"RESEARCH AND PRODUCTION COMPANY "RADIO-SERVICE" JSC

Transmitters "Stalker"
GT-75, GT-15

Operation Manual

RAPM.435131.001OM

This Operation Manual describes components and operating principle of transmitters "Stalker" GT-75 and GT-15 (hereinafter referred to as transmitters) and contains the data relevant for proper operation, safety precautions and checking procedure.

Operating conditions:

- operating temperatures of - 30 to + 55 ºC;
- relative humidity of 90 % at the temperature of + 30°C;
- atmospheric pressure of 84 to 106.7 kPa (630 to 800 mm Hg).

Normal operating conditions:

- ambient air temperature of plus 15 to plus 25 ºC;
- relative air humidity of 30 to 80%;
- atmospheric pressure of 84 to 106 kPa (630 to 795 mm Hg).

Protection grade of the casing IP54 in accordance with GOST 14254

In terms of electrical safety, transmitters comply with the requirements of GOST 12.2.091-2012.

In terms of electromagnetic compatibility, transmitters comply with the requirements of GOST R 51522.1.

In terms of industrial interference transmitters belong to class A, group 2 as per GOST R 51318.11-2006.

Due to permanent upgrade of transmitters, design changes improving their reliability and operation conditions, the items produced and the design described in this Operation Manual may differ to some extent.

 *Warning! Please read this Operation Manual before switching on the transmitter.*

 *Warning! Dangerous voltage up to 250 V is shaped at transmitter jacks.*

1 Description and Operation

1.1 Purpose of Transmitters

Transmitters are intended for applying searching signals to target utilities. Transmitters with aid of locators of "Stalker" series are used for utility positioning, e.g. cables or pipelines, locating and depth measurement of insulation damages. Output current waveform of GT-75 transmitter is sine wave; output current waveform of for GT-15 is modified sine shape.

Transmitters can be used with any locators that have the same operating frequencies.

1.2 Specifications

1.2.1 Specifications are given in Table 1.2.1.

Table 1.2.1 – Specifications

Parameter			Value	
			GT-75	GT-15
1			2	3
Output signal frequency, ± 2 Hz		single-frequency	273, 526, 1024 and 8928	273, 1024, 8928 and 32768 (33к)
		double-frequency (basic frequency)	1024	1024 (↑↓), 8928 (φ)
Output power setting range, W			10 to 75	1 to 10
Output voltage, max., V	unlimited		250	200*
	with forced limitation		30	
Voltage accuracy, % + LSD			± (5 + 5)**	
Load conditioning range at maximum power output on frequencies, Ω		273, 526 and 1024 Hz	0.5 to 600	30 to 3000
		8928 Hz	0.5 to 300	30 to 2000
		double-frequency	0.5 to 350	
Output current, max., A			12.0	0.6
Current accuracy, % + LSD			± (5 + 3)**	
Range of DC supply voltage, V			10.5 to 15.0	
Power consumption if using 12 V external power supply, max.			110	22
Continuous operation in pulse mode at maximum output power in normal conditions with a fully charged internal rechargeable battery, h, min.			2	6

Table 1.2.1 (continued)

1	2	3
Electrical strength of insulation in normal conditions between "Output" jacks and case, 50 Hz AC current, V	1500	
Insulation resistance between "Output" jacks and enclosure (at 2500 V voltage) in normal conditions, min., MΩ	20	
Overall dimensions, max., mm	275x250x180	275x250x180
Weight, max., kg	8.5	4.9
Notes: "LSD" abbreviation – least significant digit; * - The output voltage of transmitter GT-15 on the 32768 Hz frequency is not more than 130 V; ** - The accuracy of transmitter GT-15 on 8928 and 32768 Hz frequencies is not standardized.		

1.2.2 Transmitters GT-15 and GT-75 can be powered by built-in sealed lead-acid maintenance-free rechargeable batteries (GT-75 requires two 6 V 12 A/h storage batteries; GT-15 requires one 12 V 7 A/h rechargeable battery). Alternatively, you can power the transmitter from an external 12 V DC source.

1.2.3 Transmitters have supply voltage self-check system, which warns when supply voltage drops from 11.00 to 10.5 V. When the supply voltage drops to 10.5 - 10 V transmitters switch off automatically.

1.2.4 Transmitters have the battery-charging mode, which activates automatically when transmitter is connected to the power supply unit. Transmitters provide overcharge protection of a rechargeable battery.

1.2.5 Transmitters have 3 operation modes:

- continuous operation;
- pulsed operation ⅔ (signal generation - 1 second, pause - 0.5 second);
- pulsed operation ½ (signal generation - 0.5 second, pause - 0.5 second).

1.2.6 Lifetime is 6 years minimum.

1.3 Delivery set is given in Table 1.3.

Table 1.3

Description:	Q-ty	
	GT-75	GT-15
Transmitter "Stalker" GT-75	1	-
Transmitter "Stalker" GT-15	-	1
Transmitting frame RP-02	1	1*
Transmitting antenna AP-01	1*	
Signal clamp KI-50	1*	
Signal clamp KI-100	1*	
Power supply unit	1	
Power cable «12 V»	1	1*
10-m red cable reel	1	1*
10-m blue cable reel	1	1*
5-m connecting lead	-	2
0.5-m ground rod	1	1*
0.2-m ground rod	-	1
Crocodile clip	2	
Operation Manual for transmitters GT-75 and GT-15	1	
Accessory bag for transmitter GT-75	1	-
Bag of transmitter GT-75	1*	-
Package	1**	
12V Power unit	1*	
Magnet	1*	
"12 V" charging adapter	1*	

Notes.
1 Items marked with * are to be ordered separately.
2 Positions marked with * are included in delivery set when transmitters are ordered separately.

1.4 Design and Operation

1.4.1 Appearance

Appearance of transmitters GT-75 and GT-15 is shown in Figure 1.4.1.

