

# PULNiX TM-6702

## Progressive Scan Full Frame Shutter Camera

### General Description

The PULNiX TM-6702 is a high resolution monochrome camera with non-interlace double speed scanning VGA format (60Hz or 30Hz). Since the double speed mode is standard, images can be displayed on a standard VGA monitor. PULNiX PVM multi-sync monitors can display real time VGA images. The shutter function works in all scanning modes.

The signal is analog progressive scanning (525 lines). The full frame electronic shutter with asynchronous reset permits shutter speeds to 1/32,000 sec. Square pixels provide excellent image definition in all orientations. Optional features include AGC enable, internal IR cut filter, gamma adjust to 0.45, and remoted imagers.

#### Applications

- Machine vision
- Bar code reading
- High speed on-line inspection
- Gauging
- Character reading
- High definition graphics
- Intensified CCD cameras
- Fast speed surveillance

### Asynchronous Reset

The TM-6702's asynchronous reset is flexible, accepting external horizontal drive (HD) for phase locking. Three modes control the asynchronous reset and shutter speed. With async shutter mode and external VINIT high (5V), the async mode is automatically selected and the signal readout is inhibited until the trigger starts. Without VINIT, the camera remains in the normal mode.

- 1. External VINIT with controlled pulse width.** The duration between pulse edges controls the shutter speed externally.
- 2. Internal shutter speed with Fast Mode.** The video signal capturing has no delay from the reset timing if the falling edges of VINIT and external HD are the same. Otherwise, there is a 0-1 HD delay.
- 3. Internal shutter speed with Slow Mode.** The speed control can be selected from 1/250 to 1/2,000 sec. The camera will discharge at VINIT falling edge, if VINIT and external HD falling edges are the same, and start accumulating charges. The output will be delayed depending on the selected shutter speed.

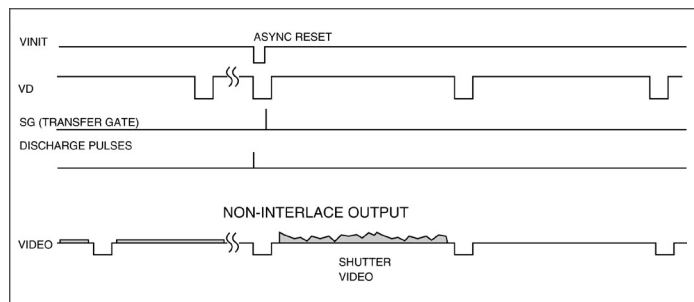
### Electronic Shutter

The TM-6702 has a substrate drain shutter mechanism which produces a superb picture without smearing. At double speed (60Hz), the built-in manual shutter speed control selects the electronic shutter rate of 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, 1/16,000, or 1/32,000 sec. At 30Hz, the shutter speeds are half of what they are at 60Hz. Progressive scanning allows a full 484 lines of vertical resolution per single shutter, resulting in crisp images of moving objects without requiring strobe lighting. In comparison, a conventional CCD camera permits only 244 lines per shutter event.



### Product Features

- High resolution 1/2" progressive scanning interline transfer CCD imager 648 (H) x 484 (V)
- Double speed progressive scan (525 lines at 60Hz or 30Hz) with single channel output
- Full frame shutter, 1/60 to 1/32,000 sec. (to 1/16,000 at 30Hz)
- Asynchronous reset with ext. shutter control
- Full frame integration
- On chip micro-lens and low smear at fast shutter
- AGC on/off, gamma 1 or 0.45
- Small, lightweight, rugged design
- Single channel VGA analog output



### Scan Speed Selection

By setting the speed switch on the back plate, the TM-6702 can scan with normal double speed (525 lines per 60 Hz).

Switch selection: Normal Mode/Async Mode  
Frame rate: 60Hz / 30Hz

### Integration

The CCD imager of the TM-6702 can be exposed longer than normal TV timing (1/60 sec.). This feature provides high sensitivity for dark environment applications. Integration is achieved by controlling the #11 pin of the 12-pin connector to Low (GND). The progressive scanning CCD chip in the TM-6702 produces a full frame of resolution, using a frame grabber to capture the one frame of integrated image in non-interlace format.

#### CE Compliance

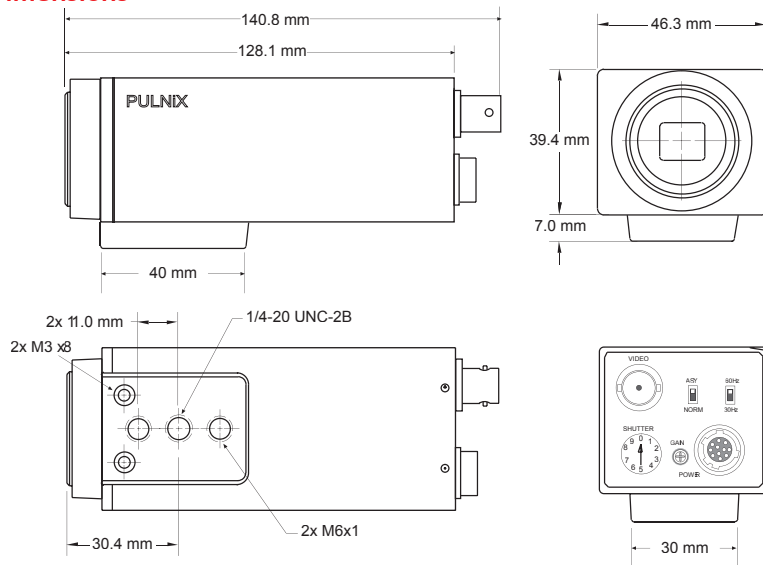
All JAI PULNiX products bearing the "CE" mark have been certified for CE compliance. Please note that the use of non-shielded or improperly shielded interconnect cables may effect CE compliance. Please contact the PULNiX Sales Applications Engineering department for further information specific to CE compliance.

