ALBUM № A-1

АПК-5В autopilot operating instruction

/2-nd edition/

[redacted]

Secret
Copy No.___

AKN-5B AUTOPILOT OPERATING INSTRUCTIONS

(2-nd edition)

[redacted]

[redacted] Secret

Copy No.___

AIK-5B AUTOPILOT OPERATING INSTRUCTIONS

(2-nd edition)

Approved For Release 2011/02/07 : CIA-RDP82-00038R001400030001-4

P R E F A C E

The "АПК-5В Autopilot Operating Instructions" are intended for the plants, manufacturing "КС" winged missiles, and mechanical personnel of the using organizations.

The "АПК-5В Autopilot Operating Instructions" are the manual for storage, shipment, installation, checks and maintenance of the АПК-5В autopilot within the guaranteed service life.

The main form of storing the АПК-5В autopilot is keeping it in the "КС" winged missile being preserved in accordance with the present instructions КС-05-ИИ, edition III for preservation and extended storage of the "КС" missile in the depots for one year since the date of arrival to the point of destination.

The complete autopilot equipment may be installed in the "КС" missile or the И-2 gyro unit may be removed from it; in this case this unit is stored in a special metal tare.

The АПК-5В autopilot is permitted to be stored in the "КС" missile in a hangar for 3 months within the entire guaranteed service life.

The АПК-5В autopilot and its individual units which are not installed in the "КС" missile can be stored in the depots packed in special metal tare for one year since the date of arrival to the point of destination.

The АПК-5В autopilot and its individual units can be transported in tare or installed in the "КС" missile.

The requirements for the AMK-5B autopilot shipment are outlined in these instructions. The autopilot installed in the "KC" missile is shipped in accordance with the "KC" Winged Missile Maintenance and Operating Instructions", Book I.

The autopilot must be installed in and removed from the "KC" missile according to the "KC" Winged Missile Maintenance and Operating Instructions" Book I.

The amount and methods of the AMK-5B autopilot checkouts at the "KC" missile manufacturing plant, during an extended storage and also during the pre-flight test and test before a take-off are given in these Instructions.

S E C T I O N I

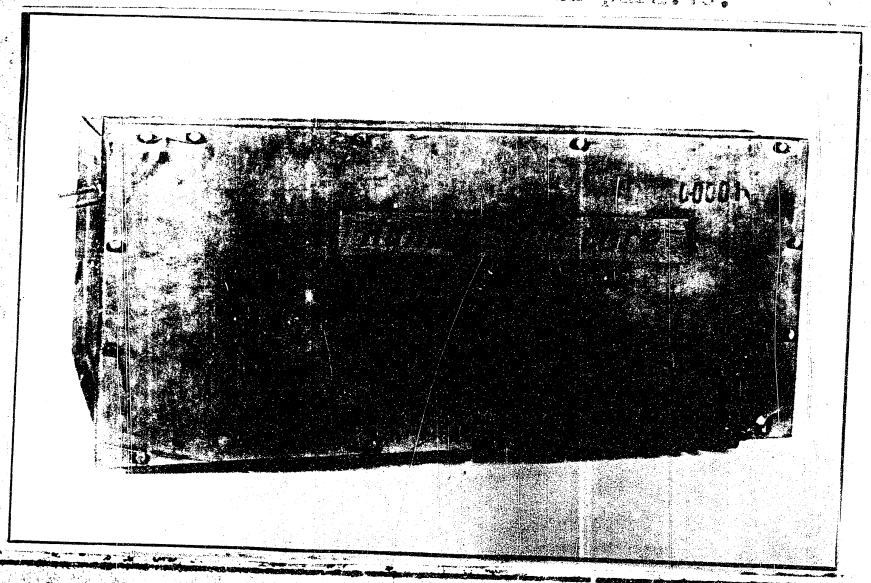
PACKING AND SHIPMENT OF THE АИК-5Б AUTOPILOT

I. INSTRUCTIONS FOR PACKING THE АИК-5Б AUTOPILOT UNITS IN TARE

1. The tare for the АИК-5Б autopilot consists of 2 welded metals cases. Packed in one of the cases are П-1 and П-2 units and in the other - П-4 and П-1БМО units and ПАГ-1ФА inverters. The cases are made according to drawings No.399.00.00.000 (for П-1 and П-2 units) and No.400.00.00.000 (for П-4, П-1БМО units and ПАГ-1ФА inverters).

The external view of one of the cases is given in Fig.1. Furnished with the metal case made according to dwg.No.399.00.00.000 is the box (dwg.399.01.00.000) with the plug connectors.

2. The rooms in which the АИК-5Б autopilots are packed should meet the requirements indicated in para.10.



2. Pack the П-1 control panel and П-2 gyro unit in cases as follows:

Install the П-1 control panel on the shock mounts (2) of the mounting (1, Fig.2) and secure it by 4 screws with nuts. Wrap the cables plug connectors with two sheets of oil paper (GOST 1760-53) and herringbone tape and bind the tape with linen threads.

Insert the plug connectors in the holders (3). Secure the cables by the tape with the button (4). Fasten the control panel filter in the clamp (6).

Install the П-2 gyro unit on the shock mounts (2) of the mounting (1, Fig.3) and secure by 3 bolts. Attach the П-2 gyro unit plug connectors No.31, 39, 42 (manufactured specially for the П-2 gyro units) 43, 45 and 47 to the flanges (3) using their coupling nuts. Fasten plug connector No.35 to the flange (4) by a coupling nut.

Cover the bent portions of cables No.39, 42 and 43 with a split chlorvinyl tubes (7, dia. 34) and secure them by the tape with the button (8) to the mounting.

Secure cables No.31, 35 and 44 by the tape with the button (9), cover them with the split chlorvinyl tube (10) and fasten them to plug connector No.35 by the tape with the button (11). Cover cables No.45 and 47 with the split chlorvinyl tube (12) and fasten them to plug connector No.45 by the tape with the button (13, Fig.3).

Secure the П-2 gyro unit filter to the mounting with the П-1 control panel by means of a clamp and plug connector No.44 by means of its coupling nut to the flange located on the same mounting.

Move the mountings with the K-I and K-2 units installed along the guide rails into the case placed on the floor; see that the mountings are in the vertical position. The mountings must move along the rails without shaking and sticking. If necessary, bend the guide rails.

Secure cables No.45 and 47 to cable No.44 by the tape with the button (1) and place them in the box (2, Fig.4) manufactured according to dwg. No.399.01.00.000, with the plug connector mating parts furnished with the autopilot set.

NOTE: The chlorvinyl tubes may be substituted by chlorvinyl tape.

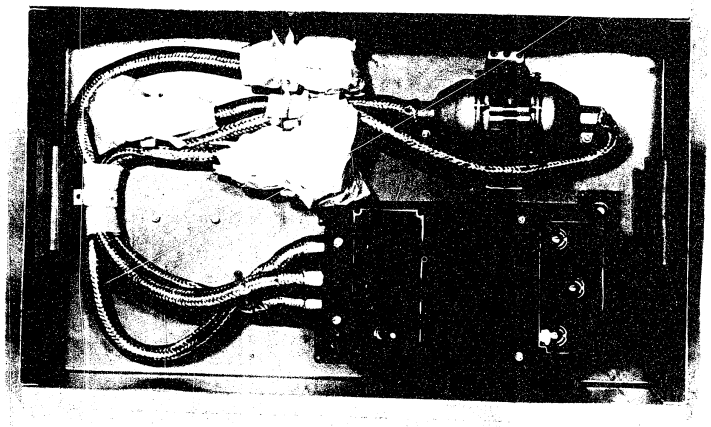


Fig.2. K-I Control Panel-to-Mounting Attachment

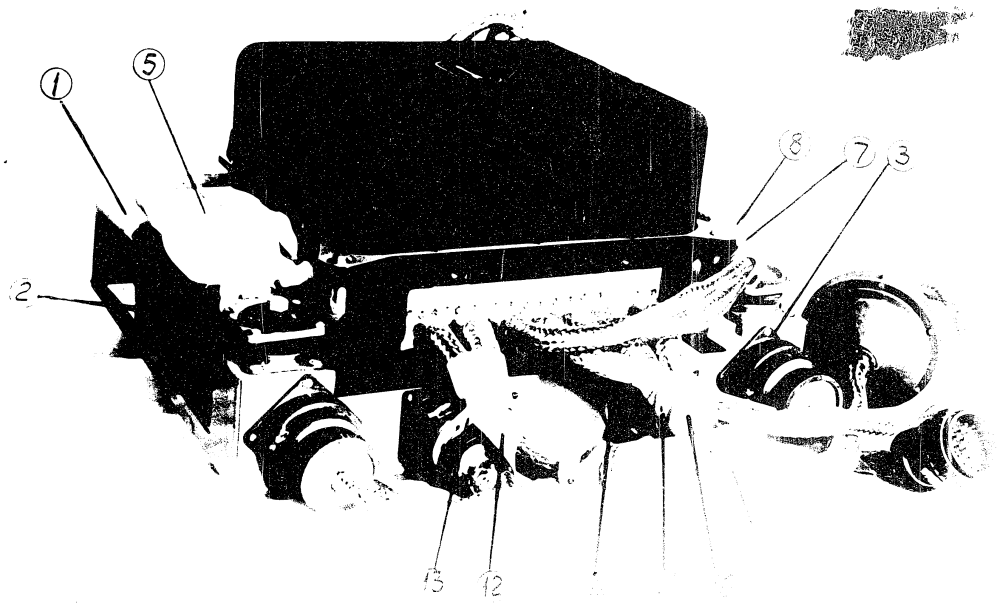


Fig.3. [redacted] Gyro Unit-to-Mounting Attachment

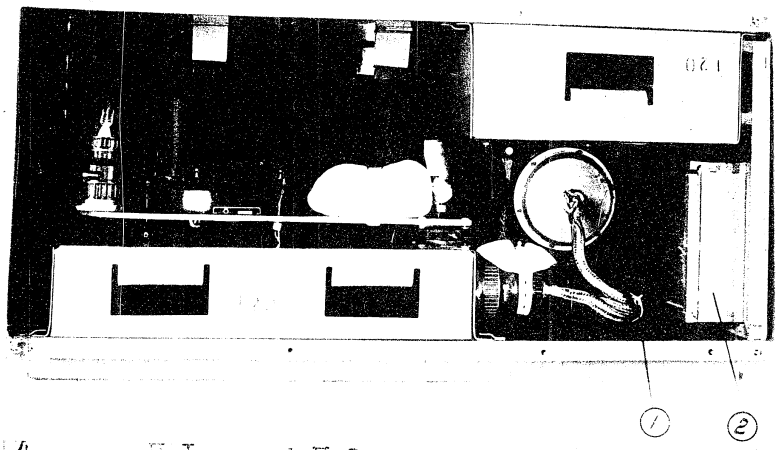


Fig.4. [redacted] and [redacted] Units in Tare

Prior to installation, place in each mounting a bag (5, Fig.2 and 3) with "KSM" silica gel dehydrator, 250 gr. (TOCT 3956-47) and in the I-2 guro unit mounting a bag (6, Fig.3) with blue silica gel indicator, 15-20 gr.

Place the silica gel bags so that they cannot shift during shipment. It is permitted to tie the bags to the cables or mounting with the I-2 guro unit by linen threads or fasten them by tapes with buttons.

NOTES: 1. When placing the cage in the canvas silica gel dehydrator humidity must not exceed 2%.

2. The silica gel dehydrator type "KSM" can be substituted by silica gel type "KM" (TOCT 3956-47).

3. If a cartridge with silica gel indicator is placed in the case, the bag (6) with silica gel indicator should not be put in the case.

4. When packing the I-2 guro unit (manufactured with plug No.42) which is incorporated in the autopilot set installed in the ZUR missile, place in the case the cap for the above mentioned plug; attach the plug to the clamp (6, Fig.2).

On accomplishing the packing, furnish the case with a packing list of a given standard, close the case with the cover, fasten the latter with 14 bolts, secure the case with two seals 1050.55 at two corners located obliquely and mark with an indelible black paint the number of the autopilot set on the right upper corner of the cover and top wall of the case.

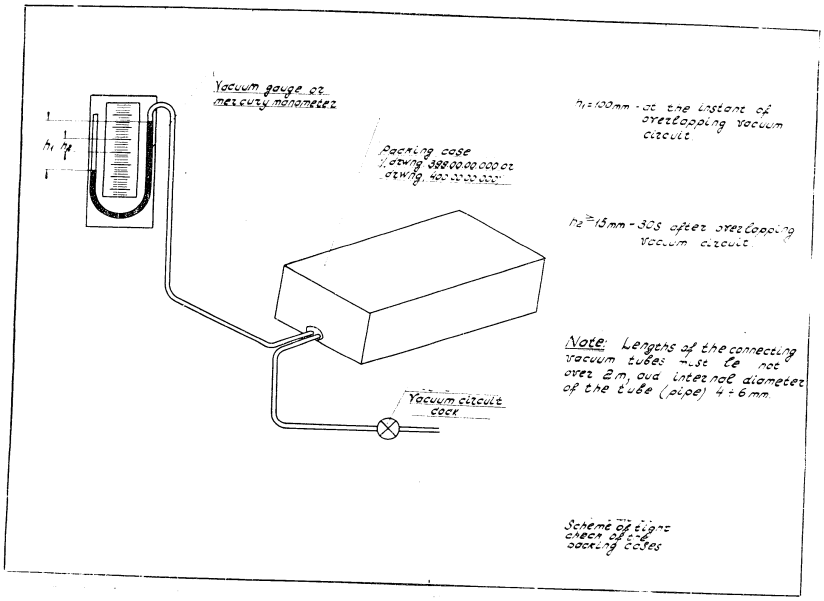


Fig.6 Testing the Packing Cases for Tightness.

Install the П-4 servo units (2 ea) on the mounting (1, Fig.6) and secure each unit by 4 bolts with nuts.

Coat the П-4 servo units output shafts with ЭН(ЭОСТ 9433-60) lubricant.

Install the П-ТЭМО timer on the mounting (2) and secure it by 4 screws with nuts.

Wrap each plug connector of the П-4 servo units and П-ТЭМО timer cables with two sheets of oil paper or herringbone tape and tie the tape with linen threads.

Insert the plug connectors in the holders (3). Fasten the П-4 servo units filters to the clamps (4). Secure the cables by the tape with the button (7).

Tighten the [illegible] inverters (2 ea) to the mounting (1, Fig.7) by the screws with nuts, wrap the end caps and plug connectors of the inverters with two sheets of oil paper (Fig.7) and tie the oil paper with linen threads.

Move the mountings with the P-4 servo units and P-1810 timer and mounting with the [illegible] inverters into the case using the guide rails (Fig.8).

The mounting should move along the guide rails without shaking and sticking.

If necessary, bend the rails. The mountings must be moved into the case placed on the floor in the vertical position.

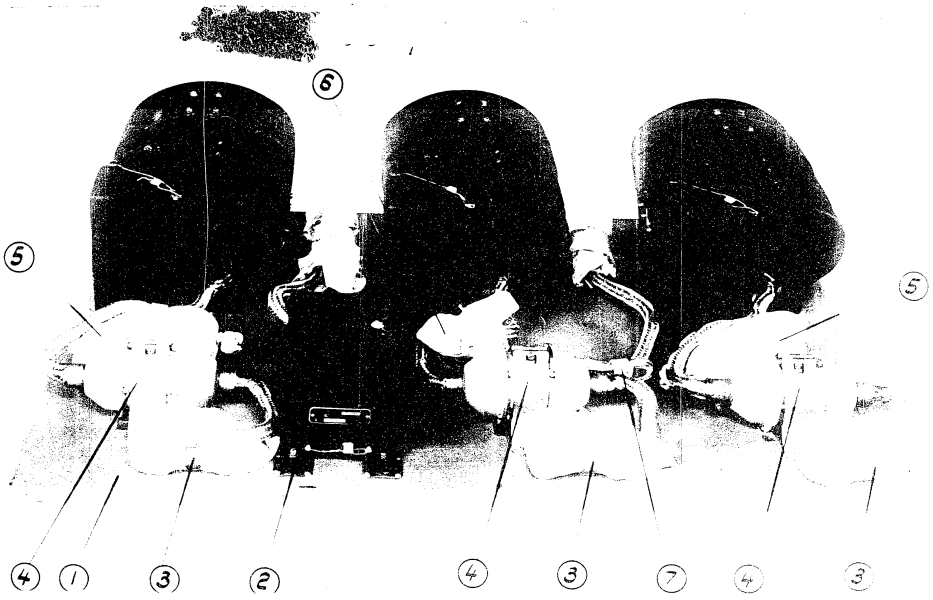


Fig.7. P-4 servo units and [illegible] fixed to mounting "attachment"

Fig.7. HAI-1QA Inverter-to-Mounting Attachment

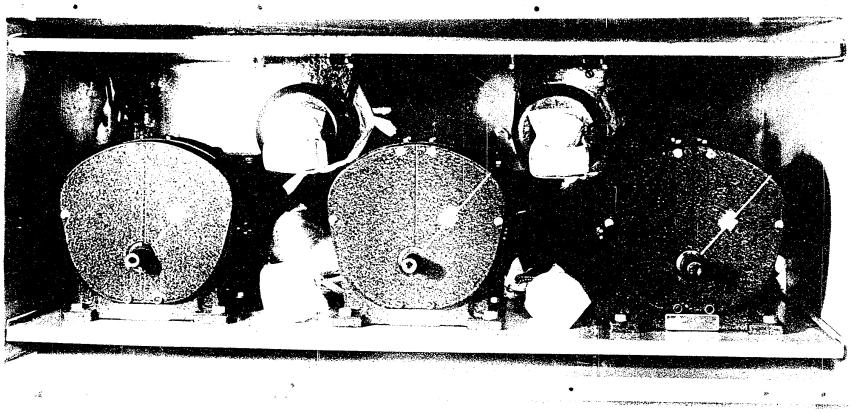


Fig.8. H-1 Servo Units, H-18MO Timer and HAI-1QA Inverters Installed in Vare.

Before installing the mountings, place on the mounting with II-4 servo units and II-16MO timer two bags (5) with "KCM" silica gel dehydrator, 200 grm. each and the bag (6) with a blue silica gel - indicator, 15-20 grm. The bags must be placed so that they are not moved during transportation. It is permitted to tie the bags to the cables with linen threads or secure them by tapes with buttons (Fig.6).

NOTES: 1. When placing the silica gel dehydrator bags in the tare, silica gel humidity must not exceed 2%.

2. The silica gel type "KCM" may be substituted by silica gel type "MCM", "KSK" and "KSM".

3. If a special cartridge with silica gel-indicator is installed in the case, the bag (6) with silica gel-indicator must not be placed in the case.

On accomplishing the packing, furnish the case with the packing list of a given standard, close the case with the cover, attach the case cover with 14 bolts, secure the case with two seals 1053A55 at two corners located obliquely (Fig.1) and mark with an indelible black paint the number of the autopilot set in the right upper corner of the cover and upper wall of the case.

Test the case welded seams tightness and tight fitness of the cover in the same way as for the case with II-1 and II-2 units (see step 3).

NOTE: When packing the autopilot in the using organization it is permitted, as an exception, not to put the silica gel bags in the case and to test the case for airtightness.

2. INSTRUCTIONS FOR PACKING THE AUK-53 AUTOPILOT UNITS IN SHIPPING BOXES

1. To transport the AUK-53 autopilot set or its individual units, the metal cases are additionally placed in the wooden shipping boxes manufactured according to dwg. No.464.00.00.000.

2. When packing the autopilot set in the shipping boxes, proceed as follows:

Open the upper cover of the shipping box. Carefully, without jerks and shocks, place the metal case in the shipping box so that the case position would correspond to the inscriptions made on the case.

Placed between the walls of the shipping box and metal case are plywood and felt spacers to prevent the metal case from shifting inside the wooden box (Fig.9).

Close the upper cover, secure the box with four iron strips and two seals 1053A55.

On accomplishing the packing, mark with an indelible black paint the number of the autopilot set in the right upper corner of the cover.

NOTE: When packing the I-2 gyro unit incorporated in the autopilot set installed in the "KS" missile, additionally mark on the case cover the number of the "KS" missile in which the I-2 gyro unit is to be installed.

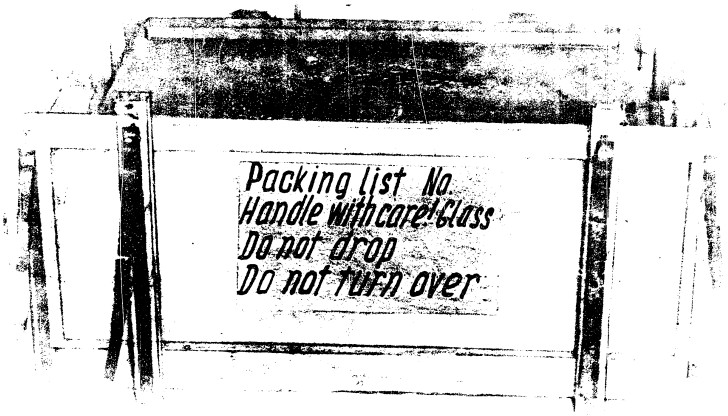


Fig.9. Packing Case in a Shipping Box

3. AP-1B AUTOPILOT UNPACKING INSTRUCTIONS

1. When unpacking the shipping boxes, proceed as follows.

Check for presence of seals on the box. Remove the iron strips and upper cover of the shipping box.

Take out the plywood and roll spacers placed between the wooden box and metal case. Carefully remove the metal case from the wooden box so that the metal case position would correspond to the inscriptions made on the case.

2. Unpack the packing cases with the K-1 and K-2 units as follows:

Check the case for freedom from damages and for presence of seals.

Break the seals and unscrew 14 bolts attaching the wall side cover. Make sure that the packing list is furnished. Check for presence of units and their numbers according to the packing and completing lists.

Inspect the silica gel-indicator. If the silica gel-indicator has become pink, replace the silica gel-indicator and silica gel dehydrator before a repeated packing.

NOTE: The autopilot units stored in the cases with pink silica gel-indicator should not be subjected to special checks; the units serviceability is determined during the next periodic check.

Remove the tape with the button securing cables No.45 and 47 to cable No.44.

Simultaneously take the mountings with the II-1 and II-2 units out of the case so that the units would be in the horizontal position.

Disconnect the II-2 gyro unit plug connector No.44 from the flange located on the mounting with the II-1 unit and release the II-2 gyro unit filter from the clamp located on the same mounting.

Remove the tapes with the buttons, securing the cables and unscrew the remaining plug connectors of the II-2 gyro unit from the mounting flanges.

Remove the silica gel bags.

Unscrew 3 bolts and remove the II-2 gyro unit from the shock-mounts of the mounting. Move the mounting in the case along the guide rails. Unscrew the screw of the clamp, release the II-1 control panel filter and take out the II-1

control panel plug connectors from the holders. Remove the tapes with buttons securing the cables.

Remove the herringbone tape and oil paper from the plug connectors.

Unscrew four screws and remove the П-I control panel from the mounting shock-mounts. Move the mounting in the case along the guide rails.

Attach the side wall by 2 bolts and place the remaining 12 bolts inside the case.

3. Unpack the cases with the П-4 servo units, П-18М timer and ПАП-12А inverters as follows:

Check the case for freedom from damages and for presence of seals.

Break the seals and unscrew 14 bolts attaching the side wall. Make sure, that the packing list is furnished. Check the units and their numbers according to the packing and completing lists. Inspect the silica gel indicator. If the silica gel has become pink, replace the silica gel-indicator and silica gel-dehydrator before a repeated packing.

NOTE: The autopilot units, stored in the cases with a pink silica gel, should not be subjected to special checks; the units serviceability is determined during the next periodic check.

Remove the mounting with the П-4 servo unit and П-18М timer so that the units would be in the horizontal position. Remove the silica gel bags.

Unscrew the screws of the clamps, release the П-4 servo unit filters and take out the П-4 servo unit plug connectors from the holders.

Remove the tapes with buttons which secure the cables. Cut the threads, remove the herringbone tape and oil paper from the plug connectors.

Unscrew four screws and remove the П-15КО timer from the shock-mounts. Unscrew 4 bolts and remove the П-4 servo units from the mounting. Move the mounting into the case along the guide rails.

Take the mounting with the ПАП-120А inverters out of the case. Cut the threads and remove oil paper from the end caps and plug connectors of the inverters. Unscrew 4 screws and remove the inverters from the mounting. Move the mounting into the case along the rails.

Attach the side wall by 2 bolts and place the remaining 12 bolts inside the case.

4. АПК-5В AUTOPILOT SHIPMENT

1. The АПК-5В autopilot and its individual units which are not installed in the "КС" winged missile must be shipped in a box according to the requirements indicated in par. 1 and 2, these Instructions.

2. When carrying, loading and shipping the boxes see that the position of the boxes corresponds to the inscriptions made on them. The boxes must be carefully carried and loaded without jerks and shocks.

When shipping, install and attach the boxes so as to protect them from falls, displacement and impacts against each other. Do not transport the autopilot and its individual units

7. The attachment parts must ensure secure attachment of the autopilot units in the missile throughout the entire service life. The autopilot units attachment parts and plug connectors must be securely locked.

8. Install and remove the autopilot units only with the electrical system de-energized.

9. The requirements for the autopilot unit's installation in and removal from the missile are given in the "Air Forces Missile Maintenance and Operating Instructions [illegible].

6. CHECKING THE [illegible]

1. Inspect the packing crate. Check the [illegible] of seals and [illegible]. Unpack the [illegible] in accordance with the instructions given in par. 2. Visually inspect all the units. Check the external surfaces of the units and cables for freedom from damages and traces of corrosion.

When checking the [illegible] proceed as follows.

2. Set in the [illegible] to the [illegible] simulator case and secure it [illegible].

3. Set the "[illegible]" switch [illegible] in the "OFF" position.

4. Connect a supply [illegible] to the control panel.

5. Connect the plug connectors [illegible] units to the control panel [illegible].

Set the "PANEL" selector switch in the "II-4" position, "WINDINGS SELECTOR SWITCH" - in the "0" position and "SIGNAL" selector switch-in the "60mA" position. Set the "FEEDBACK" knob in the "0" position.

4. Switch on the "FEEDBACK" and "POWER" switches. The II-4 servo unit outlet shaft should move to the zero position. Attach the KIA-5 simulator pointer to the outlet shaft, aligning the pointer with the scale zero division. Set the "POWER" switch in the "OFF" position.

Manually turn the servo unit outlet shaft in any direction to the stop. Switch on the "POWER" switch, in this case the II-4 servo unit outlet shaft must move to the zero position to within $\pm 0.25^{\circ}$; self-oscillations should not appear. Repeat the check with the servo unit outlet shaft turned in the opposite direction.

