

DATA RECORDER

УД-М

Users Manual

13.043.008 РЭ

13.043.008 P3

CONTENTS

Preface	5
1. Description and operation.....	6
1.1 Designation	6
1.2 Basic performances	6
1.3 УД-M parts and units.....	7
1.4 Design and operation	8
1.5 Accessories	16
1.6 Marking and sealing.....	17
1.7 Packing.....	17
2. УД-M usage.....	18
2.1 Operation restrictions.....	18
2.2 Preparation to operation.....	19
2.3 УД-M operation	25
3. Maintenance.....	27
3.1 General information	27
3.2 Daily maintenance.....	27
3.3 Monthly maintenance.....	28
3.4 Annual maintenance.....	28
4. Storage	30
5. Transportation.....	31
5.1 Transportation of УД-M packed in standard factory case	31
5.2 Transportation of УД-M packed in parcel packing box (index «Д».).....	31
6. Utilization	32
Figure 1- УД-M. General view	33
Figure 2 -УД-M. General view with lid open.....	35
Figure 3 -УД-M. Parametric DIP-switch view	37
Figure 4 -УД-M. Rear view	39
Figure 5 -УД-M. Printing unit kinematic scheme	41
Figure 6 - Paper roll mounting.....	43
Figure 7 - Paper loading and guiding.....	45
Figure 8 -УД-M312Э mounting using housing case bottom.....	47
Figure 9 -УД-M512Э mounting using housing case bottom and a slide-frame	49
Figure 10 - Mounting УД-M312ЭД on shock absorbers	51
Figure 11 - Mounting УД-M512ЭД with a slide-frame on shock absorbers	53
Figure 12 - Mounting paper reel into УД-M	55
Figure 13 - Ribbon cartridge mounting	57
Amendment A. Code tables	59
Table A.1 PC866 code table (Russian).....	59
Table A.2 KOI-7 code table.....	60

13.043.008 P3

Amendment B. YД-M instruction set	61
B.1 Printing control.....	61
B.2 Line spacing.....	62
B.3 Printing density and types.....	63
B.4 Graphic modes.....	67
Amendment C. CENTRONICS interface signals and time diagrams.....	69
Amendment D. Connecting and power supply cables circuit diagrams.....	73
Figure D.1 Cable № 1 - to connect YД-M to LPT port	73
Figure D.2 Cable № 2 - to connect YД-M to COM port (protocol XON/XOFF)	75
Figure D.3 Cable № 3 - to connect YД-M to COM port (protocol RTS “READINESS”).....	77
Figure D.4 Cable № 4 - to connect YД-M to COM port (XON/XOFF protocol) with optron decoupling at YД-M side.....	79
Figure D.5 Cable № 5 to connect YД-M to COM port (protocol RTS “READINESS”) with optron decoupling at YД-M side.....	81
Figure D.6 YД-M AC power supply cable “~220 V”	83
Figure D.7 YД-M DC power supply cable “-24/27”	83
Amendment E. Printed text samples	85
Amendment F. YД-M optron decoupling circuit diagram.....	87

Users Manual (UM) is designed for training operating staff working with data recorder УД-М, describes its design, operation, service and maintenance.

UM covers versions УД-М312Э and УД-М512Э.

Distinctive feature of УД-М512Э, compared with УД-М312Э, is a facility for swift removal of the УД-М from users complex without any need of any tools.

Only those who have studied the given UM and have decent experience in PC or other data source may be admitted to operate the УД-М.

Any information relevant to both УД-М versions is presented in a given UM without any reference to the particular version, once the distinctions happen they are referred to the particular УД-М version.

In case УД-М is shipped in a parcel type wooden box, its designation is added with letter «Д», which letter is also marked on the parcel wooden box after УД-М version designation.

During transportation of the device marked «Д» all limitations, mentioned in section 5 of the given UM should be observed.

13.043.008 PЭ

1 DESCRIPTION AND OPERATION

1.1 DESIGNATION

1.1.1 Data recorder YД-M is intended for printing onto paper media (A4 sheets or rolled paper) alphanumeric, pseudo-graphic and graphic data, received from PC or other sources connected to it through CENTRONICS or RS232C interfaces and ensure operation in severe mechano-climatic environment.

1.1.2 YД-M can operate in the following conditions:

1.1.2.1 Climatic:

- temperature range – from -10°C to $+55^{\circ}\text{C}$
- ultimate temperature range – from -60°C to $+70^{\circ}\text{C}$
- humidity – up to 100% at temperature $+50^{\circ}\text{C}$
- atmospheric pressure – from 450 to 1140 mm Hg

1.1.2.2 Mechanical:

- sinusoidal vibration 1 to 500 Hz at max. acceleration 5 g
- multiple impact loads with max. acceleration 15 g and pulse duration from 10 to 15 ms
- separate impact loads with peak acceleration 70 g and pulse duration 0.5-2.0 ms
- durable inclinations $\pm 15^{\circ}$, short time inclinations (up to 5 min) $\pm 30^{\circ}$ and periodical (7-16 sec) rocking $\pm 45^{\circ}$

1.2 BASIC PERFORMANCES

1.2.1 YД-M prints alphanumeric, pseudo-graphic and graphic data.

Printing method – dot matrix printing head

Printing head – 9 needles

Data take-in buffer – 8 KB

Output rate in DRAFT PRINTING mode – not less than 120 cps.

YД-M ensures:

- print abortion in case of printing head (PH) overheating
- print re-start after PH cooling (without loss of data)
- PH overheating protection indication

Output rate may become 2.4 times lower because of print interruptions caused by PH overheating provided YД-M is operating at maximal temperature of 55°C .

Line length – 8"

Number of characters – up to 160

Graphic mode – 60, 80, 120, 240 dpi

Interfaces:

- CENTRONICS;
- RS232C.

Paper used:

- rolled paper, width 210 mm (without edge holes) length 50 m, inner dia – 18 mm
- A4 size sheets, office paper size 210 x 297 mm.

1.2.2 Noise level – less than 55 dB.

1.2.3 Power supply:

- AC 220 V +10%, –15%, 50/400 Hz;
- DC 21-34 V.

1.2.4 Power consumption:

- from DC line – less than 28 W in operating mode and less than 6 W in “STAND-BY” mode;
- from AC line – less than 55 VA in operating mode and less than 15VA in “STAND-BY” mode.

1.2.5 Weight and overall dimensions of various УД-M versions are given below in table 1.

Table 1

Device name	Overall dimensions, mm			Weight, kg	Remarks
	Width	Depth	Height		
УД-M in a standard packing case	455	440	235	22	1
				24	2
УД-M in a parcel type box (with letter «Д»)	450	435	155	16	1
				18	2
Unpacked УД-M with open lid, mounted on a standard packing case bottom	440	410 (505)	450	-	1, 3
	440	410 (505)	460	-	2, 3
Unpacked УД-M with open lid, mounted on shock absorbers	355	370 (470)	435	-	1, 3
	355	380 (480)	445	-	2, 3
Unpacked УД-M with closed lid (reference)	355	345	117 (215)	12,5	1, 3
	355	345	115 (210)	14,5	2, 3
Remarks 1 – УД-M312Э version overall dimensions and weight 2 – УД-M512Э version overall dimensions and weight 3 – figures in brackets – height and depth with paper guide mounted					

1.2.6 УД-M start up (readiness) time – less than 30 sec.

1.3 УД-M PARTS AND UNITS

1.3.1 УД-M projection is given on Figure 1.

1.3.2 УД-M with open lid is given on Figure 2.

According to Figure 2 УД-M consists of:

- printing unit 2;
- ribbon cartridge 1 (EPSON FX/MX80 cartridge may be used);
- power supply unit УД-ИБЭП 4;
- PCB УД-ОС2 5;
- unit УД-УПГ 8;
- bobbin of paper roll 3 – paper tape 210 x 18 mm, length 50 m;
- control panel УД-ПУ 7;

13.043.008 P3

- housing 6.

1.3.3 YД-M is shipped either:

- in factory metal packing case “standard package”;
- in wooden packing box (“parcel type box” – with letter «Д»)

The case/box contains:

- data recorder
- set of documentation (UM, passport)
- basic components and set of spare parts, given in Table 2

1.3.4 The complete set of each device is listed in the included PACKING LIST.

1.4 DESIGN AND OPERATION

1.4.1 Description of YД-M design and operation

1.4.1.1 Interaction between YД-M and data source

1.4.1.1.1 YД-M has two buffers for taking-in and printing-out received data

- data take-in buffer, which capacity (8 KB or 80 B) is selected in p. 1.4.1.8.1.
- line print-out buffer, capacity 160 bytes

In the beginning the symbol and instruction codes are loaded into the line buffer, passing by data take-in buffer. Once the line buffer is full its data is printed out, and new data keeps filling the take-in buffer, and then flows from take-in buffer into line buffer after it is emptied.

When CENTRONICS interface is used, YД-M uses ASCII code and basic code table PC866 (Russian).

When RC232C interface is used, apart from basic table one may use additional code tables KOI-7-set “0” and mixed set “0/1”, the choice of which is given in p. 1.4.1.3.4.

Code tables are given in Amendment A.

To control all YД-M functions you need more instructions that are listed in the PC866 table code, therefore to extend instruction set you should use control sequences, consisting of a few codes. Each of these sequences begins from code 1BH (hexadecimal notation).

YД-M instruction set is given in Amendment B.

1.4.1.2 Parallel interface CENTRONICS

1.4.1.2.1 Interface signal levels:

High level input voltage – from +2.4 V up to +5.2 V, low level – from minus 0.2 up to +0.8 V.
Low level input current – not more than 1.2 mA.

High level output voltage – not less than +2.4 V at output outcoming current 0.5 mA. Low level output voltage – less than 0.5 V at output incoming current 8 mA.

1.4.1.2.2 The description and time diagrams of interface signals are given in Amendment C.

Signal combination in data line represents code of a symbol or instruction. The number of signal combinations is unlimited.

Data source may transmit data only after the signal “ACKN” (“ACKNOWLEDGEMENT”) has been received or when signal “BUSY” goes low level.

Data is regarded true after signal “STROBE” goes low. Signal “BUSY” is set high after signal “STROBE” goes low or when YД-M is switched to the “OFF LINE” mode.

Table 2

УД-M parts	In factory packing case (standard package)		In packing box (parcel type box)	
	Number of parts for various versions			
	УД-M312Э	УД-M512Э	УД-M312ЭД	УД-M512ЭД
Data recorder	1 УД-M312Э	1 УД-M512Э	1 УД-M312Э	1 УД-M512Э
Ribbon cartridge (EPSON FX/MX80 is acceptable)	1*	1*	1*	1*
Paper roll – tape 210 x 18 mm, length 50 m	1*	1*	1*	1*
Cable “~220 V”	1	1	1	1
Cable “-24/27 V”	1	1	1	1
Connecting cable	**	**	**	**
Paper guide packed	1	1	1	1
Fuse 1.0 A 250 B 2.0 A 250 B	2 2	2 2	2 2	2 2
Set of mounting parts	1	1	1	1
Female 2PMT30KПЭ32Г1В1В	1***	1***	1***	1***
Spare ribbon cartridge (EPSON FX/MX80 is acceptable)	1	1	-	-
Spare paper roll – tape 210 x 18 mm, length 50 m	1	1	-	-
Slide-frame	-	-	-	1
Shock absorber	-	-	4	4
* - already installed in data recorder ** - delivery should be specified in the contract *** - not delivered, provided connecting cable is included in shipment				

1.4.1.3 Serial interface RS232C

1.4.1.3.1 Interface signal levels:

- state “OFF” corresponds to the voltage level from minus 3 to minus 15 V.
- state “ON” corresponds to the voltage level from +3 to +15 V.

Interface receivers input resistance – from 3 to 7 kΩ.

Interface transmitters output current is limited to 20 mA.

Interface RS232C level signals are permissible to the CENTRONICS interface INPUT PRIME re-set line.

Input current in INPUT PRIME line at input level signal +15 V is less than 2.6 mA, at input level signal minus 15 V – less than 5 mA.

1.4.1.3.2 УД-М supports two exchange protocols with data source:

a) protocol XON/XOFF

УД-М receives data through the line RxD.

13.043.008 P3

If take-in buffer is full YД-M sends instruction XOFF (code 13H) through TxD line to suspend data transmission from data source, and to resume transmission – instruction XON (code 11H). If on receipt of the instruction XOFF data source keeps data transmission, this instruction will be repeated after every received byte.

When YД-M is switched to the OFF LINE mode the instruction XOFF is sent through the line TxD, and when it is switched to the ON LINE mode – instruction XON.

After YД-M being fed with paper is switched ON the instruction XON is transmitted, if paper is missing – instruction XOFF.

b) protocol RTS (READINESS)

The data source is permitted to transmit data only after RTS line is switched to ON.

YД-M receives data through the line RxD.

If the take-in buffer is full, YД-M switches the RTS line OFF to suspend data transmission, and to resume transmission RTS line is switched ON.

When YД-M is switched to OFF LINE mode, RTS line becomes OFF, and when YД-M is switched to ON LINE mode – RTS becomes ON.

After YД-M fed with paper is switched ON, RTS line becomes ON, if paper is missing – OFF.

The selection of the exchange protocol is carried out by connecting the YД-M to data source with relevant cables, their circuit diagrams are given in Amendment D.

The number of stop-bits for the receiver (line RxD) is at least one, for the transmitter (line TxD) – at least two.

1.4.1.3.3 For the RS232C interface the data take-in buffer is divided in two: basic and auxiliary.

After basic buffer is full the RTS line goes OFF and instruction XOFF is transmitted through the line TxD. After that the next bytes to come will be loaded into auxiliary buffer. After auxiliary buffer is also full any later bytes are ignored.

The take-in buffer of 8 KB has a basic buffer of 8063 bytes and an auxiliary buffer of 128 bytes.

The take-in buffer of 80 B has a basic buffer of 16 bytes and an auxiliary buffer of 64 bytes.

The selection of the buffer capacity is carried out according to the p. 1.4.1.8.1.

1.4.1.3.4 Interface operation mode is selected by setting the corresponding sliders on parametric DIP-switch according to Table 3.

DIP-switch location in YД-M is shown on Figure 3.

Table 3.

Slider number	RS232C operation mode when the slider is set in position	
	ON	OFF
1, 2, 3	Selection of the Bit rate according to Table 4	
4	Parity check is ON	Parity check is OFF
5	Odd parity	Even parity
6	Seven data bits, the eighth received bit is always set to 0	Eight data bits

If even or odd parity check is ON and an error is detected in received byte, YД-M substitutes this byte for “” symbol (code 0F8H) and if the check is OFF the received byte goes as it is.

Bit rate between data source and YД-M is selected according to Table 4.

Table 4

Slider position	Bit rate, bit/sec
-----------------	-------------------

1	2	3	
–	–	–	19200
+	–	–	9600
–	+	–	4800
+	+	–	2400
–	–	+	1200
+	–	+	600
–	+	+	300
+	+	+	150

Note: sign “+” means ON, sign “–” means OFF

Code table is set up according to Table 5.

Table 5

Slider position		Code table
4	6	
X	–	PC866
–	+	KOI-7 H0
+	+	KOI-7 H0/1

Note: sign “X” means “don’t care” state, sign “+” means ON, sign “–” means OFF

1.4.1.4 Operation modes

1.4.1.4.1 YД-M has the following operation modes:

– TEST mode – used for YД-M normal operation check, resulting in printing out the test, shown in Amendment E;

– ON LINE mode – used for data receiving and printing;

– OFF LINE mode – used for loading sheet and rolled paper, paper feed, interruption of the received data and printing the data out;

– STAND-BY mode:

a) ON LINE mode is ON, data transmission and printing is suspended

b) OFF LINE mode is ON, paper doesn’t move

If YД-M runs out of paper or in case of any emergencies it automatically switches to the OFF LINE mode and data transmission is prohibited.

1.4.1.5 Printing modes

1.4.1.5.1 YД-M has the following printing modes:

– symbol printing modes, when to form symbols relevant to received code internal YД-M character-generators are used.

– graphic modes, which use dots to form pictures according to received data

1.4.1.5.2 Printing density in symbol modes:

– 10 CPI (PICA) – printing density is 10 cpi or 80 cpl (characters per line)

– 12 CPI (ELITE) – printing density is 12 cpi or 96 cpl

– CONDENSED – printing density is 20 cpi or 160 cpl

13.043.008 P3

1.4.1.5.3 Type of printing used in symbols modes:

- DRAFT PRINTING – symbols are printed at maximal speed
- QUALITY PRINTING – symbols are printed at low speed in two runs
- EMPHASIZED (BOLD) PRINTING – vertical lines have double width and are printed at low speed.
- DOUBLE STRIKE – horizontal lines have double width and are printed in two runs for draft printing

EXPANDED – printed symbols have double width

UNDERLINING mode

SUPERSCRIP mode

SUBSCRIPT mode

Every type of printing can be performed with density mentioned in p. 1.4.1.5.2.

Samples of print in various modes are given in Amendment E.

1.4.1.5.4 Printing speed in symbol modes for the 8-inch line is shown in Table 6.

Table 6

Print den- sity	Type					
	1	2	3	4	5	6
	Printing speed, cps					
10 cpi	120	60	25	17	17	17
12 cpi	140	70	30	20	20	20
20 cpi	120	No	34	No	34	34
Notes Type 1 – DRAFT Type 2 – DRAFT and EMPHASIZED Type 3 – DRAFT and DOUBLE STRIKE Type 4 – DRAFT, EMPHASIZED and DOUBLE STRIKE Type 5 – QUALITY Type 6 – QUALITY and EMPHASIZED						

1.4.1.5.5 Graphic modes:

60 dots per inch (dpi) at high speed;

80 dpi;

120 dpi at high speed;

120 dpi at low speed;

240 dpi at low speed.

