



WIRELESS KIT KBS (RF 868 MHz) Operation Manual

PLA140.230.000.000 RE

Rev. 02

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This Manual provides information for service personnel how to perform installation, commissioning and maintenance of the Wireless Kit KBS (RF 868 MHz) (hereinafter referred to as the KBS).

The KBS exploitation is allowed to be used by personnel who has studied this manual, set of exploitation documentation and passed safety training.

The KBS kit is intended to connect the MU-150 / MU-150E Control Module and the MK-140 Communication Module. This device is made as part of the DEL-150 Drilling and Well Workover Monitoring System (hereinafter referred to as the DEL-150).

The KBS is manufactured in accordance with the requirements of ISO 9001:2015.

In order to exclude the possibility of mechanical damage, violation of electroplating and paint coatings, the rules of storage and transportation of the device should be observed. When studying the rules of operation, it is also necessary to be guided by the technical description and operating instructions of the DEL-150 System.

The KBS kit includes a complementary pair of active remote antennas.

1. Technical Characteristics

Name of parameter	Value
Frequency range, MHz	868.7...869.2
Output power, mW	25
Max. distance for stable wireless communication, m	300
Power supply range, VDC	12...18

Ingress protection	IP65
Ambient temperature range, °C	-40...+50
Dimensions, mm	Ø30 x 220
Weight, kg	0.3

2. Requirements for Keeping Equipment Specifications that Cause its Explosion Safety

During operation, it is forbidden to break the seals and open the KBS enclosure.

When the MU-150 / MU-150E / MK-140 unit of the DEL-150 System is switched on, it is forbidden to connect and disconnect cables, power cable and grounding conductors. In case of malfunctions, it is necessary to turn off the MU-150 / MU-150E / MK-140 unit and disconnect the power cable from the power source. Then replace the faulty KBS with a serviceable one by connecting it according to the documentation (operation manual for the DEL-150).

During operation, check the condition of communication cables periodically. If a violation of the protective layer on the cable lines is detected, replace the damaged cable immediately.

Do not allow sealing violations. If a damage is detected, replace the faulty equipment.

Ensuring explosion safety during operation is according to the safety regulations, applicable to the equipment with which (or as part of which) the equipment is used.



ATTENTION!!! During operation, it is necessary to monitor the equipment status and its cables. In case of any mechanical damage of the equipment or any of the cables connected, further operation is strictly prohibited!

3. Installation



NOTIFICATION. Installation and further commissioning of the equipment should be carried out only by qualified specialists.

Before installing the KBS, it is necessary to make sure that:

- Basic dimensions at the processing facilities correspond to the dimensions of the antennas (see Fig. 1);
- Fixing bolts and screws are present;
- There is no damage of the connector insulation;
- There is no external damage of the components;
- There is no damage of insulation of the signal cable.

Disregard of this instruction may lead to a serious failure of the KBS's components.

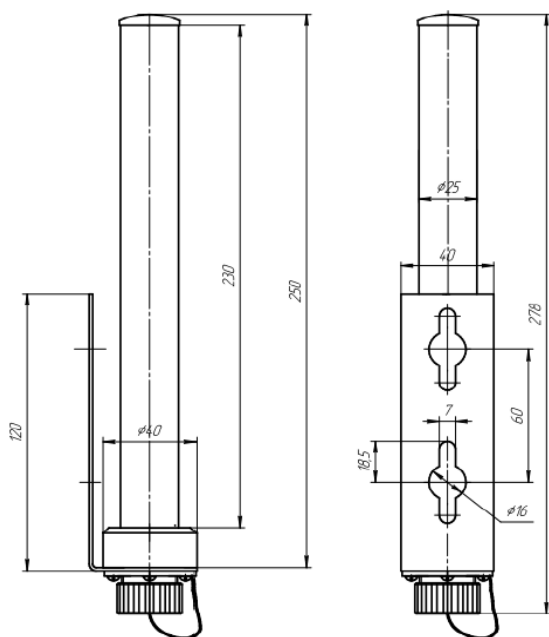


Figure 1. Overall dimensions of the KBS's antenna

The KBS installation must be carried out using a standard connection bracket. For proper and stable operation, the antennas must be in line of sight relatively to each other. During installation, make sure that the antenna and its cable are protected from any mechanical damages.