5. Set the "FEEDBACK" switch in the "OFF" position, the "WINDING SELECTOR SWITCH" - in the "I" position and the "SIGNAL" selector switch-in the "3mA" position (for the KII-I control panels, whose "SIGNAL" milliammeter has the scales of "3-0-3mA", "60-0-70mA"). Smoothly turn the "SIGNAL" knob to the right, increase the control signal till the servo unit outlet shaft starts steadily rotating and moves to the limit switch (turning through an angle of $10-11^{\circ}$ from the zero position). The control signal value (in mA) is the unit sensitivity.

When using the KII-I control panel whose "SIGNAL" milliammeter has the scales of "I-0-1mA", "1.5-0-1.5 mA", "2.5-0-2.5mA" and "60-0-60mA", check as described above except for the position of the "SIGNAL" selector switch which must be set before the check in the "1mA" position. If, when turning the "SIGNAL" knob, the

Set the "PANEL" selector switch in the "I-" position, "WINDINGS SELECTOR SWITCH" - in the "0" position and "SIGNAL" selector switch in the "60mA" position. Set the "BALANCE" knob in the "0" position.

4. Switch on the "POWER" and "SIGNAL" switches. The II-4 servo unit output shaft should come to the zero position. Attach the III-6 simulator pointer to the output shaft aligning the pointer with the scale zero division. Set the "POWER" switch in the "OFF" position.

Manually turn the servo unit output shaft to the stop. Switch on the "POWER" switch. The II-4 servo unit output shaft must move to the position to within ±1.5°; self-oscillation must not occur. Repeat the check with the servo unit output shaft turned in the opposite direction.

5. Set the "PANEL" selector switch in the "WINDING CURRENT" position, "WINDINGS SELECTOR SWITCH" in the "Control" selector switch in the control panels, whose [illegible] "3-0.3mA", "60-0-60mA", [illegible] the right, [illegible] let shaft starts steadily [illegible] (turning through an angle of [illegible]

The control signal value [illegible]

When using the [illegible] control panel whose [illegible] has the scales of "1mA", "3-0-3mA", "6-0-6mA" and "60-0-60mA", check as described here except for the position of the "SIGNAL" selector switch which must be set before the check in the "1mA" position. If, when turning the "SIGNAL" knob, the

Set the "RANGE" selector switch in the "0-1mA" position, "WINDINGS SELECTOR SWITCH" in the "0" position and "SIGNAL" selector switch in the "GOAL" position. Set the "BALANCE" knob in the "0" position.

4. Switch on the "SERVOAMP" and "SERVO" switches. The II-4 servo unit output shaft should now be in the zero position. Attach the II-4 servo-indicator pointer to the output shaft, aligning the pointer with the scale zero division. Set the "POWER" switch in the "ON" position.

Manually turn the servo unit output shaft in one direction to the stop. Switch on the "SERVO" switch. The II-4 servo unit output shaft must move in the opposite direction to within ±0.25°; self-oscillation must not occur. Repeat the check with the servo unit output shaft turned in the opposite direction.

5. Set the "SERVOAMP" switch to the "OFF" position. Set the "WINDINGS SELECTOR SWITCH" and "SIGNAL" selector switches to the [illegible] position. Set the "RANGE" switch on the control panel, whose [illegible] corresponds to the range "3-0.3mA", "60-0-60μA", [illegible] the right, increase the [illegible] let shaft starts rotating [illegible] (turning through an angle [illegible]

The control [illegible]

[illegible] the [illegible]

[illegible]

[illegible] "OFF" [illegible]

in the [illegible]

Set the "CHAN" selector switch in the "1" position, "SIMULATOR SELECTOR SWITCH" in the "0" position and "SIGNAL" selector switch in the "OFF" position. Set the "SIGNAL" knob in the "0" position.

4. Switch on the "MAGNETIC" and "LIGHT" switches. The M-4 servo unit output shaft should now be in the zero position. Attach the M-4 simulator pointer to the servo shaft, aligning the pointer with the guide mark (provided) on the "POWER" switch in the "off" position.

Manually turn the servo unit output shaft anti-clockwise to the stop. Switch on the "POWER" switch. The M-4 servo unit output shaft must move to the zero position to within $\pm 0.25°$; self-oscillation must not occur. Turn the shaft in the check with the servo unit shaft rotating clockwise in the opposite direction.

5. Set the "SIGNAL" switch to the "ON" position. Set the "SIMULATOR SELECTOR SWITCH" in the two simulator control panels to the "CHAN 1" position. Set the "SIGNAL" selector switch in the "ON" position on the two control panels, whose "SIGNAL" milliammeters have the scales of "3-0-3mA", "60-0-60mA", respectively. Turn the "SIGNAL" knob to the right, increase the control signal till the servo unit output shaft starts steadily rotating and moves to the right position (turning through an angle of $45 \pm 1°$ from the zero position).

The control signal value (in mA) at this moment is noted.

Then using the M-4 servo unit shaft, turn the other simulator has the scales of "3-0-3mA", "60-0-60mA", check as described above for the position of the "SIGNAL" selector switch which must be set to the "ON" position in the "1mA" position. If, when turning the "SIGNAL" knob, the

control signal value, at which the shaft starts rotating, exceeds 1mA, it is necessary to set the "SENS." selector switch in the "1.5mA" position and if these values are exceeded, set the selector switch in the "2.5mA" position.

Repeat checking with the "SENS." knob turned to the left. The servo unit outlet shaft should move to the opposite limit switch.

When setting to zero, the [illegible] in the position "0", [illegible] sensitivity. [illegible] OR SWITCH in the "1", "2" and "3" positions [illegible] unit sensitivity must be [illegible] - 0.95-1.05 mA.

6. Switch on the [illegible] selector switch in the [illegible] SERVOMOTOR UNIT" - in the [illegible]

Gradually increase the control signal [illegible] the "SIGNAL" knob to the [illegible] smoothly without jerks.

Repeat the check when feeding the signal [illegible] ty. Set the [illegible] the [illegible] servo unit [illegible]

7. Check the other two [illegible] subgroups in the [illegible]

Check the [illegible]

8. Set the [illegible] control panel in the "0" position and the [illegible] SWITCH" in the "0" position.

Connect a supply of 36 V A.C. to the control panel.

Connect the control panel cable to the plug connector of one of the NAT-TBA inverters.

9. Switch on the "POWER" and "LOAD" switches.

The gyro motors installed in the control panel must start rotating. After 3 min. check by the control panel D.C. ammeter the current drawn by the inverter which under normal conditions must not exceed 2.9 A.

When checking the autopilot at a temperature different from the normal temperature within a range of -35°C to +50°C, increase the above mentioned tolerance by 0.06 A for each 10°C of the temperature change either side from normal.

10. Set the "PHASE SELECTOR SWITCH" in the "1" position. Check A.C. voltage generated by the inverter using the control panel A.C. voltmeter and the alternating current generated by the inverter using the control panel A.C. ammeter. Under normal conditions voltage should be equal to 36±4 V and current should not exceed 1.5 ± A.

When checking at a temperature different from the normal temperature within a range of -35° to +50°C, increase the 4 V tolerance of the voltmeter readings by 0.2 V for every 10°C of the temperature change either side from normal.

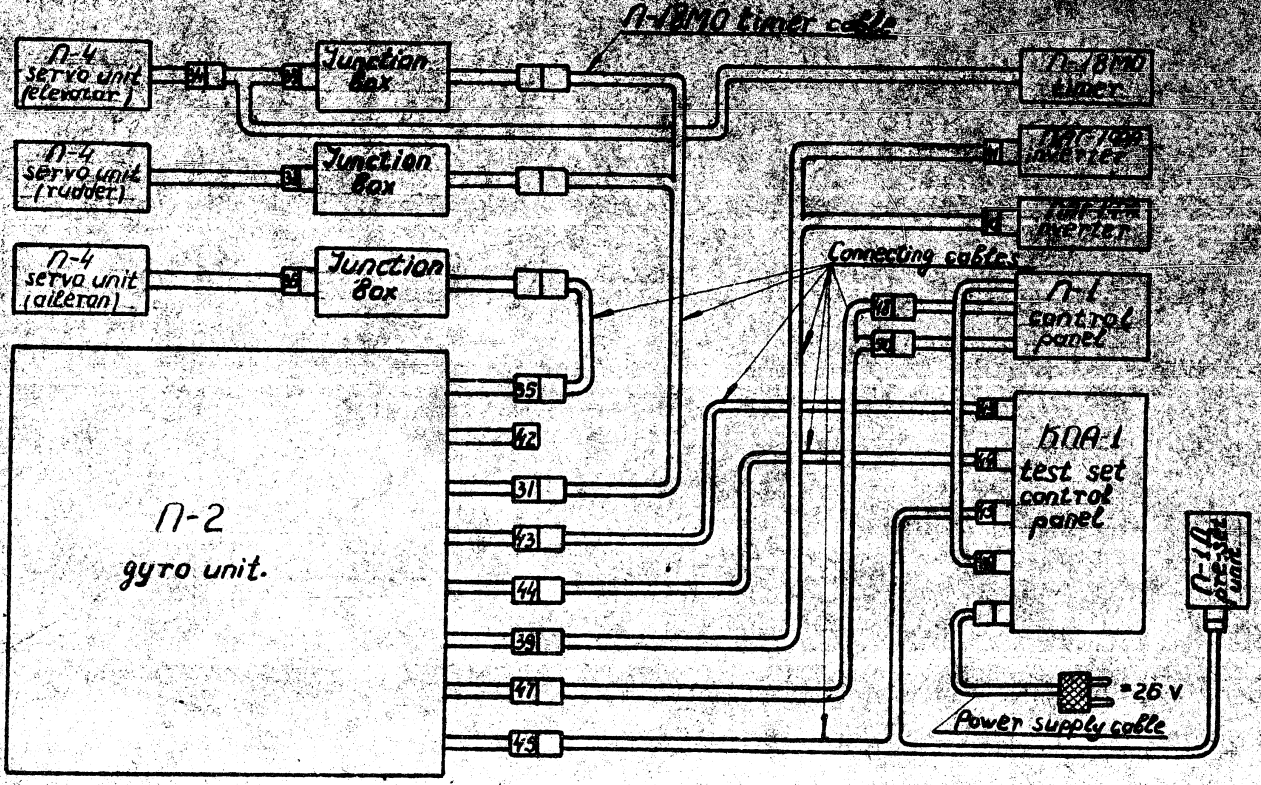
In the temperature range indicated below and other similar conditions the tolerance for the ammeter, must be increased:

at T=+20 to -35°C by 0.054 A

at T=+20 to +50°C by 0.012 A .

Set the "PHASE SELECTOR SWITCH" in the "2" and "3" positions and check voltage and current in two other phases of the inverter.

...nt. No 12 to АОК-3В autopilot specifications.



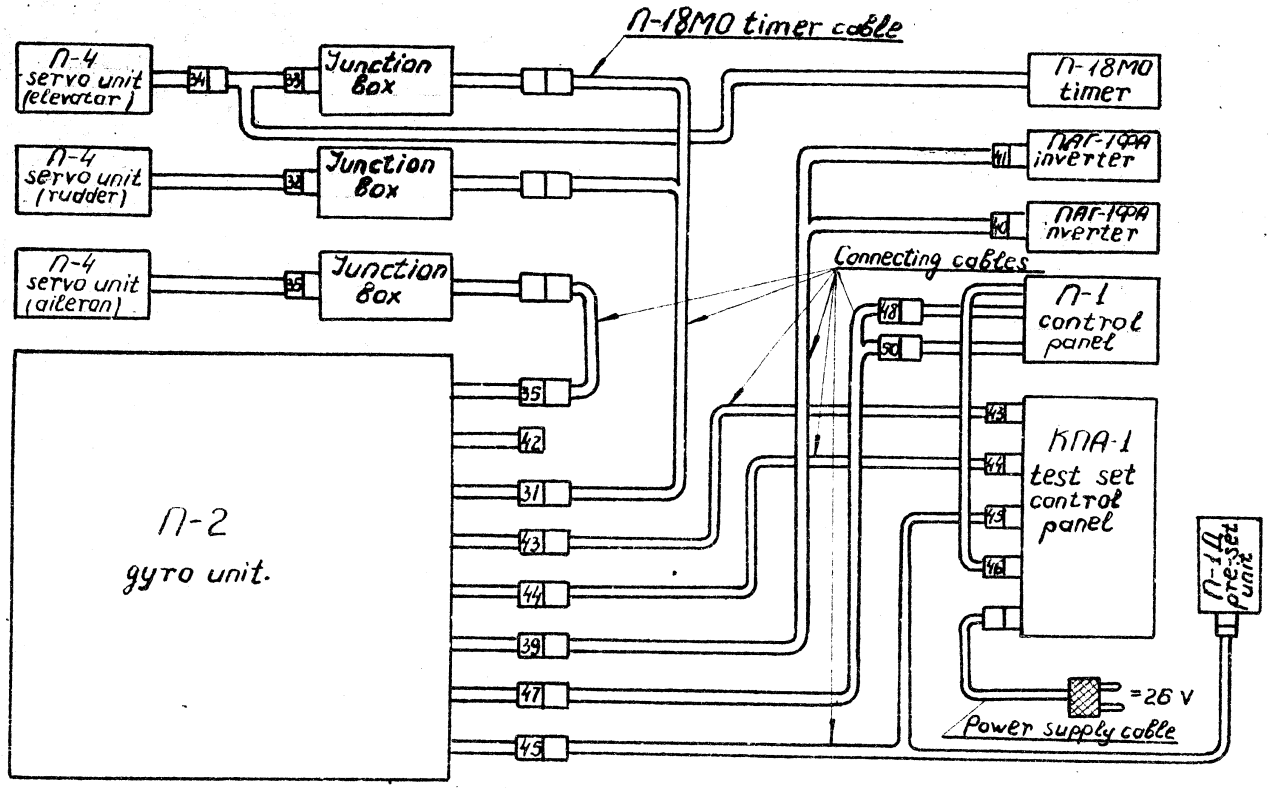
: Plug connectors are arbitrarily designated.

l (example)

- plug connector No. 35.

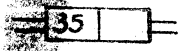
ent No. 12 to ANK-5B autopilot specifications

secret



NOTE: Plug connectors are arbitrarily designated.

Symbol (example)



- plug connector No. 35.

Fig. 10. Block Diagram of ARP-52 Autopilot Unit's Connection with Test Set.

Attach the KUA-5 simulator pointers to the П-4 servo unit outlet shafts and set the pointers at zero points on the simulator scales.

NOTES: a) Before energizing the autopilot, check the "CENTERING" potentiometer wipers position on the П-1 control panel; in this case the slot on the potentiometer shaft must be against the index on the panel cover.

b) After illumination of the "POWER ZERO" warning lights but not earlier than 3 min. after power is applied, set the selector switch on the П-1 panel in the "RIGHT" position. Set the "ERR-S Y DEG" knob of the П-1 panel in the 1 deg. "UP" position, the milliammeter pointer on the П-1 panel must deflect "UP", approx. one division. Press the "CENTERING" button on the KUA-1 control panel, the "POWER" warning light must go out and the "UNBAL" warning light must come on, the elevator simulator pointer must deflect 1°±21' to the left. Turn the "ERR-SET UNIT" knob of the П-1 panel in turn to the left and to the right. The pointers of the elevator simulator and milliammeter on the П-1 panel must be motionless. Set the "ERR-SET UNIT" knob on the П-1 panel in the zero position and change the selector switch from the "RIGHT" position to the middle position.

the off power supply on the [illegible] control panel and after 5-10 secs. energize the autopilot main. test, with the "Main Test" warning light coming on.

c) When the "Autopilot" warning light is also inop, repeat the above procedure to check out with the pre-arm unit knob on the [illegible] panel set at each of the [illegible] positions. In this case the vertical gyro attitude error should be within 2.5° of the value indicated by the pre-set unit on the [illegible] panel.

Next the above test should be repeated with the pre-set unit knob set down in the 1°, 2°, 3°, 4° and 5° positions, and at each the pitch indicator on the [illegible] unit must move over an arc of 2° further clockwise than the pre-set unit knob.

WARNING: 1. When moving the [illegible] panel pre-set unit knob to the left or to the right in the range of 0° to 2°, the "Pitch Error" warning light may remain illuminated.

2. When switching over to the [illegible]

the ATT power supply on the [illegible] control panel and after 5-10 secs. energize the autopilot gain. Wait, with the "Gyro Fail" warning light turned on.

c) When the "Gyro Fail" warning light is illuminated, repeat the check according to step "b" with the pre-set gain knob on the [illegible] panel set in turn to 2°, 4°, 6° and 8° positions. In this case the control surface displacement should be within ±3% of the value indicated by the pre-set knob on the [illegible] panel.

d) Set the three-axis stabilization pre-set knob set down in the 1°, 2°, 3°, 4°, 5° and 6° positions, in turn, and note the [illegible] on the [illegible] and make sure that the control surface simulator must def. [illegible] to the right (as viewed from the nose of the aircraft).

11.8. 1. When turning the [illegible] panel pre-set knob to the left or to the right in the range of 0° to 2°, the "BASES ALIGN" warning light may remain illuminated.

2. Upon switching over to the AA-17K

simulator, the direction indicator on the [illegible] panel is inoperative.

[illegible], after the "Preheated" warning lights come on(but not earlier than 2 min. after power is supplied) set the "[illegible]" on the control panel in the "BOARD CHECK" position and switch on the "[illegible]" switch.

The "BOARD CHECK" and "[illegible]"warning lights must come on. Promptly deflect the [illegible] gyro unit in direction; at the instant of turning the [illegible] gyro unit, the [illegible] rudder servo unit outlet shafts must turn. Repeat the check when turning the [illegible] unit in the opposite direction.

Perform similar checks when turning the [illegible] gyro unit in pitch and roll.

The rotation of the [illegible] servo unit shafts relative to [illegible] shown in Table No.1. The pointers of the control shaft dial position indicators, when the [illegible] gyro unit is turned in the directions indicated in Table No.1, must move [illegible].

Table No.1.

Channel	Direction of [illegible] gyro unit turn	Direction of outlet shafts rotation		
		[illegible] rudder servo unit	[illegible] elevator servo unit	[illegible] aileron servo unit
Direction	to the right	counter-clockwise	-	-
Pitch	up	-	clockwise	-
Roll	to the right	-	-	clockwise

NOTE: After the [illegible] gyro unit is stopped, the [illegible] servo unit outlet shafts must return to the zero position to within $\pm 0.25^{\circ}$.

15. Fully turn the "RUDDER" knob on the control panel to the "RIGHT". The M-4 rudder servo unit outlet shaft must smoothly, without jerks, turn clockwise and the M-4 aileron servo unit outlet shaft - counterclockwise. Fully turn the "RUDDER" knob to the "LEFT". The M-4 rudder servo unit outlet shaft must smoothly, without jerks, turn counterclockwise and the M-4 aileron servo unit outlet shaft - clockwise. Set the "RUDDER" knob in the zero position.

Fully turn the "ELEVATOR" knob on the control panel to the "UP" position.

The M-4 elevator servo unit outlet shaft must smoothly, without jerks, turn counterclockwise. Fully turn the "ELEVATOR" knob to the "DOWN" position. The M-4 elevator servo unit shaft must smoothly, without jerks, turn clockwise. Set the "ELEVATOR" knob in the zero position and the "CLOCK" switch in the "OFF" position. Wait till the M-4 servo units outlet shafts move to the zero position and "CAGE ZERO" warning lights come on.

17. Set the "PILOT SELECTOR SWITCH" in the "AS-17M SIMULATOR" position. The "AS-17M SIMULATOR" warning light must become illuminated. Press the "UNCAGING" button on the control panel and simultaneously start the stop-watch; in this case the "CAGE" warning light must go out and "UNCAGE" warning light must come on. 2-3 sec. after the "UNCAGING" button is pressed, the M-4 elevator servo unit outlet shaft must turn counterclockwise through an angle of 9-9.5° and 40-42 sec. after the button is pressed, the outlet shaft must return to the zero position to within ±0.55°. Perform the check twice. When uncaging for the first time, check the M-4 servo

power of 28.6 V D.C. to the control panel. Set the "PANEL" selector switch in the [illegible]-4 position, the "WINDING SELECTOR SWITCH" - in the "0" position and the "SIGNAL" selector switch - in the "COM." position. Set the "SIGNAL" knob in the "0" position.

3. Switch on the "POWER" and "FEEDBACK" switches, in this case the [illegible]-4 aileron servo unit shaft must turn to the zero position.

Check the ailerons position. If the ailerons are deflected from the neutral position(i.e. the ailerons neutral position does not correspond to the zero position of the [illegible]-4 servo unit) set the ailerons in the neutral position by changing the rods length using the adjustment elements.

4. Set the "FEEDBACK" switch in the "OFF" position and "WINDING SELECTOR SWITCH" - in the "I" position. Slowly rotating the "SIGNAL" potentiometer knob, first in one and then in the other side of zero position, determine the ailerons maximum angle of deflection (till the [illegible]-4 servo unit limit switches are actuated) which must be within ± 9.5 to 11.5° from the neutral position.

5. Set the "SIGNAL" knob in the "0" position, switch on the "FEEDBACK" switch and check that the ailerons are set in the neutral position again; in this case permissible angle of the ailerons deflection from the neutral position is up to 0.25°.

6. Set the "POWER" switch in the "OFF" position and manually deflect the ailerons in either side to the stop; then switch on the "POWER" switch, in this case the ailerons

must move to the neutral position and self-oscillations do not occur.

Repeat the check with the ailerons deflected to the opposite side. Set the "POWER" switch in the "OFF" position and disconnect the П-4 aileron servo unit plug connector from the control panel.

7. Check the П-4 rudder and elevator servo units for proper installation (steps 2-6).

NOTE: The elevator neutral position is the deflection through 2.5-3° up from the geometric neutral position. Further, this position of the elevator is called "ZERO" position.

8. TESTING THE АПК-5В AUTOPILOT AFTER INSTALLATION IN THE "КС" MISSILE

1. To check the АПК-5В autopilot after installing it in the "КС" missile, remove the П-2 gyro unit from the missile irrespective of the preservation to which the given "КС" missile will be subjected after it is accepted by the Customer.

2. Install the П-2 gyro unit on the КПА-5 turn table according to the instructions given in step 12, par.6.

NOTE: It is permitted to install the П-2 gyro unit on the КПА-5 turn table without removing the gyro unit from the mounting.

3. Place the П-2 gyro unit secured to the turn table at a distance of 1-2.5 m. from the access door in the fuselage bottom section between frames 14 and 18.

NOTE: When installing the turn table see that it does not slide on the base.

4. Connect the II-2 gyro unit plug connectors observing the numbers on the plug connectors and the autopilot wiring diagram (Fig.11), in this case:

a) connect the II-2 gyro unit receptacles No.31, 35,39,43 and 47 to the mating plugs of the missile wiring system through the connecting cables;

b) connect the II-2 gyro unit receptacle No.4 to the mating plug of the MIA-I control panel through the connecting cable; the MIA-I control panel plug connector No.43 through the connecting cable - to plug connector No.36 used for checking the autopilot installed in the missile and the II-2 gyro unit plug connector No.42 - to the MIA-I and II-2 control panels through the connecting cable according to the block diagram given in Fig.10.

NOTES: 1. Do not connect plug connectors when the system is energized.

2. Connect the autopilot to the missile electrical system to check it only after the missile wiring system is approved by the Quality Inspection Department and by the Customer.

When checking the autopilot operation, proceed as follows:

a) supply power of 28.5±1.5 V d.c. to the missile electrical system. Switch on the "TC-115" switch on the control panel. In this case the MAP-I-2 inverters start operating, the "CAUTION" warning lights are (no later than after 1 min.) the "GYRO ERROR" warning light goes on. Do not check the gyro at this "0" missile magnetic heading.

The rudder and ailerons must be set in the neutral positions to within $\pm 0.5^{\circ}$ and the elevator must be set $2.5-3^{\circ}$ Up from the geometric neutral position (further, this position of the elevator is called a "ZERO" position). The control surfaces position indicators pointers must be in the middle positions.

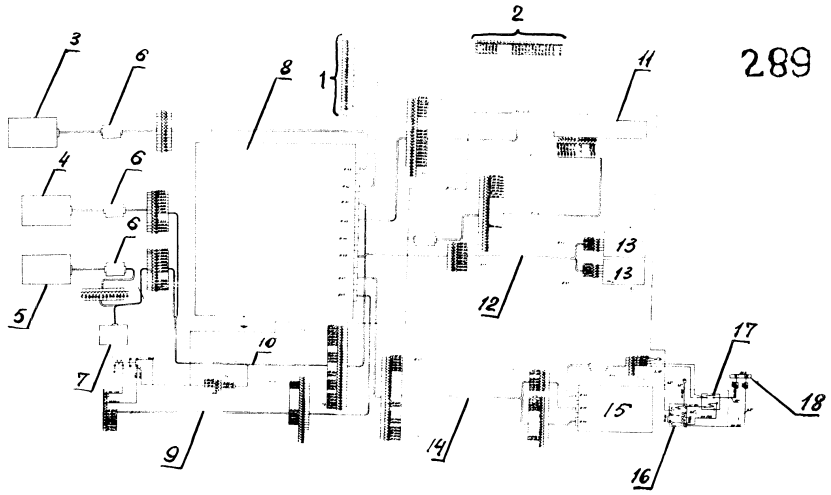
a) After the "BASES ZERO" warning lights become illuminated, but not earlier than 3 min. after power is supplied, set the "B" selector switch on the ПП-Д control panel in the "TO THE RIGHT" position. Set the pre-set unit knob on the ПП-Д control panel in the position 4 divisions down. The pointer of the milliammeter on the ПП-Д panel must deflect down approx. 4 divisions. The "BASES ZERO" warning light on the КПА-1 control panel must go out. Press the "UNCAGING" button; the elevator must move through an angle of $4^{\circ} \pm 1^{\circ} 24'$ down from the initial position.

Turn the pre-set unit knob on the ПП-Д control panel to "UP", "DOWN" and then set it in the zero position.

The elevator must be motionless. Set the selector switch on the ПП-Д control panel in the middle position.

De-energize the autopilot. Repeat the check with the pre-set unit knob set in the 3° and 6° positions.

b) Repeat the check as specified in step "a" with the pre-set unit knob set 4° "UP". In this case the elevator must move through an angle of $4^{\circ} \pm 1^{\circ} 24'$ up.



to TKC System
see dwg. KC-7406-10
2) Test plug connector ШР48ПК243Ш2
3) П-4 servo unit (ailerons)
4) П-4 servo unit (rudder)
5) П-4 servo unit (elevator)
6) Filter
7) П-18МО timer
8) П-2 gyro unit
9) Cable No. 9
10) Cable No. 1
11) К-1-13М unit
12) Cable No. 3
13) ПАГ-1ФА inverter
14) Cable No. 2
15) П-1 control panel
16) РП-2 relay
17) К-20Д contactor
18) Junction box (see dwg. 7201-00)

1) Cable N. 11/4
to TKC System
see dwg. KC-7406-10
2) Test plug connector ШР48ПК24Эш2
3) П-4 servo unit (ailerons)
4) П-4 servo unit (rudder)
5) П-4 servo unit (elevator)
6) Filter
7) П-18МО timer
8) П-2 gyro unit
9) Cable No. 9
10) Cable No. 1
11) К-1-13М unit
12) Cable No. 3
13) ПАГ-1ФА inverter
14) Cable No. 2
15) П-1 control panel
16) РП-2 relay
17) К-20Д contactor
18) Junction box (see dwg. 7201-00)

4. If two stop-watches are available check the programmed operation at a single switching-on of the П-18М timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the П-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the П-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the П-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of П-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-18M timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-12M timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 5^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-18M0 timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-12M timer.

5. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-16M0 timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 5^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the M-12M timer.

5. Check how the control surfaces are controlled by the free gyros: smoothly turn the M-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the M-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the M-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of M-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

4. If two stop-watches are available check the programmed operation at a single switching-on of the П-16М timer.

9. Check how the control surfaces are controlled by the free gyros: smoothly turn the П-2 gyro unit through an angle of $\pm 45^{\circ}$ in yaw, $\pm 25^{\circ}$ in pitch and $\pm 40^{\circ}$ in roll. The control surfaces must smoothly, without jerks, deflect in accordance with Table No.4.

When stopping the П-2 gyro unit being deflected, the control surfaces and ailerons must not return to the neutral positions.

NOTE: Before checking the pitch control, turn the gyro unit in pitch, with the free gyros caged, through an angle of 10° in the direction opposite to that checked. Then, one minute after the autopilot is uncaged, check the control system. Perform a similar check with the unit turned in the opposite direction; proceed as specified in this note if the turn table does not permit turning the П-2 unit in pitch within $\pm 25^{\circ}$.

Table No.4

Channel	Direction of П-2 gyro unit turn	Direction of deflection		
		Rudder	Elevator	Ailerons
Direction	to the right	to the left	-	right aileron down
Pitch	up	-	down	-
Roll	to the right	-	-	right aileron down

10. Set the "[illegible] SELECTOR" to "TCH" in the "Z-1M SIMULATOR" position. The "Z-1M SIMULATOR" warning light must come on.

Switch on the "COMM... No.1" switch on the control panel. The "COMMAND No.1" warning light must become illuminated. When command No.1 is sent, the control surfaces may deflect from the position, occupied by them before the command is sent, through the angles within ±1.6° (elevator and ailerons) and ±0.8° (rudder).

Fully turn the "RUDDER" knob on the control panel to the "left". The rudder must smoothly, without jerks, deflect to the left, and the right aileron - up. Set the "RUDDER" knob in the zero position; in this case the rudder and ailerons must move to the neutral position.

Repeat the check with the "RUDDER" knob turned to the "right".

Next turn the "ELEVATOR" knob on the control panel to the "up", the elevator must smoothly, without jerks, deflect upwards. Set the "ELEVATOR" knob in the zero position; in this case the elevator must move to the zero position. Repeat the check with the "ELEVATOR" knob turned to the "DOWN" position.

NOTE: The time, required for sending a signal of one polarity, should not exceed 15 sec.

11. Switch on the "COMM... No.2" switch on the control panel. The "COMMAND No.2" warning light must become illuminated. Check how the control surfaces are controlled by the "RUDDER" and "ELEVATOR" pre-set units on the control panel in the same manner as when sending command No.1; in this case, when setting the "RUDDER" and "ELEVATOR" knobs in the zero positions, the control surfaces must not move to the neutral position.

12. Set the "CONTROL No.1" and "CONTROL No.2" switches in the "OFF" position and the "CONTROL SELECTOR SWITCH" on the control panel - in the "[illegible] CONTROL" position. Set the "POWER" switch of the [illegible] control unit in the "OFF" position and if the autopilot has operated for more than 60 min.make an interval for not less than 30 min. to cool the [illegible] gyro unit.

13. Switch on the [illegible] control unit "SCAN" switch.After the "GYRO ZERO" warning light comes on (but not earlier than 3 min. after power is supplied) press the "UNCAGING" button on the control panel.

The "CAGE" warning light must go out and the "UNCAGE" warning light must come on.

After 5 min., check the autopilot free gyros precession. The gyros rigidity should be so,that the control surfaces deflection from the neutral position for 5 min. would not exceed:

rudder $\pm$ 1.25°

elevator $\pm$ 2.5°

ailerons $\pm$ 1.25°.

When checking the gyros rigidity, the [illegible] gyro unit must be in the horizontal position.

NOTE: The ailerons deflection depends also on the yaw free gyro precession (due to a signal picked up from the coordination potentiometer): therefore before determining the value of the roll free gyro precession, set the rudder in the neutral position by turning the "[illegible]" gyro unit in yaw. In this case the ailerons deflection from the neutral position corresponds to the roll gyro precession.

14. Set the "POWER" switch on the П-I control panel in the "OFF" position. Disconnect the П-2 gyro unit plug connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "КС" missile Log-Book.

16. Install the П-2 unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the Ш1-13М unit and connect plug connector No.45 through the control panel connecting cable to plug connector No.45 of the П-2 gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28±0.5 V d.c. to the missile electrical system and 26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the П-I control unit. The ПАИ-1-А inverters must start operating. The "CAGED" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position.

The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CLOCK" switches on the control panel. Turn the "RUDDER" knob on the control panel

14. Set the "POWER" switch on the П-1 control panel in the "OFF" position. Disconnect the П-2 gyro unit plug connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "KC" missile Log-Book.

16. Install the П-2 unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the К1-13М unit and connect plug connector No.45 through the control panel connecting cable to plug connector No.45 of the П-2 gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28±0.5 V d.c. to the missile electrical system and 26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the П-1 control unit. The ПАП-14А inverters must start operating. The "CAGED" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position.

The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CHECK" switches on the control panel. Turn the "RUDDER" knob on the control panel.

14. Set the "POWER" switch on the [illegible] control panel in the "OFF" position. Disconnect the [illegible] gyro unit plug connectors and remove the unit from the turn table.

15. Make entries about the autopilot checks performed in the "KC" missile Log-Book.

16. Install the [illegible] unit in the missile and check the autopilot operation as follows (steps 17-24).

17. Connect plug connector No.36 of the ground test panel to the autopilot board check plug connector No.36 via the connecting cable, control panel plug connector No.12 through the connecting cable to plug connector No.12 of the missile wiring system having disconnected this plug connector from the K1-13M unit and connect plug connector No.49 through the control panel connecting cable to plug connector No.49 of the [illegible] gyro unit having disconnected it from the missile electrical system.

Switch off all the switches on the control panel, supply power of 28±1.5 V d.c. to the missile electrical system and -26 volts to the "+" terminal of the control panel.

18. Switch on the "POWER" switch on the [illegible] control unit. The [illegible] inverters must start operating. The "CAGED" and "BASES ZERO" warning lights on the control panel must become illuminated.

The control surfaces should be set in the neutral position.

The indicator pointers on the control panel must be in the middle positions.

19. Switch on the "POWER" and "CHECK" switches on the control panel. Turn the "RUDDER" knob on the control panel.

The rudder and ailerons must deflect. Turn the "RUDDER" knob in the opposite direction. The rudder and ailerons must move in the opposite direction. Set the "RUDDER" knob in the zero position. Turn the "ELEVATOR" knob on the control panel. The elevator and ailerons. Turn the "ELEVATOR" knob in the opposite direction. The elevator must deflect in the opposite direction. Set the "ELEVATOR" knob in the zero position.

Set the "CHECK" switch in the "ON" position. Wait, till the control surfaces move to the neutral position and the "CHECK MODE" warning light comes on.

20. Press the "CANCEL" button on the control panel. The "CHECK" warning light must go out and the "RUDDER" warning light must come on. Press the "RUDDER LEFT" button and hold it pressed for 5-10 sec.; in this case, the elevator must deflect up. Wait, till the elevator returns to the initial position.

21. Switch on the "RUDDER" test switch on the control panel. The "RUDDER MODE" warning light must come on. Turn the "RUDDER" knob on the control panel.

The rudder and elevator must deflect.

Set the "RUDDER" knob in the zero position; in this case the rudder and ailerons must move to the neutral position. Repeat the check when turning the "RUDDER" knob in the opposite direction.

Turn the "ELEVATOR" knob on the control panel. The rudder must deflect. Set the "ELEVATOR" knob in the zero position; in this case the elevator must move to the neutral position. Repeat the check with the "ELEVATOR" knob turned in the opposite direction.

(CCL): It is permitted to check how the autopilot responds to control signals by operator No.1 and No.2 (steps 17-23) when sending the signals directly from the [illegible] station. In this case do not disconnect plug connector No.12 from the [illegible] unit and set the [illegible] control panel instead of the ground test control panel.

9. [illegible]

The [illegible] autopilot output signals are switched when adjusting the airborne equipment of the [illegible] version, at the MMZ's plant.

Given below are the instructions for switching the signals.

1. Install the [illegible] unit on the [illegible] and connect the [illegible] unit with plug connectors [illegible] (steps 1 and 2). Connect the [illegible] plug connector No.A2 to the [illegible] connector of the [illegible] control panel through the connecting cable.

Adjust the direction channel as follows:

2. Set the [illegible] switch of the control panel in the "[illegible]" [illegible] position and switch on the "[illegible]" switch of the [illegible] control panel.

Connect the "+" terminal of the [illegible] voltmeter (scale - 30 V, division value - not more than 2.5 V, input resistance - not less than 2 kilohms/volt, precision - 1.5) to the [illegible] terminal of the socket and to the "+" terminal to the "[illegible]" terminal on the control panel.

After the "[illegible]" warning lights come on (but not earlier than 3 min. after power is supplied) press the "[illegible]" button.

3. Setting the "[illegible]" switch of the control panel in the "[illegible]", "[illegible]" and "[illegible]" positions in turn, measure steering voltage, output signal from the free gyro and [illegible] servo unit feedback output signal by the voltmeter connected.

4. Measure as specified in step 3 with the [illegible] gyro unit turned about the vertical axis in the following succession:

to the right through the angles of: 1°, 3°, 6°, 9°, 11°;
reverse travel: 8°, 5°, 2°, 0°;
to the left through the angles of: 1°, 3°, 6°, 9°, 11°;
reverse travel: 8°, 5°, 2°, 0°.

Before measuring with the [illegible] gyro unit turned to the left, cut off power supply for a short time using the "[illegible]" switch of the [illegible] control panel and then send the "[illegible]" command.

NOTE: Tests are as specified in steps 3 and 4 for not more than 3 min.

5. Set the "[illegible]" switch on the [illegible] control panel in the "OFF" position.

Enter the check results in the Table (at the end of Section II.)

Adjust the pitch channel as follows:

1. Switch on the "[illegible]" switch on the [illegible] control panel. Connect the "+" terminal of the D.C. voltmeter, indi-

cated in step 2, to the [illegible] terminal on the control panel and the [illegible] terminal of the voltmeter to the "GND" terminal on the control panel.

8. Turn the "POWER" switch on (but not earlier than [illegible] after power supply has been switched "ON") at the control panel.

7. Check [illegible] the "Roll", "Pitch" and "Yaw" positions in turn, noting the [illegible] volts, output signal from the rate gyro and [illegible] output signal of the voltmeter connected.

6. Measure as specified in step 7 with the [illegible] gyro unit turned about the [illegible] axis as follows:

- [illegible]
- reverse direction [illegible]
- over the [illegible]
- reverse travel [illegible]

[illegible] with the [illegible] unit switched off power supply [illegible] at a time using the "POWER" switch on the [illegible] control panel and [illegible] the "OUTPUT" command.

NOTE: Ensure the position in steps 4 and 5, for not [illegible] min.

9. Set the "POWER" switch on the [illegible] control panel to the "OFF" position. [illegible] the measurements obtained in Table [illegible].

10. [illegible] the "POWER" switch on the [illegible] control panel. Connect the [illegible] terminal of the voltmeter, indicated in step 2, to the "+" terminal on the control panel and the [illegible] of the voltmeter to the "GND" terminal on the control panel.

After the "READY" [illegible] lights come on (but not earlier than 3 min. after power is applied), press the "CONTINUE" button.

11. When setting the [illegible] of the control rods in the [illegible] and "EQUIPMENT" positions in the [illegible] signal of the [illegible] unit feedback output signal by [illegible].

12. Measure of obtained in [illegible] the [illegible] unit turned about the longitudinal [illegible].

to the [illegible] through [illegible],

reverse travel to [illegible].

to the left through the region of [illegible],

reverse travel to [illegible].

Before removing [illegible] left out of power supply [illegible] the "OFF" [illegible] the "UNLOAD" button.

NOTE: [illegible]

not more than 1 min.

13. Set the "START" switch on the [illegible] panel in the "OFF" position. Press the [illegible] the Table.

[illegible]

[illegible]

[illegible]

1. It is permitted to store the [illegible] that:

a) In the [illegible] missile preserved in conforming with the present [illegible] edition [illegible], instructions on preservation and [illegible] storage of the [illegible] winged missile with all the autopilot units installed or with the [illegible] gyro unit removed from the missile for one year since the date of arrival to the point of destination.

NOTE: If the [illegible] unit is removed from the missile, it should be stored in the same conditions packed in the metal case manufactured according to [illegible].

b) [illegible] the [illegible] to be covered with tarpaulin [illegible] in the [illegible] without [illegible] for [illegible] months throughout the [illegible] guaranteed service life.

c) It is permitted to store the [illegible] autopilot set or its individual units which were not installed in the [illegible] missile and which were packed in the metal case, manufactured according to drawings [illegible].00.00.[illegible] and [illegible].00.[illegible].000 for one year since the date of arrival to the point of destination.

2. The [illegible] autopilot kept in the depots in the packing case prior to installation in the [illegible] missile for not more than [illegible] months since the date of acceptance by the Customer at the [illegible] Plant are permitted to be stored as specified in [illegible] 1.

c. It is permitted to keep the MK-3 autopilot in the "KIT" standard covers, both in hangarage or in the open air for 2 days.

d. [illegible] for storage in cabinets in steps 1a and 1c must be [illegible] ventilation.

e. The engineer must be equipped with the instruments to measure [illegible] temperature and humidity. The temperature and humidity must be checked every day, in the morning, as at the end of the working day.

The results of the measurements must be entered in the log book.

f. The cabinet must have [illegible] wooden floor, equipped, like a [illegible] floor. Never store the equipment in the cabinet having an earthen floor.

g. The cabinet must be free from acid and alkali vapours. Instruments or cabinets [illegible] free from [illegible] vapours.

h. The cabinet must be [illegible] the floor must be cleaned by means of wet rags [illegible] by using vacuum cleaners. Do not sweep the dry floor. Do not [illegible] water on the floor.

3. The MK-3 autopilot set of spare parts, tools and [illegible] (ZIP) is furnished by the [illegible] and comprises the following equipment and tools:

Kit No.2

No.	Name	Type	Qty per one set	Weight kg.
1	2			3
1.	Spare unit	[illegible]	[illegible]	[illegible]
2.	Servo unit	[illegible]	1	[illegible]
3.	Timer	[illegible]	[illegible]	[illegible]
4.	Hand [illegible]	[illegible]	[illegible]	[illegible]

1	2	3	4	5
5.	Relay, [illegible]	[illegible]	[illegible]	РЭС.[illegible].024ТУ
6.	Fuse, glass	[illegible]	5	[illegible] 559-139-57
7.	Fuse, glass	[illegible]	5	[illegible] 559.139-57
8.	T. e. tool kit		1	637.01.00.000
9.	Shipping box for T. e. tool kits		1	637.01.00.000
10.	Box for [illegible] spare parts		1	637.03.00.000
11.	Box for [illegible] (for [illegible] and [illegible] units)		1	637.04.00.000
12.	Unifying box		1	637.05.00.000
13.	Intermediate		1	637.06.00.000
14.	Tube, [illegible]	[illegible]	[illegible]	[illegible]
15.	[illegible] [illegible] [illegible] [illegible]		[illegible]	[illegible]

The [illegible] first set of spare parts, tools and devices, box manufactured according to drawings 637.00.00.000, 637.01.00.000 and 637.[illegible].00.000.

The set of spare parts, tools and devices is packed and stored in the same way as the [illegible] autopilot.

The differences are:

a) In the designation it is not 657.04.00.000 instead of [illegible] the mountings with SG-110 relay regulators and boxes with [illegible] polarized relays and [illegible] fuses.

b) [illegible] tool kits are packed in a wooden box (drg. 657.07.00.00).

NOTE: It is permitted to keep the autopilot tool kit in the general tool kit for the "KS" missile.

When storing, periodically check the autopilot units incorporated in the set of spare parts, tools and devices in the same manner as the autopilot and its individual units which were not installed in the "KS" missile and which are stored in the crate.

It is permitted to store the [illegible] autopilot in the [illegible] version covered with a tarpaulin cover in unheated [illegible] throughout the entire guaranteed service life.

10. [illegible] OF THE AP-3 AUTOPILOT IN STORAGE

1. When storing the AP-3 autopilot in the "KS" missile (or with the [illegible] gyro unit removed from the missile) preserve it in accordance with the present SO-05-[illegible], section III, instructions on preservation and extended storage of the "KS" winged missile, check after every 4 months 10% of the AP-3 autopilots of the batch but not less than 2 autopilots.

[redacted]

[illegible] The [illegible] the number of autopilots subjected to [illegible] for the month.

2. The storing box of the autopilot in the "13" missile covered with a tarpaulin cover in the hangar, check all 100% of the autopilots not less than once a month.

3. The [illegible] autopilots, which were not installed on the "13" missile, and the autopilot individual units stored in boxes, check after six months (but of the [illegible] autopilots (their individual units) to be taken but not less than 2 autopilots (units).

4. [illegible] work as specified in step 3 the [illegible] subpilots of the same not checked during the previous periodic checks.

5. [illegible] periodically every six [illegible] autopilots in the manner that the requirement included in step 3 during the [illegible] the temperature in the room must be within +5° to +35°.

Note: [illegible] is not [illegible] the [illegible] of the [illegible] autopilots in the [illegible].

6. The time, required for a continuous operation of the autopilot energized during all the checks specified in these instructions, must not exceed 2 hours to be followed by an interval of not less than a half an hour.

In case of need, it is permitted to change the succession of checks in the [illegible] programmed operation and the total [illegible] to be checked during the first 24 hrs. of the autopilot's existence on.

7. If the [redacted] autopilots, taken for the next check in turn, are defective (corrosion included), check an additional number of the autopilots equal to the initial number of the autopilots to be checked.

If similar or some other defects are found in the autopilots checked, check all the [redacted] of the autopilots included in the batch.

8. If during the check of an additional number of the [redacted] autopilots (checked accord. to step 7), defects are not found, all the autopilots of the batch checked (defective excluded) can be admitted to a further storage.

The way of delivering the unsatisfactory reports and elimination of defects in the defective units is given in the "Instructions for making up the unsatisfactory reports".

9. During each periodic check enter the results of checks and information on all the operations performed during the inspection and checks in the certificate for the autopilot and the individual units.

10. The [redacted] autopilot operating time, required for the periodic checks during storage, is determined by the time required for the checks specified by these instructions.

11. After the expiration of the AUK-5B autopilot storage life (for all specified storage conditions), check all the

autopilots as specified in these Instructions for the periodic checks during storage.

The decision on the AK-53 autopilot further storage and operation is adopted by the comission appointed by the organization commander.

12. CHECKING THE AK-53 AUTOPILOT OPERATION IN STORAGE WITHOUT REMOVING IT FROM THE "XC" MISSILE

1. After depreserving the "XC" missile and attaching the missile wings, remove the K-4 gyro unit from the missile.

Visually inspect all the autopilot units. Check that the units and cables outer surfaces are free from damage.

If corrosion is found on the autopilot units, proceed as outlined in steps 7-8, par. 20, these instructions.

2. Disconnect plug connectors No.32 and 33 from the missile wiring system and check the K-4 servo unit as indicated in par. 6 (steps 3-6); when checking the K-4 rudder servo unit, connect plug connector No.32 to the AK-1 panel, when checking the K-4 elevator servo unit, connect plug connector No.33 and when checking the K-4 aileron's servo unit connect plug connector No.35.

NOTE: 1. During this check the K-4 servo unit outlet shaft direction of rotation indicated in

par. 6 (steps 3-6) corresponds to deflection of the control surface (ailerons) connected to the II-4 servo unit to be checked.

2. When checking at a temperature below 0°C, (when storing the "K2" missile in the hangar), the II-4 servo units sensitivity must be:

with the "WINDING SELECTOR SWITCH" in "1", "2" and "3" positions....0.3-1.56 mA

and in "4" position .....0.62-2.82 mA

When checking sensitivity use the II-3 panel with the II-70 test instruments at a temperature of -5°C and with the M5-2 test instruments at a temperature of -40°C.

3. Check the II-4 rudder and elevator servo units without disconnecting plug connectors Nos.32 and 34 via plug connector 34 by means of the connecting cable. After checking the II-4 servo units, connect plug connectors Nos.32 and No.33 to the missile wiring system.

[redacted]

4. During the AMK-53 autopilot storage under normal conditions the sensitivity of the M-4 servo units installed on a fixed base should be 0.5-1.2 mA with the "WINDING SELECTOR SWITCH" in "1", "2" and "3" positions and 0.95-2.22 mA - in the "4" position.

3. Disconnect plug connectors Nos40 and 41 of the missile wiring system from the MAP-1P4 inverters and check the inverters operation as outlined in par. 6(steps 8-10).

NOTE: When checking the MAP-1P4 inverters at a temperature below 0°C (when storing the "KC" missile in the hangar) use the KP-3 panel with the MM-70 and MM-70 test instruments only to check rotation of the P-5 panel gyro motors without measuring the input and output current and the voltage generated by the inverter.

4. Install the G-2 gyro unit on the MA-5 turn table and connect the gyro unit plug connectors as indicated in par. 8 (steps 3 and 4).

5. Check the autopilot operation as specified in par. 8 (steps 5-13).

NOTES: When checking at a temperature below 0°C (when storing the "KC" missile in the hangar):

a) apply the "UNCAGING" command, 6 min. after power is supplied;

b) the elevator must return to the initial position 40-43 sec. after the " П-18МО START." button is pressed.

6. Check the time required for the yaw and pitch gyro bases to match in the zero position as follows: switch on the "POWER" switch on the П-1 control panel. After the "BASES ZERO" warning lights come on, set the "POWER SELECTOR SWITCH" in the "BOARD CHECK" position and switch on the "CHECK" switch. The "BOARD CHECK" and "CHECK" warning lights must come on.

Fully turn the "RUDDER" knob on the control panel to the "RIGHT". The rudder must smoothly, without jerks, deflect to the right and the right aileron must deflect up. Wait for 7 min. Set the "RUDDER" knob in the zero position and the "CHECK" switch in the "OFF" position. The rudder must move to the neutral position. After 4.5-6.5 min. the ailerons must move to the neutral position and the "BASES ZERO" warning lights must come on.

Switch on the "CHECK" switch and repeat the check with the "RUDDER" knob turned to the "LEFT".

After the "BASES ZERO" warning lights come on switch on the "CHECK" switch and fully turn the "ELEVATOR" knob upward.

The elevator must smoothly, without jerks deflect up. Make an interval for 4 min. Set the "ELEVATOR" knob in the zero position and the "CHECK" switch in the "OFF" position. The elevator must move to the neutral position. After 2-3.5min the "BASES ZERO" warning light must come on.

Switch on the "CHECK" switch and repeat the check with the "ELEVATOR" knob turned to the "DOWN" position.

Check the time required for the bases to match at a supply voltage of 26 V.

7. Check the autopilot transmission ratios as indicated in par. 15, step 6.

NOTES: 1. When checking at a temperature below 0°C (when storing the "KC" missile in the hangar):

a) make an interval for 7.5 min. when sending the "DIRECTION" signal; in this case the "BASES ZERO" warning lights must come on 4-7 min. after the "CHECK" command is removed.

b) when sending the "PITCH" signal, make on interval for 5 min.; in this case the "BASES ZERO" warning lights must come on 1.5-4.0 min. after the "CHECK" command is removed.

c) do not check the autopilot transmission ratios.

2. When storing the "KC" missiles in the hangar, check the time required for the bases to match once in 6 months.

8. Set the "POWER" switch on the П-1 control panel in the "OFF" position. Disconnect the П-2 gyro unit plug connectors and remove the gyro unit from the turn table. Install the П-2 gyro unit in the "KC" missile and check the autopilot operation using the ТНК ground test control panel as outlined in par. 8 (steps 17-24).

9. Enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and АПК-5В autopilot set.

10. It is permitted to check the [illegible] gyro unit in a reference or any other serviceable autopilot set system as indicated in par. 6(steps 14-23).

In this case we not check the autopilot stored in the set but check the [illegible]-4 servo unit, [illegible]-1.1D timer and NAT-I0A inverter which are stored in the missile as follows:

a) [illegible]-4 servo units - as outlined in par. 6(steps 3-6 ;

b) [illegible]-1.1D timers - as outlined in steps 11-13, this par.

c) [illegible] inverters - as outlined in par. 6(steps 8-10)

11. Check the [illegible]-18M timers as follows:

disconnect plug connector No.33 from the missile wiring system. Set the "[illegible]" switch of the [illegible]-7 panel in the "OFF" position.

Supply power of 26 V d.c. to the control panel. Connect the [illegible]-18M timer plug connector No.33 to the panel via the connecting cable. Set the "PANEL" selector switch in the "[illegible]-18M" position and the "[illegible] SELECTOR SWITCH" in the "0" position.

12. Switch on the "POWER" and "FEEDBACK" switches. The elevator must move to the initial position(2.5°-3° Up from the geometric neutral position).

Switch on the "[illegible]-18M START." switch and simultaneously start the step-watch. 2-3 sec. after the "[illegible]-18M START." switch is on the elevators must deflect through an angle of 8-9.5° Up from the initial position (12-12.5° Up from the geometric neutral position) and 40-42 sec. after the switch is on the elevators must return to the required initial position.

Start the E-10MO timer twice. When starting the timer for the first time, check the elevator angle of deflection and the program starting time (2-3 sec.), to do this, start the stop-watch when the elevator deflects upward. When starting the timer for the second time, check the time of the program completion (40-42 sec.); to do this, stop the stop-watch when the elevator begins moving to the initial position. The second check is performed 20-30 seconds after the first actuation of the program is over.

NOTES: 1. It is permitted to adjust the E-10MO timer rheostat if the elevator fails to deflect through an angle of 12^{0}-12.5^{0} up from the geometric neutral position.

2. If it is necessary to check the programmed operation for the third and subsequent times, bear in mind, that the E-10MO timer operating duty is intermittent consisting of 6 cycles followed by a complete cooling. A cycle implies one actuation of the program.

