memo, CH1, CH2, CH3, CH4
	Output level		

### 9-8-3. SYSTEM - CAN

Parameter	Default value	Setting values	Note	
Use	OFF	OFF/ON		
Port settings	Baud rate	500kbps	125kbps, 200kbps, 250kbps, 500kbps, 1000kbps	
	Sampling point	73.3%	60.0%, 66.7%, 73.3%, 80.0%, 86.7%	
	BSP	Triple	Single, Triple	
	SJW	4	1, 2, 3, 4	
	Mode	Normal	Normal, Listen only	
Signal settings	ID type	Standard	Standard, Extended	
	Frame ID	0		
	Start bit	0	0-63	
	Bit length	1	1-64	
	Byte order	Intel	Intel, Motorola	
	Value type	Unsigned	Unsigned, Signed, Float, Double	
	Name	Signal XX		20 ASCII characters maximum
	Unit			20 ASCII characters maximum
	Coefficient	1.0000000		
Offset	0.0000000			
IGNI trigger	OFF	OFF, ON		

### 9-8-4. SYSTEM - GPS

Parameter	Default value	Setting values	Note
Data recording	OFF	OFF, ON	
Time zone	Time zone	Japan	Japan, UTC, Custom
	Difference	UTC+9:00	UTC±14:00
Status			
Adjust time			

### 9-8-5. SYSTEM - Pulse

Parameter	Default value	Setting values	Note
Use	OFF	OFF, ON	
Mode	Pulse count	Pulse count, rpm	
Edge	UP	UP, DOWN	

Parameter	Default value	Setting values	Note
Pulses per revolution	1.0		ASCII
Unit substitution			

### 9-8-6. SYSTEM - Sync

Parameter	Default value	Setting values	Note
Synchronization type	OFF	OFF, VR sync master, VR sync slave, WX sync, LX sync	
Connection check			

### 9-8-7. FILE - RecFile

Parameter	Default value	Setting values	Note
Recording device	CFast	CFast, SD	
File name	VR24DAT_		8 ASCII characters maximum
Comment	VR-24 DATA		20 ASCII characters maximum

### 9-8-8. FILE - PlayFile

Parameter	Default value	Setting values	Note
File search			

### 9-8-9. FILE - Media

Parameter	Default value	Setting values	Note
Format			

### 9-8-10. TRIGGER - Mode - Trigger

Parameter			Default value	Setting values	Note
Start conditions	Level trigger	Use	OFF	OFF, ON	
		Logic	AND	AND, OR	
		Count	1	1-9999	
	External trigger		OFF	OFF, ON	
	Timeout		00:00:00		
Pre-trigger			OFF	OFF, 3sec, 5sec, 10sec	
Stop conditions	Level trigger	Use	OFF	OFF, ON	
		Logic	AND	AND, OR	
		Count	1	1-9999	
	External trigger		OFF	OFF, ON	
	Recording time		00:00:00		
Post-trigger			OFF	OFF, 3sec, 5sec, 10sec	
Repetitions			0	0-9999	

## 9. Settings

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### 9-8-11. TRIGGER - Mode - Interval

Parameter	Default value	Setting values	Note
Start time			
Recording time	00:00:00		
Interval time	00:00:00		
Repetitions	0	0-9999	

### 9-8-12. MISC - LCD

Parameter	Default value	Setting values	Note
Backlight dimming	OFF	OFF, 1 minute, 5 minutes, 30 minutes	
Brightness			

### 9-8-13. MISC - Date time

Parameter	Default value	Setting values	Note
Set date and time			
Display	Year/month/ day	Year/month/day, Month/day/year, Day/month/year	

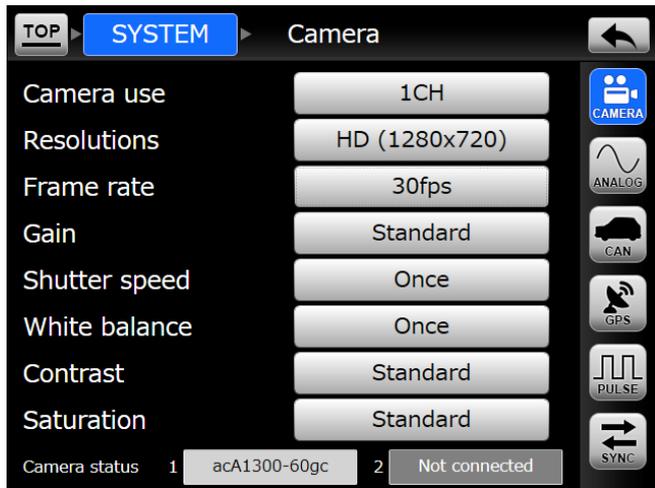
### 9-8-14. MISC - Parameters

Parameter	Default value	Setting values	Note
Load parameters			
Save parameters			
Initialize settings			

### 9-8-15. MISC - Etc

Parameter	Default value	Setting values	Note
Sampling display	Frequency	Frequency, Band	
Language (言語)	日本語	日本語, English	
Beep settings	Button beep	OFF	OFF, ON
	Warning beep	ON	OFF, ON
Fan	ON	OFF, ON	
Calibration	Amp calibration		
Version			

## 10-1. Camera



### Camera use

Select the camera to use.

- No recording will occur when set to OFF.

### Resolutions

Select the resolution to use for recording.

- A resolution higher than the camera resolution cannot be selected.

### Frame rate

Select the frame rate to use for recording.

### Gain

Standard: Use the standard camera gain. Bright recording is not possible in dark areas, but the images are clear with little noise.

Increased: The camera gain is increased. The images will be noisier than usual, but recording that is relatively bright is possible even in dark areas.

Continuous: Adjustments occur automatically to always achieve optimal gain when record ready or recording.

### Shutter speed

Continuous: Adjustments occur automatically to always achieve optimal shutter speed when record ready or recording.

Once: Adjustments occur automatically to achieve optimal shutter speed when record ready or when the camera button on the Home Screen is touched.

Fixed: Recording occurs with the selected shutter speed. Select "Max" to record using the slowest shutter speed of the connected camera.

### White balance

Once: When record ready or when the white balance button on the Home Screen is touched, the white balance is adjusted automatically.

Tungsten (3100K): Use this setting when in an area lit by light bulbs.

Fluorescent (4200K): Use this setting when in an area lit by fluorescent lights.

Daylight (5000K): Use this setting when outdoors on a clear day.

Cloudy (6500K): Use this setting when outdoors on a cloudy day.

### ATTENTION

The color temperatures are estimates.

### Contrast

Select the contrast.

### NOTE

When recording images with high contrast differences, using a lower setting can reduce areas that are too light or dark.

### Saturation

This sets the color intensity.

### Camera status

This shows the name of the connected model.

### ATTENTION

- Automatic adjustment will occur after the unit is made record ready. Adjustment will occur for some time after the unit is made record ready. For this reason, if recording is started soon after becoming record ready, the image might be recorded while being adjusted.
- When 1fps is selected as the frame rate, automatic adjustment could take up to 10 seconds.
- When automatic adjustment occurs, the frame rate might decrease temporarily.

## 10.SYSTEM settings

### 10-1-1. Camera setting combinations

Camera connection combinations		Selectable settings
1 camera connected	Camera that supports HD resolution connected to CAMERA-1	1CH (HD 30fps)
		1CH (VGA 30fps)
		1CH (QVGA 100fps)
		1CH (HD 1fps)
	Camera that supports VGA resolution connected to CAMERA-1	1CH (VGA 1fps)
		1CH (VGA 30fps)
		1CH (QVGA 100fps)
		1CH (VGA 1fps)
2 cameras connected	2 cameras that support HD resolution connected	1CH (HD 30fps)
		1CH (VGA 30fps)
		1CH (QVGA 100fps)
		1CH (HD 1fps)
		1CH (VGA 1fps)
		2CH (VGA 30fps)
		2CH (QVGA 30fps)
		2CH (VGA 1fps)
	Camera that supports HD resolution connected to CAMERA-1 and camera that supports VGA resolution connected to CAMERA-2	1CH (HD 30fps)
		1CH (VGA 30fps)
		1CH (QVGA 100fps)
		1CH (HD 1fps)
		1CH (VGA 1fps)
		2CH (VGA 30fps)
		2CH (QVGA 30fps)
		2CH (VGA 1fps)
	2 cameras that support VGA resolution connected	1CH (VGA 30fps)
		1CH (QVGA 100fps)
		1CH (VGA 1fps)
		2CH (VGA 30fps)
		2CH (QVGA 30fps)
		2CH (VGA 1fps)

- To record HD resolution video, connect a camera that supports HD resolution to CAMERA-1.

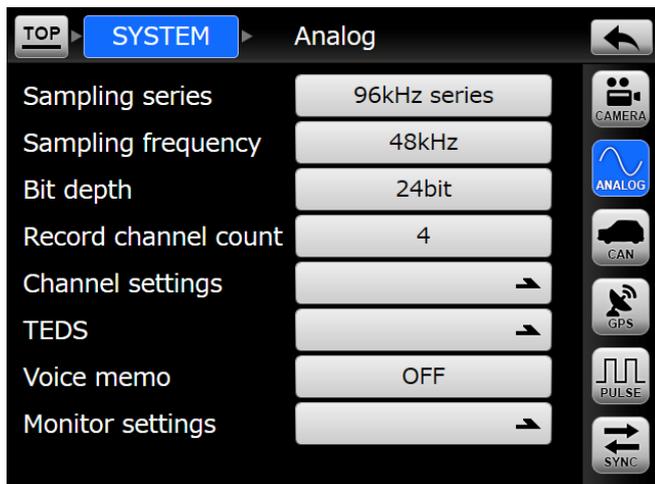
### 10-1-2. Camera use

Settings that cannot be used are shown with a dark gray background.



- If a setting that cannot be used is selected when the unit is started up, it will not be changed automatically. Change the setting manually. If you do not change the setting manually, an error message stating that the setting is invalid will be shown when recording is attempted.

