ETC "Kontour"

Radio-communication service tester

RST-430

Novosibirsk

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CERTIFICATE
ИТЦК468166.002ПС

1 GENERAL DIRECTIONS

1.1 This certificate verifies the parameters and technical specifications of the radio-communication service tester RST-430 (hereinafter – the tester) guaranteed by the manufacturer.

1.2 The certificate contains the basic technical data of the tester and establishes the rules of its operation.

1.3 After-sales service, technical maintenance and repair of the tester are carried out by the manufacturer.

1.4 According to operation conditions the testers correspond to the group 2 of GOST 22261-94.

1.5 The testers are manufactured in the climatic modification of moderate and frigid climate 4.2 as per GOST15150-69.

1.6 Power supply of the tester is performed from the direct current source with the voltage (10...15) V.

2 BASIC INFORMATION ON THE TESTER

2.1 The testers are designed for technical maintenance and repair of communication radio stations of different purpose in fixed-site and mobile laboratories (workshops).

2.2 Functional principle of the tester

According to a functional principle, the tester is a processor-based measuring and computing device.

3. BASIC TECHNICAL DATA

Metrological characteristics of the RST-430 tester

Name of characteristic, unit of measurement	Parameter	Limits of error
1 Output signal frequency range (high-frequency (HF) connector) (step 1 kHz) By agreement with the customer – the extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4}$ % In the range of 470-520 mHz the readings are indicative
2 Output HF level dBm.	60…-80... -120 dBm	$\Delta_{abs} = \pm 4$ dB
3 HF signals frequency deviation, kHz. Range of modulating frequencies 0.1…10 kHz	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_k / D_{set})]$ %, where D_k = 20 kHz – an upper value of the setting range of frequency deviation; D_{set} – a set value of frequency deviation, kHz.
4 Range of the output low-frequency (LF) signals, kHz	0.1÷20	± 1 Hz
5 Output LF voltage, V.	0.02 ÷ 2	$\Delta_{abs} = \pm (0.02 + 0.05 \cdot U_{lf\ set})$V, where $U_{lf\ set}$ – a set value of

		the output voltage, V.
6 Coefficient of nonlinear distortion (CND) of the output LF voltage, %.	not more than 1	–
7 Output signal frequency range (high-frequency (HF) connector) (step 1 kHz) By agreement with the customer – the extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4}$ %.
8 Measurement range of the HF signals frequency deviation, kHz.	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_k / D_{mes})]$ %, where D_k = 20 kHz – an upper value of the measurement range of frequency deviation; D_{set} – a measured value of frequency deviation, kHz.
9 Measurement range of the output HF signal power, W.	0.2 ÷ 20	$\delta_{rel} = \pm [10 + (P_k / D_{mes})]$ %, where P_k = 20 W - an upper value of the measurement range of the HF output signal power; P_{mes} - a measured value of the power of the HF output signal, W.
10 Measurement range of the LF signals frequency, kHz.	20 ÷ $1 \cdot 10^5$	± 1 Hz.
11 Measurement range of the alternating voltage of sinusoidal form in the range of frequencies from 0.02 to 20 kHz, V.	0.02 ÷ 15	$\delta_{rel} = \pm [3 + 2 (U_k / U_{mes})]$ %, where U_k = 15 V - an upper value of the measurement range of the alternating voltage; U_{mes} – a measured value of the alternating voltage, V.
12 Measurements of CND	1 ÷ 100 %	In the range from 1 to 50%: $\Delta_{abs} = \pm [1 + 0.1 CND_{mes}]$ %, In the range from 50 to 100 % it is not standardized.
13 The time of continuous operation of the tester is no more than 8 h. 14 The power consumed by the tester is no more than 20 W. 15 The overall dimensions of the tester are not more than 270×160×270 mm. 16 The mass of the tester is no more than 8.0 kg. 17 The average time between failures is no less than 5,000 h. 18 The average service life is no less than 5 years.		

TECHNICAL DESCRIPTION
OPERATION GUIDE
ИТЦК468166.002РЭ

1. PURPOSE

1.1. This document is applied to the radio-communication service testers RST-430 (hereinafter – the tester) designed for technical maintenance and repair of radio stations of different purpose in fixed-site and mobile laboratories.

1.2. The testers can be used during setting, control and trials of radio stations when they are released from production.

The tester provides check of the basic parameters of radio stations:

- carrier frequency of the transmitter;
- carrier power of the transmitter;
- frequency deviation;
- amplitude frequency modulation characteristic (AFMC) of the transmitter;
- coefficient of nonlinear distortion (CND) of the modulation characteristic of the transmitter;
- sensitivity of the modulation input of the transmitter;
- frequency of the modulating signal (frequency of the ring signal);
- sensitivity of the receiver ("SINAD" method, method of switching off of modulation);
- output voltage of the receiver;
- amplitude-frequency characteristic (AFC) of the receiver;
- CND of the receiver;

1.3. The tester provides measurement of one or more parameters, necessary mathematical processing and display of a received parameter in a human-readable form.

1.4. According to operation conditions the tester corresponds to the group 2 of GOST 22261.

1.5. The tester is manufactured in the climatic modification of moderate and frigid climate

4.2 as per GOST15150.

1.6. The tester power supply is performed from the direct current source of 10.0-15 V.

1.7. Normal application conditions:

- ambient temperature, °C ……..…...…	20 ± 5;
- relative air humidity, % ……..…	50 – 80;
- atmospheric pressure, kPa (mm Hg) ……..……...…	86.6 – 106; (650-795);

1.8 Operational application conditions:

- ambient temperature, °C ……..…..…	10 – 35;
- value of the relative air humidity at the temperature of 25 ºC, % ……..……	40 – 90;
- atmospheric pressure, kPa (mm Hg) ……..…	84 – 106.7; (630-800).

1.9. Design of the tester complies with the safety requirements as per GOST R 51350 and the requirements for fire safety as per GOST 12.1.004; the requirements of electromagnetic compatibility as per GOST R 51318. 24; GOST R 51318. 22.

1.10. According to outer appearance the paint-and-lacquer coatings comply with GOST 9.032.

1.11. The tester is restored and repaired at the manufacturer's enterprise.

2. TECHNICAL SPECIFICATIONS

2.1. The radio-communication service tester RST-430 complies with the requirements of GOST 22261, these technical specifications ИТЦК468166.002ТУ and a set of design documents (DD) ИТЦК468166.002.

2.2. Basic parameters

2.2.1. The time of continuous operation of the tester is 8 hours (in 2 hours)
2.2.2. The power consumed by the tester: from mains – no more than 20 W, from the direct current source – no more than 10 W.
2.2.3. The overall dimensions of the tester are not more than 270×160×270 mm.
2.2.4. The mass of the tester is no more than 8.0 kg.
2.2.5. The outer appearance and structural design of the tester comply with the design documents ИТЦК468166.002.

2.3. The metrological characteristics are listed in Appendix A.

3. RELIABILITY REQUIREMENTS

3.1. The average time between failures is no less than 5,000 h.
3.2. The average service life is no less than 5 years.

DESCRIPTION OF THE DEVICE

CONFIGURATION AND OPERATION PRINCIPLE

The device is a functionally complete apparatus. It is designed in a case of the type K 324 RH of the VARIO-BOX series manufactured by the OKW company, which has high strength and dust and water resistance, either in a metallic case of similar overall dimensions. The outer appearance of the device is shown in fig.1.

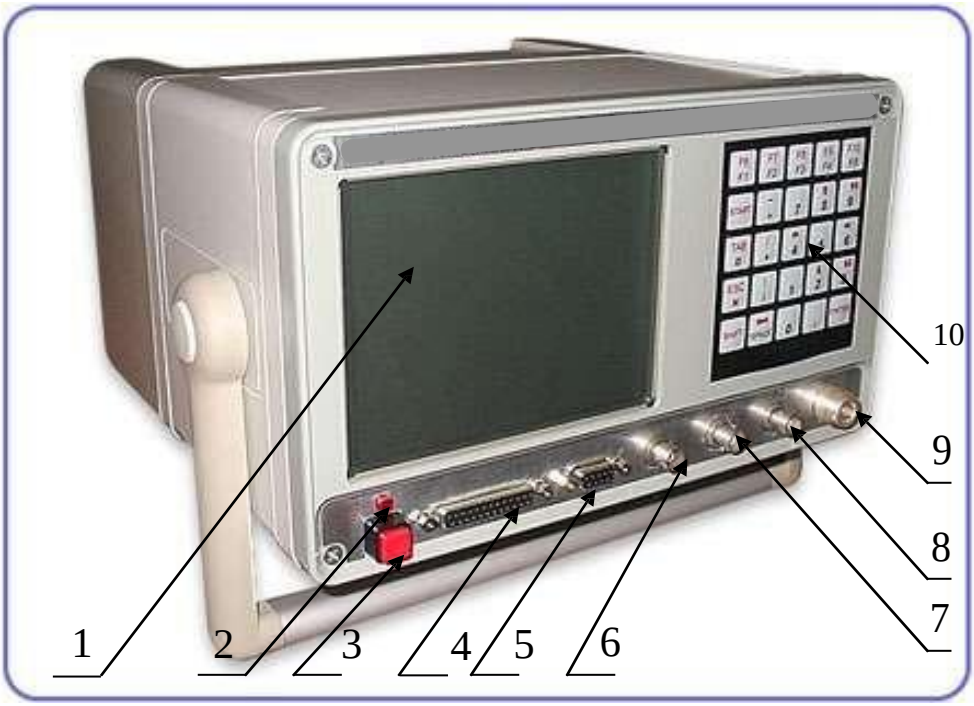

Fig.1

3.3. The front panel of the device has:

1. Liquid-crystal graphic display.
2. Power-on indicator.
3. Power button.
4. "CONTROL" connector serving for connection of optional devices.
5. "EXT" connector serving for connection of the external computer.
6. "AF IN" connector — LF input of the device.
7. "AF OUT" connector — LF output of the device.
8. "RF II" connector — additional output
9. "RF I" connector — main HF input/output of the DEVICE.
10. 25-button keyboard.

