

SECRET
NO FOREIGN D

50X1

MARINE RADAR TYPE "ZARNICA"

Volume I: Technical Description

Volume II: Specifications and Diagrams

GROUP 1
Excluded from automatic
downgrading and
declassification

SECRET
NO FOREIGN DISSEM

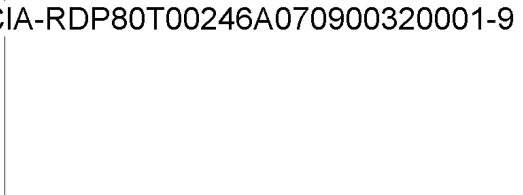
S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

SECRET
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- 1 -

50X1

C E R T I F I C A T E .

For the MARINE RADAR TYPE "EARTHICA" No. MK-C73
produced at 1954 in USSR, mounted on the salvaged
ship at [redacted]

Marine radar type "EARTHICA" destined to discover over
waters aims and the low flying aeroplanes.
It enables [redacted] observation. Scanner
driving [redacted] or with
gyroscopically [redacted] to the course's
deflection [redacted] is maintained
in the [redacted] north.
This [redacted] the aim
bearing [redacted]

The power [redacted] angle
determination [redacted] marine
radar [redacted] too.

[redacted]

- Supply [redacted]
- Supply [redacted]
- Primary [redacted] 220V/110V
direct current
- Total power [redacted]
- Peak power [redacted]
- Loading resistance [redacted] impulse voltage
during loading : 3,4 - 4,5 kV ,
- Loading impulse current : c.a. 20A
- Impulse shape : very near to the rectangle
- Voltage over output : 120 - 140 V.
- [redacted] voltage : 110V , 400 o/s
- [redacted] current input if 110V, 400 o/s
[redacted] about 1,7 Ampe
- [redacted] input 110V, 400 o/s
[redacted] about 1,5 VA

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 2 -

50X1

- Magnetron filament voltage : 6,3 V
- Filament current : 1,7 Amps.
- Impulse led to the magnetron power about 30 kW.
- Generator power output measured in the R.F. not:
not less than 80 kW /average output generator
power : about 32 kW.
- Impulse electrode voltage : about 15,5 kV ,
- Average magnetron current : 7 ± 2 mA ,
- Magnetron efficiency : 50-60% ,
- Magnetron magnet : magnetic field strength
1800 - 1850 G ;
- Impulse transformer primary winding voltage :
about 4 kV ,
- Impulse transformer ratio : 7-4
- Peak led to the impulse transformer power;
about 350 kW .
- Working frequency : about 3000 Mc/s ;
wavelength = 10 cm
- Impulse duration : 1 microsecond ;
- Repetition frequency : 400 impulses/sec ;
- Receiver luminous sensitivity : 2×10^{-12} W/67 db/
- Frequency band breadth : $2 \pm 0,5$ Mc/s.
- Intermediate frequency : 50 Mc/s
- Mixer current : not less than 0,6 milliamps.
- Dumb beam breadth of the horizontal
radiation : 14°
- Admissible maintenance of the lateral and back
radiation level up to 0,8% in relation to the
maximum power.
- Dead region : 1,5 - 2 cables ;
- Indicator type PFI / panoramic with the valve
type 15K-1
- Distance ranges : 2,5 ; 15 ; 50 miles.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

2. The principle exploitation data.

- Radar service : 1 operator
- Continuous work period : 2 hours.
- Scanner revolutions : 11 - 15 r.p.m.
- Preparation works time before "ON" : 3-5 minutes
- Admissible supply voltage drop : $\pm 10\%$
- Admissible air moisture : $95 \pm 3\%$ if the temperature is up to $20 \pm 5^\circ\text{C}$.
- A new MARINE RADAR TYPE "ZARNICA" worked on board of the ship during regulation and tuning : 40 hours.

3. Marine Radar type "ZARNICA"

o n t a i n s :

- Mast with the scanner unit and transmitting-receiving arrangement "A"
- T-R arrangement "F"
- Scanner unit "AU"
- Indicator "I"
- Intermediate frequency amplifier "U"
- Receiver rectifier "W"
- Control resonator /echoresonator/ "EK"
- Switch block "BW"
- Converter with the modulator "KA-M"
- Converter "EA"
- Modulator "M"
- Voltage regulation block "RKW"
- Measuring instrument block "BP"
- Synchronising box "KS"
- Filter "KF"
- T-R switch "R.Cz"
- Distance amplifications's regulation set "ZRE"
- Tools and spare parts "ZIP"

GUARANTEE ENGINEER

S-E-C-R-E-T
NO FOREIGN DISSE

- 1 -

50X1

TECHNICAL DESCRIPTION OF THE MARINE RADAR
TYPE "ZARNICA"

Destination

The Marine Radar Type "Zarnica" is destined for detecting targets on the sea level and low-down flying aeroplanes. It enables a continuous and circular observations.

Principal technical data

The principal technical data of the marine radar type "ZARNICA" are as follows:

1. Supply voltage - 110 V
2. Frequency of the supply voltage - 400 Hz
3. Original supply source - D.C. ship's mains 110 V
4. Total power consumption - about 1.5 kW
5. Total weight - about 420 kg
6. Service personnel - 3 operators

THE MARINE RADAR SET TYPE "ZARNICA"

Marine radar type "ZARNICA" consists of following principal blocks and units:

1. "MA" - "M" unit, which consists of a 110 V \pm 110 V 400 Hz converter type MGL - M and a modulator with rotary discharger.
2. "A" unit which consists of block "P", mast and scanner unit "AU"; block "P" contains the transmitter, consisting of magnetron and T-R/transmitting-receiving/cell and the receiver, consisting of a crystal mixer, klystron, intermediate frequency /IF/ amplifier, detector and impulses limiter. "AU" scanner unit consists of the radiation set and driving mechanism.
3. Block "I" - display unit, which contains a complete T. I tube, time base set, rectifier and regulation controls placed on the front panel.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 2 -

50X1

4. Block "R" - receiver supply rectifier.
5. Block "IS" - synchronizing box of the scanner's initial position with the gyrocompass.
6. Block "BP" - measuring instrument block for the ship mains and converter voltage control.
7. "EK" instrument - echoresonator for the control and adjusting purposes if there are no targets reflecting electromagnetic waves.
8. Block "BW" - mains switch block.
9. "RKW-42" block - adjusting box of the converters ~~170~~ V, 400 Hz A.C. voltage.
10. "ZIP" - spare parts and tools set.

Radars supply system

The original source of the radar supply is the D.C. 110 V ship's mains. The converter type MGL-A converts the 220 V D.C. voltage to 220 V 400 Hz A.C. voltage.

The A.C. voltage generated by the converter is stabilized by a carbon-pile automatic voltage regulator.

The 400 Hz A.C. voltage supplies all radar rectifiers, valves filament, deflecting coils synchronous driving system, solenoids /transmitter and receiver/ and fan's motor.

The ship's D.C. mains voltage supplies the converter's motor, the scanner driving motor and the wave-guide electromagnetic coil in block "P".

The power supply circuits for all consumers are protected with fuses located in switch block "BW" and in blocks "I" and "W".

The total radars power consumption from the ship's mains amounts to 1,7 kW. The total A.C. ~~110~~ V, 400 Hz radars consumption from the converter amounts to 1 kW/without additional units collaborating with the radar set/.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 3 -

Block 20 shows the radar cable diagram.

50X1

Converter MGL - A

Block "MA" mounted on the same base plate as the modulator "M" is destined for supplying the radar's blocks with 110 V, 400 Hz A.C.

Block "MA" consists of:

- converter type MGL - A
- D.C. magnet starter
- control box type RKW-422.

The starter is fixed directly to the converter motor. Control box is located near the display unit.

Table 6

Converter's type MGL - A ratings

Specification	Unit	Motor	Generator
1.	2.	3.	4.
Power	kW	0,9	1,35
Voltage	V	220	115
Current	A	19	13
Revolutions	r.p.m.	4800	4800
Frequency	Hz	400	400
cos	-	0,9	0,9

The control box type RKW-422 is provided for the remote hand or automatic operated control of the outgoing converter's voltage. The automatic voltage regulator type URW-422 is provided for automatic control of the converter's outgoing /110 V 400 Hz/ voltage. The 110 V, 400 Hz voltage level, which is to be maintained by the automatic voltage regulator, can be adjusted in the regulation box type RKW-422.

This voltage may change because of the load changes and the ship's main voltage changes, supplying the converter.

The voltage regulator adjusts the converter's exciting windings current. The converter's exciting windings current increases if the converter voltage decreases and vice versa.

Automatic voltage regulator is switched on if the box RKW-422 switch is in position "Automatic".

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

= 4 =

The control wheel "voltage adjusting" is provided for working 50X1 voltage regulation. If the automatic voltage regulator is damaged, the converter's voltage can be adjusted by the emergency hand operated resistor situated in the control box. The emergency hand operated resistor is switched on if the box RKW-422 switch is in position "hand operating".

SERVICE OF THE MARINE RADAR TYPE "ZARNICA"

Switching on and off of the marine radar type "ZARNICA".

Preparing the radar for switching on.

Before switching on the radar it is necessary to know all radar blocks works and individual control and tuning units.

To prepare the radar for switching on following operations to be done:

- a. The switch /135/ "scanner rotation" to be put to "off" position.
- b. ~~Work switch "normal work - emergency work" to be put to "normal work" position.~~
- c. Potentiometer /77/ control wheel "Brightness" to be put to the left end position,
- d. Potentiometer /48/ control wheel "Scale lighting" to be put to the middle position.

If the potentiometer control wheel "Brightness" will be left in the right end position, the PPI tube screen clearance increases rapidly immediately after switching on the radar. It can lead to the PPI tube screen burning.

The first switching on and calibrating ^{of the} radar.

1. Before switching on the radar, it is necessary to check once again the cables location, and individual blocks connections according to the main diagram.
2. All switches to be put to "off" position and the insulation resistance to be checked according to appendix 10.
3. Potentiometer "Brightness" and "Gain" control wheels to be put to left end position.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T |
NO FOREIGN DISSEM |

- 5 -

50X1

4. Switch on the ship's system voltage with the switch block B1 and check the 220 V D.C. voltage value with the block DP voltmeter (410V).
5. Main switch control wheel located in the display unit front plate to be put to "ON" position.
6. The 220 V, 400 Hz A.C. voltage to be checked with the block BP voltmeter.
7. Converter H01-B and transmitter block motor fan work to be checked.
8. To heat the radar during 10 minutes. In winter the radar to be heated during 15-20 minutes.
9. The display unit scale lighting to be checked. The scale lighting indicates simultaneously that the 220 V, 400 Hz voltage is applied to the set.
10. Check if the time base line does not appear on the P11 tube screen when turning slowly the potentiometer control wheel "Brightness" to the right and then back to the left end.
If the time base ^{line} / TB line appears, it is necessary to withdraw the block from the housing and to adjust [the flip-flop circuit valve] control grid voltage of [...]
11. Switch on the high tension /HT/ and turn slowly the potentiometer control wheel "Brightness" until the TB line appears. Switch on the sonar unit driving set and check the TB line focusing. The potentiometer control wheel "Focusing" optimum position is the middle position. If on the P11 tube screen does not appear a bright spot and the TB line, it is necessary to check the P11 tube and the work of all rectifier. If the bright spot appears on the screen centre, but no TB line is visible, it is necessary to check if the cables No. 9 and 12 in the display unit are correctly connected and then to check the following valves: 9a, 9b, 9c and 12.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 6 -

12. After the dB line on the P I tube appears, turn slowly to 50X1
and right the potentiometer control wheel "Gain" until obtain-
ing reflected signals on the P I screen. Then turn the po-
tentiometer control wheel "Calibration" until the calibration
rings appear on the P I screen.

If there are no reflected signals, it is necessary to check
the generator's radiation with the neon discharge lamp. To do
this it is necessary to bring the neon discharge lamp close
to the transmitter out-put near the joint gland.

If there is no U.H.F. generation it is necessary to check:
the veil lifting, the artificial line discharging in the
arc chamber and the cable No. 5, connecting the modulator
with the transmitter. The magnetron current to be measured.
If there is no magnetron current it is necessary to remove
the magnetron.

If, however the radiation exists, it is necessary to check
the current connections of cable No. 8, connecting the display
unit with the transmitter. Check then the display unit valve
9k and 9l. Check whether the voltage stabilization and
rectifier valves 5C3F and 5C4S in the W rectifier have fila-
ment supply. Withdraw afterwards the TR coil housing and check
the receiver block valves. All receiver block valves should
be hot. The cold ones should be replaced.

Check the klystron filament supply voltage. Measure with
the A-1 voltmeter the terminal plate No. 101 voltages.

- the voltage value of the terminal No. 1 to be +250 V
- the voltage value of the terminal No. 3 to be +130 V
- the voltage value of the terminals 4 and 5 to be
110 V, 400 Hz

- the terminal No. 2 voltage should change within the
limits 0 - 130 V while adjusting the potentiometer
"Gain", located on the display unit front plate.

The crystal current to be measured. If there is no crystal
current it is necessary to replace the crystal. If there is
no current even after crystal's replacement, it is necessary
to make mechanical and electrical adjusting of the klystron.
If there is still no crystal current, the klystron should be
replaced and the klystron circuits should be tuned again.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

7

13. Check the accuracy of the calibration rings. Check the limit of the 25 line length. The limit of the 25 lines should be visible on the P.I screen between the calibration rings. 50X1

a/ not less than 4.9 but not more than 5.9 for the 150, 110 and 80 miles distance ranges;

b/ not less than 1.9 but not more than 2.9 for the two miles distance ranges:-.

14. Check the possibility of tuning and centralising of the RB. The RB line origin should move smoothly from the centre to the screen edge. It should be possible to shift the time base within 2-3 millimeters from the centre during normal working.

15. Check the continuously adjustable accuracy of the receiver when there are reflecting targets on the P.I screen. For this purpose it is necessary to choose a visible and far located target and set the scanner exactly to the target's direction. Afterwards turn the potentiometer control wheel "Fine tuning" until a maximal brightness of the reflected target will be obtained. The potentiometer control wheel should be located in this case within the 4-6 scale graduations. If the position of the potentiometer control wheel "Fine tuning" will differ from the above, it is necessary to adjust the potentiometer control wheel "Tuning" until a correct position of the potentiometer control wheel "Fine tuning" will be obtained. While turning the potentiometer control wheel "Fine tuning" from the centre position in both directions, the brightness of the targets should be continuously decrease. If there is a rapid signal disappearing it means that the Myster circuit is not correctly tuned.

The brightness of the signals reflected from close located targets can decrease when turning of the potentiometer control wheel "Fine tuning" in one direction and when turning in the other direction, the signals can completely disappear.

16. Check the ship's heading /heading marker/ and adjust it suitable. To this it is necessary to stop the scanner unit in an optional direction, switch off the radar and turn the scanner unit by hand to the ship symmetric plane.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 8 -

Afterwards slack ^{bells fixing} the microswitches joint ~~fixing screws~~ and lead them under the microswitches in such a way that they begin to work, whereupon fix the joint.

50X1

Switch on the radar again and check its work.

17. Switch on the 90 range scale and check the breadth of the ship's headline; it should not exceed 1.5° on the scale.

~~18. To check the radar while working, an emergency supply circuits.~~

Switching on of the Radar

To Switch on the radar proceed as follows:

1. Main switch "EW" control wheel to be put to "ON" position.
2. The block "BP" switch to be put to "Ship system" position and ship system 110 V supply voltage to be checked.

The ship system supply voltage value is correct if the block "BP" voltmeter arrow is located within the black scale sector. There is a $\pm 10\%$ voltage value tolerance within the black scale sector. If the voltmeter arrow points other value than black scale sector, the switching on of the radar is prohibited.

3. The switch "start-stop" on the front plate of block "I" to be put to "start" position.
4. The 110 V, 400 Hz A.C. voltage to be checked with the voltmeter in block "BP". For this purpose switch the control wheel to "110 V 400 Hz" position on the "BP" block.
5. To check the operating of hand and automatic voltage regulation. The control wheel "Hand-Automatic" in the "RW" block front plate put to "Hand" position. With the hand regulating control wheel adjust the 110 V, 400 Hz voltage value. Moreover the voltmeter arrow in the block "BP" will be within the narrower sector. The control wheel "Hand-Automatic" set to the position "Automatic": with the "voltage adjusting" control wheel adjust the voltage value of 110 V, 400 Hz, observing the voltmeter in "BP" block.
6. With the potentiometer */37/* control wheel "brightness" check the PPI tube work. To do this it is necessary to turn continuously the potentiometer */77/* control wheel to the right until the bright spot, in the centre of the PPI screen appears. Then the potentiometer control wheel to be turned back to the left end.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 9 -

50X1

7. The block "I" front plate push button /119/ "High tension on" to be pushed after three minutes. It is strictly prohibited to switch on the high tension earlier than after three minutes from the moment of switching on the radar.

The verification of the work and calibration of the radar blocks

After each switching on it is necessary to verify and to adjust the individual radar blocks and instruments. It is necessary to do the following works:

1. Potentiometer /77/ control wheel "Brightness" located on the display unit block front plate to be turned right until a bright TB line on the PPI screen appears.
2. With the potentiometer /80/ control wheel "Focusing" the TB line acuteness to be correctly adjusted.
3. The switch /135/ "Scanner revolutions" situated on the front plate of the display unit should be turned to "Right" or "Left" position, moreover the TB line should rotate on the PPI screen in the same direction as the scanner unit.
4. With the potentiometer /74/ control wheel "Suitable brightness of the calibration wings on the PPI screen" should be adjusted.
5. With the potentiometer /27/ "Centralizing" set the TB line origin in a distance of 2-3 millimeters from the PPI screen centre. The TB line adjusting is correctly made if the TB line, while rotating, limits a 4-6 millimeter diameter dark spot in the PPI screen centre.
6. With the potentiometer /48/ control wheel "Scale lighting" the suitable scale lighting to be adjusted.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 10 -

50X1

7. In order to be tuned to the control resonator signal. To do this it is necessary:
- a/ Set the scanner to the control scanner/21/direction, which is located under the scanner unit cupola; in this case the RB line on the P-I screen should be directed at 180° in relation to the ships head line /e.g. opposite to the ships head line/;
 - b/ The range scale switch /5/ to be put to 5 miles range position;
 - c/ The control resonator to be switched on with the lever /4/;
 - d/ The resonator to be tuned to the resonant frequency, by which the neon discharge lamp indicates the biggest brightness;
 - e/ With the potentiometer /12A/ control wheel "fine tuning" situated on the front plate of the display unit a maximum control resonator signal length on the P-I screen to be obtained; the normal control resonator signal length adequate to the distance not less than 1-2 nautical miles /RM/;
 - f/ The control resonator to be switched off with the lever /4/.

Switching off of the Radar

To switch off the radar proceed as follows:

- a/ the switch /135/"Scanner revolutions" to be put to "Off" position.
- b/ potentiometers /77/"Brightness" and /129/"Gain" put to left end position /anti-clockwise direction/;

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 11 -

50X1

- c/ switch off the high tension by pressing the push-button /120/ on the display unit front plate,
- d/ the switch /116/ "Start-stop" put to "Stop" position,
- e/ the ship's mains voltage switch "BT" put to "Off" position.

Notice: The radar emergency switching off, can be used only in case of fatal accident takes place/e.g. electrical strike, short circuit etc./.

The emergency radar switching off follows after rapidly switching off the ship's mains, supplying the whole radar set, putting the "BT" in "off" position.

Full readiness conditions

To switch on the radar in case of alarm it is necessary to carry out all operations described in subsection "switching on the radar" except the paragraph 7.

Emergency switching on

When the radar is working during longer period without interruption the transmitting-receiving arrangements are heating up very much.

One thermal switch is provided in the radar to protect against overheating. It switches off the HT supply circuit if the radar is going to be hot and enables further operating of the radar unit.

The radar unit has the possibility to work continuously even in case the transceiver unit is overheated. For this purpose the radar should be switched to "emergency work". ~~As get into radar a emergency work before switching off the HT by the thermal switch, it is necessary to press the push button on the display unit front plate and not releasing it to set the switch /116/ in the "Emergency" position.~~

~~Emergency switching on can be executed on the order of the radio officer or ship's commander only.~~

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 12 -

Working of the Marine Radar in battle conditions

50X1

Before commencing to trace the targets, following operations should be carried out:

- a/ The range switch to be set to 50 SM
- b/ The scanner unit to be switched on.
- c/ The H.T. to be switched on by pressing the H.T. push button on the display unit plate.

