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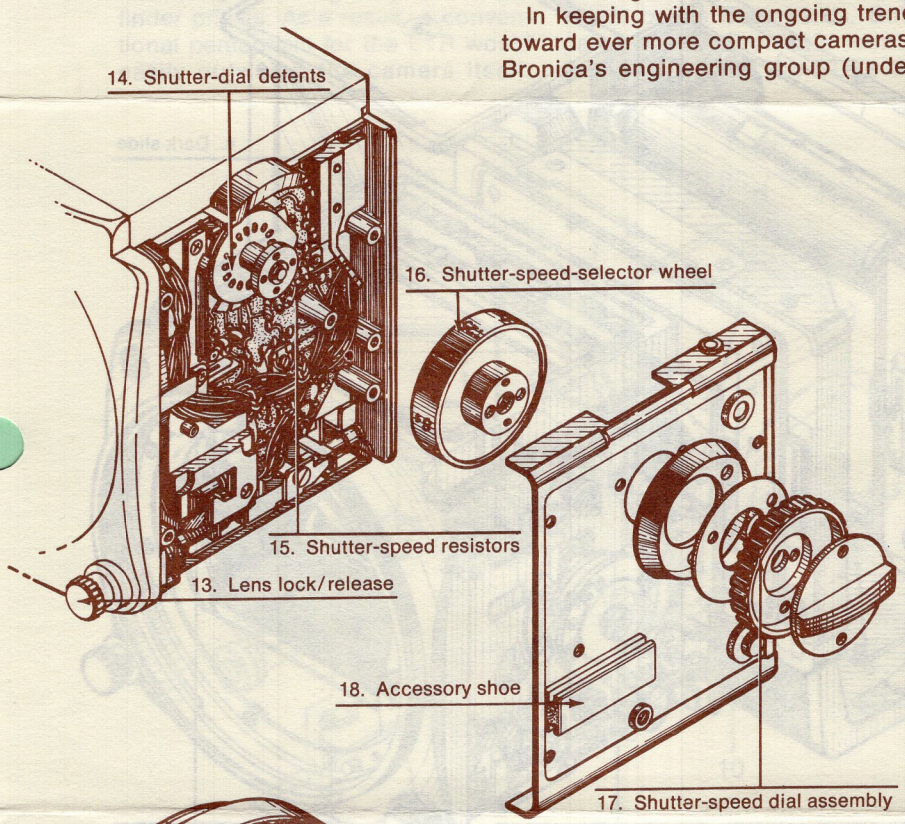
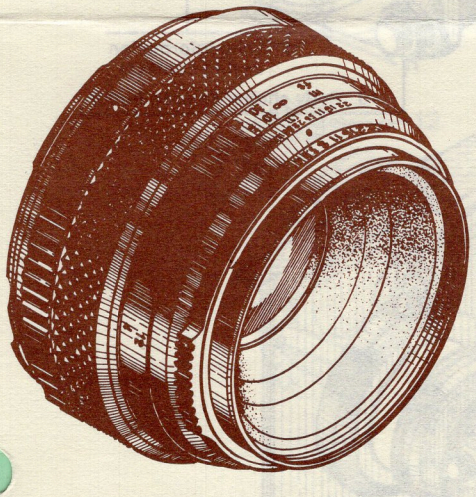
Bronica ETRS

In designing the ETR, Bronica not only brought the medium-format leaf-shutter SLR up to date with electronics, it also created one of the few roll-film cameras that handles like a 35.

Note: The new ETR S introduces minor but important changes. The electrical contacts throughout are now gold-plated for improved performance, important in a camera as electronically sophisticated as this one. With the AE-II finder, pressure on the shutter release will now illuminate the shutter speed indicating LED's directly without having to hunt for the meter prism mounted switch. Minor improvements have been made in the strap lugs and in the camera on/off switch concentric with the shutter release. All these changes, however, do not alter our Inside Your Camera diagrams and their utility.

In keeping with the ongoing trend toward ever more compact cameras, Bronica's engineering group (under the direction of G. Ando) has produced a remarkably small, lightweight, medium-format SLR—the Bronica ETR. Like the previously released Mamiya M645, it's a 120 roll-film camera designed around the 4.5 x 6 cm (1⅝ x 2¼ in.) format, instead of the more familiar 6 x 6 cm (2¼-in. square) film frame size. However, as you'll see, its design concept, centering around leaf-shutter lenses and interchangeable film magazines, is more akin to the Hasselblad 500 C/M.





