SPECIAL NIKKOR LENSES

Included in the comprehensive selection of high-quality interchangeable lenses offered by Nikon is a set of lenses unique in concept, design and application. They are designed for special-purpose photography in the fields of journalism, sciences, industries and commerce to add a completely new dimension to 35mm SLR photography.

The 35mm f/2.8 PC-Nikkor incorporates shifting and rotating movements of the lens for perspective control, offering superb results in architectural photography.

Other special Nikkor lenses include the Fisheye Nikkors covering a 180° or a 220° picture angle and the GN Auto Nikkor employing a guide number coupling system for automatic diaphragm aperture control in flash photography.

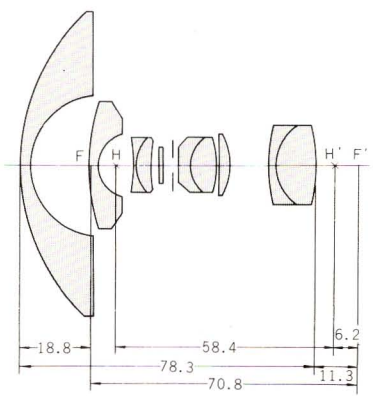
6mm f/5.6 Fisheye-Nikkor

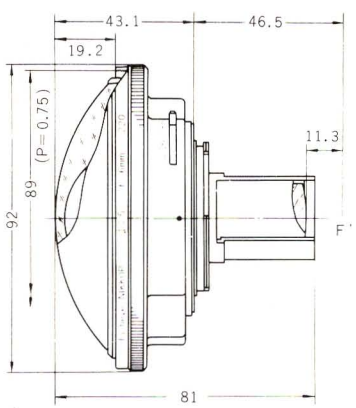
Code No. 108-03-010

This is the widest of the Fisheye-Nikkor lenses, with an angle of view of 220°, 40° wider than the standard Fisheye lenses. Subjects slightly behind the camera will be included in the 21.6mm diameter image on the film. There are six filters built-in on a rotating turret wheel.

Its equidistant projection design is similar to the 7.5mm f/5.6 and 8mm f/2.8 Fisheye-Nikkors. With the 220° ultra-wide angle of view, the 6mm Fisheye offers more impact in the fisheye photography and is especially useful in scientific and industrial photography. Interiors of constricted areas, such as tubular or tank construction, are apt subjects for the 6mm Fisheye. This lens may also be applied to measure the field of view in a plane or an airport control tower, or that of a driver in an automobile or a speaker in a lecture room. The reflex mirror of the camera must be in the up and locked position before the lens is mounted. The Fisheye finder, 160° optical viewfinder, may be used to locate the center of the picture field.

Focal length:	6mm
Maximum aperture:	1 : 5.6
Lens construction:	9 elements in 6 groups
Picture angle:	220°
Projection formula:	Equidistant
Image size on film:	21.6mm in dia.
Focusing:	Fixed focus
Aperture scale:	f/5.6–f/22
Aperture diaphragm:	Manual
Attachment size:	89mm (P=0.75)
Filter:	Built-in, L1A, Y48, Y52, O57, R60 & XO
Dimensions:	92mm dia. X 81mm length (3-5/8 in. X 3-3/16 in.)
Weight:	430g (15.2 oz)
Accessories:	89mm screw-in front cap, rear cap type 3F (108–03–400), fisheye finder (108–03–500)





(m/m)

8mm f/2.8 Fisheye-Nikkor Auto

Code No. 108-03-114

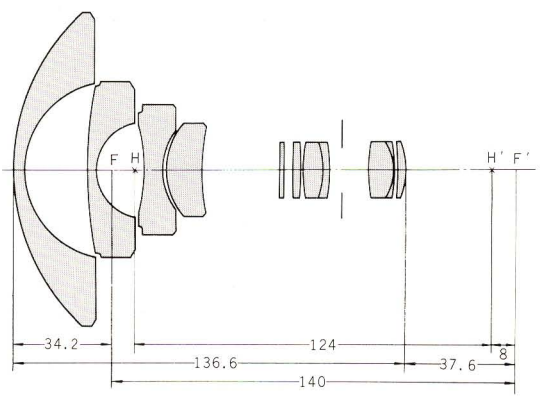
This is the first Fisheye Nikkor that has adopted the automatic aperture diaphragm. The lens speed of f/2.8 is the fastest in the array of Fisheye Nikkor lenses. The design of the lens is such that it obviates the need for locking up the mirror. Thus, viewing and focusing can be done on the focusing screen with the f/2.8 brightness.

