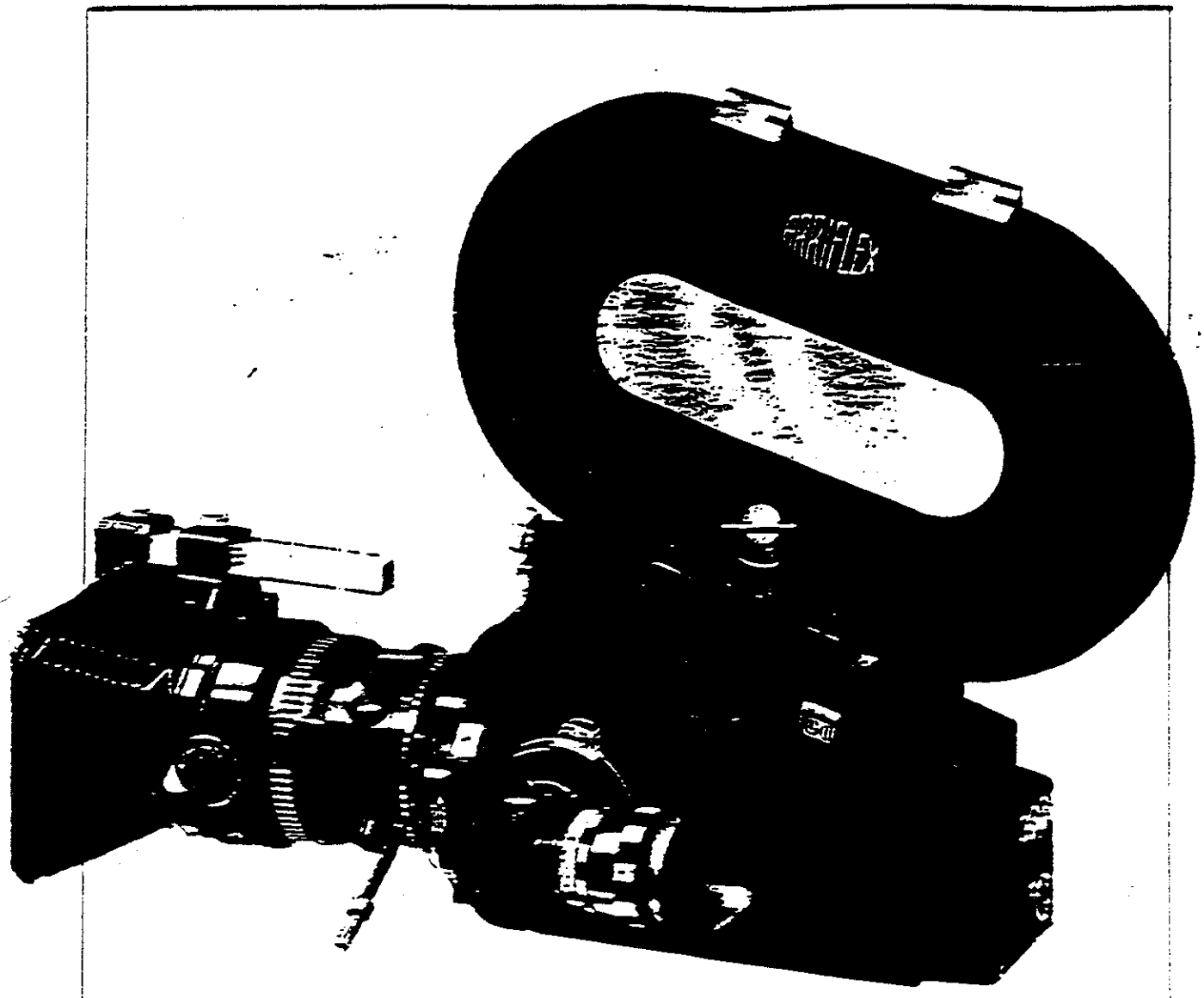
ARRIFLEX 16 BL

Mirror-Reflex Motion-Picture Camera for 16 mm Film



ARRI

Instruction Manual

Construction and Design:

The ARRIFLEX 16 BL is a noiseless 16 mm mirror reflex newsreel camera with electric drive. In order to maintain the excellent technical features of the proven ARRIFLEX models 16 St and 16 M (such as the precision film registration pin, forward and reverse operation, tachometer, footage indicator, interchangeable motors, mirror reflex system, etc.), achieve a low noise level and avoid excess weight, this new camera has been built with a fully sound-proofed construction in which all components which produce or conduct noise have been insulated within or upon the camera body. This applies to the camera mechanism complete with the film transport system, the interchangeable motors, the lens, the viewfinder system, and the magazines. This construction makes the ARRIFLEX 16 BL an extremely versatile, noiseless, and relatively light-weight newsreel camera which can be used equally well whether mounted upon a tripod or hand-held, with or without a shoulder support. Taking today's highly advanced zoom lenses into consideration, the ARRIFLEX 16 BL has been constructed with only one lens mount especially designed for the use of zoom lenses although normal lenses may also be used. The lenses can be exchanged quite easily. The ARRIFLEX 16 BL works with quick-changing magazines with built-in feed and take-up mechanisms. The film transport is the same as in the ARRIFLEX 16 St and 16 M, having a precision registration pin for forward and reverse operation. The viewfinder system is different in some respects from other ARRIFLEX 16 models, the most important difference being the relocation of the ground glass in the forward focal plane. The ARRIFLEX 16 BL is operated in the same manner as the ARRIFLEX 16 M, with the exception of the following changes:

The operating controls normally firmly coupled with the camera mechanism are insulated in the ARRIFLEX 16 BL to prevent noise from being conducted from the camera interior. This applies to the lens controls for focus (I/4), focal length (I/10 a. 11), diaphragm (II/10), inching knob (III/1), re-set for the footage indicator (III/4), and the two knurled disks (II/14) for taking up film slack in the magazine. The three lens controls are connected to the lens by means of rubber elements. The latter four control knobs mentioned above are completely disengaged and must be pressed in to couple them with the gears of the camera mechanism. <u>Important! Never use the inching knob (III/1) while the camera motor is running!</u>

Fig. I

1 Knurled knob for adjusting bellows
2 Matte box [illegible]
3 [illegible]
4 One of three [illegible] grips
5 Latch [illegible] lens mounting/camera
6 Magazine lid latch
7 [illegible] pilot lamp and start marking unit
8 Latch to filter door
9 Focus image mark
10 [illegible] zoom lever
11 Focal length adjustment ring
12 Push button to unlock lens
13 Short orthoscopic viewfinder
14 Collar for mounting eyepiece
15 Knurled ring for locking diopter adjustment
16 Diopter adjustment ring
17 Rubber eyecup
18 Latch to orthoscopic viewfinder
19 Camera door lock

Fig. II

1 Magazine lock
2 Accessory shoe
3 [illegible]
4 Hand grip
5 Matte box [illegible]
6 Effects mask [illegible]
7 Matte box bellows
8 Hinge to filter door
9 Filter holder
10 Diaphragm adjustment grips
11 Camera motor cap
12 Zero reset for footage counter
13 Film plane mark
14 Knurled disks for tightening film slack
15 Film supply indicator

1. The interchangeable sound-proofed lenses of the ARRIFLEX 16 3L

The lenses for the ARRIFLEX 16 3L are contained in a separate insulated housing and can be exchanged quickly. The lens and outer housing form a single unit, even though each connects separately with the camera. The lens is locked inside the camera whereas the housing is locked on the front of the camera.

In Figs. I and II the operating controls of the lens are shown:

focusing adjustment I/4
focal length (zoom) adjustment I/10 a. I/11
diaphragm adjustment II/10

The plexiglass window on the housing (I/3) enables reading of the original lensscales. For focusing, focal length, and diaphragm, additional scales are located on the adjustment rings of the housing and can be read off at the index marks on the side by the camera assistant. The adjustment rings have handy grips for easy operation. For comfortable adjustment of the zoom range, a detachable lever (I/10) has been added. This lever is screwed into a separate ring which fits loosely over the focal length adjustment ring and can be brought into any desired position. When the zoom lever has been screwed in, the counter sleeve is left loose and the outer ring and zoom adjustment ring are brought into the desired position. The counter sleeve of the zoom lever is then screwed tight, whereby one makes certain that the rings are firmly locked together. The lens' outer housing is equipped with a hinge (II/8) so that the frontpart becomes a door (V/3) for the filter holder (V/9). A knurled tension lock, which catches automatically and can be tightened, presses the filter holder against an elastic sound-insulation support. To change the filter or plane glass (V/10), the lock is turned counter-clockwise and the hinged front (V/3) ist opened so that the interchangeable filter holder (V/9) can be taken out. The filter holder contains the filter or plane glass (V/10) mounted upon an elastic support and retained by four leaf springs. To change filters, the upper and lower parts of the filter holder (V/9) are turned against each other until the two square cut-outs match. The filter is taken out, a new one put in, and the process reversed. Important: If square filters of up to 5 mm thickness are used, the knurled upper part is to be turned against the lower part in a clockwise direction. If filters thicker than 5 mm are used, the upper part is turned in a counter-clockwise direction to avoid damaging the leaf springs. When no filter is mounted, the plane glass of the same size must be used. The filter and the plane glass, however, can never be used together. The adjustable matte box with bellows (II/7) is mounted upon the hinged front (V/3) by seating it at the lugs (V/1) and locking it with the snap catch (V/2). The matte box swings with the hinged front (V/3) when it is opened.

A zoom lens consists of a stationary main lens and an adjustable system of auxiliary lenses. The latter system is usually of considerable length so that the front lens, because of this, enters into the focusing range of the main lens. This is especially the case with short focal length settings and small apertures. For this reason, the front lenses must always be kept especially clean, as foreign particles could easily show up in the picture. The same applies to the plane glass and the filter.

A. Removal of the sound-proofed lens

The lock of the outer housing is opened by turning the locking grip (I/5) counter-clockwise from position FEST to position LOSE. Then the push button (I/12 a. V/T6) is pressed in with the index finger of the right hand and the sound-proofed lens turned counter-clockwise with the left hand until it disengages and can be slid out.

3. Mounting the sound-proofed lens

The mark LOSE on the lock of the outer housing (I/5) is matched with the red dot. The sound-proofed lens is taken in the left hand, plexiglass window up (I/3), and slid with the lens mount and its bayonet catch into the grooves of the lens socket (V/T4) and turned clockwise until it engages, this being indicated by a slight click. The push button (I/12 a. V/T6) need not be depressed while mounting the lens. Once the lens is locked, the outer housing (V/6) is locked by turning the ring clockwise from LOOSE to FIX.

