

ACCEPTANCE TEST RECORD FOR TTK-59.
 I-1059

Steadiness of readings for 30 minutes at normal temperature after warming up for 15 minutes.
 Drift of the cord on a swinging base.
 Drift of the cord against mark "0" on the vibration test stand.
 Mark '0' Mark '3' Mark 'B'

AS PER TECHNICAL SPECIFICATION.
 Device no.
 Date

External appearance, delivery set.
 consumed current each phase.
 Insulation resistance in normal condition.
 20 megohms minimum.
 ± 1 small division.
 ± 2 small divisions
 ± 2 small divisions

10	9	8	7	6	5	4	3	2	1	TID Representative	19 years.

Ordnance Factory
Project
Hyderabad

I 1052

NUMBER LTK-59

SHEET 62 OF

CONTINUED INSPECTION TEST PROTOCOL FOR LTK-59

1	2	3	4	5	6
19.	Resistance to low atmospheric pressure.	Drift on swinging base, ± 1 small division.			

ELECTRIC DIRECTIONAL GYRO · ГПК -59

List of repair and assembly tools & gauges set for
overhaul and restoring article ГПК-59.

Sl. No.	Description of tools, gauges	Code	Quantity	Remark
1	2	3	4	5
1.	Desk to check number of resolutions and speeding up time of gyromotor.	6365-1373	1	127-cδ
2.	Screw Driver for part 127-64.	6350-4605	2	"-
	Screw driver for part 127-85.	6350-6405	2	"-
4.	Special wrench for part 252-114.	6350-6453	2	"-
5.	Internal special wrench.	6350-6472	2	"-
6.	Socket wrench S=7 for part 127-100.	6350-4716	2	"-
7.	Device to measure gimbal axial play of in the body.	6350-4443	1	"-
8.	Load gauge to press in the inner race of the bearing, upto 10 Kg, capacity.	6350-1835	1	"-
	Double wrench for part 127-101.	6350-6454	2	"-
10.	Gramgauge, 0 to 1.5 grams.	6350-6537	1	"-
11.	Screw driver for part 9A8.632.000.	6350-6751	2	"-
12.	Gramgauge of 3g. maximum to measure the force of brushes.	6350-4759	1	"-
13.	Equipment to check for airtightness.	6350-2057	1	"-
14.	Technological wire bundle.	6350-4911	1	"-
15.	Technological wire bundle.	6350-4912	1	"-
16.	Brackets for checking on "SKORSBi".	6350-4636	1	"-
17.	Screw driver.	127-cδ6	2	"-

1	2	3	4	5
18.	Support for assembly.	6350-7185	1	127-cd1
19.	Wrench for nuts 2538-192.	6350-4717	2	"-
20.	Wrench for part 252-cd11, c127-76.	6350-4603	2	"-
21.	Device to measure gimbals play.	6350-784	1	"-
22.	Device to measure gimbals play.	6350-785	1	"-
23.	Torque meter to check turning torque of the cage shaft from 1 to 1000 g.cm.	y-169	1	"-
24.	Support for soldering wires to the plug.	6350-4733	1	"-
25.	Device for assembling and drying purpose.	6350-4436	1	127-cd10
26.	Wrench for part 127-86.	6350-4604	2	127-cd14
27.	Device to measure axial play.	6350-6704	1	"-
28.	Wrench for part 127-50.	6350-4608	2	"-
29.	Device to check Beat.	6350-6549	1	"-
30.	Wrench for part 953-40.	64410-003	2	"-
31.	Gramgauge from 0.4 to 1Kg.	6350-7820	1	"-
32.	Stud for centering (aligen- ing) the contact group.	6350-4432	2	"-
33.	Gramgauge upto 10g.	6350-1967	1	"-
34.	Weight 1.25gr.	6350-4766	1	"-
35.	Device to measure axial play of gyrounit.	6350-6704	1	"-
36.	Device to check play 0.02 to 0.06 mm.	6365-621	1	127-cd15
37.	Centers to check Beat.	63624-018	1	"-
38.	Tapered needle to measure the diameter of hole of ball bearing 5 and 3.	6034-412	2 pieces	"- and cd18
39.	Socket wrench 1.8 x 1.8	160-265	2	127-cd15
40.	Templet - plug for mounting contact unit.	6350-4602	2	"-
41.	Wrench for threaded bushing.	6350-1151	2	127-cd18

1	2	3	4	5
42.	Wrench for gyrounit lock nut.	6350-290	2	"
43.	Wrench for screwing and locking the nut and screw ЭУП-53-28.	6350-4725	2	"
44.	Wrench.	6350-451	2	"
45.	Wrench for nut 160-329.	6350-4768	2	"
46.	Equipment for statistic adjustment.	У-118	1	"
47.	Device to center the Cam.	П-5322	1	"
48.	Assembly device.	П-6018	1	127-сб22
49.	Device to check heat of part 252-190.	6350-134	1	160-сб14

REMARK: 1. Tools as per the given list is not included in the set of article ГМК-59. It is delivered under special agreements.

2. The list is corrected (amended) not more than once a year if required.

CHIEF PRODUCTION ENGINEER.

LEADING ENGINEER.

L I S T

List of spare parts repair set for overhauling and restoring the directional gyro ГПК-59 (for 20 articles).

Number.	Number of the parts and units	Description	Quantity
1	2	3	4
1.	127-сд2	Bracket with slide block	2
2.	127-сд6	Screw driver	5
3.	127-сд7	Contact	6
4.	127-сд8	Contact	3
5.	127-сд10	Block assembly unit	3
6.	127-сд12	Contact	3
7.	127-сд24	Body with cover	1
8.	160-сд22	Contact	6
9.	9Д.6.354.001	Control button	2
10.	9Д.6.615.003	Lamp holder	2
11.	9Д.6.617.000	Collector	5
12.	9Д.6.635.001	Cap with contact	3
13.	359.00.00.000	Gyromotor	3
14.	A1000095y ^x)	Bearing	5
15.	A6005k1 ^x)	Bearing	5
16.	A23ym ^x)	Bearing	10
17.	МН.26.012.1	Miniature bulb	10
18.	127-6	Glass	5
19.	127-59	Gasket	5
20.	127-73 ^x)	Spring	3
21.	127-100	Stud	10
22.	160-75	Wire	4
23.	9Д.8.683.011	Gasket	12
24.	9Д.8.683.012	Gasket	5
25.	3494A-1-8	Pin	3

contd.

1	2	3	4
26.	3494A-1-10	Pin	4

- REMARK: 1. The spare parts specified in the above list are delivered under a special agreement.
- 2^x) Parts marked with 'x' subjected to slushing and deslushing.
3. It is permitted to deliver bearings 5MA6025 in place of AG005k1.

Certificate for
electrical directional gyro ГПК-59

No. _____

1. Acceptance Certificate

The electrical directional gyro ГПК-59 with the above specified number is manufactured in compliance with technical specifications, checked and accepted by TID and approved for serviceability.

TID Inspector

" " _____

19 84.

2. Delivery Set

Serial Number	Description	Quantity
1.	Electrical directional gyro ГПК -59.	1
2.	Socket 2PMД18ky 9 4Г 5B1.	1
3.	Miniature bulb MH-26-012-1 (spare).	3

3. A Brief Technical Data

- a) The article operates on 36 ± 4 volts, $400 \pm 10\%$ Hz AC and DC 26 ± 5 volts DC.
- b) Current consumption in each phase at steady operation conditions, $36 \pm 1V$ and 400 ± 10 Hz should not exceed 0.30A.
- c) Temperature range from $+50^{\circ}C$ to $-50^{\circ}C$.
- d) Overall dimensions : 237 x 130 x 122mm.
- e) Weight : 2200g. maximum.
- f) Drift of the card against mark '0' on a horizontal vibrating table in 30 minutes after warming up the device for 15 minutes should not exceed ± 1 small division.
- g) Drift of the card against mark '0' on a swinging base in 30 minutes after warming up the device for 15 minutes should not exceed ± 2 small divisions.
- h) Drift of the card against marks W_3 or E_3 after warming up the device for 15 minutes on a swinging base, in 30 minutes should not exceed ± 2 small divisions.

4. Scheduled Maintenance

The scheduled maintenance is performed in compliance with the requirements of "Instruction manual" (section "Maintenance").

5. Overhaul period, service and storage life.

Operating period of the article till first scheduled repair is _____ hours for _____ years including transportation and storage period.

Guaranteed service and storage period as well as procedure to forward claims are specified in the agreement between customer and manufacturer for exporting articles. The specified operating life service and storage periods are effective on conditions of proper maintenance and storage of article in compliance with instructions and other indications of the manufacturer for transporting, storing unpacking mounting, maintenance (repairs) and preserving the article.

6. Records on preserving the article are absent.

T A B L E

RESULTS OF CHECKING CONDUCTED AS PER ITEMS '2', 'G' and 'H' § 3

Num-ber	Date of checking	Cause for checking	Operating hours	Results of Checking			Signature of the person in-charge
				F	G	H	
		NCH Scheduled testing;					

7. IN-SERVICE TRANSFERS

Sl. No.	Mounted on Vehicle		Dismount date	Operating hours		Cause for dismount	New specified service period and signature of the person in-charge.	Signature of the person who mounted/dismounted.
	Date	No. of the Vehicle		From the beginning of operation	After the last extension			

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§ 9. MAINTENANCE NOTES

1. Before operating get acquainted with instruction manual.
2. While uncaging do not turn the handle because it can cause unproper readings of the device.
3. Power supply should be through a screened cable.

REQUIREMENTS FOR PARTS

1. Wash the ball bearings A6005k1 and A1000095 ky in three vessels containing petrol "Calosha" and dry them in air.
Lubricate with oil 132-20 (2 to 3 drops from an injector with a tip of \varnothing 0.6 mm).
2. Damage of silver colour enamel MJL -165 from the outside is not allowed.

