3-CCD Color Camera

MODEL HV-F31CL
HV-F22CL
HV-F31CL-S1
HV-F22CL-S1

OPERATION MANUAL

Please read this operation manual carefully for proper operation, and keep it for future reference.

NOTE: The model and serial numbers of your product are important for you to keep for your convenience and protection. These numbers appear on the nameplate located on the bottom of the product. Please record these numbers in the spaces provided below, and retain this manual for future reference.

Model No. _____ **Serial No.** _____

Hitachi Kokusai Electric Inc.

IMPORTANT SAFETY INSTRUCTIONS

1. Read Instructions

All the safety and operating instructions should be read before the product is operated.

2. Retain Instructions

The safety and operating instructions should be retained for future reference.

3. Heed Warnings

All warnings on the product and the operating instructions should be adhered to.

4. Follow Instructions

All operating and use instructions should be followed.

5. Cleaning

Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

6. Attachments

Do not use attachments not recommended by the product manufacturer as they may cause hazards.

7. Water and Moisture

Do not use this product near water - for example, near a bath tub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool; and the like.

8. Accessories

Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.

9. Moving

A product and cart combination should be moved with care.

Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.

10. Ventilation

Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered.

The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should not be placed in a

built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

11. Power Sources

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your product dealer or local power company. For products intended to operate from battery power, or other sources, refer to the operating instructions.

12. Grounding or Polarization

This product is equipped with a three-wire grounding-type plug a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.

13. Power-Cord Protection

Power-supply cords should be routed to that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plug, convenience receptacles, and the point where they exit from the product.

14. Lightning

For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet. This will prevent damage to the product due to lightning and power-line surges.

15. Overloading

Do not overload wall outlets, extension cords or integral convenience receptacles as this can result in a risk of fire or electric shock.

16. Object and Liquid Entry

Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.

17. Inflammable and Explosive Substance

Avoid using this product where there are gases, and also where there are inflammable and explosive substances in the immediate vicinity.

18. Heavy Shock or Vibration

When carrying this product around, do not subject the product to heavy shock or vibration.

19. Servicing

Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

20. Damage Requiring Service

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a. When the power-supply cord or plug is damaged.

b. If liquid has been spilled, or objects have fallen into the product.

c. If the product has been exposed to rain or water.

d. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.

e. If the product has been dropped or damaged in any way.

f. When the product exhibits a distinct change in performance-this indicates a need for service.

21. Replacement Parts

When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part.

Unauthorized substitutions may result in fire, electric shock, or other hazards.

22. Safety Check

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.

23. Wall or Ceiling Mounting

The product should be mounted to a wall or ceiling only as recommended by the manufacturer.

24. Heat

The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.

WICHTIGE SICHERHEITSANWEISUNGEN

1. Alle Anweisungen lesen

Vor Betrieb des Erzeugnisses sollten alle Sicherheits-und Bedienungsanleitungen gelesen werden.

2. Die Anweisungen aufbewahren

Die Sicherheits-und Bedienungsanleitungen sollten fünftigen Bezug aufbewahrt werden.

3. Warnungen beachten

Die Warnungen auf dem Erzeugnis und in den Bedienungsanleitungen solten beachtet werden.

4. Anweisungen befolgen

Alle Bedienungsanleitung-und Verwendungsanweisungen sollten befolgt werden.

5. Reinigung

Den Stecker des Geräts vor Reinigung aus der Steckdose ziehen. Keine flüssigen Reinigungsmittel oder Aerosolreiniger verwenden. Zum Reinigen einen feuchten Lappen verwenden.

6. Zubehör

Nur vom-Hersteller des Erzeugnisses empfohlenes Zubehör verwenden, da es sonst zu Störungen kommen kann.

7. Wasser und Feuchtigkeit

Dieses Erzeugnis nicht in der Nähe von Wasser verwenden - z.B, in der Nähe einer Badewanne, eines Waschbeckens, einer Küchenspüle, eines Waschzubers, in einem nassen Keller, in der Nähe eines Schwimmbeckens usw.

8. Aufstellung

Das Erzeugnis nicht auf einen unstabilen Wagen, Stand, Dreifuß, Träger oder Tisch stellen.

Das Erzeugnis kann sonst herunterfallen und ein kind oder einen Erwachsenen schwer verietzen.

Außerdem kann das Gerät schwer beschädigt werden. Nur mit einem Wagen, Stand, Dreifuß, Träger oder Tisch verwenden, der vom Hersteller empfohlen oder mit dem Erzeugnis verkauft worden ist. Für jegliche Anbringung sollten die Anweisungen des Herstellers befolgt werden, und das vom Hersteller empfohlene Anbringungszubehör sollte verwendet werden.

9. Eine Kombination von Erzeugnis und Wagen sollte vorsichtig bewegt werden

Schneller Halt, übermäßige Krafteinwirkung und unebene Oberflächen können Umkippen der kombination von Erzeugnis und Wagen verursachen.

10. Ventilation

Schlitze und Öffnungen im Gehäuse dienen der Ventilation. Sie sind für zuverlässigen Betrieb des Gerätes und Schutz vor Überhitzung

erforderlich und dürfen nicht blockiert oder abgedeckt werden.

Die Öffnungen sollten niemals dadurch blockiert werden, daß, das Gerät auf ein Bett, ein Sofa, einen Teppich oder eine ähnliche Oberfläche gestellt wird.

Das Gerät sollte nur dann in Einbauinstallierung wie in einem Bücherschrank oder einem Gestell verwendet werden, wenn angemessene Ventilation vorgesehen ist bzw. Die Anweisungen des Herstellers befolgt worden sind.

11. Stromversorgung

Dieses Erzeugnis sollte nur an der auf dem Typenschild angegebenen Stromversorgungsart betrieben werden. Wenn Sie nicht sicher sind, was für eine Stromversorgung Sie haben, so wenden Sie sich bitte an Ihren Erzeugnishändler oder an das lokale Elektrizitätswerk. Beziehen Sie sich für Batteriebetrieb oder andere Stromquellen vorgesehene Erzeugnisse bitte auf die Bedienungsanleitungen.

12. Erdung oder Polarisierung

Dieses Erzeugnis ist mit einem Schutzkontaktstecker mit drei Leitern ausgerüstet, mit einem Erdungskontakt. Dieser Stecker paßt nur in ein schuko-Steckdose. Dies ist eine Sicherheitsmaßnahme. Wenn Sie den Stecker nicht in die Steckdose stecken können, so wenden Sie sich bitte an ihren Elektriker, damit er die veraltete Schuts des Schutzkontaktsteckers unwirksam.

13. Netzkabelschutz

Netzkabel sollten so verlegt werden, deß möglichst nicht darauf getreten wird und daß sie nicht eingeklemmt werden, mit besonderer Beachtung der kabel an Stackern, Verlängerungskabeln und dem Austritt des Kabels aus dem Erzeugnis.

14. Blitzschlag

Für zusätzlichen Schutz des Erzeugnisses während eines Gewitters oder bei Nichtverwendung für lange Zeit den Stecker aus der Steckdose ziehen. Dies verhütet Beschädigung durch Blitzschlag und Netzspannungsstöße.

15. Überlastung

Wandsteckdosen, Verlängerungskabel und eingebaute Bequemlickkeitssteckdosen nicht überlasten, da dies Feuer oder elektrischen Schlag verursachen kann.

16. Eindringen von Fremdkörpern und Flüssigkeit

Niemals Objekte irgendwelcher Art durch die Öffnungen in das Gerät schieben, da diese unter hoher Spannung stehende Teile berühren oder kurzschließen können, wodurch es zu Feuer oder elektrischem Schlag kommen kann. Niemals Flüssigkeiten irgendwelcher Art auf das Erzeugnis verschütten.

17. Entflammbare und explosive Substanzen

Vermeiden Sie Verwendung dieses Erzeugnisses an Orten mit Gasen bzw. entflammbaren oder explosiven Substanzen in der direkten Umgebung.

18. Starke stöße oder Vibrationen

Setzen Sie das Erzeugnis beim Transport nicht starken Stößen oder Vibrationen aus.

19. Wartung

Versuchen Sie nicht, dieses Erzeugnis Selbst zu warten, da Sie sich durch Öffnen bzw. Entfernen von Abdeckungen hohen Spannungen und sonstigen Gefährdungen ausserzen können.

Beziehen Sie sich für jegliche Wartung auf qualifiziertes Wartungspersonal.

20. Beschädigung, die Wartung erfordert

Ziehen Sie den Stecker dieses Erzeugnisses aus der Steckdose und wenden Sie sich an qualifiziertes Wartungspersonal, wenn eine der folgenden Bedingungen vorliegt:

a. Wenn das Netzkabel oder der Stecker beschädigt ist.
b. Bei Eindringen von Flüssigkeit oder Fremdkörpern in das Gerät.
c. Wenn das Erzeugnis Regen oder Wasser ausgesetzt worden ist.
d. Wenn das Erzeugnis bei Befolgen der Bedienungsanleitungen nicht normal funktioniert.

   Nur die Regelelemente verstellen, die in den Bedienungsanleitungen behandelt werden, da unangemessene Einstellung anderer Regelelemente Beschädigung verursachen kann und oft beträchtliche Arbeit durch einen qualifizierten Techniker erfordert, um das Erzeugnis wieder, zu normalem Betrieb zurückzubringen.
e. Wenn das Erzeugnis fallen gelassen oder beschädigt worden ist.
f. Wenn das Erzeugnis eine klare Änderung in der Leistung zeigt-dies weist darauf hin, daß Wartung erforderlich ist.

21. Ersatzteile

Wenn Ersatzteile erforderlich sind, darauf achten, daß der Wartungstechniker nur die vom Hersteller festgelegten Ersatzteile oder Teile mit den gleichen Charakteristiken wie die ursprünglichen Teile verwendet. Unautorisierte Ersatzteile können Feuer, elektrischen Schlag oder sonstige Gefährdungen verursachen.

22. Sicherheitsprüfung

Bitten Sie den Wartungstechniker nach der Vollendung von Wartung oder Reparaturarbeiten an diesem Erzeugnis um die Durchführung von Sicherheitsprüfungen, um zu bestimmen, daß das Erzeugnis im angemissenen Betriebszustand ist.

23. Anbringung an der Wand oder an der Decke

Das Erzeugnis sollte nur entsprechend den Empfehlungen des Herstellers an einer Wand oder an der Decke angebracht werden.