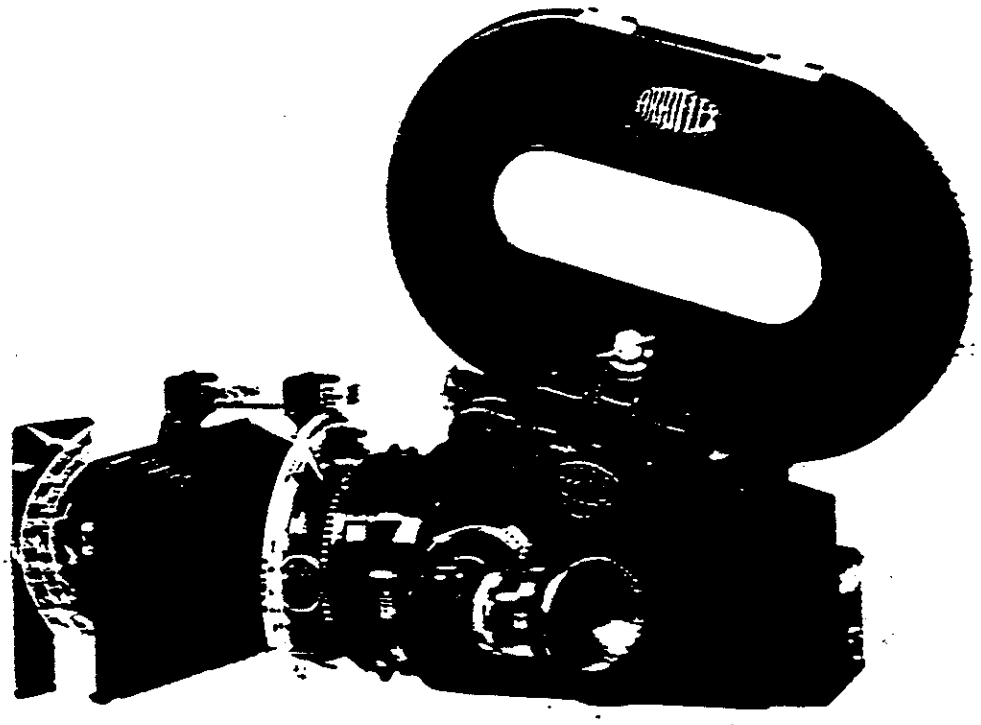


Fig. 1

In conjunction with the Universal Lens Blimp, the following lenses of fixed focal length from the ARRI Lens Programme can be used for sound-insulated shootings:

Schneider Cinegon	f / 1.8 / 10 mm (as from 1967)
Cine-Xenon	f / 2 / 28 mm
Cine-Xenon	f / 2 / 35 mm
Cine-Xenon	f / 2 / 40 mm
Cine-Xenon	f / 2 / 50 mm
Cine-Xenon	f / 2 / 75 mm
Zeiss Distagon	f / 2 / 8 mm
Distagon	f / 2 / 16 mm
Distagon	f / 2 / 24 mm
Planar	f / 2 / 32 mm
Planar	f / 2 / 50 mm
Planar	f / 2 / 85 mm
Sonnar	f / 2 / 85 mm
Cooke Speed Panchro	T / 2.2 / 25 mm
Speed Panchro	T / 2.3 / 32 mm
Speed Panchro	T / 2.3 / 40 mm
Speed Panchro	T / 2.3 / 50 mm
Speed Panchro	T / 2.3 / 75 mm

For various reasons all other lenses in the ARRI Lens Programme cannot be used with the lens blimp, or only with limitations.

1. The following lenses:

Schneider Cinegon	f / 1.8 / 18 mm
Cinegon-Xenon	f / 2 / 100 mm
Zeiss Sonnar	f / 4 / 135 mm
Cooke Speed Panchro	T / 2.2 / 18 mm
Speed Panchro	T / 2.3 / 100 mm
Kilfitt Makro-Kilar	f / 2.3 / 40 mm
Makro-Kilar	f / 2.3 / 90 mm

fit the lens mounting of the ARRIFLEX 16 BL, but will not fit into the Universal Lens Blimp, because in some cases their diameter and in others their overall length are too big. These lenses should therefore be used only when sound-insulation requirements are not critical. Moreover, lenses with a focal length in excess of 100 mm need a lens support (in preparation).

2. The fixed-focal-length lenses not listed above have too short a back focal distance (distance from rear element to mirror reflex position). This point will be taken into account in future lens designs so that all new models included in the ARRI Lens Programme will also be adapted to the ARRIFLEX 16 BL.

The Universal Lens Blimp is dimensioned so that, in principle, standard 75 x 75 mm ARRI filters and 3 x 3 " Wratten filters can be used. These standard filters are large enough for the shortest focal length used. In view of the short focal lengths, however, filter size is governed by the overall length of the Universal Lens Blimp and hence by the maximum length of the lenses used.

The filter holders for the two zoom lenses, Angénieux Multifocus 10 x 12 and Zeiss Vario-Sonnar 6 x 12.5, are the same as those for the Universal Lens Blimp and can therefore be used interchangeably. We recommend the use of a separate holder for each filter. This makes it considerably easier to keep the filter glasses clean.

The matte box for the Universal Lens Blimp can also be used for the above-mentioned blimped zoom lenses. As from mid-1967, we will be supplying the same matte box for these lenses as for the Universal Lens Blimp. The difference from their predecessors is a mirror-holder hinge on the front frame. On request, we supply for the Universal Lens Blimp a rectangular mirror which permits indirect reading of the focusing aperture scales from a longer distance.

The length of the matte box booms is adapted to the blimped lenses. For the Universal Lens Blimp only the short boom should be used. There are no engraved bellows extension markings, as the focal lengths of the usable lenses vary.

We deliver lenses ordered for the Universal Lens Blimp ready for installation, i.e. with adjusted coupling elements and calibrated focusing aperture scales, as is the usual practice for the big studio blimps.

If already available lenses (see list on page 24) are to be used in the Universal Lens Blimp, coupling modifications and calibration of the focusing aperture scale are necessary. This can be done either by ARNOLD & RICHTER or in an authorized service workshop. Precise installation and adjustment instructions are available on request.

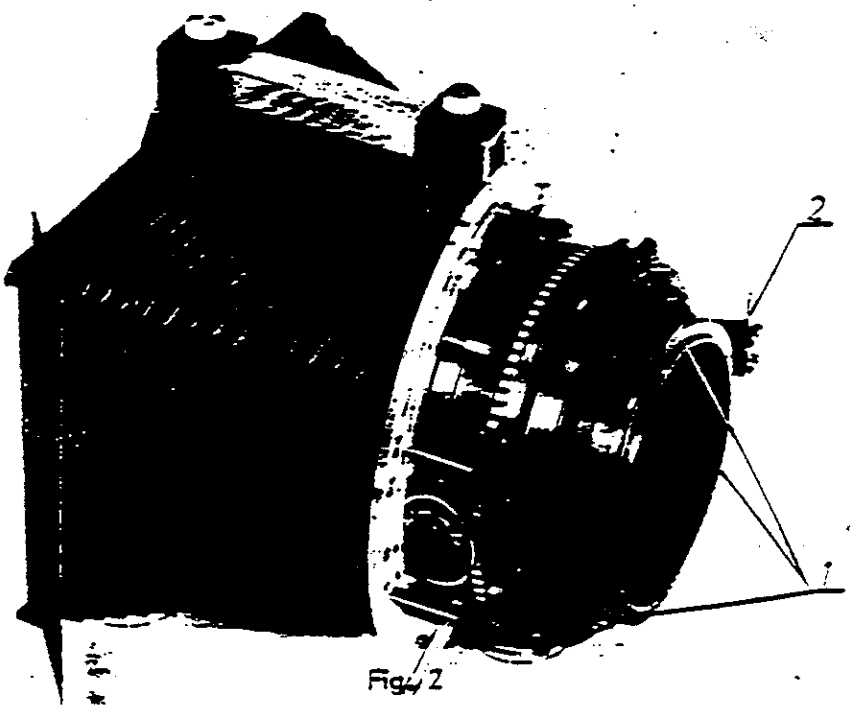


Fig. 2

1. Universal Lens Blimp, Fig. 2, with the three clamping lugs (Fig. 2/1) in the three grooves on the camera (as for zoom lens), then turn to right until the lens blimp engages the larch (Fig. 2/2). The matte box is mounted exactly as on zoom lenses.

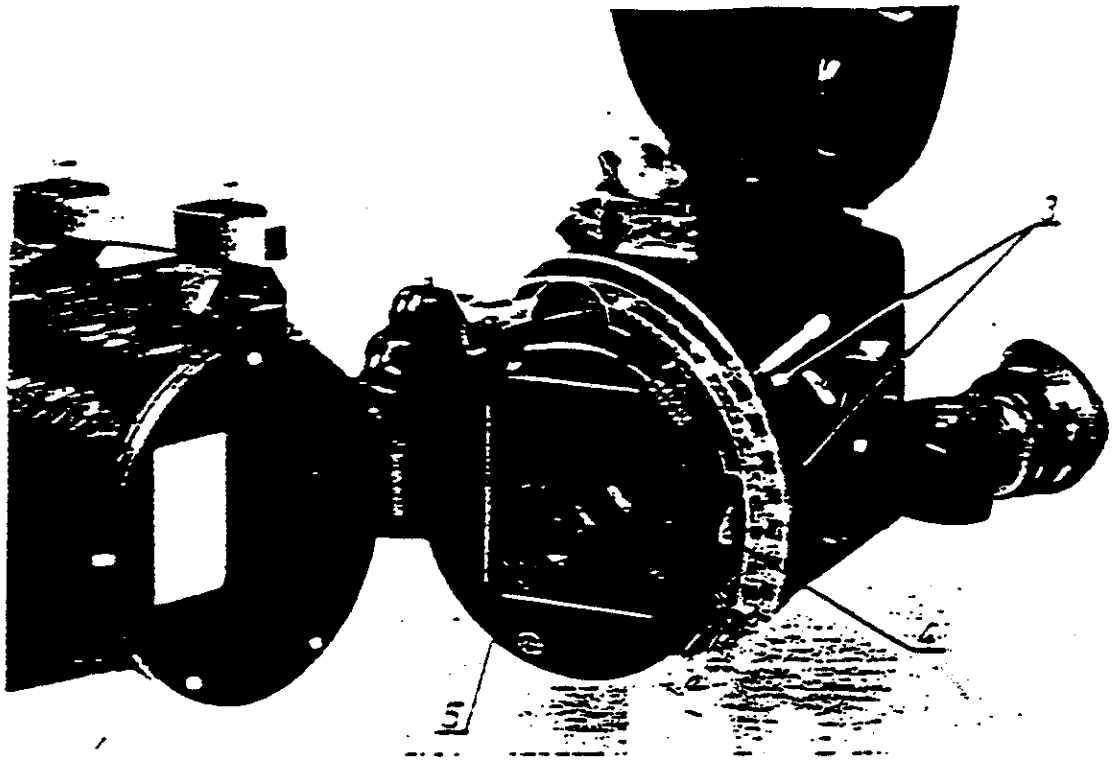


Fig. 3

11. Turn the locking ring (Fig. 3/3) to give a firm seating, loosen the closure of the front door (Fig. 3/4), open the hinged door and remove the filter holder (Fig. 3/5). Set focusing lever at ∞, and swing out diaphragme driver (Fig. 4/7).

