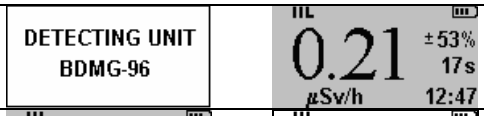
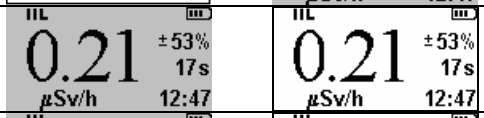
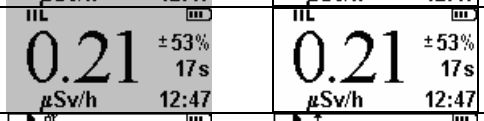
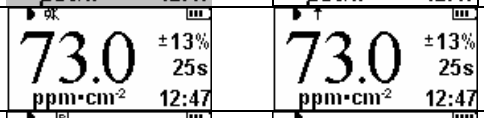
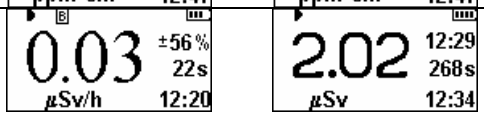
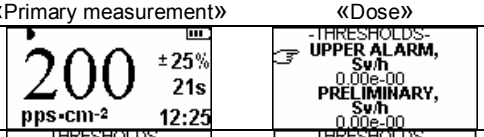
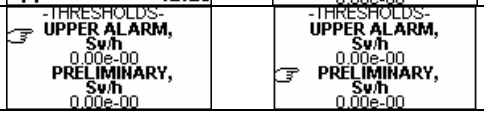
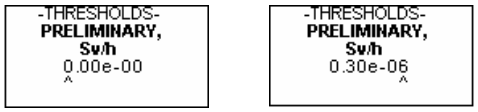
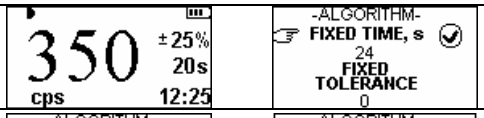
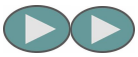
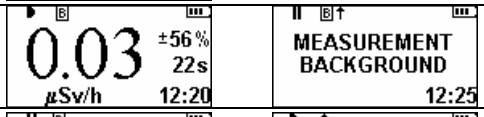
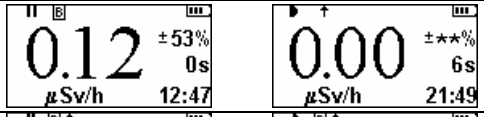
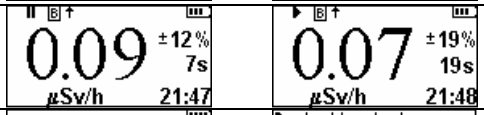
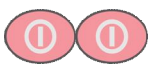
DOSIMETER-RADIOMETER
DKS – 96

Operating manual
TE1.415313.003RE

Action	Key	Activity description	Window (example of indication)
Turn on the dosimeter		Press and release the key	
Turn on the display illumination for 2 s		Press and release the key	
Turn on the display illumination for a long time period		Press and hold the key pressed within 2 s	
Turn on/off the sound		Press and release the key	
Switch the measurement result viewing window		Press and release the key	 «Primary measurement» «Dose»
Turn on the setting value correction window		Press and hold the key pressed within 2 s	
Set the cursor to the another line		Press and release the key	
Change the preset threshold value		Press and release the key. Set the value by pressing and releasing the key …	
Turn on the algorithm parameter selection and correction window		Press and hold the key pressed within 2 s	
Select the next algorithm		Press and release the first key. Press and release the second key	
Turn on the background level measurement mode		Press and hold the key pressed within 2 s	
Save the background measurement result and start the measurement		Press and release the key	
Restart the measurement without saving the result		Press and release the key	
Activate the help menu		Press the first key and holding it pressed press and release the second key	
Turn off the dosimeter		Press and hold the key pressed within 2 s	

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* - Dosimeter-radiometer DKS-96. Maintenance book TE1.415313.003OP available upon the customer's request.

This operating manual is intended to learn structure, construction and principle of operation of the dosimeter-radiometer DKS-96 (henceforth referred to as a dosimeter-radiometer) with the measuring console of the UIK-05, UIK-06 type . The operating manual contains the basic technical data and features as well as other information required to provide the full use of technical capabilities of the dosimeter-radiometer. Furthermore, the operating manual contains information required for proper service of the dosimeter-radiometer.

The operating manual consists of two sections:

Section 1. Basic quantities and operation procedure;

Section 2. Advanced features.

In the course of manufacturing the dosimeter-radiometer some changes could be made in its electrical circuit (Appendix A), operation software and design, which do not influence on technical and metrological characteristics, and therefore are not described in this operating manual.

Section 1. Basic quantities and operation procedure

1 Description and operation

1.1 **Purpose**

1.1.1 The dosimeter-radiometer depending on the type of the connected detecting block (DB) provides the measurement of:

- ambient dose equivalent H*(10) (henceforth referred to as ED) of continuous and pulsed X-ray and gamma-radiation;
- ambient dose equivalent rate Ḣ*(10) (henceforth referred to as EDR) of continuous and pulsed X-ray and gamma-radiation;
- ambient dose equivalent H*(10) (henceforth referred to as ED) of neutron radiation;
- ambient dose equivalent rate Ḣ*(10) (henceforth referred to as EDR) of neutron radiation;
- exposure dose rate of gamma-radiation;
- alpha-flux density;
- beta-flux density;
- gamma-flux density;
- gamma- flux.

1.1.2 The dosimeter-radiometer is used in dosimetry services of manufacturing enterprises, in medical, scientific and other institutions for:

- task-related and routine monitoring of radiation environment (the «Primary measurement» window; «Dose» window);
- alpha, beta and gamma surface contamination monitoring (the «Primary measurement» window; «Secondary measurement» window);
- search and localization of ionizing radiation sources (the «Search» window);
- operative detection of point and extended zones with abnormal levels of gamma-radiation (the «Detection» window);
- threshold assessment of radiation level (the «Threshold mode» window);
- measurement of gamma-flux and exposure dose rate of gamma-radiation in wells and fluid media (the «Primary measurement» window);
- radiation survey of locality with referencing to geographical coordinates of locality (with a sensor of a global positioning system (GPS)) (the «Primary measurement» window).

1.1.3 By tolerance to temperature and humidity effects, the dosimeter-radiometer concerns group C3, and by tolerance to mechanical effects - group L1 according to GOST 12997.

Climatic design type is U1.1 according to GOST 15150.

1.1.4 By level of protection against electrical shock, the technical means of the dosimeter-radiometer are referred to GOST 12.2.007.0:

- measuring consoles …….…… class III;
- detecting blocks ……..… class III.

1.1.5 Operating conditions for the dosimeter-radiometer:

- ambient temperature is minus 20 to +50 °C;
- relative humidity is up to 98 % at the temperature of +35 °C;
- atmosphere pressure is 84 to 106.7 kPa;
- low-frequency vibration with frequency of 5 to 35 Hz and bias amplitude up to 0.35 mm;
- single mechanical shocks with peak acceleration no greater than 50 $m \cdot s^{-2}$ and shock pulse duration of 0.5 to 30 ms;
- variable magnetic field of commercial frequency up to 400 $A \cdot m^{-1}$.

1.1.6 Operating conditions for the GSP sensor are described in documentation supplied by the sensor manufacturer.

1.1.7 Delivery set of the dosimeter-radiometer is determined at the stage of execution of the vendor contract.

1.1.8 The casing protection degree on IEC 529:1989:

Name of blocks	Code IP
Detecting block BDZA-96	54
Detecting block BDZA-96b	54
Detecting block BDZA-96m	54
Detecting block BDZA-96s	54
Detecting block BDZA-96t	54
Detecting block BDZB-96	54
Detecting block BDZB-96b	54
Detecting block BDZB-96s	54
Detecting block BDZB-99	54
Detecting block BDPS-96	54
Detecting block BDKS-96	65
Detecting block BDKS-96s	54
Detecting block BDMG-96	65
Detecting block BDPG-96m	65
Detecting block BDPG-96	65
Detecting block BDVG-96	65
Detecting block BDKG-96	68
Detecting block BDKN-96	65
Detecting block BDMN-96	65
Console UIK-05	54
Console UIK-06	54

1.2 Technical characteristics

1.2.1 Technical characteristics of the dosimeter-radiometer when measuring alpha-flux density.

1.2.1.1 The dosimeter-radiometer upon connection of the detecting block for alpha-detection provides the measurement of the alpha surface contamination level.

1.2.1.2 Basic metrological characteristics of the dosimeter-radiometer when measuring the alpha-flux density are summarized in table 1.1.

Table 1.1 - Basic metrological characteristics when measuring alpha-flux density

Detecting block type	Measurement range, $min^{-1} \cdot cm^{-2}$	Limits of intrinsic relative error, %	Detector area, cm^2	Inherent background, $min^{-1} \cdot cm^{-2}$, no greater	Efficiency of alpha-detection, %, no less		
					^{239}Pu	^{234}U	^{238}U
BDZA-96	0.1 to $1 \cdot 10^4$	±(20+6/Ax)%, where Ax is a numerical value of the measured quantity	70	0.3	42	25	15
BDZA-96b	0.1 to $2 \cdot 10^3$		300	1.0	20	15	10
BDZA-96m	0.1 to $1 \cdot 10^5$		10	0.2	50	30	18
BDZA-96s	0.1 to $5 \cdot 10^4$		28	0.2	45	25	15
BDZA-96t	0.1 to $1 \cdot 10^6$		5	0.1	55	39	37
BDPS-96	0.2 to $1 \cdot 10^4$		28	0.2	45	25	15

Notes

1 Limits of an intrinsic relative error are rated with a confidence probability of 0.95 for alpha-radiation from sources with ^{239}Pu.

2 Upon the customer's request the dosimeter-radiometer may be adapted to measure alpha-flux density from sources with ^{234}U or ^{238}U.

3 Inherent background level is rated for external gamma-background level not exceeding 0.20 μSv/h.

1.2.1.3 The dosimeter-radiometer provides the measurement of alpha-flux density with error not exceeding the intrinsic relative error value under effect of background radiation with limiting levels for EDR of gamma-radiation:

- 1.0 μSv/h for blocks BDZA-96, BDZA-96m, BDZA-96s, BDPS-96;
- 0.01 mSv/h for blocks BDZA-96b;
- 100 mSv/h for blocks BDZA-96t.

Besides, the dosimeter-radiometer with a detecting block BDZA-96t provides the measurement of alpha-flux density under effect of neutron background radiation with EDR level up to 500 $\mu Sv \cdot h^{-1}$.

1.2.2 Technical characteristics of the dosimeter-radiometer when measuring the beta-flux density.

1.2.2.1 The dosimeter-radiometer upon connection of detecting blocks for beta-detection provides measurement of the beta surface contamination level.

1.2.2.2 Basic metrological characteristics of the dosimeter-radiometer when measuring the beta-radiation flux density are summarized in table 1.2.

Table 1.2 - Basic metrological characteristics when measuring beta-flux density

Detecting block type	Measurement range, $min^{-1} \cdot cm^{-2}$	Limits of intrinsic relative error	Energy range, MeV	Detector area, cm^2	Inherent background, $min^{-1} \cdot cm^{-2}$, no greater	Efficiency of beta-detection, %, no less		
						$^{90}Sr+^{90}Y$	^{204}Tl	^{14}C
BDZB-96	10 to $1 \cdot 10^5$	± 20 %	0.3 to 3.0	28	20	25	-	-
BDZB-96b	3 to $1 \cdot 10^4$		0.12 to 3.0	100	15	25	16	-
BDZB-96s	10 to $3 \cdot 10^4$		0.12 to 3.0	15	15	30	10	3
BDZB-99	20 to $1 \cdot 10^4$		0.12 to 3.0	30	30	45	20	3
BDKS-96s	10 to $3 \cdot 10^4$		0.12 to 3.0	15	-	30	10	3
BDPS-96	10 to $1 \cdot 10^5$		0.3 to 3.0	28	20	25	-	-

Notes

1 Limits of an intrinsic relative error are rated with a confidence probability of 0.95 for beta-radiation from sources with $^{90}Sr + ^{90}Y$.

2 3 Inherent background level is rated for external gamma-background level not exceeding 0.20 μSv/h.

1.2.2.3 The dosimeter-radiometer provides the measurement of beta-flux density under effect of gamma background radiation. At such a condition the lower level of beta-flux density measurement range is limited according to the following equation:

$FF_{min} = 0{,}3 \cdot PP_{bgrd}$, $cm^{-2} \cdot min^{-1}$, where PP_{bgrd} – background measurement result with the face lead installed.

1.2.3 Technical characteristics of the dosimeter-radiometer when measuring X- ray and gamma-radiation.

1.2.3.1 The dosimeter-radiometer upon connection of detecting blocks for gamma-detection provides the measurement of ambient dose equivalent H*(10) and ambient dose equivalent rate $\dot{H}^*(10)$ of X-ray and gamma-radiation.

1.2.3.2 Basic metrological characteristics of the dosimeter-radiometer when measuring X-ray and gamma radiation are summarized in Tables 1.3 a, 1.3 b.

Table 1.3 a - Basic metrological characteristics when measuring X-ray and gamma-radiation

Detecting block type	ED measurement range	EDR measurement range	Limits of intrinsic relative error, %	Sensitivity anisotropy, %
BDKS-96	0.1 μSv to 10 Sv	0.1 $\mu Sv \cdot h^{-1}$ to 1.0 $Sv \cdot h^{-1}$	±(15+6/Ax), where Ax is a numerical value of the measured quantity	±25
BDKS-96s	0.1 μSv to 10 Sv	0.1 $\mu Sv \cdot h^{-1}$ to 1.0 $mSv \cdot h^{-1}$	±(20+2/Ax), where Ax is a numerical value of the measured quantity	±35
BDMG-96	0.1 μSv to 10 Sv	0.1 $\mu Sv \cdot h^{-1}$ to 10 $Sv \cdot h^{-1}$		±25
BDVG-96	-	0.03 to 30 $\mu Sv \cdot h^{-1}$	±13	±35
BDPG-96	-	0.05 to 100 $\mu Sv \cdot h^{-1}$	±13	±35
BDPG-96m	-	0.05 300 $\mu Sv \cdot h^{-1}$	±13	±35

Notes

1 Limits of an intrinsic relative error are rated with a confidence probability of 0.95 for radiation from sources with ^{137}Cs.

2 The dosimeter-radiometer equipped with detecting blocks of the BDVG-96, BDPG-96, BDPG-96m, type is recommended to use for assessment of relative change in radiation environment.

Table 1.3b - Basic metrological characteristics when measuring X-ray and gamma-radiation

Detecting block type	Range of the detected radiation energies	Energy dependence, %	Energy threshold of detection, keV
BDKS-96	15 to 25 keV 25 to 1250 keV; 1.25 to 10 MeV	±45 +20 to minus 30 ±15	-
BDKS-96s	0.05 to 3.0 MeV	±30	-
BDMG-96	0.05 to 3.0 MeV	±30	-
BDVG-96	Not rated		20
BDPG-96	Not rated, see App.B		50
BDPG-96m	Not rated		50

1.2.3.3 The dosimeter-radiometer upon connection of the detecting block BDKS-96 provides the measurement of EDR and ED of pulsed X-ray and gamma-radiation. Pulsed radiation parameters are indicated in table 1.4.

Table 1.4 - Parameters of pulsed radiation being detected by the detecting block BDKS-96

Measurement subrange	Pulsed radiation parameters		Parameters of measured quantity limits	
	Frequency, s^{-1}	Pulse duration	EDR, $Sv \cdot s^{-1}$	ED in a pulse, μSv
«High»	No greater than 1	No less than 0.3 ms	No greater than 1.0	*
	1 to 10	0.3 ms to 0.01 μs	No greater than 5.0	*
	Greater than 10	No greater than 0.01 μs	*	No greater than 0.05
«Low»	No greater than 1	No less than 0.3 ms	No greater than 0.01	*
	1 to 10	0.3 ms to 0.01 μs	No greater than 0.05	*
	Greater than 10	No greater than 0.01 μs	*	No greater than 0.0005
* - Dose equivalent in a pulse is estimated as the EDR and pulse duration product.				