## 10-2. Analog



### Sampling series

Sets the sampling frequency series.

### Sampling frequency

This shows the set sampling frequency.

### Bit depth

Sets the analog-digital resolution (quantization bit depth).

### Record channel count

Sets the number of recording channels.

### Voice memo

Set voice memo recording.

OFF: Not recorded

ON: Recorded

- Voice memos are not recorded during the pre-trigger interval.
- When playing data recorded using the pre-trigger function, the beginning of the voice memo will be lined up with the recording data, so the voice memo and recorded data playback positions will be shifted by the amount of pre-trigger data.

### ATTENTION

The maximum file size of voice memo data is 4 GB. Voice memo data in excess of 4 GB will not be recorded, but normal recording will not be interrupted. (For voice memo data to exceed 4 GB, it would take about 6 days.)

### NOTE

When the sampling frequency is set to 96 kHz or 102.4 kHz, set the Analog settings "Record channel count" and CAN, GPS and pulse channels so that the total number of channels does not exceed 4.

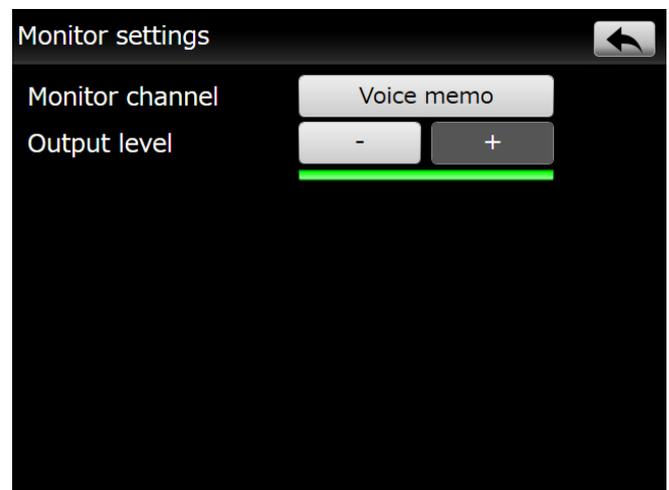
Enabling these inputs will use the following number of channels.

CAN: 2 channels

GPS: 1 channel

Pulse: 1 channel

### 10-2-1. Monitor settings



### Monitor channel

Sets the channel output through the EARPHONE jack. Nothing will be output when set to OFF.

- Nothing will be output when an unrecorded channel is selected.

### Output level

Set the earphone jack output level.

### ATTENTION

- When recording starts, for example, output might be interrupted momentarily.
- Voice memos will not be output when record ready or recording.

## 10.SYSTEM settings

### 10-2-2. Channel settings

TOP SYSTEM Channel settings CH1

Range 1V

Mode DC

HPF OFF

LPF OFF

Channel name VR24\_CH1

Unit substitution 1 V = 1 V Offset 0 V

Actual load cal. Apply to all channels

CH 1

CH 2

CH 3

CH 4

Make input amplification settings for each channel.

- Use the buttons on the right side of the screen to select the channel to set.

#### Range

Sets the input amplification range. Set the range to a voltage value that the analog signal will not exceed.

#### Mode

- DC: DC mode
- AC: AC mode
- ICP: ICP mode

Select this when using an ICP sensor. 24V 4mA power will be supplied.

#### HPF

Sets the high pass filter.  
Select OFF to disable the high pass filter.

#### LPF

Sets the low pass filter.  
Select OFF to disable the low pass filter.

#### Channel name

Sets the name of the channel.

- A maximum of 20 characters can be used for a channel name.
- See "9-4. Inputting characters as setting values" on page 43 for how to input characters.

#### Unit substitution

Use to apply a coefficient to the measured voltage to convert the physical quantity. The physical quantity is calculated using the following formula.

Unit substitution  
= (measured voltage – offset) × coefficient

#### Actual load cal.

Calibrate by applying an actual load to the sensor.  
See "7-5-2. Actual load calibration" on page 36 for the operation procedures.

#### Apply to all channels

Touch this button to apply the range, mode, HPF and LPF settings shown to all channels.

### 10-2-3. TEDS

TOP SYSTEM TEDS CH1

Sensor

Manufacturer

Model

Serial number

Sensitivity

Unit

Update TEDS info

CH 1

CH 2

CH 3

CH 4

This screen shows the TEDS data read when the unit is turned on.

Each item will be shown for channels that have had TEDS data read.

- Use the buttons on the right side of the screen to select the channel to show.

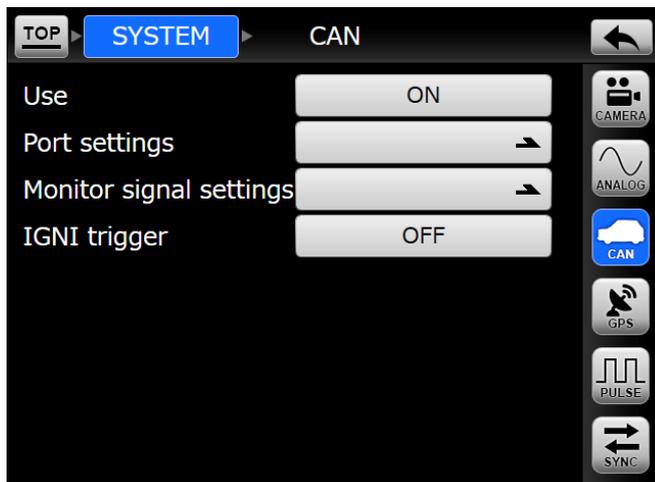
#### Update TEDS info

Touch this button to load TEDS sensor data again.

- Touch this button to refresh TEDS data when, for example, a TEDS sensor was connected after the unit was already on.

### 10-3.CAN

When Use is ON, the setting items are shown.



#### IGNI trigger

When ON, it will function as a start trigger.

- When using CAN, there are limits on the sampling frequency and number of recording channels.

#### NOTE

When the sampling frequency is set to 96 kHz or 102.4 kHz, set the Analog settings "Record channel count" and CAN, GPS and pulse channels so that the total number of channels does not exceed 4.

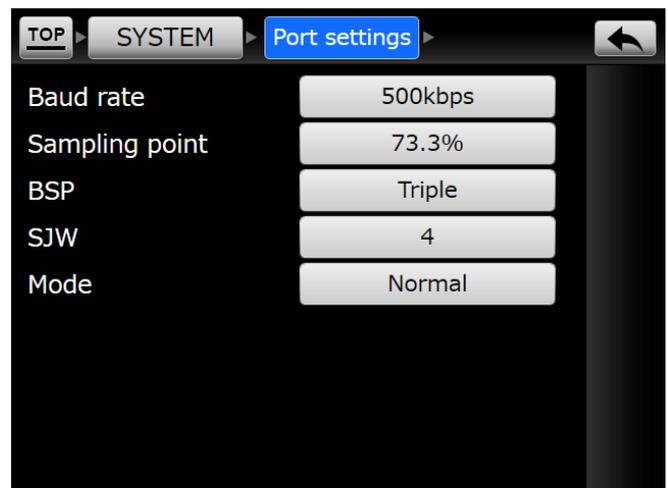
Enabling these inputs will use the following number of channels.

CAN: 2 channels

GPS: 1 channel

Pulse: 1 channel

### 10-3-1.Port settings



Make settings related to the CAN port.

#### Baud rate

Sets the transmission speed.

#### Sampling point

Sets the sampling timing.

#### BSP

Sets whether sampling occurs at one point or takes the most frequent value from three points.

#### SJW

Sets the resynchronization jump width.

#### Mode

Normal

This is the normal setting.

Listen only

This controls ACK transmission. This has no effect on the operation of the CAN bus.

(Communication is not possible when connected one-to-one with a CAN device.)

#### ATTENTION

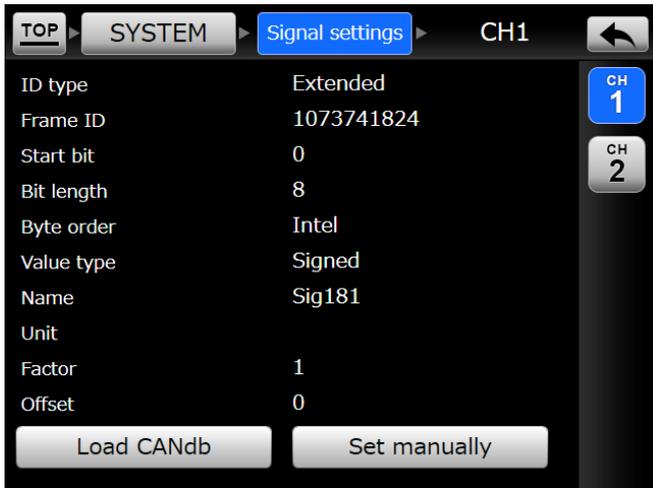
When the sampling frequency is low, CAN data could be lost.

The following table shows the minimum required sampling frequency settings for recording without CAN data loss.

CAN baud rate	16-bit depth		24-bit depth	
	96kHz series	102.4kHz series	96kHz series	102.4kHz series
125 kbps	12 kHz	12.8 kHz	6 kHz	12.8 kHz
200 kbps	24 kHz	25.6 kHz	12 kHz	12.8 kHz
250 kbps	24 kHz	25.6 kHz	12 kHz	12.8 kHz
500 kbps	48 kHz	51.2 kHz	24 kHz	25.6 kHz
1000 kbps	96 kHz	102.4 kHz	48 kHz	51.2 kHz

## 10.SYSTEM settings

### 10-3-2. Signal settings (monitor signal settings)



Makes settings related to monitor signals.

- Use the buttons on the right side of the screen to select the monitoring signal to set.

#### Load CANdb

Load the CANdb file saved on the SD card, and select the CAN signal.

- Using a computer, create a directory called "CANdb" in the root directory of the SD card, and save the CANdb file in it. The file extension is "dbc". (If there are more than 8 CANdb files, 8 files will be shown in modification date order with the most recent first.)

