



Meade Instruments Corporation

16542 MILLIKAN AVENUE, IRVINE, CALIFORNIA 92714 ■ (714) 756-2291
FAX: (714) 756-1450

Series 4000™ f/6.3 Focal Reducer/Field Flatteners

The Meade Series 4000 f/6.3 Focal Reducer/Field Flatteners (FR/FF) is designed for use with Schmidt-Cassegrain telescopes, of any aperture, using the standard 2-24 (2" dia., 24 threads per inch) rear-cell thread. This rear-cell thread is standard on all Meade Schmidt-Cassegrain Telescope (SCT) models and on other SCT brands as well. The FR/FF unit consists of 4 lenses in 2 groups with all air-to-glass surfaces multi-coated for maximum light transmission and image contrast. (See figure at right.)

Purpose: The FR/FF reduces the effective focal ratio of the main telescope's optical system by a factor of 0.63. For example, when applied to an SCT of f/10 focal ratio, the resulting effective f/ratio is f/6.3. In addition the FR/FF significantly improves edge-of-field resolution by flattening the slightly curved focal plane inherent in the Schmidt-Cassegrain design. As discussed below, the FR/FF yields many, but not all, of the advantages of an intrinsically f/6.3 SCT telescope.

Applications: The FR/FF may be used in any of several formats, in visual, photographic, and CCD-imager applications:

1. Visual Use: For visual observing applications thread the FR/FF on to the SCT's rear cell, followed by the telescope's 1.25" diagonal prism or 2" diagonal mirror, followed in turn by an eyepiece. (See figure, over.) Use of the FR/FF in a visual mode results in 36% lower magnifying power and 56% more field of view than if the same eyepiece were used without the FR/FF.

Notes: (a) Use of wide-angle eyepieces (of either 1.25" or 2" barrel diameter) with the FR/FF may result in vignetting of the image, particularly in longer focal lengths, as well as a deterioration of image quality near the edge of the field. Eyepieces such as the Meade Super Plössl (SP) 26mm, or other eyepieces of similar focal length and apparent field, generally yield the best visual results with the FR/FF. Vignetting is typical when a focal reducing lens is "added-on" to an existing telescope of f/10, for example; such vignetting can be avoided only by using a Schmidt-Cassegrain telescope with intrinsically f/6.3 optics. (b) The long mechanical lengths of most 2" diagonals, combined with the reduced back-focus distance caused by the FR/FF, may result in an inability to reach focus with such a system. (c) The FR/FF can be used with Meade f/6.3 SCT's, for an effective focal ratio of f/4, but in such an application the image quality of the total system will be poor, particularly near the edge of the field, since the main optical system is not designed to function at such very low f/ratios.

2. Photographic Use: The FR/FF may be used in conjunction with a standard T-Adapter or Off-Axis Guider on f/10 SCT's, and in such applications the unit reduces effective photographic exposure times by about 60%. (See figure, over.) Astrophotographers will find that they not only achieve a much wider actual field of view but also that guiding is much less demanding at the shorter effective focal length, and for shorter periods of time, than is the case without the FR/FF. The FR/FF will achieve satisfactory photographic results with an f/6.3 SCT, but the edge of the photographic field will be vignetted.

3. CCD Imaging: The FR/FF is a particularly valuable accessory when used in conjunction with a CCD imager. In this case the resultant reduced image size is beneficial to locating and centering the image on to the relatively small CCD chip. In addition, use of the f/6.3 FR/FF with an f/6.3 telescope (for an effective focal ratio of f/4) becomes entirely practical, since only on-axis or nearly-on-axis images are used.