1.2.3.4 In addition, the dosimeter-radiometer upon connection of the detecting blocks BDPG-96, BDPG-96m, BDVG-96 provides the measurement of gamma-flux density in the measurement ranges of:

- 4 to 2000 $s^{-1} \cdot cm^{-2}$ – for the detecting block BDVG-96;
- 10 to 8000 $s^{-1} \cdot cm^{-2}$ – for the detecting block BDPG-96;
- 10 to 24000 $s^{-1} \cdot cm^{-2}$ - for the detecting block BDPG-96m.

1.2.3.5 The dosimeter-radiometer upon connection of the detecting block BDKG-96 provides the measurement of exposure dose rate of gamma-radiation. The dosimeter-radiometer characteristics when measuring exposure dose rate of gamma-radiation are given in table 1.5.

Table 1.5 - Basic metrological characteristics when measuring exposure dose rate of gamma-radiation

Detecting block type	Measurement range of exposure dose rate, $\mu R \cdot h^{-1}$	Limits of intrinsic relative error, %	Energy dependence	Sensitivity anisotropy, %, no greater	Energy threshold of gamma-detection, keV, no greater
BDKG-96	5 to $1 \cdot 10^4$	± 30	Not rated	± 45	100
Note - Limits of an intrinsic relative error are rated with a confidence probability of 0.95 for gamma-radiation from sources with ^{137}Cs					

1.2.3.6 The dosimeter-radiometer upon connection of the detecting block BDKG-96 provides the measurement of gamma-flux density in the measurement range of 4 to $2000 \cdot s^{-1}$.

1.2.4 Technical characteristics of the dosimeter-radiometer when measuring neutron-radiation.

1.2.4.1 The dosimeter-radiometer upon connection of the detecting block BDMN-96 provides the measurement of ambient dose equivalent H*(10) and ambient dose equivalent rate $\dot{H}$*(10) of neutron-radiation.

1.2.4.2 Basic metrological characteristics when measuring neutron radiation are summarized in table 1.6.

Table 1.6 - Basic metrological characteristics when measuring neutron radiation

Detecting block type	ED meas. range	EDR meas. range [flux]	Limits of intrinsic relative error	Range of detected radiation energies	Energy dependence	Sensitivity anisotropy
BDMN-96	0.1 μSv to 1.0 Sv	0.1 $\mu Sv \cdot h^{-1}$ to 0.1 $Sv \cdot h^{-1}$	± (25 + 5/Ax)%, where Ax is a numerical value of the measured quantity	0.025 eV to 10.0 MeV	± 40%	± 30%
BDKN-96	0.1 μSv to 1.0 Sv	0.1 $\mu Sv \cdot h^{-1}$ to 0.1 $Sv \cdot h^{-1}$ [$1 \div 10^4$ $n/(s \cdot cm^2)$]	± (25 + 5/Ax)%, where Ax is a numerical value of the measured quantity	0.025 eV to 14.0 MeV	± 40%	± 30%
Notes 1 Limits of an intrinsic relative error are rated with a confidence probability of 0.95 for neutron radiation from the Pu-α-Be source. 2 Energy Dependence is rated for typical neutron spectra as ref. to Pu-α-Be source. 3 Gamma rejection rate for BDKN-96 is typ.10000.						

1.2.5 Technical characteristics of the dosimeter-radiometer, common for all detecting blocks.

1.2.5.1 Complementary relative errors of measurements with the dosimeter radiometer, due to environmental effects do not exceed:

- ±10 % for each 10°C of temperature change in the ambient temperature range of minus 20 to + 50°C;
- ±10 % at high relative ambient humidity up to 95% at +35°C;

- ±10 % upon action of magnetic field of commercial frequency with field strength up to 400 $A \cdot m^{-1}$;

- ±5 % upon supply voltage change from 6.0 to 3.9 V.

1.2.5.2 Power supply of the dosimeter-radiometer is provided:

1.2.5.2.1 For UIK-05 - upon equipment with power supply unit PNN-02-02 – from galvanic cells of the A-343 type,

1.2.5.2.2 For UIK-05 - upon equipment with power supply unit PNN-02-03 - from four accumulators of the AA type with capacity no less than 2100 mA·h.

1.2.5.2.3 - For UIK-06 - upon equipment with power supply from accumulator battery AA type with capacity no less than 2100 mA·h built into the console battery compartment.

The accumulators are charged by means of the charging device ZU-02S.

1.2.5.3 Operation time of the dosimeter-radiometer with fresh power supply elements depending on a type of the connected detecting block is given in table 1.7.

Table 1.7 - Operation time with a power supply kit:

Detecting block type (detector type)	Hours of service, h, no less		
	Power supply unit PNN -02-02 (A-343 cells)	Power supply unit PNN-02-03 (accumulators)	Power supply unit accumulator battery (UIK-06)
BDKS-96	45	40	25
BDZA, BDZB, BDPG, BDPS, BDMN-96 (scintillator+PMT) and BDKN-96 (^{3}He-counter)	120	80	40
BDMG-96, BDKS-96s, BDZB (Geiger tube)	200	120	50

1.2.5.4 Continuous operation time of the dosimeter-radiometer is 10 hours. Reading instability within continuous operation time does not exceed ± 10 %.

1.2.5.5 The console UIK-05, UIK-06 has a graphic display as an indication element.

1.2.5.6 The dosimeter-radiometer has a non-volatile memory the capacity of which provides the opportunity to store information about results of 2000 measurements and further view on the console display or transmission of those data to a PC (using the «TETRA_Reporter» software).

1.2.5.7 The dosimeter-radiometer software provides the opportunity of selection and adjustment by operator of threshold settings for each dosimeter-radiometer version.

1.2.5.8 The dosimeter-radiometer software provides an audible alarm when exceeding the threshold setting levels, sound accompaniment of detection of ionizing particles or photons by the detector, audible signals on completion of measurement and discharge of power supply elements.

1.2.5.9 The dosimeter-radiometer algorithm provides performance of the following functions:

- automatic determination and display of information about type of the detecting block being connected to the measuring console and basic unit of the measured physical quantity appropriate to this detecting block;

- automatic subtraction (compensation) of the background value from the measurement result;

- automatic control of supply voltage and display of visual information about current charge level of power supply elements as an icon;

- automatic control of supply voltage down to the threshold value equal to 3.5 V, generation of 3 beeps when reaching the stated threshold value and shutoff of the console;

- automatic count of real date and time after installation of galvanic cells or accumulators into the console UIK-05, UIK-06 and until they (or power supply unit PNN-02-02 (PNN-02-03)) are removed from the console UIK-05, UIK-06. On turning-on the console after replacement of galvanic cells (accumulators) or power supply failure, the console generates automatic demand to enter the real date and time;

- automatic (upon selection of the «Autosave» mode) or manual saving the measurement data into archive;

- automatic display of real time data;

- graphical display of results from comparison of the current radiation value with the background value in the «Detection» mode and simultaneous digital indication of instantaneous value of the measured quantity;

- graphical display of current measurement results in the «Search» mode and maximum radiation value, detected in the current measurement cycle;

- indication of one of transparencies «Dirty», «Norma», «Clean», «Clean!» in the «Threshold» mode in compliance with results from comparison of the measured value against threshold settings in the «Threshold» mode;

- indication of the ⚠ icon and sound generation in the «Primary measurement» mode, when the measured radiation level exceeds the threshold setting «Alarm» in the «Primary measurement» mode;

- setting up in the «Threshold» mode and storage in non-volatile memory of threshold setting values of three levels - «Alarm», «Preliminary» and «Bottom», being used in the «Threshold» mode only;

- setting up the threshold settings «On dose» (being set in the «Dose» mode for detecting blocks BDMG-96, BDKS-96, BDKS-96s) and «On beta» (being set in the «Secondary measurement» mode for detecting blocks BDKS-96s and BDPS-96);

- setting up in the «Primary measurement» mode and storage in the non-volatile memory of threshold settings «Alarm», «Preliminary» and «Bottom», being used in the «Primary measurement» mode.

1.2.5.10 The dosimeter-radiometer may be used as a control point in the ATE which supports the link protocol DiBUS (for example, PTK «Atlant»).

1.2.5.11 The dosimeter-radiometer may be employed together with the GPS sensor. To receive data from the sensor, RS-232 interface and software protocol NMEA 0183, version 2.0 are used. Upon sharing of the dosimeter-radiometer and GSP sensor, the saved-in-archive information about the measurement result is complemented with information about geographical coordinates of locality points where the measurement has been made.

1.2.5.12 The dosimeter-radiometer remains serviceable:

- after action of ambient temperature in the range of minus 40 to +50˚C;

- after action of high relative humidity up to 95 % at the temperature of +35˚C;

- after short-term (no greater than 5 minutes) effect of ionizing radiation with 100-multiple excess of the measured value.

1.2.5.13 Weight and overall dimensions of devices and blocks from the dosimeter-radiometer set do not exceed those stated in table 1.8.

Table 1.8 - Weight and overall dimensions of devices and blocks of the dosimeter-radiometer

Designation	Name	Weight, kg	Overall dimensions, mm
AJAH.418287.006	Measuring console UIK-05 with power supply unit PNN-02-02 (02-03)	1,0	200×90×85
AJAH.418287.018	Measuring console UIK-06	0,3	136×75×26
TE2.328.001	Detecting block BDZA-96	0,9	Diameter 130, length 240
TE2.328.036	Detecting block BDZA-96b	4,0	Diameter 230, length 290
TE2.328.001-01	Detecting block BDZA-96m	0,9	Diameter 65, length 240
TE2.328.001-02	Detecting block BDZA-96s	1,0	Diameter 90, length 240
TE2.328.039	Detecting block BDZA-96t	0,15	Diameter 50, height 60
TE2.328.005	Detecting block BDZB-96	0,9	Diameter 90, length 230
TE2.328.031	Detecting block BDZB-96b	1,5	150x200x110
TE2.328.037	Detecting block BDZB-96s	0,3	Diameter 65, height 65
TE2.328.021	Detecting block BDZB-99	0,5	Diameter 88, height 80
AJAH.418252.025	Detecting block BDPS-96	1,2	Diameter 90, height 280
TE2.328.007	Detecting block BDKS-96	1,5	Diameter 72, length a 265
TE2.328.040	Detecting block BDKS-96s	0,35	Diameter 80, height a 80
TE2.328.015	Detecting block BDMG-96	0,3	Diameter 40, length 250
AJAH.418268.007	Detecting block BDPG-96m	0,5	Diameter 28, length 310
TE2.328.017	Detecting block BDPG-96	1,0	50x191x480
TE2.328.018	Detecting block BDVG-96	2,0	Diameter 88, length 400
TE2.328.026	Detecting block BDKG-96	6,0	Diameter 65, length 760
AJAH.418268.022	Detecting block BDKN-96	2,0	Diameter 100, length 300
TE2.328.008	Detecting block BDMN-96	0,8	Diameter 54, length 200
AJAH.301124.001	Spherical moderator to BDMN-96	7,3	Diameter 245
AJAH.436231.001	Charging device ZU-02S	0,1	30×40×60
AJAH.418292.012	Matching device US-96	0,1	(45x50x65) x 2 pcs
AJAH.685611.001	Matching device US-96K (UIK – BDKG-96)	0,1	45x50, cable length 1,5 m

1.2.5.14 Mean time between failures is 8000 hours.

1.2.5.15 Specified lifetime of the dosimeter-radiometer is 8 years.

1.3 Dosimeter-radiometer set

1.3.1 The dosimeter-radiometer set may consist of units, devices and documentation stated in table 1.9. Specific package is determined by the supply agreement.

Table 1.9 – Dosimeter-radiometer set

	Name	Q-ty	Note
1.	Measuring console UIK-05 with power supply unit PNN-02-02	1	1
2.	Measuring console UIK-05-01 with power supply unit PNN-02-03	1	1
3.	Measuring console UIK-06	1	1
4.	Detecting block BDKS-96	1	1
5.	Detecting block BDKS-96s	1	1
6.	Detecting block BDZA-96	1	1
7.	Detecting block BDZA-96b	1	1
8.	Detecting block BDZA-96m	1	1
9.	Detecting block BDZA-96s	1	1

Name	Q-ty	Note
10. Detecting block BDZA-96t	1	1
11. Detecting block BDZB-96	1	1
12. Detecting block BDZB-96b	1	1
13. Detecting block BDZB-96s	1	1
14. Detecting block BDZB-99	1	1
15. Detecting block BDPS-96	1	1
16. Detecting block BDVG-96	1	1
17. Detecting block BDKG-96	1	1
18. Detecting block BDMG-96	1	1
19. Detecting block BDKN-96	1	1
20. Detecting block BDMN-96	1	1
21. Detecting block BDPG-96	1	1
22. Detecting block BDPG-96m	1	1
23. Protective shield for BDZB-96b	2	2
24. Glareshield for BDZA-96	2	2
25. Glareshield for BDZA-96m	2	2
26. Glareshield for BDZA-96s	2	2
27. Protective shield for BDZA-96t	2	2
28. Glareshield for BDZB-96	2	2
29. Glareshield for BDPS-96	2	2
30. Filter Beta for BDPS-96	1	2
31. GSP sensor	1	1
32. Adapter (DKS-96 – GSP)	1	2
33. Handle for BDKS-96, BDVG-96	1	2
34. Matching device (UIK – BDKG-96)	1	2
35. Cable for BDKG-96	1	2, 3
36. Telescopic rod for BDMG-96,BDZB-96s, BDZA-96t, BDKS-96s, BDZB-99, 0.7 m long	1	2
37. Telescopic rod and connecting cable for BDMG-96, BDZB-96s, BDZA-96t, BDKS-96s, BDZB-99, 4 m long	1	1
38. Extension cable for BDMG-96, 20 m long	1	1
39. Charging device ZU-02S	1	2
40. Telescopic rod for BDVG-96, 1.6 m long	1	1
41. CD with software	1	1,4
42. Cable for operation with PC (USB) (AJAH.685621.004)	1	1,4
43. Packing box	1	
Maintenance documentation		
44. Operating manual TE1.415313.003RE	1	
45. Verification procedures TE1.415313.003VP	1	
46. Registration certificate TE1.415313.003PS	1	

Notes

1 The package is determined by the supply agreement. On default, the product is delivered with the power supply unit PNN-02-02, the A-343 cells are not supplied. The power supply unit PNN-02-03 is supplied with an accumulator.

2 An item will be included into the dosimeter-radiometer set if the appropriate blocks are available in the product configuration.

3 The cable length to be supplied with the product is 10 m. The customer-desired length of a cable may be stated in the agreement.

4 Data transmission to a PC is available upon delivery of items 41, 42 only.

1.4 Basic design and operation

1.4.1 General

1.4.1.1 The dosimeter-radiometer is a portable instrument consisting of a measuring console UIK-05 or UIK-06 and one of the detecting blocks from the delivery set of the dosimeter-radiometer. The detecting block is connected to the console via the connector of the PC7 type. The length of a cable fixed in the tail piece of the detecting block is 1.5 m. To make operator's work easy, the dosimeter-radiometer is equipped at the customer's request with telescopic rods of different length and connecting brackets.

1.4.1.2 The dosimeter-radiometer set may include the detecting blocks of all types indicated in Table 1.9, no greater than one of each type, in number. This is because the operation algorithm of the dosimeter-radiometer provides automatic determination of the detecting block type and storage in memory of calibration factors for the detecting block of a particular type without number identification (for example, factory number).

1.4.1.3 Indication elements of the dosimeter-radiometer provide continuous control of change in the measured quantity according to readings on the graphical display, and also sound accompaniment of the radiation detection process.

1.4.1.4 Methods of converting the ionizing radiation energy to electrical signals, digital and analog, and also block-diagrams of power supply, amplification, discrimination and other units employed while making detecting blocks are well known. As detectors, the scintillators, gas-discharge counters or semiconductor detectors are employed.

1.4.1.5 Processing of the measuring information in the dosimeter-radiometer is made as follows

$$P = K \cdot \frac{N}{T - N \cdot \Theta} \qquad (1.1)$$

where P - are the dosimeter-radiometer readings in the appropriate units of the measured quantity;

Κ - is a detecting block sensitivity coefficient;

N - is a number of detected pulses;

T - is an exposure time, s;

Θ - is a «dead time», s.

1.4.1.6 Compliance of metrological parameters of the dosimeter-radiometer with figures stated in Section 1 of this Manual is provided by determination of specific values of sensitivity coefficients and «dead time» for each detecting block during calibration. With this, if the detecting block has two channels («low» and «high»; «gamma» and «beta»), the stated coefficients and «dead time» values are determined separately for each channel and each physical quantity to be measured (dose rate, flux density, pulse counting rate …).

