



### Product Features

- Very high resolution 1" progressive scanning 1024(H) x 1024(V) interline transfer CCD imager
- Digital RS-422 output for progressive scan or analog output with monitor display format
- 15 frames per sec.
- Full-frame shutter to 1/16,000 sec.
- Asynchronous reset with ext. shutter control
- Frame memory built-in for async image capturing
- Full frame integration with uninterrupted video
- AGC on/off, gamma 1 or 0.45
- Small and light weight; high-rel connectors

### General Description

The PULNiX TM-1001 is a very high resolution monochrome progressive scan CCD camera. The interline type progressive scan CCD permits full vertical and horizontal resolution of very high speed shutter images. The electronic shutter, which has speeds to 1/16,000 sec., can be reset asynchronously by external pulse control. The frame rate is 15 fps. A square imager format with uniform square pixels provides superior image definition in any orientation. On-chip micro lenses mean increased sensitivity.

The TM-1001 has its own built-in frame store which captures and outputs full-frame images in real time. The camera has an 8-bit, RS-422 digital signal output for interfacing with external image processing systems. Special interface cables are available for connecting the TM-1001 directly to many existing commercial frame grabbers.

Applications for the TM-1001 include medical imaging, intelligent transportation systems, high definition graphics, on-line inspection, gauging, character reading, archiving, and long range acquisition.

### Electronic Shutter

The TM-1001 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 1/60 (non-async mode only), 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, or 1/16,000 second.

With VINIT high (5V), the CCD keeps discharging. With a negative pulse to VINIT, the camera resets and purges the charge momentarily. Then it starts integrating for the period of shutter control set by either an external pulse width or internal shutter control. Progressive scanning permits a full 1000 lines of vertical resolution, as compared to a conventional CCD camera which captures only half the vertical lines per shutter.

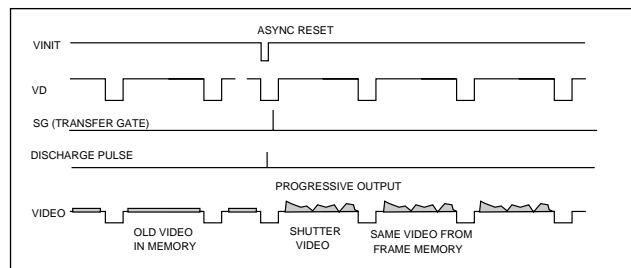
### Integration

The CCD imager of the TM-1001 can be exposed for longer than the normal scan timing of 1/15 sec. This integration feature provides extra sensitivity for dark environment applications. The progressive scan imager permits a full frame of resolution in non-interlace format. Integration is achieved by controlling the #11 pin of the 12-pin connector to low (GND). The internal frame memory provides continuous video output without a frame grabber.

### Asynchronous Reset

The TM-1001's asynchronous reset is flexible and accepts external horizontal drive (HD) for phase locking. When the VINIT pulse is applied, it resets the camera's scanning and purging of the CCD. There are three modes to control the asynchronous reset and shutter speed:

- 1. External VINIT with pulse width.** The duration between pulse edges controls the shutter speed externally.
- 2. Internal shutter speed with Fast mode.** The video signal has no delay from the reset timing (shutter speed range is 1/2,000 to 1/16,000 sec.)
- 3. Internal shutter speed with Slow mode.** The speed control varies from 1/125 to 1/1,000 sec. The video signal starts with internal V reset timing related to shutter speed. The built-in frame memory maintains the asynchronously captured full frame image until the next VINIT pulse comes in. The output can be either 1/15 sec. or 1/30 sec. of progressive scanning. Both analog non-interlace format (1Vp-p, 75Ω) and 8-bit digital format (RS-422) are available from the camera.



