

Digital camera having communication capability with internally synchronized with provided RS-232C

FC320R (30frame/sec)  
FC820R (15frame/sec)

## PROGRESSIVE SCAN CAMERA

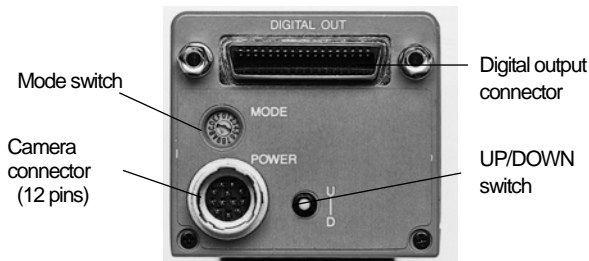


### Usage

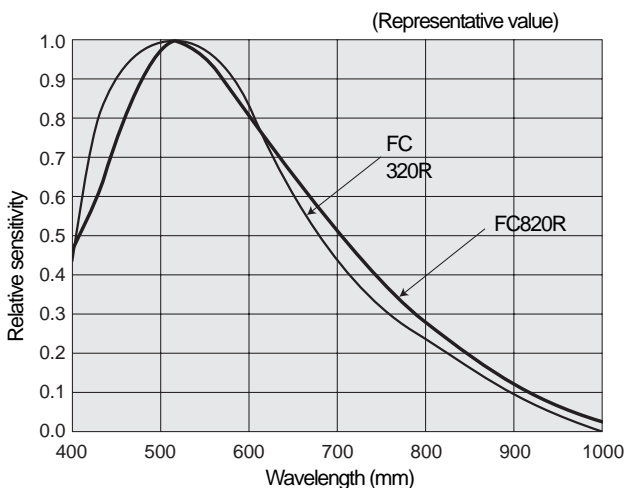
- Inputting apparatus for image processing device provided high resolution electronic shutter
- Reading device for high density bar code information
- Reading device for running car number (Lens optional.)
- Reading device for controlling car number in parking area
- Inspection to detect defective for LCD and Braun tube
- Microscope usage
- Miscellaneous overall devices required image processing connected to computer

### Description for panel at backside of camera

Connectors for digital cable and camera cable are provided on panel at backside together with electronic shutter mode and speed change switches



### Spectral sensitivity characteristic



### Outline

- Internal set values in camera can be controlled externally using communication through RS-232C.
- Image can be obtained with electronic shutter only inputting external trigger into camera to asynchronous reset. (asynchronous shutter mode)
- Video output signal is outputted by digitized signal. Progressive scan 10 bit parallel digitized video signals are outputted through digital output connector (36 pins).
- Video signal is outputted in progressive scan (non-interlace scan).
- TAKEX FC Series cameras adopt new designed CCD interline transfer method therefore smear at high-speed shutter is remarkably reduced comparing with conventional camera.
- Small sized and light in weight as well as low cost are realized by special design dedicated to digitized signal output.

