

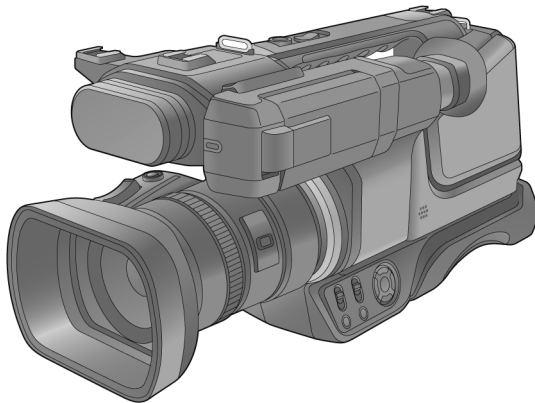
Service Manual

High Definition Video Camera



Model No. **HC-MDH2GC**
HC-MDH2GK
HC-MDH2MGC

Colour
(K).....Black Type



⚠ 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.

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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 $1\text{ M}\Omega$ and $5.2\text{ M}\Omega$. 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 $1.5\text{ k}\Omega$, 10 W resistor, in parallel with a $0.15\text{ }\mu\text{F}$ 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 $1\text{ k}\Omega/\text{V}$ 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 $1/2\text{ mA}$. 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

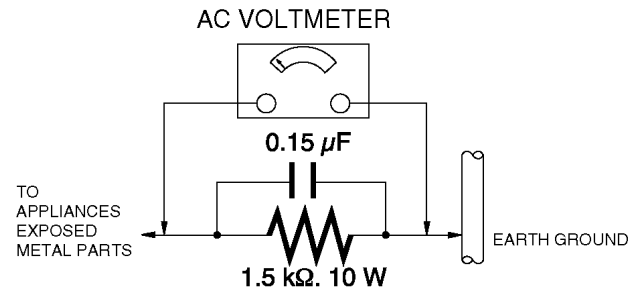


Figure. 1

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. Caution for AC Cord (For GC)

2.2.1. 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.

2.2.2. 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 safely.

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.

2.2.2.1. 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.

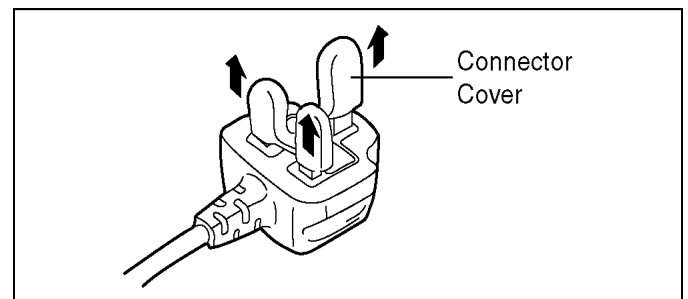
The wire which is coloured BROWN must be connected to the terminal in the plug which is marked with the letter L or coloured RED.

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.



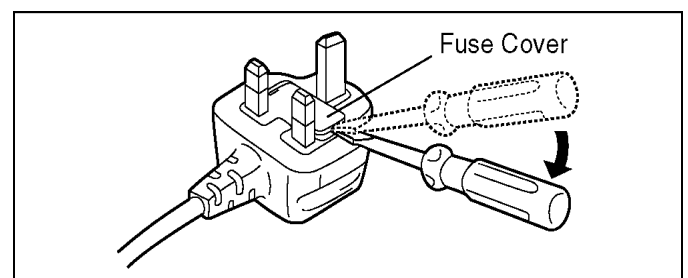
2.2.2.2. Before Use

Remove the Connector Cover as follows.

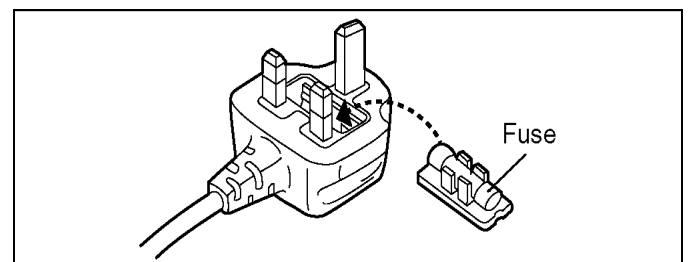


2.2.2.3. How to Replace the Fuse

1. Remove the Fuse Cover with a screwdriver.



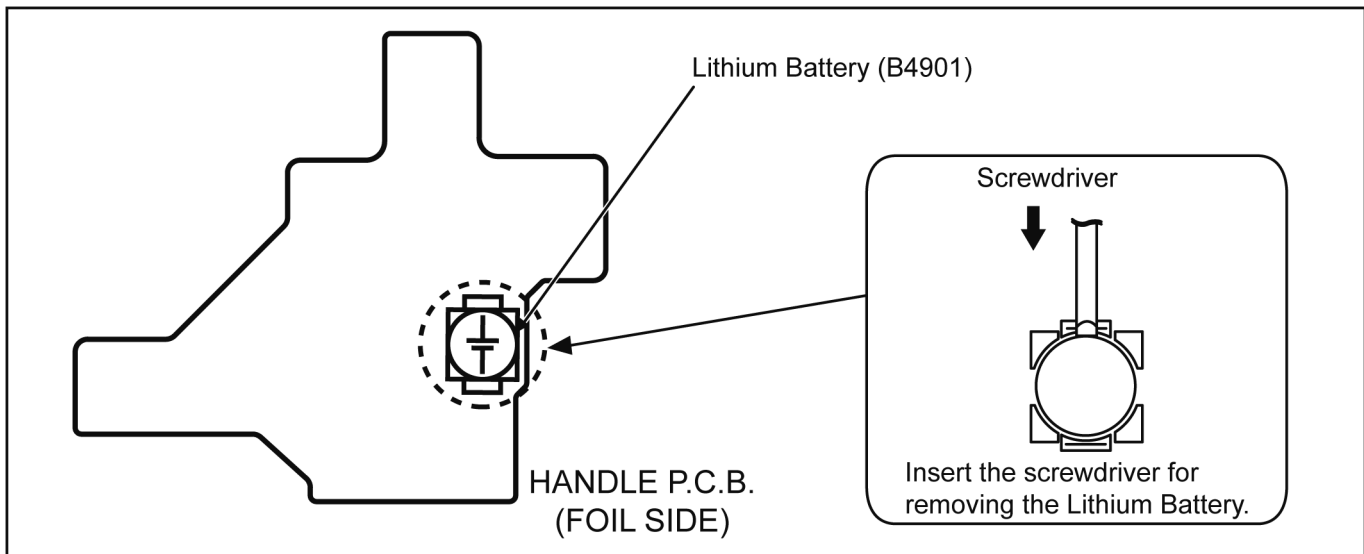
2. Replace the fuse and attach the Fuse cover.



2.3. How to Replace the Lithium Battery

2.3.1. Replacement Procedure

1. Remove the HANDLE P.C.B.. (Refer to Disassembly Procedures.)
2. Remove the Lithium battery (Ref. No. "B4901" at foil side of HANDLE P.C.B.) and then replace it into new one



NOTE:

This Lithium battery is a critical component.
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 same or equivalent type recommended by the manufacturer.
Dispose of used batteries according to the manufacturer's instructions.

(For German)

ACHTUNG

Explosionsgefahr bei falschem Anbringen der Batterie. Ersetzen Sie nur mit einem äquivalentem vom Hersteller empfohlenem Typ.
Behandeln Sie gebrauchte Batterien nach den Anweisungen des Herstellers.

(For French)

MISE EN GARDE

Une batterie de remplacement inappropriée peut exploser. Ne remplacez qu'avec une batterie identique ou d'un type recommandé par le fabricant. L'élimination des batteries usées doit être faite conformément aux instructions du fabricant.

NOTE:

Above caution is applicable for a battery pack which is for HC-MDH2/MDH2M series, as well.

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. How to Define the Model Suffix


There are two kinds of HC-MDH2/MDH2M.

- a) HC-MDH2GK
- b) HC-MDH2GC, MDH2MGC

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

3.3.1. Defining methods:

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

<p>a) HC-MDH2GK The nameplate for this model shows the following Safety registration mark.</p> <div style="text-align: center;"></div> <p>b) HC-MDH2GC, MDH2MGC The nameplate for these models do not show any above Safety registration mark.</p>

NOTE:

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

3.4. Formatting

The page number in this chapter does not show the page number of this service manual.

[FORMAT MEDIA]

The SD cards, built-in memory or external drive can be formatted.

- 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. (→ 96)

[HC-MDH2]

[SD CARD 1]/[SD CARD 2]/[EXTERNAL]*

[HC-MDH2M]

[Built-inMemory]/[SD CARD]/[EXTERNAL]*

* Displayed when connecting an external drive. (→ 82)

- When formatting is complete, select [EXIT] and press the button in the centre to exit the message screen.
- Perform a physical formatting of the SD card when the SD card is to be disposed/ transferred. (→ 131)
- [HC-MDH2M]
Perform a physical formatting of the built-in memory when this unit is to be disposed/ transferred. (→ 129)

- 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 data on 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.

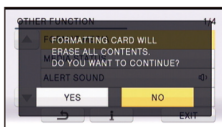
[HC-MDH2]

To physically format the SD card, connect the unit via the AC adaptor, select [OTHER FUNCTION] → [FORMAT MEDIA] → [SD CARD 1] or [SD CARD 2] from the menu, and then press and hold the recording start/stop button or sub 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-MDH2M]

To physically format the SD card, connect the unit via the AC adaptor, select [OTHER FUNCTION] → [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.

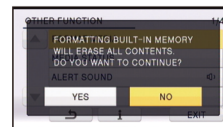


- The customer is responsible for the management of the data in the SD card.

[HC-MDH2M]

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 [OTHER FUNCTION] → [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.



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

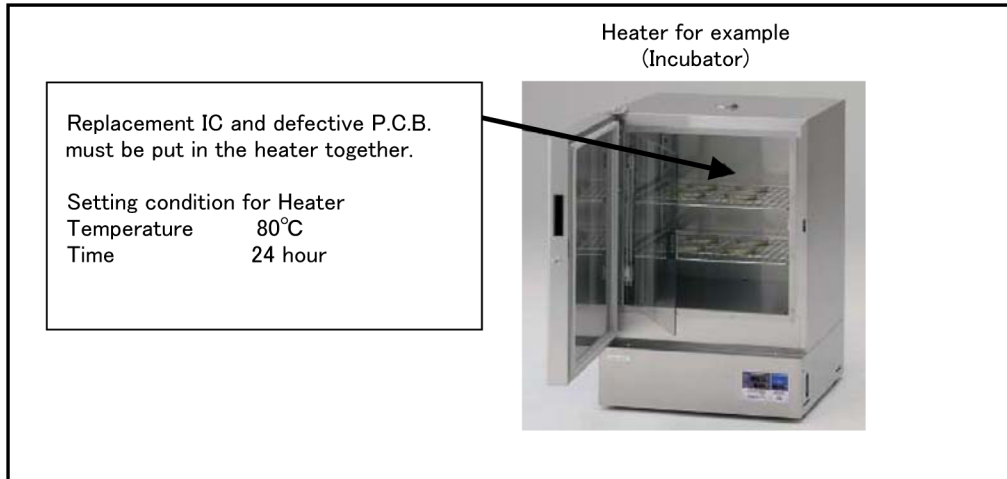
When replacing the CSP/BGA/QFN type IC mounted on the P.C.B., the problem of IC crack or foil pattern breaking in the P.C.B. might sometimes occur by rapid heating.

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

The page number in this chapter does not show the page number of this service manual.

High Definition Video Camera

Information for your safety

Power source:

DC 9.3 V (When using AC adaptor)
DC 7.2 V (When using battery)

Power consumption:

Recording; 6.7 W
Charging; 10.7 W

Motion picture recording format:

AVCHD format version 2.0 compliant (AVCHD Progressive)

Motion picture compression:

MPEG-4 AVC/H.264

Audio compression:

Dolby® Digital (2 ch)

Recording mode and transfer rate:

[1080/50p]; Maximum 28 Mbps (VBR)
[PH 1080/50i]; Maximum 24 Mbps (VBR)
[HA 1080/50i]; Average 17 Mbps (VBR)
[HG 1080/50i]; Average 13 Mbps (VBR)
[HE 1080/50i]; Average 5 Mbps (VBR)
[SA 576/50i]; Average 9 Mbps (VBR)
[SX 576/50i]; Average 4.5 Mbps (VBR)
Refer to "Recording formats/approximate recordable 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-MDH2M

Built-in memory; 32 GB

Image sensor:

1/2.33 type (1/2.33") 1MOS image sensor
Total; 17520 K
Effective pixels;
Motion picture*; 4140 K (16:9), 3110 K (4:3)
Still picture; 3240 K (4:3), 3240 K (3:2),
4140 K (16:9)
* When Level Shot Function is set to off

Lens:

Auto Iris, 21× optical zoom, F1.8 to F3.5
Focal length;
2.82 mm to 59.2 mm
Macro (Full range AF)
35 mm equivalent;
Motion picture;
28 mm to 729.6 mm (16:9),
36.2 mm to 893 mm (4:3)
Still picture;
33.9 mm to 712.6 mm (4:3),
33.2 mm to 697.6 mm (3:2),
28 mm to 729.6 mm (16:9)
Minimum focus distance;
Normal; Approx. 3.0 cm (Wide)/
Approx. 1.5 m (Tele)
Tele Macro; Approx. 60 cm (Tele)
Intelligent Auto Macro;
Approx. 1 cm (Wide)/Approx. 60 cm (Tele)

Filter diameter:

49 mm

Zoom:

i.Zoom OFF 26×, 50× i.Zoom, 60×/1500×
digital zoom
(Using image sensor effective area)

Image stabilizer function:

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

Monitor:

7.5 cm (3.0") wide LCD monitor (Approx. 460 K dots)

Viewfinder:

0.61 cm (0.24") wide EVF (Approx. 263 K dots equivalent)

Microphone:

Stereo (with a Zoom Microphone)

Minimum required illumination:

Approx. 2 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**Component connector video output level:**Y; 1.0 Vp-p, 75 Ω Pb; 0.7 Vp-p, 75 Ω Pr; 0.7 Vp-p, 75 Ω **HDMI connector video output level:**

HDMI™ Type A 1080p/1080i/576p

AV connector audio output level (Line):316 mV, 600 Ω , 2 ch**Headphone output:**77 mV, 32 Ω (Stereo mini jack)**HDMI connector audio output level:**

Dolby Digital/Linear PCM

MIC input:

-60 dBV (Mic sensitivity -40 dB equivalent,

0 dB=1 V/Pa, 1 kHz)

(Stereo mini jack)

USB:

Reader function

SD card; Read only (No copyright protection support)

HC-MDH2M

Built-in memory; Read only

Hi-Speed USB (USB 2.0),

[HOST]; USB terminal Type A

[DEVICE]; USB terminal Type Mini B

USB host function (for external drive)

Dimensions:

205 mm (W)×217 mm (H)×479 mm (D)

(including projecting parts)

Mass:

Approx. 2270 g

[without battery (supplied) and an SD card (optional)]

Mass in operation:

Approx. 2400 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"

AC adaptor

Information for your safety

Power source: AC 110 V to 240 V, 50/60 Hz Power consumption: 16 W DC output: DC 9.3 V, 1.2 A
--

Dimensions:

52 mm (W)×26 mm (H)×86.3 mm (D)

Mass:

Approx. 115 g

Recording formats/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 format		[1080/50p]	[PH 1080/50i]	[HA 1080/50i]	[HG 1080/50i]	[HE 1080/50i]
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-MDH2M Built-in memory	32 GB	2 h 40 min	3 h	4 h 10 min	5 h 30 min	13 h 40 min

- Ⓐ Favours image quality
- Ⓑ Favours Recording time

Recording format		[SA 576/50i]	[SX 576/50i]
Picture size/ Frame rate		720×576/ 50i	720×576/ 50i
SD card	4 GB	1 h	2 h
	16 GB	4 h	8 h
	64 GB	16 h 30 min	33 h
HC-MDH2M Built-in memory	32 GB	8 h	16 h

- "h" is an abbreviation for hour and "min" for minute.
- If recording for long periods, prepare batteries for 3 or 4 times the period you wish to record for. (→ 14)
- The default setting is [HG 1080/50i].
- 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		20.4m	9.4m	2.1m	
		6016×3384	4096×2304	1920×1080	
Aspect ratio		16:9			
SD card	4 GB	300	650	3200	
	16 GB	1300	2700	12500	
	64 GB	5000	10500	52000	
HC-MDH2M Built-in memory		32 GB	2700	5000	25000

Picture size		15.1m	5.8m	0.3m	
		4480×3360	2784×2088	640×480	
Aspect ratio		4:3			
SD card	4 GB	400	1000	28000	
	16 GB	1700	4100	117000	
	64 GB	7000	16500	475000	
HC-MDH2M Built-in memory		32 GB	3600	8000	235000

Picture size		15.1m	8m	2m	
		4752×3168	3456×2304	1728×1152	
Aspect ratio		3:2			
SD card	4 GB	400	750	2200	
	16 GB	1700	3100	8500	
	64 GB	7000	12500	36000	
HC-MDH2M Built-in memory		32 GB	3600	6000	18000

- 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.:



- Please check the latest information on the support website below.
http://panasonic.jp/support/global/cs/e_cam
(This website is in English only.)
- 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. (→ 93)
- 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 motion picture 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

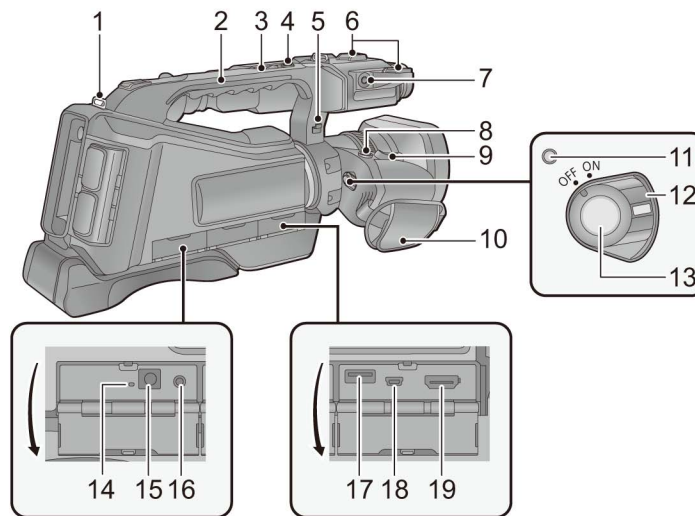
- Temperature: 25 °C/humidity: 60%RH
- When using the viewfinder (times in parentheses are when using the LCD monitor)
- These charging times are for when the unit is turned off.





Battery model number [Voltage/Capacity (minimum)]	Charging time	Recording format	Maximum continuous recordable time	Actual recordable time
Supplied battery [7.2 V/2900 mAh]	4 h	[1080/50p]	5 h 25 min (5 h 10 min)	3 h 20 min (3 h 10 min)
		[PH 1080/50i]	5 h 45 min (5 h 25 min)	3 h 35 min (3 h 20 min)
		[HA 1080/50i]	5 h 45 min (5 h 30 min)	3 h 35 min (3 h 20 min)
		[HG 1080/50i]/ [HE 1080/50i]	5 h 50 min (5 h 30 min)	3 h 35 min (3 h 25 min)
		[SA 576/50i]/ [SX 576/50i]	6 h 10 min (5 h 50 min)	3 h 50 min (3 h 35 min)
CGA-D54s (optional) [7.2 V/5400 mAh]	7 h	[1080/50p]	10 h 40 min (10 h 10 min)	6 h 35 min (6 h 15 min)
		[PH 1080/50i]	11 h 15 min (10 h 40 min)	7 h (6 h 35 min)
		[HA 1080/50i]	11 h 20 min (10 h 45 min)	7 h (6 h 40 min)
		[HG 1080/50i]	11 h 25 min (10 h 50 min)	7 h 5 min (6 h 40 min)
		[HE 1080/50i]	11 h 30 min (10 h 55 min)	7 h 5 min (6 h 45 min)
		[SA 576/50i]/ [SX 576/50i]	12 h 5 min (11 h 25 min)	7 h 30 min (7 h 5 min)

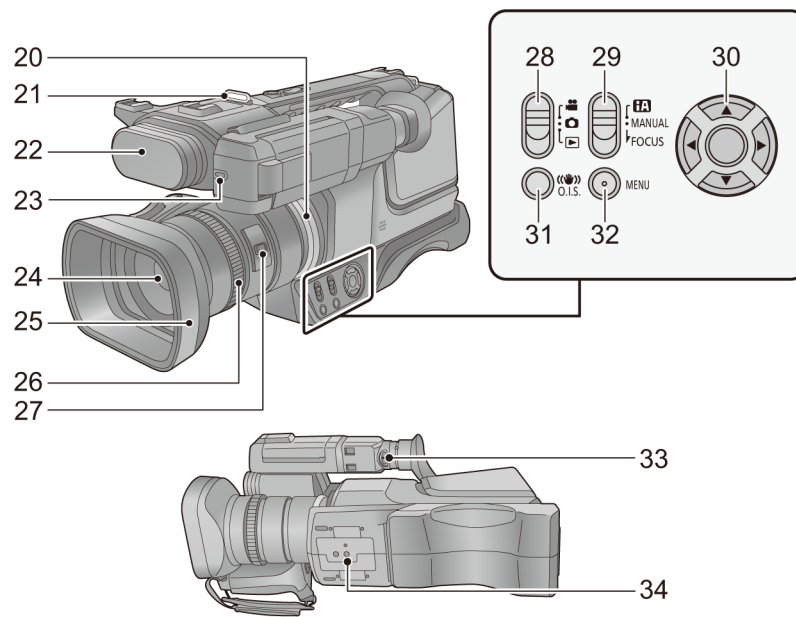
- "h" is an abbreviation for hour and "min" for minute.
- These times are approximations.
- **The indicated charging time is for when the battery has been discharged completely.**
Charging time and recordable time vary depending on the usage conditions such as high/low temperature.

5 Location of Controls and Components

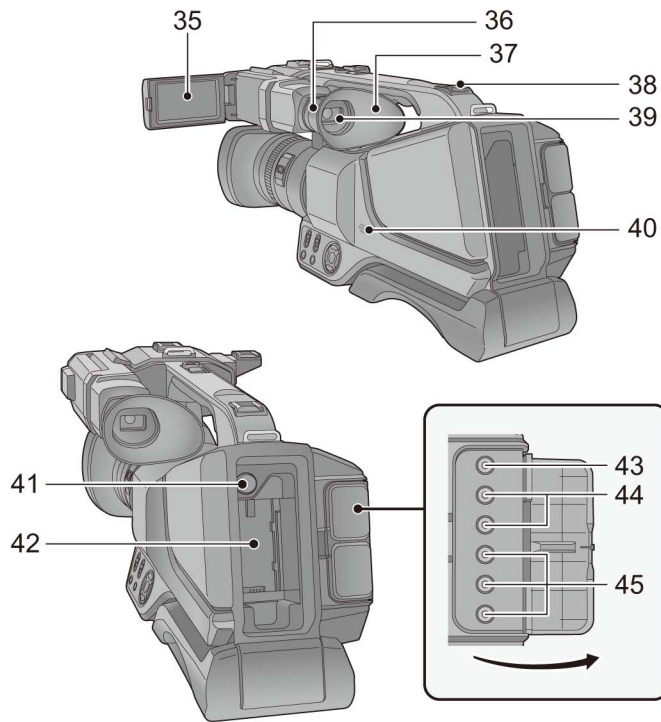
The page number in this chapter does not show the page number of this service manual.



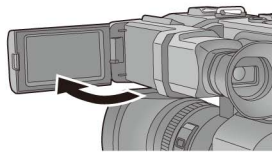
- | | |
|---|--|
| <p>1 Shoulder strap fixture</p> <p>2 Handle</p> <p>3 Sub zoom lever [W/T] (→ 36, 110)</p> <ul style="list-style-type: none"> • This lever functions in the same manner as the zoom lever. <p>4 Sub recording start/stop button (→ 24, 110)</p> <ul style="list-style-type: none"> • This button functions in the same manner as the recording start/stop button. <p>5 Microphone cable holder</p> <p>6 Accessory shoe</p> <p>7 External microphone terminal [EXT MIC] (→ 11)</p> <ul style="list-style-type: none"> • A compatible plug-in powered microphone can be used as an external microphone. • When the unit is connected with the AC adaptor, sometimes noise may be heard depending on the microphone type. In this case, please switch to the battery for the power supply and the noise will stop. <p>8 Photoshot button [] (→ 29)</p> | <p>9 Zoom lever [W/T] (In Recording Mode) (→ 36)</p> <p>Volume lever [+VOL-]/Thumbnail display switch [ / ] (In Playback Mode) (→ 34, 35)</p> <p>10 Grip belt (→ 10)</p> <p>11 Status indicator (→ 18)</p> <p>12 Power switch (→ 18)</p> <p>13 Recording start/stop button (→ 27)</p> <p>14 Charging lamp [CHG] (→ 13)</p> <p>15 DC input terminal [DC IN] (→ 13)</p> <ul style="list-style-type: none"> • Do not use any other AC adaptors except the supplied one. <p>16 Headphone terminal [] (→ 48)</p> <p>17 USB terminal [HOST]/[USB 2.0] (→ 82)</p> <p>18 USB terminal [DEVICE]/[USB 2.0] (→ 90, 98)</p> <p>19 HDMI terminal [HDMI] (→ 75)</p> |
|---|--|



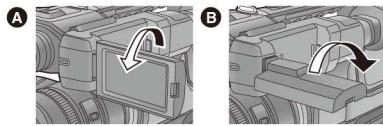
- 20 Ring LED (→ 113)
 - 21 Shoulder strap fixture
 - 22 Internal microphones
 - 23 Recording lamp (→ 113)
 - 24 Lens (→ 10)
 - 25 Lens hood
 - 26 Multi manual ring (→ 39, 43)
 - 27 Camera function button
[CAMERA FUNCTION] (→ 39)
 - 28 Mode switch (→ 18)
 - 29 Intelligent auto/Manual/Manual focus
switch [i/MANUAL/FOCUS] (→ 31)
 - 30 Cursor button
 - 31 Optical Image Stabilizer button
[(((hand))) O.I.S.] (→ 38)
 - 32 Menu button [MENU] (→ 23)
 - 33 Eyepiece corrector lever (→ 21)
 - 34 Tripod receptacle
- Attaching a tripod with a screw length of 5.5 mm or more may damage the unit.



35 LCD monitor (Touch screen) (→ 19)



- It can open up to 90°.



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

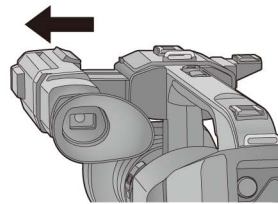
36 Eye cup attachment part (→ 10)

37 Eye cup (→ 10)

38 Accessory shoe

39 Viewfinder (→ 21)

- Extend the viewfinder before use.



40 Speaker

41 Battery release button [PUSH] (→ 12)

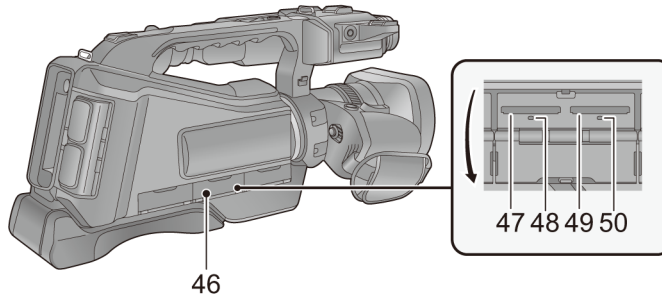
42 Battery holder (→ 12)

43 Video output terminal [VIDEO OUT] (→ 75)

44 Audio output terminal [AUDIO OUT] (→ 75)

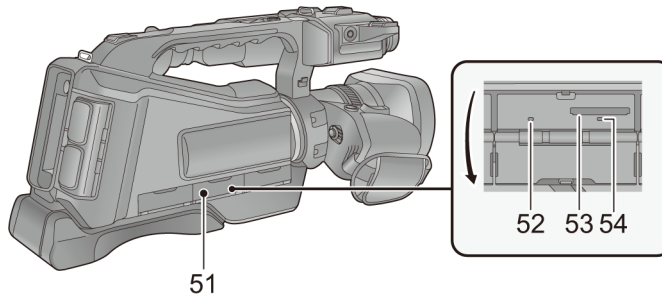
45 Component terminal [Y]/[PB/CB]/[PR/CR] (→ 75)

HC-MDH2



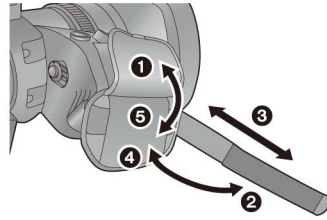
- 46 SD card cover (→ 17)
- 47 Card slot 2 (left) (→ 17)
- 48 Access lamp (card 2) (→ 17)
- 49 Card slot 1 (right) (→ 17)
- 50 Access lamp (card 1) (→ 17)

HC-MDH2M



- 51 SD card cover (→ 17)
- 52 Access lamp [BUILT-IN MEMORY]
- 53 Card slot (→ 17)
- 54 Access lamp (SD card) (→ 17)

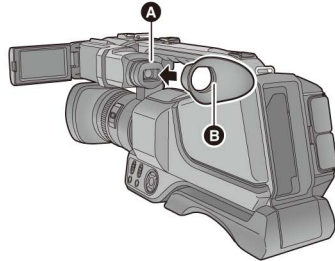
■ Adjust the length of the grip belt so that it fits your hand.



- ① ② Flip the belt cover and the belt.
- ③ Adjust the length.
- ④ ⑤ Replace the belt.

■ Attaching the eye cup

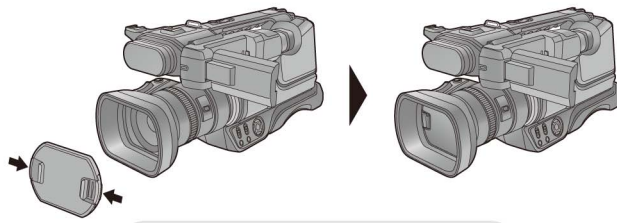
Attach by aligning the notch of the eye cup attachment part with the protrusion at the inside of the eye cup.



- Ⓐ Notch
- Ⓑ Protrusion

■ Attaching the lens cap

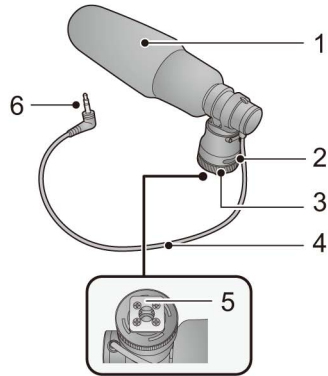
Protect the lens surface with the lens cap while the unit is not used.



Attach or remove it by pinching on it.

■ **About the external stereo microphone**

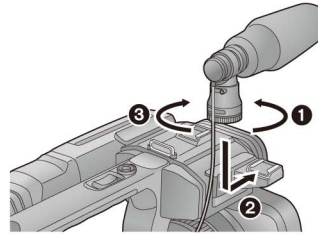
External stereo microphone



- 1 Microphone condenser
- 2 Cable Holder
- 3 Lock ring
- 4 Mini plug and Cable
- 5 Shoe
- 6 Plug section

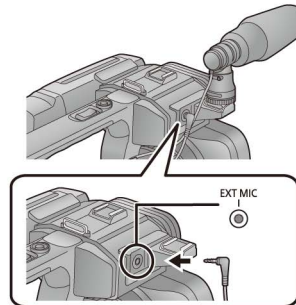
Attaching the external stereo microphone to the unit

1 Attach the microphone to the accessory shoe.



- ① Loosen the lock ring.
- ② Attach the microphone.
- ③ Firmly tighten the lock ring.
- Do not apply excessive force on the lock ring.
- Make sure that the microphone is securely attached.

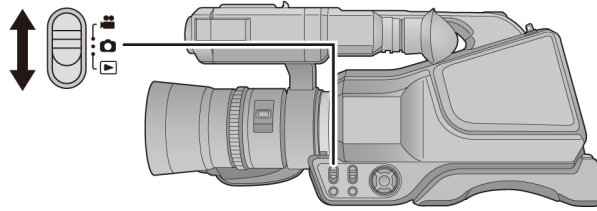
2 Connect the plug to the external microphone terminal.