Transmitter GT-75 **Transmitter GT-15**

Figure 1.4.1 - Appearance of transmitters

The front panel of transmitter GT-75 and GT-15 is shown in Figures 1.4.2 a and 1.4.2 b, respectively.

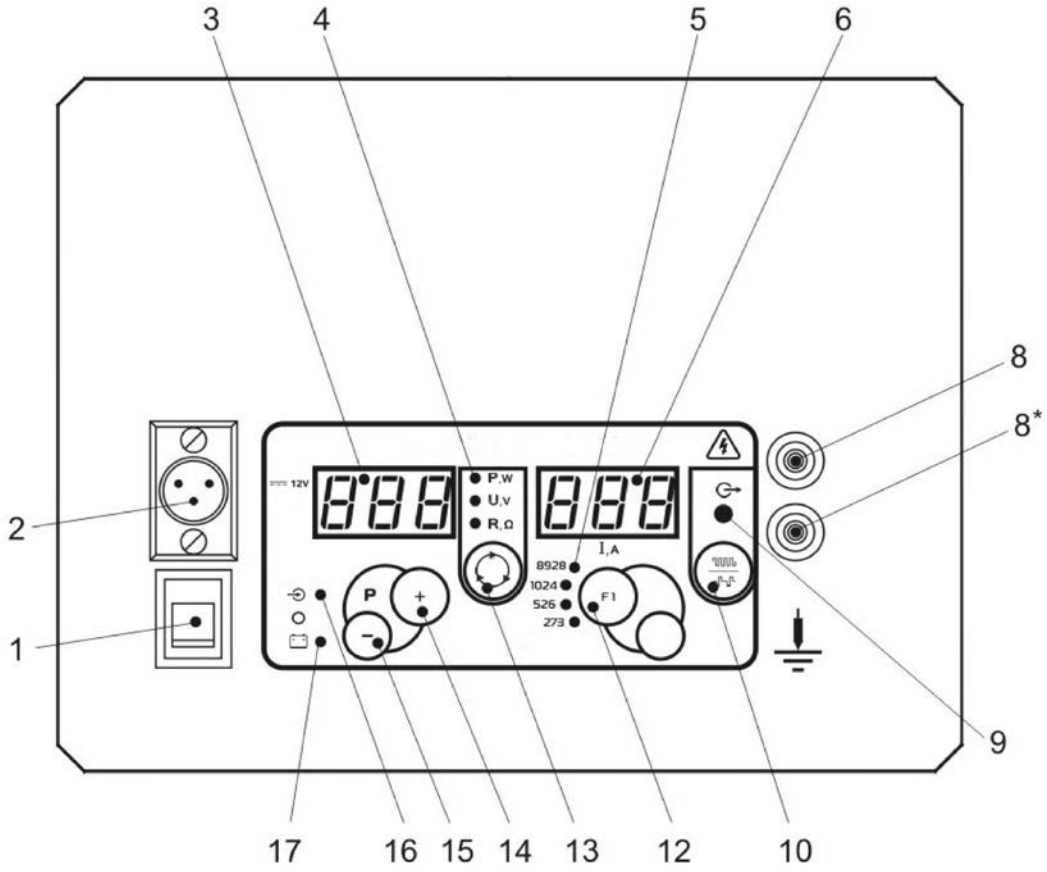


Figure 1.4.2 a - Front panel of transmitter GT-75

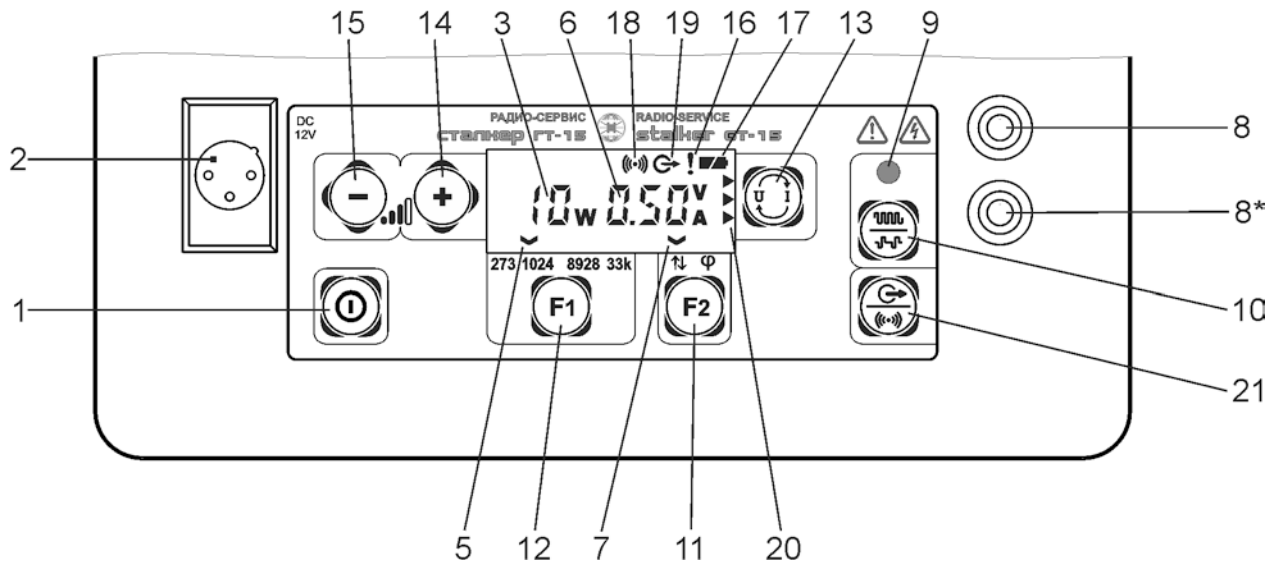


Figure 1.4.2 b - Front panel of transmitter GT-15

In Figures:

1 – GT-75 front panel has three-position power switch key / GT-15 has on/off key.

