

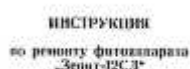
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# Zenit-12XP / Zenit-12SD Repair Manual

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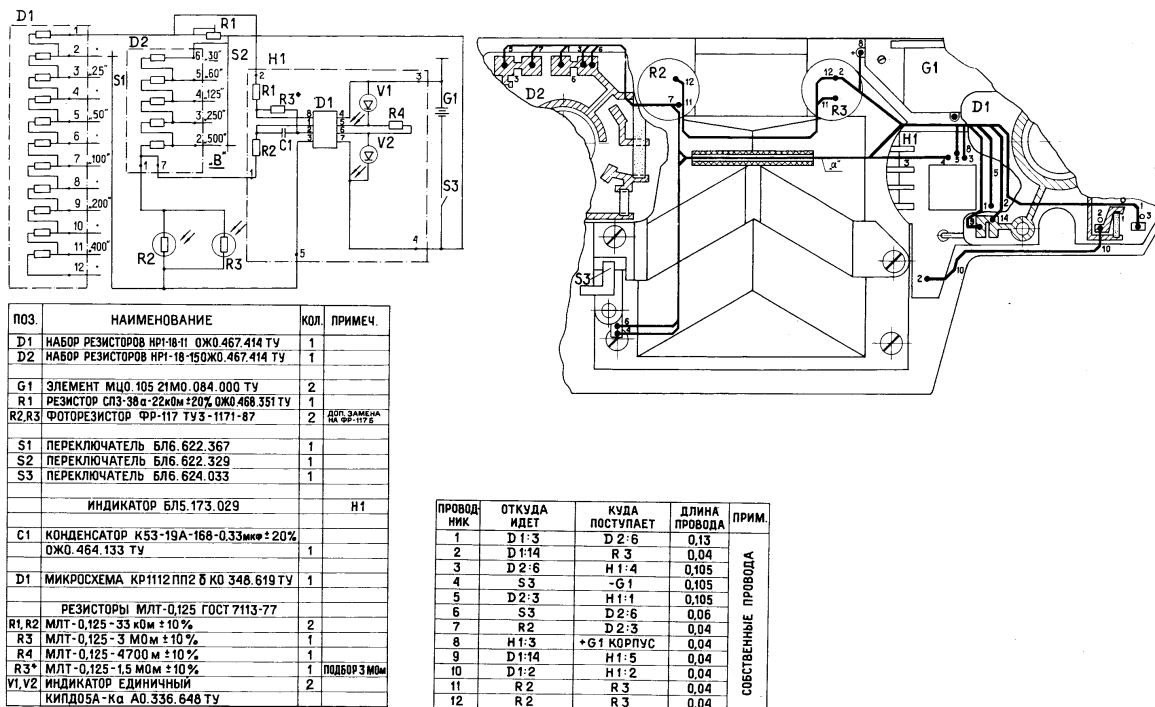
English technical translation rebuilt from the original Russian Zenitcamera HTML archive.

Source: <https://www.zenitcamera.com/mans/zenit-12xp/zenit-12xp-repair.html>



ZENIT-12xp / 12sd repair guide cover

Source note: the original Russian page states that this text corresponds to the 1983 repair instruction and was specially prepared for HTML format in 2004. This English edition preserves original part-position numbers, adjustment values, instrument codes, material standards, and repair order.



Electrical schematic and wiring diagram

Electrical schematic and wiring diagram. The embedded image is generated from the original high-resolution TIFF asset; the original TIFF is included in the package.

## 1. Purpose

This instruction is intended for warranty repair workshops as a guide for repairing the Zenit-12SD camera, also marked as the ZENIT-12xp.

## 2. General provisions

- 2.1. Use this instruction only together with the parts catalogue.
- 2.2. Before beginning repair, study both this instruction and the catalogue carefully.
- 2.3. The instruction covers possible faults of the camera.
- 2.4. Before any type of repair, inspect the outside of the camera, check the operation of the mechanism, and determine the faults.
- 2.5. Final checking, cleaning of optics, and adjustment must be carried out after every type of repair.
- 2.6. Codes for tools and auxiliary materials are given according to the enterprise standards, GOST standards, and OST standards.
- 2.7. The ordinal part numbers shown in the text refer to the parts catalogue.