3.4. The back panel of the device has a power connector and ground.

4. PREPARATION OF THE TESTER FOR OPERATION

4.1. Safety measures when preparing the tester

4.1.1. Only persons who got through a safety instruction for working with electrical measuring and radio measuring devices are allowed to work with the tester.

4.1.2. Before switching on the tester it is necessary to check intactness of the power supply cable and compliance of the power supply voltage with the operating voltage.

4.1.3. For connection use the network adapter supplied as a set with the device.

4.1.4. Take the tester out of the transportation case, making sure in absence of mechanical damages by means of visual inspection.

4.1.5. If the tester was in climatic conditions not complying with the working conditions of operation, it is necessary to hold it in conditions complying with the working ones for no less than 2 hours.

4.1.6. Before starting work it is necessary to study this operation guide and get acquainted with placement and purpose of the control elements, connectors.

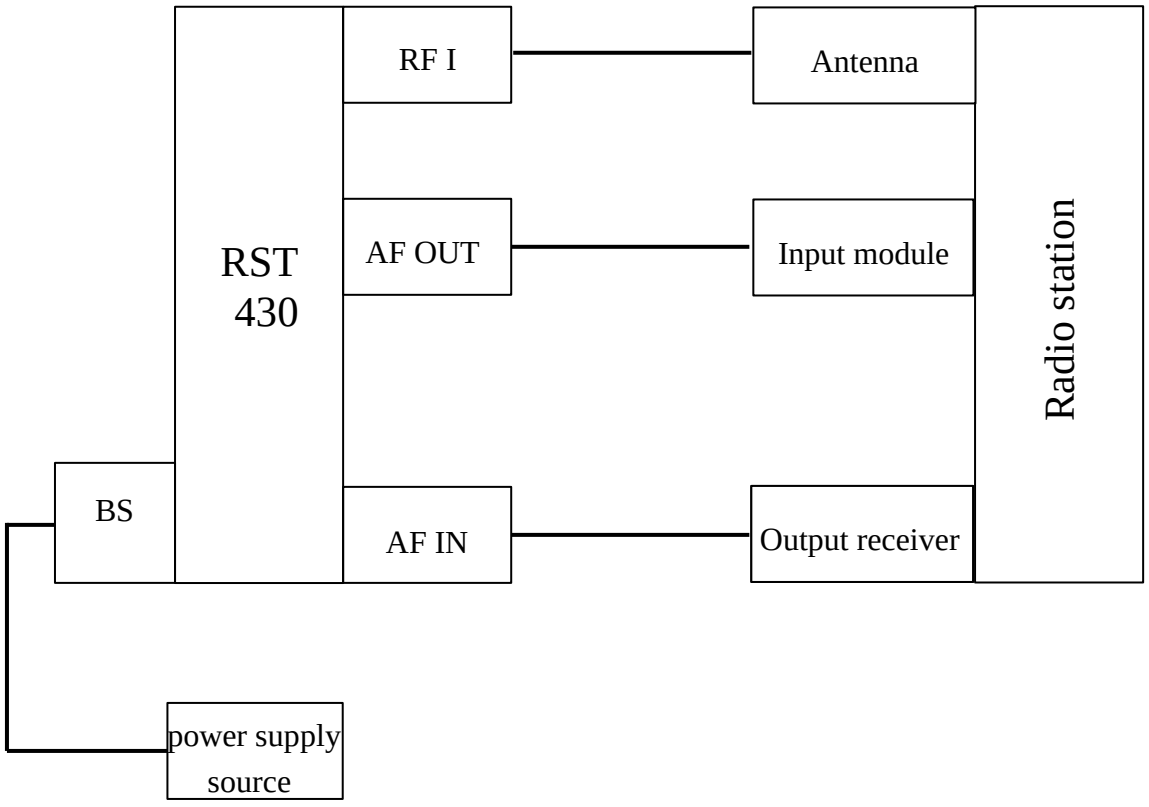

Fig.2

4.2. Place the tester at the workplace, providing operational comfort and conditions of self-ventilation.

4.3. Switch off the power-on key.

4.4. Connect the tester to the power supply source, observing the polarity.

4.5. Connect the tester and the checked radio station according to fig.2.

4.6. Press the power-on button. The screen of the tester must display a startup screen (fig.3) indicating that the device is ready for operation.

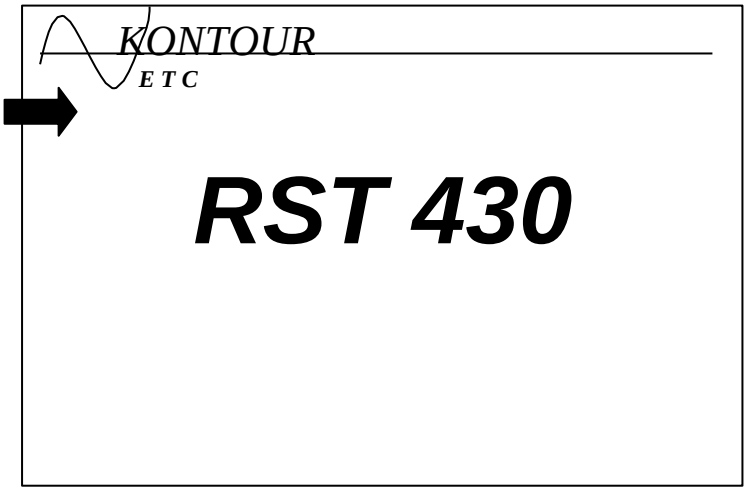

Fig.3

5. USE OF THE RADIO TESTER

5.1. Fulfil the requirements of section 5.

5.2. After finishing self-testing (no more than 10 sec.) a main menu of measurement of the transmitter parameters must appear:

RECEIVER ◂ TAB	TRANSMITTER
F1 FREQUENCY F2 POWER F3 DEVIATION F4 CND F5 LF FREQUENCY	
ESC SETTINGS	

Fig.4

5.3. Before starting any measurement it is necessary to connect the radio station to the device, set it into a necessary mode (set a necessary channel, for measurement of the transmitter parameters press the press-to-talk switch, etc.), then with the help of TAB and F1-F5 buttons

select a necessary type of measurement.

After switching on the radio station into a relevant mode and pressing the F1-F5 buttons, it is possible to measure a certain parameter. For example, we need to measure the power of the radio station. After pressing the button F2 we will see the following on the screen:

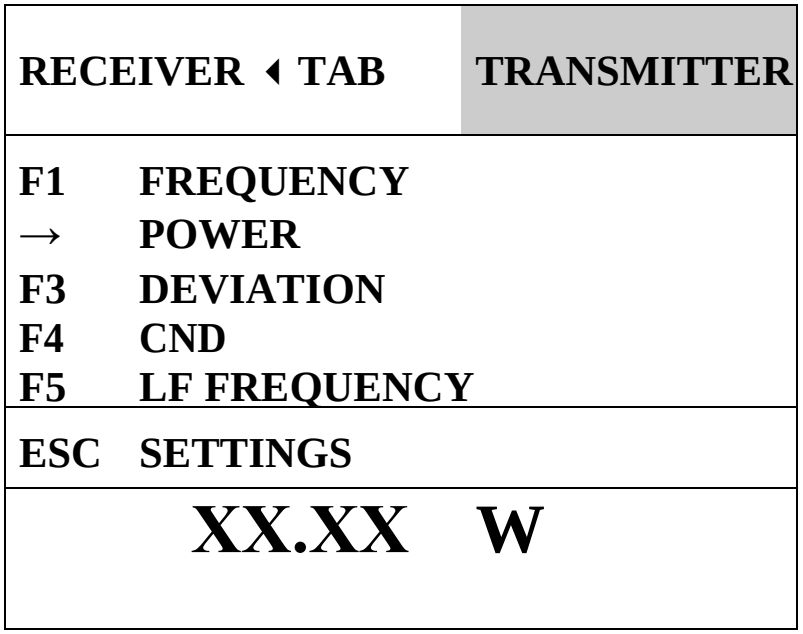

Fig.5

Where "XX.XX W" is a measured power value

"Attention! When using the fixed attenuators (of the FAD-2...FAD-6 or similar type) for measurement of radio stations transmitters parameters with the output power more than 20 W, it is necessary to multiply a value measured by the device by a relevant coefficient of attenuation (damping) of the attenuator expressed in times from the formula Katt, times = 10 in the degree Katt, dB/10."