24. Wärme

Das Erzeugnis sollte fern von Wärmequellen wie Radiatoren, Heizwiderständen, Öfen und anderen Wärme erzeugenden Erzeugnissen (einschließlich Verstärkern) aufgestellt werden.

MISES EN GARDE IMPORTANTES

1. Lire les instructions

Lire toutes les instructions de sécurité et de fonctionnement avant de faire fonctionner l'appareil.

2. Conserver ces instructions

Conserver les instructions de sécurité et de fonctionnement á des fins de référence ultérieure.

3. Tenir compte des avertissements

Tous les avertissements qui figurent sur l'appareil et dans le mode d'emploi devront être respectés.

4. Observer les instructions

Observer toutes les instructions de fonctionnement et d'utilisation.

5. Nettoyage

Avant de procéder au nettoyage, débrancher l'appareil de la prise secteur. Ne pas utiliser de produits de nettoyage liquides ou en aérosol. Nettoyer l'appareil avec un chiffon humide.

6. Fixations

Ne pas utiliser de fixations non recommandées par le fabricant de l'appareil car elles pourraient être source de danger.

7. Eau et humidité

Ne pas utiliser l'appareil á proximité d'eau-ar exemple prés d'une baignoire, d'un lavabo, d'un évier ou d'un bac á lessive, dans un sous-sol humide, ou prés d'une piscine, etc.

8. Accessoires

Ne pas placer l'appareil sur un chariot, un socle, un pied, un support ou one table instables L'appareil pourrait tomber, blessant griévement des enfants ou des adultes, et étant sérieusement endommagé.

Utiliser exclusivement le chariot, le socle, le pied, le support ou la table recommandés par le fabricant, ou vendus avec l'appareil. Pour tout montage de l'appareil, respecter les instructions du fabricant, et utiliser á cette fin l'accessoire de montage recommandé par le fabricant.

9. L'appareil monté sur son chariot devra être déplacé avec précaution

Des arrêts brusques, une force excessive et des surfaces irréguliéres pourraient provoquer le renversement de l'ensemble appareil-chariot.

10. Ventilation

Les fentes et les ouvertures du coffret sont prévues pour la ventilation ainsi que pour garantir un fonctionnement en toute sécurité de

l'appareil et le protéger de toute surchauffe, et ces ouvertures ne devront donc être ni obstruées ni recouvertes. Ne jamais obstruer les ouvertures en placant l'appareil sur un lit, un sofa, un tapis ou toute surface similaire. Ne jamais placer l'appareil dans un support confiné, par exemple une bibliothéque ou une é tagé re, sans ventilation suffisante ou sans repecter les instructions du fabricant.

11. Sources d'allmentation

L'appareil devra être alimenté exclusivement sur le type d'alimentation indiqué sur l'étiquette signalétique. Sil'on n'est pas sûr du type d'alimentatio du local, consulter le revendeur de l'appareil ou la compagnie d'électricité locale. Pour les appareils qui fonctionnent sur batterie ou sur d'autres sources, voir le mode d'emploi.

12. Mise á la terre ou polarisation

L'appareil est doté d'une fiche trifilaire avec mise á la terre, dont la troisiéme broche assure la mise á la terre. Cette fiche ne rentrera que dans les prises trifilaires de mise á la terre. Ceci est une mesure de sécurité. Si la fiche ne rentre pas dans la prise, faire remplacer la prise désuéte par un électricien.

Ne pas rendre vaine la measure de sécurité assurée par cette prise avec mise á la terre.

13. Protection du cordon d'alimentation

Acheminer les cordons d'alimentation de facon qu'on ne risque pas de marcher dessus ou de les coincer sous un objet placé dessus ou contre eux.

Faire particuliérement attention aux fiches des cordons, á la proximité des prises, et á l'endroit oú ils ressortent de l'appareil.

14. Foudre

Pour renforcer la protection de l'appareil pendant un orage, ou si l'on s'en éloigne ou qu'on reste longtemps sans l'utiliser, le débrancher de la source d'alimentation. Ceci permettra d'éviter tout dommage de l'appareil dú á la foudre et aux surtensions de ligne.

15. Surcharge

Ne pas surcharger les prises, rallonges et prises multiples car cela pourrait entraîner un risque de feu ou de choc électrique.

16. Pénétration d'objets et de liquides

Ne jamais enfoncer d'objets d'aucune sorte dans les ouvertures de l'appareil car ils pourraient toucher des points de tension dangereuse ou court-circuiter des piéces, ce qui pourrait

provoquer un feu ou un choc électrique. Ne jamais renverser de liquide d'aucune sorte sur l'appareil.

17. Substances inflammabes et explosives

Eviter d'utiliser l'appareil en présence de gaz, ainsi qu'á proximité immédiate de substances inflammables et explosives.

18. Chocs ou vibrations violents

Lorsqu'on transporte l'appareil, ne pas le soumettre á des chocs ou des vibrations violents.

19. Réparations

Ne pas tenter de réparer l'aapareil soi-même car le fait d'ouvrir ou de retirer les caches risque d'exposer l'utilisateur á des tensions dangereuses notamment. Confier toute réparation á un personnel qualifié.

20. Dommages nécessitant réparations

Débrancher l'appareil de la source d'alimentation et confier les réparations á un personnel qualifié dans les cas suivants:

a. Lorsque le cordon d'alimentation ou sa fiche sont endommagés
b. Si du liquide s'est renversé sur l'appareil ou que des objets sont tombés dedans
c. Si l'appareil a été exposé á la pluie ou á l'eau.
d. Si l'appareil ne fonctionne pas normalement lorsqu'on observe les instructions d'utilisation. Ne régler que les commandes couvertes par le mode d'emploi ; en effet, un réglage incorrect des autres commandes pourrait entrainer des dommages et nécessiteront souvent des travaux de réparation coûteux par un technicien qualifié pour remettre l'appareil en état de marche.
e. Si l'appareil est tombé ou qu'il a été endommagé.
f. Si l'appareil affiche une nette modification de ses performances, cela signifie qu'il a besoin d'être réparé.

21. Piéces de rechange

Si l'on a besoin de piéces de rechange, veiller á ce que le technicien de réparation utilise exclusivement les piéces de rechange spécifiées par le fabricant ou des piéces ayant les mêmes caractéristiques que les piéces d'origine. Les piéces de rechange non autorisées risquent de provoquer un feu, un choc électrique et autres dangers.

22. Vérificaton de sécurité

Aprés tout travail d'entretien ou de réparation de l'appareil, demander au technicien de réparation d'effectuer les vérifications de sécurité pour s'assurer que l'appareil est en bon état de marche.

23.Montage au mur ou au plafond

L'appareil ne pourra être monté au mur ou au plafond que de la maniére recommandée par le fabricant.

24. Chaleur

Eloigner l'appareil des sources de chaleur, telles que radiateurs, appareils de chauffage, cuisiniéres, et de tour produit engendrant de la chaleur (y compris les amplificateurs).

IMPORTANT NOTICE

For USA

These products have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or modifications not expressly approved by Hitachi Denshi responsible for compliance could void the user's authority to operate the equipment.

For Canada

This product does not exceed the class A/class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations.

Le présent appareil n'émet pas de bruits radioélectriques dépassant les limités applicable aux appareils numériques de classe A prescrites dans le rVglement sur le brouillage radioélectrique édicter par le ministére des communications du canada.

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Overview

The Hitachi HV-F31CL / HV-F22CL / HV-F31CL-S1 / HV-F22CL-S1 are high precision 3CCD progressive scan color camera, which has single chip digital processing LSI, a C mount prism, three 1/3-inch 800,000 pixels (HV-F31CL, HV-F31CL-S1) / 1/2-inch 1,450,000 pixels (HV-F22CL, HV-F22CL-S1) square CCDs , and a Camera Link interface.

A newly developed multi-functional LSI use the accurate 14 bit digital processing technology, which performs the high picture quality signal processing and the picture compensating functions, beyond the capability of the other conventional analog cameras.

The Camera Link interface brings RGB digital video output of 3 x 10 bit (HV-F31CL / HV-F22CL), or 3 x 8 bit (HV-F31CL-S1 / HV-F22CL-S1).

Features

- **Camera signal processor is single chip LSI.**
  The Hitachi's most advanced technology (0.18 um design process, 1.8V internal core drive voltage) produces a single newly developed ultra LSI chip (3 million gates), and contributes to the downsizing and the low power of the camera. In addition, the 12-bit A/D converter and 14 bit internal processor provide high S/N and wide dynamic range.
- **High quality picture**
  Excellent color reappearance and high definition are materialized by CCD with a high sensitivity micro lens and LSI signal processing technology.
- **6 vector masking**
  Independent six colors masking is the Hitachi innovation for optimizing color balance. The saturation and the hue of 6 colors (Red, blue, green, cyan, magenta and yellow) are adjusted independently to deliver the best color in image capture, microscope and other applications.
- **Auto white shading compensation**
  Color shading due to the aberration of C mount lens is automatically compensated (reduced).

Notes to users

Important safety notes

- Use this camera with a 12 VDC power supply.
- Observe that flammable objects, water or metal do not enter the camera interior. These may lead to failure or accident.
- Do not modify the camera or use the camera with external covers removed. These may cause failure, void any warranties and pose a safety hazard.
- Stop using the camera at the approach of an electrical storm (thunder audible). Protect the camera from rain if using it outdoors.
- In event the camera shows any abnormality, switch off the camera and disconnect the power cord. Contact a Hitachi Denshi service representative.

Operating considerations

- **Power supply**
  Check that the supplied voltage is between 10.5 and 15 VDC. Inadequate voltage can affect color fidelity and cause noise, while voltage over 15 V can damage the camera.
- **Connectors**
  Confirm the power is off before connecting or disconnecting a signal cable. Grasp connectors by the body, not the attached wires.
- **Lens**
  The correct lens is important for deriving optimum performance from the camera. Consult a Hitachi Denshi dealer for a selection of fine lenses according to the application.
- **Installation and storage sites**
  The following types of environment can impair performance, lead to damage, pose safety hazards and shorten the useful life of the camera. Select the sites for installing the storing the camera carefully.
  - Direct sunlight, rain or snow
  - Flammable or corrosive gasses
  - Very hot or cold (beyond 0 to 4 ℃ operating, -20 to 60℃ storage)

- Humid or dusty
- Exposed to vibration or shock
- Strong electrical or magnetic fields
- Exceptionally strong light

Continuous operation

In situations where the camera is used continuously for long periods of time, the ambient temperature should be kept below 40 ℃ in order to avoid accelerated deterioration of internal parts and to derive maximum long-term reliability.