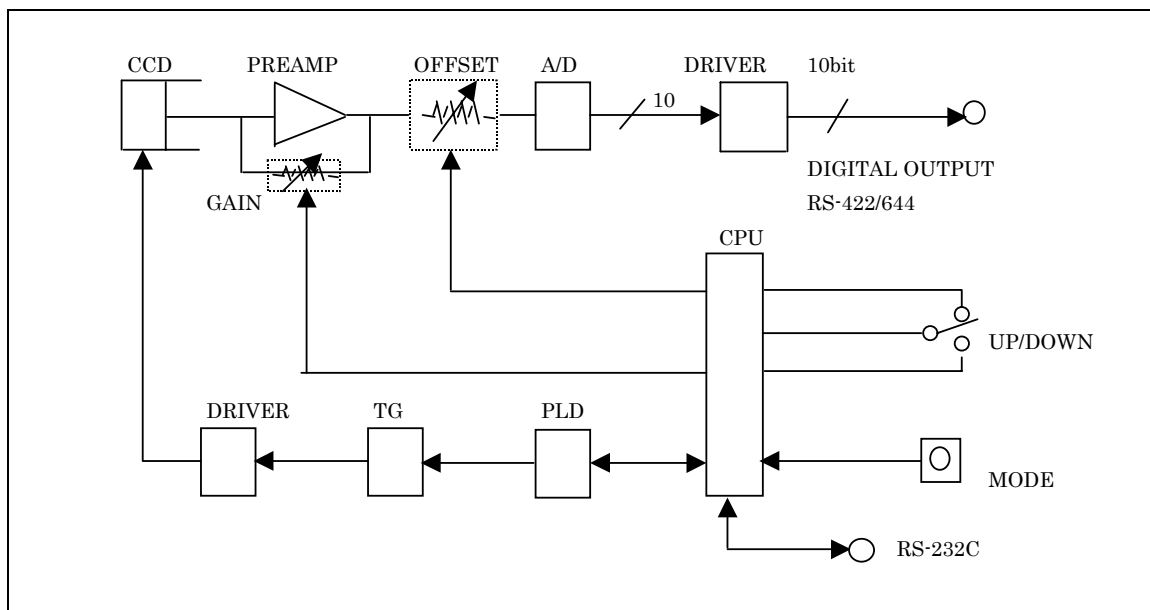
### Features

- Vertical resolution capability is not deteriorated during even electronic shutter operation because all pixels reading out method is adopted for progressive scanning.
- 10 bits digital video are outputted through RS-422. Also RS-644 is also available.
- All pixels reading out scanning for frames from 12 to 30 per second (Differs depending on model.) are possible without mechanical shutter and random shutter is also possible because electronic shutter function is equipped.
- Full frame continuous electronic shutter and asynchronous shutter exposing time fixed in eight steps from 1/10000 second (maximum) or pulse width changed as well as long exposing time setting are possible.
- Variable time setting is possible for each frame (Differs depend on camera model) at long time shutter because camera has two frame exposing times.
- Released timing (Stroboscope trigger signal) for electronic shutter is outputted in asynchronous shutter mode.
- Doubled speed-reading out using vertical two pixels mixed reading out is possible in continuous shutter function. (Excluding FC320R)
- Three kinds of memories from various operation setting parameters can be saved in backup memory. (E<sup>2</sup>PROM)
- Our video cameras provide high sensitivity and low smear.

## Specifications

Item	Camera model	FC320R	FC820R
camera element	Scanning method	1/3 progressive scanning inter line transfer CCD	1/2 progressive scanning inter line transfer CCD
	Number of total pixels	692 (H) × 504 (V) 350 thousand pixels	1077 (H) × 788 (V) 850 thousand pixels
	Number of valid pixels	659 (H) × 494 (V) 330 thousand pixels	1034 (H) × 779 (V) 800 thousand pixels
	Chip size	5.84(H) × 4.94(V) mm	7.6(H) × 6.2(V) mm
	Unit cell size	7.4 (H) × 7.4 (H) μm	6.25 (H) × 6.25(H) μm
	Optical black	Horizontal (H) direction front 2 pixels rear 31 pixels Vertical (V) direction front 8 pixels rear 2 pixels	Horizontal (H) direction front 3 pixels rear 40 pixels Vertical (V) direction front 7 pixels rear 2 pixels
	Number of dummy bit	Horizontal (H) direction 16 vertical (V) 5	Horizontal (H) direction 29 vertical (V) 1
Reading out scanning	Horizontal scanning frequency $f_H = 15.7\text{KHz}$ Vertical scanning frequency $f_V = 30\text{KHz}$ Pixel clock frequency $F_{CLK} = 12.27\text{ MHz}$	Horizontal scanning frequency $f_H = 12.0\text{KHz}$ Vertical scanning frequency $f_V = 15\text{KHz}$ Pixel clock frequency $F_{CLK} = 14.318\text{ MHz}$	
External synchronization	No function (internal synchronizing operation)		
Sensitivity	100L x F11 (1/30 sec shutter)	100L x F11 (1/15 sec shutter)	
Minimum subject luminous intensity	1 Lx F1.4 (Infrared rays cut filter is not provided)		
SN	More than 50dB		
Video output signal	Non-interlace method: 30Hz/frame		
	Non-interlace method: 15Hz/frame		
	Digital output : 10 bit RS-422 differential output, 100 load		
Gamma	$\gamma = 1$ fixed (0.45 is optionally provided)		
Electronic shutter	1/10000 ~ 1/30 sec. and long time shutter		
	1/10000 to 1/15 sec. and long time shutter Continuous shutter, asynchronous shutter, and long time exposing mode change are possible.		
RS-232C	Communication is possible.		
Lens mount	C mount		
Power source	DC 12V ±10%		
	380mA maximum	450mA maximum	
Operation ambient temp.	0°C ~ 40°C		
Storing temperature range	-30°C ~ 60°C		
Anti-shock	70G		
Anti-vibration	7G (11 ~ 200Hz)		
External dimension	46 (W) × 49 (H) × 120 (L) mm (excluding connector)		
Weight	About 300g		

## Block diagram



## Shutter speed setting

Shutter speed setting is determined by mode switch setting from "0" to "9" mainly at the time when power source is turned on. Changing over of continuous shutter/ asynchronous switch and high-speed/low speed shutter change are implemented by using both mode switch and UP/DOWN switch. (Refer to operation mode setting.)