1.4.2 Software

1.4.2.1 Software of the dosimeter-radiometer is recorded in the ROM of the processor. The operation algorithm of the dosimeter-radiometer eliminates probability of unauthorized change in software.

1.4.2.2 The operation program of the dosimeter-radiometer provides three algorithms for continuous measurement of physical quantities, which define the detected ionizing radiation:

- «Fixed time,s»;
- «Fixed tolerance»;
- «Tracking,s».

1.4.2.3 The «Fixed time,s» algorithm provides obtaining the measurement result equal to the current mean value with preset exposure. Range of permissible exposure values (measurement time) is 3 to 9999 seconds inclusive. The «Fixed time,s» algorithm automatically starts when putting on the dosimeter-radiometer to the «Measurement» mode – being set «on default» with the exposure time indicated in table 1.10 b.

1.4.2.4 The «Fixed tolerance» algorithm provides obtaining the measurement result with default uncertainty equal to 6%. Calculation of uncertainty is performed as follows

$$u = \frac{2}{\sqrt{N}} \times 100\% \qquad (1.2)$$

where N is a number of currently detected pulses.

The measurement process is completed after detection of such number of pulses (1111 pls), which provides the acceptable level of the statistical error (uncertainty), or after expiry of the operator-defined time if the desired number of pulses is not detected within this period. Upon setting the measurement time equal to zero, limitation for measurement time interval is withdrawn.

At any moment the operator may terminate displaying the current measurement value by executing the ⬇ action, not stopping the measurement process. After repeating the ⬇ action, data output is resumed.

1.4.2.5 The «Tracking, s» algorithm provides obtaining the measurement result equal to the average value calculated by the sliding average method over results of N observations with exposure time equal to one second. The number of N observations is determined by the averaging period within which the algorithm-defined number of pulses is detected by a console. Duration of the averaging period depends on change in the radiation environment only, and if there are no significant changes, it may reach 200 s. If the number of pulses, detected within the next averaging period, differs from the number of pulses, detected within the previous period for the value exceeding three sigma (standard deviation), the measurement process will automatically start and readings will be updated. When calculating the updated readings, the result from the previous measurement is not taken into account that provides quick response to change in radiation environment. This algorithm is recommended to be used with detecting blocks of the BDPG-96, BDPG-96m, BDVG-96, BDMG-96 type in the «Search» mode.

1.4.2.6 Selection and start of algorithms are performed in the «Settings» mode. Description of algorithms and operation procedure for the dosimeter-radiometer with use of the «Settings» mode features are described in Section 2 «Advanced features» of this Manual.

1.4.3 The dosimeter-radiometer provides two operation modes:

- basic mode - «Measurement»;
- auxiliary mode - «Settings».

1.4.3.1 Start of each operation mode of the console UIK-05, UIK-06 is performed from the off mode:

- «Measurement» mode – when turning on the instrument – execution of the ⓘ action;
- «Settings» mode - when holding pressed the ► key and executing the ⓘ action.

1.4.3.2 The measuring console UIK-05, UIK-06 may be used as the mean pulse count rate meter upon selection of the appropriate measurement unit – s^{-1} – in the «Settings» mode (see Section 2 of this Manual).

1.4.3.3 The dosimeter-radiometer is delivered with preset factory settings – default settings:

- operation mode and display of measurement results - the «Primary measurement» window. For some detecting blocks listed in Table 1.10a, also other measurement modes are available;

- measurement unit – basic unit for this type of the detecting block in accordance with Table 1.10b;

- measurement algorithm - «Fixed time,s»;

- measurement time in compliance with Table 1.10b – for each detecting block is specified such way that upon minimum value of the measured quantity within the measurement range the measurement uncertainty would not exceed 50%;

- threshold setting values are equal to zero;

- dynamic scale is disabled;

- work with archive of measurement results is forbidden;

- mode of auto-saving the results is disabled;

- the «N» value of the «Stop after N meas» mode is equal to zero.

1.4.3.4 Default settings of the console provide metering with optimal parameters. Types of detecting blocks for which the background compensation is provided for, and the enable- allowed- windows are summarized in Table 1.10a. Typical values of sensitivity coefficients and «dead» time T being set when manufacturing the console UIK-05, UIK-06 are summarized in Table 1.10b.

Table 10a - Default parameters being set when manufacturing the console

Detecting block type	Background measurement	Background measurement time, s	«Default» enabled windows, using the ⬆ key	Windows enabled in the «Settings» mode
BDZA-96	+	100	«Primary measurement»	«Threshold mode», «Archive»
BDZA-96b	+	50	«Primary measurement»	
BDZA-96m	+	200	«Primary measurement»	
BDZA-96s	+	150	«Primary measurement»	
BDZA-96t	-	-	«Primary measurement»	
BDZB-96	+	50	«Primary measurement»	
BDZB-96b	+	40	«Primary measurement»	
BDZB-96s	+	50	«Primary measurement»	
BDZB-99	+	50	«Primary measurement»	
BDKN-96	+	250 (saved in non-volatile memory)	«Primary measurement»; «Dose»	
BDMN-96	-	-	«Primary measurement»; «Dose»	
BDPS-96	+	$100_{\alpha}/30_{\beta}$	«Primary measurement»; «Secondary measurement»	
BDKS-96s	-	-	«Primary measurement»; «Dose»; «Secondary measurement»	«Search», «Detection», «Archive»
BDKS-96	-	-	«Primary measurement»; «Dose»	
BDMG-96	-	-	«Primary measurement»; «Dose»	
BDPG-96	-	-	«Primary measurement»; «Detection»	
BDPG-96m	-	-	«Primary measurement»; «Detection»	
BDVG-96	-	-	«Primary measurement»; «Detection»	
BDKG-96	-	-	«Primary measurement»	

Table 1.10b - Default parameters being set when manufacturing the console

Detecting block type	Basic unit of measurement	Supplementary unit of measurement	Sensitivity coefficient	Dead time, μs	Measurement algorithm	Measurement time, s	Note
BDZA-96	$min^{-1} \cdot cm^{-2}$	-	2,20e-0	005,0	Fixed time,s	20	2
BDZA-96b	$min^{-1} \cdot cm^{-2}$	-	5,00e-1	002,0		10	2
BDZA-96m	$min^{-1} \cdot cm^{-2}$	-	1,50e+1	020,0		40	2
BDZA-96s	$min^{-1} \cdot cm^{-2}$	-	5,00e-0	015,0		30	2
BDZA-96t	$min^{-1} \cdot cm^{-2}$	-	2,50e+1	015,0		20	2
		CPS	1,00e-0	015,0		20	1
BDZB-96	$min^{-1} \cdot cm^{-2}$	-	8,00e-0	002,0		10	2
BDZB-96b	$min^{-1} \cdot cm^{-2}$	-	1,61e-0	055,0		10	2
BDZB-96s	$min^{-1} \cdot cm^{-2}$	-	1,30e+1	050,0		10	2
BDZB-99	$min^{-1} \cdot cm^{-2}$	-	4,00e-0	150,0		8	2
BDPS-96 (alfa)	$min^{-1} \cdot cm^{-2}$		5,0e-0	5,0		20	2
BDPS-96 (beta)	$min^{-1} \cdot cm^{-2}$		7,0e-0	2,0		20	2
BDKS-96s-beta	$min^{-1} \cdot cm^{-2}$	-	7,00e-0	055,0		20	-
BDKS-96s-gamma	Sv/h, Sv	-	2,00e-7	055,0		20	-
BDKS-96 («low» subrange)	Sv/h, Sv	-	1,00e-7	015,0		10	-
BDKS-96 («high» subrange)	Sv/h, Sv	-	1,00e-4	010,0		10	-
BDMG-96 («low» subrange)	Sv/h, Sv	-	2,50e-7	060,0		20	-
BDMG-96 («high» subrange)	Sv/h, Sv	-	2,50e-4	035,0		20	-
BDPG-96	Sv/h	-	2,50e-9	003,0		10	-
	-	$s^{-1} \cdot cm^{-2}$	0,26e-0	003,0		10	1
BDPG-96m	Sv/h	-	4,24e-9	005,0		10	-
	-	$s^{-1} \cdot cm^{-2}$	0,56e-0	005,0		10	1
BDVG-96	Sv/h	-	4,00e-10	002,0		10	-
	-	$s^{-1} \cdot cm^{-2}$	3,00e-2	002,0		10	1
BDKG-96	R/h	-	5,00e-7	002,0		10	-
	-	CPS	1,0e-0	002,0		10	1
BDKN-96	Sv/h, Sv	-	5,1e-7	025,0		20	1
		$s^{-1} \cdot cm^{-2}$	0,46	025,0			
BDMN-96	Sv/h, Sv	-	2,00e-6	025,0		20	-

Notes

1 Use of supplementary measurement unit “cps” for all detecting blocks is available after selection of them in the «Settings» mode.

2 For detecting blocks of the BDZA, BDZB and BDPS use of measurement units «$Bq \cdot cm^{-2}$» is available after selection of them in the «Settings» mode and customized calibration of the dosimeter-radiometer.

3 When returning to factory settings in the «Settings» mode, the values of parameters «Units of measurements», «Algorithm» and «Fixed time, s» are reset.

1.4.3.5 Following the results of calibrating the dosimeter-radiometer with a detecting block (blocks) from the delivery set, the values of sensitivity coefficient and «dead» time are corrected and subsequently may be changed upon use of the «Settings» mode features. Specific values of sensitivity coefficient and «dead» time being preset in the dosimeter-radiometer for detecting blocks from the delivery set are stated in the registration certificate TE1.415313.003PS.

1.4.4 Construction and operation of the dosimeter-radiometer components

1.4.4.1 Detectors being employed in the detecting blocks and structural features of different detecting blocks are stated in Table 1.11.

Table 1.11 - Detector types

Type of the detecting block	Detector type	Detector sizes and structural features	PMT type	Note
BDZA-96	ZnS(Ag)	S = 70 cm^2	ФЭУ-35-1	
BDZA-96b	ZnS(Ag)	S = 300 cm^2	ФЭУ-35-1	
BDZA-96m	ZnS(Ag)	S = 10 cm^2	ФЭУ-35-1	
BDZA-96s	ZnS(Ag)	S = 30 cm^2	ФЭУ-35-1	
BDZA-96t	Semiconductor detector	S = 5 cm^2	-	
BDZB-96	Plastic scintillator	S = 28 cm^2	ФЭУ-35-1	
BDZB-96b	Counters: SBT-10 - 2 pcs	S = 100 cm^2	-	
BDZB-96s	Counter Beta – 2	S = 15 cm^2	-	
BDZB-99	Counter SI-8B	S = 30 cm^2	-	
BDPS-96	Combined plastic scintillator	S = 28 cm^2	ФЭУ-118	
BDKS-96s	Counters: Beta-2 and Beta-2m	S = 15 cm^2	-	
BDKS-96	Tissue-equivalent plastic scintillator	Diameter 45, height 20 mm, light gate with three fixed positions: «КОМП», «mSv», «μSv »	ФЭУ -118 (R980-A)	
BDMG-96	Counters: SBM-20 -2 pcs, SI-34G – 1 pc		-	
BDPG-96	NaJ(Tl)	Diameter 25; height 40 mm	ФЭУ-35-1	
BDPG-96m	NaJ(Tl)	Diameter 18; height 30 mm	ФЭУ- 67б	
BDVG-96	NaJ(Tl)	Diameter 63; height 63 mm	ФЭУ-35-1	
BDKG-96	NaJ(Tl)	Diameter 18; height 30 mm	ФЭУ-67Б	Logging
BDKN-96	He-3 counter	Diameter 100; height 300 mm		Positioned inside the moderator
BDMN-96	Plastic scintillator + ZnS(Ag)	S=5,0 cm^2	ФЭУ-35-1	

1.4.4.2 Arrangement of detector center in detecting block BDMG-96 is shown on Figure 1.1 and described for all the blocks in Table 1.12.

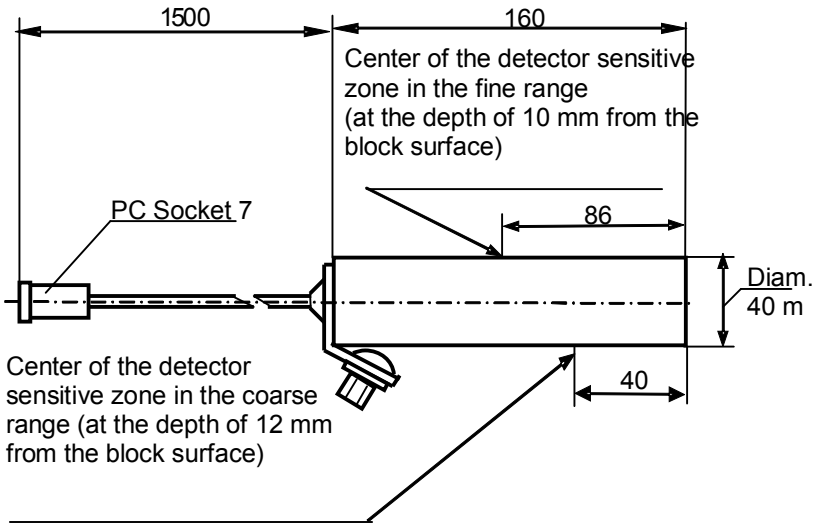


Figure 1.1

Table 1.12 - Arrangement of detector centers

Type of the detecting block	Arrangement of detector centers	Notes
BDZA-96	At the depth of 1 mm from the surface of a protective film deep down the block	
BDZA-96b	At the depth of 3 mm from the surface of a protective film deep down the block	
BDZA-96m	At the depth of 1 mm from the surface of a protective film deep down the block	
BDZA-96s	At the depth of 1 mm from the surface of a protective film deep down the block	
BDZA-96t	On the longitudinal axis of the block at a distance of 1 mm from the surface of a protective film deep down the block	
BDZB-96	At the depth of 2 mm from the surface of a protective film deep down the block	
BDZB-96b	At the depth of 3 mm from the end sensitive surface of the block	
BDZB-96s	At the depth of 3 mm from the end sensitive surface of the block	
BDZB-99	At the depth of 3 mm from the end sensitive surface of the block	
BDPS-96	At the depth of 12 mm from the top filter surface installed on the block	
BDKS-96s	For beta-range - at the depth of 3 mm from the end surface of the block For gamma-range - on the longitudinal axis of the block at a distance of 30 mm from the end surface of the block (collar mark)	
BDKS-96	In the cross-point of the longitudinal axis of the block, passing through the «+» mark on the end surface, and the surface passing through the ring groove colored in white, inside the block cover	

Type of the detecting block	Arrangement of detector centers	Notes
BDMG-96	Arrangement of detector centers of «low» and «high» sub-ranges is shown in Figure 1.1	
BDPG-96; BDPG-96m	In the cross-point of the longitudinal axis of the block and the surface passing through the ring groove on the block housing	
BDVG-96	On the longitudinal axis of the block at a distance of 35 mm from the end surface of the block	
BDKG-96	In the cross-point of the longitudinal axis of the block and the surface passing through the ring groove on the block housing	
BDKN-96	On the longitudinal axis and at a distance of 80 mm from the end surface of the block	
BDMN-96	On the longitudinal axis of the block at a distance of 5 mm from the end surface of the block	Without moderator

1.4.4.3 On the detecting blocks intended to measure alpha- and beta- flux density, the shutters are installed, which are intended to completely absorb the measured radiation energy when measuring the inherent background, and to protect the input window of the detector when transportation. Measurement of ionizing radiation flux density should be performed with the shutter removed.

1.4.5 Measuring console UIK-05, UIK-06.

1.4.5.1 Figure 1.2 shows an external view of the console UIK-05, UIK-06.

Figure 1.2 - Console UIK-05, UIK-06.

1.4.5.2 The console UIK-05 has a metal shockproof housing to which the cell power supply unit PNN-02-02 or accumulator power supply unit PNN-02-03 is connected.

The console UIK-06 has a plastic body which sits down suitably in the palm.

The console UIK-06 is included into dosimeter-radiometer structure with accumulator battery built in into the console battery compartment.

The time of dosimeter-radiometer operation with the battery of newly charged accumulators makes at least 45 hours. The accumulators are charged by means of the charging device ZU-02S.

1.4.5.3 The face panel houses the following: graphical display and dosimeter-radiometer control keys.

1.4.5.4 On the side surface of the console UIK-05, the connector to connect the detecting block is located, and on the power supply unit – the jack to connect headphones or charging device, when kitting up with the power supply unit of the PNN-02-03 type.