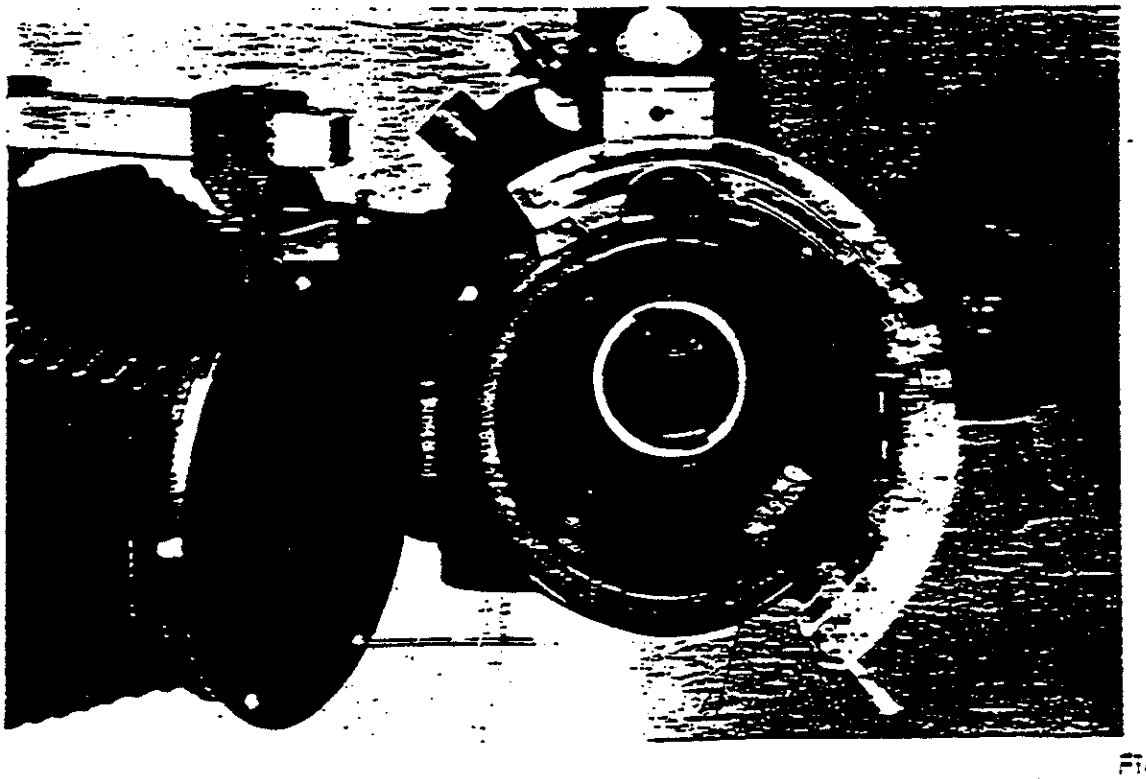
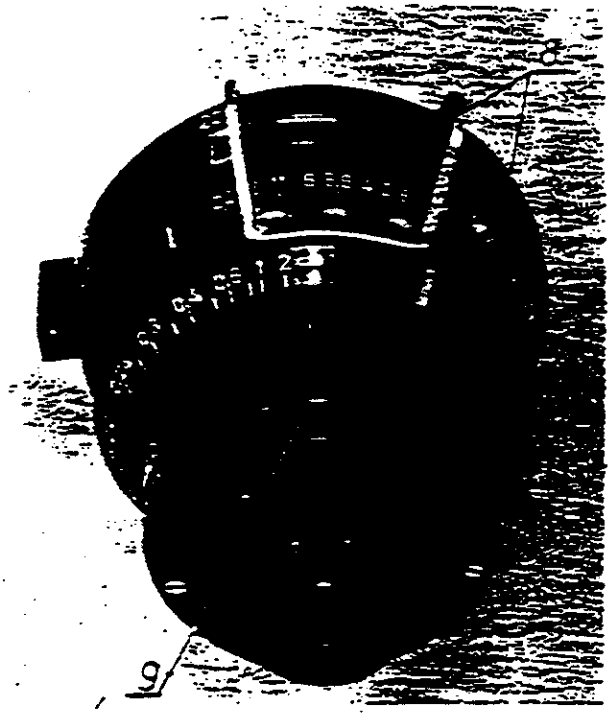


Fig.



III. Turn lens focusing ring (Fig. 5/8) to ∞ mark, so that the middle of the retaining pin slot (Fig. 5/9) is opposite ∞ with the ring up against the stop.

Fig. 5

IV. Open the catches for locking the lens by depressing the push button (Fig. 6/10), and insert the lens in the bore with the retaining pin slot (Fig. 5/9) uppermost. The focusing driver (Fig. 6/11) of the lens blimp engages the left leaf (in Fig. 6) of the focusing lever on the lens. The bracket makes coupling with the wrong leaf (on the right in Fig. 6) of the lens focusing lever impossible. Swing diaphragm driver back into place and couple with the diaphragm ring (Fig. 6/12).

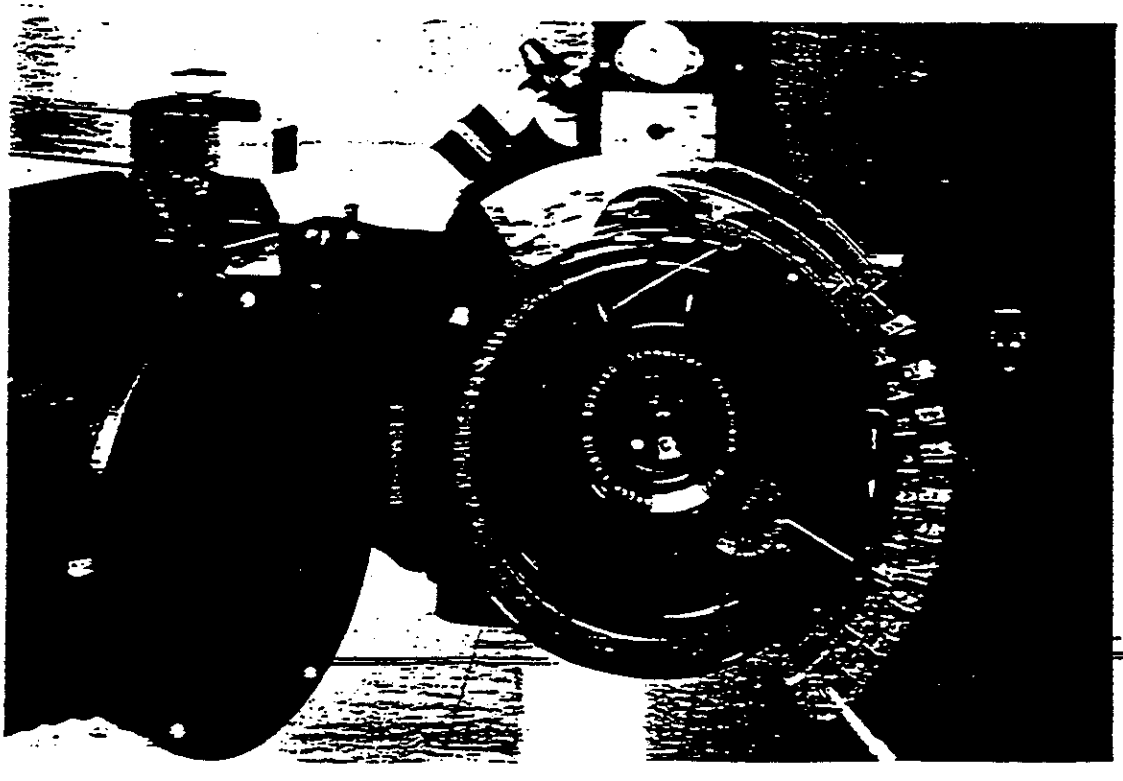


Fig. 6

V. Insert the filter holder (Fig. 3/5) and close the front door (as for zoom lenses).

VI. The focusing aperture scale (Fig. 7/13) is attached by slipping it over the pin (Fig. 7/14) and then pivoting the scale into the slot of the guide elements until it engages the catch pin (Fig. 7/16). To remove or replace the scale, the catch pin (Fig. 7/16) is pulled out.

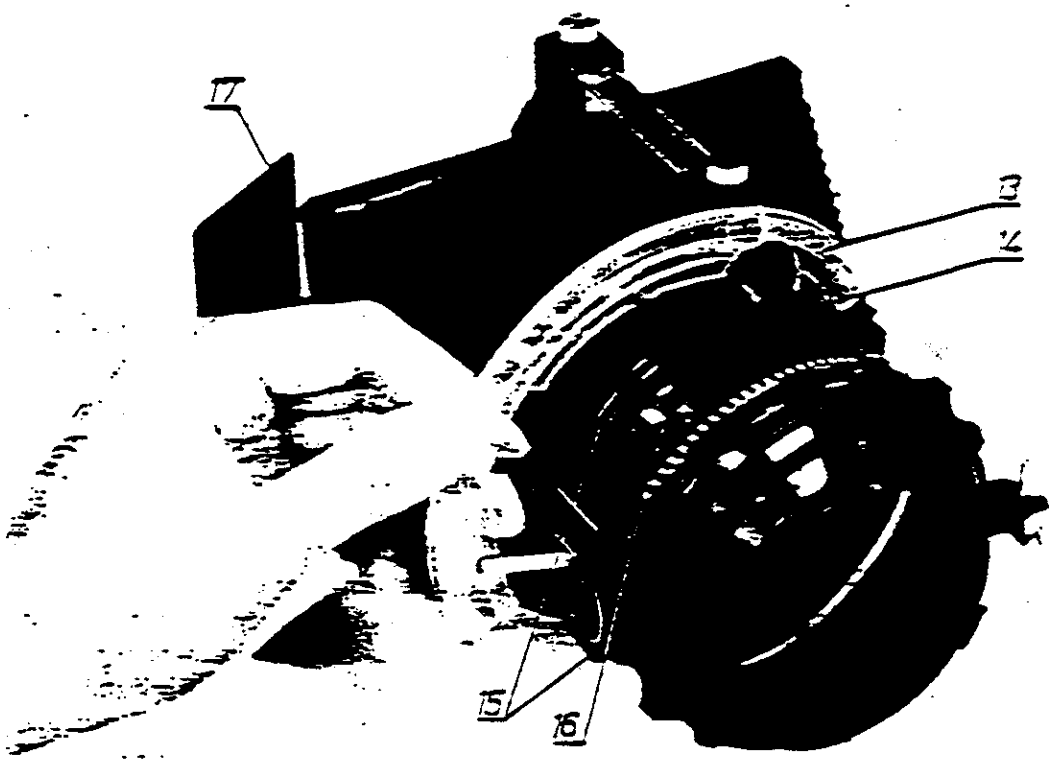


Fig. 7

VII. The interchangeable mirror (Fig. 7/17) permits indirect reading of the focusing aperture scale (Fig. 7/13) from a greater distance.

