

HITACHI

BE-IR20 / 21

Infrared B/W Camera Module Operation Guide

Please read this operation Guide carefully for proper operation, and keep it for future refernce.

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1. Introduction

Thank you very much for your purchase of the Hitachi BE-IR20/21 Black and White Camera Module.

Prior to using this camera , read this manual carefully.

2. General

The Hitachi BE-IR20/21 are black and white camera modules using a 1/4 inch interline CCD. The BE-IR20/21 are so small that they are most suitable for use with the equipment provided with limited space.

BE-IR20 : Internal sync

BE-IR21 : External sync

3. Composition

- 1) Black and white camera module 1
- 2) Interface cable 1

Note : The standard accessory cable is 300 mm signal conductor.

Different length cable requires shielding to avoid external noise.

4. Specifications

- | | |
|-----------------------------|---|
| 1) Imaging device | 1/2 inch interline CCD |
| No. of pixels | EIA : 811(H) × 508(V)
CCIR : 795(H) × 596(V) |
| No. of effective pixels | EIA : 768(H) × 494(V)
CCIR : 752(H) × 582 |
| Pixel pitch | EIA : 8.4(H) × 9.8(V) μm
CCIR : 8.6(H) × 8.3(V) μm |
| 2) Sensing area | EIA : 6.45(H) × 4.84(V) mm
CCIR : 6.47(H) × 4.83(V) mm |
| 3) Signal format | Conforming to EIA or CCIR. |
| 4) Scanning system | 2:1 interlaced |
| 5) Hor. scanning frequency | EIA : 15.734 kHz
CCIR : 15.625 kHz |
| 6) Vert. scanning frequency | EIA : 59.94 Hz
CCIR : 50 Hz |
| 7) Sync system | BE-IR20 : Internal sync
BE-IR21 : External sync |

4. Specifications

8) External sync input	HD & VD : 5V peak-to-peak negative Input impedance : 1k Ω Frequency deviation : $\pm 1\%$
9) Video output	1.0 Vp-p, 75 Ω , unbalanced Video component : 0.7 Vp-p Sync component : 0.3 Vp-p negative
10) Resolution	EIA : 570(H) \times 484(V) TV lines CCIR : 560(H) \times 575(V) TV lines
11) Signal to noise ratio	56 dB
12) Auto electronic shutter	Provided (factory setting OFF)
13) Automatic gain control (AGC)	Max. 32 dB approx. Fixed gain(factory setting)
14) Integration mode	Field integration mode
15) Gamma correction	0.45 ON (factory setting) or OFF Selected by changing chip parts
16) Sensitivity	30 lux , F4, 3200k
17) Minimum illumination	0.3 lux , F1.4 , AGC and gamma on
18) Power supply voltage	9 \pm 0.5 VDC
19) Power consumption	Approx. 160mA
20) Ambient conditions	Operating : -5 to 45 $^{\circ}$ C , 90% RH or less Storage : -10 to 60 $^{\circ}$ C , 70% RH or less
21) External dimensions	34(W) \times 34(H) \times 20(D) mm
22) Mass	Approx. 17 grams (w/o cable)
23) Options	Mount adaptor LA-IR20

5. Notes to users

◆ 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 8 , 9)

◆ 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.

◆ 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°C , compared with the outside air temperature. The camera operates in the temperature range from -5 to 45°C. 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.

◆ 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.

◆ 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.

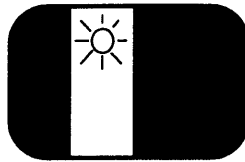
◆ Phenomena inherent to CCD imaging device

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

- 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.



- Fixed pattern noise

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

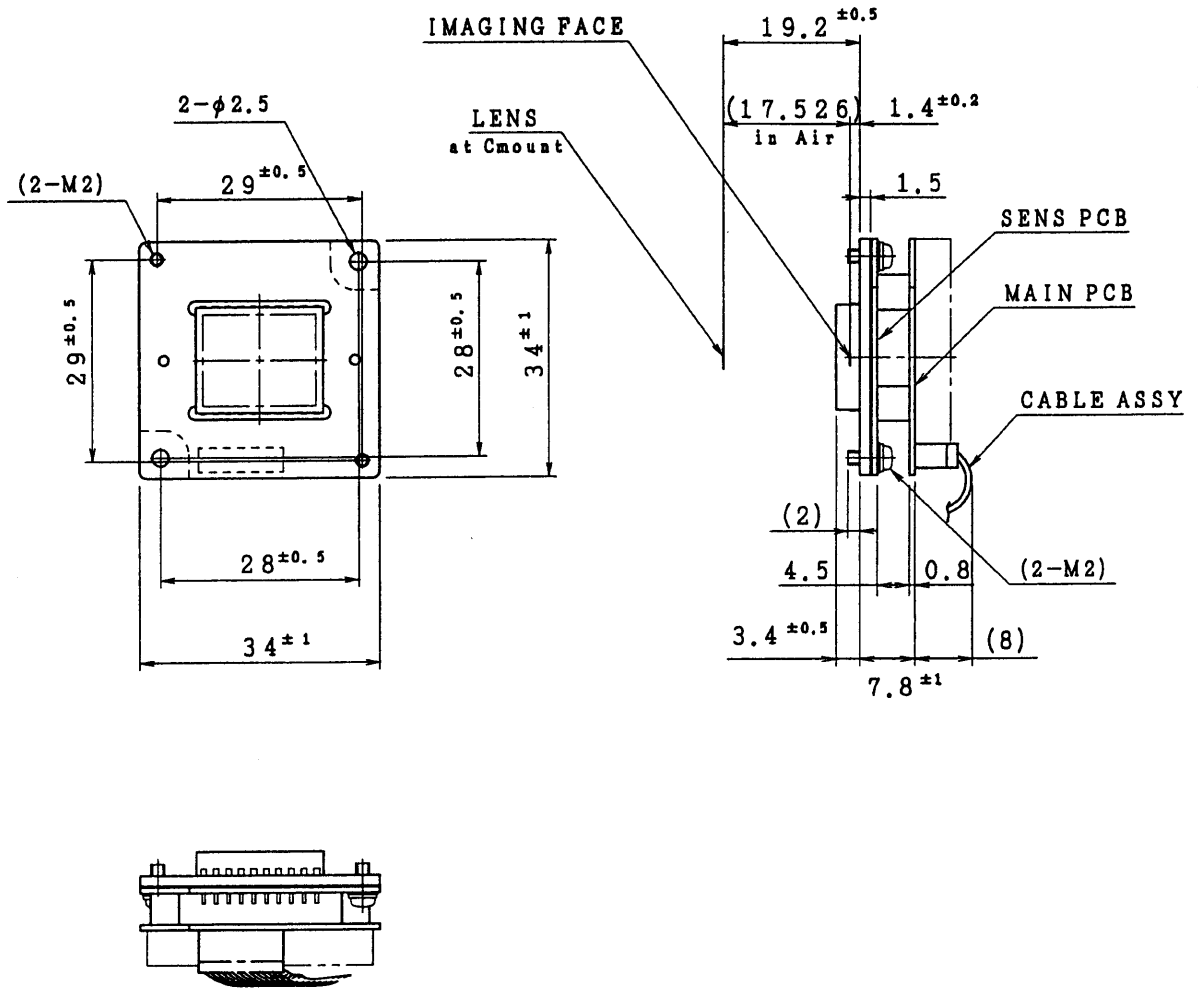
The higher the sensitivity of camera , the more this fixed pattern noise appears.