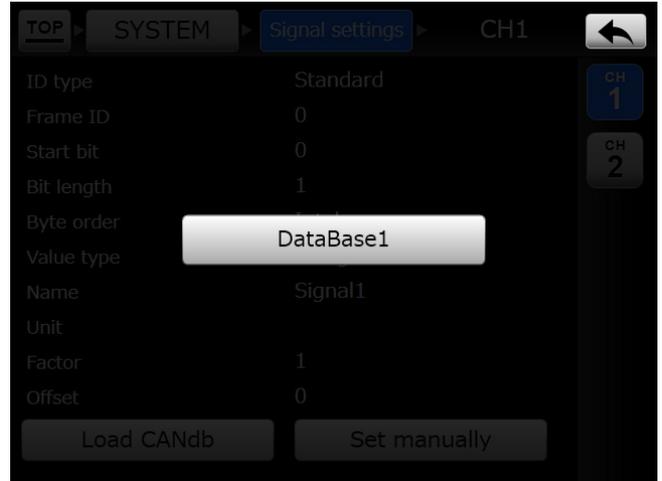
#### Set manually

Set the monitoring signal items manually.

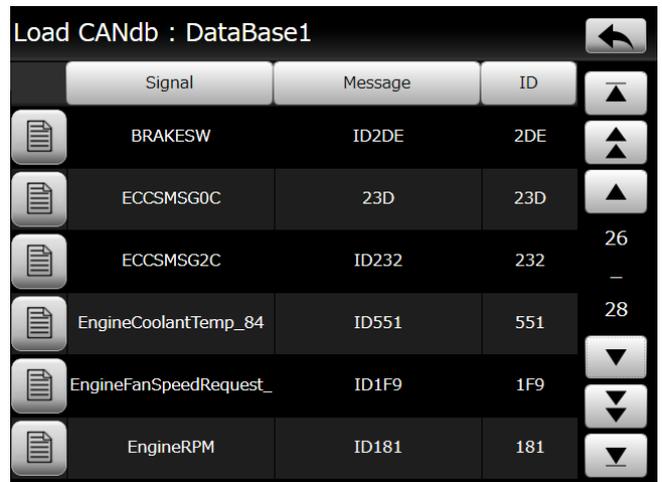
### 10-3-2-1. Loading CANdb files

Touch the Load CANdb button to open a screen where you can select CANdb files saved on the SD card.

If there is only one CANdb file, a screen like the following will appear. (The number of selection buttons shown will be the same as the number of CANdb files saved on the SD card.)



When you select a CANdb file, a screen like the following will appear.



A list of CANdb signals in the file is shown.

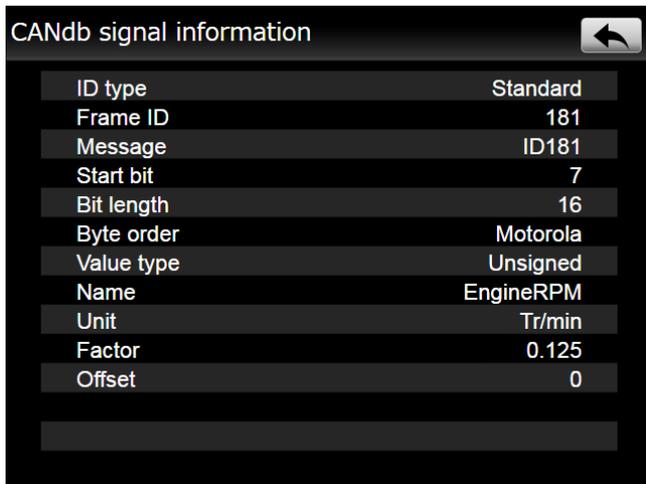
Touch the list displayed to select a signal to load it.

Use the Signal, Message and ID buttons at the top of the screen to sort the list.

In order from top to bottom, the buttons and numbers on the right side have the following functions and meanings.

-  Return to the top of the list.
-  Go back 10 pages in the list.
-  Go back 1 page in the list.
- 26 Current page number
- 28 Final page number
-  Go forward 1 page in the list.
-  Go forward 10 pages in the list.
-  Go forward to the last page in the list.

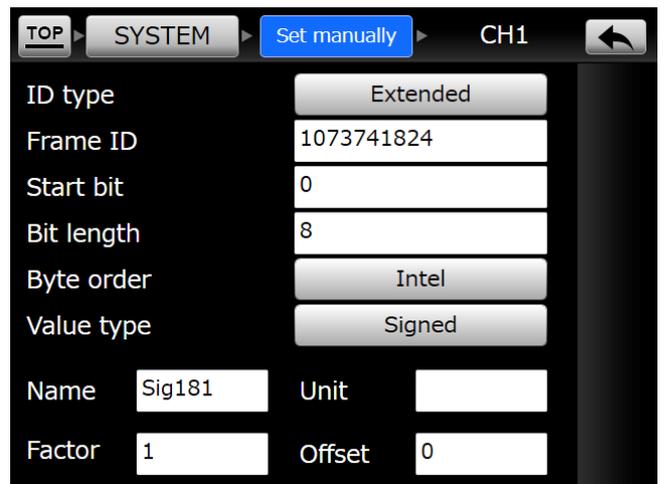
Touch the  buttons at the left side of the list to show details.



If there are no CANdb files, an error screen like the following will appear.

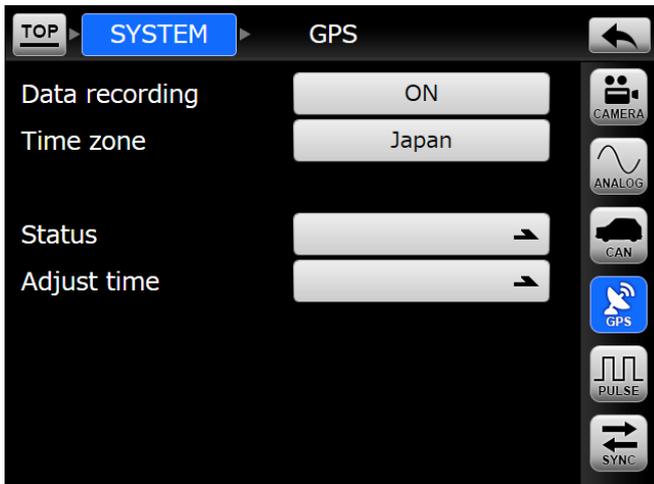


### 10-3-2-2. Setting items manually



Set the monitoring signal items.

10-4. GPS



**Data recording**

When ON, GPS location information will be recorded.

- When using GPS, there are limits on the sampling frequency and number of recording channels.

**NOTE**

When the sampling frequency is set to 96 kHz or 102.4 kHz, set the Analog settings "Record channel count" and CAN, GPS and pulse channels so that the total number of channels does not exceed 4.

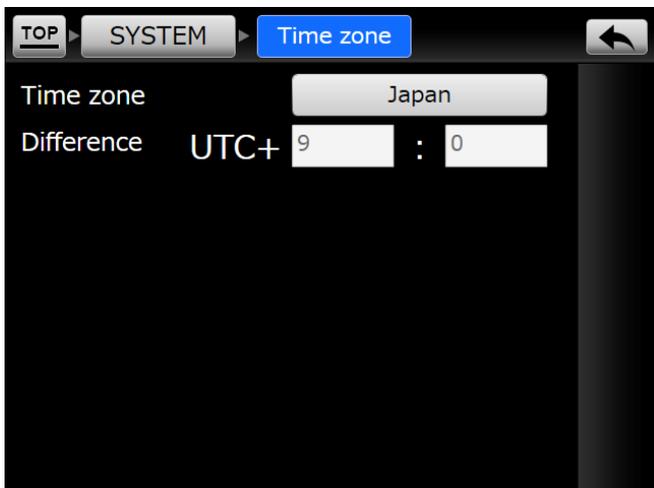
Enabling these inputs will use the following number of channels.

CAN: 2 channels

GPS: 1 channel

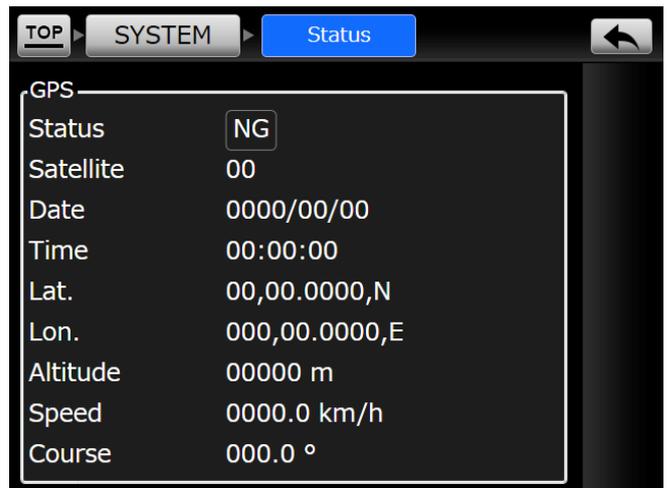
Pulse: 1 channel

**10-4-1. Time zone**



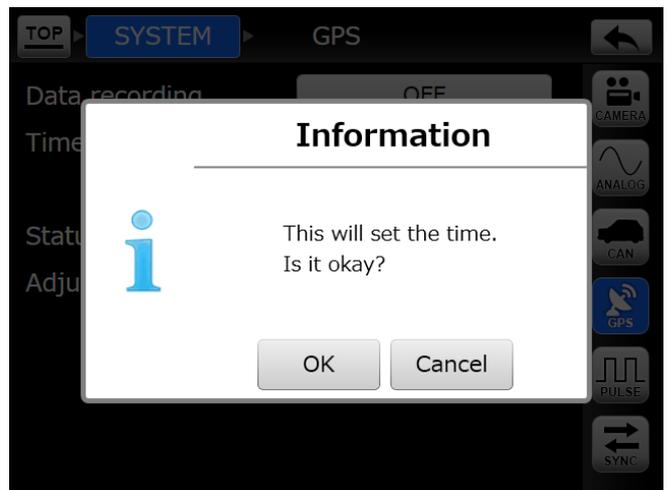
Set the time zone for showing the time. To set a time zone other than Japan or UTC, select "Custom" and input the time difference from UTC.

