PRODUCT NO.23111

ASAHI PENTAX ES

SERVICE MANUAL

4 : 72 : 3H

TABLE OF CONTENTS

1. INTRODUCTION

This service manual is prepared for servicing Product No. 23111 ASAHI PENTAX ES.
ASAHI PENTAX ES is the developped camera from ASAHI PENTAX SPOTMATIC (Product No. 23102).

More than 50% of the parts of ES are common with those of SPOTMATIC.

ES consists of 15 kinds of mechanical and electronical structures.
Each structure has each Parts number and Description starting from A1, B1, C1, --------.

In this service manual, exclusive characteristic features of ES are described later.
The same characteristic features with SPOTMATIC are not described here.
Refer to ASAHI PENTAX SERVICE MANUAL.

In ES camera, many electronical parts and many distributing lead wires are used.
The lead wires are soldered to the electronical parts.
As the result of this, soldering are very important factors for servicing ES camera.
It is desirable to use the following materials or other similar materials for soldering.
Solder : 「COLOHOCHIN SOLDER with paste」 Diameter=1mm, Ratio of Sn (Tin) and Pb (Lead) 60:40.
Flux : 「COLOHOCHIN GS Flux No. 500」

Soldering needs very careful treatment.
The following defects should be avoided.
(Poor soldering, too much paste, too much flux, and too much solder.)
If the lead wires are soldered poorly, or are soldered with too much paste, too much flux and too much solder, these defects will give the very bad result for camera, mechanically and electronically.

Lubricants :
Mechanical parts are lubricated mainly with L1 (Liquid type) and G8 (Grease type).
G8 is the new lubricant and is used instead of G2b.
Electronical parts are not lubricated usually.
The positions where the lubricants are applied are the quite same with those of SPOTMATIC (Product No. 23102).

Caution :
P. C. Board pattern assembly (0-T1) should never be repaired or disassembled to pieces.
If some troubles are found on P. C. board pattern assembly (0-T1), replace it with new one.

a. Classification of parts numbers of Product No. 23111.
Mechanical and electronical structures are classified as follows:

A. Body proper and cover parts

B. Mirror housing

C. Film winding mechanism

D. Film rewinding mechanism

E. Shutter mechanism

F. Switch mechanism

I. Electronical timing switch mechanism

K. Aperture variable resistor

L. Optical parts

M. Prism seat

N. CdS mechanism

O. Ammeter

R. ASA volume resistor

S. Magnet

T. Printed circuit board

Standard parts including small screws, washers, lock washers etc. are mostly common with those of Product No. 23102.
Small screws are unified to Cross recessed head screws.

b. The structures and functions.
The mechanical structures and functions are approximately the same with SPOTMATIC (Product No. 23102) or SPII (Product No. 23108) But many electronical structures-which are not included in SPOTMATIC or SPII- are installed.
In this article, no explanations are given to the same structures with SPOTMATIC or SPII, but explanations are given to the exclusive structures of ES.

Body proper and cover parts ⟶ (=23102, 23108)
Mirror housing
Film winding mechanism ⟶ (=23102)
Shutter mechanism ⟶ (=23102)

c. Electrical timing switch mechanism.
This mechanism consists of 5 kinds of electronical parts and other small parts.

0-I1	Timing switch assembly
0-I200	Battery checker assembly
0-I300	Relay switch assembly
0-I400	Memory block assembly
I500	Connector

These functions or characteristic features are described later briefly.

* Timing switch

This is used for deciding proper exposure time of electronic shutter coupling with shutter mechanism and electronic circuit of exposure time setting.
This feels starting time of shutter mechanism, and converts it to electric signal, after that starting time is formed in time controller circuit.
This is called as timing switch.

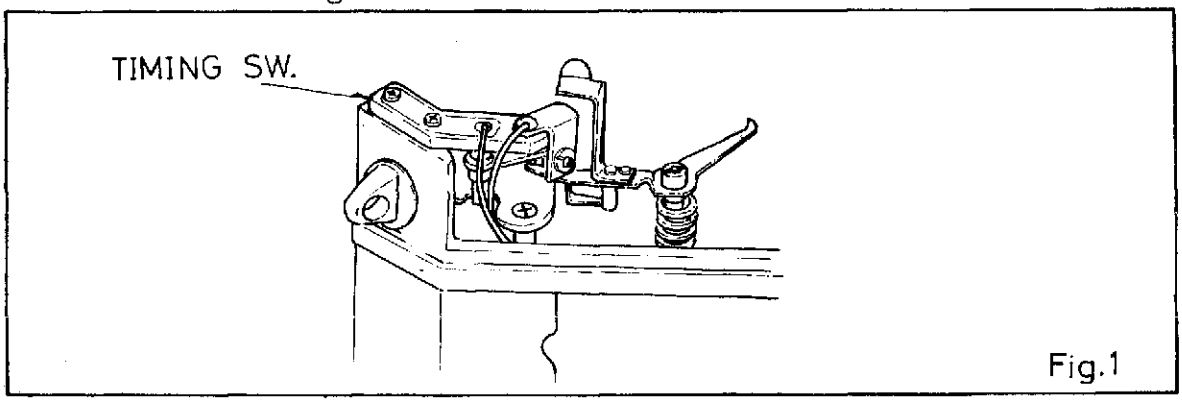


Fig.1

* Battery checker

Large capacity Silver battery (Eveready, mallory etc) is used for the electro-magnet of shutter curtain controller and for the electro-circuit. Large amount of current is used in ES camera compared with other camera equipped with only an exposure meter.
Normally after electronic shutter is released more than 10,000 times, capacity of battery decreases and is not sufficient for actuating electronic shutter.
ES camera holds checker mechanism to confirm quantity of electricity whether it is enough to controll the shutter mechanism correctly or not.
Electronic shutter and battery checker have their own circuits connecting to an Ammeter (⊖1), and those circuits are switched with switch mechanism.

* Power switch

Electricity flows when the battery is checked with aformentioned battery checker.
In case of actuating electronic shutter, electricity does not flow always to the circuit or to the magnet, but flows only when the release button is operated.
Power switch is placed at the bottom parts of Shutter rod (E51) with corresponding release button, and by depressing the release button, switch contact pieces are driven to contact directly.

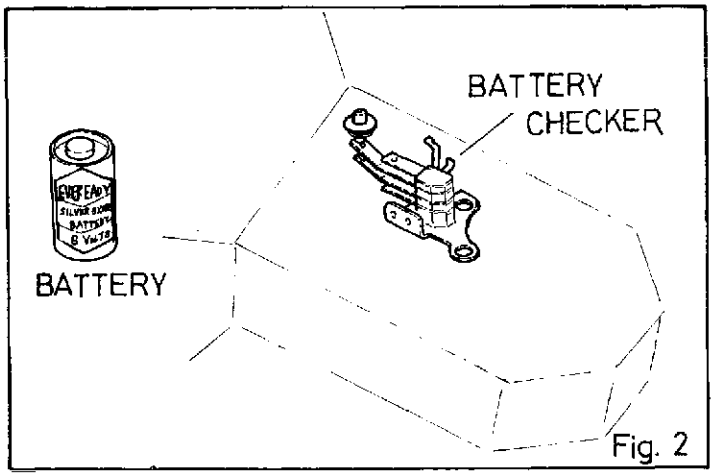


Fig. 2

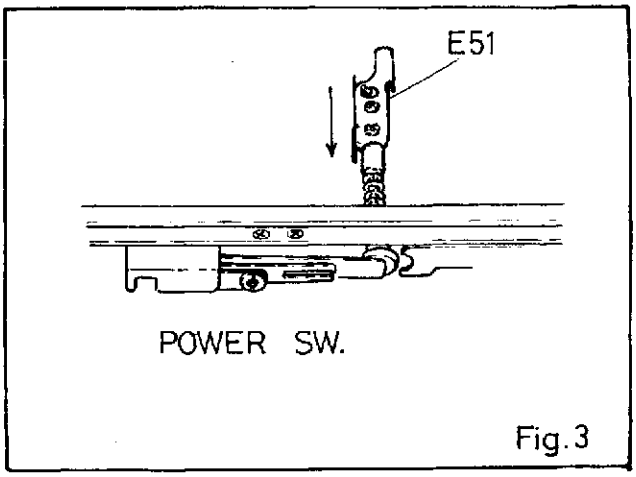


Fig.3

* Memory block

Informations to decide exposure time are required very quickly within the period between the time after release button is depressed in cocked condition and the time before the mirror begins to flip up.

Correct informations are sent to the circuit steadily, especially in case of varied light quantities with stopped down aperture, or in case of no exposure is given to CdS cell with mirror-up, after camera mechanism begins to function with depressed release button.

In SLR (Single lens reflex) camera, gathered informations are not sent to the circuit sometimes. While no informations are given, to memorize or to keep the stored informations, memory device should be installed in SLR camera. Even if no informations are given, they must be sent to the circuit continuously to controll the shutter mechanism.

This memory device and the switch part are unified as memory block.

