

CF-4700

FFT Comparator

◀ User guide ▶



ONOSOKKI

Introduction

This instruction manual describes the basic operation procedure for the CF-4700 FFT comparator.

To ensure safe and proper use of the CF-4700 FFT comparator, be sure to read and understand warnings and precautions in this user's guide before using the product.

Ono Sokki, Co. Ltd. bears no responsibility for any damages resulting from negligence of the instructions given in this guide.



● Overview and features

The CF-4700 FFT comparator analyzes the frequencies of the sound and vibration coming from products and parts on the manufacturing line and is thus the best FFT analyzer for acceptance judgment and quality inspection.

- Setting up to 20 blocks that judge at the level of characteristic frequency signal is feasible (Further, setting six different judgment approaches for each of the judgment blocks is feasible).
- An 8.4-inch color TFT-LCD (resistance film type touch panel unit) employed in this system helps the operator readily watch waveforms and judgment results, and enables intuitive operations on the touch panel.
- The USB interface and SD card slot mounted enables measurement data and evaluation results to be saved to the USB flash memory and SD card.
- The shape comparator function (optionally installed) allows the user to give a pass/fail judgment by waveforms.
- The tracking function (optionally installed) facilitates judgments from the level variation of a specific degree while varying the revolution speed.
- The installed optional CF-0473 amplitude modulation component extraction function (bandpass envelop monitoring function) enables checking the sound with headphones, thus operators can distinguish characteristic abnormal sounds and make a judgment on them.
- In consideration of line measurement, the power source backup function (optionally installed) enables a normal termination of units even in case of an instantaneous power failure or outage of the main power supply.

● How to use this manual

This manual uses the following marks in addition to safety symbols. Before reading the instructions, be familiar with the meanings of the following symbol:



CAUTION

Indicates supplementary explanations or restrictions. It is recommended to read the information followed by this symbol.



WARNING

Indicates important instructions that need to be observed. Be sure to read the instructions followed by this symbol.



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1. The products warranty period is one year from the date of purchase.
2. Repairs will be performed free of charge only within the warranty period, under the circumstance that the product malfunctioned in usage complying to the warnings on this manual and the labels attached to the main unit.
3. If the product malfunctions during the warranty period, and you choose to have the product repaired free of charge, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.
4. This warranty does not apply in the following cases, even within the warranty period:
 - Malfunction or damage due to incorrect operation, repairs or modifications
 - Malfunction or damage due to shocks caused by drops or contacts
 - Malfunction or damage due to acts of God such as fire, earthquakes, lightning, and public disruptions or abnormal voltage
5. Actual cost for the trip will be requested for repairs that require trips to isolated islands or remote locations.




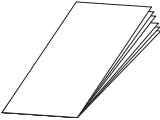
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For products that do not apply, there are cases where non-applicable written findings are required for customs clearance. Consult the nearest Ono Sokki sales office or our legal affairs group (phone: +81-45-476-9707) when exporting or taking our products (including services) abroad.

Manual Configuration

■ Manuals related to CF-4700 FFT comparator

Manual Name	Description
 User guide (This manual)	<p>This user guide comes with the CF-4700 FFT comparator as one of the attached documents.</p> <p>This is an instruction manual that describes the basic operation of the CF-4700 FFT comparator including how to turn on/off the power, part names and functions, and hardware specifications.</p> <hr/> <p>The user guide also describes the following:</p> <ul style="list-style-type: none">• CF-0473 amplitude modulation component extraction function• CF-0477 USB mass storage function• CF-0478 power source backup function
 Reference guide	<p>The reference guide is included in the CD-ROM that comes with the CF-4700 FFT comparator. This reference guide describes the overview and basic operation of the software, command references, and the explanation of technical terms.</p> <p>This reference guide describes basic operating procedures for the following:</p> <ul style="list-style-type: none">• Preparation of CF-4700 and measurement (FFT analysis)• CF-0471 tracking function• Comparator (block/shape) function <hr/> <p>The reference guide also describes the following optional functions:</p> <ul style="list-style-type: none">• CF-0471 tracking function• CF-0472 shape comparator function• CF-0473 amplitude modulation component extraction function• CF-0477 USB mass storage function• CF-0478 power source backup function
 External control reference guide	<p>The external control reference guide is included in the CD-ROM that comes with the CF-4700 FFT comparator.</p> <p>The reference guide describes the RS232C interface and the LAN external control function.</p> <p>The overviews, sample programs, command references and communication code words of the RS232C interface and the LAN external control function are described in this manual.</p>
 Installation manual	<p>The installation manual is included in the CD-ROM that comes with the CF-4700 FFT comparator.</p> <p>The installation manual describes how to upgrade the application software programs installed on the CF-4700 FFT comparator.</p>

For Your Safety

- Before using the CF-4700 FFT comparator, be sure to read this user's guide thoroughly.
- When using CF-4700 FFT comparator, observe the instructions in this guide.
- Some of the precautions specific to the CF-4700 FFT comparator appear on its main unit or in supplementary manuals other than this user's guide. Be sure to follow these precautions to ensure your safety.
- Keep this manual in a safe place where it is readily available for future reference.
- Note that this manual merely covers the information at the time of publication, and thus contact information (such as company address, phone number, website URL, and e-mail address) may be changed without prior notice.

● Safety symbols

In this manual the safety precautions are classified into the following categories.

Each category indicates the degree of hazard caused by negligence of the suggested precautions.



WARNING Failure to follow the precaution results in death or serious injury.









CAUTION Failure to follow the precaution results in moderate injury or property damage.



NOTICE Failure to follow the precaution cannot lead not to personal injury but can damage your property, including the system, facilities or equipment.

● Meanings of symbols

Precautions and notices for danger are given by three different symbols: Attention, Prohibition, and Mandatory. Each symbol has the following meaning.

Symbol	Definition	Meaning	Example
	Attention	Indicates that failure to follow the instruction could lead to a risk of danger. The drawing in the symbol indicates the type of danger involved.	
	Prohibition	Indicates actions that must not be taken. The drawing in or near the symbol indicates the action that is prohibited.	
	Mandatory	Indicates an action that is mandatory. The drawing in the symbol indicates the action that you must do to avoid the hazard.	

■ Precautions on usage



CAUTION



Do not use the product for operations that can lead to death or require high levels of reliability.

- The CF-4700 FFT comparator is not intended to be part of or to control facilities or devices, the use of which can lead to death or requires high levels of reliability, such as medical equipment, nuclear power facilities and equipment, aerospace systems, and transport facilities and equipment.
Ono Sokki Co., Ltd. shall not be held liable for any injury, death or property damage resulting from using the CF-4700 FFT comparator with these facilities, equipment or control systems.

■ Precautions on use

WARNING



Avoid touching the main unit or the display (resistive touch panel) of the CF-4700 FFT comparator with wet hands.



When replacing a battery pack due to expiration of the battery service life or purchasing an additional battery pack, be sure to purchase the one that we recommend using for the CF-0478 power source backup function. Using a battery pack other than specified may not only result in equipment failure or malfunction but also cause an extremely hazardous situation including electric shock, fumes, fire and explosions

CAUTION



Be sure to use the specified AC adapter.

- Using an AC adapter other than the specified one may result in electric shock or fire.



Do not disassemble the CF-4700 FFT comparator.

- If the product requires disassembling due to failure or modification, please contact the nearest Ono Sokki sales office or the distributor where you purchased the product.



Do not expose the CF-4700 FFT comparator to water.

- If the product is exposed to water, immediately stop using it and contact the the nearest Ono Sokki sales office or the distributor where you purchased the product.

■ Precautions on disposal

CAUTION



When disposing the CF-4700 FFT comparator or its accessories, be sure to observe relevant local laws and regulations. For details, please contact your local municipalities.

When disposing and replacing the lithium battery inside the CF-4700 FFT comparator, contact the nearest Ono Sokki sales office or the distributor to maintain the current date, time and configurations of the comparator.

When disposing of a battery pack having been used for the CF-0478 power source backup function, be sure to protect the electrodes with electrical insulation tapes in order to prevent short circuit, and observe relevant local laws and regulations.

Careless disposal of a battery pack may result in a fire, explosion or environmental destruction. Note that you may be punished by your local regulations and rules if you fail to follow the instructions

■ Precautions on electromagnetic environment

CAUTION



This product is intended the equipment to be used in industrial electromagnetic environment.

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.

■ Precautions on storage

NOTICE



The CF-4700 FFT comparator is a precision electronic equipment. Do not leave it in a place where temperature becomes excessively high or low.

■ Safety symbols and warning labels

The following figures illustrate the locations and meanings of the safety symbols and warning labels attached to the CF-4700 FFT comparator cabinet. Before operating the equipment, be sure to read and understand all instructions attached to it.



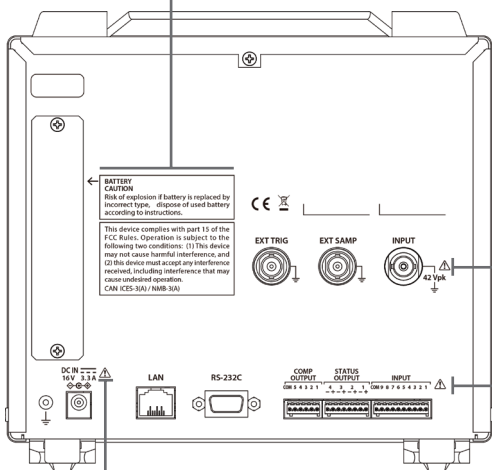
Installation of the ferrite core (for EMC)

Be sure to install the ferrite core (E04SR200932 by Seiwa Electric) that comes with the CF-0473 amplitude modulation component extract function to the stereo headphone cable. This is necessary to conform to the EMC directives.

Warning label on handling a battery pack

Be sure to use a specified battery pack for the CF-0478 power source backup function. Using a battery pack other than the specified one may result in explosions, causing an extremely hazardous situation.

When disposing of a battery pack, be sure to observe relevant local laws and regulations.



The signal ground is isolated from the cabinet.

Note that a potential difference may appear between the signal ground and the cabinet.

Do not apply a voltage exceeding the peak value of 42 VAC between the signal ground and the cabinet.

Installation of the ferrite core (for EMC)

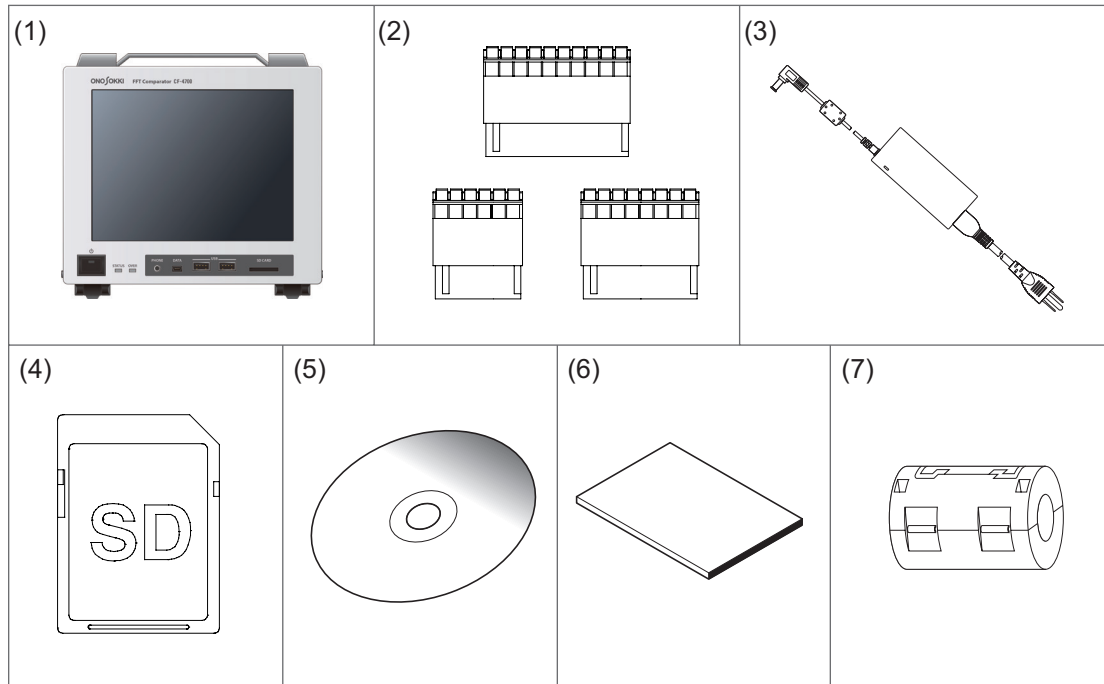
The supplied ferrite core (E04SR301334) must be wound with a single turn of the cable to be connected to the signal input contact terminal (INPUT). This must be necessary to conform to the EMC directives.

Be sure to use the specified AC adapter. Using an AC adapter other than the specified one may result in a fire or electric shock.

Checking Supplied Items

After receiving the product, make sure that the package includes the items listed below.

■ Supplied items



Number	Product Name	Quantity	Remarks
(1)	CF-4700 FFT comparator	1	
(2)	Terminal block plug (3 types)	3	Phoenix Contact <ul style="list-style-type: none"> • FK-MC 0, 5/10-ST-2, 5 • FK-MC 0, 5/8-ST-2, 5 • FK-MC 0, 5/6-ST-2, 5
(3)	AC adapter	1	
(4)	SD card (512 MB)	1	For update <ul style="list-style-type: none"> • For the update operation, refer to the separate CF-4700 FFR Comparator Installation Manual.
(5)	CD-ROM	1	Stores reference manuals, utilities, DLLs.
(6)	Hardware User's Guide (this document)	1	The reference manual is stored as a Help file in PDF, in the CD-ROM.
(7)	Ferrite core	1	For signal input contact terminal cable (E04SR301334 by Seiwa Electric)



- If any of the items is missing or damaged, immediately contact the nearest Ono Sokki sales office or the distributor where you purchased the product.
- The above items are supplied with the standard unit. Optional device or software is not included. If you purchased optional devices or software, make sure that your product package includes all the items by referring to the optional specifications in "Options" on page 58.

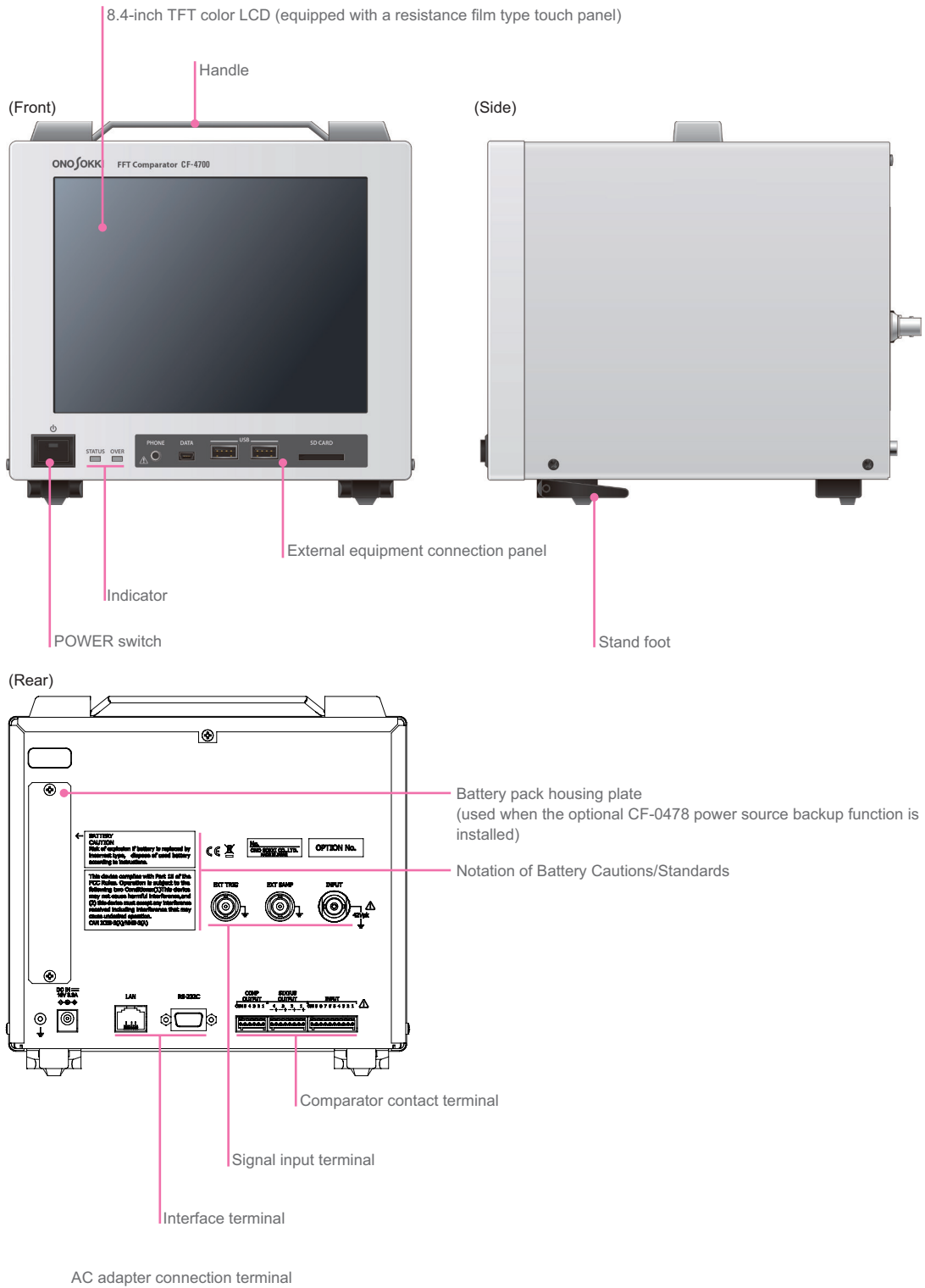
Contents

Introduction	1
License for Products and Software	2
Manual Configuration	3
For Your Safety	4
Checking Supplied Items	7
1. Parts Names and Functions of CF-4700	10
1.1 General View	10
1.2 Size and Operation of Color TFT LCD	11
1.3 Names and Functions of the Front Panel	12
1.4 Names and Functions of Components on the Rear Panel	14
1.5 Names and Functions of Components on the Sides and Top	17
2. Installation and Preparation	18
2.1 Workflow from Installation to Measurement	18
2.2 Installation	19
2.3 System Configuration Examples	20
2.4 Connection of Measuring Equipment	21
2.5 Preparation for Power Supply (AC Adapter Connection)	22
2.6 Power-on and Power-off Procedures	23
3. Software Component Names and Basic Operations	24
3.1 Main Screen (CF-4700 Main Screen)	24
3.2 Component Names and Functions of Input Information Area	26
3.3 Component Names and Functions of System Information Display Area	27
3.4 Component Names and Functions of Utility Area and Tool Area	30

3.5	Component Names and Functions of Control Key Area	32
3.6	Component Names and Functions of Setting Key Area	34
4.	Basic Operation of Hardware.....	35
4.1	Connection to USB Connectors (Type A)	35
4.2	Connection to Mass Storage Connector.....	37
4.3	SD Card Handling.....	40
4.4	Media Formatting Procedure	42
4.5	Memory Management Directory and File Naming Rules.....	43
5.	Optional Hardware	44
5.1	CF-0473 Amplitude Modulation Component Extraction Function (Bandpass Envelop Monitoring Function).....	44
5.2	CF-0478 Power Source Backup Function	45
6.	Specifications.....	51
7.	External Dimensions.....	60

1. Parts Names and Functions of CF-4700

1.1 General View



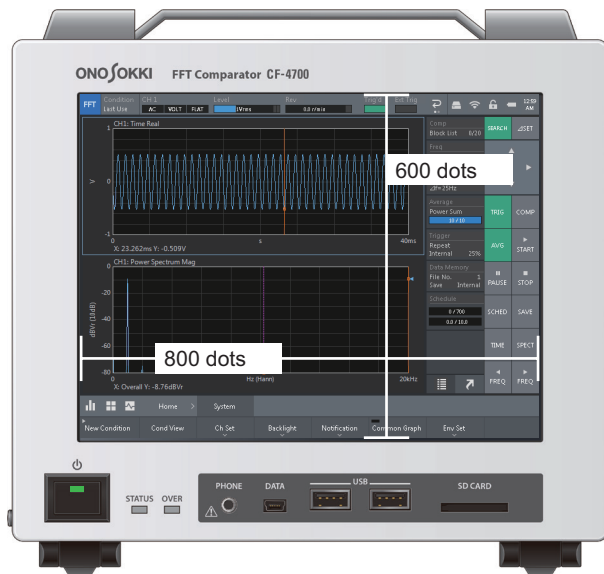
1.2 Size and Operation of Color TFT LCD



- Precautions on LCD (liquid crystal display)
All liquid crystal displays have dots that do not illuminate (black) and those that stay illuminated (white or other colors). This phenomenon is called dot omission (dot missing) and is not a defect.

