BELARUS
920.4/952.4
WITH ENGINE
D-245.43S3A/D-245.5S3A

920.4-0000010 OM

OPERATING MANUAL

(Supplement to operating manual for
BELARUS 920.3/952.3 tractors)

MTW 2009

CONTENTS

The operating manual is intended for study of arrangement, operating rules and maintenance of the tractors Belarus 920.4 / 952.4.

The present manual is a supplement of operating manual 900–0000010 OM and should be enclosed together with this manual.

Read carefully through this manual, operating manual 900–0000010 OM, operating manual for diesel engine 245 S3A – 0000100 OM, enclosed with your tractor. It will help you to get acquainted with methods of proper operation and maintenance.

Failure to follow this instruction can result in operator's injuries and tractor breakings.

Tractor operation, its maintenance and repairing must be carried out only by the specialists, acquainted with all its characteristics and informed about necessary safety requirements to prevent accidents.

Due to constant development of tractor, changes, which are not shown in the present operating manual, can be introduced into design of some assembly units and parts.

All unspecified changes, introduced into structure of any assembly units by the consumer, release the manufacturer from responsibility for subsequent operator's injuries and tractor breakings.

Accepted abbreviations and legend

ECM – Engine control module;
FPFV – frequency probe of fuel volume
ID – Integrated display;
MD – Multifunction display;
IDPC – Integrated display program console;
OM – Operating manual.

Other abbreviations and legend are given in Operating manual 900–0000010 OM.

1 TRACTOR DESCRIPTION AND OPERATION

1.1 Tractor designation

Tractor “BELARUS - 920.4” is manufactured on the base of tractor “BELARUS - 920.3”.

Tractor “BELARUS - 952.4” is manufactured on the base of tractor “BELARUS - 952.3”.

Tractors “BELARUS - 920.4 / 952.4” are designed for executing various agricultural works with mounted, semi-mounted and trailed machines and implements, for loading-unloading works, transportation works and for driving stationary agricultural machines; they are supplied to consumers in the Republic of Belarus and abroad.

1.2 Technical characteristics

1.2.1 General description

The tractors “BELARUS - 920.4/952.4” represent universal row-crop tractors of drawbar category 1.4.

The tractors “BELARUS - 920.4” are equipped with engine D-245.43S3A, produced by Minsk motor works, with electronic control system, with power of 62 kW. Engine conforms to environmental requirement of stage III A according to harmful substance emission.

Tractors “BELARUS - 952.4” is equipped with engine D-245.5S3A, produced by Minsk motor works, with electronic control system, with power of 70 kW. Engine conforms to environmental requirement of stage III A according to harmful substance emission .

Clutch coupling: friction, single-disk, closed-circuit, mechanically controlled.
Clutch facings: cerametallic.

Gearbox: mechanical, synchronized, with synchronized accelerator, doubling number of gears.

Rear axle: with main gear, differential and final drives. Differential lock control: electrohydraulic.

Front driving axle: with main gear, self-locking differential, final drives (planetary-cylindrical reduction gears). Front driving axle drive: transfer case with automatic engagement of FDA, two cardan shafts and intermediate bearing with overload clutch.

Service brakes: multidisk, oil-bath lubricated (“wet”), installed on the shafts of driving pinions of hub drives; parking brake – independent, with independent manual control.

Trailer brake drive: hydraulic, interconnected with tractor brake control or combined pneumatic drive interconnected with tractor brake control.

Hydraulic system: remote-cylinder with hydraulic hoist, with rear right-hand duplicated outlets of hydraulic system.

Rear lift linkage NU-2, with adjustable braces; NU lower links: telescopic; rod interlocking: outer, by means of telescopic tie-rods.

Rear power take-off shaft (PTO): separate, two-speed (540 and 1000 min^{-1}) and synchronous, rotation direction – clockwise from the side of shank end. PTO shanks: PTO 1 (6 or 8 splines, 540 min^{-1}), PTO 2 (21 splines, 1000 min^{-1}).

Cabin: unified, protection, securing safety, microclimate, protection against noise and vibration. Cabin is equipped with an electric wipers for front and rear windows and front window washer, climatic unit and cabin heater, Grammer sprung seat, adjustable according to operator’s height and weight. Additional front working headlights are installed on the brackets of front lamps.

1.2.2 Main parameters and characteristics

1.1.2 Main parameters and characteristics are specified in Table 1

Table 1

Parameter (characteristic) designation	Value for tractor “BELARUS”	
	920.4	952.4
1 Drawbar category according to GOST 27021	1,4	
2 Force exerted rating, kN	14	
3 Engine:		
a) Model	D-245.43S3A	D-245.5S3A
b) Type	Turbocharged	
c) Cylinder number and arrangement [2]	Four, in-line, vertical	
d) Displacement volume, l	4,75	
e) Power, kW:		
1) rated	62,0 ±2,0	70,0±2,0
2) normal	58,7±2,0	66,7±2,0
f) Crankshaft rated speed, rpm	1800	1800
g) Specific fuel consumption at nominal power, g/(kWh)	220±5,0/	220±5,0
h) Rated ratio of torque backup, %	25	
i) Specific oil consumption for burn-out, measured according to GOST 18509, g/(kWh)	$0,3^{+0,2}$	
j) Peak torque, Nm	411	464
4 PTO power at PTO mode “540 rpm”, at least kWh	58,3	
5 Specific fuel consumption at PTO power in PTO mode “540 rpm”, at least g/(kWh)	248	
6 Number of gears:		
a) forward	14	
b) reverse	4	
7 Tractor (design) speed on basic configuration tires at rated engine crankshaft speed, km/h:		
a) forward:		
1) minimum operating speed	2,65	
2) maximum traveling speed	38,1	
b) reverse:		
1) minimum	5,58	
2) maximum	12,57	

Cont. of Table 1

Parameter (characteristic) designation	Value for tractor “BELARUS”	
	920.4	952.4
8 Tractor weight, kg:		
a) structural weight	4150 ± 100	
b) operating weight	4450 ± 100	
c) maximum operating weight	7000	
d) shipping weight [1)]	4250	
9 Maximum of the average nominal floor pressures of driving machines, MPa	0,14	
10 Operating weight distribution over the axles, kg:		
a) front axle	1750 ± 50	
b) rear axle	2700 ± 50	
11 Allowable axle load, kN:		
a) front axle	37,0	
b) rear axle	53,0	
12 Maximum weight of towed trailer (trailer brakes are interconnected with tractor brakes), kg	9000	
13 Agrotechnical clearance under front axle, rear-axle and front-axle tubes, when interlocking of lift linkage lower rods is installed, at least mm:	510	
14 Wheel track dimension, mm:		
a) front wheels	1420-1970	
б) rear wheels	1500-1600, 1800-2100	
15 Minimal radius of turning in the middle of the outer front wheel mark at minimum wheel track applying partial braking of the inner rear wheel, m	4,5	
16 Tractor wheelbase, mm	2450±20	
17 Maximum fordable depth, m	0,85	
18 Nonrefuelling continuous work duration at 80 % engine load, at least h	10	
19 Mean time between failures of II and III complexity groups over the warranty period, at least h	500	

Cont. of Table 1

Parameter (characteristic) designation	Value for tractor "BELARUS"	
	920.4	952.4
20 Specific total operational maintenance burden, at least man –hour/h	0,026	
21 Service life period, years	10	
22 Overall dimensions, mm:		
a) length with ballast weights and rear lift linkage in transit condition	4440± 50	
b) length without ballast weights, with lift linkage in transport position	4060± 50	
c) length over external diameters of wheels	3850± 50	
d) width over the ends of rear wheel semi-axles	1970± 50	
e) cab height	2850± 50	
23 Tires (basic configuration):		
Front	360/70R24	
Rear	18.4R34	
24 Steering:		
a) steering wheel turning effort, when feeding pump is operating, not more than N	30	
b) number of steering wheel revolutions, ensuring complete angle of guide wheel turning, at least	6	
c) steering wheel backlash (free play), when feeding pump is operating, at least	25º	
d) steering wheel adjustment range:		
1) adjustment for tilt angle to the horizon with four position fixation	25º - 40º	
2) height adjustment along the steering shaft axis, mm	100±20 steplessly	
25 Electrical system		
a) operating supply voltage of onboard network, V	12	
b) rated starting voltage, V:	24	
26 Working equipment:		
a) rear PTO		
1) PTO shank speed with separate drive, rpm:		
- I speed	540	
- II speed	1000	

End of Table 1

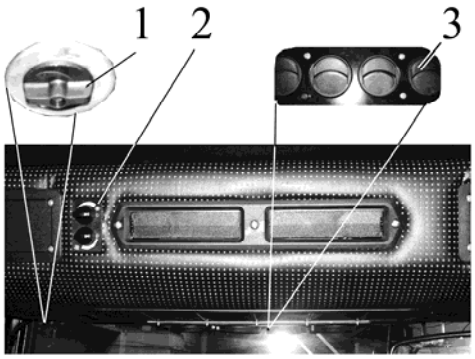
Parameter (characteristic) designation	Value for tractor “BELARUS”
2) PTO shank speed with synchronous drive, rev. per meter of travel	3,2 For tires 18.4R34
b) rear lift linkage:	
1) lifting capacity of rear lift linkage on suspension axle, at least kg	4000
2) pump volume feed at rated engine crankshaft speed, at least l/min	45
3) hydraulic system pressure relief cracking pressure, MPa	20^{-2}
4) conditional volume factor of hydraulic system (efficiency factor), at least	0,65
5) lifting time for rear lift linkage from the lowermost position into uppermost position with test load on the suspension axle, s, at least	2,2
c) drawbar hitch:	
1) virtual displacement of coupling point, mm:	
- in horizontal plane relative to tractor longitudinal axis	160 with intervals of 80±5
- in vertical plane relative to ground surface on the basic configuration tires, mm:	200 – 500
2) distance between PTO end and towing yoke hole axis, mm	395±10
3) opening, mm:	
- depth	65±2
- height	62±2

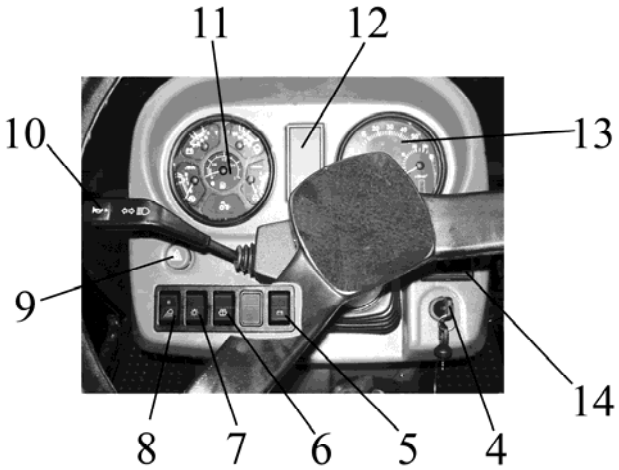
[1)] To be specified depending on the configuration.

1.3 Tractor structure and operation

1.3.1 Controls and Instruments

This operating manual gives description and principle of operation of only controls and instruments, specified in section 1.3.1. Location, designation and principle of operation of other controls (levers, pedals, key switches, etc.) are similar to BELARUS-920.3/952.3 and are represented in Operating manual RE 900-0000010, attached to tractors BELARUS -920.4/952.4.





1 – Control handle of heater control valve;
2 – Climatic installation control panel;
3 – Deflectors;
4 – Switch of starter and instruments;
5 – Remote battery disconnect switch;
6 – Windshield washer switch;
7 – Main light switch;
8 – switch of front headlights installed on brackets of front lights;
9 – Switch of hazard warning flasher;
10 – Multi-function underwheel switch (turn indicator, high/low beams, horn, signaling with high beam);
11 – Instrument cluster;
12 – Signal lamp unit;
13 – Integrated display;
14 – Program console of integrated display.

Figure 1.1 – Controls and instruments

1.3.2. Switch of starter and instruments

Switch of starter and instruments 4 (Fig. 1) has four positions:

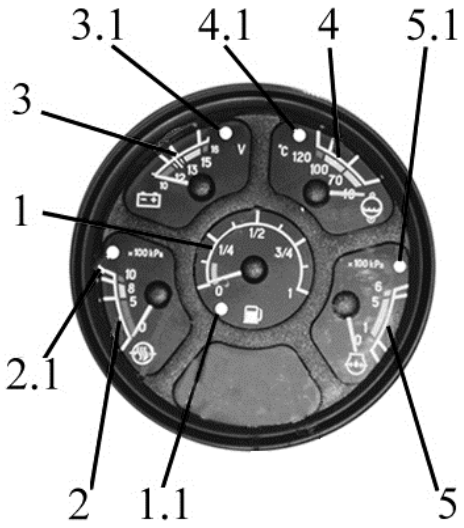
- 0 — Switched off;
- I — Instruments, pilot lamp unit, glow plugs are switched on;
- II — Starter is switched on (non-retained position);
- III —Radio receiver is on (the key turned counterclockwise).

Figure 1.2 – Switch of starter and instruments

ATTENTION: STARTER REENGAGEMENT IS POSSIBLE ONLY AFTER RETURNING THE KEY TO “0” SWITCH POSITION. TO MOVE THE SWITCH OF STARTER AND INSTRUMENTS INTO “III” POSITION IT IS NECESSARY TO FORCE THE KEY INTO THE SWITCH AND TURN IT COUNTERCLOCKWISE.

1.3.3 Instrument cluster

Instrument cluster 11 (fig. 1.1) includes five indicators with alarm lamps (fig. 1.3).



1 – Fuel gauge;
1.1 – Reserve fuel level alarm lamp;
2 – Pneumatic system air pressure gauge;
2.1 – Emergency pneumatic system pressure alarm lamp;
3 – Voltage indicator;
3.1 – Indicator lamp of additional battery charging;
4 – Engine coolant temperature gauge;
4.1 – Engine coolant temperature alarm lamp;
5 – Engine lubricating system oil pressure indicator;
5.1 – Alarm lamp of emergency engine lubricating system oil pressure.

Figure 1.3 – Instrument cluster

Scale of fuel gauge 1 (Fig. 1.3) has sections 0 – 1/4 – 1/2 – 3/4 – 1**.**
Alarm lamp 1.1 is built into the gauge scale (Fig. 1.3) (orange), which lights up when fuel quantity in tank drops down to 1/8 of total tank capacity.
ATTENTION: AVOID USING THE FUEL TO REACH THE STATE OF "DRY TANK" (INDICATOR NEEDLE IS IN ORANGE AREA)

Scale of pneumatic system air pressure gauge 2 (Fig. 1.3) has three areas:
- operating area – from 500 to 800 kPa (green);
- emergency area (two) – from 0 to 500 kPa and from 800 to 1000 kPa (red).
Alarm lamp 2.1 (Fig. 1.3) (red) is built into the gauge scale, and it lights up when pneumatic pressure drops down below 500 kPa.

Voltage indicator 3 (Fig. 1.3) shows storage batteries voltage with shut-down engine, when the switch key of starter and instruments (Fig. 1.2) is in I position. When the engine is running, voltage indicator shows voltage across generator terminals. Red alarm lamp 3.1 (Fig. 1.3) is built into the voltage indicator scale. It is used only in 24V starting system, shows the charging process of the second storage battery with 24V voltage, tests performance of voltage converter.

State of power-supply system

Table 2

Area on the scale of voltage indicator 3 (Fig. 1.3), color	State of power-supply system	
	with running engine	with shut-down engine
13.0 – 15.0 V green	normal charging function	-
10.0 – 12.0 V red	generator is out of operation	Storage battery is discharged
12.0 – 13.0 V yellow	no storage battery charging (low charging voltage)	Storage battery has normal charge
15.0 – 16.0 V red	Overcharging of storage battery	-
white matchmark in yellow area	-	Rated EMF of Storage battery – 12.7 V

ATTENTION: IF VOLTAGE INDICATOR DISPLAYS ABSENCE OF STORAGE BATTERY CHARGING, CHECK THE STATE AND TENSION OF GENERATOR DRIVING BELT

Engine coolant temperature gauge 4 (Fig. 1.3) reads information from engine control module (ECM). Gauge scale has three areas:
- operating area — from 70 to 100 °C (green).
- information area — from 40 to 70 °C (yellow)
- emergency area — from 105 to 120 °C (red).
High temperature alarm lamp (red) 4.1 (Fig. 1.3) is built into the gauge scale, it works in two modes:
a) – lights up and works in a flashing mode at coolant temperature values from 109 to 112 °C inclusive.
b) – is constantly glows at coolant temperature values from 113 °C and above.

Engine lubricating system oil pressure indicator 5 (Fig. 1.3) reads information from engine control module (ECM). Gauge scale has three areas:
- operating area — from 100 to 500 kPa (green);
- emergency areas (two) — 0 to 100 kPa and from 500 to 600 kPa (red).

Alarm lamp of emergency oil pressure drop (red) 5.1 (Fig. 1.3) is built into the gauge scale, and lights up when oil pressure drops below 100 kPa.

Note – During the cold engine starting the pressure can come up to 600 kPa.

Attention: IF LOW PRESSURE LAMP IS ON WITH THE ENGINE RUNNING, STOP THE ENGINE IMMEDIATELY AND ELIMINATE THE MALFUNCTION.

1.3.4. Pilot lamp unit

The pilot lamp unit 12 (fig 1.1) is located on the dashboard and includes three lamps. Layout chart of pilot lamps corresponds to Figure 1.4.

