

With 2048 pixels and scanning clock of 20MHz

Digital Line Sensor

TL-2048FD

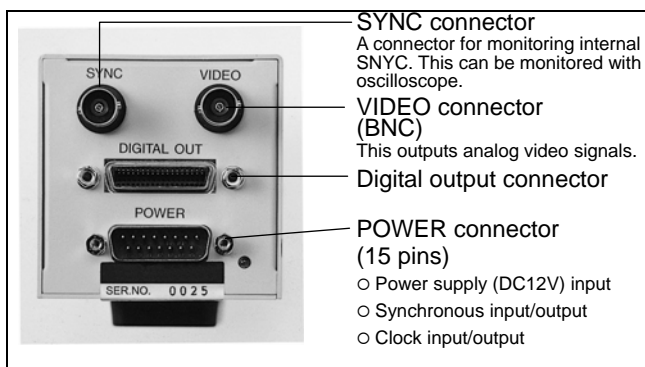


(Lens optional.)

Outline

- This camera is a high-resolution and digital-output type of line sensor that has a linear image sensor.
- Its video signal output is in 2 systems; 10-bit digital signal, and analog signal.
- It's a CCD line sensor camera with 2048 pixels and scanning clock of 20MHz.
- External input also is available as for driving clock and line transfer pulse. (RS-644).

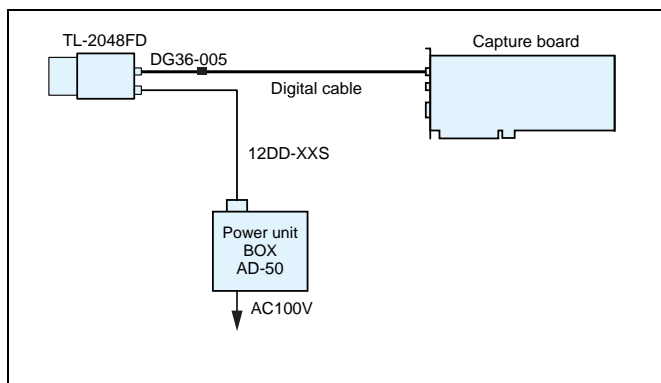
I/O connectors



- SYNC connector
A connector for monitoring internal SYNC. This can be monitored with oscilloscope.
- VIDEO connector (BNC)
This outputs analog video signals.
- Digital output connector
- POWER connector (15 pins)
 - Power supply (DC12V) input
 - Synchronous input/output
 - Clock input/output

Example of uses

By connecting TL-2048FD with capture board in PC, it is possible to use it for both development and field line operation of image processing equipment.



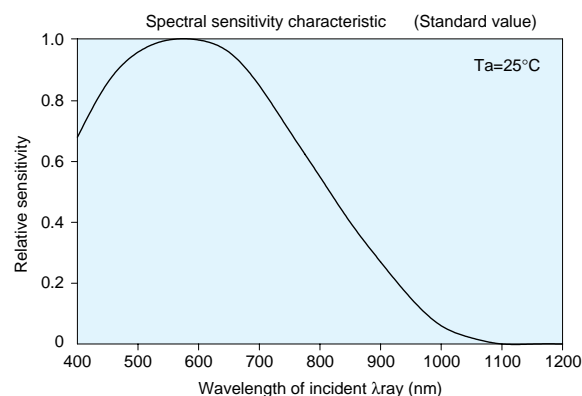
Features

- Clear and vivid image can be obtained, as there is less variation depending on odd/even number.
- It matches well to most of capture boards from other manufacturers, which makes it possible to construct high definition image processing systems.
- It is operated with a single power source of DC12V.
- Output waveform can be monitored with analog signal output.