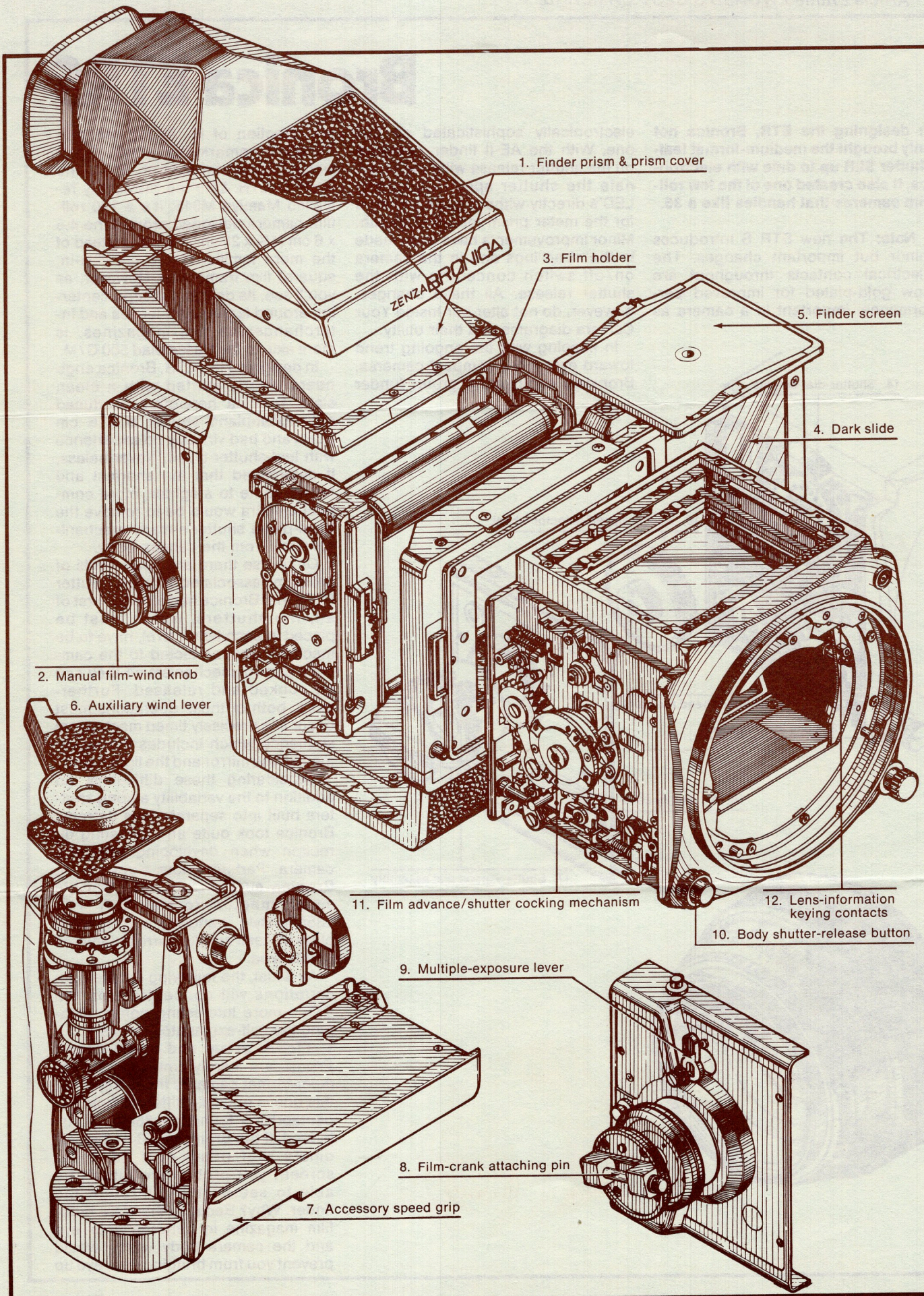
In designing the ETR, Bronica engineers clearly started with a clean slate. Bronica heretofore produced only focal-plane shutter 6 x 6 cm SLRs and had virtually no experience with leaf-shutter types. Nevertheless, it determined that the shortest and fastest route to a lighter, more compact camera would be to remove the focal-plane shutter's many mechanical parts from the camera body.

Of course there are other kinds of problems associated with leaf-shutter SLRs that Bronica had to face. First of all, the shutters, which must be placed in each lens barrel, have to be mechanically connected to the camera's control mechanism so they can be cocked and released. Furthermore, both of these operations must occur in a precisely timed mechanical sequence which includes the movement of the mirror and the light baffle.