At the back panel of the console UIK-06 there is a socket jack to connect head phones and charging device ZU-02S. The sequence of the accumulator compartment opening is the following: unzip and take off the protective case, then unscrew the two screws on the top and bottom edges of the compartment lid.

1.4.5.5 The power supply unit is connected to the console UIK-05, UIK-06 using the connector of the PC4TB type and fastened using screws along two guides.

1.4.5.6 Description of the graphical display (console UIK-05, UIK-06).

1.4.5.6.1 In general on the display screen, letterings and signs according to Figure 1.3 may appear

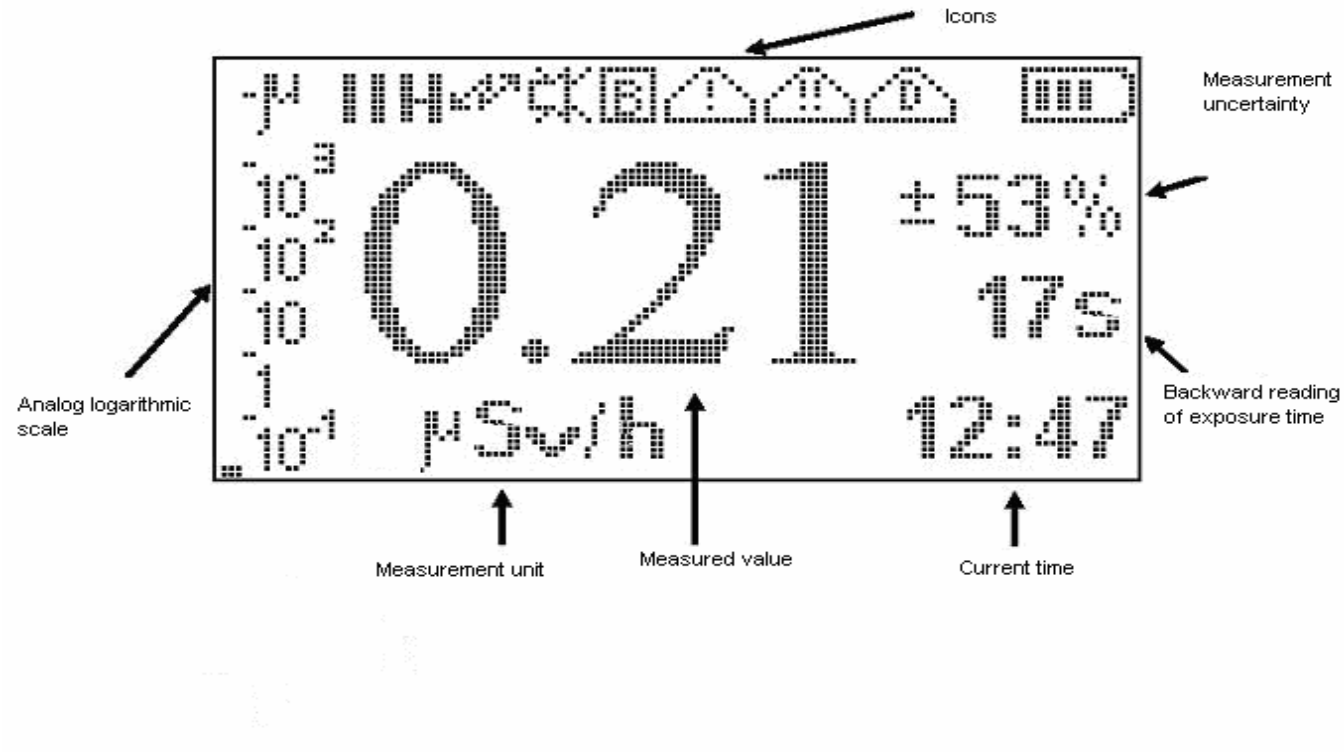


Figure 1.3

1.4.5.6.2 Icons intended to display information about a dimension of measurement units, current events and operation modes of the dosimeter-radiometer:

- the **μ** or **m** icon being displayed in the presence of the analog scale only, and indicating the dimension of the measurement unit which is displayed at the bottom. Display of the «**μ**» icon corresponds to the dose equivalent rate range of 0.1 to 10000 μSv/h, indication of the «**m**» icon - to the range of 0.1 to 10000 mSv/h.

- the ► or ❙❙ indicating the current state of the dosimeter-radiometer corresponds tomeasurement process or pause between measurement cycles;

- the **L** or **H** icon indicating which measurement subrange is enabled – «low» or «high»;

- Icon **α** or **β** indicating the type of radiation currently measured with detecting block BDKS-96;

- the icon indicating presence of a pulse noise and advisability to repeat the measurement;

- the icon indicating that sound is disabled. If sound is enabled, then in this character location, one of icons: ↑ or ↓, or ↕ is displayed, that indicates available variants of adjusting the sound frequency;

- the B icon indicating that the measurement of a background level with detecting blocks, which must be used to provide automatic compensation of the background level, has not been carried out. After performing the measurement of a background level, no icon is displayed. During the measurement, it is displayed in the blinking mode;

- the icon indicating that the current value of the basic measured quantity does not exceed the «Alarm» threshold setting value;

- the icon indicating that the current value of the complementary quantity (beta-flux density), measured with the detecting block of the BDKS-96s type, exceeds the «On beta» threshold setting value;

- the icon indicating that the value of the measured dose exceeds the «On dose» threshold setting value;

- the icon indicating the battery charge level.

1.4.5.7 Description of the dosimeter-radiometer controls

1.4.5.7.1 As controls, the dosimeter-radiometer with the console UIK-05, UIK-06 has the following multifunctional buttons:

ⓘ - the «ON» button;

► - the «SELECTION» button;

- the «SOUND» button;

☼ - the «LIGHT» button;

⬇/ ⏸ - the «DOWN / PAUSE» button (henceforth referred to as ⬇);

⬆/ - the «UP / NEXT WINDOW» button (henceforth referred to as ⬆).

Furthermore, different combinations of buttons provide enabling or disabling of either mode.

1.4.5.7.2 In this operating manual, the following designations of operator's actions with buttons when using the console are accepted:

☼ (single character of the button) - **press** (within ~0,5 s) of the button;

☼☼ (double character of the button) – **long-term press (~1,5 s)** of the button;

⬆ ⬆ (two identical characters after a space) – **sequential presses** of the same button;

⬆ (two different characters close to) - **simultaneous press** (press and holding of the first button, just then – of the second one) of the buttons;

►⬇ ⬇ (three characters close to a space between the first and second ones) – **press and holding of the first button, double successive press of the second one**;

Each action of the operator is accompanied by the beep or melody.

1.4.5.7.3 In the console UIK-05, UIK-06 the following variants of using the buttons with factory settings are provided for:

ⓘ - power-up, starting the measurement, canceling the edition, going to the upper level menu (analog of the Esc/Cancel key on the PC keyboard);

☼⬆ – calling the help window;

ⓘⓘ - power-down;

☼ - turning on for a while (about 3 seconds) / turning off the display illumination;

☼☼ - turning on the display illumination (permanently);

- turning on / off a sound;

🔉🔉 - setting the threshold setting values for the current measurement window;

⬇ - pause / continuation of the measurement cycle;

⬇⬇ - setting up the algorithm parameters (for example, measurement time);

🔉⬆ - increment of the sound divider value;

🔉⬇ - decrement of the sound divider value;

►► – turning on the background measurement mode (for the detecting blocks for which capability of measuring the background level and compensate background is provided for);

⬆ - successive switch of windows on which the measurement results are displayed in operator-selected modes;

►⬆ - manual turning-on of the high range (for two-channel detecting blocks BDMG-96 and BDKS-96);

►⬇ - manual turning-on of the low range (for two-channel detecting blocks BDMG-96 and BDKS-96);

►⬇ ⬇- enabling the automatic switch of range – for the BDMG-96 only.

1.4.5.7.4 Correction of numerical values (date, time, coefficients, and threshold settings) is performed, when executing the following actions: ► (cursor update to the next character location) and ⬇ (decrement of a figure above a cursor for a unit) or ⬆ - (increment of a figure above a cursor for a unit).

1.4.5.7.5 The display is capable to rotate clock-wise at 90 degree increment by means of executing the action ⬆⬆:

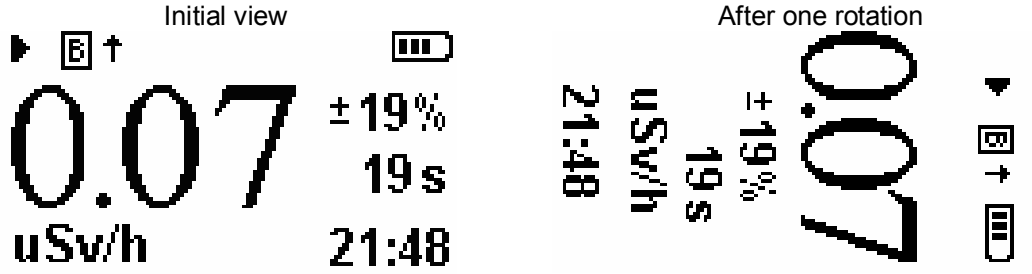


Fig. 1.4

The current view of the display is stored in the memory after powe-of.

1.4.6 Charging device ZU-02S

1.4.6.1 The charging device ZU-02S is a compact plastic housing combined with a standard power-line plug. The unsoldered-inside-device line cord, one meter long, is terminated by the plug. Indication of operation modes and results from testing of the device status is performed by means of two-color LED:

- green – «Charged»,
- red – «Taking charge»,
- red - green – «Short circuit»,
- blinking green – «Breakage».

1.4.6.2 Correspondence of the LED light color to either mode is indicated on the plate located on the device housing – Figure 1.5.

Figure 1.5

1.5 Marking and sealing

1.5.1 Onto the console housing the following identification marks are applied:

- reference designation of the dosimeter-radiometer;
- manufacturer's trade-mark;
- serial number according to the manufacturer's numbering system;
- pattern approval mark;
- year of manufacture.

1.5.2 Onto the detecting block housing the following identification marks are applied:

- reference designation of the dosimeter-radiometer;
- reference designation of the detecting block;
- manufacturer's trade-mark;
- serial number according to the manufacturer's numbering system;
- year of manufacture.

1.5.3 Marking of a shipping container consists of the basic, supplementary and information labels, and also manipulation marks: «UP», «FRAGILE, CAUTION», «PROTECT AGAINST MOISTURE».

1.5.4 Sealing of the dosimeter-radiometer is performed by applying a mastic seal onto the screw head located on the console.

1.6 Packing

1.6.1 Packing together with conservation provides storageability of the dosimeter-radiometer during transportation and storage, and meets the requirements stated in GOST 23170, GOST 23216 and specifications for the dosimeter-radiometer.

1.6.2 Blocks of the dosimeter-radiometer are wrapped with polyethylene film M-0.15, 1 sort GOST 10354.

1.6.3 Documentation attached to the dosimeter-radiometer is packed into cases from polyethylene M-0.15, 1 sort GOST 10354, and put inside the shipping container together with the dosimeter-radiometer.

2 Intended use

2.1 Operating limitations

2.1.1 The dosimeter-radiometer is a complex multipurpose easy-to-use electronic-physical system. Before starting operation with the system, be sure to learn this document, the dosimeter-radiometer design, designation of input and output connectors, an also operation sequence.

Be sure to strictly observe requirements stated in maintenance documentation. Never remove defects on your own except those described below. To carry out analysis of defect causes and their removal, contact the manufacturer

When performing works with the dosimeter-radiometer (maintenance, verification, etc.), make the appropriate records in the registration certificate.

2.1.2 The dosimeter-radiometer should be used under conditions meeting the operating conditions stated in Section 1 of this Manual.

ATTENTION! MONOCRYSTAL DETECTORS USED IN THE DETECTING BLOCKS BDVG-96, BDPG-96, BDKG-96 ARE RESPONSIVE TO THERMAL DISCONTINUITIES AND MAY FAIL UPON AMBIENT TEMPERATURE DROP WITH RATE GREATER THAN 2 °C PER A MINUTE

2.1.3 The dosimeter-radiometer is intended for use by personnel suitably trained in electrical safety procedures and proper use of electrical and radio metering devices.

2.1.4 Design and materials if the dosimeter-radiometer cover provide the performance of decontamination by thrice-repeated wipe with gauze tampon moistened in decontaminant of the following: - 5 % solution of citric acid in ethyl alcohol C_2H_5OH (96 % density).

2.1.5 When in use, be sure to follow this Manual, «Radiation safety standards», «Basic sanitary rules of radiation safety» OSPORB-99 and «Operational regulations for customers' electric installations and safety standards when using customers' electric installations» being in force.

2.1.6 Detecting blocks generate high HAZARDOUS voltage. All operations with the dosimeter-radiometer should be performed in accordance with safety standards to be followed during work at 1000 volts. Be sure to observe particular caution when performing repairs.

2.2 Pre-starting procedure

2.2.1 Check compliance of factory numbers on the detecting blocks and console UIK-05 with those stated in the Registration certificate for the dosimeter-radiometer.

2.2.2 Examine the console UIK-05 or UIK-06, detecting block employed, connecting cable and accessories used – telescopic rods, adapters, handles, container with "Filter Beta" for BDPS-96 block etc. for possible mechanical damages. After removing the surface cover visually make sure of protective film integrity for blocks of BDZA, BDZB, BDPS-96, BDKS-96 types. In case of protective film damage, replace the film (glareshield or protective shield).

2.2.3 Install the power supply elements into the PNN-02-02 unit or charge the accumulators. To do this, connect the charging device ZU-02S to the power supply unit PNN-02-03, and then to AC mains of 220 V, 50 Hz. The LED color will indicate the current mode of operation. After charging the LED color will change from red to green. Disconnect the charging device from AC mains and then from the console.

2.2.4 Turn on the console UIK-05 or UIK-06. Set the real date and time. This operation should be performed upon each connection of the power supply unit to the console and disconnection from it or replacement of power supply elements.

2.2.5 Turn off the console UIK-05 or UIK-06.

2.3 Use of the dosimeter-radiometer

2.3.1 General information about operation with the dosimeter-radiometer

2.3.1.1 Turning on the dosimeter-radiometer

2.3.1.1.1 Connect the selected-for-measurement detecting block to the console UIK-05 or UIK-06, and turn on the dosimeter-radiometer, executing the action ⓘ.

2.3.1.1.2 Make sure that the console properly identifies the type of the connected-to-console detecting block which is displayed within ~ 2 seconds. When turning on the console UIK-05 or UIK-06, to the connector of which no detecting block is connected, the «BDZA-96 connected» message is displayed.

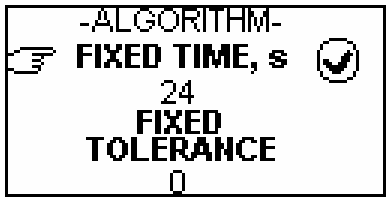
2.3.1.1.3 If together with the detecting block, the GPS sensor is connected and properly identified, the «GPS sensor connected» message is displayed within ~ 2 seconds.

2.3.1.1.4 After the warm-up time equal to one minute for all detecting blocks except for BDKS-96 is expired, the dosimeter-radiometer is ready for operation. The warm-up time for the detecting block BDKS-96 is 15 minutes.

2.3.1.1.5 When turning on, the dosimeter-radiometer will automatically switch to the «Measurement» mode of the «Primary measurement» window, the measurement algorithm - «Fixed time,s», algorithm parameter – measurement time is determined by factory settings (see Table 1.10). If during the previous turning-off of the dosimeter-radiometer, the operator selected in the «Settings» mode the other windows different from the default settings, then the dosimeter-radiometer will save them in a non-volatile memory, add measurement will start with those settings.

2.3.1.1.6 It is able to select another algorithm of measurement and correct the appropriate default parameter in the following sequence:

- execute the action ⬇⬇. The algorithm selection window is displayed:



- while executing the action ⬇, move the cursor → «Fixed time,s», «Fixed tolerance», «Autosave», «Stop after N meas», «Tracking» …;

- select the optimum-for-measurement algorithm by executing the action ► when the cursor is near this algorithm name;

- executing in series the actions ⬇ or ⬆ and ►, correct the parameter value. After correcting the figure in the right-most character location, execute the action ►;

- set, if necessary, number of measurement cycles which the dosimeter-radiometer must perform in the automatic mode (with specified algorithm «Fixed time,s» or «Fixed tolerance»), that is enough to obtain reasonable statistic data. Execute the action ⬇ until the cursor is moved to the «Stop after N meas» line. Execute the action ► and executing in series the actions ⬇ or ⬆ and ►, correct the parameter value. After correcting the figure in the right-most character location, execute the action ►;

- execute the action ⓘ and return to the «Primary measurement» window.