- Moire

When fine patterns are shot , moire may be displayed.

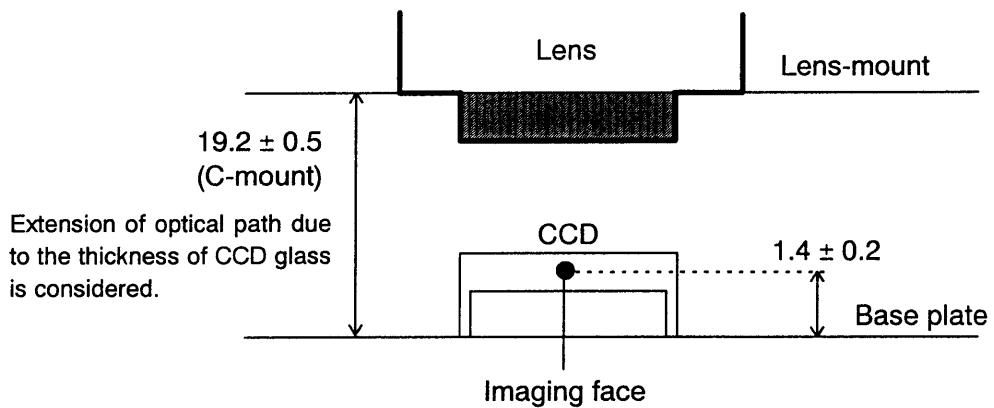
- The CE mark is required when exporting to Europe. Obtain the necessary authorization for the customer's system. Enclose the camera in a shielded case and use shielded cable.

