TM-1300 PROGRESSIVE SCAN
# HIGH RESOLUTION SHUTTER CAMERA

Product Features

- **Very high resolution 2/3" progressive scanning interline transfer CCD imager 1300(H) x 1030(V)**
- **8/10-bit digital output for progressive scan (RS-422)**
- **Real time, 12 frame/sec (20 MHz data clock) with SVGA display (47 frame/sec.) output**
- **Full-frame shutter ....1/50 to 1/39,000 sec.**
- **Asynchronous reset with smear reduction**
- **Built-in continuous sync**
- **Strobe trigger output**
- **Frame memory built-in for async image capturing**
- **Full frame integration with uninterrupted video output**
- **Excellent S/N (>50 dB)**
- **RS-232C (or RS-485 option) external control for gain, A/D**

General Description

The PULNiX TM-1300 is a very high resolution (1300 x 1030 active pixels, 5:4 aspect) monochrome CCD camera which uses a progressive scan interline transfer CCD with a single channel output to achieve outstanding shutter and integration characteristics. It is specifically designed for low noise and high resolution image capturing with externally controlled gain and dynamic range adjustments which extract the best imaging performance from the CCD. The electronic shutter, which has speeds selectable to 1/39,000 sec., may be asynchronously reset by external pulse control.

The TM-1300 has its own 8-bit built-in frame store which can capture and output full-frame images in real time. At 10-bits, the RS-422 digital signal output is provided for interfacing with external image processing systems. The SVGA display output provides a great convenience for video monitoring with a standard computer monitor. Special interface cables are available for connecting the TM-1300 directly to many existing commercial frame grabbers. All functions are remotely controllable via RS-232C (or RS-485) communication.

Applications for the TM-1300 include medical imaging, high definition graphics, on-line inspection, gauging, character reading, archiving, intelligent transportation systems, and long range image acquisition.

Asynchronous Reset

The TM-1300's asynchronous reset is flexible. CCD scanning and purging is reset by applying the VINIT pulse. There are three modes to control the asynchronous reset and shutter speed:

1. Internal shutter speed mode. The speed control can be selected from 1/50 to 1/39,000 sec., with a standard output of 12 frames per second (FPS). The video signal starts with internal V-reset timing related to shutter speed. The built-in frame memory can maintain the asynchronously captured full frame image until the next VINIT pulse comes in (memory mode).

2. Direct shutter mode. Selectable from 1/39,000 to 1/12, in increments of one horizontal scan time.

3. Async Reset with no shutter. Video images are acquired at 1/12 of a second, with no electronic shutter. Shuttle dial switch position is set to the zero position.

Integration

The CCD imager of the TM-1300 can be exposed longer than normal scan timing (1/12 sec.). Integration is achieved by controlling the #11 pin of the 12-pin connector to Low (GND). This integration feature provides high sensitivity in dark environments. The internal frame memory provides continuous video output without interruption during the integration period. The progressive scan CCD chip permits a full frame of resolution in non-interlace format. Designed for low noise applications, the integration mode and slower clock scanning with 10-bit output make this camera suitable for a variety of applications.

Electronic Shutter

The TM-1300 has a substrate drain type shutter mechanism which provides a superb picture at various speeds without smearing. A built-in manual shutter speed control selects the electronic shutter rate of 1/50, 1/100, 1/200, 1/400, 1/1,500, 1/3,000, 1/5,500, 1/9,500 or 1/39,000 second. With VINIT high (5V), the CCD keeps discharging. With a negative going pulse to VINIT, the camera resets and purges the charge momentarily. Then it starts integrating for the period of shutter control set by internal shutter control. A full 1030 lines of vertical resolution per single shutter is available, as compared to a conventional CCD camera which allows only half lines per shutter.
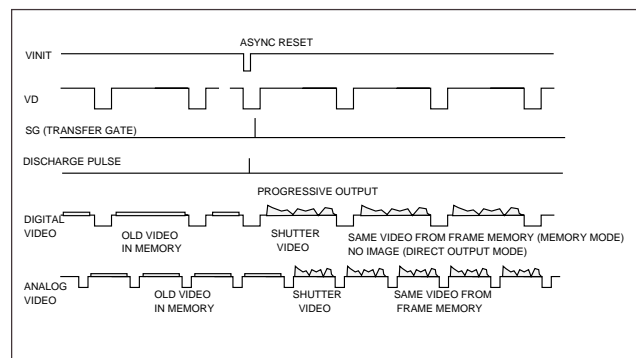
Mode Selection

Mode selection is available from either the back plate switch or RS-232C remote control.

