

TMC-1000 PROGRESSIVE SCAN FULL-FRAME COLOR CAMERA



GENERAL DESCRIPTION

The PULNiX TMC-1000 is a 1k x 1k resolution progressive scan color camera with asynchronous reset capability. The primary color, Bayer CFA progressive scan interline transfer CCD combines excellent resolution and color fidelity with superb electronic shutter capability. Progressive scanning permits a full frame of image resolution per shutter or integration, a significant advantage over TV format (interlace) color cameras including 3-chip cameras.

The digital output is 24-bit, LVDS Channel Link™* output. The built-in Digital Signal Processor (DSP) is controlled by an RS-232 communication port for remotely adjusting color matrix, white balance, gain, edge enhancement, and other functions. Up to four sets of control parameters can be stored in the 4 RAM banks and saved to EEPROM. This makes it particularly easy to switch between sets of parameters as the application setting demands.

APPLICATIONS

- Dynamic motion capturing
- Gauging
- Still picture storage
- Printing
- On-line inspection
- high definition graphics
- High resolution surveillance.



PULNiX's proprietary DSP chip

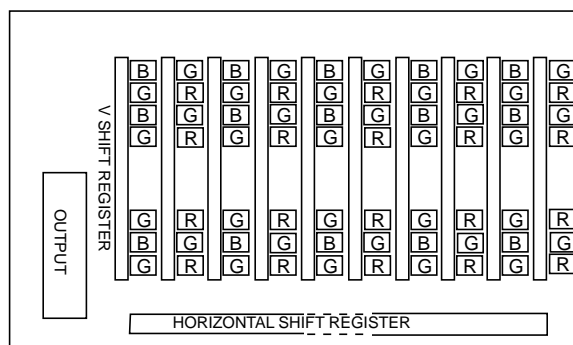
NEW PRODUCT SUMMARY

- RGB primary color 1" progressive scanning interline transfer CCD imager (1008 H x 1018 V)
- Full digital processing using real time DSP via LVDS channel link
- Progressive scan output in 24-bit RGB digital and analog output
- Built-in YCrCb 4:4:4 and 4:2:2 converter
- Full frame shutter, 1/15 to 1/16,000 sec.
- Asynchronous reset with external shutter control
- External sync control
- Full frame integration
- RS-232 control

PROGRESSIVE SCAN INTERLINE TRANSFER CCD COLOR FILTER

The TMC-1000 employs a color filter array (CFA) called a "Bayer CFA" which comprises a ratio of two green pixels to one red or blue pixels. The color interpolation is implemented by digital signal processing developed by PULNiX.

All signal processing is controlled by digital calculation. The color matrix generates a high level of color consistency for the most demanding industrial applications. The color matrix coefficients are externally controllable via the RS-232. PULNiX offers the user a simple Windows-based software package for basic function control.



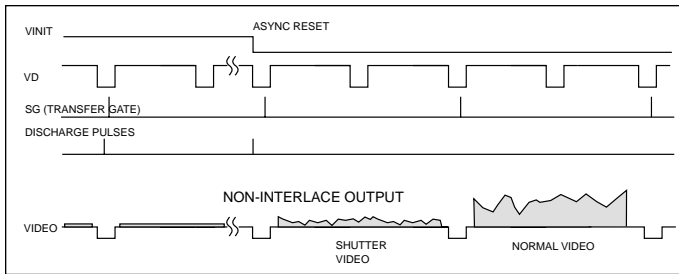
*Channel Link™ is a trademark of National Semiconductor

NOTE: All specifications and information presented in this preliminary data sheet are subject to change. PULNiX releases preliminary technical data for new products as a service to our customers with the understanding that final production models may vary from the specifications listed herein.

ASYNCHRONOUS RESET

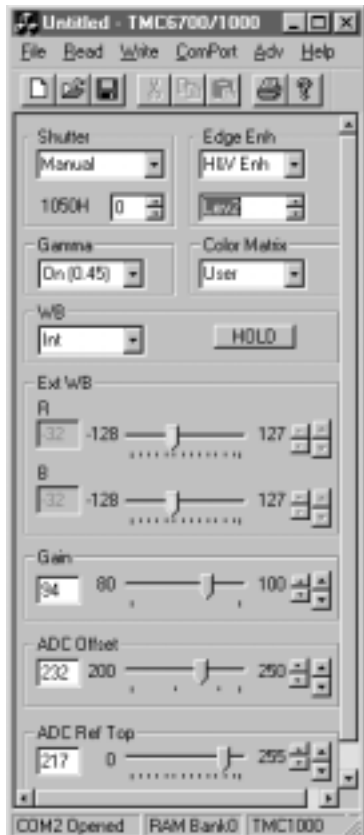
The TMC-1000 asynchronous reset operates with internal sync or external HD for phase locking. When VINIT pulse is applied, it resets the camera's scanning and purges the CCD. There are three modes to control the asynchronous reset and shutter speed:

- External VINIT with pulse width control.** The pulse width between two pulse edges controls the shutter speed externally from 1/16,000 sec. to 4 sec.
- Internal shutter speed with fast mode.** The video signal has no delay from the reset timing. The shutter speed range is 1/2,000 to 1/16,000 sec.
- Internal shutter speed with slow mode.** The speed control is variable from 1/15 to 1/1,750 sec. The video signal starts with internal V reset timing related to shutter speed.



Fast Mode Operation

SOFTWARE



ELECTRONIC SHUTTER

The TMC-1000 has a substrate drain type shutter mechanism which provides a superb picture at various speeds without smearing. Progressive scanning permits 1016 lines (2 lines less than the imager) of full vertical resolution per single shutter. The manual shutter speed control selects the electronic shutter rate of 1/15 to 1/16,000 sec. The user can assign any shutter speed to any of the preset shutter positions. The factory default values are as follows:

Shutter Control Switch		
	Manual	Async
0	no shutter	no shutter
1	1/60	1/16,000
2	1/125	1/8,000
3	1/250	1/4,000
4	1/500	1/2,000
5	1/1,000	1/1,000
6	1/2,000	1/500
7	1/4,000	1/250
8	1/8,000	1/125
9	1/16,000	Pulse width control

SHUTTER



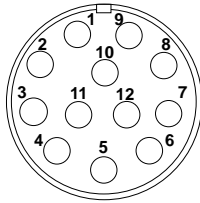
The asynchronous shutter is activated by selecting async reset and the shutter speed. The async reset pulse, VINIT, must be applied to set up the shutter. With VINIT high (5V), the CCD keeps discharging. With a negative going pulse to VINIT, the camera resets and purges the charge momentarily. Then it starts integrating for the period of shutter control set either by internal shutter control or external pulse width control. Then "0" shutter is selected in async mode, the camera resets asynchronously without shutter function; this can be used for applications requiring strobe lighting.

INTEGRATION

The CCD imager of the TMC-1000 can be exposed for longer than 1 frame timing (1/15 sec.). This feature provides high sensitivity for low light applications. Integration is achieved by controlling the #11 pin of the 12-pin connector to Low (GND). Integration also can be achieved by VINIT pulse width control of the async shutter up to four seconds.

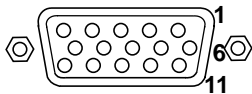
PIN CONFIGURATIONS

12-Pin Connector



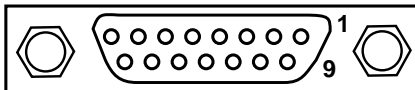
Pin	TMC-1000	12P-02 Cable
1	GND	Gray
2	+12V DC IN	Yellow
3	GND	Red Shield
4	N/C	Red Coax Signal
5	GND	Orange Shield
6	VINIT	Orange Coax Shield
7	VD IN	Black Coax Signal
8	GND	White Shield
9	HDIN	White Coax Signal
10	N/C	Brown
11	INTEG CONT	Blue
12	GND	Black Shield

15-Pin SVGA Output Connector



Pin#	Description	Pin#	Description
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		

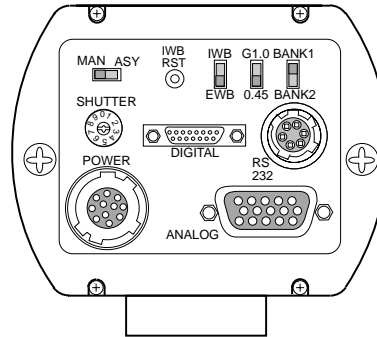
15-Pin Connector Airborn: MP2210152432200



Pin#	Description	Pin#	Description
1	CH CLK+	9	CH CLK-
2	CH0+	10	CH0-
3	CH1+	11	CH1-
4	CH2+	12	CH2-
5	CH3+	13	CH3-
6	D_VINIT+	14	D_VINIT-
7	D_INTEG+	15	D_INTEG-
8	GND		

Note: CH** : LVDS Channel Link™ output
 D_VINIT, D_INTEG: LVDS input for camera control

REAR PANEL



Shutter Mode Switch

The shutter mode switch selects between manual shutter mode (MAN) and asynchronous shutter mode (ASY).