Cleaning

- A photographer's blower or lens brush can be used for clearing dust from the lens and optical filters.
- Wipe dust from the case with a soft dry cloth. If soiling is severe, moisten the cloth with a solution of neutral detergent. Afterwards, wipe the cover with a dry cloth.
- Do not use petroleum distillates, alcohol or spray type cleaners.

Transportation

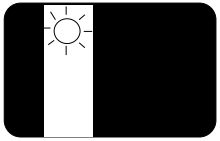
Remove the lens (install lens mount cap) and other attachments. Pack the camera carefully in its original or equivalent container. Use ample cushioning to protect the camera from physical shock.

CCD properties

The following phenomena are inherent to a charge coupled device imaging element and do not indicate malfunction.

1) **Smear and blooming**

Vertical bands are visible when a strong light enters the scene. Adjust the camera aiming direction carefully to avoid strong direct or reflected light.

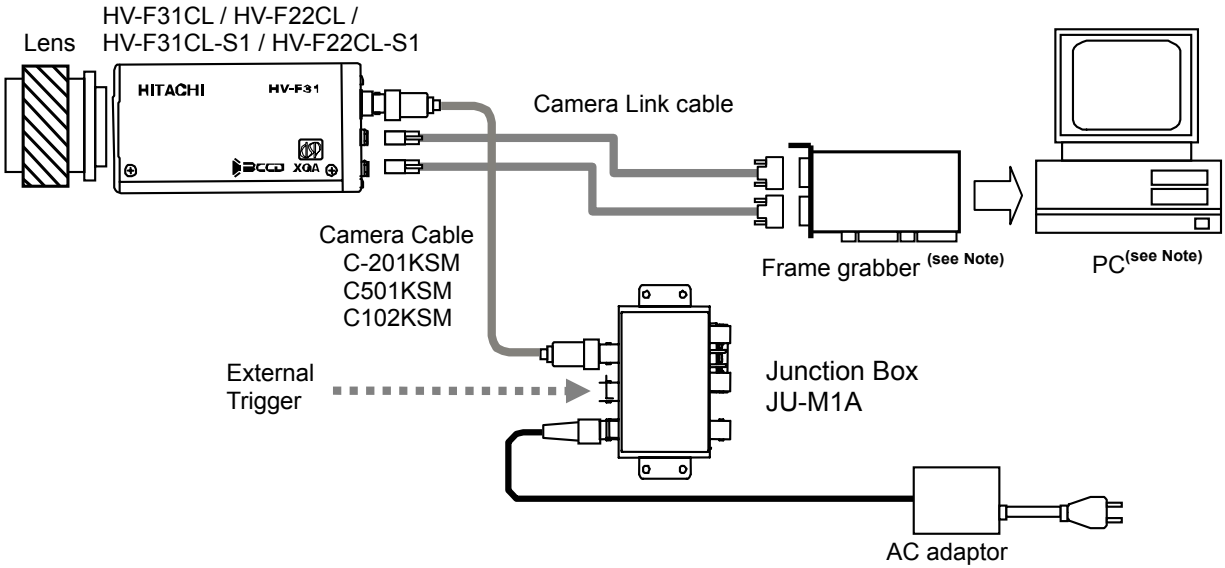


2) Fixed pattern noise
High ambient temperature can cause fixed pattern noise to appear throughout the scene.

3) Moire
Interaction between patterns can produce an additional "phantom" pattern to appear. The CCD picture elements (pixels) are arranged in a pattern, which can interact with a pattern in the scene (e.g., a performer wearing a finely striped necktie) to result in a Moire pattern. The effect should be considered when selecting costumes, props and other scene elements.

4) Ghosting
Strong direct or reflected light near an object of interest can cause ghosting of the object to appear in the picture. The effect is more obtrusive with certain iris settings and lens types. Select the scene layout and camera pointing direction carefully in order to avoid this effect.

System example

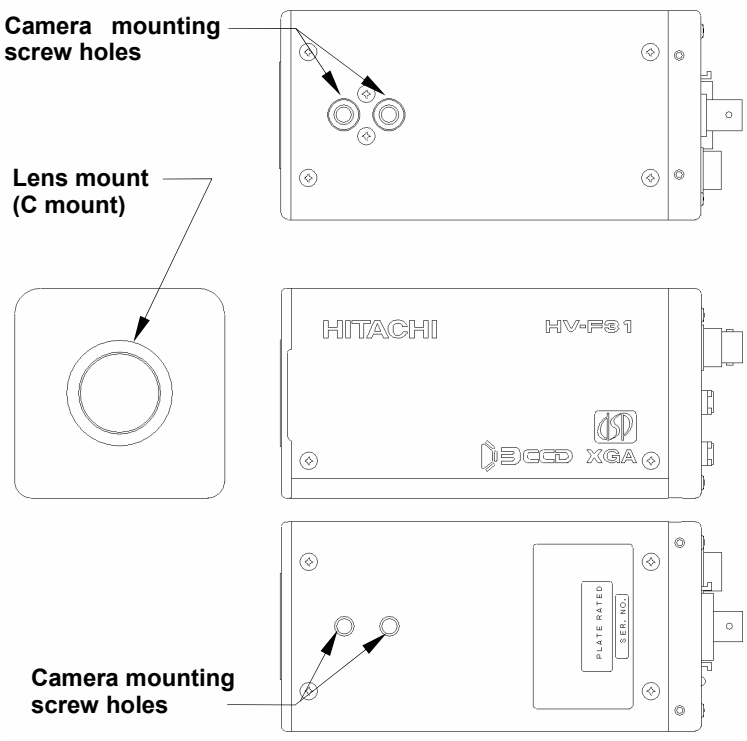


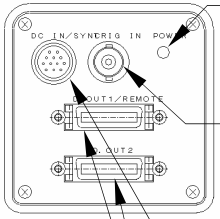
NOTE

The frame grabber should conform to medium configuration (HV-F31CL / HV-F22CL) or base configuration (HV-F31CL-S1 / HV-F22CL-S1) of Camera Link standard.

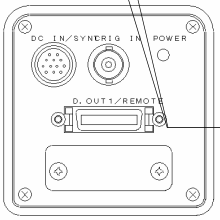
With HV-F31CL / HV-F22CL, both the frame grabber and the PC should have a PCI interface of 64bit / 66MHz or higher.

Section names and functions





HV-F31CL
HV-F22CL



HV-F31CL-S1
HV-F22CL-S1

Pilot lamp
Light when power is supplied.

TRIG IN connector
External trigger signal input

DC IN/SYNC connector
Connect to +12 VDC power supply.
Input for external HD/VD and sync signals.

Camera Link connector (see Note)
Digital video output and serial communication.
Connect to the frame grabber with Camera Link cable.

NOTE

HV-F31CL and HV-F22CL have two Camera Link connectors: D.OUT 1 / REMOTE and D.OUT 2.

HV-F31CL-S1 and HV-F22CL-S1 has single Camera Link connector: D.OUT 1 / REMOTE.

Connectors

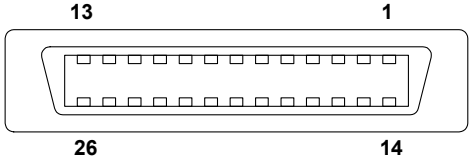
1. **Camera Link connector**
   (3M, 10226-2210VE)

D.OUT 1 / REMOTE

Pin No.	Signal designation	Pin No.	Signal designation
1	GND	14	GND
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	Xclk-	18	Xclk+
6	X3-	19	X3+
7	SerTC+	20	SerTC-
8	SerTFG-	21	SerTFG+
9	NC[CC1]-	22	NC[CC1]+
10	NC[CC2]+	23	NC[CC2]-
11	NC[CC3]-	24	NC[CC3]+
12	NC[CC4]+	25	NC[CC4]-
13	GND	26	GND

D.OUT 2

Pin No.	Signal designation	Pin No.	Signal designation
1	GND	14	GND
2	Y0-	15	Y0+
3	Y1-	16	Y1+
4	Y2-	17	Y2+
5	Yclk-	18	Yclk+
6	Y3-	19	Y3+
7	NC	20	NC
8	NC	21	NC
9	NC	22	NC
10	NC	23	NC
11	NC	24	NC
12	NC	25	NC
13	GND	26	GND

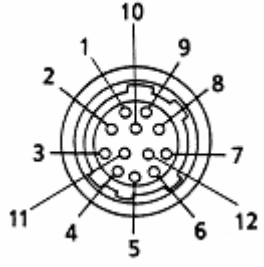


X0～X2, Y0～Y2 : Video and sync output
Xclk, Yclk : Pixel clock output
SerTC : RXD serial data to camera
SerTFG : TXD serial data to frame grabber

2. DC IN/SYNC connector

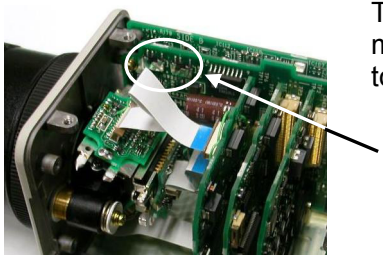
(Hirose, HR10A-10R-12PB(01))

Pin NO.	Signal designation
1	GND
2	+12V input
3	GND
4	FLASH OUT
5	GND
6	HD IN / TXD (see Note)
7	VD IN / RXD (see Note)
8	GND
9	TRIG (H)
10	TRIG (C)
11	+12V input
12	GND

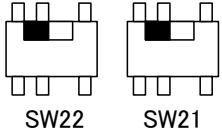


NOTE

Serial communication port (RS-232C) can be assigned in Pin No.6 and No.7 of DC IN/SYNC connector using inside switches. These switches are placed on the PCB behind the lens mount.



These switches should be moved to the same direction together.



