Black and White Camera Module

BE-211A/B/C

Operation Guide

Hitachi Denshi, Ltd.

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1. Introduction

Thank you very much for your purchase of the Hitachi BE-211A/B/C Black and White Camera Module.

Prior to using this camera, read this manual carefully.

2. General

The Hitachi BE-211A/B/C are black and white camera modules using a 1/4 inch interline CCD. The BE-211A/B/C are so small that they are most suitable for use with the equipment provided with limited space.

BE-211A: Supplied without lens

BE-211B: Supplied with lens mount and board lens

BE-211C: Supplied with mount for pinhole lens (mount only, lens not provided)

3. Composition

1) Black and white camera module 1

2) Interface cable 1

Note : The standard accessory cable is 300 mm single conductor.
Different length cable requires shielding to avoid external noise.

4. Specifications

1) Imaging device	1/4 inch interline CCD
No. of pixels	EIA : 537(H) × 505(V)
	CCIR : 537(H) × 597(V)
No. of effective pixels	EIA : 510(H) × 492(V)
	CCIR : 500(H) × 582(V)
Pixel pitch	EIA : 7.15(H) × 5.55(V)μm
	CCIR : 7.3(H) × 4.7(V)μm
2) Sensing area	EIA : 3.65(H) × 2.73(V)mm
	CCIR : 3.65(H) × 2.74(V)mm
3) Signal format	Conforming to EIA or CCIR.
4) Hor. scanning frequency	EIA : 15.734 kHz
	CCIR : 15.625 kHz
5) Vert. scanning frequency	EIA : 59.94 Hz
	CCIR : 50 Hz
6) Sync system	Internal
7) Scanning system	2:1 interlaced

8) Video output	1.0 Vp-p, 75 Ω , unbalanced Video: 0.7 Vp-p Sync: 0.3 Vp-p, negative
9) Horizontal resolution	EIA : 380 TVL CCIR : 370 TVL
10) Signal-to-noise ratio	Better than 46dB (AGC:OFF)
11) Auto electronic shutter	Provided
12) AGC	Max. 18 dB approx.
13) Integration mode	Field integration mode
14) Gamma correction	0.45
15) Minimum illumination	0.5 lx, f1.4
16) Power supply	9 VDC ± 0.5 V
17) Power consumption	100mA approx.
18) Standard lens	f 3.8 (BE-211B only)

Focal distance (mm)		3.8
f-value		2.0
Angular field of view (Deg)	H	52.9
	V	39.6

19) Ambient conditions	
Operating	-5 to 45 ℃, 90 %RH or less
Storage	-10 to 60 ℃, 70 %RH or less
20) Dimensions	BE-211A : 25(W) × 25(H) × 16(D)mm BE-211B : 25(W) × 25(H) × 28(D)mm BE-211C : 25(W) × 25(H) × 20(D)mm
21) Mass	BE-211A : 6 g approx. (w/o cable) BE-211B : 17 g approx. (w/lens & w/o cable) BE-211C : 10 g approx. (w/o cable)
22) Composition	Camera module 1 Camera cable (300mm) 1 Pin arrangement

Pin No.	Signal name	Color
1	Video GND	BLK
2	Video OUT	YEL
3	GND	GRN
4	+9 V	RED

23) Options

BE-211B lenses

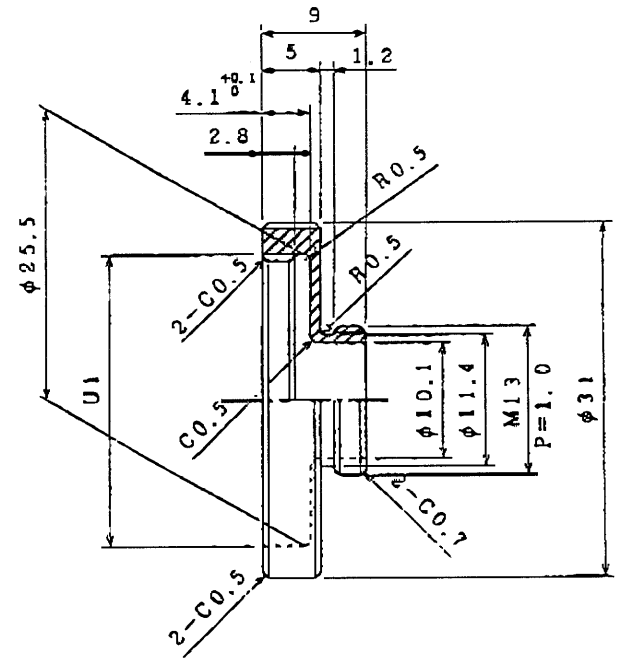
Focal distance (mm)		2.5	6.0
f-value		2.0	2.0
Angular field of view (Deg)	H	83.8	33.8
	V	61.9	25.3

BE-211C pinhole lenses

Focal distance (mm)		3.2	3.7
f-value		4.5	4.5
Angular field of view (Deg)	H	66.9	54.2
	V	49.8	40.6

BE-211C CS mount adaptor

(Use in combination with pinhole lens adaptor)



5. Notes to users

3-1 Power supply

- Connect a 9V DC voltage (8.5 to 9.5V) from an external regulated DC power supply.
- Use a stable power supply without ripple and noise.
- Prior to turning on the power switch, check that the polarities of the power cable are correct, referring to the connection diagram (Page 11).

3-2 To protect CCD (sensor)

- Do not touch the glass surface of the CCD sensor to avoid deterioration in picture quality due to dirt and scratches.
- If the glass surface of the sensor should become dusty or dirty, remove dust or dirt carefully with a cotton-tipped applicator. Do not wipe the surface with dry cloth or paper tissue to avoid possible damage to the glass surface by static electricity.