The targets tracing is based on the thorough observation of the PPI screen.

The signals reflected from targets are visible as bright spots. About every detected target and appearing of new targets the operator is obliged to announce immediately to the adequate commander.

During targets tracing the brightness of the calibration rings should be so tuned that they would be hardly visible on the PPI screen. At a strong light of the calibration rings, the observation of targets is difficult, especially for targets, amplitude of which is very small.

Experienced operator can approximately determine from the kind of signals reflected from targets, the class of vessel, type of airplanes and number of targets displaced nearby.

In every case the greater targets will be detected from longer distance. The high, rocky shore will be detected from longer distance, than low one.

In order to determine approximately the kind of a target the operator should know the speed of pulse propagation on the PPI screen, pulses of pulse and distance from target.

To make final classification of target and having these data, operator should take into account following principles:

- a/ the number of the reflected pulses on the PPI screen is corresponding always to the targets number.
- b/ If the pulse with the relatively small length, is unproportionally wide, then in the most cases it can be two or several targets situated in close distance between them.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 13 -

50X1

- c/ the lowdown flying aeroplanes will be recognized in the most cases by the high speed of propagation of the spots on the P.P.I. screen;
- d/ the high shore is appearing on the screen as light spots let the low shore softly falling down to the sea direction, is giving weak and little glaring reflection.
- e/ reflections on the P.P.I. screen deriving from the clouds will be visible as spots of small brightness, proceeding to the wind direction.

Every operator is obliged to systematic studying of the principles of detecting and determining of various kinds of targets on the P.P.I. screen.

Reflections deriving from the sea waves, at the sea condition 3 - 4^o B, by normal amplification can overshadow the picture at the beginning of R. B. - on the distance up to 1 SM, and the close laying targets may be invisible. In such case, for close distance observation, the R.M. amplification block may be switched on. For this purpose, the potentiometer 104 SW on the display unit frame plate should be turned to the right.

If there arise necessity to use the radar for navigation purposes, the amplification should be decreased because at the same time decreases the breadth of pulses on the P.P.I. screen, which improve the focus of a picture and decrease the dead zones of radar.

Distance determination.

For determining the distance to a target, brightness of calibration rings should be so tuned, with the potentiometer "Calibration", that they would be clearly visible along the TB line.

The distance between the calibration rings depends from position of the switch range.

The radar has four distance ranges: 2, 5, 15, 50 SM.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 14 -

The distances between calibration rings amount correspondingly to the ranges: 1, 1, 5 and 10 SM.

50X1

Every operator is obliged to know by heart the distances between calibration rings adequate to each range.

If the target, to which the distance is to be determined, is situated on a calibration ring, then the successive number of calibration ring, counting from the centre of the screen, will point the distance. If the target is situated between two calibration rings, then the distance is to be read approximately by optical interpolation - between calibration rings.

Working of the Marine Radar in various weather conditions

Using the radar it is possible to determine the coordinates of a target at any time a day, 24 hours, and practically in any weather conditions.

But it is to remember that in some cases, at especially favourable weather conditions, air temperature, humidity, air pressure, altitude of clouds, it can happen that the detecting distance will increase exceeding a little bit the normal range.

Also an opposite phenomenon can take place when inconvenient weather conditions decrease the waves propagation. In such a case the detecting distance will be smaller than normal range.

Favourable weather conditions, by which the detecting distance of radar increases, take place very often.

Opposite phenomenon can be observed rarely. The attenuation of electromagnetic waves caused by heavy rain is insignificant and has not serious influence on the detecting distance for the radar in question.

Working of the Marine Radar in case of average of particular instruments and blocks

Operator being on duty watch of battle should not interrupt the observation, even when some damaged of radar's units will be stated.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

- 15 -

The operator is obliged to report immediately to his adequate commander about any damage of radar's block or unit, and receive from his particular for performing the battle watch at radar, working with not fully technical efficiency.

In case the cardex pile regulator will be damaged, the handoperated voltage regulation 110 V, 400 Hz to be used. For this purpose the switch "Hand-Automatic" in block "RMT" should be set in the position "Hand"; at the same time the arrow in the scanning instrument of block "RMT" should be situated within the ascertained sector.

When in the stabilization system a limit will be stated i. e. the course change will not be introduced into the scanner unit, then the position of "course marker" on F.I screen will not correspond to the true course of vessel.

In such conditions the operator can determine the distance to target and the course angle only.

The targets bearing can not be determined in this case.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 16 -

TECHNICAL SERVICE

TRANSMITTING ARRANGEMENTS

50X1

Calibration of the transmitting unit should be carried out only in case of abnormal working of the transmitter will be stated or some elements and blocks of the unit will be found defective. While operating the transmitter unit following elements can be calibrated:

- a/ magnetron coupling with waveguide - scanner unit,
- b/ air gap between the permanent electrodes and movable electrodes and the angle between them.

Besides of that the discharging phase of the artificial line to be checked.

The magnetron coupling with waveguide scanner unit should be calibrated during magnetron replacement.

The air gap between the permanent electrode and movable electrodes and the angle between them should be calibrated after replacement of the rotary arc chamber.

The discharging phase of the artificial line should be calibrated after replacement of movable electrodes, discharging chamber or converter HLL.

Magnetron replacement and calibration of coupling with waveguide scanner unit

For removal of magnetron proceed as follows:

- a/ Take off the cover from the chassis on the upper part of the magnetron.
- b/ Disconnect magnetron filament conductors by removing the plugs from the magnetron socket.
- c/ Unscrew the big knurled nut "1", which fastens the magnetron to the T.R. cell waveguide section /drawing 9/.
- d/ Unscrew with screwdriver four retaining screws fastening the flange of magnetron to supporting plate; by removing the screws from the rear side the half-round washer to be supported with one hand and then removed.
- e/ Unscrew two first screws and take off carefully the magnetron until the anode terminal is withdrawn from the T.R. cell waveguide section. Select now from the magnetron the corner, supporting plate and strip by removing two prior unscrewed screws.
- f/ With the help of special tongs, spanner and screwdriver, which are in the tool set, remove the anode coupling terminal as follows:

catch the terminal with tongs whereby the two outstanding tongs pins insert into the holes of the terminal stay, using special spanner remove the upper part of the terminal.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 11 -

50X1

- With special screwdriver release the turnbuckle

- remove the lower part of the terminal.

The terminal layed on the loop outlet of magnetron coupling is polished, covered with thin silver sheet and bliskoned. Therefore the operating with tools must be very careful in order not to damage the terminal's surface.

To reset the magnetron proceed as follows:

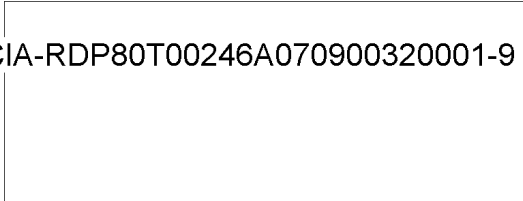
- a/ Check whether the anode outlet and terminal are clear,
- b/ Put upon the magnetron outlet the terminal; for this purpose insert the two outstanding pins of special tongs into the holes of the terminal stay, holding the terminal at the base insert a special screwdriver into the notch of the press-screw and turn the screwdriver right until the terminal base is wholly fastened to the magnetron outlet,
- c/ Holding the terminal with tongs hold the upper round part of the terminal and insert it using a special piece,
- d/ Check again the terminal length using pattern "A" the terminal length should not differ from the pattern more than 0.1 mm,
- e/ Put upon the supporting plate above the filament outlet,
- f/ Insert the washer between magnetron flange and supporting plate with the washer's special directed upwards,
- g/ Put upon the fastening screws on the magnetron in such way that the washer's flange screws and strip cover each other and insert in that holes two fastening screws and turn them three times right,
- h/ Set carefully the magnetron in the block, whereby the magnetron's flange should be above the chassis and magnetron's base below the chassis,
- 1/ Insert the higher screws and fasten under the magnetron flange, check if the holes of plate, washer and strip cover each other and insert in that holes two fastening screws and turn them three times,
- 2/ Tighten carefully the six screws and which fastens the magnetron to the T.K. cell magnetic section, whereby care must be taken that the magnetron's outlet will be placed in the centre of the plug in synchronism with the waveguide and the terminal will appear symmetrical to the T.K. cell waveguide section.

Remark: If the magnetron touches one of the magnet poles, then the six fastenings screws of the cell block should be necessarily relieved and the block together with the magnetron should be set in such a way, that the magnetron flange touches the chassis and will be symmetrically centered in comparison with the magnetron poles. After setting up the block the six screws to be properly fastened.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- b/ Action six fasteners connect the inner and outer conductor plugs into the sockets and fix them.
- 1/ Put on the place the transformer cover.
- a/ After magnetron replacement the cavity circuit at the coil block and the mixer circuit to be tuned. The circuit's tuning is described in this instruction.

50X1

Magnetron 1-0.1/30 replacement in generator block

For removal of magnetron proceed as follows:

- a/ take off the cover of the connection
- b/ relieve the screws on right and left supporting struts so that the struts are released the ceramic valve holder
- c/ take off the valve holder.

To refit the magnetron, the above described operations should be carried out reversely to the dismantling alternation.

Removal of magnetron electrodes of arc chamber

To replace the movable electrodes the arc chamber should be dismantled.

While replacing the permanent electrode or brushes the dismantling of arc chamber is not necessary.

The adjustment of air gap between permanent and movable electrode and the angle between them should be carried out simultaneously with the movable electrode replacement.

The dismantling of arc chamber should be carried out when the power unit is disconnected. Before commencing the dismantling it should be checked whether on the conductors the factory signs are marked, which facilitate quick and correct setting of the electrode in operation with the converters axle. These factory signs are visible through the small hole of the ventilator after taking out the filter cover. By dismantling the arc chamber the conductors are to be set in such a way that the signs cover each other.

For dismantling the arc chamber proceed as follows:

- a/ take off the ventilator cover and disconnect the inner conductor of electrical cable X-3 from the voltage regulator.
- b/ unscrew three screws fastening the electrical cable X-3 to the ventilator housing.
- c/ unscrew the screws connecting the arc chamber with converter motor and carefully take out the arc chamber.
- d/ take off the transformer plate in order to repair it later.
- e/ unscrew the screws in the cavity to be out the magnetron.
- f/ unscrew four screws in the X-3 cable and disconnect it.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 19 -

50X1

The replacement of permanent electrode can be executed through the air inlet hole. Hence to replace the permanent electrode it is not necessary to dismantle the arc chamber, but only to unloosen the fastenings screws and replace the permanent electrode by a new one.

The replacement of arc chamber brushes can be executed through brush socket, which are covered with a shield with notch for screw driver.

To refit the arc chamber proceed as follows:

- a/ Put away the wave with movable electrodes on the object of chamber axis.
 - b/ put to the wave with electrode the current-carrying and fasten them with four screws.
 - c/ set the retainer and fasten them with the screw on the arc chamber axis.
 - d/ regulate the movable electrode position. For this purpose the permanent electrode should be slightly moved until she touches the movable electrode, then in the arc with movable electrode should be burned by brush and each must be taken that all electrodes push equally and slightly the permanent electrode.
- The movable electrodes are made from ballroom steel of 1.5 mm diameter. Because of their size and shape, as all works with them must be carried out very carefully.
- If the position of one of the movable electrode differs from the position of the remaining electrode, then the electrode should be carefully bent until the same distance will be obtained. It means the distance between the movable and permanent electrode should be strictly a 2.5 mm thick pattern.
- e/ regulate the permanent electrode position by turning her in the socket until on each all distance electrodes will be obtained. This angle should be obtained a special pattern. After setting the permanent electrode, the permanent electrode should be fastened in the socket.
 - f/ insert the contact plate in the socket and fasten the arc chamber to the converter. Before fastening it should be checked whether the contact plate is in the correct position on the converter's axle and conductor does not slip.
 - g/ fasten the electrical cable from the regulator housing and the internal conductor, secured with the villit resistant.
 - h/ continuing the refitting of arc chamber all other operations should be carried out reversely to the dismantling alternation.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

-20-

50X1

Discharge phase checking

The discharging of the artificial line should take place in the event of action of the negative alternation of 110 V, 400 Hz voltage on the klystron K1-0,1/30 anode. This can be checked observing permanent sparking between electrodes of the discharge by a stand on II.

Checking take proceed as follows:

a/ disconnect the terminal of HF line insulator from the villit resistor.

b/ switch on the HF during 1-2 sec.

In sensitive sparking between arc chamber electrodes indicates that the discharging of artificial takes place in the event of action of the positive alternation of 110 V, 400 Hz voltage on the klystron K1-0,1/30 anode.

In this case the coupling of arc chamber to be disconnected from the converters HUL armature and the arc chamber shaft to be turned 180° and the coupling anew connected.

The factory signs between these two units should cover each other.

Connect the terminal of artificial line insulator to the villit resistor and switching on the HF check the discharging period.

Transceiver unit service

The service of the transceiver unit comes to carry out the periodical revisions and signature replacement in case of its damage.

During the periodical revisions special attention to be drawn whether any moisture came to the unit.

The humidity grade of unit is indicated by a humidity indicator. In case some moisture will be inside the unit, the humidity indicator will be rose-coloured.

It is strictly prohibited to switch on the radar in case while the transceiver unit moisture will be stated.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

Using metal tools be careful when operating near the magnet, also do not bring closer to the magnet tools and other metal objects. It is also prohibited to strike directly into the magnet with metal objects.

To carry out an internal preservation of the unit, the cover should be removed as follows:

- a/ turn off the rubber cover and unscrew four retaining screws/levelling/ and push forward the block until the cover comes out from the waveguide.
- b/ unscrew all bullets screws in the upper part of the block and take off the cover, sharp bending of co-axial cables to be avoided.

To disconnect the transmitter unit, the radio proceed as follows:

- 1/ unscrew the retaining screws and withdraw the big terminal plate with three glands, which is situated in the lower part of the block.
- 2/ take off from the block the terminal box disconnecting previously the connection between the terminal box and the block.
- 3/ take off the cover from the smaller terminal box, which also is situated in the lower part of the block, and disconnect the co-axial cable connected from the insulator and the connection connecting the screen with earth.
- 4/ unscrew four screws from the gland of co-axial cable and withdraw the cable from the gland.

For refitting and getting the transmitter unit in the sound-ings - reverse procedure.

Before fastening the transmitter unit in the soundings, the following operations to be done:

- a/ regulate the internal waveguide holes and glands passage in such a way that glands with walls will cover each other in vertical line and the edges of the glands passage fitting cover will be placed symmetrical in comparison with the waveguide hole.
- b/ set the glands passage (screen) parallel to the waveguide surface observing a distance 7-8 mm between them. The size of this gap will be regulated until a maximum reflected signal will be obtained on the PR screen.

During the exploitation of the transmitter unit the ventilator motor should be preserved too. This motor is placed inside the block and serves for cooling the magnetron.

The ball-bearings preservation of the motor, M-252 A is regulated for a long period, although the preservation of the water should be carried out every three months.

Adjoining the bigger terminal box with three glands/ and the inlet gland of co-axial cable, the setting surfaces should be smeared with non-drying grease.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

22

... the transmitter cover and minimum control
... should be withdrawn.

50X1

... the spare parts set (Part No. III) then in the
... the holes to avoid the moisture coming into
... the cover, the indicators
... into the unit, being prior carefully
...

SCANNER WAVEGUIDE UNIT

Operating the counter-waveguide unit, only the tuning of
the discharge cavity circuit in the 2d coil is necessary.

Tuning should be carried out after 20-40 min. from the
start of switching on the radar.

Method of resonance discharge as follows:

1. Remove the resonance discharger proceed as follows:

- a/ withdraw the ignition electrode cowl of the discharger,
- b/ remove the mixer circuit,
- c/ unhook the front and aft retaining rings,
- d/ remove carefully one half of cavity circuit,
- e/ withdraw the valve from the permanent part of the
cavity circuit.

Because the valve is very small and the electrodes are very
thin, all operations should be carried out very carefully.

Method of the resonance discharger, proceed as follows:

- a/ clean the electrodes with a soft brush with clean, dry
brush, then rub with brush with pure spirit and after-
wards again rub with a clean dry rag the remaining parts
of the circuit; rub with alcohol dry lintless in order
to remove eventual undecomposed and moisture sediment.
- b/ insert carefully the discharger to the permanent part
of the circuit, with the ignition electrode cowl
directed to the magnetron
- c/ insert on the right place the second part of the cavity
circuit and check if the bolts come into the holes
- d/ insert the ring pads on the discharger electrodes
- e/ put the retaining rings and uniformly screw them up
with both sides, afterwards fasten with special key,
- f/ insert back the ignition electrode cowl
- g/ insert back the mixer circuit and fasten them.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

-23-

Adjustment of the resonance discharger circuit of the IR cell

50X1

Adjustment of the resonance discharger circuit of the IR cell should be carried out as follows:

- a/ When in the neighbourhood are any objects reflecting energy, the radar can be tuned until obtaining the best reflected signal on the PPI screen.
- b/ The receiver amplification should be so adjusted, using the hand control of the amplification regulation placed on the front panel of the display unit, that the signal will not reach the saturation.
- c/ The maximum brightness of the signal on the PPI screen can be obtained by inside or outside turning of the discharger circuit pistons.
- d/ After obtaining the maximum signal the position of pistons should be fixed by setting screws. When there are not targets reflecting energy, the turning of the IR cell should be carried out without energy propagation in the space by means of a control resonator in following manner:
 - a/ The radar will be tuned according to the signal coming from the control resonator.
 - b/ The resonance discharger circuit will be tuned on maximum signal from control resonator in the same way like in case when there are not reflecting targets.

The final tuning of resonance discharger circuit can be checked through a hole, which is situated in the upper part of the transmitter unit cover.

Operating of the unit

Because the scanner-waveguide unit has no control elements for tuning, therefore in normal exploitation conditions the attention of the unit comes to checking the correct working of the scanner and the scanner-waveguide unit.

The durability period of the protective paint IR-1 does not exceed five to six months. After this time the paint splits and falls off. Therefore the cupola units be painted periodical every five-six months.

The painting of the scanner-unit cupola with other paints can lead to detecting range decrease caused by increasing of electrical energy losses due to not correct chosen paints.

The resonance discharger IR-3 should be changed after its working under IR without regard in that condition.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

RECEIVING UNIT

While operating the receiving unit following elements should be tuned:

- Klystron frequency
- Klystron coupling with mixer circuit
- mixer circuit
- amplification
- size of the RF signal

The tuning of klystron follows after magnetron's or klystron's replacement. The coupling of klystron with mixer circuit will be calibrated during klystron and mixer circuit's tuning. Mixer circuit should be tuned after magnetron's, klystron's or crystal's replacement. The amplification and size of RF signal will be tuned during steady operation.

The tuning of RF section and mixer circuits should be carried out after warming up of the receiver during a time of 30-40 minutes. The klystron and mixer circuits can be tuned after appearing of reflecting targets, taking into consideration the reflected signals.

When there are not reflecting targets, the tuning can be carried out using the signal coming from the control resonator.

The tuning of klystron and mixer follows on the biggest signal coming from the control resonator.

Klystron replacement

To replace the klystron, proceed as follows:

- a/ remove the lower part of the klystron screws; unscrew the upper screw and relieve the lower knurled nut;
- b/ remove the contact terminal of the klystron;
- c/ unscrew four screws securing the klystron resonator to the mounting plate and separate same;
- d/ remove the junction nut connecting the aerial cable with the resonator;
- e/ disconnect the stand from klystron, holding the klystron on the holder;
- f/ unscrew the knurled nuts (upper and lower), remove the upper ring and lower half-rings and afterwards separate two halves of circuit from the klystron.

The klystron electrodes are very thin and the valve itself very frail. For that reason all operations connected with klystron replacement should be carried out very carefully.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

To refit the Klystron proceed as follows:

- a/ clean the electrodes with a soft, clean rag, remove the fat with spirits and rub to dry with clean rag
- b/ insert the Klystron to one half of circuit
- c/ set the ground part of the circuit and set on the lower rings
- d/ put on the upper ring and adjust
- e/ adjust the Klystron

Circuit Details

The output of Klystron follows the input signal. For this purpose following procedure:

- a/ insert the transmitter into the circuit
- b/ the circuit passing to the Klystron must be such that the Klystron will receive the maximum signal.
- c/ the receiving antenna should be connected to the antenna circuit on the receiving side of the receiver.
- d/ the control "fine tuning" on the front panel of the display unit to be set on the central position.
- e/ connect the block and switch on the Klystron
- f/ the control "tuning" on the front panel of the display unit to be set in such position, by which the maximum current will reach the maximum value. The crystal current cannot exceed a value of 5 mA, this current can be regulated by changing the coupling between local oscillator and mixer circuit.
- g/ the amplification of receiver should be regulated in such a way that the noises will not overshadow the Klystron.
- h/ preliminary tuning can be executed by turning the local oscillator circuit pistons, whereas by turning the piston when is situated opposite the Klystron operating point, the final fine tuning can be carried out, which is giving the maximum signal on the FEM display. The position of the piston should be marked and the Klystron should be turned on energy source. When the tuning should be carried out on the Klystron.
- i/ insert the Klystron into the circuit "fine tuning", the Klystron should be set on the central position, observing the maximum signal on the FEM display.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

-26-

If the crystal current exceeds 0,6 mA, the coupling between local oscillator and mixer circuit must be regulated.