VIII. To remove the lens, reverse the above procedure.

3. The mirror reflex viewfinder system

In contrast to the previous models of the ARRIFLEX 16, the ARRIFLEX 16 BL has its ground glass (IV/6) at the front as does the ARRIFLEX 35. The ground glass area surrounding the format markings is somewhat darker than the format itself. In this manner objects located outside of the picture being filmed can also be seen. The ground glass holder is fastened with two screws (IV/7) parallel to the ground glass plane. Two precision adjusted bolts guarantee that the film and ground glass images are equal and free of parallax. This enables the ground glass holder with the ground glass to be easily exchanged for others with different formats without losing the adjustment. The viewfinder assembly is built into the camera door and the image is observed through the eyepiece. A short periscopic viewer attachment is located between the ground glass and the eyepiece. This attachment, can be turned and swivelled and locks in the operating position. By turning the lock (I/18) in a counter-clockwise direction, the short periscopic viewfinder together with the eyepiece can be removed and exchanged for the angular viewfinder (Cat. No. 1633). With this angular viewfinder attachment the eyepiece is further forward, thus granting a more favourable weight distribution for hand-held shots, as the camera may be supported against the shoulder. The viewfinder eyepiece itself is detachable as on other ARRIFLEX 16 cameras (I/14) with the only difference from previous standard eye-pieces being that it is equipped with an automatic light sealing device. This is necessary because of the viewfinder construction of the ARRIFLEX 16 BL. The light closure mechanism opens automatically when the eye is pressed against the eyecup. The adjustable rubber eyecup (I/12) is detachable and can be removed by simply pulling it to the rear. When the eyecup is removed, a knurled ring becomesvisible which, when turned in a clockwise direction, locks the automatic light closure mechanism at an open position. This arrangement is especially practical for hand-held shots (from a moving automobile, etc.) during which it is difficult to hold the camera steady. The light closure mechanism can be returned to automatic functioning by turning the knurled ring back in a counter-clockwise direction. The detachable rubber eyecup offers the additional advantage that each cameraman - especially if he wears glasses - can use his own eyecup. At the rear of the eyecup a centered recess is povided for the mounting of a prescription lens by an optician. As the rubber eyecup is made to fit the eye anatomically, lenses for correcting astigmatism can be mounted in the correct position.

The viewfinder eyepiece is focused with the knurled focusing ring (I/16). The focus is held with the knurled locking ring (I/16) which has the setting FEST (tight) and LOSE (loose) engraved upon it (see also the leaflet TI E 01 101 "Interchangeable Viewfinder Eyepiece for ARRIFLEX Motion Picture Cameras").

4. The Periscope Finder for the ARRIFLEX 16 3L and its advantages over the standard viewfinder.

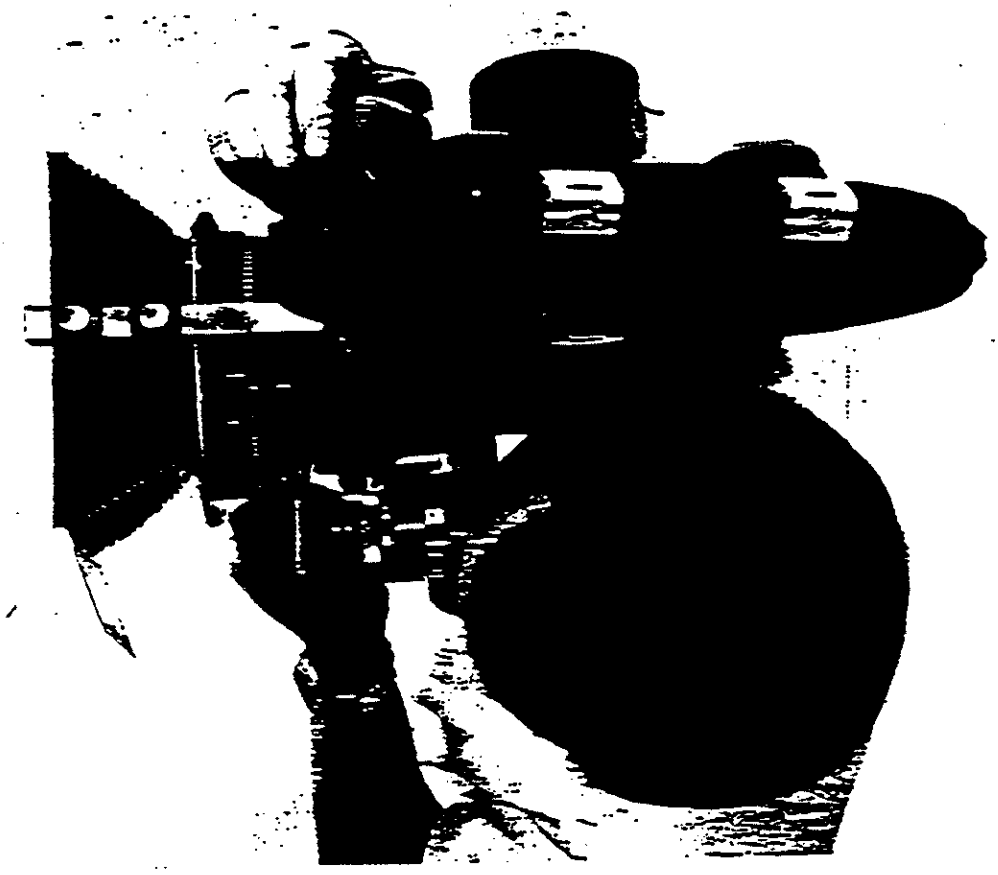


Fig. 1

To give the self-blimped ARRIFLEX 16 3L even greater versatility, especially for news work, tripodless operation has been made possible by equipment that holds the camera firmly on the cameraman's shoulder. This has been achieved by favourable displacement of the centre of gravity and also of the viewfinder eyepiece. The right hand on the hand grip operates the release, and the left hand sets the focus, focal length and iris diaphragm. This ensures a steady camera even for long, hand-held shooting.

In addition, as from serial No. 30701 the viewfinder mounting of the ARRIFLEX 16 3L has been modified so that in a few seconds the standard viewfinder can be removed and replaced by a newly developed periscope finder attachment that enables the ARRIFLEX 16 3L to be operated from the shoulder.

The new viewfinder mounting is constructed as a quick-change mounting integral with the camera door lock. The viewfinder in use is held firmly in this quick-change mounting by three movable, centrically arranged nylon clamp jaws and is prevented from turning by a spring-loaded locking pin.

To change the viewfinder, the black knurled ring (Fig. 2/1) is turned anti-clockwise as far as it will go. The finder can then be removed with a slight

CAMERA PREP

PROCEDURE 8

You have probably worked with a 16SR before. But, for the purposes of a quick review, let us assume that you have spent the last twenty years on an anthropological expedition to the remotest corner of the earth. You have just returned, and are staring down at two cases labeled "Arriflex 16SR".

When working on this or any camera, find a well lit work surface. Lay out a soft, no slip pad. A white terry bath towel borrowed from a hotel bathroom will do very nicely. It provides a soft cushion to protect the equipment from nicks and scratches, and prevents tools and parts from rolling around.

Wait! Do NOT take anything apart.

The ARRI 16SR is basically maintenance free. You will spend most of your time cleaning and checking. If a repair must be done, it should usually be at an authorized ARRI service facility. Once taken apart, the camera flange focal depth must be recalibrated.

Although the 16SR is highly complex, it is modular in construction. Repairs can be made quickly - faster, in fact, than on previous ARRI cameras.

- Do NOT force anything. Everything FINGER TIGHTENS that should be tightened. Use common sense.
- Do NOT use over or undersized screwdrivers. You will burr the screw heads, and make things more difficult. Use only the right tools. Tools for the 16SR are METRIC.
- NEVER use a Q-TIP on any camera. Q-Tips contain lint. Make your own swabs out of orangewood sticks (available at drugstores) with lens tissue wrapped around the end. In a pinch, wrap the lens tissue over the shaft of a Q-Tip to contain the lint. Tapehead cleaning swabs, made of lint free foam, work very well.

> NEVER use ACETONE. It will remove paint and enamel. The strongest solvent you will need on the camera is lens fluid or denatured alcohol.

> Do NOT grease or OIL the camera. It runs dry.

Now, take the camera out of the case. Do NOT pick it up by the eyepiece or lens. Use the handgrip, carrying handle or camera body.

MOUNTING THE CAMERA

Let's say you're in a rental house or at a production company checking out the equipment for a shoot.

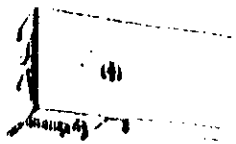
Note how everything is packed, so you can put it back that way.

The nose the 16SR has a tripod that base. It is very simple to examine it on a table top. Use the towel or soft pad.

Some assistants prefer to set the camera up on a tripod for check out.

1. The 16SR has one mounting hole in its base: tapped 3/8"-16 (3/8" diameter, 16 threads to the inch).

   It is helpful to carry with you several 3/8" - 16 bolts for mounting or emergency purposes. Also, get spacing washers with 3/8" holes.

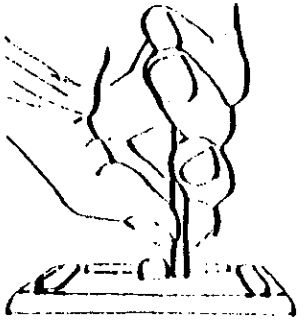


> CAUTION! The tripod mounting hole is shallow. If you screw a bolt in too deep, it will go through a printed circuit board.