2 – Power supply socket for charging built-in rechargeable batteries or for connection of external rechargeable battery;

3 – GT-75 front panel has multi-functional indicator of the output power, on-load voltage and load resistance (including the resistance of connecting leads) / GT-15 has output power indicator;

4 – GT 75 indicators of measurement units on the indicator panel (from top downward, respectively - power (P), on-load voltage (U) and load resistance (R);

5 – Operating frequency indicator;

6 – GT-75 front panel has output current indicator / GT-15 has output current (A) or voltage (V) indicator.

7 – Indicators of double-frequency selection;

8 and 8* – "Output" jacks for load connection. In case of direct connection to the utility, the ground rod shall be connected to jack 8*;

9 – Indicator of the transmitter output signal (Tables 2.2.1 and 2.2.2);

10 – “Operation mode” key for setting continuous or pulse operation mode;

11 – Key to select the double frequency;

12 – Key to select the signal frequency;

13 – Key to select the displaying parameter: GT-75 - power, voltage or resistance, GT-15 - voltage or current;

14 and 15 - Keys to increase/decrease the output power;

16 – Icon of external power supply status (see Table 2.2.2);

17 – Icon of internal power supply status (see Table 2.2.2);

18 – Icon of internal inductor signal;

19 – Icon of a signal application through "Output" jacks;

20 – Icons indicating the charging of the internal rechargeable battery;

21 – Key to select the signal application method: induction or direct galvanic connection;

1.4.2 Operating principle of transmitters

Operating principle of the transmitter is based on conversion of the DC power supply's energy to the AC signal. For this purpose, the transmitter microprocessor produces required control pulses. Microprocessor also controls load matching to provide maximum power output. Information on operation and status of the transmitter is shown on its display.

2 Intended Use

2.1 Electrical Safety Measures

The transmitter shall be used in compliance with electrical safety rules by qualified personnel who have studied this Operation Manual and have the required electrical safety access qualification level.

WARNING!

- During operation, the output voltage level on "Output" jacks and connected circuits may reach 240 V.
- Avoid touching conductive parts connected to the working transmitter.
- Transmitters shall be switched off when during connection or disconnection from target utility.

Prior to operation, check the status of "Output" jacks, the surface around them and clean if needed.

Do NOT use mechanically damaged transmitter and its components.

Do NOT operate the faulty transmitter or the transmitter with the dirty insulation of “output” jacks.

Do NOT operate the transmitters with accessories not included in delivery set.

During operation, prevent moisture getting into the transmitter panel and power supply unit.

2.2 Preparation for Operation

2.2.1 Charging the Rechargeable Battery

Charging of the rechargeable battery shall be performed when the transmitter is off.

WARNING! Do not switch the transmitter on at least for 1 hour after charging.

Charging a dead rechargeable battery takes 8 hours. Charging a battery to full capacity takes no more than 12 hours.

WARNING! To prolong the service life of storage batteries:

- charge the rechargeable battery at the temperature of +10 to +30 ºC;
- do not discharge the battery competely;
- charge the rechargeable battery immediately after it has been discharged;
- store the transmitter at the temperature of -15 to +30 ºC and recharge once every 3 months.

To charge the rechargeable battery from the standard power supply unit, connect its output plug to the "12 V" jack of the transmitter (item 2 Figures 1.4.2a or 1.4.2b). Plug power unit into the 220 V mains. While transmitter GT-75 is being charged, its " " indicator (item 17, Fig. 1.4.2a) is blinking in green. The indicator stops blinking when the battery is fully charged. The charging process of transmitter GT-15 is displayed with moving symbols " ▶ " (item20, Fig. 1.4.2b). These symbols stop moving when the transmitter battery is fully charged.

After charging is complete disconnect power supply unit from 220 V mains and then from the transmitter.

In order to charge the rechargeable battery from the external "12 V" DC power supply (e.g. from car), connect one connector of the adapter for charging from "12 V" external power supply to "12 V" power cable , and the other one - to the "12 V" transmitter jack. Connect the red clamp of the "12 V" power cable to the positive terminal of the external power supply, and the black one - to the negative one.

2.2.2 Preparing to operation

If the transmitter was exposed to a temperature differing from the operating one, keep it at operating temperature for two hours.

Switching on and off the transmitter GT-75 is performed by setting the switch key (item 1 Figure 1.4.2) to " " position to run on the internal rechargeable battery or to " " position to run on the external "12 V" DC power supply. In the latter case, the maximum output power of the transmitter shall be set depending on the power of the external "12 V" power supply. The car network or 220/12-100 W power supply unit may be used as a power supply. Set the switch to the middle position "O" to turn off the transmitter.

To connect the transmitter to the external "12V" DC power supply, plug the "12 V" power cable to "12 V" power socket of the transmitter. Then connect red clamp of the "12 V" power cable to the positive terminal of the external power supply, and the black one - to the negative terminal.

Transmitter GT-75 could be used with power supply unit from the delivery set if the output power does not exceed 20 W. In this case case the transmitter is switched on by setting the switch key (item 1, Figure 1.4.2) to "" position.

Transmitter GT-15 is switched on and off by pressing " ⏻ " key. Connection to external power supplies is performed similarly to GT-75.

Upon switching on, transmitters set the minimum output power and operating frequency of 273 Hz automatically, but the output voltage level is not limited.

Transmitters operating modes, status of internal battery or external power supply are displayed by the appropriate icons, which are given in Table 2.2.1 for GT-75 and in Table 2.2.2 for GT-15.