■ Size of color TFT LCD

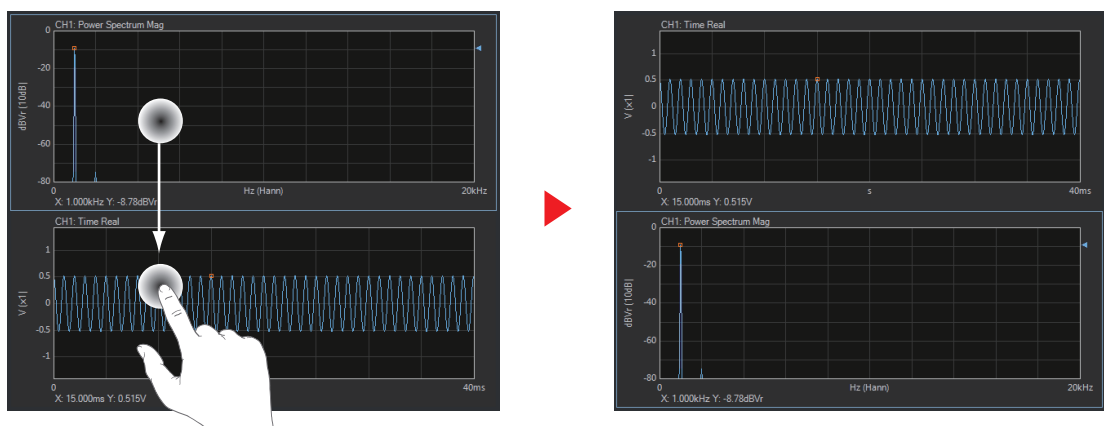
The CF-4700 FFT comparator is equipped with a color TFT LCD with an 8.4-inch resistive film type touch panel (800 × 600 dots).



■ How to use the touch panel

The color TFT LCD of the CF-4700 FFT comparator is equipped with a resistive touch panel.

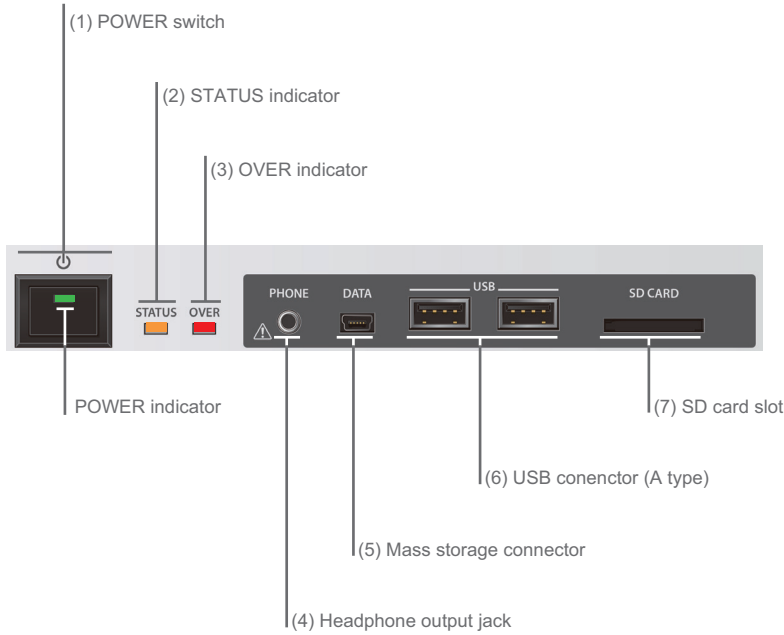
The touch panel of CF-4700 FFT comparator employs a human interface that enables the software to be operated with finger tips (see the figure below), instead of using the mouse or keyboard.



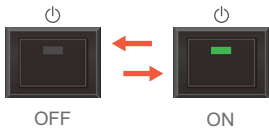
- Do not push the touch panel surface with any pointed object such as ball-point pen, or screwdriver, but use your fingers or stylus pen. Otherwise, the touch panel can be scratched or damaged.
- Do not give impact on the touch panel or push it stronger than required. Otherwise, it may be damaged.
- Do not wipe the touch panel with thinners or organic solvents. These liquid may damage the panel.
- To wipe the touch panel, use a piece of dry cloth to lightly wipe off dust or the like. Never use a wet towel or the like, because the liquid may intrude inside the unit.

1.3 Names and Functions of the Front Panel

The following switch and connectors are provided on the front panel of CF-4700 FFT comparator:



- (1) : POWER switch
Turns on and off the power to the CF-4700 FFT comparator.



Power supply	Operation
ON	Press the POWER switch for more than 1 second with the power turned off. The device beeps and turns on the POWER indicator in green. The CF-4700 FFT comparator then starts to boot. <ul style="list-style-type: none"> Release the finger from the POWER switch after the device beeps and the POWER indicator is lit green.
OFF	Press the POWER switch for more than 1 second with the power turned on. The device beeps. The CF-4700 FFT comparator then starts termination processing. <ul style="list-style-type: none"> Release the finger from the POWER switch after hearing the beep.



- Do not press down the POWER switch of the CF-4700 FFT comparator for more than 5 seconds. Pressing it more than 5 seconds causes an abort.

- (2) STATUS: STATUS indicator
Indicates the states of the CF-4700 FFT comparator by LED colors.

State	Indicator colors and operations
Unlock (Password Lock: OFF)	ON (green)
Lock (Password Lock: ON)	ON (orange)
External access	Blinking
Error occurrence	ON (red)

(3) OVER: OVER indicator

Lit in red when the signal that is input to the input terminal mounted on the rear panel of the CF-4700 FFT comparator exceeds the voltage level of 95% of the full scale.

(4) PHONE: Headphone output jack

Used to connect headphones. This is a stereo mini jack (3.5 φ).

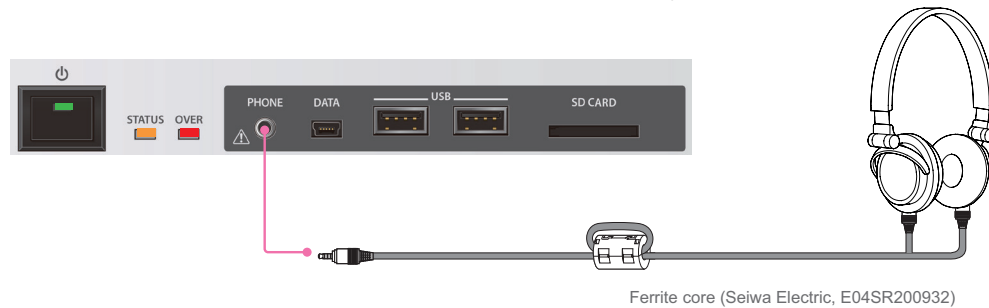
By adding an optional CF-0473 amplitude modulation component extraction function, signals which have passed through the filter (LPF or HPF) can be heard as a sound from the stereo headphones.



- Connect stereo type headphones to PHONE (headphone terminal). However, the signal is actually output monaurally (same L/R signals).



- Installation of the ferrite core (for EMC)
Be sure to install the ferrite core (E04SR200932 by Seiwa Electric) that comes with the CF-0473 amplitude modulation component extraction function to the stereo headphone cable. This is necessary to conform to the EMC directives.



(5) DATA: Mass storage connector

This connector is dedicated to a mass storage connector.

If the optional CF-0477 USB mass storage function is added, a USB mass storage corresponding to a mass storage class can be connected and accordingly a personal computer (PC) can be connected.

Connecting the PC enables the data in the CF-4700 FFT comparator to be sent to the PC.

(6) USB: USB connector (type A)

USB2.0 connector used to connect external equipment.



- Do not turn on the power to the CF-4700 FFT comparator with a USB flash memory connected.
Note that the CF-4700 FFT comparator, with a USB flash memory connected, cannot be started correctly even when the power is turned on.
- The comparator does not work normally, either, when a USB device other than those recommended by Ono Sokki. For details about the USB devices recommended by Ono Sokki, contact the distributor where you purchased the product or the nearest Ono Sokki sales office.

(7) SD CARD: SD card slot

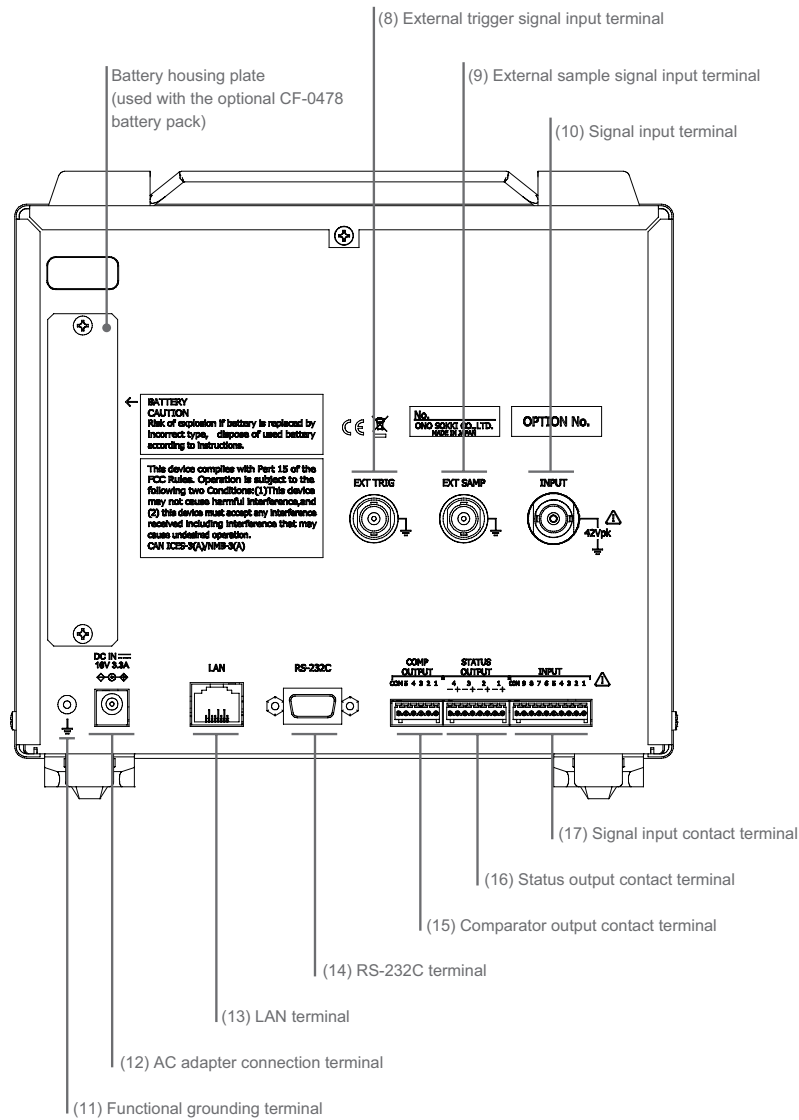
Used to insert an SD card.



- Before using the SD card, be sure to format it with FAT32 or FAT (file system). Note that an unformatted SD card cannot be used (not recognized).
- Always use an SD card recommended by Ono Sokki. Note that using an SD card other than recommended by Ono Sokki could compromise the system performance or cause faults.
For details about the SD cards recommended by Ono Sokki, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.

1.4 Names and Functions of Components on the Rear Panel

The rear panel of the CF-4700 FFT comparator has the following types of terminals.



- (8) EXT TRIG: External trigger signal input terminal
Input terminal for external trigger signals. The signal ground has the same potential as the cabinet.
- (9) EXT SAMP: External sample signal input terminal
Input terminal for external sampling signals. The signal ground has the same potential as the cabinet.
- (10) INPUT: Signal input terminal
General-purpose signal input terminal



- The signal ground is isolated from the cabinet.
- Note that a potential difference may be generated between the signal ground and cabinet depending on the measurement condition.
- Do not apply voltage exceeding the 42-V peak between the signal ground and cabinet.

(11) : Functional ground terminal

This terminal is used for functional grounding.

If noise is generated during measurement, grounding the terminal could reduce noise.



- Use a lug terminal or crimp terminal with an M3 6-mm screw for connection to the functional ground terminal. Be sure to use screws with a reasonable length to avoid damaging the inside of the CF-4700 FFT comparator.
- Make the functional grounding wire as short as possible and connect it to the stable ground. Do not connect it to a location affected by noise.

(12) DC IN: AC adapter connection terminal

Used to connect the AC adapter that comes with the product.



- Always use the AC adapter that comes with the CF-4700 FFT comparator. Using an AC adapter other than specified is very dangerous, since it could cause not only a failure or malfunction but also a fire or electric shock.

(13) LAN: LAN terminal

Connecting the LAN cable to the personal computer (client PC) enables the PC to operate the CF-4700 FFT comparator.

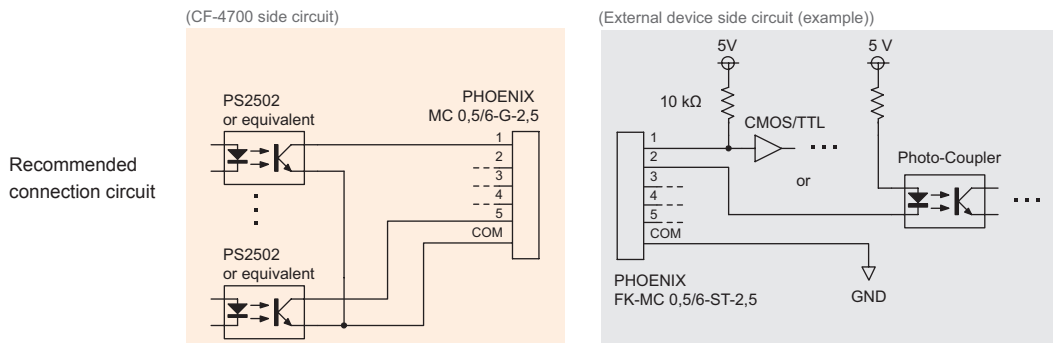
(14) RS-232C: RS-232C terminal

Connecting the cross cable connected to the RS-232C terminal to the personal computer (client PC) enables the PC to operate the CF-4700 FFT comparator.

(15) COMP OUTPUT: Comparator output contact terminal

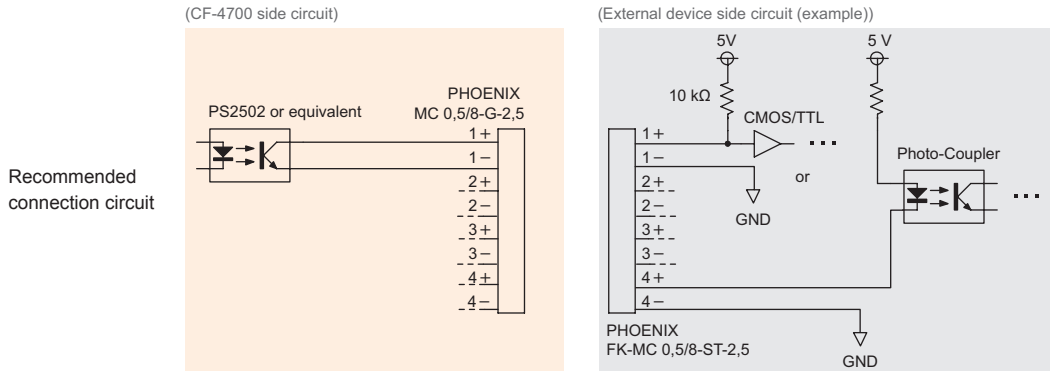
Used to output the results of five settings which have been optionally selected from 20 check settings.

Output Type	Open collector (5 points + common: collective insulation)
Output withstand voltage	30 V
Output current	25 mA max. (sink)
Collector saturation voltage	1.0 V or less
Logic	Negative logic (Lo = 1, Hi = 0)
Applicable plug	FK-MC 0,5/6-ST-2,5 (Phoenix Contact standard accessories)



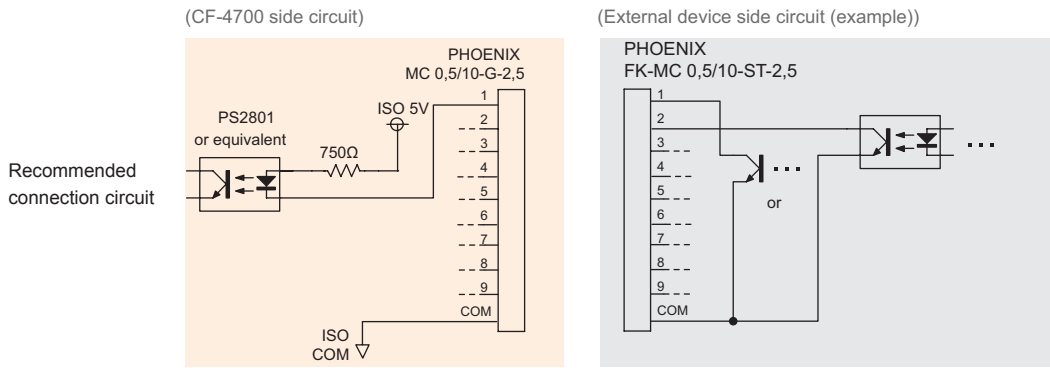
(16) STATUS OUTPUT: Status output contact terminal
 Outputs four types of status (Comp-BUSY/OK/NG/ERROR)

Output Type	Open collector (four independent points, each signal insulated)
Output withstand voltage	30 V
Output current	25 mA max. (sink)
Collector saturation voltage	1.0 V or less
Logic	Negative logic (Lo = 1, Hi = 0)
Applicable plug	FK-MC 0,5/8-ST-2,5 (Phoenix Contact standard accessories)

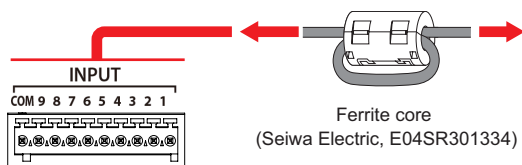


(17) INPUT: Signal input contact terminal
 Used with the following functions allocated.
 Control by command assignment (up to 9 terminals), selection of panel conditions (4 terminals), switching of decision blocks (4 terminals)

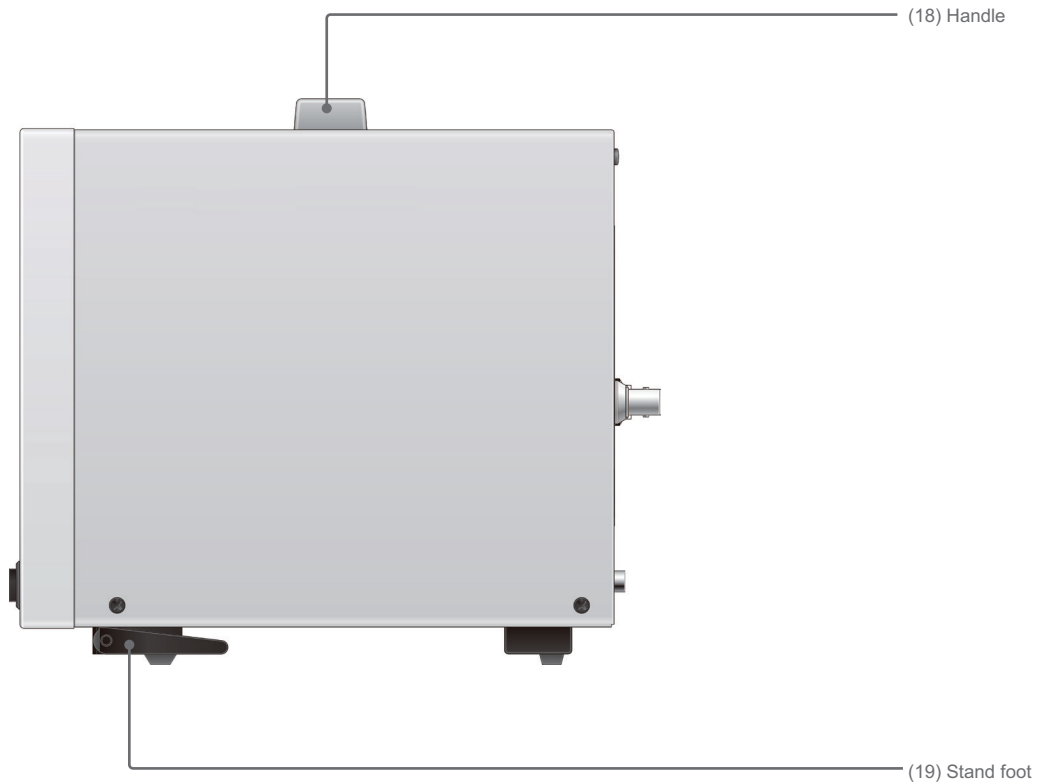
Input type	Driven by contact or open collector (common collective insulation)
Input current	5 mA max.
Logic	Negative logic (Lo = 1, Hi = 0)
Power supply voltage	Isolation 5 V
Applicable plug	FK-MC 0,5/10-ST-2,5 (Phoenix Contact standard accessories)



- The supplied ferrite core (E04SR301334) must be wound with a single turn of the cable to be connected to the signal input contact terminal (INPUT) as shown in the following figure. This must be necessary to conform to the EMC directives. No ferrite core needs to be attached to the cables connected to STATUS OUTPUT and COMP OUTPUT other than INPUT.



1.5 Names and Functions of Components on the Sides and Top



(18) Handle

Used to move the CF-4700 FFT comparator.

This handle is used to carry the CF-4700 FFT comparator.



- The handle cannot be removed. Removing the handle could cause a malfunction or damage the device. Never try to remove it. If the handle needs to be removed, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.

(19) Stand foot

Used to change the angle of the cabinet.

