UNIQ

UF-1000CL
High Speed CCD Camera
User's Manual

091-1000 V.1.4
08-09-17

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WARNING

**TO PREVENT FIRE OR ELECTRIC SHOCK HAZARD,
DO NOT EXPOSE THIS CAMERA UNIT TO RAIN OR MOISTURE.
DO NOT ATTEMPT TO REMOVE CAMERA COVER OR MODIFY THE CAMERA UNIT,
WARRANTY WILL BE VOIDED.**

PRECAUTIONS

**Do dot attempt to disassemble, modify, or repair the camera. Contact UNIQ for help.
Do not point the camera at bright objects, such as the sun, for a long period. It may cause CCD blooming and permanent damages.
Do not operate the camera beyond the temperature range. Avoid using the camera above 90% humidity.
Do not use unregulated power supply source.
Do not touch CCD glass cover with fingers or any hard objects other than professional glass cleaning solvents.**

Limited Warranty

UNIQ warrants to the original customer to be free from defects in material and workmanship for two full years from the date of original purchase. This warranty covers failures or damages due to defects in material or workmanship, which occur during normal use. It does not cover damages or failures, which result from shipment, mishandling, abuse, misuse, or modification.

A Return Material Authorization (RMA) number is required prior to returning any UNIQ product for repair or replacement.

For immediate technical assistance, please call (408) 330-0818 or email to tech@uniqvision.com

1. Introduction

1.1 General Description

The UF-1000CL is a very high frame rate, 10-bit digital CCD camera using progressive scanning interline-transfer technology. Four different frame rates can be selected via mode switches located on rear plate or RS232C serial commands. High speed moving objects can be captured with the external asynchronous capture control. This compact and lightweight camera offers excellent signal to noise performance

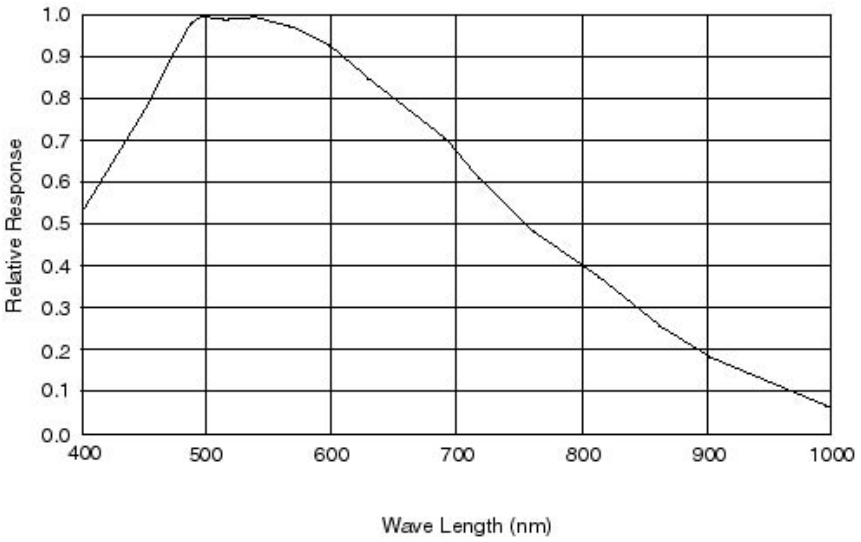
1.2 Features

- **108 x 80 resolution at 1000 FPS**
- **160 x 120 resolution at 600 FPS**
- **210 x 165 resolution at 500 FPS**
- **320 x 240 resolution at 400 FPS**
- **Single output**
- **1/3" Progressive scan CCD imager**
- **10-bit Camera Link digital output (Analog output available)**
- **58 dB or better**
- **40.00 MHz pixel clock**
- **Asynchronous reset at full frame shutter**
- **RS232C interface control**
- **C-mount lens**

1.3 Applications

UF-1000CL applications include high-speed machine vision, automated inspection, and motion analysis.

