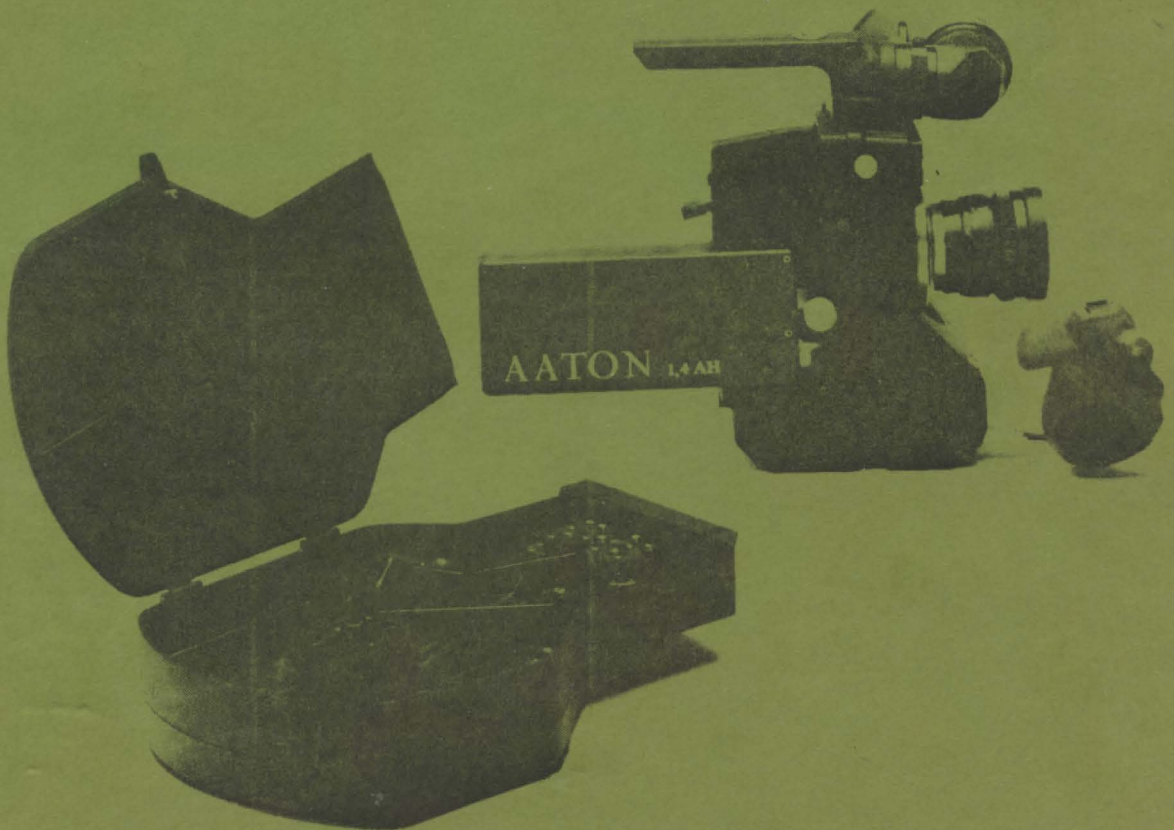


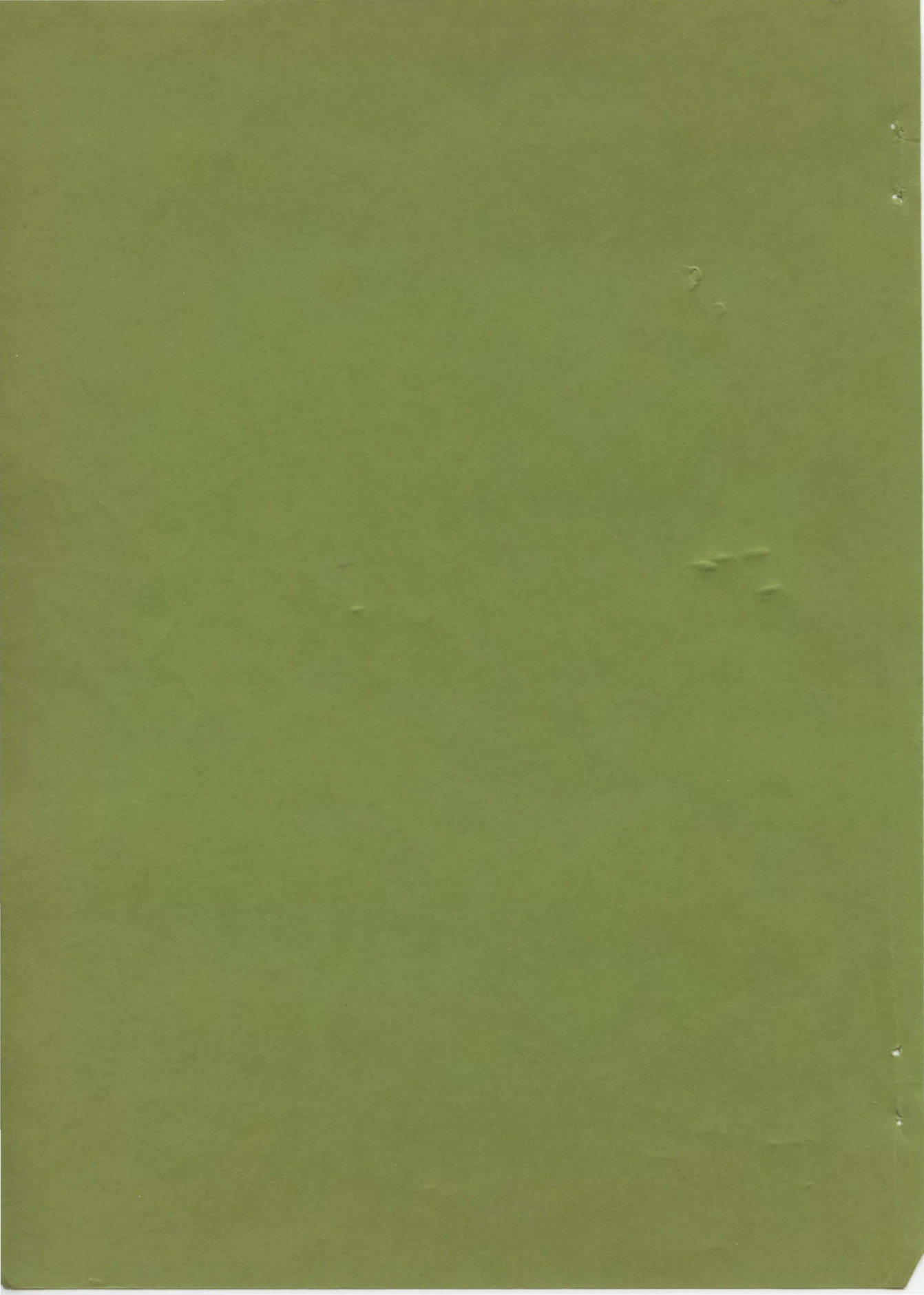
# AATON CAMERAS

D & ADUT 1981  
PROVISIONAL  
INSTRUCTIONS

Aaton 7 LTR  
Technicians' Man

June 1981 document N° 99 017 01 00





# Introduction

This instruction manual is meant to assist those technicians who have had some training on the Aaton 7LTR, and who are in possession of the Aaton tool kit. Why, then, is it supplied to camera owners who are not necessarily technicians and who do not normally even have the tool kit? The reason is simple: the day a cameraman is miles away from civilization, and an accident occurs (for example a walrus bumps him into an icy sea off the Siberian coast), he will, instructions or not, go about repairing the damage. How much more successful the operation will be if he has this manual in his bag of tricks.



The Aaton 7LTR is constructed in such a way that it can in crisis situations be taken apart and put back together again by a person who is otherwise inexperienced with the camera. (Some of the procedures described in the manual necessitate special Aaton tools: it is a good idea to have the tools around before going crazy with the Allen wrenches!)

The words of advice and warning in this manual are given so that the unsuspecting cameraman does not find himself in trouble when what he thought was a simple adjustment turns into a mishap.

Remember though, that unauthorized disassembly during the warranty period invalidates the camera guarantee.

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# Disassembly

The following instructions refer to parts as they are numbered in the booklet of exploded diagrams. (As a rule, the diagrams show individual part numbers only)

The operations described here are the progressive steps of opening up a camera; none of these operations in any way affect the camera's critical optical and mechanical settings.

When working on the camera, it is always advisable to work on a clean surface, away from dust and dirt (you've heard the refrain before!).

## Lateral housing (01.102.64)

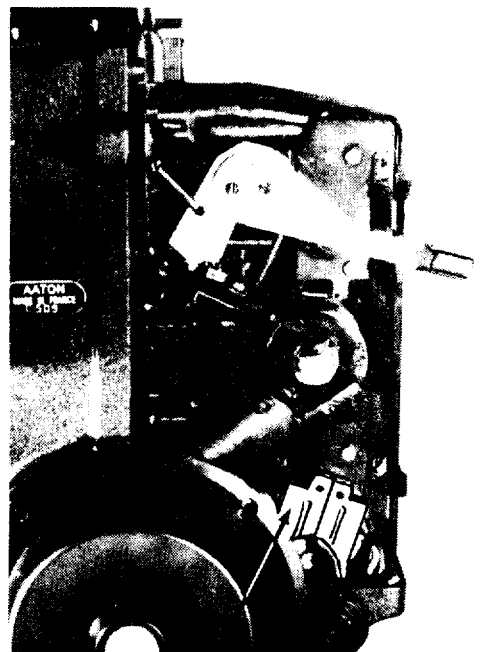
for access to: drive clutch assembly  
drive clutch extractor assembly  
magazine lock assembly

If baseplate, motor, or front housing are to be removed, the lateral housing must come off first, for reasons either of mechanical access or electronic connections.

### Remove

- the one CHc 2.5 x 8 screw on the motor ring (01.102.21) which is held by the lateral housing
- one CHc 4 x 10 screw at the rear of the baseplate
- one CHc 2.5 x 8 screw which holds the lateral housing to the body.

Note the position of the black (or red) Socopec motor connectors: tucked away back of the motor ring, and below the intermediary shaft. It is essential when re-assembling to tuck the connectors into the same position with the housing off, and to be certain the wires aren't pushed into the way of the intermediary shaft gear.



*Socopec connectors tucked away.*

## Baseplate

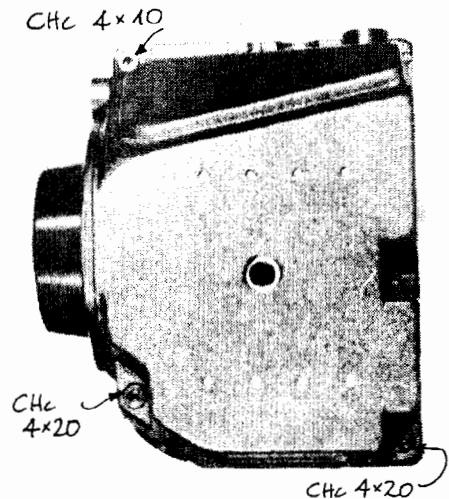
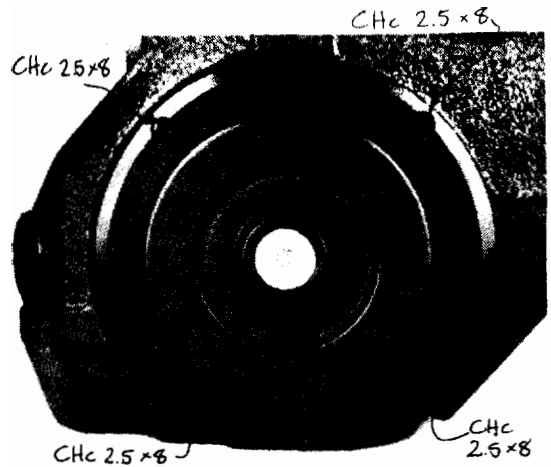
The baseplate contains the camera's electronic circuitry, and can be removed and replaced in a matter of minutes.

### Remove

- the 3 remaining CHc 2.5 x 8 screws on the motor ring
- the motor ring and foam rubber ring (01.102.22)
- the 2 remaining CHc 4 x 20 screws from the camera baseplate

Disconnect the black (or red) Socalpex motor connectors; to do so, slide your thumbnail or a screwdriver between the plugs so as to separate them without having to pull on the wires. Separate them entirely, then, by pulling on the plugs themselves.

Gently pull the baseplate slightly downwards, away from the camera body. You will see the green Socalpex connectors from baseplate to PBX battery holder: separate them as shown above, and the baseplate is now free.



## MOTOR

Lateral housing and baseplate must be removed first; thus the screws, motor ring and foam ring are already out of the way, and the motor can gently be pulled out of its cradle.

## VIEWFINDER

Remove the four CHc 3 x 6 screws. You will note, as you lift the viewfinder away from the camera body, that there is a small positioning slot (part n° 03.610.18) on one side of the finder. Put it aside carefully, remembering that it provides Super 16 centering when placed on the battery side, and standard 16 mm centering on the motor side.

## HOUSING

For access to: claw movement  
mirror shutter  
viewing screen  
lens holder  
video relay optics

This operation is carried out after lateral housing, baseplate, motor ring and viewfinder have been removed. The motor can be left on the bared camera body, which makes it possible to run the camera open for observation or adjustments.

### Remove

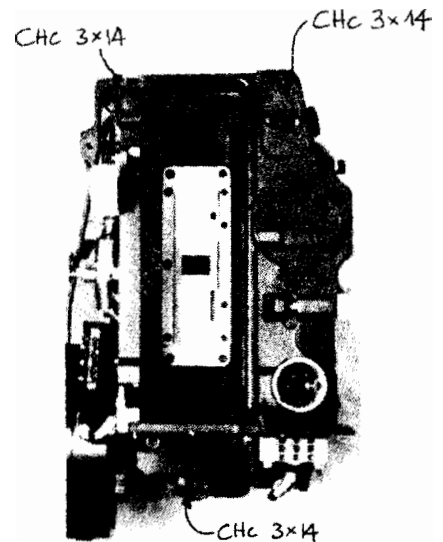
- the lens port cover (01.112.30), should it be in place
- the lens lock-in ring (01.112.09) by removing the CHc 2.5 x 3 screw and lever (01.112.08), and unscrewing the lock-in ring.

Make sure the mirror shutter is in viewing position (the middle of the mirror blocking the film gate).

Unscrew the three CHc 3 x 14 screws holding the housing onto the central chassis. You will note that the one at the top of the PBX battery holder is simply loosened, and remains attached to the PBX.

Disconnect the black Socapex connectors on the flying buttress (01.101.16; in fact it is a brace; we chose the term flying buttress for fun!). There is not much space up in there, so this is a little "fiddly"; as usual, use a screwdriver to separate the two connectors. Gently pull the body housing away from the chassis, paying careful attention to the mirror shutter (and exposure meter circuits above the lens holder).

Note the O-ring on the lens side of the central chassis where the lower CHc 3 x 14 screw was removed; don't lose it! On the other CHc 3 x 14 screw, the O-ring is on the magazine side of the central chassis, and hidden by an insert.



