HV-F22CL
Color Camera
Specifications
1. Introduction

The Hitachi HV-F22CL is a SXGA high precision 3CCD progressive scan color camera, which has single chip digital processing LSI, a C mount prism, three 1/2-inch 1,450,000 pixels square CCDs, and 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 that is the standard of the digital camera for FA makes it possible to transmit large capacity digital data effectively with less wire number than a conventional RS-644 method.

2. Features

1) High resolution
The 1/2 inch 1,450,000 pixels progressive scan CCD and the accurate CCD matching technology achieves a high-resolution image of 1360 H x 1024 V (SXGA).

2) Camera Link interface
Based on the medium configuration of Camera Link, which includes the digital video signal of 30 bits RGB, an external trigger input, and camera control signal (RS-232C).

Note: A frame grabber board and two cables for Camera Link are optional.

3) 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.
4) C mount lens adapter
   The de facto industry standard C mount lens adapter allows choosing from a various
type of lenses and optical systems.

5) Digital processing for various picture quality enhancements
   • 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.
   • Variable sharpness (detail) width function optimizes the width of image contours. The
     bold contours show the picture clear, while the thin contours show it natural.

6) Auto shading correction (ASC)
   Color shading due to the aberration of C mount lens is automatically compensated
   (reduced).

7) Versatile CCD drive functions
   • Video frame capture on demand using external trigger signal.
     See detailed specifications item 6.
   • Long integration mode.
   • Auto electronic shutter (AES) mode for stabilized video level.
8) Versatile imaging functions
   - Four application files.
     User settings provided for sharpness(d detail), masking etc.
   - Scene color temperature is detected in dynamic for automatic white balance adjustment.
     By varying the detection area in a scene, the whole white balance can be controlled in only the area. Thus, even if a light source of a different color temperature enters the scene (e.g., situation often occurs in a retail showroom suddenly exposed to outdoor lighting when the entrance door opens), white balance is not severely disturbed.
   - Auto exposure (ALC : auto level control)
     Light strength is measured in divided 64 areas, combined with continued control of AGC and AES, to provide extremely wide response to light variations. The fine level and peak or average of ALC response can be set from menu.
   - Focus data output (serial data)
   - Two mode gain control
     AGC or user-programmable gain in 1 dB steps
   - Contrast function
   - Flare compensation
   - Master black, R/B black, and R/B gain are variable.
   - Color bar
   - Selectable negative/positive image

9) LED indicator
   Camera rear panel has a LED indicator for power on/off.

3. Standard composition

3.1 HV-F22CL camera ............................................. 1

3.2 Accessories
   1) Lens mount sheet ............................................. 1
   2) DC IN/SYNC connector plug (HR10A-10P-12S) ........... 1
   3) Operation manual ............................................. 1
4. Specifications

1) Optical system  1/2-inch F1.6 prism
2) Imaging system  RGB 3 CCD
3) Imaging device  1/2-inch interline CCD
   Total pixels  1392 (H) x 1050 (V)
   Effective pixels  1360 (H) x 1024 (V)
   Effective image area  6.32 (H) x 4.76(V) mm
4) Scanning system  Progressive scan
5) Sync system  Internal/external (automatically switched by HD/VD)
6) Standard sensitivity  2000 lx, F5.6
   (at 1/30s shutter speed)
7) Gamma correction  0.45/1.0 (on/off)
8) Picture distortion  Full screen 0% (not including lens response)
9) Registration  Full screen 0.05% (not including lens response)
10) Vertical contour correction  2H
11) Lens mount  C mount (flangeback: 17.526 mm in air)
12) Sensitivity selection  AGC (0 to +12 dB) or 1 dB steps
13) Sharpness(detail) control functions  Level, width
14) CCD drive functions
   Variable shutter mode  : 1/15 to approx. 1/100,000 second
   AES mode  : Off to approx. 1/100,000 second
   Long time integration mode  : 1/15 to approx. 4 seconds in 1 frame steps
15) Color bar  Full
16) Power supply voltage  12 VDC nominal
   (Stable operation from 10.5 to 15 VDC, without ripple and noise.)
17) Power consumption  Approx. 6.5W
18) Dimensions  65 (W) x 65 (H) x 130 (D) mm
19) Mass  Approx. 600 g (not including lens)
20) Recommended ambient temperature, operating
   0 to +40 °C
21) Recommended ambient temperature, storage
   -20 to +60 °C
5. Input and output signals

5.1 Camera Link interface

1) Conformance standard
   Medium configuration of Camera Link
2) Video signal output
   RGB 30bit
3) Video sync signal output
   - Horizontal frequency (LVAL) : 16.09 kHz
   - Vertical frequency (FVAL) : 15.06 Hz
   - Pixel clock : 28.8 MHz
4) Camera control signal input/output
   RS-232C protocol [LVDS level]
5) External sync input
   HD/VD [LVDS level]
6) External trigger input
   Trig in [LVDS level]

