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TECHNICAL DESCRIPTION

General information

Receiver "Vega-404" is a portable superheterodyne for reception of broadcast stations operated in the range of long (LW) and middle waves (MW) and meets the requirements 5651-76.

The reception is performed by interval aerial.

The receiver is provided with jacks to plug in an external aerial, midget earphone and external supply.

To be easily tuned in the dark, the receiver is provided with the button for momentary illumination of the radio scale.

The receiver is fed from batteries with total voltage 9V or from external power supply source.

The receiver is designed for operation at the temperature of environment from- 10°C to +40°C, relative air humidity 60±15%, atmospheric pressure from 86 to 106 Pa.

SPECIFICATION

Ranges of received waves (frequencies):	
long waves LW, m (kHz)	2000,0-740,0(150,0-405,0)
medium waves (MW), m (kHz)	571,4-186,9(525,0-1605,0)
Sensitivity, not worse than:	
in the range LW	2,0 mV/m
in the range MW	1,5 mV/m
Selectivity (weaking of signal at mistuning of ± 9 kHz), not worse than	- 20 dB
Rated output power	0,2 W
Maximum output power	0,4 W
Reproducible accoustic frequency range	315-3550 Hz
Receiver dimensions without packing	180x55x162mm
Receiver mass without power supply	0,8 kg

CIRCUIT DIAGRAM DESCRIPTION

Radio receiver "Vega-404" is provided with a microschema, three transistors and four diodes.

The input circuits use magnetic aerial and has an inductive coupling with frequency changer. When the receiver operates in the range of LW, the MW antenna coil L1 is parallel - connected with capacitor C6, and when opening in the range of MW, the LW antenna coil L3 is short-circuited.

Frequency changer is provided with one transistor KT315A (V2). The heterodyne uses coils L5,L6 (MW heterodyne) and L7,L8 (LW hete - rodyne).

For amplitude stabilisation of heterodyne when the supply voltage weaks,the regime transistor V2 is stabilized by diode type 7GE2A-K.

Intermediate frequency (IFA) is a two-stage unit and includes transistors type KT315B (V4,V5).The first IFA stage is a resonant circuit the load of which consists of acceptor L12,C21.The coupling with the second stage is accomplished through coil L13.The second IFA stage is aperiodic (resistive).

Through coupling capacitor C26 the IF voltage is fed to detector consisting of diodes of type KD521G (V6,V7) connected in "Diode Integrator" circuit.The load of detector is the variable resistor R16 which operates as volume control.The signal detector simultaneously runs an AGC detector.The AGC voltage is fed to base of transistor V4 through resistor R10.

Low-frequency amplifier uses one microschema type K174UH4B. Capacitor C22 is the element of filter.

CONSTRUCTION OF THE RECEIVER

The "Vega-404" circuitry is of printed plate construction.

There are:volume control,adjustable capacitor unit,magnetic aerial,band selector and all the rest elements of the electrical circuit except the illuminating lamp,on the plate.

The illuminating lamp is on the end of the tuning scale.

The receiver casing is made from stable polystyrene and consists of three panels:front,middle and back.

There are: vernier mechanism,loudspeaker,printed circuit, jacks for telephone and external power,and the compartment of the power supply on the front panel.

There is the battery compartment cover on the rear panel.

All the receiver panels join together by two screws.

The electrical connection of printed circuit is coupled with speaker,earphone and external power jacks,and illuminating lamp by use the plug.

REPAIR OF THE RECEIVER

Checking and tuning instruments

1.AM signal generator with 140-2000 kHz frequency range.
2.Audio-frequency generator with 100-5000 Hz range.
3.Alternating voltmeter with 0-30 and 0-300 mV measurement ranges.
4.DC milliammeter with 0-20 and 0-100 mA measurement ranges and accuracy not worse than 1.5.
5.Meter of low-powered transistors parameters.
6.Combined device for measurement of voltage and resistance with input resistance not less than 10 kOhm/V.
7.Loop-type radiator of uniform field with internal resistance corresponding to output resistance of AM signal generator.
8.Measurer of inductance with measurement range up to 1000 μH.

PREPARATION OF THE RECEIVER FOR REPAIR

To inspect and check the receiver do the following:

1.Pull the supply elements out of the battery compartment.
2.Unscrew the two screws that fix back panel of the receiver and remove it together with the middle part of panel.
3.Separate the back panel from the middle part of panel (when it is necessary) by pressing the back panel from the casing of the receiver.

