

The Cadet

**An Introduction
to 4x5 Photography**



by Roger W. Hicks



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LOADING FILM HOLDERS

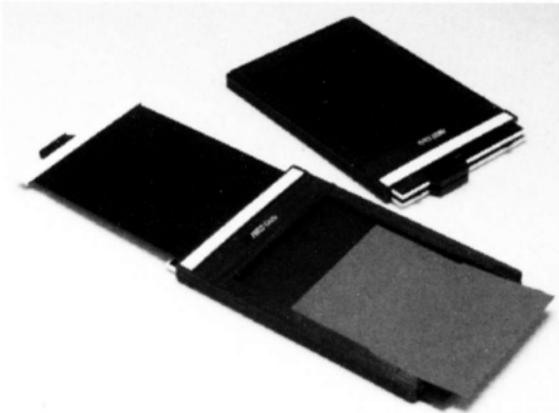
Film choice in 4x5 inch is enormous, from general-application monochrome and colour films (transparency or negative) to all kinds of specialist films for copying, high-contrast work, and even direct reversal (Agfa Scala).

Cut film is exposed in standardized double cut film holders (DCFHs); the most usual brands are Lisco and Fidelity. The DCFH has a removable dark-slide or film sheath, and a hinged door at the bottom of the holder. The top of the dark-slide is white on one side (to denote unexposed film) and black on the other (exposed). On many types (including the Fidelity illustrated) one side is also textured so that you can tell the sides apart by touch.

Practice loading DCFHs in daylight, with a sheet of scrap film, until you can do it with your eyes closed. Loading 'for real' is easiest in a darkroom, on an uncluttered work-bench, but you can load film in a changing bag. All film is notched, and when the notches are along the upper right hand edge of the film, the emulsion side is towards you.

Make sure the dark-slide has the white side out. Withdraw it until the film aperture is clear (you can feel this with your fingers). Push down the door at the bottom of the DCFH and slide the film in. Flip the door back, and close the dark-slide.

As well as cut film, the Cadet can be used with Polaroid backs (inside back cover) and roll film backs (page 8).



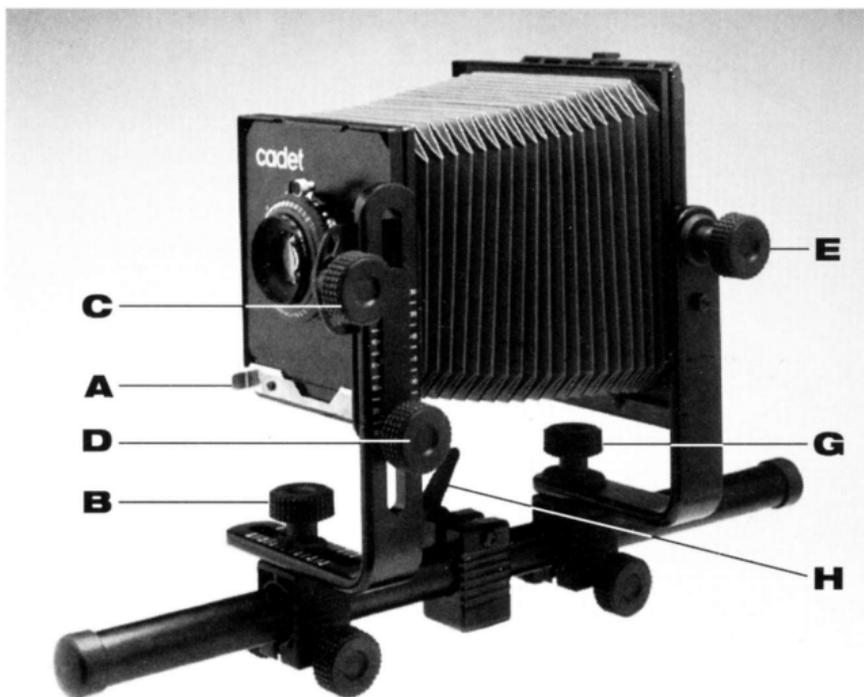
The film must slip under the rails on either side of the DCFH. Hold the 'door' down to avoid scratching and ease loading. Note the white top to the dark-slide, indicating unexposed film: compare it with the one in the other holder, which is black side out.

THE CADET 4x5 INCH CAMERA

Standard Cadet

- A** Sliding bar to lock lens panel for lens changing.
- B** Combined locking knob for front swing and cross.
- C** Front tilt lock.
- D** Front rise lock.
- E** Rear tilt lock.
- G** Locking knob for rear swing.
- H** Rail clamp.

