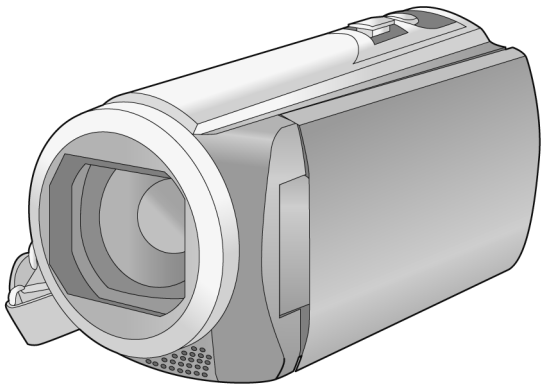
ORDER NO. VM1301002CE
B27

Service Manual

High Definition Video Camera

Model No. **HC-V520P**
HC-V520PC
HC-V520EB
HC-V520EF
HC-V520EG
HC-V520EP
HC-V520EE
HC-V520GC
HC-V520GK
HC-V520MPU
HC-V520MGK
HC-V520MGN
HC-V520MGT
HC-V510PC
HC-V510PU
HC-V510EG
HC-V510EF
HC-V510EP
HC-V510EB
HC-V510EE
HC-V510GC



Panasonic

Colour

(K).....Black Type (except HC-V520GC/GK/V520MGK/V510GC)

(S).....Silver Type (only HC-V520EG/V510EG/EE)

(W).....White Type (only HC-V520GC/GK/V520MGK/V510GC)

(P).....Pink Type (only HC-V520GC/GK/V520MGK/V510GC)

(R).....Red Type (only HC-V520EG/EP/EB/V510EG/EB/EE)

(A).....Blue Type (only HC-V520GC/V510GC)

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

TABLE OF CONTENTS

1 Safety Precautions

1.1. General Guidelines

1. **IMPORTANT SAFETY NOTICE**
   There are special components used in this equipment which are important for safety. These parts are marked by

   ⚠ in the Schematic Diagrams, Circuit Board Layout, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X-RADIATION, shock, fire, or other hazards. Do not modify the original design without permission of manufacturer.
2. An Isolation Transformer should always be used during the servicing of AC Adaptor whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect AC Adaptor from being damaged by accidental shorting that may occur during servicing.
3. When servicing, observe the original lead dress. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
4. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers shields are properly installed.
5. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

1.2. Leakage Current Cold Check

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Measure the resistance value, with an ohmmeter, between the jumpered AC plug and each exposed metallic cabinet part on the equipment such as screwheads, connectors, control shafts, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 MΩ and 5.2 MΩ. When the exposed metal does not have a return path to the chassis, the reading must be infinity.

1.3. Leakage Current Hot Check (See Figure. 1)

1. Plug the AC cord directly into the AC outlet. Do not use an isolation transformer for this check.
2. Connect a 1.5 kΩ, 10 W resistor, in parallel with a 0.15 μF capacitor, between each exposed metallic part on the set and a good earth ground, as shown in Figure. 1.
3. Use an AC voltmeter, with 1 kΩ/V or more sensitivity, to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the AC plug in the AC outlet and repeat each of the above measurements.
6. The potential at any point should not exceed 0.75 V RMS. A leakage current tester (Simpson Model 229 or equivalent) may be used to make the hot checks, leakage current must not exceed 1/2 mA. In case a measurement is outside of the limits specified, there is a possibility of a shock hazard, and the equipment should be repaired and rechecked before it is returned to the customer.

Hot-Check Circuit

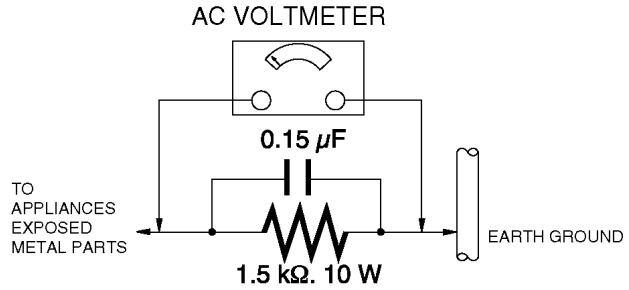


Figure. 1

2 Warning

2.1. Prevention of Electrostatic Discharge (ESD) to Electrostatically Sensitive (ES) Devices

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by electrostatic discharge (ESD).

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any ESD on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging ESD wrist strap, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an antistatic solder removal device. Some solder removal devices not classified as “antistatic (ESD protected)” can generate electrical charge sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION :
   Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity (ESD) sufficient to damage an ES device).

2.2. How to Recycle the Lithium Ion Battery (U.S. Only)

ENGLISH

A lithium ion/polymer battery that is recyclable powers the product you have purchased. Please call 1-800-8-BATTERY for information on how to recycle this battery.

FRANÇAIS

L’appareil que vous vous êtes procuré est alimenté par une batterie au lithium-ion/lithium-polymère. Pour des renseignements sur le recyclage de la batterie, veuillez composer le 1-800-8-BATTERY.

2.3. Caution for AC Cord (For EB/GC)

2.3.1. Information for Your Safety

IMPORTANT

Your attention is drawn to the fact that recording of pre-recorded tapes or discs or other published or broadcast material may infringe copyright laws.

WARNING

To reduce the risk of fire or shock hazard, do not expose this equipment to rain or moisture.

CAUTION

To reduce the risk of fire or shock hazard and annoying interference, use the recommended accessories only.

FOR YOUR SAFETY

DO NOT REMOVE THE OUTER COVER

To prevent electric shock, do not remove the cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

2.3.2. Caution for AC Mains Lead

For your safety, please read the following text carefully.

This appliance is supplied with a moulded three-pin mains plug for your safety and convenience.
A 5-ampere fuse is fitted in this plug.
Should the fuse need to be replaced please ensure that the replacement fuse has a rating of 5 amperes and it is approved by ASTA or BSI to BS1362
Check for the ASTA mark or the BSI mark on the body of the fuse.

If the plug contains a removable fuse cover you must ensure that it is refitted when the fuse is replaced.
If you lose the fuse cover, the plug must not be used until a replacement cover is obtained.
A replacement fuse cover can be purchased from your local Panasonic Dealer.

If the fitted moulded plug is unsuitable for the socket outlet in your home then the fuse should be removed and the plug cut off and disposed of safety.
There is a danger of severe electrical shock if the cut off plug is inserted into any 13-ampere socket.

If a new plug is to be fitted please observe the wiring code as shown below.
If in any doubt, please consult a qualified electrician.

2.3.2.1. Important

The wires in this mains lead are coloured in accordance with the following code:

Blue	Neutral
Brown	Live

As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

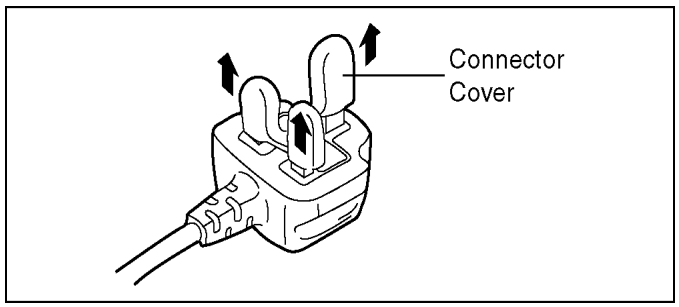
The wire which is coloured BLUE must be connected to the terminal in the plug which is marked with the letter N or coloured BLACK.

The wire which is coloured BROWN must be connected to the terminal in the plug which is marked with the letter L or coloured RED.

Under no circumstances should either of these wires be connected to the earth terminal of the three pin plug, marked with the letter E or the Earth Symbol.

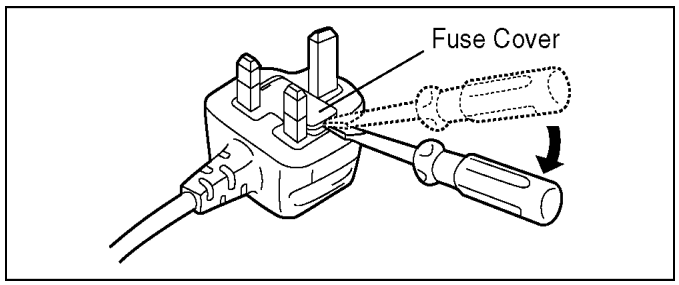
2.3.2.2. Before Use

Remove the Connector Cover as follows.

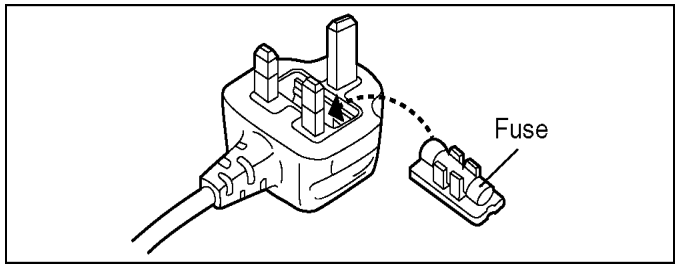


2.3.2.3. How to Replace the Fuse

1. Remove the Fuse Cover with a screwdriver.



2. Replace the fuse and attach the Fuse cover.



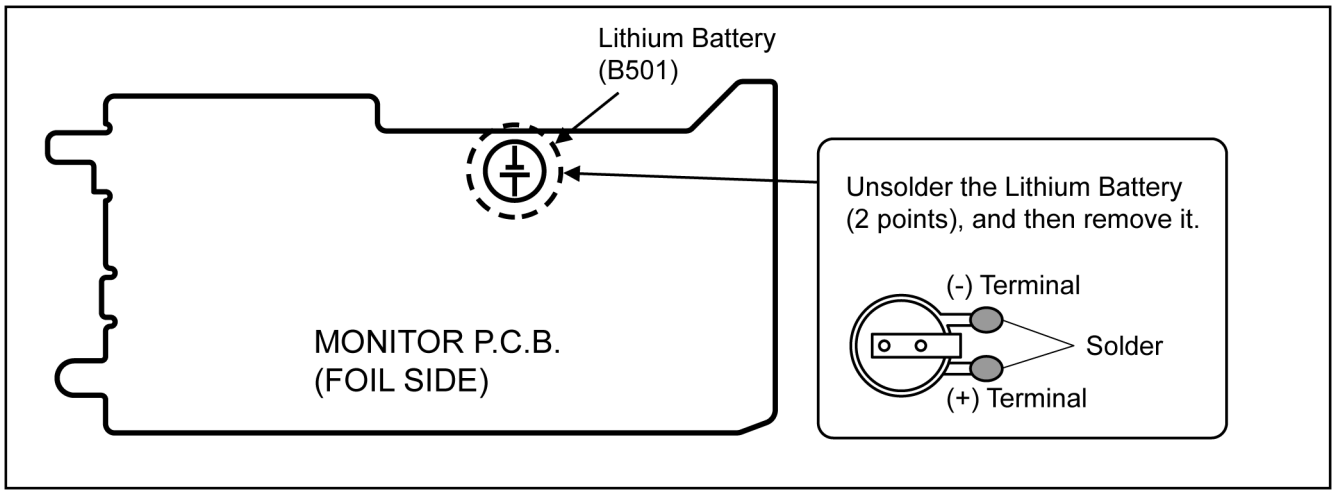
2.4. How to Replace the Lithium Battery

2.4.1. Replacement Procedure

1. Remove the MONITOR P.C.B.. (Refer to Disassembly Procedures.)
2. Unsolder the each soldering point of electric lead terminal for Lithium battery (Ref. No. “B501” at foil side of MONITOR P.C.B.) and remove the Lithium battery together with electric lead terminal. Then replace it into new one.

NOTE:

The Type No. ML-614S/DN includes electric lead terminals.



NOTE:

This Lithium battery is a critical component.
(Type No.: ML-614S/DN **Manufactured by Energy Company, Panasonic Corporation**)
It must never be subjected to excessive heat or discharge.
It must therefore only be fitted in requirement designed specifically for its use.
Replacement batteries must be of same type and manufacture.
They must be fitted in the same manner and location as the original battery, with the correct polarity contacts observed.
Do not attempt to re-charge the old battery or re-use it for any other purpose.
It should be disposed of in waste products destined for burial rather than incineration.

(For English)

CAUTION

- Danger of explosion if battery is incorrectly replaced. Replace only with the type recommended by the manufacturer.
- When disposing the batteries, please contact your local authorities or dealer and ask for the correct method of disposal.

(For German)

ACHTUNG

- Explosionsgefahr bei falschem Anbringen der Batterie. Ersetzen Sie die Batterie nur durch den vom Hersteller empfohlenen Typ.
- Wenden Sie sich zur Entsorgung der Batterien an die lokalen Behörden oder erfragen Sie die richtige Vorgehensweise zur Entsorgung.

(For French)

ATTENTION

- Il y a un danger d'explosion si la batterie n'est pas remplacée correctement. Remplacez uniquement avec le type recommandé par le fabricant.
- Pour mettre au rebut les batteries, prenez contact avec les autorités locales ou le revendeur et renseignez-vous sur la méthode correcte de la mise au rebut.

NOTE:

Above caution is applicable for a battery pack which is for HC-V520/V520M/V510 series, as well.

1. Battery Pack for this model.

3 Service Navigation

3.1. Introduction

This service manual contains technical information, which allow service personnel's to understand and service this model.
Please place orders using the parts list and not the drawing reference numbers.
If the circuit is changed or modified, the information will be followed by service manual to be controlled with original service manual.

3.2. General Description About Lead Free Solder (PbF)

The lead free solder has been used in the mounting process of all electrical components on the printed circuit boards used for this equipment in considering the globally environmental conservation.
The normal solder is the alloy of tin (Sn) and lead (Pb). On the other hand, the lead free solder is the alloy mainly consists of tin (Sn), silver (Ag) and Copper (Cu), and the melting point of the lead free solder is higher approx.30°C (86°F) more than that of the normal solder.

Distinction of P.C.B. Lead Free Solder being used

The letter of "PbF" is printed either foil side or components side on the P.C.B. using the lead free solder.(See right figure)	PbF

Service caution for repair work using Lead Free Solder (PbF)

- The lead free solder has to be used when repairing the equipment for which the lead free solder is used.
  (Definition: The letter of "PbF" is printed on the P.C.B. using the lead free solder.)
- To put lead free solder, it should be well molten and mixed with the original lead free solder.
- Remove the remaining lead free solder on the P.C.B. cleanly for soldering of the new IC.
- Since the melting point of the lead free solder is higher than that of the normal lead solder, it takes the longer time to melt the lead free solder.
- Use the soldering iron (more than 70W) equipped with the temperature control after setting the temperature at 350±30°C (662±86°F).

Recommended Lead Free Solder (Service Parts Route.)

- The following 3 types of lead free solder are available through the service parts route.
  RFKZ03D01KS----------(0.3mm 100g Reel)
  RFKZ06D01KS----------(0.6mm 100g Reel)
  RFKZ10D01KS----------(1.0mm 100g Reel)

Note

* Ingredient: tin (Sn) 96.5%, silver (Ag) 3.0%, Copper (Cu) 0.5%, Cobalt (Co) / Germanium (Ge) 0.1 to 0.3%

3.3. Important Notice 1:(Other than U.S.A. and Canadian Market)

1. The service manual does not contain the following information, because of the impossibility of servicing at component level without concerned equipment/facilities.
   a. Schematic diagram, Block Diagram and P.C.B. layout of MAIN P.C.B..
   b. Parts list for individual parts for MAIN P.C.B..
   When a part replacement is required for repairing MAIN P.C.B., replace as an assembled parts. (Main P.C.B.)
2. The following category is /are recycle module part. Please send it/them to Central Repair Center.
   - MAIN P.C.B. (VEP03J86C): HC-V520P/PC/EB/EF/EG/EP/EE/GC/GK
   - MAIN P.C.B. (VEP03J86A): HC-V520MPU/GK/GN/GT
   - MAIN P.C.B. (VEP03J86D): HC-V510PC/PU/EG/EF/EP/EB/EE/GC

3.4. How to Define the Model Suffix (NTSC or PAL model)

There are nine kinds of HC-V520/V520M/V510.

- a) HC-V520M (Japan domestic model)
- b) HC-V520P
- c) HC-V520PC, V510PC
- d) HC-V520EB/EF/EG/EP, V510EB/EG/EP/EF
- e) HC-V520EE, V510EE
- f) HC-V520MGN
- g) HC-V520MGT
- h) HC-V520GK, V520MGK
- i) HC-V520GC, V520MPU, V510PU/GC

What is the difference is that the “INITIAL SETTING” data which is stored in Flash ROM mounted on Main P.C.B..

3.4.1. Defining methods:

To define the model suffix to be serviced, refer to the rating label and caution label which are putted on the Unit.

a) HC-V520M (Japan domestic model)

The nameplate for this model shows the following Safety registration mark.

b) HC-V520P

The nameplate for this model shows the following Safety registration mark.

c) HC-V520PC, V510PC

The nameplate for these models show the following Safety registration mark.

d) HC-V520EB/EF/EG/EP, V510EB/EG/EP/EF

The nameplate for these models show the following Safety registration mark.

e) HC-V520EE, V510EE

The nameplate for these models show the following Safety registration mark.

f) HC-V520MGN

The nameplate for this model shows the following Safety registration mark.

g) HC-V520MGT

The nameplate for this model shows the following Safety registration mark.

h) HC-V520GK, V520MGK

The nameplate for these models show the following Safety registration mark.

i) HC-V520GC, V520MPU, V510PU/GC

The nameplate for these models does not show any above Safety registration mark.

NOTE:

After replacing the MAIN P.C.B., be sure to achieve adjustment.

3.5. Formatting

[FORMAT MEDIA]

Please be aware that if a medium is formatted, then all the data recorded on the medium will be erased and cannot be restored. Back up important data on a PC, DVD disc etc.

MENU : [SETUP] → [FORMAT MEDIA] → desired media

[Built-inMemory]*1/[SD CARD]/[HDD]*2

*1 HC-V520M only.
*2 Displayed when connecting a USB HDD.

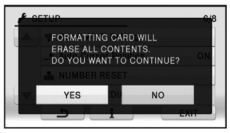
- HC-V520/HC-V510
  Media selection screen is not displayed when the USB HDD is not connected. Touch [YES].
- When formatting is complete, touch [EXIT] to exit the message screen.
- Perform a physical formatting of the SD card when the SD card is to be disposed/ transferred.
- HC-V520M
  Perform a physical formatting of the built-in memory when this unit is to be disposed/ transferred.

- Do not turn this unit off or remove the SD card, while formatting. Do not expose the unit to vibrations or shock.

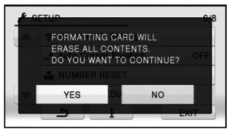
Use this unit to format media.
Formatting built-in memory is only available with this unit.
Do not format an SD card using any other equipment such as a PC. The card may not be used on this unit.

When disposing of or giving away the SD card, note that:

- Formatting and deletion of this unit or computer only changes the file management information and does not completely delete the data in the SD card.
- It is recommended that the SD card is physically destroyed or the SD card is physically formatted using this unit when disposing of or giving away the SD card.
  HC-V520/HC-V510
  To physically format the SD card, connect the unit via the AC adaptor, select [SETUP] → [FORMAT MEDIA] → [YES] from the menu, and then press and hold the recording start/ stop button on the screen below for about 3 seconds. When the SD card data deletion screen appears, select [YES], and then follow the on-screen instructions.



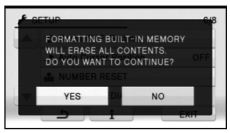
HC-V520M
To physically format the SD card, connect the unit via the AC adaptor, select [SETUP] →[FORMAT MEDIA] → [SD CARD] from the menu, and then press and hold the recording start/stop button on the screen below for about 3 seconds. When the SD card data deletion screen appears, select [YES], and then follow the on-screen instructions.



- The customer is responsible for the management of the data in the SD card.

HC-V520M
When disposing of or giving away this unit, note that:

- Formatting and deletion simply change the file management information and cannot be used to completely erase the data in built-in memory of this unit. The data can be recovered using commercially available software or the like.
- We recommend that you physically format the built-in memory before disposing of or giving away this unit.
  To physically format the built-in memory, connect the unit via the AC adaptor, select [SETUP] →[FORMAT MEDIA] → [Built-inMemory] from the menu, and then press and hold the recording start/stop button on the screen below for about 3 seconds. When the built-in memory data deletion screen appears, select [YES], and then follow the on-screen instructions.

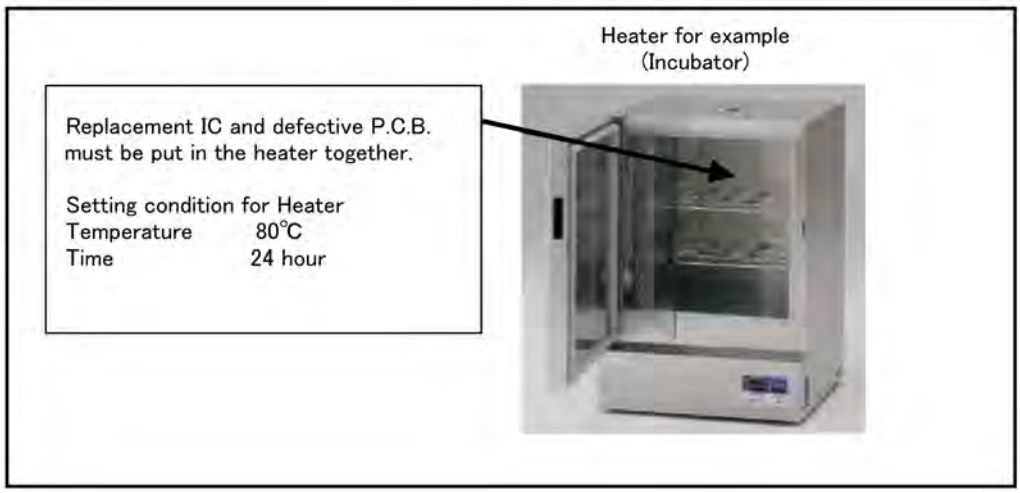


- Please look after the data in your built-in memory carefully. Panasonic will not be held responsible in the unlikely case that private data is divulged.

3.6. Baking of replacement IC and defective P.C.B.

When replacing the CSP/BGA/QFN type IC mounted on the P.C.B., the problem of IC crack or foil pattern breaking in the P.C.B. might sometimes occur by rapid heating.
In order to improve the success rate of IC replacement for repair, it would be required to work out baking of replacement IC and defective P.C.B. before replacing IC.
Please refer the way of baking as follows.
Replacement IC and defective P.C.B. must be put in the heater together.

- Baking temperature and time (Hour)
  80°C / 24 hour



4 Specifications

4.1. For NTSC Areas

High Definition Video Camera
Information for your safety

Power source:
DC 5.0 V (When using AC adaptor)
DC 3.6 V (When using battery)

Power consumption:
Recording; 5.8 W
Charging; 7.7 W

Motion picture recording format:
[AVCHD]; AVCHD format version 2.0 compliant (AVCHD Progressive)
[iFrame]; MPEG-4 AVC file format compliant (.MP4)

Motion picture compression:
MPEG-4 AVC/H.264

Audio compression:
[AVCHD]; Dolby® Digital/2 ch
[iFrame], [MP4]; AAC/2 ch

Recording mode and transfer rate:
[1080/60p]; Maximum 28 Mbps (VBR)
[PH]; Maximum 24 Mbps (VBR)
[HA]; Average 17 Mbps (VBR)
[HG]; Average 13 Mbps (VBR)
[HE]; Average 5 Mbps (VBR)
[iFrame]; Maximum 28 Mbps (VBR)
Refer to “Recording modes/approximate recording time” for the picture size and recordable time of a motion picture.

Still picture recording format:
JPEG (Design rule for Camera File system, based on Exif 2.2 standard)
Refer to “Approximate number of recordable pictures” for picture size of a still picture and number of recordable pictures.

Recording media:
SD Memory Card
SDHC Memory Card
SDXC Memory Card
Refer to “Cards that you can use with this unit” for details on SD cards usable in this unit.

HC-V520M
Built-in memory; 16 GB

Image sensor:
1/5.8 ″ 1MOS image sensor
Total; 2510 K
Effective pixels;
Motion picture; 2250 K (16:9)*
Still picture;
2250 K (16:9), 1690 K (4:3), 1690 K (3:2)

Lens:
Auto Iris, 50× optical zoom, F1.8 to F4.2
Focal length;
2.06 mm to 103 mm
Macro (Full range AF)
35 mm equivalent;
Motion picture;
28.0 mm to 1748 mm (16:9)*
Still picture;
28.0 mm to 1748 mm (16:9)
34.2 mm to 1708 mm (4:3),
33.5 mm to 1676 mm (3:2),
Minimum focus distance;
Normal; Approx. 2.0 cm (0.8″) (Wide)/
Approx. 2.2 m (7.2 feet) (Tele)
Tele Macro; Approx. 1.1 m (3.6 feet) (Tele)
Intelligent Auto Macro;
Approx. 1.0 cm (0.4″) (Wide)/
Approx. 1.1 m (3.6 feet) (Tele)

Zoom:
i.Zoom OFF 62×*, 80× i.Zoom, 150×/3000× digital zoom
(Using image sensor effective area)

* When [O.I.S.] is set to [Standard]

Image stabilizer function:
Optical (Hybrid Optical Image Stabilizer, Active Mode (Rotation correction), Optical Image Stabilizer Lock, Tilt correction function)

Creative Control:
[Miniature Effect]/[Silent movie]/[8mm movie]/[Time Lapse Rec]

Monitor:
3.0″ wide LCD monitor (Approx. 460 K dots)

Microphone:
Stereo (with a Zoom Microphone)

Minimum required illumination:
Approx. 4 lx (1/30 with Low Light Mode in the Scene Mode)
Approx. 1 lx with the Color Night Rec function

AV connector video output level:
1.0 Vp-p, 75 Ω, NTSC system

HDMI mini connector video output level:
HDMI™ (x.v.Color™) 1080p/1080i/480p

AV connector audio output level (Line):
251 mV, 600 Ω, 2 ch

HDMI mini connector audio output level:
[AVCHD]; Dolby Digital/Linear PCM
[iFrame], [MP4]; Linear PCM

USB:
Reader function
SD card; Read only (No copyright protection support)
HC-V520M
Built-in memory; Read only
Hi-Speed USB (USB 2.0), USB terminal Type Mini AB
USB host function (for USB HDD)
Battery charging function (Charges from USB terminal when the main unit is off)

Dimensions:
53 mm (W)×61 mm (H)×116 mm (D)
[2.087 ″ (W)×2.402 ″ (H)×4.567 ″ (D)]
(including projecting parts)

Mass (Weight):
HC-V520
Approx. 229 g (Approx. 0.505 lbs.)
[without battery (supplied) and an SD card (optional)]
HC-V520M
Approx. 230 g (Approx. 0.508 lbs.)
[without battery (supplied)]
HC-V510
Approx. 225 g (Approx. 0.497 lbs.)
[without battery (supplied) and an SD card (optional)]

Mass (Weight) in operation:
HC-V520
Approx. 274 g (Approx. 0.605 lbs.)
[with battery (supplied) and an SD card (optional)]
HC-V520M
Approx. 273 g (Approx. 0.602 lbs.)
[with battery (supplied)]
HC-V510
Approx. 270 g (Approx. 0.596 lbs.)
[with battery (supplied) and an SD card (optional)]

Operating temperature:
0 °C to 40 °C (32 °F to 104 °F)

Operating humidity:
10%RH to 80%RH

Battery operation time:
See “Charging and recording time”.

HC-V520 / HC-V520M
Wireless transmitter:
Compliance standard; IEEE802.11b/g/n
Frequency range used;
Central frequency 2412 MHz to 2462 MHz [11ch]
Encryption method; Wi-Fi compliant WPA™/WPA2™/WEP
Access method; Infrastructure mode

AC adaptor
Information for your safety

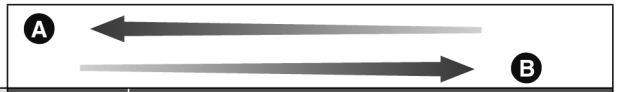
Power source:
AC 100 V to 240 V, 50/60 Hz (VSK0780)
AC 110 V to 240 V, 50/60 Hz (VSK0781)
Power consumption:
12 W
DC output:
DC 5.0 V, 1.6 A

Dimensions:
49 mm (W)×24 mm (H)×79 mm (D)
[1.93 ″ (W)×0.94 ″ (H)×3.11 ″ (D)]

Mass (Weight):
Approx. 91 g (Approx. 0.20 lbs.)