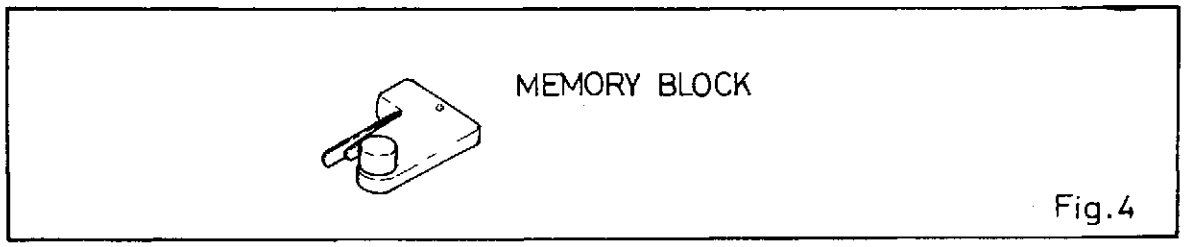


Fig.4

* Connector

Camera body and print pattern are connected with connector which plays a very important part.

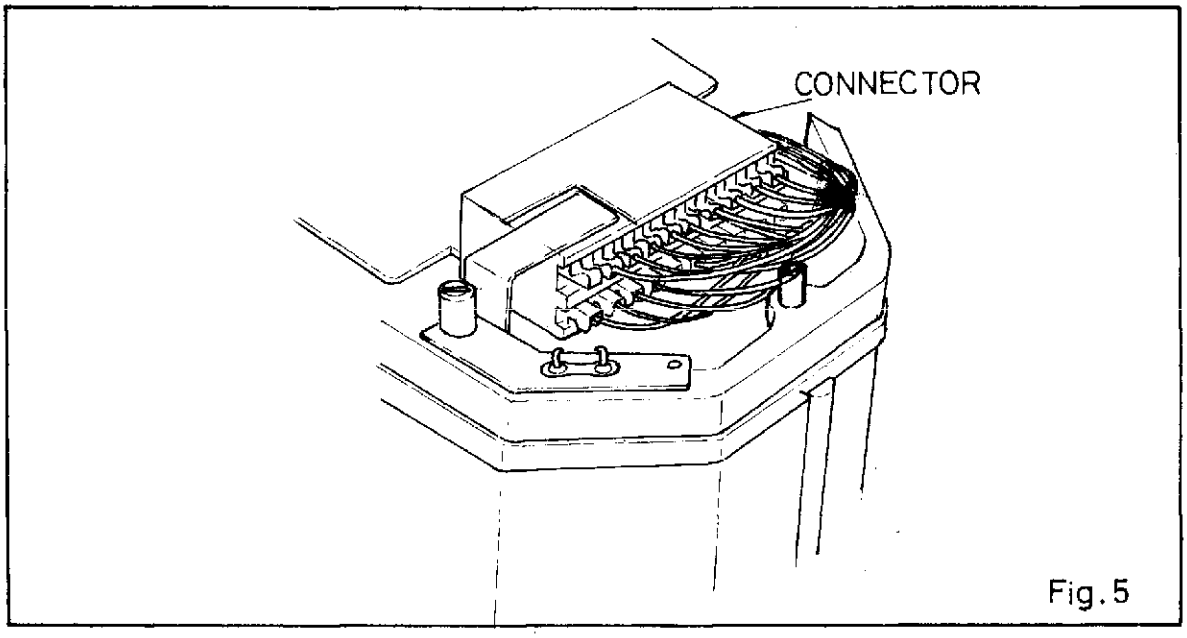


Fig.5

2. ASSEMBLY AND ADJUSTMENT

ASAHI PENTAX ES is similar to ASAHI PENTAX SPOTMATIC (Product No. 23102) mechanically.
There are many adjustment ways for assembling SPOTMATIC camera, but these adjustments are already described in ASAHI PENTAX SPOTMATIC SERVICE MANUAL.
ES camera includes some exclusive mechanical and electronical structures. In the following article, only the exclusive assembly and adjustment are described.

3. BOUNCE PREVENTION MECHANISM

Lubricants are lubricated to bounce prevention mechanism with Lubrication tube (E164) installed at Stopper (C7).
Lubrication tube (E164) should be set carefully sliding it underneath Retainer tube (E163) so that the tip of Lubrication tube (E164) may contact to the pin of Top selector gear assembly (0-E35) after shutter curtain is released.
Take care that the tip of Lubrication tube (E164) should never come out further.

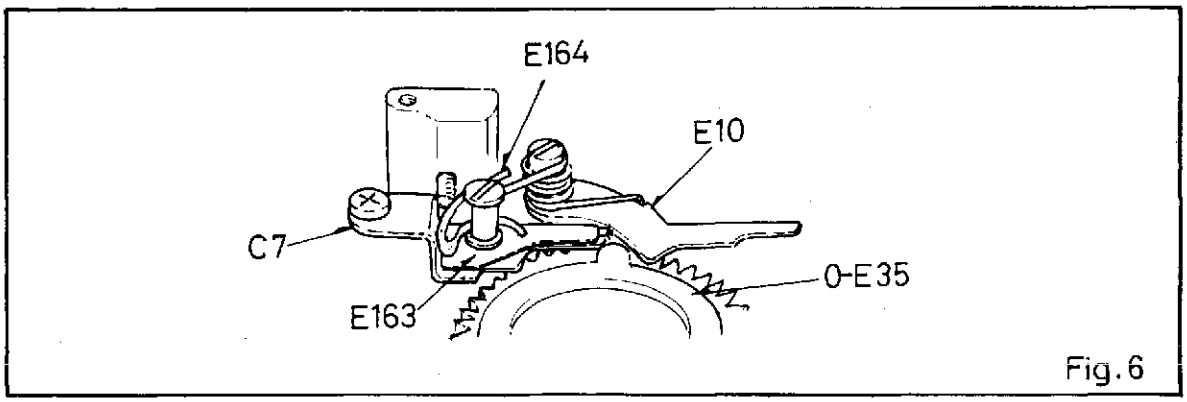


Fig.6

4. MAGNET ACTUATOR PLATE

Magnet actuator plate assembly (0-E13) controling the second curtain of electronic shutter should be installed before High speed lever assembly (0-E6) is installed.
Temporarily, put Magnet actuator plate (0-E13) in the pin shaft of Top mec. plate assembly (0-C1-01) with Intervention stopper (E152) and Dia. plate retainer nut (E159).
Magnet actuator plate assembly (0-E13) arrests the second curtain with energized magnet holder assembly (0-S1).
Magnet actuator plate assembly (0-E13) should function smoothly in winding and releasing the shutter curtains, it moves as the bottom selector gear turns.
Refer to Fig. 7 in the next page.

5. TIMING CONTACT SWITCH LEVER ASSEMBLY (0-E151)

Timing contact switch lever assembly (0-E151) is installed to the shaft where Magnet actuator plate assembly (0-E13) and Intervention stopper (E152) are installed. Timing contact switch lever assembly (0-E151) should be installed horizontally, if the tips of it touch to the other parts, shutter exposure times will show uneven. Correct it by bending with twizzers.
It takes a part of not only cocked indicator but also of essential connector between the mechanical and electronical part, the functions of it should be smooth and accurate.

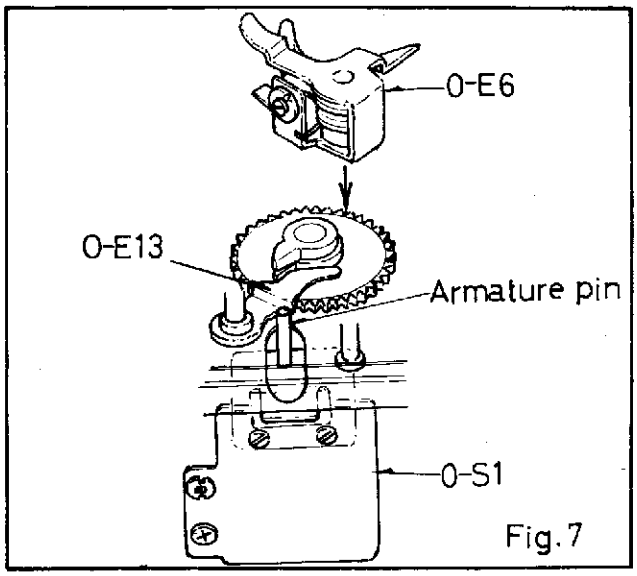


Fig. 7

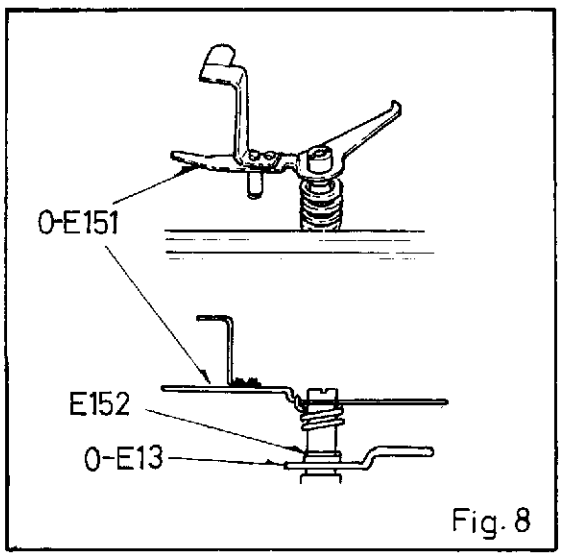


Fig. 8

6. SHUTTER ROD (E51)

At first, insert adjusting screw (Set F1.4x4.0) in Shutter rod (E51) so that the tip of the screw appear at 1mm length. Shutter actuator plate assembly (0-E22) and Shutter actuator plate retainer (E146) are installed together with two screws. Both parts should be parallel with Shutter rod (E51).
Shutter actuator plate retainer (E146) is the parts to make Shutter actuator plate assembly (0-E22) and adjusting screw (Set F1.4x4.0) contact each other always. Check the elasticity of Shutter actuator plate retainer (E146) by depressing Shutter actuator plate assembly (0-E22) lightly.
If it is depressed too much, it deviates and does not contact to adjusting screw.

