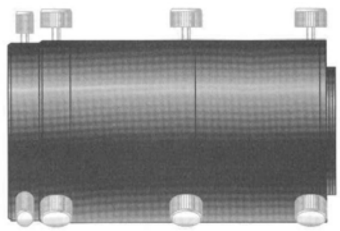
Vixen

! ! ! ! Eyepiece Projection Camera Adapter ! ! ! ! ! ! ! ! ! ! ! ! !

Instruction Manual

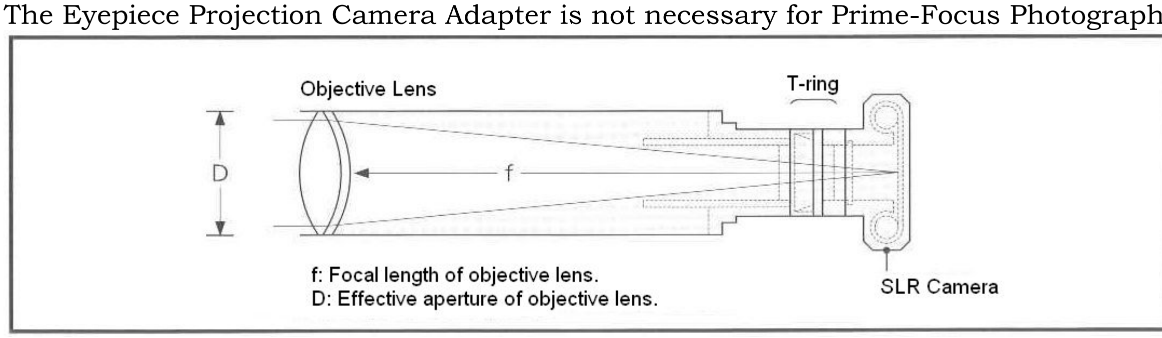
! ! ! ! 

Before Use

There are two methods used in astrophotography of attaching the camera adapter to the telescope. One is called Prime-Focus Photography and another is Eyepiece-Projection Photography. With Eyepiece-Projection Photography, a T-ring appropriate for your SLR camera is required. The T-ring is sold separately.

Prime-focus Photography

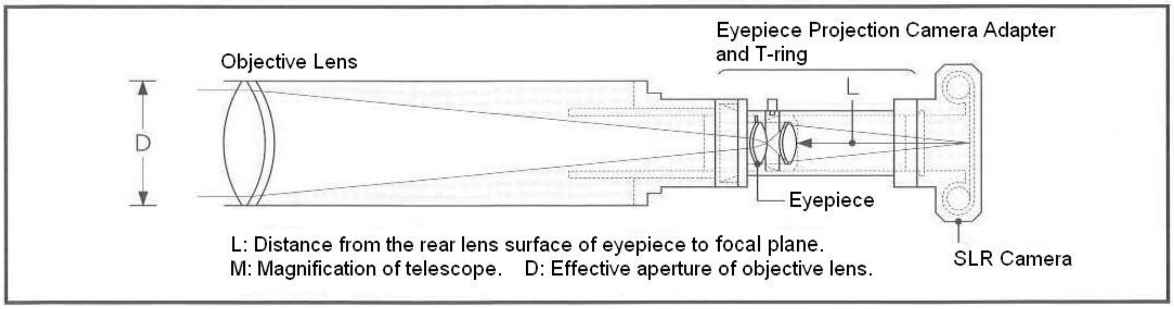
The telescope is used like a telephoto lens and light entering from the objective lens will focus on the focal plane of a camera or a CCD imaging device to form an image. With prime-focus photography, a telescope of 1,800mm in focal length becomes a 1,800mm telephoto lens.
Taking photos of the moon, for example, allows the camera to be set at a faster shutter speed. The longer the focal length of the telescope, the dimmer the celestial objects like nebulae and star clusters. This will require a longer exposure time and more precise tracking. A sturdy, high-precision equatorial mount is essential for successful astrophotography.
Prime-Focus Photography is useful for photographs of the moon and the entire image of nebulae or star clusters.
The Eyepiece Projection Camera Adapter is not necessary for Prime-Focus Photography.



Eyepiece-Projection Photography

The Eyepiece-Projection Photography method takes photos of a magnified image through an eyepiece attached in the back of the telescope as shown in the figure below.

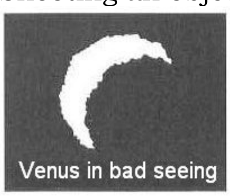
The eyepiece inserted must be able to fit into the Eyepiece Projection Camera Adapter. (The biggest 31.7mm eyepiece allowable is 48mm in outer diameter and 90mm in length.) It is ideal for taking close-ups of small regions of the moon and details of the planets.