FC320R Mode switch position	Shutter time (unit/sec)			
	High speed shutter		Low speed shutter	
0	Without shutter	(1/30 sec.)	Without shutter	(1/30 sec.)
1	1/10000 sec	(1H)	1/15 sec	(2V)
2	1/6000 sec	(2H)	1/8 sec	(4V)
3	1/3500 sec	(4H)	1/4 sec	(8V)
4	1/1800 sec	(8H)	1/2 sec	(16V)
5	1/1000 sec	(16H)	1 sec	(32V)
6	1/500 sec	(32H)	2 sec	(64V)
7	1/250 sec	(64H)	4 sec	(128V)
8	1/125 sec	(128H)	8 sec	(256V)
9	1/60 sec. (256H) / continuous	Pulse width control time / asynchronous	16 sec. (512V) / continuous	Pulse width control time / asynchronous

FC820R Mode switch position	Shutter time (unit/sec)			
	High speed shutter		Low speed shutter	
0	Without shutter	(1/15 sec.)	Without shutter	(1/15 sec.)
1	1/10000 sec	(1H)	1/7.5 sec	(2V)
2	1/6000 sec	(2H)	1/5 sec	(3V)
3	1/2000 sec	(6H)	1/3.8 sec	(4V)
4	1/1000 sec	(12H)	1/3 sec	(5V)
5	1/500 sec	(25H)	1/2.5 sec	(6V)
6	1/250 sec	(50H)	1/2.1 sec	(7V)
7	1/125 sec	(100H)	1/1.9 sec	(8V)
8	1/60 sec	(208H)	1/1.7 sec	(9V)
9	1/24 sec. (525H) / continuous	Pulse width control time / asynchronous	1/1.5 sec. (10V) / continuous	Pulse width control time / asynchronous

Signals for all pixels are outputted independently and sequentially by all pixels independent read out method.

This method is called progressive scan and in this method high resolved image can be obtained without deteriorating vertical resolution even electronic shutter is applied.

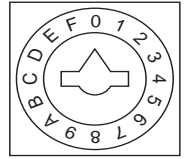
## Operation mode setting

Operation mode can be changed using mode switch provided at back panel.  
Refer to following descriptions in each table concerning relation among numerals and UP/DOWN switch operation.

(Note)  
Each camera is shipped from factory with following conditions:

Continuous shutter operation,  
High speed shutter operation,  
Normal scanning speed, and  
Without high speed sweeping away

Mode switch



function

Setting item of operation mode is divided into group 1 and group 2 as following.

Group 1 ----- Operation mode is changed with normal turning on of power source. Setting content is changed with combining setting of mode switch positions from "A" to "C" and UP/DOWN switch after turning on of power source.

Group 2 ----- Make mode switch at "A" position in advance and keep UP/DOWN switch lever pushed up (or pushed down). These are required operation mode to change setting when power source is turned on. Setting item can be changed by changing mode switch to required position either "5", "6", "7", or "9" position from "A" position and operating UP/DOWN switch after started up by the method mentioned above.

Table 6-2 Setting operation of operation mode set [Group 1]

Position of mode switch	Change contents	UP/DOWN switch	
		UP operation	DOWN operation
A	Changeover of continuous shutter / asynchronous shutter	Continuous shutter	asynchronous shutter
B	Gain change	Gain increase	Gain decrease
C	Offset change	Offset increase	Offset decrease

Table 6-3 Setting operation of operation mode set [Group 2]

Position of mode switch	Change contents	UP/DOWN switch	
		UP operation	DOWN operation
5	Changeover of high speed shutter / low speed shutter	High speed shutter	Low speed shutter
6	Changeover of normal scan / double speed scan	Normal scan	Double speed scan
7	FDV phase change	Normal	Graph in response
9	Change over of high speed sweep off function	Not	Yes

Turn off power source when starting as factory shipped condition is required. Turn on power source with mode switch set to "9" then set either UP or DOWN side of UP/DOWN switch and hold for several seconds. By this operation as factory shipped condition is read out and saved into internal RAM. Subsequently implement saving by similar process concerning program "D", "E", and "F" respectively.

## Program page set

Nonvolatile memory is internally equipped in FC series camera therefore various operation modes setting and level setting can be memorized.