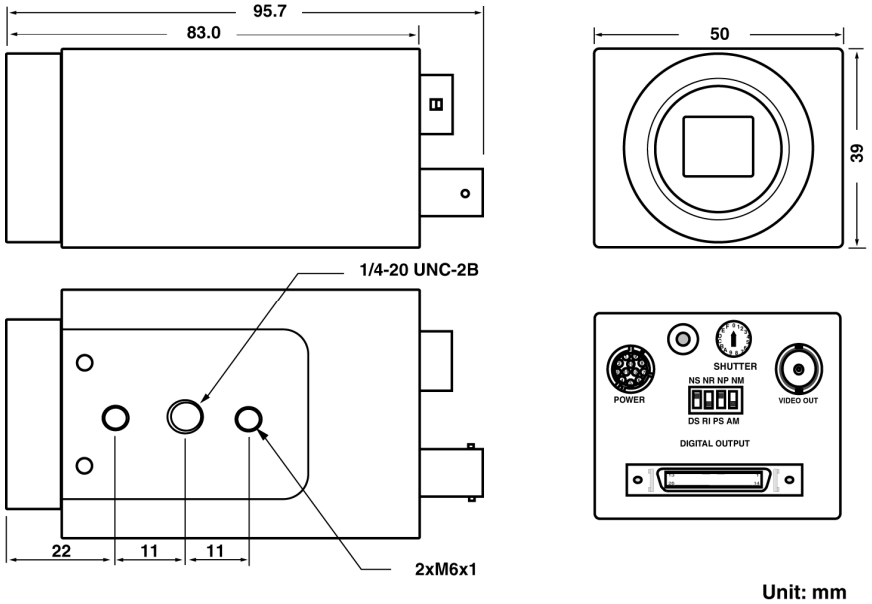
1.4 CCD Imager Spectral Response Curve



1.5 Camera Specifications

Model	UF-1000CL			
CCD Sensor	1/3" Hyper HAD progressive scan interline-transfer CCD			
Chip Size	5.79 mm x 4.89 mm			
Effective Pixels (H x V)	320 x 240	210 x 165	160 x 120	108 x 80
Unit Cell Size (H x V)	14.8 um x 14.8 um	22.2 um x 22.2 um	29.6 um x 29.6 um	44.4 um x 44.4 um
Pixel Clock	40.00MHz	26.67MHz	20.00 MHz	13.3MHz
Frame Rate	400 FPS	500 FPS	600 FPS	1000 FPS
Sync.	HD: 100.00 KHz VD: 400.00 Hz	HD: 88.11 KHz VD: 500.61 Hz	HD: 76.20 KHz VD: 599.93 Hz	HD: 84.04 KHz VD: 1000.4 Hz
Digital Video Output	Camera Link format			
Analog Video Output	1 V p-p, 75ohm (BNC or 12 pin Hirose)			
S/N Ratio	<58 dB			
Min. Illumination	0.5 lux			
Gain	MGC			
Gamma	1.0			
Electronic Shutter	1/60 ~ 1/62,000 selectable 16 steps			
Lens Mount	C-Mount			
Operating Temperature	-10 °C ~ +50 °C			
Power Requirement	12V DC, 250mA, 3.0W			
Dimension	50mm x 39mm x 83mm			
Ext. Sync.	Internal/External Auto Switch			
Async Reset	Standard			
Weight	200 g			

1.6 Camera Dimension



Unit: mm

2. Camera Setup

A basic camera and frame grabber system setup, as shown in Figure 1 below, requires a UF-1000CL camera, a standard C-mount lens, a PS-12C power supply or equivalent, a PC system and a VGA monitor, a frame grabber, and an external trigger device if necessary.

