Pilot Plant since 1959

PATON®

Data sheet and operating manual

PATON™ inverter rectifier

ECO-160 | ECO-200 | ECO-250

CONTENTS

Connection to power mains / power board (at 25ºC):

ATTENTION: Make provision for cables routed in the walls and other extension cords!

Electrode used	Set current value	Power cable cross-section, sq. mm	Maximum cable length, m
Φ2 mm	80 A at most	1.0	120
		1.5	180
		2.0	240
		2.5	300
		4.0	480
		6.0	720
Φ3 mm	120 A at most	1.5	120
		2.0	160
		2.5	200
		4.0	320
		6.0	480
Φ4 mm	160 A at most	2.0	120
		2.5	150
		4.0	240
		6.0	360
Φ5 mm, low-melting	200 A at most	2.5	120
		4.0	190
		6.0	290
Φ5 mm, high-melting	250 A at most	2.5	100
		4.0	150
		6.0	230

ATTENTION: Supply button on the rear panel of the machine is not a power button, so it does not provide complete de-energization of internal electronic parts, when the machine is switched off. Therefore, in accordance with safety rules, disconnect the plug from the mains after completion of welding.

1. GENERAL PROVISIONS

Inverter rectifiers PATON ECO-160, ECO-200, ECO-250 are designed for direct current manual arc welding (MMA). This Eco series is intended for demanding users, who need the most compact and powerful machine with full rated current of 160 A / 200 A / 250 A respectively. This current is enough to work with any electrodes from Φ1.6 mm to Φ5 mm in diameter, including high-melting electrodes. At the same time, its load duration is 40% and higher, which is more than enough for most applications more demanding than household use (workshops, motor transport services etc.).

All brand PATON™ ECO models produced by PATON are equipped with a built-in undervoltage protection unit.

Due to increased frequency of voltage supplied to the transformer, the transformer can be made tenfold smaller. That's why weight and overall dimensions of this machine is several times smaller than those of regular equipment with identical output parameters.

Main advantages:

1. In addition to voltage surge protection, the machine is equipped with a stabilization system for **large long-term** voltage variations in the supply mains from 170 V to 260 V. However, minimum voltage of 170 V allows welding with an electrode not more than Φ3 mm in diameter.
2. The machine fits standard domestic power mains. Due to high efficiency factor, the source provides **twice lower power consumption** compared to regular sources.
3. Convenient use due to high load duration (LD) at **rated current**, which enables **continuous** welding with Φ3 mm electrodes at their rated current.
4. Increased machine reliability in dusty production environment.
5. All electronic parts of the machine are impregnated with **two layers** of high-quality varnish which ensures product reliability during the entire service life.
6. Smooth adjustment of arc current.
7. Enhanced arcing stability.

PARAMETERS	ECO– 160	ECO – 200	ECO – 250
Rated voltage of 50 Hz supply mains, V	220	220	220
Rated current consumption from mains, A	20	25	32
Rated arc current, A	160	200	250
Maximum root-mean-square current, A	190	240	300
Load duration (LD)	40% at 160 A 100% at 101 A	40% at 200 A 100% at 126 A	40% at 250 A 100% at 158 A
Mains voltage variation range, V	170~260	170~260	170~260
Arc current adjustment range, A	20~160	25~200	32~250
Hot Start	yes	yes	yes
Arc Force	yes	yes	yes
Anti-Stick	yes	yes	yes
Open-circuit voltage, V	80	80	80
Arc striking voltage, V	110	110	110
Rated power consumption, kW	4.4	5.5	7.0
Maximum power consumption, kW	5.5	6.9	8.8
Efficiency factor, %	90	90	90
Cooling	forced		
Operating temperature range	–25… +45°C	–25… +45°C	–25… +45°C
Overall dimensions (length, width, height)	245 x 100 x 200	270 x 110 x 200	270 x 110 x 200
Weight, kg	3.75	3.95	4.30
Ingress protection class*	IP21	IP21	IP21

** For Eco series machines, their frame protects them from ingress of objects more than 5.5 mm in diameter, and vertically dripping water does not infringe the machine operation*

Recommended length of power welding cables during welding:

Machine model	Cable length, m (one way)	Cross-section area, sq. mm	Cable grade
ECO – 160	1…4	8	КГ 1х8
	2…5	10	КГ 1х10
	3…8	16	КГ 1х16
ECO– 200	1…4	10	КГ 1х10
	2…6.5	16	КГ 1х16
	3…10	25	КГ 1х25
ECO – 250	1…5	16	КГ 1х16
	2…8	25	КГ 1х25
	3…11	35	КГ 1х35

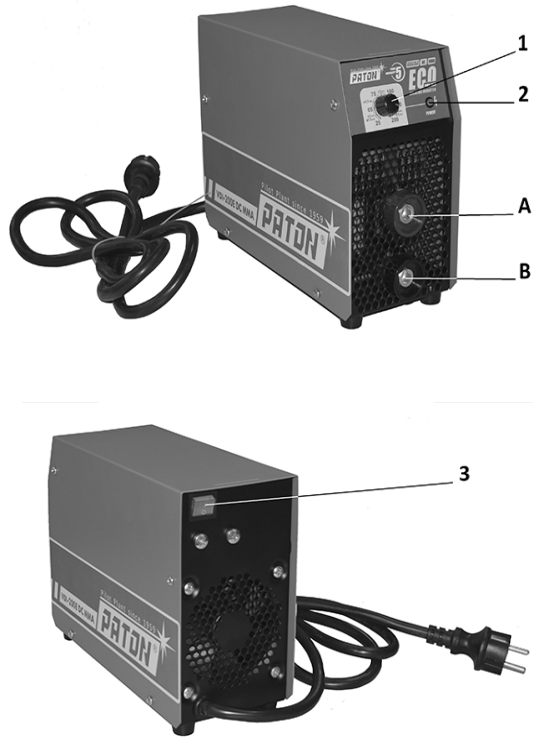


Fig. 1 Control elements and indication

1 – Arc current controller, allows for smooth adjustment of arc current.
2 – Status indicator:
a) permanent green light – the machine is ready for operation;
b) flashing yellow light during striking – mains voltage is not sufficient;
c) permanent yellow light – the source is overheated;
d) no light – no power supply.
3 – Mains switch (does not light up, the colour is adopted for design purposes).
A – Power current socket "+" of bayonet type:
in case of MMA welding – for connection of electrode cable (very occasionally "earth" cable can be connected, if special electrodes are used).
B – Power current socket "-" of bayonet type:
in case of MMA welding – for connection of "earth" cable (very occasionally electrode cable can be connected, if special electrodes are used).

2. START-UP

ATTENTION: Before start-up, read the chapter "Safety rules", paragraph 11.

2.1 INTENDED USE

The welding machine is designed solely for manual arc welding with a stick electrode, as well as for argon welding.

Other use of the machine is considered undue. The manufacturer is not responsible for damage cause by undue use of the machine.

Intended use of the machine implies adherence to instructions of this operating manual.

ATTENTION: Do not use the welding machine for pipes defrosting.

2.2 INSTALLATION REQUIREMENTS

The welding machine is protected from ingress of foreign solid objects of more than 5.5 mm in diameter.

The welding machine can be placed and operated outdoors. Internal electric parts of the machine are protected against direct moisture impact.

ATTENTION: Do not switch the machine off immediately after completion of welding works in hot weather or intense welding works in any weather conditions! Electronic parts must be allowed to cool down for 5 minutes.

ATTENTION: When the machine is switched off and cools down after operation in cold season, condensate forms inside of it, so do not switch the machine on again in less than 3...4 hours!!!

Therefore, don't switch the machine off in cold season, if you are going to switch it on within 4 hours.

ATTENTION: The machine may be life-threatening after a hard fall. So place it on stable solid surface.

The machine must be placed so as to ensure free inlet and outlet of cooling air through vent holes on the front and the rear panels. Take care that metal dust (for example, during emery grinding) does drawn directly into the machine by the cooling fan.

2.3 POWER CONNECTION

The welding machine of series design is rated for mains voltage of 220 V (-23% +18%).

ATTENTION: All manufacturer's warranty liabilities become void if the machine is used with supply voltage exceeding 270 V!

Mains connector, cross-sections of power supply cables and supply-line fuses must be selected on the basis of technical specifications of the machine.

2.4 MAINS PLUG CONNECTION

ATTENTION: Mains plug shall correspond to supply voltage and current consumption of the welding machine (see technical data). In accordance with safety practices, use receptacles with guaranteed earthing!!!