- Check that the unit is turned off. Connecting or removing the microphone while the unit is turned on may cause malfunction.
- You can fasten the excess cable by tucking it into the cable holder.
- When removing the microphone, disconnect the plug, and then remove the microphone in reverse order of attaching.
- Hold the lock ring when mounting or removing the microphone.

Selecting a mode

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



	Motion Picture Recording Mode (→ 27)
	Still Picture Recording Mode (→ 29)
	Playback Mode (→ 33, 63)

How to use the touch screen

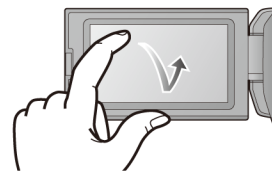
You can operate by directly touching the LCD monitor (touch screen) with your finger.

- The unit supports both operations using the cursor buttons and operations using the touch screen. Select the optimal method according to the situation.
- In this operating instructions, the majority of functions are described on the basis of operations using the cursor buttons.

■ Touch

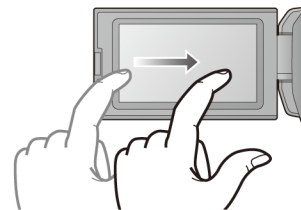
Touch and release the touch screen to select icon or picture.

- Touch the centre 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

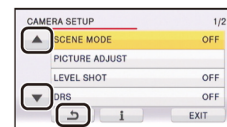
- To operate the following icons using the cursor buttons, select the desired icon using the cursor buttons and then press the button in the centre. (Excluding some functions)



These icons are used to switch the menu and thumbnail display page, for item selection and setting etc.



This icon is used to return to the previous screen such as when setting menus.



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

Viewfinder adjustment

- These settings will not affect the images actually recorded.

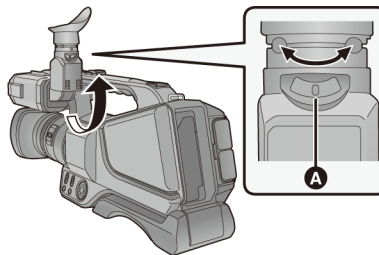
Adjusting the field of view

It adjusts the field of view to show the image on the viewfinder clearly.

1 Adjust the viewfinder to suit your vision so that you can see the display images clearly.

- Be careful not to trap your fingers when moving the viewfinder.
- The viewfinder can be lifted vertically up to approximately 90°.
- Close the LCD monitor and turn on the viewfinder.

2 Adjust the focus by operating the eyepiece corrector lever.

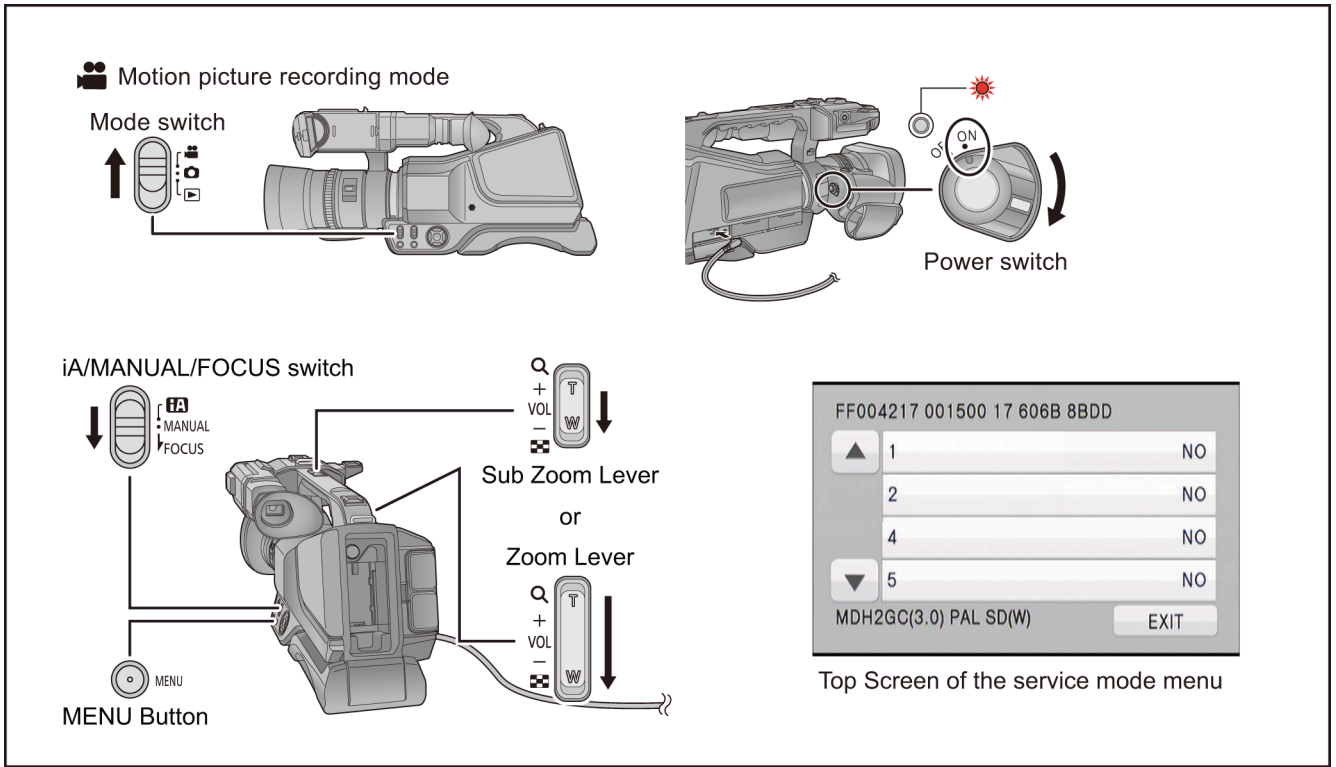


A Eyepiece corrector lever

6 Service Mode

Indication method of the service menu

1. Set the mode switch "Motion Picture Recording" mode.
2. Set the power switch to ON, and turn to ON.
3. Keep pressing the "iA/MANUAL/FOCUS" switch to "FOCUS" side, "MENU" button and "Zoom Lever" (or "Sub Zoom Lever") to W side 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.)
2	Model/Destination settings	Change the Model/Destination. (Selectable models and destinations are displayed.)
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.
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.

NOTE:

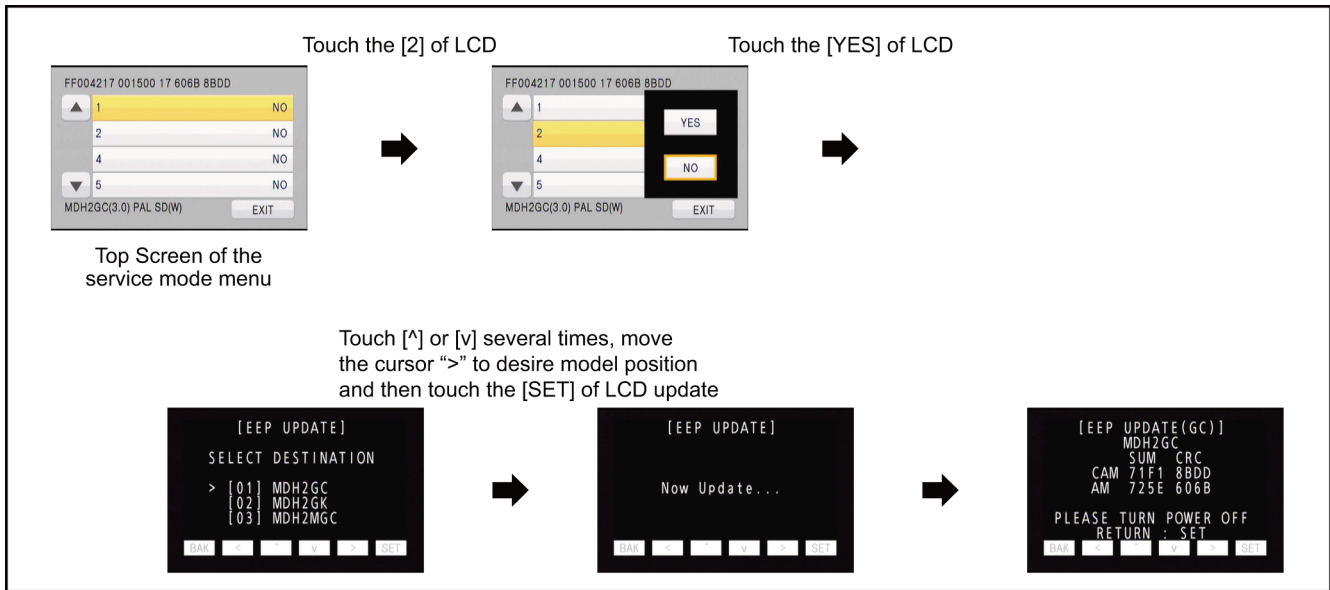
Do not using service mode except above table of Service mode menu.

4. 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. Model/Destination Settings

Touch the [2] of LCD, select model/destination.

Operation specifications



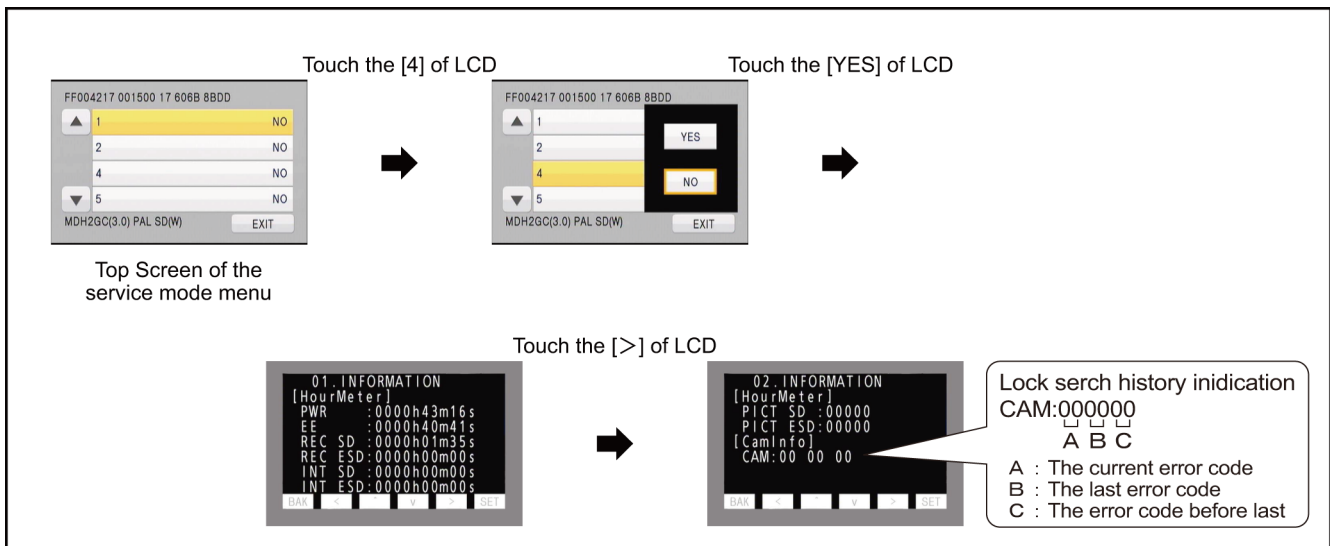
Function description

- Change the Model/Destination
Display the lists of model/distination which the unit can be changed.
Therefore in some cases, the model/destination that is currently set is only displayed.
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

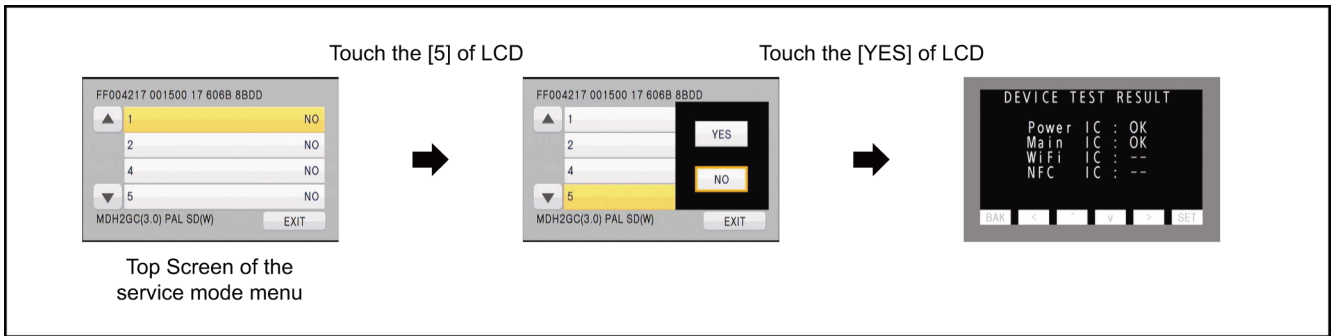
Error code	Function
51	Focus control is abnormal
52	Zoom control is abnormal
53	OIS lens control is abnormal
54	Zoom control is abnormal (2)

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.

- Power IC : Communication test between IC3401 and IC2303
- Main IC : Communication test between IC3401 and IC3402
- WiFi IC : (Excluded)
- NFC IC : (Excluded)

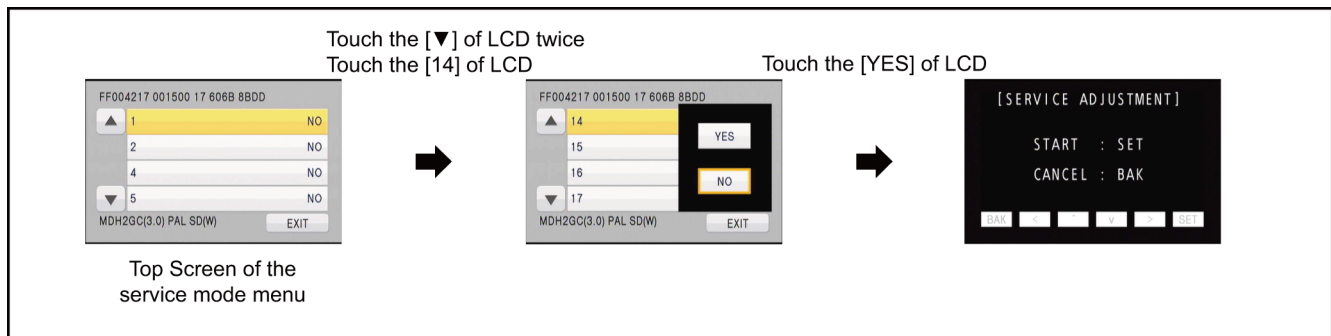
Display other than "OK" are abnormalities of each lines.

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

6.4. 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”.

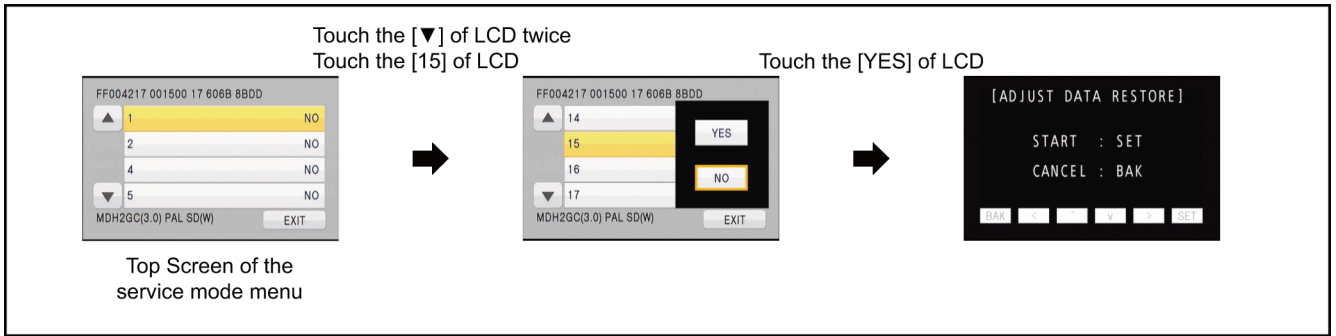
- Model setting
- Setting of the file name for adjustment data backup to SD card.
- Execution of adjustment data backup to SD card
- Checking of Switches
- Zoom Lever adjustment
- Camera adjustment (Iris, Gyro, OIS and Missing pixels)
- Zoom Tracking adjustments
- Indoor White Balance Adjustment (CH-GAIN,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

Set the power switch to OFF and turn the unit off.

6.5. 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

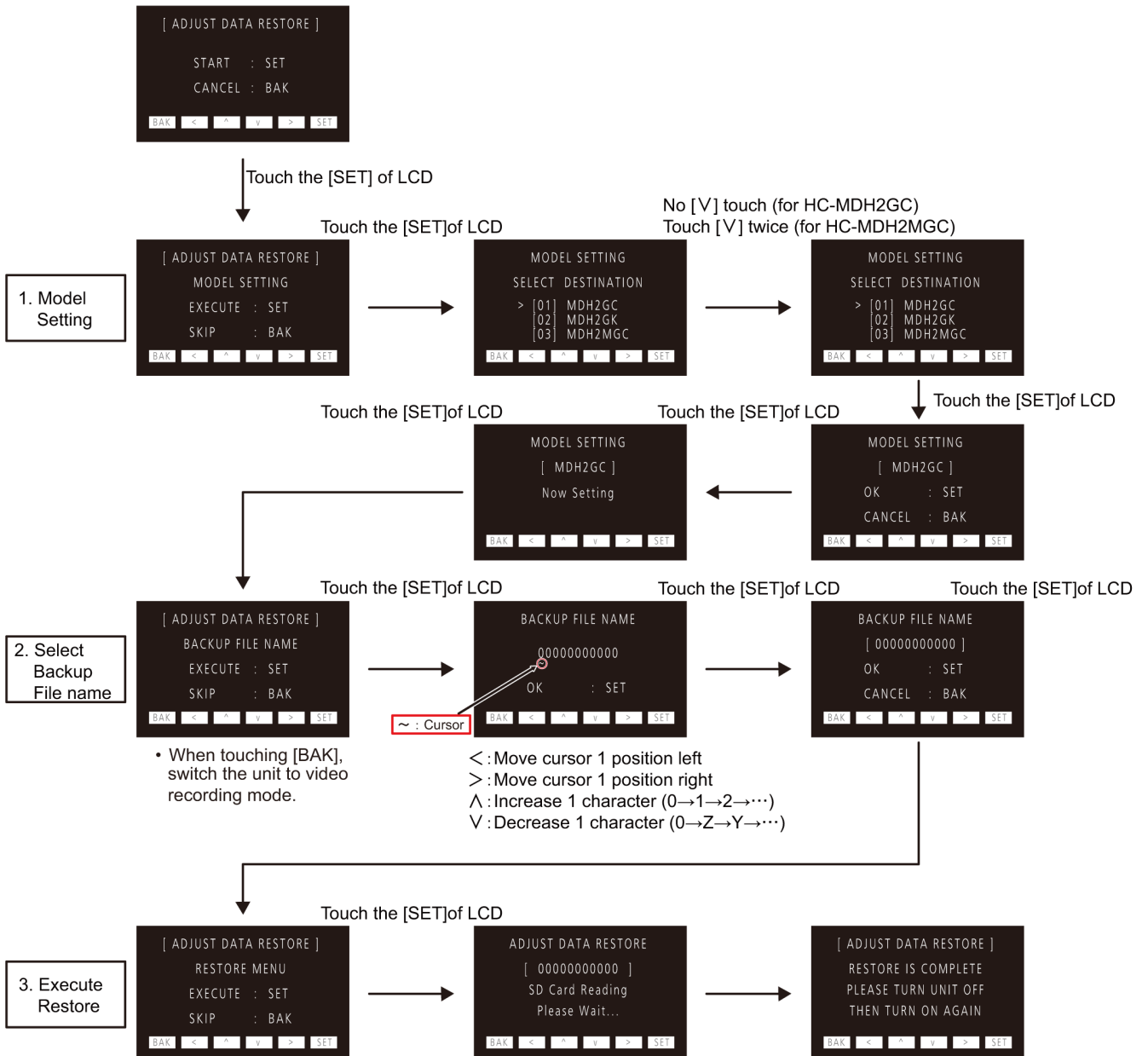


Function description

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 "6.4. Adjustment function for the Service".

Restoring procedure

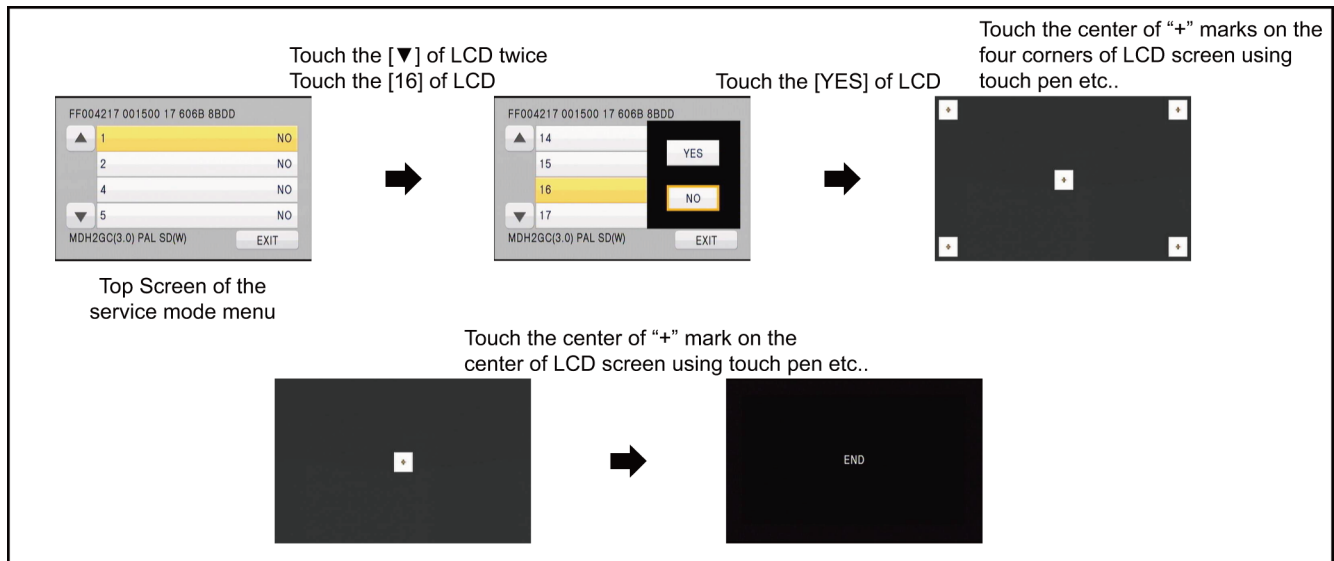


Set the power switch to OFF and turn the unit off.

6.6. 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.

Set the power switch to OFF and turn the unit off.

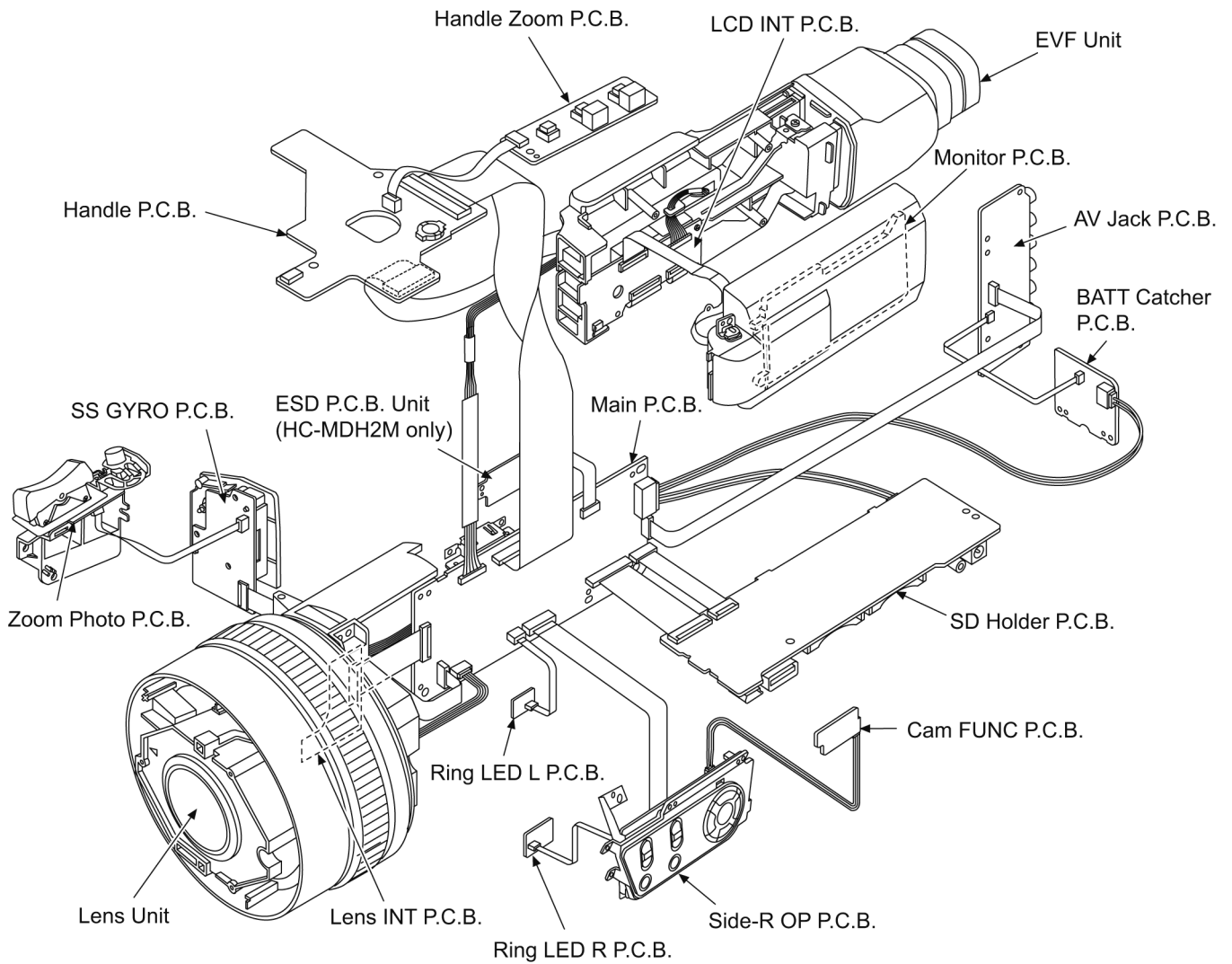
7 Service Fixture & Tools

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. (Extension cable is not use.)

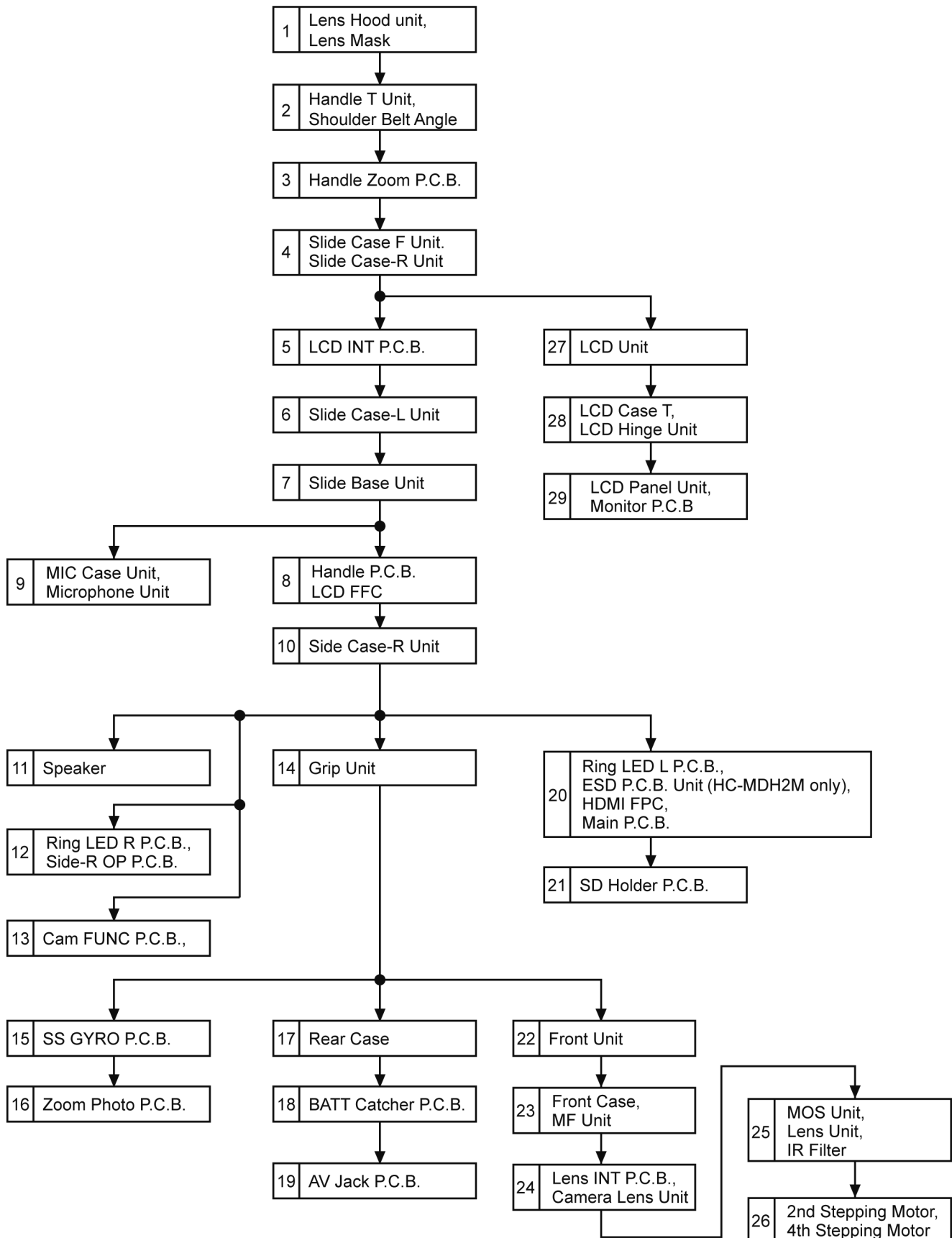


8 Disassembly and Assembly Instructions

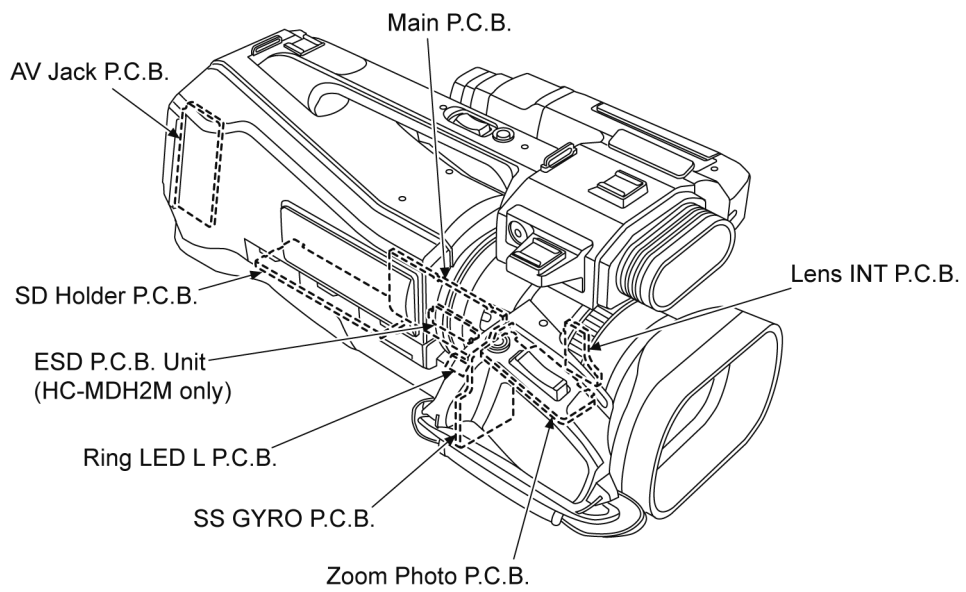
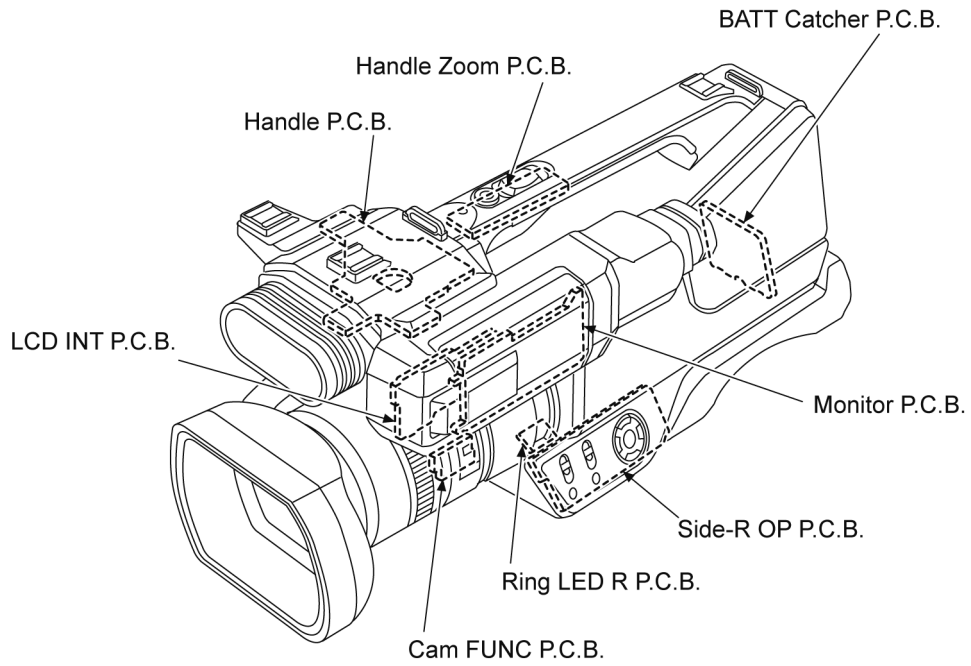
8.1. Disassembly Flow Chart for the Unit

This is a disassembling chart.