The standard Cadet has a 450mm bellows. The bellows extension at infinity is normally equal to the focal length of the lens – in this case, 150mm. Interchangeable lens panels are available for common shutter sizes (#0, #1, #3) or undrilled for custom fitting.



Wide Angle Cadet

F Sliding bar to lock reversing back.

Allows selection of 'landscape' (horizontal) and 'portrait' (vertical) formats without turning the camera on its side.

J Rear focusing knob and lock.

K Front focusing knob and lock.

The wide angle Cadet (here seen at its full extension of 200mm) has a shorter rail and a bag bellows, allowing movements with lenses as short as 47mm. The tripod boss is behind the two standards, in order to allow them to be pressed together as closely as possible. This camera is fitted with the optional Fresnel screen (for added brightness) and optional Graflok sliding bars. A double cut film holder is partially inserted in the camera back.



AN INTRODUCTION TO 4x5

Monorail cameras are so versatile that it is quicker and easier to list what they cannot do, rather than what they can do. They are not much use for sports and action, for example. It is however no coincidence that in many of the most demanding areas of photography – advertising, architecture, still life, food, interiors, landscape, and fine art, to name a few – the large format (LF) camera reigns supreme. In many other areas, from portraiture to special effects, LF gives results which cannot be equalled with smaller formats.

LF is intimidating at first: there is no doubt about that. But really, it is not difficult. Loading (see opposite) and processing (page 8) are simple mechanical processes; focusing is scarcely demanding; a few minutes practice will soon show you what the shift movements do (page 4); and even the forbidding-sounding Scheimpflug Rule is easily explained with an example and a diagram (pages 2 and 3). The extra control which is afforded by camera movements is at least as important a reason for using LF as the extra image quality.

Perhaps the most difficult thing for the newcomer to LF to appreciate is that half a dozen exposures can be a good day's work. The 35mm camera has famously been likened to the codfish, which lays a million eggs in order that one or two may survive. The 4x5 camera is more like the elephant: gestation is prolonged, but the big calf is tenderly looked after and valued in its own right from the moment it is born.

Basic outfit of camera, lens, cable release, film holders, film, focusing cloth and focusing lupe. The only other essentials, at least to begin with, are a meter and a middleweight or heavier tripod and head: a Gitzo or Manfrotto, for example.



SETTING UP THE CAMERA

Tighten the tripod boss well on the tripod head to avoid any risk of movement. When the rail clamp is slackened off, the rail can rotate slightly about its own axis for precise levelling.

Focusing

Open the shutter for focusing (see inside back cover). You can focus using either front or rear standards, or both. For extreme close-ups, back focusing may be essential. If you try to focus with the front standard, you are changing the lens/subject distance and the lens/film distance simultaneously, and focusing may be impossible. A Fresnel screen (a user-fitted option) makes the screen brighter all the way to the corners.

Shift Movements

The 'shift' movements on the front standard are rise/fall (vertical shift) and cross (horizontal shift). As you shift the lens, the whole image moves upwards, downwards or sideways on the ground glass, allowing considerable control of framing, apparent viewpoint and perspective. Obviously, the lens must have a big enough circle of coverage to allow the desired shifts.

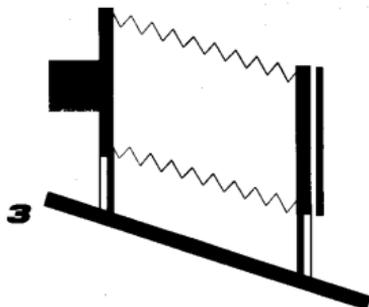
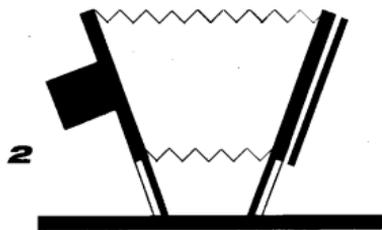
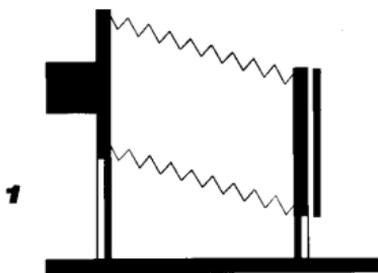
Manufacturers publish tables of coverage for all their lenses, but these are usually conservative. The best way to see if a lens is suitable for a particular application is to test it, with and without movements. Picture A was taken using a 105mm lens designed for 6x9cm format; note the cut-off. For a quick, cheap, easy test, load a DCFH with regular photographic printing paper and rate it at about EI 3.