Shutter Speed Control Dial

Shutter speed can be selected by switching the shutter dial to the appropriate setting (0 through 9). The factory default settings can be used, or each position can have any shutter speed by assigning a value to the proper register address.

White Balance Control Switches

The IWB/EWB switch selects between Internal White Balance (IWB) and External White Balance (EWB).

IWB Reset Button

When held down, the IWB Reset Button calibrates the white balance so that the selected object appears to be white. After it is released, the camera maintains the last white balance value.

Gamma Control Switch

The Gamma Control switch selects between gamma 1.0 and gamma 0.45.

Bank Switch

The Bank Switch selects Bank1/Bank2 parameter sets. Bank3 and Bank4 are selectable only via RS-232C control.

TMC-1000 PRELIMINARY DATA SHEET

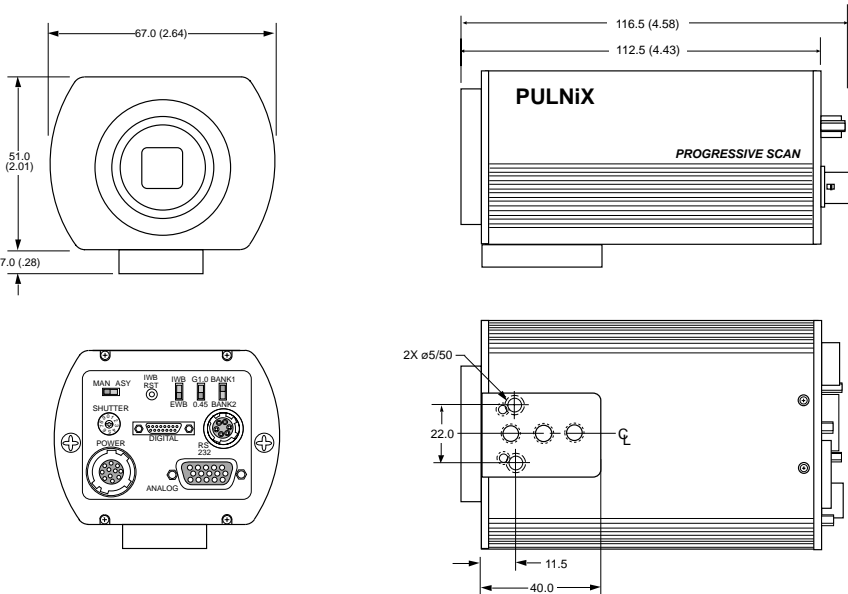
Rev.04/12/99

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PRELIMINARY PRODUCT SPECIFICATIONS

Imager	1" progressive scanning interline transfer CCD (Primary RGB color filter)
Pixel	1008 (H) x 1018 (V)
Cell size	9.0μm x 9.0μm
Scanning	Progressive, 1050 lines 15Hz
Sync	Internal/external auto switch HD/VD, 4.0 Vp-p impedance 4.7KΩ VD = 15Hz ±5%, non-interlace HD = 15.75KHz ±3%
Data clock output	20.034MHz
Resolution	Digital: 1006 (H) x 1016 (V)
S/N ratio	50dB min., 56dB typical
Min. illumination	10.0 lux, f-1.4 (no shutter). Sensitivity: 10μV/e-
Video output	Digital: 24-bit LVDS Channel Link™ Analog: 0.66 Vp-p 75Ω RGB video
Gamma	0.45 or 1.0 (0.45 std.)
Lens mount	C-mount
Power req.	12V DC 600mA
Operating temp.	-10°C to 50°C
Vibration & shock	Vibration: 7G, Shock: 70G
Size (W x H x L)	51mm x 67mm x 116.5mm (2.01" x 2.64" x 4.58")
Weight	374g (13.2 oz.)
Power cable	12P-02
Power supply	K25-12V or PD-12
Functional options	TBD
Accessories	Digital cable (model# TBD), model CS-232 RS-232 cable with software set, TBD

PHYSICAL DIMENSIONS



For product availability information or technical assistance contact the Imaging Products Sales Department.



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