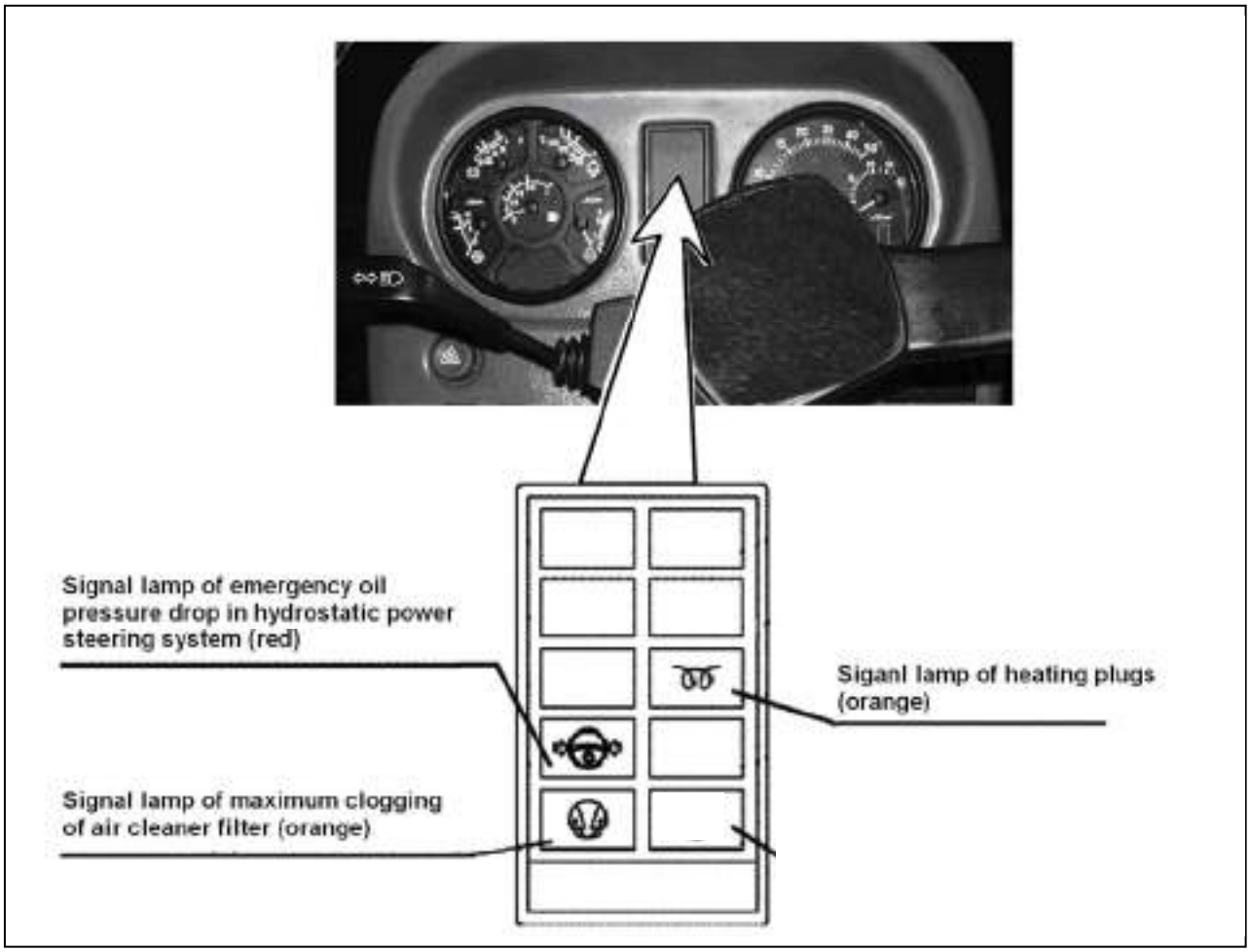


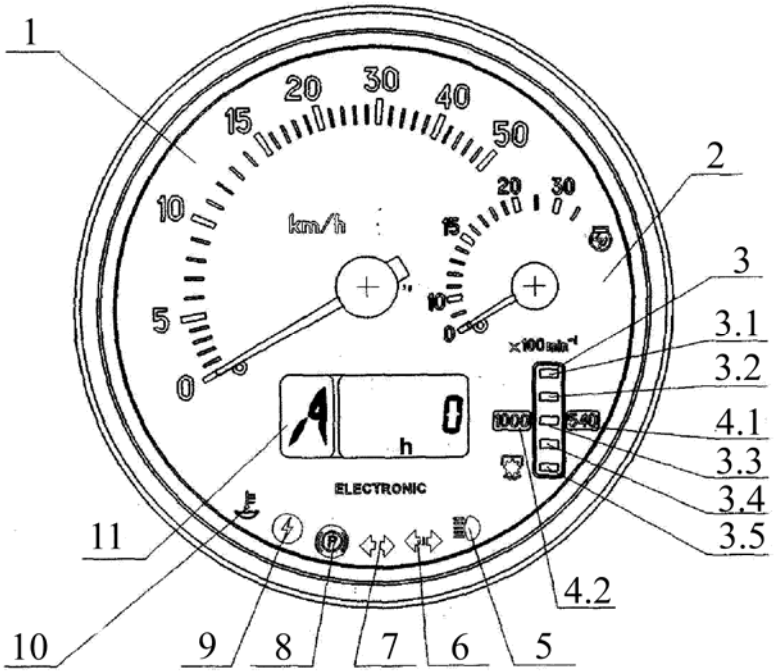
Figure 1.4 – Pilot lamp unit

Principles of pilot lamps operation shown in Figure 1.4 are described in the 900–0000010 OM.

1.3.5. Integrated display

Integrated display 13 (Fig. 1.1) (hereafter - ID) and program console of integrated display 14 (Fig. 1.1) (hereafter - PU) display information on performance parameters of tractor systems and assemblies and provide operator with data on malfunction and failure of some system.

ID includes indicators and announciating lamps according to Figure 1.5:



1 – speedometer (needle indicator);

2 – tachometer (needle indicator);

3 – PTO tachometer (indicator lamp);

3.1, 3.5 – segments of PTO speed scale (yellow);

3.2, 3.3, 3.4 – segments of PTO speed scale (green);

4.1, 4.2– announciators of PTO speed scale ranges (yellow);

5 – high-beam pilot lamp-indicator (blue);

6 – trailer turn pilot lamp – indicator (green);

7 – tractor turn pilot lamp – indicator (green);

8 – parking brake pilot lamp – indicator (red);

9 – high on-board voltage pilot lamp-indicator (red);

10 – low coolant level pilot lamp-indicator (yellow);

11 – multifunction display;

Figure 1.5 – Integrated display

1.3.6. Designation and principle of operation of integrated display indicators

a) 1 (Fig. 5) – speedometer – displays design tractor speed on needle indicator. Design speed is higher than actual speed as far as tractor skidding is not considered.

The indicator works upon signals from pulse sensors of final drive tooth gear speed of left and right rear tractor wheels. Speed is indicated upon a signal from the sensor, installed on final drive gear of the wheel, rotating at lower speed.

If one of speed sensors is defective, integrated display shows speed readouts with speedometer upon the signal from nondefective sensor. On LCD display of ID specific malfunction of circuits or speed sensors, if signals from them are missing, is represented in the form of digit “0”, which defines malfunction location, to the left and to the right (see below).

b) 2 (Fig. 1.5) – tachometer, displays engine crankshaft speed on needle indicator.

Information on engine speed on tractors BELARUS-952.4/920.4 comes from electronic control module. Speed readouts range is from 0 to 3500 (rpm).

c) 3 (Fig. 1.5) – PTO tachometer displays PTO speed on indicator lamp.

PTO tachometer operates upon the frequency signal, resulting from recalculation of engine speed by means of entered value of index “KV2” (see below), other than “0”, meanwhile value of index “ZV”, equal to “0”, should be entered (see below).

When ID is switched on (see below the description of device functional check) and engine is running (message “engine speed” from ECM is transmitted) identifications of scales “540” and “1000” are illuminated simultaneously.

Indication of PTO scale segment (with regard to the entered value of index “KV2”) occurs when PTO rated speed, equal to 750 rpm, is achieved.

For reference:

indication of lower PTO scale segment (with regard to index “KV2”) occurs when engine speed of 1400-1500 rpm and above is achieved.

According to selected PTO speed mode (540 or 1000) illuminated scale segments identify value of PTO speed in accordance with given table 3.

Table 3

“540”	“1000”	Segment location on scale
650	1150	3.1
580	1050	3.2
500	950	3.3
420	850	3.4
320	750	3.5

“PTO speed” mode of liquid-crystal display 11 of multifunctional display (Fig. 1.5) (see below the description of multifunctional display operation) is not active in this case.

d) 11 (Fig. 1.5) - multifunctional display (MD) is a liquid-crystal display, displays information in two fields at the same time (see fig. 1.6):

"1" – digital identification of transmission switch position (digits from 0 to 6) or letter identification of reduction unit switch position (letters L, M, H, N);
"2" – current numerical value of one of tractor system parameters

Figure 6 – MD information fields

Integrated display receives information on transmission switch position from transmission control module (if combined electronic control system (CECS) is available) or from range reduction unit control module (if available). This parameter is displayed in information field "1" (Fig. 1.6). If control modules are not available or are not connected or wire is broken, letter "A" is displayed in the information field "1".

Following parameters are displayed in information field "2" (Fig. 1.6):
- Total elapsed operating time of engine;
- Instantaneous fuel consumption;
- On-board system voltage;
- Remaining fuel volume;
- Operation time with remaining fuel;
- Operability diagnostics of speed sensors;
- Operability diagnostics of frequency probe of fuel volume (FPFV)
- Diagnostics of operability and connection of CAN-bus to ID.

Selection of display modes among "Total elapsed operating time of engine", "Instantaneous fuel consumption", "Remaining fuel volume", "Operation time with remaining fuel", "On-board system voltage", failure messages is made with "Mode" button of program console 14 (Fig. 1.1). Description of operation algorithms of modes "Operability diagnostics of speed sensors", "Operability diagnostics of frequency probe of fuel volume (FPFV)", "Diagnostics of operability and connection of CAN-bus to ID" is given above.

1. Total elapsed operating time of engine in hours.

Counter amasses information on total time of engine operation when message "engine speed" is transmitted from ECM and stores it when power supply is disconnected.

Readout range is from 0 to 99999 of engine operating hours.

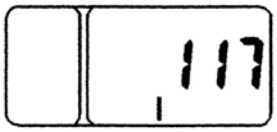
2. Instantaneous fuel consumption

This mode displays current value of instantaneous fuel consumption, readout resolution is 0,1 l/h.

3. On-board system voltage

This mode displays current value of system voltage in digital form.

4. Remaining fuel volume



This mode displays current fuel amount in tank in liters.
This mode is available only on stopped tractor (when there are no signals from speed sensors).

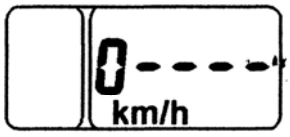
Note: Tractor should be stopped on horizontal surface in order to increase displaying accuracy of fuel amount in tank.

5. Operation time with remaining fuel

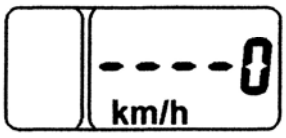
This mode displays anticipated time of engine operation, calculated for current values of instantaneous fuel consumption and remaining fuel.

ID in the mode of failure messages displaying

1. Diagnostics of speed sensor operability and connection:



– left wheel sensor



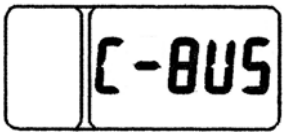
– right wheel sensor

When signals from speed sensors are missing for 10-12 seconds, LCD display shows a message in form of digit “0”, characterizing location of defective sensor (left of right).

2. Operability diagnostics of frequency probe of fuel volume (FPFV):

When frequency signal from FPFV is missing for 2 seconds, LCD display of ID displays “FUEL” message.

3. Diagnostics of operability and connection of CAN-bus to ID with CAN interface:



Absence of signal in CAN-bus (ID) is accompanied with “C-BUS” message.

Every failure message (**Example**: 0---, FUEL, C-BUS) is displayed on LCD display in priority irrespective of information displayed. When pressing “Mode” button consecutively, there should be messages paging. When viewing the last message and pressing “Mode” button again, LCD display proceeds to the mapping mode according to the cycle of previously specified operating parameters.

Failure message displaying on LCD display occurs during every switching on of the device up to the moment of failure cause removal.

Notes:
1 – When powering on the ID, MD displays information in indication mode, selected before the moment of ID power shut-down.
2 – If there is no information on parameter values, which are received from ECM only, corresponding indication modes switch off automatically.

1.3.7. Integrated display pilot lamps

"ATTENTION: PILOT LAMP-INDICATORS SWITCH ON AND OFF SYNCHRONOUSLY WITH CHANGES OF SYSTEM SENSOR STATES".

a) 5 (figure 1.5) – headlight high-beam pilot lamp-indicator.
Illuminates when headlight high beam is switched on.

b) 6, 7 (figure 1.5) – tractor and trailer turn pilot indicators. Operate in flashing mode when right or left turn signal is switched on by multi-function underwheel switch 10 (figure 1.5), or when the switch of hazard warning lights is on.

c) 8 (figure 1.5) – parking brake pilot lamp-indicator. "Parking brake" indicator operates in flashing mode with 1 Hz frequency, when parking brake sensor goes off;

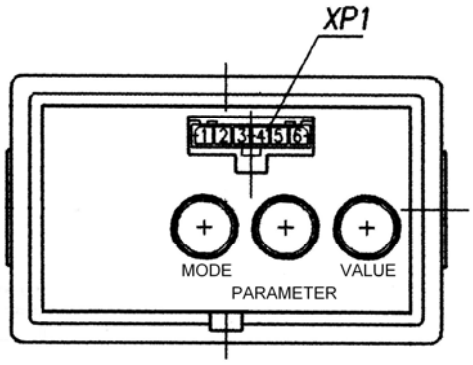
d) 9 (figure 1.5) – high on-board system voltage pilot lamp-indicator. Switches on when tractor on-board system voltage exceeds 19V and goes out when supply voltage level goes down to 17V;
In this case ID switches off completely, and recovers its operational capability when the voltage goes down to rated value of on-board system voltage.

e) 10 (figure 1.5) – coolant low level pilot lamp-indicator. Lights up when coolant level in recovery bottle drops below 20% of general level.

1.3.8 Description of instrument function check

In the course of every connection to power supply, needle indicators and elements of PTO indicator scale in the ID are checked for functioning. And during a second at most indicator needles deviate from initial marks and run over the first following digitized scale marks (over "5" for the speed and over "10" for revolutions), and all segments and indications "540" and "1000" of PTO scale are activated.

1.3.9 Integrated display program console



Program console 14 (figure 1.1) allows to perform manual programming of indicator by means of "Parameter" and "Value" buttons (see figure 1.7), to change the displaying mode for parameters, displayed on LCD display.
Note – There is a diagnostic slot XP1 on console front surface that allows to perform automatic programming (reprogramming) of ID by means of a special instrument (if available). If it is not available reprogramming is performed by means of the buttons mentioned above. *XP1 is not enabled on tractors "Belarus-952.4/920.4"*.

Figure 1.7 – Integrated display program console

ID programming algorithm

1. When selecting specified value of programming parameter:

1.1 When pressing "Parameter" button for the first time (see figure 7), LCD display goes to the mode of viewing the programmed parameter identification and its numerical value. Cyclic change of parameters occurs during the repeated button pressings.
1.2 When consecutively pressing "Value" button (see figure 7) numerical value of set programmed parameter changes.
1.3 Mode exit is fulfilled automatically when "Parameter" and "Value" buttons have not been pressed for 7 sec.
In case of mode exit the last parameter values, selected with "Value" button, are stored.

2. When entering non-specified value of programming parameter:

2.1 Select parameter, which value needs to be set up, with "Parameter" button;
2.2 Press "Mode" button twice, least significant digit of numerical value will start flashing on LCD display;
2.3 The value of flashing parameter digit should be changed by pressing "Value" button;
2.4 Transfer to more significant digit is fulfilled by pressing "Parameter" button;
2.5 Exit from the programming mode of non-specified value of any parameter is accomplished by double pressing of "Mode" button;
2.6 After the exit from the said mode digits of the entered parameter value stop operating in flashing mode;
2.7 New entered value is placed as the last in the list of parameter values, allowed for programming;

Note:

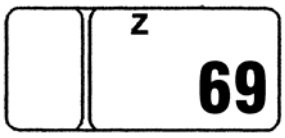
- in case of single pressing of "Mode" button in programming mode, it is not possible to enter arbitrary value of parameter;

- if "Mode", "Parameter" and "Value" buttons have not been pressed for 7 seconds in the mode of entering non-specified value of parameter, ID goes to main mode of LCD display operation saving set parameter values.

It is allowed to enter one non-specified value within the range:

for «**Z**» - from 23 to 69;
for «**I**» - from 1.000 to 4.000;
for «**R**» - from 400 to 1000;
for «**K**» - from 2.360 to 4.000; (For ID without CAN-interface)
for «**KV2**» - from 0.346 to 0.600;
for «**ZV**» - from 12 to 78;
for «**V**» - from 0 to 600.

List of programmed coefficients (graphic examples of displaying parameters and their values in programming mode):

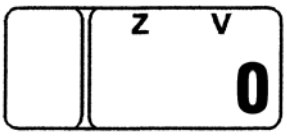


Parameter “Z”
Z – number of gear teeth of final shafts of driving wheels (right and left), above which speed sensor (sender) are installed;

Parameter “I”
I – raising ratio correction factor of wheel-hub drive;

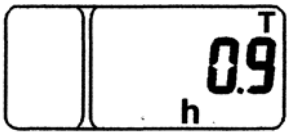
Parameter “ R”
R – rear wheel rolling radius, mm. In case of reprogramming it is possible to change this parameter with 5 mm increment.
Note: 770 is the value for tires 18.4R34. In case of new types of tires set the parameter "R” value which corresponds to rolling radius of installed tires.

Parameter “ KV2”
KV2 – power take-off shaft (PTO) ratio;



Parameter “ZV”
ZV – number of gear teeth of PTO speed sender
(Note – if the sender is not installed, “0” value should be entered)

Parameter “V”
V – fuel tank volume, l.



Also in programming mode when pressing on “Parameter” button in the list of programmed parameters independent parameter “T” of refined content of astronomical engine operating time meter is displayed. This parameter can not be changed, it gives precise value (up to 1/10 hour) of engine operating time.

During the operational process it is allowed to change the value of parameter “wheel rolling radius R” that is defined on the basis of tires, installed on tractor, by measuring the distance between wheel center and supporting surface.

IT IS PROHIBITED TO CHANGE ENTERED VALUES OF EVERY OTHER PARAMETERS (FACTORY SETTINGS).

When switching on the instrument dial illumination, i.e. when shifting main light switch 7 (Figure 1.1) into position II “Dash panel illumination and side-marker lights are turned on” and position III “Consumers of II position and front road headlamps are turned on” light intensity of MI display of PTO indicator segments reduces automatically.

1.3.10. Dashboard switches

a) 5 (Figure 1.1) – remote battery disconnect switch. When pressing the button (unfixed) of remote battery disconnect switch, storage batteries switch on, and after repeated pressing they switch off.

b) 6 (Figure 1.1) – windshield washer switch. When pressing the button (unfixed), windshield washer switches on.

c) 7 (Figure 1.1) – main light switch, has three positions:
— “Switched off” (upper part of the button in the photo is sunken, **I** position);
— “Front marker and tail, license plate and instrument panel lights as well as additional lights on trailed machine are switched on” (middle position, **II**);
— “All consumers of II position and road headlamps are switched on” (lower part of the button in the photo is pressed to the full, **III**).

d) 8 (Figure 1.1) switch of front headlights installed on brackets of front lights. When the key 8 is pressed, two front headlights (located on brackets of front lights) and the light indicator built into the key are switched on.

e) 9 (Figure 1.1) – switch of hazard warning flasher. Pressing the button actuates hazard warning flasher. Control lamp, built into the button, flashes simultaneously with flashing warning light. Hazard warning flasher shuts down after repeated pressing the button 9.

f) 10 (Figure 1.1) – Multi-function switch (under steering wheel). Secures the switching-on of turn signals, low/high beam of road headlamps, signaling (flashing) with high beam and horn.