Uses

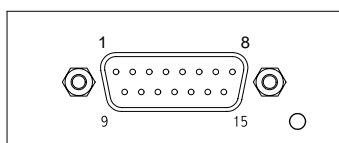
- Image processing equipment
- Appearance inspection equipment
- Pattern inspection equipment
- Dimension measuring instrument
- Sheet materials inspection equipment
- Width measuring equipment
- Tube-bore measuring equipment
- Length measuring equipment
- Position control equipment
- Various types of selectors

Sensitivity wavelength



● Power connector

The association between pin number of 15-pin D-sub connector and Input/Output is as per the table below:



(A view from connecting surface)

Pin No.	Signal name	Pin No.	Signal name
1	SHIELD	9	NC
2	+12V	10	GND
3	GND	11	NC
4	NC	12	SYNC- IN
5	SYNC+ IN	13	CLOCK- IN
6	CLOCK+ IN	14	SYNC- OUT
7	SYNC+ OUT	15	CLOCK- OUT
8	CLOCK+ OUT		

Outline of operation

Photo diodes, the light-receiving element, output from No.1 to n in consecutive order. Therefore, when there is an object like shown in the figure below, output voltage responding to the light/shade of the object can be obtained, as shown in the waveform figure, regarding output waveform of analog video signals.

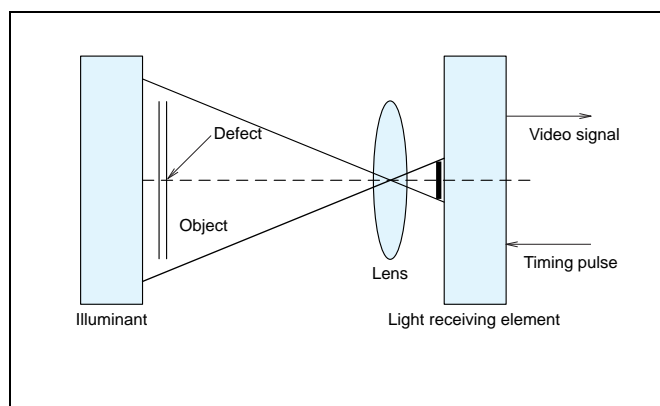
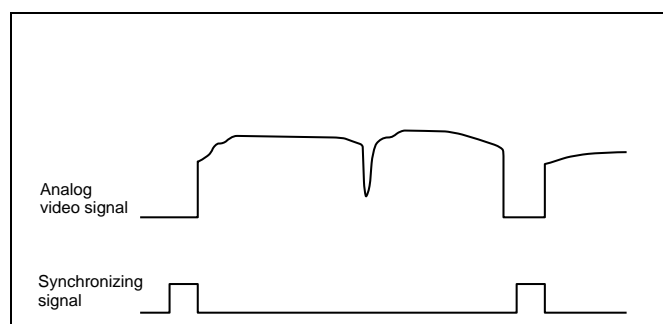


Image pickup principle diagram



Video signal output

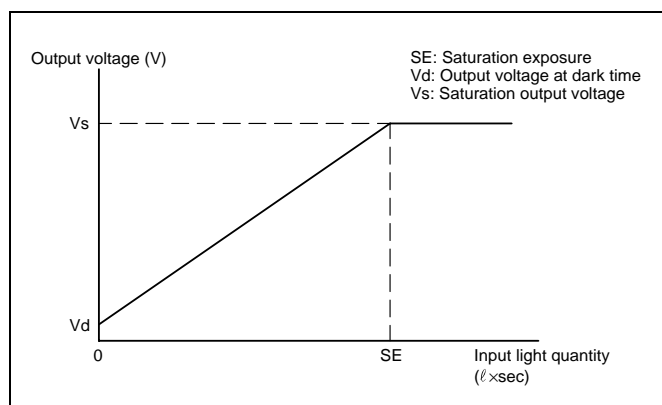
Photoelectric transfer characteristics

Image of the object is formed on the photo diode array, the light-receiving element, through a lens. The line sensor consists of multiple photo diodes, and each photo diode outputs electric signals in proportion to the light quantity received.

Photoelectric transfer characteristics is expressed by the equation of $y=ax^\gamma+b$.