## The PBX battery holder

The PBX does not normally need to be removed from the central chassis. (For removal to replace a LED for example, see p.24).

# Re-assembly

## Housing

Place the mirror shutter in viewing position, and lay the body on its "back", lens port upwards.

Delicately fit the front housing onto the central chassis making sure there is a small amount of play between the two. Check that the rubber ring on the lens mount (01.112.23) is not pinched.

If you are right handed, now take the camera into your left hand with the lens port in the palm of your hand.

Screw down the three CHc 3 x 14 screws, making sure neither of the O-rings have slipped away. Place the lens port cover (01.112.30) onto the steel lens holder ring, with one of the three lugs between the two pins (01.112.30). Screw the lock-in ring onto the steel lens holder ring; it is in the correct position when you cannot tighten it any farther. Re-install lever 01.112.08.

## Motor

With the motor connected electrically (but not mechanically), run it for a few seconds and stop it; it will stop automatically in "viewing" position.

Position the drive shaft pins (01.132.62) parallel to the lower motor support bar (01.110.53), making sure that the mirror is in viewing position (i.e. barring the gate).

Approach the motor to its holder (01.110.28), with the braid of wires and connector at 2 to 3 o'clock position. Gently slide the motor into the holder; do not force, otherwise



the pins will not enter the openings on the rubber coupling correctly.

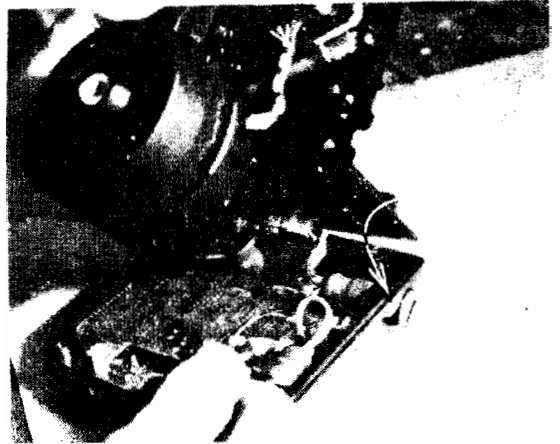
The motor rings will be re-installed once the baseplate and lateral housing have been re-assembled.

### Baseplate

Operation to be carried out after body and motor have been re-installed.

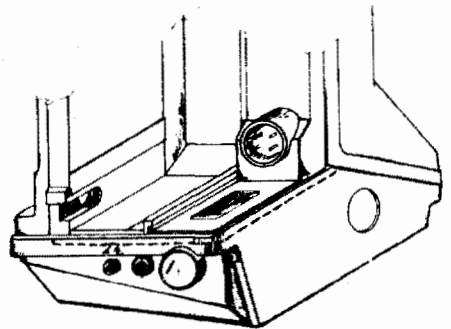
Connect the single black Socapex plug to its partner on the flying buttress (01.101.06). This is rather awkward because of the tight quarters.

Connect the green Socapex plugs and bring the body towards the baseplate as if they were on a hinge along the battery side. As you bring the body down towards the motor, make sure the wires to the variable speed knob at the rear of the baseplate are not pinched. The black (or red) motor connectors will be connected later, and should be guided out towards the motor.



Insert the two CHC 4 x 20 screws fixing the baseplate to the front housing.

There should be no metal contact between the rear of the baseplate and the magazine guide and PBX battery holder. (See dotted line on diagram.)



### Lateral housing

The black (or red) Socapex connectors should now be connected and carefully tucked into position below the lateral shaft - see dis-assembly instructions.

Now the foam rubber and motor ring can be fixed into position. Note the indentation on the foam ring: it should be lined up with the corresponding salience on the motor. The flat external surface on the motor ring corresponds to the lower surface of the base plate.

## Viewfinder

When replacing the viewfinder on the camera, never use screws any longer than CHc 3 x 6: any longer and they will damage the upper electronic circuits of the exposuremeter. .

The centering slot (03.610.18) should be positioned appropriately: battery side for Super 16, motor side for standard 16 mm.

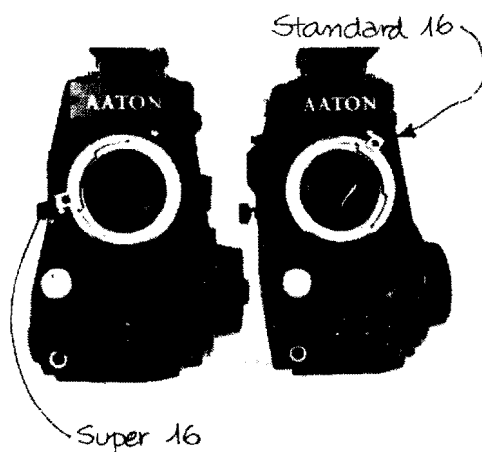
It is a good idea to check once the camera has been totally re-assembled that it actually runs (i.e. no pinched wires, etc.)!

## Super 16

To transform an Aaton LTR from standard 16 mm to Super 16, the following adjustments must be made:

1. change viewfinder centering on slot 03.610.18 (see above)
2. install S-16 viewing screen (see p.16)
3. change optical lens centre (see p.10)
4. install S-16 aperture plate (see p.37)

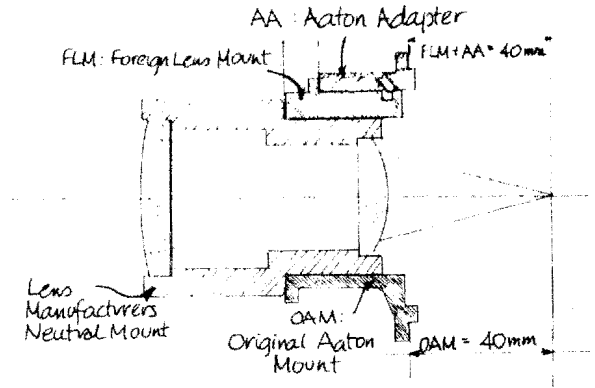
This is a workshop operation which necessitates the use of Aaton jigs and tools, and should be followed by a collimation check.



## Lens Mount

Check the flange focal distance\* of the lens fitted with its adaptor and/or mount (e.g. lens with "Foreign" lens mount - Arri, Eclair, or Nikon - plus Aaton Adapter; or lens with Original Aaton Mount).

\*using a Richter focal plane micrometer and Aaton Camera focus standard, or equivalent.



To eliminate any added risk of inaccuracy due to the addition of three tolerances (lens manufacturer's neutral mount plus FLM + AA), it is advisable to eliminate both FLM and AA definitively, and to replace an Original Aaton Mount on the Lens manufacturer's neutral mount.\*\*

## Lens Centering

Without opening the camera, the optical center can be set for Super 16 by repositioning the steel holder ring (n° 01.112.18): refer to tool 73, p. 10.

There should always be a certain amount of play between the holder ring and the lock ring.

\*\*For Angenieux 9.5 to 57, order parts n° 101867 and 40733, and for 10 to 150 or 12-120, parts n° 101867 and 40731.

**TOOL 73: lens holder centering**

**Object:**

Ensuring optical centering of the steel lens holder ring (standard 16 mm and Super 16);

Changing the optical center from 16 mm to Super 16.

**Parts:**

- Centering device 73A, with two openings corresponding to the locating pins on the steel holder ring, and a central opening for the gauge.
- A gauge, 73B, one end of which is milled to the size of the 16 mm aperture, the other end being Super 16 format.

**Use:**

The mirror shutter must be out of the aperture area.

The lever and lock ring (01.112.09) are removed.

The three CHc 5 x 10 screws are removed,

as is the steel ring (01.112.10). If standard 16 mm centering is being set, the two locating pins on the steel ring should be at 11 and 1 o'clock. If Super 16 is being set, they should be at 7 and 9 o'clock.

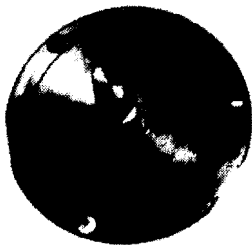
Place the steel ring onto the aluminium holder in the appropriate position for 16 mm or Super 16, and screw the three CHc 2.5 x 10 screws in loosely.

Place the jig over the steel ring which is loosely screwed down to the aluminium holder, so that the two small openings in it fit over the two positioning pins.

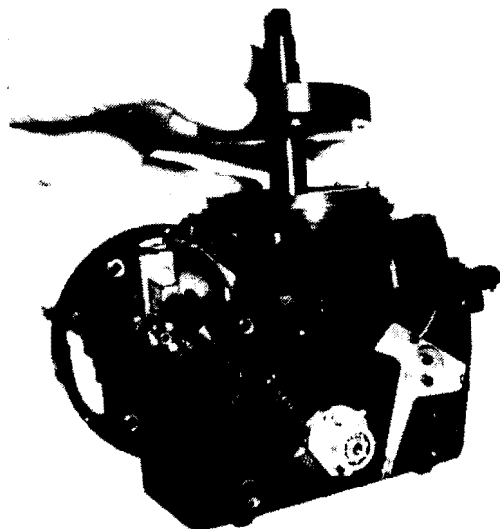
Insert the gauge through the center of the jig:

- so that the 16 mm format end goes into the aperture plate of the camera, or
- so that the Super 16 mm format end goes into the aperture plate of the camera.

With the gauge through the gate, tighten the three CHc 2.5 x 10 screws into position.



tool 73



using tool 73

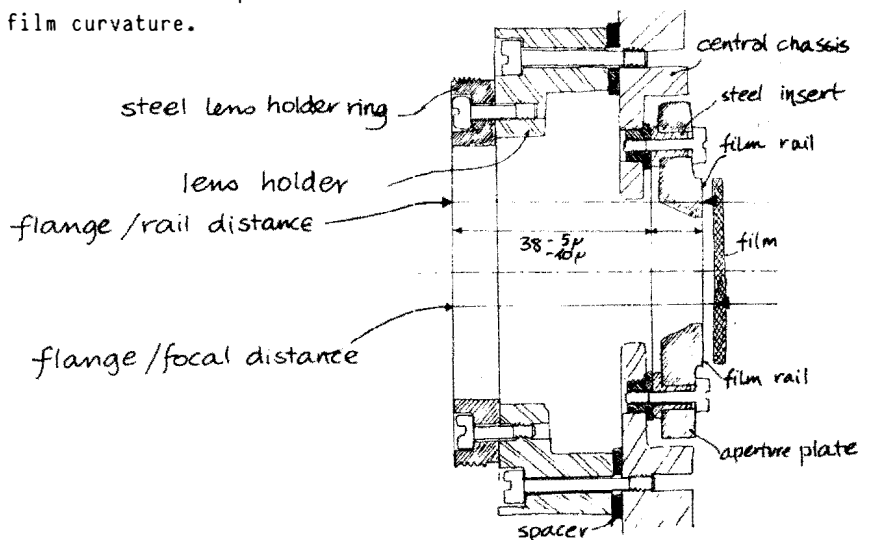
# Flange Focal Distance

## Very Important Preliminaries

The Flange / Focal distance (i.e. from the lens reference surface on the steel holder ring to the film emulsion or viewing screen where the image is formed, with the film running) is 40 mm on Aaton cameras. See diagram.

## Do not confuse

the F/F distance with the Flange / Rail distance (from the lens reference surface on the steel holder ring to the film rails on the aperture plate (not the guide bars, but simply the raised and more highly polished surface on the aperture plate itself), which is shorter, taking into account the air gap between the film and the aperture gate rails, and film curvature.



In the Aaton camera, this Flange / Rail distance is  $40 \text{ mm} \begin{smallmatrix} -8 \\ -17 \end{smallmatrix}$  (the sum of the  $38 \text{ mm} \begin{smallmatrix} -5 \\ -10 \end{smallmatrix}$  between the lens reference surface on the steel holder ring (01.112.18) and the four aperture plate inserts (01.110.54) on the central chassis + the  $2 \text{ mm} \begin{smallmatrix} -5 \\ -12 \end{smallmatrix}$  thickness of the aperture plate. To obtain this, see Lens Holder (p.13) for the  $38 \text{ mm} \begin{smallmatrix} -5 \\ -10 \end{smallmatrix}$ , and Aperture Plate (p.15) for the  $2 \text{ mm} \begin{smallmatrix} -5 \\ -10 \end{smallmatrix}$ .

TOOL 71: flange focal distance

Object:

Checking the flange focal distance on the Aaton 16 mm camera:

-8  
40 mm -17

Parts:

- 40 mm gauge ring 71A
- clock holder 71B
- Aaton lens mount 71C
- micrometer clock
- glass calibration block (one side polished, the other ground)

Use:

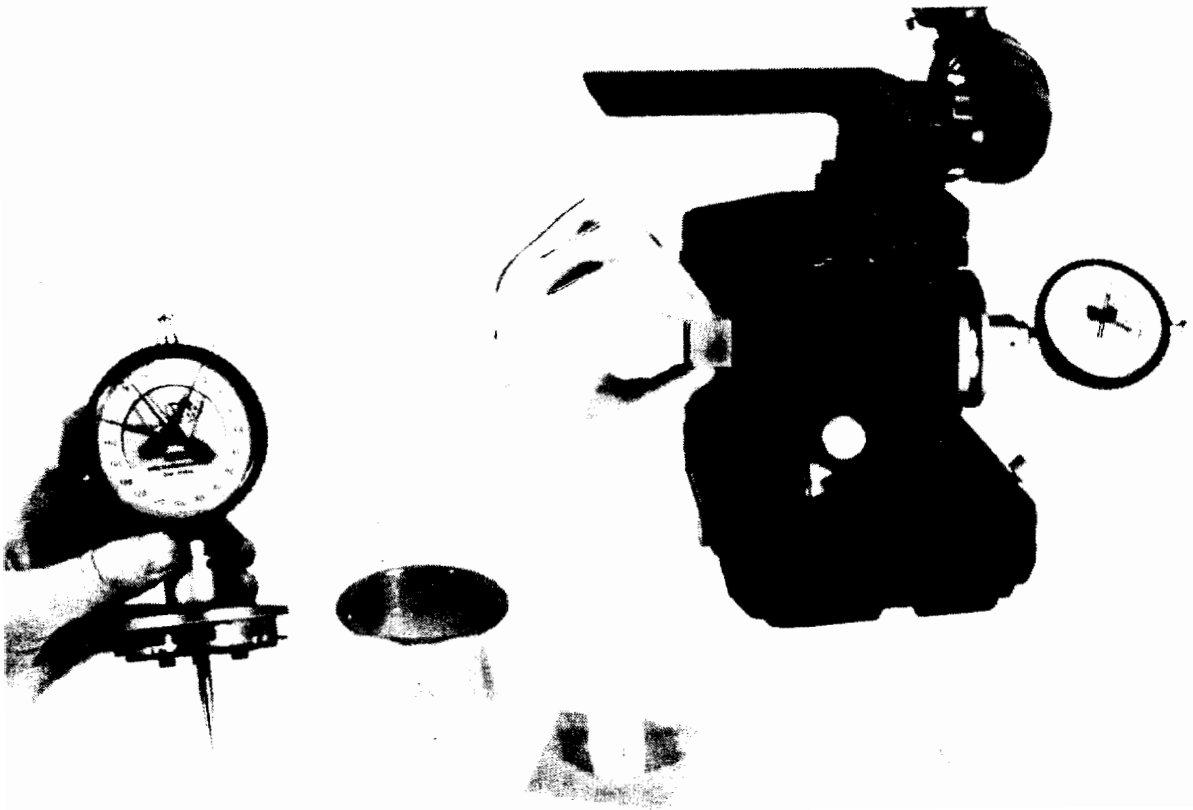
Set the micron clock to zero on a marble surface with the gauge ring. Move the reflex shutter out of viewing position.