To select the proper graphic mode use instructions given in Amendment B.

The last two bytes of instruction show the number of bytes of graphic information (columns), which are transmitted after graphic mode selection instruction. When the last graphic data byte is received, the next received byte is interpreted as a symbol or instruction code.

YД-M uses 8-needle graphic mode. The highest order bit of a graphic data byte controls the first

(upper) needle of the printing head (PH), the low order one – the eighth needle. Bit 0 means switching PH needle OFF, bit 1 means switching it ON.

The ninth needle (the low one) is used for underlining in symbol mode.

1.4.1.6 Roll and sheet printing

1.4.1.6.1 At roll printing, after all received data is printed out, paper is automatically advanced for visual verification.

Before next printing the paper pulls back to the initial position, after that the paper moves forward for 1/6".

At sheet printing paper does not move either forward or backward.

The sign for switching the roll printing ON is the presence of paper in YД-M at it reset state according to p.p. 1.4.1.7.2a and 1.4.1.7.2b. When the rolled paper is over YД-M automatically switches to sheet printing mode.

1.4.1.7 YД-M initial status

1.4.1.7.1 YД-M takes the following initial status after:

- DRAFT PRINTING mode is ON, at density of 10 dpi.
- printing position is at the beginning of the line.
- line feed interval is set 1/6"
- line buffer data is deleted
- if YД-M is loaded with paper ON LINE mode is switched ON, if the paper is missing – OFF

LINE.

1.4.1.7.2 How to set YД-M into initial status:

a) system reset using controls:

- switch OFF and again switch ON YД-M power supply
- press RESET button at control panel and while keeping it pressed, press also LF-FF button.

b) system reset from external signal is carried out by setting line INPUT PRIME in CENTRONICS interface at low level for the time period not less than 500 microseconds.

c) program reset is carried out by sending ESC@ instruction into YД-M.

At system reset data take-in buffer is emptied.

At program reset data take-in buffer is not emptied and mode of operation (paper or roll) does not change (remains as it was).

1.4.1.8 Parametric DIP-switch

1.4.1.8.1 DIP-switch is used to change YД-M parameters according to current demands.

DIP-switch purpose is given in Table 7.

Sliders numbers and the direction of sliders shift to ON position is shown on Figure 3.

Table 7

Slider number	ON	OFF
1 – 6	Interface RS232C mode of operation is carried out according to p. 1.4.1.3.4	
7	80 bytes data take-in buffer	8 KB data take-in buffer
8	Rolled paper advance (when printing	Rolled paper advance (when printing

13.043.008 PЭ

	stops) is OFF and paper pull back (when printing re-starts) is also OFF	stops) is ON and paper pull back (when printing re-starts) is also ON
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Table 8 shows DIP-switch factory setting.

Table 8

Slider number							
1	2	3	4	5	6	7	8
+	–	–	–	–	–	–	–
Note: sign “+” means ON, sign “–” means OFF							

1.4.1.9 YД-M units and parts

1.4.1.9.1 YД-M consists of:

- printing unit
- signal processing PCB (PCB YД-OC2)
- printing head (PH)
- control panel (YД-ПУ unit)
- power supply unit (YД-ИБЭП)

1.4.1.9.2 YД-M represents an electromechanical device, assembled of separable units, mounted in casing body.

When used indoors YД-M may be placed in its working area directly on its legs, without housing standard case bottom.

When used on moving vehicles YД-M is mounted on shock absorbers 3, Figure 1.

1.4.2 YД-M units description and operation.

1.4.2.1 Control panel

1.4.2.1.1 Control panel includes controls and indicators and is shown on Figure 2.

Control and indicators:

– indicator “POWER” is blinking in the OFF LINE mode, provided any data in a data take-in buffer, in all other cases (if YД-M is ON) it is always ON.

– indicator “PAPER” is ON if paper is over and goes OFF when paper is present.

– indicator LINE is ON in the ON LINE mode, is OFF in OFF LINE mode, and is blinking in printing modes and in case of PH overheating.

- pushbutton LINE is used for:

- a) switching from ON LINE mode to OFF LINE mode and back;
- b) switching TEST mode ON;
- c) switching printing modes ON, see p.2.3.4
- d) top margin setting, see p.2.3.3

- pushbutton LF-FF is used for:

- a) paper advance, see p.2.3.2
- b) switching printing modes ON, see p.2.3.4
- c) top margin setting, see p.2.3.3

- pushbutton RESET – sets YД-M to initial status (pushbutton LF-FF should be pressed simultane-

ously)

1.4.2.2 УД-ИБЭП unit

1.4.2.2.1 УД-М power supply unit (PSU) (УД-ИБЭП) is designed for conversion AC 220 V 50 (400) Hz and also DC 21–34 V into stabilized voltages of 5 V and 24 V, needed for УД-М operation.

To eliminate any interference caused by УД-М operation, and also to protect it from any interference in power lines power supply unit has input and output protective filters.

1.4.2.2.2 To reduce electromagnetic emission all units of the PSU are enclosed into protective guards.

1.4.2.2.3 PSU has:

- tumbler “~220 V” – to switch AC power supply ON
- connector “~220 V” – to connect to AC power supply
- tumbler “24/27 V” – to switch DC power supply ON
- connector “24/27 V” – to connect to DC power supply
- fuse nests with fuses installed:

a) “1 A” – AC power line

b) “2 A” – DC power line

Input connectors are shown on Figure 4, tumblers and fuse nests – on Figure 2

1.4.2.3 УД-ОС PCB

1.4.2.3.1 УД-ОС PCB controls printing and data intake through CENTRONICS and RS232C interfaces.

1.4.2.4 Printing unit (PU)

1.4.2.4.1 Printing unit is mounted on two walls bound by two rods.

Printing unit kinematic diagram is shown on Figure 5

Printing unit consists of:

- nine needle printing head (PH) 21 of the impact type
- carriage 20, to mount PH on
- screw shaft 18, designed for carriage transportation, the latter is moved along it by means of sliding block, positioned in the screw groove. Ring 22 prevents the screw from axial bias
- motor 5 through reduction gear 3 rotates the screw shaft and through worm gear 23 moves the ink tape in cartridge 17
- paper support shaft (PSS) 13
- step motor 14, which through reduction gear 15 rotates PSS to advance paper. PSS may be rotated manually, by knurled knob 16
- reel 8, to support paper roll 10
- lever 9 with rollers – to form paper loop
- start of line (SOL) optron sensor 4, the carriage deflector serves as its shutter
- carriage position optron sensor (CPS) 6, the shutter for it is a slit disc fixed on motor axle.
- paper presence optron sensor (PPS) 11, the shutter for it is a lever 12, driven by paper.

1.4.2.4.2 The reel and PPS are mounted into walls by means of sleeve bearings, 90° turn of the latter permits quick removal of the reel and PSS from printing mechanism.

1.4.2.4.3 Quality of printed dots depends on distance between paper and PH. To use paper of various thickness this distance may be adjusted by turning lever 2.

1.4.2.4.4 Lever 7 is used for leading away the pressure rolls (not shown) of the PSS to release pa-

13.043.008 P3

per for its alignment.

1.4.2.4.5 When printing starts up the motor 5 is ON and through reduction gear 3 rotates screw shaft 18 and through worm gear 23 advances the ink tape. Screw shaft drives the carriage 20. The position of the first printed dot in the line is determined at the very moment when optron sensor 4 is overlapped by carriage deflector. The dots are printed at the very moment when slits of the disc, installed on motor 5 shaft pass by optron sensor 6 (CPS).

1.4.2.4.6 Paper advance for predetermined number of steps is carried out by PSS 13.

If the paper is over or not loaded, lever 12 overlaps sensor 11 (PPS) and printing is prohibited.

1.4.2.5 Reel

1.4.2.5.1 Reel is intended for mounting a paper roll.

The reel with mounted roll and mnemonic sketch explaining roll mounting are shown on Figure 6. The reel consists of a shaft 1, with fixed right cheek and gear to prevent roll from idling under vibration.

Left cheek 2 has an attachment to fix paper roll on shaft 1. On both ends of the shaft there are locking bearing sleeves 3, mounted into printing unit walls. The left cheek and left sleeve are removable.

1.4.2.6 Casing

1.4.2.6.1 Casing consists of a body 5 and a lid 6, see Figure 1, hinged to each other.

In closed position the lid is held by two clamps 4, mounted on the left and right sides.

To release the lid index pins must be pressed in.

Input connector LINE is located on the rear wall of the body. To ensure reliable electrical contact inner surfaces of the lid and the body are coated with Sn–Zn alloy, and there is also a reliable spring contact between the body and the lid.

One of the index pins has a micro switch to suppress printing once the lid is open.

1.5 ACCESSORIES

1.5.1 YД-M is connected to AC or DC lines by means of cables “~220 V” or “-24/27 V” included in complete YД-M shipping set.

1.5.2 YД-M is connected to the data source through connecting cable.

Connecting cable should be made by the YД-M user. To prepare the connecting cable YД-M already has the matching part of the cable LINE YД-M – female 2PMT30KПЭ32Г1В1В.

1.5.3 Amendment D of the given UM contains circuit diagrams of:

1.5.3.1 Connecting cables to connect YД-M to IBM PC:

- to LPT port
- to COM port, protocol XON/XOFF
- to COM port, protocol RTS (READINESS)
- to COM port, protocol XON/XOFF with optron decoupling at YД-M side
- to COM port, protocol RTS (READINESS) with optron decoupling at YД-M side.

1.5.3.2 Power supply cables to connect YД-M to AC and DC lines

1.5.4 Connecting cables to connect YД-M to the ports LPT and COM may be supplied by manufacturer provided a proper reservation has been made in shipment contract.

1.5.5 YД-M is completed with a set of mounting parts to mount YД-M on board of moving vehicles according to the packing list for the specific YД-M version.

1.6 MARKING AND SEALING

1.6.1 Factory standard case or parcel type box are marked with:

- handling signs;
- number and article version – on a standard packing case;
- number, article version and letter “Д” – on a parcel box;
- weight of the packed article.

1.6.2 Factory standard case has an attachment for plasticine sealing

In case of transportation and long-duration storage the standard case may be sealed.

1.6.3 Each УД-M is marked with:

- article version;
- article number;
- power supply voltage.

1.6.4 Cable for connecting УД-M to DC line has marking – the wire to be connected to the positive terminal of power source has “+” mark.

1.7 PACKING

1.7.1 Standard УД-M packing case is a metal box, consisting of the bottom and removable lid, coupled with the bottom by laid-on locks and spring rings.

УД-M is mounted on shock absorbers, fixed to the bottom.

The lid has a handle for carrying packed article.

УД-M may be shipped in a parcel type packing box.

1.7.2 Type of packing is described in p. 1.3.3 and corresponds to the packing list for specific УД-M version.

2 УД-M USAGE

2.1 OPERATION RESTRICTIONS

2.1.1 УД-M is intended for long service life provided it is subject to a proper obligatory maintenance.

Maintenance is carried out according to section 3 of the given UM.

2.1.2 OPERATION OF THE UNGROUNDED УД-M IS PROHIBITED!

2.1.3 ALCOHOL, ACETONE AND BENZIN MIXTURES ARE PROHIBITED FOR PRINTING HEAD AND OPTRON SENSORS CLEANING!

2.1.4 MANUAL ROTATION OF THE PAPER SUPPORT SHAFT IS PROHIBITED WHEN УД-M POWER IS ON!

2.1.5 IT IS PROHIBITED TO USE LEVER 2, FIGURE 5 TO IMPROVE QUALITY OF THE PRINT, PROVIDED INK TAPE IS WORN OUT!

13.043.008 P3

LEVEL 2 SHOULD BE IN THE MIDDLE POSITION WHILE PRINTING ON:

- paper tape – roll, 210 mm width, inner dia 18 mm, 50 m length, paper weight 65 g/m²;
- sheet paper – paper weight 65 g/m²

IF THIN PAPER IS USED THE LEVER SHOULD BE MOVED AWAY FROM THE OPERATOR, IF USED PAPER IS THICK – TOWARDS OPERATOR.

2.1.6 ATTENTION: BEFORE PACKING YД-M FOR FUTURE TRANSPORTATION OR STORAGE THE LEVER 1, FIGURE 7 SHOULD BE MOVED TO THE FIXED POSITION Б.

2.1.7 Cable connecting YД-M with data source through CENTRONICS interface should not be longer than 3 m, through RS232C interface – 15 m, at Bit rate of 19200 bps.

IT IS POSSIBLE TO USE LONGER CABLE FOR CONNECTING YД-M TO THE DATA SOURCE THROUGH RS232C INTERFACE, BUT IN THIS CASE THE BIT RATE SHOULD BE REDUCED TO THE VALUE, WHICH EXCLUDES ERRORS IN RECEIVED DATA PRINTING.

2.1.8 It is allowed to connect YД-M to the data source through both CENTRONICS and RS232C interfaces simultaneously by a cable, made according to cable circuit diagram, shown on Figures D1–D5, Amendment D, provided proper interfaces exchange signals are ensured.

2.1.9 Check parametric DIP-switch state. Its location, sliders numbers and their ON position are shown on Figure 3. When shipped from the factory, sliders positions are as in the table 8.

When it is necessary to match YД-M parameters with those of the specific data source, the user himself should select the sliders position of parametric DIP-switch according to p.p. 1.4.1.8 and 2.2.2.2 of the given UM.

2.1.10 Slightly inclined position of the ribbon cartridge is provided by the YД-M design intentionally.

2.1.11 Should YД-M is kept (separately or included in other complexes) at temperatures higher or lower than recommended temperature range, than before being switched ON, YД-M should be kept at working temperature in power OFF position as long as it is necessary for leveling the temperature in the whole unit, but not less than for 2 hours.

2.1.12 IT IS PROHIBITED TO DISMANTLE PRINTING HEAD AT MAINTENANCE SERVICE ACCORDING TO P.P. 3.4.2d2 AND 3.4.2d3, IF THE PRINTING HEAD IS NOT IN ITS UTTER LEFT POSITION.

2.2 PREPARATION TO OPERATION

2.2.1 Safety measures.

2.2.1.1 YД-M casing lid in working condition should be closed.

2.2.1.2 YД-M in working condition should be grounded.

2.2.1.3 Before changing the fuses disconnect YД-M from power supply.

2.2.1.4 Be sure that before connecting YД-M to power supply and data source all power supply tumblers are OFF.

2.2.2 Preparation to use

2.2.2.1 General directions.

2.2.2.1.1 Remove spring rings from standard case locks or open the parcel type box.

Produce from the package YД-M shock absorbers and a set of mounting parts.

Place YД-M onto working site depending on its version and usage conditions in the following order:

a) when installed with the bottom of the standard packing case according to Figure 8:

1) drill four holes dia 24 mm and 5 mm depth according to M and H coordinates in table top

1, destined for YД-M fixing, to fit legs 3 of the bottom 2.

2) drill four through holes $\varnothing 7$ mm in the table top1 according to coordinates K and Л.

3) fix YД-M on table top 1 with four M6 screws with washers.

b) when installed using standard packing case bottom and a slide-frame 4, according to the Figure 9:

1) install YД-M following the p.p. 2.2.2.1.1a1–2.2.2.1.1a3

c) when installed on shock absorbers according to Figure 10:

1) fix four shock absorbers АПН-3 on table top 1, designed for YД-M mounting, according to coordinates K and Л with four wood screws 3.5x16 each.

2) fix YД-M on shock absorbers using washers 18.942.188, by screwing shock absorbers sleeves on YД-M fastening screws using spanner S=10. Prior to mounting YД-M on shock absorbers remove four small legs, located close to YД-M fastening screws.

d) when installed with a slide-frame on shock absorbers according to Figure 11:

1) fix four shock-absorbers АПН-3 on table 1, according to coordinates K and Л with four wood screws 3.5x16 each;

2) move away levers Д and Е in the direction shown by arrows and shift YД-M till it reaches fixed position, then again move levers Д and Е and remove YД-M from slide-frame 2;

3) fix slide-frame 2 on shock absorbers with four M5 screws and four spring washers;

4) place YД-M into the slide-frame and push it to the stop position when levers Д and Е are fixed.

2.2.2.1.2 Ground YД-M, connecting its ground terminal 2 (“⊥”) according to Figure 4 to the ground bus, using at least 1.5 mm² cross section wire.

2.2.2.1.3 Produce from the package AC or DC power supply cable, and a connecting cable if any.

ATTENTION: WHEN CONNECTING YД-M TO THE DC POWER SUPPLY STRICTLY OBSERVE POLARITY, ACCORDING TO THE MARKINGS ON CABLE AND POWER SOURCE.

2.2.2.1.4 Prepare (make yourself using female 2PMT30KПЭ32Г1В1В) connecting cable to link YД-M to the data source.

Cables circuit diagrams are represented in Amendment D.

In need of galvanic decoupling of YД-M from data source it is necessary to follow the scheme of optron decoupling shown in Amendment F.

Galvanic decoupling of links “ТxD” or “RTS” should be performed at data source side.

2.2.2.1.5 CENTRONICS interface cable should not be longer than 3 m.

2.2.2.1.6 RS232C interface cable should not exceed 15 m at Bit rate of 19200 bps.

Cable may be elongated at reduced data exchange rate. In this case data exchange rate and cable length are chosen experimentally, provided there are no distortions in printed data.

When using the optron decoupling cable length may be increased and is selected experimentally.

2.2.2.1.7 Connection of the cables, mentioned in p. 2.2.2.1.6 to the circuits “PAPED END” and “ERROR” of “CENTRONICS” interface is permissible.

2.2.2.1.8 Set the RS232C interface operation mode using parametric DIP-switch according to p. 1.4.1.3.4:

– number of bits of received information and, if necessary, presence of odd or even parity check select according to the table 3;

– select Bit rate according to the table 4

– select code table according to the table 5.