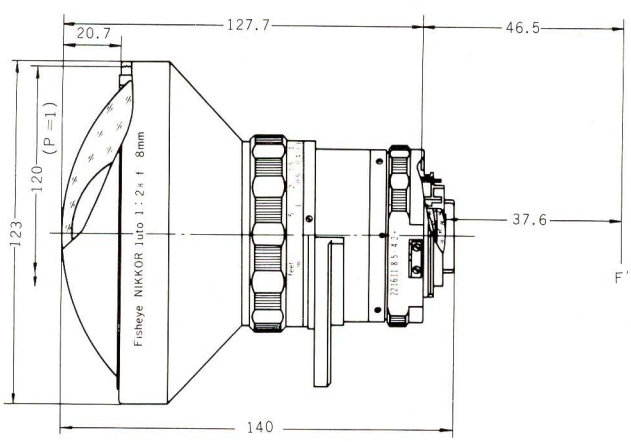
As the meter-coupling prong is provided with this lens, it also allows through-the-lens exposure metering at full opening.

The 8mm f/2.8 Fisheye-Nikkor Auto covers 180° angle of view adopting the equidistant projection formula like 7.5mm f/5.6 and 6mm f/5.6 Fisheye-Nikkors. The lens speed, the automatic diaphragm and through-the-lens viewing capability, all contributes to the easiness of handling and versatile applications in scientific, industrial and commercial photography where the use of fisheye lenses are employed.

The front element has a very large diameter of 123mm (4-27/32 in.) but the lens weighs only 1 kg (2.2 lb). The automatic diaphragm stops down to f/22. There are five built-in filters on a rotating turret.

Focal length:	8mm
Maximum aperture:	1 : 2.8
Lens construction:	10 elements in 8 groups
Picture angle:	180°
Projection formula:	Equidistant
Image size on film:	23mm in dia.
Distance scale:	Graduated both in meters and feet up to 0.3m and 1 ft
Aperture scale:	f/2.8–f/22
Aperture diaphragm:	Fully automatic
Meter coupling prong:	Integrated (fully open exposure metering)
Attachment size:	120mm (P=1.00)
Filter:	Built-in, L1A, Y48, Y52, O56 & R60
Dimensions:	123mm dia. X 140mm length (4-27/32 in. X 5-1/2 in.)
Weight:	1kg (2.2 lb)
Accessories:	120mm screw-in front cap (109–00–232), rear cap type 3F (108–03–400), leatherette case (108–03–305)





(m/m)