Mount the jig onto the camera as if it were a lens.

Place the polished side of the glass block across the gate, holding it in place without applying pressure. Read the micron clock, which should show minus 8 to minus 17 microns.

Aaton cameras are set between 39.983 and 39.992 microns because collimation measurements made on cameras with film in motion during shooting show that between the aperture plate and the film there is a 10 micron air gap.

This procedure allows measurement at the center of the image only. This jig can also be used with an Eclair lens adaptor (flange focal depth: 48 mm). In this case, remove the lower part of the clock holder (three CHc 3 x 14 screws); the measurement is made over the whole surface of the gate.



## 1. Lens Holder

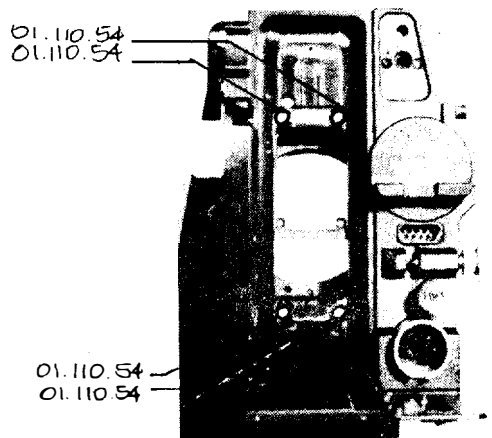
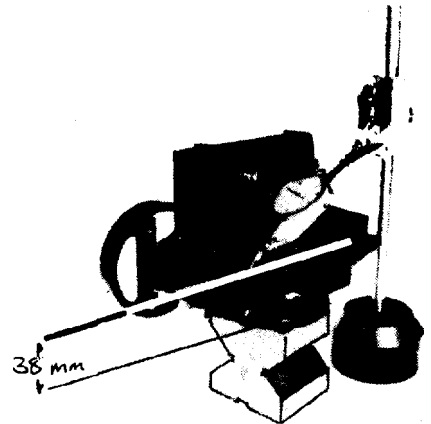
The lens holder assembly is removed when in-depth work on the mechanism is to be carried out, or when the beam splitter assembly is worked upon. It consists of a steel lock ring (01.112.09), a steel holder ring (01.112.08), a rubber gasket (01.112.23), and an aluminium holder with four feet (01.112.21); see exploded diagram p. 19. The exposure meter circuitry and photocells are fixed onto this holder.

Check that the distance between the lens reference surface on the steel holder ring (01.110.18) and the four aperture plate reference inserts (01.110.54) is  $38 \text{ mm} \pm 0.10$ . This is done using a V-block on a marble slab. If this tolerance has been lost for any reason, check first that there are no dust particles between the steel holder ring and the lens holder port. The washers (01.112.28) between the lens holder and the central chassis may provide the solution to loss of tolerance here:

- are they clean?
- if the camera has received a violent blow on the lens, they may have become embedded in the central chassis. If such is the case, they should be removed and replaced with thicker or thinner ones as required.

The lens holder is dismantled by removing the upper two CHc 4 x 25 screws from the front of the central chassis, and the lower two CHc 4 x 10 from the rear.

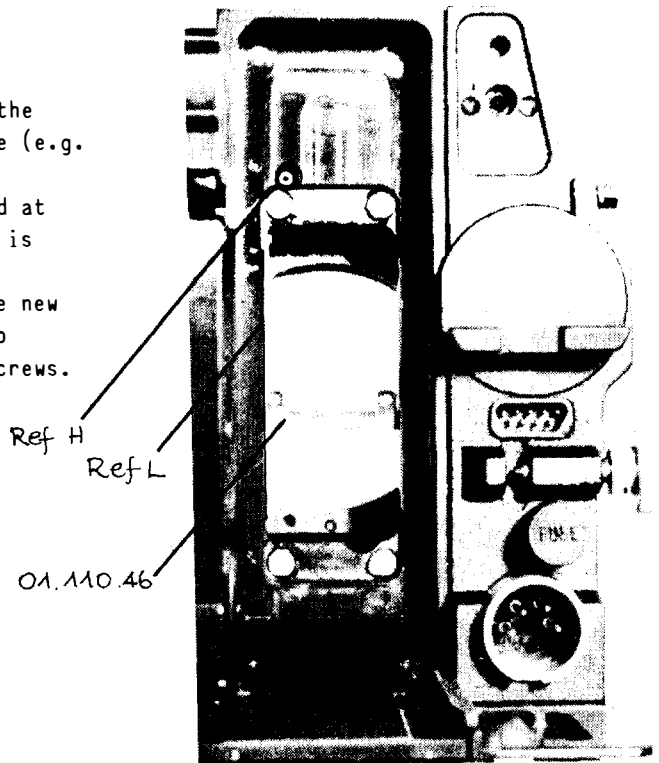
Be sure, when removing the lens holder assembly, to swing the mirror down out of viewing position before proceeding. As the lens holder is pinned to the central chassis, it takes a little effort to pull it outwards, and when it comes free, any inopportune movement could mean mirror disaster. The position of the exposure meter diodes is another reason to have the mirror down below: they would otherwise be caught by the mirror as the lens holder assembly was removed.



## 2. Aperture (see also pp. 36-38)

The aperture plate may be removed from the camera in order to install another plate (e.g. Super 16).

- Remove the four TC 2 x 4 screws placed at the corners of the aperture plate; it is now free.
- Check that the contact surfaces of the new aperture plate are clean, put it into position, and loosely install the 4 screws.



Given that the plate no longer has positioning pins, correct positioning is obtained by the tolerancing of the aperture plate itself ("REF" engraved on the back) and of the horizontal and vertical positioning surfaces on the central chassis (Ref H and Ref L).

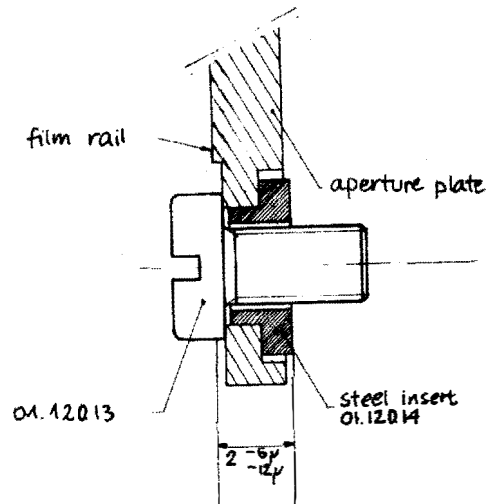
When positioning a REF aperture plate, maintain pressure with thumb and forefinger in direction F1 as shown opposite, ensuring flush contact along Ref L and on Ref H. With this combination of pressure leftwards and upwards, the four TC 2 x 4 screws can be tightened down.

Aaton 7c cameras have across their aperture plate a small transversal bar (ref: 01.110.43 or 01.110.46) with one or two Hc 2 x 3 screws which serve as an abutment, protecting the flange / rail distance from the aggressions of the magazine being banged on the camera. It remains in place when the aperture plate is removed. The main function of these screws then, is that of a support, a simple contact surface set at the factory. In addition, they can if necessary be adjusted to correct



the final microns on either side of the gate in establishing correct flange focal distance, though this is not always necessary. Given their position, they can only increase FFD which is too short, and not the opposite. If, when installing a new aperture plate, you find that the FFD is too great, it may be that these screws are pressing on the plate, and should be unscrewed to the point of correct FFD and straight contact rather than pressure. These adjustments can be made through the lens port without opening the camera body.

The aperture plate is  $2\text{ mm } \begin{smallmatrix} -5 \\ -12 \end{smallmatrix}$  thick, measured at the four corners of the gate from the exterior surface of the steel inserts below and the film rails above (see diagram).



## Viewfinder

The viewfinder itself does not usually occasion disassembly or maintenance work. Here are a few general remarks related to the finder.

An independent part of the camera, it is fixed to the camera body with four CHc 3 x 6 screws: they should not be longer than this, otherwise they will extend into the exposuremeter circuitry, and cause problems.

The C model of the 7LTR has a viewfinder centering slot (03.610.18) positioned on battery side for Super 16, motor side for standard 16. Be sure to re-install it when putting a new viewfinder on the camera.

If, in an automatic erect image finder, the frame is not perfectly centered, two checks should be made:

- Make sure the 16/Super 16 centering slot (03.610.18) is in fact in the correct position for the chosen lens centering
- Swing the eyepiece around 360°; this may correct any slight offset.

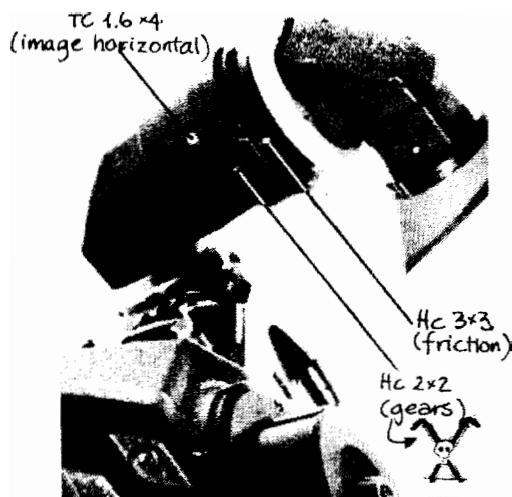
The eyepiece friction can be adjusted as follows:

- With an Allen wrench, loosen the Hc 3 x 3 blocking screw.
- Insert the Allen wrench into the opening at 90° from the blocking screw and, holding the rest of the viewfinder immobile, gently turn the friction ring (03.631.09) until the desired friction is obtained. **Be certain that you have unscrewed the Hc 3 x 3 screw on friction ring 03.631.09 (and not the Hc 2 x 2 screw on gear retainer ring 01.631.07, which releases and tightens the gears);** otherwise you could cause gear damage by forcing.
- Tighten the Hc 3 X 3, and swing the eyepiece around to see if you are satisfied with the friction: you should not feel the gear movement in your fingers.

The friction adjustment should be a firm movement but **by no means** should it require force.

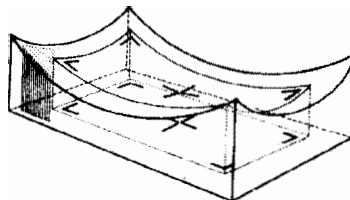
The TC 1.6 x 4 screw on the underside of the viewfinder is used to adjust the horizontal position of the image in the viewing screen.

The eyepiece shutter of the viewfinder (03.643.10) should be fixed down tightly enough so that it does not slide open or closed on its own. You may wish to install it with the knob towards the top rather than below (i.e. 180° from its "traditional" position): this will protect it from blows.



## Viewing Screen

You may observe a certain number of blemishes on the Aaton fiber optic viewing screen. The spherical aberration correction necessary here requires a thick fiber screen, which fiber optics technology has great difficulty in producing blemish free. This explains the small dots you see, which are in fact air bubbles. Though the dots can be an apparent source of annoyance, they are the price that has to be paid for the extraordinary acuteness of viewing in the Aaton.



When collimating, the viewing screen may be moved vertically via an opening at the top of the camera body. Only the viewfinder need be removed for this operation. The opening is between the tapped holes for the viewfinder attachment onto the body, giving access to a spring mounted micrometric screw (CHc 2 x 12).

Insert an Allen key into this opening; turn counter clockwise, pressing downwards farther than the correct point as observed on the collimator; then turn clockwise to return to the correct position.

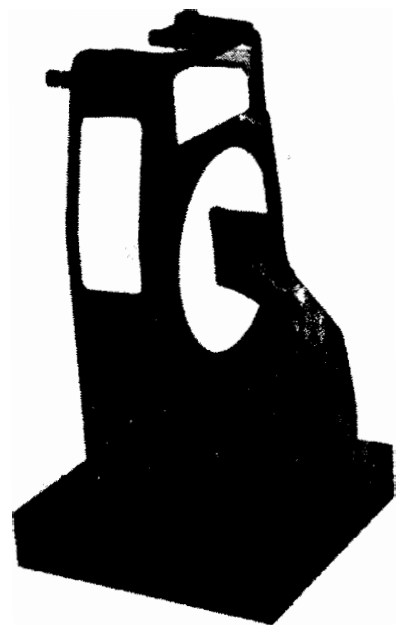
- When the correct position is attained (checked on the collimator), put a drop of varnish between 01.111.26 and 01.111.24 (see exploded diagram p. 20).



If the viewing screen is to be removed or changed, the front housing must be removed; however, the lens holder may be left in place.

- Move the reflex mirror out of viewing position
- Remove the two CHc 2.5 x 8 screws from the holder (01.111.26)
- Slide the screen assembly out, and replace it with the new one. Loosely insert the two CHc 2.5 x 8 screws - they will be tightened once lateral and longitudinal position have been set.
- Collimate (positioning the screen along the vertical axis as shown above).

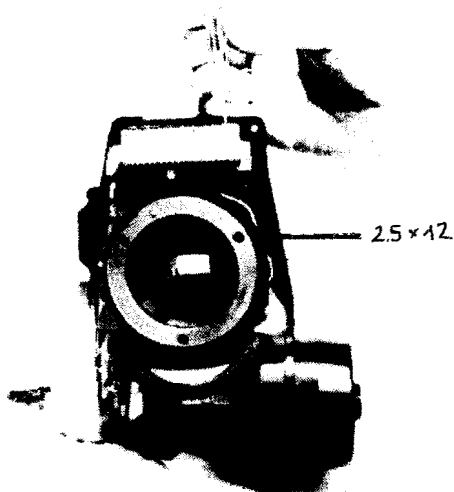
In order to carry out the final adjustments, install the Aaton "Open body housing" (tool n° 65) onto the body: it provides easy access to the necessary parts and allows the viewfinder to be fixed to the camera while the adjustments are being made.



tool 65

The viewing screen assembly can now be positioned laterally and longitudinally by inserting a long screw (2.5 x 12) into the tapped hole on the side of the assembly (see pic.). The two 2.5 x 8 screws should be just loose to make this adjustment.

1. Fit a lens on the camera (preferably short focal length: e.g. 25 mm). Position the camera body on a tripod, and swing the mirror out of viewing position. With a small piece of ground glass between the guide bars of the aperture plate and covering the gate, position the camera on the tripod so that the frame of the chart is positioned evenly over the gate area (a magnifying glass helps to "read" the piece of ground glass).
2. Now swing the mirror into viewing position, and look through the viewfinder. The frame lines of the chart should correspond evenly to the engravings on the viewing screen. If you have just installed a new screen, there's a fair chance that they won't correspond! But making them do so is easy: use the long 2.5 x 12 screw as a lever, and move the viewing screen assembly until the frame on the screen coincides evenly with the one on the chart.