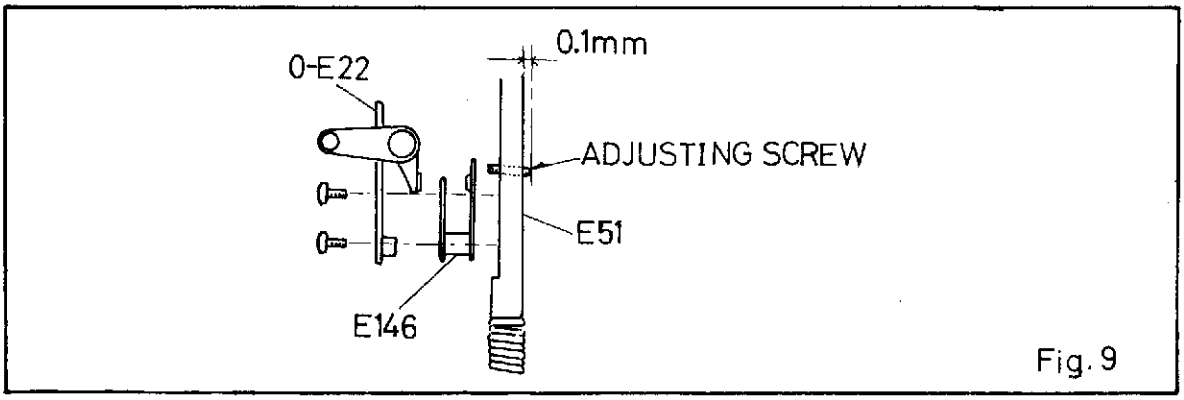


Fig. 9

7. TIMING SWITCH ASSEMBLY (0-I1)

In cocked condition, Timing switch assembly (0-I1) is installed, inserting the tip inner than the shaft of Timing contact switch lever assembly (0-F151). Two small washers are used underneath Timing switch assembly (0-I1) to prevent the basic material from breaking when fastening the two retainer screws.

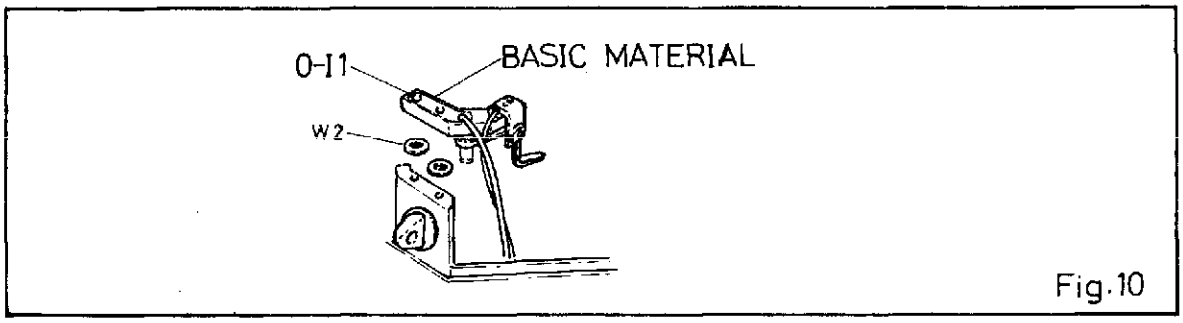


Fig.10

Adjustment :
In cocked condition, connect the lead wires soldered at Timing switch assembly (0-I1) to circuit tester.
Turn adjusting screw counterclockwise until circuit tester shows no conductivity (The adjusting screw does not contact to timing switch lever). After confirming no conductivity, turn again the adjusting screw clockwise slowly until circuit tester is beginning to show conductivity.
(The adjusting screw contacts to timing switch lever) When electric current flows, needle of circuit tester shows zero point.

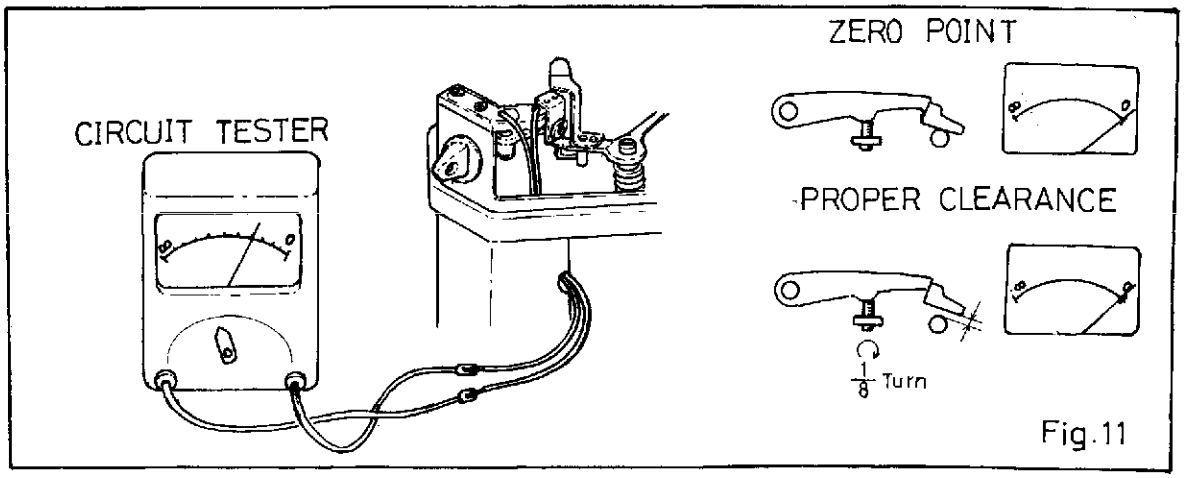


Fig.11

It is difficult to obtain zero point.
Adjustment is very critical but important.
After zero point is obtained, the adjusting screw should be screwed in 1/8 turn clockwise.
After this adjustment is finished, nut is fastened.
When fastening it, the adjusting screw should not be moved.
Fasten nut lightly so that the adjusting screw is under adjustable range.
Timing switch assembly (0-I1) should not be moved or disassembled after the adjustment is finished.

8. MAGNET

At first, install magnet adjusting screw (A138) to camera body, making the clearance at one and a half reverse turns between the neck of screw and camera body.
Magnet assembly (0-S1) is retained with nut and a screw.
Armature or it's pin should not touch to camera body.
Armature pin should come just in the middle of the hole of Top mec. plate assembly (0-C1).
No clearance is desirable between the armature pin and Magnet actuator plate assembly (0-E13) in cocked condition.

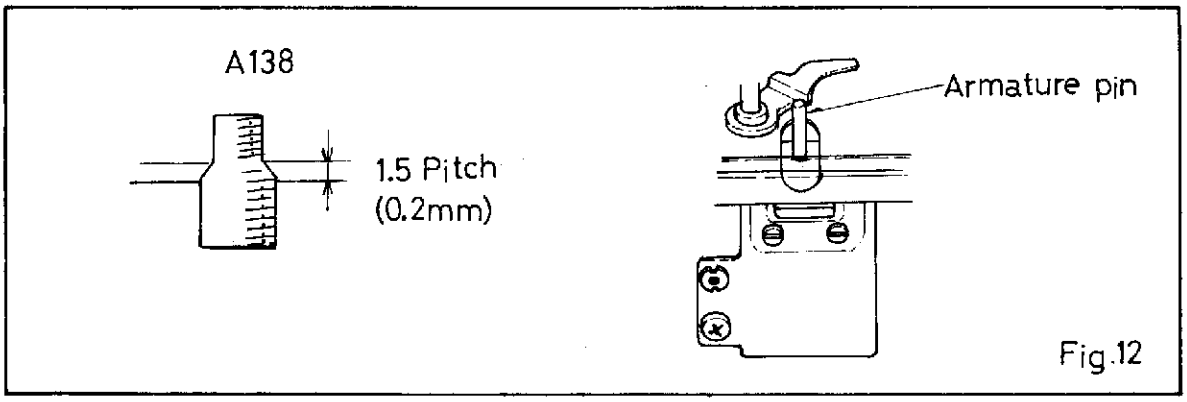


Fig.12

Adjustment :
Magnet adjustment is fundamental for electronic shutter and must be done accurately.
Solder the wire between the magnet and Contact piece assembly (0-E26) and connect the lead wire to Power source at 4V.
Set the shutter dial at AUTOMATIC.
When shutter mechanism is operated at 4V, second curtain should not be released by energized magnet. Sometimes, the second curtain is released even if the magnet is energized.
This adjustment is to find out the holding limits to arrest the second curtain.
Magnet adjusting screw (A138) is utilized for this adjustment.
After the holding limits are required, turn the magnet adjusting screw (A138) counterclockwise only a very little.
Fix the magnet assembly (0-S1).