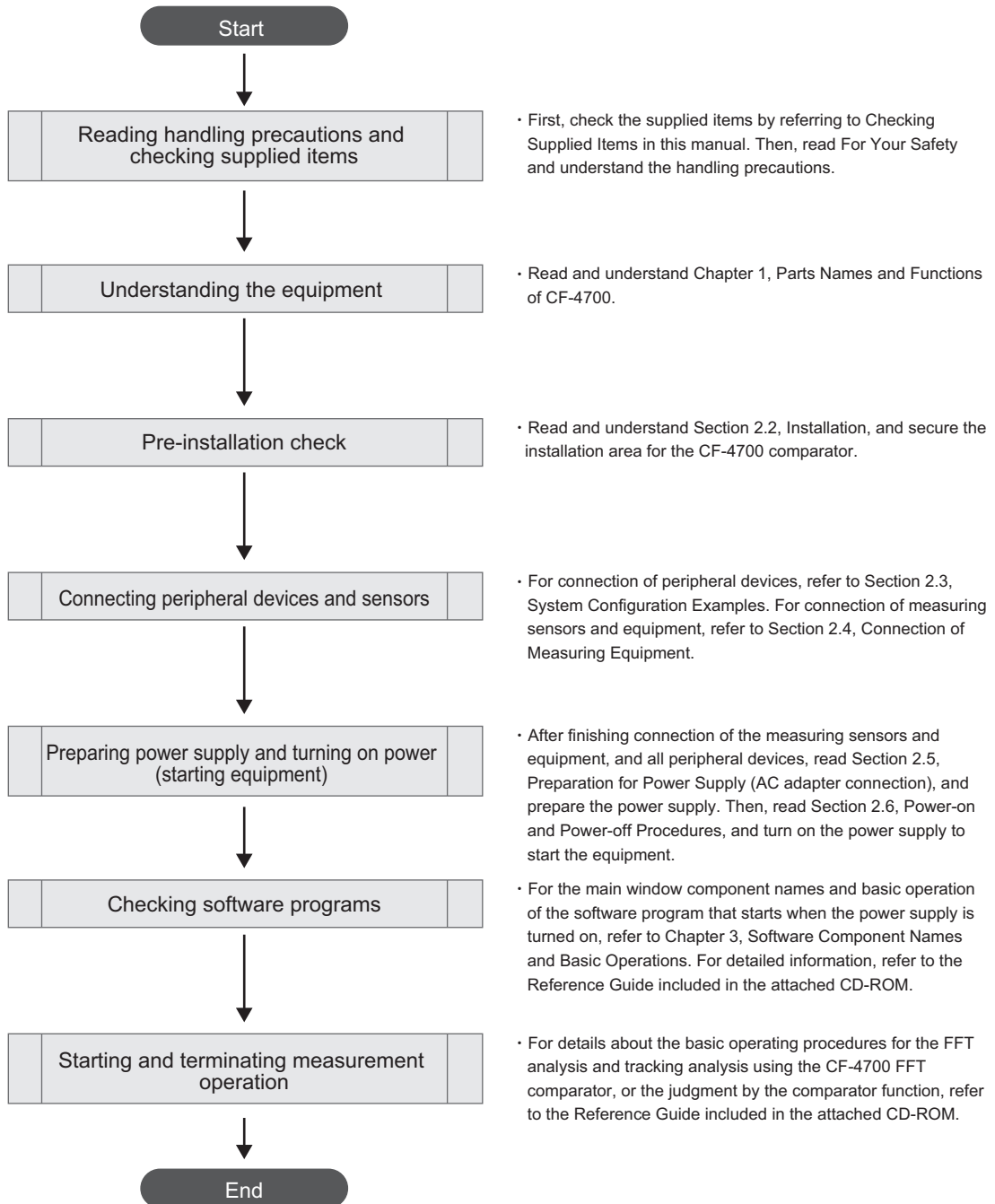
When it is hard to see the liquid crystal display due to the reflected light of the sun or lighting, for example, the stand foot can be used to change the display angle of the color TFT LCD of the CF-4700 FFT comparator.

2. Installation and Preparation

2.1 Workflow from Installation to Measurement

The workflow from the installation of the CF-4700FFT comparator to measurement operation is shown below.

For details about each step, refer to the corresponding chapter or section in this manual.



2.2 Installation

When installing the CF-4700 FFT comparator, be sure to observe the following precautions.



■ Installation area

- The CF-4700 FFT comparator has been designed on the supposition that it is installed and used on a horizontal ground. Therefore, the standard cabinet cannot be fixed to the rack or installed on the panel. A request for attachment to the rack or panel will be accepted for a fee. For details, please consult the nearest Ono Sokki sales office or the distributor where you purchased the product.
- Do not install the CF-4700 FFT comparator on the following locations. Otherwise, it may result in a fire or injury. Dusty area, damp area such as besides the water heater, direct sunlight area, and unstable area

■ Interface cable

- Connect the specified interface cable after checking the counterpart device and connector. Using a cable other than specified or connecting it to a wrong destination could cause a fire due to a short circuit.
- For the handling and connection of the interface cable, observe the following precautions. Do not use broken cables or cable connectors. Do not step on the cable or place any object on it. Do not use the cable connected loosely.

■ Not placing any object on the CF-4700 FFT comparator

- The CF-4700 FFT comparator may fall down due to the weight of the object placed on it and may damage not only the comparator itself but also the peripheral equipment.

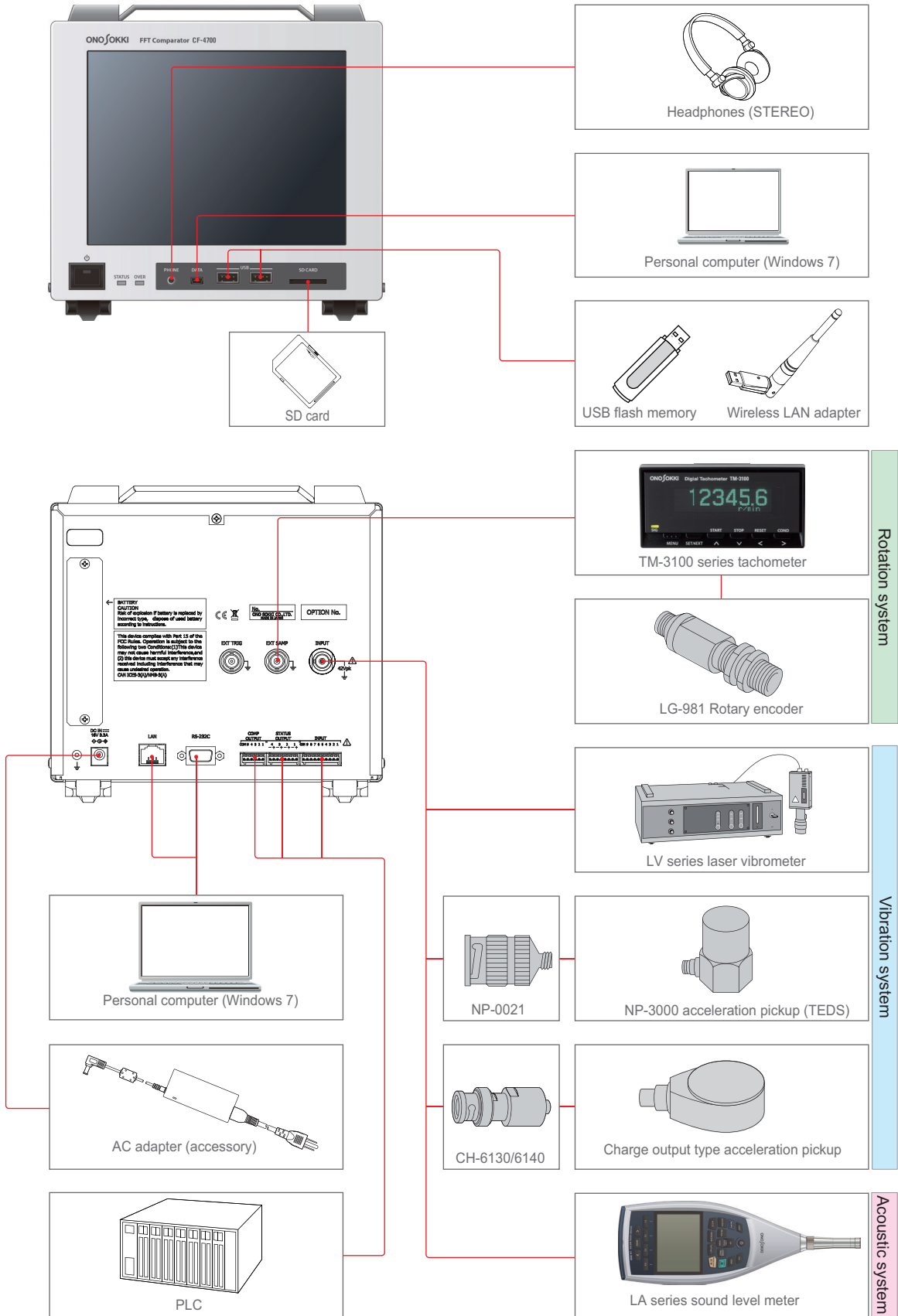
■ Connection of measuring equipment

- Connect measuring devices and sensors to the CF-4700 FFT comparator by referring to the following "2.3 System Configuration Examples" on page 20.



- For purchasing optional measuring equipment, please consult your dealer or your local Ono Sokki sales office to let us help you choose the equipment that suits your application and purpose.
- Connecting instruments other than recommended by Ono Sokki or modifications to the CF-4700 FFT comparator may result in failure or malfunction of the product, or a fire or electric shock, besides compromising the product performance.

2.3 System Configuration Examples



2.4 Connection of Measuring Equipment

Connect the measuring equipment and sensors to the CF-4700 FFT comparator by referring to “2.3 System Configuration Examples” on page 20.



- For purchasing optional measuring equipment, please contact your dealer or your local Ono Sokki sales office to let us help you choose the equipment that suits your application and purpose.
- Connecting instruments other than those recommended by Ono Sokki or making modifications to the CF-4700 FFT comparator may not only compromise the product performance but also result in failure or malfunction of the product, a fire or an electric shock.

■ Inputting signals to signal input terminal (INPUT/EXT SAMP/EXT TRIG)

To execute the basic FFT analysis or tracking analysis, or making a judgment using the CF-4700 FFT comparator, connect signals to the signal input terminal (INPUT/EXT SAMP/EXT TRIG) located on the rear panel. For details about the specifications of signals to be input, refer to “Input” on page 51.

● Connection of signals to be input to signal input terminal (INPUT)

Connect the signals from the sensors or measuring equipment to the signal input terminal (INPUT) so as to allow the FFT analysis or the comparator function to make judgments on the input signals. A condition for the input signals can be configured on the **Input Condition Setting** dialog box that is displayed after touching the following soft keys in the order mentioned: **Home, Input and Input Cond.** (For details, refer to the Reference Guide included in the attached CD-ROM.)

● Connection of the revolution signals to be input to the external sample signal input terminal (EXT SAMP)

To measure the signals in proportion to revolutions, input revolution signals to the external sample signal input terminal (EXT SAMP) so as to enable the order analysis.

The revolution signals can be input through our MP-981 electromagnetic detector (to which signals are input through the TM-3100 series digital tachometer) or HT-5000 series handheld digital tachometer.

To execute analysis for the external sampling signals, the optional CF-0471 tracking function is required.

A condition for the input sampling signals can be configured on the **Rotation Condition Setting** dialog box that is displayed after touching the following soft keys in the order mentioned: **Home, Input and Ext Sample.** (For details, refer to the Reference Guide included in the attached CD-ROM.)

● Connection of a trigger signal to be input to external trigger signal input terminal (EXT TRIG)

To start executing measurement or judgment via an external device, a trigger signal must be input to the external trigger signal input terminal (EXT TRIG).

A condition for the input external trigger signal can be configured on the **External Trig Setting** dialog box that is displayed after touching the following soft keys in the order mentioned: **Home, Input, Trigger, and Ext Trigger.** (For details, refer to the Reference Guide included in the attached CD-ROM.)

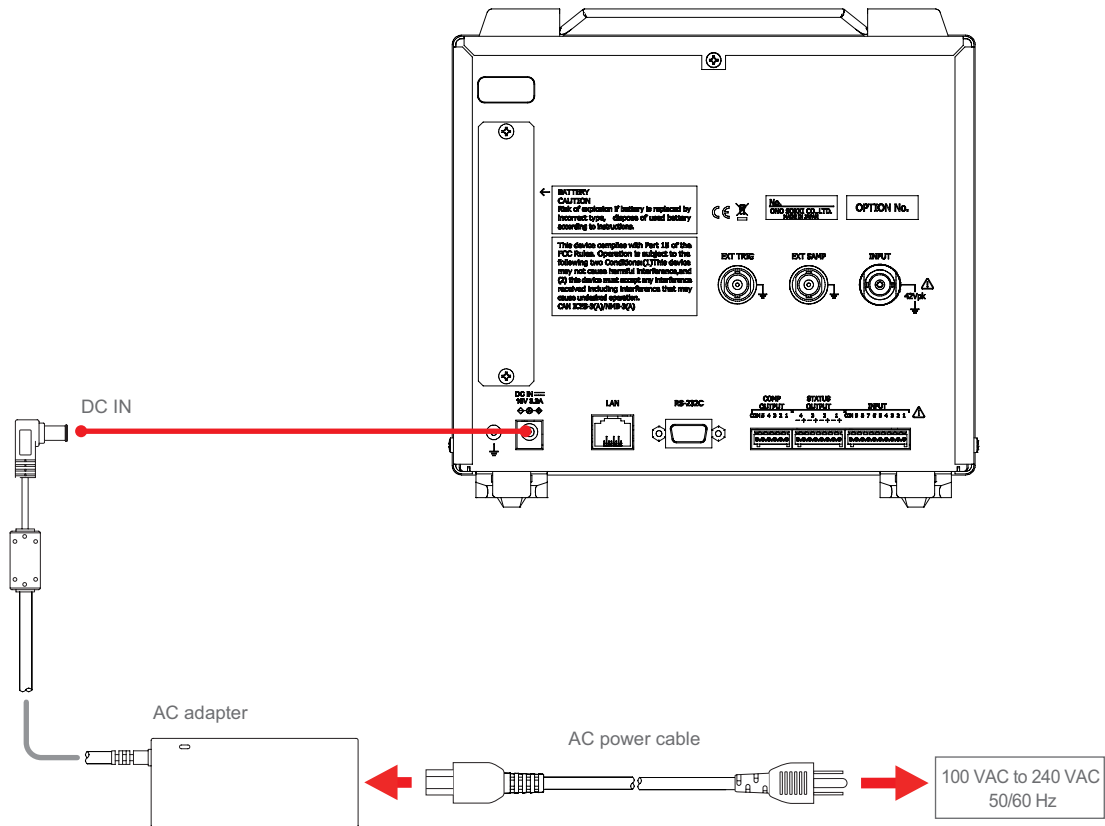
2.5 Preparation for Power Supply (AC Adapter Connection)



- Always use the AC adapter within the specified range of rated voltage. The supply voltage of the AC adapter that comes with the CF-4700 FFT comparator is 100 to 240 VAC (50/60 Hz). Note that using a power supply other than specified could cause a fire or electric shock.
- Always use the AC adapter and power cable that come with the CF-4700 FFT comparator. Note that using ones other than supplied could cause a fire or electric shock.

Connect the AC adapter that comes with the product as follows:

- [1] Check the connections of peripheral devices.
Make sure that the relevant peripheral devices are correctly connected to the CF-4700 FFT comparator. For details, refer to the instruction manuals of the peripheral equipment connected.
- [2] Connect the AC adapter.
Insert the plug of the AC adapter securely into the bottom of the DC power input terminal (DC IN) located on the rear panel of the CF-4700 FFT comparator.
- [3] Connect the AC power cable to the AC adapter.
Fully insert the AC power cable into the AC adapter.
Next, insert the power plug of the AC power cable into the 3-wire AC outlet (100 to 240 VAC).



2.6 Power-on and Power-off Procedures

■ Power-on procedure

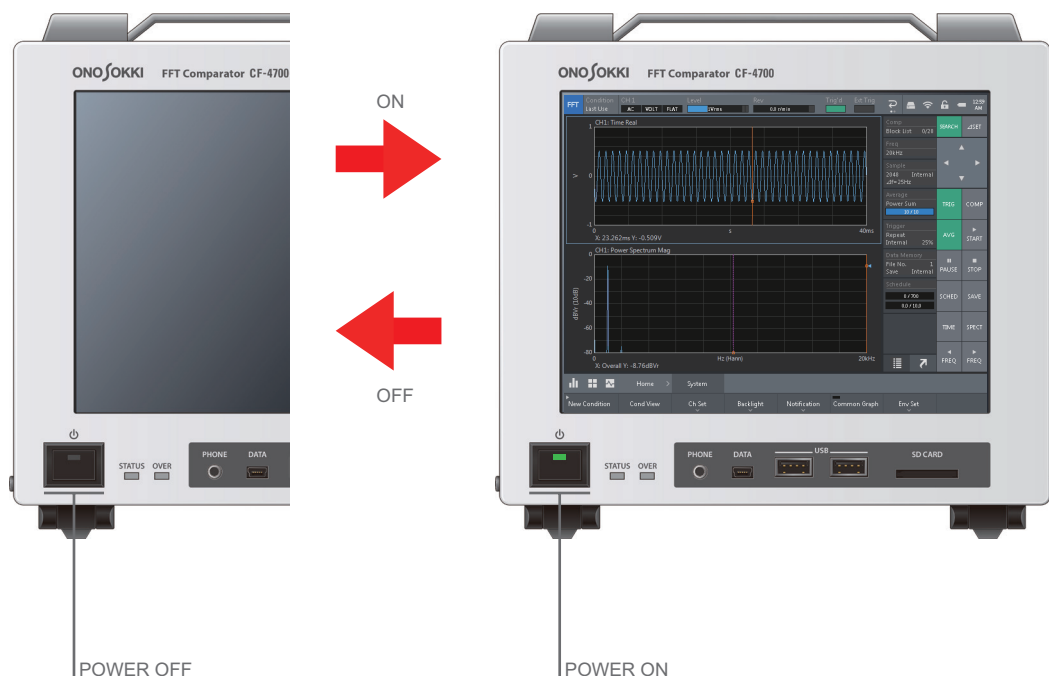
- [1] Check the connections of peripheral devices and prepare the power supply (AC adapter).
Verify the connections of peripheral devices and prepare the supply of power (AC adapter).
- [2] Set the POWER switch to ON.
Press the POWER switch for more than 1 second. The comparator beeps and turns on the POWER indicator in green. After confirming the lighting of the POWER indicator, immediately release the POWER switch.
Then, the CF-4700 FFT comparator starts to boot.
- [3] Verify the startup of software.
When the CF-4700 FFT comparator starts to boot, the logo of Ono Sokki appears and then the software main screen is displayed. It takes about 60 seconds until the main screen is displayed.



- Note that if the POWER switch is kept pressed down even after the POWER indicator is lit green, the CF-4700 FFT comparator is forcibly powered off and fails to start to boot.
- Note that the power cannot be turned off within 30 seconds after it is turned on. When needed, turn off the power at least 30 seconds after power-on.

■ Power-off procedure

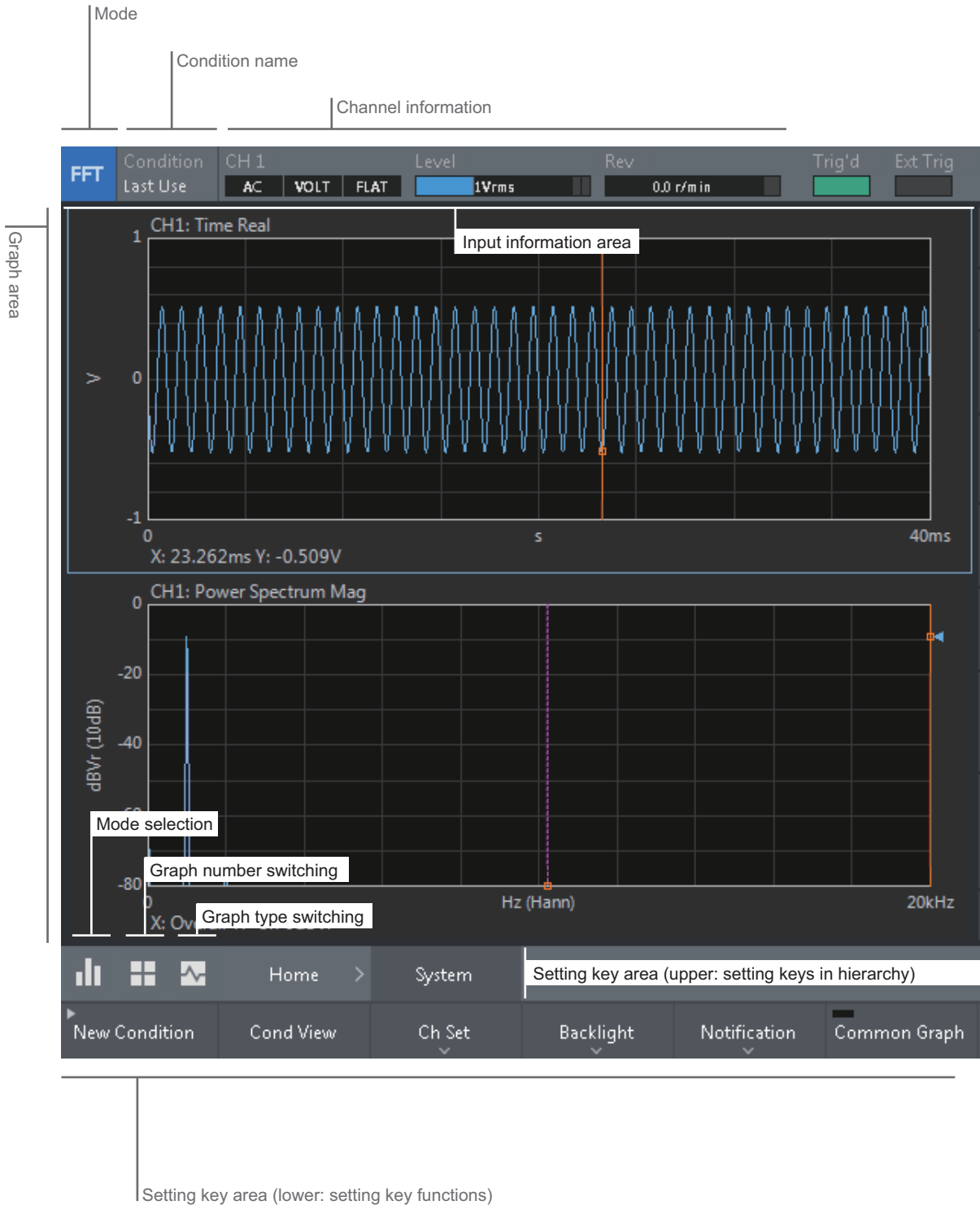
Press the POWER switch for more than 1 second with the power turned on. The device beeps. Then, the CF-4700 FFT comparator starts termination processing. Release the finger from the POWER switch after the beep.