When using CENTRONICS interface DIP-switch sliders 1–6 may have any settings.

13.043.008 PЭ

DIP-switch is easily accessible when the lid is open and paper roll removed.

2.2.2.1.9 Select the capacity of data take-in buffer and paper advance and pull back mode according to table 7, following the rules of the complex, where YД-M is installed.

2.2.2.1.10 Exchange protocol selection for RS232C interface is carried out according to data source interface parameters.

2.2.2.1.11 Move the paper release lever 1, Figure 7 from transportation position B to the operating position A.

2.2.2.2 Data source preparation.

2.2.2.2.1 An IBM type PC, used as a data source should have a parallel port LPT to run CENTRONICS interface or serial port COM to run RS232C interface.

2.2.2.2.2 When working in DOS operation system through LPT port preliminary DOS preparation is not needed. Data printout is carried out by means of DOS itself or by user's program.

When working in DOS through COM port it is necessary to connect YД-M to PC with cable according to RTS protocol.

If YД-M parametric DIP-switch is set according to table 8 and YД-M is connected to the COM 2 port, it is necessary to select COM 2 port parameters according to RS232C mode of operation set by YД-M parametric DIP-switch. To do that it is necessary to introduce successively two instructions into DOS instruction line:

mode lpt 1 = com 2 [press ENTER];

mode com 2: 96, n, 8 [press ENTER].

Data, printed out by DOS or by users program will be redirected by DOS to COM 2 port.

Note – When selecting another RS232C interface parameters it is necessary to change parameters of the MODE instruction, the description of the latter is given in DOS directory.

2.2.2.2.3 WINDOWS operation system should have a driver for EPSON LX-800 printer, connected to the LPT port or COM port. Data is printed out by means of WINDOWS or user's program.

If data is output through LPT port any additional settings in WINDOWS are not needed.

When data is output through COM port it is necessary to set port parameters according to RS232C interface mode of operation, selected by YД-M parametric DIP-switch.

If YД-M parametric DIP-switch is set according to table 8, it is necessary to set the following parameters of COM port in operation system WINDOWS 95:

– Bit rate: 9600 bps;

– data bits: 8;

– parity: ignored;

– stop bits: 1–2;

– transmission control:

a) XON/XOFF, when YД-M is connected to the COM port according to XON/XOFF protocol;

b) System control, when YД-M is connected to the COM port according to RTS protocol.

2.2.2.2.4 In case data source differs from IBM PC type, the user should prepare data and its printout himself according to Instruction Manual of his data source having in mind operation concept, described in p.1.4.1 of the given UM.

2.2.2.3 Preparation to the roll printing

2.2.2.3.1 On top of YД-M casing lid install and fix with two non-removable screws 2, deflector 1, according to Figure 16.

2.2.2.3.2 Open YД-M lid and turn OFF tumblers “-24/27V” and “~220V” of the

УД-ИБЭП unit.

2.2.2.3.3 Load rolled paper as follows:

- press sleeves 5 of the levers, Figure 12, until their fix pins come out of holes 4 in printing unit walls and position the sleeves according to mnemonic scheme, shown on Figure 12;
- remove the reel in upright direction;
- mount the paper roll on the reel according to Figure 6, namely:
 - a) remove sleeve 3 and cheek 2 from shaft 1;
 - b) install the roll on the shaft until it rests against the cheek 6;
 - c) install cheek 2 until it rests against the roll;
 - d) press spring-loaded sleeve 5 of the cheek 2 and turn it until pin 4 of the shaft 1 comes into blind recess A of the sleeve;
 - e) mount sleeve 3 on shaft 1;
- install the reel into УД-М according to mnemonic scheme, shown on Figure 12;
- load paper tape as follows:
 - a) by means of knurled knob 1, Figure 12, move the paper edge from under upper pressure rollers 2 for 10–15 sm;
 - b) drive the paper release lever 1, Figure 7, to position B. Align the side edges of the paper in front of and behind the paper support shaft according to the mnemonic scheme on Figure 7 and, shifting paper along paper supporting shaft axle, place it between guides 3, Figure 12;
 - c) return the lever 1 to position A until it rests against stop 2.
 - d) by means of paper support shaft knob move the paper edge backwards under upper pressure rollers;
 - e) pull the lever 7 Figure 12 towards operator and rotate the roll to draw paper tight.

2.2.2.3.4 By means of connecting cable, prepared according to p.p. 2.2.2.1.4 –2.2.2.1.6, connect УД-М input connector LINE to the output connector of the data source.

2.2.2.3.5 Plug УД-М to the power supply, keeping in mind polarity if DC supply is used, refer to p. 2.2.2.1.3. Install cap 1, Figure 4, onto unused power connector.

2.2.2.3.6 Set УД-М power supply tumbler “~220 V” or “-24/27 V” (the proper one) to ON position.

When power is ON (with paper loaded) УД-М is set to “ON LINE” mode, and indicators “POWER” and “LINE” on the control panel should go ON.

Turn ON data source power supply.

Close УД-М lid.

УД-М is ready to receive and print data.

2.2.2.4 Preparations to A4 size sheet printing.

2.2.2.4.1 Install and fix with two non-removable screws 2 paper guide 1, on top of the case lid, according to Figure 1a.

2.2.2.4.2 Open УД-М lid, set power supply tumblers “-24/27 V” and “~220 V” of УД-ИБЭП unit to OFF position.

2.2.2.4.3 Remove paper from paper pathway, if any.

2.2.2.4.4 By means of connecting cable (see p.p. 2.2.2.1.4–2.2.2.1.6) connect УД-М input connector “LINE” to the data source output connector.

2.2.2.4.5 Plug УД-М to the selected power supply according to p. 2.2.2.1.3. Install cap 1, Figure 6,

13.043.008 P3

onto unused power supply connector.

2.2.2.4.6 Set YД-M power supply tumbler “~220 V” or “-24/27 V” (the proper one) to ON position.

YД-M is set to “OFF LINE” mode and indicators POWER and PAPER on the control panel should go ON.

2.2.2.4.7 Turn ON data source power supply.

2.2.2.4.8 Close YД-M lid.

Place sheet of paper into paper guide and push it down to the rest. PAPER indicator should go OFF.

Paper loading is performed automatically in 2–3 seconds after it is placed into the paper guide.

2.2.2.4.9 Reduce top and bottom margins, if necessary, as per p. 2.3.3.

Advance paper sheet, if necessary, pressing LF–FF push button. Switch YД-M to “ON LINE” mode, pressing button LINE. Indicator LINE should go ON.

YД-M is ready to receive and print data.

2.2.2.5 Workability check.

2.2.2.5.1 Workability check should be carried out in TEST mode as follows:

a) printing the test onto rolled paper:

– prepare YД-M for roll printing (see p.p. 2.2.2.3.1–2.2.2.3.3, 2.2.2.3.5)

– press and hold button LINE and switch ON YД-M power supply. In this case YД-M is set to TEST mode, POWER indicator will blink once;

– release button LINE, after POWER indicator will blink once;

– close YД-M lid;

– press LINE button.

Test printing starts up. After printing is over paper is advanced for verification.

To suspend printing press LINE button.

To repeat printing press LINE button again. The paper pulls back and printing starts up again from the beginning.

Check the printed test visually and compare it with a sample, given in Amendment E.

b) printing test onto sheet paper:

– prepare YД-M for sheet printing (see p.p. 2.2.2.4.1–2.2.2.4.3, 2.2.2.4.5);

– press and hold LINE button and switch YД-M power supply ON. YД-M is set in TEST mode, POWER indicator will blink once;

– release LINE button after POWER indicator will blink once;

– close YД-M lid;

– place a sheet of paper onto paper guide and push it down to stop.

PAPER indicator goes OFF, paper is loaded automatically, test is printed and the sheet comes out.

To suspend printing press LINE button.

To repeat test printing press LINE button again.

Verify the printed test (see p. 2.2.2.5.1a).

2.2.2.5.2 TEST mode is completed either:

– automatically, when paper is over;

– to interrupt TEST printing press LINE button, then press LF–FF button

– after YД-M power is OFF and ON again but without pressing LINE button.

After the test mode is over YД-M is set to initial status, the description of the latter is given in p. 1.4.1.7.1.

2.2.2.6 Mounting and removal of the ribbon cartridge.

2.2.2.6.1 Before cartridge mounting make sure that:

- YД-M power tumbler is OFF;
- printing head is in the middle of paper supporting shaft.

If not, drive printing head to the middle position, rotating gear 1, Figure 5, by hand.

2.2.2.6.2 Mount the cartridge as follows:

- place the cartridge at its seats 1, Figure 13;
- Turning knob 2 of the cartridge drive provide proper coupling between cartridge and worm gear and then press the cartridge down to secure coupling of all four cartridge lugs with slots in the walls of the YД-M printing mechanism.

– insert ink tape into the gap between printing head and carriage deflector;

– turn cartridge knob 2, as shows arrow sign 3 to tighten the tape.

2.2.2.6.3 To remove cartridge press with two thumbs on the edges of the cartridge front wall in horizontal direction, lift the rear wall and pull the cartridge out.

2.2.2.7 Malfunctions and remedies.

List of possible YД-M malfunctions and recommendations on their correction is given it table 9.

All the rest defects are corrected by qualified technicians in a repair shop.

Table 9

Malfunction description	Possible reasons	Remedies
After power is ON all indicators of the control panel remain OFF	Faulty fuse in selected power line	Replace fuse
All indicators are always ON	YД-M is connected to the switched OFF PC through LPT port and is in the system reset state through INPUT PRIME circuit	Switch the PC ON or disconnect cable from YД-M LINE connector
YД-M fails to print, PAPER and LINE indicators are blinking	Lid is open or not properly fixed	Close the lid until locks are completely fixed and press simultaneously push-buttons RESET and LF–FF
	Ribbon cartridge has a fault: the tape slacks, winds on screw shaft 18, Figure 5, and as a result carriage motor slows down	Turning gear 1, Figure 5, release the tape. Replace ribbon cartridge
	Wrong position of the paper release lever	Fix lever 1, Figure 7 in position A
YД-M fails to print, indica-	Printing head is overheated	After PH temperature goes

13.043.008 P3

tor LINE is blinking		below 95° C printing will resume without operator's assistance
Symbols “o” (0F8H code) are periodically printed when data comes through RS232C interface	Bit rate or parity check are wrong	Correct setting according to p. 1.4.1.3.4
	Interference in data source channel	Reduce bit rate (see p. 1.4.1.3.4)
Bleak printing	Ink tape is worn out	Replace ribbon cartridge
	Ink tape does not move owing to cartridge fault	Do the same
	Wrong gap between printing head and paper	Correct lever 2 position (Figure 5) moving it forward or backward to another fixed position until better contrast is obtained

Table 9 (cont.)

Malfunction description	Possible reasons	Remedies
Bleak printing Paper has wide dark horizontal stripes	Ink tape is pressed against the paper	Drive lever 2, Figure 5 towards operator to another fixed position to obtain contrast printing
Print is mirror reflected	Wrong position of the paper release lever	Fix lever 1, Figure 7 in position A

2.3 УД-М OPERATION

2.3.1 Data printing

2.3.1.1 Prepare УД-М for roll (p. 2.2.2.3) or sheet (p. 2.2.2.4) operation.

Prepare data source (p. 2.2.2.2).

To suspend data reception and printing switch УД-М to OFF LINE mode, pressing LINE push button.

If printing head is overheated, printing stops and indicator LINE starts blinking.

After PH cools down, printing resumes from where it had stopped without operator assistance.

If PH cooling time was too long and PC had stopped data exchange with УД-М than after PH has cooled down (indicator LINE does not blink any more) it is necessary to select PC message to continue printing. Printing resumes from where it had stopped.

2.3.2 Paper advance

2.3.2.1 Switch УД-М to OFF LINE mode pressing LINE button.

To advance paper for one step (1/6") push sharply button LF – FF.

If LF – FF button is pressed and hold longer than 1 sec., rolled paper will be advanced to reach the lower edge of A4 size sheet being printed, in case of sheet printing – the whole sheet will come out.

When in ON LINE mode paper advance by means of LF – FF button is interlocked.

Paper advance at roll or sheet printing in ON LINE mode is described in p. 1.4.1.7.

Roll advance and pull back may be interlocked by DIP-switch, described in p. 1.4.1.8.

2.3.3 Margin setting

2.3.3.1 It is possible to reduce top margin (distance from paper sheet top edge till the first printed line).

To do it follow the below rules:

- prepare YД-M for sheet printing (p. 2.2.2.4);
- press LINE button, and holding it pressed push the button LF – FF.

Each short-time pressing of LF – FF button reduces top margin for 0,35 mm.

When top margin is set less than 10 mm, the bottom margin is automatically reduced for 10 mm and the last line is printed at the very bottom edge.

Top margin is limited to 5 mm.

The selected top and bottom margins will be kept in YД-M memory until it is turned OFF.

Margin setting mode is valid only after the sheet paper has been loaded.

2.3.4 Setting printing modes from control panel

2.3.4.1 It is possible to use YД-M control panel to set printing modes, described in p. 1.4.1.5.

To do it follow the below steps:

- switch YД-M to ON LINE mode;
- press LINE button on YД-M control panel, and holding it pressed, push LF–FF button;
- release buttons in any sequence.

Indicator LINE will start blinking.

To select printing mode press LINE button.

Number of pressings corresponding to selected printing mode is given in table 10.

Table 10

Number of pressings	Printing modes
1	QUALITY
2	ELITE
3	CONDENSED
4	EMPHASIZED
5	DOUBLE STRIPE
6	DOUBLE WIDTH
7	UNDERLINING

To complete printing mode selection press LF–FF button

If before pressing LF–FF button, LINE button was not pressed or was pressed more than seven times, selection mode is over and printing mode remains unchanged.

13.043.008 PЭ

Any combinations of the above modes are possible.

Modes ELITE, EMPHASIZED and DOUBLE WIDTH are interlocked while CONDENSED mode is in force, and restore after its cancellation.

To cancel selected printing modes it is necessary to set УД-М to the initial status as per p. 2.3.5.

2.3.5 Setting УД-М to the initial status

2.3.5.1 УД-М initial status is described in p. 1.4.1.7.1, control means used to set this status are described in p. 1.4.1.7.2a.

2.3.5.2 When indication is ON (see p. 2.2.2.7) except for PH overheating, УД-М further operation is impossible. To switch the indication OFF it is necessary to perform system reset to the initial status (see p. 1.4.1.7.2a).

3 MAINTENANCE

3.1 GENERAL INFORMATION

3.1.1 The purpose of УД-М maintenance is to ensure its permanent readiness for reliable operation.

3.1.2 Maintenance is carried out according to preventive scheme, based on obligatory operations performed with УД-М according to directions of the given section of UM and the duration of УД-М service life.

3.1.3 Categories of maintenance:

- DM – daily maintenance;
- MM – monthly maintenance;
- AM – annual maintenance.

Provided УД-М operates in a dusty conditions, undergoes sharp temperature changes, high humidity and strong vibrations AM should be performed every six months.

3.1.4 All categories of maintenance are performed by service personnel, working with УД-М (operator) of specially trained technicians.

Any needed maintenance can be performed by tools included in complete УД-М set.

3.1.5 The following materials are used for maintenance.

3.1.5.1 Degreasing:

- benzin for industrial usage purposes.

3.1.5.2 Lubricating:

- thin oil for rubbing surfaces;
- grease for gears and carriage shaft screw groove.

3.1.5.3 Wipening:

- gauze;
- cloth.

3.2 DAILY MAINTENANCE

3.2.1 DM is performed every day at the beginning of a working day (shift change);

Time needed for DM is 2 min.

DM includes:

- visual inspection;
- cleaning.

3.2.2 During the exterior examination pay your attention at:

- reliability of couplings – connecting cable, power supply cable and YД-M grounding;
- any cable damages;
- ink tape condition.

3.2.3 While cleaning YД-M with soft cloth remove dust from casing surface.

3.3 MONTHLY MAINTENANCE

3.3.1 MM is performed to check YД-M working condition and to maintain its workability until next MM.

MM includes:

- visual inspection;
- cleaning;
- workability check.

Time needed for MM – less than 5 min.

3.3.2 During the external examination give special attention to:

- reliability of couplings – connecting cable, power supply cable and YД-M grounding;
- any cable damages;
- ink tape condition.

3.3.3 While cleaning YД-M with soft cloth remove dust from casing surface.

It necessary clean paper pathway.

3.3.4 Check YД-M workability (see p. 2.2.2.5).

3.3.5 Provided any faults in YД-M operation locate and correct them according to p. 2.2.2.7.

3.4 ANNUAL MAINTENANCE

3.4.1 AM is performed to check YД-M working condition and to maintain its workability until next AM.

AM includes:

- visual examination;
- partial dismantling;
- cleaning and lubricating;
- workability check.

13.043.008 P3

Time needed for AM—less than half an hour.

3.4.2 To lubricate rubbing surfaces it is necessary to perform YД-M partial dismantling in the following order:

- a) disconnect power supply and interface cables from YД-M;
- b) remove ribbon cartridge according to p. 2.2.2.6.3;
- c) remove paper reel following recommendation of p. 2.2.2.3.3 and according to mnemonic scheme Fig. 12;
- d) remove printing unit as described below:
 - 1) rotating gear 1 with your finger, Figure 5, drive printing head carriage to the far left position to prevent carriage leading shaft deformation while removing shield and PH;
 - 2) unscrew two PH fastening screws, remove PH with flat cable still connected and place it alongside screw shaft 18, Figure 5.
 - 3) disconnect printing unit connectors from YД-OC2 PCB.
 - 4) unscrew six screws fastening printing unit to the bottom.
 - 5) remove the printing unit.