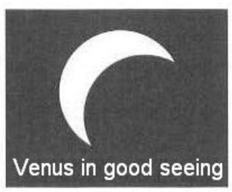


FYI: Using a method of Afocal Imaging photography with a compact digital camera is also good for taking photos of the planets. A small CCD area produces a large image of the planets without excessively boosting magnification. This will result in a shorter exposure time and will help to avoid the influence of atmospheric turbulence (scintillation).

Tips on Successful Photography

1. Take photos in conditions of good seeing. The seeing is how the image of a celestial object can be seen in random turbulent motion in the atmosphere. In bad seeing, light from the celestial object is bent or diffused and the image appears to shiver constantly. Shooting an object at low altitude may also blur the image.





2. Use a commercially available camera cable release to release the shutter on the camera. As the focal length of the telescope becomes longer by compound optics, it will cause blurring by vibration even if the shutter is pressed gently with your finger.

3. Put the object precisely in focus. The focus range of an astronomical telescope is narrow due to its long focal length. The point of the best focus varies by changes in the outside temperature.

4. Leave the telescope outside until it becomes equivalent to the ambient temperature. It may take one or two hours for a reflecting or catadioptric telescope to calm down the air current inside the optical tube before start photographing.

Calculating a Focal Length and an F-number of Compound Optical System

Apply the formula below, in the box, to determine the size of a celestial object on the focal plane and the duration of exposure.

(Example)
Telescope : D=80mm f=910mm
Eyepiece : LV20mm (46x)
Camera : 35mm-size SLR camera with Pentax K-mount (Flange-back: 45.5mm)

	Compound Focal Length (Tele-pohoto Effect)	Compound F-number (Image Brightness)
Prime-focus Photography	F Focal length of the telescope. Example: 910mm	F÷D Divide a focal length by an effective aperture of the telescope. Example: 910/80=11.375....about 11.4
Eyepiece-projection Photography	L×M Multiply a distance from the rear lens surface of the eyepiece to the focal plane by a magnification of the telescope. Example: The measured distance is 113mm with use of a LV20mm. The magnification is 46x. 113x46=5198, it is 5198mm.	L×M÷D Multiply a distance from the rear lens surface of the eyepiece to the focal plane by a magnification of the telescope and divide the product by an effective aperture of the telescope. Example: 113x46/80=64.975, it is about 65.

Distance (L) to the Focal Plane (Reference)

The table below shows distances between the focal plane on the camera with Pentax K-mount and the rear lens surface of the eyepieces applicable to the Eyepiece Projection Camera Adapter.

Distance (L) to the focal plane					
Eyepiece	Eyepiece Projection Camera Adapter		Eyepiece	Eyepiece Projection Camera Adapter	
	①+②	①+②+③		①+②	①+②+③
NLV2.5	×	92mm	NLV12	×	106mm
NLV4	×	99mm	NLV15	68mm	108mm
NLV5	×	101mm	NLV18	71mm	111mm
NLV6	×	103mm	NLV20	73mm	113mm
NLV7	×	105mm	NLV25	70mm	110mm
NLV9	×	100mm	NLV40	×	94mm
NLV10	×	103mm	LV ZOOM	×	93mm

Size of Image on the Focal Plane

Object of Photography	Size of the object at a given compaund focal length					
	1000mm	2000mm	3000mm	4000mm	5000mm	10000mm
The Moon	9.05	18.0	27.14	36.17	45.23	90.47
Mercury	0.05	0.11	0.16	0.21	0.27	0.53
Venus	0.29	0.59	0.88	1.17	1.46	2.93
Mars	0.09	0.17	0.26	0.35	0.43	0.88
Jupter	0.23	0.45	0.68	0.91	1.13	2.27
The rings of Saturn	0.21	0.42	0.63	0.85	1.06	2.11
Uranus	0.02	0.03	0.05	0.07	0.09	0.17

(The size of the planets changes as they come close to and go away from the earth.)

Duration of the Exposure

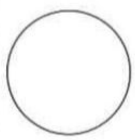
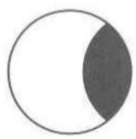
The table below is an example for standard exposure duration with use of ISO400 films.

Compound F-number		Prime-focus Photography		Eyepiece-projection Photography				
		10	15	22	32	45	64	90
The Moon	New Moon	1/32	1/15	1/8	1/4	1/2	1	2
	Half Moon	1/250	1/125	1/60	1/30	1/15	1/8	1/4
	Full Moon	1/500	1/250	1/125	1/60	1/30	1/15	1/8
Mercury		—	—	1/250	1/125	1/60	1/30	1/15
Venus		—	—	1/2000	1/1000	1/500	1/250	1/125
Mars		—	—	1/125	1/60	1/30	1/15	1/8
Jupiter		—	—	1/30	1/15	1/8	1/4	1/2
Saturn		—	—	1/8	1/4	1/2	1	2

If ISO 100 films are used, increase the value by 4 times. (Unit: Second)
If ISO1600 films are used, decrease the value by a fourth.