Recording modes/approximate recordable time

- SD cards are only mentioned with their main memory size. The stated times are the approximate recordable times for continuous recording.



Recording mode		[1080/60p]	[1080/60i]			
			[PH]	[HA]	[HG]	[HE]
Picture size/ Frame rate		1920×1080/ 60p	1920×1080/ 60i	1920×1080/ 60i	1920×1080/ 60i	1920×1080/ 60i
SD card	4 GB	19 min	21 min	30 min	40 min	1 h 30 min
	16 GB	1 h 20 min	1 h 30 min	2 h	2 h 40 min	6 h 40 min
	64 GB	5 h 20 min	6 h	8 h 30 min	11 h	27 h 30 min
HC-V520M Built-in memory	16 GB	1 h 20 min	1 h 30 min	2 h	2 h 40 min	6 h 40 min

Ⓐ Favors image quality
Ⓑ Favors Recording time

Recording mode		[iFrame]
Picture size/ Frame rate		960×540/ 30p
SD card	4 GB	19 min
	16 GB	1 h 20 min
	64 GB	5 h 20 min
HC-V520M Built-in memory	16 GB	1 h 20 min

- If recording for long periods, prepare batteries for 3 or 4 times the period you wish to record for.
- The default setting is [HG] Mode.
- Maximum continuously recordable time for one scene: 6 hours
- The recording is paused once when the recording time for one scene exceeds 6 hours, and the recording will automatically resume after a few seconds.
- The recordable time may be reduced if recording with a lot of action is recorded or recording of short scene is repeated.
- Use time in the row of 4 GB in above table as a guideline for the time that can be copied onto one DVD disc (4.7 GB).

Approximate number of recordable pictures

- SD cards are only mentioned with their main memory size. The stated number is the approximate number of recordable pictures.

Picture size		10M 4224×2376	2.1M 1920×1080	7.4M 3136×2352	0.3M 640×480
Aspect ratio		[16:9]		[4:3]	
SD card	4 GB	600	3200	800	28000
	16 GB	2500	12500	3300	117000
	64 GB	10000	52000	13000	475000
HC-V520M Built-in memory	16 GB	2500	12500	3300	117000

Picture size		7.7M 3408×2272	2M 1728×1152
Aspect ratio		[3:2]	
SD card	4 GB	800	2200
	16 GB	3200	8500
	64 GB	13000	36000
HC-V520M Built-in memory	16 GB	3200	8500

- **The number of recordable pictures depends on the subject being recorded.**
- Maximum number of recordable pictures that can be displayed is 9999. If the number of recordable pictures exceeds 9999, R 9999+ is displayed. The number will not change when the picture is taken until the number of recordable pictures is 9999 or less.
- The memory capacity indicated on the label of an SD card is the total of the capacity for copyright protection and management and the capacity which can be used on the unit, a PC etc.

Cards that you can use with this unit

Use SD cards conforming to Class 4 or higher of the SD Speed Class Rating* for motion picture recording.

Card type	Capacity
SD Memory Card	512 MB/1 GB/2 GB
SDHC Memory Card	4 GB/6 GB/8 GB/12 GB/16 GB/24 GB/32 GB
SDXC Memory Card	48 GB/64 GB

* SD Speed Class Rating is the speed standard regarding continuous writing. Check via the label on the card, etc.

e.g.: 

- **When using an SDHC Memory Card/SDXC Memory Card with other equipment, check the equipment is compatible with these Memory Cards.**
- An Eye-Fi X2 series SD card is required to use functions related to Eye-Fi.
- We do not guarantee the operation of SD cards other than the ones above. Further, SD cards with a capacity of less than 32 MB cannot be used for video recording.
- 4 GB or more Memory Cards that do not have the SDHC logo or 48 GB or more Memory Cards that do not have the SDXC logo are not based on SD Memory Card Specifications.

Charging and recording time

■ Charging/Recording time

- Temperature: 25 °C (77 °F)/humidity: 60%RH
- Charging times in parentheses are when charging from the USB terminal.

Battery model number [Voltage/Capacity (minimum)]	Charging time	Recording mode	Maximum continuous recordable time	Actual recordable time
Supplied battery/ VW-VBT190 (optional) [3.6 V/1940 mAh]	2 h 20 min (5 h 20 min)	[1080/60p]	1 h 55 min	1 h
		[PH], [HA]	2 h	
		[HG], [HE]	2 h 5 min	1 h 5 min
		[iFrame]	2 h 15 min	1 h 10 min
VW-VBT380 (optional) [3.6 V/3880 mAh]	3 h 45 min (9 h 45 min)	[1080/60p]	4 h 5 min	2 h 5 min
		[PH]	4 h 15 min	2 h 10 min
		[HA], [HG]	4 h 20 min	2 h 15 min
		[HE]	4 h 25 min	
		[iFrame]	4 h 45 min	2 h 25 min

- These times are approximations.
- **The indicated charging time is for when the battery has been discharged completely. Charging time and recordable time vary depending on the usage conditions such as high/ low temperature.**

4.2. For PAL Areas

High Definition Video Camera
Information for your safety

Power source:
DC 5.0 V (When using AC adaptor)
DC 3.6 V (When using battery)

Power consumption:
Recording; 5.8 W
Charging; 7.7 W

Motion picture recording format:
[AVCHD]; AVCHD format version 2.0 compliant (AVCHD Progressive)
[iFrame]; MPEG-4 AVC file format compliant (.MP4)

Motion picture compression:
MPEG-4 AVC/H.264

Audio compression:
[AVCHD]; Dolby® Digital/2 ch
[iFrame], [MP4]; AAC/2 ch

Recording mode and transfer rate:
[1080/50p]; Maximum 28 Mbps (VBR)
[PH]; Maximum 24 Mbps (VBR)
[HA]; Average 17 Mbps (VBR)
[HG]; Average 13 Mbps (VBR)
[HE]; Average 5 Mbps (VBR)
[iFrame]; Maximum 28 Mbps (VBR)
Refer to “Recording modes/approximate recording time” for the picture size and recordable time of a motion picture.

Still picture recording format:
JPEG (Design rule for Camera File system, based on Exif 2.2 standard)
Refer to “Approximate number of recordable pictures” for picture size of a still picture and number of recordable pictures.

Recording media:
SD Memory Card
SDHC Memory Card
SDXC Memory Card
Refer to “Cards that you can use with this unit” for details on SD cards usable in this unit.

HC-V520M
Built-in memory; 16 GB

Image sensor:
1/5.8 type (1/5.8″) 1MOS image sensor
Total; 2510 K
Effective pixels;
Motion picture; 2250 K (16:9)*
Still picture;
2250 K (16:9), 1690 K (4:3), 1690 K (3:2)

Lens:
Auto Iris, 50× optical zoom, F1.8 to F4.2
Focal length;
2.06 mm to 103 mm
Macro (Full range AF)
35 mm equivalent;
Motion picture;
28.0 mm to 1748 mm (16:9)*
Still picture;
28.0 mm to 1748 mm (16:9)
34.2 mm to 1708 mm (4:3),
33.5 mm to 1676 mm (3:2),
Minimum focus distance;
Normal; Approx. 2.0 cm (Wide)/
Approx. 2.2 m (Tele)
Tele Macro; Approx. 1.1 m (Tele)
Intelligent Auto Macro;
Approx. 1.0 cm (Wide)/Approx. 1.1 m (Tele)

Zoom:
i.Zoom OFF 62×*, 80× i.Zoom, 150×/3000× digital zoom
(Using image sensor effective area)

* When [O.I.S.] is set to [Standard]

Image stabilizer function:
Optical (Hybrid Optical Image Stabilizer, Active Mode (Rotation correction), Optical Image Stabilizer Lock, Tilt correction function)

Creative Control:
[Miniature Effect]/[Silent movie]/[8mm movie]/[Time Lapse Rec]

Monitor:
7.5 cm (3.0″) wide LCD monitor (Approx. 460 K dots)

Microphone:
Stereo (with a Zoom Microphone)

Minimum required illumination:
Approx. 4 lx (1/25 with Low Light Mode in the Scene Mode)
Approx. 1 lx with the Colour Night View function

AV connector video output level:
1.0 Vp-p, 75 Ω, PAL system

HDMI mini connector video output level:
HDMI™ (x.v.Colour™) 1080p/1080i/576p

AV connector audio output level (Line):
251 mV, 600 Ω, 2 ch

HDMI mini connector audio output level:
[AVCHD]; Dolby Digital/Linear PCM
[iFrame], [MP4]; Linear PCM

USB:
Reader function
SD card; Read only (No copyright protection support)
HC-V520M
Built-in memory; Read only
Hi-Speed USB (USB 2.0), USB terminal Type Mini AB
USB host function (for USB HDD)
Battery charging function (Charges from USB terminal when the main unit is off)

Dimensions:
53 mm (W)×61 mm (H)×116 mm (D) (including projecting parts)

Mass:
HC-V520
Approx. 229 g
[without battery (supplied) and an SD card (optional)]
HC-V520M
Approx. 230 g
[without battery (supplied)]
HC-V510
Approx. 225 g
[without battery (supplied) and an SD card (optional)]

Mass in operation:
HC-V520
Approx. 274 g
[with battery (supplied) and an SD card (optional)]
HC-V520M
Approx. 273 g
[with battery (supplied)]
HC-V510
Approx. 270 g
[with battery (supplied) and an SD card (optional)]

Operating temperature:
0 °C to 40 °C

Operating humidity:
10%RH to 80%RH

Battery operation time:
See “Charging and recording time”.
HC-V520/ HC-V520M

Wireless transmitter:
Compliance standard; IEEE802.11b/g/n
Frequency range used;
Central frequency 2412 MHz to 2462 MHz [11ch]
Encryption method; Wi-Fi compliant WPA™/ WPA2™/WEP
Access method; Infrastructure mode

AC adaptor
Information for your safety

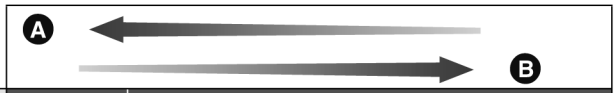
Power source:
AC 110 V to 240 V, 50/60 Hz
Power consumption:
12 W
DC output:
DC 5.0 V, 1.6 A

Dimensions:
49 mm (W)×24 mm (H)×79 mm (D)

Mass:
Approx. 91 g

Recording modes/approximate recordable time

- SD cards are only mentioned with their main memory size. The stated times are the approximate recordable times for continuous recording.



Recording mode		[1080/50p]	[1080/50i]			
			[PH]	[HA]	[HG]	[HE]
Picture size/ Frame rate		1920×1080/ 50p	1920×1080/ 50i	1920×1080/ 50i	1920×1080/ 50i	1920×1080/ 50i
SD card	4 GB	19 min	21 min	30 min	40 min	1 h 30 min
	16 GB	1 h 20 min	1 h 30 min	2 h	2 h 40 min	6 h 40 min
	64 GB	5 h 20 min	6 h	8 h 30 min	11 h	27 h 30 min
HC-V520M Built-in memory	16 GB	1 h 20 min	1 h 30 min	2 h	2 h 40 min	6 h 40 min

Ⓐ Favours image quality
Ⓑ Favours Recording time

Recording mode		[iFrame]
Picture size/ Frame rate		960×540/ 25p
SD card	4 GB	19 min
	16 GB	1 h 20 min
	64 GB	5 h 20 min
HC-V520M Built-in memory	16 GB	1 h 20 min

- If recording for long periods, prepare batteries for 3 or 4 times the period you wish to record for.
- The default setting is [HG] Mode.
- Maximum continuously recordable time for one scene: 6 hours
- The recording is paused once when the recording time for one scene exceeds 6 hours, and the recording will automatically resume after a few seconds.
- The recordable time may be reduced if recording with a lot of action is recorded or recording of short scene is repeated.
- Use time in the row of 4 GB in above table as a guideline for the time that can be copied onto one DVD disc (4.7 GB).

Approximate number of recordable pictures

- SD cards are only mentioned with their main memory size. The stated number is the approximate number of recordable pictures.

Picture size		10M 4224×2376	2.1M 1920×1080	7.4M 3136×2352	0.3M 640×480
Aspect ratio		[16:9]		[4:3]	
SD card	4 GB	600	3200	800	28000
	16 GB	2500	12500	3300	117000
	64 GB	10000	52000	13000	475000
HC-V520M Built-in memory	16 GB	2500	12500	3300	117000

Picture size		7.7M 3408×2272	2M 1728×1152
Aspect ratio		[3:2]	
SD card	4 GB	800	2200
	16 GB	3200	8500
	64 GB	13000	36000
HC-V520M Built-in memory	16 GB	3200	8500

- **The number of recordable pictures depends on the subject being recorded.**
- Maximum number of recordable pictures that can be displayed is 9999. If the number of recordable pictures exceeds 9999, R 9999+ is displayed. The number will not change when the picture is taken until the number of recordable pictures is 9999 or less.
- The memory capacity indicated on the label of an SD card is the total of the capacity for copyright protection and management and the capacity which can be used on the unit, a PC etc.

Cards that you can use with this unit

Use SD cards conforming to Class 4 or higher of the SD Speed Class Rating* for motion picture recording.

Card type	Capacity
SD Memory Card	512 MB/1 GB/2 GB
SDHC Memory Card	4 GB/6 GB/8 GB/12 GB/16 GB/24 GB/32 GB
SDXC Memory Card	48 GB/64 GB

* SD Speed Class Rating is the speed standard regarding continuous writing. Check via the label on the card, etc.

e.g.: 

- **When using an SDHC Memory Card/SDXC Memory Card with other equipment, check the equipment is compatible with these Memory Cards.**
- An Eye-Fi X2 series SD card is required to use functions related to Eye-Fi.
- We do not guarantee the operation of SD cards other than the ones above. Further, SD cards with a capacity of less than 32 MB cannot be used for video recording.
- 4 GB or more Memory Cards that do not have the SDHC logo or 48 GB or more Memory Cards that do not have the SDXC logo are not based on SD Memory Card Specifications.

Charging and recording time

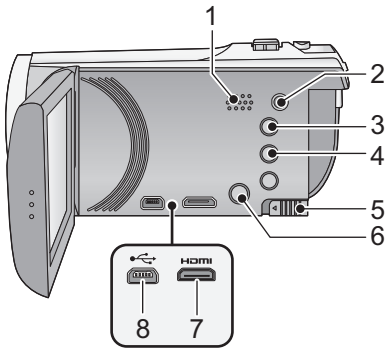
■ Charging/Recording time

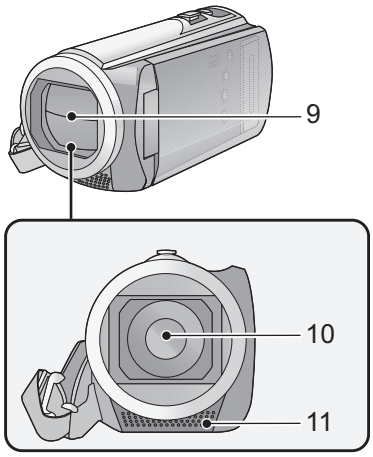
- Temperature: 25 °C/humidity: 60%RH
- Charging times in parentheses are when charging from the USB terminal.

Battery model number [Voltage/Capacity (minimum)]	Charging time	Recording mode	Maximum continuous recordable time	Actual recordable time
Supplied battery/ VW-VBT190 (optional) [3.6 V/1940 mAh]	2 h 20 min (5 h 20 min)	[1080/50p]	2 h 5 min	1 h 5 min
		[PH],[HA], [HG]	2 h 15 min	1 h 10 min
		[HE]	2 h 20 min	
		[iFrame]	2 h 30 min	1 h 15 min
VW-VBT380 (optional) [3.6 V/3880 mAh]	3 h 45 min (9 h 45 min)	[1080/50p]	4 h 30 min	2 h 20 min
		[PH]	4 h 45 min	2 h 25 min
		[HA]		2 h 30 min
		[HG],[HE]	4 h 50 min	
		[iFrame]	5 h 20 min	2 h 45 min

- These times are approximations.
- **The indicated charging time is for when the battery has been discharged completely. Charging time and recordable time vary depending on the usage conditions such as high/ low temperature.**

5 Location of Controls and Components

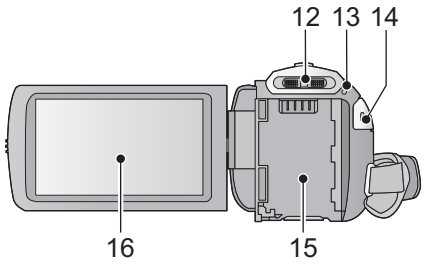


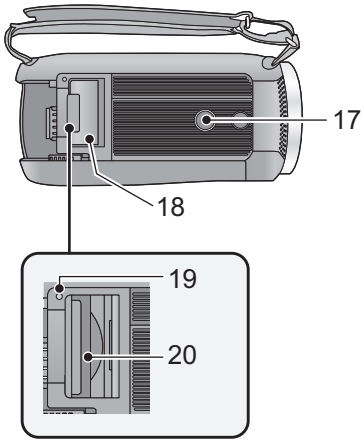


1 **Speaker**
2 **A/V connector [A/V]**
3 **Intelligent auto button [iA]**
4 **Optical Image Stabilizer button [((✋)) O.I.S.]**
5 **Battery release lever [BATT]**
6 **Power button [⏻/I]**
7 **HDMI mini connector [HDMI]**
8 **USB terminal [⇐]**

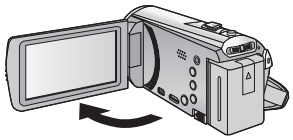
9 **Lens cover**
- The lens cover opens in 🎥 Motion Picture Recording Mode or 📷 Still Picture Recording Mode.

10 **Lens**
11 **Internal stereo microphones**

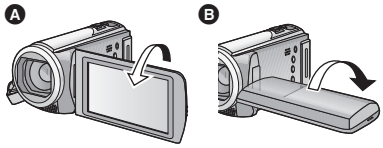




12 **Mode switch**
13 **Status indicator**
14 **Recording start/stop button**
15 **Battery holder**
16 **LCD monitor (Touch screen)**



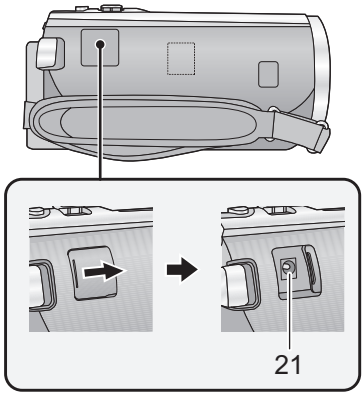
- It can open up to 90°.



- It can rotate up to 180° Ⓐ towards the lens or 90° Ⓑ towards the opposite direction.

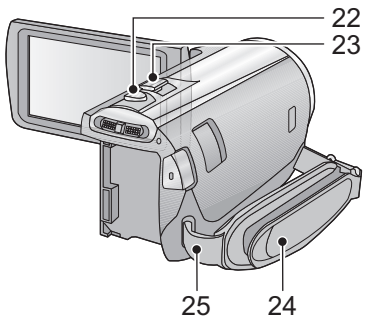
17 **Tripod receptacle**
- If you attach a tripod which has 5.5 mm (0.22 ″) screw or larger, it may damage this unit.

18 **SD card cover**
19 **Access lamp [ACCESS]**
20 **Card slot**



21 DC input terminal [DC IN]

- Do not use any other AC adaptors except the supplied one.

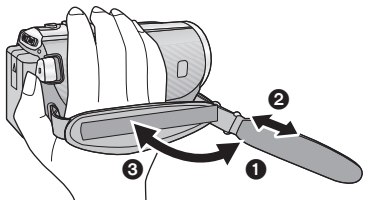


22 Photoshot button [ ]

23 Zoom lever [W/T] (In Motion Picture Recording Mode or Still Picture Recording Mode)
Thumbnail display switch [/]/ Volume lever [−VOL+] (In Playback Mode)

24 Grip belt

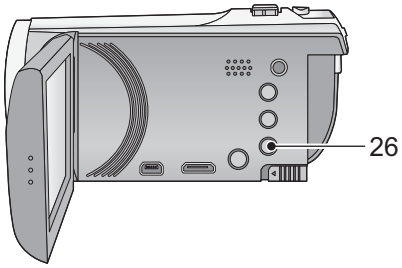
Adjust the length of the grip belt so that it fits your hand.



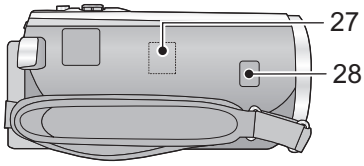
❶ Flip the belt.
❷ Adjust the length.
❸ Replace the belt.

25 Shoulder strap fixture

HC-V520 / HC-V520M



26 Wi-Fi button [Wi-Fi]

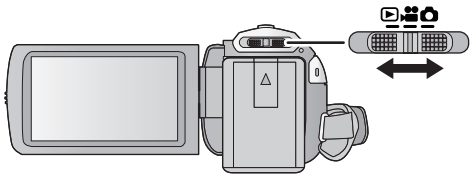


27 Wi-Fi Transmitter

28 NFC touch part

Selecting a mode

Operate the mode switch to change the mode to , or .



	Motion Picture Recording Mode
	Still Picture Recording Mode
	Playback Mode

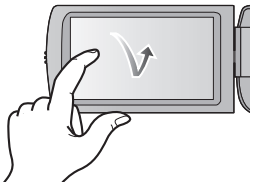
How to use the touch screen

You can operate by directly touching the LCD monitor (touch screen) with your finger.

■ Touch

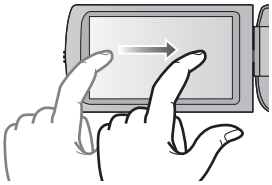
Touch and release the touch screen to select icon or picture.

- Touch the center of the icon.
- Touching the touch screen will not operate while you are touching another part of the touch screen.



■ Slide while touching

Move your finger while pressing on the touch screen.



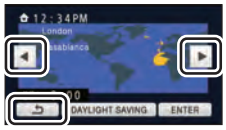
■ About the operation icons

/ / / :

Touch when changing a page or performing settings.

:

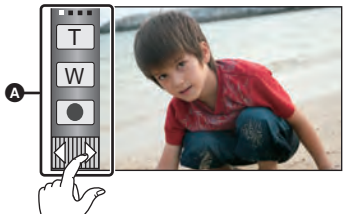
Touch to return to the previous screen.



About the Touch Menu

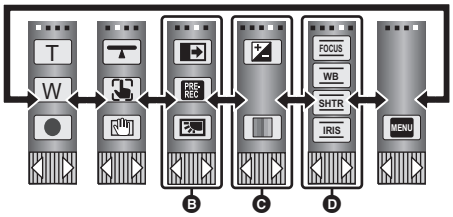
Touch ◁ (left side)/▷ (right side) of [|||] on the Touch Menu to switch the operation icons.

- It is also possible to switch the operation icons by sliding the Touch Menu right or left while touching it.

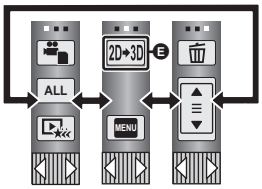


Ⓐ Touch Menu

Recording Mode



Playback Mode



Ⓑ You can change the operation icons to display.
Ⓒ Displayed only in Intelligent Auto Plus Mode and [Miniature Effect]/[8mm movie]/[Silent movie] of the Creative Control Mode.
Ⓓ Displayed only in [Time Lapse Rec] of the Creative Control Mode , Scene Mode and the Manual Mode.
Ⓔ Displayed only when connected to a TV.

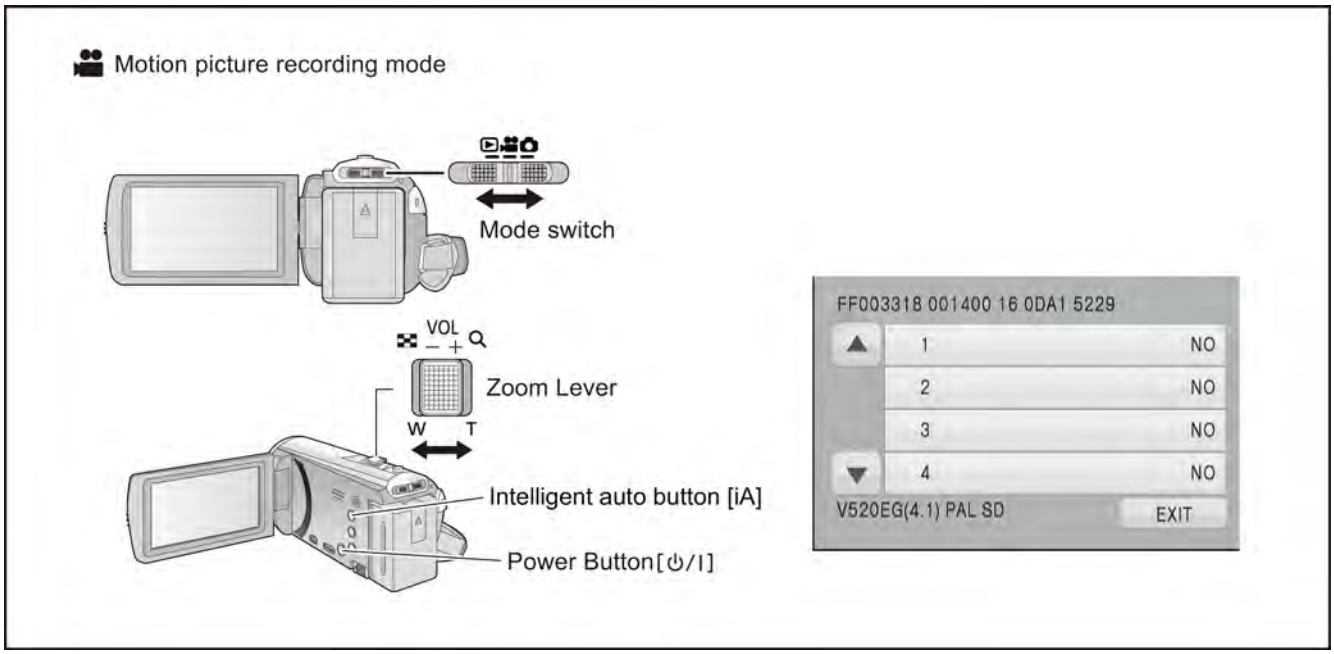
■ To display the Touch Menu

Display of the Touch Menu will disappear when no touch operation is performed for a specific period of time during recording of motion picture/still picture. To display it again, touch [|||].

- Do not touch on the LCD monitor with hard pointed tips, such as ball point pens.

6 Service Mode

1. **Indication method of the service menu**
   Set the mode switch “Motion Picture Recording” mode.
2. While the power is turned OFF, keep pressing the “Power” button, “Zoom lever” to W side and “intelligent auto/Manual” button for more than 3 seconds until the top screen of the Service Mode Menu being displayed.



Service mode menu

Screen display	Contents	Function
1	Factory settings	Function to throw a product up in a factory shipment state (When recorded data in Built-in memory, “error display” is done)
3	Built-in memory self check execution (HC-V520M only)	Function to check self as for the state of Built-in memory
4	Lock search history indication	Display the camera system error cord for three histories saved in EEPROM
5	Power ON self check result display	Power ON self check (function to diagnose correct function of the device and interface between devices) result display
10	Erasing the lock histories	Erasing the error histories (working time is not erased)
12	Camera data indications while the video playback	Display the camera informations (Shutter speed, Iris value, White balance and focal length) while playing recorded video
14	Adjutment function for the service	The service adjustment do setup and adjustment of the following items required in the field service.
15	Restore the backed up adjustment data	Restore the adjustment data to new or repaired Main P.C.B. from SD card that the data backed up from original Main P.C.B. before repairs or replacement.
16	Touch panel calibration	Calibrate the touch positions of the touch panel.
17	NFC initialization (HC-V520M/V520 only)	Performs the Initialization of the NFC chip and erase the settings like as Wi-Fi connection etc..