5.2 DC IN and Sync I/O signals

1) External sync input
   - HD/VD 2 to 5 Vp-p, negative polarity

2) External trigger input (Photo-coupler input)
   - Trig in   low 0 VDC, high 3 to 24 VDC

3) Strobe sync signal output
   - Flash out  low 0 VDC, high 5 VDC

4) Power supply input
   - 10.5 to 15 VDC , 6.5W

5.3 Trig in input signal

Only external trigger signal can be supplied even with BNC cable
(Switched DC in/ Sync by connector Trig in and command)
   - Trig in   low 0 VDC, high 2 to 5 VDC
6. Camera Link output timing chart

6.1 Horizontal sync and video timing

6.2 Vertical sync and video timing

1 clk = 34.7 ns

1 H = 62.2 us = 1790 clk
6.3 Transmitter LVDS output pulse position
7. External Trigger timing chart

7.1. External trigger mode

The exposure time is controlled by the width of external trigger, and 1 frame image is output when the reset timing of VD signal.

The minimum exposure time is $1/10,000$ seconds even with minimum trigger width.

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External Trigger

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Exposure: Trigger pulse width > 64us

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Internal VD

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1Frame = 66.6ms

15FPS

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Internal Video

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DATA transfer (RGB 30bit)

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External Trigger

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Internal HD

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1H(cam) = 63us

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Internal VD

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9H(cam) = 563us

Frame reset

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Exposure

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95 to 157us

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Internal Video

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Blank: 20H(cam) = 1,250us

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DATA transfer (RGB 30bit)
7.2. Flash pulse output

When the external trigger signal is input, a flash signal is output after the end of trigger signal. When the VD signal of the camera is reset after the end of flash signal, 1 frame image is output. The output timing of a flash signal against the trigger signal can be set on the camera.

External Trigger

Exposure

Flash Pulse Output

Internal VD

| A |

Internal Video

V Blank: 20H=1250us

Internal HD

Frame reset

Exposure

0 to 1H(cam) = 0 to 63us

0 to 30H(cam)=0 to 1875us

set 1H(63us) step

Flash Pulse Output

6H(cam) = 375us

Internal Video

Blank: 20H(cam)=1250us

DATA transfer

---

**Legend**

- A

---

**Specifications**

- HV-F22CL
  - Color Camera
  - Specification(10/14)
  - Hitachi Kokusai Electric Inc.
  - Tokyo Japan
8. Main connector pin arrangements

1) Camera Link connector
   Use connector: 10226-2200VE (3M) x2
   Recommended cable: 14B26 series (3M)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Function</th>
<th>Pin</th>
<th>Signal Name</th>
<th>Function</th>
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<td>Ground</td>
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<td>Ground</td>
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<td>Yclk-</td>
<td>Video clock output</td>
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<td>X3-</td>
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<td>NC[CC4]-</td>
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<td>25</td>
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<td>GND</td>
<td>Ground</td>
<td>26</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>
2) DC IN / SYNC connector

Use connector:  HR10A-10R-12PB(01) (HIROSE) or equivalent
Matching plug:  HR10A-10P-12S(01) (HIROSE) or equivalent

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Function</th>
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<td>Ground</td>
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<td>+12V IN</td>
<td>Power supply</td>
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<tr>
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<td>GND</td>
<td>Ground</td>
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<tr>
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<td>FLASH OUT</td>
<td>Strobe sync signal output</td>
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<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>HD IN</td>
<td>External HD sync input</td>
</tr>
<tr>
<td>7</td>
<td>VD IN</td>
<td>External VD sync input</td>
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<tr>
<td>8</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>9</td>
<td>TRIG (H)</td>
<td>Photo coupler input (Hot)</td>
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<tr>
<td>10</td>
<td>TRIG (C)</td>
<td>Photo coupler input (Cold)</td>
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<tr>
<td>11</td>
<td>+12V IN</td>
<td>Power supply</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>
9. Main accessories

1) Power supply adapter
2) DC IN / SYNC cable
3) Camera Link cable
4) SDK (Software Development Kit)

10. Cautions in using lens

1) Lens protrusion from flange face (T)

Observe the limit of lens protrusion from the flange face (T in figure).
Notice the lens and camera can be damaged if this mounting dimension is not maintained.

Lens flange face

T: Less than 4.0 mm

2) Choosing a lens

The proper lens is important for obtaining the best camera performance.
When choosing a lens, check with the lens maker and note the following points.

- Size should be for 1/2-inch. If too large (such as 2/3 inch) ghosting can appear in the scene.
- Vertical color shading can occur with a lens of short exit pupil.
- When used with the iris nearly fully open, shading and flare can detract from image quality.
11. External View