Collimate again, just to confirm that everything is in order

If for any reason the fixed holder (01.111.24) has been moved, re-align it using a comparator to ensure absolute parallelism between the lower surface of 01.111.26 and the lower reference surface of the mirror shaft holder (spider: part 01.131.18).

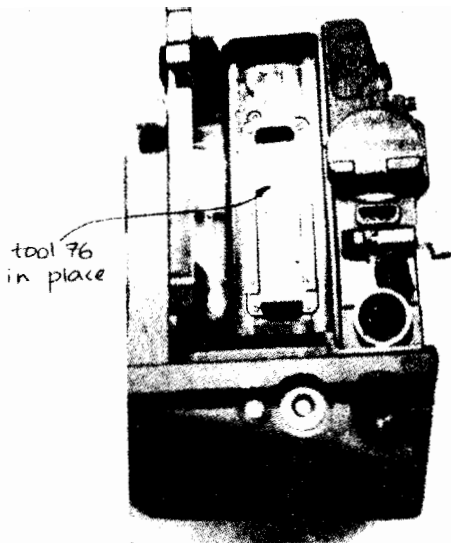
## Mirror

The mirror may occasion removal for replacement with another opening ratio (180°/180°; 187°/173°)

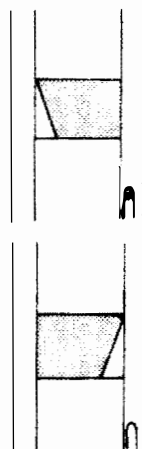
Remove the lens holder assembly (see p.13). Remove the four TC 2 x 4 screws that fix the mirror holding disc (01.131.44) down, and remove the mirror.

Before setting the new mirror, make sure the contact surfaces on both the mirror itself and the shaft head (01.131.17) are clean. The phase of the mirror position must be set in relation to the claw: the four screws that hold the mirror disc (01.131.44) should be screwed down, holding the new mirror loosely; this facilitates the fine positioning which is determined as follows:

- Put a piece of metal film (pitch: 7.62 mm) onto the aperture plate, ensuring that the claw enters a perforation. Place tool 76 ("ski") onto the metal film to maintain it flush against the aperture; put on a pair of magnifying binoculars, and bring the claw to its upper dead point. At the very moment before it starts pulling down the film, take the film off, and look through the gate. The mirror will appear something like this: \_\_\_\_\_



- put the film and ski back onto the plate, and carefully pull down another frame. At the lower dead point remove the film again, and the mirror as seen through the gate should appear in a position equivalent to the one observed at the upper dead point: e.g. \_\_\_\_\_



- When a position providing equal gate coverage by the mirror at upper and lower dead points has been obtained, tighten the four TC 2 x 4 screws.



The flatness of the mirror is checked by fixing it into a vice set at  $42^{\circ}30'$ , and measuring it with a comparator (a laser beam system may also be used to check flatness).

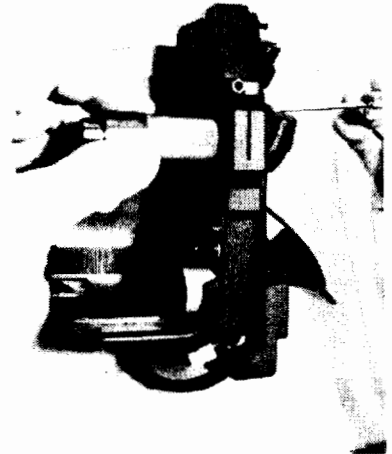
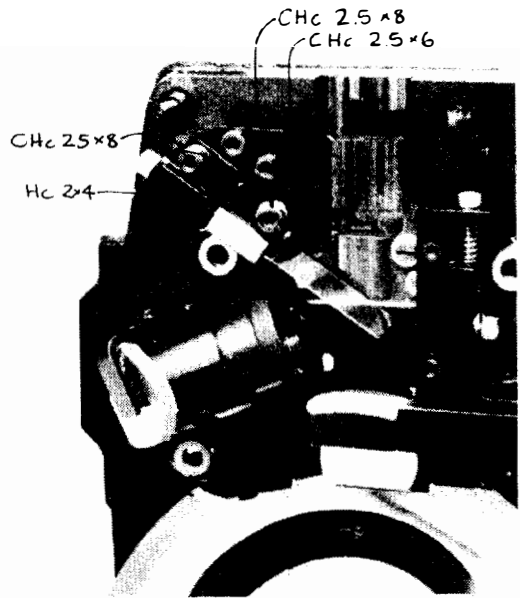
# Video Relay Optics

To set the retractable beam splitter in viewing position, the small cover (01.101.25) must be unscrewed, and an M3 Allen wrench inserted in the opening. Screw clockwise (about 30 turns) until the wrench blocks; then two turns clockwise to bring the pellicle back into the correct position. If the camera is open, check that the beam splitter holder is firmly grasped by the spring as it moves along the guide rail.

Is it necessary to remind you of the fragility of the beam splitter pellicle?

When working on the video relay optics, it is advisable to hold the central chassis in an orientable vice, gripping the lower magazine square. The lens holder assembly should be removed beforehand.

To adjust or replace the retractable beam splitter, use tool 168, plugged into the video camera well on the PBX battery/video holder, in order to align the pellicle correctly (see p. 21). The front housing and lens holder must be removed.



using tool 07

## TOOL 07: video relay lens centering

### Object:

Centering the video relay optics.  
Aligning the PBX video passage to the central chassis

### Parts:

14/15 mm diameter gauge

### Use:

Position the video relay lens block

(01.118.00) onto the front surface of the central chassis so that it is guided by the 2 x 4 pin.

From the rear, insert the 14/15 gauge, so that the 15 mm diameter coincides with that of the PBX and central chassis, and the 14 mm diameter with that of the relay lens block.

- Holding the gauge in position, insert the TC 2 x 4 screw, and tighten the assembly into position.

TOOL 168: beam splitter centering

Object:

Centering the beam splitter  
Checking framing of video image

Parts:

Small optical assembly with Amphenol connector (for centering), viewing screen engraving and diopter ring.

Use:

- With the beam splitter assembly mounted on the central chassis, and the relay optics fixed into position, insert the tool into the video camera well. The Amphenol connector ensures accurate positioning.
- Observe the frame on the tool: the object of the operation is for it to coincide with that of the viewing screen as transported by the beam splitter.

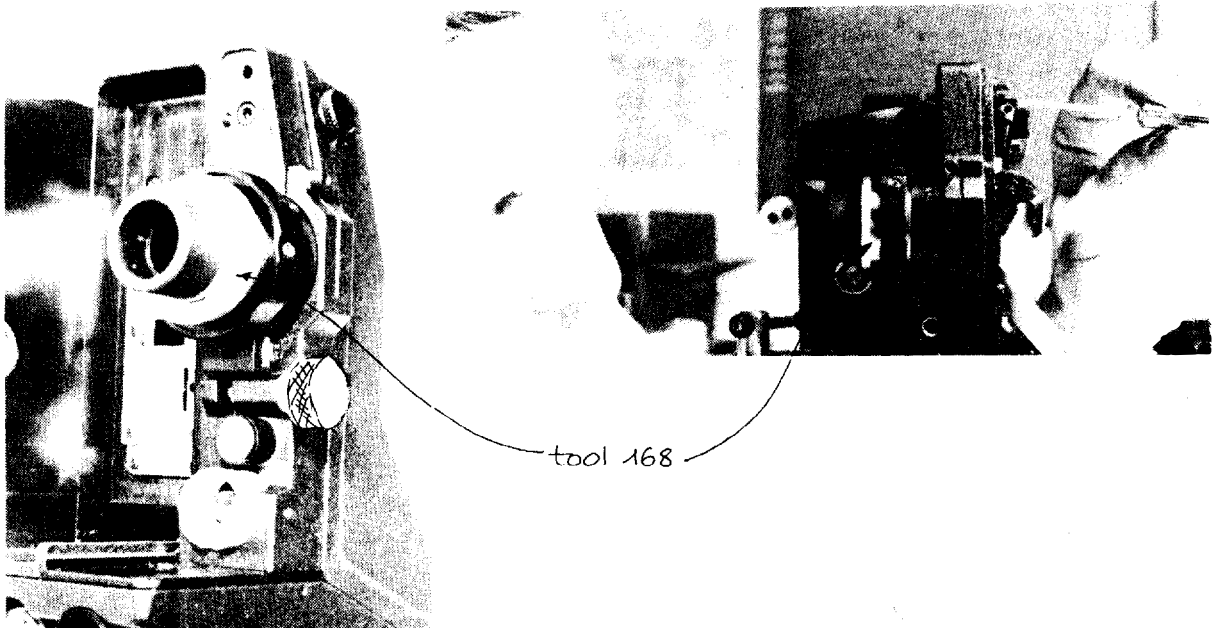
Left-right adjustment

- Loosen the two upper screws (one CHc 2.5 x 10, one CHc 2.5 x 6).
- With one finger, pivot the assembly until there is no trace of left/right oriented trapezoidal aspect; while doing this, make sure that the vertical movement keeps in line with the axis of the optical viewfinder.
- Tighten the screws down when the correct position has been found.

Up-down movement

- Loosen the two CHc 2.5 x 8 screws on spring washers. Then adjust either of the two small Hc 2 x 4 screws between the spring holder attachments until a close approximation of the desirable position is obtained.
- Tighten the 2.5 x 8 screws back down.

Before closing the camera, actuate the retraction system two or three times to be certain the beam splitter consistently returns to the correct position.



# Exposuremeter

The exposuremeter circuits and photocells can be removed and replaced.

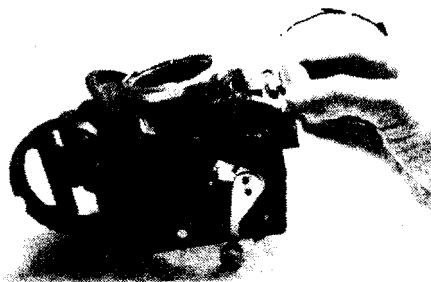
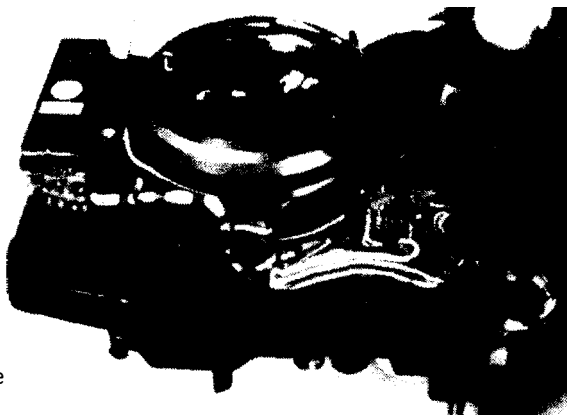
## Removal of exposuremeter

The camera is open to start with; the mirror should be in viewing position, so as to keep it out of harm's way.

If the camera is equipped with the retractable beam splitter, this will be a rather delicate operation. At all times the beam splitter pellicle should be in its non-viewing position.

A viable alternative when the camera is equipped with beamsplitter, is simply to remove the lens holder (see p. 13). The most dangerous steps below are thereby eliminated.

1. Remove the TC 2 x 4 screw on the lens holder, just above the electronic circuits, and free the tab attached to the wire braid.
2. Remove two screws holding the triple green Socapex connector onto the PBX: the triple\* green and single black connectors are now free. Remove the green exposuremeter connector from the stack.
3. The upper microprocessor circuitry is now to be removed. While holding the circuit boards up and against the inside surface of the lens holder, the two TC 2 x 4 screws holding them should be removed. Delicately lift the boards out, guiding the display as shown in picture. If the beam splitter gets broken, it generally happens here. Beware!!
4. Remove the TC 2 x 3 screw on the motor side of the lens holder, thus freeing the white wire.
5. Turn the mirror out of viewing position, and remove the CHc 2 x 12 screw on the motor side: this will release the photocell, which is removed downwards between the mirror ring and the lower lens holder leg.
6. Snip the small tab holding the white wire at 12 o'clock on the lens holder.



7. With the mirror positioned entirely on the motor side of the camera, remove the TC 2 x 4 screw holding the triangular circuits down. This will free the small tab holding the wire braid.
8. Loosen the TC 2 x 8 holding the lightweight metal plate to the mechanism cover (or to the central chassis on option T cameras); this will free the triangular circuits.
9. Remove the CHc 2 x 12 screw, thus freeing the other photocell, which is pulled downwards between the mirror ring and the lower lens holder leg.

For re-installation, the instructions above can be used in inverse order. From 9 to 5 there are no remarks; steps 4 and 3 merit special attention.

4. The white wire should have no slack between the screw and the photocell.
3. When repositioning the upper microprocessor circuits, guide the diode array so that it lines up with the top of the viewing screen. You will note as you set the upper circuits into place that the inner surface of the lens holder has two surface references: the large circuit board should be placed flush against the thickest part of the lens holder. This may require some careful "twiddling"; if it is against the thinner part the diode array will not be in the correct position, and it will be impossible to screw down the two TC 2 x 4 screws.

During all of this step, utmost attention should be paid to the beam splitter pellicle. Inadvertently, if the diode array does not line up perfectly parallel to the viewing screen, the array should be cambered into position on its lateral attachment. Parallelism should be ensured both laterally and vertically, taking into account the 5° offset of the viewing screen (in relation to the central chassis). The standard diode display reflected off the viewing screen silvering is positioned flush along the bottom of the viewing screen: the microdiode display is positioned flush along the bottom of the viewing screen.



Now, back through steps 2 and 1, and you're off.

If you are removing a 7b model exposuremeter and replacing it with the new microdiode model, remember that the microprocessor must be exchanged as well, since the programme for each is different.

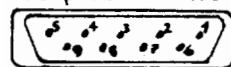
For notes on the sensitivity settings, see the user's Instruction Manual.

## PBX battery/video holder

The PBX is positioned more or less permanently at the factory, and does not normally need to be removed. If, however, it needs to be removed to replace a diode or repair a connector for example, the following notes may be useful.

- the front housing must be removed
- the PBX is fixed down at three points:
  - one CHc 3 x 14
  - one TC 3 x 6 (accessible from front of central chassis)
  - one TC 2 x 4 (attachment to lower magazine guide (01.110.63))
- The CHc 4 x 10 screw which holds down the lens holder must also be removed, since it protrudes slightly in the video camera well.

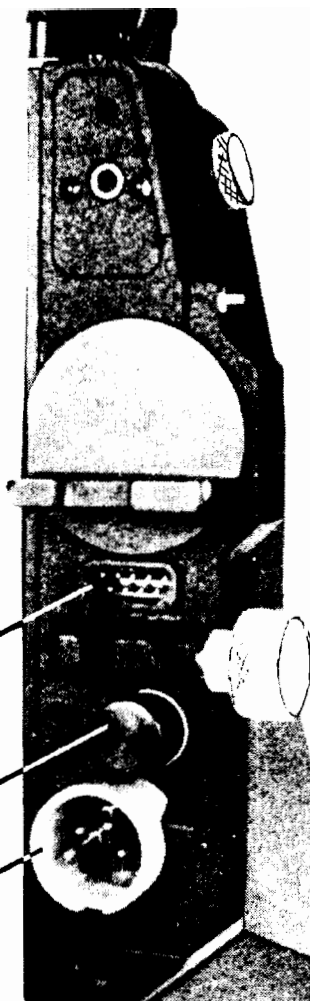
Amphenol connector



1. ground
2. TV sync
3. 2400 Hz
4. CTR II
5. +12v. battery
6. ground
7. n.a.
8. on/off
9. +12 v. battery

fuse

Cannon  
XLR  
4.42



When re-assembling...