Turn signals switch on when lever is shifted forward (“a” – right turn) or backward (“b” – left turn) from middle position in accordance with figure 1.8. After tractor makes a turn, the lever returns to initial position automatically.

To switch on road headlamps, set main light switch 7 (Figure 1.1) into III position (see above) and switch lever into middle position “c” – “low beam” in accordance with figure 1.8. “High beam” should be switched on by turning the switch lever forward as far as it will go (“d” position). “Low”/”High” beam positions of the lever are fixed.

When pulling the lever backward as far as it will go (“e” position, Figure 1.8) from “low beam” position, unfixed switching-on of high beam, “high beam flashing” occurs, irrespective of main light switch position.

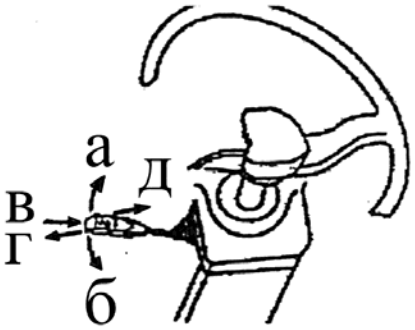
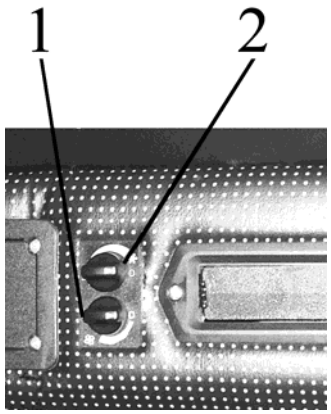


Figure 1.8 – Multi-function switch

Horn is actuated when pressing on the lever in axial direction “e” (axis of the switch lever). The horn can be actuated in any switch lever position.

1.3.11 Climate system control

Climate system control console 2 (Figure 1.1) has switches 1 and 2 (Figure 1.9).



1 – Air flow adjustment switch;
2 – Air conditioner and refrigerating capacity adjustment;

Figure 1.9 – Climate system control console

Climate system control rules in air conditioning and heating modes are presented in **Section 2.5 “Air conditioning and cab heating system”.**

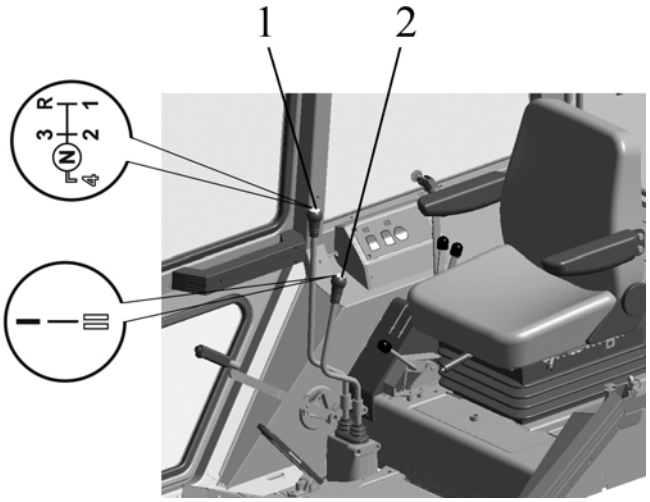
Note – Instead of a climate system, a heater fan can be installed on your tractor. Control and design of the fan heater is described in the operating manual 900–0000010 OM supplied with your tractor.

1.3.12 Double-lever gear box control

1.3.12.1 General information

Gear box (GB) is mechanical, step-by-step, simultaneous and double-range 7F/2R, with double-lever control (gear and ranges shifting is executed by independent levers). Together with synchronized accelerator doubling the number of gears, GB allows to have 14 gears of forward movement and 14 gears of rear movement.

1.3.12.2 Shifting of ranges and gears in GB with double-lever control



1 – gear shift lever; 2 – range selector lever

Figure 1.10 – Shifting of ranges and gears in GB with double-lever control

Shifting of ranges and gears is carried out by independent levers according to diagrams, shown in Figure 1.10.

Chose the required speed of tractor movement as per information plate on the right side cab window.

NOTE: synchronized accelerator control rules are listed in 900-0000010 OM.

To engage a gear, corresponding to the required speed of tractor movement, perform the following actions:

A) depress the clutch coupling pedal and select the required range in GB by shifting the range reducing gear lever 2 (Figure 1.10) back and forth as per the information plate on its handle.

ATTENTION: PASSES OF GEARING SHALL BE CARRIED OUT WHEN THE TRACTOR IS FULLY STOPPED AND CLUTCH COUPLING PEDAL IS DEPRESSED.

ATTENTION: THERE IS NO NEUTRAL POSITION IN RANGE REDUCING GEAR IN GB, THEREFORE EITHER THE I^{ST} OR THE II^{ND} PASS OF GEARING IS ALWAYS ACTUATED IN THE REDUCING GEAR.

B) depress the clutch coupling pedal and shift the gear shift lever 1 (Figure 1.10) to the required gear position as per information plate on its handle.

ATTENTION: ENGAGEMENT OF THE I^{ST} GEAR AND REVERSE GEAR SHALL BE CARRIED OUT WHEN THE TRACTOR IS STOPPED AND WITH CLUTCH COUPLING PEDAL DEPRESSED.

Shifting of the 1^{st} gear and reverse gear and selection of pass of gearing also is not synchronized, and is carried out by sliding pinions when the tractor is fully stopped. Before engagement of the specified gears or range reducing gear stages release slightly and then fully depress the clutch coupling pedal. The said technique ensures rotation of pinions and smooth engagement of gears and ranges.

ATTENTION: TO EXCLUDE THE INCREASED NOISE LEVEL IN GB, THE GB CONTROL MECHANISM WAS DESIGNED WITH LOCKING SIMULTANEOUS ENGAGEMENT OF THE 4^{TH} (DIRECT) GEAR AND THE I^{ST} STAGE OF RANGE REDUCING GEAR. THEREFORE ENGAGEMENT OF THE 4^{TH} (DIRECT) GEAR CAN BE POSSIBLE ONLY IF THE II^{ND} STAGE OF RANGE REDUCING GEAR IS ENGAGED.

B) Release the clutch coupling pedal, start to move slowly in the selected gear .

ATTENTION: DO NOT HOLD YOUR FOOT ON THE CLUTCH PEDAL DURING TRACTOR OPERATION. IT WIL ALLOW TO AVOID SLIPPING OF CLUTCH COUPLING RESULTING IN OVERHEAT OR PREMATURE FAILURE OF THE CLUTCH.

NOTE: Your tractor can be equipped with one-lever GB control where gears are shifted and stages of the range reducing gear are selected by the same one lever, placed under the right hand of the operator. Rules of operation of GB, controlled by one lever placed under the right hand of the operator, are presented in 900-0000010 OM.

2 TRACTOR COMPONENTS DESCRIPTION AND OPERATION

2.1 D-245.43S3A/D-245.5S3A engine

Information about the design, troubleshooting, rules of operation and maintenance of the D-245.43S3A/D-245.5S3A engines are described in the engine operating manual 245 S3A – 0000100 OM applied to your tractor.

2.2 Electronic engine control system for D-245.43S3A (D-245.5S3A)

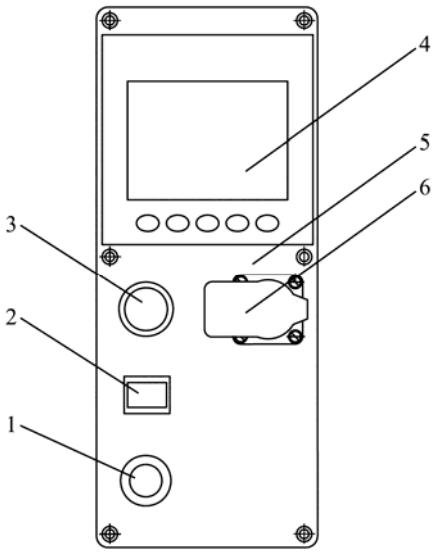
2.2.1 General Information

The electronic engine control system (Figure 2.2) includes the electronic unit 7, the information display 3, the control panel 4, the engine mode manual control lever 5, the engine mode electronic foot pedal 8, the switching and protection unit 6, which are installed in the tractor cab and connected to each other by cables 1. The system is powered from the battery via the switching and protection unit as per the electric circuit diagram presented in Figure 2.4.

After the starter and instrument switch is turned from the “OFF” to “Instrument power” position, the system is powered up. When the supply voltage is supplied, the system performs self-diagnostics. If no errors in system operation are found, the failure signal indicator 2 (Figure 2.1) on the engine control system panel should go on and off, and the information display 4 (Figure 2.1) switches to the operating mode. If an error is found, the information display emits a sound signal, and the screen shows a short description of detected errors (error code designation and its description), as well as the failure signal indicator 2 on the engine control system panel flashes or blinks. Error code interpretation as well as advised actions for troubleshooting of the detected errors are described in the engine operating manual 245 S3A – 0000100 OM enclosed to your tractor. Eliminate detected errors before starting the engine.

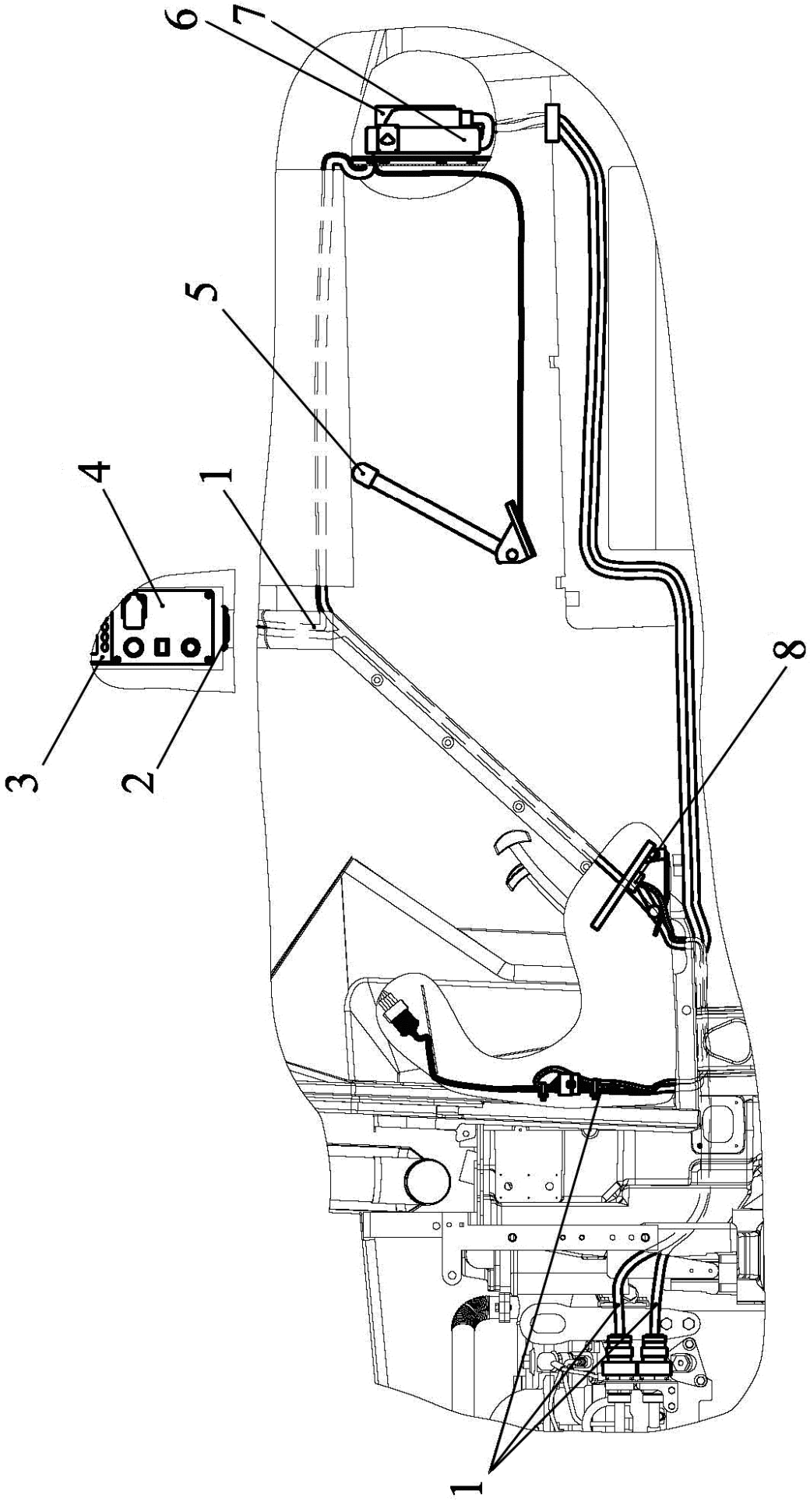
The engine is started by turning and holding the starter and instrument switch in the “Starter ON” position. After the engine starts, the display shows actually measured parameters of engine operation.

Figure 2.4 shows the electric circuit diagram of the external part of the control system of the D-245.43S3A/D-245.5S3A engines of the BELARUS-920.4/952.4 tractor.



1 – diagnostics activation button switch; 2 - failure diagnostics indicator; 3 – cigarette lighter; 4 – information display; 5-panel; 5 - appliance receptacle 12 V/ 25 A.

Figure 2.1 - Engine control system panel

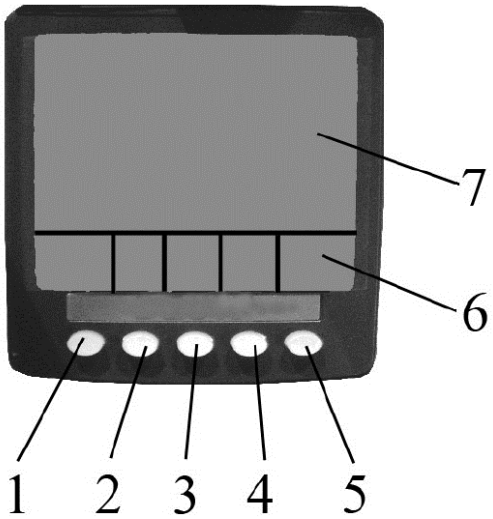


1-connection harnesses, 2-diagnostic equipment connector, 3-information display; 4-control panel; 5- engine mode manual control lever, 6- switching and protection unit; 7- electronic engine control unit; 8- engine mode control electronic foot pedal.

Figure 2.2 - Engine control system for D-245.43S3A (D-245.5S3A)

2.2.2 Adjust brightness and contrast of display indicator

Press the button 5 (Figure 2.3) to enter the display brightness and contrast adjustment mode. In the lower part of the screen, button images are shown. Press the button 1 to reduce brightness, press the button 2 to increase brightness, press the button 3 to reduce contrast, press the button 4 to increase contrast, press the buttons 1, 2, 3, 4 simultaneously to set the medium contrast and maximum brightness. Press the button 5 again to exit the brightness and contrast adjustment mode.



1 – button to call a presentation of the main indicator and browse through indicated parameters,
2 – button to call the four-section indicator and browse through indicated parameters,
3 – button to call the graphic presentation indicator and browse through indicated parameters,
4 – button to call error (failure) list,
5 – button to enter/exit the mode of brightness and contrast adjustment and PIN code,
6 – changeable presentation of button purpose, 7 – screen.

Figure 2.3 - Information display

2.2.3 Call up changeable presentations and parameters to display

Press the button 1 on the display (Figure 2.3) to call the main image to the screen. At that, the upper left corner presents an engine speed scale, the upper right angle presents a travel speed scale (when no speed parameter available, oil pressure in the engine lubrication system is shown), the lower right angle presents the coolant temperature, the lower left angle presents the current fuel consumption per hour.

Press the button 2 to call the four-section parameter presentation on the display screen. After a first stroke of the button 2, four parameters in numeric form are shown on the screen:

- in the upper left corner – voltage directly on the connection terminals of the information display;
- in the upper right corner – coolant temperature;
- in the lower left corner – electric system voltage;
- in the lower right corner – oil pressure in the engine lubrication system.

After a second and third stroke on the button 2, the screen shows four parameters in analog form.

Using the adjustment mode, the user can call, as necessary, presentation of various engine parameters as listed in Table 4 to the screen. Press the button 5 to enter the adjustment mode. Sequential pressing of the button 1 changes indicated parameters in the upper left corner, the button 2 – in the upper right corner, the button 3 – in the lower left corner, the button 4 – in the lower right corner. Press the button 5 to exit the adjustment mode.

Press the button 3 to call the graphic parameter presentation in time (works as an analog recorder of parameters).

Required parameters listed in Table 4 are selected by sequentially pressing the button 3.

The time grid can be set up in the configuration menu from 2, 10, or 30 minutes to 1, 2, 4, or 8 hours. To open the configuration menu, enter the code (PIN number). To open the PIN number window, press the button 5 for over 3 seconds. This menu also allows selecting metric or impe-

rial units of measurement, as well as English, Spanish, Swedish, French, German, Italian, Dutch, Portuguese and Russian among the available languages.

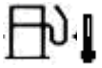
ATTENTION: ONLY DEALERS ARE ALLOWED TO CHANGE PARAMETERS OF THE CONFIGURATION MENU.

Press the button 4 to call error (failure) list. Browse the list with the buttons 1 and 2.

When any error (failure) emerges during work, the display emits a sound signal, and a blinking windows pops up with description of last errors (failures).

ATTENTION: THE ENGINE IS STOPPED BY TURING THE STARTER AND INSTRUMENT SWITCH TO “OFF” POSITION.

Table 4 - List of parameters of graphic and four-section indication of engine operation.