- Pressing the POWER switch for more than 5 seconds causes forced power-off during shutdown processing and may not complete the processing normally. After shutdown processing starts, release the POWER switch immediately.
- Disconnect the AC adapter after confirming that the POWER indicator (green) goes off.
Note that while the POWER indicator is lit, shutdown processing is going on even when nothing is displayed on the screen.

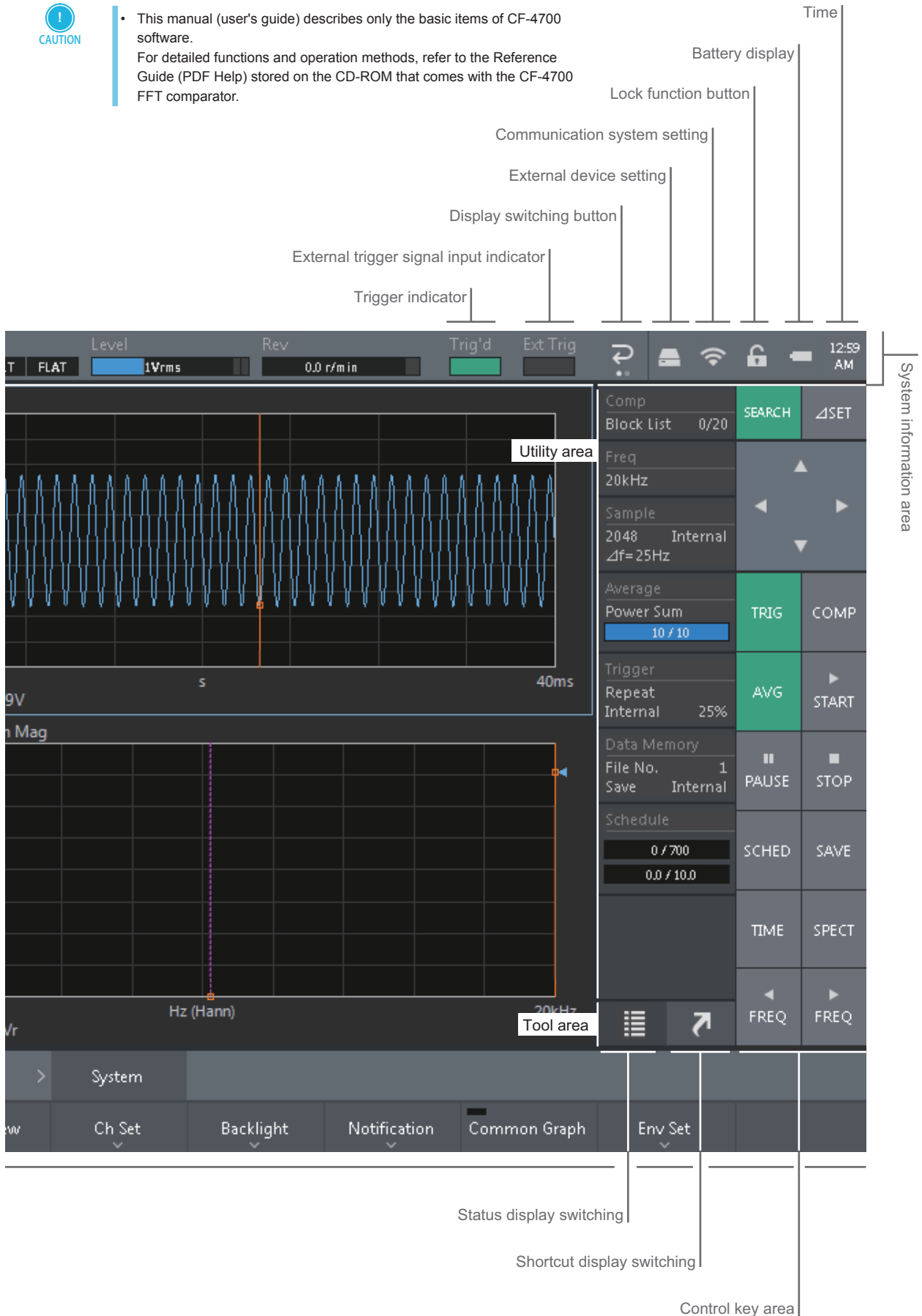
3. Software Component Names and Basic Operations

3.1 Main Screen (CF-4700 Main Screen)





- This manual (user's guide) describes only the basic items of CF-4700 software. For detailed functions and operation methods, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.



3.2 Component Names and Functions of Input Information Area

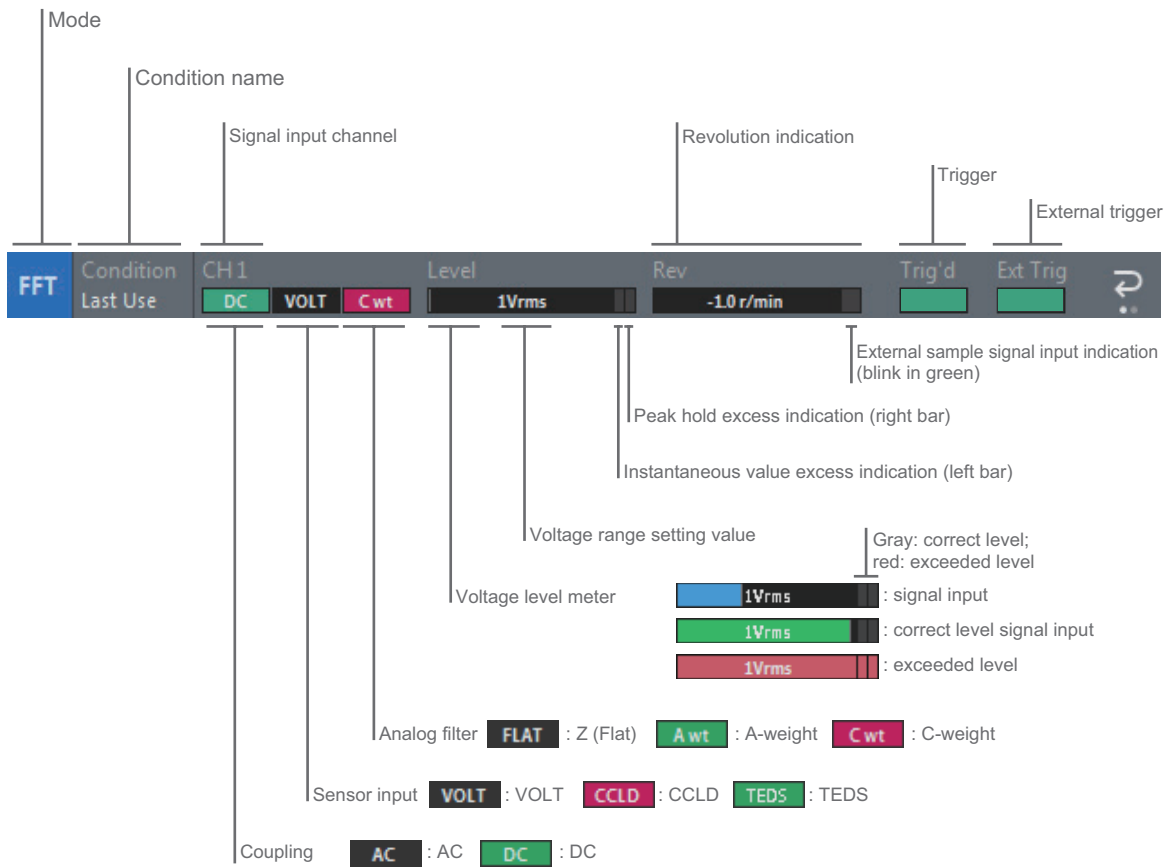
An area that displays input information such as a level monitor is provided on the upper left of the main screen.

The display switches to input information or communication information each time the display switching button is touched.

For the functions and other details of individual components, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.

■ Display of input information

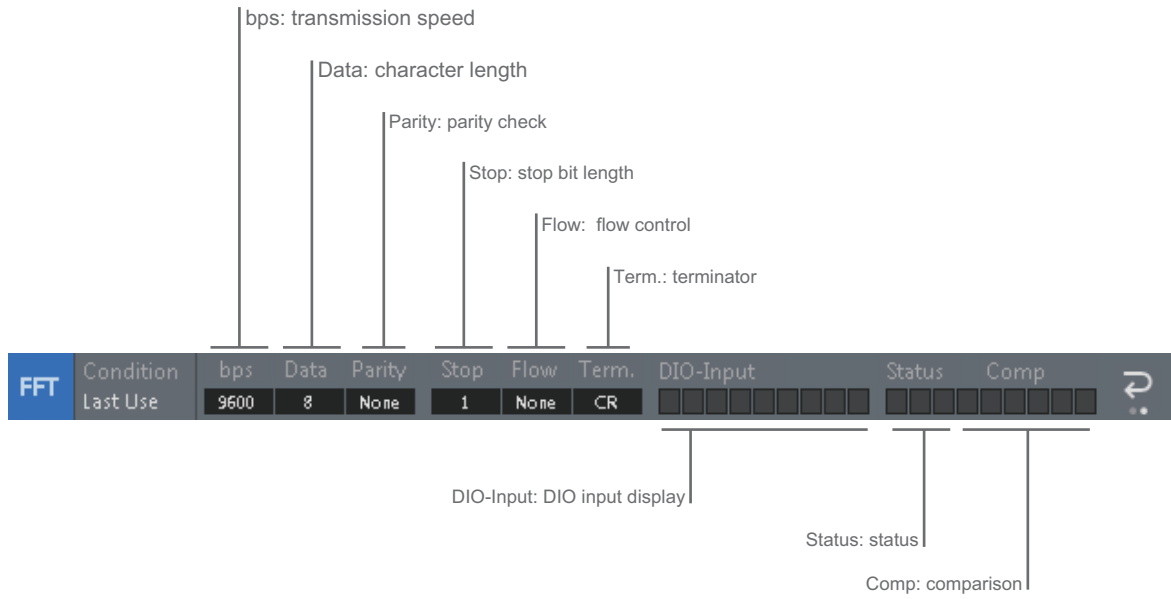
Immediately after the startup of the CF-4700 FFT comparator, input information such as signal input and level monitor is displayed in the input information area.



■ Display of communication information

Touching the display switching button with input information displayed switches to the display of communication information.

The mode and project names are shown in every display.



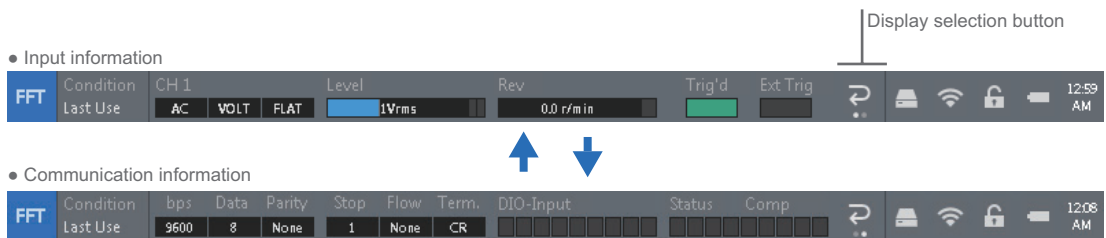
3.3 Component Names and Functions of System Information Display Area

System information is displayed in the upper right area of the main screen.

For the functions and other details of individual components, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.

■ Display switching button

The display switches to input information or communication information each time the display switching button is touched.

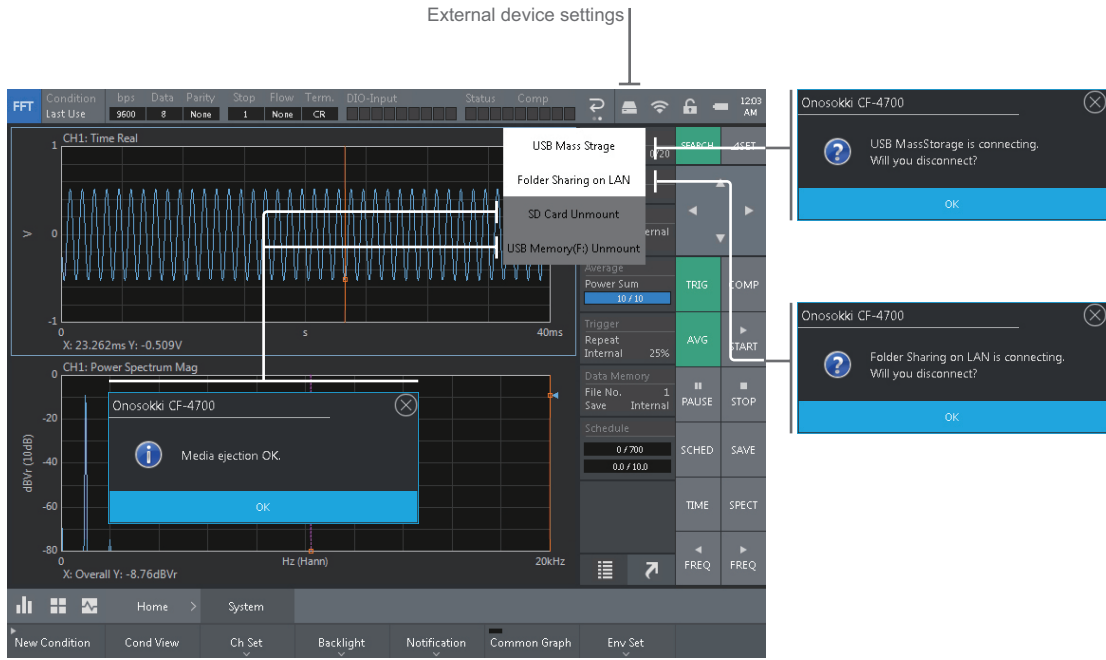


■ External device setting

External devices such as the personal computer and USB flash memory card attached to the CF-4700 FFT comparator can be removed.

Touch the external device setting button to list the external devices attached to the CF-4700 FFT comparator.

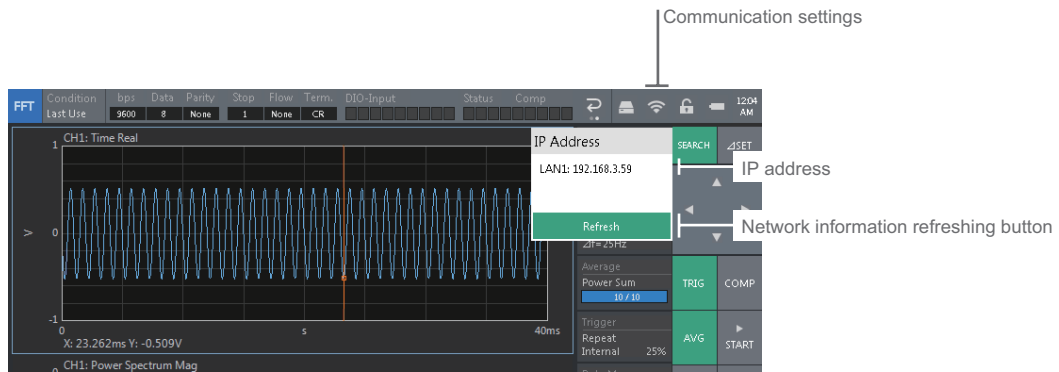
Touch the external device to remove on the list.



■ Communication system setting



Network information is displayed.

Touch the communication system setting button to display the menu containing the IP Address and Refresh button (network information reacquisition button).



- Immediately after the LAN cable is connected, multiple IP addresses may be displayed. In this case, reopening (closing and opening again) the menu or touching the Refresh button displays a correct IP address.
- If an IP address beginning from 169 is displayed, the device may be connected to the network incorrectly. Here, check the LAN connection destination and connection environment. If the connection is wrong, correct it. If an IP address beginning from 169 is still displayed even after confirming the correct connection environment, reopen (close and open again) the menu or touch the Refresh button to display a correct IP address.
- Note that, if the LAN cable and wireless LAN adapter are both connected simultaneously, multiple IP addresses are displayed.

■ Lock button

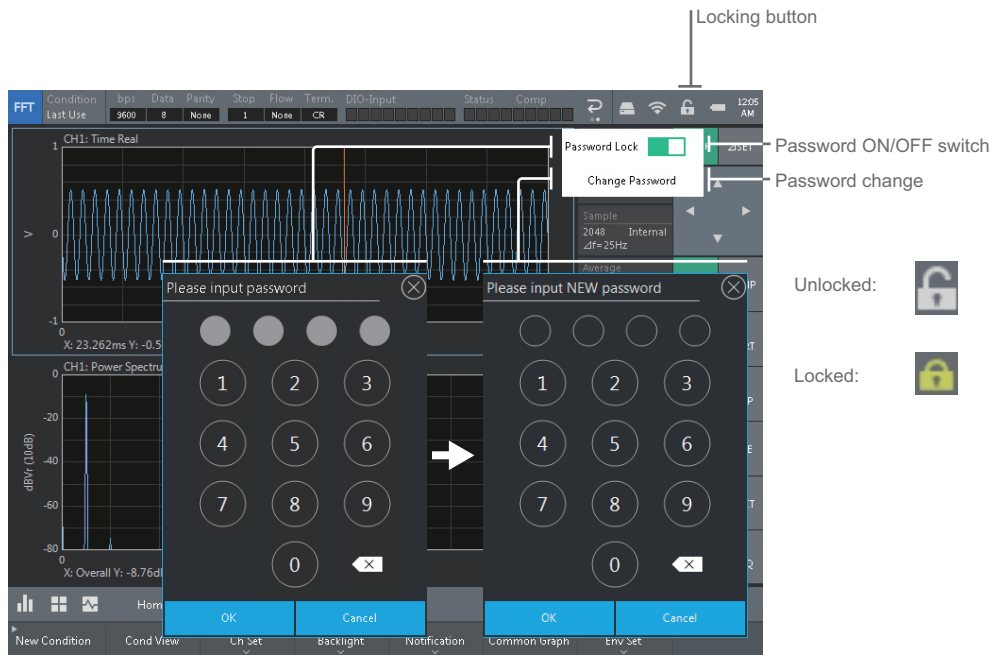
The lock button enables (unlock ) or disables (lock ) the operation of the screen touch panel.

Tapping the lock button opens the menu listing Password Lock (unlock password ON/OFF switching) and Change Password (lock password change).

Selecting Password Lock allows switching the unlock method between ON (with a password) and OFF (without password). It is set to OFF (without password) by default and no password has been set.

Pressing down the lock button disables (lock) the touch panel operation.

To unlock the operation, press down the lock button again. If the operation is locked with a password, the "Please input password" dialog box appears. Enter the password to unlock.



Battery display

When the optional CF-0478 power source backup function is installed, the following status indications are used to display the availability of battery pack and the state of charge.

If the power source backup function is not installed, a non-installed mark is displayed as the battery status.

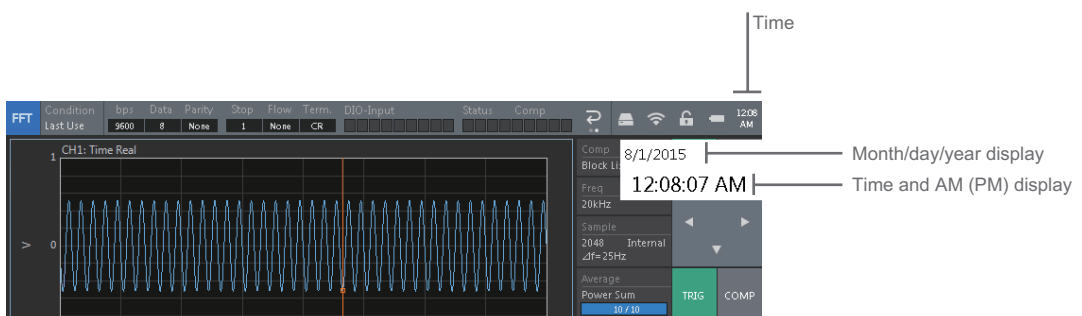
For details, refer to "5.2 CF-0478 Power Source Backup Function" on page 45.



Time

The current date and time are displayed.

Touching the time button showing the current time opens the menu listing the current date and time.



3.4 Component Names and Functions of Utility Area and Tool Area

The right side of the graph area is the utility area displaying the status list or the shortcut list.

The bottom of the utility area is the tool area used to switch between the status list and the shortcut list.