Check the flatness of the PBX's inner surface on a marble slab and remove any saliences (dirt, protruding wires ...).

When the PBX is held up to the central chassis in its normal position, it should be freely in place, i.e. no sticking or forcing. It may be necessary to remove particles of the Silastic seal (using baltane or trichlorethylene) from the chassis to achieve this.

You will note at the top of the PBX that the CHc 3 x 14 screw is "locked" into place via the brass ground connection tab (01.171.18). Make sure it is in fact there before repositioning the PBX definitively. Do not forget this step. Otherwise you will have to open the PBX again; which is specially boring when you have just cleaned and prepared the surfaces, and have to start over again ...

Make sure the O-ring and insert are in position on the central chassis for the upper CHc 3 x 14 screw.

Spread a continuous thread of Silastic\* along the edge of the central chassis and the magazine guide.

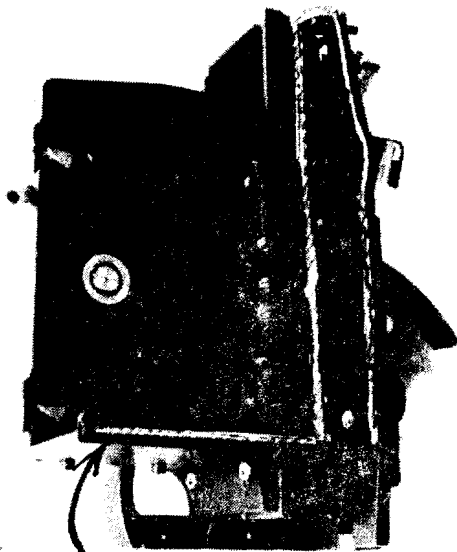
Set the PBX in position using tool n° 07 (p. 20) which ensures the alignment of the 15 mm video relay diameter on both PBX and central chassis (if this 15 mm tool is not available, a simple 15 mm gauge will do the trick). With the tool in position, screw down the PBX (at 3 points, see above).

Note the stacking order of the Socapex plugs fixed below the PBX:

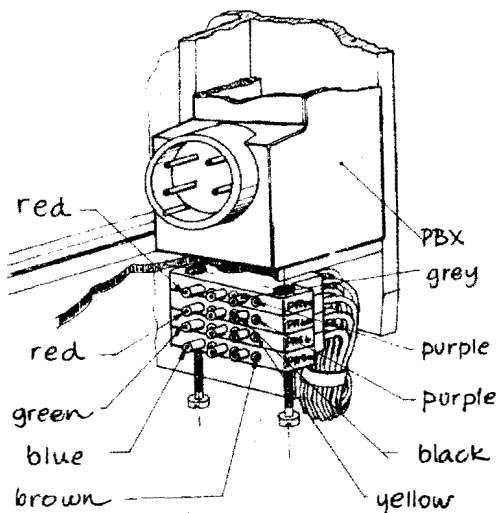
- bottom: photometer / warning LED
- middle: TV sync
- top: power

On Option I cameras, there is a fourth Socapex connector attached to the bottom of the above stack. It carries the Option I functions.

\*Dow Corning Silastic 732 RTV Adhesive sealant, or equivalent.



Silastic Sealant.



# Battery

In order to conform Aaton batteries made between 1972 and 1974 to the present standard, two simple operations:

- inverse the steel retainer so that the notch is on the side corresponding to the PBX
- on the Cannon connector, cut all connections to and from pin 3.

# Motor

The speed settings are now all on the rear of the camera baseplate: variable speed from 6 to 36 fps. The threaded opening below the "24" engraving contains an electrical contact which functions as follows:

- no conduction (i.e. no screw, or plastic screw): 25 fps
- conduction (i.e. metal screw): 24 fps.

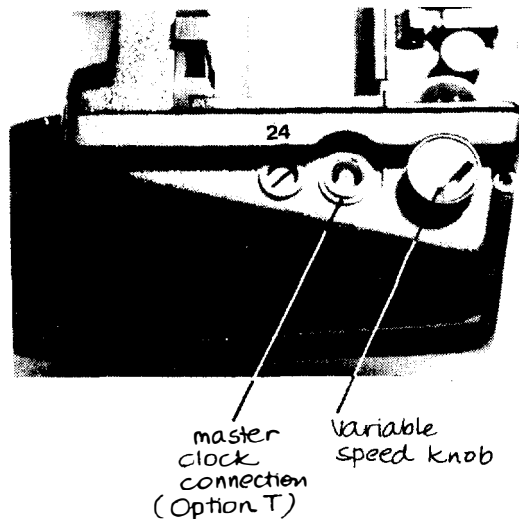
If you have motor trouble (extremely high power drain, very noisy camera, mirror doesn't stop in viewing position, motor runs at high speed or slightly out of sync....), the first thing to do is to locate the problem: the motor itself, or electronic base. Start by interchanging with a spare base to determine which is at fault. If the baseplate is not at fault, check the motor itself.

To remove the motor, see disassembly, p.4.

An undamaged motor should be noiseless and vibrationless when running without any load. If accelerometer equipment is not available to test it, the best way is to hold it running in your hand, and compare it to a new motor.

If the motor does not vibrate in your hand, this means the motor holder may be disaligned (see Motor Holder, p.27). If the motor vibrates, first check to see if there are any broken wires. If the problems are not there, then the onboard electronic circuit or bearings can be suspected. If such is the case, the motor should be returned to the factory.

N.B. To keep your guarantee intact, do not get involved in repairing the electronic circuits!



To install a new motor:

- With the motor connected electrically (only) to the base, run it and stop it so that it is in its usual stopping position.
- Place the mirror in viewing position (i.e. up behind the lens holder assembly), with the drive shaft pins (01.132.62) facing the openings in the rubber motor coupling (01.132.64). The diameter of this rubber coupling should be no greater than 15.9 mm, and thickness: 3.8 mm
- Run the motor at 12 fps (do not screw it down); there should be no vibration. When the camera is moved about, the power drain should not increase, whatever the position.
- Fix the motor into position (three CHC 2 x 8 screws); be sure to place the foam rubber ring correctly in position before attaching the motor ring.

## Motor holder

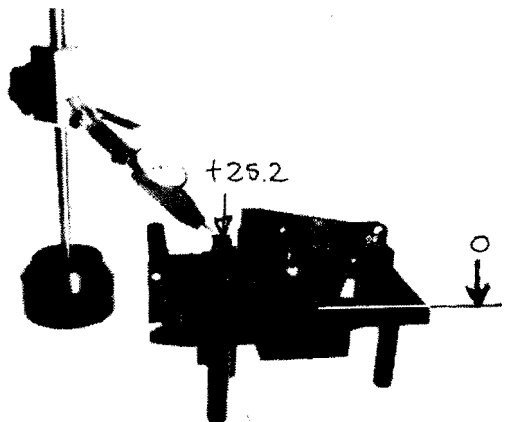
Two settings are essential here:

- depth and parallelism of the motor well
- centering of the motor holder

If, for any reason, the motor holder has been removed, both settings must be made without further ado.

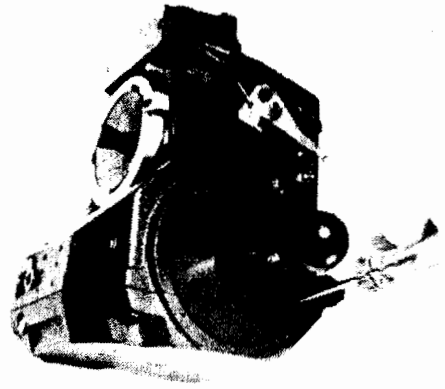
The reference surface on the motor holder bar (01.110.53) should be 12.6 mm above the reference surface of the lateral chassis; as the motor holder ring (01.110.28) is also 12.6 mm thick, this puts the outer surface of the motor holder at 25.2 mm (toleranced at  $\pm 0.1$  mm) from the lateral chassis. This tolerance can be checked and obtained by using tool 67, the magazine nose dummy.

- Insert it into the body as if it were a magazine, lay it on its 3 legs
- Establish zero along the lateral chassis reference surface (i.e. the two slightly raised bars), and with a comparator, check the 25.2 tolerance
- The parallelism should be set to under .05 mm measured between any two points 180° apart. If the parallelism does not meet this tolerance, it could possibly mean that the camera has fallen, or suffered



some sort of blow. Each of the 12.6 tolerances should be checked for parallelism; the holder parallelism (on 01.110.52 and 01.110.53) can be adjusted by replacing one of the washers (01.110.24) with a thicker or thinner one as required.

To center the motor holder once the 25.2 tolerance has been established, use tool 63.



using tool 63

TOOL 63: motor holder centering

Object:

Checking the alignment of the motor and claw shafts.

This alignment is of consequence as concerns:

- the noise level of the camera
- its power drain
- the lifespan of the oil bearings on the motor and claw shafts.

Parts:

- centering device 63A whose 65 mm diameter centers into the internal diameter of motor holder 01.110.28
- a gauge whose 16 mm diameter fits into the motor drive transport 01.131.61.

Use:

The motor holder (01.110.28) must be positioned correctly on the three shock mounted inserts (01.110.23).

With the three TC 2 x 4 screws on the motor ring loosened, fit the centering device into place with the 3 openings over the three TC screws.

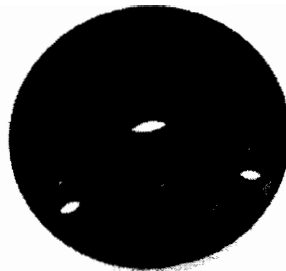
Push the gauge through the centering device so that its two slots correspond to the two pins (01.132.62) on the motor transport.

Tighten the three TC 2 x 4 screws.

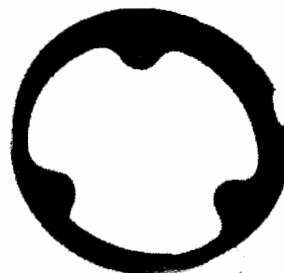
These operations are to be carried out each time work has been done on the motor holder, intermediary shaft, or drive clutch.



gauge  
63 B



63a



motor ring

If you find yourself out in the jungle, and your motor has just been bashed by a beast, and you do not have a motor centering tool, do not despair. There is something you can try, which has a good chance of success.

You must remember, though, that if the motor shaft has been seriously disaligned, you won't be able to do anything about it. If, however, the holder has taken the brunt of the damage, try this:

- Remove the motor by unscrewing the three CHc 2 x 6 screws holding it in place.
- Slightly loosen the three CHc 2 x 4 screws holding the motor holder onto cross bar 01.110.53 and bracket 01.110.52.
- With mirror in viewing position, and the motor connected electrically to the base, and in its normal stop position, now set the motor onto the drive shaft (coupling aligned with drive shaft pins), and turn on the power (12fps).
- With your right hand, move the motor so that it explores the various possible alignments by pressure on the holder; with the left hand, hold the holder. When a position with less vibration is found, tighten your grip on the holder so as to retain it in that particular position. Remove the motor with right hand, take an Allen wrench, and still holding the holder with your left hand, tighten down the three CHc 2 x 4 screws. Then put the motor back into place.
- If at first you don't succeed ....

## Film Drive Mechanism

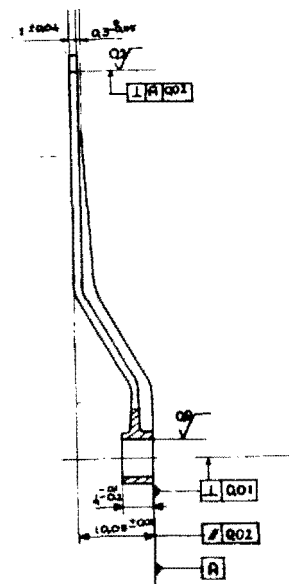
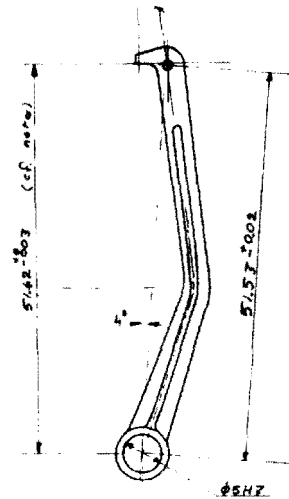
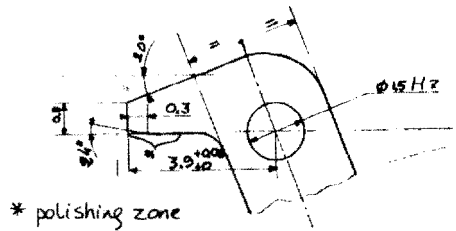
Work on the mechanism may be called for in cases of unsteadiness, claw penetration and stroke problems, dust or dirt particles in the gears, mirror wobble.

For access to the film drive mechanism, remove the small cover (01.130.05), and pivot the exposuremeter circuits out of the way by loosening the TC 2 x 4 screw on the lens holder.

# Claw

Incorrect claw stroke and penetration may be the cause of noisiness

- The claw tip profile should resemble the drawing here. The underside should be polished in the zone indicated. There is no need to polish right into the stalk.
- The claw's stroke downwards should not run quite parallel to the aperture plate surface; i.e. it should move very slightly towards the lens as it goes down (between  $-.02$  and  $-.05$  mm)
- Axial play between the claw sleeve (01.132.52) and the eccentric (01.132.57) should be checked: a maximum of 4 microns is tolerated. Laterally, the eccentric should not protrude from the sleeve more than  $.04$  mm
- The claw tip should penetrate between  $.40$  and  $.55$  mm beyond the rails of the aperture plate: this is measured by holding tool 75 against the aperture plate. If the penetration is not to this tolerance, adjustment can be made on the bascule eccentric (01.134.25) using tool 25b, see p. 31.
- The stroke is measured using metal test film. The Aaton should normally be set to a pitch of  $7.62$  mm. This is obtained by loosening the claw eccentric nut (01.132.09) with tool 25a (see p. 31). This adjustment is important for noise reduction; however too short a stroke can cause the claw to miss the perf. In any case, the pitch should never be below  $7.620$  mm.
- To set the phase between stroke and penetration, the two TC  $1.6 \times 1.6$  screws (01.132.11) on the cam (01.132.04) are loosened, and rotated using a pointed instrument in the small notch in the cam. When these screws are tightened again, make sure the washers apply well upon the cam.



All the above adjustments can be made without removing the mechanism from the central chassis.

TOOL 25: eccentric adjustment wrenches  
25a: claw eccentric adjustment

Object:  
Adjustment of claw pitch

Parts:  
A flat wrench  $\phi 4$  mm.