	Parameters	Four-section presentation	Graphic presentation	Symbol
1.	Voltage directly on the connection terminals of the information display, V	✓	✓	
2.	Voltage at battery terminals measured by electronic control unit of engine, V	✓	✓	
3.	Fuel consumption	✓	✓	
4.	Incoming air pressure	✓		
5.	Oil pressure in engine	✓	✓	
6.	Coolant temperature in engine	✓	✓	
7.	Engine oil temperature	✓	✓	
8.	Fuel temperature	✓		
9.	Air temperature at inlet pipe	✓	✓	
10.	Accelerator position, %	✓		
11.	Coolant level in engine, %	✓		
12.	Torque use, rpm	✓		
13.	Engine speed (rpm)	✓	✓	

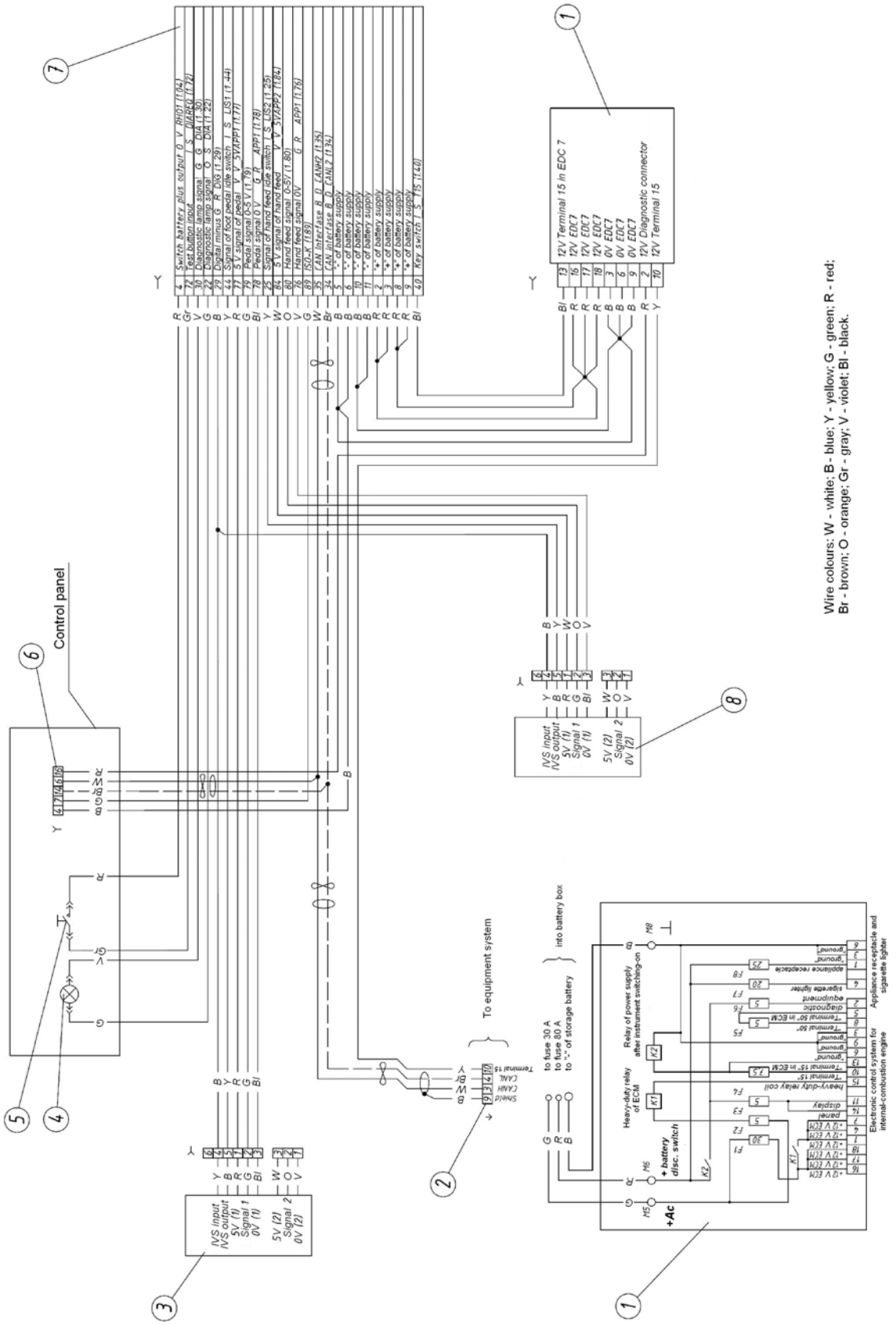


Figure 2.4- Wiring diagram for outer part of engine control system for D-245.43S3A (D-245.5S3A) of tractors "BELARUS-920.4/952.4"

Annex to Figure 2.4: Elements of wiring diagram for outer part of engine control system for D-245.43S3A (D-245.5S3A) of tractors “BELARUS-920.4/952.4”:

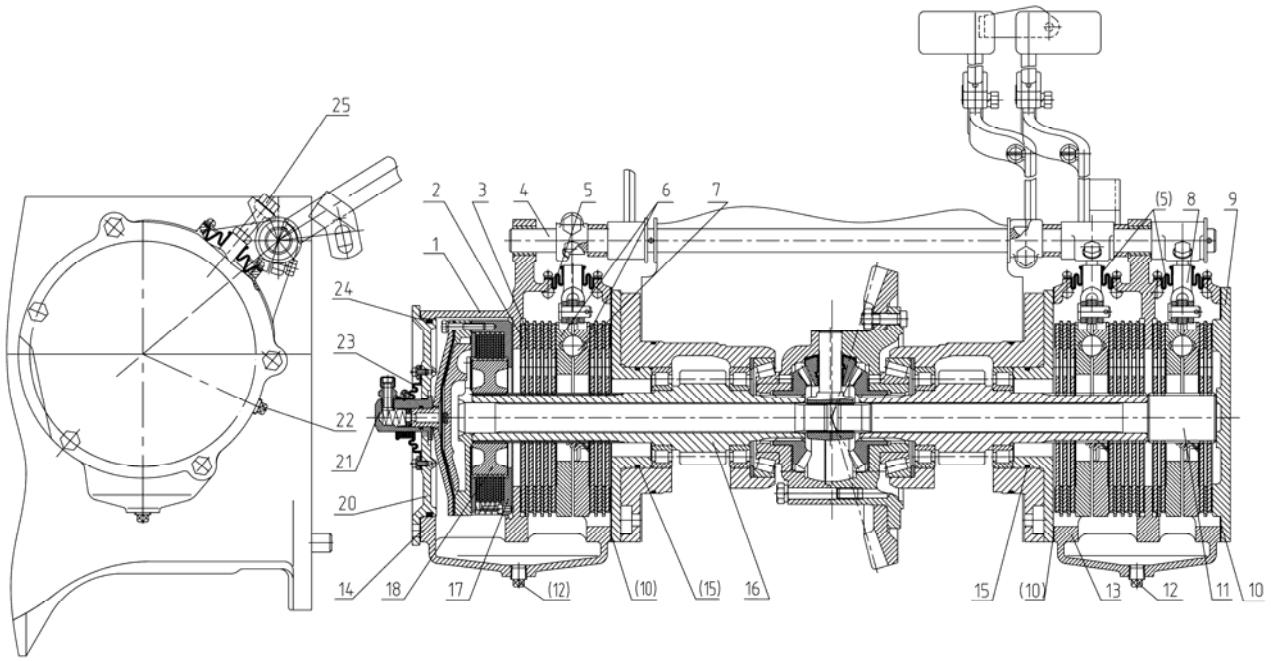
1 - switching and security unit,
2 - CAN bus connector,
3 - forward trace accelerator pedal,
4 – diagnostics indicator,
5 – diagnostics button,
6 – information display,
7 – plug connector for diagnostic device connection,
8 – plug connector (89 pins),
9 – hand fuel supply sensor.

Annex B contains the electric circuit diagram of rear axle DL and PTO drive control system of BELARUS – 920.4/952.4 tractors with list of components.

2.3 Wet brakes and rear axle differential lock clutch

2.3.1 General information

In order to improve tractor brakes energy consumption, their reliability and durability, brakes operating in oil bath (wet brakes) are designed and installed on tractors “BELARUS-920.4/952.4”. The rear axle differential lock clutch is mounted in the brake housing, both within the same oil bath, thus the clutch is also designed as wet. Figure 2.5 presents the design of wet brakes and rear axle differential lock clutch



1 — body housing, 2 — friction disk, 3 — spacing disk; 4 — pedal shaft; 5 — sealing hood; 6 — pressure plate; 7 - ball. 8 — park brake, 9 — cover; 10 — gasket; 11 — park brake shaft, 12 — drain plug, 13 — brake housing; 14 — gasket; 15 — O-ring; 16 — axle drive gear; 17 — lock clutch; 18 — hub, 20 — cover; 21 — adapter; 22 — check (filler) plug; 23 — sealing hood; 24 — O-ring; 25 — adjusting bolt.

Figure 2.5 – Design of wet brakes and rear axle differential lock clutch

2.3.2 Wet service and park brakes, wet brakes control

The service brake is eight-disk. The friction disks 2 (Figure 2.5) are installed on the splined ends of the rear-axle drive gears 16. The pressure plates 6 are by design similar to ones used in dry brakes but have a reduced angle of gradient of holes for balls to provide the necessary compressive force of friction and intermediate disks packs.

NOTE: PRESSURE PLATES OF DRY AND WET BRAKES HAVE THE SAME OVERALL AND MOUNTING DIMENSIONS, BUT ARE NOT INTERCHANGEABLE. IT IS STRICTLY FORBIDDEN TO INSTALL DRY BRAKE PLATES TO WET BRAKES AND VICE VERSA FOR THE SAKE OF SAFETY OF TRACTOR OPERATION.

The intermediate disks 3 (Figure 2.5) are fixed to prevent rotation in housings 1, 13 with shoulders made on the external circuit. Tightness of oil baths is ensured by O-rings 15, 24, gaskets 10, 14 and rubber hoods 5, 23. The housings have the check plugs 22 and the drain plugs 12.

The BELARUS-920.4/952.4 tractors are equipped with a wet four-disk park brake 8 (Figure 2.5) made in the same housing with the service brake. Parts of the park brake are common with parts of the service brakes.

The service brake control drive of BELARUS-920.4/952.4 is mechanical, through levers and pedals. The park brake is driven mechanically.

The service and park brake control drives of wet brakes are principally the same as ones used for dry brakes of the respective tractor model.

The wet service and park brakes adjustment are performed each 500 service hours of the tractor in the process of performing MS-2. Techniques of checking and adjusting wet service and park brake see in Maintenance (Operation 32a) of the 900-0000010 OM.

IT IS FORBIDDEN TO OPERATE BRAKES WITHOUT OIL OR WITH INSUFFICIENT OIL LEVEL.

2.3.3 Differential lock wet clutch

The lock clutch 17 (Figure 2.5) has six discs with metal-ceramic friction pads installed on the spline hub 18 tied with the axle drive gear 16. The pack of six friction and five intermediate disks is compressed when oil is delivered under pressure into the diaphragm cavity, the friction torque developed at that provides locking the rear axle differential. The clutch is made in a single housing with the service brake, has an oil bath common with it, is sealed with the cover 20 and the special corrugated hood 23 of the oil supply adapter 21 in the diaphragm working cavity.

Note – Your tractor can be equipped with dry twin-disk or tipple-disk brakes. Information about the design and adjustments of dry brakes is presented in the 900-0000010 OM document.

2.4 Trailer brake drive

2.4.1 General information

Your tractor can be equipped with a combined trailer brake pneumatic drive or trailer brake hydraulic drive. Short information about the design and main adjustments of the combined trailer brake pneumatic drive is presented in the **Section 2.4.2.** Short information about the design and main adjustments of the trailer brake hydraulic drive is presented in the **Section 2.4.3.**

ATTENTION: PERFORM ADJUSTMENT OR TROUBLESHOOTING OF THE TRACTOR TRAILER BRAKE SYSTEM AND BRAKE DRIVE ONLY WHEN THE ENGINE IS SHUT OFF AND THE TRACTOR IS ON AN EVEN SURFACE, BLOCKED WITH BRAKE SHOES PUT UNDER THE WHEELS, WHICH EXCLUDE SPONTANEOUS MOVEMENT OF THE TRACTOR.

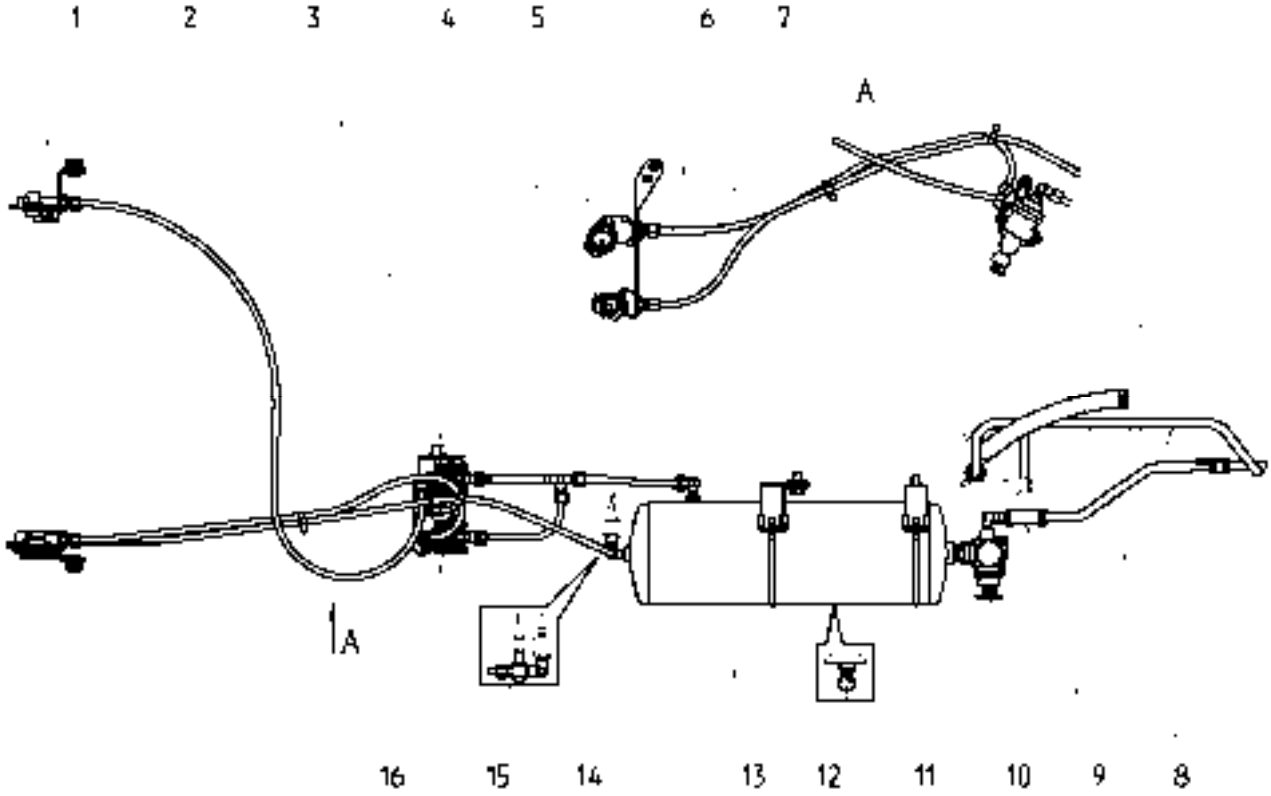
2.4.2 Combined trailer brake pneumatic drive

2.4.2 General information

BELARUS-920.4/952.4 tractors can be equipped with a combined trailer brake pneumatic drive.

The pneumatic drive can also be used to inflate tires and for other purposes, where energy of compressed air is required.

Figure 2.6 shows the pneumatic drive diagram.



1, 4, 5 - coupling heads; 2 - control manifold; 3 - brake valve (single-wire); 6 – connecting line; 7 – supply line; 8 - line from engine intake manifold; 9 – compressor; 10 – air bleed valve; 11 - pressure regulator; 12 – condensate drain valve; 13 - cylinder; 14 - air pressure sensor; 15 - emergency air pressure sensor; 16 - brake valve (single-wire).

Figure 2.6 – Trailer brake pneumatic drive diagram

Air is taken to the pneumatic drive from the engine intake manifold through the line 8 (Figure 2.6). The air is compressed in the compressor 9 and delivered to the cylinder 13 through the pressure regulator 11 maintaining required pressure in the cylinder. From the cylinder, compressed air goes to the brake valves 3 and 16 and to the supply line 7 with the coupling head 4 (with red cap) that is always under pressure. The brake valve 3 is connected through the control manifold 2 with the coupling head 1 (with yellow cap). There is no pressure in it. The brake valve 16 is connected through the connecting line 6 with the coupling head 5 (with black cap).

Brakes of trailers and agricultural machines are controlled in two modes: direct and automatic.

When connecting a trailer with a single-wire pneumatic drive, the trailer head is connected to the coupling head 5 (Figure 2.6) and air goes to the trailer pneumatic drive. When the brake pedal is pressed on or the park brake is engaged, compressed air through the brake valve 16 is vented from the connecting line 6 to atmosphere.

The air distributor operates on the trailer, supplying compressed air from the trailer cylinders to the brake chambers, and the trailer stops. If the trailer is disconnected in case of emergency, the coupling heads are disconnected, air from the trailer line is vented to atmosphere, and the trailer stops automatically.

Direct control of the brakes is performed due to pressure drop in the connecting line 6 up to 0 MPa when the tractor decelerates. In such a case, delivery of compressed air to the trailer pneumatic system stops.

Automatic control of the brakes (automatic braking) is performed in case of a break of the coupling and disconnection of the trailer due to pressure drop in the trailer connecting line.

When a trailer with a two-wire pneumatic drive is used, the trailer coupling heads are connected to the coupling heads 4 (Figure 2.6) with red cap and 1 with yellow cap, i.e. to the supply line 7 and to the control manifold 2. At that, compressed air constantly flows to the trailer through the supply line 7. When the brake pedal is pressed on or the park brake is engaged, compressed air through the brake valve 3 and the control manifold 2 is supplied to the trailer. The air distributor operates on the trailer, supplying compressed air from the trailer cylinder to the brake chambers, and the trailer stops.

Direct control of the brakes is performed due to pressure rise in the control manifold 2 up to 0.65...0.8 MPa when the tractor decelerates. In such a case, the supply line 7 remains under pressure, and delivery of compressed air to the trailer pneumatic system is preserved.

Automatic control of the brakes (automatic braking) is performed in case of a break of the coupling and disconnection of the trailer due to pressure drop in the trailer supply line.

In the pneumatic drive, the valve coupling heads 1, 4, 5 are installed. The coupling head valves prevent air loss in case of use of the pneumatic drive without a trailer (for example, for tire inflation) and in case of an emergency disconnection of a trailer. When the trailer brake lines are connected with the tractor lines, the coupling head valves open, ensuring passage of compressed air from the tractor pneumatic drive to the trailer. At that, it is recommended to connect the pneumatic lines when there is no pressure in the cylinder 13 of the tractor.

Air pressure in the cylinder 13 is monitored with the air pressure indicator and the red emergency air pressure lamp (installed on the instrument panel), the air pressure sensor 14 and the emergency air pressure sensor 15.

To drain condensate from the cylinder 13, the condensate drain valve 12 is provided. To drain condensate, tilt the push bar with the ring aside and up.

Air bleeding from the pneumatic drive (to inflate tires etc.) is performed through the air bleed valve 10 of the pressure regulator 11.

2.4.2.2 Check and adjust drive of single-wire and two-wire brake valves of pneumatic system

ATTENTION: ADJUST THE BRAKE VALVE DRIVE WHEN THE SERVICE BRAKE PEDALS ARE NOT PRESSED AND THE PARK EMERGENCY BRAKE IS COMPLETELY DISENGAGED, WHICH MUST BE ADJUSTED FIRST.