REQUIREMENTS FOR ASSEMBLY

3. Conduct wiring as per 127 cx 3 .
4. All adjustments and checks of scale readings of the device are carried out at permanent vibration of 0.1 to 0.3g and a frequency of 40 Hz.
5. The axial play of the vertical axle of gimbal suspension should be within the limits of 0.05 to 0.1 mm when a force of 2.5 Kg. is applied to the lower(bottom) semi-axle.
6. Friction torque in the vertical axis of the gimbal suspension should not exceed 2 gm.cm; in some points 3 gm.cm.
7. Total play of the card should not exceed 2° when the axle of cage shaft is fixed.
8. The cage axle should shift smoothly without seizing. While rotating the cage shaft in push, in position the coupling should rotate freely without seizing and jamming. Torque of the handle should not exceed 500 gm.cm. The difference of torques in various points should not exceed 350 gm.cm.
9. The reliability of contacts of gimbal current feeding units is checked with an ohmmeter, rotating the gimbal unit by cage handle through $\pm 360^{\circ}$. Contact faults are not permitted.
10. Consumed current at 36V and 400 Hz frequency ~~xxx~~ should not exceed 0.3A.
11. Contact pressure of the brushes of unit 127-cd10 should be 0.8 to 2 gm.
12. The assembled device should be run-in on "SKORSBI" unit for 10 hours, by 2.5 hours at marks $\begin{matrix} N & E & S & W \\ C & B & "10" & "3" \end{matrix}$.
13. After adjustment, the device is subjected to vibrations.

at a frequency of 40 Hz and an overload of 6g for 10 minutes. After this, check for drifts against mark "0" on "SKORSBI" unit.

REMARK:1. When the device is subjected to running in and vibrations, the device should be mounted in shockabsorbers 271c49-1-3.

- 14. The device should be airtight at excess pressure of 0.1 Kg/Cm². The pressure may fall for no more than 20 mm H₂O per minute. Check with a technological cap through the plug connector.
- 15. The screwdriver should fall into the slit of adjusting screw when the card is set against mark '0' with an accuracy of +1 division.
- 16. The device should not get caged when free movement of the control handle against the retainer is being taken up.

Technical Specifications. Device body With parts 127. c 81.

REQUIREMENTS FOR PARTS

- 1. Wash all parts in aviation gasoline and blow with filtered air.

REQUIREMENTS FOR ASSEMBLY

- 2. The axle of the cage should shift smoothly without seizing. When the shaft is being pushed, the lock pins should get into the disc holes in all positions, smoothly slide on bridges, and enter the disc holes. During this the cage fork with its dog should smoothly raise and slide over the inclined surface of the slide block and then spring up onto the upper plane of the latch; the cage coupling should be raised smoothly with dogs without seizing or jamming.
- 3. When the shaft of the cage is in the pushed position, the coupling should rotate freely without seizing.
- 4. When the cage is being disengaged (when the shaft is being pulled) the fork dog under the action of the spring should slip into the groove of the latch and the fork with coupling should come back to their initial position. Seizing and jamming are not allowed.
- 5. Total play in gearing from shaft, part 252-31 to the gear part 160-123 should not exceed 20°. The play should be adjusted by turning the eccentric axles 9A7.927.001-1 and 9A7.927.001-2.

6. The operation of caging mechanism should be checked for a temperature of -60°C . In translational and rotary motions of the handle seizing and jamming are not allowed. Checking should be performed at random, 2% of the devices from a batch but not less than 2 pieces, if the caging mechanism is malfunctioning, check the remaining devices.

TECHNICAL SPECIFICATIONS GIMBAL UNIT 127-cd14

REQUIREMENTS FOR PARTS

1. Before mounting the ball bearings A23yM into 127-cd14 rinse them in petrol "ГALOSHIA", ГОСТ 443-76, dry in air in desiccator at normal temperature and check as per Ty No.100/6.
Bearings with friction torque not exceeding 0.25 gm.cm are lubricated with oil, grade 132-20 and installed into the device.

ASSEMBLY REQUIREMENTS

2. Axial play of the gyrounit 127-cd18 should be within 0.02 to 0.04 mm when applying 700 gm. force.
3. Spherical contacts should be set along the rotating axis of gyrounit 127-cd18 (y-y) with an accuracy of ± 0.05 mm by the device and should have a contact pressure of 7 ± 1 gm.
4. Reliability of contacting of current feeding and brushes is checked with ohmmeter, rotating the gyrounit until stop. Faulty contacts are not allowed.
5. Friction torque in the bearings of the horizontal axle and current feeders should not exceed 0.5 gm.cm. Friction torque is checked by using specific weights.
6. Radial run-out and end-play of the card with respect to axis X-X should not exceed 0.3 gm.
7. After installation of all parts and units of 127-cd14, the gimbal unit should be statically balanced around axis X-X with the help of weights 127-39, 127-40 and 127-43.

REMARK: The gimbal unit may be balanced with X-X axis inclined at 45° to the horizontal plane.

8. ~~Сказок~~

8. ~~Check~~ Electric feeders should be checked for insulation resistance as per procedure of item 6.4 127Ty. The insulation resistance should be of at least 50 megohm.
9. Check insulation between output wires and axle for breakdown and range as per procedure of item 6.8 127 Ty.

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Technical Specifications

for overhauling the

electric directional gyro

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127 - YP

Total Sheets - 168.

6. Instructions for slushing and deslushing spare parts.
7. Instructions for impregnating oil seal gaskets in oil MB II.
8. Instructions for preparing and using cold, curing epoxy adhesive.
9. Instructions for coating parts with primer Ak-070 during assembly.
10. Instructions for spot painting parts with rivelled enamel АА-165.
11. Instructions for spot painting parts with black and white colour nitrocellulose enamel Hγ-25.
12. Instructions for using adhesive "88HY".
13. Instructions for preparing flux АТН-1 for soldering parts of various materials.

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INTRODUCTION

The present technical specifications refer to organizing repair works of electrical directional gyro ГПК-59 at specialized factories and work shops equipped for repairing gyroscopic and accuracy devices. These technical specifications study in detail the disassembly-assembly process condition - inspection ~~etc~~ charts of basic units and the device itself. The technical specifications are meant for maintenance-fitters, of III and IV category, well acquainted with the design and functioning of the device and who have undergone special training and have experience in conducting wiring works. Prior to conducting repair works it is necessary to get acquainted with the technical description of directional gyro ГПК-59.

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II. General

II. General

General

For each device delivered for repairing and restoring a technological certificate should be filled in indicating the scope of repair works performed. This certificate is required for making notes on the performed repairs in the certificate for vehicle.

Before performing condition - inspection works and repairs clean all the devices, assembly units and components from dust and mud. Wipe the devices and assembly units with coarse calico cloth soaked in petrol $\bar{5}$ -70 and blow with compressed air.

The devices should be disassembled to a minimum, sufficient to determine the cause of defect and it's removal.

Individual or aggregate technique can be used to repair the devices. While performing the repairs as per aggregate technique the faulty units, parts and components are replaced with proper ones, checked before replacing.

While repairing the device follow the below given rules:

1. Thoroughly inspect all fastening parts. Threaded parts with stripped threads should be replaced. The slits of screw heads should not have warping side surfaces and nuts and bolt heads should not have warping and broken edges.
Breaking of more than two threads is not allowed in the threaded holes of the parts.
2. Clean polished surfaces having indents and scales with sand paper K3M - 14, wipe with coarse calico cloth soaked in petrol $\bar{5}$ -70. After that wipe with batiste soaked in rectifying ethyl alcohol.
3. Remove the traces of corrosion on the parts and assembly units with abrasive paper K3M-14 and then rinse them in petrol $\bar{5}$ -70. The cleaned places are coated with two layers of prima Ak-070.
4. Wires, end pieces and other parts are foldered & tinned with solder $\bar{170C}$ -61 and flux $\bar{17H}$. Soldered places are protected with pigment varnish AK-113. Replace uncovered wires with new ones. Any other acid-free flux may be used instead of flux $\bar{17H}$.

Damaged varnish-paint coatings on parts and assembly units should be restored with varnish or enamel of same colour.

6. Replace damaged rubber gaskets used for packing (sealing) the Joint connections, with new ones.
7. Before assembling rinse the bearings of device for three times in petrol 5 -70, blow with compressed air, check for smooth rotation and then lubricate. Lubricate the bearings with oil 132-20.
8. Replace cotton pins, pin wires, lock washers and lock rings with new ones.
9. Screws not having spring washers should be secured with primer AK-070.
10. Before the assembly chamoir gaskets of oil seal should be rinsed in petrol 5 -70 and soaked in oil MB II.
11. Materials used for repairing should comply with requirements of standards - specified in appendix No.4.

REPAIR ARRANGEMENTS AND SAFETY PRECAUTIONS

For repairing of the directional gyro ГПК-59 isolated sub-sections are recommended:

1. Sub-section for cleaning the devices and their separate parts and assembly units from corrosion, for restoring protective and decorative coatings.
2. Sub-section for conducting mechanical (machine) works.
3. Sub-section for disassembling, condition - inspection works and assembling devices.
4. Sub-section for running-in, adjusting and checking the devices.
5. Packing section.

GENERAL REQUIREMENTS FOR PRODUCTION PREMISES

The premises should be spacious with adequate illumination (light) the ceiling and walls should be painted in light colours, the floor should be covered with linoleum or thoroughly puttied and oil painted.

(In the second and fifth sub-sections the floor may concrete without pot-holes.

The air temperature should be within 16 to 30°C range. Illumination and dust contents in air should comply with the following rates:

Number of the sub-sections.	Luminance, lux		Permissible quantity of dust particles settled in an hour per 1 cm ³ .	Relative Humidity
	General lighting	Combined lighting		
1	75	500	1000	30-70%
2	75	500	-	30-80%
3	75	500	750	30-80%
4	75	300	750-1000	30-80%
5	50	300	-	30-80%

The first sub-section should be provided with comfortable work benches for cleaning devices and special baths for degreasing the parts. The floor near the cleaning baths should be chemically resistant. In this sub-section operations with epoxy compound, luminous compound, varnishes and paints ~~manufacture~~ are conducted. Sub-section No.1 should be located in an isolated premises ~~so that~~ that other workers do not have direct contact with vapours, dust or cured compounds. This sub-section should be provided with permanently operating plenum-exhaust ventilation and explosionproof electric facilities, exhaust cabinet and hot water. Open fire and electric hot plates with open heating system are not permitted in the premises. Electric lighting should be explosionproof and should be switched on outside the sub-section area. The solvents should be kept in sealed vessels in metallic cabinets. To prevent sparking do not use steel vessels. The mechanical sub-section should have drilling machine, lathe, work-benches, vices and other tools to carry out mechanical operations. The main passage ways where in places of permanent presence of workers should be at least 1.5 m. wide. The passages for inspection checking and adjusting the equipment should be at least 1m. wide.