3.4.3 YД-M cleaning and lubricating (proceed as follows):

- using soft cloth remove dust and grease from exposed parts.
- use benzine for cleaning dirty surfaces, paying special attention to electronic elements (optron sensors in particular) and wires avoiding their contacts with dirt removed;
- blow the optron sensors 4, 6 and 11, Figure 5;
- lubricate units and parts according to Figure 5.
 - 1) lubricate teeth of all gears in reducers 3 and 15 and shaft 18 screw groove;
 - 2) lubricate with thin oil the following parts:
 - all gears axles;
 - ring 22 and gear slot with roller inside;
 - all pressure rollers axles;
 - levers 9 and 12 axles.

3.4.4 After cleaning and lubricating are completed perform assembling in reversed order (see p. 3.4.2).

3.4.5 Check YД-M workability according to p. 2.2.2.5.

3.4.6 In case of any faults in YД-M operation locate and correct these faults as described in p. 2.2.2.7.

3.4.7 Expendable materials rates and their basic performances are given in table 11.

Table 11

Material	Basic performances	Consumption rate for		
		DM	MM	AM
Benzine	For industrial purposes	-	-	0,02 kg
Consistent grease	1 Temperature range - from + 120 °C to – 60 °C; 2 Viscosity: - at + 50 °C - not less 1.2 Pa·sec;	-	-	0,02 kg

	- at – 30 °C - not more 1800 Pa·sec. 3 Free alkali content, in terms of OH - less than 0,03%.			
Lubricating oil	1 Temperature range - from + 70 °C to – 65 °C; 2 Density at + 20 °C - 0.95 - 0.97 g/s ³ ; 3 Kinematic viscosity: - at + 20 °C - 47-55 sSt; - at – 50 °C - not more 2200 sSt. 4 Water content - not more 0.005 %. 5 Congelation temperature - below –70 °C.	-	-	0,02 kg
Gauze	-	-	0,01m	0,01m
Cloth	-	0,01 kg	0,03 kg	0,03 kg

4 STORAGE

4.1 УД-М should be kept in a heated room at 5° C to 40° C temperature and less than 80% humidity.

4.2 Storage room should provide proper safety and ability to keep УД-М in operation condition.

4.3 Storage room should have enough tables to perform preventive treatment and racks to keep УД-М on.

Racks must be wooden or metal. Their design should provide easy access to the articles.

Distance between racks and walls should not be less than 200 mm.

4.4 It is prohibited to keep УД-М:

- on the floor;
- in presence of chemicals, acids and alkalis.

4.5 Storage room should be equipped with suction-and-exhaust ventilation.

4.6 Room floors should have firm coating preventing formation of crumb, sand and dust and be easy for tidying.

4.7 Good and defective articles must be kept separately.

4.8 УД-М should be kept on racks. The articles should be stacked by two in horizontal (flat) position.

4.9 Factory lubricated and packed in standard case УД-М should not be kept longer than 18 months.

4.10 УД-М included into any users complex should be kept in heated room in the above conditions.



5 TRANSPORTATION



5.1 Transportation of УД-М packed is standard factory case

5.1.1 During transportation articles are placed in horizontal (working) position not more than one on top of the other.

5.1.2 During transportation УД-М must be protected from atmospheric precipitation. If carried by truck use tarpaulin covering. In case of water transport don't keep УД-М on open decks.

5.1.3 During transportation the articles should be properly fastened to avoid their mutual collision.

5.2 Transportation of УД-М packed in parcel packing box (letter “Д”)

5.2.1 Follow the below transportation symbols, drawn on the box:

– handle with care;

– protect from moisture;

– keep in vertical position;



20kg

– stacking limitation



5.2.2 Article safe keeping during any kind of transportation is consignee's responsibility.

6 UTILIZATION

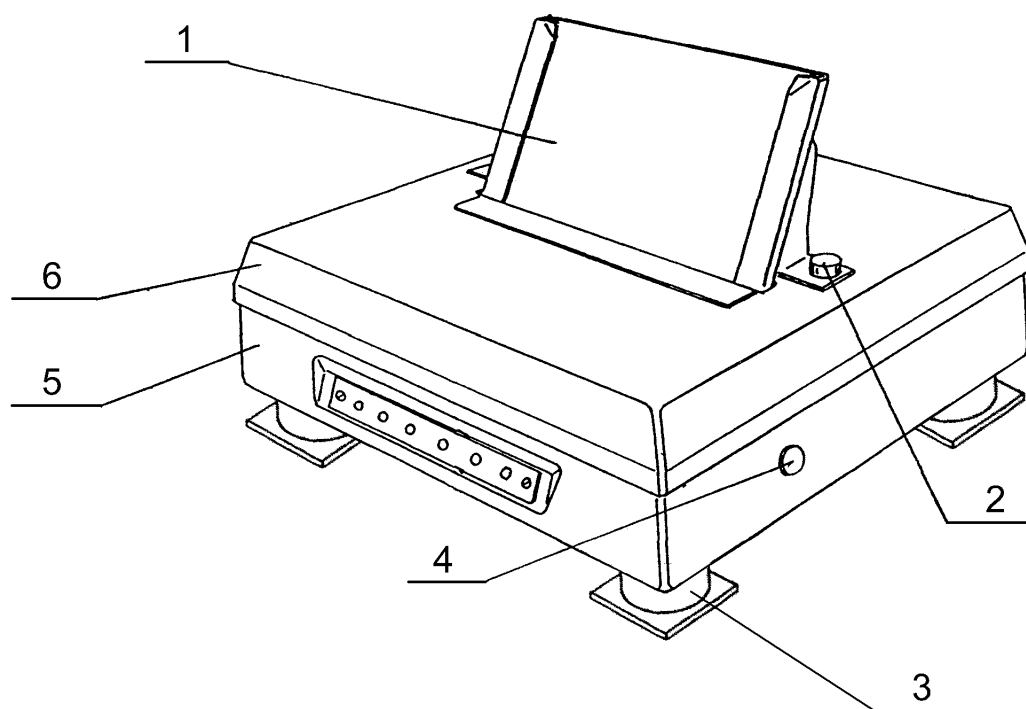
6.1 In case УД-М (or its parts) lifetime is over and are no more subject to further repair they are subject to utilization.

6.2 УД-М design has no harmful components, that may be released during utilization and hurt personnel's health or environment, apart from plastic parts.

6.3 List of components containing precious metals and non-ferrous parts, their location and utilization procedure may be dispatched by manufacturing factory on separate demand.