When assembling, perform this chart conversely.



8.2. P.C.B. Location



8.3. Disassembly Procedure for the Unit

No.	Item	Fig.	Removal
1	Lens Hood Unit Lens Mask	(Fig. D1)	Screw (A) x 1 Lens Hood Unit
		(Fig. D2)	Screw (B) x 3 Lens Mask
2	Handle T Unit Sholder Belt Angle Frame	(Fig. D3)	Screw (C) x 6 Screw (D) x 2 Hooking part x 2 Handle T Unit
		(Fig. D4)	Screw (E) x 4 Sholder Belt Angle Frame
3	Handle Zoom P.C.B.	(Fig. D5)	Screw (F) x 2 Flex Handle Zoom P.C.B.
		(Fig. D6)	Screw (G) x 2 Slide Case Frame
4	Slide Case Frame Slide Case-R Unit	(Fig. D7)	Screw (H) x 5 Screw (I) x 1 FP852 (Flex) Locking tab x 3 Slide Case-R Unit
		(Fig. D8)	(NOTE: When Installing)
5	LCD INT P.C.B.	(Fig. D9)	Screw (J) x 1 FP851 (Flex) FP853 (Flex) PS851 (Connector) Hooking part x 1 Locking tab x 1 LCD INT P.C.B.
		(Fig. D10)	Screw (K) x 4 Slide Case-L Unit
7	Slide Base Unit	(Fig. D11)	FP4901 (Flex) FP4903 (Flex) Screw (L) x 6 Screw (M) x 1
		(Fig. D12)	Slide Base Unit
8	Handle P.C.B. LCD FFC	(Fig. D13)	Screw (N) x 2 MIC Shoe Attach Screw (O) x 2 FP4902 (Flex)
		(Fig. D14)	FP4904 (Flex) Handle P.C.B. Locking tab x 2 LCD FFC
9	MIC Case Unit Microphone Unit	(Fig. D15)	Locking tab x 1 MIC Case Unit MIC Cushion A MIC Cushion B MIC Cushion C Microphone Unit
		(Fig. D16)	Screw (P) x 6 Screw (Q) x 6 Screw (R) x 4 Locking tab x 3 FP6007 (Flex) Side Case-R Unit
11	Speaker	(Fig. D17)	Screw (S) x 2 SP Angle P6951 (Connector) Speaker

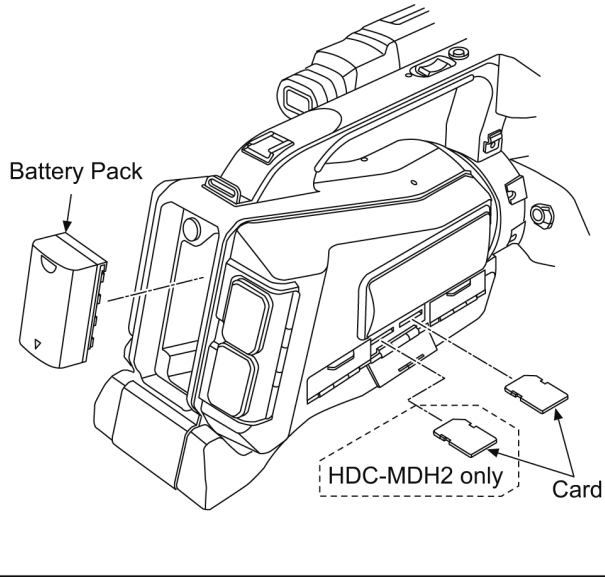
No.	Item	Fig.	Removal
12	Ring LED R P.C.B. Side-R OP P.C.B.	(Fig. D18)	Screw (T) x 1 FP6631 (Flex) Ring LED R P.C.B. P6951 (Connector) P6952 (Connector) Screw (U) x 6
		(Fig. D19)	Screw (V) x 5 Side-R OP P.C.B.
13	Cam FUNC P.C.B.	(Fig. D20)	P6601 (Connector) Screw (W) x 2 Cam FUNC P.C.B.
		(Fig. D21)	Screw (X) x 3 Screw (Y) x 5 FP6401 (Flex) Grip Unit
15	SS GYRO P.C.B.	(Fig. D22)	Screw (Z) x 5 FP6402 (Flex) SS GYRO P.C.B.
		(Fig. D23)	Screw (a) x 2 Screw (b) x 1 Photo Shot Button Hooking part x 2 Zoom SW Hold Frame Screw (c) x 2 Zoom Lever Zoom Lever Cussion(B) Zoom Photo P.C.B.
17	Rear Case	(Fig. D24)	FP6701 (Flex) P6701 (Connector) Screw (d) x 1 Screw (e) x 2 Locking tab x 2 Rear Case
		(Fig. D25)	Screw (f) x 2 BATT Catcher P.C.B.
19	AV Jack P.C.B.	(Fig. D26)	FP4501 (Flex) FP4502 (Flex) Screw (g) x 4 AV Jack P.C.B.
		(Fig. D27)	Screw (h) x 2 Screw (i) x 1 FP6011 (Flex) Ring LED L P.C.B.
20	Ring LED L P.C.B. ESD P.C.B. Unit (HC-MDH2M only) HDMI FPC Unit Main P.C.B.	(Fig. D28)	Screw (j) x 3 Screw (k) x 2 FP6003 (Flex) FP6004 (Flex) FP6005 (Flex) FP6008 (Flex) P301 (Connector) P6002 (Connector) P6003 (Connector)
		(Fig. D29)	Screw (l) x 2 Flex ESD P.C.B. Unit
21	SD Holder P.C.B.	(Fig. D30)	Screw (m) x 3 Locking tab x 1 Main Frame FP6002 (Flex) HDMI FPC Unit Main P.C.B.
		(Fig. D31)	Screw (n) x 3 Screw (o) x 2 Hooking part x 3 SD Holder P.C.B.

No.	Item	Fig.	Removal
22	Front Unit	(Fig. D32)	Screw (p) x 1
			Screw (q) x 2
			Front Unit
23	Front Case MF Unit	(Fig. D33)	Hooking part x 2
			Front Case
			Screw (r) x 1
		(Fig. D34)	Connector
			MF Unit
24	Lens INT P.C.B. Camera Lens Unit	(Fig. D35)	Locking tab x 2
			Lens Frame-R Unit
			Screw (s) x 1
			Locking tab x 2
		(Fig. D36)	FP6108 (Flex)
			Lens INT P.C.B.
		Camera Lens Unit	
		Lens Frame-L Unit	
25	MOS Unit Lens Unit IR Filter	(Fig. D37)	Screw (t) x 3
			Lens Unit
			MOS Unit
			MOS Cushion
			IR Filter
26	2nd Stepping Motor 4th Stepping Motor	(Fig. D38)	Screw (u) x 2
			Solder x 8 points
			Convex x 1
			2nd Stepping Motor
		(Fig. D39)	Screw (v) x 1
			Solder x 6 points
			Convex x 4
			4th Stepping Motor
27	LCD Unit	(Fig. D40)	Screw (w) x 2
			Locking tab x 2
			Hooking part x 2
			LCD Hinge Angle
			LCD SW Lever
			LCD SW Spring
			Convex x 2
		(Fig. D41)	LCD Case-R Unit
			LCD Unit
28	LCD Case-T LCD Hinge Unit	(Fig. D42)	Screw (x) x 2
			Locking tab x 8
			LCD Case-T
		(Fig. D43)	FP901 (Flex)
			LCD Hinge Unit
29	LCD Panel Unit Monitor P.C.B.	(Fig. D44)	Screw (y) x 1
			LCD Frame A
			FP904 (Flex)
			FP905 (Flex)
		(Fig. D45)	Locking tab x 2
			LCD Case B
			LCD Panel Unit
			Locking tab x 2
			Monitor P.C.B.
		(Fig. D46)	Reflection Sheet
			Light Guide Plate
			Diffusion Sheet
			Prism Sheet B
Prism Sheet A			
		LCD Holder	

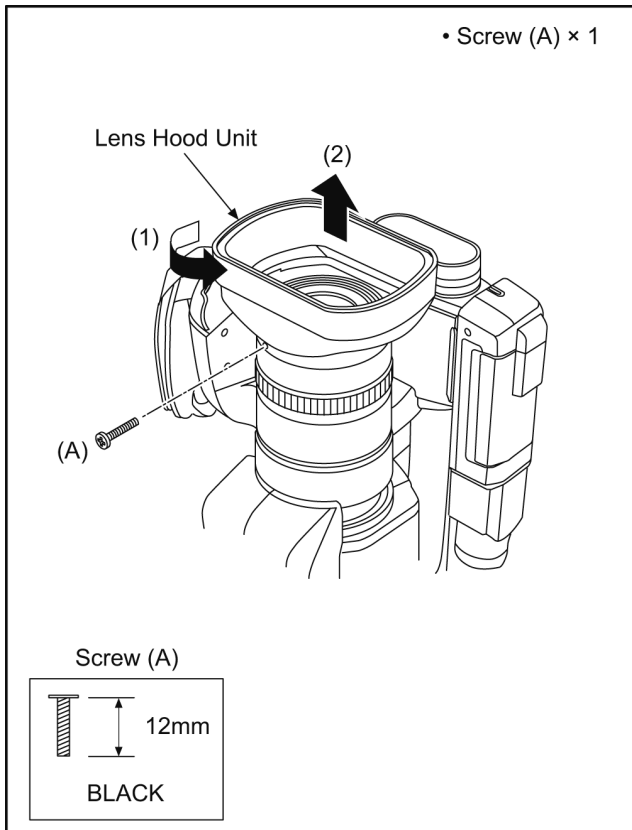
NOTE:

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

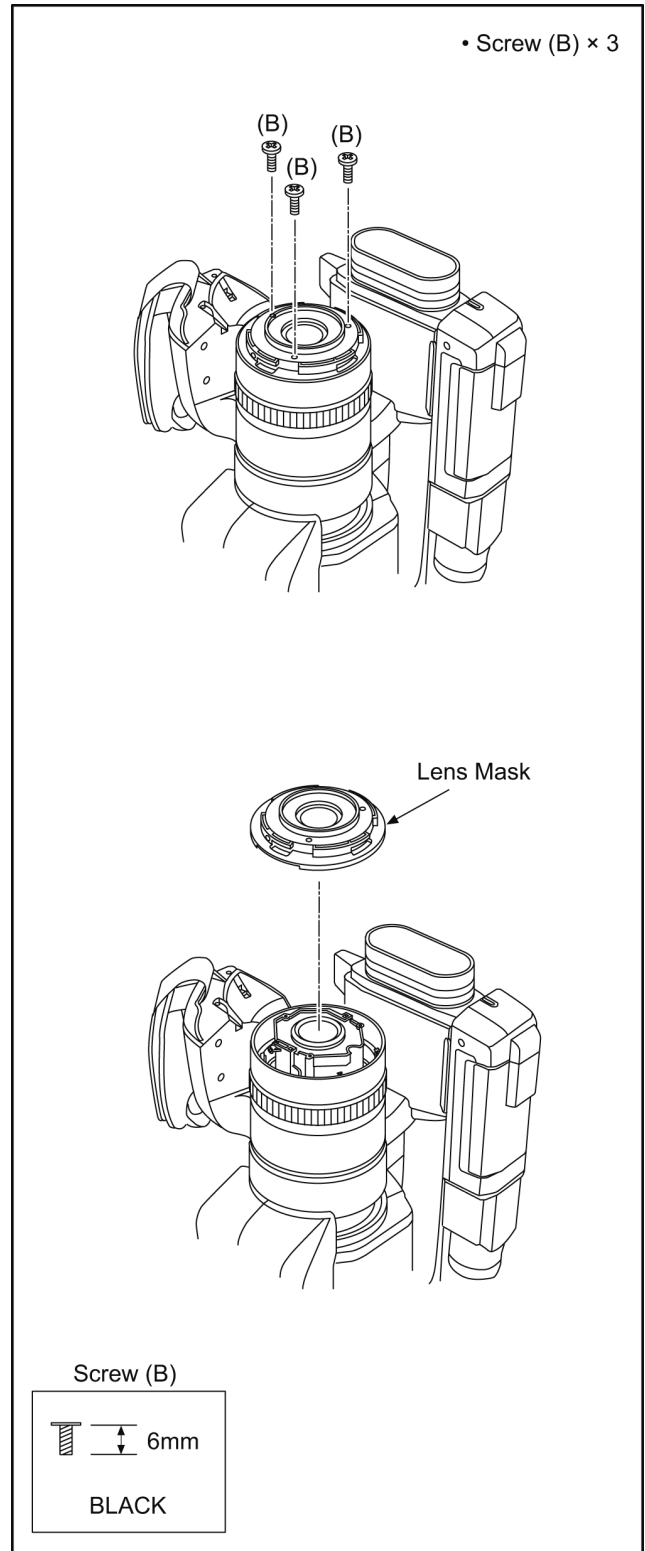
- Card
- Battery Pack



8.3.1. Removal of the Lens Hood Unit and Lens Mask

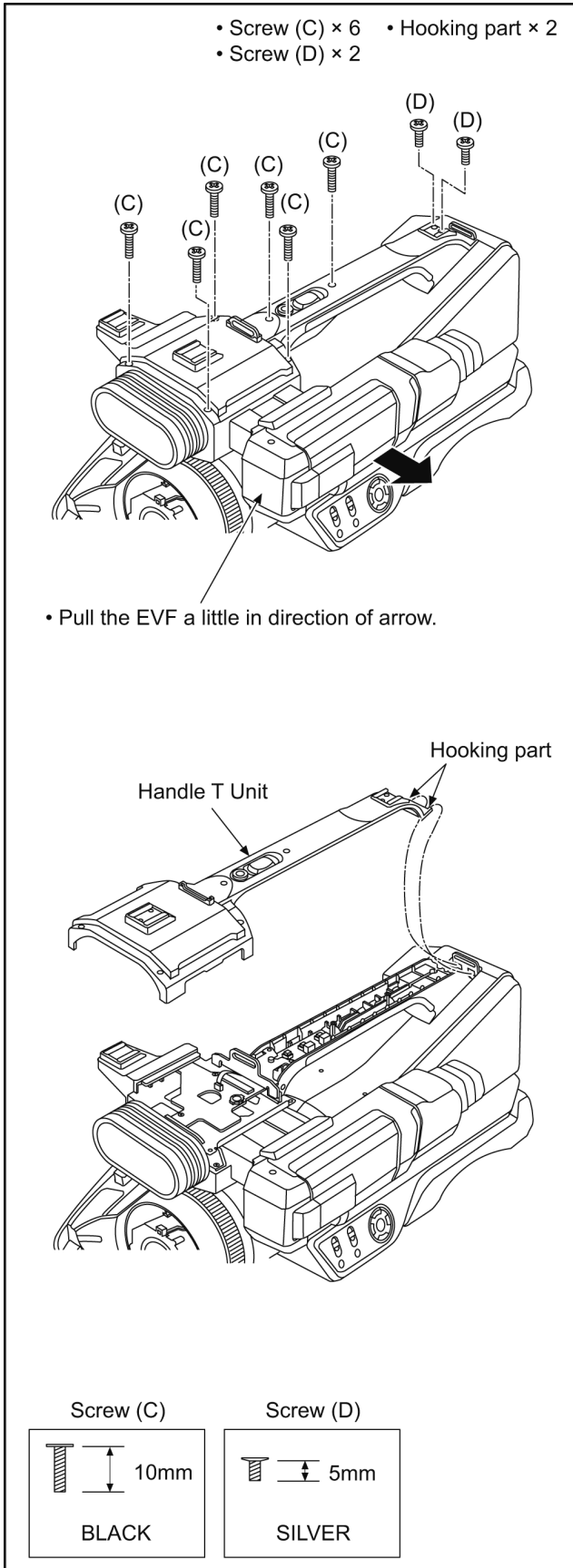


(Fig. D1)

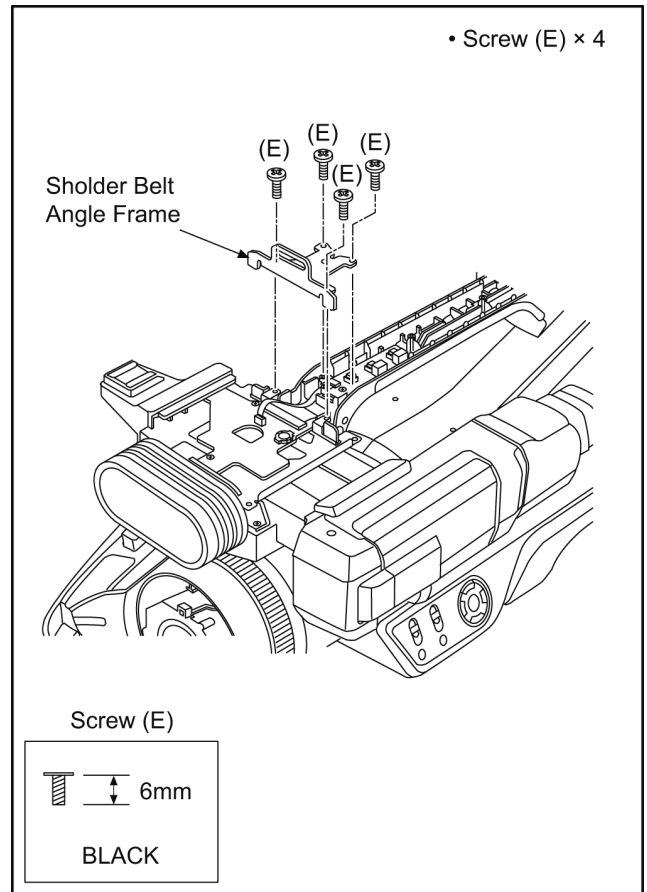


(Fig. D2)

8.3.2. Removal of the Handle T Unit and Sholder Belt Angle Frame

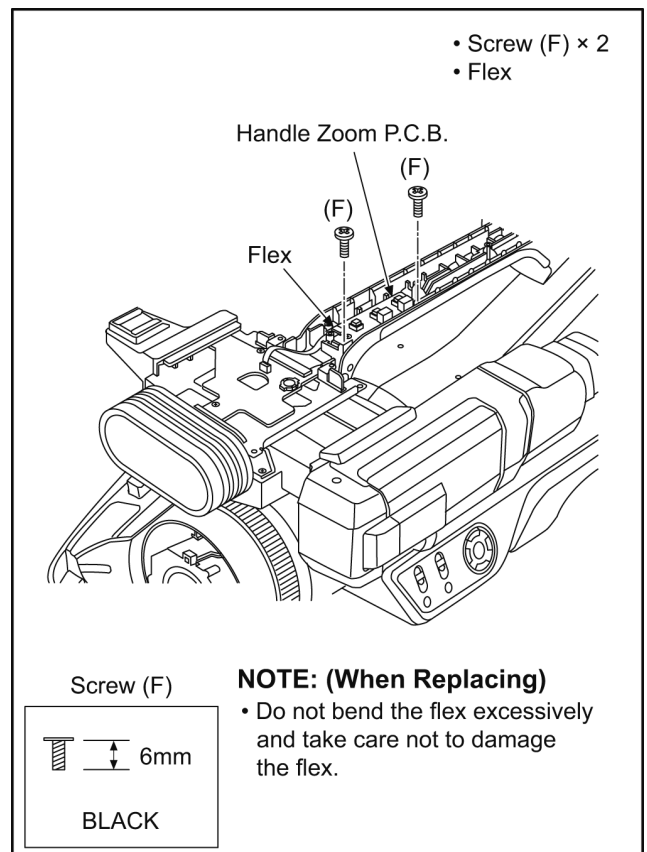


(Fig. D3)



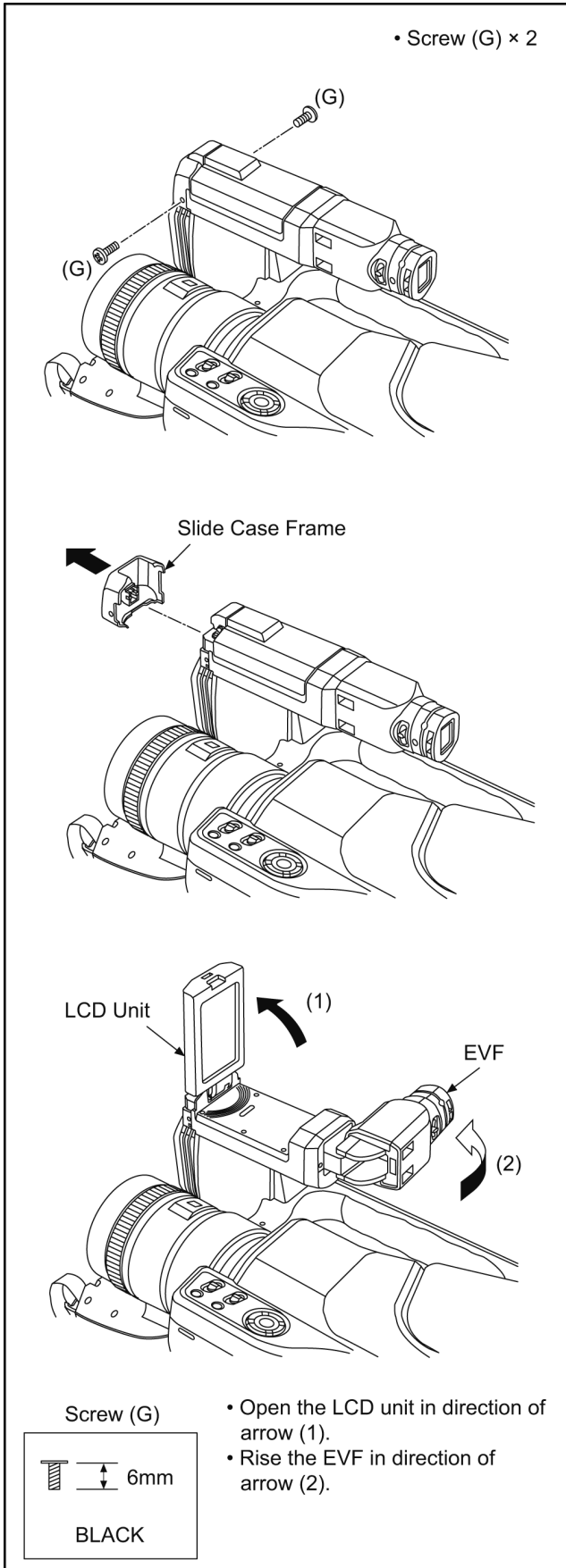
(Fig. D4)

8.3.3. Removal of the Handle Zoom P.C.B.

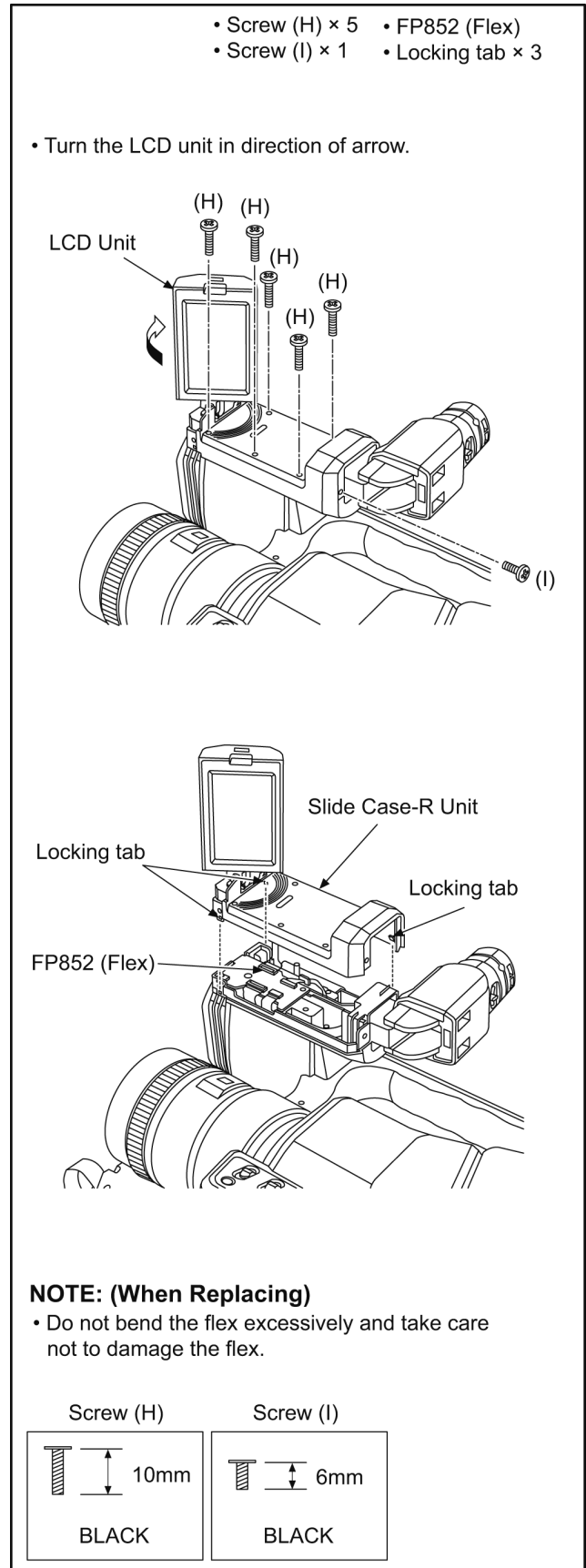


(Fig. D5)

8.3.4. Removal of the Slide Case Frame and Slide Case-R Unit



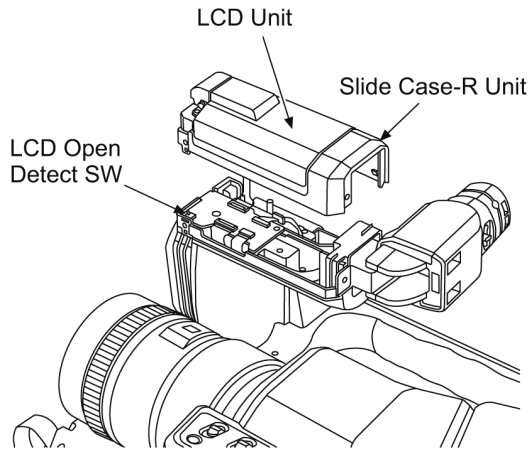
(Fig. D6)



(Fig. D7)

NOTE: (When Installing)

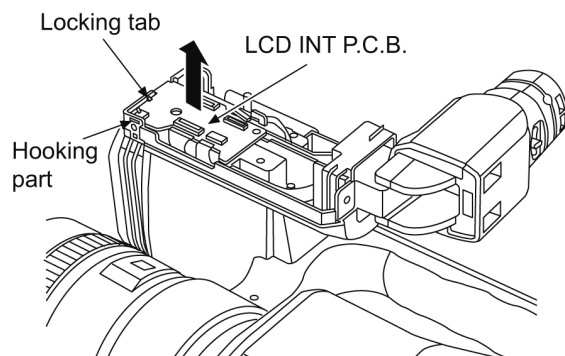
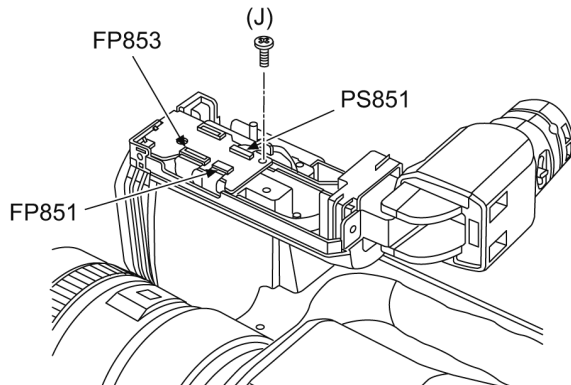
- When installing the Slide Case-R Unit, keep the LCD unit close.
(To prevent damage to the LCD open detect SW.)



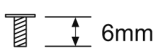
(Fig. D8)

8.3.5. Removal of the LCD INT P.C.B.

- Screw (J) × 1 • FP853 (Flex) • Hooking part × 1
- FP851 (Flex) • PS851 (Connector) • Locking tab × 1



Screw (J)



BLACK

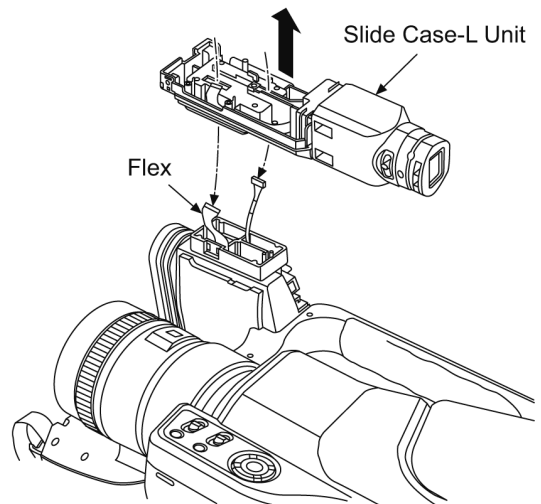
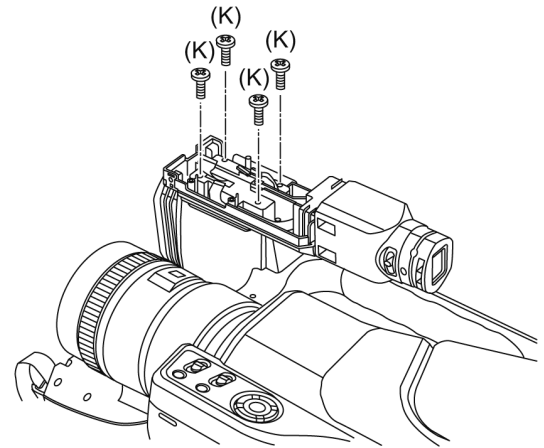
NOTE: (When Replacing)

- Do not bend the flex excessively and take care not to damage the flex.