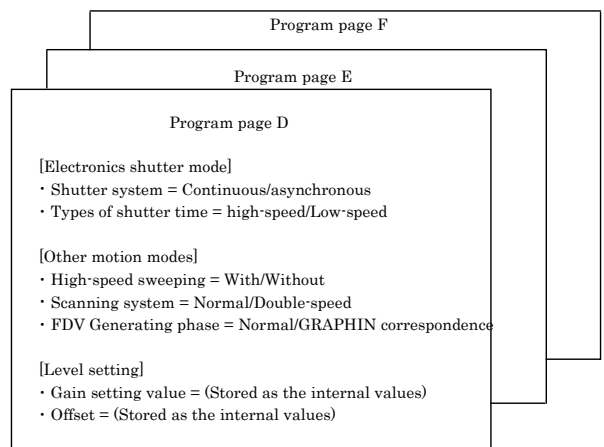
Inside camera setting items are saved in virtual pages (from here called "program page").

Three pages: "D", "E", and "F" are provided in this camera. (Refer to right figure.)

Camera starts operation according to various setting contents responding to program pages set to the position either "D", "E", or "F" when power source is turned on.

Camera starts operation according to setting condition memorized in "F" program if power source is turned on when mode switch is at other than "D", "E", or "F" program.

(Note): Note that the value for shutter time is not saved in program page.  
Shutter time at starting is determined by corresponding shutter time determined by mode switch position "0" to "9".



## Connection

Connection example of camera and peripheral devices is shown in following figure.

Maximum permissible length of camera cable (separate order) used for connection between camera and camera power source (separate order) is 25 meters.

Digital cable (separate order) is used for connection between digital output connector provided back panel of camera and input terminal (interface board and computer, etc.) provided at image processing device.

Maximum permissible length of digital cable is 30 meters.

Settings for shutter time and operation mode are implemented after cable connection.

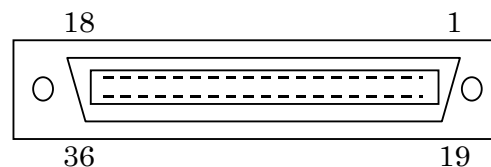
Vinit signal input is required when camera is operated by random shutter operation. Input point is either pins (6) in camera connector (12 pins) at back panel of camera or pins (14) in digital output connector (36 pins).

Following figure shows connection example when asynchronous shutter trigger input is made from interface board side.

Applying trigger from camera side is possible by connecting Vinit signal to BNC at "EXT" of PU-97 when camera and power source is connected 12W series cable of our company using dedicated power source PU-97.

## ● Digital output connector (HRS DX 10A-30S)

Relation between pin number and signal is as shown in following table.

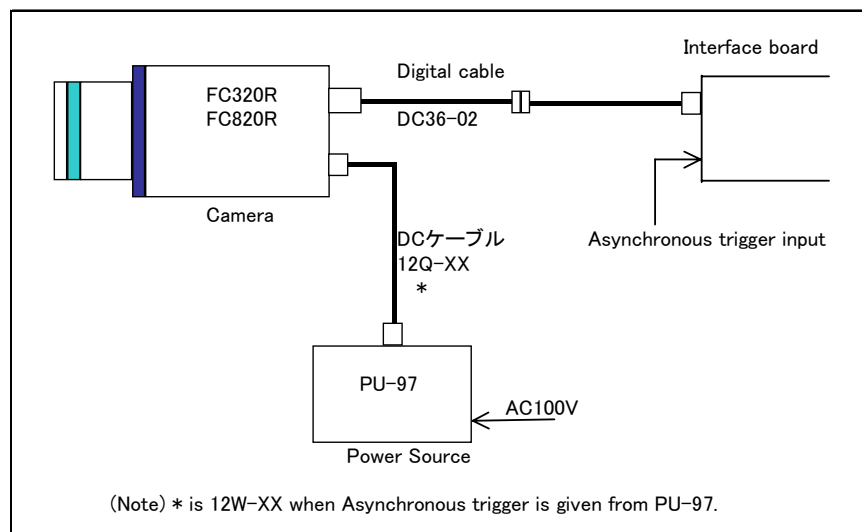


(Figure Viewed from outside the camera)

Pin no.	Signal name	I/O	Pin no.	Signal name	I/O
1	CLK+	Out	2	CLK-	Out
3	LDV+	Out	4	LDV-	Out
5	FDV+	Out	6	FDV-	Out
7	GND		8	GND	
9	NC		10	NC	
11	NC		12	BUSY	Out
13	WEN	Out	14	WEN	In
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  
 LDV-----Line timing signal  
 FDV-----Field timing signal  
 DO0~DO9--- Digital video output (10-bit)  
 Vinit --- External trigger input  
 BUSY-----Busy signal  
 WEN-----Light enable signal

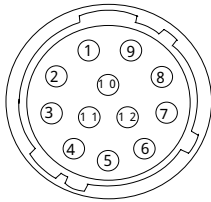
## Cable connection diagram



Refer to interface connection catalogue of our company concerning connection between camera and interface board.