All the equipment should be subjected to regular technical inspection.

Subsection for disassemble, condition - inspection works and assembling part and units should have provided with tables of the following dimensions: Length 1.3 m, width 0.7m, height 0.8m. The surface of the table should be covered with smooth wear-resistant plastic. The table should have a rounded skirting to a height of

6 to 10 mm, around its perimeter to prevent tools and parts from falling down. As a rule the working area on the table is provided with a spongy rubber mat. Power sockets for supplying $36V \pm 10\%$ 50 Hz, AC (for soldering irons) and three phase, $36V \pm 10\%$ 400 Hz AC (to check proper workability of the device and the rotating direction of the gyromotor) are fitted to each table. To blow parts and assembly units each working place is provided with a filtered compressed air feeder under a pressure of 1 to 2 Kg/cm^2 .

For additional lightning the working place is provided with a table lamp, with ball and socket joint at the base and a deep shade coated from inside with white enamel and a 60 - 75W bulb. Illumination at the working place should be of at least 300 lux. Day light lamps which give better light and do not get heated may be used.

The working table should be provided with drawers divided into separate cells to keep tools, smaller attachments and parts.

Measuring gauges and cutting tools should be kept separately from each other. All liquids (alcohol, adhesive, nitrocellulose enamels, oils to lubricate bearings, etc) should be stored in one type glass jars (or bottles) of a volume of 50 to 100 cm^3 with grinded glass or rubber stoppers. Petrol should be stored in metallic containers with covers.

The jar containing oil to lubricate bearings should have in a label indicating grade and life period.

Sub-section for running-in rolling, adjusting and checking should be provided with "SKORSBI" installation (supply from 220V, 50 Hz mains or γ TT-48 unit with motor MC-2P) ($27V \pm 10\%$ DC) with accentric type vibrators to develop checking vibration of 0.3 to 0.8g. and panels No.6365-1373 to measure current consumed by gyromotor ТМА4П.

While assembling and repairing the devices only required tools attachments and parts should be on the working table.

The clothes of the assembler (white overall, cap, etc) should be made of material without fleece and should be always clean.

REQUIREMENTS FOR SAFETY PRECAUTION

During repair works observe the following safety rules:

1. The passage ways of the shop should ~~be~~ always be free, should not be locked with containers, transportation means and other materials.
2. All equipment with moving parts should be provided with guarding means.
3. Dangerous current feeders of the electric equipment are also guarded (for example knife switches, on-off starters equipment to test insulation strength of units, devices etc).
4. Personnel who have undergone special training are permitted to work on this equipment.
5. It is necessary to thoroughly check the condition and steadiness of the working table. Floor at the table should be clean and even without hollows and slipping places.
6. Pneumatic tool hoses should always be kept in good condition and their components should be properly inter-connected.
7. Operating with hand tools.
 - a) The assembling attachments are handed over to the assembler only after checking their serviceability.
 - b) The vice and other fixtures clamping devices should have as a low play (lost motion) as possible. Their jaws should not ~~have~~ have dents and chips.
 - c) Hammer handles should be smooth without knots and cracks, made of hard wood (dogwood, beech, oak etc) and have oval section thickening towards the end; the wrenches should strictly comply with the dimensions of bolts and nuts.
8. Working with electric tools:
 - a) All high voltage plug connectors (220V), electric motors of machines and installations should be grounded.
 - b) Electric tools is given to the assembler in set provided they are in good condition, with card insulated and plug in proper order and also checked for breakdown to the body.

- c) Electrical soldering irons should be used designed to 36V maximum; if feeding current is above 36V, their bodies should be grounded.
While cleaning the soldering iron tips prevent hands from burns with forming oxide film.
 - d) To prevent dropping of melted solder from the tip and part surfaces, shake off the excess solder from the soldering iron surface.
 - e) It is not allowed to use soldering irons without fire-proof support; put foreign elements on the electric devices; leave the electric heating devices switched on without attendance. Before leaving the working place check if the light, devices and installations are switched off.
 - g) The assembler should never block the passage way near his working place.
9. Combustible and easily inflammable liquids (petrol, alcohol, acetone, ether) should be provided at the working place in quantities to meet daily requirements after work. The unused liquids should be returned for storage in a specially equipped fire-proof premises. Discharge of combustible and other easily inflammable liquids into the sewerage system is strictly prohibited.
10. The parts should be rinsed in aluminium baths with tightly closing covers.
11. Smoking and open fire at the working places are strictly prohibited.
12. Production wastage (cleaning rags, paper etc.) upon accumulation at the working area should be removed.

III. List of required operations

performed while repairing

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LIST OF REQUIRED OPERATIONS PERFORMED WHILE
REPAIRING ГПК-59.

After the expiry of the rated operating life of the directional gyro ГПК-59 the following obligatory repair operations:

1. Rinse and check the smooth motion of ball bearings 523ya, A1000095ky, A6005ki (5MA6025). After this, lubricate them with oil 132-20.
2. Check corrugated bands 127-1, 127-2, 127-3 and replace them if required.
3. Inspect, clean and polish the slip rings of collector 926.617.000. If the rings have large burnt spots replace the collector.
4. Buff and rinse point contacts. In case of large burns replace the contacts.
5. Overhaul the oil seal, Rinse and impregnate the chamois gaskets of oil seal 252-98 with instrument oil MBT.
6. Check rubber gaskets. If cracks are present replace the gaskets with new ~~ones~~ ones.
7. Measure and adjust the play of gyrounit in the gimbals (0.02 to 0.04 mm) and of the gimbals in Body (0.06 to ~~0.1~~ 0.1 mm).
8. Measure the contact pressure of central point contacts (2 to 7gr) and brushes on slip-rings of collector (1.2 to 2gm).
9. Remove the old grease from toothed wheels and apply new grease OKB - 122-7.

IV. Condition - inspection chart of

directional gyro

ГПК - 59.

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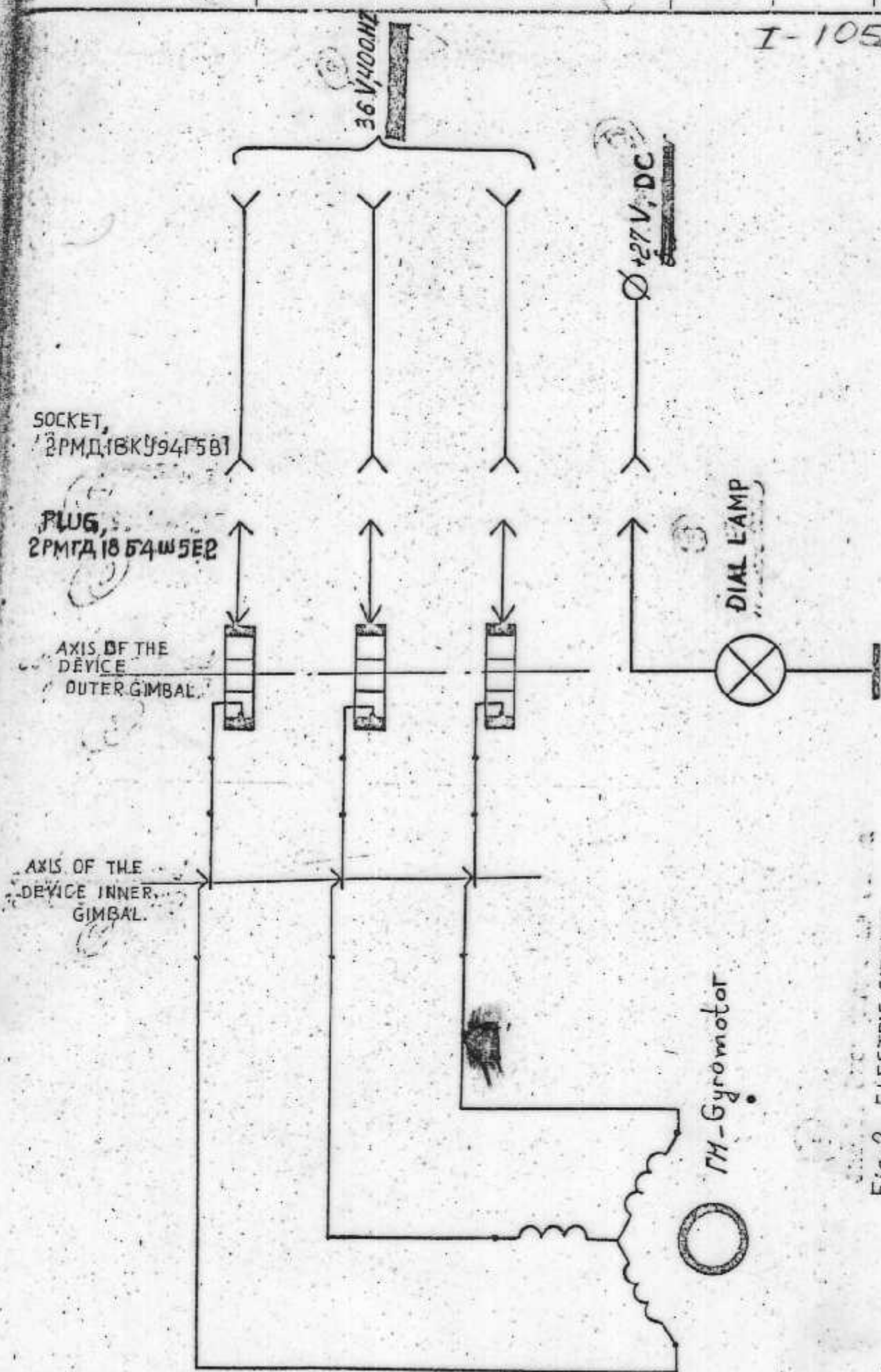


Fig. 2. ELECTRIC CIRCUIT.

