

Introduction to the 1998 CD-ROM Version of the 1973 Minolta-16 Guide

I joined Minolta Corporation, the U.S.A. wholly owned subsidiary of Minolta Camera Co. Ltd, Osaka, Japan, in 1970 as Customer Relations Manager. Along with associates such as Harold Center, Advertising Manager; Charles Panarella, National Sales Manager and Sam Kusumoto, President, I began a long and warm working relationship.

During 1972 I was asked by Sy Uslan, Publisher for Amphoto of Garden City, N.Y. to proof-read and check for accuracy, the manuscript of Dr. Joseph Cooper's *The Minolta SRT System Handbook*, an impressive, looseleaf bound, reference guide. At some point, Mr. Uslan asked me if I had ever considered writing a book. I replied that I had not. He invited me to write a new edition of *The Minolta-16 Guide*. Dr. Cooper had written the first edition some years before. Mr. Uslan pointed out that a new update was needed. I agreed to do it and about a year later the book was printed. It enjoyed a moderate success during its print run. It has been out-of-print now for about 17 years.

Recently I learned of the existence of a devoted group of Minolta-16 users and collectors who patronized a web site known as The Sub Club, I also found out that my long out-of-print book was in great demand. Therefore, to fill that demand and provide those still devoted to the Minolta subminiature family with the information they needed, I began the conversion of the book to an Adobe® Acrobat® Portable Document File format and transfer of that PDF to CD-ROM.

Along the way I have had assistance from and questions answered by several present day associates. I want to thank Mr. J. Scott Lamb, Mr. Phil Bradon, Mr. Rodney Davis, Mr. J. D. Elliott, and Mr. Joe McGloin.

Finally, this entire project would not have been possible if it had not been for Harriet, whom I miss so very much.

Ted Rosenberg
September 27, 1998



Minolta 16 guide

by Ted Rosenberg

Minolta-16 Guide

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AMPHOTO
American Photographic Book Publishing Co., Inc.
Garden City, New York

To Harriet, who helped.

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Library of Congress Catalog Card Number 72-85821
ISBN 0-8174-0464-3
Manufactured in the United States of America

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Preface

It has been twelve years since the last *Minolta 16 Guide* was written. In that span of time, not only have the cameras changed remarkably in size, features, and ability, but the 16 as a camera type has become more accepted than ever before. It is not a "sometime" camera, one that rests comfortably in a dresser drawer for most of the year, and is used only on very special occasions. Nothing could be further from the minds of those who designed and brought these instruments to the public. In fact, the 16's are cameras that can be, and often are, worn all the time by their owners. It is with this thought in mind that this book has been written.

Here you will find that not only are general photo procedures outlined, but also those peculiar to the 16, along with certain special procedures and techniques that can help you use this remarkable camera to its fullest for business and pleasure are described as well. In addition, I have enumerated several special uses that can stimulate your imagination and possibly create further applications for this unique camera, while at the same time providing you with the information needed to perform these somewhat different photographic operations.

As Customer Relations Manager of Minolta Corp. I was privileged to have access to information and complete data for all phases of the Minolta 16 line for this book. Yet, there were several fellow employees who made this work easier and added much to my gathering of this data. Therefore I should like to extend my appreciation to Ted Katoh, Miichi Ohsaka, Kris Pentinnen, and Tucker Ranson for their patience, translations from Japanese, and their knowledgeable replies to my many questions. In addition I would like to thank Dr. Joseph Cooper, who started this project years ago and who allowed me to bring it to fruition.



CHAPTER 1

The Purpose and Place of the 16mm Format

"The room was dark as he entered except for the pale moonlight filtering in through the partly closed window blinds. It was enough light for the intruder to be able to find the desk. Locating the drawer containing the documents, he spread them out on the desktop. Then, switching on the desk lamp, he produced a small camera which he held to his eye for what seemed but a moment or two. The minute click of the camera's shutter went undetected. Replacing the papers, he left as quickly as he had come."

This scene has been presented dramatically over the years in movies, television, and theater. It is also a primary example of one of the extreme, but popular, views about the use of the subminiature camera. Most potential photographers, when asked their opinion of the subminiature camera, believe it to be either the tool of the professional spy or a toy to be quickly dismissed as incapable of producing a quality photograph. Both may be true in part, but there is a great middle ground that is sometimes overlooked.

Since shortly after the discovery of photography, one inventor or another has devised a camera capable of producing photographs of miniature, or pocket-sized proportions. They came in all shapes and sizes. Some were qualified to be called subminiature for they were indeed smaller than the smallest. The

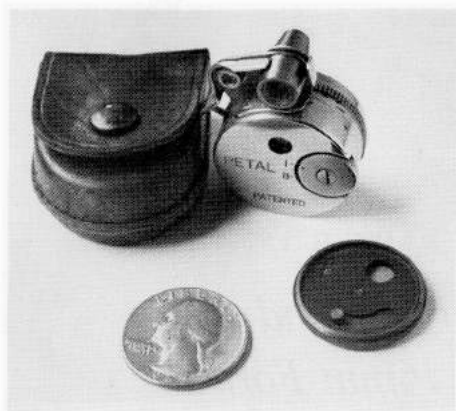


Fig. 1. The Petal Camera with case and film magazine. A 25¢ piece is shown for size. The cut out in the magazine was the actual picture area, approximately $\frac{1}{4}$ " in diameter.

popular Leica 35mm camera led to the coining of the term "miniature" camera. Therefore, any device producing an image smaller than the standard 24×36 mm format of the Leica was said to be subminiature. Before World War II the majority of subminiature cameras were made by craftsmen on the European continent; shortly after World War II, the Japanese camera industry, coming into its own, began to produce subminiature cameras. One of the earliest examples of the Japanese subminiature cameras is pictured here.

The Minolta 16, originally called the Konan 16, was introduced in 1951. In addition to being one of the two cameras in the subminiature category that has continued virtually unchanged in production for twenty years, it has the honor of being one of the few products on the photo market that has not changed its price in many years. The retail price of the Minolta 16 when introduced was \$39.95 and remained at \$39.95 until a short time ago when Minolta had to raise its price to \$40.00.

This particular instrument, typical of the Minolta subminiature line, has maintained a constant popularity over the years due to its convenience of use, its unique size, and its amazing quality.

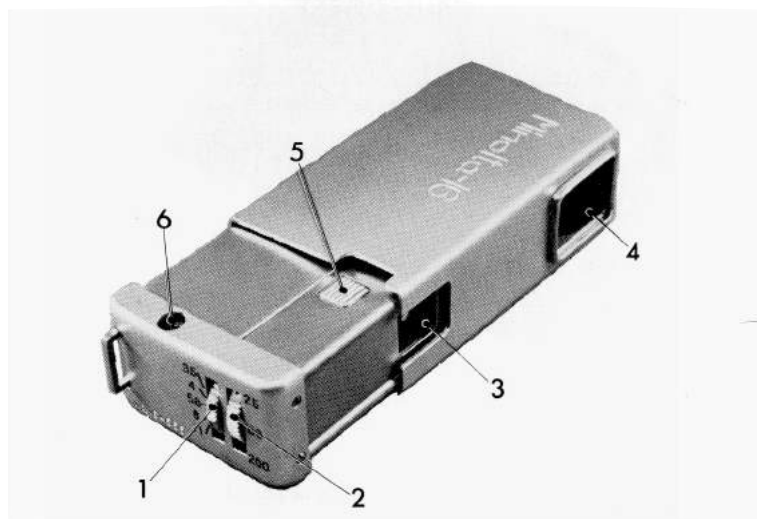


Fig. 2. The original \$39.95 special, the Minolta 16. The price included case and filters. A bargain.

- | | |
|-----------------------|--------------------|
| 1. <i>f</i> /stops | 4. Shutter release |
| 2. Shutter-speed dial | 5. Viewfinder |
| 3. Lens and shutter | 6. Flash terminal |

In its desire to provide the photographic public with cameras that they seem to desire, Minolta has produced several styles, embodying features found on cameras costing far more, weighing far more, and taking up far more room in one's suitcase. In other words, here we have a world devoted to 16mm photography from the simplified 16Ps to the advanced 16MGs, a camera with a host of specialized accessories available.

The question that is asked most often is, why bother with a 16mm format camera at all? The answer becomes apparent as soon as you pick up one of these masterpieces in precision. It is pocket-sized, easily carried without being a bother. It is a dependable second camera, one to be relied upon should your

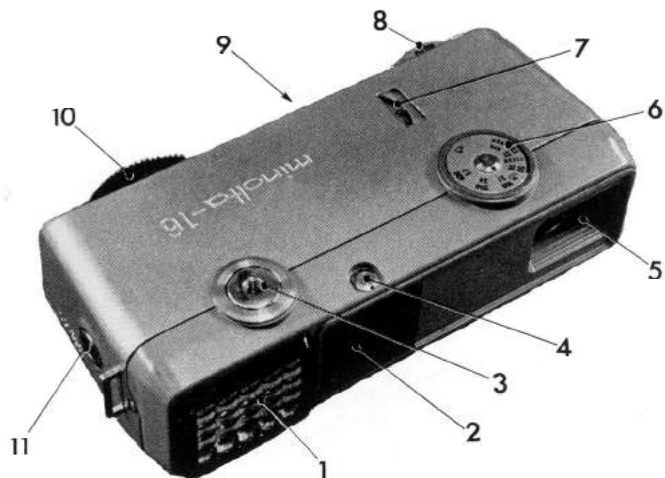
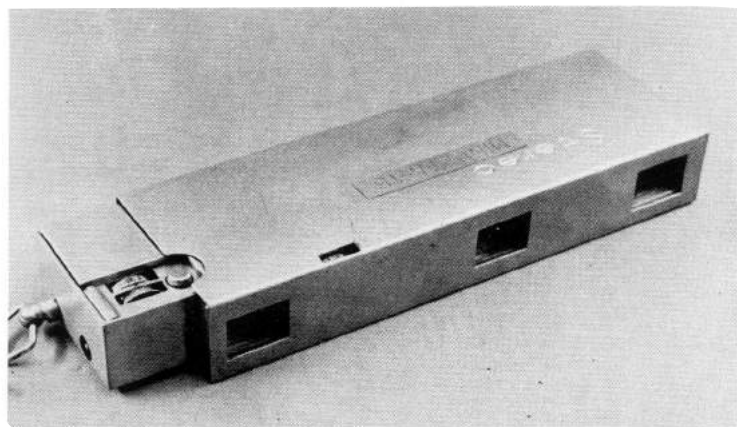


Fig. 3. The breakthrough. A 16 with a built-in electric eye. The 16EE:

- | | |
|---------------------------|------------------------------|
| 1. Selenium eye | 6. ASA-setting dial |
| 2. Lens and shutter | 7. Film counter |
| 3. Shutter release | 8. Auto/flash wheel |
| 4. Filter attaching clamp | 9. Tripod socket (not shown) |
| 5. Viewfinder | 10. Film advance |
| 11. Flash terminal | |

Fig. 4. A modification of the Konan 16 was the Stereo 16. It was short lived.



primary camera fail for some reason. It is unobtrusive, for the ultimate in candid pictures. Most importantly, it is an instrument capable of producing a photograph hardly discernible from one produced by a camera many times larger. It can be the serious instrument of the microfilmer, or the casual camera of the snapshooter. It is all of these things and more.

Because of the size of the 16mm camera and the uses peculiar to it alone, the owner needs more than just an instruction book for the operation of the camera. Whereas becoming totally familiar with the controls is mandatory for the consistent successful operation of any camera, your Minolta 16 needs just a bit more. Special techniques, unique applications, and a general understanding of what is going on inside that mysterious device you can hold in the palm of your hand will not only lead to a fuller enjoyment of a profession or hobby, but will at the same time develop your imagination, allowing you to expand on the camera's already myriad uses.

CHAPTER 2

Equipment

To use the camera you have purchased, you need only give the instruction book a cursory reading. It's written to provide the "man in a hurry" with enough information to take a photograph. But then, why be in a hurry to begin with? Your camera deserves a few minutes more of your time, and by taking that time, you will not only be able to utilize the camera to its fullest, but you will enjoy doing so.

This section is designed to supplement the instruction book you received with the camera, and in cases where the instruction book has been lost, to serve as an operations guide.

THE 16Ps: A SIMPLIFIED CAMERA FOR THE BEGINNER (INTRODUCED: 1965)

The 16Ps is a 16mm camera capable of providing its user with quality photographs at the lowest possible cost. While simple in its general features, it does have a rather unique device, the Weather Dial, which makes photography easy for the neophyte. The operation of the Weather Dial will be explained as we proceed.

Loading

Loading this camera, as with any Minolta 16, is made convenient and uncomplicated by means of a plastic, drop-in double

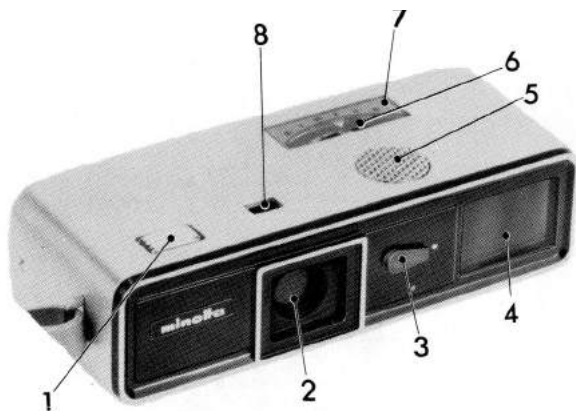
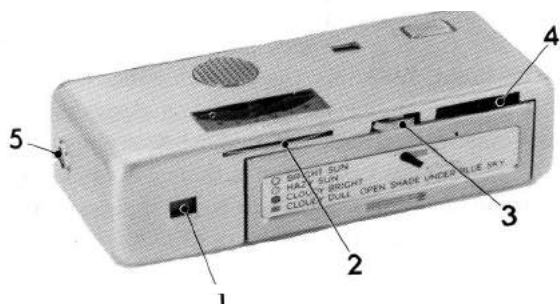


Fig. 5A. 16Ps front and top controls:

- | | |
|--------------------|-------------------------|
| 1. Shutter release | 5. ASA-setting dial |
| 2. Tripod socket | 6. ASA window |
| 3. Flash lever | 7. <i>f</i> /stop scale |
| 4. Viewfinder | 8. Film counter |

Fig. 5B. 16Ps back and top controls:

- | | |
|------------------------|-----------------------|
| 1. Viewfinder eyepiece | 3. Back cover latch |
| 2. Exposure dial | 4. Film-advance wheel |
| 5. Flash terminal | |



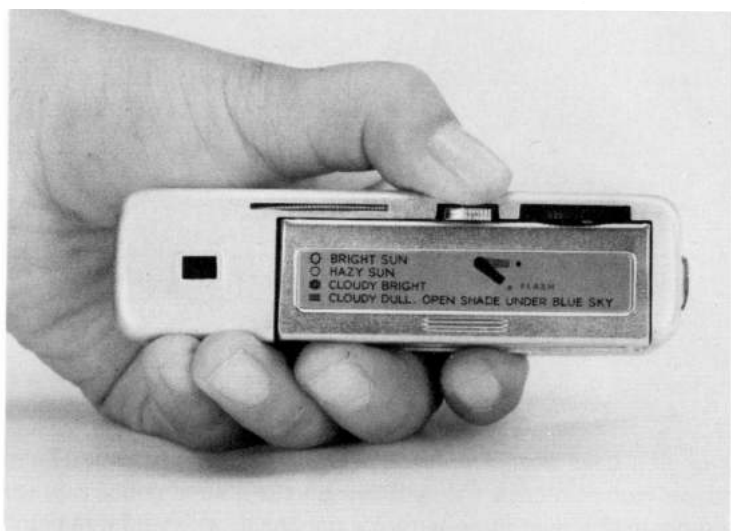


Fig. 6A. Open the back by moving lever to left.

cassette. Standard 16mm motion picture film is respooled by Minolta into this cassette. Since all of the cameras depend upon a pin in the camera to pull the film from its supply chamber in the cassette and not upon a sprocket drive (as with 35mm), the owner can use 16mm single perforate, double perforate (unless he has a 16MGs) or imperforate film. More on this later, in the section devoted to reloading your own cassettes.

You open the back of the 16Ps by pressing a spring loaded lever on the rear apron, midway between the exposure adjustment wheel and the film-advance dial. The back and top piece may then be lifted, revealing the film chamber. Place the film cassette flat in the chamber, so that you can close the cover without undue force. If resistance is met while trying to close the cover, it means that the keyed slot in the cassette is not meshing with the turning key of the camera. If this happens (and it should be noted that this can happen with any Minolta 16), all you need

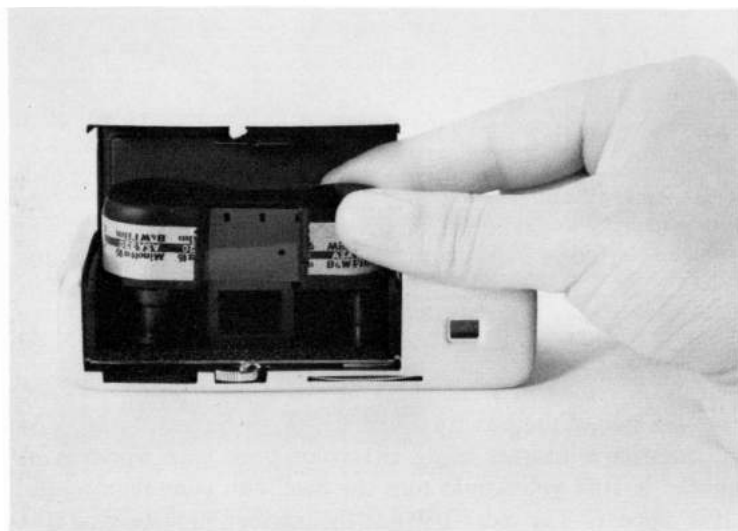


Fig. 6B. Drop in film cartridge, making sure it seats flat.

do is advance the shutter wheel slightly to turn the camera winding key to make it mesh. You should be able to close the cover easily at this point.

The film counter for the 16Ps is located on the top of the camera and should now be on "S" (for start), as it automatically resets upon opening the back. Turn the advance wheel and press the shutter release button (found in the front right corner) until the number "20" appears in the counter window. You are now ready to take your first picture.

Setting the Film Speed

Before an exposure is made, however, you must "tell" the camera what kind of film you've put into it. This is done by turning the round knurled disc on the top of the camera and noting the number that appears in the window directly above the pictorial weather representations that comprise the Weather Dial. This is

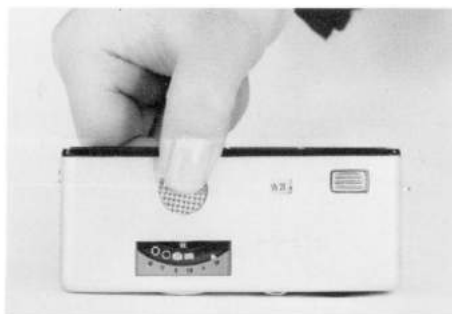


Fig. 7. Turn knurled disk to set ASA—shown is ASA 80.

your ASA setting. The number that should be set is obtained from the side of the box from which you obtained your film. As an example, if you are using Ektacolor print film, whose ASA number is 100, you would turn the disc with your thumb until "100" appears. The older 16P had the number 80 instead of 100. Either number will provide satisfactory results with this film.

Using the Weather Dial

While the 16Ps has no electric eye, its weather calculator does permit you to dial in the existing light conditions and by doing so, set the correct aperture. The film-speed and the *f*/stop scales are interlocking so that if you place a pictorial representation opposite the index mark, you will have also set the actual *f*/stop that you wanted. The sky conditions indicated are "BRIGHT SUN," "HAZY SUN," "CLOUDY BRIGHT," and "CLOUDY DULL" or "OPEN SHADE." The *f*/stops are provided for depth of field calculation and for use with flash.

Setting the Shutter Speed

The shutter-speed selector lever in the front of the 16Ps has two positions. The position indicated by the white dot is used for all outdoor exposures and indoor shots by daylight through a window when no flash will be used. The speed of this position is 1/100 sec. The red dot shows that you have set the camera for flash operation. The speed is set at 1/30 sec.



Fig. 8. Turn Weather Dial disk to align pointer with light conditions—shown is HAZY.

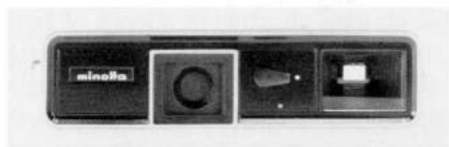


Fig. 9. Exposure lever in DAYLIGHT position.

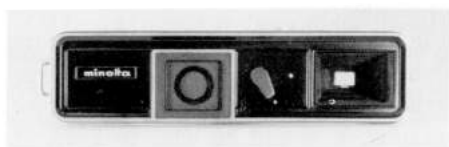


Fig. 10. Exposure lever in FLASH position.

Releasing the Shutter

At this point a word should be said about shutter-button pressing, or should I say "pushing." It would appear that most photographers have the strength of a Samson when it comes to depressing the shutter-release button of their 16mm camera. It is, without doubt, one of the most important contributors to poor pictures. The pressure required to release the shutter of the 16Ps or any other Minolta 16 is very slight. The camera was engineered in this manner to permit you to use as little force as possible. When any camera is moved while pressing the shutter button, the picture it takes will simply not be sharp, no matter how careful you are in every other respect. The smaller the camera, the easier it is to impart a movement to it while taking the picture. Therefore, the answer is easy. Squeeze the shutter release in such a manner that you will not even realize that it has gone off. The

problems of releasing the shutter of a camera and the trigger of a rifle to obtain minimum movement during that moment are very similar indeed. With 16mm cameras, it cannot be emphasized enough.

Focus and Depth of Field

The 16Ps has no adjustment for focus. A fixed focus camera is set at the factory to one particular distance at which it will be sharpest for all taking apertures. For the 16Ps, that distance is 16 feet. By applying the lens' depth of field, one can shoot as close as $4\frac{3}{4}$ feet without a closeup attachment. Depth of field refers to the length of the zone of sharpness, in front and in back of your primary object of sharpest focus for a given focal length lens and for a given aperture of that lens. Vary any of the three factors, focal length of the lens, aperture, or distance focused on, and your depth of field will change.

The 16Ps, by virtue of its short focal length lens (25mm) has a greater depth of field than would a 35mm camera or larger format instrument. Although more will be said about this subject relative to closeup photography, it would be wise to keep the distances on the chart below in mind when composing your picture. Remember, the sharpest photos at any given aperture will result if you keep your subject of greatest interest within the range of distances given for that aperture:

Lens Opening	Depth of Field (feet)
f/3.5	$10\frac{1}{2}$ –37
f/4.0	10– $45\frac{1}{2}$
f/5.6	$8\frac{3}{4}$ –158
f/8.0	$7\frac{1}{3}$ – ∞
f/11.0	6– ∞
f/16.0	$4\frac{3}{4}$ – ∞

It is easy to see from the above chart that by contriving to use a specific opening, you can move closer to your subject. This will become a vital part of closeup applications.

The viewfinder of the 16Ps is life size and made of optical glass for maximum clarity. Take care not to get fingerprints on it

or to scratch it. The camera is equipped with a tripod socket that is most often used for attaching a flashgun.

Unloading Film

When all of the pictures have been taken on the cassette, the number "0" will appear in the counter window. At this point, wind and shoot until the letter "E" appears. Then, in shade, open the back and remove the cassette. For maximum protection for your valuable (but as yet undeveloped) film, it should be placed immediately into the original outer plastic container. This provides protection and light tightness for the cassette while it is in your pocket or purse, and of course, while it is in transit to the film processing lab.

THE 16II: THE INEXPENSIVE CAMERA WITH BUILT-IN FLEXIBILITY (INTRODUCED: 1960)

The 16II, which looks amazingly like its predecessor the 16, has been in the Minolta line for many years. Its popularity is due in part to its range of shutter speeds, wide aperture setting, overall size, ease of use, and price.

It comes with a shutter speed range of **B** (bulb for time exposures), 1/30, 1/60, 1/125, 1/250, and 1/500 sec. It has an *f*/2.8 lens, which is fast enough for available light photography, yet stops down to *f*/16 for beach scenes and maximum depth of field. The only difference between this camera and the 16 of almost twenty years ago is that the 16 had shutter speeds of **B**, 1/25, 1/50, and 1/200 and apertures from *f*/3.5 to *f*/11. In all other respects, they are the same.