3-3 Protection of camera

- Do not use or store the camera under direct sunlight, at a place exposed to rain or snow, or at a place where flammable or corrosive gas is present.
- When housing the camera in a camera case, use the utmost care regarding rise of internal temperature.
  When casing the camera, the temperature normally rises by 10 to 20℃, compared with the outside air temperature. The camera operates in the temperature range from -5 to 45℃. If the camera is used or left in high temperature environment for hours, the life of the camera may be shortened.
- Do not drop the camera. Do not apply strong shock or vibration to the camera.
- Before connecting or disconnecting a connector, turn off the camera and be sure to hold connector body to connect or disconnect the connector.

3-4 Camera arrangement

Mutual interference noise can occur if multiple cameras are arranged in close proximity. Separate the cameras to the extent possible.

When camera units are installed directly into other equipment, external noise can prevent a normal picture. In such cases, shield the camera units.

The camera can be damaged by static electricity. Use ample care when installing and arranging.

3-5 Auto electric shutter

In regions using 50 Hz power line frequency, flicker can appear on the monitor screen from light sources such as fluorescent or mercury. In such cases, release the auto electronic shutter.

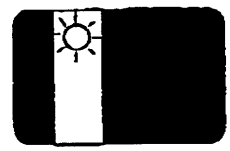
3-6 Phenomena inherent to CCD imaging device

Following are phenomena inherent to a CCD imaging device, and not defects.

1) Smear and blooming

When strong light (lamp, fluorescent lamp, reflected light, etc.) is shot, pale bands are displayed vertically above and below the light.

In this case, change the angle of the camera so that such strong light does not enter the camera through the lens.



2) Fixed pattern noise

When the camera is operated in a high temperature, fixed pattern noise may appear on the entire screen.

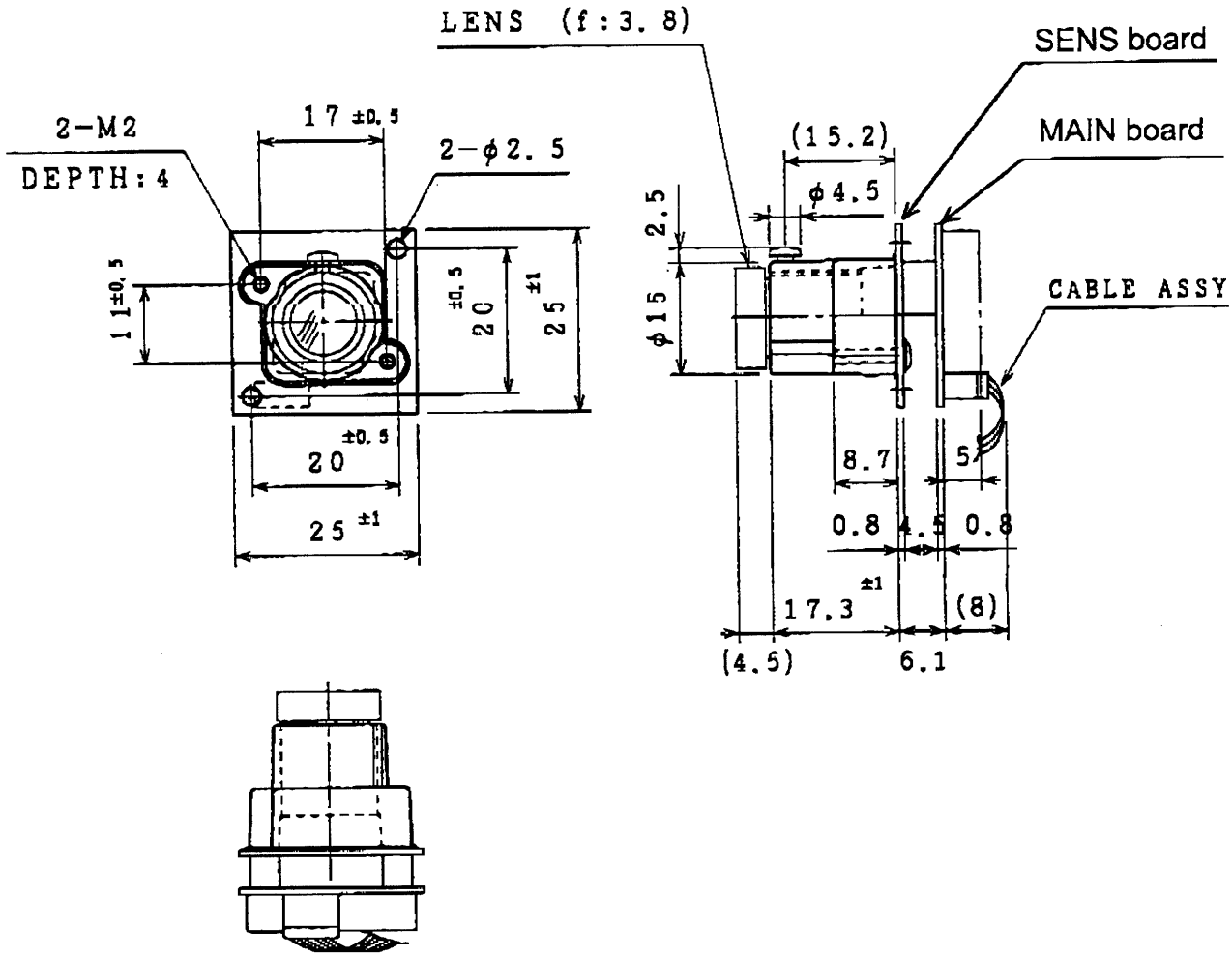
The higher the sensitivity of camera, the more this fixed pattern noise appears.