●Camera connector (HRS HR 10A-10R-12PB)

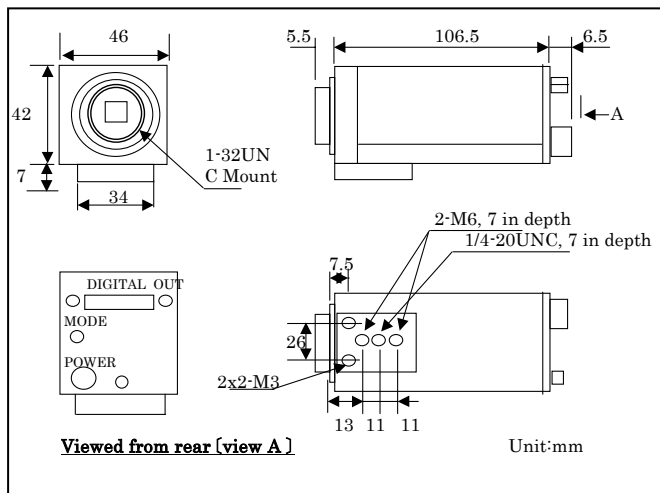
Relation between camera connector pin arrangement and their signals are shown in following table.  
Use this cable within length of 25m.



Pin No.	Signal name	Contents	I/O
1	GND(0V)	Ground for power source	
2	+12VDC	DC power input	
3	GND	Ground for signal	
4	NC	Non-contact	
5	GND	Ground for signal	
6	Vinit	External trigger input	In
7	NC	Non-contact	
8	GND	Ground for signal	
9	NC	Non-contact	
10	GND	Ground for signal	
11	STRB	Strobe output	Out
12	GND	Ground for signal	

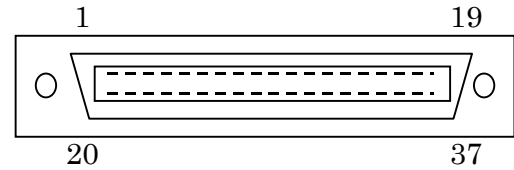
- Both external trigger input and stroboscope output are TTL level.
- Plug HR10A-10P-12S manufactured by Hirose Electric Co., Ltd. is complied.
- Voltage range of RS-232C is maximum from -15V~+15V.  
Pay adequate attention for connection.

Outline dimensional drawing



●37 pins D-SUB connector

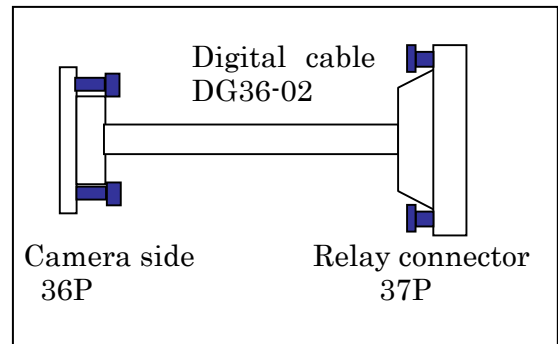
Pin number and signal name at 37 pins connector side for digital cable



(Figure viewed from connection side)

Pin No.	Signal name	Pin No.	Signal name
1	CLK+	20	CLK-
2	LDV+	21	LDV-
3	FDV+	22	FDV-
4	NC	23	GND
5	NC	24	NC
6	DO0+	25	DO0-
7	DO1+	26	DO1-
8	DO2+	27	DO2-
9	DO3+	28	DO3-
10	DO4+	29	DO4-
11	DO5+	30	DO5-
12	DO6+	31	DO6-
13	DO7+	32	DO7-
14	DO8+	33	DO8-
15	DO9+	34	DO9-
16	GND	35	GND
17	Vinit	36	NC
18	NC	37	NC
19	NC		

○Digital cable is available by separate order.



- Specifications are subject to change without notice for revision
- <http://www.takenaka-system.com>

Video Camera & Image Sensor System  
**TAKENAKA SYSTEM CO.,LTD.**

HEAD OFFICE:

2-1Narano-cho, Shinomiya, Yamashina-ku, Kyoto, 607-8032 JAPAN

Tel. 81-75-593-9300 Fax. 81-75-593-9790

E-mail: takex@ma.newweb.ne.jp

Camera Division: Tel. 81-77-545-4331 Fax. 81-77-545-4335

Offices: Tokyo, Nagoya