Loading

Loading this camera is essentially the same as the other 16's in that you drop in a Minolta film cassette. However, in this compact model the film is advanced by a push-pull of the inner and outer cases of the camera body. To gain access to the film, you must first pull the outer case away from the inner body, as though you were going to take a picture. Then, by depressing a projecting catch next to the film-counter window, you can continue to

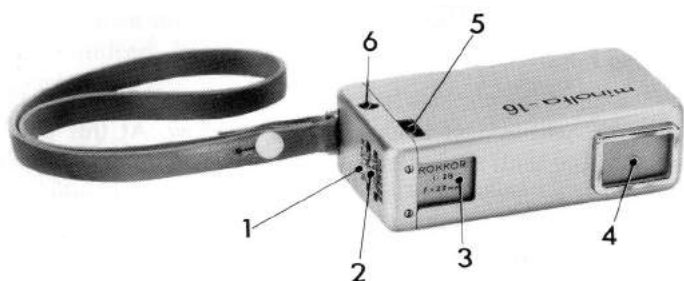


Fig. 11A. 16II front and side controls:

- | | |
|--------------------|--------------------|
| 1. <i>f</i> /stops | 4. Viewfinder |
| 2. Shutter speeds | 5. Shutter release |
| 3. Lens (covered) | 6. Flash terminal |

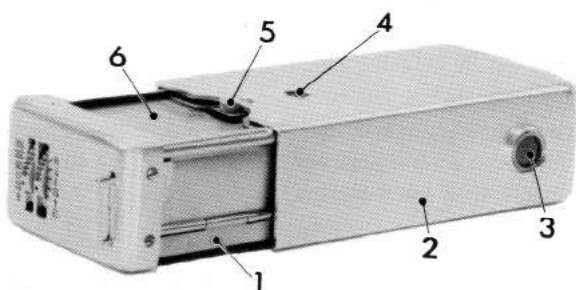


Fig. 11B. 16II bottom and side controls:

- | | |
|------------------------|------------------|
| 1. Loading door | 4. Film counter |
| 2. Outer case | 5. Cover release |
| 3. Viewfinder eyepiece | 6. Camera body |

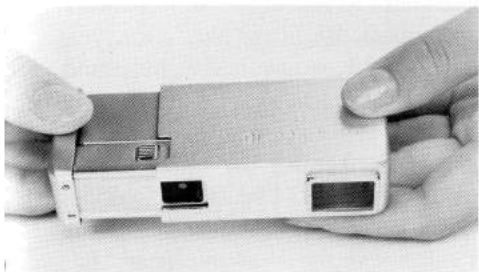


Fig. 12A. To load the 16II, grasp each end of the outer case and pull as if you were going to photograph with it.

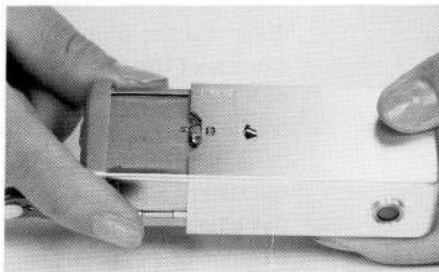


Fig. 12B. Flip it over so the counter faces you.

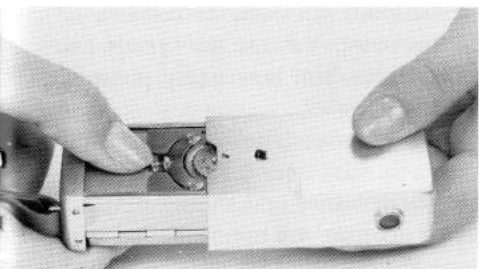


Fig. 12C. Depress the counter catch and continue to pull the camera case.

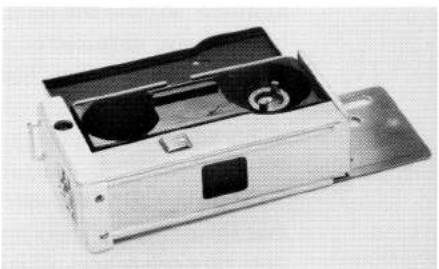


Fig. 12D. Lift the loading door.

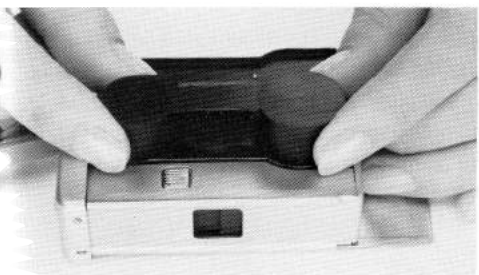


Fig. 12E. Drop in the film cassette and close door.

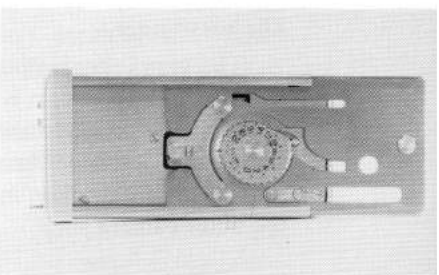


Fig. 12F. Make sure the counter is placed on "S" before closing the case.

separate the two halves of the camera to reveal the film-chamber door and the film-counter mechanism. By lifting this door, you can insert the cassette. If the cassette does not lie flat, push and pull the advance mechanism slightly to once again align the key of the camera with the slot of the cassette. Once this has been done, set the film counter by manually turning the wheel so that the letter "S" is opposite the red index mark. Unless this is done, the camera counter will not give an accurate indication of the number of pictures taken or will not move from the letter "E", which will have moved into position at the end of the previous roll of film. Once you have made this adjustment, the inner body is reinserted into the outer shell and the camera closed. If the camera is pulled again, the film counter will move toward the number "20." Two or three push-pulls with shutter releases in between are required to reach this point. You are now ready for the first picture. The film counter tells you how many pictures you have left.

Setting Exposure

To set your exposure, turn the aperture and shutter dials so that the desired shutter speed and aperture are opposite the index dots on each wheel. Click stops are provided for ease of setting so that once set, the position will not accidentally change. (For information on determining correct exposure, see Exposure Techniques.)

The Viewfinder

The viewfinder is optical glass set into a frame. As this is not recessed in any way, it is suggested that when the camera is not in use, it be carried in its protective carrying case. Of course, should the viewfinder become damaged, you can replace it yourself: Insert a new glass into the frame, and crimp the frame into the outer camera shell.

Shutter Release

The camera is cocked by pulling the outer shell as far as it will go. Pushing the outer shell back to the closed position advances

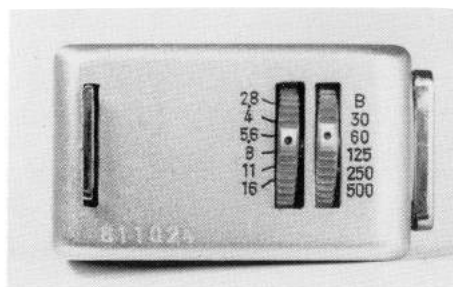


Fig. 13. The shutter speed and aperture controls of the 16II.

the film. The shutter-release button is, like the shutter release of the 16Ps, very easy to depress. A gentle squeeze is all that is needed. When the camera is cocked, a blue dot will be seen on the face of the shutter assembly. When the shutter is released, this dot disappears. It should be kept in mind that in order to provide a compact design, the winding mechanism does not depend upon firing the shutter to operate. Therefore, if you cock the shutter and do not wish to take a picture, but instead close the camera, you will lose that frame. However, inasmuch as 16mm film can be extremely inexpensive, especially if you reload your own film, the compact design offsets this shortcoming.

Focus

This model has a fixed-focus lens. The point of maximum sharpness will be found approximately seven feet from the camera. Yet, like the other 16's in the line, depth of field makes this a moot point. The zone of sharpness for each aperture is as follows:

Lens Opening	Depth of Field (feet)
f/2.8	6 $\frac{1}{2}$ –10 $\frac{3}{4}$
f/4.	6–12 $\frac{1}{2}$
f/5.6	5 $\frac{1}{2}$ –16
f/8.	4 $\frac{3}{4}$ –27
f/11.	4–20 $\frac{1}{2}$
f/16.	3 $\frac{1}{2}$ – ∞

All distances have been rounded off to the nearest $\frac{1}{4}$ foot for ease of application.

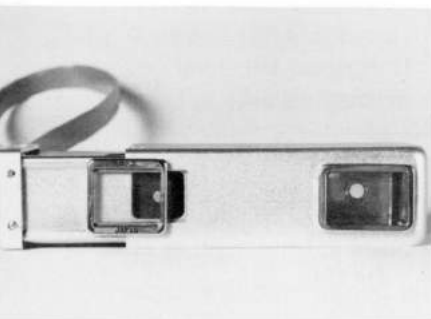


Fig. 14. Place a filter on the 16II by sliding it onto the case frame.

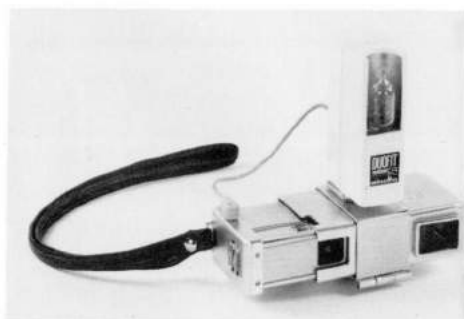


Fig. 15. The Duo Fit-S flashgun on the 16II using the clamp attachment.

Since this camera also has provision for interchanging accessory lenses, depth of field plays an important part in closeup photography. Closeup lenses as well as filters are removed and inserted in front of the taking lens by sliding the accessory-lens frame into the slots provided in the outer camera shell.

Flash Attachment

A standard PC type flash terminal is provided in one end of the camera body. The tripod socket found on the body of other 16's is not included in the 16II. Instead, an accessory clamp is available that surrounds the middle of the camera when in place. This clamp has a tripod socket on one side and a flash gun shoe on the other.

This camera has as great a range of shutter speeds and apertures as the top-of-the-line 16MGs, but at a third the price; however, it does not have a built-in light meter. Thus, the 16II is an ideal candidate for applications requiring great flexibility with inherent ruggedness. You can see examples of this in the section devoted to specific applications.

THE 16MGs: THE SYSTEM SUBMINIATURE (INTRODUCED: 1970)

Over the years, a continuing effort has been made to provide

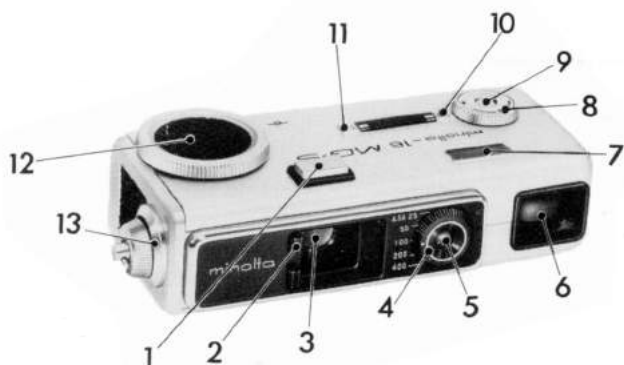


Fig. 16. The 16MGs showing all major controls.

- | | |
|--------------------------|--------------------------------------------|
| 1. Shutter release | 8. Shutter-speed dial |
| 2. Closeup-lens knob | 9. Auto/flash control |
| 3. Lens | 10. Shutter-speed window |
| 4. ASA-setting dial | 11. Film-counter window |
| 5. CdS eye | 12. Shutter winding and film-advance wheel |
| 6. Viewfinder | 13. Tripod socket |
| 7. <i>f</i> /stop window | |

a larger negative size in a smaller camera. The standard 16mm subminiature negative size until recently had been 10 x 14mm, the size used in all Minolta 16mm cameras up until the 16MGs. This instrument is to 16's what the Super 8 is to movies. It gives a super size 16mm negative on the same film with little, if any, increase in camera mass. The trick? Eliminate one set of sprocket holes or use imperforate film so that the image goes right to the edge. Result? A negative 12 x 17mm. This is just about one-quarter the frame size of a standard 35mm camera, but the instrument is many times smaller.

This model is the most sophisticated yet designed. A built-in, battery-operated CdS light meter automatically selects the correct aperture from *f*/2.8 to *f*/16 for a pre-selected shutter speed from

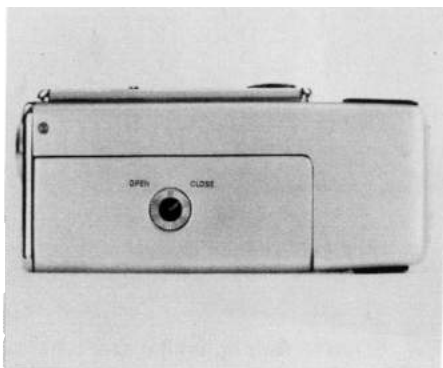


Fig. 17A. To load the 16MGs, turn the film-chamber door latch to open.

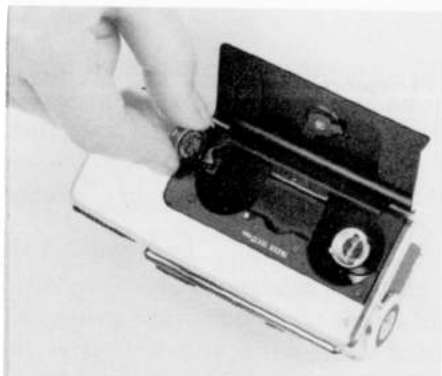


Fig. 17B. Before dropping that cassette into the camera, think, has it been a year since you replaced the battery?

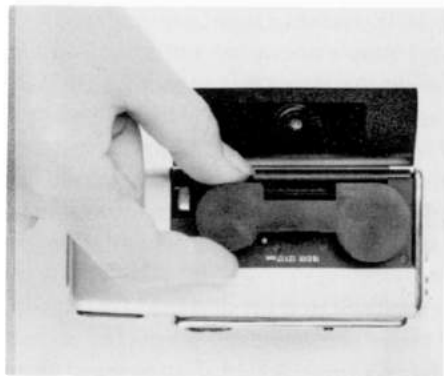


Fig. 17C. The film is seated flush.

1/30 to 1/500 sec. It also operates a mechanism that prevents shutter release if too little or too much light is present for the shutter speed selected.

Loading and Film Advance

Loading is accomplished by opening the film door on the bottom of the camera, dropping the cassette in, and closing the door. As with most other models, the film counter automatically resets to "S."

When the film door is opened for the first time, however, you would insert the battery, which is held in a small corner of the film chamber by a separate plastic piece. The battery used is a Mallory PX 675, 1.35V type which has a useful life of well over a year. It is best to arbitrarily replace it yearly. A good way to remember is to do so on your birthday.

You wind the shutter and advance the film by turning the large wheel on the right top rear of the camera until it stops. Continue to do so, releasing the shutter each time, until the number "18" appears in the film counter window. Due to the super size of the image, this camera produces 18 frames on the standard length of film. Other Minolta cameras provide 20.

Setting the ASA

Since the 16MGs has a built-in CdS eye, you must now set the film speed. In the front of the camera, between the covered taking lens and the optical viewfinder, you will find a wheel with an index dot. This wheel sets the electric eye. A scale runs vertically alongside. The ASA numbers indicated are 25, 50, 100, 200, and 400. In between numbers are click stops, which represent ASA values 40, 80, 160, and 320. The DIN equivalents are given in the instruction book.

Setting the Shutter Speed

For best results, set the shutter-speed dial after the camera is cocked. Do this by first selecting automatic or flash operation by means of the central wheel within the shutter dial. For automatic operation, make sure that the "A" is *exactly* opposite the

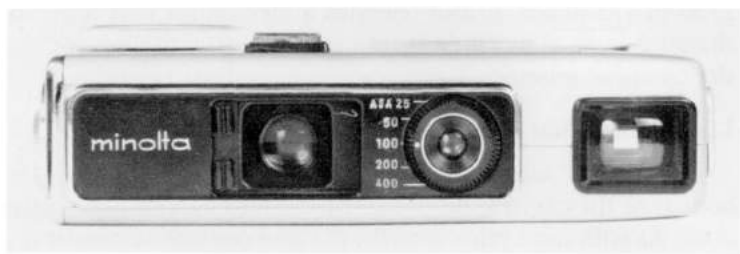


Fig. 18. Set the ASA indicated, shown here is 100.

speed window. Then, by turning the outer dial, you select the speed between the range mentioned. Note that 1/30 is in red. This is so marked for flash operation, explained in the section on flash technique.

Before taking a picture, move the lens cover to the side so that the camera can function. If you forget, the camera will remember for you by signaling with a red flag in the viewfinder, which means that you have either forgotten to remove the cover, or that there is too little or too much light present for the speed selected.

Framing and Focusing

Framing your photo is nothing more than sighting through the finder and placing the extreme left part of your scene at the



Fig. 19A. If the shutter speed is too high, the *f*/stop indicator will be in the red area past *f*/2.8.



Fig. 19B. If the speed selected is too slow, the indicator will be past *f*/16 and the shutter will lock too.

left side of the bright-line finder. The marks just within this extreme are there to provide a left side reference when the built-in, medium-closeup lens is in place. This closeup lens is used to focus sharply on subjects placed anywhere from as little as 2'4¾" to as much as 10'9½", depending upon the aperture used. The accompanying depth-of-field chart covers both the closeup lens and the standard lens chart.

<i>f</i> /Number	Without Closeup Lens	With Closeup Lens in Place
<i>f</i> /2.8	8'8⅝"–16'9⅞"	3'6⅞"–4'4¾"
<i>f</i> /4.	7'10"–20'10⅜"	3'4⅞"–4'8¼"
<i>f</i> /5.6	6'11"–31'10¼"	3'2⅝"–5'1"
<i>f</i> /8.	5'11⅝"–124'3"	2'11¾"–5'9¼"
<i>f</i> /11.	4'11¾"–∞	2'8⅝"–7'1¾"
<i>f</i> /16.	4'¾"–∞	2'4¾"–10'9½"

Once you have chosen the speed, brought the camera to eye level, and pointed at the subject, the electric eye will choose the correct aperture. Since the scale indicating this is on the top of the camera, you would not normally know what aperture has been chosen. However, at the moment the picture is taken, the scale is locked, so that when you bring the camera away from your eye, you can note the actual *f*/stop used.

This scale plays a more important role in flash photography. As will be indicated at a later point in this book, a guide number, indicative of the strength of a particular flash for a given film, is provided by the manufacturer of the film or flash. To determine the *f*/stop to be used for a given distance from the subject to camera, divide the guide number by that distance. Set the resulting *f*/stop on the 16MGs by first cocking the camera and then turning the inner dial of the speed selector so that the "A" is no longer opposite the speed window. As you continue to turn this inner wheel the *f*/scale pointer will move upscale toward *f*/16. You should turn the wheel only as far as needed to arrive at the calculated *f*/stop. The shutter speed should be at 1/30 sec. This speed can be used for both M class bulbs and electronic flash. If there is enough ambient light present to permit a photograph to be taken at, for example, *f*/5.6, and yet because of the distance involved, you want to shoot at *f*/2.8, you must hold your finger

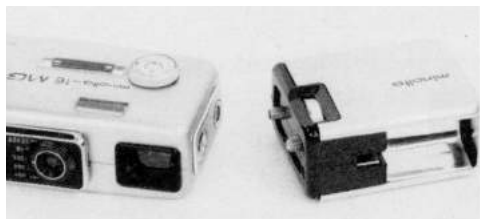


Fig. 20. The 16MGs and the matching AG flash gun which mates into special fittings on the camera end.



Fig. 21. When you use flash, make sure that the AUTO/FLASH control is set to its manual position and that the f /stop you desire is indicated as here, $f/8$ at $1/30$ sec.

over the electric eye opening, and then proceed to turn the dial until the pointer reaches $f/2.8$. If you do not block off the electric eye, it will not be possible to go below the ambient light f /number without forcing the wheel, which will damage the mechanism.

The 16MGs in addition to all else that has been mentioned, has an array of accessories that make it extremely versatile. The individual items in its collection of accessories are described in the chapter on accessories.

A tripod socket as well as a PC connector is provided for flash. Unlike the preceding models, however, there is a connector for a special mated flash gun that attaches without the usual cord. A gun that uses AG bulbs and one that accepts flash cubes is offered, as well as a hot-shoe strobe adapter.

THE 16QT (INTRODUCED: 1972)

The 16QT introduced to fill the void left when the 16MG was discontinued, is a quarter-frame 16 with a 12×17 mm format. It has a 23mm $f/3.5$ lens that stops down to $f/22$, providing even more depth of field than its predecessors and allowing you to move in closer with flash. Instead of several speeds, it has two: $1/30$ sec. for low light levels and flash; $1/250$ sec. for daylight and action shots. Since most blurred 16 pictures can be traced to camera movement, $1/250$ sec. is provided rather than the usual $1/125$ sec.

The camera also has provision for ASA settings of 50 to 400, which are dialed into a disc provided with click stops on the front

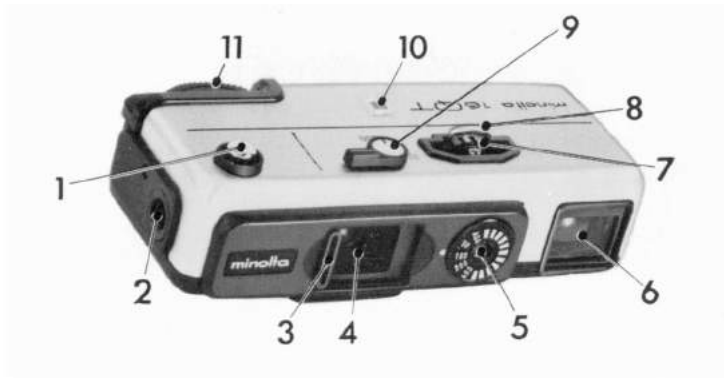


Fig. 22A. 16QT top and front controls:

- | | |
|--------------------------|---------------------------|
| 1. Shutter release | 6. Viewfinder |
| 2. Tripod socket | 7. f/stop wheel |
| 3. Sliding lens cover | 8. Meter switch |
| 4. Lens and shutter | 9. Shutter-speed selector |
| 5. CdS eye | 10. Film counter |
| 11. Shutter/film advance | |

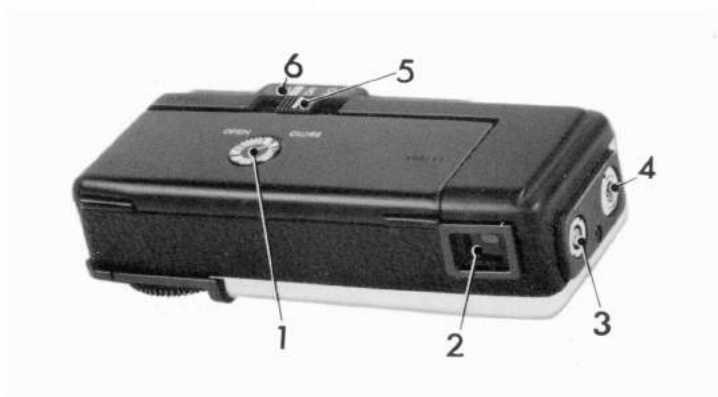


Fig. 22B. 16QT bottom and side features:

- | | |
|-------------------------|--------------------------|
| 1. Film-chamber lock | 4. Flash-gun socket |
| 2. Viewfinder eyepiece | 5. Focus adjustment |
| 3. Flash-sync connector | 6. Zone-focus pictograms |

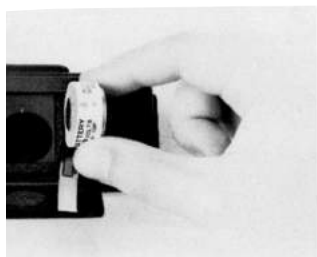


Fig. 23. Before loading, drop in a PX 30 power cell.

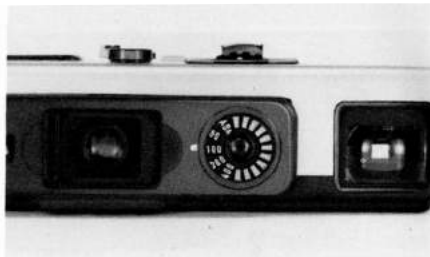


Fig. 24. Set the film speed on the dial surrounding the CdS eye.

of the camera. Values of 50, 100, 200, and 400 are indicated in silver numbers; intermediate positions representing 64, 80, 125, 160, 250, and 320 have click stops. You load this model as you would any other 16. The auto counter will go back to "S" when you open the film door. The battery compartment for the built-in meter is adjacent to the film chamber. It holds a PX30 battery.

Framing and Focusing

When you look through the viewfinder, the most obvious thing you will see is the bright-line frame and the parallax marks on its left. At the bottom of the frame are four pictograms, which correspond to the pictograms on the bottom front edge of the camera. By moving the focusing lever on the bottom of the camera from side to side, you can focus on a general area or zone.

As you move the lever to one of the pictograms, the camera focuses on a specific distance shown below. As you close down the lens, depth of field extends in front and behind that distance, creating a zone of sharpness. The zone for each f /stop at the various focusing distance is shown in the accompanying table.