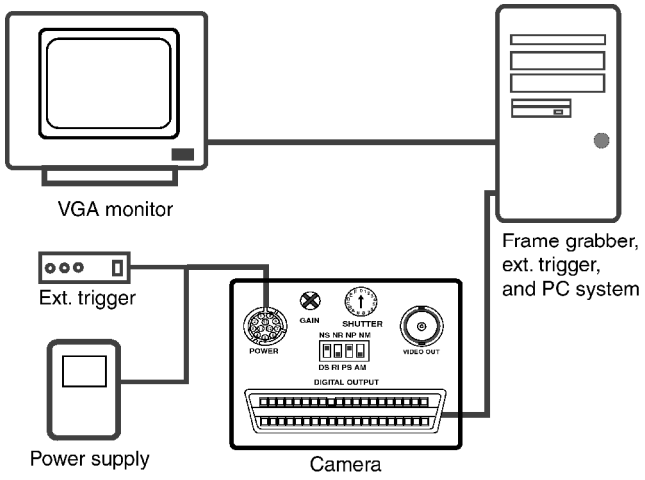


Figure 1. Camera and Frame Grabber System Setup

3. Camera Functions

3.1 12-Pin Connector

The 12-pin Hirose connector is located on the rear panel of the camera. All ground signals on pin 1, 3, 5, and 8 are common grounds. +12 V DC input is recommended on pin 2, but this camera should withstand +12 V ± 1V input voltage. Make sure to set the NM/AM switch to NM position for external HD and VD locking. Figure 2 below shows a top view of the 12-pin Hirose connector.

Pin No.	UF-1000CL
1	GND
2	+12V DC input
3	GND
4	Video
5	GND
6	N/C
7	N/C
8	GND
9	N/C
10	N/C
11	Integration control
12	N/C

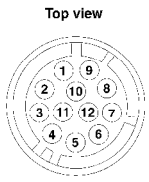


Figure 2. 12-Pin Hirose Connector

3.2 Mode Switches Selection

Designation:
NS- Functional select
DS- Shutter speed select
NR- RS-232C communication Enable
RI- Rear switch control Enable
NP- Reserved for custom options
PS- Reserved for custom options
NM- Normal mode
AM- Asynchronous mode

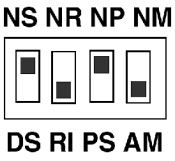


Figure 3. Mode switches

Timing details of the mode switches are shown in section 6.

3.3 Shutter Speed Dial Switch

Shutter speed dial switch is located on the rear panel and there are 16 different positions. To select camera gain, reference, or to save a user page, set NS/DS switch to NS position. To adjust shutter speed, set NS/DS to DS position. For normal shutter speed, make sure to set NM/AM mode to NM location. For asynchronous capture, set NM/AM mode to AM location.

Position No.	Functional Select (NS)	Shutter Speed Select (DS) in msec.				
		400fps	500fps	600fps	1000fps	Async*
0	Normal	2.500	2.000	1.667	1.000	1/F
1	Gain Adjustment	2.425	1.768	1.425	0.464	124H
2	Reference Adjustment	1.625	1.416	1.286	0.432	62H
3	Factory Page	1.325	1.288	1.231	0.422	31H
4	User Page 1	1.175	1.224	1.197	0.414	16H
5	User Page 2	1.100	1.192	1.170	0.408	8H
6	User Page 3	1.063	1.168	1.147	0.404	6H
7	User Page 4	1.013	1.152	1.136	0.401	5H
8	Normal/Double Speed	0.994	1.144	1.120	0.399	4H
9	Reserved	0.981	1.136	1.117	0.337	3H
A	Reserved	0.969	1.128	1.114	0.338	3H
B	Reserved	0.956	1.124	1.111	0.337	2H
C	Reserved	0.950	1.120	1.107	0.336	2H
D	Reserved	0.944	1.116	1.103	0.335	1H
E	Reserved	0.938	1.112	1.100	0.334	1H
F	Reserved	0.006	0.004	0.003	0.001	Pulse Width

*** Where F is frame rate and H is HD timing.**

Figure 4. Shutter Speed Dial Switch

3.4 Momentary Switch (UP/Down Switch)

Position No.	Functional Select (NS)	Up/Down Switch
0	Normal	N/A
1	Gain Adjustment	Move up or down to adjust gain
2	Reference Adjustment	Move up or down to adjust reference
3	Factory Page	Move up or down to recall factory page
4	User Page 1	Up: Recall; Down: Save
5	User Page 2	Up: Recall; Down: Save
6	User Page 3	Up: Recall; Down: Save
7	User Page 4	Up: Recall; Down: Save
8	400fps/500fps	Up: 400fps; Down: 500fps
9	Reserved	
A	600fps/1000fps	Up: 600fps; Down: 1000fps
B	Reserved	
C	Reserved	
D	Reserved	
E	Reserved	
F	Reserved	

Camera settings can be saved into four different user pages. Once the user page is saved and set between shutter speeds 4 and 7, it will be activated as long as the camera is powered ON. User Page works in both rear plate control and RS232C communication selections.