2.3.1.1.7 Set up, if necessary, threshold settings for the «Primary measurement» mode different from zero as follows:

- execute the action 🔊. The threshold setting window is displayed:

- execute the action ► when the cursor is near the name of a setting to be corrected;

- executing the action ⬇ or ⬆ and after selecting the desired figure in each character location - ►, specify the numerical value of the threshold setting. After correcting the figure in the right-most character location, execute the action ►. (The threshold setting value of 25.0 $\mu Sv \cdot h^{-1}$ looks like «2,50e-05»).

2.3.1.1.8 Setting up of the threshold setting «Alarm» automatically includes the control algorithm of comparing the measured quantity level against the threshold setting level. Excess of the measured quantity level above the threshold setting level causes generation by the console of audio-visual signal as an appropriate icon and sound. If with this, non-zero values of «Preliminary» and «Bottom» settings are specified, the fact of their excess is fixed in the status register (protocol DiBUS, www.doza.ru). Information from the status register can be read out, for example, by the «Tetra_Checker» software in case if connected to a PC.

2.3.1.1.9 Set by executing the action ☼ or ☼☼ the desired mode of display illumination. Permanent illumination of the display reduces operation period of the dosimeter-radiometer from the moment of charging accumulators to next charging.

2.3.1.1.10 Set by executing the action 🔊 , the desired mode of audible alarm.

2.3.1.2 Measurement of background level

2.3.1.2.1 Measurement time of background level for different types of detecting blocks is specified automatically and summarized in Table1.10a.

2.3.1.2.2 Subtraction of a summary result for a quantity caused by contribution of background radiation occurs automatically, therefore determination of its numerical value should be performed before carrying out measurements and occasionally during measurements, taking into account changes in the environment and possible external contamination of detecting blocks.

2.3.1.2.3 The 🅱 icon on the data line of a display indicates on possibility to perform measurement of background level (inherent background). To start the background level measurement mode, execute the action ►►. The measurement process of background level begins since displaying the information message «Measurement background». During measurement of background level, the icon is displaying in the blinking mode. After completing the measurement process of background level, indication of the icon ends, the measurement result is indicated on a display until an operator makes decision about its servicing procedure:

– execute the action ► – record the measurement result into memory in order to automatically compensate the background level and return to the primary measurement mode;

- execute the action ⬇ – exit from the background measurement mode, annulling the measurement result – save the previous result of background measurement in memory;

- execute the action ⓘ - exit from the background measurement mode, annulling the measurement result– save i the zero value of the background level n memory;

- execute the action ►► – restart the background measurement process.

2.4 Performing the measurements. Settings – «Factory defaults»

2.4.1 Measurement of alpha- and beta- flux density

2.4.1.1 Detecting blocks of the BDZA, BDZB and BDPS types:

- turn on the dosimeter-radiometer;

- place the block with a protective shutter on a surface under control and perform the measurement of the background level by executing the action ►►. When using the detecting blocks of the BDZA-96t and BDZB-96b types, the measurement of background level is not conditioned for;

- after completing the background measurement process, execute the action ►. The console will automatically go to the primary measurement mode;

- remove the shutter from the detecting block, place the block on the surface under control and freeze the desired number of measurements results. Measurement time - in compliance with Table 1.10b.

2.4.1.2 The detecting block BDKS-96s – measurement of beta-flux density:

- remove the shutter from the detecting block;

- switch to the «Secondary measurement» window, executing the actions ⬆ ⬆. With this, the measurement unit «$\mu Sv \cdot h^{-1}$» being indicated on the bottom line of a display will change for «$min^{-1} \cdot cm^{-2}$»;

- place the block on the surface under control and freeze the desired number of measurement results. Measurement time - in compliance with Table 1.10b.

2.4.1.3 Detecting block BDPS-96 – alpha radiation flux measurements:

- turn on the dosimeter-radiometer;
- make sure the icon **α** is displayed on the screen;
- remove the surface cover and install the “Filter Beta” on the active surface of the block;
- press continuously button ► (action ►►) to start background measurement, after 100 seconds press button ► to confirm the result;
- remove the “Filter Beta” ;
- place the block on the surface under control and freeze the desired number of measurements results. Measurement time - in compliance with Table 1.10b.

2.4.1.4 Detecting block BDPS-96 – beta radiation flux measurements:

- turn on the dosimeter-radiometer;
- turn the dosimeter to «Secondary measurement» mode by pressing button ⬆;
- make sure the icon **β** is displayed on the screen;
- install the surface cover on the active surface of the block;
- press continuously button ► (action ►►) to start background measurement, after 30 seconds press button ► to confirm the result;
- remove the surface cover and install the “Filter Beta” on the active surface of the block;
- place the block on the surface under control and freeze the desired number of measurements results. Measurement time - in compliance with Table 1.10b.

2.4.2 Measurement of EDR $\dot{H}^*(10)$ and ED $H^*(10)$

2.4.2.1 The detecting block BDKS-96.

2.4.2.1.1 Measurement of EDR $\dot{H}^*(10)$ of continuous and pulsed X-ray and gamma-radiation in the range of 0.1 μSv /h to 0.5 mSv/h («low» subrange - «μSv»):

- turn on the dosimeter-radiometer by executing the action ⓘ;
- set the DB lock to the «Комп» position and perform the measurement of «inherent» background by executing the action ►►;
- after completing the background measurement process, save the measurements result in the console memory by executing the action ►. The console will automatically switch to the primary measurement mode;
- set the DB lock to the «μSv» position and freeze the desired number of measurement results of EDR.

2.4.2.1.2 Measurement of EDR $\dot{H}^*(10)$ of continuous and pulsed X-ray and gamma-radiation in the range of 0.5 mSv/h to 1.0 Sv/h («high» subrange - «mSv»):

- set the DB lock to the «mSv» position;
- switch the console to the «high» subrange by executing the action ►⬆;
- freeze the desired number of measurement results.

2.4.2.1.3 Measurement of ED H*(10) of continuous and pulsed X-ray and gamma-radiation:

- measurement of ED H*(10) – automatically starts since turning on the dosimeter-radiometer;
- execute the action ⬆ to switch to the dose measurement window. With this, information about the current value of EDR (in units of «$\mu Sv \cdot h^{-1}$») being displayed will change for information about the current accumulated ED (in units of μSv») and exposure time;
- execute (if necessary) the action ⬇ to stop displaying the current measurement result. The measurement process does not stop;
- execute (if necessary) the action ⓘ to restart the measurement process. Information about the current accumulated dose will begin erasing and a new measurement cycle will start;
- execute the action ⬆ to switch to the «Primary measurement» window in order to obtain information about the current EDR value.

2.4.2.2 Detecting block BDKS-96s.

2.4.2.2.1 Measurement of EDR $\dot{H}^*(10)$ of continuous gamma-radiation:

- turn on the dosimeter-radiometer by executing the action ⓘ;
- freeze the desired number of measurement results.

2.4.2.2.2 Measurement of ED H*(10) of continuous gamma-radiation – according to procedures in 2.4.2.1.3.

2.4.2.3 Detecting blocks BDPG-96, BDPG-96m, BDVG-96.

2.4.2.3.1 Measurement of EDR $\dot{H}^*(10)$ of continuous gamma-radiation:

- turn on the dosimeter-radiometer by executing the action ⓘ;
- freeze the desired number of measurement results.

2.4.2.4 Detecting blocks BDKN-96, BDMN-96.

2.4.2.4.1 Measurement of EDR $\dot{H}^*(10)$ of neutron radiation:

- turn on the dosimeter-radiometer by executing the action ⓘ;
- *BDKN-96 only:* press continuously button ► to start background measurement, after 250 seconds press button ► to confirm the result;
- freeze the desired number of measurement results.

Note: measurement unit of "$n/(min \cdot cm^2)$" is allowed for BDKN-96,

2.4.2.4.2 Measurement of EDH*(10) of neutron radiation– according to procedures 2.4.2.1.3.

2.4.3 Measurement of exposure dose rate of gamma-radiation.

2.4.3.1 Detecting block BDKG-96:

- turn on the dosimeter-radiometer by executing the action ⓘ;
- freeze the desired number of measurement results.

2.4.4 Performing operations in the «Detection» mode.

2.4.4.1 Detecting blocks BDPG-96, BDPG-96m, BDVG-96:

- turn on the dosimeter-radiometer by executing the action ⓘ;
- execute the action ⬆, to switch to the «Detection» window;
- execute the action ►. After accumulating the sufficient content of information about the background level in the detecting block location, the console will automatically goes to detection of anomalous point and area sources (contaminated places). Moving the detecting block over the surface under control, analyze the sound frequency change and dynamics of change in vertical sections on a graph being displayed;
- use the pulse count rate value being displayed on the bottom line to relatively assess the radiation level in the point of a surface under control;
- execute the action ⬆, to switch to the «primary measurement» mode with the purpose of measuring the EDR in a zone where the anomalous radiation level was detected.

2.4.5 Adjustment and setting of the dosimeter-radiometer

2.4.5.1 Adjustment and setting of the dosimeter-radiometer are carried out during manufacturing by the manufacturer or maintenance organization during repair of the dosimeter-radiometer.

2.4.5.2 Adjustment and setting procedure of the dosimeter-radiometer is described in this Manual, Section 2.

2.4.6 Possible troubles and methods of their removal

2.4.6.1 Possible troubles and methods of their removal are summarized in Table 2.2.

Table 2.2 – Possible troubles and methods of their removal

Trouble symptom	Possible cause	Method of removal
1 No sound and indication on a display, when turning on the dosimeter-radiometer	Accumulators are discharged	Connect the charging device to the console and charge the accumulators (Replace galvanic cells)
2 The inherent background value exceeds the rated one	Protective film in the detecting block is damaged	Replace the film
3 During operation, the measurement result is displayed as «*****»	Digit capacity of the displayed value exceeds the number of character locations provided for its indication. Perhaps, the sensitivity coefficient value is incorrectly specified	Restore the sensitivity coefficient value stated in the registration certificate of the dosimeter-radiometer
4 Information being displayed does not comply with the expected one	Sequence of actions stated in the Operating manual is violated	Turn off the dosimeter-radiometer. Learn the sequence of actions when servicing the dosimeter-radiometer in appropriate Section of the Operating manual

2.4.6.2 In case of other trouble symptoms or impossibility to remove the trouble using the proposed methods, call the manufacturer.

3 Maintenance

3.1 Maintenance of the dosimeter-radiometer comprises periodic visual inspection of the console and detecting blocks in order to check absence of damages, and serviceability in compliance with Section 2 of this manual. Additional requirements for manning level and workplaces are not made.

4 Transportation

4.1 The dosimeter-radiometer in the manufacturer's packaging may be transported by all means of transport at any distance, under observation of the following conditions:

- by rail freightage - in covered clean wagons;
- by air - in the airproof heated section;
- by water - in hold sections;
- by motor transport – in covered boxcars.

4.2 Ambient temperature during transportation should be in the range of minus 40 to +50 ºC.

4.3 Placement and fastening of boxes with dosimeters-radiometers in transportation facilities should provide steady position throughout the entire journey, protection against lading shifts and impacts.

4.4 When loading and unloading the boxes with dosimeters-radiometers, the inscription requirements stated on a shipping container should be observed.

5 Storage

5.1 The dosimeter-radiometer should be kept under conditions free from mechanical damage, in ventilated, dry and clean storehouses with an ambient temperature of +5 to $+40^0$C and relative humidity of air up to 70% upon absence of dust, acid and alkaline vapors and also of corrosive gases.

Section 2 Advanced features

6 Advanced features and setting-ups

6.1 General

6.1.1 List of basic functions of the dosimeter-radiometer is summarized in 1.1.2 of Section 1 of this manual.

6.1.2 Implementation of basic functions of the dosimeter-radiometer is performed using information windows being indicated on a graphic display. Information content being displayed provides the operator with data on measurement results and also with visual and audio information about the dosimeter-radiometer status and current data of the measurement process.

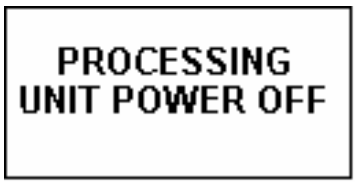
6.1.3 Adjustment of measurement modes and complementary functions realized in the dosimeter-radiometer such as date/time, audio signals, measurement units, measurement algorithms, etc. is performed using the «Settings» menu.

6.1.4 Number of information windows and their information content are determined by pre-settings using the «Settings» menu for each type of the detecting block involved in the delivery set of the dosimeter-radiometer.

6.2 Comments to the «Settings» menu

6.2.1 To work in the «Settings» menu, perform the following:

- turn off the console UIK-05 or UIK-06 by executing the action ⓘⓘ (press and hold the ⓘ button until turning on the audio signal and displaying the transparency)



- connect the desired detecting block to the console UIK-05 or UIK-06;

- turn on the console UIK-05 or UIK-06 in the «Settings» menu by executing the actions ►► ⓘ (press and hold the ► button, then press the ⓘ button). On a display, the «Settings» menu window will be displayed:

6.2.2 List of available menu items and their values should correspond to the type of the detecting block being connected to the console. When changing either setting, note that these changes concern only the detecting block being connected at the moment (except for allowance to display a dynamic scale – see 6.2.4.8). Settings of detecting blocks of other types remain unchanged. The menu content in the «Settings» mode and «Configuration» menu are shown in figures 6.1 and 6.2.

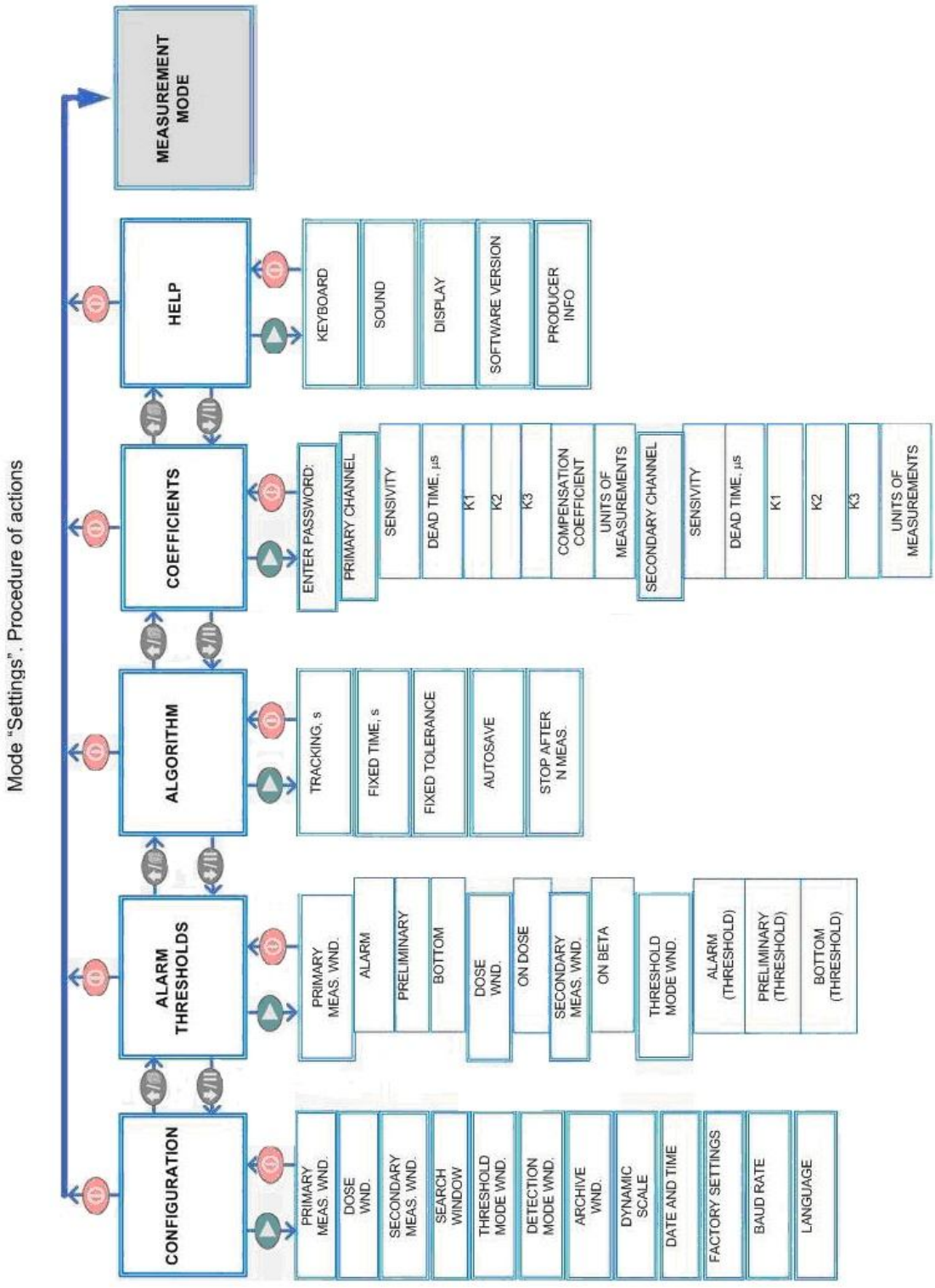

Mode "Settings". Procedure of actions
MEASUREMENT MODE
HELP
KEYBOARD
SOUND
DISPLAY
SOFTWARE VERSION
PRODUCER INFO
COEFFICIENTS
ENTER PASSWORD:
PRIMARY CHANNEL
SENSIVITY
DEAD TIME, µs
K1
K2
K3
COMPENSATION COEFFICIENT
UNITS OF MEASUREMENTS
SECONDARY CHANNEL
SENSIVITY
DEAD TIME, µs
K1
K2
K3
UNITS OF MEASUREMENTS
ALGORITHM
TRACKING, s
FIXED TIME, s
FIXED TOLERANCE
AUTOSAVE
STOP AFTER N MEAS.
ALARM THRESHOLDS
PRIMARY MEAS. WND.
ALARM
PRELIMINARY
BOTTOM
DOSE WND.
ON DOSE
SECONDARY MEAS. WND.
ON BETA
THRESHOLD MODE WND.
ALARM (THRESHOLD)
PRELIMINARY (THRESHOLD)
BOTTOM (THRESHOLD)
CONFIGURATION
PRIMARY MEAS. WND.
DOSE WND.
SECONDARY MEAS. WND.
SEARCH WINDOW
THRESHOLD MODE WND.
DETECTION MODE WND.
ARCHIVE WND.
DYNAMIC SCALE
DATE AND TIME
FACTORY SETTINGS
BAUD RATE
LANGUAGE