4. External Electrical Connections Installation

The WY20/WY20 universal commutation cable from the supplied package (see Fig. 2) is used for connection of the KBS to the MU-150 / MU-150E / MK-140 unit of the DEL-150 System.

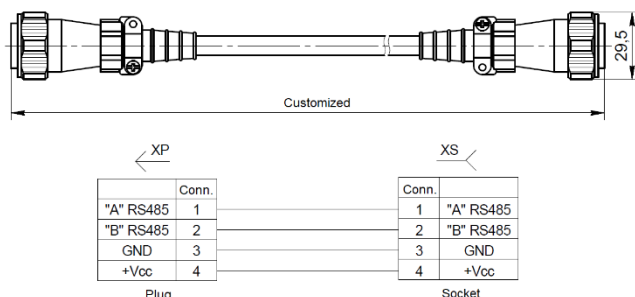


Figure 2. WY20/WY20 universal commutation cable

The cable from the KBS is connected to any of the connectors of the MU-150 / MU-150E / MK-140 unit marked "RS-485" / "Sensor" (see Fig. 3).

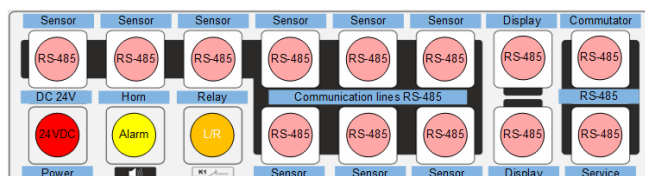


Figure 3. The MU-150 / MU-150E / MK-140 unit's connectors "RS-485" / "Sensor" for the KBS connection

5. The KBS Functional Test

For functional test of the KBS it is necessary to connect its antennas to the MU-150 / MU-150E / MK-140 unit, to turn power on and make sure that reliable connection is established between devices.

6. Setting of the KBS

If the KBS's antennas are not configured, then it is necessary to setup using "rfsetter" software. A personnel computer and the following tools are required for setup:

- Service cable;
- USB cable;
- Power supply unit;
- USB/RS-485 converter.

The setup procedure is the following:

1. Connect the "MASTER" antenna, run the "rfsetter" software and perform a COM-port setting (see Fig. 4, 5, 6).

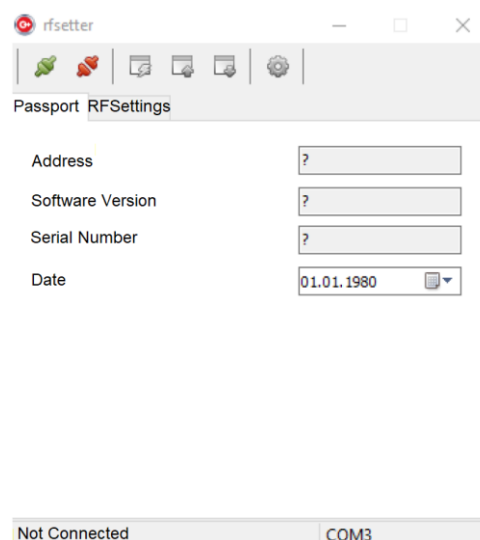


Figure 4. Setup of connection in the "rfsetter" software

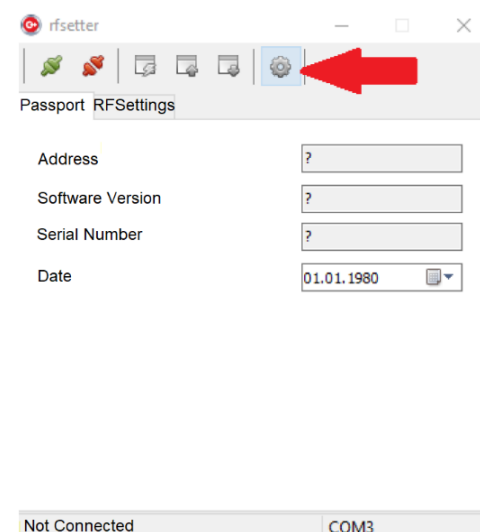


Figure 5. Setup of connection in the "rfsetter" software

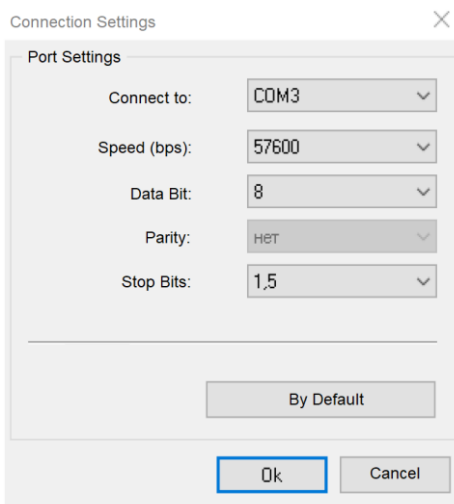


Figure 6. Setup of connection in the “rfsetter” software

Number of the COM-port is assigned by the computer (see Fig.7).

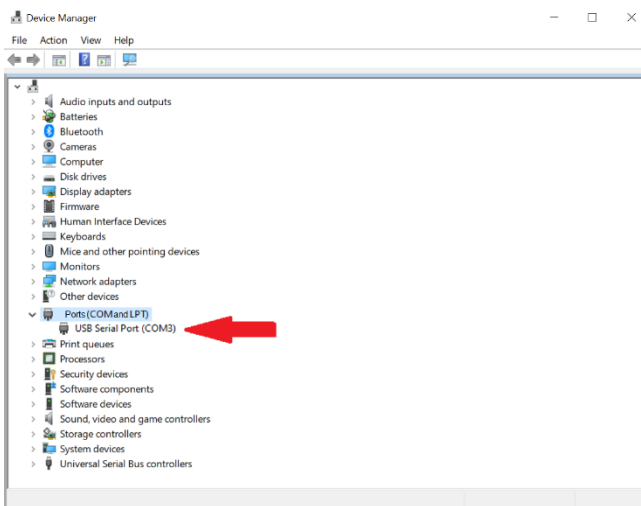


Figure 7. Checking of the COM-port number

2. Open the port (see Fig. 8).

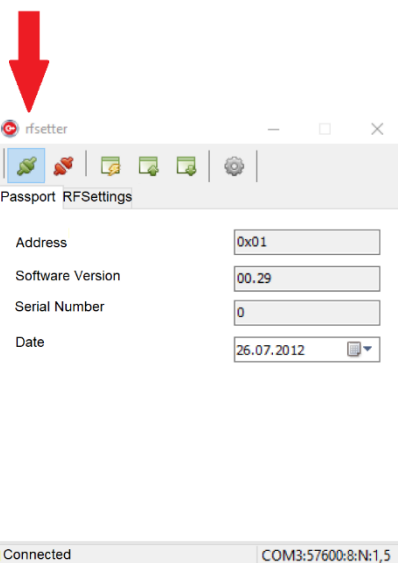


Figure 8. Setup of connection in the “rfsetter” software

3. Setup tab “RFSettings” (see Fig. 9).

The operating mode for the antenna “MASTER” must be selected as “RF master”, for the antenna “SLAVE” is the “RF slave” mode.

Select channel on which the antennas will work together (see number 1 on Fig. 9). The “MASTER” and the “SLAVE” antennas must have the same channel selected, for example “mode 1”.

Select output power (see number 2 on Fig. 9).

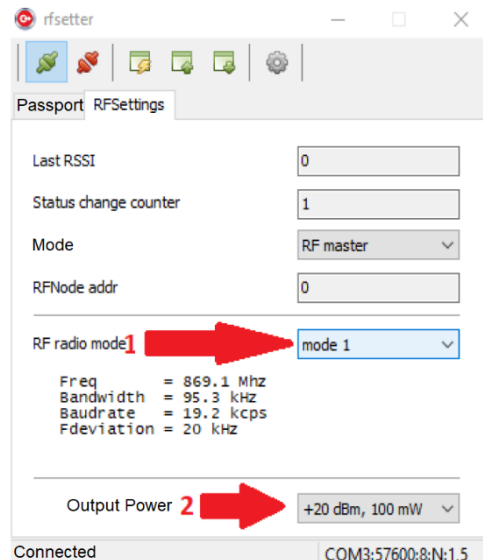


Figure 9. Setup of connection in the “rfsetter” software

Click on the “Record” tab (see Fig. 10).