Figure 5. Up/Down Switch

3.5 Gain Control (AGC/MGC)

Note: This gain potentiometer only applies to cameras without Up/Down switch on rear plate.

Manual gain control (MGC)

MGC is standard factory setting on this camera. The manual gain control can be adjusted from 4 dB to 36 dB. Adjusting the gain potentiometer located on rear panel will change the gain value.

Automatic gain control (AGC):

AGC is not available and it is not recommended to use. Contact UNIQ for further details.

Figure 6. Gain potentiometer

3.6 26-Pin Camera Link Connector

PIN NO.	CAMERA LINK SYMBOL	UNIQ CAMERA SYMBOL	FUNCTION
1, 14	INNER SHIELD	SHIELD	Inner shielding
2, 15	X0-, X0+	DATA0-, DATA0+	Video, LEN and FEN data output
3, 16	X1-, X1+	DATA1-, DATA1+	Video, LEN and FEN data output
4, 17	X2-, X2+	DATA2-, DATA2+	Video, LEN and FEN data output
5, 18	Xclk-, Xclk+	CLK-, CLK+	Pixel clock output
6, 19	X3-, X3+	DATA3-, DATA3+	Video, LEN and FEN data output
7, 20	SerTC+, SerTC-	Rx+, Rx-	Differential pair, serial communications from frame grabber
8, 21	SerTFG-, SerTFG+	Tx-, Tx+	Differential pair, serial communications to frame grabber
9, 22	CC1-, CC1+	HD-, HD+	Camera Control 1 (CC1) - Horizontal signal input
10, 23	CC2+, CC2-	VINT/VD+, VINT/VD-	Camera Control 2 (CC2) - Vertical signal or asynchronous reset input
11, 24	CC3-, CC3+	Reserved	Reserved for custom options
12, 25	CC4+, CC4-	Reserved	Reserved for custom options
13, 26	INNNER SHIELD	SHIELD	Inner shielding

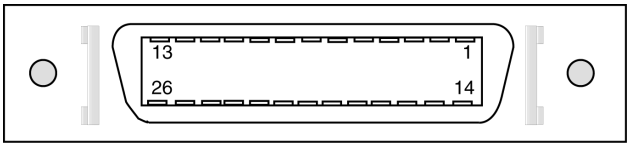


Figure 8. 3M 26-pin Camera Link Connector (MDR-26 pin)

4. RS-232C Communication Control

UNIQ does not provide its own software program for RS232C communication, contact frame grabber vendor or UNIQ for further details.

Command	Command Name	Notes
?	Error	"?" Error will appear on screen if incorrect command is entered
ru#	Recall user page	Must have a number after "ru" such as 1, 2, 3 or 4
rp	Report current camera setting	G = Gain; R = Reference S = Shutter Mode; NS, NM (refer to rear plate setting)
rf	Recall factory setting page	Factory default setting
sm#	Shutter mode	Must have a number after sm (1 ~ f), refer to section 3.3 for details.
sp#	Save user page	There are 4 user page available
ns	Normal speed	Refer to camera specifications
ds	Double speed	Refer to camera specifications
nm	Normal mode	Normal free running
am	Asynchronous mode	Asynchronous reset
sc0 sc1 sc2 sc3	400fps 500fps 600fps 1000fps	400 frame per second 500 frame per second 600 frame per second 1000 frame per second
Gi###	Gain increase	### = Hexadecimals (000 ~ 3ff). If no number entered, gain will be increased by factor of 1. If a number is entered, then number will be added to stored gain.
gd###	Gain decrease	### = Hexadecimals (000 ~ 3ff). Same as gi above, except it will be decreased.
gn###	Gain number	### = Hexadecimals (000 ~ 3ff). Refer to the gain curves below for details. Only one curve applies to each camera depending on camera model, contact UNIQ for further details.
bi###	Reference increase	### = Hexadecimals (000 ~ 3ff). If no number entered, reference will be increased by factor of 1. If a number is entered, then number will be added to stored reference. Note: It's very uncommon to change reference level, contact UNIQ for further details.
bd###	Reference decrease	
bn###	Reference number	