6. External view



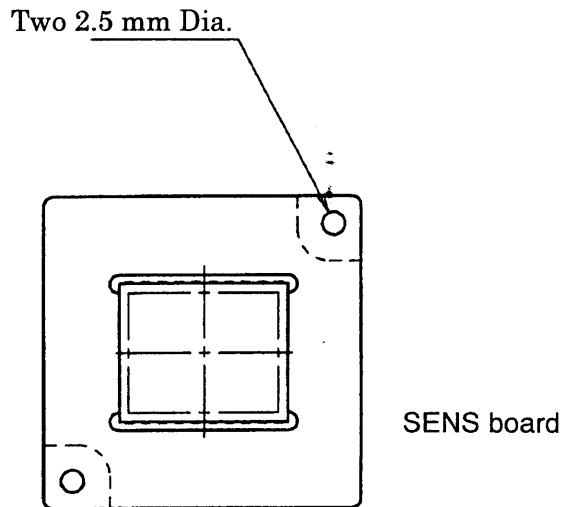
Dimensions

7. Optical dimensions

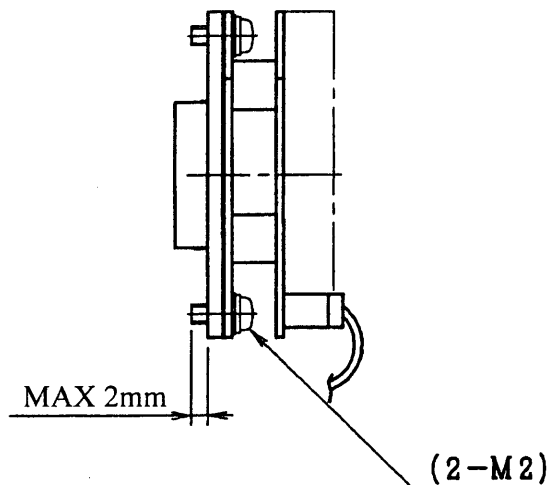


8. Installation

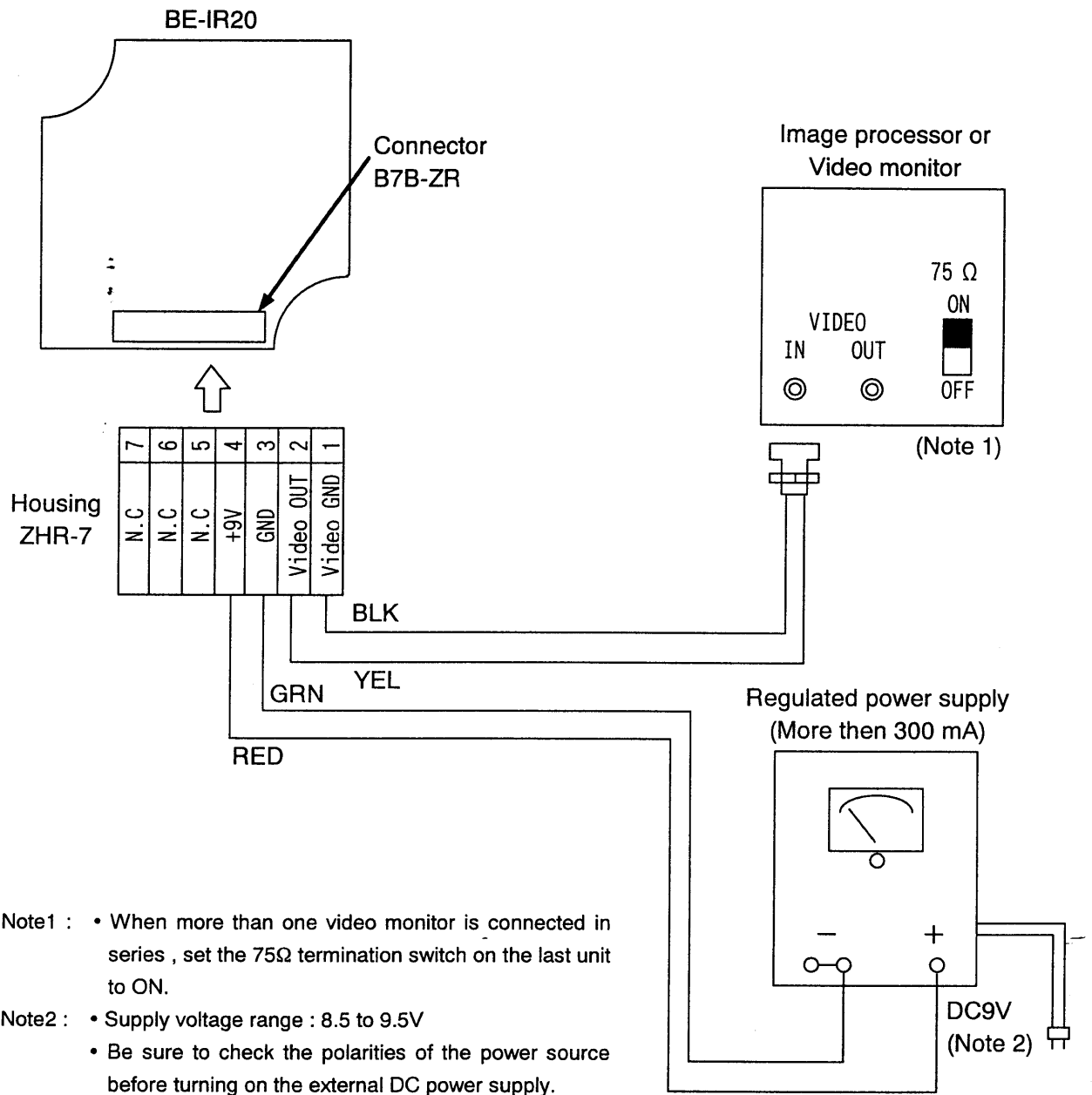
When installing the camera in a housing or unit of equipment, secure with two M2 screws inserted into the 2.5 mm diameters holes of the SENS board base plate.



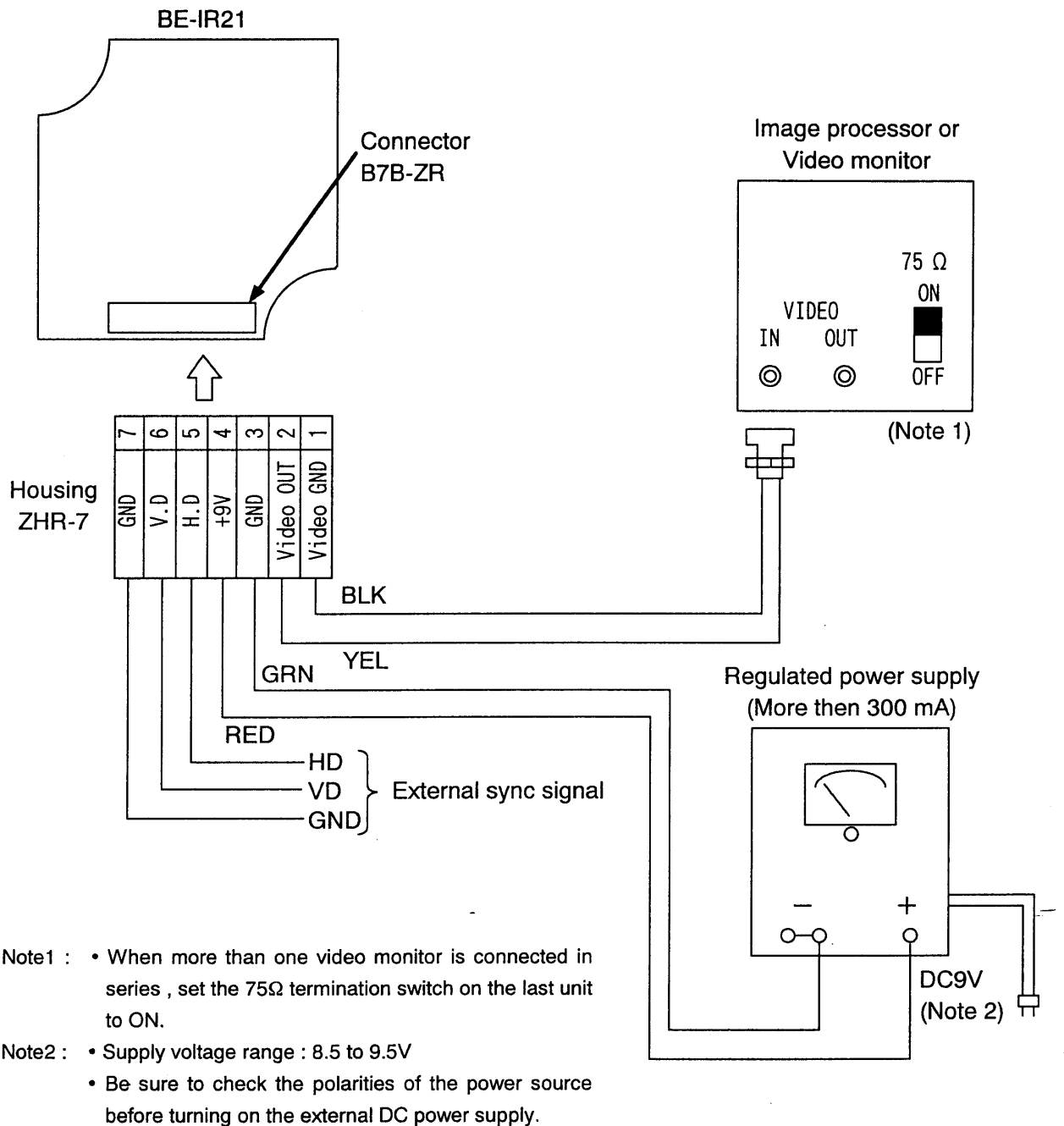
- Notes :
1. Use the SENS board holds to install the camera. Avoid using only the Main board, due to risk of damage to the board connector.
 2. Avoid unnecessary stress on the printed board when engaging and disengaging the connectors.
 3. The screws securing the base plate and SENS board protrude a maximum of 2 mm from the base plate. Observe these screws do not contact the housing or installed equipment.



