

- High magnification, long working distance auto focus design.
- Very fast auto focus adjustment (less than 0.5 seconds).
- Built-in optical zoom varies from 5.5X up to 14X.
- Operational with only ambient light.
- Extremely reliable and durable in demanding factory environments.
- High magnification infinity corrected objectives can be integrated.
- RS-232 computer controllable.
- Coaxial illumination available with high magnification system.
- Low cost.



Easy Reader Auto Focus Optical Systems

Easy Reader

AF Systems



Navitar's Auto Focus systems are ideal for imaging objects with varying feature heights. The DSP technology used to adjust focus eliminates the need to move the optical system or object to regain sharp focus. This feature can dramatically reduce the cost of developing fixtures.

The Easy Reader Auto Focus systems are RS-232 controllable, allowing computer operation of the camera's zoom, gain, iris, electronic shutter and white balance functions. Navitar offers Compact Easy Reader AF Systems, High Magnification AF models and many custom units that can be configured to meet nearly any field of view or working distance. Please call for more information on configuring an Easy Reader Auto Focus system to meet your specific needs.

Ideal for High Magnification Vision Applications

As a result of the ever increasing demand for automated optical inspection (AOI), Navitar has introduced a line of Easy Reader Auto Focus zoom systems. These systems automatically adjust focus using Digital Signal Processing (DSP) technology.

Compact Easy Reader Field of View (14:1 Zoom Ratio)

Lens Attachment	W.D.	FOV at High Mag.		Resolution (microns)	FOV at Low Mag.		AF Adjustment	
		H	V		H	V	High Mag.	Low Mag.
0.25X	309	12.6	9.3	15	173.0	129.8	129	300
0.5X	160	6.4	4.8	8	89.6	67.2	35	150
0.75X	107	4.3	3.2	5	59.9	44.9	15	100
1X	86	3.4	2.6	4	48.2	36.1	10	80
1.5X	50	2.0	1.5	3	28.0	21.0	3	45
2X	37	1.5	1.1	2	20.7	15.5	2	30

**Measurements are in millimeters unless otherwise specified.*



High Magnification Easy Reader Field of View (8:1 Zoom Ratio)

Lens Attachment	W.D.	FOV at High Mag.		FOV at Low Mag.		AF Adjustment	
		H	V	H	V	High Mag.	Low Mag.
0.25X	356	4.8	3.6	38.4	28.8	19	78
0.5X	175	2.4	1.8	19.2	14.4	5	39
0.75X	113	1.6	1.2	12.8	9.6	2	26
1X	92	1.2	0.9	9.6	7.2	1	19
1.5X	51	0.8	0.6	6.4	4.8	0.5	13
2X	36	0.6	0.5	4.8	3.6	0.3	10
Mitutoyo (5.5:1)							
5X	34	0.5	0.4	2.9	2.1	0.2	6
10X	33	0.2	0.2	1.4	1.1	0.05	3
20X	20	0.1	0.1	0.7	0.5	0.01	1

**Measurements are in millimeters unless otherwise specified.*

How Does the Auto Focus Work?

Passive Auto Focus

Passive auto focus determines the distance to the subject by computer analysis of the image itself. The camera actually looks at the scene and drives the lens back and forth searching for the best focus.

A typical auto focus sensor is a charge-coupled device (CCD) that provides input to FFT (fast fourier transforms) algorithms that compute the contrast of the actual picture elements. The CCD is typically a single strip of 100 or 200 pixels. Light from the scene hits this strip and the microprocessor looks at the values from each pixel. (See image to the right to help you understand what the camera sees.)

The microprocessor in the camera looks at the strip of pixels and looks at the difference in intensity among the adjacent pixels. If the scene is out of focus, adjacent pixels have very similar intensities. The microprocessor moves the lens, then looks at the CCD's pixels again to see if the difference in the intensity between adjacent pixels improved or declined. The microprocessor then searches for the point where there is a maximum intensity difference between adjacent pixels. That point is the point of best focus.

Passive auto focus must have light and image contrast in order to do its job. The image needs to have some detail in it that provides contrast. If you try to take a picture of a blank wall or large object of uniform color, the camera cannot compare adjacent pixels, so it cannot focus. Navitar's high contrast optical systems allow the combination of these two technologies, resulting in the creation of the Easy Reader Auto Focus System.