13.043.008 P3

a) with paper sheet guide



б) with rolled paper deflector

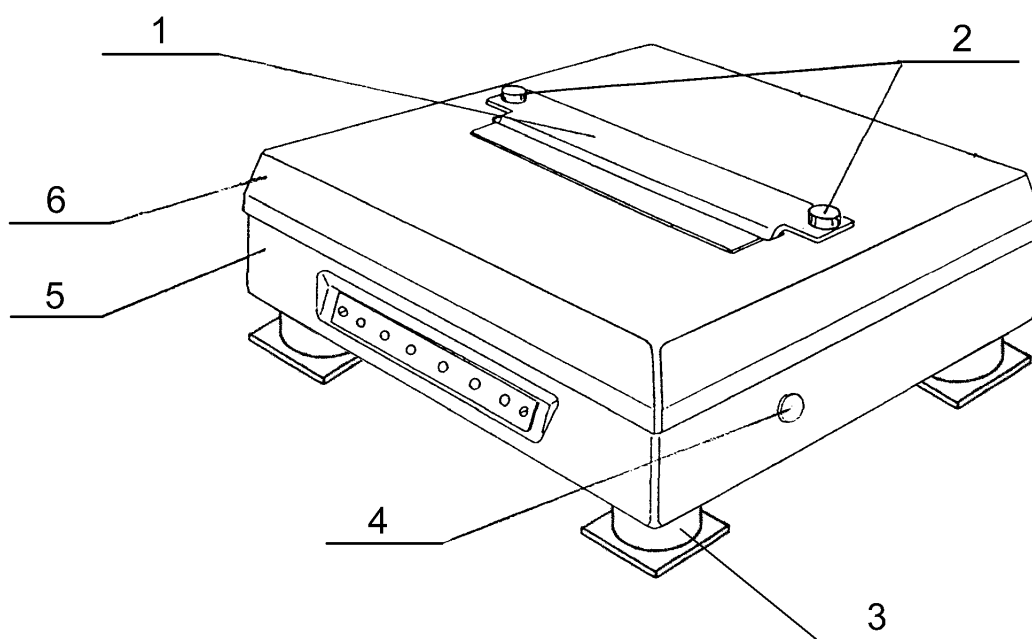


Figure 1 – УД-М. General view

13.043.008 P3

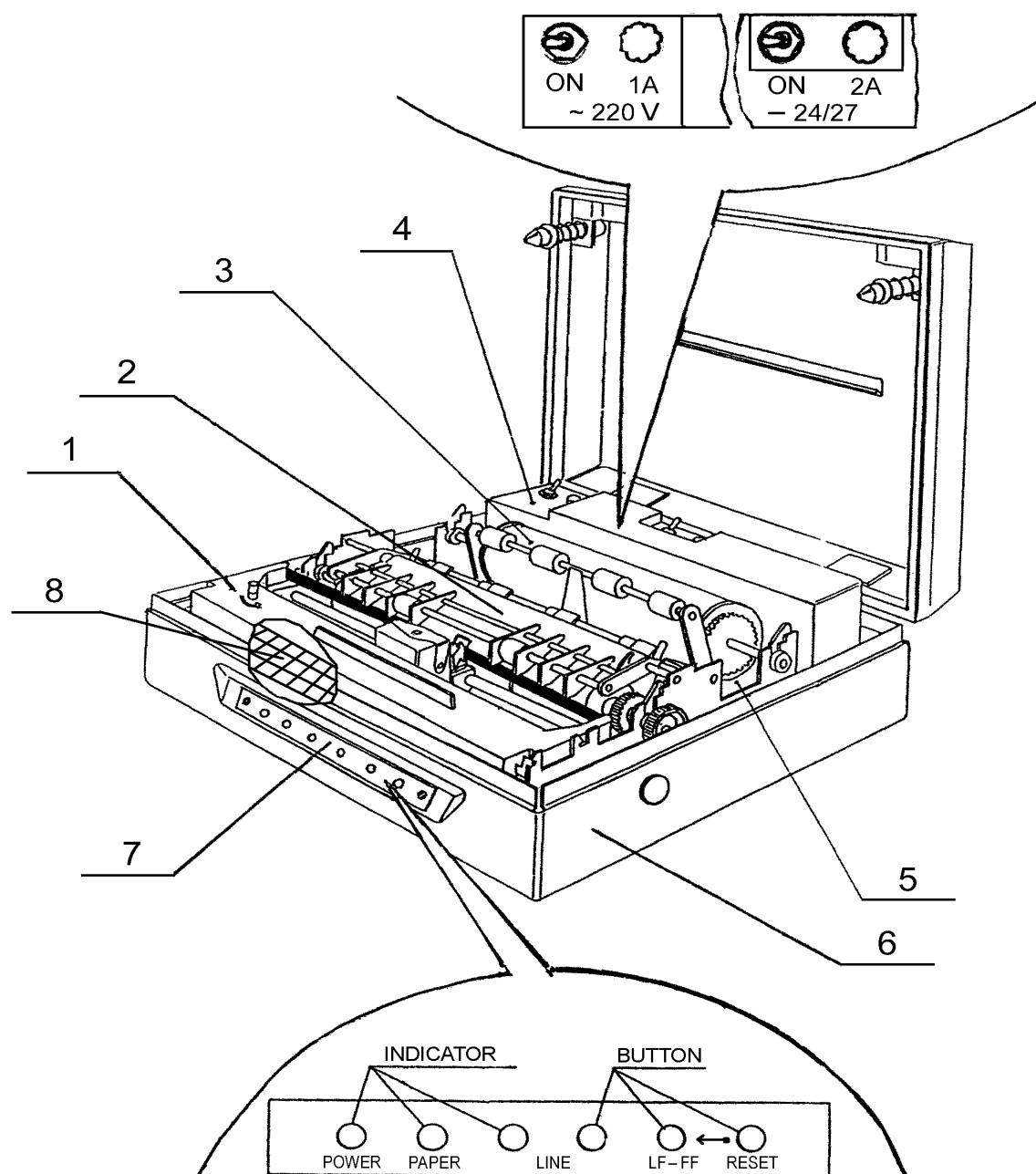


Figure 2 – УД-М. General view with lid open

13.043.008 P3

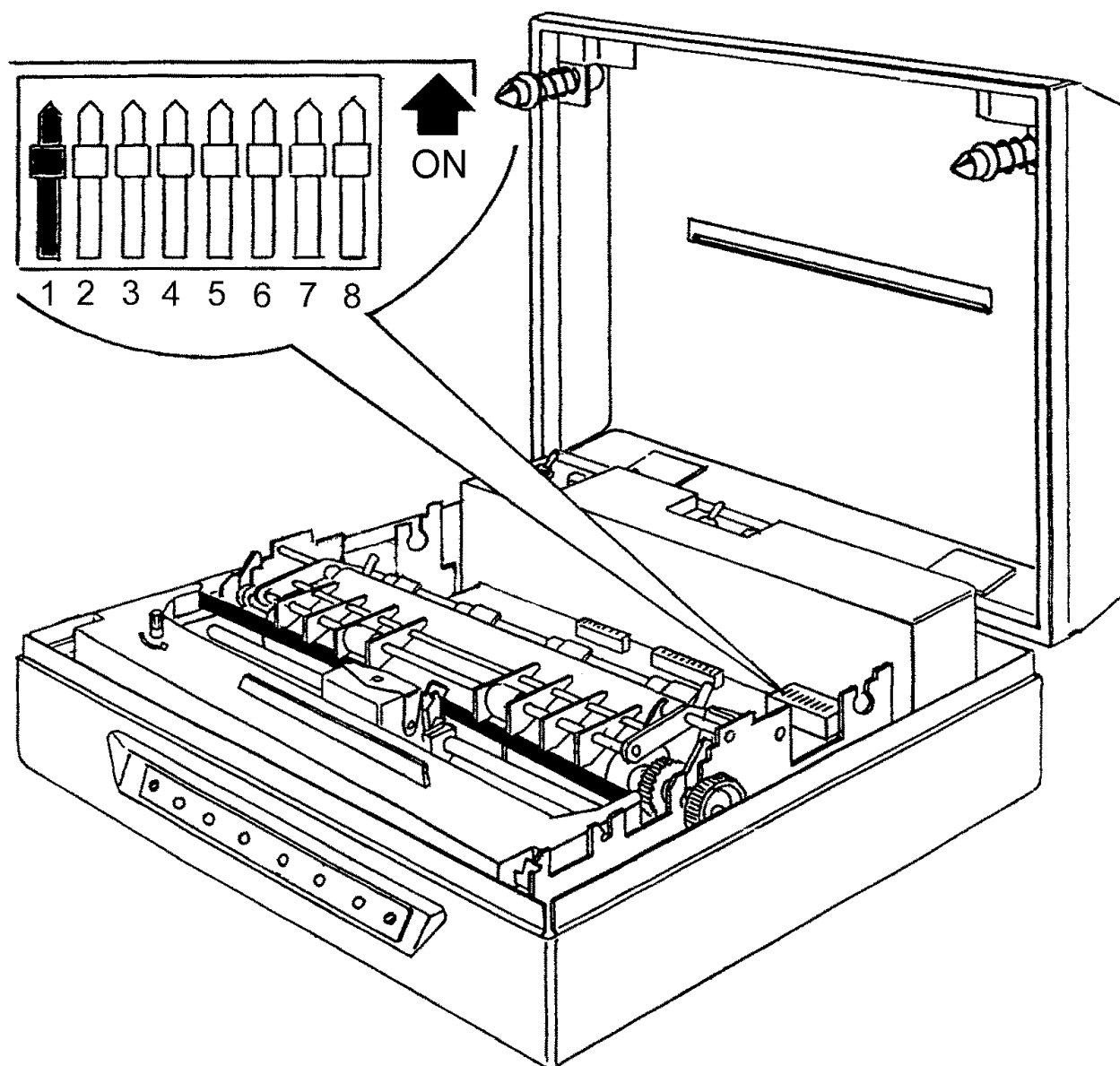


Figure 3 – УД-М. Parametric DIP-switch view

13.043.008 P3

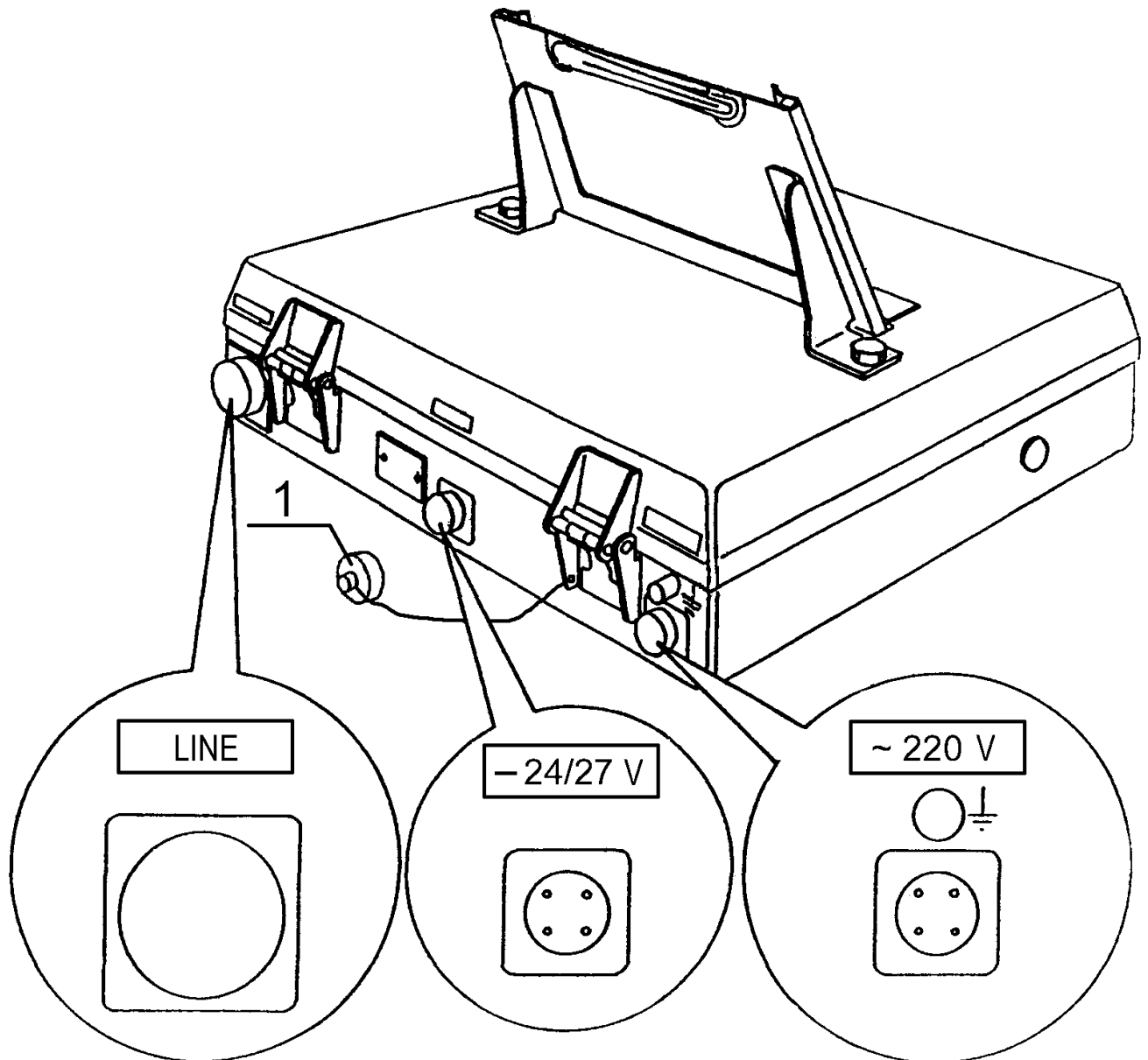


Figure 4 – УД-М. Rear view

13.043.008 P3

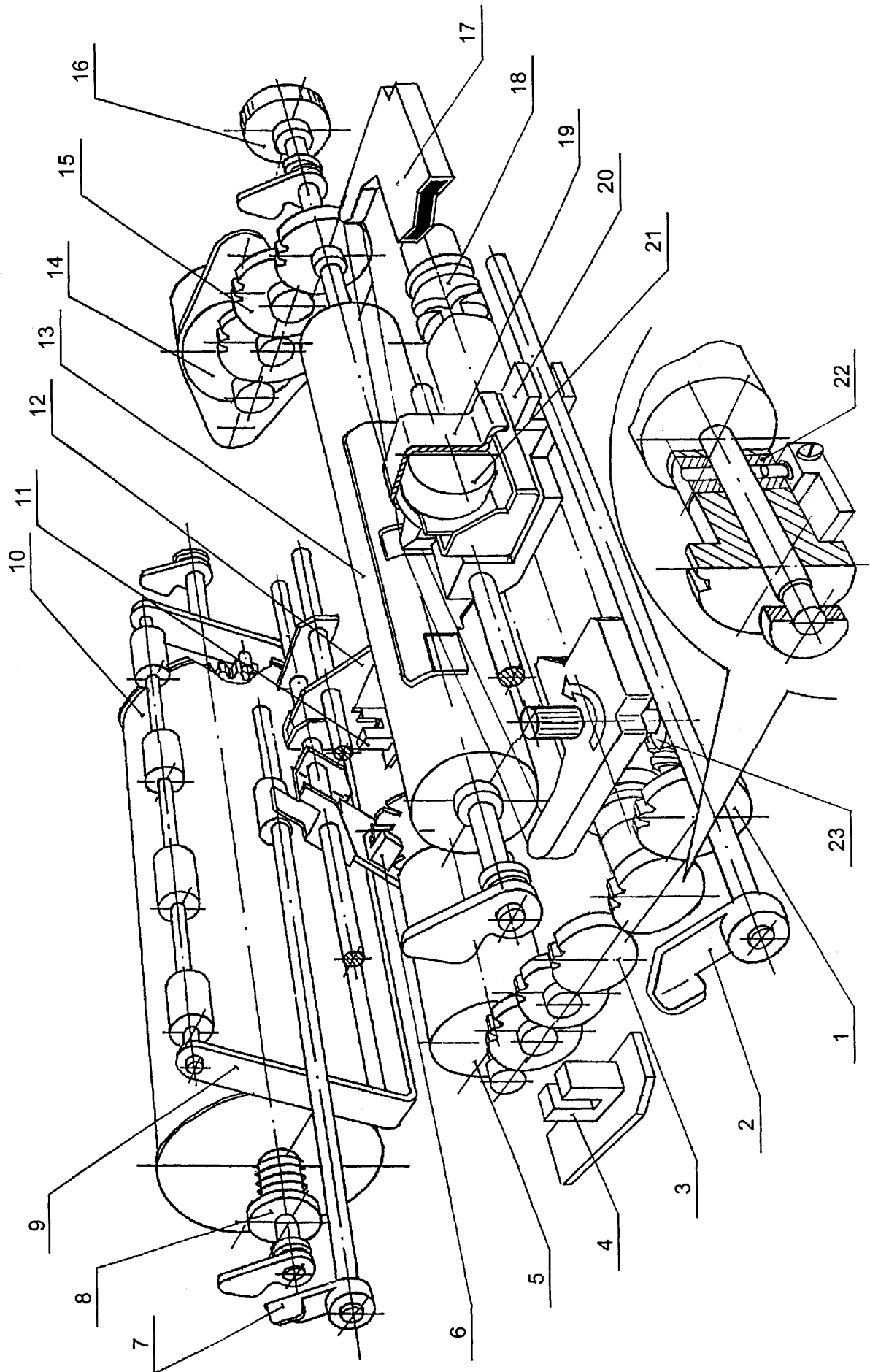


Figure 5 - УД-М. Printing unit kinematic scheme

13.043.008 P3

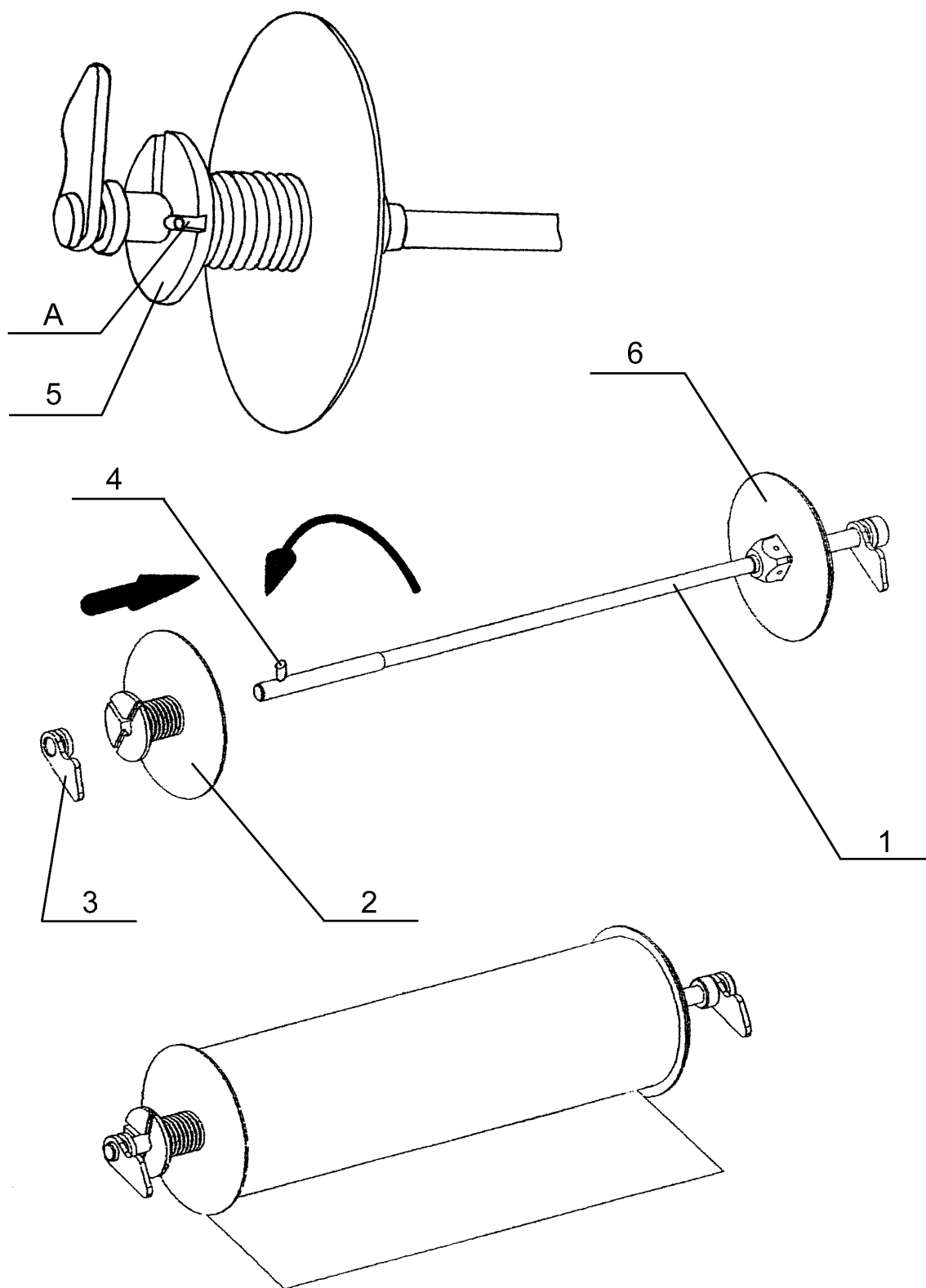


Figure 6 – Paper roll mounting

13.043.008 P3

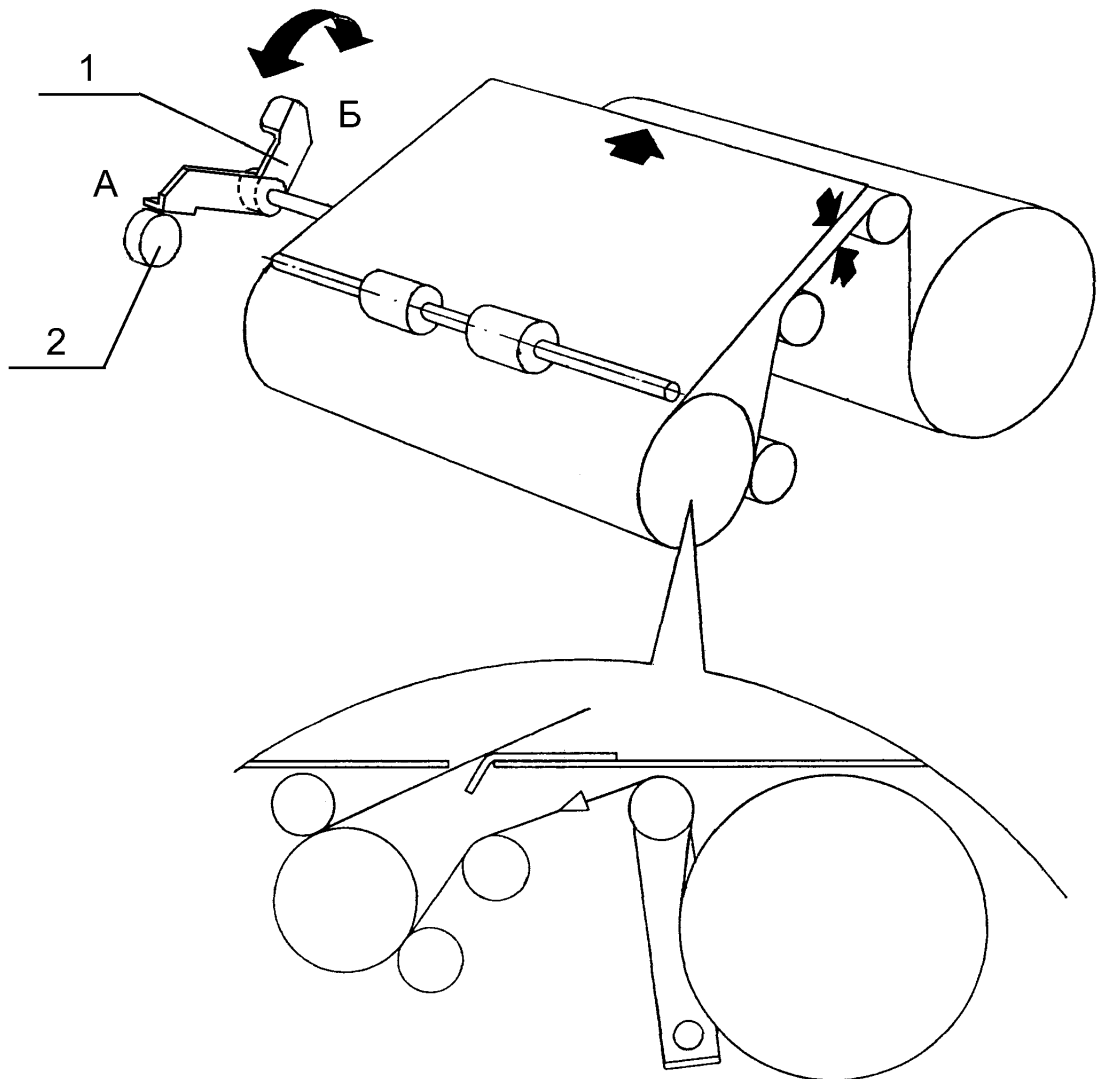


Figure 7 – Paper loading and guiding

13.043.008 P3

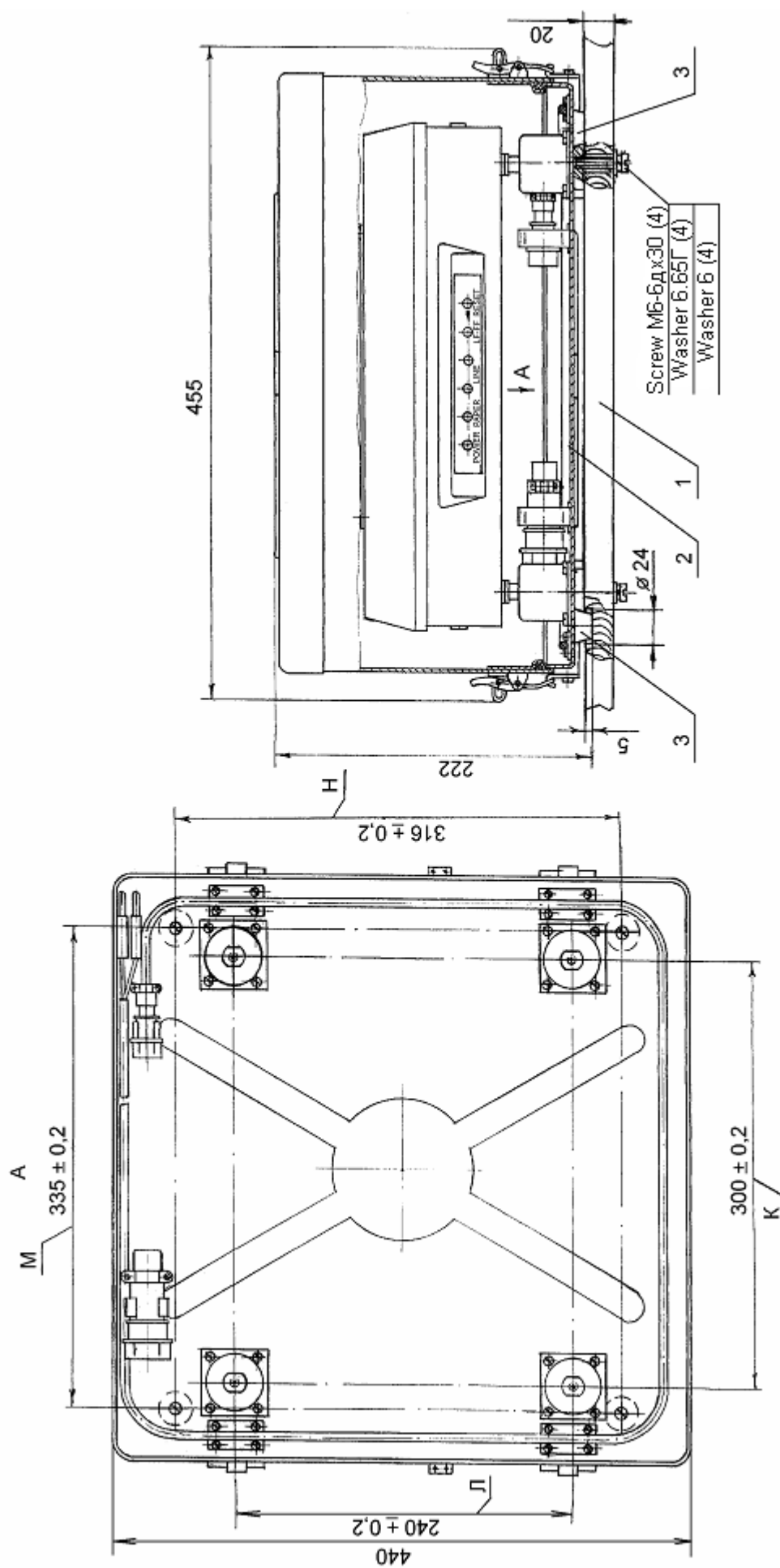


Figure 8 - УД-М312Э mounting using housing case bottom

13.043.008 P3



13.043.008 P3



Figure 10 – УД-М312ЭД on shock absorbers

13.043.008 P3

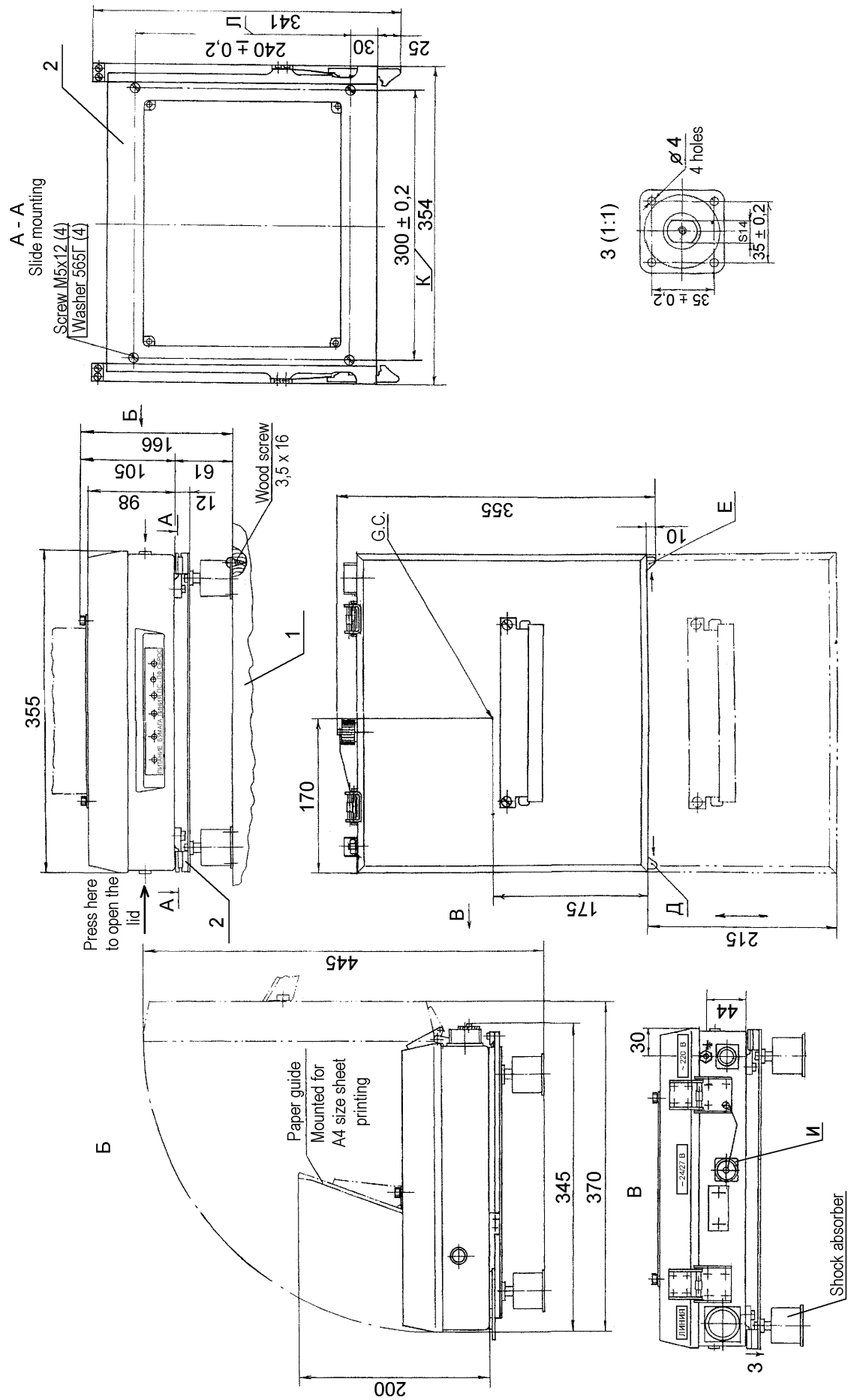


Figure 11 – Mounting УД-М512ЭД with a slide-frame on shock absorbers

13.043.008 P3

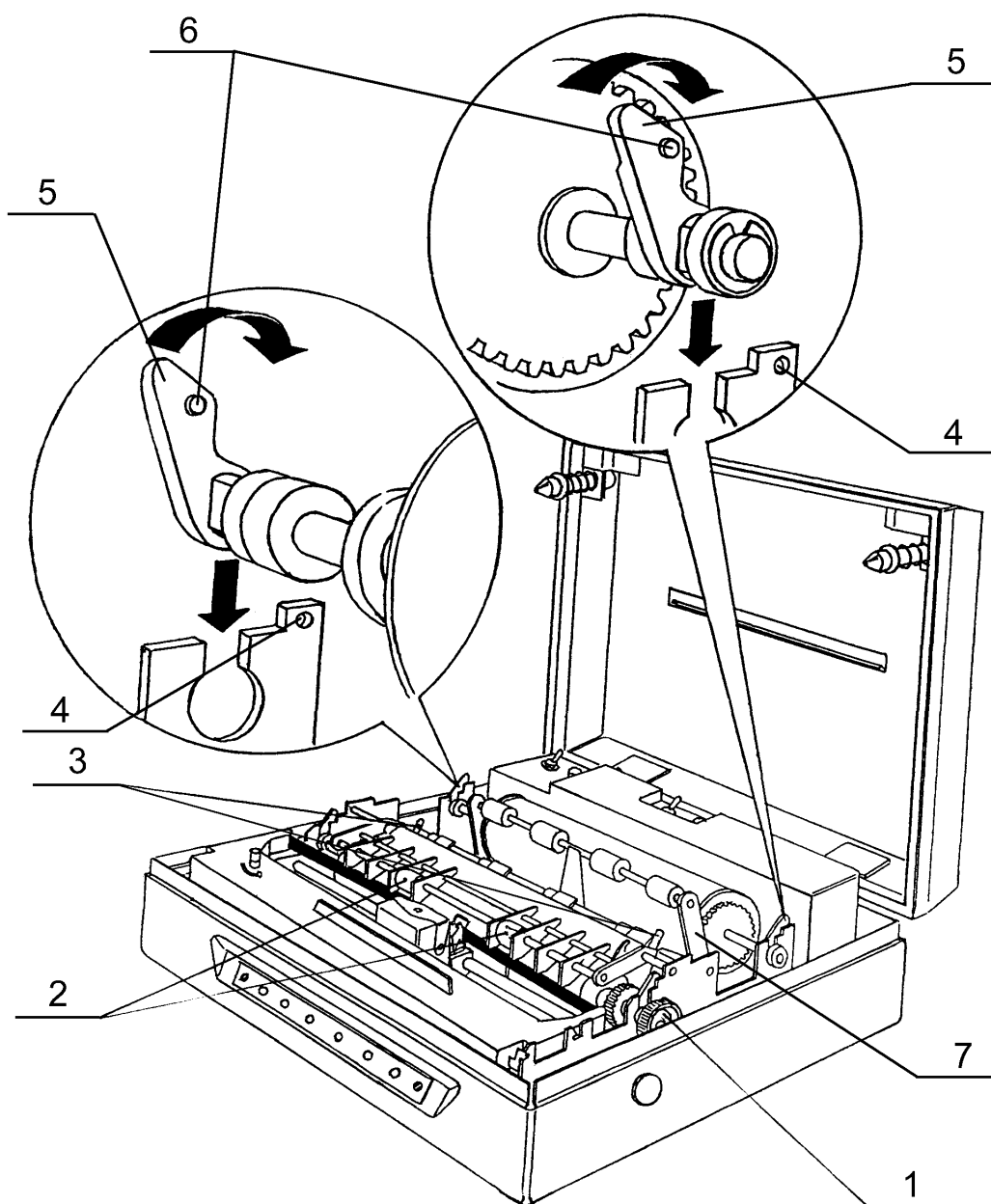


Figure 12 – Mounting paper reel into УД-М

13.043.008 P3

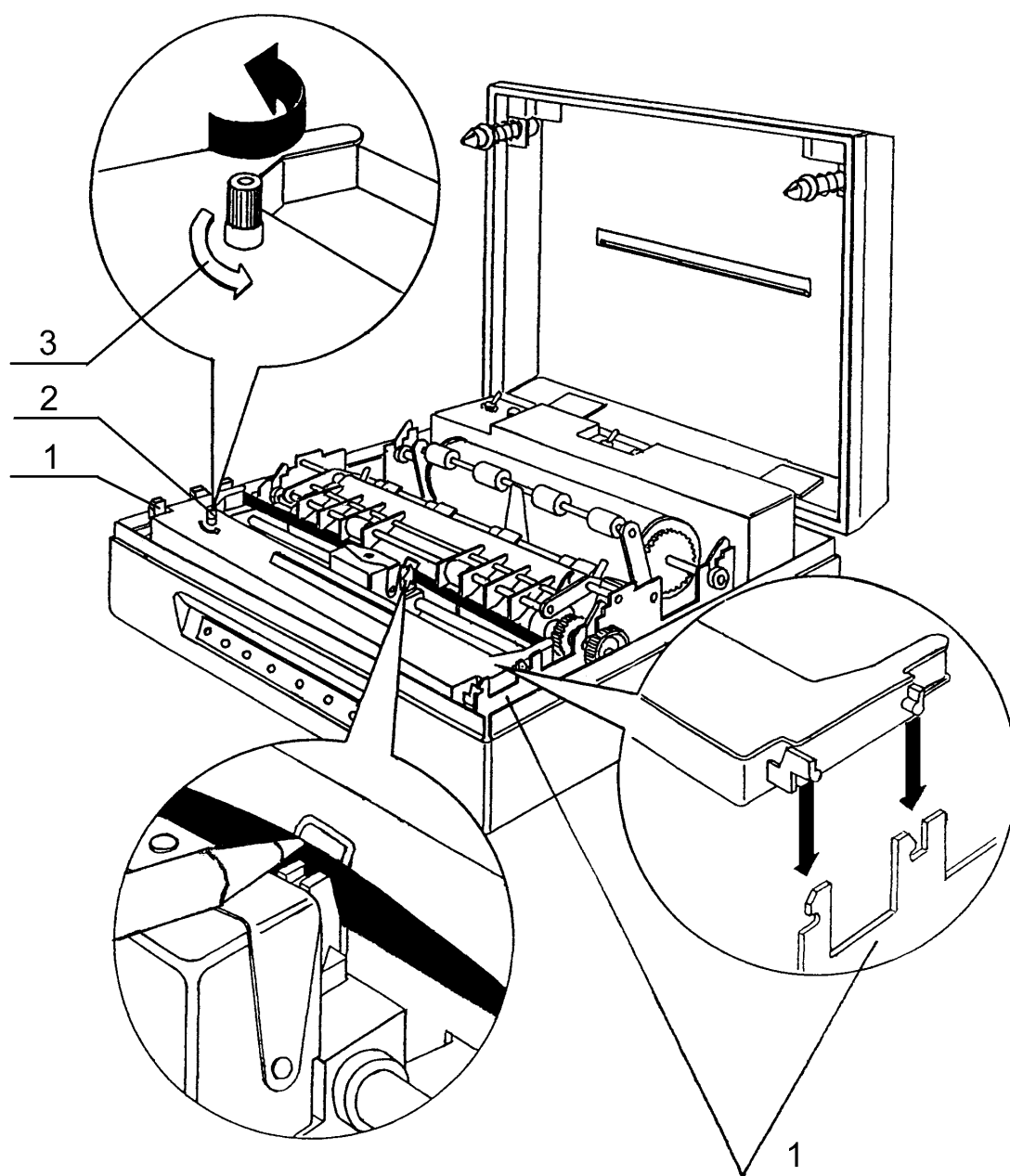


Figure 13 – Ribbon cartridge mounting

13.043.008 P3

(reference)

Table A.1 – PC866 code table (Russian)

Codes	High order bits															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	§	CAN	0	@	P	`	p	А	Р	а	␣	␣	␣	␣	р	Ё
1			!	1	A	Q	a	q	Б	С	б	␣	␣	␣	с	ё
2			«	2	B	R	b	r	В	Т	в	␣	␣	␣	т	ё
3			#	3	C	S	c	s	Г	У	г	|	|	␣	у	ё
4			\$	4	D	T	d	t	Д	Ф	д	|	—	␣	ф	ï
5			%	5	E	U	e	u	Е	Х	е	|	+	␣	х	ï
6			&	6	F	V	f	v	Ж	Ц	ж	||	|	␣	ц	ÿ
7	‘	7	G	W	g	w	З	Ч	з	␣	||	||	ч	ÿ		
8	LF	ESC	(	8	H	X	h	И	Ш	и	␣	␣	␣	ш	°	
9			)	9	I	Y	i	y	Й	Щ	й	||	␣	␣	щ	•
A	CR	*	:	J	Z	j	z	К	Ъ	к	||	␣	␣	ъ	·	
B		+	;	K	[	k	{	Л	Ы	л	␣	␣	␣	ы	√	
C		,	<	L	\	l	|	М	Ь	м	␣	␣	␣	ь	№	
D		-	=	M	]	m	}	Н	Э	н	␣	=	␣	э	⌘	
E		.	>	N	^	n	~	О	Ю	о	␣	␣	␣	ю	■	
F		/	?	O	_	o	DEL	Π	Я	п	␣	␣	␣	я	“	
Notes																
1 “LF” – line feed																
2 “FF” – form feed																
3 “CR” – carriage return																
4 “CAN” – cancel line buffer																
5 “ESC” – first byte of the control instruction																
6 “DEL” – delete last symbol in line buffer																

Table A.2 - KOI-7 code table

Codes	KOI-7 set “0”								KOI-7 set “0/1”							
	(High order bits)								(High order bits)							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0	0 @ P ` p								0 @ P Ю П							
1	! 1 A Q a q								! 1 A Q А Я							
2	« 2 B R b r								« 2 B R Б Р							
3	# 3 C S c s								# 3 C S Ц С							
4	\$ 4 D T d t								\$ 4 D T Д Т							
5	§	%	5	E	U	e	u		§	%	5	E	U	Е	У	
6	& 6 F V f v								& 6 F V Ф Ж							
7	‘ 7 G W g w								‘ 7 G W Г Б							
8	CAN	(	8	H	X	h	x		CAN	(	8	H	X	Х	Ь	