CONDITION - INSPECTION CHART
 DIRECTIONAL GYRO ETK-59

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FNK-59

Number.	Fault	Fault detecting procedure and instrument (tool).	Technical Specifications	Recommended method for reconditioning & instrument
1	2	3	4	5
1.	Damaged, rivelled enamel coating.	Inspection.	Damaged coating is not allowed.	Restore coating by painting (see instruction in the Appendices).
2.	Chipping of plastic on screwdriver handle 127-cd6, control button. 9 6.354.001 and socket 9P, 6.615.003.	Inspection.	Plastic chippings more than 3mm in diameter are not allowed.	If the plastic chips are of less than 3mm diameter paint with black enamel Y-25 as per instructions specified in appendices. If the chippings are more than 3mm in diameter, replace the part.
3.	Broken sight glass 127-6.	Inspection.	Broken glass 127-6 is not permitted.	Replace the glass (see condition - inspection chart of unit 127-cd5).
4.	Corroded chain links.	Inspection.	Corroded chain links are not permitted.	Clean separate chain links with abrasive cloth K3M-14, Rinse with petrol B-70 and coat with primer AK-070 as per instructions specified in appendices.
5.	Broken chain links.	Inspection.	Broken chain links are not permitted.	Replace broken chain links.
6.	Damaged coating and corrosion of bushings 127-20 and stopper 9 8.632.005.	Inspection.	Damaged coating and corrosion are not permitted.	Clean the corroded places with abrasive cloth K3M-14, Rinse with petrol b-70 and coat with nigrosine primer AK-070 as per instructions specified in the appendices.

1	2	3	4	5
7.	Bent studs or broken edges of studs 127-100.	Inspection.	Bent studs and broken edges of the rod wrench are not permitted.	Replace the stud.
8.	Thread stripping of stud 127-100.	Inspection.	Stripping of more than 2 threads is not allowed.	Replace the stud.
9.	Bent pins of plug connectors.	Inspection.	Bent pins are not permitted.	Straighten the pins.
10.	Axial play of gimbals in the body is beyond the permissible tolerance.	Screw out stopper 9 6.632. 000 with Gasket 127-24, unscrew eight screws 3177-3-8K, remove cover 127-62 with gasket 126-63 turn in the attachment with indicator and measure the play applying a load of 2.5 Kg. to lower semi-axle of the gimbals. Clock screwdriver 7810-0306. Wrench 6350-6751 indicator with 0.01mm value division attachment 6350-4443. Dynamometer 6350-1835.	Axial play of the gimbals should be within 0.06mm to 0.1mm.	Readjust the device by shifting threaded plug 127-64 and upper plug 127-85 and secure the plugs with nuts 252-114 and 127-101. Wrenches 6350-6453, 6350-6454, 6350-6455, 6350-4605.
11.	Contact pressure of brushes of unit 127-cd10 is beyond permissible tolerances.	Measure the brush pressure with grammeater 6350-4769.	Brush pressure should be within 0.9 to 2gm.	Adjust the pressure of brushes by bending springs.
12.	The bulb is not glowing: a) The bulb has burned out. b) Broken current feeding wire.	Supply "±" 27V DC to pin 1 mp, and negative to the device body.	The bulb should glow.	1. Replace the bulb. 2. Replace the wire.

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1 2 3 4 5

13. Weak afterglow of temporary effect
luminescence compound on card 9 7.021.010.

Check afterglow of luminescence compound on card after its excitation for 5 min. from a distance of 0.5m with a 100W filament lamp with a reflector.

Reading of the device should be distinct from a distance of 0.6m in 3 min. after switching-off excitation.

Colour the divisions, letters and numerals on card 9 7.021.010 with luminescent compound as specified in the appendices.

14. Difficulty in rotating the cage(ing) handle.

Cage the device. Measure the rotational torque of the cage handle, torque-meter Y-167.

Rotational torque of the cage handle should not exceed 600 gm.cm.

1. Wash ball bearings (see device assembly chart).
2. Clean the caging mechanism from mud and adjust it (see condition-inspection chart for unit 127-cd1)

15. Current consumption of gyromotor in each phase exceeds the permissible.

Supply 36V, 400Hz, A.C. to the device through desk 6365-1373 and after 3 min. measure current consumption in all three phases. Braided wire 6350-4912 or 6350-4912.

Current consumption in each phase should not exceed 0.3A.

Replace gyromotor (see condition - inspection chart of unit 127-cd19).

16. Gyromotor is not rotating.

Supply three phase, 36V, 400Hz.

Gyromotor should rotate.

If the current feeding wires are broken, replace them (see condition - inspection chart of unit 127-cd1).

If the brushes of collector are burned or broken, replace assembly unit 127-cd10.

If the wires of the collector 9 6.617.000 are broken, replace the collector. (see condition-inspection chart of assembly unit 127-cd15).

1 2 3 4 5

If the central contacts are improper clean the contacts from carbon polish them, check contact pressure which should be within the limits of 7 + 1gm; if required, adjust the pressure by shifting the contacts on the stud.

17. Low insulation resistance under normal operating conditions.

Remove the dial lamp through megger supply 100V DC to (1) pin 1 of plug connector and body, (2) pin 1 and short circuited pins 2;3 and 4 of the plug connector (3) the short-circuited pins 2;3 and 4 and body megohmmeter, type M1101 of 100V.

Insulation resistance should be of at least 20 megohms.

1. With stopper 9 8.632.005 turned out and cover removed 127-62 dry the device at the temperature of +60 C for 10 to 12 hours and recheck insulation resistance.
2. Check insulation resistance of assembly units 127-cd1, 127-cd10, 127-cd15 (see condition-inspection chart of units 127-cd1, 127-cd10 and 127-cd15.

18. Large drift on vibrating and swinging bases and unsteady readings of the device on swinging base.

Check the device against marks 'O', 'B'-5 or '3'-W as specified in operations No.34, 35 and 36 of assembly and adjustment chart.

Drifts on vibrating and swinging base should not exceed value specified in operations No. 34, 35 and 36 of assembly and adjustment chart.

Check for power in all three phases of the dynamotor as per the readings of devices at desk 6365-1373 check the current feeding circuits are intact.
2. Wash the bearings, check easy rotation (see condition-inspection chart of assembly unit 127-cd19 and device assembly chart.

1 2 3 4 5

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19. Loss of tightness.

Check the device for tightness. Installation 6365-2057, bath with technical ethyl alcohol (hydrolytic) stopwatch.

With access pressure of 0.1 kg/cm inside the device, the pressure drop by 20mm H2O maximum per 1 min. is allowed.

- 3. Balance assembly unit 127-cd18.
- 4. Adjust the gimbals play.
- 5. Check the gyromotor and, if required, replace it (see condition-inspection chart of assembly unit 127-cd18).

By air bubbles detect the leaking place and seal it, partly dismounting the device (turning the screw with force replace gaskets).

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V. Process sheet for

disassembling device

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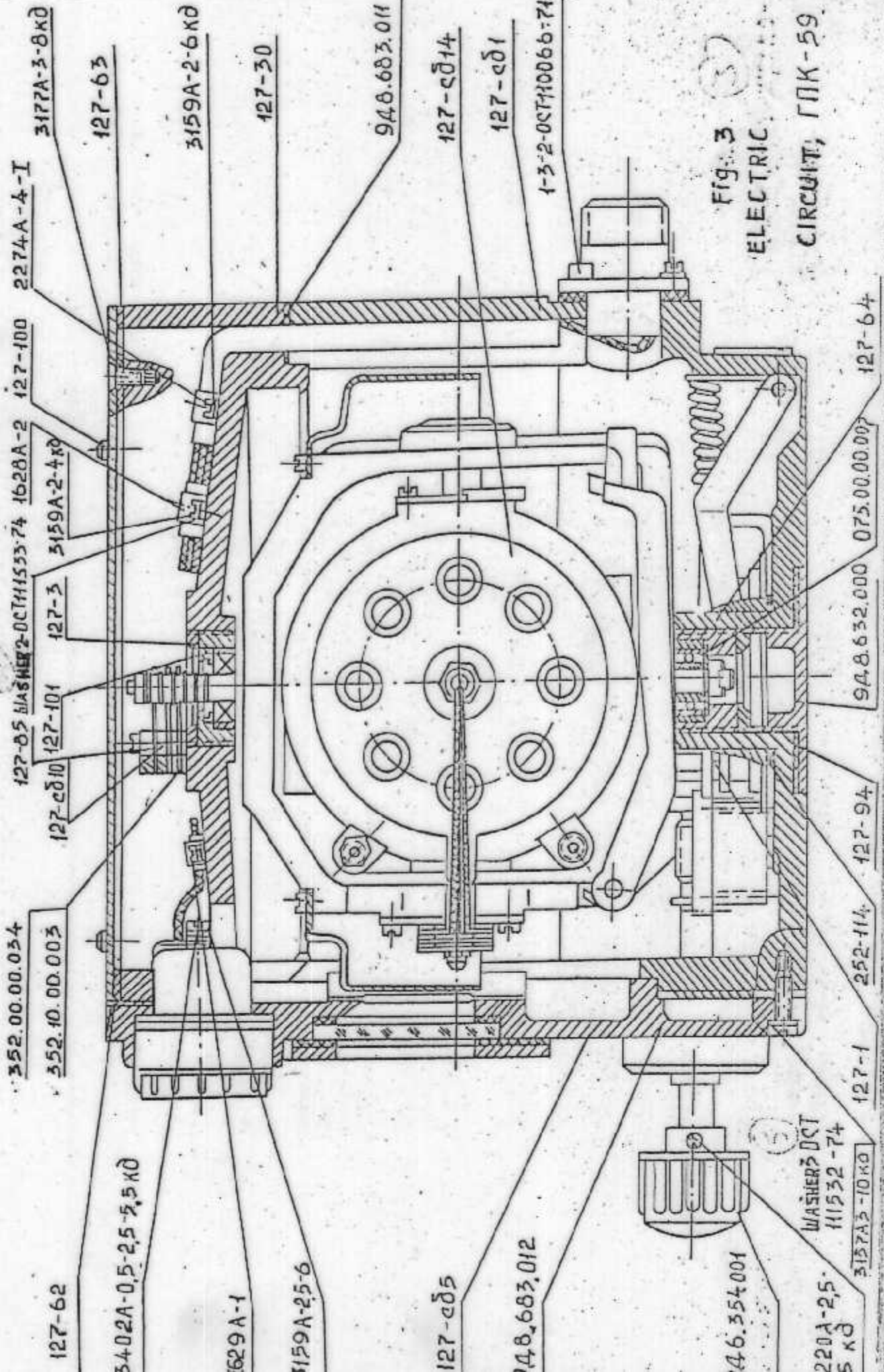


Fig. 3
ELECTRIC
CIRCUIT, ГПК-59.