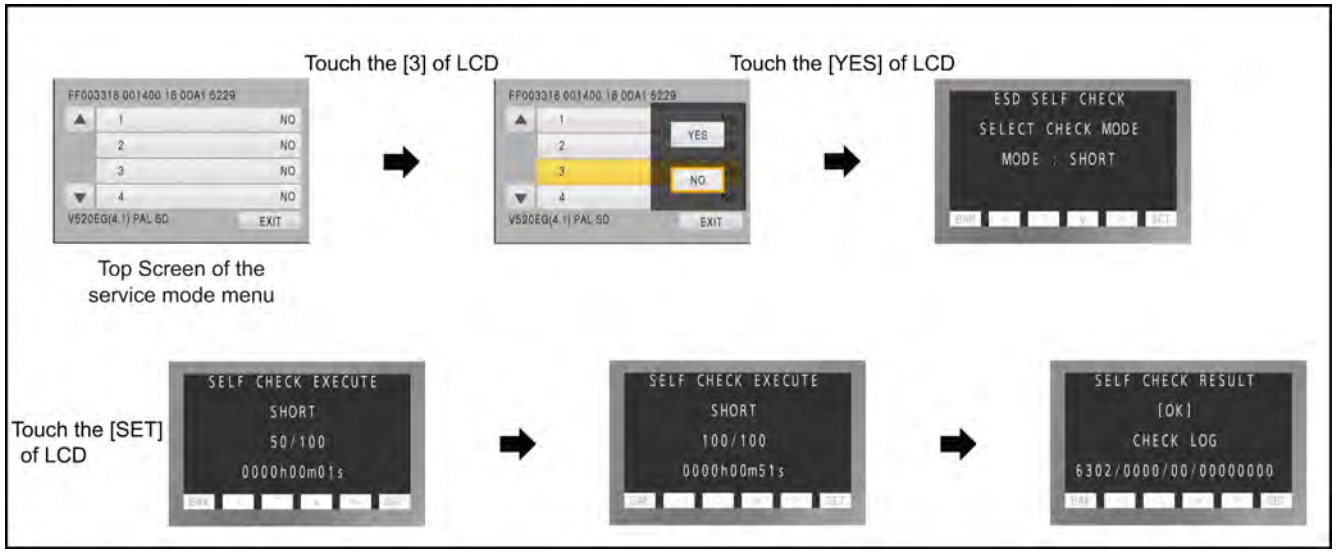
NOTE:
Do not using service mode except above table of Service mode menu.

3. End method of the top screen of the service mode menu
   Touch the [EXIT] of LCD to end the service mode, and then POWER OFF.

6.1. Built-in Memory Self Check Execution (HC-V520M only)

Touch the [3] of LCD, select Built-in memory self check execution.

Operation specifications



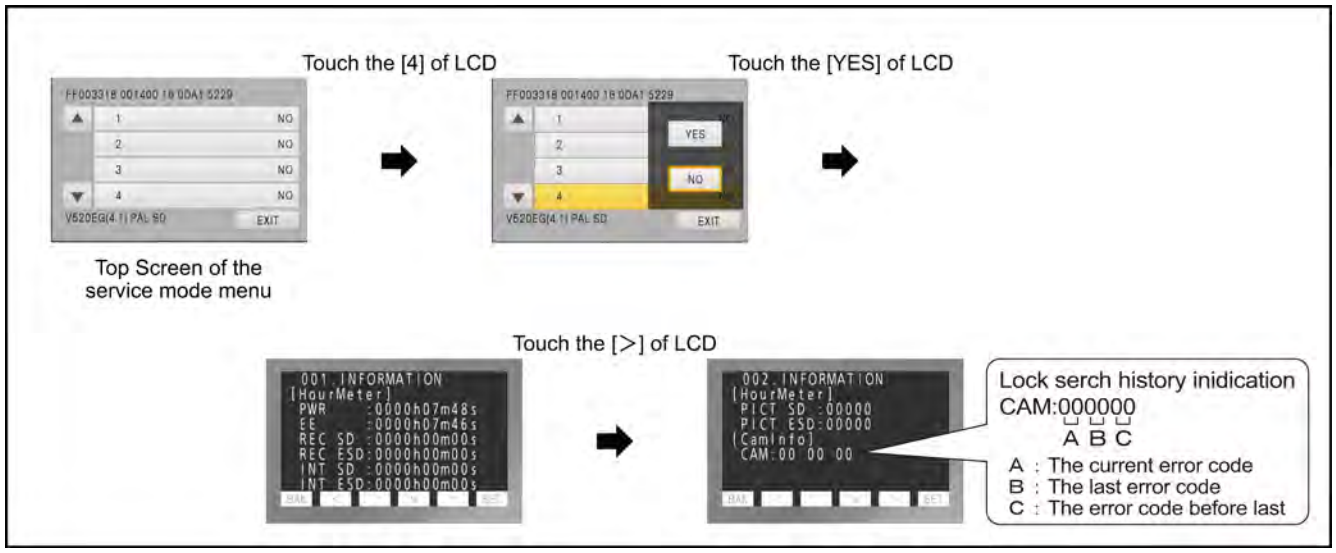
Indication contents

- Built-in memory self check result display
  Display the Built-in memory self check execution.
  Displays other than “OK” are abnormalities of Built-in memory.
  Touch the [BAK] of LCD to end the service mode, and then POWER OFF.

6.2. Lock Search History Indication

Touch the [4] of LCD, select Lock search history indication.

Operation specifications



Indication contents

- Lock search history indication
  Display the camera system error cord for three histories saved in EEPROM.
- The error cord contents which are displayed

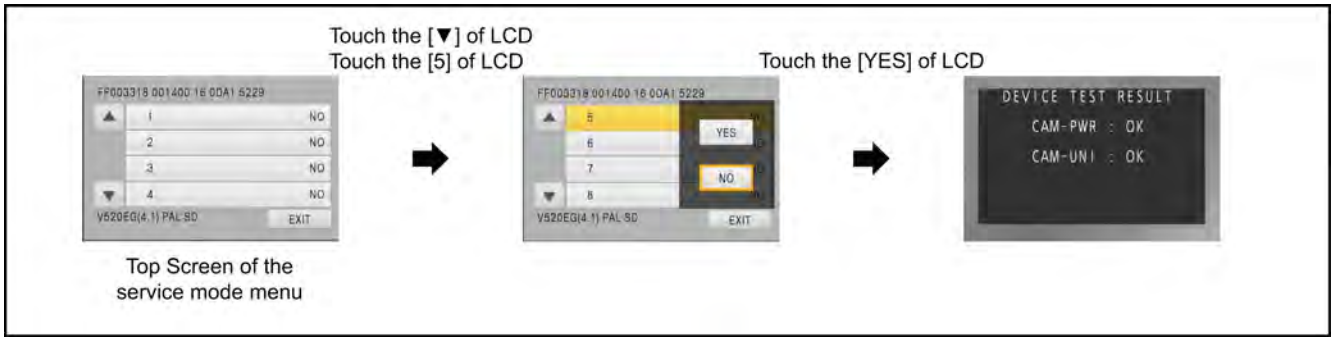
Error code	Function
51	Focus control is abnormal
52	Zoom control is abnormal
53	OIS lens control is abnormal
54	Zoom control is abnormal (2)
71	Lens cover open/close is abnormal
73	High temperature is abnormal

Touch the [BAK] of LCD to end the service mode, and then POWER OFF.

6.3. Power ON Self Check Result Display

Touch the [5] of LCD, select Power ON self check result display.

Operation specifications



Indication contents

- Power ON self check result display

  Function to diagnose correct function of the device and interface between devices result display.

  Display the following communication test result.
  - CAM-PWR : communication test between IC3401 and IC1503
  - CAM-UNI : Internal communication test of IC3401

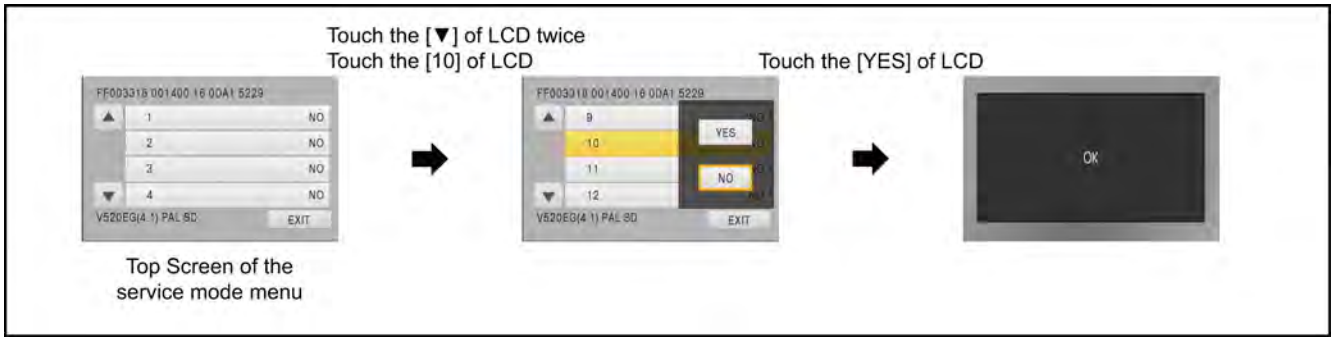
  Display other than “OK” are abnomalities of each lines.

Cutting of battery connection or AC power supply connection to end the service mode.

6.4. Erasing the lock histories

Touch the [10] of LCD, select erasing the lock histories execution.

Operation specifications



Function Description

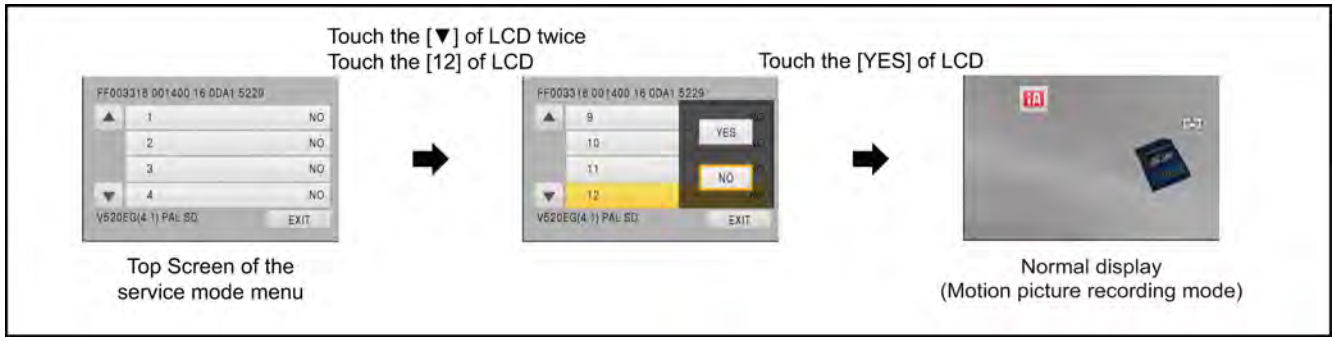
- Erasing the error histories stored in EEPROM. (working time is not erased)

Press the power button and turn off.

6.5. Camera data indications while the video playback

Touch the [12] of LCD, select indicating the camera informations while playing back the recorded video.

Operation specifications



Indication contents

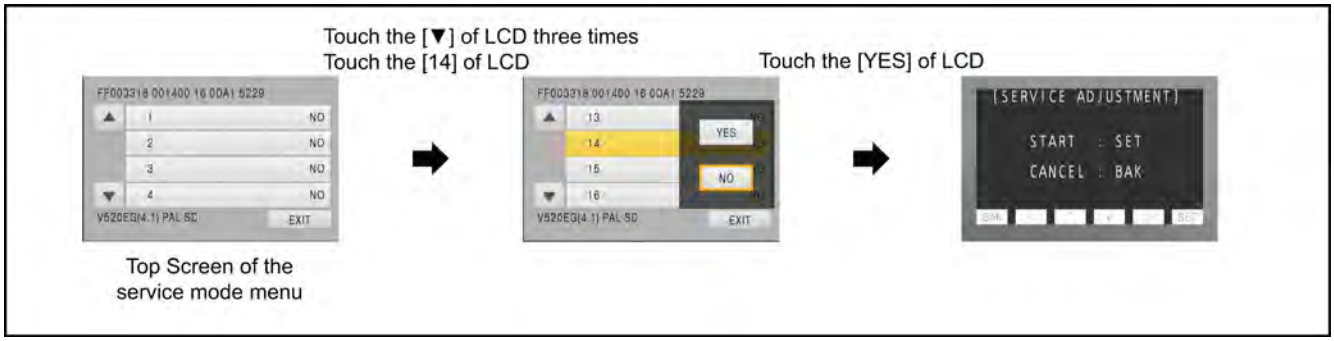
- While playing back the recorded videos, the camera informations (Shutter speed, Iris value, White balance and focal length) are superimposed on the LCD screen.

Press the power button and turn off.

6.6. Adjustment function for the Service

Touch the [14] of LCD, select the adjustment function for the service.

Operation Specifications (until before the start of the adjustment)



Function description

The service adjustment do setup and adjustment of the following items required in the field service.
For a detailed content, such as the adjustment procedure, refer to “9 Measurements and Adjustments”.

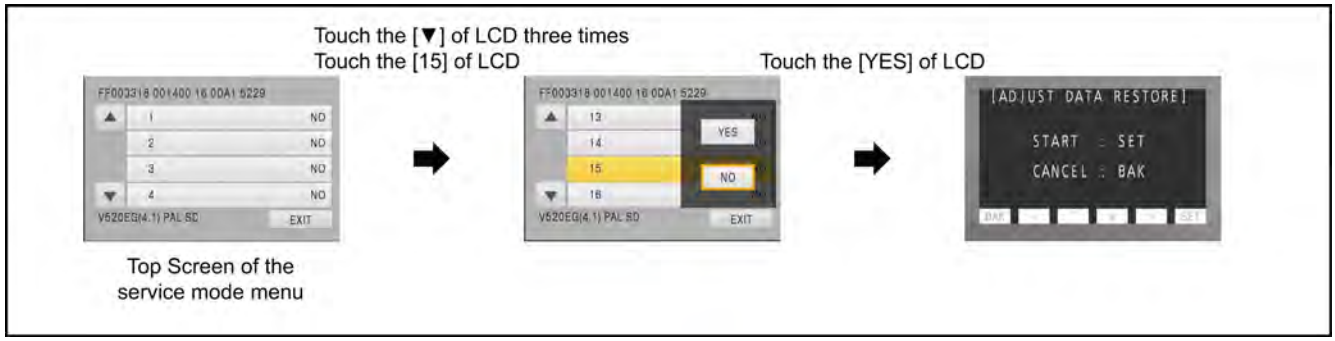
- Setting of the file name for adjustment data backup to SD card.
- Model setting
- Execution of adjustment data backup to SD card
- Checking of Switches
- Camera adjustment (Iris, Gyro, OIS and Missing pixels)
- Zoom Tracking adjustments
- Indoor White Balance Adjustment (CH-GAIN, PWM, WB)
- Outdoor White Balance Adjustment (PWM, WB)
- Level shot adjustment

Press the power button and turn the unit off.

6.7. Restore the backed up adjustment data

Touch the [15] of LCD, select restoring the backed up adjustment data from SD card to the unit.

Operation Specifications

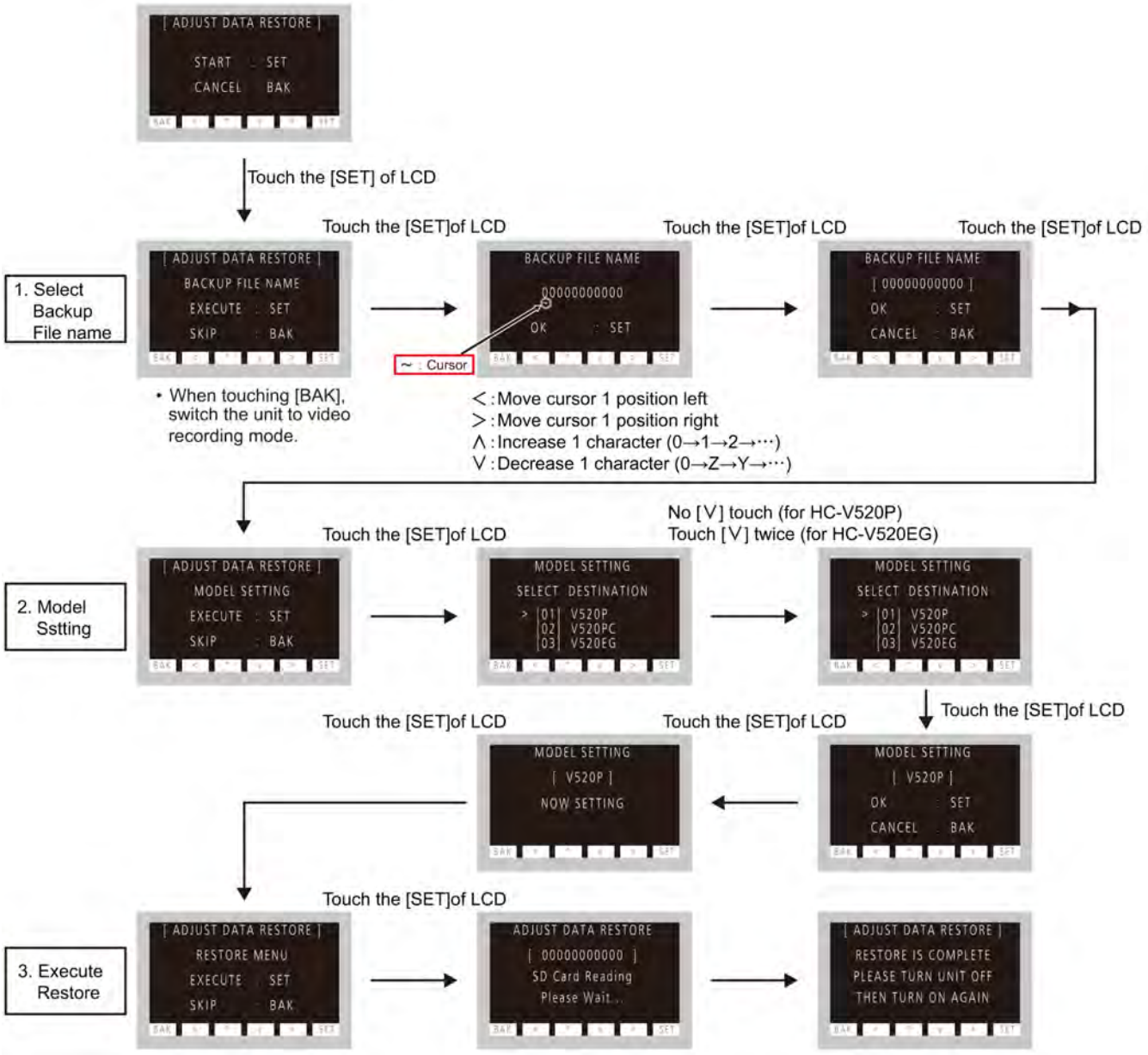


Function description

Restore the adjustment data to new or repaired Main P.C.B. from SD card that the data backed up from original Main P.C.B. before repairs or replacement.

To backup the adjustment data, use “6.6. Adjustment function for the Service”.

Restoring procedure

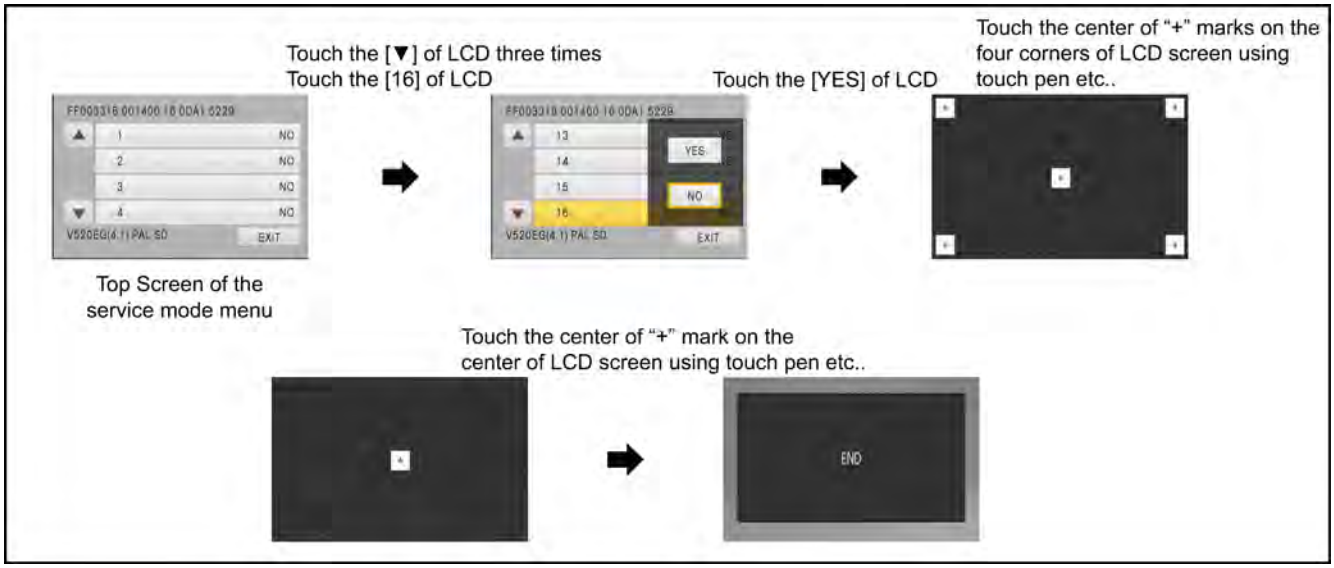


Press the power button and turn the unit off.

6.8. Touch Panel Calibration

Touch the [16] of LCD, select the calibration of touch panel.

Operation Specifications



Function description

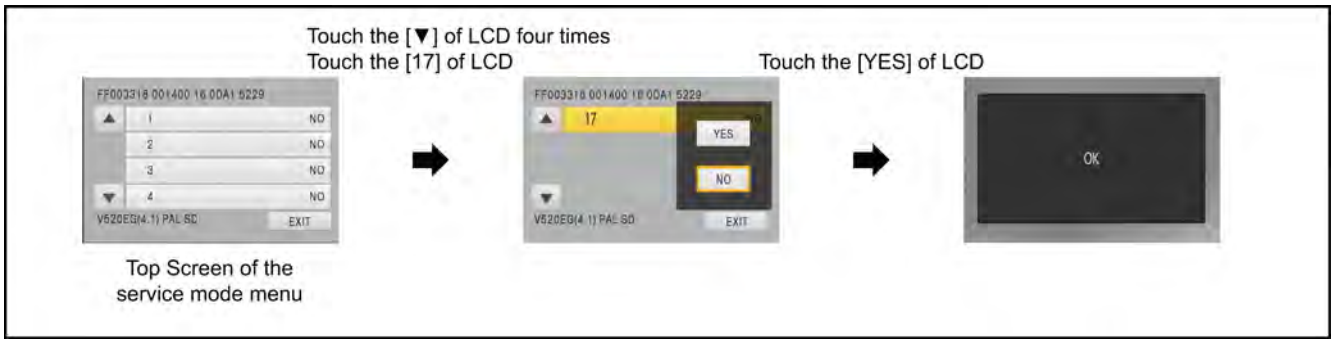
Calibrate the touch positions of the touch panel.

Press the power button and turn the unit off.

6.9. NFC Initialization (HC-V520/V520 only)

Touch the [17] of LCD, select initialization of NFC (Near Field Communication) function.

Operation Specifications



Function description

This function performs the Initialization of the NFC chip and erase the settings like as Wi-Fi connection etc..

Press the power button and turn the unit off.

7 Service Fixture & Tools

7.1. When Replacing the Main P.C.B.

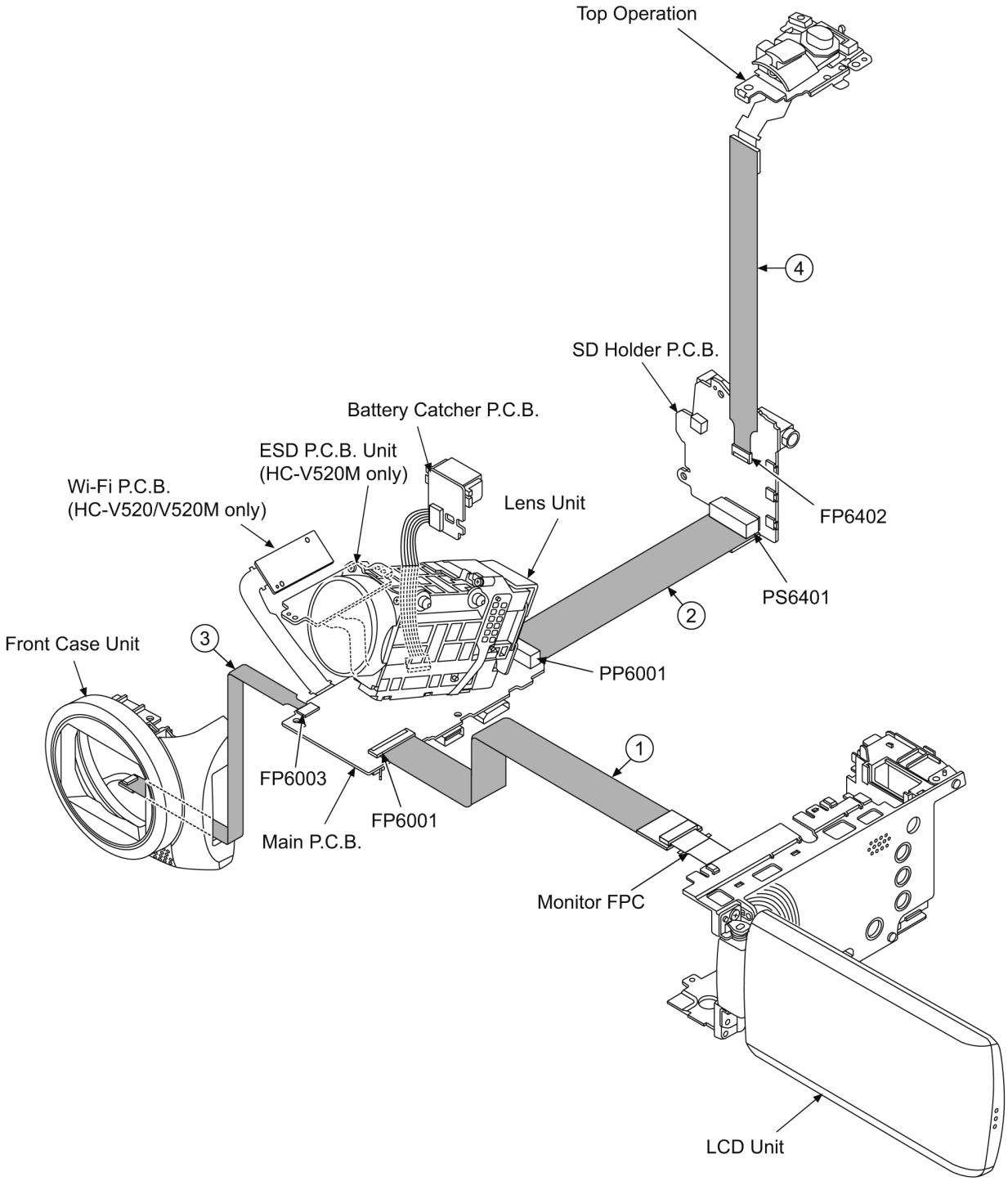
After replacing the MAIN P.C.B., be sure to achieve adjustment.

7.2. Service Position

This Service Position is used for checking and replacing parts. Use the following Extension cables for servicing.