In order to extract the printed plate from receiver's cabinet do the following:

1.Take off the plug X3Б ,which connect the receiver plate with instrument panel lamp and contact group of instrument panel lamp.
2.Unscrew the two posts fixing the plate and pull it out cabinet, beforehand take off the regulator volume.

To disassemble of vernier mechanism do the following:

1.Remove the tuning knob.
2.Pull the vernier mechanism chassis out of the cabinet.
3.Remove scale,pulling it out along the grooves.
4.Pull the illuminating lamp-socket.

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5.Remove the tuning disc.
6.Remove the vernier mechanism cord and tuning pointer.
7.Unscrew the tuning roller axis.
8.Remove the reflector,pulling it along the grooves.

Checking the receiver,finding out the defect and their elimination

1.Inspect the printed plate and elements located outside the plate,check reliability of connecting wires in soldering points;elements located on the plate should not be closed with each other or with metal parts.

2.Check the low-frequency amplifier (in good condition of loudspeaker), for this purpose apply 100 Hz signal,value 10 mV from audio-frequency generator to the amplifier input (control point KT2).Establish the volume knob to position corresponding to max. volume.In this case the distortions,wheeze must be not visible,and A.C.voltmeter,connecting to the loudspeaker shows the voltage,not less than 1.3 V.

Rotating the volume knob from one extreme position to the another,signal of output LFA fluently without failures,clicks, crashes and etc.

When it is necessary,do the checking of microschema regime in constant current.When You find incompability of microschema regime,check the setting regime circuits in constant current.When the all circuits are in good conditions,replace the microschema.

3.Check operation of the heterodyne,for this purpose connect the tube voltmeter in parallel with resistor R5.Heterodyne waveform amplitude must be within 60-80 mV.

Turn the VCU rotor from max.capacity position to min.capacity position with this,the heterodyne must have no failures in generation.Do this checking on both bands.

4.Check operation of IF amplifier,for this purpose:

- establish bandswitch in position LW and tuning pointer in the extreme left position in scale;
- establish volume knob in max,volume position,connect the variable voltmeter to loudspeaker;
- apply a signal of 465 kHz frequency and 5 μV amplitude

from AM signal generator to control point KT1 through acapacitor 0,15-0,5 μF,the applied signal must be modulated by 1000 Hz frequency and have the modulation factor equal to 0,3;

- slightly varying the generator frequency,obtain max.value of the receiver's output voltage which must be not less than 0,63 V.

5.Test the input circuit of the receiver,for this purpose connect the field radiator to AM signal generator,place the receiver by the axle of radiator at one metre distance from it and apply 250 kHz signal from generator;the signal should be modulated by 1000 Hz frequency with modulation factor equal to 0,3.The signal amplitude must ensure field strength equal to 0.8 mV/m at a place where receiver is located.Connect the tube voltmeter to receiver's loudspeaker terminals; turn volume knob to max.volume position and tune the receiver obtsining the max.value of output voltage.With this the output voltage of receiver must be not less than 0.63 V.

The check on MW band can be carried out the same way by applying 1000 kHz signal;field strength at place of receiver's location must be equal to 0.5 mV/m.

Should a discrepancy with above-mentioned requirements occur when checking, it is necessary to make a stage-by-stage testing of the receiver;for this purpose successively apply a corresponding signal to bases of transistors.Frequencies and amplitudes of these applied signals are shown in elementary circuit diagram of the receiver.

Should a defective stage be detected,test the transistor conditions about the "-" terminal of supply source by use of voltmeter with internal resistance not less than 10 kOhm/V,The conditions of transistor should not differ from those mentioned in elementary circuit diagram by more than ± 20%.

In case of need,solder the transistor out of circuit and test it by means of a corresponding instrument.

ADJUSTMENT AND TUNING OF THE RECEIVER

For adjustment of LVA apply a signal of 1000 Hz and 6 mV amplitude from AM signal generator to control point KT2 and by using the resistor R28 place the voltage 0,7 V at loudspeaker.

The tuning of IF path necessary when change one of the coils L9,L10,L12 and also when insufficient sensitivity of the

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receiver.

For tuning of the IF path do the following:

- connect A.C. voltmeter to the loudspeaker;
- switch the LW band on;
- apply signal of 465 kHz frequency and 5-50 μV amplitude from AM generator to control point KT1 through the capacitor 0,015-0,5 μF the applied signal must be modulated by 1000 Hz frequency and have the modulation factor equal to 0,3;
- tune the changing coil at max.voltage on the output of the receiver;
- establish the voltage of applied signal equal to 5 μV: in this case the output voltage of the receiver at max.volume must be not less than 0,63 V.