10mm f/5.6 OP Fisheye-Nikkor

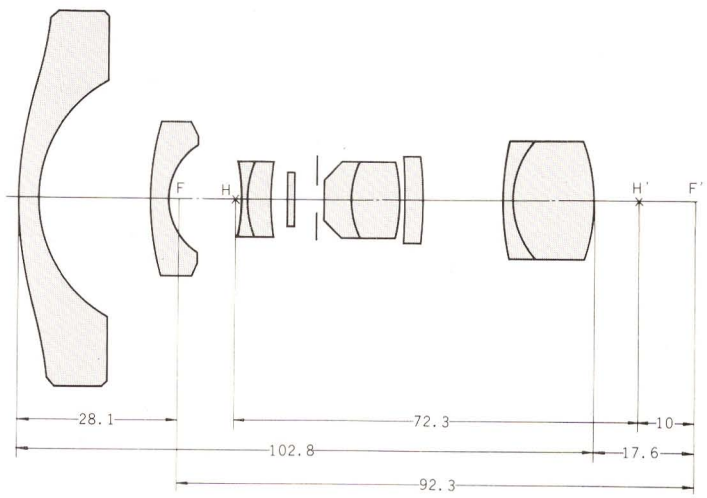
Code No. 108-03-110

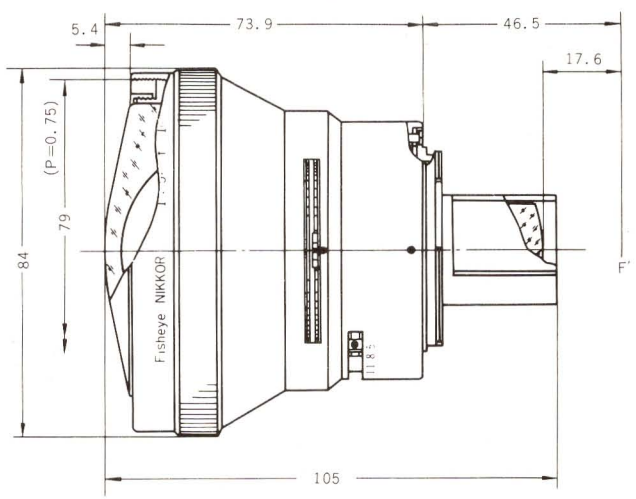
High-rise construction in urban planning is now found throughout the world. Care must be taken to avoid narrow streets thus cutting the level of illumination, both inside and outside high-rise areas. Considerable study must also be given to the effects of radiant heat, generated by fire, on adjacent buildings to give maximum safety to inhabitants.

The OP Fisheye-Nikkor lens was designed especially to meet the needs of the urban planner and safety investigator. The lens is used to determine the quantitative luminance of an area or the effects of radiant heat by providing a geometrical configuration of the subject image.

The OP Fisheye as well as the Fisheye 7.5mm and 8mm lenses covers an angle of view of 180°. But this lens is designed on an orthographic projection for-

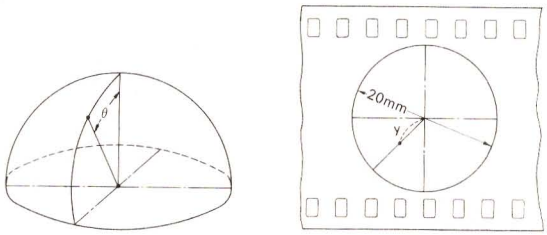
Focal length:	10mm
Maximum aperture:	1 : 5.6
Lens construction:	9 elements in 6 groups
Picture angle:	180°
Projection formula:	Orthographic
Image size on film:	20mm in dia.
Focusing:	Fixed focus
Aperture scale:	f/5.6–f/22
Aperture diaphragm:	Manual
Attachment size:	79mm (P=0.75)
Filter:	Built-in, L1A, Y48, Y52, O56, R60 & X0
Dimensions:	84mm dia. X 105mm length (3-5/16 in. X 4-5/32 in.)
Weight:	400g (14.1 oz)
Accessories:	79mm screw-in front cap (109–00–179), rear cap type 3F (108–03–400), leatherette case CL-4 (108–03–303), fisheye finder (108–03–500)





(m/m)

mula, from which the "OP" designation is obtained. Other Nikkor Fisheye lenses are designed on equidistant projection formula.



The difference between orthographic and equidistant projection formula is expressed in the following:

Equidistant projection: $Y = c \cdot \theta$

Orthographic projection: $Y = c \cdot \sin\theta$

Y: Distance of image point from picture center
θ: Zenith angle
C: Constant

The construction of the OP Fisheye-Nikkor has been accomplished by use of an aspheric front element to meet the exacting requirements of the orthographic projection formula.

When it is required to measure luminance of a certain area, it is easy to use a photometer. But the data obtained by such measurements cannot be utilized objectively to compare the luminance at different places or to evaluate the illumination of an area because of dependence on season, time and weather. This being the case, it is more convenient to use, instead of the intensity of illumination, the configuration factor. When an area of light is measured in a picture made with the OP Fisheye, it is proportional to the illumination of the plane parallel with the film surface. The configuration factor is the ratio of this area to the total area of the picture.

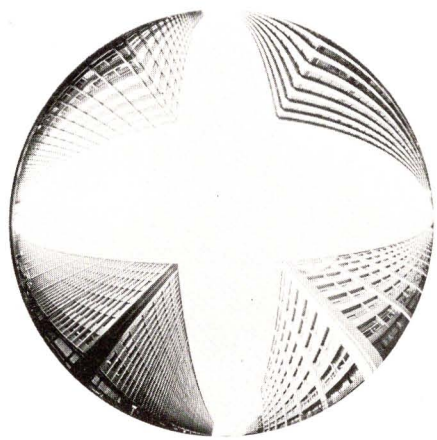
In other words, the proportion between the total area pictured and the light source is termed the "configuration factor." When the light source is the sky, the configuration factor is called the "sky factor."