5.4. To change the setting parameters press the "ESC" button:

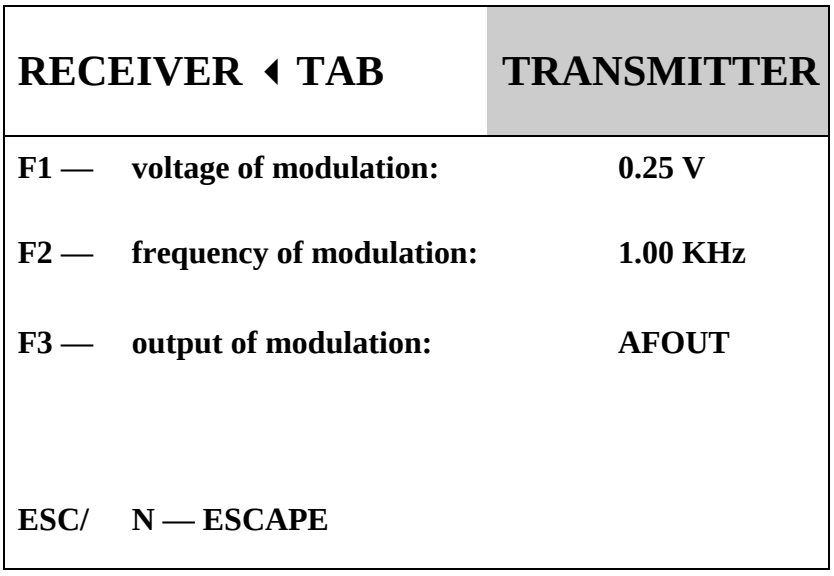

Fig.6

5.5. Select a necessary menu item. Type a new value of a parameter. Press "ENTER". The setting parameters will be changed and displayed on the screen.

5.6. To return to the main menu of the transmitter press "ESC".

5.7. To go into the menu of the receiver press the "TAB" button:

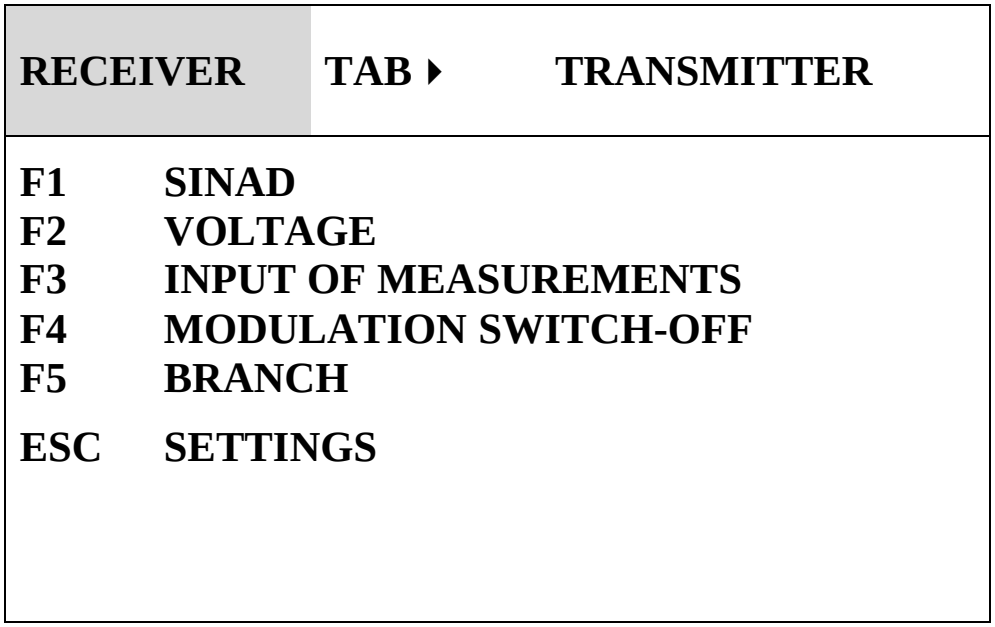

Fig.7

5.8. Changes of settings pressing "ESC":

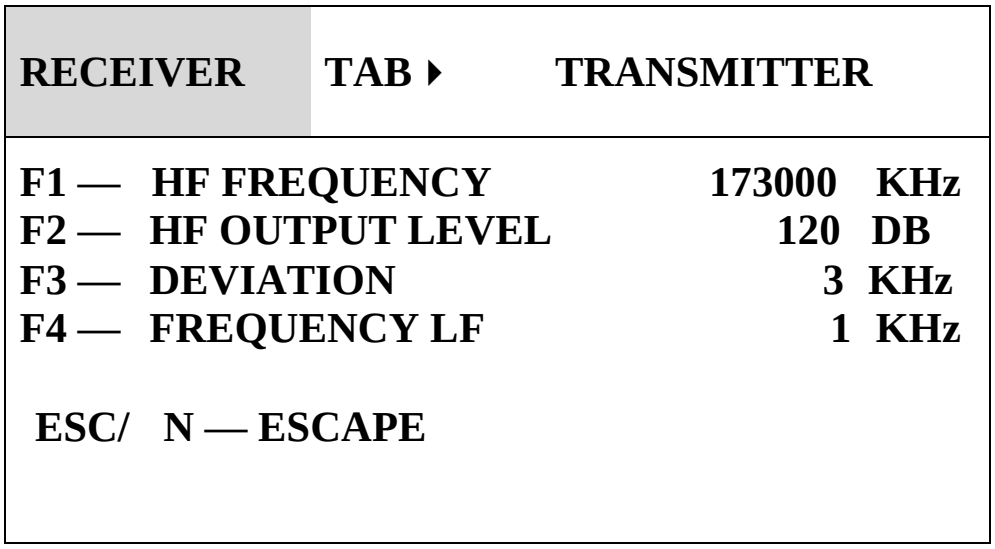

Fig.8

5.9. At present time 2 methods of measurement of sensitivity are used: SINAD method and the method of switching off modulation giving a little different results. Besides, in TS for certain radio stations different thresholds of CND and a signal/noise when measuring by these

methods are established. So the item "SENSITIVITY" was not included into the main menu.

5.10. To measure sensitivity according to the SINAD method, it is necessary to set such an output level of the HF generator that the receiver CND made up some threshold value (usually 20…30 %).

5.11. To measure sensitivity by the method of switching off modulation, it is necessary to set a level of the HF generator that the relation of the output voltage of the receiver with modulation switched on to the voltage with modulation switched off made up some threshold value (usually about 10 DB).

5.12. Calibration of the device according to paragraph 6.3 of calibration procedure.

Works on perfection of the device are being carried out now. Therefore, the user interface can be changed—that will not make difficulties, but only improve operational comfort, single devices, additional options established by agreement with the customer not reflected in the standard instruction.

APPENDIX A

Metrological characteristics of the RST-430 tester

Name of characteristic, unit of measurement	Parameter	Limits of error
1 Output signal frequency range (high-frequency (HF) connector) (step 1 kHz) By agreement with the customer – the extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4}$ % In the range of 470-520 mHz the readings are indicative
2 Output HF level dBm.	60…(-80)... -120 dBm	$\Delta_{abs} = \pm 4$ dB
3 HF signals frequency deviation, kHz. Range of modulating frequencies 0.1…10 kHz	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_к / D_{set})]$ %, where $D_к$ = 20 kHz – an upper value of the setting range of frequency deviation; D_{set} – a set value of frequency deviation, kHz.
4 Range of the output low-frequency (LF) signals, kHz	0.1÷ 20	± 1 Hz
5 Output LF voltage, V.	0.02 ÷ 2	$\Delta_{abs} = \pm (0.02 + 0.05 \cdot U_{lf\ set})$V, where $U_{lf\ set}$ – a set value of the output voltage, V.
6 Coefficient of nonlinear distortion (CND) of the output LF voltage, %.	not more than 1	–
7 Output signal frequency range (high-frequency (HF) connector) (step 1 kHz) By agreement with the customer – the extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4}$ %.
8 Measurement range of the HF signals frequency deviation, kHz.	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_k / D_{mes})]$ %, where Dk = 20 kHz – an upper value of the measurement range of frequency deviation; Dset – a measured value of frequency deviation, kHz.
9 Measurement range of the output HF signal power, W.	0.2 ÷ 20	$\delta_{rel} = \pm [10 + (P_k / D_{mes})]$ %, where P_k = 20 W - an upper value of the measurement range of the power the HF output signal; P_{mes} - a measured value of the power of the HF output signal, W.
10 Measurement range of the LF signals frequency, kHz.	20 ÷ $1 \cdot 10^5$	± 1 Hz.
11 Measurement range of the alternating voltage of sinusoidal form in the range of frequencies from 0.02 to 20 kHz, V.	0.02 ÷ 15	$\delta_{rel} = \pm [3 + 2 (U_k / U_{mes})]$ %, where Uk = 15 V- an upper value of the measurement range of the alternating voltage; U_{mes} – a measured value of the alternating voltage, V.
12 Measurements of CND	1 ÷ 100 %	In the range from 1 to 50%: $\Delta_{abs} = \pm [1 + 0.1$ CNDmes] %, In the range from 50% to 100 % it is not standardized.

CALIBRATION PROCEDURE
ИТЦК468166.002МП

This calibration procedure is applied to the radio-communication service tester RST-430 (hereinafter – the tester) and establishes the procedure and means of primary and periodic calibrations in accordance with the ИТЦК468166.002ТУ technical specifications.

Calibration is carried out to ascertain serviceability of the tester:

- primary, carried out when releasing the tester into handling from production and repair;
- periodic, carried out when operating;
- unscheduled, carried out according to established procedure, in particular, in case of loss of documents for calibration; after long term storage in conditions, when it is necessary to make sure in intactness of the tester.

The calibration interval is 1 year.

The metrological characteristics are listed in appendix A.