3. If two stop-watches are available, check the program at a single switching-on of the E-10MO timer.

12. Set the "POWER" switch on the panel in the "OFF" position. Disconnect the panel from the E-10MO timer plug connector and connect this plug connector to the missile wiring system.

13. CHECKING THE AHR-5B AUTOPILOT OPERATION IN STORAGE WITH SOME UNITS REMOVED FROM THE MISSILE

1. After the "DC" missile is depreserved and its wings are attached, visually inspect the H-1 control panel, H-3 servo units, H-[illegible] timer and HA[illegible]-1A inverters which are stored installed in the missile. Open the case with the H-2 gyro unit as indicated in par. 3. and visually inspect the unit. Check that the units outer surfaces and cables are free from damage.

If corrosion is detected, proceed as outlined in steps 7-8, par. 20.

2. Check the AHR-5B autopilot as indicated in par. 12 without checking the autopilot set by means of the HH ground test control panel.

After checking the H-2 gyro unit, pack it in a metal case as indicated in par. 1(without packing the H-1 control panel). Enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and AHR-5B autopilot set.

14. CHECKING THE AHR-5B AUTOPILOT SET IN STORING IT PACKED IN T-2E

1. Inspect the packing cases. Check the cases for presence of seals and for freedom from damages. Unpack the autopilot units as indicated in par. 3. Inspect all the units. Check the outer surfaces of the units and cables for freedom from damages.

13. CHECKING THE AHK-5B AUTOPILOT OPERATION IN STORAGE WITH SOME UNITS REMOVED FROM THE MISSILE

1. After the "FC" missile is depreserved and its wings are attached, visually inspect the B-1 control panel, B-4 servo units, B-[illegible] timer and HA1-1A inverters which are stored installed in the missile. Open the case with the B-2 gyro unit as indicated in par. 3. and visually inspect the unit. Check that the units outer surfaces and cables are free from damage.

If corrosion is detected, proceed as outlined in steps 7-8, par. 70.

2. Check the AHK-5B autopilot as indicated in par. 12 without checking the autopilot set by means of the EMK ground test control panel.

After checking the B-2 gyro unit, pack it in a metal case as indicated in par. 1(without packing the B-1 control panel). Enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and AHK-5B autopilot set.

14. CHECKING THE AHK-5B AUTOPILOT SET IN STORING IT PACKED IN CASE

1. Inspect the packing cases. Check the cases for presence of seals and for freedom from damages. Unpack the autopilot units as indicated in par. 3. Inspect all the units. Check the outer surfaces of the units and cables for freedom from damages.

If corrosion is found on the autopilot units, proceed as outlined in steps 7-8, par. 20, these Instructions.

2. Check the П-4 servo units as indicated in par. 6 (steps 3-6); in this case, under normal conditions the sensitivity of the П-4 servo units installed on a fixed base is equal to 0.5-1.2 mA with the "WINDING SELECTOR SWITCH" in "1", "2" and "3" positions and 0.95-2.22 mA in the "4" position.

3. Check the ПАП-1ФА inverters as indicated in par. 6 (steps 8-10).

4. Check the autopilot set operation as outlined in par. 6 (steps 14-23) and time required for the bases to match, as outlined in par. 12 (step 6).

After the check is completed, pack the autopilot units in the metal case as indicated in par. 1 and enter the results of checks and time required for checking the units and autopilot set energized in the certificates for the individual units and set of the АПК-5Б autopilot.

15. PROCEDURE OF REPLACING THE АПК-5Б AUTOPILOT INDIVIDUAL UNITS AND COMPONENTS

1. If during the АПК-5Б autopilot operation and storage defects are found, replace the П-1 , П-2 , П-4, П-18МО units, П2-1, П2-2, П2-3, П2-4, П2-6АМ, П2-6К components, polarized relay and trimming rheostat in the П-2 gyro unit, П4-1МО component in the П-4 servo unit and П-4-1МО component polarized relay.

2. Remove and install the units to be replaced in the "К" missile in accordance with the "Maintenance and Operating Instructions for the "К" Winged Missile", Book I.

3. Replace the П4-ТМО component in the П-4 servo unit as follows:

remove the seal and unscrew by socket wrench two studs attaching the defective П4-ТМО component to the П-4 servo unit and remove the component from the unit. Install a new П4-ТМО component on the П-4 servo unit.

Carefully insert two attaching studs of the component into the holes in the component casing and tighten the studs by the socket wrench; tighten the studs alternately, and evenly, secure the studs with a locking wire and seal it with the using organization seal.

4. Replace the РПО polarized relay in the П-2 gyro unit as follows:

Unscrew 6 screws attaching the П-2 gyro unit side cover. Unscrew 4 screws attaching the defective relay to the П2-6М (П2-6АМ) component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the П2-6М (П2-6МА) component and tighten the relay attaching screws; tighten the screws alternately and evenly. Secure the screws with АК-20 nitro glue according to instructions No. ИВ-62I (See the appendix). Screw the П-2 unit side cover, in this case safety the screws with АК-20 nitroglue according to instructions No. ИВ-62I.

5. Replace the trimming rheostats as follows:

Remove the П-2 gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

3. Replace the [illegible] component in the [illegible] servo unit as follows:

remove the seal and unscrew by socket wrench two studs attaching the defective [illegible] component to the [illegible] servo unit and remove the component from the unit. Install a new [illegible] component on the [illegible] servo unit.

Carefully insert two attaching studs of the component into the holes on the component casing and tighten the studs by the socket wrench; tighten the studs alternately, and evenly, secure the studs with a locking wire and seal it with the using organization seal.

4. Replace the [illegible] polarized relay in the [illegible] gyro unit as follows:

Unscrew [illegible] screws attaching the [illegible] gyro unit side cover. Unscrew [illegible] screws attaching the defective relay to the [illegible] component and remove the relay out of the unit. Carefully install (without touching the electric wires) a new polarized relay in the [illegible] component and tighten the relay attaching screws; tighten the screws alternately and evenly. Secure the screws with AK-20 nitro glue according to instructions No. [illegible] (see the appendix). Screw the [illegible] unit side cover, in this case safety the screws with AK-20 nitroglue according to instructions No. AK-82I.

5. Replace the trimming rheostats as follows:

Remove the [illegible] gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced and measure the resistance set for the given rheostat.

3. Replace the [illegible] component in the [illegible] servo unit as follows:

Remove the seal and unscrew by socket wrench two studs attaching the [illegible] component to the [illegible] servo unit and remove the component from the unit. Install a new [illegible] component on the [illegible] servo unit.

Carefully insert the attaching studs of the component into the [illegible] and tighten the studs by the socket wrench, tighten the studs alternately, one evenly, secure the nuts with a locking wire and seal it with the unit's organization seal.

4. Replace the [illegible] polarized relay in the [illegible] gyro unit as follows:

Unscrew [illegible] attaching the [illegible] gyro unit side cover. Unscrew [illegible] at solder the defective relay to the [illegible] (ДК-[illegible]) [illegible] and remove the relay out of the unit. Carefully install (without touching the electric wires) a new alternating relay in the ДК-[illegible] ([illegible]-ДП) component and tighten the [illegible] attaching screws. tighten the screws alternately and [illegible]. Secure the screws with АК-20 nitro glue according to instructions No. [illegible] (see the appendix). Screw the [illegible] unit lid cover, in this case safety the screws with [illegible] nitro glue according to instructions No. [illegible].

5. [illegible] the trimming rheostats as follows:

Remove the [illegible] gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced [illegible] the necessary the resistance set for the given rheostat.

3. [illegible] component in the [illegible] servo unit as follows:

[illegible] socket wrench two studs attaching the [illegible] component to the [illegible] servo unit [illegible] from the unit. Install a new [illegible] in the [illegible] servo unit.

[illegible] the bleeding studs of the component into [illegible] and [illegible] using a [illegible] tighten the studs by the [illegible] Bleed the [illegible] studs alternately, and evenly, [illegible] with a locking wire and seal in with the [illegible].

4. [illegible] in the [illegible] servo unit as follows:

Unscrew [illegible] and remove the [illegible] unit side cover. Unscrew [illegible] and remove the electric relay to the [illegible] ([illegible]) [illegible] and remove the relay out of the unit. Carefully [illegible] (not to unsolder the electric wires) a new [illegible] relay in the [illegible] ([illegible]) component and tighten the [illegible] retaining screws. Tighten the screws alternately [illegible] use the screws with Ni-Fe nitro plus [illegible] instructions No. [illegible]. Set the [illegible] Screw the [illegible] cover, in this case safety the screws with [illegible] with glue according to instructions No. [illegible].

5. [illegible] the trimming rheostats as follows:

Remove the [illegible] servo unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced [illegible] the resistance set for the given rheostat

2. [illegible] component in the [illegible] servo unit as follows:

[illegible] unscrew by socket wrench two studs [illegible] component to the [illegible] servo unit [illegible] from the unit. Install a new [illegible] servo unit.

[illegible] the locking studs of the component [illegible] and tighten the studs by the [illegible] opposite the studs alternately, and [illegible] with a locking wire and seal it with the [illegible].

[illegible] the [illegible] polarized relay in the [illegible] gyro unit as follows:

[illegible] the [illegible] gyro unit side cover. [illegible] the defective relay to the [illegible] remove the relay out of the unit. Carefully [illegible] without touching the electric wires) a new [illegible] component and tighten the screws. Tighten the screws [illegible] the screws with [illegible] nitro glue [illegible] see instructions No. [illegible] (see the Appendix). [illegible] cover, in this case safety the screws [illegible] according to instructions No. [illegible].

[illegible] the trimming rheostats as follows:

[illegible] unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced [illegible] resistance out for the given rheostat.

3. [illegible] component in the [illegible] servo unit as follows:

[illegible] the nut and unscrew [illegible] socket wrench two studs [illegible] component to the [illegible] servo unit [illegible] the mount from the unit. Install a new [illegible] unit in the [illegible] servo unit.

[illegible] the mounting studs of the component into [illegible] and, using an [illegible] wrench, tighten the studs by [illegible] Then tighten the studs alternately, and evenly, [illegible] nuts with a locking wire and seal it with the [illegible] seal.

4. [illegible] the [illegible] polarized relay in the [illegible] gyro unit as follows:

Loosen [illegible] securing the [illegible] gyro unit side cover. Unscrew [illegible] for the defective relay to the [illegible] and remove the relay out of the unit. Carefully install [illegible] (not touching the electric wires) a new [illegible] relay of the [illegible] component and tighten the mounting screws; tighten the screws alternately [illegible] Secure the screws with [illegible] nitro glue according to instructions No. [illegible] (see the Appendix). Close the [illegible] cover, in this case safety the screws [illegible] with glue according to instructions No. [illegible].

5. [illegible] the trimming rheostats as follows:

Remove [illegible] gyro unit lower cover.

Unsolder [illegible] from the trimming rheostat to be replaced [illegible] resistance set for the given rheostat

[redacted]

3. [illegible] component in the [illegible] servo unit as follows:

[illegible] the seal and remove the socket wrench-type studs attaching the [illegible] component to the [illegible] servo unit [illegible] unit. Install a new [illegible] unit.

[illegible] the [illegible] studs of the component into the [illegible] and [illegible] tighten the studs by [illegible] the studs alternately, and [illegible] with a locking wire and seal it with the [illegible] seal.

4. [illegible] in the [illegible] gyro unit as follows:

[illegible] the [illegible] unit side cover. [illegible] the [illegible] relay to the [illegible] [illegible] relay out of the unit. [illegible] disconnecting the electric wires) a new [illegible] component and [illegible] mounting screws. Tighten the screws [illegible] the screws with [illegible] micro [illegible] Refer to the appendix [illegible] cover, in this case safety the [illegible] according to instructions [illegible].

[illegible] the following [illegible] as follows:

[illegible] unit lower cover.

[illegible] the trimming rheostat to be replaced [illegible] resistance set for the given rheostat.

2. [illegible] component in the [illegible] servo unit as follows:

[illegible] unscrew [illegible] sucker wrench two studs attaching the [illegible] component to the [illegible] servo unit and remove the component from the unit. Install a new [illegible] component on the [illegible] servo unit.

[illegible] the attaching studs of the component into the [illegible] and screw them tight, then tighten the studs by the [illegible] tightening the studs alternately, and evenly, secure the studs with a locking wire and seal it with the [illegible] seal.

[illegible] the [illegible] polarized relay in the [illegible] gyro unit as follows:

Unscrew [illegible] securing the [illegible] gyro unit side cover. Unscrew [illegible] attaching the defective relay to the [illegible] and remove the relay out of the unit. Carefully [illegible] without touching the electric wires) a new [illegible] relay in the [illegible] component and tighten the [illegible] attaching screws; tighten the screws alternately [illegible] remove the screws with AK-20 nitro glue according to instructions No. [illegible] (see the appendix). Screw to the unit side cover, in this case safety the screws with nitro glue according to instructions No. [illegible].

3. [illegible] the trimming rheostats as follows:

Remove the [illegible] gyro unit lower cover.

Unsolder the wires from the trimming rheostat to be replaced [illegible] resistance set for the given rheostat

Unscrew the screws attaching the plate with the trimming rheostats to the [illegible] gyro unit casing. Unscrew the nut attaching the rheostat to be removed and remove the rheostat.

Install a new rheostat in place. Secure the rheostat by a screw with a nut (place a washer under the nut).

Install the rheostat without any cant, the adjusting screws must have a clearance between the screw head and hole in the upper plate.

Set the rheostat resistance equal to that measured before the rheostat is replaced.

Solder the wires to the trimming rheostat, attach the plate with the trimming rheostats to the [illegible] gyro unit casing using the screws (place washers under the screw heads).

Safety the fastening screws and nuts with K-60 [illegible] according to Instruction No. [illegible].

6. After the [illegible] gyro unit is replaced, proceed as follows:

a) check the autopilot [illegible] as outlined in Sec. [illegible], para. [illegible] of this manual. When the autopilot is stored in the missile or [illegible], the [illegible] removed from the missile as outlined in Sec. [illegible], para. [illegible] (when the autopilot is stored in the [illegible]).

b) check the autopilot transmission ratio as described below:

Note: [illegible] check the autopilot transmission ratio at a temperature not below [illegible]°C.

[illegible] the method of checking the [illegible] autopilot transmission ratios refer to chapter [illegible] of the [illegible] servo [illegible] manual for the [illegible] missile.

If the autopilots are packed in the cases the methods of checking the autopilot transmission ratios are the same; in this case the ammount of the П-4 servo units outlet shafts turn must be:

With the П-2 gyro unit deviated in yaw; direction control surface(rudder) - 2.25-2.75° (instead of 2.1-2.9°)
roll control surface (aileron)4-5° (instead of 3.8-5.3)

With the П-2 gyro unit deviated in pitch:
elevator - 4.5-5.5° (instead of 4.3-5.8)

With the П-2 gyro unit deviated in roll:
roll control surface(aileron) -
- 4.5-5.5° (instead of 4.3-5.8).

3. Check the autopilot transmission ratios at a power supply of 26 V d.c.

Check the rudder transmission ratio and the angle of the П-4 aileron servo unit turn controlled by the coordination signals as follows:

After sending the "TURN LEFT" command, turn the П-2 gyro unit in yaw through an angle of 5°. The rudder must deflect 2.1-2.9° and ailerons - through an angle of 3.8-5.3°.

Turn the П-2 unit in opposite direction through an angle of 5° in yaw. The rudder and ailerons must deflect respectively through the angles of 2.1-2.9° and 3.8-5.3° to the opposite side.

NOTES: 1. The difference in the ailerons deflection in both directions must not exceed 0.5°.

2. If the rudder deflection does not meet the required value, adjust the П-2 gyro unit rheostat No.3 connected in the yaw free gyro circuit. To do this, remove the lower cover of the П-2 gyro unit and rotate rheostat No.3 screw till the required deflection of the rudder is obtained. It is permitted to adjust the rheostat No.3 within 290±29 ohms. The place of the bridge connection for checking the resistance value is given in Table No.3

3. If the ailerons deflection does not meet the required value, adjust rheostat No.12 connected in the coordination signal circuit. It is permitted to adjust rheostat No.12 within the range of 300±30 ohms.

Check the elevator transmission ratio as follows: after sending the "UNCAGING" command, turn the П-2 gyro unit in pitch through an angle of 5°. The elevator must deflect 4.3-5.8°. Turn the П-2 gyro unit in pitch through an angle of 5° in the opposite direction. The elevator must deflect through an angle of 4.3-5.8° in the opposite side.

NOTE: If the elevator deflection does not meet the required value, adjust rheostat No.5 connected in the pitch free gyro circuit. It is permitted to adjust rheostat No.5 within the range of 115±11.5 ohms.

Check the ailerons transmission ratio as follows:

After sending the "UNCAGING" command, turn the M-2 gyro unit in roll through an angle of 10°. The ailerons must deflect 4.3-5.8°.

Turn the M-2 gyro unit in roll through an angle of 10° in the opposite direction.

The aileron must deflect 4.3-5.8° in the opposite side.

NOTE: If the ailerons deflection does not meet the required value, adjust rheostat No.10 connected in the roll feedback circuit. It is permitted to adjust rheostat No.10 within the range of 100±5 ohms.

Table No.6

Resistor No.	Name of electric circuit	Pins across which measurement is performed.	Resistance ohms
3	Yaw free gyro signal circuit	31/3-42/2	290±29
5	Pitch free gyro signal circuit	31/22-42/4	115±11.5
10	Roll feedback signal circuit	35/11-35/13	100±5
12	Bank coordination signal circuit	35/7-35/8	300±30

NOTES: 1. Check resistance by a d.c. bridge having the degree of precision not less than 2.5.

2. The plug connectors pins are arbitrarily designated: the numerator shows the number of the plug connector and the denominator – the number of the plug connector pin.

3. When checking, connect the plugs to the units mating receptacles. Connect the measuring bridge wires to the pins (sockets) of the plug connected.

4. Pins 31/3-42/2; 31/22-42/4 refer to П-2 gyro unit and are manufactured according to a special order with connector plug No.42. Measure resistors 3,5 of the production units across their contacts.

7. After replacing the П-4 unit or ПА-1МО component (or polarized relay in this component) check as outlined in par. 6 (steps 3-6) and check transmission ratio of the corresponding channel of the autopilot as described in step 6, this paragraph).

8. After replacing the П-1МО timer check as indicated in step 8, par. 8 (when storing the П-1МО timer in the missile) or as in step 17, par. 6 (when storing the timer in a packing case).

9. After replacing the П-1 control panel, check as outlined in steps 2-5, par. 8(when storing the panel in the missile) or as in steps 13-14, par. 6(when storing the panel in a packing case).

10. After the П2-6М, П2-6АМ components or РПС polarized relay in the П 2 gyro unit are replaced, check as specified in steps 7, 10 and 11, par. 5 (when storing all the autopilot units installed in the missile or with the П-2 gyro unit removed from the missile) or as in steps 16, 19 and 20 par. 6 (when storing the autopilot units in packing cases).

11. After replacing the [illegible] or ПВ-1 components in the П-3 gyro unit, check as indicated in steps 9, 7-11, par. 5 (when storing all the autopilot units installed in the missile or with the П-3 gyro unit removed from the missile) or as in steps 14, 17-22, par. 6 (when storing the autopilot units in packing cases) and check the transmission ratio of the [illegible] channel as outlined in step 6, this paragraph.

12. After replacing the [illegible] component in the П-3 gyro unit, check as indicated in steps 8, 9, 10 par. 5 (when storing all the autopilot units installed in the missile or with the П-3 unit removed from the missile) or as in steps 14, 15, 22, par. 6 (when storing the autopilot in packing cases) and check the aileron deflection transmission ratio as indicated in step 6, this paragraph.

13. After replacing the ДУ-3 component in the П-3 gyro unit, check as specified in step 8, par. 5 (when storing all the autopilot units installed on the missile or with the П-3 gyro unit removed from the missile) or as in step 15, par. 6 (when storing the autopilot units in packing cases).

14. After replacing trimming rheostats No. 3, 5, 10 and 12, check the transmission ratio of the corresponding channel as outlined in step 6, par. 12.

15. [illegible] transistors,
type [illegible] with switches
type [illegible] relaxation relay,
[illegible] and [illegible] and 4 models from
the [illegible]

[illegible] of the [illegible] and on the [illegible]
of the [illegible] [illegible] supplementary reports to
the [illegible]

[illegible] should be given a similar check
[illegible] to replacement.

[illegible] make the re-
quired [illegible] in [illegible] autopilot
individual [illegible].

[redacted]

1. Perform a separate check of the [redacted] autopilot during the pre-flight preparation as outlined below, bearing in mind that:

a) the autopilot stored installed in the "V" missile must not be subjected to preliminary checks;

b) the autopilots when as individual units are stored being removed from the "V" missile, must be preliminarily checked, irrespective of the time of the previous periodic checks, in accordance with para. 1, and after that may be stored unit as fully serviceable;

c) the autopilot stored in packing cases must be preliminarily checked, irrespective of the time of the previous periodic checks, not later than 24 hours before the start of the launch of the autopilot unit must be installed in the missile.

2. Bring [redacted] from [redacted] place the [redacted] missile [redacted] unit on an earthed mast.

3. Connect plug connector No.6 [redacted] control unit with the connecting cable to the autopilot [redacted] check plug connector No.36 and plug connector No.37 [redacted] panel through the connecting cable - to the missile socket plug connector No.12, having disconnected this plug connector from the [redacted] unit.

3. If two stop-watches are available, check the program at a single switching-on of the [illegible] timer.

4. Check as outlined in this step and step 11, this paragraph during the first 30 minutes after the autopilot is on.

5. Upon checking at a temperature below 0°C, the elevator must return to the initial position [illegible] sec. after the "[illegible]" button is pressed.

6. Deflect the missile by the wing to the right. The right aileron must deflect down. Deflect the missile to the left. The right aileron must deflect upward. In the missile is the original position, in this case, the ailerons must be set in the neutral position.

7. Switch on the "[illegible] No.1" switch on the control panel. The "[illegible] No.1" warning light must come on. Turn the "[illegible]" knob on the panel. The rudder and ailerons must deflect. Set the "[illegible]" knob in the zero position; in this case the rudder and ailerons must move to the neutral position. Repeat the check with the "[illegible]" knob turned in the opposite direction.

Turn the "[illegible]" knob on the panel. The elevator must deflect. [illegible] knob in the zero position, the elevator must move to the neutral position. Repeat the check with the "[illegible]" knob turned in the opposite direction.

[illegible] time, required for sending a signal of one polarity, must not exceed 15 seconds.

10. Switch on the "COMMAND No.2" switch on the panel. The "COMMAND No.2" warning light must come on. Check how the control surfaces are controlled by the "RUDDER" and "ELEVATOR" pre-set knobs on the panel in the same way as when sending command No.1: in this case when putting the "RUDDER" and "ELEVATOR" knobs in the zero positions, the control surfaces and ailerons must not reflect to the neutral position. Set the "POWER", "COMMAND No.1" and "COMMAND No.2" switches on the panel in the "OFF" position.

11. Bring the "POWER" switch on the [illegible] control panel cut off power supply for a short time. The "COMMAND" warning light must come on. The control surfaces and ailerons must occupy the neutral position and the "COMMAND" warning light must become illuminated.

Press the "BLOCKING" button on the control panel. The "COMMAND" warning light must go out. After 5 minutes check the free gyros precession. The gyros rigidity must be so that the control surfaces deflection for 5 minutes would not exceed:

rudder $\pm$ 1.25°

elevator $\pm$ 2.5°

ailerons $\pm$ 1.25°.

NOTE: The allowable deflection also depends on the gyro free [illegible] precession due to a signal picked up from the precession potentiometer. Therefore, before measuring the roll from gyro precession, switch on the "POWER" switch on the panel and send the directive control signal of a low value and such a polarity that the rudder could move to the neutral position.

after that quickly remove the control signal. In this case the deflection of ailerons from the neutral position will correspond to the roll gyro precession.

12. Set the "[illegible]" switch on the [illegible] control panel in the "OFF" position. Disconnect the ground test control panel from plug connectors No.36 and 12.

Connect the missile wiring system plug connector No.12 to the "[illegible]" unit.

De-energize the missile electrical system.

17. [illegible] Unit A[illegible]-33 [illegible] and A-17 [illegible]

1. [illegible] the A[illegible]-33 auto-pilot and A-17 station separate [illegible], control the ground test control panel plug connector No.[illegible], to the autopilot board, check plug connector No.36 [illegible].

[illegible] switches on the panel and supply power of 27 ± 2.7 v.d.c. to the missile electrical system.

2. Switch on the A-17 station. The "Check" No.1 "warning" light on the [illegible] must come on. Wait till zero control currents are sent from the station to the autopilot (check by using the "[illegible]" panel).

Switch on the [illegible] switch on the [illegible] control panel. The "[illegible]" and "[illegible]" warning lights on the panel must come on. [illegible] press the "Operating" button.

3. [illegible] the A-17 station to regime "[illegible]".

When sending the "RIGHT" signal, the rudder must deflect to the right or the right aileron - up. When removing the signal the rudder and ailerons must move to the neutral position.

When sending the "LEFT" signal, the rudder must deflect to the left and the right aileron - down. When removing the signal the rudder and ailerons must move to the neutral position. When sending the "UP" signal, the elevator must deflect upward. When removing the signal, the elevator must move to the zero position.

When sending the "DOWN" signal, the elevator must deflect down. When removing the signal, the elevator must move to the zero position.

NOTE: Time required for sending a signal of one polarity must not exceed 15 seconds.

4. Using the "[illegible]" switch on the [illegible] control panel cut off power supply for a short time. The "[illegible]" warning light must come on.

Wait, till the control surfaces are set in the neutral position and the "[illegible]" warning light becomes illuminated. Set the "[illegible]" switch on the [illegible] control panel in the "OFF" position.

5. Send command No.1 from the "[illegible]" station. The "[illegible] No.2" warning light on the panel must come on. Wait till zero control currents are supplied from the station to the auto-pilot.

Switch on the "[illegible]" switch on the [illegible] control panel. The "CAGED" and "[illegible] CAGED" warning lights on the panel must come on. After 3 minutes press the "UNCAGING" button.

Send control signals in regime " [illegible] " from the K-1M station to the autopilot.

The direction of the control surfaces deflection must be the same as in step 3. When removing control signals the control surfaces must not move to the neutral position.

6. De-energize the autopilot as indicated in step 4. Disconnect the ground test control panel from plug connector No.36.

S E C T I O N V

AK-53 AUTOPILOT TEST BEFORE TAKE-OFF

18. TESTING THE AK-53 AUTOPILOT BY USING THE CARRIER-AIRCRAFT EQUIPMENT

1. Connect the ground test control panel plug connector No.36 to the autopilot board check plug connector No.37 through the connecting cable.

Check that the "POWER" switches on the K-3 control panel and "1-13K" unit are in the "OFF" position.

2. Switch on the "BOMBARDIER POWER" and "AP AND K-1" switches on the bombardier control panel in the front cabin. The "AP AN" K-1 "MONITOR" warning light on the bombardier's panel comes on.