## 3. Checking and adjusting instruments

- 3.1. EA-34M - instrument for adjusting the focal-plane curtain shutter.
- 3.2. YuT-687 - instrument for setting the mirror at an angle of 45 degrees.

3.3. YuT-376 - instrument for checking the installation of the camera ground glass.

3.4. YuT-192 - instrument for checking and calibrating the exposure-metering device.

## 4. Tools

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4.1. 7812-4371 - wrench for shaped nut, pos. 271.

4.2. 7812-4121 - wrench for self-timer button, pos. 162.

4.3. 7812-4342 - wrench for screw, pos. 52.

4.4. 7812-4376 - wrench for springs, pos. 128 and 130.

4.5. 7812-4384 - wrench for bushing, pos. 49.

4.6. 7812-4565 - wrench for nut, pos. 211.

4.7. 8800-7517 - template for checking the slot width between the curtain leading edges at 1/500 s.

4.8. 8159-6747 - template for checking the 8.7 mm dimension from the lens ring reference plane to lever pos. 155 in the free state.

4.9. 7800-7169 - template for checking the recessing of the first curtain.

4.10. 8153-4585 - template for checking curtain overlap.

4.11. 6211-4567 - mandrel for setting the light-protection shield, pos. 279, relative to the frame aperture.

4.12. 7810-4079 - screwdriver for the axle screw, pos. 181, of the take-up spool.

4.13. 8800-7262 - fixture for setting the 6.1 +0.2 -0.3 mm dimension from the lens ring reference plane to lever pos. 155 when the shutter release button is pressed.

Notes: in addition to the special tools listed, a set of tested general tools is required: screwdrivers, drills, needle files, taps, brushes, tweezers, pliers, hand vices, a 36 V soldering iron, and so on.

For convenience during repair, the following parts and assemblies may be used as technological/service parts: top shield, shutter release button, and shutter-cocking lever.

## 5. Auxiliary materials

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5.1. Petrol, GOST 8505-80.

5.2. Optical cotton wool, GOST 10477-75.

5.3. BF-4 adhesive, GOST 12172-74.

5.4. 88-N adhesive, TU 38-1051061-76.

5.5. MZP-6 watch oil, GOST 7935-74.

5.6. POS-61 solder, GOST 21931-76.

5.7. Cotton cloth, GOST 11680-76.

5.8. Abrasive paper, GOST 10054-75.

5.9. Petroleum ether, GOST 11992-66.

5.10. PKhV paste, TU 18-176-75.

5.11. ASZh-3 mixture, TU 6-05-041-551-74.

5.12. OKB-122-7 lubricant, GOST 18179-72.

- 5.13. Sp-10% mixture, NBL0.029.003.
- 5.14. SE-15% mixture, RM01913-68.
- 5.15. Rectified ethyl alcohol, GOST 18300-72.
- 5.16. OS-2 sealant, STP BL196-73.
- 5.17. KN-1-35 film, TU 6-17-445-75.

## **6. List of possible failures and their correction**

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### **6.1. Shutter does not operate on B**

#### **6.1.1. Disassemble the camera.**

Unscrew lens 2; unscrew screw 52, left-hand thread, with wrench 7812-4342; remove scale 51 and washer 50; unscrew bushing 49, left-hand thread, with wrench 7812-4384; unscrew three screws 47; remove lever 45, bushing 38 with spring 39, and toothed wheel 37.

Loosen the screws of handle 57, remove the handle and ball 56.

Unscrew plug 53 and remove the power cells.

Unscrew handle 62 and set the film-speed value of 500 GOST units opposite the index on cover 16.

Unscrew two screws 44 and remove cover 16.

Set contact 74 to B by turning it counter-clockwise as far as it will go.

6.1.2. Check the clearance and engagement of pawl 256 with the cam of coupling 247-249. The clearance between the lower face of pawl 256 and the upper face of the coupling cam must be  $0.2 \pm 0.05$  mm. Adjust by dressing the axle of pawl 256, lubricating the filed area afterwards, or by replacing the pawl. Engagement of the pawl with the coupling cam of 0.7-0.9 mm is obtained by selecting adjusting screws 263-267.