In pictures 1 and 2, the sky area to the total area photographed is about 48% and 39% respectively, with the sky (configuration) factors 0.48 and 0.39 respectively. Thus the luminosity of the former is greater than that of the latter.

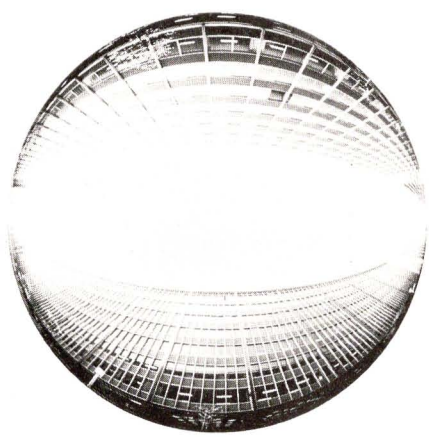
In a photograph taken with an OP Fisheye-Nikkor, objects of the same luminance are pictured with the same density regardless of their position in the whole picture. This is attained by the orthographic projection formula and is especially useful for measurement of sky light distribution. And even with the use of narrow latitude color film, uniform image brightness over the entire circular field is obtained.

In use with the Nikon F camera, the OP Fisheye-Nikkor lens is mounted after the viewfinder mirror has been placed in the up and locked position. An optical viewfinder with a 160° angle of view is mounted on the camera body accessory shoe for viewing. Six filters are built into the lens in a turret which is rotated easily for the necessary filter.

The lens is fixed focus since its extreme depth of field covers from infinity to one meter even at full aperture.



Picture 1



Picture 2

A wideangle lens of retrofocus design, the PC-Nikkor incorporates the lens shifting feature for control of image perspective.

In covering large rectangular subjects, for example, a tall building, the photographer has to tilt his camera upwards to include the top of the structure, especially when working at close range. The result is that in the photograph the walls of the building appear to converge, as if the building were falling over backwards.

With the PC-Nikkor, the photographer is able to shift the lens horizontally, vertically or diagonally to include the top of the building while keeping the film plane parallel to the wall surface to eliminate unwanted converging lines.

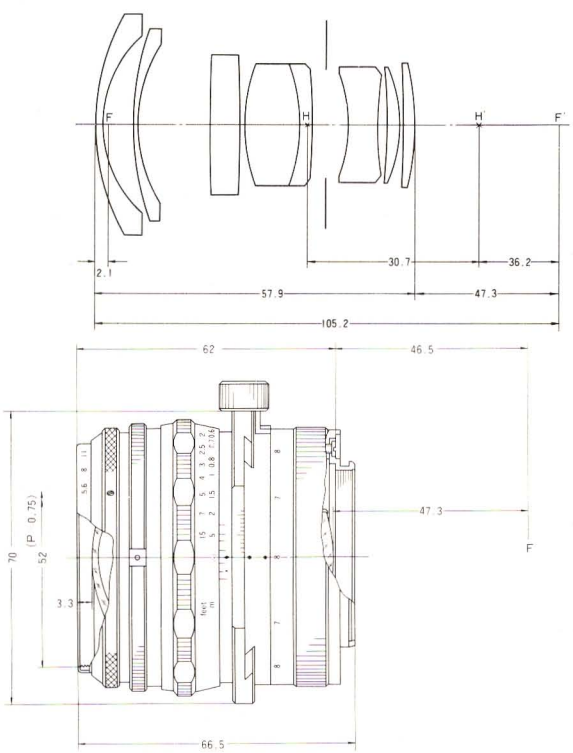
The front part of the lens may be shifted by as much as 11mm off-center by means of a micrometer leadscrew. In addition, the entire lens mount may be rotated a full 360° with click-stops at every 30°. By combining the parallel movements with full circle rotation, the lens can be shifted to any desired direction by 11mm.