(Fig. D9)

8.3.6. Removal of the Slide Case-L Unit

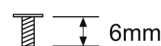
- Screw (K) × 4



NOTE: (When Replacing)

- When pulling out the slide case-L unit, be care careful not to brake or not to damage the flex.

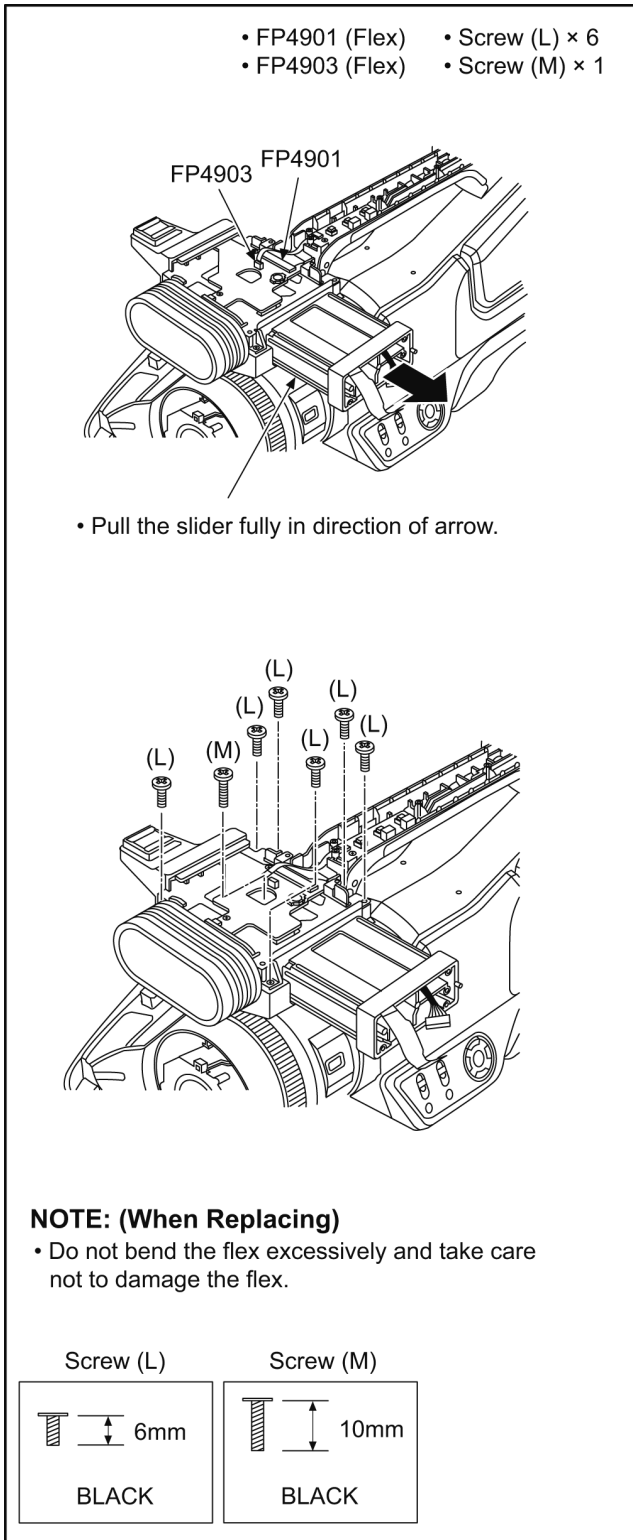
Screw (K)



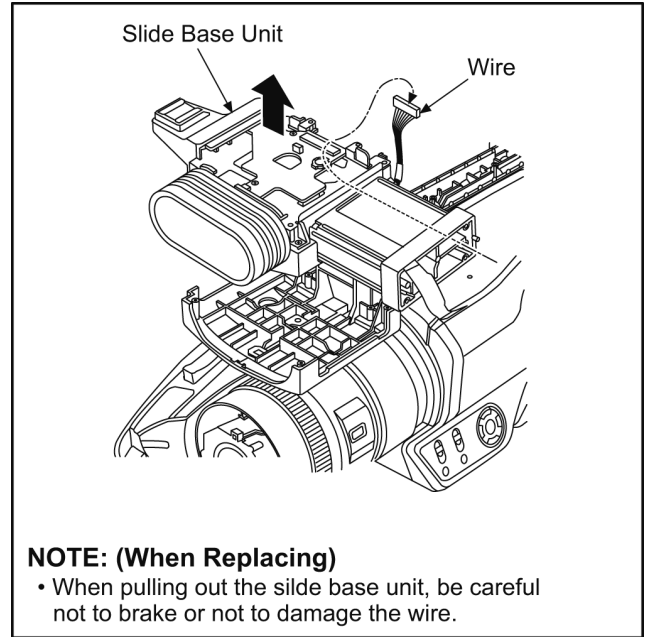
BLACK

(Fig. D10)

8.3.7. Removal of the Slide Base Unit

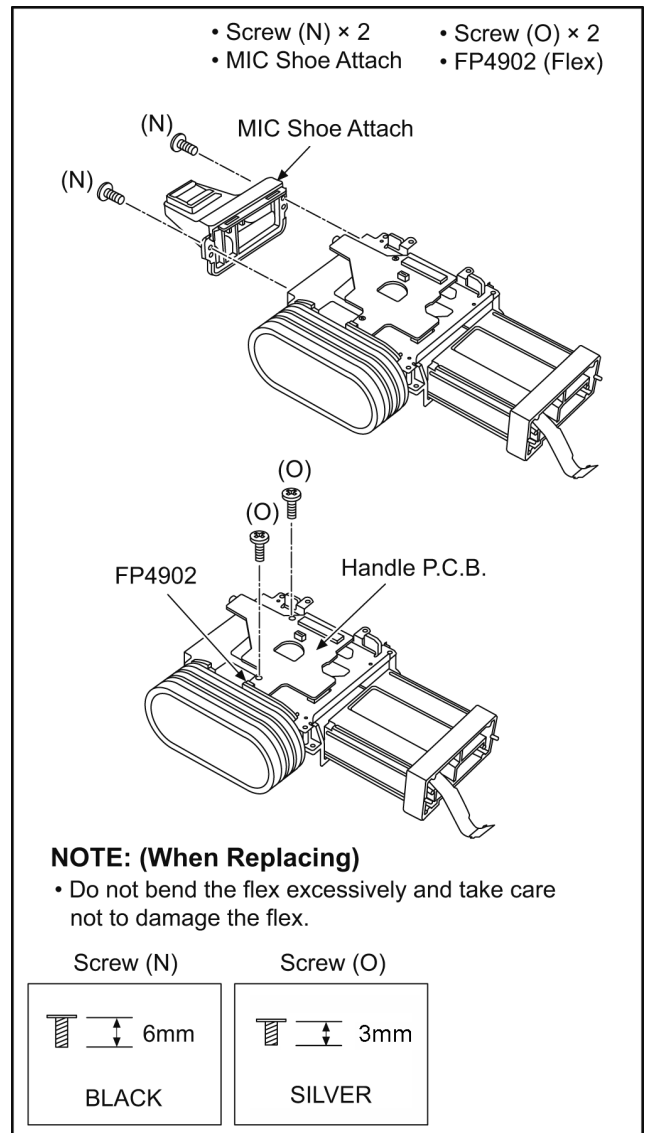


(Fig. D11)

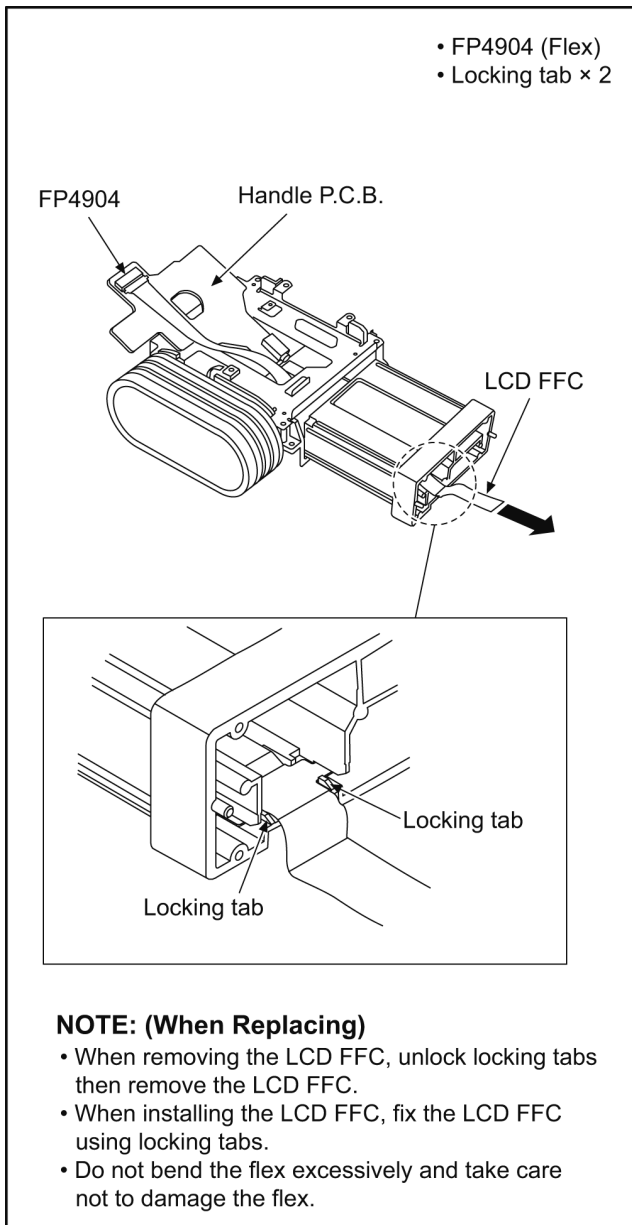


(Fig. D12)

8.3.8. Removal of the Handle P.C.B.

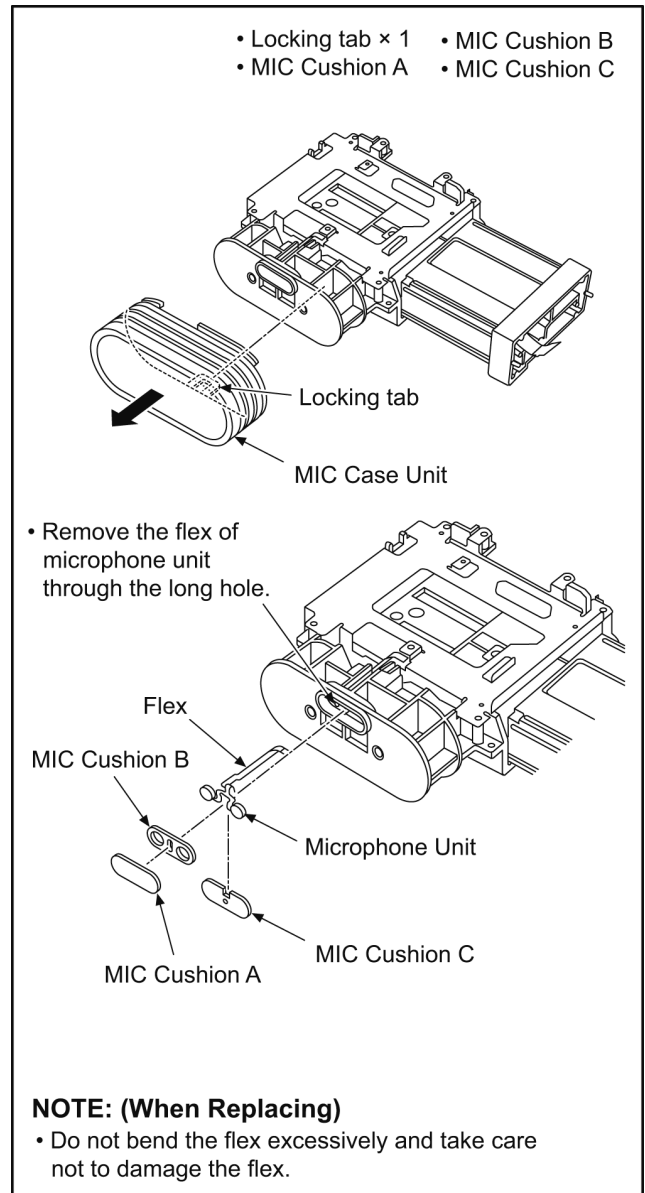


(Fig. D13)



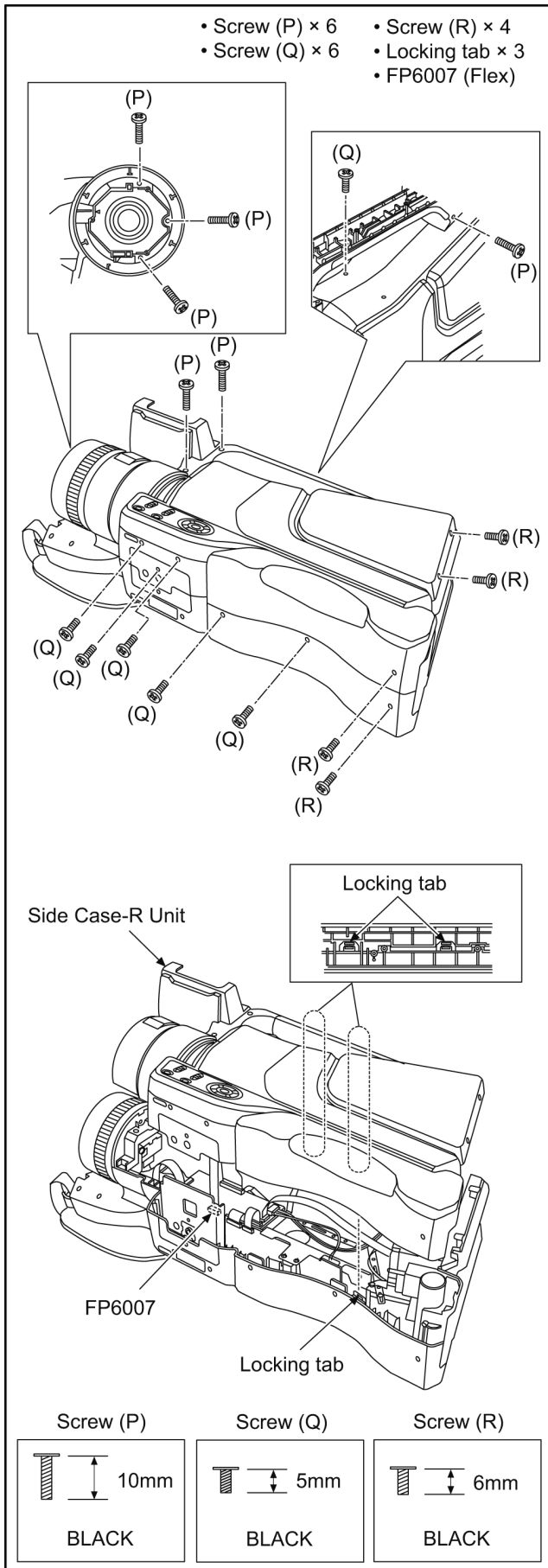
(Fig. D14)

8.3.9. Removal of the MIC Case Unit and Microphone Unit



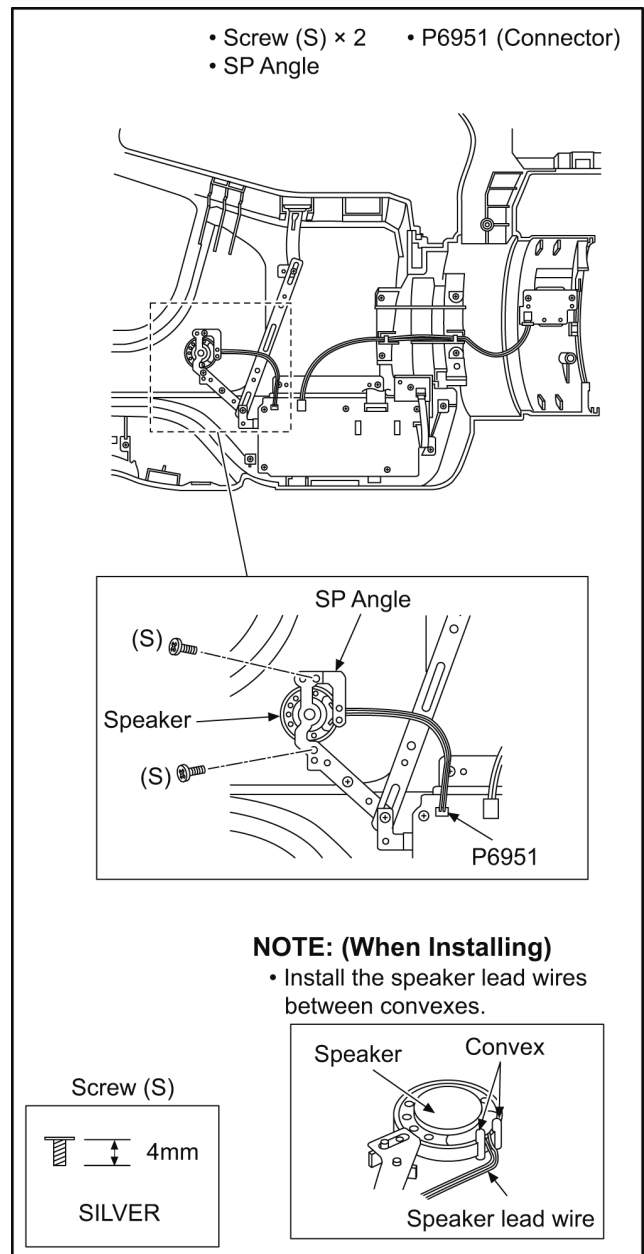
(Fig. D15)

8.3.10. Removal of the Side Case-R Unit



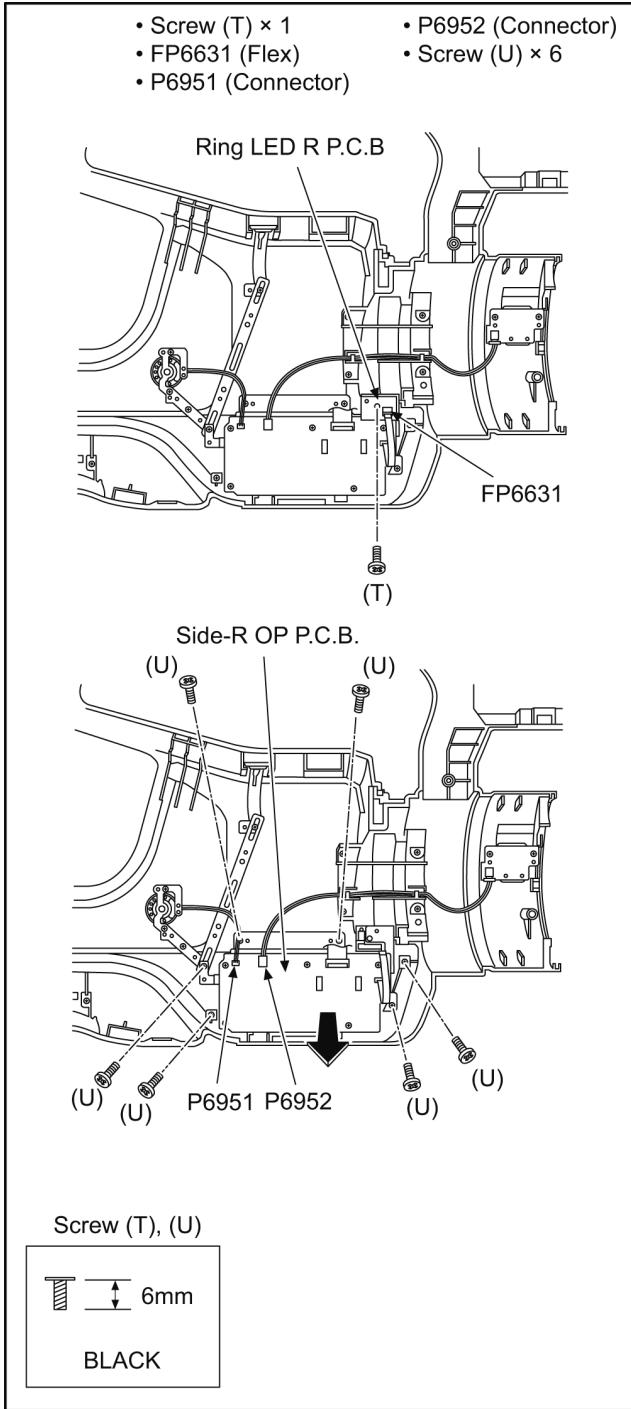
(Fig. D16)

8.3.11. Removal of the Speaker

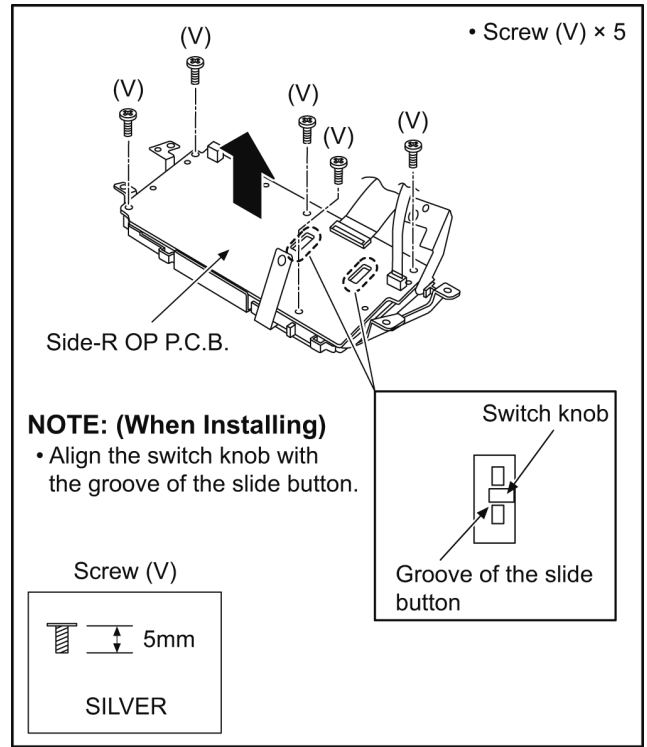


(Fig. D17)

8.3.12. Removal of the Ring LED R P.C.B. and Side-R OP P.C.B.

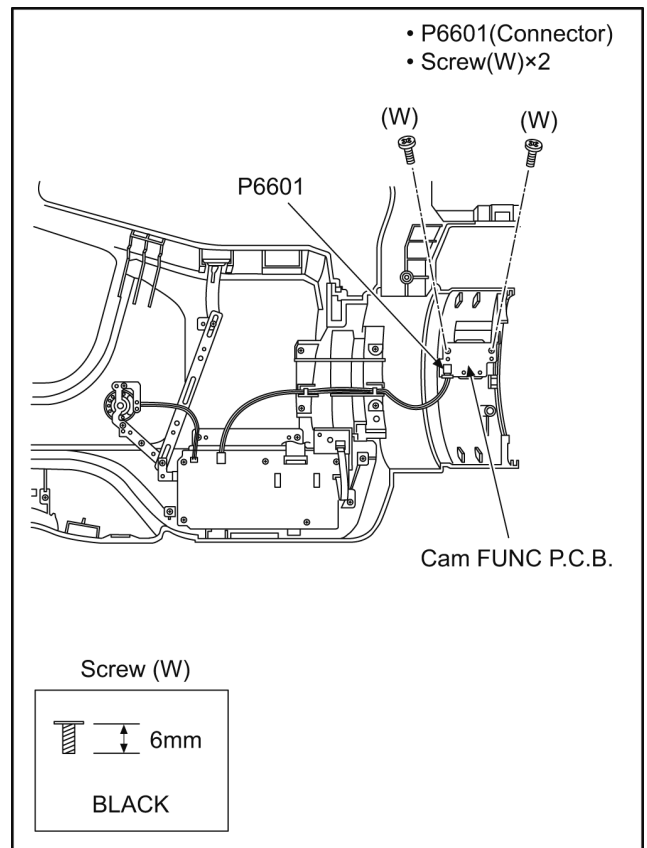


(Fig. D18)



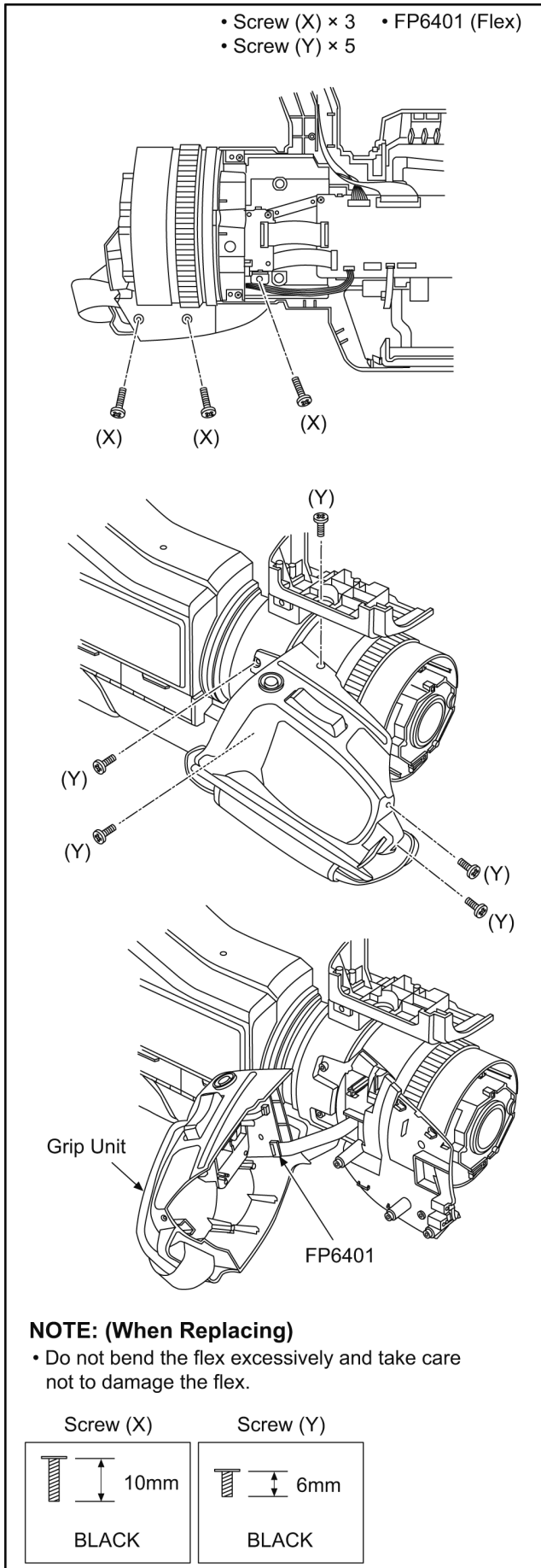
(Fig. D19)

8.3.13. Removal of the Cam FUNC P.C.B.



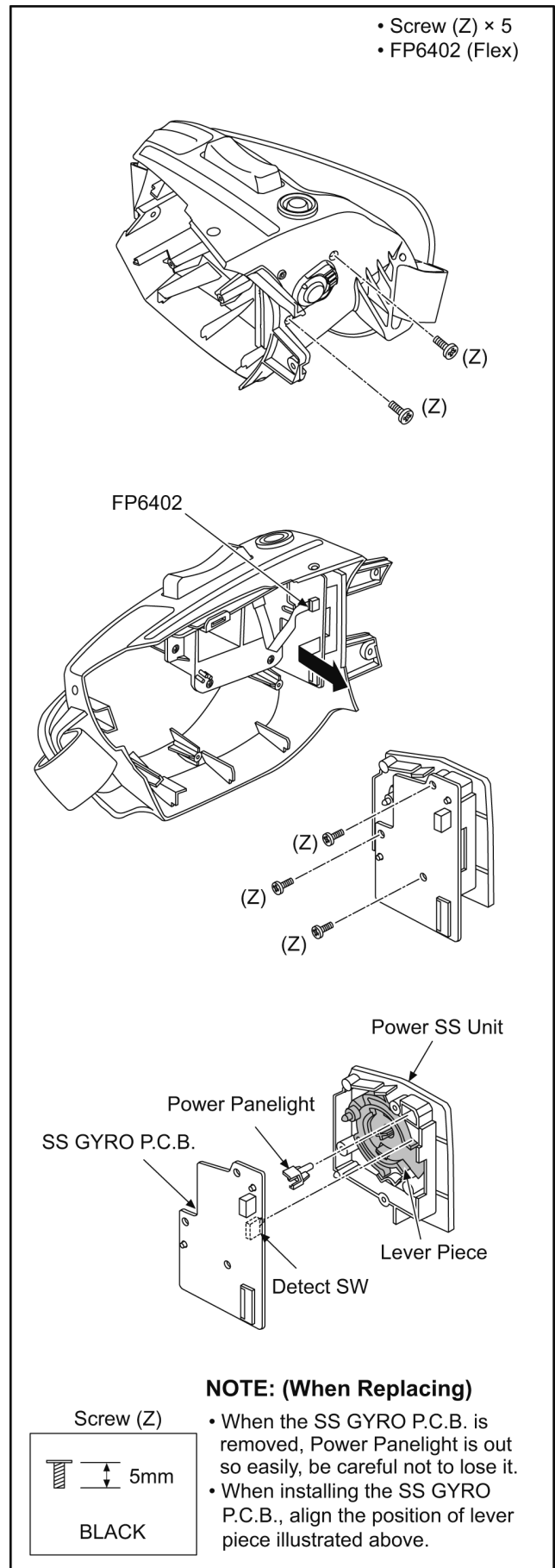
(Fig. D20)

8.3.14. Removal of the Grip Unit



(Fig. D21)

8.3.15. Removal of the SS GYRO P.C.B.



(Fig. D22)

8.3.16. Removal of the Zoom Photo P.C.B.

- Screw (a) × 2
- Screw (b) × 1
- Photo Shot Button
- Hooking part × 2
- Zoom SW Hold Frame
- Screw (c) × 2
- Zoom Lever
- Zoom Lever Cussion (B)

NOTE: (When Installing)

- Align the switch knob with the projection part of Switch.

Screw (a),(c)	Screw(b)
 4mm BLACK	 5mm BLACK

(Fig. D23)

8.3.17. Removal of the Rear Case

- FP6701 (Flex)
- P6701 (Connector)
- Screw (d) × 1
- Screw (e) × 2
- Locking tab × 2

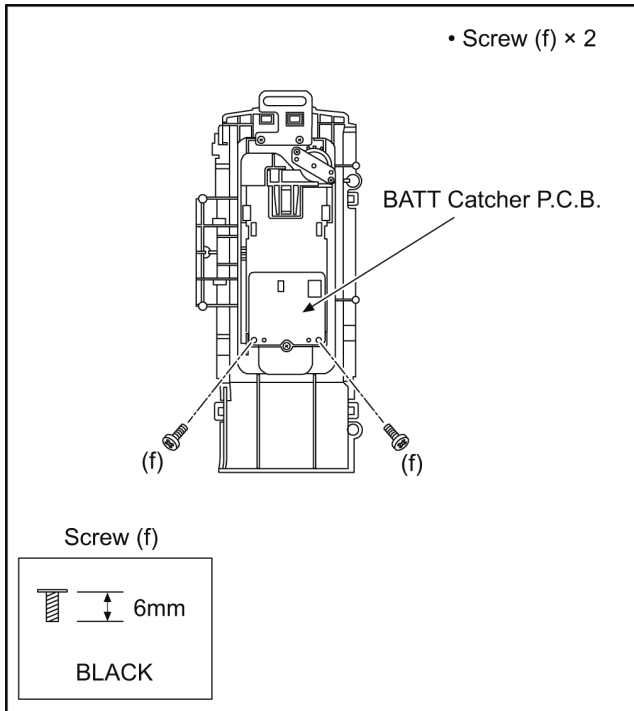
NOTE: (When Replacing)

- Do not bend the flex excessively and take care not to damage the flex.