Figure 6.1

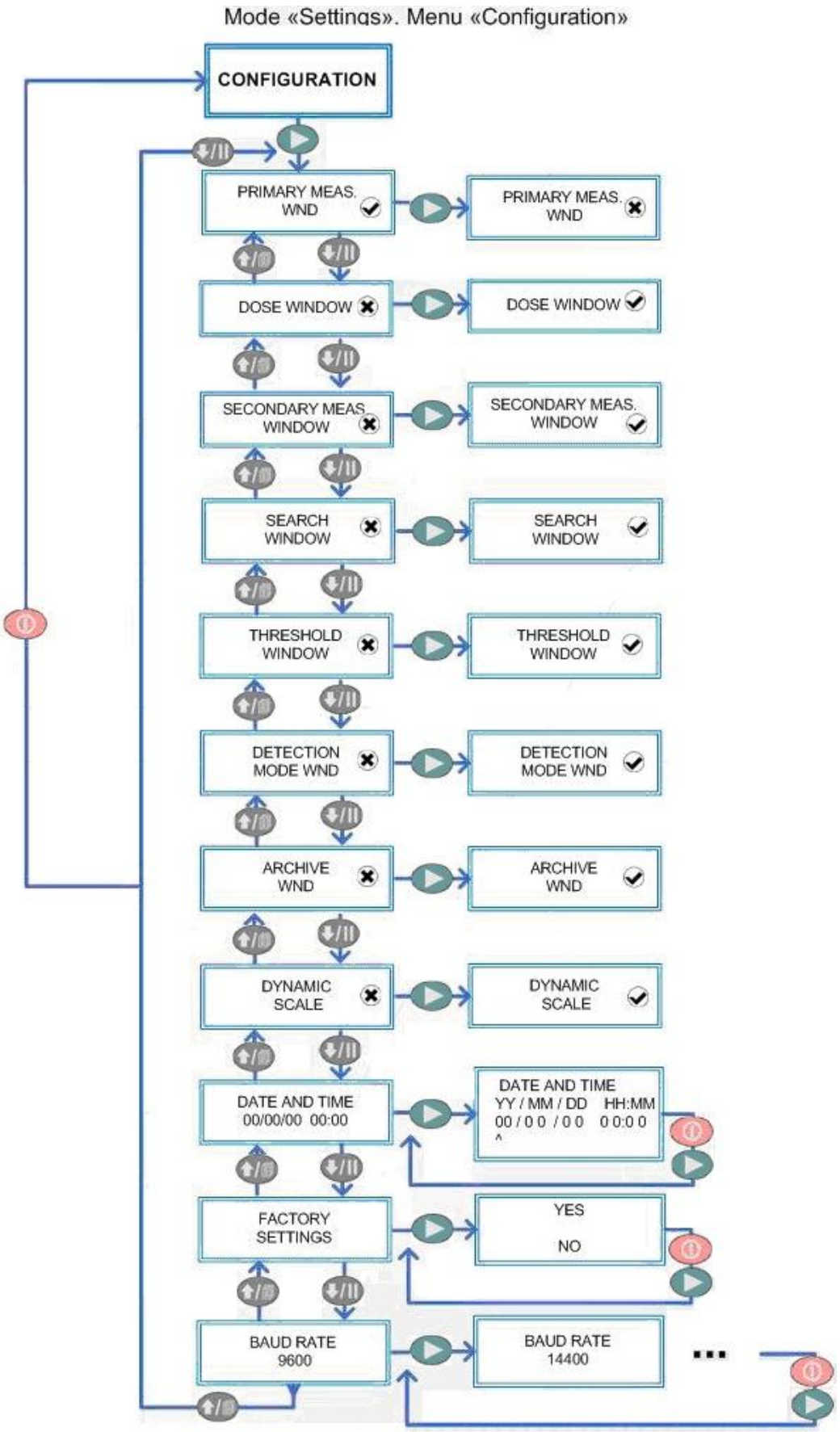

Mode «Settings». Menu «Configuration»
CONFIGURATION
PRIMARY MEAS. WND
PRIMARY MEAS. WND
DOSE WINDOW
DOSE WINDOW
SECONDARY MEAS. WINDOW
SECONDARY MEAS. WINDOW
SEARCH WINDOW
SEARCH WINDOW
THRESHOLD WINDOW
THRESHOLD WINDOW
DETECTION MODE WND
DETECTION MODE WND
ARCHIVE WND
ARCHIVE WND
DYNAMIC SCALE
DYNAMIC SCALE
DATE AND TIME 00/00/00 00:00
DATE AND TIME YY / MM / DD HH:MM 00 / 0 0 / 0 0 0 0:0 0
FACTORY SETTINGS
YES
NO
BAUD RATE 9600
BAUD RATE 14400

Figure 6.2

6.2.3 Switch to the submenu of the menu item to which the cursor points, is performed by executing the action ►. Switch to the next item of a menu (submenu) or return to the previous one - ⬆ or ⬇. Exit from the submenu to the menu item – ⓘ. Exit from the «Settings» menu to the operation mode of the dosimeter-radiometer «primary measurement» - ⓘ.

6.2.4 The «Configuration» item of a menu. Execute the action ►. Items of a submenu – names of operation modes of the dosimeter-radiometer upon which the results are displayed in windows with appropriate names. Operation of the dosimeter-radiometer in either mode may be enabled – the action ► - (✓ icon) or disabled by re-executing the action ► - (✗ icon).

6.2.4.1 The «primary measurement window» item. Authorization for the dosimeter-radiometer to operate with displaying the results in this window provides the measurement of a physical quantity which is accepted for the connected detecting block as the basic one, and reception of measuring information in the measurement units listed in Table 1.10. In case of inhibiting the display of all available windows from the «Configuration» submenu, the display the «Primary measurement» window is automatically authorized - Figure 6.3.

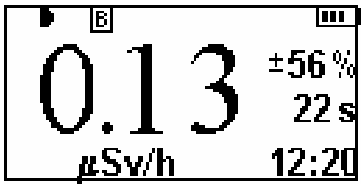


Figure 6.3

6.2.4.2 The «Dose window» item. Available in the list of sub-menu items, when the detecting blocks of the BDKS-96, BDKS-96s, BDMG-96, BDMN-96 type are connected to the console. Authorization for the dosimeter-radiometer to operate with displaying the results in this window provides the measurement of ambient dose equivalent H*(10) of gamma- and neutron radiation. For other detecting blocks, the «Dose window» menu item - (Figure 6.4) is absent.

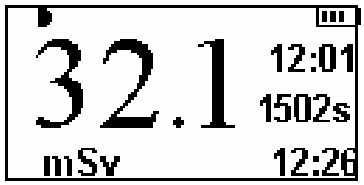
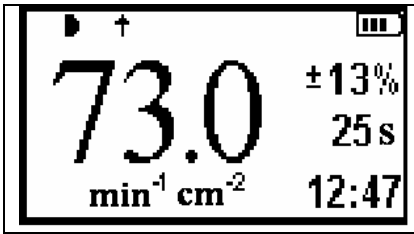


Figure 6.4

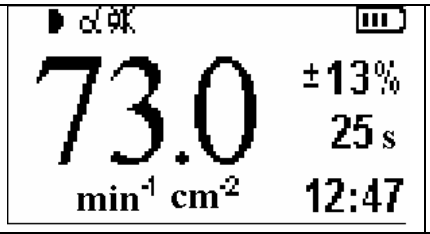
6.2.4.3 Dose measurement mode – independent of other being currently performed modes. The dose measurement mode starts since turning on the console. After turning off the console, the measured value of dose is not saved in memory. The «Dose» window indicator is a characteristic unit of measurement - «Sv» with a weighting factor (micro or milli) in the left bottom corner of the screen. To the right of the measured value, the dosimeter-radiometer turn-on time and dose measurement duration in seconds are displayed.

6.2.4.4 Item «Window “Secondary measurements is included in the menu “Settings” for detecting block BDKS-96s which comprises two channels: primary (gamma) channel and secondary (beta) channel, and the same manner for detecting block BDPS-96 which provides alpha and beta flux measurements. The both measurements for BDKS-96s, gamma and beta, are performed simultaneously, thus the gamma background is automatically subtracted

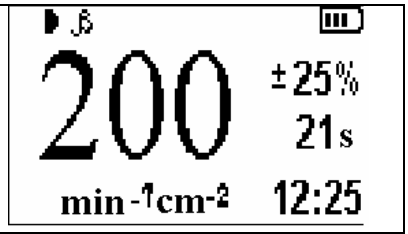
from the beta channel. By pressing button ⬆ it is possible to turn between the both windows: “Primary measurement” and “Secondary measurement”. A display pattern is shown on Fig.6.5.



BDKS-96s (window “Secondary measurement”)



BDPS-96 (window «Primary measurement»)

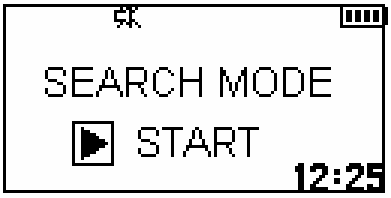


BDPS-96 (window “Secondary measurement”)

Figure 6.5

6.2.4.5 The «Search window» item. Authorization for the dosimeter-radiometer to operate with displaying the results in this window provides search and localization of ionizing radiation sources using the «Search» algorithm. This algorithm provides for automatic measurement of background level and further comparison of the measurement result of radiation level in terms of dose rate (Sv/h) against the background value.

6.2.4.5.1 The current measurement result is displayed as a graph (dynamic scale. Along the X-axis –quotient of the measurement result by the background value) and as digits – on the bottom line in terms of the measured quantity. On the top line (and as a flag on the X-axis) – maximum radiation value detected in the current search cycle - Figure 6.6.



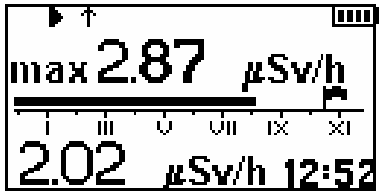


Figure 6.6

6.2.4.5.2 Upon detection of a local zone with radiation level exceeding the background level for greater than twelve times, the dosimeter-radiometer generates an audio alarm. To continue search in a zone with high level of radiation (background), it is reasonable to update the basic value of background level by executing the action ►►.

6.2.4.6 The «Threshold mode window» item. Authorization for the dosimeter-radiometer to operate with displaying the results in this window provides performing the express assess of the contamination level of the object under control and comparison of this against the values of preset threshold settings – alarm, preliminary, bottom (see The «Alarm thresholds» menu item).

6.2.4.6.1 Number of threshold settings used in the «Threshold» mode - any. Setting sequence is important:

- one setting – alarm;
- two settings – alarm and preliminary;
- three settings – alarm, preliminary and bottom.

A mandatory requirement is the following ratio – the alarm setting should be greater than the preliminary one, and the preliminary setting should be greater than the lower one.

6.2.4.6.2 The measurement result is an information message on the console display (Figure 6.5).

«DIRTY» - contamination level value is greater than the alarm threshold setting;

«NORMA» - contamination level value is less than the alarm threshold setting, but greater than the preliminary threshold setting;

«CLEAN» - contamination level value is less than the preliminary threshold setting, but greater than the lower threshold setting;

«CLEAN!» - contamination level value is less than the lower threshold setting.

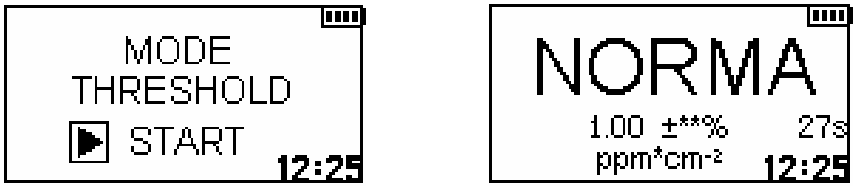


Figure 6.7

6.2.4.6.3 The comparison result may be either absolute – without consideration of the background level value, or relative, with consideration of pre-checked background level in the area of metering. The measurement of the background level may be performed any time after enabling the «Preliminary mode» window by executing the action ►►.

6.2.4.7 The «Detection window» item. Available in the list of sub-menu items when detecting blocks of the BDVG-96, BDPG-96, and BDPG-96 m type are connected to the console. Authorization for the dosimeter-radiometer to operate with displaying the results in this window provides obtaining measurement information about presence or absence of sources (local zones) with high level of radiation on the object or area.

6.2.4.7.1 Information is presented as a graph - Figure 6.8, or audio signal being generated at a time when quantum detection beep occurs. The mentioned audio signal is generated at the moment of detecting the radiation intensity the instantaneous value of which is twice as much as the background value. Increase of input-to-output frequency ratio of audio signals (executing the acting ⬆ ⬆) allows obtaining the audio signals of the «Detection» mode only.

6.2.4.7.2 When surveying the object, the periodical, about once per ten-twenty seconds, repetition of audio signals is considered to be normal. Increase of the audio-signal-repetition frequency indicates the increase in the detected radiation intensity.

6.2.4.7.3 The diagram shows the current information about the relative intensity of particle or quantum detection events. Along the X-axis – real time (three seconds in each division – graduation marks below the data line). Along the Y-axis – pulse count rate (solid line – background level; vertical line segment – instantaneous value of the radiation intensity. The segment length is proportional to the ratio value of the instantaneous value of the radiation intensity to the background level, and a repetition period– inversely proportional to the radiation intensity).

Figure 6.8

6.2.4.8 The «Archive window» item. Authorization for the dosimeter-radiometer to operate in this window provides saving in archive and further viewing the retrospective information about measurement results saved in non-volatile memory, and also obtaining the data of statistical analysis of measurement results in a specified range of record numbers.

6.2.4.8.1 Measurement results may be saved in archive (if «Autosave» is authorized in the «Algorithm» window) automatically or manually, when executing the action ►, only in the case if indication of the «Archive» window is authorized - Figure 6.9. Maximum capacity of archive is 2000 records.