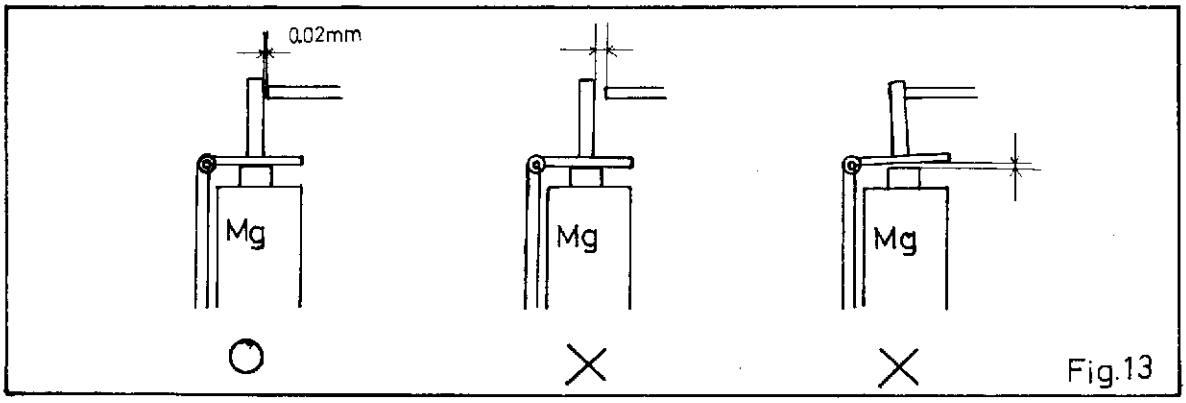


Fig.13

9. ADJUSTMENT OF MECHANICAL EXPOSURE TIME

* Curtain speed — shutter speed tester (PA16C, PA31C)

First curtain	11.5ms	at 1/1000sec
Second curtain	11.5ms	at 1/1000sec

The adjustment procedures are quite same with SPOTMATIC (Product No. 23102)

* Bounce adjustment of first curtain

First curtain bounce is adjusted at 1/60sec by screwing in or out Bounce stopper adjust screw (E109).

The adjustment procedures are quite same with SPOTMATIC (Product No. 23102)

* High speed adjustment

The adjustment procedures are quite same with SPOTMATIC (Product No. 23102)

But, there are two kinds of high speed cam assembly (0-E19-00A, 0-E19-00B) exclusively used for ASAHI PENTAX ES.

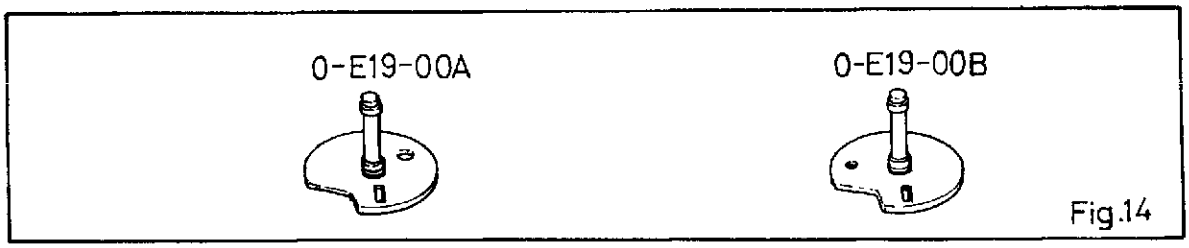


Fig.14

These high speed cams are not interchangeable with those of SPOTMATIC.

10. T. ADJUSTER

T. adjuster and shutter speed tester (PA16C or PA31C) are used for this adjustment Connect the magnet wire and timing switch lever wires to each terminals of T. adjuster.
Set the shutter speed at AUTO. and power source at 4V. (T. adjuster)
Shutter mechanism shuld be operated with "B" condition. The second curtain stops when shutter button in depressed. (If it is not operated with "B" condition, adjust the magnet position again.)
After shutter mechanism is acknowledged as good functions, set the voltage at 5.7V and set T. adjuster at 5.7V and at 2ms (1/500sec) indicator.
Release the shutter mechanism, and memorize the Exposure time of 1/500sec.
Switch to 1ms (1/1000sec) indicator. If the difference of both exposure times shows more than 0.7ms. And both exposure times are within allowable range. This adjustment is finished. If exposure time at 1/500sec shows faster than allowances, turn the adjusting screw of Timing switch assembly (0-11) clockwise and try to approach exposure time at 2.0～2.1ms.
check 1/1000sec, whether it shows 0.7ms faster than 2.0～2.1ms.
But care should be taken, because, if exposure time shows faster than 1ms, sometimes the magnet may not keep the second curtain.

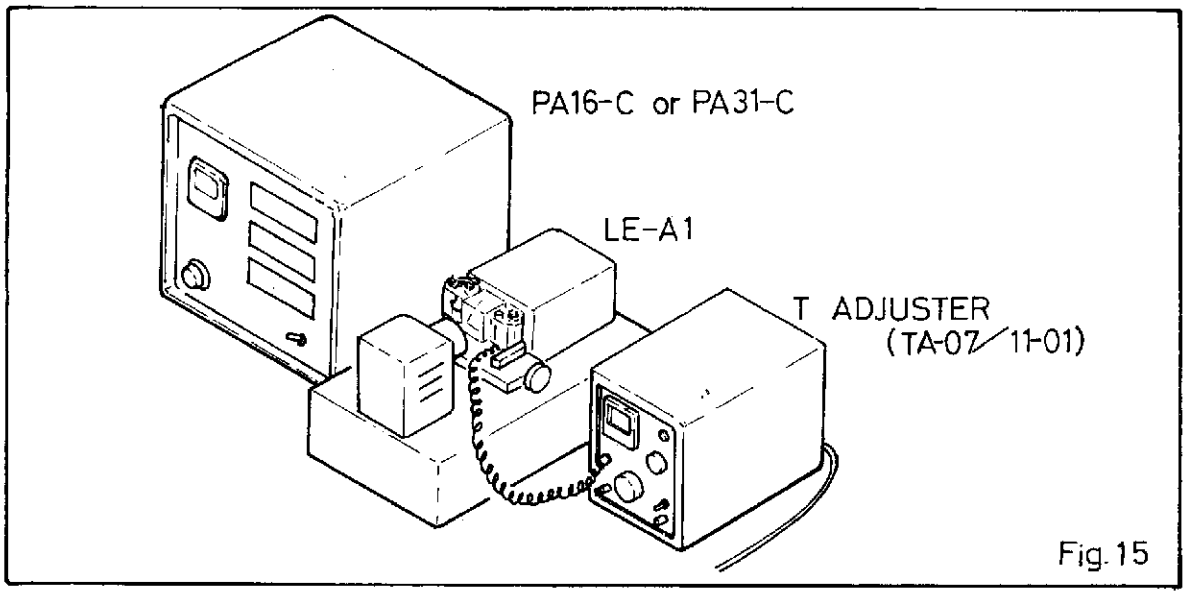


Fig.15

When the difference of both exposure times does not exceed 0.7ms, the magnet must be adjusted again by turning the Magnet adjusting screw (A138) clockwise slowly, But if it is turned too much, the magnet does not keep the second curtain at 4V. Sometimes, the magnet has some troubles itself, in that case, replace the magnet.

11. POWER SWITCH

The clearance of both contact pieces should be adjusted in 0.5mm.

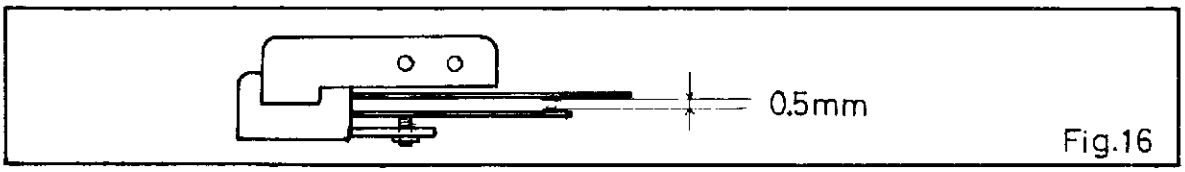


Fig.16

12. MEMORY BLOCK

The clearance between Switch actuator lever assembly (0-B176) and the contact piece of Memory block assembly (0-I400) should be adjusted from 1.0mm to 2.0mm.