2. CHECK DEPTH FIRST. Insert a plastic skewer, toothpick, or match into the hole. Note how far it goes in.

3. Now, compare the skewer or toothpick depth with the tripod bolt.

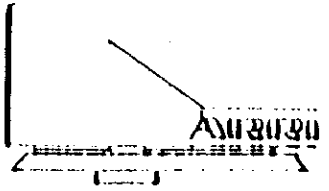
> Newmodel 16SR mounting holes are 7/16" (11mm) deep.
>
> Older model 16SR mounting holes are 7/32" (7mm) deep.



4. When mounting the camera on a tripod, or when attaching a baseplate or quick release plate, you often wind up with a metal to metal contact. The camera may twist right or left.

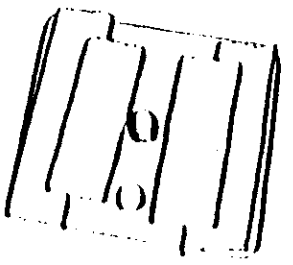
   For a tighter fit, put two pieces of gaffers or camera tape on either side of the tripod mounting bolt.

   The soft tape will compress, and provide better grip.



6. Put the tape on the accessory plate, tripod head, teleprompter plate, etc. NOT DIRECTLY ON THE CAMERA BASE.

   The camera base can heat up, and as the paint on the camera base is soft, it may peel off as you remove the tape. Messy business.



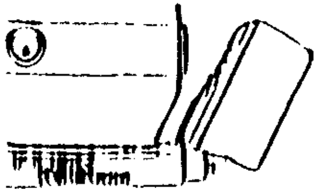
CAMERA CHECK-OUT AND ASSEMBLY

Before any job, you should run down this check list. While you're assembling the camera, check all the things that could possibly be wrong. You should assume the worst, trust no one, and do it yourself. Murphy's Law lurks everywhere.

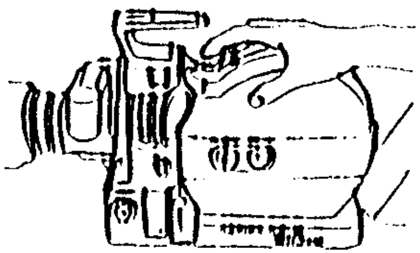
- A REMOVE MAGAZINE
- B CHECK CAMERA SPEED and PILOTONE OUTPUT
- C CHECK GEL FILTER SLOT (on older SR's)
- D MOUNT ON-BOARD BATTERY
- E CHECK CAMERA SWITCHES
- F MOUNT HANDGRIP
- G CHECK INCHING KNOB
- H REPLACE MAGAZINE or APERTURE COVER
- I CHECK FOR SCRATCHES
- J MOUNT LENSES
- K CHECK DEPTH and COLLIMATION
- L SIMPLE LENS TEST
- M SETTING UP LENS
- N CHECK FINDER OPTIC SCREEN and METER
- O CHECK EXPOSURE CONTROL

A. Remove Magazine

1 If the on-board battery is attached, swing it back. It is held to the magazine with a magnet.

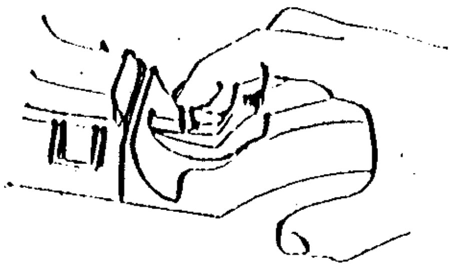


2 Grasp the magazine with one hand.



3 Hold camera body or camera handle with other hand.

4 With your index finger, flip the safety lock back to the "OPEN" position.



5. Depress the release lever. Push it all the way down.

Lift up on the magazine. Pivoting from the top, the bottom will open out.

6. Raise the rear end of the mag until your index finger is almost touching the rubber tip of the camera handle. At this point, the quick change lock will disengage.

7. Pull the magazine straight back.

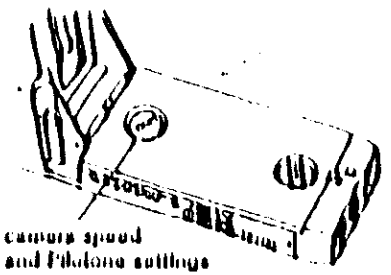
8. If there is an aperture cover instead of a magazine, the cover pivots from the top and snaps in or out at the bottom.

B. Check ... Speed and Pilotone Output

1 CHECK CAMERA SPEED. Look on top of the base, through the plexi disc at the front of the electronics base cover

2 CHECK PILOTONE OUTPUT. Same place

For shooting in the USA, settings should be at 24 fps and 60Hz



camera speed and Pilotone settings

While the 24-25 fps switch does indeed change camera speed, the 50-60Hz switch only controls Pilotone sync pulse output. When a tape recorder is attached to the 16SR with an umbilical sync cord, the recorder gets its sync pulse from the camera. USA standard is 60Hz, while European standard is 50Hz. Since we usually use crystal control both in camera and recorder (no umbilical cord), the 50-60Hz setting will have no effect on camera operation other than to serve as a reminder.

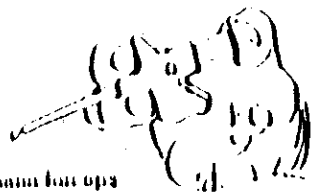
1 To change the speed or Pilotone settings, unscrew the plexi disc with a large coin. Don't use a screwdriver.

2 The newest SR cameras are equipped to shoot at 30fps for direct transfer to video. The switches look like this:

Important: If you intend to shoot at 30 fps, listen to the pitch of the camera while it's running. It sounds similar to the camera when running at 24 fps, the internal control circuitry has been bridged back to 25 fps. It should be reset in the repair shop to 30 fps.

3 Most 16SR cameras have slide switches. Put a pin point in the hole on tip of the switch to slide it

Older model cameras have wire contact bridges. They can be removed and replugged across the appropriate two posts. Use a Hirschmann forceps, available from ARRI, or electronic stores



Hirschmann forceps

C. Check Gel Filter Slot

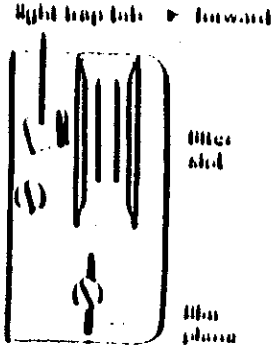
Older model cameras have gel filter slots. Newer ones do not, for reasons that will soon become apparent.

1. If your camera has a gel filter slot, be ABSOLUTELY certain that no one has left a gel inside.

2. The LIGHT TRAP should be closed – small tab all the way forward

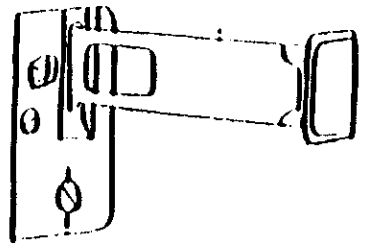
3. The vertical line below the filter slot shows the film plane.

   Note how close the filter slot is to the film plane. Dirt, dust or fingerprints may show up on the film itself. And since a behind the lens gel will shift flange to film focus back by 1/3 the thickness of the gel, you theoretically would have to use a clear gel when none would normally be needed to maintain consistency. You also would have had to shift your camera's depth to compensate for the 1/3 back-focus difference.



4. When you check the camera aperture later on, you have a second chance to notice whether a gel has been left inside the filter slot.

5. If you must use a gel, you will first have to find a gel holder, which has also been discontinued.



The two pieces of spring steel separate at the gelholder's handle. Open it. Insert the gel. Snap shut. Cut off excess with an X-Acto knife. Open light trap. Push holder in slot, all the way.

If there is any dirt or dust on the gel, brush it off with a camel's hair lens brush, or use an air syringe. Avoid Dust Off, as it will leave a chemical residue. If fingerprints or moisture get on the gel, you'll have to use another one. Use cotton editing gloves when handling the gels.

D. Mount On-Board Battery

1. Check battery voltage

Beginning 1984, ARRI 16SR 2 cameras are equipped with a green LED battery checker. The LED glows when the camera is switched to the "ready" or "on" position, and the voltage is between 9.5 and 12 volts. Below 9.5 volts, the LED goes out, and the battery should be changed. The green battery checker will also light up when you press the test button.

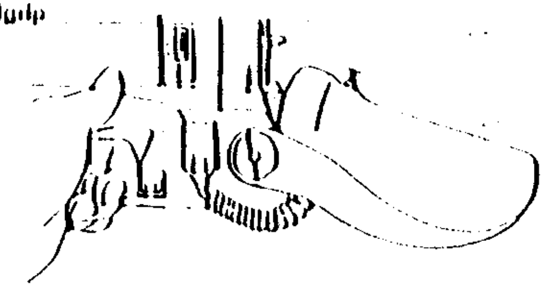
In addition, the single camera running light has been replaced by two red running lights on either side of the base, which makes it easier for the sound man, assistant and others to know when the camera is on.

16SR 2 cameras equipped with Auto Servo Exposure have a Memory Lock. You switch the camera to READY. The exposure control servo motor stops the lens down to the correct aperture. If you are panning a scene with highlights and shadows, and don't want the lens to automatically open and close in the middle of the shot, you push the red Memory Lock button in and slide the whole plastic strip down. To release the Memory Lock, you either turn the camera OFF, or slide the plastic strip up while the camera is running. You can also engage the Memory directly while the camera is ON and running.

F. Mount Handgrip

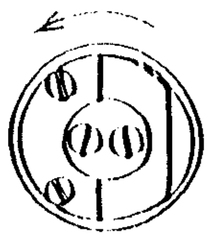
Attach the handgrip to the right side. Some grips have a steel knurled spacer ring which can be rotated to bevel the grip away from or towards the camera body. Tighten the grip. Plug in the four-prong electrical connection, and secure the wire bale. To remove the bale, use your fingernail.

With the camera switch at READY, you can turn the camera ON and OFF with the switch on the handgrip.



G. Check Inching Knob

To manually advance the mirror shutter, for checking the gate, turn the inching knob in the direction of the arrow (counterclockwise.)



For a good grip, you pull the inching knob handle 90 degrees away from the camera with your fingernail. When you push it back flat, note that IT ONLY RETURNS ONE WAY. If you force the tab the wrong way, it will break.

Older cameras did not have a handle. You pushed hard against a flat nylon disc, or used a coin in the slot of the disc.

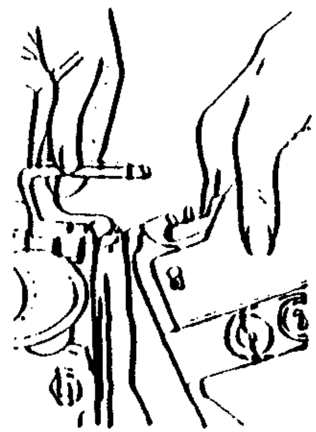
H. Replace Magazine or Aperture Cover

Never leave the camera open for more than a few minutes without the aperture cover or magazine in place. Dust will surely fly in. Sometimes insects will get inside. We once shut down an entire production for hours while trying to extract a curious critter.