PROCESS SHEET FOR DISASSEMBLING THE DEVICE

FMK-59

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Number of the operation	Contents	Equipment and Tools
1.	Turnout set screw 3220A-2, 5-5K and remove control button 9 6.354.001.	Screw driver 7810-0306
2.	Turnout 8 screws 3177A-3-9K and remove cover 127-62 with gasket 127-63.	Screw driver 7810-0313
3.	Turnout screw 3159 A-2, 5-6, remove three washers 3H02A-0, 5-2, 5-5, 5K, and wire from the screw.	Screw driver 7810-0309
4.	Turnout 8 screws 3159 A-3-10K with washers 30cT111532-74, remove washer 3402A-0, 8-3-6K under the chain, remove front wall with parts 127- d5 and gasket 9 8.683.012.	Screw driver 7810-0314
5.	Turnout 2 screws 3157A-2-14K and remove assembly unit of contacts 127-cd10 with gaskets 352.00.00.034 and 352.10.00.003.	Screw driver 7810-0306
6.	Remove varnish from the soldered places, unsolder three wires from contact assembly unit 127-cd10.	Electric soldering Iron, 36V
7.	Turnout 3 screws 3159 A-2-4K with washer 20cT111533-74, 1 screw 3159A-2-6K, remove 2 clamps 7629A-1, 1629A-2, yoke and yvc tubes.	Screw driver 7810-0306
8.	Turnout 4 studs 127-100 with washers 40cT111532-74 and 3402A-0, 8-4-8K, remove cover 127-30 and gasket 9 8.683.011.	Wrench 6350-4716
9.	Turnout nut 127-101 and upper plug 127-85 from the cover. Remove corrugated band 127-3 from the plug.	Wrench 6350-6454 Wrench 6350-6455
10.	Remove gimbal assembly unit 127-cd14 with parts 127-cd1 from body.	

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1

2

3

11. Turnout screw 9 0.532.000 from the body with parts 127-001 and remove O-ring 127-004.

Wrench 6350-6751

12. Turnout nut 252-114, threaded plug 127-64 from the body with parts 127-001.

Wrench 6350-6453
Wrench 6350-4605

13. Remove external ring of bearing A6005M (SN26025), cotterhead pins 127-1 and spring washer 075.00.00.007 from threaded plug 127-64.

Forceps

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VI. Process sheet for

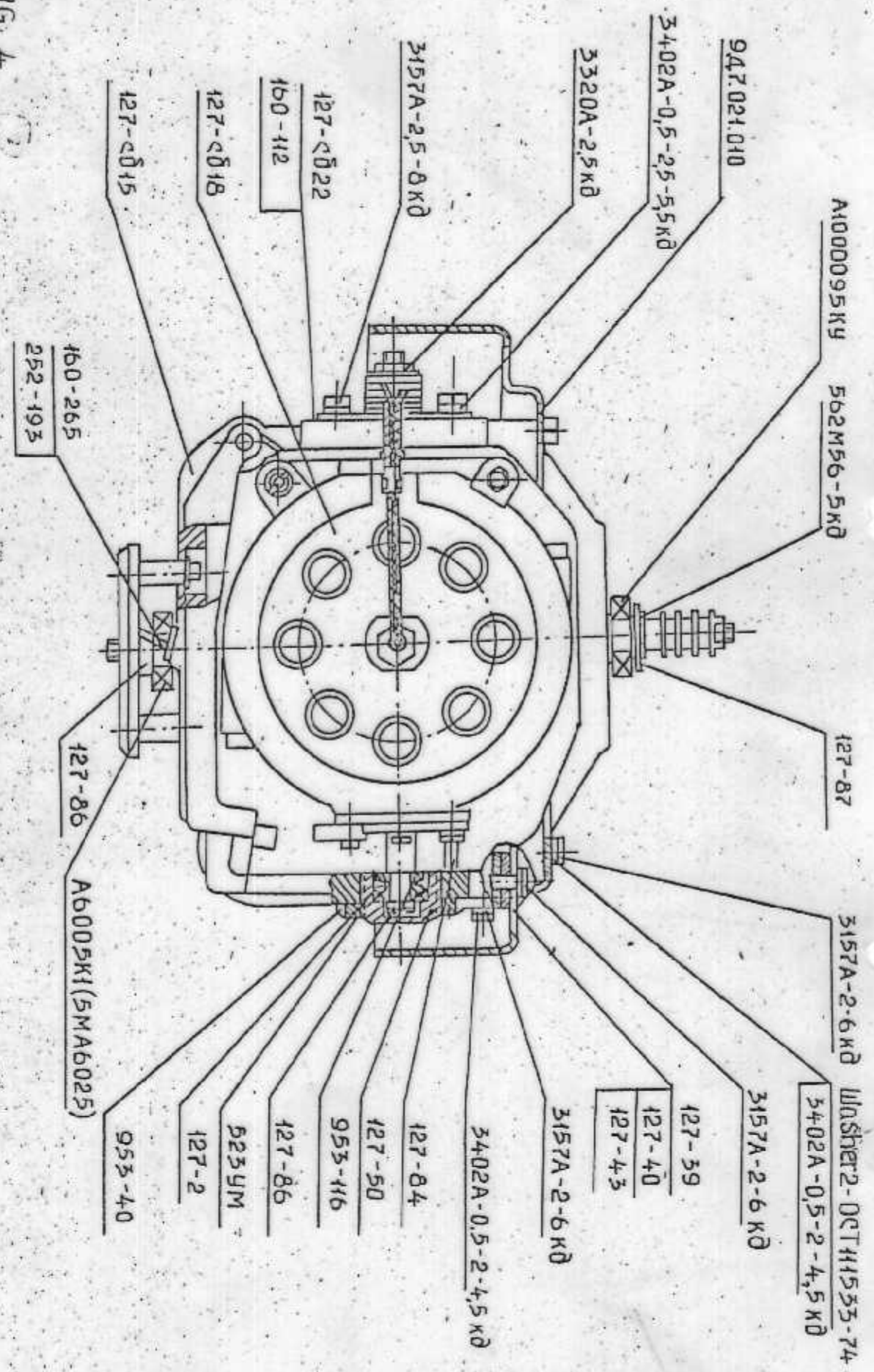
disassembling unit

127-cd14.

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FIG. 4

DIRCTIONAL GIMBAL UNIT, 127-C814



Number of the operation	Contents	Tools
1.	Turnout nut 127-36, remove bearing A6005K1 (5MA6025).	Wrench 6350-4604
2.	Remove lock ring 562 M56-5K, protective washer 127-87 and bearing A1000095Kx from the collector.	Support 6355-1042 Two screwdrivers 7810-0313 Protective cap 6355-1078.
3.	Turnout 4 screws 3157A-2-6K, with 2 washers OCT111533-74 and 3402A-0, 5-2-4, 5K and remove card 9 7.021.010 with weights. Turnout screws 3157A-2-6K, with washers 3402A-0, 5-2-4, 5K, from the card and remove weights 127-39, 127-40 and 127-43.	Screw driver 7810-0306
4.	Loose nut 3320A-2, 5K which secure the contact assembly unit by turning through 90°.	Wrench S = 5 x 6 mm
5.	Turnout two screws 3157A-2, 5-8K, with washers 3402-0, 5-2, 5-5, 5K, remove contact unit 127-cd22 and Gasket 160-112 from studs.	Screw driver 7810-0306
6.	Turn gimbal assembly unit by 180°, turnout screw 3157A-2-6K, with washer 3402A-0, 5-2-4, 5K, and remove gyronut stop 127-84.	Screw driver 7810-0306
7.	Turnout lock nut 953-10, turnout bushings 127-50 with corrugated bands from 2 sides of the gimbal frames.	Wrench 64410-003 Wrench 6350-4608 Wrench 6350-6472
8.	Remove corrugated bands 127-2 from two bushings 127-50.	
9.	Take frame 127-cd15 with gyronut by left hand incline and remove gyronut 127-cd18 from the frame.	
10.	Turnout two nuts 127-86 from two gyronut axles remove bearings 523yh with protective washers 953-116.	Wrench 6350-4604

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VII. Condition - inspection

charts of assembly units

and parts.