50X1

For this purpose the vertically situated knurled nut should be released and the position of the coupling circuit, leading to the mixer-circuit, should be regulated.

The definite tuning of klystron should be carried out during transmitter-unit working using a screwdriver and a special key through the holes in the cover and with the control "fine tuning" placed on the front plate of the display unit.

The klystron can be considered correctly tuned when, turning the control "fine tuning" in both directions, it can be observed no evident and continuous change of signal intensity on the PPI screen.

Mixer circuit tuning

The mixer circuit should be tuned on maximum reflected signal on the PPI screen, after previous tuning of TX coil and local oscillator.

The tuning can be executed by regulating the resonant frequency of mixer and its coupling with local oscillator.

The replacement of crystal in the mixer and tuning of the mixer can be executed as follows:

- a/ unscrew the retaining cap of the crystal
- b/ withdraw the old crystal and insert a new one and screw back the cap. The crystal should be changed in case it will be stated that the detecting range decreases. When after the replacement the detecting range does not increase another fault should be found. The replacing of crystal should be carried out at ~~withed off~~ of the radar.
- c/ the measuring instrument M-1 should be switched into the measuring socket "crystal current" placed on the mounting plate of the receiver.
- d/ the amplification of receiver should be calibrated in such way that the noises on the PPI screen will not overshadow the picture.
- e/ release the vertical knurled screw and shift the movable part of the circuit until a maximum reflected signal will be obtained on the PPI screen. The crystal current should not exceed 0,6 mA.

After the crystal current is calibrated fix the movable part of the mixer with ~~control~~

Principles of crystal mixer treatment

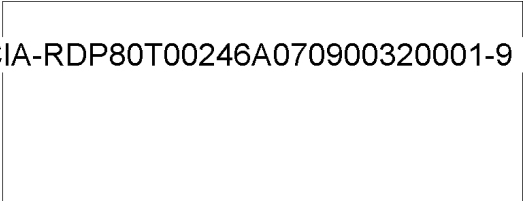
To avoid an untimely damage of the crystal detector M-51 during the radar exploitation, following remarks to be observed:

- a/ avoid any shocks and do not strike with the crystal against the floor,
- b/ pay attention not to exceed the crystal current value of 0,6 mA.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- a/ do not withdraw the crystal from the lead cartridge or mixer circuit under RF or when in the neighbourhood of other radar is working.

50X1

When the replacement of crystal is necessary, insert it directly from the lead cartridge.

DISPLAY UNIT

Before the regulation elements placed on the front plate of the display unit following units should be regulated too:

- a/ mechanical centering of the TB line,
 - b/ the tension value of the flip-flap valve/potentiometer 39/.
- The mechanical centering of TB line should be carried out after the tube replacement.
- The tension of the bias of the flip-flap valve should be adjusted in case it is necessary to get a TB line without stitching on the H /self-excitation/.

PII tube replacement

To replace the PII tube proceed as follows:

- a/ unscrew sixteen screws on the front plate of the display unit,
- b/ shift upwards the blocking arm from the right side of the display unit,
- c/ withdraw the display unit,
- d/ withdraw the PII tube spectacle,
- e/ unscrew the retaining screws of the PII frame ring on the front plate; remove the ring and protecting film,
- f/ remove the ring with ocular,
- g/ disconnect the rubber terminal from the collective mode of the PII tube,
- h/ release the retaining screw of the PII tube holder,
- i/ withdraw the PII tube from the stand,
- j/ withdraw the PII tube carefully from the display unit.

When refitting the PII tube apply reverse procedure. When refitting special care must be taken that the PII tube holder will be correctly seated to the valve stand.

After PII tube replacement, mechanical centering to be carried out. The TB line length should be established. The mechanical centering of the TB line can be executed as follows:

- a/ changing the position of the focusing coil in comparison with the PII tube axis, using four screws retaining the focusing coil/107/;
- b/ changing the PII tube position in comparison with the focusing coil, using three special screws situated in the fore part of the PII tube block.

The regulation of the TB length can be carried out using the control knob situated on the front plate of the display unit, by the potentiometer.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

28

The bias calibration on the flip-flap valves

50X1

When the lock impulse from the modulator does not reach the generator, proceed as follows:

- a/ withdraw the display unit block from the frame,
- b/ connect the display unit block with the connecting plate of the frame, using a special wire with plugs and sockets. /This wire is in the spare parts set./
- c/ turn right the potentiometer /33/axis with a screw-driver until a permanent EB line will appear on the P.J screen,
- d/ check the proper operation of all controls of the display unit front plate.

Display unit calibration

In the rear display unit following adjusting possibilities are provided: focusing, brilliance tuning, EB length calibration, calibration rings brilliance regulation, landing marker brilliance and scales lighting.

All kinds of calibration are performed by potentiometers, changing the tension on the electrodes of respective valves and values of the focusing coil current.

The controls of all potentiometers are situated on the front plate of the display unit and have respective inscriptions.

Before commencement of work, the display unit must be calibrated as follows:

- 1/ Set the EB line beginning in a distance of 2-3 cm from the P.J tube centre in such a way that by rotating of the EB a dark spot of a diameter 4-6 mm will appear in the tube centre, using the control /27/"contouring".
- 2/ Using the control /80/"focus" tune the EB line as narrow /sharp/ as possible. Do not allow to rise the brilliance to an excessive value, because this causes the screen damage.
- 3/ The brilliance of the EB should be tuned so that the EB line will be scarcely visible.
- 4/ Using the control /74/"calibration" tune the brilliance of the calibration rings so that they will be scarcely visible on the back ground of the common brilliance of the screen.
- 5/ Tune the potentiometer /33/"EB length", which has the control situated on the front plate of the display unit, so that on the P.J screen, that 4,5-5,5 sector will be visible on the range 10, 15, 20, 30, 40, 50 and 60. It is absolutely prohibited to tune the potentiometer /33/ to other values, which will cause the damage of the calibration rings and the EB line. The EB line calibration

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

29

6/ The display unit screen lighting should be so tuned that all scales will be clearly visible, but the picture on the PPI screen will not be overshadowed.

50X1

7/ Check the position of the TB centre in comparison with the mechanical ocular on the PPI screen during TB rotating. In case the difference between the electrical centre and the ocular centre will be bigger than 1,5 mm, centering of the PPI tube should be carried out.

SCANNER DRIVING

While operating the scanner unit, following calibrations can be carried out:

- 1/ Ship's head line tuning
- 2/ Tuning of the scanner servomechanism synchronizing system with the TB rollers of the display unit
- 3/ Tuning of the contact unit K2011

The ship's head line should be checked after replacement of the microswitch or its base. It will be stated that the basic position of the microswitch is visible.

The tuning of the synchronizing system should be carried out after the replacement of the rollers K2011 in the scanner unit or display unit or after the adjustment of rollers in the scanner unit or display unit.

The tuning of contact unit K2011 should be carried out after its replacement only.

Ship's head line tuning

To replace the microswitch in the scanner unit proceed as follows:

- a/ remove the cupola from the scanner unit
- b/ unscrew the damaged microswitch
- c/ unscrew the mounting plates from the ground connection terminal
- d/ unscrew the contact plate of the new microswitch and in its place fasten the contact plate of the damaged microswitch
- e/ check the new microswitch
- f/ check the breadth of the ship's head line, which should not exceed 1,5° on the scale. When the breadth of the ship's head line exceeds 1,5° or is badly visible, the stopping screws of the joint in the scanner unit should be released and the breadth of the ship's head line calibrated by shifting the joint.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 39 -

of discrepancy between the shiphead line and vessel's
Following procedure should be observed for the change
of microswitch:

50X1

- a/ the screw on which the microswitch is mounted should be slightly released,
- b/ station to be switched on,
- c/ to show one object visible on screen and by optical bearing,
- d/ to determine course angle optically and by radar
- e/ to switch on the scanner unit,
- f/ by changing the position of the microswitch in the scanner system obtain a course angle of the same size as determined by optical bearing.

After receiving equal course angles, the adjustment should be considered as correct. The microswitch to be stopped and the shiphead line checked again.

Replacement of segments and adjustment of synchronizing system of the scanner turning and T.S. deflecting coils.

To replace the relay 308-1 in the scanner unit proceed as follows:

- a/ take off the cover of the scanner arrangement,
- b/ disconnect mounting cables of the relay from slip-plate /11/ terminals 2,3,4 and 5,
- c/ release the relay from fastening plates,
- d/ take out the relay and remove the coupling from axle,
- e/ set out the coupling on new relay 308-1,
- f/ set in new relay on place,
- g/ fasten new relay,
- h/ connect relay with cables.

In the purpose to renew relay 303-1 in display unit proceed as follows:

- a/ take out display unit from housing, disconnect cables of the plain position indicator unit /PPI/ from fastening plates /111 and 112/,
- b/ unsolder of relay cables from terminals /7 and 8/ of fastening plate /112/ and from terminals /4 and 7/ of the repeater /114/,
- c/ take out the plain position indicator proceeding as follows:
 - remove ocular and ring from frames,
 - remove turning handle of the scale, remove turning handle of the diopter and glands collars,
 - unscrew eight screws fastening valve housing with front plate,
 - unscrew two screws fastening the housing of the valve to the mounting plate of the valve and supply unit,

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

31

- / disconnect the screw's stopping the rubber coupling's connection with the rotation of deflecting coils;
- / take off the coil's housing;
- / disconnect the four screws fastening roller and remove the coil's from holder carefully;
- / bring out elastic gear on one of the new coils and fasten with two stopping screws;
- / subsequently carry out all the above described procedure in opposite successive way.

50X1

During fastening the elastic gear take care that the stopping screws have not in the covits on the ex of the coil of the driving mechanism.

The replacing of hour time base/revolutions with the scanner should be done as follows:

- a/ to take out display unit from housing;
- b/ to take out plain position indicator;
- c/ to connect display unit by transitory cord with transitory board of the AT housing;
- d/ to switch on scanner /without switching revolutions of scanner/;
- e/ to turn over by hand the scanner driving motor to put in this way that roller of the micro-switch will stay on the circle of coils;
- f/ to release screws fastening coil's stator 303-1 of counter arrangement;
- g/ by turning coil's stator in scanner's arrangement find out such position by which rotor of coil's 303-1 in display unit will be in permanent position after pressing the roller of the micro-switch in display unit;
- h/ to fasten the stator of coil's 303-1 in counter arrangement;
- i/ to release four screws fastening ring of joining layer in display unit and put it on the middle of the micro-switch roller, then fasten the ring;
- j/ to check phasing work by pressing roller of scanner /114/ say "very short time /att. 230./, checking to be made by turning the scanner to left and right, phasing should be visible during one turning;
- k/ to place the plain position indicator on normal position and its position as per instruction in per/Technical Service/
- l/ check off the repair.

or if the synchronizing of the unit is not succeeded by using method, adjustment should be made to working mechanism.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

• 3. •

50X1

The microswitch in the scanner unit, normally connected, should be disconnected in radius from 16° to 20° of scanner's angle, each passing the joint on its roller. The microswitch in the display unit is normally disconnected and after procedure in the joint lever on its roller, should be connected in radius from 0° to 11° of the scanner's turning.

Working centers of the microswitches in the scanner unit and inside display unit should have the same readings as shown on the drawing 39a. Both parts "A" and "B" should be equal. The possible deviation of segment's center should not exceed 1° .

Adjustment of the working segments of the microswitches should be done in a following way:

1. Complete one unit of two similar DC voltmeters with calibration scale 30 V / drawing 39 b/.

Remark: if second voltmeter is not available, the a resistor of 300 - 500 kilohms should be inserted between the terminals on the terminal plate and the terminals of the extension cord instead of the mount of second voltmeter.

Voltmeter V₁ should be connected directly to the terminals of the microswitch in display unit and voltmeter V₂ to terminal /1/ on the terminal strip /1a/ and terminal /2/ on strip /1b/ in scanner unit. In this case the mounting conductors between microswitches and terminal strip should not be disconnected.

- 2/ Motor to be switched on and scanner turned around with hand using the coupling of driving motor until the joint inside the scanner unit is slightly touching the roller of the microswitch, but is not pressing on it.
- 3/ Turn around the axle of scanner's driving motor smoothly and slowly causing successive disconnecting of the microswitch in the scanner unit, connecting and disconnecting of the microswitch in display unit and connecting the microswitch in the scanner unit /table 7/.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

Table 7

50X1

Position	Position of microswitches		Indications of voltmeter in scanner unit	Indications of voltmeter in display unit
	in scanner unit //	in display unit		
0	Connected	disconnected	0	1
1	disconnected	disconnected	0,5	0,5
2	disconnected	connected	1	0
3	disconnected	disconnected	0,5	0,5
4	connected	disconnected	0	1

Remark: Scanner's position marked on the diagram by star is considered as the beginning of taking the readings on the dial of the measuring instrument.

4. The magnitude of the working sectors of the micro-switches is determined by scale in degrees. The shape and size of this scale are shown on drawing No. 390.

The diagram made according to drawing to be put on the permanent part of the scanner at the base of the scanner. Zero of the scale is to be placed opposite to the arrow fixed to the turning part of scanner.

The biggest deviation of the zero of the measuring instrument is taken as a unit.

Scanner's position in the interval from 1 to 4 is corresponding to the microswitch disconnecting sector in the scanner unit while the scanner's position in the interval from 2 to 3 is corresponding to the microswitch connecting sector in the display unit.

5. In case, the magnitudes of the microswitches sectors are not agreeing with the above assumption, so it should be adjusted by changing the position of the microswitches. In this case, the screws fastening microswitches to respective plates to be released and microswitches to be shifted as required up or down. By shifting up, the working sector of the microswitch is getting bigger and by shifting it down it is getting smaller.

6. If the centres of working sectors of the microswitches are not covering each other /shifted more than 10°, it should be adjusted by slightly shifting in proper direction the joint ring in the display unit.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

• 14 •

7. After completing the adjustment of the microswitches sectors, the ring with joint in the display unit to be fastened with four screws and the proper work of synchronizing transmitting system to be checked. It is obligatory to check the working sectors of the microswitches by right and left scanner - rotating. 50X1

After correct setting up the working sectors of the microswitches the work of synchronizing transmitting system to be checked in the following ways:

- a/ scanner unit to be switched on,
- b/ scanner's position to be disturbed in comparison to the deflecting coils by transient joining of the synchronizing relay contacts or by other means,
- c/ Observe the return to the synchronizing revolutions. If the unit is desynchronized, then the relay as well as the deflecting coil in the display unit will stop. If the unit was correctly adjusted, then the synchronizing should become automatic at the moment when joint in display unit will connect the microswitch. From this moment the relay and together with it the deflecting coils should turn around smoothly without jumps. By stopping the deflecting coils, short and quick vanishing vibrations of the ring with arm/ which is mechanically connected with the deviating coils/ is possible. During starting the coils, after the synchronizing system is acting, short and quick vanishing vibration of the coils can also be expected.
- d/ The above described procedure to be repeated not less than ten times by turning around the scanner in both sides, observing at the same time the process of coming back to synchronizing. If the synchronizing is proceeding correctly then the radar to be switched off, the PFI tube to be placed in normal position and check over the work of the whole system including the time base.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



4. When the synchronizing transmission unit is not working correctly, it means that the adjustment was not done properly or that there is some damaged element in the synchronizing transmission unit.

50X1

Adjustment of the contactor unit KP-111.

The necessity of adjustment of the contactor unit arises in normal operating conditions only due to wear and tear or renewing it. Adjustment of the contactor unit should be executed in a following way:

- a/ Damaged or useless for further service contactor unit can be taken out only if it is in reserve position. If the unit is not working for any reason, the current to be switched off and axis of stability motor to be turned around by hand to right or left until the contactor unit will not be in reserve position.
- b/ New spare contactor unit should be placed into reserve position before mounting it, in the following way: axis of driving mechanism to be turned around until the ratchet of the lever will get in proper reserve position.
- c/ After getting up the contactor unit into reserve position, the working terminals to be disconnected, and the unit to be disconnected by screwing the adjustment screw to the right.
- d/ After completing in this way the preliminary adjustment, the contactor unit to be put into reserve position and to be switched on; if the vibrations of the contactor unit will not stop, and the information about the contactor unit will be received, the current to be switched off and the axis of driving mechanism to be turned around by hand to right or left until the vibrations will stop.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 36 -

The tuning of the radar while ship being at sea
should be carried out as follows:

50X1

- a/ switch on the radar /if not yet switched on/
 - b/ the ship should keep its course steadily,
 - c/ ship's head line should indicate on the scale the ship's course,
 - d/ set the control "synchronisation-gyrocompass" in the position "synchronisation",
 - e/ set the control in the "IS" block in such a way that the ship's heading on the screen will indicate the actual ship's course,
 - f/ set the control "synchronisation-gyrocompass" in the position "gyrocompass",
 - g/ check the scanner stabilization on a steady course and by ship's circulation, comparing the readings of the courses on the display unit scale and on the gyrocompass scale;
- These readings should be carried out simultaneously by two men, on the command of one of them.

Supply of radar unit

Starting and stepping of the converter.

The main parts of the radar's supply system are: the converter and apparatus set, consisting of regulating box and starter which are destined for starting and adjusting. Before switching the converter, the ship's mains to be switched on by switch on block "B" and current to be checked by voltmeter inside the block "B".

In case the converter is switched first time so it is obligatory to check if the individual parts of the generator and radar are connected properly as shown on the installation diagram.

S-E-C-R-E-T

NO FOREIGN DISSEM

I
S-E-C-R-E-T
NO FOREIGN DISSEM

- 37 -

Also the state of motor's and generator's brushes should be examined. In this purpose the fastening screws to be released and cowl existing on the opposite side of the arc chamber to be taken off, screw existing at front of the converter to be unscrewed and protection covering the brushes from side of the arc chamber to be taken off. 50X1

Surface of the collector and terminal rings should be cleaned /there should be no trace of burning/. Make sure that the fastening screws of the motor brush holders are screwed down to resistance and that the springs position of the generator is normal.

Make several rounds by hand with rotor by turning around the ventilator, rotor should go around smoothly /without ohkings/, then the cowl and protection to be placed on. All screws loosened before to be made fast.

Box switch "PP" in regulating box to be put into position "Automatic" and rheostat screwing gear of the hand adjustment into most left position, by which the rheostat of the hand adjustment must be switched off. The rheostat of voltage adjustment to be put at most left position.

The converter is switched on by using the switch /116/ on the front plate of the display unit.

Setting up of voltage keeping the automatic adjustment, is made by proper setting up of the screwing gear with description "Setting up the voltage".

In case the generator's automatic voltage adjustment unit will be damaged, it should be switched off.

Hand adjustment screwing gear to be put on the center position and the switch of the kind of adjustment on the "hand position".

After switching on the radar, it means after connecting the full load, the indispensable value of voltage to be hand-adjusted with rheostat.

The converter to be switched off by the same switch, it is switched on.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

• 38 •

Revisions of the Radar Unit

50X1

General Information

The purpose of the preventive examinations and preservations of radar is to keep the apparatus in constant service condition. The examinations are carried out periodically with the purpose of undertaking necessary steps to prevent average of the radar or putting it out of service for longer time period.

One of the principal undertakings is to remove all kind of dirt and moisture.

During operating of the radar the principles of safeness and procedure with high voltage units should be strictly observed. Do not start the work before assuring yourself that the radar is switched off and that condensers are discharged.

During work avoid unnecessary stressings of the mounting leads, i.e. cables etc., and avoid touching the hot parts of the unit/resistors, valves/ until they are chilled.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

39

When using tools, clips, screwdrivers etc., keep it strong in hand that it will not be dropped down on the main or specially on valves. During periodical overhauls parts of the apparatus (ventilating and driving motors, generators) special care should be taken on their heating while at work.