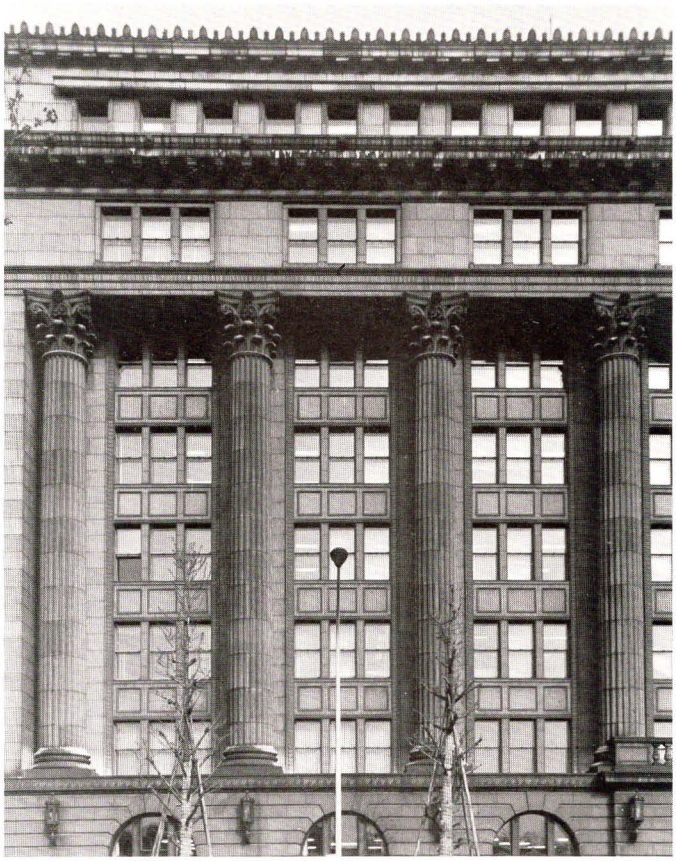
This feature renders the lens highly valuable for architectural and interior photography, especially when using color or monochrome reversal films which do not accommodate perspective correction in the process of enlargement.

Due to its shifting and rotating mechanism, the diaphragm has to be preset manually. There are eight settings on the aperture scale—from f/2.8 to f/32. When perspective correction is not required, the PC-Nikkor may be used as a conventional medium wideangle lens with excellent results.

The photographer may also take advantage of the shifting movements of the PC-Nikkor to make panoramic pictures by joining two exposures. Its advantage over an ordinary lens mounted on a panoramic equipment is that it is able to maintain the film plane parallel to the subject at all times, and hence, the pictures will match perfectly.

Focal length:	35mm
Maximum aperture:	1 : 2.8
Lens construction:	8 elements in 7 groups
Picture angle:	62°
Distance scale:	Graduated both in meters and feet up to 0.3m and 1ft
Aperture scale:	f/2.8 – f/32
Aperture diaphragm:	Manual preset
Attachment size:	52mm (P=0.75)
Filter:	52mm screw-in
Dimensions:	70mm dia. X 66.5mm length (2-3/4 in. X 2-5/8 in.)
Weight:	335g (11.8oz)
Accessories:	52mm snap-on front cap (108–00–400), rear cap type F (108–00–401), leather case (108–03–304), 52mm screw-in lens hood (108–01–201), flexible pouch No. 51 (108–00–302)





How PC-Nikkor overcomes perspective distortion

As long as the film is in the vertical plane—the camera held parallel to the subject—there is no perspective distortion. But shooting in this position with a conventional lens frequently produces unbalanced* composition. When photographing a tall building, for instance, the top of the building is cut off, and unwanted foreground is included because the camera is usually held close to the ground level (fig. 1). To include the top of the building and reduce the foreground, the camera must be tilted, but this results in converging vertical lines (fig. 2). Similar distortions result in horizontal lines when photographing a long line of buildings with the camera tilted.

However, with the PC-Nikkor's shifting and rotating movements, the photographer is able to get balanced composition without tilting the camera. The film plane remains vertical while the center of the lens is placed on the line connecting the center of the subject with that of the film (fig. 3).

* Theoretically, the converging verticals would be acceptable in terms of the perspective that is true to life. But the human eye will not psychologically accept such vertical convergence while it is quite prepared to accept the same effect in the horizontal plane.