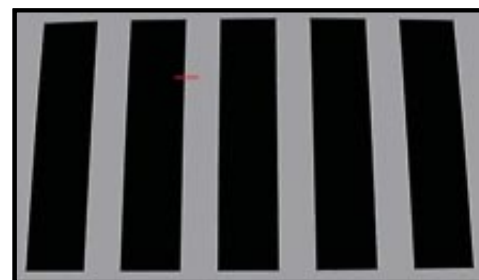
Out-of-Focus Scene



Out-of-Focus Pixel Strip



In-Focus Scene

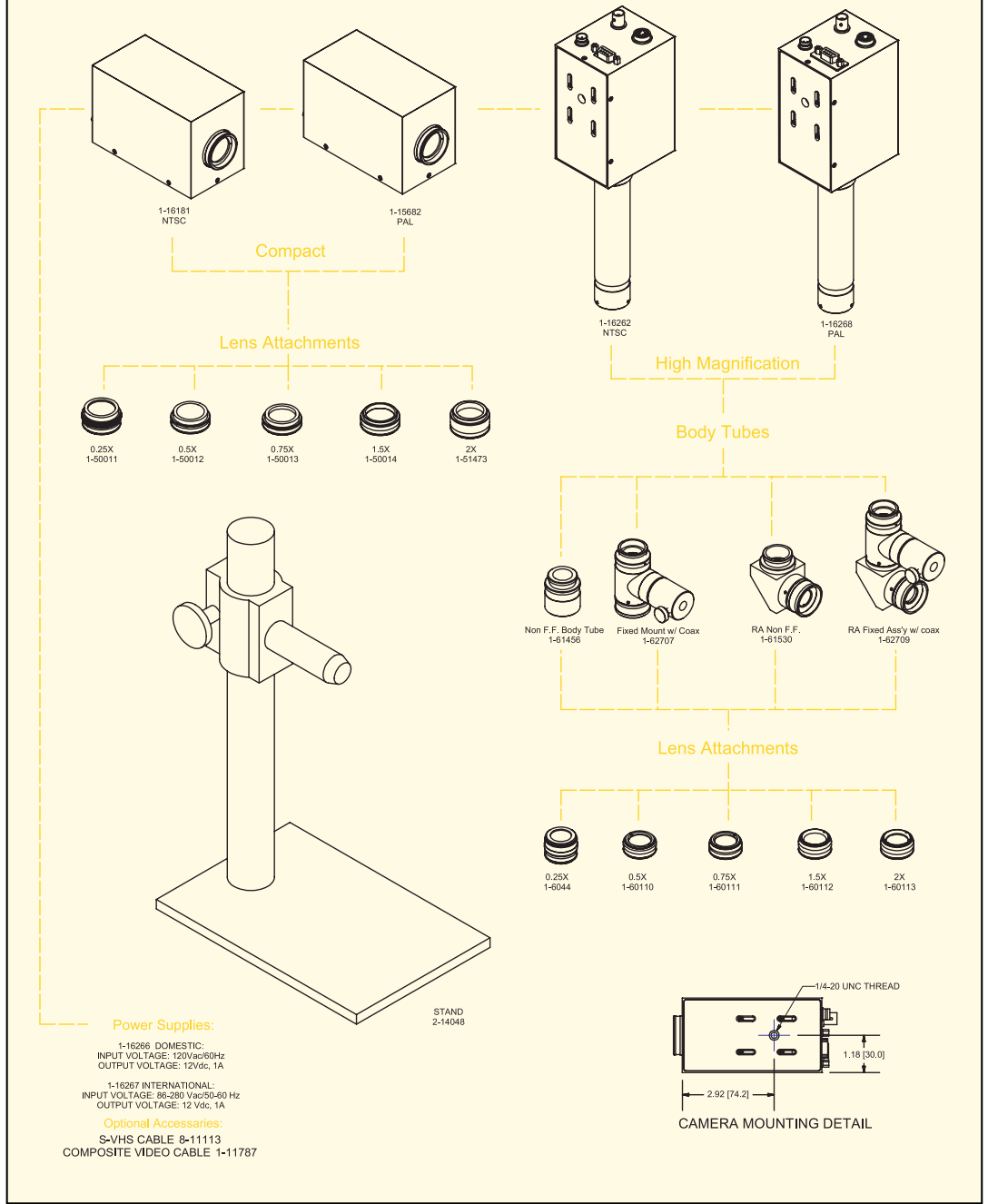


In-Focus Pixel Strip



Easy Reader Auto Focus Optical Systems

Easy Reader System Diagram.....



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