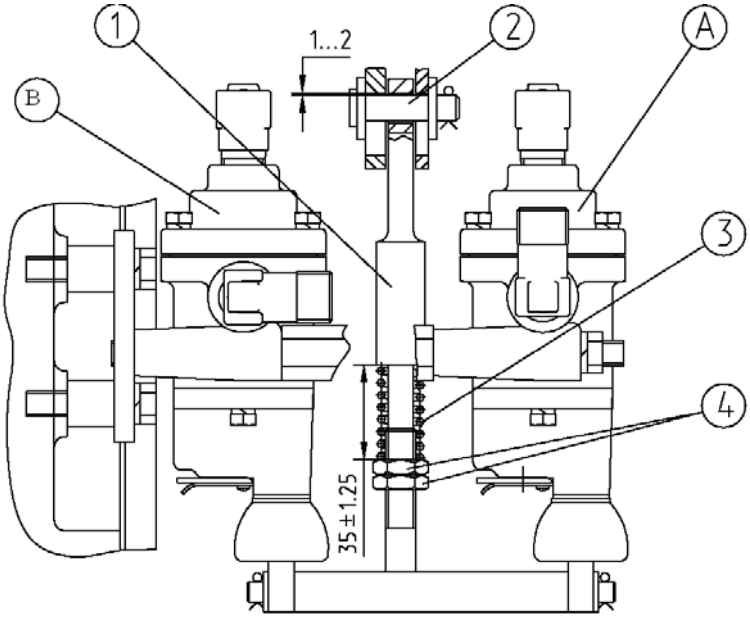


Figure 2.7 — Check and adjust drive of single-wire and two-wire brake valves of pneumatic system

Check the drive of the single-wire brake valve “A” (Figure 2.7) as follows:

1. Connect a pressure gage scaled of not less than 1 MPa to the coupling head (with black cap) of the tractor pneumatic drive.

2. Turn on the compressor and fill the cylinder with air to a pressure of 0.77 to 0.8 MPa as per the pressure gage located on the instrument panel.

3. Air pressure as per the pressure gage connected to the coupling head must be 0.77 MPa or higher or 0.53 MPa or higher for Hungary and Germany. If it is lower than specified, do as follows:

4. Check availability of clearance gap of 1 to 2 mm between the finger 2 (Figure 2.7) and the upper edges of the grooves in the arms. If there is no gap, remove the cotter pin and remove the finger 2 and adjust the length of the arm by turning the end 1(Figure 2.7).

5. Check and adjust as necessary pressing of the spring 3 to a size of 35±1.25 mm by rotating the nuts 4 and lock them. Check valve operation as per clause 3.

6. If air pressure as per the pressure gage connected to the coupling head has not reached the required value, replace the brake valve “A”.

ATTENTION: WITH THE BRAKE VALVE “A” (FIGURE 2.7) AND ITS DRIVE CORRECTLY ADJUSTED, PRESSURE AS PER THE PRESSURE GAGE CONNECTED TO THE COUPLING HEAD WITH A BLACK CAP MUST DROP TO ZERO IN CASE OF A FULL TRAVEL OF THE INTERLOCKED BRAKE PEDALS OR WHEN THE PARK BRAKE IS FULLY ENGAGED.

Check the drive of the two-wire brake valve “B” (Figure 2.7) as follows:

1. Connect a pressure gage with a scale of 1 MPa min. to the coupling head (with yellow cap) of the tractor pneumatic drive.

2. Turn on the compressor and fill the cylinder with air to reach pressure of 0.77 to 0.8 MPa as per the pressure gage located on the instrument panel.

3. Air pressure as per the pressure gage connected to the coupling head (with a yellow cap) of the control manifold must be equal to zero. Move the interlocked brake pedals to a full travel. The pressure must rise to 0.65…0.8 MPa Release the brake pedals. Engage the parking brake by shifting its handle to the maximum extent. The pressure must be raised to 0.65…0.8 MPa. If the pressure according to the pressure gage connected to the control connection line head does not correspond to the above values, perform the following actions:

4. Check availability of a clearance gap of 1 to 2 mm between the finger 2 and the upper edges of the grooves in the arms. If there is no gap, remove the finger 2 and adjust the length of the arm by turning the end 1.

5. Check and adjust as necessary compressing of the spring 3 to a size of 35±1.25 mm by rotating the nuts 4 and lock them. Check valve operation according to clause 3.

6. If air pressure as per the pressure gage connected to the coupling head has not reached the required value, replace the brake valve “B”.

ATTENTION: WITH THE BRAKE VALVE “B” (FIGURE 2.7) AND ITS DRIVE CORRECTLY ADJUSTED, PRESSURE AS PER THE PRESSURE GAGE CONNECTED TO THE COUPLING HEAD (WITH A YELLOW CAP) MUST BE EQUAL TO ZERO WHEN THE INTERLOCKED BRAKE PEDALS ARE NOT PRESSED AND WHEN THE PARK BRAKE IS FULLY DISENGAGED.

2.4.3 Trailer brake hydraulic drive

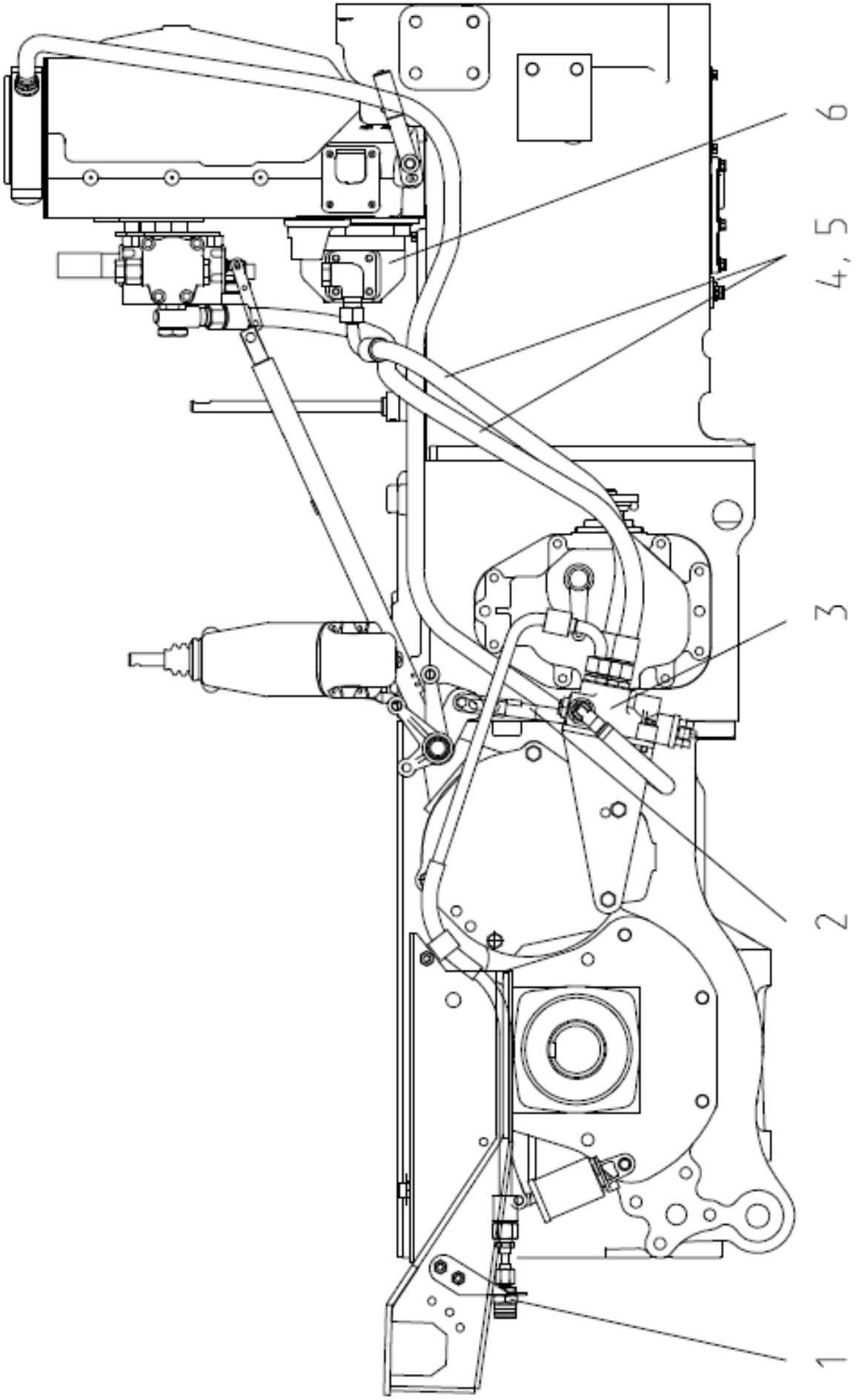
2.4.3.1 General information

The tractors "BELARUS-920.4/952.4" can be equipped with trailer brake hydraulic drive.

Trailer brake hydraulic drive is interconnected with service brake control of tractor “BELARUS-920.4” and secures actuation of wheel brakes of trailer or semi-trailer, equipped with the system of brake hydraulic drive. Hydraulic connecting line is powered from pump of hydraulic lift linkage, which provides pressure from 10 to 15 MPa, and is designed as single-line brake system. Hydraulic drive linking-up conforms to standard ISO/5676 dated 1983.

Trailer brake hydraulic drive consists of mechanically controlled brake valve 3 (Figure 2.8), which is actuated by pull-rod 2, connected to tractor parking brake pedals, and clutch 1 that connects brake drive system of trailer or semi-trailer with tractor brake hydraulic drive. Trailer brake hydraulic drive is powered sequentially from pump 6 of tractor hydraulic lift linkage by means of high-pressure hoses 4, 5.

ATTENTION: TRACTOR, EQUIPPED WITH TRAILER BRAKE HYDRAULIC DRIVE, CAN NOT BE GANGED UP WITH TRAILERS THAT HAVE SERVICE BRAKE HYDRAULIC DRIVE.

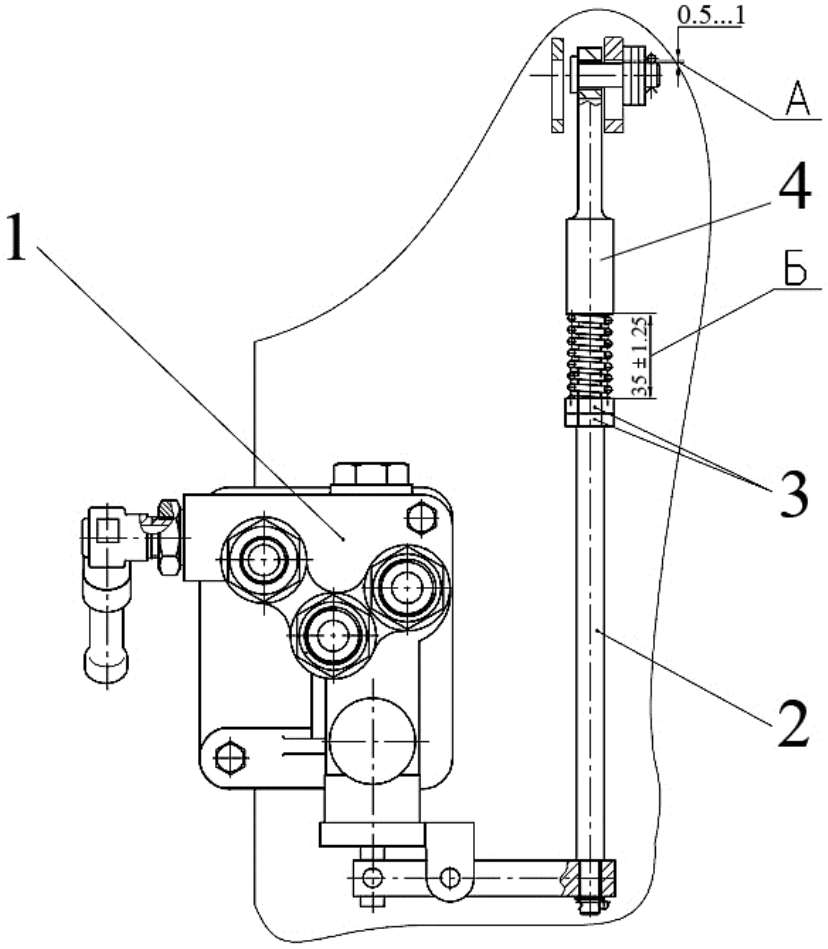


1 – clutch; 2 – pull- rod; 3 – brake valve; 4, 5 – high pressure horses; 6 – pump

Figure 2.8 – Trailer brake hydraulic drive

2.4.3.2 Adjustment of trailer brake hydraulic drive

Adjustment of trailer brake hydraulic drive consists in adjustment of pull-rod 2 (Fig. 2.9) of brake valve 1. Dimension A (0.5 to 1 mm, between the finger and the upper edges of the grooves in the arms) should be checked, when service brake pedals are released, while changing it by means of the end 2 of the pull-rod 4 rotation. Dimension B (35 ± 1.25 mm) between lower edge of the end 4 and upper nut 3 (Fig. 2.9) should be secured through rotation of nuts 3 and locking them after the adjustment.



1 – brake valve; 2 – pull-rod; 3 – nut; 4 – rod end

Figure 2.9 Adjustment of brake valve pull-rod

ATTENTION: ADJUST THE BRAKE VALVE DRIVE WHEN THE SERVICE BRAKE PEDALS ARE NOT PRESSED AND THE PARK EMERGENCY BRAKE IS COMPLETELY DISENGAGED, WHICH MUST BE ADJUSTED FIRST.

2.5 Cab air conditioning and heating system

2.5.1 Climate system control in air conditioning mode

The climate system control panel is in the center of the upper panel of the cab. The control panel has the switches 1 and 2 (Figure 2.10).

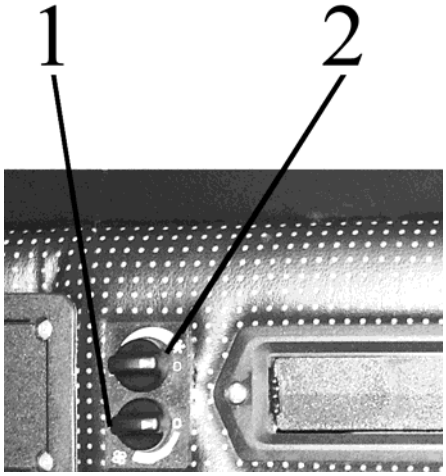


Figure 2.10 – Controls of cab air conditioning and heating system

With the switch 1, you can adjust air flow by changing fan speed. With the switch 2, you can change temperature of cold and dry air going out of the deflectors in the air conditioning mode.

ATTENTION: AIR CONDITIONER CAN BE TURNED ON AND OPERATE ONLY WHEN THE ENGINE IS RUNNING

To turn on the conditioner, proceed as follows:

- turn the switch 2 (Figure 2.10) clockwise by 180°C to the beginning of the blue scale;
- then turn the switch 1 to one of the three marked positions (the fan impeller has three speeds). In 3-5 minutes, use the switch 2 to adjust the desired temperature in the cab;
- with the shutters located on the upper panel, near to the operator's head, the mix of external and recirculating air can be adjusted;

To turn off the air conditioner, turn both switches 1 and 2 counterclockwise to “0” position.

ATTENTION: WHEN WORKING IN THE COOLING MODE, THE HEATER VALVE MUST BE CLOSED TO PREVENT SIMULTANEOUS OPERATION OF THE AIR HEATING AND COOLING SYSTEMS.

2.5.2 Climate system control in heating mode

ATTENTION: REFILL THE ENGINE COOLING SYSTEM ONLY WITH AN ANTIFREEZE AGENT.

For efficient operation of the heating system, observe the following recommendations:

1. After refilling the cooling system with antifreeze agent, start the engine and, without opening the valve, let the engine work at medium speed to have the antifreeze agent in the cooling system warmed up to 70 to 80°C, after that open the valve, increase the engine speed and let it work for 1 to 2 minutes to have the heat exchanger filled with the agent. Make sure that the antifreeze agent is circulating through the heater. The heat exchanger must warm up. The coolant level in the heat exchanger of the engine cooling system will drop at that.
2. Add coolant to the heat exchanger to the required level (up to the “MAX” mark on the expansion tank);
3. To have the cab quickly warmed up, turn on the heater fan and open the recirculating shutters;

4. To discharge the coolant from the engine heater and cooling system, install the tractor on an even surface. Remove the extension tank plug of the engine cooling system, open the valve on the cylinder block in the rear part of the engine and disconnect the heater hoses before the entry to the cab posts.

ATTENTION: WHEN WORKING IN THE HEATING MODE, THE SWITCH 2 (FIGURE 2.10) MUST BE FULLY OFF TO PREVENT SIMULTANEOUS OPERATION OF THE AIR HEATING AND COOLING SYSTEMS.

2.5.3 General arrangement and operation of cab air conditioning and heating system

The cab air conditioning and heating system is intended to create and maintain normal microclimate in the tractor cab. The air conditioning system consists of two circuits — cooling and heating. Figure 2.11 shows the system layout.

The cooling circuit includes a compressor, a condenser, a filter drain with pressure sensor, an evaporator and heat exchanger unit (cooler-heater), a cooler-heater fan, connection hoses with a set of quick couplings, electric cables, air filters, a cool air regulator and a fan switch. The heating circuit is filled with hoses connected to the tractor engine cooling system and a shutoff cock.