Unscrew axle screw 250 and remove spring 251 and pawl 256. Carry out the repair.

Also check the clearance between the upper face of the rebound ring of coupling 247-249 and cam 241. The clearance must be  $0.1 \pm 0.06$  mm. If there is no clearance, the shutter on B will operate at 1/30 s. Conversely, if the clearance is too large, the shutter at 1/30 s will operate as B. Adjust the  $0.1 \pm 0.08$  mm clearance by selecting washer 77-79.

Check operation of the focal-plane curtain shutter at all speeds.

6.1.3. If the camera fails to operate on the long exposure setting D, select one of the three stops 40-43. Play in release button 18 must not exceed 0.2 mm.

#### **6.1.4. Assemble the camera.**

Fit toothed wheel 37 onto bushing 38 so that pawl 234 engages with toothed wheel 37. Install bushing 38 with toothed wheel 37 and spring 39 on base 233.

Wind spring 39 and, while holding it against unwinding, secure its free end in the slot of the body post. Fasten cover 16 to the camera with screws 44. Disengage the gears. Turning bushing 38 counter-clockwise, wind spring 39 fully, then release it by 1.5 turns.

Install lever 45 and, after aligning the holes, secure it with screws 47. Cock the shutter and screw in bushing 49, left-hand thread, with wrench 7812-4384. Then install washer 50 on bushing 49 with its tabs upward, install scale 51, and secure it with screw 52, left-hand thread.

Turn contact 74 counter-clockwise to the stop, corresponding to B. Insert spring 55 and ball 56 into the hole of scale 54. Place scale 54 on contact 74, aligning the B marking on scale 54 with the index on cover 16, and secure with screws 73 and 75.

Insert the spring and ball into handle 57, then install handle 57 on contact 64, aligning the film-speed value of 500 GOST units with the index on cover 16, and secure with screws.

Screw in handle 62. Insert the power cells and install plug 53. Screw on the lens.

Check camera operation. When the release button is pressed, the lens diaphragm must first close, then the first curtain must run. When the button is released, the second curtain must run and the lens diaphragm must open. Check viewfinder-system adjustment on YuT-192 and curtain-shutter operation on EA-34M.

## **6.2. Poor film transport**

6.2.1. Open back cover 189, remove spring 195, and check the flatness of the spring. If flatness is out, 0.03 mm, straighten or replace the spring.

6.2.2. Place exposed film on the camera film rails, press it with spring 195, and pull the film through to check the height difference of the rails. If film motion is tight, carefully clean the guide rails. Check resolving power photographically.

6.2.3. If spool 180 rubs, unscrew screws 29 and remove cover 33. Unscrew screws 168 and remove bush 169. Cock the shutter and unscrew axle screw 181 inside spool 180 with screwdriver 7810-4079. Replace parts 180, 182, and 183 as required.

Assembly of spool 180 after repair: fit washer 185 and spring 183 onto axle screw 181. Insert the assembled unit into spool 180. Fit driver 184 onto the spool. With the shutter cocked, fasten the spool with axle screw 181. Fasten bush 169 with four screws 168. Spool play is 0.2 mm and is adjusted by installing washers 176-178 on bush 169. Check spool rotation. Fit cover 33 and fasten with screws 29.

6.2.4. Tight or uneven gear motion in the cocking mechanism.

Disassemble the camera according to 6.1.1. Check gear motion in the cocking mechanism. Motion must be smooth, without jerks or binding. Adjust by shifting base 233 after loosening screws 235 and 237. If necessary replace base 233 and toothed wheel 252. To replace toothed wheel 252, unscrew screws 127, lift the lever, and remove parts 119 and 120. Remove washer 219 and replace toothed wheel 252.

Lubricate rubbing surfaces with OKB-122-7 lubricant. Assemble the instrument and check the gear motion of the cocking mechanism.

## **6.3. Synchronizing contact does not operate**

Disassemble according to 6.1.1. Using clearance-adjusting screw 87, obtain reliable contact with pawl 256 when the shutter operates. When the shutter is cocked, pawl 256 must not touch the contact.

Check contact by means of a test lamp, using the technological top cover and technological cocking lever.