9. Typical connection



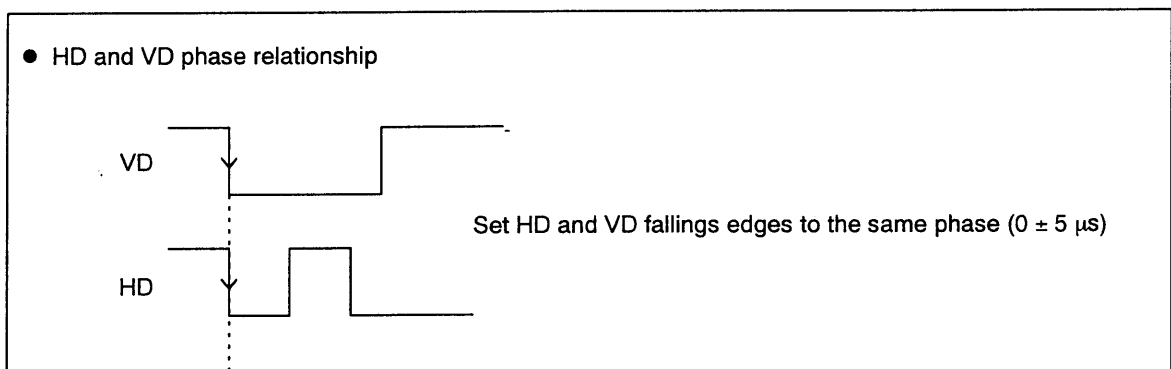
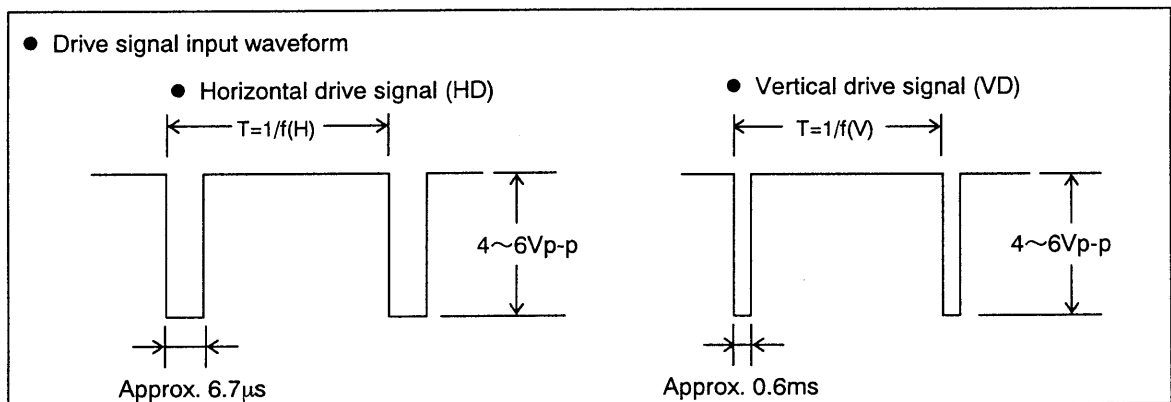
9. Typical connection



10. External sync (BE-IR21)

Supply sync signals (HD and VD) for BE-IR21 operation. Refer to connection on page 9.

- Horizontal and vertical drive signal inputs
HD EIA: $f(H) = 15.734 \text{ kHz} \pm 1 \%$
VD EIA: $f(V) = 59.94 \text{ Hz}$ ($f(V) = f(H) \div 262.5$)
- Input level
HD 4 to 6 Vp-p negative
VD 4 to 6 Vp-p negative
- Input impedance 1 k Ω



11. Function setting 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 on 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.

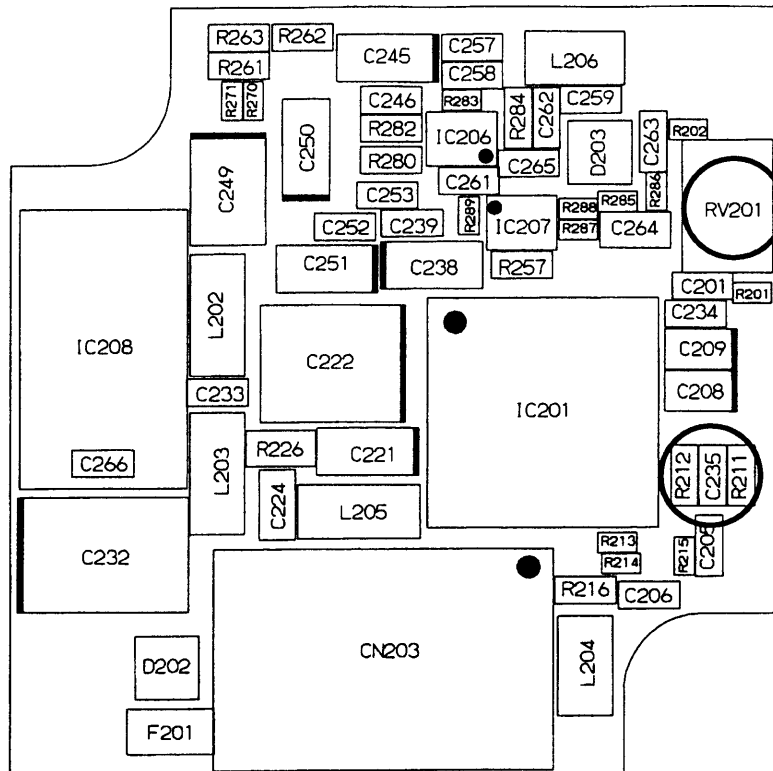
11-1 AGC on / off

Factory setting is AGC off (fixed gain). If necessary in the application, AGC can be set to on.

When the AGC is off, the gain can be changed by turning RV201.

Set AGC on by changing the indicated chip parts.