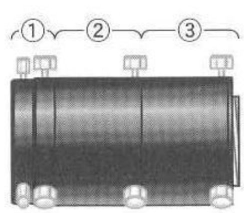
Taking photos of a Lunar Eclipse

Duration of the exposure varies as the moon wanes and waxes during an eclipse. An appropriate exposure in a certain phase of the eclipsed moon can be calculated by multiplying a given exposure of the full moon by the value in the table below.

Phase of the eclipsed moon	 0%	 40%	 60%	 80%	 90%
Exposure	1X	4X	8X	30X	50X

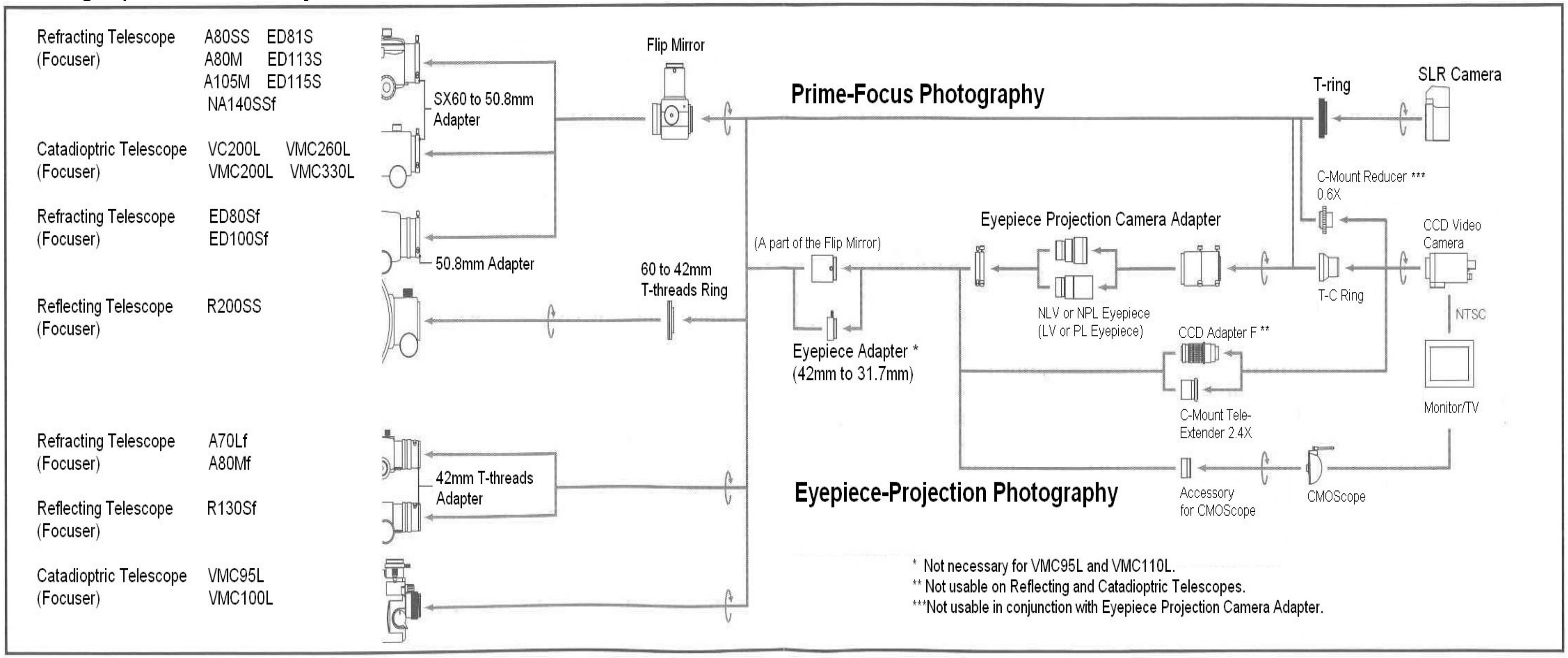
Example: If the appropriate exposure of the full moon is 1/60th seconds and you want to take photos of a 60% waning moon, you can calculate as follows; 1/60 x 8 = 7.5
The appropriate exposure is about 1/8 seconds.

Attaching the Eyepiece Projection Camera Adapter to your Vixen telescope

Eyepiece Projection Camera Adapter	T-ring (Optional)
 The Eyepiece Projection Camera Adapter consists of part (1), part (2) and part (3) tube rings as shown above.	 Use a T-ring that is appropriate for your SLR camera.

The eyepiece projection camera adapter can be easily coupled onto the 31.7mm visual back of the Vixen flip mirror.

Photographic Accessory Chart



Note: If your purchase of the Vixen refracting telescope or catadioptric telescope does not come with the flip mirror, a complete set of 60mm thread-diameter extension tube, downsizing ring and 42mm to 31.7mm eyepiece adapter may be needed to attach the eyepiece projection camera adapter.

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