Assemble the camera. Check synchronizing-contact operation with a flash lamp.

## 6.4. Self-timer does not operate

6.4.1. Check self-timer operation. Wind the self-timer spring with lever 161. Press button 162. The self-timer may operate spontaneously or may not operate at all. Adjust by selecting axle 162.

6.4.2. Self-timer stops because its gears are dirty. Unscrew screws 29 and remove cover 33. Remove spool 180 according to 6.2.3. Unscrew screws 188 and remove cover 187. Unscrew screw 215 of the self-timer lever, left-hand thread, and remove lever 161. Unscrew two screws 179 and screw 197 and remove the self-timer. Take care that pin 171 does not fall out of the camera body. Wash the self-timer in petrol and dry it; lubricate rubbing points with watch oil.

For all other self-timer faults, replace the self-timer.

After repair, assemble as follows. Install self-timer 175 and secure with screws 179 and 197. Install cover 187 and secure with screws 188. Install the self-timer lever and secure it with screw 215, left-hand thread. Glue on leatherette 2156. Assemble spool 180 according to 6.2.3. Check operation of the self-timer and curtain shutter simultaneously. Wind the self-timer mechanism by turning the self-timer lever counter-clockwise to the stop, then cock the shutter. Press the self-timer button. The shutter must operate after  $11 \pm 4$  s. When operating on B, the self-timer must hold the curtains open for at least 1 s. Adjust self-timer delay by selecting pins 171 and by turning the self-timer eccentric, after first removing cover 187.

## 6.5. Mirror frame does not operate

Unscrew the lens.

6.5.1. Move mirror frame 107 aside. If spring 105 has slipped off lever 104 of the mirror mechanism, fit spring 105 onto lever 104 with tweezers.

6.5.2. When checking the travel of mirror frame 107 by hand, with the shutter released or cocked, the pin on lever 104 catches on cam 205.

Disassemble the camera according to 6.1.1. Unscrew two screws 80, lift resistor block 72 assembled with the IC and contact, and move it aside. Unscrew two screws 139 and remove contact holder 138. Unscrew screw 63, remove contact 64, unscrew screws 65, 82, and 83, and carefully lift and move aside microassembly 66 and body 84. Unscrew screw 148 of retaining foot 85 and carefully free the indicator from the camera body.

Unscrew screws 158 and remove angle piece 157. Unscrew screws 148 and 147 and remove the mirror mechanism. Unscrew screw 203.

Holding toothed wheel 206 against unwinding, set cam 205 so that when the shutter is cocked cam 205 does not touch the pin of lever 104, and when the shutter is released the pin drops off the cam freely without binding. It is more convenient to adjust on B. Remove and install the mirror mechanism in the camera body as necessary. Check the clearance between mirror frame 107 and body 93 of the mirror mechanism. Clearance must be 0.5-1 mm. Adjust as follows: remove the mirror mechanism, loosen two screws 97 on plate 103, insert the mirror mechanism into the body, cock the shutter on B, press pin 120 so that the mirror frame rises, and set the 0.5-1 mm clearance by turning adjusting screw 98. Remove the mirror mechanism from the body, tighten screws 97, and secure them with BF-4 adhesive. Install the mirror mechanism in the body and secure with screws 147 and 148. Check operation of the mirror frame.

### 6.5.3. Install the exposure-metering unit on the body.

Install indicator 86. With screw 148 and the retaining foot, secure the front part of the indicator; secure the rear part of the indicator with the clamp of the power-supply base using screws 82 and 83. Check correct installation of the indicator. Skewing and short-circuiting are not permissible. Install board 66 and secure it with screw 65. Install contact 64 and secure it with screw 63. Secure resistor block 72 with screws 80. Carefully tuck in the wires.

Install angle piece 157 and secure with screws 158. Continue assembly according to 6.1.4. Check operation of the mirror frame. Check operation of the exposure-metering unit according to 6.7.1.