Control functions:

Gain control: (SW #1)
Variable gain mode from 6dB to 22dB (or max. 32dB). Up and down switch or RS-232 (8-bit) controls continuous gain changes.

Gain selection: (SW #3 & #4)
Select four preset gains of 9, 12, 18, 22dB (18dB factory set).

Image output: (SW #5)
Direct digital output without memory.

Digital output: 1-bit, 12 frame/sec. (20MHz). Must use frame grabber to capture video.

Analog output: SVGA output of 47 frame/sec.

Memory mode:

Digital output: 8-bit, 12 frame/sec. Can grab images in built-in frame buffer.

Analog output: No scan conversion. 12 frame/sec.

A/D Reference control: (SW #6 & #7)
Varies A/D high (top) and low (bottom) reference voltages for various dynamic range control and digital black level control.

Adjust top reference: Control digital saturation level and gain.

Adjust bottom reference: Control digital black level (offset) can be controlled.

Freeze: (SW #8)
Switches real time image and freeze image in the frame buffer.

Selecting async reset: Each image captured asynchronously will output as a frozen image.

For integration: It is necessary to enable the freeze (ENINT).

Page memory: (SW #A - D)
Save and read the set parameters.

Page A: Power up default page.

Page B - D: User pages.

Direct shutter control: (SW #E)
Changes shutter speed from 1/12 sec. to 1/39,000 sec. by increment or deincrement of 1H (80µsec.).

Fast dump: (SW #F)
Clears V-shift registers upon async trigger and reduces upper portion of smear.

Display Output: for SVGA Monitor with Continuous Sync

The TM-1300 provides scan conversion video output which can be displayed with a standard computer monitor for easy focusing and optical alignment or on-site maintenance. The scan converted frequency is:

Hsync=49.5kHz, Vsync=47.2Hz

Note: Some SXGA monitors may not sync. Contact PULNiX for more information.

The video output is equal amplitude R G B (3 channel) for full B/W display with a standard color SVGA monitor. The analog output is available from the BNC connector for single channel 1.0 Vp-p composite video output. Analog sync output is continuous even if async reset mode is selected, so that the monitor maintains steady images without interruption or jumping images.

Strobe Output

The TM-1300 outputs a strobe control signal for asynchronous shutter and strobing applications. This output is a useful tool for applications such as intelligent transportation systems, laser studies and background cancellation imaging. The strobe output is provided 1 1/2H (120µsec) prior to the CCD charge transfer gate. The output is RS-422 differential and each polarity (Strobe+: pin 7, Strobe-: pin 8) can be used as a positive pulse or negative pulse with single ended TTL.
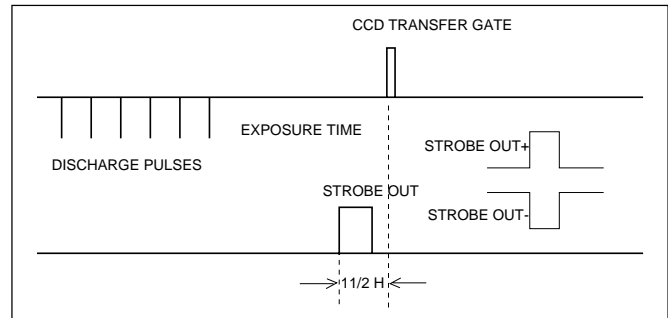
Note: The strobe may not work properly when the shutter speed is selected at 1/9,600 and 1/39,000, as the interval between the strobe and the transfer gate is only 1/2H (40µsec).

Fast Dump Mode

The fast dump mode is designed to reduce upper side smear from point light sources such as laser and vehicle head lights. At async reset, it clears both the photosite and vertical shift registers of the CCD imager. As the fast dump takes 6.08 msec after the async reset and image output follows with selected shutter speed, the image capturing timing must be delayed by this amount. The strobe output adjusts the delay automatically when the fast dump mode is selected.