3. Check the autopilot operation using the ground test control panel:

a) switch on the "POWER" switch on the K-3 control panel. The "CAGED" and "BLOCK ZERO" warning lights on the panel must come on.

b) after 3 minutes, press the "UNCAGING" button on the panel.

The "CAGED" warning light must go out.

Press the "K-TURN RIGHT" button on the panel and keep it pressed for 5-10 seconds. The elevator must deflect 9-9.5° up from the initial position (12-12.5° up from the geometric neutral position). Wait, till the elevator returns to the initial position.

c) switch on the "[illegible]" switch on the panel, and the control signals by turning the "[illegible]" and "[illegible]" pre-set units knobs. When sending the direction signal the rudder and ailerons must deflect and when sending the pitch signal the elevator must deflect. Set the "[illegible]" switch on the panel in the "OFF" position.

d) Using the "[illegible]" switch on the [illegible] control panel cut off power supply for a short time. The "[illegible]" warning light must come on. Then, till the control surfaces and ailerons are set in the neutral position and the "[illegible]" warning light comes on.

4. Calibrate the [illegible] panel signals and check the autopilot operation by the instruments in the front cockpit

a) Calibrate the [illegible] panel signals: the "[illegible]" warning light on the [illegible] panel must be illuminated and the roll and pitch [illegible] pointers must be in the middle positions; switch on the "[illegible]" switch on the [illegible] panel in the tail cabin. Turn the [illegible] pre-set unit knob 4^0 down, the indicator pointer on the [illegible] panel must deflect "right" approximately one division.

Press the "[illegible]" button, the "[illegible]" warning light on the bombardier control panel must come on and the "[illegible]" missile elevator must deflect $\pm 2^0$ each from the initial position. Measure the exact value of the elevator deflection angle.

Set the pre-set unit knob on the [illegible] panel in the zero position.

Switch off and after 5-10 seconds switch on the "A" and "[illegible]" switch on the bombardier's control panel.

The "A.P. UNCAGE" warning light must go out. The "BOMB ZERO" warning light on the [illegible] panel must be illuminated.

Repeat the calibration with the pre-set unit knob turned 3°, 4°, 6° "DOWN", and then "UP" for each value indicated by the pre-set unit; the elevator must respectively deflect "DOWN" or "UP" with a tolerance of ±0.5° for the value indicated by the pre-set unit.

NOTE: When calibrating the angles of 3°, 4°, 6° (unlike 1°) the "BOMB ZERO" warning light must go out.

Calibrate the left suspension in the similar way.

Using the results of measurements make a calibration chart of the elevator deflection angles versus the position of the [illegible] panel pre-set unit knob.

b) Check the elevator deflection angles caused by the [illegible] panel signals as outlined in step 4a, this section with the pre-set unit knob turned 1°, 3°, 4°, 6° "UP" and 3° "DOWN" according to the calibration chart.

In this case the difference between the actual values of the elevator deflection angles and values given in the calibration chart must not exceed 0.5°.

c) In flight the [illegible] panel pre-set unit is set for a required angle by the carrier-aircraft crew in accordance with the "[illegible] pre-set unit operating instructions".

d) Press the "UNCAGING" button on the bombardier's control panel. The "A.P. UNCAGE" warning light must come on.

Press the "[illegible] CAGE" button on the bombardier's panel and keep it pressed for 5-10 seconds. The "PITCH" indicator pointer on the [illegible] panel must sharply deflect. After the

program is completed this pointer must return to the zero position.

e) Switch off and on the "A.P. and K-1" switch on the bombardier's control panel. The "A.P. UNCAGED" light must go out. The "BASS ZERO" warning light on the [illegible] panel must be illuminated.

5. Set the "OXYGEN POWER" and "A.P. and K-1" switches on the bombardier's control panel in the "OFF" position.

The "A.P. and K-1" "ENERGIZED" warning lights on the bombardier's control panel and the "BASS ZERO" on the panel must go out.

Set the "POWER" switch on the K-1 control panel in the "OFF" position.

Disconnect the ground test control panel from plug connector No.36.

6. Before a flight, set the "POWER" switch on the K-1 control panel in the "ON" position and then close the access door.

program is completed this pointer must return to the zero position.

e) Switch off and on the "[illegible] and K-1" switch on the bombardier's control panel. The "[illegible] UNLOCK" light must go out. The "BASS ZERO" warning light on the [illegible] panel must be illuminated.

5. Set the "SYSTEM POWER" and "[illegible] and K-1" switches on the bombardier's control panel in the "OFF" position.

The "[illegible] and K-1" "SYSTEM ON" warning lights on the bombardier's control panel and the "BASS ZERO" on the panel must go out.

Set the "POWER" switch on the K-1 control panel in the "OFF" position.

Disconnect the ground test control panel from plug connector No.36.

6. Before a flight, set the "POWER" switch on the K-1 control panel in the "ON" position and then close the access door.

S E C T I O N VI

АПК-5В AUTOPILOT PERIODIC MAINTENANCE OPERATIONS

19. АПК-5В AUTOPILOT PERIODIC MAINTENANCE OPERATIONS

PROCEDURES

1. The autopilot maintenance operations are periodic checks of the АПК-5В autopilot units condition which are performed to determine the autopilots serviceability for operation and further storage and also to prepare them so that they would meet the specifications.

2. The periodic maintenance operations are performed by the using organization mechanical personnel of the corresponding speciality.

The record of the periodic maintenance operations is made by the organization engineer or senior technician in the special Log Book or certificates for the autopilot units and set.

NOTE: The form of the periodic maintenance operation Log Book must correspond to the Aircraft Maintenance Manual.

3. The periodic maintenance operations are scheduled to the period of periodic inspections performed as outlined in paragraph 11, these Instructions.

30. PERIODIC MAINTENANCE OPERATIONS RECORD

Nos.	Operations Performed	Devices, Tools, materials
1.	Visually inspect all the autopilot units. Make sure that the external surfaces of the units and mountings are free from damages. Remove dust and dirt from the units external surfaces. If corrosion is detected proceed as outlined in step 7, this paragraph. Remove the lower cover of the [illegible] gyro unit and inspect the windings of the trimming rheostats on the unit mounting for condition. If corrosion (green coating) is found on the rheostat winding surface, proceed as specified in step 8, this paragraph.	Portable lamp, mirror, rags.
2.	Disconnect the units plug connectors. Inspect the plug connector pins. If the pins contacting surfaces are dirty, clean them with a bristle brush slightly dampened with T-70 gasoline and blow with compressed air at a pressure of 1-2 atm. Connect and safety the plug connectors.	T-70 gasoline, hair brush.

Nos.	Operations Performed	Devices, Tools, Materials
3.	Remove the end cap from the MX-[illegible] rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, dip in each clean rags slightly dampened with [illegible]-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 12 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Wood kit [illegible]-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other [illegible] inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the MX-[illegible] autopilot installed in the "A" missile. paragraph 13 - when storing the MX-[illegible] autopilot with some units removed from the "C" missile. paragraph 14 - when storing the MX-[illegible] autopilot in the packing cases.	Test Instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the MB-1A rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with TS-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Work bit TS-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other MB-1A inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the AJB-3B autopilot installed in the "Minuteman" missile. paragraph 13 - when storing the AJB-3B autopilot with its units removed from the "Atlas" missile. paragraph 14 - when storing the AJB-3B autopilot in the packing cases.	Test instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the [redacted] rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with TM-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 14 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Wool lint rags TM-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other [redacted] inverter, incorporated in the autopilot set.	
5.	Clean the autopilot units and set as specified in paragraph 60 - when storing the [redacted] autopilot installed in the "G" missile. paragraph 61 - when storing the [redacted] autopilot with both units removed from the "G" missile. paragraph 62 - when storing the [redacted] autopilot in the packing cases.	Test Instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the [illegible] rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with [illegible]-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Tool kit B-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other [illegible] inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the AHK-5B autopilot installed in the "KS" missile. paragraph 13 - when storing the AHK-5B autopilot with some units removed from the "KS" missile. paragraph 14 - when storing the AHK-5B autopilot in the packing cases.	Test Instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the MAP-I&A rear end housing assembly and take out the bruches from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with B-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter bruches length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Tool Kit B-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other MAP-I&A inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the AMA-5B autopilot installed in the "KC" missile. paragraph 13 - when storing the AMA-5B autopilot with servo units removed from the "KC" missile. paragraph 14 - when storing the AMA-5B autopilot in the packing cases.	Test Instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the ПАГ-1ФА rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with Б-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Tool kit Б-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other ПАГ-1ФА inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the АПК-5В autopilot installed in the "КС" missile. paragraph 13 - when storing the АПК-5В autopilot with some units removed from the "КС" missile. paragraph 14 - when storing the АПК-5В autopilot in the packing cases.	Test Instruments Set.

Operations Performed	Devices, tools, materials
Remove the end cap from the ПАТ-15А inverter rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface of the commutator for burrs; wipe it with cloth rags slightly dampened with 5-70% gasoline and clean the commutator with "00" sand paper. Measure the operating brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders.	Tool kit 5-76 pages 106" sand paper.
Close the inverter rear end housing assembly with the end cap.	
4. Perform the operations outlined in step 3 on the other ПАТ-15А inverter, incorporated in the autopilot set.	
5. Check the autopilot units and set as specified in: paragraph 12 - when storing the АПК-5В autopilot installed in the "КС" missile. paragraph 13 - when storing the АПК-5В autopilot with some units removed from the "КС" missile. paragraph 14 - when storing the АПК-5В autopilot in the packing cases.	Test Instruments Set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the ПАГ-1ФА rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with Б-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Tool kit Б-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other ПАГ-1ФА inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the АПК-5В autopilot installed in the "КС" missile. paragraph 13 - when storing the АПК-5В autopilot with some units removed from the "КС" missile. paragraph 14 - when storing the АПК-5В autopilot in the packing cases.	Test Instruments set.

Nos.	Operations Performed	Devices, Tools, materials
3.	Remove the end cap from the ПАГ-1ФА rear end housing assembly and take out the brushes from the brush holders. Inspect the commutator surface. If the commutator is burnt, wipe it with clean rags slightly dampened with Б-70 gasoline and clean the commutator with "00" sand paper. Measure the inverter brushes length. Brushes worn to 10 mm. or less must be replaced with new ones. Install the brushes in the brush holders. Close the inverter rear end housing assembly with the end cap.	Tool Kit Б-70 gasoline. Rags "00" sand paper.
4.	Perform the operations outlined in step 3 on the other ПАГ-1ФА inverter, incorporated in the autopilot set.	
5.	Check the autopilot units and set as specified in: paragraph 12 - when storing the АПК-5В autopilot installed in the "КС" missile. paragraph 13 - when storing the АПК-5В autopilot with some units removed from the "КС" missile. paragraph 14 - when storing the АПК-5В autopilot in the packing cases.	Test Instruments Set.

Nos.	Procedure Performed	Instruments, Tools, Materials
3.	Remove the end cap from the [illegible] rear end bearing assembly and [illegible] the bearing from the bench [illegible] the commutator surface. If the commutator is burnt, pits by use of an [illegible] sandpaper, dip [illegible] gasoline or [illegible] commutator with a [illegible] the brushes [illegible] brushes are to be [illegible] [illegible] with the [illegible]	~20 gasoline. [illegible] type.
4.	[illegible]	
5.	[illegible]	

Services, Supplies & Materials

Item

6.

Nos.	Operations Performed	Devices, Tools, Materials
	rating surface by moving the slightly pressed chamois along the potentiometer winding turns. Clean two or three times, check the potentiometer cleanliness by means of a magnifying glass (x4) having a four-fold enlargement. Clean dirty chamois:	
	a) Wipe current-carrying wires (silver) of the [illegible] units potentiometer by an axle slightly dampened with ethyl alcohol.	
	Note: When cleaning the potentiometer do not touch the brushes.	
	b. Clean thoroughly units gear assemblies slip rings as follows:	
	a) manually energize the gear assembly [illegible] the corresponding [illegible] ring to the stop;	Wooden stick, hair brush, magnifying glass [illegible]
	b) carefully clean the slip ring surface by means of a sharp (1/2 in. wide) chamois on a stick made of thick wood (bread or bamboo preferable); check the surface for cleanliness by means of a magnifying glass having a four-fold enlargement;	

Nos.	Operations performed	Levers, dials, buttons
	c) Remove dirt or rust from the slip ring surface by a fine wire brush.	
	NOTE: When cleaning the slip rings, be sure to not touch the brushes.	
	3. Clean the [illegible] servo unit potentiometer as follows:	
	a) Move the potentiometer wiper to one of the extreme positions by rotating the unit output shaft (do not leave in this [illegible]).	Turn [illegible] dials, [illegible] buttons.
	b) [illegible] in one of a series of [illegible] with [illegible]	
	c) [illegible]	
	d) [illegible]	
	e) [illegible]	
	f) [illegible]	
	g) [illegible]	
	h) [illegible]	
	i) [illegible]	
	j) [illegible]	
	k) [illegible]	
	l) [illegible]	
	m) [illegible]	
	n) [illegible]	
	o) [illegible]	
	p) [illegible]	
	q) [illegible]	
	r) [illegible]	
	s) [illegible]	
	t) [illegible]	
	u) [illegible]	
	v) [illegible]	
	w) [illegible]	
	x) [illegible]	
	y) [illegible]	
	z) [illegible]	
	aa) [illegible]	
	bb) [illegible]	
	cc) [illegible]	
	dd) [illegible]	
	ee) [illegible]	
	ff) [illegible]	
	gg) [illegible]	
	hh) [illegible]	
	ii) [illegible]	
	jj) [illegible]	
	kk) [illegible]	
	ll) [illegible]	
	mm) [illegible]	
	nn) [illegible]	
	oo) [illegible]	
	pp) [illegible]	
	qq) [illegible]	
	rr) [illegible]	
	ss) [illegible]	
	tt) [illegible]	
	uu) [illegible]	
	vv) [illegible]	
	ww) [illegible]	
	xx) [illegible]	
	yy) [illegible]	
	zz) [illegible]	
	aaa) [illegible]	
	bbb) [illegible]	
	ccc) [illegible]	
	ddd) [illegible]	
	eee) [illegible]	
	fff) [illegible]	
	ggg) [illegible]	
	hhh) [illegible]	
	iii) [illegible]	
	jjj) [illegible]	
	kkk) [illegible]	
	lll) [illegible]	
	mmm) [illegible]	
	nnn) [illegible]	
	ooo) [illegible]	
	ppp) [illegible]	
	qqq) [illegible]	
	rrr) [illegible]	
	sss) [illegible]	
	ttt) [illegible]	
	uuu) [illegible]	
	vvv) [illegible]	
	www) [illegible]	
	xxx) [illegible]	
	yyy) [illegible]	
	zzz) [illegible]	
	aaaa) [illegible]	
	bbbb) [illegible]	
	cccc) [illegible]	
	dddd) [illegible]	
	eeee) [illegible]	
	ffff) [illegible]	
	gggg) [illegible]	
	hhhh) [illegible]	
	iiii) [illegible]	
	jjjj) [illegible]	
	kkkk) [illegible]	
	llll) [illegible]	
	mmmm) [illegible]	
	nnnn) [illegible]	
	oooo) [illegible]	
	pppp) [illegible]	
	qqqq) [illegible]	
	rrrr) [illegible]	
	ssss) [illegible]	
	tttt) [illegible]	
	uuuu) [illegible]	
	vvvv) [illegible]	
	wwww) [illegible]	
	xxxx) [illegible]	
	yyyy) [illegible]	
	zzzz) [illegible]	

Nos.	Operations Performed	Devices, Tools, Materials
	a) manually unwind the [illegible] assembly and move the inner and outer gimbal rings so that the large and small cams operating surfaces are clearly seen.	
	b) wrap on a blunt end of a wooden stick (2-3 mm.wide) a strip of chamois slightly dampened with rectified alcohol and wipe the cams, blade and tappet operating surfaces.	wooden stick, strip of chamois, rectified alcohol.
	c) perform the operations outlined in steps "a" and "b" on the [illegible] assembly.	screwdriver, support, wooden stick, strip of chamois, rectified alcohol.
	d) unscrew 4 screws attaching the [illegible] assembly. Unscrew 6 hex-head screws securing the [illegible] assembly. Slightly lift the [illegible] assembly and remove the [illegible]-1 assembly. Install the [illegible]-2 assembly in place. Install the [illegible] assembly on the support (plate, 150x17x3 mm.)	
	e) clean the [illegible]-2 assembly cams, blade and tappet as indicated in steps "a" and "b".	
	f) slightly lift the [illegible]-2 assembly, install the [illegible]-1 and then [illegible] assembly in place and secure them by attaching screws placing split washers under the screw heads.	

Nos.	Operations Performed	Devices, Tools, Materials
	Note: Upon observation, do not touch the penetrating dyes and dust fingerprints.	
7.	If penetration is found on the outer surfaces of the shell having metal or varnish coating, proceed as follows:	
	a) Wipe the area suspected of penetration with a clean cloth slightly moistened with gasoline.	Cotton cloth, (-40) gasoline
	b) Remove penetration products by nail brush.	Nail brush.
	c) If the treated area with a clean piece of cloth, by carefully with [illegible]	Nail brush, [illegible] nitro- -ne moist.
	[illegible]	
	[illegible]	
	[illegible]	
c.	[illegible] of the surface of the cartridge, rheostats windings, proceed as follows:	
	a) If penetration is not considerable, the cartridge [illegible] on a sharp end of a wooden [illegible] (3-4 mm. wide) a strip of [illegible] slightly moistened with [illegible] gasoline and, wipe the rheostat winding, [illegible] rolling the slightly moistened [illegible] along the mounted winding [illegible] wires.	Wooden stick, cotton, [illegible] gasoline.

Nos.	Operations Performed	Services, Tools, Materials

b) replace the rheostat, if corrosion cannot be removed completely.

NOTES: 1. It is also permitted to perform the operations outlined in step 4, when performing every month maintenance operations on the missile.

2. After accomplishing the operations described in paragraphs 12, 13, the [illegible] and [illegible] units must be closed with the covers and secured with seals of the using organization. The [illegible] guarantee will remain valid.

S E C T I O N VII

AUK-5B AUTOPILOT [illegible] EQUIPMENT

21. AUK-5B AUTOPILOT [illegible] EQUIPMENT

1. The AUK-5B autopilot combined checkout in the "S" missile with the [illegible] gyro unit removed from the missile and also the autopilot checkout on the test stand is performed by means of the test equipment set.

2. Check the AUK-5B autopilot installed in the "S" missile by means of the [illegible] ground test control panel.

3. The set of the test equipment (dwg.379.00.00.000) incorporates:

[illegible]A-1	control panel	- 1
[illegible]A-2	mounting	- 1
[illegible]A-3	simulator	- 2
[illegible]A-4	junction box	- 3
[illegible]A-5	turn table	- 1
	Connecting cables	- 1 set.

NOTE: When checking the AUK-5B autopilot installed in the missile, the [illegible]A-3 simulators and [illegible]A-4 junction boxes are not used.

The test equipment set is shown in fig.12.

[illegible]A-1 control panel (dwg.379.00.00.000 or 379.00.01.000) is a [illegible] with [illegible] [illegible] respectively [illegible] and [illegible]. The weight of it does not exceed 15 kg.

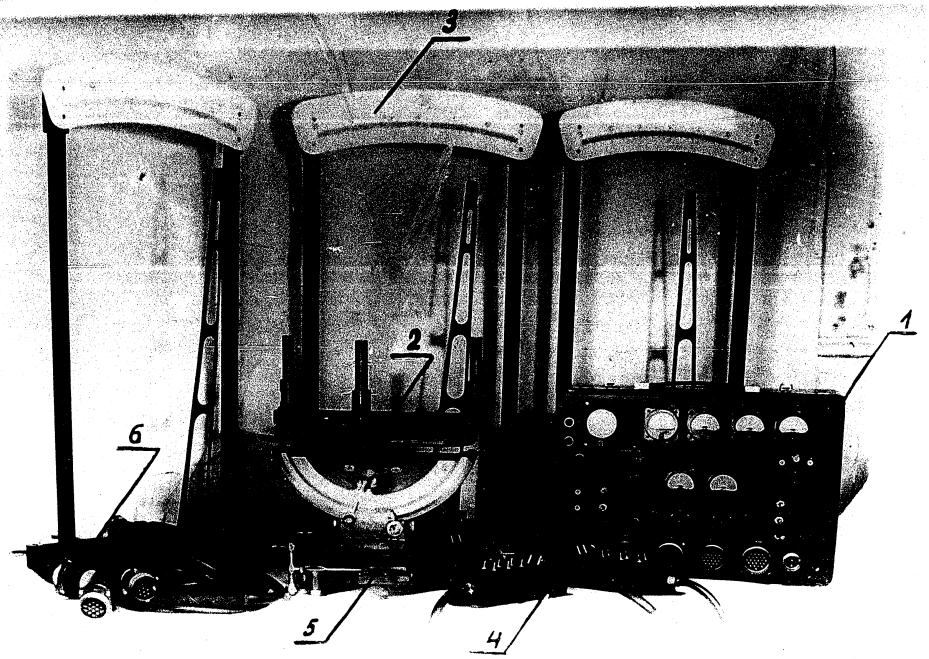


Fig.12. Test Equipment Set.

1. - KIIA-I control panel; 2 - KIIA-2 mounting; 3 - KIIA-3 simulator; 4 - KIIA-4 junction box; 5 - KIIA-5 turn table; 6 - connecting cables.

Approved For Release 2011/02/07 : CIA-RDP82-00038R001400030001-4

Shock-mounted to the control panel casing is the face panel carrying all the control panel electrical units and the clock showing the time during which the autopilot is energized. The clock is started by a special electromagnetic relay built-in the control panel which is actuated whenever the autopilot is energized.

The autopilot supplies D.C. power of 26 V to plug connector No.43 to feed the control panel circuits. The panel is provided with a special "POWER SELECTOR SWITCH" used to change the modes of the control panel functioning; with the "POWER SELECTOR SWITCH" in the "BOARD CHECK" position, the autopilot is checked via the board check plug connector, and with the switch in the " ДК-17М SIMULATOR" position, the autopilot check is simulated by means of the ДК-17М panel of the carrier-aircraft and with the switch in the "К-1М SIMULATOR" position a combined operation of the autopilot and K-1M station is sumulated.

The КПА-1 control panel schematic diagram is given in Fig.13.

The control panel operating temperature range:

a) control panel with test instruments model ИМУ and ИМ-70 (dwg.3790100000) - 20°C to +50°C.

b) control panel with test instruments model МЭ-2 (dwg. 3370000000) - 35°C to +50°C.

NOTE: When operating at a temperature below zero do not use the clock of the panel (dwg.3790[illegible].00.00C);when operating the panel (dwg.3370000000) close the "CLOCK HEAT" switch.

KHA-2 mounting (dwg.3790200000) is intended for attaching the II-2 gyro unit to the KHA-5 turn table. The II-2 gyro unit is secured on three steel posts screwed in the mounting base. The mounting attachment holes are displaced from the line of symmetry to shift the C.G. position of the II-2 gyro unit together with the mounting from the turn table axis of rotation when attaching the unit to the turn table.

This shift is made to prevent the turn table plays from affecting the accuracy of the turning angles measurement. The mounting weight is not more than 8.5 kg.

KHA-3 simulators (dwg. 379.03.00.000) are designed to indicate the II-4 servo units outlet shafts turning angles when checking the autopilot on the stand.

The simulator scale is graduated from 0 to $\pm 15^{\circ}$. Each degree division is divided into 10 parts i.e. the scale division value is equal to 6 minutes of arc. The angles are indicated by the pointer attached to the outlet shaft of the II-4 servo unit to be checked. The simulator weight is not more than 7.2 kg.

KHA-4 junction boxes (dwg.379.04.00.000) are connected to the autopilot circuit when checking the autopilot on the stand to permit switching-on and checking of the II-4 servo units various control circuits. The junction box weight does not exceed 1 kg. The junction box schematic diagram is given in Fig.14.

KHA-5 turn table (dwg.379.05.00.000) is designed to set the II-2 gyro unit angle of turn about 3 mutually perpendicular axes. Angles of the table turn (see Fig.15):

The above mentioned failures of the turn table are prevented in operation by careful handling and periodic maintenance operations performed as follows:

a) once a month thoroughly wipe (without disassembling) the frictional surfaces of the lower and upper semi-cylinders with a clean cloth or rags and then cover them with a light coating of OKB-122-7 lubricant;

b) adjust the angular play by means of eccentric bearings and locking screws.

The turn table weight is not more than 21 kg.

Connecting cables (dwg.379.06.00.000) are intended to connect the autopilot units when checking the autopilot on the stand and to connect the II-2 gyro unit, removed from the missile, to the missile wiring system and KPA-I control panel when checking the autopilot in the missile.

Incorporated in the test equipment set are 12 connecting cables and KPA-I control panel power supply cable.

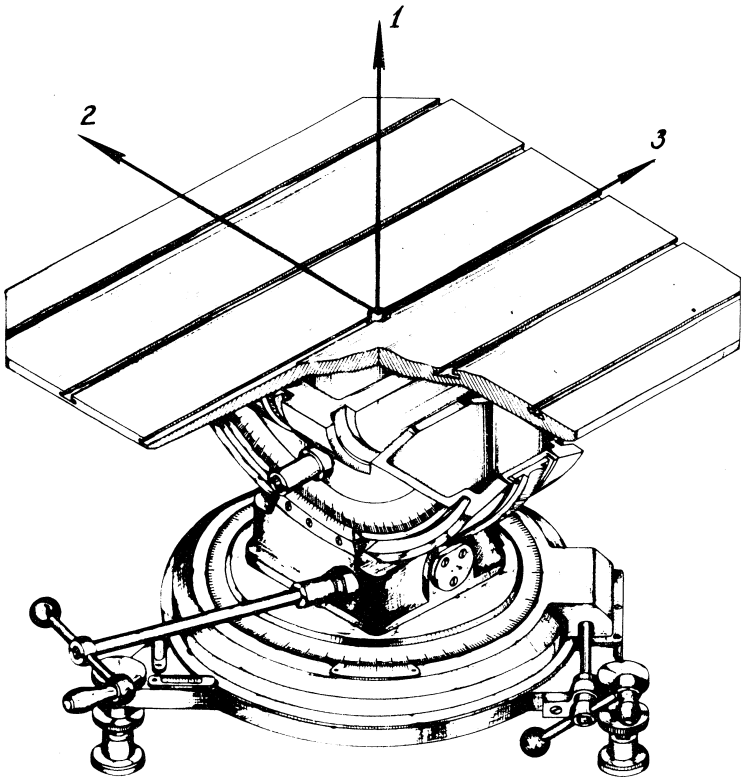


Fig. 15. [illegible] Turn Table [illegible] Diagram.