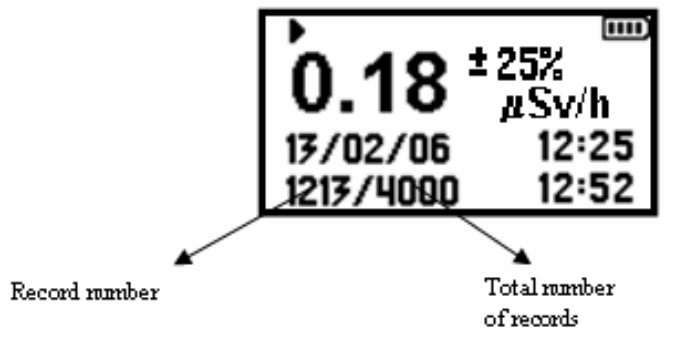


Figure 6.9

6.2.4.8.2 When enabling the «Archive» window, information about the last saved record is displayed. This provides view of the last saved measurement result.

6.2.4.8.3 Information read-out from archive to a PC is available using the «TETRA_Reporter» software. Each record contains the following information:

- name of the dosimeter-radiometer version with which the measurement has been made;
- measurement result;
- measurement unit designation;
- measurement uncertainty value;
- date and time of measurement;
- geographical coordinates of place of measurement (when using the GPS sensor).

6.2.4.8.4 Executing the action provides switch to the «Service» sub-menu in the «Archive» window. Menu items:

- «Begin» - the record number of origin of the interval to be analyzed is indicated;
- «End» - the record number of end of the interval to be analyzed is indicated;
- «Statistics» - results of statistical analysis of measurement results in the specified range (no greater than 500 results) of archive records are displayed:
  - serial numbers of origin and end of the interval of record to be analyzed;
  - minimum and maximum values of measurement results;
  - mean value;
  - mean-square deviation.

If the stated range contains records of measurement results made by detecting blocks of different types, to carry out statistical analysis, only measurement results made with the detecting block with which the first measurement was performed in the analyzed interval are used;

- «Clear archive» - deleting all archive records with confirmation of operation carried out.

6.2.4.9 The «Dynamic scale» item. Provides displaying in windows being authorized for indication of a dynamic scale (6.2.4.1 – 6.2.4.6). The «Dynamic scale» provides presentation of measurement information in analog form in a logarithmic scale – Figure 6.10.

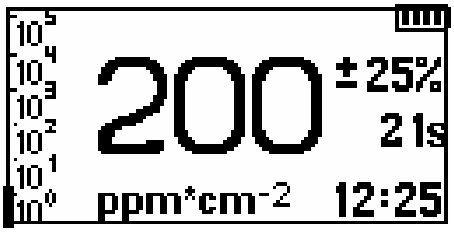


Figure 6.10

6.2.4.9.1 Data processing algorithm, the result of which is displayed using the dynamic scale – «Tracking», regardless of the operator-selected type of an algorithm. This provides on-line visual tracking of dynamics in change of the detected radiation intensity.

6.2.4.9.2 The «Dynamic scale» is a console's function, therefore the enabling (disabling) covers all types of detecting blocks connected to the console.

6.2.4.10 The «Date and time» item. Provides correcting the real date and time in the built-in clocks of the console. After replacing galvanic cells, when turning on the console, the «Date and time» window will be automatically displayed. Entry of data and time values is performed by executing the action ⬆ – increment (from 0 to 9) of the value entry for a unit, ⬇ – decrement (from 0 to 9) of the value entry for a unit, ► – movement of a cursor to the next character location and exit to the measurement mode after entering (correcting) the figure in the right-most character location.

6.2.4.11 The «Factory settings» item. Provides restoring initial, made-during-manufacture settings for the dosimeter-radiometer operation modes simultaneously for all detecting blocks in compliance with Table1.10b.

6.2.4.12 The «Baud rate» item. Provides selection of rate of exchange with external device by executing the action ►. The default rate of exchange is 9600 bauds.

6.2.4.13 The «Language» item. Provides selection of either interface language: Russian or English.

6.2.5 The «Alarm thresholds» menu item. Execute the action ►. The «Primary measurement», «Dose» and «Threshold mode» submenu. Provides setting up non-zero values of appropriate threshold settings in compliance with procedures described in 2.3.1.1.7.

6.2.5.1 The non-zero «Alarm» setting provides continuous comparison of this setting value against the current measurement result obtained using the «Tracking» algorithm. When the current value of the measured quantity exceeds the alarm threshold setting value, while in the measurement mode, in windows stated in 6.2.4.1 – 6.2.4.6, the ⚠ icon is displayed on a data line, and the appropriate audio signal is generated.

6.2.5.2 For two-channel detecting blocks (BDMG-96, BDKS-96), the alarm threshold setting (as well as «Preliminary» and «Bottom») is the same for both channels («low» and «high»). For the detecting block BDKS-96s, the threshold setting is the setting for gamma-channel.

6.2.5.3 Setting of zero value for the «Alarm» threshold setting disables the comparison algorithm, and therefore, automatic control of the threshold level.

6.2.5.4 Setting up the «Preliminary» and (or) «Bottom» setting different from zero provides executing by the console the same actions as selecting the «Alarm» setting. At the same time, when the current value of the measured quantity exceeds the value of those settings, to establish the fact of exceeding the threshold is possible only using a computer, for example, by the «Tetra_Checker» status line.

6.2.5.5 Setting of the «On beta» threshold setting is available upon connection of detecting blocks of the BDKS-96s and BDPS-96 types to the console (window "Secondary measurements"). Used to set the threshold setting for beta flux. Assignment of a non-zero

threshold setting turns on the comparison algorithm. The «On beta» threshold setting value is continuously compared against the current measurement result for beta flux. When the current value of beta flux exceeds the threshold setting value, while in the measurement mode, in windows stated in 6.2.4.1 – 6.2.4.6, the  icon is displayed on a data line, and the appropriate audio signal is generated. The setting of a zero value of the «On beta» threshold setting disables the comparison algorithm, and therefore, automatic control of the threshold level.

6.2.5.6 Setting of the «On dose» threshold setting is available upon connection of detecting blocks of the BDKS-96, BDKS-96s, BDMG-96, BDKN-96, BDMN-96 type to the console only. Used to set the threshold setting for dose. Assignment of a non-zero threshold setting includes the comparison algorithm. The «On dose» threshold setting value is continuously compared against the current measurement result for dose. When the current value of dose exceeds the threshold setting value, while in the measurement mode, in windows stated in 6.2.4.1 – 6.2.4.6, the  icon is displayed on a data line, and the appropriate audio signal is generated. The setting of a zero value of the «On dose» threshold setting disables the comparison algorithm, and therefore, automatic control of the threshold level.

6.2.6 The «Algorithm» menu item ►. Used to select one of continuous measurement algorithms, which will be employed in the course of obtaining measurement information in the «Measurement» mode, and also to correct parameters of those algorithms. Selection of any algorithm is confirmed by displaying the  icon in a cursor-marked line.

6.2.6.1 Selection of the «Tracking, s» algorithm provides performing continuous measurements with auto-starting (see 1.4.2.5) the measurement process in case of stepwise change in the measured radiation level. After the measurements in archive automatically start, if operation with archive is permitted, the immediate record which contains values of the measured quantity and time corresponding to the restart time will be saved. The operator-changed parameter of the algorithm is a period of time, after expiry of which the current measurement result is saved in archive even the measurement was not restarted. In factory settings of the «Tracking» algorithm, the parameter value is set to be 60 s.

6.2.6.2 Selection of the «Fixed time,s» algorithm provides performing continuous measurements and averaging the results using the moving-average method with exposure time equal one second and averaging time corresponding to the algorithm parameter value. Upon expiry of the averaging time, the measurements will stop, the measurement result will be saved in archive (upon selection of the «Autosave» mode - see 6.2.6.5, or executing the action ►), and a new measurement cycle will automatically start.

6.2.6.3 Selection of the «Fixed tolerance» algorithm provides performing continuous measurements and averaging the results using the moving-average method with exposure time equal one second. The averaging time is determined automatically: when reaching the measurement uncertainty value equal to 6%, the measurement process will stop, the measurement result will be saved in archive (upon selection of the «Autosave» - see 6.2.6.5, or executing the action ►), and a new measurement cycle will automatically start. The algorithm parameter – limitation of maximum measurement time. Upon selection of non-zero value of the measurement time, the measurement process will stop if one of the following events occur:

- specified value of the measurement uncertainty is reached;
- maximum measurement time is expired.

Setting up the zero value for the algorithm parameter cancels the limitation for measurement time.

6.2.6.4 Irrespectively of the operator-selected measurement algorithm, processing of the measuring data using the «Tracking» algorithm is carried out continuously in order to provide presentation of results on a dynamic scale and comparison of the measured level against the threshold setting levels in the «Primary measurement» mode: alarm, preliminary, bottom.

6.2.6.5 Selection of the «Autosave» mode provides the enabling (disabling) of auto-saving the measurement results in the console archive. Measurement results obtained using the «Fixed time,s» and «Fixed tolerance» algorithms will be saved after expiry of the measurement time, and for the «Tracking» algorithm – with frequency specified while selecting the algorithm, or while automatically restarting the measurement process.

6.2.6.6 Selection of the «Stop after N meas» mode provides performing the series of N measurements with sequentially writing the measurement results to memory.

6.2.7 The «Coefficients» menu item. ►. Provides entering to the dosimeter-radiometer memory the parameter values used during the analytical processing of measurement results, and determining the metrological feature of the dosimeter-radiometer. As a result of this, capability of correcting the stated parameters is limited and protected with a password.

6.2.7.1 The «Enter password» sub-item. The procedure of entering a password is described in 6.4.5.

6.2.7.2 The «Primary channel» and «Secondary channel» sub-items are available in a menu if the detecting blocks of the BDKS-96, BDKS-96s, BDMG-96 type are connected to the console. List of parameters for both channels is the same, parameter values are determined during calibration and stated in the registration certificate of the dosimeter-radiometer.

6.2.7.3 The «Coefficient K1», «Coefficient K2», « Coefficient K3» sub-items are available only in menus of some detecting blocks. If necessary, the values of those coefficients different from zero are determined and entered during calibration of the DKS-96, to provide measurement in the extended measuring range.

6.2.7.4 The «Compensation coefficient» sub-item is available only in the detecting block BDKS-96s menu. The compensation factor is used to correlate the value of the detecting block response to beta - and gamma-radiation. If necessary, the values of the coefficient different from a unit are determined and entered during calibration of the DKS-96.

6.2.7.5 The «Units of measurement» sub-item. Provides performing measurements of different physical quantities with a detecting block of one type (basic and supplementary units of measurement). Switch from one measurement units to another provides an automatic change in coefficient values. When selecting the measurement unit «s^{-1}», the dosimeter-radiometer measures the mean pulse count rate.

6.2.8 The «Help» menu item. Provides obtaining visual information about actions («Keyboard» sub-item), which the operator should execute to enable the either operation mode of the console, select the algorithm, enter the setting values, and etc. upon display of different windows, and also to get an audio-help («Sound» sub-item) about sounding of audio-signals in different situations, being accompanied by generation of audio-signals. The «Display» sub-item contains information about icon values displayed on the data line in the «Measurement» mode.

6.3 Sequence of actions when operating in the measurement mode

6.3.1 Entry to the measurement mode is performed by executing the action ⓘ.

6.3.2 Call of the contextual help menu - ☼⬆ is available from any information window. The help menu describes all possible operator's actions when working in the current window.

6.3.3 General information about operation with a keyboard:

☼ – turning on the display illumination for a certain time (about 3 seconds)/turning off;

☼☼ - turning on the display illumination (permanently);

🔊 - turning on /off audio-signals. When turning off the sound accompaniment on data line, the 🔇 is displayed;

🔊⬆- turning on the frequency divider in «two» of audio signal accompanying the detection process being performed with the particle or quantum detecting block. To the state when one beep corresponds to each detected particle, the «↑» icon corresponds. To the state when one beep corresponds to maximum number of particles or quanta detected per second (65535), the «↓» icon corresponds. To all intermediate states, the «↕» icon corresponds;

🔊⬇ - turning on the frequency divider by «half» frequency of audio signals accompanying the detection process being performed with the particle or quantum detecting block.

6.3.4 Actions in the measurement mode. Information windows (the «Primary measurement» window, «Dose» window, etc.). Actions to be executed:

► – record the measurement result, if the operation in the «Archive» window is authorized (see 6.2.4.8), and start a new measurement. On the line with the measurement result, on the right, the record number in archive is displayed. If operation in the «Archive» is disabled - start a new measurement (the «Measurement restarted» message is displayed);

⬇ - suspend/resume the measurement process - pause;

►► – start the measurement of the background level, if on the data line, the 🅱 icon is displayed. The measurement process is accompanied by displaying the blinking 🅱 icon. Upon completion of the measurement of the background level, the console will automatically goes to the measurement mode. The 🅱 icon is not displayed;

⬇⬇ – select another measurement algorithm or correct the parameters of the earlier selected algorithm. Return to the measurement mode - ⓘ;

🔊🔊 - correct the threshold setting values. Return to the measurement mode - ⓘ;

►⬆ – activate the «high» range of measurement (for detecting blocks BDMG-96 and BDKS-96);

►⬇ - activate the «low» range of measurement (for detecting blocks BDMG-96 and BDKS-96);

►⬇⬇ – activate the mode of automatic switch of measuring ranges of the detecting block BDMG-96. The mode is automatically on, when turning on the console;

⬆ - activate the operation mode and display of the next window, the indication of which is permitted.

6.3.5 Actions in the «Measurement background» window:

- ► – record measured background value, and exit to the measurement mode;
- ►► – restart the background measurement process;
- ⓘ – exit from the measurement mode with saving in memory the background value equal to zero;

⬆ or ⬇ - exit from the background measurement mode with saving in memory the previous measurement result for the background level.

6.3.6 Adjustment of the measurement algorithm

6.3.6.1 The «Measurement» window provides executing the action ⬇⬇ – selection of the measurement algorithm and correction of its parameters.

6.3.6.2 Description of algorithms and operating sequence are described in 1.4.2.

6.3.7 Setting up the threshold setting values

6.3.7.1 The «Measurement» window provides executing the action – correction of threshold setting values of the «Primary measurement» mode.

6.3.7.2 Set-up procedure for threshold setting values is described in 2.3.1.1.7. Setting up the zero value of the threshold setting disables the automatic control mode for the appropriate threshold level.

6.3.8 Actions in the «Dose» window:

⬇ – enable the pause / continuation in display of current data on the measurement of dose. Pause does not terminate the dose measurement process, but stops data updating on a screen. Executing the action ⬇ again provides updating data for accumulation of dose with taking into account the pause time;

– correct the dose setting;

ⓘ – restart the measurement of dose;

⬆ - go to the next permitted mode of measurement (next window).

6.3.9 Actions in the «Secondary measurement» window:

► – record the measurement result (6.2.4.4). To the right from the values of the measured quantity, the record number in archive is displayed. Start a new measurement;

ⓘ – start a new measurement without saving the current measurement result in archive (the «Measurement restarted» message is displayed);

⬇ - pause (stop/restart displaying the current data on the measurement process);

- correct the threshold setting for the supplementary value (beta setting);

⬆ - go to the next permitted mode of measurement (next window).

6.3.10 Actions in the «Search» window. Directly in the search mode, the operator, moving the detecting block in different directions, visually (by readings of the console display) and orally, determines the orientation of maximum radiation intensity. Moving towards the maximum radiation intensity, the operator step-by-step makes a search of the object with increased radioactivity. When the intensity of radiation detected becomes relatively high (a dynamic scale overfilled, audio signals are merging into the uniform audio signal flow), the operator may repeat the measurement of background under new conditions by executing the action - ►.

6.3.11 Actions in the «Threshold mode» window:

►► – start the background measurement mode;

► - start a new measurement cycle;

– correct the threshold setting values of the «Threshold» mode (only during the pause between measurements);

⬆ - go to the next permitted mode of measurement (next window);

ⓘ - start a new measurement cycle.

6.3.12 Actions in the «Detection» window:

► – start a new measurement cycle;

⬆ – go to the next permitted mode of measurement (next window);

ⓘ - start a new measurement cycle.

6.3.13 Actions in the «Archive» window. In the «Archive» window, the following actions are available:

► - switching to the next record;

►► – dynamic paging forward;

☼ ► - forward for 100 records;

⬇ – to the previous record;

⬇⬇ - dynamic paging backward;

☼ ⬇ - backward for 100 records;

🕪 🕪 – switching to the «Service» menu;

⬆ - switching to the next permitted mode of measurement (next window).