Gain	R211	R212	Factory setting
fixed gain	0Ω	Absent	
AGC	Remove	0Ω	



Location of chip resistor (Main board side A)

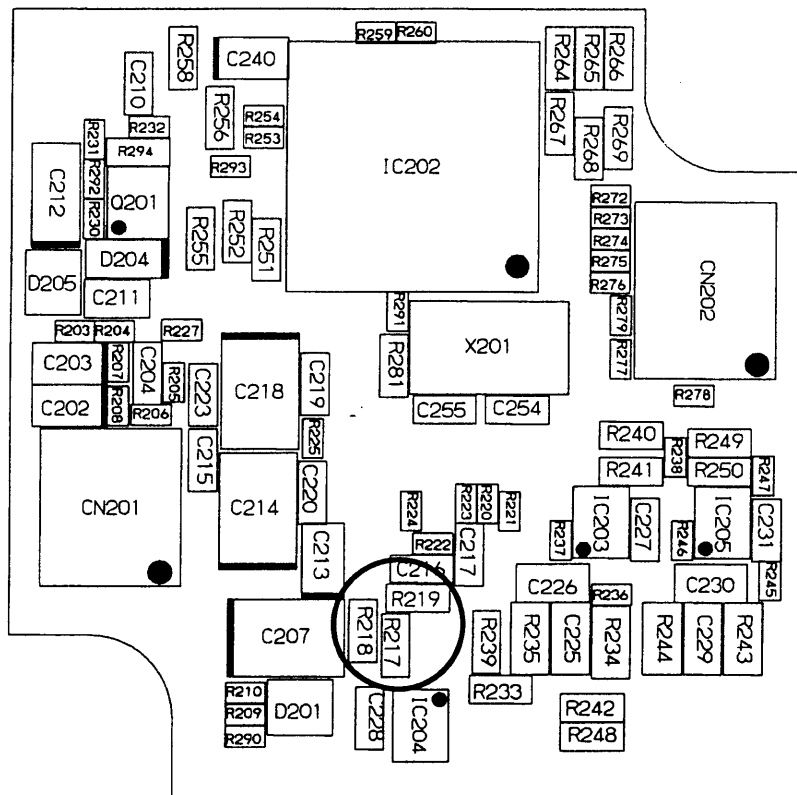
11-2 Gamma response

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

Change the gamma response by changing the chip part.

Gamma(γ)response	R217	R218	R219	Factory setting
ON	0 Ω	Absent	Absent	
OFF	Remove	0 Ω	0 Ω	

0 Ω : Part code RME1784
 Description ERJ3GEYJ0R00V



Location of chip capacitors (Main board side B)

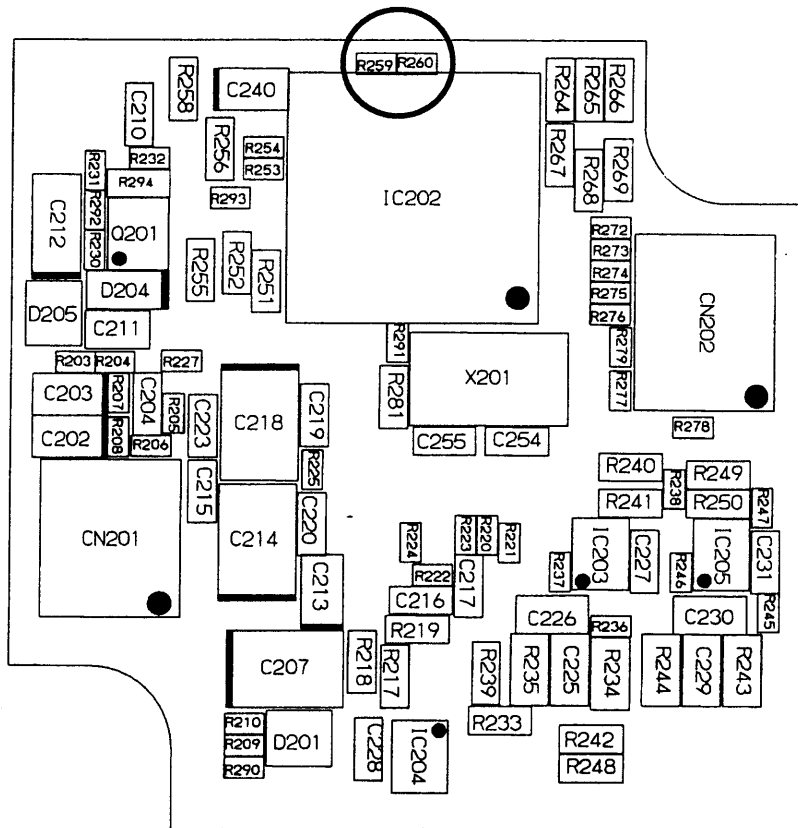
11. Function setting and changes

11-3 Auto electronic shutter on / off

Factory setting for auto electronic shutter is off. If necessary, it can be set to on.
 Absent the R259, R260 chip to set the auto electronic shutter to on.

Auto electronic shutter	R259	R260	
OFF	0Ω	0Ω	Factory setting
ON	Absent	Absent	

0Ω : Part code RME2068
 Description ERJ2GE0R00X



Location of chip resistors (Main board side B)