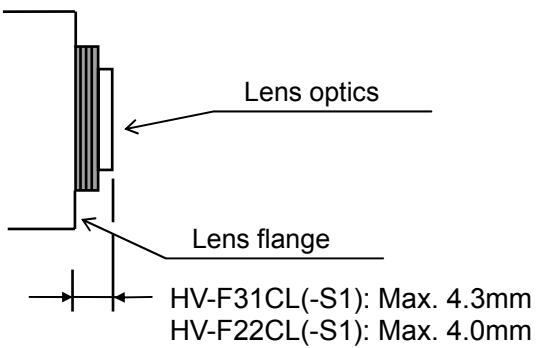
DC IN/SYNC Pin No.	Direction	
	Left (Default)	Right
No. 6	HD IN	TXD to PC
No. 7	VD IN	RXD to camera

When the direction is right, the serial communication via Camera Link is not available.

Matching Plug: Hirose, HR10A-10P-12S

Lens

CAUTION:
Observe the dimensions of the lens mounting selection as illustrated at the right.
If the dimensions are not observed, do not use such a lens, because the lens and the camera will be damaged.



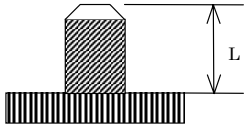
Selecting a lens

The proper lens is important for obtaining adequate performance from the camera. Especially in the case of a three elements CCD system C mount camera, the lens incidence and exit distances are important. If separation is too short, color irregularity is apt to occur at the top and bottom of the image.
Conversely if too long, where the lens iris is a nearly fully open, resolution is impaired, while shading and flare can seriously detract from image quality. When using 3 CCD color system camera, it is also recommended to use a lens designed for this purpose.

Camera mounting

The camera is provided with threaded screw holes at the top and bottom. These allow mounting to either a tripod or a mounting bracket.

Screw type: U 1/4-20
Length: 4.5 to 6 mm



Screws longer than 6 mm can cause internal damage, while less than 5 mm prevents secure fastening and risks dropping to cause damage and injury.

Functions and operations

Camera function setting is by computer via Camera Link connector or DC IN/SYNC connector. In this chapter, the camera function and the operation are described.
For the send/receive procedure, refer to another manual: "*Technical Information for Remote Control*".

1. MAIN function

(1) BRIGHTNESS

Master black level adjustment

-Manual adjustment-

Setting value **302Bxxzz** h xx: 80h to 7Fh (default 00h) zz: undefined

Set the value toward 80h side to lower black level, toward 7Fh side to raise that.

(2) SHARPNESS

Sharpness level adjustment (object contour correction)

-OFF-

Contour correction is disabled.

Setting value **200210EF** h

-Manual adjustment-

Setting value **302Cxxzz** h xx: 80h to 7Fh (default 00h) zz: undefined

Set xx toward 80h side to reduce edge level for softer contours and toward FFh side to increase edge level for sharper contours.

(3) WHITE BALANCE

White balance adjustment

-White balance mode-

MEMORY : White balance is held at the time when the AWB is set.

AUTO : White balance is always adjusted automatically.

Setting value **20040xxF3** h xx: 04h(MEMORY), 08h(AUTO)

-AUTO ADJUST (One Push) (AWB)-

Setting value **4010** h

-Manual adjustment-

Adjust the gain of R ch and B ch independently.

R ch gain : Setting value **3000xxzz** h

B ch gain : Setting value **3002xxzz** h

xx: 80h to 7Fh signed (default 00h) zz: undefined

Gain is reduced at 80h side and raised at 7Fh side.

(4) GAIN

Electrical sensitivity adjustment

-Gain mode-

MANUAL : Gain is manually adjustable from 0 to +12 dB.

AUTO : Gain is automatically adjusted from 0 to +12 dB for proper video level.

Setting value **2004xxCF** h xx: 10h(MANUAL), 20h(AUTO)

-Manual adjustment-

Manual adjustment is available on MANUAL mode.

Setting value **302Axxzz** h xx: 80h to 40h signed (default 00h) zz: undefined

The minimum value 80h is equal to 0 dB and the maximum value 40h is equal to 12 dB.

(5) SHUTTER

Electronic shutter speed adjustment

-Shutter mode-

MANUAL : The shutter speed is variable.

AUTO : The shutter speed is always adjusted automatically for proper video level when excessive light has entered. This mode is effective when using microscope or other optical system without an automatic lens iris.

OFF : The shutter speed is fixed in 1/15 sec (HV-F22) or 1/30 sec (HV-F31).

Setting value **2005xxF8** h xx: 03h- MANUAL, 05h- AUTO, 00h- OFF

-Manual adjustment-

Shutter speed adjustment is available on MANUAL mode.

Setting value **3038xxxx** h xxxx: FFC5h to 036Ch signed (HV-F22)
FF89h to 0327h signed (HV-F31)

Electronic shutter speed can be set in the range of 4 to 1/100,000 second.

Shutter speed is calculated as follows.

Note: "OFF_VALUE" equals to 15 in HV-F22 or 30 in HV-F31.

1) In the case that shutter speed is equal to (1 / OFF_VALUE) or shorter

Calculate value from exposure time

$nnnnh = log_{0.99}($ **OFF_VALUE**$\times$ *"Shutter Speed")*

Exp) Exposure time = 1/100 sec (for HV-F31CL)

Value:nnnn = $\log_{0.99}(30\times(1/100))$

$= \log(30\times(1/100)) / \log 0.99 \fallingdotseq$ 0078h

Calculate exposure time from value

Shutter Speed[sec] = **OFF_VALUE** × $0.99^{(nnnn)}$

Exp) Value:nnnn = 0078h (for HV-F31CL)

Exposure time = (1/30) × $0.99^{(78h)}$ ≒ 1/100(sec)

2) In the case that shutter speed is longer than (1 / OFF_VALUE)

Calculate value from exposure time

*nnnnh = 10001h - (***OFF_VALUE** × *"Shutter Speed")*

Exp) Exposure time = 1/7.5 sec (for HV-F31CL)

10001h- (30×(1/7.5)) = FFFDh

Calculate exposure time from value

Shutter Speed[sec] = (10001h – nnnnh) / **OFF_VALUE**

(6) AUTO EXPOSURE

Both gain and shutter speed are always adjusted automatically for proper video level.

Adjust the video level manually.

-Manual adjustment-

Setting value **3039xxzz** h xx: 80h to 7Fh signed (default: 00h) zz: undefined

The video level decreases toward 80h and increases toward 7Fh.

(7) SATURATION

Total color saturation adjustment

-Manual adjustment-

Setting value 3052xxzz h xx: 80h to 7Fh signed (default: 00h) zz: undefined

Color saturation is reduced toward 80h and raised toward 7Fh.

(8) GAMMA

Gamma correction is adjusted.

-ON/OFF-

Setting value **20020xFD** h x: 0- ON, 2- OFF

- Manual adjustment -

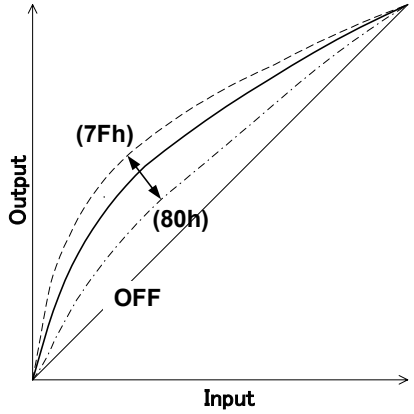
TOTAL : Adjust total (R, G, and B) gamma curve.
Setting value **3027xxzz** h

R OFFSET : Adjust only R gamma curve.
Setting value **3003xxzz** h

B OFFSET : Adjust only B gamma curve.
Setting value **3005xxzz** h

xx: 80h to 7Fh signed (default: 00h) zz: undefined

Dark component gradation is reduced toward 80h and increased toward 7Fh.



(9) TRIGGER

Set external trigger operation available.

-ON/OFF-

Setting value **20050xF8** h x: 0- OFF, 7- ON

-Trigger mode-

MODE 0 : Exposure timing is linked with flash pulse output.
Setting value **203600FC** h

MODE 1 : Exposure timing is linked with trigger pulse rising/falling edge.
Setting value **203601FC** h

-Trigger polarity-

Select positive or negative trigger pulse polarity.

NEGATIVE : Setting value **203600DF** h

POSITIVE : Setting value **203620DF** h

-Flash pulse width-

Select width of flash pulse output.

NARROW : Setting value **204801FC** h

MIDDLE : Setting value **204802FC** h

WIDE : Setting value **204803FC** h

-Flash pulse delay-

Set the delay time of flash pulse output.

Setting value **30CExxxz** h xxx: 800h to 610h signed z: undefined

The delay decreases toward 0 ms (800h) and increases toward 2 ms (610h) by 556 ns.

For the details about trigger operation, see the timing chart (page 41-44).

(10) AUTO SHADING

Chromatic shading due to lens aberration or light unevenness can be automatically compensated.

NOTE:

1. When using a camera for the first time or replacing the lens, execute shading correction.

2. When using under the special type light source, for example fluorescent, mercury, etc., a flicker can

prevent white balance adjustment or shading correction. In such cases, adjust the shutter speed to minimize the flicker before white balance adjustment or shading correction.

-OFF-

Set white shading compensation to OFF.

Setting value **200220DF** h

-Shading mode-

LUMINANCE : Auto shading compensation operates to maintain uniform vertical level for the RGB video signals. Use with microscopes and other uniformly illuminated equipment.

Setting value **280100F3** h

COLOR : Auto shading correction operates to minimize vertical color irregularity in the image. Use for non-uniformly lit general-purpose image material.

Setting value **280104F3** h

FLAT : Auto shading compensation operates to maintain uniform RGB video signal level for the full screen. Use with microscopes and other equipment when peripheral shading is of concern.

Setting value **280108F3** h

In the case that shading is extreme or light variation random, compensation error can occur. Adjust uniformity of the light source.

-AUTO ADJUST (One Push) -

Execute the adjustment of the shading set above.

Setting value **4030** h

The implementation procedure

1. Prepare auto iris lens or manual iris lens already set to proper aperture.

2. Pickup a white object in the full screen. Be sure that the object is evenly lighted from top to bottom.
3. Execute white balance adjustment.
4. Execute the shading adjustment.
   The video image is flashing during shading adjustment.

(11) INITIALIZE

Return the setting parameters of camera to values at time of release from factory.

-Initialization-

Setting value **9000FF** h

(12) FILE SAVE

Save the setting data to an EEPROM. 4 sets of memory are available.