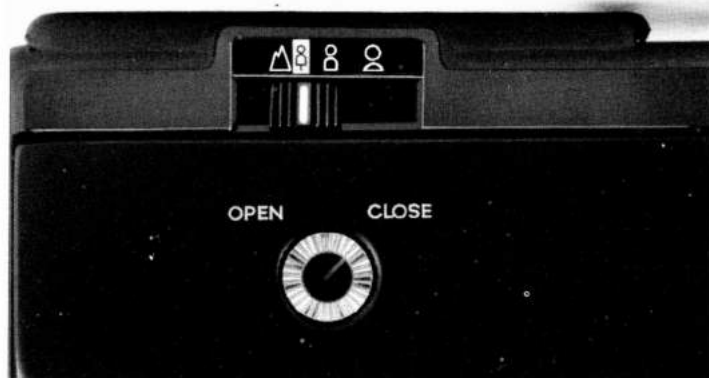


Fig. 25. The 16QT can be set to specific focus zones indicated by the pictograms: the setting at far left, the mountain, places focus at 33 feet; the full standing figure, 11½ feet; the head and shoulders, 6½ feet; the head closeup, 4 feet. The medium setting can be used for most outdoor shots by bright sunlight.

f/stop	33 feet	11½ feet	6½ feet	4 feet
3.5	15'4⅝"–∞	8'2⅝"–18'11½"	5'4⅝"– 8'5⅙"	3'5¾"– 4'6⅜"
5.6	11'8⅙"–∞	7'⅝"–31'2⅜"	4'10¼"–10'2⅜"	3'3⅛"– 4'11⅝"
8	9'1⅝"–∞	6'⅝"–∞	4'4⅜"–13'4⅝"	3'½"– 5'7⅜"
11	7'2⅝"–∞	5'1⅝"–∞	3'10½"–22'½"	2'9⅝"– 6'8⅜"
16	5'4⅙"–∞	4'1⅝"–∞	3'3⅜"–∞	2'5¾"– 9'10½"
22	4'1⅙"–∞	3'4⅙"–∞	2'9¼"–∞	2'2⅙"–23'4⅜"

At the top of the viewfinder a red flag warns you that you are set for 1/30 sec. shutter speed. Knowing this, you should make an extra effort to hold the camera steady.

Setting the Aperture

Once you have chosen your shutter speed by moving the lever on the top of the 16QT so that the pointer, not the lever itself, indicates the speed to be used, you place your index finger on the

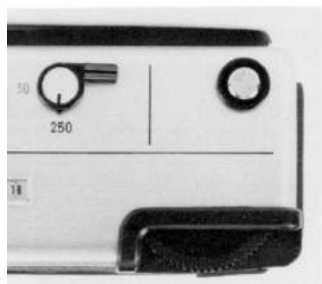


Fig. 26. For outdoor shots choose the 1/250 sec. position.



Fig. 27. Pressing the meter switch, roll the ball of your finger back and forth over the aperture wheel. When you see the flashing "O.K." signal, the proper *f*/stop has been set.

chrome projection and black ribbed aperture wheel. Then, while looking through the finder, press the projection and turn the wheel by rolling the ball of your finger back and forth. If the lens cover has been slid back, you will see an orange arrow light up on the left or the right side of the extreme top of the finder. The left arrow has an "O" superimposed on it, whereas the right has a "K." If the right arrow lights, it means that you are under exposed. If the left arrow lights, you are giving too much exposure. Soon you will reach one point at which both arrows will flicker on and off. You will see a flashing "OK" as both lights blink back and forth. This indicates that the proper *f*/stop has been set. The arrows will light only as long as you press the chrome tab. This has been designed to conserve your battery; it acts as the on-off switch for the meter. The shutter release itself is located in the upper right-hand corner of the camera body and is quite easy to press, requiring less force than any other Minolta 16 to date. Be gentle as you squeeze it.

Other Features

A tripod socket will be found on the right end of the 16GT. A flash mounting hole and PC connection are located on the left



Fig. 28. The 16QT fitted with strobe adapter and Electroflash P.

end. The flash accessories designed for the 16MGs fit the 16QT in the same manner. The shutter winder and film-advance wheel is half concealed in the top cover, preventing accidental partial winding of the shutter while handling.

DISCONTINUED MODELS: THE 16, 16P, 16EII (16CdS), AND 16MC

**The 16 (Introduced 1957; discontinued 1960.
Last list price—\$37.50)**

Because this camera is in most ways similar to the current 16II, only its differences are described here. Essentially a very compact instrument, the 16 succeeded the original Konan 16 by a few years. It came with a 25mm, three-element $f/3.5$ lens, with click stops at 3.5, 4, 5.6, 8, and 11. It had three shutter speeds: 1/25, 1/50, and 1/200 sec. Flash was X synchronized

at 1/25 sec., which covered both M lamps and electronic flash. The negative produced was the standard 10 x 14mm on double perforated 16mm film. In all other respects, the camera handled like its newer counterpart, the 16II, mentioned previously.

**The 16P (Introduced 1960; discontinued 1965.
Last list price—\$26.90)**

This camera resembles its current successor, the 16Ps; however, the 16P had only one shutter speed, 1/100 sec. This, of course, limited the capabilities of the camera for both available light work and flash photography. For example, with a given flashlamp and film, the guide number is higher when a slower shutter speed is used (1/30 with the 16Ps) and therefore allows properly exposed pictures at greater distances than is possible with this model. The easy way to identify this camera is to note the *lack* of a switch on the camera front to change shutter speeds. The 16P was a short-lived instrument and gave way quickly to the improved 16Ps.

**The 16EE (Introduced 1962; discontinued 1964.
Last list price—\$79.50)**

When it was introduced, the 16EE was a revolutionary product; for the first time you could buy a subminiature camera with a built-in electric eye. The 16EE has a sensitive selenium cell (no battery) adjacent to its lens and shutter that controls an automatic diaphragm. By setting of the ASA of the film in use on the dial just above the optical viewfinder, you also set the shutter speed. Using ASA 25 film gives you 1/30 sec., ASA 50 makes it 1/60 sec., ASA 100, 1/125 sec., ASA 200, 1/250 sec., and ASA 400 gives you an action stopping 1/400 sec.

The camera is equipped with a 25mm *f*/2.8 lens that stops down to *f*/16 as the electric-eye programmed it. The method of loading the camera and setting the auto-reset counter is the same as that used for current models of the Minolta line: You drop in the film cartridge, close the door, and click off two pictures to bring "20" into position in the counter window. Then, after turn-

ing the ASA dial so that the film speed in use is opposite the index dot, look through the viewfinder.

This camera incorporates another radical departure from previous models—zone focusing. Before pressing the shutter release, it is necessary for you to move the pin on the underside of the 16EE. This reveals either a pictogram of a man and woman, indicating 7 feet, or a diagram of a tree and house, used for a prime focus of 16 feet. Of course, the inherent depth of field makes these distances merely starting points.

Finally, after making sure that the "AUTO/FLASH" dial in the rear of the 16EE is set to "AUTO," look for the yellow signal dot in the upper right-hand corner of the viewfinder. If this dot appears, you are ready to start taking pictures.

If you do not see that dot, it means that flash is called for. If this is the case, switch the "AUTO/FLASH" dial to the flash position, pop on your flash gun, and turn the ASA dial to either ASA 25 for 1/30 sec. or ASA 50 for 1/60 sec. at a fixed aperture of $f/11$. While limiting the useful range of flash, this combination is sufficient for most average snapshots by flash. Either shutter speed had X synch.

Closeup lenses and filters were designed for this camera as well. Filter factors can be incorporated into the electric eye by changing the ASA number used according to the filter factor given. Closeup lenses No. 1 and No. 2 snap into the frame surrounding the taking lens. Set the zone-focus adjustment to the near position: A No. 1 lens allows shots at 4 feet; a No. 2 allows you to move as close as $2\frac{1}{3}$ feet. If this lens is used, the parallax correction line in the viewfinder becomes the left edge guide.

**The 16EEII: United States designation—16CdS
(Introduced 1963; discontinued 1965. Last list price—\$89.50)**

The 16EE with its selenium cell gave way to progress in the form of the 16EEII with a built in CdS eye. This camera retains the popular features of the 16EE, but has a range of shutter speeds interlocked with the ASA setting. The 16EEII has a three position shutter-speed selector that indicates "H" (high speed,

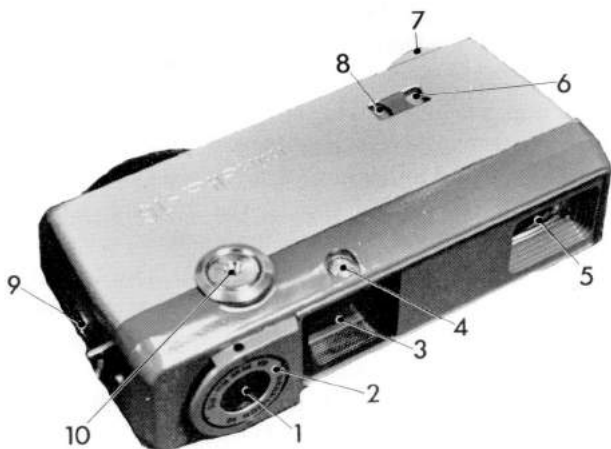


Fig. 29. The 16EEII or 16 CdS. Exit selenium, enter battery:

- | | |
|---------------------------|----------------------------|
| 1. CdS eye | 6. Exposure scale window |
| 2. ASA-setting dial | 7. Exposure setting window |
| 3. Lens and shutter | 8. Film counter |
| 4. Filter attaching clamp | 9. Flash terminal |
| 5. Viewfinder | 10. Shutter release |

1/200 sec.); "L" (low speed, 1/50 sec.), and "F" (flash 1/30 sec.). The procedure for loading and setting the film counter is the same as the 16EE.

On the side of the camera is a slotted cap. As you unscrew this cap, you see a chamber for a PX 13 1.35V battery. The battery should be placed with the + side up.

After setting the ASA value of the film on the dial to the left of the lens and shutter frame (ASA 25–320 with two dots representing ASA 50 and 100), look in the viewfinder for the yellow dot. If you do not see it while the shutter speed selector is in the "H" position, switch to "L." If it does not appear then, your

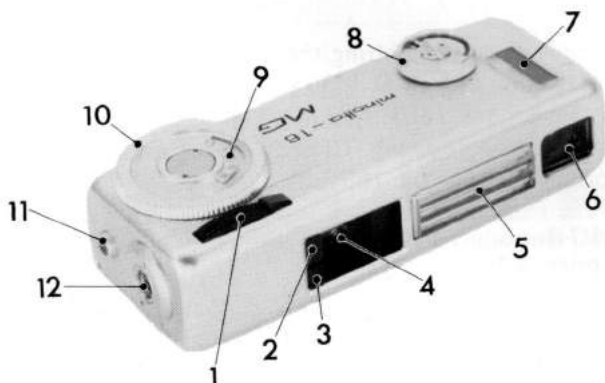
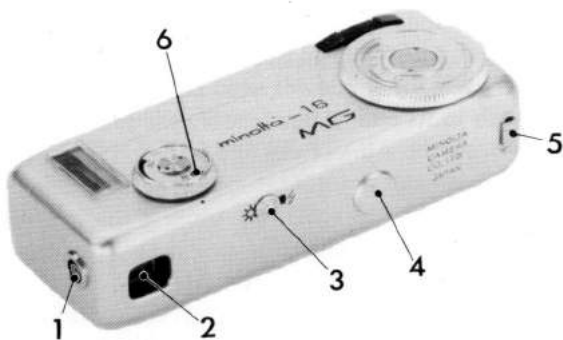


Fig. 30A. The 16MG front and top controls:

- | | |
|----------------------|-------------------------------|
| 1. Shutter release | 7. Meter match-needle window |
| 2. Lens-cap knob | 8. Exposure-control wheel |
| 3. Closeup-lens knob | 9. Film counter |
| 4. Lens and shutter | 10. Film advance wheel |
| 5. Selenium eye | 11. Flash terminal for MG gun |
| 6. Viewfinder | 12. Tripod socket |

Fig. 30B. Rear controls:

- | | |
|------------------------|------------------------------------|
| 1. P.C. terminal | 4. Focus test plug (do not remove) |
| 2. Viewfinder eyepiece | 5. Back latch cover |
| 3. Auto/flash selector | 6. ASA-setting window |



battery needs changing. Setting the shutter selector dial to "F" fixes the exposure at $f/11$ at $1/30$ sec. The aperture range is the same as that for the 16EE ($f/2.8$ – $f/11$), and there is the same provision for zone focusing. Closeup lenses available give the same working range as the 16EE.

**The 16MG (Introduced 1966; discontinued 1971.
Last list price—\$79.50)**

With each model change Minolta either tried to refine the previous model or incorporate a revolutionary feature not available before. The 16MG had a bit of both when it was introduced. Reverting back to a selenium meter, the 16MG had the first match-needle electric eye for a 16mm subminiature.

On the top of the camera, there is a large wheel with a semi-circular slot in it. This is the shutter-advance and film-winding knob, which incorporates a thermometer-type exposure counter. As you click off your exposures, a red line advances in the slot, indicating the number of pictures left as it approaches the letter "E." To the left of this wheel is a smaller wheel in which you can see a rectangular cutout. The outside of this wheel has f /stops on the upper edge ($f/2.8$ – $f/16$) and shutter speeds ($1/30$ sec. and a line to $1/250$ sec.) on the lower edge. Reference dots are found on the camera body, 180° apart. By turning the wheel in either direction until some resistance is encountered, and then going on, you change the ASA number that appears in the window. The ASA scale runs from 25 to 400, with click stops at the unnumbered positions of 32, 80, 160, and 320.

To the left and just a bit in front of the ASA wheel is a vertical window. Within the window is a red needle and a silver pointer with a V-notch in its end. After loading the film in the conventional manner, set the ASA of the film in use. Then, by uncovering the taking lens and pointing the camera at a scene you find the red needle swings up scale. By turning the aperture-speed wheel in either direction, align the two needles so that the red needle rests within the notch of the silver pointer. This automatically selects an aperture–shutter-speed combination. The f /stop is indicated; the shutter speed is continuous. However, a

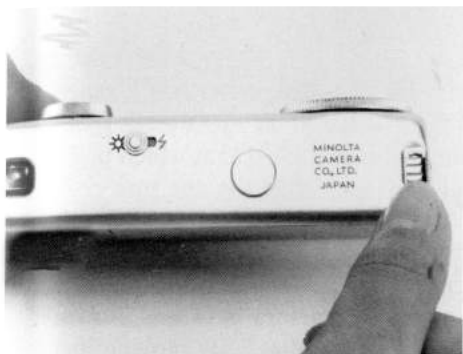


Fig. 31A. The catch releases the film chamber door.

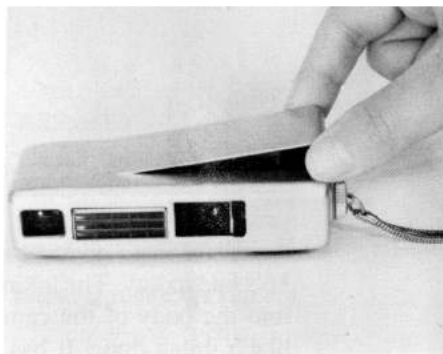


Fig. 31B. Lift and remove the cover completely.

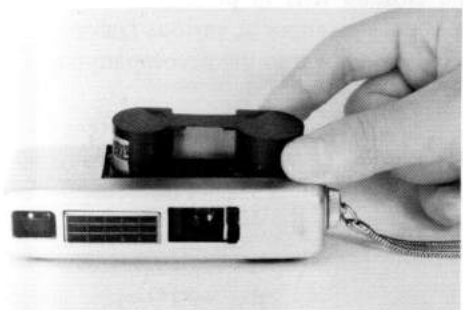


Fig. 31C. Drop the film cartridge in.

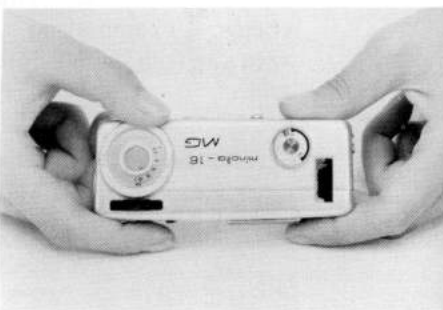
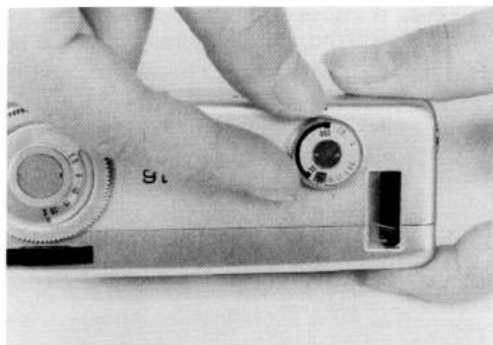


Fig. 31D. Advance the shutter wheel until red line is next to 20.

Fig. 31E. Align the pointer and the notched indicator by turning the adjacent wheel. The ASA (100 shown) has been set in window next to "30" on control wheel.



relationship does exist between the two: The meter has a range of EV 8–EV 16 for ASA 100 film. At EV 8, the exposure is $f/2.8$ at $1/30$ sec. Both progress uniformly until EV 13, at which point the shutter speed remains at $1/250$ sec. while the aperture continues to $f/16$.

The 16MG gives you a built-in extra that owners of earlier 16's had to buy. The taking lens is protected by a cover that slides into the body of the camera when the camera is in use, almost like a dutch door. It has two plastic "handles." By moving just one of them across after opening, you move the built-in closeup lens into place. A red indicator will appear in the viewfinder to remind you of this. With the closeup lens in place, the focus changes. A comparison of the focusing ranges at various f /stops, with and without the closeup lens, is shown in the accompanying table.

f /Number	(point of focus: $3'11\frac{1}{4}"$)	
	Without the closeup lens	With the closeup lens
$f/2.8$	$7'10"-18'4"$	$3'5\frac{3}{8}"-4'6\frac{3}{4}"$
$f/4.$	$7'-25'4"$	$3'3\frac{3}{8}"-4'11"$
$f/5.6$	$6'1"-55'6"$	$3'1"-5'5\frac{3}{4}"$
$f/8.$	$5'2"- \infty$	$2'9\frac{7}{8}"-6'6\frac{3}{4}"$
$f/11.$	$4'3"- \infty$	$2'6\frac{1}{4}"-9'1"$
$f/16.$	$3'5"- \infty$	$2'2\frac{3}{8}"-20'1"$

It is easy to see from the table that if you could arrange it so that $f/16$ could be used all the time, you could keep the closeup lens in place and have an excellent range of focus without any adjustment whatsoever. One firm of private investigators does just that. More on this later on.

A parallax compensating line is also visible on the left edge of the viewfinder.

Flash operation of the 16MG is fairly simple. On the rear apron of the camera, towards the left hand side, you find a button switch that can be moved horizontally between a pictorial representation of the sun (auto mode) and a lightning mark (flash). In the flash position, the shutter speed is set to $1/30$ sec. regardless of the position of the f /stop–shutter-speed dial. Therefore, it is important if you take shots outdoors without flash to make sure

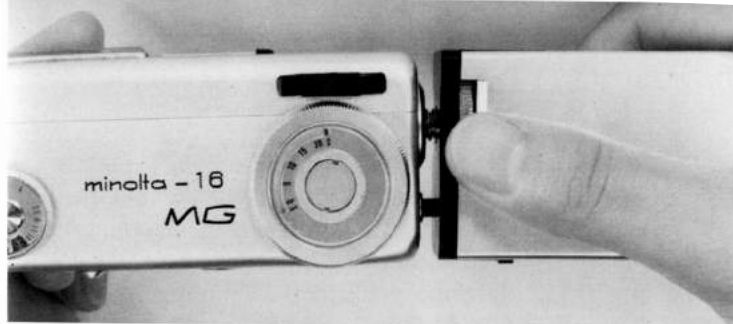


Fig. 32. The 16MG flashgun is attached by screwing it into the camera end. Make sure it is tight.

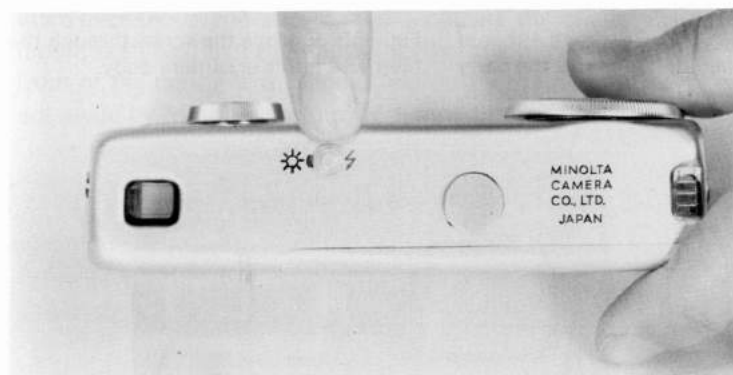
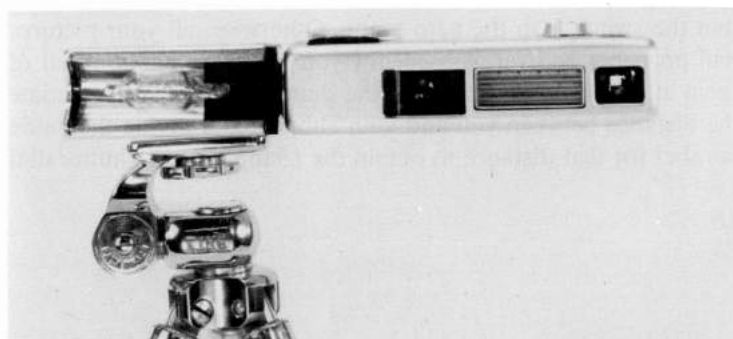


Fig. 33. The FLASH/DAYLIGHT button is moved over to FLASH. This switches your shutter speed to 1/30 sec. You now adjust the aperture by turning the control wheel so that the *f*/stop desired is opposite the upper dot.

Fig. 34. Since the tripod socket of the camera is used for the flashgun, the gun itself has a built-in tripod socket.



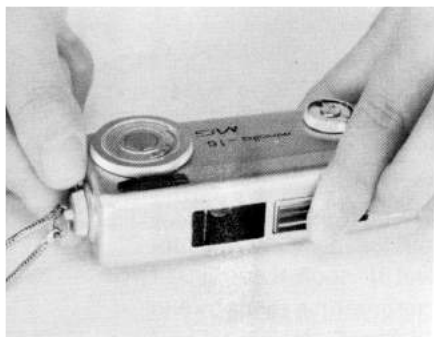


Fig. 35A. To attach either of the filters, remove the carry chain from the tripod socket.

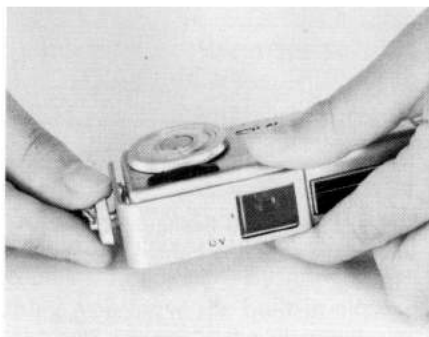


Fig. 35B. Replace the screw through the filter and into the camera body.

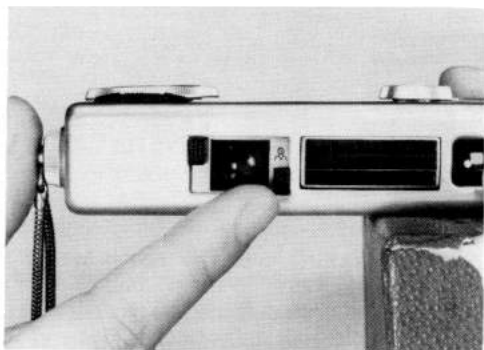


Fig. 36. The close-up lens, built in, is slid into place for portraits. A red warning will appear in the viewfinder telling you it is in place.

that the switch is in the auto mode. Otherwise, all your pictures will probably be overexposed, for you would be shooting all of them at 1/30 sec. For flash, set the shutter to 1/30 sec., estimate the distance between you and your subject, and divide the guide number for that distance to obtain the *f*/stop, set the shutter dial

so that this *f*/stop is adjacent to the upper index dot. In addition to the standard BC type flash connector on the end of the camera, a special connection is provided for an AG1, BC type flash gun, which screws into the end of the camera and mates electrically, making an extremely small, flash-equipped package. Since the tripod socket of the 16MG is used to attach the flash, another socket is provided on the flash gun itself.

Minolta provides two filters for this camera, a UV and a yellow. Both were designed to be attached to the camera by removing the carrying chain from the tripod socket, placing the filter over the tripod socket, and replacing the chain. The filter mount is shaped in a right angle, so that the filter glass itself is in front of the taking lens. Should you desire to obtain other filters not made by Minolta, see the section on filters.