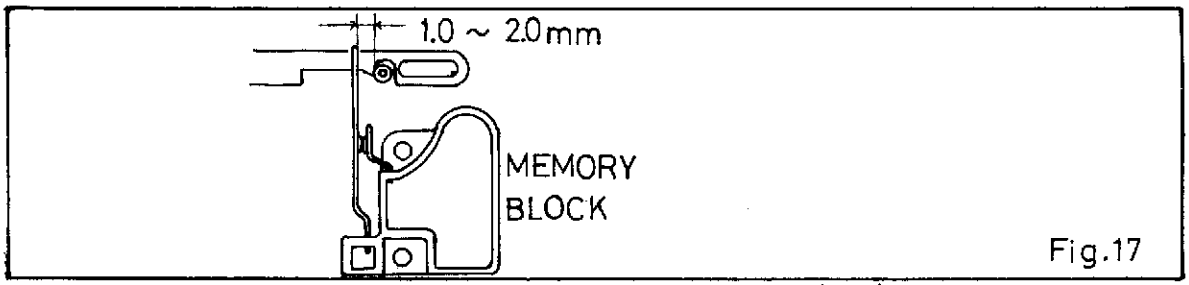
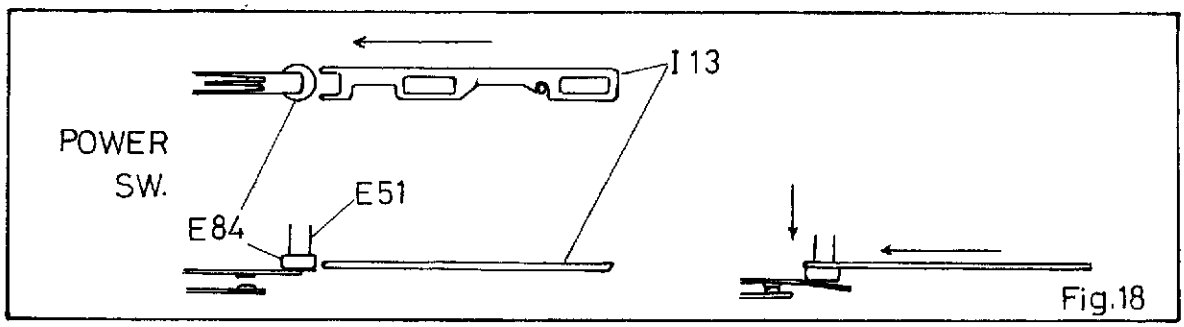


Fig.17

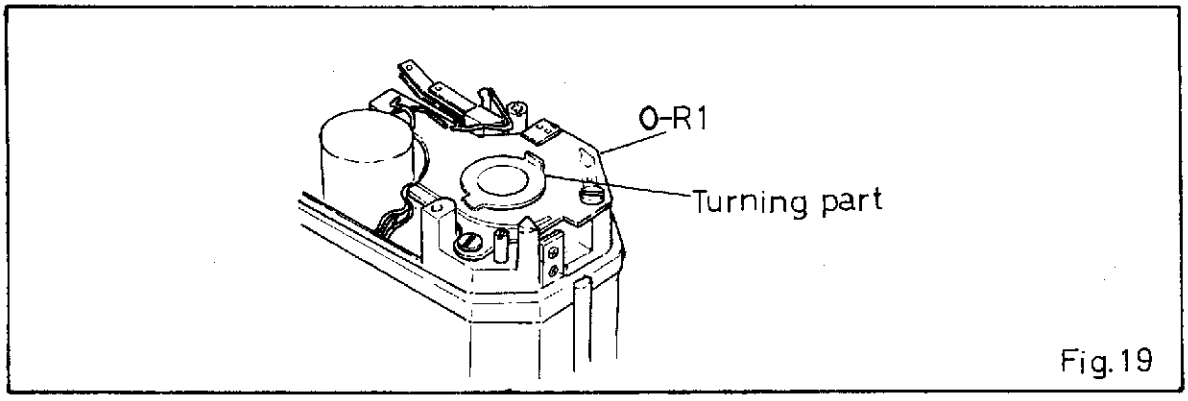
13. SWITCH SUPPORTER PLATE (I13)

This part should be installed in parallel with the bottom part of camera body. When the shutter is operated at "B", Switch supporter plate (I13) moves in parallel directions with the movement of switch actuater lever pin, and Switch supporter plate (I13) arrests Insulation collar (E84) installed in Shutter rod (E51) to keep it down enough without coupling with the movement of shutter rod.



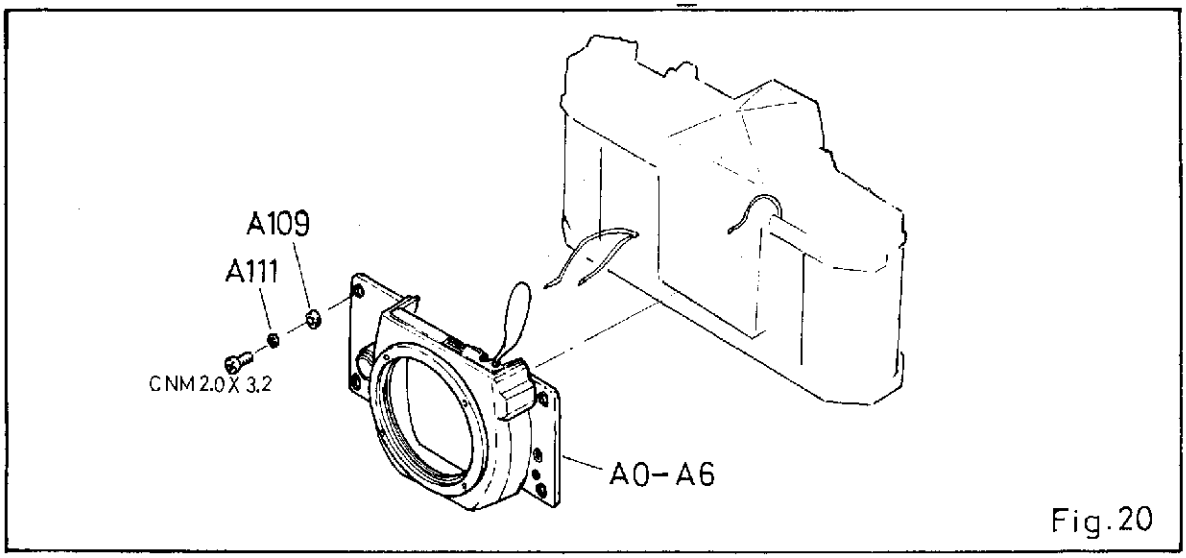
14. ASA VOLUME RESISTOR ASSEMBLY (0-R1)

When this part is installed, care should be taken not to make uneven turning of it's turning part. Install the parts as shown in the Fig. 19



15. FRONT COVER COMPLETE ASSEMBLY (A0-A6)

Before installing this part, check Diaphragm coupler lever (K17) whether it turns smoothly or not. Front board adjusting collars (A111 & A112) should be pre-assembled. Connect the two lead wires to Battery.
Mechanical back is adjusted by Front board adjusting collars (A111 & A112) turning clockwise and ccunterclockwise with special tool (23107K-A109-A).
Mechanical back measurement is 45.46mm ± 0.02.



Mechanical back adjustment
Mechanical back measurement is 45.46mm. Mechanical back is adjusted with Front board adjusting nut (A109 and A110), turning left or right with Special tool (23107K-A109-A) or twizzers.