3) Moire

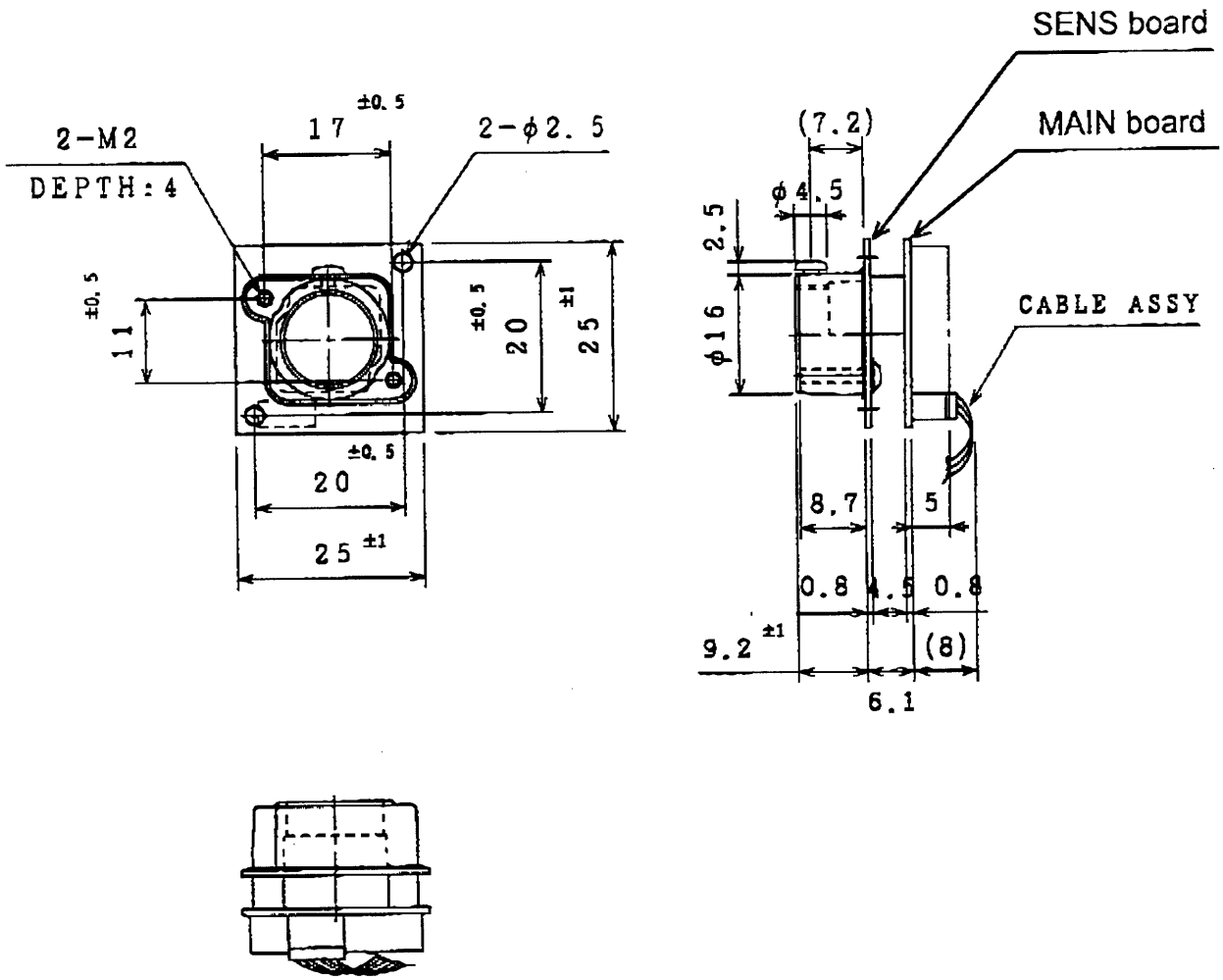
When fine patterns are shot, moire may be displayed.

3-7 The CE mark is required when exporting to Europe. Obtain the necessary authorization for the customer's system. Enclose the camera in a shielded case and use shielded cable