**10-4-2. Status (reception status)**



If the reception status is "NG", GPS is not connected or no signal is being received from a satellite. If the reception status is "OK", the GPS data being received will be shown.

**10-4-3. Adjust time**

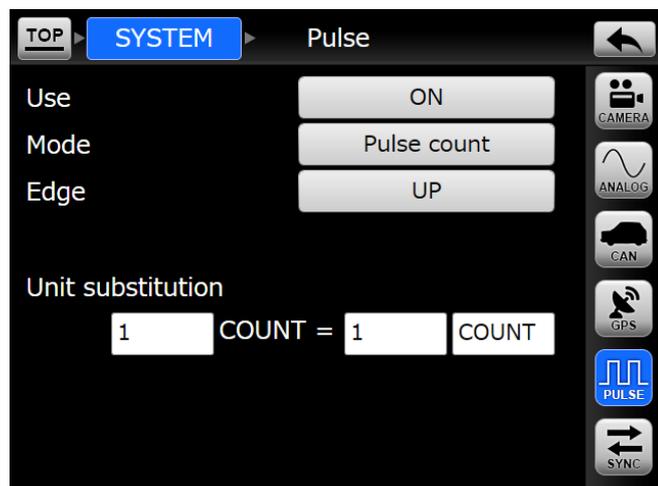


Use to set the unit's clock according to the GPS time information.

- To set the time without using GPS, input it using the "Date time" item on the MISC settings screen.

## 10-5. Pulse

When Use is ON, the setting items are shown.



### Use

Set the function of the PULSE/TRIG IN connector.

OFF: Use as an external trigger input connector.

ON: Use as a pulse input connector.

- When using pulse input, there are limits on the sampling frequency and number of recording channels.

### Mode

Pulse count

The pulse count is recorded.

rpm

The number of revolutions per minute is recorded.

### Edge

This sets the timing for counting pulses.

### Pulses per revolution

- This is shown when the mode is rpm.

### Unit substitution

Use to apply a coefficient to the measured count to convert the physical quantity.

- This is shown when the mode is pulse count.

### NOTE

When the sampling frequency is set to 96 kHz or 102.4 kHz, set the Analog settings "Record channel count" and CAN, GPS and pulse channels so that the total number of channels does not exceed 4.

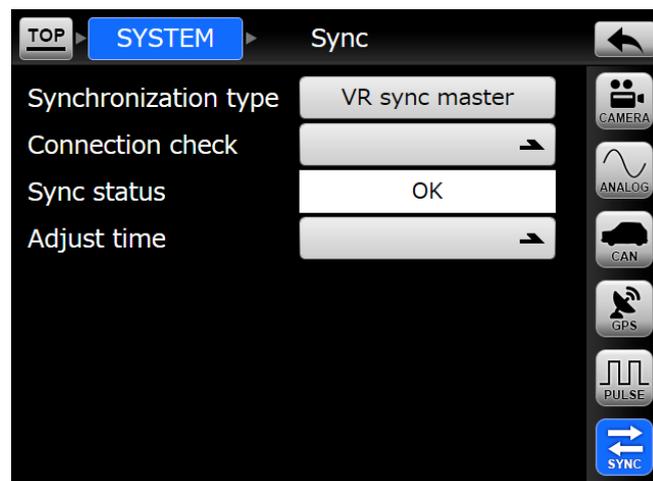
Enabling these inputs will use the following number of channels.

CAN: 2 channels

GPS: 1 channel

Pulse: 1 channel

## 10-6. Sync



### Synchronization type

OFF: The unit will operate independently without recording synchronization.

VR sync master: When using two VR-24 units for synchronized recording, use this setting for the VR-24 that will be used as the master unit.

VR sync slave: When using two VR-24 units for synchronized recording, use this setting for the VR-24 that will be used as the slave unit.

WX sync: Use this setting when using a WX-7000 and a VR-24 for synchronized recording. The VR-24 will operate as the slave unit.

LX sync: Use this setting when using a LX-110/120 and a VR-24 for synchronized recording. The VR-24 will operate as the slave unit.

### Connection check

### Sync status

### Adjust time

- Please refer to the following pages for operations of the various synchronization settings.

### ATTENTION

Playback is not possible when set to synchronize. Set synchronization to OFF in order to play back recordings.

### 10-6-1. VR sync

#### Preparation

- 1** Use a synchronization cable to connect the VR-24/WX SYNC connectors of the master and slave units.
- 2** Turn each VR-24 on.
- 3** Set the slave unit to "VR Sync slave".
- 4** Set the master unit to "VR Sync master".
- 5** Touch the "Connection check" button on the master unit.

If there are no connection problems, the "Sync status" will be "OK".

- 6** Touch the "Adjust time" button to set the time used by the slave unit to that used by the master unit.

- The error is  $\pm 1$  second.

#### Recording

When recording operations are conducted with the master unit, the same operations will automatically be conducted on the slave unit.

#### NOTE

- When the following settings are made on the master unit, they will also be made on the slave unit automatically.
  - Sampling series
  - Sampling frequency
  - Bit depth
- Event marks can only be set on the master unit.

### 10-6-2. WX sync

#### Preparation

- 1** Use a synchronization cable to connect the SYNC OUT connector of the WX-7000 to the VR-24/WX SYNC connector of the VR-24.

The VR-24 will operate as the slave unit.

- 2** Turn the VR-24 on.
- 3** Set the VR-24 Synchronization type to "WX sync".
- 4** Turn the WX-7000 on.
- 5** Use the WX-7000 synchronization settings to conduct a "connection check".

If there are no connection problems, the "Sync status" will be "OK".

- 6** Touch the "Adjust time" button to set the time used by the VR-24 to that used by the WX-7000.

- The error is  $\pm 1$  second.

#### Recording

When recording operations are conducted with the WX-7000, the same operations will automatically be conducted on the VR-24.

#### NOTE

- When the following settings are made on the WX-7000, they will also be made on the VR-24 automatically.
  - Sampling series
  - Sampling frequency
  - Bit depth
- Set the sampling series and sampling frequency to values supported by the VR-24.
- Event marks can only be set on the WX-7000.

### 10-6-3. LX sync

#### Preparation

- 1 Use a synchronization cable to connect the AQ-VU connector of the LX-110/120 to the VR-24/WX SYNC connector of the VR-24.**

The VR-24 will operate as the slave unit.

- 2 Turn the VR-24 and LX-110/120 on.**
- 3 Set the VR-24 Synchronization type to “LX sync”.**

#### Recording

- 1 Press the VR-24 Record button to make it record ready.**
- 2 Make the LX-110/120 record ready.**
- 3 Start recording with the LX-110/120.**

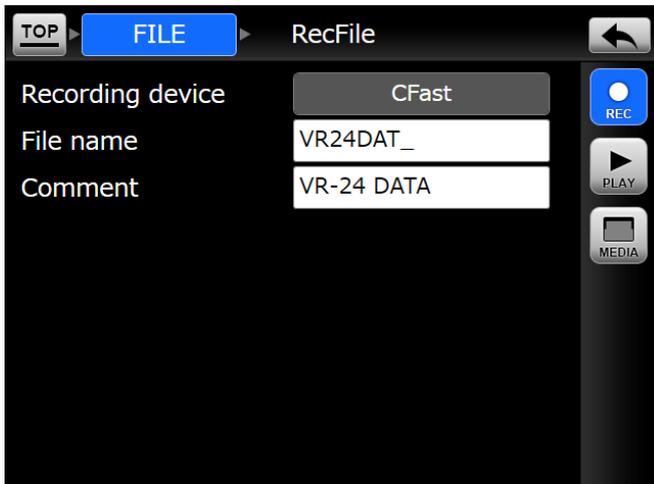
The VR-24 will also start recording automatically.

#### ATTENTION

- During LX synchronization, the VR-24 cannot be switched from recording to record ready. When the LX-110/120 is switched from recording to record ready, the VR-24 will stop recording and enter a stopped state.
- The time cannot be adjusted automatically. Adjust the times used by the units manually before recording.
- Make sampling settings and related settings manually.
- Set the following settings on the LX-110/120 and the VR-24 to the same values.
  - Sampling series
  - Sampling frequency
  - Bit depth

# 11.FILE settings

## 11-1. RecFile (recording settings)



### Recording device

Select the media where recording files are saved.

- This unit cannot record video data to SDHC cards.
- When recording to an SDHC card, recording will stop if the size of an analog data file reaches 4 GB.

### File name

Sets the name given to recorded files.

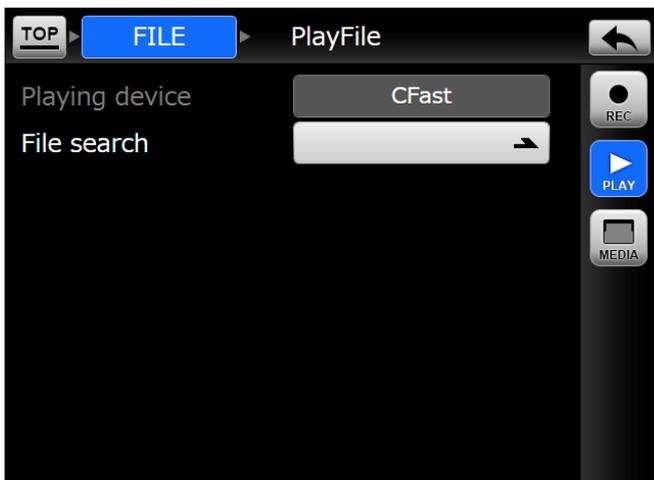
- Lowercase letters cannot be used in file names.
- See "9-4. Inputting characters as setting values" on page 43 for how to input characters.