Screw (d)	Screw (e)
 4mm RED	 6mm BLACK

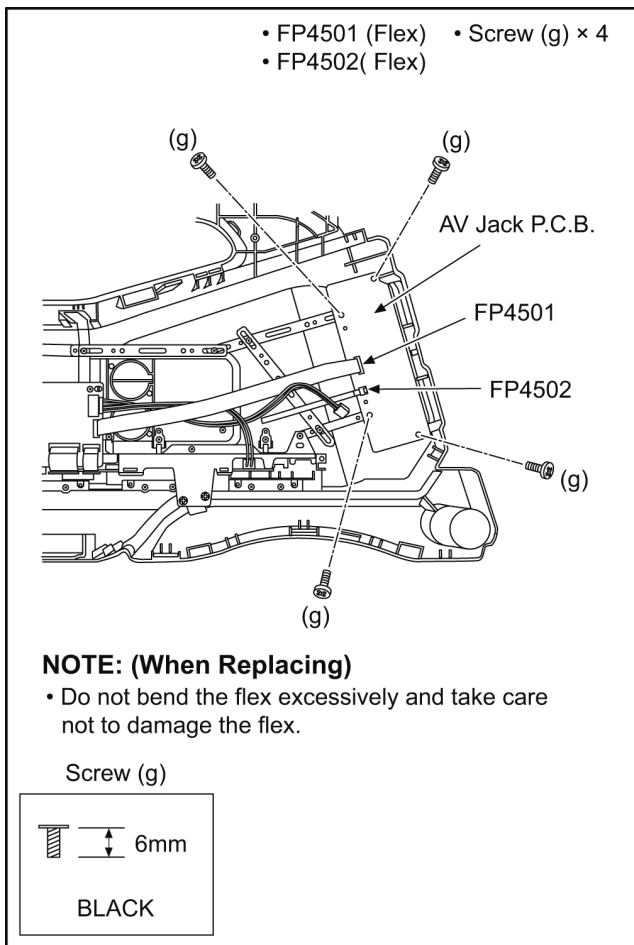
(Fig. D24)

8.3.18. Removal of the BATT Catcher P.C.B.



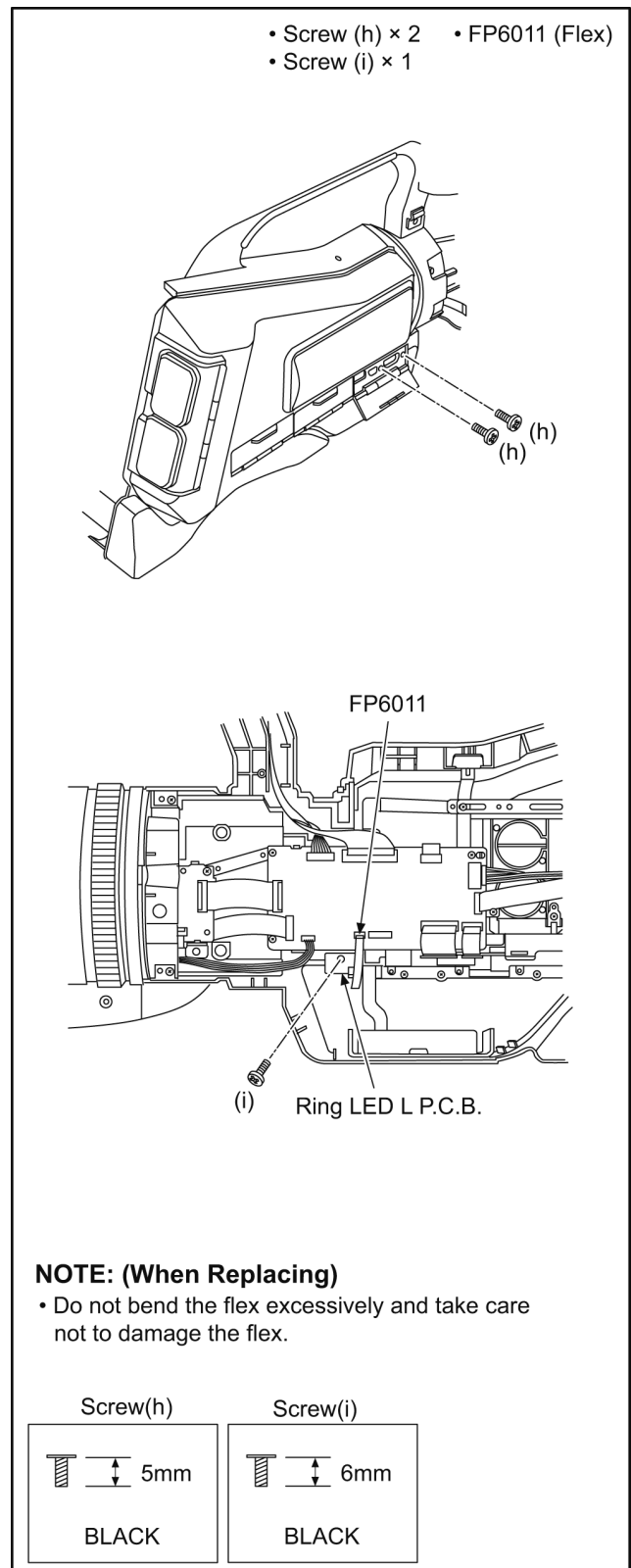
(Fig. D25)

8.3.19. Removal of the AV Jack P.C.B.



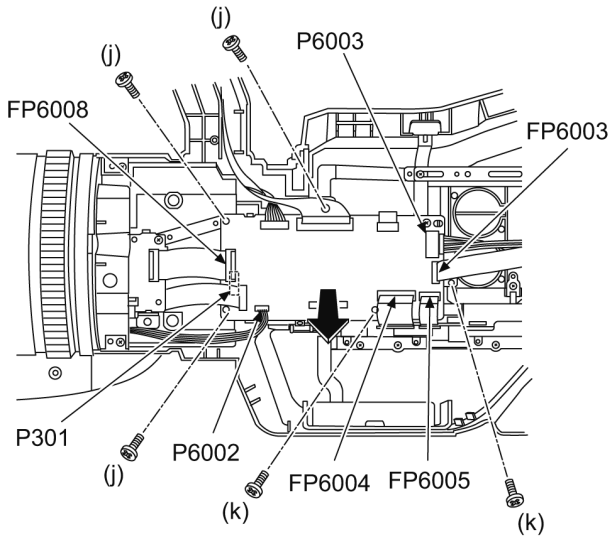
(Fig. D26)

8.3.20. Removal of the Ring LED L P.C.B., ESD P.C.B. Unit (HC-MDH2M only), HDMI FPC Unit and Main P.C.B.



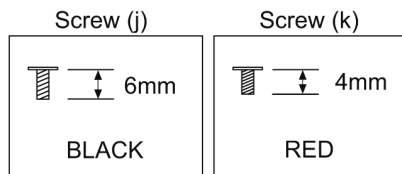
(Fig. D27)

- Screw (j) × 3
- FP6004 (Flex)
- P301 (Connector)
- Screw (k) × 2
- FP6005 (Flex)
- P6002 (Connector)
- FP6003 (Flex)
- FP6008 (Flex)
- P6003 (Connector)



NOTE: (When Replacing)

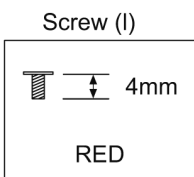
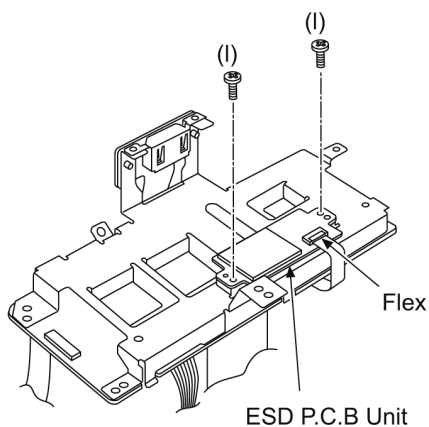
- Do not bend the flex excessively and take care not to damage the flex.



(Fig. D28)

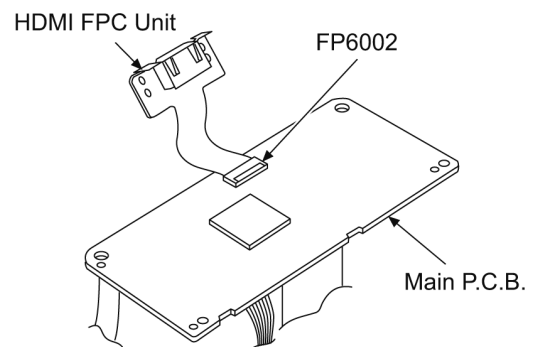
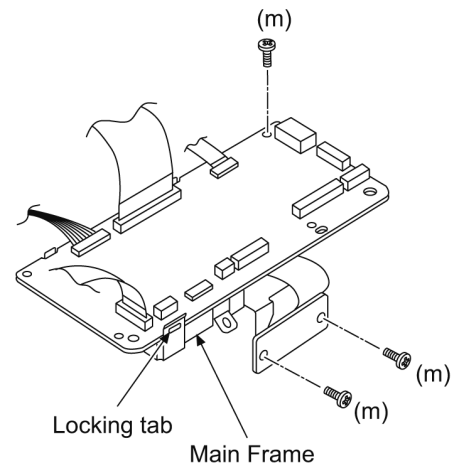
NOTE: (for HC-MDH2M only)

- Screw (l) × 2
- Flex



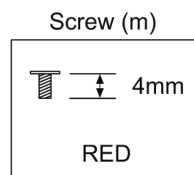
(Fig. D29)

- Screw (m) × 3
- Main Frame
- Locking tab × 1
- FP6002 (Flex)



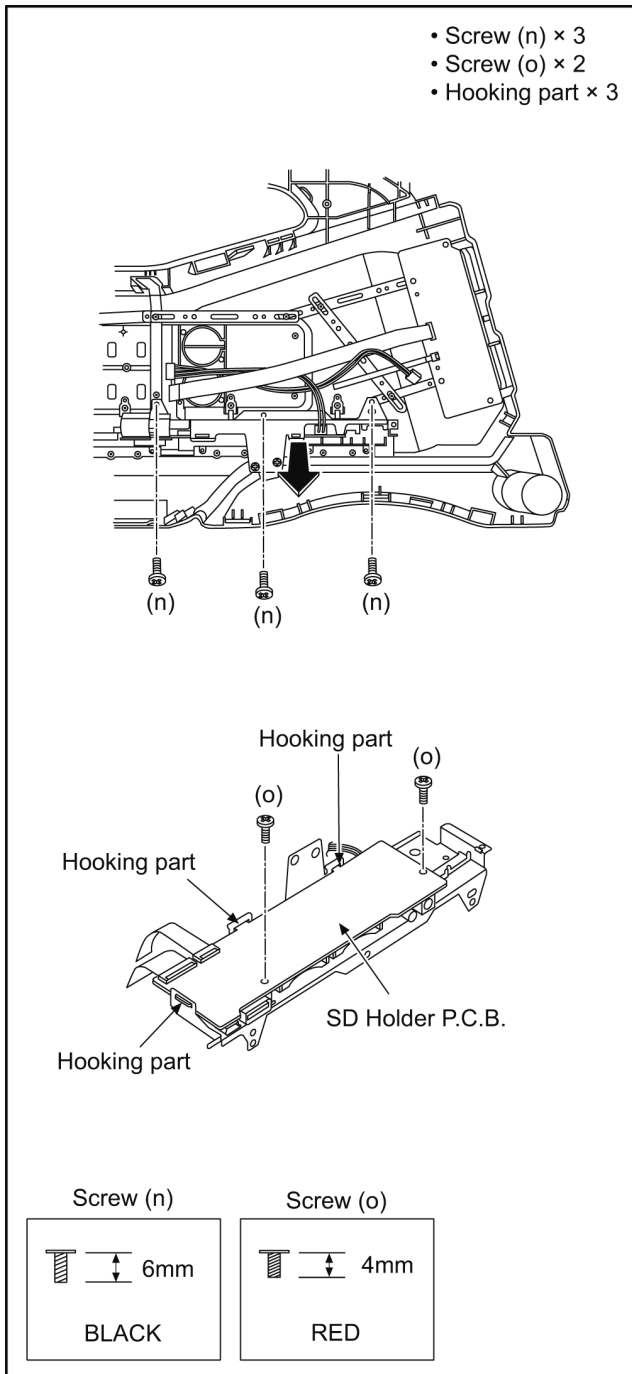
NOTE: (When Replacing)

- Do not bend the flex excessively and take care not to damage the flex.



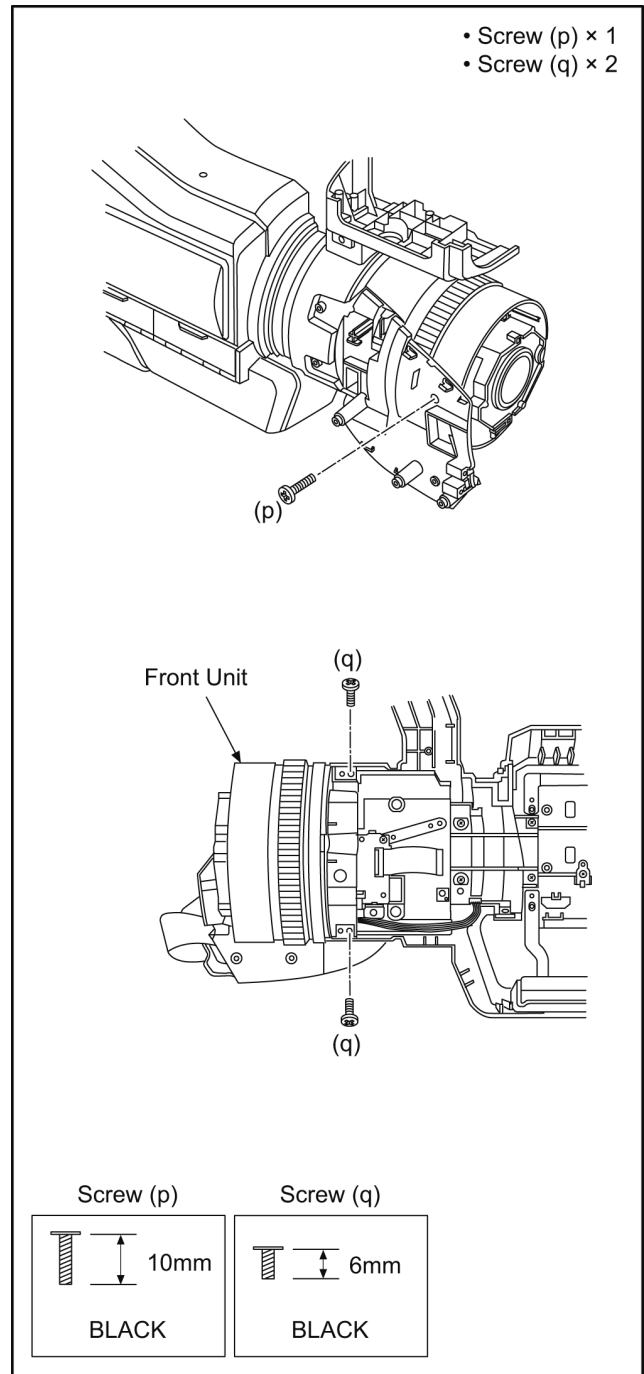
(Fig. D30)

8.3.21. Removal of the SD Holder P.C.B.



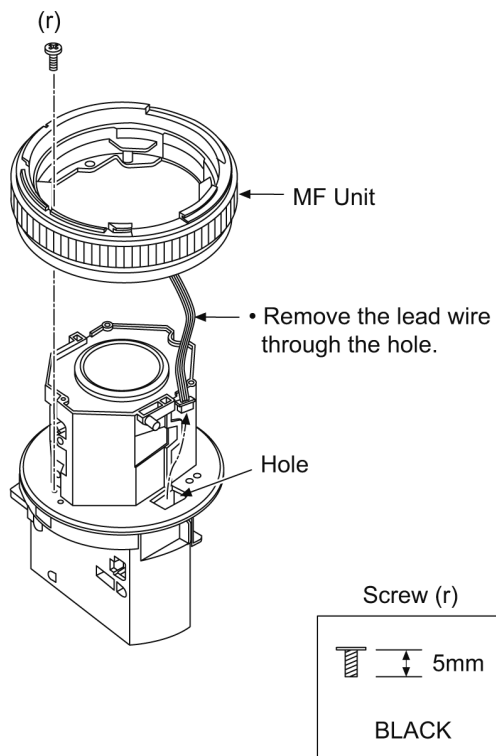
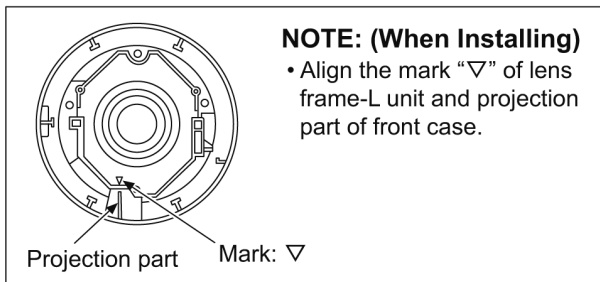
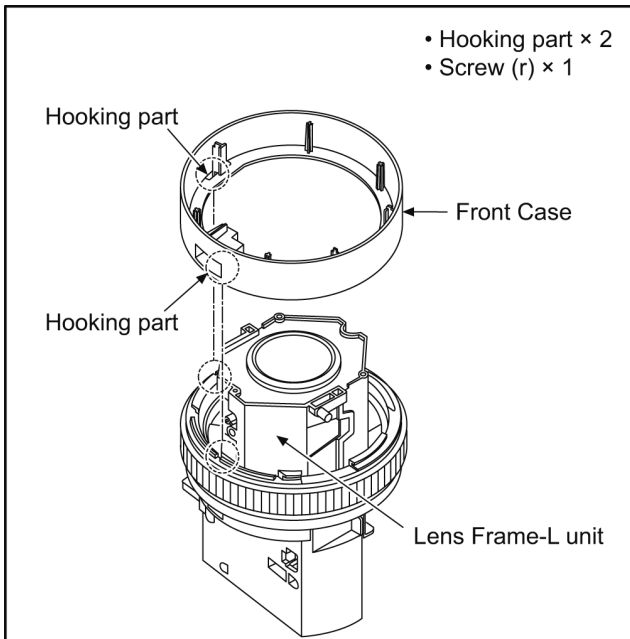
(Fig. D31)

8.3.22. Removal of the Front Unit

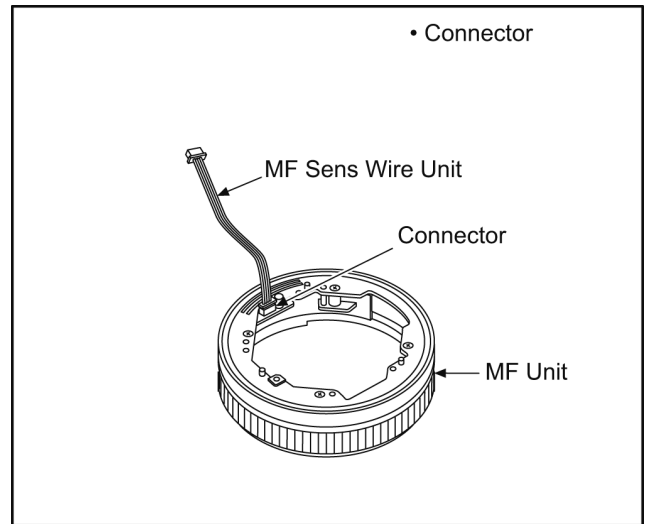


(Fig. D32)

8.3.23. Removal of the Front Case and MF Unit

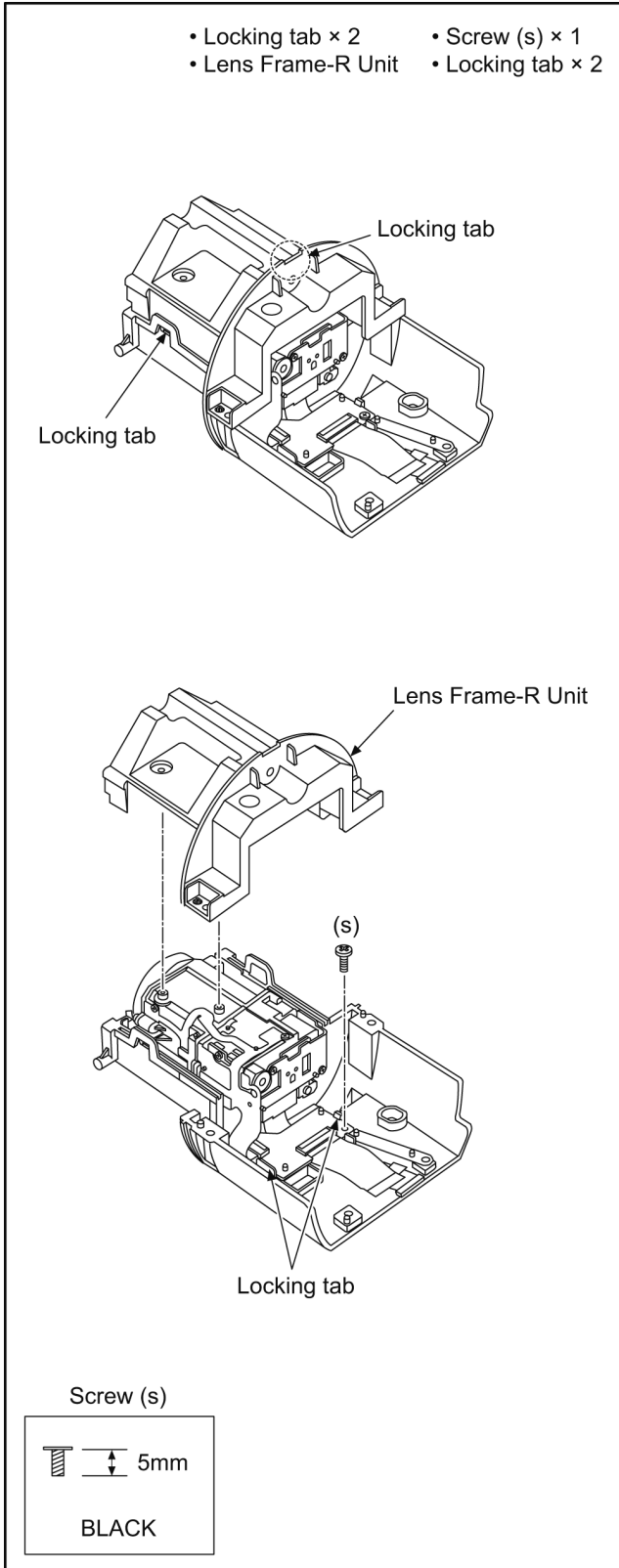


(Fig. D33)

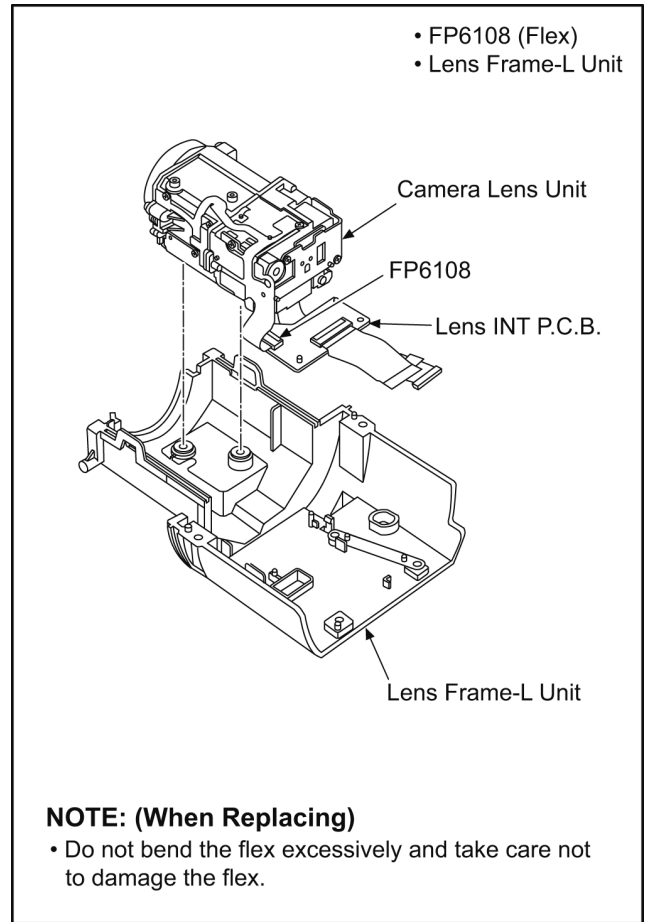


(Fig. D34)

8.3.24. Removal of the Lens INT P.C.B. and Camera Lens Unit

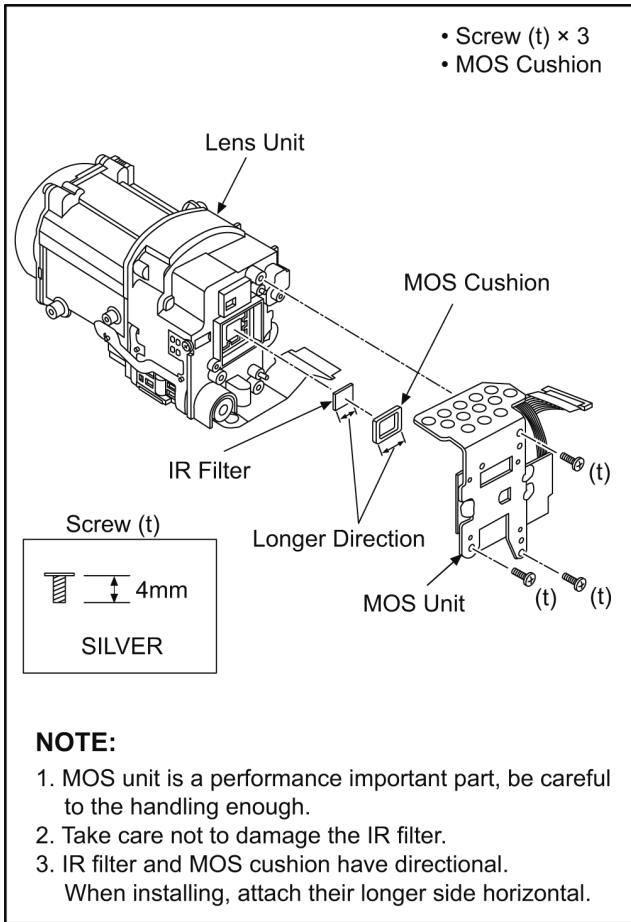


(Fig. D35)



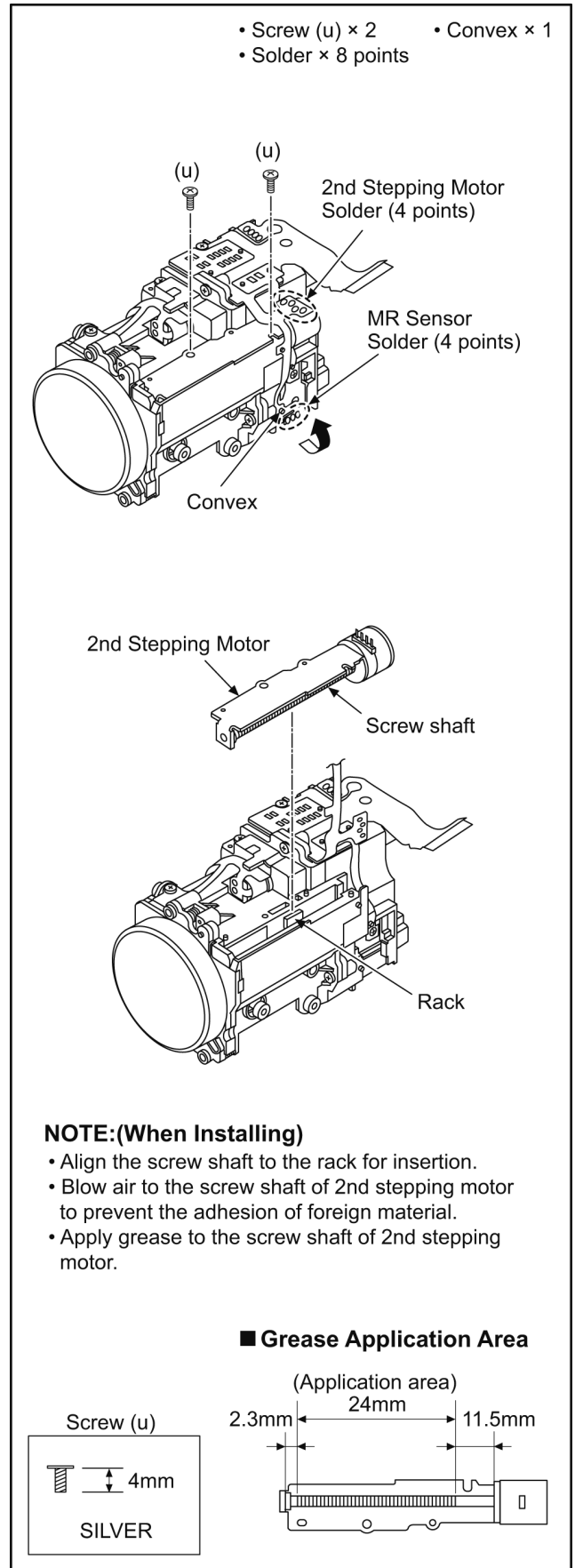
(Fig. D36)

8.3.25. Removal of the MOS Unit, Lens Unit and IR Filter

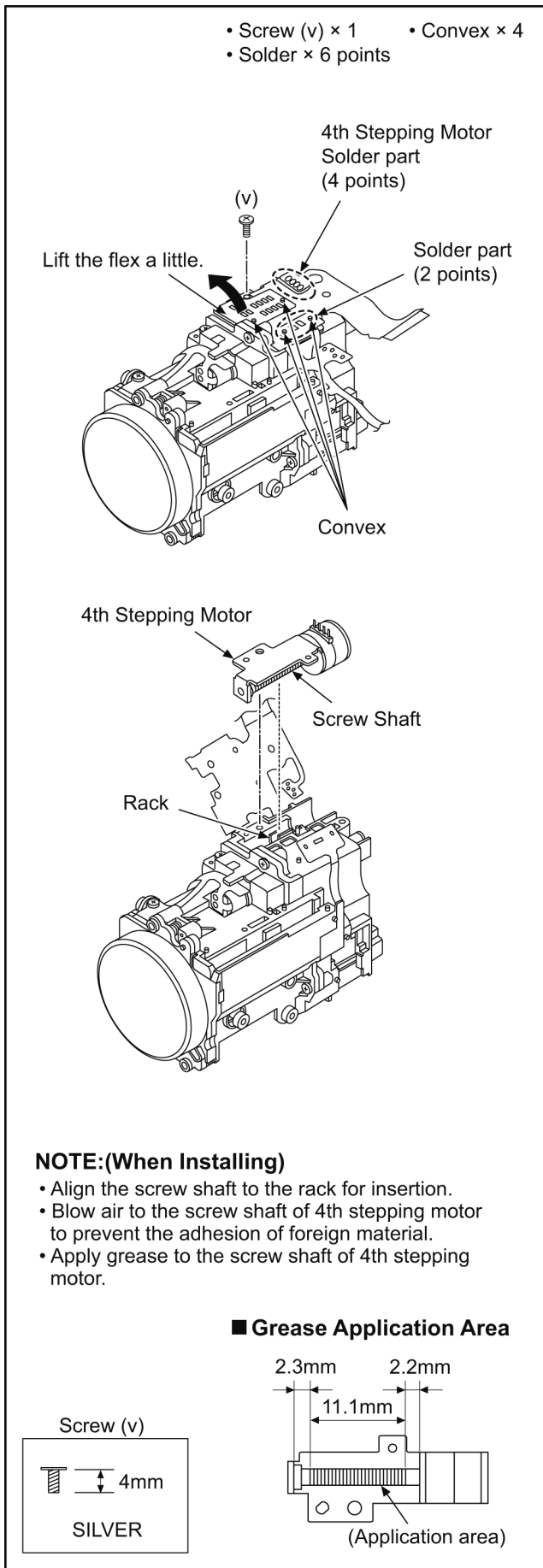


(Fig. D37)