Table 2.2 1 - Light indication of status and operation modes of transmitter GT-75

Position of icon in Fig. 1.4.2 a	**Status of icon**	**Operation mode and status of the transmitter**
4 " P "	Flashing	The transmitter is in the progress (process) of matching with the load.
	Permanent	The transmitter stabilized the power output with the load.
9 " "	Flashing green	Normal operation of the transmitter in continuous mode
	Flashing green	Normal operation of the transmitter in pulse mode
	Flashing green and red	1 Short-circuit at the transmitter output (load resistance of less than 0.08 Ω). 2 The load resistance has changed sharply - the transmitter is being matched with the new load.
	Flashing red at the 1 Hz frequency	The transmitter is overheated, signal generation stops and will continue only when the transmitter will be cooled down, but no sooner than in one minute.
16 " "	Permanent green	The voltage level of the external power supply is normal.
	Flashing green	External power supply voltage is within the range of 11.0 to 10.5 V. The external rechargeable battery may be discharged.
	Flashing red	The voltage of the external power supply has dropped below 10.5 V and 1 minute later the transmitter will switch off automatically
17 " "	Permanent green	1 During charging of the rechargeable battery - the rechargeable battery is charged. 2 At signal generation - the voltage of the internal rechargeable battery is normal.
	Flashing green	1 During charging of the rechargeable battery - the rechargeable battery is charging. 2 During operation - the voltage level in the internal rechargeable battery is within the range of 11.0 to 10.5 V, which means the battery is discharged.
	Flashing red	The voltage of the internal rechargeable battery is below 10.5 V and the transmitter will switch off automatically within a minute.

Attention! Set the power switch key to "O" position after GT-75 transmitter has switched off automatically.

Table 2.2 2 -Indication of status and operation modes of transmitter GT-15

Position of indicator in Fig. 1.4.2 b	Status of indicator	Operation mode and status of the transmitter
19 " "	Flashing	The transmitter is being matched with the load.
	Permanent	Transmitter stabilized the power output with the load.
9 " "	Permanent green	Normal operation of the transmitter in continuous mode
	Flashing green	Normal operation of the transmitter in pulse mode
	Flashing red at the 1 Hz frequency	The transmitter is overheated, signal generation stops and will continue only when the transmitter will be cooled down, but no sooner than in one minute
	Permanent red	The external voltage is present on "Output" jacks of the transmitter. The transmitter may have been connected to a live circuit.
17 " "	permanent	The voltage of the internal rechargeable battery is normal.
	Flashing half of the "battery" icon	The voltage of the internal rechargeable battery is within the range of 11.0 to 10.5 V, which means battery is discharged.
	Flashing	The voltage of the internal rechargeable battery is below 10.5 V and the transmitter will switch off automatically within a minute
16 " ! "	None	The voltage of the external power supply is normal
	Permanent	The voltage of the external power supply is within the range of 11.0 to 10.5 V. The external rechargeable battery may have been discharged.
	Intermittent glowing	The voltage of the external power supply has dropped below 10.5 V and the transmitter will switch off automatically within a minute
20 " ▶ "	Moving from top downwards	The rechargeable battery is charging.
	Permanent	The rechargeable battery is charged

2.3 Operating the Transmitter

WARNING! To avoid overheating of the operating transmitter in summer time, never leave it under the direct sunlight.

In winter, the effective capacitance of the rechargeable battery is getting lower. Therefore, it is recommended to preheat the transmitter by switching it on for up to 10 minutes on a low power, and only after that set the required output power.

The protective cap of the power switch is less flexible when operating in winter condition. Therefore, warm up the cap, for example, by holding it in hands, before switching the transmitter on.

2.3.1. Operating principle of the transmitter connected directly to the utility

⚠ ***ATTENTION! Make sure that there is no hazardous voltage in the target utility.***

Connecting the load to the transmitter output is only allowed when the transmitter is off.

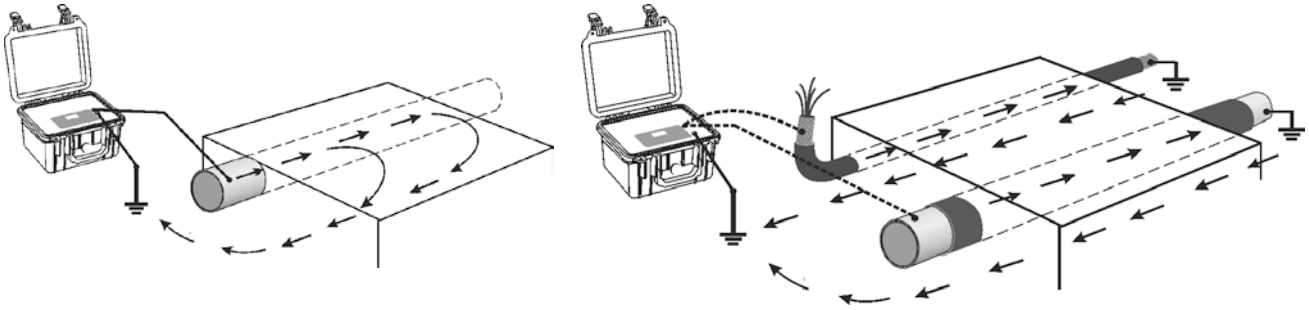
The direct connection of transmitter to energized line is prohibited.

During operation, avoid touching conductive parts, connected to the transmitter.

In other aspect observe the electrical safety requirement and use electrical protection equipment in accordance with national standards.

Using connection wires connect the "Output" jack of the transmitter to the conductive part of the utility (Figures 2.3.1 a). The second jack marked with " ⏚ " shall be connected to the ground rod driven into the ground at the distance of 5-10 m from the utility. To increase the search current, the ground rod shall be driven into the ground as deep as possible.