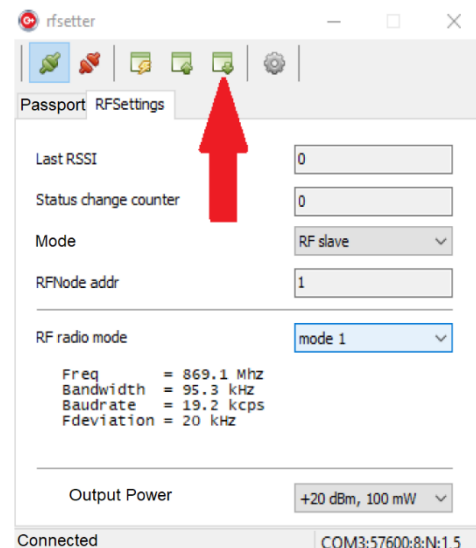


Figure 10. Setup of connection in the “rfsetter” software

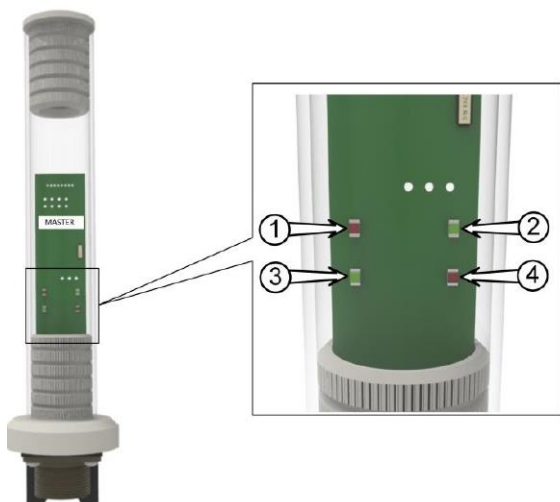
4. Disconnect the “MASTER” antenna without closing the “rfsetter” software and connect the “SLAVE” antenna. It should catch on and values will appear in the windows instead of question marks. Make the channel, output power, operating mode settings and click “Record”.

5. Connect the “MASTER” antenna to the “Commutator” connector of the MU-150 / MU-150E Control Module and the

"SLAVE" antenna to the same connector of the MK-140 Commutation Module. A sequence of connection must be the following: "SLAVE" antenna is the first, then "MASTER" antenna.

7. Light Indication

The KBS's antennas are made in a transparent enclosure, which allows to check of the LEDs that are located on the printed circuit board and to figure out equipment status by their light (see Fig. 11).



1. **Blue LED** – data exchanging by RS-485;
2. **Green LED** – wireless data exchanging;
3. **Red LED** – power supply indication;
4. **Green LED** – wireless connection quality level:
 - No light – poor communication quality, communication is absent;
 - Flashing – normal communication quality;
 - Light permanently – excellent communication quality

Figure 11. Light indication of the KBS's antenna

8. Functionality Issues

The following diagnostic is available based on the LED's lightning (see Fig. 11):

- LED #3 flashes, LED #2 lights all the time – repairing is required;
- LED #3 flashes, LED #2 flashes – reconfiguration of antennas is required;
- All LEDs are flashing – internal error, repairing is required.

If the connection between antennas is lost, the symbol "-----" opposite the parameter, which is related sensor connected to the MK-140 Communication Module, is displayed on the MU-150 / MU-150E EL screen (for example, see Fig. 12).

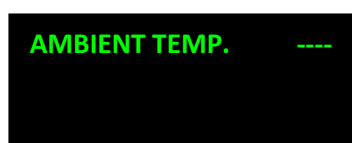


Figure 12. Readings in case of loss of communication

In case of loss of communication, it is necessary to carry out actions in the following order:

1. Restarting of the MU-150 / MU-150E / MK-140 unit;
2. Checking of the integrity of the commutation cable;
3. Replacement of the cable;
4. Replacement of antenna.