8.3.26. Removal of the 2nd Stepping Motor and 4th Stepping Motor

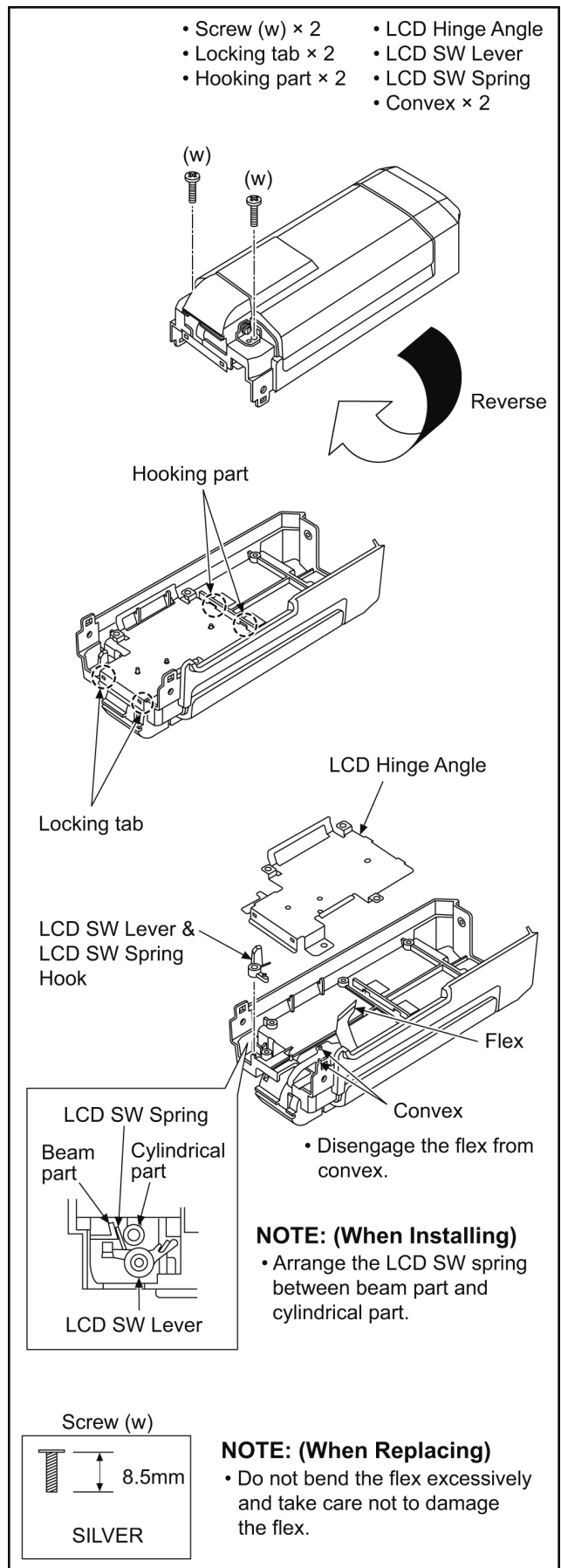


(Fig. D38)

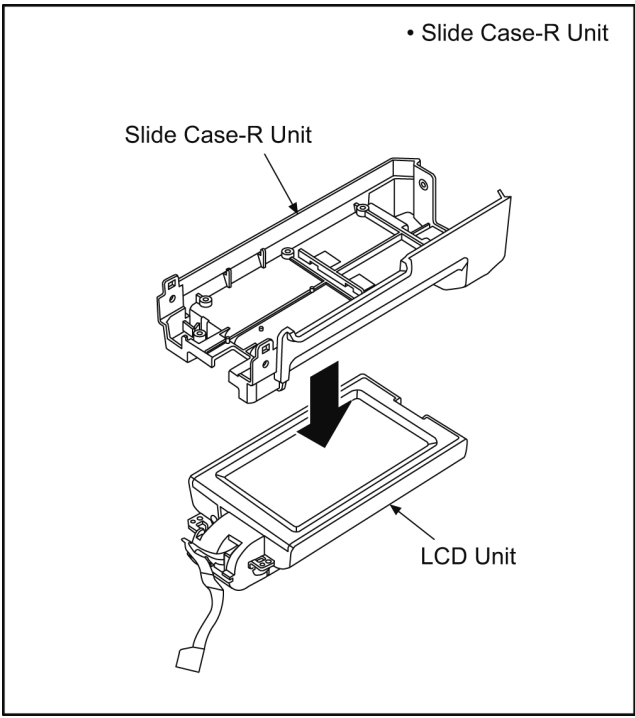


(Fig. D39)

8.3.27. Removal of the LCD Unit

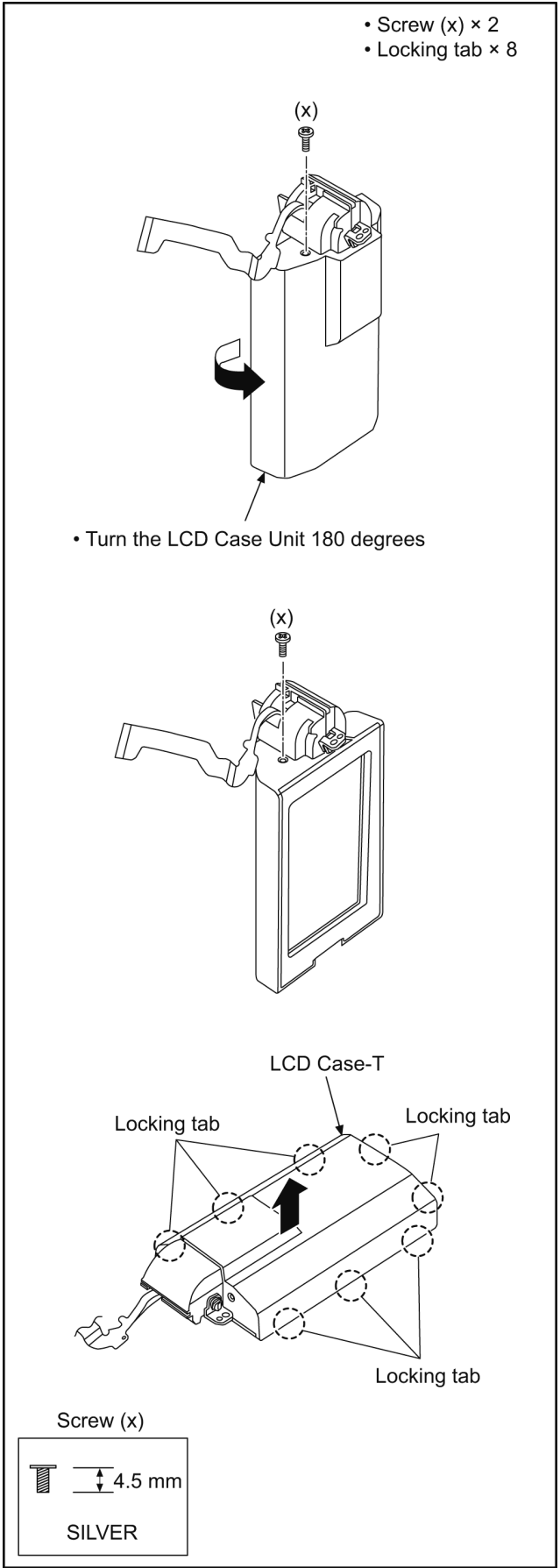


(Fig. D40)

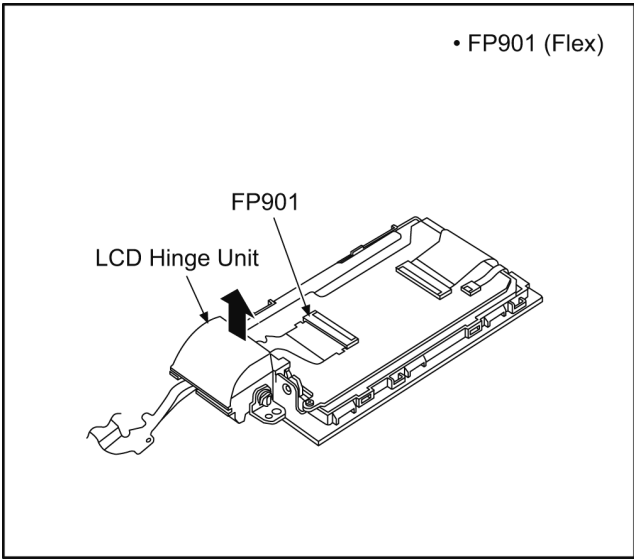


(Fig. D41)

8.3.28. Removal of the LCD Case-T and LCD Hinge Unit

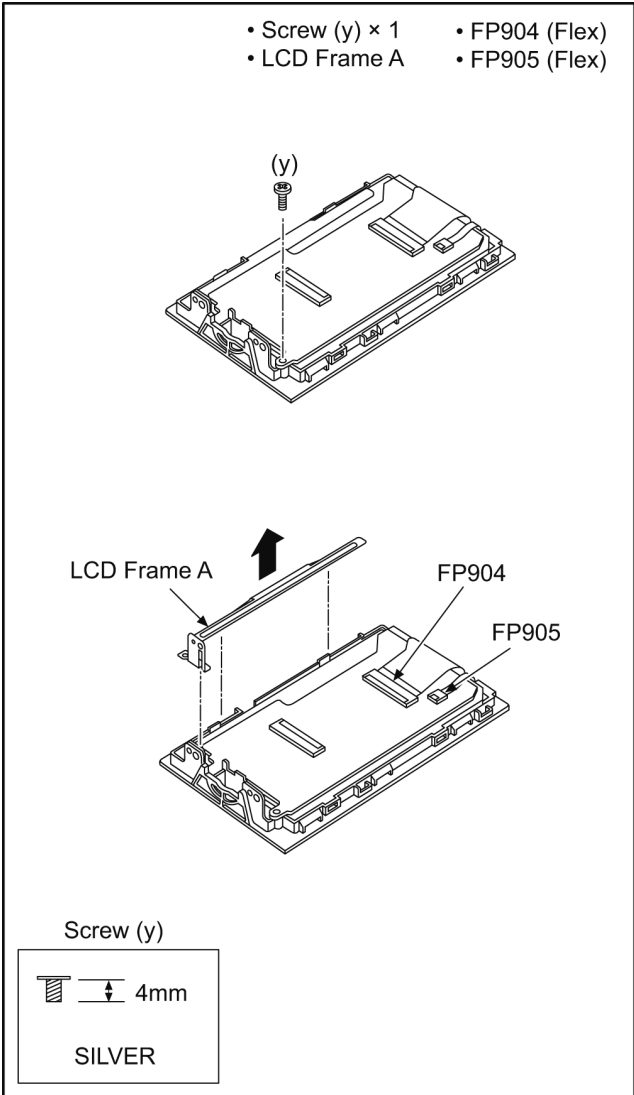


(Fig. D42)

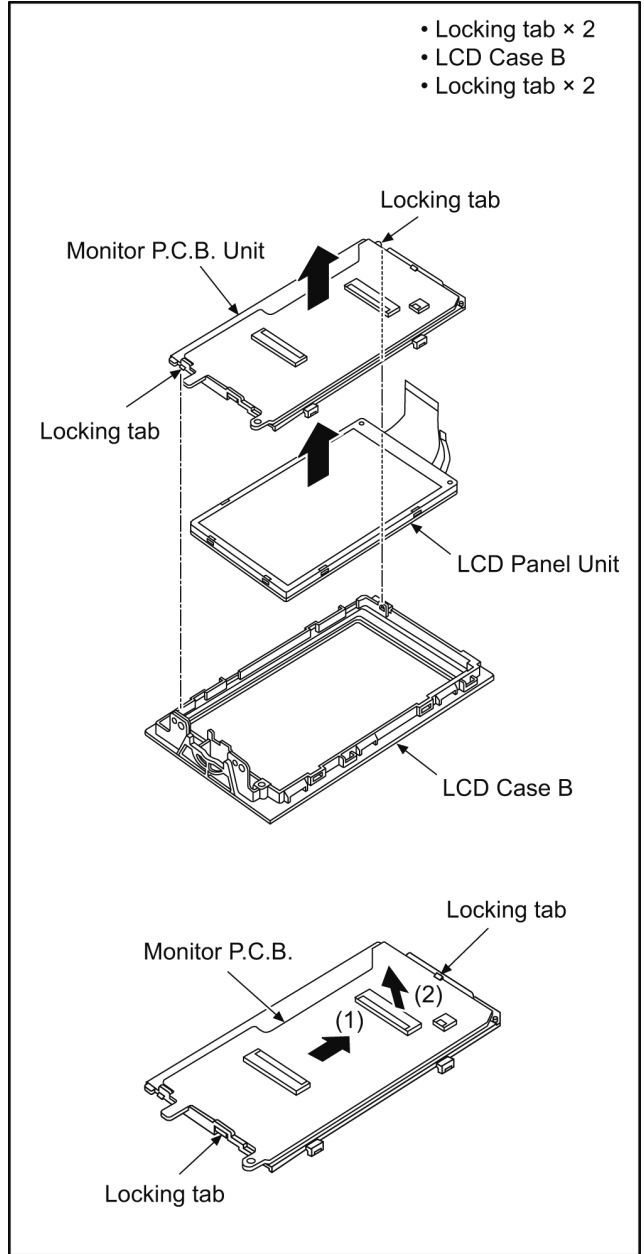


(Fig. D43)

8.3.29. Removal of the LCD Panel Unit and Monitor P.C.B.

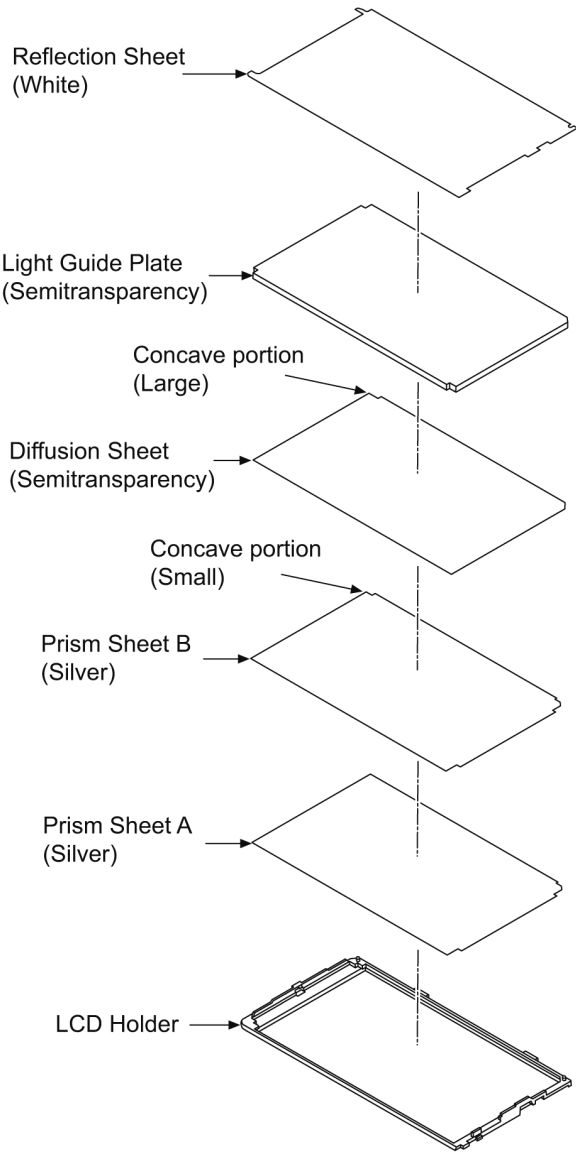


(Fig. D44)



(Fig. D45)

- Reflection Sheet
- Light Guide Plate
- Diffusion Sheet
- Prism Sheet B
- Prism Sheet A
- LCD Holder



(Fig. D46)

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.

Figure of connection

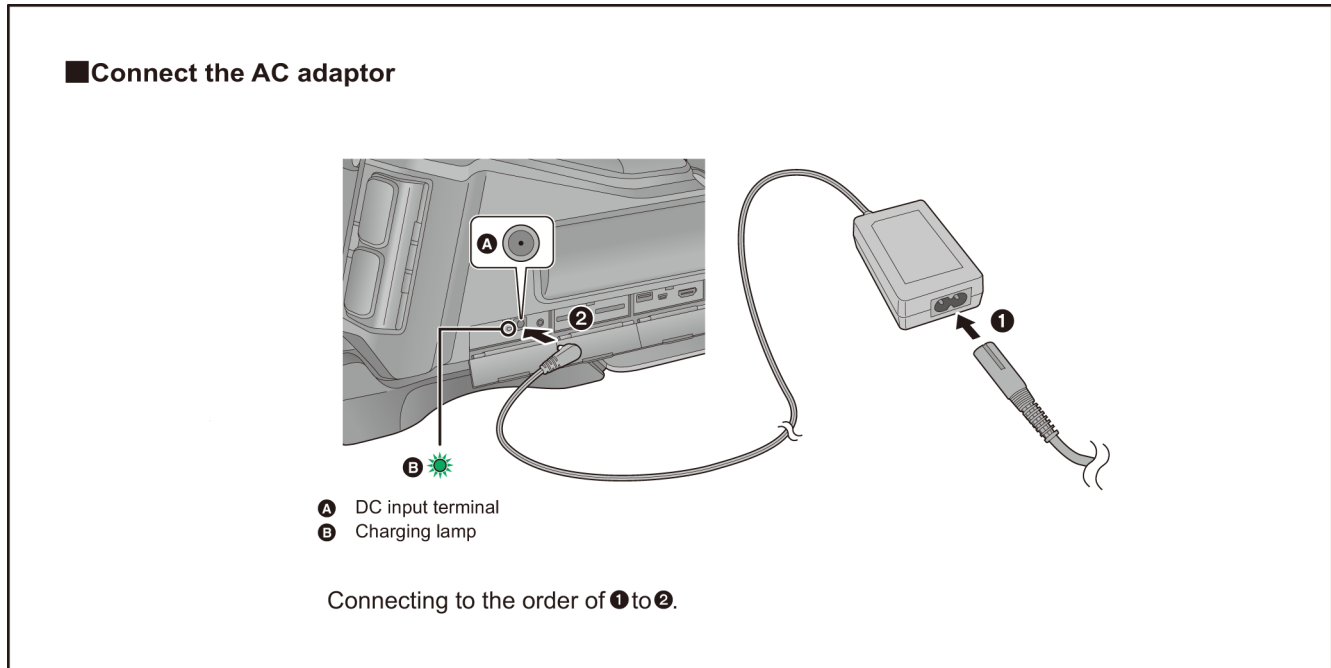
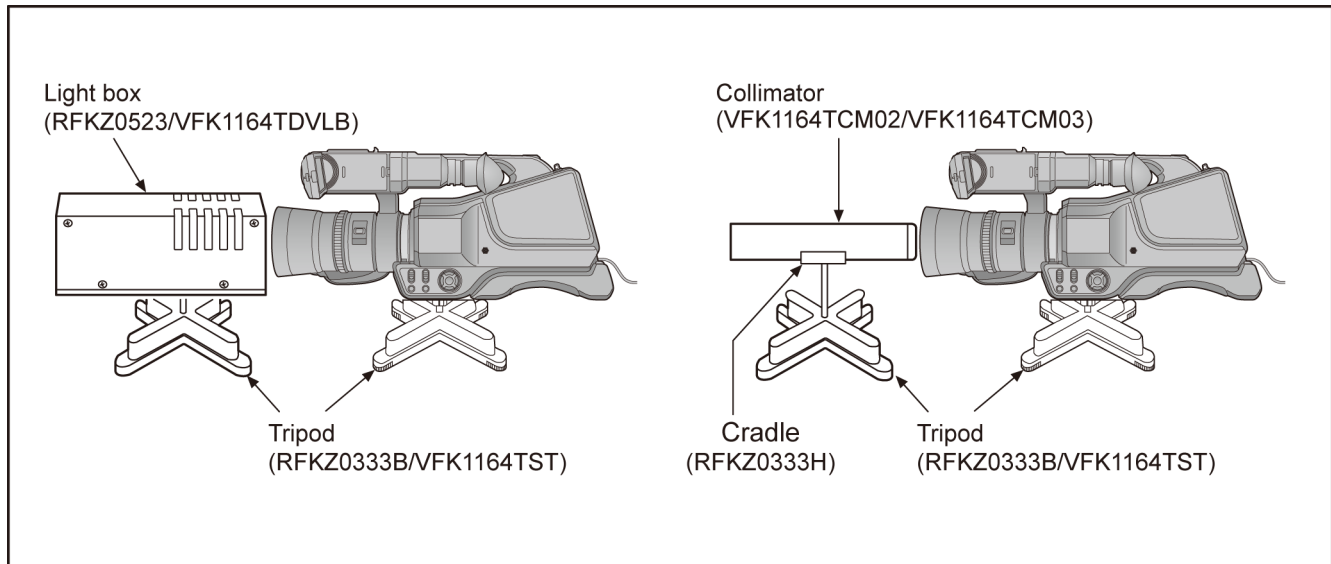


Figure of image when adjustment



Part Number of jig

1. Basic Jig

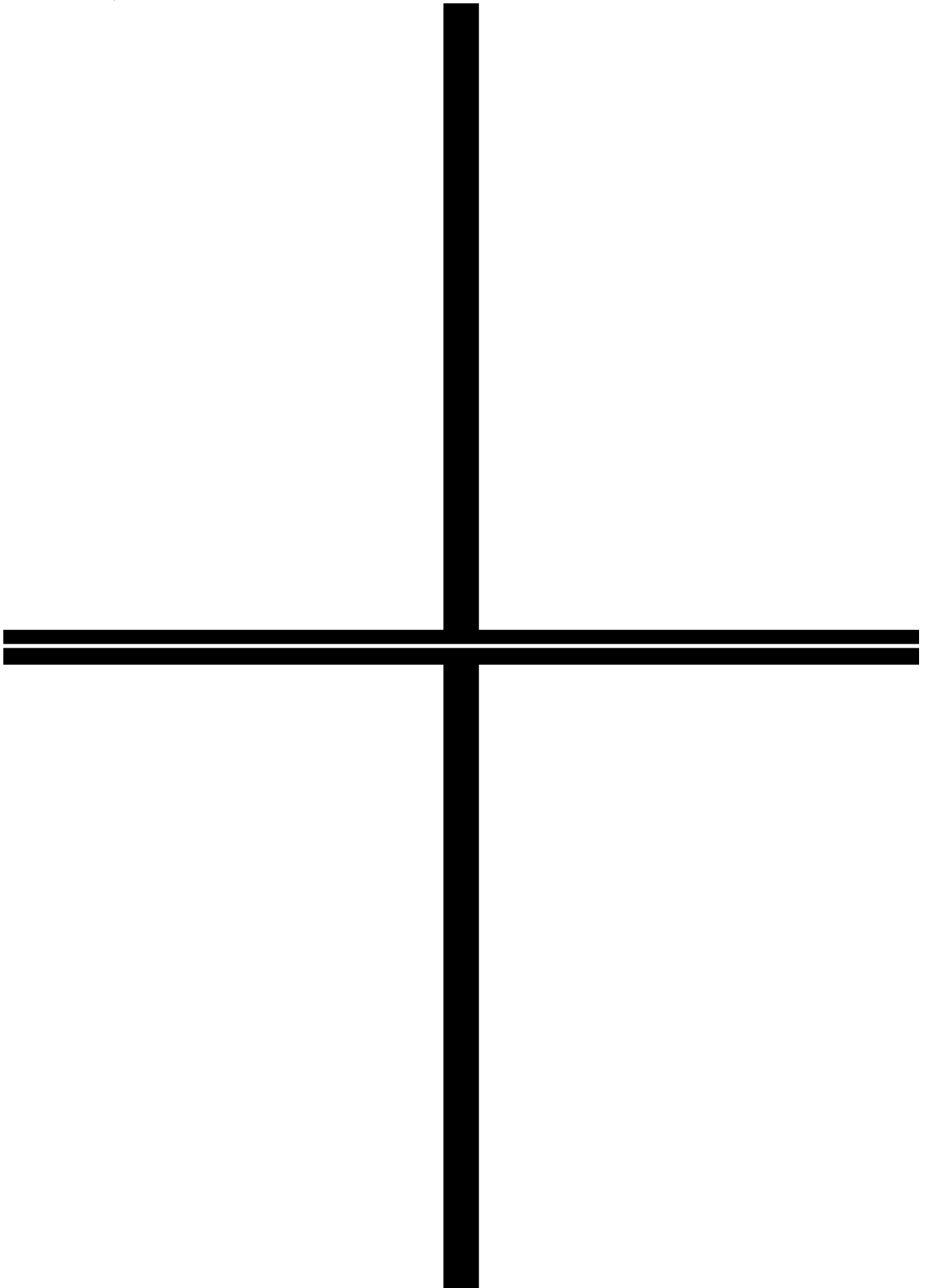
Item	Contents
AC adaptor	Banded with camcorder
AC Cable	Banded with camcorder

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	
CC filter	3100K/5100K	VFK1164CC10G	Need 2 set. For indoor/outdoor white balance adjustment
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	VFK1164ND06	For indoor white balance adjustment
Adjustment chart for Level Shot	Banded with this Manual	For Level shot adjustment	

* RFKZ0523 (same as DSC) is recommended.

[Level Shot Adjutment Chart]

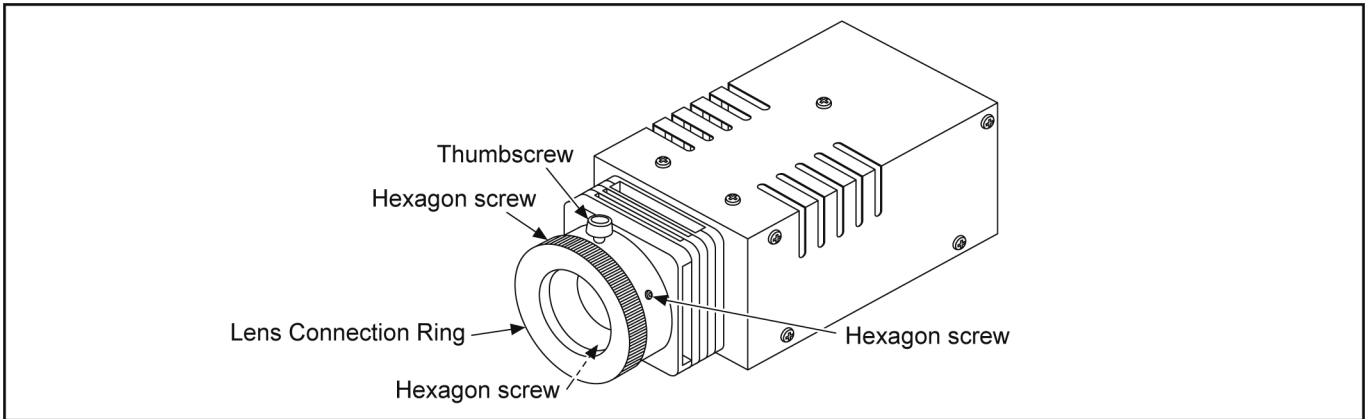


9.1.1. About Light Box

When using VFK1164TDVLB Light Box

If using VFK1164TDVLB Light Box, remove the lens connection ring by loosening thumbscrew and three hexagon screws.

* RFKZ0523 Light Box has no lens connection ring.



How to remove the Front Hood

In order to utilize maximum of the diffusing surface of light box, some adjustment items need the distance between diffusing surface of light box and camera body becomes several centimeters.

Before the adjustments, remove the front hood of light box following steps below.

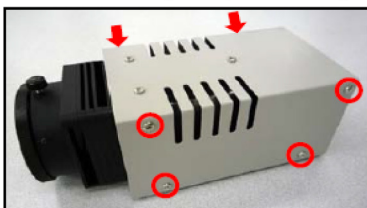
[For VFK1164TDVLB Light Box]



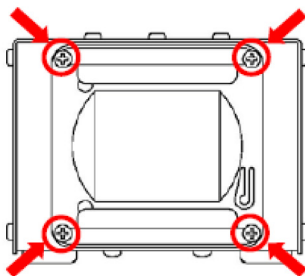
(1) Unscrew the 8 screws.
Slide the body case, then lift it up.

(2) Unscrew the 4 screws.

(3) Remove the front hood. Install the body case, then tighten the 8 screws.



[For RFKZ0523 Light Box]



Unscrew the 4 screws, then remove the front hood.

9.1.2. Adjustment Items

Adjustment item as follows.

Replacement part	Adjustment item		Adjustments						Settings		
			Camera Adjutments ^{*1} (Automatic)	Zoom Tracking Adjustment	Zoom Lever Offset Adjustment	Indoor White Balance Adjustment	Outdoor White Balance Adjustment	Level Shot adjustment ^{*2}	Touch Panel Calibration	Model setting	Factory settings
MAIN P.C.B.			○	○	○	○	○	○	-	○	○
	IC701	LENS DRIVE IC	○	○	-	-	-	-	-	-	-
	IC751	ROLL GYRO	○	-	-	-	-	-	-	-	-
	IC1001	7CH DC/DC IC	○	○	○	○	○	-	-	-	-
	IC1421	REG 3V IC	○	○	○	○	○	-	-	-	-
	IC3403	FLASH ROM	○	○	○	○	○	○	-	○	○
SS GYRO P.C.B.			○	-	-	-	-	○	-	-	-
	IC6401	PIT/YAW GYRO	○	-	-	-	-	○	-	-	-
	IC6411	ACCELEROMETER	-	-	-	-	-	○	-	-	-
ZOOM PHOTO P.C.B.			-	-	○	-	-	○	-	-	-
MF SENSE P.C.B.			-	-	-	-	-	○	-	-	-
LENS INT P.C.B.			-	-	-	-	-	○	-	-	-
LENS UNIT			○	○	-	○	○	○	-	-	-
MOS UNIT			○	○	-	○	○	○	-	-	-
LCD U			-	-	-	-	-	-	○	-	-

*1...IRIS adjustment, OIS hall amp adjustment, Missing pixels compensation, OIS gyro adjustment, AGS adjustment

*2...Accelerometer : Since the assembly is accompanied, always need to be adjusted.

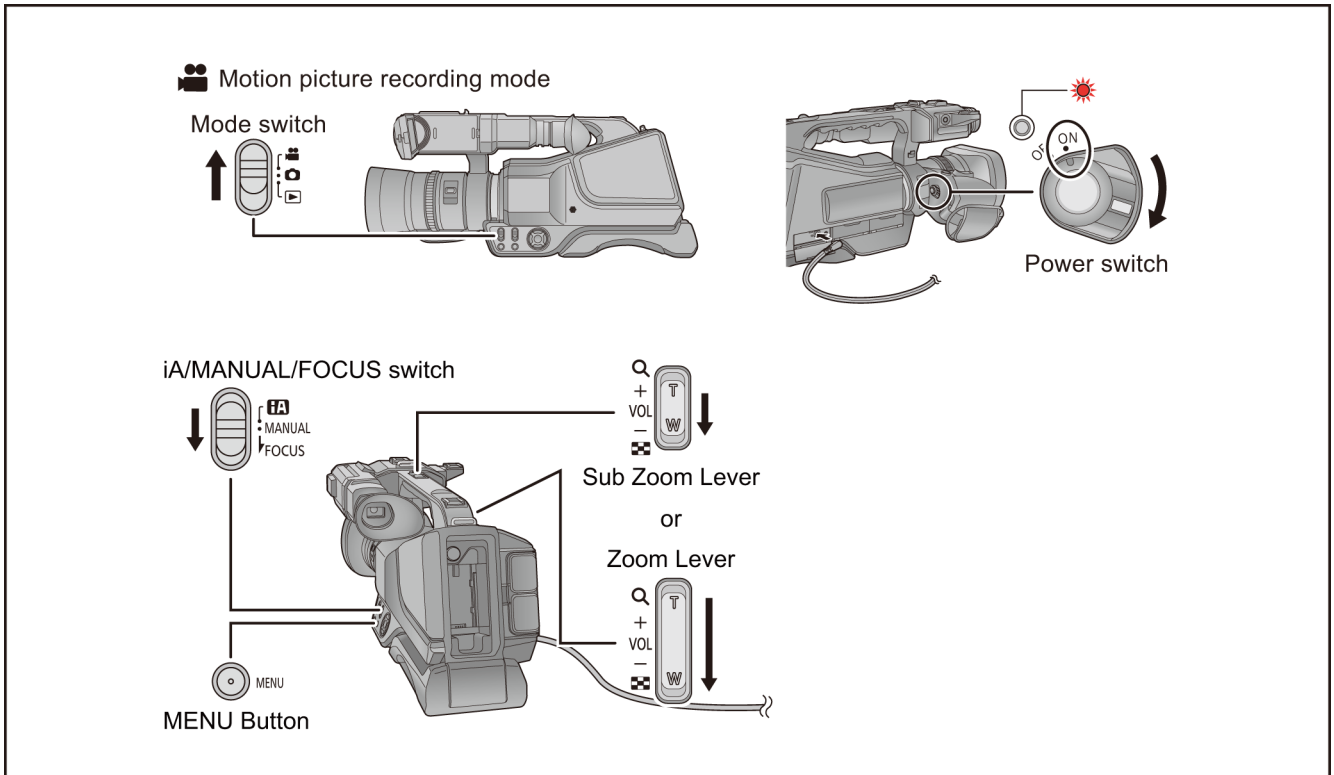
9.1.3. Adjustment Procedure

All adjustments except “Touch Panel Calibration” and “Factory Setting” performs using “14 Adjustment function for the service” in service mode menu.