2C. [illegible] control unit (Ser. 77.00.00.000) is a portable metal case containing [illegible]. The panel dimensions are 242x242x[illegible] (used [illegible] before 1957) and 302x252x[illegible] (later 1957).

The panel weight is not [illegible] kg. Interconnection to the panel unit is by [illegible] connector [illegible] the ground units.

The [illegible] supplies [illegible] over a 26 [illegible] through plug connector No.[illegible] to the [illegible] test panel [illegible] to feed the test panel circuits.

The test panel [illegible] is given in Table [illegible].

Furnished with the [illegible] test panel [illegible] interconnecting cables to connect it to the [illegible] cable socket plug connector and [illegible] wiring [illegible] connector No.12 (to simulate a terminal operation of the [illegible] K-12 station).

The test panel operation temperature range:

a) panel with test instruments type [illegible] to +50°;

b) panel with test instruments type [illegible] to +50°.

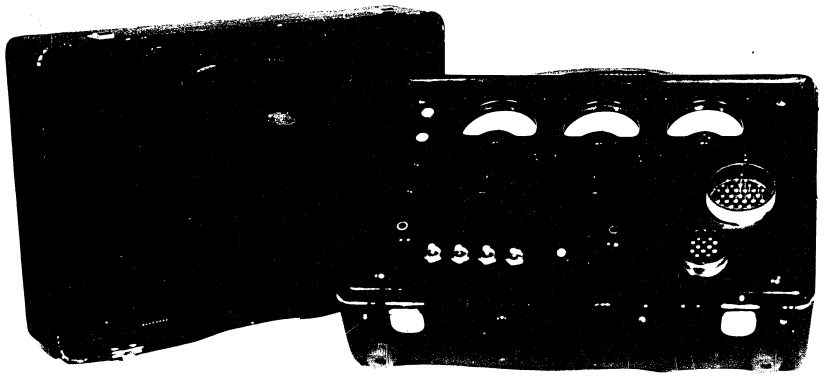


Fig.16. ПИК Ground Test Control Panel

[redacted] (Dwg. [illegible] 00.000) is a portable metal case containing [illegible] (Fig.16). The panel dimensions are [illegible] (front cover) and 302x252x192 (outer case).

The panel weight is not more than [illegible] kg. Connection of the panel using [illegible] units.

The [illegible] connector No.[illegible] to the [illegible] to feed the test [illegible].

The test panel [illegible].

Furnished with the [illegible] connecting cables to connect it to the [illegible] plug connector and single wiring [illegible] No.12 (to simulate a [illegible] station).

The test panel [illegible]:

a) panel with test instruments type [illegible];

b) panel with test instruments type [illegible].

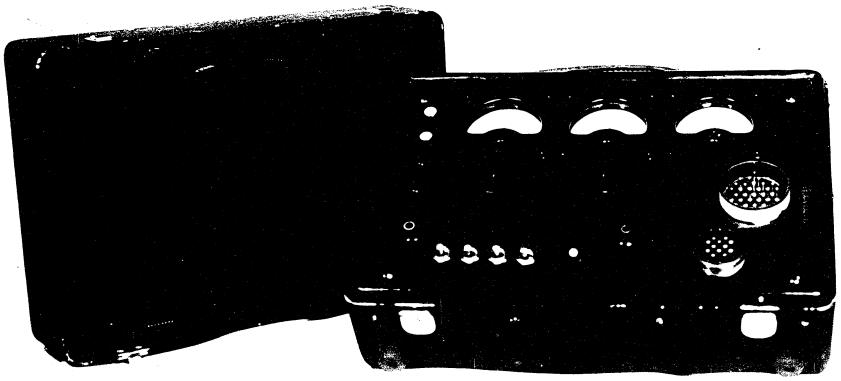
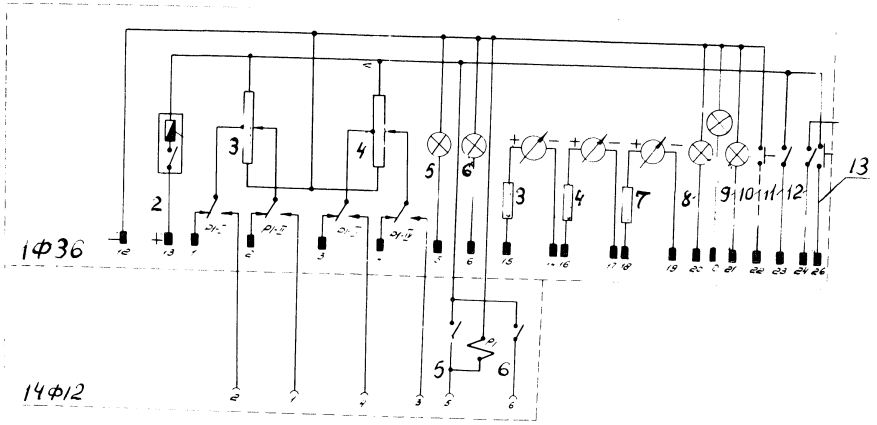


Fig.16. [redacted] Ground Test Control Panel



1) Board check. 2) Power. 3) Yaw 4) Pitch. 5) Command No 1. 6) Command No. 2
7) Roll. 8) Bases zero. 9) Caged. 10) Uncaging. 11) Check. 12) Emergency.
13) A-18M0 start. 14) KI-13M unit simulator.
15) Control surfaces position indicators (1-0-1MA)

Approved For Release 2011/02/07 : CIA-RDP82-00038R001400030001-4

22. [illegible]

[illegible] auto[illegible].

[illegible]

b) [illegible] so through - by means of the [illegible] panel;

c) [illegible] the [illegible]

[illegible]

[illegible] (before 1957) [illegible] (after 1957).

[illegible] on the panel [illegible] positions. The [illegible] terminals on the face [illegible]

The [illegible] panel subemat[illegible]

Furnished with the [illegible] panel [illegible] to connect the panel to the unit [illegible]

The [illegible] panel operati[illegible]

a) panel with test instruments [illegible]

b) panel with test instruments [illegible]

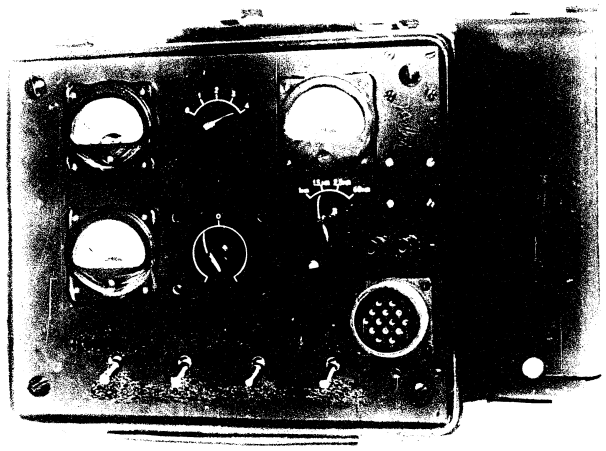
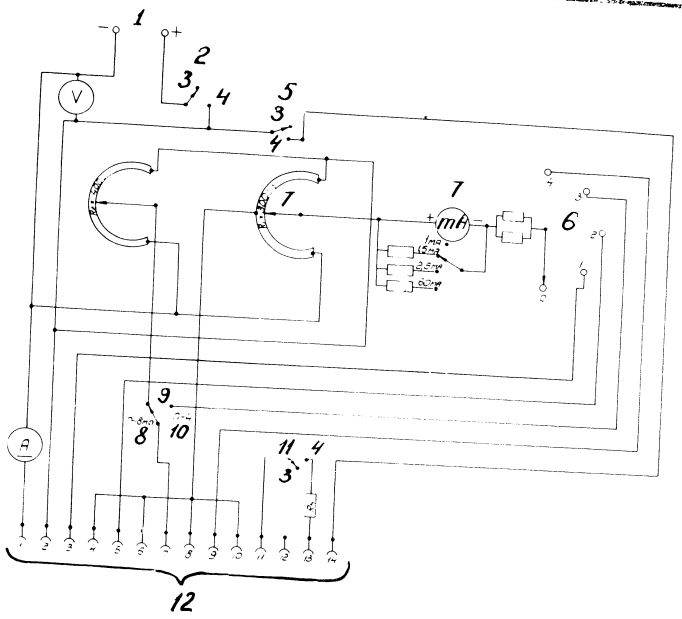
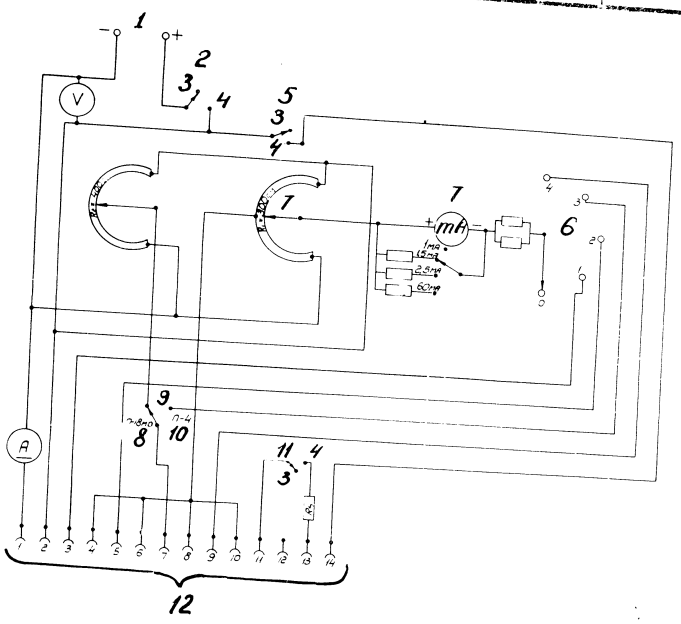


Fig.16. MI-1 Control Panel



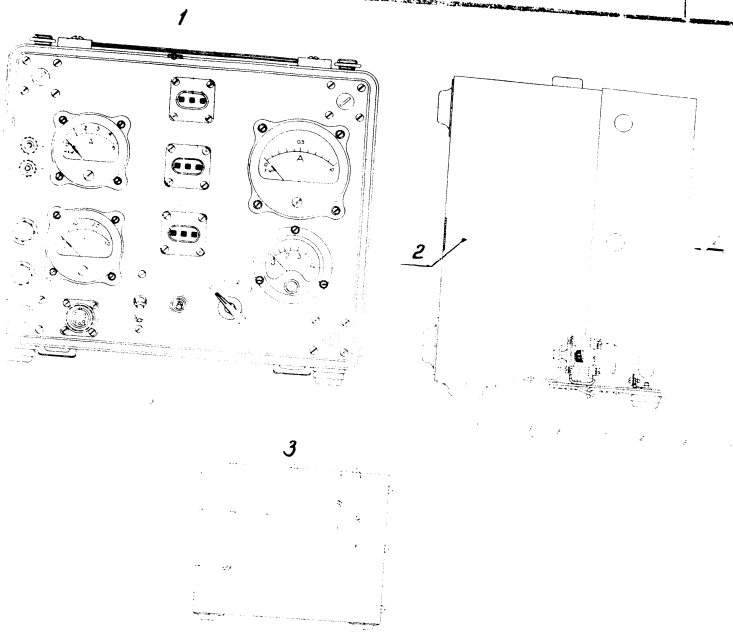
1) Power 26 V. 2) Power on.
3) Off 4) On 5) П-18МО start
6) Winding selector switch
7) Signal 8) П-18МО tuner
9) Panel 10) П-4 servo unit
11) Feedback 12) Receptacle
13) Key to diagram
A – D.C. ammeter with the scale range of 0-10 A, 2.5 degree of precision
V – D.C. voltmeter with the scale range of 0-30 V, 3.5 degree of precision
MA – milliammeter model MD-2 with the scale range of 1-0-1 with w_1, w_2, w_3 shunts connected, the scales are respectively 15-0-15, 2.5-0-2.5, 50-0-50

Fig. 19. [illegible]



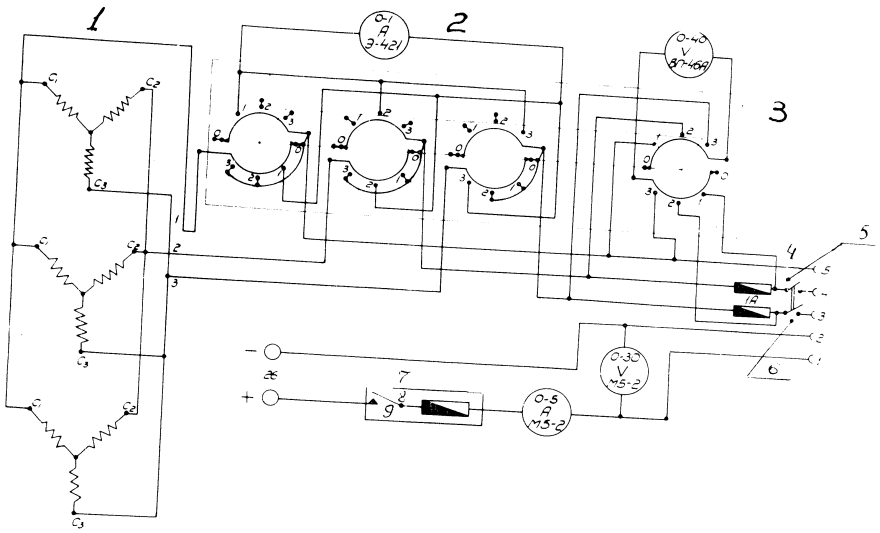
1) Power 26 V. 2) Power.
3) Off 4) On. 5) П-18МО start
6) Winding selector switch
7) Signal. 8) П-18МО timer
9) Panel. 10) П-4 servo unit
11) Feedback. 12) Receptacle.
13) Key to diagram
A - D.C. ammeter with the scale range of 0-10 A, 2.5 degree of precision
V - D.C. voltmeter with the scale range of 0-30 V, 3.5 degree of precision
MA - milliammeter model M5-2 with the scale range of 1-0-1 with w_1, w_2, w_3 shunts connected, the scales are respectively 15-0-15, 2.5-0-2.5, 60-0-60

Fig.19. ИП-1 Control Panel [illegible]



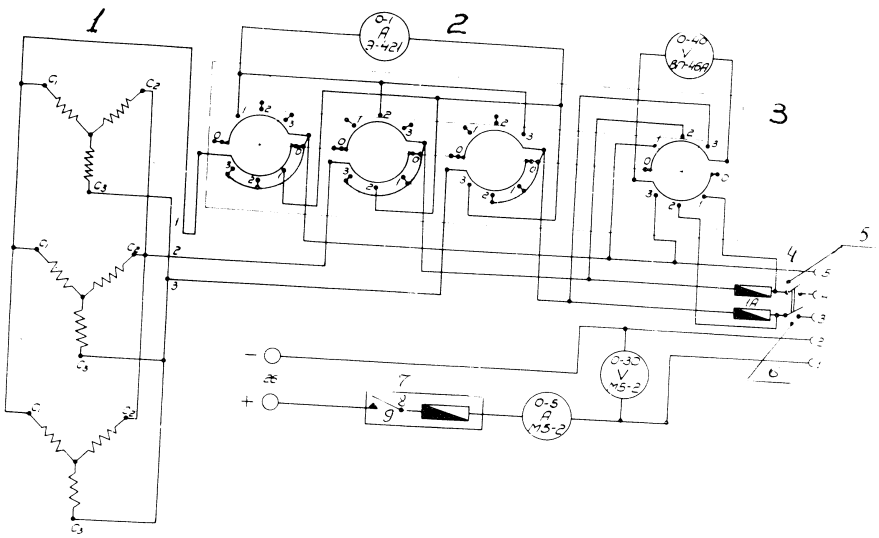
1) View without protective cover (5) and cover (2)
2) Inspection Department stamp here
3) View on arrow A, Scale 1:2

Fig.20. KL-5 Control Panel

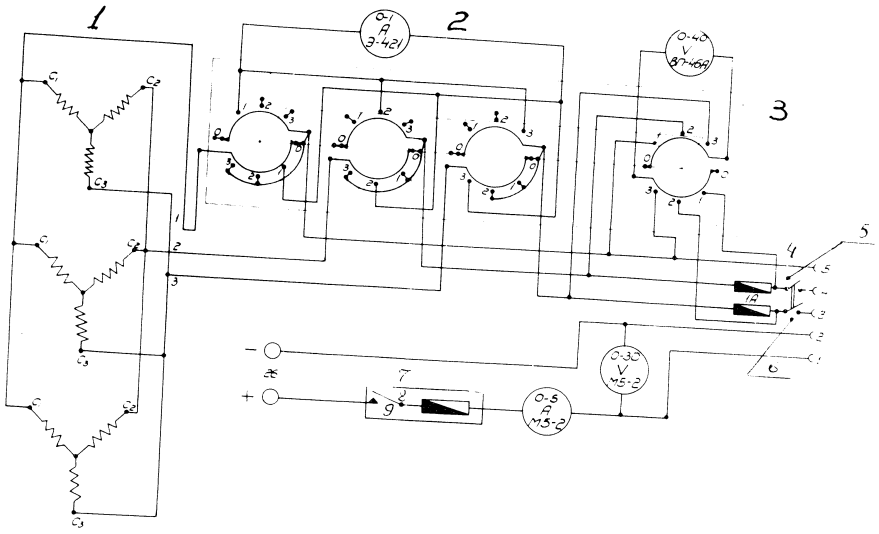


1) Gyromotors № 483 00 04 000
2) Phase selector switch
3) Selector 24 Kf 578н
4) Load
5) Off
6) On
7) Power
8) Off
9) On

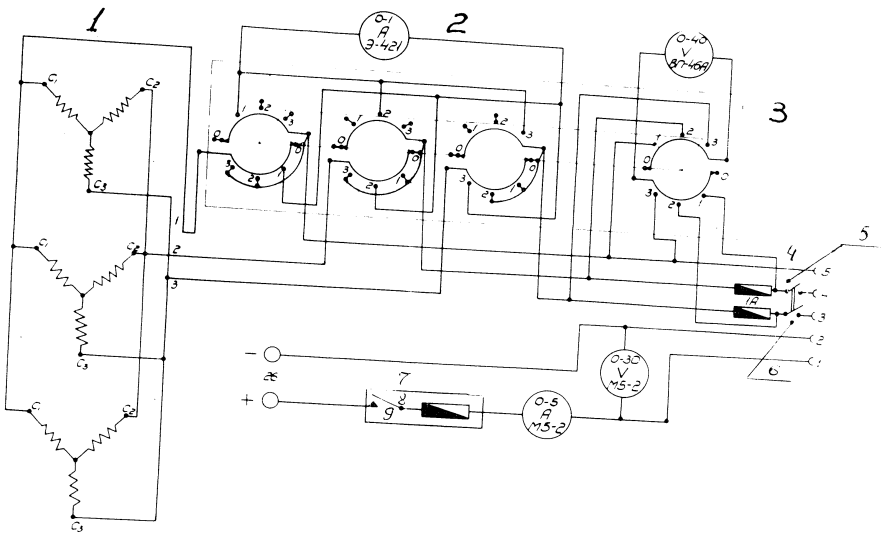
Fig. 21. [illegible]



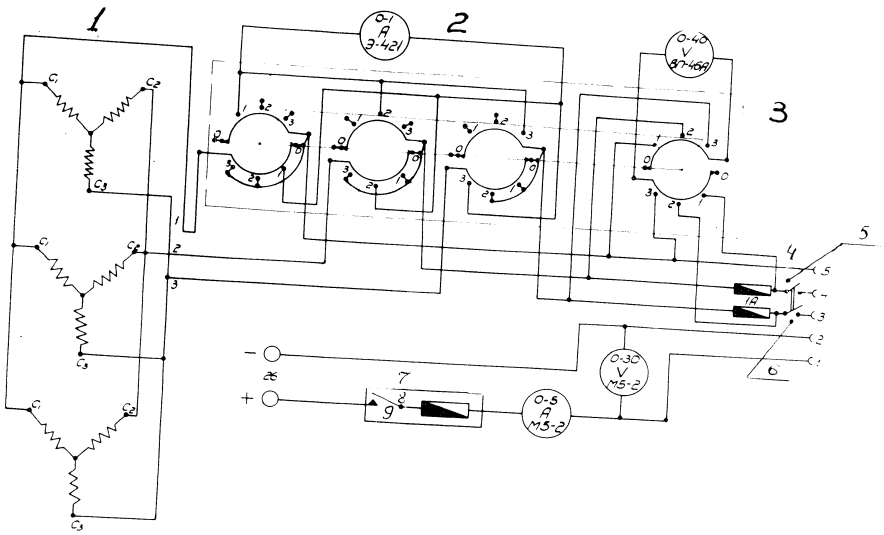
1) Gyromotors No 483 00 02 000
2) Phase selector switch
3) Selector 34 ПКИ 573 В
4) Load
5) Off
6) On
7) Power
8) Off
9) On



1) Gyromotors
2) Phase selector switch
3) Selector switch
4) Load
5) Off
6) On
7) Power
8) Off
9) On

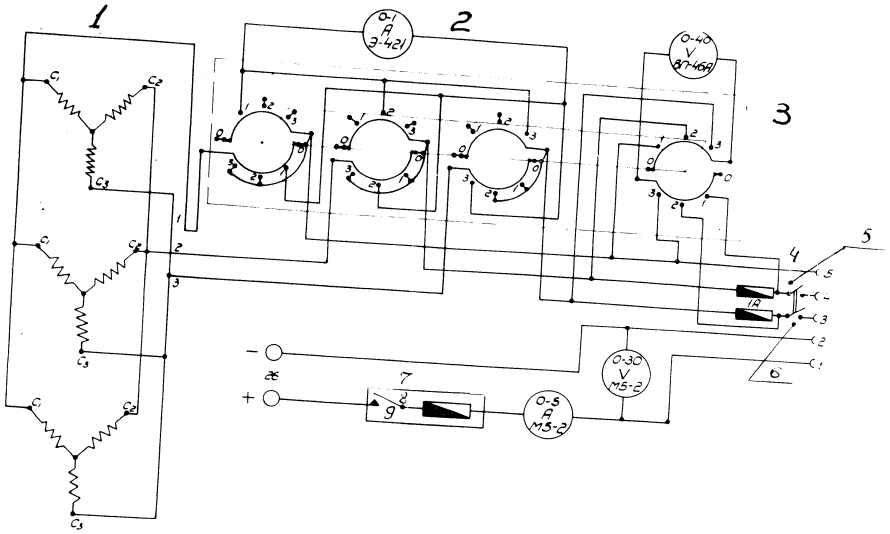


1) Gyromotors No 489 80 04 000
2) Phase selector switch
3) Selector 54 KB 5.78A
4) Load
5) Off
6) On
7) Power
8) Off
9) On



1) Gyromotors No 489 00 04 000
2) Phase selector switch
3) Selector switch 5.78Н
4) Load
5) Off
6) On
7) Power
8) Off
9) On

Fig. 2. [illegible]



1) Gyromotors No.489.00.04.000
2) Phase selector switch
3) Selector switch 5П8Н
4) Load
5) Off
6) On
7) Power
8) Off
9) On

Fig.21. КП-5 Control Panel Schematic

[redacted]

Secret

[redacted]

 [redacted] 14

[illegible]

[illegible]

[illegible] provided for [illegible] the following [illegible]

[illegible] to the [illegible]

[illegible]

[illegible]

[illegible]) Failure of the [illegible]

[illegible]

[illegible]

[illegible] command [illegible] for the [illegible] self-destroying [illegible] time [illegible] between the [illegible] away;

b) [illegible] of the device, i.e. there is an interval between the moment of [illegible] output voltage disappearance and the moment of initiating the self-destroying command, this interval [illegible] equal to [illegible] ± [illegible] secs.;

c) setting of the A.G.C. output voltage level for the self-destroying command within -Iv ± -0,5 v;

d) that a minimum error of the command initiating at the minimum A.G.C. voltage, in no more than ±3% of an established value;

e) when the command initiating threshold is lower than -45 dbm, the command is initiated in the autopilot "АП -К-55-Р" under conditions, which are listed in the table № 1.

Table № 1.

Distance between mother-ship and missile	Angle of missile deviation from target direction	Linear missile deviation from target direction
10 km	24°	4.5 km
30 km	10°	5.25 km
50 km	6°	5.25 km
70 km	4.5°	5.5 km

B. Unit dimensions: 127 x [illegible] x 120 mm³

C. Unit weight: 1.5 kg.

3. The elementary circuit description

The unit "СЛ КО-Р" is a relay device, which gives away the execution command (+27 v) for missile "КО" self-destroying to the autopilot elevation driver when the Radar A-regime A.G.C. output voltage is less than a preestablished value. The A.G.C. goes through the plug-connection "Ш -20" pin № 5. When missile "КО" guidance is normal beam-riding, the A.G.C. output voltage, applied to the balanced network, cutsoff the unit from

Изм. Кол. № прик. Подпись Дата | Лист Кол. № прик. Подпись Дата | Разраб. Провер.

Ф. XVa

the "KG" control devices by means of the [illegible] relay [illegible], which is placed in the balanced network diagonal. In any other case, when the [illegible] target voltage [illegible], the unit initiates the command [illegible] the [illegible] steep dive [illegible].

[illegible]

[illegible]

[illegible] in the balanced [illegible] across the bridge diagonal, and with it, [illegible] the control and feeds [illegible] to the "[illegible]" circuit ([illegible], [illegible], [illegible] and the relay [illegible]). The "[illegible]" circuit shuts off the self-destroying command [illegible], through momentary disappearances.

The missile-borne power supply +27 v goes through the closed relay P-3 contacts to the intermediate relay P-4, which de-energizes the control relay P-5, and with it disconnects the unit from the control circuit of the

automatic elevation driver. If the missile "KC" goes out from the radio beam, the A.G.C. voltage starts decreasing. When it becomes less than a level necessary to hold the relay contacts in a closed position, the +150 v is disconnected from the "memory" circuit by means of K.

The capacitor C1 starts discharging across the resistor R, and the relay P1 operates one time later the relay P2 opens the anode winding of the +7 v. Now the relay P2 contacts path for the relay P3 winding will be closed and the terminal 8 of network voltage will be applied to the winding of the relay P3, which inverts and gives out a command impulse "up" to the plug III-th of the block of the inverse network.

The potentiometer R9 and the resistor R10 provide voltage delay of the +150 v network. The potentiometer R9 serves for adjusting the relay P1 releasing moment, when A.G.C. voltage level on the tube L2 control grid is constant.

The relay P2 provides the unit "C L C-1" self-destroying command in the case, when the unit KI-58P A.G.C. detector tube 6L6-T3 is defective. When this fact takes place the unit KI-58P gives away a voltage approximately equal to -65 v ÷ -80 v, the relay opens its contacts K 2 and K 3, +150 v is disconnected from the "memory" circuit and it will produce self-destroying command.

The resistor R6 is matched so, that the relay P2 operates, when the plug III 20 pin K 5 voltage is equal to 20 v ± 2v.