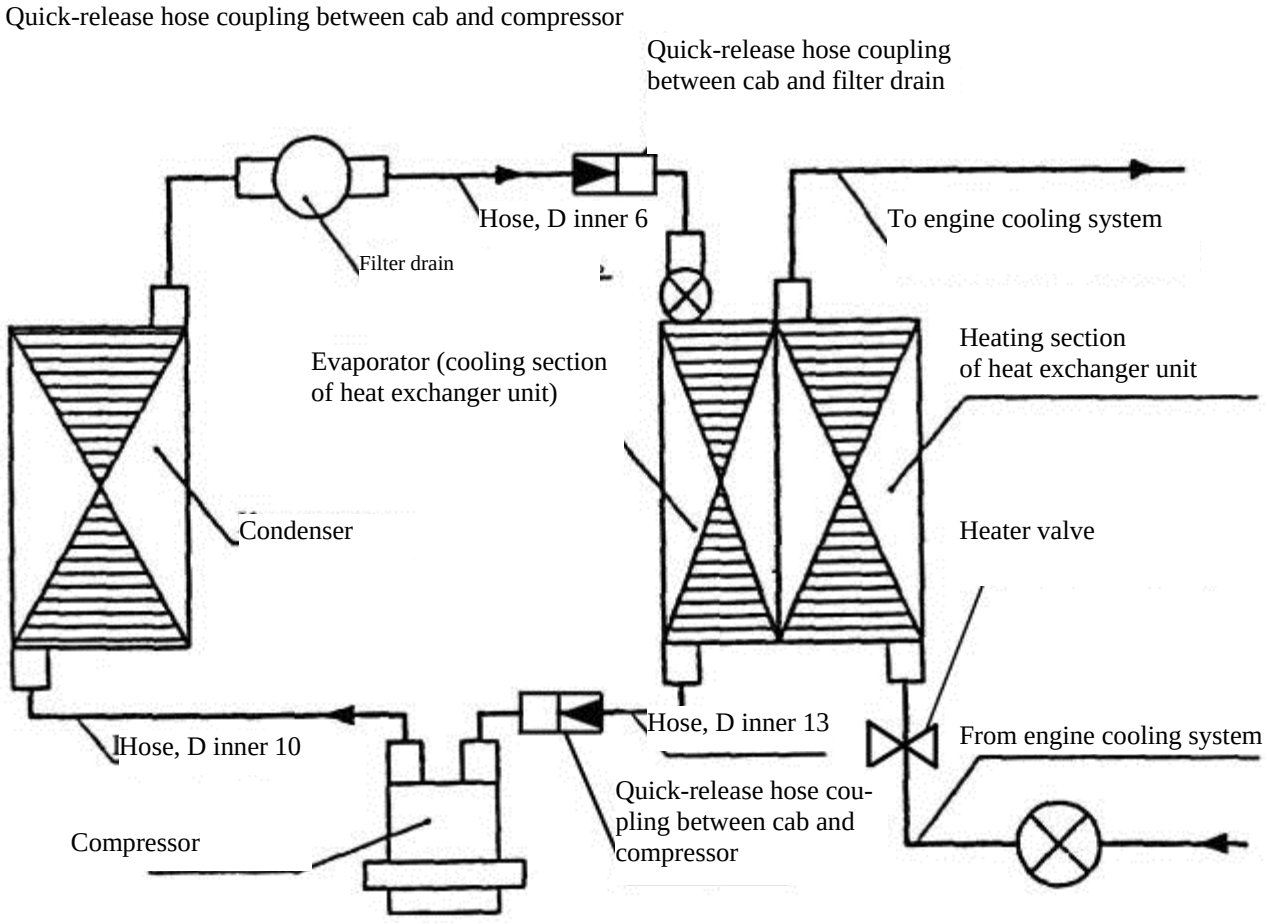
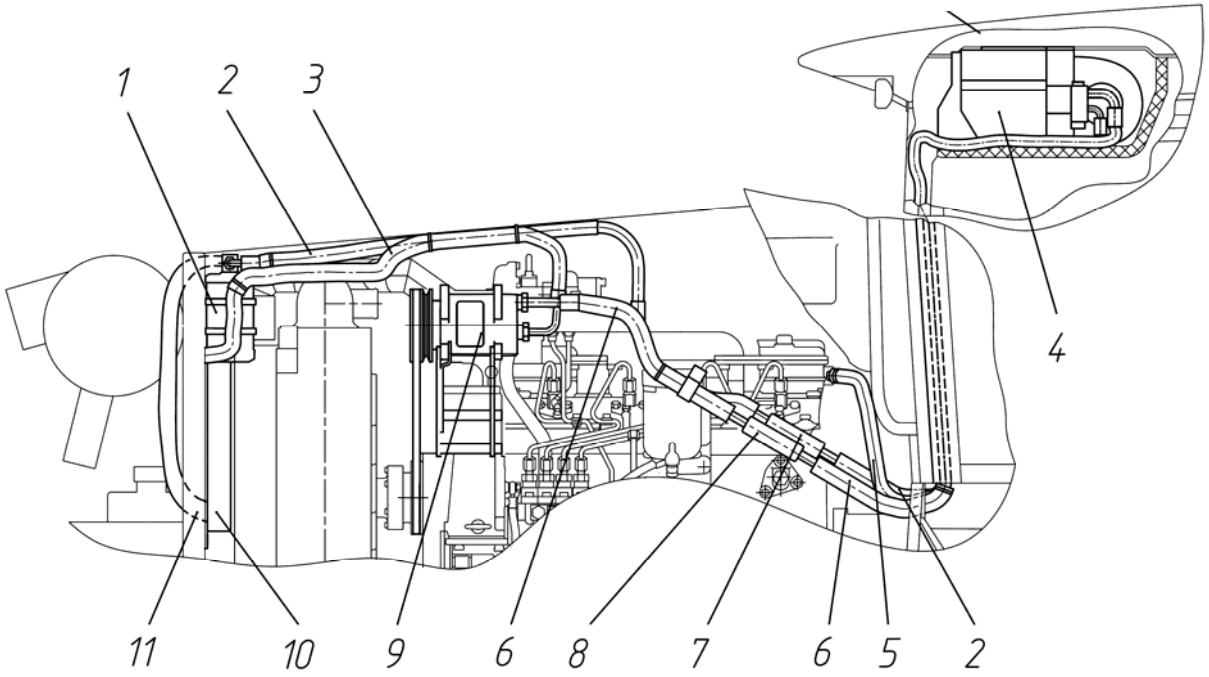


Figure 2.11 – Cab air conditioning and heating system

Arrangement of the air conditioning system elements:
- compressor – from the left on the half-frame below;
- condenser – before the CAC heat exchanger;
- filter drain – on the condenser frame;
- pressure sensor – on the filter drain;

- cooler-heater – under the roof over the ventilation box panel;
- cold air regulator and fan switch — on the upper section panel;
- service valves – on the fittings near the compressor and the filter drain.

Tractor cab roof



1 - filter drain; 2 - refrigerating fluid delivery line from filter drain to cooler-heater; 3 - refrigerating fluid delivery line from compressor to condenser; 4 - cooler-heater; 5 - refrigerating fluid delivery line from engine cooling system to cooler-heater; 6 - refrigerating fluid delivery line from heater-cooler to compressor; 7 - quick-release hoses coupling between a cab and filter drain; 8- quick-release hoses coupling between a cab and a compressor; 9 - compressor; 10 - condenser; 11 - refrigerating fluid delivery line from condenser to filter drain;

Figure 2.12 – Arrangement of main elements of cab air conditioning and heating system

The climate system starts operating in the air conditioning mode with the engine running, when the desired fan speed is set with the switch 1 (Figure 2.10), and the switch 2(Figure 2.10) is set to the beginning of the blue scale.

At that, voltage is supplied to the electromagnetic coupling of the compressor through the control circuit. The coupling is engaged transferring rotation from the engine crankshaft pulley to the compressor shaft. The compressor pumps the refrigerating fluid through the elements of the air conditioning system. At that the refrigerating fluid absorbs heat from the air passing through the cooler-heater, and then releasing heat to the environment through the condenser.

The air conditioning system can automatically maintain the preset temperature that is set by turning the switch 2 (Figure 2.10) controlling the thermostat. Turning clockwise will decrease the temperature setting, turning counterclockwise will increase it. Protection from critical conditions is ensured by the pressure sensor and the thermostat. The sensor turns off the system when the pressure is too high (over 2.6±0.2 MPa) or too low (below 0.21±0.03 MPa) pressure. The thermostat turns off the system when the temperature of the cooling section of the heat exchanger unit drops too low. Performance of the system is adjusted by the fan speed and the thermostat. The compressor can operate at that both continuously and cyclically.

Table 5 presents main parameters and characteristics of the cab air conditioning and heating system.

Table 5

Parameter (characteristic) name	Value
Refrigerating capacity, kW	6.4
Heating capacity, kW	8.7
Operating voltage, V	12
Electrical power consumption, W	260
Mechanical power consumption, kW	From 1.4 to 8.0
Coolant	R134a, ozone-friendly
Compressor	DELPHI SP15
Compressor drive belt	AVX-13x1200

In case of nonregular operation, in order to maintain good condition, it is recommended once in every 15 days to turn on the system in the cooling mode (with the ambient temperature above 15°C) for 15 to 20 minutes.

Independently of operating conditions, operation of the system must be checked once a year at a service station with special equipment.

When putting the tractor to short-term storage, no preparation work is carried out for the air conditioning system. During storage, turn on the air conditioner each 15 days for 15 to 20 minutes with the engine running. The air temperature in the tractor cab must be not less than 20 °C.

When putting the tractor to long-term storage, check operation of the air conditioning system with special equipment. If necessary, refill with refrigerating fluid. During storage, no service work is carried out.

When removing from storage, have the air conditioning system serviced by a special service station with diagnostic equipment.

Other details on maintenance and servicing of the air conditioning and heating system of the cab are given in **3.2 “Maintenance of tractor components”** of this manual.

WARNINGS:

1. ONLY SPECIALLY TRAINED PERSONNEL IS ALLOWED TO PERFORM MAINTENANCE AND REPAIR WORKS FOR THE AIR CONDITIONING SYSTEM.

2. ANY WORK RELATED TO DISCONNECTION OF THE AIR CONDITIONING SYSTEM ELEMENTS MUST BE PERFORMED BY TRAINED PERSONNEL WITH USE OF SPECIAL EQUIPMENT FOR MAINTENANCE OF AIR CONDITIONERS. THE SYSTEM IS UNDER HIGH PRESSURE EVEN WHEN IT IS OFF.

3. BEFORE STOPPING THE TRACTOR ENGINE, MAKE SURE TO TURN OFF THE AIR CONDITIONER.

4. THE R134A REFRIGERATING FLUID IS NONTOXIC, NONFLAMMABLE, DOES NOT FORM EXPLOSIVE MIXTURES. THE REFRIGERATING FLUID BOILING TEMPERATURE IS MINUS 27°C UNDER NORMAL CONDITIONS. IN CASE OF SKIN CONTACT, THE REFRIGERATING FLUID IMMEDIATELY EVAPORATES AND CAN CAUSE SUPERCOOLING OF SKIN AREAS.

5. WHEN DISCONNECTING THE TRACTOR, THE CLOSED AIR CONDITIONING SYSTEM CAN BE DETACHED BY DISCONNECTING THE QUICK-RELEASE COUPLINGS.

2.5.4 Air conditioning unit troubleshooting

Table 6

Fault	Possible reason	Remedy
The electromagnetic coupling of the compressor does not operate (when turning the temperature regulator, no distinctive metallic click is heard)	1. Electric equipment failure	With a tester or multimeter, check operation of the pressure sensor unit, the sensor unit terminals (the red and pink wires) must create a continuous circuit. Check operation of the electric circuit connections from the compressor coupling to the air conditioner control panel.
	2. Coolant leak occurred.	Find the refrigerating fluid leak spot. Detection of leaks, replacement of hoses and components is performed by trained personnel with use of special equipment (warranty service and repair is performed by Belvneshinvest CJSC, Minsk, tel./fax ++375-17-262-40-75, ++375-29-662-97-69, +375-29-628-67-98)
Air conditioner fan engine does not operate	Electric equipment failure	Check condition of the respective fuse (25A, see the electric circuit diagram, Annex A) on the fuse block F4 located on the instrument panel. Replace if faulty. With a test lamp, check availability of power at the air conditioner engine (M7, Annex A) with the switch ON and the engine “ground” available. If the electric circuits are in good condition, but there is no power at M7, replace the switch.
When the air conditioner is in the heating mode, warm air is supplied to the cab	Sealing of the valve ПО-11 (or ВС11) damaged.	Replace the valve ПО-11 (or ВС11)
Leak of refrigerating fluid from cab ventilation box	Broken pipes of the heat exchanger (damage from frost due to incomplete discharge when working with water during cold season).	Replace the climate unit of the conditioner.

Note – Instead of a climate system, a heater fan can be installed on your tractor. Control and design of the fan heater is described in the operating manual 900–0000010 OM supplied with your tractor.

2.6 Electric equipment

Annex A contains the electric circuit diagram of BELARUS– 920.4/952.4/1025.4/1221.4 tractors with a list of components.

3 MAINTENANCE

3.1 Maintenance of tractor

Kinds of scheduled maintenance, MS procedure, contents of scheduled maintenance operations (MS), as well as names, brands, quantity, intervals of change of fuels and lubricants of "BELARUS–920.4/952.4" tractor chassis are described in the operating manual 900-0000010 OM supplied with your tractor.

Kinds of scheduled maintenance, MS procedure, contents of scheduled maintenance operations (MS), as well as names, brands, quantity, intervals of change of fuels and lubricants of D-245.43S3A/D-245.5S3A engines installed on the BELARUS-920.4/952.4 tractors are described in the engine operating manual 245S3A-0000100 OM supplied with your tractor.

This manual provides only description of those operations that, due to variation in design of "BELARUS-920.4/952.4" tractors from models "BELARUS-920.3/952.3" differ in maintenance operations for the "BELARUS-920.3/952.3" tractors or are not performed for "BELARUS-920.3/952.3".

Before you carry out any maintenance work, raise, then lock the tractor hood and, as necessary, remove the both sides (Figure 3.1). To do that, proceed as follows:

- pull the handle 2 and raise the hood 1 by the grip 3;
- lock the hood 1 with the arm 4;
- make sure that the hood 1 is securely locked in the raised position;
- as necessary, remove the left side 6 and the right side 5, first unscrewing three mounting bolts 7 on each side.

To provide access to the expansion tank of the engine cooling system, open the hatch 8 (Figure 3.1), first unlocking the lock 9.

DO NOT OPEN THE HOOD 1 (FIGURE 3.1) AND THE HATCH 8 AT THE SAME TIME.

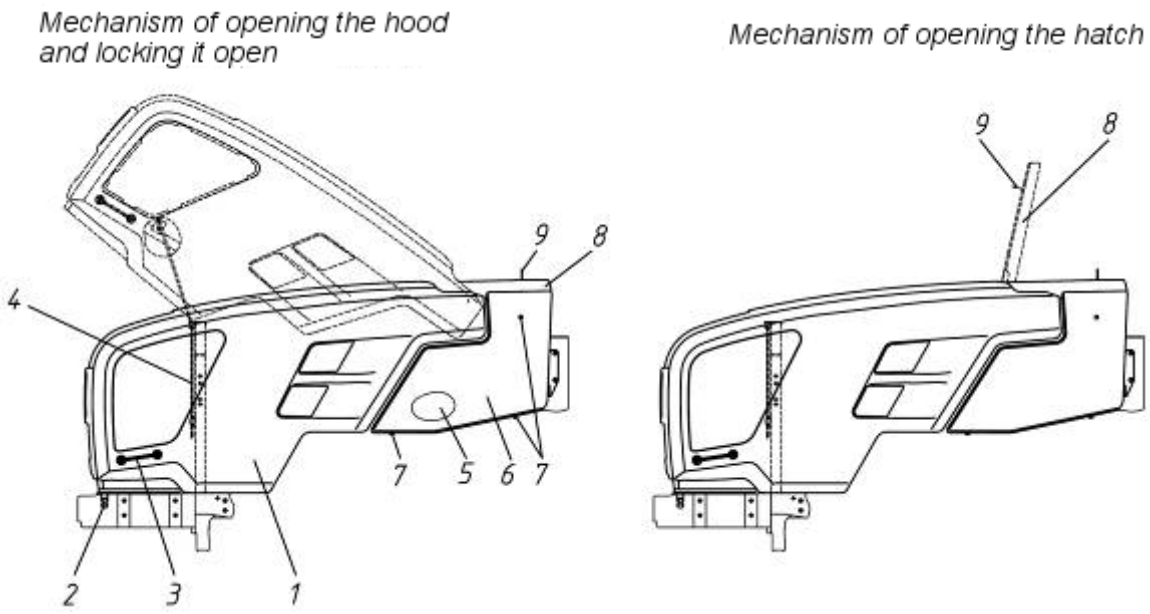


Figure 3.1 Mechanism of opening the hood and the hatch, locking the hood open

3.2 Maintenance of tractor components

Table 7 lists maintenance works for the chassis and engine of the "BELARUS-920.4/952.4" tractors to perform additionally to the maintenance works specified in the table of scheduled maintenance of the operating manual 900–0000010 OM and Table 14 of the 245S3A-0000100 OM document, as well as operations that due to differences in the designs of the BELARUS–920.4/952.4 and BELARUS-920.3/952.3 models are to be performed instead of works specified in the manuals 900–0000010 OM and 245S3A-0000100 OM.

Notes

1. Instead of engine maintenance works 1, 2, 5, 5a, 8, 19a, 20, 21, 22, 31, 34, 38, 39, 40, 51, 53, 54, 55, 56, 57, 58, as listed in the table of scheduled maintenance on pages 109-111 of the operating manual 900-0000010 OM, perform maintenance works as listed in **Section 3. MAINTENANCE** of the engine operating manual 245S3A-0000100 OM.

2. Because the Belarus-920.4/952.4 tractors are equipped with the air cleaner Donaldson FPG09-0219, instead of operations on 4, 7, 12, 13, as listed in table 14 of the 245S3A-0000100 OM document, perform the operation 7a (Table 7) of this manual.

3. The engines of the Belarus-920.4/952.4 tractors are equipped with generators with automatic seasonal voltage adjustment. At that, there is no Winter-Summer seasonal voltage adjustment screw. Consequently, performing MS operations 18, 20, as listed in Table 14 of the 245S3A-0000100 OM document, is not needed.

4. Because air pressure regulator is used in pneumatic system of improved design on the tractors "BELARUS-920.4/952.4", the operation 25 "Filter cleaning of air pressure regulator in pneumatic system", specified in the table of scheduled maintenance of the 900–0000010 OM operating manual, is not needed.

Table 7 – Maintenance works of "BELARUS-920.4/952.4" tractors

No. of operation	Operation name	Interval, hours			
		10	125	500	1,000
1a	Check fastenings of air conditioner hoses	×			
2a	Check/clean air conditioner condenser	×			
3a	Check/clean conditioner drain pipes	×			
4a	Remove condensate from the tanks of the heat exchanger of the engine charge air cooler (CAC)	× winter	× summer		
5a	Check/service engine air cleaner		×		
6a	Check / adjust tension of the air conditioner compressor drive.		×		
7a	Check tightening of the bolts fastening the CAC air ducts;			×	
8a	Check oil level in wet brake housings			×	
9a	Replace filter drain	Each 800 service hours or ones a year			
10a	Change oil in wet brake housings				×
11a	Replace filter element of coarse fuel filter				×

Operation 1a. Check fastening of air conditioner hoses

The conditioner hoses must be securely fastened with tension bands. Do not allow contact of the hoses with tractor's moving parts.

Operation 2a. Check / clean air conditioner condenser

Check cleanliness of the air conditioner core. If it is clogged, clean the air conditioner with compressed air. Direct air flow with the hood open perpendicularly to the condenser plane top-down. Straighten folded finning with a special comb or plastic (wooden) plate. In case of severe clogging of the condenser, rinse it with hot water under pressure of 0.15 to 0.2 MPa max and blow with compressed air.

Operation 3a. Check / clean drain pipes of condensate

Blue drain pipes are to the right and left of the heat exchanger pipe under the ceiling panel. Check and, as necessary in order not to allow plugging, clean the drain pipes. A sign of a clean drain pipe is water dripping when the conditioner is working during hot weather.

Operation 4a. Remove condensate from the tanks of the heat exchanger of the engine charge air cooler (CAC)

To remove condensate from the tanks of the engine CAC heat exchanger, proceed as follows:

- unscrew two plugs 1 (Figure 3.2) in the lower part of the charged air cooler 2;
- let condensate drain;
- screw the plugs 1.