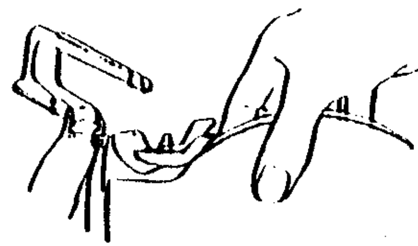
To attach the MAGAZINE:

1. Make sure film loop is centered, and held in place by the four side guide hooks.

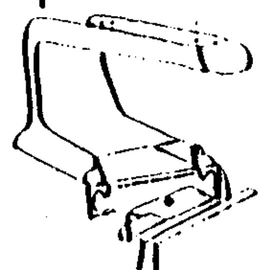
   Grab the mag with one hand. Hold the camera with the other hand.



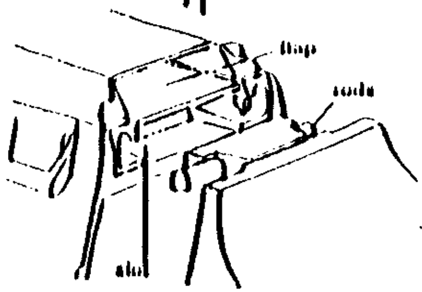
2. Angle the magazine about 30 degrees above the base.



3. The release lever need not be pressed when you're at the proper angle. It will be at the same height as the handle on top of the camera.



4. Slide the rods of the magazine into the slot of the camera. The flap, which goes up as the mag goes in, will snap down when properly inserted. If you don't hear a click, wiggle gently, and pivot the mag up and down until you hear the click.

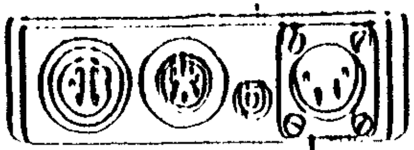


5. Then pivot the mag down gently until it locks in place.

> DO NOT SLAM THE MAGAZINE.
> You will burr the magazine gears.

6. Slide the mag SAFETY LOCK to the LOCK position.

The Aaton LTR uses an on board battery, which frees you from cables and battery belts. Each on-board battery will run about five 400' magazines at room temperature. (Six mags on more recent models.)

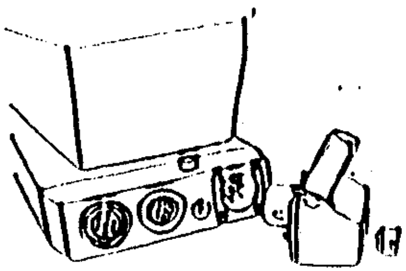


4 pin cannon XLR receptacle

Heavier on board packs are available. You can shoot more film per unit, but you have to carry more weight around.

Cine 60 modifies LTR batteries to run about 10 mags.

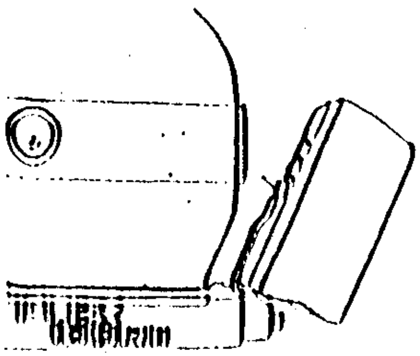
[illegible] Power Products makes their own on board units to run about 15 mags.



2 Attach the battery adapter to the four pin Cannon XLR receptacle at the back of the camera. Finger tighten the slotted screw. It will loosen in time, with use, so check it occasionally.

3 Slide battery onto the square plug. Slide straight up or down. NEVER wiggle battery from side to side. You'll crack the socket.

> Sometimes, this plug gets tight. Lubricate with an electrical contact restorer such as Miller-Stephenson Contact Re-New or CRC 2-26. Ordinary lubricants will gum up the electrical connection, so do NOT use WD-40 or CRC 5-56 here.



4 Later, when you attach a magazine, the battery pivots against the mag, and is held in place with a magnet. DO NOT SLAM the battery against the magazine. While it does give off a satisfying and efficient sound, you might break the battery's plastic case.

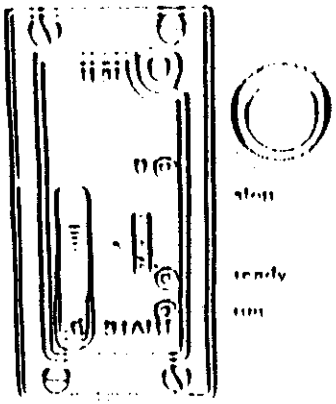
E. Check Camera Switches

The MAIN CAMERA SWITCH is on the forward left (dovetailed) side. In the UP position, the camera is OFF. In the MIDDLE position, the camera is READY and the light metering circuit is on; auto iris lenses are stopped down to their preset aperture. In the DOWN position, the camera runs.

But before turning the camera on, get in the habit of pushing the red TEST BUTTON for a few seconds. The motor will make a low groaning sound (which is normal.) Whenever you put a magazine on the camera, push the TEST button - it will gently engage the pull down claw into the film sprockets. If you turn the camera on at regular speed without running the TEST button (or manually inching) you risk damaging a perf.

Now, switch the camera ON. It will run at crystal speed. If you have a strobe or crystal checker you can check speed now.

Type 1

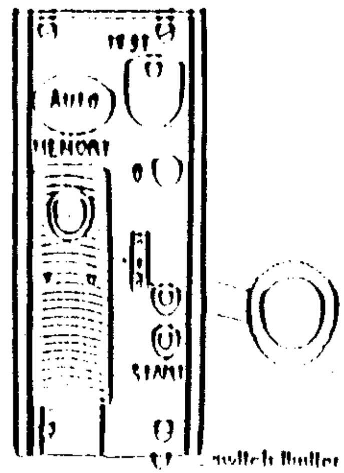


• Type 1

The Plastic Slide Cover on older models can be pushed up to reveal a metal tab, which can be moved up or down with a skewer or pen. In the down position, all switch functions are normal. However, if you switch the camera to READY, and then slide the metal tab up, you will not be able to switch the camera to OFF. This device is sometimes used in fast paced, documentary shooting when you want rapid starts and stops with the handgrip trigger (coming up in the next section).

Reminder - turn the camera OFF at the end of the day. The READY position will drain a battery.

Type 2



• Type 2

New model cameras don't have a plastic slide cover. The Switch Limiter is located below the main switch, and can be moved with your finger nail - back is normal, forward is limiting.

with film loaded, you will hear the sprocket click in with a definitive and satisfying click. Keep the TEST button on until you hear that click. Sometimes it takes a few cycles to engage.

Although the camera will run without first running the TEST button, you could damage a perf.

Remember - If you slam the magazine onto the body, you could punch an extra, unwanted perf in the film. So, gently attach mag to camera.

> IMPORTANT:
>
> If your magazines are black, they are for the regular speed cameras (up to 75 fps)
>
> If the magazines are gray and black, and marked HIGHSPEED, they are for the Highspeed Cameras (up to 150 fps)
>
> You should not interchange them.
>
> DON'T USE REGULAR MAGAZINES ON HIGHSPEED CAMERAS: Your film might be out of focus. This is because regular magazines have a spring-loaded pressure plate. At high speed, the film can cause the pressure plate to breathe, and focus is lost.
>
> You may, however, use Highspeed Magazines on regular 8H cameras.

1. Check for Scratches

When checking out a camera, run a scratch test on each of the mags before the job.

You can use loaded magazines or test film.

Run about four feet of film with the take up side magazine door open. Inspect the film with a magnifying glass. There should be no visible scratches or abrasions.

The area between the sprockets may show marks. This is normal.

If you do find scratches, check all obvious sources: gate, pressure pad, loop size, etc.

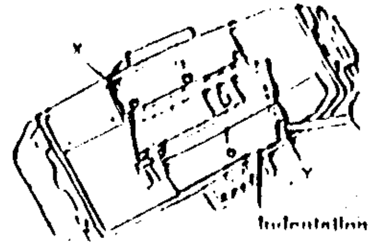
If no evidence at this point, you will have to remove magazine sprocket cover.

DO NOT REMOVE COVER WITHOUT [illegible] FIRST UNLOADING THE MAGAZINE

1. Use only the special AATON screwdriver, or a screwdriver with a long, thin, flat blade. Tapered head screwdrivers will burr the screws.

You can grind a tapered screwdriver down on a grinding wheel

2. The two screws (x,y) are on very tight, and painted with enamel. Turn counterclockwise. It will be tight at first; don't burr up the screw heads. Push down and turn. Then the screw will loosen freely.



The entire assembly will lift away to reveal sprockets and film channels. Emulsion or chips may be found there.

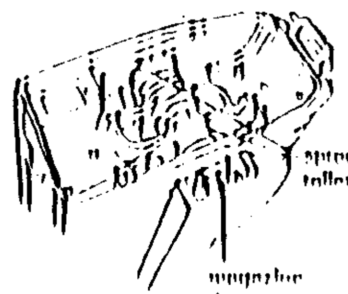
DO NOT blow the chips away with Dust Off - you'll just blow them into the mag. Pull the chips away with some double sided tape, camera tape or something sticky.

> Do not scrape anything with a METAL OBJECT.

Use wooden or plastic skewers or Kimwipes moistened with alcohol to remove any emulsion build up. After chips are gone, blow with Dust Off.

3. Replace cover - it will only go on one way (Indentation "I" on right). Wiggle cover around to be sure it is seated properly.

Remove flaked enamel from screws. Center cover. Insert screws. Tighten one, then the other. Last turn of screws will be tight - but don't force.



> Screw tightness does not affect image sharpness, and has no effect on pressure pad or fixed gap film channel.