Setting value **61010x** h x: 1- ch1, 2- ch2, 3- ch3, 4- ch4

(13) FILE LOAD

Loading saved data

Setting value **6001xx** h x: 01h- ch1, 02h- ch2, 03h- ch3, 04h- ch4, FFh- Factory setting

2. MASKING function

Saturation and hue of 6 primary colors: R-G-B-Ye-Cy-Mg can be independently varied (6 vector independent masking). Color reproduction and fidelity are effectively enhanced.

-ON/OFF-

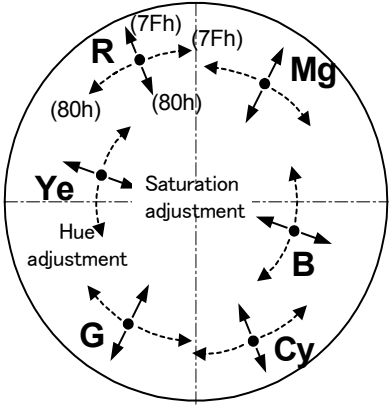
Setting value **2002x0BF** h x: 0- OFF, 4- ON

-Manual adjustment (Saturation)-

R saturation : Setting value **3046xxzz** h
G saturation : Setting value **3047xxzz** h
B saturation : Setting value **3048xxzz** h
Ye saturation : Setting value **3049xxzz** h
Cy saturation : Setting value **304Axxzz** h
Mg saturation : Setting value **304Bxxzz** h

xx: 80h to 7Fh signed (default: 00h) zz: undefined

Saturation decreases toward 80h (-100%) and increase toward 7Fh (+100%).



-Manual adjustment (Hue)-

R hue : Setting value **3040xxzz** h
G hue : Setting value **3041xxzz** h
B hue : Setting value **3042xxzz** h
Ye hue : Setting value **3043xxzz** h
Cy hue : Setting value **3044xxzz** h
Mg hue : Setting value **3045xxzz** h

xx: 80h to 7Fh signed (default: 00h) zz: undefined

Hue turns counter-clockwise toward 80h (+30°) and turns clockwise toward 7Fh (-30°).

3. BLACK BALANCE & WHITE GATE function

(1) BLACK BALANCE

Adjust black balance to provide proper color tone at a dark part of video image.

-Manual adjustment-

The pedestal level of R ch and B ch is adjusted independently.

R BLACK : Setting value **3021xxzz** h

B BLACK : Setting value **3023xxzz** h

xx: 80h to 7Fh signed

The pedestal level decreases toward 80h and increases toward 7Fh.

-AUTO ADJUST (One Push) (ABB)-

Adjusts standard level for R/B BLACK and independent of R/B BLACK.

Setting value **4020** h

Be sure that a lens iris is completely closed in advance.

(2) WHITE GATE

Square window for detecting white balance appears in the screen. White balance is computed only in the window.

-INDICATE-

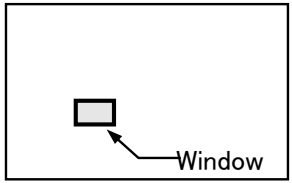
The white gate window is selectable visible(ON) or invisible(OFF).

Setting value **20170xF3** h x: 0- OFF, 4- ON

-ON/OFF-

Setting value **28100xFE** h x: 0- OFF, 1- ON

The video signal of the overall screen is detected for white balance control. The window is not shown on the screen.



-Manual adjustment-

The window position is moved horizontal and vertical.

H POSITION : Setting value **30A2xxzz** h
xx: AFh to 51h signed [HV-F22] / C4h to 3Ch signed [HV-F31], zz: undefined

V POSITION : Setting value **30A3xxzz** h
xx: C4h to 3Ch signed [HV-F22] / D4h to 2Ch signed [HV-F31], zz: undefined

4. AUTO EXPOSURE* function

*Auto exposure (A.E) is also called Auto Level Control (ALC).

(1) ALC PEAK/AVERAGE

Sets PEAK or AVERAGE signal level detection for the **AUTO EXPOSURE** function.

-Manual adjustment-

Setting value **2007x0CF** h x: 0- 50/50, 1- 25/75, 2- 15/85, 3- 0/100

Set auto level control for Peak or Average in 4 steps of 50/50, 15/85, 25/75, or 0/100. At high Average setting, background may be difficult to see in picture bright components. Increasing the Peak setting may render spotlighted components easier to see.

(2) ALC SPEED

AGC and AES response speed

-Manual adjustment

Setting value **28110xFC** h x: 0- SLOW, 1- STANDARD, 2- FAST

- SLOW : Scene brightness variation rate is sufficiently slow to allow stable observing of detail. Allows a stable image when a strong light source enters the scene.
- STANDARD : Standard setting.
- FAST : Scene brightness variation rate is too rapid to stable use of effects such as microscope

variable magnification.

(3) ALC GATE

AUTO EXPOSURE signal detect area (8 x 8) can be set as desired.

-OFF-

Setting value **2800007F** h

The screen overall video signal is detected for **AUTO EXPOSURE** control.

-ON-

Setting value **2800807F** h

GATE for detecting the **AUTO EXPOSURE** video signal is set in lines 1-2 to 7-8. The area is not shown on the screen.

-Manual setting-

Detect area of ALC GATE can be arranged in 8 x 8 matrix areas.

Setting value **282xyy00** h

x: line selection

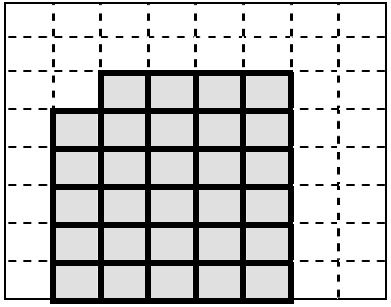
0(line1) to 7(line8)

yy: column selection

Set “1” in detect area and “0” in non-detect area to generate 8 binary digits (left side: MSB, right side: LSB). Convert the 8 binary digits to 2 hexadecimal digits.

ALC GATE arrangement examples

Detect area image



Setting values: corresponding to detect areas
Detect area (ON): 1 Non-detect area (OFF): 0

		Column yy (binary)							
		7	6	5	4	3	2	1	0
Line x	1	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
	2	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
	3	*0*	*0*	***1***	***1***	***1***	***1***	*0*	*0*
	4	*0*	***1***	***1***	***1***	***1***	***1***	*0*	*0*
	5	*0*	***1***	***1***	***1***	***1***	***1***	*0*	*0*
	6	*0*	***1***	***1***	***1***	***1***	***1***	*0*	*0*
	7	*0*	***1***	***1***	***1***	***1***	***1***	*0*	*0*
	8	*0*	***1***	***1***	***1***	***1***	***1***	*0*	*0*

ALC GATE line1 setting: **28 20 00 00** h
ALC GATE line2 setting: **28 21 00 00** h
ALC GATE line3 setting: **28 22 3C 00** h
ALC GATE line4 setting: **28 23 7C 00** h
ALC GATE line5 setting: **28 24 7C 00** h
ALC GATE line6 setting: **28 25 7C 00** h
ALC GATE line7 setting: **28 26 7C 00** h
ALC GATE line8 setting: **28 27 7C 00** h

5. SHARPNESS function

Specialized function about Sharpness can be adjusted.

(1) (SHARPNESS) FREQ.

Sharpness edge width can be adjusted.

-Manual adjustment-

Setting value **20290xFC** h x: 0- LOW, 1- MID, 2- HIGH

- LOW :thick edge
- MID :normal edge
- HIGH :thin edge

(2) (SHARPNESS) LEVEL DEPENDENT

Sharpness is suppressed at video levels below the setting value.
Use mainly to avoid noise enhancement in dark signal components.

-Manual adjustment-

Setting value **3053xxzz** h xx: 80h to 7Fh signed zz: undefined

Setting toward 7Fh to reduce the sharpness level and expand the video signal level range.

(3) (SHARPNESS) CLISP

Excessive sharpness signal upper the setting value is removed. But set the value too low, some detailed image can be dim.

-Manual adjustment-

Setting value **3054xxzz** h xx: 80h to 7Fh signed zz: undefined

Set toward 80h to reduce sharpness and set toward 7Fh to increase sharpness.

(4) (SHARPNESS) H/V BALANCE

Setting for horizontal and vertical sharpness balance

-Manual adjustment-

Setting value **3055xxzz** h xx: 80h to 7Fh signed zz: undefined

Set toward 80h to enhance vertical and toward 7Fh to enhance horizontal.

(5) (SHARPNESS) COLOR DTL Ch1

Chromatic sharpness can be adjusted in the range of hue set.

The hue can be set in different ranges for channels 1 and 2. The color detail channel 1 width/level can be set in any combination. Select channel 1 or 2, then set the hue for fine adjusting.

-ON/OFF-

Setting value **2035x0EF** h x: 0- OFF, 1- ON

-Manual setting-

Select one from 6 primary color areas, and then adjust finely in the area.

Color select : Setting value **20200xF8** h
x: 0(R-Mg), 1(Mg-B), 2(B-Cy), 3(Cy-G), 4(G-Ye), 5(Ye-R)

Fine adjust : Setting value **3059xxzz** h
xx: 80h to 7Ch signed zz: undefined
Hue moves clockwise.

-One Push (AUTO SETUP)-

The hue in center of screen is automatically picked up.

Setting value **41D0** h

(6) (SHARPNESS) COLOR DTL Ch1 WIDTH/LEVEL

The effective phase range and sharpness level can be adjusted.

-Manual adjustment-

WIDTH : Setting value **305Axxzz** h xx: 80h to 7Fh signed zz: undefined
Set color phase range. Reduce range toward 80h; increase range toward FFh.
Select range with Phase and position at color phase center to set.

LEVEL : Setting value **3058xxzz** h xx: 80h to 7Eh signed zz: undefined
Set sharpness level in the range. Reduce sharpness toward 00h for a soft image; increase sharpness toward FFh for a stark image.

(7) (SHARPNESS) COLOR DTL Ch2

Same function as COLOR DTL Ch1. (Ch 1 and 2 can be used as independent functions.)

-ON/OFF-

Setting value **2035x0DF** h x: 0- OFF, 2- ON

-Manual setting-

Color select : Setting value **20210xF8** h
x: 0(R-Mg), 1(Mg-B), 2(B-Cy), 3(Cy-G), 4(G-Ye), 5(Ye-R)

Fine adjust : Setting value **306Bxxzz** h
xx: 80h to 7Ch signed zz: undefined
Hue moves clockwise.