Temperature is considered as normal one in such case when the hand bare hand can be kept on the housing of the warm parts during 5 sec. Raised temperature of bearing shows that the oiling is not sufficient or there exists some other damage. After switching off radar it is obligatory to check the temperature of other parts / resistors, condensers etc./

50X1

During overhauling all parts of apparatus should be examined but special care should be taken on:

- a/ overheating, which is recognized by changed colours of the individual parts, appearance of cracks on their surfaces, blisters, melting out of insulating materials and redness on metal surface of terminals.
- b/ proper placing of cables and counting lines - mine in conformity with the counting diagram,
- c/ existence of dirt of all kinds between the transmitter's terminals; all connecting parts should be clean, free of dust, rust and outside objects.

If the radar is working in a zone of more condensed moisture it should be secured from getting mould.

Fastening and stopping of the individual parts is executed directly after bringing the radar apparatus, or after ascertaining of troubles and vibrations, or in case if the connections and terminals have got loose. Loose, bad terminals/connections/ can cause interval in the work of the radar.

During screwing down, fastening, stopping screws, bolts and nuts same care should be taken that they will not break, therefore tools of proper kind should be used for this purpose.

The apparatus is cleaned of dust by brushes and clean rags swept with spirit or petrol.

Individual parts of apparatus to be oiled with engine oil or grease by using grease rags. Only the motors, relays, generators wings, turning axis and tooth-gear are due for greasing.

In case the damage to any parts is ascertained it should be reported immediately to the proper commanding officer.

Preventive examination of blocks and parts

The kind of preventive means depends on the kind of blocks and parts of the radar. According to this, all parts of the radar are divided into the following groups:

- vacuum valves,
- condenser,
- resistors,
- fuses,
- insulators,
- relays,
- switches,
- electric motors and solenoids,

S-E-C-R-E-T

NO FOREIGN DISSEM

NO FOREIGN DISSEM

- 40 -

- transformers and chokes,
- regulators,
- rheostats and potentiometers,
- contacts and terminal plates,
- air filters,
- cables and glands,
- signaling lamp,
- measuring instruments,
- connecting sockets,
- blocks and amortizers housings.

50X1

For each of these groups special attention is called for making advanced preventive steps.

Vacuum valves

While examining the vacuum valves, care should be taken that there is no dust on all valves and valve holders.

Valves without sockets to be checked if electrodes are on and not broken or loose.

By examining the metal cowls of valves in place of contact with glass make sure if there is good connection and if there is no rust. Check all contacts points, contacts and terminals. Loose springs to be lifted up carefully with screw driver and loose screws fastening the valves heels to be made fast. Dust and dirt on valves to be removed with small brush or dry rag. Rust and corrosion on valves to be removed with glass paper No.00, then cleaned with dry and clean rag.

Condensers

Before starting examination of condensers they should be discharged.

All condensers of high voltage or electrolytic should be cold during overhauling or hardly warm /tepid/.

If they are hot or warm it means the electrolytic leakage. This type of condensers are not guaranteed in service and they can be damaged any moment. Therefore ~~the~~ they should be removed immediately.

All terminals and contacters should be examined, cleaned of dust and moisture. Dust and moisture can make arc and piercing of insulation.

Examine insulators and make sure if they have no cracks. Check condensers with care if there are no ruptures and marks of electrolytic leakage. Remove all electrolytic condenser which have the above mentioned damage. /In case removing is not possible ~~the~~ the leakage to be stopped by soldering/.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

When fastening the condenser's terminals do not allow to be so the connections inside of condenser, but if it has happened - go down by proper manner the opposing nut keeping at the same time the terminal by pinners.

When cleaning the high voltage condensers do your best to make them dry completely. 50X1

In case of corrosion existing on the terminal, disconnect cables, clean contacts-- and with emery paper, clean them with dry rag and connect the conductors.

All small condensers including of low voltage and their contactors should be kept clean.

Resistors

The radar is provided with ceramic resistors of various kind, rheostats, potentiometers etc.

Examining the resistors, special care should be paid if they are not partly melted or ~~excessively~~ overheated, which is indicated by their colour.

During examination conductors' terminals and metal connecting ends of resistors care should be paid if there is no rust, dust, roughness, cracks etc. All kind of dirt and rust should be removed with brush or rag. Special attention should be paid to cleanliness of the resistors destined for high voltage blocks. In case of taking out the resistors be careful that the spring terminals are stiff. Weak terminals should be tightened by hand or with pinners.

Examination of the small ceramic resistors is limited to checking their outside appearance and soldered points. Weak solderings should be resoldered immediately. Meltings of all kinds and abrasive surface of resistors shows that it is due to overloading. If normal quality of such resistors have lost the value considerably, they should be removed immediately. Contaminating places of the resistors should be carefully cleaned of dust by brush.

FUSES

In case the fuse is burned out, the cause of the burning should be found out and liquidated before new fuse is put in place. During examination of fuses check if they are not covered with dust or residue.

Check if fuses sockets if they are clean including contactor connections.

All doubtful connections should be made fast and weakened terminals pressed in. Corrosion should be removed with emery paper or cleaned spots wiped with dry rag.

Insulators

Insulators should be examined very carefully and their surface should be specially protected against damage with tools.

During examination of high voltage insulators moisture, outside dirt and dirt of all kinds should be removed. The insulators should be kept always dry and clean, otherwise there shall be findings and short circuits causing their damage. In case of finding out cracks, curves on their surface carbon paths, piercings and other damage on the surface of the insulators, they should be absolutely removed. Loose fastening screws should be carefully

removed.
Insulators should be cleaned with small brush and wiped out with dry rag.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

• 42 •

Radar is provided with the following relays:

- 1/ Contacting relays for power circuits. Contacts of these relays have bigger dimensions /for higher currents/ and coils not big resistance. 50X1
- 2/ Relays of telephone type are possessing small contacts, made mostly of silver or hard alloys. During cleaning of such contacts, attention should be paid that their shape shall not change by polishing them.

During general overhauling check if the relays are strongly fitted and connecting conductors cleaned, if the moving parts are moving easily and freely. All springs should be stretched and properly fitted, relays contacts, cleaned and properly adjusted. Relays coils should not be overheated, no dirt should be existing on the parts of relays.

While examining mechanically the work of relays it should be ascertained that the moving and permanent contacts of relays are opposing each other. Cores and pistons should move easily, freely and without obstacles or vibration. All loosened connection and fastening screws should be carefully screwed down. Outside surfaces of relays to be cleaned with dry cloth or small brush.

During cleaning of relays contacts the following principles should be observed:

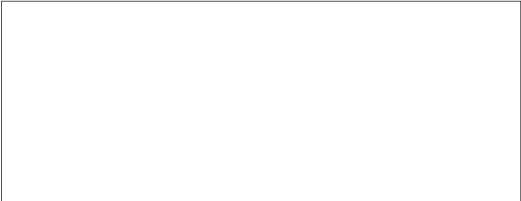
1. For cleaning the contacts a stripe of clean, thin cloth or paper should be inserted between contacts and moved to and fro while the contacts are closed. If it is necessary, the cloth can be made wet with spirit and contacts: wiped dry afterwards.
2. If the contacts are rusted they should be cleaned carefully with emery paper No.000, after removing the rust the contacts to be cleaned first with cloth wetted in spirit and then with dry cloth.
3. Contacts partly burned out to be cleaned with emery paper No.00 carefully as to avoid change of their shape. After cleaning them with sharp paper contactors to be polished with emery paper No.000, then cleaned with clean cloth dampened with spirit.

Switches

During examination of switches, the terminals and connection should be checked if they are clean and properly connected. Movable parts of switches to be checked and if they are working good and contacts parts pressed in. All loosened contacts to be made tight and conductors made fast. If there is dirt, rust or dust, it should be removed with dry cloth or dampened with spirit. Rust and residue to be removed with emery paper No.00. Clean surface of contacts to be cleaned with dry cloth.

S-E-C-R-E-T

NO FOREIGN DISSEM



S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

All national technical drawings should be made in ink, double ruled, and all lines should be drawn with a sharp pencil. All drawings should be made on a standard size of paper (e.g. 11 x 17 inches) and should be drawn with enough margin to allow for a binding. All drawings should be made on a standard size of paper (e.g. 11 x 17 inches) and should be drawn with enough margin to allow for a binding.

Examining Instrument

During examination special care should be taken to ensure that the instrument is not dirty or that the contact surfaces are not broken. If there is no crack on the instrument which can be in any way cause damage to the instrument.

Specimen of the measuring instrument on the spot should be taken. It should be noted that the instrument should be used in a clean and dry place and should be kept for repairs to the instrument.

Dirty contact surfaces should be cleaned with fine sand paper (e.g. No. 000) and then polished with dry cloth. Corroded places should be cleaned with dry paper (No. 00), then perfectly dried with dry cloth.

While the radar is switched off, the instrument should be checked. In case there is certain deviation from the zero point, it should be absolutely placed on zero point.

Beckets

Dirty or rusty beackets should be cleaned with a fine brush, and with spirit or emery paper.

Hourglass of Blocks

During examination of individual blocks, attention should be paid to the gaps of plates and their fastenings. It should be checked if there is any change of rust on either the outside and inside surfaces should be cleaned with clean dry cloth. Greases and mechanisms of blocks should be covered with thin film of lubricating oil. Surplus of the oil should be removed with dry cloth. Special care should be taken to avoid damage to the working of the individual blocks and instruments.

Preventive examinations of blocks and radar's instruments

It should be borne in mind that only person who is trained in the preservation the work of the radar shall be proper. The work of radar the readings of the checking mechanism, instruments and signalling arrangements should be watched.

It is a duty of the operator to look after the radar. In the work, but as well to check it well and preserve it well if not working.

General preventive examination

1. The radar should be examined everyday and the outside surface of the blocks to be removed.
2. Check if outside surface are not damaged.
3. Check the preservation of all outside parts of the radar parts and fastenings, etc. parts of the radar.
4. Check the state of rings and collectors of the radar.

S-E-C-R-E-T
NO FOREIGN DISSEM

NO FOREIGN DISSEM

- 5. Switch on the radar and check all work the indicated readings of instruments. On 1000 Hz the current is showing their nominal value.
Remark: Radar should be instructed in the 50X1 radar's maintenance book.
- 6. Check scanner's revolution arrangement in circular observation system.
- 7. Switch on the high voltage to ensure that the radar is working normally according to instruments and length of resonator's control signals to equipment and by commander's command as well as by local device of scanner receiver.
- 8. In case of damage take all possible steps to repair the damage. Report to commander results of examination and make entries in the record book.

Weekly Examination

- 1. Carry out all procedure foreseen by the daily examination.
- 2. Clean all blocks and radar units.
 - Remove dirt from conductors and from individual parts.
 - Check state of contactors, relays and switches.
 - Check state of parts, components and elements.
- 3. Check state and work of some blocking circuits.
- 4. Check surface of collectors and all electric contacts.
- 5. Check lamps, nests and brushes.
- 6. Check state of air filter in spark chamber and if found necessary clean it.
- 7. Check state and state of spark parts being on duty station.
- 8. After examination is completed, check radar by switching it on. Results of checking report to commander and make entries in the record book.

Remark: because during work of radar in wet atmospheric circumstances moisture can be collected inside scanner's housing which may diminish resistance of the insulation. Therefore the scanner arrangement should be checked periodically and in case of moisture found it should be removed by suitable cleaning brush.

Monthly Examination

- 1. Carry on all procedure foreseen by the weekly examination.
- 2. Check state of collectors and contactors rings of all electric engines and if found necessary clean them. Check efficiency and tightness of brushes and pressure of tightening springs.
- 3. Check state of brushes of spark chamber and if required renew them.
- 4. Check wave guide with attention to mechanical damage.
- 5. Check engine's bearings and if necessary overhaul them according to the maintenance book.

S-E-C-R-E-T

NO FOREIGN DISSEM

NO FOREIGN DISSEM

- 47 -

6. Clean all relays' contacts and switches. 50X1
7. Clean with clean painting brush damped with spirit all insulators, insulation plates and valves cups inside blocks and arrangements.
8. Check the state of amortizers of all outside arrangements and their earthing.
9. Check the insulation resistance of the converter and supply circuits, according to the maintenance book.
10. Check spare parts if complete.
11. Damaged painting on blocks housings should be painted and repainted.
12. Valves to be examined.
13. Radar to be switched and examined:
- wave forms and AC and DC voltage values according to tables
 - power and frequency of the transmitter and sensitivity of the receiver.
14. Check scanner's surface and the cups of connector and make it clean if necessary.

All remaining current repairs and work indispensable during preventive examinations but not included in this instruction should be carried out during monthly examination.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

48

Preservation of the radar unit

General basis

50X1

During the exploitation of the radar unit all block's rubbing units and elements should be systematically preserved to reduce the rubbing coefficient and protect against corrosion.

Following kinds of grease to be used for the preservation of block and radar units.

1/ Universal grease type GO1-54 /GOST-3276-43/ resistible against low temperatures and water from the outer appearance similar to the vaseline grease, homogeneous with a lightbricky colour.

2/ Vaseline oil for instruments KVP /GOST 1803-51/ with a light-yellow colour.

Because the working period of the units is not equal for all parts and mechanical systems, for that reason it is recommended to use the grease GO1-54 for preservation of following equipment :

- a/ all highspeed gear : cylindrical differential gear, tooth, wheels, worm strips and another parts of rubbing mechanisms /greasing every 100 hours working/
- b/ levers, direction axles, and sliding screws /greasing every 300 hours working/ and noiseless tooth-gear/up to 20 r.p.m./

The necessity of the prophylactic preservation of the teeth wheels and couplings can be determined according to the surface condition /when there appears glittering dry spots/ In that case the necessary preservation of respective units should be carried out immediately, independing from the exploitation period of the equipment.

Decides that the preservation should be carried out by temperature rise and by changed sound of the mechanical sub-units /appearing of increased sounds, periodical disappearing 'arr etc/. Therefore during the exploitation time and overhauling of the equipment the work of particular mechanical sub-units should be often checked.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

49

It is strictly prohibited to grease the blocks during the radar unit operation. These works should be done by switched off radar only. While greasing care must be taken not to damage the montage elements and not to cover with grease the life parts of contacts or insulating materials as rubber canvas etc. The ball bearings greasing of the display unit and scanner unit, because of difficult access, should be in generally carried out during every over-hauling of this blocks i.e. after 2500 hours working.

The ball bearings of the diameter up to 10 mm and the bearings in the display unit should be greased with MFP oil /four to five drops/. Ball bearings of the diameter bigger than 10 mm should be covered with thin sheet of the grease G01-54.

The threaded parts of all cable glands should be covered with thin sheet of the grease G01-54. Retaining parts (except covered with zinc / of a diameter up to 6 mm should be preserved with MFP oil, and the parts bigger than 6 mm in diameter with the greaser G01-54.

All parts which are not protected against corrosion, cylindrical springs and flat covers should be covered with thin sheet of grease G01-54.

The springs parts should be preserved using a rag wetted in suitable grease. The cylindrical springs, levers and spring washers should be preserved with oil using a small brush. Preservation of this part should be carried out when it is needed.

The selynes should work normally 1500 hours; preservation of the ball-bearings should be done only by greasing them with two-three oil drops type MFP, but not rarer than once a year.

The kind of grease should not be changed depending the seasons because the a.m. greases are suitable for the exploitation by temperature changes from -60°C up to $+60^{\circ}\text{C}$. The change of the grease type G01-54 should take place once a year.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50

During the overhaul operation, besides changing the greases of all types, all rubbing parts should be cleaned with benzine. 50X1

The grease can be removed by rubbing the mechanism with a rag wetted in benzine. The preservation of the converter "MGL - 7" and "MGL - 8" should be carried out according to the exploitation instruction of the arrangements.

Block preservation

Scanner Unit "AW"

- 1/ Unscrew the retaining screws /butterfly unit/ and take off the cupola.
- 2/ Unscrew the screws fastening the cover of the contact unit KP 211 and take them off.
Take off the cover of the greasing inlet in the scanner reduction gear and preserve the accessible, through the inlet, inversion gear and tooth wheels.
- 3/ Take off the side cover, where the microswitch is fastened /11/ and the upper cover situated besides.
Turning the driving motor axes /6,7/ preserve through the inlets all accessible racks, axes, washers and other parts.
- 4/ Take off the cover of the "KP" unit and cover with thin sheet of G01-25 grease the rack-gear and lubricate with MPW oil, the springs, using a small brush. This operation should be done very carefully that the grease will not get through to the contacts.
- 5/ All parts accessible for preservation as springs, washers, springs, couplings of motors 61 and solenoid 62 - 1 should be covered with a thin sheet of G01 - 25 grease.

The ball-bearings greasing, because of difficult access, should be carried out during the overhauling of the scanner unit. After completing the preservation the cupola should be put back in her place and the retaining screws preserved with the grease G01-25.

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

51

Transmitter unit *pw*

50X1

The retaining screws of the cover and the cover fastening the housing to the base plate should be preserved with the grease 801-54. The setting belts of the block housing should be carefully preserved.

Rectifier unit *pw*

The block thrust springs should be covered with thin sheet of grease 801 - 54 if needed.

Block *pw*

The threaded part of the bolt with calibration nut should be covered with thin sheet of grease 801-54.

Display unit *pw*

Undo the retaining screws on the front plate and withdraw the unit from the housing. In the lower part of the montage plate the accessible tooth wheels driving the TB deflecting coil to be preserved with thin sheet of 801-54 grease.

The scale driving rack gear /PPI tube block/ and ball bearings should be preserved with a thin sheet of 801-54 /the bearings up to 10 mm diameter should be lubricated with 3 - 4 drops of MWP oil by overhauling only/.

While overhauling the display unit should be also cleaned and preserved the glands of all regulating controls and the display unit front plate.

Block *pw*

Through the inlets in the gland the axle where the rack is placed, should be lubricated with several drops of MWP oil. When some jars /creaks / will be stated the breaking spring should be preserved too.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

32

Block "RK"

50X1

The "RK" block is a component part of the "MA-H" block, therefore should not be dismantled if it is not necessarily needed. Refitting the unit after overhauling the ball-bearings should be lubricated with the "CLIXIN - 204" grease using a special greasing ^{pump} whereby care ^{must} be taken that the grease will not get through to the life parts and current conductions.