Use:  
Use this tool to release claw eccentric nut (01.132.09). With a needle in one of the small holes on the eccentric (01.132.57), change the orientation appropriately. Tighten the claw eccentric nut when correct stroke has been obtained. This nut (1 mm thick) should not be tightened too firmly; it should be fixed into position with Loctite.

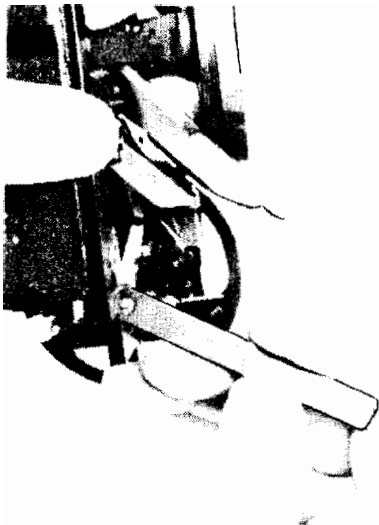
25b: bascule eccentric adjustment

Object:  
Fine adjustments for claw penetration through perforation ( $.50 \pm .05$  mm).

Parts:  
A flat wrench  $\phi 5$  mm.

Use:  
With this tool, the bascule eccentric (01.134.25) can be orientated. Adjustments to nut 01.134.26 will change the orientation of the eccentric. This moves the upper part of the bascule (01.134.17) forward or back; which in turn governs the claw's penetration, via pin 01.132.53.

Once the penetration has been adjusted as above, use tool 75 to check that the claw tip penetration is within the acceptable tolerance of .45 to .55 mm.



using tool 25 a



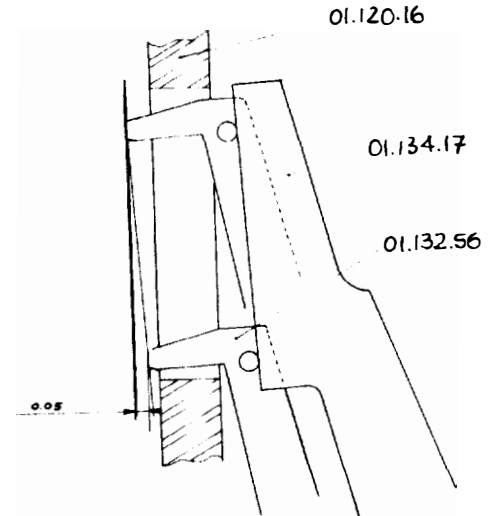
using tool 25 b.

# Bascule

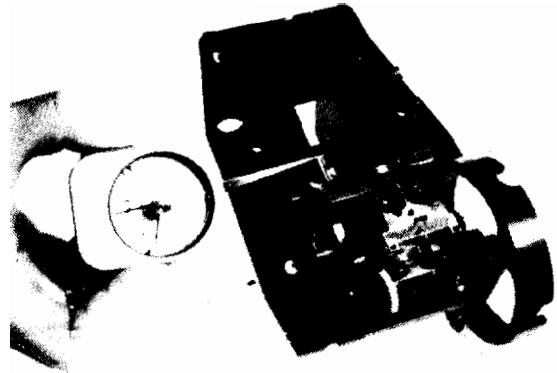
To set up the correct position, two parameters should be considered:

- The position of the eccentric (adjusted as shown with tool 25b)
- The lateral position of the bascule assembly on its holder (01.134.08). The bascule holder should be positioned laterally on sliding holder 01.132.23, such that the bascule working surface is parallel to the central chassis. This is obtained by loosening the two TC 2 x 8 screws on the bascule holder (01.134.08) and sliding this subassembly along holder 01.132.23.

When correctly positioned, the head of the bascule is flush and almost parallel to the central chassis as the claw moves downwards.



The pressure on spring 01.134.33 should not exceed 40 grams.



# Gears

To clean the gears, the camera body must be completely opened up, as per instructions pp. 3 - 6.

In addition the motor holder should be removed (three TC 2 x 4 screws), as should the intermediary shaft (two CHc 2.5 x 6 screws: n.b. see p. 40).

When re-assembling, you will need factory tools and jigs: make sure you have them before getting carried away!



Remove the lens holder (see p. 13).  
Remove the spider (01.131.18 - three screws on central chassis: two TC 2 x 8, one CHc 3 x 8). The mirror and claw assemblies are thus removed in one piece. Exercise great precaution so as not to harm the mirror.

Using a small paintbrush with stiff bristles, vigorously brush mirror shaft gear (01.131.06), claw shaft gear (01.132.43), motor gear (01.132.02). (The intermediary shaft gears can of course be cleaned without disassembling the entire camera as described here.)

Though this operation is not necessary in normal maintenance, if for any reason the sliding claw mechanism holder (01.132.23) has been disassembled from the "spider" (01.131.18), the correct meshing of gears 01.131.06 and 01.132.43 will have gone by the wayside. They should be set so that the datum point on a tooth of 01.131.06 meshes into the groove of 01.132.43 indicated with another datum point.

When reassembling the two holders (01.132.23 and 01.131.18) be sure that the two elastic washers (Rondex  $\varnothing 3$ ) are in place on the two CHc 3 x 10 (or 3 x 14) screws below 01.132.23.

For fine meshing adjustments, see p.34 , tool 81.

tool 82 →



When adjusting these gears, it is a good practice to have the motor in position, running it through the electronic base on the bench, using two extension cables (short 54 1L for power supply, tool 82 for electronic interconnection).

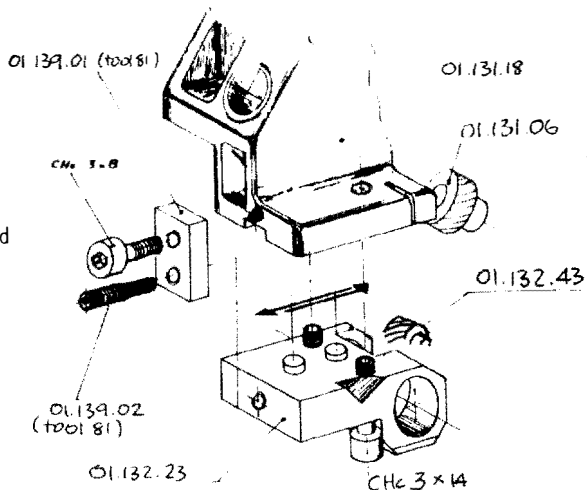
tool 50 →



A galvanometer between the power supply and the camera gives the power consumption. (An alternate solution is to have tool 50, which in a single unit functions as battery holder, electronic base, and amperemeter).

Use tool 81 to adjust the relative position of the holders until a satisfactory balance (minimum noise/minimum power drain) is obtained.

As seen on the drawing on this page, the sound level is measured with a dB meter placed 4 cm away from the upper left corner of the central chassis; the sound level is around 40 dB, high enough to be consistent from one measurement to another whatever the background noise level.



**TOOL 81: meshing gears of mirror and claw shafts**

**Object:**

Meshing gear 01.131.06 on mirror shaft with 01.132.43 on claw shaft.

**Parts:**

- small rectangular screw holder plate (01.139.01)
- 1 micrometric screw (01.139.02)
- 1 CHc 3 x 8 screw

**Use:**

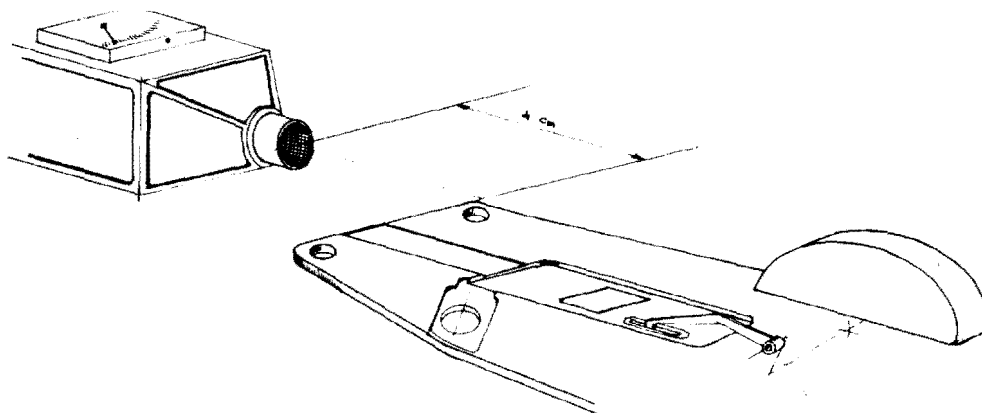
Fix the small plate vertically onto

sliding holder 01.132.23, using the micrometric screw.

When the surface of the plate comes just flush against the spider (01.131.18), fix it to the spider with the CHc 3 x 8 screw.

Turning the micrometric screw increases or decreases the distance between mirror and claw shafts.

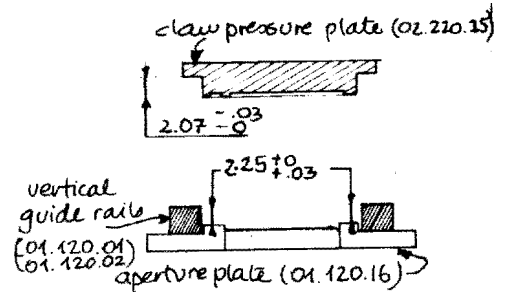
Mesh the gears together with a very small amount of play. Too much play causes noise; if they are meshed too tightly, though, this will cause excessive power drain, and could deform the teeth.



When you have finished operating on the gears, oil them with ~~ISS~~ P12, and when you have reassembled, grease with Aeroshell 6.

## Aperture plate

The aperture plate is 2 mm thick (tolerance:  $-5$   
 $-12$  microns), measured at the four corners of the gate from the lower surface of the steel inserts (01.120.14) to the film rails on the upper side.



### Vertical Guide Bars

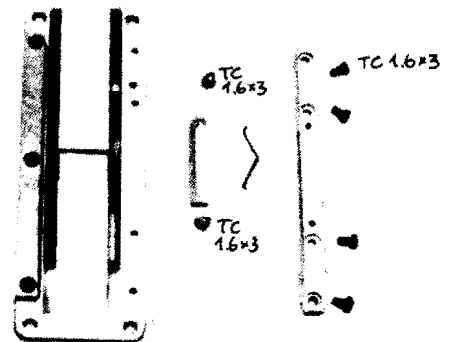
The vertical film guide bars (01.120.01 and 01.120.02:  $2.25 + .03$  mm above the film rails) serve as a reference surface for the claw pressure plate on the magazine. They should be 16.05 mm apart at top and bottom (see tool n<sup>o</sup> 86).

The left guide bar (01.120.01) should never be removed. Its position on the aperture plate is set in the factory, and serves as a reference:  $10 \text{ mm} \pm .04$  between the film side of the guide bar, and the magazine reference surface on the lock-in plate.

### Lateral Pressure Bar

Not only should the lateral pressure bar provide the correct pressure as determined with tool 86, it should also float freely, and not stick. The spring system inside should be totally clean and dry: no grease, no oil, no caked up film particles.

- To dismantle the pressure bar
- Remove the four TC 1.6 x 3 screws (01.120.08); the mobile pressure bar is now free.
  - Remove the 1.6 x 3 screws (01.120.07) underneath the bar; the spring system is now free.
  - Camber the spring (01.120.04) adequately.
  - reassemble, and set the 16.05 mm between-bar tolerance.



TOOL 86: aperture plate tolerances

Object:

Checking pressure on lateral pressure bar.

Setting 16.05 mm distance and parallelism between vertical guide bars

Checking height of vertical guide bars.

Parts:

A steel plate 16.04 mm wide and 2.25mm thick.

Use:

1. Lateral pressure in the aperture plate

Place the steel plate over the gate, making sure it is "squeezed" by the lateral pressure bar.

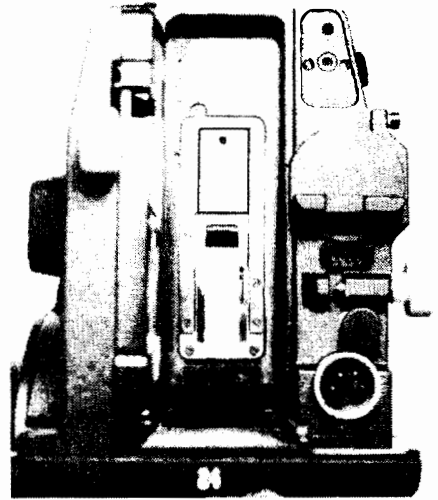
Using a 50 gr. dynamometer (tool n° 79a), delicately push the steel plate downwards from above; it should take between 10 and 20 grams of pressure to move the plate.



2. Parallelism between vertical guide bars

Loosen the 4 TC 1.6 x 3 screws on the mobile pressure bar (01.120.02). Squeeze the steel plate between the two vertical bars at the upper reference point, and tighten the upper TC 1.6 x 3 screws; same pro-

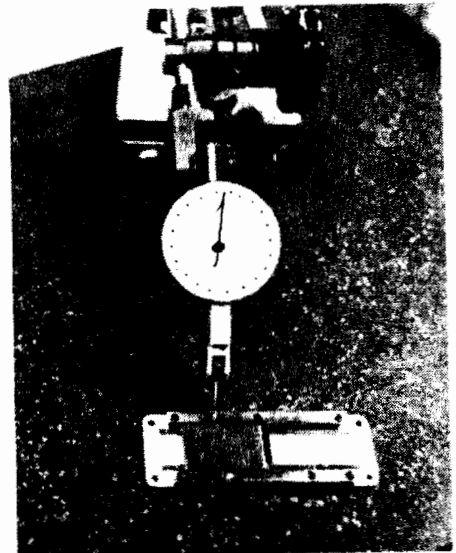
cedure for the lower reference point. There should be no play between the steel plate and the vertical bars, however the plate should be able to slide up and down the aperture plate.



3. Height of vertical guide bars relative to film channel bars

With a comparator clock set at zero on the surface of tool 86 placed in the aperture plate, check the vertical guide bar height.

The tolerance of the vertical bars in relation to the polished film rails on the aperture plate itself is 25 mm + .03.



## Positioning on Central Chassis

7c aperture plates bear the word REF engraved on the back, which means they have been toleranced as follows:

X describes the distance between the bottom of the film gate and the top of the aperture plate. The manufacturing tolerance here is  $41.6 \text{ mm} \pm 20 \text{ microns}$ . All 7c aperture plates display this.

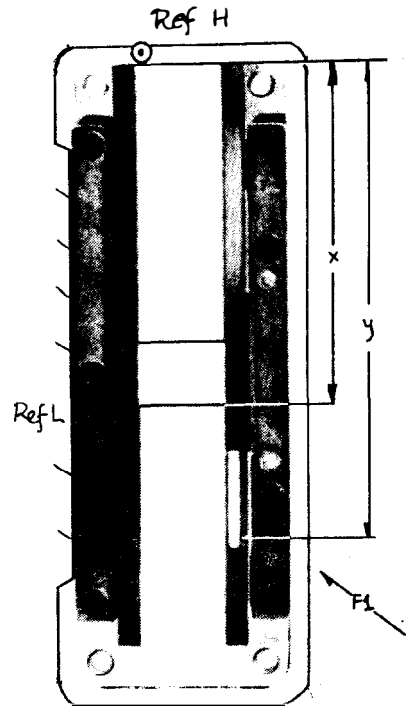
Y describes the distance between Ref H (see diagram) at the top of the aperture plate, and the lower dead point where the claw tip leaves the perf, lifting up and out. This distance should be  $57.547 \text{ mm}$  (i.e. the  $41.6 \text{ mm}$  tolerance on the aperture plate + two pitch ( $2 \times 7.605$ ) + half a frame line ( $.102 \text{ m}$ ) + half a perf ( $.635 \text{ m}$ ). Got it?!