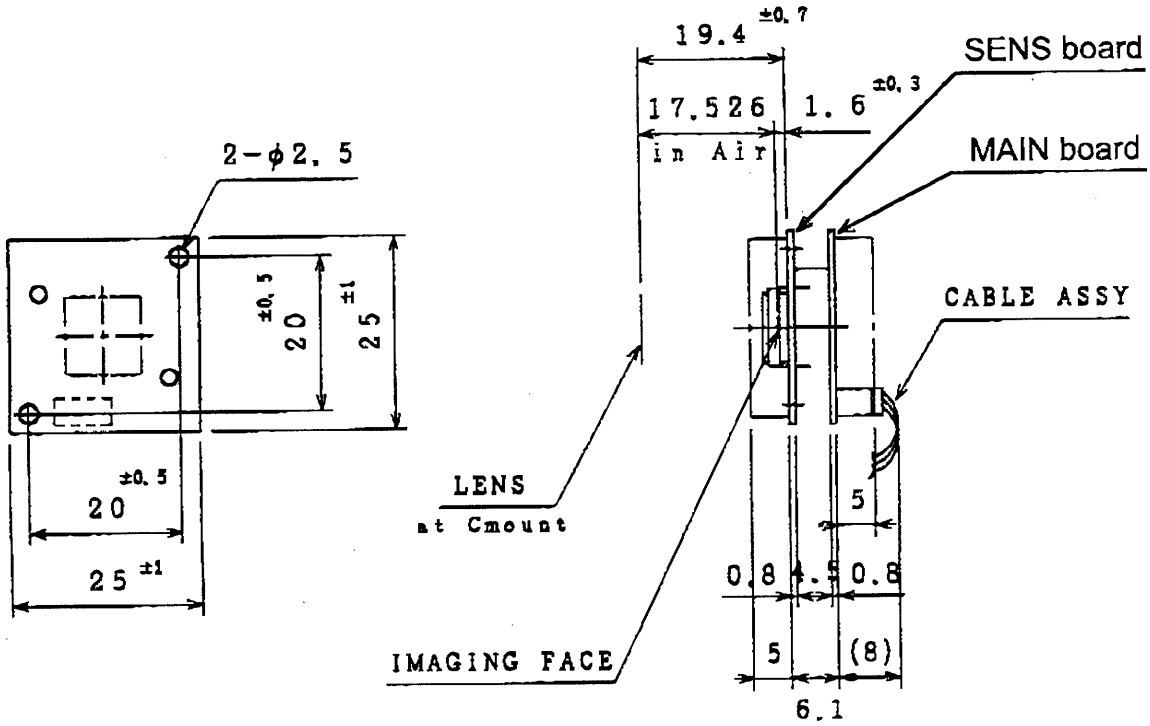
6. External view

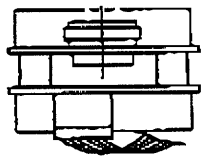


Dimensions (BE-211B)



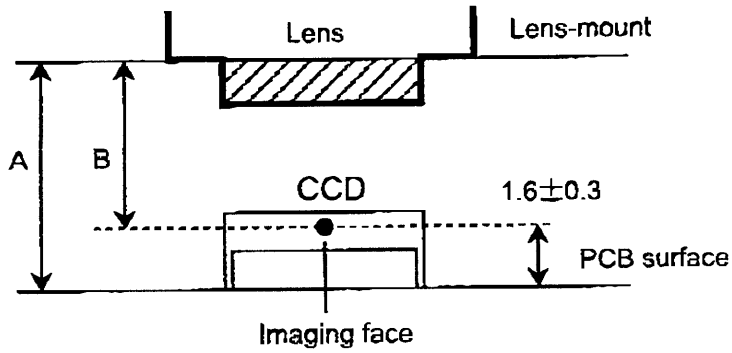
Dimensions (BE-211C)





Dimensions (BE-211A)

7. Optical dimensions



Extension of optical path due to the thickness of CCD glass is considered.

Mounts	A (mm)	B (mm)
C-mount	19.4±0.7	17.776
CS-mount	14.4±0.7	12.75

Reference

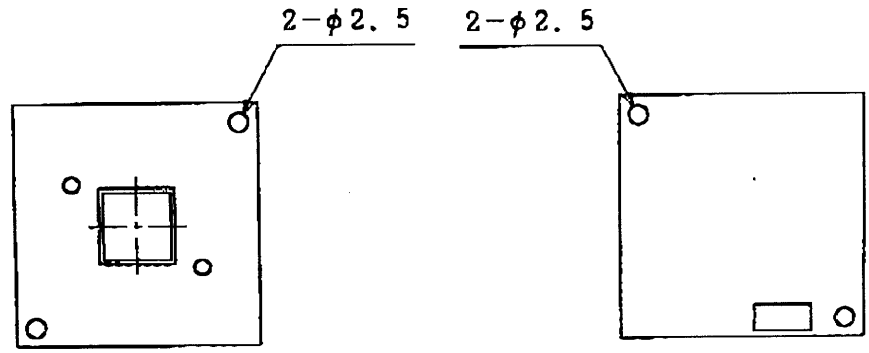
Lens flangeback in air	
Mounts	B (mm)
C-mount	17.526
CS-mount	12.5

8. Installation

When installing this unit in a housing or other device, secure by using the holes indicated in the figures.

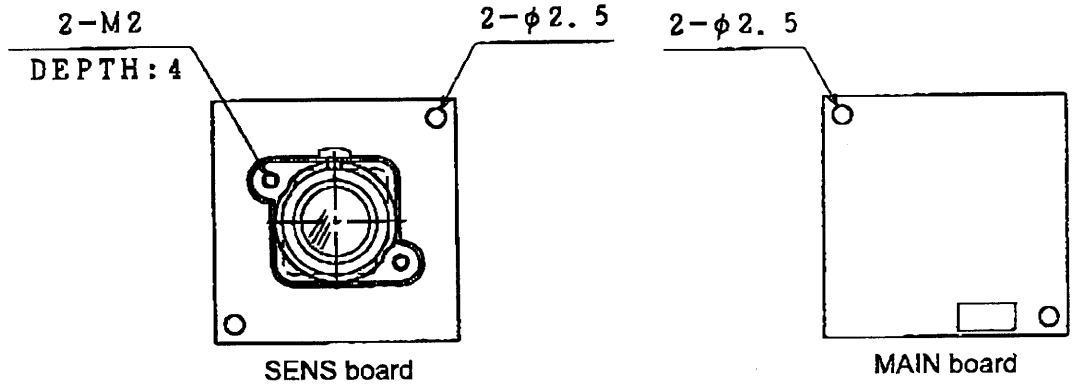
BE-211A

Use (two) holes of the SENS board to secure the SENS board. Connect the SENS and MAIN board connectors, then use (two) holes to secure the MAIN board. Observe proper spacing between the boards.