3. WELDING WITH STICK ELECTRODES (MMA)

- insert the electrode cable into the source socket A "+";
- insert the "earth" cable into the source socket B "-";
- connect the "earth" cable to the work piece;
- connect the mains plug to the supply mains;
- set power switch 3 on the rear panel to position "I";

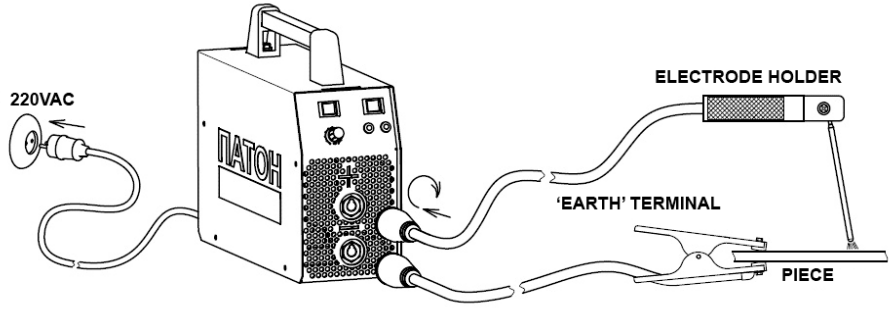


Fig. 2. Machine connection diagram for welding with stick electrodes

ATTENTION: Once the power switch 3 is set to position "I", the stick electrode becomes energized. Do not touch conductive or earthed objects, such as, for example, welding machine frame etc., with the electrode.

3.1 HOT START FUNCTION

Advantages:

- improved striking even when using electrodes with bad striking properties;
- better penetration of base material during striking and, consequently, less poor penetrations;
- prevention of slag inclusions.

The result is achieved by the following means:

In the moment of arc striking, arc current increases by 33% of the set arc current value for a short time (Fig. 3).

Example: welding with an electrode of Φ3 mm in diameter.

Arc current value, which is set using the controller, is 90 A.

Hot start current is 90 A + 33% = 120 A.

3.2 ARC FORCE FUNCTION

Advantages:

- enhanced short-arc welding stability;
- better transfer of metal drops into the weld pool;
- better arc striking;
- reduced risk of electrode sticking.

The result is achieved by the following means:

Due to reduction of arc voltage below the minimum permissible voltage of stable arc burning, arc current increases by 30% of the set value (Fig. 4).

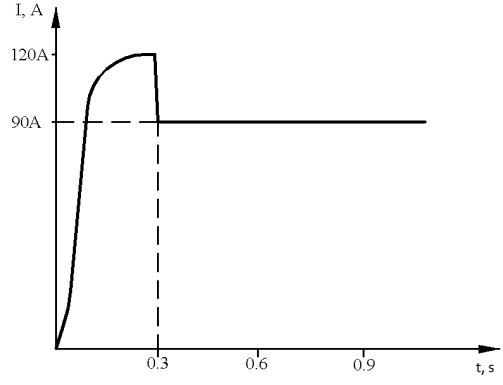


Fig. 3. HOT START function

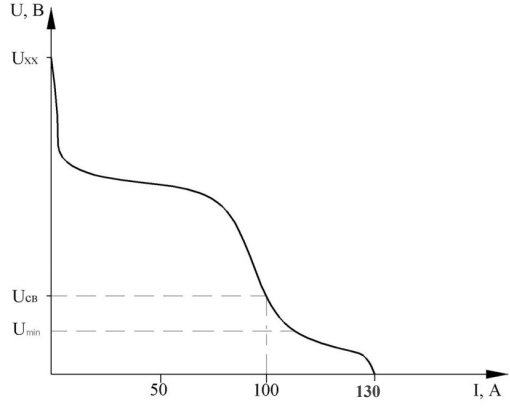


Fig. 4. ARC FORCE function

3.3 ANTI-STICK FUNCTION

During initial arc striking, the electrode can stick or be tacked to the work piece, first leading to overheating and eventually to damage of the electrode.

If the electrode has stuck to the work piece, the machine reduces arc current within 0.6...0.8 s. This function helps the welding operator to separate (detach) the electrode from the work piece without risk to burn his eyes with accidental arc striking. Once the electrode is detached from the work piece, the process of welding can be readily resumed.