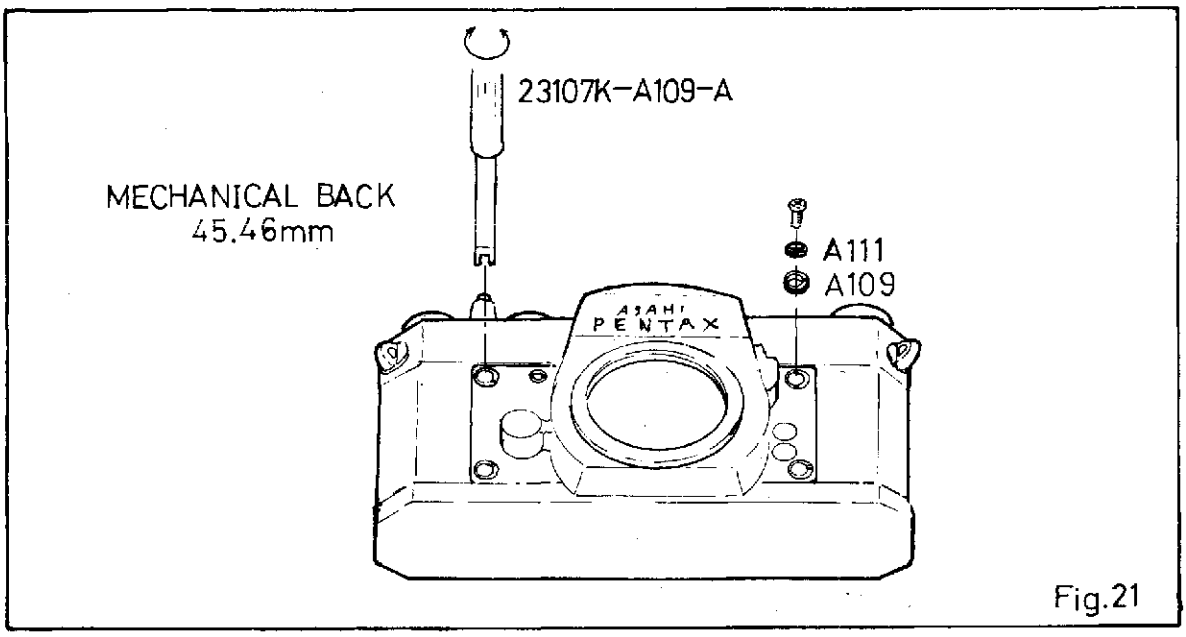


Fig.21

Check of memory block
Set shutter speed at "B".
After cocking the shutter, release the shutter 10 seconds later.
Digital auto volt meter must show under 10mV.or 12mV. If it does not show around those "mV", replace Memory block assembly (0-I400) with new one.

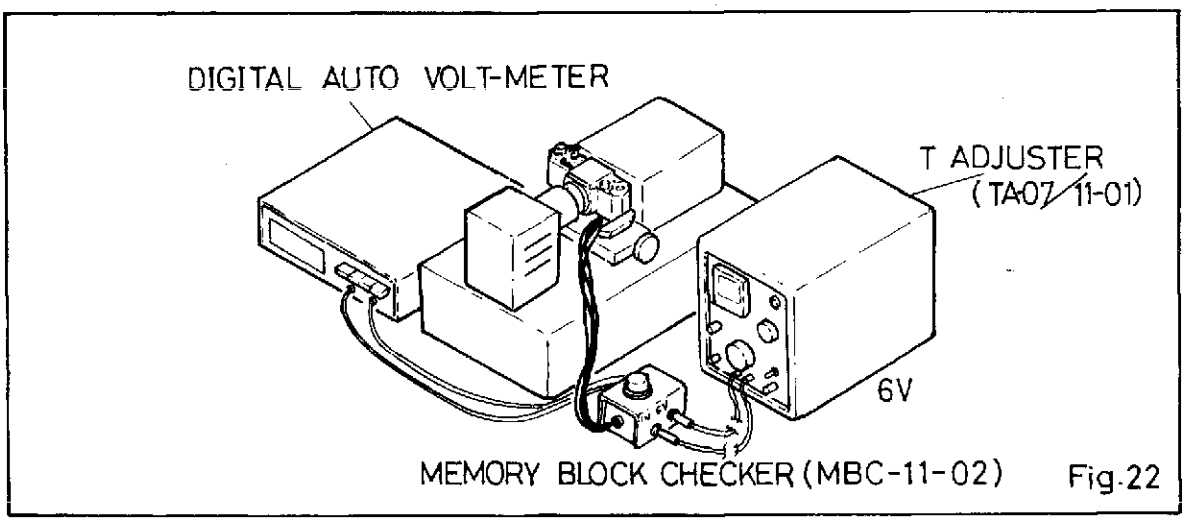


Fig.22

How to install Ammeter (⊖1)
When replacing Ammeter (⊖1), use meter installing tester (MC-11-01). Power source (6V) is supplied from T. adjuster, and Ammeter (⊖1) is connected to meter installing tester with lead wires. (Refer to Fig. 23)
Set Switch at 1000, look at the needle of Ammeter (A1) through view finder. When the needle does not point at 1000, move Ammeter slightly so that the needle will point at 1000. Set Switch at 1-1000, turn Slider in either direction and check the needle whether it functions smoothly from 1000 to 1.

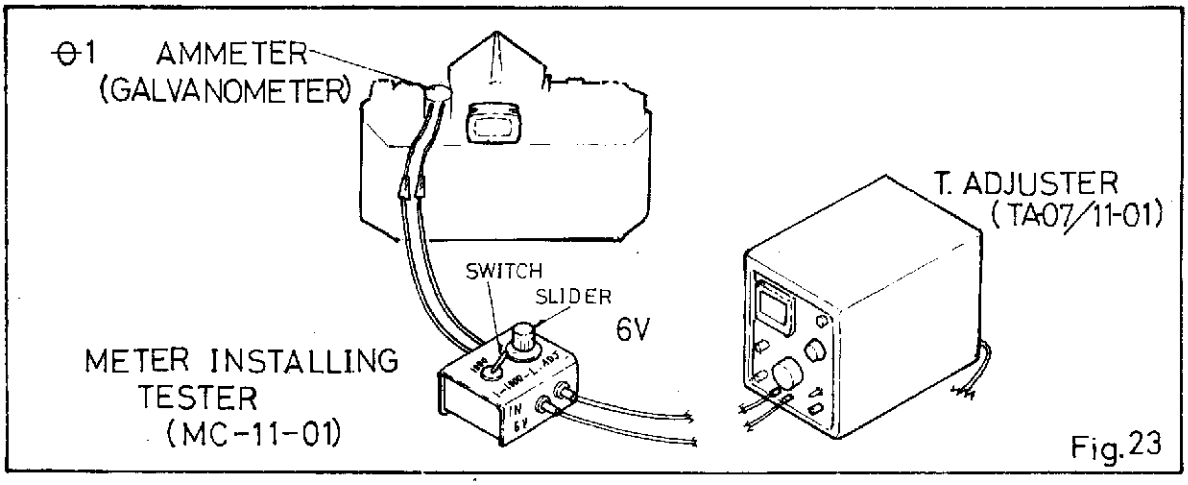


Fig.23

CdS R box is used instead of CdS cell frame assembly (0-N1-01).
Unsolder the green lead wire from CdS P. C. board (I17), and solder it again in the corner of CdS P. C. board (Shown in Fig. 24.
Connect the cord of CdS R box to CdS P. C. board.
Check exposure times in a way as shown in Fig. 25.

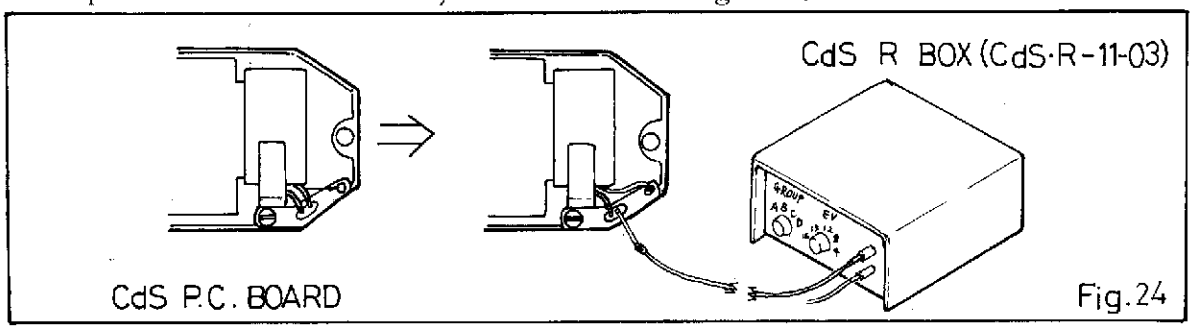


Fig.24

With this tester, characters of CdS cell and electronical functions of P. C. board pattern assembly (0-T1) are inspected.