1 CALIBRATION OPERATIONS

1.1 When carrying out calibration it is necessary to perform operations listed in table 1.

Table 1

Name of operation	No. of an item in a normative document for calibration	Carrying out an operation during	
		primary calibration	periodic cali-bration
1 Visual inspection	6.1	yes	yes
2 Testing	6.2	yes	yes
3 Determination of metrological characteristics: 3.1 Determination of the error of the output signals frequency formation (HF)	6.3.1	yes	yes
3.2 Determination of the error of the output HF level setting	6.3.2	yes	yes
3.3 Determination of the error of setting of the HF signals frequency deviation	6.3.3	yes	yes
3.4 Determination of the error of the output signals frequency formation (LF)	6.3.4	yes	yes
3.5 Determination of the error of the output LF voltage setting	6.3.5	yes	yes
3.6 Determination of the measurement error of the HF signals frequency	6.3.6	yes	yes
3.7 Determination of the measurement error of the HF signals frequency deviation	6.3.7	yes	yes
3.8 Determination of the measurement error of the HF power	6.3.8	yes	yes
3.9 Determination of the absolute measurement error of the LF signals frequency	6.3.9	yes	yes
3.10 Determination of the measurement error of the alternating voltage	6.3.10	yes	yes

3.11 Determination of the measurement error of the coefficient of nonlinear distortions (CND) of the alternating voltage	6.3.11	yes	yes

1.2 If when carrying out one or another operation of calibration a negative result is obtained, further calibration is stopped.

2 CALIBRATION DEVICES*

2.1 When carrying out calibration, it is necessary to use the measuring devices and auxiliary equipment specified in table 2.

Table 2

No. of an item of calibration procedure	Name, type, trade mark of a standard device or auxiliary equipment	Basic technical and (or) metrological characteristics
1	2	3
6.3.1	Spectrum analyser S4-74	Range of frequency measurement is 300 Hz to 300 MHz $\Delta_{abs} = \pm(1 \cdot 10^{-7} \cdot f_c + 1/ t_{read})$, Hz. Measurement range of the voltage level is 300 nV to 3 V.
6.3.2	Selective microvoltmeter SMV8.5	Frequency range is 26 to 1000 MHz Calibration error is 0.8 dB. Additional error in the frequency range from 26 to 300 MHz is 0.4 dB.
6.3.3	Amplifier U3-33 Computing modulation meter SK3-45 Selective microvoltmeter SMV8.5	Amplification is 25 dB, inequality is <2.2 dB Frequency range is 0.1 to 400 MHz. Measurement range of peak values of deviation is 0.1 ÷ 1000 kHz $\Delta_{abs} = \pm (0{,}02\Delta f + 0.02)$, kHz.
6.3.4	Counting-type electronic frequency meter Ch3-54	Measurement range of frequency is 0.1 to 120 MHz. $\delta_{rel} = \pm\{5 \cdot 10^{-7} + 1/ (f_{mes} \cdot t_{read})\}$
6.3.5	Universal digital voltmeter V7-34 Distortion meter S6-12	Measurement range of sinusoidal voltage is up to 500 V in the frequency range from 20 Hz to 100 kHz. $\delta\delta_{rel} = \pm\{0.15+0.05[(U_{kx}/U_x)-1]\}\%$ Measurement range of CND is 0.03 ÷ 100 %. $\Delta_{abs} = \pm (0.05\ K_{read} + 0.02)$ %, where K_{read} – readings of the device.
6.3.6	High-frequency programmable signal generator G4-164 Power amplifier UM100-400	Frequency range is 0.1 to 639.999 MHz. . Range of the output voltage is from $0{,}032 \cdot 10^{-6}$ up to 2 V. $\Delta_{abs} = 2 \ldots 2{,}5$ dB. Output power is up to 20 W in the frequency range from 90 to 400 MHz. Amplification is up to 30 dB.

Continuation of table 2

1	2	3
6.3.7	High-frequency programmable signal generator G4-164 Power amplifier UM100-400 Computing modulation meter SK3-45	
6.3.8	Terminating power meter M3-56 Power amplifier UM100-400 High-frequency programmable signal generator G4-164	Measurement range of wattage is 0 ÷ 20 W in the frequency range up to 17.85 GHz. $\delta\delta_{rel} = \pm\{4 + 0,1[(P_k/P_x) - 1]\}$, %.
6.3.9	Generator of low-frequency signals G3-112/1 Counting-type electronic frequency meter Ch3-54	Output voltage is 0 ÷ 25 V. Frequency range is from 10 Hz to 1 MHz. δ_{rel} = ± 6 %.
6.3.10	Generator of low-frequency signals G3-112/1 Universal digital voltmeter V7-34	
6.3.11	Distortion meter S6-12 Generator of low-frequency signals G3-112/1 2pcs.	Measurement range of CND is 0.03 ÷ 100 %. $\Delta_{abs} = \pm (0,05\ K_{read} + 0,02)$ %, where K_{read} – readings of the device, %

* It is possible to use devices of other types having parameters not worse than the specified ones.

2.2 It is allowed to use other devices and methods of calibration not listed in this document, but approved for use in the Russian Federation in established procedure, which are not worse than the specified ones according to accuracy and characteristics.

2.3 All the measuring devices specified in table 2 must be calibrated in established procedure and must have effective certificates of calibration.

3 SAFETY REQUIREMENTS

3.1 Only persons who got through safety instructions for work with electrical measuring and radio measuring devices are allowed to calibrate the tester.

3.2 Before switching on the tester it is necessary to check compliance of the output voltage of the supply unit with the operating voltage.

3.3 When carrying out calibration it is necessary to comply with the safety requirements stated in the operating documentation for measuring devices.

3.4 Overcommutation of cables when the devices are switched on is PROHIBITED.

4 CALIBRATION CONDITIONS

4.1 When carrying out calibration, it is necessary to comply with the following conditions:
- ambient temperature, °C ……..…….…… 20 ± 5;
- relative air humidity, % ……...… 50 ÷ 80;
- atmospheric pressure, kPa (mm Hg) …….. 86.6 ÷ 106.7 (650 ÷ 795);

- power supply voltage, V …….……. 220 ± 22;
- frequency of power supply voltage, Hz …….…….. 50 ± 1;

Voltage of the power supply line must be steady and free of jumps.

5 PREPARATION FOR CALIBRATION

5.1. Before carrying out calibration of the testers, it is necessary to perform the following preparatory works:

1) the calibrated testers and calibration devices must be held in a room where calibration is carried out, in the conditions specified in paragraph 4.1 for 2 h;

2) the calibration devices must be prepared according to the requirements of the operating documentation for them;

3) the calibrated testers must be prepared for operation in accordance with the operation guide for them.

6 CARRYING OUT CALIBRATION

6.1 Visual inspection

6.1.1 When carrying out visual inspection, it is necessary to make sure of full completeness of the RST-430 tester according to the certificate.

6.1.2 Check conformity of the marking according to the operating documentation.

6.1.3 Check absence of external damages and dirts which influence operability of the tester.

6.1.4 Check intactness of the control elements and settings (buttons, tumbler switches, etc.).

6.1.5 Check presence of the sharp stamp impression of QCD and the calibration officer or presence of
the certificate of state calibration (when carrying out periodic calibration).

6.1.6 It is not allowed to calibrate the tester if damages are detected.

6.2 Testing

6.2.1 When testing, operability of the tester is checked, wherefore it is necessary to perform the following operations:

1) Make sure that the power button is in start (switched off) position.

2) Connect the tester to the network adapter according to the diagram shown in figure 1.

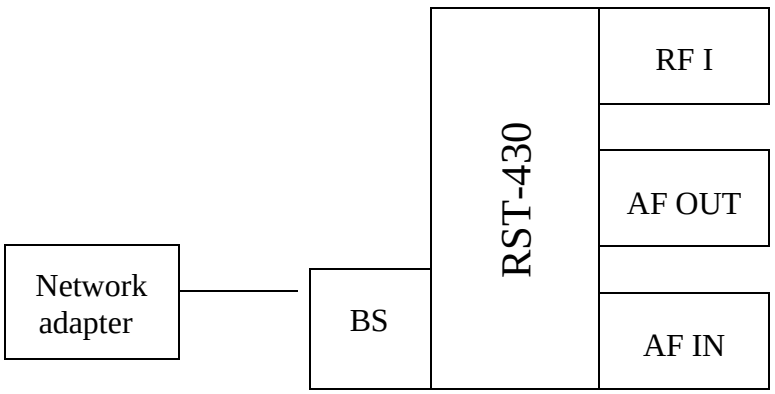

Fig.1

3) Press the power button. The screen of the tester must display a startup screen in accordance with figure 2.

Fig.2

5) In 10 seconds (time of self-testing) the tester is ready for operation.

6.3 Determination of metrological characteristics

6.3.1 Determination of the error of the output HF signals frequency formation

6.3.1.1 Measurement of the HF signals frequency is performed with the use of the spectrum analyser S4-74 in the range 90...210 MHz.

6.3.1.2 Connect the tester ("RFI" connector) to the S4-74 spectrum analyser ("Input" connector) by the connecting cable.

6.3.1.3 At the spectrum analyser set:

- swath, equal to 5 kHz;
- pass band, equal to 300 Hz;
- frequency of 155 MHz.

At the tester set:

- "Receiver" mode;
- maximum HF level;
- switch off modulation;
- frequency F_{hf}, equal to 155 MHz.

6.3.1.4 Measure the frequency of the HF signal with the S4-74 spectrum analyser in accordance with its operating documentation.

6.3.1.5 The relative error of the HF signals frequency formation is determined from the formula:

$$\delta_{rel} = (1 - F_{mes} / F_{set})\cdot 100\%$$

where F_{set} is a set value of the output HF signal frequency on the tester

F_{mes} is a measured value.

6.3.1.6 Repeat the measurement in accordance with 6.3.1.2 ÷ 6.3.1.5 for the frequencies of 90 and 210 MHz.

Results of measurements are considered as acceptable, if the error does not exceed the value specified in Appendix A.