CHAPTER 3

Accessories

While a camera by itself is useful and fun, the addition of wisely chosen accessories can make any camera, and especially the Minolta 16, a photographic system. There are general categories of accessories that apply to all of the Minolta 16's and a few specialized ones designed for the 16MGs and 16QT. In this chapter you will find a description of all those accessories, including filters, closeup lenses, and flash guns.

FILTERS

Probably the most useful accessory purchased for the camera you own will be a filter of one sort or another, because for a small investment, filters give you expanded versatility and new scope of your photographs.

A photographic filter is usually made of optical glass, gelatin, or plastic. It can be colorless to the eye or have a specific color. It is almost always placed in front of your taking lens so that it will have an effect on the image formed by the lens. Filters are divided into several groups—those suited only for black-and-white-films, those designed to have an effect on color film, and those that can be used with either black-and-white or color films. The effect produced will vary with each type of filter. Minolta makes several, covering all the categories.

Black-and-White Filters

Filters in this category are designed to bring about a change in the contrast of a scene rendered on black-and-white film. Depending upon the color of the original scene and the color of the filter chosen, you can increase or decrease the brightness of selected colors in the scene. A general rule of thumb is that a filter lightens subjects of its own color and darkens objects of a complementary color, so far as the final print is concerned.

Minolta makes a yellow filter (designated as Y-48) for all their current 16's and one was available for discontinued models. A yellow filter is a complementary color to the blue of the sky, and if you place it in front of your lens, it darkens the blue sky, thus increasing the contrast between the sky area and the white clouds.

Although no other colored filters for black-and-white films are supplied by Minolta, you can easily make your own, a procedure that is described later on. Let's examine what other colors would be suited for. Another commonly used filter for black-and-white is green. Often designated as X1, this color adds a certain virility to male portraits. It can also be used for lightening foliage to contrast grass or leaves with some subject that may be attired in red, blue, or violet. Orange filters can increase the contrast of furniture and by doing so, bring out that lovely grain you admire. They will also increase visibility on a hazy day when shooting mountain scenery. The red filter is popular for black-and-white work. With a medium or deep red filter in front of your lens, blue sky becomes almost jet black. The clouds stand out stark against the sky. With a little purposeful underexposure you can use this filter to turn that otherwise drab day into a "moonlighted" night.

Filters for Color Film

Filters designed specifically for color film either remove ultra-violet light (UV) from the picture (color film records ultraviolet light although our eyes cannot see it) or they match the quality of the available light to the type of light that the film in use requires for a pleasing rendition of the subject at hand. When this

adjustment is modest, such filters are called light-balancing filters. When a large change in light quality is desired, you would use a conversion filter. Minolta makes both types, although conversion filters tend to be more useful.

The 1A filter supplied for the entire line of Minolta 16's, with the exception of the 16MG, is a weak UV-type filter. It removes ultraviolet from scenes and warms the picture slightly at the same time. I am sure you've seen shots of snow in which the shadows displayed a predominant bluish cast. This is caused by ultraviolet light, which can be blocked by either the 1A or the UV filter.

The UV filter, sold with all 16's except the 16EE, 16MGs and 16QT, is a stronger "1A" and goes further to get rid of that hazy look that some of your scenes may have, especially if you take pictures of distant mountains or fields at high altitudes.

The film generally available for your Minolta 16 is a daylight type, either to be used outdoors or indoors with blue flashbulbs or electronic flash. But what if you're indoors, have plenty of table lights, and do not have a flashgun with you? A conversion filter would then be able to provide you with the correct color values for the light you do have. The 80A filter supplied for the 16, 16II, 16P, and 16Ps allows you to use daylight film with photoflood lamps rated 3200 K. The *K* means Kelvin and refers to the color of light. The lower the number, the redder the light. Daylight contains a lot of blue light and is usually 5500–6500 K.

Filter Factors

Most filters remove some portion of the light that would otherwise reach your film. Therefore a compensation must be made for this loss of light by opening up the diaphragm of the lens. In the 16 and 16II you do this by actually shifting the aperture wheel to the next smaller number for each $2\times$ filter factor. If you used a red filter with a filter factor of $8\times$, you would open up 3 stops, from $f/11$ to $f/4$ for example. With cameras such as the 16P, 16Ps, 16MG, 16EE, and 16CdS the simplest way of compensating would be to change to an appropriately reduced

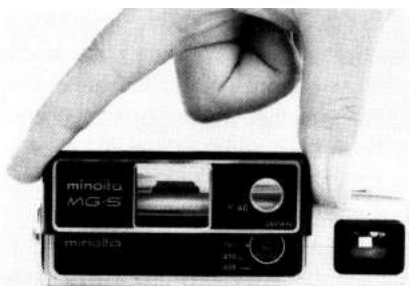


Fig. 37. When you place a filter onto the camera, the electric eye automatically compensates for the change.

ASA setting. Divide your ASA number by 2 to adjust for a $2\times$ factor (one stop). Do it again for a $4\times$ factor (two stops), and so on. The 16QT and 16MGs have filters placed into frames that when placed over the front of those cameras, automatically affect the operation of the electric eye, causing the eye to take the filter factor into account at all times. No calculation by you is required.

UV and 1A filters are almost colorless and no compensation is required.

The 80B filter available for the 16CdS, 16EE, 16MGs, and 16QT converts daylight film for use indoors with 3400 K photo-floods. Unless 3200 K or 3400 K lamps are available, you are better off using blue flashlamps or strobe, which require no filter at all.

Finally, as an accessory filter for the 16CdS, 16EE, 16, 16II, 16P, and 16Ps there is an 81B light-balancing filter. This filter removes some of the blue cast found in color photographs taken late in the day under cloudy skies.

Filters for Both Black-and-White and Color

Two filters, the UV and 1A mentioned previously, fall into the category of being useful in both color and black-and-white photography. The effect will probably not be noticeable with black-and-white film. Many photographers keep one of these filters in front of the lens at all times to protect it from a careless finger or other foreign object.

Do-It-Yourself Filters

You may have noticed that there are many filters not made by Minolta. Don't let this fact stop you from using them or experimenting to your heart's delight. You can make your own combination with ease. As pointed out above, the UV and 1A filters are sort of neutral, imparting no visible color of their own. They can then become the base for your new filter. Eastman Kodak and several other firms manufacture filter gels. Squares, either 2" x 2" or 3" x 3", of optical gelatin are easily cut with scissors and taped to the UV or 1A filter frame. Take care in doing this for the gels are easily scratched and are sensitive to finger prints. They can be purchased in many shades of colors such as orange, green or red, or in neutral density values, used to reduce the amount of light so that a highly sensitive film can be used on a bright day with the smallest aperture your camera may have.

CLOSEUP LENSES

Since we do not generally look at people and things from inches away, a closeup lens can provide you with a completely different perspective.

The closeup lens is a simple positive lens whose strength is calculated to provide a specific focusing range when used in combination with the primary taking lens of a camera. Combine this ability with the unique way that a 16mm camera employs depth of field to come closer than it otherwise might and you have quite a focusing range to work with.

For each of the Minolta 16 cameras there are specific closeup lenses available, generally designated as No. 1 and No. 2 lenses. The 16MGs has three lenses, rated by their prime-focus distances. The accompanying charts provide you with the various distances you can include in your shot using a closeup lens in conjunction with the depth of field for the *f*/stop indicated. All distances are in feet unless otherwise indicated.

16 (discontinued)

<i>f</i> /stop	No. 1 closeup lens	No. 2 closeup lens
3.5	3.38-4.43	1.7-2.2
4	3.3 -4.6	1.7-2.23
5.6	3.2 -4.7	1.6-2.4
8	3.0 -5.18	1.5-2.6
11	2.8 -6.0	1.3-3.5

16II

<i>f</i> /stop	No. 1 closeup lens	No. 2 closeup lens
2.8	3.8-4.9	2.3-2.6
4	3.6-5.2	2.2-2.7
5.6	3.4-5.7	2.2-2.9
8	3.2-6.6	2.1-3.1
11	2.9-8.4	2.0-3.4
16	2.5-15.0	1.8-4.1

16P AND 16Ps

<i>f</i> /stop	No. 1 closeup lens	No. 2 closeup lens
3.5	3.5-4.5	2.1-2.5
4	3.4-4.6	2.1-2.5
5.6	3.3-5.0	2.0-2.6
8	3.0-5.6	2.0-2.7
11	2.8-6.6	1.9-3.0
16	2.5-9.7	1.7-3.4

Since the 16EE and 16EEII had internally automatic *f*/stops, depth of field tables would be meaningless.

The table for the 16MG appears within the section devoted to that camera. The built-in lens for the 16MGs is also covered within its section. However, in addition to the closeup lens built into the 16MGs, there are three accessory lenses available.

Closeup Lenses with the 16MGs and 16QT

The sides of the 16MGs and the 16QT have grooves into which you can slide one of three different closeup lenses. The 80cm (2.6') and the 40cm (1.3') closeup lenses have two pieces of glass in each frame. One part falls in front of the taking lens and reduces its point of focus. The other glass lies in front of the

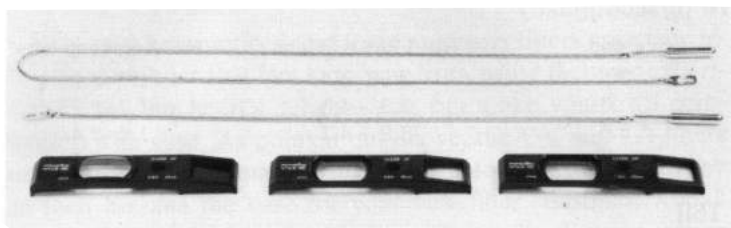


Fig. 38. For flexibility, use the three close-up lenses and their measuring chains, 25cm, 40cm and 80cm.

camera's viewfinder. This glass is ground in such a way as to bend the line of your sight as you look through the finder; you look exactly at the subject you plan to shoot. This is referred to as *parallax correction*. The 25cm (0.8') lens does not provide for direct viewing. It would have required a very strong correction to eliminate parallax. This would have tired your eyes. So it was dispensed with in favor of the use of the lens' measuring chain or, for the 16MGs, the copy cradle, and stand. When the lens is used with the 16MGs, copy cradle, and stand, it covers an area of $4\frac{1}{2}'' \times 6\frac{1}{8}''$. The maximum area covered by the 80cm lens is $7\frac{1}{8}'' \times 11''$; by the 40cm lens, $7\frac{1}{2}'' \times 10\frac{5}{8}''$.

With either the 40cm or 80cm lens, you can move in closer than the prime distance by using the depth of field shown in the accompanying tables. All distances indicated are in inches:

<i>f</i> /stop	40cm lens	80cm lens
2.8	15 $\frac{1}{4}$ –16 $\frac{1}{4}$	29 $\frac{1}{2}$ –33 $\frac{3}{4}$
4	15–16 $\frac{1}{2}$	28 $\frac{3}{4}$ –34 $\frac{7}{8}$
5.6	14 $\frac{7}{8}$ –16 $\frac{3}{4}$	27 $\frac{3}{4}$ –36 $\frac{1}{2}$
8	14 $\frac{1}{2}$ –17 $\frac{1}{4}$	26 $\frac{1}{2}$ –39
11	14–18	25–43
16	13 $\frac{1}{8}$ –19 $\frac{1}{4}$	22 $\frac{3}{4}$ –51 $\frac{5}{8}$
22	12–21	20–68

The 16MGs copy stand consists of a cradle that is attached to the camera by means of the tripod socket. At each corner of this cradle you can screw in an adjustable metal leg so that when

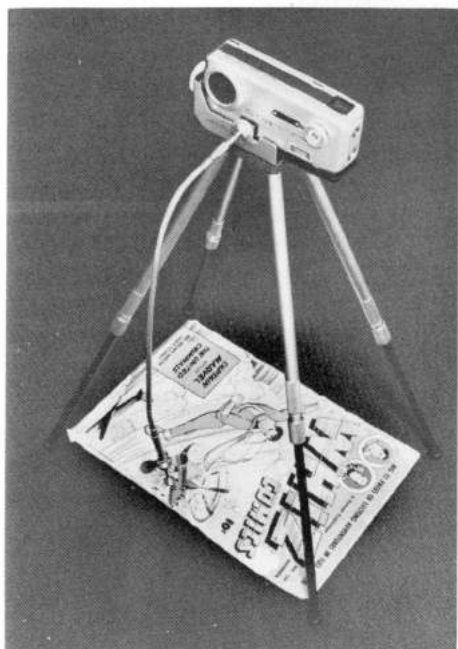


Fig. 39. The 16MGs, copy stand and close-up lens in use. Note the provision for a cable release socket on the cradle. The legs of the stand are shown extended for use with the 40 cm lens.

all four are attached, the stand rests on the work to be copied, supporting the camera precisely centered over the work. Part of the cradle covers the shutter-release button; a cable-release socket is mounted into the metal just over the button to assure you of vibrationless copying. The legs can be extended not only to provide the exact distance for the 25cm lens, but for the 40cm lens as well.

The 16QT and 16MGs have identical grooves into which you slide the close-up lenses; therefore the lenses themselves can be used with either camera. The zone focus for the 16QT should be set to the $11\frac{1}{2}'$ position. Since the 16QT will not fit into the copy cradle, which is designed to hold only the 16MGs, if you wish to use the 25cm lens with the 16QT, you will have to determine the

distance from the camera to your subject with a ruler and then frame your subject either with a prepared wire frame or by eye-guess.

A convenient way to measure off the distance when you have either lens in place is with the measuring chain accessory. Remove the wrist chain from either the 16QT or 16MGs and replace it with the longer chain for either the 40cm or 80cm lens. Then, by holding the chain taut, you can accurately measure the exact prime-focus distance for the closeup lens in use. Remember, once you have determined the correct shooting distance, do not move the camera. Simply bring it to your eye and shoot. Another way to use this chain is to hold the camera at eye level with the chain attached. Use your left hand to stretch the chain to the subject. Then, bring that hand back, let go of the chain, and shoot.

FLASH BRACKETS AND FLASH GUNS

Since the incorporation of a standard flash shoe on most of the Minolta 16's would require them to be larger, it was felt that the use of accessory flash brackets would be more suitable. Therefore, for the 16 and 16II a clamp which slips over the middle of the camera is used. One side overlaps itself and snaps closed, holding the clamp secure. On the top is a flash shoe and on the bottom a tripod socket.

The 16EE, 16EEII, 16P, and 16Ps use a clamp shaped like a letter C. This slips over one end of the camera while a ¼-20 screw engages the tripod socket. The flash shoe is positioned on top of the clamp, at the extreme end of the camera. Once you place a clamp on one of these cameras, you can use almost any flash gun. Of course, it would be silly to use a four-pound strobe on a five-ounce camera, so Minolta designed several mini flashes for these. The only one still being produced is the Duo Fit S. This BC type flash is not much bigger than a butane "slim-line" lighter. It sits easily in the flash shoes of the various brackets and connects to the cameras by means of a short cord and PC tip. It accepts AG-1 and AG-1B bulbs, which are plentiful and relatively inexpensive. For convenience, on the back of each gun is

a flash guide-number chart for AG bulbs, as well as a BC test-light button and a used-bulb ejector.

For the 16MG, 16MGs, and 16QT, for which no brackets are available, Minolta made specially mating flash units. For both of these cameras, you obtain a BC-type gun that uses AG bulbs and screws into the tripod socket and at the same time into a special electrical fitting for flash. In effect, this is simply a two inch extension of the camera. There is also a flashcube gun available for the MGs and 16QT. The accompanying table shows suggested guide numbers for these units.

SUGGESTED GUIDE NUMBERS FOR THE AG FLASHGUN

(For use with the 16MG, 16MGs, and 16QT)

Use either AG1 or AG1B Bulbs

ASA:	32	50	80	100	160	200	320	400
AG1	46	55	75	80	102	110	142	160
AG1B	33	40	50	55	75	80	102	110

Recently, in response to many demands for just such an item, Minolta introduced an adapter that fits the 16MGs and the 16QT. This adapter screws into the flash-sync end of the camera and mates with the PC tip. At a right angle to this connection is a hot shoe that will accept any hot-shoe flash, such as the Duo Fit S (with its cord connected internally, changing it over to hot-shoe operation) or such strobes as Minolta's Electroflash 2. A PC connection is provided on the adapter as well.

Of course, all of the cameras can use any strobe, because all are equipped with X sync. If you have a strobe or flash too large for the clamp shoe, then a standard right-angle or flat flash bracket of another manufacturer can be used via the tripod socket of the camera.

MISCELLANEOUS ACCESSORIES

Two items that do not belong to any category of accessory but that are very convenient for the 16QT and 16MGs owner are the Spy Finder, which is a right-angle eye-level or waist-level finder, and the deluxe attaché case.



Fig. 40. Like a clown act in the circus, all of these articles will fit snugly into the fiber case in the background.

If you want the utmost in candid technique, the Spy Finder will do the job. You attach it to the tripod socket of either the 16OT or the 16MGs so that it rests over the front of the viewfinder. Placing the finder window to your eye, you can see at right angles to the direction you face and thus take shots of people without pointing yourself or the camera at them. It can also be used as a waist level finder for shots "from the hip," which can be very effective when you wish to be unobtrusive.

Although gadget bags are available for cameras in general, Minolta designed a slim-line attaché case to hold an entire system. Within this case you can fit a 16MGs or 16QT, three close-up lenses, measuring chains and wrist chain, three filters, cube and AG flash gun, strobe adapter, copy stand and legs, and have room left over for film and/or bulbs.

An alternative to this is a fiber case. I picked up a fiber case that at one time housed a lens of some sort for the Army. The case measures $6\frac{1}{2}'' \times 5'' \times 5''$. It is velvet lined and padded within. Yet, in a box of this size, I have carried a 16QT, a 16MGs, three close-up lenses, an Electroflash 2, the strobe adapter, a separate cube flash gun, three filters, and two extra cassettes of film. For travel, the Minolta case is ideal protection. In addition, having everything in one place keeps things from becoming lost or mislaid.

CHAPTER 4

The Technique of Exposure

In the preceding sections we have reviewed the history and origins of the Minolta 16mm line, as well as the individual camera models and their associated accessories. However, being familiar with the equipment, in regard to loading, basic operation, and the use of the accessories is certainly not the entire story.

While it is true that the 16MGs by virtue of its electric eye allows the operator to drop in film, advance, and shoot with a very great certainty of getting a perfectly exposed picture, better photographs can be made with this and other Minolta 16mm models if you, the operator, is willing to take a more active part in bringing your picture-taking efforts to fruition.

There are three basic areas of photography that you should be familiar with if you are going to get the high-quality results possible in 16mm photography. These three areas change the 16mm camera from a casual instrument of picture taking to an instrument producing quality photographs even beyond that which you would ordinarily believe possible. I am referring to *proper exposure*, *proper development* of the film, and the technique of *printing and enlarging* the developed negative. You may give your film to a commercial processor for developing and printing, in which case the last two areas will not be under your direct control. But proper exposure is always under your control.

Success in photography in general, and 16mm photography in particular, depends upon the proper correlation of many fac-

tors, one of the most important being the correct exposure of the film. Although it is true that for the larger format negative a more casual determination of exposure will lead to a very "usable" negative, for the 16mm negative, the *exact* exposure may mean the difference between outstanding results and mediocrity.

WHAT IS EXPOSURE?

Almost everyone would assume that exposure means, in terms of photography, allowing light to fall onto a sensitized surface, which we usually refer to as film. This generally takes place through a lens that produces a focused image on that sensitive surface. The amount of exposure is controlled by the photographer when he adjusts two controls of his camera. One control determines the duration of the light reaching the film; the other determines the amount of light that is allowed to reach the film for that given period of time. The former is called the *shutter speed*. The latter is called the *aperture* or *diaphragm*.

The shutter of a camera is similar to your eyelid. By opening and closing the shutter for a specific, controlled period of time, you allow that predetermined amount of light to reach the film. The aperture or diaphragm is an opening, the size of which is determined by a ratio relative to the focal length of the lens in use. In its simplest terms, that ratio consists of the focal length of the lens divided by the diameter of the opening. For convenience, the ratio is expressed in digits called *f/stops*. A lens having a 50mm focal length and an aperture 10mm in diameter, will be said to have an *f/stop* of *f/5*.

EXPOSURE GUIDES

Now that we know what exposure is, how do we determine the correct exposure? There are two methods of exposure determination used today. Both are certainly applicable to all Minolta 16mm cameras.

For those of us who have a non-automatic camera, such as the 16Ps or 16II, the least expensive method of obtaining an exposure is the exposure guide.

As previously mentioned in the section devoted to the 16Ps camera's features, the exclusive Minolta Weather Dial will assist the 16Ps user to obtain an exposure determination with a great deal of accuracy. Because of the standardization with respect to color film development and printing, as well as a built-in tolerance (no matter how small) within the films available for this camera, the use of a guide such as the Weather Dial produces good results. The user simply adjusts the Weather Dial for the type of film in the camera.

Each film has a number assigned to it, referred to as either *ASA* or *DIN*. These numbers, suggested by the American Standards Association in the United States and the Deutsche Industrie Norm in Germany are arbitrary numbers representing the comparative sensitivity of the films. The numbers have no units such as feet, pounds, meters, etc. attached to them. All one can say is that a film having an ASA number of 100 is twice as sensitive (or requires half as much light) as a film having an ASA number of 50. DIN numbers are seldom used in the United States, but this system prevails in Europe where it was originally introduced.

Once the knurled disc on the 16Ps is turned so that the ASA value of the film in use appears in the window below it, you are ready to adjust the Weather Dial to suit the existing weather conditions. There are four symbols that you will see just below the ASA window. These pictorial representations stand for *bright sun*, *hazy sun*, *cloudy bright* and *cloudy dull* or *open shade under a blue sky*. A triangular pointer is a reference mark, next to which you place the pictogram best suited to the present sky conditions. Once you have done this, the proper aperture will be set opposite that reference point. Since the shutter of the 16Ps is fixed for daylight exposure at 1/100 sec., the aperture will be the only factor that you need be concerned with for the purposes of adjustment, and this is taken care of by using the Weather Dial.

If you own a 16II, then it will be necessary to concern yourself with not only determining the proper aperture, but determining the proper shutter speed as well. You will find that in the 16II both the aperture and shutter speed are variable. The fact that the user can adjust the shutter speed and aperture independ-

ently of each other makes the 16II versatile. However, you need to understand the relationship between the aperture and shutter speed so that you will get the correct exposure.

As we have seen previously, aperture is expressed as numbers, written as $f/stops$. Typical numbers that you would find on your 16II camera would be $f/2.8$, $f/4$, $f/5.6$, $f/8$, $f/11$, and $f/16$. The key to the understanding of the relationship between the $f/number$ and the shutter speed is that as you decrease the diameter of the opening of your lens, the $f/number$ increases numerically, and at the same time decreases the amount of light that reaches the film. When you go from one $f/stop$ to the next (larger), you increase the amount of light that reaches the film by two times. If you "open up" from $f/4$ to $f/2.8$ to maintain a constant exposure, you would have to decrease your exposure duration by one-half. An easy way to remember this is that if you were to make fractions out of your $f/numbers$, the larger $f/stop$ would also be a larger fraction numerically i.e. $1/2.8$ is larger than $1/4$. This is the system you apply to the 16II.

The two wheels on the end of the 16II control the choice of aperture and shutter speed. Although the proper combination can easily be determined by the use of a photo guide, a photo guide is not built into the 16II as it is with the 16Ps. It is easy, however, to obtain a commercially made weather dial from your nearest Kodak dealer. The Kodak Outdoor Exposure Guide is a device slightly larger than the size of a playing card, upon which there are representations of sky conditions, a scale of shutter speeds, a scale of apertures, and ASA numbers of films commonly available. Just as with the 16Ps, you need only line up the inner wheel with the outer sky condition and choose the proper $f/number$ and shutter speed in combination with the sensitivity of your film. A similar guide, in chart form, accompanies each roll of Minolta-packaged 16mm film.

EXPOSURE METERS

This brings us to the other, and more accurate, method of exposure determination—the built-in or hand-held exposure

meter. Ever since 1939 when the Weston Instrument Corporation of Newark, N.J., introduced the Weston Master Exposure Meter, the exposure meter has been the most valuable and possibly least appreciated tool of the amateur and professional photographer. Today it is taken for granted, whether it be a hand-held meter or the type built into a camera.

In 1939, the only type of electric exposure meter employed a selenium photo-electric cell. When it was exposed to light, it generated a feeble electric current. This current was fed to a meter movement, which in turn swung a needle on an exposure scale. Today a photographer usually employs a meter that makes use of the cadmium sulfide (CdS) cell. This cell, much more sensitive than the old selenium type, acts as a variable resistor upon receiving light and allows more or less current to flow through the meter movement, depending on the amount of light. The source of power for this circuit is supplied by a battery, which the photographer puts into the meter. Although these hand-held meters can be as large as the older selenium type, they can also be quite small. In 1962, Minolta introduced the first camera with a built-in cadmium sulfide cell in the SR-7. Since 1962 there have been engineering developments that have resulted in a meter as small as the one built into the 16MGs.