4. ATTENDANCE AND TECHNICAL MAINTENANCE

ATTENTION: Before opening the machine, switch it off and disconnect the mains plug. Wait until internal circuits of the machine de-energize (about 5 minutes), and only then proceed with other actions. When leaving the machine, install a restrictive plate which prohibits switching the machine on.

In order to ensure proper operation of the machine for many years, adhere to several rules:

- conduct inspection in accordance with safety practices within the established time intervals (see "Safety rules" chapter);
- if the machine is subject to heavy use, it is recommended to purge it with dry compressed air once per six month. **Attention:** If the machine is purged from a very short distance, electronic components may be damaged;
- if the machine is very dust-laden, clean channels of the cooling system manually.

5. GENERATOR OPERATION MODE

The power source can be operated from a generator upon the following condition:

When working with electrodes	Set current value	Minimum generator power, kVA
$\Phi 2$	80 A at most	2.6
$\Phi 3$	120 A at most	4.1
$\Phi 4$	160 A at most	5.5
$\Phi 5$, low-melting	200 A at most	6.9
$\Phi 5$, high-melting	250 A at most	8.8

ATTENTION: In order to ensure trouble-free operation, output voltage of the generator shall not fall beyond the permissible range of 170~260 V!

6. STORAGE RULES

A preserved and packaged source shall be stored in storage conditions 4 as per GOST 15150-69 for 5 years.

A de-preserved source shall be stored in dry closed rooms at air temperature not lower than plus 5 °C. The rooms must be free from acid vapours and other active substances.

7. TRANSPORTATION

A packaged source can be transported by any means of transportation, which provide its integrity, complying with all transportation rules established for this type of transport.

8. TECHNICAL SPECIFICATIONS

ATTENTION: If a source is designed for special supply voltage, its technical specifications are provided on the identification plate on the front or the rear panel. In this case, mains plug and mains cable shall be selected according to the voltage used.

Parameters	ECO-160	ECO-200	ECO-250
Rated voltage of mains 50/60 Hz, V	~220	~220	~220
Mains voltage variation range, V	170~260	170~260	170~260
Efficiency factor, %	90	90	90
Arc current adjustment range, A	20~160	25~200	32~250
Arc current at: 5 min. / 45% LD 5 min. / 100% LD	 160 A 101 A	 200 A 126 A	 250 A 158 A
Maximum power consumption, kVA	5.5	6.9	8.8
Normal operating voltage: - MMA stick electrode	20.4~26 V	20.4~26.5 V	20.4~27.0 V

9. DELIVERY SET

1. Welding arc supply source with a mains cable – 1 pce.
2. Shoulder carrying strap – 1 pce.
3. PATON brand corrugated box – 1 pce.
4. 3 m welding cable with an electrode holder – 1 pce.
5. 3 m welding cable with earth terminal – 1 pce.
6. Operating manual – 1 pce.

10. TROUBLESHOOTING

Fault	Cause	Correction
No arc current The mains switch is on, but the status indicator is not lit.	Mains cable break	Check the mains cable.
	Supply mains voltage is lower than 155 V	Disconnect the machine and connect it to the mains with proper supply voltage
	Supply mains voltage exceeds the permissible value of 260 V	Disconnect the machine and connect it to the mains with proper supply voltage
	Internal source supply unit has failed	Contact the service facility
No arc current The mains switch is on, the source status indicator lights green	Welding cables are disconnected	Check plug connection
	Earth is not connected or connected poorly	Establish reliable connection of the earth cable with the work piece
No arc current The mains switch is on, the source status indicator lights yellow	Temperature sensor has been actuated	Wait until the machine cools down; then it will switch on again automatically
	Insufficient cooling air supply	Provide sufficient air inflow
	Temperature sensor is faulty	Contact the service facility
Bad striking during welding with a stick electrode, the source status indicator flashes green for short periods	Supply mains voltage at the start of loading is near the minimum permissible value of 165 V.	If it is impossible to increase cross-section of feeding mains cables, try reducing the set current value, until it will allow for striking the arc. Then use an electrode corresponding to the current value.

Continuation of table on page 14.

Continuation of table started on page 13.