Preparing of the radar unit for preservation

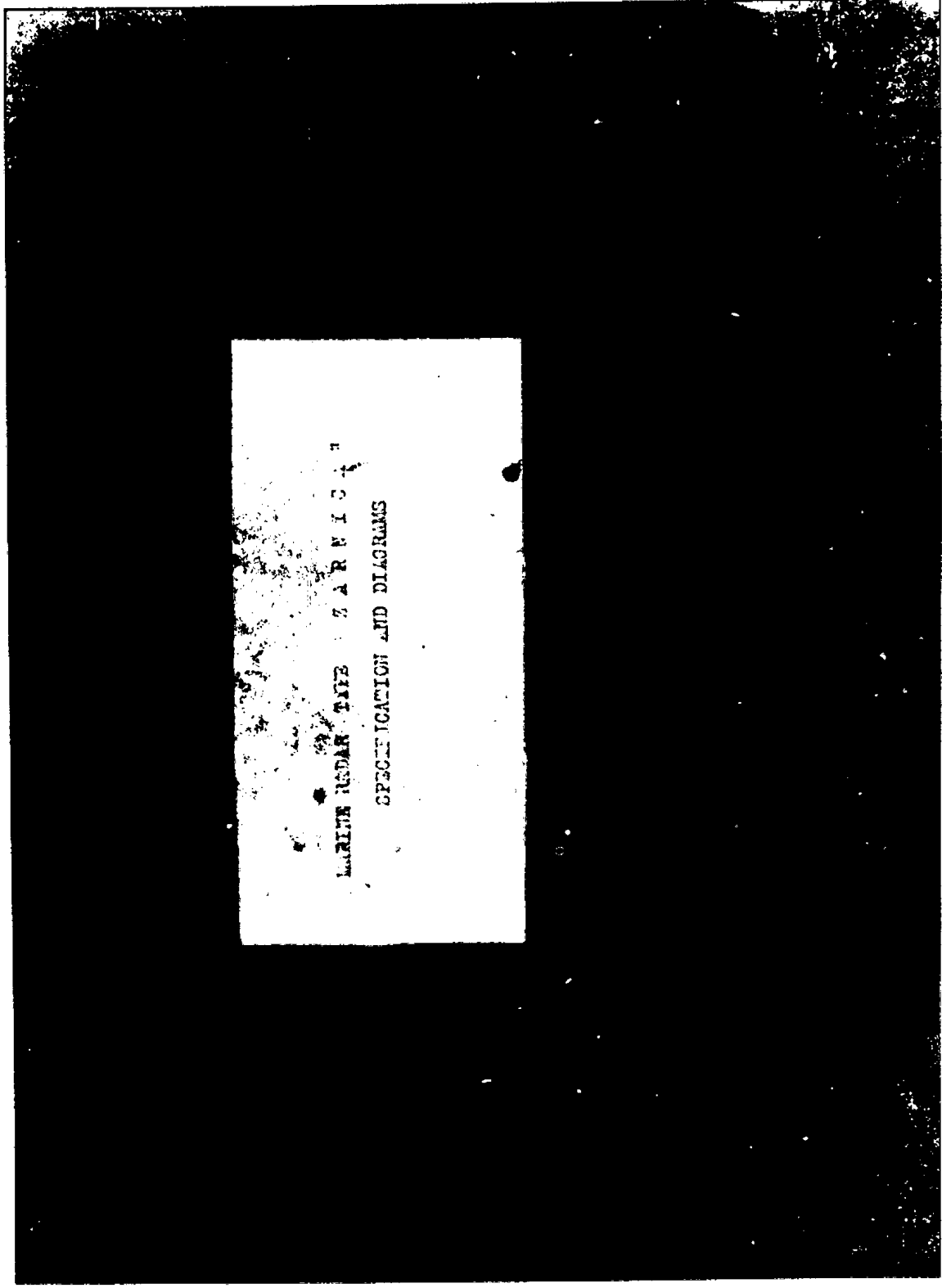
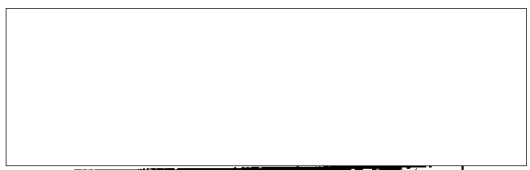
While preparing of the radar unit for preservation, following operations should be carried out:

- a/ remove the fuses in the supply circuits.
- b/ cover with grease G01-34 all rubbing parts of the mechanisms and all outer parts, which have the surfaces not protected.
- c/ all tools should be cleaned and fat removed using a small brush and benzine and afterwards covered with a thin sheet of G01-34 grease.
- d/ all metallic handles should be covered with a thin sheet of G01-34 grease whereupon wrapped with saturated oil cloth.
- e/ all control ^{handles} having blockades should be obligatory fixed.
- f/ all blocks and instruments to be lead-sealed in places for this purposes designed.
- g/ the compartment where the units are displaced should be continually ventilated, keeping temperature and moisture.

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



LARGE RADAR TYPE : ZARNIC
SPECIFICATION AND DIAGRAMS

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 5 -

SPECIFICATION OF MARINE RADAR
type " ZARNICA "

No on diagram	Diagram No.	Construction details Description	El. Values	Quantity	Remarks
1	2	SCANNER UNIT		5	6
4	Je O 673.403	Condensers KB0-MN-2B-600-20-0-1-III	2x0.5 F ± 20%	1	parallel
19	Je O 673.403	KB0-MN-2-400-2x0.5-III	2x0.5 F ± 20%	1	
20	Je O 673.403	KB0-MN-2-400-2x0.5-III	2x0.5 F ± 20%	1	
22-25	Je O 673.412	KB0-250-20-0-1-III	0.1 F ± 20%	4	
26-29	Je O 673.412	KPB-S-250-20-1-III	F ± 20%	4	
30-33	Je O 673.401	KS0-5-250-A-8200-II	8200 PF ± 10%	4	
2	17 538.243	Wire resistor	10 om ± 5%	1	
5		Ceramlo resistor type SR-200	200 om ± 8%	1	

50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

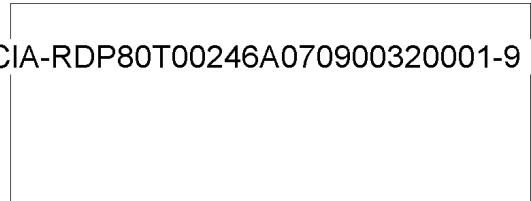
- 6 -

1	2	3	4	5
		<u>Miscellaneous</u>		
1	E6 786.064-sw	DC el. motor type SZ-321	110 V	1
6	E6 786.004-sw	DC el. motor type SZ-321	110 V	1
7	Ja6 750.001	Relay	110 V	2
8	16 728.101	Contacto unit WP-211W		1
9	A6 784.008	Selayn type SS-153	120 V 500 Hz	1
10	16 759.004 gas	Selayn type SAS-1	110 V 400 Hz	1
11	P6 772.017	Microswitch		1
12	P6 772.017	Microswitch		2
13	Je6.757.053	Terminal interconnecting strip RT	10 terminals	1
14	Je6.757.053	Terminal strip RT	10 terminals	1
17		Scanner		1
18		Waveguide flange coupling		1
21	16 291.057	Control vibrator		1
		TRANSMITTING UNIT		
		<u>Valves</u>		
11	Magnatron MI-13	Magnatron MI-13		1
16		Spark gap rezonans discharger RR-5		1
23		Klystron K-11		1

S-E-C-P-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- 7 -

1	2	3	4	5
		Condensers		
3	Je0 673.401	KS0-13-1000-A-25000-II	25000 pF ± 10%	1
4	Je0 673.403	KBG-MN-2-600-0,5-III	0,5 F ± 20%	1
7	Je0 673.401	KS0-5-250-A-10000-II	20000 pF ± 10%	2
10	Je0 673.401	KS0-5-250-A-10000-II	20000 pF ± 10%	2
13	Je0 673.403	KBG-MN-2-400-1-II	1 F ± 10%	1
19	Je0 673.401	KS0-11-2000-A-1000-II	1000 pF ± 10%	1
26	GOST 6119-54	KS0-2-500-A-1000-II	1000 pF ± 10%	1
28	GOST 6119-54	KS0-2-500-A-1000-II	1000 pF ± 10%	1
34	Je0 673.403	KS0-5-250-0,5-III	0,5 F ± 20%	1
42	Je0 673.401	KS0-5-250-A-10000-II	10000 pF ± 10%	1
43	Je0 673.401	KS0-2-250-A-10000-II	10000 pF ± 10%	1
		Resistors		
2	Je0 673.102	WS-1-1000 om - 5%	1 Kom ± 5%	1
5	Je0 673.102	WS-2-10000 om - 10%	70 Kom ± 10%	7
18	Je0 673.102	WS-0,25-1000000 om - 10%	2 Mom ± 10%	2
20	Je0 673.102	WS-2-220000 om - 10%	440 Kom ± 10%	2
27	Je0 673.102	WS-0,25-1000000 om - 10%	1 Mom ± 10%	1
48	Je0 673.102	WS-0,25-1-10000 om - 10%	10 Kom ± 10%	1

parallel
parallel

to be chosen

series
series
series

50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

1	2	3	5	6
6	P6 772.021	Transformers and chokes		
8	P6 772.027	Micron filament transformer	1	
24	17 550.004	Labruse transformer	1	
25	P6 772.017	Choke	2	
44	387 547.015	Inductance and rock transformer	1	
45	387 547.015	Inductive coils	1	
		Inductive coil	1	
		Microtransonic		
11	16 738.006	Spokes		
9	386 770.001	Permanent magnet		
12	386 769.001	Element with ventillation		
		Shielded magnet		
14	386 770.002	Block of H.H. cell		
15	P6 793.047	Mixer circuit		
17	16 299.077	Crystal detector type DK-S		
21		Co-axial plug		
22	P6 797.009	H.H. terminal strap		
29	386 737.053	Connecting plate/plugs/		
30	17 570.262	Connecting plate/sockets		
31	17 570.262			

according to special requirements

8 - 1

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

- 9 -

1	2	3	4	5	6
31	I7 570.262	Connecting plate / socket of		1	
32	P6 724.066	Blocking plug		1	
33	P6 733.040	Blocking socket		1	
35	P6 275.001	...		1	
36	I8 579.023	...		1	
37	P6 797.008	...		1	
38	P6 797.008	...		1	
46	I7 724.066	...		1	
47	I6 724.066	...		1	
49	P6 633.008	...		1	
11		...		1	
21		...		1	
32		...		1	
37		...		1	
44		...		1	
65		...		1	
74		...		1	
92		...		1	

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

10

1	2	3	4	5	6
		<u>Condensers</u>			
2	Jeo 673.406	KSR-1-S-10-II		10 PF ± 10%	1
2	GOST 6119-54	KSO-2-500-A-1000-II		1000 PF ± 10%	1
9	Jeo 673.401	KSO-5-500-A-2200-II		2200 PF ± 10%	1
12	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
13	GOST 6119-54	KSO-2-500-A-1000-II		1000 PF ± 10%	1
16	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
17	GOST 6119-54	KSO-2-500-A-1000-II		100 PF ± 10%	1
19	Jeo 673.401	KSO-5-500-A-2200-II		2200 PF ± 10%	1
24	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
26	Jeo 673.401	KSO-2-500-A-1000-II		100 PF ± 10%	1
29	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
30	Jeo 673.401	KSO-5-500-A-2200-II		2200 PF ± 10%	1
33	Jeo 673.401	KSO-2-500-A-1000-II		100 PF ± 10%	1
34	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
36	Jeo 673.401	KSO-2-500-A-1000-II		100 PF ± 10%	1
38	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
42	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
43	Jeo 673.401	KSO-2-500-A-1000-II		100 PF ± 10%	1
47	Jeo 673.401	KSO-5-500-A-1500-II		1500 PF ± 10%	1
49	Jeo 673.401	KSO-5-500-A-2200-II		2200 PF ± 10%	1

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

- 11 -

1	2	3	4	5	6
52	Je0 673.401	KSO-5-500-A-1500-II	1500 PF ± 10%	1	
54	Je0 673.401	KSO-5-500-A-2200-II	2200 PF ± 10%	1	
58	Je0 673.401	KSO-5-500-A-2200-II	2200 PF ± 10%	1	
60	Je0 673.406	KTK-1-S-10-II	10 PF ± 10%	1	
61	Je0 673.401	KSO-5-500-A-1500-II	1500 PF ± 10%	1	
69	Je0 673.401	KSO-5-500-A-1500-II	1500 PF ± 10%	1	
70	Je0 673.403	KBO-M-2-600-0,5-III	0,5MF ± 20%	1	
73	Je0 673.403	KBO-M-2-600-0,1-III	0,1MF ± 20%	1	
75	Je0 673.401	KSO-5-500-A-2200-II	2200 PF ± 10%	2	parallel
78	Je0 673.403	KBO-M-2-600-0,1-III	0,1MF ± 20%	1	
83	Je0 673.401	KSO-5-500-A-2200-II	2200 PF ± 10%	1	
86	Je0 673.401	KSO-5-500-A-2200-II	2200 PF ± 10%	1	
88	Je0 673.403	KBO-M-2-600-0,5-III	0,5MF ± 20%	1	
89	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
90	Je0 673.403	KBO-M-2-600-0,1-III	0,1MF ± 20%	1	
91	Je0 673.403	KBO-M-2-600-0,1-III	0,1MF ± 20%	1	
96	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
97	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
98	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
106	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
107	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	
108	Je0 673.401	KSO-2-500-A-1000-II	1000 PF ± 10%	1	

50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

1	2	3	4	5
113	Jeo 673.103	KBG-1-600-0.01-11	0.01, 1 F ± 10%	1
109	Jeo 673.101	KSQ-2-200-1-1000-11	1000, 2 F ± 10%	1
		REGIONS		
1	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
4	Jeo 673.102	WS-0,25-160 om ± 10%	100 om ± 10%	1
5	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
8	Jeo 673.102	WS-0,25-160 om ± 10%	100 om ± 10%	1
14	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
15	Jeo 673.102	WS-0,5-1500 om ± 10%	15 Kom ± 10%	1
22	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
23	Jeo 673.102	WS-0,5-1500 om ± 10%	15 Kom ± 10%	1
25	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
28	Jeo 673.102	WS-0,25-160 om ± 10%	100 om ± 10%	1
35	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
39	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
40	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1
41	Jeo 673.102	WS-0,5-1500 om ± 10%	1500 om ± 10%	1
46	Jeo 673.102	WS-0,25-160 om ± 10%	100 om ± 10%	1
51	Jeo 673.102	WS-0,25-150 om ± 10%	150 om ± 10%	1
56	Jeo 673.102	WS-0,25-5600 om ± 10%	5600 om ± 10%	1
59	Jeo 673.102	WS-0,25-220 om ± 10%	220 om ± 10%	1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

1	2	3	4	5	6
52	Je0 673.102	WS-0,25-100 om - 10%	100 om ± 10%	1	
53	Je0 673.102	WS-0,5-1500 om - 10%	1500 om ± 10%	1	
54	Je0 673.102	WS-0,5-1500 om - 10%	1500 om ± 10%	1	
57	Je0 673.102	WS-0,25-56 om - 10%	56 om ± 10%	1	
71	Je0 673.102	WS-1,5-300 om - 10%	3.5 Kom ± 10%	1	
72	Je0 673.102	WS-1-220 om - 5%	2.2 Kom ± 5%	1	
76	Je0 673.102	WS-1-10000 om - 5%	10 Kom ± 5%	1	
77	Je0 673.102	WS-0,25-220 om - 10%	220 om ± 10%	1	
79	Je0 673.102	WS-1-50000 om ± 10%	19.5 Kom ± 10%	2	parallel
80	Je0 673.102	WS-0,25-220 om - 10%	220 om ± 10%	1	
81	Je0 673.102	WS-0,25-220 om - 10%	220 om ± 10%	1	
85	Je0 673.102	WS-0,25-10000 om - 10%	10 Kom ± 10%	1	
92	Je0 673.102	WS-1-560 om - 10%	560 om ± 10%	1	
93	Je0 673.102	WS-1-220 om - 10%	220 om ± 10%	1	
99	Je0 673.102	WS-1-560 om ± 10%	560 om ± 10%	1	
112	Je0 673.102	WS-0,25-100 om - 10%	100 om ± 10%	1	
3	Ja6 793.002	Inductive coil		1	
7	Ja6 793.002	Inductive coil		1	
18	Ja6 793.002	Inductive coil		1	
27	Ja6 793.002	Inductive coil		1	
45	Ja6 793.002	Inductive coil		1	
50	Ja6 793.002	Inductive coil _g		1	
55	Ja6 793.002	Inductive coil		1	

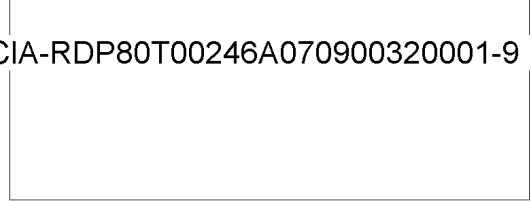
50X1

- 13 -

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- 14 -

1	2	3	4	5	6
10	17 554.004	Filament sock		1	to be chosen by tuning
20	17 554.004	Filament sock		1	
31	17 554.004	Filament sock		1	
48	17 554.004	Filament sock		1	
53	17 554.004	Filament sock		1	
57	17 554.004	Filament sock		1	
66	17 554.004	Filament sock	10 H I 204	1	
68	16 775.069	Filament sock	10 H I 104	1	
84	17 554.004	Filament sock		1	
87	17 554.004	Filament sock		1	
94	P6 772.023	Transformer		1	
95	17 554.004	Filament sock		1	
105	17 554.004	Filament sock		1	
100	P6 797.017	Co-axial socket		1	
101	17 570.519	Terminal strip	6 terminals	1	
102	P6 797.010	Co-axial socket		1	
103	P6 797.011	Co-axial socket		1	
104	I6 736.107	Control socket		1	

50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

2	3	4	5
DISPLAY UNIT			
<u>Valves</u>			
50 - k	6553		
32	6S5S		9
52	6P3S		1
85	6503S		1
106	W1-0,02/20		1
109	typ 14	6.3 V 0.28 A	4
9a	13 EN 31		1
145	6N8S		1
	6N8S		1
<u>Condensers</u>			
2	Jeo 673.401	240 pF ± 5%	1
6	Jeo 673.401	2000 pF ± 5%	1
12	Jeo 673.403	0.2 μF ± 20%	2
14	Jeo 683.401	20000 pF ± 5%	1
17	Jeo 673.403	0.5 μF ± 20%	1
20	Jeo 673.401	200-300 pF ± 10%	1
21	Jeo 673.406	24 pF ± 5%	1
22	Jeo 673.406	24 pF ± 5%	1
25	Jeo 673.401	880-1110 pF ± 10%	1/1
31	Jeo 673.403	2x2 pF ± 10%	1
33	Jeo 673.401	2600-3600 pF ± 10%	1
36	Jeo 673.401	1000 pF ± 10%	1

50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

2	3	5	6
51	Jeo 673.403	K80-1E-2-600-4-II	4.7K PF ± 10%
54	Jeo 673.401	K80-2-500-0-510-I	510 PF ± 5%
57	Jeo 673.401	K80-12-500-A-20000-II	20000 PF ± 10%
61	Jeo 673.401	K80-2-500-G-510-I	2510 PF ± 5%
61	Jeo 673.401	K80-3-500-G-2000-I	
62	Jeo 673.401	K80-3-500-G-2000-I	4000 PF ± 5%
66	Jeo 673.401	K80-3-250-A-8200-IE	8200 PF ± 10%
70	Jeo 673.401	K80-3-250-A-8200-II	8200 PF ± 10%
75	Jeo 673.401	K80-3-250-A-8200-II	8200 PF ± 10%
82	Jeo 673.401	K80-4-1-6-Q,1-II	0.1 PF ± 10%
87	Jeo 673.401	K80-12-1000-A-10000-II	10000 PF ± 10%
91	Jeo 673.401	K80-12-1000-A-10000-II	10000 PF ± 10%
92	Jeo 673.401	K80-3-500-B-1000-II	1000 PF ± 10%
103	Jeo 673.403	H8G-82-800-0,1-1-III	1000 PF ± 10%
123	Jeo 673.403	K80-3-250-0,1-1-III	0.1 PF ± 20%
138	Jeo 673.401	K80-2-500-G-220-II	0.5 PF ± 10%
140	Jeo 673.406	K8K-1-M-24-1	220 PF ± 10%
146	Jeo 673.401	K80-5-250-A-10000-II	250 PF ± 5%
147	Jeo 673.401	K80-2-500-B-240-III	10000 PF ± 10%
149	Jeo 673.401	K80-3-250-A-10000-II	240 PF ± 10%
			10000 PF ± 10%
			Resistors
1	17 538.246	Wire Resistor 68 oh	68 oh ± 10%
3	Jeo 673.102	WS-1-24000 oh - 5%	24 Koh ± 10%
4	Jeo 673.102	WS-1-62000 oh - 5%	62 Koh ± 5%
7	Jeo 673.102	WS-1-370000 oh - 5%	370 Koh ± 10%
	Jeo 673.102	WS-2-3000 oh - 5%	6 Koh ± 5%

parallel
to be chosen
parallel

50X1

in series

- 16 -

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



- 17 -

10	Jeo	673.102	WS-2-3900 om - 5%	3,9 Kom ± 5%	1	
11	Jeo	673.102	WS-1-51000 om - 5%	51 Kom ± 5%	1	parallel
13	Jeo	673.102	WS-1-50000 om - 5%	15 Kom ± 5%	2	
15	Jeo	673.102	WS-0,5-470000 om - 10%	470 Kom ± 10%	1	
16	Jeo	673.102	WS-0,5-47000 om - 10%	47 Kom ± 10%	1	
18	Jeo	673.102	WS-1-510000 om - 5%	510 Kom ± 5%	1	
19	I7	538.245	Wire resistant 100 om	100 om ± 5%	1	
23	Jeo	673.102	WS-0,5-10000 om - 10%	10 Kom ± 10%	1	to be chosen /5,6- 52 Kom/ to be chosen
24	Jeo	673.102	WS-0,5-1530-4700 - 10%	1,5-4,7 Kom ± 10%	1	
26	I7	538.244	Wire resistant 50 om	50 om ± 5%	1	
27	Jeo	731.006	Potentiometer 5000 om	5 Kom ± 5%	1	
28	Jeo	673.102	WS-1-1000 om - 5%	1 Kom ± 5%	1	to be chosen from 0.6-2 Kom
30	Jeo	673.102	WS-2-22000 om - 10%	22 Kom ± 10%	1	
34	Jeo	673.102	WS-2-560-om - 10%	560 om ± 10%	1	
35	Jeo	731.003	Potentiometer - 600 om	600 om ± 5%	1	
37	Jeo	673.102	WS-1-33000 om - 10%	11 Kom ± 10%	1	
38	Jeo	673.102	WS-2-10000 om - 10%	10 Kom ± 10%	1	parallel
39	Jeo	673.106	SP-1-2b-22A13	22 Kom	1	
40	Jeo	673.200	Ceramic resistant IV-500	500 om ± 8%	1	
41	Jeo	673.200	Ceramic resistant IV-10000	10 Kom ± 8%	1	
42	Jeo	673.102	WS-1-2000 om - 5%	2 Kom ± 5%	1	parallel
43	Jeo	673.102	WS-1-4700 om - 10%	2,35 Kom ± 10%	2	parallel
44	Jeo	673.102	WS-1-4700 om - 10%	2,35 Kom ± 10%	2	parallel
45	Jeo	673.102	WS-1-5600 om - 10%	2,8 Kom ± 10%	2	parallel 50X1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