## Specifications

Imager	1/2" progressive scan interline transfer CCD
Pixels	648 (H) x 484 (V)
Cell Size	9.0 μm x 9.0 μm square pixels
Scanning	60 Hz (double speed) non-interlace or 30 Hz non-interlace. 525 scan lines both modes.
Sync	Internal/External Auto Switch HD= 31.468 KHz ± 5% or 15.734 KHz Vertical aasync reset or VD=60 Hz / VD=30 Hz
Asynchronous Reset	Vertical scan initialization (VINIT) upon TTL trigger from external source. Balck video output while VINIT is inactive. Ext. shutter speed control pulse (pulse width control).
Pixel Clock	25.49 MHz / 12.745 MHz
TV Resolution	500 (H) x 484 (V) lines
S/N Ratio	50 dB min. (AGC off), 56 dB min (30 Hz)
Min. Illumination	2 lux at normal speed, 1 lux at 30 Hz
Video Output	1.0 Vp-p composite video, 75Ω non-interlace
AGC	OFF (AGC ON is a factory option)
Gamma	1.0 or 0.45 (1.0 std)
Asynchronous Electronic Shutter Capability	1-8 shutter mode switch controls exposure in periods of horizontal scan times (H). Shutter control mode 9 is controlled via external pulse width. Periods of H vary depending on scan mode. Full frame resolution per shutter.
Lens Mount	C-mount
Power Requirement	12V DC 400 mA
Operating temperature	-10° C to 50° C
Vibration & Shock	Vibration: 7GrS @ 10-2000 Hz, Shock: 70G
Size (W x H x L)	46.3 mm x 39.4 mm x 140.8 mm
Weight	220 grams (7.8 oz)
Power Cable	12P-02S
Power Supply	PD-12U Series
Auto Iris Connector	None
Functional Options	See current price list

\* NOTE: Image degradation may occur at increased temperatures.

## Dimensions



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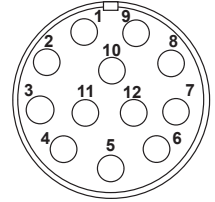
## Option 7-2 (Clock and HD, VD Output)

Clock is output from pin #4 (CLK+) and pin #3 (CLK-). HD+ (#9) and VD+ (#7) are negative common (single ended). The negative side is GND. The RS-422 driver is DS90C031M. If the termination resistor is high impedance, it may work with TTL input.

## Pin Configuration

### 12-Pin Connector

1 GND	7 VD in (out)
2 12V in	8 GND
3 GND	9 HD in (out)
4 Video out (CLK out)	10 N/C
5 GND	11 Integ
6 Vinit	12 GND



NOTE: Items in parentheses are options.

## Shutter Control Settings (60 Hz)

1H = 31.8μs

Position	Manual Shutter	Async Shutter	
0	No Shutter	No Shutter	
1	1/125	1.0H	1/32,000
2	1/250	2.0H	1/16,000
3	1/500	4.0H	1/8,000
4	1/1,000	8.0H	1/4,000
5	1/2,000	16.0H	1/2,000
6	1/4,000	32.0H	1/1,000
7	1/8,000	64.0H	1/500
8	1/16,000	128.0H	1/250
9	1/32,000	Shutter det. by pulse width	

## Shutter Control Settings (30 Hz)

1H = 63.5μs

Position	Manual Shutter	Async Shutter	
0	No Shutter	No Shutter	
1	1/62.5	1.0H	1/16,000
2	1/125	2.0H	1/8,000
3	1/250	4.0H	1/4,000
4	1/500	8.0H	1/2,000
5	1/1,000	16.0H	1/1,000
6	1/2,000	32.0H	1/500
7	1/4,000	64.0H	1/250
8	1/8,000	128.0H	1/125
9	1/16,000	Shutter det. by pulse width	

Async Reset Mode: Mode 0: normal mode; Mode 1-4: fast mode; Mode 5-8: slow mode; Mode 9: pulse width mode. In modes 1-9, the camera is in standby only, and black video is output. One frame image will be output upon receiving an async reset pulse. No shutter is equivalent to a frame period for the applicable mode. H = horizontal scan time, which depends on scan mode. Please refer to TM-6702 Operations Manual for Async timing information.

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71-0024, Rev.C.10.28.2003



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