During searching of unearthed utilities, e.g., gas pipeline or cable, it is preferable the far end of the line to be grounded (Fig. 2.3.1 b), since this grounding will provide the maximum search current. Otherwise the current will leak to the ground through insulation capacitance, so it strength will decrease and the search range will be reduced.



a) b)

Figure 2.3.1 – Direct connection of the transmitters to the utility:

a) to the metal pipeline;

b) to the cable armour (shield), to one of the cords in case of unshielded cable or to metal section of insulated pipeline.

Note. Depending on the purposes of locating, e.g. search for the insulation fault, there are other possible methods of connecting the transmitter to utilities. These methods are described in operation manuals for locators PT-14, PT-12 and PT-04.

Switch the transmitter on, set the operating frequency of the output signal, output power and operation mode. Additionally, using the  key (item 21 in Figure 1.4.2 b) of transmitter GT-15, , select the signal output from the transmitter's "Output" jacks, and the  icon will appear on the display (item 19 in Figure 1.4.2 b). Selection depends on particular search conditions and purpose and requires practical skills from the operator.

Selecting the Signal Frequency.

On transmitter GT-75, the signal frequency is selected with "F1" key according to the loop: "273" → "526" → "1024" → "8928" → double "1024" → "273", etc. Every one-frequency signal has its indicator, which is glowing when the signal frequency is selected. When the double-frequency signal "1024" is set, "1024" indicator is blinking.

On transmitter GT-15, the signal frequency is selected with "F1" key according to the cycle: "273" → "1024" → "8928" → "33к" → "273", etc. The selected frequency is indicated on the display. Double-frequency signals are set with "F2" key and displayed with "↑↓" indicator for double frequency "1024" and with "φ" indicator for double frequency "8928".

Low signal frequency in the wet ground provides the maximum search range and minimizes interferences of the search signals in other utilities ("273", "526" and"1024"). At the same time, the noise influence of power current and signals in neighbouring lines is stronger.

High signal frequency ("8928") provides expended search range and reduces noise influence from power lines. The signal frequency of “33 k” is recommended for searching for insulated utilities with ungrounded far end. In this case, the search current generated as a result of ground leakage through distributed isolation capacitance is higher. In addition, the high signal frequency is preferable during on-contact connection of the transmitter to the utility (p. 2.3.2).

However, it should be taken into account that at high signal frequencies the interference of transmitter signal to adjacent utilities is stronger, which may result in false direction of the search.

When the transmitter is used with PT-14 or PT-04 locator in areas of high density of utilities, you may apply the method of searching by current direction. The search signal may flow from the transmitter (forward current) or towards the transmitter (reverse current through neighbouring utilities). In order to apply this method, set the double-frequency signal "1024" on the transmitter and select the operating frequency "1024" on the locator.

Setting the output power of the signal.

The operator should correlate the output power of transmitter, expected search time, parameters of power supply source and estimated search range.

Increase or decrease output power by pressing the keys (items 14 and 15 in Figures 1.4.2, respectively).

The output power value on transmitter GT-75 is displayed with the indicator (item 3 Fig. 1.4.2 a). The indicated parameters, such as output power (P), output voltage (U), or load resistance (R), may be selected by pressing the key (item 13 Fig. 1.4.2 a). The output signal current is shown on the display (item 6 in Fig. 1.4.2 a).

On GT-15 transmitter, the indicator (item 3 in Fig. 1.4.2 b) shows the output power. The output voltage (V) or output signal current (A) is displayed by the indicator (item 6 in Fig. 1.4.2 b). The parameter to display is selected by pressing the key (item 13 in Fig. 1.4.2 b).

If the required strength of search current cannot be reached, check the quality of grounding and/or change the signal frequency for this type of soil.

If the transmitter cannot provide the selected power, it is automatically limited to the maximum possible value at this load. In case of high load circuit resistance when even the minimum output power cannot be generated (e.g., open load), the output power indicator shows the following: for GT-75 – "-10", for GT-15 – "-1". Limitation of output power may be caused by insufficient capacity of the rechargeable battery.

Generally, the time required for the transmitter to match with load does not exceed a minute. If this time exceed one minute, it is recommended to check the quality of connections and grounding, change the output power or switch the transmitter over to the continuous operation mode.

Selecting Operation Mode

Transmitters provide continuous and pulsing signal generation modes. Continuous operation mode is recommended for searching the utility position and depth and for tracing of the insulation fault. The pulse mode is recommended for utility locating when there is a high interferences level or when the signal received by the locator is weak. This mode facilitates identification of the search signal due to a typical pause in signal generation. Moreover, the power consumption of the transmitter in pulse mode is reduced. Switch transmitter to continuous or pulse operation mode is made by pressing  key (item 10 in Figures 1.4.2). Signal generation is displayed by indicator (item 9 in Fig.1.4.2).

Limitation of the output voltage

The output voltage limitation to 30 V is activated for safety reasons during operations. It is reasonable to limit the output voltage, for example during cable core selection, in order to prevent damage caused by touching the cable core with hand.

Press the "-" key (item 15 in Figures 1.4.2) while holding  key (item 10 in Figures 1.4.2) to activate the output voltage limitation. When the output voltage limitation is activated, the "U" icon (item 4 in Figure 1.4.2a) shall start blinking on GT-75, or the "V" icon on GT-15 (item 6 in Figure 1.4.2 b). In case the transmitter cannot provide the selected output power, it is automatically limited to maximum possible value at the given load.

To deactivate voltage limitation, press "+" key (item 14 in Figures 1.4.2) while holding  key.