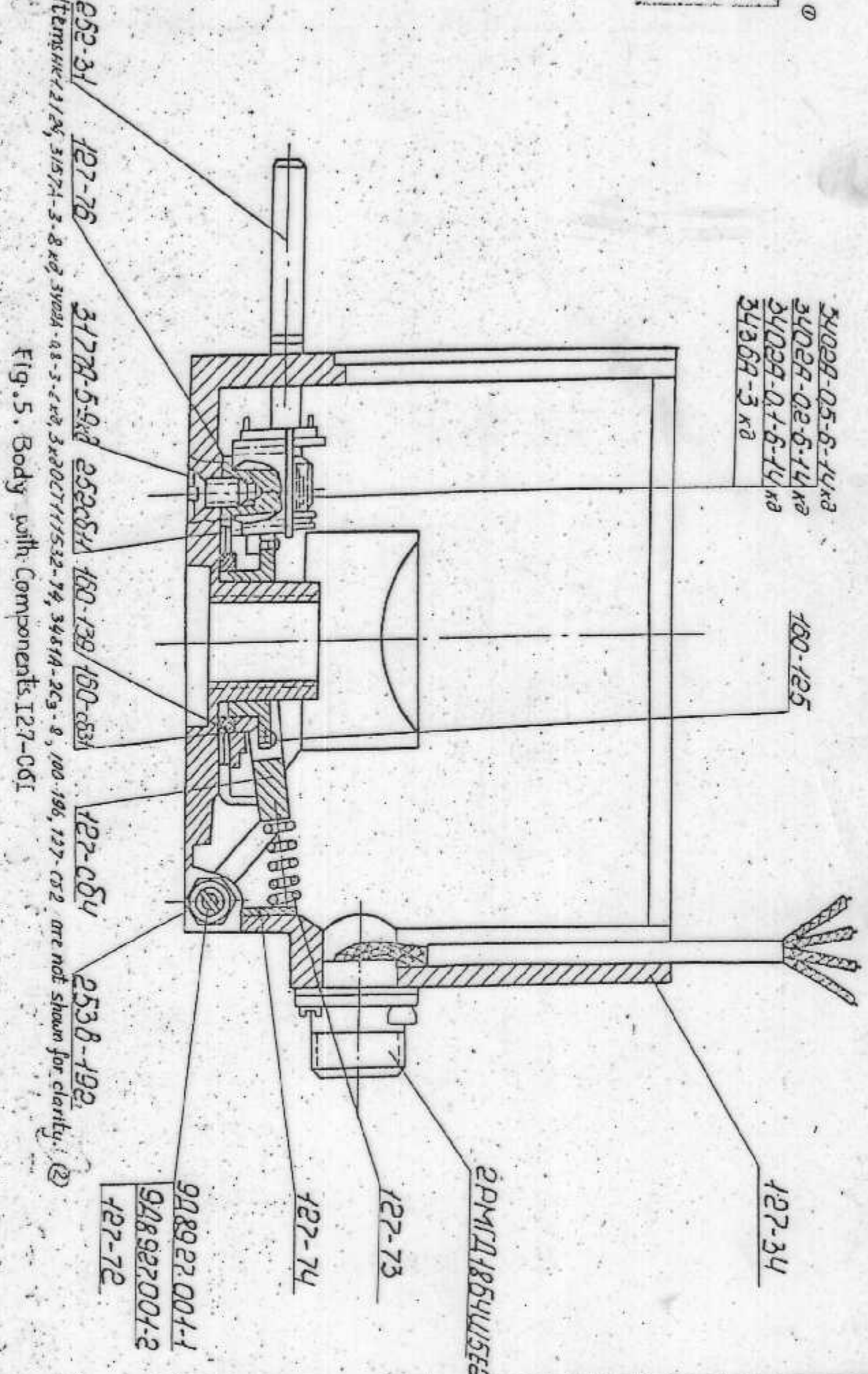


Fig. 5. Body with Components I27-06I

Items 127-24, 31574-3, 8K2, 34029-08-3-6K2, 34027111532-74, 3461A-2C3-8, 100-196, 127-052 are not shown for clarity. (2)

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TECHNICAL SPECIFICATION FOR
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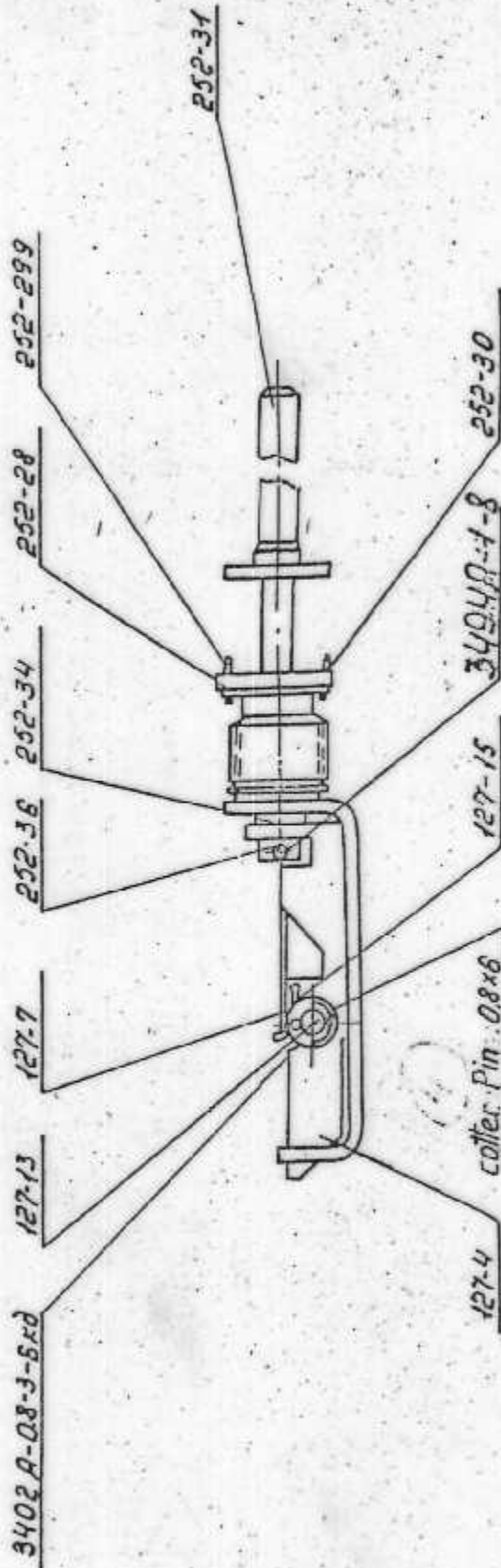


Fig. 6. Bracket with slide block I27 - C62

a) Condition-inspection chart for assembly units and parts 127-cd1
"Body with parts".

I-1052

Sl. No.	Fault	Fault removing procedure and tools	Technical Specifications	Recommended storing method and tools
1	2	3	4	5
1.	Broken wires	Test pins of plug connectors and connecting wires for continuity tester.	Broken wires are not allowed.	Replace the broken wire.
2.	Great total play of caging mechanism.	Measure play. Attachment 6350-7185.	Total play shaft 252-31 to clutch gear of cage 160-cd31 should not exceed 20.	Adjust the play revolving eccentric axle 127-76. Wrench 6350-4603 clock screw driver 7910-0306.
3.	Latch of unit 127-cd2 is slipped off (in devices manufactured before 1965).	Inspection.	Breaking the assembly of unit 127-cd2 is not permitted.	Replace assembly unit 127-cd2 by existing design (see item 1 of the repair chart).
4.	Studs 252-30 and 252-299 cut (Fig.6).	Inspection.	Breakage of studs is not permitted.	Replace the studs (see item 2 of the repair chart).
5.	Breakage of spring 127-15 (Fig.6).	Inspection.	Broken springs are not permitted.	Replace the spring (see item 3 of repair chart).
6.	Swelled or uncemented rubber gasket 160-139 in the cage clutch 160-cd31.	Inspection checking proper working of caging mechanism.	Swelling and uncementing of gaskets are not permitted.	Replace the gasket (see item 4 of the repair chart).
7.	Hovering of cage clutch 160-cd31.	When the cage is disengaged (the shaft 252-31 is pulled) the cage fork dog 127-cd4 should slip into the groove of the latch and the fork with coupling should fall down.	Hovering sticking and jamming of cage coupling are not permitted.	Adjust the unit by shifting studs 9 8. 927.001-1 and 9 8. 927.001-2.
8.	Breakage of spring 127-73.	Inspection.	Broken springs are not permitted.	Replace the spring.

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TECHNICAL SPECIFICATIONS
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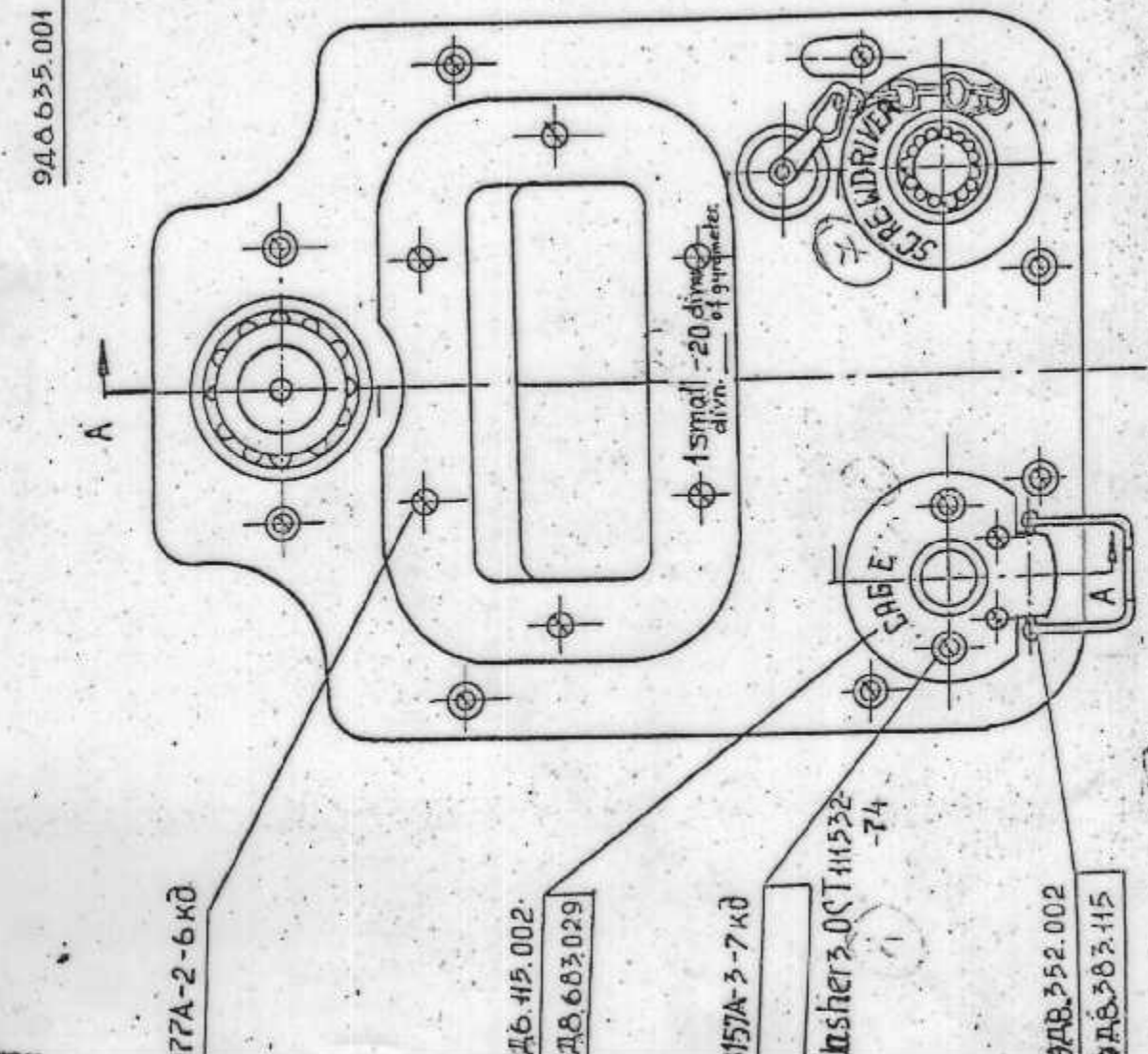
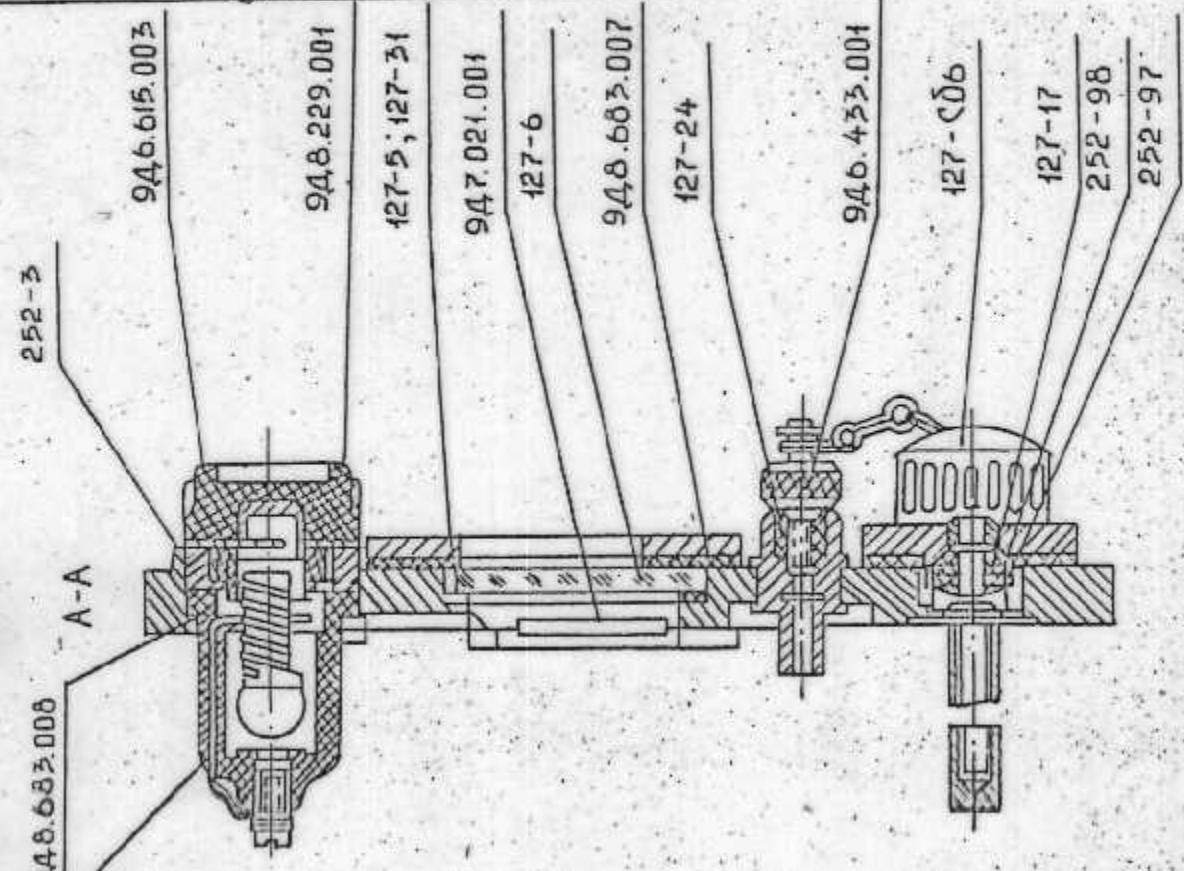