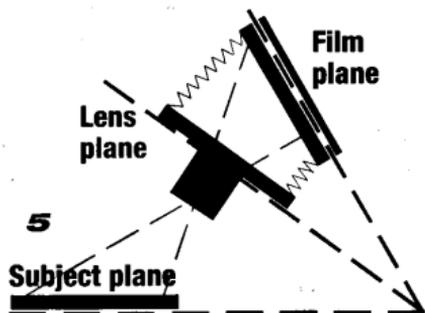
Swings and Tilts

Swings (movements about the vertical axis) and tilts (movements about the horizontal axis) are provided at both front and rear. They are used both to hold receding planes in focus (the Scheimpflug Rule) and for 'indirect' shift movements. Swinging or tilting the front standard does not affect image shape, but swinging or tilting the rear standard does. See pages 4 and 5 for an example of this.

- 1 *Front rise*
- 2 *Front and back tilt (in opposite directions).*
- 3 *Front and back tilt together, to create 'indirect' rise*
- 4 *Front and back swing (in opposite directions).*
- 5 *The Scheimpflug Rule states that if the subject plane, lens panel plane and image plane all meet at a single line, everything will be in focus without stopping down.*



The picture B (left) was taken at full aperture with a 150mm lens, without any movements. Picture C (lower left) was again taken at full aperture, from the same camera position, but with the front tilted in conformity with the Scheimpflug Rule.



MOVEMENTS AND IMAGE SHAPE



90mm lens without any front rise.



90mm lens with front rise. Note the improvement in composition and that all uprights are parallel.

The camera, with a 90mm lens, was set more or less level with the model car; no movements were used. The car looks slab-sided and dull. The artwork on the hood is barely visible, and though it will not show in small-scale reproduction, the rear end is slightly out of focus even at f/22.



The camera has been raised, and drop front has been introduced to create a pleasing perspective with a 'side/top' view. Front swing and tilt have been introduced to ensure front-to-back sharpness. The car still looks natural, and the hood is now much more visible.





Everything in this shot is identical to the previous picture, except that back swing and tilt have been used instead of front. The image shape is grotesquely distorted.



Once again, the camera position is identical and the subject has not been moved, but using front tilt together with back swing makes the car look longer, lower, wider and more aggressive. Exactly the same techniques can be applied to a real car...

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The same 90mm lens was used for this as for the other shots of the police car. At full extension, the subject is close to 5x life size on the film and you have to give about 5 stops extra exposure. The car itself is about 50mm (2 inches) long.

MAKING AN EXPOSURE

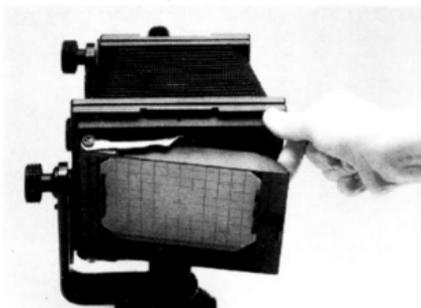
Working methodically is the secret of avoiding mistakes such as double exposures, blank exposures, wrong exposures and fogged film: there are no interlocks. Work methodically, though, and after a few mistakes (everyone makes them) it will soon become second nature to operate the camera. Each photographer has a particular preference, but a typical drill is as follows.

- 1 Set the camera up on the tripod.** Lock all movements at zero (no shifts, swings or tilts).
- 2 Open the shutter,** and open the diaphragm to maximum aperture.
- 3 Compose and focus roughly,** without using the lupe. You may find that you need to move closer or further away – or to change lenses.
- 4 Compose accurately** using shift movements if necessary, either to preserve parallels without convergence or to shift apparent viewpoint.
- 5 Focus accurately.** Use the lupe to make sure that everything is in focus. As well as focusing controls, use swings and tilts as necessary.
- 6 Lock all the controls,** including focusing, shift, swing and tilt. Failure to do so can mean that your carefully-composed shot is knocked out of alignment as you insert the film holder.
- 7 Close the shutter** and re-cock it if necessary.
- 8 Take an exposure reading** and set appropriate speed and aperture.
- 9 Insert film holder.** Check that the top of the dark-slide is white side out (unexposed film).
- 10 Pull dark-slide.** In bright light, shade the mouth of the film holder if necessary, or cover it with the focusing cloth.
- 11 Fire the shutter.**
- 12 Reverse and replace dark-slide** so that it is dark side out, indicating that the film has been exposed. Some photographers partially re-insert the dark-slide before they fire the shutter.
- 13 Remove film holder.**
- 14 Zero all movements.**

CHECK LIST

In practice, the sequence on these pages can be reduced to a much shorter seven-step check list to avoid double exposures, blank exposures, etc. If you follow these seven steps, everything else comes naturally. (This list is repeated on the back cover.)