Note:

1. **Command must be in "lower case."**
2. **All numbers have to be in "hex" format, use a PC calculator to convert between hex and decimal numbers if necessary.**
3. **Command example:**

   User Enters: "sm5" (shutter speed at 5)

   Camera returns: "?" or "3f" in Hex
   (incorrect answer, no RS232C communication or something's wrong)

   or

   Camera return: "□" or "1" in Hex (correct answer, it might show other symbols depending on PC system)

4. **Gain Curves:**

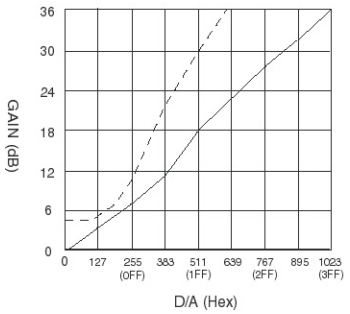
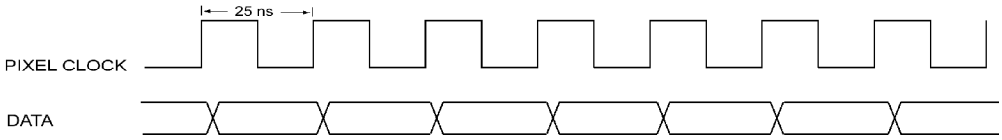