Considering these difficulties (in addition to the variability among shutters built into separate lens barrels), Bronica took quite an interesting direction when developing this new camera. Perhaps more significantly, Bronica successfully endowed its small, medium-format SLR with "35mm-style" handling, placing it in a class by itself among current cameras of this type.

As usual, the following detailed descriptions will concentrate on the ETR's more interesting points, skipping the self-explanatory areas.

1. Finder prism and prism cover: Prisms are hardly unusual on medium-format cameras these days, but this one is optically different from the pentaprisms found on 35mm SLRs. Indeed, if the Bronica ETR had an ordinary roof prism over its finder screen, you probably wouldn't be able to see anything through the finder. Why? Because there's a bulky film magazine in between your eye and the camera body which would prevent you from bringing your eye up


1. Finder prism & prism cover
3. Film holder
5. Finder screen
4. Dark slide
2. Manual film-wind knob
6. Auxiliary wind lever
11. Film advance/shutter cocking mechanism
12. Lens-information keying contacts
10. Body shutter-release button
9. Multiple-exposure lever
8. Film-crank attaching pin
7. Accessory speed grip
ZENZABRONICA

to the eyepiece. As you can see in the main drawing, the ETR's extended roof prism is located quite far to the rear of the finder optics. The large, flat prism in front of it actually functions as a large mirror. This mirror prism relays the image from the finder screen to the roof prism which, in turn, erects and laterally reverses the image, presenting it in the proper orientation.

Also, you have to realize that a medium-format camera has inherent weight problems to begin with. Mathematically, as the film width doubles, the picture space quadruples, and the mass and weight of the camera increases as much as eight times. This calculation doesn't even include the necessity of using larger, heavier finder prisms. As a result, a conventional pentaprism for the ETR would easily outweigh the camera itself. Now that you see how difficult it is to design a small SLR around a medium-sized film format, you can appreciate Bronica's ingenuity.

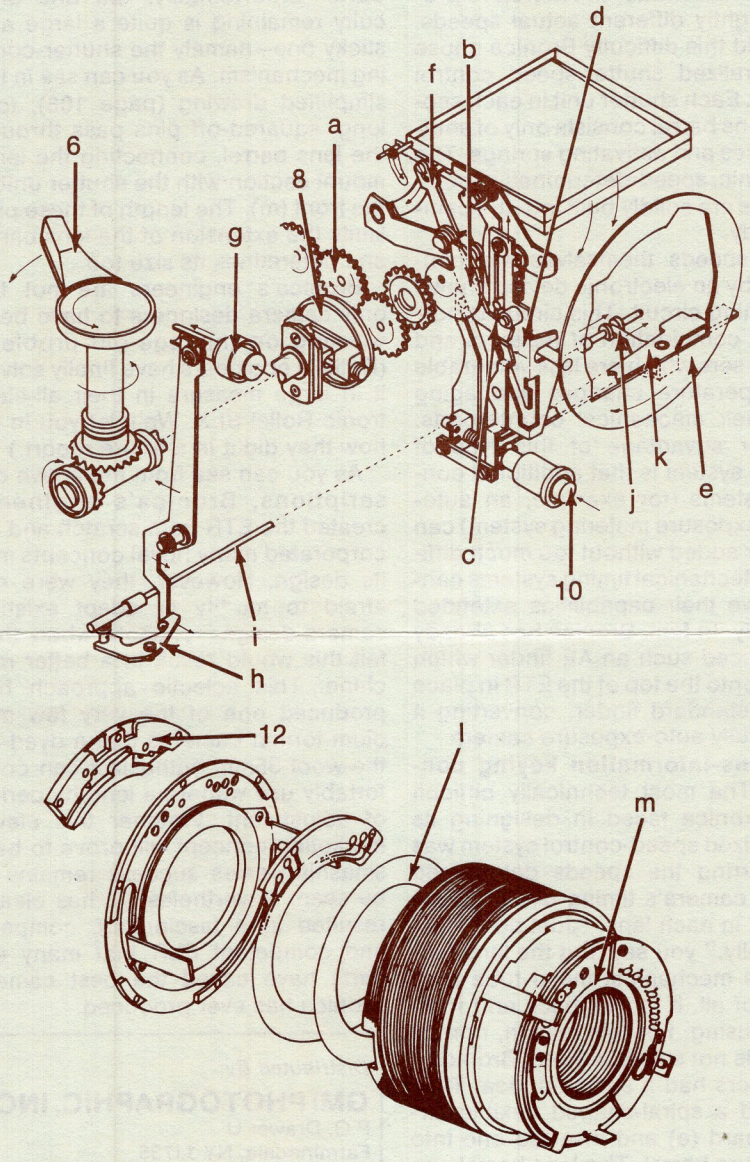
3. Film holder: In producing their leaf-shutter single-lens reflex, Bronica followed basically the same path taken by Hasselblad in 1957. If you compare our "Inside Your Camera" drawing of the Hasselblad 500 C/M (June 1976, page 100) you'll find that there are many similar mechanical assemblies common to both cameras. The film magazine is just one such mechanism. It's remarkably similar to the one found on the Hasselblad 500 series. However, while the Hasselblad magazine has a slide-in film holder, the Bronica ETR's has a hinged back which opens downwards. But compared with the Bronica's counterpart, the Mamiya M645, the ETR's film system is quite different. In fact, the Mamiya doesn't have a true interchangeable film magazine.