Table S1 Extension Cable List

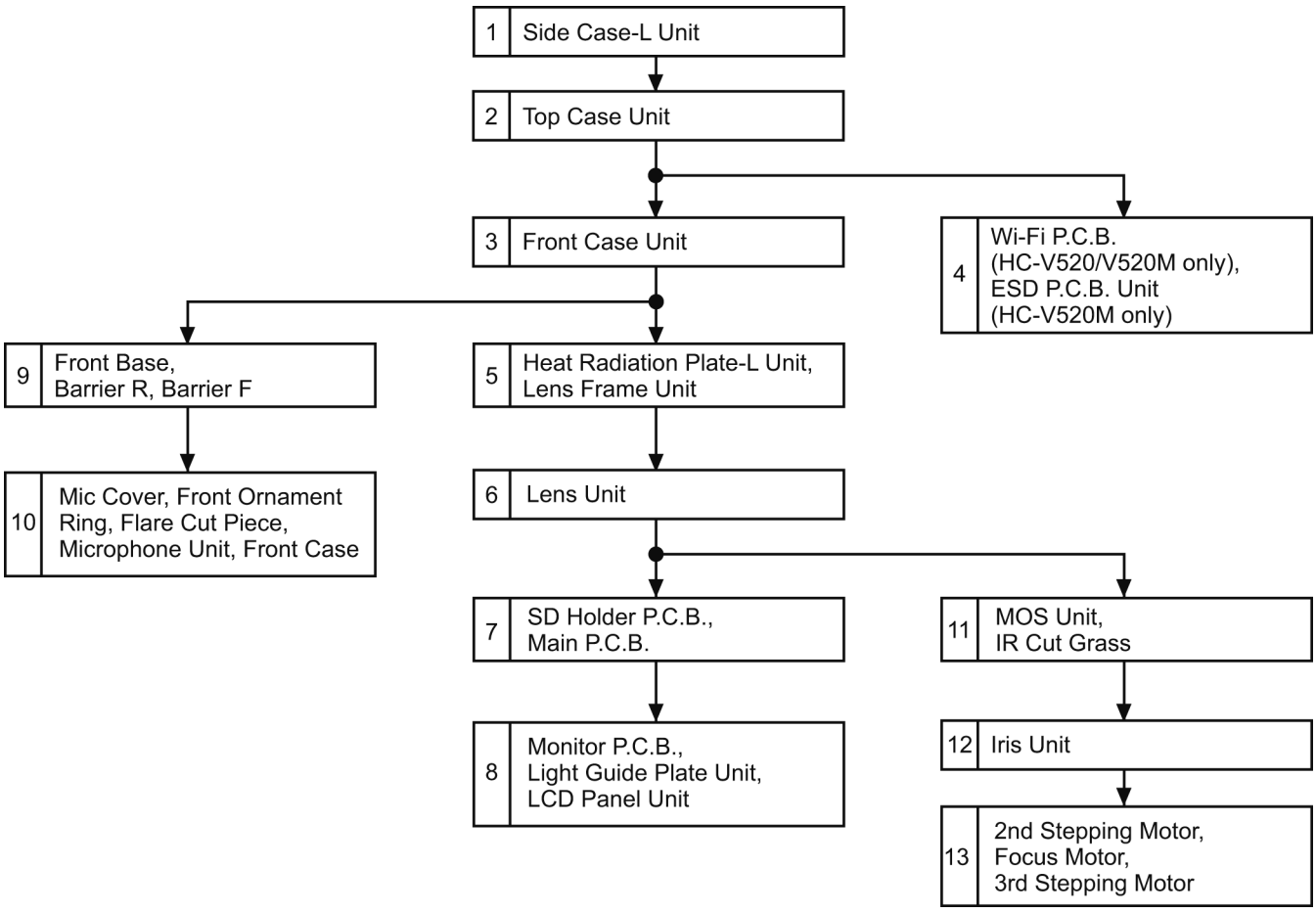
No.	Parts No.	Connection	Form
1	RFKZ0354	FP6001(MAIN) - MONITOR FPC	37PIN 0.3 FFC
2	RFKZ0444	PP6001(MAIN) - PS6401(SD HOLDER)	50PIN 0.5 B to B
3	VFK1480	FP6003(MAIN) - ECM FPC	6PIN 0.5 FFC
4	VFK1440	FP6402(SD HOLDER) - TOP OPERATION	10PIN 0.5 FFC



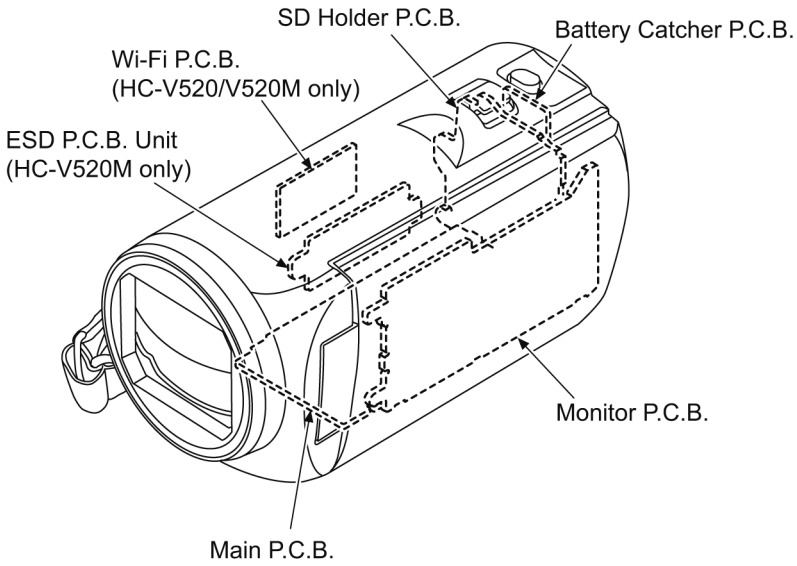
8 Disassembly and Assembly Instructions

8.1. Disassembly Flow Chart for the Unit

This is a disassembling chart.
When assembling, perform this chart conversely.



8.2. PCB Location

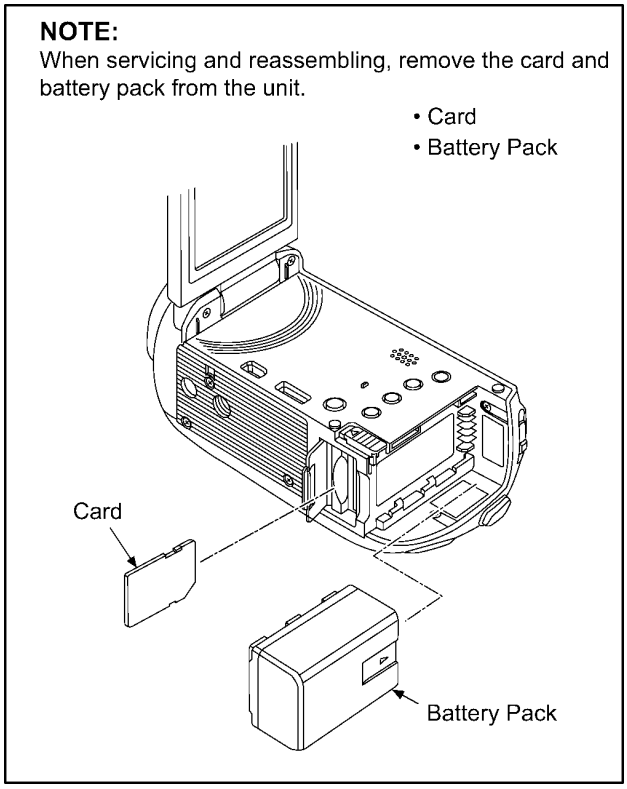


8.3. Disassembly Procedure for the Unit

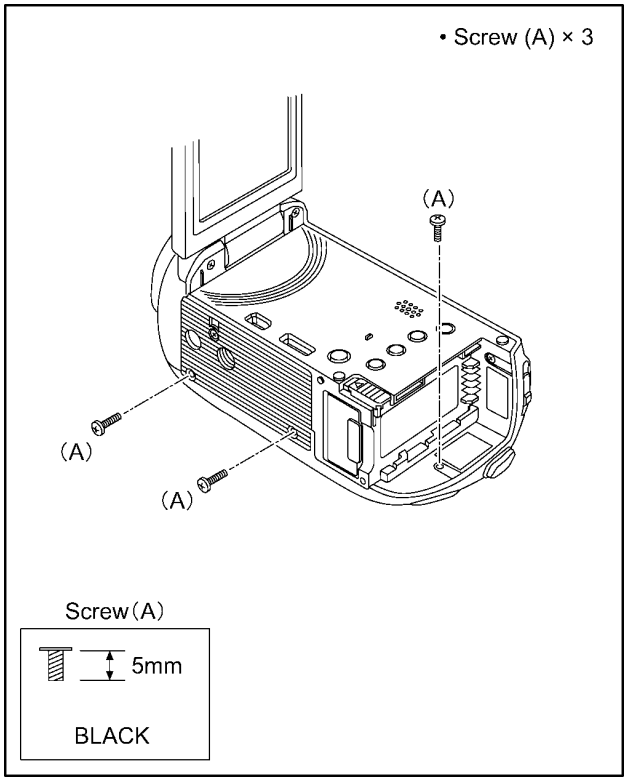
No.	Item	Fig	Removal
1	Side Case-L Unit	(Fig. D1)	3 Screws (A)
		(Fig. D2)	1 Screw (B)
			3 Locking tabs
			Side Case-L Unit
2	Top Case Unit	(Fig. D3)	1 Screw (C)
		(Fig. D4)	1 Screw (D) (-K/-S/-R model only)
			3 Locking tabs
			Top Case Unit
3	Front Case Unit	(Fig. D5)	1 Screw (E)
			2 Screws (F)
			FP6003 (Flex)
			1 Screw (G)
			1 Locking tab
			1 Rib
		(Fig. D6)	Front Case Unit
4	Wi-Fi P.C.B. (HC-V520/V520M only) ESD P.C.B. Unit (HC-V520M only)	(Fig. D7)	FP3001 (Flex)
			FP3201 (Flex)
			2 Screws (H)
			Wi-Fi P.C.B.
			ESD P.C.B. Unit
5	Heat Radiation Plate-L Unit Lens Frame Unit	(Fig. D8)	1 Screw (I)
			1 Screw (J)
			P6003 (Connector)
			1 Screw (K)
		(Fig. D9)	4 Locking tabs
			FP6006 (Flex)
			FP6004 (Flex)
			1 Screw (L)
			Heat Radiation Plate-L Unit
			Lens Frame Unit
6	Lens Unit	(Fig. D10)	FP301 (Flex)
			FP6008 (Flex)
			2 Convexes
			Lens Unit
7	SD Holder P.C.B. Main P.C.B.	(Fig. D11)	1 Screw (M)
			3 Screws (N)
			1 Screw (O)
			Heat Radiation Plate Unit
			P6401 (Connector)
			FP6402 (Flex)
			FP6001 (Flex)
		(Fig. D12)	4 Locking tabs
			Bottom Frame Unit
			SD Holder P.C.B.
			Main P.C.B.

No.	Item	Fig	Removal
8	Monitor P.C.B. Light Guide Plate Unit LCD Panel Unit	(Fig. D13)	2 Screws (P)
			8 Locking tabs
			LCD Case (T) Unit
		(Fig. D14)	FP901 (Flex)
			FP904 (Flex)
			FP905 (Flex)
			1 Screw (Q)
			1 Locking tab
			1 Projection part
			Monitor P.C.B.
		(Fig. D15)	LCD Frame A
			4 Locking tabs
			Light Guide Plate Unit
			LCD Panel Unit
		(Fig. D16)	Reflection Sheet
			Light Guide Plate
			Diffusion Sheet
			Prism Sheet B
			Prism Sheet A
			LGP Holder
9	Front Base Barrier R Barrier F	(Fig. D17)	3 Projection part
			Lens Damper Rubber
			4 Screws (R)
			3 Ribs
			Front Base
			Barrier R
			Barrier F
10	Mic Cover Front Ornament Ring Flare Cut Piece Microphone Unit Front Case	(Fig. D18)	2 Screws (S)
			1 Locking tab
			Mic Cover
			Front Ornament Ring
			Flare Cut Piece
			Mic Sponge F
			Mic Sponge M
			Microphone Unit
			Mic Sponge R
			Front Case
11	MOS Unit IR Cut Grass	(Fig. D19)	3 Screws (T)
			MOS Unit
			MOS Cushion
			IR Cut Grass
			Lens Unit
		(Fig. D20)	NOTE: (When Installing the MOS Unit)
		(Fig. D21)	
12	Iris Unit	(Fig. D22)	2 Ribs
			Solder (24 points)
			MOS FPC Sheet
			4 Screws (U)
			4 Ribs
		(Fig. D23)	Iris Unit
13	2nd Stepping Motor Focus Motor 3rd Stepping Motor	(Fig. D24)	6 Screws (V)
			2nd Stepping Motor
			Focus Motor
			3rd Stepping Motor
		(Fig. D25)	NOTE:(When Installing)

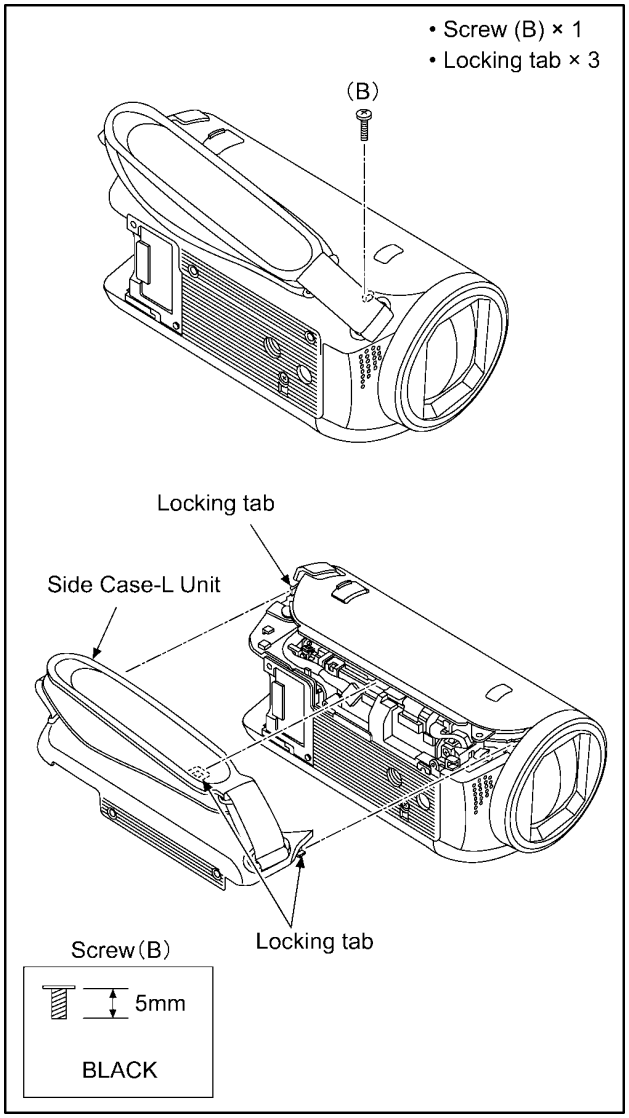
NOTE:
When servicing and reassembling, remove the card and battery pack from the unit.



8.3.1. Removal of the Side Case-L Unit

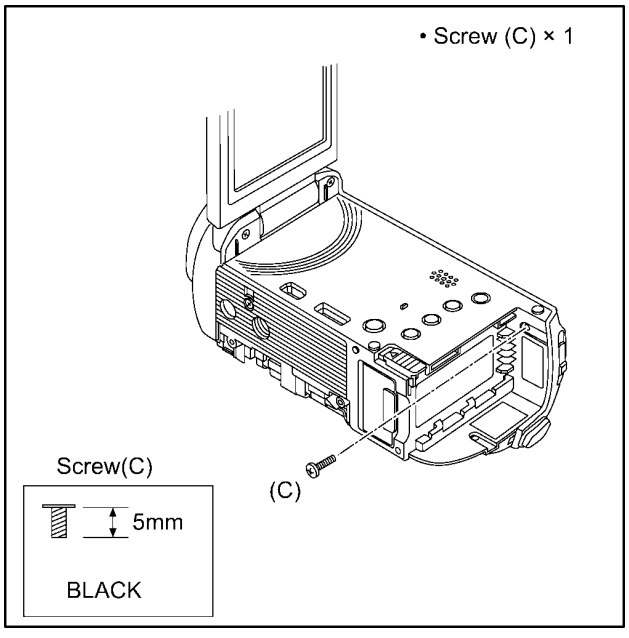


(Fig. D1)



(Fig. D2)

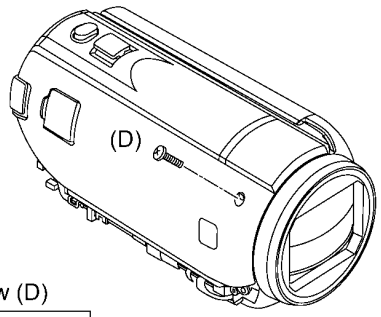
8.3.2. Removal of the Top Case Unit



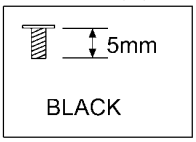
(Fig. D3)

For -K/-S/-R models

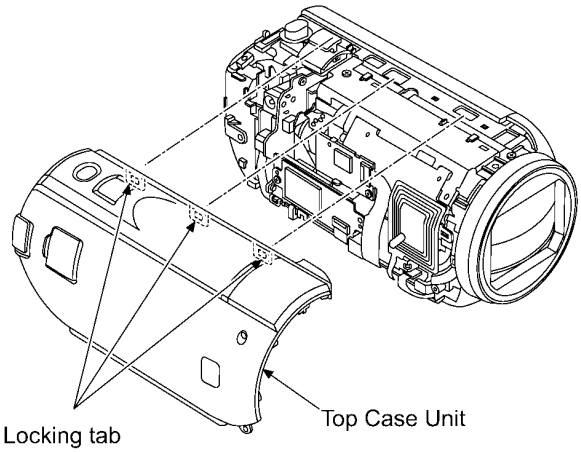
• Screw (D) × 1



Screw (D)

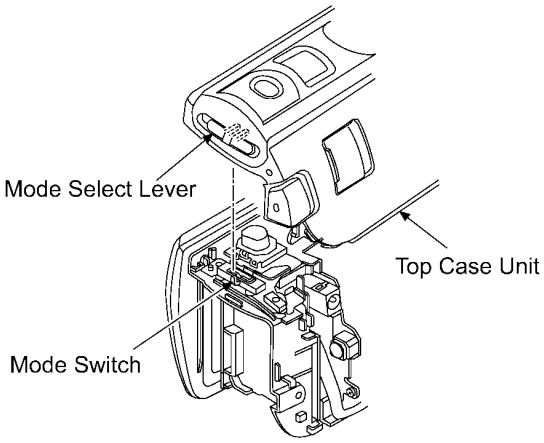


• Locking tab × 3



NOTE: (When Installing)

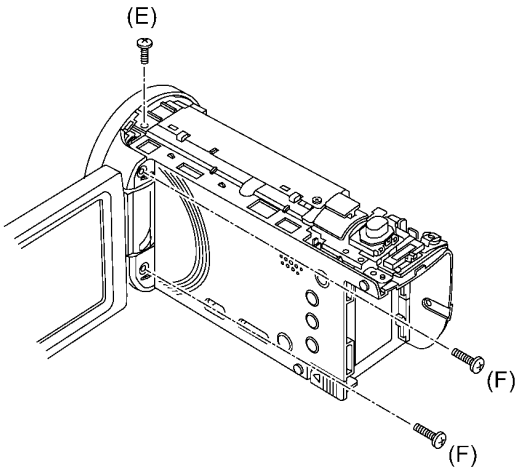
• Align the convex of mode switch to slot of mode select lever.

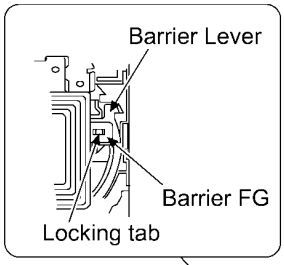


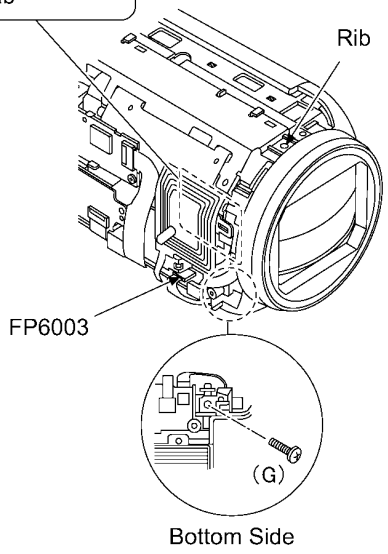
(Fig. D4)

8.3.3. Removal of the Front Case Unit

• Screw (E) × 1
• Screw (F) × 2
• FP6003 (Flex)
• Screw (G) × 1
• Locking tab × 1
• Rib × 1



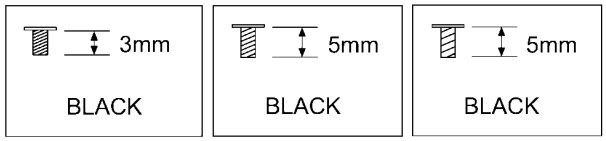




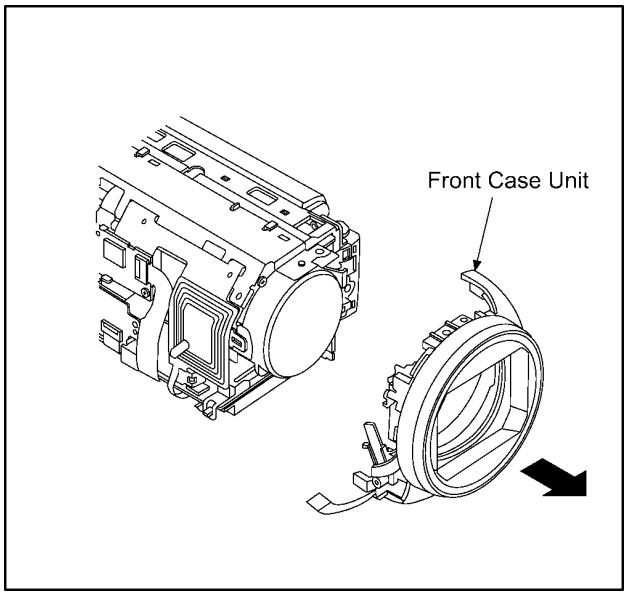
NOTE: (When Replacing)

1. When remove the locking tab, do not damege the barrier FG and barrier lever.
2. Do not bend the flex excessively and take care not to damage the flex.

Screw (E) | Screw (F) | Screw (F)

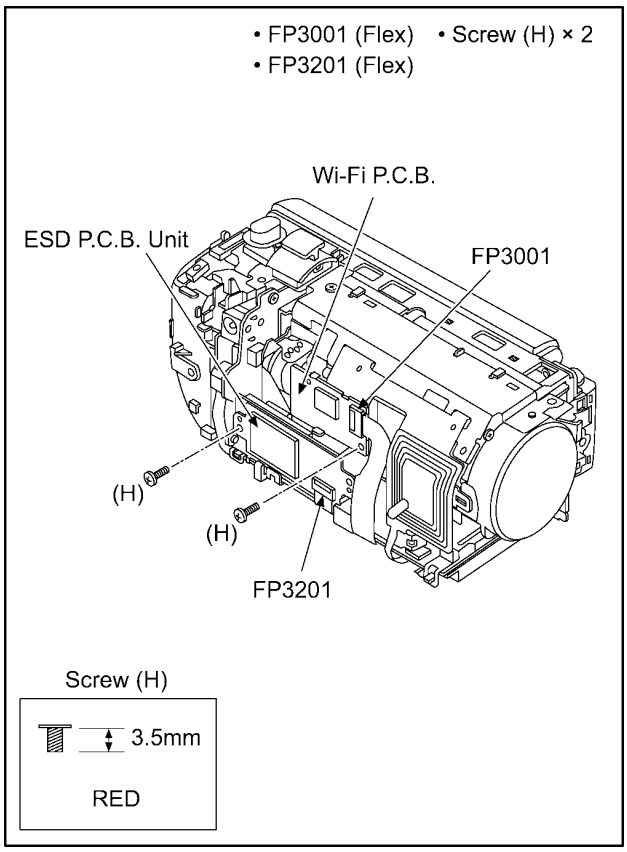


(Fig. D5)



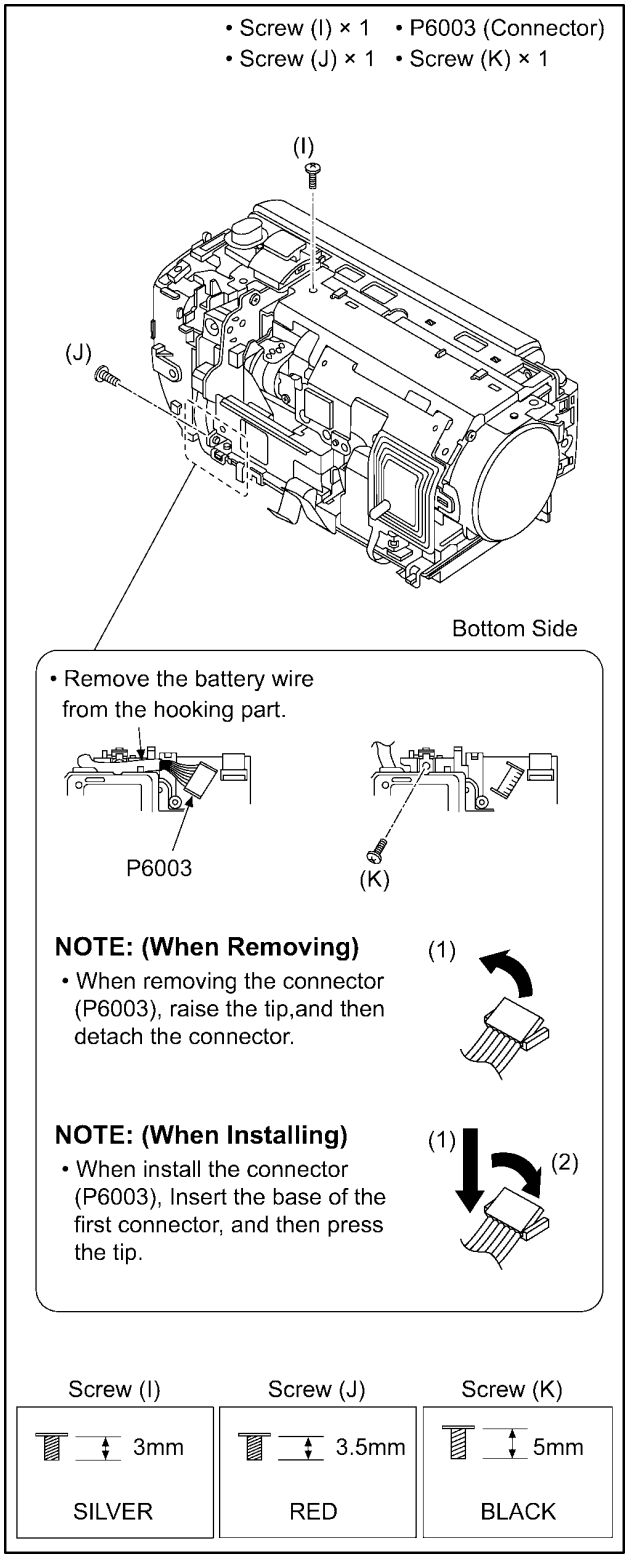
(Fig. D6)

8.3.4. Removal of the Wi-Fi P.C.B. (HC-V520/V520M only), ESD P.C.B. Unit (HC-V520M only)



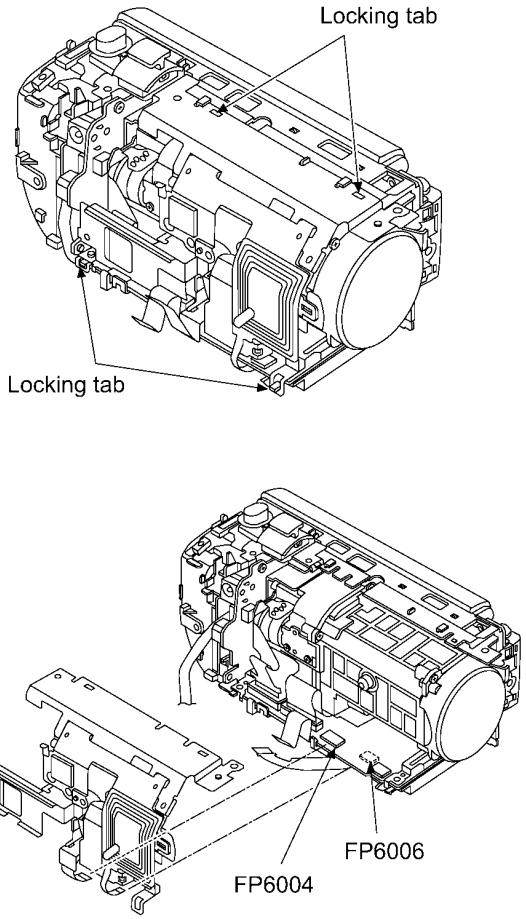
(Fig. D7)

8.3.5. Removal of the Heat Radiation Plate-L Unit and Lens Frame Unit

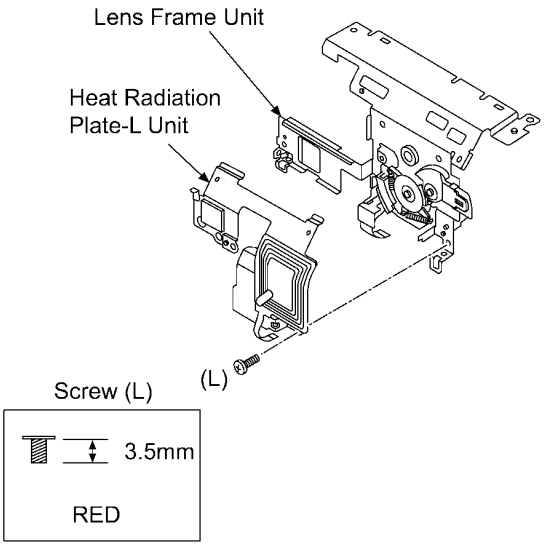


(Fig. D8)

• Locking tab × 4
• FP6006 (Flex)
• FP6004 (Flex)
• Screw (L) × 1



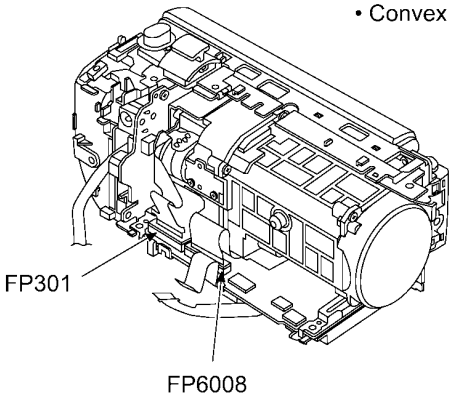
NOTE: (When Replacing)
• Do not bend the flex excessively and take care not to damage the flex.