Normal scanning | Fast dump mode

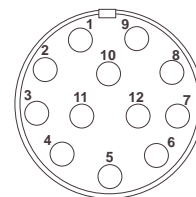# Pin Configurations

31-Pin connector   (MP211-031-113-4300)

Pin#	Description	I/O	Pin#	Description	I/O
1	CLK+	Out	17	CLK-	Out
2	LDV+	Out	18	LDV-	Out
3	FDV+	Out	19	FDV-	Out
4	GND		20	VINIT	In
5	N/C		21	INTEG	In
6	D0+	Out	22	D0	Out
7	D1+	Out	23	D1-	Out
8	D2+	Out	24	D2-	Out
9	D3+	Out	25	D3-	Out
10	D4+	Out	26	D4-	Out
11	D5+	Out	27	D5-	Out
12	D6+	Out	28	D6-	Out
13	D7+	Out	29	D7-	Out
14	D8+	Out	30	D8-	Out
15	D9+	Out	31	D9-	Out
16	GND			Shield	

Pin 1
Pin 31
(View from back of camera)
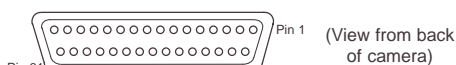
31 Pin Configuration

12-Pin Connector

1	GND	7	Strobe output **+**
2	+12V	8	Strobe output **-**
3	GND	9	RS-232 TXD (RS-485)
4	Video	10	RS-232 RXD (RS-485)
5	GND	11	Integration control
6	VINIT	12	N/C

12 Pin Configuration

SVGA Output (15 pin D-sub Connector)

1	RED	9	N/C
2	GREEN	10	GND
3	BLUE	11	GND
4	I.D.	12	I.D.
5	N/C	13	H SYNC
6	RED GND	14	V SYNC
7	GREEN GND	15	N/C
8	BLUE GND		
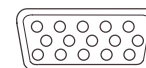
15 Pin Configuration

Control Switches

Mode Control Switch

Up/Down Switch

0	Normal mode				
1	Gain control (variable)	up/down			
2	Async/man shutter	up:	Manual,	down:	Async
3	Gain selection (fixed)	up:	9db,	down:	12db
4	Gain selection (fixed)	up:	18db,	down:	22db
5	Image output selection	up:	Direct mode (digital)		

Analog output: 47 frame/sec. SVGA output fHD=49.5 kHz, VfD=47.2Hz

Digital output: 10-bits output without memory, 12 frame/sec (20MHz)

down: Memory mode

Analog output: 12 frame/sec. Non SVGA output
Digital output: 8-bits output with memory 12 frame/sec (20MHz)

6	A/D top	up/down			
7	A/D bottom	up/down			
8	Freeze (ENINT) enable	up:	Real time,	down:	Freeze
9	Factory set recall	up:	Load,	down:	Load
A	Power up default page	up:	Load,	down:	Save
B-D	User page storage (store user settings)	up:	Load,	down:	Save
E	Direct Shutter	up/down(1/39,000 to 1/12 sec., 1H intervals)			
F	Fast Dump	up:	Normal,	down:	Fast Dump

Shutter Control Switch

	Manual	Async
0	no shutter	no shutter
1	1/50	1/39,000
2	1/100	1/9,500
3	1/200	1/5,500
4	1/400	1/3,000
5	1/1,500	1/1,500
6	1/3,000	1/400
7	1/5,500	1/200
8	1/9,500	1/100
9	1/39,000	1/50

SHUTTER   MODE   POWER
UP
DWN
SVGA   VIDEO
DIGITAL
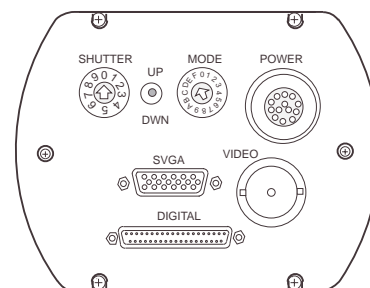
Back Plate