11. Film advance/shutter-cocking mechanism. This is also quite similar to the Hasselblad's in basic concept. However, the design of the ETR's mechanism is simpler and more modular. Since this camera uses Japanese Seiko leaf shutters, the shutter-cocking mechanism must be considerably different from the Hasselblad's. Instead of turning a key way at the end of a small shaft to cock the shutter, a large ring placed concentrically around the lens mount turns to cock the shutter (see simplified drawing on this page). Let's examine the simplified drawing a bit to see precisely how these operations take place.

As you turn the film-advance crank, the wheel behind crank (8) (actually the pin attached to this wheel which connects or disconnects the film-wind crank or accessory-speed grip with the camera's wind mechanism) turns gear train (a), which advances the film by transferring its movement to the film-holder mechanism. At the same time, a spiral cam (b) turns clockwise, pushing upwards on the pin above it and pivoting lever (f) to the left. This movement causes the light baffle and mirror to come down into viewing and focusing position. Also, this cam movement causes the righthand end of lever (c) to lift sliding bar (d). This cocks the shutter by turning shutter-cocking ring (e) clockwise via a pin.

The Bronica ETR's film-advance and mirror-cocking mechanisms are quite similar to the Hasselblad 500 C/M's. But due to the difference between the Compur and Seiko shutters, the shutter-cocking mechanisms are dramatically different. The Hasselblad uses a sophisticated gear train, while the ETR uses the sliding bar and large ring combination we've described. Furthermore, Bronica's engineers separated the film-advance mechanism from the mirror and shutter-cocking mechanism. The ETR's film-advance mechanism is built onto a plate which is subsequently affixed inside the diecast body, while the mirror and shutter-cocking mechanism are built directly into the camera body. The Hasselblad has separate springs for the mirror mechanism and shutter-cocking escapement, while the ETR has one powerful spring behind the shutter-cocking sliding bar (the top part of it is visible in the simplified drawing on this page) to accomplish both these functions.

6. Auxiliary wind lever: This is truly a revolutionary idea because it brings medium-format camera handling up to the level of 35mm SLRs. The ETR's basic identity can be described as a



Bronica ETR: Film-wind and mirror-cocking mechanisms (above), shutter-cocking and electronic-information-transfer systems (below). See text.

modified Hasselblad-type, medium-format camera, but when the accessory grip is attached, it is transformed into a different camera entirely. The grip is surmounted by a double-action wind lever. Wind the lever two short strokes and the film is advanced and the shutter's cocked. Here's how it works. Below the lever, in the grip's midsection, is a set of bevel gears which transfer the wind lever's motion 90° to a wheel on the side of the grip facing the camera. This wheel terminates in a pincer-like channel, or slot, which grips onto the camera's film-crank attaching pin once the crank has been removed. This optional film-advancing grip is definitely more convenient than the crank normally found on medium-format SLRs. When you consider that the grip it's attached to also helps you aim and steady the camera, it's easy to understand why relatively few ETR's are sold without this novel accessory.

And that's not all. Bronica's Speed Grip incorporates its own angled shutter-release button that falls nicely under your right index finger. As you press the shutter button on the speed grip (see the simplified drawing on page 104), a long lever pushed crescent-shaped lever (h) clockwise. This lever transfers the mechanism's direction of motion 90°, pushing the thin rod (i) inward through the base of the grip. Most interestingly, this rod (i) doesn't contact the shutter-release mechanism (right behind the shutter button on the camera body 10) directly. Instead, it presses against a short pin in the bottom of the camera body, turning the short lever (j) clockwise. This movement in turn rotates the shutter-mechanism release lever (k) in a clockwise direction which causes the sliding bar (d) to slide downwards. Thus, the ETR's entire shutter-cocking mechanism actually reverses directions to release the camera's shutter.