Fault	Cause	Correction
Sporadic arc extinction occurs during welding	Arc burning voltage is too high for the electrode used	If possible, use other electrodes or another welding machine designed for higher power
Stick electrode is sticking to the work piece	Arc current value is too low	Set arc current to a higher value
Bad welding quality (intense splashing)	Incorrect polarity of the electrode	Change polarity of the electrode (in accordance with data of the electrodes manufacturer)
	Poor contact with earth	Connect earth terminal as close to the welding zone as possible

11. SAFETY RULES

GENERAL PROVISIONS

The welding machine is manufactured in accordance with technical standards and established safety rules. However, incorrect handling results in the following dangers:

- injury of maintenance personnel or third persons;
- damage of the machine or property of the enterprise;
- derangement of efficient working process.

All persons dealing with start-up, operation, attendance and maintenance of the machine must:

- undergo relevant qualifying examination;
- have knowledge about welding;
- carefully follow these instructions.

Malfunctions that can reduce safety must be eliminated immediately.

USER'S RESPONSIBILITIES

To ensure individual protection, adhere to the following rules:

- wear robust footwear, which retains insulating properties in moist conditions as well;
- protect the hands with insulating gloves;
- protect the eyes with a headshield, with is equipped with a black-light filter complying with safety standards;
- wear only proper low-flammable clothes.

INDIVIDUAL PROTECTIVE EQUIPMENT

To ensure individual protection, adhere to the following rules:

- wear robust footwear, which retains insulating properties in moist conditions as well;
- protect the hands with insulating gloves;
- protect the eyes with a headshield, with is equipped with a black-light filter complying with safety standards;
- wear only proper low-flammable clothes.

DANGER OF HAZARDOUS GASES AND VAPOURS

- if smoke and hazardous gases emerge in the operating zone, remove them with special means;
- provide sufficient fresh air inflow;
- arc radiation field must be free from solvent vapours.

DANGER OF SPARKING

- remove flammable objects from the operating zone;
- it is not allowed to weld vessels where gases, fuel or oil products are stored or used to be stored. Residues of these products may explode;
- when working in fire-dangerous or explosion-dangerous rooms, adhere to special rules in compliance with national and international regulations.

DANGER OF MAINS AND ARC CURRENT

- electric shock can lead to death;
- magnetic fields created by this machine can have adverse effect on operability of electrical appliances (such as cardiac pacemakers). People who use such appliances shall consult with a doctor before approaching the operating welding area;
- welding cable must be robust, intact and insulated. Loose connections and damaged cables must be immediately replaced. Mains cables and cables of the welding machine must be checked for insulation integrity by an electrical engineer on a regular basis;
- when using the machine, never remove its outer case.

INFORMAL SAFETY MEASURES

- the manual must be always stored near the place where the welding machine is used;
- in additional to the manual, adhere to general and local safety and environmental rules;
- all instructions on the welding machine shall be kept readable.