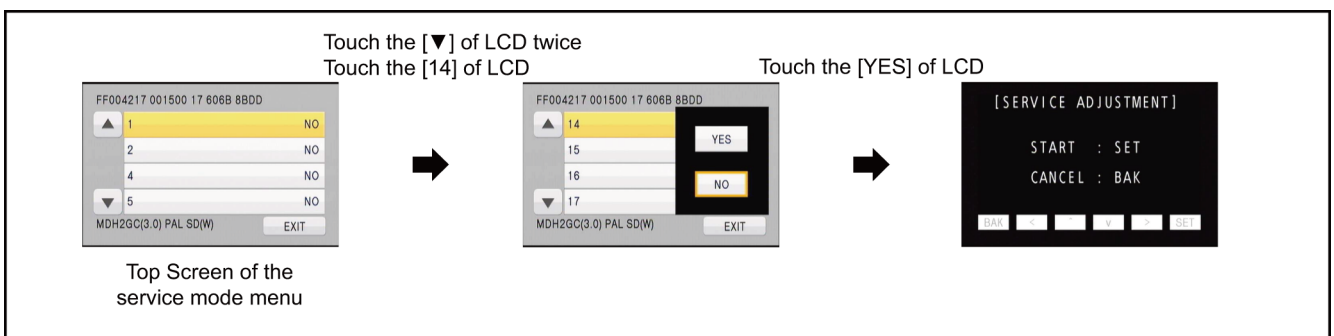
“Touch Panel Calibration” is performed using 16 of service mode menu and “Factory Setting” is performed using 1, of service mode menu. Refer to “6 Service mode” and “10 Factory Setting”.

[Execute adjustment function for service]

1. Set the mode switch “Motion Picture Recording” mode.
2. Set the power switch to ON, and turn to ON.
3. Keep pressing the “iA/MANUAL/FOCUS” switch to “FOCUS” side, “MENU” button and “Zoom Lever” (or “Sub Zoom Lever”) to W side for more than 3 seconds until the top screen of the Service Mode Menu being displayed.



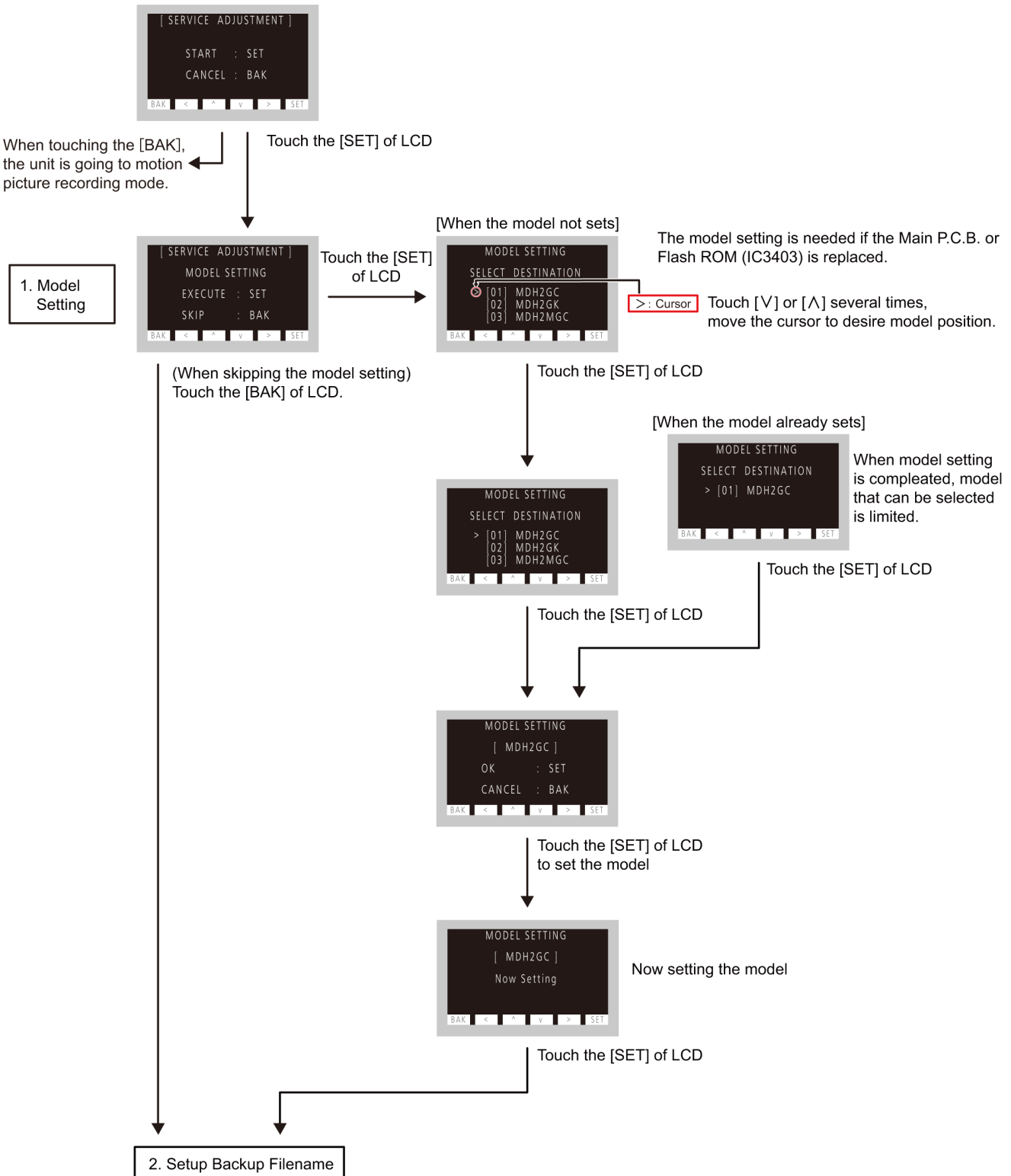
4. Touch the ▼ twice then touch the [14] of LCD.
5. Touch the [YES] of LCD.



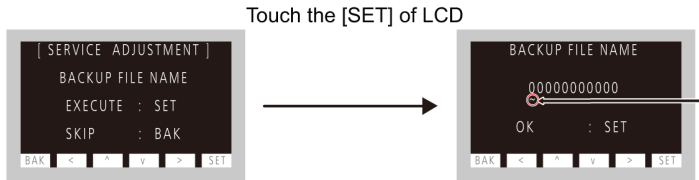
[Adjustment Procedure]

Adjustments and settings are performed following order:

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

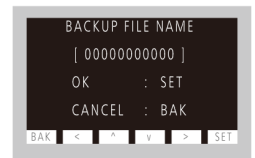


2. Setup Backup Filename



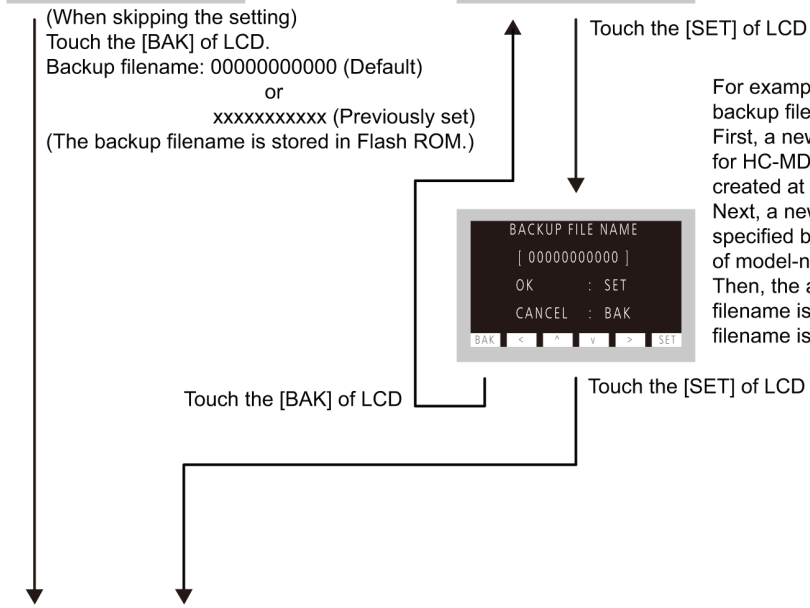
- < : Move cursor 1 position left
- > : Move cursor 1 position right
- ^ : Increase 1 character (0→1→2→...)
- v : Decrease 1 character (0→Z→Y→...)
- ~ : Cursor

(When skipping the setting)
 Touch the [BAK] of LCD.
 Backup filename: 0000000000 (Default)
 or
 xxxxxxxxxxxx (Previously set)
 (The backup filename is stored in Flash ROM.)

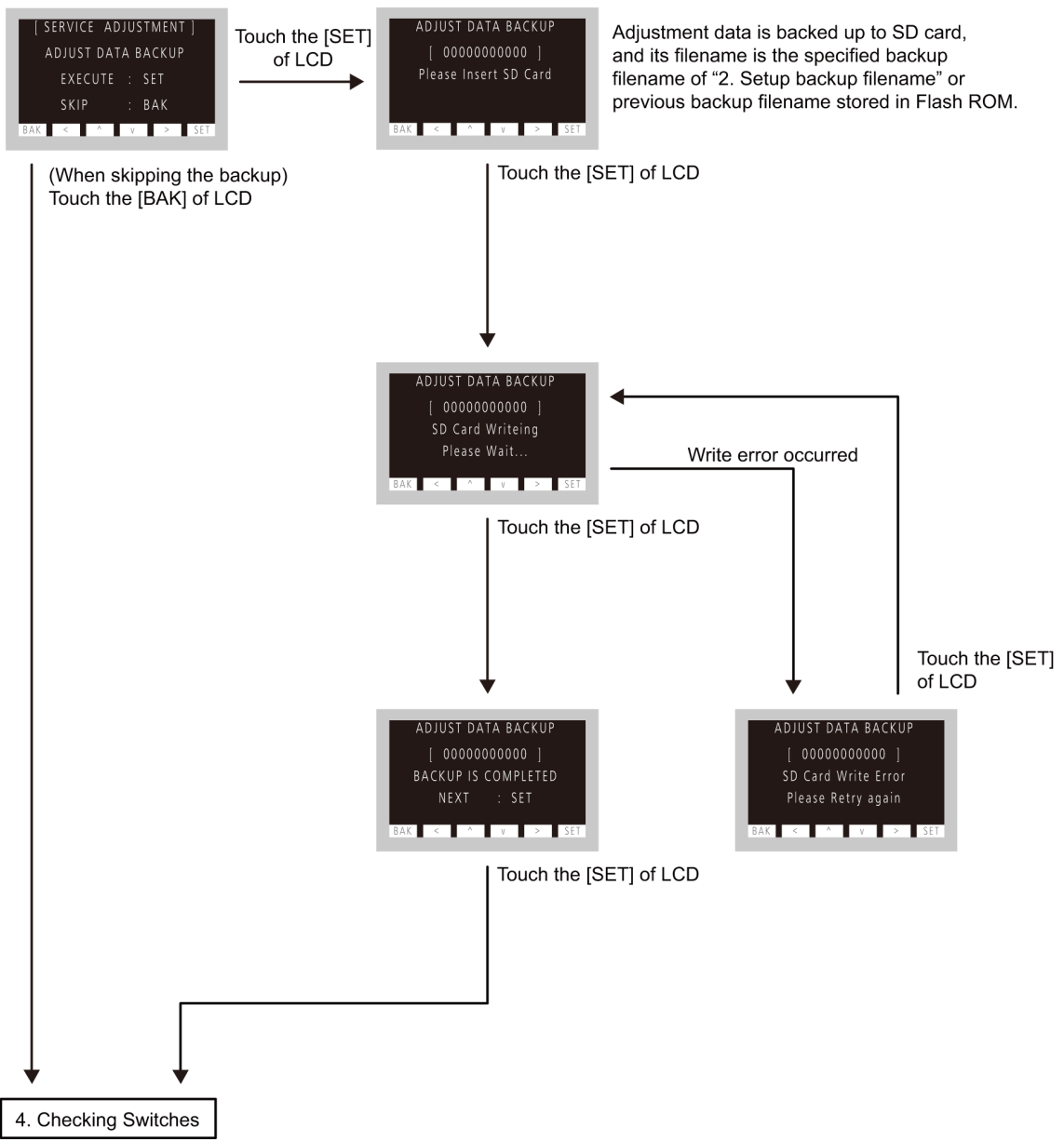


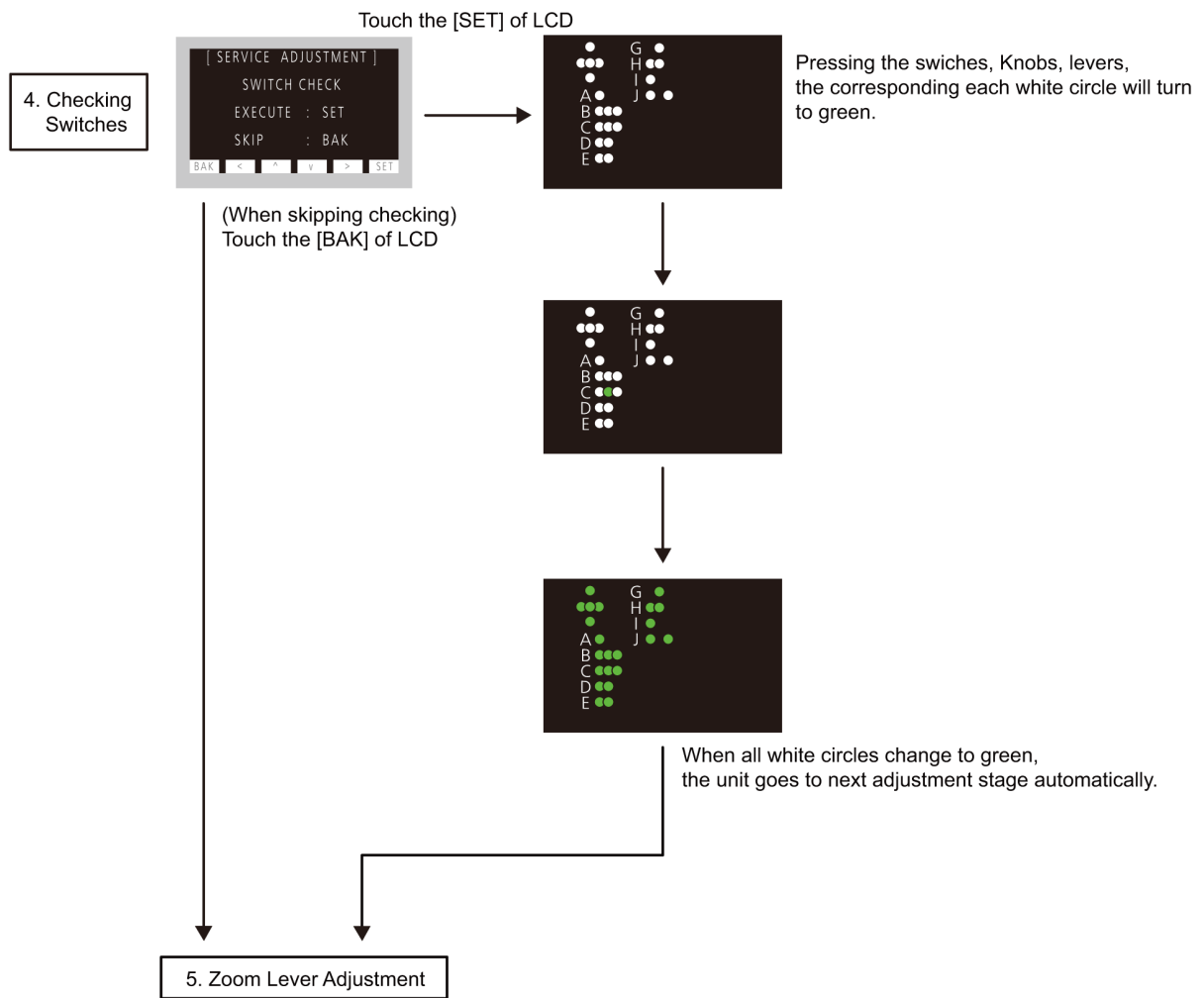
For example, "ABCDE123456" as the specified backup filename;
 First, a new folder (folder name is "MDH2M" for HC-MDH2M, "MDH2" for HC-MDH2.) is created at root folder of SD card.
 Next, a new folder that is named first 5 letter of specified backup filename is created inside of model-named folder.
 Then, the adjustment data backup file which filename is last 6 letter of specified backup filename is created inside of above folder.

3. Backup Execution

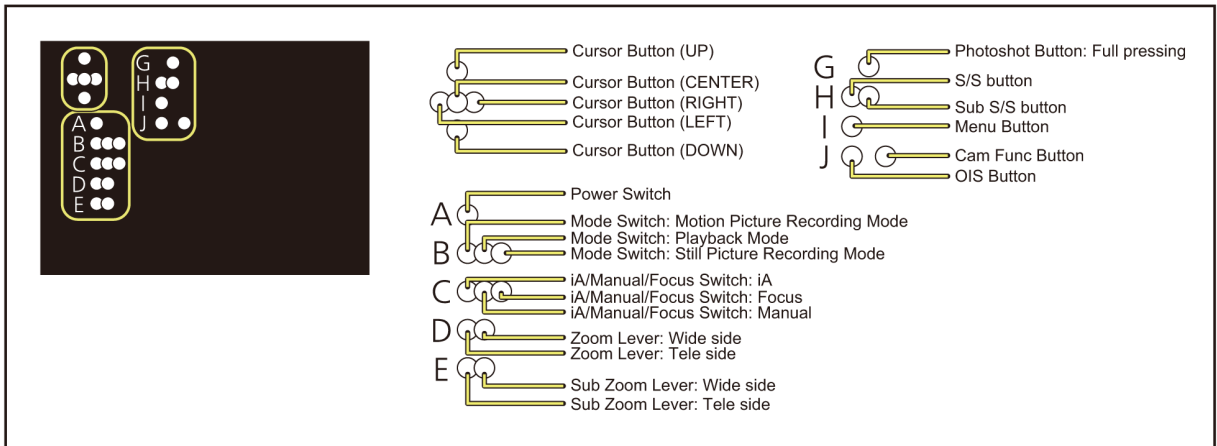


3. Backup Execution

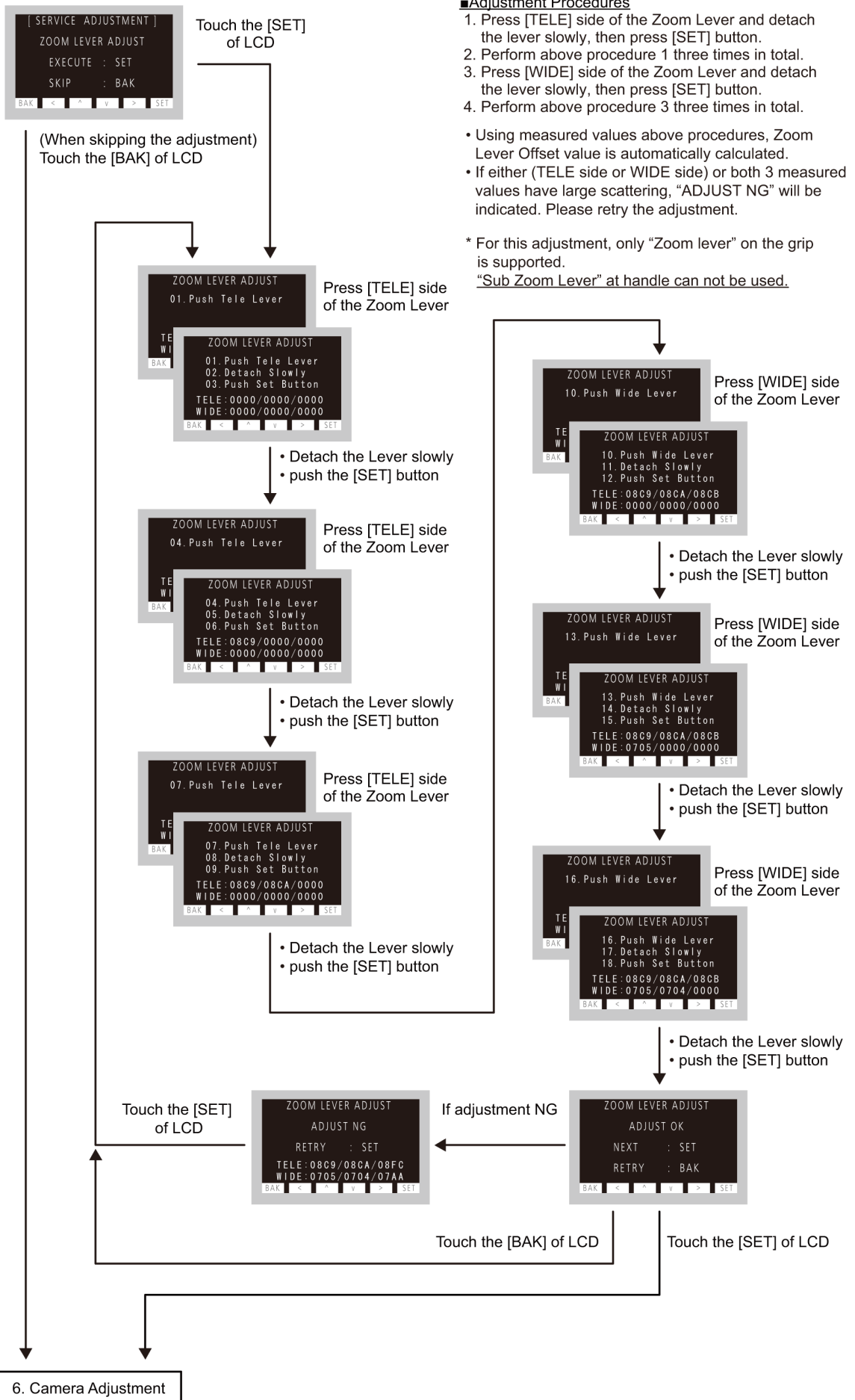




< Switches arrangement >



5. Zoom Lever Adjustment



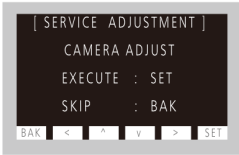
■Adjustment Procedures

1. Press [TELE] side of the Zoom Lever and detach the lever slowly, then press [SET] button.
2. Perform above procedure 1 three times in total.
3. Press [WIDE] side of the Zoom Lever and detach the lever slowly, then press [SET] button.
4. Perform above procedure 3 three times in total.

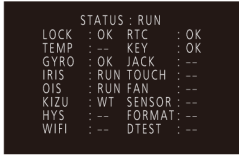
- Using measured values above procedures, Zoom Lever Offset value is automatically calculated.
- If either (TELE side or WIDE side) or both 3 measured values have large scattering, "ADJUST NG" will be indicated. Please retry the adjustment.

* For this adjustment, only "Zoom lever" on the grip is supported.
"Sub Zoom Lever" at handle can not be used.

6. Camera Adjustment



Touch the [SET] of LCD

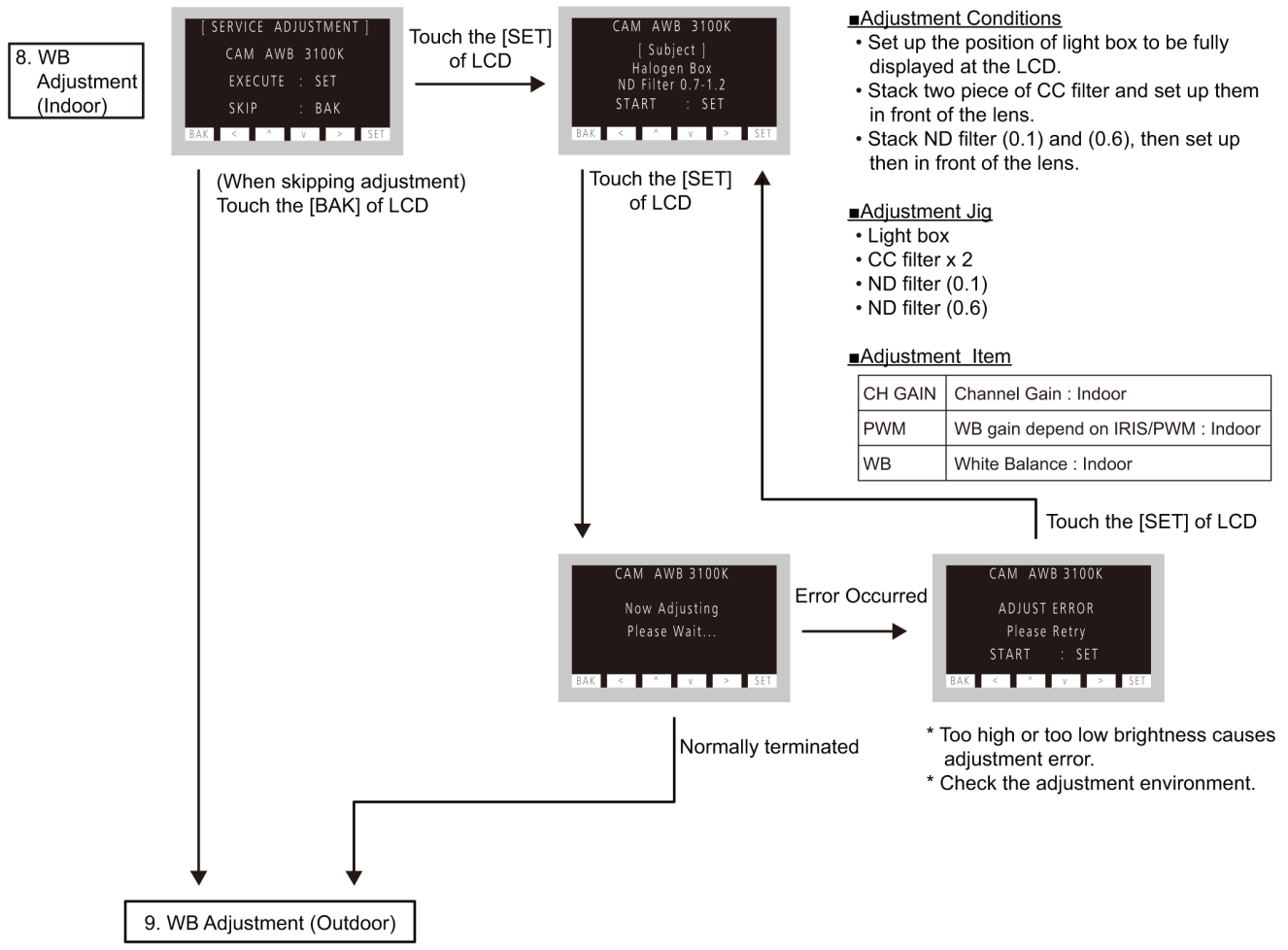
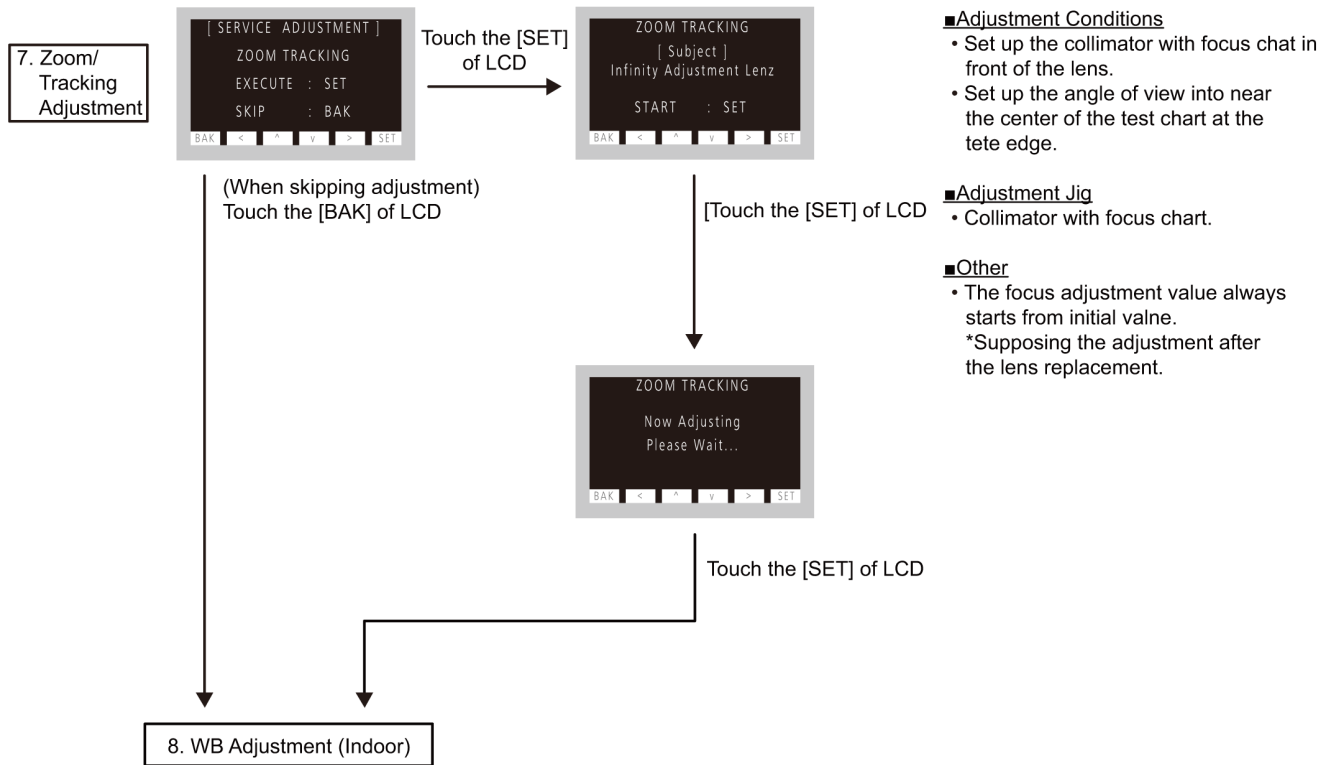


WT : Waiting for Adjust
 RUN : Now adjusting
 OK : Normal Condition
 NG : Abnormal Condition
 -- : Excluded

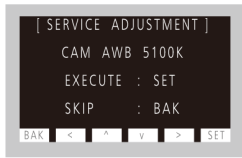
(When skipping the adjustment)
 Touch the [BAK] of LCD

Adjustment Item	
LOCK	Confirmation that the lens lock has not occurred.
TEMP	(Excluded)
GYRO	Result of Gyro DC compensation
IRIS	Result of Iris adjustment
OIS	Result of OIS adjustment
KIZU	Result of missing pixels compensation
HYS	(Excluded)
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)

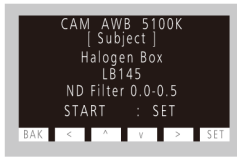
7. Zoom/Tracking Adjustment



9. WB Adjustment (Outdoor)



Touch the [SET] of LCD



Touch the [SET] of LCD



Normally terminated

Error Occurred



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

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

10. Level Shot Adjustment

■ 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

10. Level Shot Adjustment



Touch the [SET] of LCD

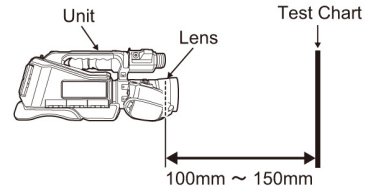


Press the [Photo shot] button

■ 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

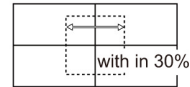


• Unit Installation Condition

- Horizontal Tilt (ROLL) : with in ± 1.45 degree
- Vertical Tilt (PITCH) : with in ± 0.8 degree

■ 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 $\pm 30\%$ 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 $\pm 0.1^\circ$

Horizontal tilt (YAW) : with in $\pm 5.0^\circ$

Vertical tilt (PITCH) : with in $\pm 5.0^\circ$

Touch the [SET] of LCD



Error Occurred

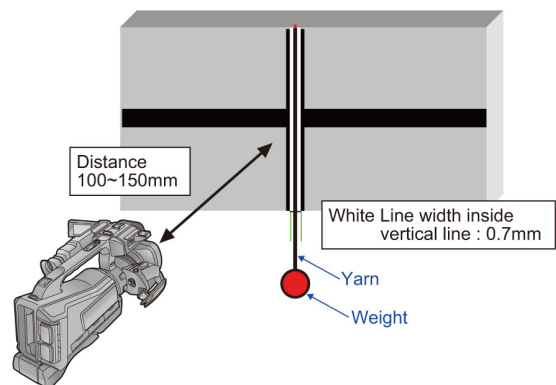


Normally terminated



Set the power switch to OFF and turn off. Adjustment completed.