BE-211B and BE-211C

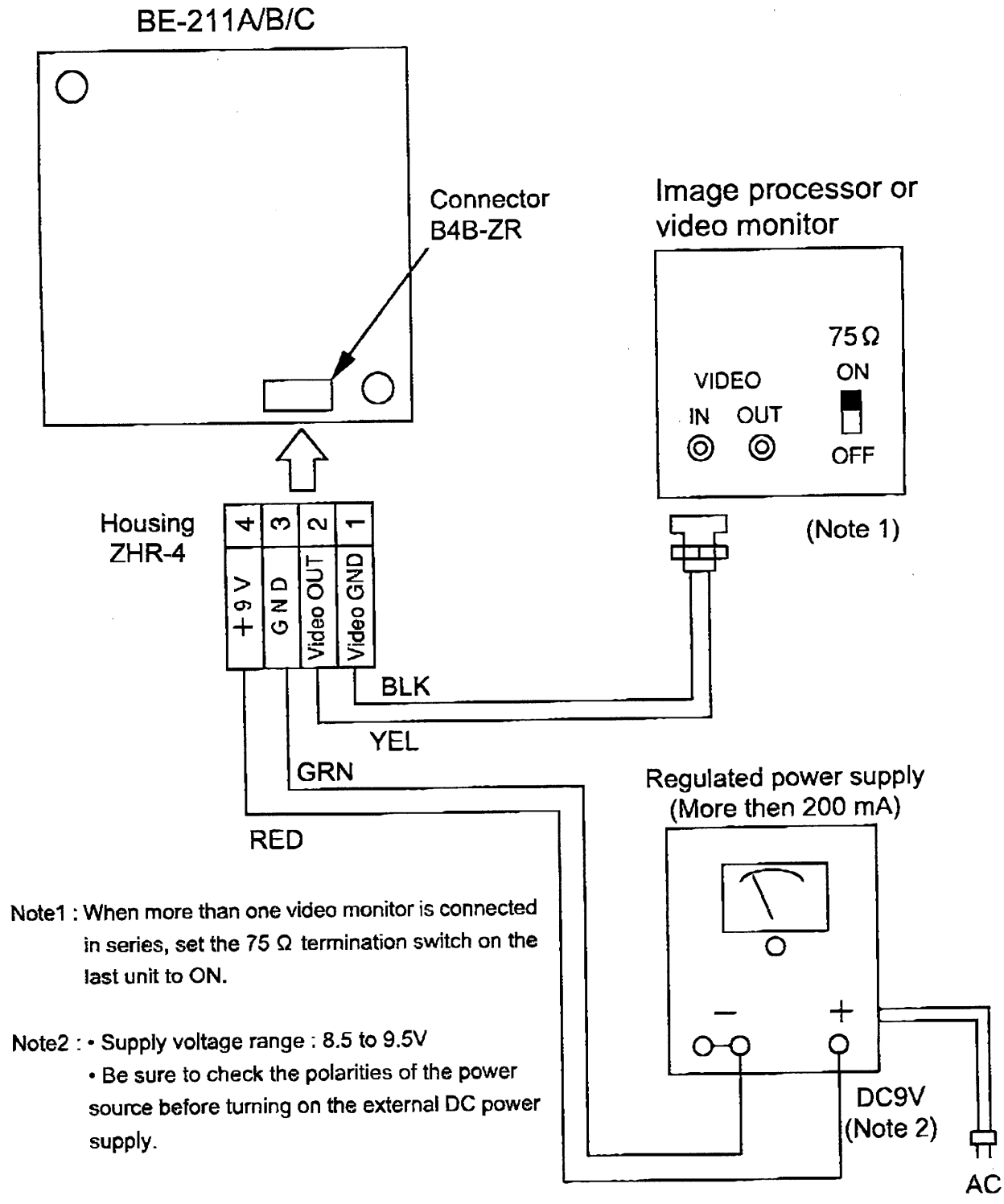
Secure the SENS board by using the two holes of the board or the two holes of the lens mount. Connect the SENS and MAIN board connectors, then use (two) holes to secure the MAIN board. Observe proper spacing between the boards.



Notes

1. Be sure to also secure the SENS board when installing in a housing or other device. If secured only by the MAIN board holes, there is risk of damage to the board connectors.
2. When connecting or disconnecting a connector, use care not to apply excessive force to the printed circuit board. When the board is warped, soldering may be peeled off or chip components may be broken.
3. The SENS and MAIN boards are adjusted as a matched pair. Be sure to use these as a single set.

9. Typical connection



Note1 : When more than one video monitor is connected in series, set the 75 Ω termination switch on the last unit to ON.

Note2 : • Supply voltage range : 8.5 to 9.5V
• Be sure to check the polarities of the power source before turning on the external DC power supply.

10. Function settting and changes

When changing the function settings, perform the work with thorough care. Be sure to use anti-static measures such as a grounding band. Also observe safety precautions when soldering to avoid burn and fire hazards.

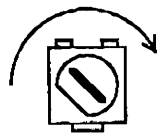
Hitachi Denshi assumes no liability for damage or injury resulting from such work.

Since the function setting can be provided at the time of shipment, consult a Hitachi Denshi representative.

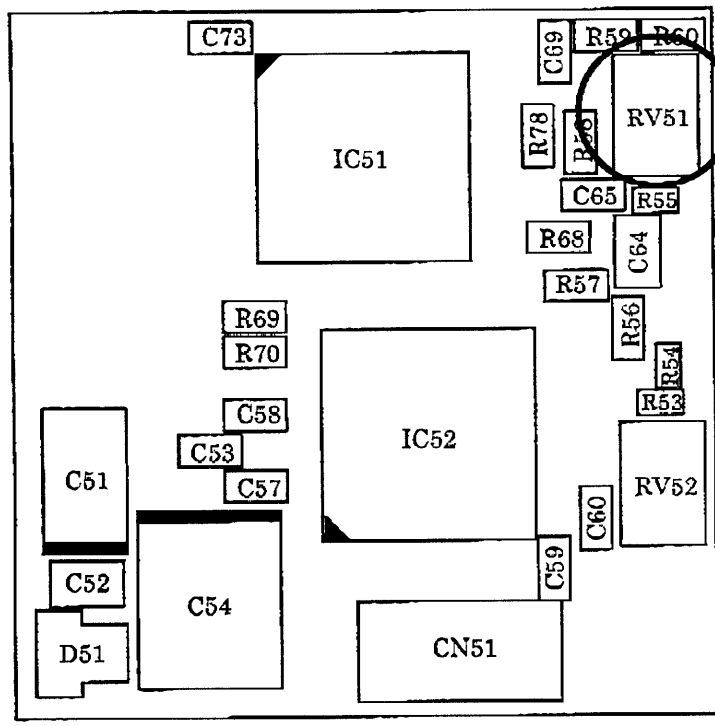
10-1 AGC on/off

The AGC is set to off at time of shipment. The AGC can be set to on by turning the control.