Figure 9. Camera Gain Curves

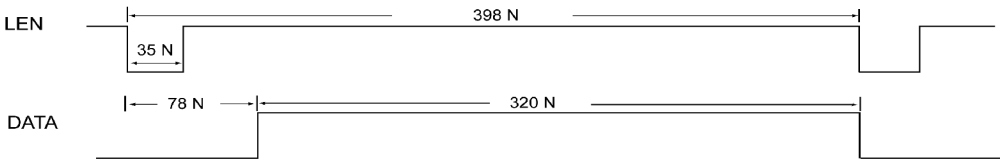
5. Digital Interface Timing

5.1 400 FPS Mode

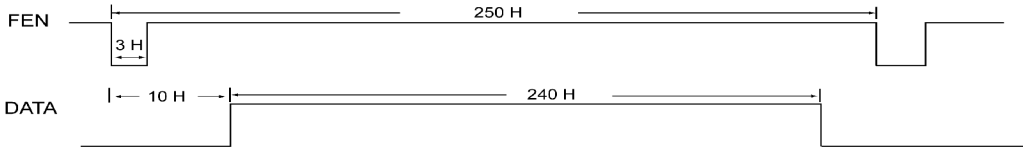
Pixel Clock



Line Enable

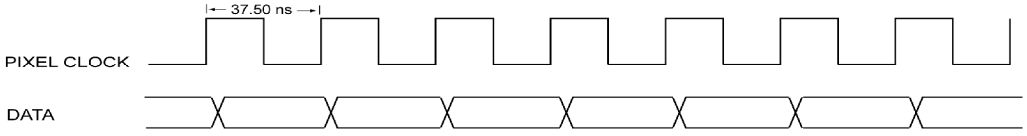


Frame Enable



5.2 500 FPS Mode

Pixel Clock



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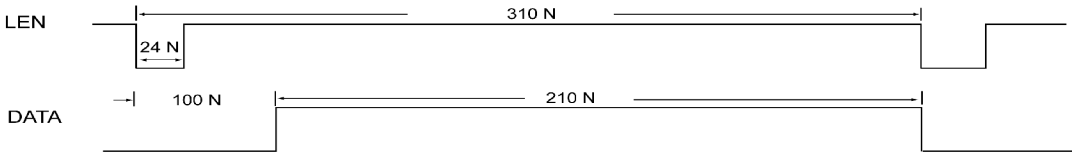
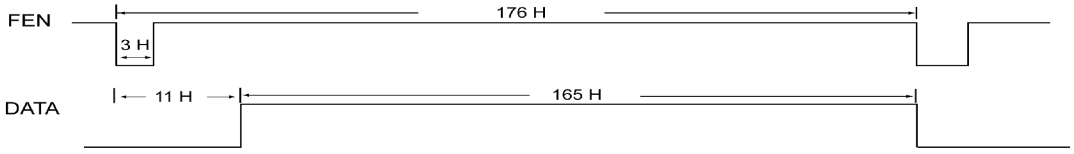
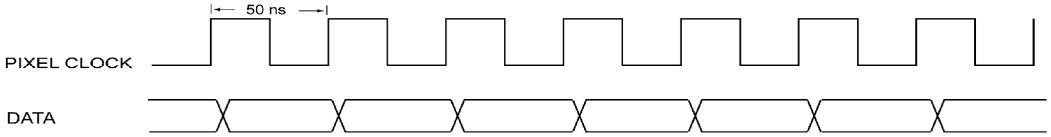


Frame Enable

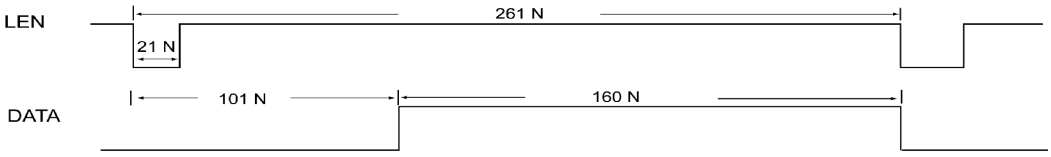


5.3 600 FPS Mode

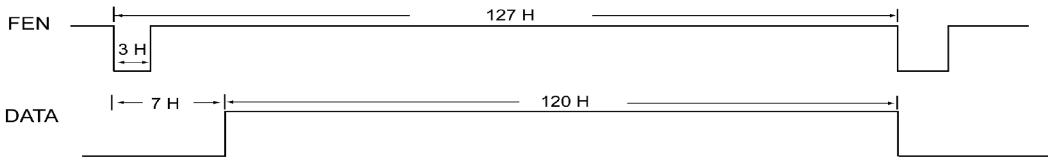
Pixel Clock



Line Enable

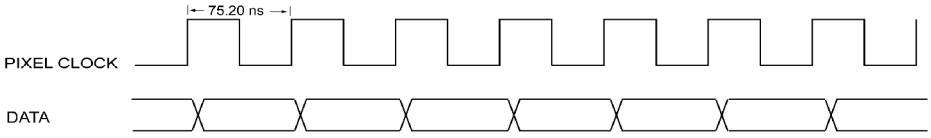


Frame Enable



5.4 1000 FPS Mode

Pixel Clock



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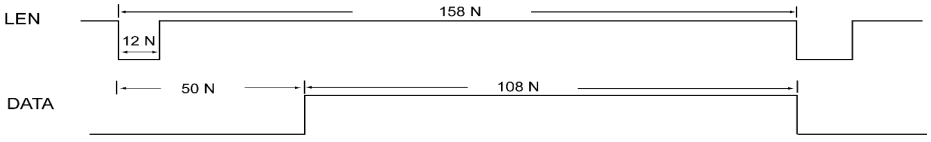
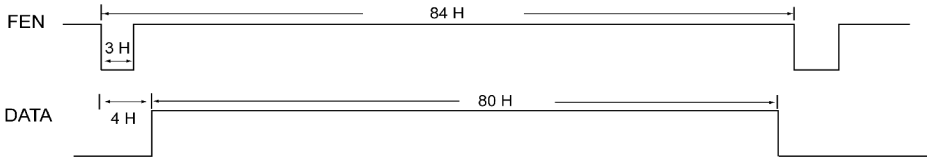
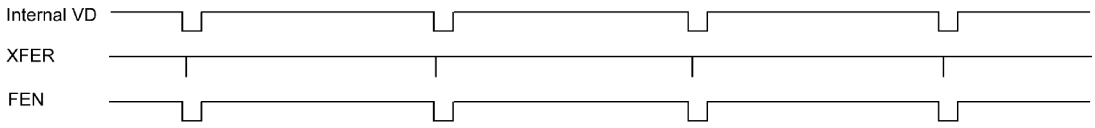