6.3.2 Determination of the error of the output HF level setting is performed according to the diagram shown in figure 3.

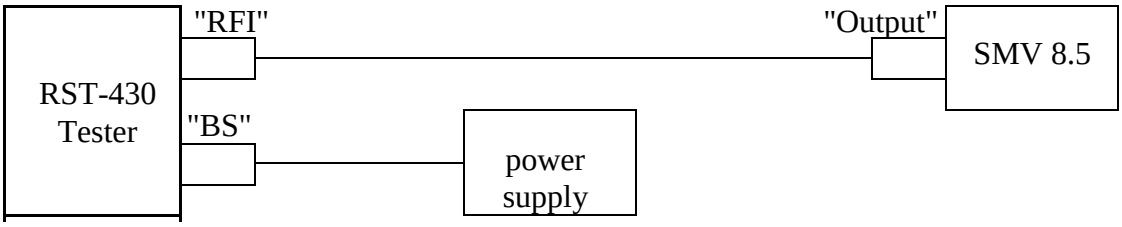

Fig.3

6.3.2.1 Connect up.

6.3.2.2 Measurement of the output HF level is performed using SMV 8.5

6.3.2.3 At the tester set:
- "Receiver" mode;
- max HF level;
- frequency F_{hf}, equal to 155 MHz.
- switch off modulation.

6.3.2.4 Measure the output HF level using SMV 8.5

6.3.2.5 The absolute error of the output HF level setting is determined from the formula:

$$\Delta_{abs} = (A_{hf\ set} - A_{hf\ mes} + 107)\ dB$$

where $A_{hf\ set}$ is a set value of the HF level on the tester, dBm;
$A_{hf\ mes}$ is a measured value, dBuV.

Note:

- dBV for 50 ohm HF circuit corresponds to (dBm - 13 dB);
- dBuV for 50 ohm HF circuit corresponds to (dBm + 107 dB)
- dBV for 75 ohm circuit corresponds to (dBm - 11 dB); dBuV
- for 75 ohm circuit corresponds to (dBm + 109 dB)

6.3.2.6 Repeat the measurement in accordance with 6.3.2.3 ÷ 6.3.2.5 at the frequencies of 90 and 210 MHz.

6.3.2.7 Repeat the measurement in accordance with 6.3.2.3 ÷ 6.3.2.6 at the output levels minus 90 dBm, minus 100 dBm.

Results of measurements are considered as acceptable, if the error does not exceed the value specified in Appendix A.

6.3.3 Determination of the error of setting of the HF signals frequency deviation is performed according to the diagram shown in figure 4.

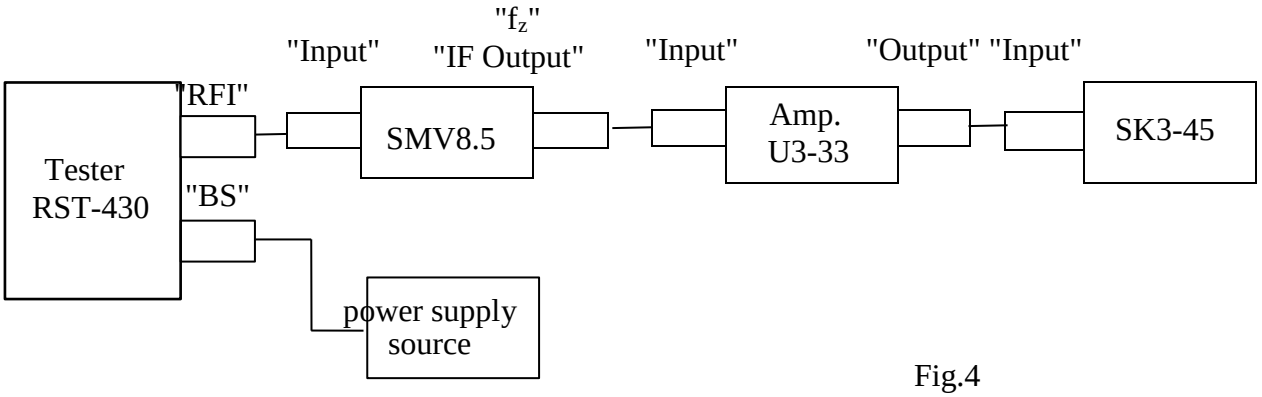

Fig.4

6.3.3.1 Connect up.

6.3.3.2 In accordance with the operating documentation on the SK3-45 meter set:

- mode of operation "IF", "+";
- pass band of 0.2 ÷ 200 kHz;
- range of 0.1…4 MHz

6.3.3.3 At the tester set:

- "Receiver" mode;
- frequency F_{hf}, equal to 155 MHz;
- modulation frequency, equal to 1 kHz;
- deviation, equal to 3 kHz.
- max HF level ;

6.3.3.4 Set SMV8.5 to the frequency of 155 MHz. Pass band is 120 kHz.

6.3.3.5 Measure the HF signals frequency deviation with the SK3-45 meter.

6.3.3.6 The relative error of frequency deviation setting is determined from the formula:

$$\delta_{rel} = (1 – D_{mes} / D_{set})\cdot 100\ \%$$

where D_{set} is a set value of frequency deviation on the tester.

$D_{mes\ is}$ a measured value.

6.3.3.7 Repeat the measurement in accordance with 6.3.3.2 ÷ 6.3.3.6 with the set frequency deviation of 5 and 20 kHz.

6.3.3.8 Repeat the measurement in accordance with 6.3.3.2 ÷ 6.3.3.7 with the set frequency deviation of 3 and 10 kHz.

Results of measurements are considered as acceptable, if the error does not exceed the value specified in Appendix A.

6.3.4 Determination of the error of frequency formation of the output HF signals is performed as follows:

6.3.4.1 Connect the tester ("AF OUT" connector) to the Ch3-54 frequency meter ("Input" connector) by the connecting cable.

6.3.4.2 At the tester set:

- "Transmission" mode;
- output voltage U_{lf}, equal to 2 V.
- frequency F_{lf}, equal to 1 kHz.

6.3.4.3 Measure the output LF signals frequency (F_{lf}) with the Ch3-54 frequency meter.

6.3.4.4 The absolute error of the frequency formation F_{lf} is determined from the formula:

$$\delta_{abs} = (F_{lf\ set} - F_{lf\ mes})\ Hz$$

where $F_{lf\ set}$ is a set value of the frequency of the output LF signals on the tester.

$F_{lf\ mes}$ is a set value of the frequency of the output LF signals on the frequency meter Ch3-54.

6.3.4.5 Repeat the measurement in accordance with 6.3.4.2 ÷ 6.3.4.4 with the set frequency on the tester of 200 Hz; 20 kHz.

Results of measurements are considered as acceptable, if the error does not exceed the value ± 1 Hz.

6.3.5 Determination of the error of setting of the output LF voltage is performed as follows:

6.3.5.1 Connect the tester ("AF OUT" connector) to the V7-34 voltmeter by the connecting cable.

6.3.5.2 At the tester set:

- "Transmission" mode;
- output voltage U_{lf}, equal to 0.25 V;
- frequency F_{lf}, equal to 1 kHz.

6.3.5.3 Measure the output voltage U_{lf} with the voltmeter V7-34 in accordance with its operating documentation.

6.3.5.4 The absolute error of setting of the output voltage U_{lf} is determined from the formula:

$$\delta_{abs} = (U_{lf\ set} - U_{lf\ mes})V,$$

where $U_{lf\ set}$ is a set value of the output voltage, V;

$U_{lf\ mes}$ is a measured value of the output voltage on the voltmeter V7-34, V.

6.3.5.5 Repeat the measurement in accordance with 6.3.5.2 ÷ 6.3.5.4, setting at the tester the values of the output voltage, equal to 1 V; 2.0 V.

6.3.5.6 Repeat the measurement in accordance with 6.3.5.2 ÷ 6.3.5.5, setting at the tester the values of the frequency F_{lf}, equal to 5 kHz; 20 kHz.

Results of measurements are considered as acceptable, if the error does not exceed the value specified in Appendix A.

6.3.6 Determination of the error of measurement of the frequency of the HF signals is performed according to the diagram shown on figure 5.

6.3.6.2 In accordance with its operating documentation at the G4-164 generator set:

- voltage, equal to 1 V;
- frequency F_{hf}, equal to 155 MHz.

6.3.6.3 At the tester set the mode “Transmission / Frequency”

6.3.6.4 Take the readings from the tester.

6.3.6.5 The absolute error of the measurement of the HF signals frequency F_{hf} is determined from the formula:

$$\delta_{rel} = (1 - F_{hf\ mes} / F_{hf\ set})\cdot 100\ \%$$

6.3.6.6 Repeat the measurement in accordance with 6.3.5.2 ÷ 6.3.6.5, setting at the G4-164 generator the frequency values 90 MHz; 210 MHz.

Results of measurements are considered as acceptable, if the absolute error of the measured frequency of the HF signal does not exceed the value specified in Appendix A.

6.3.7 Determination of the error of measurement of the HF signals frequency deviation is performed according to the diagram shown in figure 5.

6.3.7.2 At the generator G4-164 set:
- voltage level, equal to 0.5 V;
- frequency F_{hf}, equal to 155 MHz;
- frequency modulation – internal;
- frequency of modulation – 1 kHz;
- deviation, equal to 1 kHz, control with SK3-45.

6.3.7.3 At the tester set the "Transmission / Deviation" mode.

6.3.7.4 Take the readings from the tester.

6.3.7.5 The relative measurement error of the HF signals frequency deviation is determined from the formula:

$$\delta_{rel} = (D_{mes} / D_{set} - 1)\cdot 100\ \%$$

6.3.7.6 Repeat the measurement in accordance with 6.3.7.2 ÷ 6.3.7.5, setting at the G4-164 generator the frequency values 90 MHz; 210 MHz.

6.3.7.7 Repeat the measurement in accordance with 6.3.7.2 ÷ 6.3.7.6, setting at the G4-164 generator the value of deviation 5.0 kHz; 20 kHz.