TM-1001

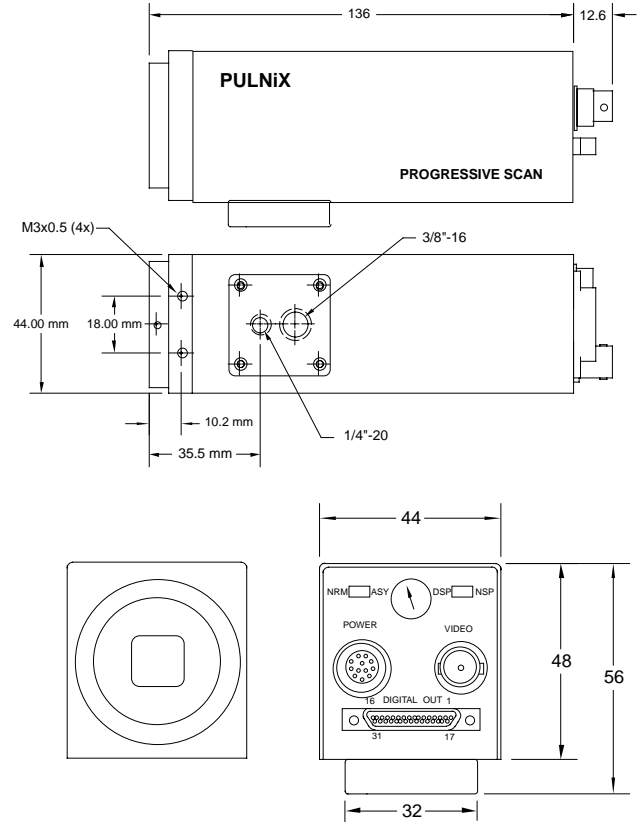
# Specifications

<b>Imager</b>	1" (9.1mm x 9.2mm) progressive scan interline transfer CCD
<b>Pixel Cell size</b>	1024 (H) x 1024 (V) 9.0 μm x 9.0 μm
<b>Scanning Sync</b>	1050 lines; 15 Hz (30 Hz display mode) Internal/external auto switch HD/VD, 4.0 Vp-p impedance 4.7KΩ VD=15 Hz ±5%, non-interlace HD=15.75kHz±5%
<b>Data clock output Resolution</b>	20.034 MHz (40.068 MHz for DSP)
<b>S/N ratio Min. illumination</b>	Digital: 1008 (H) x 1018 (V), Analog: over 700 TV lines (H) x 800 TV lines (V) 50dB min. ( AGC = off ) 1.0 lux, f=1.4 without IR cut filter (no shutter) Sensitivity: 10μV/e-
<b>Video output</b>	1.0 Vp-p composite video, 75Ω and 8-bit RS-422 output
<b>AGC</b>	ON*/OFF (OFF std.) *AGC is applicable on analog output only
<b>Gamma Lens</b>	0.45 or 1.0 (1.0 std.) C-mount (use 1" format lenses) Adjustable Back Focus
<b>Power req. Operating temp. Vibration &amp; shock</b>	12V DC, 600 mA -10°C to 50°C* Random Vibration: 7G (200 Hz to 2000 Hz) Shock: 70G
<b>Size (W x H x L)</b>	44mm x 48mm x 136mm (1.73" x 1.91" x 5.35")
<b>Weight</b>	330 grams (11.6 oz)
<b>Power cable</b>	12P-02
<b>Power supply</b>	PD-12P (includes power connector)
<b>Auto iris connector</b>	None
<b>Functional options I/O</b>	See price list for current listings. MP-211-031-113-4300 31-pin mating connector; 30DG-02, or 30DG-02K interface cable

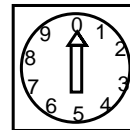
Note: The TM-1001 is provided with a 30DG-02 interface cable and PD-12P power supply/power cable as standard.

\* Image quality will degrade with increasing temperature.

# Dimensions (mm)



## SH CONTROL



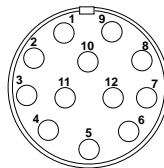
## Shutter Control Switch

	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	Ext. pulse width

# Pin Configuration

## 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	EXT HD	In	21	EXT VD	In
6	INTEG	In	22	ENINT	In
7	LPULSE	Out	23	GND	
8	D0+	Out	24	D0-	Out
9	D1+	Out	25	D1-	Out
10	D2+	Out	26	D2-	Out
11	D3+	Out	27	D3-	Out
12	D4+	Out	28	D4-	Out
13	D5+	Out	29	D5-	Out
14	D6+	Out	30	D6-	Out
15	D7+	Out	31	D7-	Out
16	GND				



## 12-Pin Connector

1	GND	7	VD in
2	+12V	8	GND
3	GND	9	HD in
4	Video	10	GND
5	GND	11	Int. cont
6	VINIT	12	GND

**Note:** CLK: data clock, LDV: Line data valid, FDV: Frame data valid, ENINT: Integration enable, LPULSE: Last pulse

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