Frame Enable

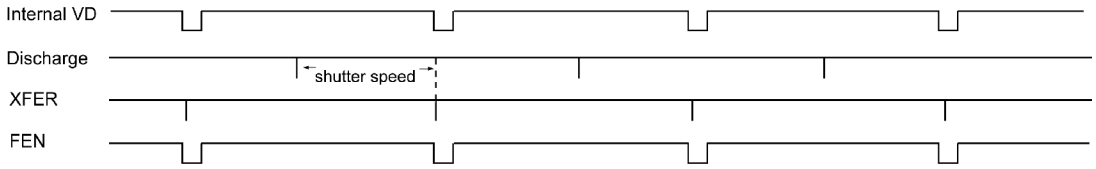


6. Camera Functional Timing

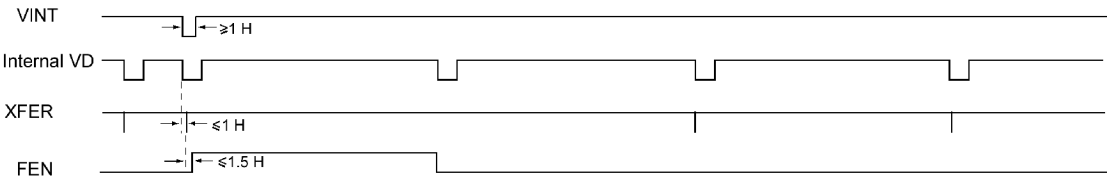
6.1 Free Run (shutter speed position 0, 1000 fps)



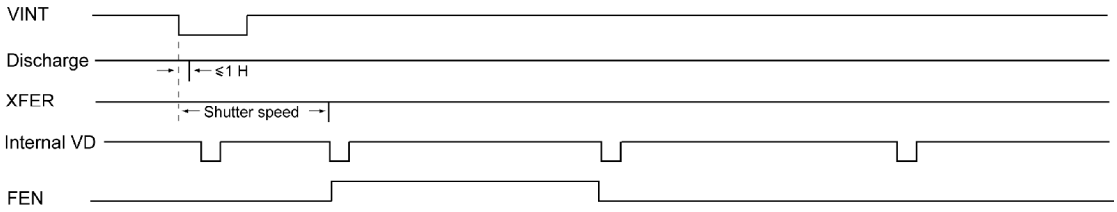
6.2 Free Run (shutter speed position from 1 to F)



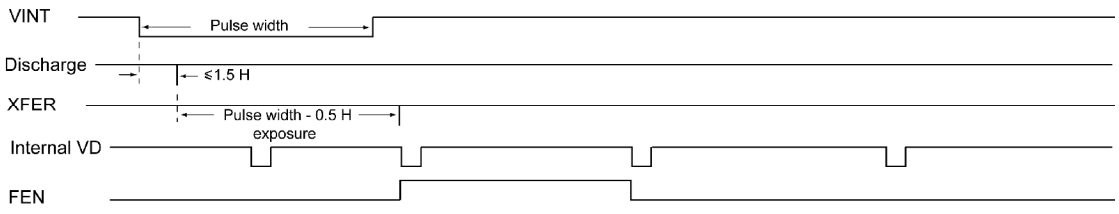
6.3 Asynchronous Capture (shutter speed position 0)



6.4 Asynchronous Capture (shutter speed position from 1 to E)



6.5 Asynchronous Capture with Pulse Width Control (shutter speed: F)



6.6 External Synchronization and Gen-lock (via Camera Link interface ONLY)

The UF-1000CL camera automatically locks to the external sync source. The external sync source must match the camera HD and VD specification in section 1.5. Both external HD and VD are TTL level signals.