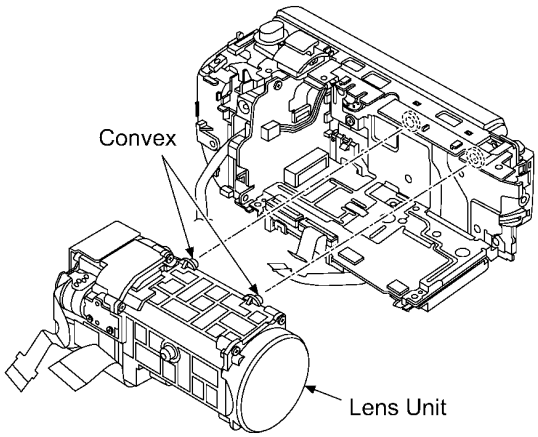


(Fig. D9)

8.3.6. Removal of the Lens Unit

• P301 (Flex)
• FP6008 (Flex)
• Convex × 2

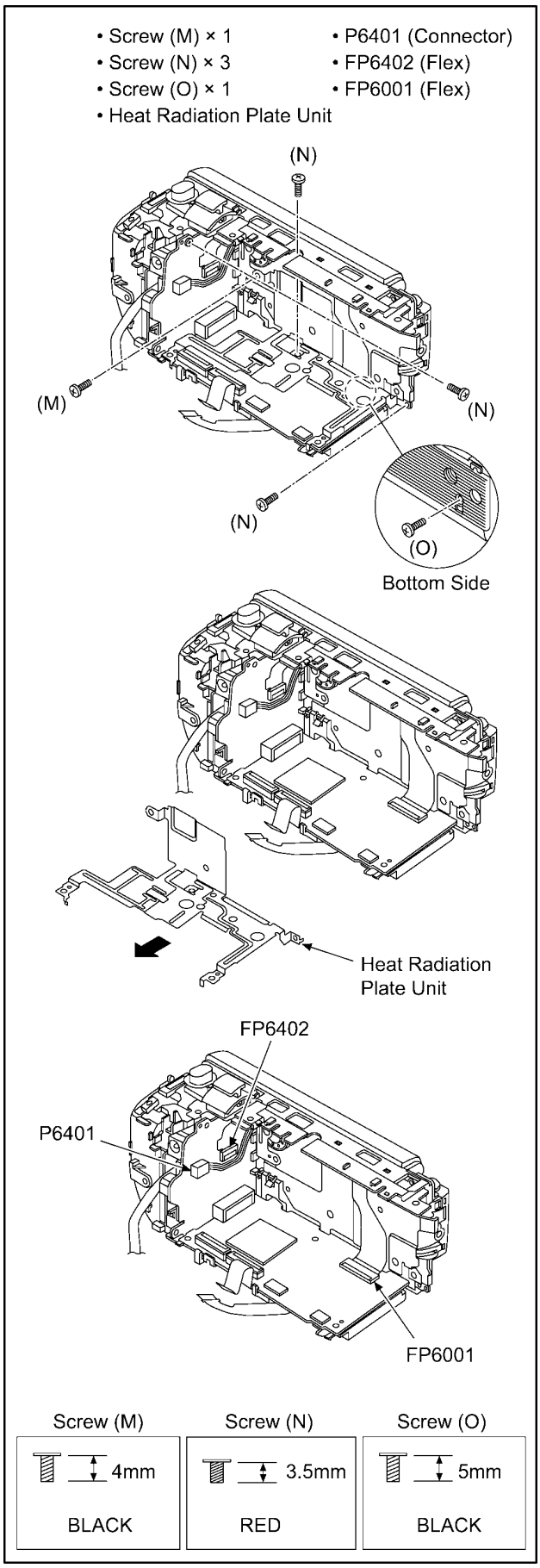




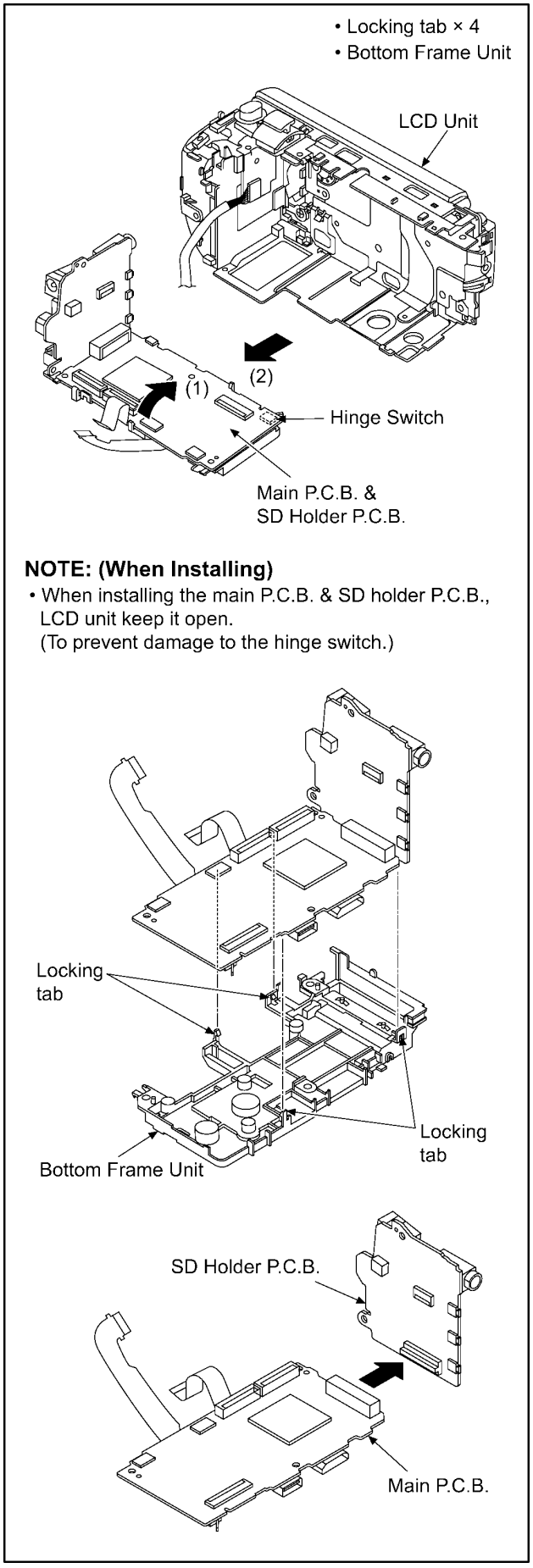
NOTE: (When Replacing)
• Do not bend the flex excessively and take care not to damage the flex.

(Fig. D10)

8.3.7. Removal of the SD Holder P.C.B., Main P.C.B.

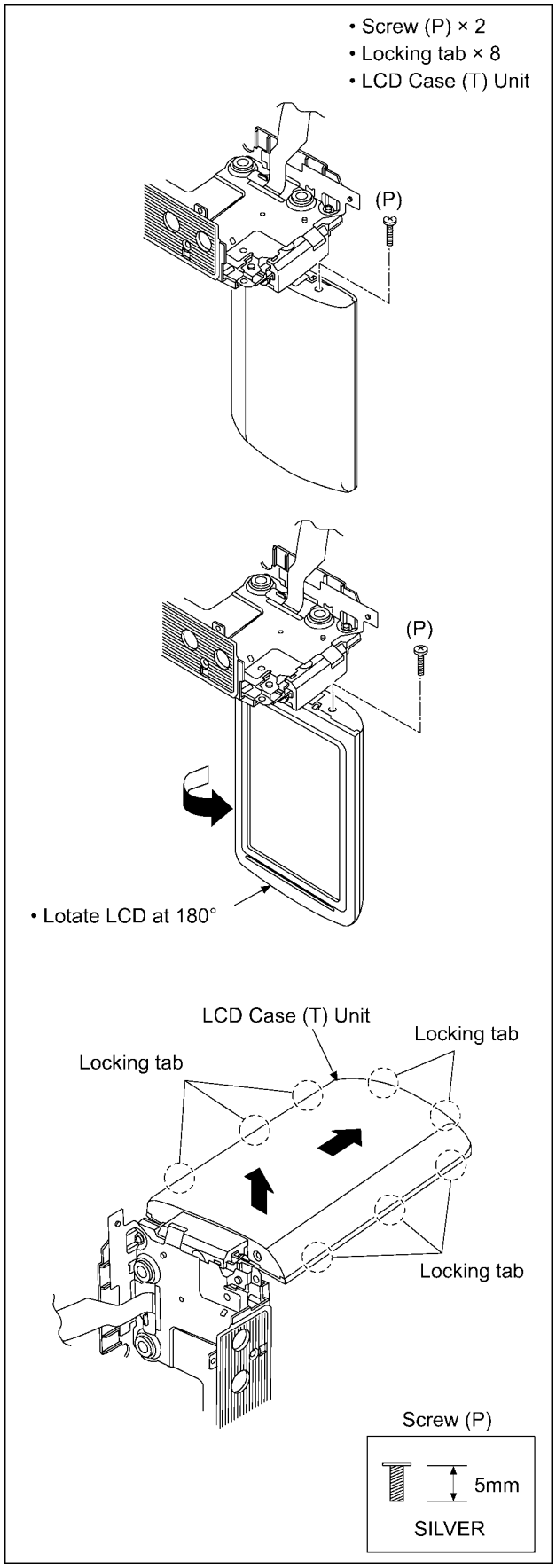


(Fig. D11)

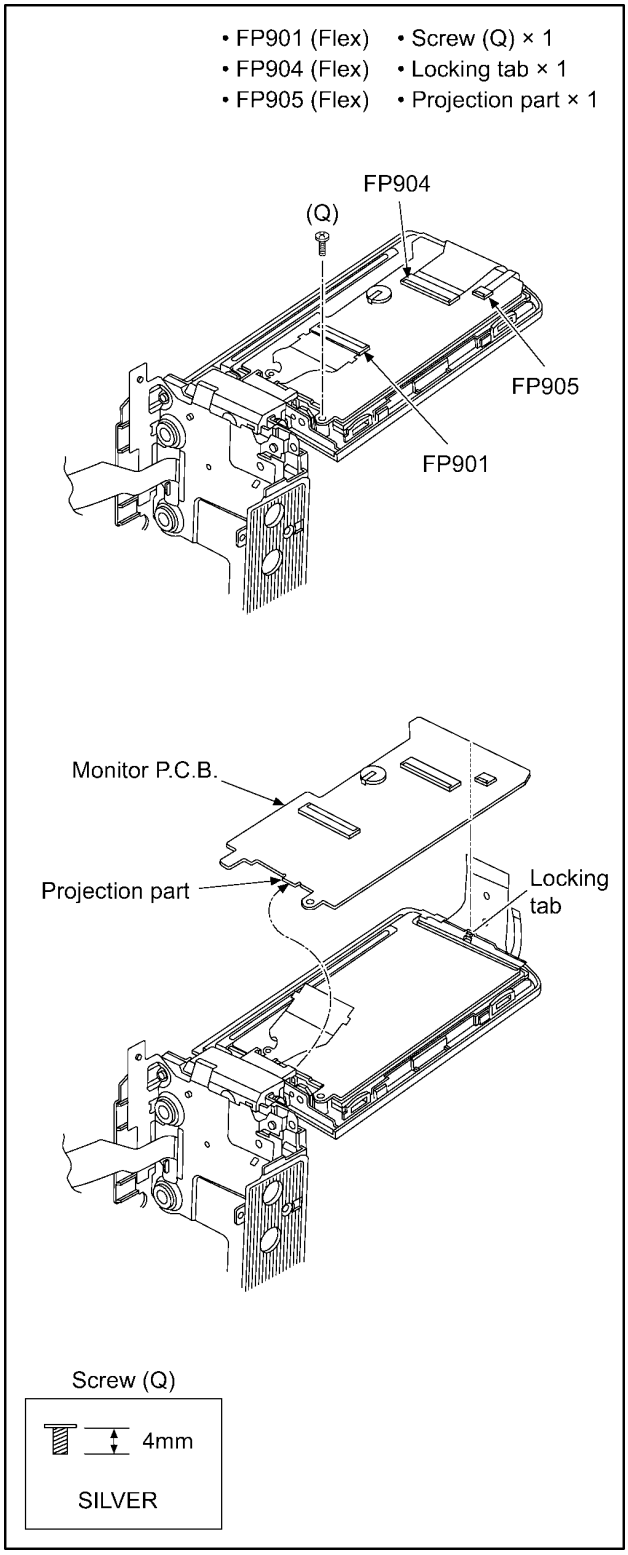


(Fig. D12)

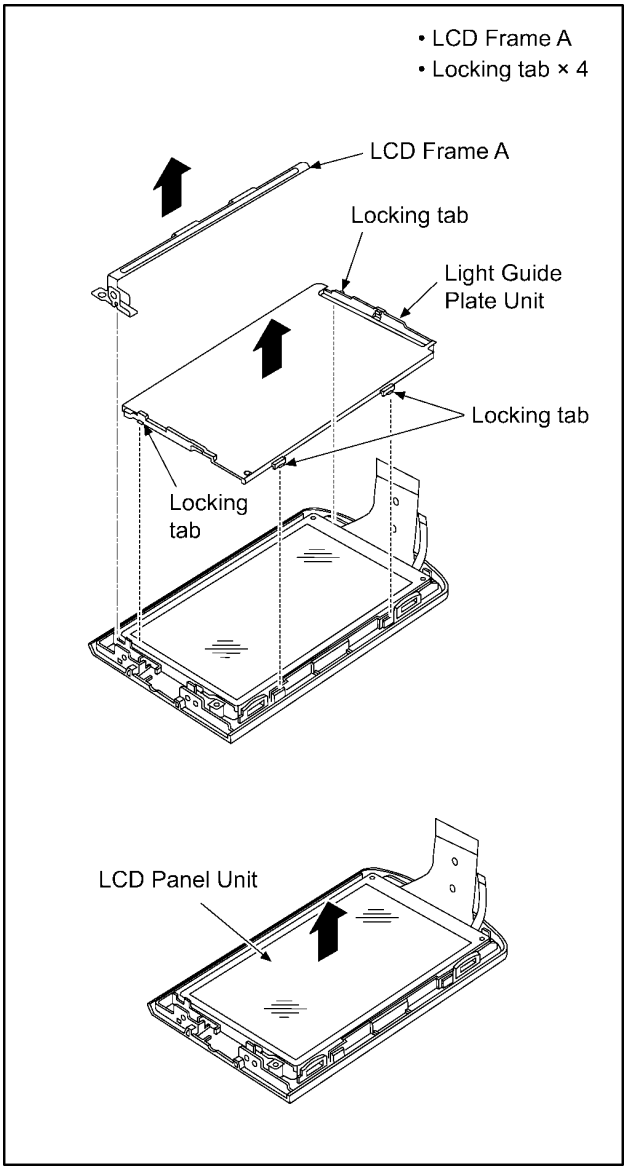
8.3.8. Removal of the Monitor P.C.B., Light Guide Plate Unit, LCD Panel Unit.



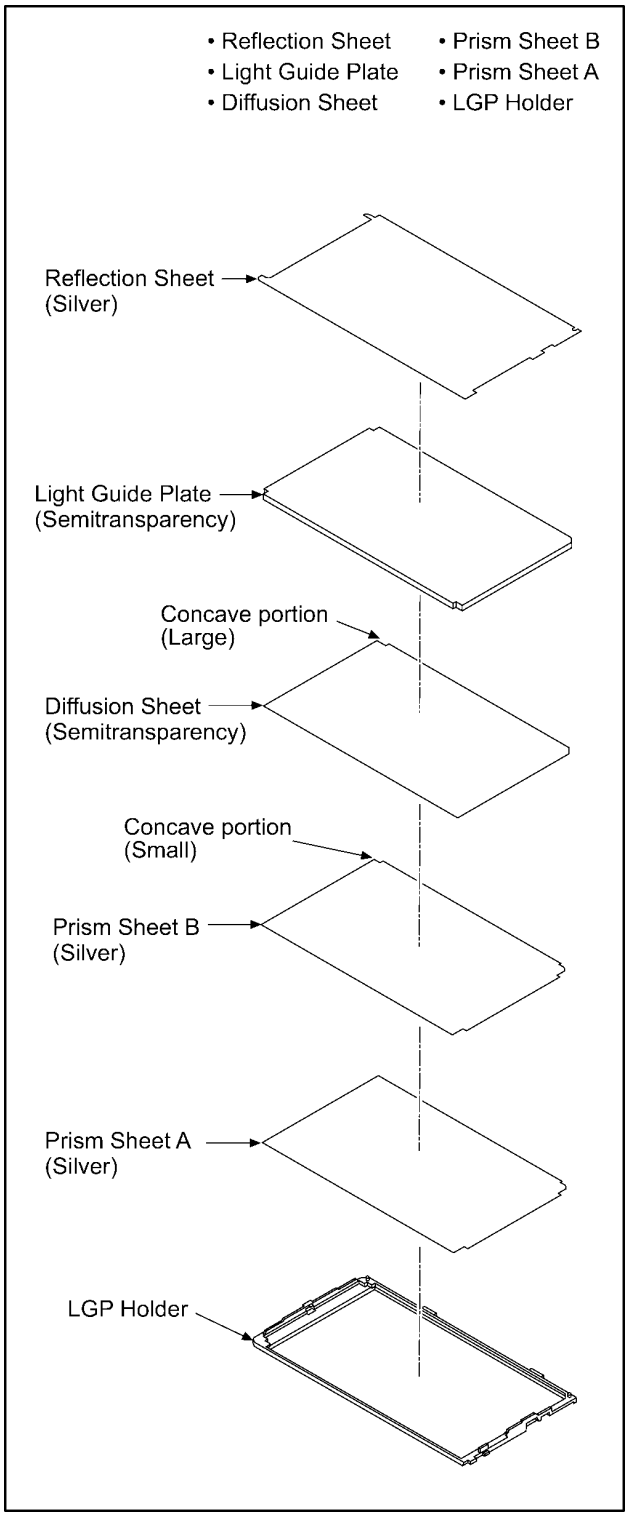
(Fig. D13)



(Fig. D14)

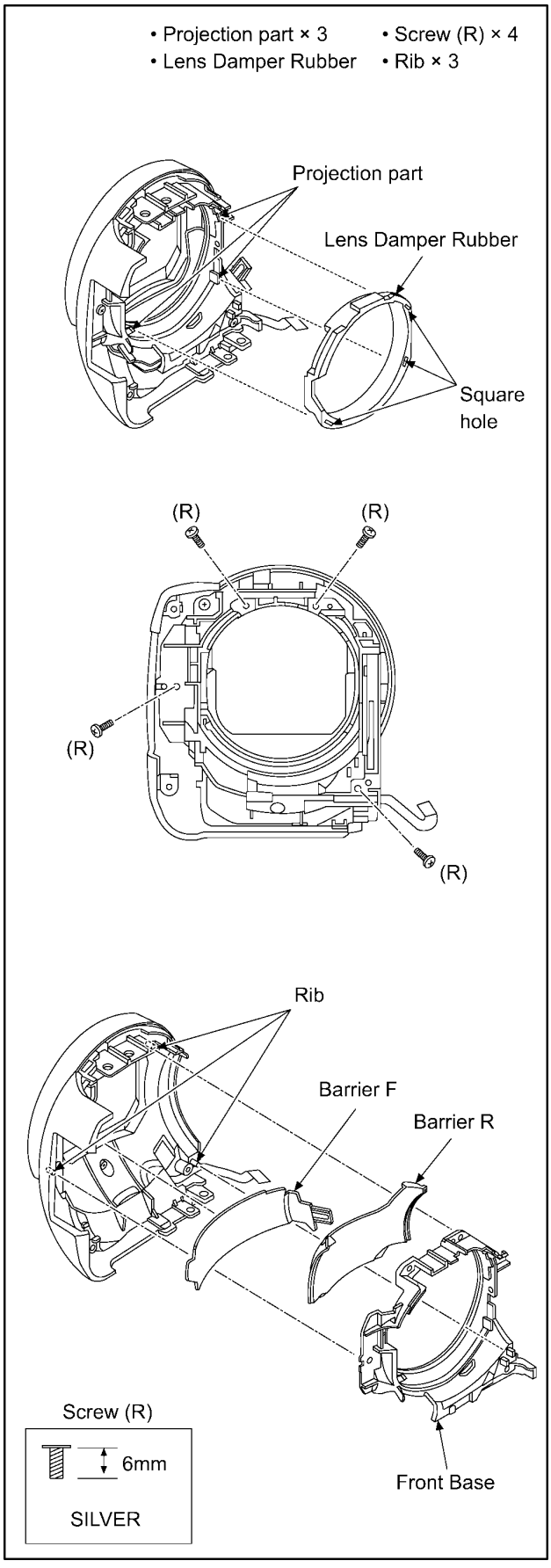


(Fig. D15)



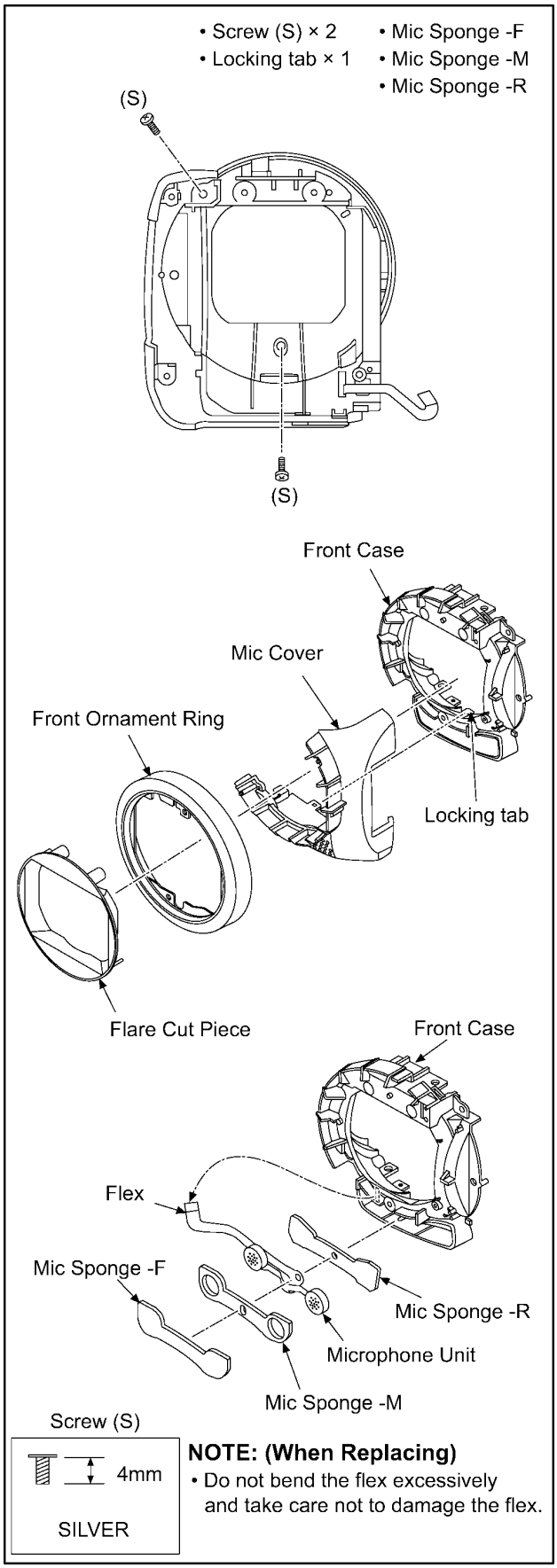
(Fig. D16)

8.3.9. Removal of the Front Base, Barrier R, Barrier F



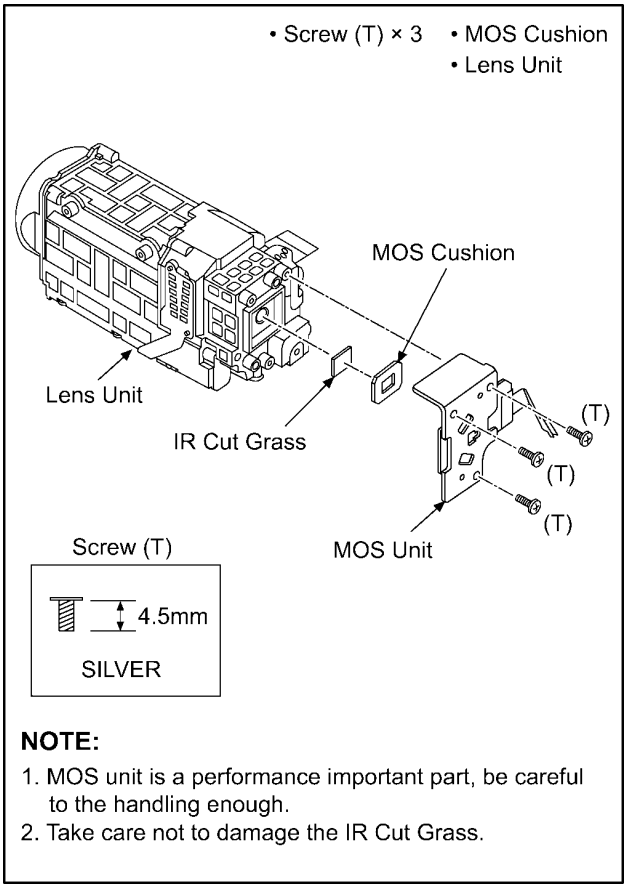
(Fig. D17)

8.3.10. Removal of the Mic Cover, Front Ornament Ring, Flare Cut Piece, Microphone Unit, Front Case



(Fig. D18)

8.3.11. Removal of the MOS Unit, IR Cut Grass



NOTE:

1. MOS unit is a performance important part, be careful to the handling enough.
2. Take care not to damage the IR Cut Grass.