Fig. 7. Front wall with parts - 127-СД6.

Sl. No.	Fault	Fault removing procedure and tools	Technical Specifications	Recommended restoring method and tools
1.	Damaged (broken) Glass 127-6.	Inspection.	The glass should be transparent. Cracks and chips affecting the splash proofness of the device are not permitted.	Replace the glass. In case cracks are present on gaskets 127-5, 127-31, 9 9.683.007 - replace them. Cement gaskets with adhesive 99H as per instructions specified in the appendices. Clock screw driver 7810-0313.
2.	Broken or bent pointer.	Inspection.	Broken or bent pointer is not allowed.	Replace the pointer (see item 5 of repair chart).
3.	Loss of tightness, cracks, chips on dial lamp Cap 9 5.635.001 (Broken or unglued glass of the dial lamp of devices manufactured before Oct.1966).	Inspect and check the sealing of dial lamp cap at a pressure of 0.3 ATM, on installation (Broken or unglued 5365-2057).	1) Cracks, chips, faults in transparency of dial lamp cap are not permitted. 2) Dial lamp cap should be tight (sealed).	Replace the cap (see item 6 of repair chart).
4.	Broken slipring 252-3.	Inspection.	Broken slipring is not permitted.	Replace the cap (see item 6 of repair chart).
5.	The bulb of dial light M3-26-0.12-1 is not glowing.	Inspection.	Broken lug of terminal is not permitted.	Replace the bulb.
6.	Broken lug of the lampholder terminal 9 6.615.0 03.	Inspection.	Broken lug of terminal is not permitted.	Replace the lampholder.
7.	Chipping of the lampholder 9 615.003.	Inspection.	Plastic chippings exceeding 3mm in diameter are not allowed.	If the chips are of less than 3mm in diameter coat them with black enamel Hy-25 as per instruction specified in the appendices. If the chips are of more than 3mm diameter replace the lampholder.

1	2	3	4	5
8.	Screwdriver is lost. 127-cd6.	Inspection.	Absence of screwdriver is not permitted.	Fix a new screwdriver
9.	Chips on the screwdriver handle. 127-cd6.	Inspection.	Chips of more than 3mm are not allowed on the screwdriver handle.	In case of small chips paint them with black enamel H 25 as per instructions specified in the appendices. If the chips are of more than 3mm replace the screwdriver.
10.	Notches on screws driver blade. 127-cd6.	Inspection.	Notches on the screwdriver blade are not allowed.	Grind the notches on a grinding wheel.
11.	Bent rod of screw driver 127-cd6.	Inspection.	Bent screwdriver rod is not permitted.	Straighten vices, hammer with textile block head of 50gm. weight.
12.	Dry packing of oil seal 252-98 and cracks in packing 127-17.	Inspection.	Drying and cracks in the packing are not allowed.	Replace packing 127-17 and impregnate packing 252-98 (see item 7 of repair chart).
13.	Corrosion and damaged coating on parts 127-20 and 9 8.632. 005.	Inspection.	Damaged coating and corrosion are not allowed.	Dress corroded places with sand paper K3M-14, rinse in petrol b-70 and coat with primer AK-070 with nigroline as per instructions of appendices.
14.	Corroded chain links.	Inspection.	Corroded chain links are not allowed.	Separate the links, dress corroded links, coat with primer AK-070 as per instructions given in the appendices.
15.	Breakage of separate chain links.	Inspection.	Broken links are not allowed.	Replace faulty links.

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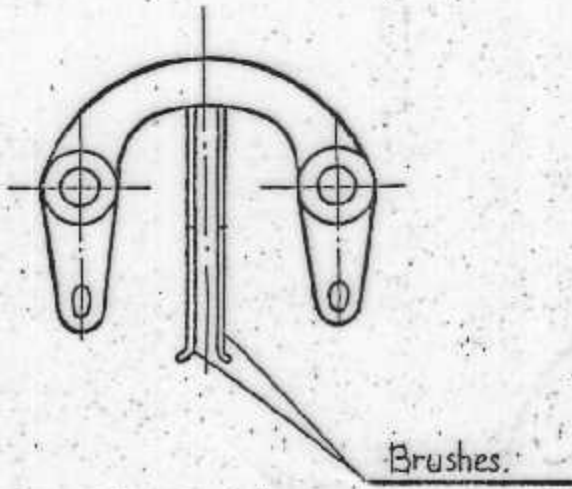