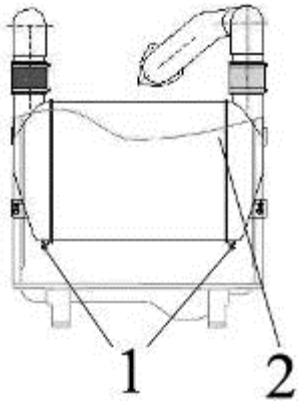


Figure 3.2 – Removal of condensate from the tanks of the engine CAC heat exchanger

Operation 5a. Check and maintenance of the engine air cleaner

Check condition of the paper filter elements (PFE) for presence of paper break and correct installation of the PFE. To check the basic filter element (BFE), perform the following:

- open the tractor hood mask to get access to the air cleaner;
- pull the yellow latch 1 (Figure 3.3), turn the cover 2 counterclockwise by 12.5° and remove it;

- remove the basic filter element 3;
- check if there dirt in the master filter element (MFE) without removing it from its housing.
- blow the filter element with compressed air first from inside, then from outside to completely remove dust. To avoid a break of the paper blind, air pressure must not exceed 0.2 to 0.3 MPa. Direct the air jet at an angle to the filter element surface. During maintenance work, protect the filter element from mechanical damages and contamination with oil.

ATTENTION: DO NOT BLOW THE BFE WITH EXHAUST GASES OR RINSE IN DIESEL FUEL.

ATTENTION: REMOVING THE MFE FROM ITS HOUSING IS NOT RECOMMENDED. DIRT IN THE MFE INDICATES A FAILED BFE (BREAK OF THE PAPER SHUTTER, LOOSE BOND OF THE BOTTOM). IN SUCH A CASE, RINSE THE MFE AND REPLACE THE BFE.

- clean the supply pipe, the inner surfaces of the casing and pan of the air cleaner of dust and dirt;
- check condition of the sealing rings;
- assemble the air cleaner in the reverse order;
- make sure that the BFE is correctly installed in the housing and close the latches 1;
- set the hood mask to its original position.

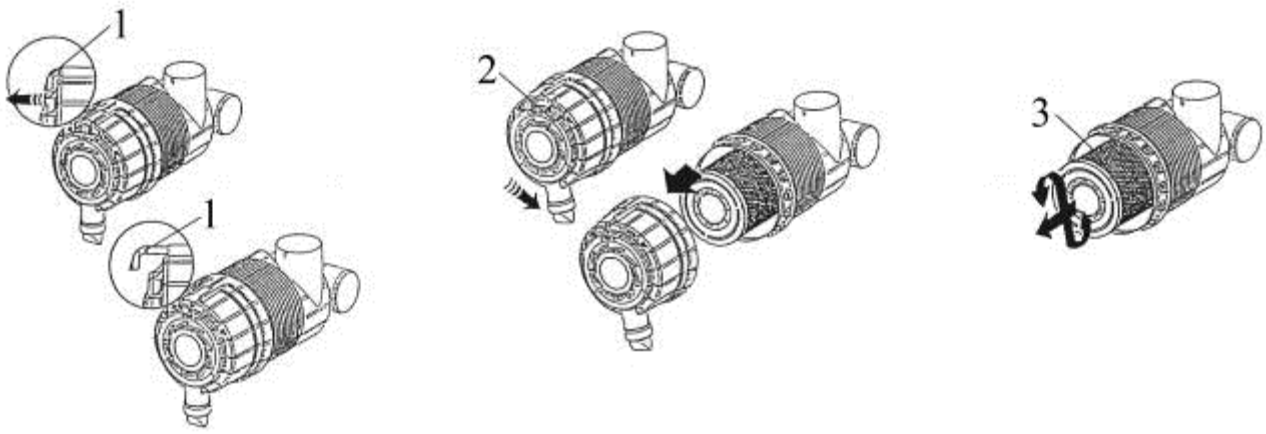


Figure 3.3 — Check of engine air cleaner

ATTENTION: AFTER ASSEMBLING THE AIR CLEANER, CHECK TIGHTNESS OF ALL INTAKE CONNECTIONS. IF THE CHECK REVEALS ANY FAULTS OR DAMAGES, FIND OUT THEIR REASON AND TAKE MEASURES TO ELIMINATE THEM.

Operation 6a. Check / adjust tension of the air conditioner compressor drive belt.

Check/adjust tension of the air conditioner compressor drive belt:

tension of the belt 1 of the air conditioner drive (Figure 3.4) is deemed normal if deflection of its branch from the engine crankshaft pulley to the compressor pulley as measured in the middle point is 4 to 6 mm when a force of (39 + 2.0) N is applied perpendicularly to the middle part of the branch.

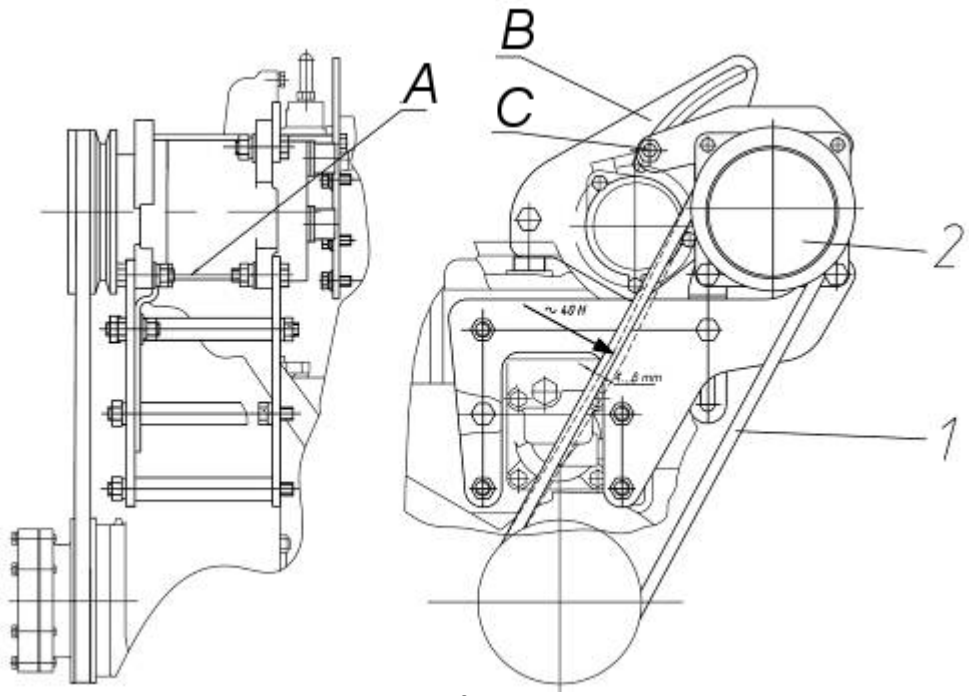


Figure 3.4 — Check / adjust tension of the air conditioner compressor drive belt.

Adjust tension of the air conditioner compressor drive belt:

adjust tension of the belt 1 (Figure 3.4) by turning the compressor 2 around the rotation axis A and tightening the threaded coupling B in the groove of the sector C. After adjustment, the belt deflection under a force of (39 + 2.0) N, applied perpendicularly to the middle part of the branch, must be 4 to 6 mm.

Operation 7a. Check tightening of the bolts fastening the CAC air ducts

Check and tighten up as necessary the bolts fastening the CAC air ducts. The tightening torque of the CAC air duct clamps must be 10 to 15 N•m.

Operation 8a. Check the oil level in the wet brake housings

To check the oil level in the wet brakes housing, perform the following:

- install the tractor on an even surface;
- unscrew the check-filler plugs 22 (Figure 2.5) in the right and left brake housings;
- the oil level in the brake housings must up to the hole edges of the check-filler plugs 22 on the front walls of the housings;
- if necessary, add oil through the holes of the plugs 22;
- screw the plugs 22.

Operation 9a. Replace the filter drain

Performed once a year or after 800 service hours.

ATTENTION: FOR REPLACEMENT OF FILTER DRAIN, CONTACT A SPECIAL SERVICE STATION. REPLACE ONLY USING SPECIAL EQUIPMENT.

Operation 10a. Change oil in wet brake housings

To drain the oil from the wet brake housings, perform the following:

- install the tractor on an even surface;
- unscrew the check-filler plugs 22 (Figure 2.5) in the right and left brake housings;
- unscrew the drain plugs 12 (Figure 2.5) in the right and left brake housings and drain the oil into a container for waste oil;
- screw the drain plugs 12.
- through the holes in the check-filler plugs 22, fill oil to the both brake housings to the hole edges of the check-filler plugs 22 on the front walls of the housings.
- screw the check-filler plugs 22.

Notes

1. Perform operations of oil change in the brake housings simultaneously with oil change in the transmission. The oil grade used for the brakes is the same as the oil grade used for the transmission.
2. The total oil volume filled into the both brake housings is (2.5±0.1) liters.

Operation 11a. Replace filter element of coarse fuel filter

In accordance with Section 3.2.8 of the 245S3A-0000100 OM document, replacement of the coarse fuel filter or the filter element of the coarse fuel filter must be performed in accordance with the instructions of this manual.

To replace the filter element of the coarse fuel filter on the “BELARUS-920.4/952.4” tractor, perform the following:

- unscrew the spent filter element 4 (Figure 3.5) of the coarse fuel filter;
- if the catchment cup 5 is to be reused, unscrew it from the spent filter element, then lubricate the sealing 6 between the new filter element and the catchment cup with motor oil, screw on the catchment cup to the new filter element;
- manually screw on the new filter element until the seal (seal between the filter element 4 and the filter housing 2) tightly fits to the surface of the filter housing, continue screwing on the filter element manually by 3/4 turn;
- then bleed air from the fuel line, to do that, unscrew the air-bleeding screw 1 and pump air with the manual pump 3 at the spot pointed to by the arrow until fuel without air bubbles emerges from the air-bleed screw hole, tighten back the air-bleed screw;
- check tightness of all fuel line connections — no fuel leakage is allowed.

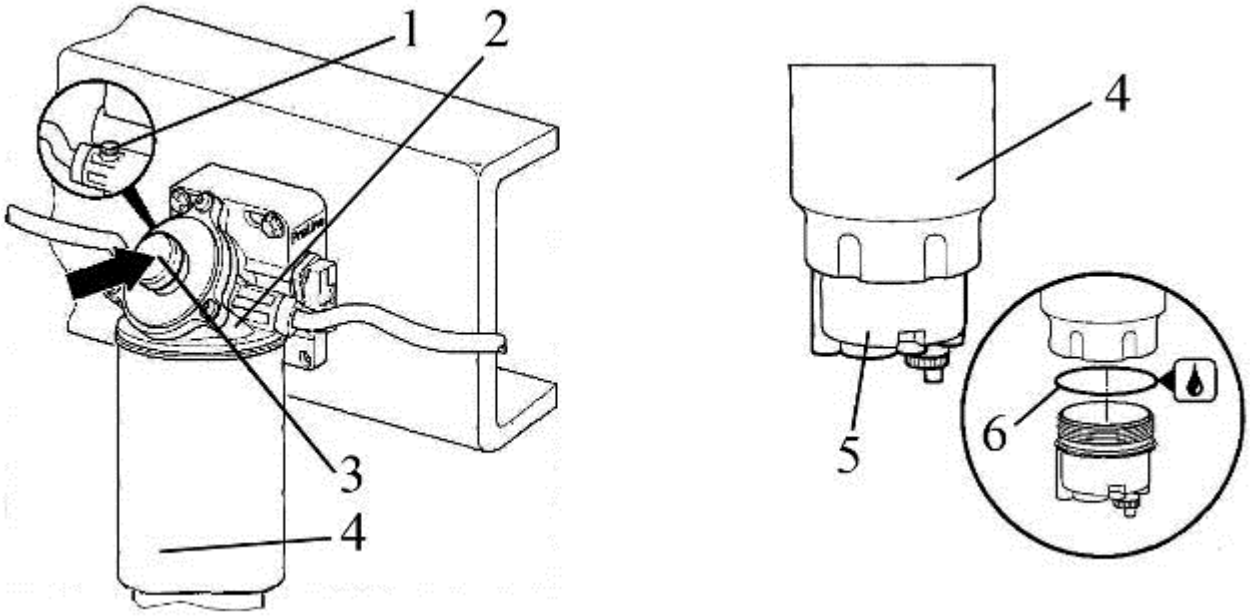


Figure 3.4 — Replacement of filter element of coarse fuel filter

Annex A
(informative)

Electric circuit diagram

Table A.1 lists items of the electric circuit diagram presented on Figure A.1.

Table A.1

Designation	*Name*	*Qty.*	*Note*
A1	*Cassette radio recorder*	*1*	
A2	*Spark plugs*	*6*	*Supplied with engine For 920.4/952.4/1025.4 — 4 pcs.*
A3	*Control panel with tachometer/speedometer (with CAN)*	*1*	
A4	***Air conditioner***	*1*	
A4.1	*Air processing unit*	*1*	*Supplied with conditioner*
A4.1.1	*Output air temperature regulator*	*1*	*Supplied with conditioner*
A4.2	*Compressor-condenser unit*	*1*	*Supplied with conditioner*
A4.3	*Pressure sensor unit*	*1*	*Supplied with conditioner*
M7	*Fan electric motor*	*1*	*Supplied with conditioner*
S1	*Fan mode selector*	*1*	*Supplied with conditioner*
BA1, BA2	*Loud speaker*	*2*	*Supplied with radio cassette recorder*
BN1	*Fuel volume sensor*	*1*	
BP1	*Pneumatic system air pressure indicator*	*1*	
BP2	*Gearbox oil pressure sensor*	*1*	*For 1025.4/1221.4*
BV1, BV3	*Speed sensor*	*2*	
BV2	*PTO speed sensor*	*1*	*For 1221.4 with PTO speed sensor*
E1, E2	*Road headlight*	*2*	
E3, E4, E6, E7	*Working headlight*	*4*	
E5	*Interior lamp*	*1*	
E8	*Number plate light*	*1*	
EL1, EL2	*Lamp AKG12-60+55-1*	*2*	*Included into E1, E2*
EL3, EL4, EL13, EL14	*Lamp AKG12-55-1*	*4*	*Included into E3, E4, E6, E7*
EL5…EL7, EL9, EL10, EL18, EL19	*Lamp A12-5*	*7*	*Included into HL1…HL5, E8*
EL8, EL11, EL12, EL15, EL17, EL20, EL22	*Lamp A12-21-3*	*7*	*Included into HL4, HL5, E5, HL6,HL7*
EL16, EL21	*Lamp A12-10*	*2*	*Included into HL6, HL7*

Table A.1, continued

Designation	*Name*	*Qty.*	*Note*
F1	*Fuse block*	*1*	
F2	*Fuse block*	*1*	
F3	*Fuse block*	*1*	
F4	*Fuse block*	*1*	
F5	*Fuse block*	*1*	
F6	*Fuse block*	*1*	
FU1	*Fuse*	*1*	*Supplied with radio cassette recorder*
FU2, FU3	*Fuse link 25 A*	*2*	
G1	*Generator*	*1*	*Supplied with engine*
GB1, GB2	*Battery 12V, 120 Ah.*	*2*	*For 1221.4*
	Battery 12V, 88 Ah.	*2*	*For 920.4/950.4/1025.4*
HA1	*High-pitch horn*	*1*	
HA2	*Low-pitch horn*	*1*	
HA3	*Signal switch (buzzer)*	*1*	
HA4	*Horn*	*1*	
HG1	*Indicator lamp block*	*1*	
HL1…HL3	*Road train lamp*	*3*	
HL4, HL5	*Front lamp*	*2*	
HL6, HL7	*Rear lamp*	*2*	
HL8	*Signal beacon*	*1*	
K1	*Spark plug relay switch*	*1*	
K2	*Instrumentation power supply relay switch*	*1*	
K3, K4, K7…K10	*Normally open relay switch 30A*	*6*	
K5	*Normally closed relay switch 20A*	*1*	
K6	*Starter relay switch*	*1*	
KH1	*Turn indicator breaker*	*1*	
KT1	*Spark plug unit*	*1*	
M1	*Heater fan*	*1*	
M2	*Parallel-motion windshield wiper*	*1*	
M3	*Starter*	*1*	*Supplied with engine*
M4	*Electric washer*	*1*	
M5	*Rear window wiper*	*1*	
M6	*Heater motor*	*1*	
P1	*Display integrated with CAN*	*1*	

Table A.1, continued

Designation	*Name*	*Qty.*	*Note*
P2	*Instrument clusters (KP-5) with CAN*	*1*	*For 920.4/950.4*
	Instrument clusters (KP-6) with CAN	*1*	*For Belarus-1025.4/1221A*
QS1	*Remote battery switch 24V*	*1*	
R1	*Ballast resistor*	*1*	
R2	*Generator ballast resistor (CAN)*	*1*	
SA1	*Roadtrain sign lamp switch*	*1*	
SA2, SA3	*Headlight switch*	*2*	
SA4	*Fan heater switch*	*1*	
SA5	*Windshield wiper switch*	*1*	
SA6	*Starter and instrument switch*	*1*	*COBO, Italy*
SA7	*Understeering combined switch*	*1*	
SA8	*Battery switch*	*1*	
SA9	*Windshield washer switch*	*1*	
SA10	*Central light switch*	*1*	
SA11	*Start lock switch BK12-41*	*1*	*For 1025.4/1221.4*
	Start lock switch BK 2-41	*1*	*For 920.4/950.4/1021.4*
SA12	*Flashing beacon switch*	*1*	
SB1	*Emergency stop signaling switch*	*1*	
SB2	*Brake light switch*	*1*	
SB3	*Park brake light switch*	*1*	
SP1	*Air filter clogging sensor*	*1*	
SP2	*HSU emergency oil pressure sensor*	*1*	
SP3	*Pneumatic system emergency air pressure indicator*	*1*	
UZ1	*Voltage converter*	*1*	
XP1.1, XP116	*Single-pin terminal block*	*16*	
XP2.1…XP2.7	*Two-pin terminal block*	*7*	
XP4.1, XP4.2	*Four-pin terminal block*	*2*	
XP6.1	*Six-pin terminal block*	*1*	
XS1.1… XS1.20	*Single-pin female receptacle*	*20*	
XS2.1…XS2.4, XS2.6…XS2.18	*Two-pin female receptacle*	*18*	
XS3.1, XS3.2, XS3.4	*Three-pin female receptacle*	*3*	
XS4.1	*Four-pin female receptacle*	*1*	
XS5.1, XSS.2, XS5.5…XS2.10	*Five-pin female receptacle for relay switch*	*9*	