In this case when the output voltage less than 0,63 V, tune the coils L9,L10,L12 obtaining the max.value of output voltage.

To tuning of output circuits do following;

- connect the radiator of uniform field AM generator;place the receiver by the axle of radiator at one metre distance from the latter,switch the LW band;
- apply a signal of 145 kHz frequency and 1-3 mV amplitude from generator,the applied signal must be modulated by 1000 Hz frequency and have the modulation factor equal to 0,3.

Place the tuning pointer to the extreme left position on the scale by using the tuning knob and rotating the core of coil L7 (LW heterodyne),obtain the maximum factors of voltmeter.

Establish the generator frequency equal to 160 kHz.By using the tuning knob,tune at the generator frequency obtaining the max.factors of the voltmeter.Rotating the coil L3 (LW antenna) along the core of the magnetic aerial obtain the max.factors of voltmeter. Establish the generator frequency equal to 415 kHz.Place the tuning pointer to the extreme right position along tha scale by using tuning knob of the receiver.Obtain the max.output voltage of the receiver by using capacitor C12.Repeat the tuning operation 2-3 times. Tune the input and heterodyne circuit IW band as you tune the LW band.

In this case tune the heterodyne circuit by coil L5 at frequency 515 kHz in the left part of the scale,the input circuit by coil L1 at the frequency 560 kHz;tune the heterodyne circuit at the frequency 1630 kHz by capacitor C11 in the right part of the scale,input circuit - by capacitor C9 at the frequency 1400 kHz.

BASIC DEFECTS

Defects	Additional Signs	Reasons,additional Measurent	Remedies
Receiver does play		No contacts in phone jack,feeding jack and connection of batteries	Check the reliability of contacts in the unit
Receiver does not play.Signal not fed from LFA input (control point KT2	Quiescent current is nor - mal (18 mA) Microschema regime is normal	No contact in phone jack,the wire disconnected	Tuck in springs solder the wire
		Break in voice coil of loudspeaker	Replace the voice coil
Receiver does not play.Sensitivity from LFA is normal Signal not fed from control point KT1	Conditions of transistors V2,V4,V5 are normal	Terminals of coils L10 and L13 are broken or closed to screen. Test by ohmmeter.	Replace faulty coil
		One of capacitors C16 C17,C18,C21,C24,C26 faulty	Change the faulty capacitor
		Stage-by-stage in - spect IFA,the inspection should be carried out by exposing the ability to tune the IF circuits	
	Conditions of transistors V2 V4 and V5 are out of norm	Terminals of coils L9,L11,L12 broken or closed to screen	Replace faulty coil
		One of transistors V2,V4,V5.Test transistor of faulty stage	Replace faulty transistor Test transistor of faulty stage

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1	2	3	4
Receiver does not play. Sensitivity from control point KT1 is worse than normal one.LFA sensitivity is normal. Receiver becomes excited	Conditions of transistors V2 V4,V5 are normal	One of capacitors C20, C25,C27 faulty	Replace faulty capacitor
		Heterodyne does not effect	Replace faulty coil
		Measure the heterodyne amplitude.Test the heterodyne coils by ohmmeter	
		Capacitor C13,C23,C27 C33,C38,C39	Replace faulty capacitor
Receiver does not play.Sensitivity from control point KT1 is normal	When turning tuning knob, the heterodyne voltage waveform does not change its frequency	Capacitor C3 faulty	Change variable capacitors unit
		Capacitors C4,C5 faulty	Replace faulty capacitor
	Heterodyne operates normally, its frequency changes within the range	Break in antenna coil or coupling coil	Replace faulty coil
		Capacitor C2 faulty	Change variable capacitors unit

1	2	3	4
Signal is distorted.Signal from LFA input is normal	Sensitivity of control point KT1 is out of normal	Faulty one of diodes V6 or V7 Test the diodes by ohmmeter	Replace faulty diode
Receiver's sensitivity by field is worse than rated one Sensitivity from control point KT1 is rated	Sensitivity increases when hand is close to magnetic aerial	Input circuits mistuned	Tune up coils L1 or L3 and capacitors C9 or C10
		Magnetic aerial core is broken	Change core

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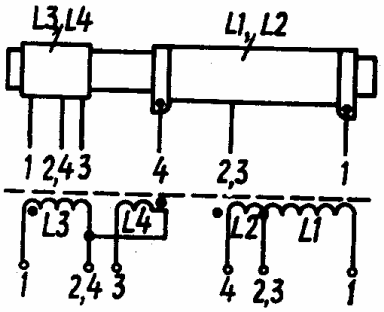