For the setting of Y, the aperture plate must be able to slide up and down a few hundredths (this would be incompatible with the integral locating pins of the past).

To provide a fixed lateral reference surface, the left side of the aperture plate opening in the central chassis has become a reference surface (Ref L) as shown here.

It should be noted that in normal use, there is no reason to change the position of Ref H, which is set in the factory. However, if a Super 16 plate without the REF marking on the back is being placed in a 7c camera, or if the camera mechanism has been replaced, then it may be necessary to readjust Ref H. This is done from the inside of the camera chassis; see p. 38.

When the aperture plate is being placed back into position, the technician should maintain pressure in direction F1 with thumb and forefinger on the plate. This combination of pressure upwards and leftwards ensures flush contact along Ref L and Ref H respectively.

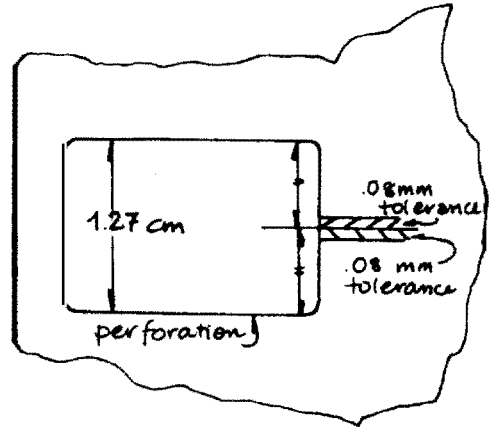


## Frame Line

In accordance with the BBC, Aaton has set out the following protocol for checking the frame line.

Tests are carried out on a projector whose gate has been shifted, and the film channel opened out, allowing the perforation to be projected.

The vertical center of the perforation is allowed a tolerance of .08 mm both up and down, making a total acceptable positioning covering .16 mm, as shown on diagram.



The best check for correct frame-line positioning is of course to expose some film and check that it is to the tolerance shown here.

Another way is to make yourself a caliber using a camera you know to be correct:

- expose black and white negative film on an evenly illuminated white field.
- upon development, you will have a film bearing black frames and a transparent frame line: lay this film over the film channel of the camera to be tested. Use the inching knob to pull it down: you will be able to observe any disalignment between the aperture gate and the "caliber".

If you should discover that REF. H needs to be repositioned, do so accordingly. Once you have changed the aperture plate position, you will also have to change:

- viewing screen
- lens holder centering

And it is a good idea to check the 10 mm tolerance between the lateral chassis reference surface and the left guide bar (01.120.01).

# Lateral Chassis

It may be necessary to work on the lateral chassis, should problems arise with the locking system, the drive clutch assembly, or the intermediary shaft, or should it be necessary to clean gears 01.140.06 and 01.150.21.

## The extractor

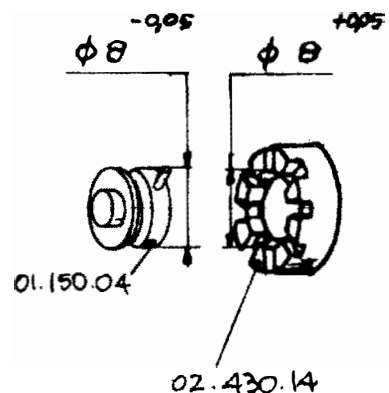
If the drive extraction and release do not function correctly, it may be that the plate (01.160.03) is not coming back into position (gummed up grease or oil; slack spring; or incorrect positioning of the two TC 2 x 3 screws which hold the brass roller (01.161.22) in position).

The small roller bar (01.161.21) should not be positioned too close to the lateral chassis otherwise it will block the lever (01.161.34) in extraction position. Adjustments can be made on the two TC 2 x 3 screws on the bar.

# Camera Drive Clutch

In case of drive clutch difficulties, for example if the sprocket wheels in the magazine don't turn when the camera is running, the following points should be checked:

- The diameter of the coupling (01.150.04) should be 8 mm. If it is greater than this (essentially at the pin dowel entry and exit), it will not be able to penetrate into the magazine, whose drive dog (02.430.14) has an inner diameter of just over 8 mm.
- Bearing 01.150.02 must be perfectly centered and it should not be allowed too much play on the 15 mm internal diameter of the general holder (01.150.11).
- The maximum play on shaft 01.150.31 ( $\varnothing 12.5$ ) should be between 15 and 20 microns. Less than that, or use of an inappropriate lubricant could lead to high power drain at low temperature (P12 is the lubricant to be used here).



- When the clutch coupling (01.150.04) is released (i.e. protruding from the lateral chassis), it should supply between 80 and 120 grams pressure measured on a dynamometer (tool n° 79b). When it is retracted, it should not protrude at all through the lateral chassis.

**N.B.** To remove the drive clutch assembly; the intermediary shaft must be loosened so as to free the upper gears. It is necessary when installing a new drive clutch assembly, to use the centering tool (n° 67), since spare part assemblies are not pinned in the factory. See below for useful remarks before and after work here.

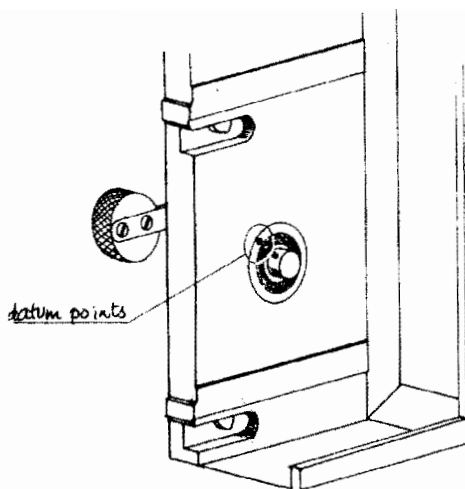
If you are in the situation of having to install a new drive clutch assembly, but do not have the centering tool (67), you can, in a pinch, use the magazine to accomplish this function. The object of the operation is for the camera drive clutch to penetrate the drive dog as easily as possible.

When positioning a new drive clutch, then, fix the three TC 2 x 8 screws down loosely; place a magazine in the camera, and moving the brass holder slightly, find the position in which the clutch coupling penetrates the drive dog with most ease. This is determined by pulling on the knob at the end of shaft 01.150.03, and releasing it; do this several times slightly varying the position of the brass holder, and you will "feel" the position in which the coupling penetration is best centered to drive the magazine.

#### Intermediary shaft

Before disassembling the intermediary shaft, observe and align the following datum points, which indicate the correct gear meshing.

- with the mirror in viewing position, the two pins on the drive coupling (01.132.62) are normally parallel to the intermediary shaft; note the position of the three screws (TC 1.6 x 4) relative to the pins.
- the datum point on the intermediary shaft holder (01.140.11) should be aligned with the one scribed onto bearing 01.140.22.
- on the lateral chassis, datum points on the steel and brass rings around the camera drive knob should be aligned.



When re-assembling, once the datum points have been aligned correctly, the "best" position of the intermediary shaft is then determined by a trade-off between noise and power drain. With the two CHc 2.5 x 6 screws loosened, and with the camera running on the workshop circuitry and amperemeter (tool 50), find the position which gives the best compromise between power drain and noise level. Then tighten the screws.

TOOL 67: camera drive clutch alignment

Object:

Ensuring magazine interchangeability on camera: position of drive clutch and magazine locks.

Test for motor holder parallelism (p. 27)

Parts:

- 67A dummy magazine nose
- 67B centering gauge of 01.150.04 drive coupling.

Use:

Checking the drive clutch position

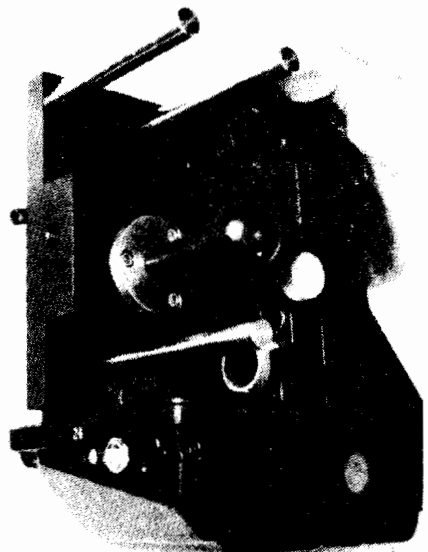
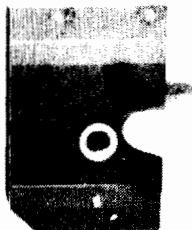
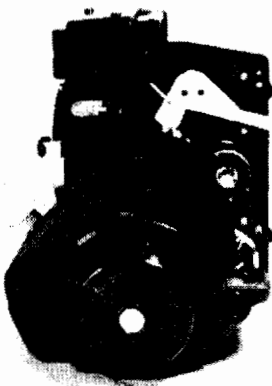
- Lateral housing (01.102.64) is removed.
- Place the jig on the camera body as if it were a magazine.
- Insert the gauge so that the two notches go over the coupling pin

(01.150.09). The gauge will penetrate the inner diameter of the extremity of shaft 01.150.07.

- If the gauge does not fit into position easily, the three TC 2 x 8 screws (i.e. not the screws which hold down the retainer: the ones that are simply passing through) on retainer 01.150.12 should be released so as to allow the clutch holder to adopt the correct position. When the gauge fits comfortably into position, tighten the three TC 2 x 8 screws.

Positioning a new drive clutch mechanism

The Aaton drive clutch assemblies are fitted with pins in the factory: those sold as spares are not. This jig is therefore necessary when positioning a drive clutch before tightening the three TC 2 x 8 screws onto holder 01.150.11.

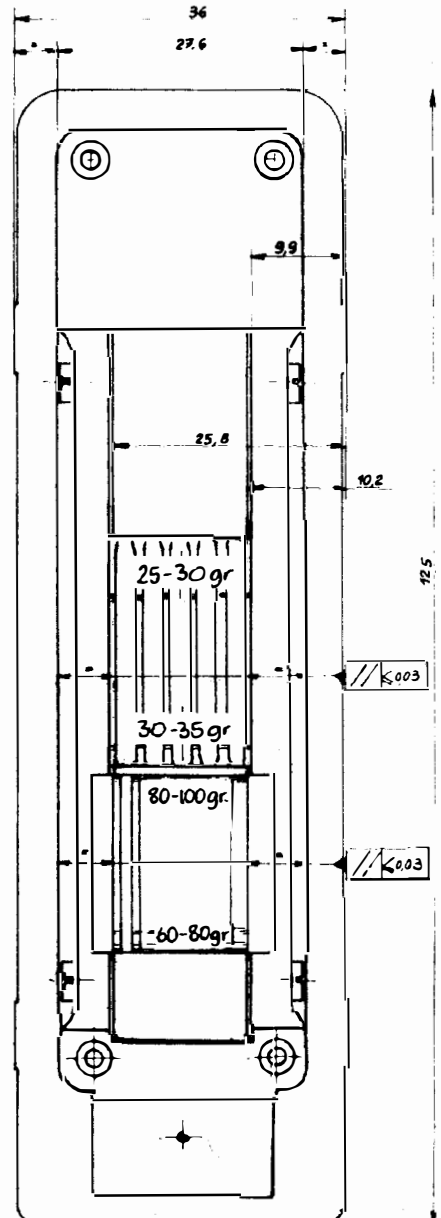
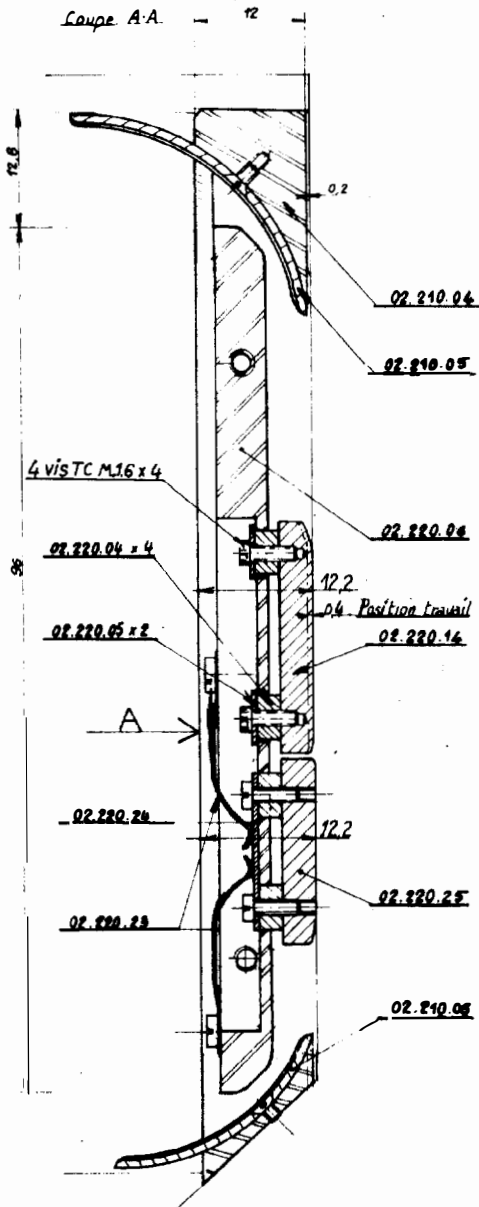
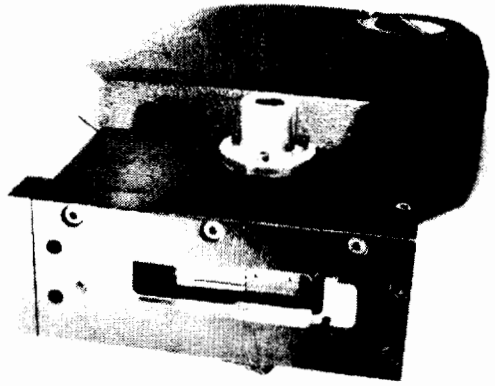


# Magazine

## Nose

In cases of unsteadiness or excessive noise, the nose and pressure plate assembly should be checked.

- with tool 70A, make sure that the pressure plate holder is correctly aligned. If it is not, loosen the four CHc 2 x 12 screws, and set the holder correctly (see use of tool 70).



- Another check is on the pressure plates:
  - image pressure plate: 25-30 grams at top  
30-35 grams below
  - claw pressure plate: 80-100 grams at top  
60-80 grams below

Note when removing the image pressure plate that there are four tiny springs (02.220.03), one at each corner: if you're not careful, you'll have them dancing like tiddly-winks on your bench!