- 1 *Open shutter and diaphragm.*
- 2 *Focus and compose.*
- 3 *Close and set shutter and diaphragm.*
- 4 *Insert film holder.*
- 5 *Pull dark-slide.*
- 6 *Expose.*
- 7 *Replace dark-slide, dark side out.*



Above: Cadet camera showing extensive movements – you are far more likely to run out of lens coverage before you run out of movements with a monorail camera.

Pull the ground-glass back with your finger to make it easier to insert or remove the film-holder. As you push the DCFH in, release the back at around the half-way point and push it in the rest of the way, steadying the camera back with your other hand. As you remove the holder, angle it backwards to disengage it from the locking groove/light trap.

PROCESSING

The traditional way to process monochrome cut film is individually in open dishes or trays, like paper, but in complete darkness. Any film developer, short-stop and fixer may be used. Experienced users can process several films at once, but for the novice, there are considerable risks of scratching and finger marks.

Daylight developing tanks of various patterns are available for batch processing, but they must be loaded in total darkness. Another possibility is a Nova deep tank intended for paper processing.

Colour processing is normally undertaken commercially in professional labs (look in the Yellow Pages) though you can also get small hand lines consisting of a row of small tanks. The film is loaded into a rack and transferred from one bath to the next, again in the dark.

Send film to the lab in used film boxes marked with your name and address and clearly labelled **“EXPOSED FILM – OPEN ONLY IN DARKROOM – PLEASE RETURN BOX”**. To each box, tape a note saying how many sheets are in there, what sort of film it is, and any special instructions. Examples might include **“TWO SHEETS E-6 PUSH ONE”** or **“FOUR SHEETS XP-2 PROCESS C-41”**.

ROLL FILM

Any Cadet can be used with slip-in roll film backs such as the Cambo (6x7cm, 6x9cm or 6x12cm). With the addition of the user-fitted Graflok sliding bar kit, it can also be used with other patterns of roll-film back which require the ground glass to be removed.



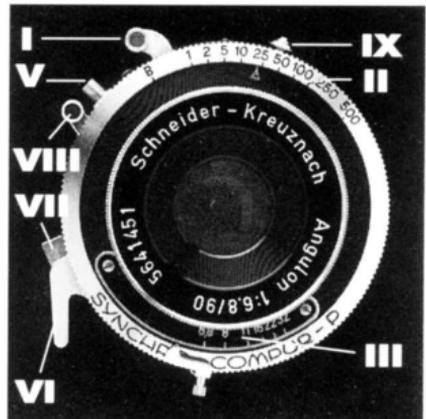
Cambo and similar roll-film backs are inserted in the same way as film holders and Polaroid 545i backs. This camera does not have the optional Graflok bars fitted.

LENSES AND SHUTTERS

- I** Shutter cocking lever.
- II** Shutter speed setting dial.
- III** Aperture setting lever and scale.
- IV** Shutter opening lever (may also open diaphragm; may work only with shutter cocked.)
- V** Flash synchronization nipple.
- VI** Shutter release.
- VII** Cable release socket.
- VIII** Flash synch selector (older lenses only) (M = bulb, X = electronic flash, V = self-timer.)
- IX** Interrupter (older lenses only) (Hold the interrupter and release the shutter; the shutter will stay open. To re-close the shutter, pull the cocking lever back slightly.)
- X** Selector for I/B/T (M/B/Z) Select I or M and cock shutter for timed speeds. Select B for brief exposures; do not cock shutter (Shutter remains open while release is depressed). Select T or Z for long exposures; do not cock shutter (Open on first pressure, close on second). With Compound shutters, allow 5-10 seconds after cocking for air pressure to equalize.