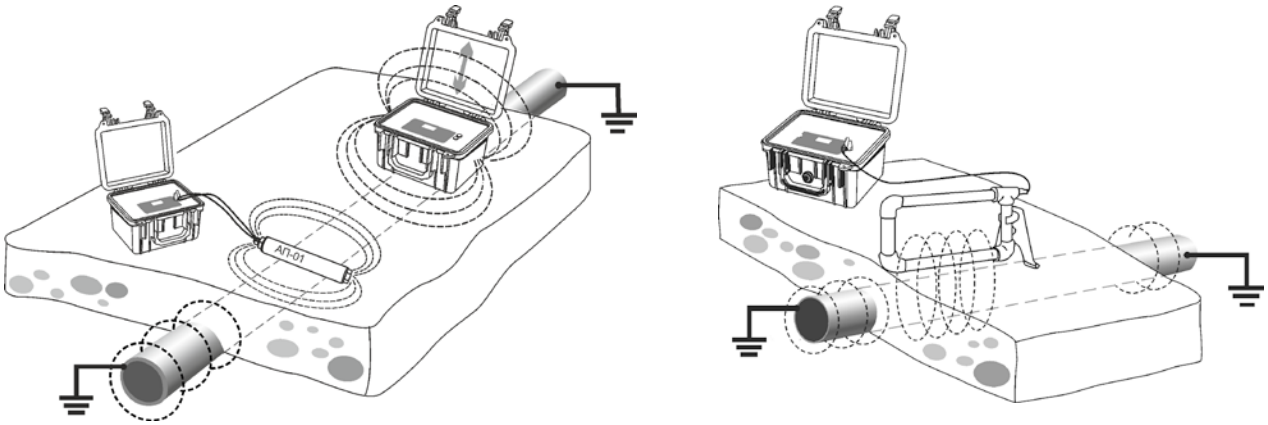
2.3.2 Inductive locating

When direct connection of the transmitter to the utility is impossible, e.g. in case when there is no access to conductive parts of utilities or if they are carrying the voltage, the search current in the utilities may be induced in utility with the internal inductor of transmitter GT-15, transmitting frame RP-02, transmitting antenna AP-01, or clamps CI-50 and CI-100.

Internal inductor, transmitting frame RP-02, and antenna AP-01

Transmitter, using transmitting frame or antenna, produces the alternating magnetic field, which induces the search current in the utility. The higher is search current, the lower is resistance of closed circuit comprising the utility. The best solution is to ground utility ends, as shown in Figures 2.3.2. If such grounding is not available, the search current strength will decrease, since its strength is determined by the capacitive current through the utility insulation. The search signal is getting stronger with the increscent of signal frequency.

During operation with internal inductor place GT-15 transmitter or AP-01 transmitting antenna across the axis of the target utility (Figure 2.3.2 a), place transmitting frame RP-02 in vertical position along the axis of the chosen utility (Figure 2.3.2 b).



a) GT-15 b) GT-75

Figure 2.3.2 – Methods of non-contact application of current in the utility

Connect the frame or antenna to "Output" jacks of the transmitter. Switch the transmitter on, select the output power, signal frequency and operation mode (p. 2.3.1.). To operate with the internal inductor, press key (item 21 in Figure 1.4.2 b) on transmitter GT-15, the icon will appear on the display (item 18 in Figure 1.4.2 b).

The internal inductor of transmitter GT-15 operates on frequency "33k". The maximum efficiency is reached by transmitting antenna AP-01 at frequency of "33k" (the antenna shall be operated in continuous operation mode), by transmitting frame RP-02 at frequency of "8928".

The following should be taken into account:

- the current level induced in the utility with the frame or antenna is much lower than current induced by direct connection;

- the closer the frame or antenna are located to the target utility, the higher is the current induced in the utility.

- the signal from the frame and antenna is induced on all conductive utilities nearby, which may result in false trails;

- during searching, the locator shall not being used at the distance closer than 10 meters from the transmitter or antenna.

Signal Clamp CI-50 and CI-100

If there is an access to the utility, e.g., when energized high-voltage insulated cable comes out, it is recommended to use inductive **clamp** KI-50 or KI-100. Due to better magnetic interaction with utility circuit, they provide generation of the higher search current and prevent the induction of search current in neighbouring lines.

The range of operating frequencies of clamps is 1 to 22 kHz; the maximum diameter for KI-50 is 50 mm; for KI-100 is 110 mm.

WARNING! Do not connect clamp energized and bare conductors.

The utility resistance shall be as low as possible in order to maximize the search current strength in the target utility. For this purpose, it is recommended to ground circuit ends as shown in Figure 2.3.2, or utility ends may be short-circuited. In addition, it should be taken into account that the higher is the operating frequency, the higher is the current induced by clamp in insulated and/or ungrounded utility.

Connect clamp to "OUTPUT" jacks of the transmitter. Grasp the target utility with clamp. On the transmitter, set the operating frequency and output power not exceeding 10 W (20 W for not more than 15 minutes).

WARNING! Long time operation of transmitting clamp with transmitter output power exceeding 10 W shall be avoided. Noncompliance with this rule may lead to overheat and failure of clamp.

To avoid overheating of clamp in summer time, do not expose clamp to direct sunlight.

KI-50 clamp has built-in resettable fuse, which disconnects the clamp from the transmitter if the maximum limit of input current is exceeded. In this case, the transmitter shall be switched off for at least 5 minutes. When the transmitter is switched on again, set the lower output power.

2.4 Potential failures and troubleshooting procedure are provided in Table 2.4.

Table 2.4 - Potential failures and troubleshooting procedures

Failure symptoms	**Probable cause**	**Troubleshooting procedure**
The transmitter does not switch on. The transmitter switches off spontaneously.	Rechargeable battery is discharged	Charge the rechargeable battery.
	Rechargeable battery failure	Replace the rechargeable battery.
The rechargeable battery is not charging within a given period.	Rechargeable battery failure	Replace the rechargeable battery.
	Power supply unit failure	Check the power supply unit.

3 Maintenance and Repair

3.1 Maintenance includes compliance with the rules of rechargeable battery operation, storage, charging, regular checks and troubleshooting.

Repair of transmitter is only allowed at the manufacturer's factory or in special repair agencies.