- Make sure that the pressure plate spaces more freely; if they do not, it may be because the screws holding the pressure plates are not tightly fixed.
- A final consideration: the noise level is always lower if the semi-circular guides (02.210.05 and 06) are perfectly polished. Check these after intensive use of the camera.

### Doors

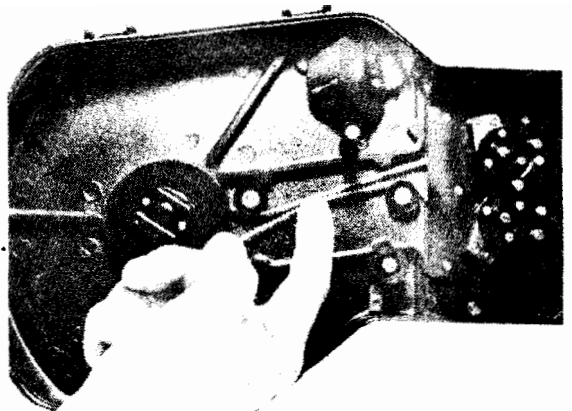
The gasket should be glued down perfectly. If it becomes unstuck in any place, remove the whole thing, and scratch away all trace of the old glue. Glue the gasket in using a very small amount of Loctite IS 496, being careful not to stretch the gasket in so doing. (If it is stretched, light-tightness can be compromised.)

### Rollers

- clean them with a cloth. Don't lose track of the teflon washers! Grease with Esso P12.
- Do not hesitate to add axial play if they are too tight.
- The pin rollers at the left/right passage (02.510.02) should receive Tonna oil.

### Drive belt

The drive belt should be loose enough for both sides to be brought together easily (see pic.). If it is too tight (and consequently causing high power consumption at low temperatures), it can be loosened by releasing the two idler rollers (02.100.52).



### Friction

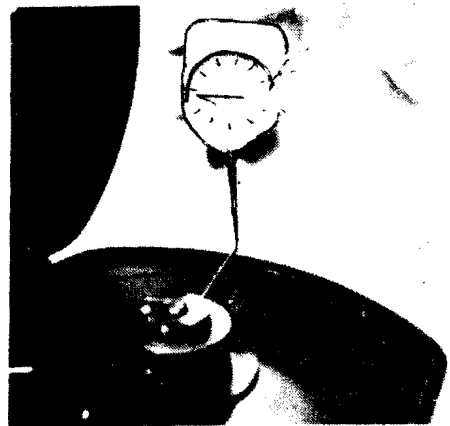
Too much friction may cause the magazine to be squeaky or noisy; too little may bring about jamming. The best is to set it relatively tight. If the camera travels in a car, for example, the vibrations may cause the film to spiral, and rub inside the magazine; this can be eliminated by tightening the take-up friction. For studio shooting, lower the friction: less power is needed to drive the magazine, and there is less noise on the drive clutch.

#### Take-up side:

- Camera running at crystal speed
- The leather pad should be lubricated with Aeroshell fluid oil
- With a dynamometer (tool 798), make sure that there is  $480 \pm 30$  gr x cm tork on the shaft; i.e. 60 gr at 8 cms along a rod inserted in a dummy spool (tool 78)
- To adjust the friction, the spool locking assembly (02.612.00) should be removed, nut 02.611.27 tightened or loosened as necessary, and blocked into position with lock nut  $\emptyset$  3 (02.611.28).

#### Feed side:

- Camera stopped
- Using a dynamometer, check that there is  $250 \pm 30$  gr x cm on the shaft, i.e. 31 gr at 8 cms on tool 78.
- To adjust the friction, the spool holder should be removed (using screw 02.620.01 to release 02.613.02 on the shaft - see User's Instruction Manual, p. 14) and spring washer 02.611.12 cambered appropriately.



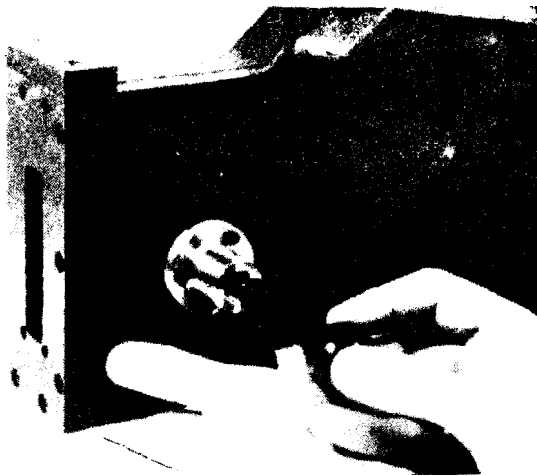
*checking magazine feed friction.*

### Feed plate

If the drive clutch has become unaligned, or if there are noise problems, work may be necessary here.

- The sprocket teeth should be perfectly smooth, and show no sign of machining or film-induced wear.

- The pinch rollers should be set so as to allow two thicknesses of film when they are locked in position.
- If the feed plate is removed or loosened (six TC 2.5 x 4 screws), use tools 70A and B to reposition it correctly, thus ensuring alignment of the drive clutch. When it is in the right position, tighten first the two central screws, then the lower two, and finally the upper two.



using tool 70

### TOOL 70: magazine drive clutch alignment

#### Parts:

Jig 70A: dummy camera body into which the nose of the magazine to be tested is placed.

Gauge 70B, whose 8 mm diameter fits into the magazine drive clutch (02.430.14).

#### Object 1: Drive clutch

Checking interchangeability of magazines and cameras by assuring the camera drive clutch (01.150.04) correctly penetrates the magazine drive clutch (02.430.14). If they do not lock together, the magazine drive is lost, and the film jams.

#### Use:

Place the magazine into jig 70A as one would in a camera body.

Slowly push gauge 70B inwards until it fits into the inner diameter of the magazine drive clutch (Ø8).

If the gauge doesn't fit directly into the drive dog, or if it is difficult to insert, loosen the six TC 2.5 x 4 screws holding the magazine feed plate (02.404.04) in place.

Moving the plate assembly as necessary, push the gauge so that it enters the inner diameter of the drive clutch. Make sure the gauge can be turned

smoothly and evenly, and does not drive the sprocket wheels.

Tighten the six screws (first the middle two, then the lower two, then the upper two).

The drive clutch is in position.

#### Object 2: Rear pressure plates

Checking that the rear image and claw pressure plates are centered. Image steadiness and definition depend upon their being well positioned.

#### Use:

With the jig mounted onto the magazine, the image pressure plate (02.220.14) and claw pressure plate (02.220.25) appear through an opening at the front of the jig. They should be parallel to the lateral surface of this opening and play freely.

If they do not, loosen the four CHc 2 x 12 screws holding the nose assembly onto the magazine.

Gently re-position the whole nose assembly until the pressure plates are parallel.

Tighten the four screws.

These operations are imperative each time work has been done on:

- any nose part numbered 02.200...
- any feed plate part numbered 02.400..

# Notes on Socapex Connectors

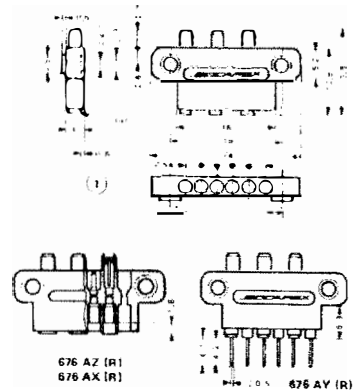
\*The two parts of the connector are identical: each is both male and female (3 male contacts + 3 female contacts), so making them absolutely fool-proof.

\*Complete protection of all electrical parts, both against accidental contact and damage through shock.

\*Body material : polycarbonate.

\*Lightness : weight of an element with its contacts: 0.9 gram.

\*Soldered contacts take wire up to a maximum diameter of 0.8 mm.



## CONDUCTORS TO BE USED:

Soldered contacts take wire up to a maximum diameter of 0.8 mm.

\***flexible wire** :-maximum core diameter: 0.8 mm corresponding to standard 00 or gauge AWG = 22.  
-minimum core diameter: 0.6 mm corresponding to standard 000 or gauge AWG = 24.

\* **rigid wire**: conductor diameter between 0.5 and 0.8 mm;

In all cases the diameter over the insulation must not exceed 1.4 mm (maximum dimension for the assembling tools).

## PREPARING THE MULTI-CORE CABLE

Remove the outer sleeve of the cable over a length of 35 to 40 mm.  
Fit an insulating sleeve over the cable.

## PREPARING THE CONDUCTORS

\*Strip the conductors over a length of 4 mm. as a maximum.

\*Fit its contact to each conductor (male or female depending on its position) and solder.

See that the solder does not flow beyond or run in the guttering.

## FITTING THE PREPARED CONTACTS

\*Insert the contacts in their respective housings, preferably following the numerical order (wiring each element in turn) and lock them in their housings by means of the insertion tool n° 90A (see pic.).

**Warning:** The holes for the sockets are identified, on the wiring side, by black rings in relief.

\*When all conductors are in position, bring the insulating sleeve (already slipped over the cable) to the cableform.

\*Raise both parts of the case and clamp the cable (or cableform) with the screws provided for closing the case.

To remove a contact use the extraction tool 90B. Insert it through the front of the connector and push centrally on the connector.

When the contact is freed, clear it and extract it through the back of the connector.

**IMPORTANT:** Never use trichlorethylene which dissolves polycarbonate.



tools 90a+b in use.

# Lubrication

The following lubrication points should be attended to from time to time.

## Claw shaft bearing (01.132.23)

- The two HC 2.5 x 4 screws are removed, and Esso P12 lubricant inserted (a hypodermic needle does the job nicely!).

## Spider (mirror shaft holder: 01.131.18)

- This part has a small hole (just opposite the claw elbow) containing felt. This should be filled with P12, which greases the oil bearings.

## Claw pin (01.132.53)

- To keep things smooth, a drop of Aeroshell 6 on this plastic pin is useful.

## Basculer roller (01.134.24) and cam 01.132.04

- Tonna oil and Aeroshell 6 should be applied here.

## Intermediary shaft

- Esso P12 and Aeroshell 6 should be used on both the nylatron gear (01.140.26) and the steel gear (01.140.06).

## Magazine drive clutch

- A drop of P12 will keep things smooth between the brass holder (01.150.11) and the steel external shaft 01.150.31; it should be applied from the magazine side (no need to open the lateral housing).

## Mirror shaft

- Noise is reduced by putting a drop of Aeroshell 6 between the spring (01.131.36) and ball (02) at the bottom of the mirror shaft.

## Gears

See p. 35.

Remember that oil mixed with dust is a very powerful abrasive compound. If the metal moving parts are kept clean and well lubricated, the precision tolerances will be much easier to maintain.

If your camera is headed for a polar or antarctic expedition, it can be winterized as follows:

- Remove the Aeroshell 6 from all gears, and replace it with P12.
- Retain Aeroshell 6 (or Tonna 72) at two points only: on claw pin 01.132.53, and between basculer roller (01.134.24) and cam 01.132.04.

All measurements made at 20°C on camera which has been run in.

1. Camera drive

motor holder parallelism: +.02 mm  
motor holder centering: +.01 mm  
play between claw and mirror shafts

2. Claw movement

penetration: .40 to .55 mm  
stroke pitch (metal film): 7.62 mm  
alignment to aperture plate: .05 mm  
claw spring <40 gr.

3. Camera drive clutch

alignment: +.01 concentricity  
drive clutch spring: 80 - 120 g  
lock release lever position  
lock movement

4. Aperture plate

height of guide bars: 2.25 to 2.28 mm  
lateral pressure bar: 10 to 20 g. with tool 86  
film rail polishing

5. Lens mount

flange/rail distance: -0.008  
optical centering: 40 mm -0.017  
lens mount lock-ring: 16 or Super 16

6. Reflex mirror

mirror flatness  
claw/shutter phase  
mirror aspect  
pressure on end of shaft spring 80 gr.

7. Viewing screen (type: )

framing: conformed to aperture plate  
flatness  
collimation: camera running  
camera stopped

8. Viewfinder (type: N°: )

16/Super 16 centering slot  
automatic upright image  
horizontal position  
viewfinder friction: 600-650 gr/cm  
position of intermediary aerial image: 4.8mm from bayonet ref. surface  
eyepiece friction  
eyepiece shutter

## 9. PBX

Amphenol function: Atelen  
VR30 video connection  
Battery: XLR connector  
LEDS: yellow  
red  
Fuse:

## 10. Dynamic tests

Power drain (camera body only): < 900 mA  
Power drain (with magazine and 7247): < 1.4 A  
Noise level (with 7247)  
- 1 meter in front of film plane: < 27 dB  
- 1 meter from film plane on  
battery side: < 29 dB  
Film steadiness (projection): 1/2000  
Frame line (projection):  $\pm .08$  mm vertical of perf centre

## 11. Options

### L: Exposuremeter

- Linearity over 50 to 400 ASA
- Compensation at 6, 12, 25, 32 fps
- Single shot
- Calibration

### T: Clear Time Recording

- Initialization
- Display final 3 digits
- Aperture plate display
- Event memory

### R: Video Relay

- Retraction of beam splitter
- Beam splitter frame alignment (tool 168)
- Test with VR30 video camera

### Super 16

- Lens mount center
- Aperture plate
- Viewing screen
- Viewfinder centering slot

## 12. Electronic circuitry (motor n° phase circuit n° ) on 11 volts, 1.2 Amperes

Power drain, motor only:  $\leq 350$ mA at 25 fps  
Automatic stop in viewing position  
Maintenance of 25 fps sync: up to 3.3A power drain  
Speed checks: - 24 / 25 fps  
- variable  
- maintenance of crystal speed down to 8 volts  
- slow flash warning LED function from 10.2V to 8V  
- fast flash out of phase LED function below 8V

## MAGAZINE

Positioning relative to magazine reference surface (i.e. 2 raised bars on either side of drive dog)

- upper sprocket wheel cover (02.420.04) 9.87 to 9.99 mm
- lower sprocket wheel cover (02.430.04) 9.87 to 9.99 mm
- steel film positioner (02.100.61) 10. <sup>-0.02</sup><sub>-.10</sub> mm
- take up shaft (02.611.22) 9.9 <sup>-0</sup><sub>-.25</sub>

### Feed side

- friction on core holder (on tool 78:  
camera not running) 250 gr/cm  $\pm 30$
- magazine lock (02.830.02)
- footage counter
- core retainer
- rollers
- coaxial pin roller (02.510.02)
- core release screw (02.620.01)

### Take-up side

- friction on core holder (on tool 78:  
camera running crystal speed) 480 gr/cm  $\pm 30$
- magazine lock
- three wells to accommodate both pinch  
roller release buttons (02.411.03) and  
TCBL 2.5 x 6 screw on 02.100.91
- pinch rollers:- blocking system
  - maximum space in blocked  
position: 2 film thicknesses
- drive belt tension: 1-2 mm space between the  
two when pressed together  
with a finger
- core retainer
- rollers: coaxial pin roller (02.510.02)  
pinch rollers (02.411.21)  
drive belt tension rollers (02.100.52)
- drive dog position, on tool 70

### Light-proof tests

- feed
- take-up

### Dynamic tests with film

- power drain at 25 fps 1.4 A
- correct film centering on pin rollers (02.510.02)
- rollers: 7 to be checked