9	) 9 I Y i y								) 9 I Y И Ы							
A	LF	*	:	J	Z	j	z		LF	*	:	J	Z	Й	З	
B	ESC	+	;	K	[	k	{		ESC	+	;	K	[	К	Ш	
C	FF	,	<	L	\	l	|		FF	,	<	L	\	Л	Э	
D	CR	-	=	M	]	m	}		CR	-	=	M	]	М	Щ	
E	. > N ^ n ~								. > N ^ Н Ч							
F	/ ? O _ o DEL								/ ? О _ О DEL							
Notes																
1 “LF” – line feed																
2 “FF” – form feed																
3 “CR” – carriage return																
4 “CAN” – cancel line buffer																
5 “ESC” – first byte of the control instruction																
6 “DEL” – delete last symbol in line buffer																

AMENDMENT B

(standard)

УД-M instruction set

B.1 Printing control

“LF” – “LINE FEED”

Format:

ASCII code	LF
------------	----

Decimal	10
---------	----

Hexadecimal	0A
-------------	----

Description:

Line buffer data is printed out, paper is advanced for one line with current line spacing and printing position is set to the beginning of the line.

“FF” – “FORM FEED”

Format:

ASCII code	FF
------------	----

Decimal	12
---------	----

Hexadecimal	0C
-------------	----

Description:

Line buffer data is printed out and paper moves forward to reach bottom limit of page being printed on rolled paper or A4 size sheet paper is pushed out.

“CR” – “CARRIAGE RETURN”

Format:

ASCII code	CR
------------	----

Decimal	13
---------	----

Hexadecimal	0D
-------------	----

Description:

Line buffer data is printed out and printing position goes to the beginning of the line. Line feed is not carried out.

“CAN” – “CANCEL LAST LINE”

Format:

ASCII code	CAN
------------	-----

Decimal	24
---------	----

Hexadecimal	18
-------------	----

Description:

Line buffer data is canceled.

“DEL” – “DELETE LAST SYMBOL IN LINE BUFFER”

Format:

ASCII code	DEL
------------	-----

13.043.008 P3

Decimal 127

Hexadecimal 8F

Description:

Deletes last symbol in line buffer. Control codes remain unchanged.

“ESC @” – “RESET PRINTER”

Format:

ASCII code ESC @

Decimal 27 64

Hexadecimal 1B 40

Description:

УД-М is set to the initial status, according to p. 2.3.5.1.

Line buffer data is deleted.

Data take- in buffer is not emptied.

“ESC J” – “PERFORM ONE n/216-INCH PAPER FEED”

Format:

ASCII code ESC J n

Decimal 27 74 n

Hexadecimal 1B 4A n

Description:

n=0...255.

Line buffer data is printed out and paper moves n/216". No carriage return happens. The instruction does not affect line spacing set for LF instruction.

“ESC j” – “PERFORM ONE n/216-INCH REVERSE LINE FEED”

Format:

ASCII code ESC j n

Decimal 27 106 n

Hexadecimal 1B 6A n

Description:

n=0...255.

Line buffer data is printed out and paper is reversed for n/216". No carriage return happens. The instruction does not affect line spacing set for LF instruction.

If the upper edge of A4 size sheet is reached paper reverse is not performed.