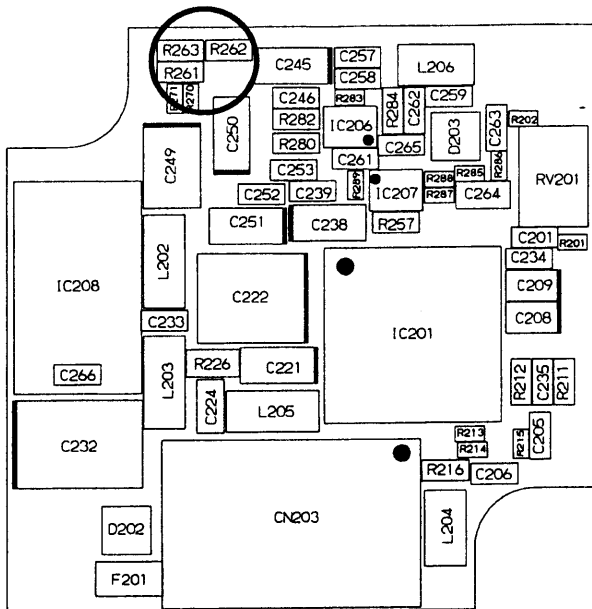
11-4 Changes to fixed shutter mode

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

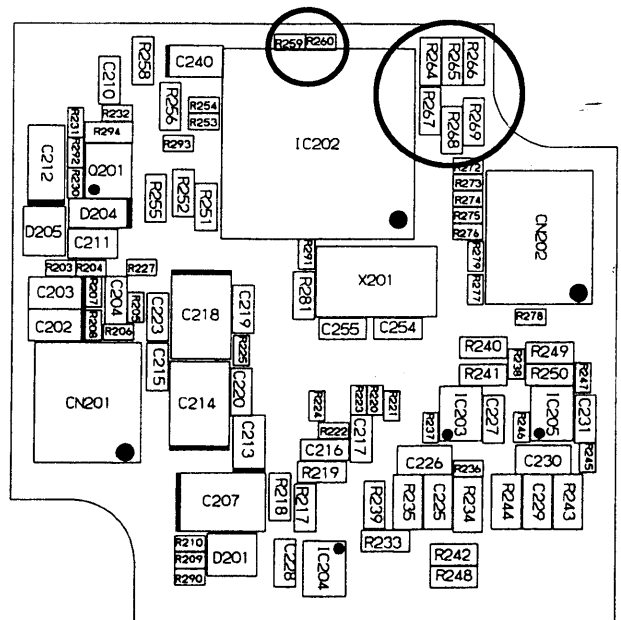
Mode	R259	R260	R261	R262	R263	R264	R265	R266	R267	R268	R269	Factory setting
Normal mode	0Ω	0Ω	Absent	0Ω	Absent	2700	2200	47k	5600	2200	47k	
Auto electronic shutter mode	Remove	Remove	Absent	0Ω	Absent	↑	↑	↑	↑	↑	↑	
Fixed shutter mode	EIA 1/100	Remove	0Ω	0Ω	Remove	Absent	0Ω	0Ω	Remove	0Ω	0Ω	Remove
	CCIR 1/120	↑	↑	↑	↑	↑	↑	↑	↑	Remove	Remove	0Ω
	1/250	↑	↑	Absent	Remove	0Ω	↑	↑	↑	0Ω	0Ω	Remove
	1/500	↑	↑	↑	↑	↑	↑	↑	↑	Remove	Remove	0Ω
	1/1000	↑	↑	0Ω	Remove	Absent	Remove	Remove	0Ω	0Ω	0Ω	Remove
	1/2000	↑	↑	↑	↑	↑	↑	↑	0Ω	Remove	Remove	0Ω
	1/5000			Absent	Remove	0Ω			0Ω	0Ω	0Ω	Remove
	1/10000			↑	↑	↑	↑	↑	0Ω	Remove	Remove	0Ω
	1/100000			↑	↑	↑			0Ω	Remove	Remove	0Ω

R259 , R260 : 0Ω Part code
Description
Others : 0Ω Part code
Description

RME2068
ERJ2GE0R00X
RME1784
ERJ3GEYJ0R00V



(Main board side A)



(Main board side B)

Location of chip resistors

11. Function setting and changes

11-5 BE-IR20 external sync

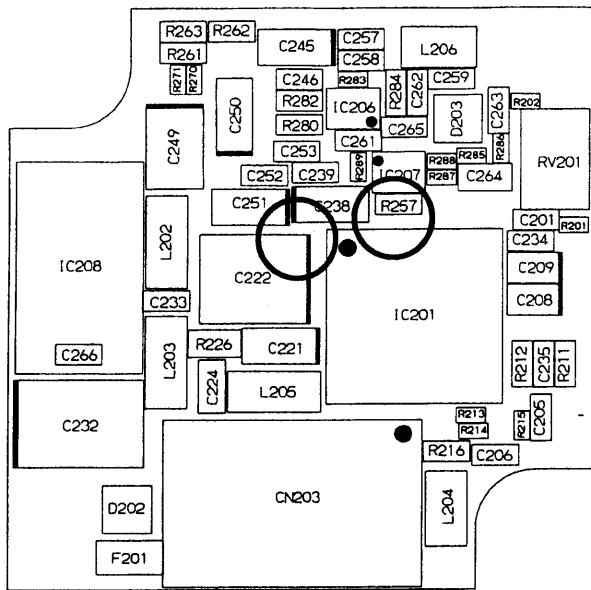
The BE-IR20 factory setting is for internal sync. If required, this can be changed to external sync by changing chip parts.

Change the following chip parts for external sync operation.

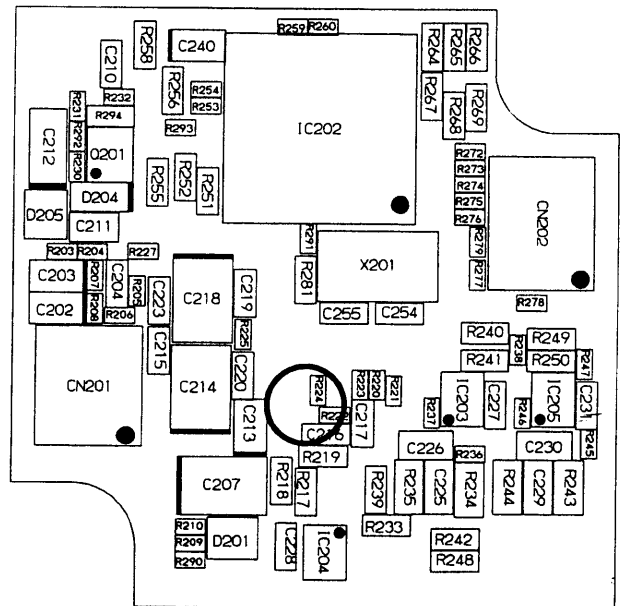
Sync system	R280	R281	R282	R284	
Internal	470 Ω	Absent	Absent	0 Ω	Factory setting
External	Delete	470 Ω	0 Ω	Delete	

0 Ω : Part code RME1784
 Type ERJ3GEYJ0R00V

470 Ω : Part code RME1805
 Type ERJ3GEYJ471V



(Main board side A)



(Main board side B)

Location of chip resistors

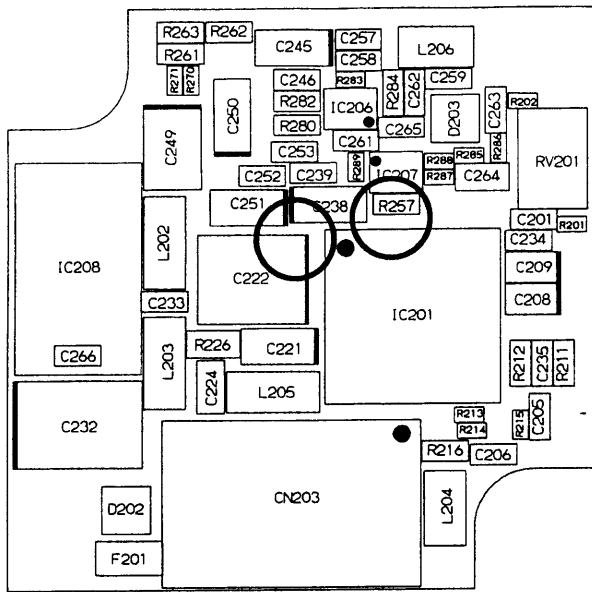
11-6 BE-IR21 internal sync

The BE-IR21 factory setting is for external sync. If required, this can be changed to internal sync by changing chip parts.