Copal Shutter



Synchro-Compur-P Shutter



Compound Shutter

Equivalent Focal Lengths for 35mm

As with any format, individual photographers prefer different focal lengths, and the following are common focal lengths with (in brackets) their approximate equivalents for 35mm:

Wide-Angle	'Standard'	Long-Focus
47mm (14mm)	120mm (35mm)	240mm (70mm)
58mm (17mm)	127mm (37mm)	270mm (80mm)
65mm (19mm)	135mm (39mm)	300mm (90mm)
72mm (20mm)	150mm (45mm)	360mm (105mm)
75mm (21mm)	180mm (50mm)	480mm (135mm)
90mm (26mm)	210mm (60mm)	600mm (180mm)

The standard Cadet (450mm bellows) can be used with lenses from 65mm to 360mm and the wide-angle Cadet (200mm bag bellows) can be used with lenses from 47mm to 180mm. Both can be used with longer lenses of telephoto construction.

With a 150mm lens, the standard Cadet will focus to twice life size. For greater magnifications, use shorter focal lengths.

BELLOWS EXTENTION FACTORS

For most general outdoor photography the lens-to-film distance is approximately equal to the focal length of the lens. However, for close-up work the lens-to-film distance increases and so the metered exposure has to be increased.

The effective f /number is equal to the total extension or lens-to-film distance (V) multiplied by the indicated aperture (f), divided by the focal length of the lens (F)...

$$\frac{V \times f}{F}$$

But as a simple rule-of-thumb the following can be applied.

For a $\frac{2}{3}$ rds life-size image increase the exposure 1 stop.

For a life-size image increase the exposure 2 stops.

For a $1\frac{1}{2}$ times life-size image increase the exposure 3 stops.

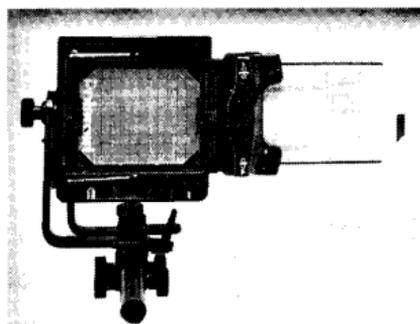
For a twice life-size image increase the exposure 2 stops.

POLAROID MATERIALS

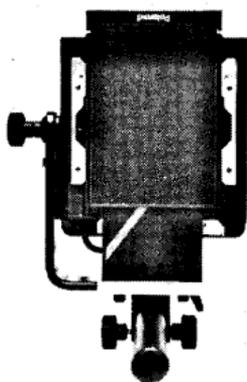
Polaroid materials are invaluable for checking exposure, lighting and composition, and for origination: all pictures in this booklet were shot on Polaroid film. Polaroids can also be a uniquely rapid and convenient learning tool. You can learn a great deal, very quickly, by experimenting with sequences of pictures like those on pages 4 and 5.

The 545i back is the most versatile and the easiest to use, but its single sheet film is the most expensive. The 405 is the cheapest to buy and to run, but the image is significantly smaller than 4x5 inches; some photographers mark the ground glass to show the reduced area. The 550 takes 4x5 inch pack film. All use peel-apart film.

Type 55 P/N sheet film (for the 545i) and Type 665 P/N pack film (for the 405) yield a positive and a sharp, high-quality monochrome negative which may be recovered by clearing in a sodium sulphite solution, or just washed off even in a bucket of water, to check critical sharpness. All processing can be carried out in daylight; many photographers use no other black and white film.



The 545i back accepts single sheets of film and slips under the ground glass like a DCFH. The outer envelope, here pulled ready for exposure, protects the film until it is loaded and while it is being processed. Exposed but unprocessed film may be removed for later processing. This camera does not have the optional Graflok bars.



The 405 back accepts 8-sheet and 10-sheet film packs. It will just about fit under the ground glass but it is easier to use the optional Graflok slides. The picture area is approximately 72x95 mm, just under 3x4 inches, and each picture must of course be pulled out and processed before the next shot can be taken.

CHECK LIST

ESSENTIAL EQUIPMENT

- **Camera**
- **Lens(es)**
- **Cable release**
- **Loaded film holders**
- **Dark cloth**
- **Focusing magnifier (lupe)**
- **Tripod**
- **Exposure meter**

OPTIONAL EQUIPMENT

- **Filters (and filter holders)**
- **Spirit level**
- **Polaroid back**
- **Polaroid film and timer**
- **Roll film backs and film**
- **Additional film**
- **Changing bag**
- **Empty boxes (for exposed film)**

SHOOTING SEQUENCE

- 1 Open shutter and diaphragm**
- 2 Focus and compose**
- 3 Close and set shutter and diaphragm**
- 4 Insert film holder**
- 5 Pull dark-slide**
- 6 Expose**
- 7 Replace dark-slide, dark side out**