### Comment

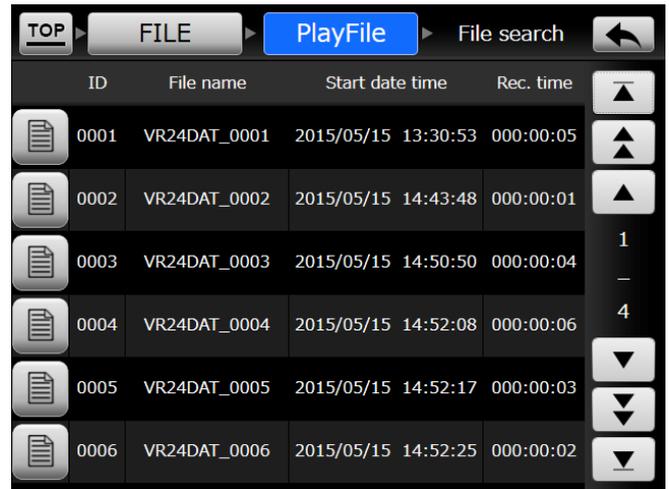
Sets the recording file comment.

- See "9-4. Inputting characters as setting values" on page 43 for how to input characters.

## 11-2. PlayFile (playback settings)



## 11-2-1. File search



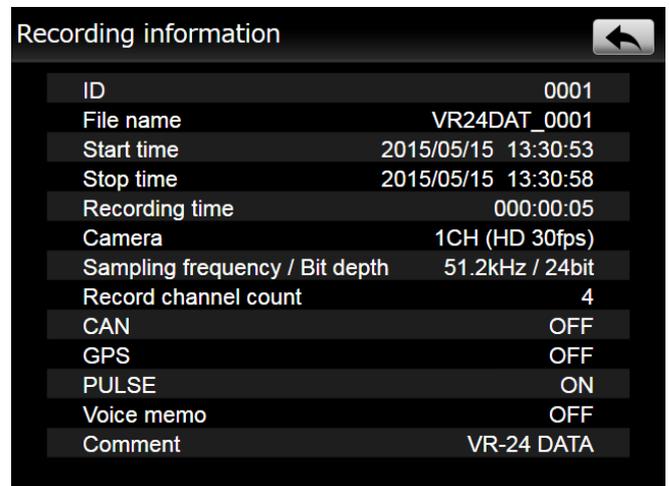
This shows a list of recorded files.

In order from top to bottom, the buttons and numbers on the right side have the following functions and meanings.

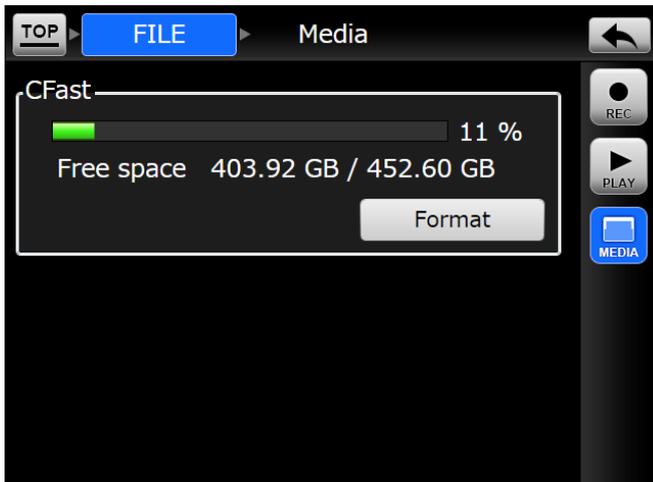
- ▲ Return to the top of the list.
- ▲ Go back 10 pages in the list.
- ▲ Go back 1 page in the list.
- (1) Current page number
- (4) Final page number
- ▼ Go forward 1 page in the list.
- ▼ Go forward 10 pages in the list.
- ▼ Go forward to the last page in the list.

Press a file in the list to start playing it.

Press an icon on the left side to show recording information.



## 11-3. Media



This shows the used and open capacities of each medium.

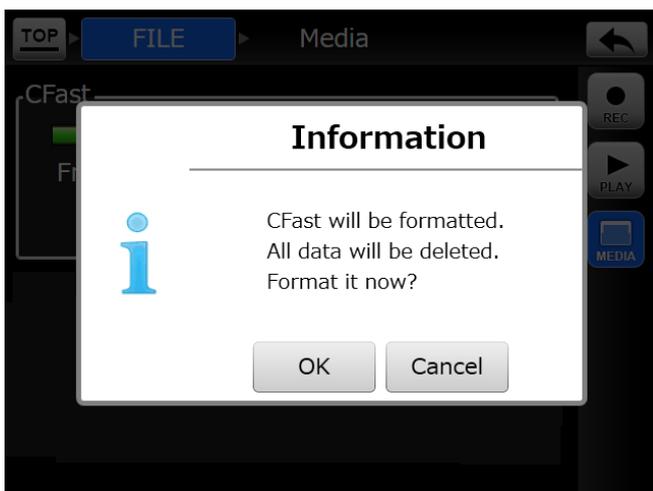
### ATTENTION

Format media with this unit before using them with the unit.

## Formatting media

### 1 Touch the Format button.

A confirmation screen will open when you touch the Format button.



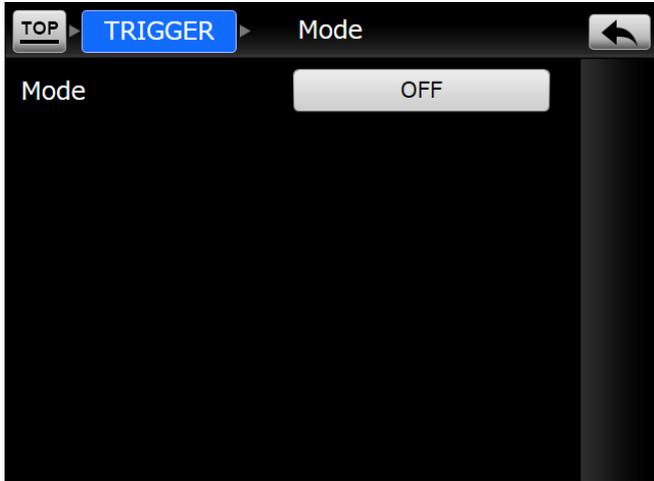
### 2 Touch the OK button to start formatting.

Touch the Cancel button to cancel.

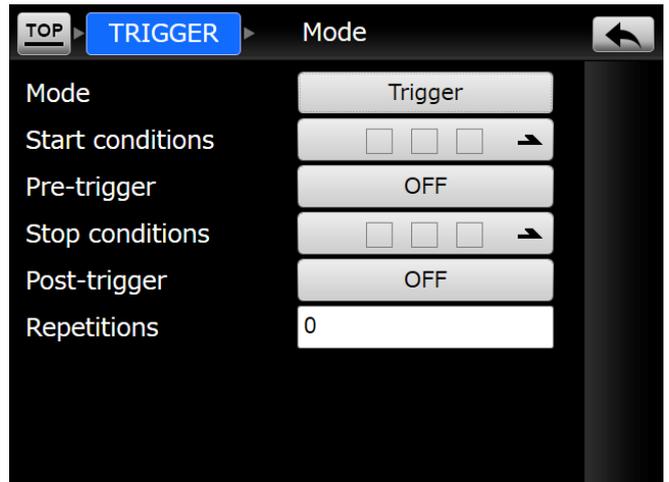
# 12. TRIGGER settings

## 12-1. Mode

When the mode is Trigger or Interval, setting items are shown.



## 12-1-1. Trigger



See "7-4. Setting triggers" on page 34 for details about each setting.

### Start conditions

### Pre-trigger

Pre-trigger recording will not occur if set to OFF.

### Stop conditions

Icons are shown on the button for the triggers that are ON.

-  External trigger
-  Level trigger
-  Recording time
-  Timeout

### Post-trigger

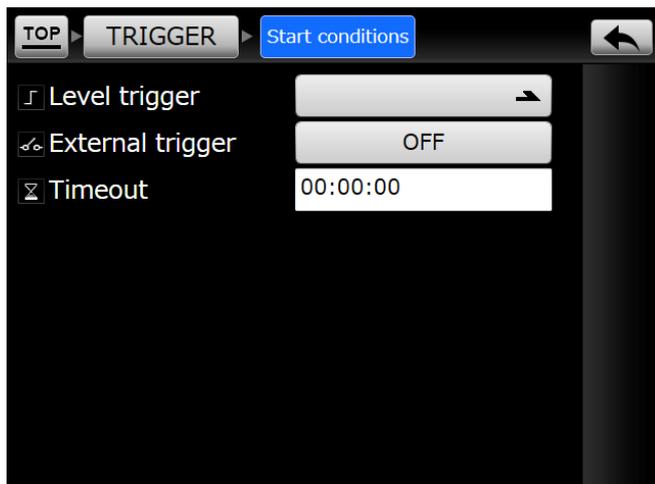
Post-trigger recording will not occur if set to OFF.

### Repetitions

Sets the number of measurements.

When set to 0, interval recording will repeat until the recording media is full or recording is stopped manually.

## 12-1-1-1. Start conditions



See "Recording starting conditions" on page 34 for details about each setting.

**Level trigger**

Set the level, UP/DOWN, logic, count and edge conditions for each channel.