Here, y : Output voltage
 x : Input light quantity
 a : Sensitivity
 b : Output voltage at dark time
 γ : 1

Output voltage at dark time gets doubled every time the temperature increases by around 8°C. (Around 20mv at 25°C)

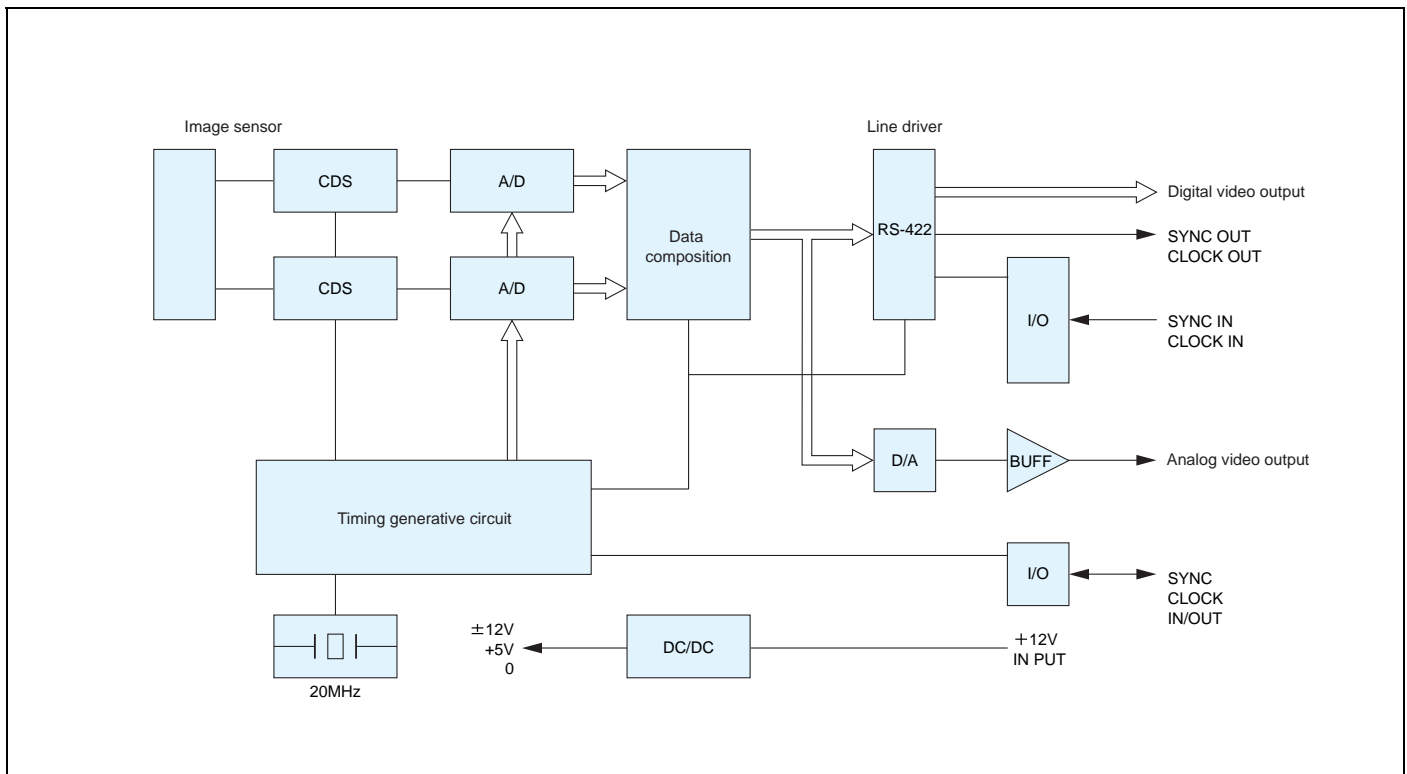


Photoelectric transfer characteristics

External synchronization

- EX CLK and EX SYNC shift to external operation mode automatically at the time of external input.
- At the time of no external input, the operation is in internal CLK mode and internal SYNC mode.
- When either one of CLK or SYNC is input externally, an external operation mode dominates in each case accordingly.