3.2 Replacement of storage batteries in transmitter GT-75.

It should be noted that a new rechargeable battery reaches the full capacitance after 2-3 charge-discharge cycles.

GT-75 transmitter uses two sealed lead-acid maintenance-free storage batteries of 6 V rated voltage, 12 A/h capacitance, connected in-series. Figure 3.2 shows the internal design of the transmitter.

WARNING!

Storage batteries shall be replaced in pairs.

It is recommended to fit storage batteries from the same batch.

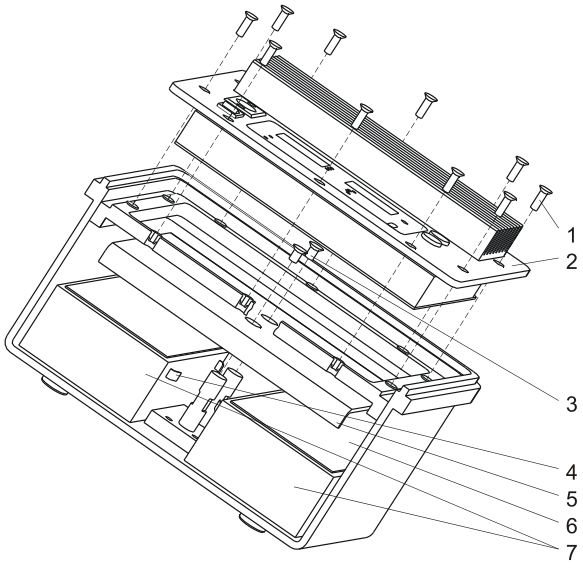


Figure 3.2 - Internal design of transmitter GT-75

Proceed as follows to replace storage batteries:

- remove 10 screws (item 1) fastening the top panel of the transmitter (item 2);

- raise the panel from the end with indicators by 30º, push it towards indicators and, holding it in inclined position, raise the panel;

- put the removed panel with its front side down next to the transmitter case;

- remove two screws (item 3), remove securing strip (item 5), rubber gaskets (item 6) and storage batteries (item 7);

- disconnect leads running to rechargeable battery terminals (item 4) and the lead between storage batteries;

- replace storage batteries and recover leads connections observing polarity: connect the lead fitted with a red connector to the positive terminal of the first rechargeable battery and the lead with a black connector to the negative terminal of the second rechargeable battery. The negative terminal of the first rechargeable battery shall be connected to the positive terminal of the second terminal through lead;

- assemble the transmitter in the reverse order, keeping power cables away from the space between the board and storage batteries;

- charge the storage batteries.

3.3 Replacement of the rechargeable battery in transmitter GT-15.

A sealed lead-acid maintenance-free rechargeable battery of 12 B rated voltage, 7 A/h capacitance is fitted in transmitter GT-15.

Figure 3.3 shows the internal design of the transmitter.

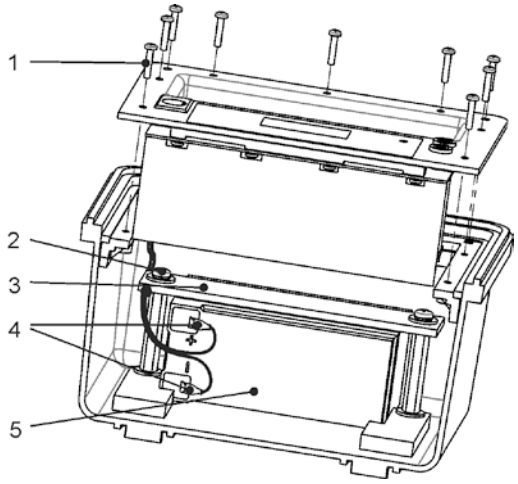


Figure 3.3 - Internal design of transmitter GT-15

To replace the rechargeable battery, proceed as follows:

- remove the screws (item 1);

- take the front panel out and put it with its front side down next to the transmitter case;

- disconnect leads from rechargeable battery terminals (item 4);

- remove out two screws (item 2), remove securing strip (item 3), rubber gasket and rechargeable battery (item 5);

- replace the rechargeable battery and connect the leads observing polarity: connect the lead fitted with a red connector to the positive terminal of the first rechargeable battery and the lead with a black connector to the negative terminal of the second rechargeable battery.

- assemble the transmitter in the reverse order, keeping the power cable and built-in antenna leads away from the space between the front panel and rechargeable battery and arranging them along side walls;

- charge the storage batteries newly installed.

4 Transportation and Storage

The transmitter packed in a standard package allows transportation by any transport without any distance limitation. When transported by an aircraft, the transmitter must be put into a heated hermetical compartment.

Transportation and storage conditions shall be within the ambient air temperature range from minus 50 to plus 70 ºC at the relative air humidity of 90% max the temperature of plus 30 ºC. The impact of precipitation is not allowed.

5 Data on Contents of Precious Metals

The transmitters do not contain any precious metals.

6 Disposal

Disposal of the transmitters shall be performed by an operating company in compliance with national standards and rules.

7 Regular Verification

7.1 To ensure proper operation of the transmitter, it is recommended to carry out verification once every two years. Verification operations are given in Table 7.1.

During verification of transmitter, which is used for generation of search signals of specified frequencies, it is allowed to test only the parameters that determine fitness of the instrument for generation of this operating frequencies.

Table 7.1 – Verification operations

Operation	Verification step number
Visual check	7.5.1
Testing	7.5.2
Check of output parameters setting error	7.5.3

7.2 Verification instruments

Verification instruments shall be serviceable and calibrated by authorized entities or departmental metrological service, auxiliary instruments shall be serviceable as well.

List of verification instruments is given in Table 7.2.