Factory setting : AGC off



Turn clockwise : AGC on



Location of chip resistor (MAIN board side A)

10-2 Gamma response

The factory setting is gamma on (0.45). If necessary, the gamma response can be changed as follows.

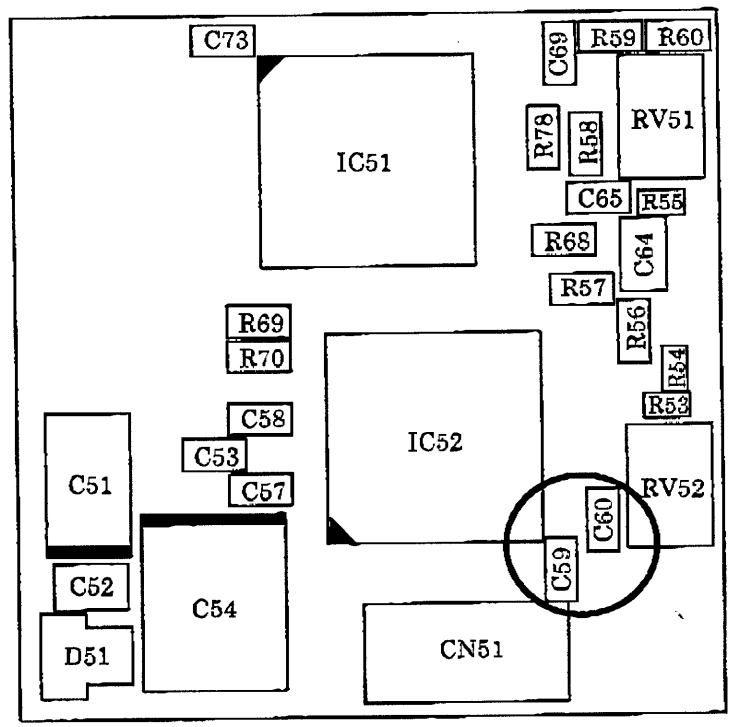
Change the gamma response by changing the chip part.

Gamma (γ)response	C59	C60	
On (0.45)	0.1 μF	Absent	(Factory setting)
Off (1.0)	Remove	0.1 μF	

Remove the C59 chip and install C60 (C59 and C60 are the same part)

0.1 μ F : Part code CCG0678

Description GRM39F104Z16P



Location of chip capacitors (MAIN board side A)

10-3 Auto electronic shutter on / off

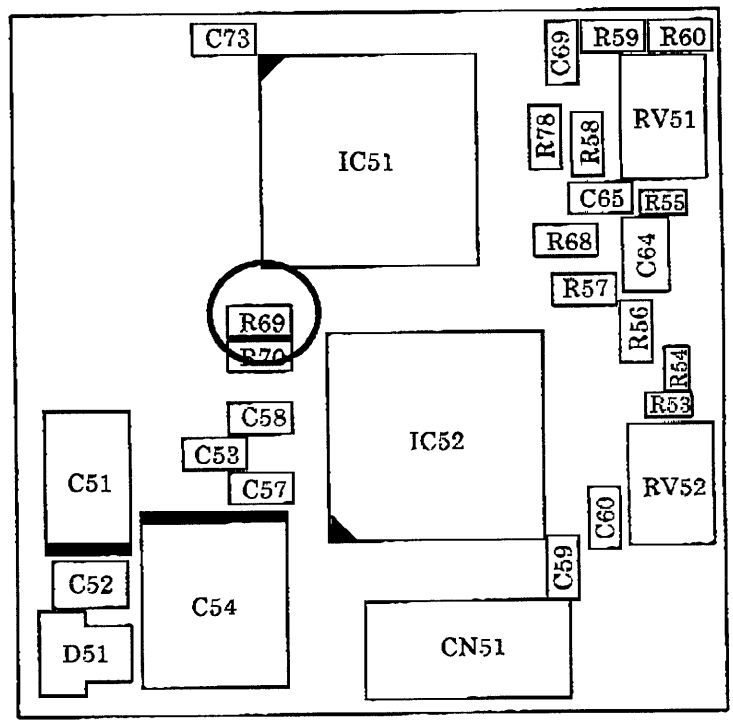
Factory setting for auto electronic shutter is on. If necessary, it can be set to off.

Install the R30 chip to set the auto electronic shutter to off.