Block diagram



Digital output connector

HRS DX10A-36S manufactured by Hirose Electric is

Pin No.	Signal name	I/O	Pin No.	Signal name	I/O
1	CLK+	Out	2	CLK-	Out
3	SYNC+	Out	4	SYNC-	Out
5	-	-	6	-	-
7	GND		8	GND	
9	EX CLK+	In	10	EX CLK-	In
11	EX SYNC+	In	12	EX SYNC-	In
13	-	-	14	-	-
15	DO0+	Out	16	DO0-	Out
17	DO1+	Out	18	DO1-	Out
19	DO2+	Out	20	DO2-	Out
21	DO3+	Out	22	DO3-	Out
23	DO4+	Out	24	DO4-	Out
25	DO5+	Out	26	DO5-	Out
27	DO6+	Out	28	DO6-	Out
29	DO7+	Out	30	DO7-	Out
31	DO8+	Out	32	DO8-	Out
33	DO9+	Out	34	DO9-	Out
35	GND		36	GND	

CLK..... Pixel clock
 SYNC..... Synchronizing signal
 DOS₀-DO₉ Digital video output

Specifications

Number of pixels	2048
Pixel pitch x aperture	14μm×14μm
Length of the Light-receiving element	28.67mm
Video rate	10~20MHz
Scanning rate (scan/sec)	MAX. 9300 times (At 20MHz)
External-clock-to-video ratio	2 : 1
Driving clock input	MAX 40MHz, RS644 100Ω terminal built in
Data clock output	MAX 20MHz, RS422/644
Line transfer pulse input	0.265~10msec, RS644, 100Ω terminal built in
Line transfer pulse output	0.265~10msec, RS422/644
Video output (Analog output) (Digital output)	0~2.5V 75Ω at terminal Digital video (D0~D9+, D0~D9-) RS422/644 standard based
SensitivityV/lx.sec	100
Saturation exposure lx.sec (Element)	0.06
Dynamic range (Element)	2000 (Standard)
Output nonuniformity (Element)	MAX 10% At 50% of saturation output
Power capacity	+12V±0.5V (450mA digital output at no load)
Operation temperature range	0~40°C
Operation humidity range	85%MAX
Storage temperature range	-10°C~65°C
Weight	450g
Dimensional outline	64×64×136mm (excl. protrusion)
Lens mount	Asahi K mount (Standard) Nikon mount (Optional)

Cables

Optional

The following special cables are available.



Digital cable
Model: DG36-005

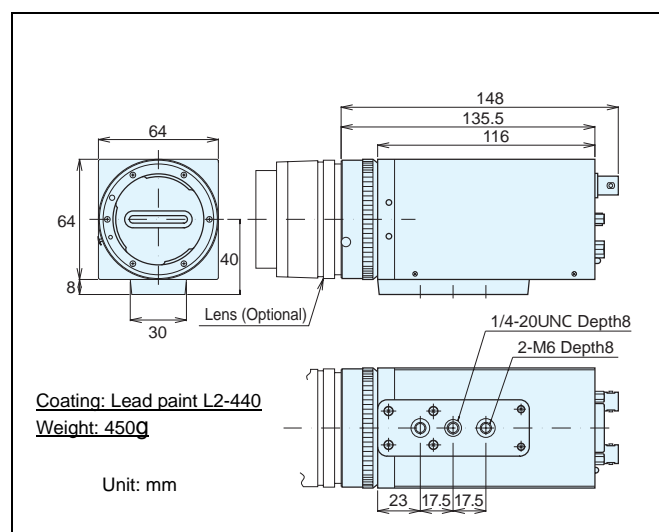
This is a digital cable with 37-pin D-sub connector, which makes connection with various types of capture board easier. This is to be used by connecting with cable for capture board.



Camera cable
Model: 12DD- XXS
XX to show cable length (m)

This is a cable to connect line sensor with power unit. It has D-sub connectors on both ends.

Dimension outline



●Specifications are subject to change without notice because of improvement. URL.<http://www.takenaka-system.com/>

Video Camera & Image Sensor System

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