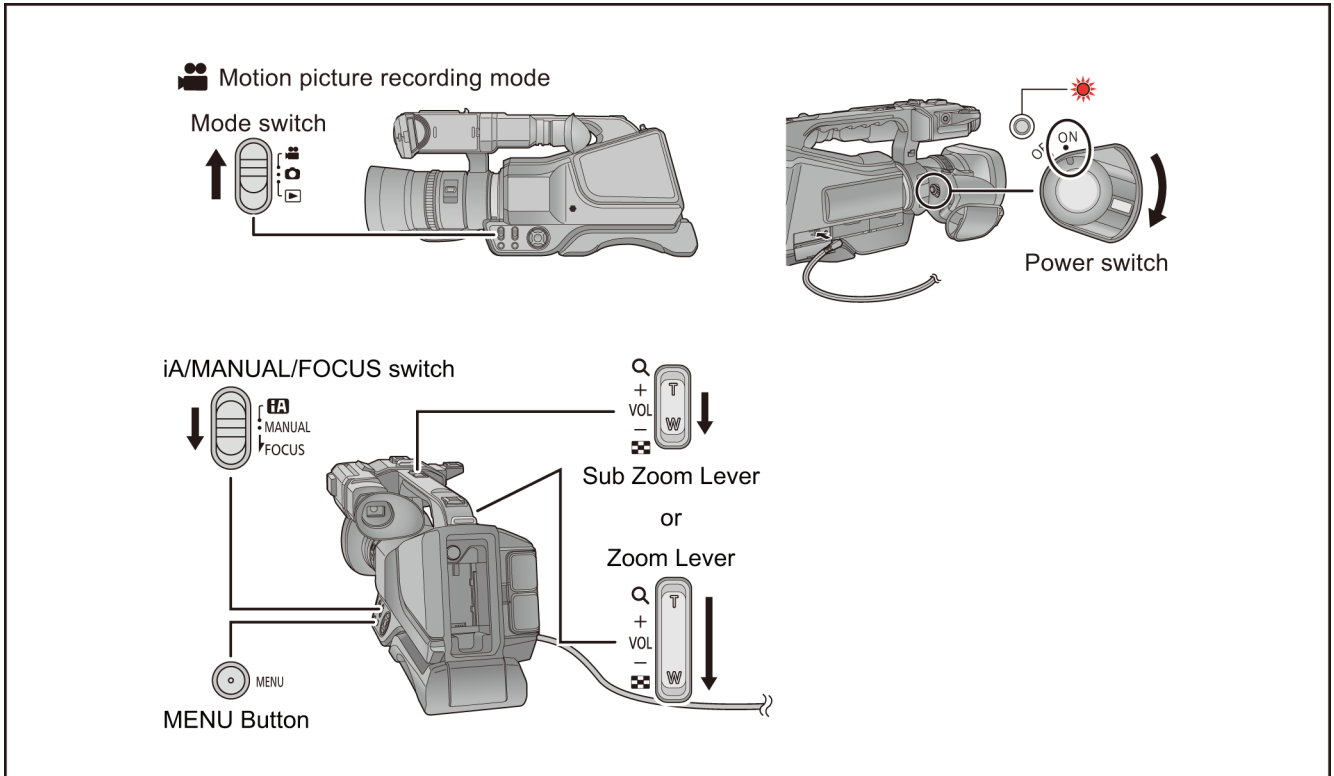
◇Level Management by Yarn Hanging



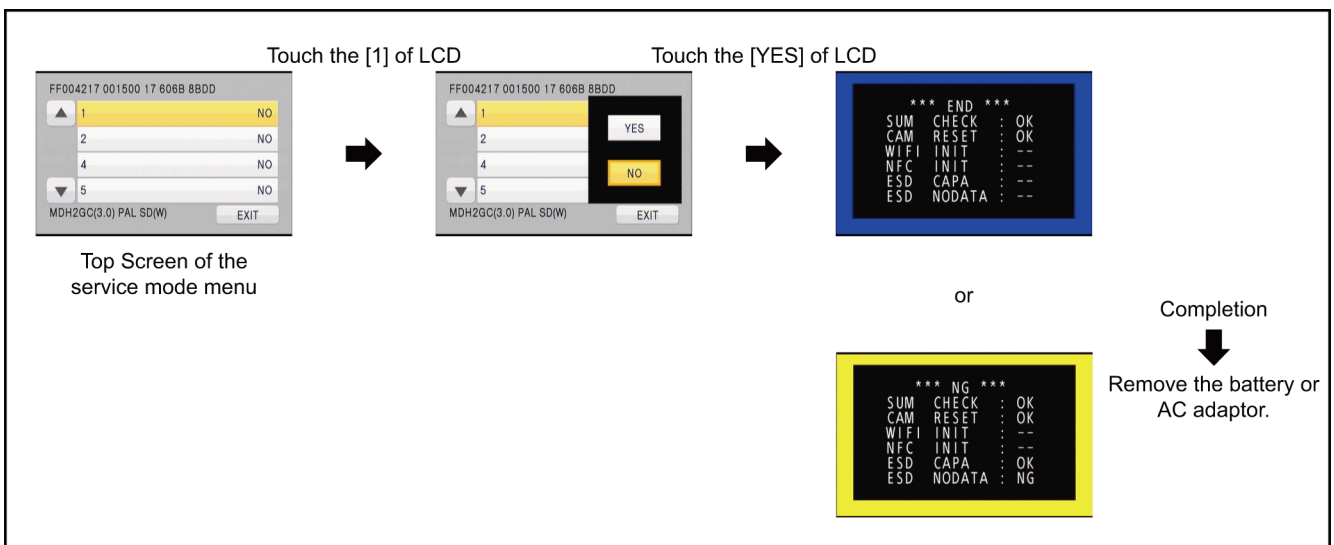
10 Factory Setting

10.1. How To Turn On The Factory Settings?

1. Set the mode switch "Motion Picture Recording" mode.
2. Set the power switch to ON, and turn to ON.
3. Keep pressing the "i/MANUAL/FOCUS" switch to "FOCUS" side, "MENU" button and "Zoom Lever" (or "Sub Zoom Lever") to W side for more than 3 seconds until the top screen of the Service Mode Menu being displayed.



4. Touch the [1] of LCD.
5. Touch the [YES] of LCD.
6. 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?

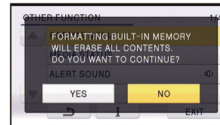
The factory settings clean up and/or refresh the following settings.

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. Initialize the VIERA Link Physical Address.
5. Confirm that the data area of built-in memory is cleared. (HC-MDH2M only)
6. Confirm that the built-in memory cappacity is correct. (HC-MDH2M only)
(Checking of the built-in memory mounting error.)

(HC-MDH2M)

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 [OTHER FUNCTION] → [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.

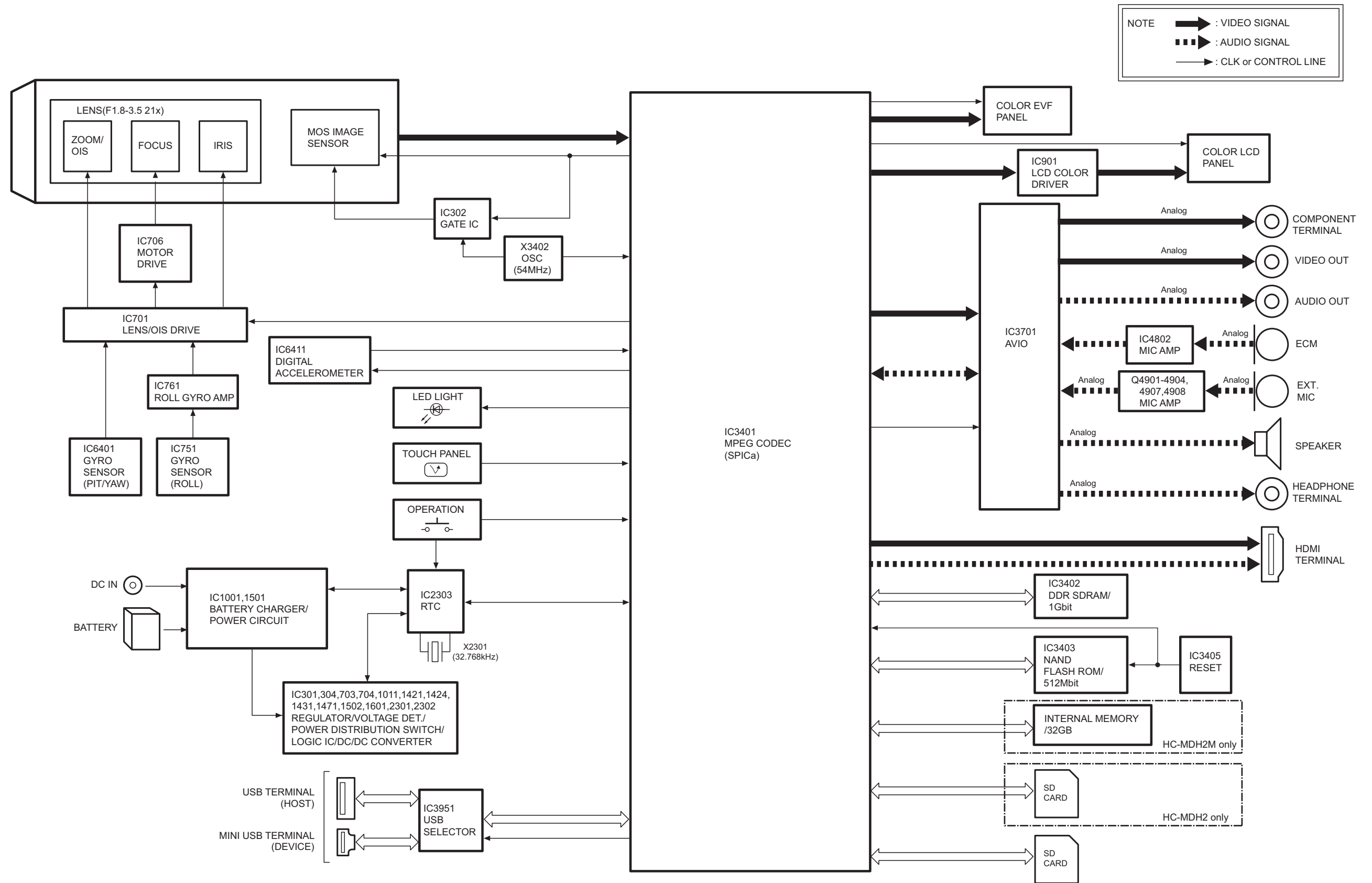


**The shipment setting position of switches and lever:
(After the factory settings, set the switches and lever as following table.)**

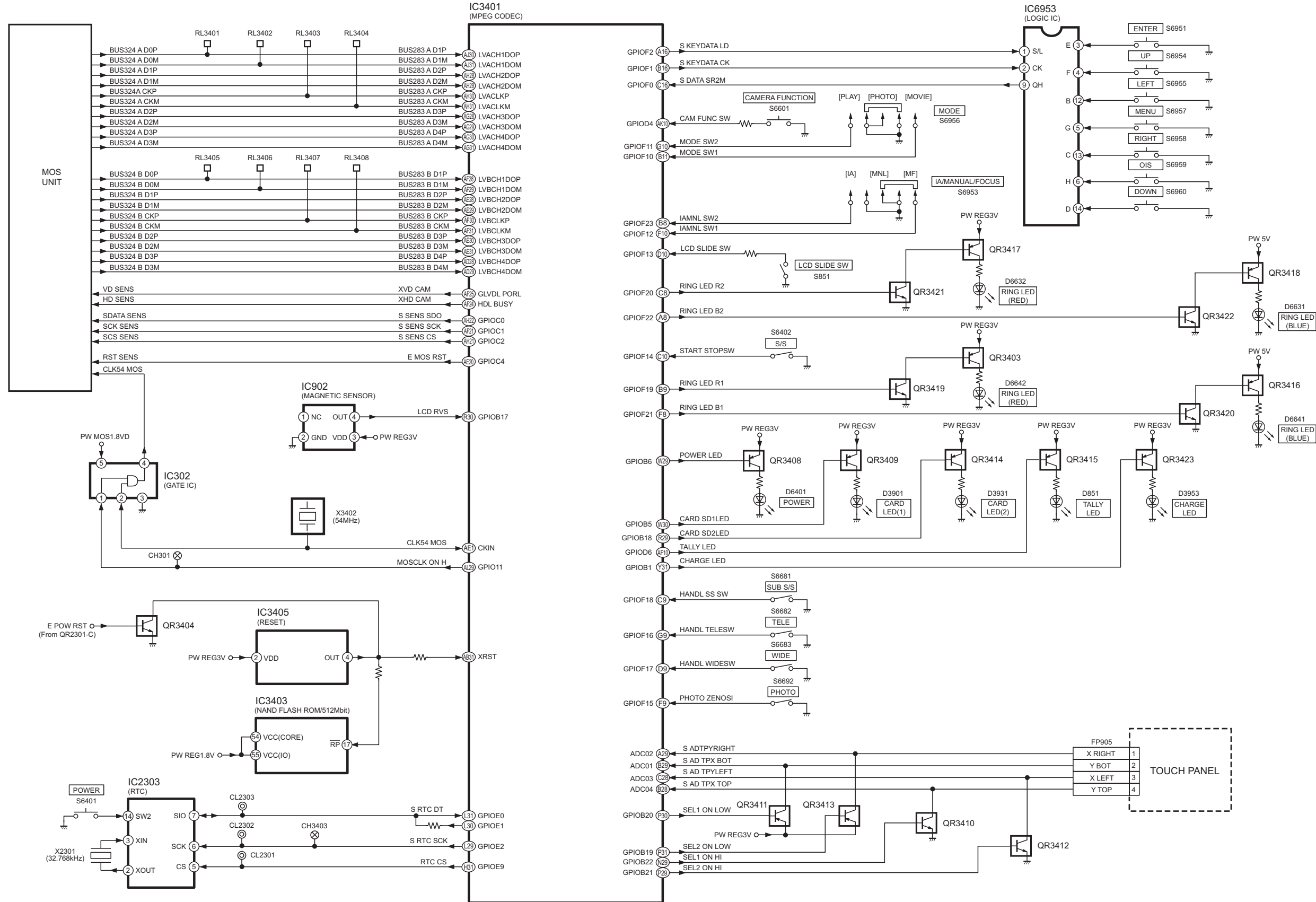
Name	Setting position
Mode switch	Motion picture recording mode
iA/MANUAL/FOCUS switch	[iA] position
Power switch	[Off] position
Eyepiece corrector lever	[Shortsighted End] position

11 Block Diagram

11.1. Overall Block Diagram

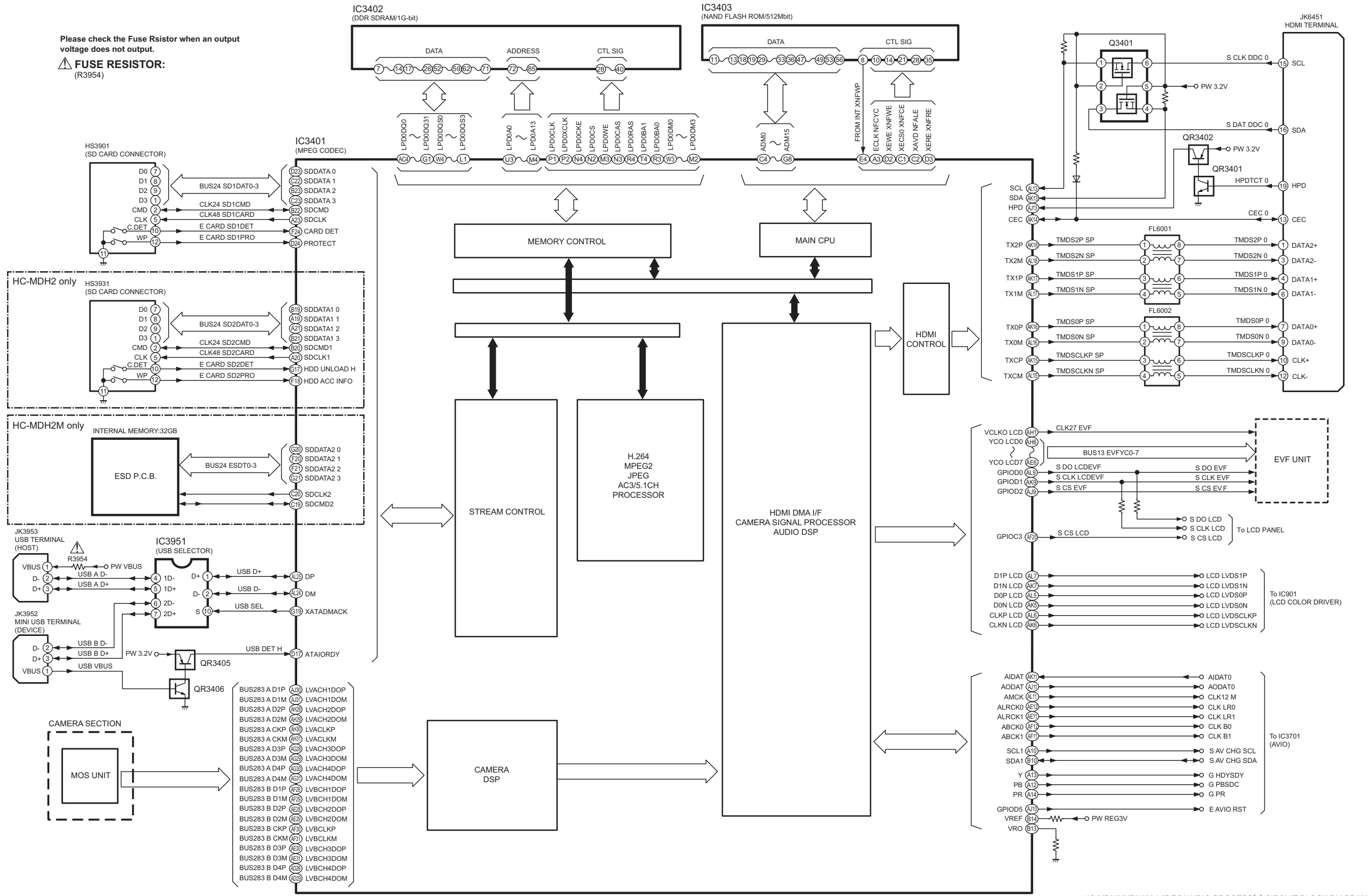


11.2. Camera/System Control Circuit Block Diagram



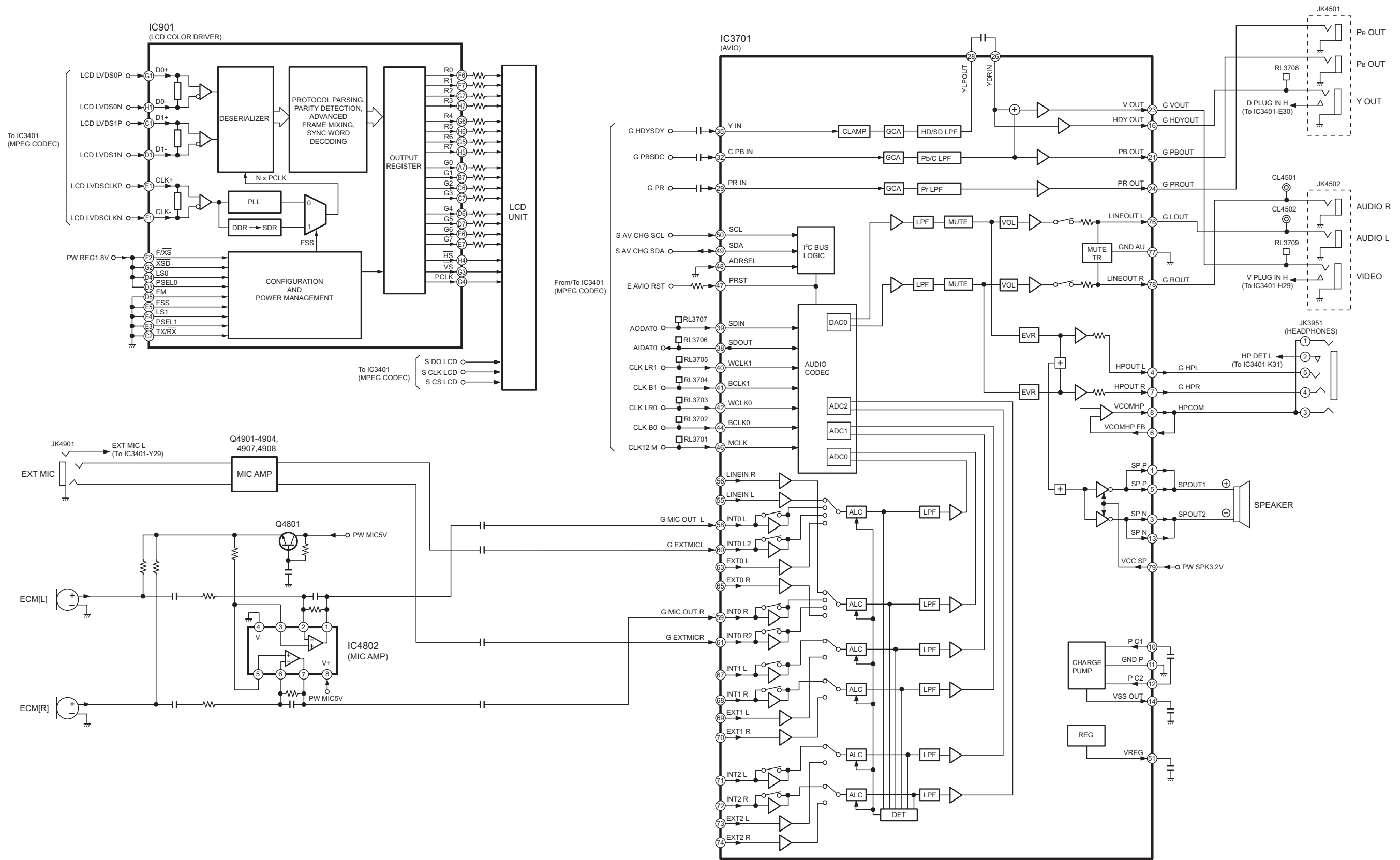
HC-MDH2/MDH2M CAMERA/SYSTEM CONTROL CIRCUIT BLOCK DIAGRAM

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

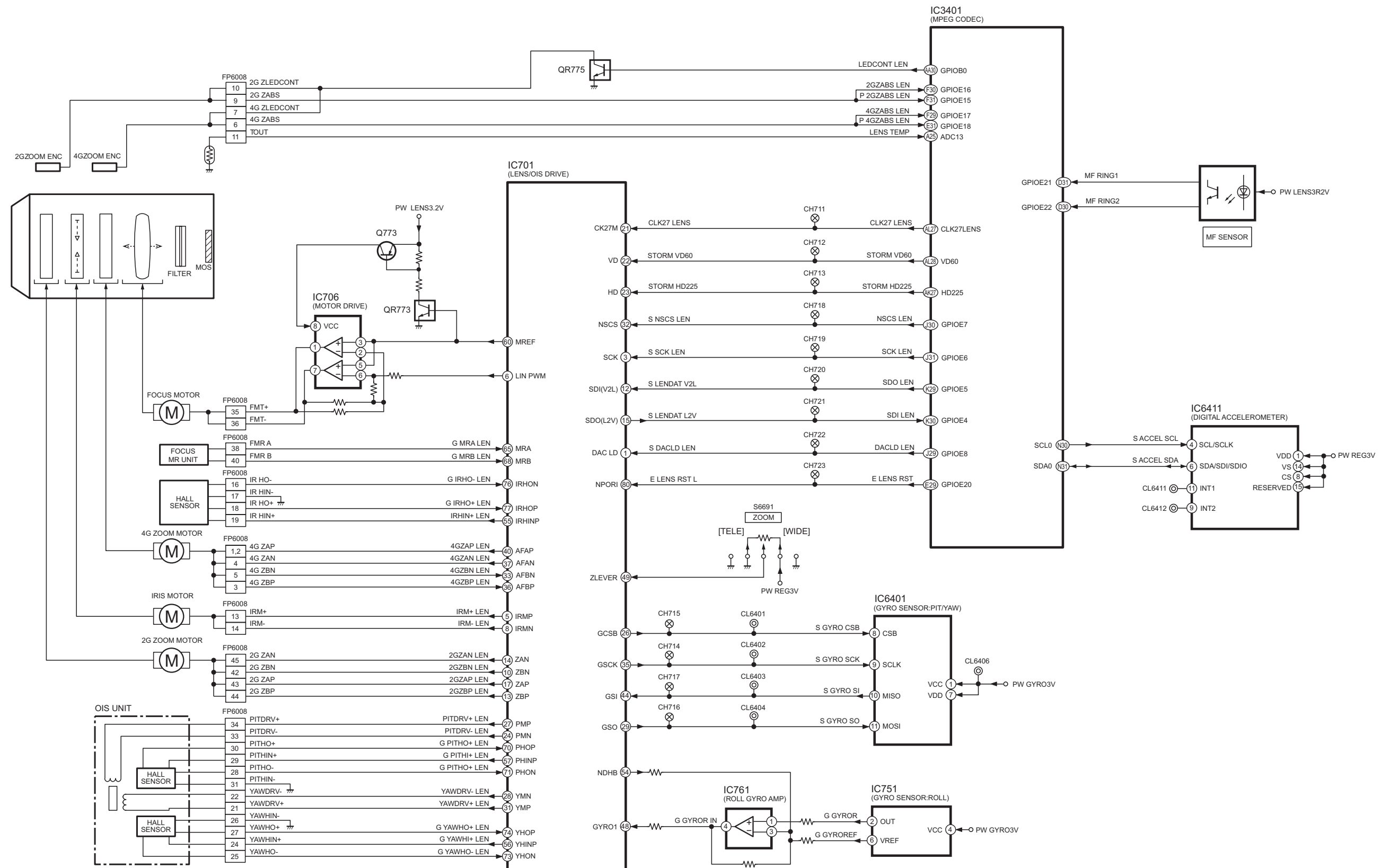


HC-MDH2/MDH2M VIDEO/AUDIO PROCESS(1) CIRCUIT BLOCK DIAGRAM

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



11.5. Lens Drive Circuit Block Diagram



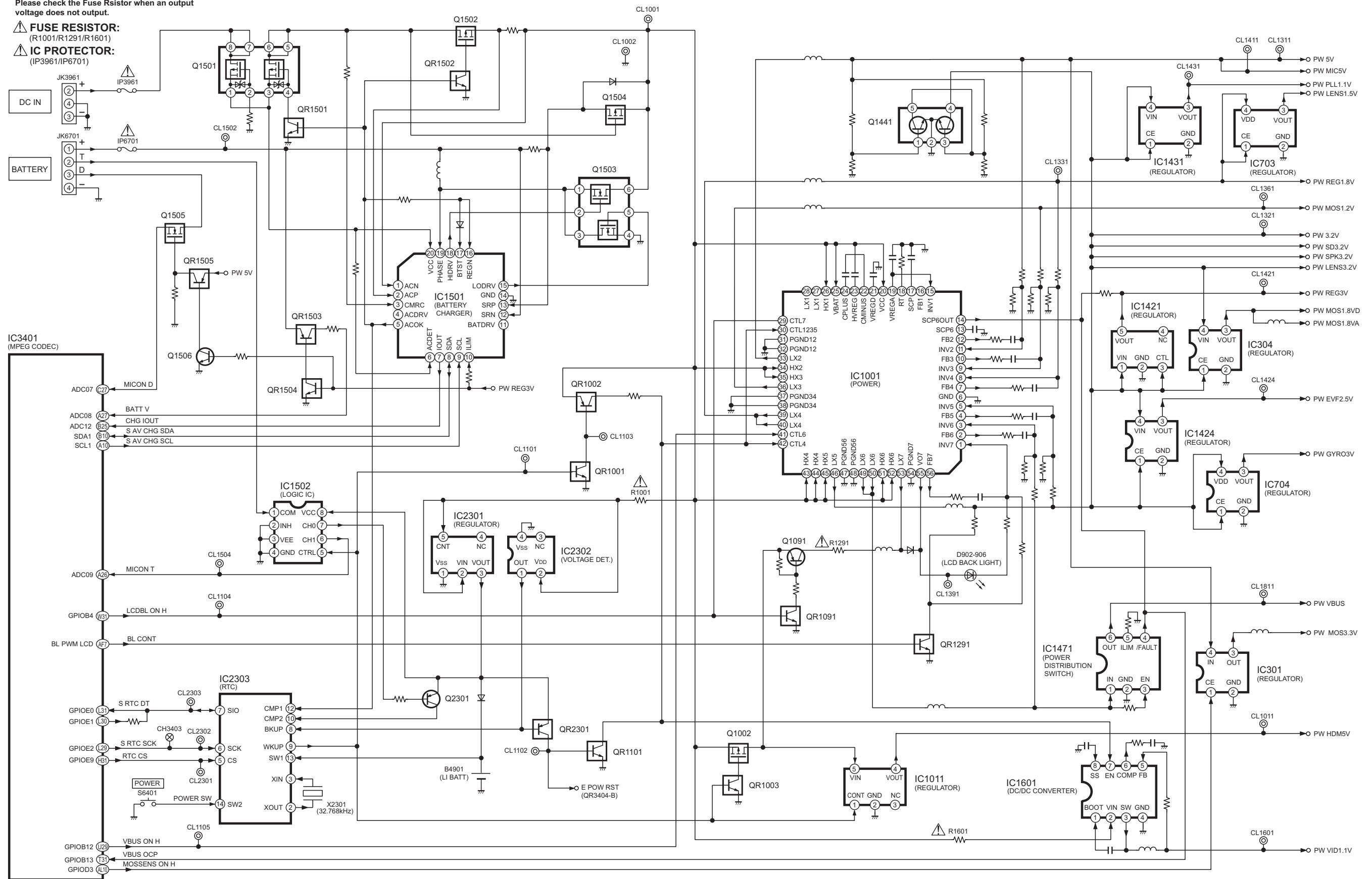
HC-MDH2/MDH2M LENS DRIVE CIRCUIT BLOCK DIAGRAM

11.6. Power Supply Circuit Block Diagram

Please check the Fuse Resistor when an output voltage does not output.

FUSE RESISTOR:
(R1001/R1291/R1601)

IC PROTECTOR:
(IP3961/IP6701)



HC-MDH2/MDH2M POWER SUPPLY CIRCUIT BLOCK DIAGRAM