At roll printing paper reverse is not limited.

B.2 Line spacing

“ESC 0” – “SET LINE SPACING TO 1/8 INCH”

Format:

ASCII code ESC 0

Decimal 27 48

Hexadecimal 1B 30

Description:

Set line spacing 1/8" for the next LF instructions.

“ESC 1” – “SET LINE SPACING TO 7/72 INCH ”

Format:

ASCII code ESC 1

Decimal 27 49

Hexadecimal 1B 31

Description:

Set line spacing 7/72" for the next LF instructions.

“ESC 2” – “SET LINE SPACING TO 1/6 INCH ”

Format:

ASCII code ESC 2

Decimal 27 50

Hexadecimal 1B 32

Description:

Set line spacing 1/6" for the next LF instructions. Set when VД-M power supply is ON.

“ESC 3” – “ SET LINE SPACING TO n/216 INCH ”

Format:

ASCII code ESC 3 n

Decimal 27 51 n

Hexadecimal 1B 33 n

Description:

n=0...255.

Set line spacing n/216" for the next LF instructions.

B.3 Printing density and types

“SI” – “CONDENSED PRINTING”

Format:

ASCII code SI

Decimal 15

Hexadecimal 0F

Description:

Set printing density 20 cpi. Modes ELITE, EMPHASIZED and DOUBLE WIDTH are blocked, but not canceled.

“ESC SI” – “CONDENSED PRINTING”

Format:

ASCII code ESC SI

13.043.008 P3

Decimal	27	15
---------	----	----

Hexadecimal	1B	0F
-------------	----	----

Description:

Set printing density 20 cpi. Modes ELITE, EMPHASIZED and DOUBLE WIDTH are blocked, but not canceled.

“DC2” – “CANCEL CONDENSED PRINTING”

Format:

ASCII code	DC2
------------	-----

Decimal	18
---------	----

Hexadecimal	12
-------------	----

Description:

Cancel printing density 20 cpi. Restore modes ELITE, EMPHASIZED and DOUBLE WIDTH.

“ESC M” – “PRINTING DENSITY 12 CPI”

Format:

ASCII code	ESC	M
------------	-----	---

Decimal	27	77
---------	----	----

Hexadecimal	1B	4D
-------------	----	----

Description:

Set printing density 12 cpi.

“ESC P” – “PRINTING DENSITY 10 CPI”

Format:

ASCII code	ESC	P
------------	-----	---

Decimal	27	80
---------	----	----

Hexadecimal	1B	50
-------------	----	----

Description:

Set printing density 10 cpi.

“ESC !” – “SELECT PRINTING MODE”

Format:

ASCII code	ESC	!	n
------------	-----	---	---

Decimal	27	33	n
---------	----	----	---

Hexadecimal	1B	21	n
-------------	----	----	---

Description:

Set printing modes according to table B.1.

Table B.1

Mode	Byte “n” (bit number)
“ELITE”	0
–	1
“CONDENSED”	2
“EMPHASIZED”	3
“DOUBLE STRIKE”	4
“DOUBLE WIDTH”	5
–	6
“UNDERLINING”	7

Digit 1 in byte “n” position sets corresponding mode, 0 – turns it off.

Any combinations of the above modes are possible.

ELITE, EMPHASIZED and DOUBLE WIDTH modes are blocked while CONDENSED mode is active and restore after it is canceled.

Modes description is given in p. 1.4.1.5.

Sign “–” in the mode column means that the bit is not activated and its state is “don’t care”.

“ESC –” – “START/STOP UNDERLINING”

Format:

ASCII code	ESC	–	n
Decimal	27	45	n
Hexadecimal	1B	2D	n

Description:

n=1 – start underlining,

n=0 – stop underlining.

Symbols “1” (code 31H) and “0” (code 30H) may be used as well.

“ESC E” – “EMPHASIZED PRINTING”

Format:

ASCII code	ESC	E
Decimal	27	69
Hexadecimal	1B	45

Description is given in p. 1.4.1.3.

“ESC F” – “CANCEL EMPHASIZED PRINTING”

Format:

ASCII code	ESC	F
Decimal	27	70
Hexadecimal	1B	46

13.043.008 P3

“ESC G” – “DOUBLE STRIKE PRINTING”

Format:

ASCII code	ESC	G
Decimal	27	71
Hexadecimal	1B	47

Description is given in p. 1.4.1.3.

“ESC H” – “CANCEL DOUBLE STRIKE PRINTING ”

Format:

ASCII code	ESC	H
Decimal	27	72
Hexadecimal	1B	48

“ESC S” – “SUBSCRIPT AND SUPERScript PRINTING”

Format:

ASCII code	ESC	S	n
Decimal	27	83	n
Hexadecimal	1B	53	n

Description:

n=1 – subscript printing, n=0 – superscript printing. Symbols “1” (code 31H) and “0” (code 30H) may be used as well.

“ESC T” – “CANCEL SUBSCRIPT AND SUPERScript PRINTING ”

Format:

ASCII code	ESC	T
Decimal	27	84
Hexadecimal	1B	54

“ESC W” – “EXPANDED PRINTING”

Format:

ASCII code	ESC	W	n
Decimal	27	87	n
Hexadecimal	1B	57	n

Description:

n=1 – expanded printing.

n=0 – cancel expanded printing.

Symbols “1” (code 31H) and “0” (code 30H) may be used as well.

“ESC x” – “SELECT NLQ OR DRAFT QUALITY CHARACTERS”

Format:

ASCII code	ESC	x	n
Decimal	27	120	n

Hexadecimal 1B 78 n

Description:

n=1 – NLQ characters, n=0 – cancel NLQ characters.

Symbols “1” (code 31H) and “0” (code 30H) may be used as well.

B.4 Graphic modes

“ESC *” – “SELECT EIGHT-NEEDLE GRAPHIC MODE”

Format:

ASCII code	ESC	*	m	n1	n2
Decimal	27	42	m	n1	n2
Hexadecimal	1B	2A	m	n1	n2

Description:

Graphic mode “m” is set.

m=0 – normal-density graphic mode – 60 dpi.

m=1 – low speed double-density graphic mode – 120 dpi .

m=2 – high speed double-density graphic mode – 120 dpi. The same needle cannot print two successive dots.

m=3 – low speed quadruple-density graphic mode – 240 dpi. The same needle cannot print two successive dots.

m=4 – graphic mode – 80 dpi.

Total number of columns = n1+(n2*256).

“ESC K” – “NORMAL-DENSITY GRAPHIC PRINTING”

Format:

ASCII code	ESC	K	n1	n2
Decimal	27	75	n1	n2
Hexadecimal	1B	4B	n1	n2

Description:

Eight-needle high speed graphic mode – 60 dpi. Total number of columns = n1+(n2*256).

“ESC L” – “DOUBLE-DENSITY GRAPHIC PRINTING”

Format:

ASCII code	ESC	L	n1	n2
Decimal	27	76	n1	n2
Hexadecimal	1B	4C	n1	n2

Description:

Eight-needle low speed graphic mode – 120 dpi. Total number of columns = n1+(n2*256).

“ESC Y” – “HIGH SPEED DOUBLE-DENSITY GRAPHIC PRINTING”

Format:

ASCII code	ESC	Y	n1	n2
Decimal	27	89	n1	n2

13.043.008 P3

Hexadecimal	1B	59	n1	n2
-------------	----	----	----	----

Description:

Eight-needle high speed graphic mode – 120 dpi. The same needle cannot print two successive dots. Total number of columns = $n1 + (n2 * 256)$.

“ESC Z” – “ LOW SPEED DOUBLE-DENSITY GRAPHIC PRINTING ”

Format:

ASCII code	ESC	Z	n1	n2
------------	-----	---	----	----

Decimal	27	90	n1	n2
---------	----	----	----	----

Hexadecimal	1B	5A	n1	n2
-------------	----	----	----	----

Description:

Eight-needle low speed graphic mode – 240 dpi. The same needle cannot print two successive dots. Total number of columns = $n1 + (n2 * 256)$.

AMENDMENT C

(standard)

CENTRONICS interface signals and time diagrams

Table C.1 – CENTRONICS interface signals

Connector LINE pin number	Signal name	Signal direction	Description
1	DATASTROBE	towards УД-М (input)	Pulse duration not less 0,5 μ s. Data is received by УД-М when high level signal goes low
2 – 9	DATA 0 – DATA 7	towards УД-М (input)	Eight lines receive data
10	ACKNOWLEDGE	from УД-М (output)	Low level signal means that data reception is completed and УД-М is ready to receive data. Pulse duration ~ 12 μ s.
11	BUSY	from УД-М (output)	High level signal means that УД-М cannot receive data. High level is set at data reception and remains high during data procession and in “OFF LINE” mode
12	PAPER END	from УД-М (output)	High level signal means “no paper” in УД-М
13	SELECT	from УД-М (output)	Terminal is connected to “+5 V” circuit through 4,7 $\kappa\Omega$ resistor
15	ERROR	from УД-М (output)	УД-М error signal. Low level signal is set when УД-М has “no paper”, in “OFF LINE” mode and in emergency situations
16	INPUT PRIME	to УД-М (input)	When this signal is low УД-М is set to initial status (system reset). Pulse duration should be not less 500 μ s
18,19	0 V	–	Signal ground
32	CHASSIS GROUND	–	Protective grounding. Terminal is connected to УД-М casing

13.043.008 PӨ

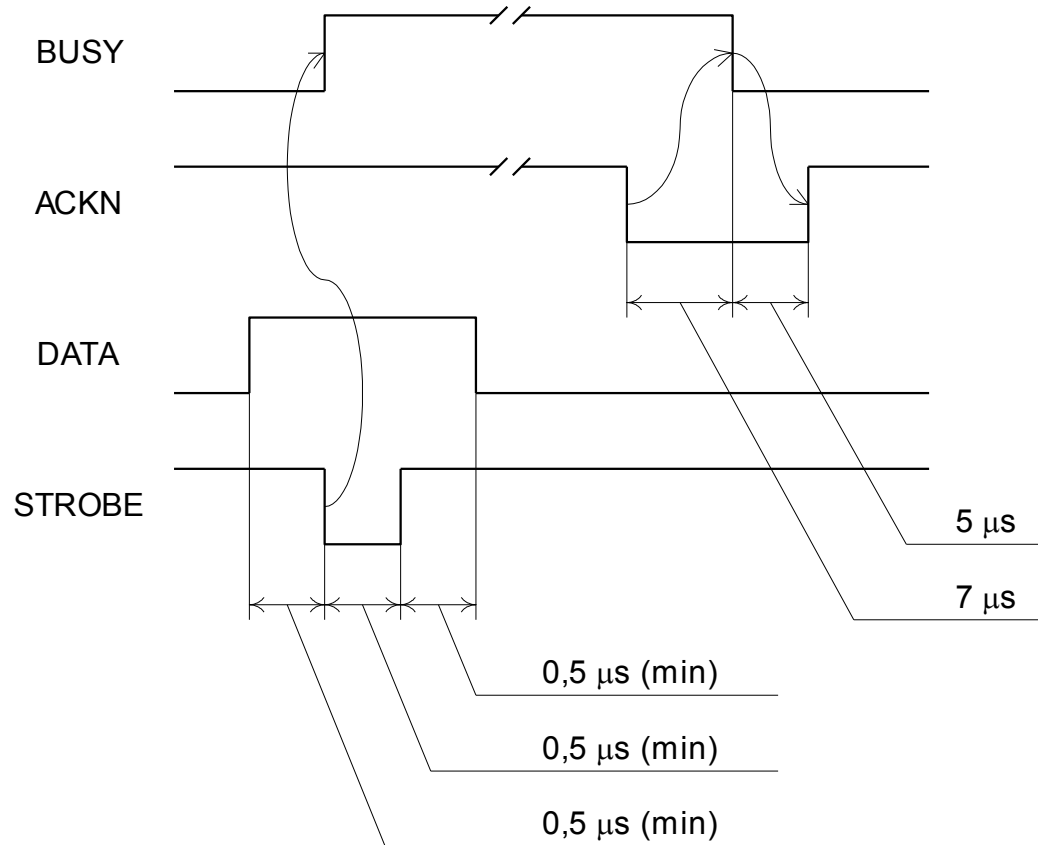


Figure C.1 CENTRONICS interface signals time diagrams

13.043.008 PӨ

AMENDMENT D

(standard)

Connecting and power supply cables circuit diagrams

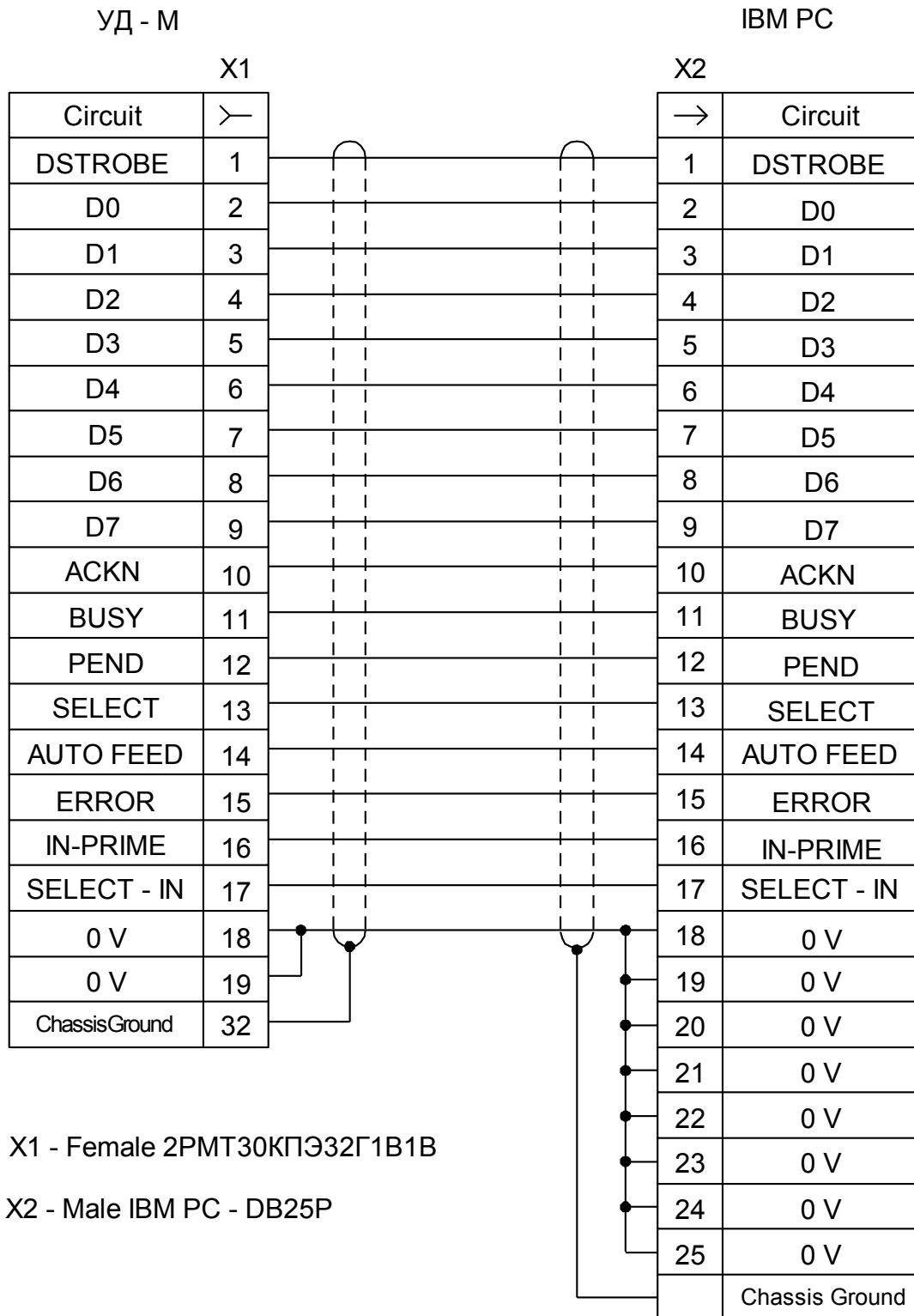
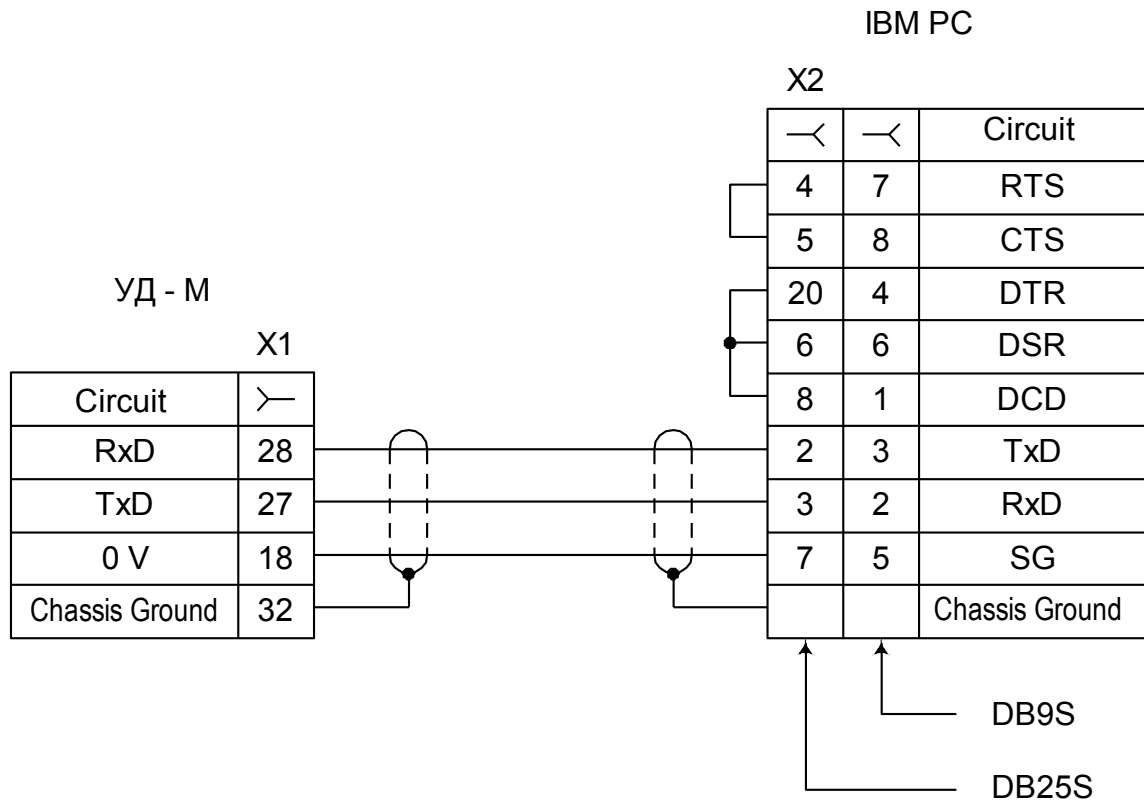