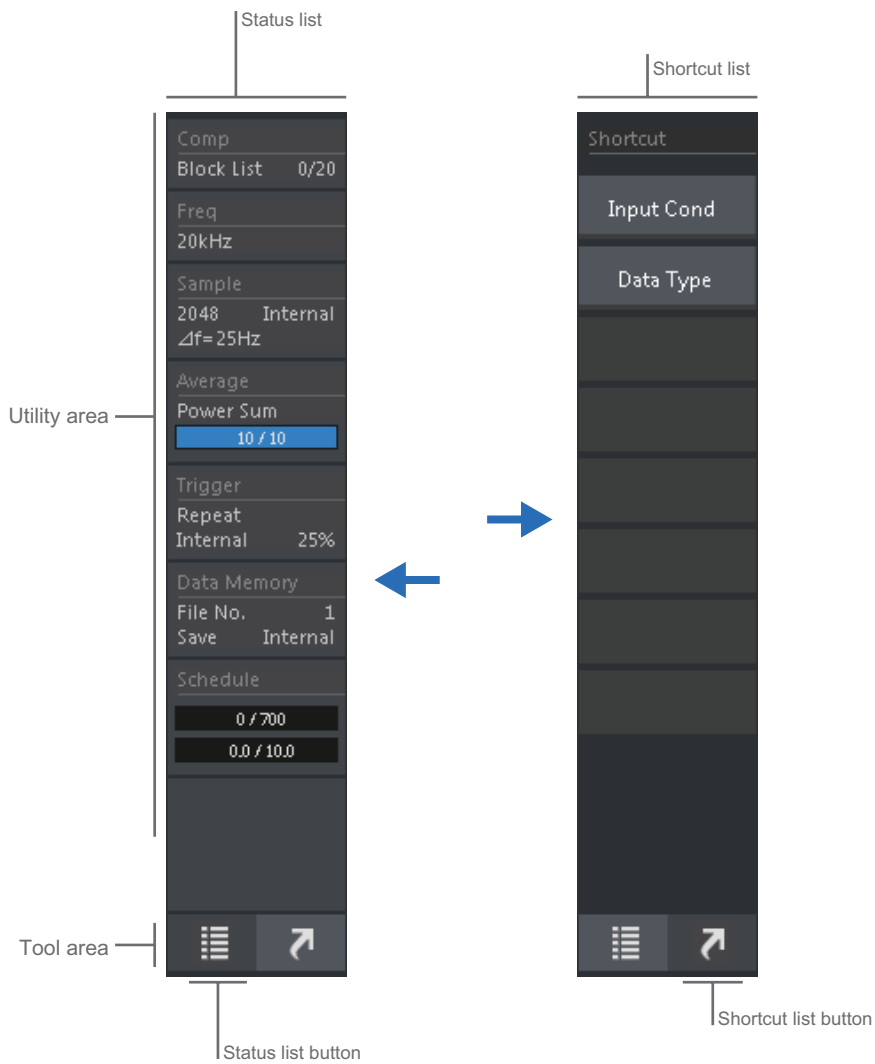
For the functions and other details of individual components, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.

■ Tool area component names and functions

The tool area has the buttons for switching between the status list and shortcut list in the utility area.

Touching the status list button displays the status list in the utility area.

Touching the shortcut list button displays the shortcut list in the utility area.



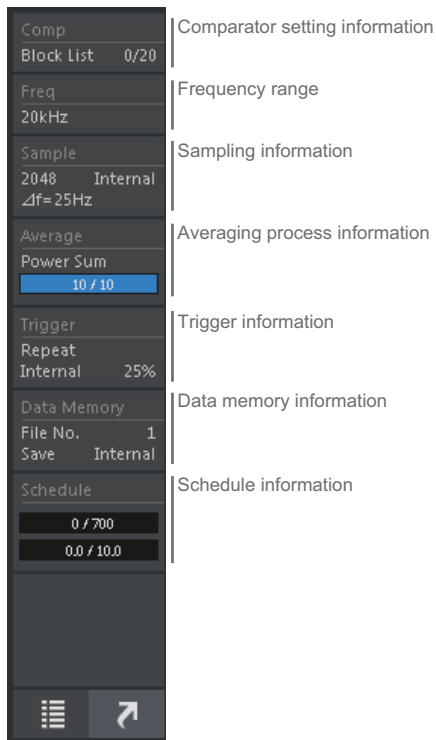
■ Utility area component names and functions

The utility area displays the status list or shortcut list by switching them with relevant buttons.

- **Status list**

Touching the status list button displays the status information in the utility area.

The status list includes various conditions that have been set in the CF-4700 FFT comparator.
 Touching an item displayed opens the soft key of the touched item or displays a setting dialog box.

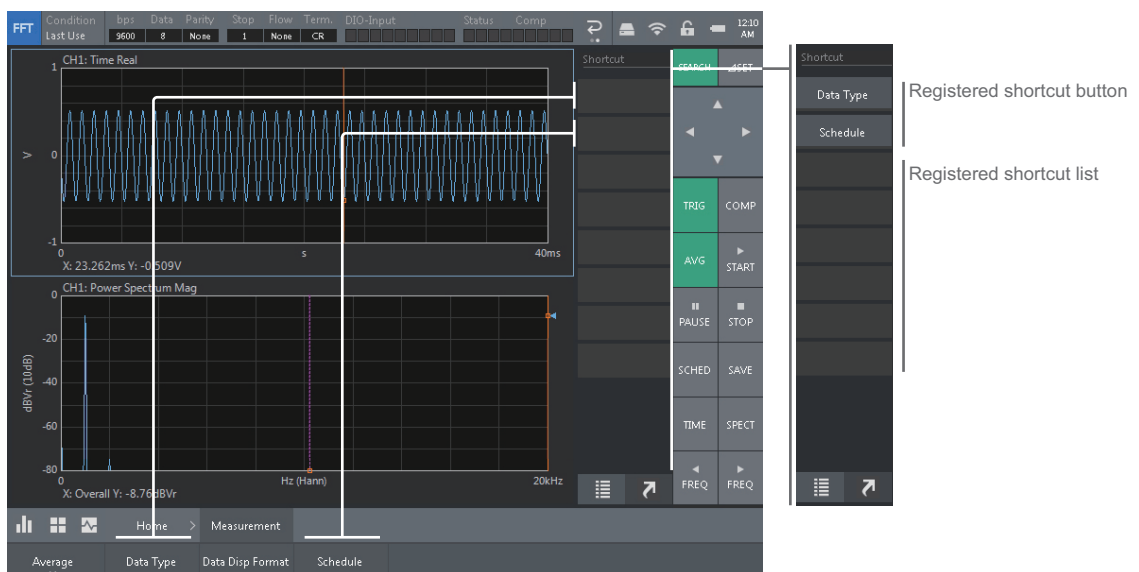


● **Shortcut list**

Touching the shortcut list button displays the shortcut list in the utility area.

Frequently used commands and functions can be registered as shortcut buttons in the shortcut list.

For registration of a shortcut button, touch the target key and drag (move) it to a shortcut button in the registration shortcut list, and drop it (release) there. To cancel the registration of a shortcut button, drag it to outside the panel and drop it.



3.5 Component Names and Functions of Control Key Area

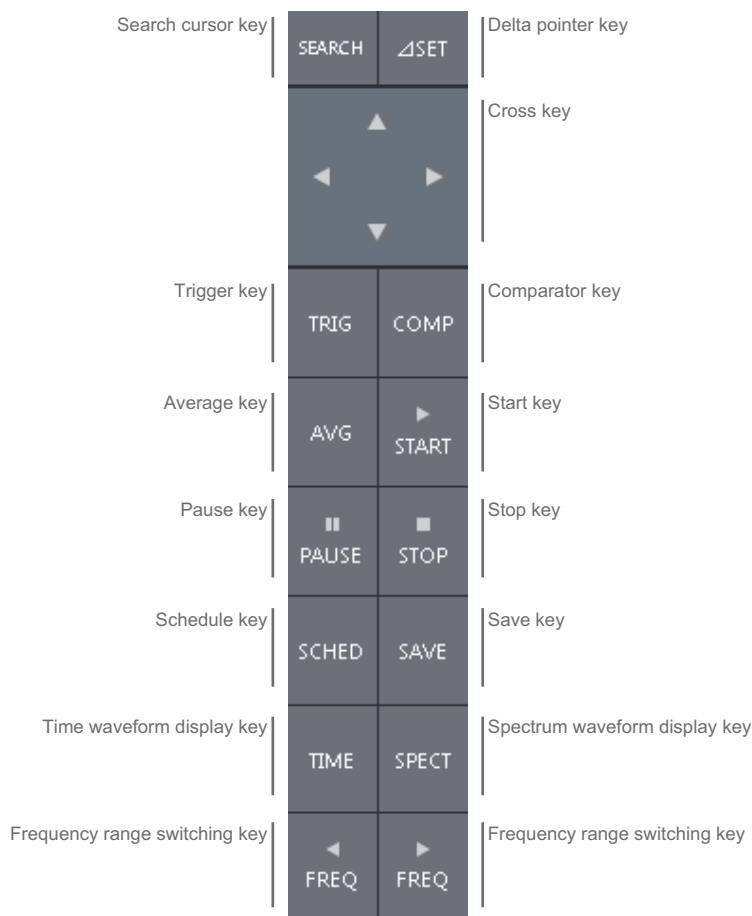
The control key area is under the system information area (on the right side of the graph area).

The control key area displays four types of control keys: FFT analysis, block comparator, and shape comparator.

For the functions and other details of individual components, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.

■ FFT analysis control keys

Usually, the control key area displays the FFT analysis control keys, which are used for measurement, analysis operations and analysis condition setting.



■ Comparator control keys

When the screen is switched to the comparator condition setting screen (Graph View or List View), the FFT analysis control keys are switched to the comparator control keys.

There are two types of comparator control keys to be used depending on comparator conditions: one is for the block comparator and the other is for the shape comparator.



- The shape comparator control keys are available only when the optional CF-0472 shape comparator function is installed. For details about the options, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.

	Block comparator control key		Shape comparator control key	
Waveform display switching key	VIEW LIST	List switching key	TEXT LOAD	Text file load key
	▲ ◀ ▶ ▼	Cross key	▲ ◀ ▶ ▼	
Display of comparator registration No.	1 ▼	Comparator registration No. switching key	1 ▼	
Comparator registration No. key (ascending)	+ No - No	Comparator registration No. key (descending)	+ No - No	
	REGISTER	Comparator registration key	REGISTER	
	DELETE	Registration cancel key	DELETE	
Average key	AVG ▶	Start key	AVG ▶	
Pose key	PAUSE ■ STOP	Stop key	PAUSE ■ STOP	
Trigger key	TRIG SCHED	Schedule key	TRIG SCHED	

	Assist comparator control keys		
Waveform display switching key	VIEW	DIFF	Difference graph display switching key
	▲ ◀ ▶ ▼		
	1 ▼		
	+ No	- No	
	REGISTER		
	DELETE		
Recalculation key	ReCalc		

3.6 Component Names and Functions of Setting Key Area

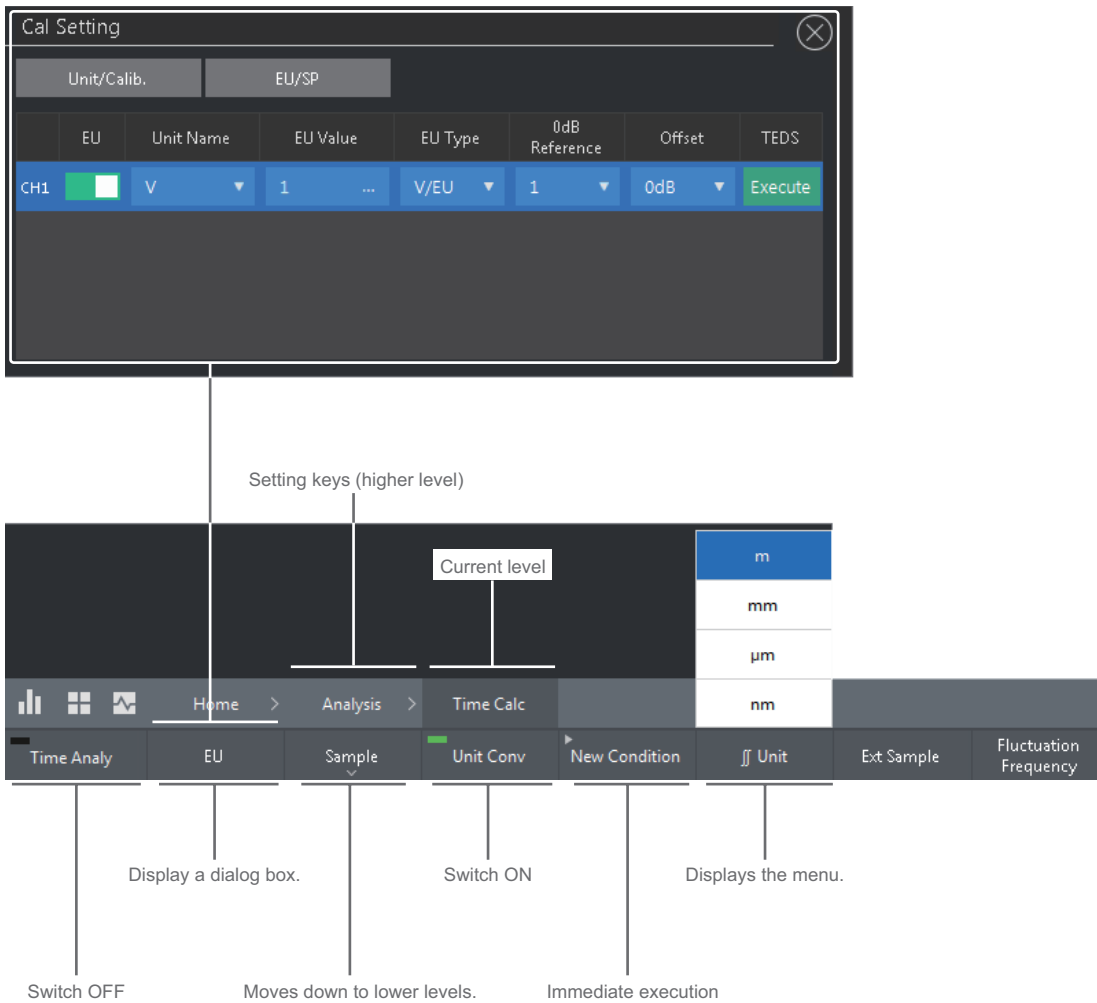
The setting key area is displayed below the graph area.

The setting key area consists of two stages.

The upper stage has, in order from left, the mode switching, graph number switching, and graph type switching buttons, and the soft key indicating the hierarchy.

The lower stage has the soft keys indicating functions.

For the functions and other details of individual components, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.



4. Basic Operation of Hardware

4.1 Connection to USB Connectors (Type A)

The front panel of the CF-4700 FFT comparator has two type-A USB (universal serial bus) interface connector ports that comply with the USB2.0 standards.

The USB flash memory and wireless LAN module can be connected to the type A USB connectors. This section describes how to connect the USB flash memory to the connector as an example.



- Note that the USB flash memory may not function normally if a USB hub is used.

■ Installing and removing the USB flash memory

The USB flash memory can be installed on the type A USB port of the CF-4700 FFT comparator.

The USB flash memory thus installed can be specified as the storage destination of measurement, analysis, and condition data.

The data stored in the USB flash memory can also be read into the CF-4700 FFT comparator.

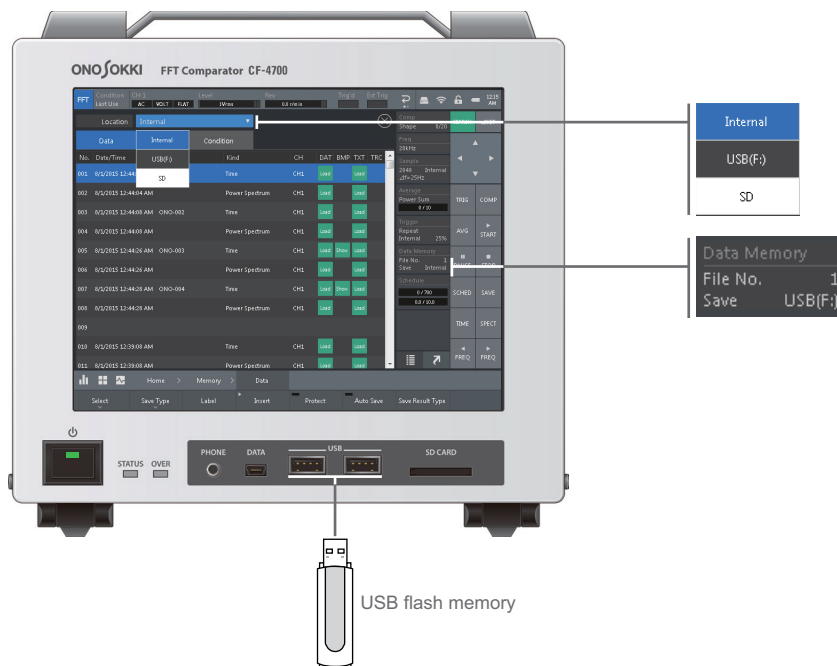


- Read the instruction manual supplied and the precautions provided and use the USB flash memory correctly. Ono Sokki Co., Ltd. bears no responsibility and accepts no claim for any failure caused by incorrect usage.
- For information on our recommended USB flash memory that can be connected to the CF-4700 FFT comparator, please the nearest Ono Sokki sales office or the distributor where you purchased the product.

Install or remove the USB flash memory as follows:

- Install USB flash memory.

Insert the USB flash memory into the type A USB port located on the front panel of the CF-4700 FFT comparator.



Drive letter F is automatically assigned to the USB flash memory installed first, and G is assigned to the second USB flash memory. Note that the drive letters cannot be changed.

- [2] Change the data storage destination to the USB flash memory thus installed in the CF-4700 FFT comparator. After the data storage is changed to the USB flash memory, the memory management directory folder for the CF-4700 FFT comparator is automatically created in the USB flash memory.

Touch soft keys Home, Memory, and Data (or Condition) in this order to display the memory management screen. Touch Location on the memory management screen, and touch USB (F:) in the menu that has been opened. This sets up the USB flash memory as the data storage memory.

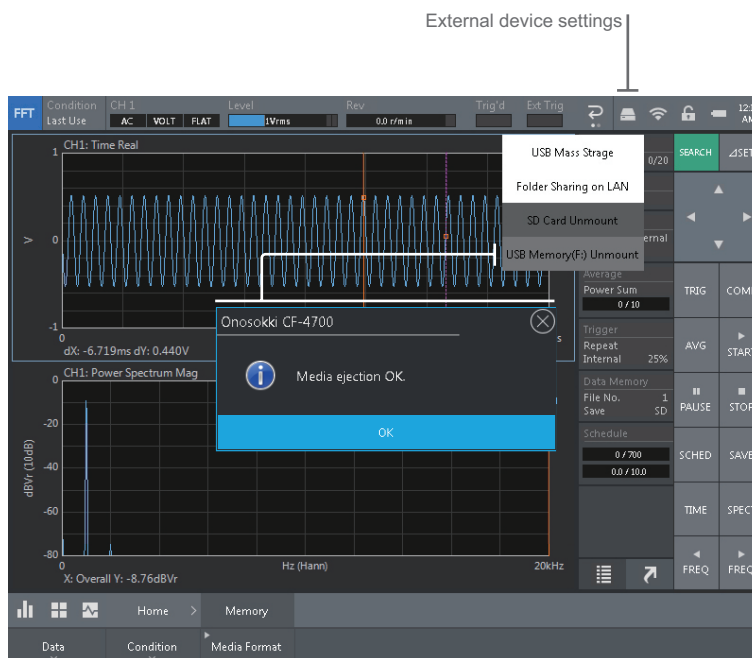
At this time, the Save field of data memory information of the status display changes from Internal to USB (F:).

- [3] Remove the USB flash memory.

Touch the external device setting button. A menu pops up, in which touch "USB flash memory (F:) Unmount" for the USB flash memory drive installed.

Message "Media has been unmounted" appears. Touch the OK button.

Then, carefully extract the USB flash memory from the CF-4700 FFT comparator.



4.2 Connection to Mass Storage Connector

If the optional CF-0477 USB mass storage function is added, USB mass storage can be connected.

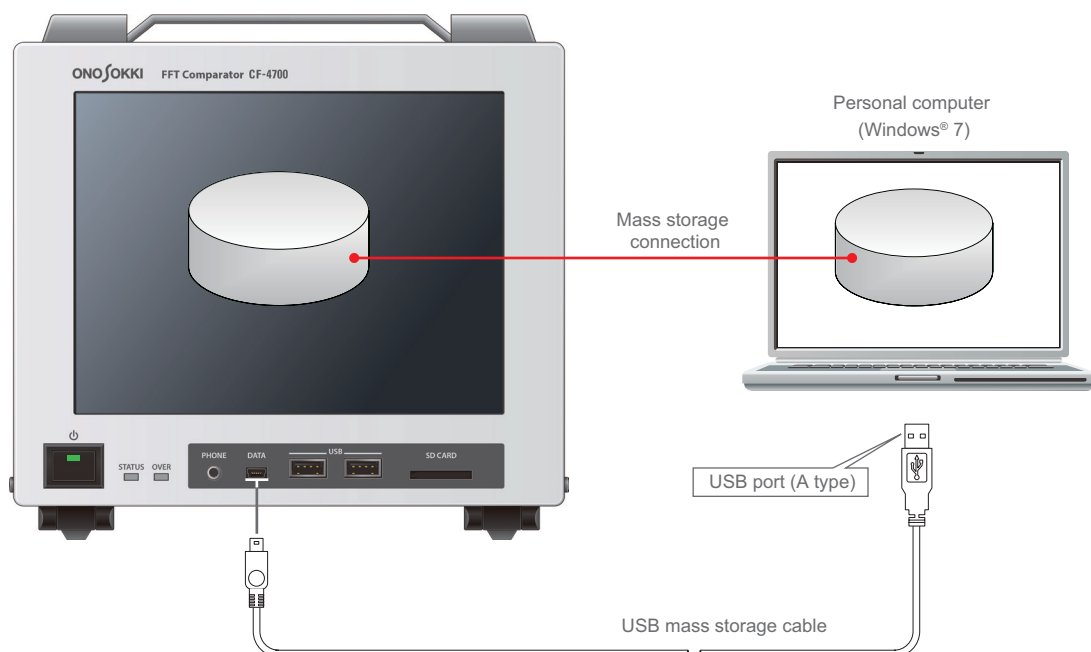
Connect the one end of the USB mass storage cable to the mass storage connector on the front panel of the CF-4700 FFT comparator, and the other end to the personal computer.