The operator 55 limits current flowing in the [illegible] driver relay winding. The jack "[illegible]" provides monitoring of relay P-I releasing in checking the [illegible] sensitivity.

II. The unit operational instruction

1. General

When the unit "O.I" shall be used it is necessary to:

a) Set a necessary operating sensitivity of the unit.

b) Establish the unit into the "O" mode check by external loops.

c) Check the unit calibration, error current elimination on the operate and the zero limit lamps.

2. Preliminary the unit operation instruction to be followed before the beginning of measurements

a) after checking and setting the "Sine Shift" on the multiplier, as mentioned above, connect the input signal to the unit "O.I";

b) connect the reference voltage 2.5 V (or suitable range 2 ... 10 V) to the jack "Γ-I" and to the ground;

c) switch on the device, set on "V" input signal range equal to 40 ohm;

d) turn the unit "O.I" front potentiometer IO knob "Sensitivity" clockwise to the end so it will go; when it will be done, the voltmeter must indicate voltage at the jack "Γ-I";

e) turn slowly the potentiometer IO knob counter-clockwise until the jack "O.I" voltage disappears;

f) increase the signal power up to 4 ohm; voltage must appear at the jack "Γ-I" in this case;

division indicates failure of the contact of the "drop" or "-27 v" network.

e) release the button "КОМ. N I";

f) set a signal power equal to -40 dbm; push the button "КОМ. N I", wait 5-10 sec., the unit must not produce the dive signal; release the button "КОМ. N I";

g) decrease the input signal down to -45 dbm; push the button "КОМ. N I", 6 ± 2 secs later the unit must produce the dive signal.

h) switch off the Radar and the Autopilot.

Caution: The unit "K-17M" operating sensitivity must be checked before every flight [illegible] the "K" computer.

4. The unit adjustment when it is on the aeroplane

The unit "K-17M" adjustment checking is to be carried out jointly with the complete system checking on the ground. In the air before laying on flight course by the navigator-observer.

The checking should be carried out in the following succession:

a) the unit is to be checked after overall complete system checking;

b) when the Radars K-1M and K-11M are switched on and the Autopilot is catched, the navigator-bombaimer should push the board "K-17M" batton "command N I" and order "Attention! Switch off high voltage!" to the navigator-operator.

в) measure time interval between the Radar "L-11М" transmitter switching off and the moment of the unit "ЦАПС-11" dive signal appearance. When the unit is operating normally, the pointer of the board "УБ-17М" elevator indicator must deviate to the left at 9 ± 1 division in t ± 2 sec after the moment of the Radar "L-11М" transmitter switching off.

г) release the button "Контроль" the indicator pointer must return to the zero position.

Remarks: 1. Simultaneous check of the unit "ЦАПС-11" and the unit "ЦАПС-11" operation (Fig. 4).

5. Storage conditions of the units

1. The units "ЦАПС-11" are allowed to be stored:

а) in an object PCP in accordance with the object "RKO" rules instructions;

б) [illegible] units in packing case, while the humidity is [illegible].

Remark: Storage is to be made in ventilated temperature within +5° ÷ +40°C, relative humidity no more than 80 percent). Storage of the units together with acids, alkalies and poisonous substances is prohibited.

2. All the units must be packed, using board boxes (drawing № ВП-4-180-018). Boxes, containing units, should be protected with a polychlorovinyl cover and stowed in a packing case (drawing № РП-40-00) in fours in each case.

6. Transportation of the units

1. The units are allowed to be transported in the above-mentioned packing.

a) by truck:

- max. distance 500 km at a speed no more than 30 km/hour (natural road) and at a speed of 40 km/hour (highway).

b) by rail, by water and by air:

- any distance.

7. Regulation works

1. Regulation works include:

a) superficial examination,

b) electrical parameter checking.

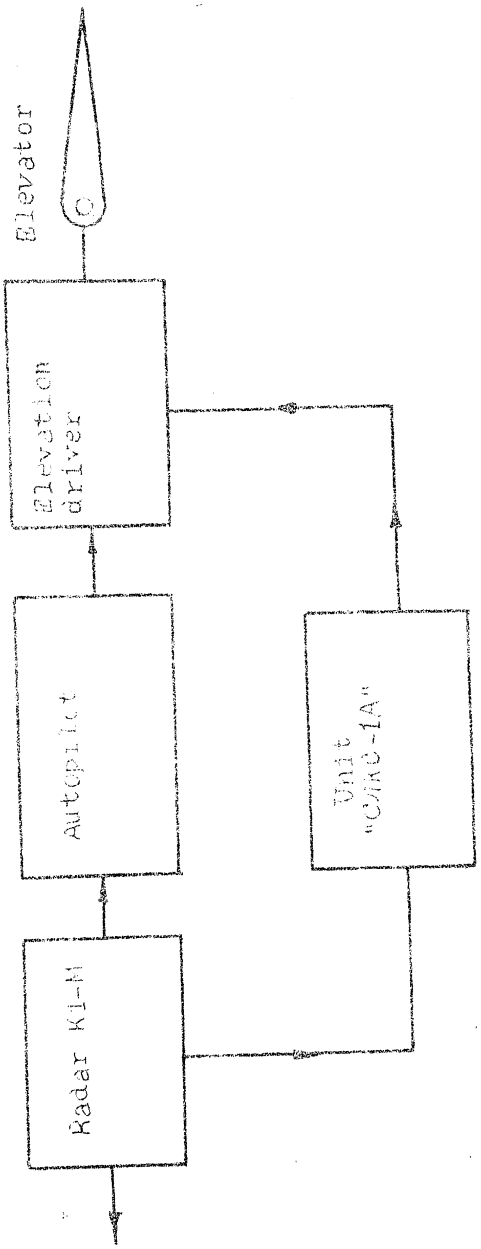
2. When the units СЛКС-1А are installed in the objects "КС", the regulation works are to be carried out simultaneously with the regulation works of the object "КС".

3. When the units С КС-1А are stored in storehouses the regulation works must be carried out monthly.

8. Manufacturer's guarantee

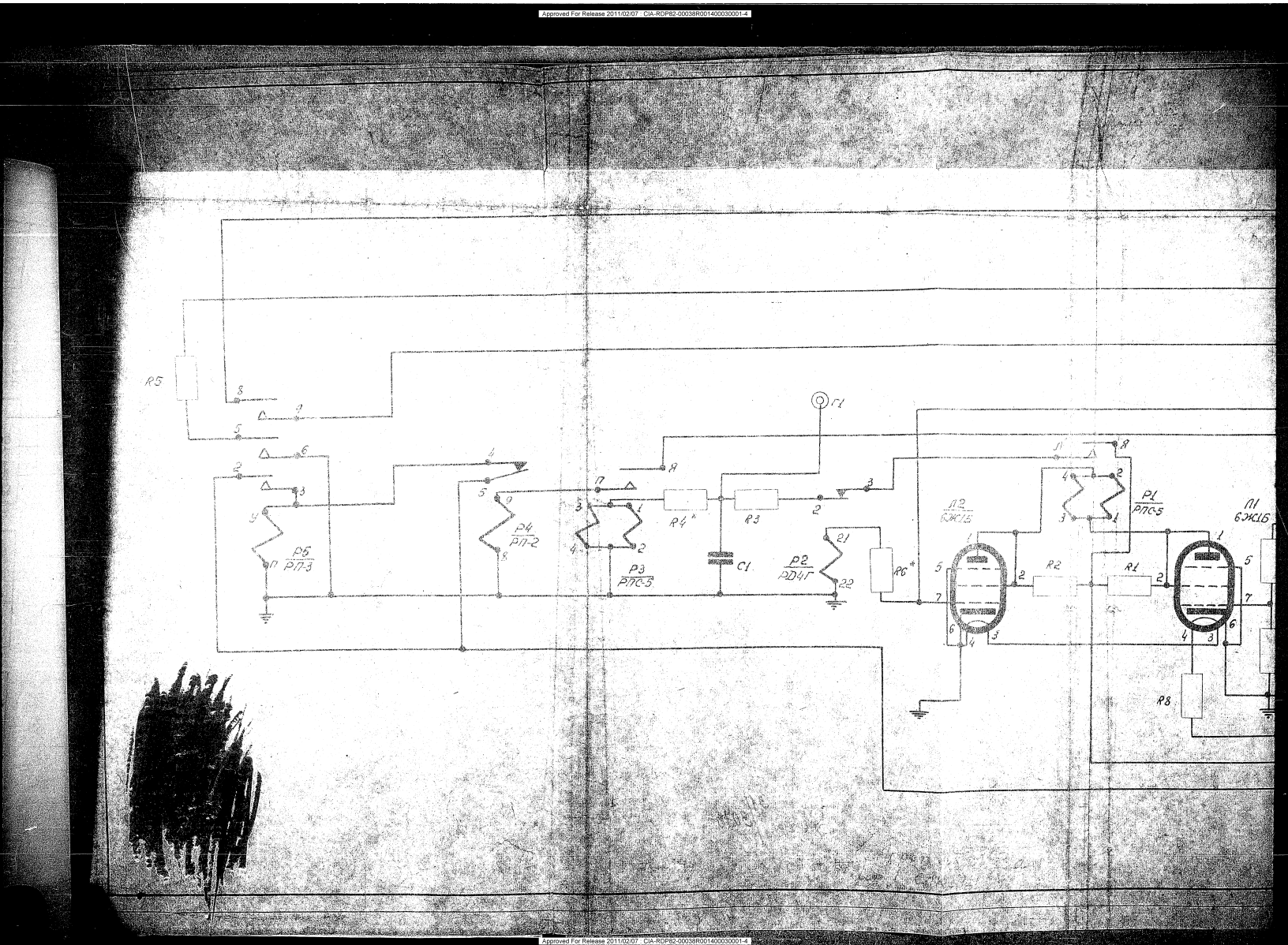
The manufacturer guarantees 1000 operational cycles during 12 months from the date of arrival in the port of destination.

Appendix N 1

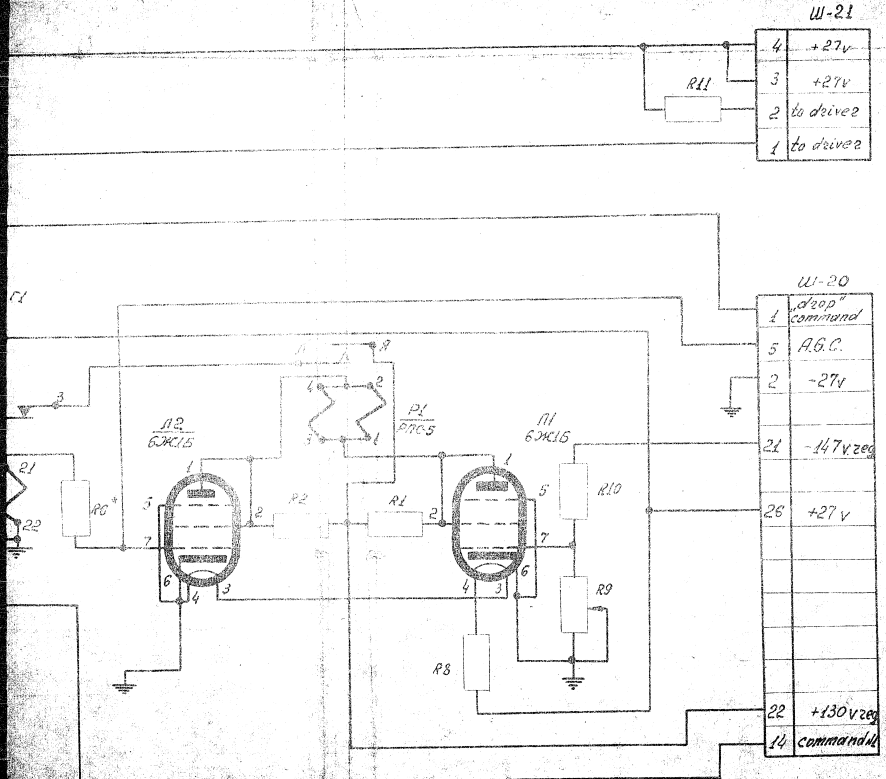


tube 6Ж15		
tube 6Ж16		
resistor МЛТ-1-100000-II	100 Kohm	
resistor МЛТ-1-100000-II	100 Kohm	
resistor МЛТ-0,5-6800-II	6,8 Kohm	
resistor МЛТ-1-6800Ω-II	51-91 Kohm	
resistor ПЭВ-10-24ом-10%	24 ohm	
resistor МЛТ-0,5,-6800-II	6,8÷12 Kohm	
resistor ПЭВ-10-75ом-10%	75 ohm	
resistor ППЗ-11-1000 ом	1000 ohm	
resistor ТТ-1-30к ± 1%	30 Kohm	
resistor МЛТ-2-180-II	180 ohm	
relay РПС-5		
relay РПС-5		
relay РДЧГ		
relay РП-2		
relay РП-3		
socket ШР20П4ЭГ8		
socket ШР48326Г.Ш2		
monitoring jack		
capacitor КБП-2-200-6-25-II	25 μF.	
name and mark		

The unit СЛКС-1А
elementary
diagram



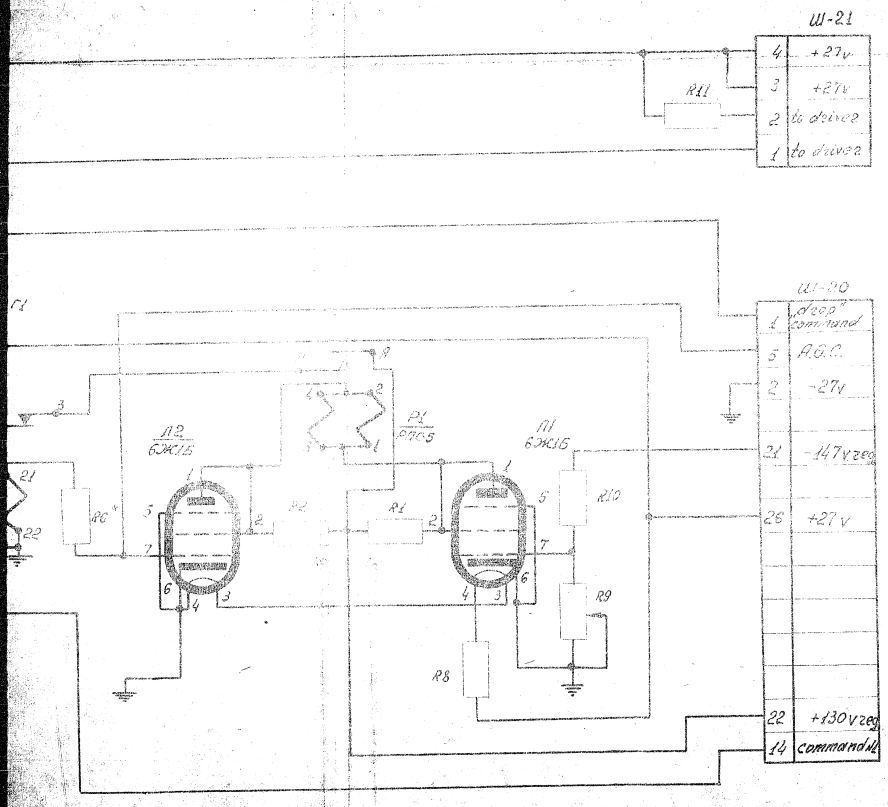
Appendix № 2



Л1		tube 6Ж16			
Л2		tube 6Ж16			
R1		resistor МЛТ-1-100000-Ī	100 Kohm		
R2		resistor МЛТ-1-100000-Ī	100 Kohm		
R3		resistor МЛТ-0,5-6800-Ī	6,8 Kohm		
R4		resistor МЛТ-1-68000-Ī	51-91 Kohm		
R5		resistor ПЭВ-10-24ом-10%	24 ohm		
R6		resistor МЛТ-0,5-6800-Ī	68÷12 Kohm		
R8		resistor ПЭВ-10-75ом-10%	75 ohm		
R9		resistor ППЭ-11-1000 ом	1000 ohm		
R10		resistor ПТ-1-30к ± 1%	30 Kohm		
R11		resistor МЛТ-2-180-Ī	180 ohm		
P1		relay РПС-5			
P2		relay РПС-5			
P3		relay РД4Г			
P4		relay РП-2			
P5		relay РП-3			
Ш-21		socket ШР2ОП4Г3Г8			
Ш-20		socket ШР48Э26Г1Ш2			
Г1		monitoring jack			
C1		capacitor КБП-2-2000-25Ī	25 μF		
Symbol		name and mark			

The Unit 1A-21A
Schematic
diagram

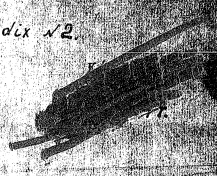
Appendix №2

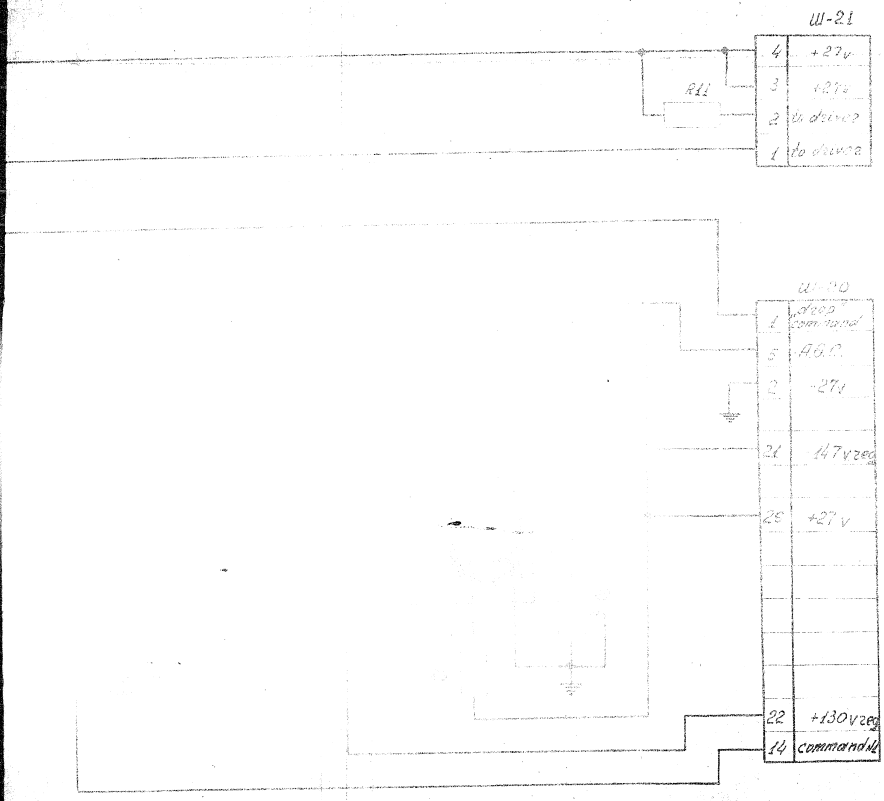


Л1		tube 6Ж15			
Л2		tube 6Ж15			
R1		resistor МЛТ-1-100000-Ⅱ	100 Kohm		
R2		resistor МЛТ-1-100000-Ⅱ	100 Kohm		
R3		resistor МЛТ-0.5-6800-Ⅱ	6,8 Kohm		
R4		resistor МЛТ-1-68000-Ⅱ	51-91 Kohm		
R5		resistor ПЭВ-10-24ом-10%	24 ohm		
R6		resistor МЛТ-0,5-6800-Ⅱ	6,8÷12 Kohm		
R8		resistor ПЭВ-10-75ом-10%	75 ohm		
R9		resistor ППЭ-11-1000 ом	1000 ohm		
R10		resistor ПТ-1-30к ± 1%	30 Kohm		
R11		resistor МЛТ-2-180-Ⅱ	180 ohm		
P1		relay РПС-5			
P2		relay РПС-5			
P3		relay РДС			
P4		relay РП-2			
P5		relay РП-3			
Ш-21		socket ШР20П4ГВ			
Ш-20		socket ШР48Э26Г.Ш2			
Г1		monitoring jack			
C1		capacitor КБП-Э-200-6-25%	25мF		
Symbol		name and mark			

The unit СИС-1А elementary diagram

Appendix №2

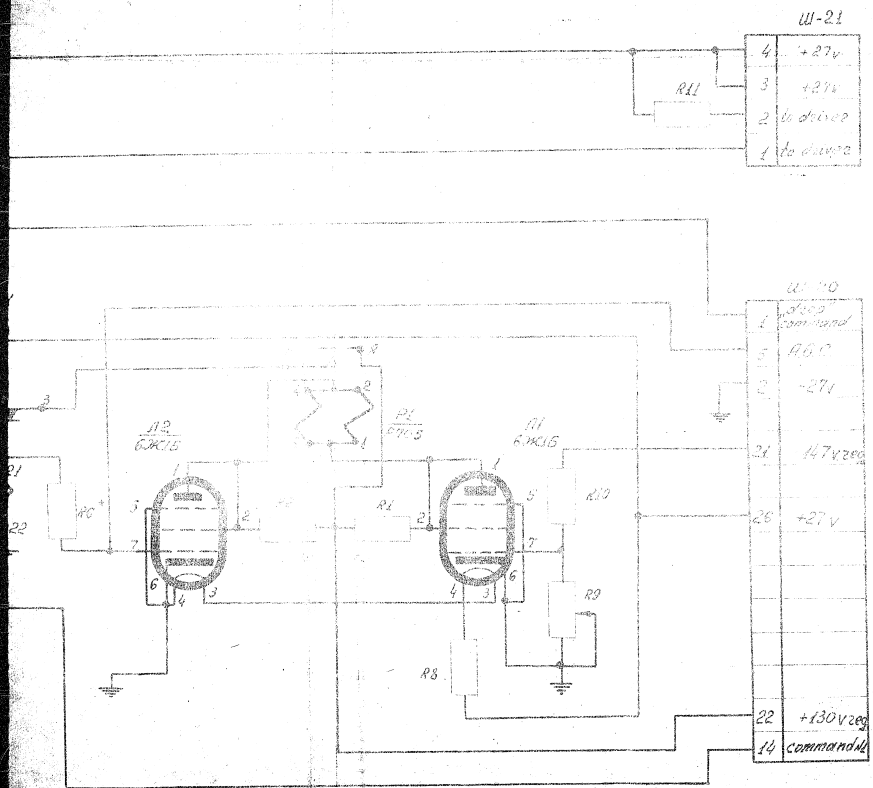




Symbol		name and mark			
Л1		tube 6Ж15			
Л2		tube 6Ж15			
R1		resistor МЛТ-1-100000-Ⅱ	100 Kohm		
R2		resistor МЛТ-1-100000-Ⅱ	100 Kohm		
R3		resistor МЛТ-.25-6800-Ⅱ	6,8 Kohm		
R4		resistor МЛТ-1-88008-Ⅱ	51-91 Kohm		
R5		resistor ПЭВ-10-24ом-10%	24 ohm		
R6		resistor МЛТ-.25-6800-Ⅱ	6,8÷12 Kohm		
R8		resistor ПЭВ-10-75ом-10%	75 ohm		
R9		resistor ППЗ-11-1060 ом	1000 ohm		
R10		resistor ПТ-1-30к ±1%	30 Kohm		
R11		resistor МЛТ-2-180-Ⅱ	180 ohm		
P1		relay РЛС-5			
P2		relay РЛС-5			
P3		relay РДУГ			
P4		relay РП-2			
P5		relay РП-3			
Ш-21		socket ШР20П4ЭГВ			
Ш-20		socket ШР48Э267.Ш2			
Г1		monitoring jack			
С1		capacitor КБП-2-200-6-25%	25мкФ		

The unit СМС-1А elementary diagram

Appendix № 2



Л1		tube 6Ж1Б		
Л2		tube 6Ж1Б		
R1		resistor МЛТ-1-100000-Ⅱ	100 Kohm	
R2		resistor МЛТ-1-100000-Ⅱ	100 Kohm	
R3		resistor МЛТ-2,5-6800-Ⅱ	6,8 Kohm	
R4		resistor МЛТ-1-68000-Ⅱ	51-91 Kohm	
R5		resistor ПЭВ-10-240м-10%	24 ohm	
R6		resistor МЛТ-0,5-6800-Ⅱ	6,8÷12 Kohm	
R8		resistor ПЭВ-10-75ом-10%	75 ohm	
R9		resistor ППЭ-11-1000 ом	1000 ohm	
R10		resistor ПТ-1-30к ± 1%	30 Kohm	
R11		resistor МЛТ-2-180-Ⅱ	180 ohm	
P1		relay РПС-5		
P2		relay РПС-5		
P3		relay РД4Т		
P4		relay РП-2		
P5		relay РП-3		
Ш-21		socket ШР20П43Г8		
Ш-20		socket ШР48Э26Г2.Ш2		
Г1		monitoring jack		
С1		capacitor КБП-2-200-6-25-Ⅱ	25 мкФ	
Symbol		name and mark		

The unit СПКС-1А elementary diagram

INVERTER MODEL ПАГ-1ФА DESCRIPTION

INVERTER MODEL ПАГ-1ФА

DESCRIPTION

INVERTER, MODEL ПАГ-1ФА

DESCRIPTION

I. GENERAL

The ПАГ-1ФА inverter is designed for feeding special units with a three-phase 400 c.p.s. A.C. and represents a unit consisting of a D.C. motor with compound field winding and a three-phase A.C. generator excited by a rotor permanent magnet.

The inverter is provided with a special filter (see the diagram) used for supressing the inverter radio-noise, the filter consists of three interlocking and one duct capacitors and a choke.

The inverter is connected to the missile electrical system by means of a five-pin plug connector.

The inverter is provided with a built-in adjusting resistor connected in the electric motor shunt winding circuit for maintaining the generator frequency and voltage constant at different ratings.

II. TECHNICAL DATA

A. FOR THE ELECTRIC MOTOR

1. Terminal voltage ..... 27 ± 10 % V
2. Current drawn ..... not more than 3.5 A
3. No-load current at supply voltage of 27 V ..... not more than 2.2 A

4. Speed of rotation ..... 8000±10% r.p.m.

5. Duty ..... continuous

6. R.H. direction of rotation

(as viewed from the commutator end)

B. FOR THE GENERATOR:

7. Voltage ..... 36 ± 4 V

8. Output current ..... not more than 0.51 A

9. Power factor 0.65

10. Frequency ..... 400 ± 10% c.p.s.

C. MTO-7 BRUSHES ("7" – a specific Mfr's Mark)

11. Size ..... 6.5x7x14 mm.

12. Quantity 2

13. Tension on brushes ..... 225±25 gr

D. MAGNETO-TYPE BALLBEARINGS No. 6007...T3 2

E. Weight ..... not more than 3.5 kg.

III. INVERTER ELECTRICAL SYSTEM

The inverter wiring schematic diagram is given in Fig.1.

IV. D E S I G N

The inverter is provided with a fan-assisted cooling (Fig.2).