Let us for a moment, however, consider the person who has the 16II and wishes to use a hand-held exposure meter rather than a Weather Guide. Although for the most part the meter will be larger than the camera in question, it will provide the necessary information to enable that photographer to take his pictures with pinpoint accuracy of exposure. Instead of you aligning a pictogram showing weather conditions, you use the sensitive electric cell of the meter to measure the light perfectly and indicate a proper range of shutter and aperture combinations.

The 16 MGs with its built-in meter makes this choice automatic. Once the film speed is selected by the ASA dial that surrounds the electric-eye opening in the front of the camera, you need only select the shutter speed; the camera itself then selects the proper matching aperture. If there is not enough light to allow a proper exposure, the shutter release will not function, and

a red flag will appear in the viewfinder window. This indicates that the shutter speed selected is too fast and that a slower speed should be chosen to permit more light to reach the film.

In addition to simply knowing that an exposure meter should be pointed at your subject or scene, you should bear in mind that there will be occasions when knowing where to point the meter will substantially improve your photograph. An average scene is one, usually outdoors, in which we have neither large, extremely bright areas nor large areas of deep, detailless shadows. You may point the meter at your subject in an average scene and may be assured of good exposure. The latitude of the film can accommodate the relatively short range of lights and darks. However, what about the extreme situation? Let's say your subject stands with his back to the sun on a snowy hillside. Do you point the meter at the general scene? If you did, you would most likely get a good exposure for the snow but not for the person facing the camera. So, move in and take a reading from that person's face. Note the reading and move back to your original position.

If you are using a 16EE, 16EEII, 16MGs or similar camera, you can fool the camera into choosing the aperture you desire by purposely changing the ASA number selected. If your normal exposure is $f/5.6$ at $1/250$ sec. and you are using ASA 100 film but wish the camera to select $f/4$ instead, set the ASA dial of your camera to ASA 50. Don't forget to change it back after this particular shot or else the rest of your photos will be overexposed.

Now that we know the basic methods of exposure determination, let us examine the ways that a photographer uses to choose either the correct shutter speed or the correct aperture for a particular situation. The combination of the two will determine the proper exposure.

If we examine several typical situations with respect to the choice being made at the time of either aperture control or shutter control, we see the technique used to make that proper determination. Most of your picture taking will be during the day, with enough illumination so that sensitivity of the film is not critical. Given these circumstances, we can apply ourselves to the proper shutter speed to be chosen. One of the greatest causes of poor

subminiature photographs is camera movement. In order to minimize any chance of movement during exposure, choose the highest possible shutter speed. In other words, light permitting, you will never be sorry if you try to maximize your shutter speed.

AVAILABLE LIGHT

If we were to divide the entire field of exposure into two main categories, we would arbitrarily call the first exposure by available light, and the second exposure by artificial light. In the category of artificial light, we would include flashbulbs, floodlamps, and electronic flash.

Available-light photography applied to action photographs outdoors will dictate a faster shutter speed than the posed portrait indoors. The child running, horse galloping, or dog chasing a ball will definitely require a shutter speed of at least 1/250 sec. Your exposure meter or exposure guide will then give you the proper aperture to be used once you have chosen this shutter speed. The other extreme of available light calls for slow shutter speed and maximum apertures. The slowest shutter speed found on a Minolta 16 camera is 1/30 sec. However, when you combine this shutter speed with the camera's maximum aperture, which in most cases is $f/2.8$, and a sensitive film such as Tri-X (ASA 400), 4X (ASA 500), or High Speed Ektachrome (ASA 160), you will be able to take pictures in dimly lit locations without flash.

Your eyes and common sense will easily give you a rough determination as to whether the picture-taking situation in which you find yourself requires a maximum shutter speed for action photography, a medium speed for posed photography or a rather slow shutter speed for borderline available-light photography. For practice you might try taking several photographs in each of the three categories. This will help you become acquainted with the general levels of illumination and equate those levels of illumination with exposure.

In a museum illuminated by skylights, for example, you may wish to take a photograph of your favorite painting. Flash is



Fig. 41. Night-time photography is easy. Load with Tri-X or Super XX. Rate it at, at least, ASA 400 and shoot by meter. This movie house may not have realized the juxtaposition of the shows it had on the bill as well as the coming feature. Tri-X, rated at 800, 1/30 at $f/5.6$.

almost always prohibited. Therefore, with diffused daylight lighting the subject, load your camera with High Speed Ektachrome and set the controls for 1/30 sec. at $f/2.8$. Taking a photograph of that painting on the wall becomes simplicity itself.

Situations that would usually fool you into believing that a picture without flash is not possible can often be the subject of a fantastic photograph if you understand available-light photography. As an example, consider your favorite resort hotel and its evening nightclub. The entertainer is on stage illuminated by several spotlights; the rest of the nightclub is almost totally dark. Certainly a flash would not be welcomed by anyone sitting next to you. So, with your 16mm camera loaded with High Speed

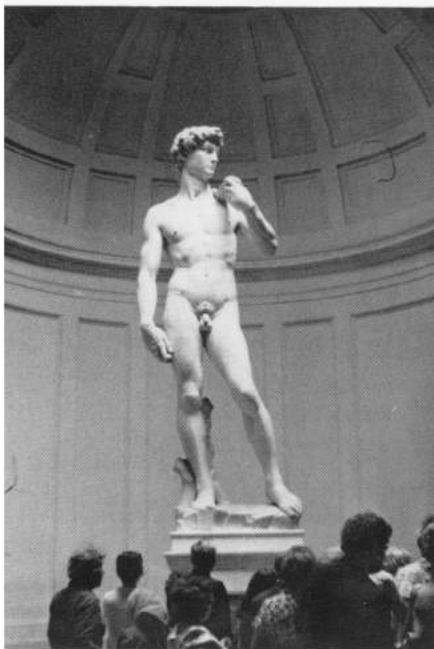


Fig. 42. The statue of David by Michelangelo overpowers the people below it. Keeping a few tourists in your shot lends presence to the picture and, in this case, size comparison. Photo by S. Usian.

Ektachrome or Ektacolor (ASA 100), you can take that impossible shot at an exposure of $1/30$ sec. at $f/2.8$ or $f/4$, depending upon the film chosen. The performer lit by those spotlights will be properly exposed.

The same basic exposure can be applied to other situations of a similar nature. The Ice Capades that appear yearly at Madison Square Garden in New York, as well as your local basketball game, are typical of indoor lighting situations. Of course, sporting events will usually require a higher shutter speed than may be possible for the lighting available. In such cases, it is often possible to get a photo anyway, if you wait for the peak of action. When a basketball player makes a jump shot, his speed in going up to the basket and coming down from the basket may be too



Fig. 43A (left). Tex Antoine serves as weather forecaster for WABC-TV, New York. Studio lights permit good candid. They can fool you into overexposure if you're not using a meter. Plus-X, 1/60 at f/8.

Fig. 43B (right). John Schubeck, formerly with the New York Eyewitness News team for WABC-TV, was kind enough to allow me to photograph the group during a broadcast. In case you have color film in your camera, the lights used were 3200 K.

fast for your camera to stop at 1/30 sec. However, at the very moment that he is putting the ball into the basket, motion is virtually zero. That is the moment to shoot.

PHOTOGRAPHS BY FLASH

As fascinating as available light photography is, more pictures are taken indoors by flash than by available light. One of the first questions that probably comes to mind is "What type of flash do I buy?" The choice of flash need not be complicated. Today, electronic science has made the choice very easy.

GUIDE TO STARTING EXPOSURES FOR AVAILABLE LIGHT WITH HIGH SPEED EKTACHROME OR EKTACHROME EF

EXISTING-LIGHT PICTURES (at ASA 160)

Use an exposure meter or automatic camera if you have one. For cameras without exposure meters, try the exposure suggested in the table.

Picture Subject and Lighting	Shutter Speed	Lens Opening
Skylines—10 minutes after sunset	1/60	f/4
Interiors with Bright Fluorescent Light	1/30	f/2.8-f/4
Ice Shows, Circuses—spotlighted acts (carbon arc)	1/60	f/4
Brightly Lighted Downtown Street Scenes at Night	1/30	f/2.8
Brightly Lighted Nightclub or Theatre District at Night—Las Vegas or Times Square	1/30	f/4
Store Window Displays at Night		
Neon and Other Lighted Signs at Night	1/60	f/4
Floodlighted Buildings, Fountains, Monuments	1*	f/4
Christmas Lighting, Trees—indoor and outdoor	1*	f/5.6
Fairs, Amusement Parks at Night	1/30	f/2
Night Football, Baseball, Racetracks	1/60	f/2.8

*Use a camera support for exposure times longer than 1/25-1/30 second.

Tungsten light produces yellow-red color rendition.

When Minolta first introduced the 16 camera in 1957, the most common flashbulb in use, the No. 5, was almost as big as the camera itself; thus, with batteries, flash reflector, and bracket, the entire flash set-up was truly gigantic compared to the palm-sized 16.

With advances in flash photography being made continually, the AG-1 and its counterpart for color photography, the AG-1B, were introduced. These flashbulbs, as big as the first digit of your pinky, obviated the No. 5, because they deliver almost the same amount of light in a very minute package. Their size, as well as the size of the flash guns that use them, complement the size of the 16mm camera. With this in mind, Minolta designed a series of flash guns and brackets suited to their cameras.

Today, the Baby BC Fan Flash, originally designed for

Minolta 16, seems large indeed by comparison with the Baby BC III, also discontinued, and its successor, the Duo Fit S. The original Baby BC flash used the No. 5 or 25 flashbulb. These bulbs are called *Class M* bulbs and are designed to be used with shutter speeds of 1/25 sec. The Baby BC III used the present AG-1 or AG-1B bulb, again at 1/25 sec. (1/30 sec. for practical purposes). The successor to the Baby BC III, the Duo Fit S is a standard item in the Minolta 16Ps kit, as well as the 16II kit.

Since neither the 16Ps nor the 16II has a flash accessory shoe, Minolta provides the shoe in the form of a bracket. The bracket for the 16Ps resembles a mini-C clamp of the type woodworkers would use. It attaches over the end of the camera, its screw engaging the tripod socket of the camera. Since the 16II has neither tripod socket nor shoe, its clamp provides both. The clamp is spring loaded so that when it is placed around the perimeter of the camera, it snaps closed with a positive "click." Your flash shoe is now on the top of the camera and a tripod socket will be found on the bottom. By placing the bracket in the middle of the camera, you neither interfere with the viewfinder nor the film-counter window.

The 16MGs, the 16QT, and discontinued 16MG have a different arrangement. In these, the flash gun is designed as a part of the camera system. Although it is possible to use the universal Duo Fit S, the 16MG, 16MGs, and 16QT use flash guns attached to the cameras by means of mating sockets and projections. There is only one flash gun employing the AG bulb for the 16MG; the 16QT and 16MGs owner has the choice of an AG flash gun or the newer flashcube gun. All the flash guns that Minolta presently makes use circuitry referred to as *BC*, which stands for battery capacitor. This type of circuit provides more dependable shots, more often, over a longer period of time with the same battery.

The cost of a flash gun using AG bulbs is usually \$10 or less. It is easy to see that it need not be expensive for the owner of a Minolta 16mm camera to obtain reliable flash photographs. If, however, over a period of time you find yourself taking many flash photographs, it certainly would pay to investigate the pur-

chase of an electronic flash gun or *strobe* as it is often called. An electronic flash gun, although not exactly a new device, is now more suitable to 16mm cameras than ever before. Advances in electronics have brought the size of this piece of equipment down from the size of an old tube-type portable radio to a size not much bigger than a couple of packs of cigarettes. Although the initial cost of an electronic flash is three or more times that of a standard flash gun, it pays for the initial outlay in convenience of operation, low maintenance cost, because it does not require the continuous purchase of flashbulbs, and dependability of operation. The electronic flash gun consists of a glass tube filled with Xenon gas, which is connected through a triggering circuit to a capacitor capable of storing a rather large charge of electricity. Inasmuch as the flash gun contains a battery-capacitor circuit, it is similar to the BC mentioned before. When the capacitor is discharged by your camera contacts, the voltage ionizes the gas in the Xenon flash tube, creating in an instant a brilliant white light with all the qualities of daylight. The actual flash duration is usually 1/1000 sec. Today there are strobes on the market whose flash duration is even shorter.

A strobe attaches to your camera no differently than a flash gun. A separate bracket is used in some, and others have a flash shoe. The only requirement is that the electronic flash unit be equipped with a synchronization cord, since the 16's have no provision for a hot-shoe type of contact. The 16Ps, the 16II, the 16MG, and the 16MGs all employ a PC tip flash outlet. This has become the standard connector for flash today. A short cord coming from the flash gun is placed into this connector on the camera for proper electrical contact. This is true in all cases. The only exceptions are the AG and cube flash guns that are designed to mate with the 16MG and 16MGs.

Once the choice of a flash gun has been made, whether it be a strobe or a unit using bulbs, you will find that it is easier to determine the correct exposure for flash than daylight photography. All Minolta 16mm cameras are equipped with X-synchronization. This is the only information that is required for you to produce consistently fine photographs by flash. Any refer-

ence to other synchronization types that you may find on your box of flashbulbs may be disregarded.

The universal shutter speed for flash photography with a Minolta 16mm camera is 1/30 sec. Any shutter speed can be used with an electronic flash; however, it is necessary to use 1/30 sec. for flashbulbs if the maximum amount of light generated by that flashbulb is to be caught by the shutter. This is the basic idea of synchronization—to match the point in time at which the shutter is completely open with the moment at which the bulb has reached its maximum light output. The use of 1/30 sec. will insure that both these points are the same.

The Minolta 16Ps has a two-position, shutter-speed-selector lever. By moving this lever to its lower position, you change the outdoor shutter speed of 1/100 sec. to the flash shutter speed of 1/30 sec. The 16II, although it has no particular flash shutter-speed mark, is fully adjustable, so it is easily set for flash. The 16MG has a switch located to the upper right of the viewfinder window on the back of the camera. One position is marked by a pictorial representation of the sun; the setting for flash is indicated by a lightning symbol. Moving the switch to the lightning position automatically switches the shutter speed to 1/30 sec. The 16MGs and 16QT have 1/30 sec marked in red for reference.

Once you have selected the shutter speed, the next thing to ascertain is your flash guide number. What is a guide number? A guide number is a way that the manufacturer of the flashbulb or strobe has of designating the strength of that flashbulb or strobe for a specific film. This is not to be confused with the ASA number, which relates directly to the sensitivity of the film, and has no bearing on the type of flash gun in use.

While flash gun manufacturers provide guide numbers for various types of film, both black-and-white and color, strobe manufacturers tend to express their guide numbers in terms of Kodachrome II because of its standardized developing process and its inherent color and exposure stability.

If you have a strobe, the strobe manufacturer will generally give you the guide number for Kodachrome II. If you are using flashcubes or flashbulbs, you need only look on the side of the

TYPICAL FLASHCUBE INSTRUCTIONS

SIMPLE CAMERAS: Color Film, 4-9 Ft.; Black and White, 4-15 Ft.

ADJUSTABLE CAMERAS: Exposure Guide Numbers and Information

	Film Speed:	25-32	40-64	80-125	160-200
Shutter Speed	"X" Up to 1/30	55	75	100	130
	"M" Up to 1/60	36	50	70	90
	"M" Only 1/125	30	42	60	75

Below film speed group and across from shutter speed, read guide number. To find f-setting, divide number by flash-to-subject distance in feet. Open 1 f-stop more if used in large rooms or for outdoor night exposures.

box of those flashbulbs to locate the chart and directions for use.

Assume for a moment that we are using color print film with an ASA number of 80. Looking at our chart, we will easily see that with X-synchronization at 1/30 sec. our guide number will be 100. The next step is to determine the distance from camera to subject in feet. For ease of calculation, let us assume a distance of 10 feet. Dividing the guide number by the distance gives an answer of 10. This number is then actually $f/10$, or for our purposes $f/11$, which is found on the Minolta 16. It is this opening to which we should set the aperture control of the camera in question. It is that simple. The nearest and farthest usable distance with any given guide number is determined by dividing the guide number by the minimum and maximum aperture. For example, dividing a guide number of 100 by 16, the smallest f /stop on most 16's, would give a minimum flash distance of five feet. If you divide 100 by $f/2.8$, the largest f /stop on the 16, you get the maximum effective flash distance for this example guide number, which is about 30 feet.

What if you have one guide number for one film, say Kodachrome II, and want another guide number for another film. With a flash calculator dial manufactured by Kodak and available at your Kodak dealer, it is possible to determine a new guide number for a different film once you have an established guide number for a film in use. It is only necessary to set the dial for the old number and read off the new.

Since the use of the guide number is based on the measurement of distance, it is possible to have guide numbers expressed in terms of feet and meters. If the scale of measurement on a flash gun or strobe is given in meters, you can convert your meter scale to a footage scale by multiplying the meter scale by 3.3.

Using Flash Effectively

More often than not, you will simply attach the flash gun to your Minolta 16, point, and shoot. However, there are times when a bit of extra thought before releasing the shutter will improve your flash picture.

How many times have you seen a point of red in the eyes of your subject upon receiving your color shots back from the lab? This effect, called "red eye" is caused by the intense light from your flash entering the pupils of your subject's eyes and bouncing back into the camera. This effect is caused by the small angle formed between the flash gun, the subject's eyes, and your lens. When you can increase this angle by removing the gun from the camera, the red eye disappears. But what if you cannot? Most Minolta 16's have their guns on brackets quite close to the camera body, if not attached to the body itself. Simple! Have your subject look away from the camera. If they don't stare into the lens, but instead look over your shoulder or, better yet, at someone else or at something they might be doing or holding, you'll get a better picture and eliminate "red eye."

If your subject wears glasses, the same technique described above will prevent your getting shots of that person with glare for eyes. Remember, any light reaching your subject will bounce back. If the light bounces off a pair of glasses, it will seem like mirrors to your camera. A tilt of your subject's head is all that is needed to prevent this effect.

And speaking of glare, consider using your flash outdoors to eliminate that squint so common due to the glare of a bright sun. Place your subject with their back to the sun or at an angle to the sun. Pop on your flash then divide the guide number of the flash/film combination by the *f*/stop required for 1/30 sec. This will give you the distance from you to your subject for the

flashlight to balance the sunlight. If you wish a slight variation in tones, or as it is called, a change in the lighting ratio, back off a bit for a slightly darker face or move in closer for a face somewhat brighter than the background. This technique, referred to as *synchro-sun*, will provide you with an entirely new approach to an otherwise usual outdoor snapshot.

CHAPTER 5

Developing, Printing and Projecting

Now that you have finished your first or second roll of film, the next step is to have it processed. You are faced with two choices. The easiest way to obtain a finished negative, print, or slide is to use the mailing envelope that accompanies each cartridge of Minolta film. All you need do in that case is place your film in the envelope along with the indicated remittance, place a stamp on the outside, and your mailbox becomes your processing lab.

However, as good as commercial processing can be, it cannot be as specialized as processing you do yourself. Developing film these days has become virtually mechanical due to the great strides made in the chemistry of developing. Developers are often pre-mixed, or in concentrated form, or packaged in such a way as to make the addition of water the only step necessary. You no longer have to weigh out the components of a chemical formula. The photographer is no longer a chemist.

The benefits of home processing are many, but most importantly, you have complete control over the negative from start to finish. You can pick your developer to suit the particular film used, which is the biggest difference between home processing and the commercial lab. Let me clarify that I am differentiat-



Fig. 44. An example of the stainless steel variety of tanks. Two Nikon reels, one loaded, with a Spiratone tank that holds them both and 8 oz. of solution.

ing between what many would refer to as a very usable but average negative and one in which all of the best qualities needed in a 16mm negative are present.

BLACK-AND-WHITE DEVELOPING

The materials you need are few and relatively inexpensive. The most expensive item, more than likely, is the developing tank. A typical developing tank allows you to load the exposed film into a container in total darkness, and once having done so, proceed with all remaining steps in the comfort of a lighted room.

There are several well known names in tanks: Nikon, Kinnerman, FR, and of course Minolta, to name a few. Generally, tanks are divided into two categories: darkroom loading and daylight loading. The Minolta 16mm tank is of the daylight type. No darkroom whatsoever is required.

In addition to your tank, you will need a graduated flask or pitcher for measuring liquids (quart size will do) and several bottles for storing solutions (again, quart size will do), unless you exclusively use "one shot" type of chemical, in which case no storage of used chemicals is required. Finally, you will need a photographic thermometer to determine the temperature of the developer and associated solutions as recommended by the manufacturer, some clips for hanging the wet film to dry, and a photo sponge to remove water spots and aid drying.

There are only three chemicals needed. The developer must be chosen first; then, an acid stop bath to quench development, and finally a fixer (often referred to as "hypo") to remove undeveloped silver in the exposed negative. Plain water is used to wash the fixer from the negative, unless you wish to invest in a commercial fixer eliminator. However, sufficient washing in circulating water is enough for the film size you are dealing with. After the final wash, it is suggested that a wetting agent such as Kodak Photo-Flo be used to prevent the formation of water spots on the film. In principle it is similar to the wetting agent used in detergents to prevent spotting of drying glassware.

Although there are many excellent books exclusively devoted to black-and-white processing, I shall go over the essential steps as they apply to 16mm film. The Nikor, Kinderman and Spiratone tanks, made of stainless steel, depend upon transference of a water-jacket temperature to the chemicals within to maintain the solution's temperature. In addition they employ a separate reel on which the 18-inch strip of 16mm film is placed in spiral fashion. The FR tank uses a reel, made of a type of plastic that depends upon its insulative properties to keep the temperature of the chemical within the tank constant. The Minolta tank is a plastic, daylight loading type, which makes using it very simple.

After you make the last exposure in the camera, make sure that a bit of film remains outside the take-up chamber. If you stop advancing the film when you get to "E" in the exposure-counter window, this will take care of itself. If no leader remains outside, it will be necessary to pull out a short length of film in

the darkroom before you can proceed to load the Minolta tank.

The tank consists of a body, film reel, cover, and a cover retaining spring. As part of the film reel you will find two holders for the ends of the film. The top of the film reel forms the reel knob. Contained within the tank cover you will find two magazine holders. To load, proceed as follows (Figs. 45A-H.):

1. Remove the spring clip holding the tank cover in place. Remove the tank cover and film reel from the body.

2. Align the white index mark of the reel knob with the dot on the tank cover. Turn the assembly over so that the reel is facing up.

3. Separate the supply chamber and plastic bridge from the take-up chamber of the film cassette at the point at which the bridge joins the take-up chamber and save the take-up chamber.

4. Obtain a stapler and place a staple through the very end of the leading edge of the film that sticks out of the take-up chamber. Insert this into the groove within the film reel, making sure that it is secure.

5. Pulling out only as much film as is required, push the magazine containing the balance of the film into the magazine chamber in the top cover, hole side down. Make sure that the holder used corresponds to the groove used. Remember, this reel accommodates two cartridges at the same time.

6. Insert the reel and cover assembly into the tank body without moving them in relationship to one another.

7. Replace the spring clip.

8. With the cover firmly in place, rotate the film-reel knob in the direction of the arrows on the cover. The amount turned should be about one revolution so that the white dots are just about aligned again. Resistance will be felt as this point is reached. If the film is pulled off the magazine core, difficulty in proceeding will be encountered.

The tank is now ready for developing.

Developers

Such manufacturers as FR, Kodak, UFG, Acufine, etc. are

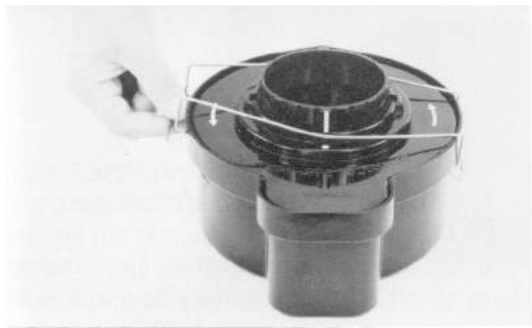


Fig. 45A.



Fig. 45B.

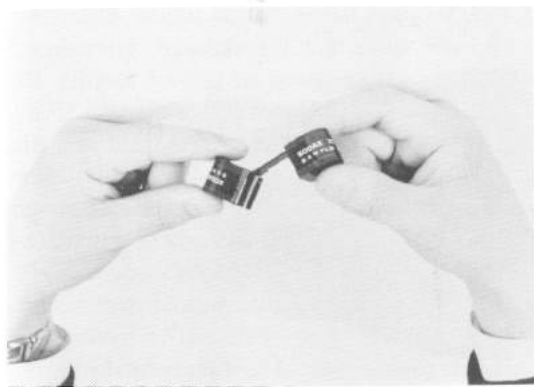


Fig. 45C.