6.3.13.1 The «Service» menu. In the «Service» menu, one may exit from the «Archive» window by executing the action 🕪 🕪. When operating with a menu, following actions are available:

⬇ - switching to the next menu item;

► – selecting the item (sub-item) of the menu, character location;

⬆ – incrementing the figures in the character location to be corrected for a unit;

⬇ – decrementing the figures in the character location to be corrected for a unit;

ⓘ - switching to the «Archive» window.

6.4 Adjustment and calibration of the dosimeter-radiometer

6.4.1 Adjustment and calibration of the dosimeter-radiometer are performed by the manufacturer during industrial process and by the maintenance organization during repair and according to the results of a routine verification of the dosimeter-radiometer. During the calibration of the dosimeter-radiometer, the following operations using ionizing radiation sources are performed:

- adjustment of the detecting block response. Performed by rotating the adjustable resistor axis located in the end portion of the detecting block and locked by the lock screw. When the detecting block has two subranges, calibration over each subrange is performed separately. On the detecting blocks with a scintillation detector, voltage on the photomultiplier is set in the middle of a counting response. If it is not able to adjust the response, and after adjusting voltage on the photomultiplier, selection of the sensitivity coefficient value K (see 1.4.1.5, formula (1.1)) of the measuring console is made;

- selection of the «dead» time Θ of the detection channel of the detecting block in order to provide linearization of a counting response of the dosimeter-radiometer.

6.4.2 Typical values of a sensitivity coefficient and «dead» time for all types of detecting blocks are summarized in Table 1.10.

6.4.3 Increase in the sensitivity coefficient during adjustment results in increase of the reading value and vice versa. This adjustment is effective over the total measurement range. This adjustment is recommended to use if the adjustment of the dosimeter-radiometer is required to be performed in the lower portion of the measurement range.

6.4.4 Increase in the «dead» time during adjustment also results in increase of the reading values, although at relatively high values of N, i.e. at the end of the measurement range.

6.4.5 Correction of the sensitivity coefficient and «dead» time should be carried out as follows:

- activate the «Settings» mode by executing the action ►ⓘ;

- go to the «Coefficients» item of a menu by executing the action ⬆ or ⬇ (set the cursor to the «Coefficients» line);

- execute the action ► and enter the password (29518) to have access to the

correction mode. Cursor update – by executing the action ►, increment in a figure corrected for a unit – ⬆, decrement in a figure corrected for a unit - ⬇. To exit from the password entry mode – execute the action ► after correcting the figure in the right-most character location;

- executing the action ⬇, set a cursor against the menu item to be corrected;
- execute the action ► and enter the desired parameter value. Procedure of setting up the values of the corrected parameter is described in 2.3.1.1.7;
- execute the action ⓘ. After correcting the values, execute the action ⓘ again, to exit to the «Measurement» mode.

6.4.6 Calibration of the dosimeter-radiometer is performed in the measurement-ranges and using the ionizing radiation sources with radionuclides listed in the document TE1.415313.003-03 MP from the set of the maintenance documentation for the dosimeter-radiometer.

6.4.7 The sensitivity coefficient and «dead» time values for the dosimeter-radiometer with each detecting block from the delivery set, determined during the calibration, are stated in the registration certificate TE1.415313.003PS.

6.5 Sequence of actions when connecting the dosimeter-radiometer to a PC

6.5.1 Connect the console UIK-05 (or UIK-06) and detecting block to a PC (USB connector) using the cable AJAH.685621.004 from the delivery set (optional).

6.5.2 Install, if necessary, the USB driver (available on a CD from the delivery set of the dosimeter, or website). After installing the driver, the system will inform the COM-port number, via which the communication between the console UIK-05 or UIK-06 and PC can be performed.

Number of the console-related COM-port is available in Section Control panel/System/Equipment/Device Manager/Ports (COM and LPT)/ Serial port (COM XX). Here XX is a number of the port concerning the console connected to the USB.

6.5.3 Install the «TETRA_Checker» software on a PC from a CD. Launch the program. Turn on the dosimeter-radiometer by executing the action ⓘ.

6.5.4 Click the «Parameters» button on the top data line of the programming window, and in the opened window «Parameters» (Figure 6.11) for the operation mode «By broadcast address», select the serial port, the number of which is determined (see 6.5.2). Click «OK».

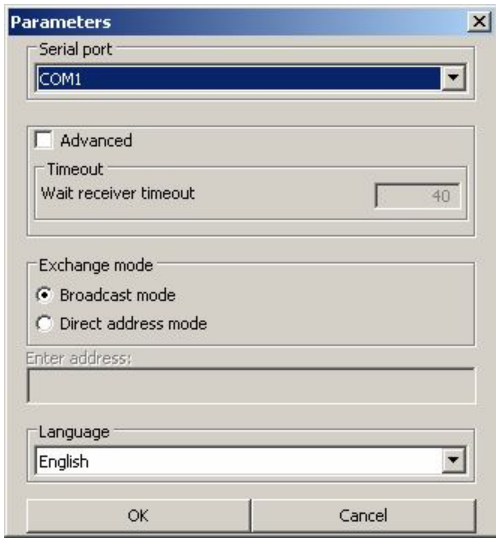


Figure 6.11

6.5.5 Information being indicated on the PC display duplicates the information on the console UIK-05 (or UIK-06) display. Moreover, the «Dynamic parameters» window contains information about the preset-in-console modes and their parameters.

6.5.6 Use of the «TETRA _Checker» software provides correction of parameters and operation modes of the dosimeter-radiometer. To correct, it is necessary to perform the following actions (see Figure 6.12):

- click twice on the «New value» column of the «Dynamic parameters» window on the line with parameters to be corrected;
- enter a new «Current value» of the parameter;
- click on the line with a non-corrected parameter, and then the «Record the parameter F2» button.

6.5.7 On the «Device status» window, information describing the dosimeter-radiometer state and comparison results for the values of measured quantities and threshold settings are displayed.

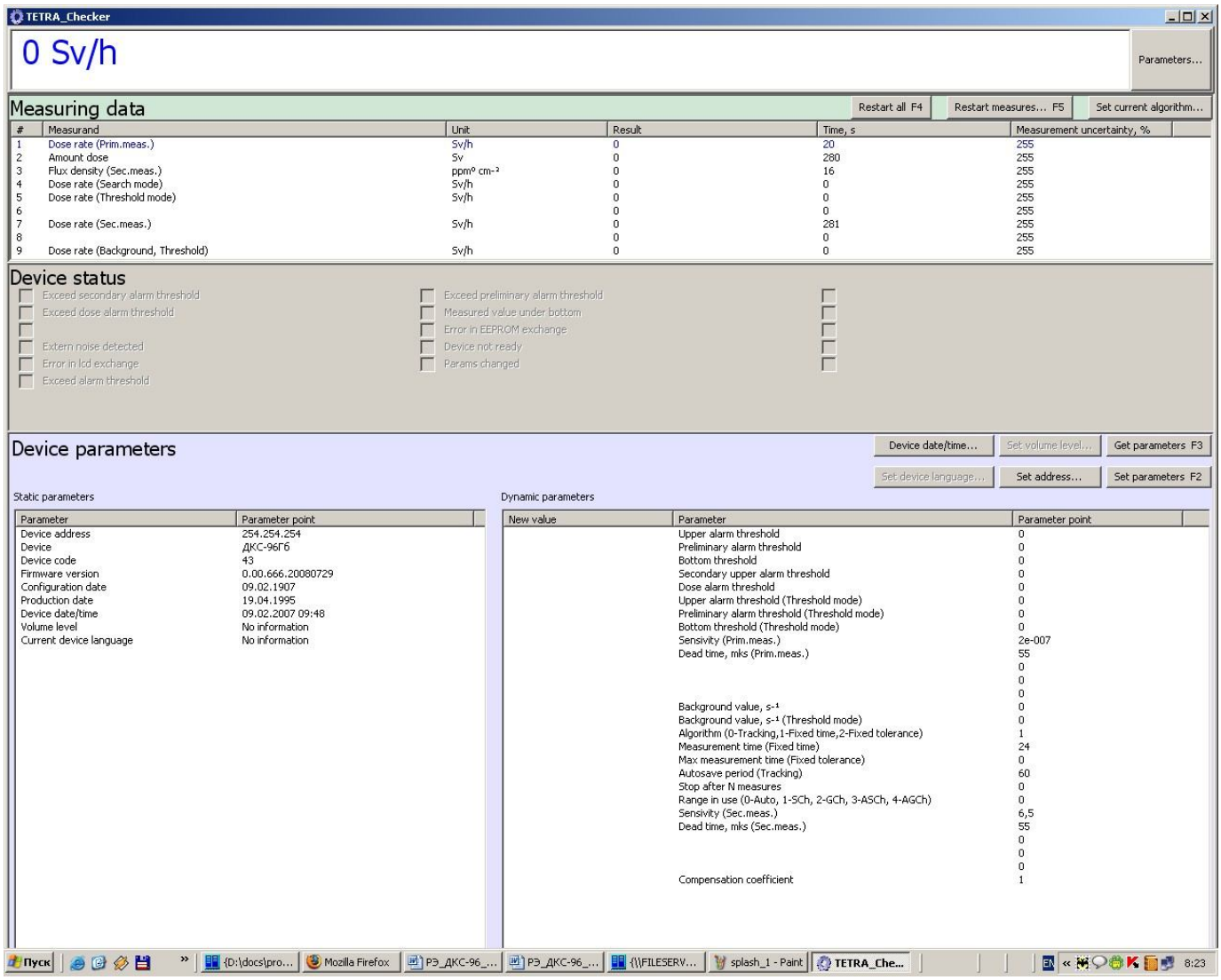


Figure 6.12

6.5.8 Install the «TETRA_ Reporter» software on a PC from a CD. Launch the program (see Figure 6.13). Indicate on the «Serial port» line the serial port number (6.5.2).

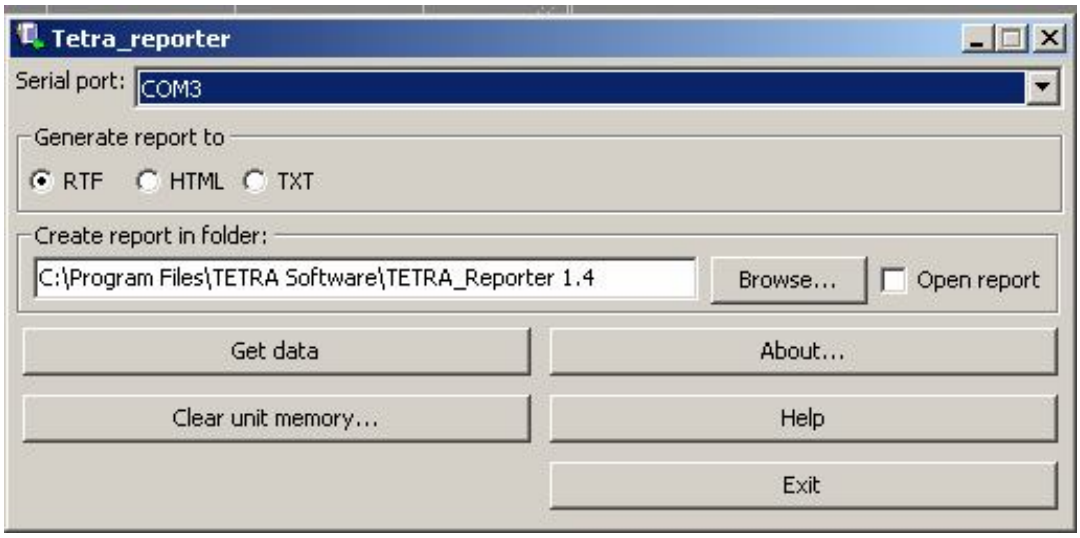


Figure 6.13

6.5.9 Select the report format - HTML, clicking on the appropriate window.

6.5.10 Select the directory address in which the report about measurement results generated on the basis of the archive database being saved in the console UIK-05 or UIK-06 will be saved, clicking the «Scroll» button.

6.5.11 Click on the «Open report» window, if necessary to view the report at once after its generation. Click the «Read out data» button. The report form is shown in Figure 6.14.

Report of 23.05.2008 15:48:47 - TETRA_Reporter

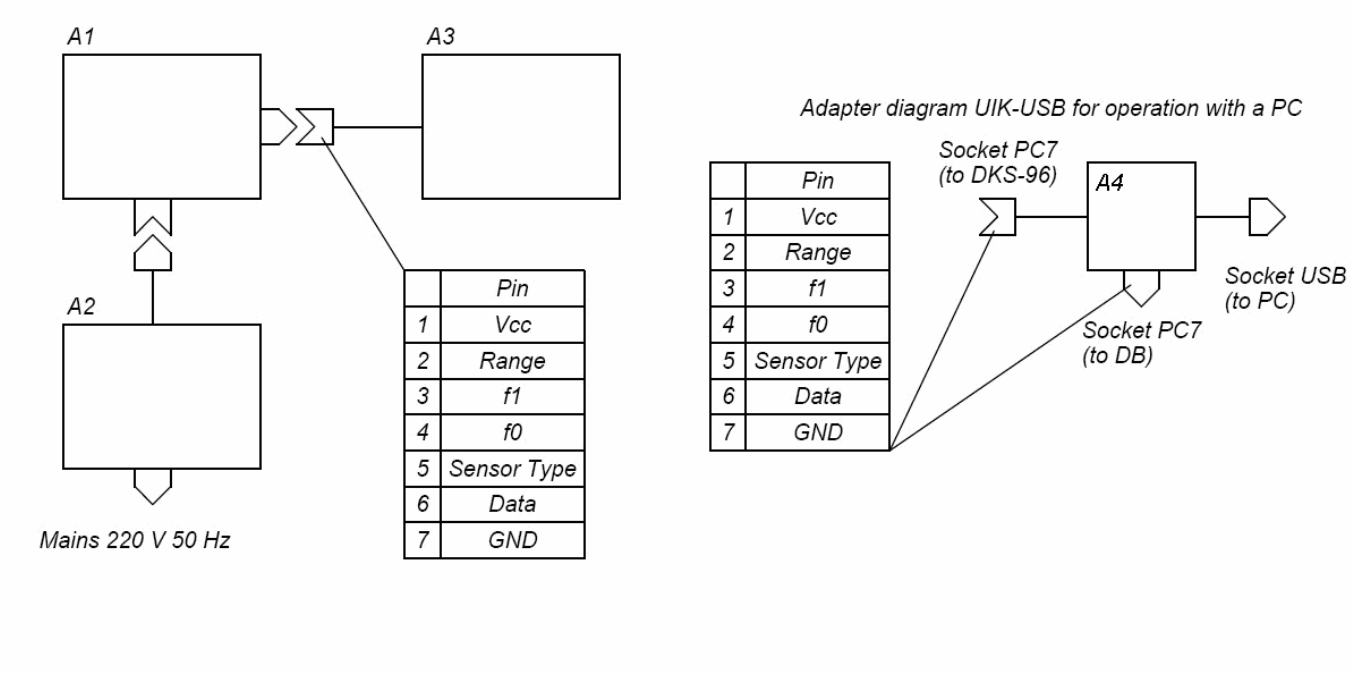
No.	Block type	Value	Meas. unit	Error, %	Date	Latitude	Longitude
0001	DKS-96A	0.00e-00	min^{-1} cm^{-2}	99	07/02/08 17:26	48°20.474N	33°30.515E
0002	DKS-96m	1.76e-07	Sv/h	02	07/02/08 17:36	48°20.473N	33°30.515E
0003	DKS -96m	1.77e-07	Sv/h	02	07/02/08 17:36	48°20.473N	33°30.515E

Figure 6.14

6.5.12 The console software supports the DiBUS protocol (www.doza.ru), that allows using the dosimeter-radiometer DKS-96-05 (DKS-96-06) in the set of information-measuring systems of radiation monitoring (for example, PTK «Atlant») as a control point. The network address of control point is specified using the «TETRA _Checker» program (see 6.5.6) in Section «Static parameters» of the «Device parameters» window.

Appendix A
(reference)

CONNECTION LAYOUT



Pos.designation	Name	Q-ty	Note
	DKS-96-05 TE.415313.0003-03		
A1	Measuring console UIK-05 AJAH.418287.006 or Measuring console UIK-06 AJAH.418287.018	1	
A2	Charging device ZU-02S TE.2520.002	1	
A3	Detecting block	1	Set of detecting blocks is determined while ordering
A4	Cable-adaptor AJAH.685621.030	1	

Appendix B
(reference)

TYPICAL ENERGY DEPENDANCE OF THE DETECTING BLOCKS RESPONSE