

Bell & Howell

Canon

NEWSLETTER

ADVANCE PRODUCT INFORMATION

FILE: Section 7

May 1, 1968

NEW CANON FL-F LENSES ...An Optical Breakthrough!

NOTE: The following is the Bell & Howell press release on Canon's new "crystal" lenses. The samples illustrated are pre-production models which may be changed slightly in production. Prices on the Canon FL-F lenses are not yet available. Further information will be released in the near future. Lens availability is expected in early 1969.

The Canon Camera Company, Tokyo, Japan, has developed new telephoto lenses for Canon single-lens reflex cameras using fluorite (CaF_2) elements. This is the first time that fluorite lens elements have been used commercially for lenses of this size. The lenses are a 200mm f/4, a 300mm f/5.6, and a 500mm f/5.6.

Lenses generally become larger and heavier and lose sharpness when they are designed in progressively longer focal lengths. The Canon FL-F lenses, however, offer complete correction of chromatic aberrations and they maintain high resolution of approximately 100 lines/mm, even in the corners of the image format. In addition to their excellent definition, these lenses are compact and light in weight. When compared to other lenses of the same focal length, they are 40% shorter and 30% lighter on the average, and hand-held picture-taking is possible with the 500mm telephoto lens.

The secret of the new lens designs is the fluorite material. This material has been regarded as impossible to use for lenses (other than microscope objectives) as it is extremely difficult to grow a large artificial crystal and process it into an optical element. However, Canon's engineering solved the problems and succeeded in making fluorite lenses for the first time on a commercial basis.

Development Goal

The present problems of technical innovation in camera and lens design include the development of new and better materials and the technology of processing and manufacturing.

Sometime ago Canon had noticed the outstanding optical characteristics of fluorite and has since spent a great deal of time and effort to develop a new type of lens utilizing this material. The new lenses feature high resolution and contrast which cannot be obtained from conventional lenses using regular optical glass. Small crystals of fluorite have been used in microscope objectives, but they have never been used in large photographic lenses except for research work. We can therefore say that this is the first time that fluorite has been used successfully in commercial production.

As to the cost of lenses using the fluorite elements, regular production methods would dictate a price about ten times more than a regular lens of the same focal length. Canon's technical research and production innovations, however, have made it possible to reduce the manufacturing cost so that the price can be set within reasonable figures.



(over)

Optical Characteristics of CaF₂

Fluorite has the characteristics of low refraction and low dispersion. Therefore:

(1) Pure artificial crystal (fluorite) has practically no chromatic aberration and apochromatic lenses can be made in combination with regular optical glass.

(2) Low partial dispersion between different wavelength makes it possible to reduce the number of lens elements for a compact design.

(3) Fluorite not only covers all areas of visible rays (380-780nm), but also covers the near-infrared area to 850nm.

Special Features of Canon FL-F Lenses

(1) Compactness—the telephoto ratio (the ratio between lens focal length and distance from the front element to the film plane) of a regular telephoto lens is approximately 1/1. In the case of the Canon FL-F lenses, the ratio is considerably decreased to 1/.65 and to 1/75. Therefore it is possible to hand-hold long telephoto lenses such as the 500mm.

(2) Clear Definition—the Canon FL-F lenses are apochromats with complete correction of chromatic aberrations, and they feature excellent resolution (100 lines/mm at the corners) and high contrast. The modulation transfer function value is high up to the high frequency area.

(3) Infrared Correction—in the case of infrared photography, chromatic aberrations are corrected to near-infrared wavelength.

FL-F LENSES SPECIFICATIONS

	FL-F 200mm f/4	FL-F 300mm f/5.6	FL-F 500mm f/5.6
Picture Size	36 x 24mm	36 x 24mm	36 x 24mm
Focal Length	200mm	300mm	500mm
Maximum Aperture	f 4.0	f 5.6	f/5.6
Lens Composition*	6 elements in 5 groups (2)	5 elements in 4 groups (1)	5 elements in 4 groups (1)
Angle of View	12°	8°	5°
Focusing Distance	7.5' to infinity	12' to infinity	25' to infinity
Focusing	Helicoid	Helicoid	Helicoid
Distance Scale	Meter and feet	Meter and feet	Meter and feet
Angle of Rotation	240°	263°	236°
Depth of Field Scale	Yes	Yes	Yes
Infrared Index "R"	Not required	Yes	Yes
Mount Type**	Canon BL	Canon BL	Canon BL
Aperture System	Automatic FL	Automatic FL	Preset
Aperture Stops	f 4—22	f/5.6—22	f/5.6—32
Cap Size	60mm	60mm	95mm
Filter Size	58mm	58mm	109mm
Maximum Diameter	2 $\frac{2}{3}$ in.	2 $\frac{1}{2}$ in.	4 $\frac{1}{4}$ in.
Length	4 $\frac{1}{3}$ in.	7 in	11 $\frac{3}{8}$ in
Weight	1 lb. 5 oz.	1 lb., 15 oz.	5 lb., 14 oz.
Hood	Separate	Built-in	Built-in

* Figures in parentheses indicate number of lens element using:
upper = fluorite lower = new type of glass

** BL = Breech-lock