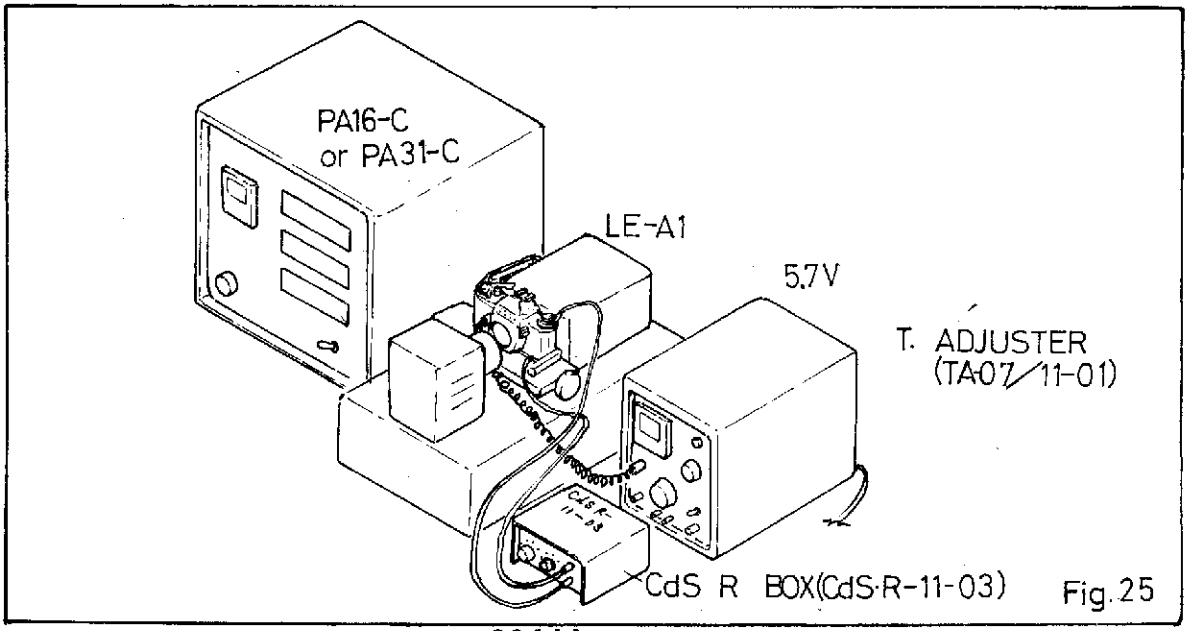


Fig.25

16. ADJUSTMENT OF ELECTRONICAL EXPOSURE TIME

Adjustment of mechanical exposure time, as mentioned before, is basically the same with that of SPOTMATIC (Product No. 23102). After exposure time is adjusted mechanically, electronical exposure time is adjusted with the adjustable resistors installed in print pattern assembly (0-T1).

Open diaphragm metering.

f 8 DC5.7V ASA100 1X

	E.V.	EXPOSURE TIME
OPEN	EV16	1 ms
	EV12	15.6ms
	EV8	250 ms
STOP	EV12	15.6ms

Fig.26

Exclusive shutter speed testers are used for this adjustment. -ESST-1A, Light value correction unit, shutter speed testers (PA16-C or PA31-C).

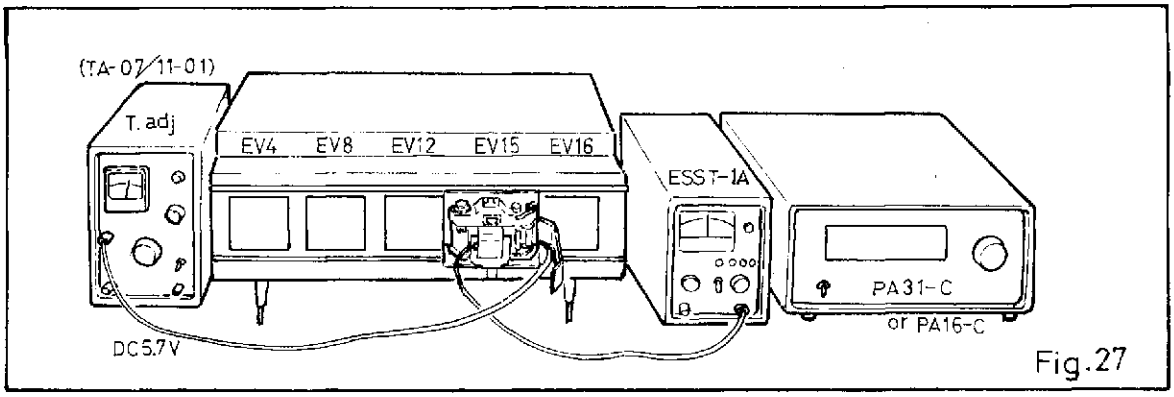


Fig.27

Put the camera on the camera stand equipped with light value correction unit. Set the camera as shown in Fig. 27
ASA 100, f8, 1X.
Electric power is supplied DC5.7V from T. adjuster through battery adaptor. Set speed dial assembly (0-E44)"AUTO"and slide the camera stand in front of EV12 window. After releasing the shutter, if exposure time shows slower (faster) than allowances, adjust the adjustable resistor (VR3) turning the slider to the right (left). Set speed dial assembly (0-E44) "AUTO" and slide the camera stand in front of EV16 window. check exposure time of 1/1000, when it shows slower (faster) than allowances, adjust the adjustable resistor (VR8).

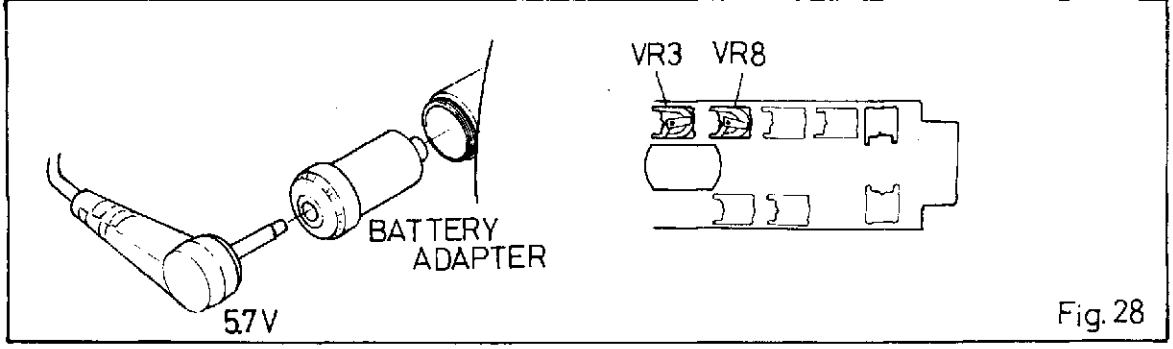


Fig.28

* Stop down metering (ASA100, 1X, f8, DC5.7V) move up OS switch lever (A69) in front of EV12 window, camera is set in the conditions as mentioned above, After releasing the shutter, if exposure time shows 1/60, it is not neccessary to adjust it. But exposure time shows faster or slower than allowances, adjust the adjustable resistor (VR2).

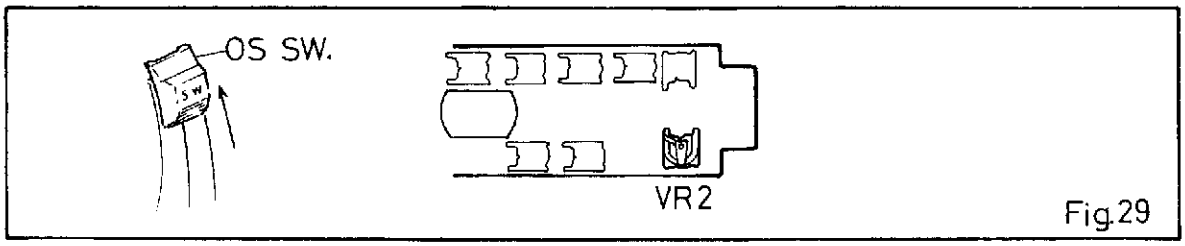


Fig.29

(Note)

1. In order to measure exposure times correctly, it is not desirable to release the shutter consecutively, but desirable to release the shutter with the following intervals.
   : EV16, EV12=5sec, EV8=10sec (Open diaphragm metering)
   : EV12=10sec (Stop down metering)
2. In front of EV12 and EV8 windows, seal camera finder window with fingers or something to prevent light leakage.

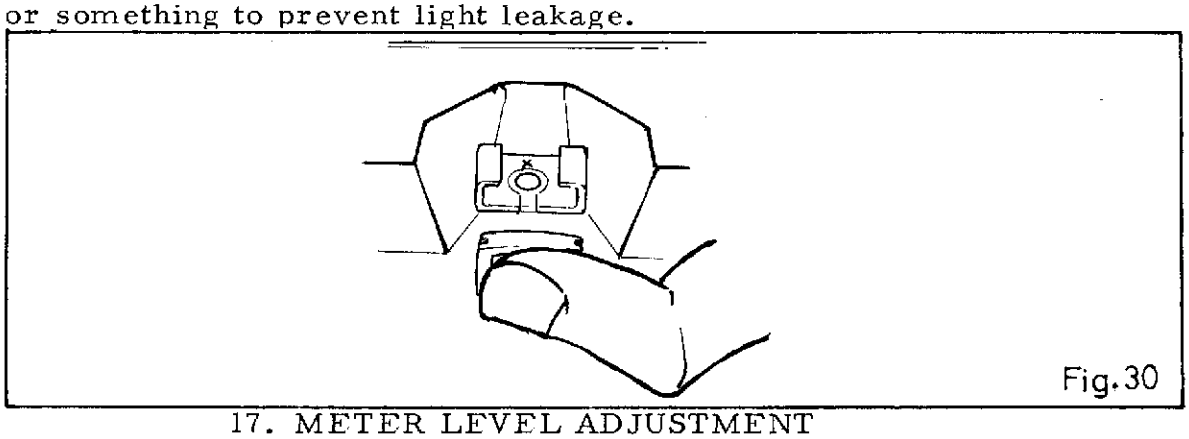


Fig.30

17. METER LEVEL ADJUSTMENT

This adjustment should be done after every exposure time is adjusted.
Meter level is adjusted with the same testers under the same conditions used in the adjustment of electronical exposure time.
(f8, ASA100, 1X, DC5.7V, open diaphragm metering, AUTOMATIC).
At first, set the camera in front of EV16 window, depress the shutter button and stop in the half way, if the needle of ammeter does not point 1000 in the view finder, adjust the adjustable resistor (VR6).
Set the camera in front of EV8 window, depress the shutter button stopping in the half way. if the needle does not point 4, adjust the adjustable resistor (VR5).