Fig. 45D.





Fig. 45E.



Fig. 45F.



Fig. 45G.

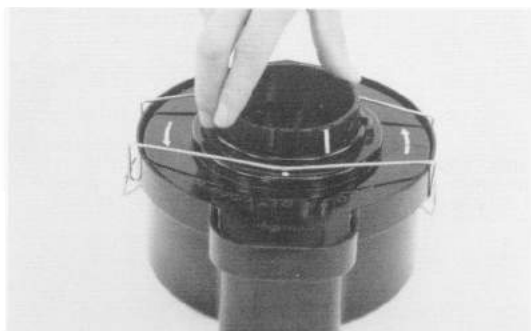


Fig. 45H.

but a few of those who offer a number of excellent developers. It is suggested that you base your selection of a developer not only on the film you are using but also on the ASA at which you intend to rate the film and on the characteristics of the developer. Most developers will clearly indicate on their labels the general types, or specific brands of film for which they are suited. A certain degree of personal taste will enter into the final choice. I choose a combination of film and developer that will give me such qualities as fine grain, high acutance (the ability to sharply define a black from a white area), and sometimes a specific boost in the manufacturer's suggested ASA rating. As an example, if I were aiming for maximum resolving power with Plus-X, I would choose FR X-22, a one shot developer with extremely fine-grain characteristics. The chart that accompanies this developer provides all the information needed with respect to developing time for a specific temperature. If, on the other hand, I wish to shoot Plus-X at ASA 200 instead of its normal 100 (or even 320 if necessary) I would use FR X-44, also a one shot developer. The results would be somewhat grainier, but my main objective is sensitivity. Acufine will also allow Plus-X to be rated at ASA 320 without having to resort to the coarser grained Super-XX film. If you are a darkroom neophyte, it is a good policy to stick with one film/developer combination and follow the chart that comes with the chemical until you are familiar with its qualities and its limitations. The one word that sums up processing is *consistency*. If you can achieve this, everything else will follow.

Once you choose the developer, prepare it according to the package instructions. Pick the temperature/time according to the temperature of the room or water or both. Pour the developer into your loaded tank and leave it in for the required time. During this period, agitate the tank on a regular basis, following the instructions of the manufacturer. It should be noted that while larger film formats are able to tolerate overagitation, which results in increased grain and contrast, 16mm cannot; minimum grain is one of the prime objectives, and all steps required to achieve this should be adhered to.

When the end of the developing time is reached, pour out the

developer and replace it with the stop bath, which will stop the developing action immediately. Then discard the stop bath and pour in the fixer. Allow the fixer to remain in, using routine agitation, for the indicated time. When you have poured the fixer out, the film is ready for washing. Many people simply open the tank and insert a hose connected to the tap of the sink or tub, allowing the water to run in and around the reel within the tank. Thorough washing is needed to remove every trace of fixer.

As a final step, dip the film in a water wetting agent to prevent spotting, and hang it to dry. The total elapsed time from tank loading to hanging the film to dry can take around 45 minutes to one hour. The film should be hung to dry in a dust free area. Enlargements made from a 16mm negative will be anywhere from 10× to 25×. With such great magnification, any dust particle will show on your finished print. Remember, you don't want a print with "dandruff."

There are many books dealing with black-and-white processing. One good reference volume is *Lootens on Photographic Enlarging and Print Quality*. Of course, the *Amphoto Lab Handbook* is the ultimate reference volume on films, developers, and the characteristics of each.

COLOR

Once you have developed a few rolls of black-and-white film, feel free to consider color film. At this point you are probably thinking that color processing is strictly for the pro—complicated, costly, and almost impossible to accomplish at home. All of the preceding may have had merit years ago, but today color processing at home has become more of a reality, thanks to advanced chemistry allowing easy packaging of chemicals, fewer chemicals, and simple methods of temperature control. Let me cite a few examples.

Color films for 16mm fall into two types, slide film and print film. At this writing, the most popular slide film is Ektachrome, medium speed and high speed, both of which lend themselves to home processing. Popular color-print films are Ektacolor or

Kodak 5020, which is similar to Kodacolor X. Both of these films can be processed with a kit you purchase from a Kodak dealer. About the only popular film not easily developed at home is Kodachrome II, which requires complicated, highly controlled processing procedures.

SUMMARY OF PROCESSING STEPS FOR C-22 CHEMISTRY (EKTACOLOR, KODACOLOR-X, 5020)

Step Procedure	Remarks	Temp (F)	Time in Min.	Total Min. at End of Step
1. Developer	First three steps in total darkness	$75 \pm \frac{1}{2}$	14	14
2. Stop Bath		73-77	4	18
3. Hardener		73-77	4	22
Remaining steps can be done in normal room light				
4. Wash	Running water	73-77	4	26
5. Bleach	See warning on label	73-77	6	32
6. Wash	Running water	73-77	4	36
7. Fixer	Agitate as prescribed	73-77	8	44
8. Wash	Running water	73-77	8	52
9. Final Rinse	Use diluted Kodak Photo-Flo Solution	73-77	1	53
10. Dry	Remove films from hangers or reels to dry	Not over 110		

The only item common to both black-and-white and color developing is the tank. If you use a stainless steel tank of the Nikkor variety, temperature control is fairly easy. The charts reproduced here spell out quite clearly the steps, time, and chemicals required for the E-4 process (Ektachrome) and C-22 (Ektacolor and Kodacolor-X) process. The descriptive data is from the *Kodak Color Dataguide*, a most useful addition to anyone's darkroom.

Color Slides

As an example of the progress made in the color-processing field in recent years, consider the re-exposure step of the older E-3 process. After developing, rinsing, and hardening bath steps,

you had to provide a reversal exposure by holding the wet reel of film before a floodlamp for a specified time at a certain distance. Needless to say, this was inconvenient, costly, and sometimes dangerous. Many floodlamps exploded upon contact with a careless drop of water. Then the E-4 process came along. Now instead of a floodlamp, a chemical re-exposure, or reversal step, takes place, eliminating the dangers of the previous method.

Temperature control has been improved through the technique of using a large volume of water at a prearranged temperature to control the temperature of a relatively small volume of solution in your tank. By almost floating the tank in a plastic washbasin full of water (about 9 gallons) the plus or minus $\frac{1}{2}^{\circ}$ F. required for the first developer can easily be maintained.

SUMMARY OF PROCESSING STEPS FOR E-4 CHEMISTRY EKTACHROME-X, EKTACHROME MS AND EKTACHROME EF

Step Procedure	Remarks	Temp (F)	Time in Min.	Total Min. at End of Step
1. Prehardener	First four steps in total darkness	85 ± 1	3	3
2. Neutralizer		83-87	1	4
3. First Developer		$85 \pm \frac{1}{2}$	7	11
4. First Stop		83-87	2	13
Remaining steps can be done in normal room light				
5. Wash	Running water	80-90	4	17
6. Color Developer	See warning on label	83-87	15	32
7. Second Stop	Don't use First Stop	83-87	3	35
8. Wash	Running water	80-90	3	38
9. Bleach		83-87	5	43
10. Fixer	Use 6 min if Fixer is powder type	83-87	6	49
11. Wash	Running water	80-90	6	55
12. Stabilizer	See warning on label	83-87	1	56
13. Dry	Remove film from reels before drying	Not over 110		

By saving your rolls of Ektachrome until ten or more are ready to develop, your monetary savings goes up markedly. Since

a one quart kit of E-4, having a list price of \$10.90, will develop about 4.5 square feet of Ektachrome and each 18 inches (one cartridge) of 16mm film measures about 1/10 square foot, it is easy to see that a quart kit will process about 45 rolls of 16mm Ektachrome, at a cost of about 25 cents per roll. Another benefit of processing your own is that you can "push" color film, use it at higher than its normally rated ASA, by changing the processing time of one or more steps. If you are willing to accept slight color shifts, you can process Ektachrome X, usually rated at ASA 64, at ASA 250, or High Speed Ektachrome, normally ASA 160, at ASA 640. The *Kodak Color Dataguide* recommends specific times for each change of ASA from the norm.

MOUNTING SLIDES AND PROJECTING THEM

Once your roll of Ektachrome has been developed and dried, it must be cut and mounted for projection. Although there are many ways of mounting transparencies using plastic, glass, or cardboard mounts, the task in this instance has been made easier by means of a 2" x 2" cardboard mount with a 10 x 14mm or 12 x 17mm aperture die cut in the center. These cardboard mounts can be obtained from Pic-Slide Mount Co., 40-20 22nd Street, Long Island City, N.Y. Check with them for prevailing prices and minimum quantities.

Cut the strip of film into individual pictures, making sure that you handle the film only by the edges, and use a sharp pair of scissors so that the edge cut is smooth and true. Then, open the slide mount and place the picture over the opening so that it is centered. Close the mount, making sure that the slide remains centered. Next, use an iron, set to about 225° (synthetics) to heat the edges of the mount so that the waxed material on the inside of the top and bottom halves of the cardboard adhere to one another. Care should be taken not to get too close to the slide itself with the iron. This completes the mounting of a slide, and it is now ready for projection.

Slide shows are enjoyable to all if planned properly using the right equipment. Minolta has made the choice of equipment

simple. In addition to ordinary slide projectors used for 35mm slides, there are two projectors (one presently discontinued but possibly still available in some stores) designed specifically to handle the smaller image of the 16.

The Mini 16

For years the Minolta Mini 16 was a standard projector used not only for home slide shows, but due to its extreme compactness, as an attaché case projector for the teacher or business man. The slide projector came equipped with a single slide changer in a vinyl zippered carrying case. The standard lens is a 40mm $f/2.5$ in front of a three-condenser assembly, including heat absorbing glass for slide protection. A concave light reflector in back of its 100 watt lamp completes the optical/light grouping. An accessory auto-changer makes it possible to place 36 slides in sequence for rapid changing and restacking. A tripod socket is provided on the bottom of the unit to allow placement of the projector anywhere that a tripod can be set up in lieu of a table. With its lens, typical image sizes for a given screen to projector distances are:

Length of Image Size (in feet)	Distance to Screen (in feet)
1	3
1.6	5
3.1	10
4.6	15

If an extended slide show is planned, the use of an accessory blower base is suggested to keep the lamp from overheating and to extend the life of the bulb. Contained within this blower base is a tilting device for table use and a separate on/off switch so that the blower can be left on after the lamp is turned off.

The Minolta Slide 16

The latest entry into the compact projector field is the versatile Slide 16 projector. In this model, Minolta has designed

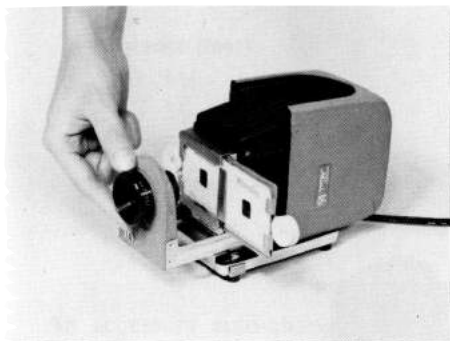


Fig. 46A. The Mini 16—
with single slide changer.

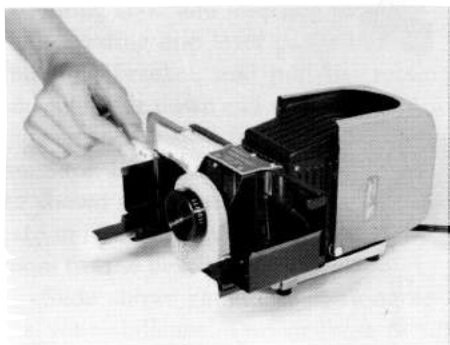


Fig. 46B. Fitted with auto
changer.

changer, condenser, assembly heat absorbing glass, lens, and blower into one body. The four element, 45mm Rokkor $f/2.8$ lens is combined with a condenser consisting of one spherical and one aspherical element in front of a 300 watt lamp for an extremely uniform, brilliant light source. An accessory auto-changer makes showing slides convenient and simple.

After connecting the power cord to the appropriate electrical source, the fan should go on immediately. Pushing the dotted end of the rocker switch in the rear of the machine turns the lamp on. An illuminated panel is provided in front of the loading slot to preview a slide in a darkened room before inserting the slide into the slot. The slide is pushed downwards manually with the image upside down and the emulsion side towards the screen.



Fig. 47. The Minolta Slide 16 Projector.

Focusing is accomplished by turning the knurled rim of the lens. An elevation control located at the front, bottom edge of the unit raises or lowers the projector as required. By pushing succeeding slides into the slot, one after another, the slide you've just shown is pushed into a receiving tray within the bottom half. The slides are stacked in this tray in the same order in which they are shown. After the last slide is pushed into the slot, use the reject lever to remove it into the tray, and then remove the filled tray from the side of the projector and empty it. The reject lever can also be used if a slide is inadvertently pushed in upside down or backwards.

Typical projection sizes obtainable from a 12×17 mm image using the 45mm lens are as follows:

Distance (feet)	Size (inches)
1½	4 × 5½
3¼	8¾ × 12½
5	14 × 19¾
6½	18 × 26½
10	28¼ × 41
13¼	37¾ × 54¾
16½	47¼ × 68½

An accessory auto-changer can hold up to 36 slides. It is fitted by lifting the manual gate assembly out of the projector mounting shoe and inserting the auto-changer in its place. With the operating-grip lever pushed all the way in, grasp the supply-retaining bracket, and pull the retainer back. Insert up to 36 slides, upside down and with the emulsion side of the film towards the screen. Release the retainer so that the stack remains under pressure. By moving the changer lever in and out, the slides will be shown and then replaced, in order, on the other side of the gate until all are shown. Then they have to be removed to make room for the next group of 36.

Slide shows should be reasonable in duration so as not to tire your audience. Two or three hundred slides are considered an absolute maximum. A narration should be thought out ahead of time, and possibly put on tape for playback along with the slides. By doing so, you will not forget the name of that building in Paris, or that street in Madrid, or was it Lisbon?

COLOR PRINTS

Should you desire to process negative color film, the results can be just as rewarding. Whether you go on to make your own prints or have them made by a commercial lab after development makes little difference. Prints, usually 3" × 4¼" or 3½" × 5" can be mounted in an album for display or carried in your wallet after trimming to show your friends and relatives. The exceptional negative can be enlarged to greater proportions by you or by a custom lab, depending upon your tastes. I would not suggest attempting to print your own color unless you have done

black-and-white printing for some time. This is covered immediately following the reloading section.

RELOADING

One of the nice aspects of using 16mm film is the convenience of filling up those empty cassettes. After we have developed our black-and-white or color film, we have a perfectly good, very reusable plastic cassette that we have paid for. Why throw it away? Load it yourself and save. There are many types of film that can be loaded by you that are either not sold by Minolta or that are not even made in 16mm size. You may have a preference for one of these emulsions in which case reloading is a must.

There are two ways of proceeding. Once you have one or more empty cassettes, you can either purchase a 100-foot roll of 16mm single perforate movie film in an emulsion made by one of the film manufacturers, or slit a 16mm strip from 35mm film with a device made for that purpose.

You can obtain 16mm film in several styles from companies such as Eastman Kodak. It is carried in stock or can be ordered by one of their dealers. You normally would choose between single or double perforate (sprocket holes on one or both edges) or imperforate (no sprocket holes). Since the Minolta system does not depend on sprockets, the single perforate type is preferred as it is more readily available "off the shelf" than others. In Kodak black-and-white emulsions, you have a choice of Plus-X, 7231 (ASA 80), stock number PXN449, Double-X, 7222 (ASA 250), stock number DXN449, or 4X, 7224 (ASA 500), stock number 4XN449, all currently selling at under \$4.00 per 100-foot spool. The above films are all negative types. Do not purchase black-and-white reversal film, since its characteristics and developing requirements are quite different from those of the negative materials ordinarily used.

In color, you could use Ektachrome MS, 7256 (ASA 64), Eastman Color Negative, type 7254, which can be purchased in 100-foot spools, but it cannot be processed by a commercial lab as can Ektacolor or Kodacolor because Eastman Color has a backing layer that will not come off in a commercial processing

machine set up for Ektacolor. A few labs outside of the United States (the closest being Mexico City) will handle this film. However, it is best to count on developing it yourself.

Although I have used Kodak films as an example, 16mm film in bulk is available from a number of manufacturers. As long as you can determine the characteristics of the film offered, you can use any negative film sold.

Let us now consider the possibilities of using a film that is not spooled in 16mm at all. As an example, suppose you prefer the shades and tones of Fujicolor N100 color negatives film. Since this emulsion is not offered in 16mm, you would not ordinarily be able to use it in your Minolta 16. However, with a device made by The Varitype Corp. you can change a roll of 35mm to 16mm in a few minutes. The Varitype Corp. (a division of Addressograph-Multigraph Corp. with offices throughout the United States) manufactures a machine called a Headliner. Its purpose is to produce labels consisting of black letters on 35mm-wide, photo-emulsion paper. Depending upon the width of the letters on this strip of paper, the Headliner operator may wish to slit the paper to a narrower width. An accessory called "a paper stripper" is used. The gadget, retailing for about \$4.50, is made from a very durable plastic. It has a lower section, into which is slid the 35mm stock. The upper section, hinged at one end, contains two razor blades of the injector variety, held at a specific angle to the lower section. To use it, all you need do is insert the 35mm film from the back (the hinged end) until it protrudes past the leading edge of the lower section. Then, after bringing the upper half down onto the film so that the blades contact the emulsion, steadily pull the film past the blades while applying an even pressure to the top and bottom sections. Both perforated edges of the 35mm film are slit away, leaving a 16mm unperforated strip from the middle of the film. This entire sequence takes but a few minutes. It must be done in a totally dark room. This is true as well for the beginning of the actual reloading operation. When the blades have slit five to ten rolls of film, they should be replaced to make certain that the next strip of home-cut 16mm film has perfectly smooth edges.

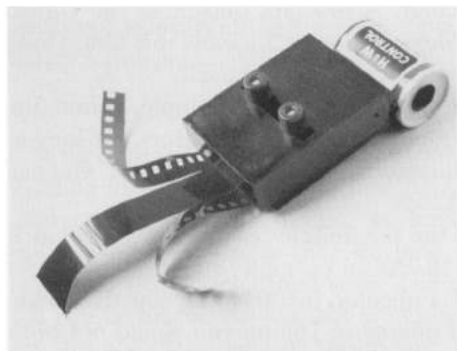


Fig. 48. The Headliner Paper Stripper shown here stripping a roll of H & W Control Film. The two adjustments on its top provide width of film variation. Each holds a razor blade at the correct angle to the film.

Now that you have a source of 16mm stock film, the actual reloading consists of ten easy steps:

1. Disassemble the cartridge into its component parts; magazine, take-up core, take-up chamber cover, and supply chamber cover. Blow out the chambers thoroughly with an ear syringe (obtainable at your local druggist) to get rid of any dust within. Choose a relatively dust free room in which to perform this.

2. *In total darkness* cut an 18" strip of film from either your 100-foot spool or the 35mm stock that you've slit. Wind this strip into a small roll, taking care not to put your fingers on either the front or the back of the film. Handle it by the edges only.

3. Place the roll into the smaller of the two chambers so that an inch of film is left protruding from the slot in the corner of the chamber.

4. Place the supply chamber cover on top of this half of the magazine. At this point you may turn the lights on. Secure the cover with a small piece of pressure-sensitive tape. If the tape can be written on, so much the better.

5. Place another piece of pressure-sensitive tape on the end of the film protruding from the magazine so that part of the tape hangs off the end.

6. Hold the take-up core on your finger like a thimble. Place it on a flat surface and fix the tape onto the core. For best results,

make sure that the tape encircles the core and attaches to the other side of the end of the film.

7. Wind one and one-half turns of film around the core, making sure that the film winds straight. Then put it into the take-up chamber, threading the film into the slot on that half of the magazine.

8. Place the remaining cover onto the take-up chamber and secure with another piece of tape.

9. Label the cartridge as to the type of film within and the expiration date obtained from the original package of film.

10. If the cartridge is not going to be used immediately, put it into its protective container for storage in a cool dry place. It is important from time to time to inspect the cassettes you use for reloading, and if you find that the light trap material at the slots becomes frayed, the cartridge should be thrown away immediately. New, empty cassettes may be ordered from Minolta through your local photo dealer.

PRINTING

If you have developed your first roll and have been pleased with the results, you may wish to set up a darkroom for the purpose of following through to the final product—a finished print. A larger format camera's negatives may be contact printed (a print made the same size as the negative), but with 16's this is out of the question. Enlargements of 10× or 20× are usually the case. The average size print is about 3½" × 5", or 5" × 7". On the plus side, the equipment required can cost much less than comparable equipment needed to process much larger negatives and prints.

Whether black-and-white or color printing is contemplated, certain items are basic to any darkroom. First, of course, is the enlarger itself. While any enlarger whose lens is the right focal length and whose illumination system is designed for subminiature negatives will suffice, some are better suited than others.

The Minolta Mini-16 Enlarger

This unit, sometimes referred to as the 3-in-1 enlarger be-

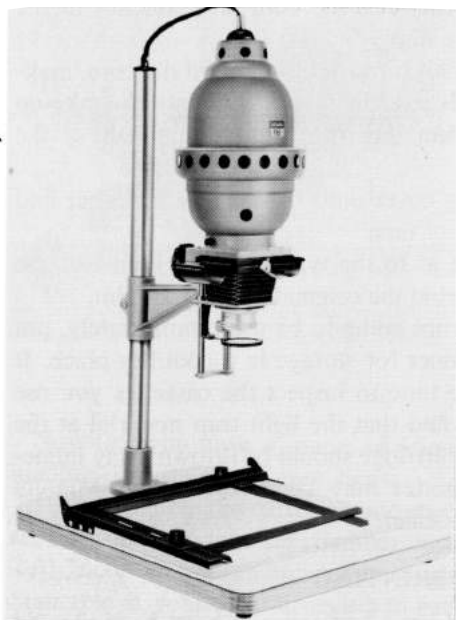


Fig. 49. The 3-In-One Enlarger.

cause it can be adapted to use 9.5mm, 16mm, and 35mm negative widths, is ideal for the mini negative. The entire enlarger strips down into several easy to store component parts, yet assembles quickly into a compact, sturdy unit. The enlarger consists of an upper lamp house containing the 100-watt light source, a lower lamp house that connects to the negative carrier stage, the arm assembly containing the focusing bellows and lens holder, and finally the pole, pole support, and baseboard.

The standard lens is the 30mm $f/4.5$ E Rokkor, which has a Leica-type flange. If the smaller 10×14 mm negative is used, the maximum enlargement to the baseboard with the above lens is $6\frac{1}{2}'' \times 8\frac{1}{2}''$. The enlarger rotates 90° to permit projection onto the wall for greater magnification.

The Minolta Enla Unit

An alternative to the Mini 16 enlarger is provided by the

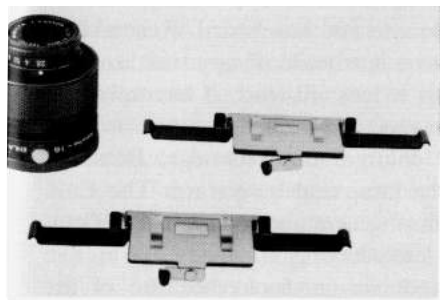


Fig. 50A. The Enla unit with a standard and quarter frame negative carrier.

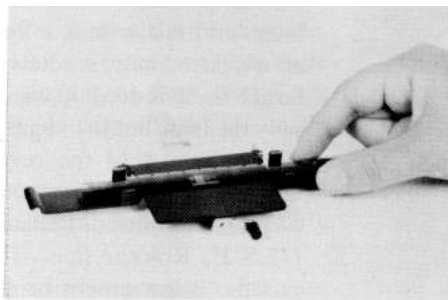


Fig. 50B. When placing the negative strip in its carrier handle it only by the edge.

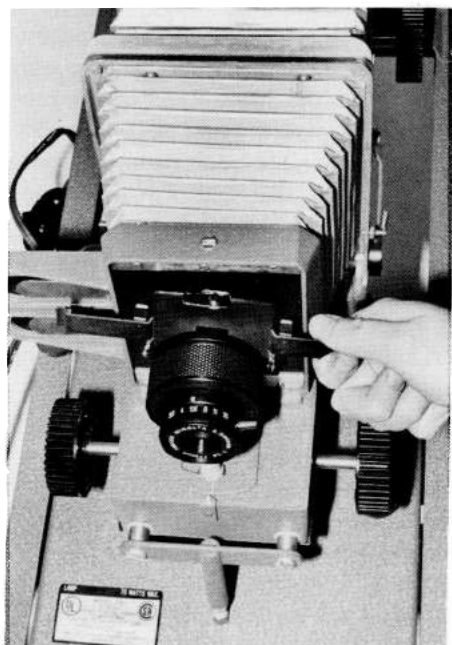


Fig. 50C. The Enla, fitted onto a Beseler enlarger, uses its own condensers. The knurled collar facilitates focusing.