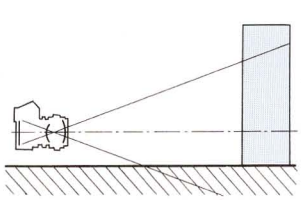


fig. 1

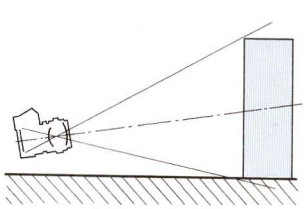


fig. 2

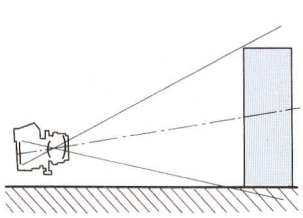


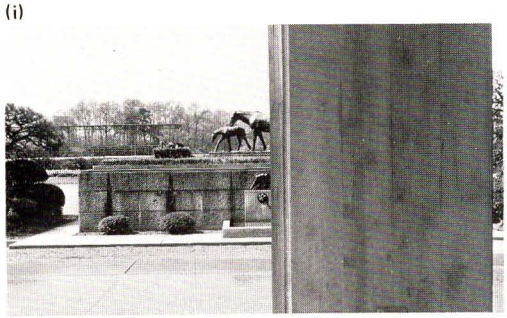
fig. 3

Some Practical Applications of the PC-Nikkor

Getting rid of unwanted elements in architectural photography

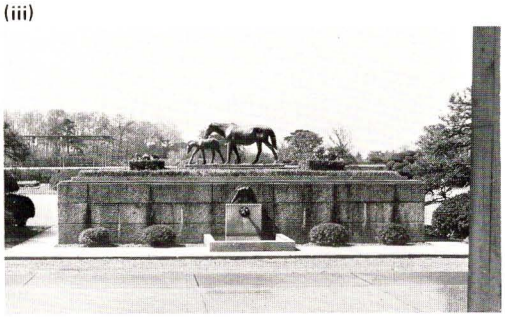
A pillar appears in the center of the viewfinder, obstructing the view of the main subject—a stone monument (i). The distance between the pillar and the subject is only about 2-1/2 meters, too short for the photographer to shoot from the front of the pillar. To get around this obstacle from behind, the photographer has to move to one side to remove the pillar from the viewfield, tilting the lens sideways to include the entire subject. With a conventional lens, this results in converging horizontal lines (ii). However, the problem is solved by using the PC-Nikkor. The photographer is able to move his camera sideways and shift the PC-Nikkor laterally to include the whole of the structure while maintaining the film plane parallel to the subject (iii).

(i)



(ii)

(iii)

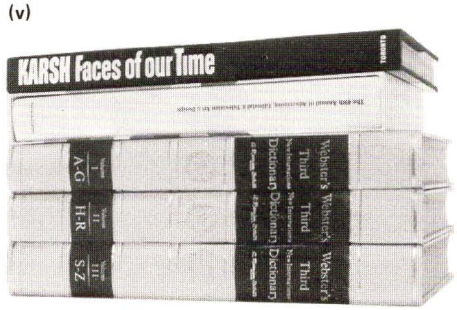


Adding a third dimension to frontal views of cubic subjects

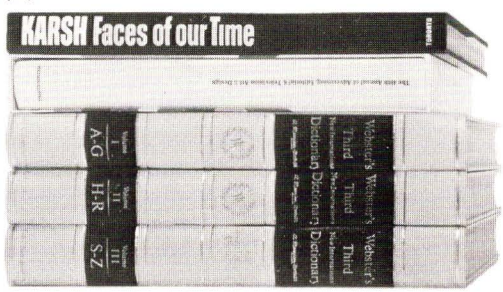
While it is possible to obtain the frontal view of cubic subjects, in this case, a stack of books, in proper perspective with a conventional lens, the feeling of depth is lost—everything appears flat in the photograph (iv). To add a third dimension, the photographer has to move his camera to one side, this resulting in converging lines (v). With the PC-Nikkor, the photographer is able to delineate depth while retaining perfect perspective. Just move the camera to one side and hold it in the vertical position, shifting the lens laterally to get the three-dimensional view of the subject (vi).

(iv)

(v)



(vi)



Correcting perspective of images on reflecting surfaces

(vii)

(viii)

(ix)

When a painting inside a picture frame is photographed directly from the front with a conventional lens, the camera itself will be reflected on the picture frame glass (vii). Moving the camera sideways removes the camera from the view, but the horizontal lines of the painting appear to converge (viii). With the PC-Nikkor, the camera may be held parallel to the reflecting glass surface while the lens is shifted to correct perspective. This removes both the camera and the converging lines from the picture (ix).