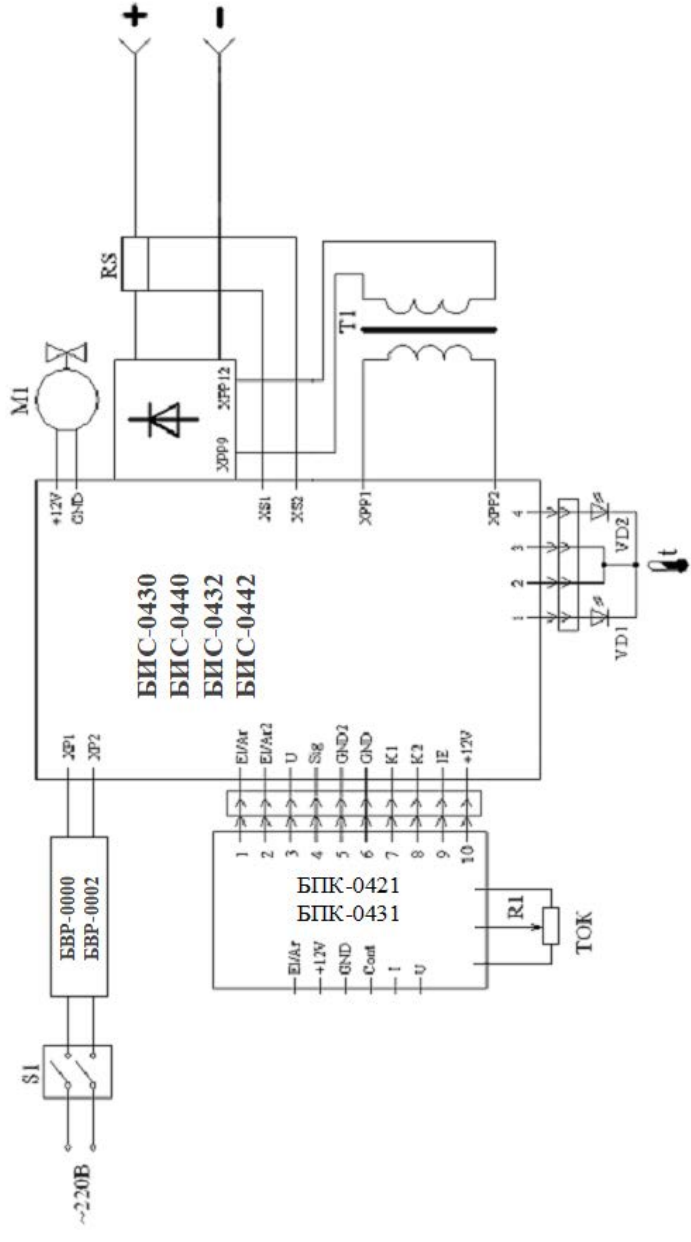
STRAY WELDING CURRENTS

- make sure that the earth cable terminal is securely connected to the work piece;
- if possible, avoid installing the welding machine directly on the conductive coating of floor or work table, use insulating pads.

SAFETY MEASURES IN NORMAL CONDITIONS

Check the machine for external damages and performance of safety devices at leat once a week.

12. SCHEMATIC ELECTRICAL DIAGRAM OF THE SOURCE



Schematic electrical diagram
of the Source ECO-160/200/250 DC MMA

13. WARRANTY LIABILITIES

Pilot Plant of Welding Equipment named after Ye. O. Paton guarantees proper operation of the supply source, provided that the consumer observes operating, storage and transportation conditions.

ATTENTION: Free warranty servicing is not provided if the welding machine is mechanically damaged!

Basic warranty period for welding inverters of E series is __ years. Basic warranty period is calculated from the date of sale of the inverter equipment to the ultimate buyer.

During the basic warranty period, the vendor is obliged to provide the owner of PATON TM inverter equipment with the following services for free:

- perform diagnostics and reveal the cause of fault;
- provide units and elements necessary to perform the repair;
- replace broken down elements and unit;
- conduct testing of the repaired equipment.

Basic warranty liabilities do not apply to equipment:

- which has mechanical damages affecting operability of the machine (deformation of the frame and details due to fall from height or drop of heavy objects on the equipment, buttons and slots falling out);
- with evidence of corrosion which caused its non-operability;
- broken down due to excess moisture affecting its power and electronic elements;
- broken down due to accumulation of conductive dust (coal dust, metal chips, etc.) inside of the machine;
- if the user attempted to repair the units of the machine and/or replace its electronic elements at his own discretion;
- depending on operating conditions, it is recommended to clean internal elements and units of this equipment with compressed air once per six months, in order to prevent break-down of the machine. Before cleaning the machine, remove the protective cover. Cleaning shall be performed carefully, with compressor hose held far enough from the machine so as not to damage the soldering of electronic elements and mechanical parts.

In addition, basic warranty liabilities do not apply to broken down external elements of the equipment, which are subject to physical contact, and associated/consumable materials which can be claimed two weeks after the sale date at the latest:

- ON and OFF button,
- welding parameters adjusting knobs,
- slots for connection of cables and hoses,
- control slots,
- mains cable and mains cable plug,
- carrying handle, shoulder strap, case, box,
- electrode holder, earth terminal, welding cables and hoses.

The vendor retains the right to refuse to perform warranty repair, or to set the warranty liabilities start day to month and year of the equipment manufacture (they can be determined from the serial number):

- if the owner has lost the data sheet;
- if the vendor did not fill in the data sheet or filled it incorrectly when selling the equipment,

- warranty period is extended by the period of warranty servicing of the equipment at the service facility.

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14. ACCEPTANCE CERTIFICATE

Arc inverter rectifier PATON ECO-_____E

Serial number _____E complies with GOST 13821-77

and has been approved for operation.

Date of sale "_____" _____ 20____

Stamp here _____

(vendor signature)

Date of receipt for repair "_____"_____20____

_____
(signature)

Symptoms of non-operability:

_____

Cause: _____

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Date of receipt for repair "_____"_____20____

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(signature)

Symptoms of non-operability:

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Cause: _____

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