a) HD

H: 2.5V to 5V
L: 0V or GND
Pulse width: 5-50% duty cycle, see figure 8 shown below.

b) VD

H: 2.5V to 5V
L: 0V or GND
Pulse width: 0.5-50% duty cycles

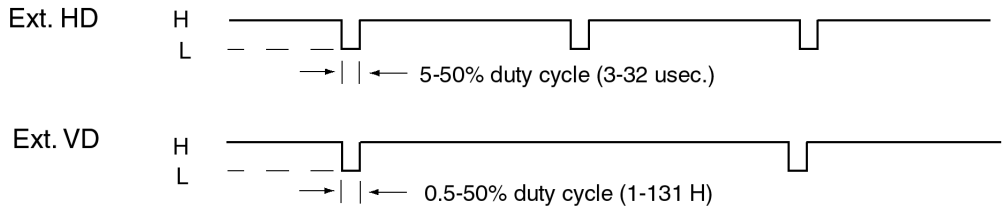


Figure 10. External Synchronization and Gen-lock Timing

6.7 Integration (via 12-pin Hirose connector ONLY)

The UF-1000CL camera can be integrated up to 2 seconds without severe noise or dark current effect. To start integration, pin #11 (same as pin #27 of 40-pin digital connector) of the 12-pin connector must be connected to GND or 0V. The integrated video will be shifted out following the next vertical drive after pin #11 goes back to high or 5V level, as shown in figure 9 below. If a frame grabber does not capture the immediate frame or integrated video, the normal video (before the integration) will display again on the monitor.

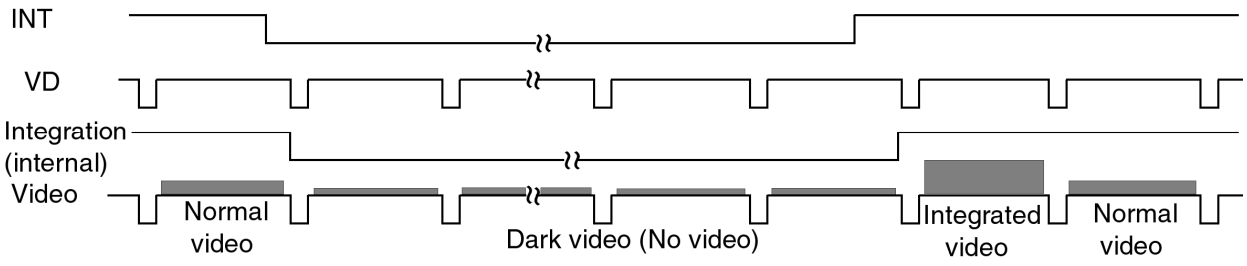


Figure 11. Integration Control Timing

7. Camera accessories

7.1 Power Supply and Power Cable

12 V DC regulated power supply with 1A current output or better is recommended. This camera uses Hirose 12-pin connector for power source. The matting cable plug connector can be purchased through distributors or UNIQ and the Hirose part number is HR10A10P12S. UNIQ provides power supplies and power cables as "one stop shopping" for customers. Alternatively, the power supplies and power cables can be purchased through power supply and cable vendors. Contact UNIQ for vendor list.

7.2 Lens

C-mount lens is the standard lens for UF-1000CL camera. There are a variety of C-mount lenses in the market that works with UF-1000CL camera. Make sure the quality and specification of the lens match the camera's application. Some of the most popular lenses in the market, such as Cosmicar, Fujinon, Rodenstock, and Schneider, are recommended.

7.3 Camera Link Cable

Camera Link cable can be purchased from 3M, Mouser, Digi-Key and frame grabber vendors.

8. Technical Support Information

For technical assistance, contact UNIQ Technical Support or Applications Engineer at

Phone: **(408) 330-0818**
Fax: **(408) 330-0886**
Email: **info@uniqvision.com**

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Fax: **(408) 330-0886**

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General Inquiries: **info@uniqvision.com**