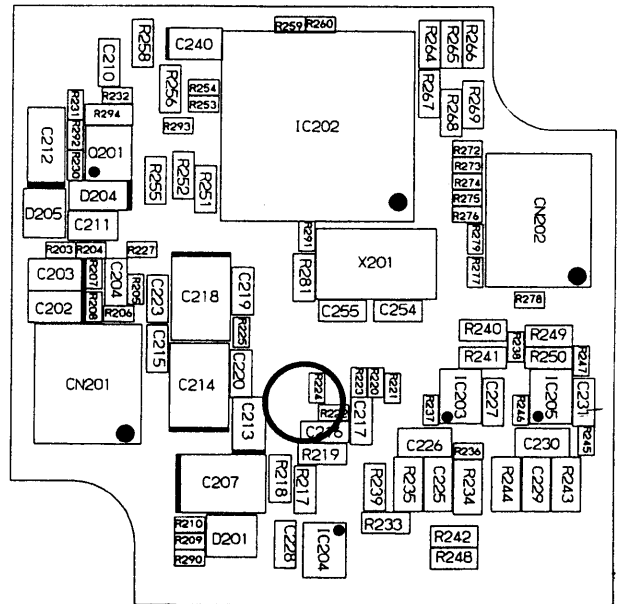
Change the following chip parts for internal sync operation.

Sync system	R280	R281	R282	R284	
External	Absent	470 Ω	0 Ω	Absent	Factory setting
Internal	470 Ω	Delete	Delete	0 Ω	

- 0 Ω : Part code RME1784
Type ERJ3GEYJ0R00V
- 470 Ω : Part code RME1805
Type ERJ3GEYJ471V



(Main board side A)



(Main board side B)

Location of chip resistors

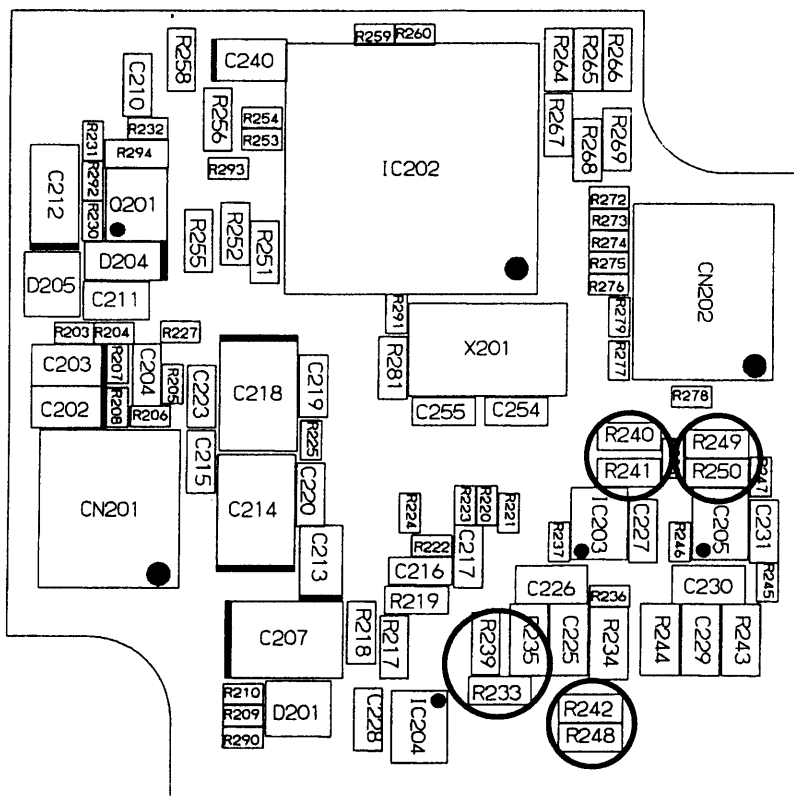
11. Function setting and changes

11-7 HD and VD output (BE-IR20 only)

The BE-IR20 can be provided with horizontal and vertical drive outputs by changing chip parts. Change the following chip parts to provide HD and VD outputs.

	R233	R239	R240	R241	R242	R248	R249	R250
Factory setting	0 Ω	Absent	0 Ω	Absent	0 Ω	Absent	0 Ω	Absent
HD & VD output	Delete	0 Ω	Delete	0 Ω	Delete	0 Ω	Delete	0 Ω

0 Ω : Part code RME1784
Type ERJ3GEYJ0R00V



Location of chip resistors(Main board side B)