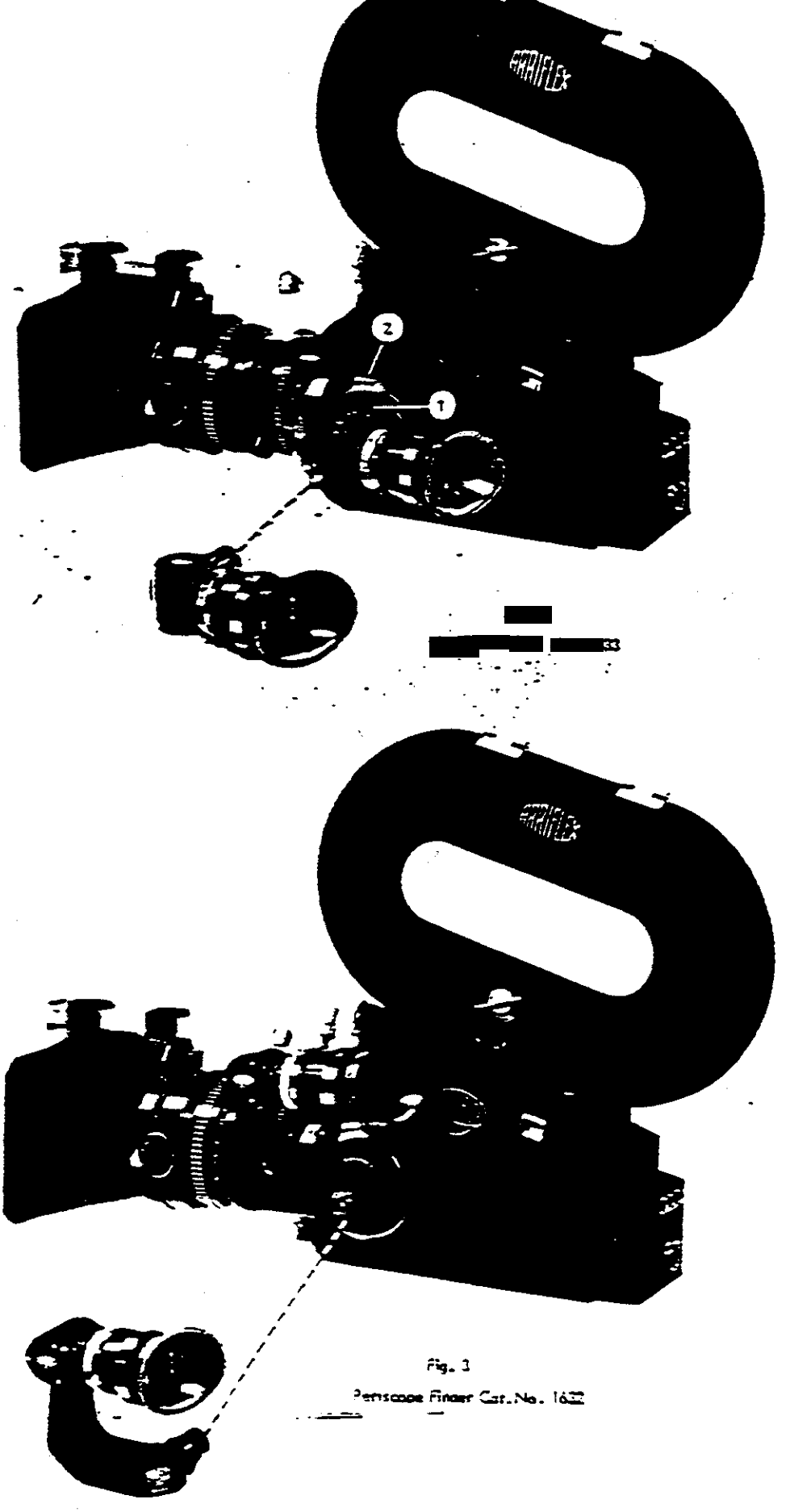


Fig. 3

Periscope Finder Cat. No. 1622

twisting motion, and another finder inserted by reversing this procedure. Care must be taken to ensure that the knurled ring is really turned right to the stop so that the nylon clamping jaws and the locking pin are completely retracted to prevent damage when changing finders.

When inserting the finder, it must be pushed in as far as it will go and the knurled ring firmly tightened in a clockwise direction. The finder is then turned to the operating position, where it will automatically snap into the locked position; the knurled ring should then be retightened.

One and the same eyepiece, which is removed in the usual way, can be used for both finders. This possibility of fitting both finders with one eyepiece simplifies interchanging. The most comfortable viewing position for the cameraman can be found by swivelling the eyepiece.

The glass element built into the camera door is part of the finder system. For occasional cleaning this element and its mount can be screwed out of the inside of the camera door. Replace carefully after cleaning.

In the course of redesigning the quick-change finder mounting, which, as already mentioned, forms an integral unit with the camera door lock, the door lock was also improved. In place of the former knurled locking ring, a knurled locking lug now makes opening the camera door easier.

In conclusion, we must emphasize that neither the periscope finder attachment nor the standard viewfinder should be used as a hold for carrying the camera.

5. The 400 ft. (120 m) BL magazine

Important! The magazines for the ARRIFLEX 16 BL and those for the ARRIFLEX 16 M are never to be used interchangeably, as besides raising the noise level this will damage the gears.

This quick-changing magazine with built-in feed and take-up mechanism holds 400 ft. (120 m) of film. If black-and-white film is used, film rolls with a total length of 500 ft. (150 m) can be used. In addition, this magazine is equipped to take 100 ft. (30 m) and 200 ft. (60 m) daylight-loading reels. Also available for the ARRIFLEX 16 BL is a 1200 ft. (360 m) double-compartment magazine (Cat. No. 1629), which is unblimped and should therefore be used in cases where long takes are expected and low noise level operation is not called for. The feed and take-up reels of this magazine are arranged side-by-side to make it relatively light and compact.

Magazine drive

The magazine is driven by the camera mechanism. It runs entirely on ball bearings. In order to reduce noise, metal gears have been matched with plastic ones.

Magazine throat

The feed and take-up sprockets in the throat of the magazine guarantee that the film loop in the interior of the camera remains at a constant length whether the camera is in forward or reverse drive. The magazine throat has a labyrinth-type film channel which acts as a light trap to keep out stray light. In this way, the use of velvet for the same purpose was avoided. The magazine throat cover can be removed for cleaning. The dovetail in the magazine housing serves to attach the magazine to the camera.

Film supply indicator

Located on the rear side of the magazine, the film supply indicator refers to black-and-white film. If colour film is used, the film supply can be estimated by subtracting 10% from the footage shown. The indicator is available with scales in metres or feet; these are interchangeable.

Film

The film must be wound with the emulsion side in on type 7 plastic cores. For 16 mm film perforated on one side only, use only type B winding. All international standard film cores with an inner diameter of 1" with slot or lug, and an external diameter of 2" may be used. The maximum capacity of 400 ft. (120 m) given by the manufacturer should never be exceeded, except for the above-mentioned case where 500 ft. (150 m) of black-and-white film is used in the 400 ft. (120 m) magazine.

It is advisable to practise the operation of the magazines in daylight with blank film. Later handling in the darkroom or changing bag will then prove easier.

A. Opening the magazines

First unlock the magazine lid by simultaneously pressing the arc-shaped safety spring and turning the lock from position Z to position A (C - O). The hinged lid of the 400 ft. (120 m) 3L magazine can then be opened.

B. Loading the magazines

Place the opened magazine and roll of film upon a level surface. Using scissors, cut at right angles through the centre of a perforation. The film is best inserted into the feed mechanism before the film roll is placed in the magazine. The film leader is inserted into the feed mechanism from the inside with care being taken to see that it engages parallel to the rear wall of the magazine and not at an angle. Gently turning the driving gear facilitates the travel of the film until it comes out of the left-hand film channel of the magazine throat.

The film roll is then slid onto the left-hand spindle. If cores with a slot are used, the drive lug of the core holder will engage automatically. If cores with a lug are used, make certain that the core is slid on with the lug in the slot of the film core holder. The film must be tightly wound and perfectly parallel to the core. The left-hand guide roller is laid against the film over-lapping both film edges. Before forming a loop, the leader is pulled out of the left-hand channel of the magazine throat and laid smoothly round the left outer edge of the magazine housing until the end of the film marches with the marking at the left-hand cover hinge. Excess film should be taken up again. After the exact length of the film loop (43 perforations) has been obtained in the aforementioned manner, the film leader is inserted from the outside into the right-hand channel of the magazine mouth to the take-up core. The sprocket in the channel is turned gently so that the inserted film is engaged, whereby one makes certain that the film loop remains the same size. If the loop is formed correctly, 40 to 41 perforations must remain visible.

The film leader is fastened to the collapsible take-up core with the clamping lever. The leader must be inserted into the slot of the core so that it lies straight. The right-hand tension roller is then laid against the film so that its profile fits over the film.

C. Daylight loading reels

If daylight loading reels are used, the film core holder and the collapsible film core must be removed by depressing the spring-mounted pins projecting from the centres of the spindles. The film tension rollers must be locked by pressing them together until they catch and then brought to the centre of the arc-shaped guide so that the daylight loading reels may turn freely. If the tension rollers are needed again for a normal core mounted film roll, they can be released by pressing them apart. The magazine and the daylight-loading reel are placed upon a level surface. The leader is cut properly and inserted into the feed mechanism until it comes out of the left-hand film channel of the magazine throat. The daylight-loading reel is then placed upon the left-hand spindle, turned gently until the square profile of the spindle marches with that of the reel and then shoved home. The film leader is measured to form a loop as previously described in section B, then inserted into the right-

hand film channel of the magazine throat from the outside. The leader is then threaded into the empty daylight-loading reel and secured with a few turns before sliding the reel into the right-hand take-up spindle in the magazine.

As the film supply indicator does not function during the use of daylight-loading reels, the film consumption must be read off the footage indicator on the camera.

D. Closing the magazines

The lid of the 400 ft. (120 m) BL magazine is shut and locked by turning the lock until the arc-shaped safety spring catches and makes the magazine light-proof.

E. Taking up film slack in the magazines

If the camera has been transported with a mounted magazine, or a new magazine is to be mounted, film in the magazine should be tightened before filming. The two knurled disks at the rear of the magazine (II/14) are pressed in and turned in the direction of the arrows until resistance of the film shows that the slack has been taken up, thus guaranteeing smooth operation of the camera.

F. Removing exposed film from the magazines

The clamping lever in the collapsible take-up core is released, freeing the film end and causing the diameter of the core to reduce considerably so that the film roll can be easily taken out. A normal plastic core is then placed into the film roll.

G. Attaching the film loop protector

To avoid possible damage to the film loop while the magazine is not mounted upon the camera, we recommend the use of the loop protector which can be quickly attached and detached at the throat of the magazine. To attach the loop protector the film is pressed gently against the magazine throat and the protector is slid over the film into the gap between the magazine throat and the retaining plate.

H. Mounting the magazines upon the camera

The magazine is placed with the rear end of its dovetail base (V/7) into the rear dovetail recess of the camera. To ensure correct meshing of the gears, gently rotate the camera gears with the inching knob (III/1) before carefully lowering the magazine at the front. Important! The inching knob must never be used while the camera motor is switched on! The knurled knob (II/1) of the open magazine lock is pressed home and turned clockwise to lock the magazine firmly.