1	2	3	4	5
46	Jeo 673.200	Carbonic resistant II - 350	350 om ± 5%	1
47	Jeo 673.102	WS-1-18000 om - 10%	18 Kom ± 10%	1
48	16 731.163	Variable wire resistant	25 om ± 10%	1
55	Jeo 673.102	WS-1-510000 om - 5%	510 Kom ± 5%	1
58	Jeo 673.102	WS-1-100000 om - 10%	25 Kom ± 10%	4
53	Jeo 673.112	WS-0,5-47000 om - 10%	47 Kom ± 10%	1
64	Jeo 673.102	WS-1-270000 om - 10%	270 Kom ± 10%	1
65	Jeo 673.101	WS-0,5-100000 om - 10%	100 Kom ± 10%	1
67	Jeo 673.102	WS-1-15000 om - 10%	15 Kom ± 10%	1
68	Jeo 673.102	WS-1-4700 om - 10%	4,7 Kom ± 10%	1
69	Jeo 673.102	WS-0,5-470000 om - 10%	470 Kom ± 10%	1
71	Jeo 673.102	WS-0,5-1000000 om - 10%	1 Kom ± 10%	1
72	Jeo 673.102	WS-1-12000 om - 10%	12 Kom ± 10%	1
74	Jeo 673.106	SP-1-2B-10A13	10 Kom	1
77	Ja6 731.003	Potentiometer 20660 om	20 Kom ± 5%	1
78	Jeo 673.102	WS-0,5-1000 om - 10%	1 Kom ± 10%	1
79	Jeo 673.102	WS-1-4700 om - 10%	2,55 Kom ± 10%	2
80	Ja6 731.003	Potentiometer 20000 om	20 Kom ± 5%	1
83	Jeo 673.102	WS-1-4700 om - 10%	4,7 Kom ± 10%	1
84	Jeo 673.102	WS-1-220000 om 10%	440 Kom ± 10%	2
88	Jeo 673.102	WS-0,5-150 om - 10%	150 om ± 10%	1
89	Jeo 673.102	WS-0,5-100000 om - 10%	100 Kom ± 10%	1
90	Jeo 673.102	WS-1-2700 om - 10%	2,7 Kom ± 10%	1
93	I7 538.245	Wire resistant 100 om	100 om ± 5%	1
94	Jeo 673.102	WS-0,5-2700 om - 10%	2,7 Kom ± 10%	1

parallel

parallel to b
chosen 1-5 ko

in series

50X1

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

- 19 -

1	2	3	4	5	6
125	Jeo 673.102	WS-0,5-100000 om - 10%	100 Kom ± 10%	1	
126	Jeo 673.102	WS-0,5-27000 om - 10%	27 Kom ± 10%	1	
127	I7 538.224	Wire resistant 50 om	50 om ± 5%	1	
128	Jeo 673.106	SP-1-2b-100A60	100 Kom ± 10%	1	
129	Jeo 673.102	WS-0,5-100000 om - 10%	100 Kom ± 10%	1	
130	Jeo 673.102	WS-0,5-100000 om - 10%	10 Kom ± 10%	1	
131	Jeo 673.102	WS-0,5-100000 om - 10%	100 Kom ± 10%	1	
132	I6 731.190	Wire potentiometer 20 Kom	15 Kom ± 10%	1	
133	Jeo 673.106	SP-1-2b-100A13	40 Kom ± 10%	2	in series
134	Jeo 731.003	Potentiometer 20000 om	100 Kom	1	
135	Jeo 673.102	WS-1-470000 om - 10%	20 Kom ± 5%	1	
136	Jeo 673.102	WS-0,5-15000 om - 10%	5640 Kom ± 10%	12	in series
137	Jeo 673.102	WS-0,5-15000 om - 10%	15 Kom ± 10%	1	
138	Jeo 673.102	WS-1-150000 om - 10%	150 Kom ± 10%	1	
139	Jeo 673.102	WS-1-2000 om - 10%	2 Kom ± 10%	1	
140	Jeo 673.106	SP-1-2b-22A13	22 Kom	1	
141	Jeo 673.102	WS-0,5-1500 om - 10%	1,5 Kom ± 10%	1	
142	Jeo 673.102	WS-1-15000 om - 10%	1,5 Kom ± 10%	1	
143	Jeo 673.102	WS-2-3000 om - 5%	3 Kom ± 5%	1	
144	Jeo 673.200	PB-20-5 om - II	5-om ± 10%	1	
Transformers and chokes					
145	P6 776.004	L.F. choke	3,5 H ± 0,7 H	1	
146	F 6 772.025	Filament transformer		1	
147	P6 776.003	Filter choke	1,3 H ± 0,25 H	2	
148	P6 772.020	Power transformer		1	
149	P6 793.045	Circuit coil	5,4 H ± 10%	1	

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



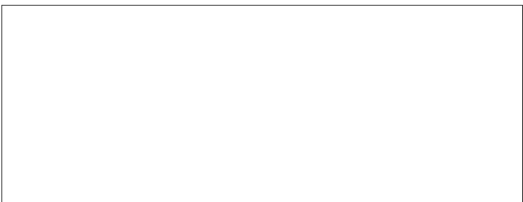
50X1

15	772.128	Switch-over	4 positions	1
16	773.208	Fuse R-1	1 A	1
16	775.004	Selsyn type SM-1	210 V 400-Hz	1
166	777.033	HE terminal strip	10 terminals	1
166	777.033	HE terminal strip	10 terminals	1
166	777.033	Micro-switch	2 10 V	1
166	778.001	Relay	2 terminals	1
166	777.023	HE terminal strip	2 positions	1
166	772.019	Switch-over	3 A	1
166	773.304	Fuse R-3	2 positions	1
166	722.020	Switch-over		1
166	628.020	Push-button		1
166	628.020	Push-button		1
166	777.306	Page 21-6		1
166	777.125	HE terminal strip	5 A	1
166	770.125	Switching plate	2 terminals	1
166	770.125	Switching plate	54 sockets	1
166	770.125	Switching plate	24 pins	1

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

- 21 -

1	2	3	4	5	6
151	16 733.503	Pwr. FU-2	2 A	1	
152	16 733.503	Connecting plate	2 A	1	
153	J-6 722.019	Switch-over	3 positions	1	
154	J-6 737.023	10 terminal strip	2 terminals	1	
		POWER SUPPLY UNIT "W"			
		Valves			
2		503S		1	
6		504S		1	
10		Stabilizer 503S		1	
11		623S		1	
12		624		1	
17		Stabilizer 502S		1	
		Resistors			
8	J-0 673.102	RS-2-220000 oh - 10%	220 Kohm ± 10%	1	
9	J-0 673.102	RS-1-56 oh ± 10%	56 oh ± 10%	1	
13	J-0 673.102	RS-1-560 oh - 10%	560 oh ± 10%	1	
14	J-0 673.102	RS-2-330000 oh - 10%	330 Kohm ± 10%	1	
15	J-0 673.200	Ceramic resistor III - 2000	2 Kohm ± 8%	1	
28	J-0 673.102	RS-0-25-150000 oh - 10%	150 Kohm ± 10%	1	
32	J-0 673.102	RS-1-1000000 oh - 10%	1 Mohm ± 10%	1	
33	J-0 673.102	RS-1-21000 oh - 10%	27 Kohm ± 10%	1	
34	J-0 673.102	RS-1-56000 oh - 10%	56 Kohm ± 10%	1	
35	J-0 673.102	RS-1-5600 oh - 10%	5,6 Kohm ± 10%	1	
36	J-0 673.106	SI-1-1b-100AL5	100 Kohm ± 10%	1	
37	J-0 673.102	RS-1-100000 oh - 10%	100 Kohm ± 10%	1	
38	J-0 673.102	RS-1-100000 oh - 10%	100 Kohm ± 10%	1	

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

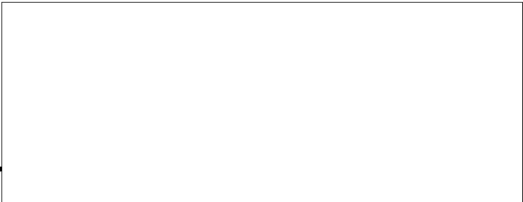
	3	4	5	6
	WS-1-2000 om - 10%	20 Koh ± 10%	1	
	WS-1-560 om - 10%	560 ohm ± 10%	1	
<u>Condensers</u>				
	KJG-M-2-690-4-II	4 MF ± 10%	3	
	KBG-MH-2-400-2-II	2 MF ± 10%	1	
	KBG-MH-2-600-4-II	4 MF ± 10%	1	
	KBG-MH-2-400-2-II	2 MF ± 10%	1	
	KBG-MH-2-490-1-II	1 MF ± 10%	1	
	KBG-MH-2-400-6-II	6 MF ± 10%	1	
<u>Transformers and chokes</u>				
	Transformer	1,3 H ± 0,25	1	
	Choke	3,5 H ± 0,7	2	
	Choke	3,5 H ± 0,7	1	
<u>Miscellaneous</u>				
	Relay	110 V	1	
	Blocking plug		1	
	Blocking socket		1	
	HT.terminal strip	10 terminals	1	
	HT.terminal strip	10 terminals	1	
	HT.terminal strip	10 terminals	1	
	HT.terminal strip	10 terminals	1	
	HT.terminal strip	10 terminals	1	
	Fuse PH-2	2 A	1	
	Fuse PH-1	1 A	1	
	Fuse PH-4,5 A	4,5 A	1	special made

- 22 -

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

- 23 -

2	3	4	5
28	Fuse PH-0,5	0,5 A	1
29	Fuse PH-0,5	0,5 A	1
4	MODULATOR "M" Valves W1-0,1/30		1
21	Condensers KSO-13-5000-A-1800-II	8580 pF ± 2%	20
27	KSO-13-5000-A-1800-II	5850 pF ± 2%	4
28	KSO-11-1600-A-4700-I	4700 pF ± 5%	1
29	KSO-11-2000-A-3000-I	6000 pF ± 5%	2
30	KSO-12-500-A-20000-I	20000 pF ± 5%	1
30	KSO-11-1000-A-5100-I	5100	
33	KBP-250-20-0,1-IIIIF	20000 pF ± 5%	
34	KBP-250-20-0,1-IIIIF	0,1 μF ± 20%	1
35	KBP-250-20-0,1-IIIIF	0,1 μF ± 20%	1
36	KSO-5-500-B-1000-II	0,1 μF ± 20%	1
5	Resistors Vallit resistant	1800 pF ± 10%	1
7	WS-1-1000000 om - 10%	9 Kom ± 10%	1
6	WS-1-200000 om - 5%	0,1 Kom ± 5%	9
9	WS-1-1000000 om - 10%	9 Kom ± 10%	2
10	WS-1-200000 om - 5%	0,1 Kom ± 5%	9
12	Ceramic resistant VI - 160	160 om ± 8%	2
14	Ceramic resistant VI - 160	160 om ± 8%	1

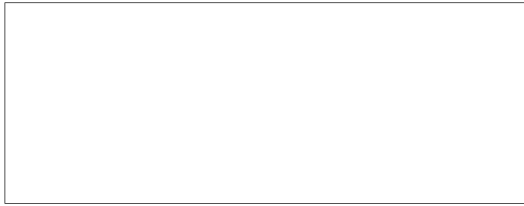
mixed connect-
ing to be chosen
to be chosen
parallel

to be chosen
parallel
to be chosen
parallel

resistors
in series
parallel
in series
parallel

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



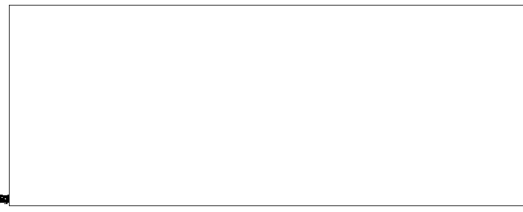
50X1

	2	3	4	5	6
15	J-0 673.200	Ceramic resistor VI - 160	160 ohm ± 8%	1	
16	J-0 673.200	Ceramic resistor III - 25	25 ohm ± 8%	1	
17	17 536.257	Wire resistor 2.0	2.0 ohm ± 5%	1	to be chosen within the limits 10, 2 - 12 ohm
<u>Inductive coils</u>					
22	17 543.681	Coil		1	
23	17 543.682	Coil		1	
24	17 543.680	Coil		1	
25	17 543.678	Coil		1	
26	17 543.679	Coil		1	
40	16 532.129	Coil		1	
<u>Transformers and chokes</u>					
3	P6 772.618	Power transformer		1	
6	P6 772.026	Filter transformer		1	
12	16 766.112	Choke	450-500 H	1	
18	P6 772.022	Transformer		1	
<u>Miscellaneous</u>					
1	P6 724.006	Blocking plug		1	
1	16 733.040	Blocking socket		1	
2	JL7 531.026	Terminal strip		1	
11	16 266.074	Delay line		1	
19	P6 797.011	Coaxial socket		1	
20	J-5 286.019	Wave chamber		1	
21	J-10 022.010	Coaxial cable BK-6		1	
22	16 797.011	Coaxial socket	10 terminals	1	

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

- 25 -

3

SIGNALING BOX "XB"

1	734.268	Bellyn type S3-153	120 V 500 Hz	1
2	733.062	Fuse F3 - 0,5	0,5 A	2
3	722.025	Switch-over	3 positions	1
4	571.062	Terminal strip	6 terminals	1
5	571.062	Terminal strip	6 terminals	1
MEASURING INSTRUMENT BLOCK "BP"				
<u>Valves</u>				
6	6868			1
7	579.106	SC 24	110 V	2
<u>Resistors</u>				
8	732.581	Wire resistant	70000 om	1
9	732.013	Wire resistant	153000 om	1
<u>Transformers</u>				
10	772.024	Transformer		1
<u>Miscellaneous</u>				
11	722.019	Switch-over	2 positions	1
12	360.011	Voltmeter	0-150 V	1
13	722.019	Switch-over	2 positions	1
14	571.062	Terminal strip	6 terminals	1
SWITCH BLOCK "BX"				
<u>Valves</u>				
15	107.570	MT - 3		1
<u>Resistors</u>				
16	573.102	RS-1-51000 om - 5%	51 Kom ± 5%	1
17	573.102	RS-0,5-170000 om - 10%	470 Kom ± 10%	1
<u>Miscellaneous</u>				
18	737.657	Terminal strip	6 terminals	1

Valve-holder-XMEX
2S-15
to be chosen
to be chosen

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



50X1

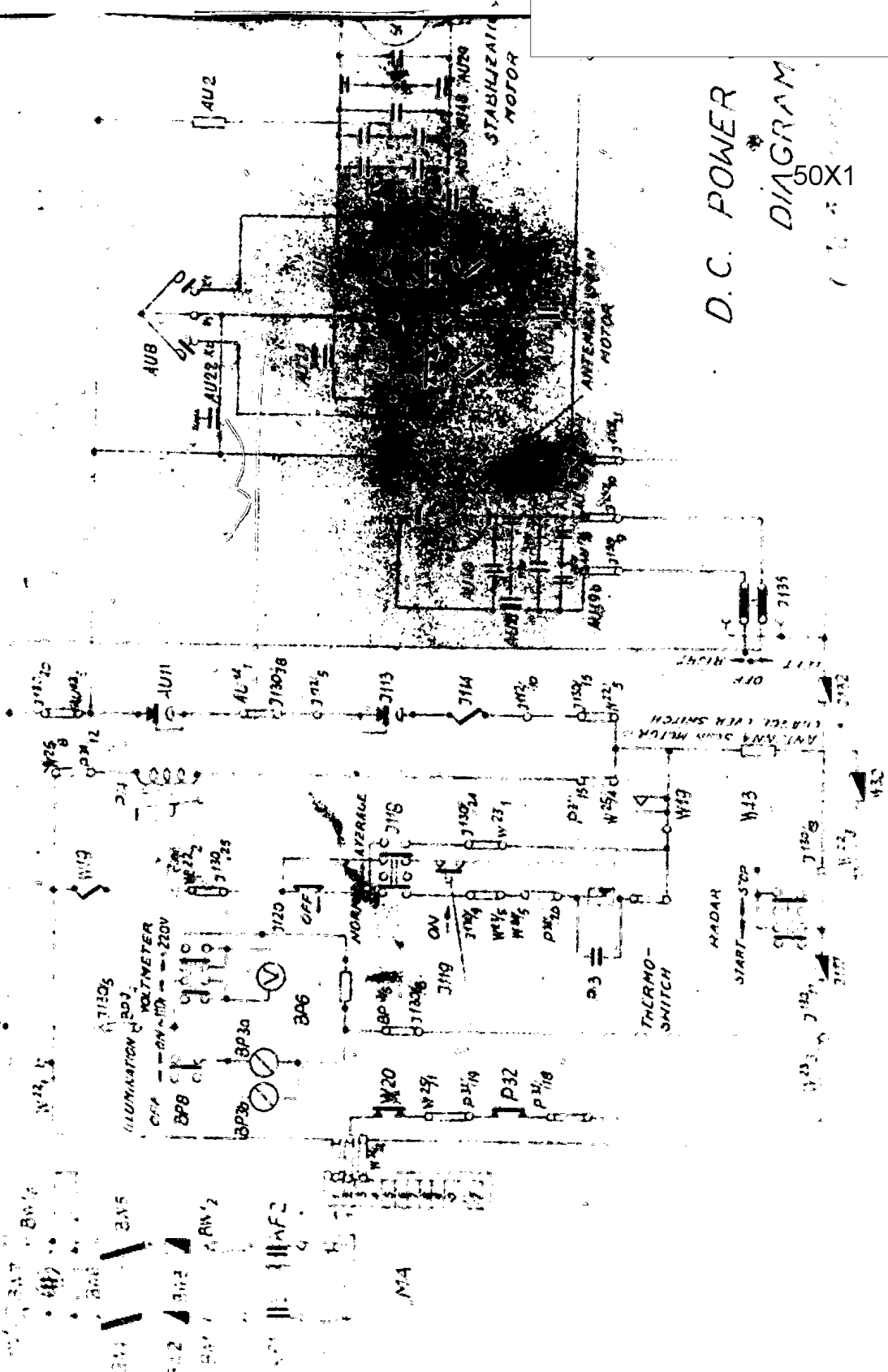
- 26 -

1	2	3	4	5	6
2	15 733.309	Fuse FI-20	20 A	1	
3	16 733.309	Fuse FI-20	20 A	1	
4	306 722.114	Packet switch	250 B.25 A	1	
		CONTROL RESCHATCH			
		Valves			
1	16 773.003	IF signalisation gas valve IW80-10			
		Miscellaneous			
2	17 538.000	Regulator			
3	17 237.019	Co-axial			
		FILTER PHONE			
		Condensator			
1	Je0 673.412	KBP-500-70-0, 5-III	20%	1	
2	Je0 673.412	KBP-500-70-0, 5-III	20%	1	