Enla Unit. This rather unique device is almost a complete enlarger in itself, minus a light source and baseboard. Resembling an oversized lens, it screws into a lensboard of any standard enlarger as if indeed it were *just* a lens; instead, it becomes not only the lens, but the negative stage and condenser system as well. The only part of the regular enlarger used (Omega, Besseler, Bogen, Leitz, Durst, etc.) is the lamp and baseboard. The Enla contains a knurled, helical focusing ring above its preset 30mm $f/2.8$ E, Rokkor lens. This lens, having six elements in five groups, is extremely bright and easy to focus because of the larger than usual f /stop. A typical set-up is illustrated.

Black-and-White Printing

Once the main unit has been chosen, you need only a few more items for black-and-white printing. Three 8" \times 10" trays, either phenolic plastic or hard rubber, are next on your list; in a pinch, Pyrex baking pans, obtainable from a housewares store, can be used. You will need an easel, which is usually an adjustable frame to hold the printing paper. If you plan to make only one size picture, a fixed easel such as the Speed Easel can be purchased at a savings. Standard sizes of 2 $\frac{1}{4}$ " \times 3 $\frac{1}{4}$ ", 4" \times 5", 3 $\frac{1}{2}$ " \times 5", and 5" \times 7" are common. In addition, you need a safelight, usually red or yellow-green, that will provide enough light for you to see what you are doing without fogging the paper. Finally, a method of determining a period of time, such as a stop watch, metronome, or darkroom timer, is needed. The chemicals used to develop enlarging paper are very similar to those used for film: a paper developer, such as Kodak Dektol, an acid stop bath to arrest development, and a fixer to make the image permanent. You can buy these in any camera supply outlet. Follow directions for mixing on each of the packages.

The trays hold the chemicals in the following order: developer, stop, and fixer. The safelight should be placed close enough to the trays for you to see the progress of development, but not so close that the paper reacts to the light.

This is the procedure you can use to make your first print.

1. Insert the negative of your choice in the negative carrier

of either the Mini-16 or the Enla Unit. An important step at this point is to make sure that the negative is as clean as possible. Since the magnification is generally $10\times$ or more, every particle of dust can become the size of rice grains on the final print if not blown away with an ear syringe or wiped away with an anti-static electricity brush (Staticmaster).

2. Turn the enlarger lamp on, compose, and focus the image on the easel. The image may be full frame or cropped so that only part of the frame fills the easel.

3. Since focusing is done at maximum aperture for ease of obtaining as sharp an image as possible, you now close the lens to about $f/8$ for better resolution.

4. Place a piece of number 2 enlarging paper in the easel. It is assumed that the negative shows gradation of tone from solid black to clear areas with all values in between. If it tends to exhibit heavy amounts of solid black areas, it requires a lower contrast paper and number 1 or number 0 would be used. If, on the other hand, the negative seems thin, with large, clear areas that on the final print would be shadow, then number 3 or 4 is in order.

5. Next, make a test print to determine the proper exposure. Turn the lamp on, and count or measure five-second intervals as you move a piece of cardboard in five or six steps at five-second intervals across the image projected onto the printing paper. Each move of the cardboard allows a new narrow strip of the paper to be exposed. Five or six strips is sufficient. If you use five strips, the first would be exposed for 25 sec., the next for 20 sec., and so on.

6. Place the exposed paper in the developer and leave it there, using agitation from time to time, for the recommended period, usually one to two minutes. The image will appear shortly in those strips given longest exposure, while those given less will take the full developing time to appear, if they appear at all.

7. At the end of those time, place the paper in the stop bath for a few seconds, then transfer it to the fixer. In a half minute or so, you may turn on the room light and inspect the print.

8. One of the strips will be better in tones than any other.

Simply multiply across the paper by 5 until that strip is reached. If the fourth strip looks best, then the best exposure will be 20 sec. at $f/8$.

9. Expose and develop the final print.

10. After the print has been in the fixer for 10 minutes, it should be placed in a sink, basin, or other receptacle filled with water and washed with a constantly changing volume of water for a half hour or so. This will remove the fixer from the emulsion and from the fibers of the paper base.

11. Dry the washed print by either placing it between photo blotters overnight for a matte (dull) finish or on a ferrotype tin (chrome plated steel) with or without heat for a glossy finish.

For more information about composition during enlarging, tricks of burning (giving more light) and dodging (holding back light) that allow you to change a small area of the image, and many other aspects of enlarging, obtain a copy of *Enlarging: Technique of the Positive* by C. I. Jacobson, Amphoto, New York, 1972. This book has been a standard reference for years as have *Lootens on Photographic Enlarging and Print Quality*, Amphoto, New York, 1967, and *The Complete Art of Printing and Enlarging* by O. R. Croy, Amphoto, New York, 1970.

Color Printing

Since color printing would require a chapter by itself to convey the simplest details, I should like to point out that once you have become familiar with black-and-white printing, color is not only simpler, but more rewarding both aesthetically and financially.

As with film, color printing has become simpler due to changes in chemistry. Such kits and associated accessories as Uicolor, Rapid Access, Luminos, and FR have given the amateur a color lab within reach. As an example, assuming you have a black-and-white darkroom, you need only add a kit of color chemicals, color printing filters, a processing tank (yes, it is very similar to processing film), and away you go. On the average, with some discounts on materials, an additional \$50-\$80 is

needed for the above items. The time required to produce a very acceptable 8" × 10" print would be about half an hour. The cost in materials is a mere 60 cents to 75 cents. Compare this figure to the custom lab fees of \$10 and up for the same print and you can see just one of the advantages. You no longer have to settle for a machine print, cropped the way the machine is set up and shaded the way the machine chooses. Everything about the size, composition, color shadings, and saturation is within your control. More on color printing can be found in the *Kodak Color Data Guide*, and *Color Printing: Materials, Processes, Control* by David Engdahl, Amphoto, New York, 1970.

CHAPTER 6

Applications

Having learned what capabilities the camera has, how to make adjustments for various lighting conditions, and should you desire, how to process the film, the next question is what to take pictures of? Are there certain situations that lend themselves to use of a 16mm camera? We shall now see that the Minolta 16 has many roles.

THE FAMILY CAMERA

The Minolta 16 cameras are used to take more snapshots of family and friends than any other subject. While the casual photographer comes away with a picture that has the ingredients of a good photo in it, it may not be framed correctly. If your goal is a photograph of your wife or child, consider a portrait so easily accomplished with the Minolta 16. By filling the frame with your subject, you are bound to come up with a more pleasing picture, all other things being correct. When you have a piece of film to use that is the size of your thumbnail, why waste any of it. If Aunt Mary is the principal subject of interest, don't waste valuable film on her house, garage, and front lawn, thus reducing her image to a pinpoint. Move in, and by using the closeup lens, either built in or added on, shoot from an angle that suggests the surroundings without actually showing it. In view of the fact

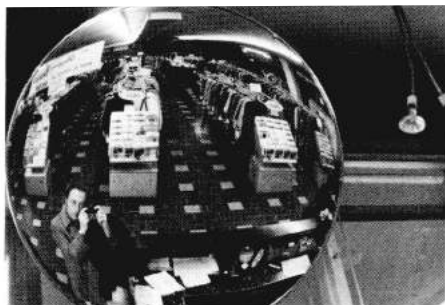


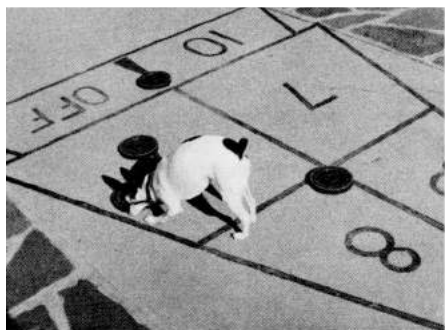
Fig. 51. Fisheye? Not quite. The photographer holds his 16 and shooting into a convex store mirror gets the store, himself and everything else into the shot. The camera, being as small as it is, becomes unnoticed in the final print. Photo by S. Uslan.

that the camera is small, taking the shot will be less obtrusive, and your subject should be more relaxed.

If you want a totally candid shot, preset your shutter and *f/stop* by taking a meter reading from a similarly lit subject or area. The less manipulation done in the presence of your subject, the better. Then, once set, move the camera to your eye, and a turn to your left or right to take the picture before the person realizes it.

A favorite technique of the candid shooter is a hip shot whereby the camera is never brought to eye level. Instead, you learn to approximate the angle of view when the camera is held with your arm at your side and the lens pointed diagonally upwards at the object or person you wish to photograph. However, an obvious shortcoming of this technique is that if the picture of the person is taken closer than six feet, it will appear to have been taken by a three-foot tall photographer because of the perspective. A way to get around this is to shoot at a right angle to the direction in which you appear to be looking. It is a psychological fact that if you do not face your subject, he will not believe you are going to take his picture. Bring the preset camera to your eye, but face 90° away from your subject. By holding the camera at 90° to your face, you will be looking at someone else, but taking your shot at right angles to yourself. The camera does not have any protrusion to give away the fact that the lens is not pointing at the area you are facing.

Children at play lend themselves beautifully to candid shots,



Figs. 52A, B, C. A sequence. Have your 16 cocked and ready to go. When my dog tried to get into our shuffleboard game, this sequence was a natural. Ektacolor, 1/250 at $f/8$.

for they seldom care whether their picture is being taken when they are wrapped up in some game. You can also take advantage of the 16 to get a picture story or sequence of pictures. If you load your own film, the cost of taking more than one or two shots of someone is very little. A sequence of pictures is used to tell a story in stills as a motion picture camera does in action: The various expressions during a tense checkers game; the concentration needed by the base runner before he steals second; getting into the rowboat . . . gracefully; building a campfire; and so on. The ideas are as far-reaching as your imagination.

There will be times when the use of a larger camera is not feasible or actually frowned upon. Many professional photographers find that relatives get in the way at a wedding or similar

occasion while they are trying to get pictures of the principal parties. How easy it would be, though, for you as a guest to use your 16 to get those desired pictures. Certainly the less equipment taken to an affair, the better for all concerned. There are family situations where the use of a camera is looked on with disfavor. Consider a religious ceremony where using the standard bulky, noisy camera would be out of the question. The Bar Mitzvah boy would probably appreciate the fact that you were able to get a totally candid picture by available light with your 16 without anyone suspecting that you took a picture until you gave him the finished print.

The most use that a 16mm camera, or for that matter, any camera gets is during vacation time. It is at this time that the 16 really shines. I am sure that at one time or another while walking for long hours through the streets of a city in Europe or a quaint village somewhere in the United States, you wished that your usual camera gear did not weigh as much as it did. The Minolta 16 provides a refreshing change of pace for the overburdened photographer. Here is a few ounces of camera that can be worn on a belt or carried in pocket or purse. It is ready in an instant, and is always available should the unexpected arise. While traveling by car, with most of the regular equipment either packed or not easily accessible, any of the passengers or even you, the driver, can use the 16.

If your regular camera, whether a 35mm or larger size, has color print film in it, shoot slides with your 16 to supplement coverage. If taking slides with a 35mm camera, shoot black-and-white with your 16. By using the 16 to complement the film in another camera, your potential for bringing back a greater variety of vacation pictures increases.

And speaking of film, how convenient it is when taking your 16 on vacation to be able to pack film, flash, and a host of accessories in an area not much larger than your usual roll-film camera takes by itself. Consider the money that might be saved in overweight charges at the airport. Those fees alone could pay for an extra cartridge of film.

When the number of vacation pictures to be taken is men-



Fig. 53. Try a different point of view. Thousands of shots have been made of New York's Flatiron Building. This approach was from underneath a traffic light, at the corner of WALK and DON'T WALK. It tends to emphasize the triangle theme of the building. 5020 print film, 1/30 at $f/22$ for maximum depth of field.

tioned, there are two theories that generally apply. The first states that by taking many pictures, which is certainly convenient with a 16, you are bound to get a few that are better than the rest. This is the shotgun method of picture taking. The other theory says that if you limit your film supply, you will automatically make each valuable frame count more towards a better photo than if you knew you could take three or four more of the same scene. Both methods have their points. Either can apply to the 16. Whichever theory you lean towards, try to keep the final print or slide in mind and say to yourself as you press the shutter release, "If it were someone else's photo, would I enjoy looking at it?"

An honest answer to this question will by itself lead to more high-quality pictures.

THE BUSINESS AND INDUSTRIAL CAMERA

There was a time not long ago when if a member of a corporation needed a product, meeting, person, or building photographed, he would check the telephone book for his nearest professional photographer. This is fast becoming the exception rather than the rule. The advent of sophisticated but easy-to-operate quality cameras has contributed to this change. With the growth in popularity of the subminiature the amateur-professional now can bring to the office a studio in an attaché case. With a reasonable investment you can have a 16 system capable of capturing the photographic requests of management.

Photos are required in business and industry every day. The Minolta 16 is versatile enough to fill all of the requirements without depleting the company budget or making a large dent in your personal expenditures. Portraits of incoming personnel for publication in internal newspapers or for files are easily and quickly made with the portrait lenses. The size factors contribute greatly to the minimum fuss made for the busy executive. Most offices provide the photographer with even, strong, and plentiful illumination by fluorescents or daylight for Plus-X film or even Panatomic X for ultra fine grain. For the company on the move, photographs of future building sites play an important roll in accompanying reports on those sites. The more shots the better. With 16 film so inexpensive, a larger quantity of pictures becomes a reality. Furthermore, the attaché-case studio travels easily in cars, planes, and certainly by foot. Once the site has been chosen and construction begun, what better way to enhance the next quarterly report than with a sequence of pictures from ground breaking to ribbon cutting.

Certain businesses require inexpensive catalogs showing their product line. Many handcrafts can be photographed inexpensively with a copy stand set up employing the 16MGs. Several watches, rings, carvings, etc. will easily fit in the frame of the four legs of



Fig. 54. Although taken on Microfilm, this picture was processed for lower contrast by greater dilution of the developer. Photos of lots, upon which your business plans to build, are just the start of records for the progress of the new building. This scene in New Jersey was one of the places Minoita has been considering for the site of their new corporate headquarters. The slow ASA made 1/60 at f/5.6 necessary.

the stand. Lighting can be provided by daylight for color film or table lamps for black-and-white. If the sales representative of your firm will be on the road, shoot transparencies and equip him with a Slide 16 projector or Mini 16 for a vivid presentation of the product line. Slides can always be kept up to the minute with respect to the latest product changes. You will not longer have to mark catalogs as to availability. Just as a portable tape recorder plays an important part for audio notes of a meeting, so a camera provides the visual impact to go with the tape. Supplement the recorded description of the latest in copying machines with pictures of the product, which can emphasize its saleable aspects. Your purchasing agent will have a field day with a 16 at a trade

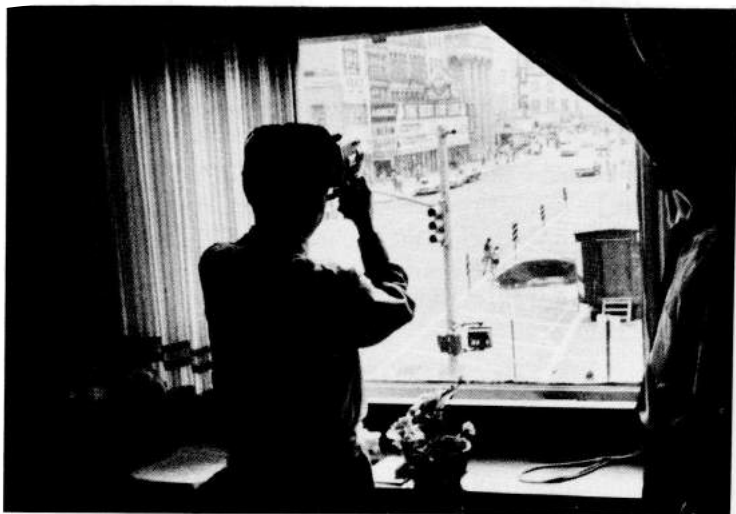


Fig. 55. When the president of Minolta Corp., Mr. S. Kusumoto, personally tested a customer's movie camera, I grabbed this shot in his office and sent a copy to the customer. I am sure you could think of a similar application in your line of work.

show. On occasion a trade show will not permit photos to be taken, for competitive purposes, of new products not yet released. With the techniques outlined in the sections on candid and surveillance work, pictures can be obtained with reasonable ease.

There are situations that may require a camera used in a lab or assembly line to be as small as possible. While fiber optics make it possible to photograph the insides of containers into which a larger camera will not fit, why not lower the entire camera into the container? When mounted on a long enough rod or bar with a lever device to trip the shutter at a distance, the 16 becomes an extension of the assembly inspector's watchful gaze. Only because of the size and weight can a camera like this be used to check manipulation of radioactive materials, once pro-

tective shields are placed around the camera to safeguard against fogging of the film due to radiation. The weight of a lead shield for a larger camera would substantially increase the total weight of the package. The same applies to similar hostile environments that need to be photographed. Many electric generating plants use television cameras to monitor the boilers. In a suitable protective case with remote operating controls attached to the case, a 16 will occupy one quarter the room of the TV camera.

The applications in industry and corporate business for this format and size are unlimited.

THE SCIENTIFIC CAMERA

The more unique a camera, the more unique are its applications. This is certainly true of the Minolta family of 16's. Of all the uses for these cameras, none are so particularly suited as those in the scientific field. I have also included hobbies within this section, for the collection and categorization of "things" defines a science.

Copying

Next to the single-lens reflex, the 16 is the easiest camera with which to perform document, picture, and record copying. If you own either the 16Ps, 16II, 16MG, or 16QT, setting up for copying consists of nothing more than slipping on the desired close-up lens, checking your depth-of-field chart, and making sure that a ruler is handy for assuring you that the correct distance exists between you and your document. If you own the 16MGs, the addition of the self-supporting copy stand makes the undertaking even easier. By placing the 16MGs in its copy stand cradle with the appropriate close-up lens already in place, you need only position the four legs of the stand over the letter or photograph.

If you are going to photograph continuous-tone pictures, where you have all shades from white to black and everything in between, then a panchromatic film such as Plus-X or Panatomic-X should be used. If you are going to copy line work, consisting

of just black-and-white with no middle tones, then Panatomic-X, developed in a high contrast developer, or microfilm stock should be chosen.

Your choice of lighting can be varied. The simplest and often the best lighting is daylight. If the rays of the sun fall on your paper at an oblique angle, place a white cardboard reflector at right angles to the opposite edge of the paper to more evenly distribute the light. This is particularly true if you are using the copy stand of the 16MGs. In this case the cardboard can be rested against two of the legs opposite the direction of the sun.

A stand can be constructed for the other 16 cameras, which cannot use the 16MGs stand. Many mini tripods are suitable for this purpose. Although they are generally too flimsy to adequately support a 35mm camera and lens, they are just right for the featherweight of the Minolta 16. Most have adjustable legs and a universally rotating top called a *pan head* that permits you to position the lens of the camera over the document to be copied.

Letters and photographs are not the only things that you may wish to copy. You might want to catalog your stamp collection or coin collection for insurance purposes or for display. Once the camera has been set up, you might want to shoot in color, slide or print. Here the lighting becomes more critical. While you must maintain even lighting, the quality of light must also match the color film's requirements. With outdoor film, daylight is best. With tungsten (type B) film, which is balanced for tungsten illumination, small photofloods can be used. To take color indoors without the sun and use daylight film, employ your strobe for lighting. For ideal results, two strobes should be used, placed at forty-five degrees to one another and connected together with the appropriate parallel-sync cord so that when the shutter of the camera is tripped, both strobes will fire at the same time. Since the distance to the subject will most probably be small, you should place a neutral density (N.D.) filter over the lens to cut down the light and bring the exposure within the reach of the aperture of the cameras. For instance, if you used the Minolta Electroflash with Kodacolor-X or Kodak 5020 print film, the guide num-

(Text continued on page 116)



Fig. 56 (left). People concentrating on their job won't see you. The everyday activities go unnoticed until photographed. Plus X, 1/125 at *f*/11



Fig. 57 (right). Lighting in a candy store is generally plentiful. Thought-provoking portraits and studies in character are easy by available light. Tri-X, 1/60 at *f*/3.5.

Fig. 58. Some thing you may see every day and yet, never photograph. Using a slightly slower speed than usual gives the water its motion. The same technique applies to falls, rivers, rapids and watergun fights. Plus-X 1/60 at *f*/11.





Fig. 59. Post card type shots are sometimes called "corny pictorialism" but they keep on selling post cards. So, why not take it anyway? The World Trade Center, rises from New York City's Battery Park section as seen from the Staten Island Ferry. 1/500 was used to offset the vibration of the boat. A brilliantly sunny day allowed $f/11$ with Plus-X.

Fig. 60. Silhouettes and high contrast. Snow, skaters and ice are made for high contrast interpretations. Frame your shots for impact. For maximum contrast, choose a Microfilm emulsion. Develop for contrast according to manufacturer's suggestions. This was shot on Kodak Recordak Microfilm and processed in X22.



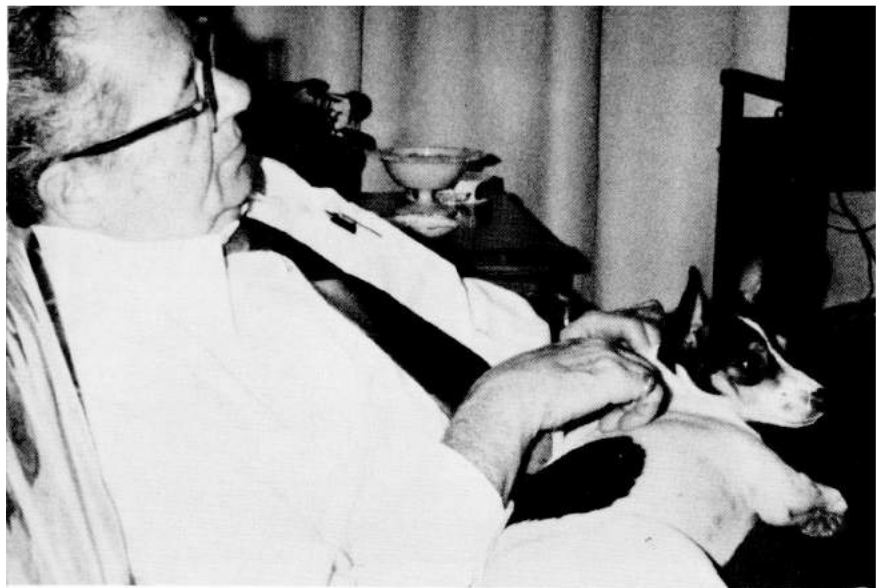


Fig. 61. Although basically a snapshot, the diagonal line formed by man and dog adds strength to the picture's composition. Plus-X, Electroflash-2.

Fig. 62. All my usual cameras were packed when I left my room to discover that an antique car caravan had arrived during the night. The 16, clipped on my belt, got it all. Last minute cleaning for the Antique Auto Show gave me easy action shots.