Table 7.2 – Verification instruments

Description and type of measurement instrument, equipment	Specifications of verification instruments	
	Measurement range	Accuracy
Frequency meter Ch3-34	10 Hz to 20 MHz	5.0×10^{-7}
Voltmeter V7-38	Up to 300 V	PR 0,05
Multifunctional instrument C4352 - 01M	Up to 15 A	PR 1,5
Filament lamp	220 V, 100 W	
Note. Other instruments with the same accuracy and measurements can be used for verification.		

7.3 Verification conditions

Verification shall be performed in the following conditions:

- ambient air temperature of +15 to +25 ºC;
- relative air humidity of 30 to 80%;

- atmospheric pressure of 84 to 106 kPa (630 to 795 mm Hg).

7.4 Preparation for verification

7.4.1 The transmitter shall be prepared for operation in accordance with the operation manual. The rechargeable battery shall be fully charged.

7.4.2 Measurement instruments and equipment required for the verification shall be prepares to operation in accordance with their operation manual and design documentation.

7.5 Verification procedure

The transmitter shall be operated in accordance with electrical safety rules by qualified personnel who have studied this Operation Manual and been granted with the relevant permit category.

7.5.1 Visual inspection

Visual inspection of the transmitter shall verify the following:

- compliance of the completer set;
- good visibility of all captions (marking);
- secure attachment of parts, "Output" jacks;
- absence of damages of electrical connectors;
- absence of cracks, scratches, dirt preventing from taking off readings;
- absence of severe mechanical damages of external parts.

7.5.2 Testing (for GT-75 only)

Shunt "Output" jacks to each other, using a wire from the transmitter's delivery set. Switch the transmitter on. "Output" indicator (item 9 in Figure 1.4.2a) shall be on continuously (blinking is allowed) in red colour. Switch the transmitter off.

7.5.3 Check of relative accuracy of output parameters setting

The connection diagram is shown in Figure 7.5.3.

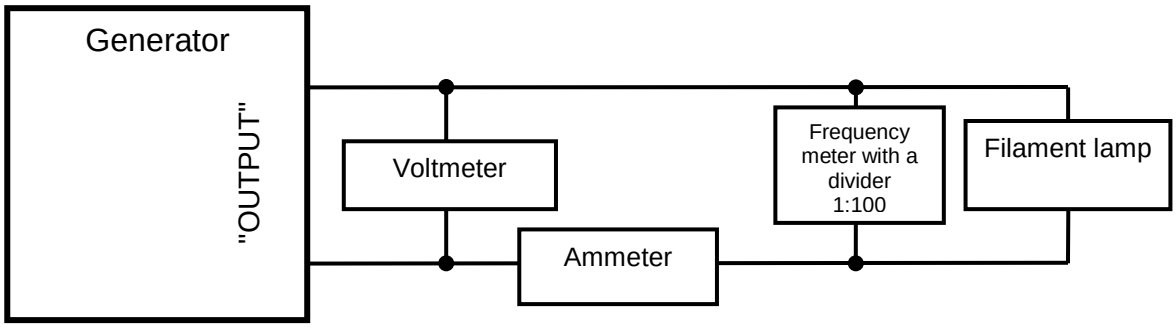


Fig. 7.5.3 – Connection diagram for verification of output parameters setting accuracy

7.5.3.1 Set the output frequency of 273 Hz and switch transmitter to continuous operation mode. Set the output power of 15 W for GT-75 and 2 W for GT-15.

Wait for one minute and register readings of measurement instrument:

- deviation of frequency readings from the present ones shall not exceed 2 Hz;
- deviation of the transmitter current displayed by the indicator from ammeter readings shall not exceed ± (5 % + 3 LSD);
- deviation of the voltage current displayed by the indicator from voltmeter readings shall not exceed ± (5 % + 5 LSD);
- deviation of the calculated power as a product of measured current and measured voltage from the preset one shall not exceed ± (15 % + 2 W) for GT-75 and ± (15 % + 0.2 W) for GT-15.

7.5.3.2 Set the maximum output power and check the output voltage again, according to p. 7.5.3.1.

7.5.3.3 Test frequency setting accuracy at 526, 1024, 8928 Hz frequencies for GT-75 and on 1024, 8928, 32768 (33к) for GT-15. The operation mode is continuous.

Deviation of frequency readings from the present ones shall not exceed 2 Hz.

7.6 Verification results

The transmitter verified with a positive result is considered fit for operation and shall be provided with verification certificate.

The transmitter failing to meet even one requirement is considered unfit for operation. Unsatisfactory results of calibration must noted in notice on unfitness.

8 Acceptance Certificate

Transcribe GT-75 __ GT-15 No. _____ corresponds
delete as appropriate **Reg. No.**

to specifications RAPM.435131.001ТУ, and has been found fit for operation.

QCD Head

Stamp here _____ _____
personal signature **print full name**

_____
day, month, year

9 Manufacturer's Warranty

The manufacturer guarantees that the transmitter meets the specification requirements provided that operation, transportation and storage rules are observed.

Warranty period is 18 months from the date of sale.

The guaranteed service life is prolonged through the period from claim presentation till elimination of failures.

The guaranteed service life does not cover storage batteries.

Manufacturer's details:

268, Pushkinskaya street, 426000 Izhevsk, Russia, Radio-Service, JSC

Phone: (3412) 43-91-44. Fax: (3412) 43-92-63.

E-mail: office@radio-service.ru Internet: www.radio-service.ru

10 In-Service Transfer Record

10.1 The in-service transfer record is given in Table 10.1.

Table 10.1 - Instrument in-service transfer record

Date of installation	Where installed	Date of removal	Operating time		Cause of removal	Signature of person in charge of installation (removal)
			since operation beginning	after last repair		

10.2 Data on acceptance and handover is given in Table 10.2.

Table 10.2 - Data on acceptance and handover

Date	Status of the instrument	Basis (document title, number and date)	Enterprise, position and signature of person in charge of		Note
			handover	acceptance	