6.5.4. Spring 201 has come loose in mirror-lift bridge 210. Disassemble according to 6.1.1 and 6.5.2. Unscrew four screws 29 and remove cover 33. Unscrew three screws 167 and remove the mirror-lift bridge from the camera body. Unscrew screw 212, unscrew nut 211 with wrench 7812-4665, and replace axle screw 202 assembled with gear 206 and spring 201. Screw nut 211 onto axle screw 202. Install the bridge in the camera body. Wind spring 201 by 1.5-2 turns clockwise with the shutter released. Tighten nut 211 and lock it with screw 212. Check operation of the mirror frame. If necessary, adjust according to 6.5.2. Assemble according to 6.5.3 and 6.1.4.

## 6.6. Incorrect operation in automatic mode

6.6.1. The lens diaphragm does not stop down to the selected value.

Unscrew the lens. Check the dimension  $6.1 +0.2 -0.3$  mm under a load of 310 g, using indicator fixture 8800-7262, from the reference plane of the lens ring to lever 155 when the release button is pressed.

If the dimension is incorrect, disassemble according to 6.1.1. Loosen two screws 151 fastening cam 152 to lever 155. Move cam 152 to set the dimension  $6.1 +0.2 -0.3$  mm, then tighten screws 151. The lever roller must move smoothly over cam 152.

Check the lever system with the lens. Set the diaphragm to 1:16 and cock the shutter with the technological cocking lever. When pin 120 is pressed smoothly, the lens diaphragm must first close to 1:16, the aperture visible through the lens must have a diameter of 3.66 mm, and then the shutter must operate. When pin 120 is released, the diaphragm blades must open completely. Make the same check at all lens aperture values. Assemble according to 6.1.4.

6.6.2. Diaphragm blades do not return to their initial position.

Unscrew the lens. Check the 8.7 mm dimension, template 8159-6747, from the reference plane of the end of the lens to lever 155 in the free position. Play in shutter release button 18 must be at least 0.2 mm.

If the 8.7 mm dimension is incorrect, disassemble according to 6.1.1. Set the 8.7 mm dimension by selecting pin 120. Dressing of the stop is permitted. Assemble according to 6.1.4 and check camera operation with the lens according to 6.6.1.

## 6.7. Unstable exposure-metering operation

Check operation of the camera exposure-metering device with the lens fitted. The metering unit must connect to the power circuit when the release button is pressed to the perceptible

light stop, the initial travel of the release button. When the release button is released, the power circuit must open.

6.7.1. When release button 18 is pressed and illumination is changed by turning the aperture ring, the indicators do not light. Remove plug 53, remove the power cells, and clean the contact of body 84. Insert the power cells into body 84 and insert plug 53.

If the defect is not eliminated, disassemble according to 6.1.1. Check reliable contact at holder 138. Using a tester and the circuit and wiring diagrams, determine the place where the circuit is open. Check solder quality and wire continuity.

6.7.2. At all film-speed and shutter-speed settings, the plus indicator is constantly lit. Cause: short-circuit of some part of the electrical circuit to the camera body or to cover 16.

At all film-speed and shutter-speed settings, the minus indicator is constantly lit. Cause: possible short-circuit of one of photoresistor 134 contacts to the body, or failure of the photoresistor itself.

Correct the identified fault. Check operation of the exposure-metering device on YuT-192 according to the table supplied with the checking/adjusting instrument.

Fine calibration of the exposure-metering device is carried out with the variable resistor installed on board 66. To do this, unscrew screw 26 on cover 16. Use the special screwdriver whose blade must have a polyvinyl-chloride tube fitted over it. When shutter release button 18 is pressed, indicators 86 light alternately; this is normal operation of the photo-exposure-metering device.

## **6.8. Frame counter does not operate**

Load the camera with film, cock the shutter, and set 0 on frame-counter scale 51 opposite the index of handle 45.

6.8.1. The frame-counter scale skips divisions. Unscrew screw 52, left-hand thread, with wrench 7812-4342. Remove scale 51 and washer 50. Bend the tabs of washer 50 or replace it. Assemble the frame counter and check its operation.

6.8.2. Scale 51 does not count frames. Disassemble according to 6.1.1. Unscrew screws 235 and 237 and replace base 233 or toothed wheel 232. To replace toothed wheel 232, disassemble according to 6.2.3. Assemble the camera and check operation of the frame counter.

## **6.9. Poor image quality**

Contaminated optics.