As a matter of fact, even if you press the shutter-release button (10) on the camera body with your finger, the inner end of the button actually contacts the end of intermediate lever (k) instead of releasing the sliding bar directly. Why such complication? We're glad you asked. Unlike the Hasselblad (which has a separate two-bladed light baffle), the ETR's light baffle is pivoted behind the main mirror and moves in conjunction with it in a precisely timed mechanical sequence. So, when the mirror is locked up, the light baffle is also in the up position. The baffle prevents the film from being fogged when the interlens shutter is open for viewing. Also, the lens-release button is automatically locked until the shutter is cocked and the mirror and the light baffle are in the down position.

This protects you against accidentally removing the lens at the wrong time. The righthand end of lever (k) serves this purpose. Only if the shutter is cocked and not fired will lever (k) (which is located right behind the lens lock/release button (13) move leftward permitting you to push in on the lens lock/release button. When you release the shutter, lever (k) moves to the right, and pushes against the lens lock/release button preventing it from being pressed in. This way, once you release the shutter there is no way to remove the lens accidentally.

15. Shutter-speed resistors: Normally, the marked speeds of a leaf shutter are controlled within the shutter unit. Therefore, you have to set your chosen shutter speed on a dial located somewhere on the lens barrel. One drawback of such a shutter-speed control system is that each lens has a separate shutter-speed governing system unit, and as you change lenses each shutter will therefore provide slightly different actual speeds. To avoid this difficulty Bronica chose a centralized shutter-speed control system. Each shutter unit in each separate lens barrel consists only of shutter blades and activating springs. The electronic, speed-determination components are solidly built into the camera body.

The speeds themselves are controlled by an electronic device known as a timing circuit. This circuit is normally a combination of resistors and condensers which are less vulnerable to temperature changes and aging than their mechanical counterparts. Another advantage of this type of control system is that additional control systems (for example, an automatic-exposure metering system) can be later added without too much difficulty. Mechanical timing systems cannot have their capabilities extended so easily. In fact, Bronica has already announced such an AE finder which snaps onto the top of the ETR in place of the standard finder, converting it into a fully auto-exposure camera.

12. Lens-information keying contacts: The most technically difficult task Bronica faced in designing its centralized speed-control system was transferring the speeds determined by the camera's timing circuit to the shutter in each lens. "Just do it electronically," you say. But the lens barrel is a mechanical metal tube and, worst of all, it moves back and forth for focusing. For this reason, normal wiring is not suitable. Here, Bronica's engineers had a splendid idea. They devised a spiral-shaped flexible circuit board (e) and inserted one into each lens barrel. The lens barrel can thus be extended as required, and shutter speeds can still be controlled electronically, with virtually no timing errors. Since they had devised this brilliant scheme for getting flexible electronic circuitry into the ETR's lens barrels, Bronica's engineers decided not to waste their ingenuity by having it perform a single function. Why not have the lens supply exposure-determining information to the body? In fact, this is precisely what happens—the camera electronically communicates shutter-timing information to the interlens shutters and the lens units return the compliment by "telling" the camera its maximum and set apertures. All these pieces of information are exchanged via contacts within the bayonet lens mount (12), and transferred to the AE finder (not shown) via contacts in front of the finder screen.

You might now conclude that Bronica's clever information transfer system has solved all the major problems encountered with leaf-shutter SLRs. Unfortunately, the one difficulty remaining is quite a large and sticky one—namely the shutter-cocking mechanism. As you can see in the simplified drawing (page 106), four long, squared-off pins pass through the lens barrel, connecting the lens-mount section with the shutter unit at the front (m). The length of these pins limits the extension of the lens barrel and determines its size too.

Bronica's engineers are not the only camera designers to have been working on this age-old problem. (Rollei's engineers have finally solved it in large measure in their all-electronic Rollei SLX. We'll let you in on how they did it in a future report.)

As you can see from the above descriptions, Bronica's engineers created the ETR from scratch and incorporated many novel concepts into its design. However, they were not afraid to modify or adapt existing camera-design concepts when they felt this would result in a better machine. This eclectic approach has produced one of the very few medium-format cameras that a dyed-in-the-wool 35mm enthusiast can comfortably use without a lengthy period of adjustment. Whether this clever marketing concept will prove to be a smashing sales success remains to be seen. Nevertheless, it has clearly resulted in a fascinating, compact, and competent SLR that many experts have called the best camera Bronica has ever produced.