**External trigger**

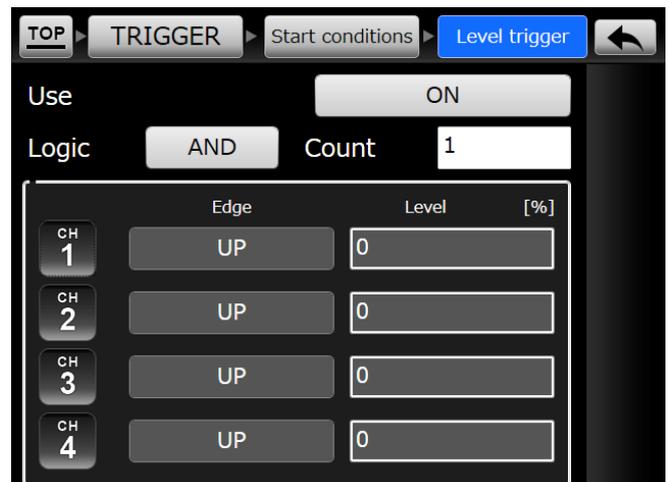
The options are ON and OFF.

**Timeout**

If the conditions set to start recording are not met within a specified time, recording will be forced to start automatically.

## 12-1-1-1-1. Level trigger

When Use is ON, the setting items are shown.

**Logic**

Set when there are multiple conditions to determine whether one or all must be fulfilled.

AND: The trigger requirements will be judged fulfilled when all set conditions are met.

OR: The trigger requirements will be judged fulfilled when any set condition is met.

**Count**

Measurement starts when the set count logic is fulfilled.

**CH1, CH2, CH3, CH4**

Touch the icon for a channel to turn use ON/OFF for it.

**Edge**

UP: The trigger requirement will be judged to be fulfilled when the input value changes from lower than the set level value to higher than that value. The trigger requirement will not be judged to be fulfilled if the level already exceeds the set level when the unit becomes record ready.

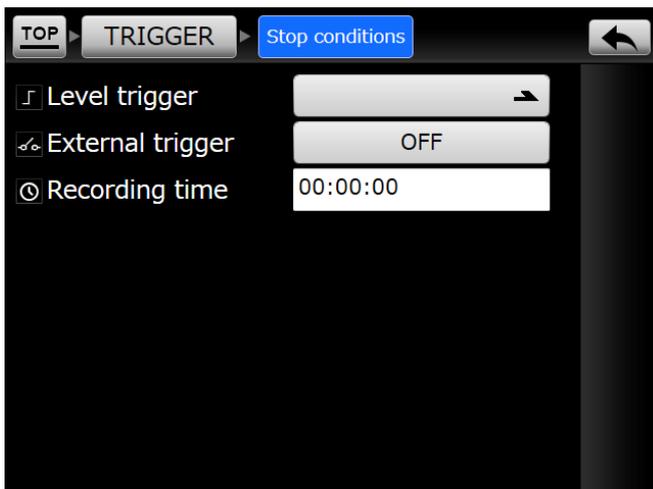
DOWN: The trigger requirement will be judged to be fulfilled when the input value changes from higher than the set level value to lower than that value. The trigger requirement will not be judged to be fulfilled if the level is already lower than the set level when the unit becomes record ready.

**Level (%)**

100% is equal to the Range value set on the Channel settings screen.

## 12. TRIGGER settings

### 12-1-1-2. Stop conditions



See “Recording stopping conditions” on page 35 for details about each setting.

#### Level trigger

Sets the level and UP/DOWN conditions for each channel.

#### External trigger

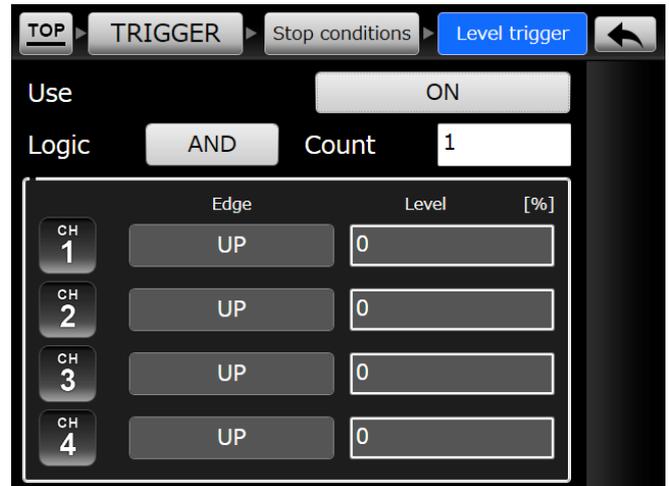
The options are ON and OFF.

#### Recording time

Sets the recording time.

### 12-1-1-2-1. Level trigger

When Use is ON, the setting items are shown.



#### Logic

Set when there are multiple conditions to determine whether one or all must be fulfilled.

AND: The trigger requirements will be judged fulfilled when all set conditions are met.

OR: The trigger requirements will be judged fulfilled when any set condition is met.

#### Count

Measurement stops when the set count logic is fulfilled.

#### CH1, CH2, CH3, CH4

Touch the icon for a channel to turn use ON/OFF for it.

#### Edge

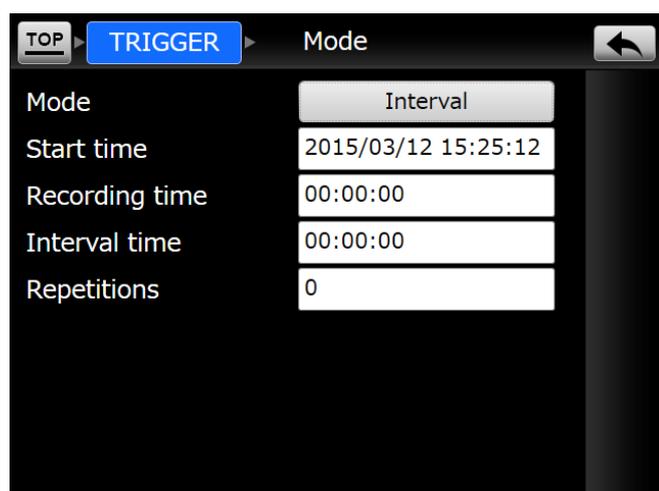
UP: The trigger requirement will be judged to be fulfilled when the input value changes from lower than the set level value to higher than that value. The trigger requirement will not be judged to be fulfilled if the level already exceeds the set level when the unit becomes record ready.

DOWN: The trigger requirement will be judged to be fulfilled when the input value changes from higher than the set level value to lower than that value. The trigger requirement will not be judged to be fulfilled if the level is already lower than the set level when the unit becomes record ready.

#### Level (%)

The set channel range value is 100%.

## 12-1-2. Interval



The screenshot shows a mobile application interface for configuring trigger settings. At the top, there is a navigation bar with a 'TOP' button, a 'TRIGGER' button, and the text 'Mode'. Below this, the 'Interval' mode is selected. The settings are displayed in a list format:

Mode	Interval
Start time	2015/03/12 15:25:12
Recording time	00:00:00
Interval time	00:00:00
Repetitions	0

See "7-4-2. Interval recording" on page 35 for details about each setting.

# 13.MISC settings

## 13-1.LCD



### Backlight dimming

Set the time until the backlight turns off automatically if no buttons are used.

None: The backlight will always stay lit.

1 minute: The backlight will turn off after 1 minute without operation.

5 minutes: The backlight will turn off after 5 minutes without operation.

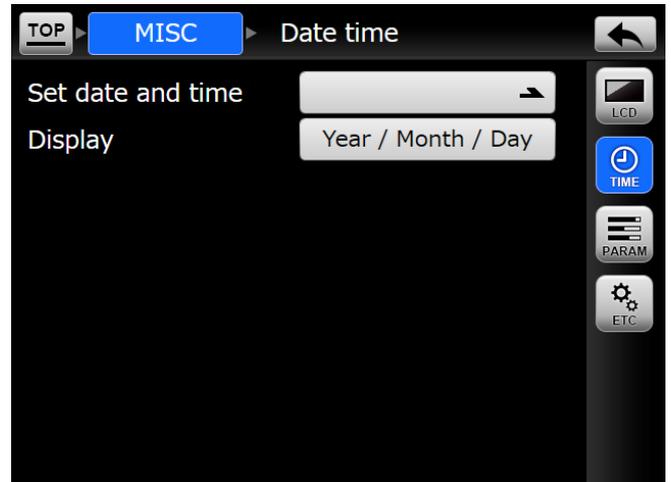
30 minutes: The backlight will turn off after 30 minutes without operation.

- When the backlight is off, touch the touchscreen or press any button to turn it on. When the backlight is off, the touchscreen and the unit buttons function as backlight activation buttons. For example, pressing the play (▶ FWD) button when the backlight is off will turn the backlight on but will not start playback.

### Brightness

Adjust the display brightness.

## 13-2.Date time (date and time settings)



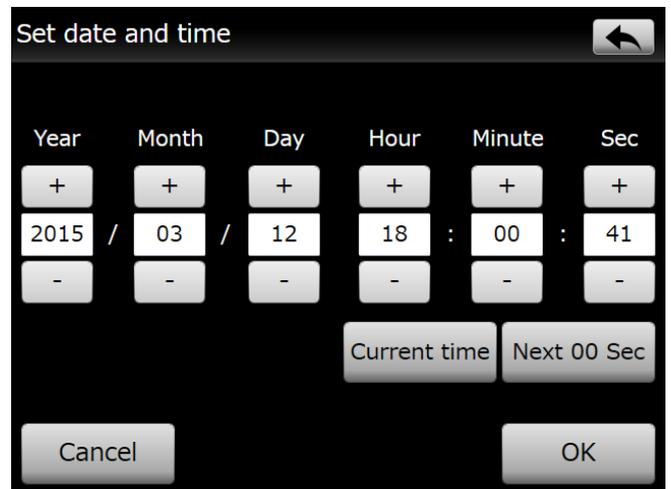
### Set date and time

Set the date and time of the internal clock.

### Display

Set the time display format.