-One Push (AUTO SETUP)-

Setting value **41D1** h

(8) (SHARPNESS) COLOR DTL Ch2 WIDTH/LEVEL

Same function as COLOR DTL Ch1. (Ch 1 and 2 can be used as independent functions.)

-Manual adjustment-

WIDTH : Setting value **306Cxxzz** h xx: 80h to 7Fh signed zz: undefined

LEVEL : Setting value **306Axxzz** h xx: 80h to 7Eh signed zz: undefined

6. Focus detection function

Integrated or peak value of sharpness signal is automatically calculated in every field. The value is available for auto focus system.

(1) FOCUS GATE

Set position and size of focus gate where the focus data is calculated.

-INDIGATE-

Focus gate window is selectable visible(ON) / invisible(OFF).

Setting value **20170xF3** h x: 0- OFF, C- ON

-GATE POSITION-

H POSITION : Setting value **30B1xxzz** h
xx: AFh to 51h signed [HV-F22] / C4h to 3Ch signed [HV-F31], zz: undefined

V POSITION : Setting value **30B2xxzz** h
xx: C4h to 3Ch signed [HV-F22] / D4h to 2Ch signed [HV-F31], zz: undefined

-GATE SIZE-

WIDTH : Setting value **30B3xxzz** h
xx: 00h to 14h [HV-F22] / 00h to 0Fh [HV-F31], zz: undefined

HEIGHT : Setting value **30B4xxzz** h
xx: 00h to 0Fh [HV-F22] / 00h to 0Bh [HV-F31], zz: undefined

(2) FOCUS DETECTION

Returns focus data.

-Value-

00000000 h(MIN) to FFFFFFFF h(MAX)

7. Other function

(1) DNR (Digital Noise Reduction)

Improve Signal to Noise ratio(S/N) by digital noise reduction.

-OFF-

Setting value **201500FC** h

-ON-

Setting value **20150xFC** h x: 1- MODE1, 2- MODE2

Although MODE 2 provides greater noise reduction, there is some sacrifice in resolution.

(2) COLOR BAR

Color Bars test pattern is available.

Setting value **20080xFE** h x: 1- ON, 0- OFF

(3) NEGA

Brightness and darkness of picture is reversed.

Setting value **2008x0EF** h x: 1- ON, 0- OFF

(4) EXT IN 75 ohm

Termination resistance of External HD/VD input is selectable.

-OFF(High Z)-

Setting value **2011807F** h

-ON (75 ohm)-

Setting value **2011007F** h

(5) H PHASE

Horizontal phase adjustment at external HD input.

Setting value **3034xxzz** h xx: 80h to 7Fh zz: undefined

See page 45 “External sync timing” about variable range.

(6) PIXEL CONCEALMENT

White spot defect on picture element can be compensated.

Setting value **20330xFE** h x: 1- ON, 0- OFF

For image processing use, the setting OFF might be better since the compensated data is not precise.

APPENDIX: AUTO SETUP STATE (read only)

Response data of **One Push Auto White Balance (AWB)**, **One push Auto BLACK Balance (ABB)**, **One push Auto Shading (ASC)** and **One Push (Color DTL Auto Setup)** are shown.

-Response data-

4000xx h xx: 00h- Normally finished,
others- Error has occurred. Refer to following table.

Error code	Countermeasure
11h	Turn off the color bar
12h	(WHITE BALANCE) change to Manual
13h	Increase the intensity of illumination, turn lens iris to ward open direction, or increase the gain to provide a proper video level.
14h	Decrease the intensity of illumination, turn lens iris toward closed direction, or decrease the gain to provide a proper video level.
15h	The color temperature is too high, making it impossible to reach the optimum value in adjustment. (If there is no problem in practical application, use the camera under the current condition.) Add a filter to the lens or illumination to decrease the color temperature.
16h	The color temperature is too low, making it impossible to reach the optimum value. (If there is no problem in practical application, use the camera under the current condition.) Add a filter to the lens or illumination to increase the color temperature.
18h	Carry out auto setup again. If this message appears in repeated attempts, it is necessary to inspect the inside of the camera. In this case, notify your local Hitachi Denshi sales agent or Hitachi Denshi service office

Error code	Countermeasure
1Fh	The color saturation is too low, making it impossible to reach the optimum value
24h	Release the long shutter mode.
25h	Release the external trigger mode.

Specification

Item	Model			
	HV-F31CL	HV-F31CL-S1	HV-F22CL	HV-F22CL-S1
Optical system	1/3-inch, F2.2 prism		1/2-inch, F1.6 prism	
Imaging system	R, G, B 3CCD			
Picture elements	1/3-inch interline transfer CCD (with micro-lenses)		1/2-inch interline transfer CCD (with micro-lenses)	
Total pixels	1077 (H) × 788 (V)		1392 (H) × 1050 (V)	
Effective pixels	1024 (H) × 768 (V)		1360 (H) × 1024 (V)	
Pixel size	4.65 (H) × 4.65 (V) µm		4.65 (H) × 4.65 (V) µm	
Effective image area	4.77 (H) × 3.58 (V) mm		6.33 (H) × 4.77 (V) mm	
Scanning system	Progressive scan			
Sync system	Internal or External(HD/VD) automatic switching			
Standard sensitivity	F5.6 at 2000 lx (1/30 sec shutter)		F8 at 2000 lx (1/30 sec shutter)	
Geometric distortion	Full screen 0% (not including lens characteristics)			
Registration	Full screen 0.05% (not including lens characteristics)			
Vertical contour compensation	2H			
Lens mount	C mount (flange back 17.526 mm in air)			
Sensitivity control	Auto or Manual : 0 to 12 dB			
Sharpness control	Sharpness level, width, and others			
Item	Model			

	HV-F31CL	HV-F31CL-S1	HV-F22CL	HV-F22CL-S1
Electric shutter control	Manual : 4 to 1/100,000 sec Auto : OFF to approx. 1/100,000 sec			
Color bar	Full bar			
Camera Link interface				
Configuration	Medium (RGB 3x10 bit)	Base (RGB 3x8 bit)	Medium (RGB 3x10 bit)	Base (RGB 3x8 bit)
Pixel clock frequency	28.8 MHz			
Maximum frame rate	Approx. 30 fps		Approx. 15 fps	
Power supply voltage	12 V rated (Stable operation at 10.5 to 15 Vdc, and neither ripple nor noise)			
Power consumption	Approx. 6 W		Approx. 6.5 W	
Dimensions	65 (W) x 65 (H) x 130 (D) mm			
Mass	Approx. 600 g (without lens)			
Ambient temperature	Operating : 0 to +40 ℃ Storage : -20 to +60 □			

Input/Output Signals

1. Camera Link interface

1) Conformation standard

HV-F31CL, HV-F22CL	: Medium configuration
HV-F31CL-S1, HV-F22CL-S1	: Base configuration

2) Video data output

HV-F31CL, HV-F22CL	: RGB: 3 x 10 bit
HV-F31CL-S1, HV-F22CL-S1	: RGB: 3 x 8 bit

3) Sync signal output

Pixel clock	: 28.8 MHz
Horizontal sync (LVAL)	
HV-F31CL, HV-F31CL-S1	: 23.72 kHz
HV-F22CL, HV-F22CL-S1	: 29.95 Hz
Vertical sync (FVAL)	
HV-F31CL, HV-F31CL-S1	: 16.09 kHz
HV-F22CL, HV-F22CL-S1	: 15.06 Hz

4) Serial communication

(1) Communication system	: Full duplex
(2) Baud rate	: 19200 bps
(3) Sync system	: Start-stop system

(4) Transmission system : Bit serial
(5) Used code : 8-bit binary
(6) Bit composition
Start bit : 1-bit
Data bit : 8-bit
Parity bit : None
Stop bit : 1-bit
(7) Error detection : 1. SUM check (16-bit)
: 2. Time check (Time between, the respond command and ACK, NAK receiving should be less than 0.5 second.)
(8) Error correction : Request repeat system

5) Signal level
LVDS 290mVp-p with 100Ω termination

2. DC IN/SYNC input and output (DC IN/SYNC connector)

1) External HD/VD signal input (see Note)

HD/VD: 2 to 5 Vp-p, Negative

2) External trigger signal input (Photo-coupler)

low 0 Vdc, high 3 to 24 Vdc

3) Flash signal output

low 0 Vdc, high 5 Vdc

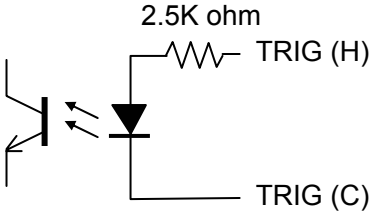


Photo-coupler input part

4) Serial communication (RS-232C) (see Note)

RXD to camera	low: -3 to -15V, high: 3 to15V
TXD to PC	low: -5 to -9V, high: 5 to 9V

4) Power supply input

12 V rated

(Stable operation at 10.5 to 15 VDC (neither ripple nor noise))

NOTE

Both external HD/VD input and serial communication are not available at the same time. See page 9.