End of Table A.1

Designation	*Name*	*Qty.*	*Note*
XS6.1, XS6.2	*Six-pin female receptacle*	*2*	
XS7.1, XS7.2	*Seven-pin female receptacle*	*2*	
XS8.1.. XS8.6. XS8.8	*Eight-pin female receptacle for switches*	*7*	
XS8.7	*Eight-pin female receptacle*	*1*	
XS9.1…XS9A	*Nine-pin female receptacle*	*4*	
XS13.1, XS13.2	*13-pin female receptacle*	*2*	
XS2.5	*Female receptacle 30-16-06570*	*1*	*COBO. Italy*
XS3.3	*Female receptacle 30-16-06571*	*1*	*COBO, Italy*
XS5.3	*Female receptacle 469.59.00.00*	*1*	*AVAR JSC*
XS10.1	*Terminal block 1-0967240-1*	*1*	*AMP, Germany*
	Cylindrical connectors		
XS12.1, XS12.2	*Socket ШС32П12Г-М-7*	*2*	
XS12.3	*Socket ШС32П12Г-МТ-7*	*1*	
XS15.1	*Socket ШС36У15Г-М-6*	*1*	
XP12.1, XP12.2	*Plug ШС32ПК12Ш-МТ-7*	*2*	
XP123	*Plug ШС32П12Ш-МТ-7*	*1*	
XP15.1	*Plug ШС35ПК15Ш-МТ-6*	*1*	
XA9.1	*Socket*	*1*	
XT1	*Splitting unit*	*1*	
XT2.1, XT2.2	*Panel*	*2*	
XT3.1, XT3.2	*Panel*	*2*	
WA1	*Antenna*	*1*	

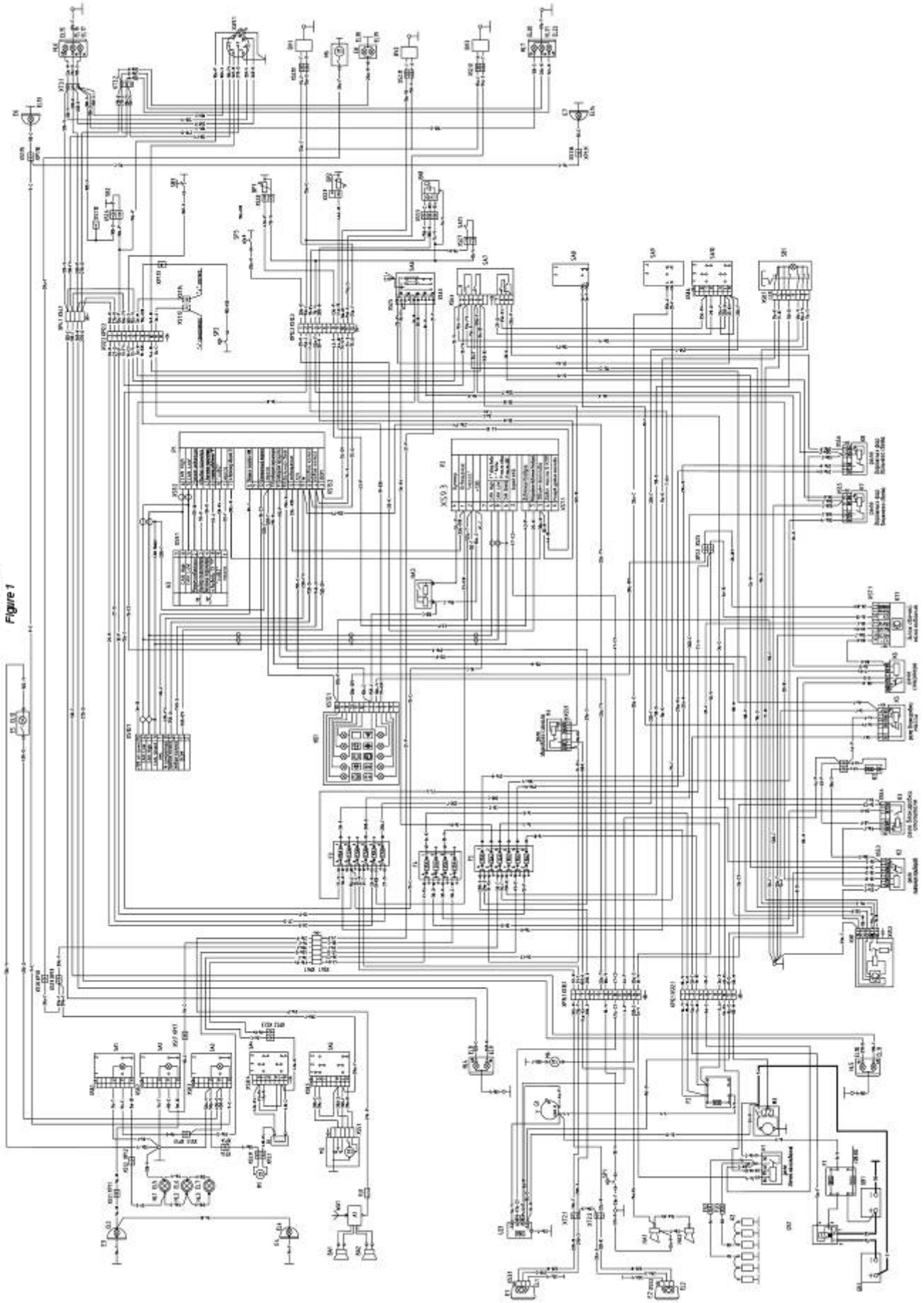
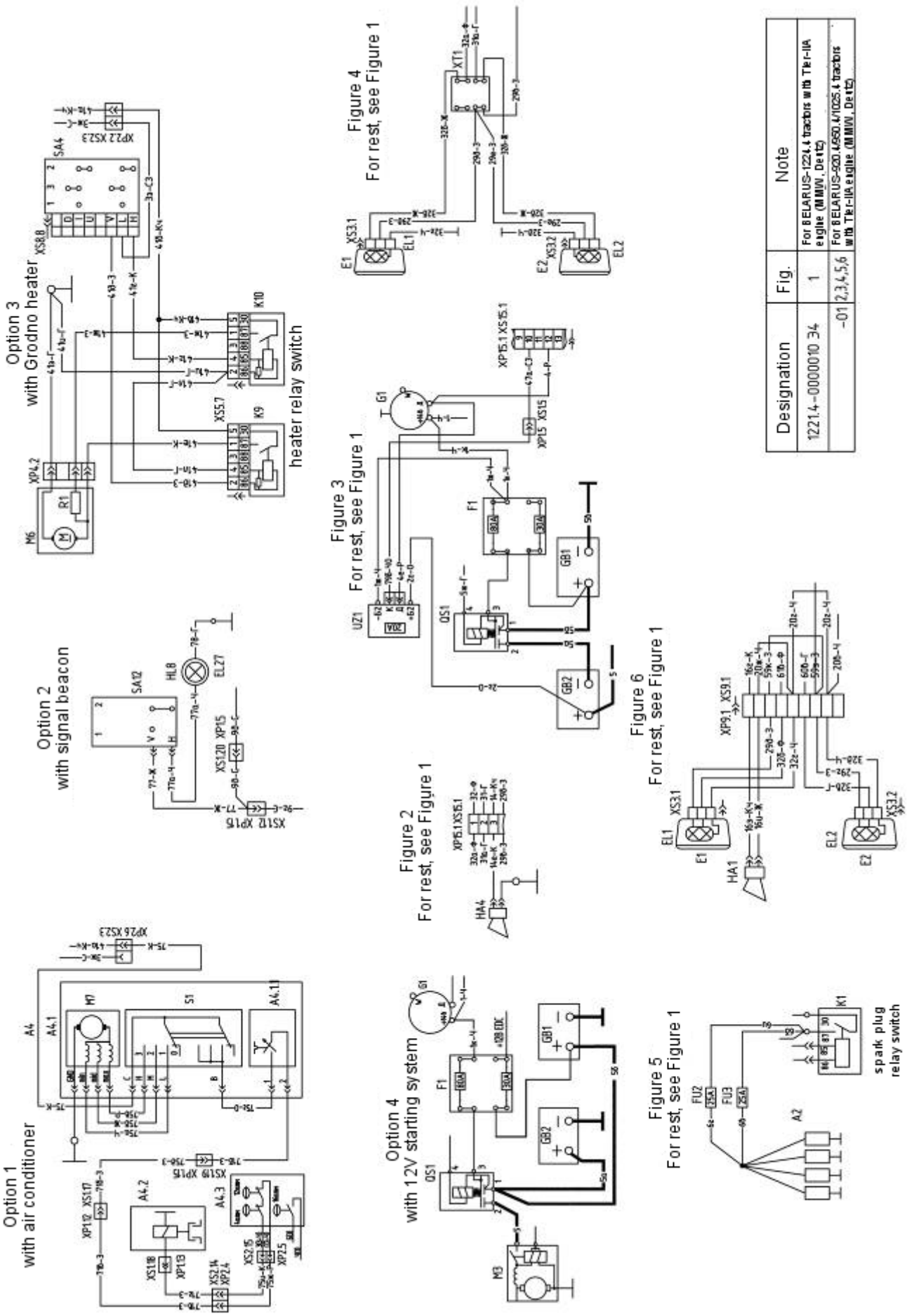


Figure A.1 – Electric circuit diagram



Designation	Fig.	Note
1221.4-0000010 34	1	For BELARUS-1221.4 tractors with Tier-IIA engine (MMZ/V, Deutz)
-01	2,3,4,5,6	For BELARUS-920.4/952.4/1025.4 tractors with Tier-IIA engine (MMZ/V, Deutz)

Figure A.1, sheet 2

To Figure A.1:

Wire colors: Г – blue, ГЧ – blue/black, Ж – yellow, ЖЗ – yellow/green, З – green, К – red, КЖ – red/yellow, Кч – brown, О - orange, Р – pink, С – grey, СЗ – grey/green, Ф – violet, Ч – black, ЧО – black/orange.

Figure A.2 presents the electric circuit diagram of connections of additional front headlights installed on brackets of front lights.

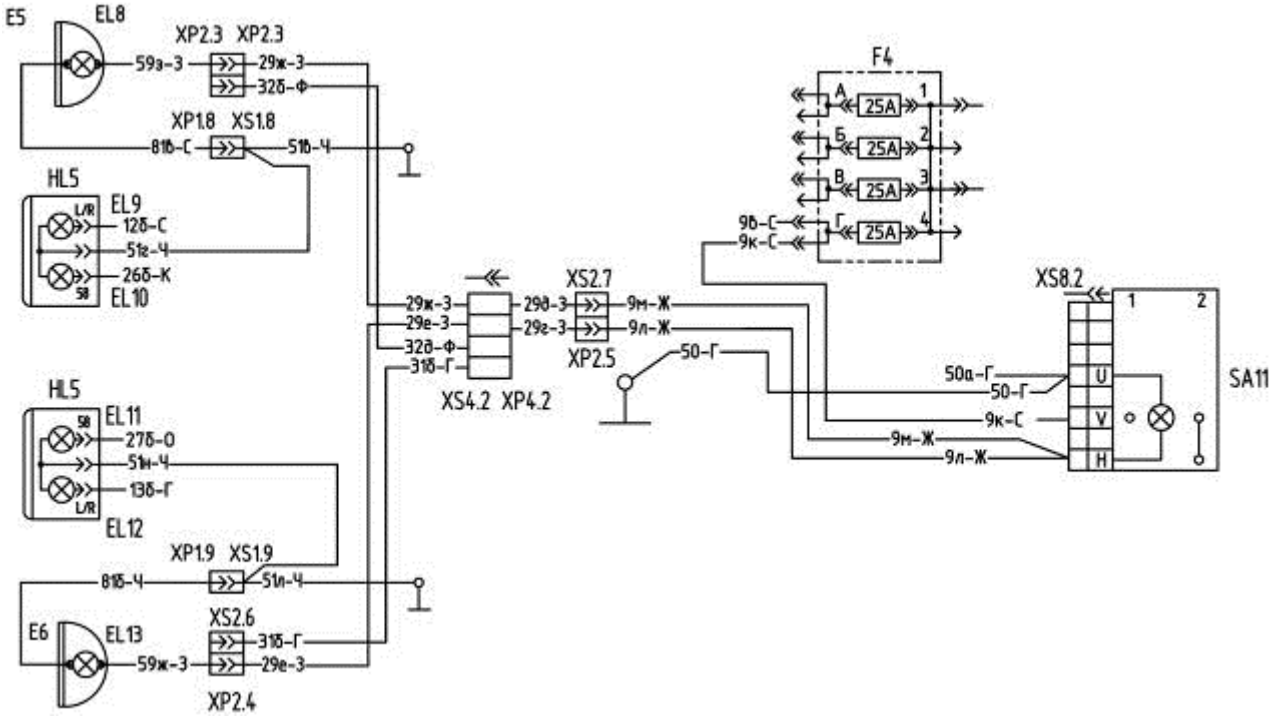


Figure A.2 – Electric circuit diagram of connections of additional front headlights

To Figure A.2:

E5, E6 – headlight;

EL8, EL13 – AKG12-55-1 lamp;

SA11 – headlight switch;

Note – Table A.1 lists names of other items of the diagram on Figure A.2.

Annex B
(informative)

Electric circuit diagram of rear axle DL and PTO control system
The components list of electric circuit diagram of rear axle DL and PTO control system, shown in Figure B.1, is specified in Table B.1.

Table B.1

Designation	***Name***	***Qty.***	***Note***
A1, A2	*Electromagnet КВМ36Т*	*2*	*A1 - DL, A2 - PTO*
EL1, EL 2	*Pilot lamp 12.3803-31 TU RB 300228919.037-2002*	*2*	*EL1 - DL, EL 2 - PTO*
EL3, EL4	*Pilot lamp 2202.3803-34 TU 37.003.1109-82*	*2*	*EL3 - DL, EL 4 - PTO*
K1, K2	*Relay 90.3747 TU 37.003.1418-94*	*2*	
SA1	*Switch П150М-06.14 TU RB799.01-97*	*1*	*DL*
SA2	*Switch П150-06.17TU RB 37.003.701-75*	*1*	*DL*
SA3	*Switch П147М-01.17 TU RB 14795799.001-97*	*1*	*PTO*
SA4	*Switch П147-01.17 TU 37.003.701-75*	*1*	*PTO*
SA5	*Switch ВК 12-1 ЦИКС 642241.001 TU*	*1*	*PTO*
SB1	*Switch ВК 12-51 TU RB 37334210.004-97*	*1*	*DL (13°)*
VD1, VD2	*Diode KD 206 A ТТ 3.362.141 TU*	*2*	
	Receptacles OST 37.003.032-88		
XP1	*Male receptacle 502601*	*1*	
XP2.1, XP2.2	*Male receptacle 502602*	*2*	
XP4	*Male receptacle 502604*	*1*	
XS2.1, XS2.2	*Male receptacle 502602*	*2*	
XS4	*Male receptacle 502604*	*1*	
	Receptacles OST 37.003.032-88		
XS5.1, XS5.2	*Female receptacle 607605*	*2*	
XS8.1, XS8.2	*Female receptacle 605608*	*2*	
	Plug-and-jacks TC		
	of the company AMP, catalogue D/E-10 A 03/93		
XS2.3	*Female receptacle 0-0282189-1*	*1*	*Black, two-pin*
XS2.4	*Female receptacle 0-0282189-4*	*1*	*Green, two-pin*
XS2.5	*Female receptacle 0-0282189-7*	*1*	*Yellow, two-pin*

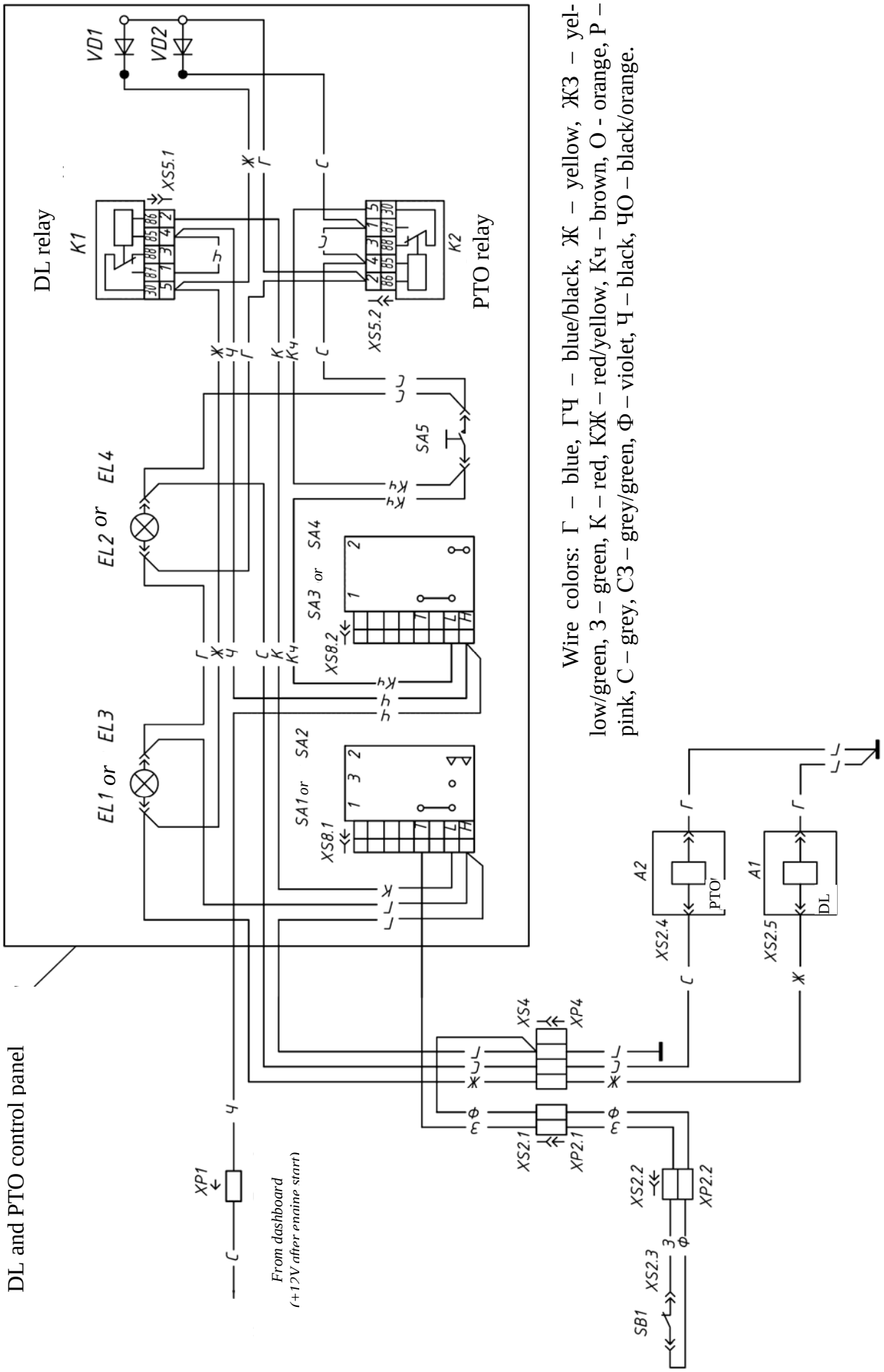


Figure B.1 – Electric circuit diagram of rear axle DL and PTO control system