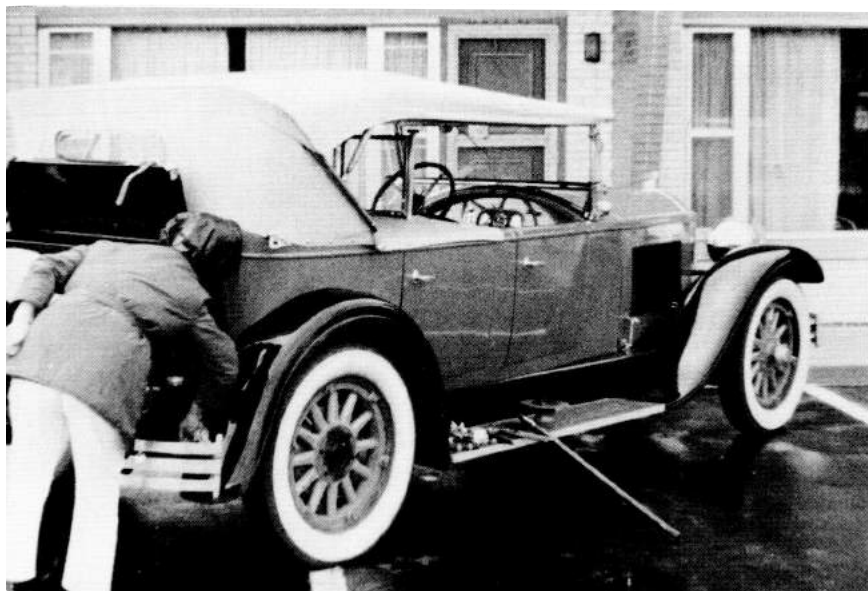
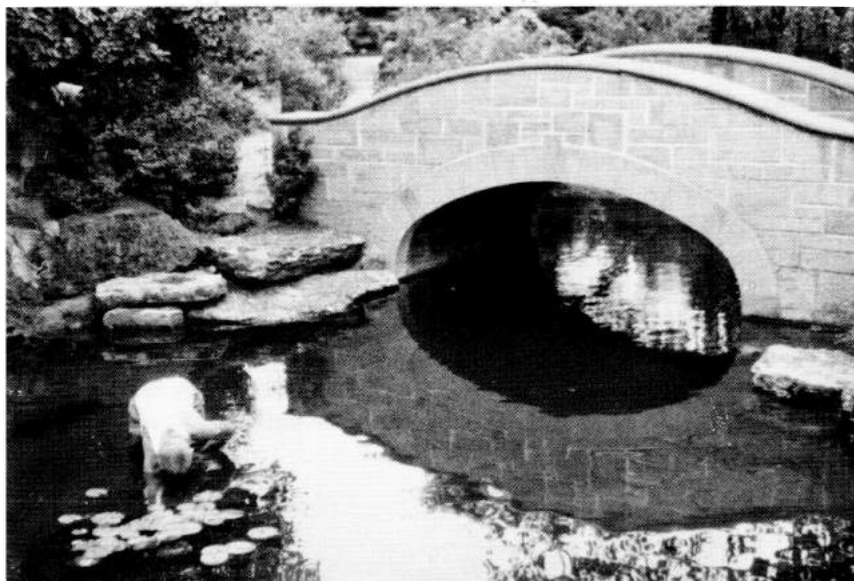




Fig. 63. A different view of the beach on Lake Ontario, Toronto, Canada. The two figures, unmindful of the poor weather provide just the atmosphere needed. Plus-X, 1/60 at f/5.6.

Fig. 64. Ever wonder what happens to the money in that wishing well or pool? At the end of the day, the water calm, the caretaker takes care of the money at the bottom of this wishing garden. The reflections in the pool make the composition strong. Lakes and pools are easy to catch with good reflections just before midmorning and just after sunset. Plus-X, 1/125 at f/5.6.



ber is 45. Since the strobe will be about one foot away from the subject, the effective aperture should be $f/45$. However, the smallest opening on the 16's is $f/16$, or $f/22$ on the 16QT. You need to use an $8 \times$ N.D. filter to cut down the intensity of the light entering the camera, which allows you to use an aperture of $f/16$.

MICROFILM AND RECORD STORAGE

Once you have an established setup for general copying of photos, it only takes a change of film and developing technique to lead to quality microfilming and record storage for you or your business. Microfilm equipment, purchased commercially can be expensive. However, equipped with your copy setup and a quantity of 16mm unperforated microfilm, you can be financially ahead.

Microfilm is a generic term that applies to emulsion especially designed to provide high-contrast black-and-white images with maximum resolution of line copy. Generally, the ASA speeds are slow, in the neighborhood of 5 to 15. Typical sources are Remington Rand Systems, Bell and Howell, and DuPont. All can supply film in 100-foot lengths, which you can then cut and load into your own Minolta cassettes. For instructions in this regard see the reloading section. The film can be stored in your refrigerator for long periods of time until you finish the roll.

The use of strobes is very suitable here for you do not have to worry about small apertures: The very slow speed will allow you to shoot at average apertures of $f/8$ to $f/16$. When a cassette is finished, you will have to process it yourself, unless you can find a custom lab that will do this for you. Since you will probably project the negatives, no prints need be made. Aside from microfilming books, newspapers, magazines, and the like, a consistently excellent microfilm system can provide you with the ultimate notebook if you are a college student or doing research in general. Most of the time spent in research is in copying notes laboriously into a notebook of some sort. Consider the time factor alone if you could go into the library and arrange with the librarian to bring along your very portable but very efficient microfilm

camera. A few minutes of shooting could leave you with time at home to go over the material at your convenience.

MEDICAL AND DENTAL APPLICATIONS

From time to time most dentists and doctors require a camera to record a condition of a patient for either a record of progress or for inspection by colleagues for evaluation. While a doctor may have access to equipment of a larger size in an office, the Minolta 16 makes an excellent "medical bag camera" for house calls or outside emergencies. If you consider the fact that many medical men give lectures to others in their specialized fields, utilizing slides to supplement their reports, what better way to operate with speed and flexibility than with a 16 loaded with Kodachrome or Ektachrome. The strobe and flash accessories provide you with ample lighting for close-up shots of your patient, while the uncluttered instrument itself keeps the "Hollywood production" aspect to a minimum. For dentists and dental assistants the 16 is an answer to reliable intra-oral photography. By mounting camera, two strobes for even lighting, and a frame on a common bracket, you have essentially a copy setup for a three dimensional object, your patient. If the 16MGs is employed, simply use the 25cm close-up lens and copy cradle, framing your patient within the four legs held horizontally. Again, for maximum resolution and ease of presentation, color-slide film is suggested.

CRIMINAL, FORENSIC, AND INVESTIGATIVE PHOTOGRAPHY

About twenty-five to thirty years ago the mainstay of police work was the cumbersome 4" x 5" Graflex or Speed Graphic and its 30 pounds of accessories contained in a case not much smaller than an Army footlocker.

Even then, cameras designed to photograph latent fingerprints, made visible by chemical powders, were large and awkward to handle. By using the 16 in such work you not only reduce the bulk of the equipment carried, making room for other cargo,

but the ease of use of such setups makes the giants of the photo era of yesterday look even more clumsy than they were. The standard copy format of closeup lens, lights, and stand can be used for shots of surfaces dusted for prints. By extending the legs of the 16MGs stand, and employing the 80cm lens, you can include tire tracks and footprints. If evidence is laid out on a table, one photo can be taken of the entire table top or close-ups can be made of individual items as may be required.

Surveillance work is the meat of the 16. If concealment is your prime goal, consider the technique used by one detective in an agency in the West. For security reasons he must remain anonymous. His 16MG is loaded with a fast black-and-white film, Super-XX or Tri-X rated at ASA 320 or ASA 400. The aperture is stopped down to $f/16$ and the close-up lens moved into place providing him with a depth of field of about 2 feet to 20 feet, certainly enough to take close-up and medium distance shots. The camera is carried by a special clip on a wristwatch band on the left wrist of the operative. It can also be kept in the left, upper inside coat pocket. A strobe of matching proportions (there are several on the market) is carried in either the belt, via a clip, or in a pocket. The connecting PC cord runs down the sleeves of the investigator, from camera to strobe. In use, the operative brings his left hand, camera forward, to his forehead, exposing the camera from beneath his sleeve. The camera is fired with the right hand. As the right hand reaches for the shutter release, the sleeve of the right hand pulls at the jacket, moving the right half of the jacket away from the strobe. Of course, the 16MG is pointed by line of sight, and if too risky, the strobe is not used.

To aid the detective in steadying the camera under adverse lighting situations, a monopod of the collapsible type is carried in his pocket. This agency uses the 16MG for general surveillance work, corroboration of gambling, narcotics use, and as a closeup camera to record TV frames from monitors of closed circuit cameras. This will be described further on. When lab tests are made of voice patterns and displayed on an oscilloscope, the 16 faithfully takes that picture for later offering as evidence in court.

While I hope that the James Bond in you has not surfaced

from reading the above, because surveillance work is dangerous in every respect, the foregoing should show that the techniques of "spy" photography in real life are just as interesting as that imagined by Ian Fleming.

RECORDING TELEVISION PICTURES

Since television pictures can be interesting and most people do not presently own video recording equipment, the next best thing would be a photograph taken of your television screen. Depending upon the size of your screen, you may or may not require close-up lenses, stand, etc. If you find that to fill the frame of your 16 you must move in close, provide a means for repeatedly being able to measure accurately the distance. If the 80cm lens is used with the 16QT or 16MGs, use the 80cm measuring chain to step off the distance from screen to camera. Adjust the picture for normal contrast, but turn brightness up a bit more than usual. Make sure that all lights in the room are extinguished, because a stray lamp may reflect off the screen and spoil an otherwise perfect shot. Under no circumstances is flash to be used. The TV gives off its own light; you do not provide it. Since the light from a TV is moderate in brightness, choose a medium-speed black-and-white or color film. In black and white, Plus-X at ASA 200, or in color Ektachrome EF, ASA 160, would be my first choice. The shutter speed must be no faster than 1/30 sec. TV frames that comprise the moving picture by a beam that scans about 30 times a second. Therefore, shooting faster than 1/30 sec. may give you a shot with dark bands in it or a partial picture. Use the meter of the camera, moving in to take the reading. If your camera does not have a meter, try 1/30 sec. at $f/2.8$ or $f/4$ with the films indicated. Wait until the performers on the screen are holding still, because action on the set is difficult to record. If the resulting shot is not enlarged too greatly, you will not even notice the usual lines of the TV picture.

MOVIES AND THEATER

The same method used to record TV can be used for movies



Fig. 65. Frozen history. When President Nixon returned from his China trip, the television coverage gave your camera a ringside seat. Have your camera handy when your TV is on. Remember the landing of Apollo 11? Close-up lens was used to fill the frame. Speed must be 1/30 or slower. In this case, Plus-X, 1/30 at $f/3.5$.

Fig. 66. Many TV shows do not permit photos to be taken. The use of your tiny 16 takes you behind the scenes with ease. Since my seat was further away than I would have liked, I included a studio monitor to show Rod Serling being interviewed on the Dick Cavett show for ABC-TV. Available light is a must, of course. Super-XX, 1/30 at $f/2.8$.



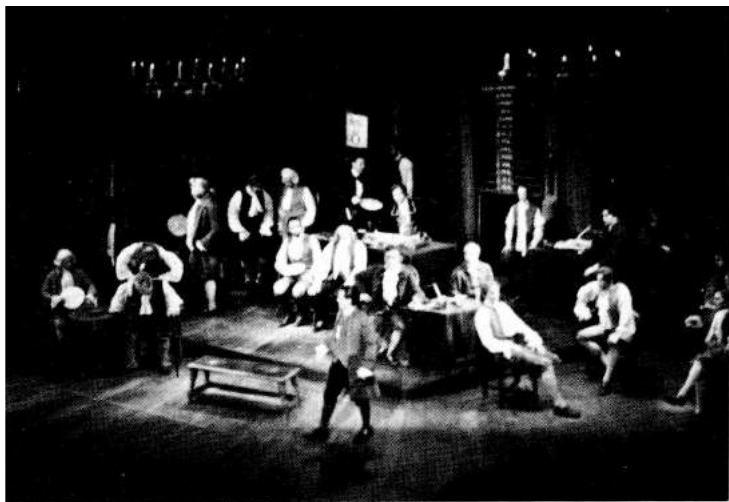


Fig. 67. Theaters prohibit pictures. Yet, your 16 can record action without flash due to the excellent lighting for most plays. Here, John Hancock addresses the Continental Congress in "1776." Plus-X, pushed to ASA 320. 1/60 at $f/2.8$.

Fig. 68. Bad news for Bond. Old 007 sits still for his portrait as I snapped this scene from "Diamonds Are Forever" directly from the movie screen. Tri-X was push processed to allow an exposure of 1/30 at $f/2.8$. No flash, of course. ASA 800 possible with many developers. Pick closeup shots for good detail. Avoid action sequences.



and legitimate theater. In these uses, it should be noted that a camera's presence may be frowned upon. In fact, don't get caught if you plan on shooting in the Broadway theater; there are signs posted everywhere warning that photography is strictly forbidden. However, equipped with your 16, Tri-X or Ektachrome EF, or High Speed Ektachrome, you can shoot to your heart's content without being discovered by anyone except possibly the person seated next to you. Again, leave your flash at home. Manually set the camera to $f/2.8$ at $1/30$ sec. If you were to use the meter of a 16MGs or 16QT, it would not respond properly due to the large area of black that it would see. Since you know that you are trying to capture the actors in the spotlight or the screen, set the camera manually or as if you were using flash. In the movies, sit a bit closer to the screen than you might otherwise to fill up the viewfinder. Remember that action sequences are out of the range of this shutter speed. If photographing a color movie, you may want to shoot at ASA 800. In this case, color film is ruled out and Tri-X must be "pushed" in either Acufine, FR X-44, or a similar developer.

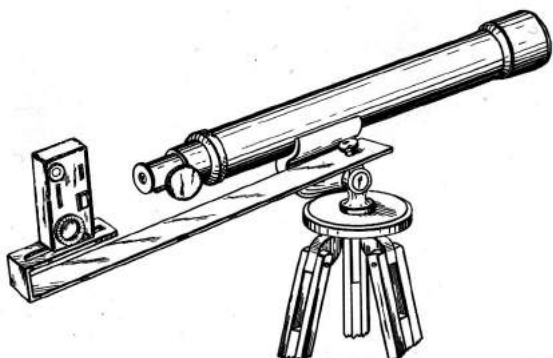
ASTRO AND TELEPHOTOGRAPHY

Although there are cameras better suited to shooting through binoculars, telescopes, and the like, the 16 can be used effectively with rewarding results for the amateur astronomer or the sports enthusiast. If your favorite pastime is moonwatching, connect your 16 to the eyepiece of your scope or binoculars. A clamp to attach your binoculars to your tripod can be obtained from Edmund Scientific Co., Barrington, N.J. The camera end of the bracket should have an adjustable slot and tripod screw so that the camera can be moved nearer and further away from the eyepiece of the scope. The proper distance can be figured out quickly. Aim the scope or binoculars on a bright, very distant object. At night, this can be the moon. During the day, do not look directly at the sun: Place the scope on a tripod, but *do not look through the scope*. Instead, point it in the general direction of the sun while holding a white piece of paper behind the eyepiece. When



Fig. 69. While not exactly a photo by Mt. Palomar, your 16 connected to a spotting scope or binocular can do justice to the moon. The full moon was caught by the combination of 16MGs and Bushell Spacemaster. The effective focal length was 460mm and the effective aperture became almost $f/8$. Shutter was at $1/30$ with Ektacolor.

you are pointed correctly you will see the brilliant light of the sun focused on the paper. Move the paper closer and further away from the eyepiece until the sharpest and smallest possible point of light is formed. The same holds true of the full moon. Mark this distance on a pad. It should be about $\frac{1}{4}$ or $\frac{1}{2}$ inch. Attach the bracket to the tripod and place the camera on the bracket so the distance from the eyepiece to the shutter blades visible in the lens is the same as the distance previously noted. This distance should be maintained throughout shooting with the scope or binoculars. The exposure that would normally be used is modified according to several calculations that must be made. When a camera lens is placed adjacent to a telescope eyepiece, the f /stop of the camera is no longer used. Instead, the camera lens is left at maximum aperture and a mathematical f /stop is determined. Multiply the focal length of the lens by the magnifi-



cation of the binoculars or scope. Then, divide that result by the diameter of the objective lens of the scope. Keep all units the same. If the scope's objective (or mirror) is measured in inches, convert it first to millimeters for convenience.

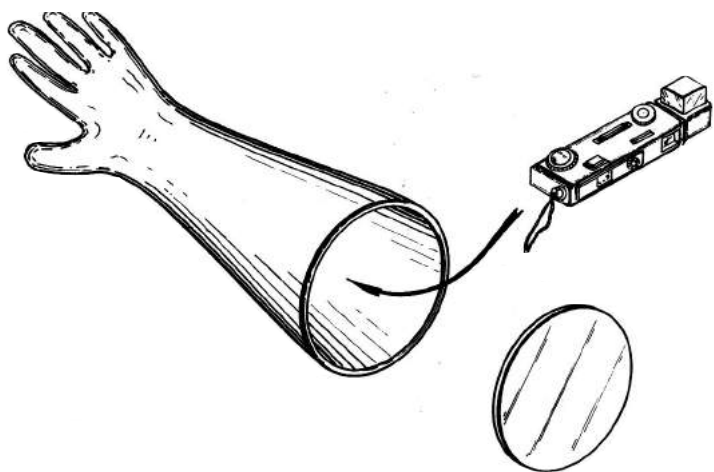
For example, let's say you are using the 16MGs and a pair of 7×35 binoculars. The 16MGs has a 23mm $f/2.8$ lens. Multiplying 23 times 7 (the power of the binoculars) gives 161. Then dividing 161 by 35, the diameter of the objective lens of the binoculars, we get 4.6. Therefore, even though the camera has a 23mm $f/2.8$ lens, we will be shooting with a combination giving us 161mm $f/4.6$. This would be the same as using a 350mm telephoto lens on a 35mm camera. Remember, if you use a 16MGs, set it on flash (manual operation) so that the f /stop will remain at $f/2.8$. If anything but the maximum aperture is used, vignetting will result: Your shots will be circular, showing only the central part of the original scene.

UNDERWATER PHOTOGRAPHY

Because size is directly proportional to costs of underwater housings, the smaller the camera, the greater its potential for marine photography. When you consider the 16, you are discussing the ultimate in a small package. In fact, due only to its size, you can construct an underwater housing for a few dollars

that will serve very well for depths of up to 10 or 15 feet. This housing consists of nothing more than a surgical rubber glove and a clear acrylic disc. Your 16, with a cube flash or strobe attached, is placed into the rubber glove, oriented with the lens toward the cuff of the glove. Into the opening normally occupied by your wrist, place the disc of plastic (Plexiglas is preferred). The diameter of the disc will be in the neighborhood of four or five inches, depending on the size of the glove. The thickness of the disc should be $\frac{1}{4}$ inch. After the glove is stretched over the disc, secure it with wire or an adjustable hose clamp of the same diameter. Of course, the entire apparatus should have a dry run without the camera to determine that it will indeed stay dry when the camera is in the glove. Sighting is by pointing.

The rubber glove will allow you to manipulate the shutter advance and the shutter release. The aperture is preset for a general distance of ten feet. If a cube gun is used, the cube can be rotated manually through the glove. If you use a strobe, leave the switch in the "on" position for the duration of shooting.



Finally, make sure that you allow one or even more stops extra exposure to compensate for the possible reduced transmission of light through the water. Select a fast film so that you will be able to use a smaller aperture with the chosen flash and thus pick up a greater depth of field for your background.

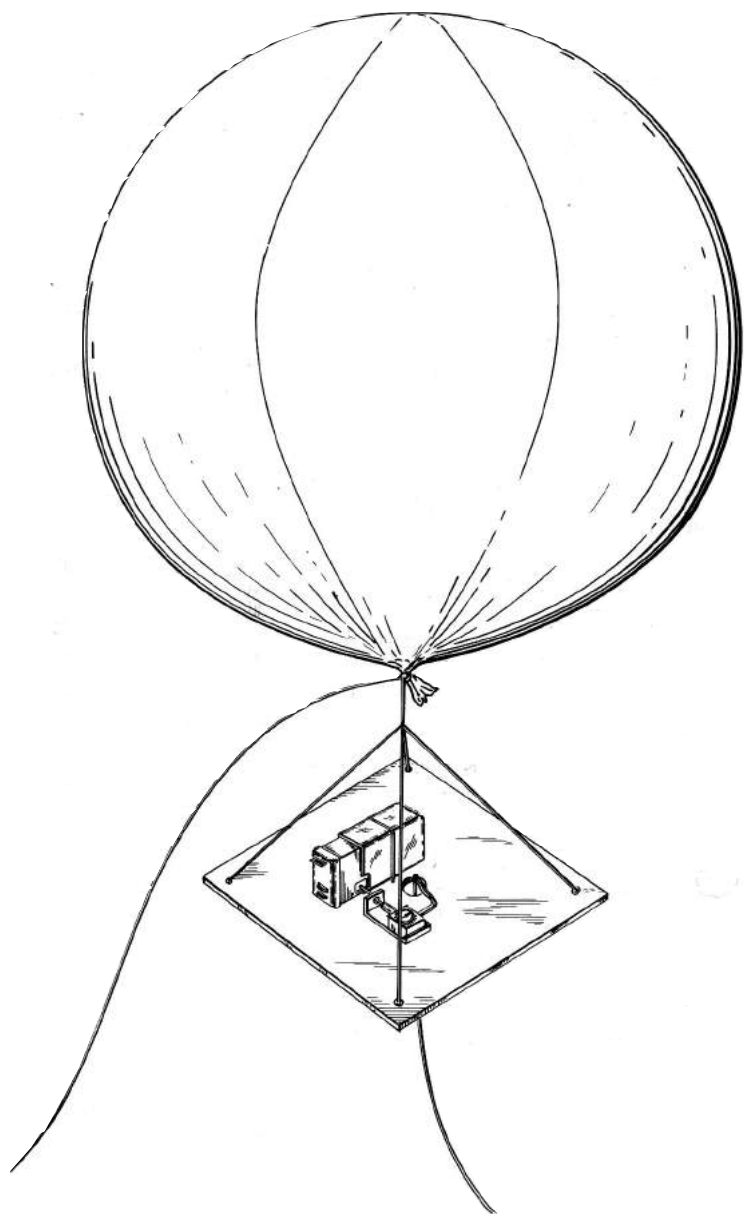
AERIAL PHOTOGRAPHY

The following description is based on a project that was undertaken by a high-school student. It can be rewarding. However, if not followed carefully, it can be disastrous for your camera, so plan slowly and proceed cautiously.

The best Minolta 16 to use in this application is the 16 original or the 16II, because of the total absence of a light meter and the camera's inherent ruggedness. The camera will be sent many feet into the air and the possibility exists that it will take a fall onto the ground. For this reason, care in constructing the platform it rests upon should be uppermost in your mind.

Obtain a piece of balsa wood about six inches square and 1/4-inch thick. You will need a right-angle bracket, which can be made or bought. In addition, a small self-timer, of the variety that screws into the cable-release socket of a camera, should be acquired. Finally, buy several high-quality balloons, a small package of number 16 copper wire, a hank of kite twine, and several cans of helium. The helium, once difficult to purchase commercially, is now available through Edmund Scientific, Barrington, N.J.

Tentatively mount the camera, lens down and in the open position, the right-angle bracket, and the self-timer on the balsa wood sheet. Make a small hole in each corner of the balsa wood and pass a nine-inch piece of twine through each hole, securing the twine to the wood with a knot underneath and a drop of white wood glue to seal the knot. Join the other ends of all four pieces of twine above the platform. Holding the junction of the four pieces of twine, move the camera, bracket, and timer until a perfectly balanced layout is achieved. This will depend upon the size of the timer and weight of the bracket used. Then, once laid



out, mount the camera with the wire, wrapping it over the camera and passing it through the board and securing it on the bottom of the platform. Prior to making the wire tight, locate the lens aperture and cut out a suitable hole in the board so that the camera can shoot through the wood. Try to position the wire over the case part of the 16II so that you can freely cock the shutter and advance the film. Drill a hole in the bracket to contain the screw-in shaft of the self-timer, and mount the bracket next to the shutter release. Adjust the timer and/or bracket so that when the timer plunger extends, it will depress the shutter-release button of the 16.

Fill the balloons with helium only a short time before lift off, because due to the density of the helium, the gas will tend to pass slowly through the rubber of the balloon by a process called *osmosis*.

When you have filled the balloons, tie them together and connect a single piece of twine to their junction, connecting that string in turn to the junction of the twine connected to the platform. Then, with one master string attached to the junction of balloons and platform and another tied or glued to the self-timer release switch, preset the shutter speed and aperture of the camera, cock the shutter, and wind the self-timer. Allow the assembly to rise until the height you've decided upon is reached. A tug on the self-timer cord will start the timer going. Ten to 15 seconds later the timer will push the shutter-release and the aerial shot will be made. Try to use the fastest shutter speed permissible for the prevailing light. An orange or deep yellow filter with black-and-white film will increase contrast and give you a better clarity. After twenty seconds or so, lower the balloons and recock the camera and self-timer for your next shot.

ABOUT THE BOOK

Many inexperienced photographers dismiss "subminiature" cameras as toys or spy devices. But, as any Minolta owner knows, this is not so! This Minolta-16 Guide shows with a clear text and numerous photographs how far this misconception is from the truth.

The versatility of all Minolta models leads to such uses in serious professional work as microfilming, and to unobtrusive snapping of candid shots for many purposes. Simply and directly, author Ted Rosenberg explains the Minolta's specific operations and how to achieve a wide variety of photographic effects by both available light and flash. By following the author's suggestions, you can make photos that can hardly be distinguished from those taken by much larger cameras.

The book also covers techniques for developing, printing, and projecting, and for other photographic applications. It includes data on Minolta camera models 16Ps, 16EE, 16II, 16MGs and 16QT, as well as older models 16, 16P, 16EEII (16CdS) and 16MG.

ABOUT THE AUTHOR

Ted Rosenberg has been using a camera since he was 12. A past president of the New York University Photo Society, he is now Customer Relations Manager for the Minolta Corporation. He has designed and built several panoramic cameras and collects antique photographic equipment. Mr. Rosenberg lives with his wife and baby son in Forest Hills, N.Y.

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