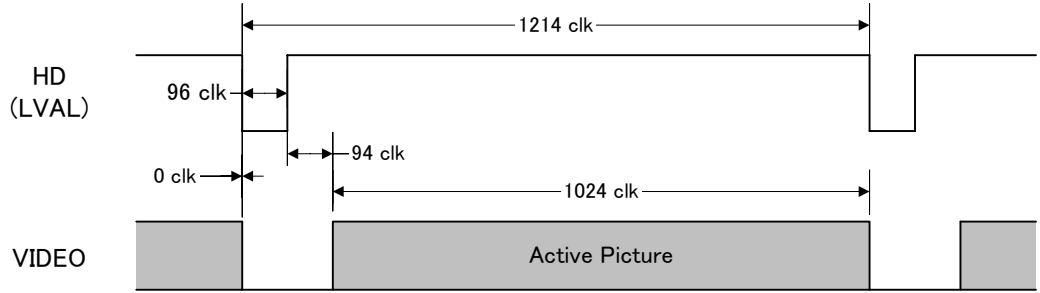
3. External trigger input (TRIG IN connector)

low 0 Vdc, high 2 to 5 Vdc

Camera Link output timing chart

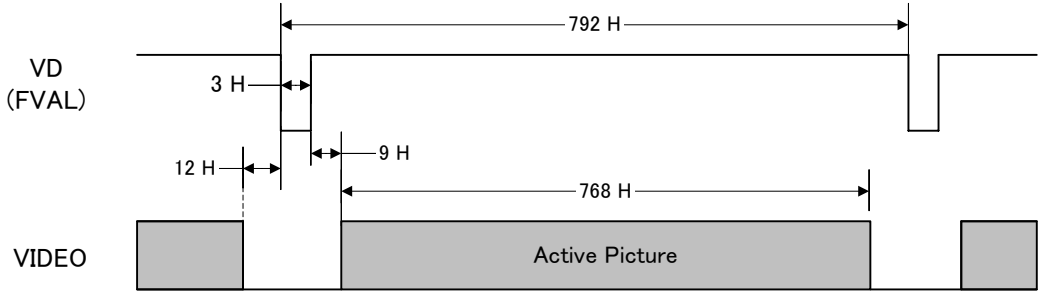
HV-F31CL / HV-F31CL-S1

Horizontal timing



1 clk = 34.7 ns

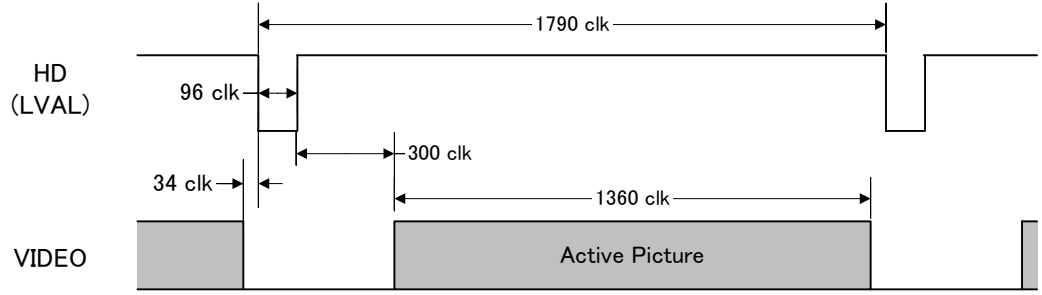
Vertical timing



1 H = 1214 clk = 42.1 us

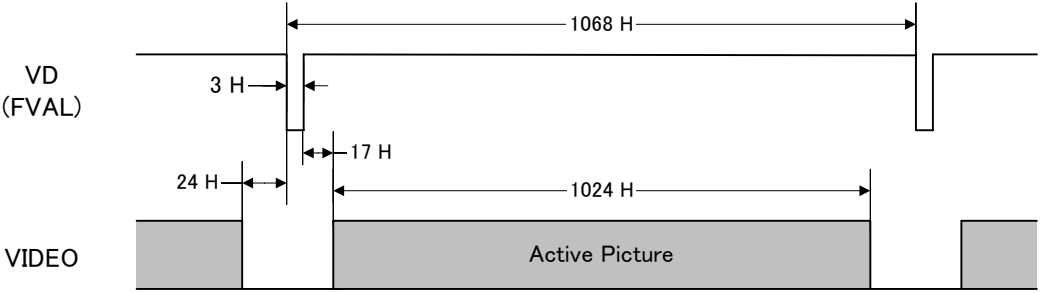
HV-F22CL / HV-F22CL-S1

Horizontal timing



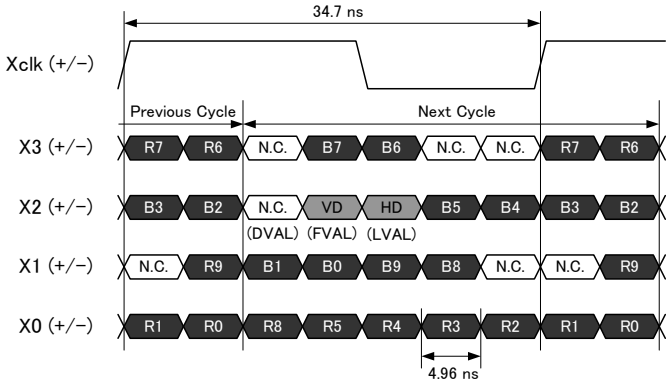
1 clk = 34.7 ns

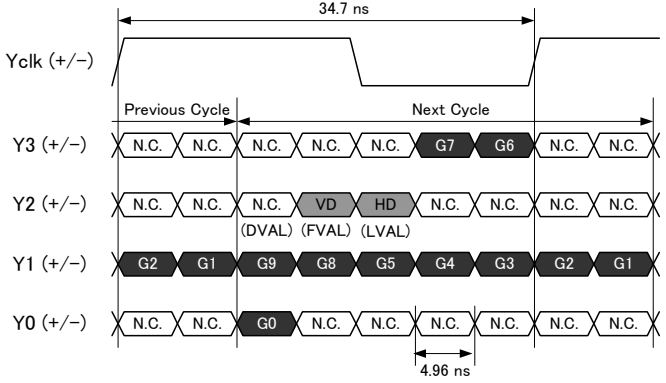
Vertical timing



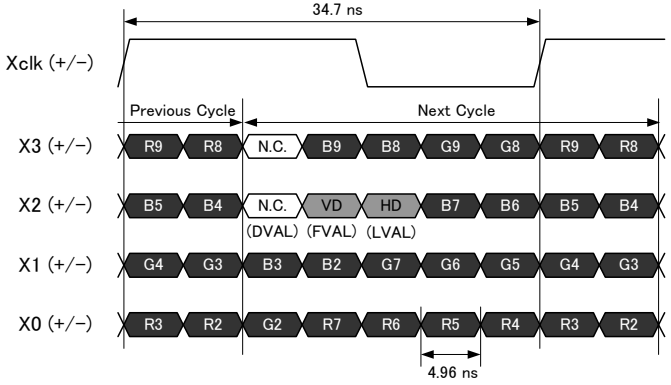
1 H = 1790 clk = 62.2 us

LVDS timing





HV-F31CL / HV-F22CL



HV-F31CL-S1/ HV-F22CL-S1

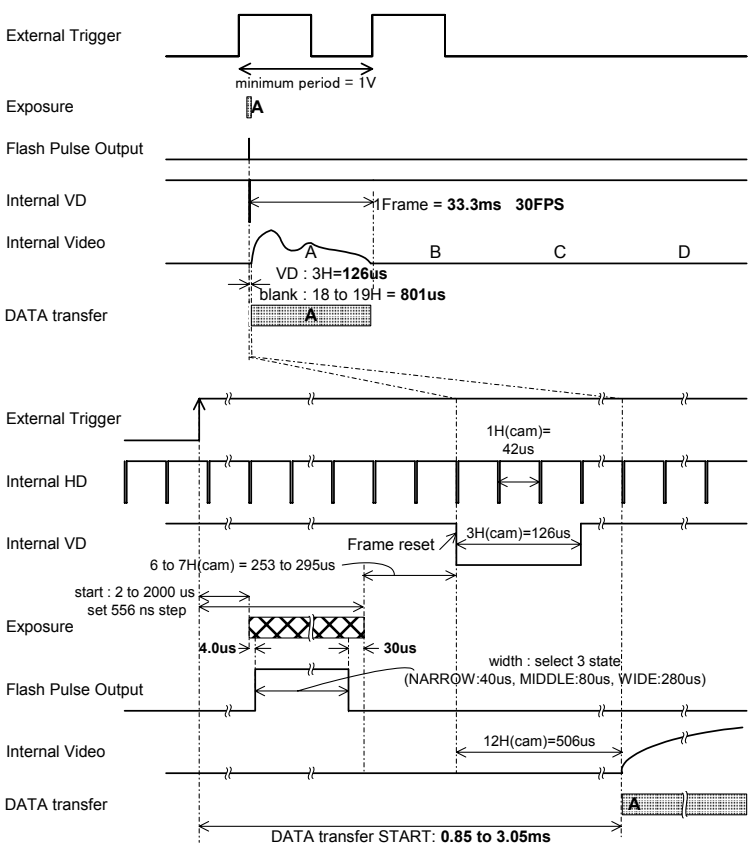
Trigger operation and timing chart

External trigger refer to a function for picking up rapidly moving objects by applying a trigger pulse input. It is possible to pick up an image with various timing.

1. HV-F31CL / HV-F31CL-S1

(1) External trigger operating mode: Mode 0

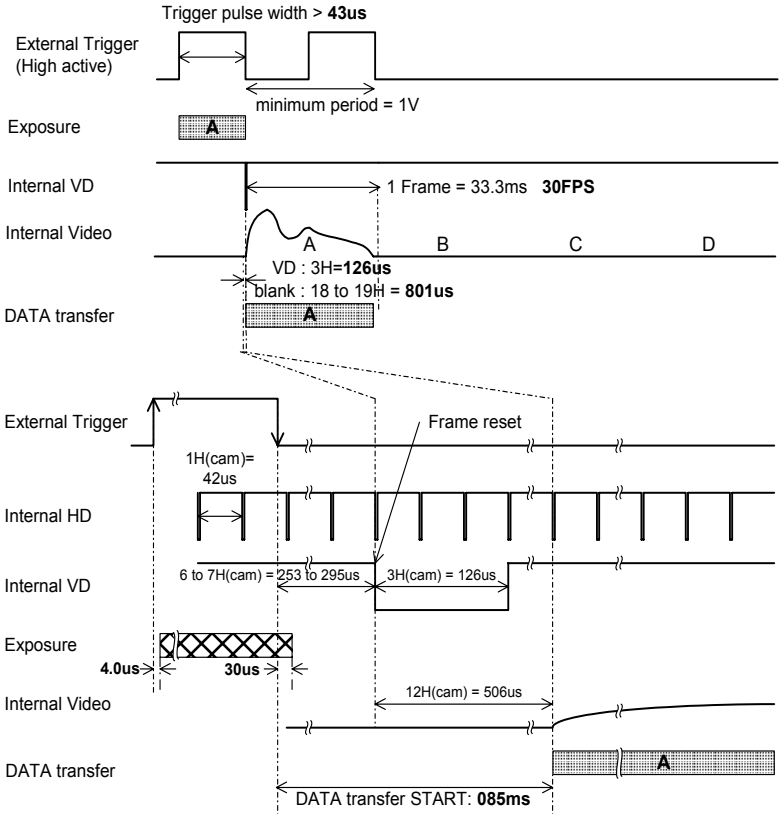
When external trigger signal is high active, light pulse begins at the rising edge of the trigger signal and ends at the falling edge. At the trigger signal falling edge, the internal VD signal is reset and the video data are transmitted.