### 13-2-1.Set date and time



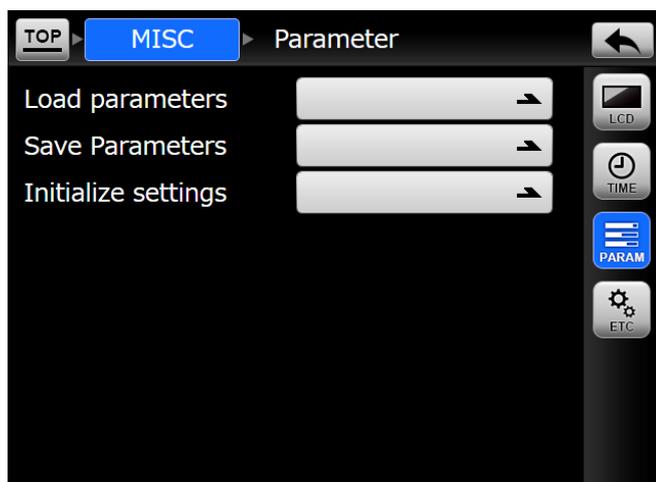
### Current time

Touch this button to set the date and time of the internal clock to the current time.

### Next 00 Sec

Touch this button to apply the set date and time when the minute changes according to the current setting of the internal clock.

### 13-3. Parameters



- Parameters can be loaded from and saved to SD cards.

#### Load parameters

Load the parameters saved on the SD card.

The 5 most recent parameter files will be shown.

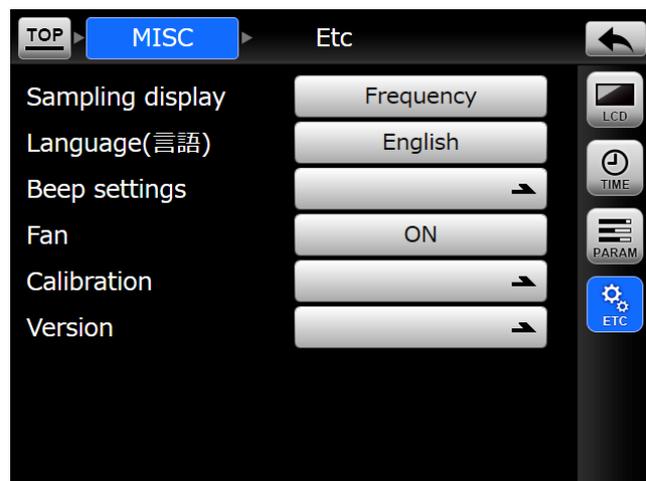
#### Save parameters

Save the parameters to the SD card.

#### Initialize settings

Initialize the parameter settings.

### 13-4. Etc



#### Sampling display

Sets the sampling notation.

Frequency: Each item is shown by sampling frequency.

Band: Each item is shown by sampling frequency band.

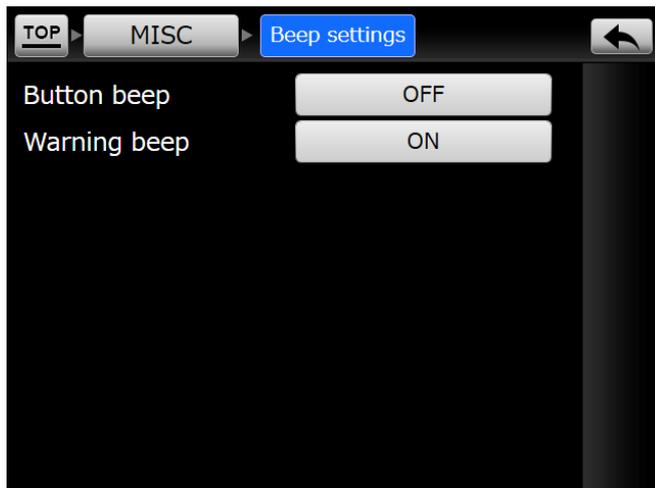
- If the "Sampling series" is set to "96kHz series", the band will be the sampling frequency divided by 2.4. If it is set to "102.4kHz series", the band will be the sampling frequency divided by 2.56.
- The sampling frequency (not the band) will be written to the header file.

#### Language (言語)

The language shown can be set to Japanese or English.

## 13.MISC settings

### 13-4-1. Beep settings



#### Button beep

Set whether or not the system beeps when buttons are used.

#### Warning beep

Set whether or not the system beeps when warnings occur.

### 13-4-2. Fan

#### OFF

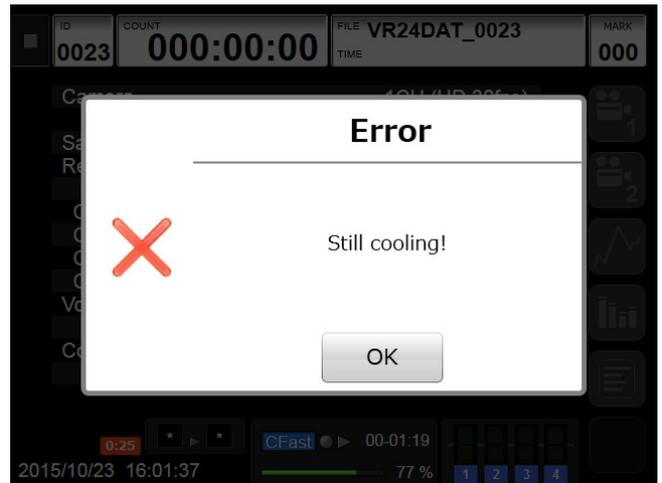
The fan will stay off for a maximum of 10 minutes from the start of recording.

#### ON

The fan will always stay on.

#### Precautions when set to OFF

- The fan will stay off when switching from recording to a record ready state.
- The fan will start operating when recording stops.
- If 10 minutes pass with the fan stopped, recording will stop and the fan will start operating.
- In order to allow cooling, recording will not be possible for a time equal to 150% the time that the fan was stopped.
- An error message will occur if a recording operation is attempted during this cooling period.



- When the Fan setting is OFF, an icon will appear at the bottom left of the Home Screen.

**FAN** Fan is set to OFF.

**9:55** Recording has started and the fan has stopped. The number is the amount of remaining time that the fan can be stopped.

**0:13** Since the fan was stopped, the unit is now being cooled. The number is the amount of remaining cooling time.

### 13-4-3. Calibration

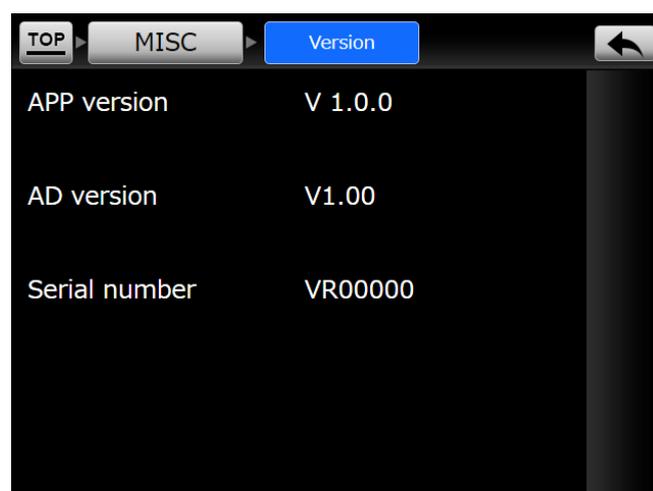


#### 13-4-3-1. Amp calibration

This adjusts the amp offset.

- Before beginning measurements, we recommend letting the system warm-up for at least 10 minutes and then calibrating amplification in order to record measurements with greater precision.

### 13-4-4. Version



This shows the different program versions and the serial number.

# 14. Specifications

## Recording media

### CFast

CFast card slot .....1  
 Compatible media.....CFast cards  
 Recording capacity .....32 GB – 128 GB

### SDHC

SDHC card slot.....1  
 Compatible media.....SDHC cards (SDXC not supported)  
 Recording capacity .....4 GB – 32 GB  
 Speed class.....Class 10 recommended

- Media that has been verified to operate with this system  
 We provide a list of CFast and SDHC cards that we have verified for operation with this unit on our Information Products Division data recorders website: <https://datarecorder.jp/en/>  
 You can also contact us. (For contact information, see the last page.)

## Sampling frequencies and bands

Series 1: Corresponds to DAT/audio sampling frequencies  
 Series 2: Frequency axis during 2N FFT analysis: integrated in resolution

Series 1		Series 2	
Fs (kHz)	Band (kHz)	Fs (kHz)	Band (kHz)
96	40	102.4	40
48	20	51.2	20
24	10	25.6	10
12	5	12.8	5
6	2.5	5.12	2
3	1.25	2.56	1
1.50	0.625	1.28	0.5
0.240	0.100	0.256	0.1

- Band  
 Series 1: sampling frequency/2.4  
 Series 2: sampling frequency/2.56

## Recording time

The times given in the table below are based on use of a CFast card with 32GB capacity as the recording media. Times are given in hours and minutes.

They are the results of a simulation using an evaluation video prepared by our company.

Video signal conditions		Analog signal conditions (Fs/AD resolution/channel count)		
Quality	Number of connected cameras	96kHz/24-bit/4ch	48kHz/24-bit/4ch	24kHz/24-bit/4ch
HD (1280*720)/30fps	1ch	1:18	1:29	1:34
	2ch	2:25	3:08	3:34
VGA (640*480)/30fps	1ch	1:32	1:48	1:56
	2ch	2:38	3:31	4:05
QVGA (320*240)/100fps	1ch	5:39	12:06	22:54
Camera OFF	—			

- The above times are total possible recording times for the media.
- The recording times given in the above tables are approximations. Actual recording times might differ depending on the video recorded and the medium used.  
 During use, refer to the amount of media capacity used shown for convenience on the display.

### Voice memo input and output

- Sampling frequency ..... 8 kHz
- Quantization bit depth ..... 8-bit (WAV file)
- Number of voice memo input channels. .... 1 (mono)
- Voice memo or monitoring signal selection function
  - The signal source for voice memo output can be set to either the voice memo or the monitoring output.
- With voice memos, video and analog signals are not synchronized.