Auto electronic shutter	R69	
On	Absent	(Factory setting)
Off	0 Ω	

0 Ω : Part code RME1784

Description ERJ3GWYJ0R00V



Location of chip resistors (MAIN board side A)

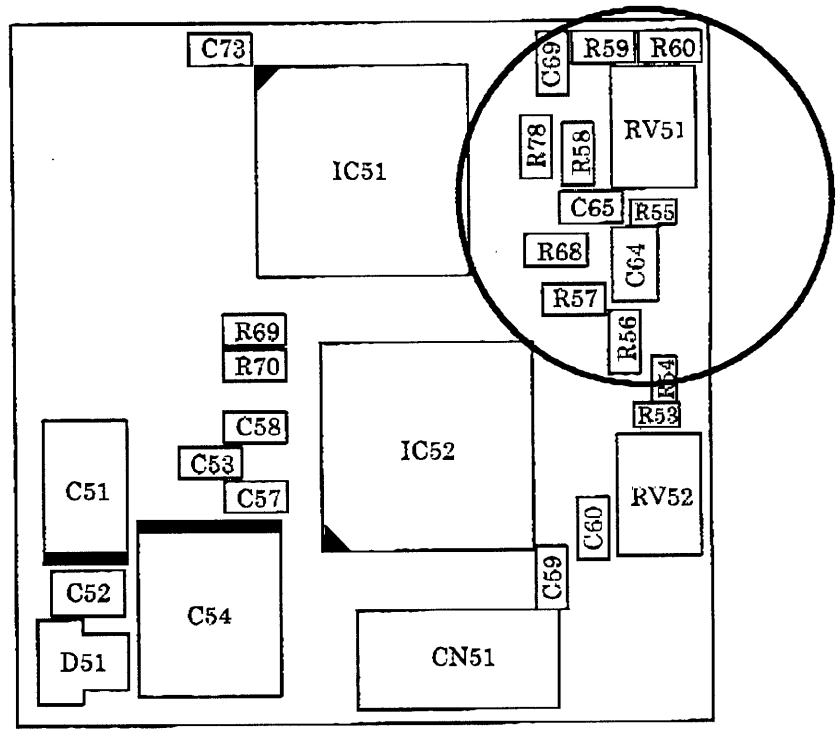
10-4 Change from fixed to adjustable gain

To change from fixed to adjustable gain, change the chip parts indicated below.

Gain	R55	R58	R59	R60	R56	
AGC	Absent	10kΩ	2700Ω	1800Ω	0Ω	(Factory setting)
Fixed	0Ω	Remove	220Ω	220Ω	Remove	

0 Ω : Part code RME2068
Description ERJ2GE0R00X

220 Ω : Part code RME1801
Description ERJ3GEYJ221V



Location of chip resistors (MAIN board side A)

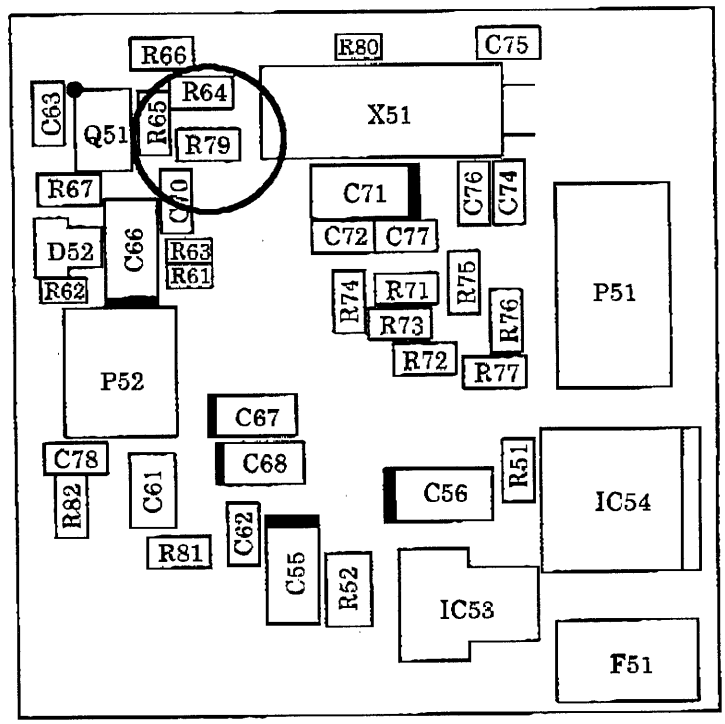
10-5 Storage mode change

The storage mode can be changed by installing the R79 chip.

Storage mode	R79	
Field	Absent	(Factory setting)
Frame	0Ω	

0 Ω : Part code RME1784

Description ERJ3GEYJ0R00V



Location of chip resistor (MAIN board side B)

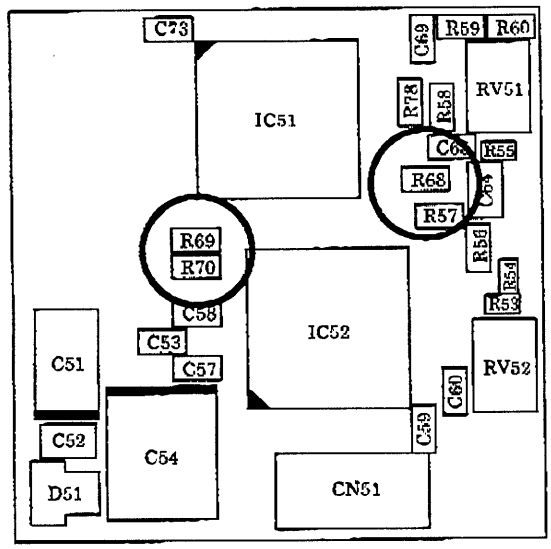
10-6 Change to fixed shutter mode

The fixed shutter mode can be changed by replacing the chip parts indicated below.