S-E-C-R-E-T

NO FOREIGN DISSEM

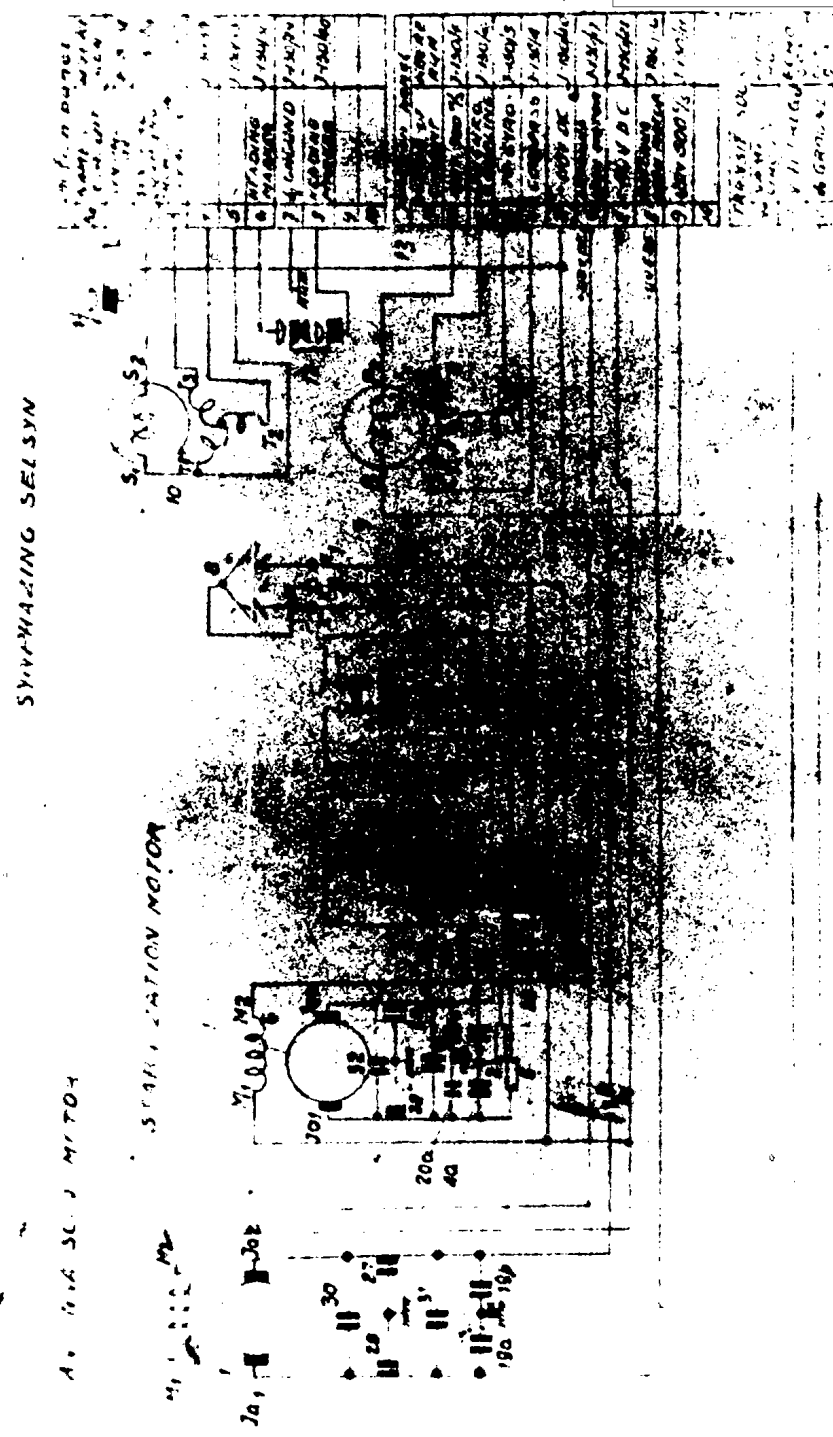
S-E-C-R-E-T
NO FOREIGN DISSEM



D.C. POWER
DIAGRAM
50X1

S-E-C-R-E-T
NO FOREIGN DISSEM

NO FOREIGN DISSEM



SYNCHRONIZING SEL SYN

START POSITION MOTOR

А. И. А. С. У. М. И. Т. О. 4

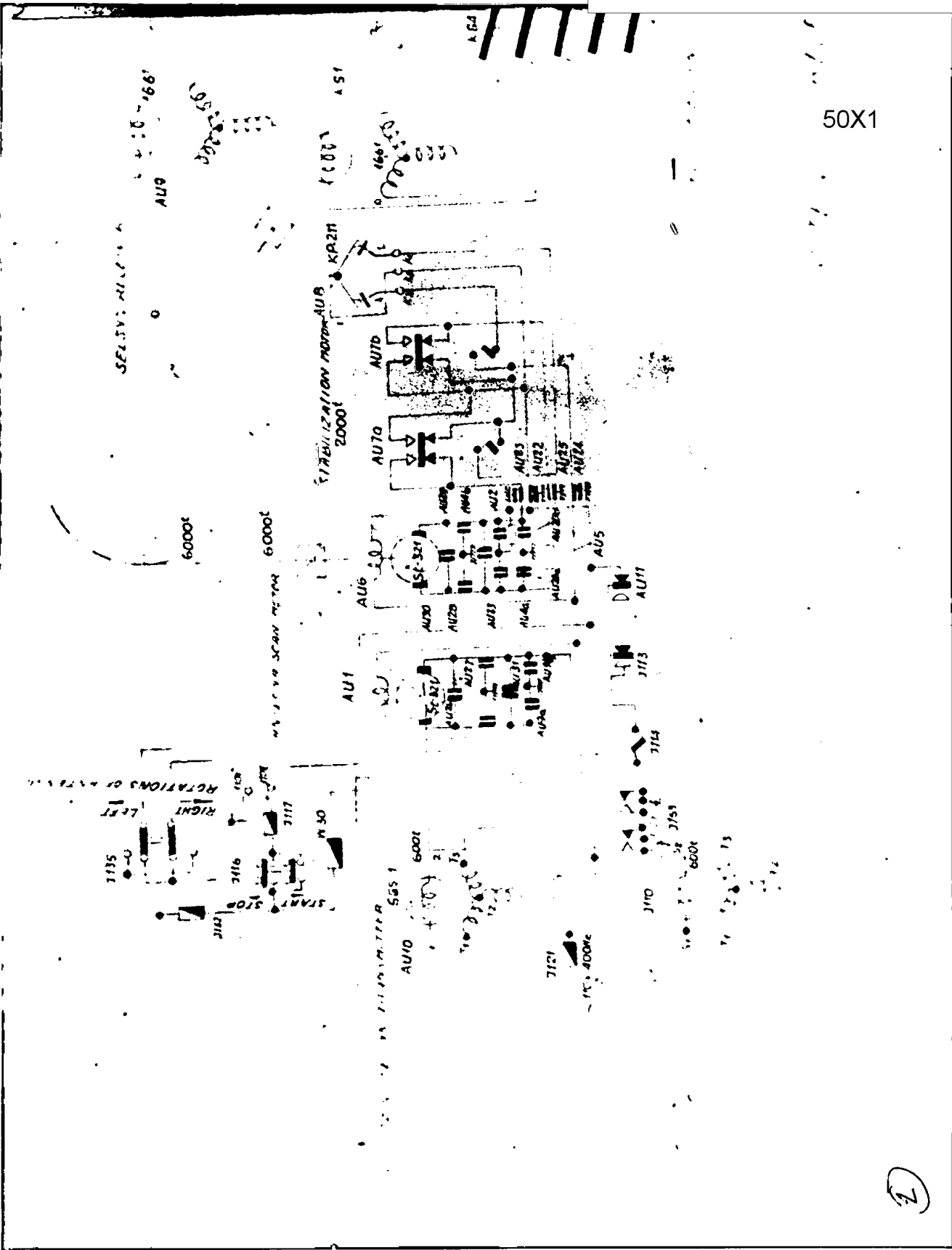
50X1

AERIAL UNIT 40 GPH
C 6 6 . 8 1 0 2 3 4

SECRET

NO FOREIGN DISSEM

NO FOREIGN DISSEM



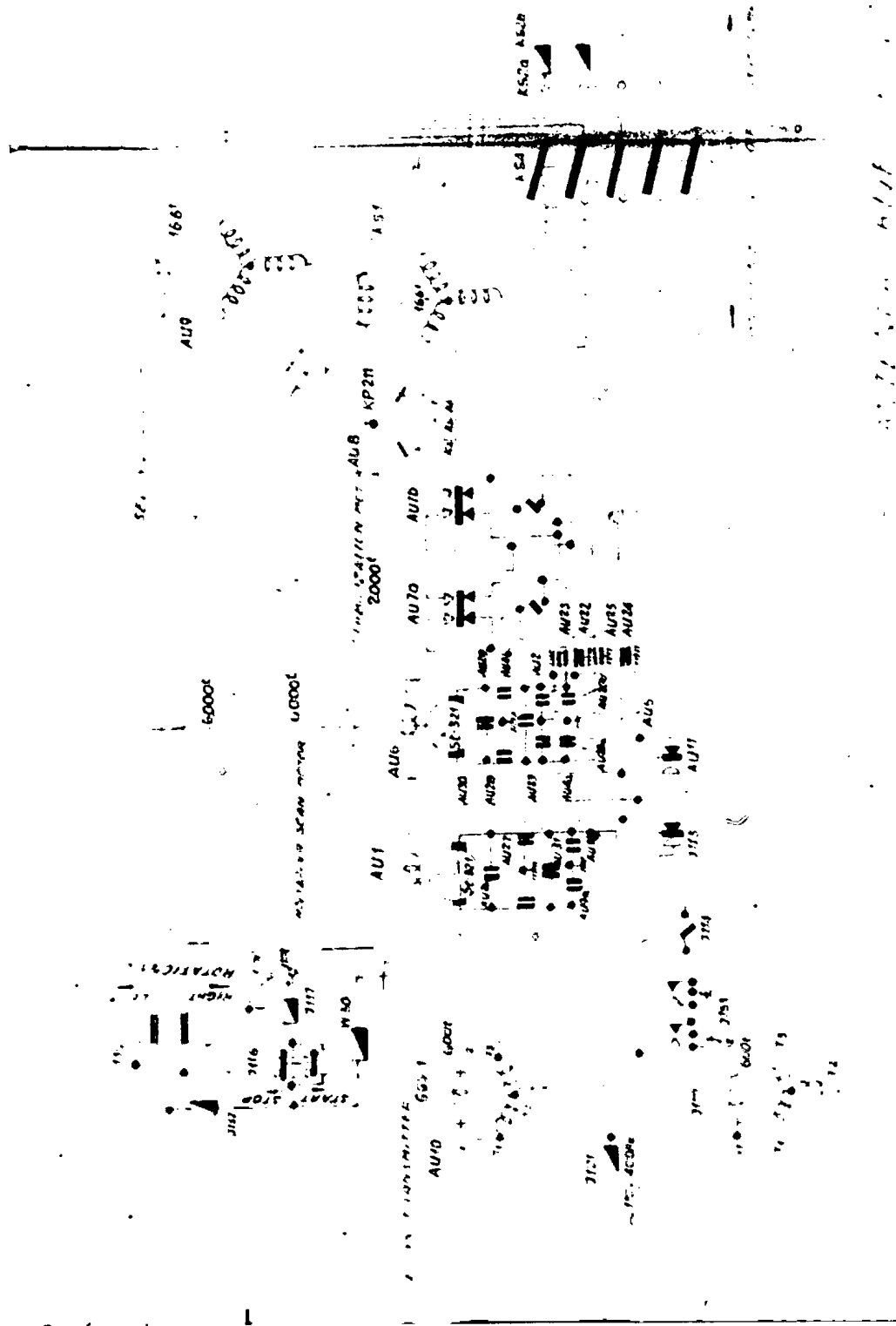
SECRET

NO FOREIGN DISSEM

NO FOREIGN DISSEM



50X1

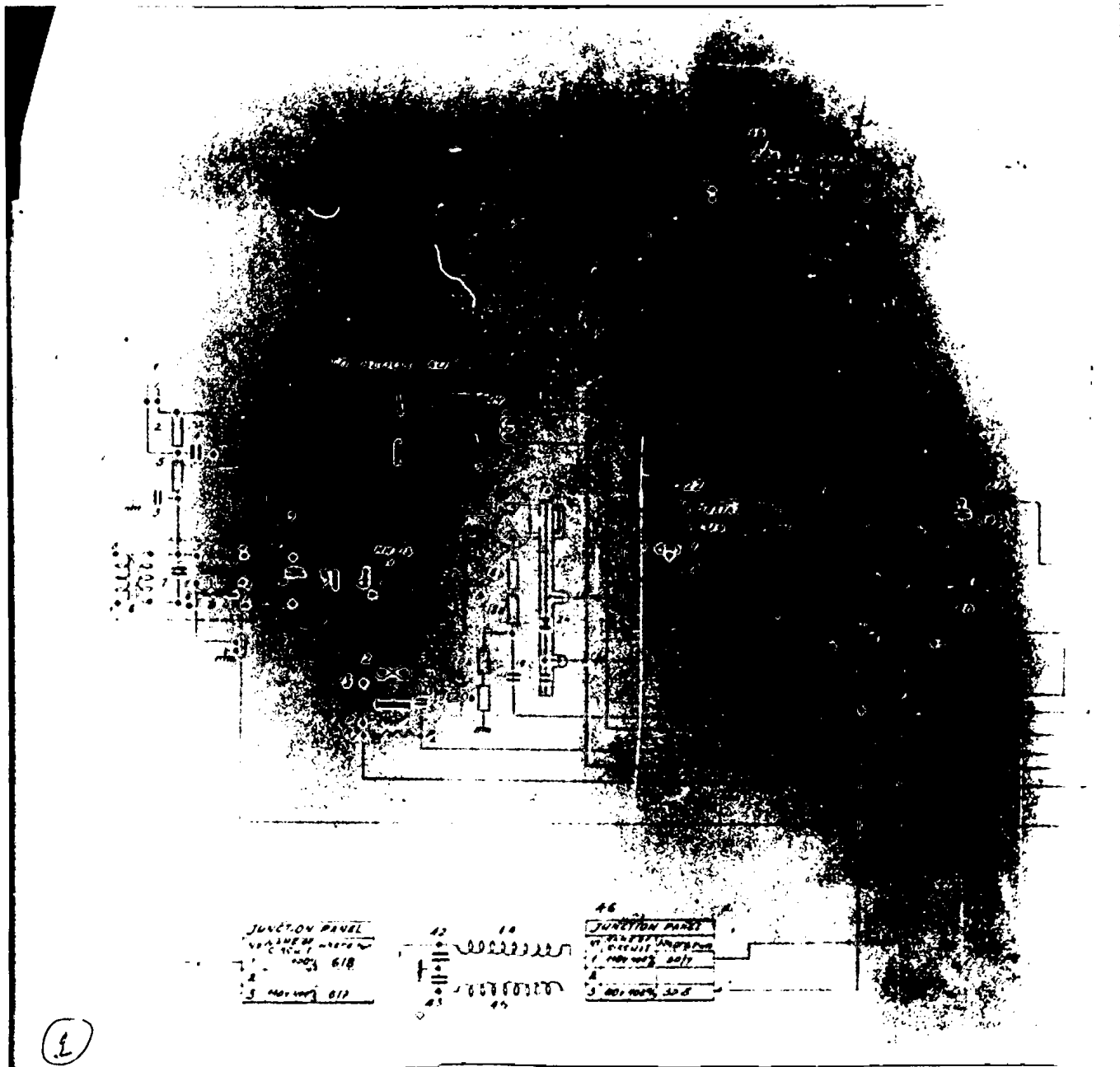


(7)

SECRET
NO FOREIGN DISSEM

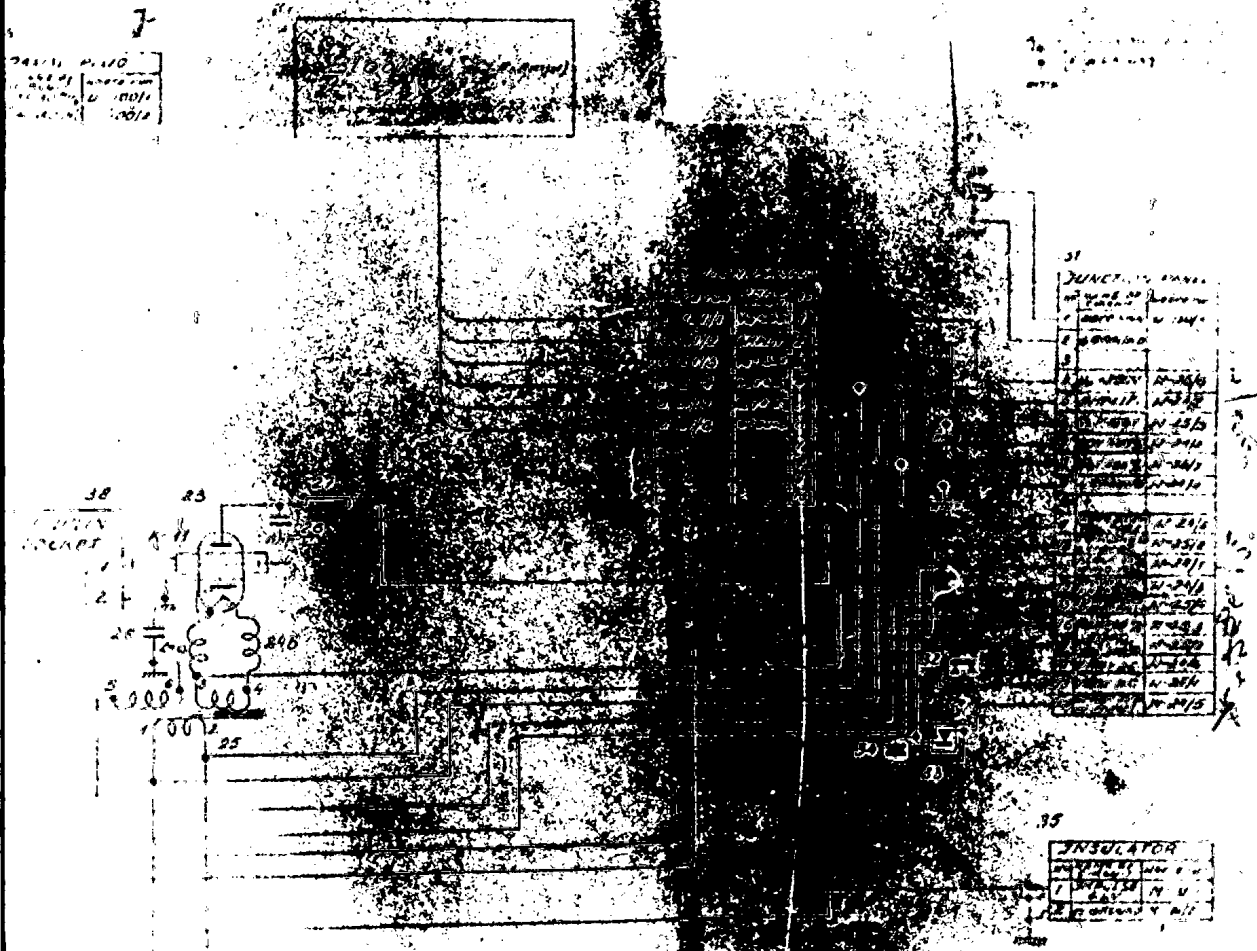
NO FOREIGN DISSEM

50X1



SECRET
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM



TRANSMITTER P UNIT
CIRCUIT DIAGRAM

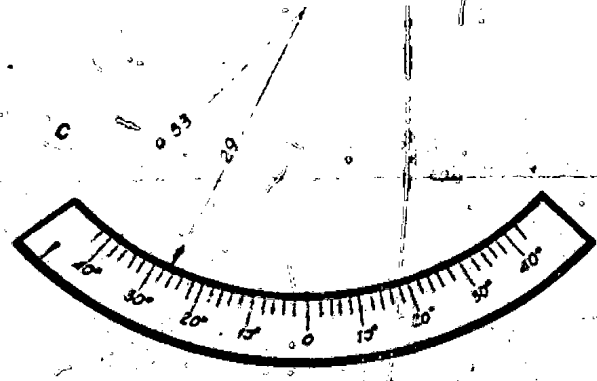
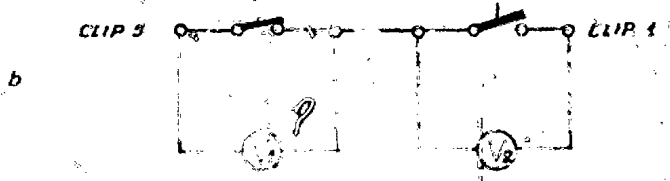
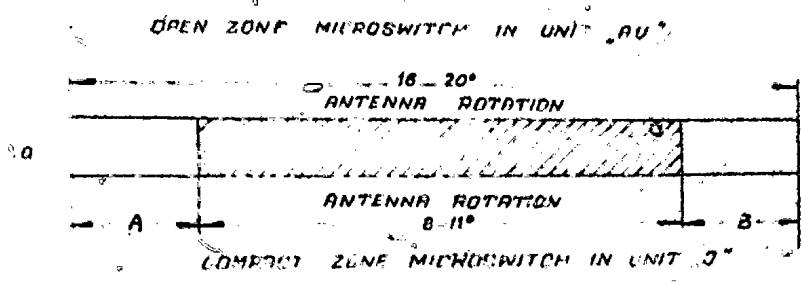
(2)