### Internal clock

- Clock precision .....  $\pm 2$  PPM (at 25°C)
- Battery life ..... 5 or more years

### External interfaces

- PULSE/TRIG IN
  - Pulse input/external trigger input connector
  - BNC connector
- CAMERA ..... 2 camera input connectors
  - Control signal connector: 6P circular connector
  - Video signal connector: LAN connector
- ANALOG IN ..... 4 analog input connectors
  - BNC connectors (Z=50Ω type)
- MEMO IN ..... Mic input jack
  - 3.5mm mini jack
- EARPHONE ..... Earphone jack
  - 3.5mm mini jack
- FG ..... Frame grounding connector
- CAN ..... CAN input connector
  - 9-pin D-sub rectangular connector
  - (Hirose RDED-9P-LNA (4-40))
- GPS/REMOTE
  - GPS input/remote control signal input connector
  - Angled, half-pitch, 20-pin connector
  - (Hirose DX10A-20S)
- LX SYNC ..... LX recording synchronization connector
  - 9-pin D-sub rectangular connector
- VR-24/WX SYNC
  - VR-24/WX recording synchronization connector
  - Angled, half-pitch, 28-pin connector

## 14. Specifications

### Analog signal input channels

Input signal type	DC	AC	ICP
Number of input channels	4 channels total		
Input connector	BNC (Z=50Ω type)		
Input format	Unbalanced		
Input impedance	1 MΩ		
Input signal and amplifier coupling	DC coupling	AC coupling	AC coupling
Input range	±0.01/0.0316/0.1/0.316/1/2/3.16/10 V		
HPF	OFF/5Hz (−12dB/oct Butterworth filter)		
LPF	OFF/200Hz/500Hz/1kHz/2kHz (−12dB/oct Butterworth filter)		
Absolute maximum input voltage	±50 V		
Input signal quantization bit depth	24-bit/16-bit		
Over range	±127% (±2.08 dB)		
Analog-digital conversion method	ΔΣ conversion method (simultaneous sampling of each channel and anti-aliasing filter)		
Input frequency flatness characteristics	within ±0.5 dB		
Offset drift	within ±0.1% (1V input range)		
Calibration function	Offset calibration function included		
Phase contrast between input channels	20kHz band and below: 40kHz band and below:	within 1 degree within 3 degrees	
S/N ratio (dynamic range: S/N ratio + 2 dB)	16-bit: at least 87 dB for 20kHz band and below, at least 87 dB for 40kHz band 24-bit: at least 98 dB for 20kHz band and below, at least 93 dB for 40kHz band (1V input range)		
Crosstalk	−93 dB or less (1V input range, 24-bit, 40kHz band)		
Distortion	0.1% or less (1V input range, sine wave)		
Voltage supplied to ICP sensors	—	—	DC 24 V
ICP sensor constant current source	—	—	4 mA
ICP sensor detection	—	—	Detection function included for each channel
TEDS	—	—	Supports TEDS Ver. 1.0.

**Video/analog signal synchronization precision**

Within  $\pm 1$  fps (at 30 fps)

**Pulse input**

Input voltage	0–12 V		
Threshold level	2.3 V ( $\pm 10\%$ )		
Pulse width	10 $\mu$ sec or more for both HI and LO intervals		
Maximum input frequency	Pulse count mode	10 kHz	
	rpm mode	500 Hz	
Setting range	Pulse count mode	16-bit depth	0–32765
		24-bit depth	0–2147483645
	rpm mode	16-bit depth	100–30000 rpm (when 1 ppr)
		24-bit depth	1–30000 rpm (when 1 ppr)
Measurement precision	Pulse count mode	Within $\pm 2$	
	rpm mode	2% or less	

- Analog signal and pulse input data sampling are not synchronized.
- If pulse input ceases while recording, the last pulse data will be retained.

**Synchronized recording****Analog signal synchronization precision****VR-24 sync**

Phase contrast between input channels: 10 degrees or less

**WX sync**

96kHz and 102.4kHz sampling frequencies: 20 degrees or less

Other sampling frequencies: 130 degrees or less

**LX sync**

Lag between input channels: within  $\pm 33.3$  msec

## 14. Specifications

### 14-1. General

#### External dimensions (W × H × D, not including protrusions)/weight\*

260 × 77 × 186 mm/2.3 kg

\*Weight does not include AC adapter, media or optional equipment.

Sidebar attachment screws . . . . . M3 binding × 6

Rubber feet attachment screws . . . . . M3 binding × 6

#### DC power supply input

Rated input voltage . . . . . DC 12–16 V

Guaranteed operating input voltage range . . DC 11–17 V

#### Power consumption

About 39 W

#### AC adapter (included)

Rated input voltage . . . . . AC 100–240 V

Input voltage range . . . . . AC 90–264 V

Input power supply frequency . . . . . 50/60 ±3 Hz

Rated output voltage . . . . . 16 V

Rated output current . . . . . 6.5 A

External dimensions (W × H × D) . . 68 × 35 × 153 mm

Weight . . . . . 650 g or less

#### Operating conditions

Operating temperature/humidity range

0 to 40°C/10 to 80% (no condensation)

Storage temperature/humidity range

–20 to 60°C/5 to 90% (no condensation)

Operating air pressure range . . . . . 860–1060 hPa

Vibration resistance

MIL-STD-810E Figure 514.4-1, 2, 3

- Confirm the operating conditions of each type of recording media. Let the unit run to warm up for at least 45 minutes before use.

#### Note

Cooling fan life . . . . . 30,000 hours (fan alone at 20°C)

- In order to improve the product, specifications and appearance could be changed at any time without warning.
- Weight and dimensions are approximate.
- Illustrations in this document might differ in part from the actual products.



## 16. Troubleshooting

If any of these problems should occur, please check the following before requesting service.

Problem	Possible causes and responses	Reference pages
Power will not turn on	Is the AC adapter connected correctly?	15
	Is the DC power supply voltage set within the specified range?	20
Main unit buttons do not function	Is the panel locked? If so, unlock it.	33
Cannot confirm media status	Is compatible media loaded in the VR-24?	7
	Has the media been formatted by the VR-24? If not, use the VR-24 to format it.	23, 61
	Are you using media that has been confirmed to work with the VR-24?	70
	Always put the unit into standby before inserting or removing media.	23, 24
	Use a CFast card in fixe disk mode.	7
	Do not use a CFast ard in removable mode. SDXC cards are not supported.	7
Camera not recognized	Are all the connection cables connected correctly? If the camera is not recognized, turn the VR-24 off and then on again.	15
	To record 30fps HD video, connect a camera that supports HD resolution to CAMERA-1.	49
Cannot start recording	When the sampling frequency is set to 96 kHz or 102.4 kHz, set the Analog settings "Record channel count" and CAN, GPS and pulse channels so that the total number of channels does not exceed 4. Enabling these inputs will use the following number of channels. CAN: 2 channels GPS: 1 channel Pulse: 1 channel Possible setting combinations when the sampling frequency is set to 96 or 102.4 kHz	50, 51, 53, 56
	This unit cannot record video data to SDHC cards.	23, 24
	In order to allow cooling, recording will not be possible for a time equal to 150% the time that the fan was stopped.	68
Recording stops	If the ID number exceeds 1000, recording will stop.	8
	When recording to an SDHC card, recording will stop if the size of an analog data file reaches 4 GB.	24, 60
	If 10 minutes pass with the fan stopped, recording will stop and the fan will start operating.	68
	During LX synchronization, the VR-24 cannot be switched from recording to record ready. When the LX-110/120 is switched from recording to record ready, the VR-24 will stop recording and enter a stopped state.	59

## 16. Troubleshooting

Problem	Possible causes and responses	Reference pages
Cannot play back	Playback is not possible when set to synchronize. Set synchronization to OFF in order to play back recordings.	24
Cannot set event marks	When synchronization is set, event marks can only be set on the master unit.	57
	When WX synchronization is set, event marks can only be set on the WX-7000.	58
Voice memo data can only be partially recorded	The maximum file size of voice memo data is 4 GB. Voice memo data in excess of 4 GB will not be recorded, but normal recording will not be interrupted. (For voice memo data to exceed 4 GB, it would take about 6 days.)	51
Voice memos are not output from the earphone jack	Voice memos will not be output when record ready or recording.	51
Cannot show CAN data	When the sampling frequency is set to 96 kHz or 102.4 kHz, CAN data cannot be shown.	31
CAN data is lost sometimes	When the sampling frequency is low, CAN data could be lost.	53
Cannot use pulse input or an external trigger	Either pulse input or an external trigger can be used. Both functions cannot be used at the same time.	17, 20, 57
Settings are not applied when using LX sync	When using LX sync, make sampling settings and related settings manually.	59
Cannot use Zoom In/Out buttons with graphed waveform display	If the Camera Use setting is set to "1CH (HD 30fps)", zoom will be fixed at ×1 when recording.	29
Cannot show FFT	If the Camera Use setting is set to "1CH (HD 30fps)", FFT display of analog data is not possible when record ready or recording.	31

If you are still unable to fix the problems after checking the above, please contact us.  
(For contact information, see the last page.)

## 17. Warranty explanation

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- The warranty period for this device is one year from the date of purchase.
- Be aware that repairs will require payment in the following cases even during the warranty period.
  - (1) Malfunction or damage due to misuse
  - (2) Malfunction or damage caused by modifications or repairs conducted by any party other than our company or a service person designated by our company
  - (3) Malfunction or damage caused by dropping, transportation or similar handling after product delivery
  - (4) Malfunction or damage caused by fire, earthquake, water, lightning or other natural disaster
  - (5) Malfunction or damage caused by external factors, including power supplies and equipment environmental conditions, that deviate from the operation requirements of this product
  - (6) Malfunction or damage if the product was not purchased from our company or an agent designated by our company
- We offer paid service after the conclusion of the warranty period. For details, please contact the retailer where you purchased the unit or a contact on the back cover of this manual.
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### PolicyConfig.h

Undocumented COM-interface IPolicyConfig.

Use for set default audio render endpoint

@author EreTIk

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