Install the camera on instrument YuT-376. Set the lens distance ring to infinity. The diaphragm blades must be fully open. Rotate the collimator handwheel to obtain a sharp test-target image on the ground plate, Fresnel lens. If adjustment is incorrect, disassemble according to 6.1.1 without removing the lens.

Using the vernier of YuT-376, determine the number of shims needed for exact adjustment at the rate of 1 division equals 0.15 mm of shim.

Unscrew two screws 135 and remove bracket 136 and prism 137. With wrench 7812-4376 remove springs 128 and 130 and install the required number of shims 142-146 under lens 141. Temporarily install prism 137 and cover 16 and check adjustment. When sharp test-



target lines are obtained on the checking/adjusting instrument, install frame 140 on lens 141 and secure with springs 128 and 130.

If Fresnel lens 141 is contaminated, clean it only with compressed air. Replace the lens if necessary. Clean prism 137 with an alcohol-ether mixture.

Install prism 137 and bracket 136 and secure with screws 135. Assemble according to 6.1.4. Check adjustment of the viewfinder system.

## **6.10. Shutter does not operate**

### **6.10.1. Tape has come unstuck on curtain shutter 286.**

Disassemble according to 6.1.1, 6.5.2, and 6.5.4. Unscrew screw 149 and remove shield 150; unscrew two screws 127 and remove the lever; unscrew screw 126 and remove shield 125; unscrew axle screw 250, remove spring 251, and remove pawl 256. Remove cam 241 as an assembly. Unscrew screw 242, remove spring 244 and washer 245, unscrew screws 246, and remove coupling 247. Unscrew screws 216 and 217 and remove board 278 with curtain shutter 286 from the camera body.

Unscrew screws 272 and nuts 271 with wrench 7812-4371, left-hand thread, and remove the curtain shutter from board 278.

If the tape of the first curtain has come unstuck, glue it to the pulley with 88-N adhesive. The tape of the second curtain is glued to the sleeve. Allow 24 hours drying time. If the tape is broken, replace the curtain.

Installation of curtains on board 278: lubricate the sleeve axles; fit rollers 283 and 284 and ring 282 onto the short sleeve. Insert the sleeves into the holes in the board and secure with nuts 271. Turn the toothed wheel on the board counter-clockwise and insert the drum axle into the board hole.

Install the assembled unit in the camera body and secure with screws. Wind the spring of the first curtain, short sleeve, by 6 turns counter-clockwise; wind the spring of the second curtain by 4 turns. Lock nuts 271 with screws 272.

Fit coupling 247 onto the drum axle; the coupling lever must enter the drum slot. Secure with screws 246. Drum-axle play must be 0.15 mm, obtained by selecting rings 254-255.

With the shutter released, the coupling cam must be opposite the hole for the axle of pawl 256. Install pawl 256 and spring 251 and secure with axle screw 250.

Check curtain skew. Permitted skew is 0.2 mm. Slight correction is permitted by gluing pieces of curtain material under the curtain tapes.

With the shutter released, the leading edge of the first curtain must be recessed behind the edge of the frame aperture by 2.7-3.5 mm, checked with template 7800-7169. This is obtained by re-meshing the toothed wheel on the drum axle with the toothed wheel on board 278. Check curtain overlap; throughout shutter cocking it must be not less than 0.8 mm, checked with template 8153-4585.

Check curtain operation on B using the technological cocking lever and technological release button. The first curtain must be recessed by 0.6 mm or protrude beyond the frame aperture by 0.2 mm. This is obtained by selecting couplings 247-249.

Finally secure board 278 to the camera body. Fit washer 245 and spring 244 onto the drum axle, screw in screw 242, and install cam 241 as an assembly. Set the slit width at the centre of the frame to  $2.2 +0.3 -0.1$  mm at 1/500 s. To do this, cock the shutter to the middle of the

frame aperture, loosen the three screws 239 fastening cam 241 of bushing 240, press bushing 240 with a finger, and bring the rebound element of coupling 247 to the smallest projection of cam 241 counter-clockwise. Set the clearance between the curtain leading edges to  $2.2 + 0.3 - 0.1$  mm, checking with template 8800-7517. Secure cam 241 in this position with screws 239.

Install shield 125 and secure with screw 126. Install the lever in the body and screw in screws 127. Install shield 150 and secure with screw 149.