I. Removing the magazines

The knurled knob (II/1) is turned counter-clockwise to the stop and drawn back. The magazine can then (provided that the film in the camera has been removed from the film gate) be lifted easily by tilting it backwards.

6. Camera Drive and Power Supply

The interchangeable motor has a general speed of 3000 rpm, no matter whether the governor controlled motor or a 50 cycle synchronous motor is used, i.e. whether the camera is operated at 25 or 24 fps. The frame speed difference between 25 and 24 fps is attained without an exchange of motors, by means of exchanging a pair of gears. When exchanging motors, the choice is between governor controlled or synchronous electric drive only. For 50 cycle pilot frequency with motors with 3000 rpm, the Pilotone generator is connected directly to the motor shaft, so that the pilot frequency stays at a constant 50 cycles, whether the camera is operated at 25 or 24 fps.

For countries with a standard frequency of 60 cycles, where a pilot frequency of 60 cycles and 24 fps are generally used; synchronous motors including 60 cycle Pilotone generator with 3600 rpm, as well as corresponding sets of gears are available for the camera because the motor speed is dependent on the current frequency. In countries with a standard frequency of 60 cycles, the pilot voltage with a frequency of 60 cycles is taken from the tachogenerator, with 60 cycle synchronous motors with 3600 rpm, as well as with DC motors with 3000 rps. When working with DC motors with 3000 rpm, one must be sure that the pair of gears for 24 fps is used.

The transistorized, governor-controlled DC motor is designed for a standard rated voltage of 12 volts. The ARRIFLEX 16 BL is usually driven from this motor, which is fed from a 12 V battery.

A control light (the middle one under the plexiglass cover (III/2) at the rear of the camera) serves as both a blink signal light for camera run and as a pilot voltage control.

As with all other ARRIFLEX camera types with governor controlled DC motor, the correct polarity of the supply voltage is important. The plugs on both ends of the connecting cable (V/20 and V/21) are so designed that they cannot be mistaken; therefore the cameraman need not pay attention to the polarity with the ARRIFLEX 16 BL, provided that the original ARRI connecting cable and the proper battery are used, and that the installation has not been interfered with.

A. Starting the camera

The camera can be switched on at three different points. When using the tripod or for hand-held shots without the pistol grip screwed into the tripod socket the front switch at the handgrip on the side of the camera is used. Upon being pressed this switch locks itself automatically for continuous filming. By pressing the switch again and releasing it, the camera is turned off. During newsreel shots with the shoulder support and handgrip or with the pistol grip alone, the camera is turned on by using the switch on the pistol grip in the same way as with other ARRIFLEX 16 cameras (the switch operates through the tripod socket). The ARRIFLEX 16 BL has two tripod sockets. The front one is best used for the pistol grip and shoulder support, whereas the socket at the

middle of the camera bottom is usually used for tripod shots although the pistol grip could also be screwed in and used to operate the camera from this socket. In addition, the camera can be switched on and off from the pan handle by the remote release. The necessary connection is situated underneath the camera handle.

B. The changing of the film speed between 24 and 25 f.p.s. is accomplished by exchanging the transfer gear (IV/1) and the motor pinion (IV/2) for others with a different number of teeth. To avoid error the transfer gears and motor pinions have been engraved as follows: 25 fps; 24 fps; 24 fps 60 ~ Sy (for 60 cycle synchronous motors with 3600 rpm). The plexiglass cover of the protruding gears is removed. The motor pinion (IV/2) which is centered upon the motor shaft is unscrewed (while the transfer gear is held fast to keep the motor shaft from turning) and then lifted off. Then the transfer gear is unscrewed (again, it must be held fast to keep the camera drive from being turned) and lifted off. The mounting and tightening of a new pair of gear wheels is accomplished in reverse order. As the drive motors for the ARRIFLEX 16 BL are rather strong, in case of jamming of the film transport the camera has a built-in overload protection in the form of a torque limiter located between the camera drive and the transfer wheel driven by the motor pinion.

C. To exchange the drive motor with another the following must be observed: the plexiglass guard for the protruding gears is removed. The sound-proof cover over the driving motor is attached to the camera housing with four screws. After these screws are removed the sound-proof cover can be lifted off. The driving motor is attached with three long, permanently mounted screws (IV/3). With the camera door open these screws can be easily loosened and the motor drawn out of its centering in the mounting plate whereby its connection releases itself automatically.

Installation of New Motor:
Remove motor pinion. Set motor in place without pinion and screw on; then set the motor pinion onto the motor shaft and secure it, thereby making sure not to damage the plastic teeth of the pinion.

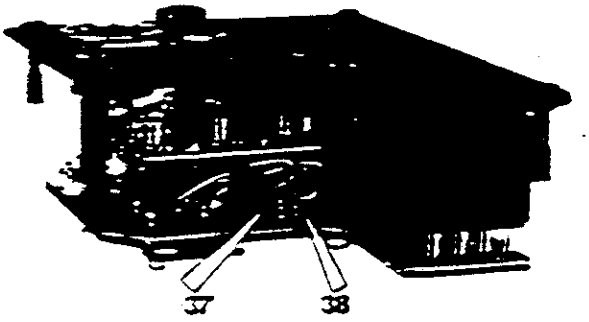
7. Pilotone and Start Marking System

The ARRIFLEX 16 BL Pilotone and start marking system is operationally similar to that of the other ARRIFLEX 16 cameras.

A two-pole Pilotone generator is connected directly to the motor shaft of the governor controlled motor or the 50 cycle synchronous motor. This has the advantage that in spite of change of frame frequency between 24 and 25 fps, the Pilotone frequency stays at a constant 50 cycles. The pilot voltage produced is led through the Pilotone conductor and a terminal strip to the connection unit at the camera rear.

This connection unit contains the automatic start marking system, the conventional 5-prong Pilotone socket (III/9) and, under a plexiglass cover, the control light for full frame exposure of the start marking system (left lamp). This unit is equipped for manual scene marking, if the 1000 cycle oscillator is built into the tape recorder. For older tape recorder models with transversal recording, we supply a 1000 cycle oscillator which can be built into the connection unit and which is push-button operated over a cable (socket III/10). A second control light is built in as a control for the edge marking light (right-hand light). The third control light (between the other two) serves as both a blink signal light for camera run and as a pilot voltage control.

With cameras equipped for 60 cycle Pilotone (Pilotone from tachogenerator), it is relatively easy to switch to 50 cycle Pilotone. Both wires (purple and brown) soldered onto the connection unit at points 37 and 38 must be reversed (see figure below and wiring diagram E 1/3/105/6 E). In addition, a motor with 3000 rpm must be used.



A. Changing the full frame exposure lamp (IV/4)

In contrast to other ARRIFLEX 16 types this lamp is changed in the camera interior (see Fig. IV) by gently pressing and swinging the leaf spring on the lamp socket to the front and carefully pulling the lamp upwards. As the lamp goes in deeply and is rather long, care must be taken that the lamp is not bent. The lamp is inserted by reversing the process. When changing this lamp the control lamp must also be exchanged as both lamps are matched as a pair. Before changing the control lamp the plexiglass cover must be removed.

B. Changing the lamp of the manual scene marking system

is just as easy. It is located underneath at the film gate (IV/5). The leaf spring is pressed downwards, the lever is tilted forwards and the lamp socket is drawn downwards. The control lamp for this must also be changed.

Fig. III

1 Locking knob
2 Zoom adjustment lever
3 Push button receiver
4 Zero reset for metre (footage) counter
5 Toggle switch for forward a. reverse operation (only up to camera Serial Number 51 200)
6 Removable toggle switch cover
7 Metre (footage) indicator
8 Power plug connection for camera motor
9 Connection for outer lens a. start marking system
10 Connection for manual scene marking system
11 Connection for eyepiece
12 Operation control lamp
13 Start marking system control lamp
14 Control lever for manual scene marking system
15 Tachometer (f.p.s.)

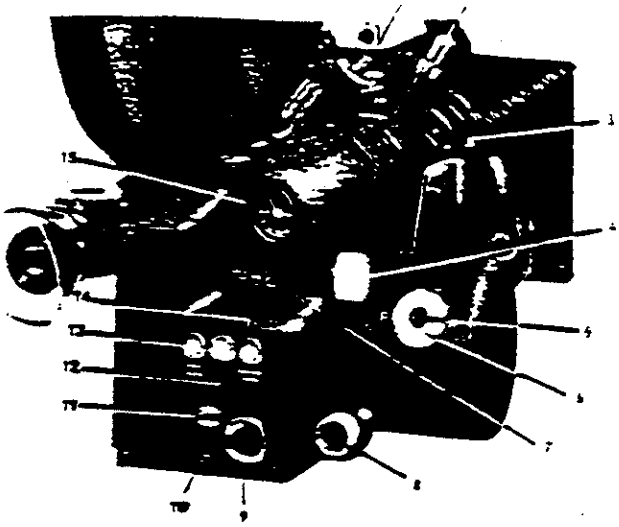
Fig. IV

1 Traveller gear
2 Motor pinion
3 Mounting screws for motor
4 Start marking lamp for automatic full frame exposure (exchangeable)
5 Manual scene marking lamp (edge marking exchangeable)
6 Ground glass with etched frame
7 Mounting screws for ground glass holder

Fig. V

1 Bellows frame
2 Lock for bellows
3 Filter door
4 Lens housing
5 One of the three locking lugs of the lens housing
6 Lens housing lock
7 Magazine mouth
8 Film channel
9 Filter holder
10 Plane glass or filter
11 Filter holder recess
12 Filter door lock
13 Locking lugs or lens
14 Slots in lens mount
15 Centering for lens housing
16 Push button to unlock lens
17 Mount for periscopic viewfinder
18 Periscopic viewfinder
19 Viewfinder eyepiece
20 Camera plug
21 Owrit battery plug

Fig. III



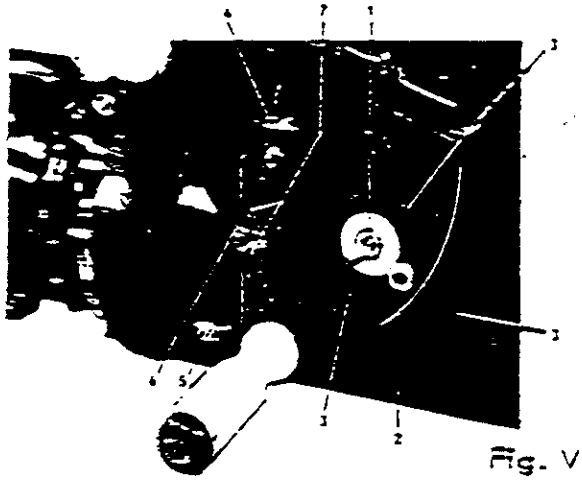


Fig. V

Fig. IV