9. List of Critical Failures and Possible Issues in Maintenance Leading to Equipment Failures and Actions to Prevent these Failures (troubleshooting)

Incorrect power supply can lead to equipment failure. The failure can be recognized by LED indication absence.

A short circuit or a break circuit in the cable of antenna may cause loss of communication. The failure can be recognized by parameter data absence, question marks or dashes instead of parameter value, lack of data of other parameters.

In case of failure of the KBS or the MU-150 / MU-150E / MK-140 unit of the DEL-150 System, it is necessary to check the equipment technical condition according to the Clause #8 of this Operation Manual. If troubleshooting did not lead to proper operation, it is necessary to stop operation and replace with obviously serviceable equipment. Defective equipment should be sent for repair to the manufacturer or to the specialized authorized service center.

In case of failures that can lead to emergency situations, it is necessary to replace the equipment that has failed. If necessary, disable additional external devices.

10. Maintenance Procedure

Maintenance is carried out in the following order:

1. Cleaning the antenna's enclosure from contamination;
2. Checking the safety of seals (if available);
3. Checking the presence and strength of the mounting components;
4. Cleaning of connectors and terminals from contamination;
5. Checking for the absence of visible mechanical damages;
6. Replacement and (or) repair of damaged cable products;
7. Replacement of damaged connectors.

The contacts of the connector should be washed with an alcohol-gasoline mixture (need 3 ml.) using a soft brush. Connectors after cleaning and drying should be treated with Vaseline or similar lubricant. It is recommended to treat the threads on the connectors with graphite grease.



NOTIFICATION. Absence of maintenance records in the passport (section "Maintenance Records") ENTAILS VIOLATION OF THE OPERATION RULES, and the manufacturer has the right to withdraw from warranty obligations

11. Limit Conditions Parameters

In case of severe mechanical damage, leakproofness violations, seals violations, heating of parts to unacceptable temperatures, supply of unacceptable currents and voltages, change of calibration data, further use is unacceptable or impractical, or restoration of its serviceable or operable condition is impossible or impractical.

12. Packaging

Boxes made of plywood with metal handles for carrying are used to transport the KBS as part of the DEL-150 System.

13. List of Components

Full completeness is indicated in the passport for equipment released by manufacturer.

14. Repair

Repair of the KBS is carried out at the manufacturer or at a specialized authorized service center.



NOTIFICATION. Absence of repair records in the passport (section "Repair Records") ENTAILS VIOLATION OF THE OPERATION RULES, and the manufacturer has the right to withdraw from warranty obligations

15. Storage

The equipment requires careful handling, storage in dry, clean rooms with a constant temperature from -50°C to +65°C and a relative humidity of no more than 80%.

The long-term storage requires conservation, according to the requirements of the equipment conservation instructions. The equipment arriving at the warehouses in the manufacturer's containers are not unpacked, packed on flat pallets and stacked or in the cells of the racks.

Factory-sealed devices are not allowed to be opened in warehouses.

Small devices and devices arriving in individual packaging are stored in box pallets with installation in a stack.

Devices and components without individual packaging should be stored in shelving cells no more than 3 rows in height with the use of cushioning materials between them.

Small devices and products arriving without packaging can be stored in small-cell racks and cabinets, while devices or products of the same type should be stored in one cell.



NOTIFICATION. Absence of storage records in the passport (section "Storage Records") ENTAILS VIOLATION OF THE OPERATION RULES, and the manufacturer has the right to withdraw from warranty obligations

16. Transportation

Transportation of the equipment is allowed by all types of closed transport. The KBS in a package for transportation allows the impact of transport shaking with an acceleration of 30 m/s² with a frequency of 100 beats per minute or 1500 beats with that acceleration.

17. Disposal

The KBS is disposed of in accordance with the requirements

and norms applicable in the oil and gas industry.

18. Warranty Obligations

The warranty period is 12 months from the date of sale.

A full description of the warranty obligations is described in the equipment passport.

RPE Petroline-A LLC
Address: 53A Lermontova St., Naberezhnye Chelny,
Republic of Tatarstan, Russian Federation, 423801
Postal address: P.O. Box 23, 423801
Phone/Fax: +7 (8552) 535-535, 71-74-61
main@pla.ru, www.pla.ru