RS-232C and RS-485 Control

The TM-1300 mode selection can be accomplished remotely via RS-232C/RS-485 control. (RS-485 communication control is available as an option.) Control software is available from PULNiX which can be used for both RS-232 and RS-485 communications.
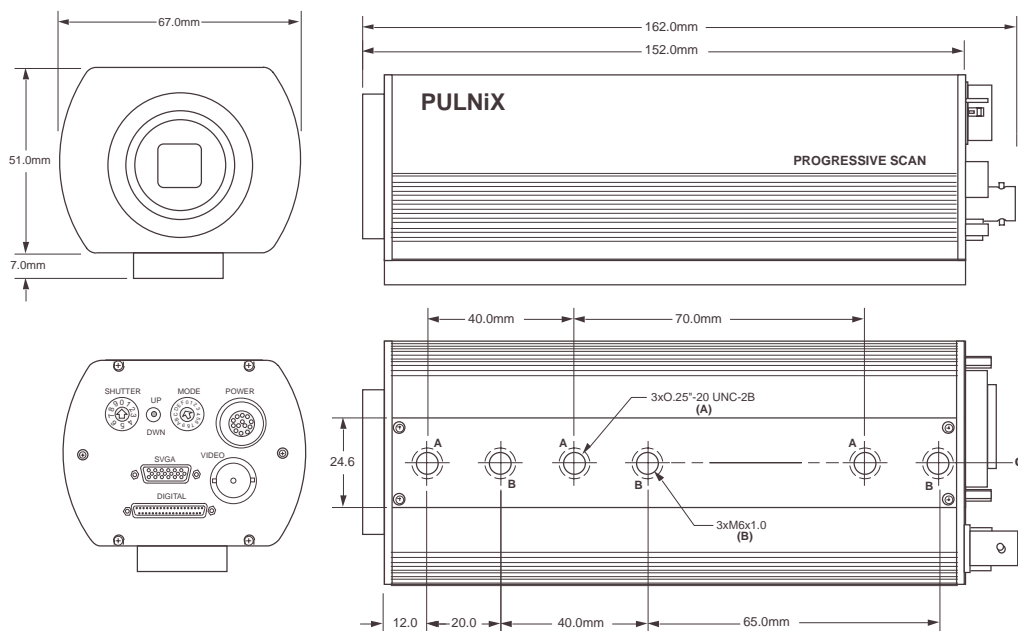
Digital Cable

The TM-1300 uses a 31-pin high-rel connector for digital output to ensure reliable contact in a wide range of demanding applications including mobile, airborne, vision robot, and long cable applications. The light weight cable together with the miniature connector ensure flexible and reliable camera installation. PULNiX standard 8-bit cable 30DG-02 or 10-bit cable 30DG-02-40 are available.

Product Specifications

Imager	2/3" (9.1mm x 6.9mm) progressive scanning interline transfer CCD
Pixel	1300 (H) x 1030 (V), active area; 5:4 aspect ratio
Cell size	6.7 µm x 6.7 µm
Scanning	1044 lines
Sync	Internal only
	Display mode: HD = 49.5 kHz, VD = 47.2 Hz
	Digital output: LDV = 12.4 kHz, FDV = 11.9 Hz, pixel clock = 20.0 MHz
Data clock output	20.000 MHz
Resolution	Digital: 1300 (H) x 1030 (V)
S/N ratio	50dB min., 56dB typical
Min. illumination	1.0 lux, f=1.4 without IR cut filter (no shutter)
Video output	Digital 8/10-bit RS-422 output and Analog 8-bit SVGA (R.G.B. channel)1.0 Vp-p video, 75Ω and sync
Gain control	Manual (18dB factory setting)
Gamma	1.0 (.45 optional)
Lens mount	C-mount
Power req.	12V DC, 600 mA (PD-12P supplied)
Operating temp.	-10°C to 50°C
Vibration & shock	Vibration: 7G (200 Hz to 2000 Hz) Shock: 70G
Size (W x H x L)	51mm x 67mm x 162mm (2.01" x 2.64" x 6.38")
Weight	475 grams w/o tripod mount (tripod mount is 60g)
Power cable	12P-02
Power supply	K25-12V or PD-12
Auto iris connector	None
Functional options	TBD
Accessories	MP-211-031-113-4300 31-pin mating connector; (30DG-02-40 cable is included), RS-232 cable & software

Physical Dimensions

TM-1300