(2) External trigger operating mode: Mode 1

When external trigger signal is high active, after the trigger signal rise, the flash signal start/end can be set to determine the flash time.

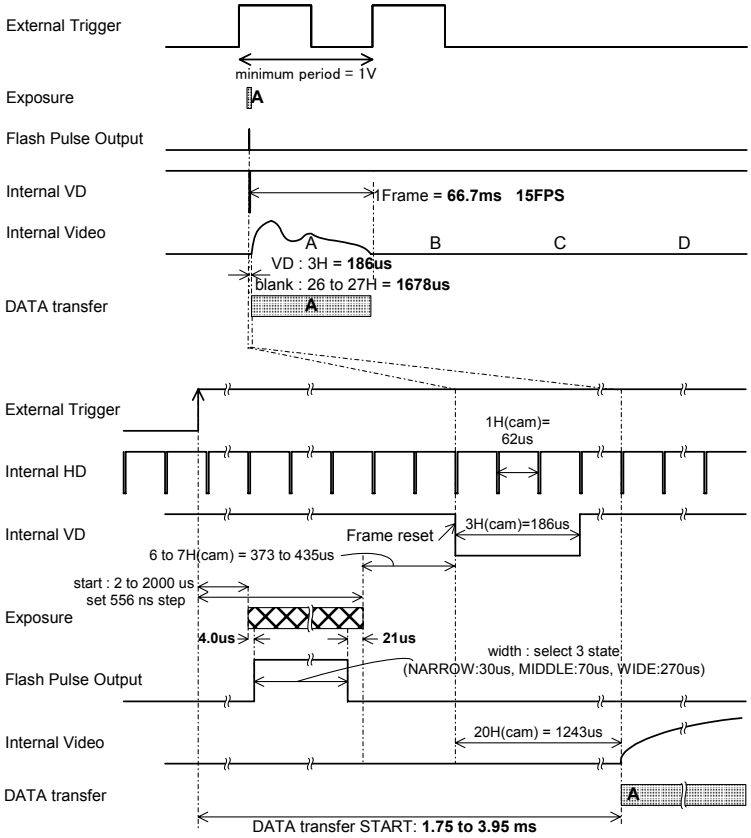
At the flash signal falling edge, the internal VD signal is reset and the video data are transmitted.



2. HV-F22CL / HV-F22CL-S1

(1) External trigger operating mode: Mode 0

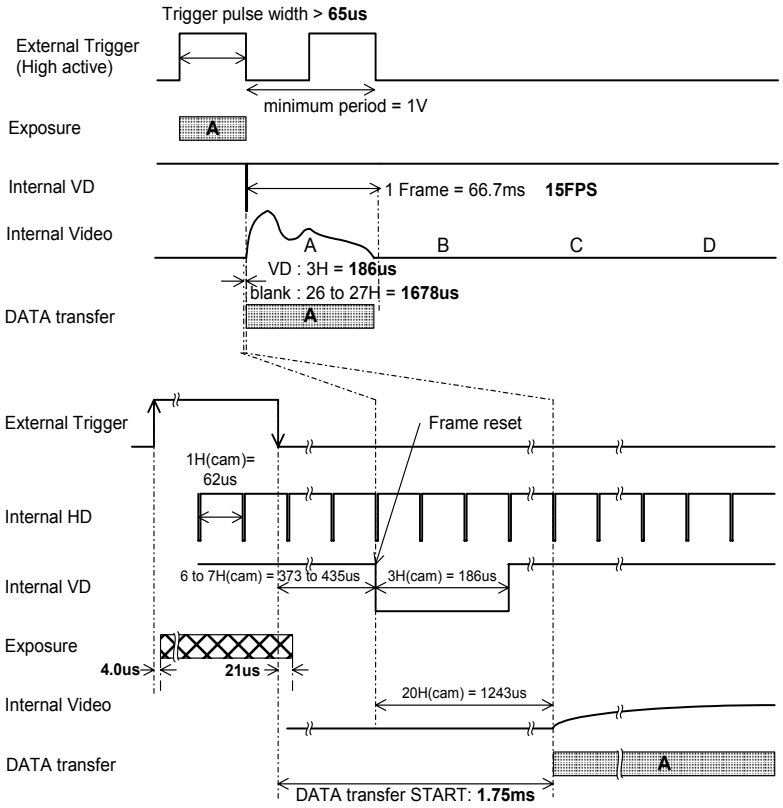
When external trigger signal is high active, light pulse begins at the rising edge of the trigger signal and ends at the falling edge. At the trigger signal falling edge, the internal VD signal is reset and the video data are transmitted.



(2) External trigger operating mode: Mode 1

When external trigger signal is high active, after the trigger signal rise, the flash signal start/end can be set to determine the flash time.

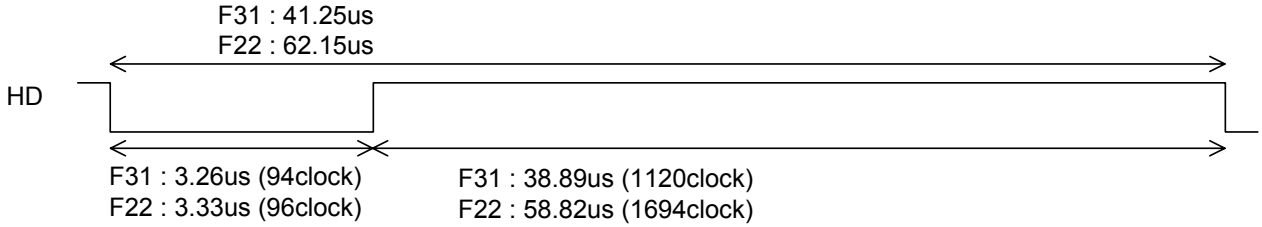
At the flash signal falling edge, the internal VD signal is reset and the video data are transmitted.

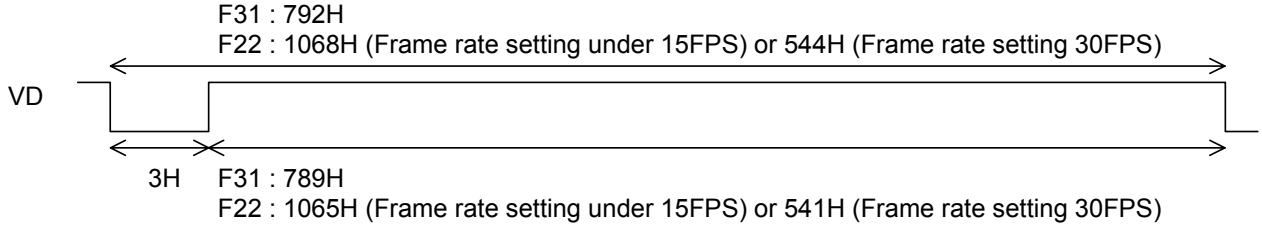


External sync timing

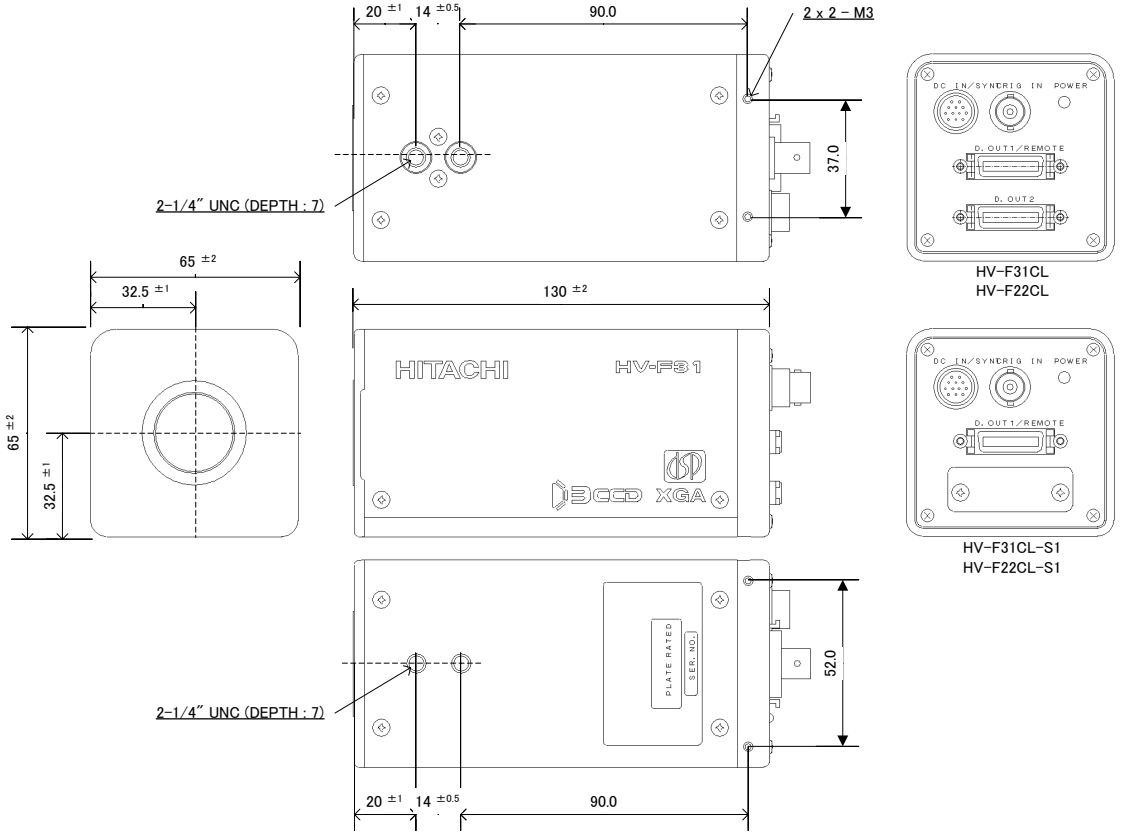
Please input the sync pulse of following specification, in the case that camera synchronization locks the external synchronization.

Clock : 28.8 MHz (±0.005%)





Dimensions



Unit: mm