Connector pin assignments after change

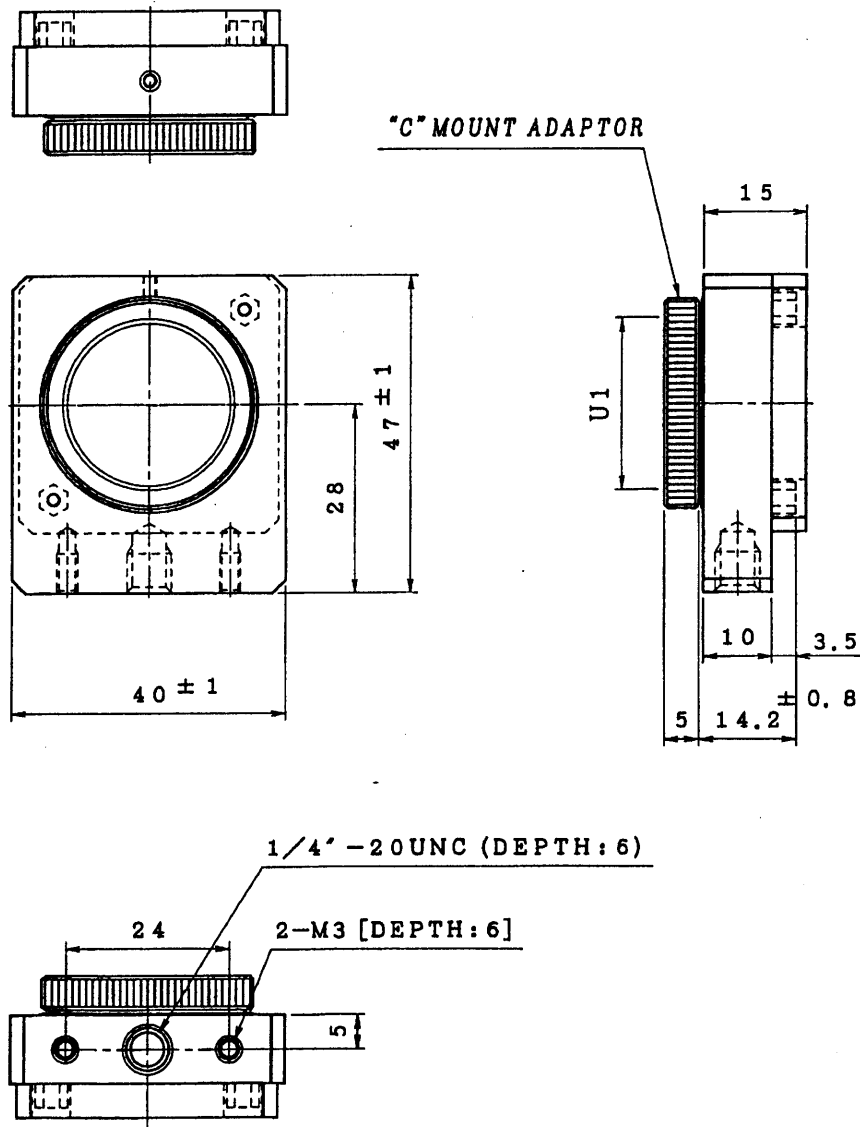
Pin No.	Signal
1	Video out
2	Video GND
3	GND
4	+9V
5	HD out
6	VD out
7	HD/VD GND

Note: The accessory cable cannot be used for signal outputs.

12. Options

LA-IR20 Mount adapter dimensions

MASS : APPROX. 60 g

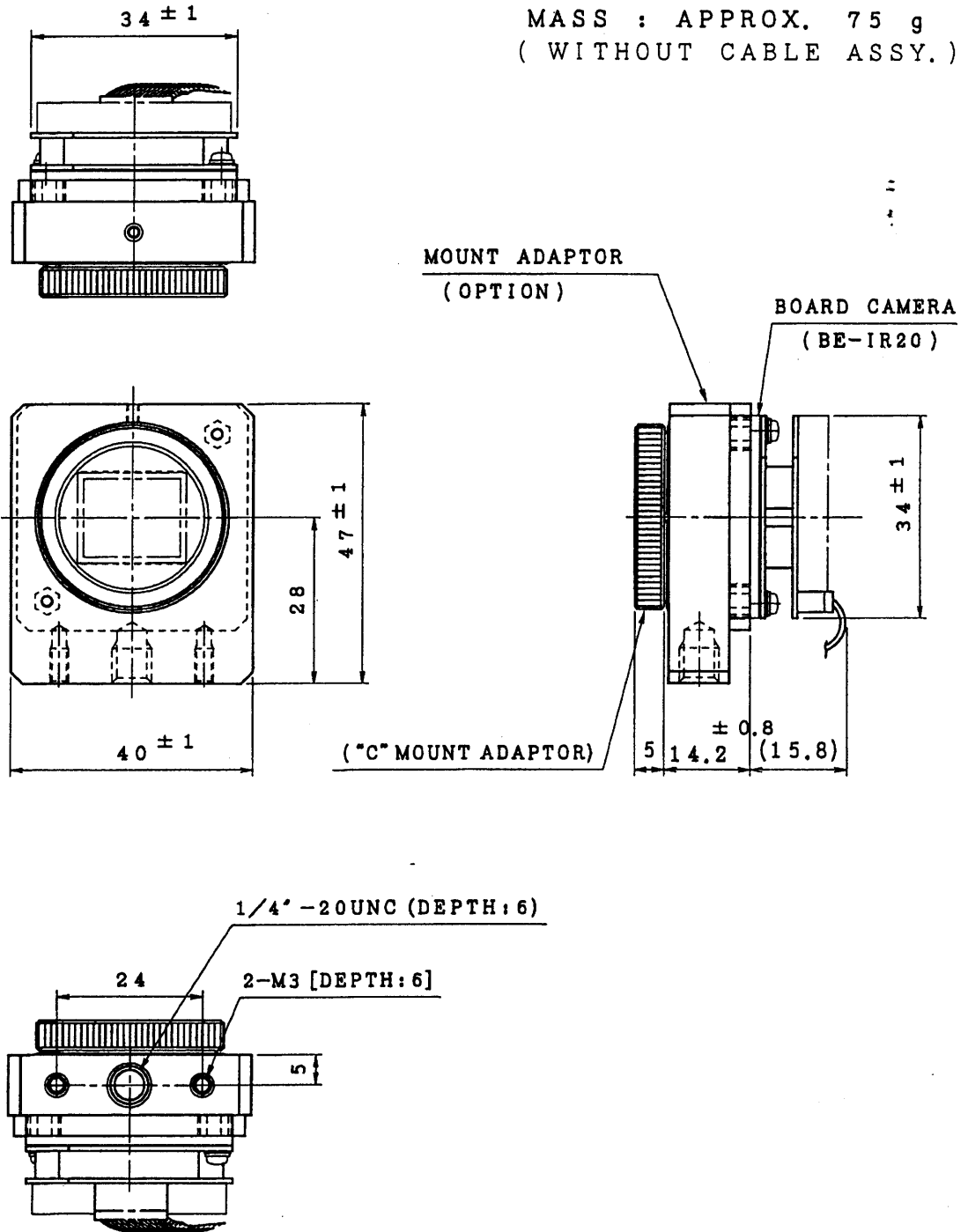


Remove c-mount attachment to use as cs-mount.

12. Options

BE-IR20/21 and LA-IR20 combined dimensions

MASS : APPROX. 75 g
(WITHOUT CABLE ASSY.)



Spectral sensitivity (typical example)