Figure D.1 Cable № 1 - to connect УД-M to LPT port

13.043.008 PӨ

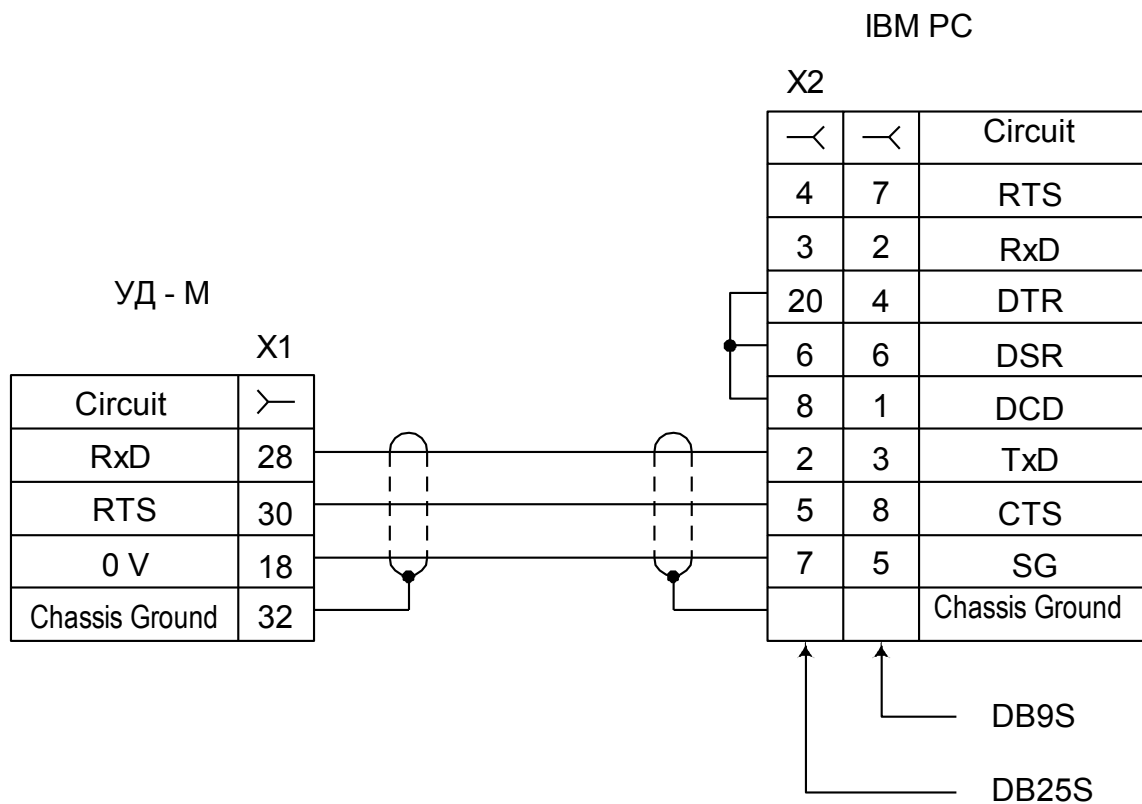


X1 – Female 2PMT30КПЭ32Г1В1В

X2 – Female IBM PC – DB25S or DB9S

Figure D.2 Cable № 2 - to connect УД-М to COM port (protocol XON/XOFF)

13.043.008 PƏ

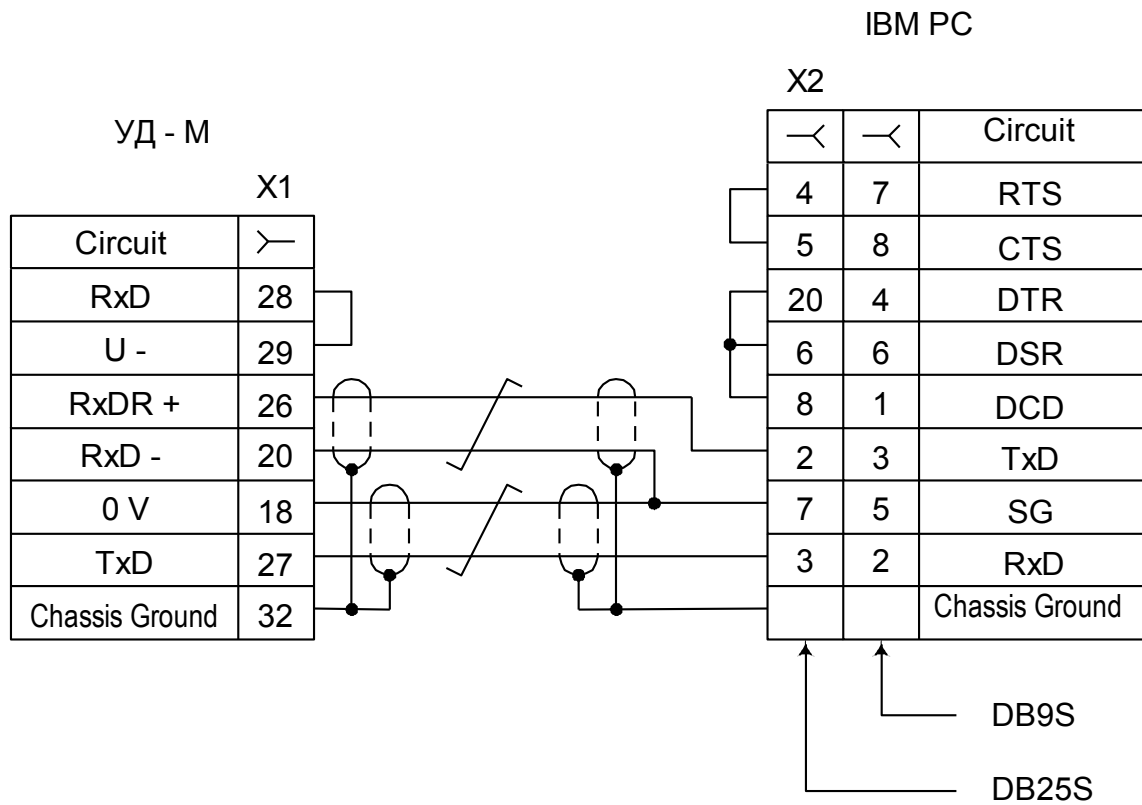


X1 – Female 2PMT30KПЭ32Г1B1B

X2 – Female IBM PC – DB25S or DB9S

Figure D.3 Cable № 3 - to connect УД-М to COM port (protocol RTS “READINESS”)

13.043.008 PӨ

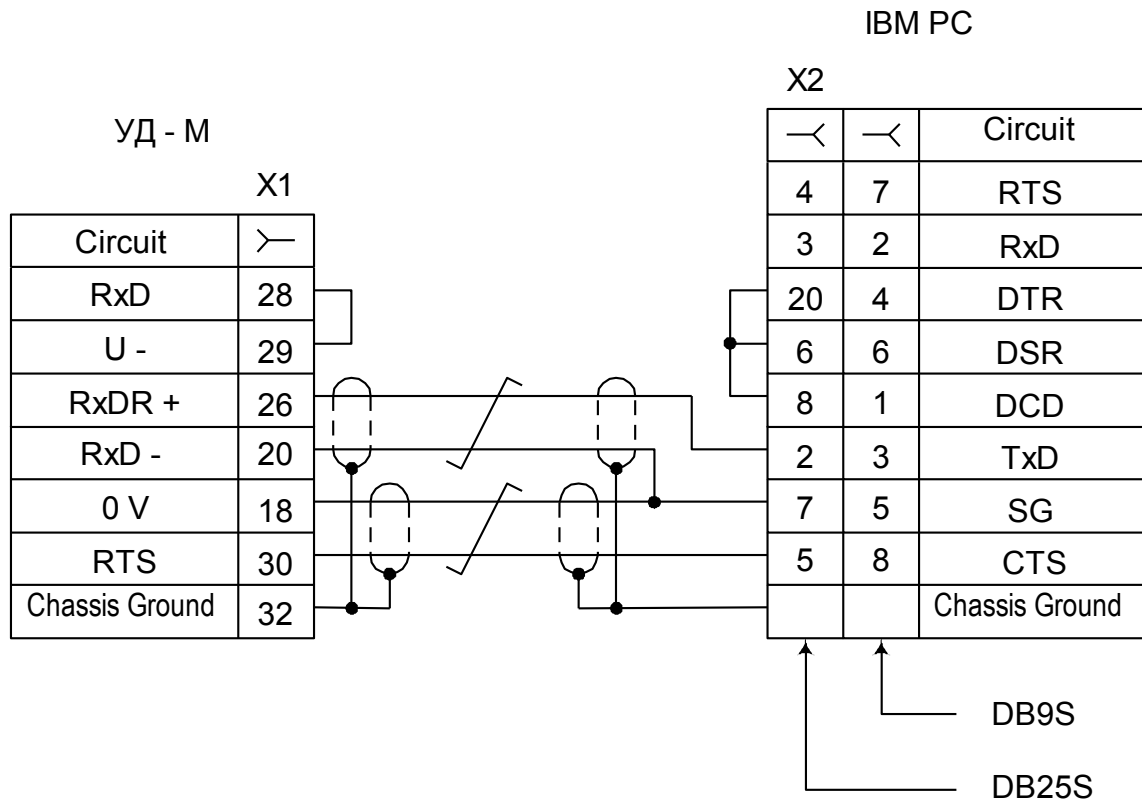


X1 – Female 2PMT30KПЭ32Г1B1B

X2 – Female IBM PC – DB25S or DB9S

Figure D.4 Cable № 4 - to connect УД-М to COM port (protocol XON/XOFF) with optron decoupling at УД-М side

13.043.008 PƏ

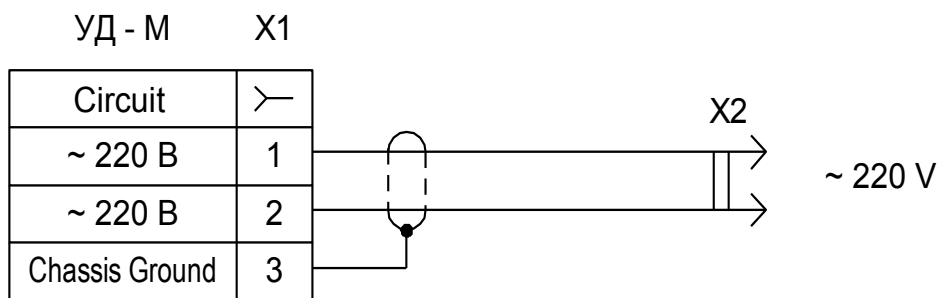


X1 – Female 2PMT30KПЭ32Г1B1B

X2 – Female IBM PC – DB25S or DB9S

Figure D.5 Cable № 5 to connect УД-М to COM port (protocol RTS “READINESS”) with optron decoupling at УД-М side

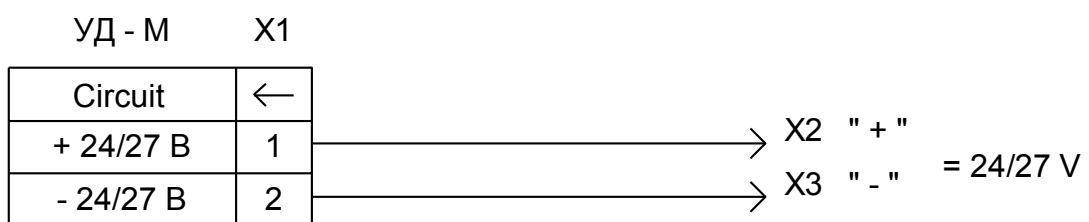
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X1 – Female 2PMT14КПН4Г1В1В

X2 – Two-pin ВД1

Figure D.6 УД-М AC power supply cable “~ 220 V”



X1 – Male 2PMT14КПН4Ш1В1В

X2, X3 – Single-pin plug

Figure D.7 УД-М DC power supply cable “–24/27 V”

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(reference)

ТЕСТ УД-М

Figure 1. Schematic diagram of the experimental setup.

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9 Черновой шрифт с подчеркиванием

10 Черновой шрифт двойной ширины

11 Качественный шрифт с подчеркиванием

12 Качественный двойной ширины

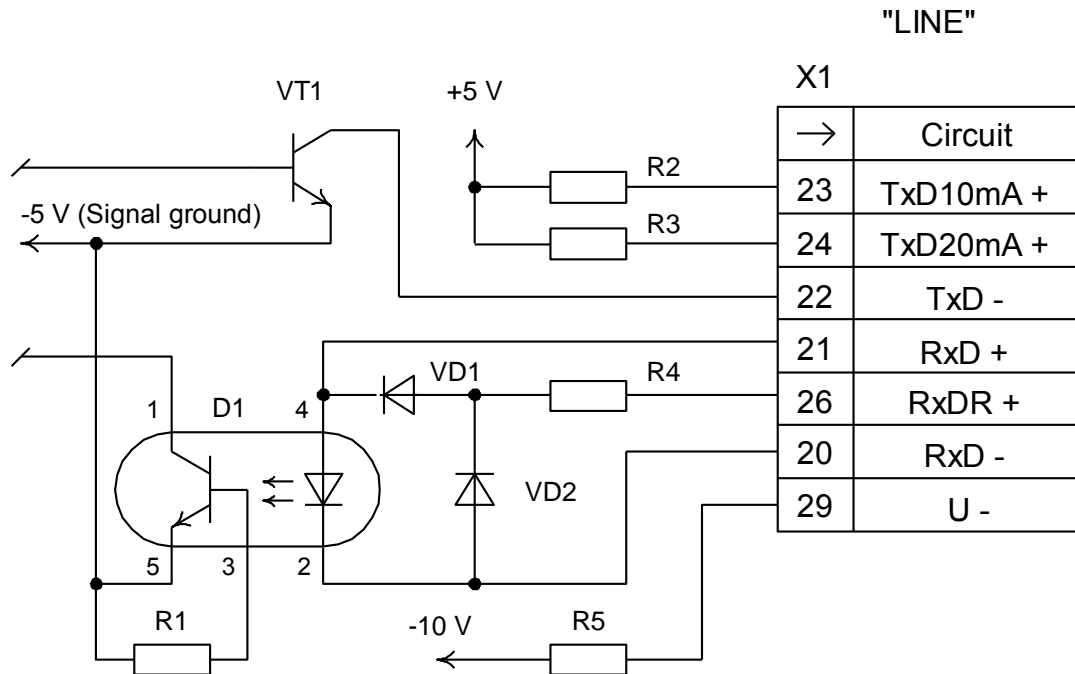
УД-М Printing TEST (sample)

TEST number	TEST name	Prints and symbol types
1	Символы псевдографики	Pseudo-graphic symbols
2	Черновой шрифт-10 знаков на дюйм	Draft printing 10 cpi
	Режим выделения	Emphasized printing
	Режим двойного удара	Double strike printing
	Режим выделения и двойного удара	Emphasized and double strike printing
3	Черновой шрифт-12 знаков на дюйм	Draft printing 12 cpi
4	Черновой шрифт-20 знаков на дюйм	Draft printing 20 cpi
	Режим двойного удара	Double strike printing
5	Качественный шрифт-10 знаков на дюйм	Quality printing 10 cpi
	Режим выделения	Emphasized printing
6	Качественный шрифт-12 знаков на дюйм	Quality printing 12 cpi
7	Качественный шрифт-20 знаков на дюйм	Quality printing 20 cpi
8	Надстрочные символы	Superscript
	Подстрочные символы	Subscript
9	Черновой шрифт с подчеркиванием	Draft printing with underlining
10	Черновой шрифт двойной ширины	Draft printing (expanded)
11	Качественный шрифт с подчеркиванием	Quality printing with underlining
12	Качественный двойной ширины	Quality printing (expanded)

AMENDMENT F

(reference)

УД-М optron decoupling circuit diagram



D1 – Transistor type optopair 3OT126A

R1 – Resistor C2-33H – 0,125 – 100 kΩ ± 10 %

R2 – Resistor C2-33H – 0,125 – 330 Ω ± 10 %

R3 – Resistor C2-33H – 0,25 – 160 Ω ± 10 %

R4 – Resistor C2-33H – 0,25 – 300 Ω ± 10 %

R5 – Resistor C2-33H – 0,125 – 10 kΩ ± 10 %

VD1, VD2 – Diode 2Д510А

VT1 – Transistor matrix 1HT251A

X1 – Male 2PMT30Б32Ш1В1В

ON state of LED in D1 optopair means that receiver is ON.

Open state of VT1 transistor means that transmitter is ON.

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