Results of measurements are considered as acceptable, if the measurement error of the HF signals frequency deviation does not exceed the value specified in Appendix A.

6.3.8 Determination of the error of power measurement is performed according to the diagram shown in figure 5.

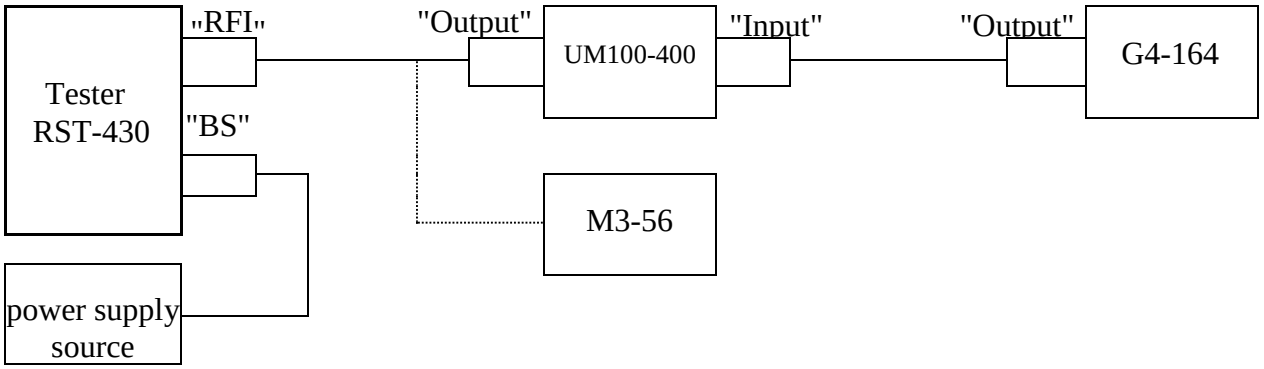

Fig.5

6.3.8.1 Connect up.

6.3.8.2 Set at the G4-164 generator a frequency equal to 150 MHz; output 1 V.

6.3.8.3 Connect the M3-56 power meter to the output of the UM100-400 power amplifier and set the power at the output of the amplifier equal to 20 W.

6.3.8.4 Connect the tester instead of the M3-56 power meter.

6.3.8.5 Measure the power.

6.3.8.6 The relative error of the power measurement is determined from the formula:

$$\delta_{rel} = (P_{mes} / P_{set} - 1)\cdot 100\ \%$$

6.3.8.7 Repeat the measurement in accordance with 6.3.8.2 ÷ 6.3.8.6, setting the values of power to 2 W; 10 W.

6.3.8.8 Repeat the measurement in accordance with 6.3.8.2 ÷ 6.3.8.7, setting the values of frequency to 90 MHz; 210 MHz.

Results of measurements are considered as acceptable, if the error does not exceed the value specified in Appendix A

Determination of the absolute measurement error of the LF signals frequency is performed according to the diagram shown in figure 6.

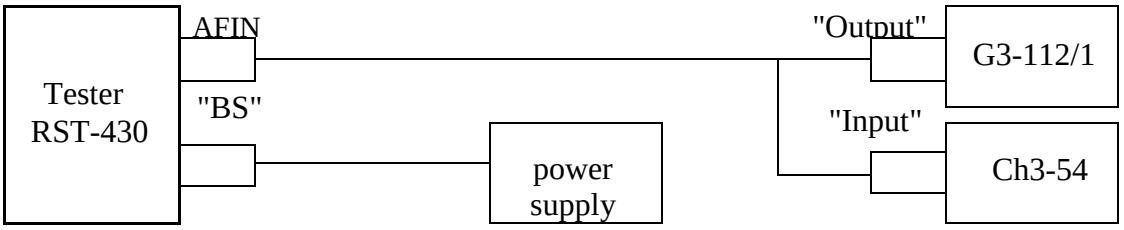

Fig.6

6.3.9.1 Connect up.

In accordance with its operating documentation at the G3-112/1 generator set:

- output voltage, equal to U_{lf} 10 V;
- frequency F_{lf}, equal to 1 kHz.

6.3.9.3 Control the frequency with the Ch3-54 frequency meter.

6.3.9.4 At the tester set the "RECEIVER, FREQUENCY" mode.

6.3.9.5 Take the readings from the tester.

6.3.9.6 The absolute measurement error of the LF signals frequency (F_{lf}) is determined from the formula:

$$\delta_{abs} = (F_{lf\ set} - F_{lf\ mes})\ \text{kHz},$$

where $F_{lf\ set}$ is a set value of frequency, kHz;

$F_{lf\ mes}$ is a measured value of frequency, kHz.

6.3.9.7 Repeat the measurement in accordance with 6.3.9.2 ÷ 6.3.9.6, setting at the G3-112/1 generator the value of frequency 10 kHz; 100 kHz.

Results of measurements are considered as acceptable, if the error of the frequency measurement does not exceed the value specified in Appendix A.

6.3.10 Determination of the error of the alternating voltage measurement is performed according to the diagram shown in figure 7.

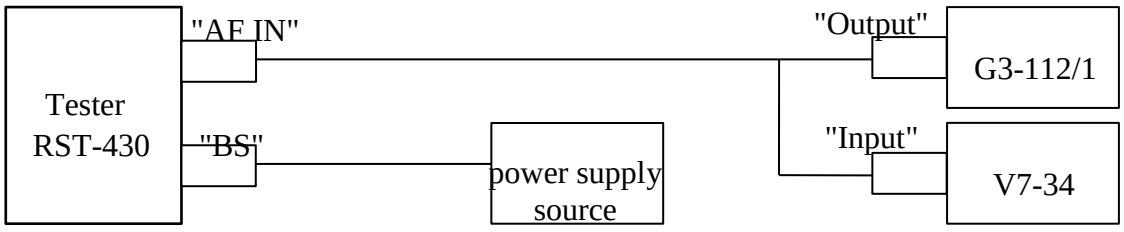

Fig.7

6.3.10.1 Connect up.

6.3.10.2 At the tester set the "Receiver / Voltage" mode.

6.3.10.3 At the G3-112/1 generator set:

- frequency F_{lf}, equal to 200 Hz.
- output voltage, equal to U_{lf} 0.2 V.

6.3.10.4 Control the set voltage with the V7-34 voltmeter.

6.3.10.5 Take the readings from the tester.

6.3.10.6 The absolute error of setting of the alternating voltage (U_{lf}) is determined from the formula:

$$\delta_{rel} = (U_{lf\ mes} / U_{lf\ set} - 1) \cdot 100\ \%$$

where $U_{lf\ set}$ is a set on the generator value of the alternating voltage, V;

$U_{lf\ mes}$ is a measured by the tester value of the alternating voltage, V.

6.3.10.7 Repeat the measurement in accordance with 6.3.10.2 ÷ 6.3.10.6, setting at the G3-112/1 generator the values of frequency 1.0 kHz; 20 kHz.

6.3.10.8 Repeat the measurement in accordance with 6.3.10.2 ÷ 6.3.10.7, setting at the G3-112/1 generator the values of output voltages 1.0 V; 15 V.

Results of measurements are considered as acceptable, if the error of the input LF voltage does not exceed the value specified in Appendix A.

6.3.11 Determination of the measurement error of the coefficient of nonlinear distortions is performed according to the diagram shown in figure 8.

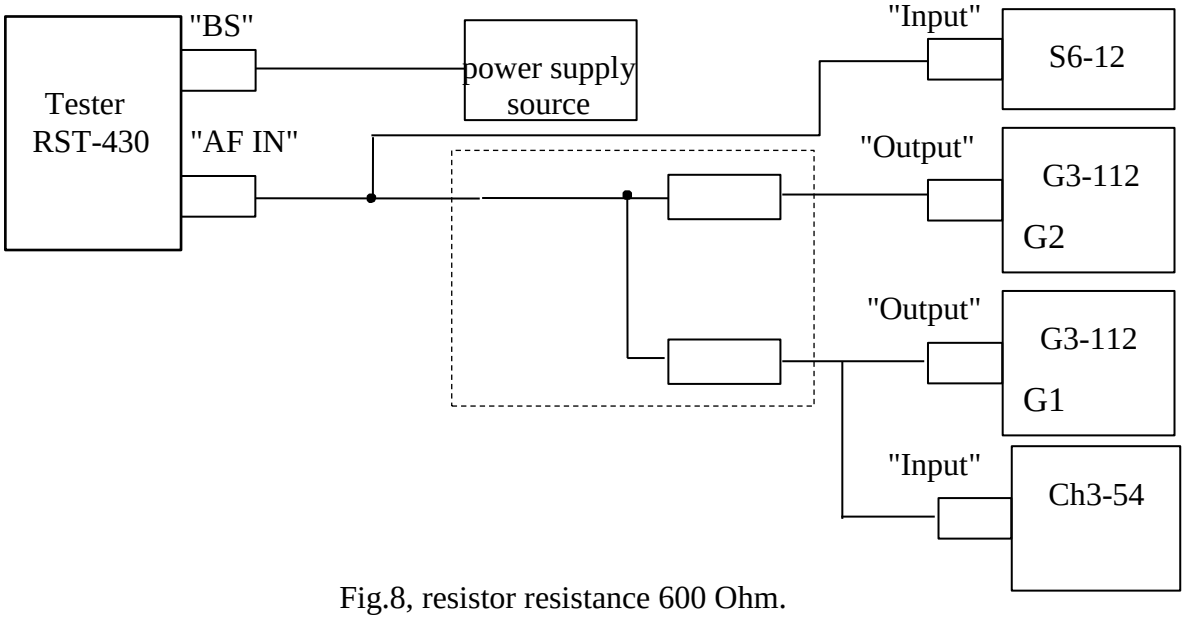

Fig.8, resistor resistance 600 Ohm.