Obtaining panoramic pictures without perspective distortion

When a conventional lens is used for photographing panoramic scenes by employing a two-section technique, the overlapping portions of the two exposures may not match perfectly when joined. This is because the camera has to be moved after the first exposure to get the second half of the panoramic scene, thereby giving rise to shifts in the film plane. With the PC-Nikkor, two separate exposures can be made without moving the camera. Simply shift the lens vertically or horizontally and shoot the first half of the scene. Then rotate the lens mount a full 180° to make the second exposure. The result is a pair of frames that match perfectly.

How to operate the PC-Nikkor

The PC-Nikkor may be shifted by as much as 11mm off-center in a plane parallel to the film, and the entire lens mount rotated through a full 360°.
Grip the camera parallel to the subject plane and shift the lens by turning the knurled shift knob, observing the correction of perspective distortion and checking how much of the subject is included in the viewfinder. The shift scale, calibrated in millimeters, shows how far the lens has been shifted. The permissible degree of shifts depends on its direction. This is because the picture format is rectangular while the lens produces a circular image area. The numbers engraved on the rotating lens mount indicate the limits beyond which image deterioration occurs. But it is still possible to compensate for any image distortion by composing in such a way that unimportant background elements, such as sky or earth, are brought to the corners of the frame in the direction of the lens shift.
Fig. 4 and 5 show the acceptable limits based on the direction of shifts.
The Type E focusing screen is recommended for use with the PC-Nikkor. The vertical and horizontal lines marked on the screen help the photographer maintain the camera parallel to the subject while framing.

fig. 4

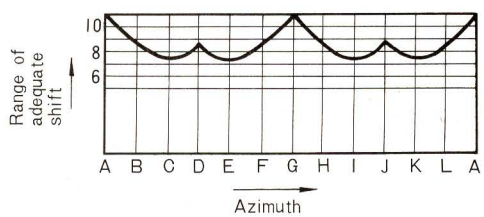
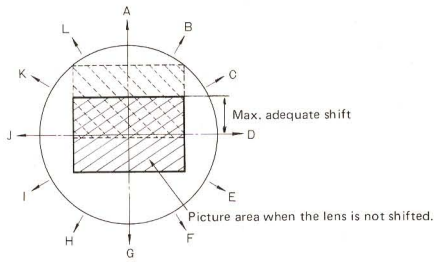


fig. 5



The GN Auto Nikkor is designed to simplify flash photography. As its name GN (guide number) suggests, the lens employs the guide number coupling system for automatic diaphragm adjustments.

By setting the appropriate guide number on the scale of the GN Auto Nikkor, the diaphragm ring is hooked to the focusing ring, allowing the aperture to be stopped down or opened up automatically in relation to the focused distance to give correct flash exposure. This frees the photographer from the trouble of calculating the correct aperture and readjusting the lens diaphragm.

The guide number coupling may be disconnected when flash is not used.

The 7-bladed polygonal diaphragm, designed to form an almost circular aperture around the most commonly used f/8 setting, reduces the effects of light diffraction to the minimum. It can be stopped down to f/32.

Light and compact, the lens weighs only 150g (5.3oz) and protrudes only 20mm (3/4 in.) from the camera body.

Used in combination with the Nikon Speedlight Unit, the lens is particularly effective for capturing a moving subject or for candids where the photographer has no time to reset the diaphragm.

The GN Auto Nikkor may also be used as a substitute for a normal lens for general photography. Its picture angle of 50° makes the lens valuable for landscapes or indoor group photographs.

The distance scale and guide-number scales are engraved in yellow (feet) and white (meters).

Focal length:	45mm
Maximum aperture:	1 : 2.8
Lens construction:	4 elements in 3 groups
Picture angle:	50°
Distance scale:	Graduated both in meters and feet up to 0.8m and 3ft
Aperture scale:	f/2.8 – f/32
Aperture diaphragm:	Fully automatic
Meter coupling prong:	Integrated (fully open exposure metering)
Attachment size:	52mm (P=0.75)
Filter:	52mm screw-in
Dimensions:	64mm dia. X 31mm length (2-17/32 in. X 1-7/32 in.)
Weight:	150g (5.3oz)
Accessories:	52mm snap-on front cap (108–00–400), rear cap type F (108–00–401), 52mm screw-in lens hood (108–03–200), plastic case type S (108–00–300) flexible pouch No. 51 (108–00–302)