Рис.4. Антенные катушки

Fig.4. Antenna coils

Наименование Name	Обозначение по схеме Symbol on Diagram	Обозначение выводов Designation of terminals	Число витков Number of turns	Марка провода Wire grade	Диаметр провода, мм Wire diameter, mm	Сопротивление обмоток, Ом Resistance of windings, Ohm	Частота измерения, кГц Frequency of measurement, kHz	Индуктивность, мкГн Inductance, μH	Добротность Quality
Контур ДВ Circuit LW	L 3	I–2	6x36 +30	ПЭВ–I	0,I8	6,2±20%	250	2760 ±I0%	I40
Связь ДВ Circuit LW	L 4	3–4	23	ПЭВ–I	0,I8		–	–	–
Контур СВ Circui MW	L I	I–2	70	ПЭВ–I	0,I8	–	I000	340± I0%	I60
Связь СВ Coupling MW	L 2	3–4	7	ПЭВ–I	0,I8	–	–	–	–

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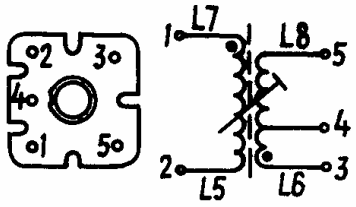
Рис.5. Катушки гетеродина ДВ, СВ

Fig.5. LW and MW heterodyne coils



Наименование Name	Обозначение по схеме Symbol on diagram	Обозначение выводов Designation of terminals	Число витков Number of turns	Марка провода Wire grade	Диаметр провода, мм Wire diameter, mm	Сопротивление обмоток Resistance of windings	Частота измерения, кГц Frequency of measurement, kHz	Индуктивность, мкГн Inductance, μH	Добротность Quality	Цвет маркировки Colour of marking
Контур ДВ Circuit LW	L 7	I–2	4x48	ПЭВ–I	0,I	6,I±I0%	I000	475	80	Красный Red
Связь ДВ Circuit LW	L 8	3–4–5	3+2+ 6,5	ПЭЛО	0,I	–	–	–	–	
Контур СВ Circuit MW	L 5	I–2	4x29	ПЭВ–I	0,I	3,5±I0%	I000	I60	80	Не маркируется No marking
Связь СВ Circuit MW	L 6	3–4–5	3,5+I +4,5	ПЭЛО	0,I	–	–	–	–	

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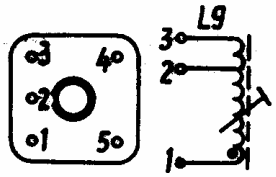
Рис.7. Трансформатор ПЧ

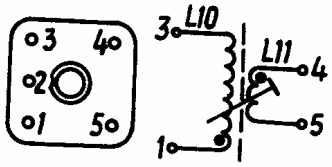
Fig.7. IF Transformer



Наименование Name	Обозначение по схеме Symbol on diagram	Обозначение выводов Designation of terminals	Число витков Number of turns	Марка провода Wire grade	Диаметр провода, мм Wire diameter, mm	Частота измерения, кГц Frequency of measurement, kHz	Индуктивность, мкГн Inductance	Добротность Quality	Цвет маркировки Colour of marking
ТПЧ	L 9	I-2-3	69+27	ПЭВ-I	0,06x5	465	240±I0%	I20	Красный Red

Рис.8. Трансформатор ПЧ

Fig.8. IF Transformer



Наименование Name	Обозначение по схеме Symbol on diagram	Обозначение выводов Designation of terminals	Число витков Number of turns	Марка провода Wire grade	Диаметр провода, мм Wire diameter, mm	Частота измерения, кГц Frequency of measurement, kHz	Индуктивность, мкГн Inductance, μH	Добротность Quality	Цвет маркировки Colour of marking
ТПЧ контур Circuit	L I0	I-3	96	ПЭВ-I	0,06 x5	465	240±I0%	I20	коричневый Brown
ТПЧ связь Coupling	L II	4-5	5	ПЭЛШО	0,I	-	-	-	

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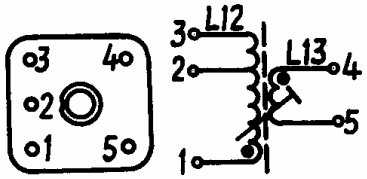
Рис.9. Трансформатор ПЧ