■ Overview of USB mass storage function

The USB mass storage function means to connect the CF-4700 FFT comparator and personal computer (Windows® 7 installed) via the USB mass storage cable.

Upon completion of the connection, the memory (internal memory, USB flash memory, or SD card) region is mounted under the name local disk in (connected to) the connected personal computer.

Data files stored in the memory region thus mounted can be copied by directly specifying them from the personal computer.



CAUTION

- The personal computer to be connected by the USB mass storage function must have Windows® 7 installed.
- The data files in the CF-4700 FFT comparator memory region that has been mounted in the personal computer can be browsed and copied only. Deleting or adding files are disabled.
- While the mass storage mode is active, every operation of the CF-4700 FFT comparator is disabled.

■ Establishing a connection to the USB mass storage

Establish a connection to the USB mass storage as follows:

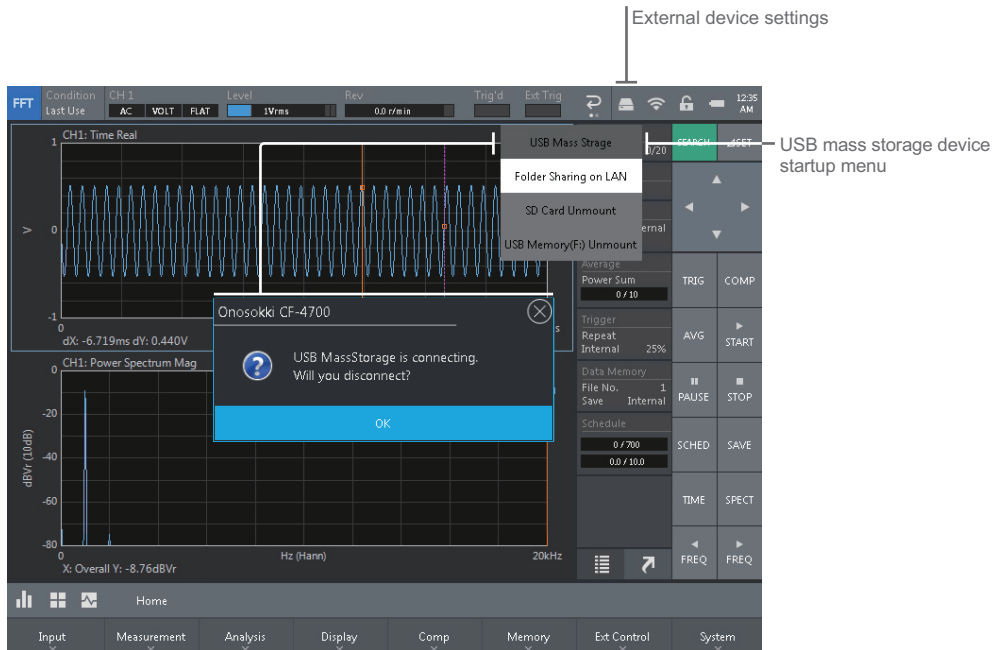
- [1] Connect the CF-4700 FFT comparator and personal computer using the USB mass storage cable.

Switch on the CF-4700 FFT comparator and personal computer.

First, connect the one end of the USB mass storage cable to the mass storage connector on the front panel of the CF-4700 FFT comparator.

Next, connect the other end of the USB mass storage cable to the USB port (type A) of the personal computer.

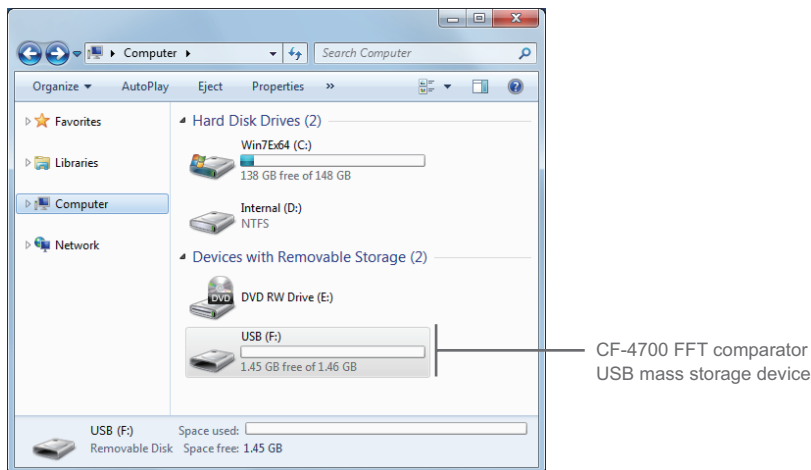
- [2] Operate the CF-4700 FFT comparator to establish a connection to the USB mass storage. Touch the external device setting button to pop up a menu, in which touch "USB Mass Storage". USB mass storage mode begins and displays message "USB mass storage is connected. OK?".



- [3] Establish a connection between the personal computer and CF-4700 FFT comparator. When the mass storage mode begins in the CF-4700 FFT comparator, device driver software is automatically installed in the personal computer. When the installation is completed (a connection between the CF-4700 FFT comparator and USB mass storage is established), a message "Device is now ready" appears.



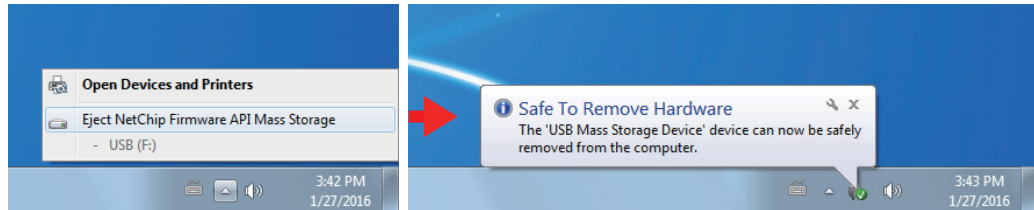
The USB mass storage device of the CF-4700 FFT comparator is mounted as a removable disk on the personal computer. The following screen is an example which shows the USB mass storage mounted with drive letter (F:).



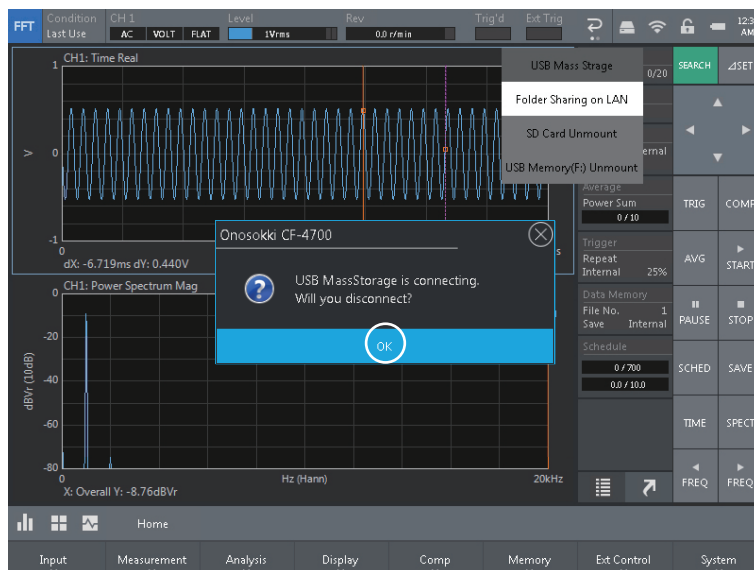
■ Canceling USB mass storage connection

Cancel the USB mass storage connection as follows:

- [1] Remove the USB mass storage device from the personal computer.
 Operate the personal computer to remove the USB mass storage device from the CF-4700 FFT comparator.
 Click the right mouse button on the Safely Remove Hardware icon on the task bar. Then, click [Remove NetChip Firmware API Mass Storage] in the menu that has popped up.
 After confirming the message [Remove Hardware], disconnect the USB mass storage cable.



- [2] Operate the CF-4700 FFT comparator to terminate the mass storage mode.
 When the CF-4700 FFT comparator displays message "Connecting USB mass storage. Cancel connection?", tap the OK button to terminate the USB mass storage mode.
 Finally, disconnect the USB mass storage cable from the CF-4700 FFT comparator.



4.3 SD Card Handling



- To prevent failure, do not insert anything into the SD card slot other than SD cards.
If foreign matter, water, or metal pieces enter the slot, immediately disconnect the AC adapter and contact the nearest Ono Sokki sales office or the distributor where you purchased the product.
- Read the instruction manual supplied and the precautions provided and use the SD card correctly.
Ono Sokki Co., Ltd. bears no responsibility and accepts no claim for any failure caused by incorrect usage.
- For information on our recommended SD card that can be connected to the CF-4700 FFT comparator, please consult the distributor where you purchased the product or our sales office near you.
Our website (<https://www.onosokki.co.jp/English/english.htm>) also provides the latest information on the SD cards that can be attached to the CF-4700 FFT comparator.

■ Installing an SD card

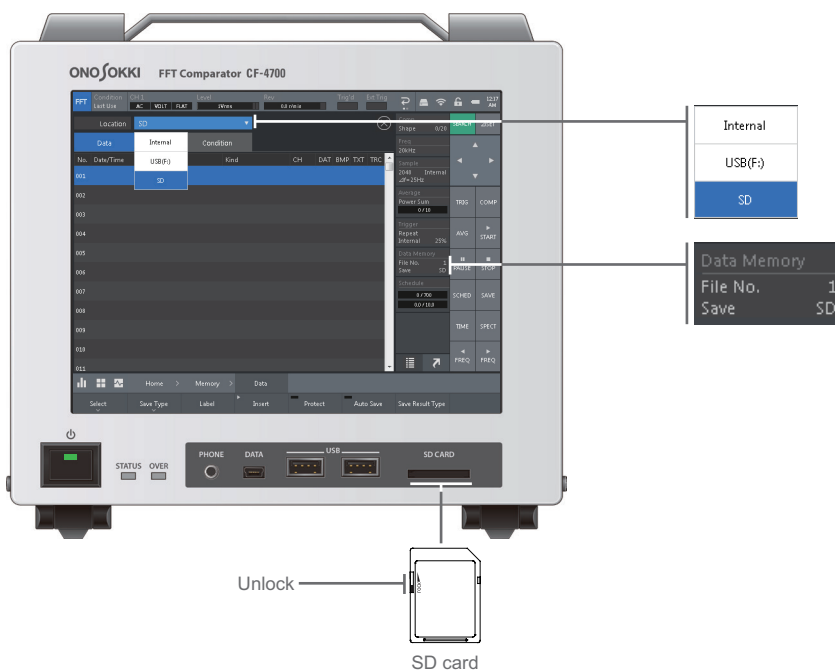
An SD card can be inserted (installed) into the SD card slot of the CF-4700 FFT comparator.

The SD card thus installed can be specified as the storage destination of measurement and analysis data or condition data.

The data stored in the SD card can also be loaded to the CF-4700 FFT comparator and can be read.

Install the SD card as follows:

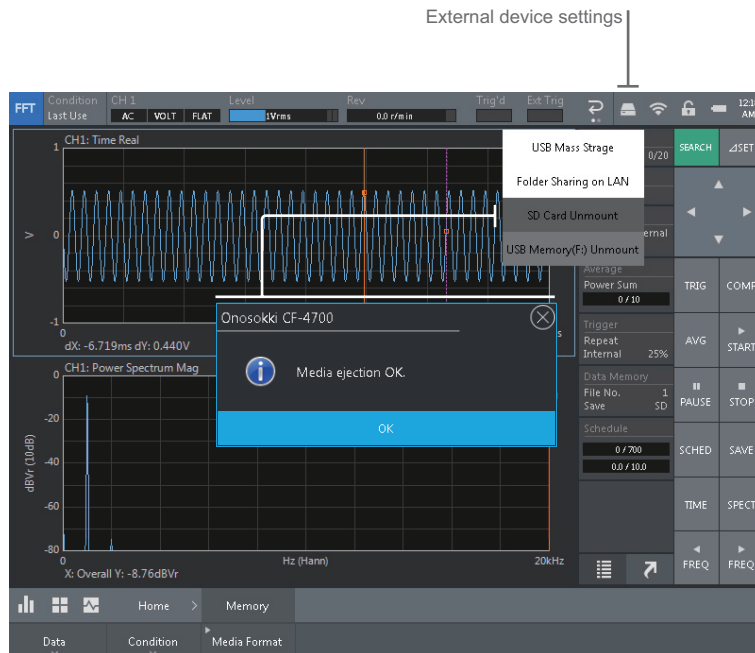
- [1] While holding the SD card with the surface facing up, insert it carefully into the SD card slot.
Unlock the SD card before inserting it.
The SD card slot is located on the front panel of the CF-4700 FFT comparator. Insert the SD card as far as it will go until it clicks.
- [2] Change the data storage destination to the SD card installed in the CF-4700 FFT comparator.
When the data storage is changed to the SD card, the memory management directory folder for the CF-4700 FFT comparator is automatically created in the SD card.
Touch soft keys Home, Memory, and Data (or Condition) in this order to display the memory management screen.
Touch Location on the memory management screen, and touch [SD] in the menu that has been opened. This sets up the SD card as the data storage memory.
The Save field of data memory information of the status display also changes from Internal to SD.



■ Removing the SD card

Remove the SD card as follows:

- [1] Touch the SD card unmount menu.
Touch the external device setting button to pop up a menu, and then touch "SD Card Unmount".
Message "Media has been unmounted" appears. Touch the OK button.



- [2] Remove the SD card.
Press back all the way the SD card that has been inserted into the CF-4700 FFT comparator card slot and confirm that the SD card pops out a little.
Manually extract the SD card that has popped out from the SD card slot.



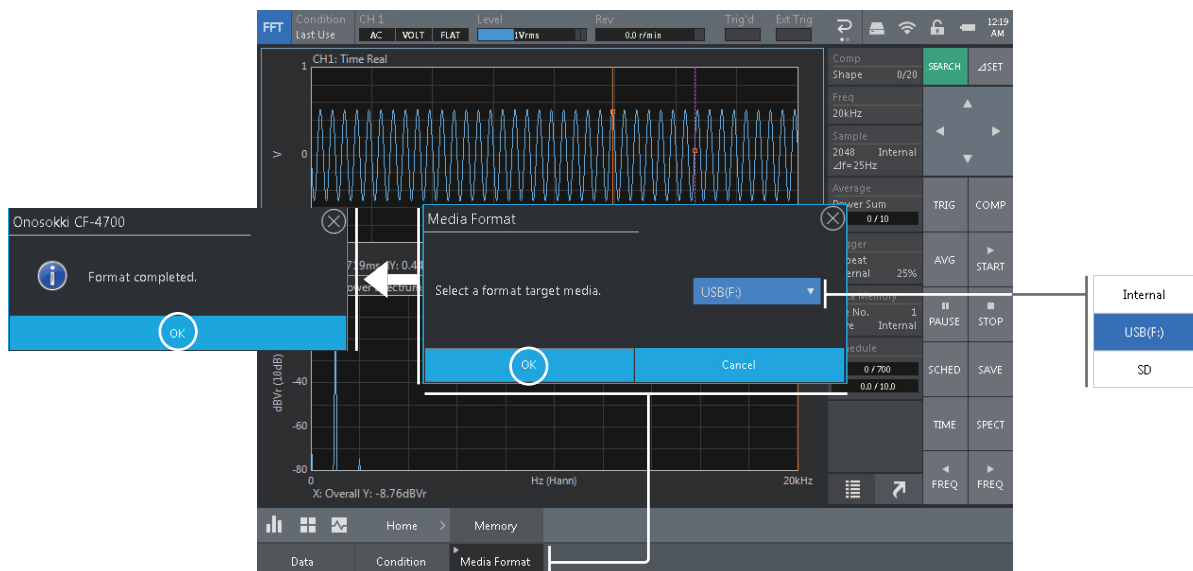
4.4 Media Formatting Procedure



- Note that formatting media erases all data stored in the media and that the erased data can no longer be restored.
- Before starting formatting, check the media for any stored data and back it up to other media as needed.

The internal memory (Internal), USB flash memory, and SD card used for the CF-4700 FFT comparator can be formatted. The following describes the formatting procedure by taking a USB flash memory as an example.

- [1] Install the USB flash memory in the type A USB port of the CF-4700 FFT comparator.
In the case of an SD card, unlock the SD card, hold the card with the surface facing up, and insert it into the SD card slot as far as it will go until it clicks.
- [2] Format the media.
Touch soft keys Home, Memory, and Media Format in this order to display the Media Format dialog box.
In the Media Format dialog box, touch the Media Format button and select the media to be formatted from the pop-up menu.
Touch the OK button to start formatting the specified media.
Upon completion of formatting, the following message is displayed. Touch the OK button to finish formatting.



4.5 Memory Management Directory and File Naming Rules

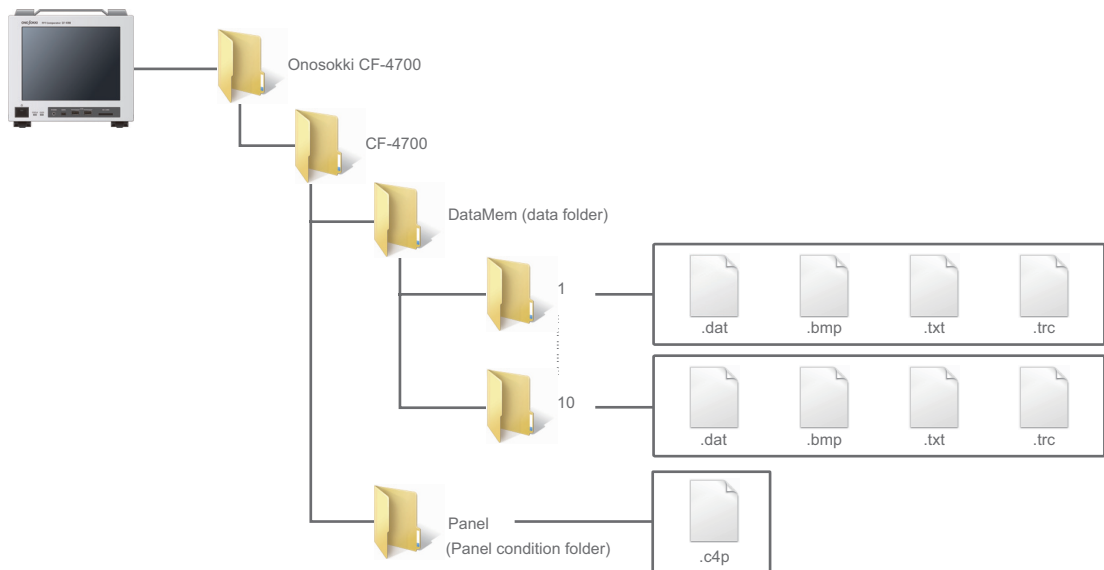
This section describes the structure of the memory management directory of the CF-4700 comparator and the naming rules for the names assigned automatically to files when they are saved.

■ Structure of memory management directory

The memory management directory structure of the CF-4700 FFT comparator is as follows:

Touch soft keys Home, Memory, and Data (or Condition) in this order to display the memory management screen. When the data storage destination (Location) is changed from USB flash memory to the SD card on this screen, memory management folders for the CF-4700 FFT comparator are automatically created in the root directory of the USB flash memory or SD card.

CF-4700 internal shared folder: connectable storage devices (USB flash memories and SD cards)



■ File naming rules

● Data file naming rules

The following types of information are given as needed, according to the following priority, to a data file as a file name.

Priority	Information	Description	Example
1	List number	List number displayed (3 digits)	003
2	Data type	Type of measurement data	Power Spectrum
3	Frequency range	Range of measurement frequency	40kHz
4	Number of samples	Number of samples at measurement	1024
5	CH information	Channel name at measurement	CH1
6	Screen number	Graph number at measurement	Graph2

```
list-number_data-type_frequency-range_number-of-samples_CH-information_screen-number(_label).extension
```

(_label) is attached only when the corresponding item exists.

Example of a data file name: 001_PowerSpect_40kHz_2048_CH1_2.dat

● Project file naming rules

A project file is assigned a file name by combining a list number and fixed string in accordance with the following naming rules.

```
list-number_fixed-string(_comment).c4p
```

Example: 001_ConditionFile.c4p

5. Optional Hardware

The CF-4700 FFT comparator has two types of optional hardware: CF-0473 amplitude modulation component extraction function and CF-0478 power source backup function.



- For purchase consultation and details about optional hardware, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.
Our website (<https://www.onosokki.co.jp/English/english.htm>) provides the latest information on the CF-4700 FFT comparator, optional hardware and software, and compatible USB flash memories.