6.3.11.1 Connect up.

6.3.11.2 At the tester set the "Receiver" / “CND” mode.

6.3.11.3 At the generator G3-112/1 (G1) set:

- frequency of 1 kHz ± 0.1 Hz (control by the frequency meter)
- output voltage, equal to U_{lf} 7 V.

6.3.11.3 At the G3-112/1 (G2) generator set the frequency of 3.4 kHz.

6.3.11.4 Changing the voltage at the output of the G2 generator, reach the value of CND on the S6-12 meter, equal to 10%.

6.3.11.5 Take the readings from the tester.

6.3.11.6 The absolute error of the coefficient of nonlinear distortions (CND) is determined from the formula:

$$\delta_{abs} = (CND_{set} - CND_{mes})\ \%$$

where CND_{set} is a set on the S6-12 meter value of CND, %;

CND_{mes} is a value of CND measured by the tester, %.

6.3.11.7 Repeat the measurement in accordance with 6.3.11.2 ÷ 6.3.11.6, setting at the C6-12 meter the CND values 20%; 50%.

Results of measurements are considered as acceptable, if the error of the measurement of CND does not exceed the value specified in Appendix A.

Note – The measurement error of CND in the range of 50%...100% is not standardized.

7 FORMALIZATION OF CALIBRATION RESULTS

7.1 The results of calibration of the testers must be formalized in the form of protocol according to the form of the compulsory appendix B.

7.2 In case of positive results of calibration a certificate of calibration of the tester of the established form is issued.

7.3 The testers which passed primary calibration with negative results are not allowed to be released into handling and it is prohibited to use them. In this case, a notice of unavailability is issued for the testers.

7.4 The testers which passed periodic calibration with negative results are retired from handling and sent to repair.

APPENDIX A (reference)

Metrological characteristics of the tester RST-430

Name of characteristic, unit of measurement	Parameter	Limits of error
1 Output signal frequency range (high-frequency (HF) connector) (step 1 kHz) By agreement with the customer – the extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4}$ %
2 Output HF level, dBm. (by agreement with the customer for testers with an extended range of frequencies the value is 80 dBm)	from minus 60 to minus 120	$\Delta_{abs} = \pm 4$ dB
3 Deviation of the HF signals frequency, kHz. Range of modulating frequencies 0,1…10 kHz	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_k / D_{set})]$ %, where D_k = 20 kHz – an upper value of the setting range of frequency deviation; Dset – a set value of frequency deviation, kHz.
4 Range of the output low-frequency (LF) signals, kHz	0.1÷ 20	± 1 Hz
5 Output LF voltage, V.	÷ 0.02 ÷ 2	$\Delta_{abs} = \pm (0.02 + 0.05 \cdot U_{lf\ set})$V, where $U_{lf\ set}$ - a set value of the output voltage, V.
6 Coefficient of nonlinear distortion (CND) of the output LF voltage, %.	not more than 1	–
7 Range of frequencies of the output signal (HF connector) (step 1 kHz) By agreement with the customer extended range	90…210 1.6-470 (520)	$\delta_{rel} = \pm 3 \cdot 10^{-4,}$ %.
8 Measurement range of the HF signals frequency deviation, kHz.	0.2 ÷ 20	$\delta_{rel} = \pm [5 + 5 (D_k / D_{mes})]$ %, where D_k = 20 kHz – an upper value of the measurement range of frequency deviation; Dset – a measured value of frequency deviation, kHz.

9 Measurement range of the output HF signal power, W.	0.2 ÷ 20	$\delta_{rel} = \pm [10 + (P_k / D_{mes})]$ %, where $P_к = 20$ W - an upper value of the measurement range of the power the HF output signal; Pmes - a measured value of the power of the HF output signal, W.
10 Measurement range of the LF signals frequency, kHz.	$20 \div 1 \cdot 10^5$	± 1 Hz.
11 Measurement range of the alternating voltage of sinusoidal form in the range of frequencies from 0.02 to 20 kHz, V.	0.02 ÷ 15	$\delta_{rel} = \pm [3 + 2 (U_k / U_{mes})]$ %, where Uk = 15 V – an upper value of the measurement range of the alternating voltage; U_{mes} – a measured value of the alternating voltage, V.
12 Measurements of CND	1 ÷ 100 %	In the range from 1 to 50%: $\Delta_{abs} = \pm [1 + 0.1$ CNDmes] %, In the range from 50% to 100 % it is not standardized.

APPENDIX B
(compulsory)

P R O T O C O L

of calibration of the RST-430 radio-communication service tester

_____
(factory number)
belonging to

_____
(name of organization)

calibrated by

_____
(name of organization)

—

Calibration condition

Ambient temperature, °C _
Relative air humidity, % _
Atmospheric pressure, kPa (mm Hg) _
Power supply voltage, V _

Used calibration devices

_____
_____
_____

1 Visual inspection, check for completeness

_____
_____

Conclusion:

_____

2 Check for operability

_____
_____

Conclusion:

_____

3 Measurement of the tester parameters, determination of an error

Table A.1

Number of paragraph	Measured parameter	Limit of error

Conclusion:

_____

General conclusion:

_____
(a certificate is issued, number or reason of unserviceability)

Chief of the Gosnadzor laboratory _____ _____

(signature) (surname)

State calibration officer _____ _____

(signature) (surname)

Place of Seal Date _____

PROGRAMME FOR CONTROL OF THE RST-430 DEVICE

1. Brief description

1.1 Purpose

The programme is designed for control of the RST-430 service monitor (tester). The programme allows setting the device, taking measurements and writing them in the Excel report.

1.2 Technical specifications

1.2.1 The speed of taking any measurement from the device is 1 measurement in a second.
1.2.2 The programme allows taking the following measurements: frequency, power, deviation/modulation, CND, LF frequency from the device in the mode of measurement of the parameters of the transmitter and SINAD, voltage and LF frequency from the device in the mode of measurement of the parameters of the receiver.
1.2.3 The programme allows setting: modulation voltage, modulation frequency, modulation output (AFOUT, EXT3, EXT4) of the device in the mode of measurement of the transmitter parameters and HF frequency, power, modulation frequency, LF frequency of the device in the mode of measurement of the receiver parameters.
1.2.4 It also allows switching off and on modulation, changing the input of measurements (AFIN,EXT1, EXT2) of the device in the mode of measurement of the receiver parameters and changing a type of modulation (AM, FM) for both modes.
1.2.5 All types of measurements can be saved in the Excel report.

2.1 General information on the programme

2.1.1. Purpose of the buttons
The outer appearance of the programme is shown in Fig.1

Fig.1

RECEIVER	**◄ TAB**	**TRANSMITTER**

F1	**FREQUENCY**
F2	**POWER**
F3	**DEVIATION**
F4	**CND**
F5	**LF FREQUENCY**

ESC	**SETTINGS**	**FM**	**START**	**OPTIONS**

Red button - switching on/off the programme. The device is certainly not switched off upon pressing this button.

Button with ? – activation of the assistance window which displays a current mode of the programme, purpose of the functioning buttons on the keyboard of the programme and the modes into which it is possible to change over. It is designed for more comprehensible and comfort work with the programme.

Button with "X" – closing the programme. If the Excel report was not saved, the programme will suggest to save it.

Status panel – at the bottom of the screen of the programme it displays the possibility of saving the report in Excel (when measurement is successful and the symbols «--.--» or «----.--» are not displayed), when the device is not switched off – it reports that it is switched off as in Fig.1.

Besides the assistance window, when hovering the mouse pointer, each button calls screen tips with information on the purpose of a button in the current mode! For those buttons which are not involved in the current mode a tip will not emerge.

2.1.2 Purpose of the buttons of the programme keyboard in the mode of measurement of the parameters of the transmitter.

The programme gets into this mode just after pressing the red button.

F1 – switch-over of the device into the mode of HF frequency measurement

F2 – switch-over of the device into the mode of power measurement

F3 – switch-over of the device into the mode of measurement of deviation in the FM mode (modulation in the AM mode)

F4 – switch-over of the device into the mode of CND measurement

F5 – switch-over of the device into the mode of LF frequency measurement

ESC – change-over of the programme into the mode of the device settings in the mode of measurement of the parameters of the transmitter. Only the programme changes over into this mode, but the device remains in that mode in which it is at the moment.

Start – change-over of the programme into the mode of change of the options of the device. Only the programme changes over into this mode, but the device remains in the mode in which it is at the moment.

Tab – switch-over of the programme into the mode of measurement of the receiver parameters. Only the programme changes over into this mode, but the device remains in the mode in which it is at the moment. After changing over into this mode, the programme will not read the measurements from the device. For this purpose it will be necessary to choose a necessary type of measurements using the F1, F2, F5 buttons.

2.1.3. Purpose of the buttons of the programme keyboard in the mode of measurement of the parameters of the receiver.

F1 – switch-over of the device into the mode of SINAD frequency measurement

F2 – switch-over of the device into the mode of voltage measurement

F3 – switch-over of the device into the mode of change of the measurements input

F4 – switching off/on modulation

F5 – switch-over of the device into the mode of LF frequency measurement

ESC – change-over of the programme into the mode of the device settings in the mode of measurement of the receiver parameters. Only the programme changes over into this mode, but the device remains in the mode in which it is at the moment.

Start – change-over of the programme into the mode of change of the options of the device. Only the programme changes over into this mode, but the device remains in the mode in which it is at the moment.