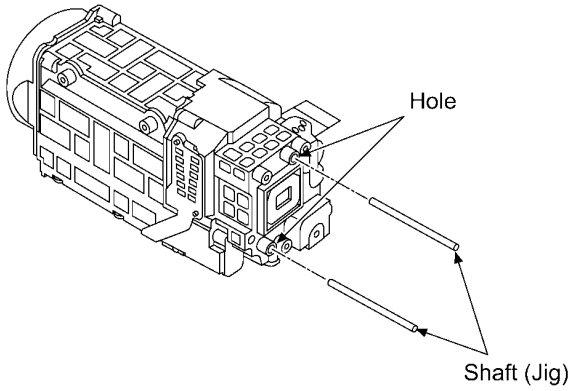
(Fig. D19)

NOTE: (When Installing the MOS Unit)

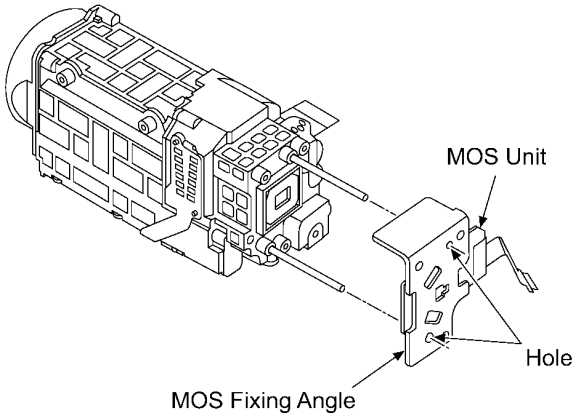
Necessary Jig:

- Shaft (VMS8231) × 2

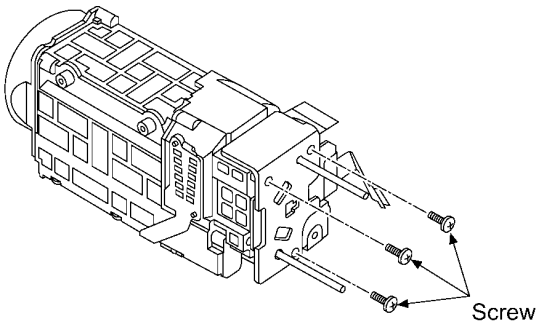
1. Insert the two shafts into the holes of the lens unit shown in below.

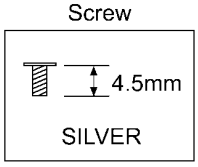


2. Insert the shafts through the holes on the MOS fixing angle, fix the position of the MOS(1).



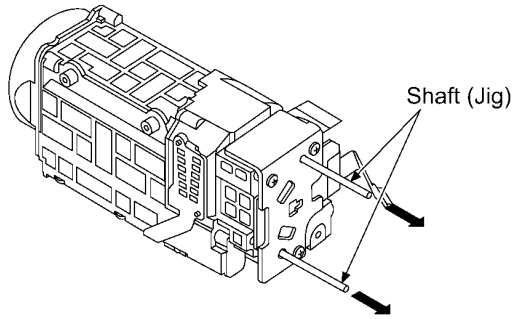
3. Tighten 3 screws and fix the MOS unit.





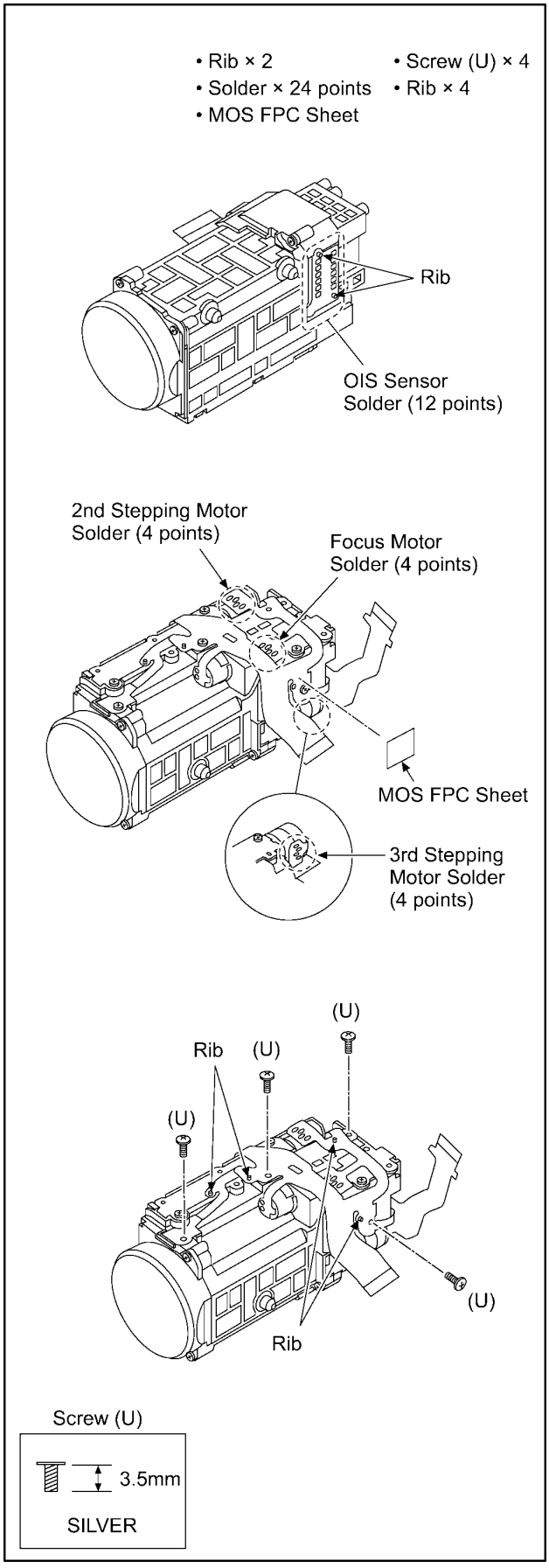
(Fig. D20)

4. Pull out both shafts.

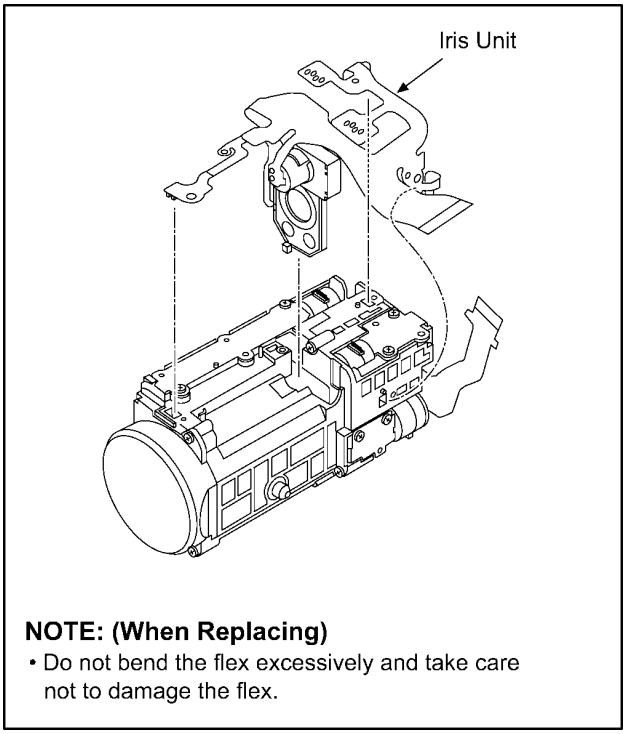


(Fig. D21)

8.3.12. Removal of the Iris Unit

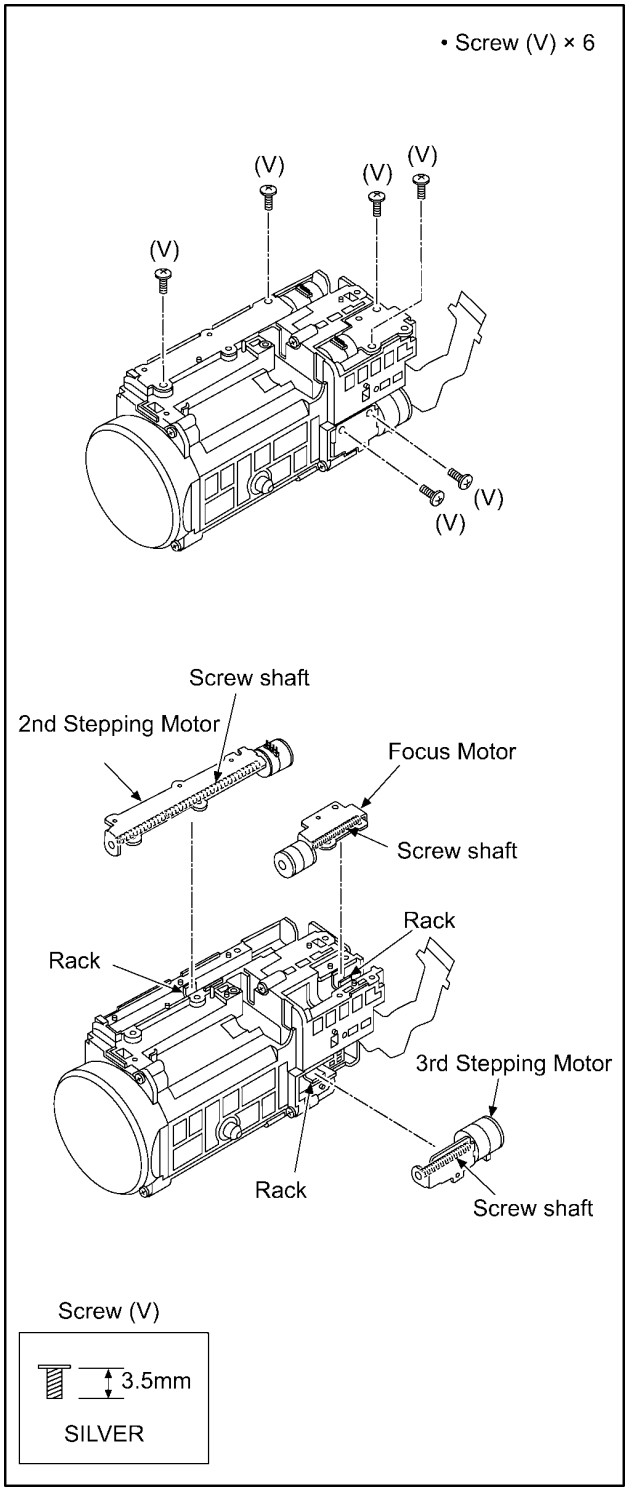


(Fig. D22)



(Fig. D23)

8.3.13. Removal of the 2nd Stepping Moter, 3rd Stepping Motor, Focus Motor

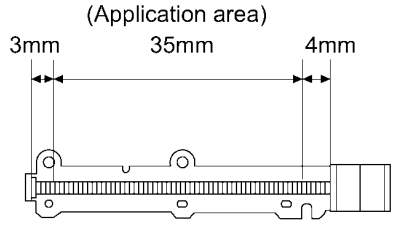


(Fig. D24)

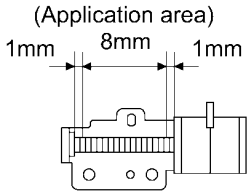
NOTE:(When Installing)

1. Move the rack of 2nd stepping motor, rack of 3rd stepping motor, rack of focus motor to each center position.
2. Align the screw shaft to the rack for insertion.
3. Blow air to the screw shaft of each motors to prevent the adhesion of foreign material.
4. Apply grease to the screw shaft of each motors.

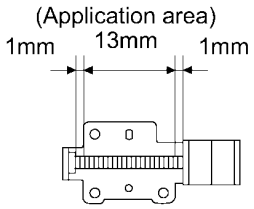
• Grease Application Area (2nd Stepping Motor)



• Grease Application Area (3rd Stepping Motor)



• Grease Application Area (Focus Motor)



(Fig. D25)

9 Measurements and Adjustments

9.1. Electric Adjustment

- Adjustment method is different from a conventional High definition video camera.
- An exclusive jig are necessary for electric adjustment.
- Connection method of the main unit and an exclusive adjustment jig as follows.

9.1.1. Adjustment Procedure

- Connect the main unit to AC adaptor.
- Set the unit to the service mode, and execute “14 Adjustment function for the service”.

Figure of connection

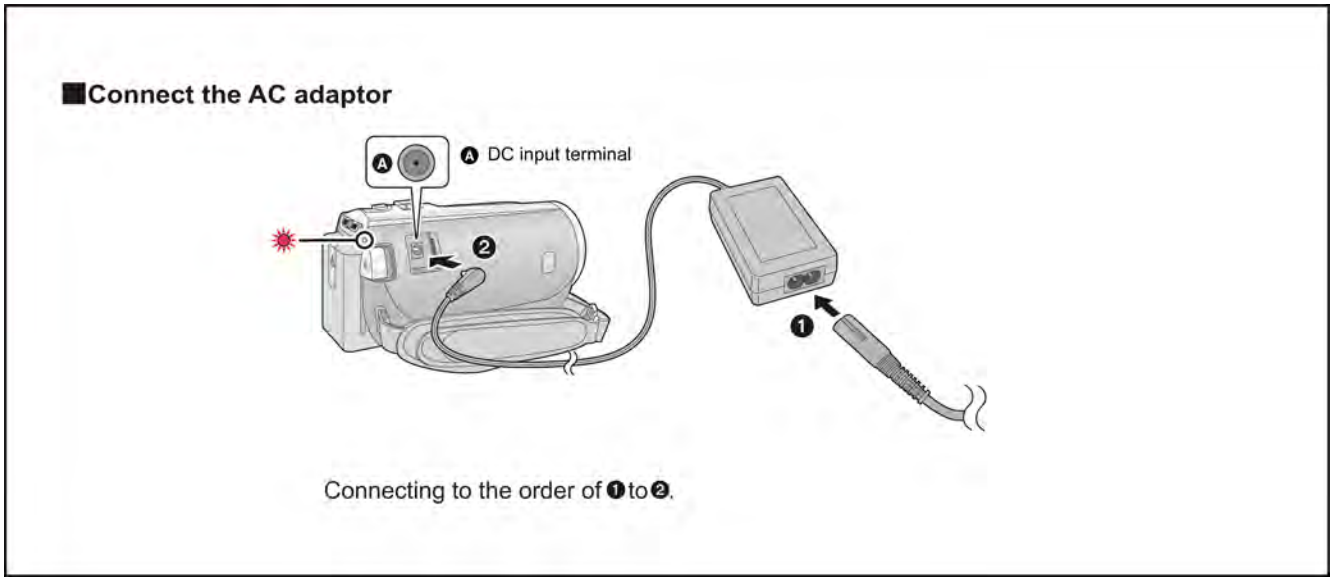
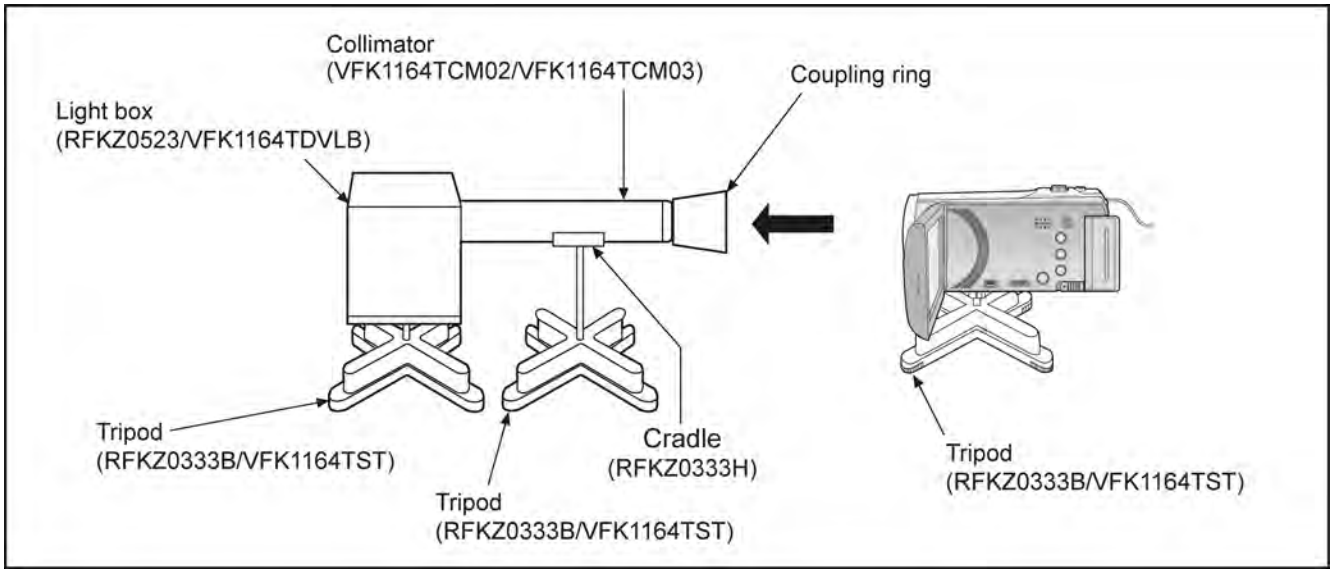


Figure of image when adjustment



Part Number of jig

1. Basic Jig

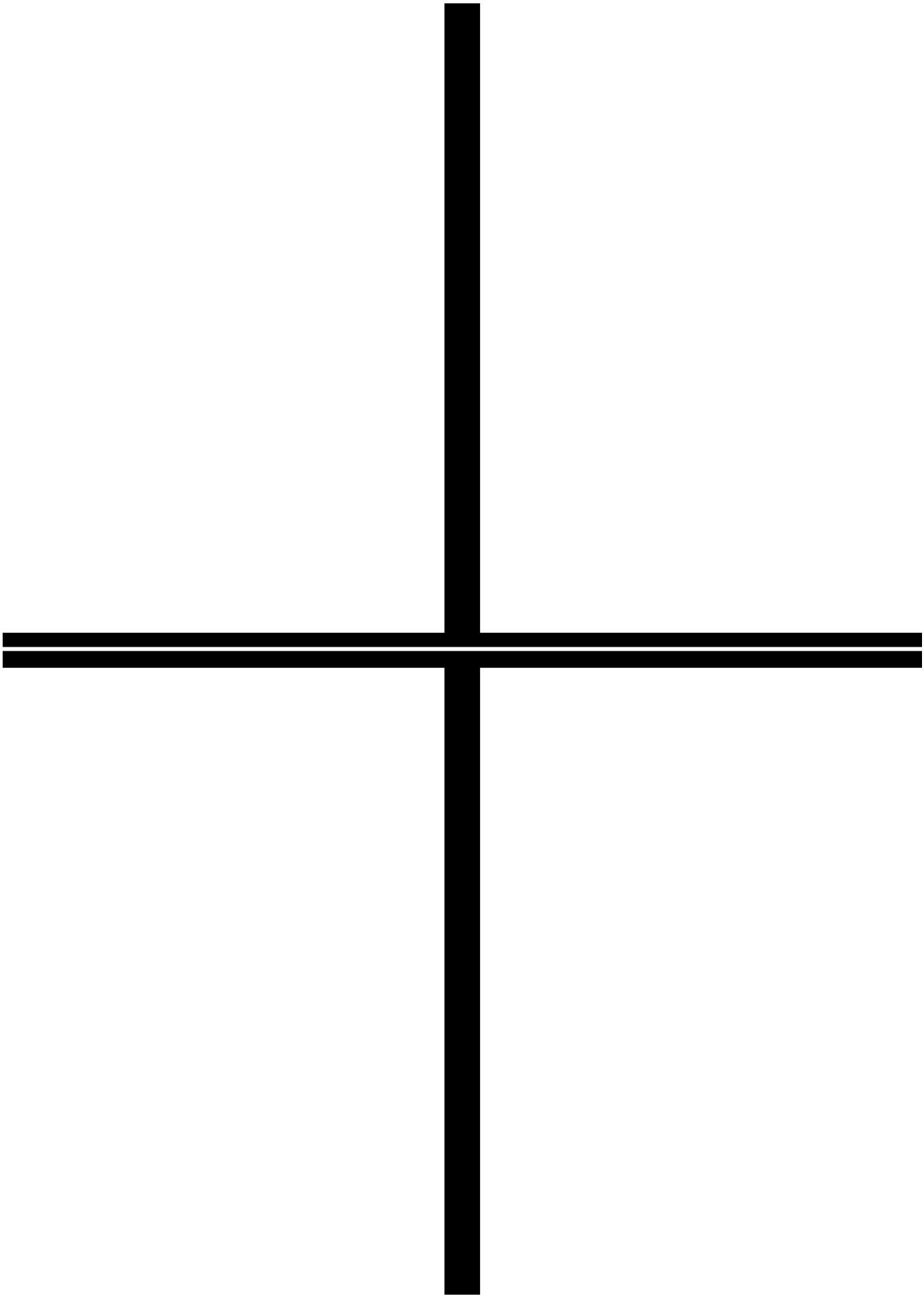
Item	Contents
AC adaptor	Bandled with camcorder
AC Cable	Bandled with camcorder
HDMI Cable	Bandled with camcorder

2. Optical Jig for Camera Adjustment

Item		Part number	Remarks
Light box		VFK1164TDVLB/RFKZ0523*	Need external power supply: 12V ± 0.1V /1.8A or over
Collimator with focus chart		VFK1164TCM02/VFK1164TCM03	Same as DSC
Coupling ring		For lens sizes	Collimator Joint to lens
CC filter	3100K/5100K	VFK1164CC10G	Need 2 set. For indoor/outdoor white balance adjutment
C2 Filter	5100K	VFK1164LBB2	For outdoor white balance adjustment
C8 Filter	5100K	VFK1164LBB8	For outdoor white balance adjustment
ND Filter 0.1	3100K	VFK1164ND01	For indoor white balance adjustment
ND Filter 0.6	3100K	VFK1164ND01	For indoor white balance adjustment
Adjustment chart for Level Shot		Bandled with this Manual	For Level shot adjustment

* RFKZ0523 (same as DSC) is recommended.

[Level Shot Adjutment Chart]



9.1.2. Adjustment Items

Adjustment item as follows.

Replacement part \ Adjustment item			Adjustments						Settings		
			Camera Adjutments *1 (Automatic)	Zoom Tracking Adjustment	Indoor White Balance Adjustment	Outdoor White Balance Adjustment	Level Shot adjustment *2	Touch Panel Calibration	Model setting	Factory settings	NFC initialization *3
MAIN P.C.B.	IC3801	NFC	–	–	–	–	○	–	–	○	○
	IC701	LENS DRIVE IC	○	○	–	–	○	–	–	–	–
	IC751	ROLL GYRO	○	–	–	–	○	–	–	–	–
	IC1001	7CH DC/DC IC	○	○	○	○	○	–	–	–	–
	IC1421	REG 3V IC	○	○	○	○	○	–	–	–	–
	IC3401	Spica	–	–	–	–	○	–	–	–	–
	IC3403	FLASH ROM	○	○	○	○	○	–	○	○	○
	MAIN P.C.B. U		○	○	○	○	○	–	○	○	○
SD HOLDER P.C.B.	IC6401	PIT/YAW GYRO	○	–	–	–	○	–	–	–	–
	IC6411	ACCELEROMETER	–	–	–	–	○	–	–	–	–
MOS P.C.B.	IC201	MOS	○	○	○	○	○	–	–	–	–
Wi-Fi P.C.B. *3	IC3001	Wi-Fi MODULE	–	–	–	–	○	–	–	○	○
ESD P.C.B. *4	IC3201	ESD	–	–	–	–	○	–	–	–	–
LENS (W/O MOS)			○	○	○	○	○	–	–	–	–
MOS			○	○	○	○	○	–	–	–	–
LENS U (W/ MOS)			○	○	○	○	○	–	–	–	–
LCD U			–	–	–	–	–	○	–	–	–

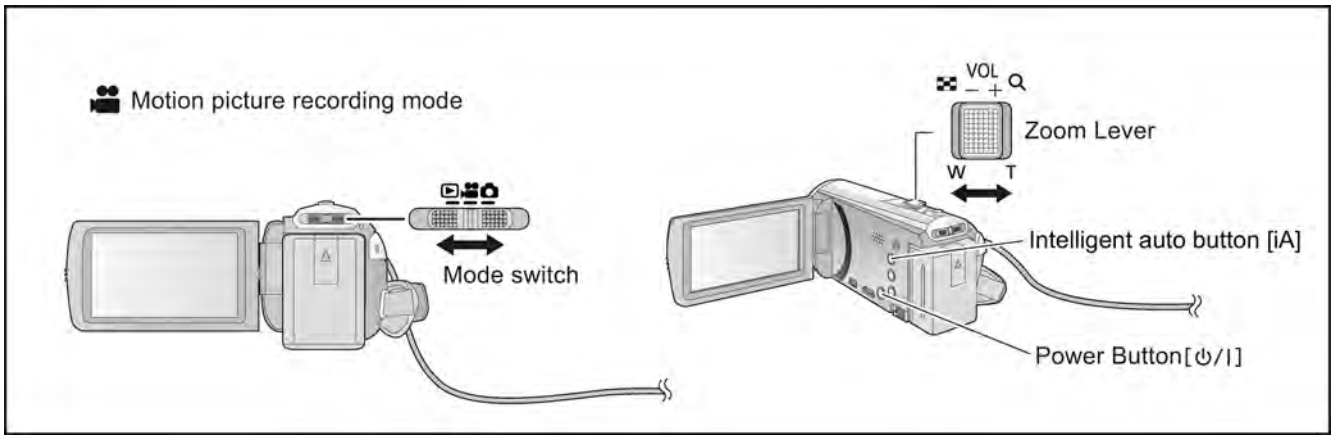
*1…IRIS adjustment, OIS hall amp adjustment, Missing pixels compensation, OIS gyro adjustment, AGS adjustment , Zoom hysteresis adjustment (detect the volume of hysteresis)
*2…Accelerometer : Since the assembly is accompanied, always need to be adjusted.
When the Wi-Fi P.C.B. and/or ESD P.C.B. can be replaced only removing the Side Case-L Unit, no need for adjustment.
*3…HC-V520M/V520 only
*4…HC-V520M only

9.1.3. Adjustment Procedure

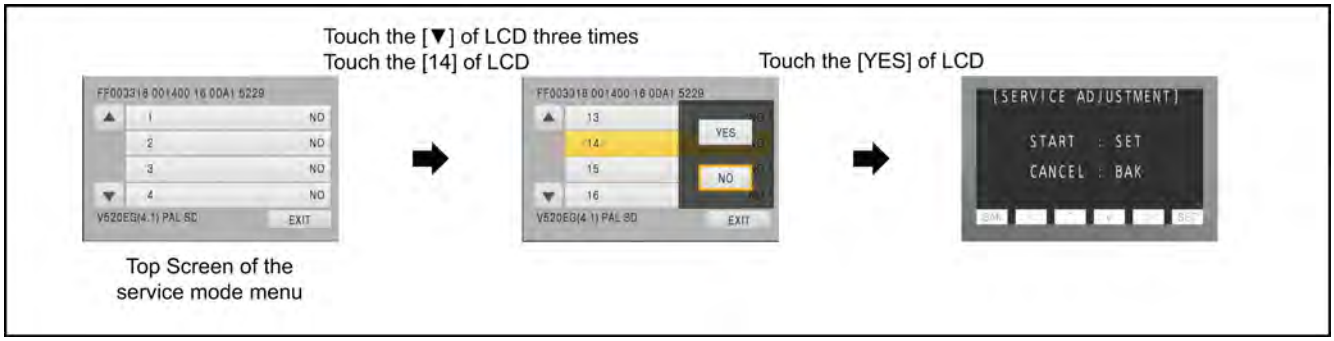
All adjustments except “Touch Panel Calibration”, “Factory Setting” and “NFC Initialization” performs using “14 Adjustment function for the service” in service mode menu.
“Touch Panel Calibration” is performed using 16 of service mode menu and “Factory Setting” is performed using 1, “NFC Initialization” is performed using 17 of service mode menu. Refer to “6 Service mode” and “9 Factory Setting”.

[Execute adjustment function for service]

1. Set the mode switch “Motion Picture Recording” mode.
2. While the power is turned OFF, keep pressing the “Power” button, “Zoom lever” to W side and “intelligent auto/Manual” button for more than 3 seconds until the top screen of the Service Mode Menu being displayed.