Install the mirror-lift bridge and mirror mechanism in the body. Carry out adjusting operations according to 6.5.2 and 6.5.4. Install the exposure-metering unit on the camera body according to 6.5.3. Complete assembly according to 6.1.4. Check shutter operation. At  $1/500$  s, the shutter must open at the beginning of the frame.

On the KYu-EA-34M instrument, adjust the camera at all speeds according to the table. Adjustment is by regulating spring tension in the sleeves of the curtain shutter. Check exposure uniformity across the frame by checking exposure time at the beginning, middle, and end of the frame at  $1/125$  and  $1/250$  s. Non-uniformity across the field when the shutter operates must not exceed 1.7.

Install shield 33 and secure with screws 29. Insert the power cells and plug 53 into body 84. Check operation of the exposure-metering device on YuT-192. Fine-calibrate if necessary.

6.10.2. The shutter operates identically at all speeds.

Cause: pawl 256 has jumped out of the slot of board 278. Disassemble according to 6.1.1. Unscrew axle screw 250 and remove spring 251. Set pawl 256 into the working position, strengthen or replace spring 251, and secure with axle screw 250. Assemble the camera and check operation of the curtain shutter.

### Table of effective shutter speeds

Effective shutter speeds, ms	Exposure non-uniformity at $1/125$ s	Exposure non-uniformity at $1/250$ s
$1/30$ : 36.0-18.8; $1/60$ : 21.4-11.5; $1/125$ : 10.7-5.7; $1/250$ : 5.3-2.8; $1/500$ : 2.7-1.4	10.7-18.2	5.3-9.0
	10.5-17.8	5.1-8.7
	10.1-17.2	4.9-8.3
	9.8-16.7	4.8-8.2
	9.6-16.3	4.7-8.0
	9.4-16.0	4.5-7.6
	9.0-15.3	4.3-7.3
	8.6-14.6	4.1-7.0
	8.2-13.9	3.9-6.6
	7.8-13.3	3.7-6.3
	7.4-12.6	3.5-5.9

Effective shutter speeds, ms	Exposure non-uniformity at 1/125 s	Exposure non-uniformity at 1/250 s
	7.0-11.9	3.3-5.6
	6.3-10.7	3.1-5.3
	5.9-10.3	2.9-4.9
	5.5-9.4	2.7-4.6

### 6.11. Synchronizing contact does not operate when the shutter is released by the self-timer

Disassemble according to 6.1.1. Unscrew two screws 80 fastening resistor block 72. Remove cam 241. Unscrew axle screw 250, free spring 251, remove pawl axle 256, and file its end; lubricate the filed place afterwards. Install pawl 256, spring 251, and axle screw 250. The clearance between the lower face of the pawl and the upper face of the coupling cam must be 0.2 +/- 0.5 mm. Install cam 241 and resistor block 72 and secure them with screws 80.

Check contact with a test lamp or flash lamp using the technological cover and technological cocking lever. Cock the shutter and wind the self-timer spring with lever 161. Press the self-timer button. During shutter operation, the washer of pawl 256 must contact the large projection of coupling cam 249 by its diameter.

Assemble according to 6.1.4.

### 6.12. Miscellaneous defects

6.12.1. Film fogging. When fogging is found on the negative, open cover 189. Check for yarn in the body grooves and velvet seals on cover 189. Glue damaged areas: yarn with 88-N adhesive, velvet seals with BF-4 adhesive. Carefully inspect the curtains. Minor damage may be sealed with black nitro lacquer. In case of major damage, replace the curtain according to 6.10.1. Load fresh film and make exposures. Develop the exposed film and inspect the negative.

6.12.2. Scratches on the film. Load a cassette with new film. Visually inspect and determine the cause of scratches on the film. This fault generally arises from three causes: burrs or dents on the film-channel rails; burrs or scratches on the pressure plate, spring 195; or a damaged cassette with detached velvet seals.

Clean the film-channel rails with a marble block and cloth. If scratches or burrs are present on the pressure plate, spring 195, replace the pressure plate. If the cassette is damaged, clean the working surfaces and glue the velvet seals back in place.

After each of these three repair types, check operation of the camera with new film.