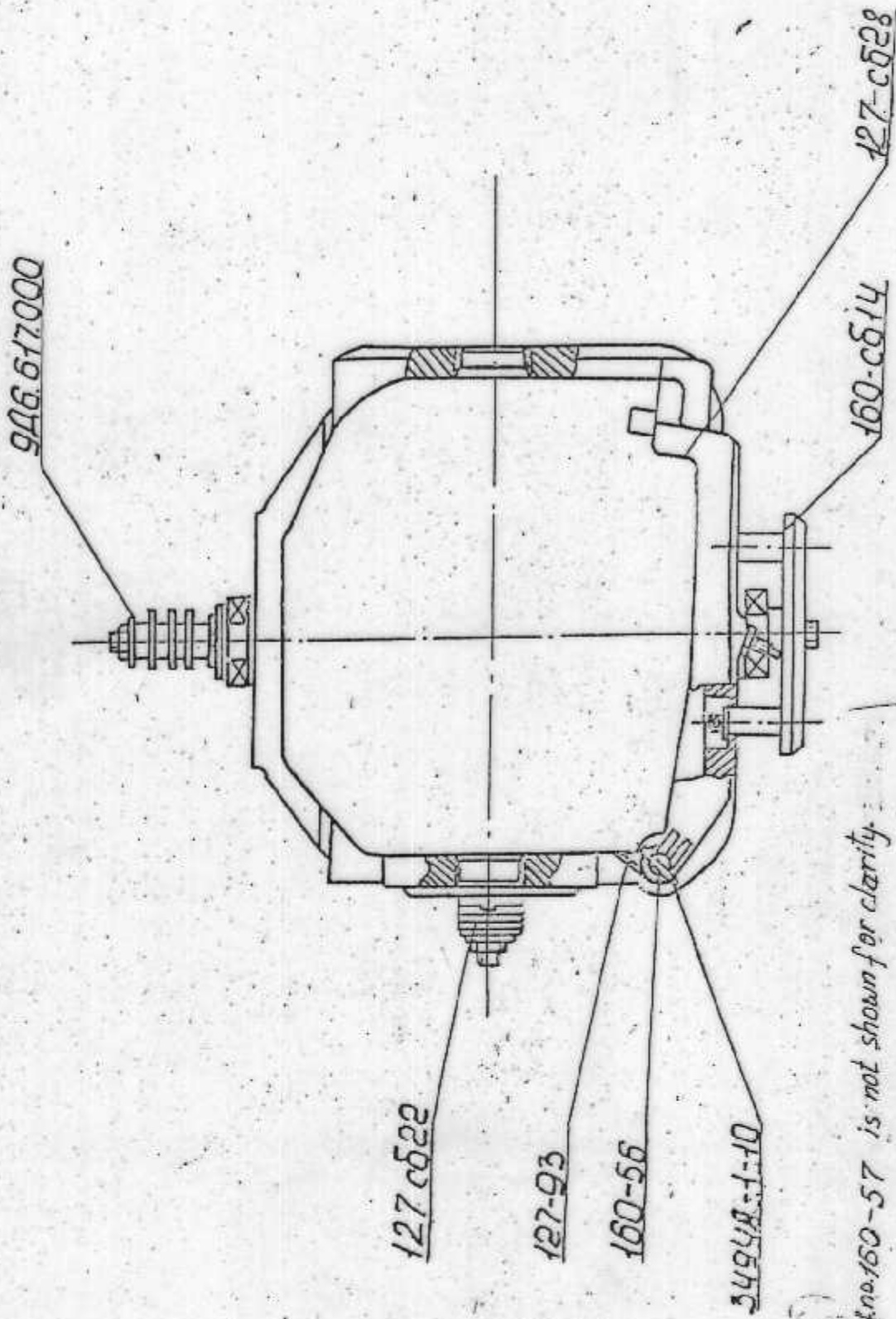
Fig .8. Block assembly unit I27 - C610

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1	2	3	4	5
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- | | | | |
|--|---|---|---|
| <p>1. Bent or broken brushes.</p> | <p>Inspection.</p> | <p>Bent or broken brushes are not allowed..</p> | <p>Replace the assembly unit.</p> |
| <p>2. Reduced insulation resistance under normal conditions.</p> | <p>Measure the insulation resistance between brushes with a megohmmeter. Megohmmeter of 500V, type M1101.</p> | <p>The insulation resistance should be of at least 20 megohm.</p> | <p>1. Dry the assembly unit at a temperature of 60°C for 10 to 12 hours and recheck the insulation resistance.</p> <p>2. Replace the assembly unit.</p> |

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Ref no. 160-57 is not shown for clarity.
Fig. 9. Frame with components 127-C615

Fault removing procedure
and tools

Recommended restoring
procedure and tools

Technical
Specification

1. Broken current feeding wires.
Check with a tester.

Replace the collector (see item 8 of repair chart).

2. Low insulation resistance of current feeding wires.
Measure insulation resistance between collector rings and axle and inter rings insulation resistance megohmmeter M1101 of 500V.

Dry the assembly unit at a temperature of 60°C for 10 to 12 hours. If after drying the insulation resistance is below 80 megohm replace the collector (see item 8 of the repair chart).

3. Carbon deposits and notches on the slip rings of collector 9 6. 017.000.

Carbon deposits and notches are not allowed on slip rings.

Inspection $\times 7.5$ times with magnifier.

Dress the rings with sand paper K3M-14, wipe with coarse calico cloth soaked in rectified ethyl alcohol. Replace the collector is the notches are deep (see item 8 of the repair chart).

4. Sticking of cage frame 127-cd28.

Check free and smooth movement of frame.

Stroking of frame is not allowed.

Straighten the cage frame with a wooden block head hammer of 30 gm. weight.

5. Broken spring 127-93.

Lifted frame of cage cd28 should fall down under the action of spring 127-93.

Loose and broken spring is not allowed.

Replace the spring (see item 9 of the repair chart).

6. Notches, scratches and nicks on the surface of frame tooth of the cage. 127-cd2 8.

Inspection.

Notches, scratches and nicks on the tooth surface are not allowed.

Dress the tooth surface with sand paper K3M-14, rinse in petrol, b-70, wipe with batiste cloth soaked in rectified ethyl alcohol.

7. Burrs, dents and scratches on 5-0.006-0.012.

Inspection.

Burrs, dents and scratches on ϕ 5-0, 006, -0.012 are not allowed.

Buff with sand paper K3M-14, rinse in petrol b-70 and blow with compressed air. Measure the diameter of the axle and if it is less than 4.988mm replace the frame. Micrometer 0-25mm.

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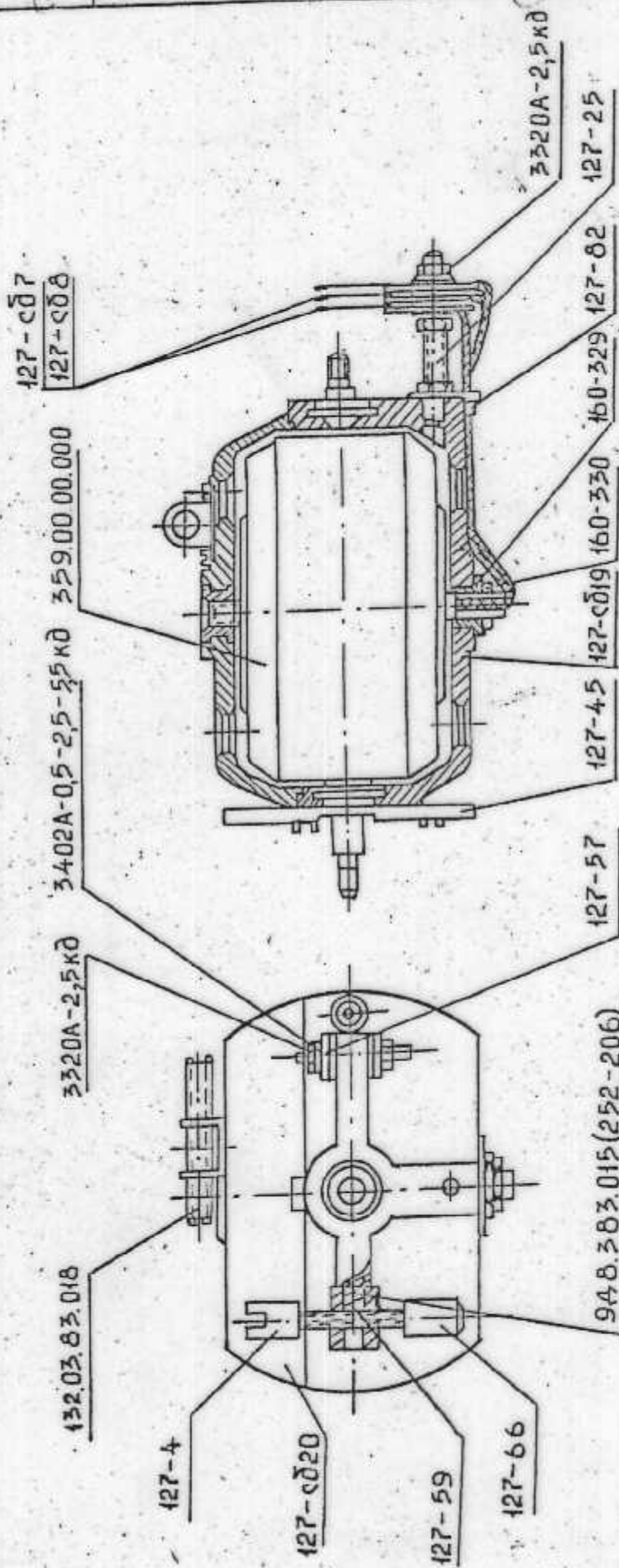


Fig. 10
Gyrounit, 127-сд 10.

Sliver No.	Fault	1) Fault removing procedure, and tools	Technical Specifications
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1.	2.	3.	4.	5.
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1. Gyrounity. Mount the Gyrounit into the unbalanced with installation. When the base special screw of centres is lightly tapped 127-46 in the Gyrounit should not roll middle position. Installation Y-118.

2. Burrs, scratches and nicks on the working surface of Cam 127-45.

3. Burrs, scratches and nicks on axes $\phi 3-0.006-0.012$.

4. Eccentricity of axes $\phi 3$ with respect to each other is more than 0.01mm.

5. Reduced (low) insulation resistance between body and contacts.

The Gyrounit should be statistically balanced.

Burrs, scratches and nicks on working polished surfaces of Cam are not allowed.

Burrs, scratches and nicks on $\phi 3-0.006-0.012$ are not allowed.

Eccentricity of axes $\phi 3$ should not exceed 0.01mm.

The insulation resistance should not exceed 80 megohms.

Balancing the Gyrounit by putting out of soldering on lead weights, displacing the balancing screw R2 122.03.23. 018 and shifting Gyromotor 359.00.000. Installation Y-118 wrench 6350-4768, wrench 6350-290, wrench S = 9 x 9mm screwdriver 7810-0312.

Press the working surface of the Cam with sand paper K3M-14. Rinse in petrol 5-70 and blow with compressed air.

Polish with sand paper K3M-14, blow with compressed air, rinse with petrol 5-70. Measure $\phi 3-0.006-0.012$, if the diameter is less than 3.988 - Replace.

Straighten the unit and conduct temperature stabilization as per procedure specified in the condition-inspection sheet of unit 127-cd15.

1. Checkout terminals of the gyromotor if the insulation is damaged, slip over the wire a fluoroelastic tube with 1mm inside diameter.
2. Dry the unit at a temperature of +60°C for 10 to 12 hours.
3. Overhaul the unit of contacts.
4. Replace the gyromotor.

1	2	3	4	5
6. Broken output wires of gyromotor.	Inspection.	Broken output wires are not allowed.	If the wire is long enough for soldering, resolder the wire or replace the gyromotor (see item 11 of repair chart).	
7. Resistance of gyromotor windings between adjacent bearings and the parallel contacts.	Measure with a tester.	The resistance of gyromotor windings should be within 6.5 to 12 Ohms.	Replace the gyromotor (see item 11 of repair chart).	
8. Large play of gyromotor.	Take the gyromount in hands and sharply shake it in the direction of gyromotor axis.	Increase in play of gyromotor is not allowed.	Replace the gyromotor (see item 11 of repair chart).	
9. Special screw 127-46 bent.	Inspection.	Special screw 127-46 is not allowed.	Replace the screw (see item 12 of repair chart).	
10. Burnt contacts 127-cd7, and 127-cf8.	Inspect and check the height of the contact.	Burnt contacts are not allowed. Height of contact should be at least 0.14mm.	Dress with sand paper K23-14 fine in petrol 6-70 and wipe with coarse. Calico cloth soaked in rectified ethyl alcohol combats the height of contact with feeler gauge if the height of contact is less than the feeler - replace the contact.	