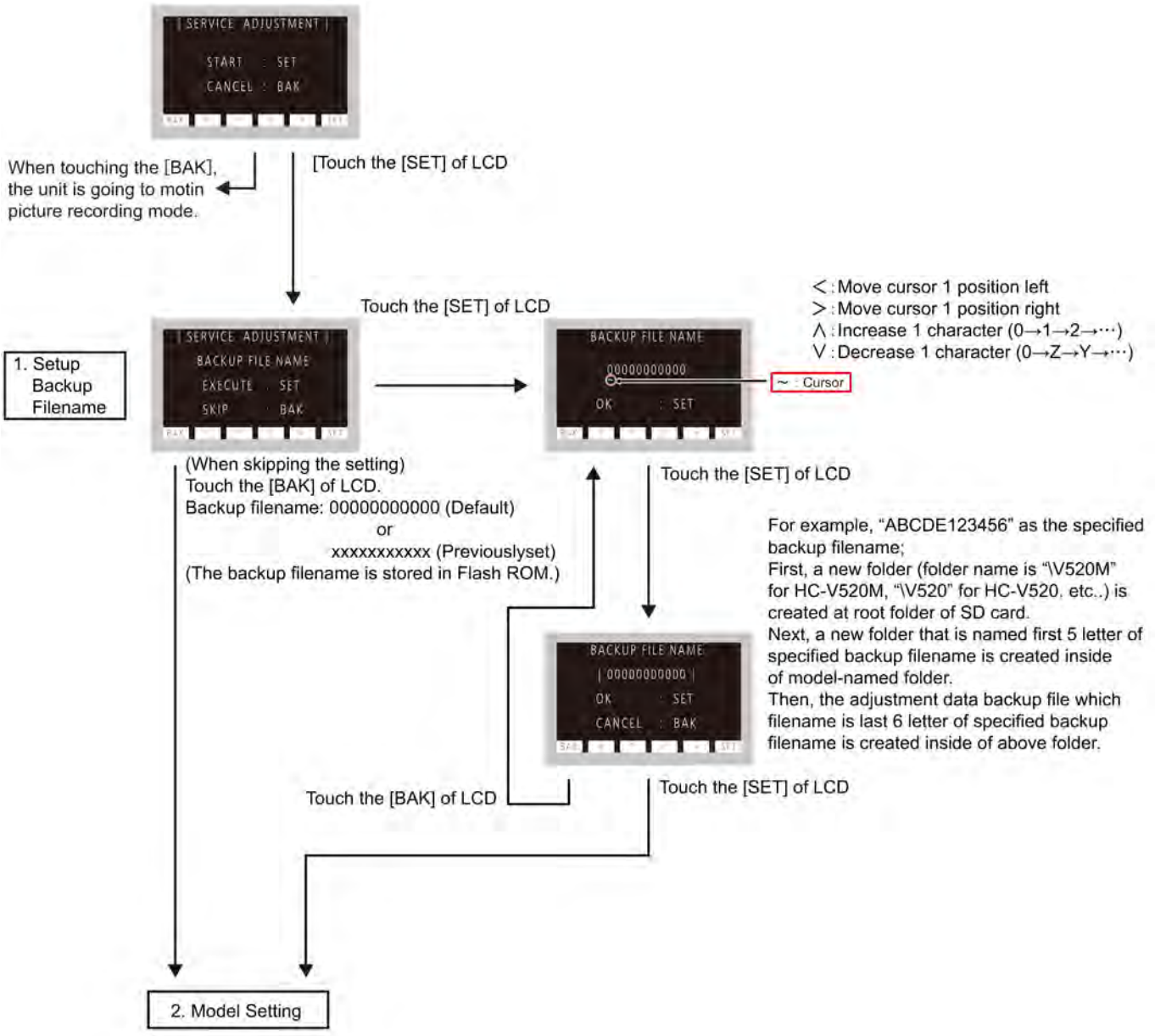
3. Touch the ▼ 3 times then touch the [14] of LCD.
4. Touch the [YES] of LCD.



[Adjustment Procedure]

Adjustments and settings are performed following order:

1. Filename setting for backup to SD card
2. Model setting
3. Backing up adjustment data to SD card
4. Checking switches
5. Camera adjustment (Iris, Gyro, OIS, Missing pixels compensation)
6. Zoom/tracking adjustment
7. Indoor white balance adjustment (CH GAIN, PWM, WB)
8. Outdoor white balance adjustment (PWM, WB)
9. Level shot adjustment



2. Model Setting

Touch the [SET] of LCD

[When the model not sets]

The model setting is needed if the Main P.C.B. or Flash ROM (IC3403) is replaced.

> : Cursor

Touch [V] or [Λ] several times, move the cursor to desire model position.

(When skipping the model setting) Touch the [BAK] of LCD.

Touch the [SET] of LCD

[When the model already sets]

When model setting is compleated, model that can be selected is limited.

Touch the [SET] of LCD

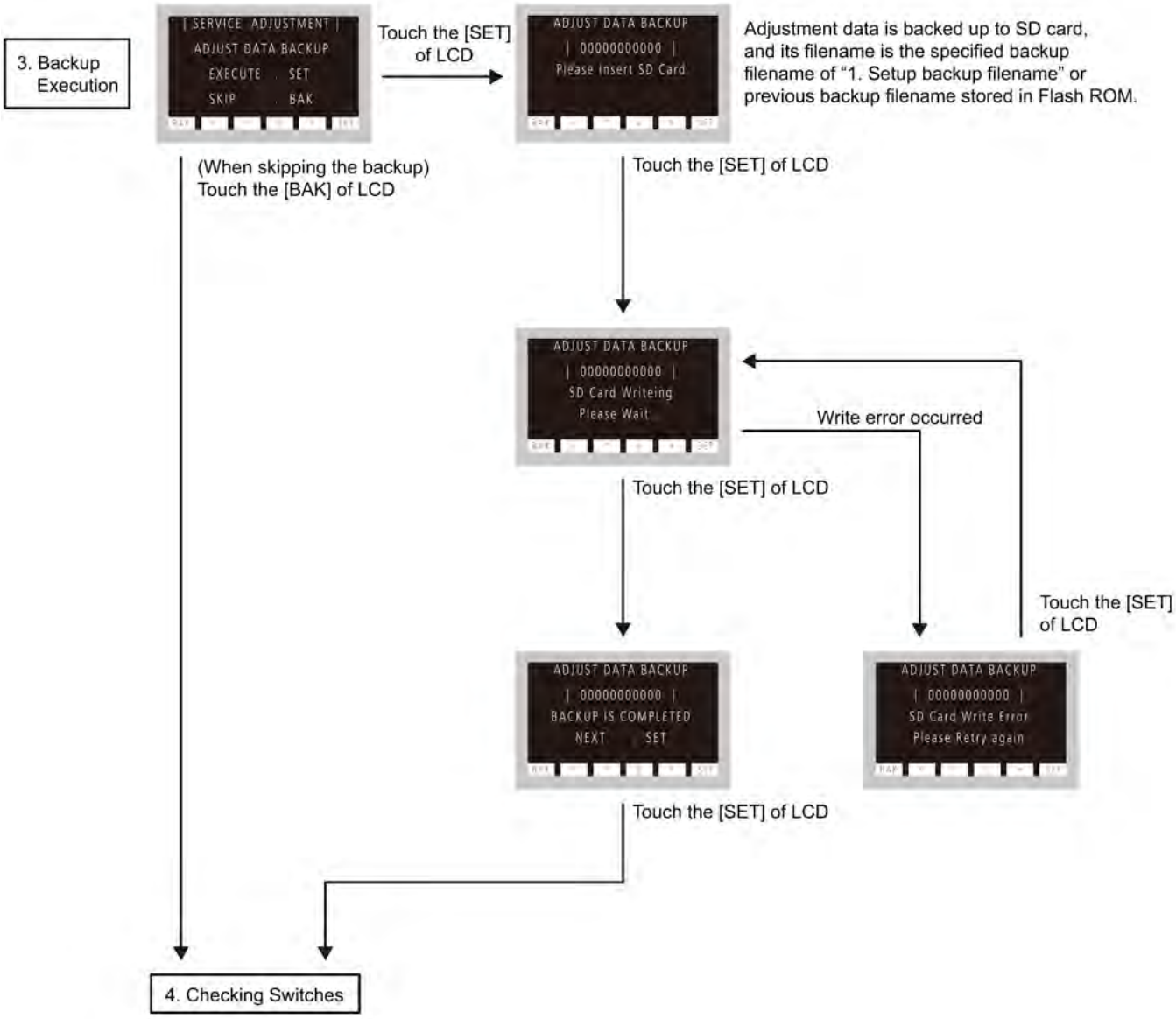
Touch the [SET] of LCD

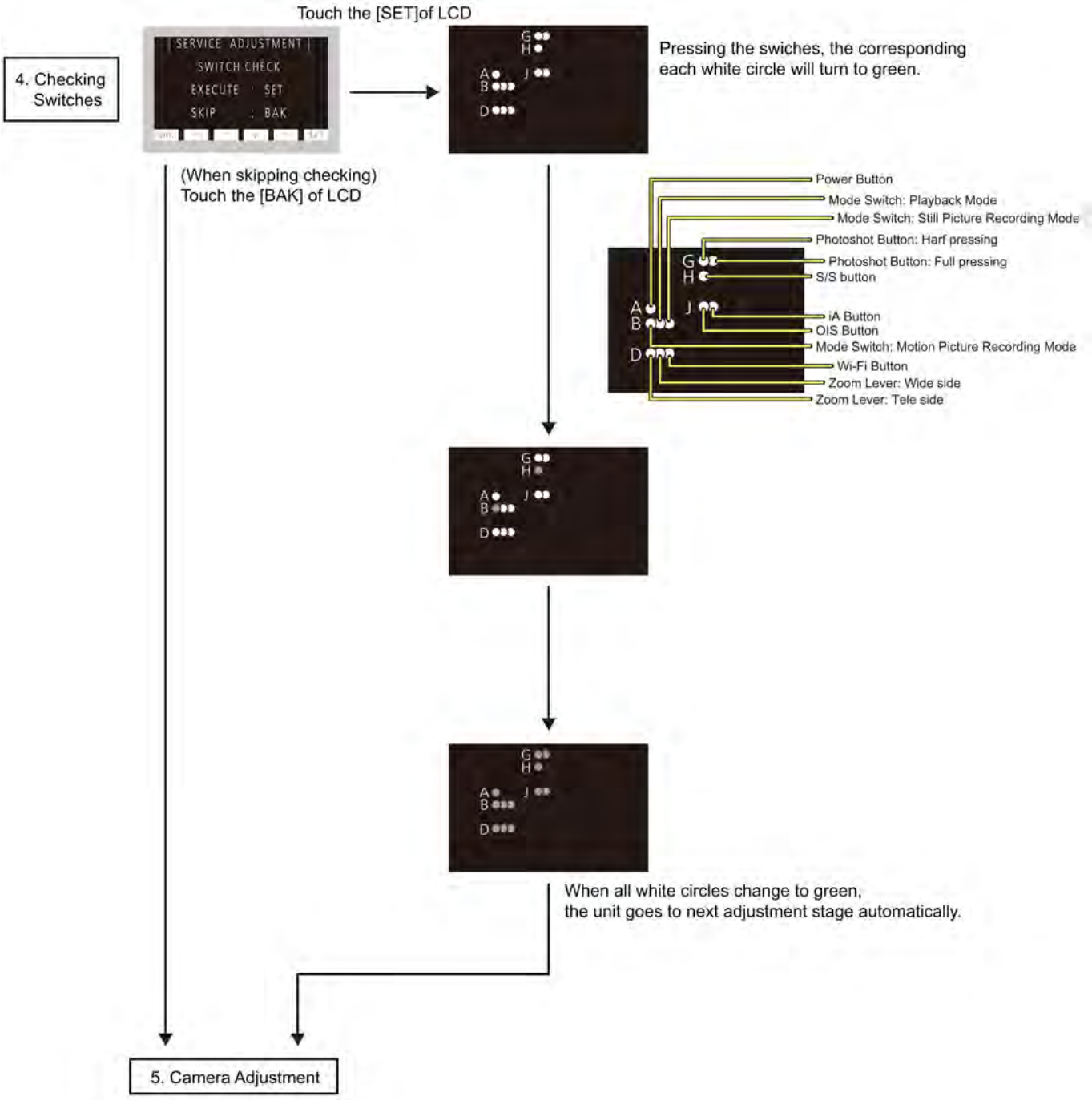
Touch the [SET] of LCD to set the model

Now setting the model

Touch the [SET] of LCD

3. Backup Execution


3. Backup Execution
[SERVICE ADJUSTMENT]
ADJUST DATA BACKUP
EXECUTE SET
SKIP BAK
Touch the [SET] of LCD
ADJUST DATA BACKUP
[00000000000]
Please Insert SD Card
Adjustment data is backed up to SD card, and its filename is the specified backup filename of "1. Setup backup filename" or previous backup filename stored in Flash ROM.
(When skipping the backup)
Touch the [BAK] of LCD
Touch the [SET] of LCD
ADJUST DATA BACKUP
[00000000000]
SD Card Writeing
Please Wait
Write error occurred
Touch the [SET] of LCD
Touch the [SET] of LCD
ADJUST DATA BACKUP
[00000000000]
BACKUP IS COMPLETED
NEXT SET
ADJUST DATA BACKUP
[00000000000]
SD Card Write Error
Please Retry again
Touch the [SET] of LCD
4. Checking Switches


4. Checking Switches
Touch the [SET]of LCD
SERVICE ADJUSTMENT
SWITCH CHECK
EXECUTE : SET
SKIP : BAK
Pressing the swiches, the corresponding each white circle will turn to green.
(When skipping checking)
Touch the [BAK] of LCD
Power Button
Mode Switch: Playback Mode
Mode Switch: Still Picture Recording Mode
Photoshot Button: Harf pressing
Photoshot Button: Full pressing
S/S button
iA Button
OIS Button
Mode Switch: Motion Picture Recording Mode
Wi-Fi Button
Zoom Lever: Wide side
Zoom Lever: Tele side
When all white circles change to green,
the unit goes to next adjustment stage automatically.
5. Camera Adjustment

5. Camera Adjustment

Touch the [SET] of LCD

WT : Waiting for Adjust
RUN : Now adjuting
OK : Normal Condition
NG : Abnormal Condition
-- : Excluded

(When skipping the adjustment)
Touch the [BAK] of LCD

Adjustment Item	
LOCK	Confirmation that the lens lock has not occurred.
TEMP	Confirmation that the lens thermistor detects no abnormal temperature. (The lens thermistor detects the temperature -5°C to 80°C)
GYRO	Result of Gyro DC compensation
IRIS	Result of Iris adjustment
OIS	Result of OIS adjustment
KIZU	Result of missing pixels compensation
HYS	Result of zooming hysteresis compensation
WIFI	(Excluded)
RTC	Result of the RTC working normally.
KEY	Confirmation that all switches on the unit are released.
JACK	(Excluded)
TOUCH	(Excluded)
FAN	(Excluded)
SENSOR	(Excluded)
FORMAT	(Excluded)
DTEST	(Excluded)

6. Zoom/Tracking Adjustment

6. Zoom/ Tracking Adjustment

Touch the [SET] of LCD

(When skipping adjustment)
Touch the [BAK] of LCD

[Touch the [SET] of LCD

Touch the [SET] of LCD

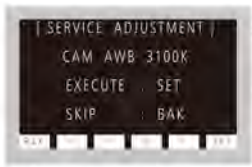
7. WB Adjustment (Indoor)

■Adjustment Conditions
- Set up the collimator with focus chart in front of the lens.
- Set up the angle of view into near the center of the test chart at the tete edge.

■Adjustment Jig
- Collimator with focus chart.

■Other
- The focus adjustment value always starts from initial valne.
  *Supposing the adjustment after the lens replacement.

7. WB Adjustment (Indoor)



Touch the [SET] of LCD

(When skipping adjustment)
Touch the [BAK] of LCD

Touch the [SET] of LCD

■Adjustment Conditions
- Set up the position of light box to be fully displayed at the LCD.
- Stack two piece of CC filter and set up them in front of the lens.
- Stack ND filter (0.1) and (0.6), then set up then in front of the lens.

■Adjustment Jig
- Light box
- CC filter x 2
- ND filter (0.1)
- ND filter (0.6)

■Adjustment Item

CH GAIN	Channel Gain : Indoor
PWM	WB gain depend on IRIS/PWM : Indoor
WB	White Balance : Indoor

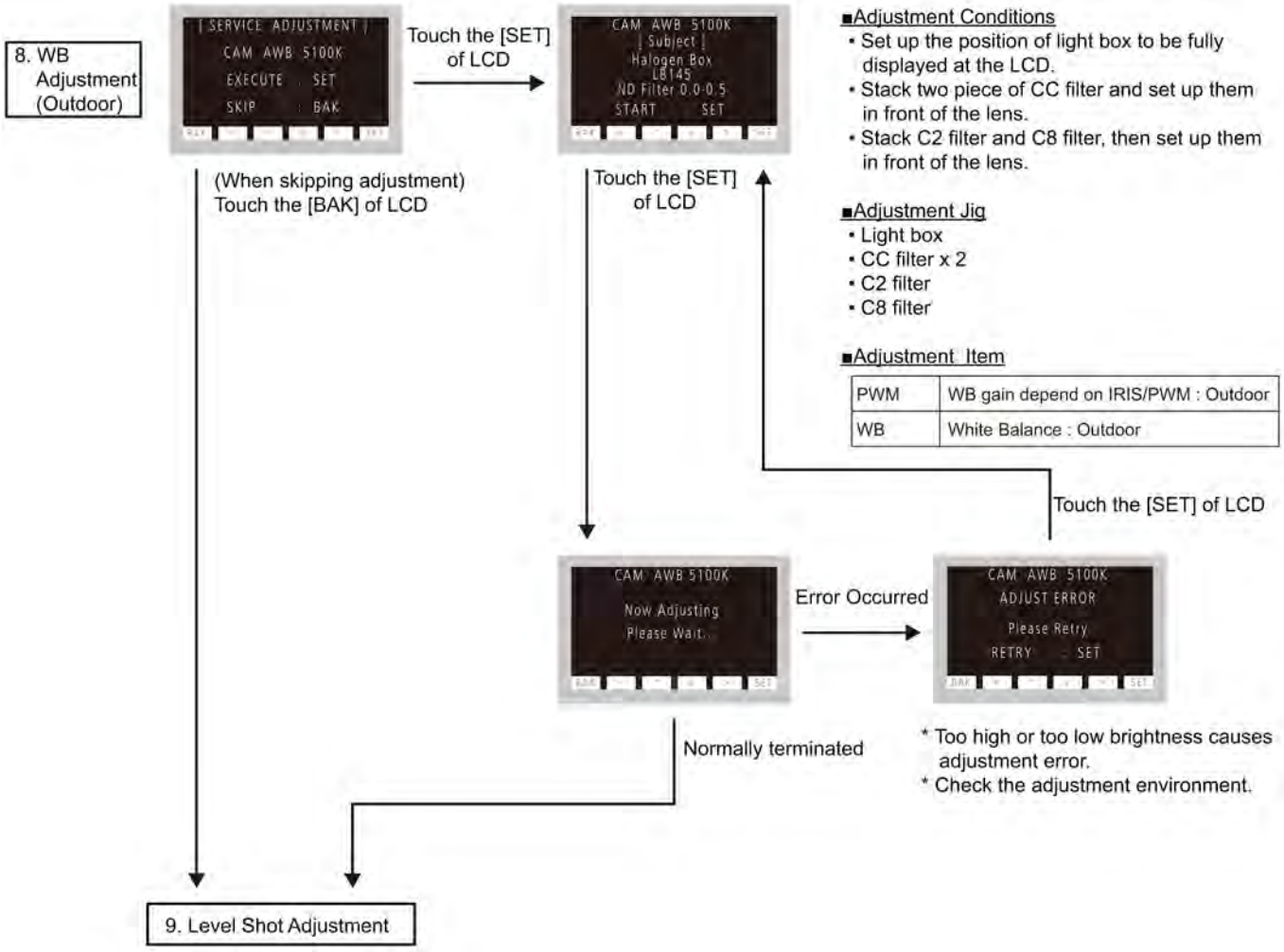
Touch the [SET] of LCD

Error Occurred

Normally terminated

* Too high or too low brightness causes adjustment error.
* Check the adjustment environment.

8. WB Adjustment (Outdoor)

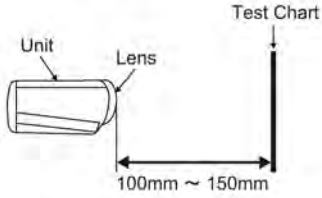

8. WB Adjustment (Outdoor)
[SERVICE ADJUSTMENT]
CAM AWB 5100K
EXECUTE : SET
SKIP : BAK
Touch the [SET] of LCD
CAM AWB 5100K
[Subject]
Halogen Box
LB145
ND Filter 0.0-0.5
START SET
(When skipping adjustment)
Touch the [BAK] of LCD
Touch the [SET] of LCD
■Adjustment Conditions
• Set up the position of light box to be fully displayed at the LCD.
• Stack two piece of CC filter and set up them in front of the lens.
• Stack C2 filter and C8 filter, then set up them in front of the lens.
■Adjustment Jig
• Light box
• CC filter x 2
• C2 filter
• C8 filter
■Adjustment Item
PWM | WB gain depend on IRIS/PWM : Outdoor
WB | White Balance : Outdoor
Touch the [SET] of LCD
CAM AWB 5100K
Now Adjusting
Please Wait...
Error Occurred
CAM AWB 5100K
ADJUST ERROR
Please Retry
RETRY : SET
* Too high or too low brightness causes adjustment error.
* Check the adjustment environment.
Normally terminated
9. Level Shot Adjustment

9. Level Shot Adjustment

Touch the [SET] of LCD

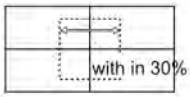
■Adjustment Conditions
- Open the LCD and turn reverse, then close.
- Shot the test chart to be displayed in full screen.

Distance (between end of lens and the chart):
100mm～150mm



- Unit Installation Condition
  Horizontal Tilt (ROLL) : with in ±1.45°
  Vertical Tilt (PITCH) : with in ±0.8°

■Adjustment Jig
- Test Chart



[Chart Size]
A4
Print the test chart that white line to be 0.7mm width inside the vertical line.
[Test Angle]
Confirm that the vertical line is with in ±30% of the center of the screen.
Confirm that the horizontal line is displayed in both ends of screen.

[Test Chart Levelness]
Horizontal tilt (ROLL) : with in ±0.1°
Horizontal tilt (YAW) : with in ±5.0°
Vertical tilt (PITCH) : with in ±5.0°

(When skipping adjustment)
Touch the [BAK] of LCD

Press the [Photo shot] button

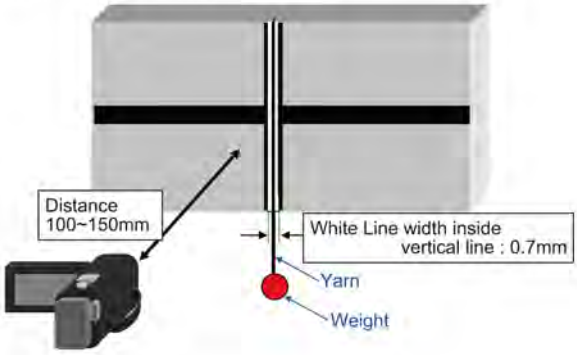
Touch the [SET] of LCD

Error Occurred

Normally terminated

Press the power button and turn off.
Adjustment completed.

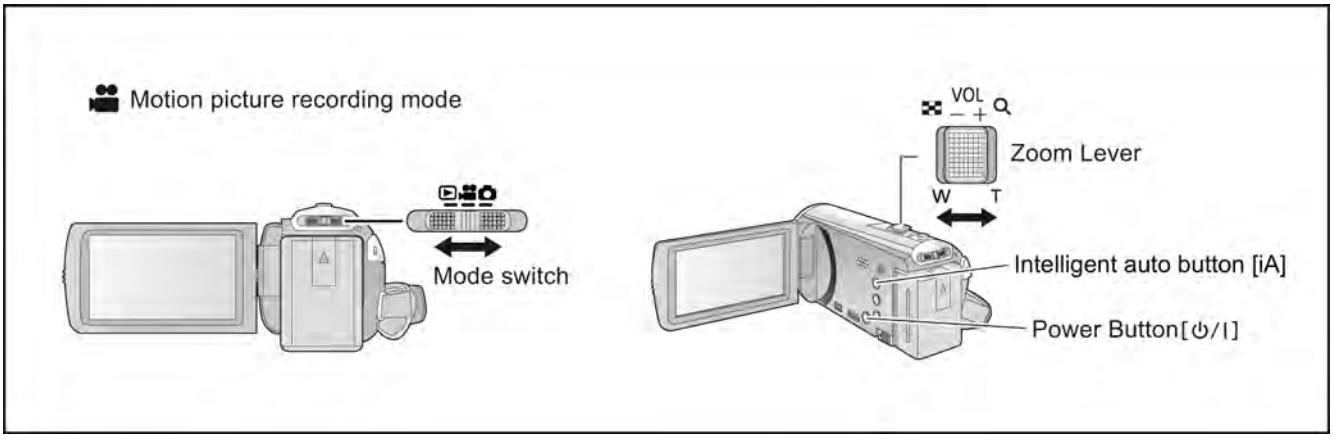
◇Level Management by Yarn Hanging



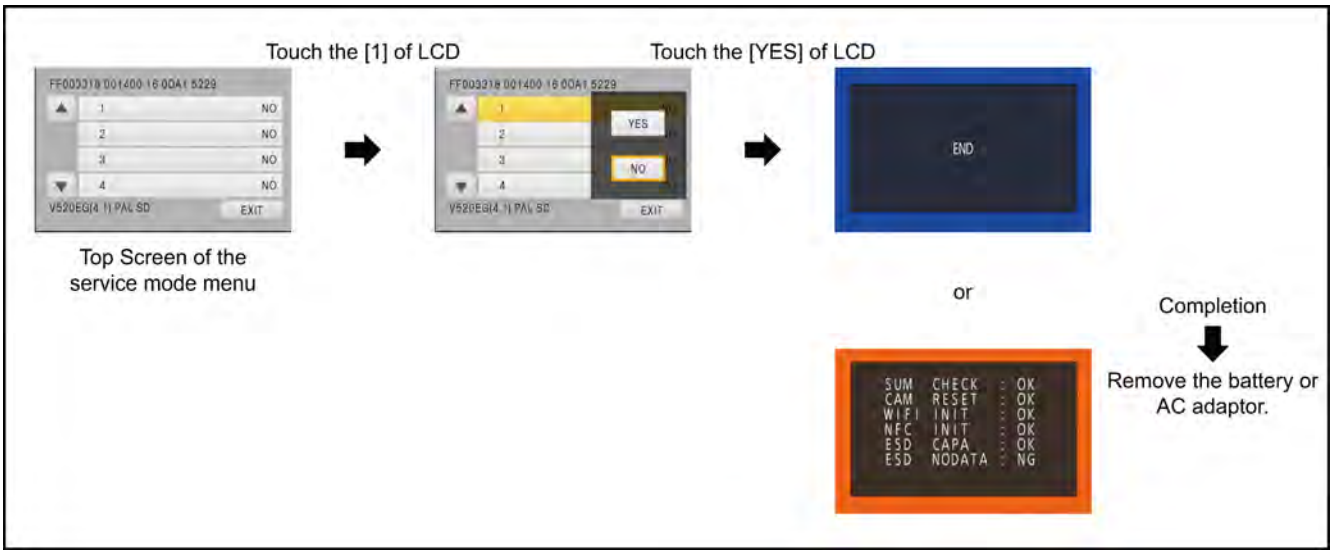
10 Factory Setting

10.1. How To Turn On The Factory Settings?

1. Set the mode switch “Motion Picture Recording” mode.
2. While the power is turned OFF, keep pressing the “Power” button, “Zoom lever” to W side and “intelligent auto/Manual” button for more than 3 seconds until the top screen of the Service Mode Menu being displayed.



3. Touch the [1] of LCD.
4. Touch the [YES] of LCD.
5. After few seconds “END” is displayed or “ESD NODATA” as “NG” is displayed on LCD monitor. Cutting of battery connection or AC power supply connection as a completion of the “FACTORY SETTINGS”.
   (After recording at least once, even if the physical format of the build-in memory will be performed, “ESD NODATA” as “NG” is indicated, but “FACTORY SETTINGS” is completed.)



10.2. What Is The Factory Settings?

The factory settings clean up and/or refresh the following settings.

1. MENU, MODE, ADJUSTMENT VALUE.
2. Reset the folder number and file number of still pictures.
   (Setting the folder number is 100, and file number is 0.)
3. Clear the time and date setting.
4. Close the lens cover
5. Initialize the VIERA Link Physical Address.
6. Initialize the Wi-Fi data settings (HC-V520/V520M only)
7. Initialize the NFC data settings (HC-V520/V520M only)
8. Confirm that the data area of built-in memory is cleared. (HC-V520M only)
9. Confirm that the built-in memory cappacity is correct. (HC-V520M only)
   (Checking of the built-in memory mounting error.)

(HC-V520M)

If the “Factory Settings” is completed, physical format of the build-in memory is not performed, execute physical format according to the following procedure.