5.1 CF-0473 Amplitude Modulation Component Extraction Function (Bandpass Envelop Monitoring Function)

If the CF-0473 amplitude modulation component extraction function is added to the CF-4700 FFT comparator, frequency bands of abnormal noise can be set through any filter while listening to the correlation with the sensitive evaluation through the headphones.

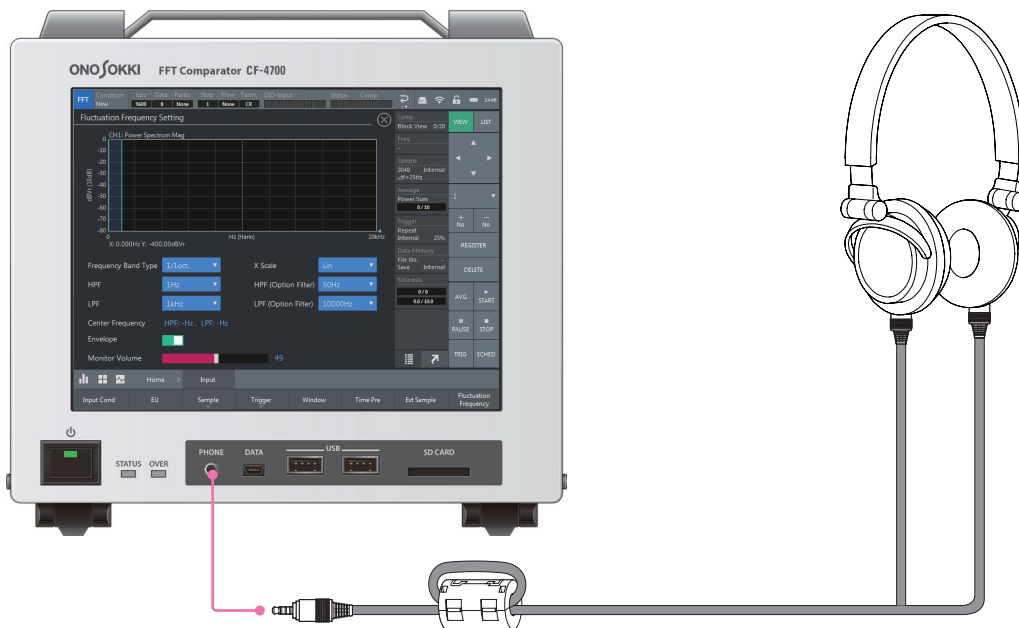
■ Preparing the CF-0473 amplitude modulation component extraction function

● Connecting headphones

Connect stereo mini type ($\phi 3.5$) headphones to the headphone output jack (PHONE) on the front panel of the CF-4700 FFT comparator.

Be sure to attach the ferrite core (E04SR200932 of Seiwa Electric) that comes with the CF-0473 amplitude modulation component extraction function to the headphones. This action is required for EMC compliance.

To control the volume, use Monitor Volume in the BPF & Monitor Setting dialog box that appears after touching soft keys Home, Input, and BPF & Monitor in this order.



Ferrite core (by Seiwa Electric, E04SR200932)



WARNING

- The use of headphones at high volumes may cause ear and hearing problems as well as increased fatigue. Always listen at moderately low volumes.
- If you feel the fatigue or discomfort, immediately stop listening.
- The headphone sound output level varies according to the headphones to be used, regardless of the preset volume level. If you replace the headphones, adjust the volume again afterwards.

● Setting filter conditions

Set the filter conditions of the CF-0473 amplitude modulation component extraction function, while listening the correlation with the sensitive evaluation through the headphones, in the BPF & Monitor Setting dialog box that appears after touching soft keys Home, Input, and BPF & Monitor in this order.

For details of the BPF & Monitor Setting dialog box, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.



CAUTION

- For details of the measurement methods and procedures of the CF-0473 amplitude modulation component extraction function, refer to the Reference Guide (PDF Help) stored on the CD-ROM that comes with the CF-4700 FFT comparator.

5.2 CF-0478 Power Source Backup Function

The CF-0478 power source backup function is to automatically start or shut down the CF-4700 comparator without operating the POWER switch by turning on/off the power to the AC adapter connected to CF-4700 FFT comparator. This function is useful such as when using the CF-4700 FFT comparator incorporated into the equipment.

The CF-0478 power source backup function becomes available when the supplied battery pack is attached to the CF-4700 FFT comparator.



- For this function, always use the specified battery pack for the CF-0478 power source backup function. When replacing the pack due to the end of service life or purchasing another pack, be sure to purchase the battery pack specified by Ono Sokki. Using a battery pack other than specified could cause a smoke, fire, electric shock or explosion in addition to failures and malfunctions.
- Do not heat or disassemble the battery pack, short circuit it or throw it into fire. It could cause explosion or ignition.
- If the CF-4700 FFT comparator is expected not to be used for a long period, keep the battery pack removed from the comparator. Keeping the battery pack installed for a long period could cause over-discharge, which could shorten the service life.
- When carrying or storing the battery pack, wrap it in plastic bags so the electrodes will not touch metal, and carry or store it in as cool an environment as possible. When transporting the battery pack independently, follow the transportation rules.
- When disposing of the battery pack, attach insulation tape to the electrodes for short circuit prevention and follow the local ordinances and regulations. Otherwise, it could cause an explosion, fire, or environment destruction. Illegal disposal could also be subject to punishment.

■ Checking items before using the CF-0478 power source backup function

Before using the CF-0478 power source backup function, be sure to check the followings:

● Checking items for CF-0478 power source backup function

- To use the CF-0478 power source backup function, the specified battery pack must be installed.
- The battery pack can be charged only while the CF-4700 FFT comparator is running. The battery is not charged when the CF-4700FFT comparator is not started even if the AD adapter is connected to the power source.
- The battery pack power alone is not sufficient for the POWER switch to start the CF-4700 FFT comparator.
- The device cannot be shut down normally while the battery level indicator on the upper right of the main screen shows "charging". Connect the AC adapter to which power is supplied and confirm that the battery level indicator shows "fully charged", then use the CF-0478 power source backup function.
- Even if the power to the AC adapter is interrupted and the power is supplied again to the AC adapter during the shutdown process, the shutdown process is continued normally.

● **Checking items when used in the low or high temperature**

- The appropriate temperature range for charging the battery pack is 10°C to 35°C.
- To protect the lithium-ion battery, the charging time to the CF-4700 FFT comparator varies depending on the ambient temperature.

The following is the necessary time for the power source backup function becomes available, along with the corresponding ambient temperature (when started with the battery pack level 0%).

Ambient temperature	Time for the power source backup function becomes available
35°C to 40°C	Approx. 30 minutes
10°C to 35°C	Approx. 15 minutes
5°C	Approx. 1 hour
0°C	Approx. 8 hours

- When continuously used in the ambient temperature 40°C or above, charging of the battery pack may be stopped to protect the lithium-ion battery.
When the battery pack is continuously used with charging stopped, the battery pack is self-discharged gradually. While the power source backup function is available, the time until the Normal Operation indication (🔌) is switched to the Unavailable indication (🔌 or ⚠️) is about one and half month with a brand-new battery.
- To turn off the power source while the status of the power source backup function is Unavailable (🔌, ⚠️, 🔌, 🔌), use the CF-4700 FFT comparator's power switch only.

● **Checking items when comparator is not in use**

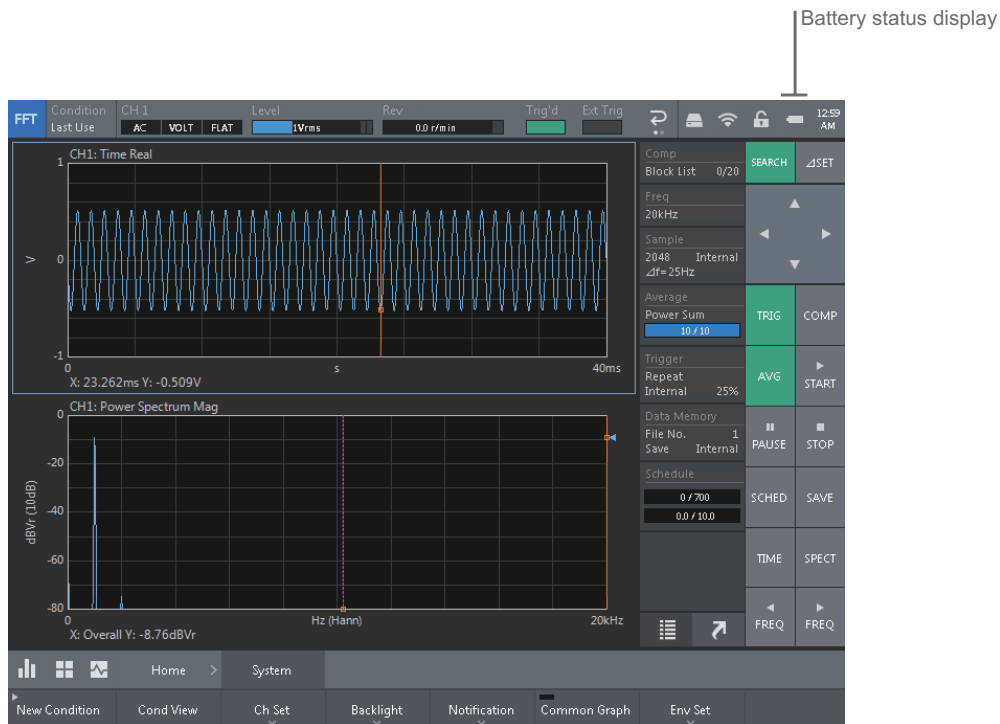
- If the CF-4700 FFT comparator is kept unused for a long period of time, the battery pack may be fully discharged because of the standby electricity of the CF-4700 FFT comparator. Use the power source backup function after the battery is fully charged and the power source backup function becomes available.

● **Battery replacement intervals**

- Replace the battery approximately every 2 years.
- To replace the battery, purchase the original battery pack only.
- If the battery pack is fully discharged, or it is unused for a long period of time in the low/high temperature environment, the replacement may be necessary in less than two years due to the battery deterioration.










■ **Internal battery status display**

The following area on the screen displays the battery installation statuses and conditions.



● Battery status symbol

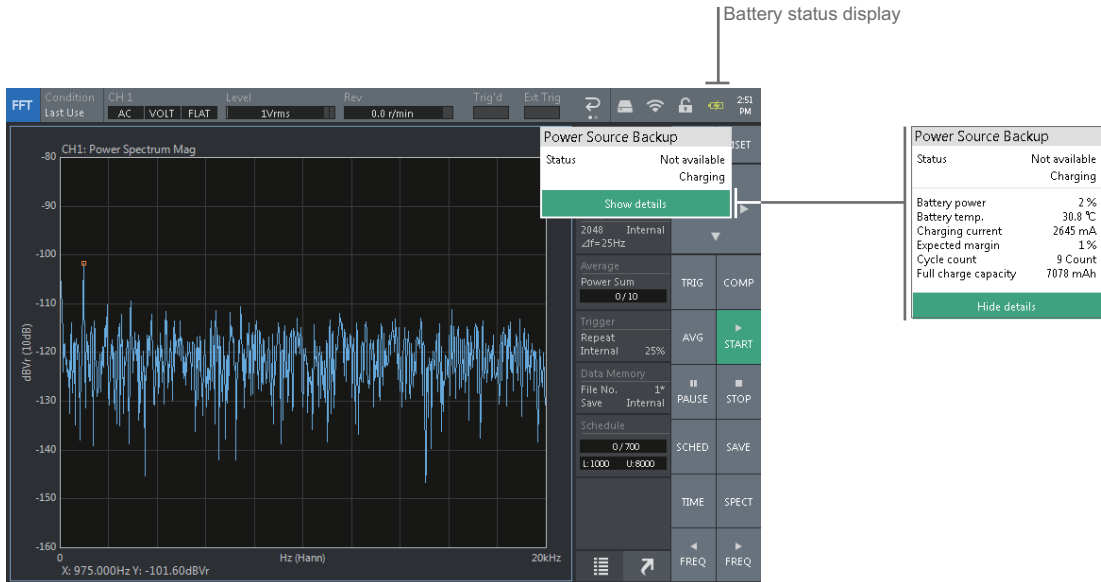
The following table shows the battery status symbols and operation statuses.

Status	Symbol	Meaning	Detail
Power source backup function available.		Battery is functioning normally.	Charging the battery pack is stopped due to the ambient temperature.
		Charging battery	Charging the battery pack.
		Charging battery with limitations/Charging stopped	Charging the battery pack is limited or stopped due to the ambient temperature. <ul style="list-style-type: none"> The power source back up function is running normally.
Power source backup function unavailable		Charging	Charging status of the battery pack. <ul style="list-style-type: none"> While charging, use the POWER switch on the CF-4700 FFT comparator to turn off the power. To use the backup function, charge the battery until the status becomes "Available". After charging more than 15 minutes, the power source backup function becomes available (when started with 0% battery level).
		Charging battery with limitations	Charging the battery pack is limited due to the ambient temperature. <ul style="list-style-type: none"> While charging with limitations, use the POWER switch on the CF-4700 FFT comparator to turn off the power. To use the backup function, charge the battery until the status becomes "Available". The following indicates the time until the power source backup function becomes available (when started with 0% battery level). At an ambient temperature of 5°C: approx. 1 hour At an ambient temperature of 0°C: approx. 8 hours
		Charging stopped	Charging the battery pack is disabled due to the ambient temperature. <ul style="list-style-type: none"> While charging, use the POWER switch on the CF-4700 FFT comparator to turn off the power. <p> Charging the battery pack is disabled to protect the lithium-ion battery in the environment with the ambient temperature below 0°C or above 40°C.</p>
		No battery pack	The CF-0478 power source backup function option is installed. No battery is installed. <ul style="list-style-type: none"> With no battery pack, use the Power switch on the CF-4700 FFT comparator to turn off the power. To use the power source backup function, open the battery pack housing plate and install the battery pack.
		Not installed	The CF-0478 power source backup function is not installed.

● **Battery status display**

You can check whether the CF-0478 power source backup function is available and the operation status of the battery pack by touching the Battery Status button.

If the CF-0478 power source backup function is available, every time you touch the Show Details or Hide Details button, the detail information of the battery is expanded or compressed.



Item	Detail
Status	Shows whether the CF-0478 power source backup function is available/unavailable. <ul style="list-style-type: none"> • Available: Power source backup function is available. • Not Available: Power source backup function is unavailable (e.g. The CF-0478 option is not installed)
Status	Shows the status of battery pack. <ul style="list-style-type: none"> • Charged: Battery is functioning normally. • Charging: Charging battery. • Charging with limitations: Charging battery with limitations. • Charge stopped: Charging stopped. • No battery: No battery pack installed. • No option: CF-0478 option is not installed.
Show details/Hide details	You can expand to see the details such as the charging level of the battery pack or the batter temperature by touching the Show Details button. Normally not used. <ul style="list-style-type: none"> • The expanded details are compressed when the Hide Details button is touched.

■ **Preparing the CF-0478 power source backup function**

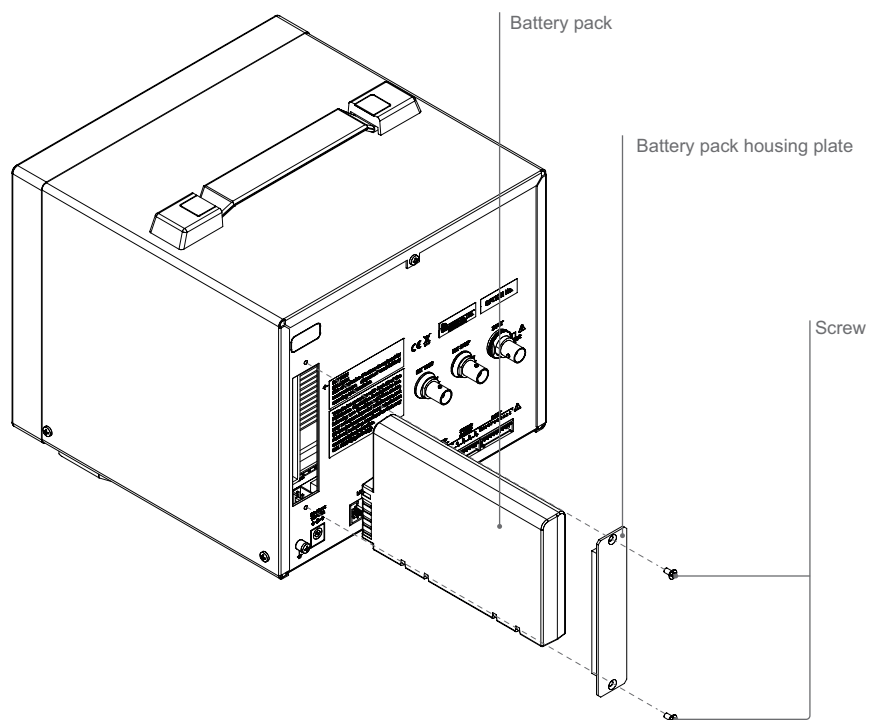
● **Battery pack installation procedure**

The CF-4700 FFT comparator is delivered with no battery pack installed.

Install the battery pack in the CF-4700 FFT comparator in the following procedure.

When removing the battery pack, reverse the installation procedure.

- [1] Remove the battery pack housing plate.
Remove two screws securing the battery pack housing plate on the back of the CF-4700 FFT comparator. Then, remove the battery pack housing plate.
- [2] Prepare the battery pack.
Prepare the battery pack delivered in the same packing as the comparator.



[3] Install the battery pack.

While holding the battery pack with the convex portion facing down, insert it carefully. Push the battery pack all the way into the housing.

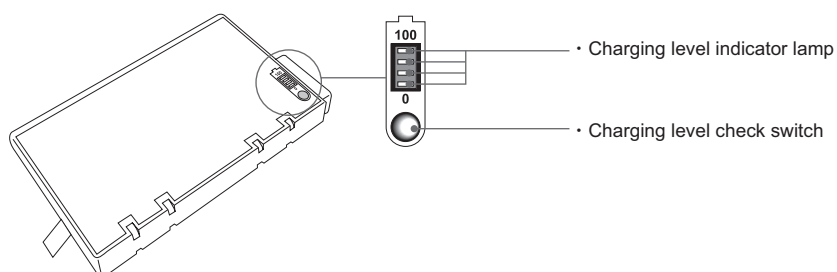
Attach the battery pack housing plate in reverse to the installation, and secure it with the screws.

● **Checking the battery charge level**

The battery pack has the indicator lamp and the switch to show the charge level.

Pressing the charge level check switch turns on the indicator lamp showing the charge level.

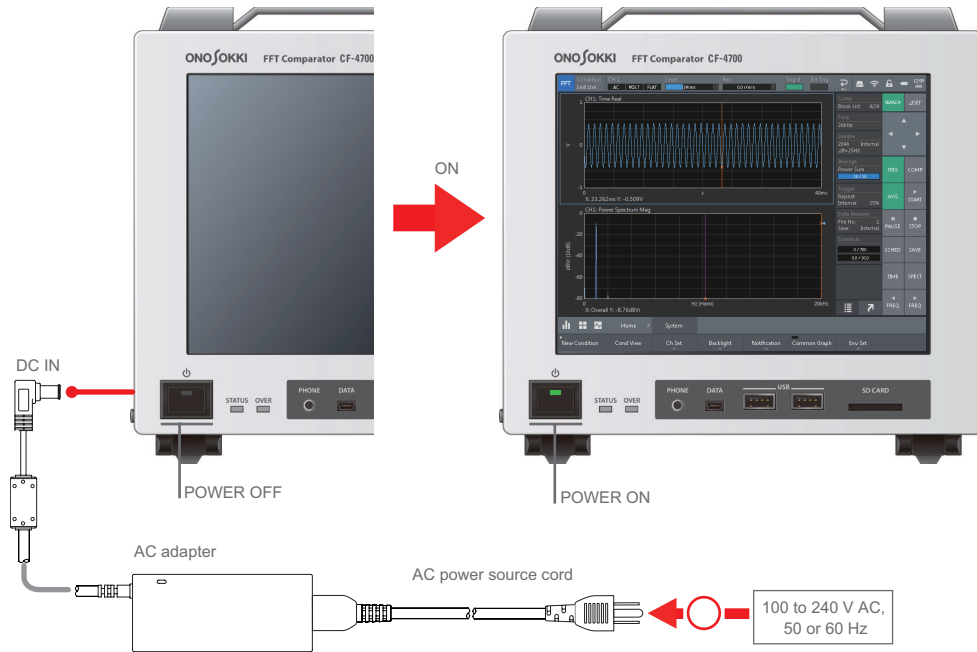
For the purpose of battery pack life extension, the charging is controlled so as not to charge the battery pack up to 100%. Thus, even after completion of charging, some indicator lamp segments remain unlit.