Fig.9. IF Transformer



Наименование Name	Обозначение по схеме Symbol on diagram	Обозначение выводов Designation of terminals	Число витков Number of turns	Марка провода Wire grade	Диаметр провода, мм Wire diameter, mm	Сопротивление обмоток, Ом Resistance of windings, Ohm	Частота измерения, кГц Frequency of measurement	Индуктивность, мкГн Inductance, μH	Добротность Quality	Цвет маркировки Colour of marking
ТПЧ контур circuit	L-I2	I-2-3	64+32	ПЭВ-I	0,I	2,8±20%	465	240±10%	80	Желтый Yellow
ТПЧ связь Circuit	L I3	4-5	I5	ПЭЛШО	0,I	-	-	-	-	

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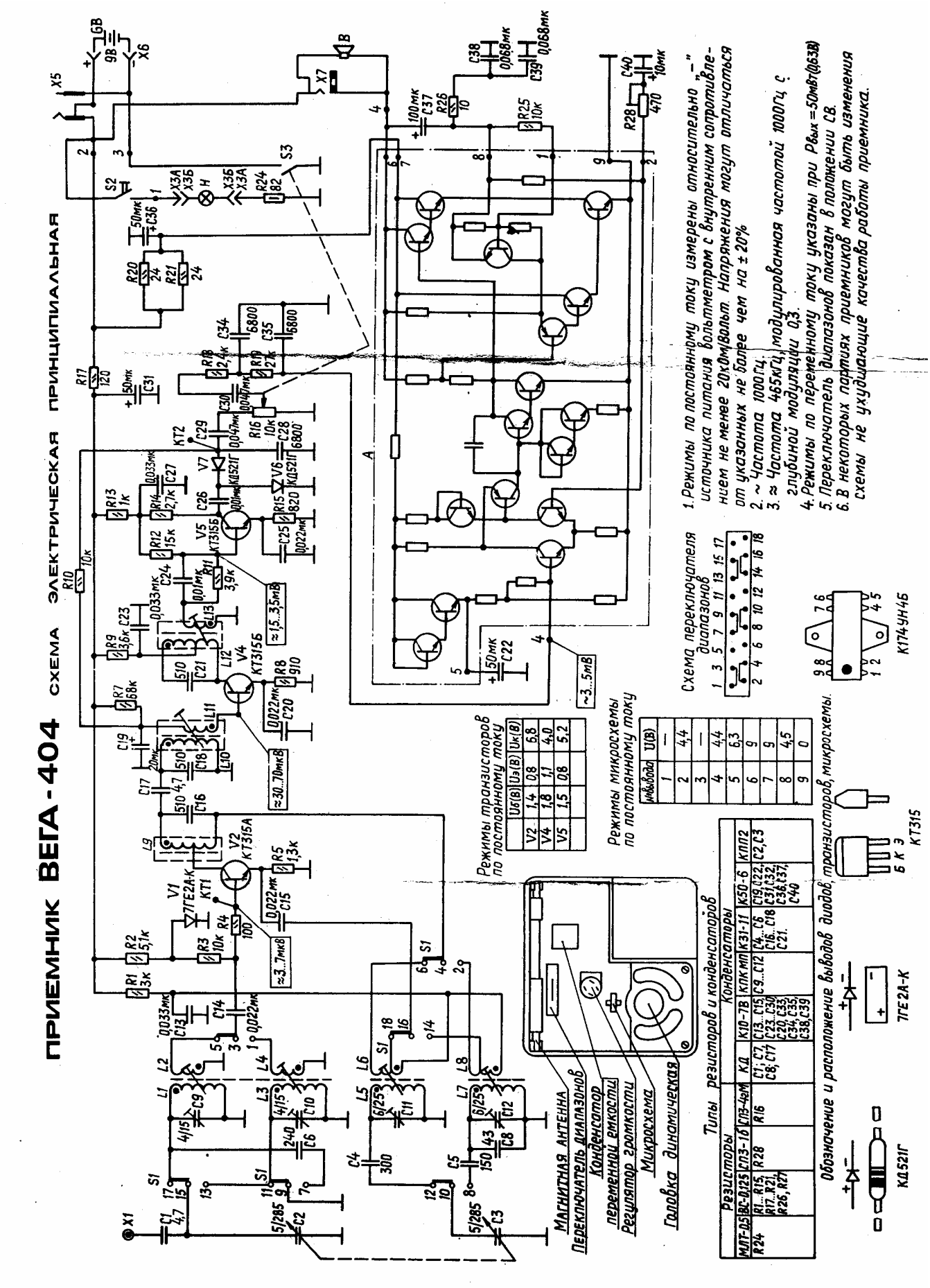

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