The iron laminations of the electric motor and generator stators are mounted in a common casing (1), cast integral with a support.

The electric motor armature and generator rotor are mounted on a common shaft (2). The electric motor magnet system

s two-pole. The electric motor field coils windings (3) are connected in series.

The end of the series field winding is connected to the positive brush-holder.

The end of the shunt field winding is connected to the regulated adjusting resistor (12) located in the support.

The negative brush-holder wire is directly connected to the plug connector, and the common field winding end-to the plug connector (Fig.1) via the duct capacitor and the choke mounted on the end housing assembly (4).

The generator stator winding ends and electric motor filter wires are connected to the plug connector (6) through the holes in the end housing assembly.

The inverter plug connector pins designation corresponds to these in the schematic diagram (Fig.1).

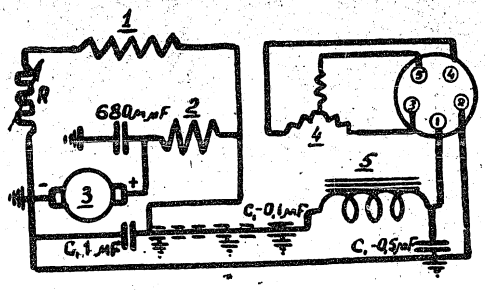
The adjusting resistor (12) mounted in the support is designed for adjusting the A.C. frequency with the inverter operating at a nominal load.

The position of the adjusting resistor slider in the electric motor shunt winding circuit is set at the Mfr's plant and is unchangeable during operation.

Mounted in the support beside the resistor, is the capacitor (11) connected in the filter circuit. The generator rotor is a permanent magnet made in the form of a six-pointed star.

Brushes are inserted in brass brush-holders mounted on the brush-holders bracket (7) which can be turned for adjustment purpose.

Two openings in the end housing assembly (5) covered with



1 Shunt.
2 Series.
3 Armature.
4 Generator.
5 Choke

Fig.1. Inverter Wiring Schematic Diagram

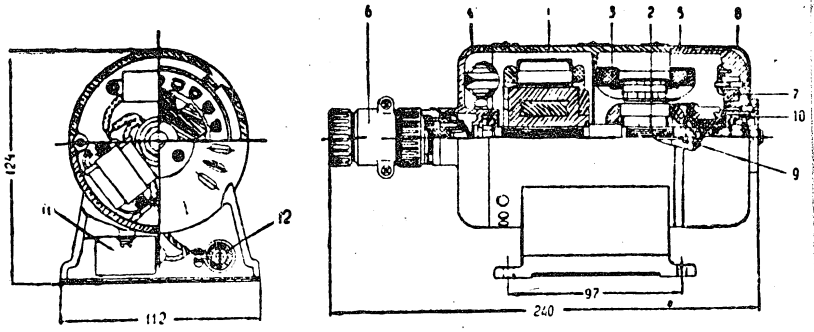


Fig.2. Inverter Cross-Section View

1 - Casing; 2 - shaft; 3 - field coil; 4 - end housing assembly; 5 - end housing assembly; 6 - plug connector; 7 - brush-holders bracket; 8 - end cap; 9 - stud; 10 - ball-bearing; 11 - capacitor; 12 - resistor.

the end cap (8) permit to inspect brushes with the end cap removed.

The end housing assemblies made of aluminium alloy are attached to the casing by two studs (9).

The armature is mounted on the magneto-type ball-bearings (10) which facilitate the inverter assembly and disassembly. The armature end play is compensated by four cylindrical springs producing an axial pressure on the ball-bearing outer race, from the commutator end.

V. INVERTER DISASSEMBLY AND RE-ASSEMBLY PROCEDURE

After the guaranteed service life has expired, disassemble the inverter when a trouble detected can't be remedied without disassembling the inverter and when it is necessary to replenish the ball-bearings lubricant.

If the generator rotor magnet was removed from the stator assembly it must be magnetized and stabilized at the Mfr's plant. The armature should not be removed from the inverter if unnecessary.

Disassemble the inverter as follows:

a) Remove the end cap from the end housing assembly;

b) Disconnect the brushes and pull them out of the brush-holders;

c) Disconnect the field winding end from the brush-holder and disconnect the wire leading from the brush-holder to the plug connector;

d) Release the studs;

e) Disconnect the plug connector from the end housing assembly and unsolder the wires from the receptacle pins;

f) Remove the end housing assembly (5) from the casing; move the end housing assembly (4) 20-30 mm.away from the casing, unsolder the wires from the capacitors and choke, and remove the end housing assembly;

g) Pull the armature out of the casing from the generator end.

When pulling the armature out of the casing, tightly enclose the rotor in a steel tube to prevent the permanent magnet demagnetizing.

Re-assemble the inverter reversing the disassembly procedure. In this case do the following:

a) Before re-assembling the inverter, wash the ball-bearings with clean gasoline. Pack the bearings with a limitted quantity of ЦИАТИМ-201 lubricant; apply the lubricant only to one side of the ball-bearing so that the lubricant would be flush with the bearing ball;

b) Insert the brushes into the brush-holders only after the inverter re-assembly is completed to prevent them from being damaged by the commutator butt.

Pay particular attention to proper fitness of the brushes to the commutator surface. Otherwise, fit the brushes to the commutator by using sandpaper 220 (ГОСТ 3647-47).

If the commutator is burnt, wipe it with a clean cloth slightly dampened with gasoline. Clean the commutator with sandpaper 220 (ГОСТ 3647-47).

c) Lock all attachment parts in the same way as they were locked before disassembly.

After the inverter reassembly is completed, check the armature for free rotation turning it by hand.

When rotating, the armature must not contact the poles and the commutator-the brush-holders.

Stiff or unsmooth rotation of the armature may result from misalignments due to a poor re-assembly.

The inverter insulation is tested:

a) on the motor side - by applying 330 volts D.C. for 10 sec. in this case the electrical circuit must be disconnected from the casing by raising the negative brush and ПЭП-5.5Х-85-11 resistor clamp;

Apply the test voltage as follows:

one pole - to the inverter casing, the other - to the plug connector contact "1";

b) On the generator end - by applying 500 volts A.C. for 1 min.

Connect the terminals of the power supply source as follows:

one - to the casing, the other - to one of the plug connector contacts "3", "4", "5".

Check the insulation resistance by using a corresponding megohmeter, connecting its terminals in the same way as they were connected when the insulation was tested.

In both cases the insulation resistance must be not less than 5 megohms.

VI. INVERTER INSTALLATION AND OPERATION INSTRUCTIONS

1. The inverter is installed in horizontal position, and attached by screws inserted through the support holes.

2. The inverter is designed for direct connection to the missile electrical system without any starting relays.

3. After the inverter is connected to the missile electrical system, fully tighten the plug connector coupling nut.

4. During the inverter service, periodically check its brushes and commutator for condition.

At normal operation the operating surface of the commutator is brown and not burnt.

If the commutator is burnt, clean the commutator as outlined in Section V.

Brushes worn by 10 mm. long or less must be replaced with the new ones of the same type.

The a.c. wires must be twisted inside the inverter and shielding conduits.

5. The inverter operates at:

a) Altitude above sea level.....up to 15000 m.

b) Ambient air temperature from -60°C to $+50^{\circ}$C.

c) Relative humidity ..... up to 98%.

INVERTER MODEL ПАГ-1ФА DESCRIPTION

ILLUSTRATED LIST FOR SPI 1:1

ILLUSTRATED

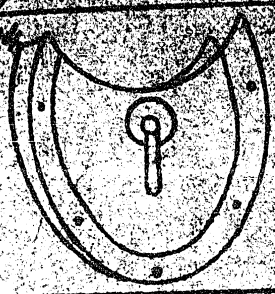
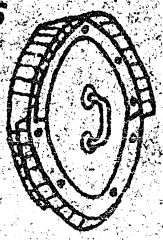
LIST

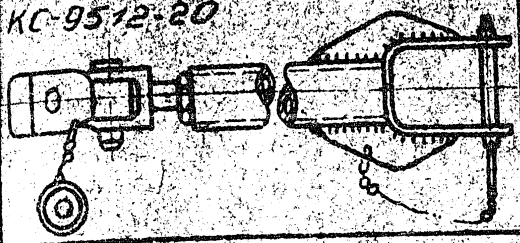
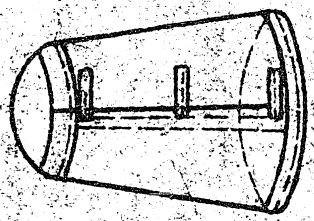
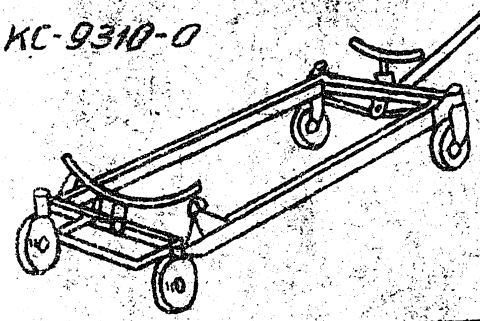
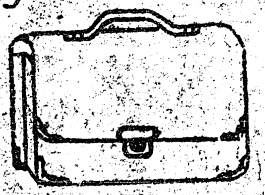
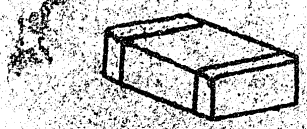
FOR GROUND EQUIPMENT

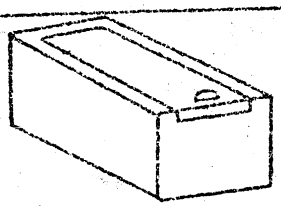
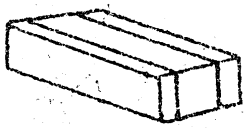
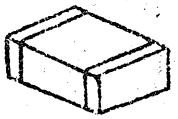
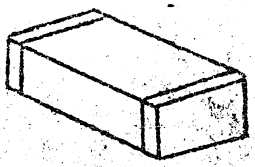
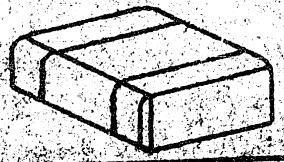
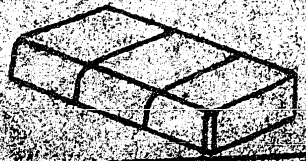
AND INDIVIDUAL SET

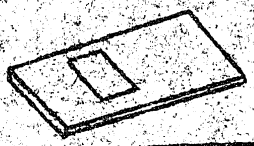
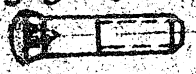
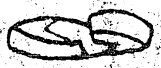
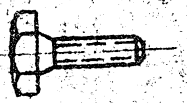
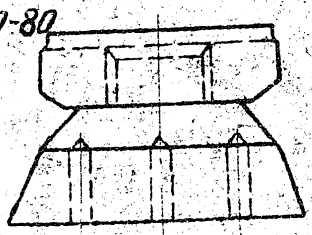
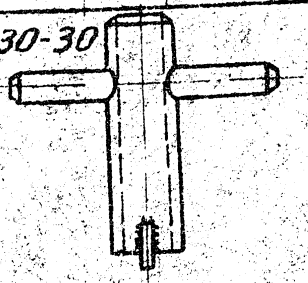
1:1

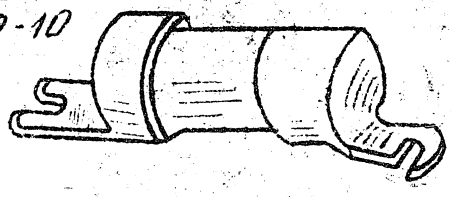
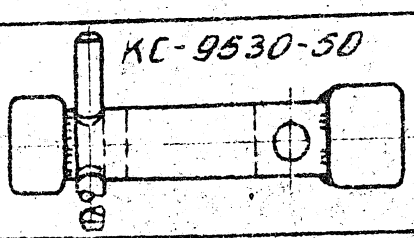
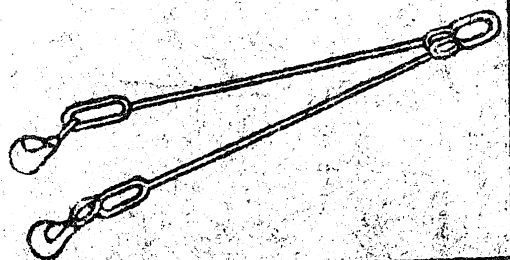
AIRCRAFT

Detail and equipment No.	Case No.	Name
08K/014 		Front shield. 1 in set.
08K/015 		Rear shield. 1 in set.
KC-9710-0	1	Fuselage front 1 in set.
		Fuselage end. 1 in set.
KC-7106-1110 	1-1	Cradle bonding strip. 2 in set.

Detail and equipment No	Case No	Name
KC-9512-20 	Installed on item.	Wing rod-support. 2 in set.
08KC/054A 		Cover for preservation of item „KC" 1 in set.
	1-1	Cover for front and rear cover of engine 2 in set.
KC-9310-0 		Hangar trolley. 1 in set.
Артикул 4043 		Documentation bag. 1 in set.
MA-500M 	1-1	Convertor spare parts. 1 set.

Detail and equipment No	Case No	Name
ИА-250М 	1-1	Spare parts for convertor. 1 set.
К1-М 	1-1	Spare parts for each radar station. 1 set.
КР-1 	1-1	Starting coil spare parts. 1 set.
	1-1	Electrical actuator. 1 set.
630613 	1-1	Stopvalve gaskets. 2 in set.
	1-1	Spare brush. 4 in set.
И1-3-0-002 	1-1	Wave guide section gasket. 5 in set.
	1-1	Brushes for electrical actuator 2 in set.
	1-1	Spare parts for generator 1 set.

Detail and equipment No	Case No	Name
		Illustrated List ground equipment. 1 set.
	1-1	P.C.V. Bag for cradle attachment bolts. 1 in set.
155H555-5-16-14 	1-1	Bolt for hatch attachment. 20 in set.
15A49-6 	1-1	Sprnig washer 4 in set.
KC-7106-102 	1-1	Cradle attachment bolts. 2 in set.
KC-1800-80 	1-1	Nut for wing attachment. 4 in set.
KC-9530-30 	1-1	Key for wing attachment. Supplied with each 2 item KC. 1 in set.
KC-7901-3056x 	1-1	Washer for wing pickups. 2 in set.

Detail and equipment No	Case No	Name
291C50-2-19-150 	1-1	Sprrig for wing attachment. 2 in set.
155H555-6-16-12 	1-1	Bolt for hatch attachment. 50 in set.
UP-10 	1-1	Delayed action fuse. 2 in set.
KC-6100-18 	1-1	Ring gasket for KC-6100-140 valve ring. 5 in set.
KC-9530-50 	1-1	Key for cradle rigid mount bolts. Supplied with each 3 item KC 1 in set.
KC-8400-110 	1-1	Safety-bar extractors. 1 set
KC-6100-202. 	1-1	Gasket for stop valve. 1 in kit.

Inspector

SUPPLEMENT TO INSTRUCTION No.369-ИЭ

I N S T R U C T I O N S

FOR CHECKING REFERENCE INSTRUMENTS ON PANELS OF 369 ITEM TEST EQUIPMENT

I. INTRODUCTION

This instruction is to be adhered to, when checking the reference instruments on the DA-369 test equipment panels during their service and storage within the guaranteed service life. The checks are performed together with the periodic maintenance operations in accordance with this instruction.

II. GENERAL

The tests are to be carried out under the following conditions:

a) at an ambient air temperature of $+20^{0}\pm5^{0}$C;

b) at an air pressure equal to the atmospheric pressure in the place of the test;

c) at a relative air humidity of 30 to 80 per cent;

d) the reference instruments should have valid certificates which certify their serviceability.

III. PERIODIC MAINTENANCE OPERATIONS IN SERVICE AND STORAGE

The periodic maintenance operations consist in checking the test panels and are performed to determine their serviceability or possibility of their further storage and also to bring them into conformity with the specifications, if necessary.

The periodic maintenance operations are performed by the technicians of the using organization or the Mfr's plant. Entries about the periodic maintenance operations performed are made in a special book by the engineer or chief technician of the organization.

The periodic maintenance operations are performed in the following manner and sequence.

After every 2 months:

1. Inspect all the plug connectors of the connecting cables for damage and corrosion, and remove dust and dirt from them. If corrosion signs are found on the pins, wash the pins with a brush dampened in alcohol and wipe with a cloth.

2. Remove the covers from the [redacted] test panels, inspect the outer surfaces of the panels, instrument panels and plug connectors for damage, panels for proper attachment and shock mounting.

Wipe the outer surfaces with a cloth to remove dust and moisture.

If the plug connector contacts are dirty or affected by corrosion, wash and wipe them clean as described in para.1 of this instruction.

3. Check the knobs for attachment and tighten those loose.

4. If in operation of the [redacted] test panel an unsmooth movement of the "Signal" milliammeter pointer occur due to a

dirty potentiometer, remove the panel and wipe the potentiometer with a chamois cloth slightly dampened in rectified alcohol.

NOTE: a) Carry out the above described operations immediately after a defect is detected during the panel operation irrespective of the time the periodic maintenance operations are to be performed.

b) When installing the panel on shock mounts, seal the panel with sealing compound by filling the sealing cup with the compound and place the cup under the panel attachment screw.

5. Check the panel electric instruments for accurate readings, taking into consideration that the test equipment for the 360 item is manufactured in the following two versions:

1) with reference instruments ensuring operation of the test equipment panels within the temperature range of -35° to $+50^{\circ}$C(M5-2, 3-42I, M1-46).

2) with reference instruments ensuring operation of the test panels within the temperature range of -20° to $+50^{\circ}$C (M4-70, M4C, M4T-70, M1-46).

Given below are permissible errors of the reference instruments for both versions of the test equipment. Therefore, when checking an instrument, refer to the tolerances for the type of the instrument whose error is to be checked.

cking the Reference Instruments of KIIA-I Test Panel

1. Check the operation of the control surfaces position indicators on the KIIA-I test panel as follows:

a) supply 26 V. D.C. to the 43/12(-)-43/13(+) pins;

b) set the "PANEL POWER SUPPLY" switch to the "BOARD CHECK";

c) supply 26 V.D.C. via a 20 kohms resistor to the 15-14, 16-17, 18-19 pins of plug connector No.43 in turn with the polarity indicated in table No.1.

In this case the indicator pointers should move to the right.

Table No.1.

Supplied voltage polarity		Indicator	Direction of indicator pointer deflection
+	-		
15	14	"Direction"	to the right
16	17	"Pitch"	to the right
18	19	"Bank"	to the right

Change the polarity of the supplied voltage; in this case the indicator pointers should move to the left.

2. Check the reading error of the panel power supply voltmeter by connecting to the 43/12-43/13 pins a d.c. reference voltmeter (0.5 degree of precision with the scale graduated from 0 to 30 V).

Difference in the readings of the two voltmeters should not exceed:

0.9 V - for the M5-2 voltmeter,

0.6 V - for the [illegible] voltmeter.

3. Check the control signal indicators for reading errors. For this purpose connect a d.c. reference milliammeter (0.5 degree of precision with a 1-0-1 mA scale to the 43/1-43/2 pins. Perform the check with the "PANEL POWER SUPPLY" switch in the "BOARD CHECK" position and the K_1 and K_2 buttons pressed. Turning the knobs of the signal preset units to both sides, compare the readings of the reference milliammeter and the control signal indicators at the scale points 0; 0.2; 0.4; 0.6; 0.8; 1. Difference in their readings, should not exceed:

0.04 mA for the [illegible] milliammeter,

0.06 mA for the M5-2 milliammeter.

Checking the Reference Instruments of [illegible] Test Panel

Test the control surface position indicators for proper functioning.

Supply 26 volts via a 20 kohms resistor in turn to the 14-15, 16-17, 18-19 pins of plug connector No.36 with the polarity indicated in table No.2, In this case the indicator pointers should move to the right.

Table No.2

Indicator	Polarity of voltage supplied to pins of plug connector No.36		Direction of indicator pointer deflection
	+	−	
"Direction"	15	14	to the right
"Pitch"	16	17	to the right
"Bank"	18	19	to the right

Change the supplied voltage polarity; this done, the indicator pointers should move to the left.

Checking the Reference Instruments of KI-I Test Panel

1. To check the supply voltmeter reading error, proceed as follows:

a) Supply +26 volts to the "+" terminal, and -26 volts to the "-" terminal of the panel;

b) connect a reference voltmeter (0.5 degree of precision) and ammeter (0.5 deg. of precision) to the 1-2 sockets of the plug connector according to the following diagram:

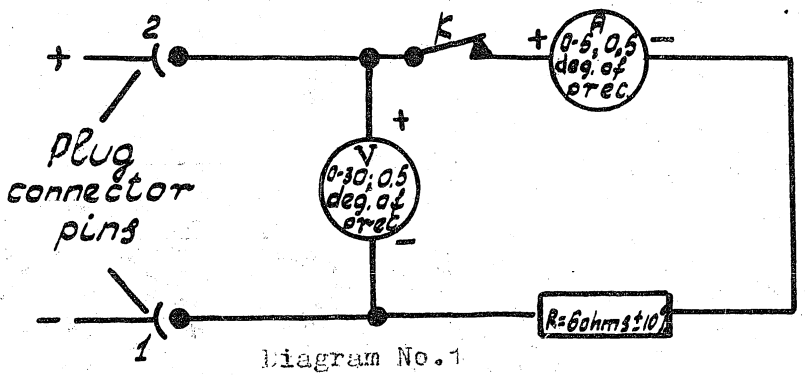


Diagram No.1

c) switch on the "PANEL POWER SUPPLY" switch; in this case the pointers of all the voltmeters and ammeters should move to the right, and the difference in their readings should not exceed:

0.9 V for the M5-2 voltmeters
0.6 V for the IIM-70 voltmeters
0.28 A for the M5-2 ammeters
0.18A for the IIM-70 ammeters.

NOTE: To take the voltmeter readings, open the ammeter circuit by the switch K.

2. To check the "SIGNAL" milliammeter reading errors proceed as follows:

a) to the 3-4 plug connector sockets connect in series the reference milliammeter of 0.5 degree of precision with a (-) scale and the resistor of 100 ohms ±10%;

b) set the "P-N-P" switch to the II-4 position;

c) set the "POWER SUPPLY" switch to the "ON" position;

d) set the "WINDING" selector switch to the "1" position, and the "SIGNAL" switch to the "1mA" position. Turn the "SIGNAL" preset unit knob on the panel clockwise, and compare the readings (on the points, marked with figures) of the panel milliammeter with those of the reference milliammeter. Difference in their readings should not exceed 0.07 mA.

e) change the polarity of the reference milliammeter connected and make a similar check, with the "SIGNAL" preset unit knob turned counterclockwise;

f) make a similar check, with the "Signal" switch in the "1.5 mA" and "2.5 mA" positions.

With the switch in those positions, the readings of the "Signal" milliammeter and the reference milliammeter should not differ in more than 0.09 mA and 0.14 mA respectively.

NOTE: For the KII-1 test panel whose "SIGNAL"milliammeter of M-70 type has a "3-0-3" mA scale,the check is performed in a similar manner;difference between the readings of the milliammeters in this case must not exceed 0.11 mA.

Checking the Reference Instruments of IIL-5 Test Panel

1. Check the power supply circuit voltmeter readings for error:

a) supply +26 volts to the "+26 V" terminal, and -26 volts to the "-26 V" terminal of the panel;

b) connect a reference voltmeter (0.5 degree of precision, 0-30 V scale) and an ammeter (0.5 degree of precision, 0-5A scale) to the 1-2 sockets of the cable plug connector according to the following diagram:

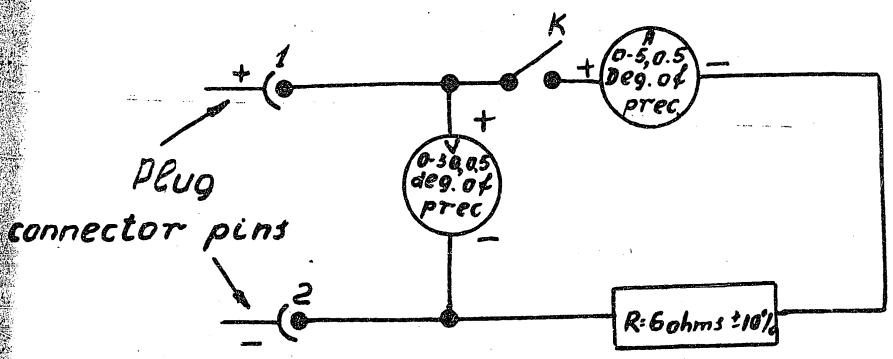


Diagram No.1a

NOTE: If an astatic voltmeter (0.5 degree of precision) is used, disconnect the latter, when checking the ammeter.

c) switch on the "PANEL POWER SUPPLY" switch, this done, the voltmeter pointers should move to the right and difference between their readings should not exceed:

0.9 V for M5-2 voltmeters,

0.6 V for M4-70 voltmeters,

d) close the ammeter circuit by the "K" switch; in this case the ammeter pointers should move to the right and difference between the readings of both ammeters should not exceed:

0.15 A for M5-2 ammeters,

0.1 A for M4-0 ammeters.

3. Check the a.c. voltmeter and ammeter for reading error proceeding as follows:

a) set the phase selector switch to the "1" position;

b) connect a reference ammeter (0.5 degree of precision, 0-1A scale) and a reference voltmeter (0.5 degree of precision, 0-60 V scale) to the 4-4 sockets of the panel plug connector and supply voltage according to the following diagram:

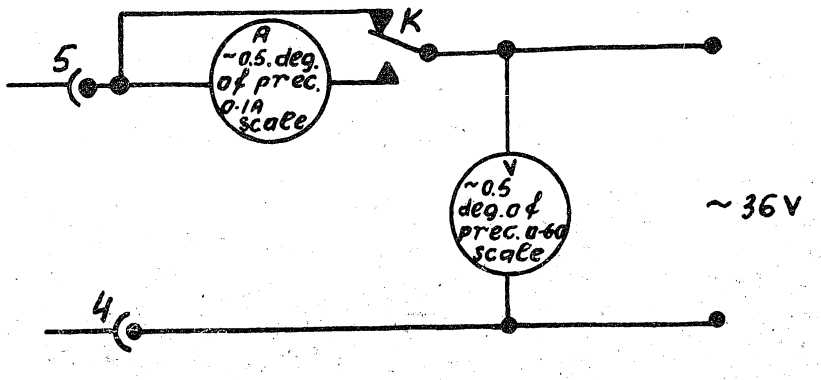


Diagram No.2.

c) switch on the "LOAD" switch on the panel: the p nel ammeter and voltmeter pointers should move to the right.

In this case difference in the readings of the electric instruments should not exceed.

1.3 V for a M-10 voltmeter,

0.03 ma for a M-42 ammeter,

0.03 ma for a M-70 ammeter.

When taking the voltmeter readings, open the ammeter circuit by the "K" switch.