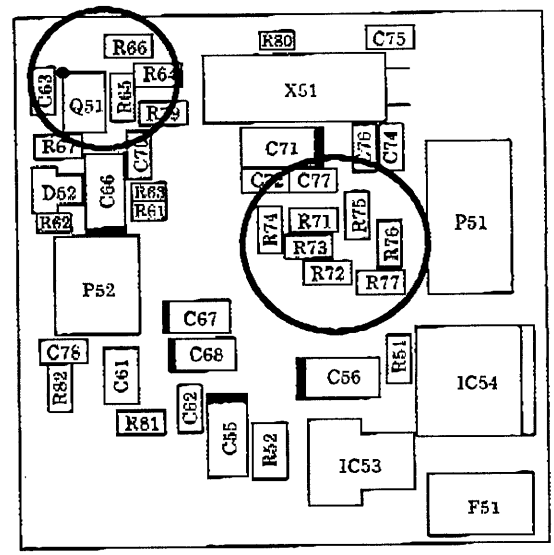
Mode		R66	Q51	R73	R72	R74	R76	R75	R77	R69	R70	R68
Auto electronic shutter mode		3300Ω	UMX1	2200Ω	2700Ω	47kΩ	2200Ω	5600Ω	47kΩ	Absent	Absent	Absent *
Normal mode		3300Ω	UMX1	2200Ω	2700Ω	47kΩ	2200Ω	5600Ω	47kΩ	0Ω	Absent	Absent
Shutter speed	EIA :1/100 CCIR:1/120 (Flickerless)	0Ω	Remove	0Ω	0Ω	Remove	0Ω	0Ω	Remove	Absent	0Ω	Absent
	1/250	0Ω	Remove	0Ω	0Ω	Remove	Remove	Remove	0Ω	Absent	0Ω	Absent
	1/500	Remove	Remove	0Ω	0Ω	Remove	0Ω	0Ω	Remove	Absent	0Ω	0Ω
	1/1000	Remove	Remove	0Ω	0Ω	Remove	Remove	Remove	0Ω	Absent	0Ω	0Ω
	1/2000	0Ω	Remove	Remove	Remove	0Ω	0Ω	0Ω	Remove	Absent	0Ω	Absent
	1/5000	0Ω	Remove	Remove	Remove	0Ω	Remove	Remove	0Ω	Absent	0Ω	Absent
	1/10000	Remove	Remove	Remove	Remove	0Ω	0Ω	0Ω	Remove	Absent	0Ω	0Ω
	1/100000	Remove	Remove	Remove	Remove	0Ω	Remove	Remove	0Ω	Absent	0Ω	0Ω

*Factory setting

0 Ω : Part code RME1784
Description ERJ3GEYJ0R00V



(MAIN board side A)



(MAIN board side B)

Location of chip resistors

10-7 OFD (sub voltage) adjustment

Use care not to disturb the OFD (sub voltage) control. If disturbed, readjust as follows.

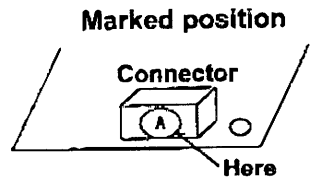
1) Supply power and shield the CCD from light.
2) Observe the code marked on the connector and note the voltage from the table.

SUB code	—	=	0	1	2	3	4	6	7	8	9
Actual value	5.0	5.25	5.5	5.75	6.0	6.25	6.5	6.75	7.0	7.25	7.5

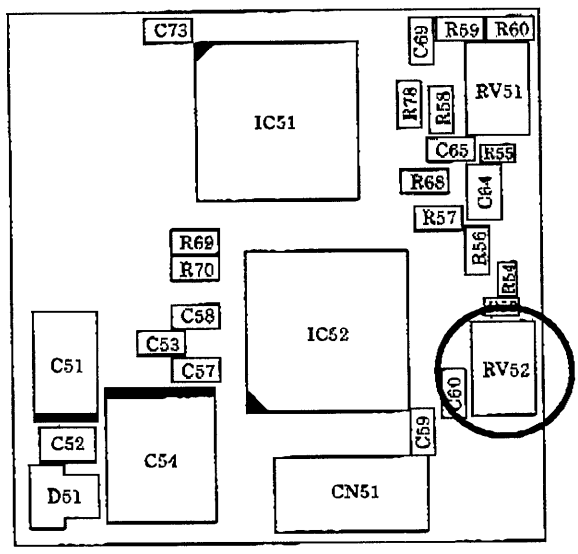
SUB code	A	C	d	e	f	G	h	J	K	L	m
Actual value	7.75	8.0	8.25	8.5	8.75	9.0	9.25	9.5	9.75	10.0	10.25

SUB code	N	P	R	S	U	V	W	X	Y	Z
Actual value	10.5	10.75	11.0	11.25	11.5	11.75	12.0	12.25	12.5	12.75

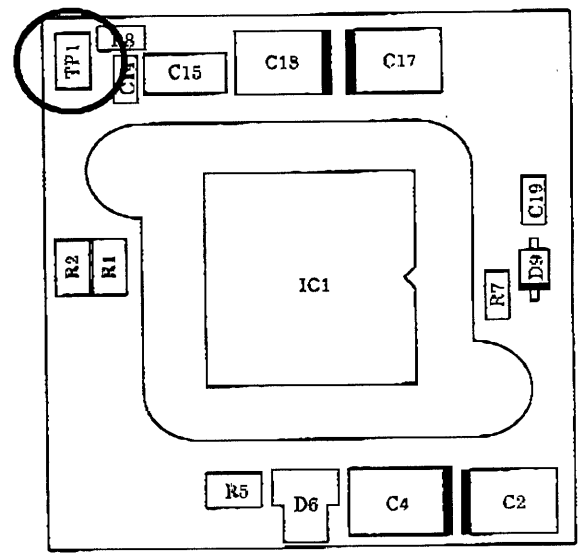
Example: L=10.0V



3) While measuring the voltage at the position indicated by the TP1, turn RV52 to set the voltage as read from the table.



(MAIN board side A)



(SENS board side B)

Attachment : Spectral sensitivity characteristic