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1



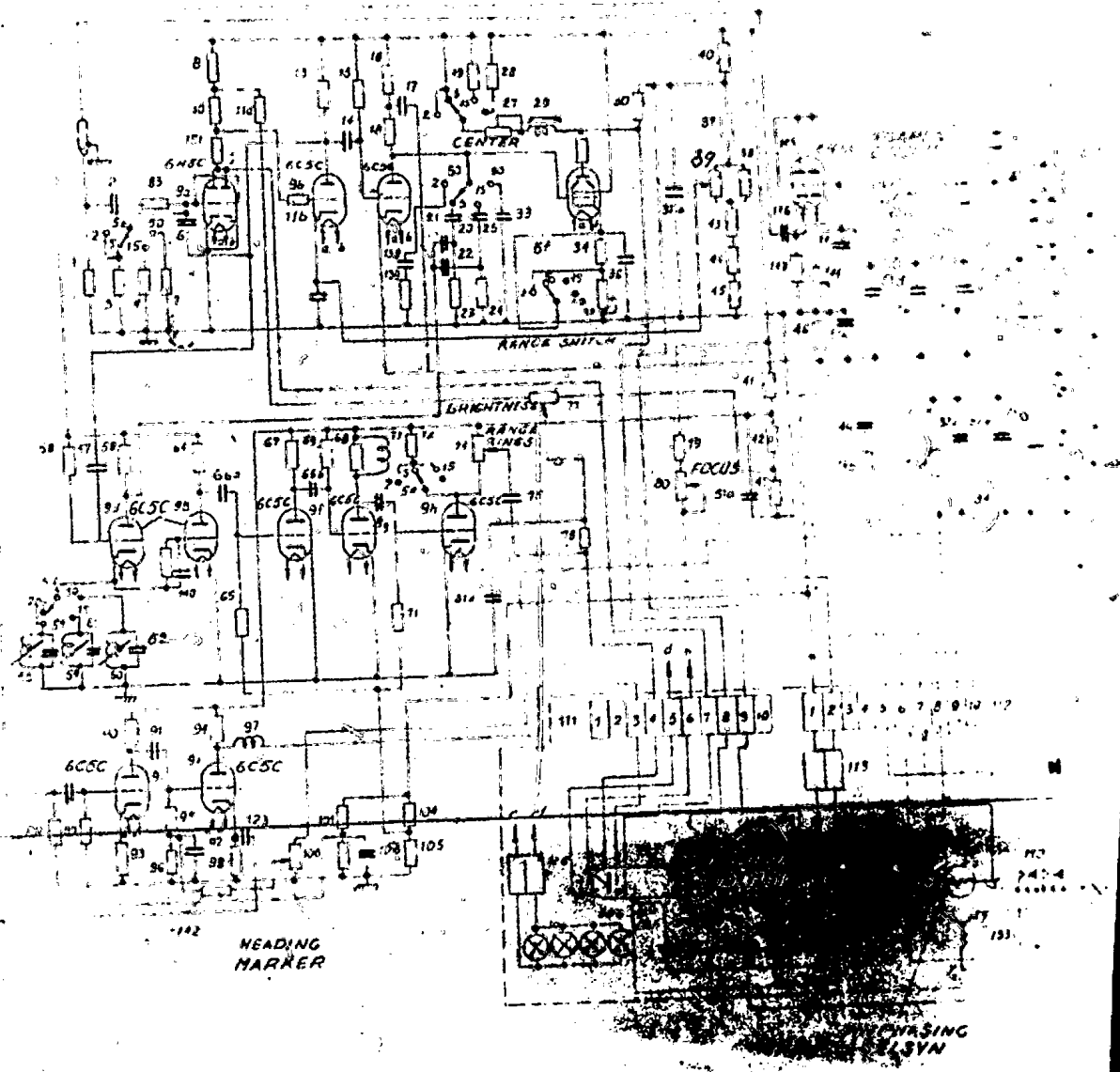
ZONES REGULATION MICROSWITCH
 a) ZONES COMPACT AND OPEN MICROSWITCH
 b) ELECTRICAL SCHEMATIC ZONES REGULATION
 c) THE SCALE ANGULAR AT TO BEH OVER OF ZONES

S-E-C-R-E-T

NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1



Display unit circuit diagram (Ja 6 2A)

1

S-E-C-R-E-T
NO FOREIGN DISSEM

S-E-C-R-E-T
NO FOREIGN DISSEM

50X1

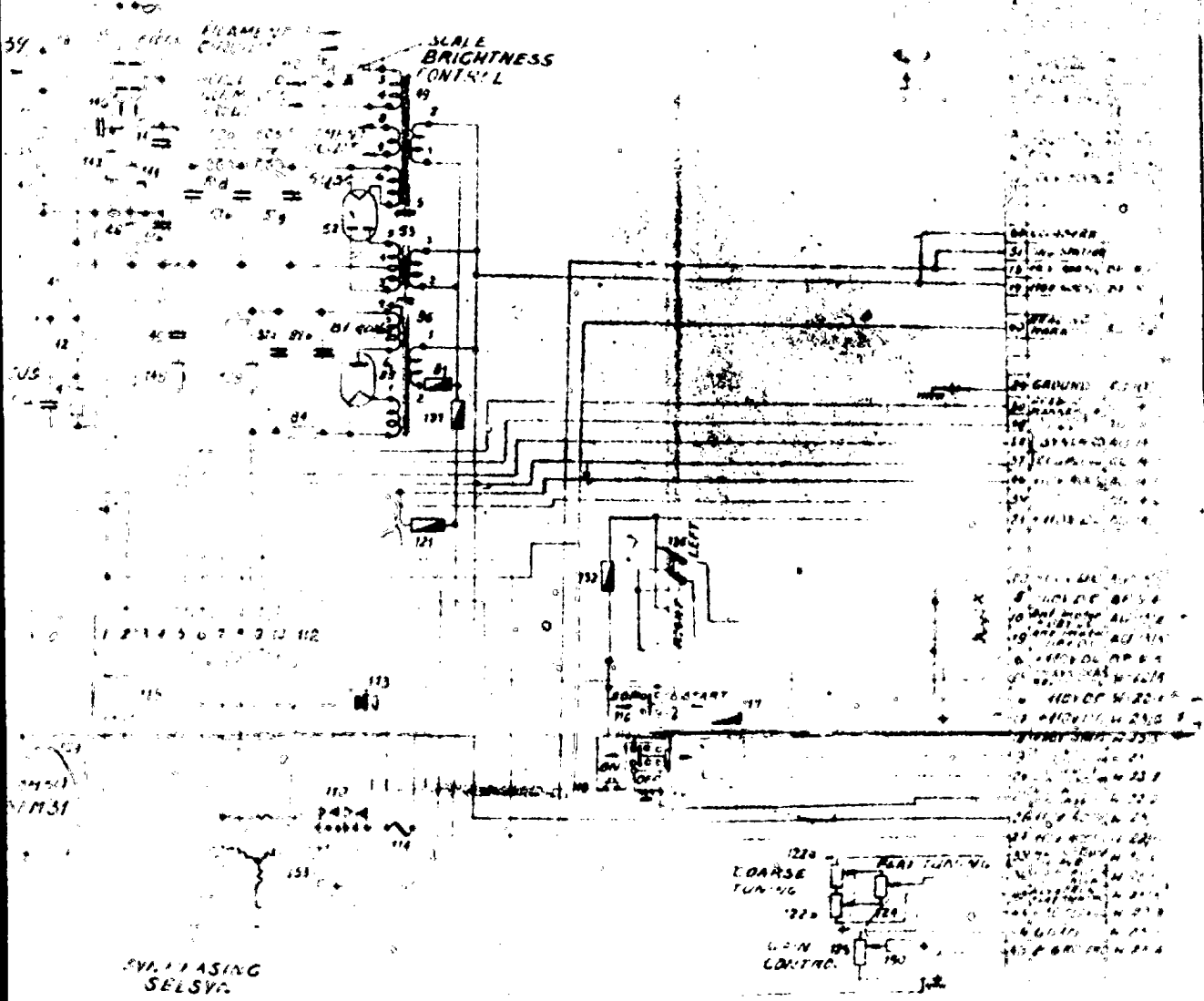


Diagram (Ja 6.291.017-spl)

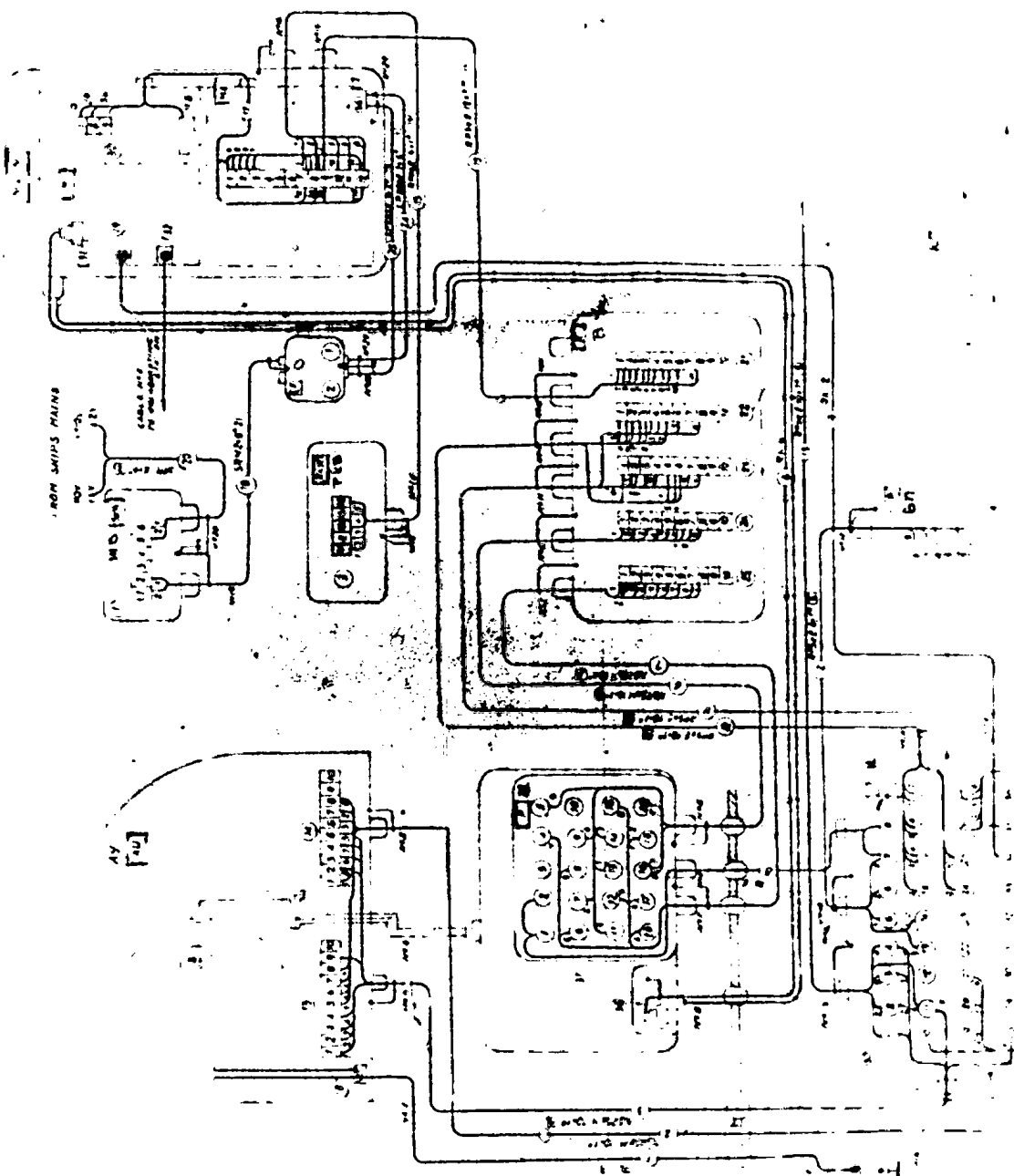
(2)

S-E-C-R-E-T

NO FOREIGN DISSEM

NO FOREIGN DISSEM

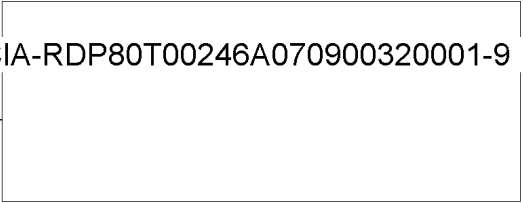
50X1



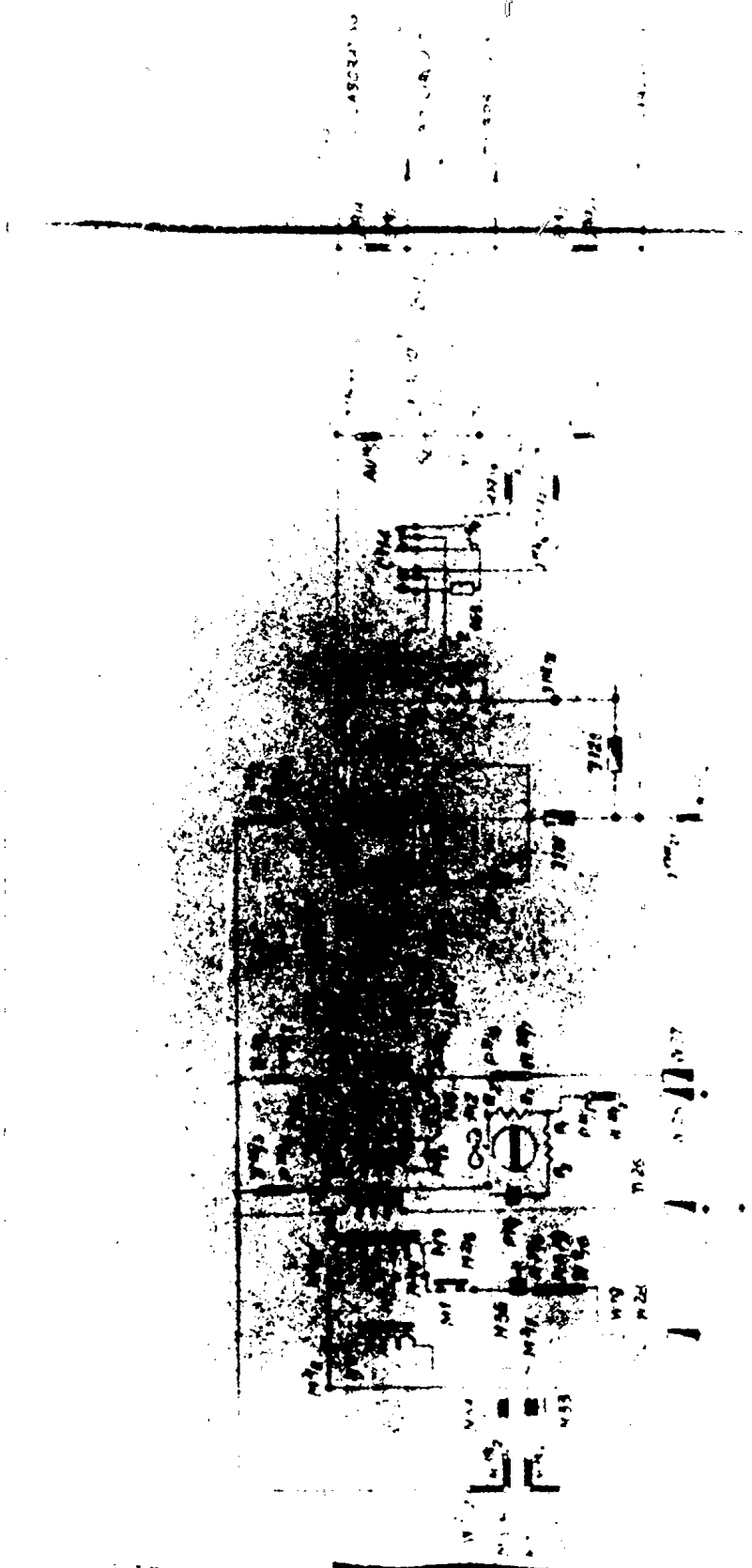
SECRET

NO FOREIGN DISSEM

NO FOREIGN DISSEM



50X1

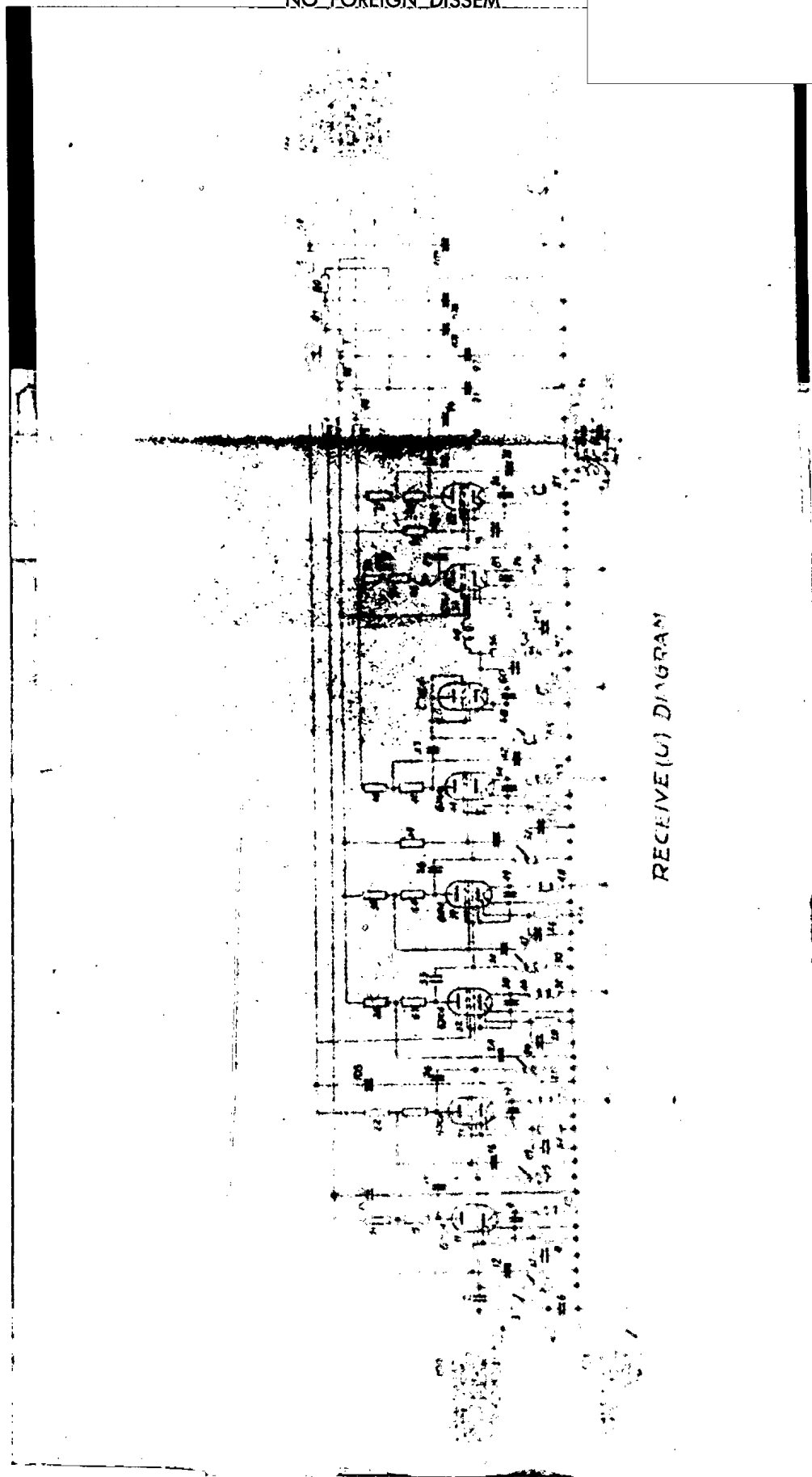


SECRET

NO FOREIGN DISSEM

NO FOREIGN DISSEM

50X1



RECEIVE (U) DIAGRAM

SECRET

NO FOREIGN DISSEM

NO FOREIGN DISSEM

50X1



SECRET

NO FOREIGN DISSEM

SECRET
NO FOREIGN DISSEM

SECRET
NO FOREIGN DISSEM