Tab – switch-over of the programme into the mode of measurement of the receiver parameters. Only the programme changes over into this mode, but the device remains in the mode in which it is at the moment. After changing over into this mode, the programme will not read the measurements from the device. For this purpose it will be necessary to choose a necessary type of measurements using the F1, F2, F5 buttons.

2.1.4. Purpose of the keyboard buttons of the programme in the mode of change of the device settings in the mode of measurement of the parameters of the transmitter

F1 – change-over into the editing mode of modulation voltage

F2 – change-over into the editing mode of modulation frequency

F3 – change-over into the setting mode of modulation output

ESC – Escape from settings

2.1.5. Purpose of the keyboard buttons of the programme in the mode of change of the device settings in the mode of measurement of the parameters of the receiver

F1 – change-over into the editing mode of frequency

F2 – change-over into the editing mode of power at the output

F3 – change-over into the editing mode of modulation

F4 – change-over into the editing mode of LF frequency

ESC – Escape from settings

2.1.6. Purpose of the keyboard buttons of the programme in the editing mode of any setting chosen in paragraphs 4.3.1.3 and 4.3.1.4.

0-9 – the keys to type a new value of an edited parameter

Space – deletion of an entered number

Enter – confirmation of an entered parameter. After pressing this button a new value of a parameter will be saved in the device, if it falls within the admissible values. The admissible values are displayed in the assistance window in the mode of the parameter editing. When a value is admissible, the device will go into settings and display all settings, including a new set value.

Esc – cancel of the parameter editing in settings

2.1.7 Purpose of the buttons of the programme keyboard in the mode of setting of modulation output

F1 – setting by AFOUT modulation output

F2 – setting by EXT3 modulation output

F3 – setting by EXT4 modulation output

2.1.8. Purpose of the buttons of the programme keyboard in the mode of setting of the

measurements input.

F1 – setting by AFIN modulation output

F2 – setting by EXT1 modulation output

F3 – setting by EXT2 modulation output

2.1.9. Purpose of the buttons of the programme keyboard in the option of the device.

F1 – change of a modulation type

ESC – Escape from option

2.1.10. Purpose of the buttons of the computer keyboard with an active form of the programme

Enter – saving a measurement result in Excel. When pressing for the first time, it downloads and displays a formed report with a changed parameter, and upon the next pressings just adds measurements into a report. This button is available only when the programme is in the mode of measurement of some parameter and the measurement is successful (the symbols «--.--» or «----.--» are not displayed) In any case the status panel at the bottom of the programme screen writes of availability of this button by the message ***Save the measurement result*** – ***Enter*** or ***Save the measurement result*** – ***Enter, Finish the protocol*** – ***Space*** when pressing it once.

Space – activation of the menu of saving a report in the ***Otschet*** folder. It is available only after saving at least one parameter into a report. In any case the status panel at the bottom of the programme screen writes of availability of this button by the message ***Save the measurement result*** – ***Enter, Finish the protocol*** – ***Space*** when pressing it once.

2.1.11. Purpose of the buttons in the saving a report menu

In the menu only enter of a report number under which it is will be saved is available.

Save – saving a report under a chosen number. In case of concurrence with an existing report, the programme will suggest re-recording or cancelling saving.

Print – printing a report

Cancel – cancel of saving and escape from the menu of saving a report.

3. Setting of the programme

3.1 Setting of the COM port.

At the beginning after the programme startup, but without pressing the red button it is necessary to set the COM port. For this, activate the menu of setting of the COM port number by the right mouse button. Setting of the COM port is available only when the red button is switched off! In the settings menu only selection of a port number is available, all other settings are saved in the programme on default and they are not changed.

3.2. Non-interface settings

Besides the control elements there is a file ***Options.ini*** with names of parameters saved in the report file when a parameter is recorded into the report by Enter. For example, the key ***F1 = Carrier frequency of the transmitter*** corresponds to the parameter saved by Enter in the mode of measurement of frequency in the position of transmitter! Thus, all these names saved by Enter can be changed if necessary! In total there are nine keys from F1 to F8. From F1 to F5 names of the measured parameters of the device are saved in the mode of measurement of the parameters of the transmitter. Besides, when measuring deviation a name from the F3_CM key is saved, and when measuring modulation it is saved from the F3_AM key.

For setting of reports saved by Space there is a template file ***Shablon.xls*** which can be also tweaked if necessary: step, names, etc., except for transposition of names! All reports are saved in the folder ***Otschet***.

4. Work with the programme along with the device

The whole interface is borrowed of the device, but functionally does not copy it. That is all pressings of the buttons do not duplicate pressings of the buttons of the device, but only make it possible to set new settings and take measurements

When pressing the red button the programme will go into in the operating mode! In this mode, the programme will save in the device set on default in the programme settings of all the settings in the device. That is it will set the modulation voltage of 0.25 V, the modulation frequency of 1 kHz, the modulation output AFOUT in setting the mode of measurement of the transmitter parameters, the frequency of 173 MHz, the output of 120 dBm, the modulation of 30 kHz, the LF frequency of 1 kHz in the settings of the device in the mode of measurement of the transmitter parameters, besides, FM modulation and switching on of modulation are set. After making settings, the programme will switch over the device into the mode of measurement of the transmitter carrier frequency. Switch-over of the device into other modes is performed by the F1-F5 buttons in the mode of measurement of the transmitter parameters and F1, F2, F5 in the mode of measurement of the transmitter parameters. In the mode of measurement of the transmitter parameters the button F3 changes the output of measurements which is memorized in the device only after pressing the buttons F1-F3 selecting a relevant input ***F1 - AFIN1***, ***F2 - EXT1*** and ***F3 - EX2.*** In the mode of measurement of the parameters of the transmitter the F4 button (switching on/off modulation) – saves at once in the device when pressing it.

When pressing Esc during measurement of any parameter by the device, the programme goes into the mode of the device settings in the mode of measurement of either the receiver or the transmitter parameters! However, the device remains in the mode of measurement, without going somewhere! In the setting mode, in the programme new settings can be set by pressing F1-F5 in the **Receiver** mode and F1-F3 in the **Transmitter** mode! The programme will go into the editing mode of a selected parameter! By the 0-9 buttons set a parameter, by the Space button of the programme keyboard entered symbols are deleted, and Esc cancels. After setting a new value, it is fixed by the Enter button on the device keyboard. The device goes into and displays a relevant section of settings with newly set parameters. To return to the mode of measurement press Esc and select a necessary measurement by the buttons F1-F5! The device will go from the settings into a selected item of measurement!

To change a type of modulation AM/FM go into the options by pressing the Start button and there AM/FM modulation can be changed by the F1 button! Only after pressing F1 modulation will be set in the device! Return to the mode of measurement is performed by pressing Esc and by pressing a relevant item of measurement by the F1-F5 buttons as well.

TECHNICAL MAINTENANCE

1. Technical maintenance is performed by persons who operate the tester for providing its operability during operation.

2. Technical maintenance includes:
   check of completeness of the item;
   inspection of external condition of the tester;
   check of overall operability,
   cleaning of the device

3. Check of completeness is performed by means of comparison of the tester set to the certificate.

4. Inspection of external condition is performed before using the tester (in case of warehouse storage at least once a year) as well as before calibration, before and after repair. It is necessary to check: positive action of the buttons, condition of the paint-and-lacquer coating, condition of the cables included into the device set, holding strength of the connectors, intactness of the keyboard.

5. Check for overall operability is performed by means of measurements according to the instruction.

6. When preparing the device for transportation by air transport, it is necessary to open the pressure valve placed on the case for carrying under the handle of the case by turning it counter-clockwise.

INFORMATION BY THE MANUFACTURER

1. COMPLETENESS

1.1 The supply set of the radio-communication service tester RST-430 is listed in table 1.

Table 1

Name and symbolic notation	Notation or document for supply	Number
1 Radio-communication service tester RST-430	ИТЦК468166.002	1
2 Network adapter		1
3 HF cable	ИТЦК418542.005	1
4 LF cable	ИТЦК418542.006	1
5 Transportation case	ИТЦК468976.005	1
6 Guidance: certificate, operation guide, calibration procedure	ИТЦК468166.002ПС ИТЦК468166.002РЭ	1 pc.

2 CERIFICATE OF PACKAGING

The radio-communication service tester RST-430 ИТЦК468166.002 factory number packed in LLC ETC "Kontour".

Date of packaging _____

Packaging performed by _

(signature, surname)

3 CERIFICATE OF ACCEPTANCE

The radio-communication service tester RST-430 ИТЦК468166.002 factory number _ complies with the technical specifications requirements ИТЦК468166.002ТУ and was considered as ready for service.

Date of release

_____

Place of Seal

Responsible for acceptance

_____

(signature, surname)

Date of primary calibration

_____

4 WARRANTY OBLIGATIONS

4.1 The manufacturer (supplier) warrants compliance of the radio-communication service tester RST-430 with the technical specifications requirements ИТЦК468166.002ТУ if the conditions of transportation, storage and operation are observed.

4.2 The guarantee service life is 12 months from the day of shipment of the tester to the customer.

4.3 The manufacturing enterprise provides free repair during the guarantee service life, and upon expiry of the guarantee service life – under contract.

Address of the manufacturer: Russia, 630058 Novosibirsk,
39 Russkaya Str. of. 518 LLC Kontour ETC
Tel. +7 (8-383) 292-18-75, tel/fax 306-67-17
E-mail: kontour@bk.ru

5 INFORMATION ON COMPLAINTS

5.1 In case of identification of a fault of the RST-430 tester during the period of the guarantee service life, it is necessary to draw up an act and send it to the address of the manufacturing enterprise (supplier).

5.2 The act must contain the following data:

1) name of the item;
2) factory number;
3) date of release;
4) date of introduction into service;
5) type of the fault (incompleteness).