■ Using the CF-0478 power source backup function

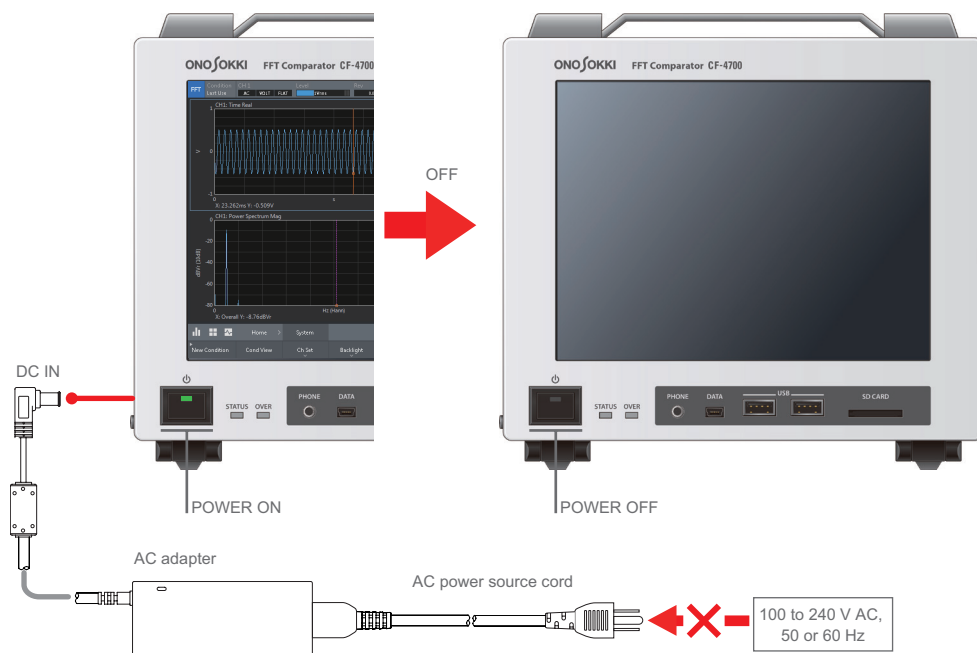
● Automatic power-on

Supplying power to the AC adapter connected to the CF-4700 FFT comparator starts the comparator automatically. Once the CF-4700 FFT comparator is started, the POWER switch is enabled to terminate or restart after termination. Ensure that power is kept supplied to the AC adapter.



● Automatic power-off

When the power to the AC adapter connected to the CF-4700 FFT comparator with the battery back installed is turned off, the shutdown process starts automatically and the comparator is turned off (terminated) normally.



6. Specifications

■ Input

Number of input channels	1CH	
Input terminal shape	BNC (C02 type)	
Input format	Single end	
Isolation	Always isolated	
Input impedance	1 MΩ ± 0.5%, 100 pF	
Input coupling	DC or AC (−3 dB ± 0.3 dB at 0.5 Hz or less)	
Supply current for sensor (CCLD)	+24 V/4 mA	
Open circuit detection	Cable open circuit detected when CCLD is used	
TEDS capability	Support for sensor compatible with IEEE1451.4 Ver0.9 and 1.0	Compatible sensor acceleration sensor, microphone Compatible TEDS Template ID (0, 12, 25, 27) TEDS Ver0.9 (0: acceleration sensor, 12: microphone) TEDS Ver1.0 (25: acceleration sensor; 27: microphone)
Maximum input voltage	30 Vrms (42.4 Vpeak)	
Absolute maximum input voltage	AC70 Vrms for 1 minute (50 Hz)	
Input voltage range	1 Vrms, 31.62 Vrms (2 ranges)	
DC offset	−60 dB full scale or less (auto zero ON, at DC coupling)	
Input level monitor	Red LED lit in excessive input (lit at 95% of full-scale range)	
Frequency range	DC to 40 kHz	
A/D converter	24bit ΔΣ type	
Dynamic range	110 dB or more	
Amplitude flatness	± 0.1 dB	
Harmonic distortion	−90 dB or less (when standard/option filters are off)	
Aliasing	−90 dB or less	
Full-scale accuracy	Within ±0.1 dB (in 1 kHz)	
Amplitude linearity	±0.0015% (in full scale)	
Anti-alias filter	Fourth-order Butterworth LPF, 100 kHz, −3 dB	
Digital filter	FFT aliasing filter	Baseband: 10th-order elliptic
	Acoustic filter	Acoustic A, C characteristics
		IEC 61672-1 Ed. 1.0 class1
		ANSI S1.4-1983 TYPE1
		JIS C1509-1: 2005 class 1
Input of external sample	Input terminal	BNC (C02 type)
	Input voltage range	±12 V
	Input impedance	100 kΩ
	Input coupling	DC or AC
	Detection level	−12 to 12 V in increments of 0.025 V
	Slope	+ (rising) or − (falling)
	Hysteresis level	Any value (0.025 to 24 V, initial value: 0.5 V)

Input of external sample	Input frequency range	0 to 300 kHz (out-of-band filter: 330 kHz, -3dB)
	Absolute maximum input voltage	AC/DC 30 V
	Number of input pulses/rotations	0.5 to 1024 P/R
	Input pulse division function	1 to 1024 division in increments of 1 • Required when the input frequency exceeds 4 kHz
	Waveform monitor	Waveform can be checked on the screen.
	External sample input display	Pulse detection Screen display Rotation speed
External trigger input	Input terminal	BNC (C02 type)
	Input voltage range	±12 V
	Input impedance	100 kΩ
	Input coupling	DC or AC
	Detection level	-12 to 12 V in increments of 0.025 V
	Slope	+ (rising) or - (falling)
	Hysteresis level	Any value (0.025 to 24 V, initial value: 0.5 V)
	Input frequency range	0 to 300 kHz (out-of-band filter: 330 kHz -3 dB)
	Absolute maximum input voltage	AC/DC 30 V
	Waveform monitor	Waveform can be checked on the screen.
	External trigger input display	Screen display at the pulse detection: EXT TRIG blinking
	Analog filter	HPF (standard)
Passband amplitude accuracy: ±0.15 dB Harmonic distortion: -75 dB or less		
LPF (standard)		Cut-off frequency (fixed) 1 kHz, 10 kHz • The 1 kHz filter is a third-order Butterworth filter and complies with the vibration severity standard, ISO 2954.
		Passband amplitude accuracy: ±0.15 dB Harmonic distortion: -75 dB or less
Band bus filter (option)		CF-0473 amplitude modulation component extraction function (option)
Envelope (option)	CF-0473 amplitude modulation component extraction function (option)	

■ Liquid crystal display

Size	8.4 type
Resolution	800 × 600 dots • Percentage of effective number of dots: 99.999% or more
System	Color TFT LCD equipped with a resistive touch panel
Brightness control	2 stages of ON and OFF
Illumination (backlight)	White LED

■ Controls

Power switch	Holding down 1 second causes power on. • Holding down causes forced power off. Holding down 1 second causes power on. • Holding down causes forced power off.
Setting key	Soft keys on the lower part of LCD screen can set each function in detail.
Control key	Soft keys on the right side of LCD screen can control measurements and analyses and can also set various conditions.

■ Analysis

Frequency range	1 Hz to 40 kHz	
Frequency accuracy	Reading $\pm 0.005\%$ (± 50 ppm)	
Sampling Frequency	Frequency 2.56 times the frequency range (during internal sampling)	
Items sampled and analyzed	Sampled	Analyzed
	256	100
	512	200
	1024	400
	2048	800
	4096	1600
	8192	3200
	16384	6400
Overlapping	MAX, 75%, 66.7%, 50%, 25%, 0%, customized	
Window function	Rectangular, Hanning, FlatTop	
Time-axis waveform processing function	1st-order, 2nd-order differential/single, double integration Absolute value conversion, DC cancel, trend removal, smoothing	
FFT realtime rate	40 kHz (internal sample: FET 16384 points)	
Averaging function	<ul style="list-style-type: none"> Averaging can be terminated by specifying the number of times or seconds A/D over cancel function 	
	Averaging count setting	1 to 65535 times
	Averaging time setting	0.1 to 999.9 seconds
	Time domain	Arithmetic mean, exponential averaging
	Frequency area	Arithmetic mean, exponential averaging, peak hold, MaxOA
	Amplitude domain	Histogram addition average
Trigger function	TRIG'D blinking green on screen during triggering	
	Trigger level (internal trigger)	-99 to 99 (unit: %), default = 25%
	Hysteresis level (internal trigger)	0 to 99 (unit: %), default = 2%
	Position	± 8191
	Mode	Free, repeat, single, one-shot
	Source	CH1/external trigger input
	Slope	+, -, \pm (internal trigger only)
FFT operation	32-bit floating point number (IEEE single precision format)	

■ Processing functions

Time area	Time-axis waveform, autocorrelation function, cepstrum
Amplitude domain	Amplitude probability density function, amplitude probability distribution function
Frequency domain	Power spectrum, Fourier spectrum, lifiered spectrum, 1/1 octave (bundled), 1/3-octave (bundled)
Arithmetic function (time-axis statistical processing)	Mean value, absolute value average value, effective value, standard deviation, maximum value, minimum value, waveform crest factor ratio (crest factor), skewness, kurtosis

■ Comparator function

Comparison judgment system	Block mode, shape mode		
Block mode	Target waveform	Power spectrum, 1/1 octave (bundled), 1/3-octave (bundled), order spectrum	
	Maximum number of blocks set	20	
	Block range specification	From minimum to maximum values of analysis frequency (and Overall)	
		Three ways: upper limit only, lower limit only, and upper and lower limits	
		Can also be specified by the EU value.	
	By data type for block		
	<ul style="list-style-type: none"> Invalidated if differentiated or integrated (automatic deletion not implemented) 		
	Block mode method	Peak level	
		Peak MAX (maximum value)	
		InsideMax	
Partial overall			
Area content			
General criterion	Level		
	Whole block NG judgment		
Valid/invalid specification of judgment block	1 block judgment		
	Specification from block list		
Peak search in block	Automatic search for peak values in the specified block		
Repeat judgment function	NG count type		
	Number of times		
Shape mode (option)	Target waveform	Time-axis waveform, power spectrum, 1/1 octave (bundled), 1/3-octave (bundled), order spectrum, tracking diagram	
	Maximum number of standard lines set	20	
	Standard line specification method	Defining two standard lines by assuming the measurement data as the standard waveform and specifying +X% and -Y%	
		Any shape is defined by the user.	
		Defining two standard lines of any shape and the shape obtained by inverting the sign (time-axis waveform only)	
By data type for standard line (invalidated if differentiated or integrated)			
Shape method	NG if any standard line is overrun or underrun		

Shape mode (option)	General criterion	Range specification
		Level specification
	Valid specification of judgment shape	Specification from shape list
Averaging mode	Comparison judgment of averaging results	
Continuous/single mode	Continuous mode	Comparison judgment each time waveform analysis is performed
	Single mode	Judged each time the comparator switch is pressed
Output of judgment result	General judgment output	Judges the result as OK based on the NG criteria (output to NG terminal)
	Individual block/shape judgment output	Output of judgment results of up to five specified blocks/shapes
	Output timing	Selection whether to output after the end of measurement or after each analysis
Automatic data saving	Automatic saving only in the case of NG or all measurement results can be saved	
Block or shape specification method	Specifying an area by dragging on the screen	
	Specifying an area by a numeric value	
	Specifying an area by the cursor	
Timer function	Specification of start delay time	0 to 255 seconds in increments of seconds
	Specification of judgment execution time	0 to 255 seconds in increments of seconds
Judgment time	Time till judgment output after the end of FFT (averaging)	300 ms or less

■ Memory function

Recorder	Main storage, USB flash memory or SD card
Data file	Max. 9990 data (999 data × 10 blocks for the comparator and the external control, respectively) DAT, TXT, BMP, TRC <ul style="list-style-type: none"> Analysis data can be recorded in three formats simultaneously. Files in .txt, .bmp, and .trc are selectable.
Panel condition memory	Measurement conditions recording and calling (max. 50 items)

■ Interface

USB	No. of ports	3 (type A × 2 + mini type B × 1)
	USB (type A)	USB2.0 USB flash memory, wireless LAN module
	DATA (type mini B) For optional CF-0477	For USB2.0 USB mass storage connection • Comparator data reading on a connected PC (no writing)
	Wireless LAN module	Recommended: Item code PE19B1586
SD	No. of ports	1
	SD- and SDHC-compatible	512 MB, 4 GB, 8 GB, 16 GB, 32 GB • Specified and operation-verified memory only
LAN	No. of ports	1
	10BASE-T, 100BASE-TX, 1000BASE-T	Remove desktop, external control
Digital I/O	Open collector input/output	
	INPUT	Number of inputs: 9 points + common (insulation withstand voltage 42.4 Vpeak) Connector on the comparator: MC 0,5/10-G-2,5 Matching connector: FK-MC 0,5/10-ST-2,5 Input function: RS232C and LAN commands are assigned to input. • Example: Start, Stop, Comparator ON/OFF, Average ON/OFF, Trigger ON/OFF, Data Store, Selection of Any Panel Condition (15 types)
		Input format: Contact or open collector driving Sink current: 5 mA Negative logic Isolation: 5 V
	Output (STATUS OUTPUT)	Number of outputs: 4 independent points, each signal insulated (insulation withstand voltage: 43.4 V peak) Connector on the comparator: MC 0,5/8-G-2,5 Matching connector: FK-MC 0,5/8-ST-2,5 Output function: BUSY, OK, NG, ERR
		Output format: Open collector output (withstand voltage 30 V) Maximum output current 25 mA (sink) Negative logic
	Output (COMP OUTPUT)	Number of outputs: 5 points + common (insulation withstand voltage: 42.4 V peak) Connector on the comparator: MC 0,5/6-G-2,5 Matching connector: FK-MC 0,5/6-ST-2,5 Output function: Individual judgment output (5 any outputs)
	Output format: Open collector output (withstand voltage 30 V) Maximum output current 25 mA (sink) Negative logic	
RS-232C	No. of ports	1
	Communication speed	1,200 to 115,200 bps
	Number of bits	7, 8 bits
	Parity check	None, even, odd
	Stop bit	1, 2 bits
	Flow control	None, XON/OFF, hardware
	Terminator	CR, CRLF

■ Other functions

Condition view	Overview of settings list shown on the screen
Clock	Year/Month/Day/Hour/Minute/Second
Beep to confirm input/ Acoustic warning	ON/OFF (can be set manually)

■ General specifications

Rated power	16 VDC, 3.3 A	
Power connector	DC jack (JEITA RC-5320A class5)	Outside: - (electrode); inside: + (electrode)
AC adapter	Rated power	100 to 240 VAC, 50 or 60 Hz
	Power consumption	65 VA or less (batteries not being charged) 150 VA or less (batteries being charged)
Clock backup battery	Primary lithium battery	Service life: about 5 years after shipment (depending on the operating environment)
Operating temperature/ humidity range	0 to +40°C (humidity: 20 to 80% RH, no condensation)	
Storage temperature range	-10 to +50 °C • Humidity: 20 to 80% RH, no condensation	
Functional ground terminal	Noise removal ground terminal	
External dimensions	220 mm (W) × 185 mm (H) × 220 mm (D) • Not including the handle, stand, and other protruding parts	
Comparator cooling	Natural air cooling (fanless)	
Mass	With no options installed	Approximately 2.8 kg
	With full options installed (including one battery)	Approximately 3.3 kg
Resistance to vibration	9.8 m/s ² (frequency 10 to 150 Hz, 150 Hz, XYZ each direction)	
Shock resistance	400 m/s ² (working time: 11 ms)	
Accessories	AC adapter	Quantity: 1
	Instruction manual (paper copy)	Quantity: 1
	CD-ROM	Quantity: 1 • Reference guide, utility, external control DLL, etc.
	SD card (for update: 512 MB)	Quantity: 1
	Ferrite core	Quantity: 1 • For signal input contact terminal cable (E04SR301334 of Seiwa Electric)
	Terminal block plug (3 types)	Quantity 1 each • FK-MC 0, 5/10-ST-2, 5 • FK-MC 0, 5/8-ST-2, 5 • FK-MC 0, 5/6-ST-2, 5

● Conforming Standards (CE Marking)

LVD Directive	2014/35/EU	Standard EN61010-1
EMC Directive	2014/30/EU	Standard EN61326-1
RoHS Directive	2011/65/EU	Standard EN50581

- For details, see : <https://www.onosokki.co.jp/English/english.htm>

● **FCC**

CFR47 Part15 Subpart B

Note: 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.

■ **Options**

	Model	Name	Remarks
Optional Software	CF-0471	Tracking function	
	CF-0472	Shape comparator function	
	CF-0477	USB mass storage function	Accessory: USB mass storage cable (1.5 m) × 1
Optional Hardware	CF-0473	Amplitude modulation component extraction function	Accessory: Ferrite core (E04SR200932) × 1
	CF-0478	Power Source Backup Function	Accessory: Battery pack × 1
Others	CF-0702	Stylus pen	
	CF-0703	USB connection cable (1.5 m)	For CF-0477 USB mass storage function
	–	SD card (4 GB)	
	–	SD card (8 GB)	
	–	SD card (16 GB)	
	–	SD card (32 GB)	
	CF-0470J	Reference guide (Japanese)	
	CF-0470E	Reference guide (English)	
–	Security software (McAfee)		

■ **CF-0473 Amplitude modulation component extraction function (bandpass envelop monitoring function)**

● **Analog filter**

Standard analog filters and optional filters can be selected individually.

HPF	Cut-off frequency (variable)	50 Hz to 10 kHz (–24 dB/oct)
	Frequency setting precision	±3.5%
	Passband amplitude accuracy	±0.15 dB
	Harmonic distortion	–75 dB or less
LPF	Cut-off frequency (variable)	50 Hz to 10 kHz (–24 dB/oct)
	Frequency setting precision	±3.5%
	Passband amplitude accuracy	±0.15 dB
	Harmonic distortion	–75 dB or less
Envelope filter	1-kHz low-pass filter system	

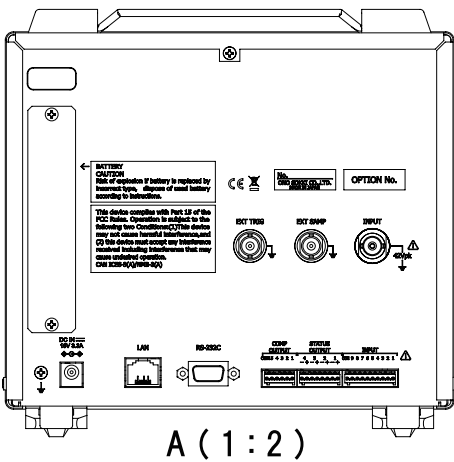
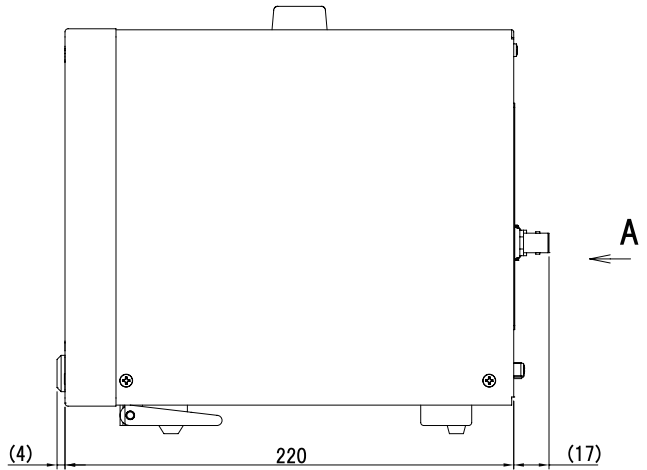
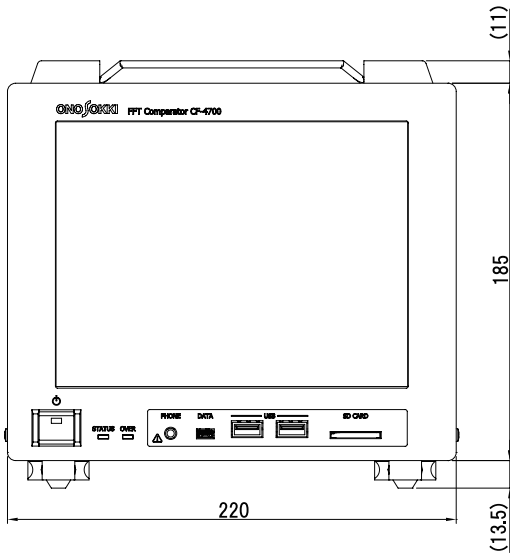
● Headphone output

Number of terminals	1
Maximum output (load resistance 24 Ω)	15 mW
Output impedance	10 Ω unbalanced
Terminal format (same signal output from L/R)	Stereo mini jack φ3.5 mm
Frequency band	25 Hz to 20 kHz ± 1.0 dB
Output signal content (AC couple)	Signals that passed the analog filter that has been set are output.
Volume	0 to 100%

■ CF-0478 Power source backup function

Function	<ul style="list-style-type: none"> When the AC power is turned off, the internal secondary battery supplies power until the shutdown process is terminated normally. Turning on or off the main power of the AC adapter can turn on or off the comparator power. 	
Battery	Secondary lithium-ion battery	
Installation	Built in the comparator (detachable)	
Quantity	One	
Battery status display	Comparator screen	<p>With the secondary battery installed, status information is displayed on the screen of the comparator.</p> <ul style="list-style-type: none"> Shows the availability of the function and the battery pack charging status.
Charging temperature range	10°C to 35°C	
Charging time	<ul style="list-style-type: none"> Until the power source function becomes available: approx. 15 minutes (with empty battery pack and charging temperature range) Charged only when the comparator is running Charging time outside the charging temperature range 35°C to 40°C: approx. 30 minutes 5°C: approx. 1 hour 0°C: approx. 8 hours 	
Battery replacement interval	Approx. every 2 years (used and stored within the charging temperature range)	

7. External Dimensions



ONO SOKKI

*Outer appearance and specifications are subject to change without prior notice.
HOME PAGE: <http://www.onosokki.co.jp/English/english.htm>

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