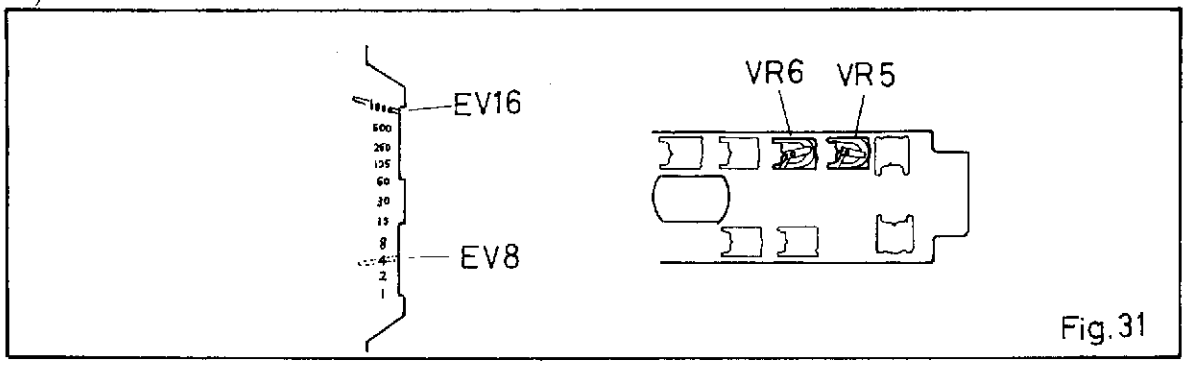


Fig.31

18. BATTERY CHECKER ADJUSTMENT

Battery checker is adjusted with DC4.4V.
Set shutter dial at AUTOMATIC.
Depress the battery checker button and look at the needle through view finder.
Check whether the needle comes in the slotted corner nearest 60, if it does not come, adjust the adjustable resistor (VR7).

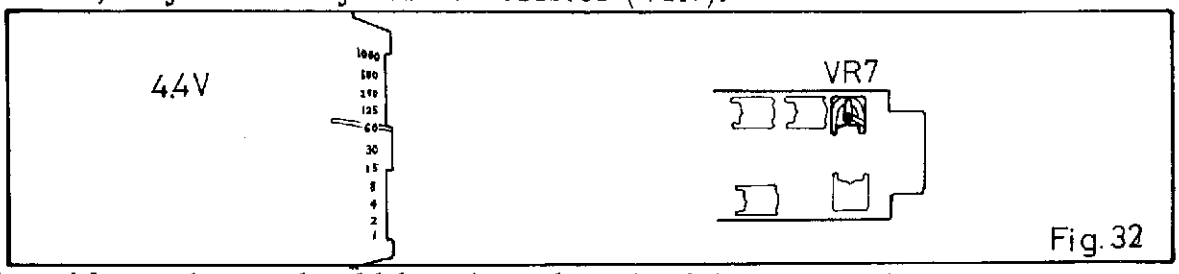


Fig.32

Adjustable resistor should be ajusted in the following order.
VR3 ⟶ VR8 ⟶ VR2 ⟶ VR6 ⟶ VR5 ⟶ VR7
This order should be kept strictly.

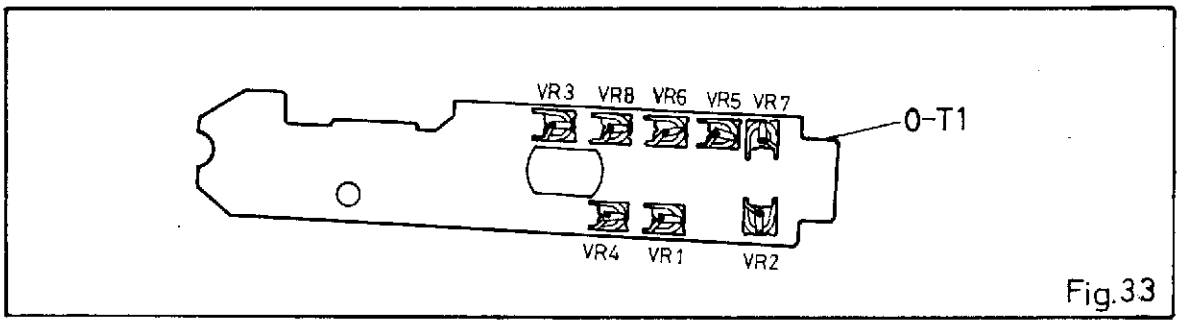


Fig.33

VR1 &. VR4: These two resistors should never be adjusted in servicing

VR2: Stop down metering measurement
(EV12, f8, 1/60, ASA100, 1X, DC5.7V)

VR3: Open diaphragm metering measurement
(EV12, f8, 1/60 ASA100, 1X, DC5.7V)

VR5: Meter level adjustment
(EV8, 1/4 , ASA100, 1X, DC5.7V)

VR6: Meter level adjustment
(EV16, 1/1000, ASA100, 1X, DC5.7V)

VR7: Battery checker
(DC4.4V, Pointing near place to 60)

VR8: Open diaphragm metering measurement
(EV16, f8, 1/1000, ASA100, 1X, DC5.7V)

19. OTHER ADJUSTMENTS

In this service manual, only the exclusive adjustments for ES camera (Product No. 23111) are described. So, the other adjustments, not described here like Mechanical back adjustment, Focusing and so forth, are quite same with SPOTMATIC (Product No. 23102).
Refer to the service manual of SPOTMATIC.

20. DISASSEMBLY

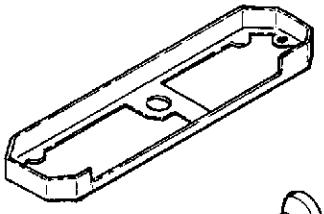
In disassembling ES camera, the following cares must be taken.

1. Front cover complete assembly (A0-A6):
   Unsolder the lead wires when taking out front cover,
2. Prism seat part
   Do not change the assorted combination of CdS and other connected electronical parts. After replacing the optical parts, exposure time and meter level should be adjusted.
3. Timing switch assembly (0-I1)
   After taking out Top cover assembly (0-A3), do not move or touch timing switch.
4. Shutter seat assembly (0-E2)
   After taking out shutter seat, Pallet release rod assembly (0-F9) may sometimes make the scratch to the 2nd curtain.
5. Distributing wires
   ES camera should be disassembled block by block, and the lead wires should be unsoldered if they have to be unsoldered.
6. Helicoid seat (A26)
   Helicoid seat should not be taken out before Front cover assembly (0-A6) and Resistor support ring assembly (0-K1) are taken out.
7. P. C. board pattern assembly (0-T1)
   After removing retainer screws, draw out this pattern with fingers quietly from connector. Do not touch the surface of adjustable resistors or other copper plates. If P. C. board pattern assembly (0-T1) is considered to have some troubles itself, replace it with new one.
   The small electronical parts on the P. C. board pattern assembly (0-T1) should never be replaced or repaired.

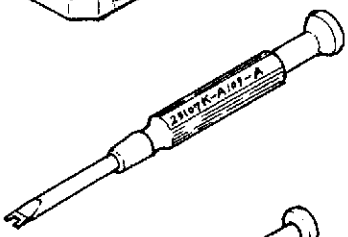
LIST OF SPECIAL SERVICING TOOLS

Product No. 23111
ASAHI PENTAX ES

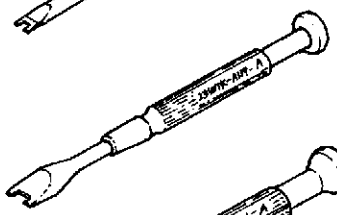
Note: 1. The following tools are for exclusive use of ASAHI PENTAX ES. The tools other than those listed below is the same as those used for Product No. 23102 ASAHI PENTAX SPOTMATIC. Please refer to the LIST OF SPECIAL SERVICING TOOLS for Product No. 23102 for details.



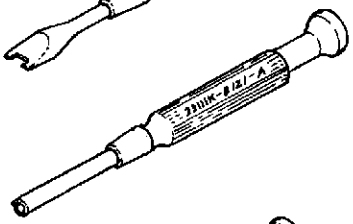
23107K-A4-A
Bottom cover tool



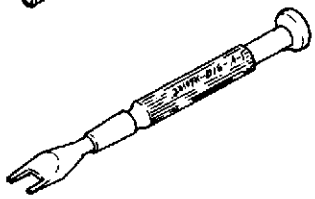
23107K-A109-A
Front board adjust nut driver



23107K-A139-A
Magnet nut driver



23111K-B121-A
Mirror housing retainer screw remover



23107K-D16-A-1
Flat nut driver

23107K-D16-A-2
Flat nut remover