To physically format the built-in memory, connect the unit via the AC adaptor, select [SETUP] →[FORMAT MEDIA] → [Built-inMemory] from the menu, and then press and hold the recording start/stop button on the screen below for about 3 seconds. When the built-in memory data deletion screen appears, select [YES], and then follow the on-screen instructions.

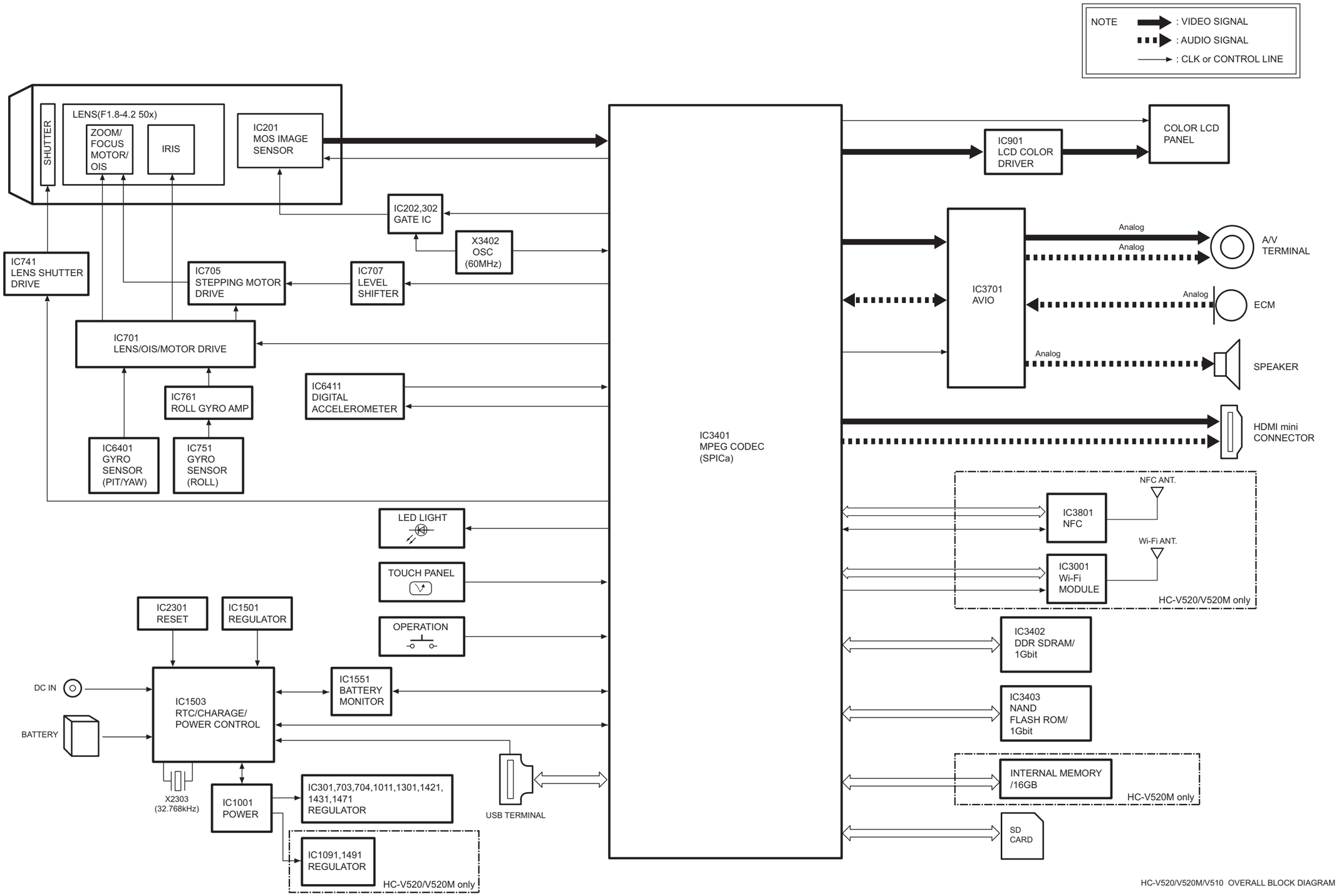
The setting position of factory settings:

Name	Setting position
Mode switch	Motion picture recording mode

11 Block Diagram

11.1. Overall Block Diagram

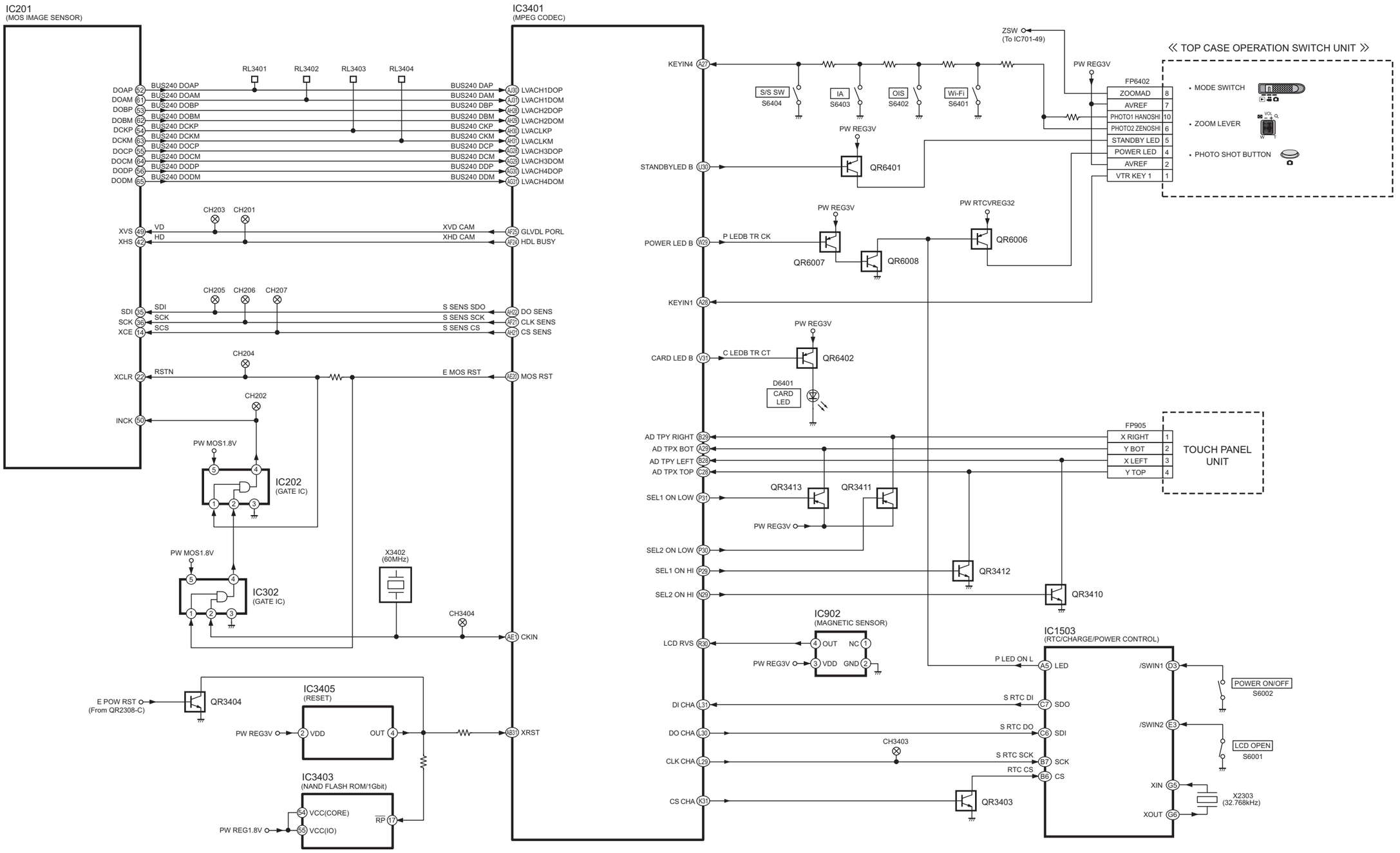
◆ OVERALL BLOCK DIAGRAM



HC-V520/V520M/V510 OVERALL BLOCK DIAGRAM

11.2. Camera/System Control Circuit Block Diagram

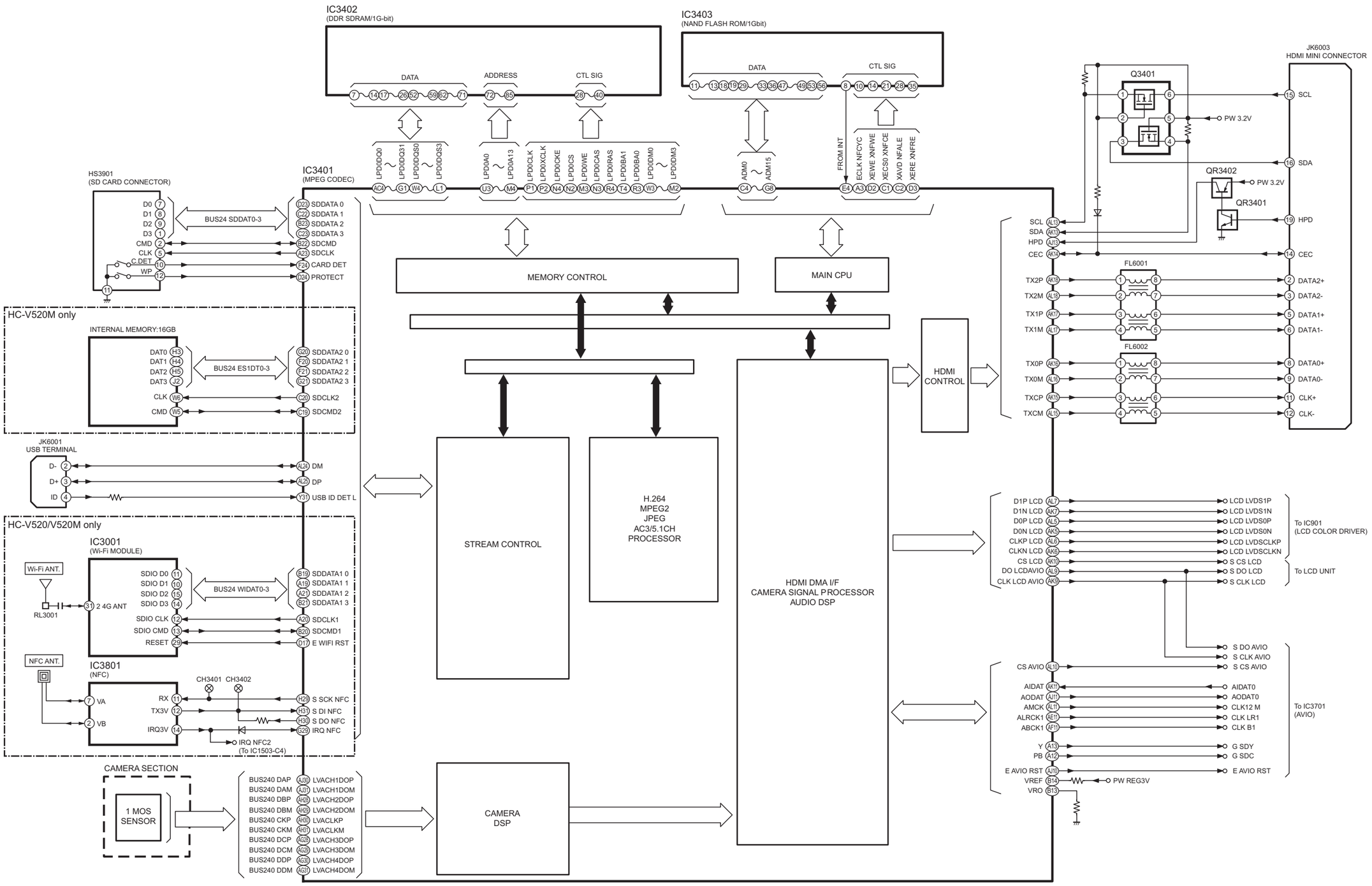
◆ CAMERA/SYSTEM CONTROL CIRCUIT BLOCK DIAGRAM



HC-V520/V520M/V510 CAMERA/SYSTEM CONTROL CIRCUIT BLOCK DIAGRAM

11.3. Video/Audio Signal Process(1) Circuit Block Diagram

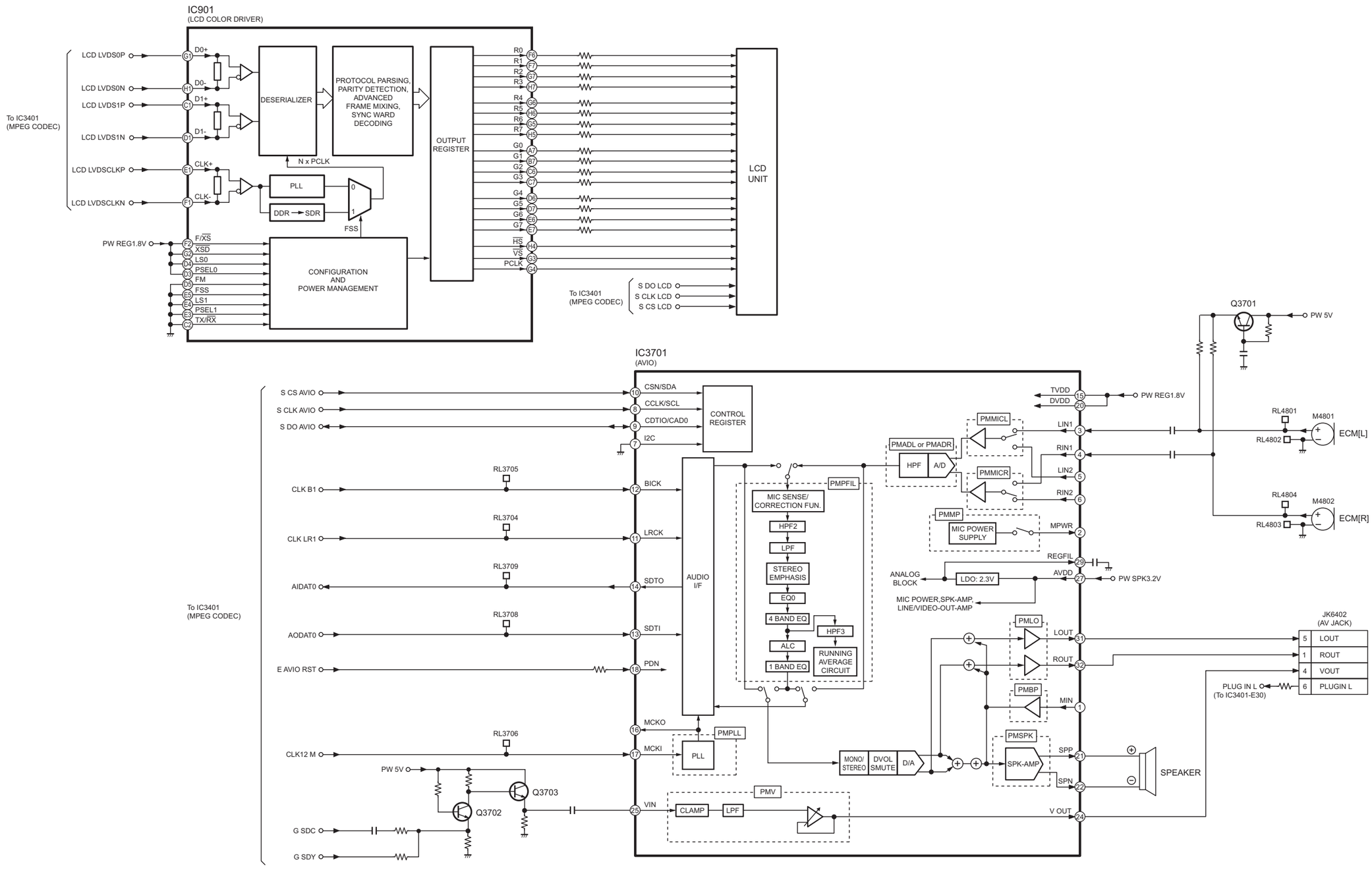
◆ VIDEO/AUDIO PROCESS(1) CIRCUIT BLOCK DIAGRAM



HC-V520/V520M/V510 VIDEO/AUDIO PROCESS(1) CIRCUIT BLOCK DIAGRAM

11.4. Video/Audio Signal Process(2) Circuit Block Diagram

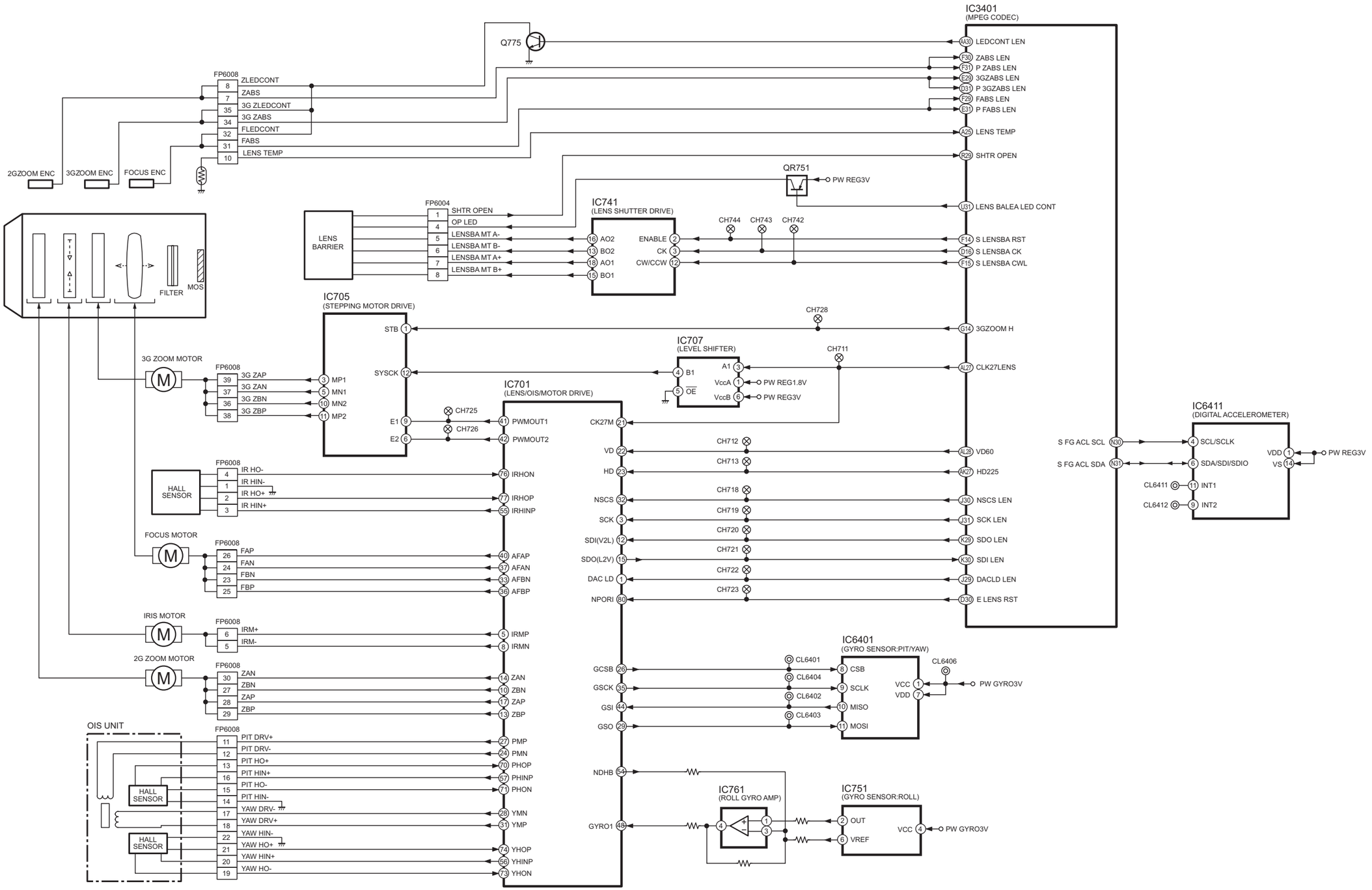
◆ VIDEO/AUDIO PROCESS(2) CIRCUIT BLOCK DIAGRAM



HC-V520/V520M/V510 VIDEO/AUDIO PROCESS(2) CIRCUIT BLOCK DIAGRAM

11.5. Lens Drive Circuit Block Diagram

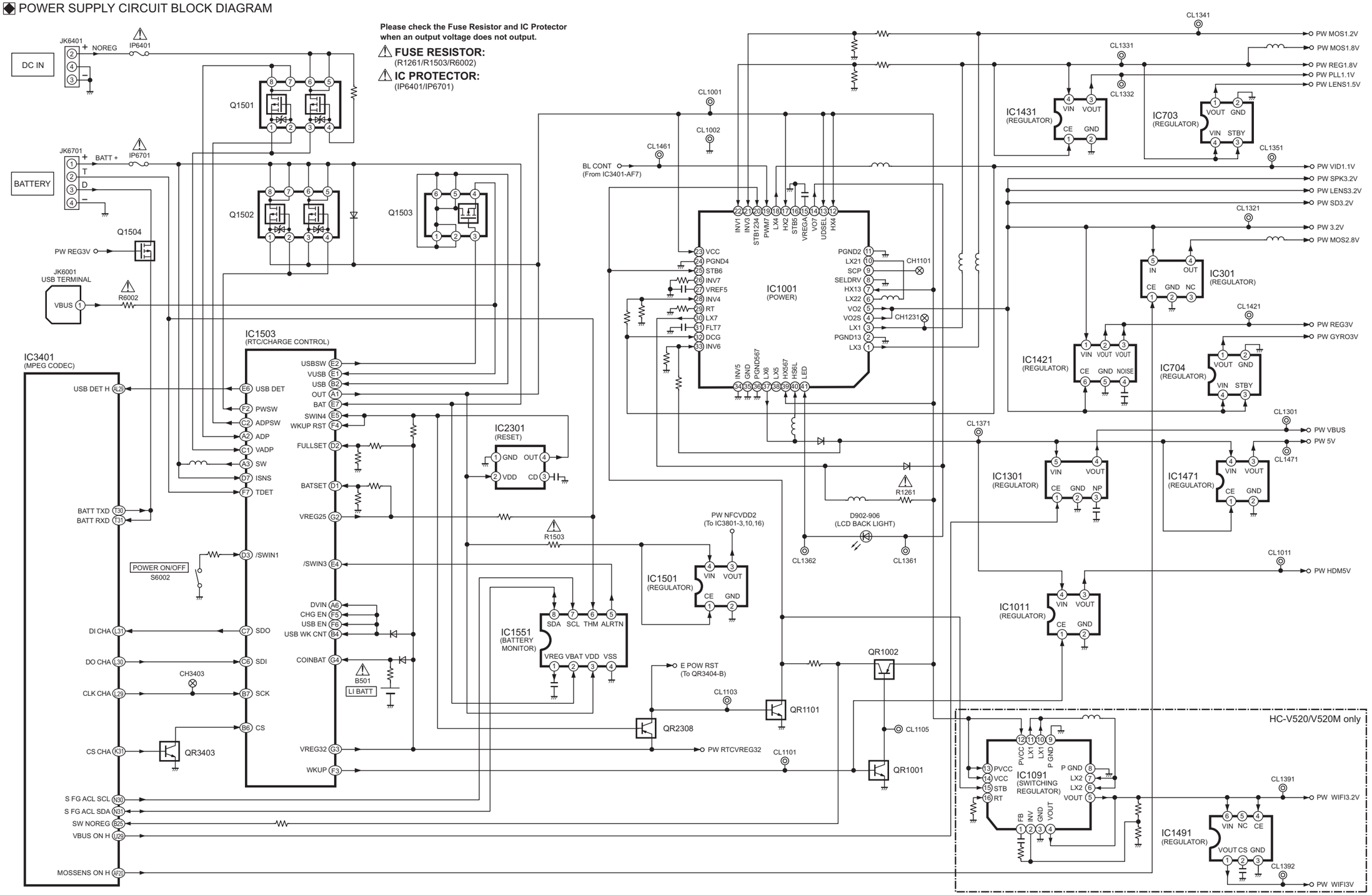
◆ LENS DRIVE CIRCUIT BLOCK DIAGRAM



HC-V520/V520M/V510 LENS DRIVE CIRCUIT BLOCK DIAGRAM

11.6. Power Supply Circuit Block Diagram

POWER SUPPLY CIRCUIT BLOCK DIAGRAM

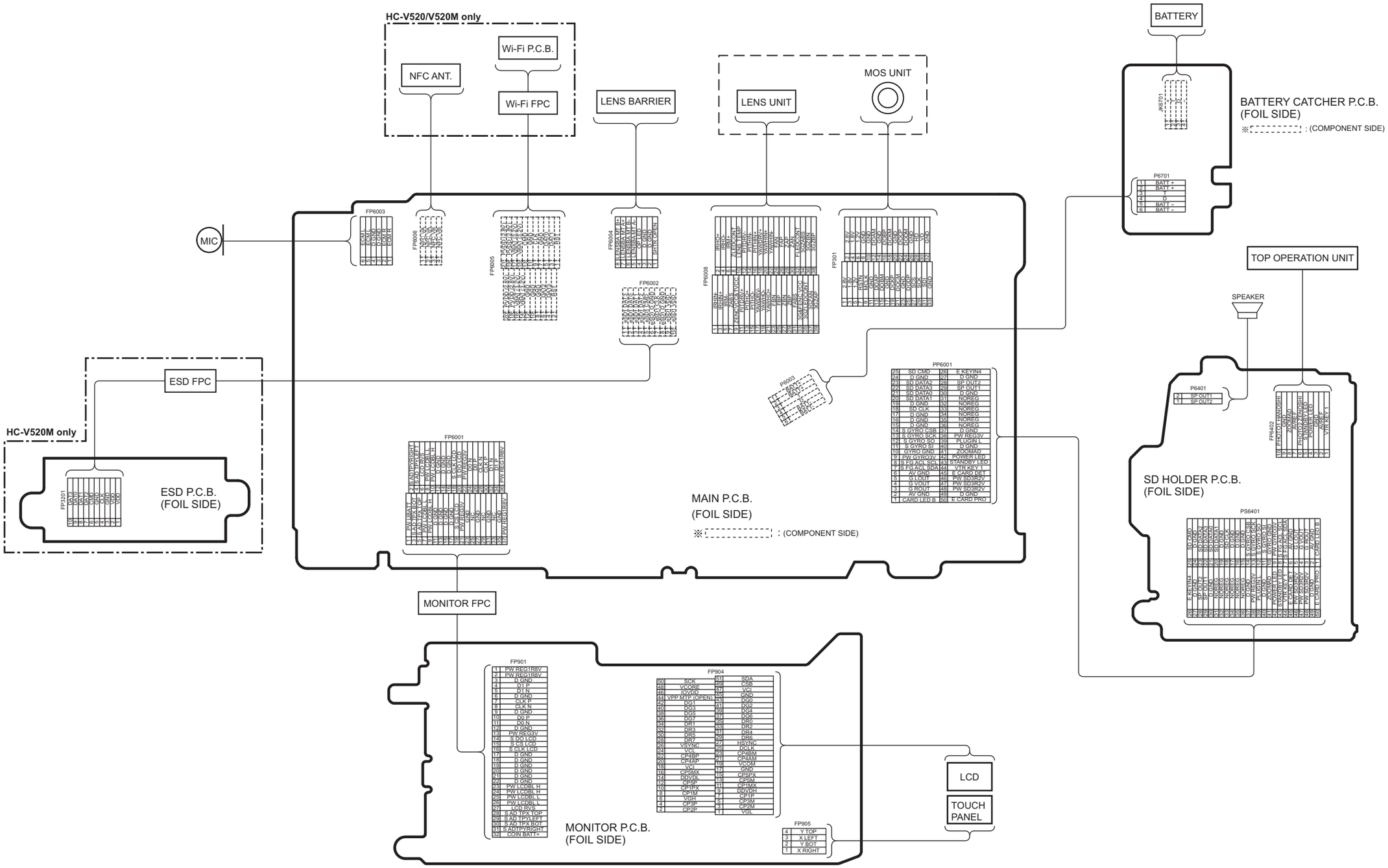


HC-V520/V520M/V510 POWER SUPPLY CIRCUIT BLOCK DIAGRAM

12 Wiring Connection Diagram

12.1. Interconnection Diagram

◆ INTERCONNECTION DIAGRAM



HC-V520/V520M/V510 INTERCONNECTION DIAGRAM